



RF TEST REPORT

Report No.: SET2020-10142

Product Name: Harman SmartAuto TAG2.0

FCC ID: 2AHPN-HSA-20UT-AA

Model No. : HSA-20UT-AA

Applicant: Harman International Industries Incorporated

Address: 30001, Cabot Drive, Novi, MI 48377, USA.

Dates of Testing: 08/14/2019 —08/31/2020

Issued by: CCIC Southern Testing Co., Ltd.

Lab Location: Electronic Testing Building, No. 43 Shahe Road, Xili Street,
Nanshan District, Shenzhen, Guangdong, China.

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Test Report

Product Name : Harman SmartAuto TAG2.0

Brand Name : Harman

Trade Name : Harman

Applicant : Harman International Industries Incorporated

Applicant Address : 30001, Cabot Drive, Novi, MI 48377, USA.

Manufacturer : Harman International Industries Incorporated

Manufacturer Address : 30001, Cabot Drive, Novi, MI 48377, USA.

Test Standards : 47 CFR Part 15 Subpart E 15.407

Test Result : PASS

Tested by :

Vincent

2020.08.31

Vincent, Test Engineer

Reviewed by :

Chris You

2020.08.31

Chris You, Senior Engineer

Approved by :

Shuangwen Zhang

2020.08.31

Shuangwen Zhang, Manager



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Change History		
Issue	Date	Reason for change
1.0	2020.08.31	First edition

1. General Information

1.1. EUT Description

EUT Type	OBD II Telematics Device
EUT supports Radios application	WLAN5.0GHz 802.11a/n (HT20/40)
Product Type	Indoor
Modulation Type	CCK, DQPSK, DBPSK for DSSS 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDM
Transfer Rate	802.11a: 54/48/36/24/18/12/9/6Mbps 802.11n : up to 135Mbps
Frequency Range	Band UNII-1: 5150 ~ 5250MHz Band UNII-3: 5725 ~ 5850MHz
Channel Bandwidth	802.11a: 20MHz, 802.11n: 20MHz/40MHz
Channel Number	5150 MHz ~ 5250MHz/5725 MHz ~ 5850MHz:4/5 for 802.11a, 802.11n (HT20), 2 for 802.11n (HT40),
Antenna Type	Internal
Antenna Gain	2dBi
Output Power (Max.)	Band UNII-1: 12.46dBm Band UNII-3: 13.71dBm

1.2. Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart E for the EUT FCC Certification:

No.	Identity	Document Title
1	47 CFR Part 15 Subpart E § 15.407	Radio Frequency Devices
2	789033 D02 General UNII Test Procedures New Rules v02r01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
3	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

Test detailed items/section required by FCC rules, and results are as below:

No.	FCC Rule	Description	Result
1	15.203	Antenna Requirement	PASS
2	15.407(a)	Maximum Conducted Output Power	PASS
3	15.407(a)	Emission Bandwidth(26 dB Bandwidth)	PASS
	15.407(e)	Emission Bandwidth(6 dB Bandwidth)	PASS
	-	Emission Bandwidth(99%)	PASS
4	15.407(a)	Power spectral density (PSD)	PASS
5	15.207	AC Power Line Conducted Emission	PASS
6	15.209	Radiated Band Edges and Spurious	PASS
	15.407(b)	Emission	
7	15.407(g)	Frequency Stability	PASS

1.3. Channel List

Operated band in 5150 MHz ~ 5250MHz

4 channels are provided for 802.11a, 802.11n-HT20

Channel	Frequency	Channel	Frequency
36	5180 MHz	44	5220 MHz
40	5200 MHz	48	5240 MHz

2 channels are provided for 802.11n-HT40

Channel	Frequency	Channel	Frequency
38	5190 MHz	46	5230 MHz

Operated band in 5725 MHz ~ 5850MHz

5 channels are provided for 802.11a, 802.11n-HT20

Channel	Frequency	Channel	Frequency
149	5745 MHz	161	5805 MHz
153	5765 MHz	165	5825 MHz
157	5785 MHz	/	/

2 channels are provided for 802.11n-HT40

Channel	Frequency	Channel	Frequency
151	5755 MHz	159	5795 MHz

1.4. Test environment and mode

Operating Environment	
Temperature	24°C
Humidity	57 % RH
Atmospheric Pressure	1010 mbar
Test mode:	
Continuously transmitting mode	Keeps the EUT in 100% duty cycle transmitting with modulation in SISO, duty cycle factor is not required.

We have verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

For Frequency band 5150 ~ 5250 MHz			
Mode	Modulation scheme / bandwidth		
	5180 MHz	5220 MHz	5240 MHz
802.11a	6 Mbps	6 Mbps	6 Mbps
802.11n – HT20	MCS 0	MCS 0	MCS 0
Frequency	5190 MHz		5230 MHz
802.11n – HT40	MCS 0		MCS 0

For Frequency band 5725 ~ 5850 MHz			
Mode	Modulation scheme / bandwidth		
	5745 MHz	5785 MHz	5825 MHz
802.11a	6 Mbps	6 Mbps	6 Mbps
802.11n/ac – HT20	MCS 0	MCS 0	MCS 0
Frequency	5755 MHz		5795 MHz
802.11n/ac – HT40	MCS 0		MCS 0

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 modes or test configuration modes mentioned above was evaluated respectively.

Pretest Test Mode	Description
Mode 1	TX A Mode / CH36, CH44, CH48 (UNII-1)
Mode 2	TX N20 Mode / CH36, CH44, CH48 (UNII-1)
Mode 3	TX N40 Mode / CH38, CH46 (UNII-1)
Mode 4	TX A Mode / CH149, CH157, CH165 (UNII-3)
Mode 5	TX N20 Mode / CH149, CH157, CH165 (UNII-3)
Mode 6	TX N40 Mode / CH151, CH159 (UNII-3)
Mode 7	TX Mode

The EUT system operated these modes were found to be the worst case during the pre-scanning test as following:

For Conducted Test	
Final Test Mode	Description
Mode 7	TX Mode
For Radiated Test	
Final Test Mode	Description
Mode 1	TX A Mode / CH36, CH44, CH48 (UNII-1)
Mode 2	TX N20 Mode / CH36, CH44, CH48 (UNII-1)
Mode 3	TX N40 Mode / CH38, CH46 (UNII-1)
Mode 4	TX A Mode / CH149, CH157, CH165 (UNII-3)
Mode 5	TX N20 Mode / CH149, CH157, CH165 (UNII-3)
Mode 6	TX N40 Mode / CH151, CH159 (UNII-3)

1.5. Power level setup in software

Power level setup in software for 5G wifi			
UNII-1			
Frequency (MHz)	5180	5220	5240
A mode	17	17	17
Frequency (MHz)	5180	5220	5240
N20 mode	15	15	15
Frequency (MHz)	5190	5230	\
N40 mode	15	15	\
Power level setup in software for 5G wifi			
UNII-3			
Frequency (MHz)	5745	5785	5825
A mode	15	15	15
Frequency (MHz)	5745	5785	5825
N20 mode	15	15	15
Frequency (MHz)	5755	5795	\
N40 mode	16	16	\

1.6. Laboratory Facilities

FCC-Registration No.: CN5031

CCIC Southern Testing Co., Ltd. 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. Designation Number: CN5031, valid time is until December 31, 2020.

ISED Registration: 11185A-1

CAB identifier:CN0064

CCIC Southern Testing Co., Ltd. EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for the performance of radiated measurements with Registration No. 11185A-1 on Aug. 04, 2016, valid time is until Dec. 31, 2020.

NVLAP Lab Code: 201008-0

CCIC-SET is a third party testing organization accredited by NVLAP according to ISO/IEC 17025. The accreditation certificate number is 201008-0.



2. 47 CFR Part 15E Requirements

2.1. Antenna requirement

2.1.1. Applicable Standard

According to FCC 15.203, 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.

And according to FCC 47 CFR Section 15.407(E), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

2.1.2. Antenna Information

Antenna Type	PCB
Antenna Gain	2dBi

2.1.3. Result: comply

The EUT has a permanently and irreplaceable attached antenna. Please refer to the EUT internal photos.

2.2. Output Power

2.2.1. Limit of Output Power

FCC 15.407(a)

The maximum conducted output power should not exceed:

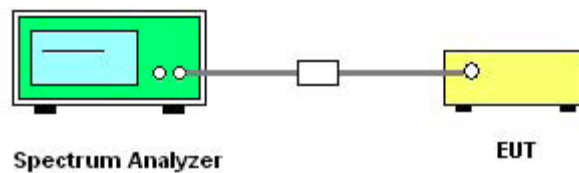
Band	EUT Category	Limit
U-NII-1	<input checked="" type="checkbox"/> Outdoor Access Point	1 Watt (30 dBm)
	<input type="checkbox"/> Fixed point-to-point Access device	1 Watt (30 dBm)
	<input type="checkbox"/> Indoor Access Point	1 Watt (30 dBm)
	<input type="checkbox"/> Mobile and portable client device	250mW (24 dBm)
U-NII-2A	<input type="checkbox"/>	250mW (24 dBm) or $11\text{dBm} + 10\log B^*$ Whichever is less.
U-NII-2C	<input type="checkbox"/>	250mW (24 dBm) or $11\text{dBm} + 10\log B^*$ Whichever is less.
U-NII-3	<input checked="" type="checkbox"/>	1 Watt (30 dBm)

Note: B* is the 26 dB emission bandwidth in MHz.

2.2.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.2.3. Test Setup



2.2.4. Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02 Method SA-1
2. The RF output of EUT was connected to spectrum analyzer 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.
4. Set RBW=1MHz, VBW=3MHz, Sweep time=Auto, Detector=average (RMS), Compute power by integrating the spectrum across the 99%OBW.
5. Measure the conducted output power and record the results in the test report.

2.2.5. Test Result

Please refer to APPENDIX A for detail

2.3. Emission Bandwidth

2.3.1. Limit of Bandwidth

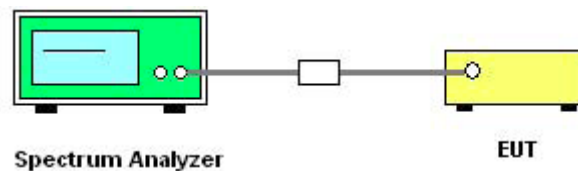
There is no limit bandwidth for band U-NII-1, U-NII-2A and U-NII-2C.

The minimum of 6dB bandwidth measurement is 0.5 MHz for U-NII-3.

2.3.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.3.3. Test Setup



2.3.4. Test Procedures

1. The testing follows the Measurement Procedure of FCC KDB 789033 D02 General UNII Test Procedures New Rules v02.

2. The RF output of EUT was connected to the spectrum analyzer 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.

4. For 26dB bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = approximately 1%EBW, VBW \geq 3RBW, Detector = Peak, Trace mode = max hold

Span > 26 dB bandwidth and Sweep time = auto

5. Use the spectrum analyzer N dB down function to find the 26dB bandwidth.

6. For 6 Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) = 100kHz
VBW = 300 kHz, Detector = Peak, Trace mode = max hold

7. Use the spectrum analyzer N dB down and 99%OBW function to find the 6dB and 99% bandwidth

8. Measure and record the worst results in the test report.



2.3.5. Test Results Bandwidth

Please refer to APPENDIX A for detail

2.4. Power spectral density (PSD)

2.4.1. Limit of Power Spectral Density

FCC 15.407(a)

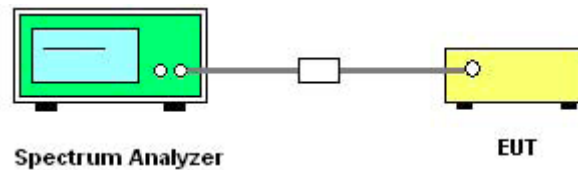
The maximum power spectral density should not exceed:

Band	EUT Category	Limit
U-NII-1	<input checked="" type="checkbox"/> Access Point (Master device)	17 dBm/MHz
	<input type="checkbox"/> Fixed point-to-point Access device	
	<input type="checkbox"/> Mobile and portable client device	11 dBm/MHz
U-NII-2A	<input type="checkbox"/>	11 dBm/MHz
U-NII-2C	<input type="checkbox"/>	11 dBm/MHz
U-NII-3	<input checked="" type="checkbox"/>	30dBm/500kHz

2.4.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.4.3. Test Setup



2.4.4. Test Procedures

1. Place the EUT on the table and set it in transmitting mode.
2. The testing follows FCC KDB 789033 D02 General UNII Test Procedures New Rules v02.
3. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to Spectrum.

4. For U-NII-1, U-NII-2A, U-NII-2C Band:

Using method SA-1

Set RBW=1MHz, VBW=3MHz, where span is enough to capture the entire bandwidth, Sweep time = Auto, detector = sample, traces 100 sweeps of averaging mode.

For U-NII-3 Band:

Set RBW=500 kHz, $VBW \geq 3RBW$, where span is enough to capture the entire bandwidth, Sweep time = Auto, detector = sample, traces 100 sweeps of averaging mode.

5. Use peak search function on the instrument to find the peak of the spectrum and record its value
6. Repeat above procedures until all default test channel (low, middle, and high) was complete.



2.4.5. Test Results of Power spectral density

Please refer to APPENDIX A for detail

2.5. Frequency Stability

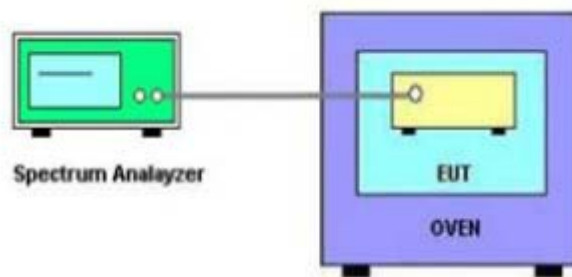
2.5.1. Limit

FCC 15.407(b) Frequency Stability	
Frequency Band(MHz)	Limit
5150~5250	Specified in the user's manual
5250~5350	
5470~5725	
5725~5850	

2.5.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.5.3. Test Setup



2.5.4. Test Procedures

1. The EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting and enable the EUT transmit continuously.
3. The EUT is installed in an environment test chamber with external power source.
4. Set the chamber to operate at 50 centigrade and external power source to output at nominal voltage of EUT.
5. A sufficient stabilization period at each temperatures in used prior to each frequency measurement.
6. The test shall be performed under -10 to 55 centigrade and 85 to 115 percent of the nominal voltage. Change setting of chamber and external power source to complete all conditions.
7. Measure and record the worst results in the test report.



2.5.5. Test Results of Frequency Stability

Please refer to APPENDIX A for detail

2.6. Radiated Band Edge and Spurious Emission

2.6.1. Limit of Radiated Band Edges and Spurious Emission

Radiated emission which fall in the restricted bands must comply with the radiated emission limits specified as below table. Other emissions shall be at least 20dB below the highest level of the desired power:

Frequency (MHz)	Field Strength ($\mu\text{V}/\text{m}$)	Measurement Distance (m)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. Emission level (dBuV/m) = 20 log Emission level ($\mu\text{V}/\text{m}$).
3. For frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

Limits of unwanted emission out of the restricted bands

Applicable To	Limit	
789033 D02 General UNII Test Procedures New Rules v01	Field Strength at 3m	
	PK:74(dB $\mu\text{V}/\text{m}$)	AV:54 (dB $\mu\text{V}/\text{m}$)

Frequency Band (MHz)	Frequency (MHz)	EIRP Limit (dBm)	Equivalent Field Strength (3m) (dB $\mu\text{V}/\text{m}$)
5150 - 5250	Outside of the 5.15~5.35 GHz	-27	68.2
5250 - 5350	Outside of the 5.15~5.35 GHz		
5470 -5725	Outside of the 5.47~5.725 GHz		

FCC 15.407			
Frequency Band (MHz)	Frequency (MHz)	EIRP Limit (dBm)	Equivalent Field Strength (3m) (dBμV/m)
5725 - 5850	<5650	-27	68.2
	5650~5700	-27~10	68.2~105.2
	5700~5720	10~15.6	105.2~110.8
	5720~5725	15.6~27	110.8~122.2
	5850~5855	27~15.6	122.2~110.8
	5855~5875	15.6~10	110.8~105.2
	5875~5925	10~-27	105.2~68.2
	>5925	-27	68.2

Note: 1. The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength:

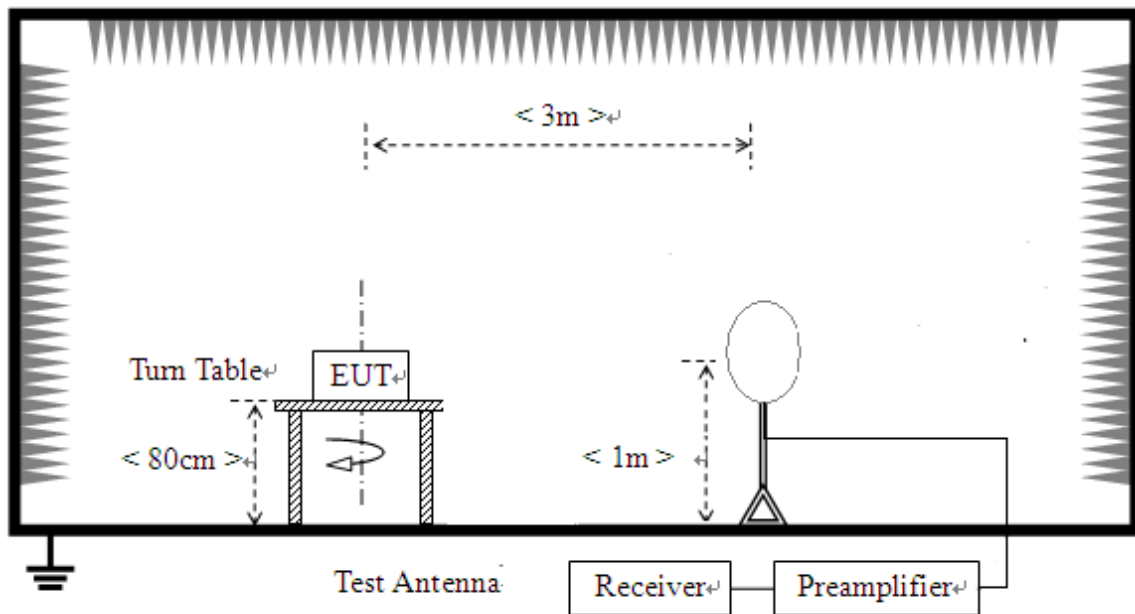
$$E = \frac{1000000 \sqrt{30P}}{3} \mu\text{V/m, where } P \text{ is the eirp (Watts).}$$

2.6.2. Measuring Instruments

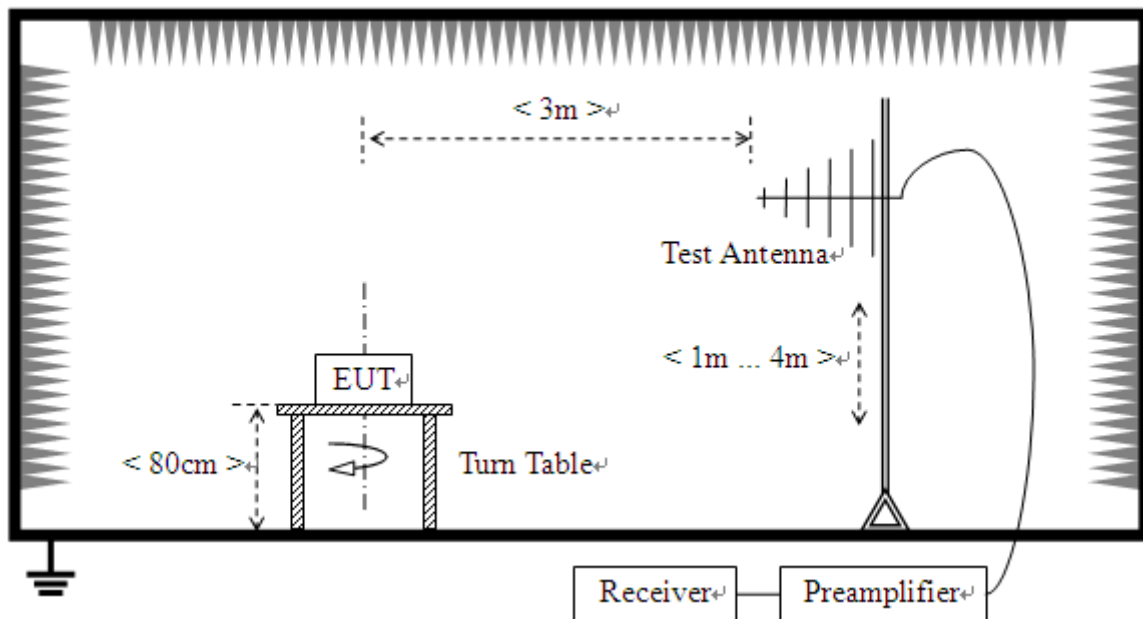
The measuring equipment is listed in the section 3 of this test report.

2.6.3. Test Setup

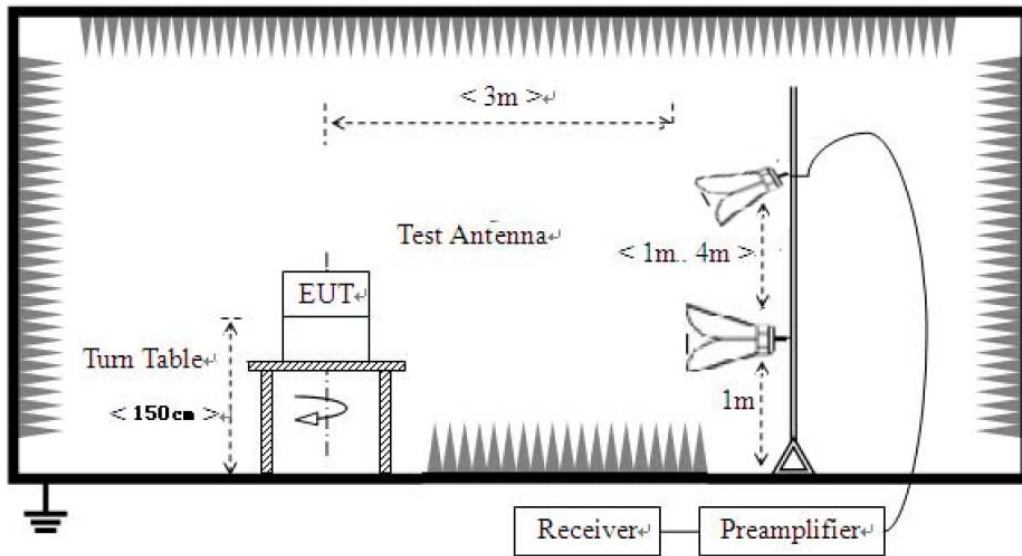
For radiated emissions from 9 KHz to 30 MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



2.6.4. Test Procedures

1. The EUT was placed on the top of a rotating table 0.8 meters (for below 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. The height of antenna is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
6. The test-receiver system was set to peak and average detects function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.



Note:

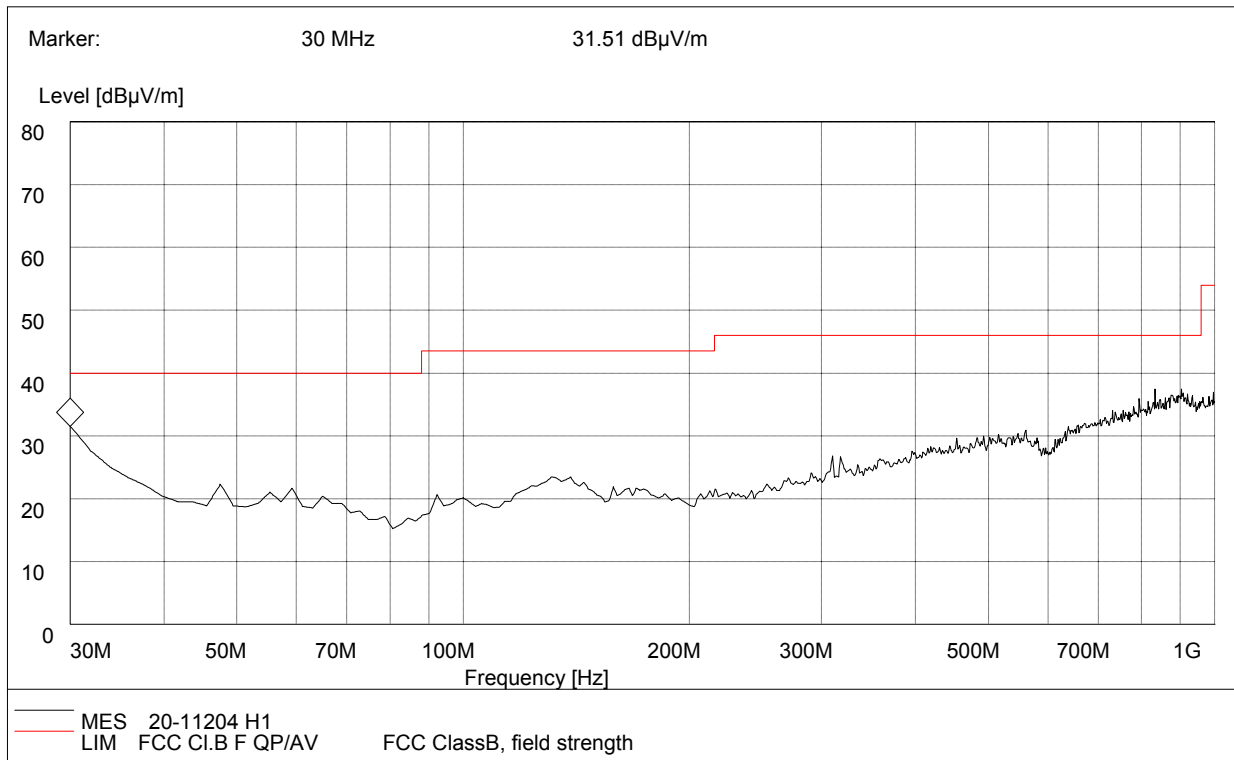
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Quasi-peak detection (QP) at frequency below 1 GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 3MHz for RMS Average (Duty cycle < 98%) for Average detection (AV) at frequency above 1GHz, then the measurement results was added to a correction factor ($10 \log(1/\text{duty cycle})$).
4. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and the video bandwidth is 10Hz (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
5. Only provide worst-Case mode data provide here, 802.11a (20MHz) 5700MHz for Below 1GHz .

2.6.5. Test Results of Radiated Band Edge and Spurious Emission

For 9 KHz to 30MHz

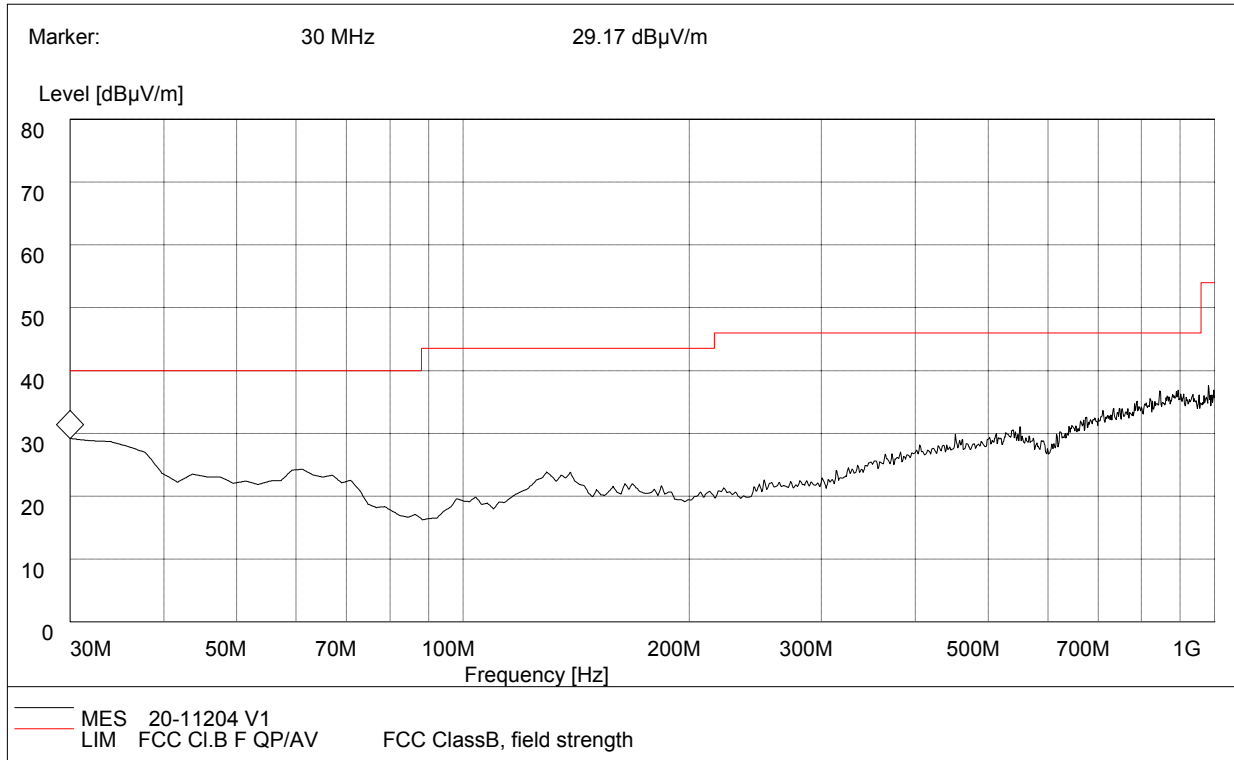
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

For 30MHz to 1000 MHz



30MHz to 1GHz, Antenna Horizontal

Frequency (MHz)	QuasiPeak (dB µ V/m)	Bandwidth (kHz)	Corr. Factor (dB/m)	Antenna height (cm)	Limit (dB µ V/m)	Margin	Antenna	Verdict
30.000000	29.86	120.000	17.90	100.0	40.0	10.14	Horizontal	Pass
47.490000	21.13	120.000	8.70	100.0	40.0	18.87	Horizontal	Pass
131.080000	22.28	120.000	13.70	100.0	43.5	21.22	Horizontal	Pass
169.9500003	19.68	120.000	11.80	100.0	43.5	23.82	Horizontal	Pass
309.910000	24.50	120.000	13.10	100.0	46.0	21.5	Horizontal	Pass
560.670000	28.69	120.000	20.00	100.0	46.0	17.31	Horizontal	Pass



30MHz to 1GHz, Antenna Vertical

Frequency (MHz)	QuasiPeak (dB μ V/m)	Bandwidth (kHz)	Corr. Factor (dB μ V/m)	Antenna height (cm)	Limit (dB μ V/m)	Margin	Antenna	Verdict
30.060000	27.56	120.000	17.90	100.0	40.0	12.44	Vertical	Pass
59.150000	22.64	120.000	8.20	100.0	40.0	17.36	Vertical	Pass
129.130000	21.89	120.000	13.70	100.0	43.5	21.61	Vertical	Pass
168.010000	20.67	120.000	11.80	100.0	43.5	22.83	Vertical	Pass
405.170000	26.94	120.000	17.50	100.0	46.0	19.06	Vertical	Pass
539.290000	30.21	120.000	20.00	100.0	46.0	15.79	Vertical	Pass

**For 1GHz to 40 GHz**

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11a_5180MHz)									
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5150.00	54.36	PK	68.20	-13.84	1.50	200	46.86	7.50
2	5150.00	43.12	AV	54.00	-10.88	1.50	200	35.62	7.50
3	10360.00	55.98	PK	68.20	-12.22	1.50	200	36.18	19.80
ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11a_5180MHz)									
No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5150.00	54.58	PK	68.20	-13.62	1.60	300	47.08	7.50
2	5150.00	43.59	AV	54.00	-10.41	1.60	300	36.09	7.50
3	10360.00	55.68	PK	68.20	-12.52	1.60	300	35.88	19.80

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11a_5220MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	10400.00	58.69	PK	68.20	-9.51	1.60	320	38.79	19.90

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11a_5220MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	10400.00	58.74	PK	68.20	-9.46	1.50	250	38.84	19.90

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11a_5240MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5350.00	57.69	PK	68.20	-10.51	1.60	320	49.69	8.00
2	5350.00	47.10	AV	54.00	-6.9	1.60	320	39.10	8.00
3	10480.00	56.84	PK	68.20	-11.36	1.60	320	36.94	19.90

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11a_5240MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5350.00	53.62	PK	68.20	-14.58	1.80	300	45.62	8.00
2	5350.00	42.60	AV	54.00	-11.4	1.80	300	34.60	8.00
3	10480.00	58.25	PK	68.20	-9.95	1.80	300	38.35	19.90

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11a_5745MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5725.00	54.62	PK	68.20	-13.58	1.60	220	44.97	9.65
2	11490.00	55.68	PK	68.20	-12.52	1.60	220	33.98	21.70
3	11490.00	45.01	AV	54.00	-8.99	1.60	220	23.31	21.70

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11a_5745MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5725.00	56.32	PK	68.20	-11.88	1.80	320	46.67	9.65
2	11490.00	54.58	PK	68.20	-13.62	1.80	320	32.88	21.70
3	11490.00	43.84	AV	54.00	-10.16	1.80	320	22.14	21.70

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11a_5785MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	11570.00	56.32	PK	68.20	-11.88	1.50	300	34.62	21.70
2	11570.00	45.97	AV	54.00	-8.03	1.50	300	24.27	21.70

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11a_5785MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	11570.00	55.84	PK	68.20	-12.36	1.80	300	34.14	21.70
2	11570.00	45.46	AV	54.00	-8.54	1.80	300	23.76	21.70

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11a_5825MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5850.00	54.58	PK	68.20	-13.62	1.80	300	44.80	9.78
2	11650.00	56.35	PK	68.20	-11.85	1.80	300	34.45	21.90
3	11650.00	46.00	AV	54.00	-8	1.80	300	24.10	21.90

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11a_5825MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5850.00	53.69	PK	68.20	-14.51	1.70	300	43.91	9.78
2	11650.00	58.63	PK	68.20	-9.57	1.70	300	36.73	21.90
3	11650.00	48.48	AV	54.00	-5.52	1.70	300	26.58	21.90

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n20_5180MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5150.00	53.62	PK	68.20	-14.58	1.50	200	46.12	7.50
2	5150.00	42.04	AV	54.00	-11.96	1.50	200	34.54	7.50
3	10360.00	54.98	PK	68.20	-13.22	1.50	200	35.18	19.80

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n20_5180MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5150.00	55.68	PK	68.20	-12.52	1.60	300	48.18	7.50
2	5150.00	44.94	AV	54.00	-9.06	1.60	300	37.44	7.50
3	10360.00	56.32	PK	68.20	-11.88	1.60	300	36.52	19.80

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n20_5220MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	10400.00	57.84	PK	68.20	-10.36	1.60	320	37.94	19.90

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n20_5220MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	10400.00	57.77	PK	68.20	-10.43	1.50	250	37.87	19.90

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n20_5240MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5350.00	56.32	PK	68.20	-11.88	1.60	320	48.32	8.00
2	5350.00	45.77	AV	54.00	-8.23	1.60	320	37.77	8.00
3	10480.00	55.94	PK	68.20	-12.26	1.60	320	36.04	19.90

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n20_5240MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5350.00	54.84	PK	68.20	-13.36	1.80	300	46.84	8.00
2	5350.00	43.46	AV	54.00	-10.54	1.80	300	35.46	8.00
3	10480.00	57.36	PK	68.20	-10.84	1.80	300	37.46	19.90

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n20_5745MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5725.00	55.87	PK	68.20	-12.33	1.60	220	46.22	9.65
2	11490.00	54.96	PK	68.20	-13.24	1.60	220	33.26	21.70
3	11490.00	44.29	AV	54.00	-9.71	1.60	220	22.59	21.70

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n20_5745MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5725.00	58.36	PK	68.20	-9.84	1.80	320	48.71	9.65
2	11490.00	55.74	PK	68.20	-12.46	1.80	320	34.04	21.70
3	11490.00	45.00	AV	54.00	-9	1.80	320	23.30	21.70

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n20_5785MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	11570.00	54.36	PK	68.20	-13.84	1.50	300	32.66	21.70
2	11570.00	44.01	AV	54.00	-9.99	1.50	300	22.31	21.70

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n20_5785MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	11570.00	56.98	PK	68.20	-11.22	1.80	300	35.28	21.70
2	11570.00	46.60	AV	54.00	-7.4	1.80	300	24.90	21.70

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n20_5825MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5850.00	55.97	PK	68.20	-12.23	1.80	300	46.19	9.78
2	11650.00	56.35	PK	68.20	-11.85	1.80	300	34.45	21.90
3	11650.00	46.00	AV	54.00	-8	1.80	300	24.10	21.90

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n20_5825MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5850.00	53.24	PK	68.20	-14.96	1.40	180	43.46	9.78
2	11650.00	51.87	PK	68.20	-16.33	2.00	0	29.97	21.90
3	11650.00	42.33	AV	54.00	-11.67	2.00	0	20.43	21.90

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n40_5190MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5150.00	54.85	PK	68.20	-13.35	1.60	300.00	47.35	7.50
2	5150.00	44.07	AV	54.00	-9.93	1.60	300.00	36.57	7.50
3	10380.00	56.33	PK	68.20	-11.87	1.60	260.00	36.53	19.80

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n40_5190MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5150.00	53.98	PK	68.20	-14.22	1.70	280.00	46.48	7.50
2	5150.00	43.24	AV	54.00	-10.76	1.70	280.00	35.74	7.50
3	10380.00	54.29	PK	68.20	-13.91	1.70	280.00	34.49	19.80

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n40_5230MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5350.00	53.69	PK	68.20	-14.51	1.60	300.00	45.69	8.00
2	5350.00	43.40	AV	54.00	-10.6	1.60	300.00	35.40	8.00
3	10460.00	55.19	PK	68.20	-13.01	1.60	300.00	35.29	19.90

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n40_5230MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5350.00	55.24	PK	68.20	-12.96	1.80	280.00	47.24	8.00
2	5350.00	44.50	AV	54.00	-9.5	1.80	280.00	36.50	8.00
3	10460.00	56.39	PK	68.20	-11.81	1.80	300.00	36.49	19.90

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n40_5755MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5725.00	54.95	PK	68.20	-13.25	1.60	120.00	45.30	9.65
2	5725.00	45.97	AV	54.00	-8.03	1.60	120.00	36.32	9.65
3	11510.00	55.78	PK	68.20	-12.42	1.60	120.00	34.08	21.70

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n40_5755MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5725.00	56.32	PK	68.20	-11.88	1.80	300.00	46.67	9.65
2	5725.00	45.67	AV	54.00	-8.33	1.80	300.00	36.02	9.65
3	11510.00	55.32	PK	68.20	-12.88	1.80	300.00	33.62	21.70

**ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M (802.11n40_5795MHz)**

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5850.00	55.98	PK	68.20	-12.22	1.60	240.00	46.20	9.78
2	5850.00	45.13	AV	54.00	-8.87	1.60	240.00	35.35	9.78
3	11590.00	56.39	PK	68.20	-11.81	1.60	240.00	34.59	21.80

ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M (802.11n40_5795MHz)

No.	Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Table Angle (Degree)	Raw Value (dBuV/m)	Correction Factor (dB/m)
1	5850.00	55.94	PK	68.20	-12.26	1.80	290.00	46.16	9.78
2	5850.00	45.16	AV	54.00	-8.84	1.80	290.00	35.38	9.78
3	11590.00	56.87	PK	68.20	-11.33	1.80	290.00	35.07	21.80

REMARKS:

1. Emission Level(dBuV/m) = Raw Value(dBuV) + Correction Factor(dB/m)
2. Correction Factor(dB/m) = Antenna Factor(dB/m) + Cable Factor(dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission Level – Limit value

2.7. Conducted Emission

2.7.1. Limit of Conducted Emission

FCC 15.207,

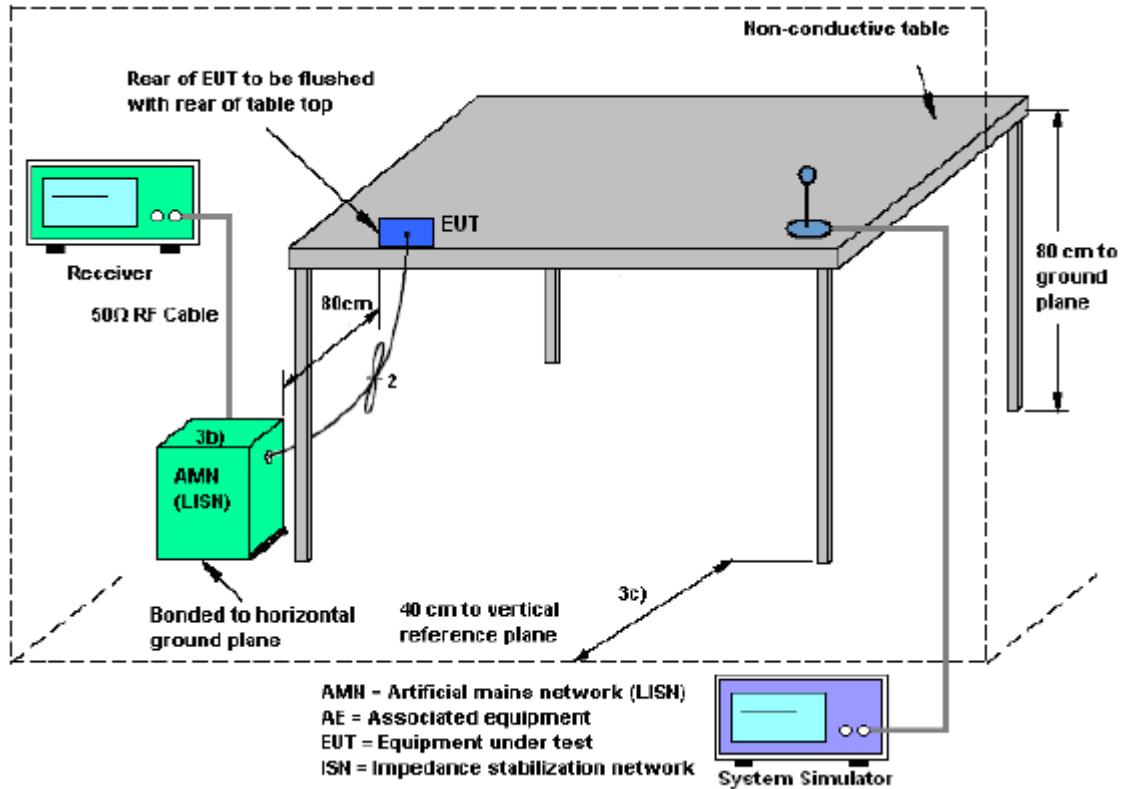
For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

2.7.2. Measuring Instruments

The measuring equipment is listed in the section 3 of this test report.

2.7.3. Test Setup

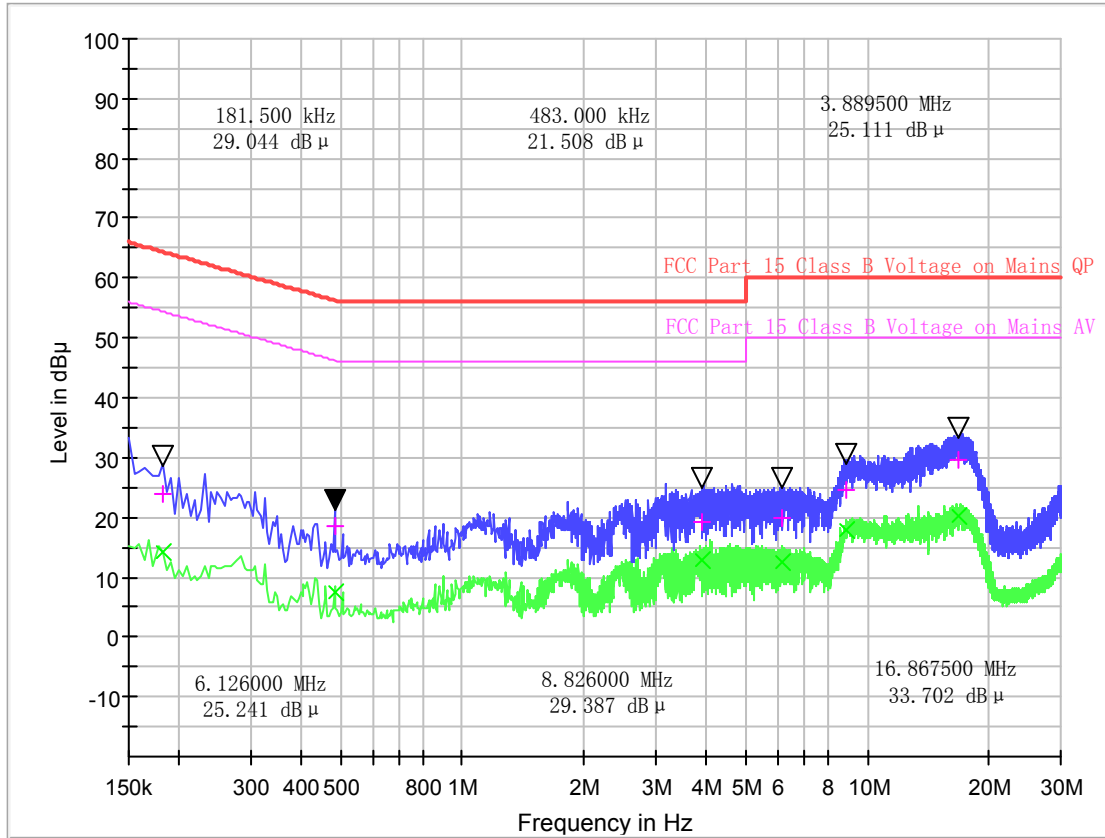


2.7.4. Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF Bandwidth = 9kHz) with Maximum Hold Mode. Then measurement is also conducted by Average Detector and Quasi-Peak Detector Function respectively.

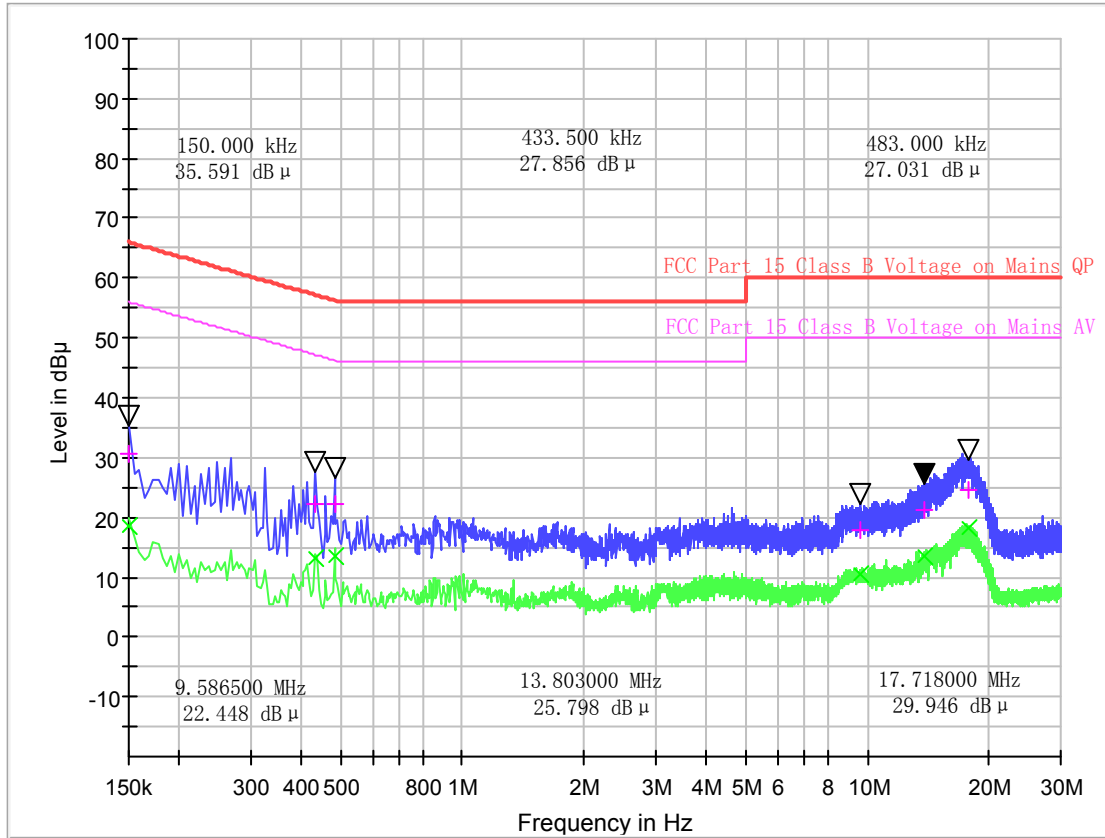
2.7.5. Test Results of Conducted Emission

The EUT configuration of the emission tests is 5G WLAN Link + USB Cable (Charging from Adapter)



(Plot A: L Phase)

Frequency (MHz)	QuasiPeak (dB µ V)	CAverage (dB µ V)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV (dB µ V)
0.181500	23.92	14.07	0.1	10.1	40.50	64.4	40.35	54.4
0.483000	18.47	7.34	0.1	10.1	37.82	56.3	38.95	46.3
3.889500	19.27	12.83	0.6	10.6	36.73	56.0	33.17	46.0
6.126000	20.01	12.39	0.6	10.6	39.99	60.0	37.61	50.0
8.826000	24.47	17.77	0.6	10.6	35.53	60.0	32.23	50.0
16.867500	29.60	20.15	0.7	10.7	30.40	60.0	29.85	50.0



(Plot A: NPhase)

Frequency (MHz)	QuasiPeak (dB µ V)	CAverage (dB µ V)	Cabel Loss (dB)	Corr. (dB)	Margin - QPK	Limit - QPK	Margin - AV	Limit - AV (dB µ V)
0.150000	30.70	18.60	0.1	10.1	35.30	66.0	37.40	56.0
0.433500	22.36	13.12	0.1	10.1	34.83	57.2	34.07	47.2
0.483000	22.07	13.55	0.6	10.6	34.22	56.3	32.74	46.3
9.586500	18.03	10.57	0.6	10.6	41.97	60.0	39.43	50.0
13.803000	21.39	13.49	0.6	10.6	38.61	60.0	36.51	50.0
17.718000	24.72	18.11	0.7	10.7	35.28	60.0	31.89	50.0

Test result:PASS

Note: Correction factor=Cabel loss+ attenuation factor
attenuation factor=10dB

3. List of measuring equipment

Item	Test Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	EMI TEST RECEIVER	R&S	ESU8	A0805559	2020.04.03	2021.04.02
2	Power Meter	R&S	NRP-Z31	102872	2020.05.18	2021.05.17
3	TURNTABLE	ETS	2088	2149	N/A	N/A
4	ANTENNA MAST	ETS	2075	2346	N/A	N/A
5	EMI TEST Software	R&S	ESK1	N/A	N/A	N/A
6	Horn antenna (18GHz~26.5GHz)	AR	AT4002A	305753	2017.11.10	2020.11.09
7	Amplifier	MILMEGA	80RF1000-250	A140901925	2017.10.09	2020.10.08
8	JS amplifier	AR	25S1G4AM1	A0304248	2017.10.09	2020.10.08
9	High pass filter	Compliance Direction systems	BSU-6	34202	2019.11.10	2020.11.09
13	Horn Antenna	AR	AT4002A	305753	2017.11.10	2020.11.09
14	Horn Antenna	AR	AT4003A	325306	2018.09.17	2020.09.16
15	ULTRA-BROADBAND ANTENNA	SCHWARZBECK	VULB9160	A0805560	2019.05.24	2022.05.23
16	Passive Loop Antenna	R&S	HFH2-Z2	100047	2019.04.26	2022.04.25
17	Temperature chamber	Tomilo	TOD-B165FXS-4K	A181003256	2019.11.21	2020.11.20
18	Spectrum Analyzer	KEYSIGHT	N9030A	A160702554	2020.05.18	2021.05.17
19	Power Supply	R&S	ESIB26	A0304218	2020.04.29	2021.04.28
20	LISN	ROHDE&SCHWARZ	ESH2-Z5	A0304221	2020.04.03	2021.04.02

4. Uncertainty of Evaluation

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013. All the measurement uncertainty value were shown with a coverage $K=2$ to indicate 95% level of confidence . The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Emission Measurement (150KHz~30MHz)

Measuring Uncertainty for a level of confidence of 95%($U=2U_c(y)$)	2.8dB
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Uncertainty of Radiated Emission Measurement (30MHz~1GHz)

Measuring Uncertainty for a level of confidence of 95%($U=2U_c(y)$)	5.0dB
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Uncertainty of Radiated Emission Measurement (1GHz~18GHz)

Measuring Uncertainty for a level of confidence of 95%($U=2U_c(y)$)	5.1dB
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Uncertainty of Radiated Emission Measurement (18GHz~40GHz)

Measuring Uncertainty for a level of confidence of 95%($U=2U_c(y)$)	5.1dB
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Appendix A

Output power

Test results

Test results of band U-NII-1 (5150 ~ 5250 MHz)

U-NII-1 AVGSA Output Power				
Mode	Test Frequency (MHz)	Max Power (dBm)	FCC Limit (dBm)	Result
802.11n (20MHz)	5180	11.72	30	Pass
802.11n (20MHz)	5220	11.44		Pass
802.11n (20MHz)	5240	11.70		Pass
802.11n (40MHz)	5190	11.24		Pass
802.11n (40MHz)	5230	11.28		Pass
802.11a (20MHz)	5180	12.46		Pass
802.11a (20MHz)	5220	11.92		Pass
802.11a (20MHz)	5240	11.50		Pass



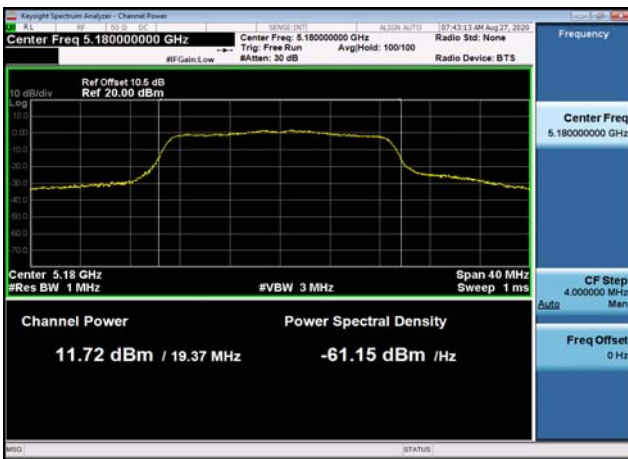
Conducted Power Test results of band U-NII-3 (5725 ~ 5850 MHz)

U-NII-3 AVGSA Output Power				
Mode	Test Frequency (MHz)	Max Power (dBm)	FCC Limit (dBm)	Result
802.11n (20MHz)	5745	11.20	30	Pass
802.11n (20MHz)	5785	11.31		Pass
802.11n (20MHz)	5825	11.40		Pass
802.11n (40MHz)	5755	11.38		Pass
802.11n (40MHz)	5795	11.85		Pass
802.11a (20MHz)	5745	12.24		Pass
802.11a (20MHz)	5785	11.81		Pass
802.11a (20MHz)	5825	13.71		Pass

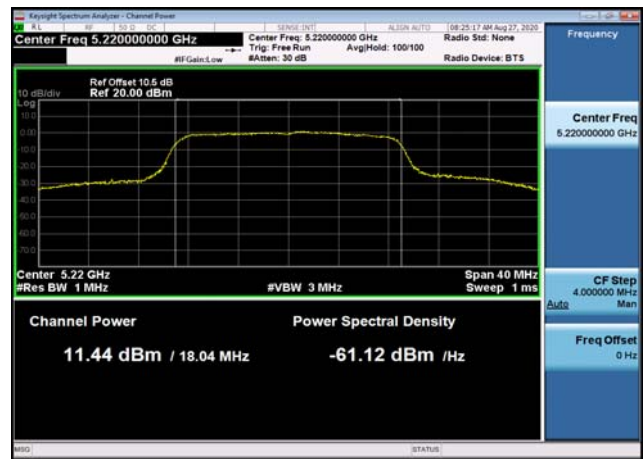


Test plots

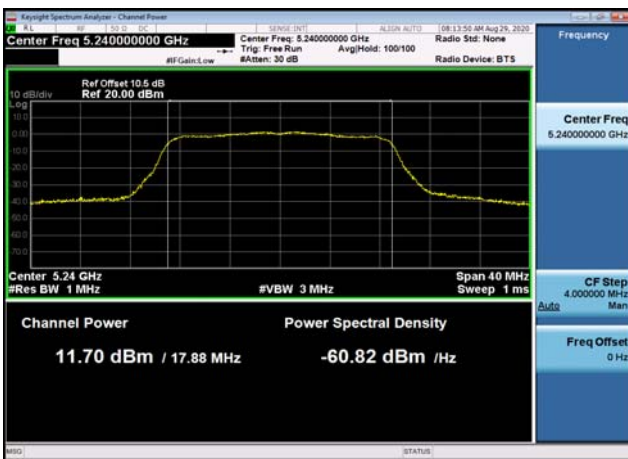
U-NII-1 Output Power-802.11n(20MHz)
,5180MHz,Ant1



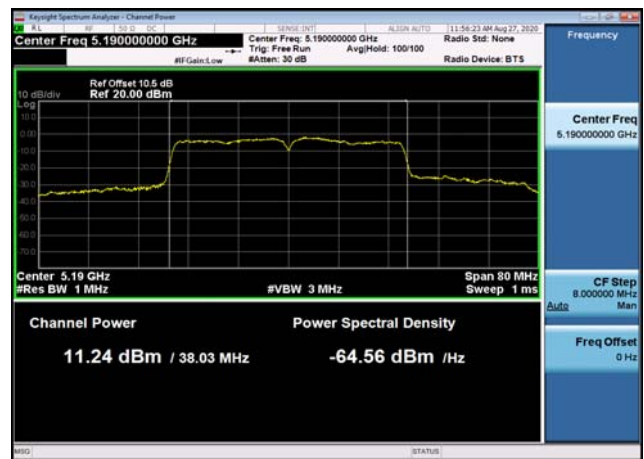
U-NII-1 Output Power-802.11n(20MHz)
,5220MHz,Ant1



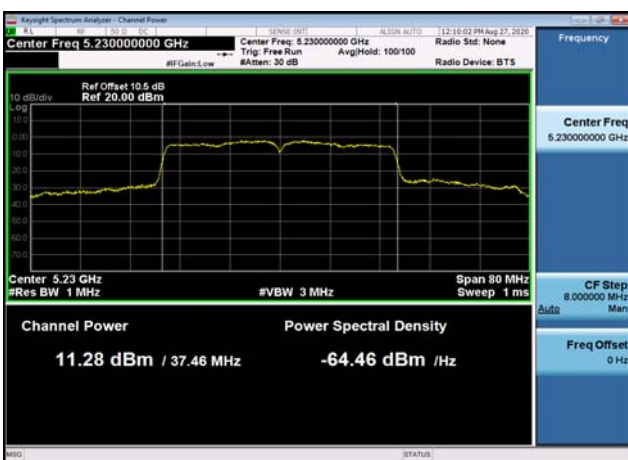
U-NII-1 Output Power-802.11n(20MHz)
,5240MHz,Ant1



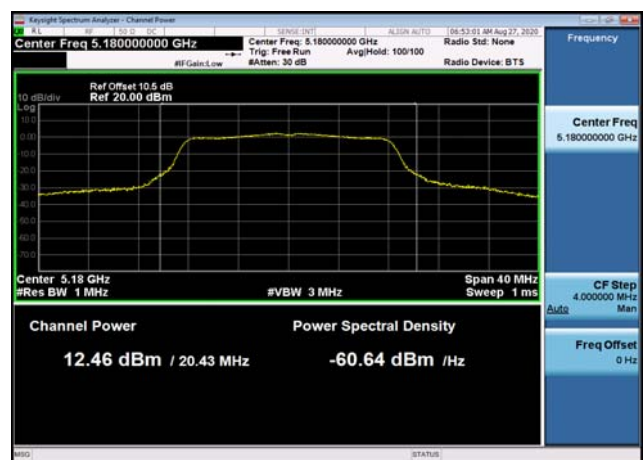
U-NII-1 Output Power-802.11n(40MHz)
,5190MHz,Ant1



U-NII-1 Output Power-802.11n(40MHz)
,5230MHz,Ant1

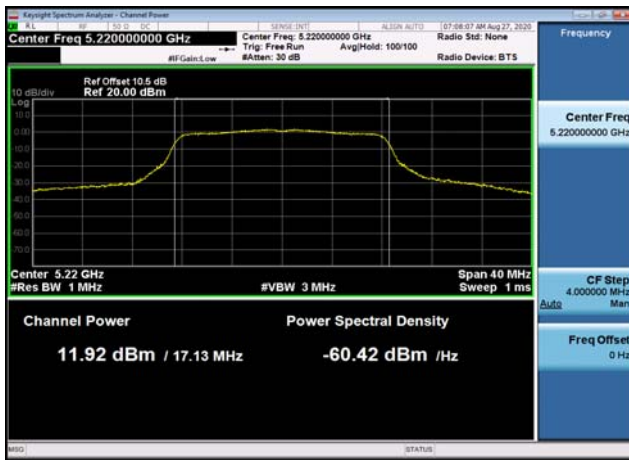


U-NII-1 Output Power-802.11a(20MHz)
,5180MHz,Ant1

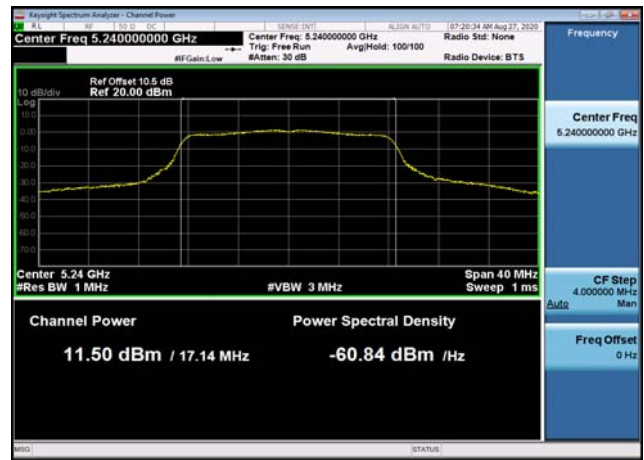




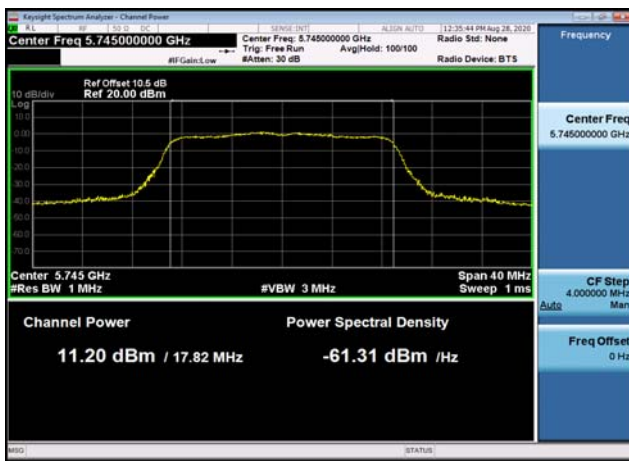
U-NII-1 Output Power-802.11a(20MHz)
,5220MHz,Ant1



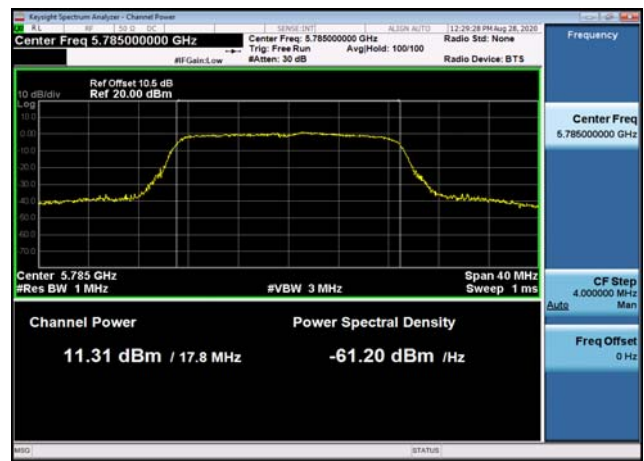
U-NII-1 Output Power-802.11a(20MHz)
,5240MHz,Ant1



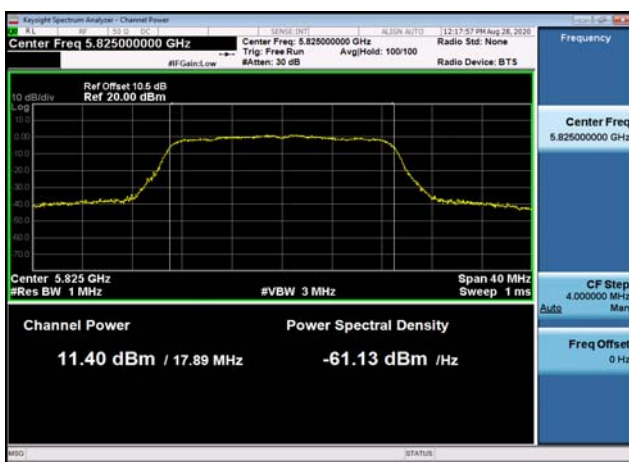
U-NII-3 Output Power-802.11n(20MHz)
,5745MHz,Ant1



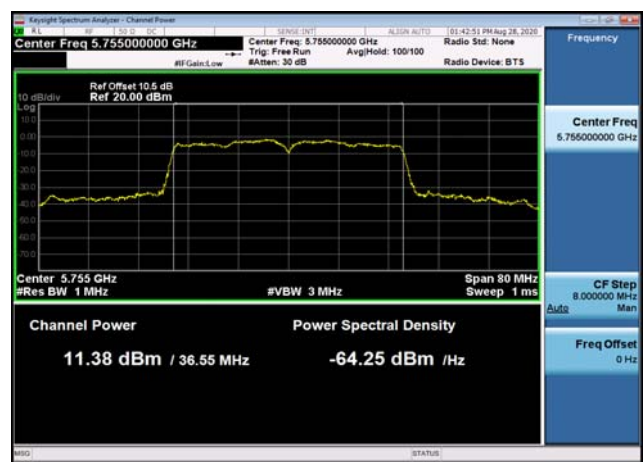
U-NII-3 Output Power-802.11n(20MHz)
,5785MHz,Ant1



U-NII-3 Output Power-802.11n(20MHz)
,5825MHz,Ant1

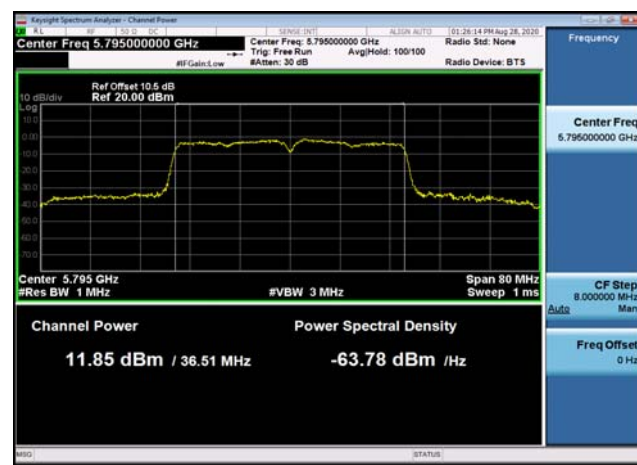


U-NII-3 Output Power-802.11n(40MHz)
,5755MHz,Ant1

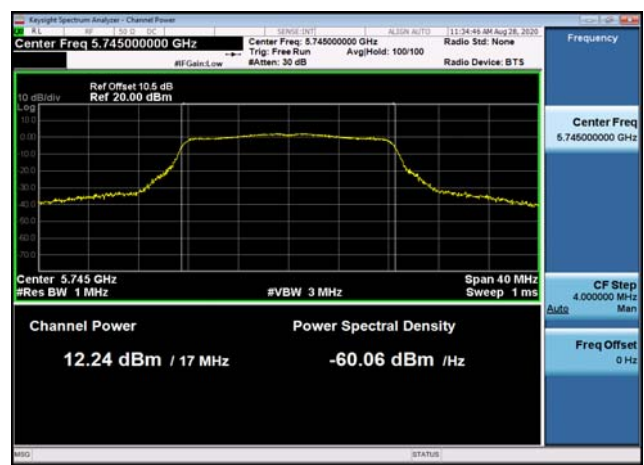




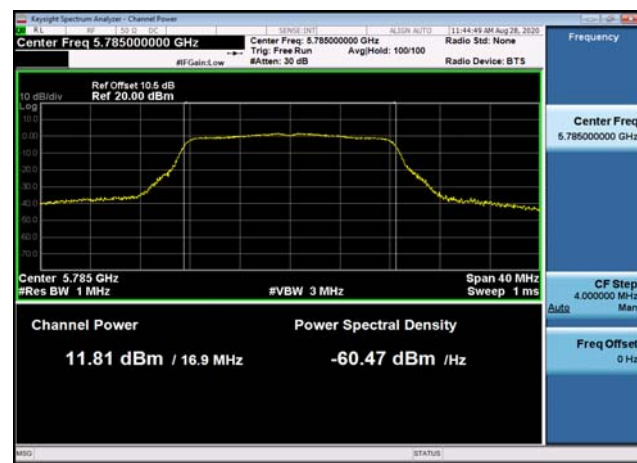
U-NII-3 Output Power-802.11n(40MHz)
,5795MHz,Ant1



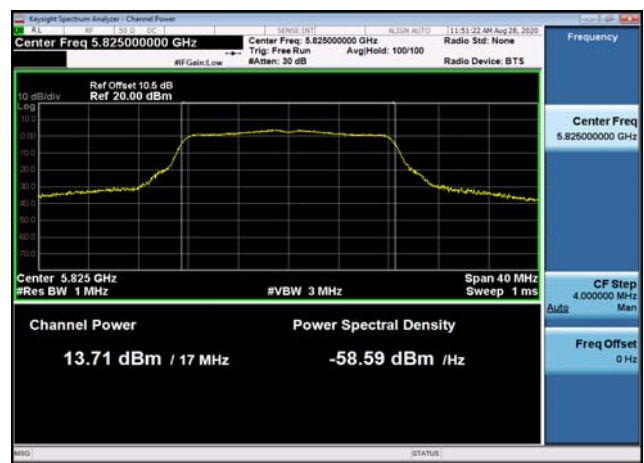
U-NII-3 Output Power-802.11a(20MHz)
,5745MHz,Ant1



U-NII-3 Output Power-802.11a(20MHz)
,5785MHz,Ant1



U-NII-3 Output Power-802.11a(20MHz)
,5825MHz,Ant1





AVGSA Power Spectral Density

Test Result and Data

U-NII-1 AVGSA Power Spectral Density				
Mode	Test Frequency (MHz)	PSD (dBm/1MHz)	Limit (dBm/1MHz)	Result
802.11n (20MHz)	5180	1.668	17	Pass
802.11n (20MHz)	5220	1.135	17	Pass
802.11n (20MHz)	5240	1.547	17	Pass
802.11n (40MHz)	5190	-1.653	17	Pass
802.11n (40MHz)	5230	-1.672	17	Pass
802.11a (20MHz)	5180	2.326	17	Pass
802.11a (20MHz)	5220	2.156	17	Pass
802.11a (20MHz)	5240	1.442	17	Pass



U-NII-3 AVGSA Power Spectral Density

Mode	Test Frequency (MHz)	PSD (dBm/510KHz)	Limit (dBm/500KHz)	Result
802.11n (20MHz)	5745	-1.416	30	Pass
802.11n (20MHz)	5785	-1.665	30	Pass
802.11n (20MHz)	5825	-1.211	30	Pass
802.11n (40MHz)	5755	-3.825	30	Pass
802.11n (40MHz)	5795	-3.911	30	Pass
802.11a (20MHz)	5745	-0.930	30	Pass
802.11a (20MHz)	5785	-0.940	30	Pass
802.11a (20MHz)	5825	1.063	30	Pass

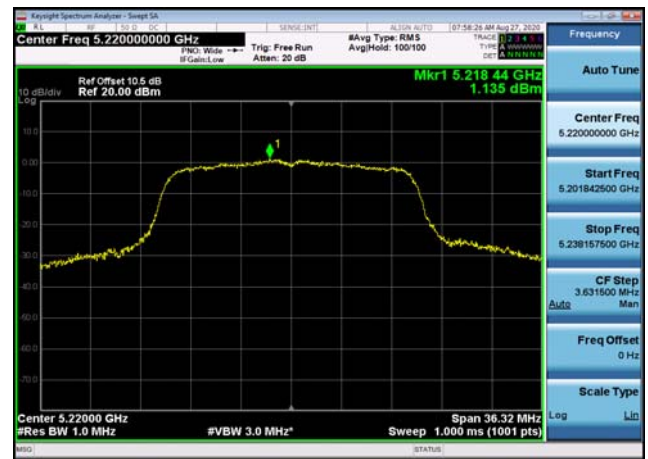


Test Plots

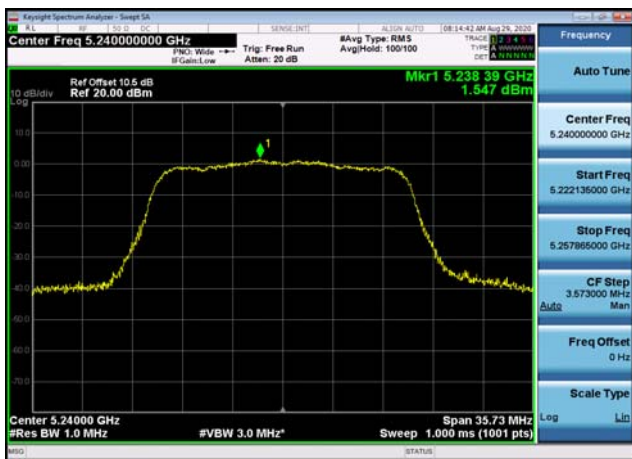
U-NII-1 Power spectral density-802.11
n(20MHz),5180MHz,Ant1



U-NII-1 Power spectral density-802.11
n(20MHz),5220MHz,Ant1



U-NII-1 Power spectral density-802.11
n(20MHz),5240MHz,Ant1



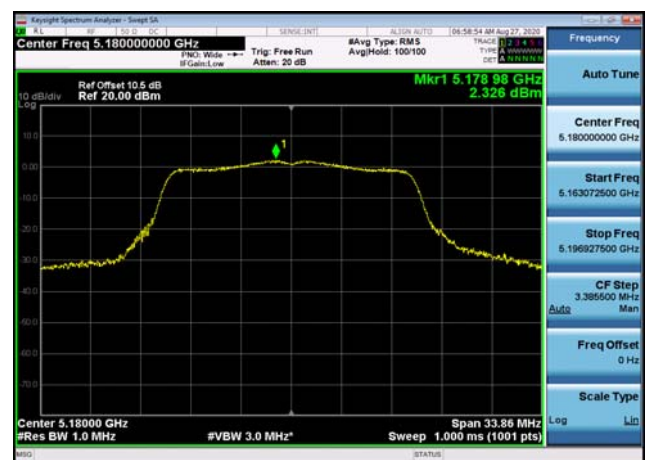
U-NII-1 Power spectral density-802.11
n(40MHz),5190MHz,Ant1



U-NII-1 Power spectral density-802.11
n(40MHz),5230MHz,Ant1

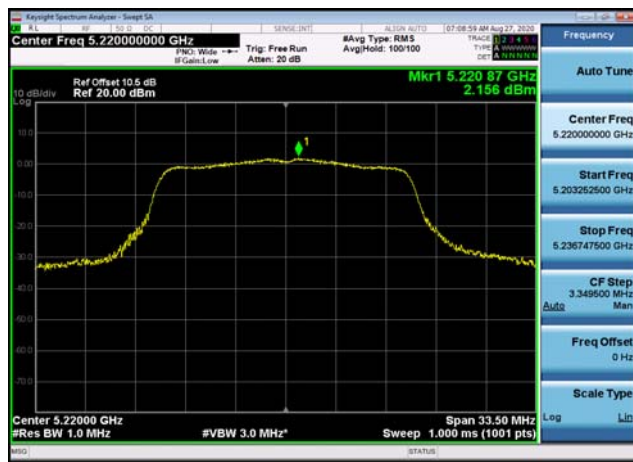


U-NII-1 Power spectral density-802.11
a(20MHz),5180MHz,Ant1

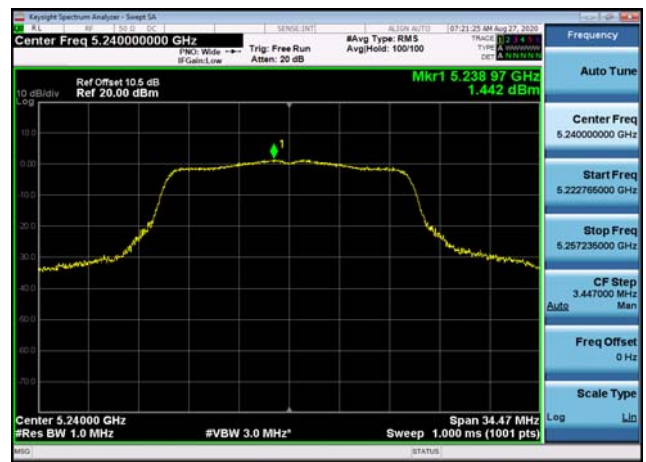




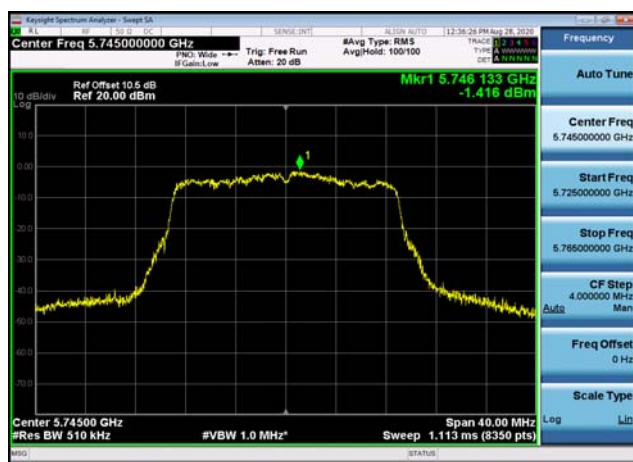
U-NII-1 Power spectral density-802.11
a(20MHz),5220MHz,Ant1



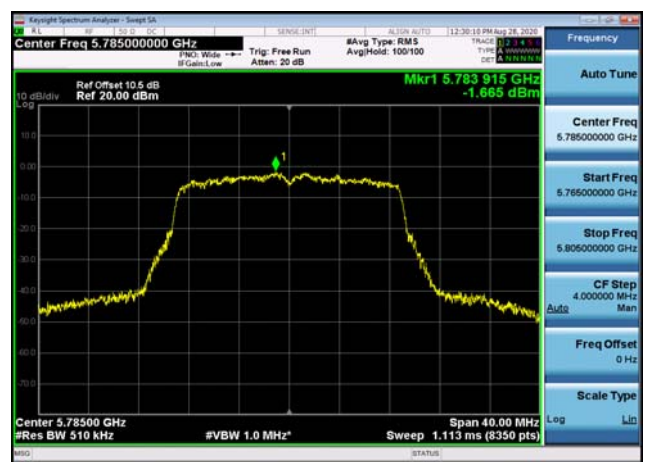
U-NII-1 Power spectral density-802.11
a(20MHz),5240MHz,Ant1



U-NII-3 Power spectral density-802.11
n(20MHz),5745MHz,Ant1



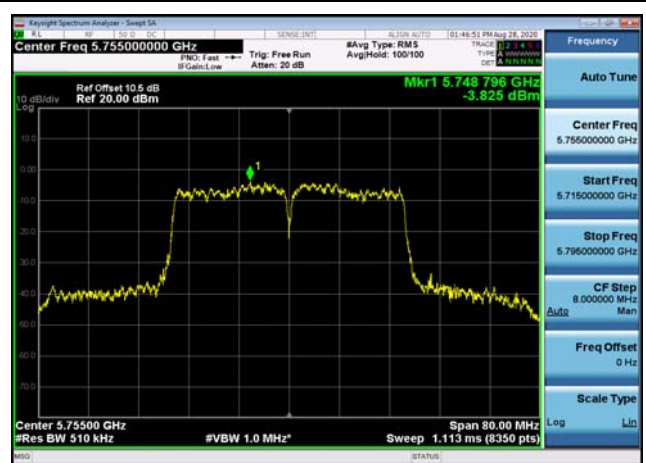
U-NII-3 Power spectral density-802.11
n(20MHz),5785MHz,Ant1



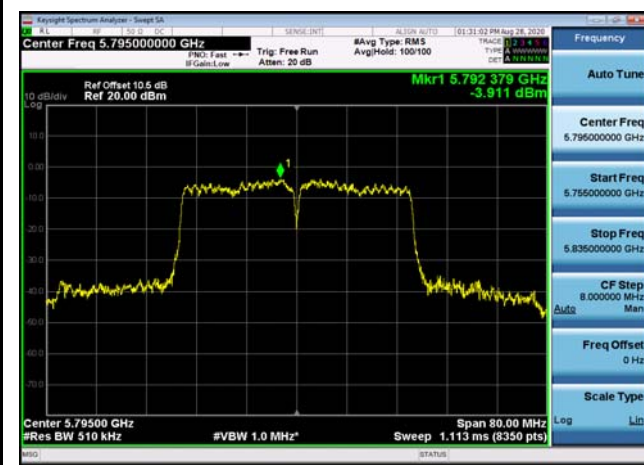
U-NII-3 Power spectral density-802.11
n(20MHz),5825MHz,Ant1



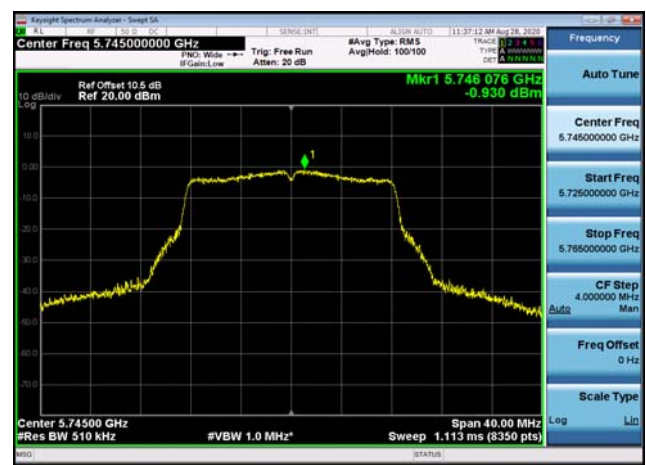
U-NII-3 Power spectral density-802.11
n(40MHz),5755MHz,Ant1



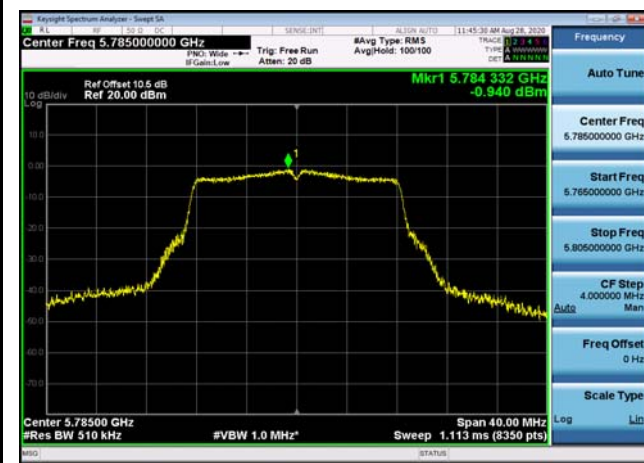
U-NII-3 Power spectral density-802.11
n(40MHz),5795MHz,Ant1



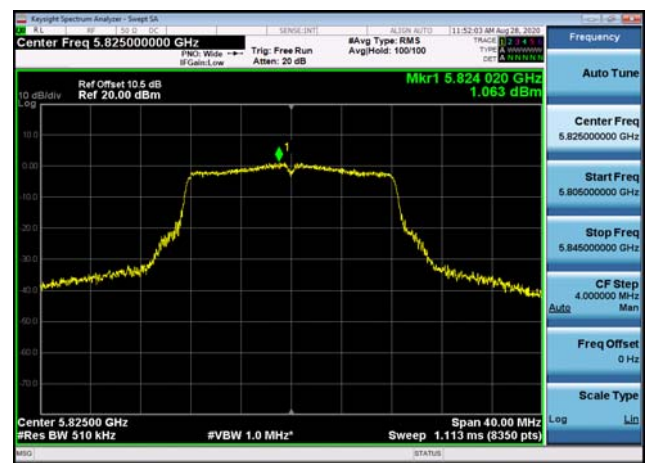
U-NII-3 Power spectral density-802.11
a(20MHz),5745MHz,Ant1



U-NII-3 Power spectral density-802.11
a(20MHz),5785MHz,Ant1



U-NII-3 Power spectral density-802.11
a(20MHz),5825MHz,Ant1





26dB Down Bandwidth

Test Result and Data

U-NII-1 Occupied 26dB Bandwidth			
Mode	Test Frequency (MHz)	Occupied Bandwidth (MHz)	Result
802.11n (20MHz)	5180	26.45	Pass
802.11n (20MHz)	5220	24.21	Pass
802.11n (20MHz)	5240	23.82	Pass
802.11n (40MHz)	5190	60.39	Pass
802.11n (40MHz)	5230	62.29	Pass
802.11a (20MHz)	5180	22.57	Pass
802.11a (20MHz)	5220	22.33	Pass
802.11a (20MHz)	5240	22.98	Pass

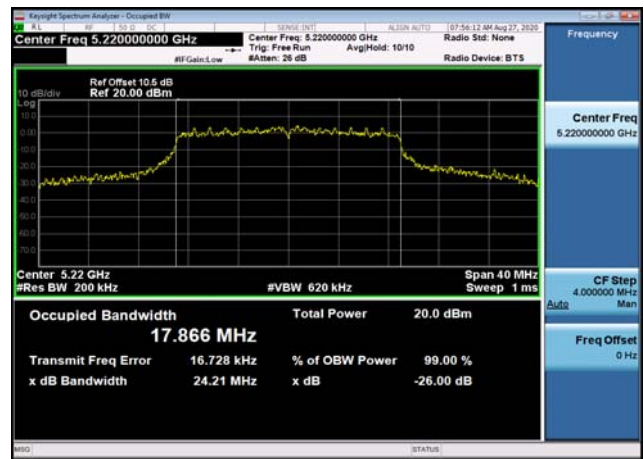


Test Plots

U-NII-1 26dB Bandwidth-802.11n(20MHz)
,5180MHz,Ant1



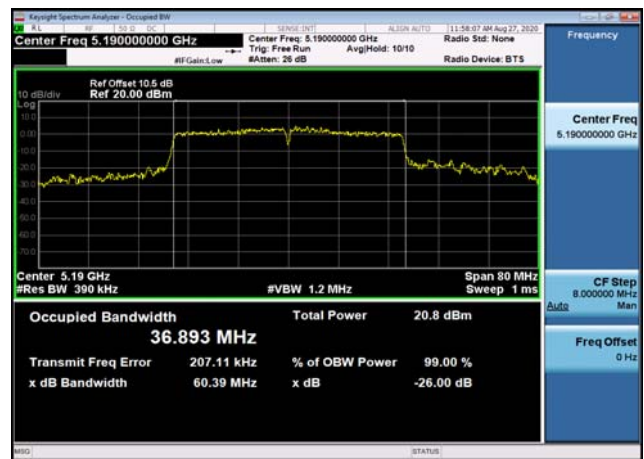
U-NII-1 26dB Bandwidth-802.11n(20MHz)
,5220MHz,Ant1



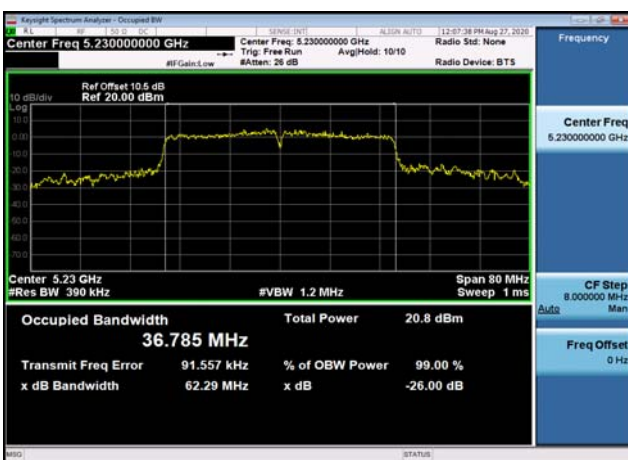
U-NII-1 26dB Bandwidth-802.11n(20MHz)
,5240MHz,Ant1



U-NII-1 26dB Bandwidth-802.11n(40MHz)
,5190MHz,Ant1



U-NII-1 26dB Bandwidth-802.11n(40MHz)
,5230MHz,Ant1



U-NII-1 26dB Bandwidth-802.11a(20MHz)
,5180MHz,Ant1





U-NII-1 26dB Bandwidth-802.11a(20MHz)
,5220MHz,Ant1

U-NII-1 26dB Bandwidth-802.11a(20MHz)
,5240MHz,Ant1





6dB down Bandwidth

Test Result and Data

U-NII-3 Occupied 6dB Bandwidth				
Mode	Test Frequency (MHz)	Occupied Bandwidth (MHz)	Min Limit (KHz)	Result
802.11n (20MHz)	5745	17.60	500	Pass
802.11n (20MHz)	5785	17.63	500	Pass
802.11n (20MHz)	5825	17.63	500	Pass
802.11n (40MHz)	5755	35.35	500	Pass
802.11n (40MHz)	5795	35.18	500	Pass
802.11a (20MHz)	5745	16.39	500	Pass
802.11a (20MHz)	5785	16.42	500	Pass
802.11a (20MHz)	5825	16.40	500	Pass



Test Plots

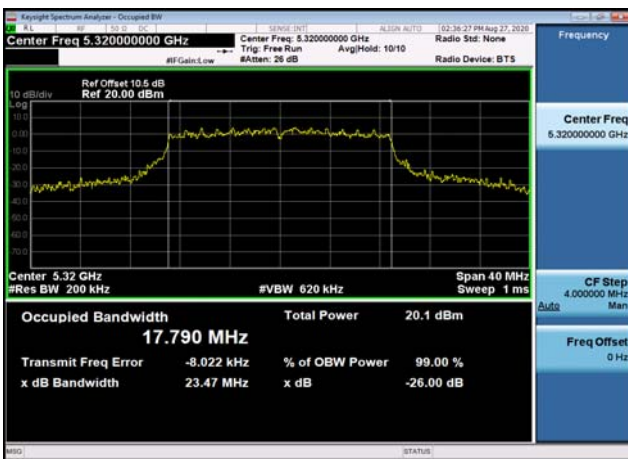
U-NII-2a 26dB Bandwidth-802.11n(20MHz),5260MHz,Ant1



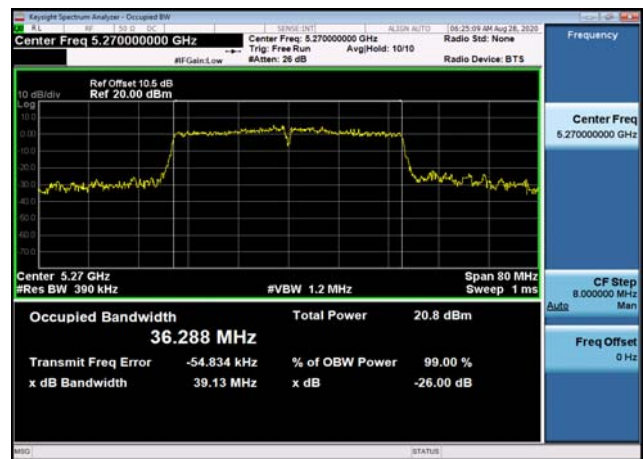
U-NII-2a 26dB Bandwidth-802.11n(20MHz),5300MHz,Ant1



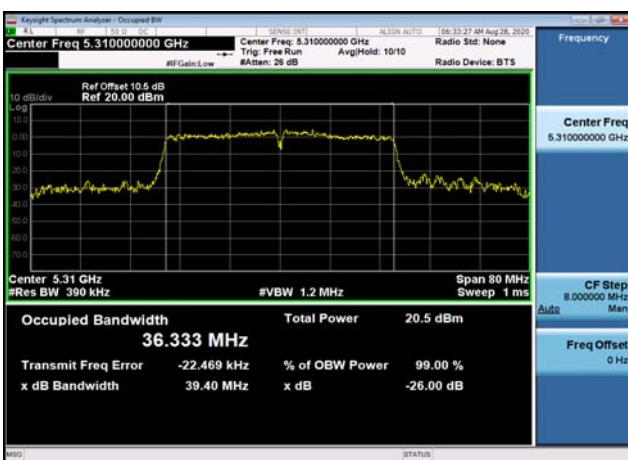
U-NII-2a 26dB Bandwidth-802.11n(20MHz),5320MHz,Ant1



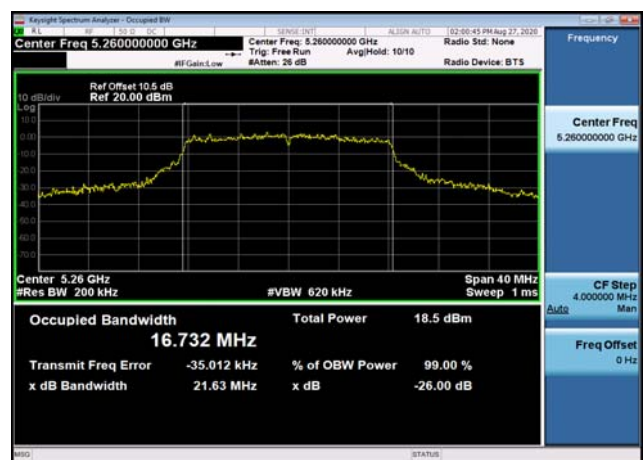
U-NII-2a 26dB Bandwidth-802.11n(40MHz),5270MHz,Ant1



U-NII-2a 26dB Bandwidth-802.11n(40MHz),5310MHz,Ant1



U-NII-2a 26dB Bandwidth-802.11a(20MHz),5260MHz,Ant1





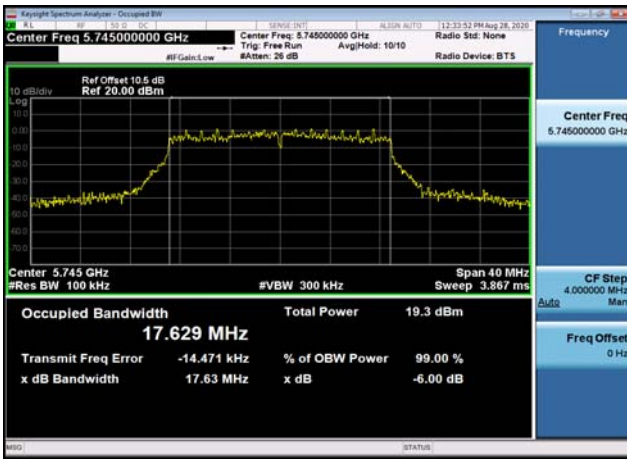
U-NII-2a 26dB Bandwidth-802.11a(20MHz),5300MHz,Ant1



U-NII-2a 26dB Bandwidth-802.11a(20MHz),5320MHz,Ant1



U-NII-3 6dB Bandwidth-802.11n(20MHz),5745MHz,Ant1



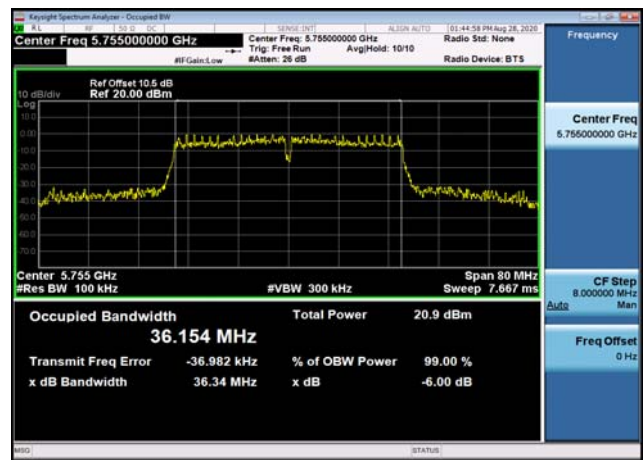
U-NII-3 6dB Bandwidth-802.11n(20MHz),5785MHz,Ant1



U-NII-3 6dB Bandwidth-802.11n(20MHz),5825MHz,Ant1

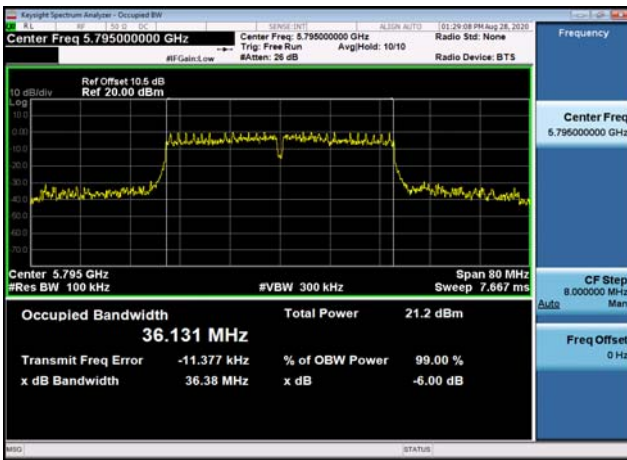


U-NII-3 6dB Bandwidth-802.11n(40MHz),5755MHz,Ant1

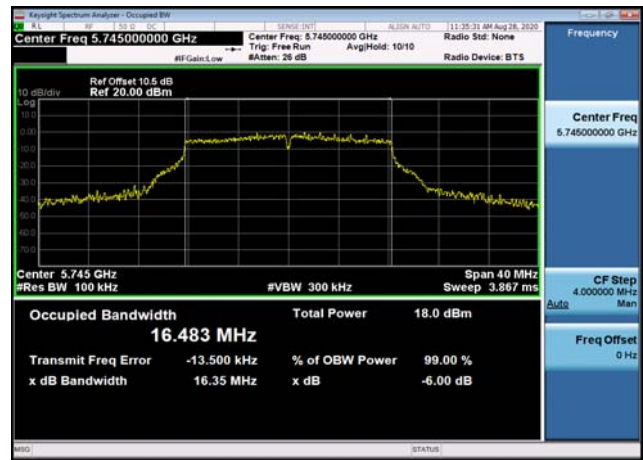




U-NII-3 6dB Bandwidth-802.11n(40MHz)
,5795MHz,Ant1



U-NII-3 6dB Bandwidth-802.11a(20MHz)
,5745MHz,Ant1



U-NII-3 6dB Bandwidth-802.11a(20MHz)
,5785MHz,Ant1



U-NII-3 6dB Bandwidth-802.11a(20MHz)
,5825MHz,Ant1



**Frequency Stability**

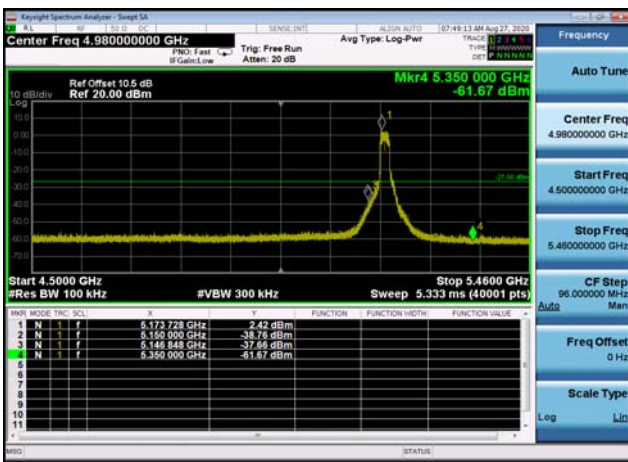
U-NII-1 Centre Frequency							
Mode	Test Frequency (MHz)	Ant	LF (MHz)	HF (MHz)	CF (MHz)	Freq Stability (ppm)	Test Result
802.11n (20MHz)	5180	Ant1	5171.110	5188.874	5179.992	-1.530	Pass
802.11n (20MHz)	5220	Ant1	5211.103	5228.857	5219.980	-3.910	Pass
802.11n (20MHz)	5240	Ant1	5231.130	5248.873	5240.002	0.320	Pass
802.11n (40MHz)	5190	Ant1	5171.736	5208.233	5189.984	-3.030	Pass
802.11n (40MHz)	5230	Ant1	5211.742	5248.251	5229.996	-0.720	Pass
802.11a (20MHz)	5180	Ant1	5171.716	5188.264	5179.990	-1.930	Pass
802.11a (20MHz)	5220	Ant1	5211.712	5228.268	5219.990	-2.000	Pass
802.11a (20MHz)	5240	Ant1	5231.713	5248.269	5239.991	-1.750	Pass



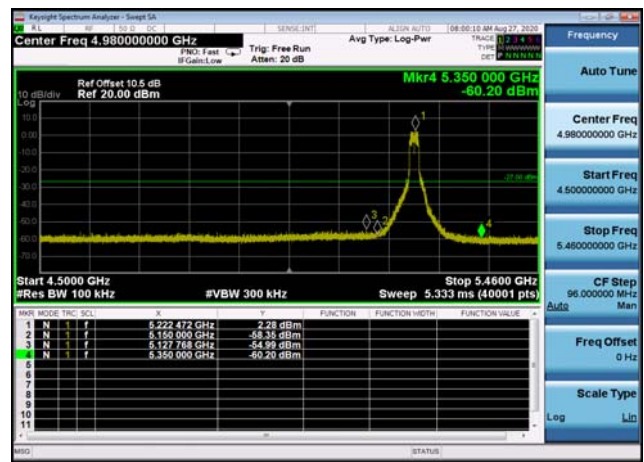
U-NII-3 Centre Frequency							
Mode	Test Frequency (MHz)	Ant	LF (MHz)	HF (MHz)	CF (MHz)	Freq Stability (ppm)	Test Result
802.11n (20MHz)	5745	Ant1	5736.069	5753.856	5744.963	-6.530	Pass
802.11n (20MHz)	5785	Ant1	5776.101	5793.860	5784.980	-3.390	Pass
802.11n (20MHz)	5825	Ant1	5816.098	5833.872	5824.985	-2.650	Pass
802.11n (40MHz)	5755	Ant1	5736.712	5773.279	5754.996	-0.780	Pass
802.11n (40MHz)	5795	Ant1	5776.739	5813.260	5794.999	-0.130	Pass
802.11a (20MHz)	5745	Ant1	5736.714	5753.268	5744.991	-1.520	Pass
802.11a (20MHz)	5785	Ant1	5776.699	5793.272	5784.985	-2.520	Pass
802.11a (20MHz)	5825	Ant1	5816.712	5833.267	5824.989	-1.860	Pass

Conducted Band Edges and spurious emission

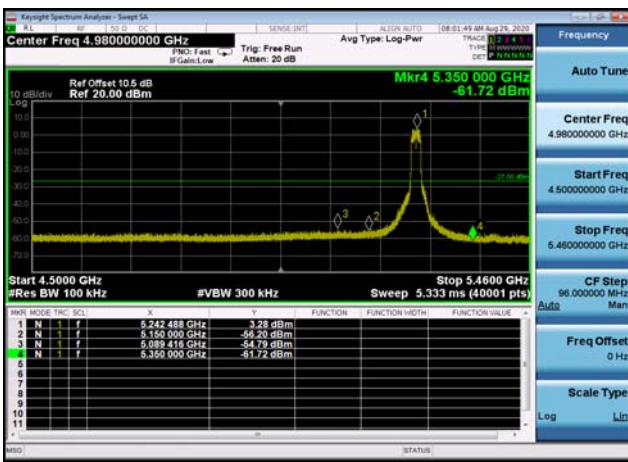
U-NII-1 ,Plot 1,Band Edge-802.11n(20M Hz),5180MHz,Ant1



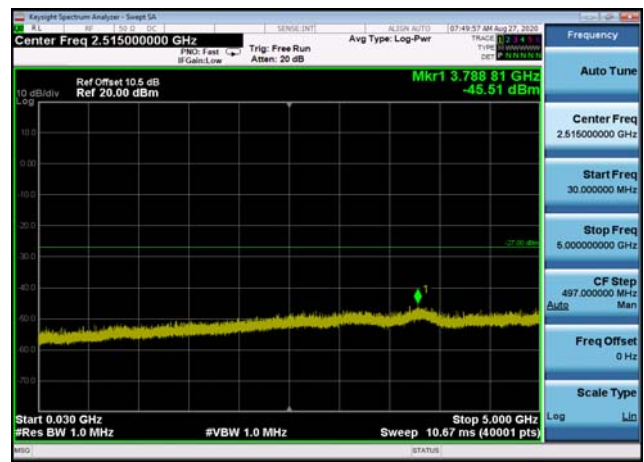
U-NII-1 ,Plot 1,Band Edge-802.11n(20M Hz),5220MHz,Ant1



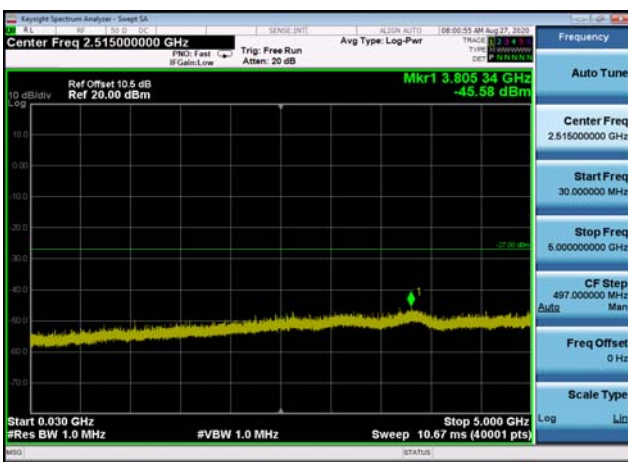
U-NII-1 ,Plot 1,Band Edge-802.11n(20M Hz),5240MHz,Ant1



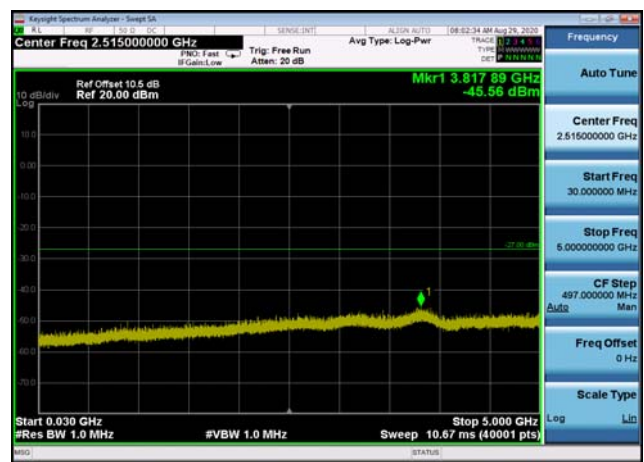
U-NII-1 ,Plot 2,30MHz~5000MHz-802.11n (20MHz),5180MHz,Ant1



U-NII-1 ,Plot 2,30MHz~5000MHz-802.11n (20MHz),5220MHz,Ant1

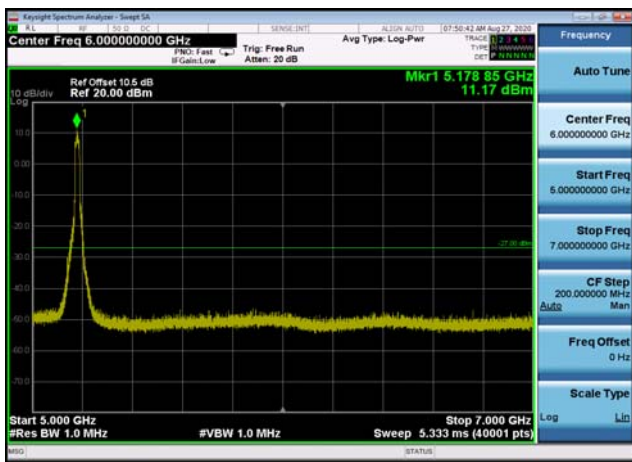


U-NII-1 ,Plot 2,30MHz~5000MHz-802.11n (20MHz),5240MHz,Ant1

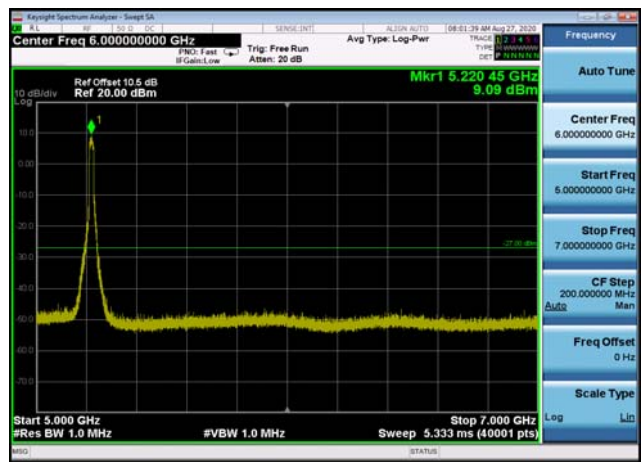




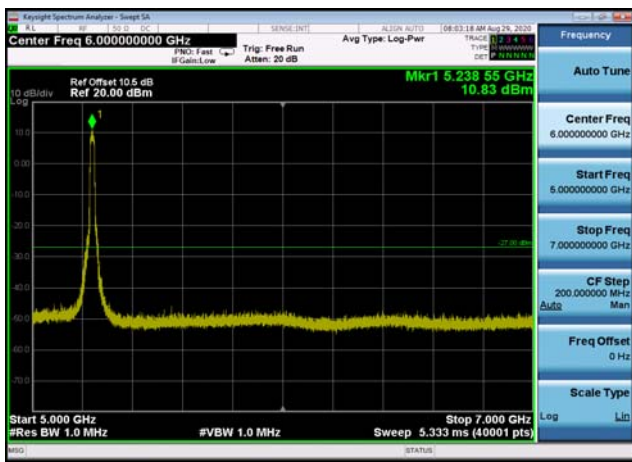
U-NII-1 ,Plot 3,5000MHz~7000MHz-802.1
1n(20MHz),5180MHz,Ant1



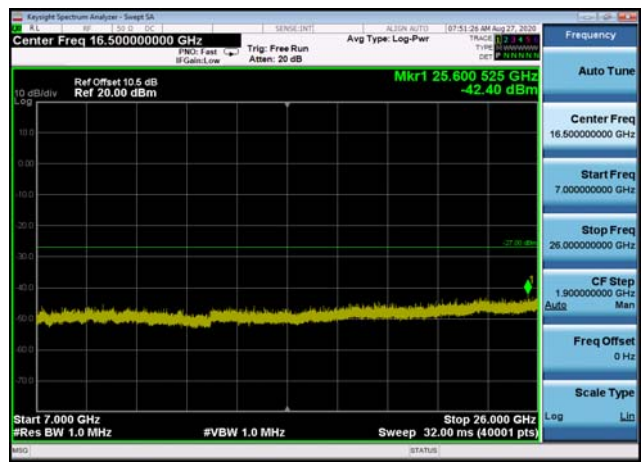
U-NII-1 ,Plot 3,5000MHz~7000MHz-802.1
1n(20MHz),5220MHz,Ant1



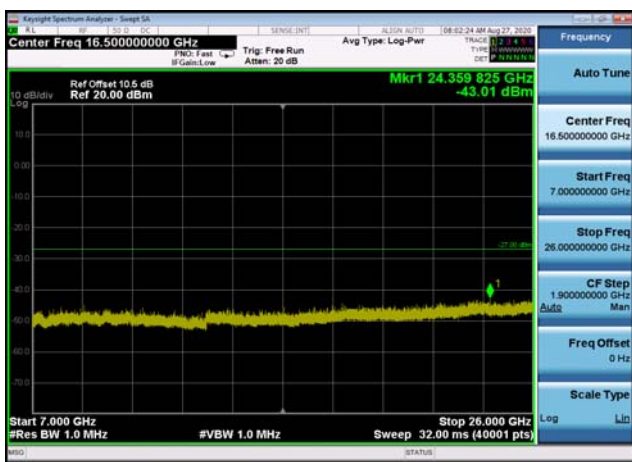
U-NII-1 ,Plot 3,5000MHz~7000MHz-802.1
1n(20MHz),5240MHz,Ant1



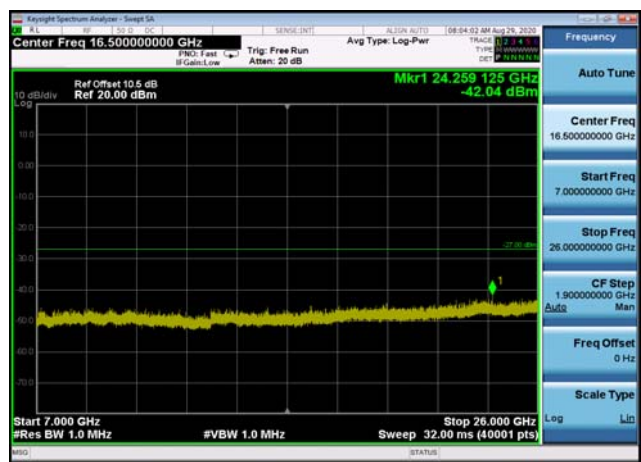
U-NII-1 ,Plot 4,7000MHz~26000MHz-802.
11n(20MHz),5180MHz,Ant1



U-NII-1 ,Plot 4,7000MHz~26000MHz-802.
11n(20MHz),5220MHz,Ant1

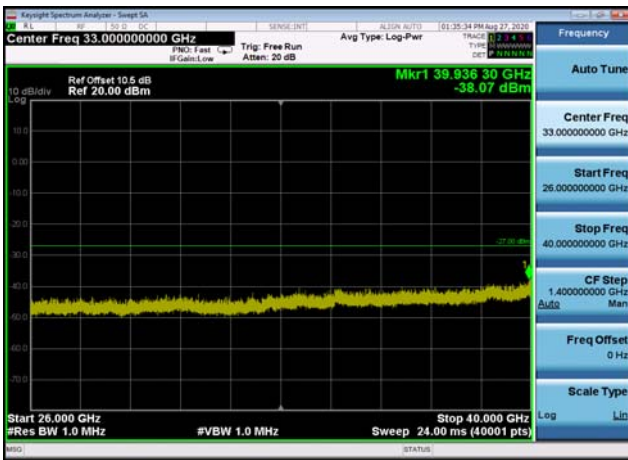


U-NII-1 ,Plot 4,7000MHz~26000MHz-802.
11n(20MHz),5240MHz,Ant1

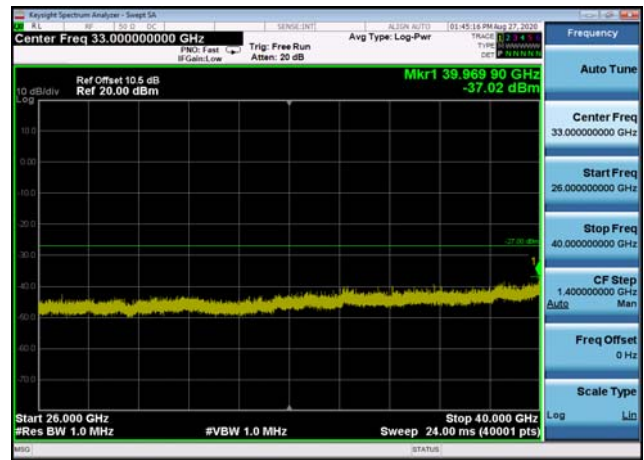




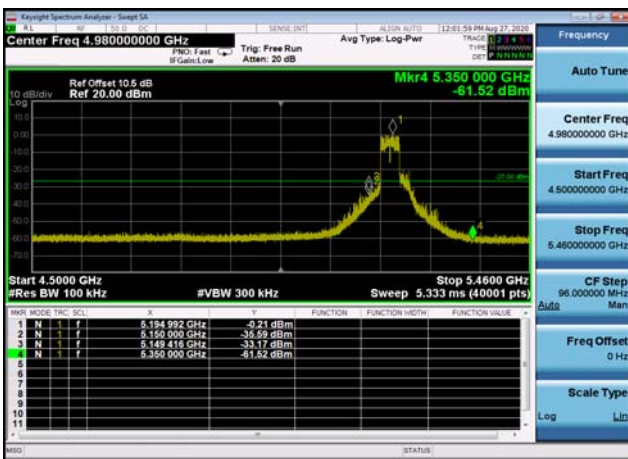
U-NII-1 ,Plot 2,26000MHz~40000MHz-802
.11n(20MHz),5220MHz,Ant1



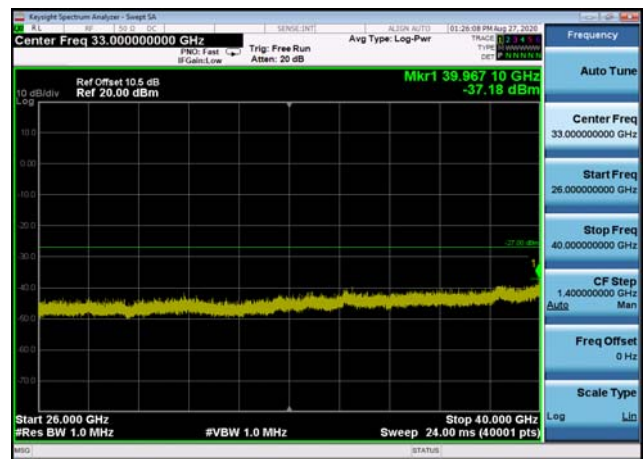
U-NII-1 ,Plot 2,26000MHz~40000MHz-802
.11n(20MHz),5180MHz,Ant1



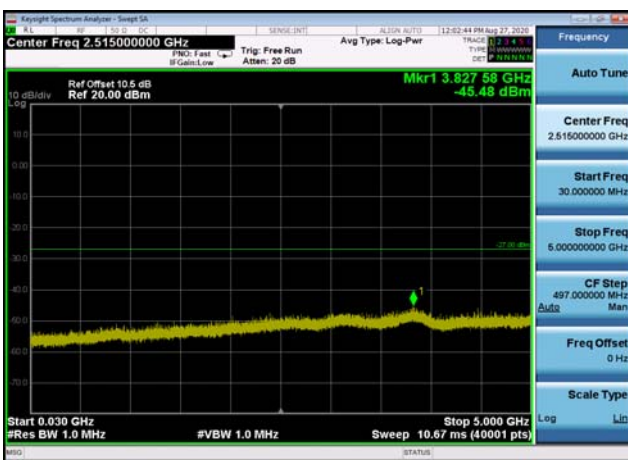
U-NII-1 ,Plot 1,Band Edge-802.11n(40M
Hz),5190MHz,Ant1



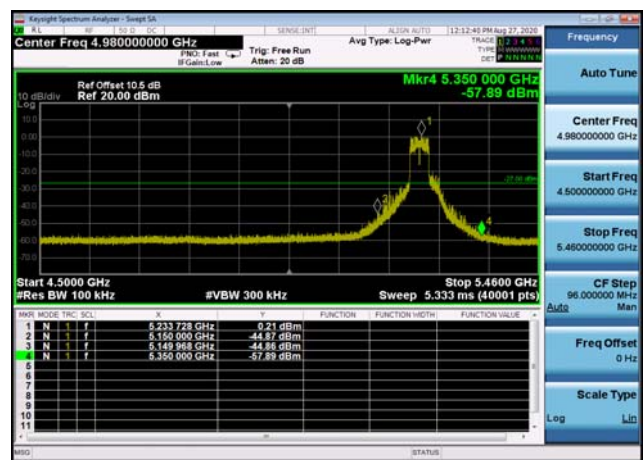
U-NII-1 ,Plot 2,26000MHz~40000MHz-802
.11n(20MHz),5240MHz,Ant1



U-NII-1 ,Plot 2,30MHz~5000MHz-802.11n
(40MHz),5190MHz,Ant1

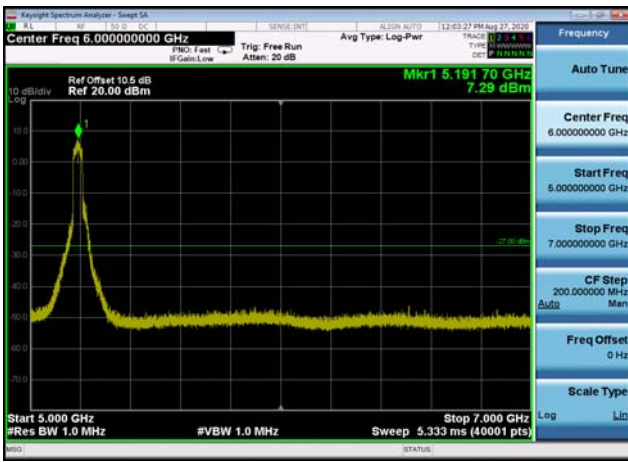


U-NII-1 ,Plot 1,Band Edge-802.11n(40M
Hz),5230MHz,Ant1

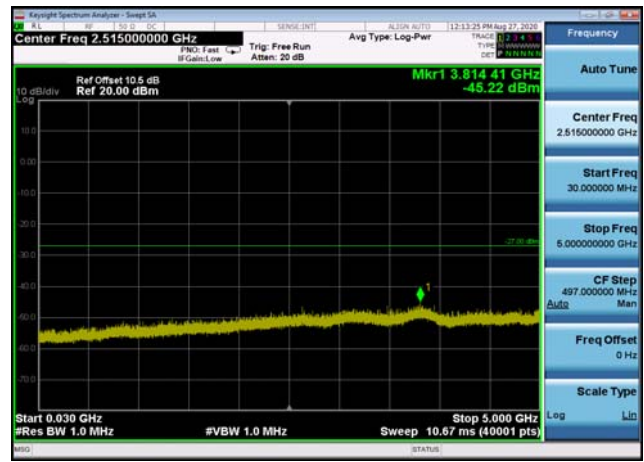




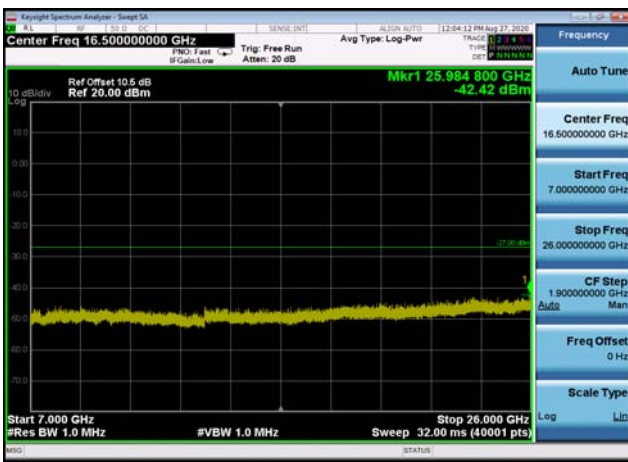
U-NII-1 ,Plot 3,5000MHz~7000MHz-802.1
1n(40MHz),5190MHz,Ant1



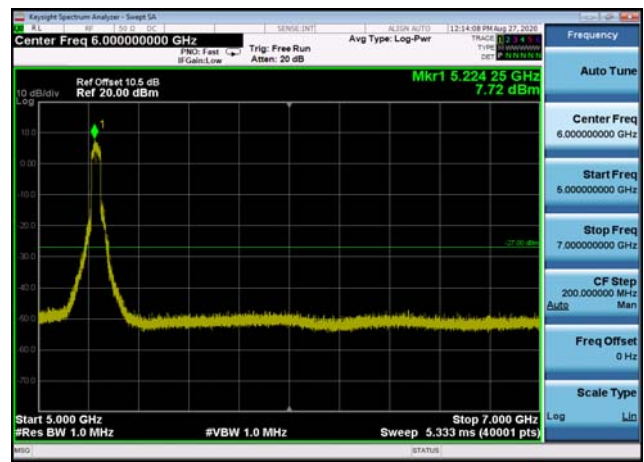
U-NII-1 ,Plot 2,30MHz~5000MHz-802.11n
(40MHz),5230MHz,Ant1



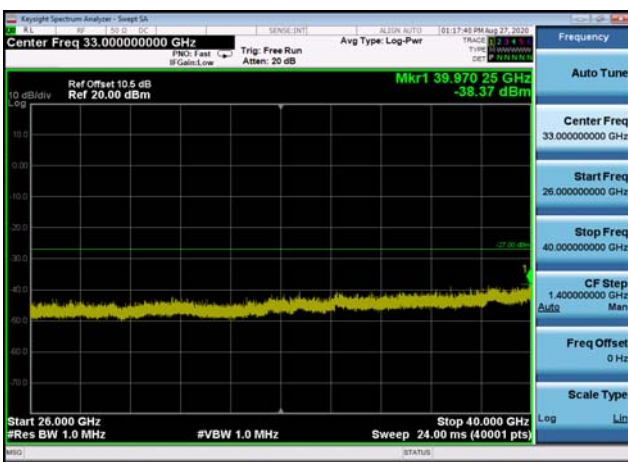
U-NII-1 ,Plot 4,7000MHz~26000MHz-802.
11n(40MHz),5190MHz,Ant1



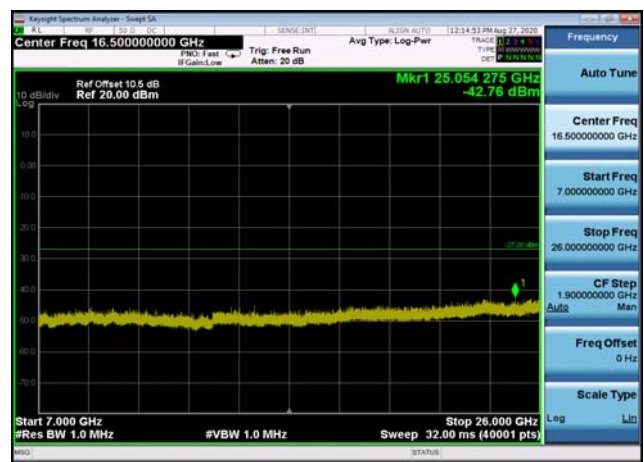
U-NII-1 ,Plot 3,5000MHz~7000MHz-802.1
1n(40MHz),5230MHz,Ant1



U-NII-1 ,Plot 2,26000MHz~40000MHz-802
.11n(40MHz),5190MHz,Ant1

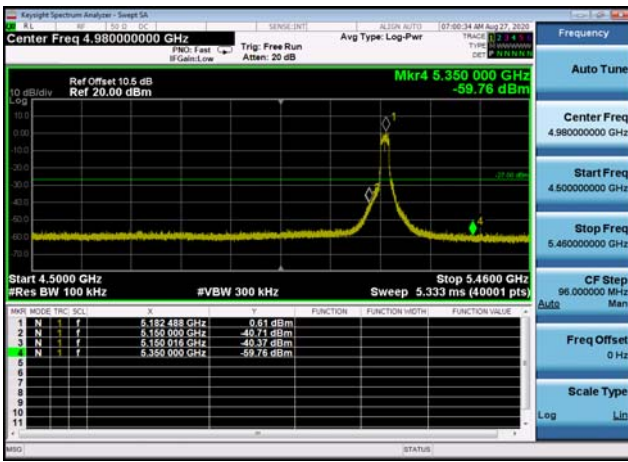


U-NII-1 ,Plot 4,7000MHz~26000MHz-802.
11n(40MHz),5230MHz,Ant1

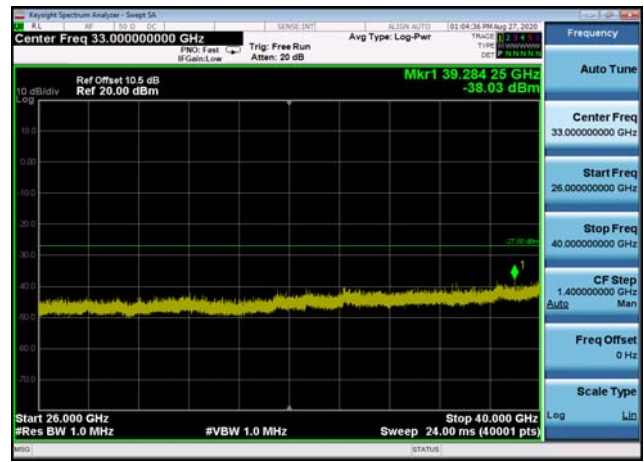




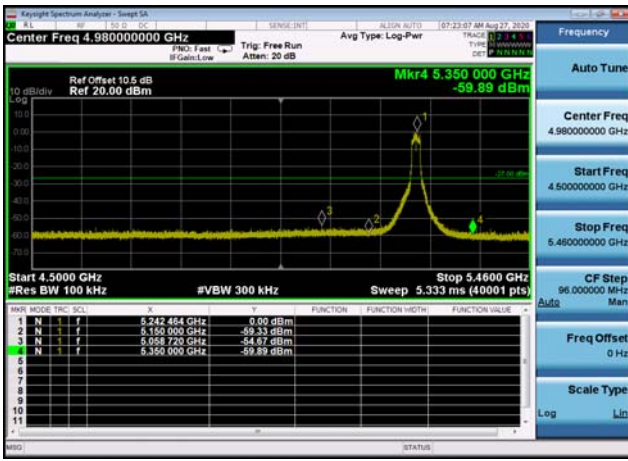
U-NII-1 ,Plot 1,Band Edge-802.11a(20M Hz),5180MHz,Ant1



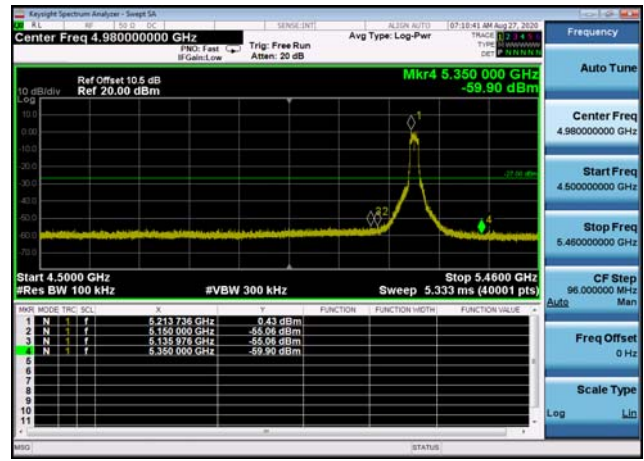
U-NII-1 ,Plot 2,26000MHz~40000MHz-802.11n(40MHz),5230MHz,Ant1



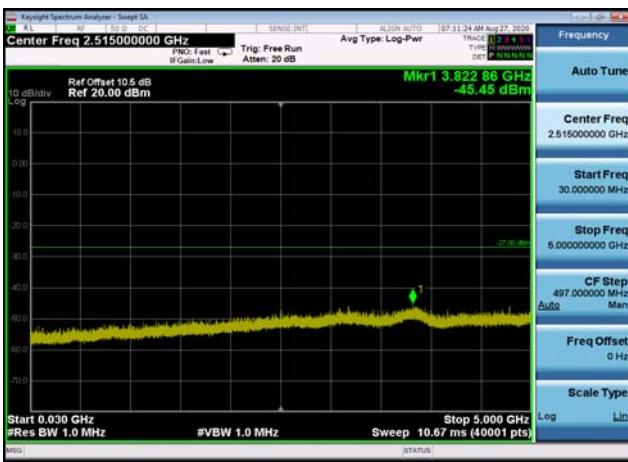
U-NII-1 ,Plot 1,Band Edge-802.11a(20M Hz),5240MHz,Ant1



U-NII-1 ,Plot 1,Band Edge-802.11a(20M Hz),5220MHz,Ant1



U-NII-1 ,Plot 2,30MHz~5000MHz-802.11a (20MHz),5220MHz,Ant1



U-NII-1 ,Plot 2,30MHz~5000MHz-802.11a (20MHz),5180MHz,Ant1

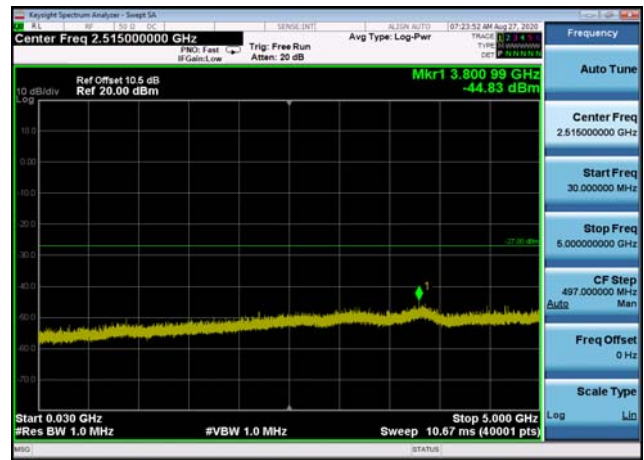




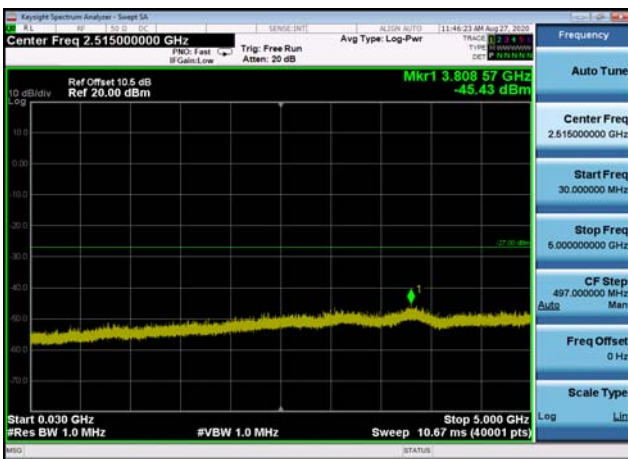
U-NII-1 ,Plot 2,30MHz~5000MHz-802.11a
c(20MHz),5180MHz,Ant1



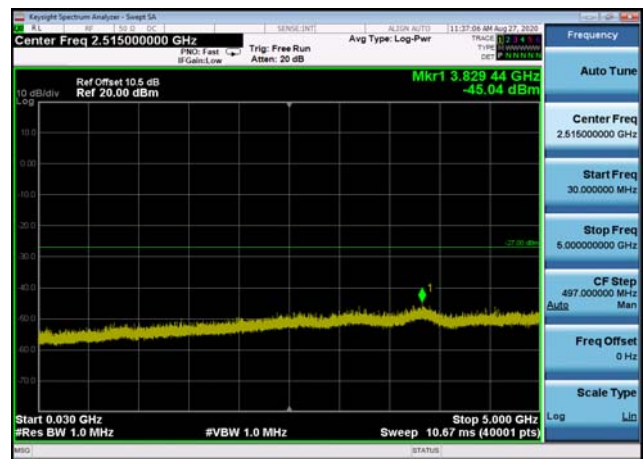
U-NII-1 ,Plot 2,30MHz~5000MHz-802.11a
(20MHz),5240MHz,Ant1



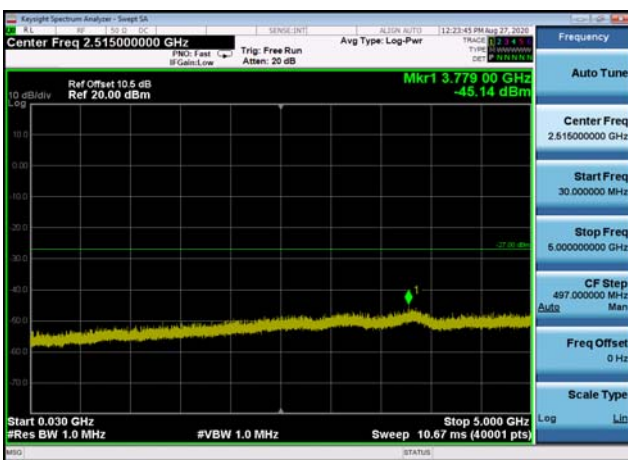
U-NII-1 ,Plot 2,30MHz~5000MHz-802.11a
c(20MHz),5240MHz,Ant1



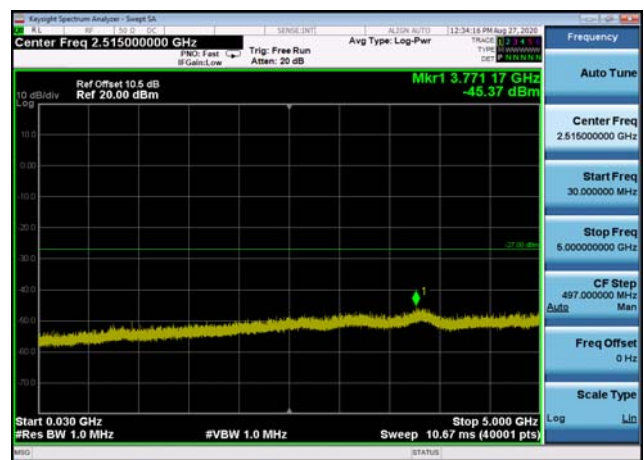
U-NII-1 ,Plot 2,30MHz~5000MHz-802.11a
c(20MHz),5220MHz,Ant1



U-NII-1 ,Plot 2,30MHz~5000MHz-802.11a
c(40MHz),5230MHz,Ant1

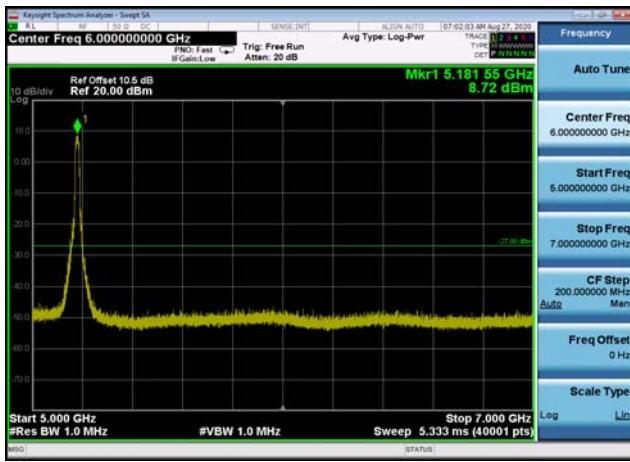


U-NII-1 ,Plot 2,30MHz~5000MHz-802.11a
c(40MHz),5190MHz,Ant1

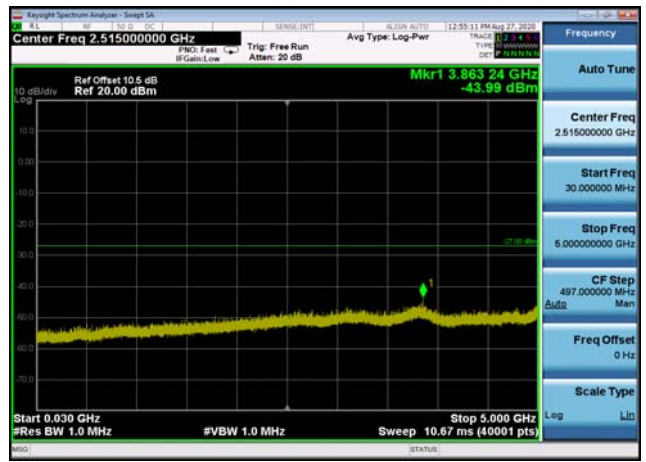




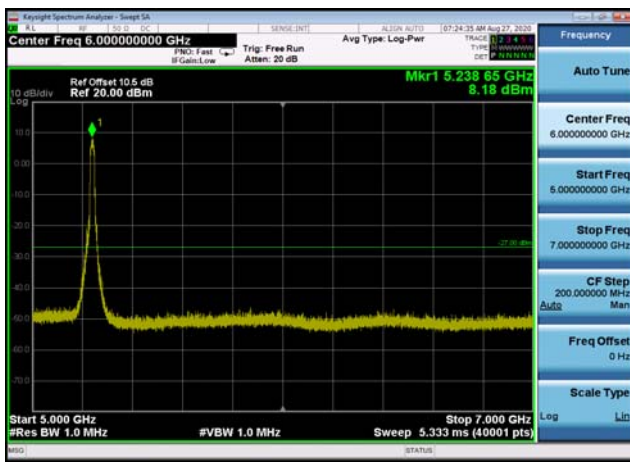
U-NII-1 ,Plot 3,5000MHz~7000MHz-802.1
1a(20MHz),5180MHz,Ant1



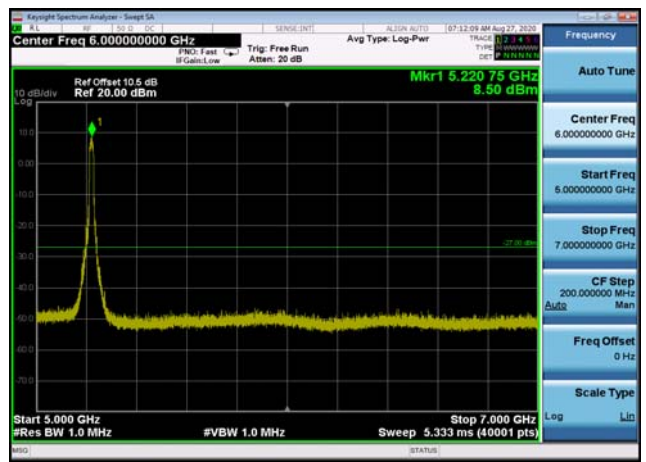
U-NII-1 ,Plot 2,30MHz~5000MHz-802.11a
c(80MHz),5210MHz,Ant1



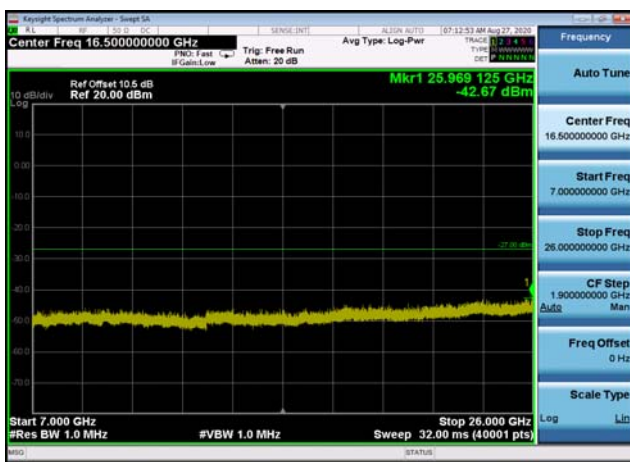
U-NII-1 ,Plot 3,5000MHz~7000MHz-802.1
1a(20MHz),5240MHz,Ant1



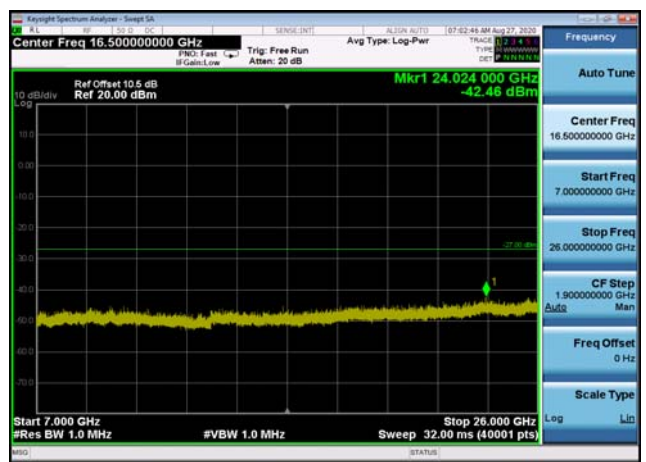
U-NII-1 ,Plot 3,5000MHz~7000MHz-802.1
1a(20MHz),5220MHz,Ant1



U-NII-1 ,Plot 4,7000MHz~26000MHz-802.
11a(20MHz),5220MHz,Ant1

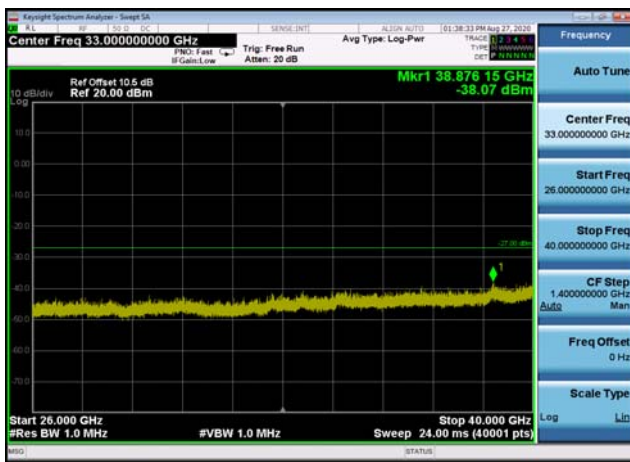


U-NII-1 ,Plot 4,7000MHz~26000MHz-802.
11a(20MHz),5180MHz,Ant1

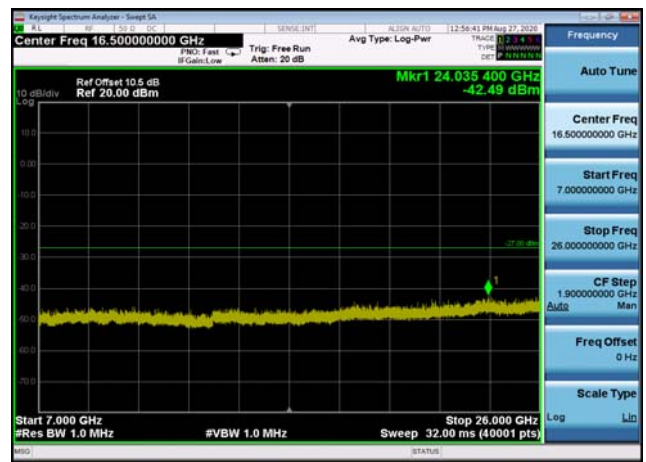




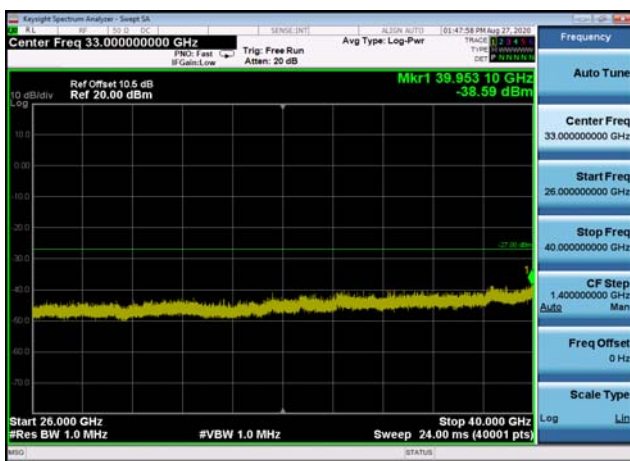
U-NII-1 ,Plot 2,26000MHz~40000MHz-802
.11a(20MHz),5220MHz,Ant1



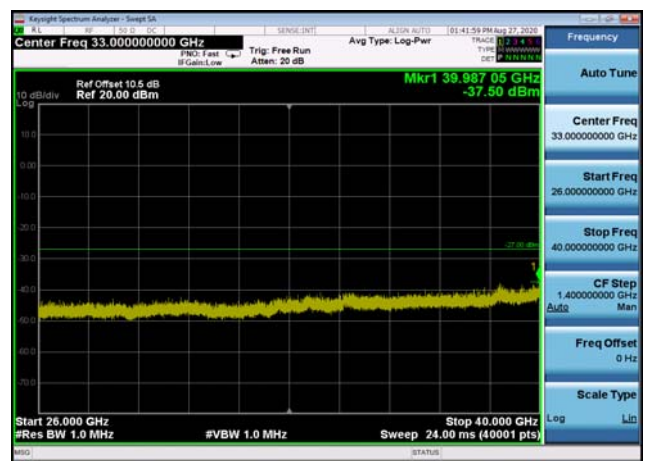
U-NII-1 ,Plot 4,7000MHz~26000MHz-802.
11ac(80MHz),5210MHz,Ant1



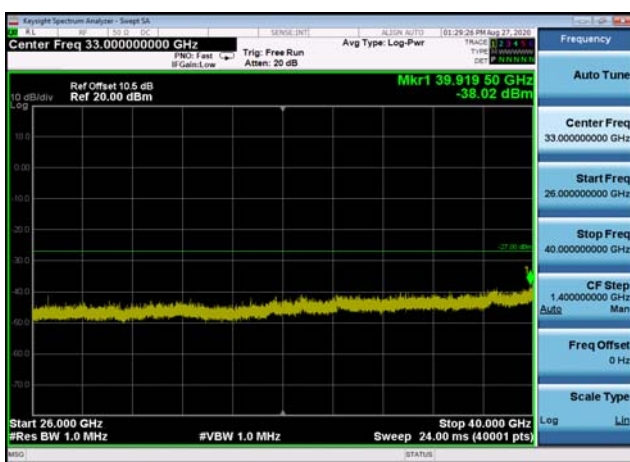
U-NII-1 ,Plot 2,26000MHz~40000MHz-802
.11ac(20MHz),5180MHz,Ant1



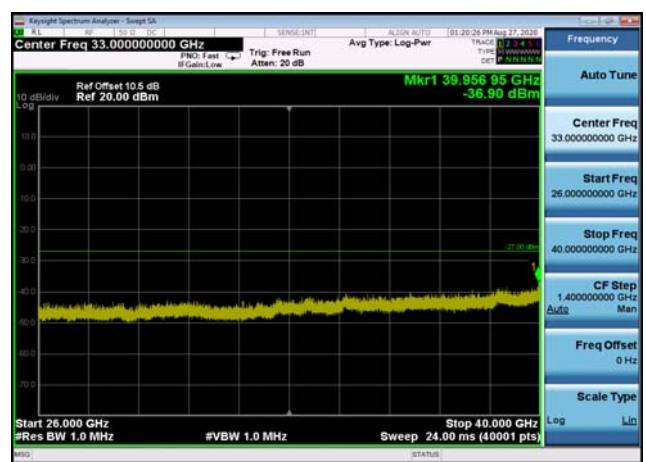
U-NII-1 ,Plot 2,26000MHz~40000MHz-802
.11a(20MHz),5180MHz,Ant1



U-NII-1 ,Plot 2,26000MHz~40000MHz-802
.11ac(20MHz),5240MHz,Ant1

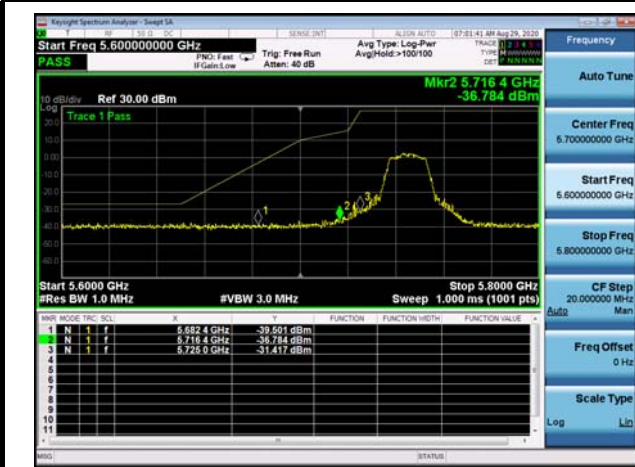


U-NII-1 ,Plot 2,26000MHz~40000MHz-802
.11a(20MHz),5240MHz,Ant1

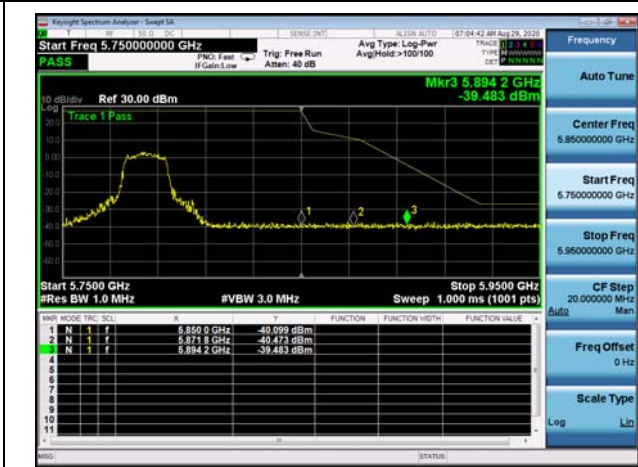




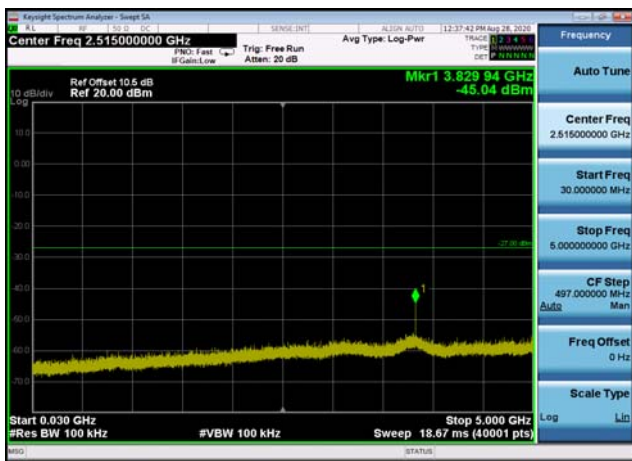
U-NII-3 ,Plot 1,Band Edge-802.11n(20M Hz),5745MHz,Ant1



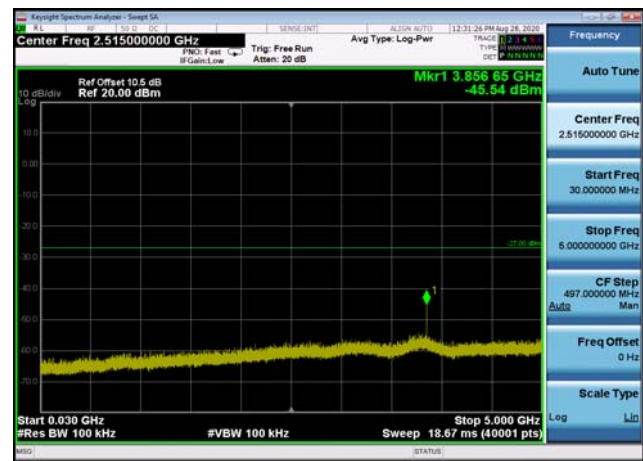
U-NII-3 ,Plot 1,Band Edge-802.11n(20M Hz),5825MHz,Ant1



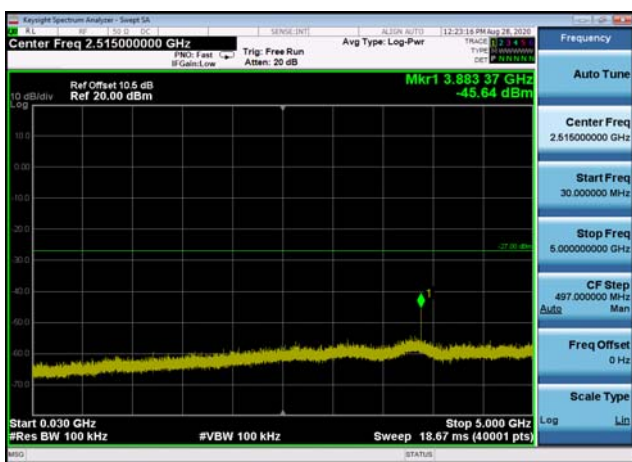
U-NII-3 ,Plot 2,30MHz~5000MHz-802.11n (20MHz),5745MHz,Ant1



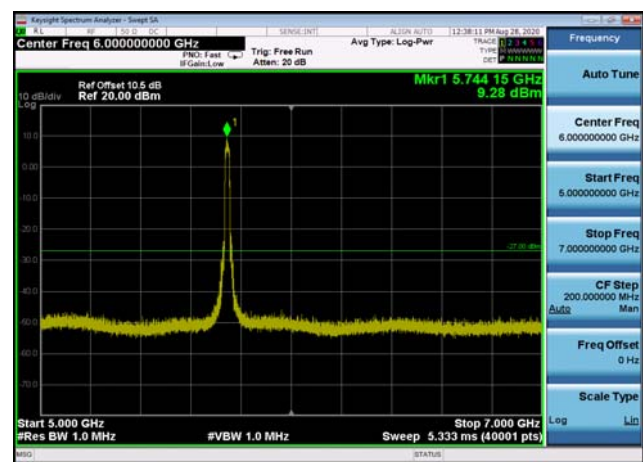
U-NII-3 ,Plot 2,30MHz~5000MHz-802.11n (20MHz),5785MHz,Ant1



U-NII-3 ,Plot 2,30MHz~5000MHz-802.11n (20MHz),5825MHz,Ant1

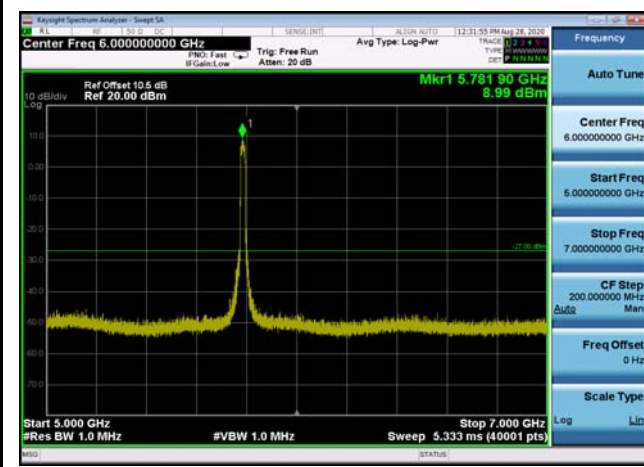


U-NII-3 ,Plot 3,5000MHz~7000MHz-802.11n(20MHz),5745MHz,Ant1

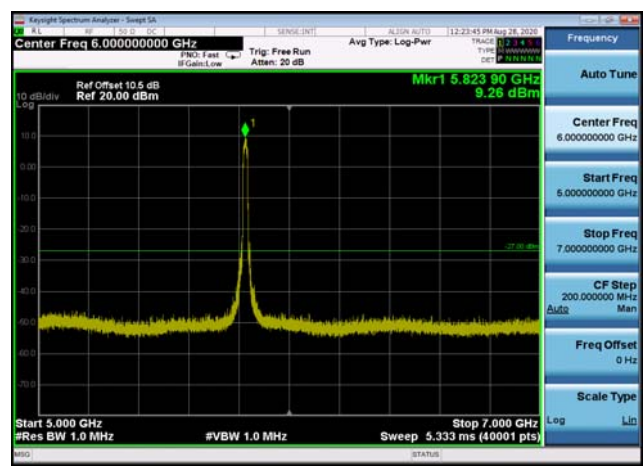




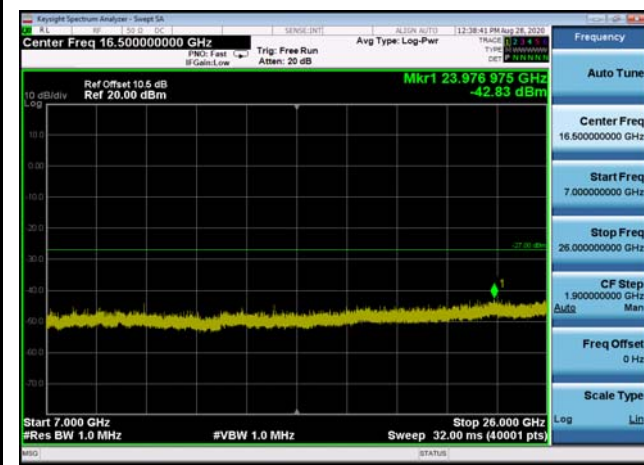
U-NII-3 ,Plot 3,5000MHz~7000MHz-802.1
1n(20MHz),5785MHz,Ant1



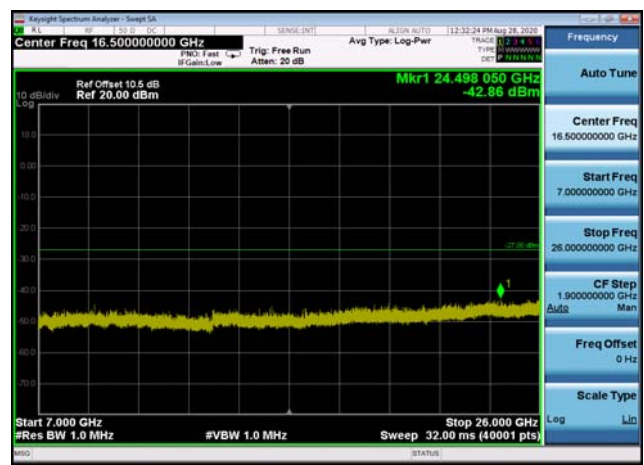
U-NII-3 ,Plot 3,5000MHz~7000MHz-802.1
1n(20MHz),5825MHz,Ant1



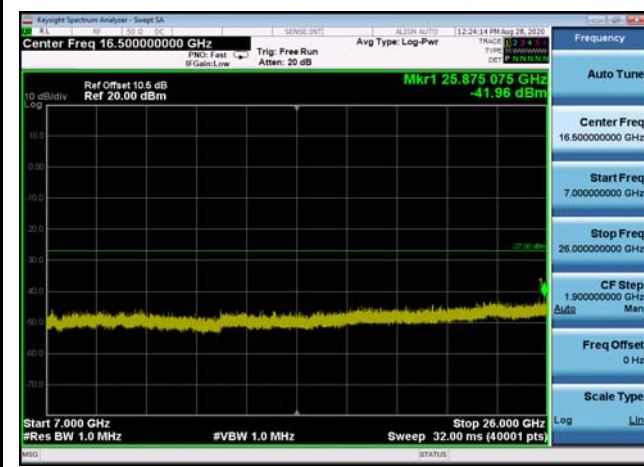
U-NII-3 ,Plot 4,7000MHz~26000MHz-802.
11n(20MHz),5745MHz,Ant1



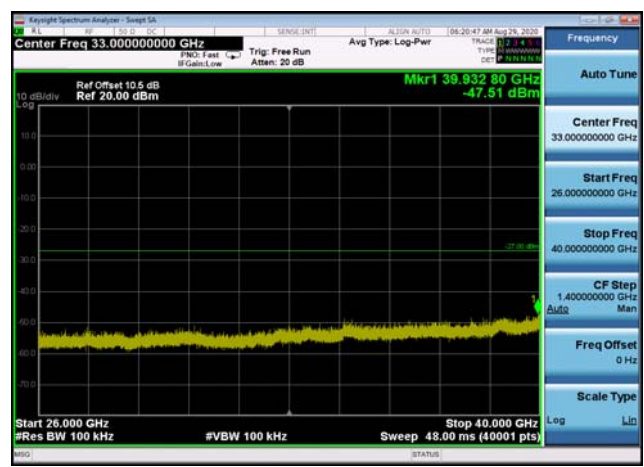
U-NII-3 ,Plot 4,7000MHz~26000MHz-802.
11n(20MHz),5785MHz,Ant1



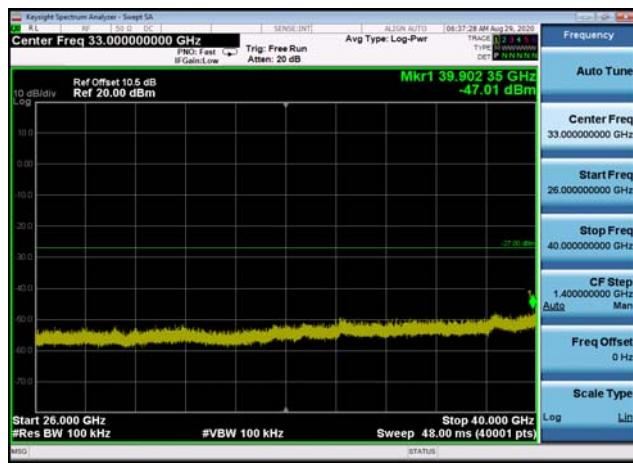
U-NII-3 ,Plot 4,7000MHz~26000MHz-802.
11n(20MHz),5825MHz,Ant1



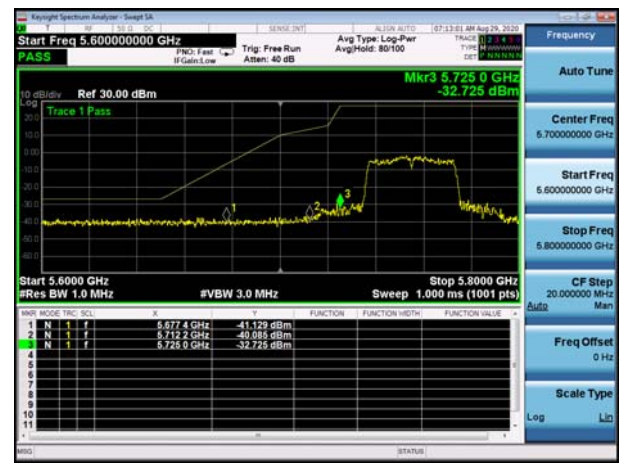
U-NII-3 ,Plot 2,26000MHz~40000MHz-802
.11n(20MHz),5785MHz,Ant1



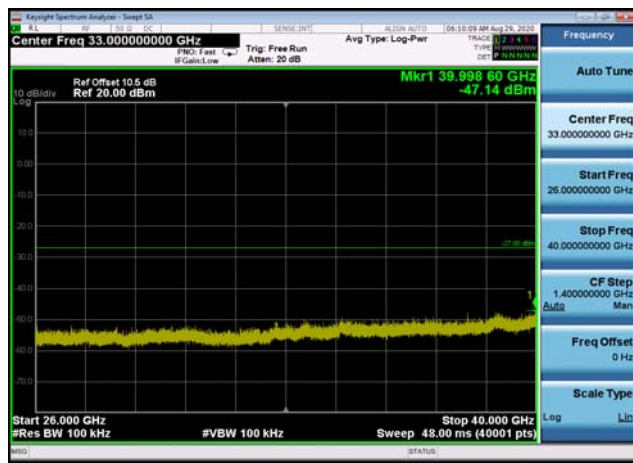
U-NII-3 ,Plot 2,26000MHz~40000MHz-802.11n(20MHz),5745MHz,Ant1



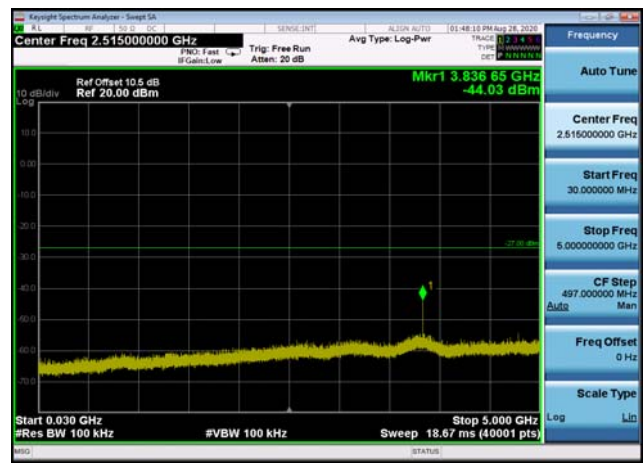
U-NII-3 ,Plot 1,Band Edge-802.11n(40M Hz),5755MHz,Ant1



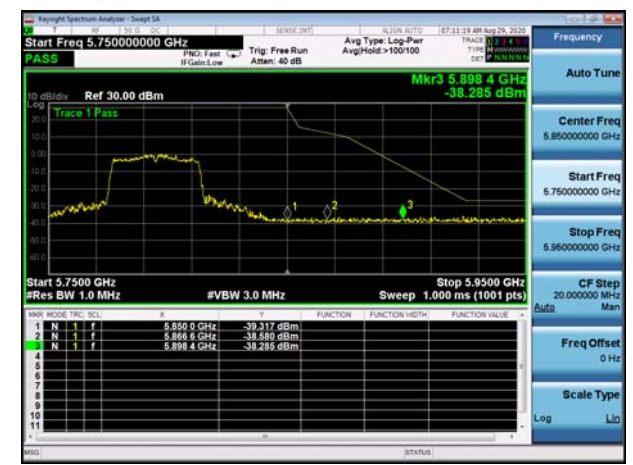
U-NII-3 ,Plot 2,26000MHz~40000MHz-802.11n(20MHz),5825MHz,Ant1



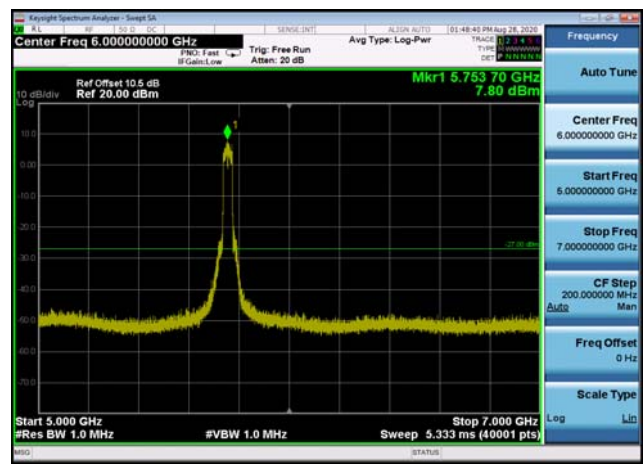
U-NII-3 ,Plot 2,30MHz~5000MHz-802.11n(40MHz),5755MHz,Ant1



U-NII-3 ,Plot 1,Band Edge-802.11n(40M Hz),5795MHz,Ant1

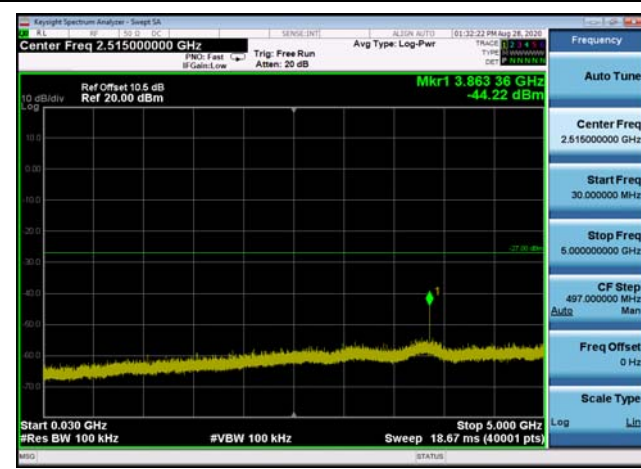


U-NII-3 ,Plot 3,5000MHz~7000MHz-802.11n(40MHz),5755MHz,Ant1

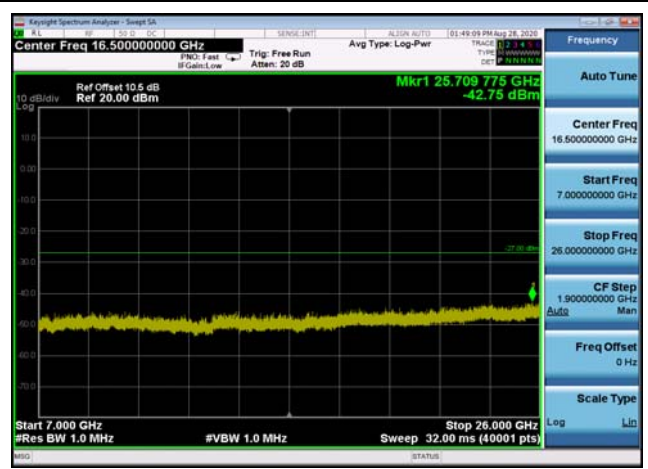




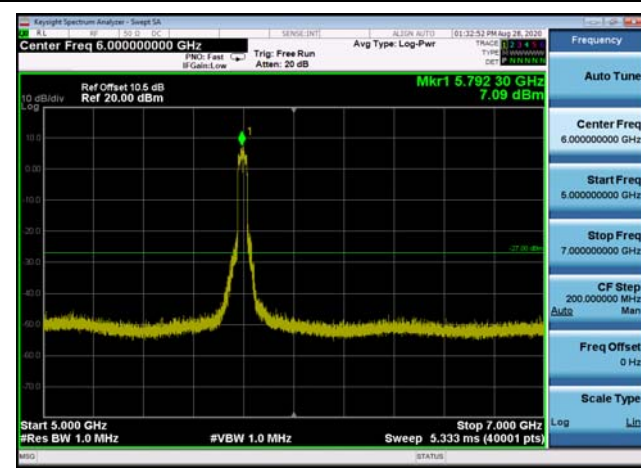
U-NII-3 ,Plot 2,30MHz~5000MHz-802.11n
(40MHz),5795MHz,Ant1



U-NII-3 ,Plot 4,7000MHz~26000MHz-802.11n(40MHz),5755MHz,Ant1



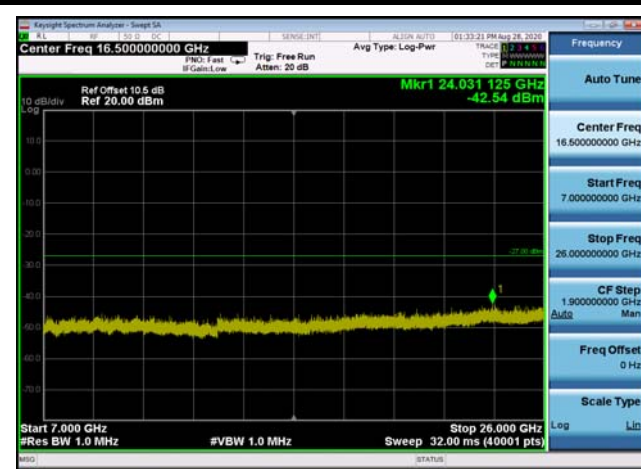
U-NII-3 ,Plot 3,5000MHz~7000MHz-802.11n(40MHz),5795MHz,Ant1



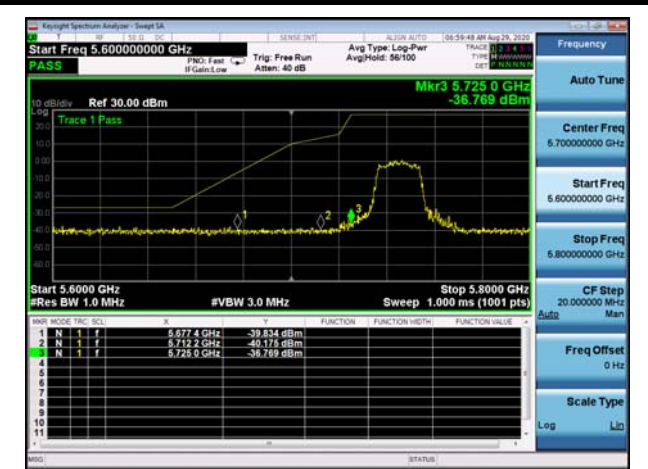
U-NII-3 ,Plot 2,26000MHz~40000MHz-802.11n(40MHz),5755MHz,Ant1



U-NII-3 ,Plot 4,7000MHz~26000MHz-802.11n(40MHz),5795MHz,Ant1

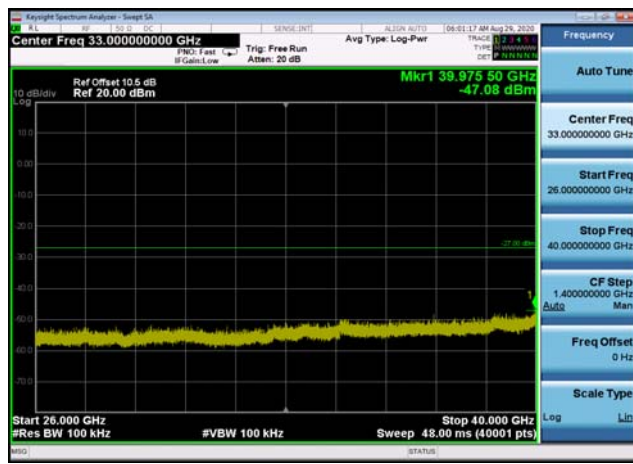


U-NII-3 ,Plot 1,Band Edge-802.11a(20MHz),5745MHz,Ant1

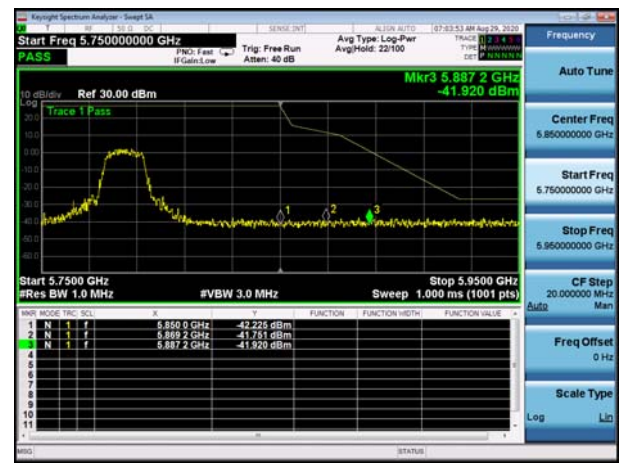




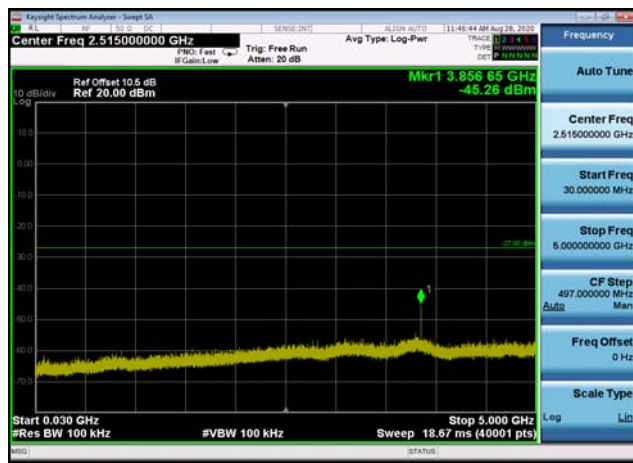
U-NII-3 ,Plot 2,26000MHz~40000MHz-802.11n(40MHz),5795MHz,Ant1



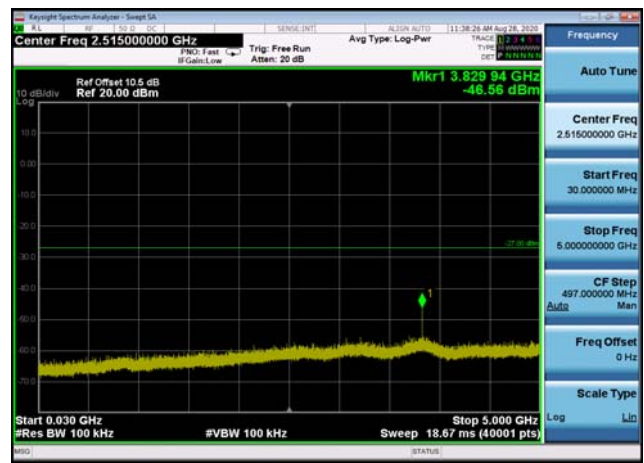
U-NII-3 ,Plot 1,Band Edge-802.11a(20M Hz),5825MHz,Ant1



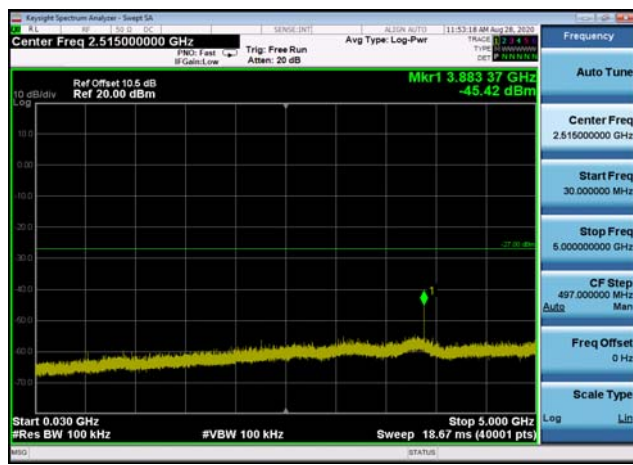
U-NII-3 ,Plot 2,30MHz~5000MHz-802.11a (20MHz),5785MHz,Ant1



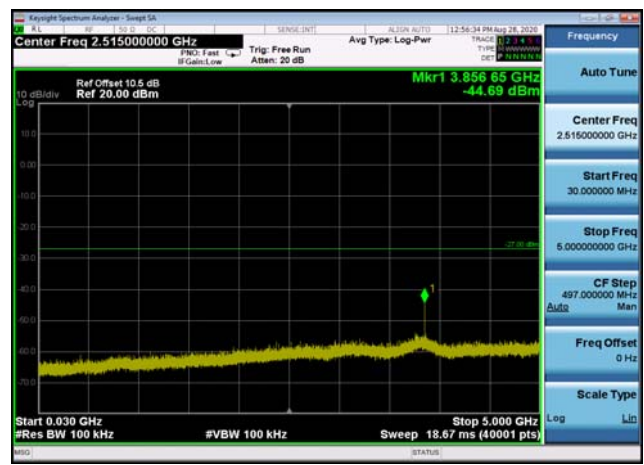
U-NII-3 ,Plot 2,30MHz~5000MHz-802.11a (20MHz),5745MHz,Ant1



U-NII-3 ,Plot 2,30MHz~5000MHz-802.11a (20MHz),5825MHz,Ant1

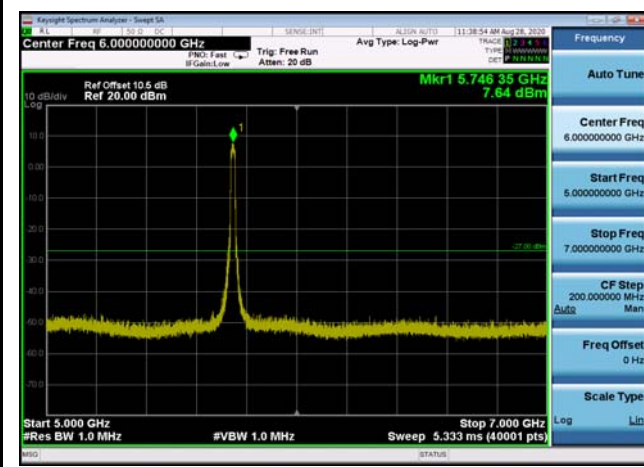


U-NII-3 ,Plot 2,30MHz~5000MHz-802.11a c(20MHz),5785MHz,Ant1

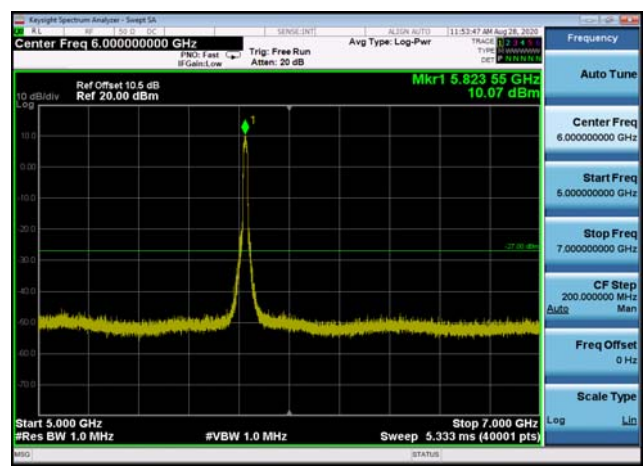




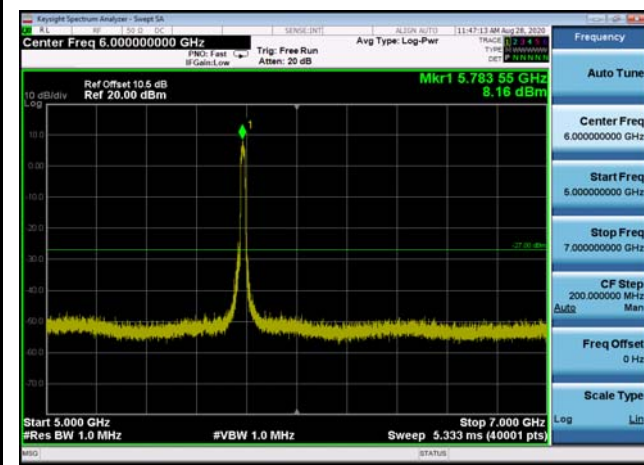
U-NII-3 ,Plot 3,5000MHz~7000MHz-802.1
1a(20MHz),5745MHz,Ant1



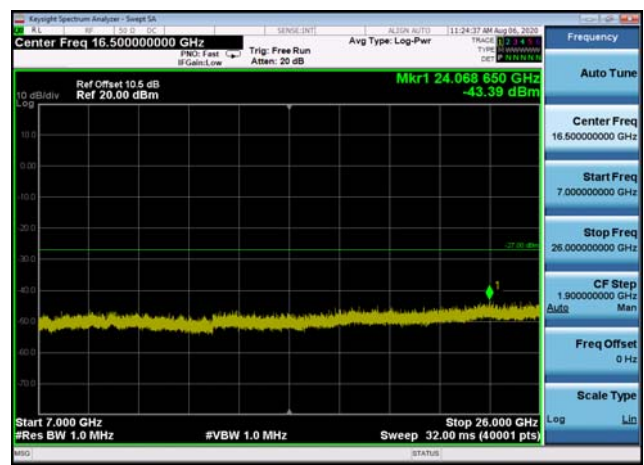
U-NII-3 ,Plot 3,5000MHz~7000MHz-802.1
1a(20MHz),5825MHz,Ant1



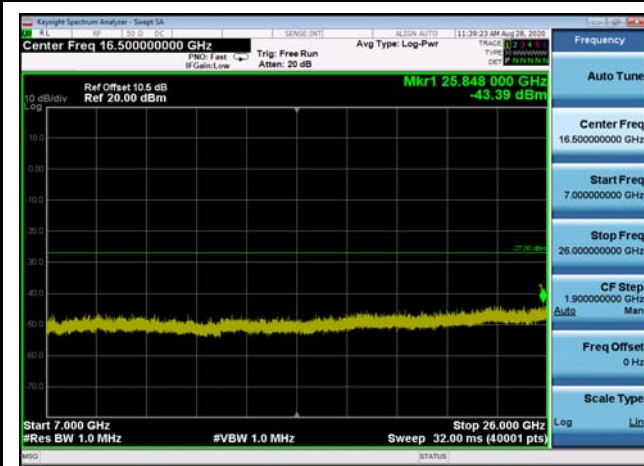
U-NII-3 ,Plot 3,5000MHz~7000MHz-802.1
1a(20MHz),5785MHz,Ant1



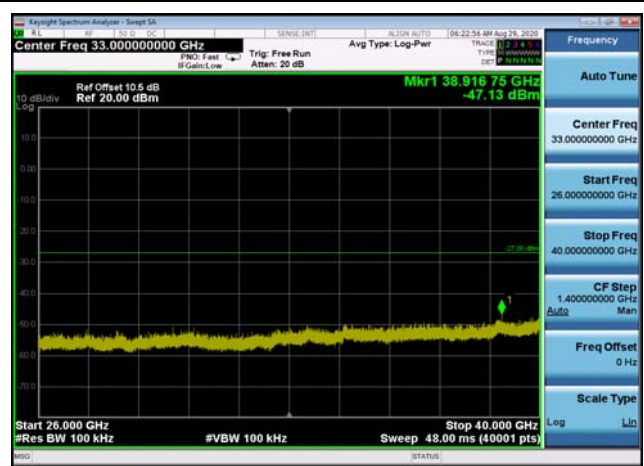
U-NII-3 ,Plot 4,7000MHz~26000MHz-802.
11a(20MHz),5785MHz,Ant1



U-NII-3 ,Plot 4,7000MHz~26000MHz-802.
11a(20MHz),5745MHz,Ant1



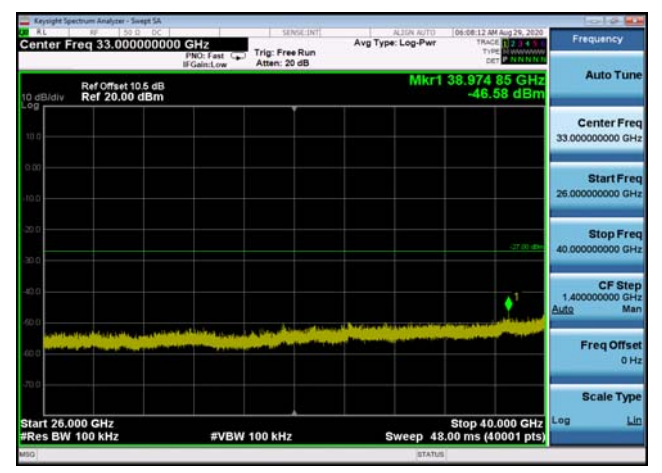
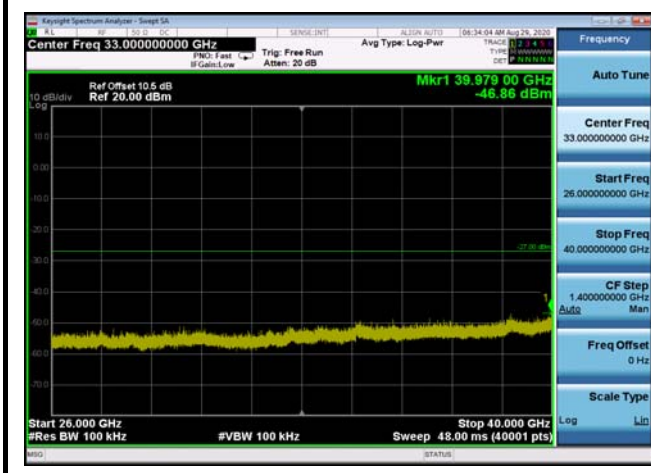
U-NII-3 ,Plot 2,26000MHz~40000MHz-802
.11a(20MHz),5785MHz,Ant1





U-NII-3 ,Plot 2,26000MHz~40000MHz-802
.11a(20MHz),5745MHz,Ant1

U-NII-3 ,Plot 2,26000MHz~40000MHz-802
.11a(20MHz),5825MHz,Ant1



** END OF REPORT **