RF TEST REPORT

Applicant	Smawave Technology Co. ,Ltd
FCC ID	2AU8HSMC411-A
Product	LTE-A Hotspot
Brand	Smawave
Model	SMC411-a
Report No.	R2011A0794-R4V2
Issue Date	December 31, 2020

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.

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TABLE OF CONTENT

1. Test Laboratory....5
1.1. Notes of the test report....5
1.2. Test facility....5
1.3. Testing Location....5
2. General Description of Equipment under Test....6
2.1. Applicant and Manufacturer Information....6
2.2. General information....6
3. Applied Standards....8
4. Test Configuration....9
5. Test Case Results....11
5.1. Occupied Bandwidth....11
5.2. Average Power Output....22
5.3. Frequency Stability....28
5.4. Power Spectral Density....31
5.5. Unwanted Emission....54
5.6. Conducted Emission....99
6. Main Test Instruments....102
ANNEX A: The EUT Appearance....103
ANNEX B: Test Setup Photos....104

Version	Revision description	Issue Date
Rev.0	/	December 25, 2020
Rev.1	Update information for USB. Update description in page 7. Update data in page 60.	December 30, 2020
Rev.2	Update information in page 6.	December 31, 2020
Note: This revised report (Report No. R2011A0794-R4V2) supersedes and replaces the previously issued report (Report No. R2011A0794-R4V1). 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: November 18, 2020 ~ December 23, 2020			
Date of Sample Received: November 18, 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 electromagnetic emissions 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
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E-mail:	xukai@ta-shanghai.com

2. General Description of Equipment under Test

2.1. Applicant and Manufacturer Information

Applicant	Smawave Technology Co. ,Ltd
Applicant address	3/F, Building 8, 1001 North Qinzhou Road，Xuhui District, Shanghai, China
Manufacturer	Smawave Technology Co. ,Ltd
Manufacturer address	3/F, Building 8, 1001 North Qinzhou Road，Xuhui District, Shanghai, China

2.2. General information

EUT Description			
Model	SMC411-a		
IMEI	862165040847046		
Hardware Version	V1.0		
Software Version	SG628_V1.0.4		
Power Supply	Battery/AC adapter		
Antenna Type	PCB Antenna		
Antenna Gain		Frequency(MHz)	Antenna Gain(dBi)
	Antenna 1	5200	-0.3
		5250	1.2
		5750	3.7
		5800	3.7
	Antenna 2	5200	0.8
		5250	1.2
		5750	3.3
		5800	2.3
Antenna Working Conditions	Antenna	Working conditions	
	ANT_WLAN1	WIFI 5G TX & RX	
	ANT_WLAN0	WIFI 5G TX & RX	
Directional Gain	3.7dBi		
Test Band	U-NII-1(5150MHz-5250MHz) U-NII-3(5725MHz-5850MHz)		
Modulation Type	802.11a/n (HT20/HT40) : OFDM 802.11ac (VHT20/VHT40/VHT80): OFDM		
Max. Conducted Power	19.97dBm		
Operating Frequency Range(s)	U-NII-1: 5150MHz-5250MHz U-NII-3: 5725MHz -5850MHz		

Extreme Temperature	-20 ° C to 50° C
Operating temperature range:	-10 ° C to 45° C
Operating voltage range:	3.6 V to 4.3 V
State DC voltage:	3.8V
EUT Accessory	
Battery	Manufacturer: HUIZHOU DXDRAGON INC. Model: BTE-4001 Output: 3.8V 4000mAh
USB Cable	Manufacturer: Chengdu Jingyue Kaibo Electronics Co., Ltd Model:SJM001
Auxiliary equipment	
Adapter	Manufacturer:SHENZHEN TIANYIN ELECTRONICS CO.,LTD Model:TPA-46050200VU
Note:1. The EUT is sent from the applicant to TA and the information of the EUT is declared by the applicant. 2. Antenna 2 can't work alone. 3. The EUT don't have standard Adapter, The Adapter used for testing in this report is the after-market accessory. 4. The device will automatically discontinue transmission in case of either absence of information to transmit or operational failure.	

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

KDB 662911 D01 Multiple Transmitter Output 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	
	SISO Antenna 1	MIMO
802.11a	6 Mbps	6 Mbps
802.11n HT20	MCS0	MCS8
802.11n HT40	MCS0	MCS8
802.11ac VHT20	MCS0	MCS8
802.11ac VHT40	MCS0	MCS8
802.11ac VHT80	MCS0	MCS8

The worst case Antenna mode for each of the following tests for Wi-Fi:

Test Cases	SISO Antenna 1	MIMO
Average conducted output power	O	O
Occupied bandwidth	O	--
Frequency stability	O	--
Power Spectral Density	O	O
Unwanted Emissions	O	--
Conducted Emissions	O	--
Note：“O”: test all bands		

According to RF Output power results in chapter 5.2, SISO Antenna 1 was selected as the worst antenna.

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-3	20 MHz	149	5745MHz
			153	5765MHz
			157	5785MHz
			161	5805MHz
			165	5825MHz
		40 MHz	151	5755MHz
			159	5795MHz
		80 MHz	155	5775MHz

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.

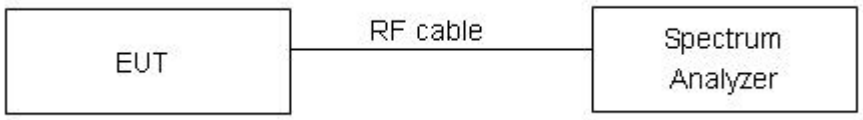
For U-NII-1/U-NII-2A/U-NII-2C, set RBW ≈1% OCB kHz, VBW ≥ 3 × RBW, measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 26 dB relative to the maximum level measured in the 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	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 26 dB bandwidth (MHz)	Conclusion
802.11a	5180	16.537	20.20	PASS
	5200	16.547	20.48	PASS
	5240	16.566	22.84	PASS
802.11n HT20	5180	17.643	20.89	PASS
	5200	17.650	21.01	PASS
	5240	17.639	21.42	PASS
802.11n HT40	5190	36.447	50.84	PASS
	5230	36.326	46.85	PASS
802.11ac VHT20	5180	17.621	21.11	PASS
	5200	17.654	20.92	PASS
	5240	17.655	22.08	PASS
802.11ac VHT40	5190	36.435	45.45	PASS
	5230	36.282	54.91	PASS
802.11ac VHT80	5210	75.502	101.77	PASS

U-NII-3

Mode	Carrier frequency (MHz)	99% bandwidth (MHz)	Minimum 6 dB bandwidth (MHz)	Limit (kHz)	Conclusion
802.11a	5745	16.607	16.31	500	PASS
	5785	16.591	16.32	500	PASS
	5825	16.701	16.35	500	PASS
802.11n HT20	5745	17.668	16.98	500	PASS
	5785	17.676	17.04	500	PASS
	5825	17.736	16.44	500	PASS
802.11n HT40	5755	36.500	35.90	500	PASS
	5795	36.529	35.68	500	PASS
802.11ac VHT20	5745	17.741	17.28	500	PASS
	5785	17.678	17.26	500	PASS
	5825	17.782	16.43	500	PASS
802.11ac VHT40	5755	36.505	36.29	500	PASS
	5795	36.331	35.90	500	PASS
802.11ac VHT80	5775	75.707	73.89	500	PASS

U-NII-1, 802.11a

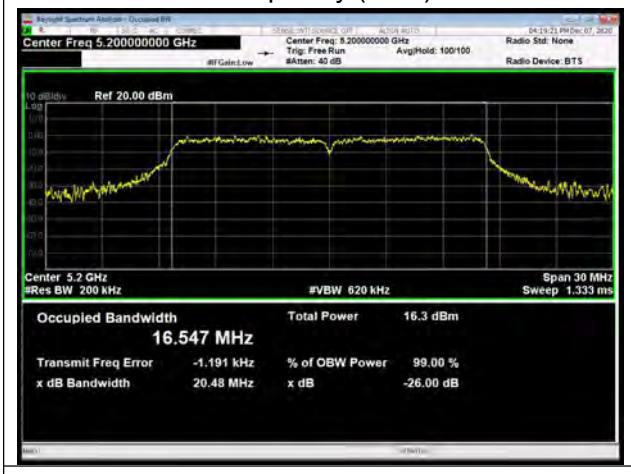
Carrier frequency (MHz): 5180

U-NII-1, 802.11n HT20

Carrier frequency (MHz): 5180

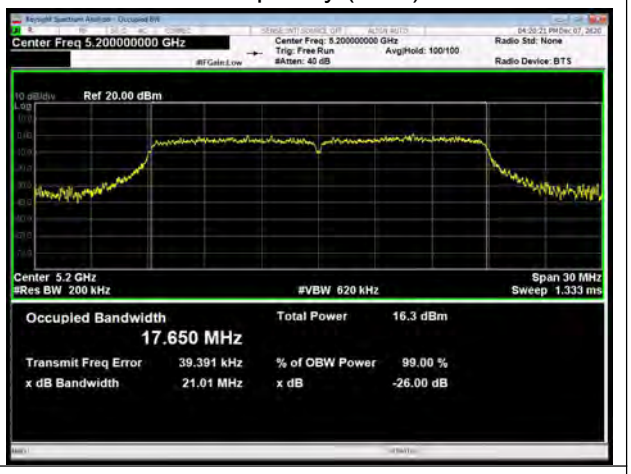
U-NII-1, 802.11a

Carrier frequency (MHz): 5200



U-NII-1, 802.11n HT20

Carrier frequency (MHz): 5200

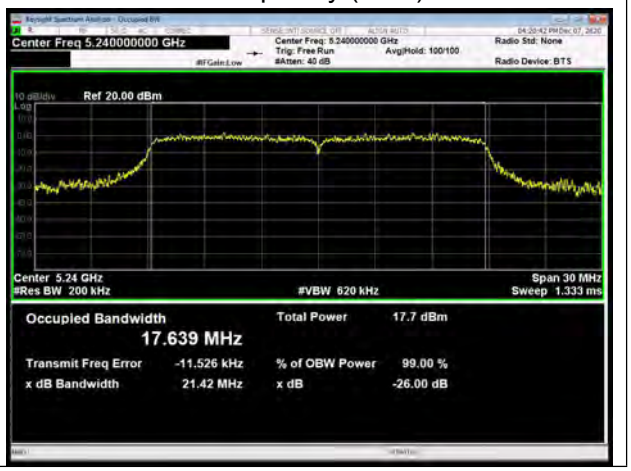


U-NII-1, 802.11a

Carrier frequency (MHz):5240

U-NII-1, 802.11n HT20

Carrier frequency (MHz):5240

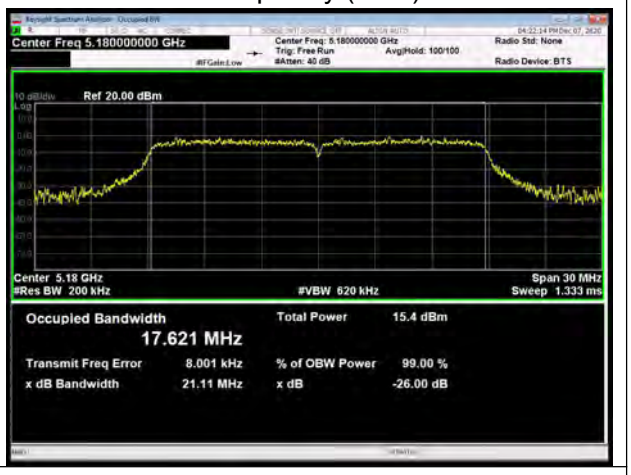


U-NII-1, 802.11n HT40

Carrier frequency (MHz): 5190

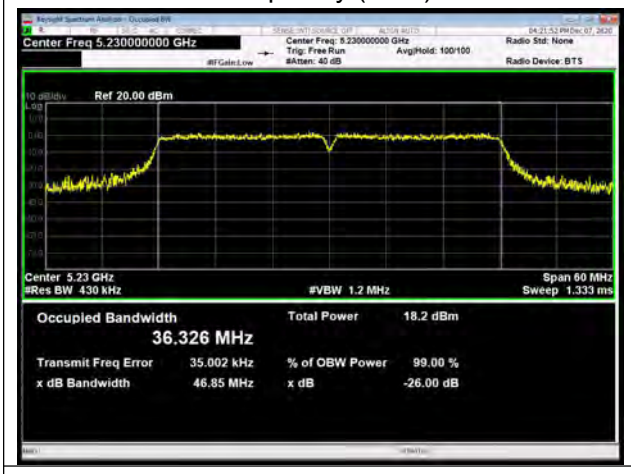
U-NII-1, 802.11ac VHT20

Carrier frequency (MHz): 5180



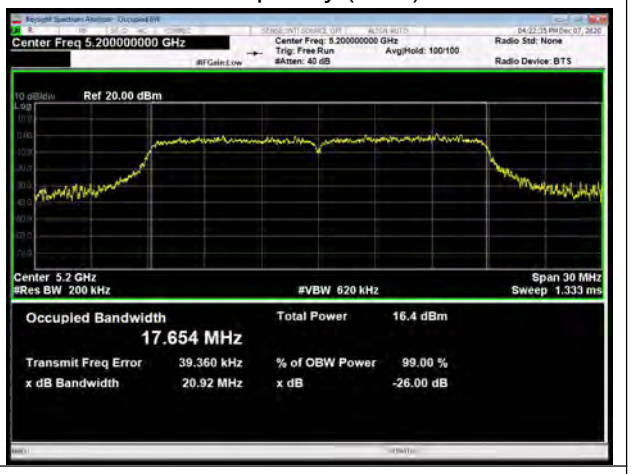
U-NII-1, 802.11n HT40

Carrier frequency (MHz): 5230



U-NII-1, 802.11ac VHT20

Carrier frequency (MHz): 5200

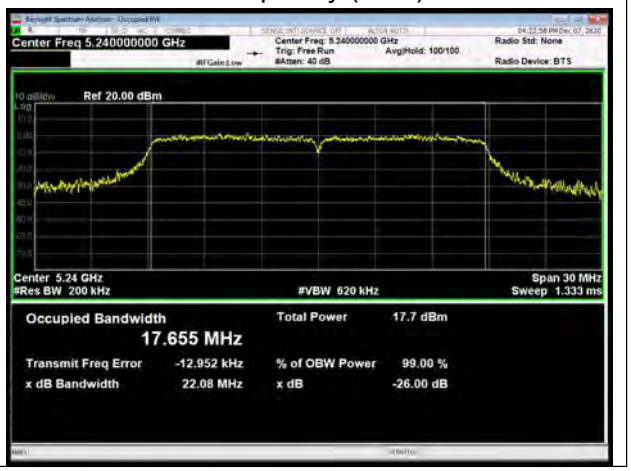


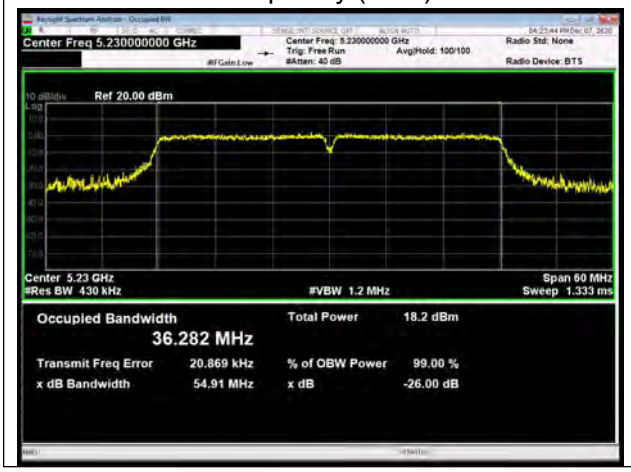
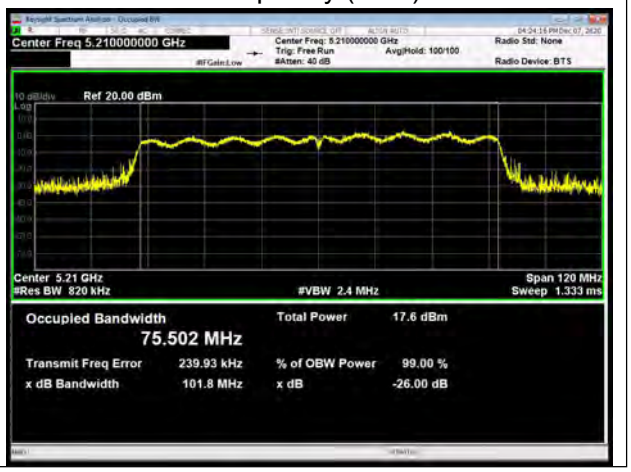
U-NII-1, 802.11ac VHT40

Carrier frequency (MHz): 5190

U-NII-1, 802.11ac VHT20

Carrier frequency (MHz):5240

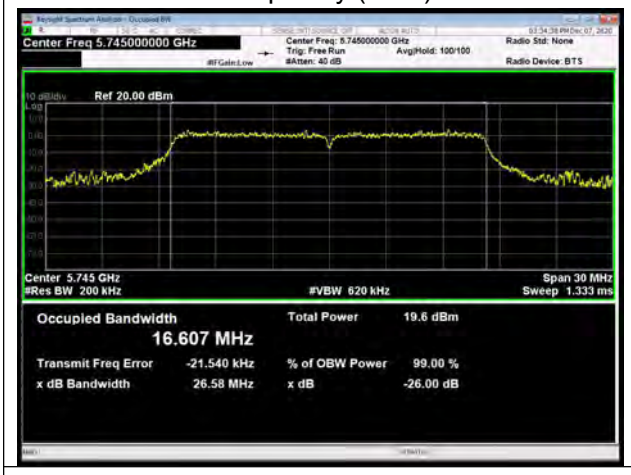


U-NII-1, 802.11ac VHT40 Carrier frequency (MHz): 5230	U-NII-1, 802.11ac VHT80 Carrier frequency (MHz): 5210
	

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

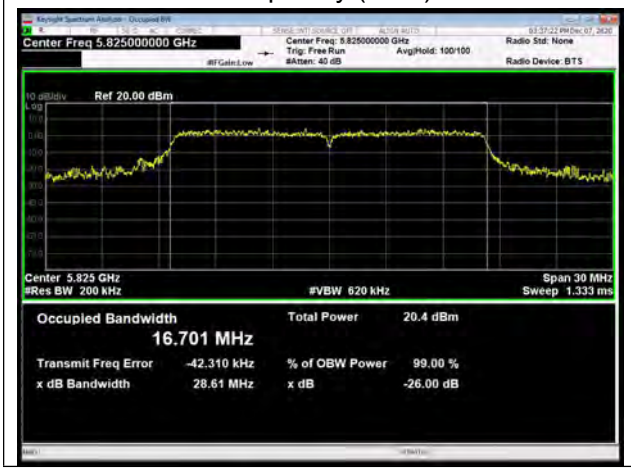
Carrier frequency (MHz): 5785

U-NII-3, 802.11n HT20

Carrier frequency (MHz): 5785

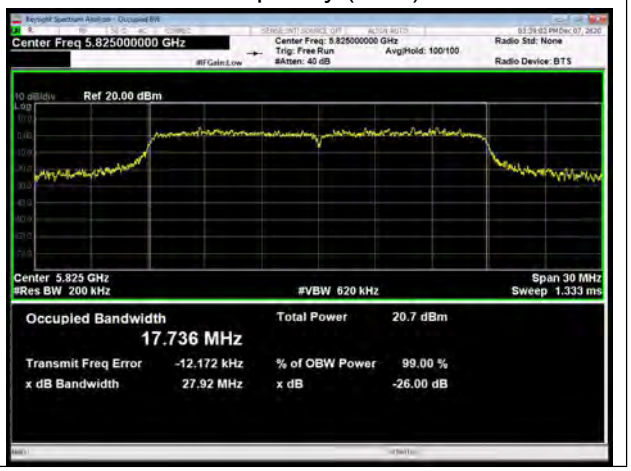
U-NII-3, 802.11a

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

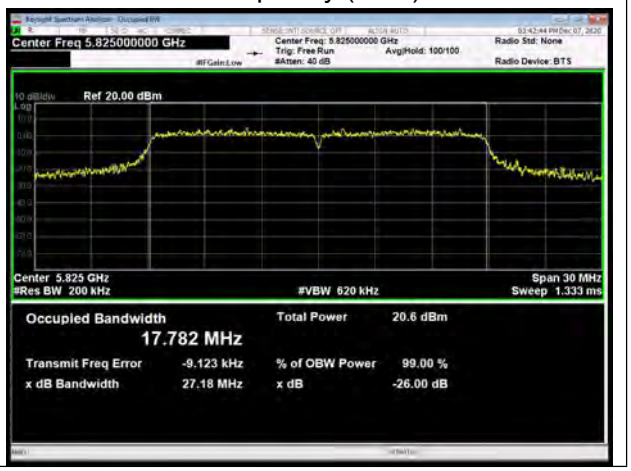
Carrier frequency (MHz): 5785

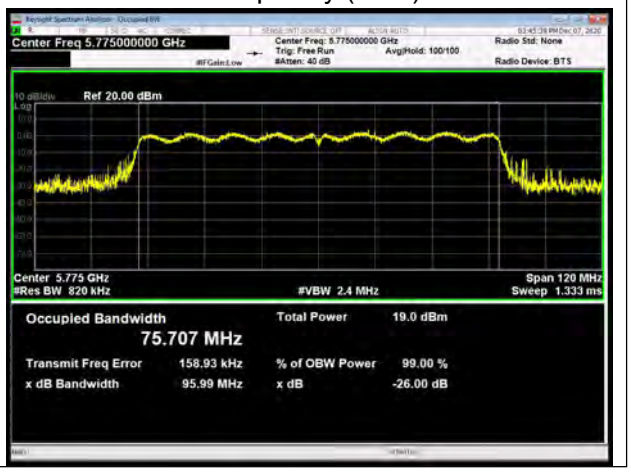
U-NII-3, 802.11ac VHT40

Carrier frequency (MHz): 5755

U-NII-3, 802.11ac VHT20

Carrier frequency (MHz): 5825

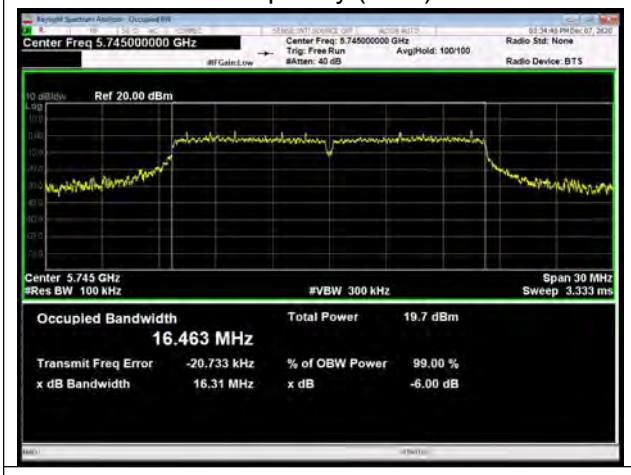


U-NII-3, 802.11ac VHT40 Carrier frequency (MHz): 5795	U-NII-3, 802.11ac VHT80 Carrier frequency (MHz): 5775
	

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

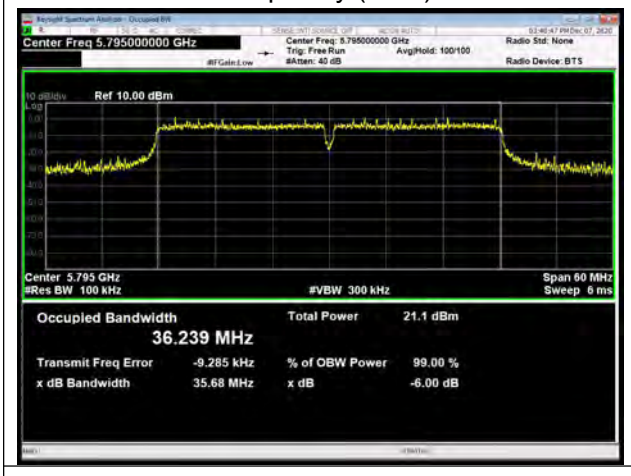
Carrier frequency (MHz): 5755

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

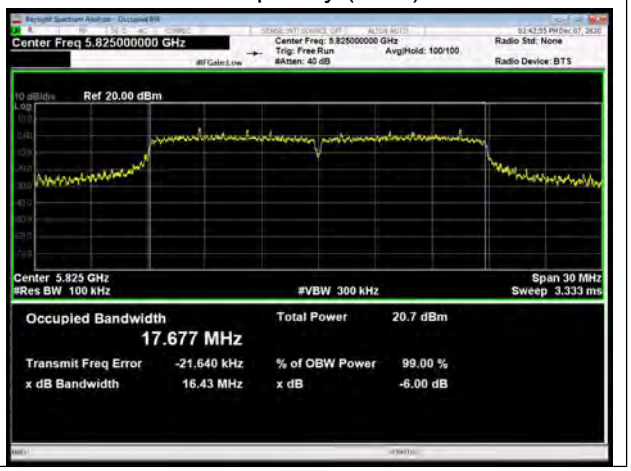
Carrier frequency (MHz): 5785

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

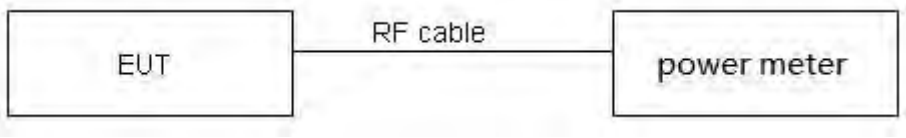
Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

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

The conducted Power 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)(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	0.25	0.35	0.70	1.55
802.11n HT20	1.92	1.99	0.97	0.15
802.11n HT40	0.95	1.05	0.90	0.44
802.11ac HT20	1.92	1.99	0.96	0.16
802.11ac HT40	0.94	1.05	0.90	0.47
802.11ac HT80	1.92	2.00	0.96	0.17
Note: when Duty cycle≥0.98, Duty cycle correction Factor not required.				

SISO Antenna 1

U-NII-1

Network Standards	Channel/ Frequency (MHz)	TP Set	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	36/5180	35	13.71	15.26	30	PASS
	40/5200	35	13.75	15.30	30	PASS
	48/5240	35	15.20	16.75	30	PASS
802.11n HT20	36/5180	32	12.32	12.47	30	PASS
	40/5200	32	12.68	12.83	30	PASS
	48/5240	28	13.51	13.66	30	PASS
802.11n HT40	38/5190	30	12.24	12.68	30	PASS
	46/5230	30	13.16	13.60	30	PASS
802.11ac VHT20	36/5180	35	14.42	14.58	30	PASS
	40/5200	35	14.37	14.53	30	PASS
	48/5240	35	15.93	16.09	30	PASS
802.11ac VHT40	38/5190	35	14.52	14.99	30	PASS
	46/5230	35	15.96	16.43	30	PASS
802.11ac VHT80	42/5210	32	12.78	12.95	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor						

U-NII-3

Network Standards	Channel/ Frequency (MHz)	TP Set	Average Power Measured (dBm)	Average Power with duty factor (dBm)	Limit (dBm)	Conclusion
802.11a	149/5745	35	17.70	19.25	30	PASS
	157/5785	35	18.42	19.97	30	PASS
	165/5825	35	18.34	19.89	30	PASS
802.11n HT20	149/5745	28	15.74	15.89	30	PASS
	157/5785	28	15.63	15.78	30	PASS
	165/5825	28	16.08	16.23	30	PASS
802.11n HT40	151/5755	28	15.86	16.30	30	PASS
	159/5795	25	14.62	15.06	30	PASS
802.11ac VHT20	149/5745	35	18.64	18.80	30	PASS
	157/5785	35	18.97	19.13	30	PASS
	165/5825	35	19.07	19.23	30	PASS
802.11ac VHT40	151/5755	35	18.95	19.42	30	PASS
	159/5795	26	15.74	16.21	30	PASS
802.11ac VHT80	155/5775	25	13.88	14.05	30	PASS
Note: Average Power with duty factor = Average Power Measured +Duty cycle correction factor						

MIMO

U-NII-1

Network Standards	Channel/ Frequency (MHz)	MIMO Antenna 1			MIMO Antenna 2			Total Power (dBm)	Limit (dBm)	Conclusion
		TP Set	Average Power Measured (dBm)	Average Power with duty factor (dBm)	TP Set	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11a	36/5180	30.00	10.63	12.18	30.00	11.32	12.87	15.54	30.00	PASS
	40/5200	30.00	10.57	12.12	30.00	10.42	11.97	15.05	30.00	PASS
	48/5240	30.00	12.04	13.59	30.00	12.23	13.78	16.69	30.00	PASS
802.11n HT20	36/5180	32.00	11.14	11.29	32.00	11.47	11.62	14.47	30.00	PASS
	40/5200	32.00	10.83	10.98	32.00	12.21	12.36	14.73	30.00	PASS
	48/5240	28.00	13.61	13.76	28.00	12.72	12.87	16.34	30.00	PASS
802.11n HT40	38/5190	30.00	12.07	12.51	30.00	13.22	13.66	16.14	30.00	PASS
	46/5230	30.00	13.26	13.70	30.00	12.32	12.76	16.27	30.00	PASS
802.11ac VHT20	36/5180	30.00	11.54	11.70	30.00	11.71	11.87	14.80	30.00	PASS
	40/5200	30.00	11.37	11.53	30.00	12.02	12.18	14.88	30.00	PASS
	48/5240	30.00	12.70	12.86	30.00	13.04	13.20	16.04	30.00	PASS
802.11ac VHT40	38/5190	32.00	12.18	12.65	32.00	12.25	12.72	15.70	30.00	PASS
	46/5230	32.00	13.41	13.88	32.00	13.01	13.48	16.70	30.00	PASS
802.11ac VHT80	42/5210	32.00	12.71	12.88	32.00	11.78	11.95	15.45	30.00	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm/10})}+10^{(\text{Power antenna2 in dBm/10})})$.

2. The manufacturer declared the transmitter output signals is CDD mode And $N_{ss}=2$. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths $\geq$ 40 MHz for any N_{ANT};

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

3.If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

So directional gain = G_{ANT} + Array Gain $=3.7+0=3.7$dBi<6dBi. So the power limt is 30dBm.

U-NII-3

Network Standards	Channel/ Frequency (MHz)	MIMO Antenna 1			MIMO Antenna 2			Total Power (dBm)	Limit (dBm)	Conclusion
		TP Set	Average Power Measured (dBm)	Average Power with duty factor (dBm)	TP Set	Average Power Measured (dBm)	Average Power with duty factor (dBm)			
802.11a	149/5745	28.00	14.28	15.83	32.00	14.72	16.27	19.06	30.00	PASS
	157/5785	26.00	14.61	16.16	30.00	15.34	16.89	19.55	30.00	PASS
	165/5825	26.00	14.53	16.08	30.00	15.05	16.60	19.35	30.00	PASS
802.11n HT20	149/5745	28.00	15.47	15.62	30.00	14.81	14.96	18.31	30.00	PASS
	157/5785	28.00	15.72	15.87	28.00	14.93	15.08	18.50	30.00	PASS
	165/5825	28.00	16.01	16.16	30.00	15.47	15.62	18.91	30.00	PASS
802.11n HT40	151/5755	28.00	15.94	16.38	30.00	15.34	15.78	19.10	30.00	PASS
	159/5795	25.00	14.76	15.20	26.00	14.02	14.46	17.86	30.00	PASS
802.11ac VHT20	149/5745	28.00	15.53	15.69	30.00	15.08	15.24	18.48	30.00	PASS
	157/5785	28.00	16.11	16.27	30.00	15.74	15.90	19.10	30.00	PASS
	165/5825	28.00	16.21	16.37	30.00	16.02	16.18	19.29	30.00	PASS
802.11ac VHT40	151/5755	28.00	16.35	16.82	30.00	15.42	15.89	19.39	30.00	PASS
	159/5795	26.00	15.42	15.89	25.00	13.34	13.51	17.87	30.00	PASS
802.11ac VHT80	155/5775	25.00	13.87	14.04	28.00	14.46	14.63	17.36	30.00	PASS

Note: 1. For Total Power, according to KDB 662911 D01 Multiple Transmitter Output v02r01 1),

The Total Power $=10\log(10^{(\text{Power antenna1 in dBm}/10)}+10^{(\text{Power antenna2 in dBm}/10)})$.

2. The manufacturer declared the transmitter output signals is CDD mode And $N_{ss}=2$. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = G_{ANT} + Array Gain,

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;

Array Gain = 0 dB (i.e., no array gain) for channel widths $\geq$ 40 MHz for any N_{ANT};

Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less, for 20-MHz channel widths with $N_{ANT} \geq 5$.

3.If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with GANT set equal to the gain of the antenna having the highest gain.

So directional gain = GANT + Array Gain =3.7+0=3.7dBi<6dBi. So the power limt is 30dBm.

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(MHz)			
		5200MHz			
		1min	2min	5min	10min
3.8	-20	5200.005122	5200.001356	5199.991587	5199.981893
3.8	-10	5200.010852	5199.994335	5199.991383	5199.981300
3.8	0	5200.009326	5199.988945	5199.982259	5199.976655
3.8	10	5200.002035	5199.982733	5199.973440	5199.973222
3.8	20	5200.001807	5199.977628	5199.967313	5199.966524
3.8	30	5200.001338	5199.969487	5199.965644	5199.963875
3.8	40	5200.000167	5199.969240	5199.959640	5199.962735
3.8	50	5199.998706	5199.962389	5199.959457	5199.960127
3.6	20	5199.998596	5199.958568	5199.959073	5199.952577
4.3	20	5199.991172	5199.950571	5199.955194	5199.947061
MHz		-0.008828	-0.049429	-0.044806	-0.052939
PPM		-1.697637	-9.505554	-8.616559	-10.180553

Voltage (V)	Temperature (°C)	U-NII-3 Test Results (MHz)			
		5785MHz			
		1min	2min	5min	10min
3.8	-20	5785.001382	5784.998342	5784.989278	5784.988528
3.8	-10	5784.992525	5784.995416	5784.979516	5784.982544
3.8	0	5784.985302	5784.992316	5784.977473	5784.980296
3.8	10	5784.983771	5784.989551	5784.970495	5784.974321
3.8	20	5784.981080	5784.980255	5784.969269	5784.970102
3.8	30	5784.979272	5784.975880	5784.963549	5784.961510
3.8	40	5784.973665	5784.973494	5784.954323	5784.961268
3.8	50	5784.965895	5784.964295	5784.952394	5784.957863
3.6	20	5784.963286	5784.958630	5784.942940	5784.957604
4.3	20	5784.956415	5784.955286	5784.934801	5784.952388
MHz		-0.043585	-0.044714	-0.065199	-0.047612
PPM		-7.534142	-7.729229	-11.270326	-8.230192

5.4. Power Spectral Density

Ambient condition

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

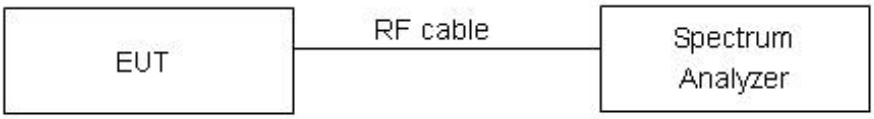
Method of Measurement

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.
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.

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	17/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:

SISO Antenna 1

U-NII-1

Mode	Channel Number	Read Value (dBm /MHz)	Power Spectral Density (dBm /MHz)	Limit (dBm /MHz)	Conclusion
802.11a	36	1.85	3.39	17	PASS
	40	3.07	4.62	17	PASS
	48	4.64	6.18	17	PASS
802.11n HT20	36	1.58	1.73	17	PASS
	40	2.90	3.05	17	PASS
	48	4.29	4.44	17	PASS
802.11n HT40	38	-0.07	0.37	17	PASS
	46	1.22	1.66	17	PASS
802.11ac VHT20	36	1.79	1.94	17	PASS
	40	2.99	3.14	17	PASS
	48	3.82	3.98	17	PASS
802.11ac VHT40	38	-0.47	0.00	17	PASS
	46	1.41	1.88	17	PASS
802.11ac VHT80	42	-1.04	-0.86	17	PASS
Note: Power Spectral Density =Read Value+Duty cycle correction factor					

U-NII-3

Mode	Channel Number	Read Value (dBm/470kHz)	Power Spectral Density (dBm/500kHz)	Limit (dBm/500kHz)	Conclusion
802.11a	149	2.62	4.16	30	PASS
	157	3.94	5.48	30	PASS
	165	3.86	5.40	30	PASS
802.11n HT20	149	2.72	2.87	30	PASS
	157	3.45	3.60	30	PASS
	165	3.51	3.66	30	PASS
802.11n HT40	151	0.35	0.79	30	PASS
	159	0.43	0.88	30	PASS
802.11ac VHT20	149	3.09	3.25	30	PASS
	157	3.46	3.62	30	PASS
	165	3.75	3.91	30	PASS
802.11ac VHT40	151	0.18	0.65	30	PASS
	159	-1.47	-1.00	30	PASS
802.11ac VHT80	155	-3.76	-3.58	30	PASS
Note:PSD=Read Value+Duty cycle+10*LOG(500/470) correction factor					

MIMO

U-NII-1

Mode	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm /MHz)	Conclusion
		Antenna 1		Antenna 2		Total Power (dBm /MHz)		
		Read Value (dBm/MHz)	PSD (dBm /MHz)	Read Value (dBm/MHz)	PSD (dBm /MHz)			
802.11a	36/5180	-4.05	-2.51	-5.92	-4.37	-0.33	17.00	PASS
	40/5200	-0.04	1.51	-1.27	0.28	3.95	17.00	PASS
	48/5240	1.15	2.69	-0.27	1.28	5.05	17.00	PASS
802.11n HT20	36/5180	-0.75	-0.61	-0.15	0.00	2.72	17.00	PASS
	40/5200	0.72	0.87	-0.84	-0.69	3.17	17.00	PASS
	48/5240	1.51	1.66	0.06	0.21	4.01	17.00	PASS
802.11n HT40	38/5190	-3.78	-3.34	-4.23	-3.79	-0.55	17.00	PASS
	46/5230	-1.95	-1.51	-3.60	-3.16	0.76	17.00	PASS
802.11ac VHT20	36/5180	-1.81	-1.65	-1.04	-0.88	1.76	17.00	PASS
	40/5200	-0.60	-0.44	-1.82	-1.66	2.00	17.00	PASS
	48/5240	0.74	0.90	-0.71	-0.55	3.25	17.00	PASS
802.11ac VHT40	38/5190	-2.85	-2.38	-3.49	-3.02	0.32	17.00	PASS
	46/5230	-1.42	-0.95	-2.68	-2.21	1.48	17.00	PASS
802.11ac VHT80	42/5210	-4.05	-3.88	-5.92	-5.75	-1.70	17.00	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})})$

3. The manufacturer declared the transmitter output signals is CDD mode And Nss=2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB.

4.If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

so directional gain=GANT+ Array Gain=3.7+10log（2/2)=3.7dBi<6dBi. So the PSD limt is 17dBm.

U-NII-3

Mode	Channel/ Frequency (MHz)	Power Spectral Density					Limit (dBm /MHz)	Conclusion
		Antenna 1		Antenna 2		Total Power (dBm /MHz)		
		Read Value (dBm/MHz)	PSD (dBm /MHz)	Read Value (dBm/MHz)	PSD (dBm /MHz)			
802.11a	149/5745	-1.25	0.57	-2.57	-0.75	2.97	30.00	PASS
	157/5785	-1.69	0.13	-2.76	-0.94	2.64	30.00	PASS
	165/5825	-1.50	0.31	-1.68	0.13	3.23	30.00	PASS
802.11n HT20	149/5745	-1.46	-1.05	-2.73	-2.31	1.38	30.00	PASS
	157/5785	-0.86	-0.44	-2.02	-1.60	2.03	30.00	PASS
	165/5825	-0.80	-0.39	-1.05	-0.63	2.50	30.00	PASS
802.11n HT40	151/5755	-4.49	-3.78	-5.78	-5.06	-1.36	30.00	PASS
	159/5795	-4.95	-4.24	-5.54	-4.82	-1.51	30.00	PASS
802.11ac VHT20	149/5745	-1.53	-1.10	-2.56	-2.13	1.43	30.00	PASS
	157/5785	-0.54	-0.11	-1.70	-1.27	2.36	30.00	PASS
	165/5825	-0.85	-0.42	-1.42	-0.99	2.32	30.00	PASS
802.11ac VHT40	151/5755	-4.24	-3.50	-5.68	-4.94	-1.15	30.00	PASS
	159/5795	-4.77	-4.03	-4.98	-4.24	-1.12	30.00	PASS
802.11ac VHT80	155/5775	-7.87	-7.43	-8.31	-7.86	-4.63	30.00	PASS

Note: 1. Power Spectral Density =Read Value+Duty cycle correction factor

2. For Total PSD, according to KDB 662911 D01 Multiple Transmitter Output v02r01 2)a),the power spectral density=$10\log(10^{(\text{PSD antenna1 in dBm/10})}+10^{(\text{PSD antenna2 in dBm/10})})$

3. The manufacturer declared the transmitter output signals is CDD mode And Nss=2. According to KDB 662911 D01 Multiple Transmitter Output v02r01 2)f)(i): If all antennas have the same gain, Directional gain = GANT + Array Gain, For PSD measurements on all devices, Array Gain=10log(Nant/Nss)dB.

4.If antenna gains are not equal, the user may use either of the following methods to calculate directional gain, provided that each transmit antenna is driven by only one spatial stream: Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain.

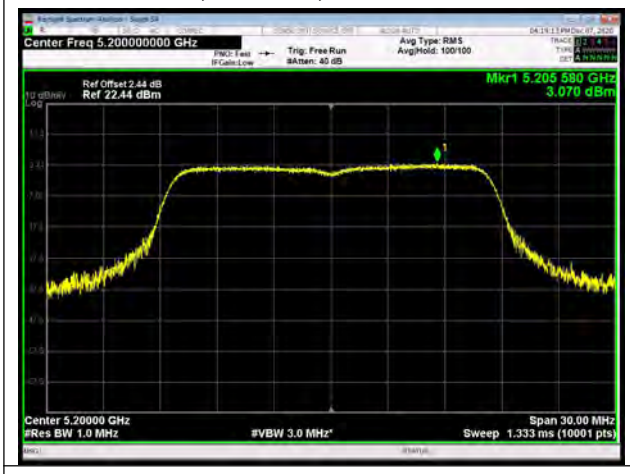
so directional gain=GANT+ Array Gain=3.7+10log（2/2)=3.7dBi<6dBi. So the PSD limt is 30dBm.

SISO Antenna 1

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

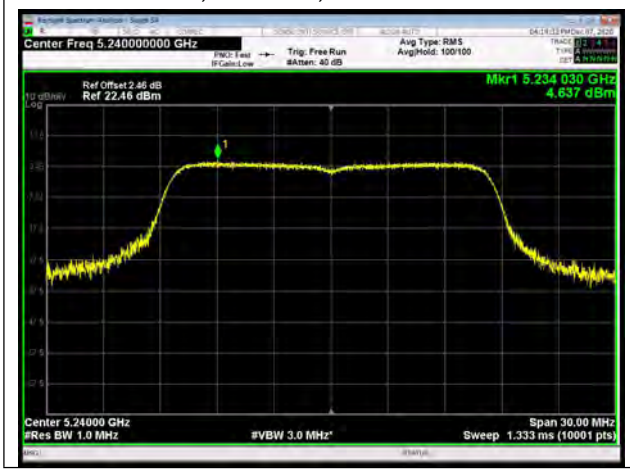
U-NII-1, 802.11n HT20, Channel No.: 36

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

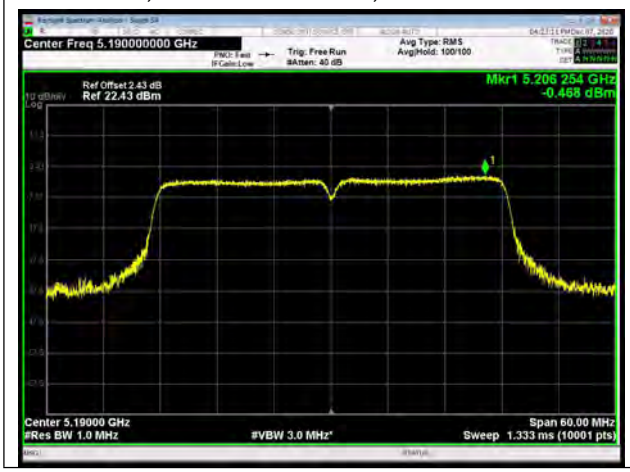
U-NII-1, 802.11n HT40, Channel No.: 38

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

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

U-NII-1, 802.11ac VHT20, Channel No.: 40

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



U-NII-1, 802.11ac VHT20, Channel No.: 48

U-NII-1, 802.11ac VHT40, Channel No.: 46	U-NII-1, 802.11ac VHT80, Channel No.: 42
	

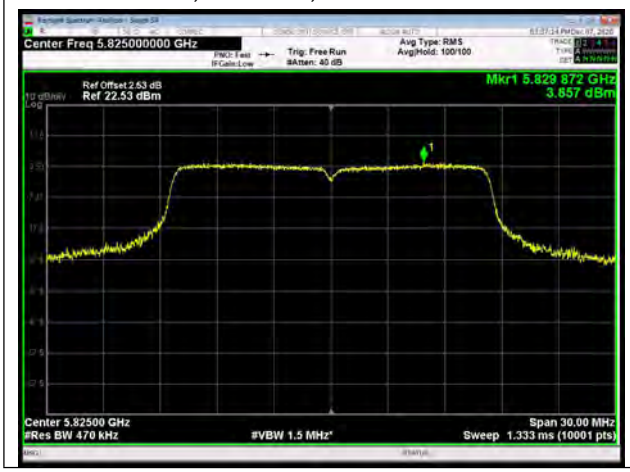
U-NII-3, 802.11a, Channel No.: 149

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

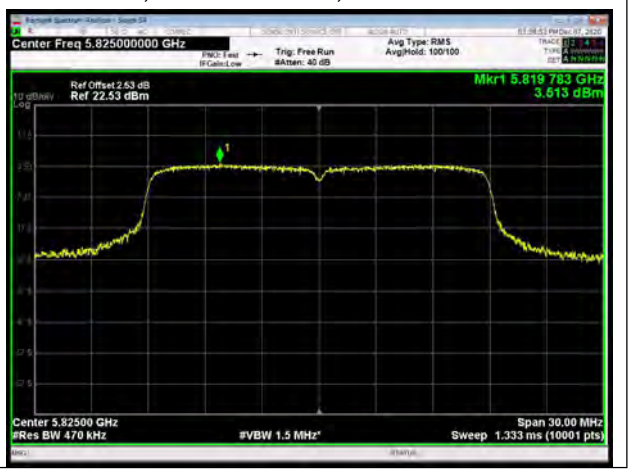
U-NII-3, 802.11a, Channel No.: 157

U-NII-3, 802.11n HT20, Channel No.: 157

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



U-NII-3, 802.11n HT20, Channel No.: 165



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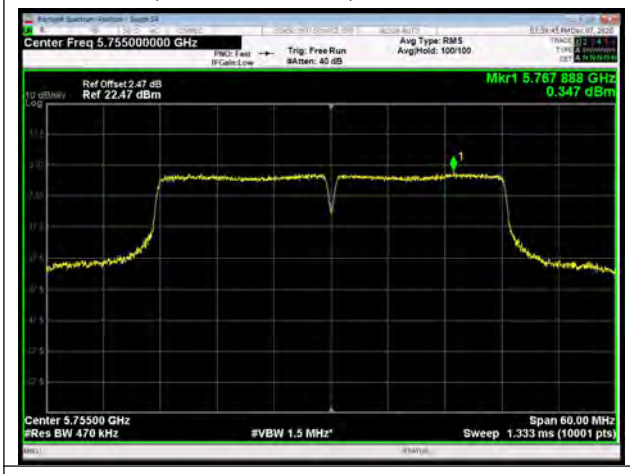
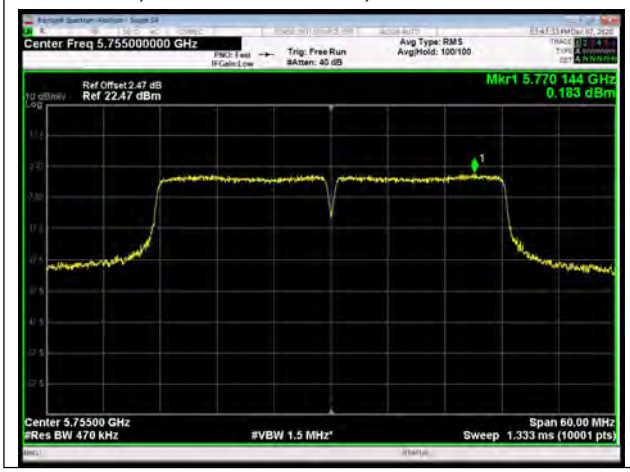


U-NII-3, 802.11ac VHT20, Channel No.: 149

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

U-NII-3, 802.11ac VHT20, Channel No.: 157

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



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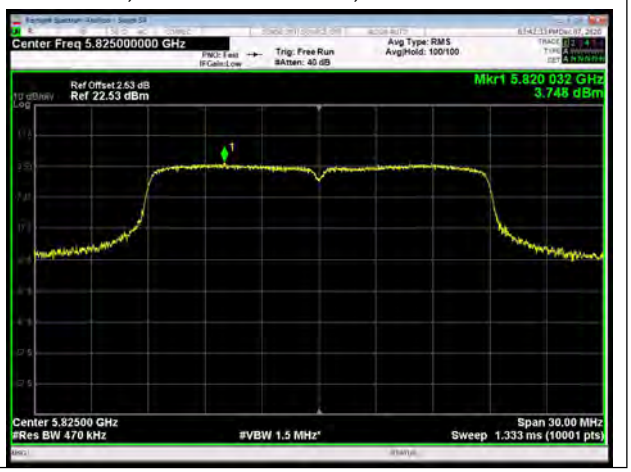
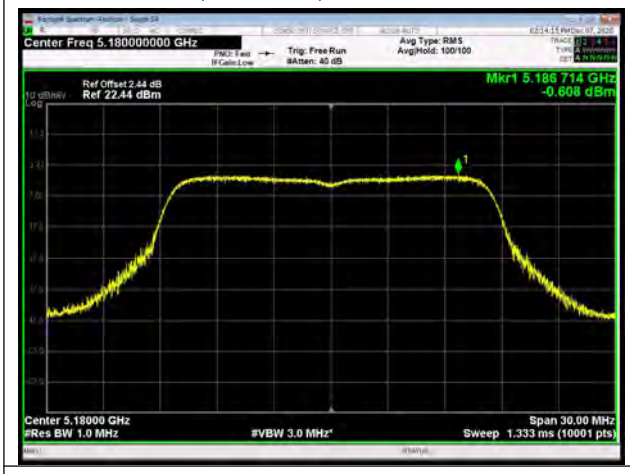


U-NII-3, 802.11ac VHT40, Channel No.: 159	U-NII-3, 802.11ac VHT80, Channel No.: 155
	

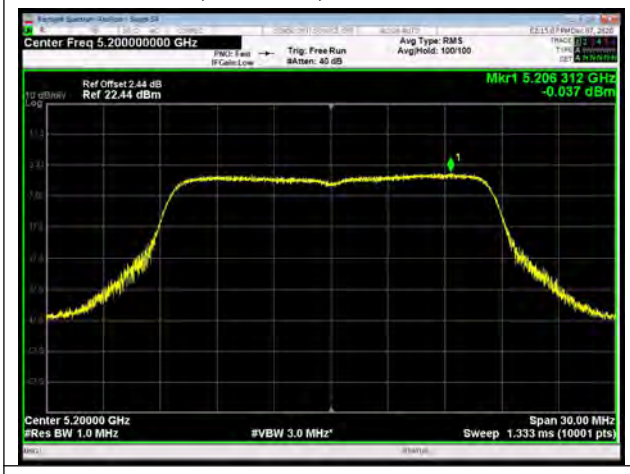
MIMO Antenna 1

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



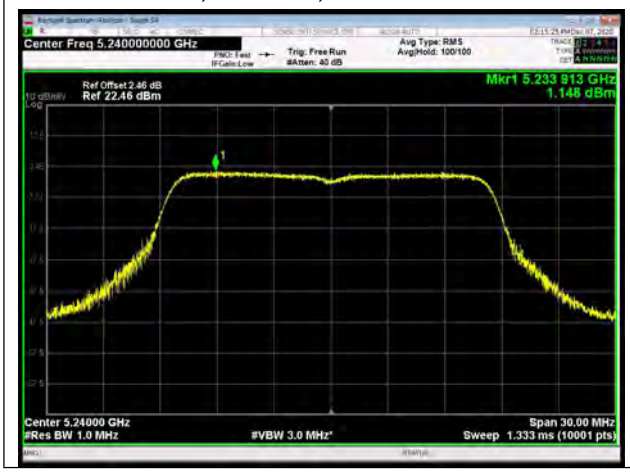
U-NII-1, 802.11n HT20, Channel No.: 36

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

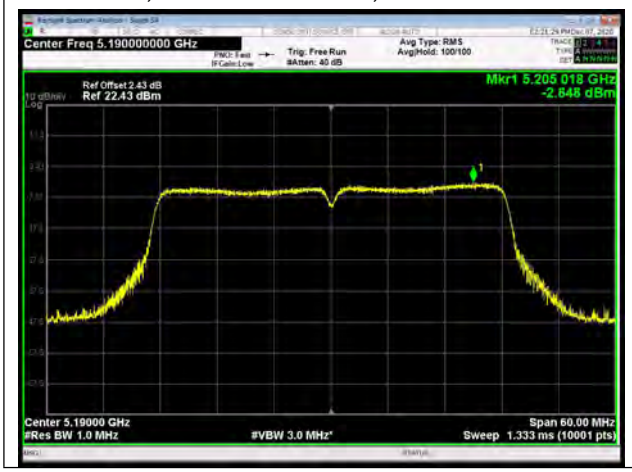
U-NII-1, 802.11n HT40, Channel No.: 38

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

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

U-NII-1, 802.11ac VHT20, Channel No.: 40

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



U-NII-1, 802.11ac VHT20, Channel No.: 48

U-NII-1, 802.11ac VHT40, Channel No.: 46	U-NII-1, 802.11ac VHT80, Channel No.: 42
	

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

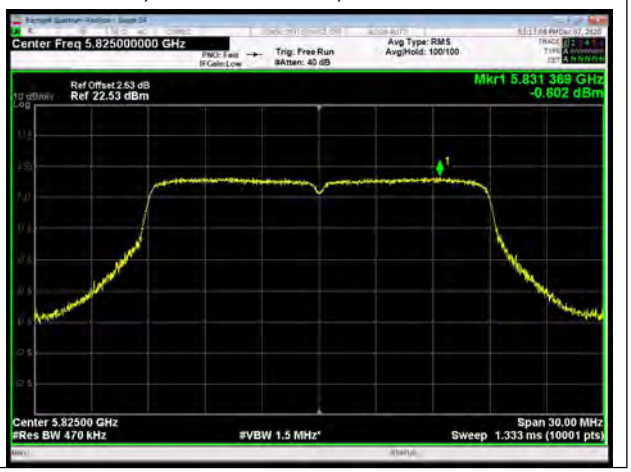
U-NII-3, 802.11n HT20, Channel No.: 149

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

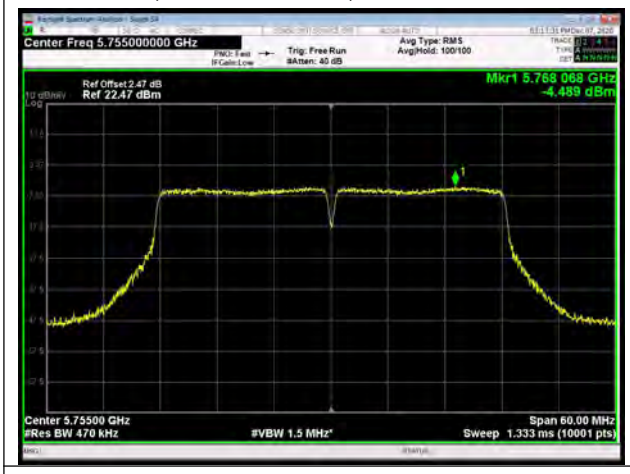
U-NII-3, 802.11n HT20, Channel No.: 157

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

U-NII-3, 802.11n HT20, Channel No.: 165



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

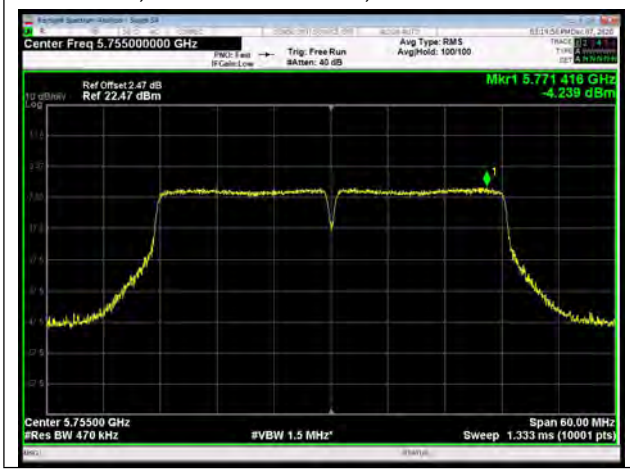


U-NII-3, 802.11ac VHT20, Channel No.: 149

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

U-NII-3, 802.11ac VHT20, Channel No.: 157

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

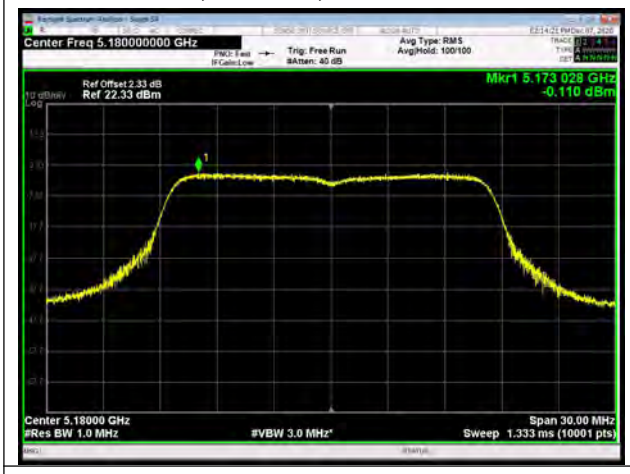


U-NII-3, 802.11ac VHT20, Channel No.: 165

U-NII-3, 802.11ac VHT40, Channel No.: 159	U-NII-3, 802.11ac VHT80, Channel No.: 155
	

MIMO Antenna 2

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

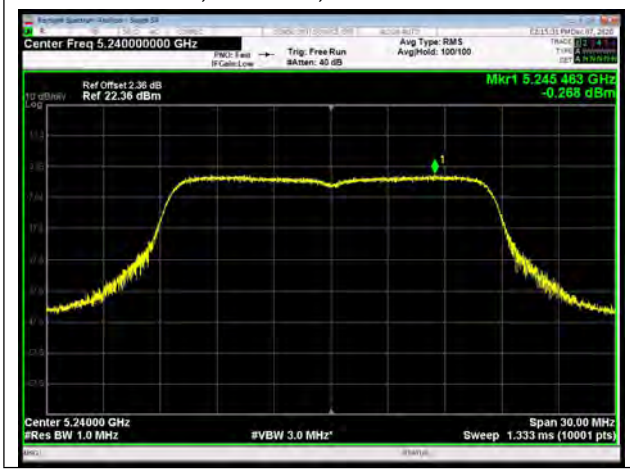


U-NII-1, 802.11n HT20, Channel No.: 36

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

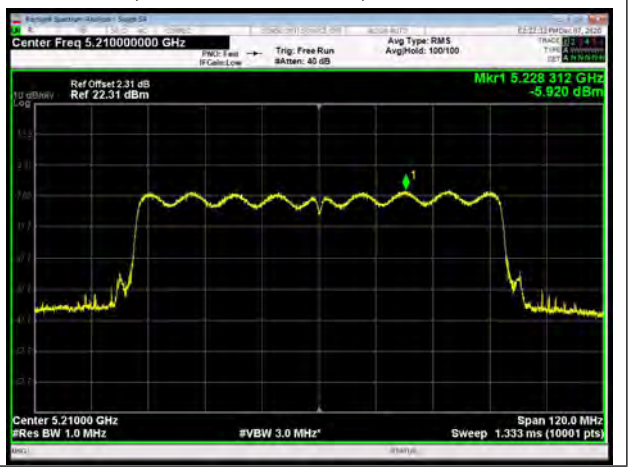
U-NII-1, 802.11ac VHT20, Channel No.: 36

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

U-NII-1, 802.11ac VHT20, Channel No.: 40

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

U-NII-1, 802.11ac VHT20, Channel No.: 48

U-NII-1, 802.11ac VHT40, Channel No.: 46	U-NII-1, 802.11ac VHT80, Channel No.: 42
	

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

U-NII-3, 802.11n HT20, Channel No.: 157

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

U-NII-3, 802.11n HT20, Channel No.: 165

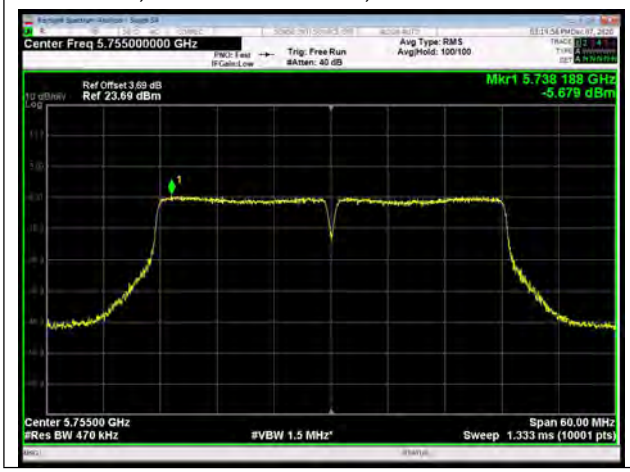
U-NII-3, 802.11n HT40, Channel No.: 151

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

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

U-NII-3, 802.11ac VHT20, Channel No.: 157

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



U-NII-3, 802.11ac VHT20, Channel No.: 165

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.

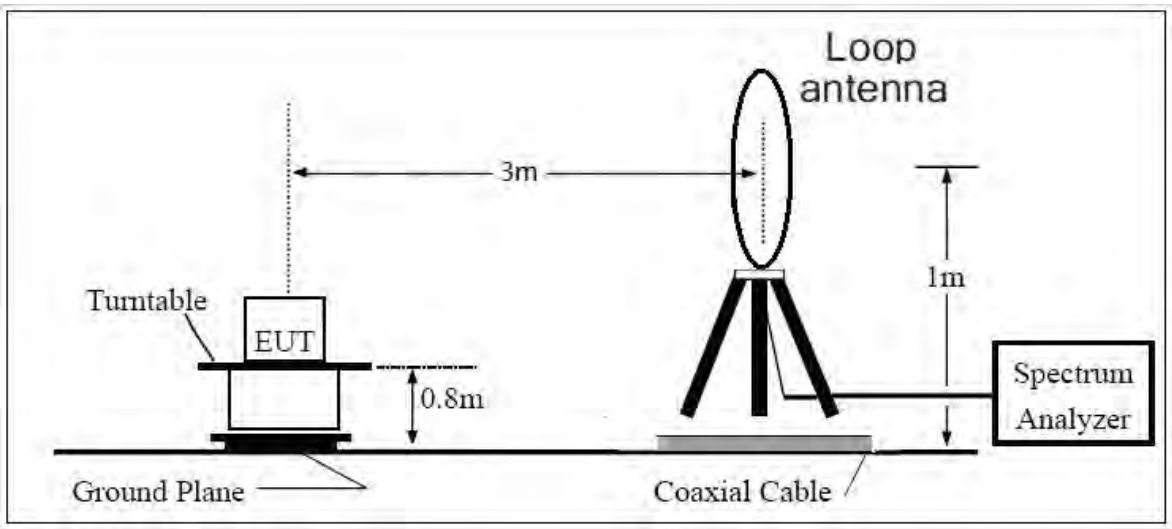
3) If a specific emission is demonstrated to be continuous (100% duty cycle) rather than turning ON and OFF with the transmit cycle, then no duty cycle correction is required for that emission.

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.

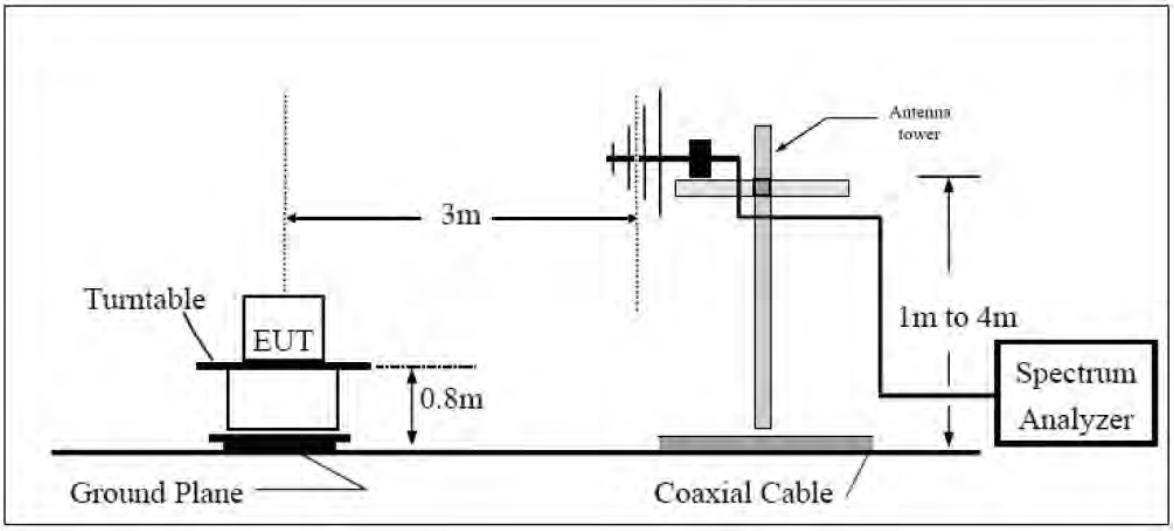
The field strength of spurious emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the loop antenna is vertical, others antenna are vertical and horizontal.

The test is in transmitting mode.

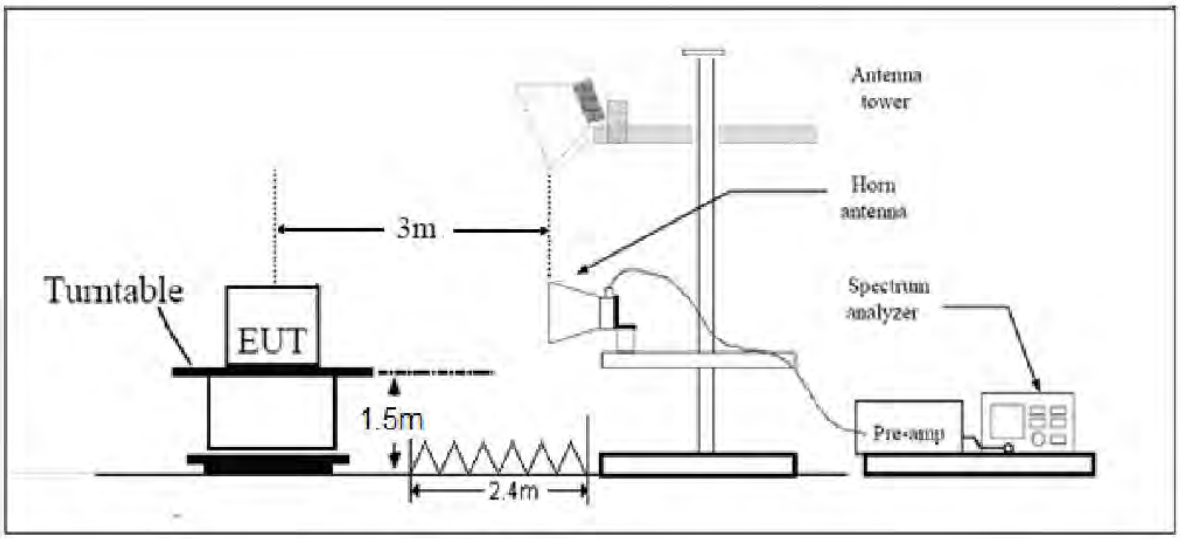
9KHz~~~30MHz



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

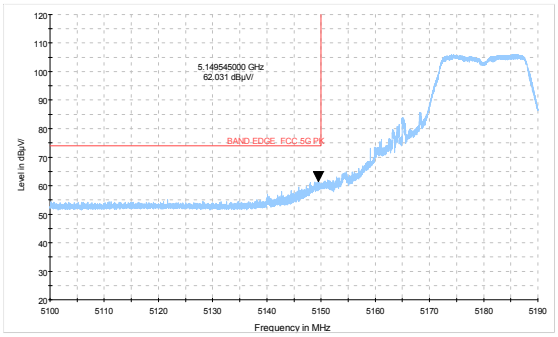
Test Results:

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.

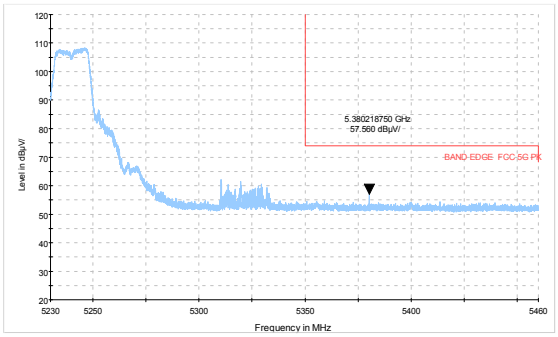
The signal beyond the limit is carrier.

U-NII-1

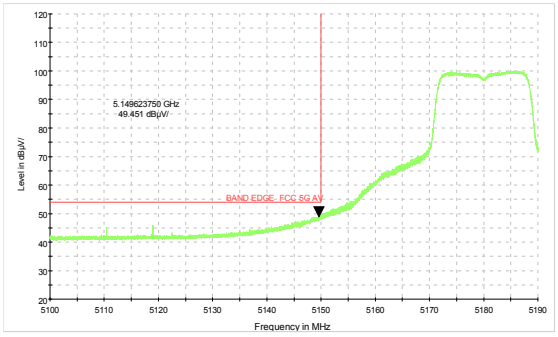
802.11a-Channel 36: Peak



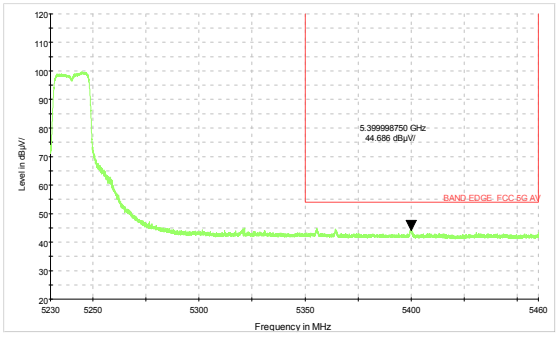
802.11a-Channel 48: Peak



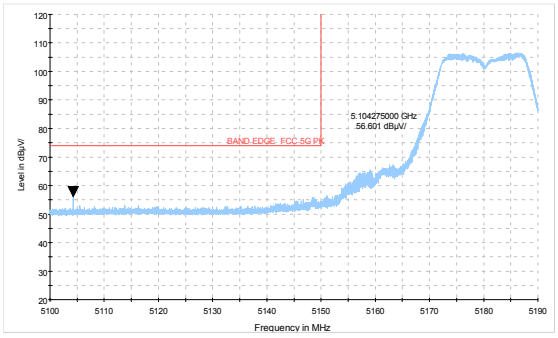
802.11a-Channel 36: Average



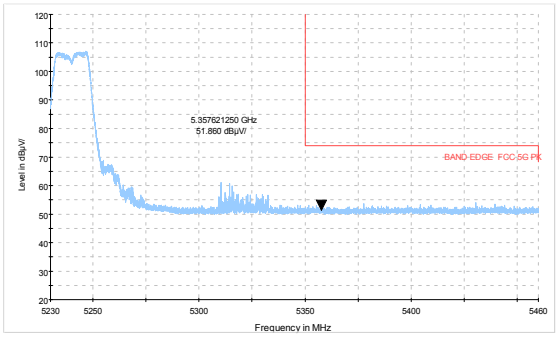
802.11a-Channel 48: Average



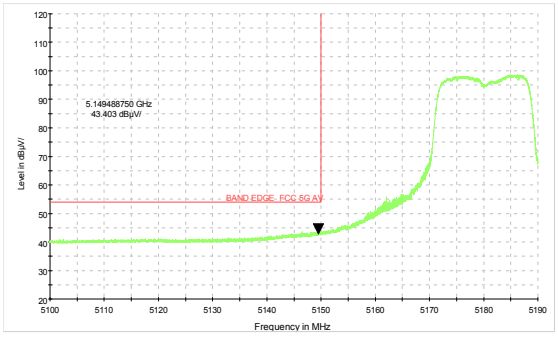
802.11n HT20-Channel 36: Peak



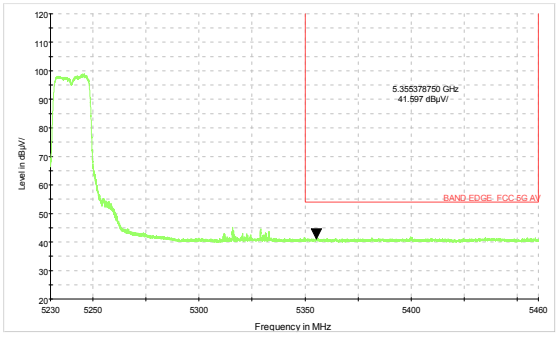
802.11n HT20-Channel 48: Peak



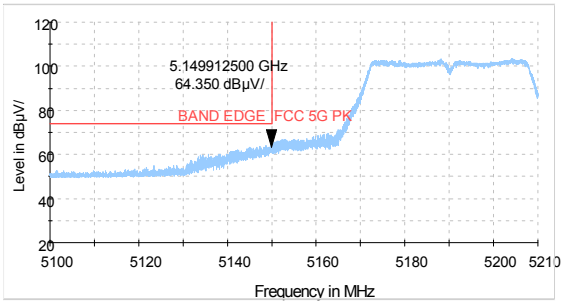
802.11n HT20-Channel 36: Average



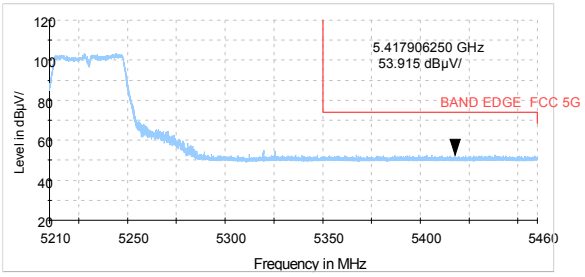
802.11n HT20-Channel 48: Average



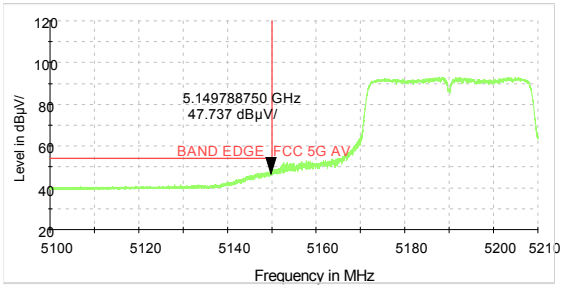
802.11n HT40-Channel 38: Peak



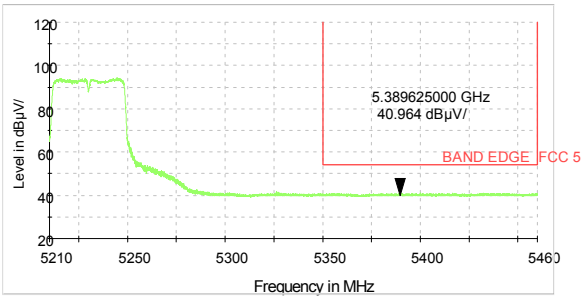
802.11n HT40-Channel 46: Peak



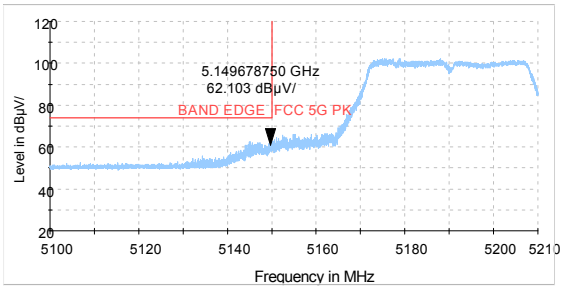
802.11n HT40-Channel 38: Average



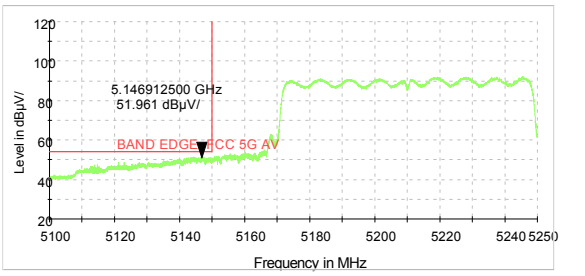
802.11n HT40-Channel 46: Average



802.11ac VHT80 –Channel 42: Peak

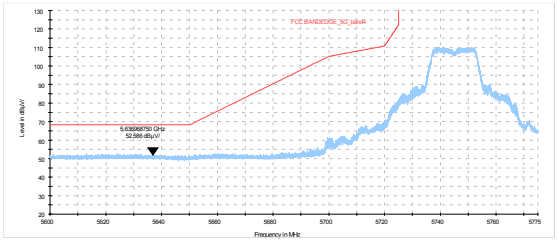


802.11ac VHT80- Channel 42: Average

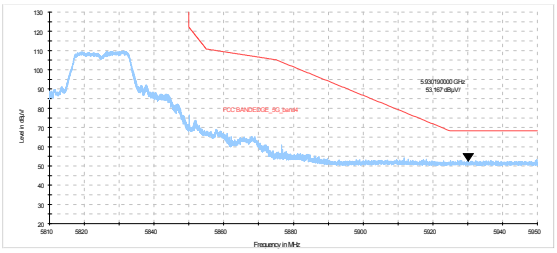


U-NII-3

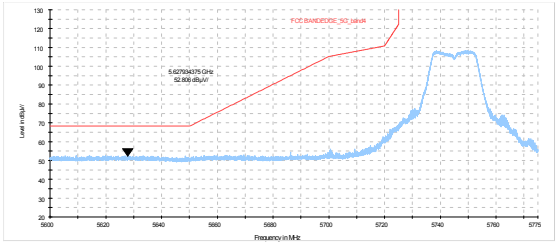
802.11a-Channel 149: Peak



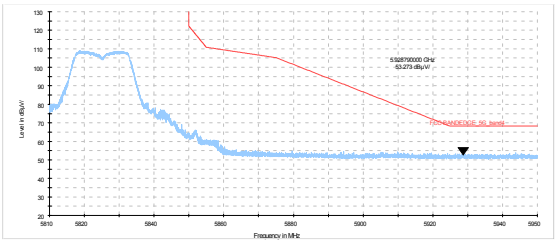
802.11a-Channel 165: Peak



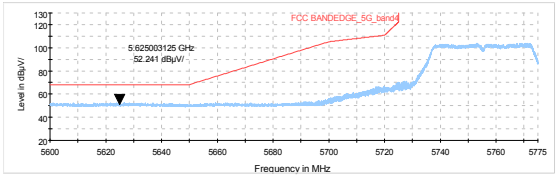
802.11n HT20-Channel 149: Peak



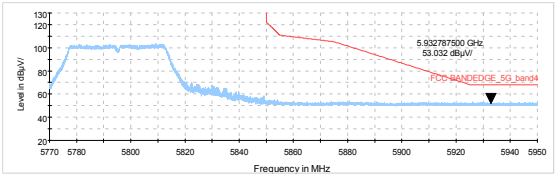
802.11n HT20-Channel 165: Peak



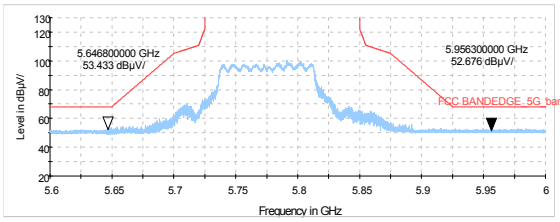
802.11n HT40-Channel 151: Peak



802.11n HT40-Channel 159: Peak



802.11ac VHT80- Channel 155: Peak



Result of RE

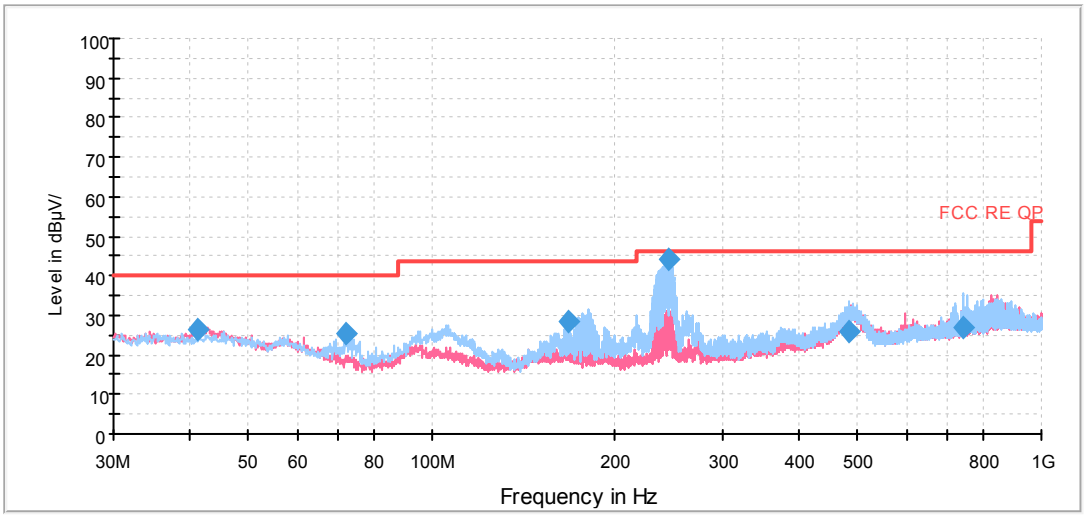
Test result

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.

After the pretest, SISO Antenna 1 was selected as the worst antenna.

During the test, the Radiates Emission from 30MHz to 1GHz was performed in all modes with all channels, 802.11n HT40, Channel 38 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.

Continuous TX mode:



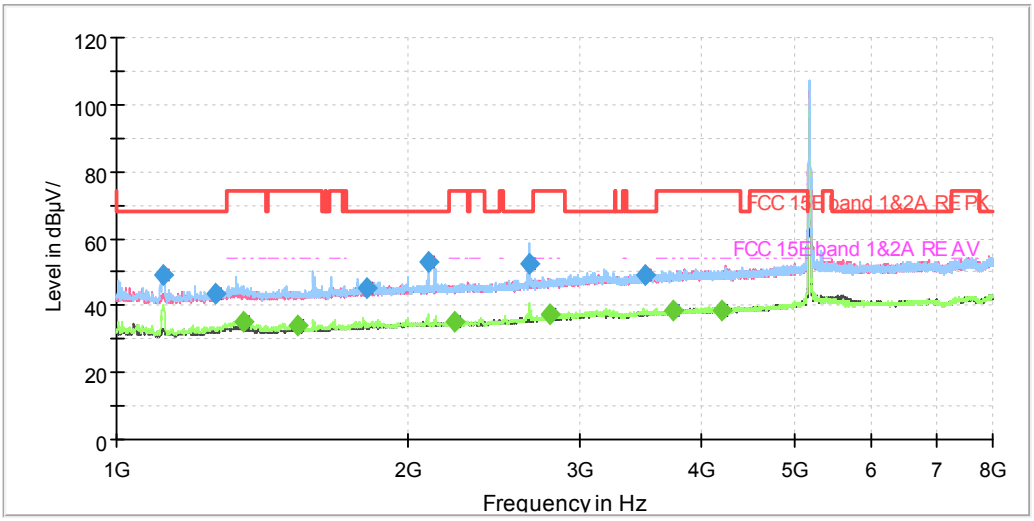
Radiates Emission from 30MHz to 1GHz

Frequency (MHz)	Quasi-Peak (dBuV/m)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)	Margin (dB)	Limit (dBuV/m)
41.148750	26.5	114.0	V	211.0	-13.1	13.5	40.0
71.995000	25.2	225.0	H	209.0	-19.2	14.8	40.0
168.022500	28.4	175.0	H	246.0	-20.5	15.1	43.5
244.285000	44.4	125.0	H	252.0	-17.3	1.6	46.0
483.478750	26.0	175.0	H	252.0	-12.3	20.0	46.0
744.926250	26.8	100.0	H	197.0	-7.4	19.2	46.0

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

2. Margin = Limit – Quasi-Peak

802.11a CH36

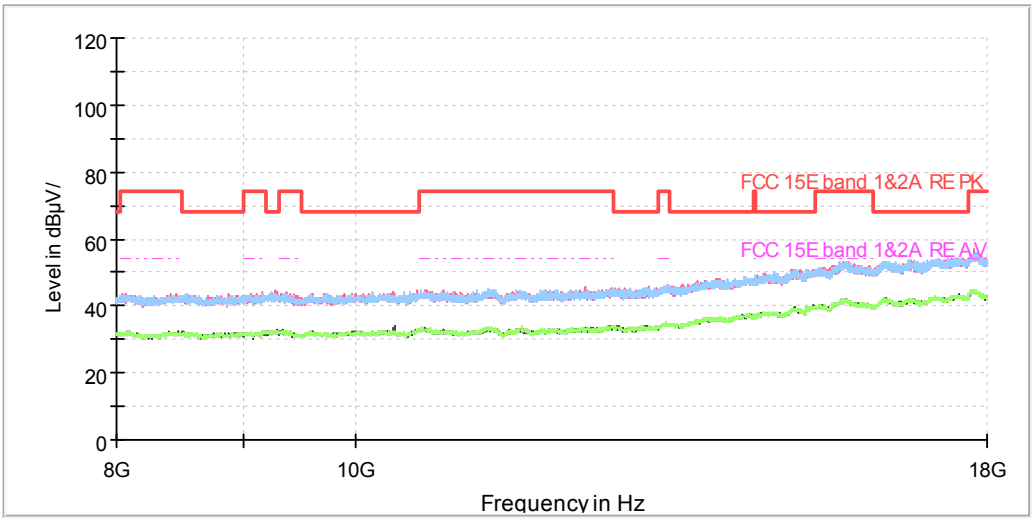


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

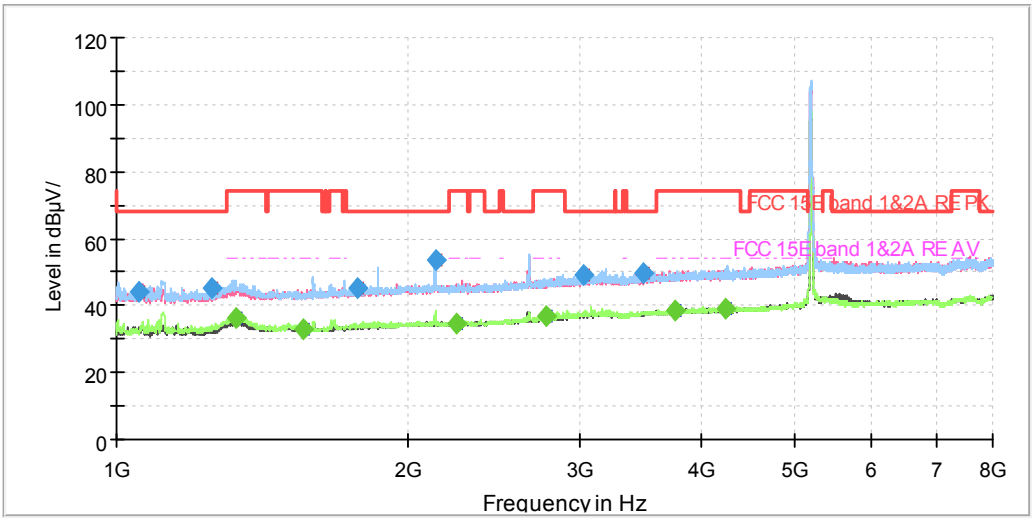
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1116.375000	49.07	---	68.20	19.13	100.0	H	96.0	-8.3
1266.875000	43.41	---	68.20	24.79	100.0	H	109.0	-7.4
1350.875000	---	35.05	54.00	18.95	200.0	H	211.0	-7.0
1540.750000	---	34.20	54.00	19.80	200.0	H	132.0	-6.0
1811.125000	45.39	---	68.20	22.81	100.0	H	116.0	-4.4
2096.375000	53.25	---	68.20	14.95	100.0	H	298.0	-3.0
2231.125000	---	35.03	54.00	18.97	100.0	H	31.0	-2.6
2664.250000	52.39	---	68.20	15.81	200.0	H	61.0	-0.7
2792.875000	---	37.63	54.00	16.37	100.0	H	0.0	0.0
3501.625000	49.03	---	68.20	19.17	100.0	V	204.0	2.3
3744.000000	---	38.68	54.00	15.32	100.0	H	128.0	3.2
4207.750000	---	38.67	54.00	15.33	100.0	V	145.0	4.4

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



Radiates Emission from 8GHz to 18GHz

802.11a CH40

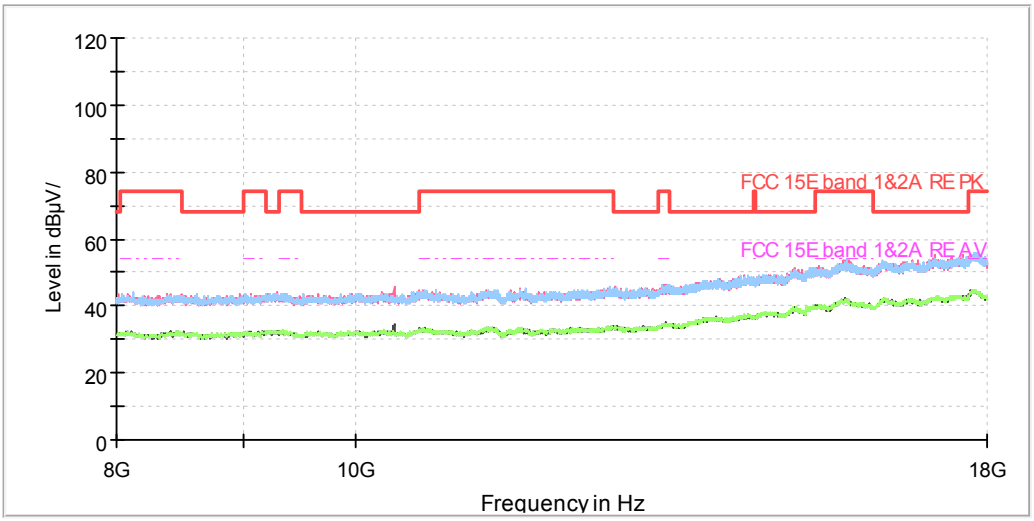


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

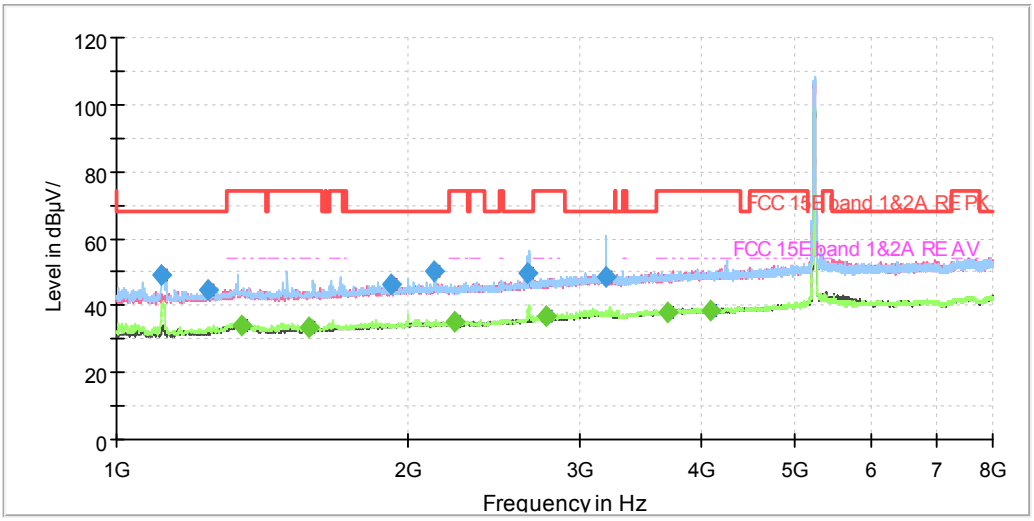
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1054.250000	44.27	---	68.20	23.93	200.0	V	202.0	-8.5
1252.875000	45.13	---	68.20	23.07	100.0	H	122.0	-7.5
1329.875000	---	36.05	54.00	17.95	100.0	H	122.0	-7.1
1556.500000	---	32.73	54.00	21.27	100.0	H	30.0	-5.8
1774.375000	44.94	---	68.20	23.26	100.0	H	70.0	-4.6
2130.500000	53.82	---	68.20	14.38	100.0	H	343.0	-2.8
2239.000000	---	34.74	54.00	19.26	100.0	H	63.0	-2.5
2775.375000	---	37.03	54.00	16.97	100.0	H	70.0	-0.1
3035.250000	49.06	---	68.20	19.14	100.0	H	50.0	1.4
3497.250000	49.60	---	68.20	18.60	100.0	H	259.0	2.3
3757.125000	---	38.30	54.00	15.70	100.0	V	337.0	3.3
4241.875000	---	38.82	54.00	15.18	200.0	V	118.0	4.5

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



Radiates Emission from 8GHz to 18GHz

802.11a CH48

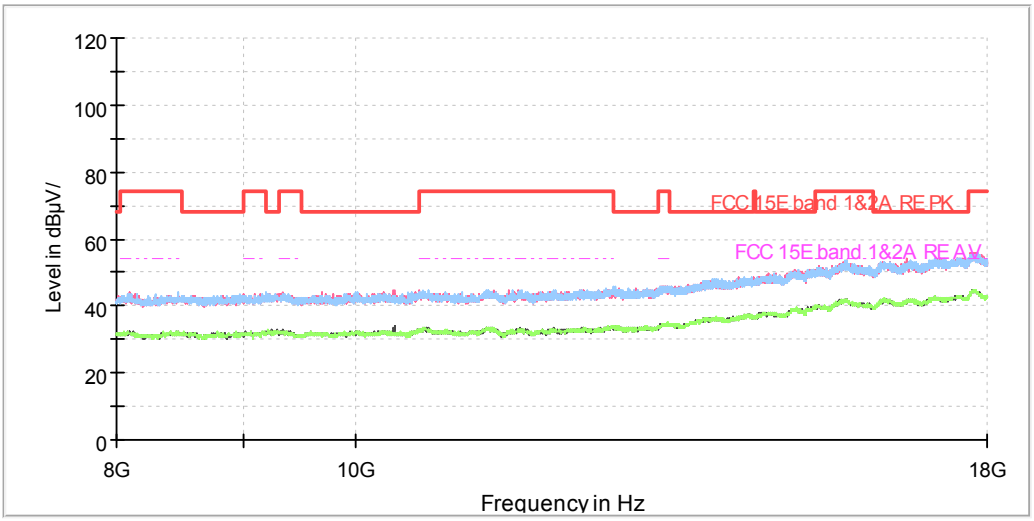


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

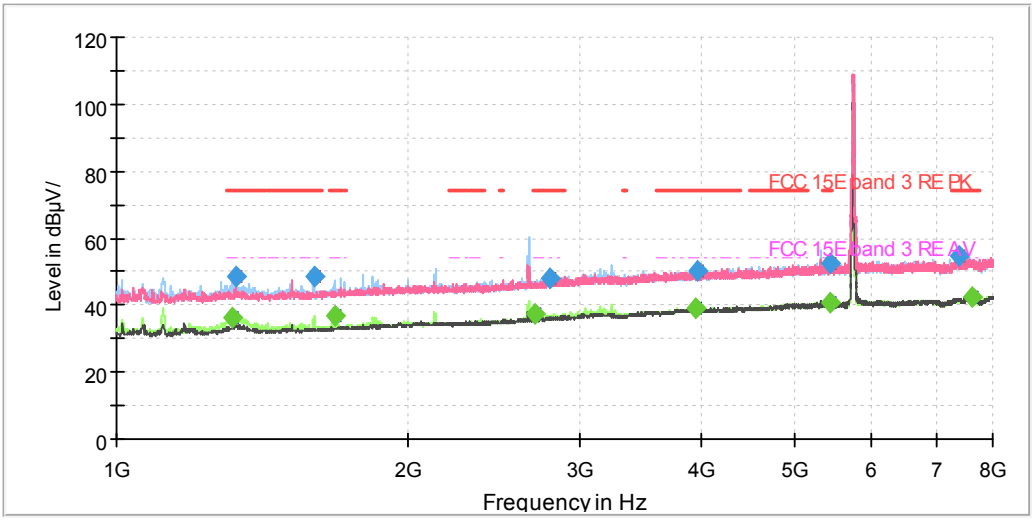
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1112.000000	49.32	---	68.20	18.88	100.0	H	108.0	-8.3
1244.125000	44.45	---	68.20	23.75	100.0	H	115.0	-7.5
1345.625000	---	34.11	54.00	19.89	100.0	H	56.0	-7.0
1581.000000	---	33.34	54.00	20.66	200.0	H	313.0	-5.7
1918.750000	46.27	---	68.20	21.93	100.0	H	49.0	-3.9
2126.125000	50.13	---	68.20	18.07	200.0	H	300.0	-2.9
2235.500000	---	35.13	54.00	18.87	100.0	H	49.0	-2.6
2658.125000	49.46	---	68.20	18.74	200.0	V	336.0	-0.7
2767.500000	---	36.58	54.00	17.42	100.0	H	232.0	-0.1
3191.875000	48.49	---	68.20	19.71	100.0	V	344.0	1.6
3692.375000	---	38.17	54.00	15.84	100.0	V	239.0	3.1
4100.125000	---	38.79	54.00	15.21	200.0	H	294.0	4.2

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



Radiates Emission from 8GHz to 18GHz

802.11a CH149

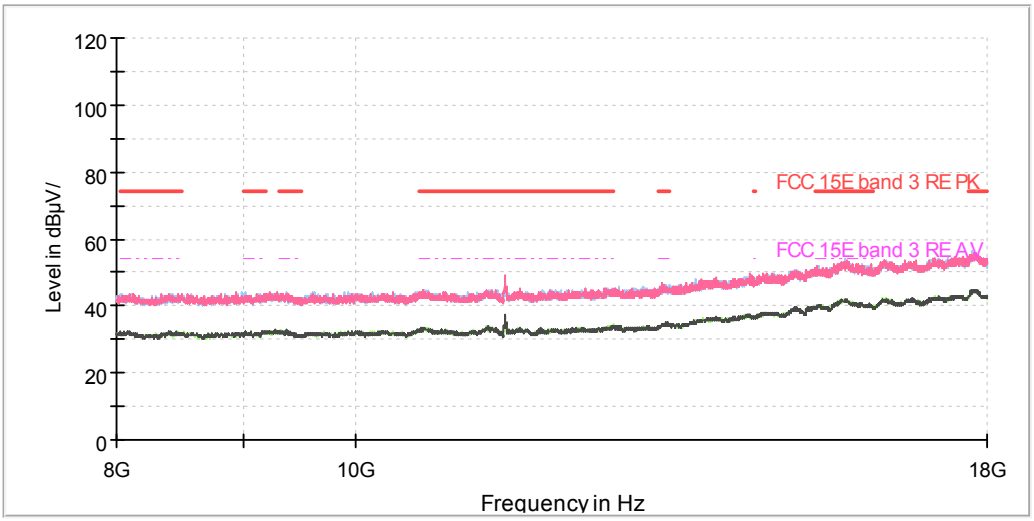


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

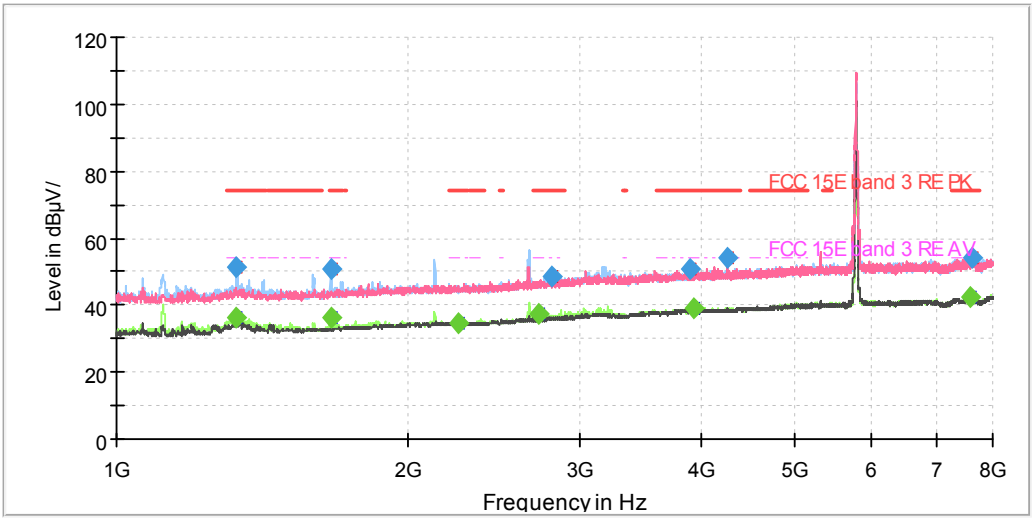
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1318.500000	---	36.08	54.00	17.92	200.0	H	104.0	-7.1
1329.000000	48.82	---	74.00	25.18	100.0	H	112.0	-7.1
1596.750000	48.36	---	74.00	25.64	100.0	H	118.0	-5.6
1676.375000	---	37.02	54.00	16.98	100.0	H	129.0	-5.1
2695.750000	---	37.28	54.00	16.72	100.0	H	112.0	-0.5
2796.375000	48.19	---	74.00	25.81	200.0	H	70.0	0.1
3945.250000	---	39.07	54.00	14.93	200.0	H	303.0	3.9
3971.500000	50.41	---	74.00	23.59	100.0	V	0.0	3.9
5431.000000	52.38	---	74.00	21.62	200.0	H	329.0	7.2
5436.250000	---	40.54	54.00	13.46	100.0	V	169.0	7.2
7397.125000	54.59	---	74.00	19.41	100.0	V	84.0	9.8
7635.125000	---	42.38	54.00	11.62	100.0	V	236.0	10.2

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



Radiates Emission from 8GHz to 18GHz

802.11a CH157

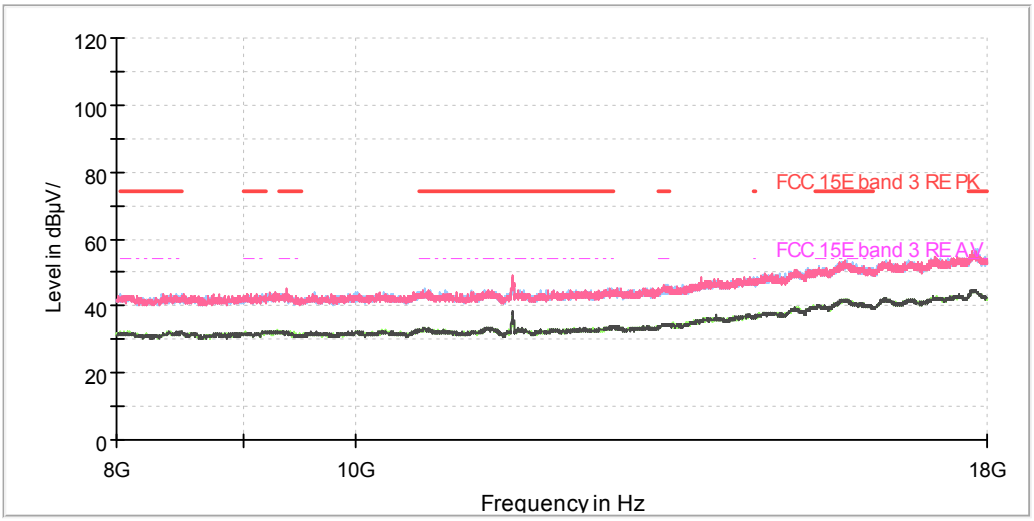


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

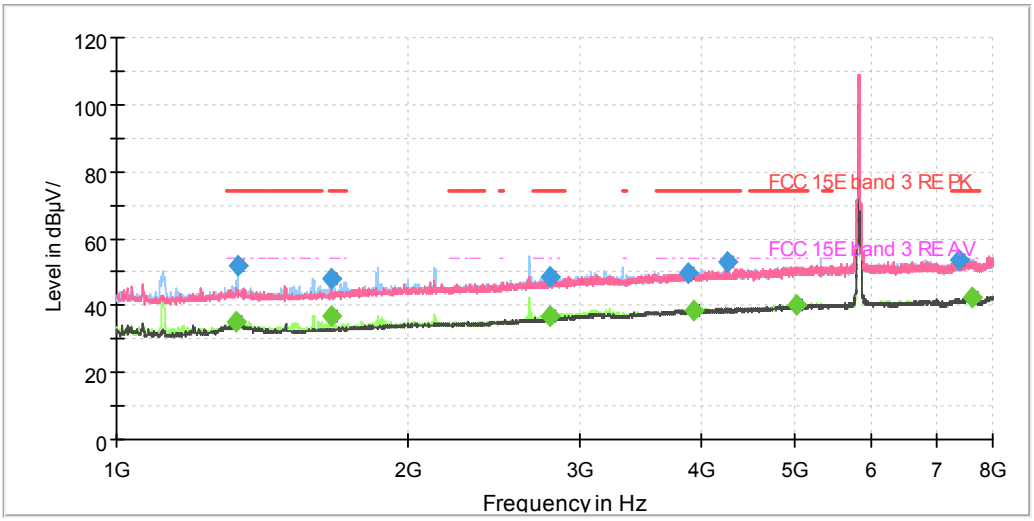
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1328.125000	51.62	---	74.00	22.38	200.0	H	119.0	-7.1
1329.000000	---	36.11	54.00	17.89	200.0	H	119.0	-7.1
1661.500000	50.68	---	74.00	23.32	100.0	H	56.0	-5.2
1661.500000	---	36.30	54.00	17.70	100.0	H	56.0	-5.2
2255.625000	---	34.76	54.00	19.24	200.0	H	113.0	-2.4
2722.875000	---	37.13	54.00	16.87	100.0	H	21.0	-0.4
2806.000000	48.40	---	74.00	25.60	100.0	H	316.0	0.1
3908.500000	51.03	---	74.00	22.97	200.0	H	96.0	3.8
3943.500000	---	38.98	54.00	15.02	200.0	V	351.0	3.9
4266.375000	54.15	---	74.00	19.85	100.0	H	246.0	4.5
7589.625000	---	42.42	54.00	11.58	200.0	V	266.0	10.1
7622.875000	54.32	---	74.00	19.68	100.0	H	167.0	10.2

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



Radiates Emission from 8GHz to 18GHz

802.11a CH165

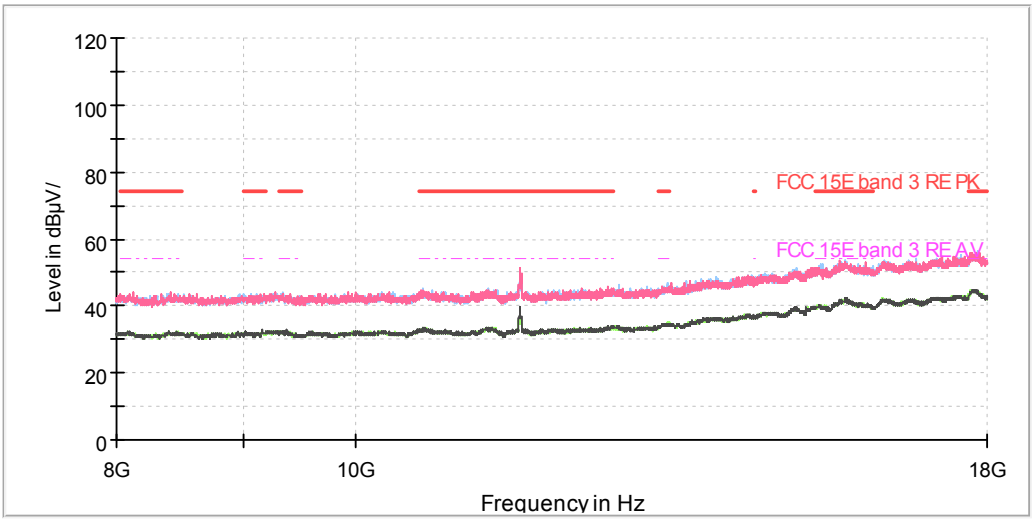


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

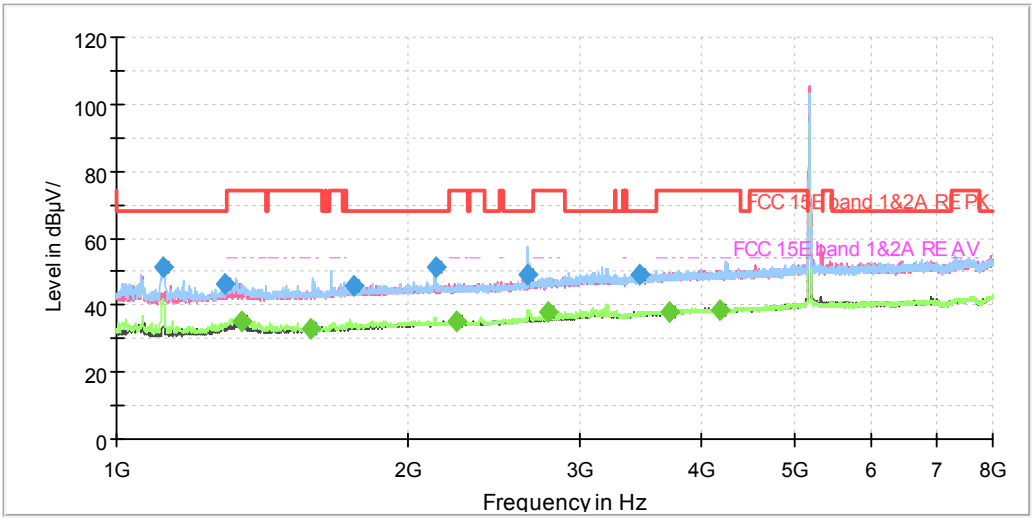
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1329.875000	---	35.31	54.00	18.69	200.0	H	130.0	-7.1
1333.375000	51.67	---	74.00	22.33	200.0	H	130.0	-7.1
1665.875000	48.20	---	74.00	25.80	100.0	H	39.0	-5.2
1665.875000	---	37.03	54.00	16.97	100.0	H	39.0	-5.2
2795.500000	---	37.09	54.00	16.91	100.0	H	340.0	0.1
2799.000000	48.62	---	74.00	25.38	100.0	H	329.0	0.1
3876.125000	49.92	---	74.00	24.08	100.0	H	312.0	3.7
3931.250000	---	38.77	54.00	15.23	100.0	H	285.0	3.9
4258.500000	53.18	---	74.00	20.82	100.0	H	86.0	4.5
5032.875000	---	40.44	54.00	13.56	200.0	V	290.0	6.6
7392.750000	53.74	---	74.00	20.26	200.0	V	108.0	9.8
7629.875000	---	42.55	54.00	11.45	100.0	H	323.0	10.2

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT20) CH36

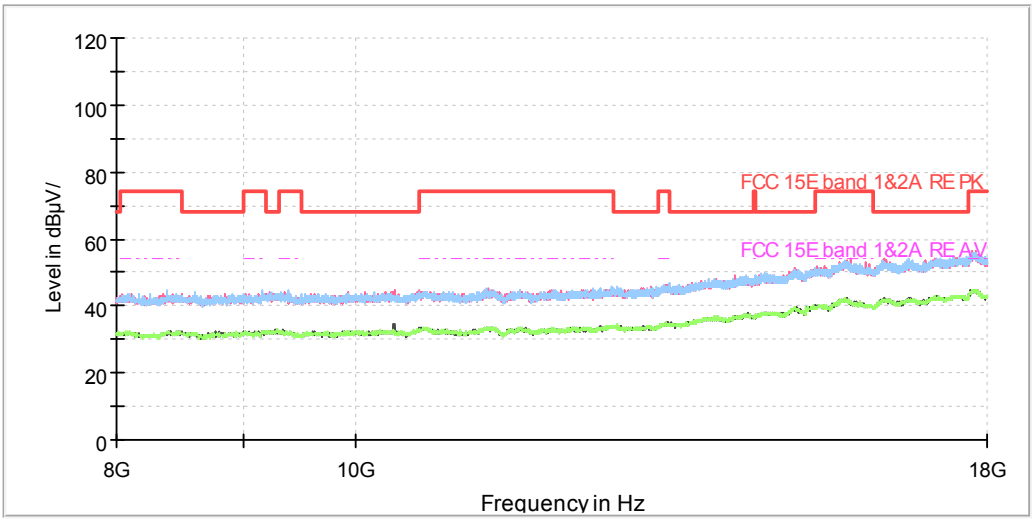


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

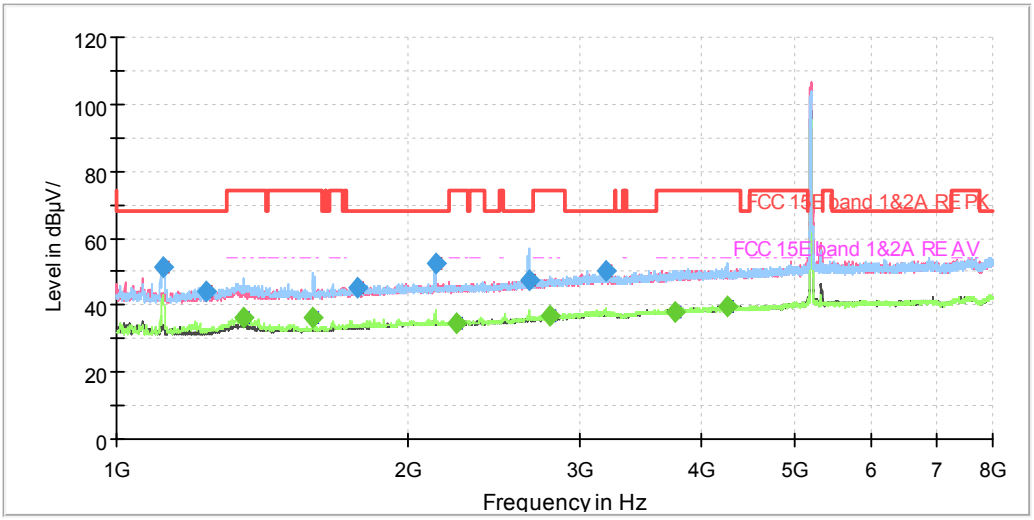
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1115.500000	51.14	---	68.20	17.06	100.0	H	97.0	-8.3
1290.500000	46.09	---	68.20	22.11	100.0	H	130.0	-7.3
1344.750000	---	35.00	54.00	19.00	200.0	H	108.0	-7.0
1582.750000	---	32.79	54.00	21.21	200.0	H	348.0	-5.7
1757.750000	45.97	---	68.20	22.23	100.0	H	130.0	-4.7
2132.250000	51.53	---	68.20	16.67	100.0	H	33.0	-2.8
2239.000000	---	35.35	54.00	18.65	100.0	H	97.0	-2.5
2656.375000	49.16	---	68.20	19.04	100.0	V	137.0	-0.7
2788.500000	---	37.74	54.00	16.26	100.0	H	40.0	0.0
3459.625000	48.92	---	68.20	19.28	100.0	H	0.0	2.2
3717.750000	---	38.23	54.00	15.77	200.0	H	88.0	3.1
4181.500000	---	38.74	54.00	15.26	200.0	V	82.0	4.4

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT20) CH40

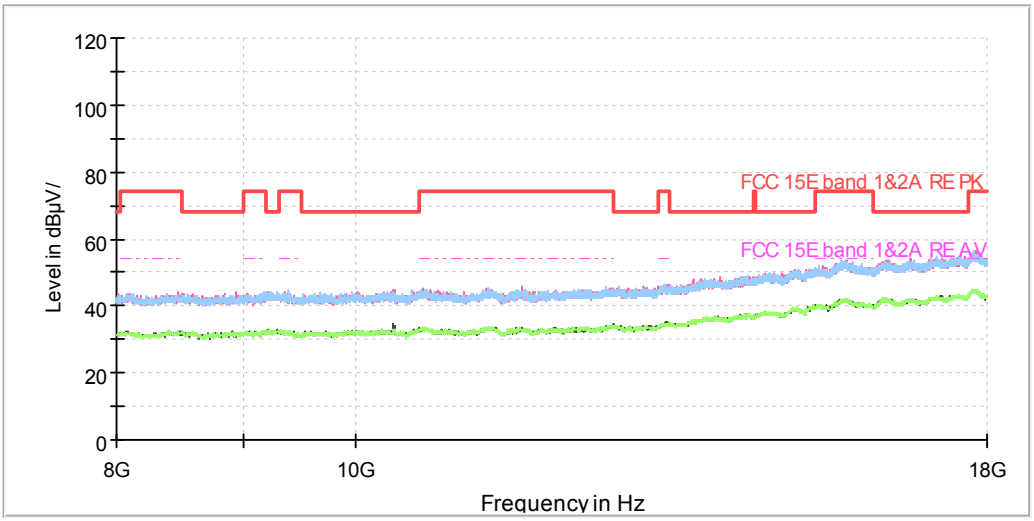


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

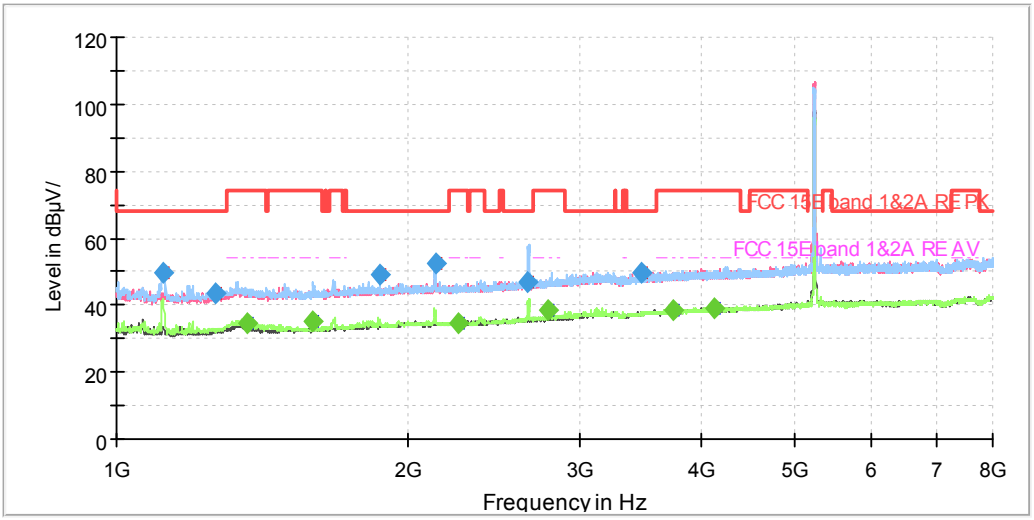
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1116.375000	51.37	---	68.20	16.83	100.0	H	271.0	-8.3
1238.000000	44.31	---	68.20	23.89	100.0	H	278.0	-7.6
1354.375000	---	36.03	54.00	17.97	100.0	H	264.0	-6.9
1595.000000	---	36.03	54.00	17.97	100.0	H	271.0	-5.6
1769.125000	45.00	---	68.20	23.20	200.0	V	28.0	-4.6
2132.250000	52.39	---	68.20	15.81	200.0	H	76.0	-2.8
2239.000000	---	34.65	54.00	19.35	200.0	V	8.0	-2.5
2659.000000	47.32	---	68.20	20.88	200.0	V	308.0	-0.7
2791.125000	---	37.10	54.00	16.90	100.0	H	205.0	0.0
3189.250000	50.21	---	68.20	17.99	100.0	H	185.0	1.6
3764.125000	---	38.15	54.00	15.85	100.0	V	351.0	3.3
4255.875000	---	39.38	54.00	14.62	200.0	H	196.0	4.5

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT20) CH48

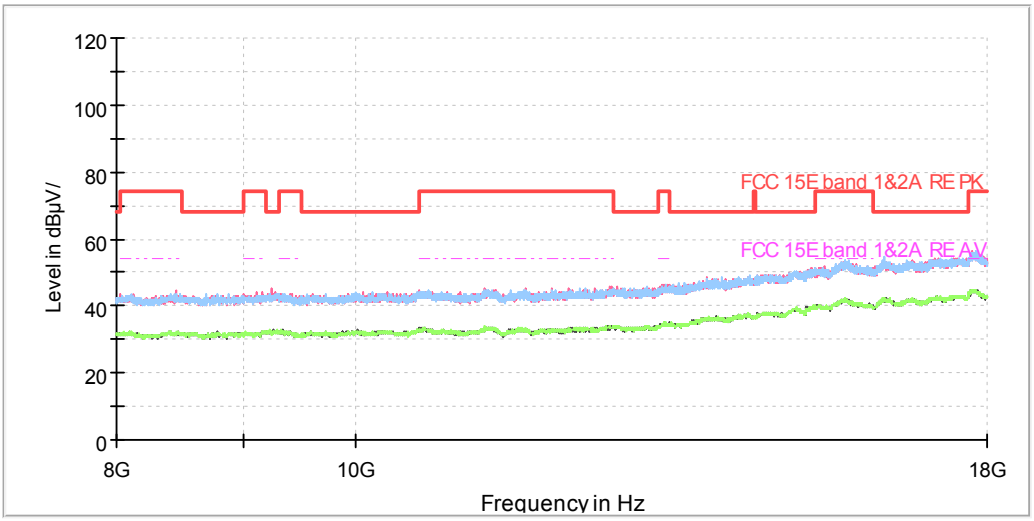


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

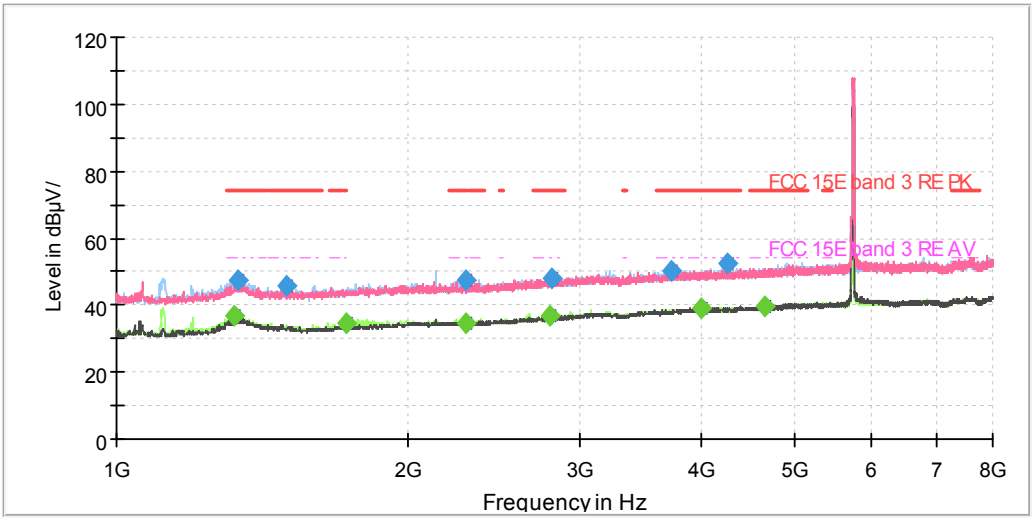
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1115.500000	49.61	---	68.20	18.59	100.0	H	296.0	-8.3
1265.125000	43.50	---	68.20	24.70	100.0	H	43.0	-7.4
1366.625000	---	34.66	54.00	19.34	100.0	H	296.0	-6.9
1595.000000	---	35.22	54.00	18.78	100.0	H	302.0	-5.6
1865.375000	49.30	---	68.20	18.90	100.0	H	212.0	-4.1
2130.500000	52.48	---	68.20	15.72	100.0	H	198.0	-2.8
2252.125000	---	34.74	54.00	19.26	200.0	H	281.0	-2.4
2657.250000	46.90	---	68.20	21.30	200.0	V	317.0	-0.7
2790.250000	---	38.43	54.00	15.57	100.0	H	302.0	0.0
3480.625000	49.68	---	68.20	18.52	200.0	H	288.0	2.2
3741.375000	---	38.29	54.00	15.71	100.0	H	120.0	3.2
4130.750000	---	38.95	54.00	15.05	200.0	H	353.0	4.3

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT20) CH149

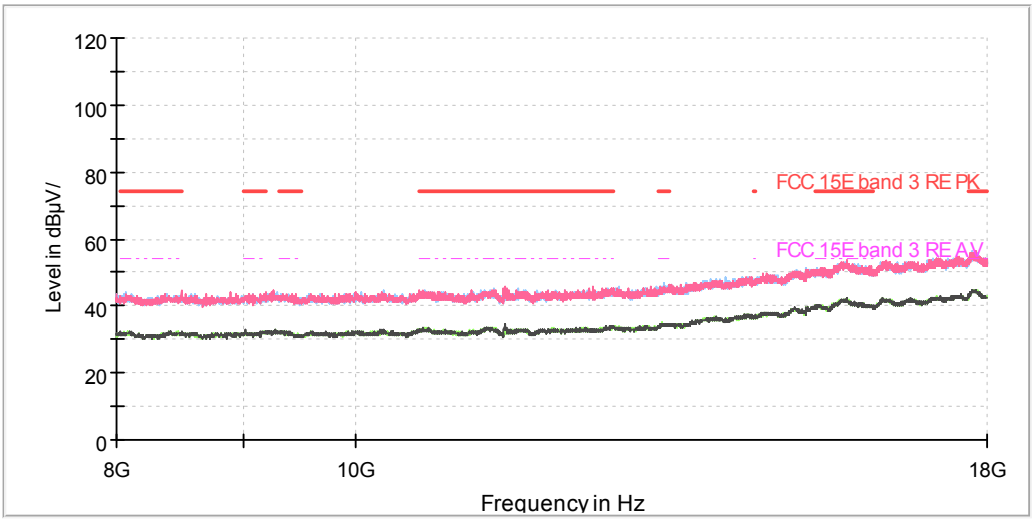


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

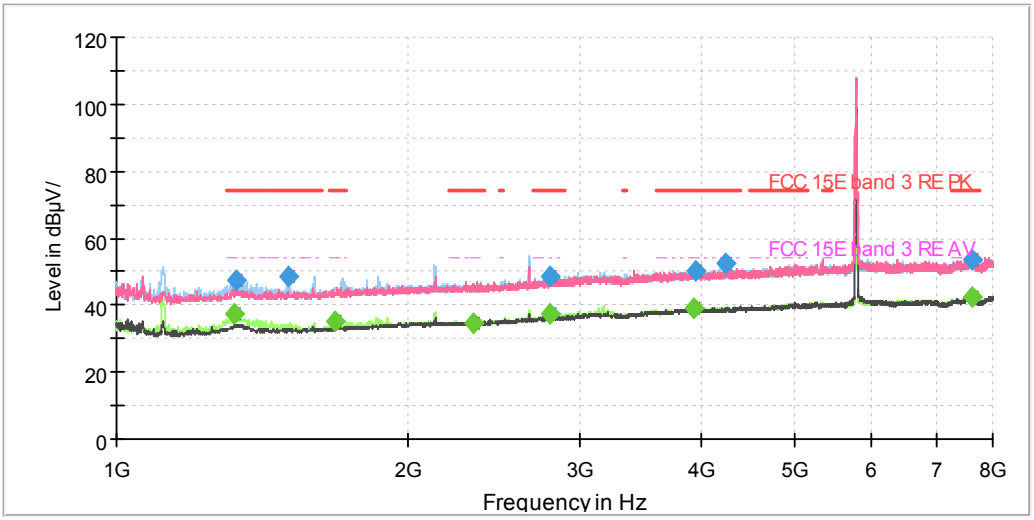
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1321.125000	---	37.02	54.00	16.98	100.0	H	15.0	-7.1
1335.125000	47.24	---	74.00	26.76	100.0	H	0.0	-7.1
1497.000000	45.91	---	74.00	28.09	200.0	H	308.0	-6.2
1721.875000	---	34.58	54.00	19.42	100.0	H	269.0	-4.9
2293.250000	---	34.73	54.00	19.27	200.0	H	263.0	-2.2
2295.000000	47.17	---	74.00	26.83	200.0	H	192.0	-2.2
2792.875000	---	36.76	54.00	17.24	100.0	H	307.0	0.0
2813.000000	48.23	---	74.00	25.77	100.0	H	155.0	0.2
3732.625000	50.40	---	74.00	23.60	200.0	V	251.0	3.1
3998.625000	---	38.92	54.00	15.08	200.0	V	107.0	4.0
4263.750000	52.72	---	74.00	21.28	200.0	H	71.0	4.5
4656.625000	---	39.38	54.00	14.62	200.0	H	43.0	5.5

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT20) CH157

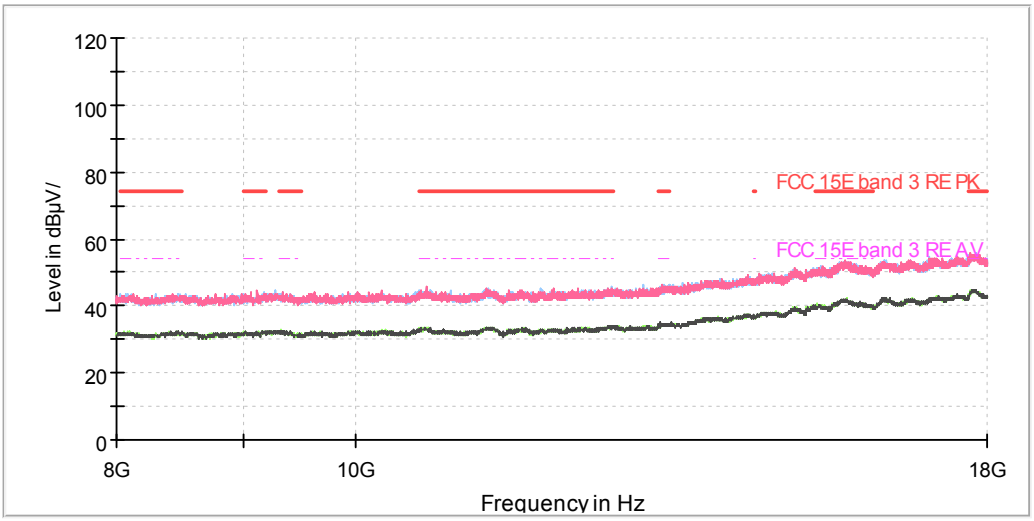


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

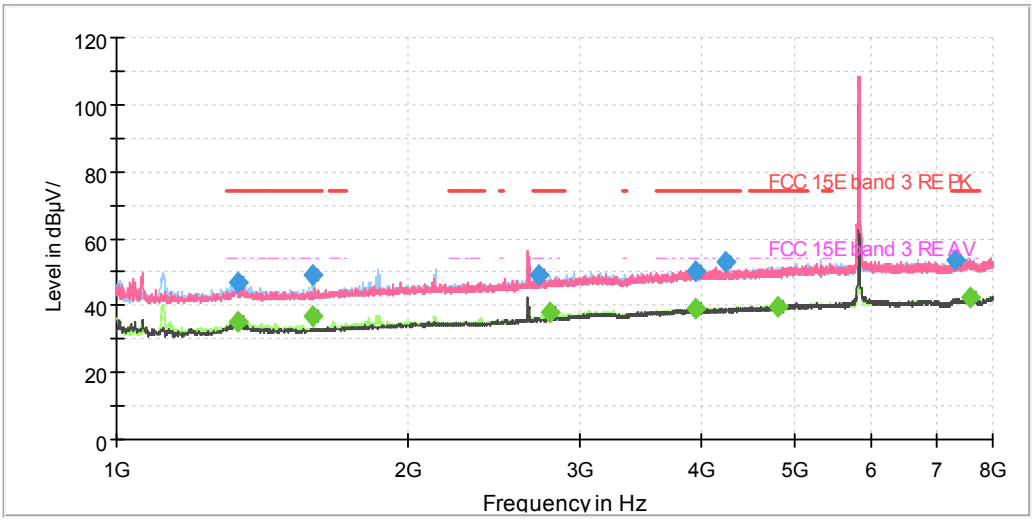
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1324.625000	---	37.23	54.00	16.77	200.0	H	279.0	-7.1
1329.000000	47.17	---	74.00	26.83	100.0	H	297.0	-7.1
1505.750000	48.71	---	74.00	25.29	100.0	H	297.0	-6.1
1677.250000	---	35.25	54.00	18.75	100.0	H	297.0	-5.1
2327.375000	---	34.71	54.00	19.29	200.0	H	163.0	-2.2
2794.625000	48.31	---	74.00	25.69	100.0	H	291.0	0.0
2795.500000	---	37.44	54.00	16.56	100.0	H	341.0	0.1
3932.125000	---	38.91	54.00	15.09	100.0	H	235.0	3.9
3947.000000	50.47	---	74.00	23.53	100.0	H	213.0	3.9
4250.625000	52.37	---	74.00	21.63	100.0	H	269.0	4.5
7608.000000	---	42.38	54.00	11.62	100.0	H	286.0	10.1
7614.125000	53.72	---	74.00	20.28	200.0	H	108.0	10.2

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT20) CH165

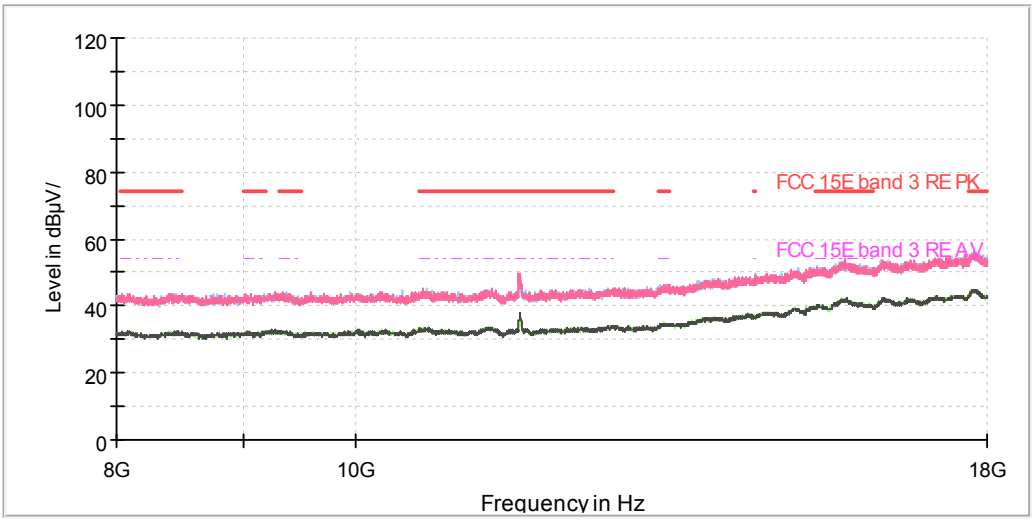


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

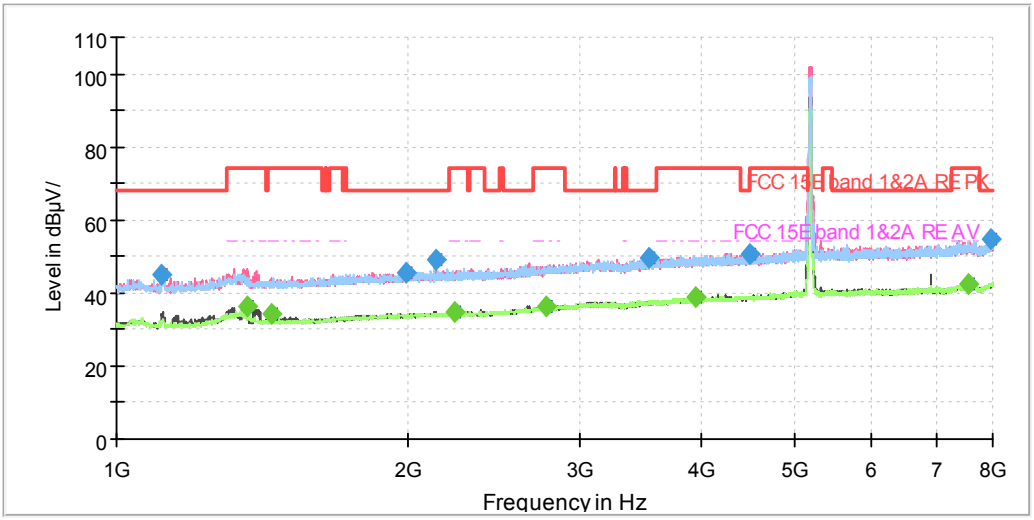
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1332.500000	47.14	---	74.00	26.86	200.0	H	275.0	-7.1
1335.125000	---	35.23	54.00	18.77	200.0	H	264.0	-7.1
1595.875000	49.28	---	74.00	24.72	100.0	H	279.0	-5.6
1595.875000	---	36.64	54.00	17.36	100.0	H	279.0	-5.6
2726.375000	49.04	---	74.00	24.96	100.0	H	213.0	-0.4
2792.875000	---	37.93	54.00	16.07	100.0	H	285.0	0.0
3947.000000	---	39.05	54.00	14.95	100.0	V	155.0	3.9
3950.500000	50.42	---	74.00	23.58	100.0	V	128.0	3.9
4248.000000	52.87	---	74.00	21.13	100.0	H	279.0	4.5
4814.125000	---	39.37	54.00	14.63	100.0	H	67.0	5.9
7328.000000	53.70	---	74.00	20.30	100.0	H	0.0	9.7
7582.625000	---	42.30	54.00	11.70	200.0	V	117.0	10.1

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT40) CH38

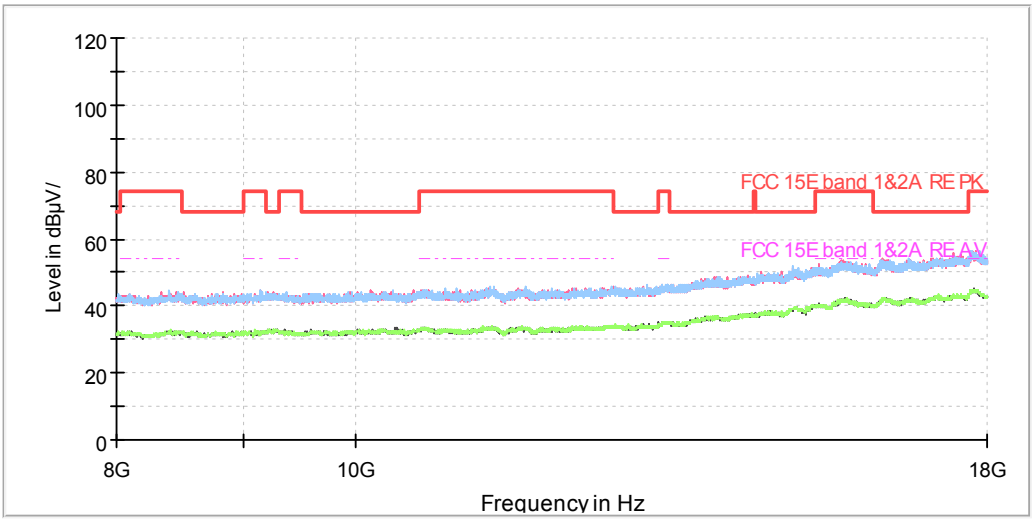


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

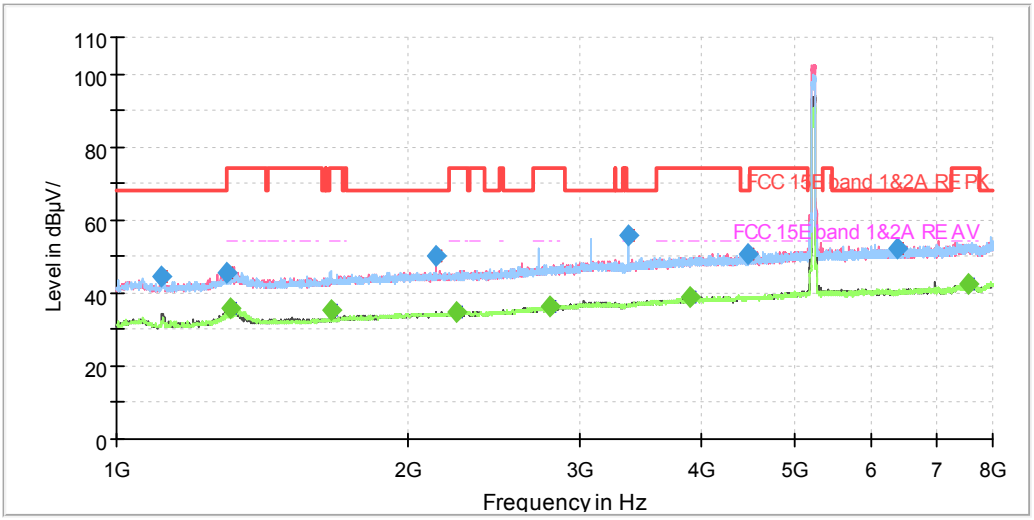
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1113.750000	45.05	---	68.20	23.15	200.0	V	305.0	-8.3
1365.750000	---	36.58	54.00	17.42	100.0	V	75.0	-6.9
1445.375000	---	34.38	54.00	19.62	100.0	V	75.0	-6.5
1990.500000	45.64	---	68.20	22.56	200.0	V	280.0	-3.4
2133.125000	49.10	---	68.20	19.10	100.0	V	231.0	-2.8
2229.375000	---	34.63	54.00	19.37	200.0	V	351.0	-2.6
2772.750000	---	36.29	54.00	17.71	200.0	V	34.0	-0.1
3541.000000	49.85	---	68.20	18.35	200.0	H	280.0	2.5
3946.125000	---	38.70	54.00	15.30	200.0	V	137.0	3.9
4486.875000	50.57	---	68.20	17.63	100.0	H	157.0	4.9
7559.000000	---	42.64	54.00	11.36	100.0	H	138.0	10.0
7970.250000	54.73	---	68.20	13.47	200.0	V	66.0	10.4

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT40) CH46

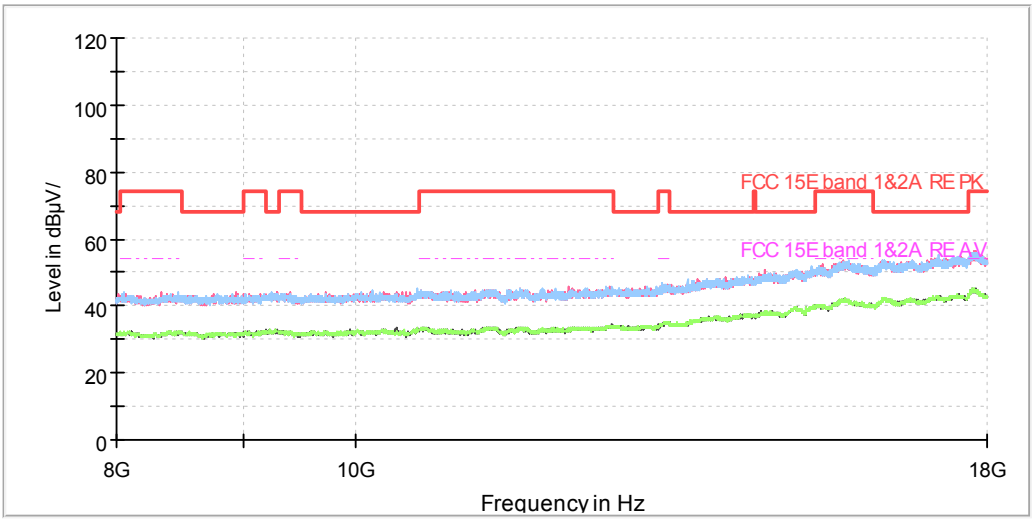


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

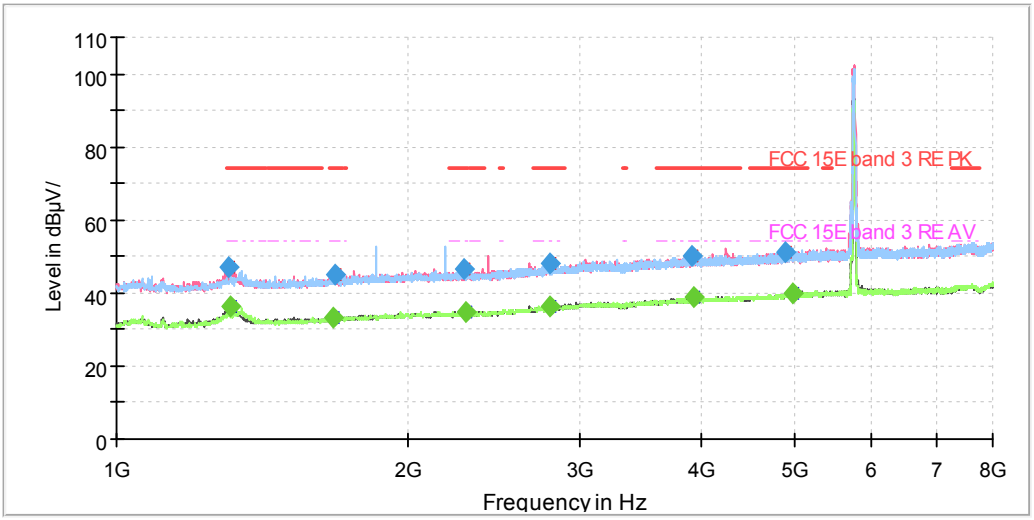
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1113.750000	44.44	---	68.20	23.76	200.0	V	0.0	-8.3
1299.250000	45.49	---	68.20	22.71	200.0	H	330.0	-7.3
1308.000000	---	35.95	54.00	18.05	200.0	V	324.0	-7.2
1662.375000	---	35.16	54.00	18.84	100.0	H	271.0	-5.2
2132.250000	50.23	---	68.20	17.97	100.0	V	214.0	-2.8
2244.250000	---	34.57	54.00	19.43	200.0	V	167.0	-2.5
2793.750000	---	36.43	54.00	17.57	100.0	V	0.0	0.0
3370.375000	55.62	---	68.20	12.58	200.0	H	133.0	1.8
3906.750000	---	38.72	54.00	15.28	200.0	V	31.0	3.8
4475.500000	50.83	---	68.20	17.37	200.0	V	154.0	4.9
6390.875000	52.16	---	68.20	16.04	100.0	V	222.0	8.4
7552.000000	---	42.32	54.00	11.68	100.0	V	337.0	10.0

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT40) CH151

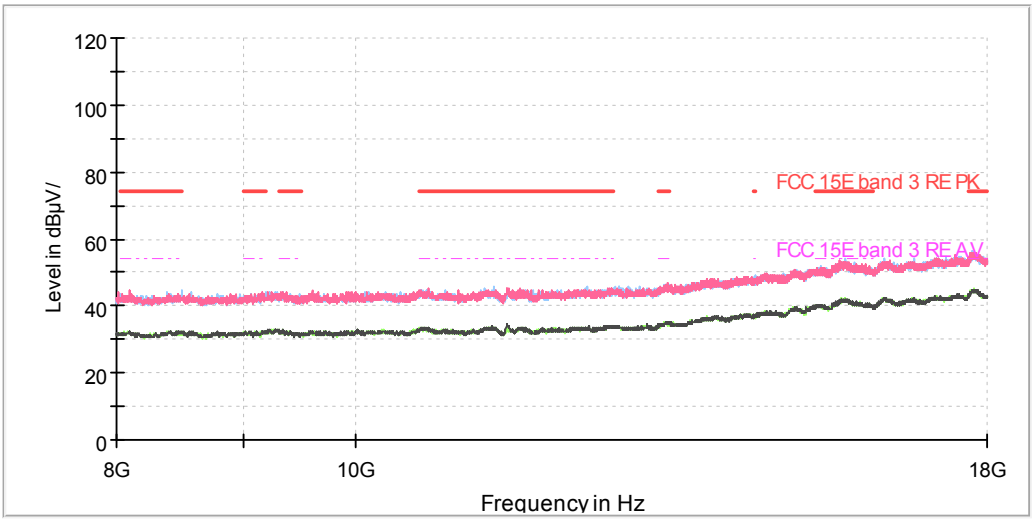


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

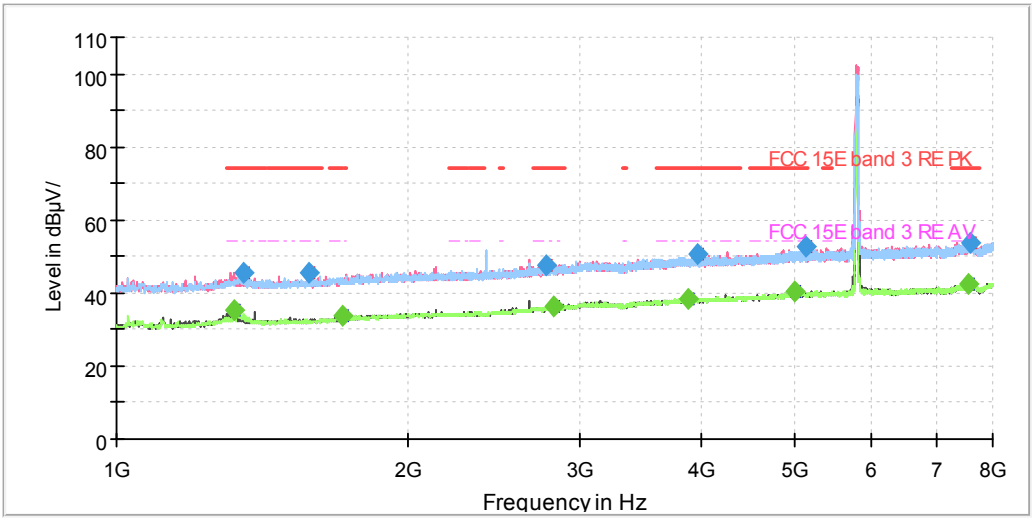
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1307.125000	47.24	---	74.00	26.76	200.0	V	318.0	-7.2
1312.375000	---	36.38	54.00	17.62	200.0	V	324.0	-7.2
1673.750000	---	33.15	54.00	20.85	200.0	H	270.0	-5.1
1682.500000	45.03	---	74.00	28.97	200.0	V	87.0	-5.1
2281.875000	46.51	---	74.00	27.49	200.0	H	160.0	-2.3
2286.250000	---	34.91	54.00	19.09	200.0	V	184.0	-2.2
2797.250000	---	36.36	54.00	17.64	200.0	V	42.0	0.1
2797.250000	48.02	---	74.00	25.98	200.0	H	205.0	0.1
3917.250000	50.08	---	74.00	23.92	100.0	V	358.0	3.8
3933.000000	---	38.72	54.00	15.28	100.0	V	344.0	3.9
4891.125000	50.95	---	74.00	23.05	200.0	H	257.0	6.4
4968.125000	---	39.88	54.00	14.12	100.0	H	112.0	6.5

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



Radiates Emission from 8GHz to 18GHz

802.11n (HT40) CH159

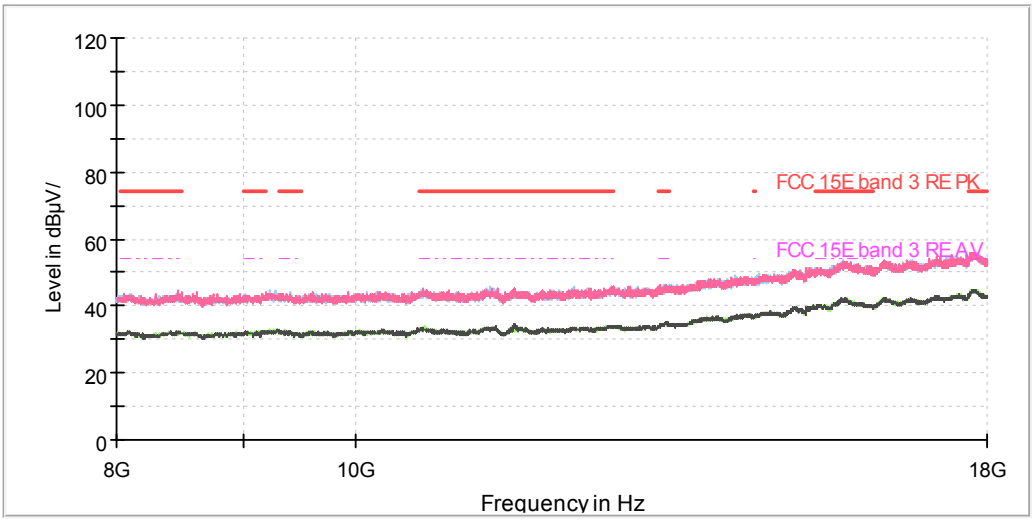


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

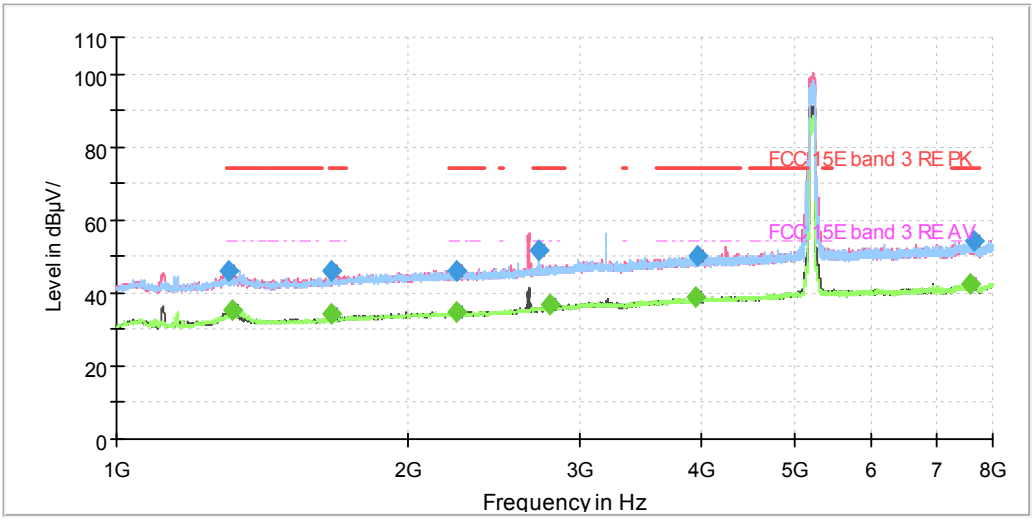
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1322.875000	---	35.26	54.00	18.74	200.0	V	319.0	-7.1
1349.125000	45.36	---	74.00	28.64	200.0	H	320.0	-7.0
1580.125000	45.70	---	74.00	28.30	100.0	H	225.0	-5.7
1709.625000	---	33.55	54.00	20.45	200.0	V	264.0	-5.0
2771.875000	47.73	---	74.00	26.27	100.0	V	288.0	-0.1
2821.750000	---	36.42	54.00	17.58	100.0	H	85.0	0.2
3875.250000	---	38.51	54.00	15.49	100.0	H	190.0	3.7
3974.125000	50.76	---	74.00	23.24	200.0	V	171.0	3.9
4994.375000	---	40.30	54.00	13.70	200.0	V	41.0	6.6
5143.125000	52.77	---	74.00	21.23	100.0	H	28.0	6.7
7554.625000	---	42.25	54.00	11.75	100.0	V	320.0	10.0
7579.125000	53.78	---	74.00	20.22	200.0	H	307.0	10.1

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



Radiates Emission from 8GHz to 18GHz

802.11ac (HT80) CH42

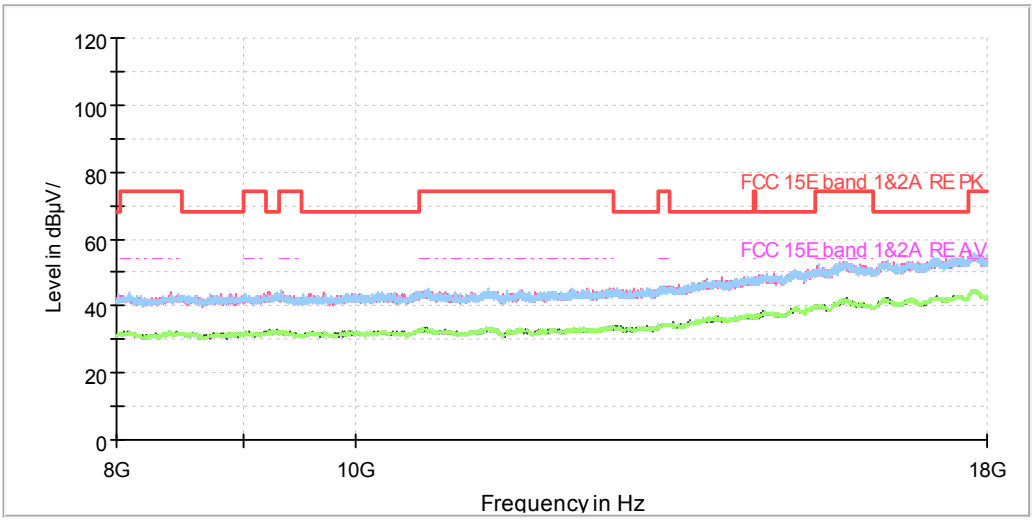


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

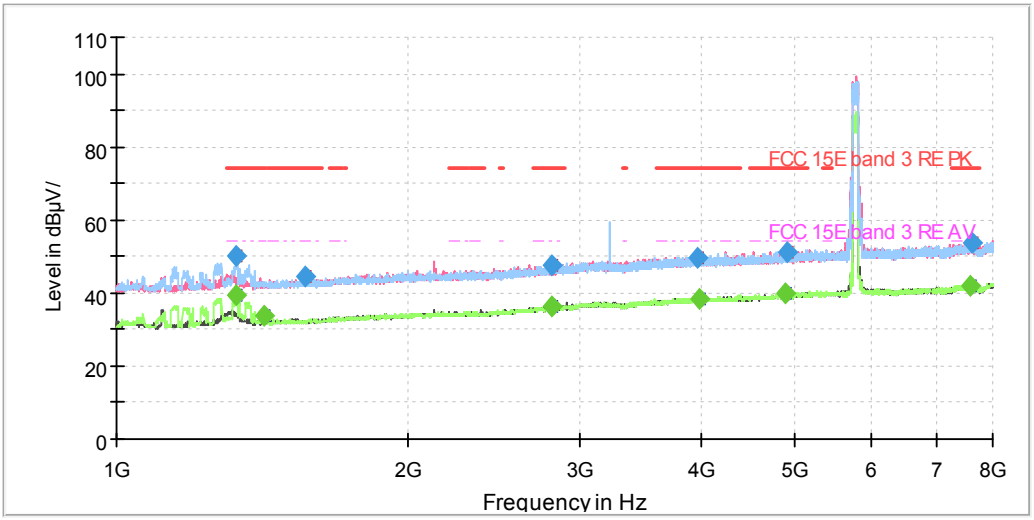
Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1305.375000	46.18	---	74.00	27.82	200.0	V	318.0	-7.2
1318.500000	---	35.11	54.00	18.89	200.0	V	323.0	-7.1
1664.125000	---	34.36	54.00	19.64	100.0	V	0.0	-5.2
1665.000000	46.11	---	74.00	27.89	100.0	V	155.0	-5.2
2236.375000	---	34.55	54.00	19.45	200.0	V	348.0	-2.5
2240.750000	46.08	---	74.00	27.92	100.0	V	309.0	-2.5
2720.250000	51.76	---	74.00	22.24	200.0	H	9.0	-0.4
2797.250000	---	36.62	54.00	17.38	100.0	V	348.0	0.1
3945.250000	---	38.70	54.00	15.30	200.0	H	37.0	3.9
3970.625000	50.21	---	74.00	23.79	100.0	V	0.0	3.9
7583.500000	---	42.26	54.00	11.74	100.0	H	142.0	10.1
7636.875000	54.43	---	74.00	19.57	200.0	H	289.0	10.2

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



Radiates Emission from 8GHz to 18GHz

802.11ac (HT80) CH155

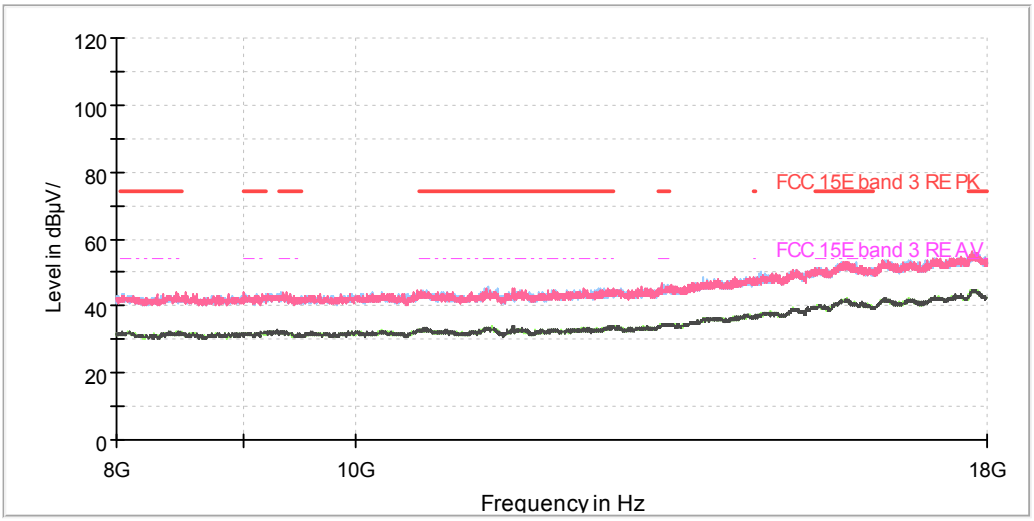


Note: The signal beyond the limit is carrier.

Radiates Emission from 1GHz to 8GHz

Frequency (MHz)	Peak (dBuV/m)	Average (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Polarization	Azimuth (deg)	Correct Factor (dB)
1329.000000	---	39.47	54.00	14.53	200.0	H	35.0	-7.1
1330.750000	50.06	---	74.00	23.94	200.0	H	35.0	-7.1
1418.250000	---	33.74	54.00	20.26	200.0	H	35.0	-6.6
1564.375000	44.49	---	74.00	29.51	200.0	H	279.0	-5.8
2806.875000	47.65	---	74.00	26.35	200.0	H	208.0	0.1
2810.375000	---	36.27	54.00	17.73	200.0	V	333.0	0.1
3975.875000	49.79	---	74.00	24.21	200.0	H	0.0	3.9
3984.625000	---	38.58	54.00	15.42	200.0	V	10.0	4.0
4882.375000	---	39.89	54.00	14.11	100.0	H	61.0	6.3
4920.000000	50.93	---	74.00	23.07	100.0	V	320.0	6.4
7574.750000	---	42.20	54.00	11.80	100.0	H	105.0	10.1
7621.125000	53.75	---	74.00	20.25	200.0	H	64.0	10.2

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



Radiates Emission from 8GHz to 18GHz

5.6. Conducted Emission

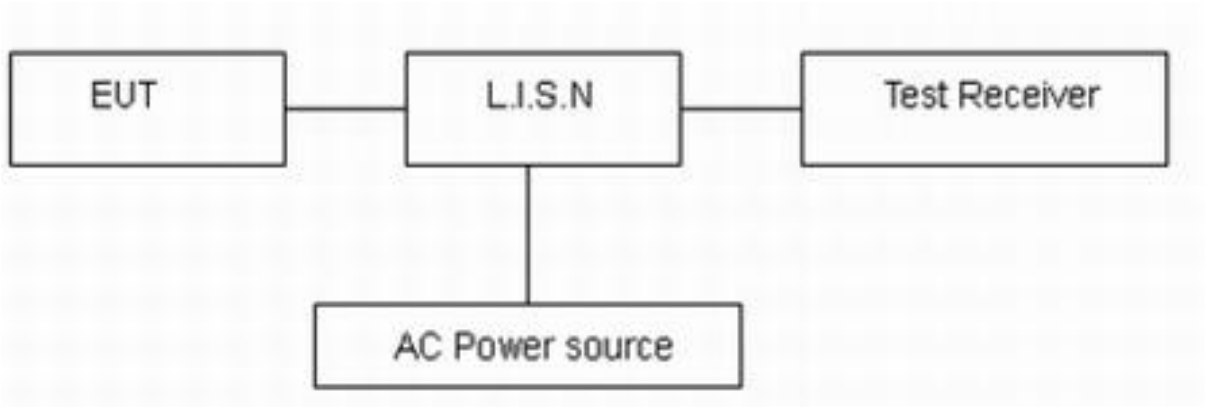
Ambient condition

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

Methods of Measurement

The EUT IS placed on a non-metallic table of 80cm height above the horizontal metal reference ground plane. During the test, the EUT was operating in its typical mode. The test method is according to ANSI C63.10-2013.Connect the AC power line of the EUT to the LISN Use EMI receiver to detect the average and Quasi-peak value. RBW is set to 9kHz, VBW is set to 30kHz The measurement result should include both L line and N line.
The test is in transmitting mode.

Test Setup



Note: AC Power source is used to change the voltage 110V/60Hz.

Limits

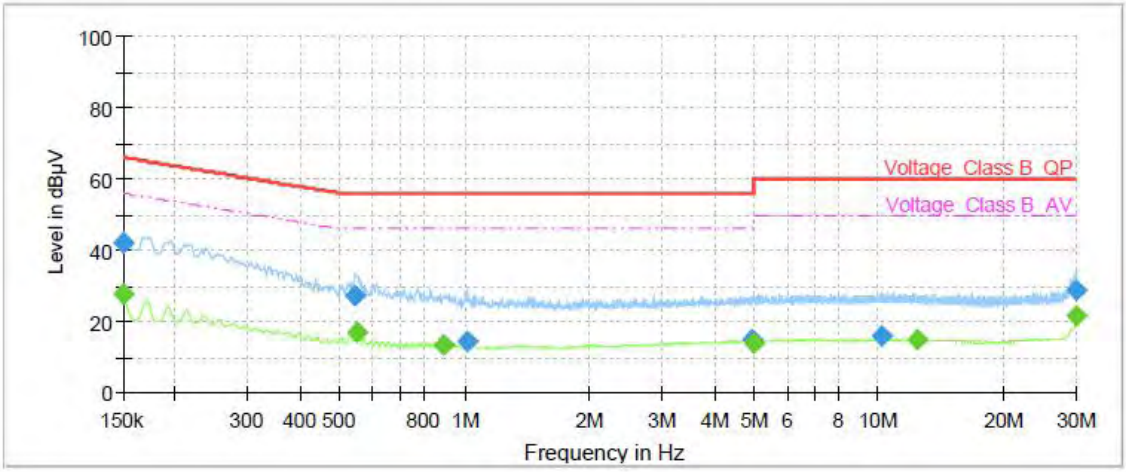
Frequency (MHz)	Conducted Limits(dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 *	56 to 46*
0.5 - 5	56	46
5 - 30	60	50
*: Decreases with the logarithm of the frequency.		

Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor k = 1.96, U= 2.69 dB.

Test Results:

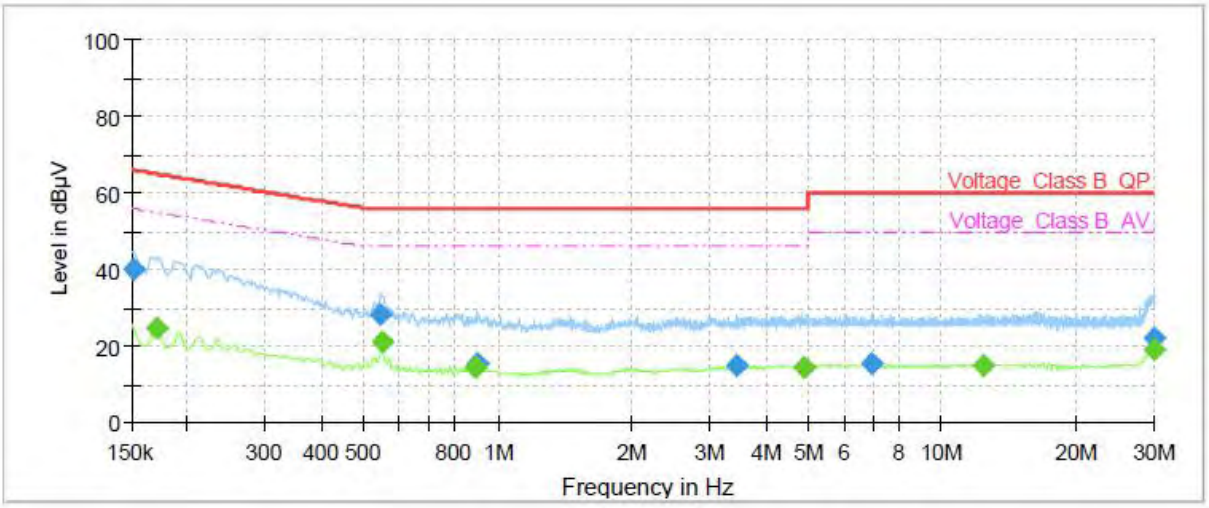
Following plots, Blue trace uses the peak detection and Green trace uses the average detection. During the test, the Conducted Emission was performed in all modes with all channels, 802.11n HT40, Channel 38 are selected as the worst condition. The test data of the worst-case condition was recorded in this report.



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.15	---	27.67	56.00	28.33	70.0	9.000	L1	ON	21
0.15	42.18	---	66.00	23.82	70.0	9.000	L1	ON	21
0.55	27.01	---	56.00	28.99	70.0	9.000	L1	ON	20
0.55	---	16.90	46.00	29.10	70.0	9.000	L1	ON	20
0.89	---	13.52	46.00	32.48	70.0	9.000	L1	ON	20
1.01	14.15	---	56.00	41.85	70.0	9.000	L1	ON	20
4.95	14.90	---	56.00	41.10	70.0	9.000	L1	ON	19
5.00	---	14.05	46.00	31.95	70.0	9.000	L1	ON	19
10.22	15.80	---	60.00	44.20	70.0	9.000	L1	ON	20
12.37	---	14.70	50.00	35.30	70.0	9.000	L1	ON	20
29.98	28.64	---	60.00	31.36	70.0	9.000	L1	ON	20
30.00	---	21.32	50.00	28.68	70.0	9.000	L1	ON	20

Remark: Correct factor=cable loss + LISN factor

L line Conducted Emission from 150 KHz to 30 MHz



Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Filter	Corr. (dB)
0.15	39.75	---	65.88	26.13	70.0	9.000	N	ON	21
0.17	---	24.85	54.95	30.10	70.0	9.000	N	ON	21
0.55	27.96	---	56.00	28.04	70.0	9.000	N	ON	20
0.55	---	21.16	46.00	24.84	70.0	9.000	N	ON	20
0.89	---	14.13	46.00	31.87	70.0	9.000	N	ON	20
0.90	15.14	---	56.00	40.86	70.0	9.000	N	ON	20
3.44	14.93	---	56.00	41.07	70.0	9.000	N	ON	19
4.89	---	14.58	46.00	31.42	70.0	9.000	N	ON	19
6.91	15.41	---	60.00	44.59	70.0	9.000	N	ON	20
12.37	---	14.80	50.00	35.20	70.0	9.000	N	ON	20
29.90	22.05	---	60.00	37.95	70.0	9.000	N	ON	20
29.95	---	19.07	50.00	30.93	70.0	9.000	N	ON	20

Remark: Correct factor=cable loss + LISN factor

N line Conducted Emission from 150 KHz to 30 MHz

6. Main Test Instruments

Name	Manufacturer	Type	Serial Number	Calibration Date	Expiration Date
Spectrum Analyzer	R&S	FSV40	15195-01-00	2020-05-18	2021-05-17
EMI Test Receiver	R&S	ESCI	100948	2020-05-18	2021-05-17
Loop Antenna	SCHWARZBECK	FMZB1519	1519-047	2020-04-02	2023-04-01
TRILOG Broadband Antenna	SCHWARZBECK	VULB 9163	391	2019-12-16	2021-12-15
Horn Antenna	R&S	HF907	102723	2018-08-11	2021-08-10
Horn Antenna	ETS-Lindgren	3160-09	00102643	2018-06-20	2021-06-19
Standard Gain Horn	STEATITE	QSH-SL-26-40 -K-15	16779	2019-12-24	2022-12-23
Broadband Horn Antenna	SCHWARZBECK	BBHA 9120D	430	2018-07-07	2021-07-06
EMI Test Receiver	R&S	ESR	101667	2020-05-18	2021-05-17
LISN	R&S	ENV216	101171	2018-12-15	2021-12-14
Spectrum Analyzer	KEYSIGHT	N9020A	MY54420163	2020-05-18	2021-05-17
RF Cable	Agilent	SMA 15cm	0001	2020-06-12	2020-12-11
				2020-12-10	2021-06-09
TEMPERATURE CHAMBER	WEISS	VT4002	582261194500 10	2019-12-15	2020-12-14
				2020-12-13	2021-12-12
Power Meter	R&S	NRP2	104306	2020-05-18	2021-05-17
Power Sensor	R&S	NRP-Z21	104799	2020-05-18	2021-05-17
DC Power Supply	GWINSTEK	GPS-3030D	GEP882653	2020-05-18	2021-05-17
Software	R&S	EMC32	9.26.0	/	/

********END OF REPORT ********

ANNEX A: The EUT Appearance

The EUT Appearance are submitted separately.

ANNEX B: Test Setup Photos

The Test Setup Photos are submitted separately.