RF TEST REPORT

Applicant	Xiaomi Communications Co., Ltd.
FCC ID	2AFZZK7AG
Product	Mobile Phone
Brand	Redmi
Model	M2101K7AG
Report No.	R2012A0833-R6V1
Issue Date	January 18, 2021

TA Technology (Shanghai) Co., Ltd. tested the above equipment in accordance with the requirements in **FCC CFR47 Part 15E (2019)**. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Prepared by: Peng Tao

Approved by: Kai Xu

TA Technology (Shanghai) Co., Ltd.

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TABLE OF CONTENT

Version	Revision description	Issue Date
Rev.0	/	January 14, 2021
Rev.1	Update information for product operating voltage range. Update data for chapter 5.3. Update information for General Information	January 18, 2021
Note: This revised report (Report No. R2012A0833-R6V1) supersedes and replaces the previously issued report (Report No. R2012A0833-R6). Please discard or destroy the previously issued report and dispose of it accordingly.		

Summary of measurement results

Number	Test Case	Clause in FCC rules	Verdict
1	Average output power	15.407(a)	PASS
2	Occupied bandwidth	15.407(e)	PASS
3	Frequency stability	15.407(g)	PASS
4	Power spectral density	15.407(a)	PASS
5	Unwanted Emissions	15.407(b)	PASS
6	Conducted Emissions	15.207	PASS
Date of Testing: December 17, 2020 ~ January 3, 2021 and January 18, 2021			
Date of Sample Received: December 14, 2020			
Note: All indications of Pass/Fail in this report are opinions expressed by TA Technology (Shanghai) Co., Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only.			

1. Test Laboratory

1.1. Notes of the test report

This report shall not be reproduced in full or partial, without the written approval of **TA technology (shanghai) co., Ltd.** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. Measurement Uncertainties were not taken into account and are published for informational purposes only. This report is written to support regulatory compliance of the applicable standards stated above.

1.2. Test facility

FCC (Designation number: CN1179, Test Firm Registration Number: 446626)

TA Technology (Shanghai) Co., Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform measurements.

A2LA (Certificate Number: 3857.01)

TA Technology (Shanghai) Co., Ltd. has been listed by American Association for Laboratory Accreditation to perform measurement.

1.3. Testing Location

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong
City:	Shanghai
Post code:	201201
Country:	P. R. China
Contact:	Xu Kai
Telephone:	+86-021-50791141/2/3
Fax:	+86-021-50791141/2/3-8000
Website:	http://www.ta-shanghai.com
E-mail:	xukai@ta-shanghai.com

2. General Description of Equipment under Test

2.1. Applicant and Manufacturer Information

Applicant	Xiaomi Communications Co., Ltd.
Applicant address	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085
Manufacturer	Xiaomi Communications Co., Ltd.
Manufacturer address	#019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085

2.2. General information

EUT Description		
Model	M2101K7AG	
IMEI	IMEI1: 868824050045800 IMEI2: 868824050045818	
Hardware Version	P2	
Software Version	MIUI12	
Power Supply	Battery / AC adapter	
Antenna Type	Internal Antenna	
Antenna Gain	Frequency (MHz)	Antenna Gain(dBi)
	5150	-3.55
	5200	-1.18
	5250	-0.41
	5300	-0.68
	5350	-1.17
	5400	-0.55
	5450	-0.01
	5500	-0.40
	5550	-0.44
	5600	-0.53
	5650	-0.09
	5700	-0.59
	5750	-0.27
	5800	-0.36
	5850	-0.22
Beamforming gain	NA	
Directional Gain	NA	
Test Band	U-NII-1(5150MHz-5250MHz) U-NII-2A(5250MHz-5350MHz)	

	U-NII-2C(5470MHz-5725MHz) U-NII-3(5725MHz-5850MHz)
Modulation Type	802.11a/n (HT20/HT40) : OFDM 802.11ac (VHT20/VHT40/VHT80): OFDM
Max. Conducted Power	16.51dBm
Operating Frequency Range(s)	U-NII-1: 5150MHz-5250MHz U-NII-2A:5250MHz -5350MHz U-NII-2C:5470MHz-5725MHz U-NII-3: 5725MHz -5850MHz
Extreme Temperature	-20 ° C to 50° C
Operating temperature range:	0 ° C to 40° C
Operating voltage range:	3.6 V to 4.2V
State DC voltage:	3.87V
Note:1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant.	

3. Applied Standards

According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

Test standards:

FCC CFR47 Part 15E (2019) Unlicensed National Information Infrastructure Devices

ANSI C63.10 (2013)

Reference standard:

KDB 789033 D02 General UNII Test Procedures New Rules v02r01

4. Test Configuration

Test Mode

The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

In order to find the worst case condition, Pre-tests are needed at the presence of different data rate. Preliminary tests have been done on all the configuration for confirming worst case. Data rate below means worst-case rate of each test item.

Worst-case data rates are shown as following table.

Mode	Data Rate
802.11a	6 Mbps
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ac VHT20	MCS0
802.11ac VHT40	MCS0
802.11ac VHT80	MCS0

Wireless Technology and Frequency Range

Wireless Technology		Bandwidth	Channel	Frequency
Wi-Fi	U-NII-1	20 MHz	36	5180MHz
			40	5200MHz
			44	5220MHz
			48	5240MHz
		40 MHz	38	5190MHz
			46	5230MHz
		80 MHz	42	5210MHz
	U-NII-2A	20 MHz	52	5260MHz
			56	5280MHz
			60	5300MHz
			64	5320MHz
		40 MHz	54	5270MHz
			62	5310MHz
		80 MHz	58	5290MHz
	U-NII-2C	20 MHz	100	5500MHz
			104	5520MHz

			108	5540MHz
			112	5560MHz
			116	5580MHz
			120	5600MHz
			124	5620MHz
			128	5640MHz
			132	5660MHz
			136	5680MHz
			140	5700MHz
		40 MHz	102	5510MHz
			110	5550MHz
			118	5590MHz
			126	5630MHz
			134	5670MHz
			142	5710MHz
		80 MHz	106	5530MHz
			122	5610MHz
			138	5690MHz
	U-NII-3	20 MHz	149	5745MHz
			153	5765MHz
			157	5785MHz
			161	5805MHz
			165	5825MHz
		40 MHz	151	5755MHz
			159	5795MHz
		80 MHz	155	5775MHz
Does this device support TPC Function? ☐Yes ☒No				
Does this device support TDWR Band? ☒Yes ☐No				

5. Test Case Results

5.1. Occupied Bandwidth

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.

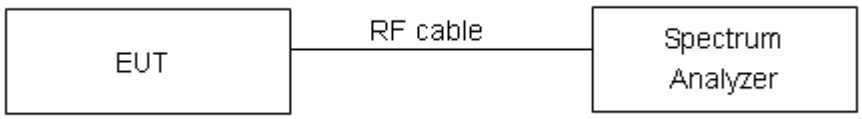
For U-NII-1/U-NII-2A/U-NII-2C, set RBW ≈1% OCB kHz, VBW ≥ 3 × RBW, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the fundamental emission.

For U-NII-3, Set RBW = 100 kHz, VBW ≥ 3 × RBW, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Note: The automatic bandwidth measurement capability of a spectrum analyzer or EMI receiver may be employed if it implements the functionality described above.

Use the 99 % power bandwidth function of the instrument

Test Setup



Limits

Rule FCC Part §15.407(e)

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936 Hz.

Test Results:

U-NII-1

Mode	Channel/Frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	36/5180	16.389	21.28	PASS
	40/5200	16.394	19.75	PASS
	48/5240	16.403	21.11	PASS
802.11n HT20	36/5180	17.585	20.38	PASS
	40/5200	17.630	21.77	PASS
	48/5240	17.601	21.58	PASS
802.11n HT40	38/5190	36.067	40.39	PASS
	46/5230	36.009	39.97	PASS
802.11ac VHT20	36/5180	17.614	20.38	PASS
	40/5200	17.572	21.04	PASS
	48/5240	17.620	22.02	PASS
802.11ac VHT40	38/5190	36.071	40.25	PASS
	46/5230	35.998	40.52	PASS
802.11ac VHT80	42/5210	75.028	81.10	PASS

U-NII-2A

Mode	Channel/Frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	52/5260	16.393	21.60	PASS
	60/5300	16.400	20.42	PASS
	64/5320	16.380	20.92	PASS
802.11n HT20	52/5260	17.563	20.46	PASS
	60/5300	17.593	22.20	PASS
	64/5320	17.582	20.70	PASS
802.11n HT40	54/5270	35.906	39.92	PASS
	62/5310	35.903	39.61	PASS
802.11ac VHT20	52/5260	17.551	21.34	PASS
	60/5300	17.574	21.95	PASS
	64/5320	17.591	21.69	PASS
802.11ac VHT40	54/5270	35.861	39.92	PASS
	62/5310	35.868	39.77	PASS
802.11ac VHT80	58/5290	74.934	80.83	PASS

U-NII-2C

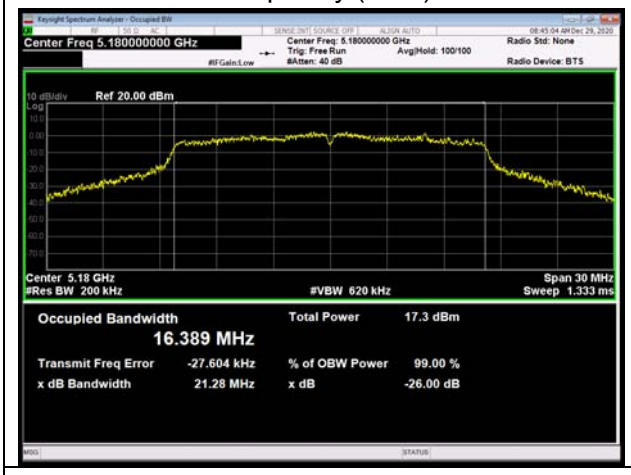
Mode	Channel/Frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	100/5500	16.365	21.10	PASS
	120/5600	16.348	19.82	PASS
	140/5700	16.343	21.39	PASS
	144/5720	16.346	20.26	PASS
802.11n HT20	100/5500	17.571	21.37	PASS
	120/5600	17.537	21.34	PASS
	140/5700	17.553	21.46	PASS
	144/5720	17.558	21.33	PASS
802.11n HT40	102/5510	35.821	39.71	PASS
	118/5590	36.010	40.08	PASS
	134/5670	35.893	40.01	PASS
	142/5710	35.848	38.91	PASS
802.11ac VHT20	100/5500	17.561	20.74	PASS
	120/5600	17.565	20.84	PASS
	140/5700	17.547	20.53	PASS
	144/5720	17.571	20.85	PASS
802.11ac VHT40	102/5510	35.870	39.48	PASS
	118/5590	36.036	40.57	PASS
	134/5670	35.901	39.95	PASS
	142/5710	35.832	39.40	PASS
802.11ac VHT80	106/5530	74.887	80.71	PASS
	122/5610	74.813	80.37	PASS
	138/5690	74.861	80.21	PASS

U-NII-3

Mode	Channel/Frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11a	149/5745	16.364	15.04	500	PASS
	157/5785	16.383	12.59	500	PASS
	165/5825	16.377	13.86	500	PASS
802.11n HT20	149/5745	17.596	15.02	500	PASS
	157/5785	17.610	15.68	500	PASS
	165/5825	17.594	13.75	500	PASS
802.11n HT40	151/5755	35.789	34.99	500	PASS
	159/5795	35.954	33.83	500	PASS
802.11ac VHT20	149/5745	17.576	13.90	500	PASS
	157/5785	17.604	11.35	500	PASS
	165/5825	17.611	13.84	500	PASS
802.11ac VHT40	151/5755	35.833	26.30	500	PASS
	159/5795	35.968	34.98	500	PASS
802.11ac VHT80	155/5775	74.900	70.00	500	PASS

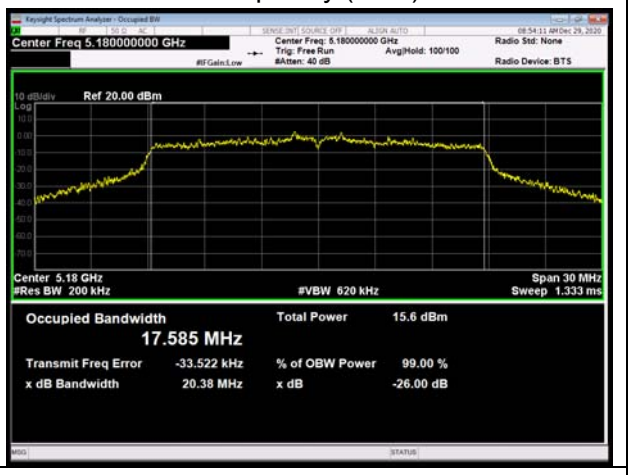
U-NII-1, 802.11a

Carrier frequency (MHz): 5180



U-NII-1, 802.11n HT20

Carrier frequency (MHz): 5180

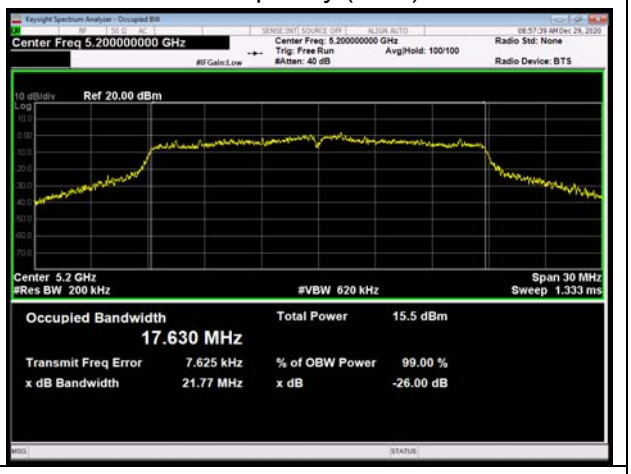


U-NII-1, 802.11a

Carrier frequency (MHz): 5200

U-NII-1, 802.11n HT20

Carrier frequency (MHz): 5200



U-NII-1, 802.11a

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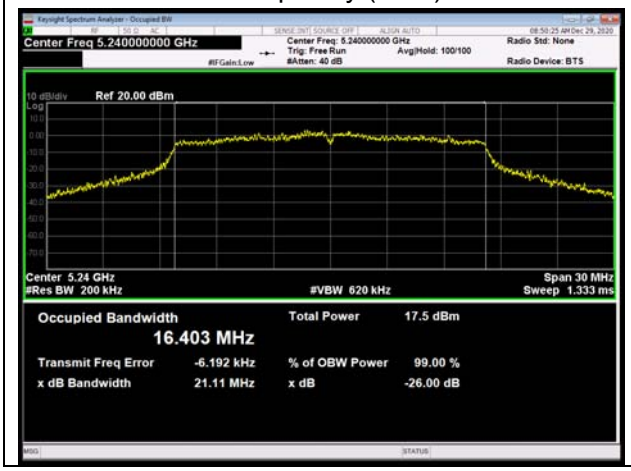

U-NII-1, 802.11n HT20

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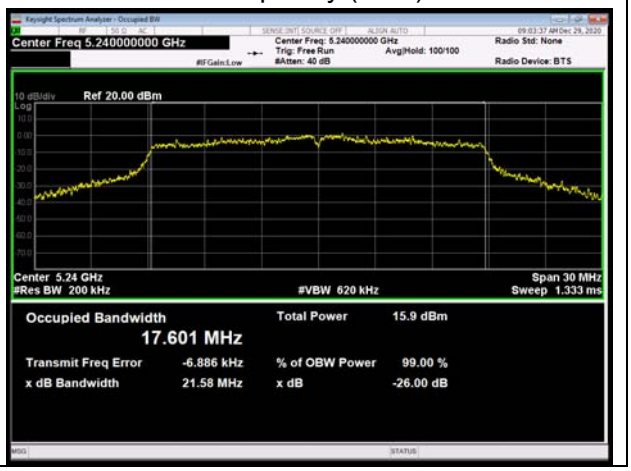
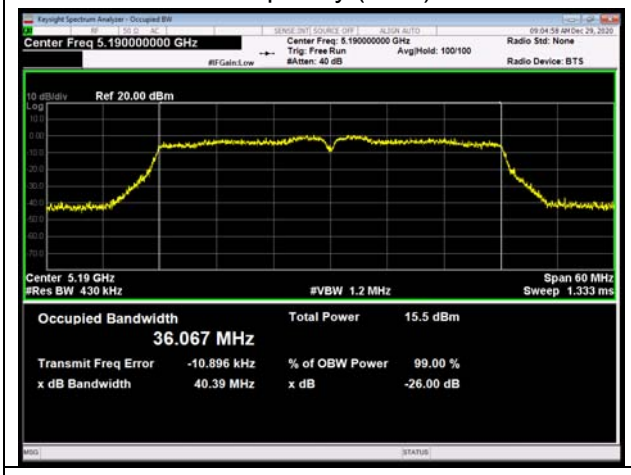


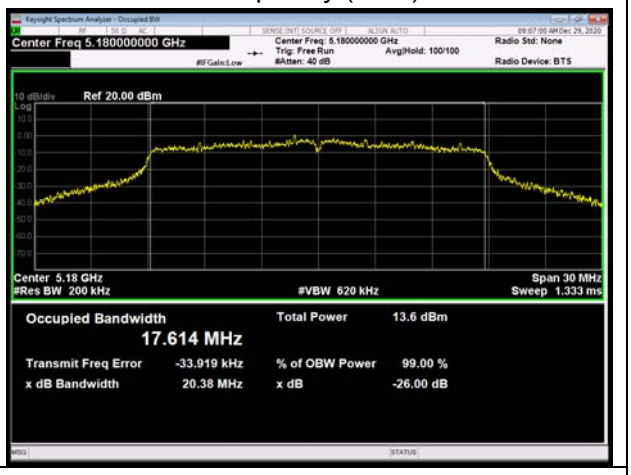
U-NII-1, 802.11n HT40

Carrier frequency (MHz): 5190



U-NII-1, 802.11ac VHT20

Carrier frequency (MHz): 5180

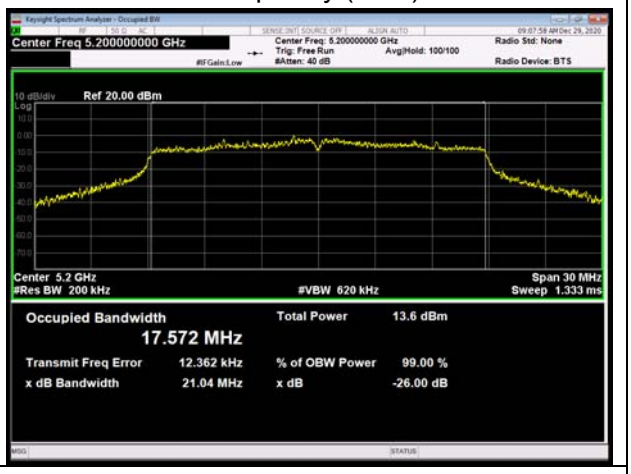


U-NII-1, 802.11n HT40

Carrier frequency (MHz): 5230

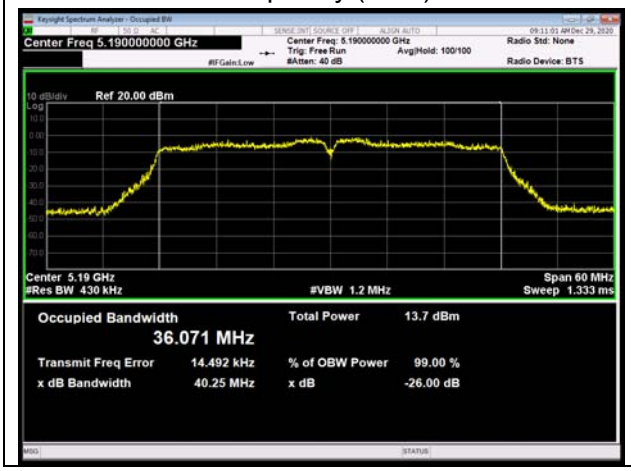
U-NII-1, 802.11ac VHT20

Carrier frequency (MHz): 5200



U-NII-1, 802.11ac VHT40

Carrier frequency (MHz): 5190



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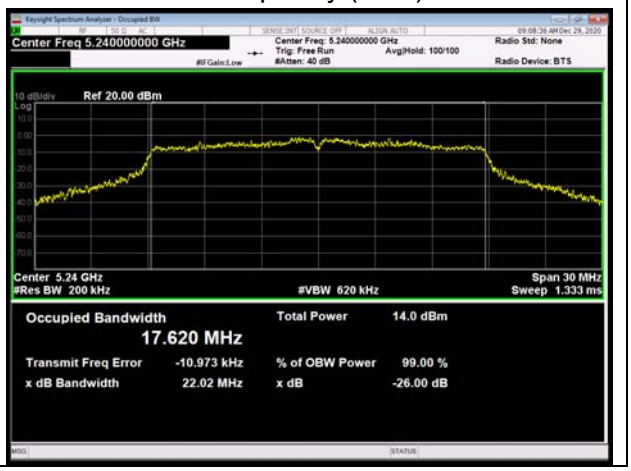
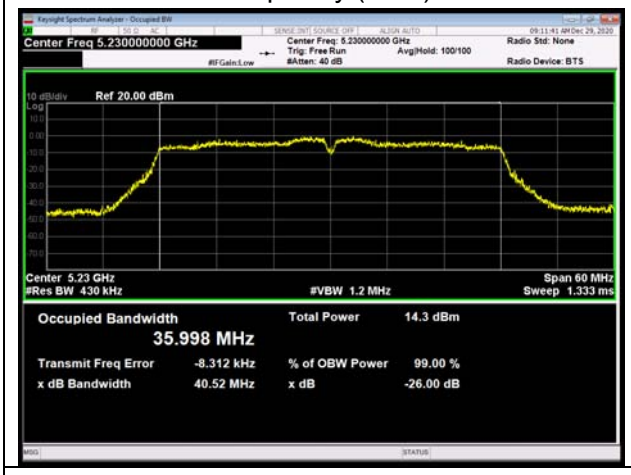


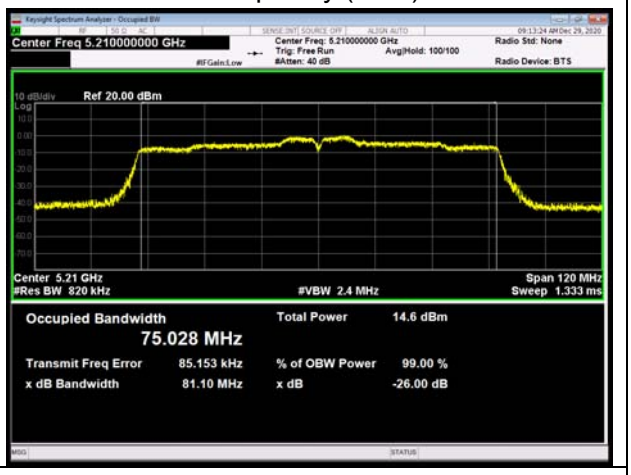
U-NII-1, 802.11ac VHT40

Carrier frequency (MHz): 5230



U-NII-1, 802.11ac VHT80

Carrier frequency (MHz): 5210



U-NII-2A, 802.11a

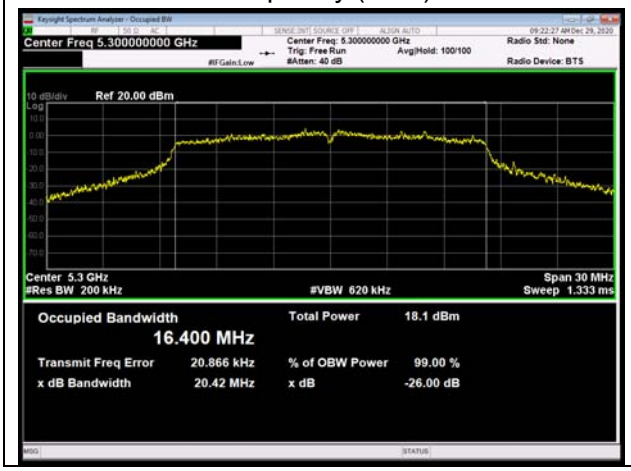
Carrier frequency (MHz): 5260

U-NII-2A, 802.11n HT20

Carrier frequency (MHz): 5260

U-NII-2A, 802.11a

Carrier frequency (MHz): 5300



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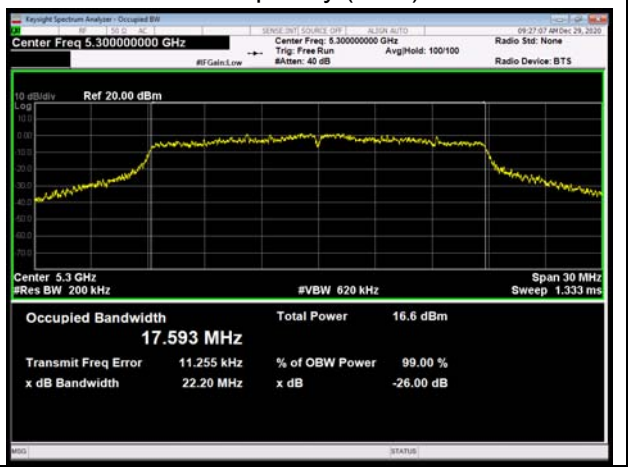
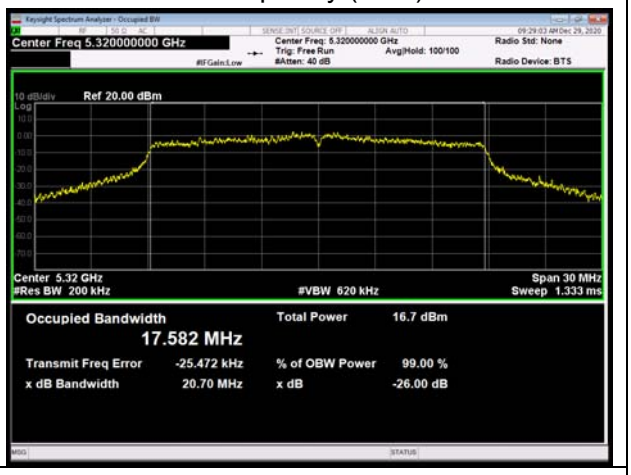


U-NII-2A, 802.11a

Carrier frequency (MHz):5320

U-NII-2A, 802.11n HT20

Carrier frequency (MHz):5320

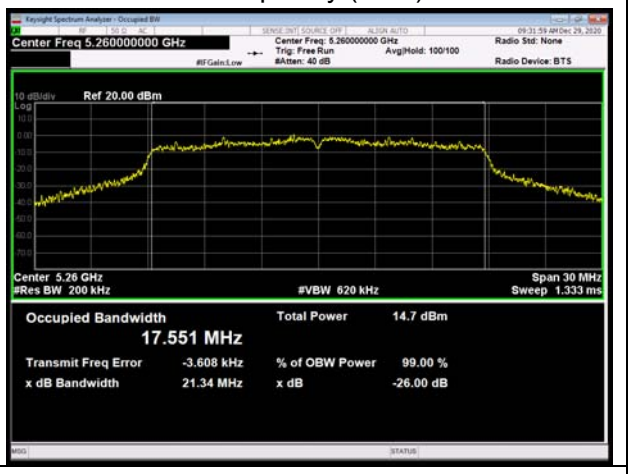


U-NII-2A, 802.11n HT40

Carrier frequency (MHz): 5270

U-NII-2A, 802.11ac VHT20

Carrier frequency (MHz):5260



U-NII-2A, 802.11n HT40

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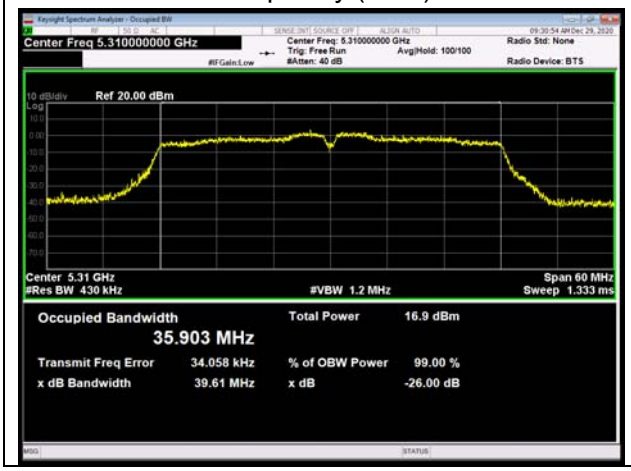

U-NII-2A, 802.11ac VHT20

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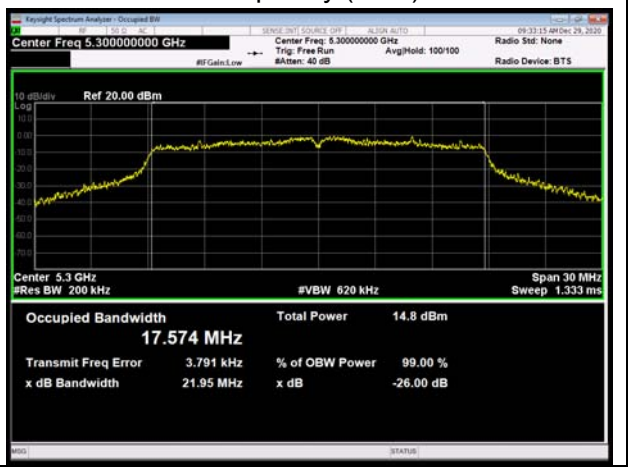

U-NII-2A, 802.11ac VHT40

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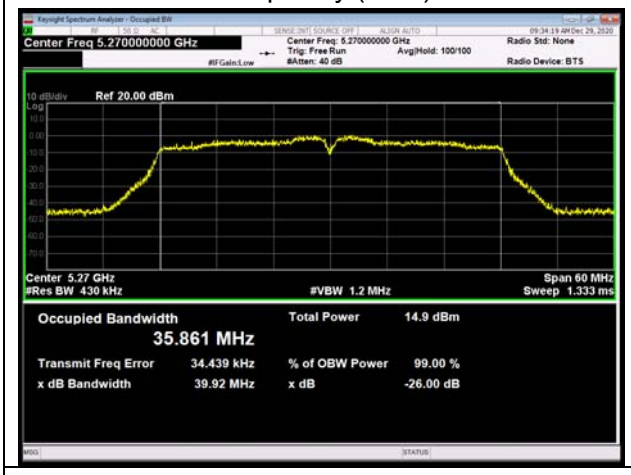

U-NII-2A, 802.11ac VHT20

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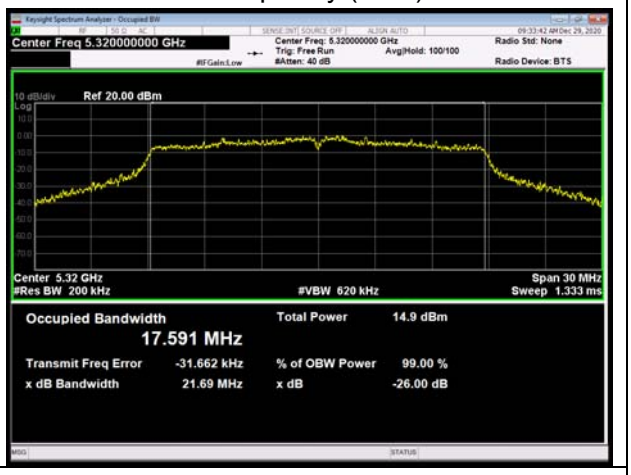
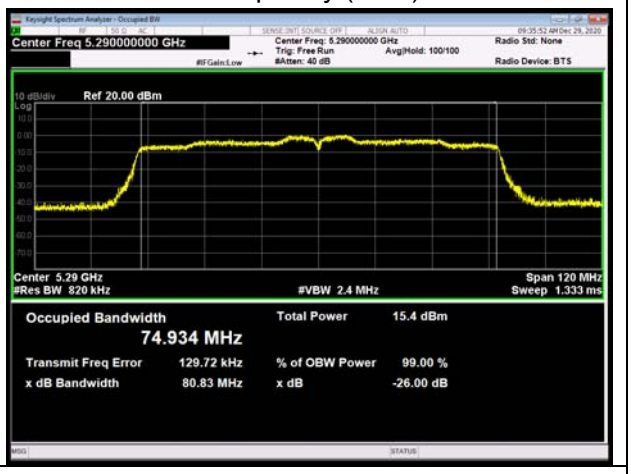


U-NII-2A, 802.11ac VHT40

Carrier frequency (MHz): 5310

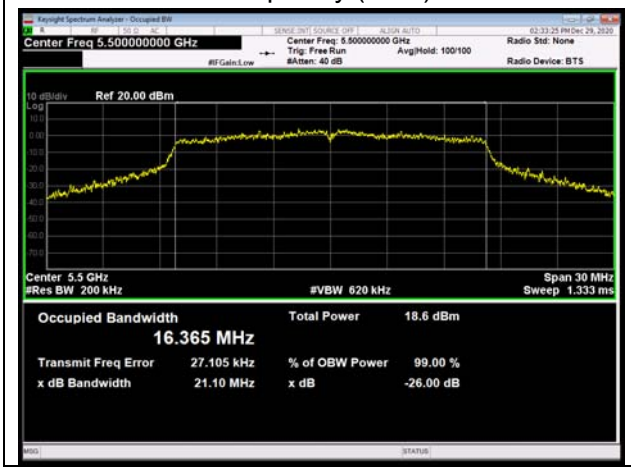
U-NII-2A, 802.11ac VHT80

Carrier frequency (MHz): 5290



U-NII-2C, 802.11a

Carrier frequency (MHz): 5500



U-NII-2C, 802.11n HT20

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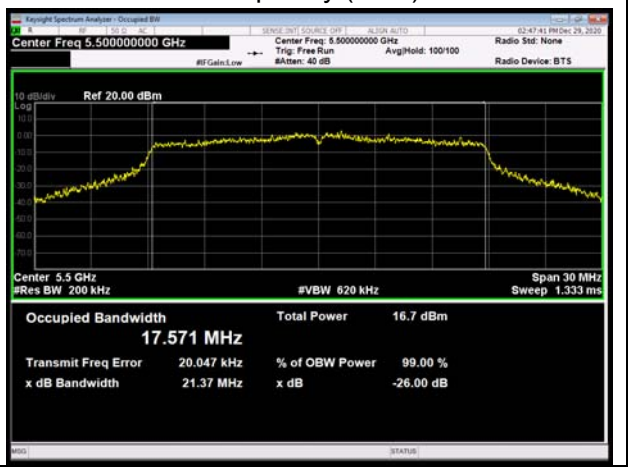
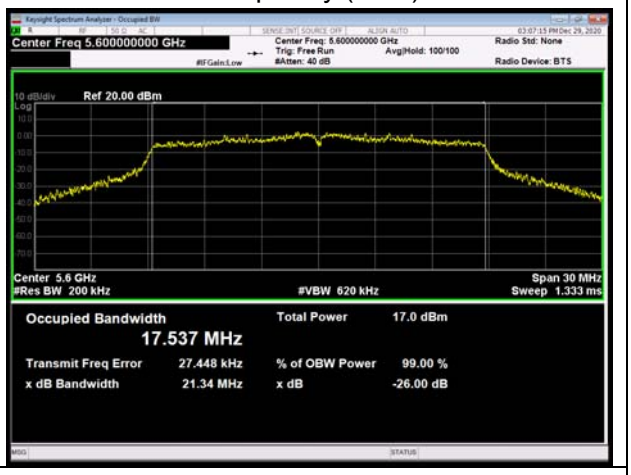


U-NII-2C, 802.11a

Carrier frequency (MHz): 5600

U-NII-2C, 802.11n HT20

Carrier frequency (MHz): 5600

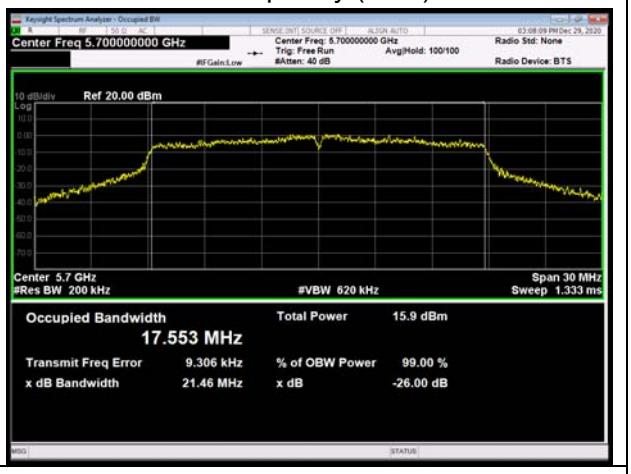


U-NII-2C, 802.11a

Carrier frequency (MHz):5700

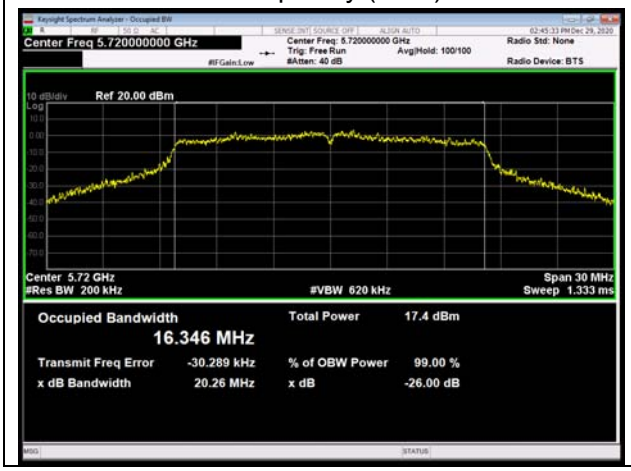
U-NII-2C, 802.11n HT20

Carrier frequency (MHz):5700



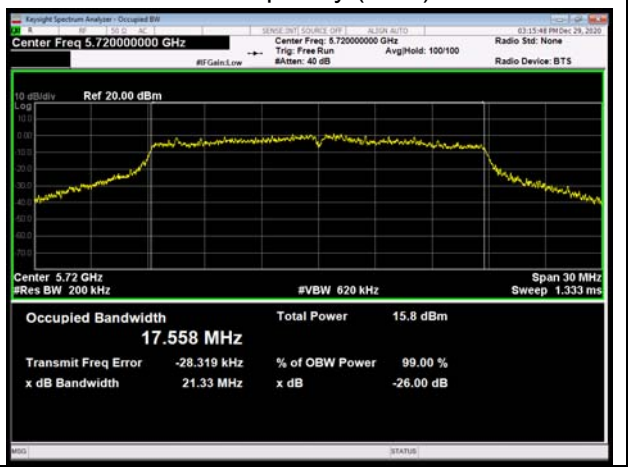
U-NII-2C, 802.11a

Carrier frequency (MHz):5720



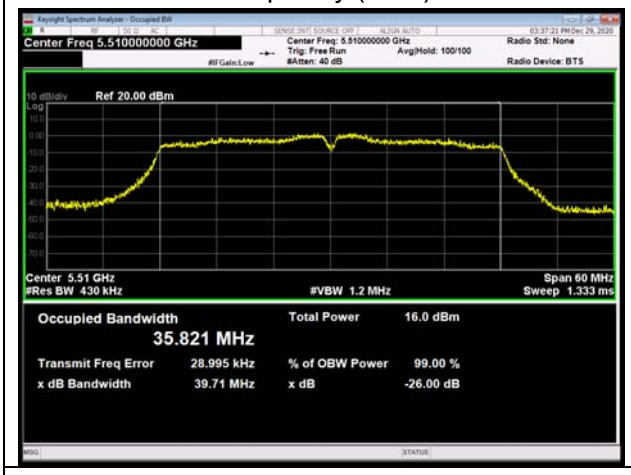
U-NII-2C, 802.11n HT20

Carrier frequency (MHz):5720



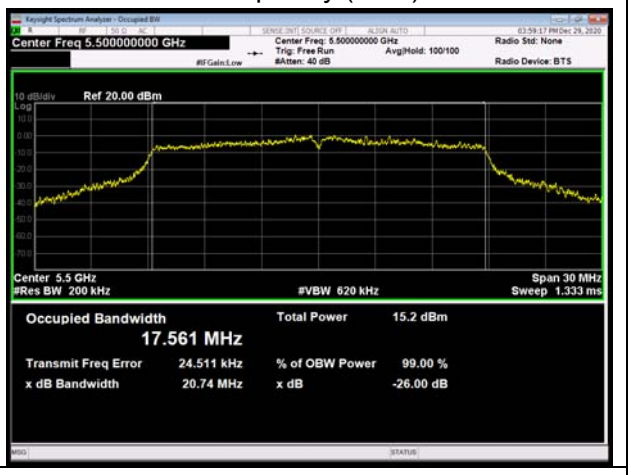
U-NII-2C, 802.11n HT40

Carrier frequency (MHz): 5510



U-NII-2C, 802.11ac VHT20

Carrier frequency (MHz): 5500

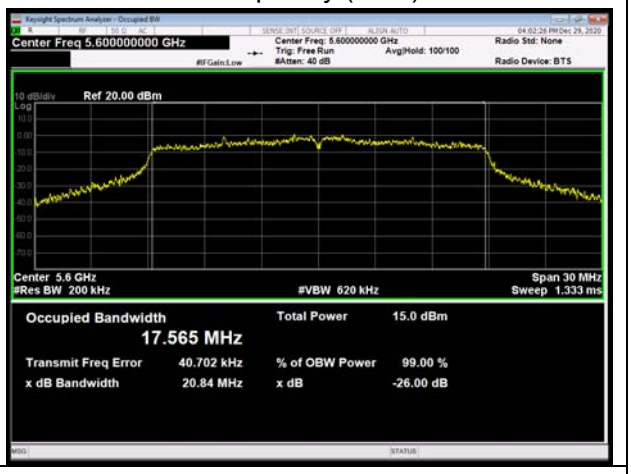


U-NII-2C, 802.11n HT40

Carrier frequency (MHz): 5590

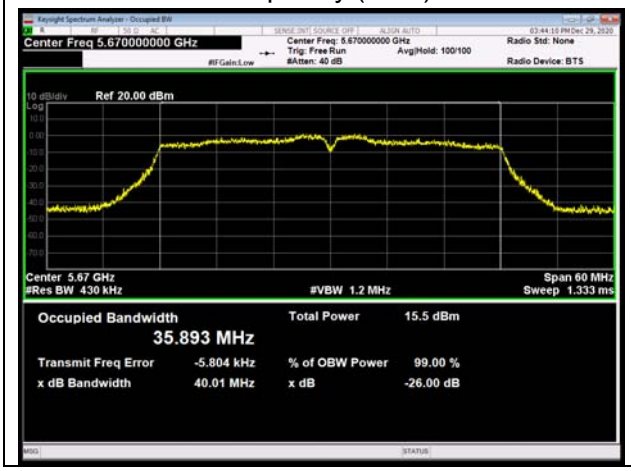
U-NII-2C, 802.11ac VHT20

Carrier frequency (MHz): 5600



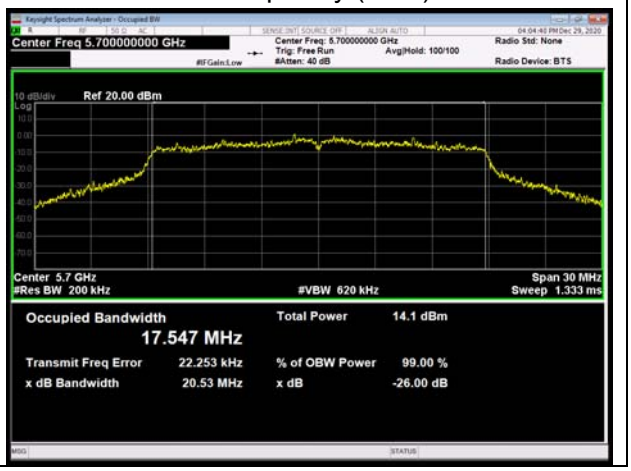
U-NII-2C, 802.11n HT40

Carrier frequency (MHz): 5670



U-NII-2C, 802.11ac VHT20

Carrier frequency (MHz):5700

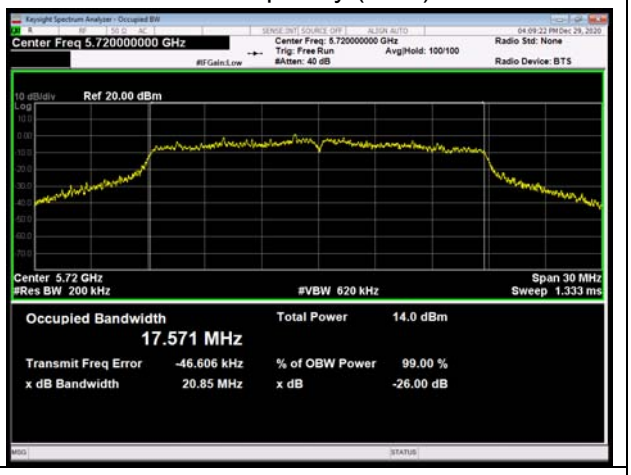


U-NII-2C, 802.11n HT40

Carrier frequency (MHz): 5710

U-NII-2C, 802.11ac VHT20

Carrier frequency (MHz):5720

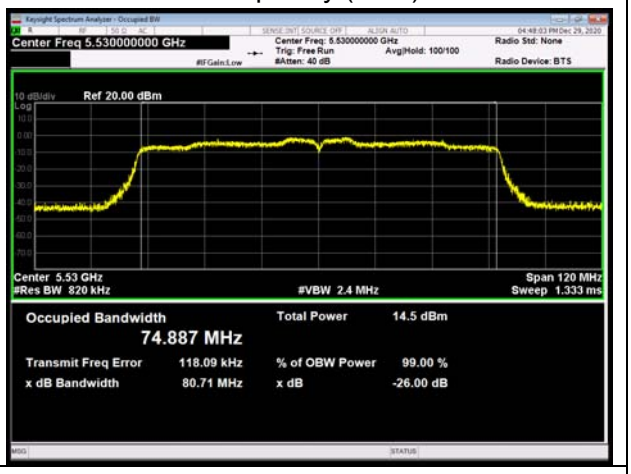


U-NII-2C, 802.11ac VHT40

Carrier frequency (MHz): 5510

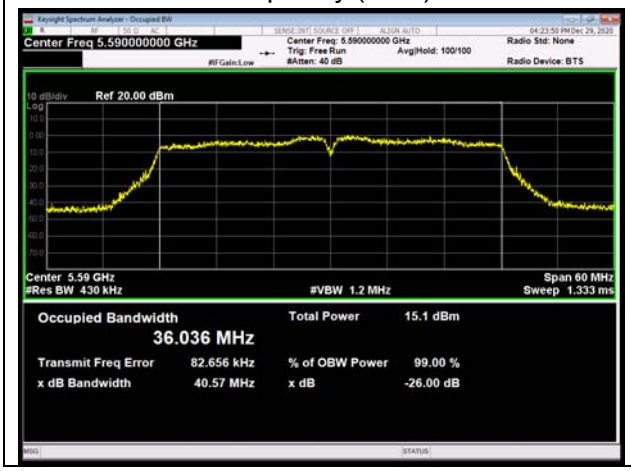
U-NII-2C, 802.11ac VHT80

Carrier frequency (MHz): 5530



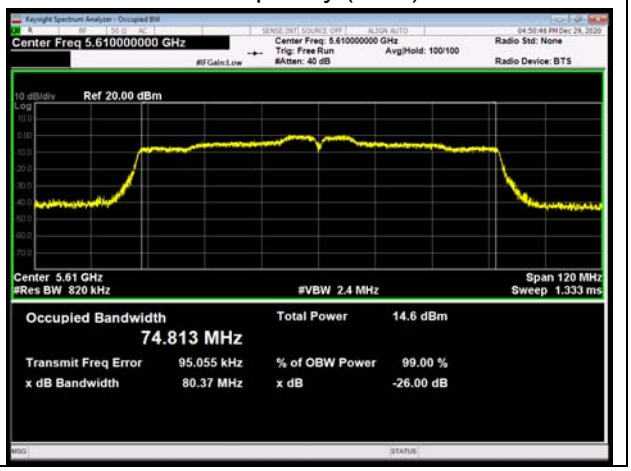
U-NII-2C, 802.11ac VHT40

Carrier frequency (MHz): 5590



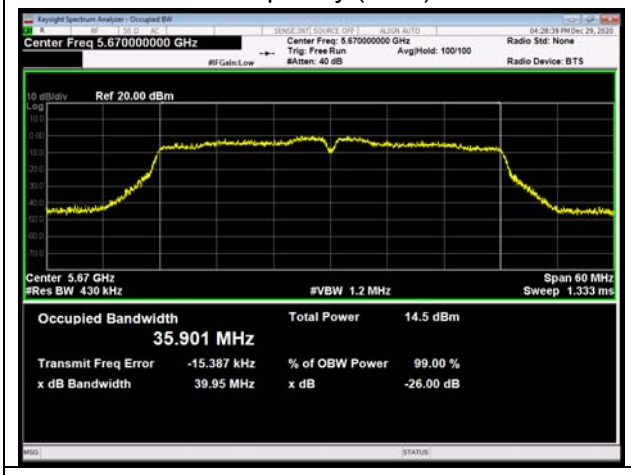
U-NII-2C, 802.11ac VHT80

Carrier frequency (MHz): 5610



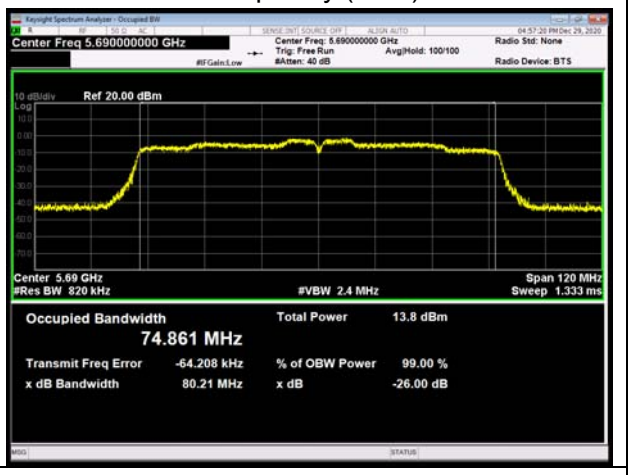
U-NII-2C, 802.11ac VHT40

Carrier frequency (MHz): 5670



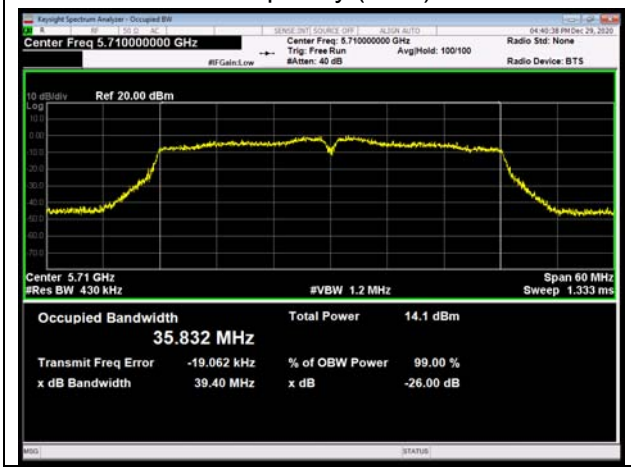
U-NII-2C, 802.11ac VHT80

Carrier frequency (MHz): 5690



U-NII-2C, 802.11ac VHT40

Carrier frequency (MHz): 5710

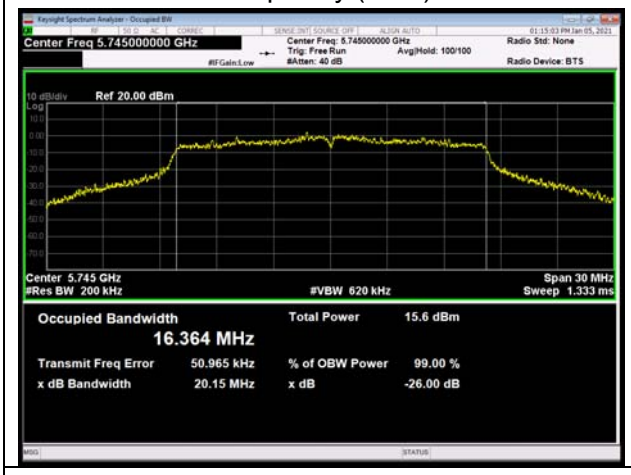


/

99% bandwidth

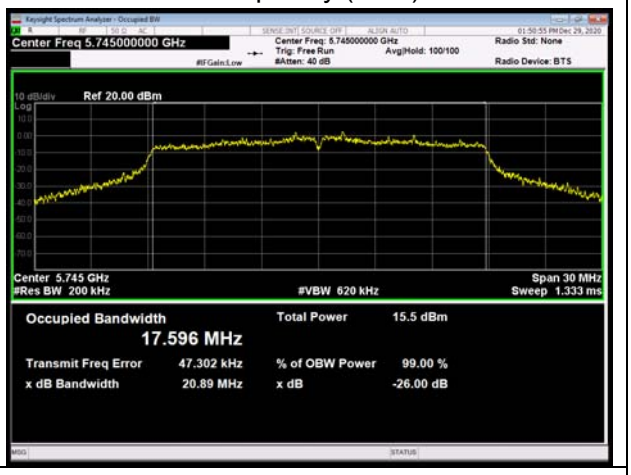
U-NII-3, 802.11a

Carrier frequency (MHz): 5745



U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5745

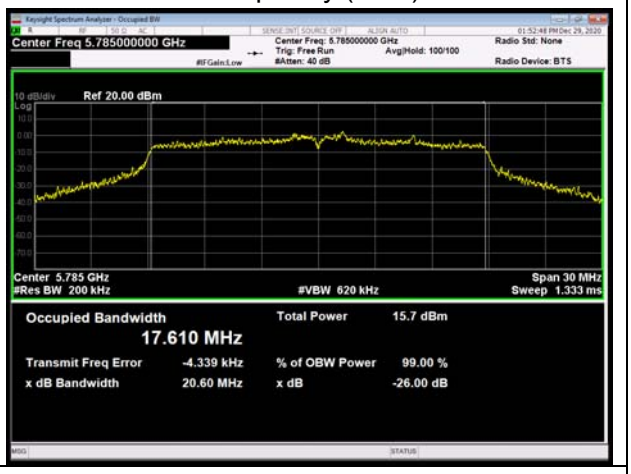


U-NII-3, 802.11a

Carrier frequency (MHz): 5785

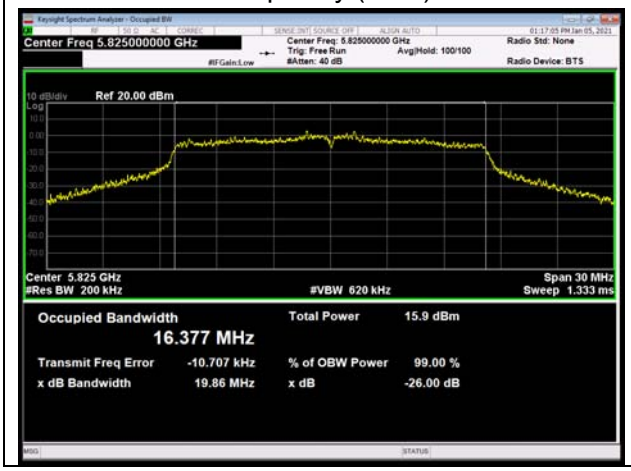
U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5785



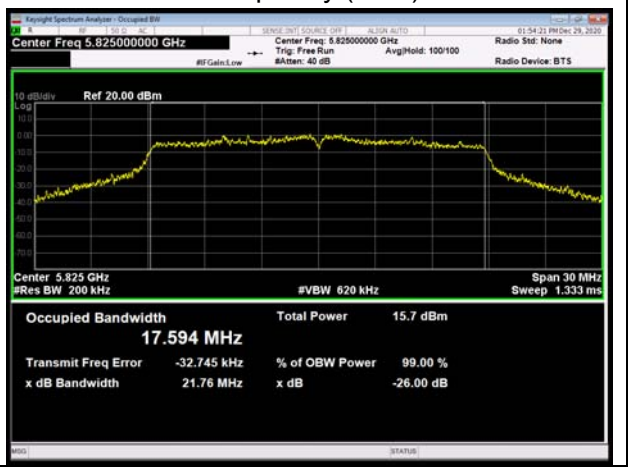
U-NII-3, 802.11a

Carrier frequency (MHz): 5825



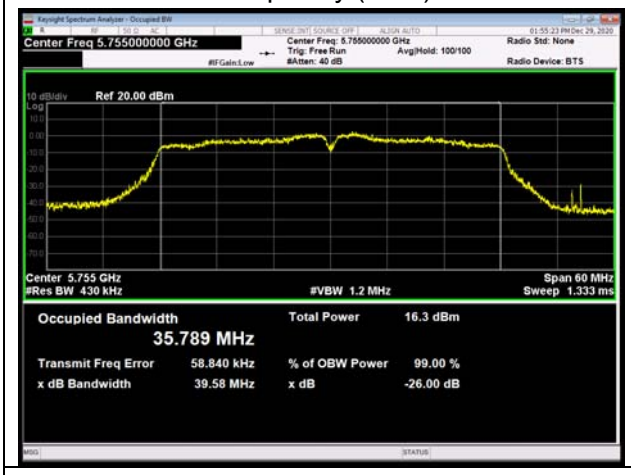
U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5825



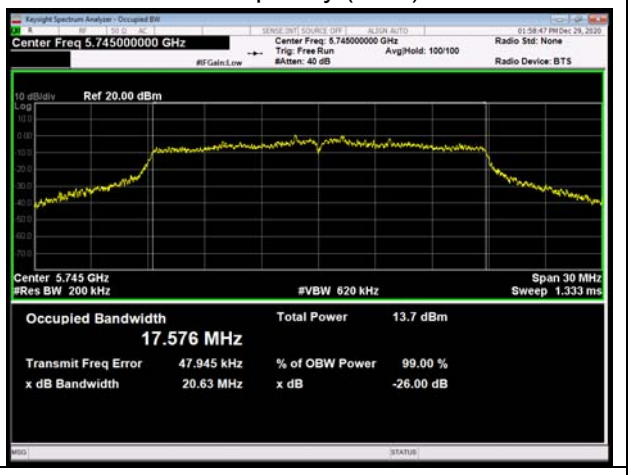
U-NII-3, 802.11n HT40

Carrier frequency (MHz): 5755



U-NII-3, 802.11ac VHT20

Carrier frequency (MHz): 5745

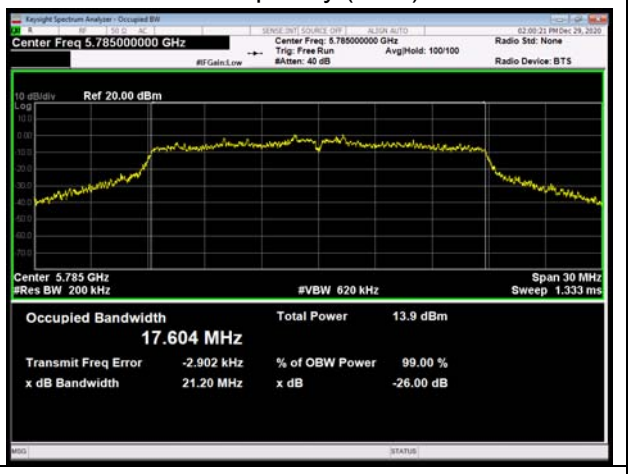


U-NII-3, 802.11n HT40

Carrier frequency (MHz): 5795

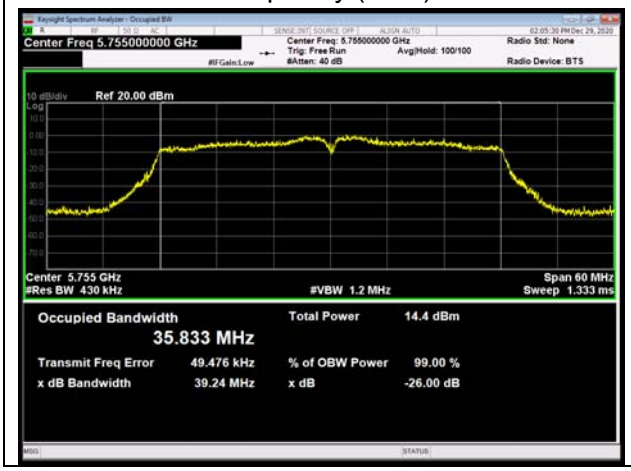
U-NII-3, 802.11ac VHT20

Carrier frequency (MHz): 5785



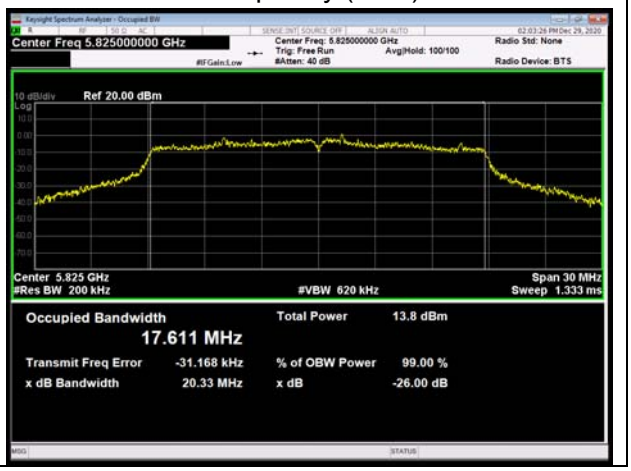
U-NII-3, 802.11ac VHT40

Carrier frequency (MHz): 5755



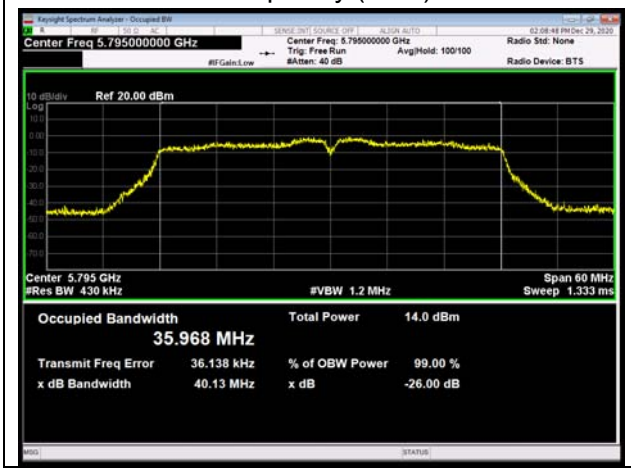
U-NII-3, 802.11ac VHT20

Carrier frequency (MHz): 5825



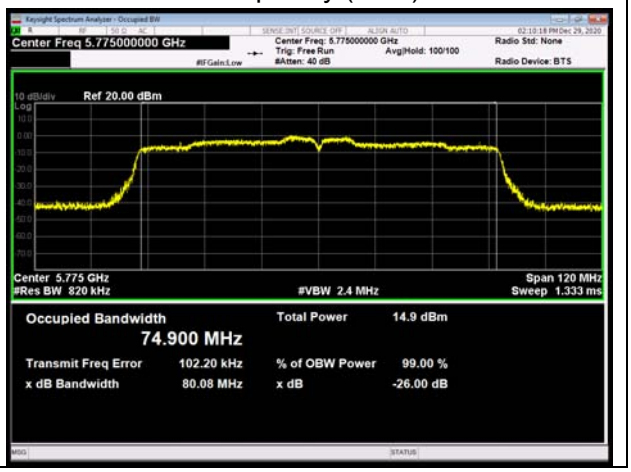
U-NII-3, 802.11ac VHT40

Carrier frequency (MHz): 5795



U-NII-3, 802.11ac VHT80

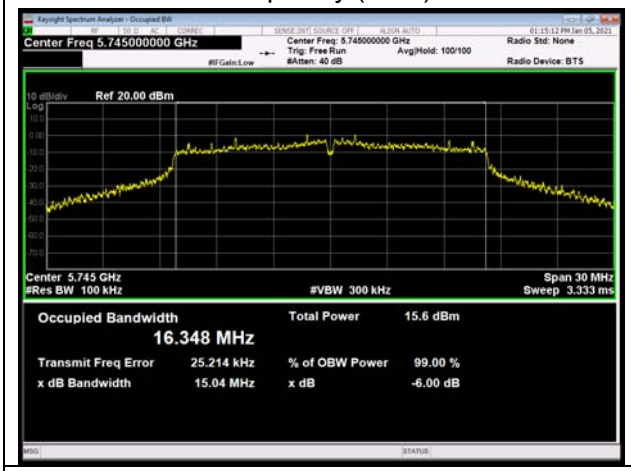
Carrier frequency (MHz): 5775



Minimum 6 dB bandwidth

U-NII-3, 802.11a

Carrier frequency (MHz): 5745

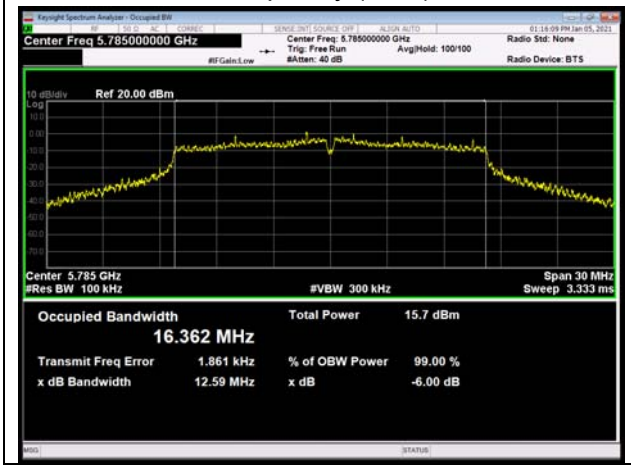


U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5745

U-NII-3, 802.11a

Carrier frequency (MHz): 5785

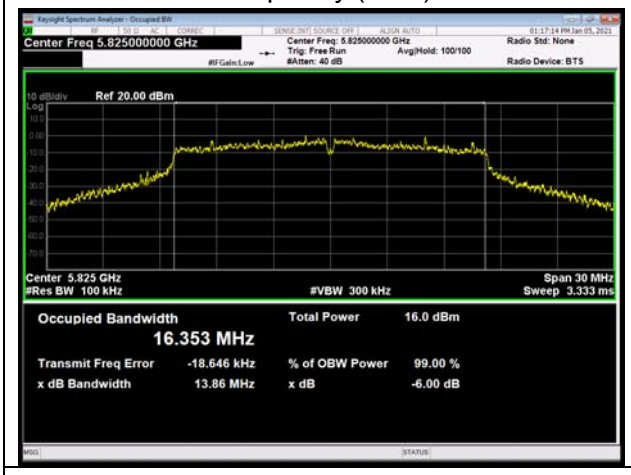


U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5785

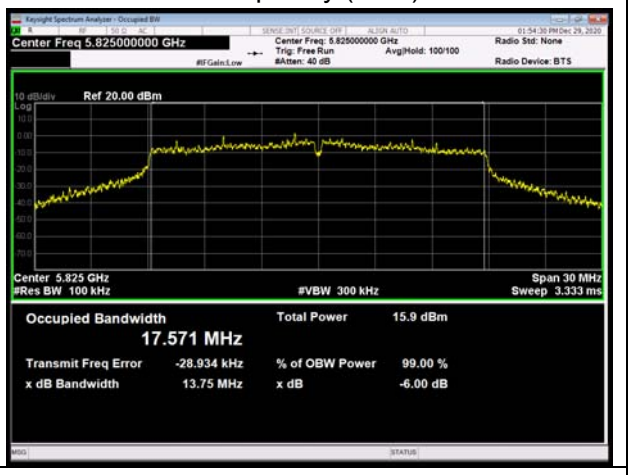
U-NII-3, 802.11a

Carrier frequency (MHz): 5825



U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5825

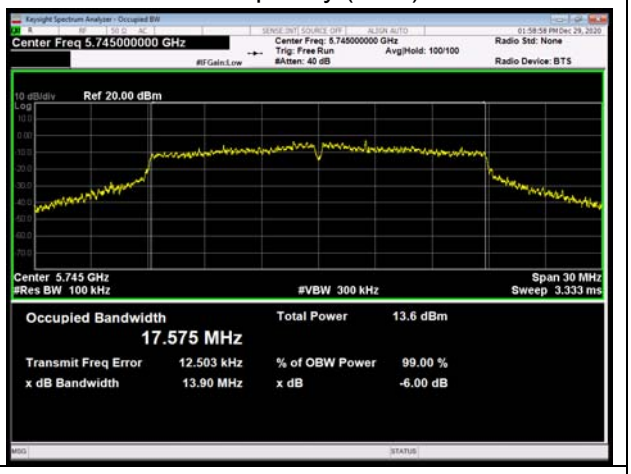


U-NII-3, 802.11n HT40

Carrier frequency (MHz): 5755

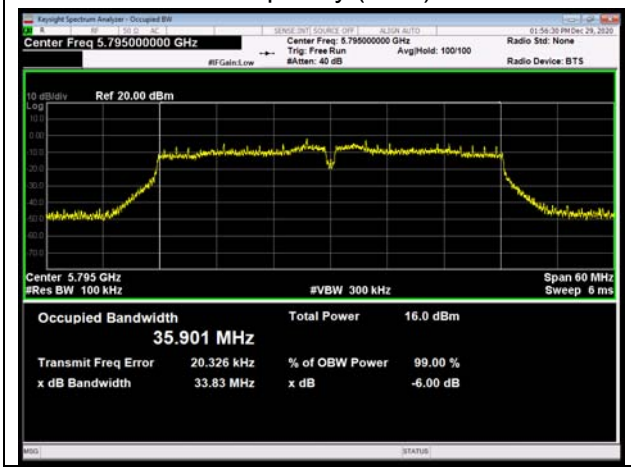
U-NII-3, 802.11ac VHT20

Carrier frequency (MHz): 5745



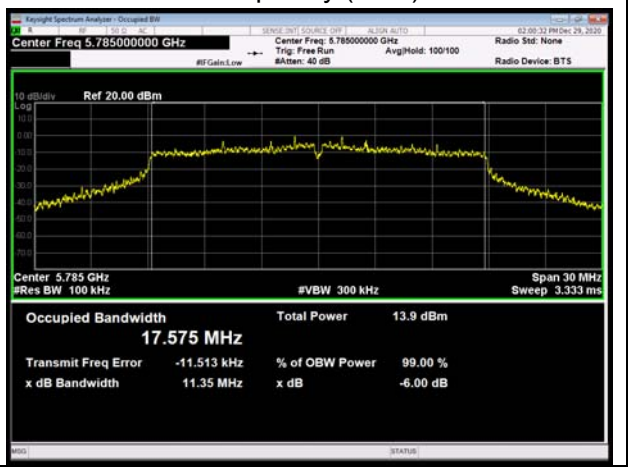
U-NII-3, 802.11n HT40

Carrier frequency (MHz): 5795



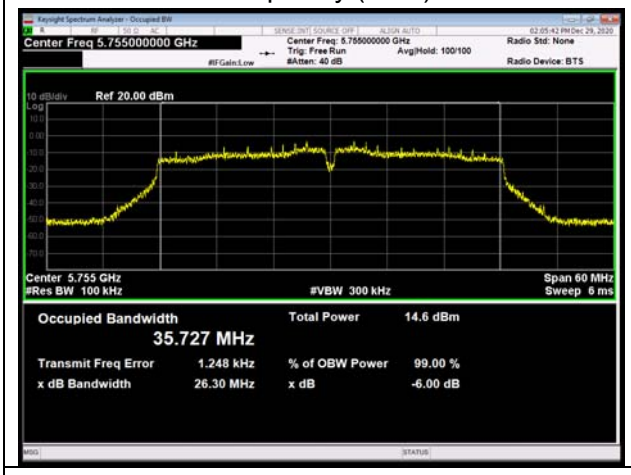
U-NII-3, 802.11ac VHT20

Carrier frequency (MHz): 5785



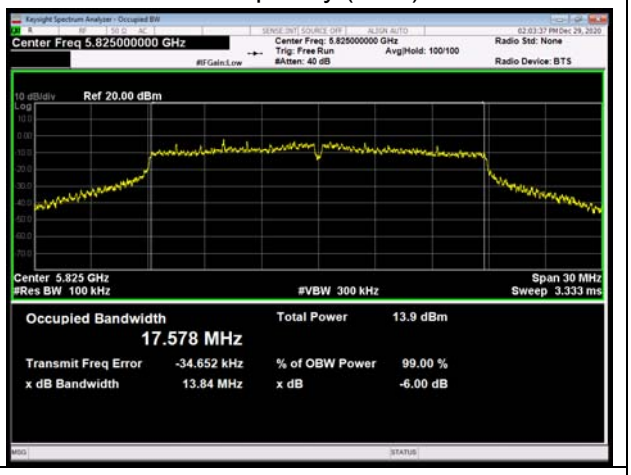
U-NII-3, 802.11ac VHT40

Carrier frequency (MHz): 5755



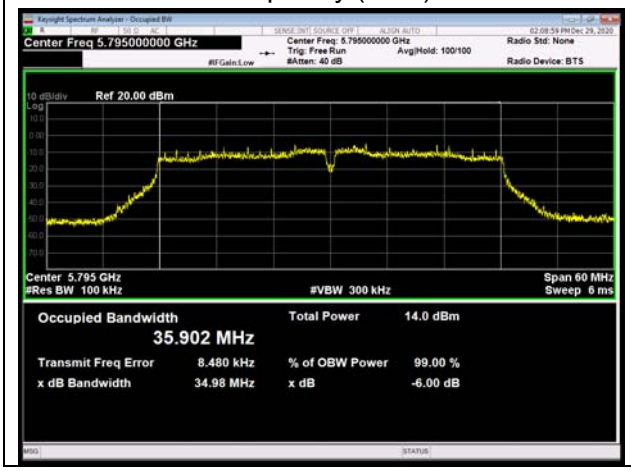
U-NII-3, 802.11ac VHT20

Carrier frequency (MHz): 5825



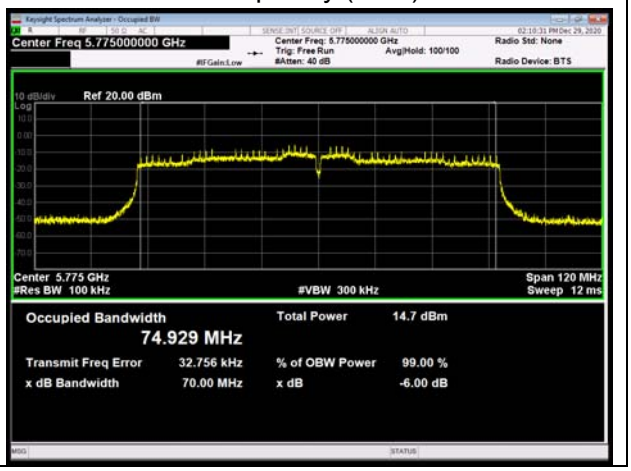
U-NII-3, 802.11ac VHT40

Carrier frequency (MHz): 5795



U-NII-3, 802.11ac VHT80

Carrier frequency (MHz): 5775



5.2. Average Power Output

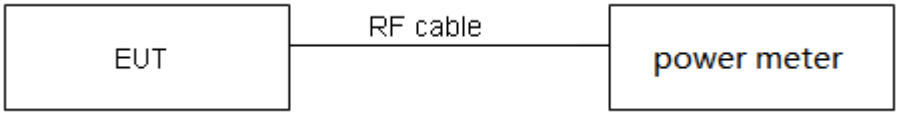
Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

During the process of the testing, The EUT was connected to the average power meter through an external attenuator and a known loss cable. The EUT is max power transmission with proper modulation. We use Maximum average Conducted Output Power Level Method in KDB789033 for this test

Test Setup



Limits

Rule FCC Part 15.407(a)(1)(2)(3)
(1) For the band 5.15-5.25 GHz.
(i) For an outdoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. The maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon must not exceed 125 mW (21 dBm).
(ii) For an indoor access point operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(iii) For fixed point-to-point access points operating in the band 5.15-5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. Fixed point-to-point U-NII devices may employ antennas with directional gain up to 23 dBi without any corresponding reduction in the maximum conducted output power or maximum power spectral density. For fixed point-to-point transmitters that employ a directional antenna gain greater than 23 dBi, a 1 dB reduction in maximum conducted output power and maximum power spectral density is required for each 1 dB of antenna gain in excess of 23 dBi. Fixed, point-to-point operations exclude

the use of point-to-multipoint systems, omnidirectional applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installed, the installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(3)For the band 5.725-5.85 GHz, the maximum conducted output power over the frequency band of operation shall not exceed 1 W. In addition, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.44 dB.

Test Results

Mode	T_{on} (ms)	$T_{(on+off)}$ (ms)	Duty cycle	Duty cycle correction Factor(dB)
802.11a	2.05	2.08	0.98	NA
802.11n HT20	1.91	1.94	0.98	NA
802.11n HT40	0.94	0.98	0.96	0.16
802.11ac VHT20	1.92	1.96	0.98	NA
802.11ac VHT40	0.94	0.98	0.96	0.16
802.11ac VHT80	0.46	0.50	0.93	0.33
Note: when Duty cycle≥0.98, Duty cycle correction Factor not required.				

Network Standards		Channel/Frequency (MHz)	B=26 dB bandwidth (MHz)	Limit 11 dBm + 10 log B (dBm)	Final Limit(dBm)
U-NII-2A	802.11a	52/5260	21.60	24.34 >24	24.00
		60/5300	20.42	24.10 >24	24.00
		64/5320	20.92	24.21 >24	24.00
	802.11n HT20	52/5260	20.46	24.11 >24	24.00
		60/5300	22.20	24.46 >24	24.00
		64/5320	20.70	24.16 >24	24.00
	802.11n HT40	54/5270	39.92	27.01 >24	24.00
		62/5310	39.61	26.98 >24	24.00
	802.11ac VHT20	52/5260	21.34	24.29 >24	24.00
		60/5300	21.95	24.41 >24	24.00
		64/5320	21.69	24.36 >24	24.00
	802.11ac VHT40	54/5270	39.92	27.01 >24	24.00
		62/5310	39.77	27.00 >24	24.00
	802.11ac VHT80	58/5290	80.83	30.08 >24	24.00
U-NII-2C	802.11a	100/5500	21.10	24.24 >24	24.00
		120/5600	19.82	23.97 <24	23.97
		140/5700	21.39	24.30 >24	24.00
		144/5720	20.26	24.07 >24	24.00
	802.11n HT20	100/5500	21.37	24.30 >24	24.00
		120/5600	21.34	24.29 >24	24.00
		140/5700	21.46	24.32 >24	24.00
		144/5720	21.33	24.29 >24	24.00
	802.11n HT40	102/5510	39.71	26.99 >24	24.00
		118/5590	40.08	27.03 >24	24.00

		134/5670	40.01	27.02 >24	24.00
		142/5710	38.91	26.90 >24	24.00
	802.11ac VHT20	100/5500	20.74	24.17 >24	24.00
		120/5600	20.84	24.19 >24	24.00
		140/5700	20.53	24.12 >24	24.00
		144/5720	20.85	24.19 >24	24.00
	802.11ac VHT40	102/5510	39.48	26.96 >24	24.00
		118/5590	40.57	27.08 >24	24.00
		134/5670	39.95	27.02 >24	24.00
		142/5710	39.40	26.95 >24	24.00
	802.11ac VHT80	106/5530	80.71	30.07 >24	24.00
		122/5610	80.37	30.05 >24	24.00
		138/5690	80.21	30.04 >24	24.00
Note: 250mW=24dBm						

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Network Standards	Channel/ Frequency (MHz)	Power Index	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	36/5180	16	15.88	15.88	24	PASS
	40/5200	16	16.31	16.31	24	PASS
	48/5240	16	16.06	16.06	24	PASS
802.11n HT20	36/5180	14	14.10	14.10	24	PASS
	40/5200	14	14.19	14.19	24	PASS
	48/5240	14	14.41	14.41	24	PASS
802.11n HT40	38/5190	14	14.21	14.37	24	PASS
	46/5230	14	14.64	14.80	24	PASS
802.11ac VHT20	36/5180	12	12.29	12.29	24	PASS
	40/5200	12	12.32	12.32	24	PASS
	48/5240	12	12.54	12.54	24	PASS
802.11ac VHT40	38/5190	12	12.46	12.62	24	PASS
	46/5230	12	12.63	12.79	24	PASS
802.11ac VHT80	42/5210	12	12.45	12.78	24	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor						

U-NII-2A

Network Standards	Channel/ Frequency (MHz)	Power Index	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	52/5260	16	15.99	15.99	24.00	PASS
	60/5300	16	16.39	16.39	24.00	PASS
	64/5320	16	16.51	16.51	24.00	PASS
802.11n HT20	52/5260	14	14.38	14.38	24.00	PASS
	60/5300	14	14.44	14.44	24.00	PASS
	64/5320	14	14.89	14.89	24.00	PASS
802.11n HT40	54/5270	14	14.56	14.72	24.00	PASS
	62/5310	14	14.94	15.10	24.00	PASS
802.11ac VHT20	52/5260	12	12.57	12.57	24.00	PASS
	60/5300	12	12.84	12.84	24.00	PASS
	64/5320	12	12.97	12.97	24.00	PASS
802.11ac VHT40	54/5270	12	12.73	12.89	24.00	PASS
	62/5310	12	13.07	13.23	24.00	PASS
802.11ac VHT80	58/5290	12	12.91	13.24	24.00	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor						

U-NII-2C

Network Standards	Channel/ Frequency (MHz)	Power Index	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	100/5500	15	16.02	16.02	24.00	PASS
	120/5600	15	16.07	16.07	23.97	PASS
	140/5700	15	15.92	15.92	24.00	PASS
	144/5720	15	16.03	16.03	24.00	PASS
802.11n HT20	100/5500	13	14.11	14.11	24.00	PASS
	120/5600	13	14.09	14.09	24.00	PASS
	140/5700	13	13.91	13.91	24.00	PASS
	144/5720	13	13.95	13.95	24.00	PASS
802.11n HT40	102/5510	13	14.16	14.32	24.00	PASS
	118/5590	13	14.21	14.37	24.00	PASS
	134/5670	13	13.84	14.00	24.00	PASS
	142/5710	13	14.17	14.33	24.00	PASS

802.11ac VHT20	100/5500	11	12.19	12.19	24.00	PASS
	120/5600	11	12.32	12.32	24.00	PASS
	140/5700	11	11.78	11.78	24.00	PASS
	144/5720	11	11.83	11.83	24.00	PASS
802.11ac VHT40	102/5510	11	12.23	12.39	24.00	PASS
	118/5590	11	12.44	12.60	24.00	PASS
	134/5670	11	11.89	12.05	24.00	PASS
	142/5710	11	12.38	12.54	24.00	PASS
802.11ac VHT80	106/5530	11	12.25	12.58	24.00	PASS
	122/5610	11	11.47	11.80	24.00	PASS
	138/5690	11	11.59	11.92	24.00	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor						

U-NII-3

Network Standards	Channel/ Frequency (MHz)	Power Index	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	149/5745	14	13.52	13.52	30	PASS
	157/5785	14	14.01	14.01	30	PASS
	165/5825	14	13.75	13.75	30	PASS
802.11n HT20	149/5745	14	13.88	13.88	30	PASS
	157/5785	14	14.03	14.03	30	PASS
	165/5825	14	13.59	13.59	30	PASS
802.11n HT40	151/5755	14	13.97	14.13	30	PASS
	159/5795	14	13.91	14.07	30	PASS
802.11ac VHT20	149/5745	12	12.17	12.17	30	PASS
	157/5785	12	12.23	12.23	30	PASS
	165/5825	12	11.83	11.83	30	PASS
802.11ac VHT40	151/5755	12	12.21	12.37	30	PASS
	159/5795	12	12.01	12.17	30	PASS
802.11ac VHT80	155/5775	12	12.23	12.56	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor						

5.3. Frequency Stability

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

1. Frequency stability with respect to ambient temperature

a) Supply the EUT with a nominal ac voltage or install a new or fully charged battery in the EUT. If possible, a dummy load shall be connected to the EUT because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, then the EUT shall be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn ON the EUT and tune it to one of the number of frequencies shown in 5.6.

b) Couple the unlicensed wireless device output to the measuring instrument by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away), or by connecting a dummy load to the measuring instrument, through an attenuator if necessary.

c) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).

d) Turn the EUT OFF and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.

e) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.

f) While maintaining a constant temperature inside the environmental chamber, turn the EUT ON and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

g) Measure the frequency at each of frequencies specified in 5.6.

h) Switch OFF the EUT but do not switch OFF the oscillator heater.

i) Lower the chamber temperature by not more that 10°C, and allow the temperature inside the chamber to stabilize.

j) Repeat step f) through step i) down to the lowest specified temperature.

2. Frequency stability when varying supply voltage

Unless otherwise specified, these tests shall be made at ambient room temperature (+15°C to +25 °C). An antenna shall be connected to the antenna output terminals of the EUT if possible. If the EUT is equipped with or uses an adjustable-length antenna, then it shall be fully extended.

a) Supply the EUT with nominal voltage or install a new or fully charged battery in the EUT. Turn ON the EUT and couple its output to a frequency counter or other frequency-measuring instrument.

b) Tune the EUT to one of the number of frequencies required in 5.6. Adjust the location of the

measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
c) Measure the frequency at each of the frequencies specified in 5.6.
d) Repeat the above procedure at 85% and 115% of the nominal supply voltage.

Limit

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the users manual.

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 936Hz

Test Results

Voltage (V)	Temperature (°C)	U-NII-1 Test Results			
		5200MHz			
		1min	2min	5min	10min
3.87	-20	5200.006697	5199.998846	5199.988847	5199.983303
3.87	-10	5200.000989	5199.994250	5199.980729	5199.980846
3.87	0	5199.998329	5199.989791	5199.975755	5199.976160
3.87	10	5199.995465	5199.981549	5199.974442	5199.974556
3.87	20	5199.987812	5199.973101	5199.973320	5199.966088
3.87	30	5199.984836	5199.963146	5199.965117	5199.959585
3.87	40	5199.976840	5199.957090	5199.960408	5199.951591
3.87	50	5199.973549	5199.951744	5199.955632	5199.946204
3.6	20	5199.971276	5199.949445	5199.953834	5199.943623
4.2	20	5199.969136	5199.942132	5199.946351	5199.934308
MHz		-0.030864	-0.057868	-0.053649	-0.065692
PPM		-5.935292	-11.128475	-10.317031	-12.633020

Voltage (V)	Temperature (°C)	U-NII-2A Test Results			
		5300MHz			
		1min	2min	5min	10min
3.87	-20	5299.991728	5299.984595	5299.976580	5299.973044
3.87	-10	5299.989433	5299.979092	5299.969652	5299.963190
3.87	0	5299.986037	5299.972534	5299.966324	5299.959753
3.87	10	5299.982011	5299.967853	5299.958974	5299.951429
3.87	20	5299.973728	5299.960969	5299.952952	5299.943226
3.87	30	5299.969925	5299.959409	5299.946001	5299.937751
3.87	40	5299.965806	5299.951782	5299.938554	5299.930472
3.87	50	5299.959501	5299.944577	5299.931494	5299.924691
3.6	20	5299.950490	5299.937434	5299.931028	5299.918201
4.2	20	5299.946220	5299.930970	5299.921221	5299.910439
MHz		-0.053780	-0.069030	-0.078779	-0.089561
PPM		-10.147154	-13.024481	-14.864018	-16.898382

Voltage (V)	Temperature (°C)	U-NII-2C Test Results			
		5580MHz			
		1min	2min	5min	10min
3.87	-20	5580.004145	5580.002267	5579.999280	5579.995437
3.87	-10	5579.996814	5579.997848	5579.994027	5579.988031
3.87	0	5579.988276	5579.988367	5579.985045	5579.987290
3.87	10	5579.984034	5579.980079	5579.976138	5579.979363
3.87	20	5579.975645	5579.978756	5579.973608	5579.979302
3.87	30	5579.971889	5579.977174	5579.966455	5579.975826
3.87	40	5579.969143	5579.967561	5579.961120	5579.966870
3.87	50	5579.965201	5579.963761	5579.957938	5579.961970
3.6	20	5579.961842	5579.957283	5579.948951	5579.960745
4.2	20	5579.953907	5579.956752	5579.938966	5579.952787
MHz		-0.046093	-0.043248	-0.061034	-0.047213
PPM		-8.260388	-7.750492	-10.938016	-8.461177

Voltage (V)	Temperature (°C)	U-NII-3 Test Results			
		5785MHz			
		1min	2min	5min	10min
3.87	-20	5785.001332	5784.993299	5784.988240	5784.988021
3.87	-10	5784.994439	5784.984257	5784.986343	5784.983161
3.87	0	5784.988990	5784.976356	5784.985764	5784.973329
3.87	10	5784.979938	5784.974238	5784.981021	5784.964671
3.87	20	5784.976185	5784.968974	5784.975172	5784.956614
3.87	30	5784.970143	5784.962968	5784.970322	5784.955666
3.87	40	5784.968622	5784.956751	5784.961962	5784.948033
3.87	50	5784.962381	5784.951197	5784.955742	5784.947899
3.6	20	5784.960509	5784.947509	5784.946568	5784.946034
4.2	20	5784.957490	5784.939399	5784.937780	5784.943362
MHz		-0.042510	-0.060601	-0.062220	-0.056638
PPM		-7.348327	-10.475568	-10.755455	-9.790449

5.4. Power Spectral Density

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

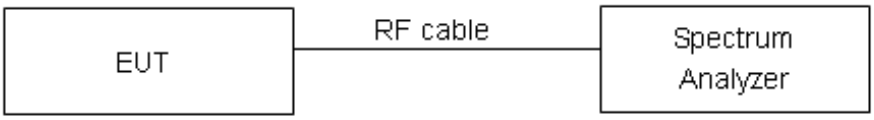
Method of Measurement

The EUT was connected to the spectrum analyzer through an external attenuator (20dB) and a known loss cable.

Set RBW = 1MHz, VBW =3MHz for the band 5.150-5.250GHz, 5.250-5.350GHz, 5.470-5.725GHz.
Set RBW = 470kHz, VBW =1.5MHz for the band 5.725-5.850GHz

The conducted PSD is measured at each antenna port. The measured results at the various antenna ports are then summed mathematically.

Test setup



Limits

Rule FCC Part 15.407(a)(1)/ Part 15.407(a)(2) / Part 15.407(a)(3)
For an indoor access point operating in the band 5.15-5.25 GHz, the maximum power spectral density shall not exceed 17 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
(iv) For client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250 mW provided the maximum antenna gain does not exceed 6 dBi. In addition, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.
For the band 5.725-5.85 GHz, the maximum power spectral density shall not exceed 30 dBm in any 500kHz band. If transmittingantennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the

amount in dB that the directional gain of the antenna exceeds 6 dBi.

Frequency Bands/MHz	Limits
5150-5250	11dBm/MHz
5.25-5.35 GHz and 5.47-5.725 GHz	11dBm/MHz
5725-5850	30dBm/500kHz

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 2, U= 0.75dB.

Test Results:

Note: Power Spectral Density =Read Value+Duty cycle correction factor

U-NII-1

Mode	Channel Number	Read Value (dBm /MHz)	Power Spectral Density (dBm /MHz)	Limit (dBm /MHz)	Conclusion
802.11a	36	6.43	6.43	11	PASS
	40	6.41	6.41	11	PASS
	48	6.28	6.28	11	PASS
802.11n HT20	36	4.37	4.37	11	PASS
	40	4.17	4.17	11	PASS
	48	4.82	4.82	11	PASS
802.11n HT40	38	1.20	1.36	11	PASS
	46	1.76	1.92	11	PASS
802.11ac VHT20	36	2.46	2.46	11	PASS
	40	2.39	2.39	11	PASS
	48	3.10	3.10	11	PASS
802.11ac VHT40	38	-0.65	-0.49	11	PASS
	46	0.29	0.45	11	PASS
802.11ac VHT80	42	-2.65	-2.33	11	PASS

U-NII-2A

Mode	Channel Number	Read Value (dBm /MHz)	Power Spectral Density (dBm /MHz)	Limit (dBm /MHz)	Conclusion
802.11a	52	7.23	7.23	11	PASS
	60	7.50	7.50	11	PASS
	64	7.24	7.24	11	PASS
802.11n HT20	52	5.46	5.46	11	PASS
	60	5.62	5.62	11	PASS
	64	5.53	5.53	11	PASS
802.11n HT40	54	2.88	3.04	11	PASS
	62	3.09	3.26	11	PASS
802.11ac VHT20	52	3.65	3.65	11	PASS
	60	3.83	3.83	11	PASS

	64	3.65	3.65	11	PASS
802.11ac VHT40	54	1.03	1.19	11	PASS
	62	1.04	1.20	11	PASS
802.11ac VHT80	58	-2.40	-2.07	11	PASS

U-NII-2C

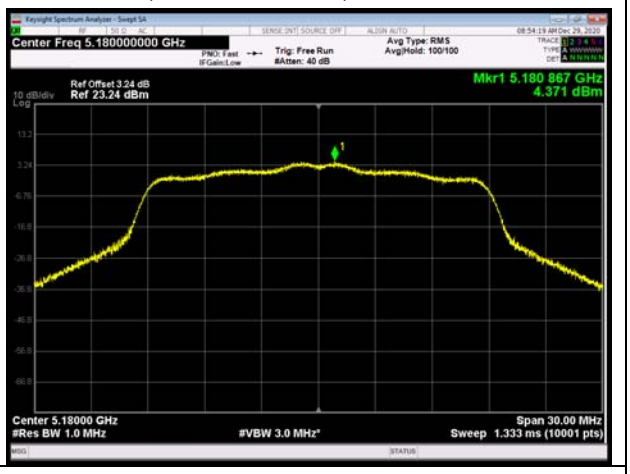
Mode	Channel Number	Read Value (dBm /MHz)	Power Spectral Density (dBm /MHz)	Limit (dBm /MHz)	Conclusion
802.11a	100	6.94	6.94	11	PASS
	120	6.06	6.06	11	PASS
	140	5.70	5.70	11	PASS
	144	5.15	5.15	11	PASS
802.11n HT20	100	3.83	3.83	11	PASS
	120	3.82	3.82	11	PASS
	140	3.69	3.69	11	PASS
	144	3.61	3.61	11	PASS
802.11n HT40	102	1.27	1.43	11	PASS
	118	0.90	1.06	11	PASS
	134	0.37	0.53	11	PASS
	142	0.55	0.72	11	PASS
802.11ac VHT20	100	2.03	2.03	11	PASS
	120	2.33	2.33	11	PASS
	140	1.31	1.31	11	PASS
	144	1.77	1.77	11	PASS
802.11ac VHT40	102	0.44	0.60	11	PASS
	118	-0.07	0.10	11	PASS
	134	-0.30	-0.13	11	PASS
	142	-0.67	-0.51	11	PASS
802.11ac VHT80	106	-4.81	-4.48	11	PASS
	122	-3.35	-3.02	11	PASS
	138	-4.85	-4.52	11	PASS

U-NII-3

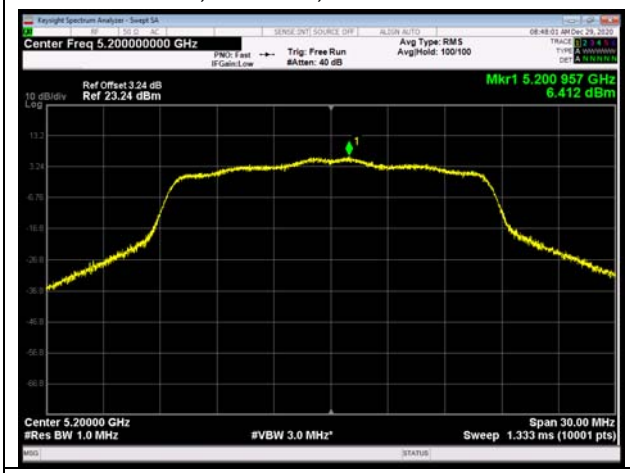
Mode	Channel Number	Read Value (dBm/470kHz)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)	Conclusion
802.11a	149	1.62	1.89	30	PASS
	157	1.61	1.88	30	PASS
	165	2.16	2.43	30	PASS
802.11n HT20	149	0.36	0.63	30	PASS
	157	0.63	0.90	30	PASS
	165	0.57	0.84	30	PASS
802.11n HT40	151	-1.96	-1.52	30	PASS
	159	-2.40	-1.97	30	PASS
802.11ac VHT20	149	-1.62	-1.35	30	PASS
	157	-1.73	-1.46	30	PASS
	165	-1.30	-1.03	30	PASS
802.11ac VHT40	151	-3.72	-3.28	30	PASS
	159	-4.45	-4.02	30	PASS
802.11ac VHT80	155	-6.79	-6.19	30	PASS
Note:PSD=Read Value+Duty cycle+10*LOG(500/470) correction factor.					

U-NII-1, 802.11a, Channel No.: 36

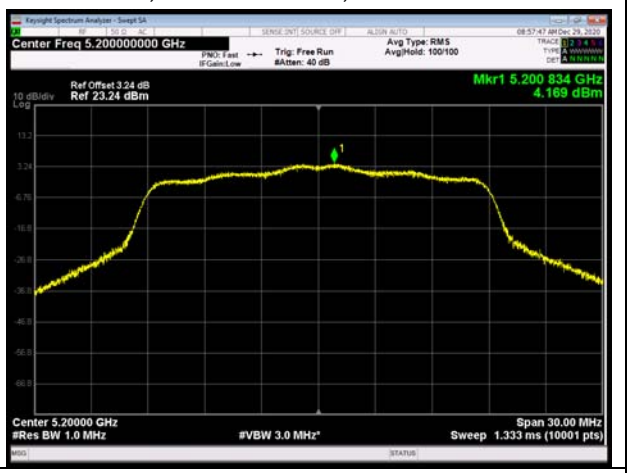
U-NII-1, 802.11n HT20, Channel No.: 36



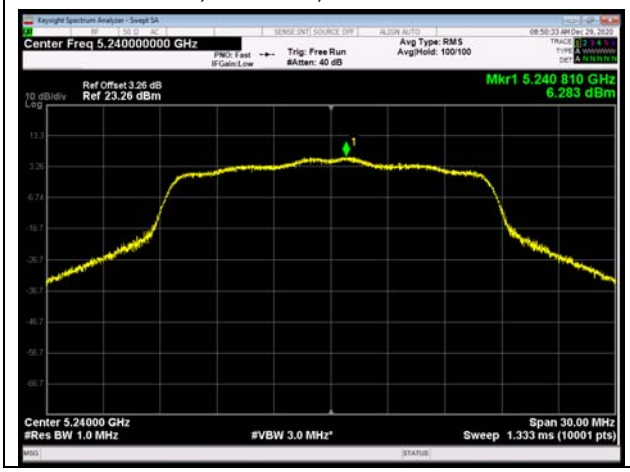
U-NII-1, 802.11a, Channel No.: 40



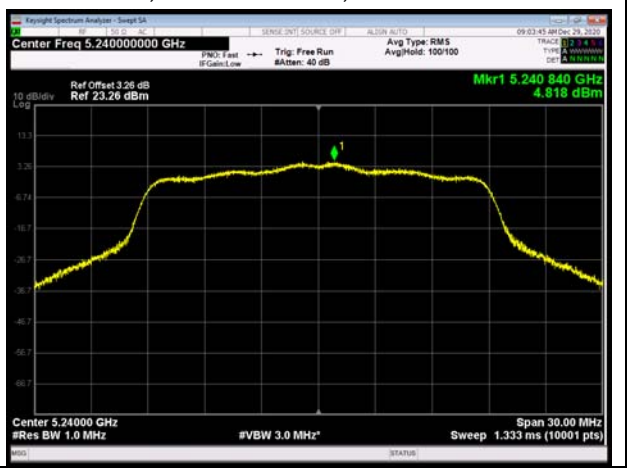
U-NII-1, 802.11n HT20, Channel No.: 40



U-NII-1, 802.11a, Channel No.: 48

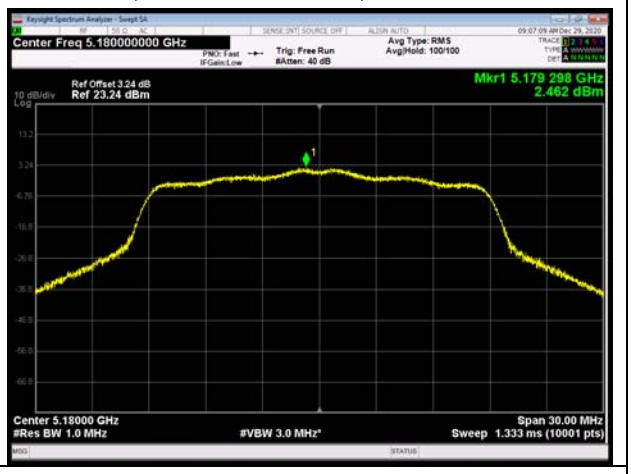


U-NII-1, 802.11n HT20, Channel No.: 48

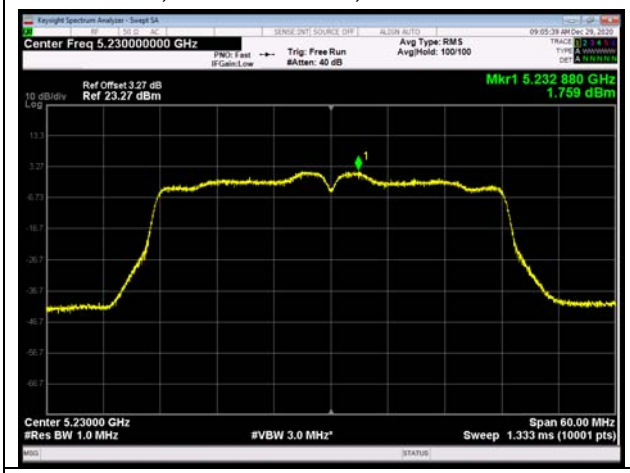


U-NII-1, 802.11n HT40, Channel No.: 38

U-NII-1, 802.11ac VHT20, Channel No.: 36



U-NII-1, 802.11n HT40, Channel No.: 46



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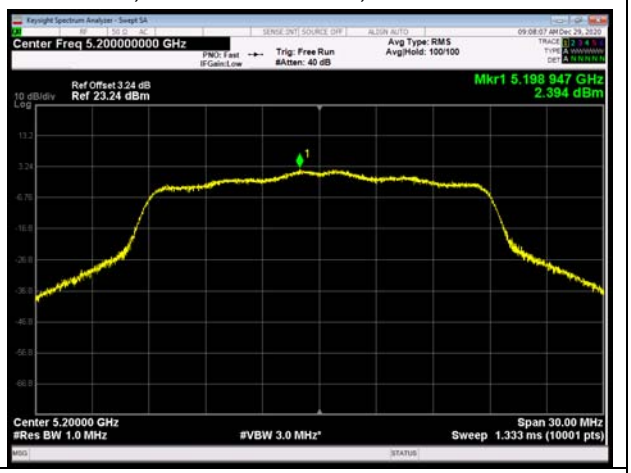
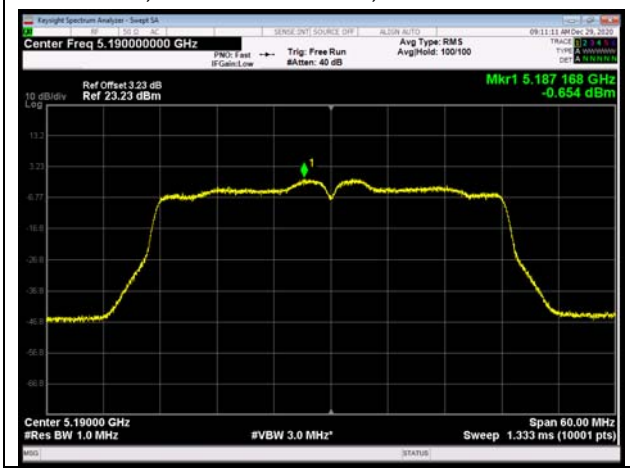


U-NII-1, 802.11ac VHT40, Channel No.: 38



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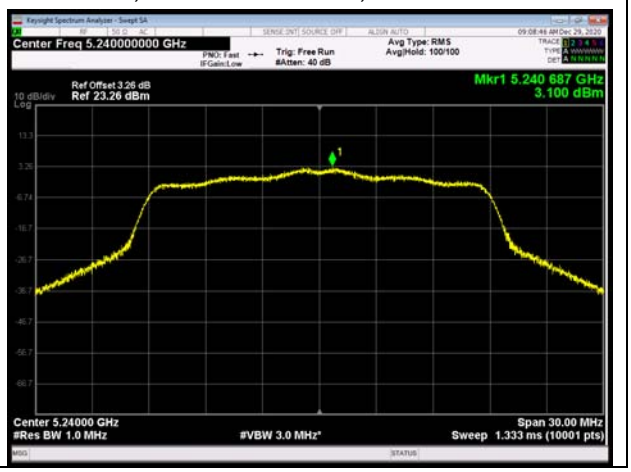
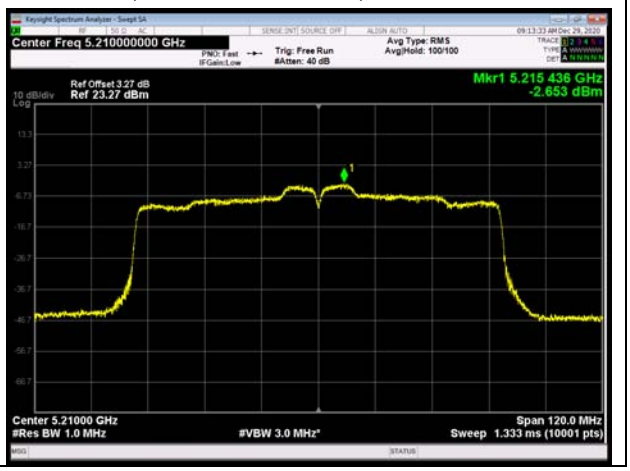
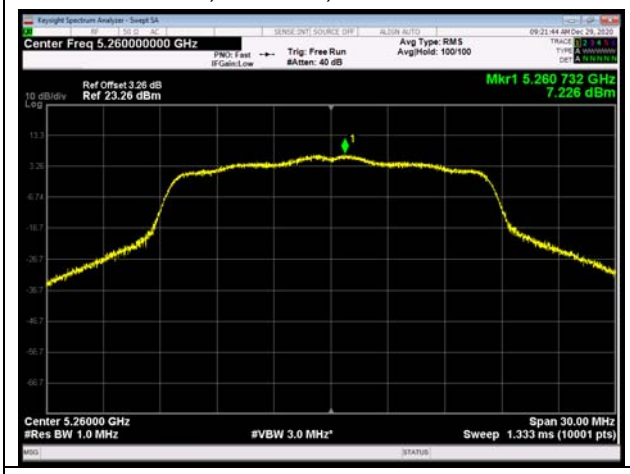


U-NII-1, 802.11ac VHT40, Channel No.: 46

U-NII-1, 802.11ac VHT80, Channel No.: 42



U-NII-2A, 802.11a, Channel No.: 52



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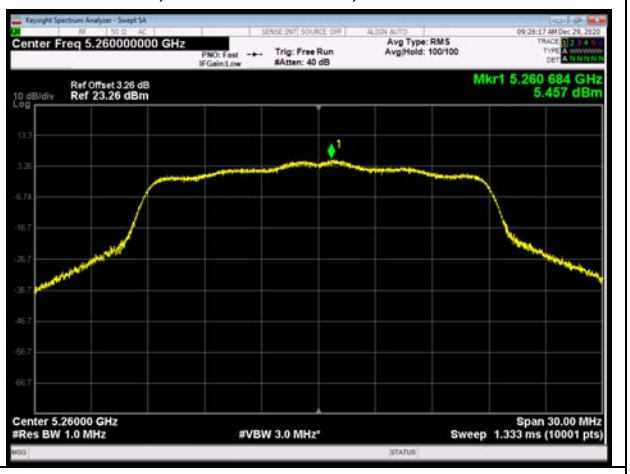

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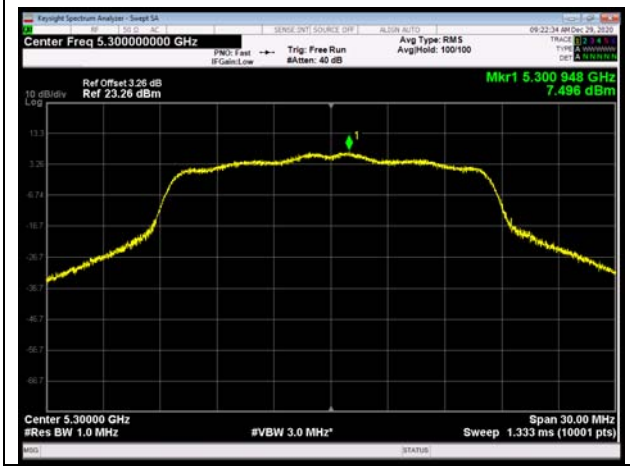

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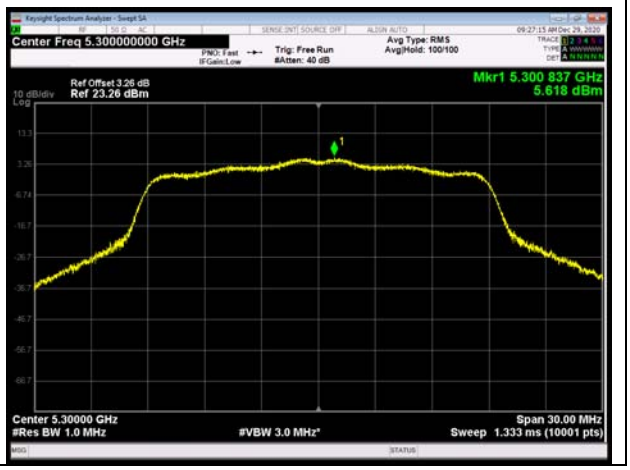

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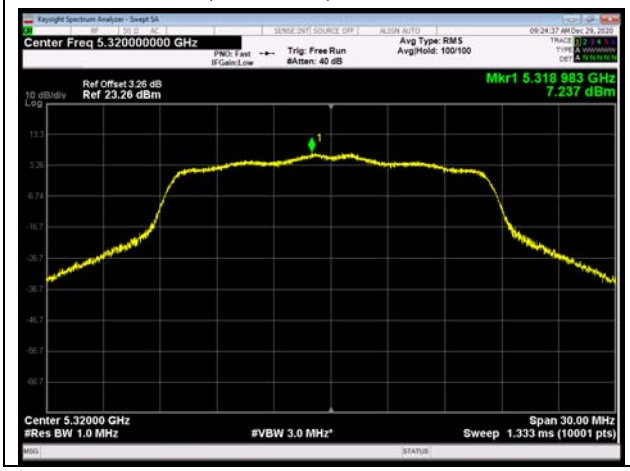

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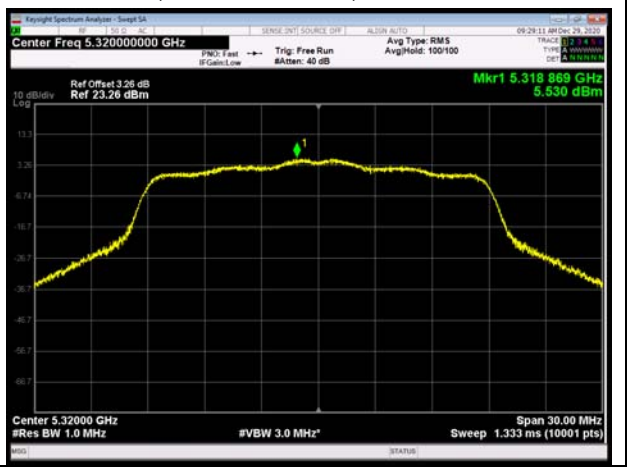

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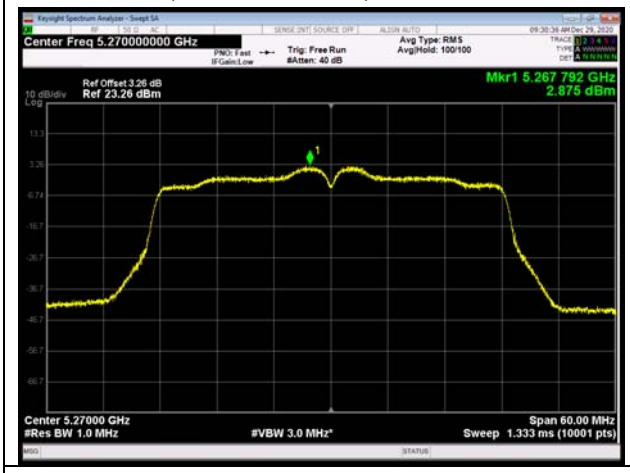

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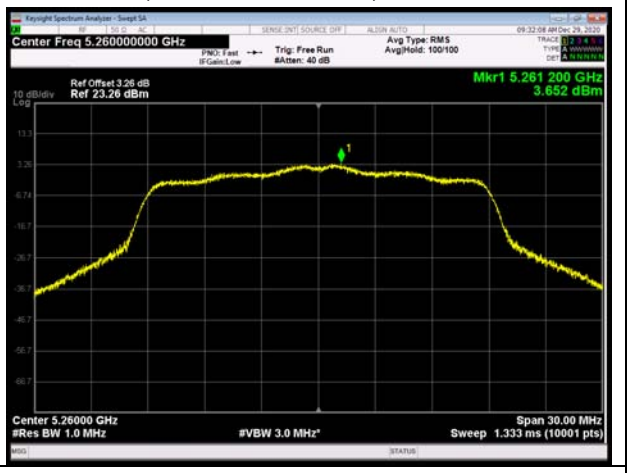

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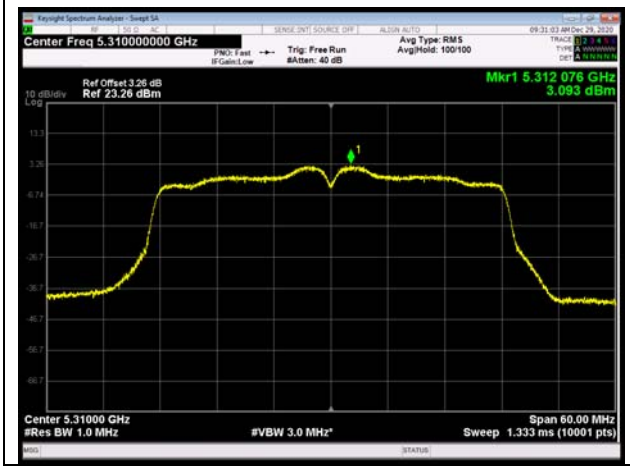

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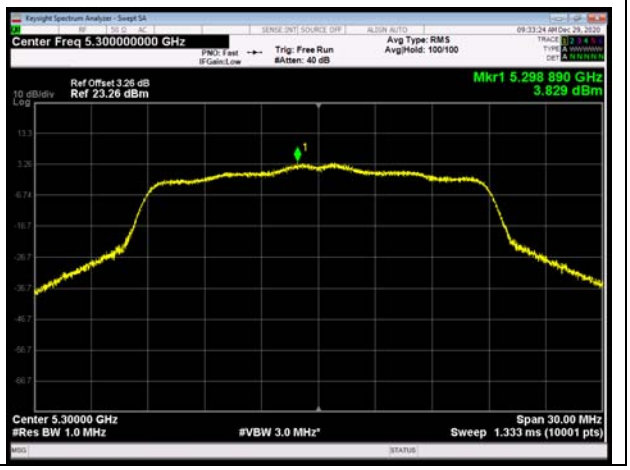

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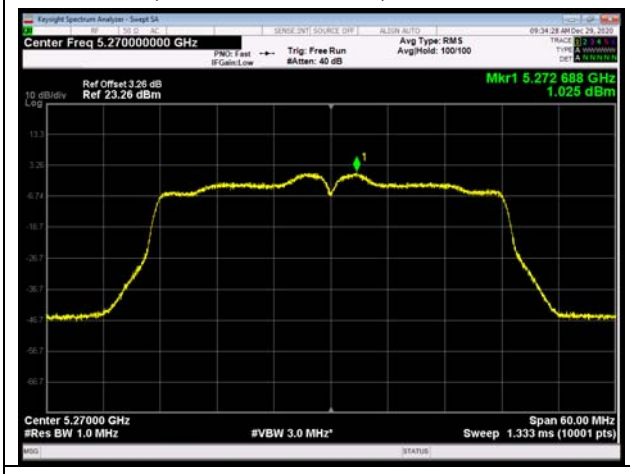

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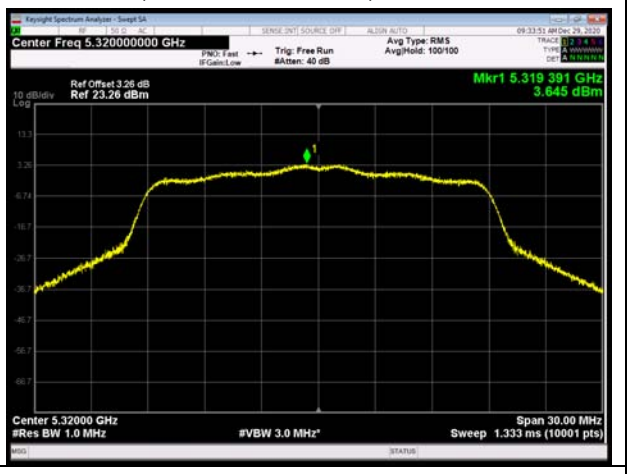

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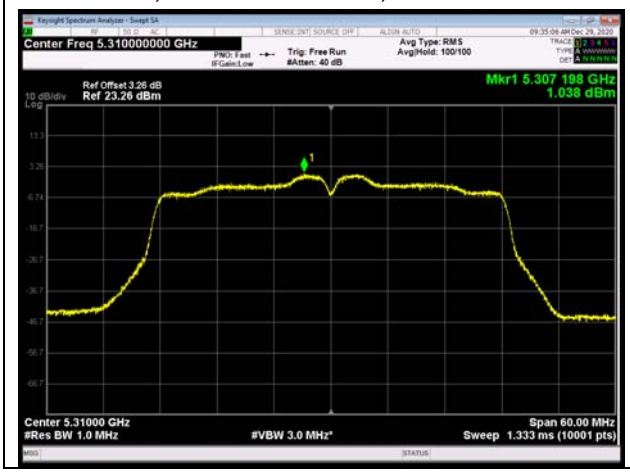

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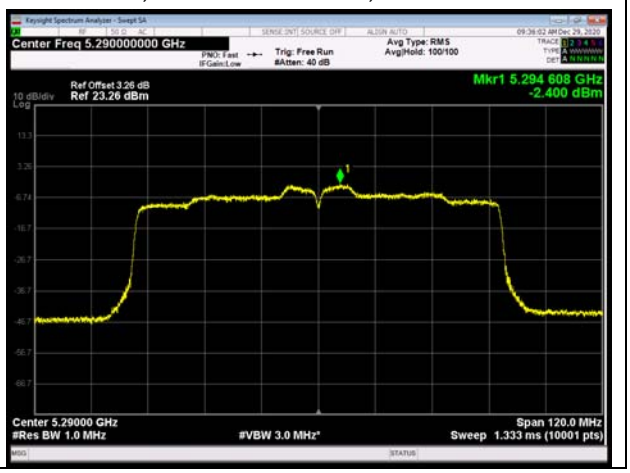
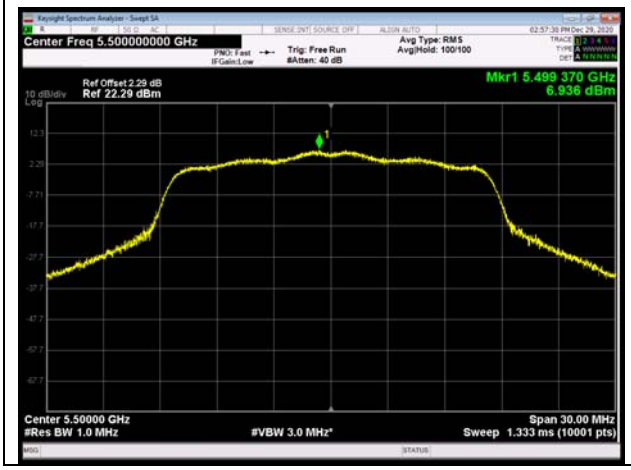
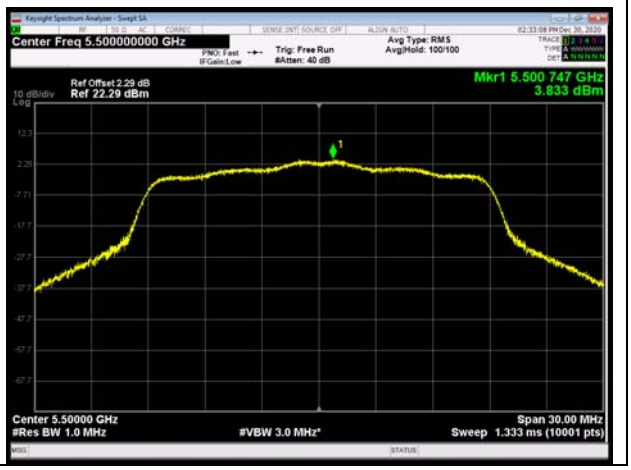


U-NII-2C, 802.11a Channel No.: 100



U-NII-2C, 802.11n HT20 Channel No.: 100



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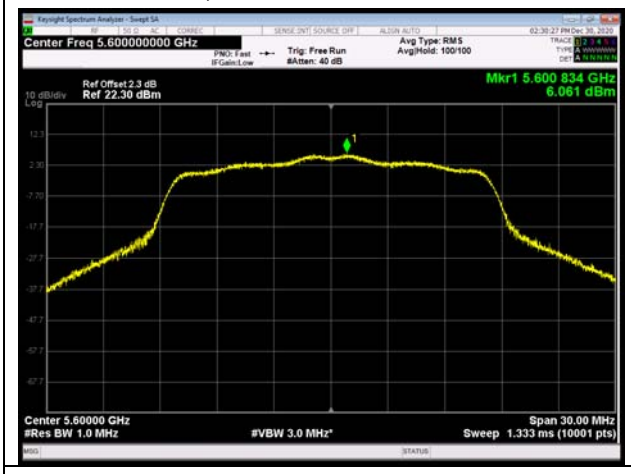

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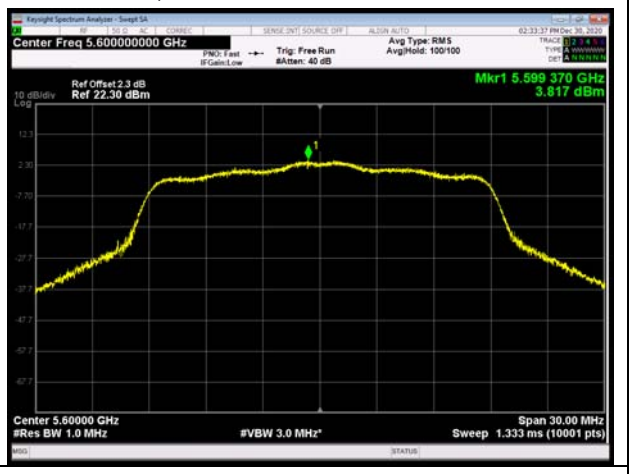

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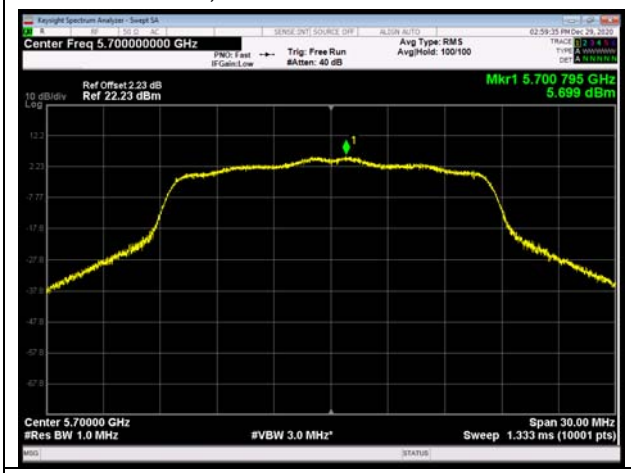

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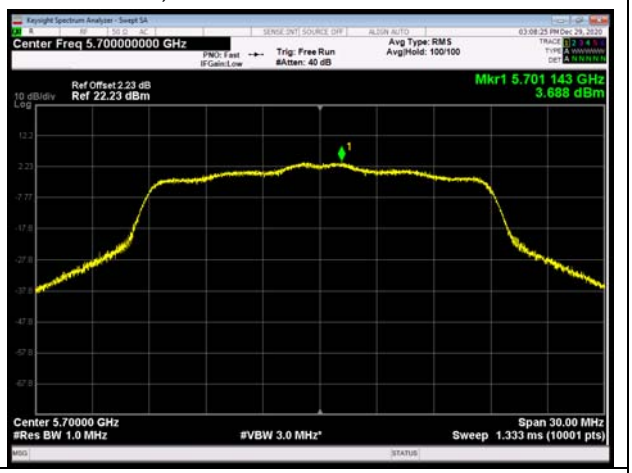
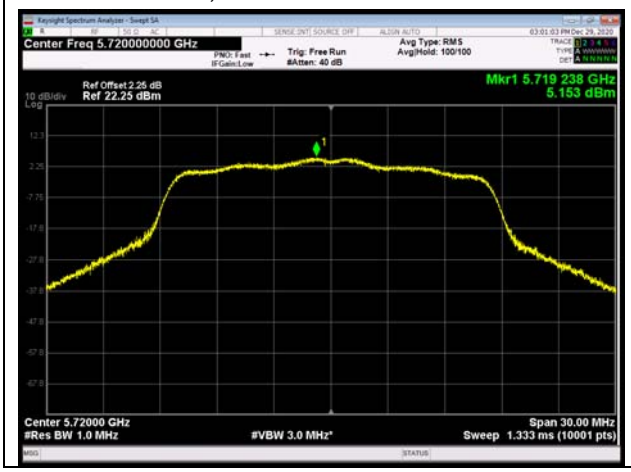
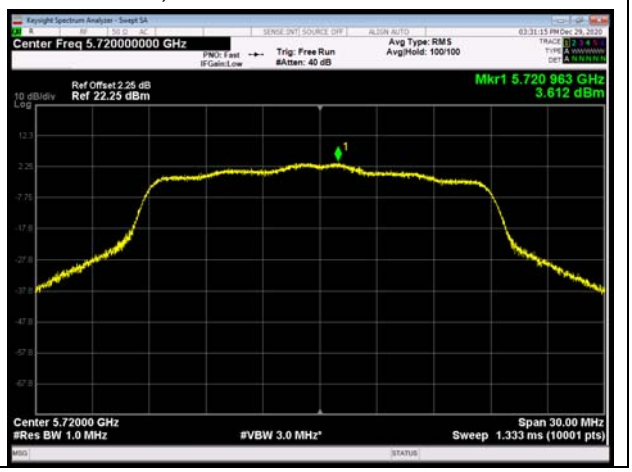


U-NII-2C, 802.11a Channel No.:144

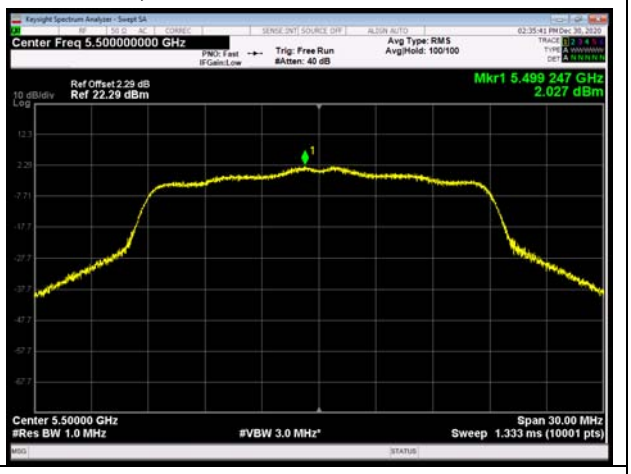


U-NII-2C, 802.11n HT20 Channel No.:144

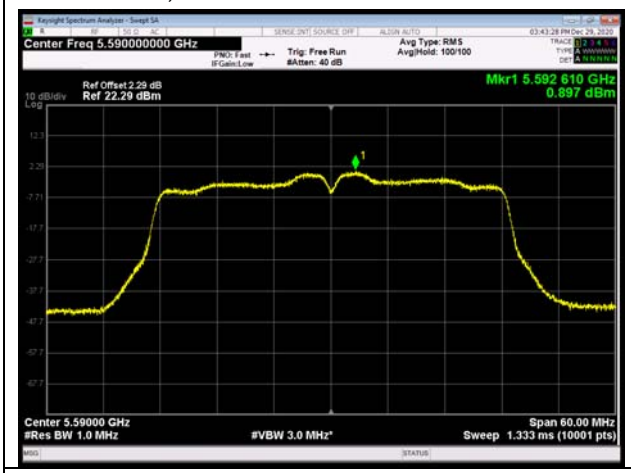


U-NII-2C, 802.11n HT40 Channel No.: 102

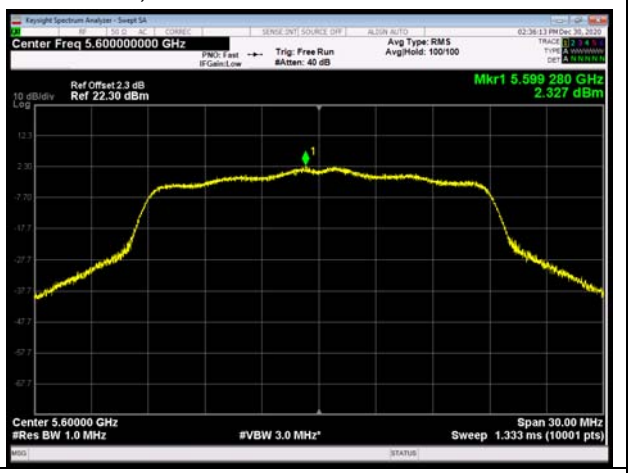
U-NII-2C, 802.11ac VHT20 Channel No.: 100



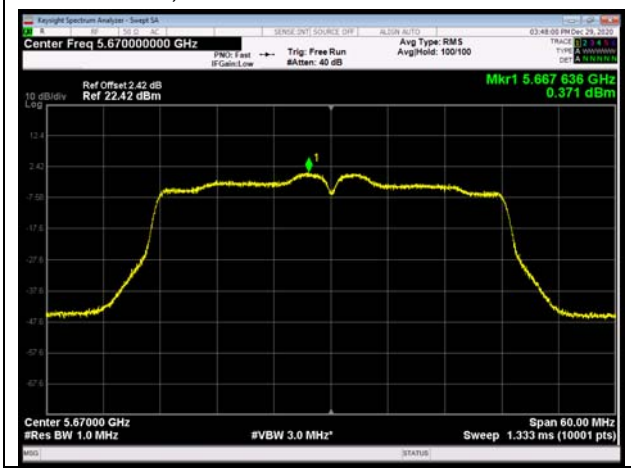
U-NII-2C, 802.11n HT40 Channel No.: 118



U-NII-2C, 802.11ac VHT20 Channel No.: 120



U-NII-2C, 802.11n HT40 Channel No.:134



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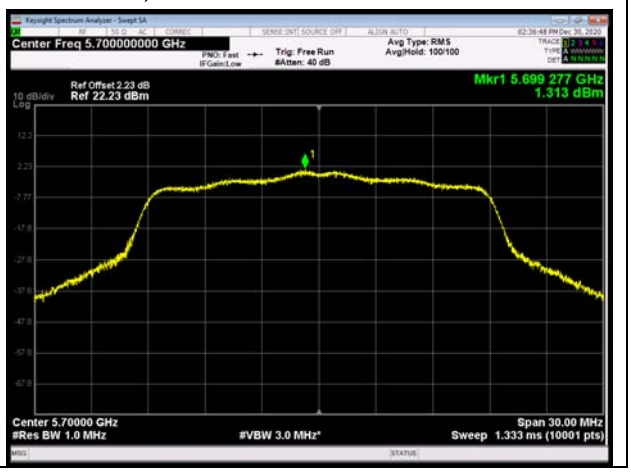

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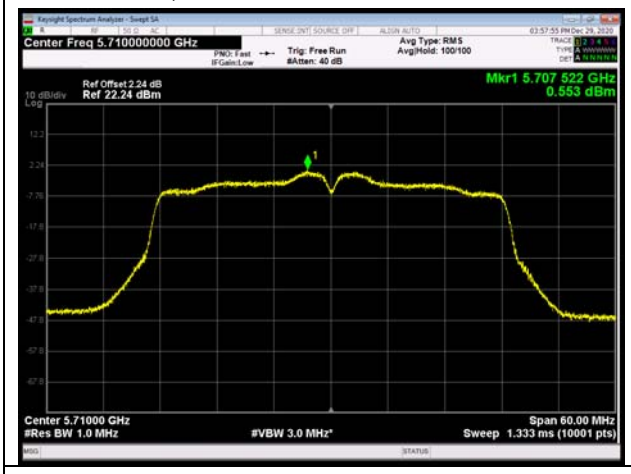
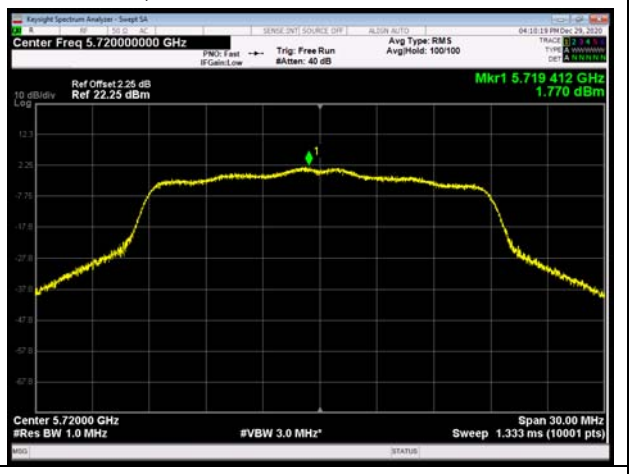


U-NII-2C, 802.11ac VHT20 Channel No.:144



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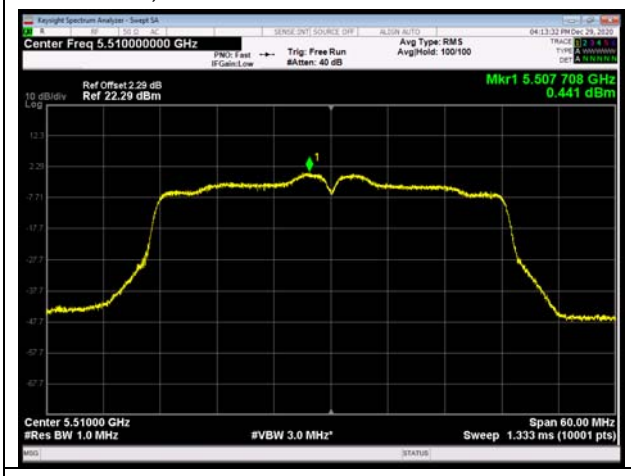

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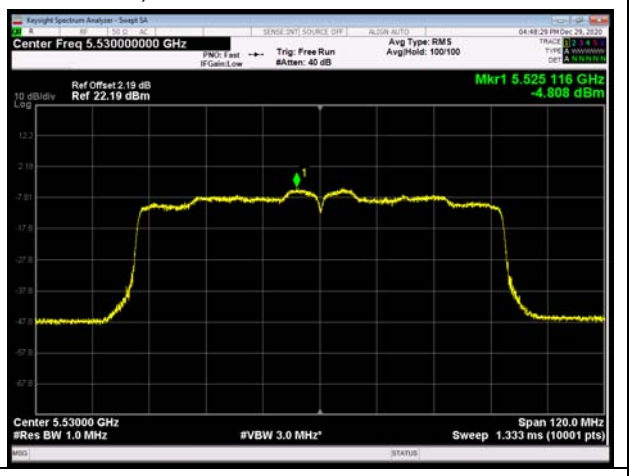

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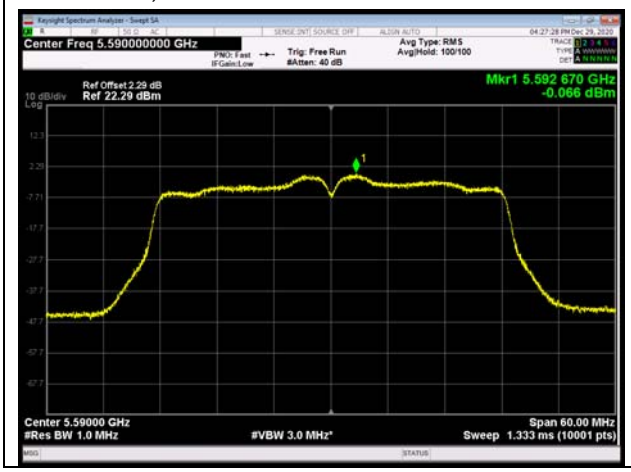

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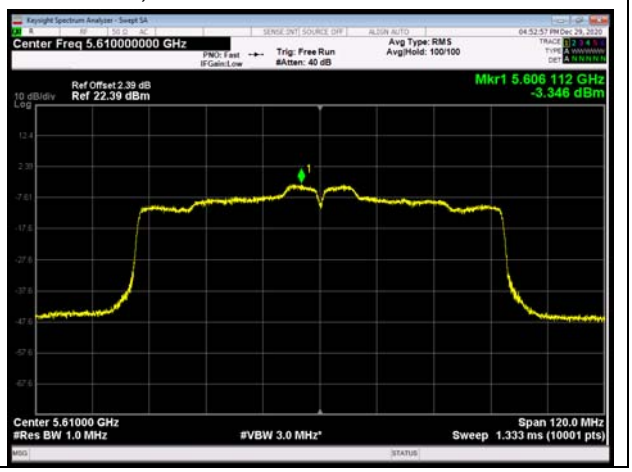
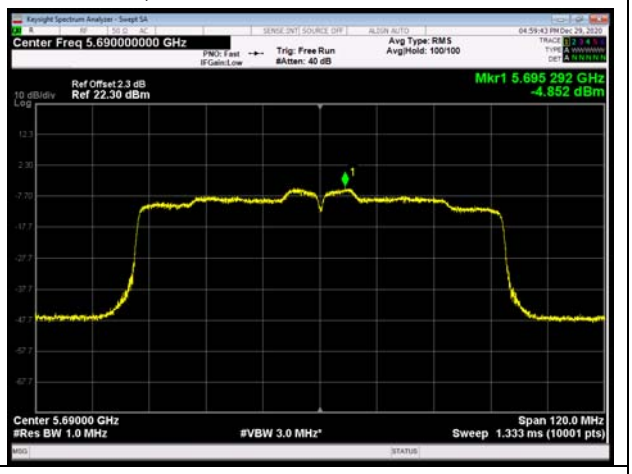
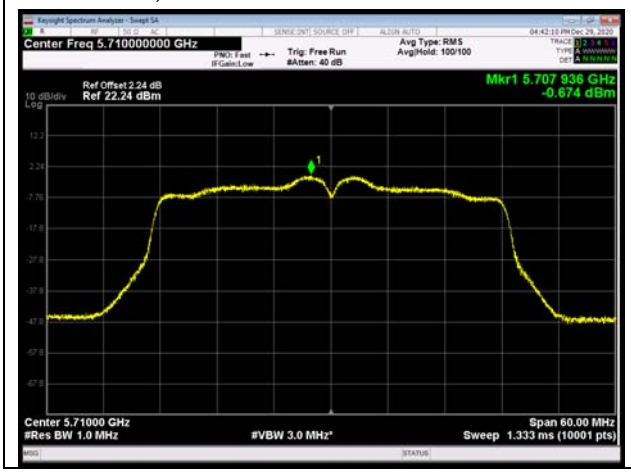


U-NII-2C, 802.11ac VHT40 Channel No.:134

U-NII-2C, 802.11ac VHT80 Channel No.:138



U-NII-2C, 802.11ac VHT40 Channel No.:142



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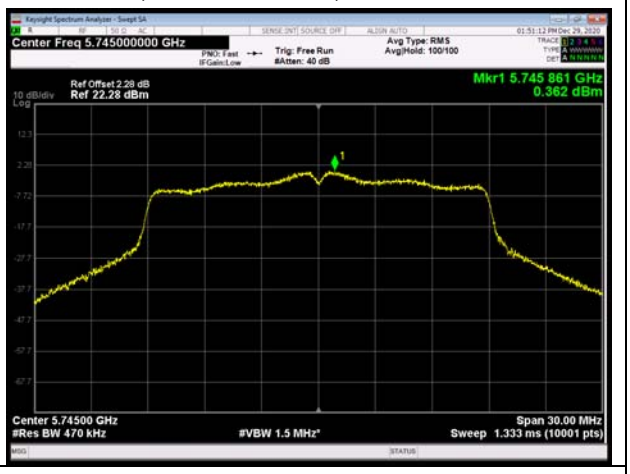
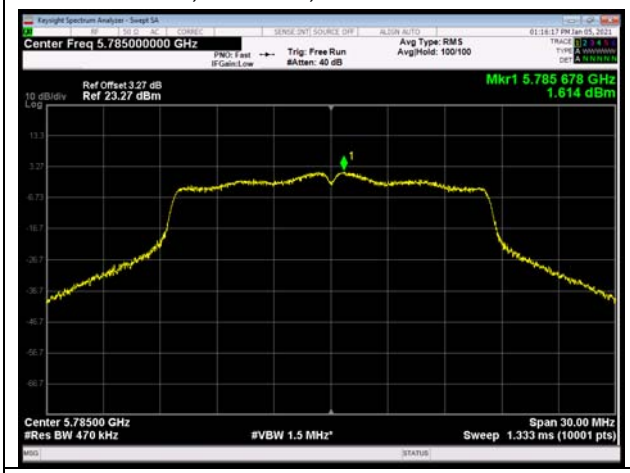
U-NII-3, 802.11a, Channel No.: 149

U-NII-3, 802.11n HT20, Channel No.: 149



U-NII-3, 802.11a, Channel No.: 157



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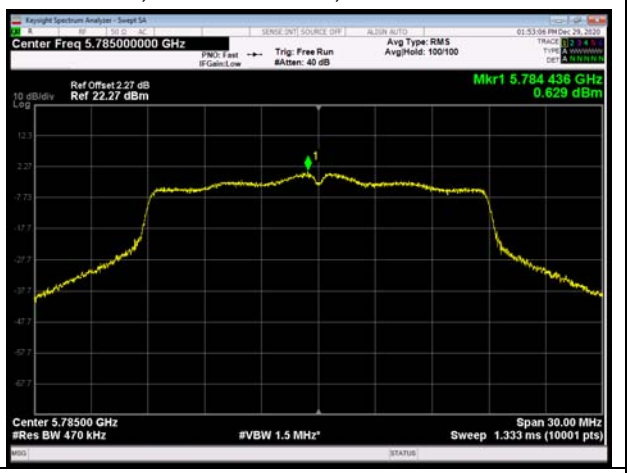
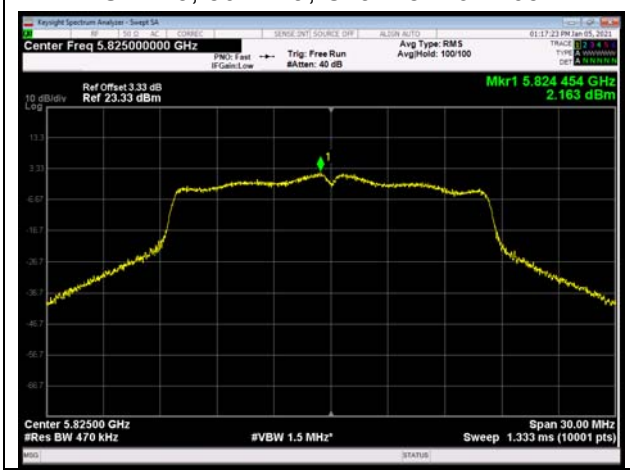


U-NII-3, 802.11a, Channel No.: 165



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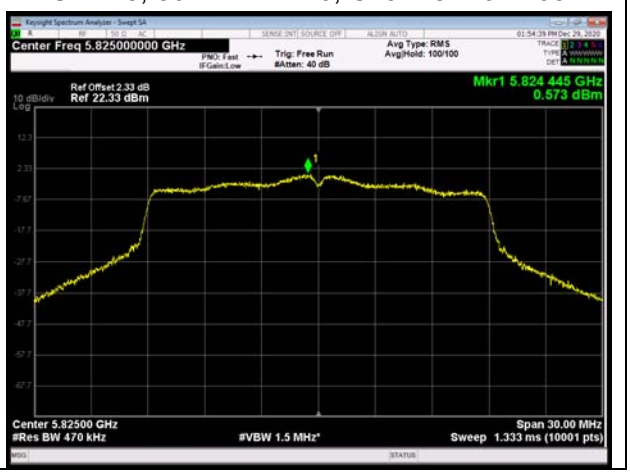
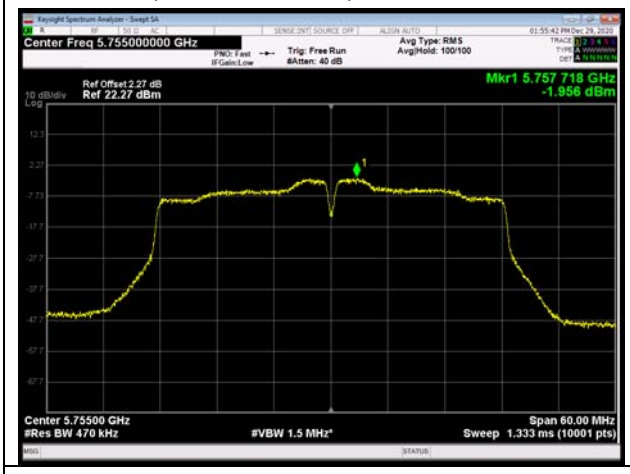
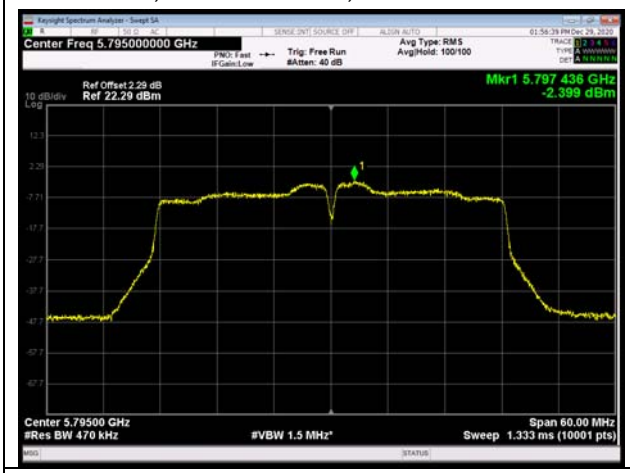


U-NII-3, 802.11n HT40, Channel No.: 151



U-NII-3, 802.11ac VHT20, Channel No.: 149

U-NII-3, 802.11n HT40, Channel No.: 159



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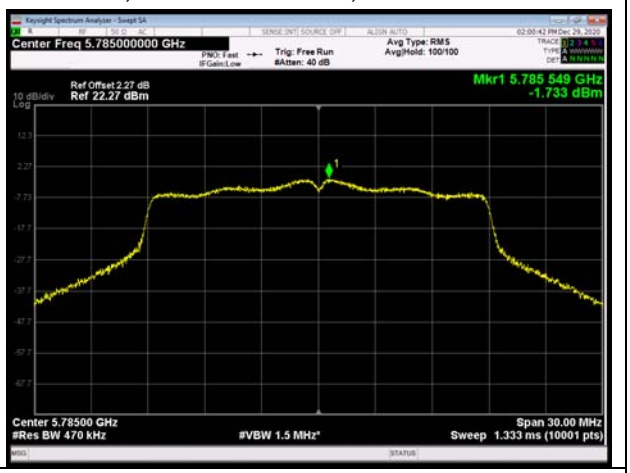
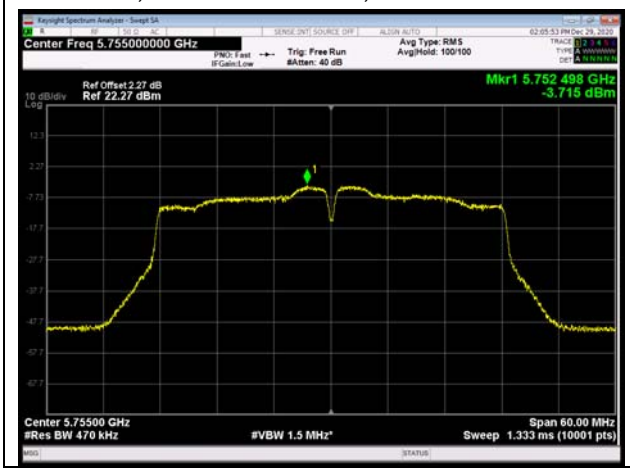


U-NII-3, 802.11ac VHT40, Channel No.: 151



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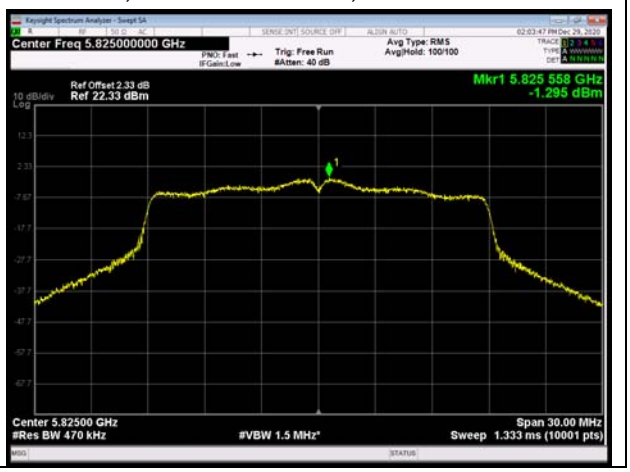
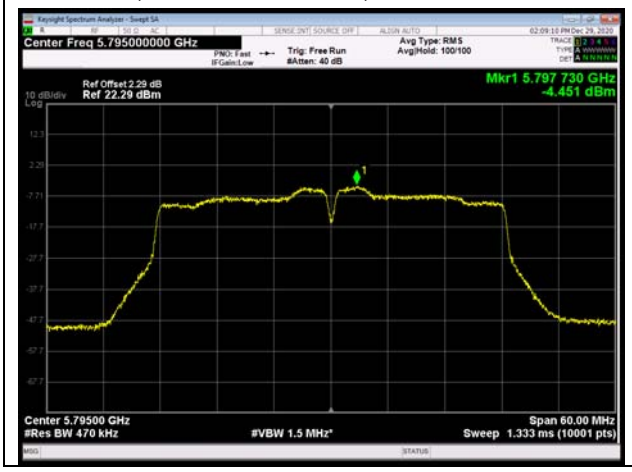
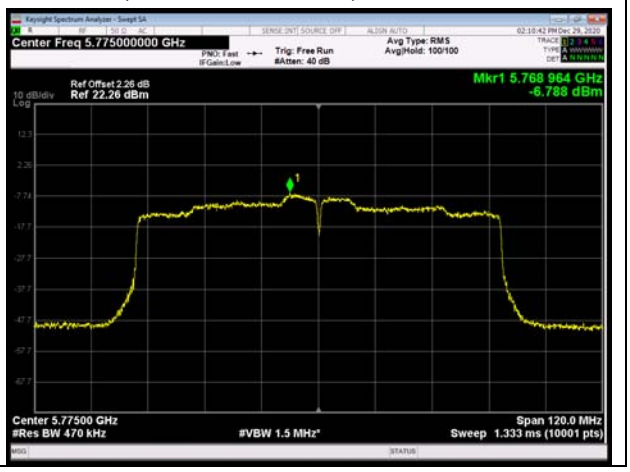


U-NII-3, 802.11ac VHT40, Channel No.: 159



U-NII-3, 802.11ac VHT80, Channel No.: 155



5.5. Unwanted Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

The test set-up was made in accordance to the general provisions of ANSI C63.10-2013. The Equipment Under Test (EUT) was set up on a non-conductive table in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna. The radiated emissions measurements were made in a typical installation configuration.
Sweep the whole frequency band range from 9kHz to the 10th harmonic of the carrier, and the emissions less than 20 dB below the permissible value are reported.

During the test, the height of receive antenna shall be moved from 1 to 4 meters, and the antenna shall be performed under horizontal and vertical polarization. The turntable shall be rotated from 0 to 360 degrees for detecting the maximum of radiated spurious signal level. The measurements shall be repeated with orthogonal polarization of the test antenna. The data of cable loss and antenna factor has been calibrated in full testing frequency range before the testing.
Set the spectrum analyzer in the following:
9kHz~150 kHz
RBW=200Hz, VBW=1kHz/ Sweep=AUTO
150 kHz~30MHz
RBW=9KHz, VBW=30KHz,/ Sweep=AUTO
Below 1GHz
RBW=100kHz / VBW=300kHz / Sweep=AUTO
a) Peak emission levels are measured by setting the instrument as follows:
Above 1GHz
PEAK: RBW=1MHz VBW=3MHz/ Sweep=AUTO
b) Average emission levels are measured by setting the instrument as follows:
Above 1GHz
AVERAGE: RBW=1MHz / VBW=3MHz / Sweep=AUTO
c) Detector: The measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector.
d) Averaging type = power (i.e., rms) (As an alternative, the detector and averaging type may be set for linear voltage averaging. Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.)
e) Sweep time = auto.
f) Perform a trace average of at least 100 traces if the transmission is continuous. If the transmission is not continuous, then the number of traces shall be increased by a factor of 1 / D, where D is the duty cycle. For example, with 50% duty cycle, at least 200 traces shall be averaged. (If a specific

emission is demonstrated to be continuous—i.e., 100% duty cycle—then rather than turning ON and OFF with the transmit cycle, at least 100 traces shall be averaged.)

g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.

2) If linear voltage averaging mode was used in the preceding step e), then the correction factor is [20 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 6 dB shall be added to the measured emission levels.

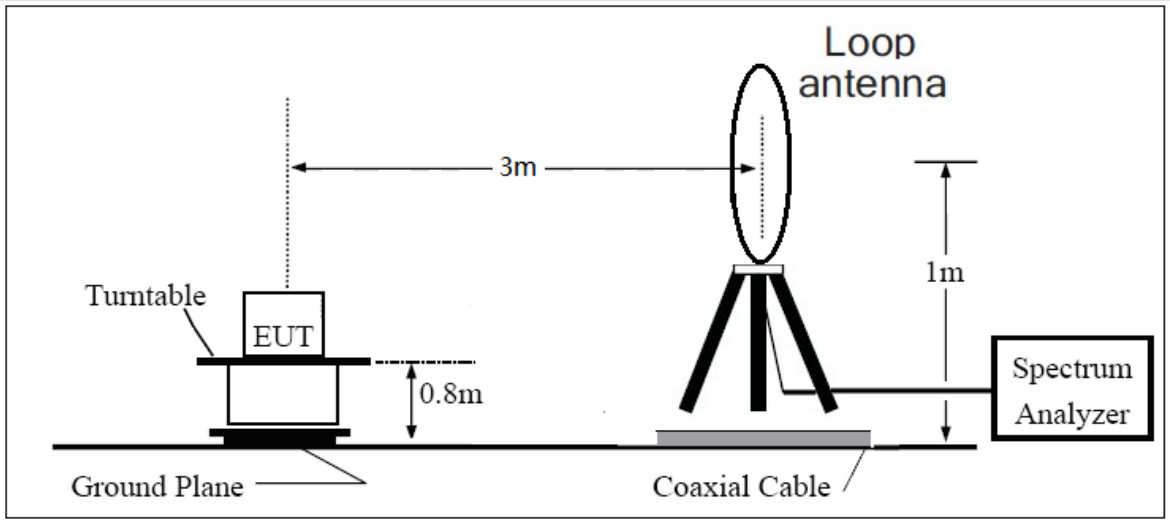
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

Reduce the video bandwidth until no significant variations in the displayed signal are observed in subsequent traces, provided the video bandwidth is no less than 1 Hz. For regulatory requirements that specify averaging only over the transmit duration (e.g., digital transmission system [DTS] and Unlicensed National Information Infrastructure [U-NII]), the video bandwidth shall be greater than [1 / (minimum transmitter on time)] and no less than 1 Hz.

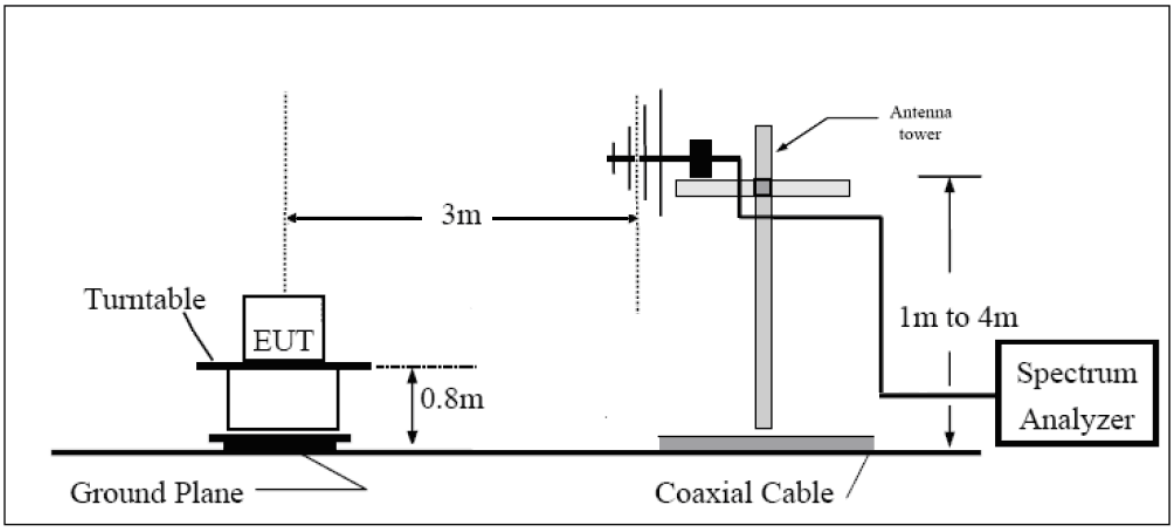
The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the loop antenna is vertical, others antenna are vertical and horizontal.

The test is in transmitting mode.

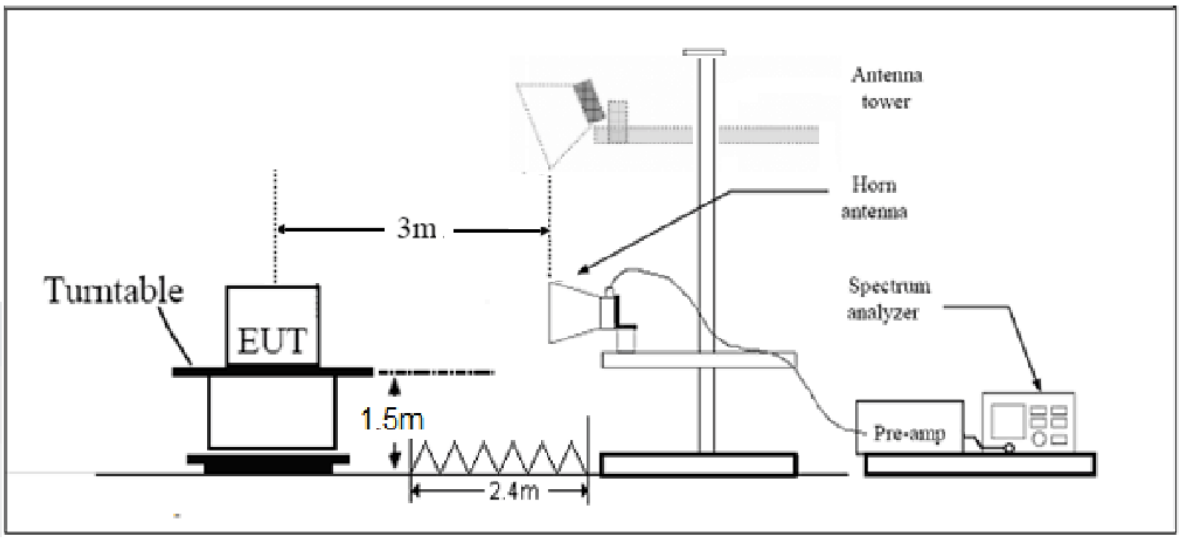
9KHz~~~30MHz



30MHz~~~ 1GHz



Above 1GHz



Note: Area side:2.4mX3.6m

Limits

(1) For transmitters operating in the 5725-5850 MHz band: All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.

(2) For transmitters operating in the 5.15-5.25 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz(68.2dBμV/m).

(3) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz(68.2dBμV/m).

(4) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz(68.2dBμV/m).

Note: the following formula is used to convert the EIRP to field strength

§1、E[dBμV/m] = EIRP[dBm] - 20 log(d[meters]) + 104.77, where E = field strength and

d = distance at which field strength limit is specified in the rules;

§2、E[dBμV/m] = EIRP[dBm] + 95.2, for d = 3 meters

(5) 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 of emission (MHz)	Field strength(uV/m)	Field strength(dBuV/m)
0.009–0.490	2400/F(kHz)	/
0.490–1.705	24000/F(kHz)	/
1.705–30.0	30	/
30-88	100	40
88-216	150	43.5
216-960	200	46
Above960	500	54

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor *k* = 1.96.

Frequency	Uncertainty
9KHz-30MHz	3.55 dB
30MHz-200MHz	4.17 dB
200MHz-1GHz	4.84 dB
1-18GHz	4.35 dB
18-26.5GHz	5.90 dB
26.5GHz~40GHz	5.92 dB

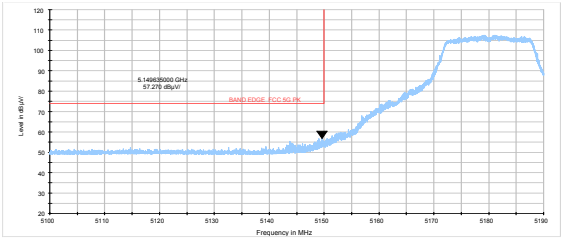
Test Results:

The modulation and bandwidth are similar for 802.11n mode for 20MHz/40MHz and 802.11ac mode for V20MHz/V40MHz, therefore investigated worst case to representative mode in test report.

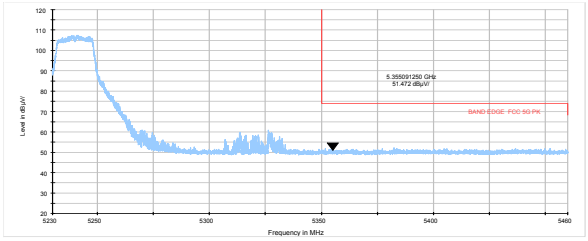
The signal beyond the limit is carrier.

U-NII-1

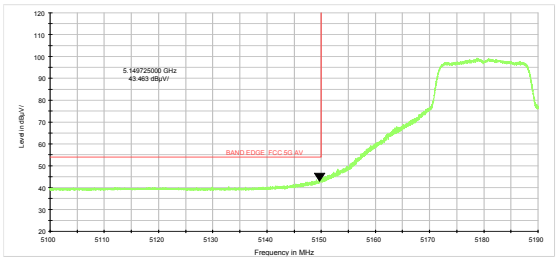
802.11a-Channel 36: Peak



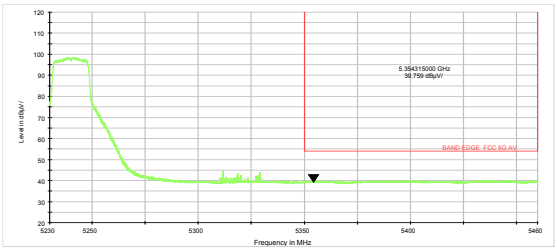
802.11a-Channel 48: Peak



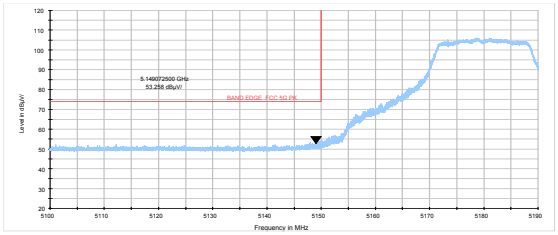
802.11a-Channel 36: Average



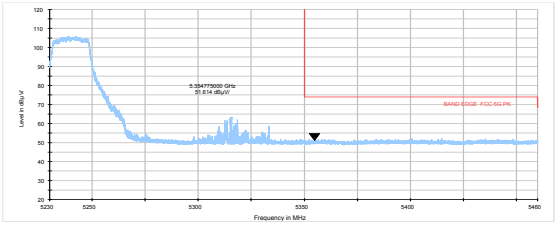
802.11a-Channel 48: Average



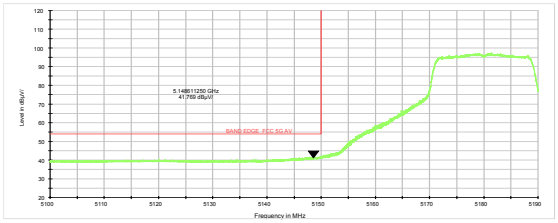
802.11n HT20-Channel 36: Peak



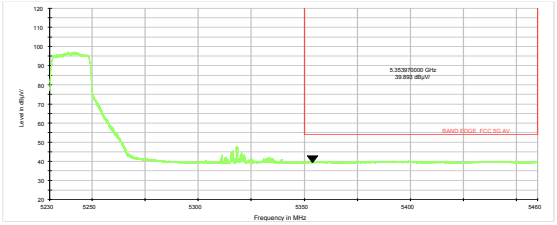
802.11n HT20-Channel 48: Peak



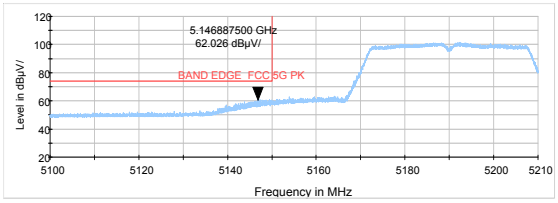
802.11n HT20-Channel 36: Average



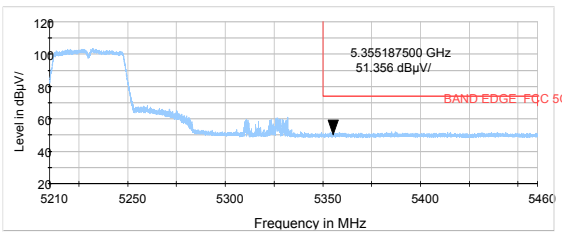
802.11n HT20-Channel 48: Average



802.11n HT40-Channel 38: Peak



802.11n HT40-Channel 46: Peak



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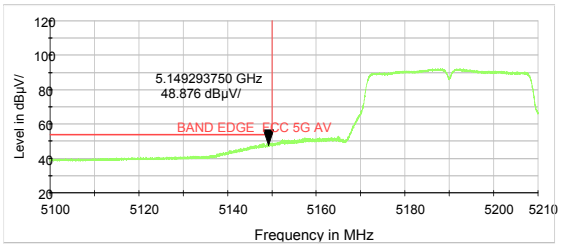

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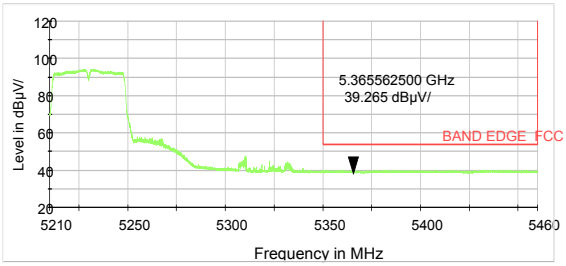
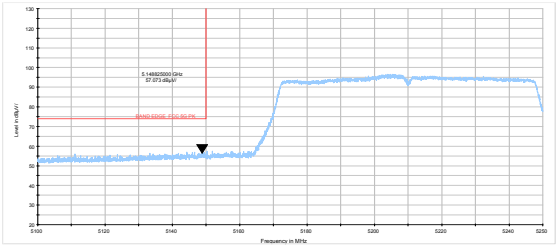
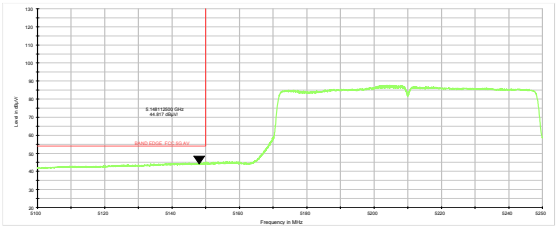


802.11ac VHT80 –Channel 42: Peak

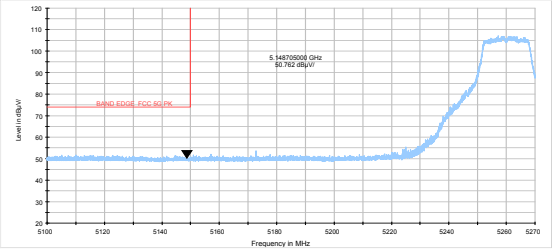


802.11ac VHT80- Channel 42: Average

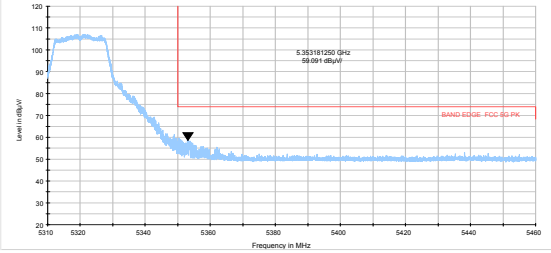


U-NII-2A

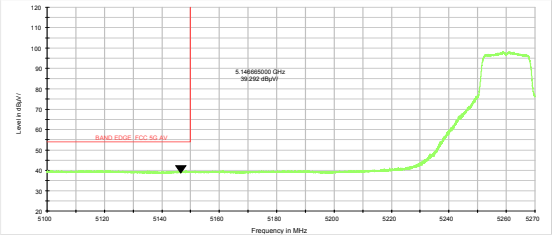
802.11a-Channel 52: Peak



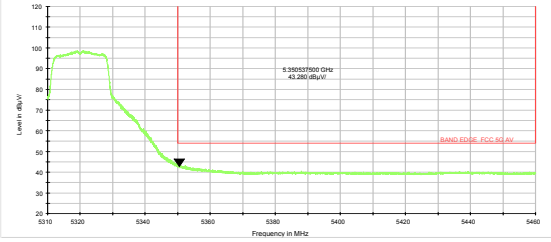
802.11a-Channel 64: Peak



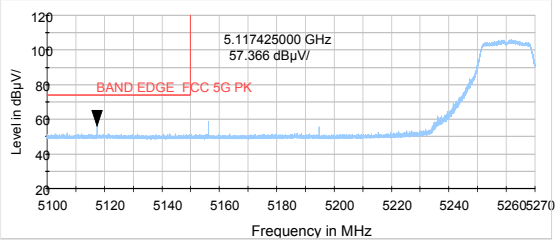
802.11a-Channel 52: Average



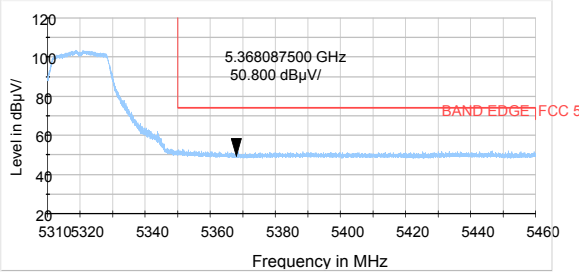
802.11a-Channel 64: Average



802.11n HT20-Channel 52: Peak



802.11n HT20-Channel 64: Peak



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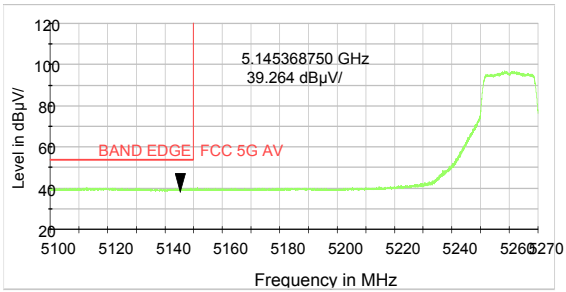

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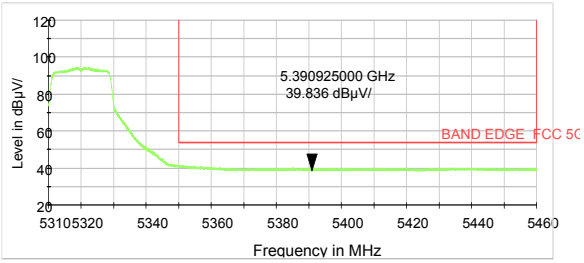
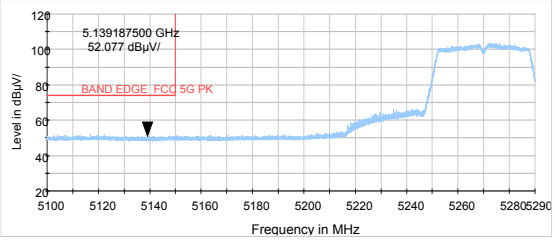
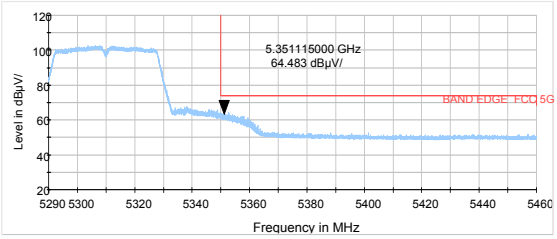
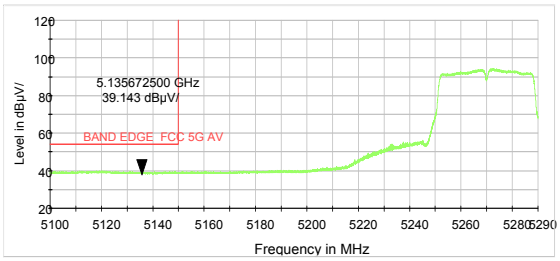
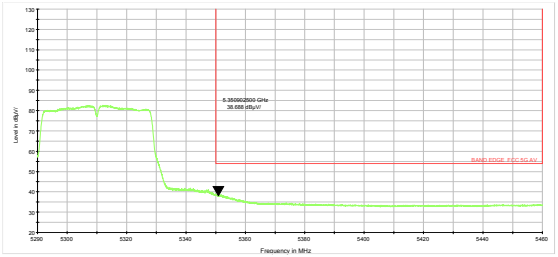
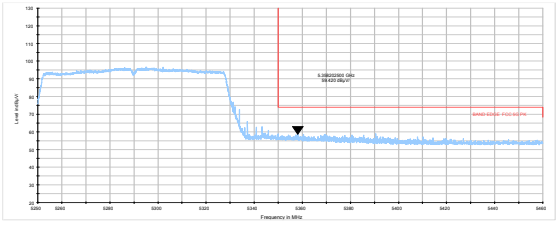
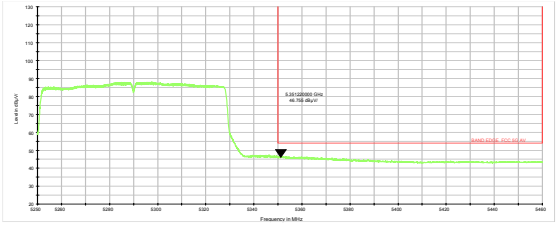


802.11n HT40-Channel 54: Peak



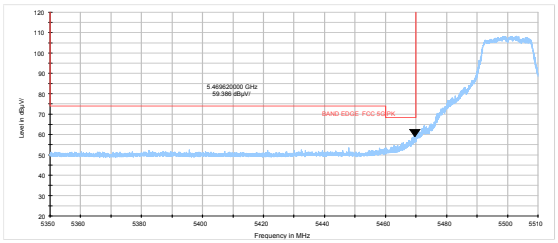
802.11n HT40-Channel 62: Peak



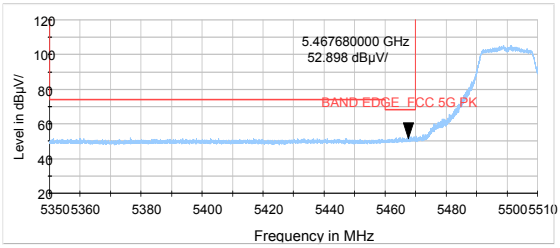
802.11n HT40-Channel 54: Average	802.11n HT40-Channel 62: Average
	
802.11ac VHT80 –Channel 58: Peak	**802.11ac VHT80- Channel 58: Average**
	

U-NII-2C

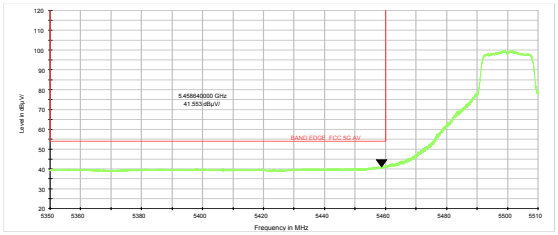
802.11a-Channel 100: Peak



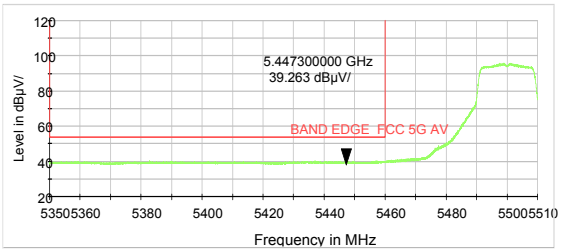
802.11n HT20-Channel 100: Peak



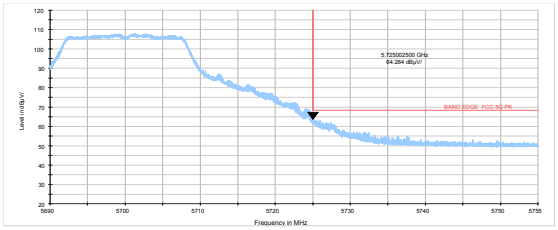
802.11a-Channel 100: Average



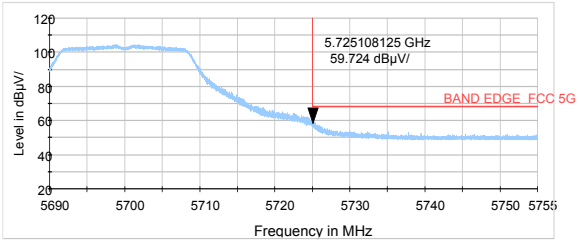
802.11n HT20-Channel 100: Average



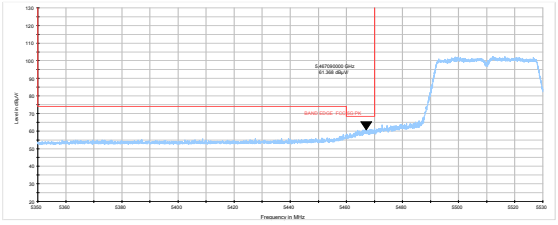
802.11a-Channel 140: Peak



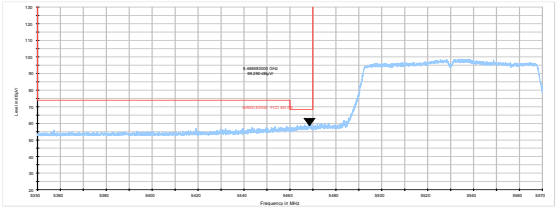
802.11n HT20-Channel 140: Peak



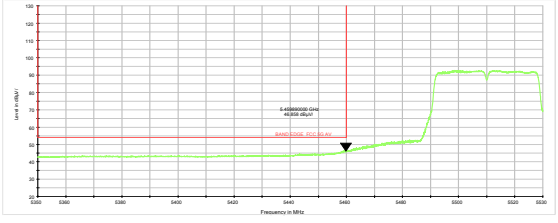
802.11n HT40-Channel 102: Peak



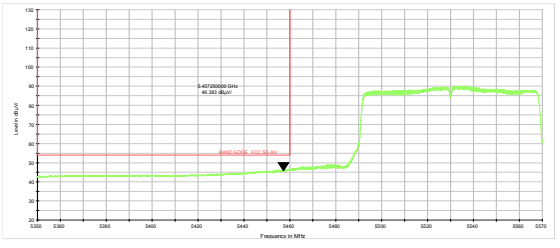
802.11ac VHT80 –Channel 106: Peak

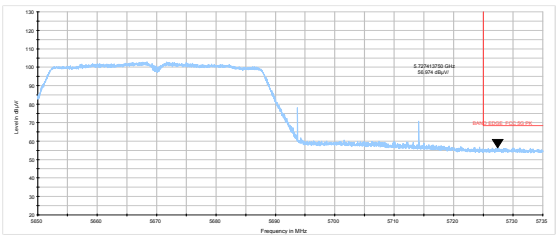
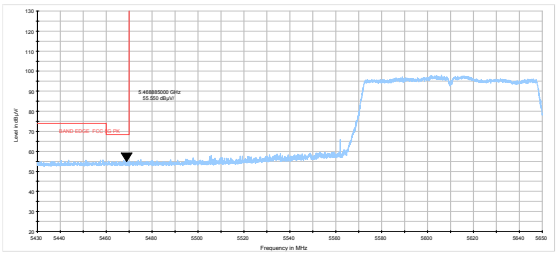


802.11n HT40-Channel 102: Average



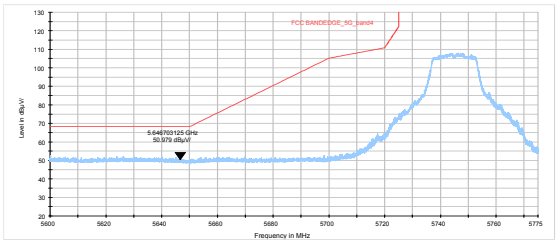
802.11ac VHT80- Channel 106: Average



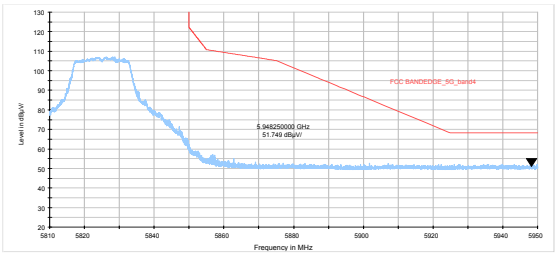
802.11n HT40-Channel 134: Peak	802.11ac VHT80 –Channel 122: Peak
	

U-NII-3

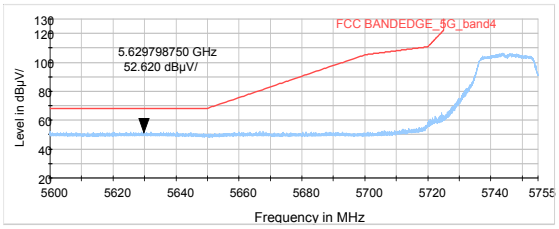
802.11a-Channel 149: Peak



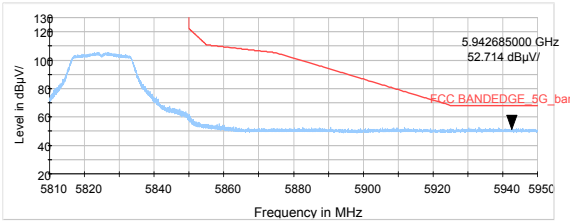
802.11a-Channel 165: Peak



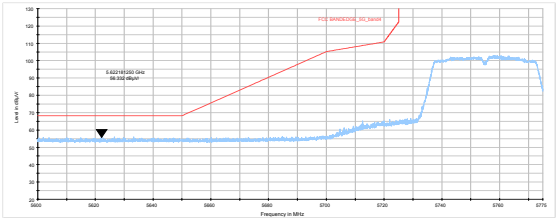
802.11n HT20-Channel 149: Peak



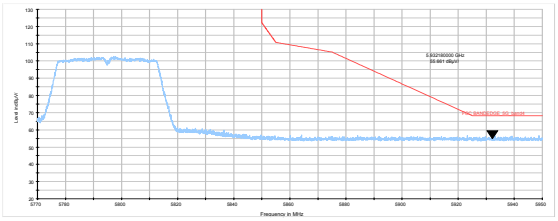
802.11n HT20-Channel 165: Peak



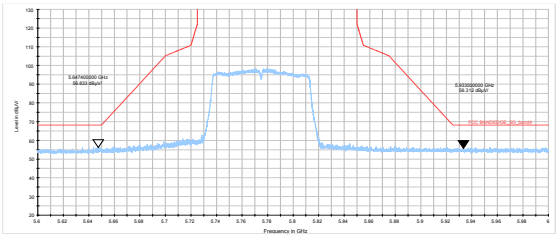
802.11n HT40-Channel 151: Peak



802.11n HT40-Channel 159: Peak



802.11ac VHT80- Channel 155: Peak



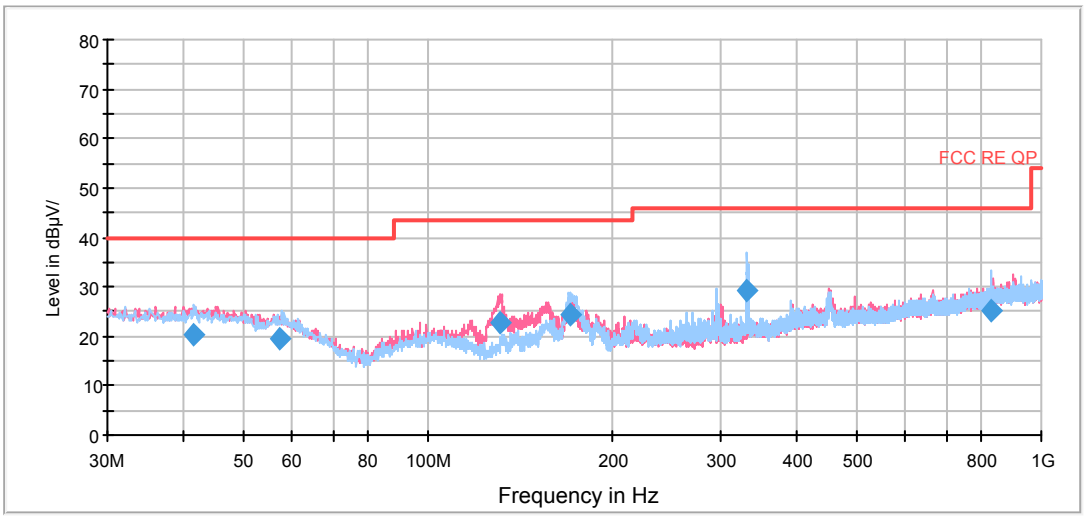
Result of RE

Test result

Sweep the whole frequency band through the range from 9kHz to the 10th harmonic of the carrier, the Emissions in the frequency band 9kHz-30MHz and 26.5GHz-40GHz are more than 20dB below the limit are not reported.

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels, 802.11n (HT40) CH118 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Continuous TX mode:



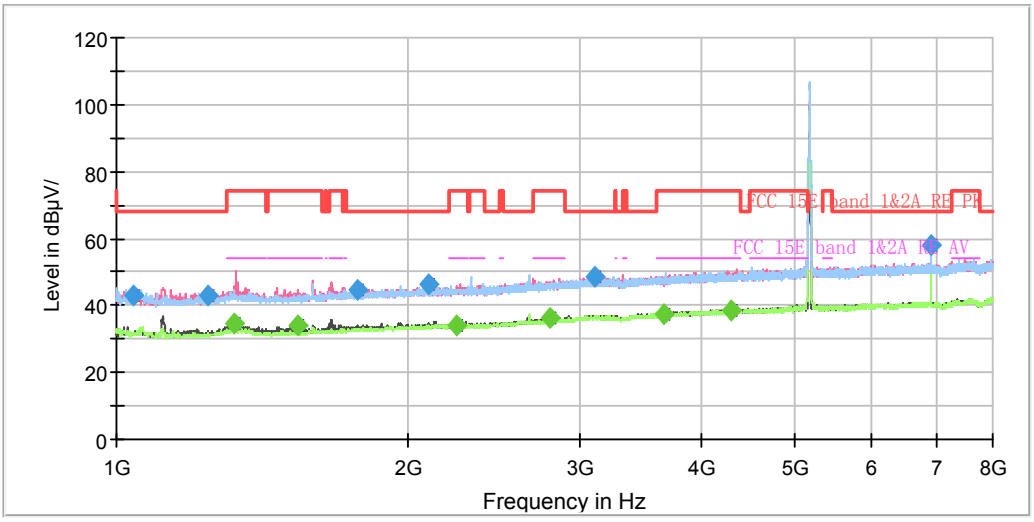
Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
41.558750	20.3	217.0	H	336.0	-13.0	19.7	40.0
57.325000	19.3	175.0	H	347.0	-13.6	20.7	40.0
131.446250	22.7	100.0	V	119.0	-20.4	20.8	43.5
170.650000	24.3	175.0	H	194.0	-20.4	19.2	43.5
331.913750	29.3	100.0	H	99.0	-15.6	16.7	46.0
831.257500	25.3	100.0	H	130.0	-6.6	20.7	46.0

Remark: 1. Correction Factor = Antenna factor+ Insertion loss(cable loss+amplifier gain)

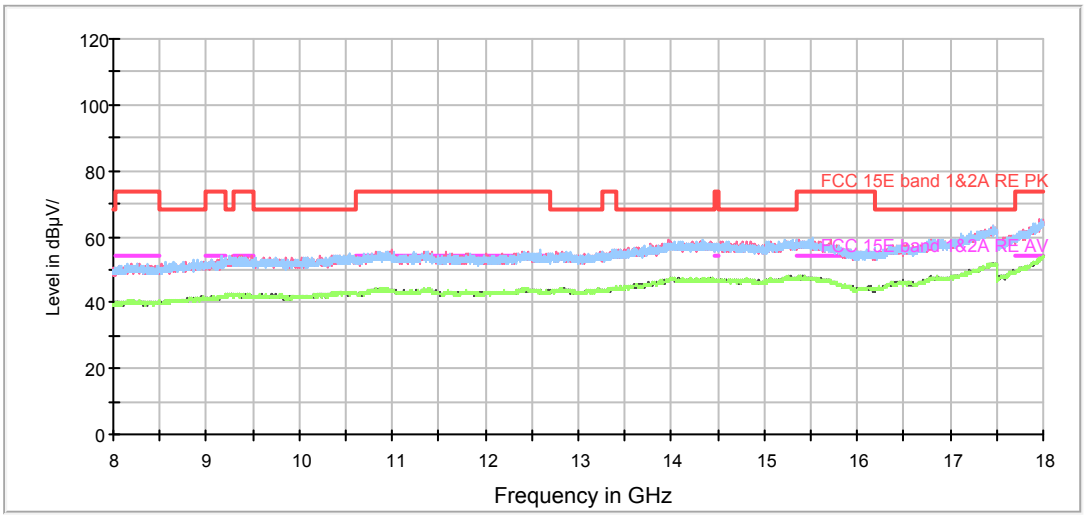
2. Margin = Limit – Quasi-Peak

802.11a CH36



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

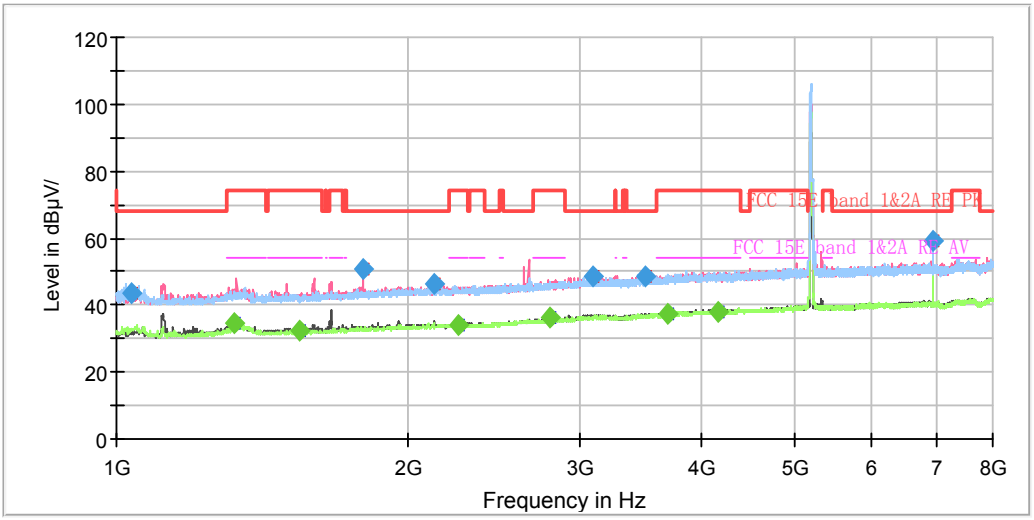


Radiates Emission from 8GHz to 18GHz

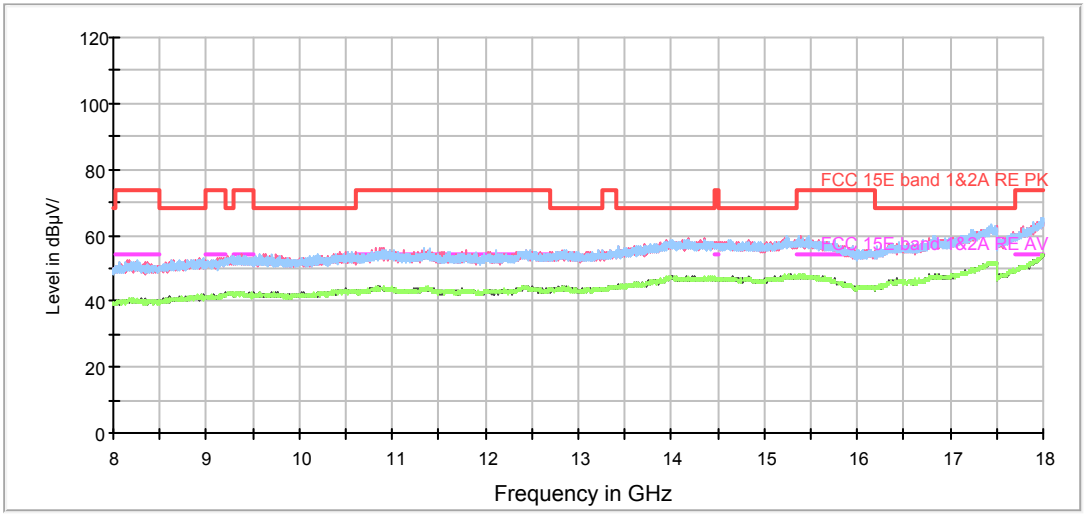
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1039.375000	42.90	---	68.20	25.30	100.0	H	113.0	-8.6
1243.250000	42.78	---	68.20	25.42	100.0	V	109.0	-7.5
1321.125000	---	34.55	54.00	19.45	100.0	V	116.0	-7.1
1539.875000	---	33.94	54.00	20.06	100.0	V	0.0	-6.0
1775.250000	44.39	---	68.20	23.81	200.0	V	145.0	-4.6
2092.875000	46.60	---	68.20	21.60	200.0	H	61.0	-3.0
2239.000000	---	33.95	54.00	20.05	100.0	V	109.0	-2.5
2797.250000	---	36.37	54.00	17.63	200.0	V	132.0	0.1
3107.000000	48.42	---	68.20	19.78	200.0	V	0.0	1.6
3665.250000	---	37.56	54.00	16.44	100.0	H	274.0	2.9
4298.750000	---	38.25	54.00	15.75	100.0	V	0.0	4.5
6907.125000	58.25	---	68.20	9.95	100.0	H	335.0	9.1

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11a CH40



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 8GHz

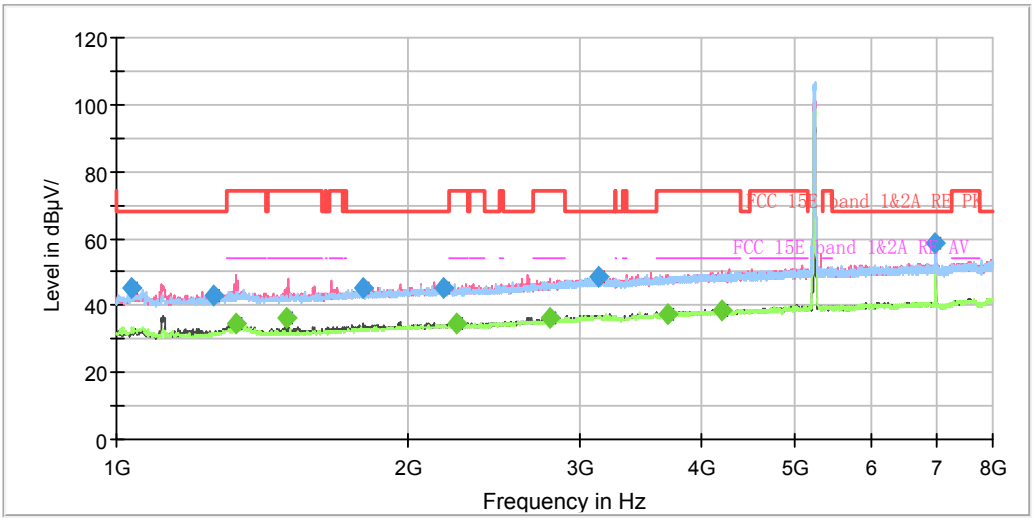


Radiates Emission from 8GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1036.750000	43.65	---	68.20	24.55	100.0	H	82.0	-8.6
1321.125000	---	34.69	54.00	19.31	100.0	V	119.0	-7.1
1546.875000	---	32.21	54.00	21.79	100.0	V	93.0	-6.0
1797.125000	51.01	---	68.20	17.19	100.0	V	171.0	-4.5
2126.125000	46.48	---	68.20	21.72	200.0	V	9.0	-2.9
2252.125000	---	33.90	54.00	20.10	100.0	V	42.0	-2.4
2794.625000	---	36.49	54.00	17.51	100.0	V	132.0	0.0
3097.375000	48.33	---	68.20	19.87	200.0	H	338.0	1.5
3513.000000	48.46	---	68.20	19.74	200.0	V	205.0	2.4
3693.250000	---	37.59	54.00	16.41	100.0	V	106.0	3.1
4171.000000	---	38.13	54.00	15.87	100.0	V	242.0	4.4
6933.375000	59.17	---	68.20	9.03	100.0	H	330.0	9.1

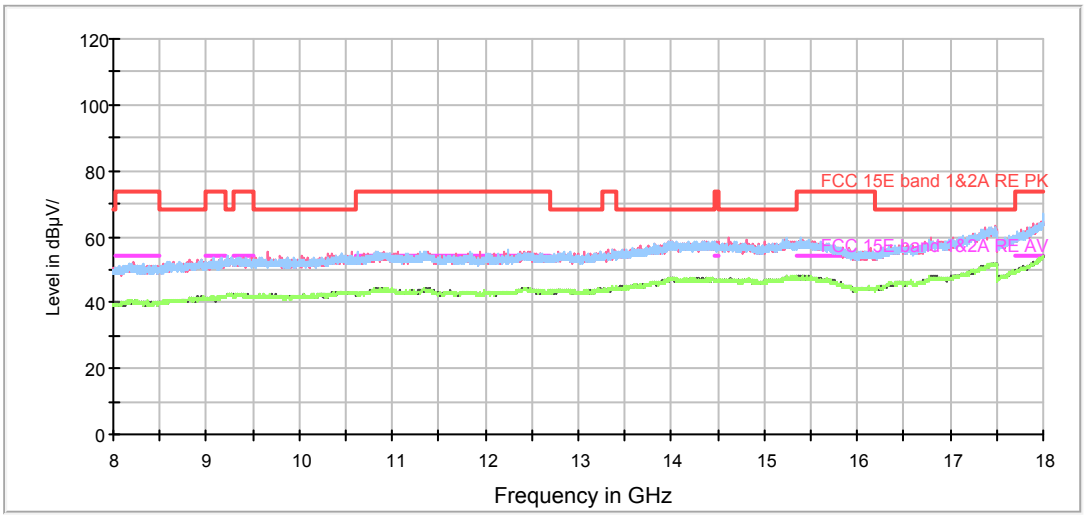
Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11a CH48



Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

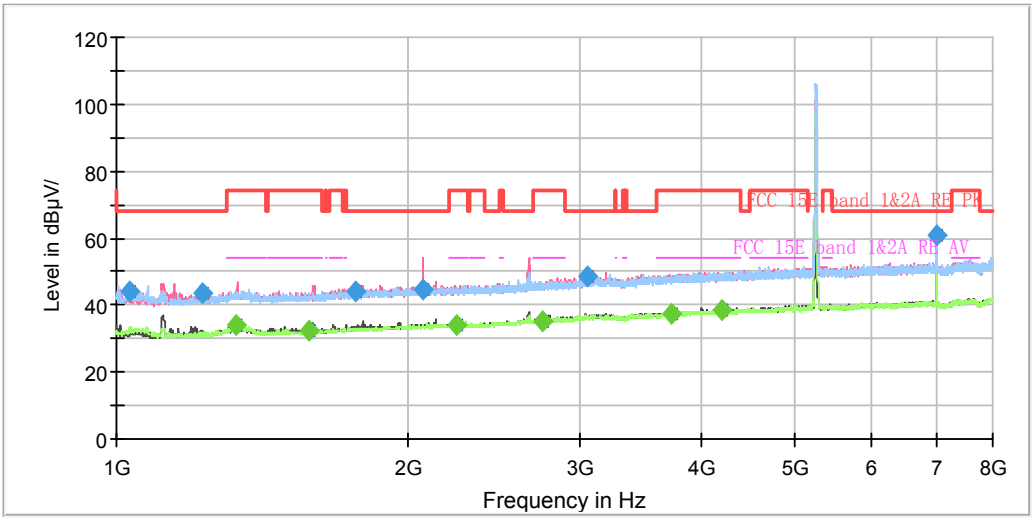


Radiates Emission from 8GHz to 18GHz

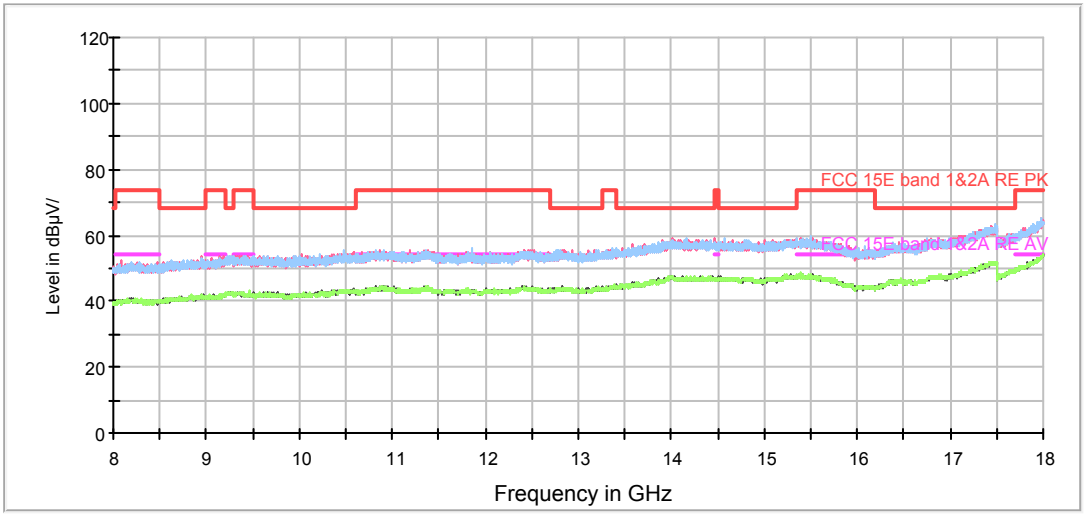
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1036.750000	45.44	---	68.20	22.76	100.0	H	98.0	-8.6
1259.875000	43.00	---	68.20	25.20	100.0	H	129.0	-7.5
1328.125000	---	34.51	54.00	19.49	100.0	V	301.0	-7.1
1498.750000	---	36.11	54.00	17.89	100.0	V	2.0	-6.2
1798.000000	45.38	---	68.20	22.82	100.0	V	136.0	-4.5
2170.750000	45.43	---	68.20	22.77	100.0	V	91.0	-2.7
2238.125000	---	34.76	54.00	19.24	100.0	H	123.0	-2.5
2797.250000	---	36.45	54.00	17.55	200.0	V	129.0	0.1
3136.750000	48.32	---	68.20	19.88	200.0	V	306.0	1.6
3694.125000	---	37.58	54.00	16.42	100.0	V	52.0	3.1
4197.250000	---	38.24	54.00	15.76	100.0	V	84.0	4.4
6986.750000	58.53	---	68.20	9.67	100.0	H	327.0	9.2

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)

802.11a CH52



Note: The signal beyond the limit is carrier.
Radiates Emission from 1GHz to 8GHz



Radiates Emission from 8GHz to 18GHz

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1030.625000	44.14	---	68.20	24.06	200.0	H	103.0	-8.7
1224.875000	43.36	---	68.20	24.84	200.0	H	91.0	-7.7
1329.875000	---	33.99	54.00	20.01	200.0	V	125.0	-7.1
1577.500000	---	32.11	54.00	21.89	200.0	V	207.0	-5.7
1761.250000	44.25	---	68.20	23.95	200.0	V	29.0	-4.7
2065.750000	44.42	---	68.20	23.78	200.0	H	153.0	-3.1
2244.250000	---	34.07	54.00	19.93	200.0	V	150.0	-2.5
2745.625000	---	35.21	54.00	18.79	100.0	V	94.0	-0.2
3050.125000	48.40	---	68.20	19.80	200.0	H	198.0	1.4
3734.375000	---	37.55	54.00	16.45	200.0	H	27.0	3.1
4210.375000	---	38.71	54.00	15.29	100.0	V	341.0	4.4
7013.875000	60.95	---	68.20	7.25	100.0	H	326.0	9.2

Remark: 1. Correction Factor = Antenna factor+ Insertion loss (cable loss + amplifier gain)