TEST REPORT

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Report No. : KES-RF250624

■ **FCC TEST REPORT**

1. Client

○ Name : Ronfic. Co.,Ltd.
○ Address : A-1411, 97, Centum jungang-ro, Haeundae-gu, Busan, South Korea

2. Sample Description

○ Product item : RONFIC MODULE
○ Model name : RONFIC KMOD-05
○ Manufacturer etc. : China Dragon Technology Limited.

3. Date of test : 2025.09.04 ~ 2025.09.19

4. Location of Test : ☑ Permanent Testing Lab ☐ On Site Testing

○ Adress : 473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea

5. Test method used : Part 15 Subpart E 15.407

6. Test result : PASS

The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
This laboratory is not accredited for the test results marked *.
This test report is not related to KOLAS accreditation.

Affirmation	Tested by	Technical Manager
	Name : Myeong-Ho, Lee (Signature) [이명호]2025/09/23	Name : Yeong-Jun Cho (Signature) [조영준]2025/09/23

2025 . 09. 23.

KES Co., Ltd.

Accredited by KOLAS, Republic of KOREA

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
2025.09.23	KES-RF250624	Initial

Use of uncertainty of measurement for decisions on conformity (decision rule):

■ No decision rule is specified by the standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty(“simple acceptance” decision rule, previously known as “accuracy method”).

☐ Other (to be specified, for example when required by the standard or client)

TABLE OF CONTENTS

1. General information 4
1.1. EUT description 4
1.2. Test configuration 5
1.3. Information about derivative model 5
1.4. Accessory information 5
1.5. Device modifications 5
1.6. Sample calculation 6
1.7. Measurement Uncertainty 6
1.8. Worst case data rate 6
1.9. Frequency/channel operations 7
2. Summary of tests 8
3. Test results 9
3.1. 26 dB bandwidth & 99% Occupied Bandwidth 9
3.2. Maximum conducted output power 13
3.3. Power spectral density 16
3.4. Frequency Stability 20
3.5. Radiated restricted band and emissions 22
3.6. AC conducted emissions 40
3.7. Antenna Requirement 42
Appendix A. Measurement equipment 43

1. General information

Applicant:	Ronfic. Co.,Ltd.
Applicant address:	A-1411, 97, Centum jungang-ro, Haeundae-gu, Busan, South Korea
Test site:	KES Co., Ltd.
Test site address:	☐ #3002, #3503, #3701, 40, Simin-daero365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Republic of Korea ☒ 473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
Test Facility	FCC Accreditation Designation No.: KR0100, Registration No.: 444148
FCC rule part(s):	15.407
FCC ID:	2BOSX-RONFICKMOD-05
Test device serial No.:	☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test	RONFIC MODULE
Frequency range & Number of channels	2 402 ㎒ ~ 2 480 ㎒ (EDR 3 Mbps) : 79 ch 2 402 ㎒ ~ 2 480 ㎒ (LE 1 Mbps) : 40 ch 2 412 ㎒ ~ 2 462 ㎒ (802.11b/g/n_HT20) : 11 ch **5 180 ㎒ ~ 5 240 ㎒ (802.11ac_VHT20) : 4 ch** **5 190 ㎒ ~ 5 230 ㎒ (802.11ac_VHT40) : 2 ch**
Model	RONFIC KMOD-05
Modulation technique	8DPSK, GFSK, DSSS, **OFDM**
Antenna specification	2.4 ㎓ band FPCB Antenna // Peak gain: 2.10 ㏈i 5 ㎓ band FPCB Antenna // Peak gain: 2.56 ㏈i
Power source	DC 3.3 V
H/W version	1.1
S/W version	v5.12.0-8-g39bbb8dd2.20201015

1.2. Test configuration

The **Ronfic. Co.,Ltd. // RONFIC MODULE // RONFIC KMOD-05 // FCC ID: 2BOSX-RONFICKMOD-05** was tested according to the specification of EUT, the EUT must comply with following standards and KDB documents.

FCC Part 15.407
KDB 789033 D02 v02r01
ANSI C63.10-2020

1.3. Information about derivative model

N/A

1.4. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
-	-	-	-	-

1.5. Device modifications

N/A

1.6. Sample calculation

Where relevant, the following sample calculation is provided
For all conducted test items :

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator 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.

Offset(㏈) = RF cable loss(㏈) + attenuator factor(㏈).
= 1.98 + 20 = 21.98 (㏈)

For Radiation test :
Field strength level (㏈㎶/m) = Measured level (㏈㎶) + Antenna factor (㏈) + Cable loss (㏈) – Amplifier gain (㏈)

1.7. Measurement Uncertainty

Test Item		Uncertainty
Uncertainty for Conduction emission test		2.22 ㏈ (SHIELD ROOM #6)
Uncertainty for Radiation emission test (include Fundamental emission)	Below 1 ㎓	4.04 ㏈ (SAC #6)
	Above 1 ㎓	5.32 ㏈ (SAC #5)
Note. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of *k*=2.		

1.8. Worst case data rate

1. Worst-case data rates were:

Mode	Data rate
802.11ac_VHT20	MCS 0
802.11ac_VHT40	MCS 0

1.9. Frequency/channel operations

Ch.	Frequency (㎒)	Rate(Mbps)
00	2 402	EDR 3 Mbps
.	.	.
40	2 442	EDR 3 Mbps
.	.	.
78	2 480	EDR 3 Mbps

Ch.	Frequency (㎒)	Rate(Mbps)
00	2 402	LE 1 Mbps
.	.	.
20	2 442	LE 1 Mbps
.	.	.
39	2 480	LE 1 Mbps

Ch.	Frequency (㎒)	Mode
1	2 412	802.11b/g/n_HT20
.	.	.
6	2 437	802.11b/g/n_HT20
.	.	.
11	2 462	802.11b/g/n_HT20

Ch.	Frequency (㎒)	Mode
36	**5 180**	**802.11ac_VHT20**
.	.	.
44	**5 220**	**802.11ac_VHT20**
.	.	.
48	**5 240**	**802.11ac_VHT20**

Ch.	Frequency (㎒)	Mode
38	**5 190**	**802.11ac_VHT40**
.	.	.
46	**5 230**	**802.11ac_VHT40**

2. Summary of tests

Section in FCC Part 15	Parameter	Test results
15.407(a)	26 dB bandwidth & 99 % bandwidth	Pass
15.407(a)	Maximum conducted output power	Pass
15.407(a)	Power spectral density	Pass
15.407(g)	Frequency stability	Pass
15.205, 15.209, 15.407(b)	Radiated restricted band and emission	Pass
15.207(a)	AC power line conducted emissions	Pass
15.203	Antenna Requirement	Pass

Note.

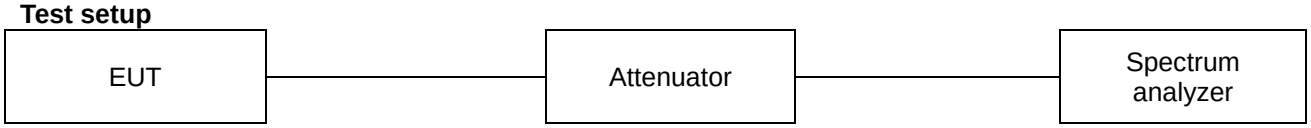
1. By the request of applicant, test is performed with power setting value below :

Mode	Frequency (㎒)	Setting value
802.11ac_VHT20	5 180 ~ 5 240	Default
802.11ac_VHT40	5 190 ~ 5 230	Default

3. Test results

3.1. 26 dB bandwidth & 99% Occupied Bandwidth

Test setup



Test procedure

26 dB bandwidth

KDB 789033 D02 v02r01– Section C.1

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 peak 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%.

99 % bandwidth

KDB 789033 D02 v02r01– Section D

1. Set span = 1.5 times to 5.0 times the OBW.
2. Set RBW = 1% to 5% of the OBW
3. Set the VBW > 3 x RBW.
4. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak bandwidth function of the instrument (if available).
5. Use the 99% power bandwidth function of the instrument (if available).
6. 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.

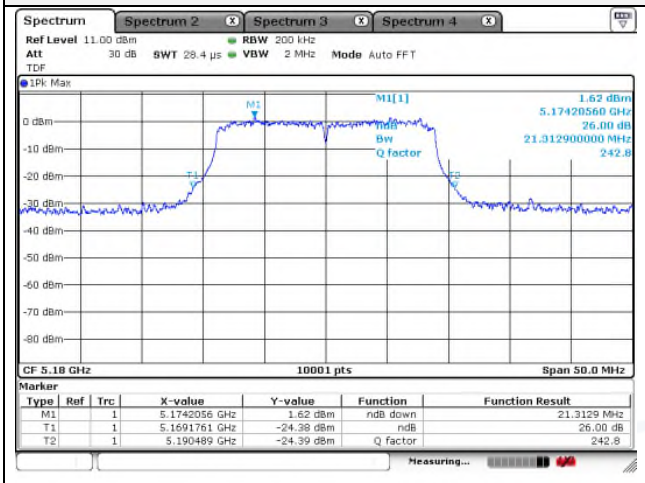
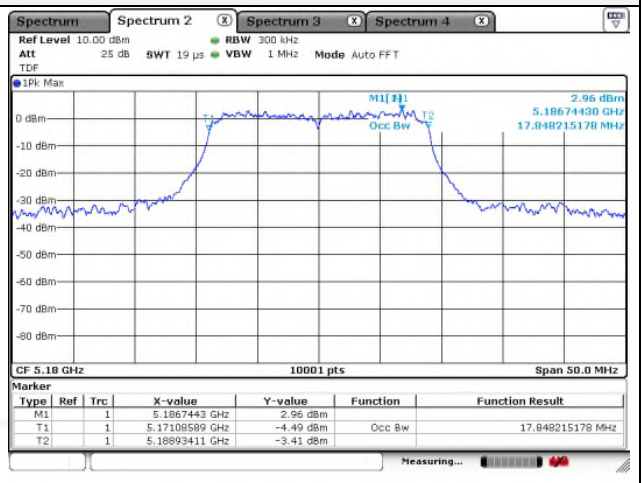
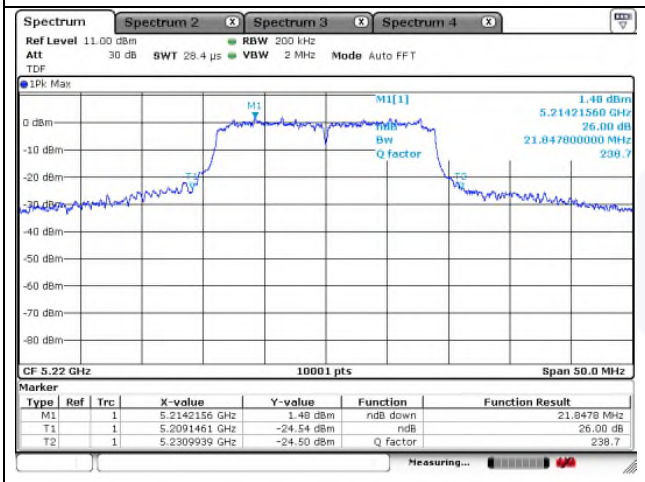
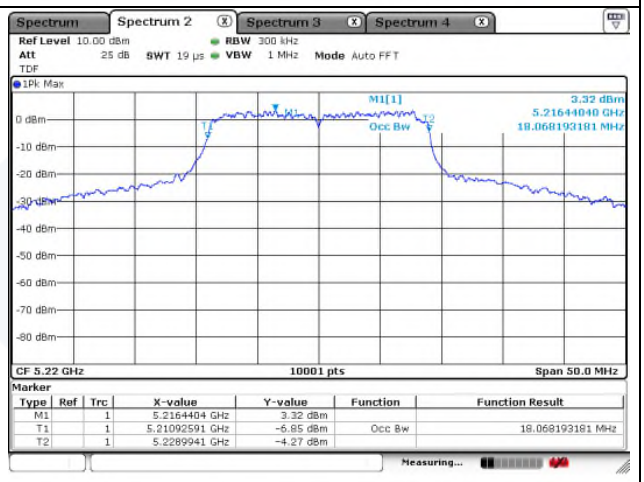
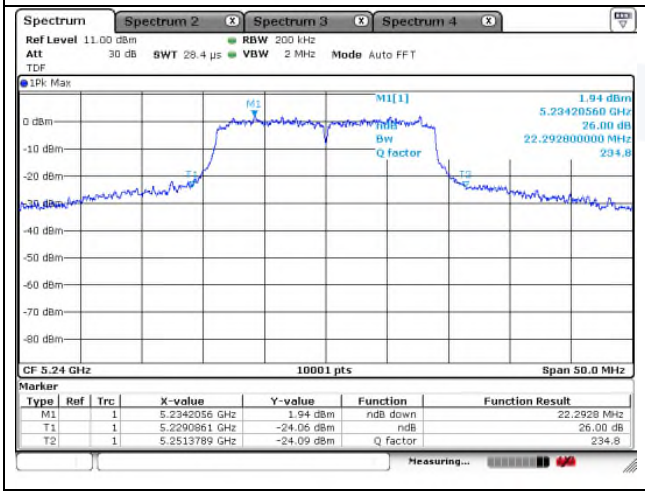
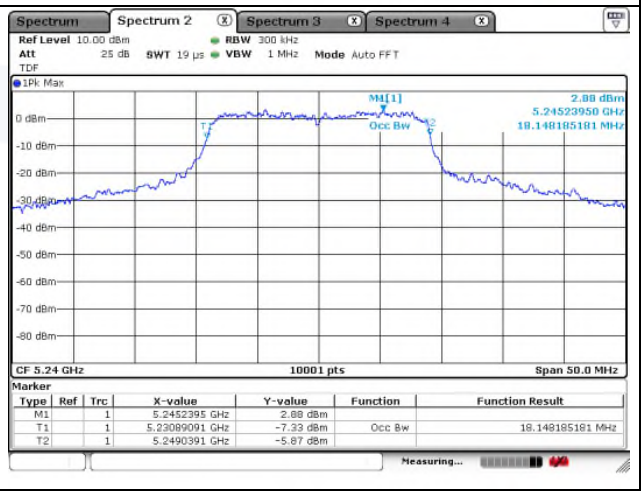
Limit

N/A

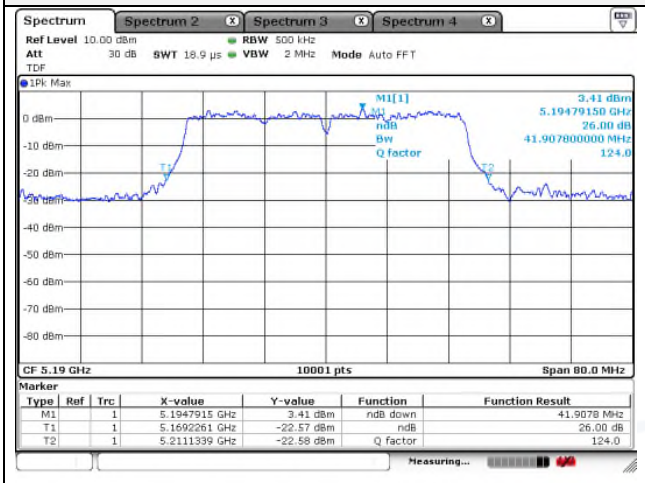
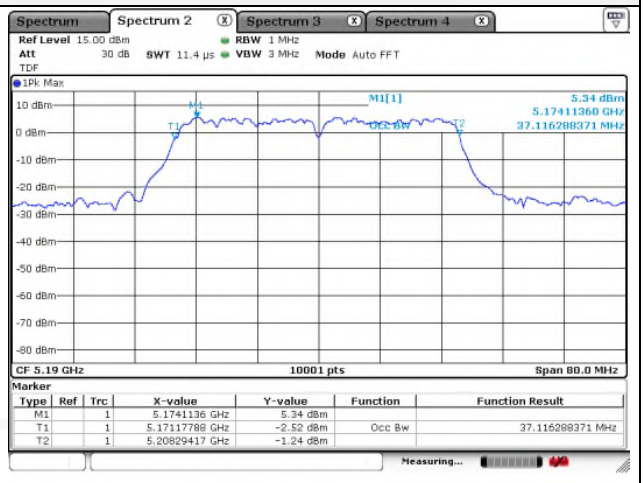
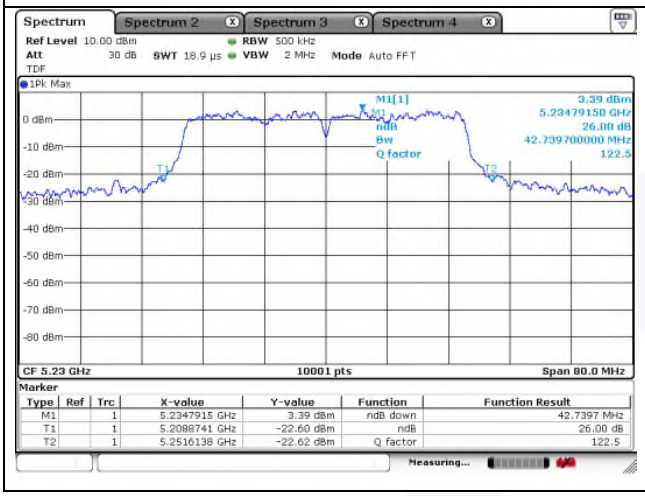
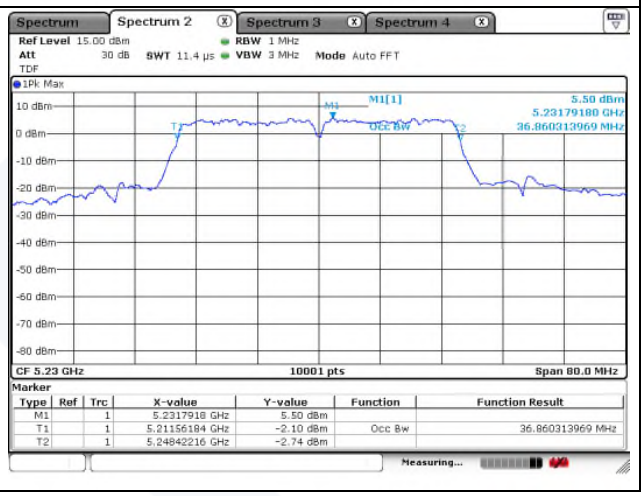
Test results

Band	Frequency(㎒)	Mode	26 ㏈ bandwidth(㎒)	99 % bandwidth(㎒)
UNII-1	5 180	802.11ac_VHT20 (MCS 0)	21.31	17.85
	5 220		21.85	18.07
	5 240		22.29	18.15
	5 190	802.11ac_VHT40 (MCS 0)	41.91	37.12
	5 230		42.74	36.86

Mode : 802.11ac_VHT20 (MCS 0)

26 dB bandwidth(㎒)	99 % bandwidth(㎒)
	
	
	

Mode : 802.11ac_VHT40 (MCS 0)

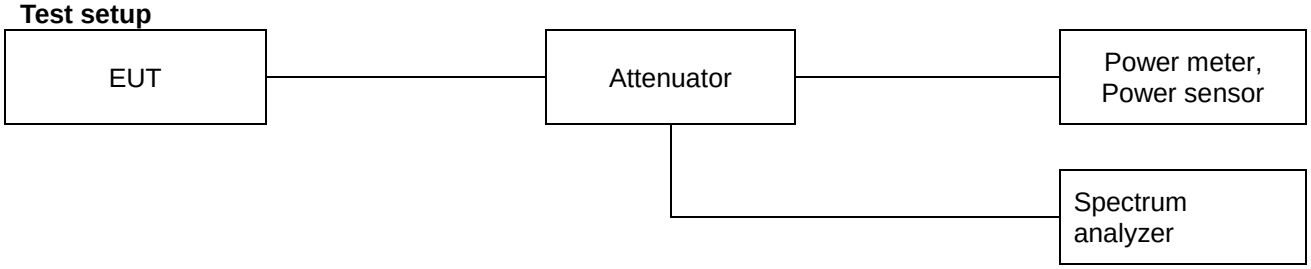
26 dB bandwidth(㎒)	99 % bandwidth(㎒)
	
	

3.2. Maximum conducted output power

Test procedure

KDB 789033 D02 v02r01– Section E.3.a) or b)
Used test method is Section E.3.b)

Test setup



Section E.3.a)

Method PM (Measurement using an RF average power meter):

i. Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.
   - The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
   - At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
   - The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

ii. If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in section II.B.

iii. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

iv. Adjust the measurement in dBm by adding 10 log (1/x) where x is the duty cycle (e.g., 10 log (1/0.25) if the duty cycle is 25 %).

Section E.3.b)

Method PM-G (Measurement using a gated RF average power meter):

Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Limit

Band	EUT Category		Limit
UNII-1		Outdoor access point	1 W (30 dBm)
	✔	Indoor access point	
		Fixed point-to-point access point	
		Mobile and portable client device	250 mW(23.97 dBm)
UNII-2A			250 mW or 11 dBm + 10logB*
UNII-2C			250 mW or 11 dBm + 10logB*
UNII-3			1 W (30 dBm)

Note.
1. Limit B is the 26 dB emission bandwidth.

Test results

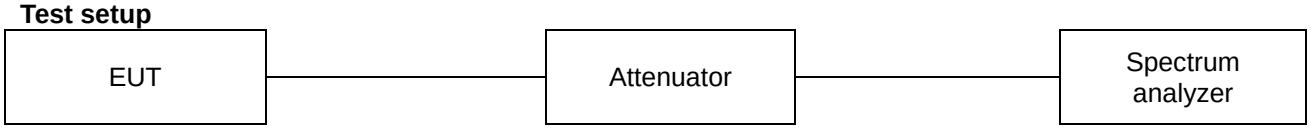
Band	Frequency (㎒)	Mode	Detector mode	Ant Gain (dBi)	Output power (㏈m)	Limit (㏈m)
UNII-1	5 180	802.11ac_VHT20 (MCS 0)	AV	2.56	10.79	30
	5 220		AV		11.10	
	5 240		AV		11.30	
	5 190	802.11ac_VHT40 (MCS 0)	AV		10.82	
	5 230		AV		11.46	

3.3. Power spectral density

Test procedure

KDB 789033 D02 v02r01 – Section F

Test setup



Section F

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section 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. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
3. Make the following 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 step II.E.2.g)(viii), add 1 ㏈ 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 above procedures make use of 1 ㎒ RBW to satisfy directly the 1 ㎒ reference bandwidth specified in § 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 a 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 section II.B.l.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.

Note.

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

Limit

Band	EUT Category		Limit
UNII-1		Outdoor access point	17 dBm/㎒
	✔	Indoor access point	
		Fixed point-to-point access point	
		Mobile and portable client device	11 dBm/㎒
UNII-2A			11 dBm/㎒
UNII-2C			11 dBm/㎒
UNII-3			30 dBm/500 ㎑

Note.

1. 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 of the antenna exceed 6 dBi.

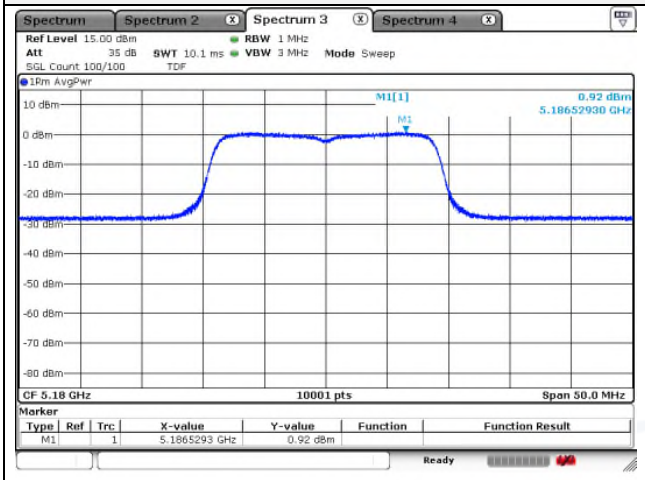
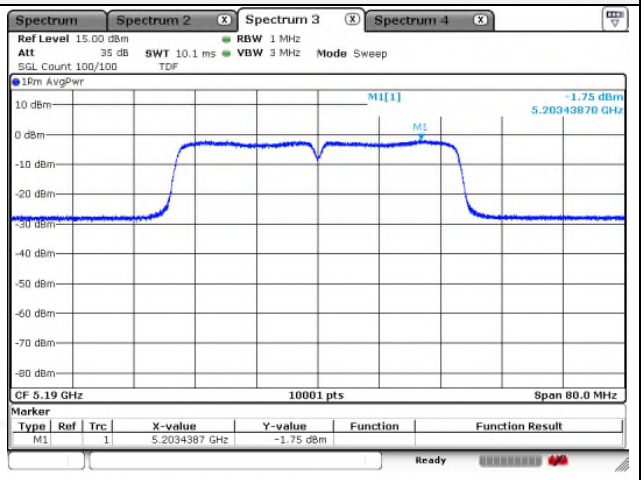
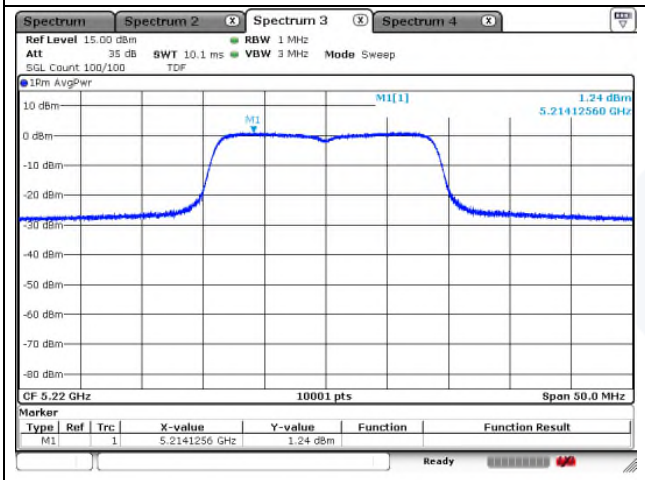
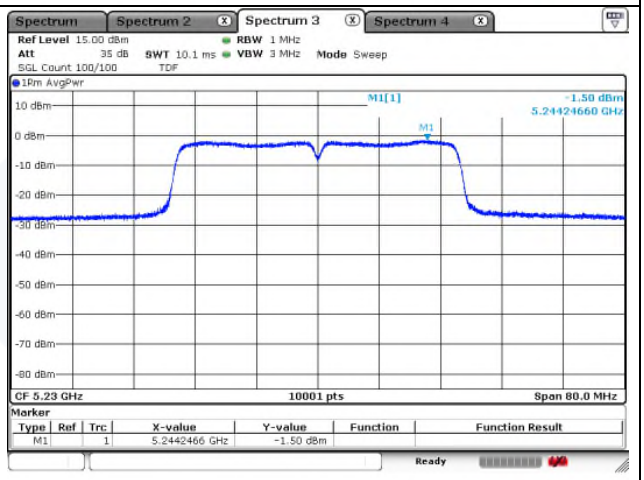
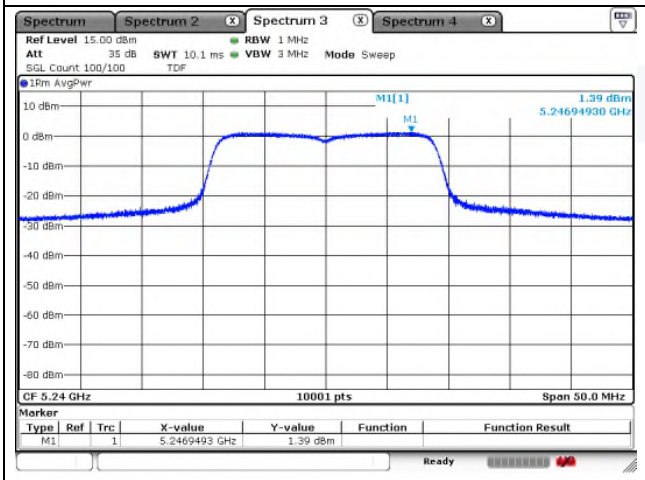
Test results

Mode	Frequency (㎒)	Band	PSD (dBm/㎒)	RBWF Note1	DCF Note2	Sum Note3	Limit
802.11ac_VHT20 (MCS 0)	5 180	UNII-1	0.92	-	-	0.92	17.00 (dB m/㎒)
	5 220		1.24			1.24	
	5 240		1.39			1.39	
802.11ac_VHT40 (MCS 0)	5 190		-1.75		-	-1.75	
	5 230		-1.50			-1.50	

Note.

1. 10log(1 ㎒/1 ㎒)
2. Refer to the page 27 on this report.
3. Sum(dBm) = PSD(dBm) + RBWF + Duty correction factor (dB)

Test Plot

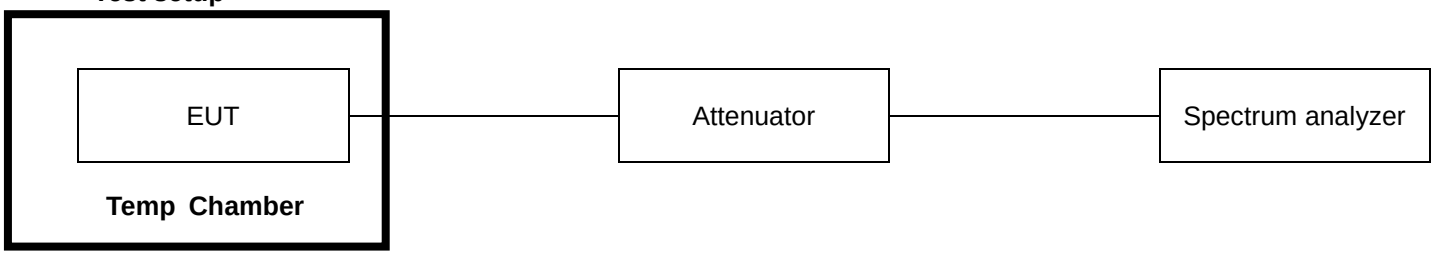
UNII-1_802.11ac_VHT20 (MCS 0)	UNII-1_802.11ac_VHT40 (MCS 0)
	
	
	Blank

3.4. Frequency Stability

Test procedure

ANSI C63.10-2020 clause 6.8.1

Test setup



1. The EUT was placed inside the environmental test chamber and powered by nominal AC voltage.
2. Turn the EUT on and couple its output to a spectrum analyzer.
3. Turn the EUT off and set the chamber to the highest temperature specified.
4. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize, turn the EUT on and measure the operating frequency.
5. Repeat step 2 and 3 with the temperature chamber set to the lowest temperature.
6. The test chamber was allowed to stabilize at +20 degree C for a minimum of 30 minutes. The supply voltage was then adjusted on the EUT from 85% to 115% and the frequency record.
7. While maintaining a constant temperature inside the environmental chamber, turn the EUT on and record the operating frequency at startup, and at 2 minutes, 5 minutes, and 10 minutes after the EUT is energized. Four measurements in total are made.

Limit

N/A

Test results

Mode: 802.11ac_VHT20

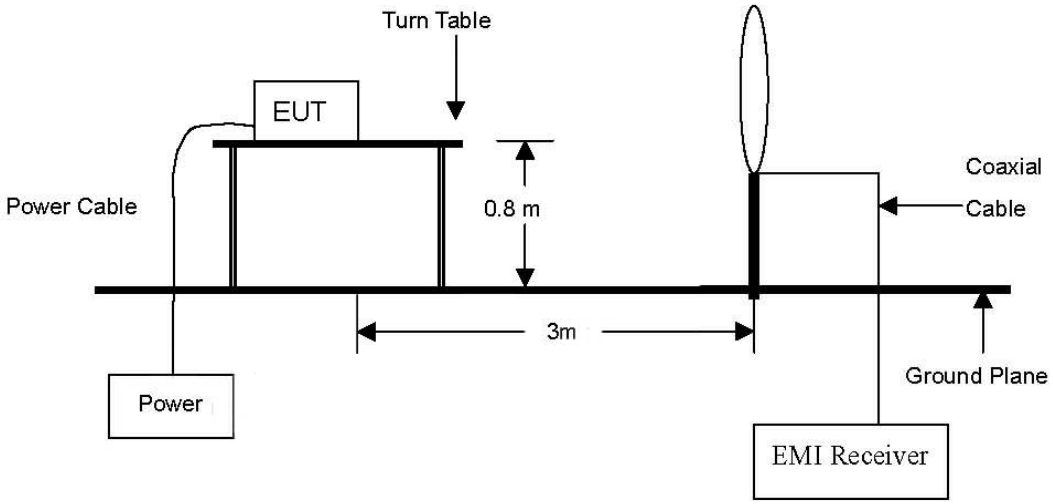
Operating frequency: 5 180 ㎒

Test voltage (%)	Test voltage (V)	Temperature (℃)	Maintaining time	Measure frequency (㎒)	Frequency deviation (㎐)	Deviation (%)
100 %	DC 3.300	-20.0	Startup	5 179.948 500	-51 500	-0.000 99
			2 minutes	5 179.946 000	-54 000	-0.001 04
			5 minutes	5 179.951 000	-49 000	-0.000 95
			10 minutes	5 179.943 500	-56 500	-0.001 09
100 %		-10.0	Startup	5 179.943 500	-56 500	-0.001 09
			2 minutes	5 179.943 500	-56 500	-0.001 09
			5 minutes	5 179.951 000	-49 000	-0.000 95
			10 minutes	5 179.946 000	-54 000	-0.001 04
100 %		0.0	Startup	5 179.941 000	-59 000	-0.001 14
			2 minutes	5 179.943 500	-56 500	-0.001 09
			5 minutes	5 179.946 000	-54 000	-0.001 04
			10 minutes	5 179.941 000	-59 000	-0.001 14
100 %		10.0	Startup	5 179.950 000	-50 000	-0.000 97
			2 minutes	5 179.945 000	-55 000	-0.001 06
			5 minutes	5 179.942 500	-57 500	-0.001 11
			10 minutes	5 179.935 000	-65 000	-0.001 25
100 %		20.0	Startup	5 179.948 500	-51 500	-0.000 99
			2 minutes	5 179.943 500	-56 500	-0.001 09
			5 minutes	5 179.941 000	-59 000	-0.001 14
			10 minutes	5 179.951 000	-49 000	-0.000 95
100 %		25.1	Startup	5 179.946 000	-54 000	-0.001 04
			2 minutes	5 179.948 500	-51 500	-0.000 99
			5 minutes	5 179.951 000	-49 000	-0.000 95
			10 minutes	5 179.941 000	-59 000	-0.001 14
100 %		30.0	Startup	5 179.943 500	-56 500	-0.001 09
			2 minutes	5 179.946 000	-54 000	-0.001 04
			5 minutes	5 179.946 000	-54 000	-0.001 04
			10 minutes	5 179.943 500	-56 500	-0.001 09
100 %		40.0	Startup	5 179.943 500	-56 500	-0.001 09
			2 minutes	5 179.943 500	-56 500	-0.001 09
			5 minutes	5 179.948 500	-51 500	-0.000 99
			10 minutes	5 179.941 000	-59 000	-0.001 14
100 %		50.0	Startup	5 179.951 000	-49 000	-0.000 95
			2 minutes	5 179.948 500	-51 500	-0.000 99
			5 minutes	5 179.951 000	-49 000	-0.000 95
			10 minutes	5 179.946 000	-54 000	-0.001 04
100 %		55.0	Startup	5 179.948 500	-51 500	-0.000 99
			2 minutes	5 179.951 000	-49 000	-0.000 95
			5 minutes	5 179.948 500	-51 500	-0.000 99
			10 minutes	5 179.946 000	-54 000	-0.001 04
85 %	DC 2.805	25.1	Startup	5 179.943 500	-56 500	-0.001 09
			2 minutes	5 179.951 000	-49 000	-0.000 95
			5 minutes	5 179.943 500	-56 500	-0.001 09
			10 minutes	5 179.941 000	-59 000	-0.001 14
115 %	DC 3.795	25.1	Startup	5 179.948 500	-51 500	-0.000 99
			2 minutes	5 179.948 500	-51 500	-0.000 99
			5 minutes	5 179.943 500	-56 500	-0.001 09
			10 minutes	5 179.948 500	-51 500	-0.000 99

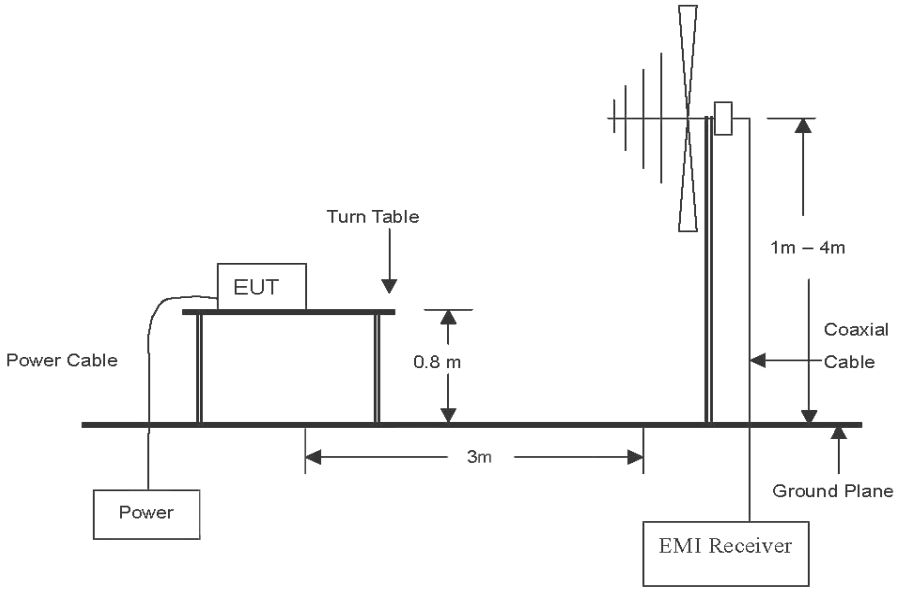
3.5. Radiated restricted band and emissions

Test setup

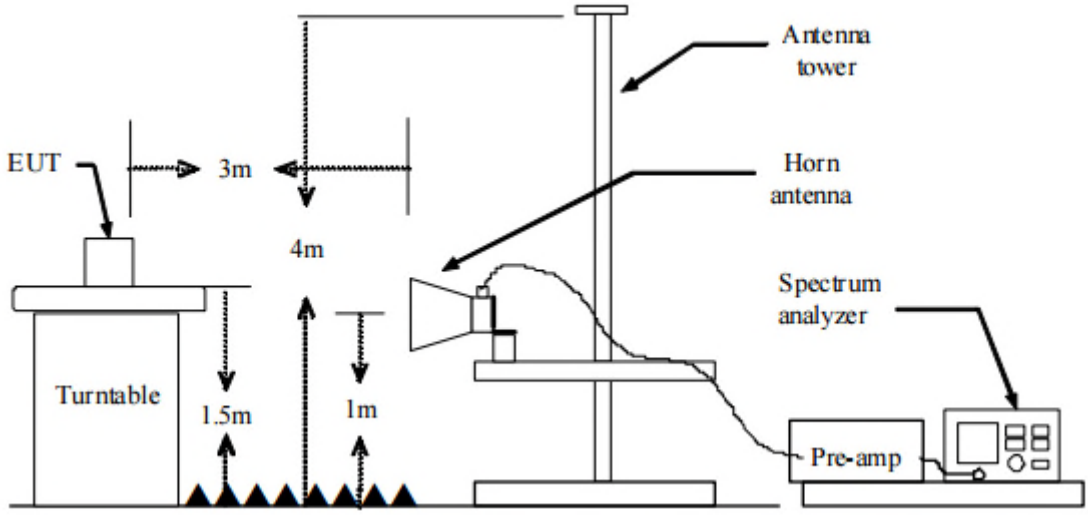
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



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.



Test procedure

Radiated emissions from the EUT were measured according to the dictates in section 11.11 & 11.12 of ANSI C63.10-2020.

Test procedure below 30 ㎒

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel, ground parallel and perpendicular of the antenna are set to make the measurement. It was determined that **parallel** was worst-case orientation; therefore, all final radiated testing was performed with the EUT in **parallel.**
3. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum hold mode.

Test procedure above 30 ㎒

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The antenna is a bi-log antenna, a horn antenna ,and its height are varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

5. Spectrum analyzer settings for f < 1 ㎓:
   ① Span = wide enough to fully capture the emission being measured
   ② RBW = 100 ㎑
   ③ VBW ≥ RBW
   ④ Detector = quasi peak
   ⑤ Sweep time = auto
   ⑥ Trace = max hold

6. Spectrum analyzer settings for *f* ≥1 ㎓: Peak
   ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
   ② RBW = 1 ㎒
   ③ VBW ≥ 3 ㎒
   ④ Detector = peak
   ⑤ Sweep time = auto
   ⑥ Trace = max hold
   ⑦ Trace was allowed to stabilize

7. Spectrum analyzer settings for *f* ≥1 ㎓: Average
   ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
   ② RBW = 1 ㎒
   ③ VBW ≥ 3 × RBW
   ④ Detector = RMS, 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.
   ⑤ 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 in order to use linear voltage averaging. Log or ㏈ averaging shall not be used.
   ⑥ Sweep = auto
   ⑦ Trace = max hold
   ⑧ Perform a trace average of at least 100 traces.
   ⑨ A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
      1) If power averaging (RMS) mode was used in step ⑤, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.
      2) If linear voltage averaging mode was used in step ⑤, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
      3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

Note.

1. *f* <30 ㎒, extrapolation factor of 40 ㏈/decade of distance. $F_d = 40\log(D_m/Ds)$
   f ≥30 ㎒, extrapolation factor of 20 ㏈/decade of distance. $F_d = 20\log(D_m/Ds)$
   Where:
   F_d = Distance factor in ㏈
   D_m = Measurement distance in meters
   D_s = Specification distance in meters
2. Field strength(㏈㎶/m) = Level(㏈㎶) + CF (㏈) + or DCF(㏈)
3. Margin(㏈) = Limit(㏈㎶/m) - Field strength(㏈㎶/m)
4. Emissions below 18 ㎓ were measured at a 3 meter test distance while emissions above 18 ㎓ were measured at a 1 meter test distance with the application of a distance correction factor.
5. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z, it was determined that **X orientation** was worst-case orientation; therefore, all final radiated testing was performed with the EUT in **X orientation.**
6. The worst-case emissions are reported however emissions whose levels were not within 20 ㏈ of respective limits were not reported.
7. 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.

Limit

According to 15.209(a), for an intentional radiator devices, the general required of field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values：

Frequency (㎒)	Distance (Meters)	Radiated (㎶/m)
0.009 ~ 0.490	300	2400/F(㎑)
0.490 ~ 1.705	30	24000/F(㎑)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

**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., Sections 15.231 and 15.241.

According to 15.407(b), (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:

(1) 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/㎒.
(2) For transmitters operating in the 5.25-5.35 GHz band: All emissions outside of the 5.15-5.35 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(3) For transmitters operating in the 5.47-5.725 GHz band: All emissions outside of the 5.47-5.725 GHz band shall not exceed an e.i.r.p. of −27 dBm/MHz.
(4) For transmitters operating in the 5.725-5.85 GHz band:
i) All emissions shall be limited to a level of −27 dBm/MHz at 75 MHz or more above or below the band edge increasing linearly to 10 dBm/MHz at 25 MHz above or below the band edge, and from 25 MHz above or below the band edge increasing linearly to a level of 15.6 dBm/MHz at 5 MHz above or below the band edge, and from 5 MHz above or below the band edge increasing linearly to a level of 27 dBm/MHz at the band edge.
ii) Devices certified before March 2, 2017 with antenna gain greater than 10 dBi may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease by March 2, 2018. Devices certified before March 2, 2018 with antenna gain of 10 dBi or less may demonstrate compliance with the emission limits in §15.247(d), but manufacturing, marketing and importing of devices certified under this alternative must cease before March 2, 2020.
(5) The emission measurements shall be performed using a minimum resolution bandwidth of 1 ㎒.
A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 ㎒.
(6) Unwanted emissions below 1 ㎓ must comply with the general field strength limits set forth in § 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in § 15.207.
(7) The provisions of §15.205 apply to intentional radiators operating under this section.
(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency band edges as the design of the equipment permits.

Duty cycle

Regarding to KDB 789033 D02 v02r01, B)2)b), the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below.

Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T, where T is defined in II.B.1.a), and the number of sweep points across duration T exceeds 100.

For the band 5.150-5.250 ㎓

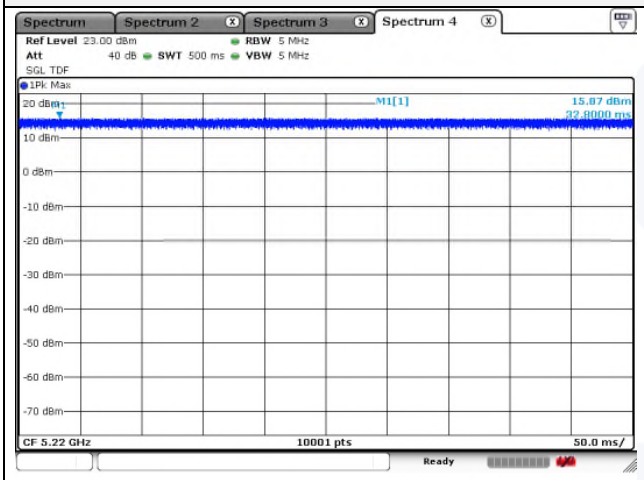
Test mode	T_{on} time (㎳)	Period (㎳)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (㏈)
802.11ac_VHT20	500	500	1	100	-
802.11ac_VHT40	500	500	1	100	-

Note:

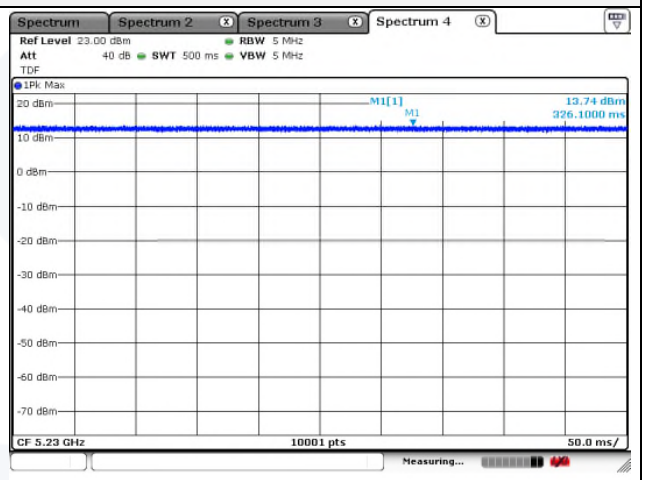
Duty cycle (Linear) = T_{on} time/Period

DCF(Duty cycle correction factor (㏈)) = 10log(1/duty cycle)

802.11ac_VHT20 (0 MCS)



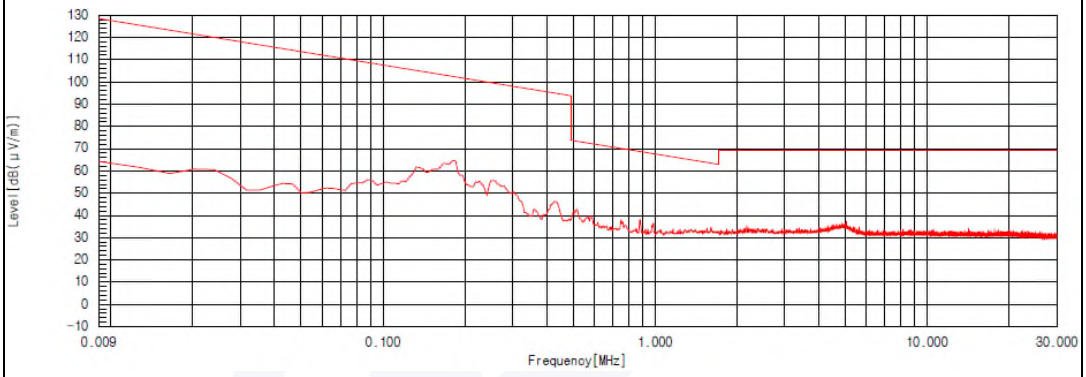
802.11ac_VHT40 (0 MCS)



Test results (Below 30 ㎒)

Band	802.11ac_VHT40 (MCS 0) (Worst case)
Distance of measurement:	3 meter
Channel	46 (Worst Case)

Parallel

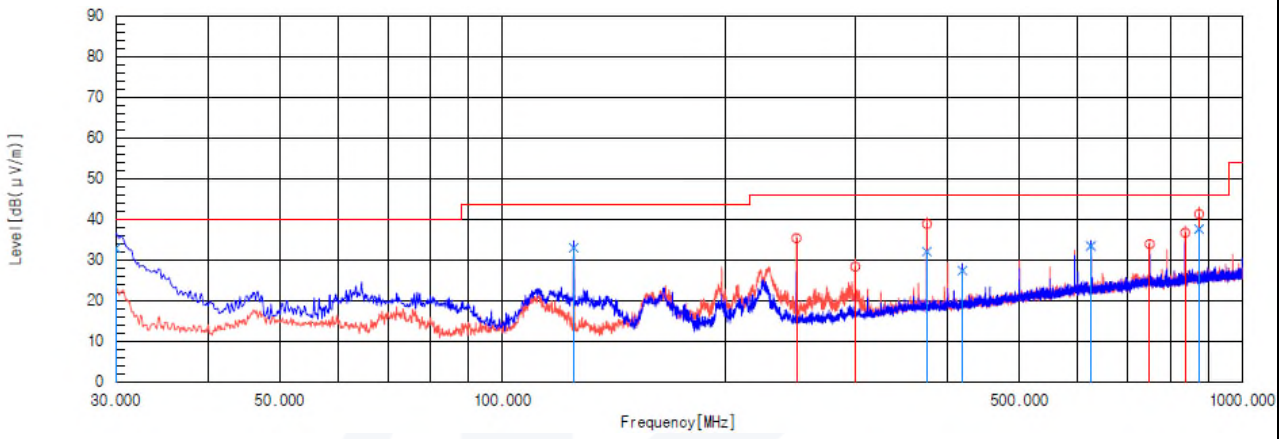


Note.
1. No spurious emission were detected under 30 ㎒.
2. Above data is peak result.

Test results (Below 1 000 ㎒)

Band	802.11ac_VHT40 (MCS 0) (Worst case)
Distance of measurement:	3 meter
Channel	46 (Worst Case)

Horizontal // Vertical



Final Result

No.	Frequency [MHz]	Pol	Reading QP [dB(μV)]	c.f [dB(1/m)]	Result QP [dB(μV/m)]	Limit QP [dB(μV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	30.000	V	49.5	-16.6	32.9	40.0	7.1	110.0	36.9	
2	124.939	V	48.9	-15.9	33.0	43.5	10.5	136.0	324.2	
3	249.948	H	47.3	-11.9	35.4	46.0	10.6	125.0	50.8	
4	299.903	H	39.1	-10.7	28.4	46.0	17.6	133.0	275.4	
5	374.956	H	47.1	-8.2	38.9	46.0	7.1	207.0	298.6	
6	374.956	V	40.3	-8.2	32.1	46.0	13.9	169.0	210.3	
7	418.728	V	35.1	-7.7	27.4	46.0	18.6	147.0	359.8	
8	624.974	V	36.8	-3.3	33.5	46.0	12.5	196.0	82.2	
9	749.983	H	35.1	-1.2	33.9	46.0	12.1	206.0	50.8	
10	837.525	H	37.1	-0.4	36.7	46.0	9.3	188.0	98.0	
11	874.991	H	40.9	0.4	41.3	46.0	4.7	163.0	320.7	
12	874.991	V	37.2	0.4	37.6	46.0	8.4	159.0	141.8	

Test results (Above 1 000 ㎒)

Mode:	802.11ac_VHT20 (MCS 0)
Band:	UNII-1
Distance of measurement:	3 meter
Channel:	36

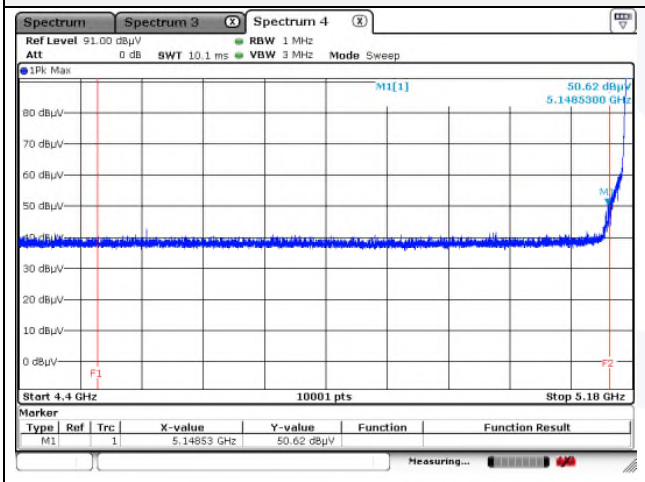
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 005.75	48.27	Peak	H	-8.11	-	40.16	74.00	33.84
1 020.25	45.76	Peak	V	-8.02	-	37.74	74.00	36.26

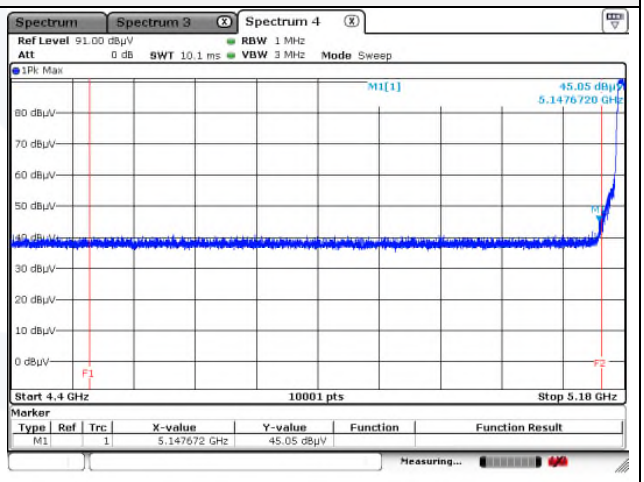
- **Band edge**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 147.67	45.05	Peak	V	7.54	-	52.59	74.00	21.41
5 148.53	50.62	Peak	H	7.54	-	58.16	74.00	15.84
5 148.53	32.92	Average	H	7.54	-	40.46	54.00	13.54

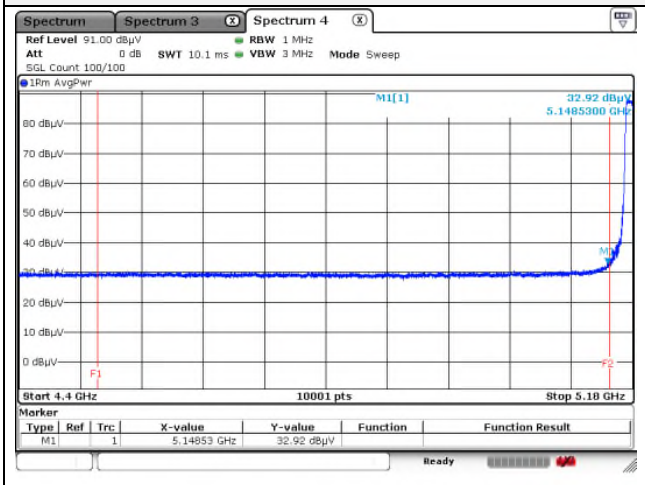
Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak

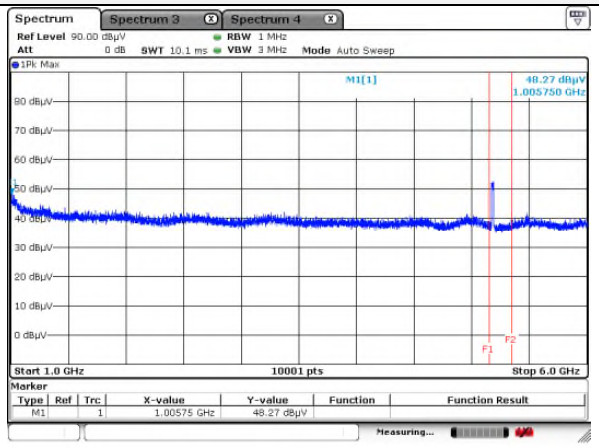
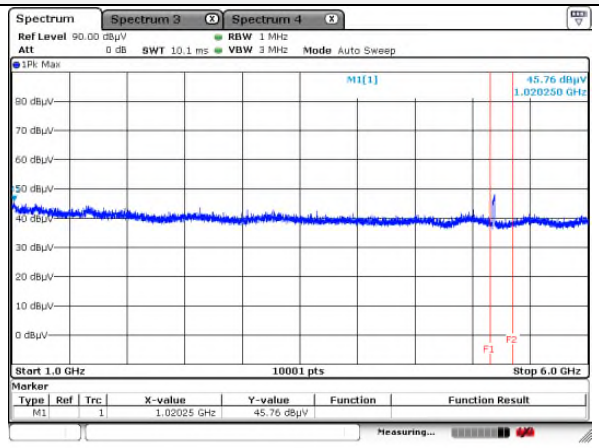
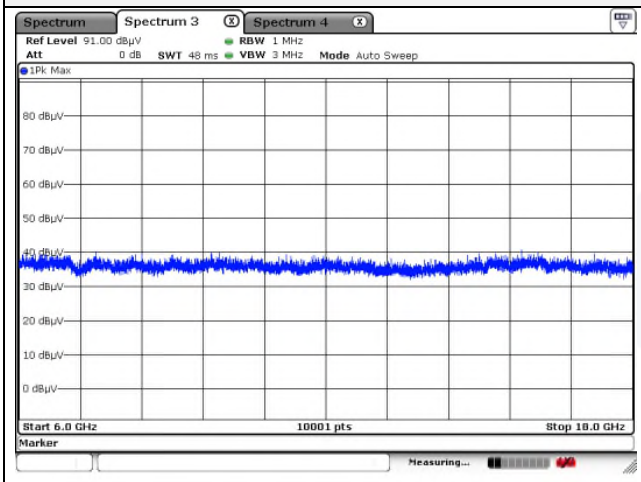
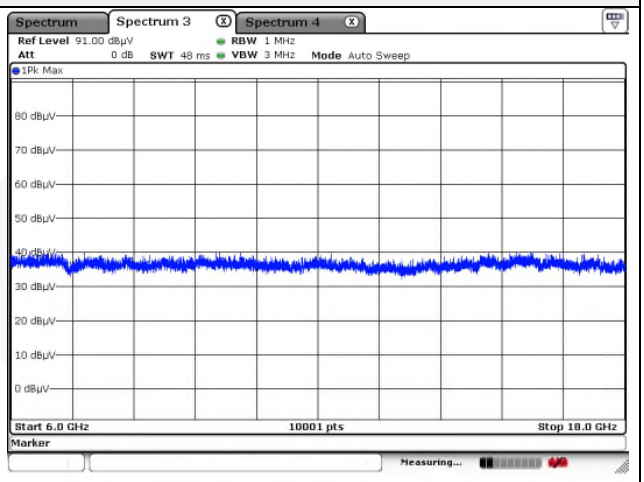


Restricted band // Horizontal // Average



Restricted band // Vertical // Average

Blank

Horizontal // Peak for 1 ㎓ to 6 ㎓	Vertical // Peak for 1 ㎓ to 6 ㎓
	
Horizontal // Peak for 6 ㎓ to 18 ㎓	**Vertical // Peak for 6 ㎓ to 18 ㎓**
	

Note.

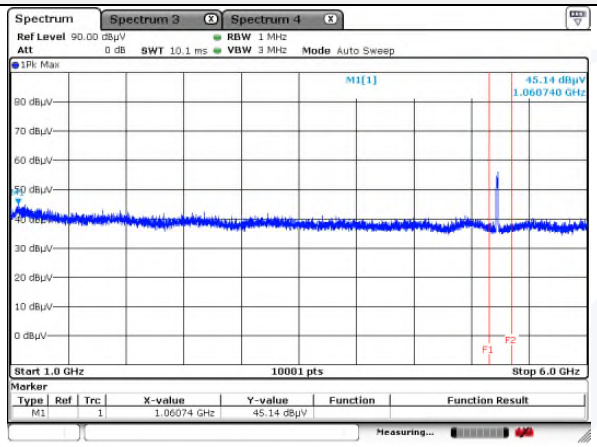
1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode:	802.11ac_VHT20 (MCS 0)
Band:	UNII-1
Distance of measurement:	3 meter
Channel:	44

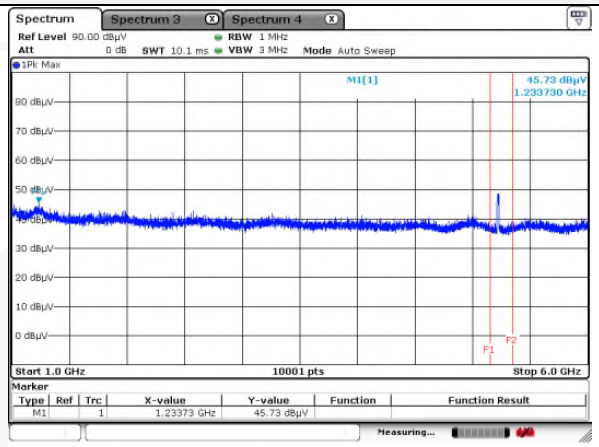
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 060.74	45.14	Peak	H	-7.78	-	37.36	74.00	36.64
1 233.73	45.73	Peak	V	-6.71	-	39.02	74.00	34.98

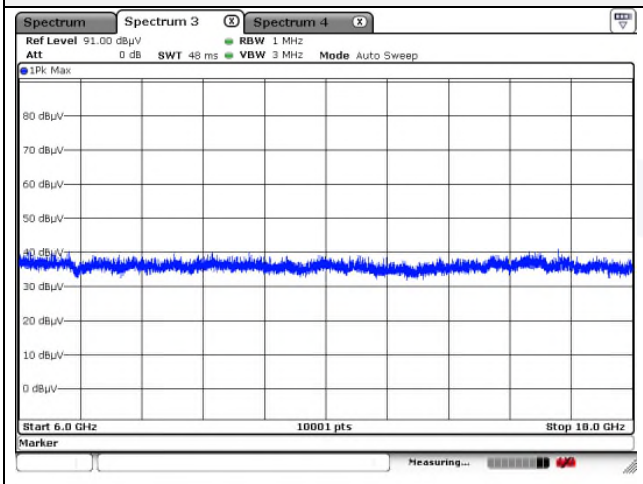
Horizontal // Peak for 1 ㎓ to 6 ㎓



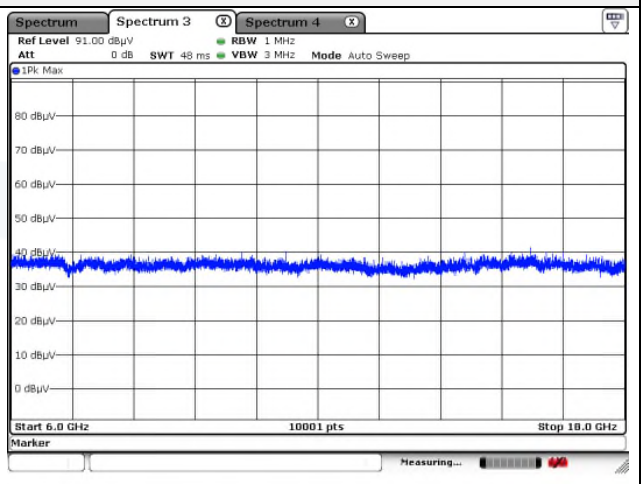
Vertical // Peak for 1 ㎓ to 6 ㎓



Horizontal // Peak for 6 ㎓ to 18 ㎓



Vertical // Peak for 6 ㎓ to 18 ㎓



Note.
1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

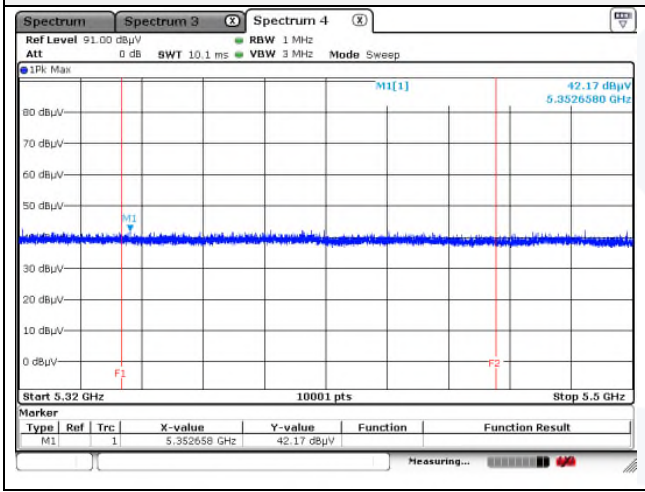
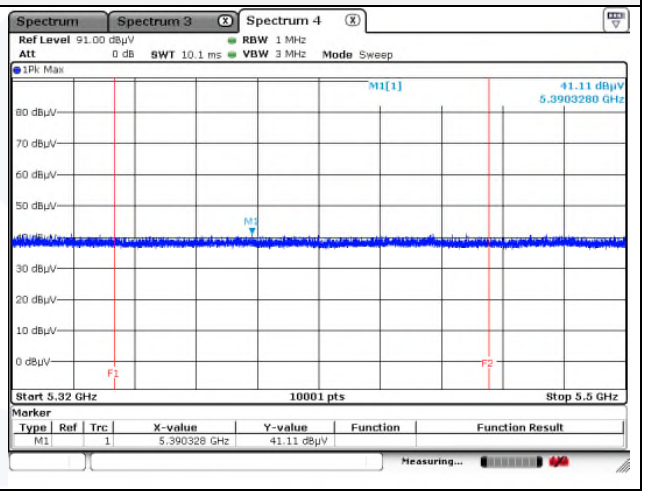
Mode:	802.11ac_VHT20 (MCS 0)
Band:	UNII-1
Distance of measurement:	3 meter
Channel:	48

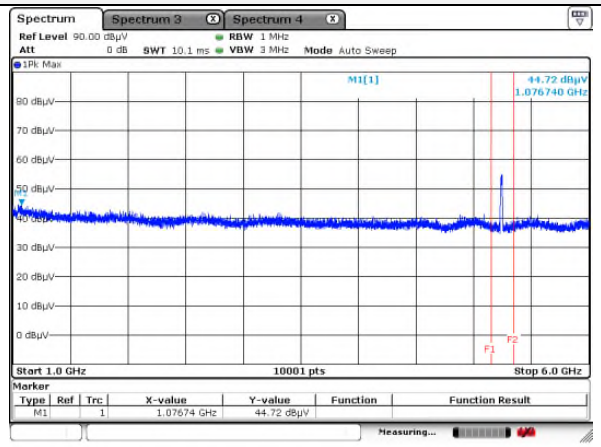
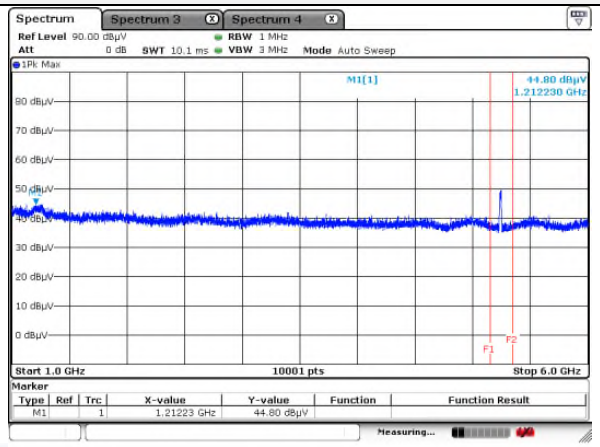
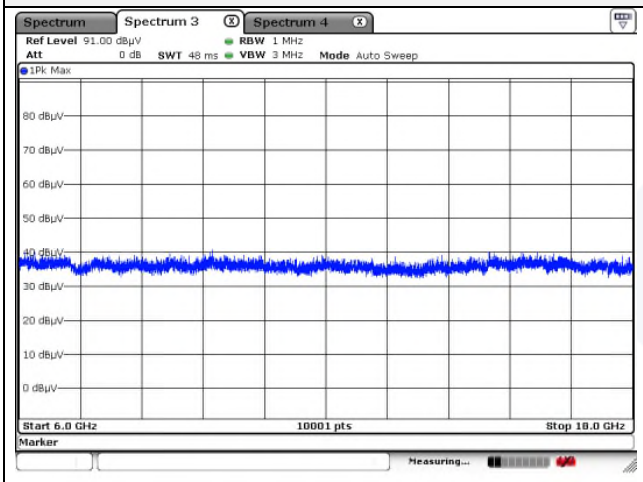
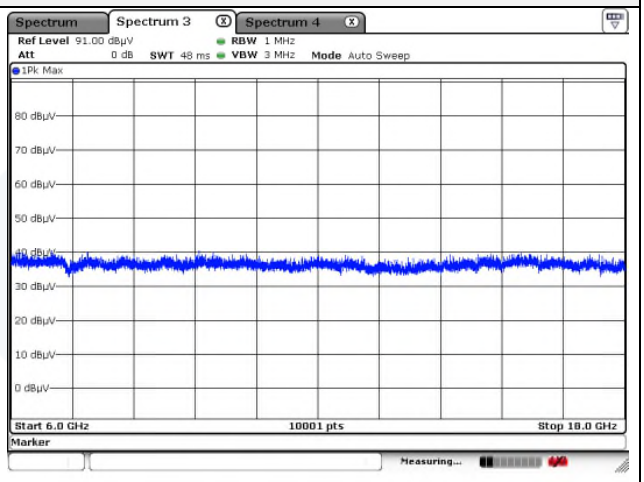
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 076.74	44.72	Peak	H	-7.69	-	37.03	74.00	36.97
1 212.23	44.80	Peak	V	-6.87	-	37.93	74.00	36.07

- **Band edge**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 352.66	42.17	Peak	H	7.78	-	49.95	74.00	24.05
5 390.33	41.11	Peak	V	7.82	-	48.93	74.00	25.07

Restricted band // Horizontal // Peak	Restricted band // Vertical // Peak
	

Horizontal // Peak for 1 ㎓ to 6 ㎓	Vertical // Peak for 1 ㎓ to 6 ㎓
	
Horizontal // Peak for 6 ㎓ to 18 ㎓	**Vertical // Peak for 6 ㎓ to 18 ㎓**
	

Note.

1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode:	802.11ac_VHT40 (MCS 0)
Band:	UNII-1
Distance of measurement:	3 meter
Channel:	38

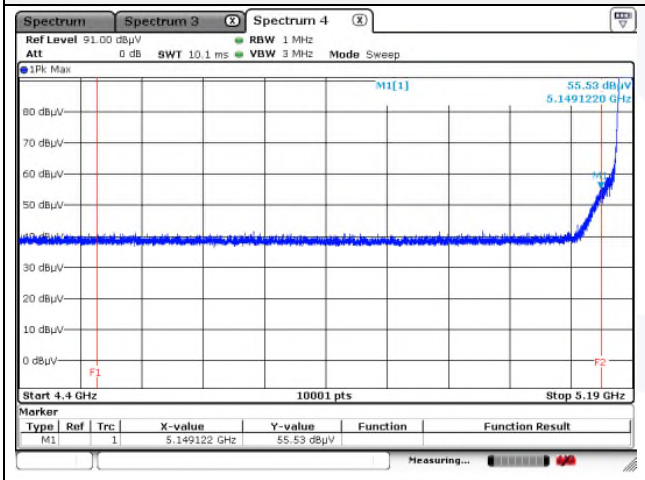
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 051.74	44.94	Peak	H	-7.84	-	37.10	74.00	36.90
1 199.73	46.22	Peak	V	-6.96	-	39.26	74.00	34.74

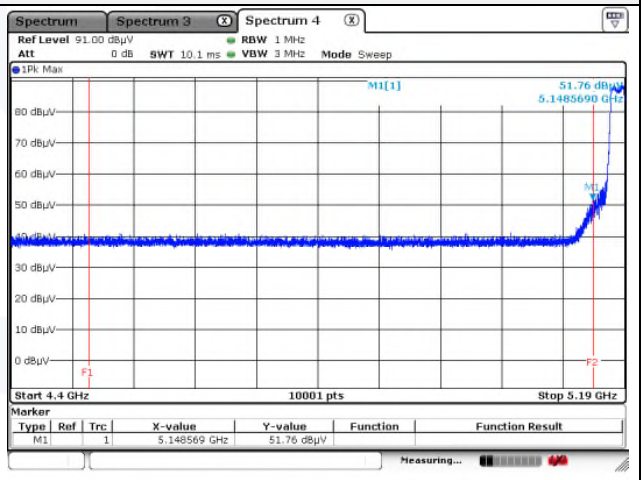
- **Band edge**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 148.57	51.76	Peak	V	7.54	-	59.30	74.00	14.70
5 148.57	33.67	Average	V	7.54	-	41.21	54.00	12.79
5 149.12	55.53	Peak	H	7.54	-	63.07	74.00	10.93
5 149.12	36.59	Average	H	7.54	-	44.13	54.00	9.87

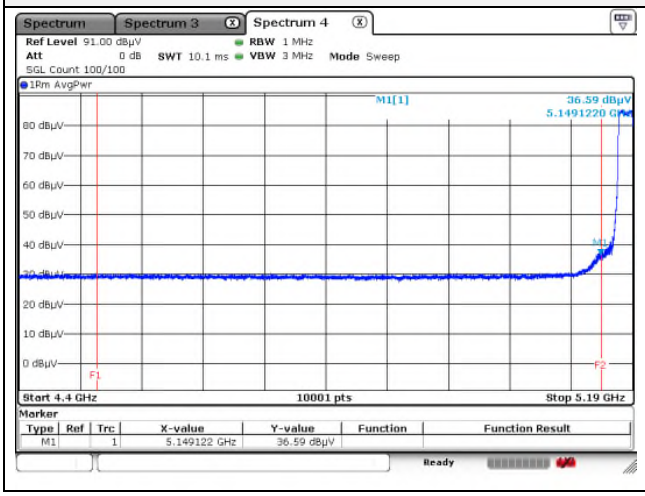
Restricted band // Horizontal // Peak



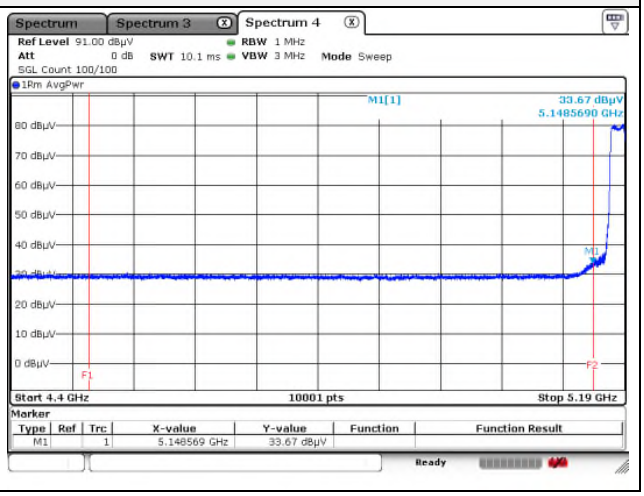
Restricted band // Vertical // Peak

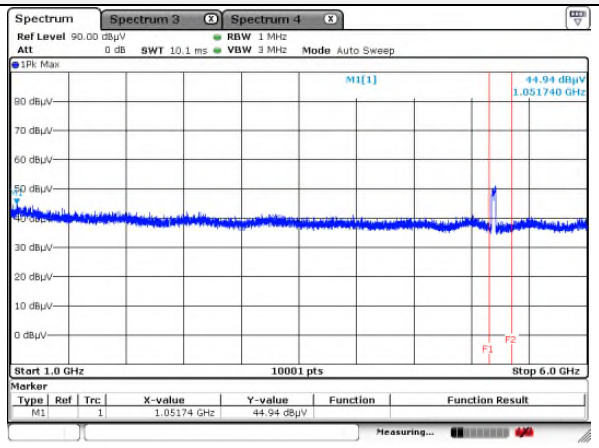
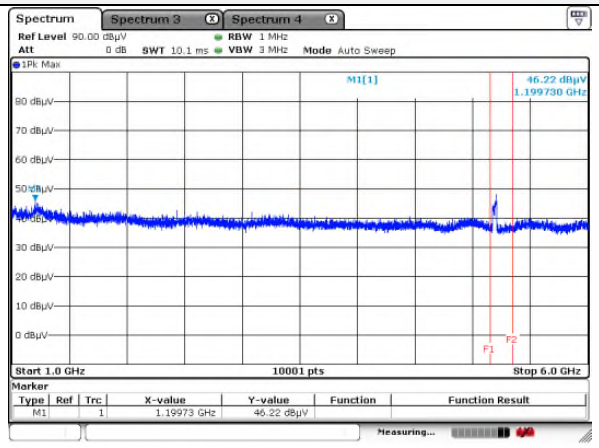
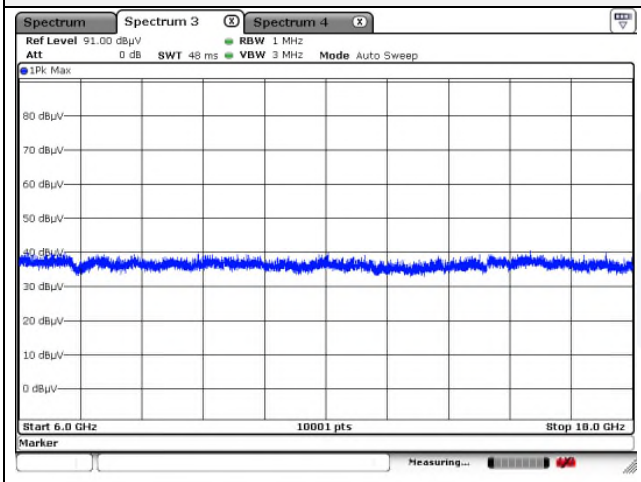
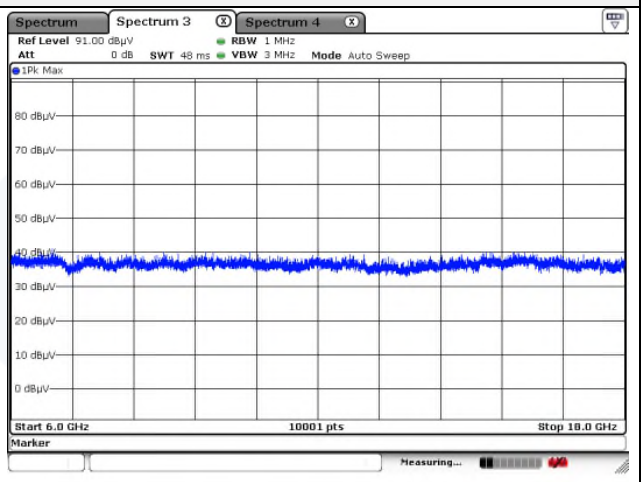


Restricted band // Horizontal // Average



Restricted band // Vertical // Average



Horizontal // Peak for 1 ㎓ to 6 ㎓	Vertical // Peak for 1 ㎓ to 6 ㎓
	
Horizontal // Peak for 6 ㎓ to 18 ㎓	**Vertical // Peak for 6 ㎓ to 18 ㎓**
	

Note.

1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

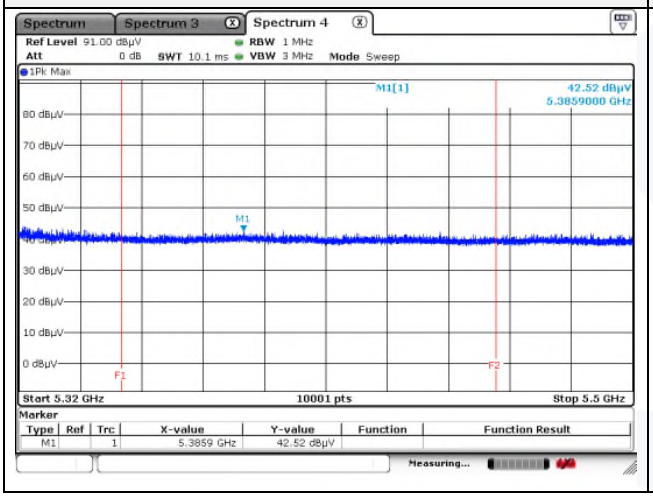
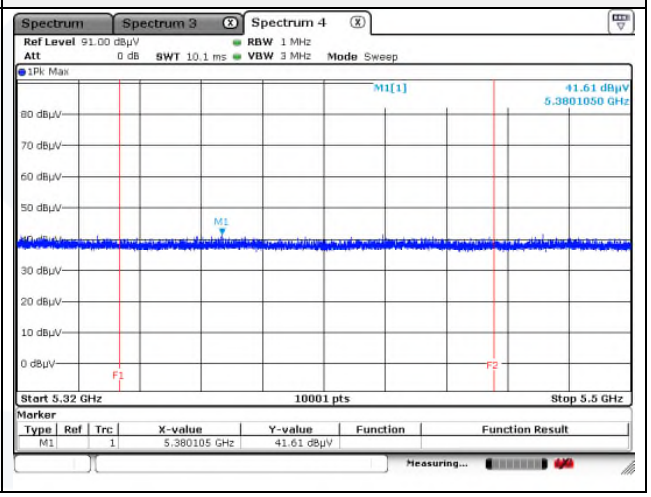
Mode:	802.11ac_VHT40 (MCS 0)
Band:	UNII-1
Distance of measurement:	3 meter
Channel:	46

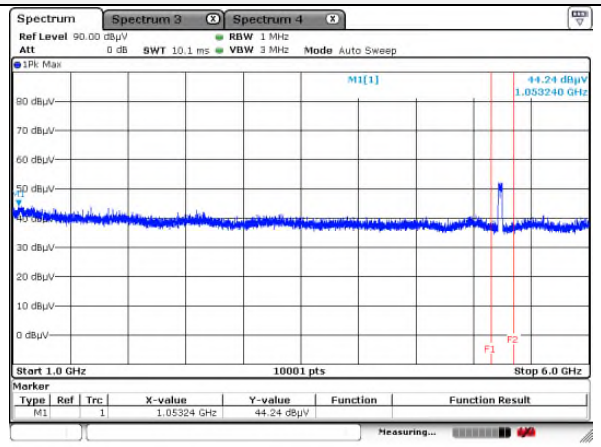
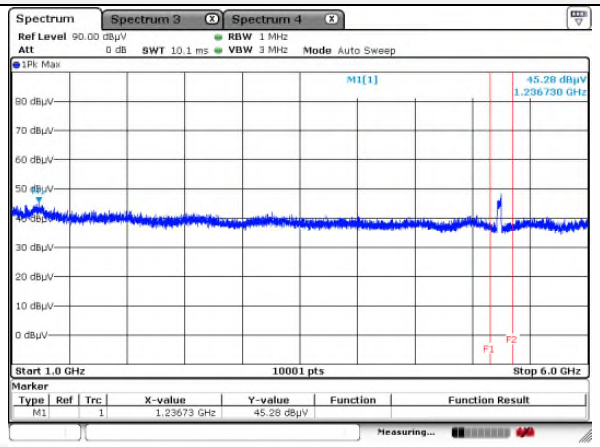
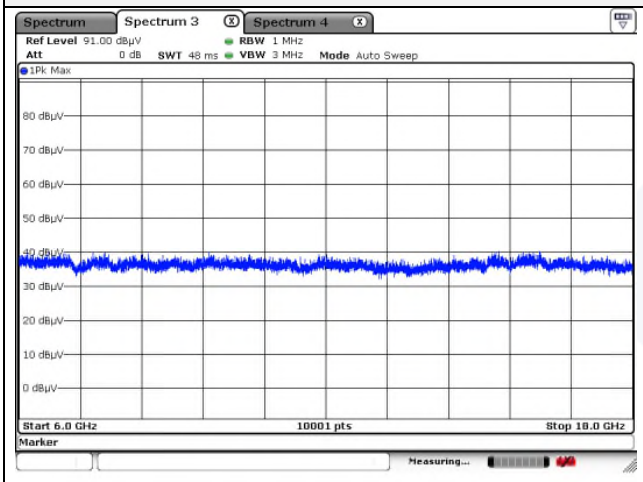
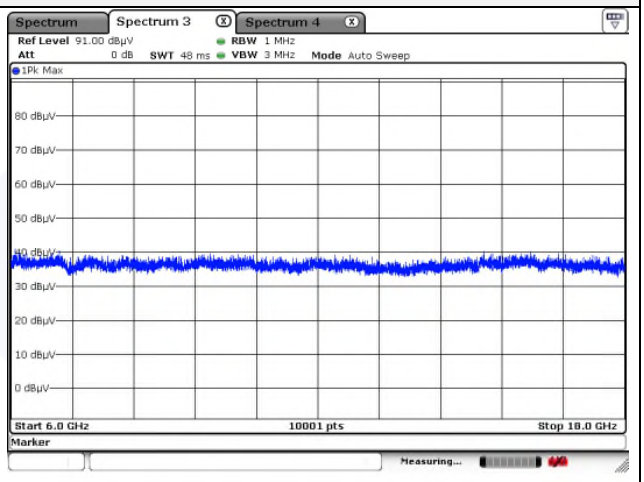
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 053.24	44.24	Peak	H	-7.83	-	36.41	74.00	37.59
1 236.73	45.28	Peak	H	-6.69	-	38.59	74.00	35.41

- **Band edge**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
5 380.11	41.61	Peak	V	7.81	-	49.42	74.00	24.58
5 385.90	42.52	Peak	H	7.81	-	50.33	74.00	23.67

Restricted band // Horizontal // Peak	Restricted band // Vertical // Peak
	

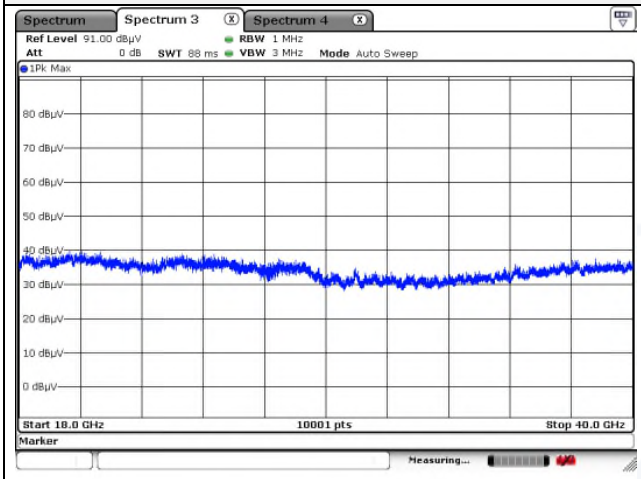
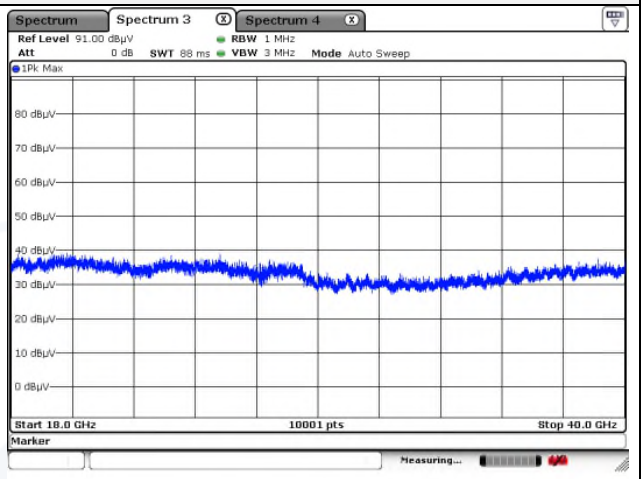
Horizontal // Peak for 1 ㎓ to 6 ㎓	Vertical // Peak for 1 ㎓ to 6 ㎓
	
Horizontal // Peak for 6 ㎓ to 18 ㎓	**Vertical // Peak for 6 ㎓ to 18 ㎓**
	

Note.

1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Test results (18 ㎓ to 40 ㎓)

Band	802.11ac_VHT40 (MCS 0) (Worst case)
Distance of measurement:	3 meter
Channel	46 (Worst Case)

Horizontal // 18 ㎓ to 40 ㎓	Vertical // 18 ㎓ to 40 ㎓
	

Note.

1. No spurious emission were detected above 18 ㎓.

3.6. AC conducted emissions

Limit

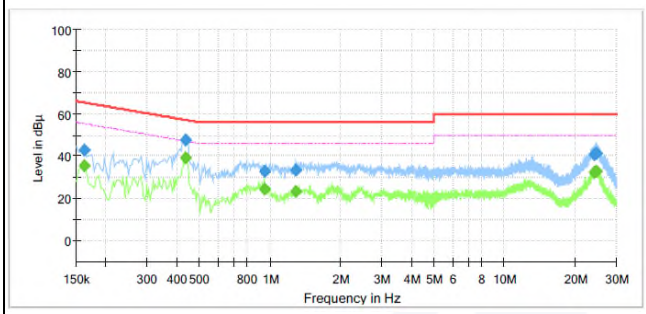
According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 ㎑ to 30 ㎒, shall not exceed the limits in the following 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 (㏈㎶)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Test results

Mode:	802.11ac_VHT40 (MCS 0) (Worst Case)
Band:	UNII-1
Channel:	46 (Worst Case)

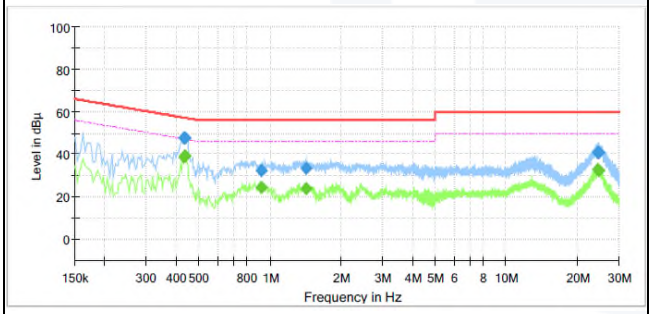
Hot Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.162000	43.10	---	65.36	22.26	1000.0	9.000	L1	19.7
0.162000	---	35.54	55.36	19.82	1000.0	9.000	L1	19.7
0.438000	---	39.18	47.10	7.92	1000.0	9.000	L1	19.7
0.438000	47.72	---	57.10	9.38	1000.0	9.000	L1	19.7
0.946000	---	24.43	46.00	21.57	1000.0	9.000	L1	19.7
0.946000	32.72	---	56.00	23.28	1000.0	9.000	L1	19.7
1.294000	---	23.47	46.00	22.53	1000.0	9.000	L1	19.8
1.294000	33.39	---	56.00	22.61	1000.0	9.000	L1	19.8
24.062000	---	32.44	50.00	17.56	1000.0	9.000	L1	21.1
24.062000	40.61	---	60.00	19.39	1000.0	9.000	L1	21.1
24.586000	---	32.66	50.00	17.34	1000.0	9.000	L1	21.1
24.586000	41.31	---	60.00	18.69	1000.0	9.000	L1	21.1

Neutral Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.434000	---	38.42	47.18	8.76	1000.0	9.000	N	19.6
0.434000	47.72	---	57.18	9.46	1000.0	9.000	N	19.6
0.438000	---	39.32	47.10	7.78	1000.0	9.000	N	19.6
0.438000	47.78	---	57.10	9.34	1000.0	9.000	N	19.6
0.918000	---	24.22	46.00	21.78	1000.0	9.000	N	19.6
0.918000	32.48	---	56.00	23.52	1000.0	9.000	N	19.6
1.418000	---	23.84	46.00	22.16	1000.0	9.000	N	19.7
1.418000	33.60	---	56.00	22.40	1000.0	9.000	N	19.7
24.258000	---	32.77	50.00	17.23	1000.0	9.000	N	21.0
24.258000	40.79	---	60.00	19.21	1000.0	9.000	N	21.0
24.770000	---	32.29	50.00	17.71	1000.0	9.000	N	21.1
24.770000	40.84	---	60.00	19.16	1000.0	9.000	N	21.1

3.7. Antenna Requirement

According to 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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Spectrum analyzer	R&S	FSV40	101725	1 year	2026.06.10
SIGNAL & SPECTRUM ANALYZER	R&S	FSVA3050	101857	1 year	2026.08.19
SIGNAL GENERATOR	KEYSIGHT	N5182B	MY59100115	1 year	2026.04.16
SIGNAL GENERATOR	Anritsu	68369B	002118	1 year	2026.04.21
Power Meter	Anritsu	ML2495A	2010001	1 year	2026.04.16
Pulse Power Sensor	Anritsu	MA2411B	1911111	1 year	2026.04.16
Attenuator	Mini-Circuits	BW-S20-2W263A+	Y1	1 year	2026.02.10
BAND REJECT FILTER	MICRO-TRONICS	BRM50716	G199	1 year	2026.01.08
BAND REJECT FILTER	MICRO-TRONICS	BRM50702	G272	1 year	2026.01.08
LOOP ANTENNA	TESEQ	HLA6121	66547	2 years	2026.01.22
TRILOG-BROADBAND ANTENNA	Schwarzbeck	VULB 9163	714	2 years	2026.04.19
Attenuator	HUBER+SHHNER	6806.17.A	NONE	1 year	2026.02.13
ATTENUATOR	HP	8491B	23094	1 year	2026.02.13
HORN ANTENNA	A.H.	SAS-571	414	1 year	2026.01.13
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA 9170550	1 year	2026.01.13
Amplifier	SONOMA INSTRUMENT	310N	401123	1 year	2026.02.13
PREAMPLIFIER	HP	8449B	3008A00899	1 year	2026.03.05
BROADBAND AMPLIFIER	SCHWARZBECK	BBV9721	PS9721-003	1 year	2026.01.09
DC POWER SUPPLY	AGILENT	6632B	MY43004090	1 year	2026.06.12
EMI TEST RECEIVER	R&S	ESR7	101190	1 year	2026.04.30
EMI Test Receiver	R&S	ESR3	101783	1 year	2025.11.06
PULSE LIMITER	R&S	ESH2-Z2	101915	1 year	2025.11.06
LISN	R&S	ENV216	101786	1 year	2026.01.09
Cable	-	-	#5	1 year	2025.11.01
Cable (SR #6)	RG 400	-	-	0.5 year	2026.01.25
Cable (SAC #5)	SUCOFLEX106	HUBER_SUHNER	-	0.5 year	2026.01.25
	SUCOFLEX106	HUBER_SUHNER	-		
	LH21D/2xSMA	OSI Cable	-		
Cable (SAC #6)	TCLH21D-SMSM-2.5M 0222	OSI Cable	-	0.5 year	2026.01.25
	TCLH21D-NMNM-10.0M 0222	OSI Cable	-		
	TCLH21D-SMSM-7.0M 0222	OSI Cable	-		

* Statement of Traceability: KES Co., Ltd. attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook computer	Samsung Electronics Suzhou Computer Co.,Ltd.	Nt500r5w	NT500R5W-KD5S
Test Jig Board	N/A	N/A	N/A

The End.