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.: KR25-SRF0094-A Page (1) of (48)	eurofins | KCTL

1. Client

- Name : YURA CORPORATION
- Address : 308, Pangyo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
- Date of Receipt : 2025-03-04

2. Use of Report : Certification

3. Name of Product / Model : Built-In CAM / BLTN_CAM2.5_LX3

4. Manufacturer / Country of Origin : YURA CORPORATION / Korea

5. FCC ID : 2A8FF-BLTNCAM25

6. IC Certificate No. : 28921-BLTNCAM25

7. Date of Test : 2025-04-01 to 2025-04-22

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

9. Test method used : FCC Part 15 Subpart E, 15.407
RSS-247 Issue 3 August 2023
RSS-Gen Issue 5 February 2021

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

	Tested by	Technical Manager
Affirmation	Name : Minki Kim (Signature)	Name : Harim Lee (Signature)

2025-05-08

Eurofins KCTL Co.,Ltd.

REPORT REVISION HISTORY

Date	Revision	Page No
2025-04-24	Originally issued	-
2025-05-08	Updated	3,10,25~26,48

Note. The report No. KR25-SRF0094 is superseded by the report No. KR25-SRF0094-A.

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	:	YURA CORPORATION
Address	:	308, Pangyo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of Korea
Manufacturer	:	YURA CORPORATION
Address	:	308, Pangyo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, Republic of 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	:	Built-In CAM		
Model	:	BLTN_CAM2.5_LX3		
Derivative model	:	BLTN_CAM2.5_NH2		
Modulation technique	:	WIFI(802.11a/b/g/n/ac)	: DSSS, OFDM	
Number of channels	:	2.4 ㎓ WLAN	: 13 ch (20 ㎒)	
		5 ㎓ UNII-1	: 4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)	
Power source	:	DC 12 V		
Antenna specification	:	Ceramic Chip Antenna		
Antenna gain	:	2.4 ㎓ WLAN	: 1.84 dBi	
		5 ㎓ UNII-1	: 1.43 dBi	
Frequency range	:	2.4 ㎓ WLAN	: 2 412 ㎒ ~ 2 472 ㎒	(802.11b/g/n_HT20)
		5 ㎓ UNII-1	: 5 180 ㎒ ~ 5 240 ㎒	(802.11a/n/ac_HT20/VHT20)
			5 190 ㎒ ~ 5 230 ㎒	(802.11n/ac_HT40/VHT40)
			5 210 ㎒	(802.11ac_VHT80)
Software version	:	01.01.70.20		
Hardware version	:	1.00		
Test device serial No.	:	(LX3)95720-P9100, (NH2) 95720-XH500		
Operation temperature	:	-40 ℃ ~ 75 ℃		

2.1. Information about derivative model

The difference between basic model and derivative models is:
The basic and derivative models are the differences between filters, capacitors and resistors.

2.2. Frequency/channel operations

This device contains the following capabilities:
WLAN 5 ㎓(802.11a/n_HT20/40/ac_VHT20/40/80)

UNII-1

Ch.	Frequency (㎒)
36	5 180
40	5 200
48	5 240

Table 2.2.1. 802.11a/n/ac_HT20/VHT20

UNII-1

Ch.	Frequency (㎒)
38	5 190
46	5 230

Table 2.2.2. 802.11n/ac_HT40/VHT40

UNII-1

Ch.	Frequency (㎒)
42	5 210

Table 2.2.3 802.11ac_VHT80

2.3. RF power setting in TEST SW

Mode	Frequency [㎒]	RF Power setting value	Test Program
802.11a	5 180	12	CMD_adb shell
	5 200	12	
	5 240	12	
802.11n_HT20	5 180	12	
	5 200	12	
	5 240	12	
802.11n_HT40	5 190	12	
	5 230	12	
802.11ac_VHT20	5 180	12	
	5 200	12	
	5 240	12	
802.11ac_VHT40	5 190	12	
	5 230	12	
802.11ac_VHT80	5 210	12	

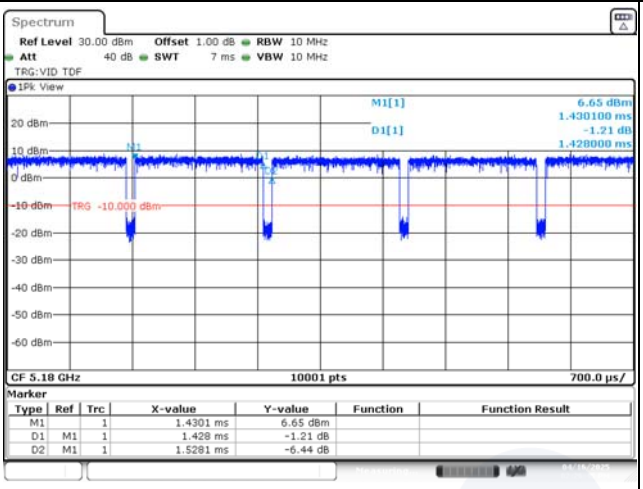
2.4. Duty Cycle Factor

Test mode	Period (ms)	T_{On} time (ms)	Duty cycle		Duty Cycle Factor (dB)
			(Linear)	(%)	
802.11a	1.528 1	1.428 0	0.934 5	93.45	0.29
802.11n_HT20	1.436 4	1.336 2	0.930 2	93.02	0.31
802.11n_HT40	0.764 4	0.664 0	0.868 7	86.87	0.61
802.11ac_VHT20	1.444 2	1.344 0	0.930 6	93.06	0.31
802.11ac_VHT40	0.768 0	0.668 0	0.869 8	86.98	0.61
802.11ac_VHT80	0.432 0	0.331 4	0.767 1	76.71	1.15

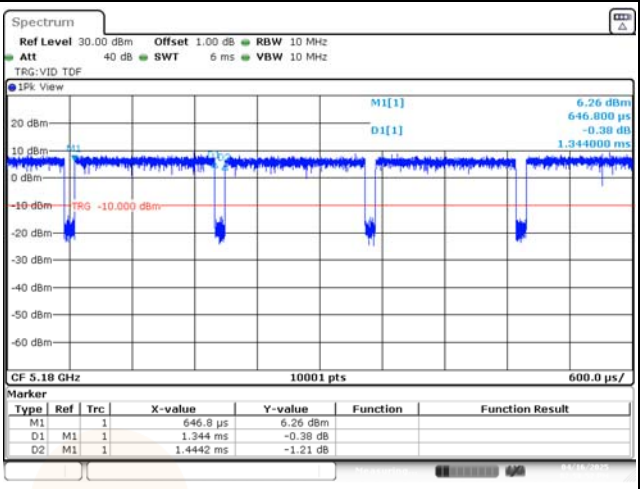
Notes:

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%

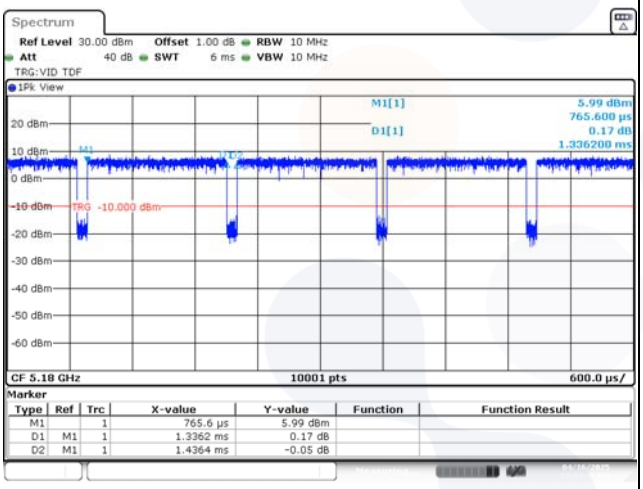
802.11a



802.11ac_VHT20



802.11n_HT20



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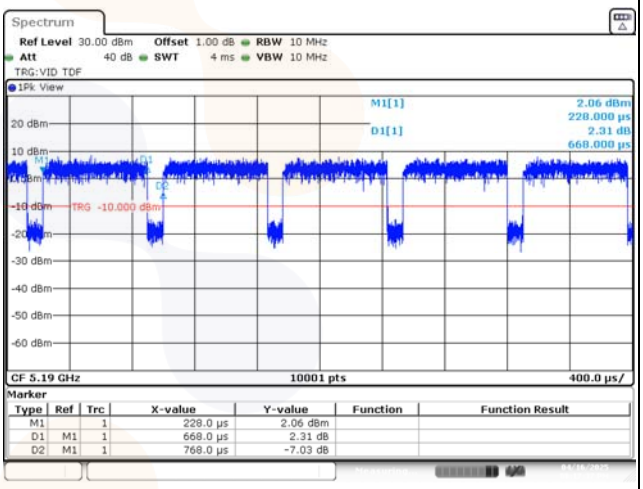
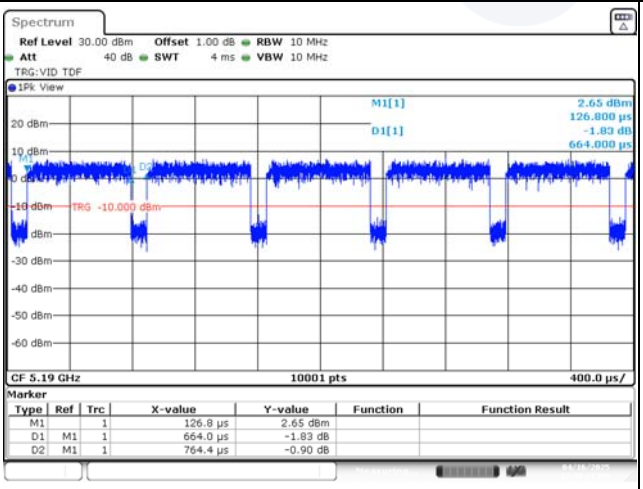
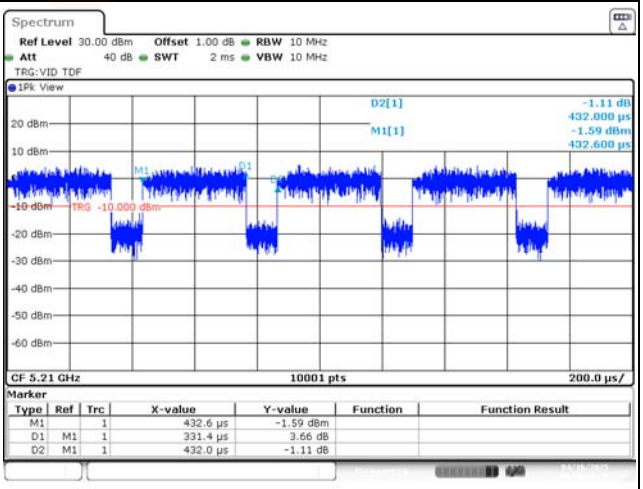


802.11n_HT40



802.11ac_VHT80



3. Antenna requirement

Requirement of FCC part section 15.203

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

Requirement of RSS-Gen Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

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

4. Summary of tests

FCC Part section(s)	IC Rule Reference	Parameter	Test Condition	Test results
15.407(a)	RSS-247 Issue 2, 6.2	Maximum conducted output power	Conducted	Pass
15.407(a)	RSS-247 Issue 2, 6.2	Maximum power spectral density		Pass
15.407(a)	RSS-Gen Issue 5, 6.7	26 dB Channel Bandwidth		Pass
15.407(e)	RSS-247 Issue 2, 6.2.4	6 dB Channel Bandwidth		N/T[1)]
-	RSS-Gen Issue 5, 6.7	Occupied Bandwidth		Pass
15.407(g)	RSS-247 Issue2, 6	Frequency Stability		Pass
15.207(a)	RSS-Gen (8.8)	AC Conducted Emissions		N/T[2)]
15.407(b), 15.205(a), 15.209(a)	RSS-Gen Issue 5, 8.9, 8.10 RSS-247 Issue 2, 6.2	Spurious emission	Radiated	Pass
		Band-edge, restricted band		Pass

Notes: (N/T: Not Tested, N/A: Not Applicable)

1. The device has not been tested as it only supports UNII-1 band.
2. The test was not conducted as the device is vehicle type.
3. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst-case emissions.
4. 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.
5. EUT was investigated in three orthogonal orientations X, Y and Z. it was determined that **Y** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **Y** orientation.
6. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 789033 D02 v02r01
7. Based on the baseline scan, the worst-case data rates were:
   802.11a mode : 6Mbps
   802.11n HT20 mode : MCS0
   802.11n HT40 mode : MCS0
   802.11ac_VHT20 mode : MCS0
   802.11ac_VHT40 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 (±)	
Maximum Peak Output Power	0.9 dB	
Peak Power Spectral Density	1.0 dB	
Channel Bandwidth	0.1 %	
Occupied Bandwidth	0.1 %	
Frequency stability	0.03 ppm	
Conducted spurious emission	2.0 dB	
Radiated spurious Emissions (Bandedge, restricted band)	Below 30 ㎒	2.3 dB
	30 ㎒ to 1 000 ㎒	2.6 dB
	1 000 ㎒ to 18 000 ㎒	4.8 dB
	Above 18 000 ㎒	4.8 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	10.03	9 000	11.93
50	10.05	10 000	12.12
100	10.15	11 000	12.62
200	10.16	12 000	12.24
300	10.22	13 000	12.01
400	10.22	14 000	12.17
500	10.34	15 000	12.41
600	10.35	16 000	12.34
700	10.46	17 000	12.42
800	10.42	18 000	12.52
900	10.43	19 000	12.56
1 000	10.52	20 000	12.41
2 000	10.86	21 000	12.74
3 000	10.88	22 000	12.61
4 000	11.17	23 000	12.84
5 000	11.28	24 000	13.53
6 000	11.39	25 000	15.15
7 000	11.48	26 000	13.02
8 000	11.94	26 500	13.41

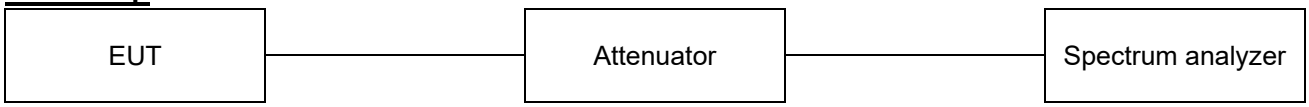
Notes:

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

7. Test results

7.1. Maximum conducted output power

Test setup



Limit

According to §15.407(a), RSS-247(6.2)

FCC

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

IC

Band	Maximum e.i.r.p. limit
UNII-1	200 mW or 10 + 10 logB[2)], dB m
UNII-2A	1 W or 17 dB m + 10logB[2)]
UNII-2C	1 W or 17 dB m + 10logB[2)]
UNII-3	1 W (30 dB m)

Note:

1) Conducted output power limit B is the 26 dB emission bandwidth.
2) Maximum e.i.r.p. limit B is the 99% emission bandwidth.

Test procedure

ANSI C63.10-2013-Section 12.3.2.4 or 12.3.3.1, 14.2
KDB 789033 D02 v02r01 - Section E.2.d) or E.3.a)

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

Conducted Output Power

Test mode	Band	Frequency (㎒)	Measured output power			FCC Limit (dB m)	IC Limit (dB m)
			Reading (dB m)	DCF (dB)	Result (dB m)		
802.11a	UNII 1	5 180	4.67	0.29	4.96	23.98	22.40
		5 200	4.81		5.10	23.98	22.40
		5 240	5.25		5.54	23.98	22.40
802.11n HT20	UNII 1	5 180	4.75	0.31	5.06	23.98	22.63
		5 200	4.83		5.14	23.98	22.63
		5 240	5.26		5.57	23.98	22.63
802.11n HT40	UNII-1	5 190	5.11	0.61	5.72	23.98	23.01
		5 230	5.50		6.11	23.98	23.01
802.11ac VHT20	UNII-1	5 180	4.87	0.31	5.18	23.98	22.63
		5 200	5.01		5.32	23.98	22.63
		5 240	5.58		5.89	23.98	22.63
802.11ac VHT40	UNII-1	5 190	5.42	0.61	6.03	23.98	23.01
		5 230	5.79		6.40	23.98	23.01
802.11ac VHT80	UNII-1	5 210	4.46	1.15	5.61	23.98	23.01

Note:

1. Conducted output power (dB m) = Average Reading (dB m) + DCF(dB)

E.I.R.P.

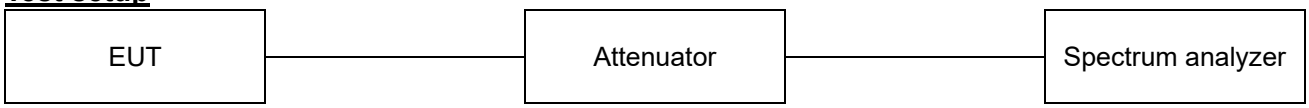
Test mode	Band	Frequency (㎒)	Measured output power			MAX e.i.r.p Limit (dB m)
			Conducted output power (dB m)	ANT gain (dB i)	MAX e.i.r.p (dB m)	
802.11a	UNII 1	5 180	4.96	1.43	6.39	22.40
		5 200	5.10		6.53	22.40
		5 240	5.54		6.97	22.40
802.11n HT20	UNII 1	5 180	5.06	1.43	6.49	22.63
		5 200	5.14		6.57	22.63
		5 240	5.57		7.00	22.63
802.11n HT40	UNII-1	5 190	5.72	1.43	7.15	23.01
		5 230	6.11		7.54	23.01
802.11ac VHT20	UNII-1	5 180	5.18	1.43	6.61	22.63
		5 200	5.32		6.75	22.63
		5 240	5.89		7.32	22.63
802.11ac VHT40	UNII-1	5 190	6.03	1.43	7.46	23.01
		5 230	6.40		7.83	23.01
802.11ac VHT80	UNII-1	5 210	5.61	1.43	7.04	23.01

Notes:

1. E.I.R.P. Calculation: E.I.R.P. (dB m) = Conducted output power (dB m) + Antenna gain (dB i)

7.2. Maximum Power Spectral Density

Test setup



Limit

FCC

According to §15.407(a)

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

IC

According to RSS-247(6.2)

Band	e.i.r.p. spectral density	Limit
UNII 1	√	10 dB m/㎒

Band	Power spectral density	Limit
UNII 2A		11 dB m /㎒
UNII 2C		11 dB m /㎒
UNII 3		30 dB m /500 ㎑

Test procedure

ANSI C63.10-2013 Section 12.3.2.2, 14.3.2.2
KDB 789033 D02 v02r01 – Section E and F

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 MHz reference bandwidth
5. For devices operating in the bands 5.15-5.25 GHz, 5.25-5.35 GHz, and 5.47-5.725 GHz, the preceding procedures make use of 1 MHz RBW to satisfy directly the 1 MHz reference bandwidth specified in Section 15.407(a)(5). For devices operating in the band 5.725-5.85 GHz, the rules specify a measurement bandwidth of 500 kHz. Many spectrum analyzers do not have 500 kHz RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1 MHz, or 500 kHz, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth(i.e., 1 MHz, or 500 kHz). If measurements are performed using a reduced resolution bandwidth (< 1 MHz, or < 500 kHz) and integrated over 1 MHz, or 500 kHz 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 kHz, add 10 log (500 kHz/RBW) to the measured result, whereas RBW (<500 kHz) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 MHz, add 10 log (1 MHz/RBW) to the measured result, whereas RBW (< 1 MHz) 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.

Note:

- As a practical matter, it is recommended to use reduced RBW of 100 kHz for the II.F.5.c) and II.F.5.d), since RBW=100 kHz is available on nearly all spectrum analyzers.
- Method SA-2 is used.

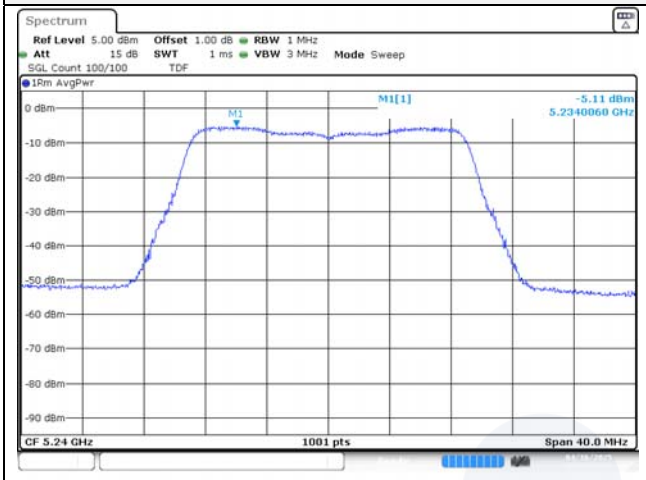
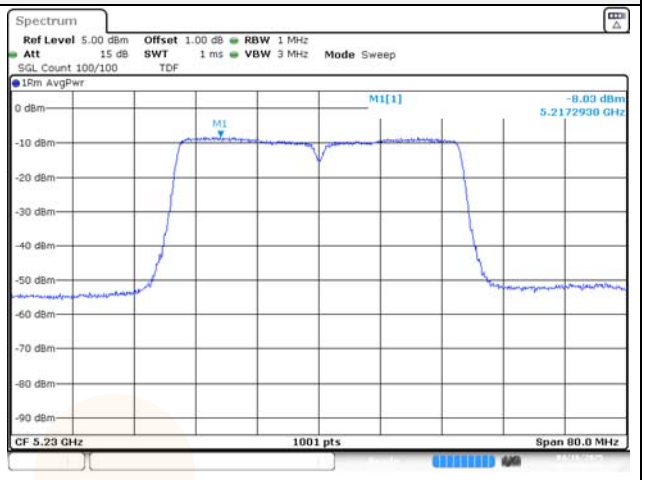
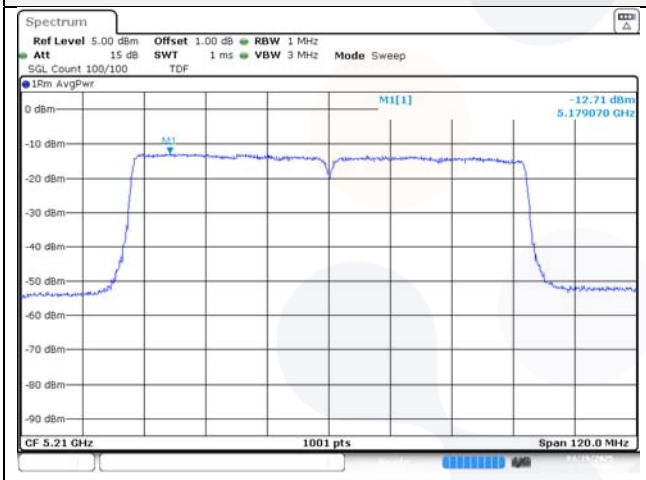
Test results

Test mode	Band	Frequency (㎒)	Measured PSD (dB m/㎒)	DCF (dB)	Maximum PSD (dB m/㎒)	ANT Gain (dB i)	E.I.R.P. PSD (dB m/㎒)	Limit (dB m/㎒)	E.I.R.P. Limit (dB m/㎒)
802.11a	UNII 1	5 180	-5.87	0.29	-5.58	1.43	-4.15	11.00	10.00
		5 200	-5.72		-5.43	1.43	-4.00	11.00	10.00
		5 240	-5.34		-5.05	1.43	-3.62	11.00	10.00
802.11n HT20	UNII 1	5 180	-6.05	0.31	-5.74	1.43	-4.31	11.00	10.00
		5 200	-6.07		-5.76	1.43	-4.33	11.00	10.00
		5 240	-5.53		-5.22	1.43	-3.79	11.00	10.00
802.11n HT40	UNII 1	5 190	-8.81	0.61	-8.20	1.43	-6.77	11.00	10.00
		5 230	-8.16		-7.55	1.43	-6.12	11.00	10.00
802.11ac VHT20	UNII 1	5 180	-6.04	0.31	-5.73	1.43	-4.30	11.00	10.00
		5 200	-5.74		-5.43	1.43	-4.00	11.00	10.00
		5 240	-5.11		-4.80	1.43	-3.37	11.00	10.00
802.11ac VHT40	UNII 1	5 190	-8.47	0.61	-7.86	1.43	-6.43	11.00	10.00
		5 230	-8.03		-7.42	1.43	-5.99	11.00	10.00
802.11ac VHT80	UNII 1	5 210	-12.71	1.15	-11.56	1.43	-10.13	11.00	10.00

Notes:

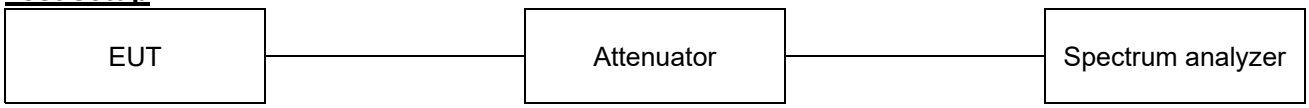
1. Maximum PSD(dB m/㎒) = Measured PSD(dB m/㎒) + D.C.F(dB)
2. E.I.R.P PSD (dB m/㎒) = Maximum PSD (dB m/㎒) + Antenna gain (dB i)

In order to simplify the report, attached plots were the worst case per bandwidth

UNII-1 / 802.11ac_VHT20 / High ch.	UNII-1 / 802.11ac_VHT40 / High ch.
	
UNII-1 / 802.11ac_VHT80 / Mid ch.	**-**
	Blank

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 (26 dB bandwidth)
KDB 789033 D02 v02r01 - Section D (99% bandwidth)

Test settings

1. 26 dB Bandwidth

a. Set RBW = approximately 1% of the emission bandwidth.
b. Set the VBW > RBW.
c. Detector = Peak.
d. Trace mode = max hold.
e. 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

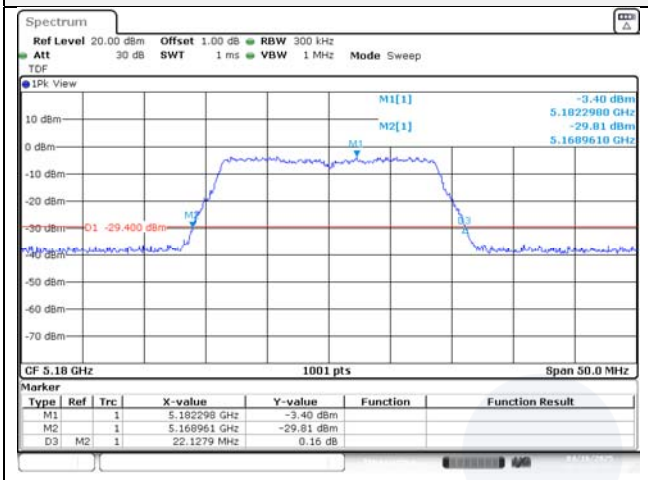
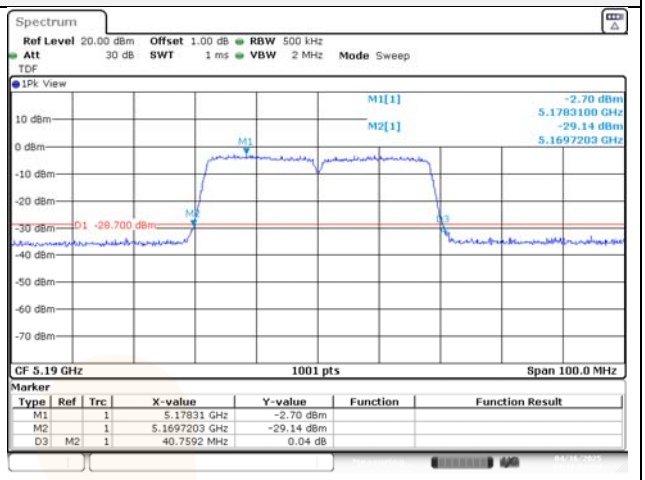
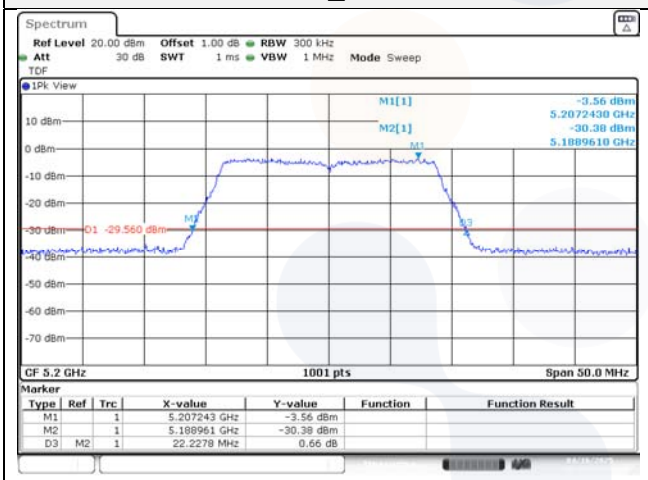
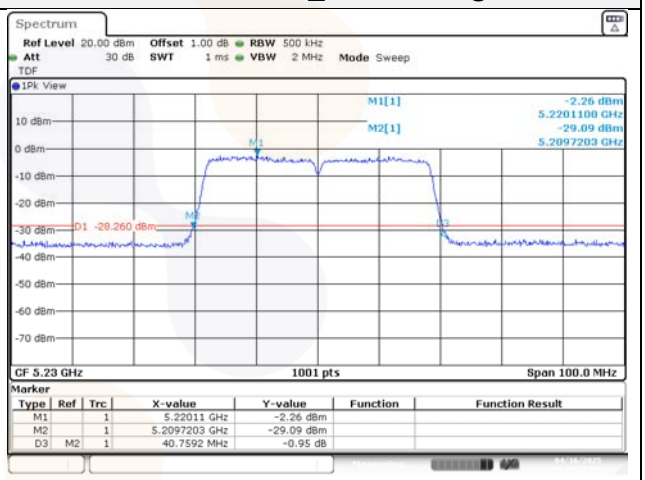
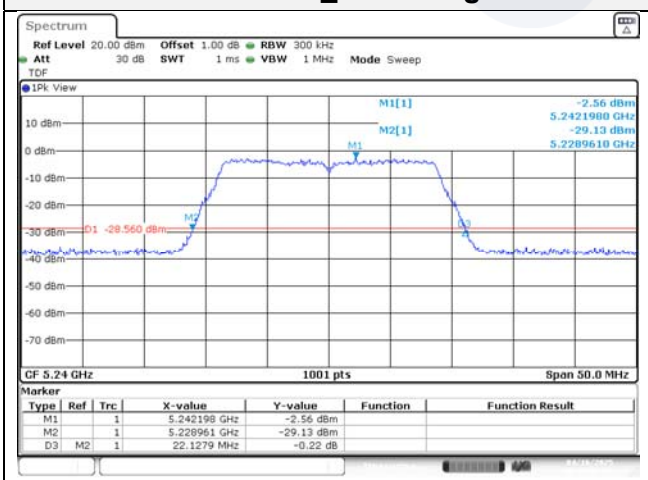
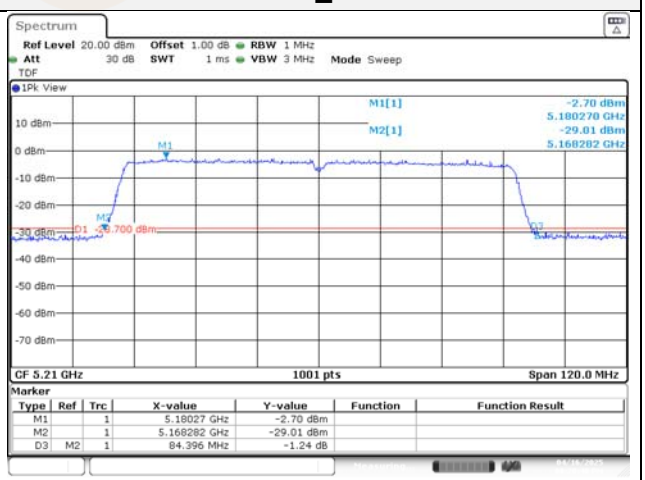
a. Set center frequency to the nominal EUT channel center frequency.
b. Set span = 1.5 times to 5.0 times the OBW.
c. Set RBW = 1% to 5% of the OBW
d. Set VBW ≥ 3 x RBW
e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f. Use the 99% power bandwidth function of the instrument (if available).
g. 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	17.38
		5 200	22.03	17.38
		5 240	21.93	17.38
802.11n HT20	UNII 1	5 180	22.13	18.33
		5 200	22.23	18.38
		5 240	22.13	18.38
802.11n HT40	UNII 1	5 190	40.66	36.76
		5 230	40.56	36.76
802.11ac VHT20	UNII 1	5 180	22.13	18.33
		5 200	22.18	18.33
		5 240	22.13	18.38
802.11ac VHT40	UNII 1	5 190	40.76	36.66
		5 230	40.76	36.66
802.11ac VHT80	UNII 1	5 210	84.40	76.12

In order to simplify the report, attached plots were the worst case per bandwidth

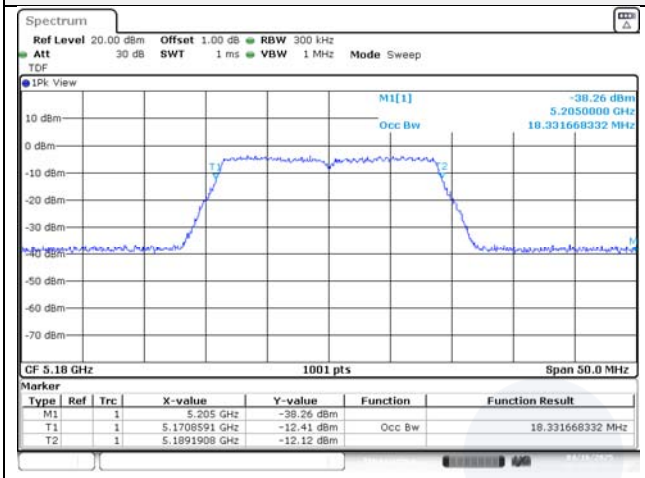
26 dB bandwidth

UNII-1 / 802.11n_HT20 / Low ch.	UNII-1 / 802.11ac_VHT40 / Low ch.
	
UNII-1 / 802.11n_HT20 / Mid ch.	**UNII-1 / 802.11ac_VHT40 / High ch.**
	
UNII-1 / 802.11n_HT20 / High ch.	**UNII-1 / 802.11ac_VHT80 / Mid ch.**
	

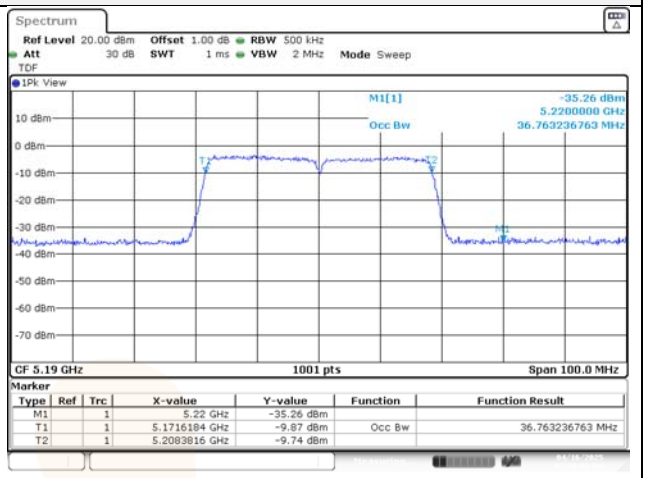
In order to simplify the report, attached plots were the worst case per bandwidth

99% bandwidth

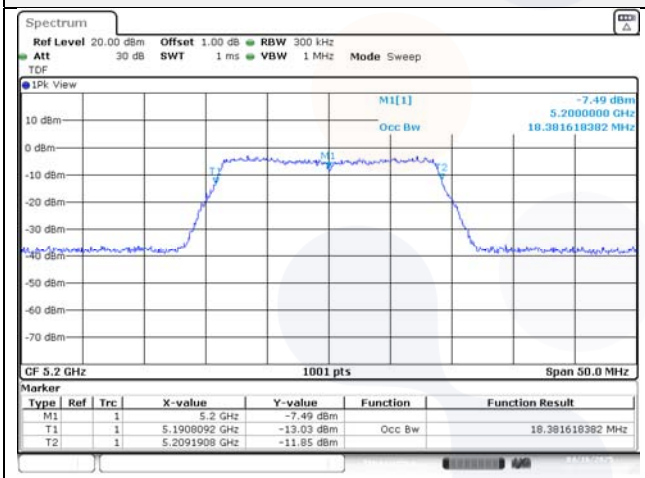
UNII-1 / 802.11n_HT20 / Low ch.



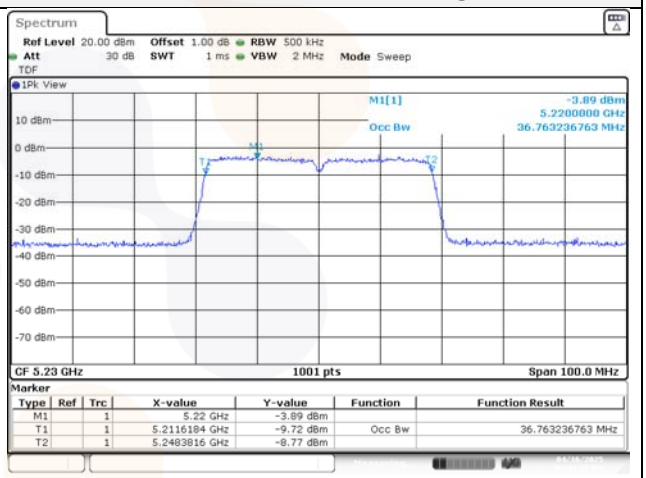
UNII-1 / 802.11n_HT40 / Low ch.



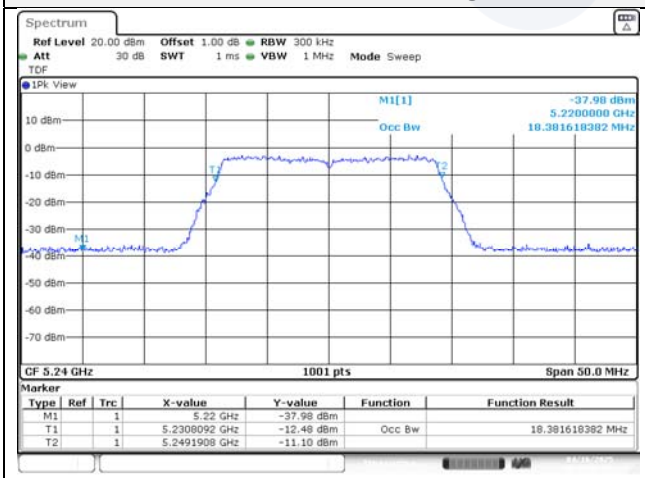
UNII-1 / 802.11n_HT20 / Mid ch.



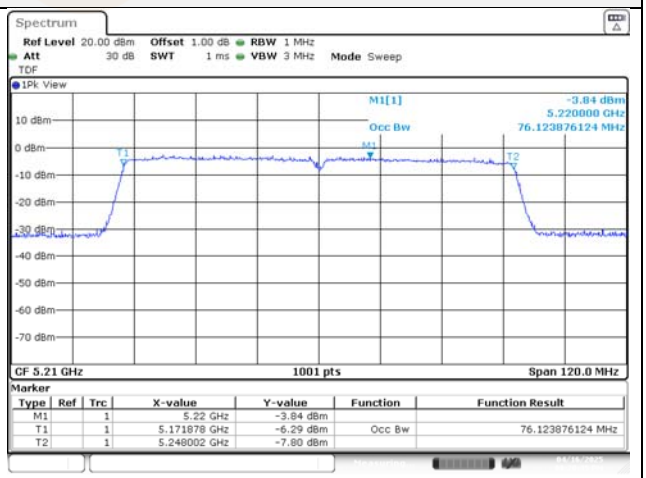
UNII-1 / 802.11n_HT40 / High ch.



UNII-1 / 802.11n_HT20 / High ch.

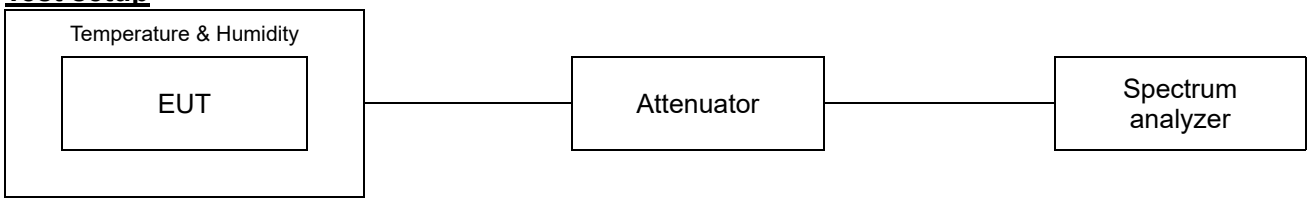


UNII-1 / 802.11ac_VHT80 / Mid ch.



7.4. Frequency stability

Test setup



Limit

According to §15.407(g),
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.

According to RSS-GEN(6.11),
For licence-exempt devices, the following conditions apply:

(a) at the temperatures of -20°C (-4°F), +20°C (+68°F) and +50°C (+122°F), and at the manufacturer's rated supply voltage

(b) at the temperature of +20°C (+68°F) and at ±15% of the manufacturer's rated supply voltage

If the frequency stability limits are only met within a temperature range that is smaller than the range specified in (a) for licensed or licence-exempt devices, the frequency stability requirement will be deemed to be met if the transmitter is automatically prevented from operating outside this smaller temperature range and if the published operating characteristics for the equipment are revised to reflect this restricted temperature range.

If the device contains both licence and licence-exempt transmitter modules, the device's frequency stability shall be measured under the most stringent condition specified in the applicable RSS of the transmitter module.

In addition, if an unmodulated carrier is not available, the method used to measure frequency stability shall be described in the test report.

According to RSS-GEN(8.11),
If the frequency stability of the licence-exempt radio apparatus is not specified in the applicable RSS, the fundamental emissions of the radio apparatus should be kept within at least the central 80% of its permitted operating frequency band in order to minimize the possibility of out-of-band operation. In addition, its occupied bandwidth shall be entirely outside the restricted bands and the prohibited TV bands of 54-72 ㎒, 76-88 ㎒, 174-216 ㎒, and 470-602 ㎒, unless otherwise indicated.

Test procedure

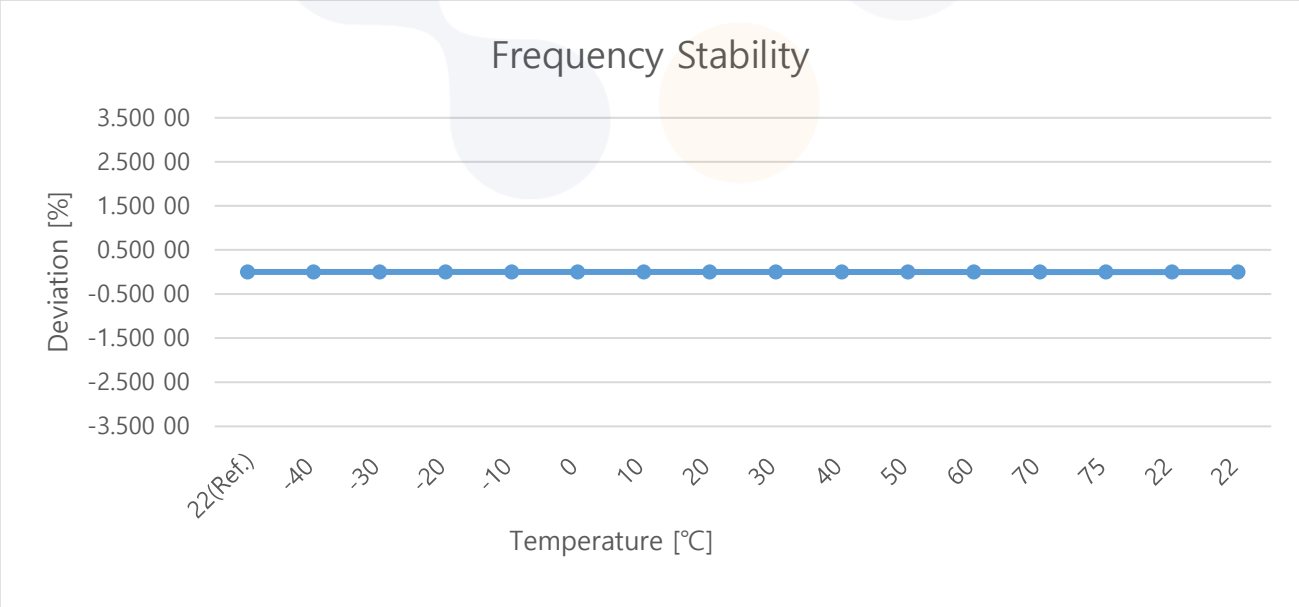
ANSI C63.10-2013 - Section 6.8.1

Test results

Test band : UNII-1

Frequency (㎐) : 5 180 000 000

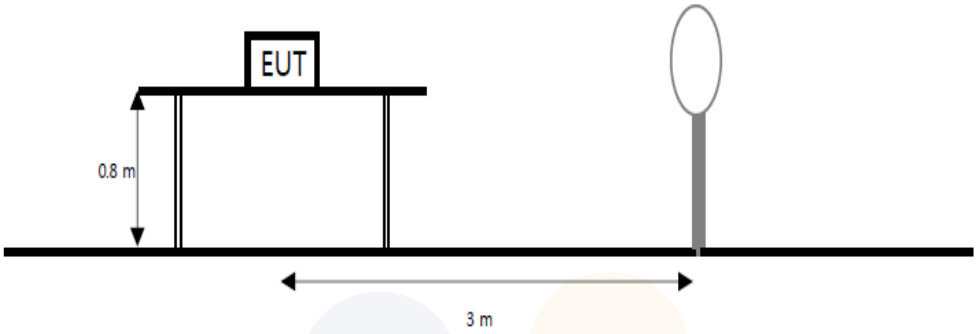
Voltage (%)	Power (V)	Temp. (°C)	Frequency (㎐)	Frequency error (㎐)	Deviation	
					(ppm)	(%)
100	12.00	22(Ref.)	5 179 996 000	-4 000	-0.77	-0.000 08
		-40	5 179 995 250	-4 750	-0.92	-0.000 09
		-30	5 179 994 250	-5 750	-1.11	-0.000 11
		-20	5 179 996 200	-3 800	-0.73	-0.000 07
		-10	5 179 993 210	-6 790	-1.31	-0.000 13
		0	5 179 994 010	-5 990	-1.16	-0.000 12
		10	5 179 994 810	-5 190	-1.00	-0.000 10
		20	5 179 995 400	-4 600	-0.89	-0.000 09
		30	5 179 996 400	-3 600	-0.69	-0.000 07
		40	5 179 996 200	-3 800	-0.73	-0.000 07
		50	5 179 995 240	-4 760	-0.92	-0.000 09
		60	5 179 995 400	-4 600	-0.89	-0.000 09
		70	5 179 996 500	-3 500	-0.68	-0.000 07
		75	5 179 996 500	-3 500	-0.68	-0.000 07
85	10.20	22	5 179 996 400	-3 600	-0.69	-0.000 07
115	13.80	22	5 179 996 400	-3 600	-0.69	-0.000 07



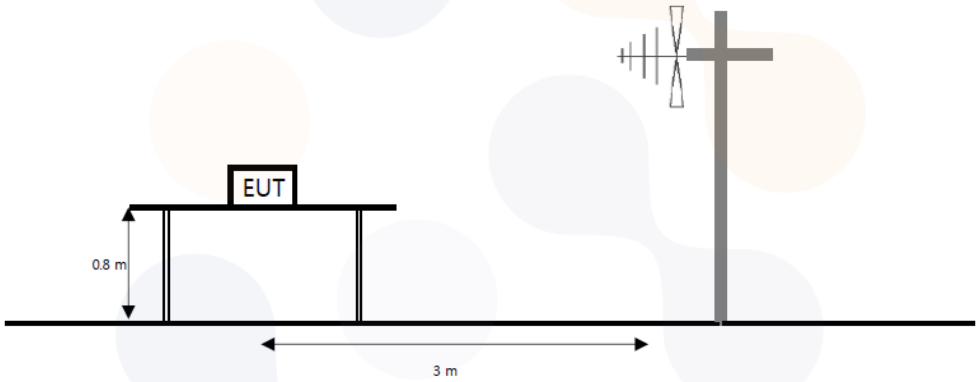
7.5. Spurious Emission, Band Edge and Restricted bands

Test setup

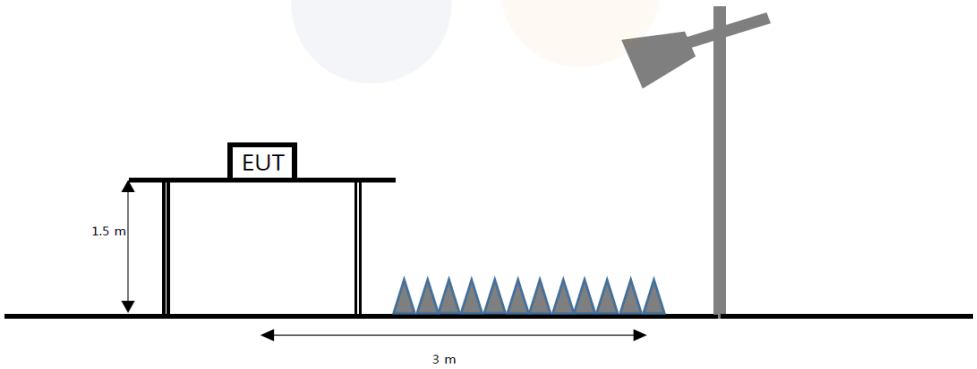
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



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

FCC

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	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.386 75	25	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	156.7 - 156.9	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	162.012 5 - 167.17	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	167.72 - 173.2	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	240 - 285	3 600 – 4 400	Above 38.6
13.36 - 13.41	322 - 335.4		

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 5.47-5.725 ㎓ 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.

IC
According to RSS-247(5.5),
In any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general field strength limits specified in RSS-Gen is not required.

According to RSS-Gen(8.9),
Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5- General field strength limits at frequencies above 30 ㎒

Frequency(㎒)	Field strength (㎶/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 6- General field strength limits at frequencies below 30 ㎒

Frequency	Magnetic field strength (H-Field) (㎂/m)	Measurement distance(m)
9 – 490 ㎑ 1)	6.37/F (F in ㎑)	300
490 – 1705 ㎑	63.7/F (F in ㎑)	30
1.705 - 30 ㎒	0.08	30

According to RSS-Gen(8.10),
Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).
(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.
(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7- Restricted frequency bands*

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138	--	

* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Test procedure

ANSI C63.10-2013 Section 12.7.7.2, 12.7.5, 12.7.6
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 kHz to 150 kHz	200 Hz to 300 Hz
0.15 MHz to 30 MHz	9 kHz to 10 kHz
30 MHz to 1 000 MHz	100 kHz to 120 kHz
> 1 000 MHz	1 MHz

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 ㏈ 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.

Band edge measurements

Integration Method

For maximum emissions measurements, follow the procedures described in II.G.5., “Procedures for unwanted maximum Emissions Measurements above 1000 ㎒. Except for the following changes:

1. Set RBW = 100 ㎑
2. Set VBW ≥ 3 × RBW
3. Perform a band-power integration across the 1 ㎒ bandwidth in which the band edge emission level is to be measured. CAUTION: you must ensure that the spectrum analyzer or EMI receiver is set for peak detection and max-hold for this measurement.

For average emissions measurements, follow the procedures described in II.G.6., “Procedures for average unwanted Emissions Measurements above 1000 ㎒. Except for the following changes:

1. Set RBW = 100 ㎑
2. Set VBW ≥ 3 × RBW
3. Perform a band-power integration across the 1 ㎒ bandwidth in which the band edge emission level is to be measured.

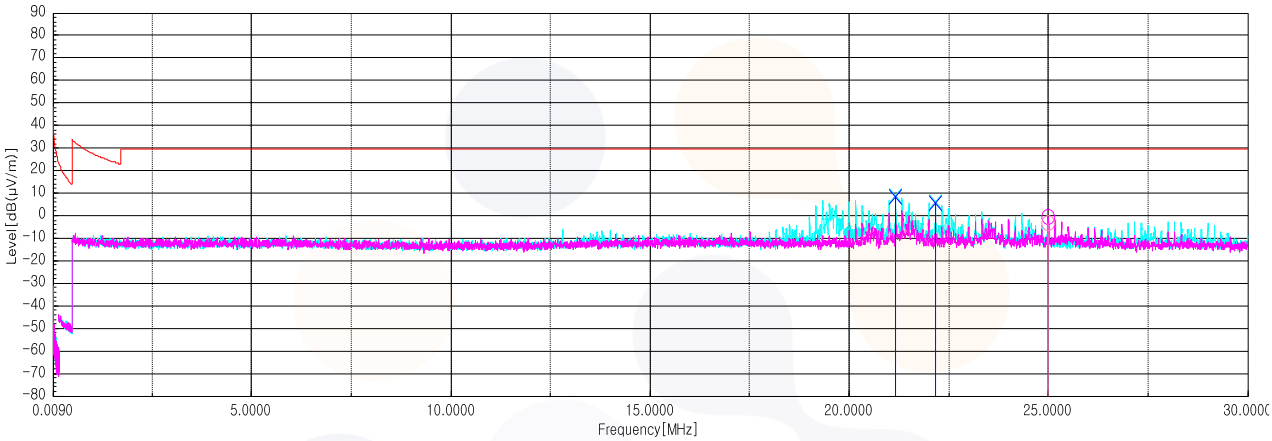
Notes:

1. *f* <30 ㎒, extrapolation factor of 40 ㏈/decade of distance. $F_d = 40\log(D_m/D_s)$
   f ≥30 ㎒, extrapolation factor of 20 ㏈/decade of distance. $F_d = 20\log(D_m/D_s)$
   Where:
   F_d= Distance factor in ㏈
   D_m= Measurement distance in meters
   D_s= Specification distance in meters
2. Factors(㏈) = Antenna factor(㏈/m) + Cable loss(㏈) + or Amp. gain(㏈) + or F_d(㏈)
3. The worst-case emissions are reported however emissions whose levels were not within 20 ㏈ 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. Above 1 ㎓ the worst results between two antenna polarizations (H and V) were documented in the test report.
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 ㏈ of the limit, then the following statement shall be made: “No spurious emissions were detected within 20 ㏈ 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.
9. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X ㎑ resulted in a level of Y ㏈㎶/m, which is equivalent to Y - 51.5 = Z ㏈㎂/m, which has the same margin, W ㏈, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Test results (Below 30 ㎒) – Worst case: 802.11ac_VHT40 / UNII-1_5 230 ㎒

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	Distance factor	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
21.16	V	59.90	20.77	-32.47	40.00	8.20	29.54	21.34
22.16	V	56.80	20.83	-32.44	40.00	5.19	29.54	24.35
25.00	H	47.80	21.00	-32.35	40.00	-3.55	29.54	33.09

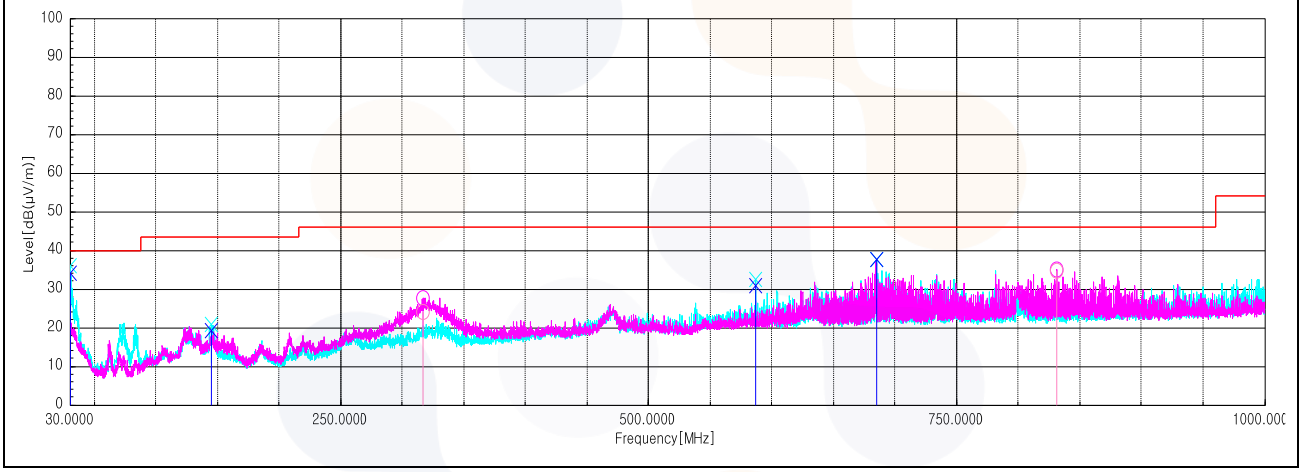
Horizontal/Vertical



Test results (Below 1 000 ㎒) – Worst case: 802.11ac_VHT40 / UNII-1_5 230 ㎒

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
30.49	V	41.60	24.61	-32.09	-	34.12	40.00	5.88
144.95	V	33.60	17.11	-31.50	-	19.21	43.52	24.31
317.12	H	35.60	19.50	-31.15	-	23.95	46.02	22.07
586.90	V	37.30	24.50	-30.99	-	30.81	46.02	15.21
684.75	V	43.40	24.90	-30.67	-	37.63	46.02	8.39
831.46	H	38.70	25.80	-29.81	-	34.69	46.02	11.33

Horizontal/Vertical



Test results (Above 1 000 ㎒)

UNII-1

802.11a_Lowest Channel (5 180 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 146.88[1)]	H	44.60	33.20	-26.64	-	51.16	74.00	22.84
1 685.67[1)]	H	69.80	25.10	-47.71	-	47.19	74.00	26.81
10 324.52	V	55.80	38.90	-43.04	-	51.66	68.20	16.54
15 597.16[1)]	V	55.00	37.81	-40.97	-	51.84	74.00	22.16
Average Data								
5 146.88[1)]	H	32.97	33.20	-26.64	0.29	39.82	54.00	14.18
15 597.16[1)]	V	44.27	37.81	-40.97	0.29	41.40	54.00	12.60

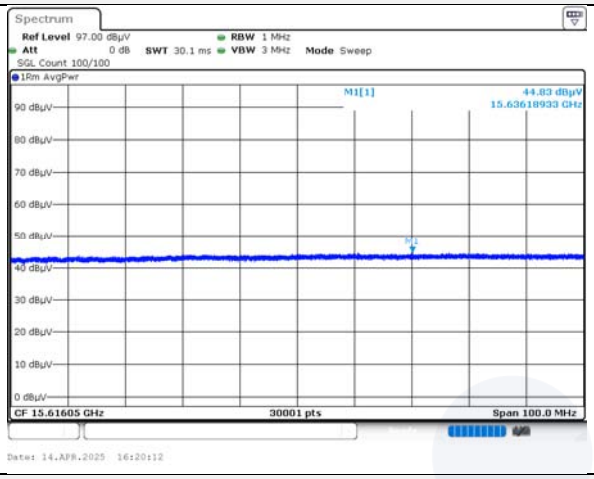
802.11a_Middle Channel (5 200 ㎒)

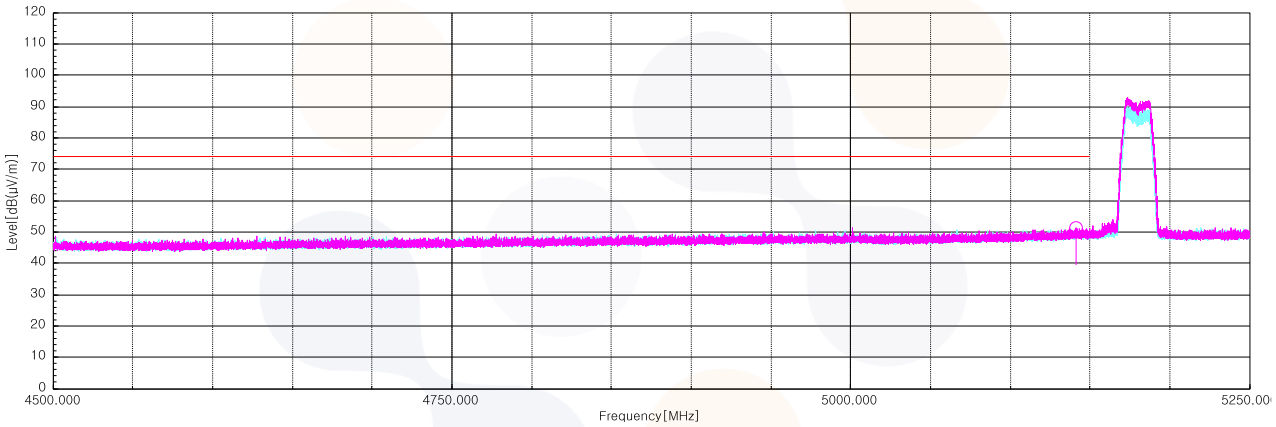
Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 687.50[1)]	H	70.40	25.10	-47.71	-	47.79	74.00	26.21
10 278.90	V	56.10	38.90	-43.03	-	51.97	68.20	16.23
15 636.19[1)]	H	55.00	37.83	-40.93	-	51.90	74.00	22.10
Average Data								
15 636.19[1)]	H	44.83	37.83	-40.93	0.29	42.02	54.00	11.98

802.11a_Highest Channel (5 240 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 686.77[1)]	H	70.30	25.10	-47.71	-	47.69	74.00	26.31
10 528.07	V	55.50	38.90	-43.12	-	51.28	68.20	16.92
15 638.55[1)]	V	56.00	37.82	-40.92	-	52.90	74.00	21.10
Average Data								
15 638.55[1)]	V	44.61	37.82	-40.92	0.29	41.80	54.00	12.20

In order to simplify the report, attached plots were only the lowest margin condition
802.11a_Middle Channel (5 200 ㎒)

Average data	
	Blank

Horizontal/Vertical for Band-edge


802.11n_HT20_Lowest Channel (5 180 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 142.61[1)]	H	44.70	33.20	-26.65	-	51.25	74.00	22.75
1 618.02[1)]	V	67.50	25.20	-47.70	-	45.00	74.00	29.00
10 335.25	V	55.30	38.90	-43.04	-	51.16	68.20	17.04
15 397.84[1)]	V	55.00	38.60	-41.02	-	52.58	74.00	21.42
Average Data								
5 142.61[1)]	H	33.21	33.20	-26.65	0.31	40.07	54.00	13.93
15 397.84[1)]	V	43.80	38.60	-41.02	0.31	41.69	54.00	12.31

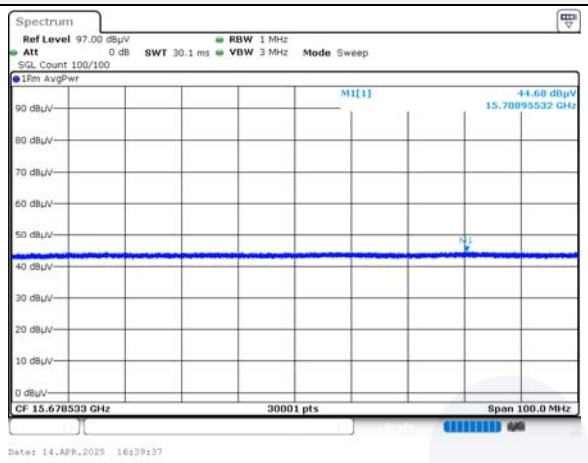
802.11n_HT20_Middle Channel (5 200 ㎒)

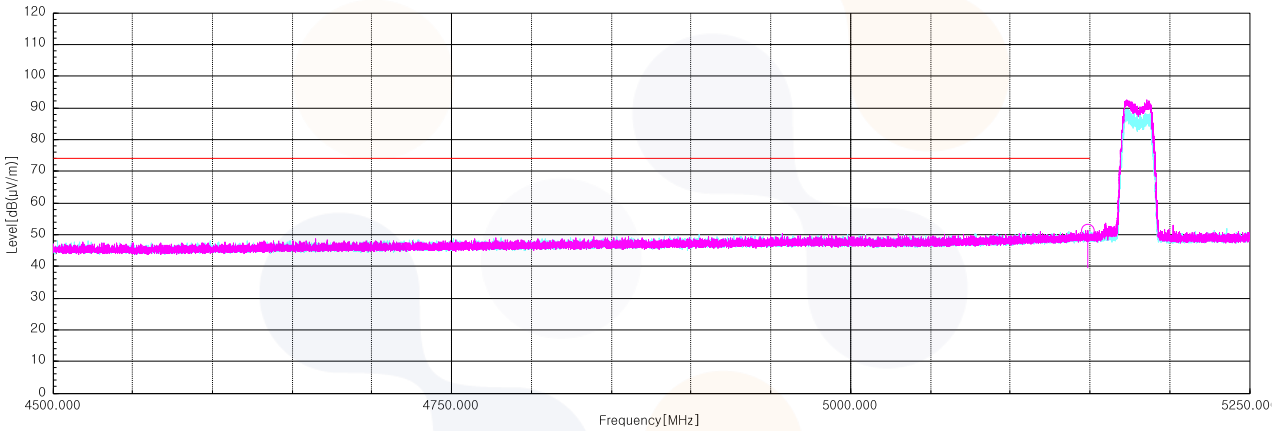
Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 638.18	H	67.40	25.20	-47.71	-	44.89	68.20	23.31
10 383.55	H	55.40	38.73	-43.05	-	51.08	68.20	17.12
15 708.96[1)]	V	55.30	37.90	-40.84	-	52.36	74.00	21.64
Average Data								
15 708.96[1)]	V	44.68	37.90	-40.84	0.31	42.05	54.00	11.95

802.11n_HT20_Highest Channel (5 240 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 686.77[1)]	H	65.70	25.10	-47.71	-	43.09	74.00	30.91
10 502.77	H	55.60	38.90	-43.07	-	51.43	68.20	16.77
15 753.71[1)]	H	55.90	37.90	-40.79	-	53.01	74.00	20.99
Average Data								
15 753.71[1)]	H	44.35	37.90	-40.79	0.31	41.77	54.00	12.23

In order to simplify the report, attached plots were only the lowest margin condition
802.11n_HT20_Lowest Channel (5 200 ㎒)

Average data	
	Blank

Horizontal/Vertical for Band-edge


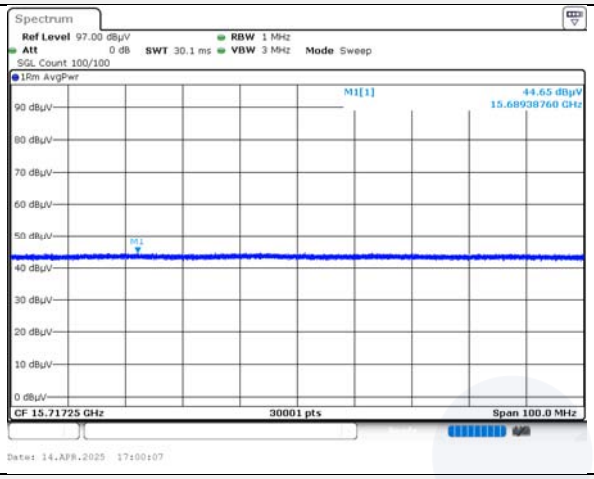
802.11n_HT40_Lowest Channel (5 190 ㎒)

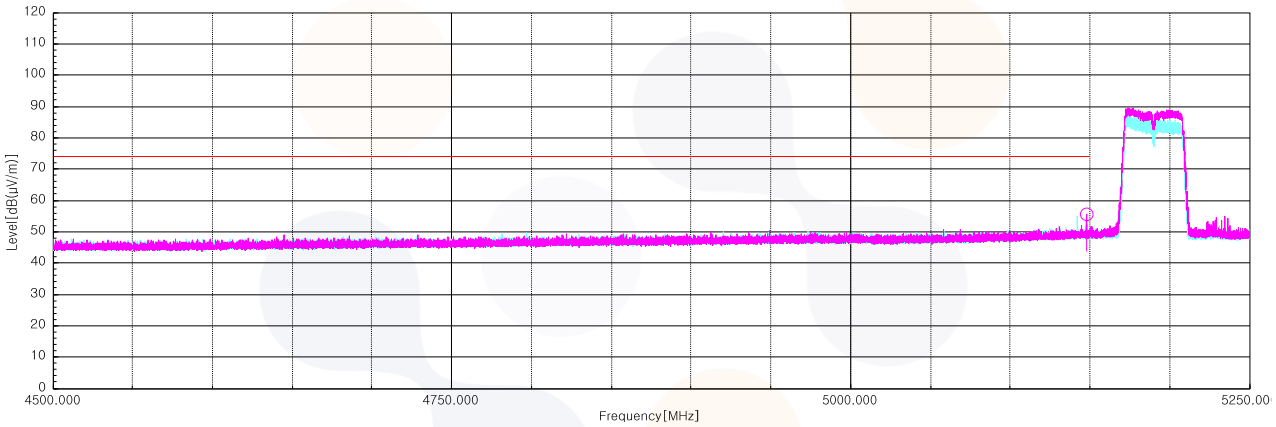
Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 144.57[1)]	H	48.90	33.20	-26.65	-	55.45	74.00	18.55
1 668.62[1)]	H	68.40	25.10	-47.71	-	45.79	74.00	28.21
10 492.42	V	55.50	38.98	-43.06	-	51.42	68.20	16.78
15 632.90[1)]	V	55.80	37.83	-40.93	-	52.70	74.00	21.30
Average Data								
5 144.57[1)]	H	33.24	33.20	-26.65	0.61	40.40	54.00	13.60
15 632.90[1)]	V	44.53	37.83	-40.93	0.61	42.04	54.00	11.96

802.11n_HT40_Highest Channel (5 230 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 681.27[1)]	H	68.80	25.10	-47.71	-	46.19	74.00	27.81
10 456.77	H	54.80	38.91	-43.05	-	50.66	68.20	17.54
15 689.39[1)]	H	54.50	37.90	-40.86	-	51.54	74.00	22.46
Average Data								
15 689.39[1)]	H	44.65	37.90	-40.86	0.61	42.30	54.00	11.70

In order to simplify the report, attached plots were only the lowest margin condition
802.11n_HT40_Highest Channel (5 230 ㎒)

Average data	
	Blank

Horizontal/Vertical for Band-edge


802.11ac_VHT20_Lowest Channel (5 180 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 143.62[1)]	H	44.90	33.20	-26.65	-	51.45	74.00	22.55
1 687.13[1)]	H	68.20	25.10	-47.71	-	45.59	74.00	28.41
10 341.00	V	55.40	38.90	-43.04	-	51.26	68.20	16.94
15 573.89[1)]	V	55.10	37.90	-41.00	-	52.00	74.00	22.00
Average Data								
5 143.62[1)]	H	32.98	33.20	-26.65	0.31	39.84	54.00	14.16
15 573.89[1)]	V	44.03	37.90	-41.00	0.31	41.24	54.00	12.76

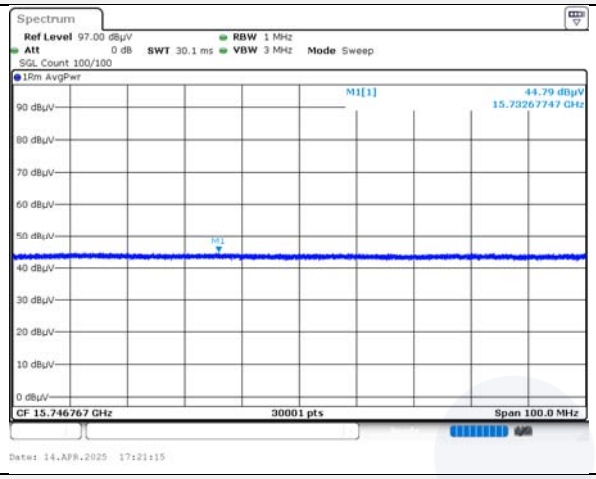
802.11ac_VHT20_Middle Channel (5 200 ㎒)

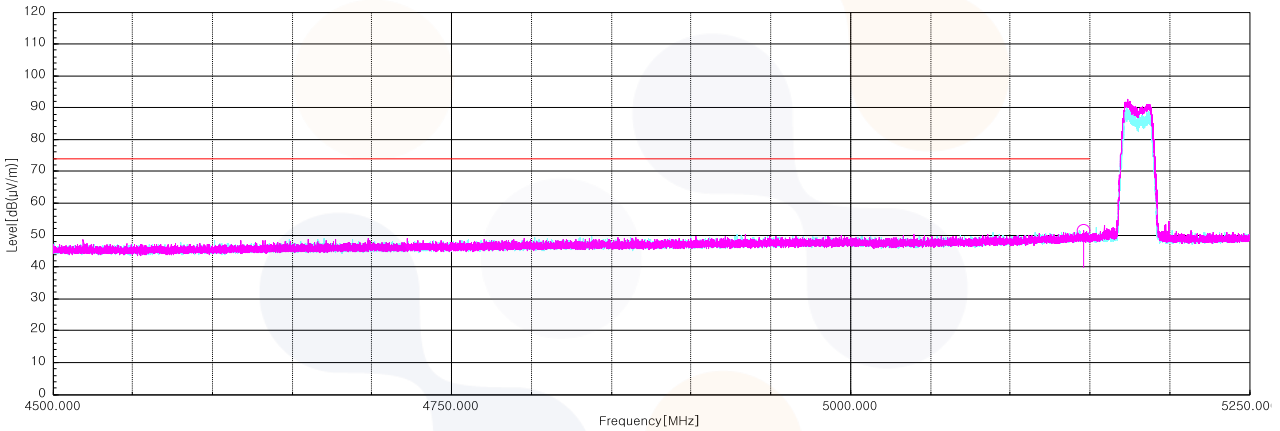
Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 685.30[1)]	H	68.00	25.10	-47.71	-	45.39	74.00	28.61
10 353.65	V	55.00	38.79	-43.04	-	50.75	68.20	17.45
15 640.87[1)]	V	55.00	37.82	-40.92	-	51.90	74.00	22.10
Average Data								
15 640.87[1)]	V	44.74	37.82	-40.92	0.31	41.95	54.00	12.05

802.11ac_VHT20_Highest Channel (5 240 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 685.30[1)]	H	67.80	25.10	-47.71	-	45.19	74.00	28.81
10 499.70	V	55.90	39.00	-43.06	-	51.84	68.20	16.36
15 732.68[1)]	V	55.40	37.90	-40.81	-	52.49	74.00	21.51
Average Data								
15 732.68[1)]	V	44.79	37.90	-40.81	0.31	42.19	54.00	11.81

In order to simplify the report, attached plots were only the lowest margin condition
802.11ac_VHT20_Highest Channel (5 240 ㎒)

Average data	
	Blank

Horizontal/Vertical for Band-edge


802.11ac_VHT40_Lowest Channel (5 190 ㎒)

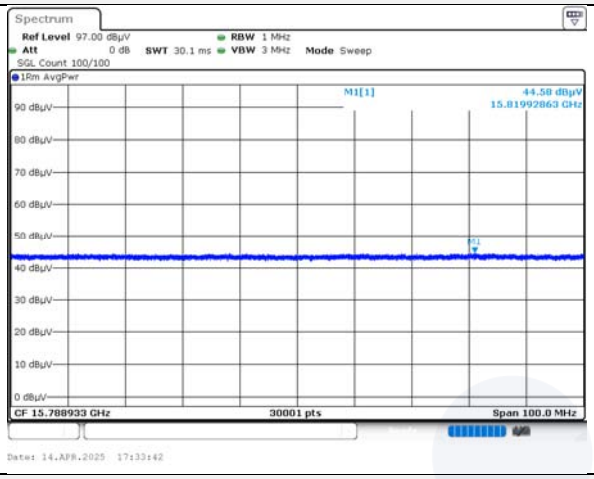
Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 149.03[1)]	H	47.40	33.20	-26.63	-	53.97	74.00	20.03
1 687.50[1)]	H	67.70	25.10	-47.71	-	45.09	74.00	28.91
10 369.75	H	55.10	38.76	-43.04	-	50.82	68.20	17.38
15 619.61[1)]	V	55.70	37.86	-40.95	-	52.61	74.00	21.39
Average Data								
5 149.03[1)]	H	33.10	33.20	-26.63	0.61	40.28	54.00	13.72
15 619.61[1)]	V	44.60	37.86	-40.95	0.61	42.12	54.00	11.88

802.11ac_VHT40_Highest Channel (5 230 ㎒)

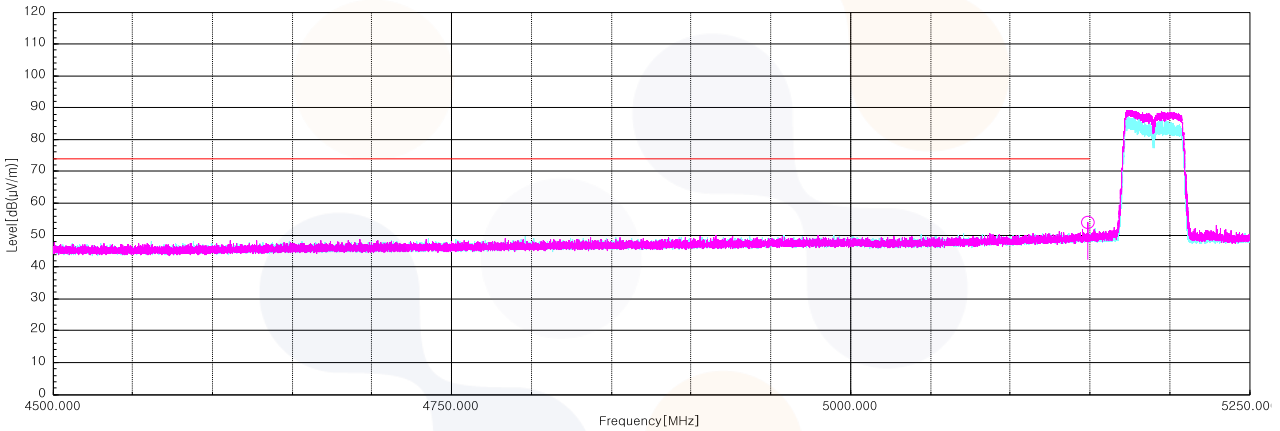
Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
1 685.12[1)]	H	67.60	25.10	-47.71	-	44.99	74.00	29.01
10 431.85	V	56.70	38.80	-43.05	-	52.45	68.20	15.75
15 819.93[1)]	H	56.20	37.90	-40.72	-	53.38	74.00	20.62
Average Data								
15 819.93[1)]	H	44.58	37.90	-40.72	0.61	42.37	54.00	11.63

In order to simplify the report, attached plots were only the lowest margin condition
802.11ac_VHT40_Highest Channel (5 230 ㎒)

Average data



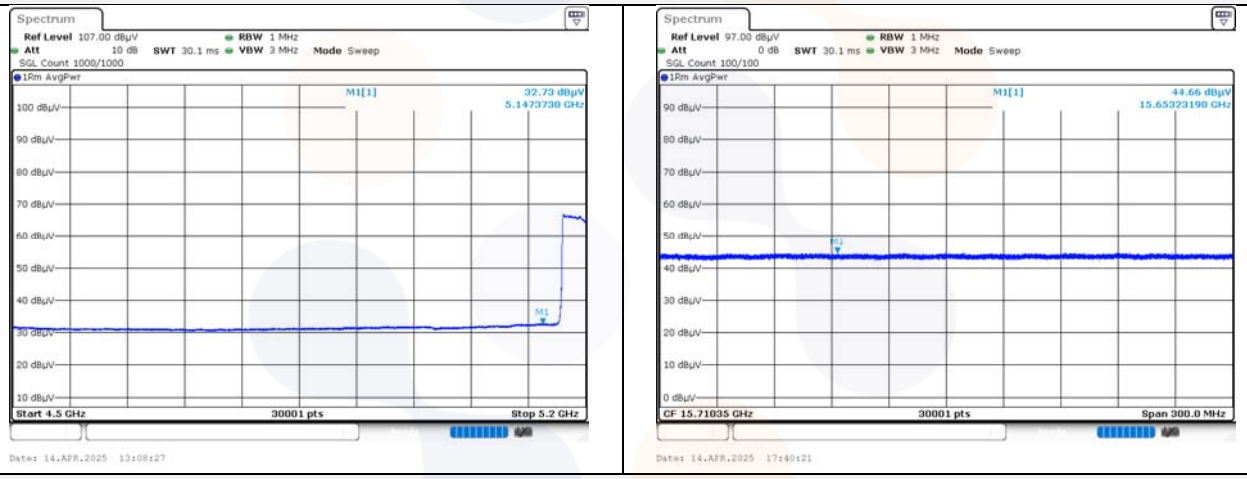
Horizontal/Vertical for Band-edge



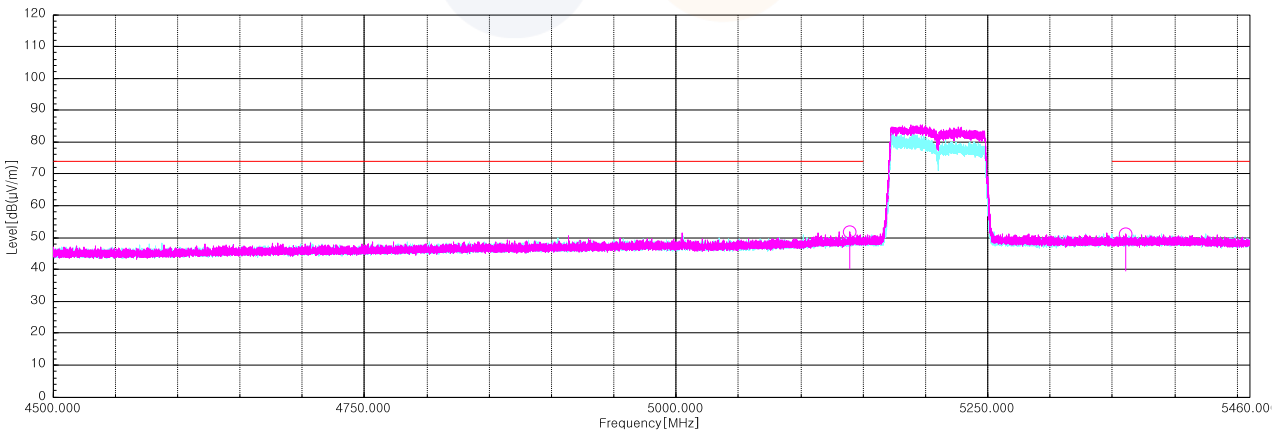
802.11ac_VHT80_Middle Channel (5 210 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 147.37[1)]	H	45.20	33.20	-26.64	-	51.76	74.00	22.24
5 360.93[1)]	H	44.10	33.00	-26.26	-	50.84	74.00	23.16
1 666.60[1)]	H	68.30	25.10	-47.71	-	45.69	74.00	28.31
10 319.53	H	56.70	38.90	-43.04	-	52.56	68.20	15.64
15 653.23[1)]	V	55.50	37.90	-40.91	-	52.49	74.00	21.51
Average Data								
5 147.37[1)]	H	32.73	33.20	-26.64	1.15	40.44	54.00	13.56
15 653.23[1)]	V	44.66	37.90	-40.91	1.15	42.80	54.00	11.20

Average data



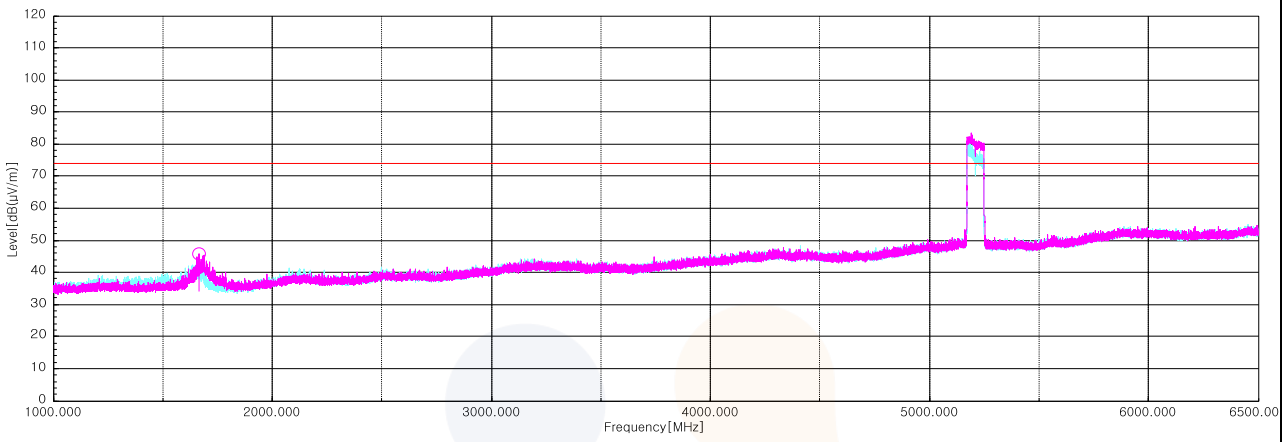
Horizontal/Vertical for Band-edge



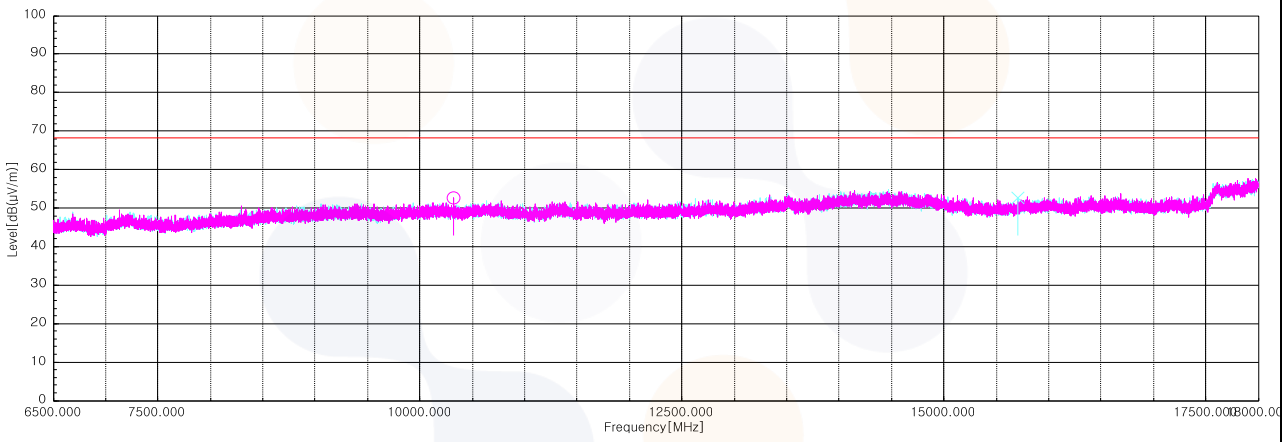
Plot of Harmonics and Spurious Emissions

In order to simplify the report, attached plots were only the lowest margin condition
UNII-1_802.11ac_VHT80_Middle Channel (5 210 ㎒)

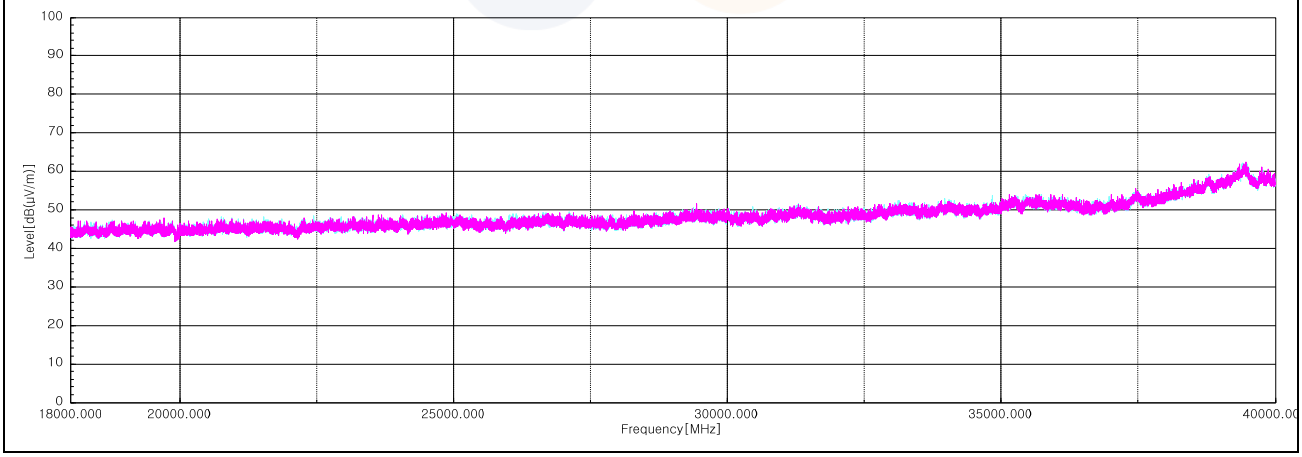
Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 40 ㎓



8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Temp & Humid Chamber	ESPEC	SH-642	93016978	26.01.16
Spectrum Analyzer	R&S	FSV30	101437	26.01.16
Attenuator	HUBER+SUHNER	6610_SK-50-1/199_NE	ATT06	26.03.17
Power Sensor	R&S	NRP-Z81	1137.9009.02-106223-bB	25.04.24
DC Power Supply	TOYOTECH	TL305TP	20100121	25.07.01
Spectrum Analyzer	R&S	FSVA40	101575	25.04.24
Broadband PreAmplifier	SCHWARZBECK	BBV9718D	57	26.01.16
Low Noise Amplifier	TESTEK	TK-PA18H	220124-L	25.10.11
Low Noise Amplifier	TESTEK	TK-PA1840H	220133-L	25.10.14
Horn Antenna	SCHWARZBECK	BBHA9120D	2763	25.10.24
Horn Antenna	SCHWARZBECK	BBHA9170	1267	25.10.15
High Pass Filter	QOTANA TECHNOLOGIES	DBHF0508004000A	23041800061	25.06.24
Signal Generator	R&S	SMB100A	176206	26.01.17
High Pass Filter	Wainwright Instruments GmbH	WHKX8-5655-6500-18000-40SS	SN8	25.10.15
Controller	INNCO SYSTEMS	CO3000	1441/54370322/P	-
Antenna Mast	INNCO SYSTEMS	MA4640-XP-ET	AM003	-
Turn Device	INNCO SYSTEMS	DS1200-S-1t	0003	-

End of test report