TEST REPORT

Eurofins KCTL Co.,Ltd. 65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea TEL: 82-70-5008-1021 FAX: 82-505-299-8311 www.kctl.co.kr	Report No.: KR23-SRF0113 Page (1) of (71)	eurofins | KCTL

1. Client

- Name : DREAMUS COMPANY
- Address : 311, Gangnam-daero, Seocho-gu, Seoul, Republic of Korea
- Date of Receipt : 2023-02-23

2. Use of Report : Certification

3. Name of Product / Model : SE300 / PPR51

4. Manufacturer / Country of Origin : DREAMUS COMPANY / Korea

5. FCC ID : QDMPPR51

5. Date of Test : 2023-03-10 to 2023-04-21

6. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

7. Test method used : FCC Part 15 Subpart E, 15.407

8. Test Result : Refer to the test result in the test report

Affirmation	Tested by Name : Hosung Lee (Signature)	Technical Manager Name : Heesu Ahn (Signature)

2023-04-27

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2023-04-27	Originally issued	-

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

CONTENTS

1. General information

Client	:	DREAMUS COMPANY
Address	:	311, Gangnam-daero, Seocho-gu, Seoul, Republic of Korea
Manufacturer	:	DREAMUS COMPANY
Address	:	311, Gangnam-daero, Seocho-gu, Seoul, Republic of Korea
Factory	:	smartelectronics
Address	:	(Ochang-eup), 256, Yeocheon 3-gil, Cheongwon-gu, Cheongju-si, Chungcheongbuk-do, Korea
Laboratory	:	Eurofins KCTL Co.,Ltd.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132
		VCCI Registration No. : R-20080, G-20078, C-20059, T-20056
		CAB Identifier: KR0040
		ISED Number: 8035A
		KOLAS No.: KT231

2. Device information

Equipment under test	:	SE300			
Model	:	PPR51			
Modulation technique	:	Bluetooth(BDR/EDR)	:	GFSK, π/4DQPSK, 8DPSK	
		Bluetooth(BLE)	:	GFSK	
		WIFI(802.11a/b/g/n/ac)	:	DSSS, OFDM	
Number of channels	:	Bluetooth	:	79 ch	
		BLE	:	40 ch	
		2.4 ㎓ WALN	:	11 ch (20 ㎒), 7 ch (40 ㎒)	
		UNII-1	:	4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)	
		UNII-3	:	5 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)	
Power source	:	DC 3.8 ㅤV			
Antenna specification	:	LPS Antenna			
Antenna gain	:	BT/BLE/2.4 ㎓ WALN	:	-2.307 dBi	
		UNII-1	:	-3.199 dBi	
		UNII-3	:	-5.673 dBi	
Frequency range	:	Bluetooth	:	2 402 ㎒ ~ 2 480 ㎒	(BDR/EDR/BLE)
		2.4 ㎓ WALN	:	2 412 ㎒ ~ 2 462 ㎒	(802.11b/g/n_HT20)
				2 422 ㎒ ~ 2 452 ㎒	(802.11n_HT40)
		UNII-1	:	5 180 ㎒ ~ 5 240 ㎒	(802.11a/n_HT20)
				5 190 ㎒ ~ 5 230 ㎒	(802.11n_HT40)
				5 210 ㎒	(802.11ac_VHT80)
		UNII-3	:	5 745 ㎒ ~ 5 825 ㎒	(802.11a/n_HT20)
				5 755 ㎒ ~ 5 795 ㎒	(802.11n_HT40)
				5 775 ㎒	(802.11ac_VHT80)
Software version	:	1.0			
Hardware version	:	1.0			
Test device serial No.	:	TP-76(Conducted)			
		TP-71, 73(Radiated)			
Operation temperature	:	-10 ℃ ~ 50 ℃			

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
Lithium Polymer Battery	Shenzhen Hypercell Company Limited	HPL606781	N/A	DC 3.8 V, 5050 mAh

2.2. Frequency/channel operations

This device contains the following capabilities:
Bluetooth(BDR/EDR/BLE), WLAN 2.4 ㎓(802.11b/g/n_HT20/HT40)
WLAN 5 ㎓(802.11a/n_HT20/40/ac_VHT80)

UNII-1		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
36	5 180	149	5 745
40	5 200	157	5 785
48	5 240	165	5 825

Table 2.2.1. 802.11a/n_HT20 mode

UNII-1		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
38	5 190	151	5 755
46	5 230	159	5 795

Table 2.2.2. 802.11n_HT40 mode

UNII-1		UNII-3	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
42	5 210	155	5 775

Table 2.2.3 802.11ac_VHT80 mode

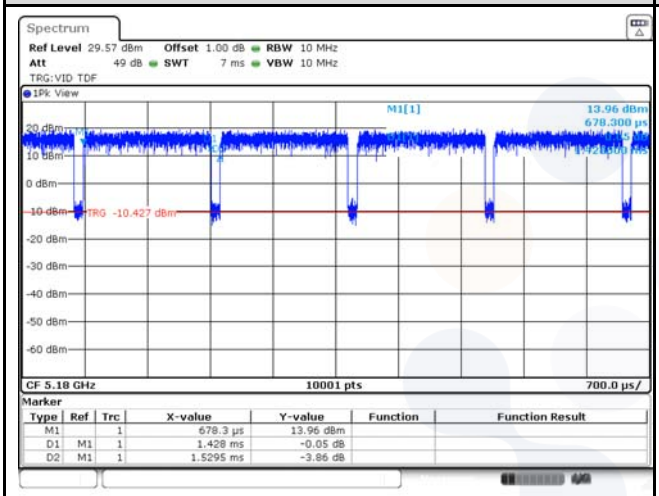
2.3. Duty Cycle Factor

Test mode	Period (ms)	T_{on} time (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.529 5	1.428 0	0.933 6	93.36	0.30
802.11n_HT20	1.438 2	1.336 2	0.929 1	92.91	0.32
802.11n_HT40	0.765 6	0.664 0	0.867 3	86.73	0.62
802.11ac_VHT80	0.433 4	0.332 0	0.766 0	76.60	1.16

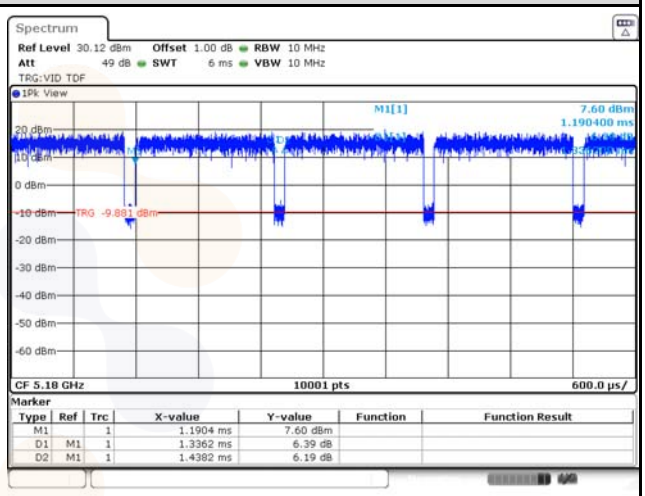
Notes.

1. Duty cycle (Linear) = T_{on} time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)
3. DCF is not compensated to average result if the duty cycle is more than 98%

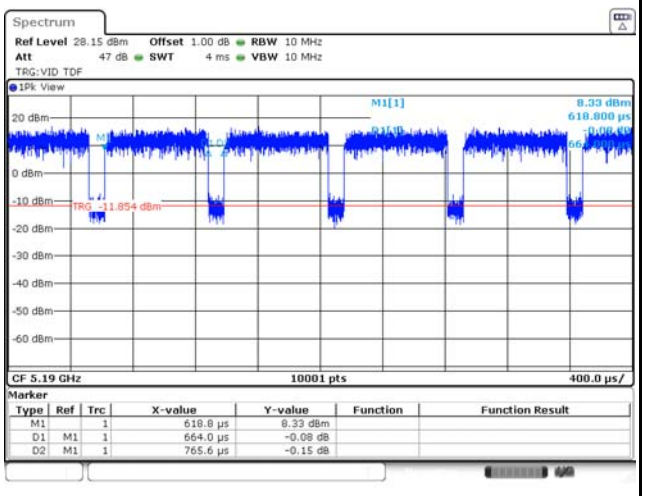
802.11a



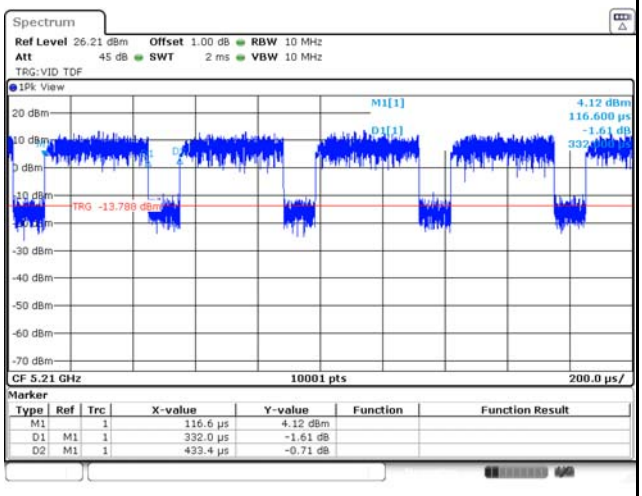
802.11n_HT20



802.11n_HT40



802.11ac_VHT80



2.4. RF power setting in TEST SW

Band	Ch.	Frequency (㎒)	RF Power setting value
UNII-1 (5 150 ㎒ - 5 250 ㎒)	802.11a (6 Mbps)	5 180	15
		5 200	
		5 240	
	802.11n(HT20) (MCS0)	5 180	15
		5 200	
		5 240	
	802.11n(HT40) (MCS0)	5 190	12
		5 230	
	802.11ac(VHT80) (MCS0)	5 210	10
UNII-3 (5 725 ㎒ - 5 850 ㎒)	802.11a (6 Mbps)	5 745	14
		5 785	
		5 825	
	802.11n(HT20) (MCS0)	5 745	14
		5 785	
		5 825	
	802.11n(HT40) (MCS0)	5 755	14
		5 795	
	802.11ac(VHT80) (MCS0)	5 775	14

2.5. Simultaneously transmission condition

Item	Technology	Test Mode	Frequency [㎒]
Case 1	WLAN 2.4 ㎓	802.11b	2 412
	Bluetooth	BDR(DH-5)	2 480
Case 2	WLAN 2.4 ㎓	802.11b	2 412
	Bluetooth Low Energy	BLE (1M Bits/s, 37 Packet)	2 440
Case 3	WLAN 5 ㎓	802.11ac VHT80	5 775
	Bluetooth	BDR(DH-5)	2 480
Case 4	WLAN 5 ㎓	802.11ac VHT80	5 775
	Bluetooth Low Energy	BLE (1M Bits/s, 37 Packet)	2 440

Notes.
The lowest margin condition among the channels and modes were selected for test.

3. Antenna requirement

Requirement of FCC part section 15.203:
An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

- The transmitter has attached FPCB Antenna (internal antenna) on the board.
- The E.U.T Complies with the requirement of §15.203, §15.407

4. Summary of tests

FCC Part section(s)	Parameter	Test Condition	Test results
15.407(a)	Maximum conducted output power	Conducted	Pass
15.407(a)	Maximum power spectral density		Pass
15.407(a)	26 dB Channel Bandwidth		Pass
15.407(e)	6 dB Channel Bandwidth		Pass
15.207(a)	AC Conducted Emissions		Pass
15.407(b), 15.205(a), 15.209(a)	Spurious emission	Radiated	Pass(Note2)
	Band-edge, restricted band		Pass

Notes:

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
   - The worst case is stand-alone without connecting accessories.
2. Please refer to the Bluetooth report for the simultaneously transmission data of this requirement. Report no. KR23-SRF0110 issued on April 27, 2023 by Eurofins KCTL Co.,Ltd.
3. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
4. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that **Z** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Z** orientation.
5. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 789033 D02 v02r01
6. The worst-case data rates were:
   802.11a mode: 6Mbps
   802.11n HT20 mode: MCS0
   802.11n HT40 mode: MCS0
   802.11ac VHT80 mode: MCS0

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (±)	
Conducted RF power	0.9 dB	
Conducted spurious emissions	1.3 dB	
Radiated spurious emissions	9 kHz ~ 30 MHz	2.3 dB
	30 MHz ~ 1 000 MHz	2.5 dB
	1 000 MHz ~ 18 000 MHz	4.7 dB
	Above 18 000 GHz	4.8 dB
Conducted emissions	9 kHz ~ 150 kHz	2.7 dB
	150 kHz ~ 30 MHz	2.7 dB

6. Measurement results explanation example

The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.
With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

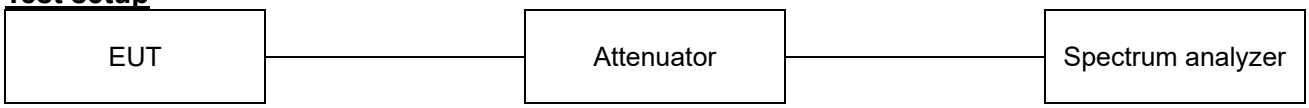
Frequency (㎒)	Factor(㏈)	Frequency (㎒)	Factor(㏈)
30	10.20	9 000	11.36
50	10.04	10 000	11.49
100	10.10	11 000	11.46
200	10.15	12 000	11.63
300	10.21	13 000	11.83
400	10.25	14 000	11.88
500	10.29	15 000	11.84
600	10.32	16 000	11.92
700	10.34	17 000	12.13
800	10.37	18 000	11.99
900	10.41	19 000	12.25
1 000	10.43	20 000	12.31
2 000	10.62	21 000	12.26
3 000	10.78	22 000	12.38
4 000	10.87	23 000	12.58
5 000	11.02	24 000	12.33
6 000	11.03	25 000	12.44
7 000	11.17	26 000	12.53
8 000	11.30	26 500	12.28

Note.
Offset(㏈) = RF cable loss(㏈) + Attenuator(㏈)

7. Test results

7.1. Maximum conducted output power

Test setup



Limit

According to §15.407(a)

Band	EUT category		Limit
UNII-1		Outdoor access point	1 W (30 dBm)
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	250 mW (23.98 dBm)
UNII-2A			250 mW or 11 dBm + 10logB[1)]
UNII-2C			250 mW or 11 dBm + 10logB[1)]
UNII-3	√		1 W (30 dBm)

Note:

1) Conducted output power limit B is the 26 dB emission bandwidth.

Test procedure

ANSI C63.10-2013-Section 12.3.2.4
KDB 789033 D02 v02r01 - Section E.2.d)

Test settings
Used test method is Section E.2.d)

◆ **KDB 789033 D02 v02r01**

Section E.2.d)
Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction):

(i) Measure the duty cycle, x, of the transmitter output signal as described in II.B..
(ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
(iii) Set RBW = 1 ㎒
(iv) Set RBW ≥ 3 ㎒
(v) Number of points in sweep ≥ 2 x span/RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
(vi) Sweep time = auto.
(vii) Detector = power averaging (rms), if available. Otherwise use sample detector mode.
(viii) Do not use sweep triggering. Allow the sweep to “free run.”
(ix) Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
(x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 ㎒ intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
(xi) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10 log(1/0,25) = 6 ㏈ if the duty cycle is 25%.

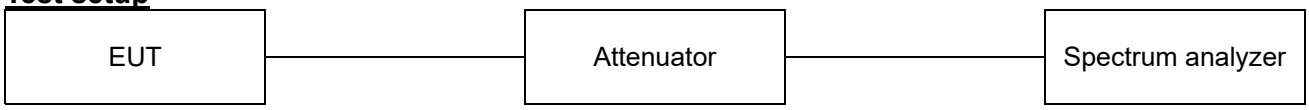
Test results

Test mode	Band	Frequency (㎒)	Measured power (dBm)	DCF (dB)	Conducted output power (dBm)	Conducted Power Limit (dBm)
					Average	
802.11a	UNII-1	5 180	13.64	0.30	13.94	23.98
		5 200	13.54		13.84	
		5 240	13.49		13.79	
	UNII-3	5 745	12.14		12.44	30.00
		5 785	12.32		12.62	
		5 825	12.62		12.92	
802.11n HT20	UNII-1	5 180	13.34	0.32	13.66	23.98
		5 200	13.37		13.69	
		5 240	13.29		13.61	
	UNII-3	5 745	11.92		12.24	30.00
		5 785	11.98		12.30	
		5 825	12.27		12.59	
802.11n HT40	UNII-1	5 190	9.74	0.62	10.36	23.98
		5 230	9.69		10.31	
	UNII-3	5 755	11.29		11.91	30.00
		5 795	11.47		12.09	
802.11ac VHT80	UNII-1	5 210	6.92	1.16	8.08	23.98
	UNII-3	5 775	10.45		11.61	30.00

Note.
1. Result(dBm) = Reading Power + D.C.F

7.2. Maximum Power Spectral Density

Test setup



Limit

According to §15.407(a)

Band	EUT category		Limit
UNII-1		Outdoor access point	17 dBm/㎒
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	11 dBm/㎒
UNII-2A			11 dBm/㎒
UNII-2C			11 dBm/㎒
UNII-3	√		30 dBm/500 ㎑

Notes:

If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain if the antenna exceed 6 dBi

Test procedure

KDB 789033 D02 v02r01 - Section F
ANSI C63.10-2013

Test settings

Section F

The rules requires “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission. Refer to III.A for additional guidance for devices that use channel aggregation.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled,
   “Compute power….” (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Search function on the instrument to find the peak of the spectrum and record its value.
3. Adjustments to the peak value of the spectrum, if applicable:

   a) If Method SA-2 or SA-2 Alternative was used, add 10 log (1/x), where x is the duty cycle, to the peak of the spectrum.
   b) If Method SA-3 Alternative was used and the linear mode was used in II.E.2.g) (viii), add 1 dB to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1 ㎒ reference bandwidth
5. For devices operating in the bands 5.15-5.25 ㎓, 5.25-5.35 ㎓, and 5.47-5.725 ㎓, the preceding procedures make use of 1 ㎒ RBW to satisfy directly the 1 ㎒ reference bandwidth specified in Section 15.407(a)(5). For devices operating in the band 5.725-5.85 ㎓,

the rules specify a measurement bandwidth of 500 ㎑. Many spectrum analyzers do not have 500 ㎑ RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1 ㎒, or 500 ㎑, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth (i.e., 1 ㎒, or 500 ㎑). If measurements are performed using a reduced resolution bandwidth (< 1 ㎒, or < 500 ㎑) and integrated over 1 ㎒, or 500 ㎑ bandwidth, the following adjustments to the procedures apply:

a) Set RBW ≥ 1/T, where T is defined in II.B.I.a).
b) Set VBW ≥ 3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 ㎑, add 10 log (500 ㎑ /RBW) to the measured result, whereas RBW (< 500 ㎑) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 ㎒, add 10 log (1 ㎒/RBW) to the measured result, whereas RBW (< 1 ㎒) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Notes:

1. As a practical matter, it is recommended to use reduced RBW of 100 ㎑ for the II.F.5.c) and II.F.5.d), since RBW = 100 ㎑ is available on nearly all spectrum analyzers.

Test results

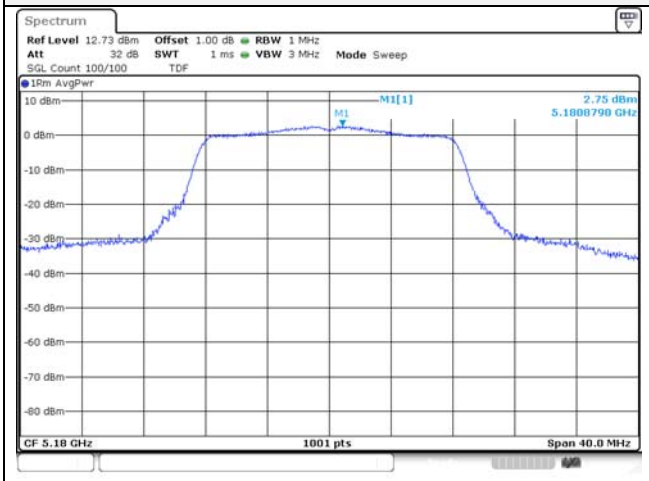
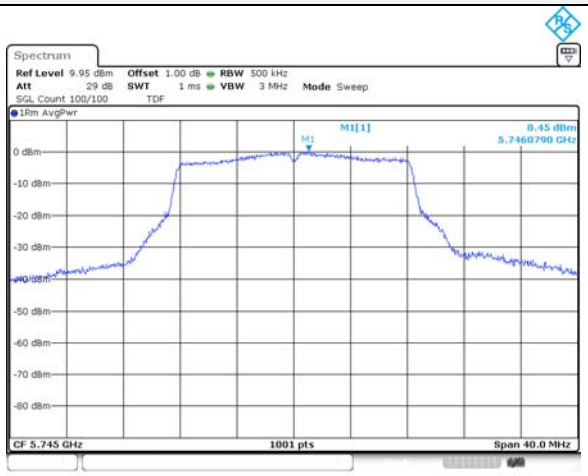
Test mode	Band	Frequency (㎒)	Measured PSD (dB m/㎒)	DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dB m/㎒)
802.11a	UNII-1	5 180	2.75	0.30	3.05	11
		5 200	2.19		2.49	
		5 240	3.05		3.35	
802.11n HT20		5 180	2.30	0.32	2.62	
		5 200	1.75		2.07	
		5 240	2.46		2.78	
802.11n HT40		5 190	-4.20	0.62	-3.58	
		5 230	-4.40		-3.78	
802.11ac VHT80		5 210	-10.10	1.16	-8.94	

Test mode	Band	Frequency (㎒)	Measured PSD (dBm)	DCF (dB)	Maximum PSD (dBm/ 500 ㎑)	Limit (dBm/ 500 ㎑)
802.11a	UNII-3	5 745	0.45	0.30	0.74	30
		5 785	1.91		2.21	
		5 825	0.60		0.90	
802.11n HT20		5 745	-0.22	0.32	0.10	
		5 785	1.26		1.58	
		5 825	-0.05		0.27	
802.11n HT40		5 755	-3.47	0.62	-2.85	
		5 795	-2.21		-1.59	
802.11ac VHT80		5 775	-6.04	1.16	-4.88	

Notes:

1. Maximum PSD calculation

- Maximum PSD = Measured PSD + DCF

UNII-1 / 802.11a / 5 180 ㎒	UNII-3 / 802.11a / 5 745 ㎒
	
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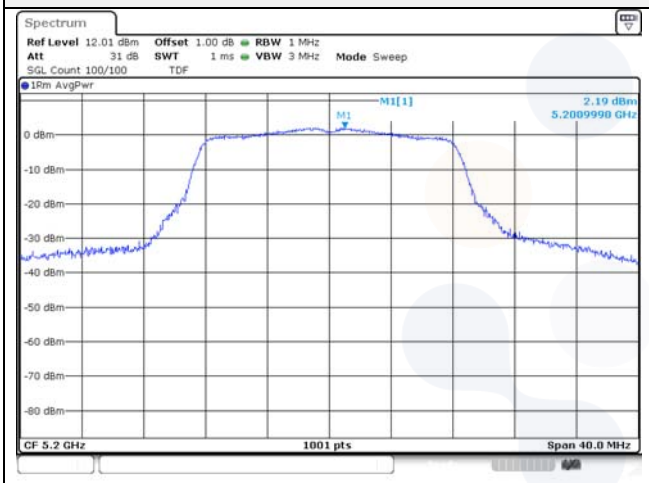
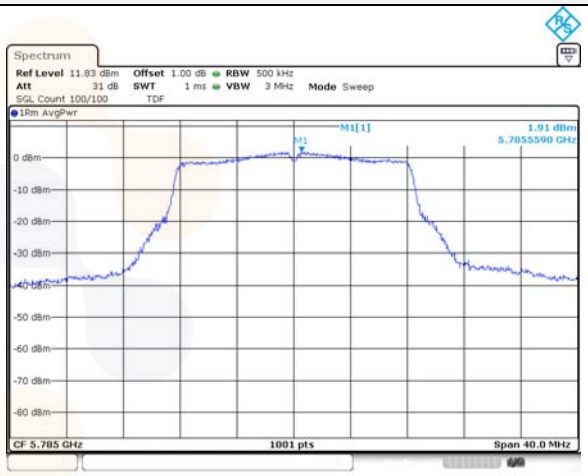
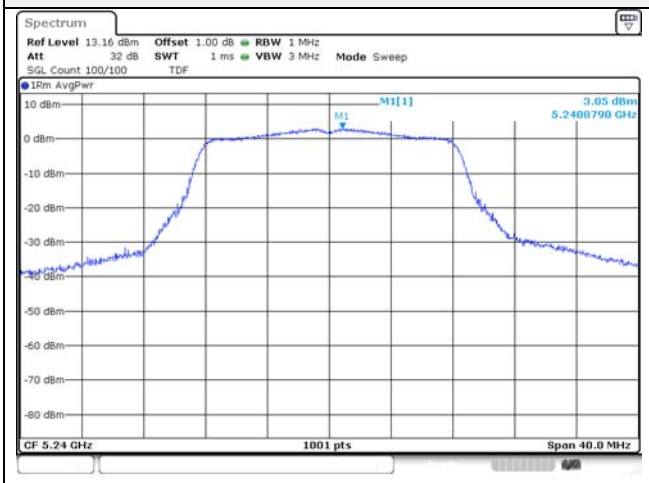
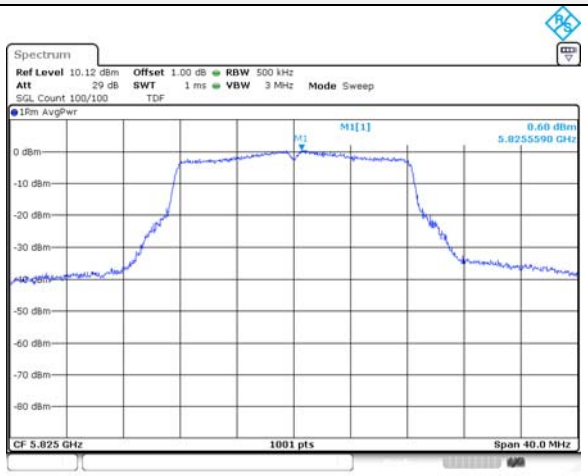
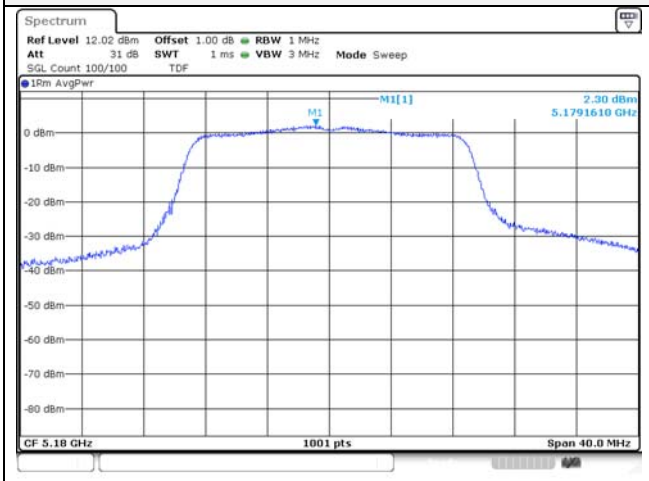
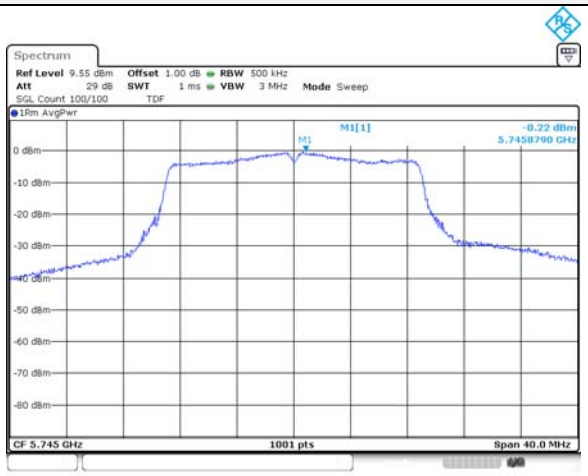
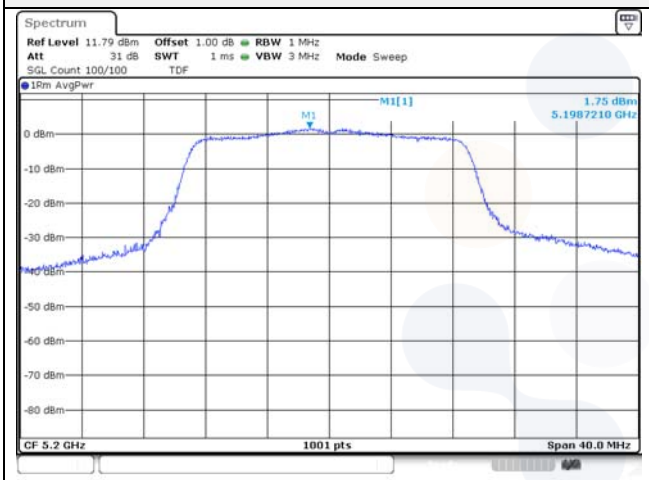
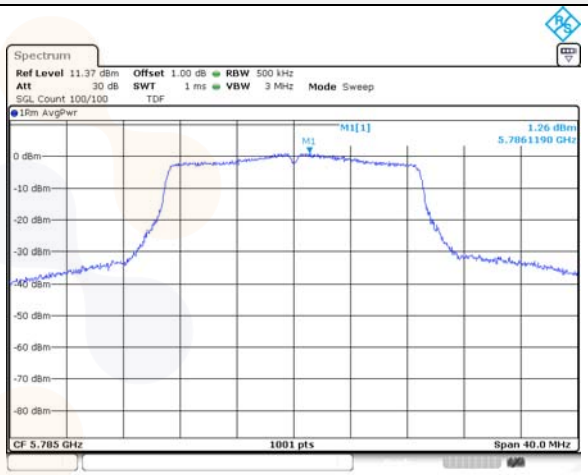
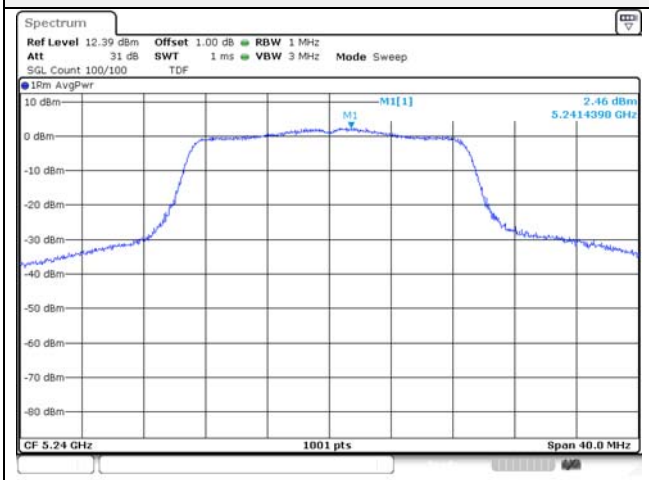
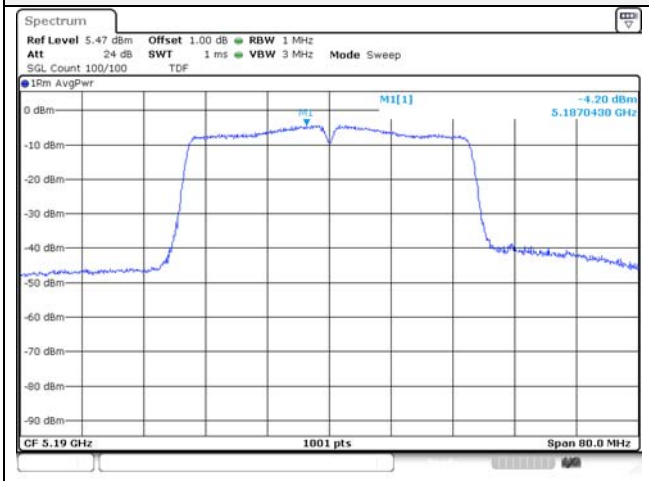
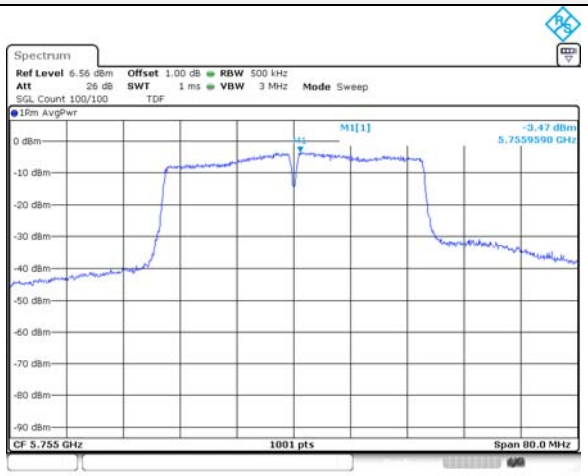
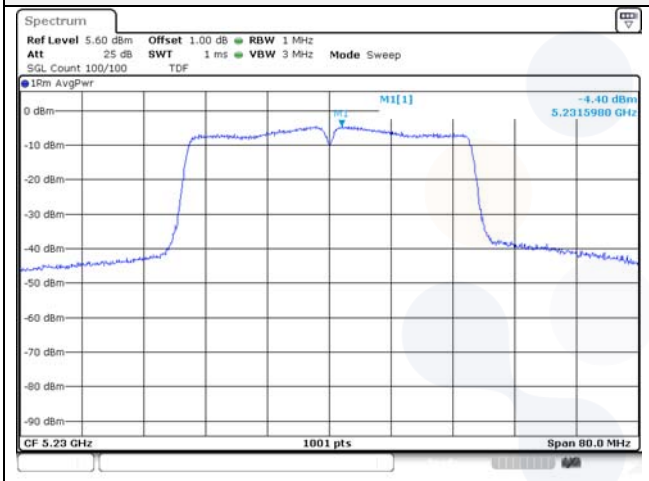
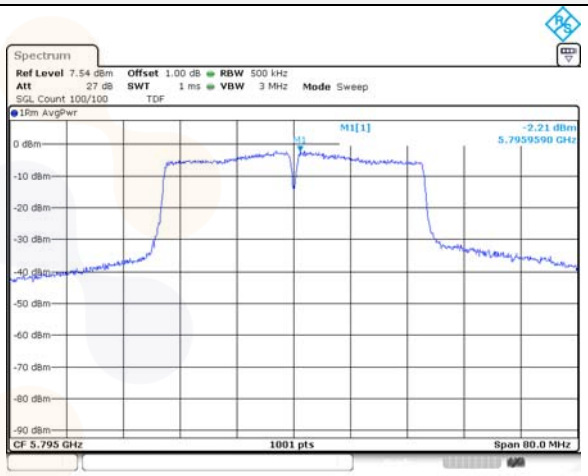
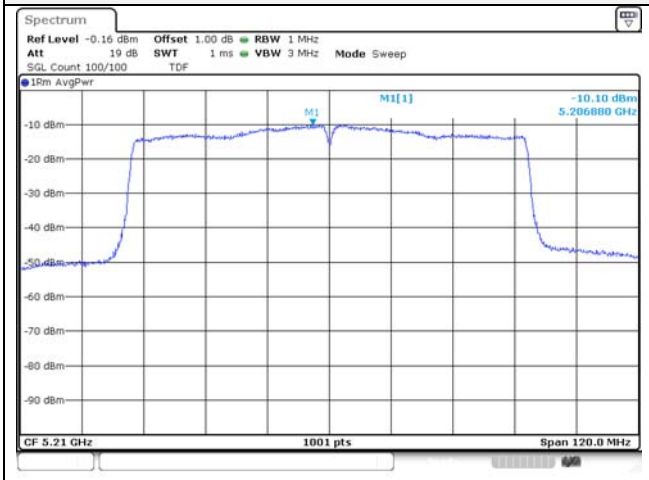
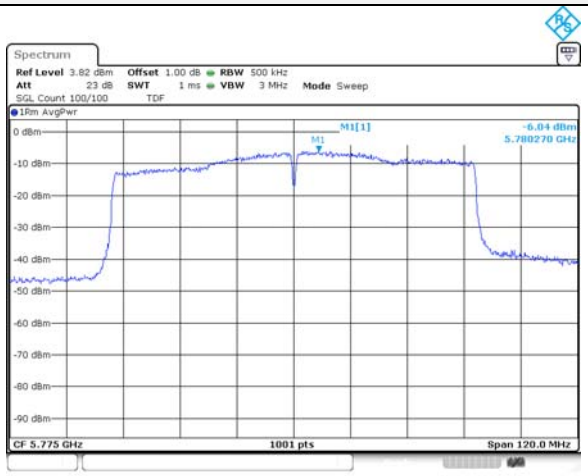
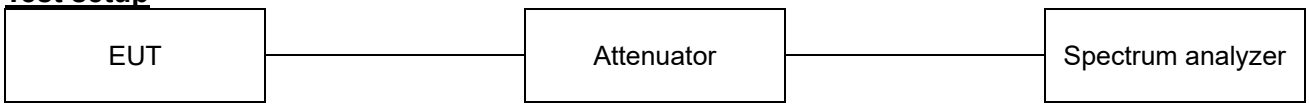
	
UNII-1 / 802.11a / 5 240 ㎒	**UNII-3 / 802.11a / 5 825 ㎒**
	

UNII-1 / 802.11n HT20 / 5 180 ㎒	UNII-3 / 802.11n HT20 / 5 745 ㎒
	
UNII-1 / 802.11n HT20 / 5 200 ㎒	**UNII-3 / 802.11n HT20 / 5 785 ㎒**
	
UNII-1 / 802.11n HT20 / 5 240 ㎒	**UNII-3 / 802.11n HT20 / 5 825 ㎒**
	

UNII-1 / 802.11n HT40 / 5 190 ㎒	UNII-3 / 802.11n HT40 / 5 755 ㎒
	
UNII-1 / 802.11n HT40 / 5 230 ㎒	**UNII-3 / 802.11n HT40 / 5 795 ㎒**
	
UNII-1 / 802.11ac VHT80 / 5 210 ㎒	**UNII-3 / 802.11ac VHT80 / 5 775 ㎒**
	

7.3. 26 dB Bandwidth & 99% Bandwidth

Test setup



Limit

N/A

Test procedure

ANSI C63.10-2013 Section 12.4
KDB 789033 D02 v02r01 - Section C.1 (26dB bandwidth)
KDB 789033 D02 v02r01 - Section D (99% bandwidth)

Test settings

1. 26 dB Bandwidth

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. 99% Occupied Bandwidth

1. Set center frequency to the nominal EUT channel center frequency.
2. Set span = 1.5 times to 5.0 times the OBW.
3. Set RBW = 1% to 5% of the OBW
4. Set VBW ≥ 3 x RBW
5. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
6. Use the 99% power bandwidth function of the instrument (if available).
7. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Test results

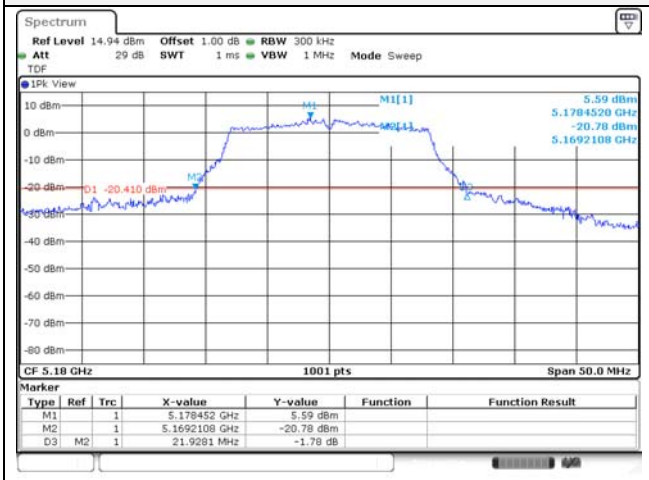
Test mode	Band	Frequency(㎒)	26 ㏈ bandwidth (㎒)	99% bandwidth (㎒)
802.11a	UNII-1	5 180	21.93	17.28
		5 200	22.73	17.68
		5 240	21.83	17.73
802.11n HT20		5 180	23.23	18.18
		5 200	24.73	18.13
		5 240	22.28	18.23
802.11n HT40		5 190	40.16	36.36
		5 230	40.56	36.46
11ac VHT80		5 210	81.88	75.52

Note.

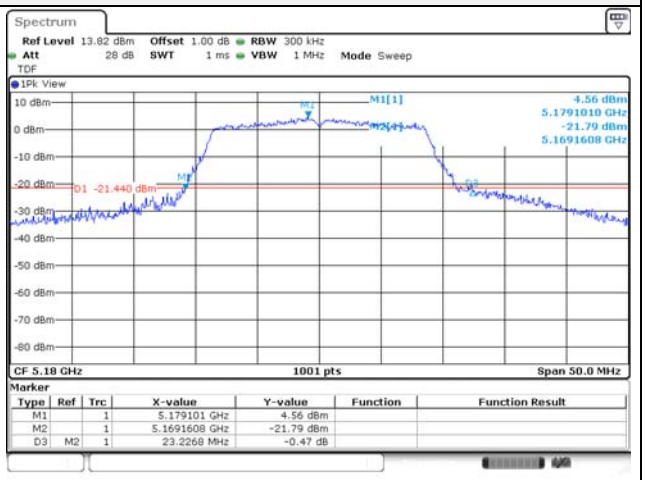
If 26㏈ Bandwidth across Band 2A or Band 1 but 99% test results are within the band no addition DFS test is needed on band 1.

26 dB bandwidth

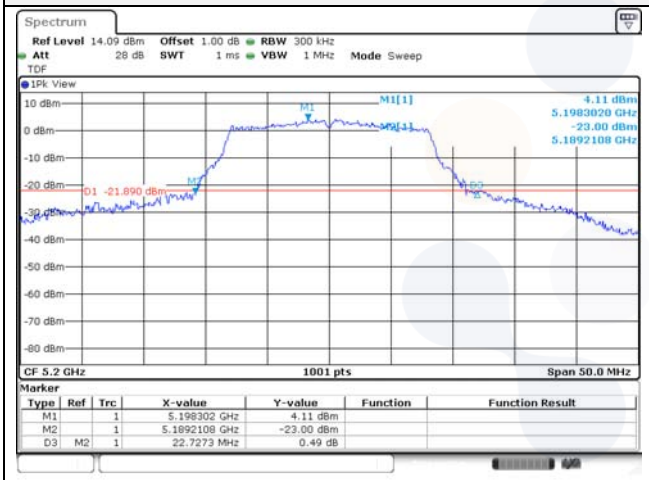
UNII-1 / 802.11a / 5 180 ㎒



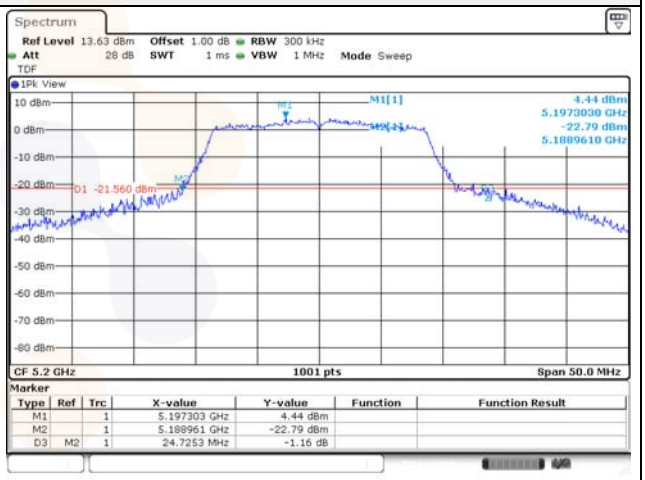
UNII-1 / 802.11n HT20 / 5 180 ㎒



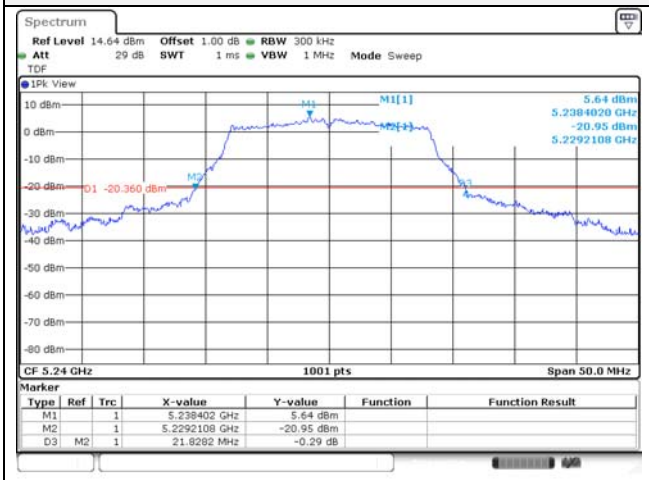
UNII-1 / 802.11a / 5 200 ㎒



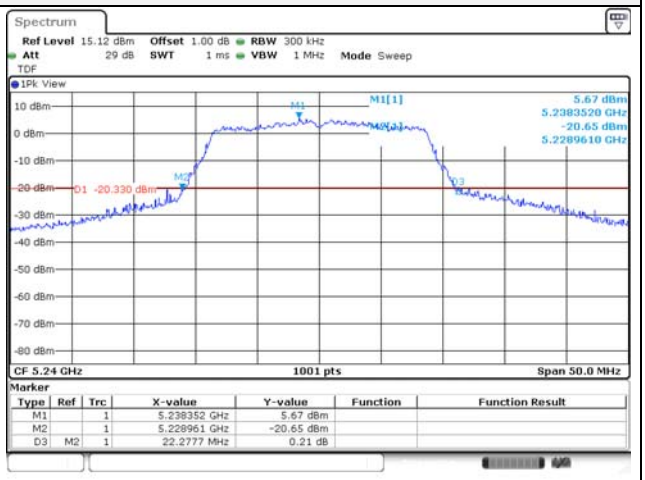
UNII-1 / 802.11n HT20 / 5 200 ㎒

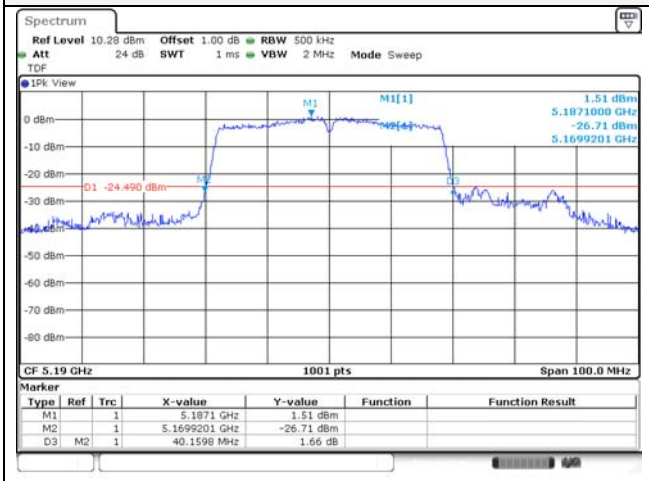
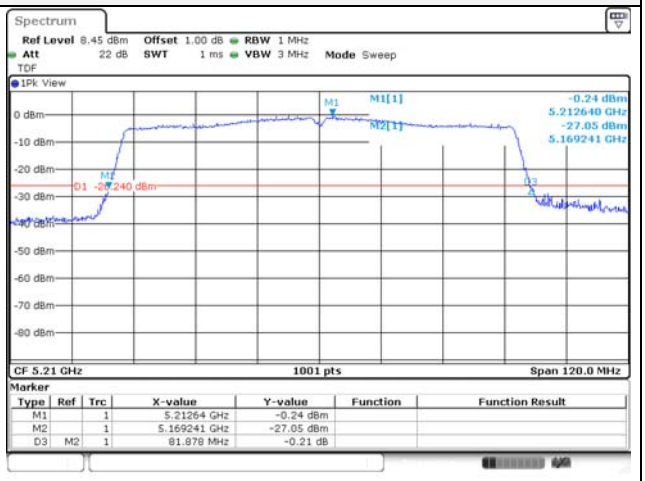
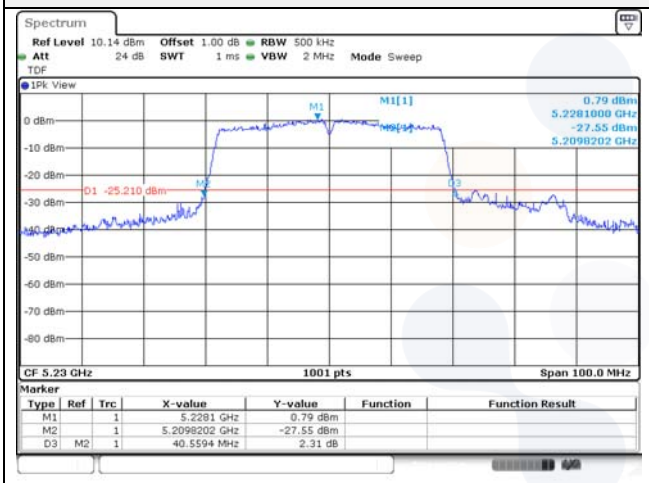


UNII-1 / 802.11a / 5 240 ㎒



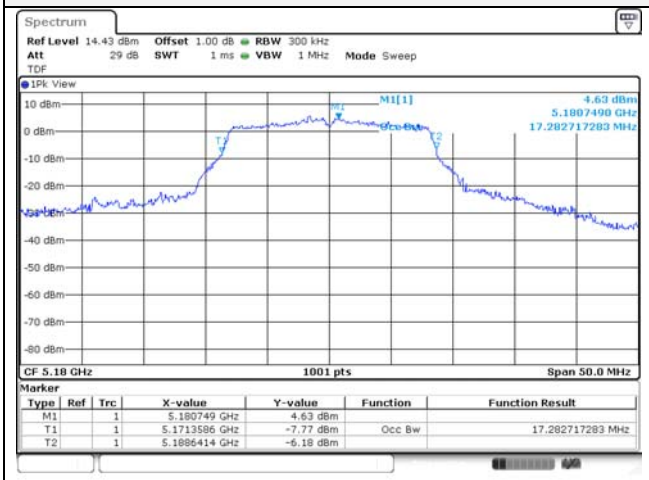
UNII-1 / 802.11n HT20 / 5 240 ㎒



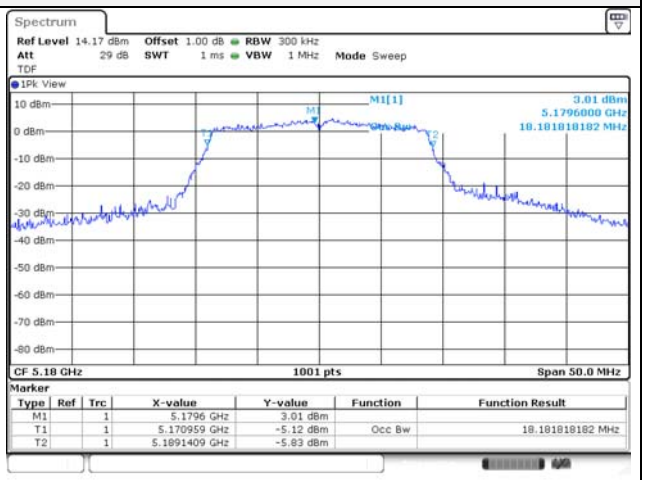
UNII-1 / 802.11n HT40 / 5 190 ㎒	UNII-1 / 802.11ac VHT80 / 5 210 ㎒
	
UNII-1 / 802.11n HT40 / 5 230 ㎒	
	Blank

99% bandwidth

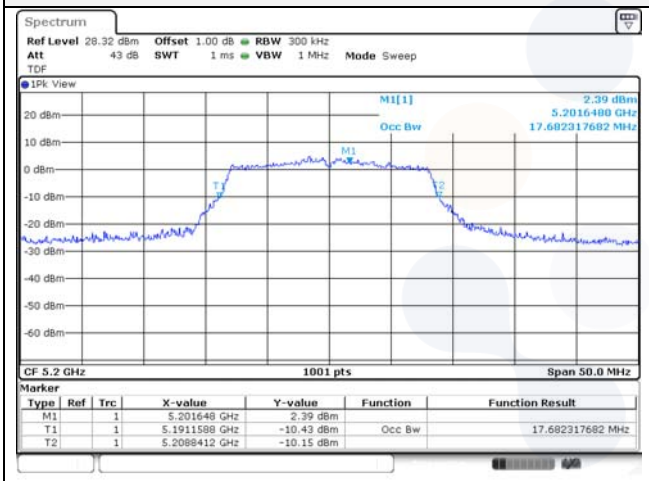
UNII-1 / 802.11a / 5 180 ㎒



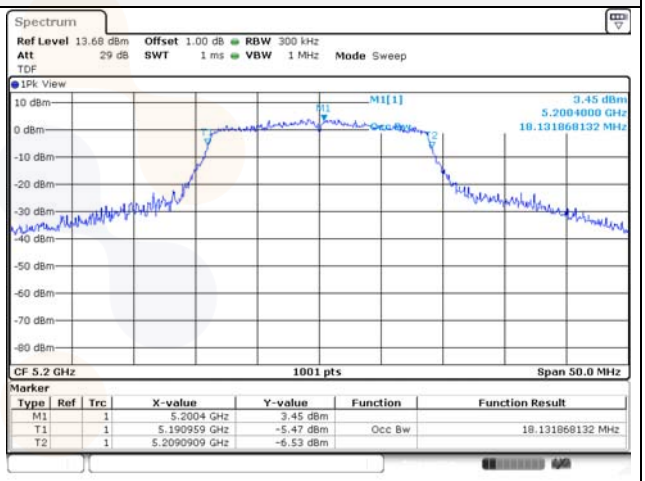
UNII-1 / 802.11n HT20 / 5 180 ㎒



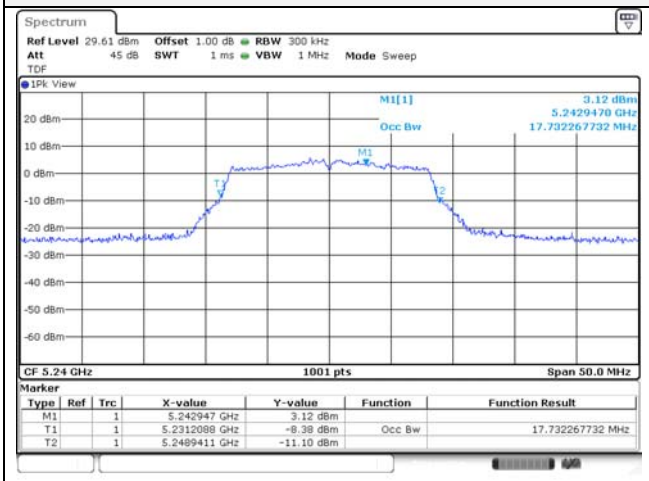
UNII-1 / 802.11a / 5 200 ㎒



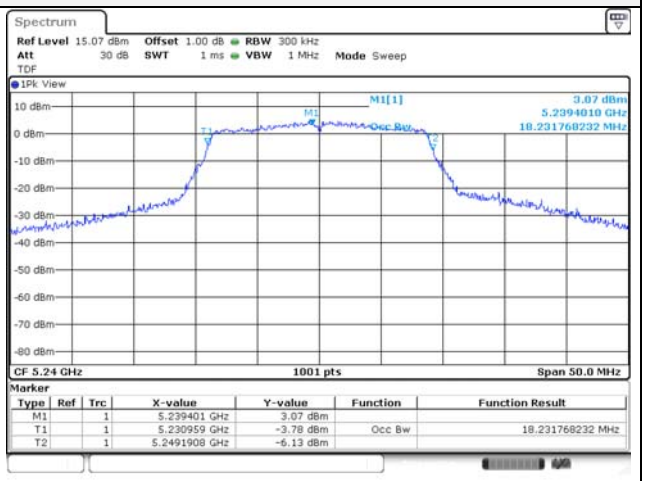
UNII-1 / 802.11n HT20 / 5 200 ㎒

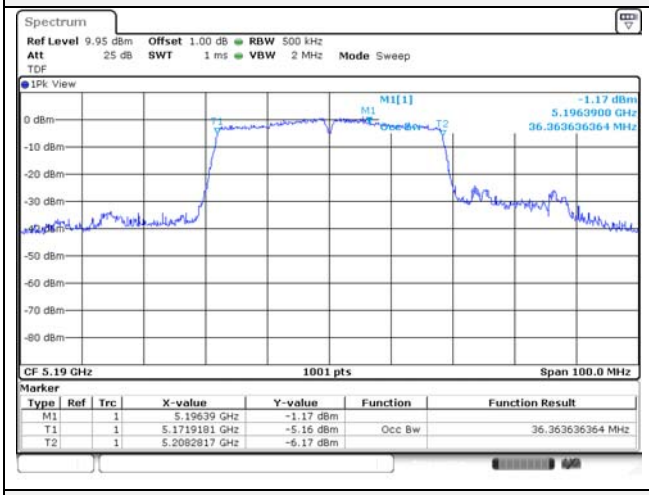
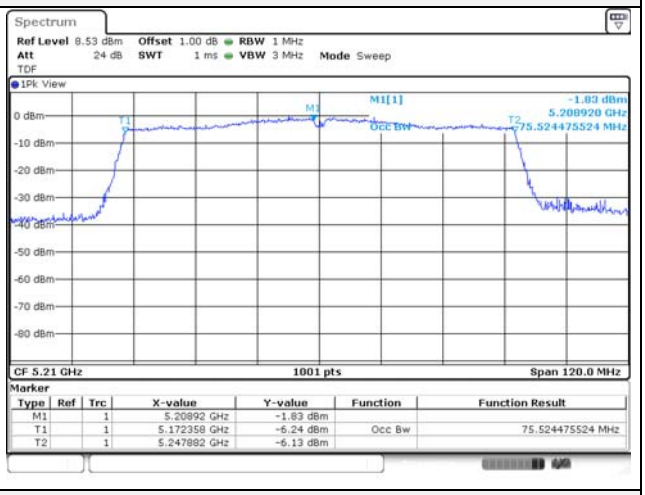


UNII-1 / 802.11a / 5 240 ㎒



UNII-1 / 802.11n HT20 / 5 240 ㎒



UNII-1 / 802.11n HT40 / 5 190 ㎒	UNII-1 / 802.11ac VHT80 / 5 210 ㎒
	
UNII-1 / 802.11n HT40 / 5 230 ㎒	
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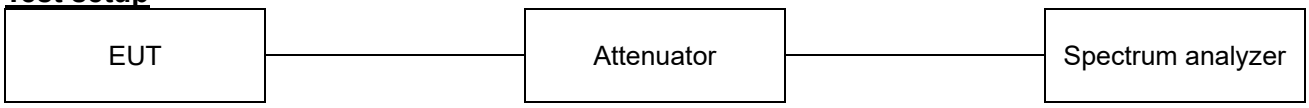
7.4. 6 dB Bandwidth

Test setup



Limit

According to §15.407(e), Within the 5.725-5.850 ㎓ band, the minimum 6 ㏈ bandwidth if U-NII devices shall be at least 500㎑

Test procedure

ANSI C63.10-2013 – Section 6.9.2
KDB 789033 D02 v02r01 - Section C.2

Test settings

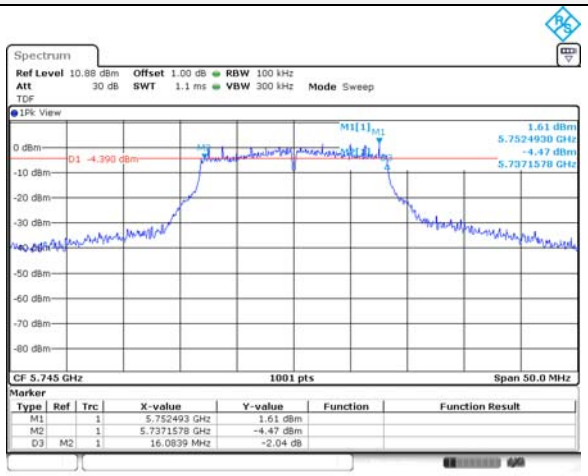
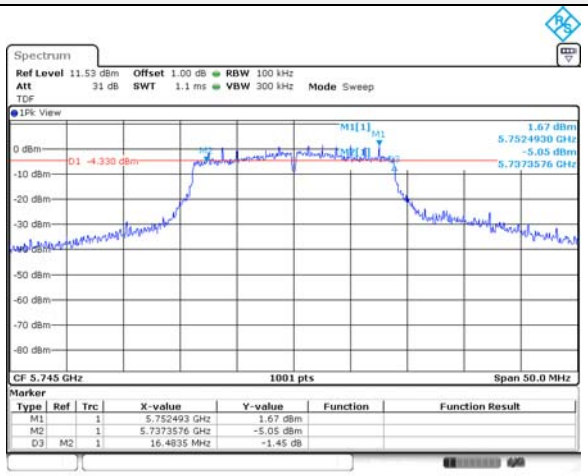
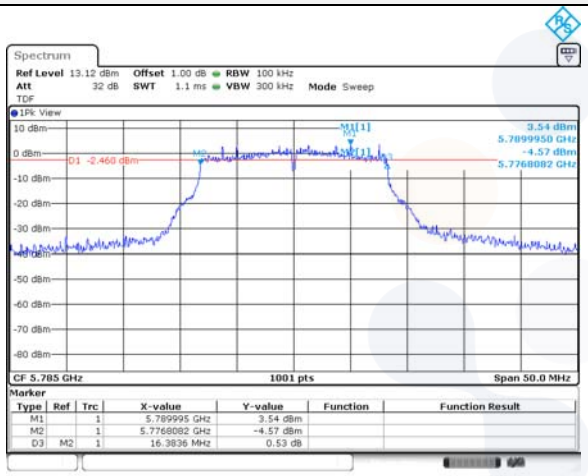
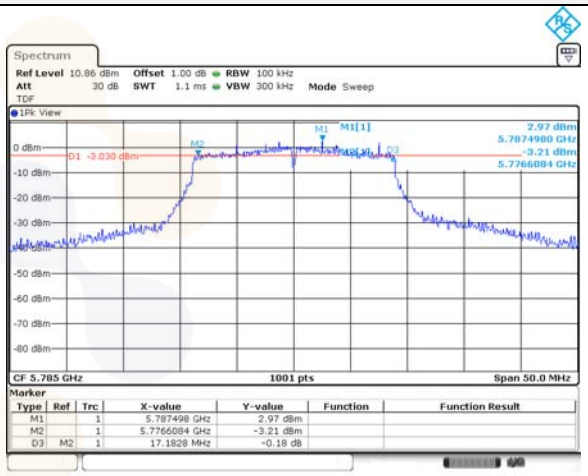
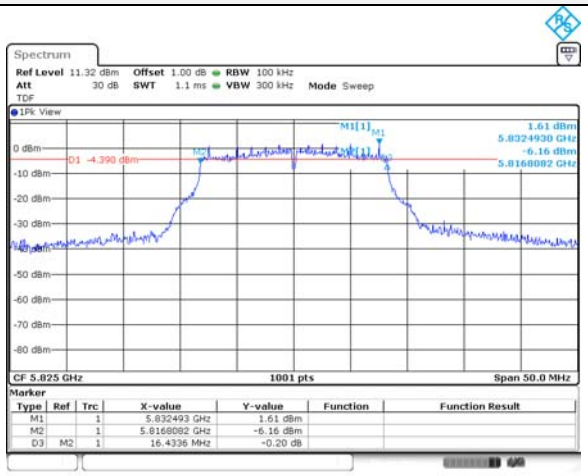
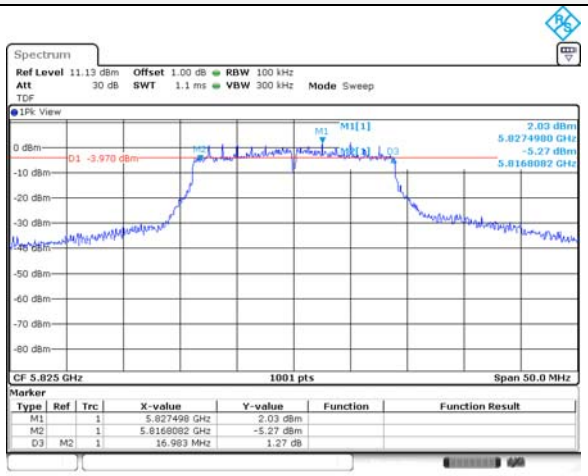
Minimum Emission Bandwidth for the band 5.725−5.85 ㎓ and 5.850–5.895 ㎓.

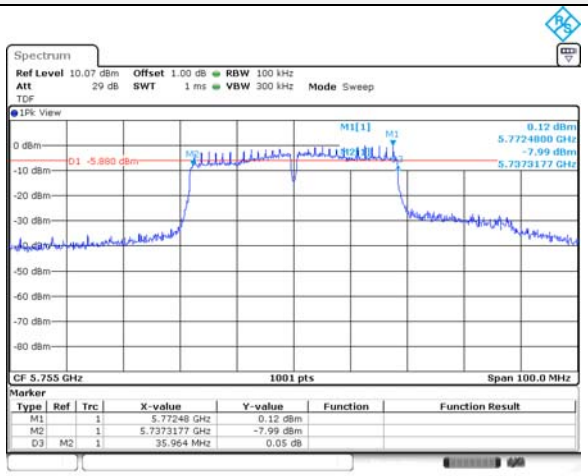
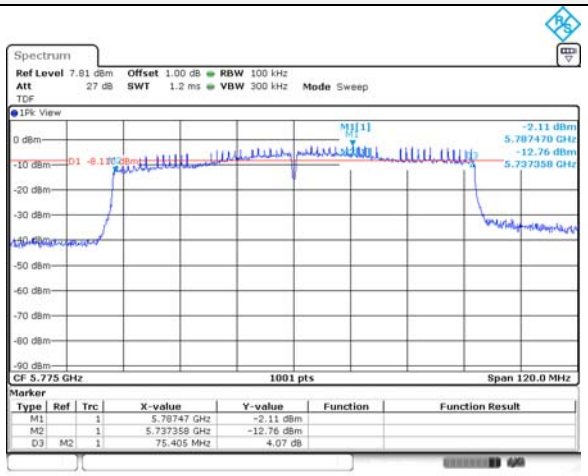
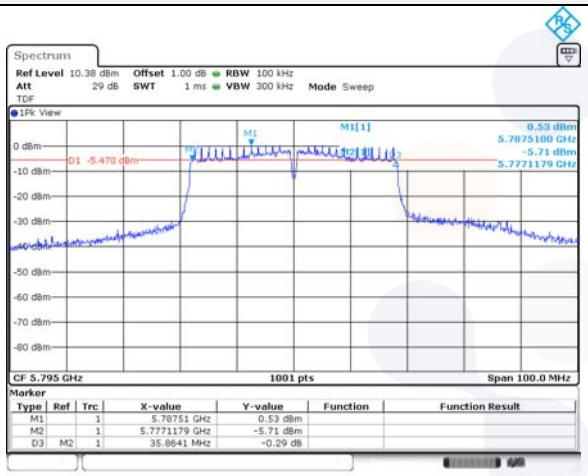
Section 15.407(e) specifies the minimum 6 ㏈ emission bandwidth of at least 500 ㎑ for the band 5.725−5.85 ㎓ and 5.850-5.895 ㎓ band. The following procedure shall be used for measuring this Bandwidth:

1. Set RBW = 100 ㎑.
2. Set the video bandwidth (VBW) ≥ 3 RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. 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 ㏈ relative to the maximum level measured in the fundamental emission.

Test results

Test mode	Band	Frequency (㎒)	6㏈ bandwidth (㎒)	Limit (㎒)
11a	UNII-3	5 745	16.08	0.5
		5 785	16.38	
		5 825	16.43	
11n HT20		5 745	16.48	
		5 785	17.18	
		5 825	16.98	
11n HT40		5 755	35.96	
		5 795	35.86	
11ac VHT80		5 775	75.40	

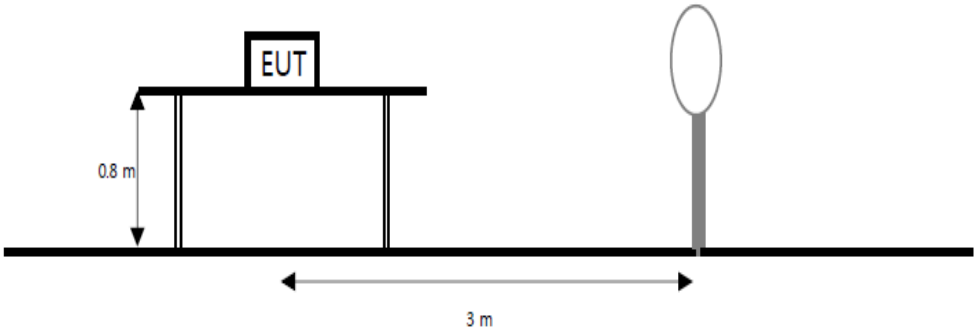
UNII-3 / 802.11a / 5 745 ㎒	UNII-3 / 802.11n HT20 / 5 745 ㎒
	
UNII-3 / 802.11a / 5 785 ㎒	**UNII-3 / 802.11n HT20 / 5 785 ㎒**
	
UNII-3 / 802.11a / 5 825 ㎒	**UNII-3 / 802.11n HT20 / 5 825 ㎒**
	

UNII-3 / 802.11n HT40 / 5 755 ㎒	UNII-3 / 802.11ac VHT80 / 5 775 ㎒
	
UNII-3 / 802.11n HT40 / 5 795 ㎒	
	Blank

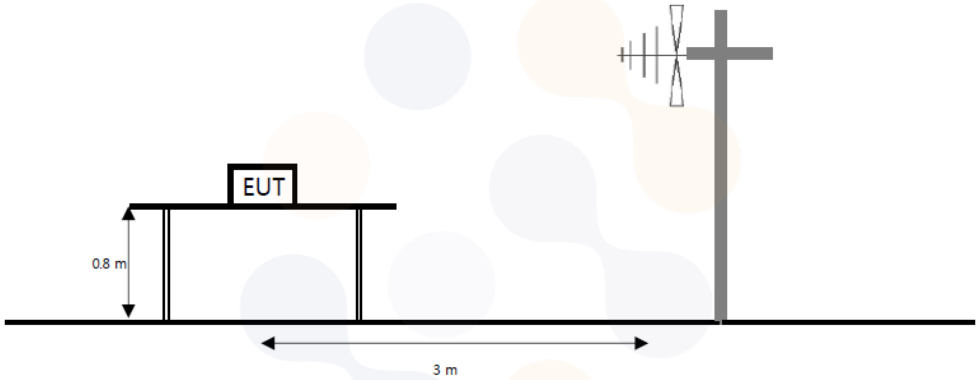
7.5. Spurious Emission, Band Edge and Restricted bands

Test setup

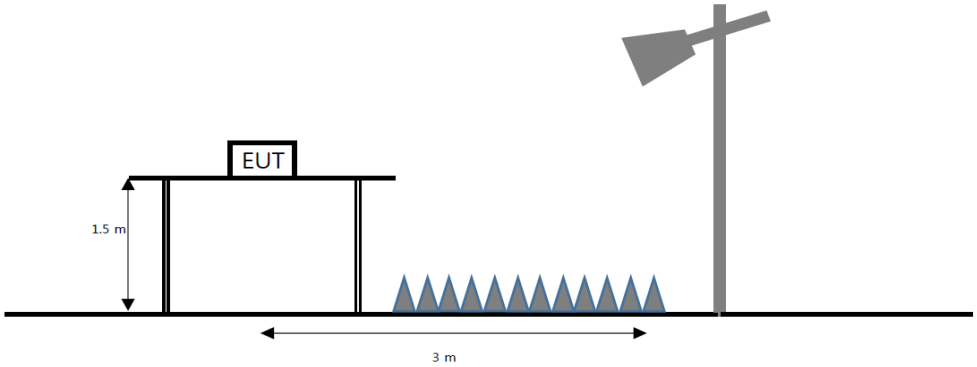
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 ㎓ to the tenth harmonic of the highest fundamental frequency or to 40 ㎓ emissions, whichever is lower.



Limit

According to section 15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (㎒)	Field strength (㎶/m)	Measurement distance (m)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	30
1.705 - 30	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54–72 ㎒, 76–88 ㎒, 174–216 ㎒ or 470–806 ㎒. However, operation within these frequency bands is permitted under other sections of this part, e.g., Section15.231 and 15.241.

According to section 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

㎒	㎒	㎒	㎓
0.009 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 – 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 – 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 – 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 – 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 – 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 – 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 – 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 – 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.386 75	156.7 - 156.9	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 – 4 400	Above 38.6
13.36 - 13.41			

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in section 15.209. At frequencies equal to or less than 1 000 ㎒, compliance with the limits in section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 ㎒, compliance with the emission limits in section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in section 15.35 apply to these measurements.

According to section 15.407(b), undesirable emission limits. Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

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

For transmitters operating in the 5.725-5.85 ㎓ band: All emissions shall be limited to a level of -27 ㏈m/㎒ at 75 ㎒ or more above or below the band edge increasing linearly to 10 ㏈m/㎒ at 25 ㎒ above or below the band edge, and form 25 ㎒ above or below the band edge increasing linearly to a level of 15.6 ㏈m/㎒ at 5 ㎒ above or below the band edge, and from 5 ㎒ above or below the band edge increasing linearly to a level of 27 ㏈m/㎒ at the band edge.

Test procedure

ANSI C63.10-2013 Section 12.7.5, 12.7.6, 12.7.7.2
KDB 789033 D02 V02r01 – Section G

Test settings

Peak field strength measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW ≥ (3×RBW)
4. Detector = peak
5. Sweep time = auto
6. Trace mode = max hold
7. Allow sweeps to continue until the trace stabilizes

Table. RBW as a function of frequency

Frequency	RBW
9 ㎑ to 150 ㎑	200 ㎐ to 300 ㎐
0.15 ㎒ to 30 ㎒	9 ㎑ to 10 ㎑
30 ㎒ to 1 000 ㎒	100 ㎑ to 120 ㎑
> 1 000 ㎒	1 ㎒

Average field strength measurements

Trace averaging with continuous EUT transmission at full power

If the EUT can be configured or modified to transmit continuously (D ≥ 98%), then the average emission levels shall be measured using the following method (with EUT transmitting continuously):

1. RBW = 1 ㎒ (unless otherwise specified).
2. VBW ≥ (3×RBW).
3. Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
4. Averaging type = power (i.e., rms):
   1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
   2) Some instruments require linear display mode to use linear voltage averaging. Log or ㏈ averaging shall not be used.
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.

Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (D ≥ 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±2%), then the following procedure shall be used:

1. The EUT shall be configured to operate at the maximum achievable duty cycle.
2. Measure the duty cycle D of the transmitter output signal as described in 11.6.
3. RBW = 1 ㎒ (unless otherwise specified).
4. VBW ≥ [3 × RBW].
5. Detector = RMS (power averaging), if [span / (# of points in sweep)] ≤ (RBW / 2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.

6. Averaging type = power (i.e., rms):
   1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
   2) Some instruments require linear display mode to use linear voltage averaging. Log or dB averaging shall not be used.
7. Sweep time = auto.
8. Perform a trace average of at least 100 traces.
9. 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 step f), then the applicable correction factor is [10 log (1 / D)], where D is the duty cycle.
   2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / D)], where D is the duty cycle.
   3) If a specific emission is demonstrated to be continuous (D ≥ 98%) rather than turning ON and OFF with with the transmit cycle, then no duty cycle correction is required for that emission.

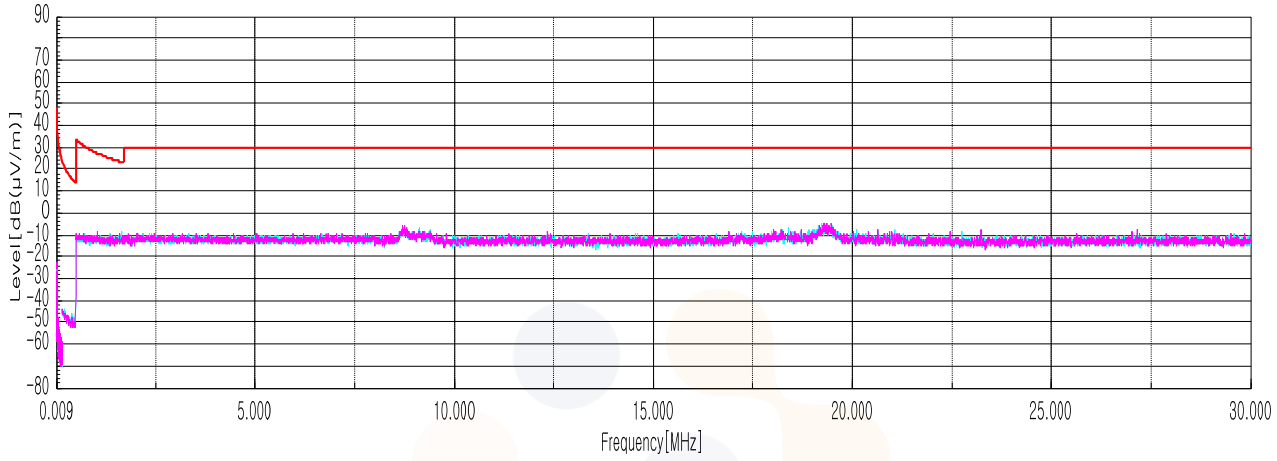
Notes:

1. *f* <30 ㎒, extrapolation factor of 40 dB/decade of distance. $F_d = 40\log(D_m/D_s)$
   f ≥30 ㎒, extrapolation factor of 20 dB/decade of distance. $F_d = 20\log(D_m/D_s)$
   Where:
   F_d= Distance factor in dB
   D_m= Measurement distance in meters
   D_s= Specification distance in meters
2. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or F_d(dB)
3. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
4. Average test would be performed if the peak result were greater than the average limit.
5. 1) means restricted band.
6. According to part 15.31(f)(2), an extrapolation factor of 40 dB/decade is applied because measured distance of radiated emission is 3m
7. Below 30 ㎒ frequency range, In order to search for the worst result, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported. when the emission level was higher than 20 dB of the limit, then the following statement shall be made: “No spurious emissions were detected within 20 dB of the limit.”
8. For above 1 ㎓ pre-scan to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 ㎒; the video bandwidth is set to 30 ㎑ for peak measurements.

Test results (Below 30 ㎒) – Worst case: 802.11a_UNII 1_ 5 180 ㎒

Frequency	Pol.	Reading	Cable Loss	Amp Gain	Antenna Factor	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
No spurious emissions were detected within 20 ㏈ of the limit.									

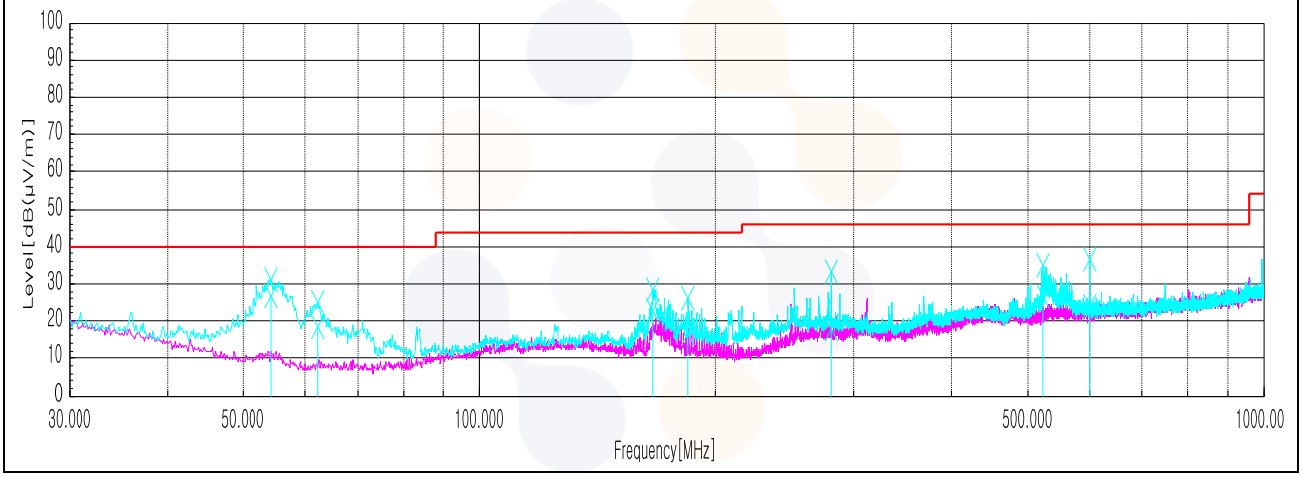
Horizontal/Vertical



Test results (Below 1 000 ㎒) – Worst case: 802.11a_UNII 1_ 5 180 ㎒

Frequency	Pol.	Reading	Amp. + Cable	Antenna Factor	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
54.25	V	43.50	12.63	-29.49	-	26.64	40.00	13.36
62.13	V	35.70	12.11	-29.35	-	18.46	40.00	21.54
166.41[1)]	V	35.10	15.60	-27.66	-	23.04	43.50	20.46
184.59	V	29.10	14.86	-27.47	-	16.49	43.50	27.01
281.11[1)]	V	25.50	18.72	-26.21	-	18.01	46.00	27.99
523.25	V	27.40	23.40	-23.89	-	26.91	46.00	19.09
600.00	V	22.90	24.50	-23.31	-	24.09	46.00	21.91

Horizontal/Vertical



Test results (Above 1 000 ㎒)

802.11a_UNII 1

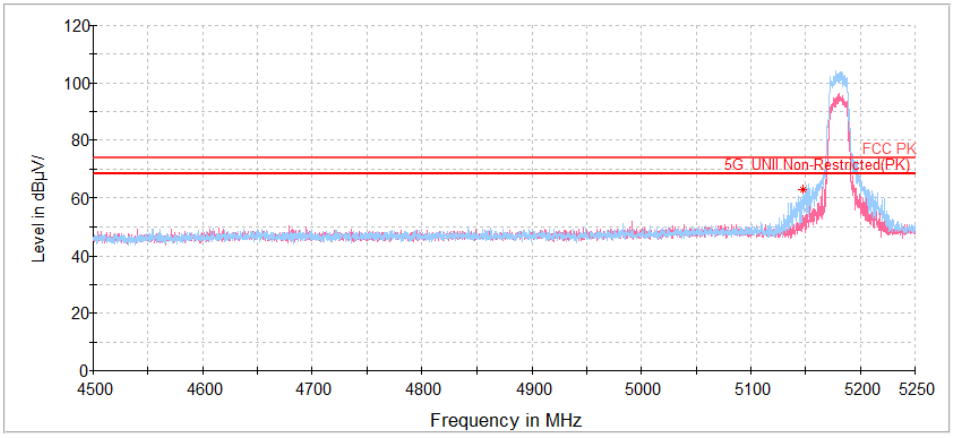
Lowest Channel (5 180 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 149.61[1)]	H	52.87	33.88	-23.99	-	62.76	74.00	11.24
9 473.83[1)]	V	60.15	36.27	-49.01	-	47.41	74.00	26.59
10 292.84	V	57.25	37.03	-48.04	-	46.24	68.20	21.96
15 498.39[1)]	V	56.49	40.20	-47.41	-	49.28	74.00	24.72
Average Data								
5 149.61[1)]	H	39.29	33.88	-23.99	0.30	49.48	54.00	4.52

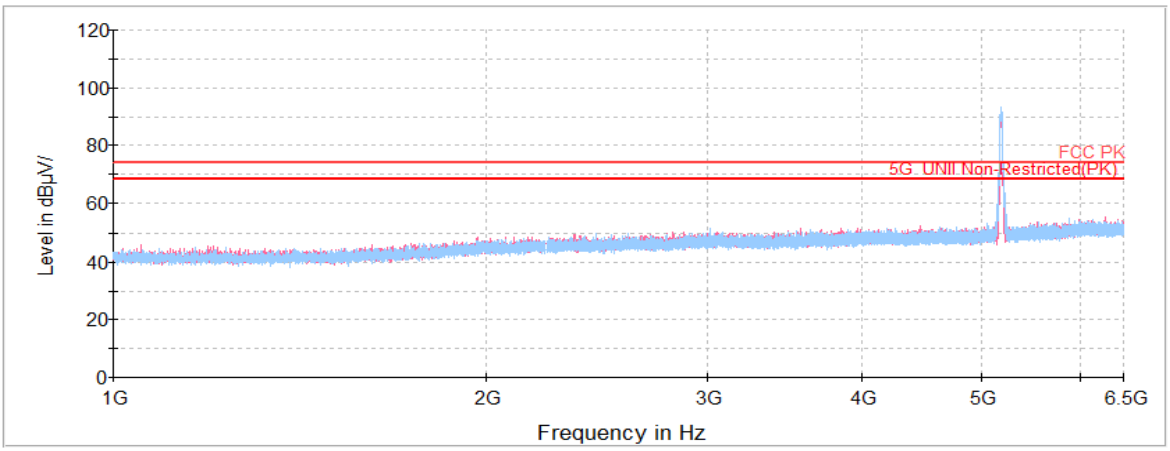
Average data

Blank

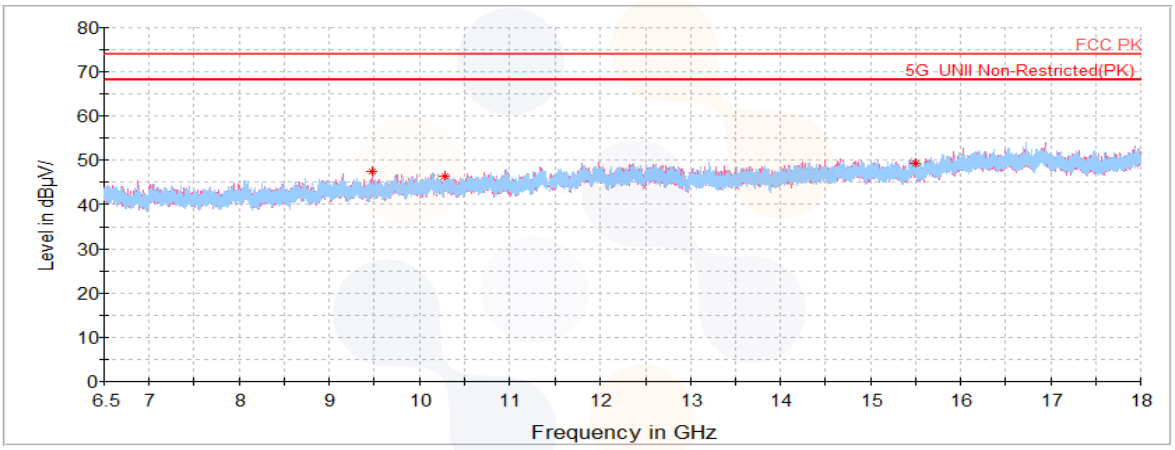
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



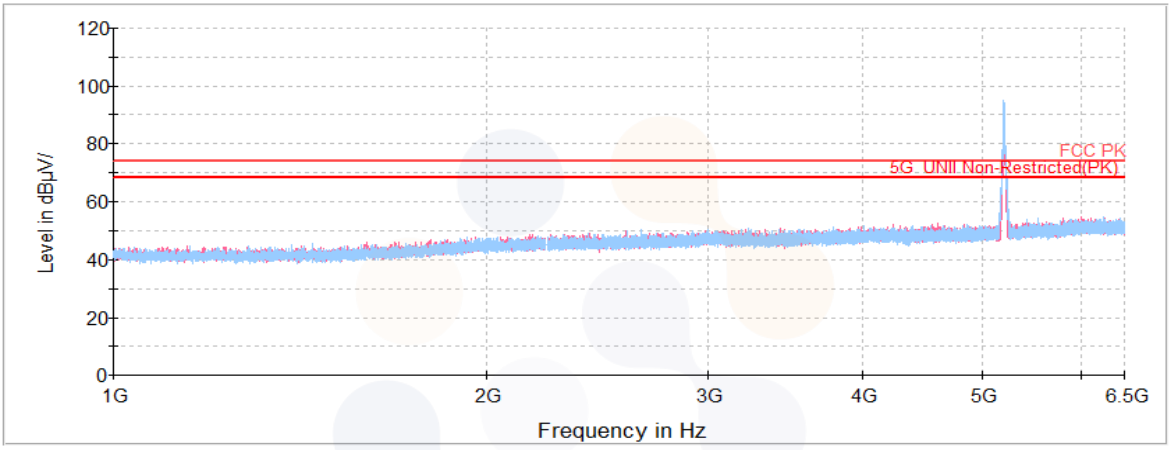
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



Middle Channel (5 200 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 390.23	V	56.64	37.11	-47.95	-	45.80	68.20	22.40
15 610.16[1)]	H	56.55	40.39	-47.19	-	49.75	74.00	24.25
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓

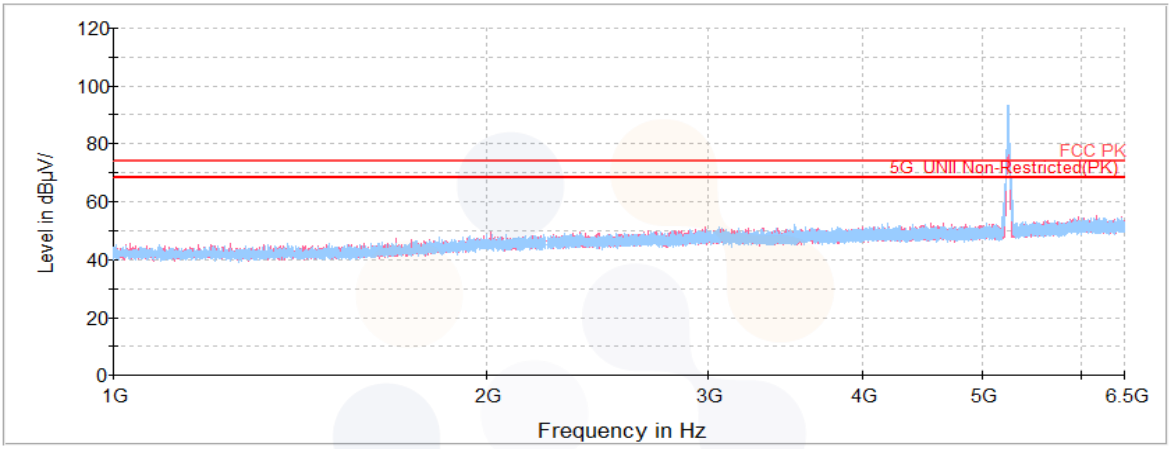


Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

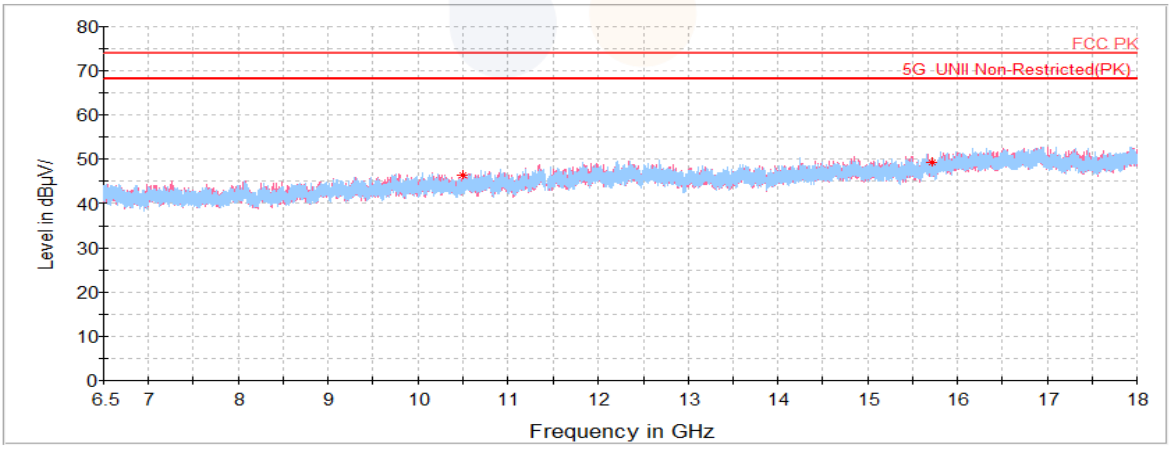
Highest Channel (5 240 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 506.31	H	56.99	37.20	-47.86	-	46.33	68.20	21.87
15 720.84[1)]	V	55.78	40.48	-46.98	-	49.28	74.00	24.72
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

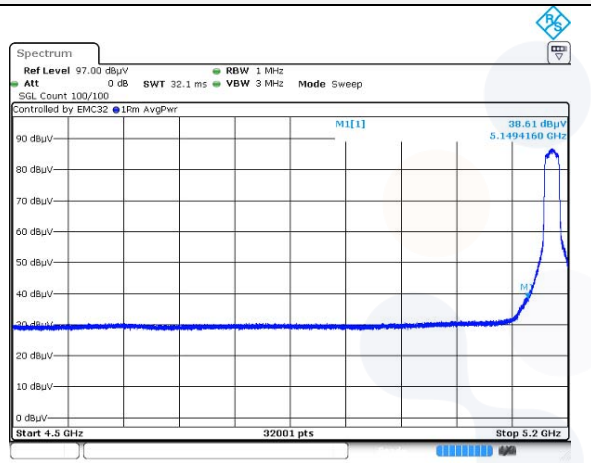


802.11n HT20_UNII 1

Lowest Channel (5 180 ㎒)

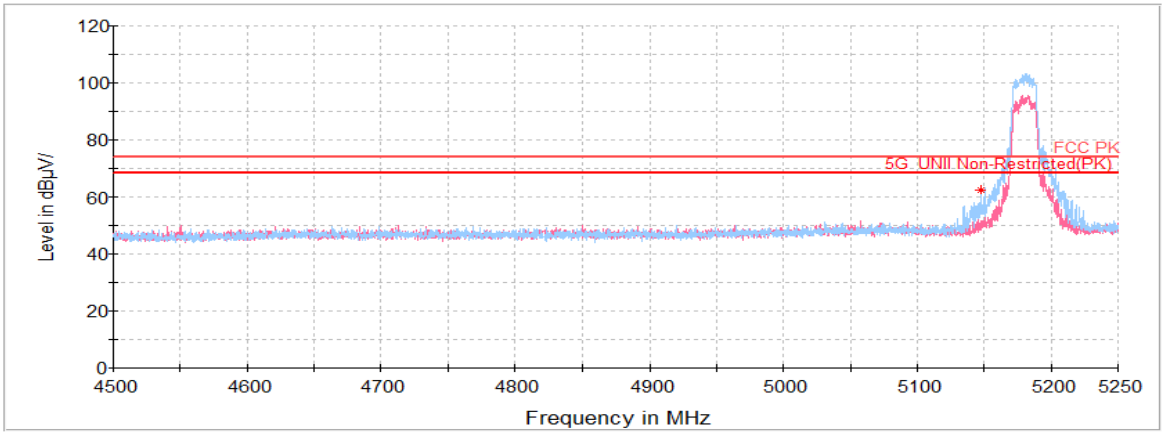
Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 149.42[1)]	H	52.27	33.88	-23.99	-	62.16	74.00	11.84
10 386.64	V	56.97	37.11	-47.95	-	46.13	68.20	22.07
15 491.56[1)]	V	57.15	40.19	-47.41	-	49.93	74.00	24.07
Average Data								
5 149.42[1)]	H	38.61	33.88	-23.99	0.32	48.82	54.00	5.18

Average data

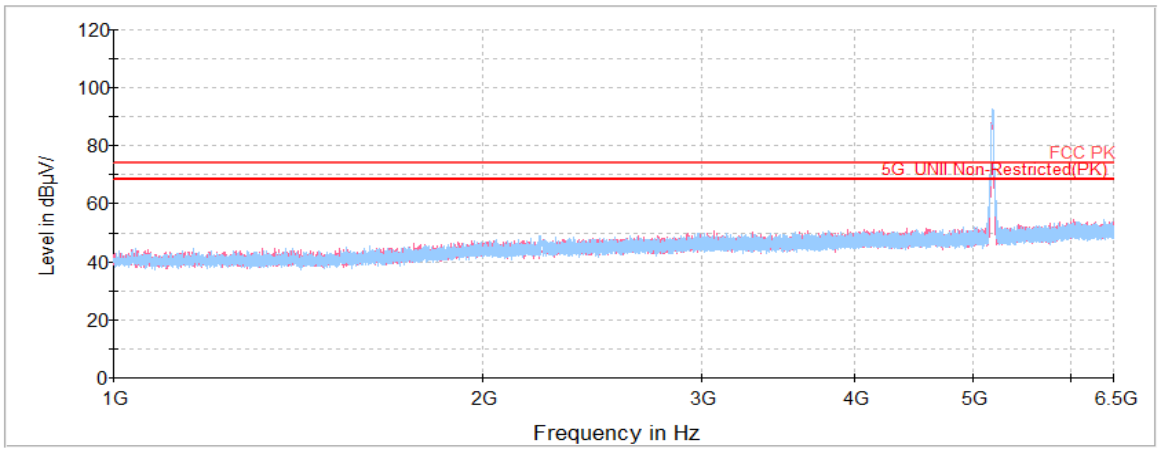


Blank

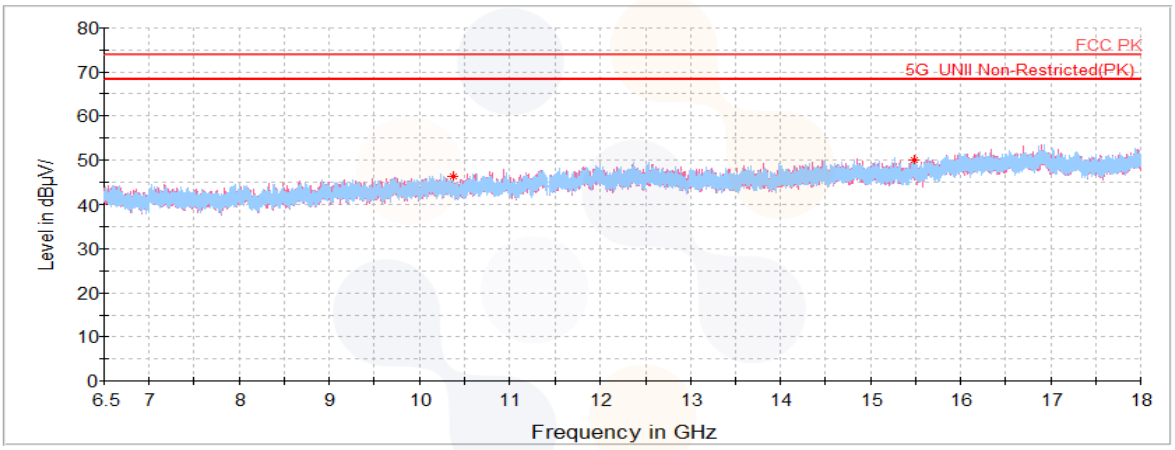
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



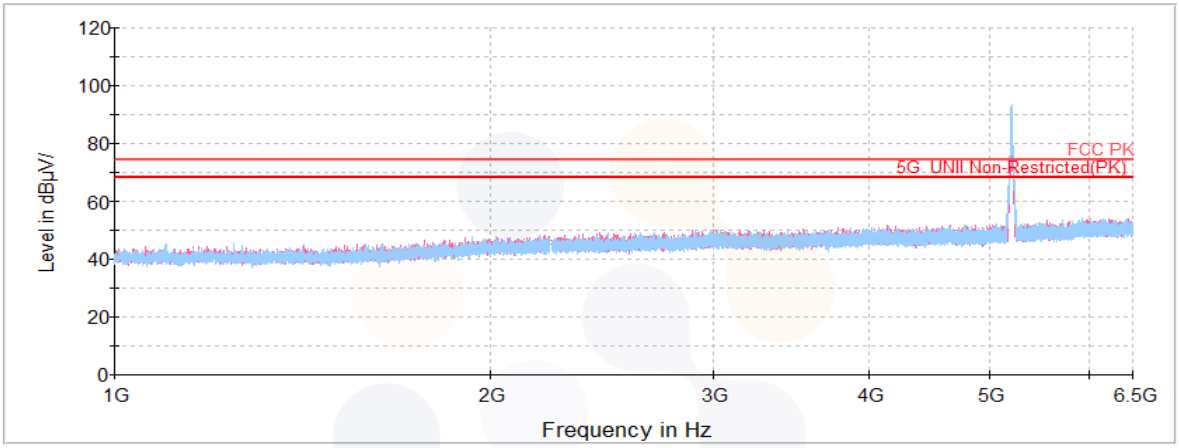
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



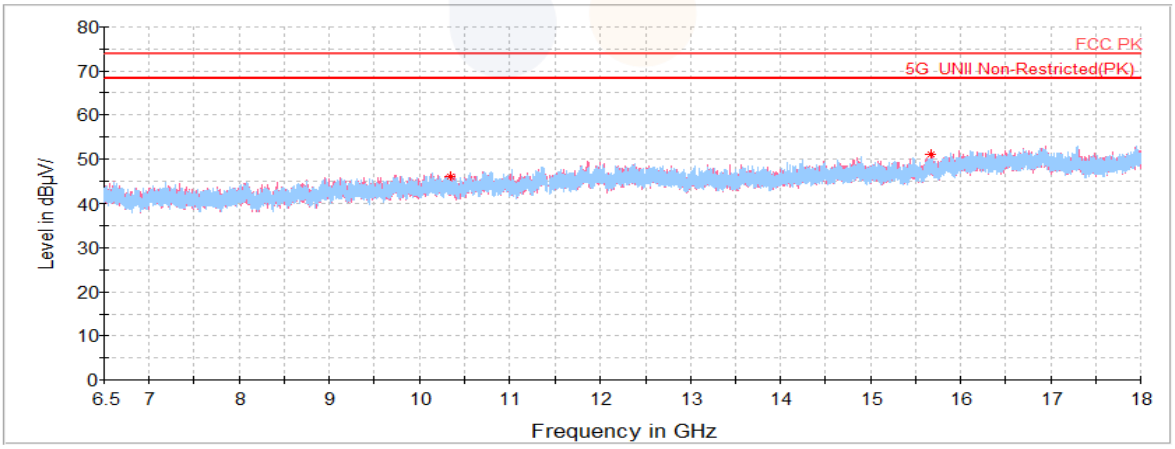
Middle Channel (5 200 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 352.14	H	56.97	37.08	-47.98	-	46.07	68.20	22.13
15 679.16[1)]	V	57.56	40.44	-47.06	-	50.94	74.00	23.06
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



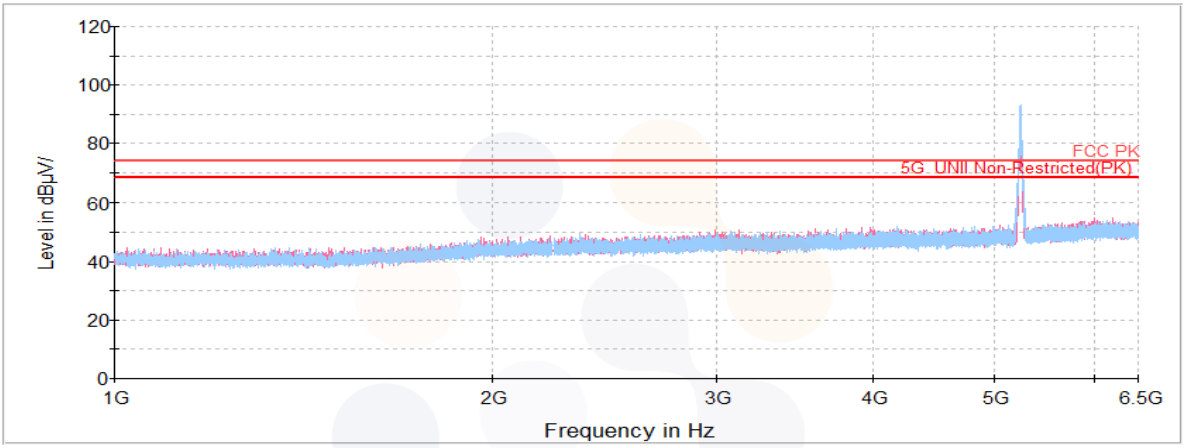
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



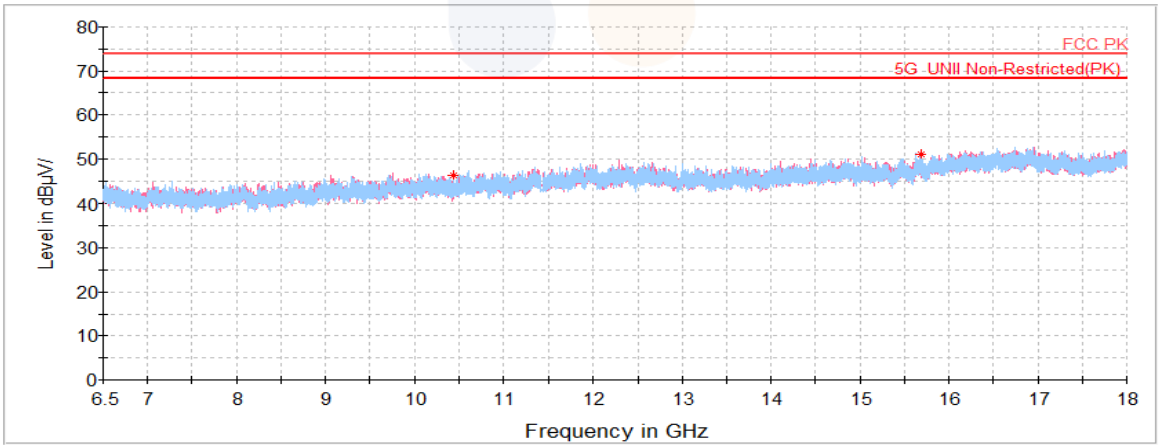
Highest Channel (5 240 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 449.53	H	56.89	37.16	-47.90	-	46.15	68.20	22.05
15 685.63[1)]	V	57.58	40.45	-47.05	-	50.98	74.00	23.02
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



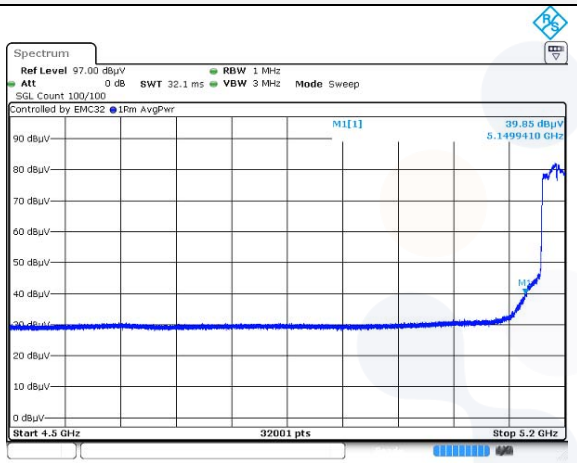
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

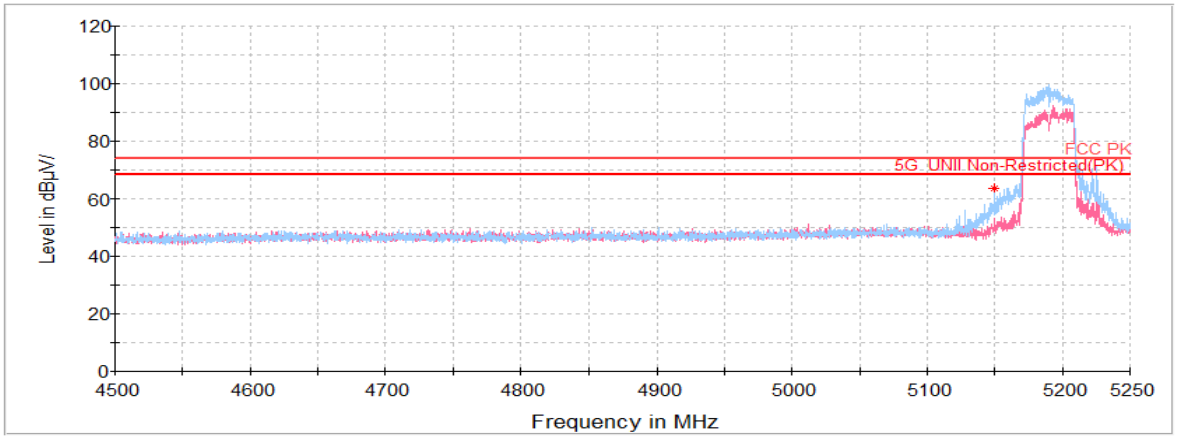


802.11n HT40_UNII 1

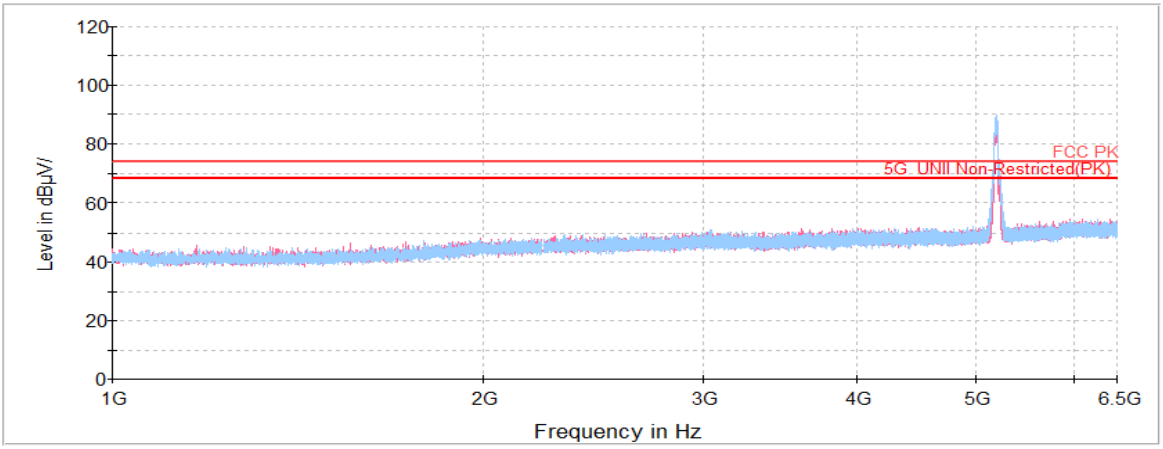
Lowest Channel (5 190 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 149.94[1)]	H	53.37	33.88	-23.99	-	63.26	74.00	10.74
10 392.75	V	57.08	37.11	-47.95	-	46.24	68.20	21.96
15 591.47[1)]	V	55.29	40.37	-47.23	-	48.43	74.00	25.57
Average Data								
5 149.94[1)]	H	39.85	33.88	-23.99	0.62	50.36	54.00	3.64

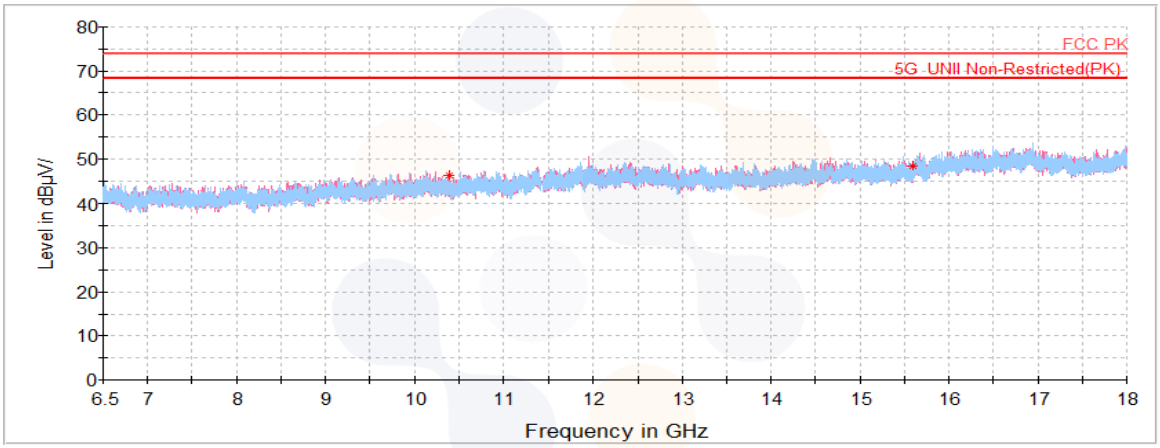
Average data	
	Blank

Horizontal/Vertical for Band-edge


Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



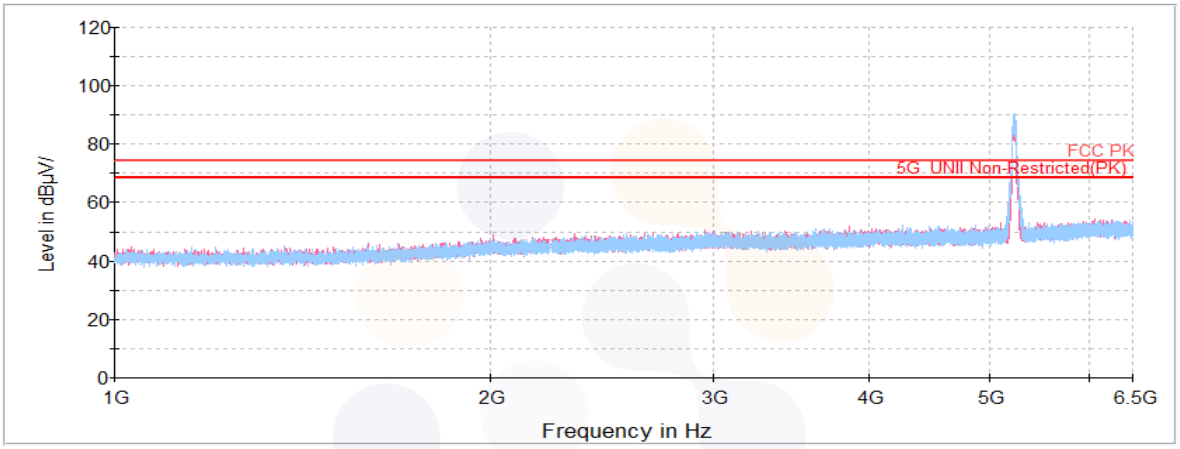
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



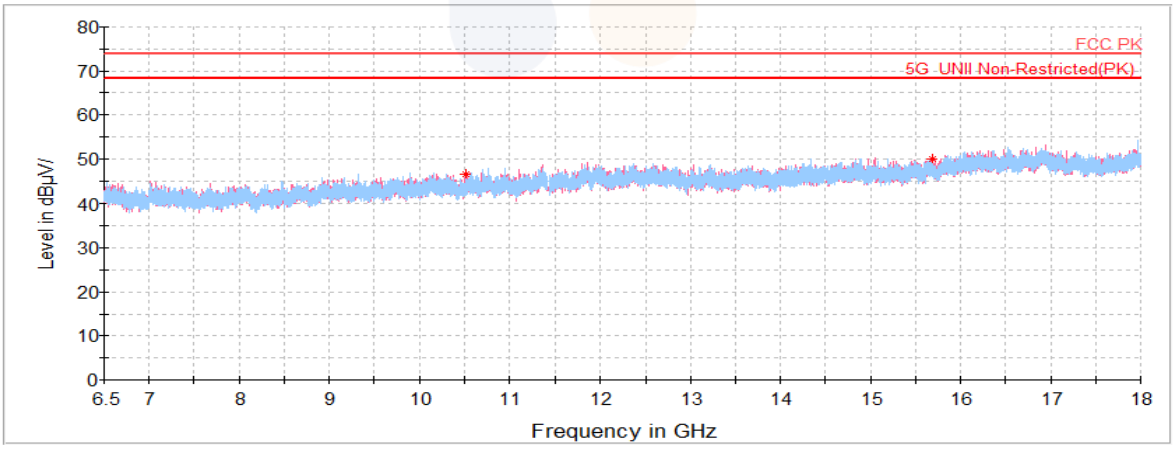
Highest Channel (5 230 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 522.13	H	57.11	37.21	-47.86	-	46.46	68.20	21.74
15 682.03[1)]	V	56.62	40.45	-47.05	-	50.02	74.00	23.98
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



802.11ac VHT80 UNII 1

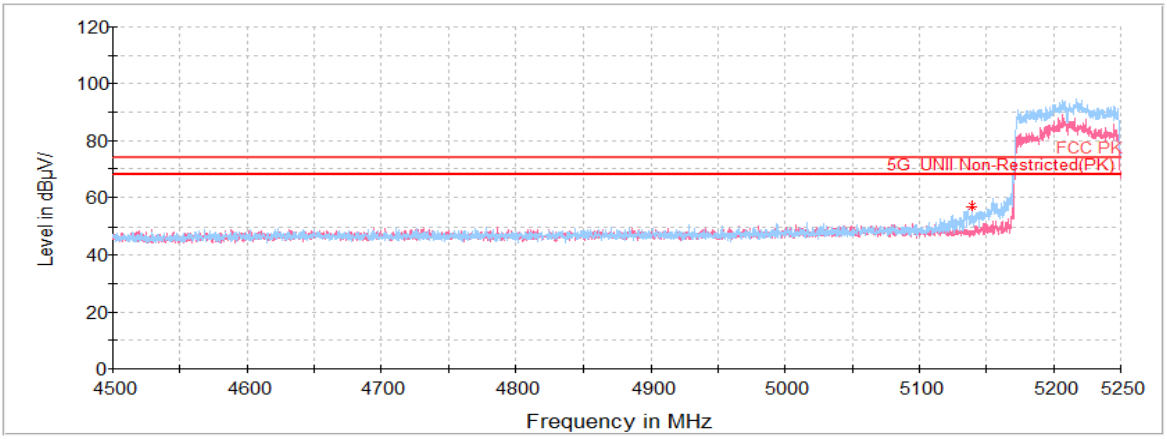
Lowest Channel (5 210 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 147.99[1)]	H	46.98	33.88	-23.98	-	56.88	74.00	17.12
9 723.59	H	60.10	36.52	-48.70	-	47.92	68.20	20.28
10 567.05	V	58.09	37.24	-47.89	-	47.44	68.20	20.76
15 628.84[1)]	H	57.32	40.40	-47.16	-	50.56	74.00	23.44
Average Data								
5 147.99[1)]	H	39.36	33.88	-23.98	1.16	50.42	54.00	3.58

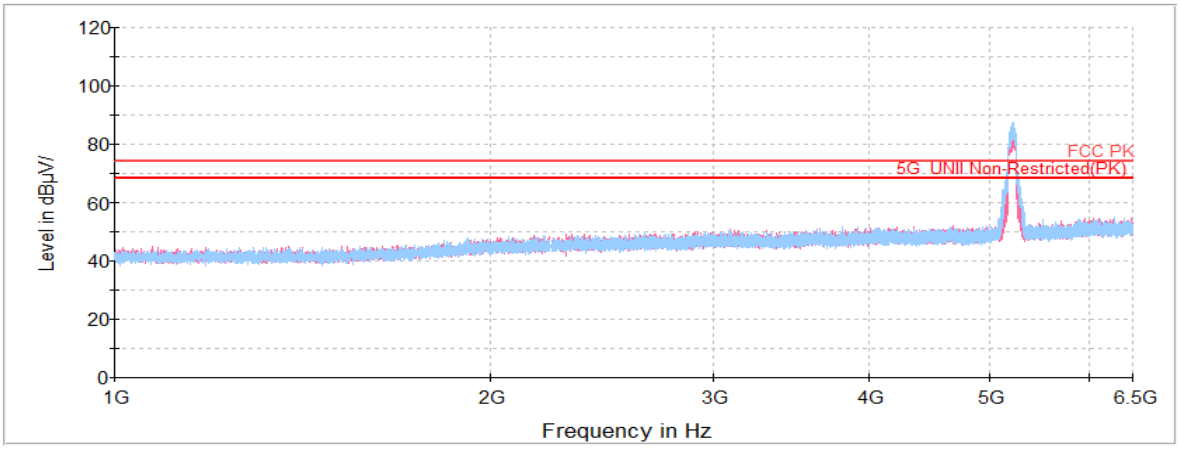
Average data

Blank

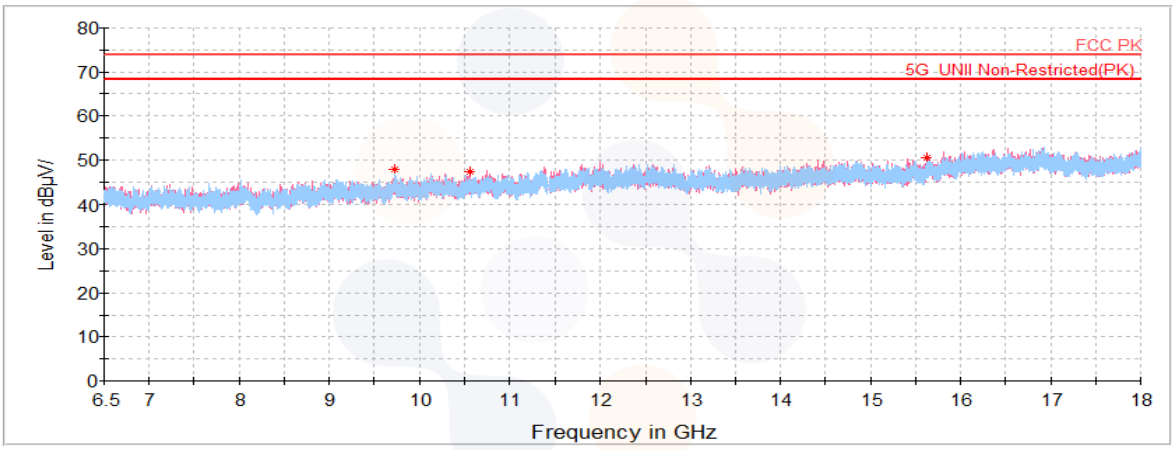
Horizontal/Vertical for Band-edge



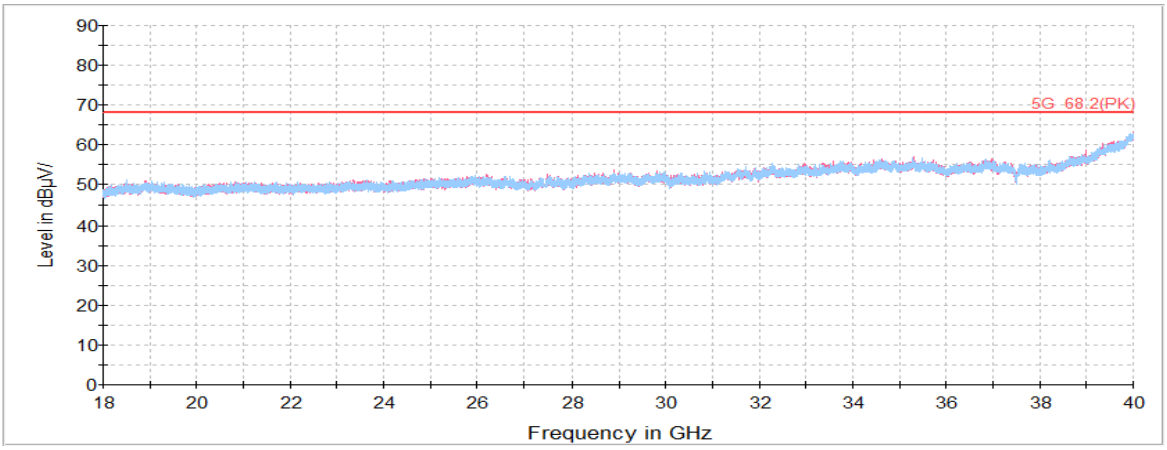
Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



Test results (Above 18 ㎓) – Worst case: 802.11ac VHT80_UNII 1_ 5 210 ㎒

Horizontal/Vertical for 18 ㎓ ~ 40 ㎓


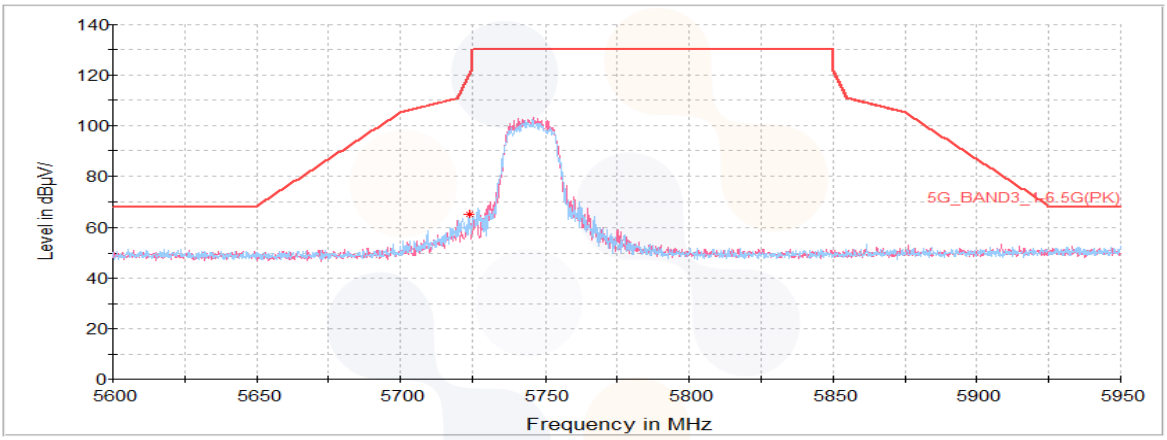
Note: The Worst case was based on the lowest margin condition considering Harmonic and Spurious Emission.

802.11a UNII 3

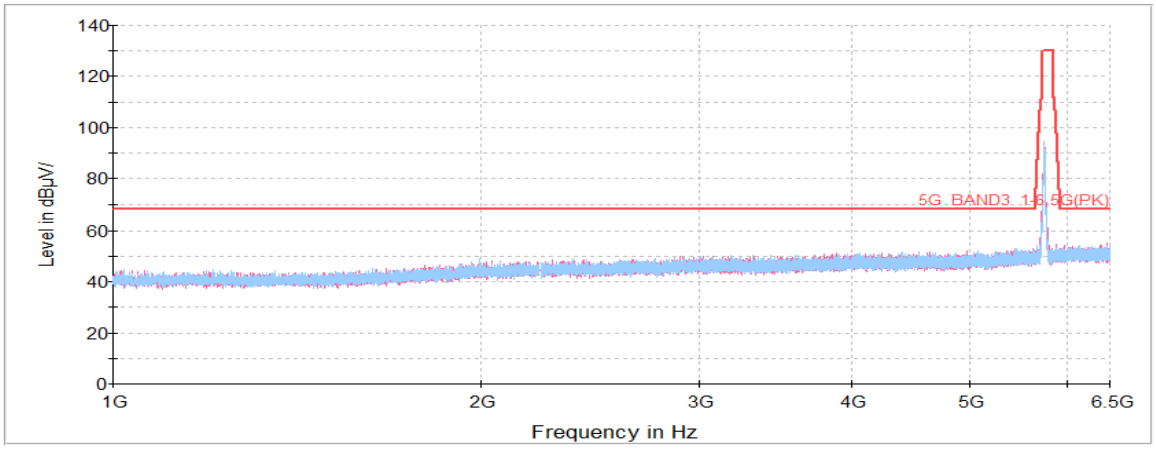
Lowest Channel (5 745 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 723.98	V	53.98	34.70	-23.30	-	65.38	119.88	54.51
11 377.08[1)]	V	57.87	37.88	-47.62	-	48.13	74.00	25.87
17 267.59	H	55.01	41.43	-45.23	-	51.21	74.00	22.79
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

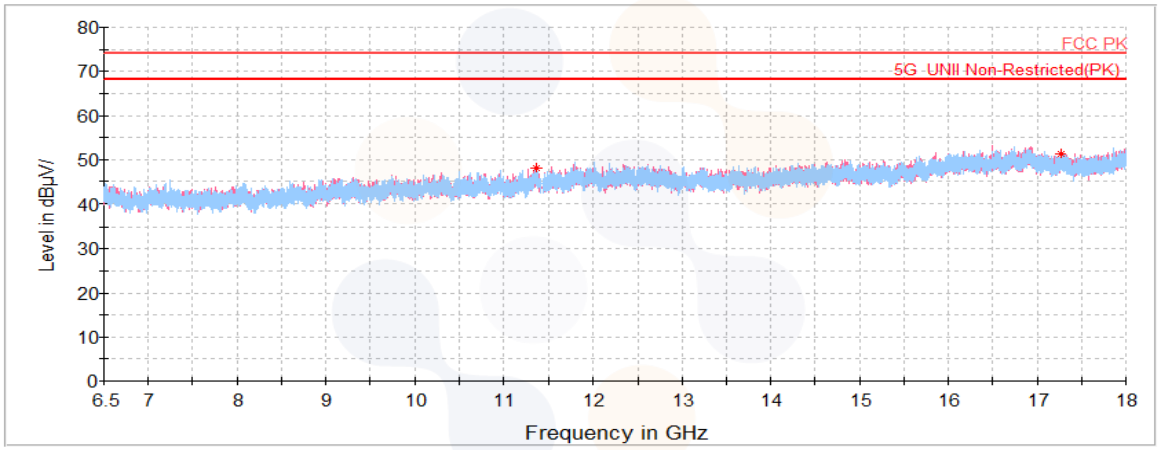
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



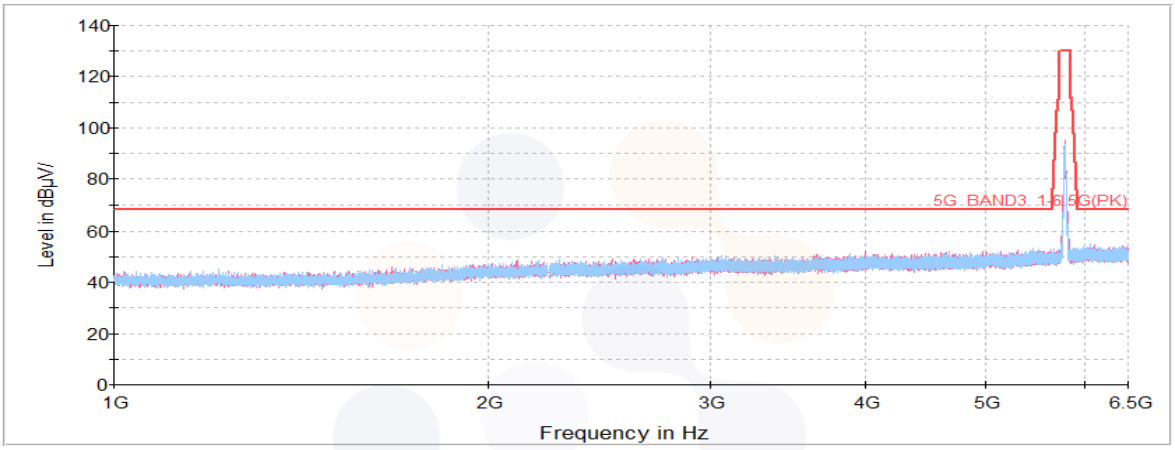
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



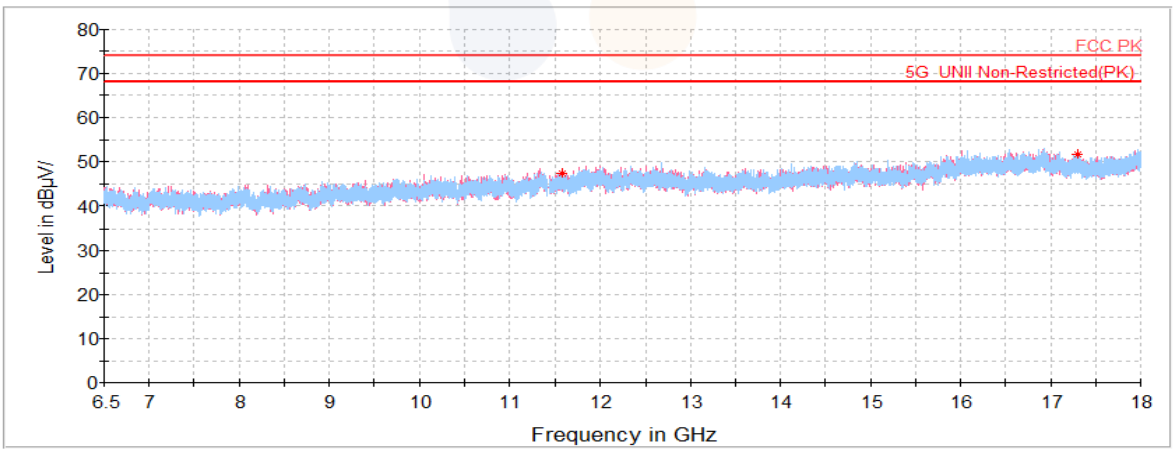
Middle Channel (5 785 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
11 567.55[1)]	H	56.72	38.05	-47.46	-	47.31	74.00	26.69
17 305.33	V	55.54	41.39	-45.31	-	51.62	68.20	16.58
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



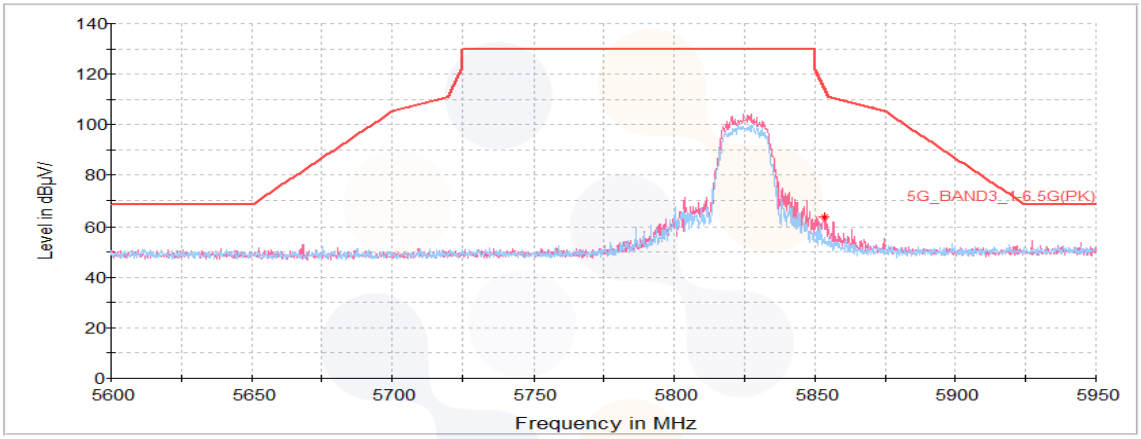
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



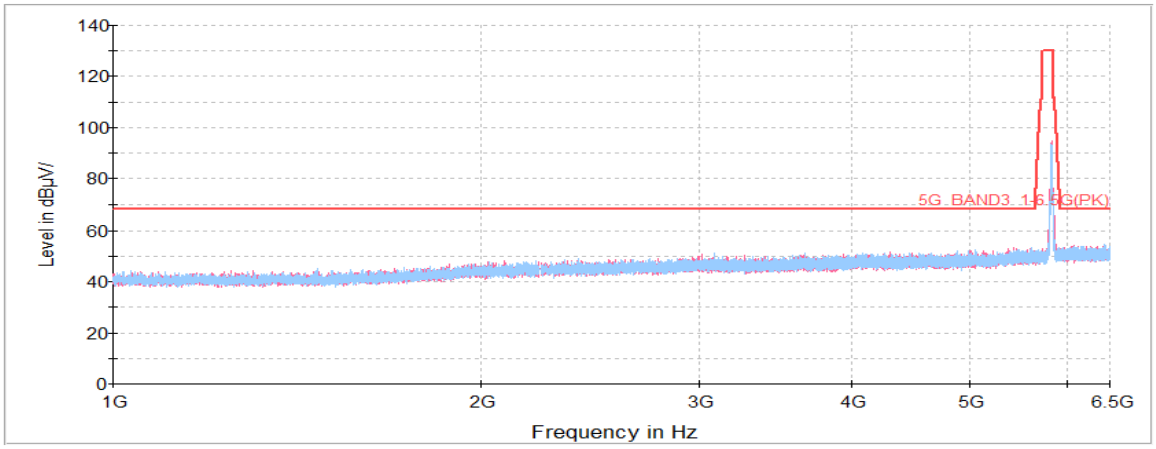
Highest Channel (5 825 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 853.58	V	51.64	34.94	-22.72	-	63.86	114.04	50.19
11 536.64[1)]	H	58.86	38.03	-47.46	-	49.43	74.00	24.57
11 652.00[1)]	H	56.08	38.12	-47.47	-	46.73	74.00	27.27
17 495.08	H	55.40	41.20	-45.67	-	50.93	68.20	17.27
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

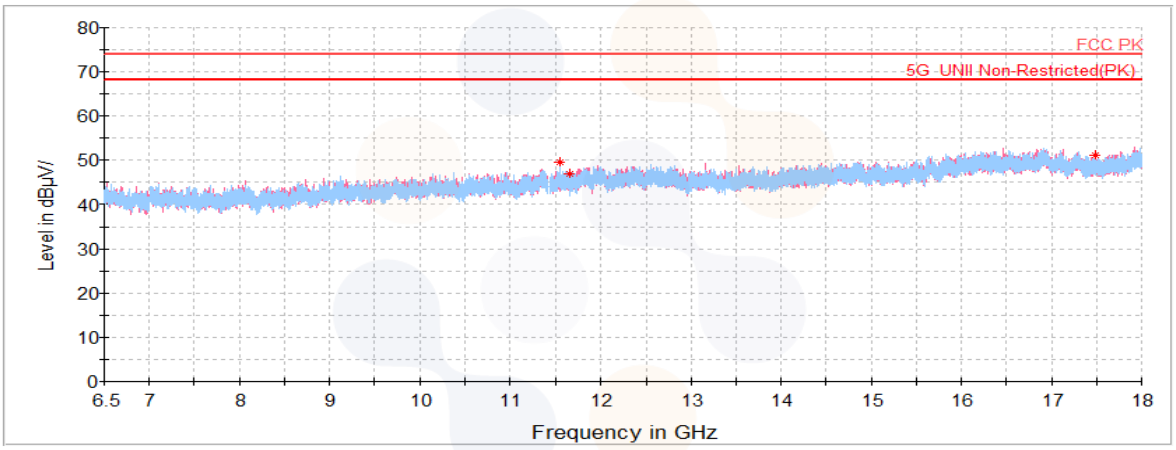
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

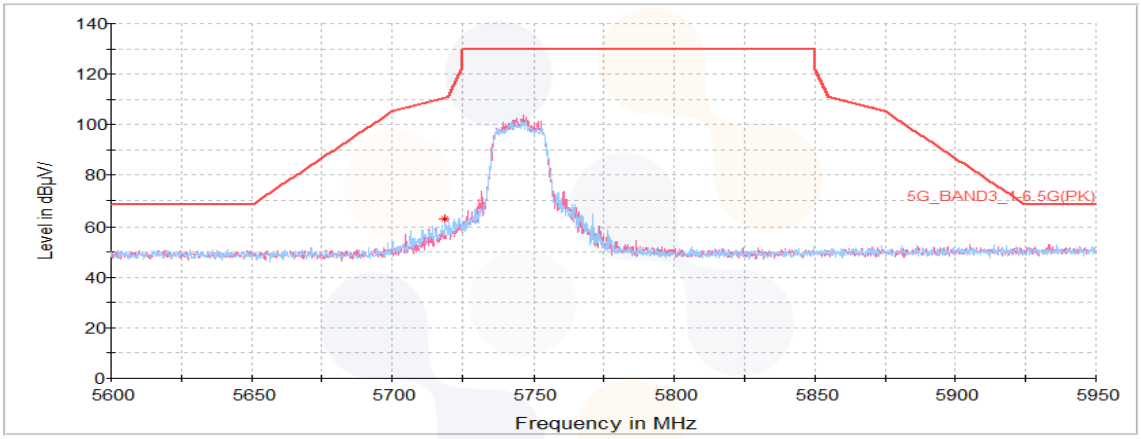


802.11n HT20_UNII 3

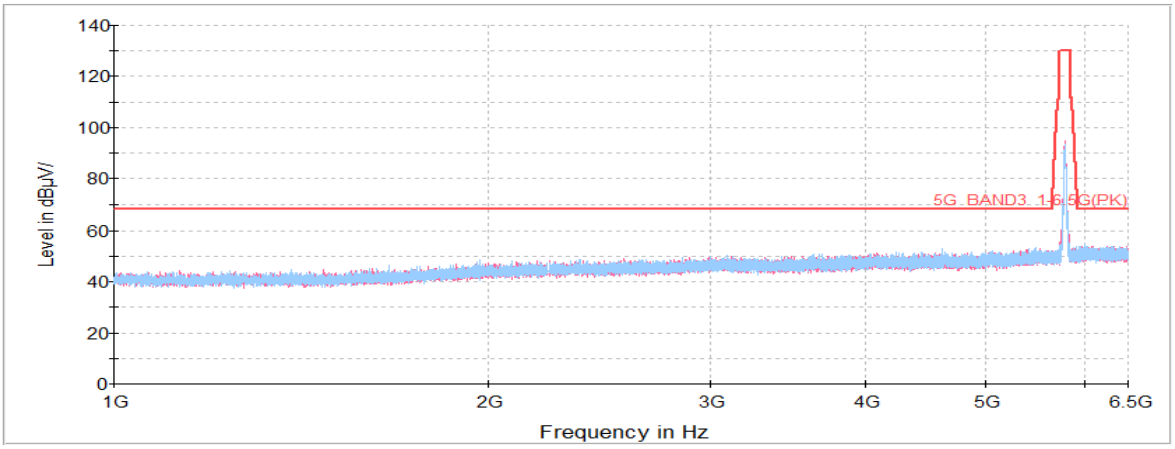
Lowest Channel (5 745 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 718.83	H	51.70	34.69	-23.33	-	63.06	110.47	47.41
11 480.58[1)]	H	58.21	37.98	-47.49	-	48.70	74.00	25.30
17 240.64	V	55.97	41.46	-45.18	-	52.25	68.20	15.95
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

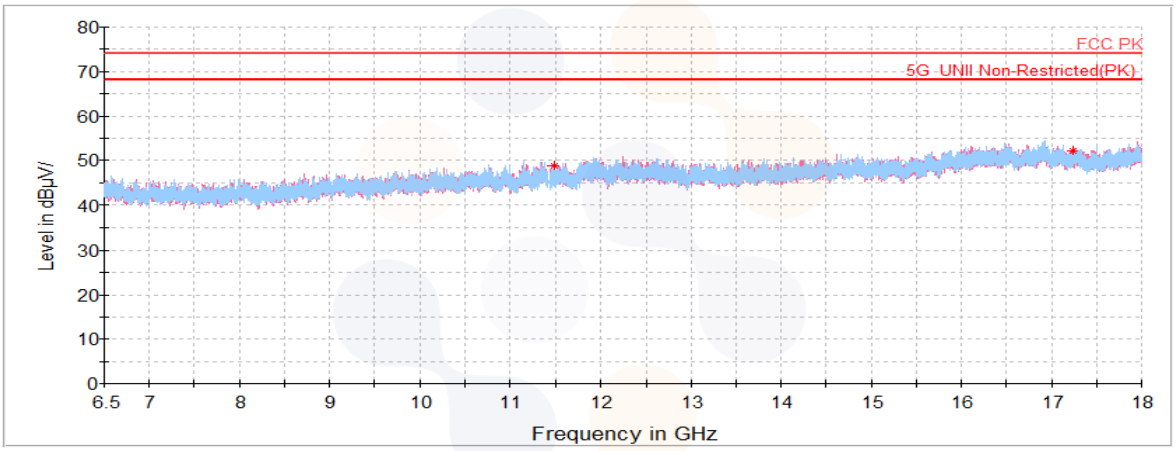
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



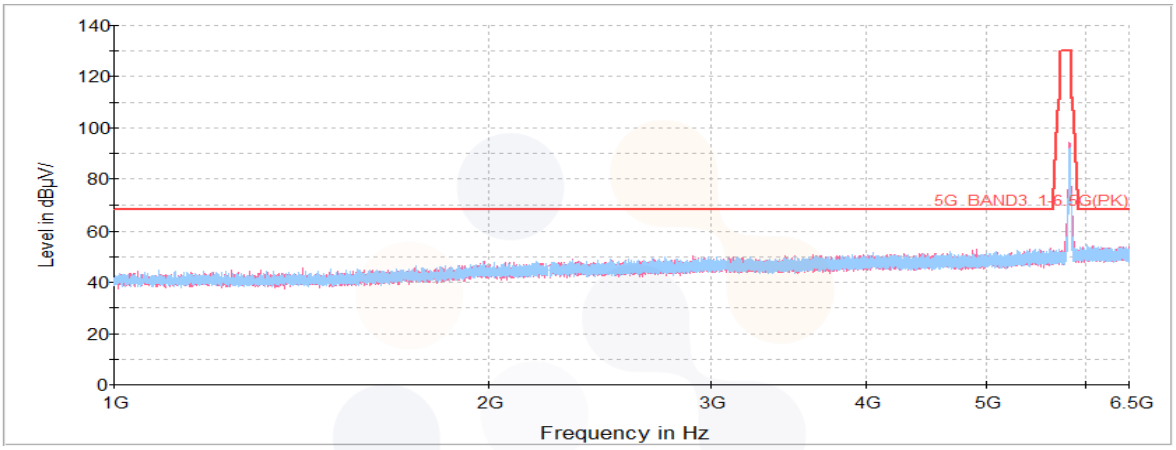
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



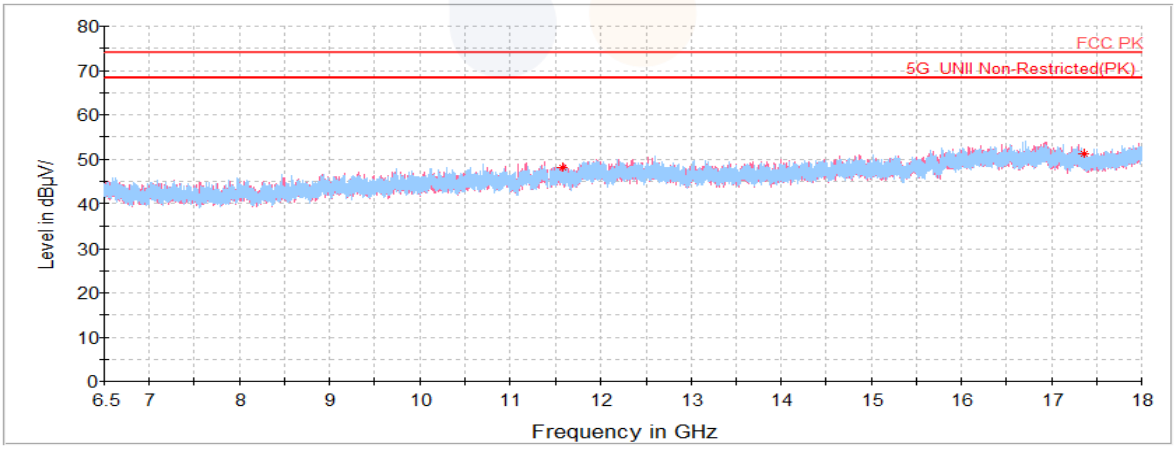
Middle Channel (5 785 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
11 577.25[1)]	H	57.55	38.06	-47.46	-	48.15	74.00	25.85
17 364.98	H	55.22	41.34	-45.42	-	51.14	68.20	17.06
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



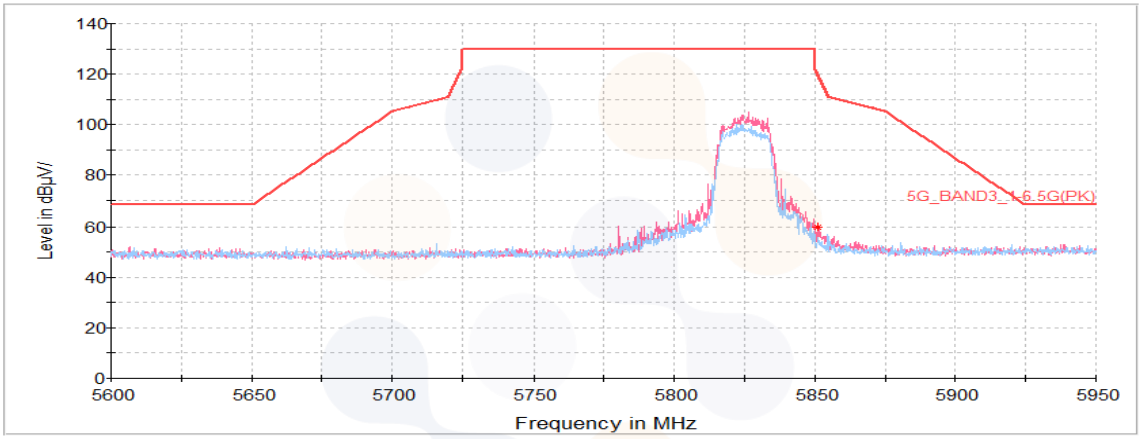
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



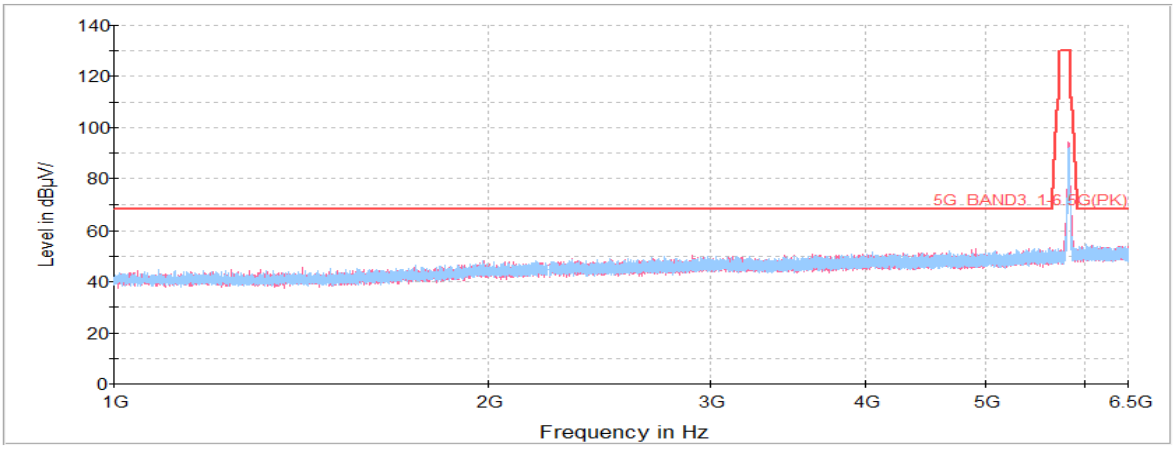
Highest Channel (5 825 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 851.17	V	47.47	34.93	-22.72	-	59.68	119.53	59.85
11 642.66[1)]	V	57.91	38.11	-47.47	-	48.55	74.00	25.45
17 448.36	V	55.59	41.25	-45.58	-	51.26	68.20	16.94
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

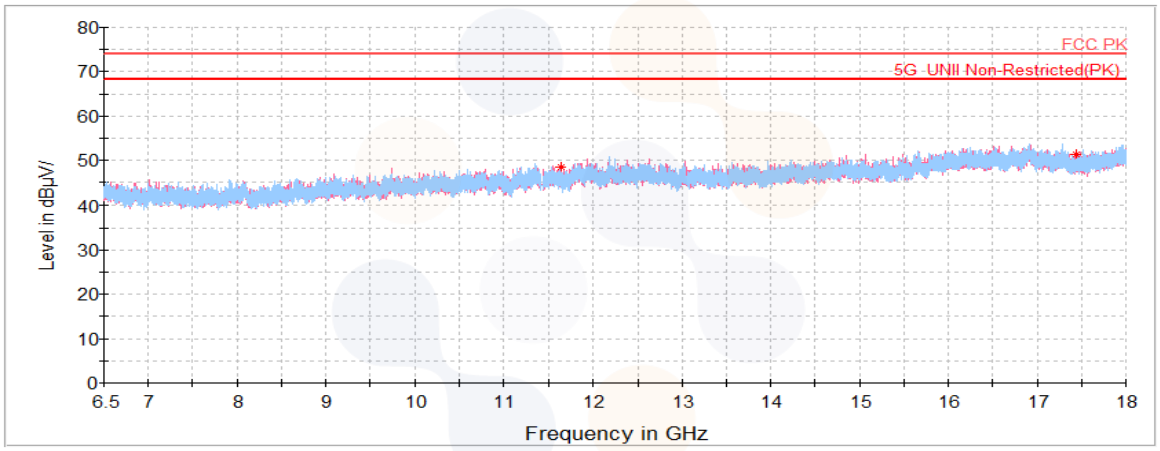
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

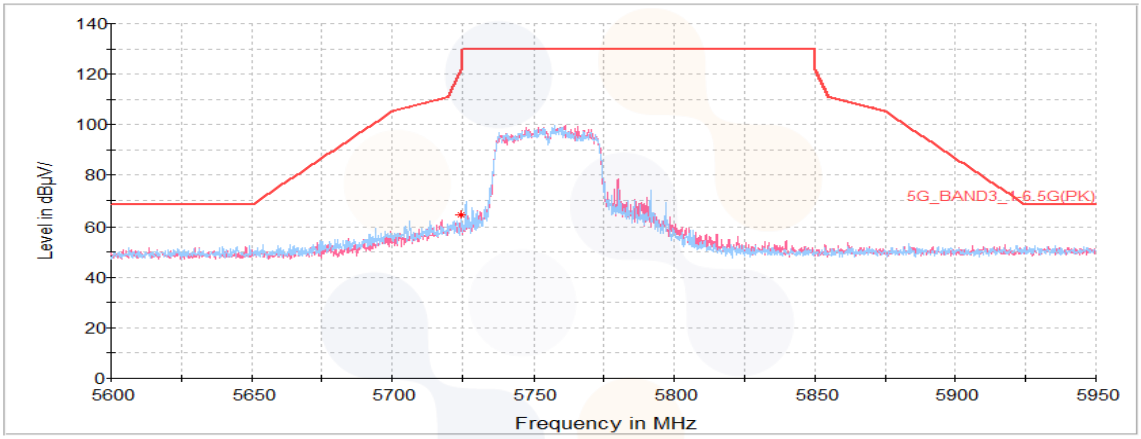


802.11n HT40_UNII 3

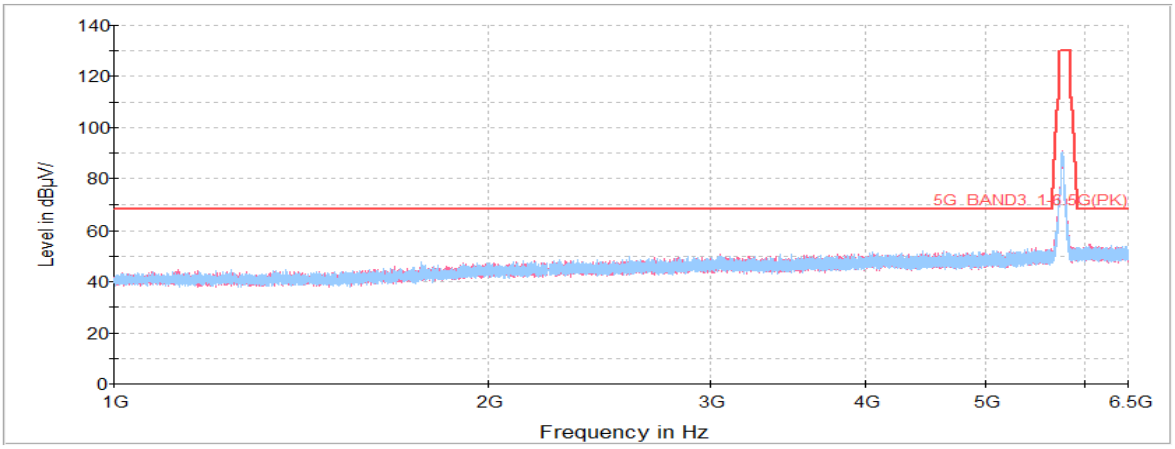
Lowest Channel (5 755 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 724.50	H	53.49	34.70	-23.30	-	64.89	121.06	56.17
11 509.33[1)]	V	58.66	38.01	-47.46	-	49.21	74.00	24.79
17 279.09	H	56.36	41.42	-45.25	-	52.53	68.20	15.67
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

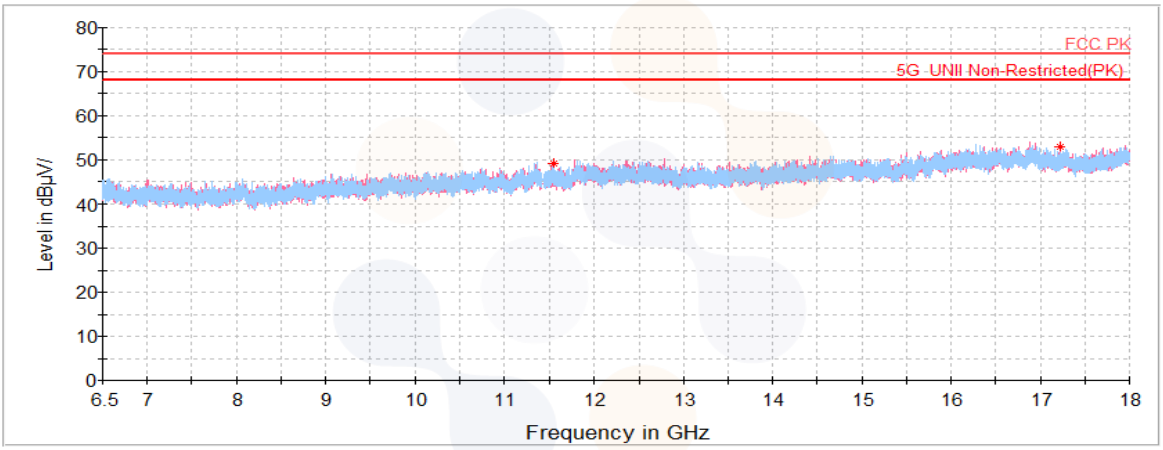
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



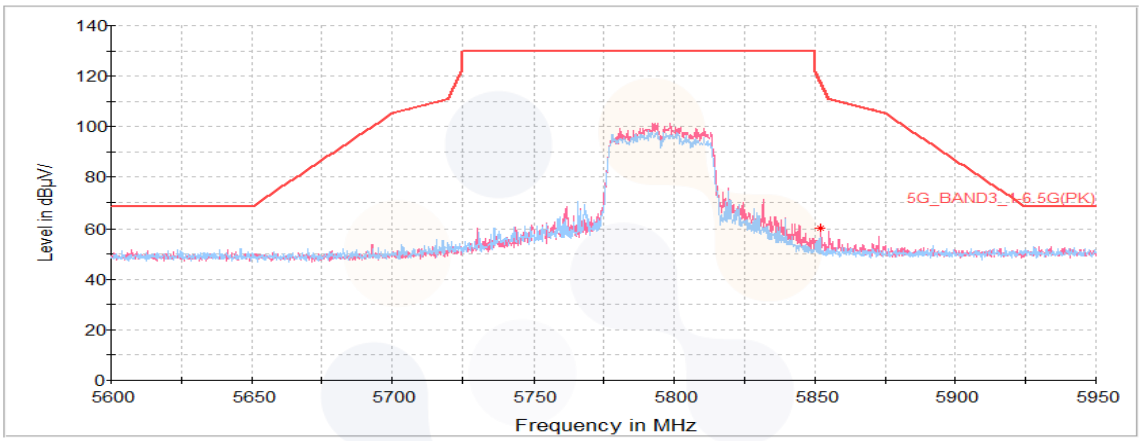
Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



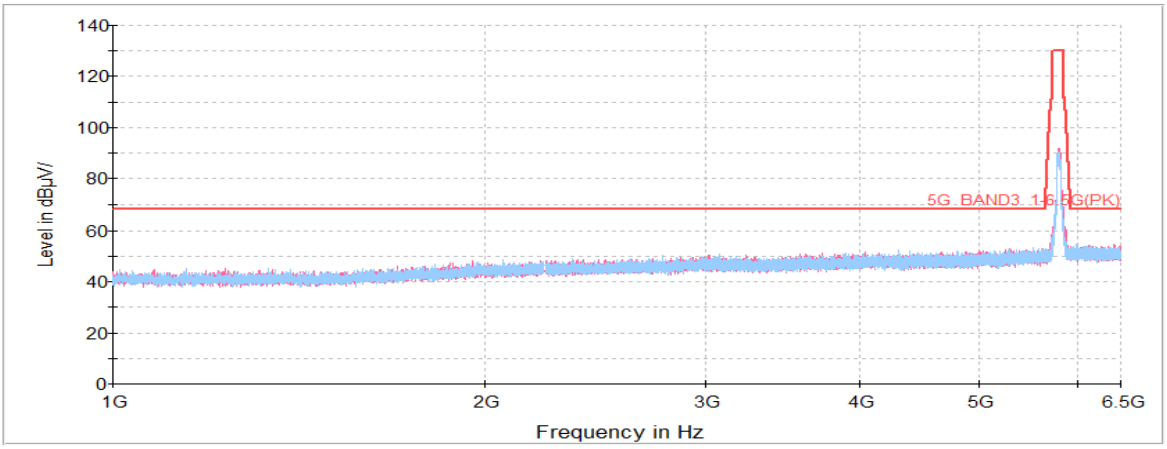
Highest Channel (5 795 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 852.20	V	47.87	34.93	-22.72	-	60.08	68.20	8.12
11 538.80[1)]	H	57.64	38.03	-47.46	-	48.21	74.00	25.79
17 263.64	H	56.62	41.44	-45.23	-	52.83	68.20	15.37
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

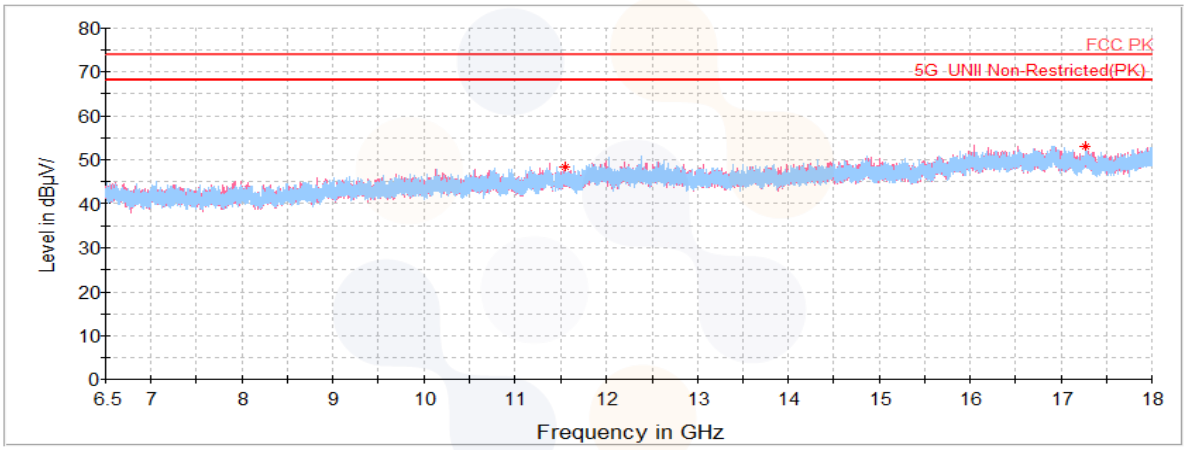
Horizontal/Vertical for Band-edge



Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

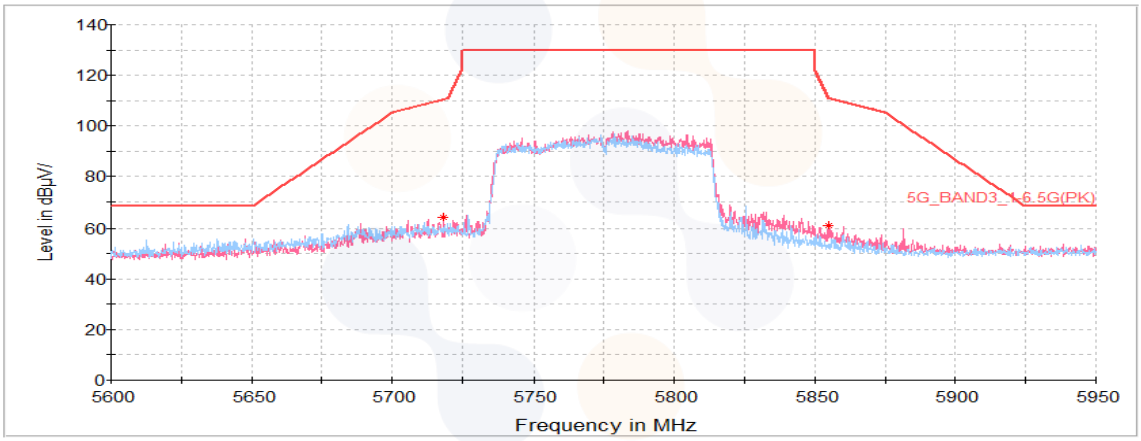


802.11ac VHT80_UNII 3

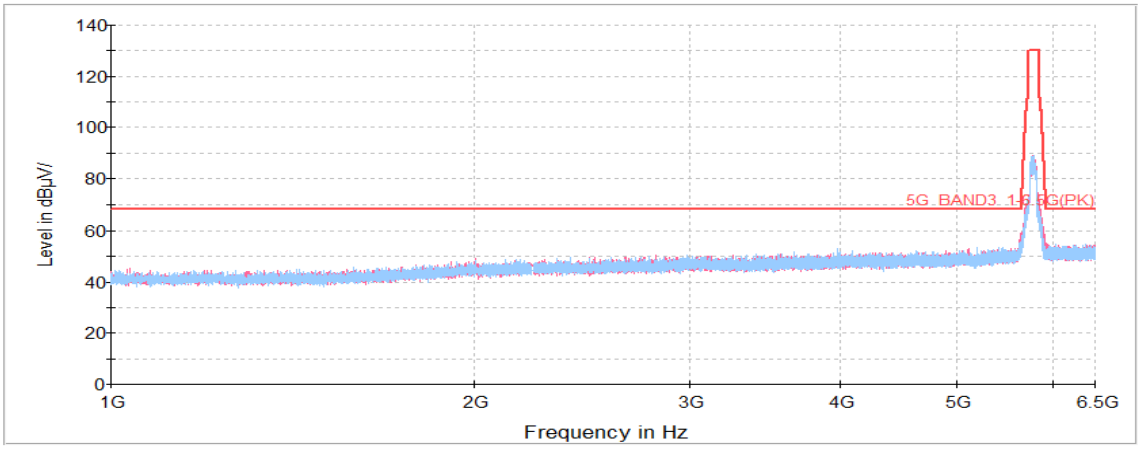
Lowest Channel (5 775 ㎒)

Frequency	Pol.	Reading	Antenna Factor	Amp. + Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 718.48	V	52.82	34.69	-23.34	-	64.17	110.38	46.21
5 855.13	V	48.74	34.94	-22.71	-	60.97	110.77	49.79
11 528.02[1)]	H	56.87	38.02	-47.46	-	47.43	74.00	26.57
17 295.98	V	56.81	41.40	-45.29	-	52.92	68.20	15.28
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

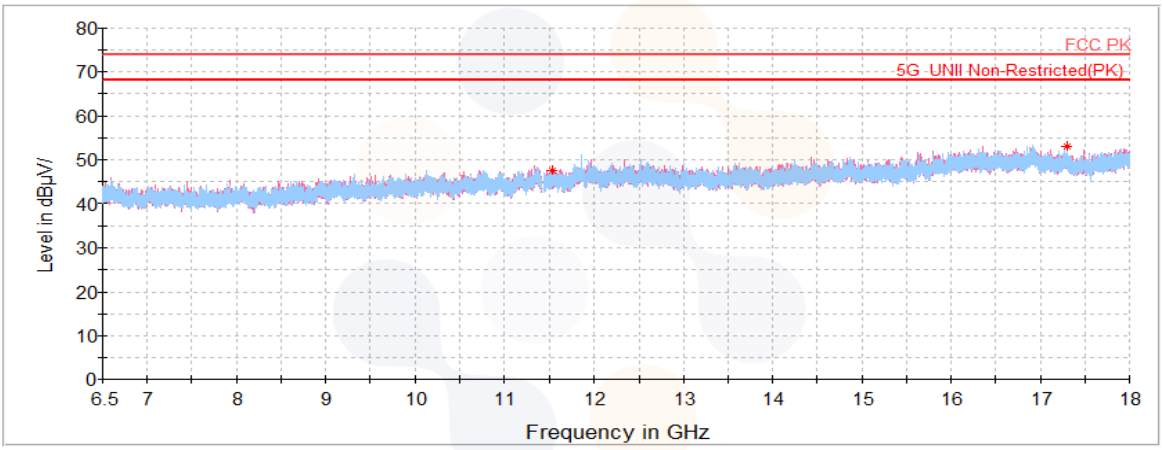
Horizontal/Vertical for Band-edge



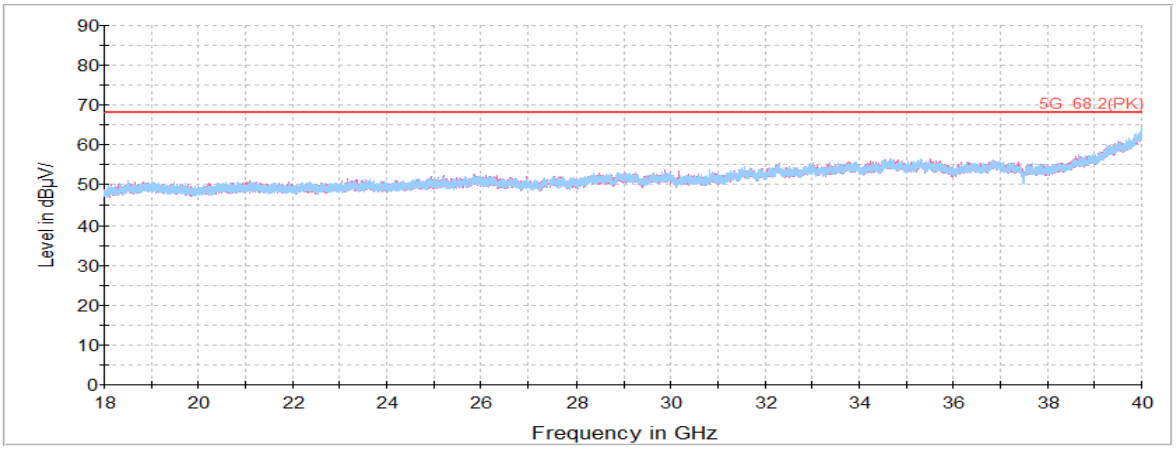
Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



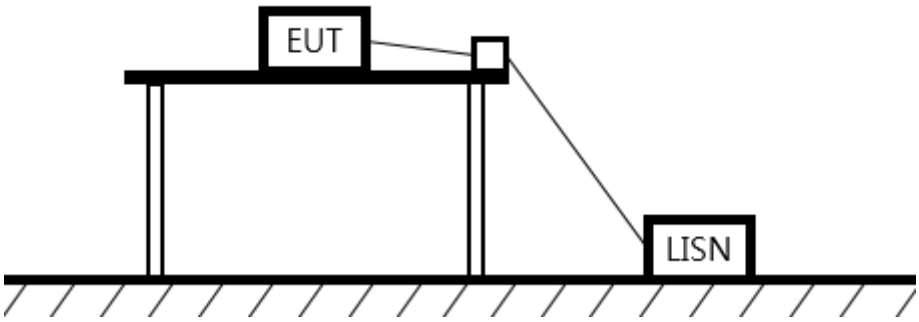
Test results (Above 18 ㎓) – Worst case: 802.11n HT40_UNII 3_ 5 795 ㎒

Horizontal/Vertical for 18 ㎓ ~ 40 ㎓


Note: The Worst case was based on the lowest margin condition considering Harmonic and Spurious Emission.

7.6. AC Conducted emission

Test setup



Limit

According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

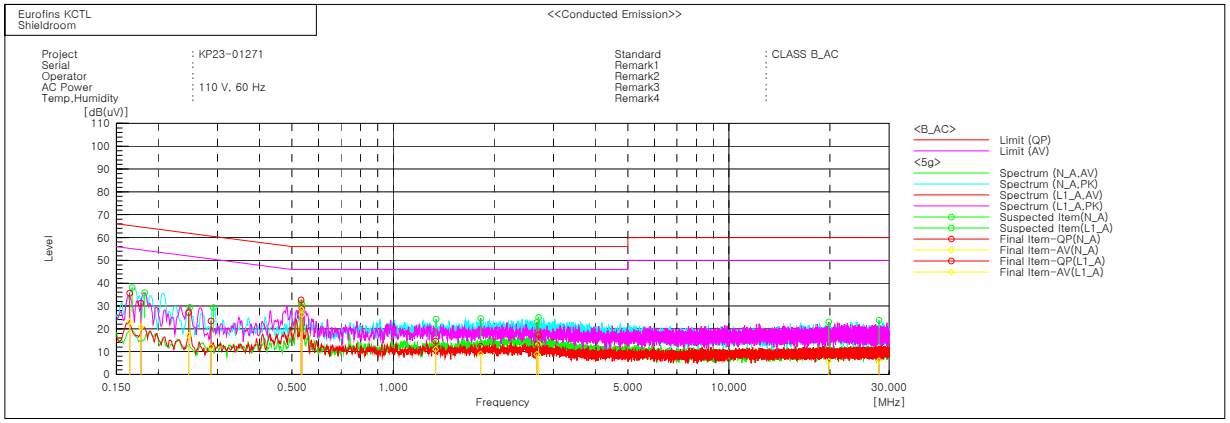
Frequency of Emission (㎒)	Conducted limit (dBμV/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Measurement procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 ㎝ in which is located 40 ㎝ away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 ㎒ to 30 ㎒.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 ㎑ or to quasi-peak and average within a bandwidth of 9 ㎑. The EUT was in transmitting mode during the measurements.

Test results

Worst case: 802.11a_UNII 1_ 5 180 ㎒



Final Result

--- N_A Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.16426	25.4	12.9	10.2	35.6	23.1	65.2	55.2	29.6	32.1
2	0.28711	13.6	2.2	9.8	23.4	12.0	60.6	50.6	37.2	38.6
3	0.5349	18.8	16.2	10.0	28.8	26.2	56.0	46.0	27.2	19.8
4	1.33861	4.8	1.2	9.8	14.6	11.0	56.0	46.0	41.4	35.0
5	2.71437	7.4	3.5	9.9	17.3	13.4	56.0	46.0	38.7	32.6
6	27.97806	-0.4	-4.9	11.0	10.6	6.1	60.0	50.0	49.4	43.9

--- L1_A Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.17754	21.1	10.6	10.2	31.3	20.8	64.6	54.6	33.3	33.8
2	0.24635	17.5	7.4	9.7	27.2	17.1	61.9	51.9	34.7	34.8
3	0.53239	22.7	18.6	9.9	32.6	28.5	56.0	46.0	23.4	17.5
4	1.8214	2.6	-0.9	9.8	12.4	8.9	56.0	46.0	43.6	37.1
5	2.67928	3.2	-1.0	9.8	13.0	8.8	56.0	46.0	43.0	37.2
6	19.81882	-0.4	-5.0	10.7	10.3	5.7	60.0	50.0	49.7	44.3

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV30	101437	23.07.12
DC Power Supply	AGILENT	E3632A	MY51220373	23.07.11
Attenuator	API Inmet	40AH2W-10	18	23.05.03
Power Sensor	R&S	NRP-Z81	1137.9009.02-106223-bB	23.05.03
Signal Generator	R&S	SMB100A	176206	24.01.19
Vector Signal Generator	R&S	SMBV100A	257566	23.07.04
Spectrum Analyzer	R&S	FSV40	100989	23.10.14
EMI TEST RECEIVER	R&S	ESCI7	100732	24.01.19
Bi-Log Antenna	TESEQ	CBL 6112D	62438	24.08.24
Amplifier	SONOMA INSTRUMENT	310N	284608	23.08.18
ATTENUATOR	KEYSIGHT	8491B-6dB	MY39271060	24.04.27
ISOLATION TRANSFORMER	ONETECH CO., LTD	OT-IT500VA	OTR1-16026	24.03.28
Horn antenna	ETS.lindgren	3117	155787	23.09.29
Horn antenna	ETS.lindgren	3116	86635	23.05.04
Attenuator	API Inmet	40AH2W-10	12	23.05.03
AMPLIFIER	B&Z Technologies	BZRT-00504000-481055-382525	26299-27735	23.09.19
AMPLIFIER	B&Z Technologies	BZR-0050400-551028-252525	27736	23.09.19
LOOP Antenna	R&S	HFH2-Z2	100355	24.08.10
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-
Antenna Mast	Innco Systems	MA4000-EP	303	-
Turn Table	Innco Systems	CO3000	1175/45850319/P	-
Highpass Filter	WT	WT-A1699-HS	WT160411002	23.05.03
Highpass Filter	Qotana	DBHF058004000A	20070100016	23.07.04
TWO-LINE V - NETWORK	R&S	ENV216	101358	23.09.29
EMI TEST RECEIVER	R&S	ESCI3	100001	23.08.18

End of test report