TEST REPORT

KES Co., Ltd.
#3002, #3503, #3701, 40, Simin-daero365beon-gil, Dongan-gu,
Anyang-si, Gyeonggi-do, 14057, Republic of Korea
Tel : +82-31-425-6200, Fax : +82-31-341-3838

■ **FCC & IC TEST REPORT**

1. Client

○ Name : THINKWARE CORPORATION

○ Address : A, 9FL., Samwhan Hipex, 240, Pangyoyeok-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, South Korea

2. Sample Description

○ Product item : THINKWARE DASH CAM

○ Model name : U1000PLUS

○ Manufacturer etc. : THINKWARE CORPORATION

3. Date of test : 2024.06.24 ~ 2024.07.04

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,
RSS-247 (Issue 3), RSS-Gen (Issue 5)

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 : Gu-Bong, Kang (Signature) [강구봉]2024/07/09	Name : Yeong-Jun Cho (Signature) [조영준]2024/07/09

2024 . 07. 09.

KES Co., Ltd.

Accredited by KOLAS, Republic of KOREA

REPORT REVISION HISTORY

Date	Test Report No.	Revision History
2024.07.05	KES-RF240420	Initial
2024.07.09	KES-RF240420-R1	Corrected typo in limit (Maximum conducted output power, Power spectral density) : Outdoor access point -> Indoor access point

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)

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1. General information

Applicant:	THINKWARE CORPORATION
Applicant address:	A, 9FL., Samwhan Hipex, 240, Pangyoyeok-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, 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 ISED Registration No.: 23298
FCC rule part(s):	15.407
FCC ID:	2ADTG-U1000PLUS
IC rule part(s):	RSS-247 (Issue 3), RSS-Gen (Issue 5)
IC Number:	12594A-U1000PLUS
Test device serial No.:	☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test	THINKWARE DASH CAM
Frequency range & Number of channels	2 402 ㎒ ~ 2 480 ㎒ (LE 1 Mbps) : 40 ch 2 412 ㎒ ~ 2 462 ㎒ (802.11b/g/n_HT20) : 11 ch **5 180 ㎒ ~ 5 240 ㎒ (802.11a/n_HT20/ac_VHT20) : 4 ch** **UNII-1 5 190 ㎒ ~ 5 230 ㎒ (802.11n_HT40/ac_VHT40) : 2 ch** **5 210 ㎒ (802.11ac_VHT80) : 1 ch**
Model	U1000PLUS
Derivative Model	XD350, D4K64DM, D4K32DM, DC-U2-FG
Modulation technique	GFSK, **DSSS, OFDM**
Antenna specification	2.4 ㎓ band Chip Antenna // Peak gain: 1.47 ㏈i 5 ㎓ band Chip Antenna // Peak gain: 2.35 ㏈i
Power source	DC 12 V, 24 V
H/W version	V3.1
S/W version	V0.21
Serial Number	QALCCFLD000282B

1.2. Test configuration

The **THINKWARE CORPORATION // THINKWARE DASH CAM // U1000PLUS // FCC ID: 2ADTG-U1000PLUS // IC number : 12594A-U1000PLUS** was tested according to the specification of EUT, the EUT must comply with following standards and KDB documents.

FCC Part 15.407
ISED RSS-247 Issue 3 and RSS-Gen Issue 5
KDB 789033 D02 v02r01
ANSI C63.10-2013

1.3. Information about derivative model

The basic model **U1000PLUS** and the derivative model **XD350, D4K64DM, D4K32DM, DC-U2-FG** have the same circuit, parts, etc., and only the model name is different according to the buyer's request.

1.4. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
Front camera(main unit)	THINKWARE CORPORATION	-	-	DC 12 V, DC 24 V
Mount	-	-	-	-
Hardwiring cable	-	-	-	-
Adhesive cable holder	-	-	-	-
MicroSD memory card	-	-	-	-
CPL filter	-	-	-	-
Warranty & CS informaytion	-	-	-	-

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(㏈).
= 1.68 + 10 = 11.68 (㏈)

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

1.7. Worst case data rate

1. Worst-case data rates were:

802.11a : 6 Mbps

802.11n_HT20/40 : MCS0

802.11ac_VHT20/40/80 : MCS0

1.8. 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.		

1.9. Frequency/channel operations

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**	**802.11a/an_HT20/ac_VHT20**
.	.	.
44	**5 220**	**802.11a/an_HT20/ac_VHT20**
.	.	.
48	**5 240**	**802.11a/an_HT20/ac_VHT20**

Ch.	Frequency (㎒)	Mode
38	**5 190**	**802.11an_HT40/ac_VHT40**
.	.	.
46	**5 230**	**802.11an_HT40/ac_VHT40**

Ch.	Frequency (㎒)	Mode
42	**5 210**	**802.11ac_VHT80**

2. Summary of tests

Section in FCC Part 15	Section in RSS-247 & Gen	Parameter	Test results
15.407(a)	RSS-247 6.2	26 dB bandwidth & 99 % bandwidth	Pass
15.407(a)	-	6 dB bandwidth	Pass
15.407(a)	RSS-247 6.2	Maximum conducted output power	Pass
15.407(a)	RSS-247 6.2	Power spectral density	Pass
15.407(g)	RSS-Gen 6.11	Frequency stability	Pass
15.205, 15.209, 15.407(b)	RSS-247 6.2, RSS-Gen 8.9, 8.10	Radiated restricted band and emission	Pass
15.207(a)	RSS-Gen 8.8	AC power line conducted emissions	N/A Note.1
15.203	-	Antenna Requirement	Pass

Note.

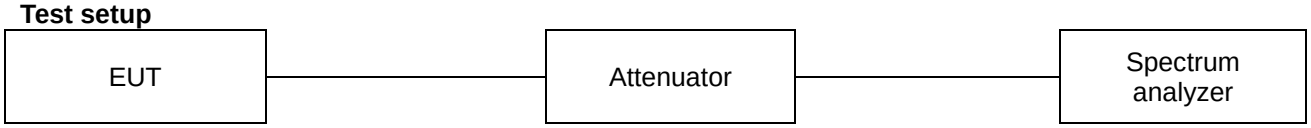
1. This device is powered by DC 12 V or DC 24 V.
2. By the request of applicant, test is performed with power setting value below :

Mode	UNII-1	
	Frequency (㎒)	Setting value
802.11a (6 Mbps)	5 180 ~ 5 240	44
802.11n_HT20 (MCS0)		44
802.11ac_VHT20 (MCS0)		44
802.11n_HT40 (MCS0)	5 190 ~ 5 230	44
802.11ac_VHT40 (MCS0)		44
802.11ac_VHT80 (MCS0)	5 210	44

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.

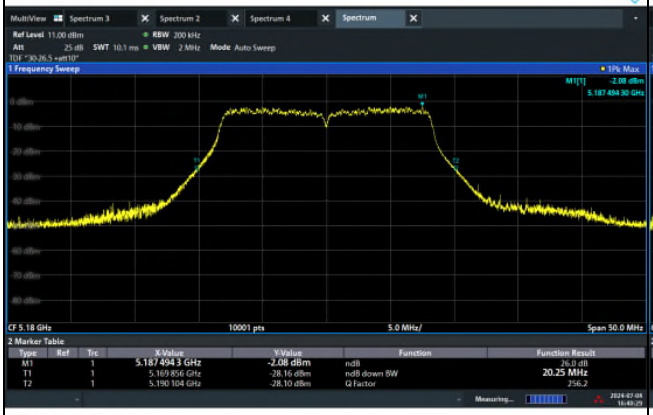
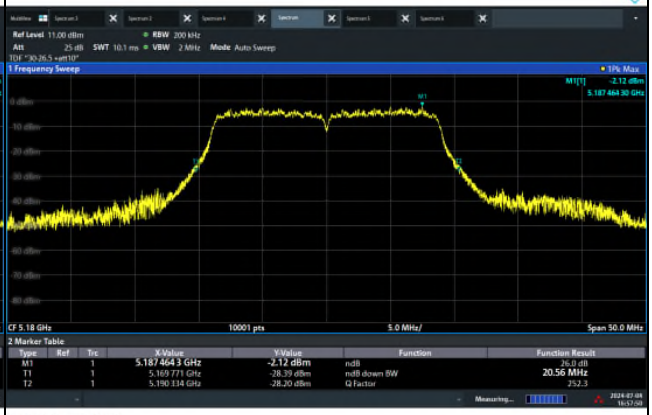
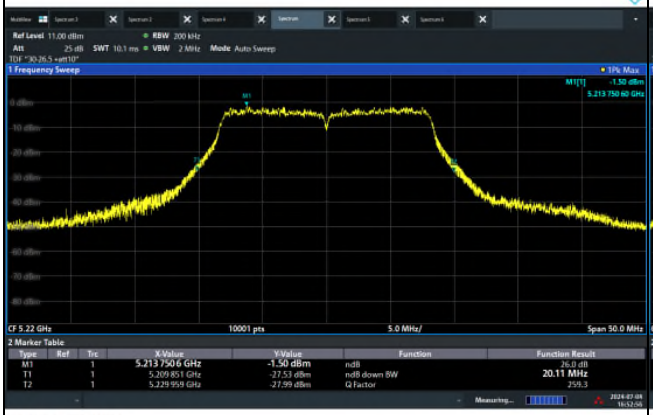
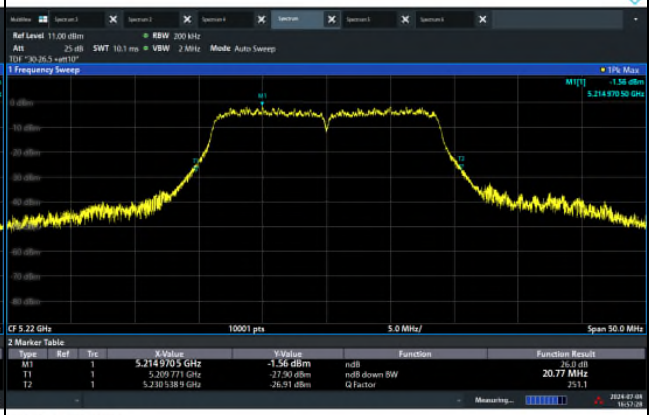
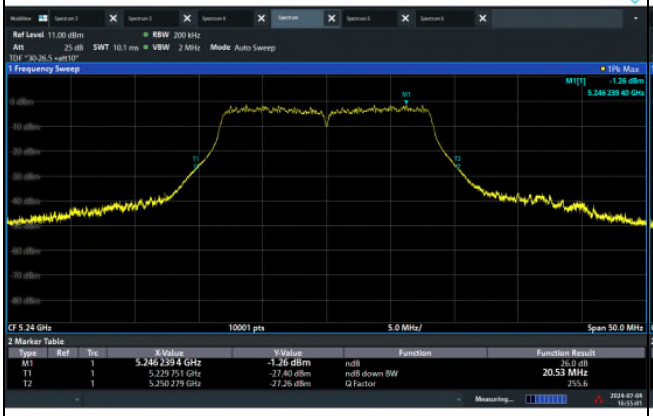
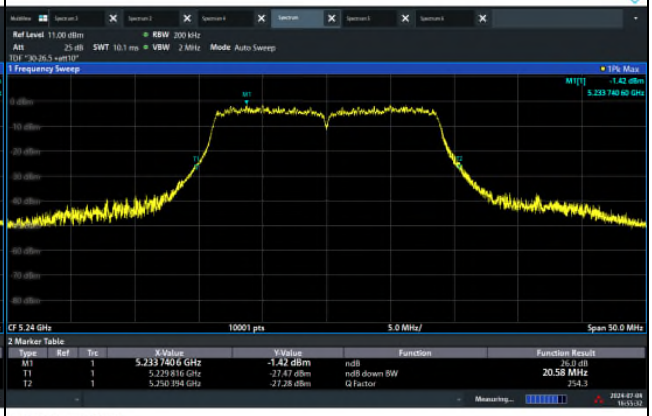
Limit

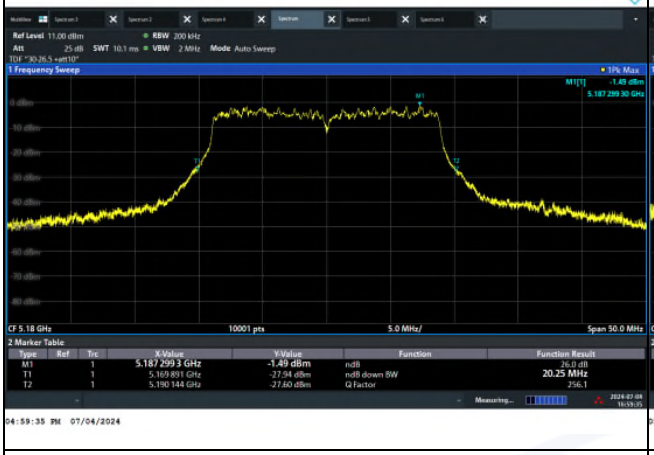
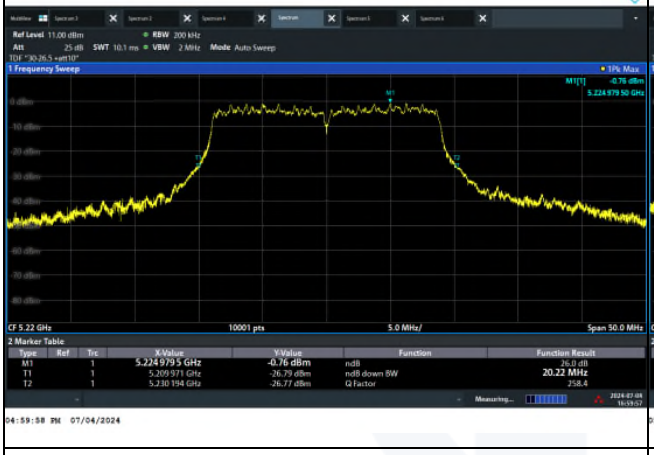
N/A

Test results

Band	Frequency(㎒)	Mode	26 ㏈ bandwidth(㎒)	99 % bandwidth(㎒)
UNII-1	5 180	802.11a	20.25	16.74
	5 220		20.11	16.86
	5 240		20.53	16.82
	5 180	802.11n _HT20	20.56	17.88
	5 220		20.77	17.87
	5 240		20.58	17.82
	5 180	802.11ac _VHT20	20.25	17.77
	5 220		20.22	17.76
	5 240		20.08	17.75
	5 190	802.11n _HT40	41.21	36.72
	5 230		40.52	36.71
	5 190	802.11ac _VHT40	40.73	36.62
	5 230		41.03	36.61
	5 210	802.11ac _VHT80	82.15	76.40

26 ㏈ bandwidth

802.11a	802.11n_HT20
	
	
	

802.11ac_VHT20	802.11n_HT40
	
	
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802.11ac_VHT40	802.11ac_VHT80
	
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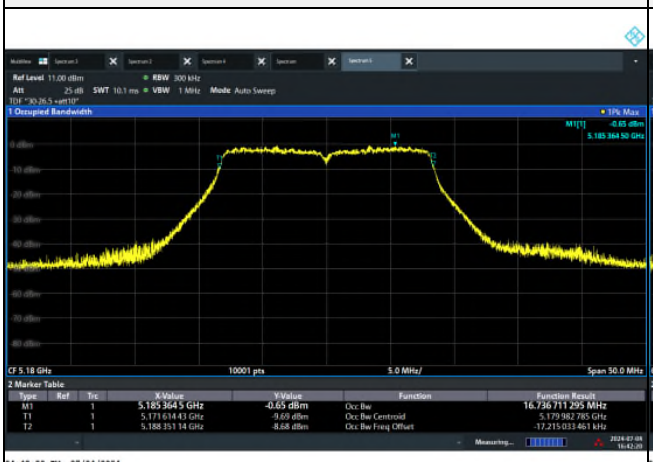
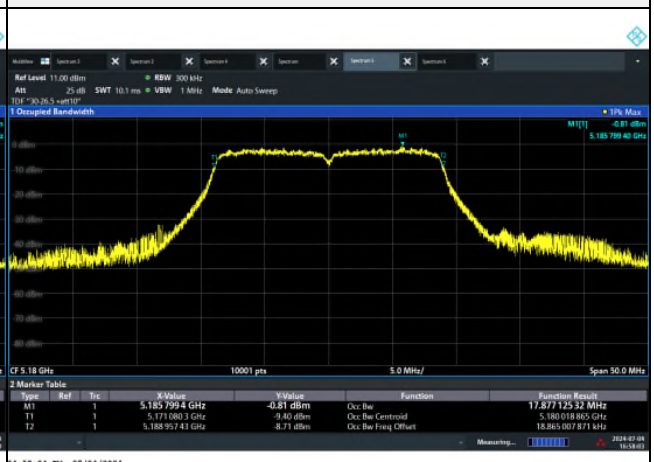
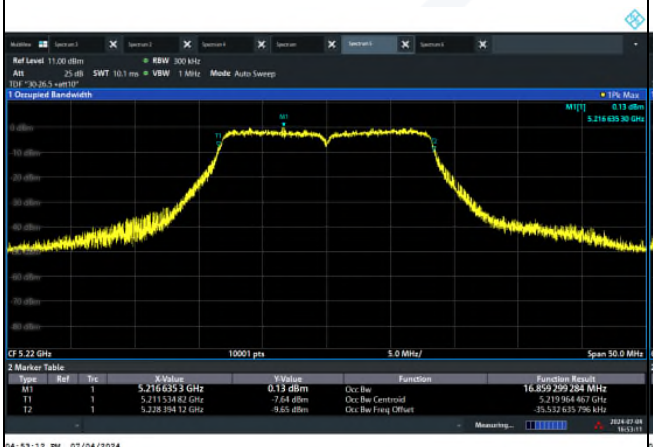
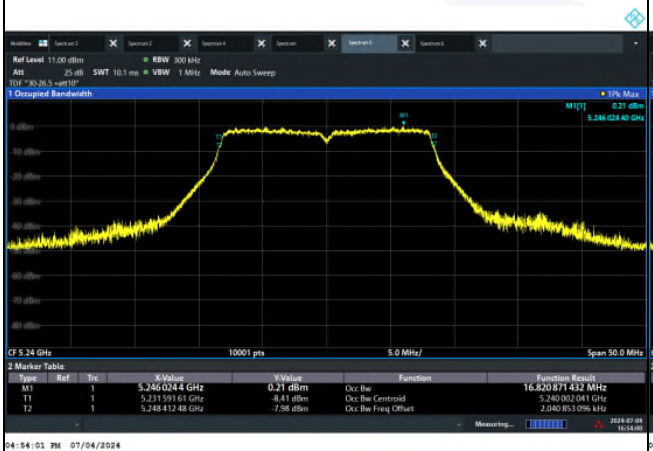
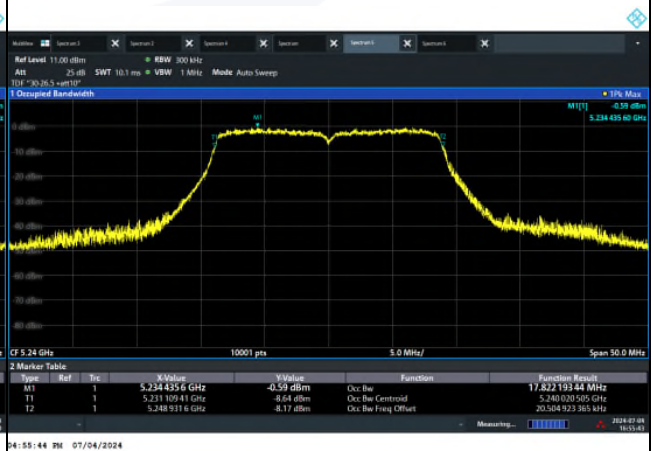
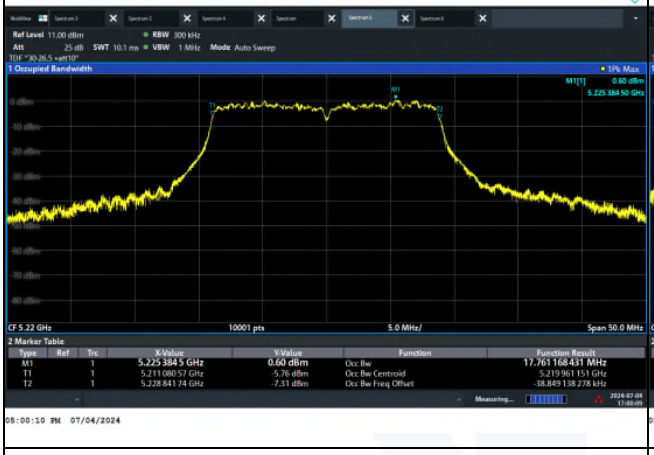
99% bandwidth

802.11a	802.11n_HT20
	
	
	

802.11ac_VHT20	802.11n_HT40
	
	
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802.11ac_VHT40	802.11ac_VHT80
	
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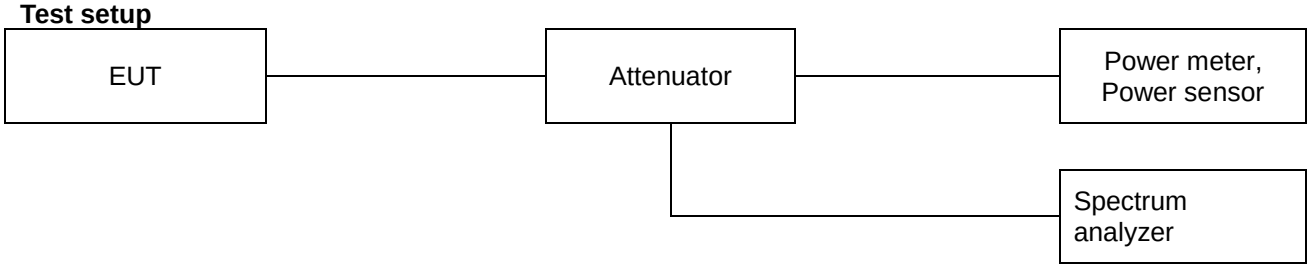
3.2. Maximum conducted output power

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.

FCC 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.

IC Limit

Band	Limit
5 150~5 250 ㎒	EIRP shall not exceed 200 mW or 10+10logB*, dBm
5 250~5 350 ㎒	Conducted output power shall not exceed 250 mW or 11 dBm + 10logB* EIRP shall not exceed 1.0 W or 17+10logB*, dBm
5 470~5 600 ㎒ and 5 650~5 725㎒	Conducted output power shall not exceed 250 mW or 11 dBm + 10logB* EIRP shall not exceed 1.0 W or 17+10logB*, dBm
5 725~5 850 ㎒	Conducted output power shall not exceed 1 W

Note.

1. IC Limit B is the 99% emission bandwidth in megahertz.

Test results

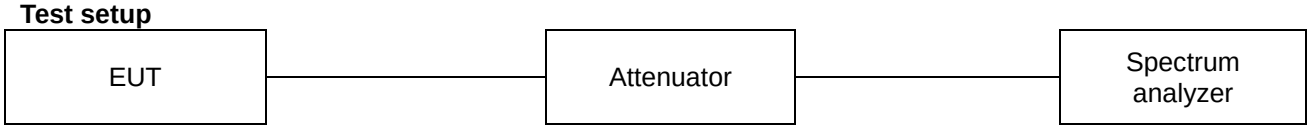
Mode	Frequency (㎒)	Detector mode	Ant Gain (dBi)	Output power (㏈m)	FCC Limit (㏈m)	IC Limit (㏈m)
802.11a	5 180	AV	2.35	7.05	30	22.24
	5 220			7.67		
	5 240			7.97		
802.11n_HT20	5 180			6.54		22.51
	5 220			7.35		
	5 240			7.66		
802.11ac_VHT20	5 180			8.03		22.49
	5 220			8.96		
	5 240			9.15		
802.11n_HT40	5 190			7.17		23.01
	5 230			7.87		
802.11ac_VHT40	5 190			7.59		23.01
	5 230			8.34		
802.11ac_VHT80	5 210			8.37		23.01

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.

FCC 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.

IC Limit

Band	Limit
5 150~5 250 ㎒	The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 ㎒ band.
5 250~5 350 ㎒	The power spectral density shall not exceed 11 dBm in any 1.0 ㎒ band
5 470~5 600 ㎒ and 5 650~5 725㎒	The power spectral density shall not exceed 11 dBm in any 1.0 ㎒ band
5 725~5 850 ㎒	The output power spectral density shall not exceed 30 dBm in any 500 ㎑ band

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.

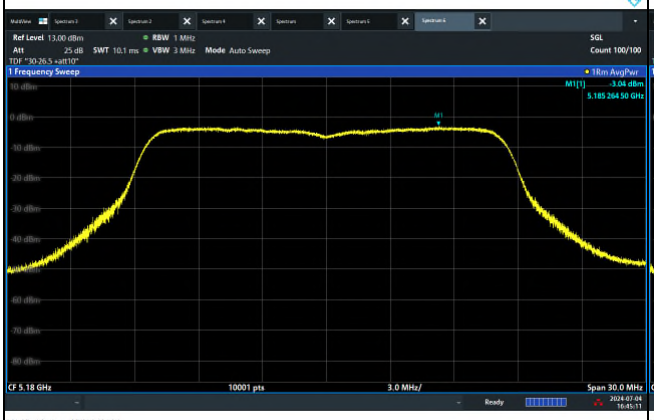
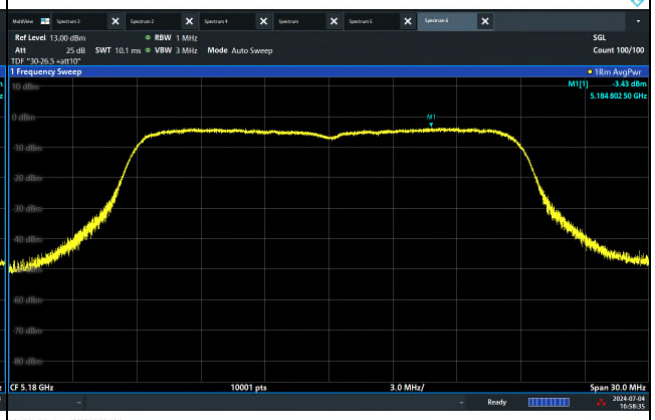
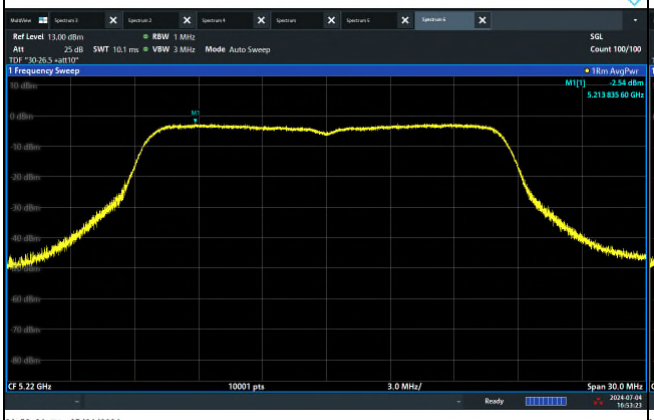
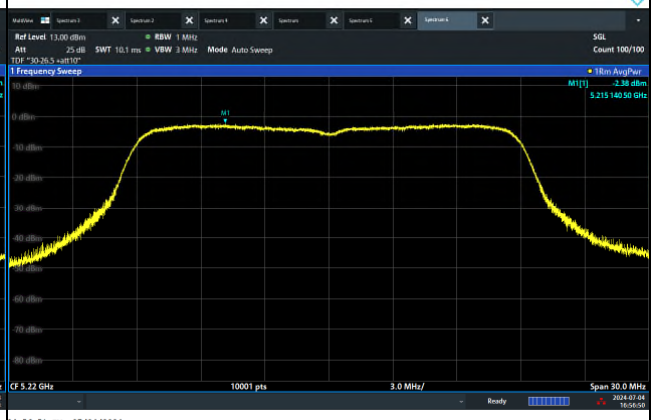
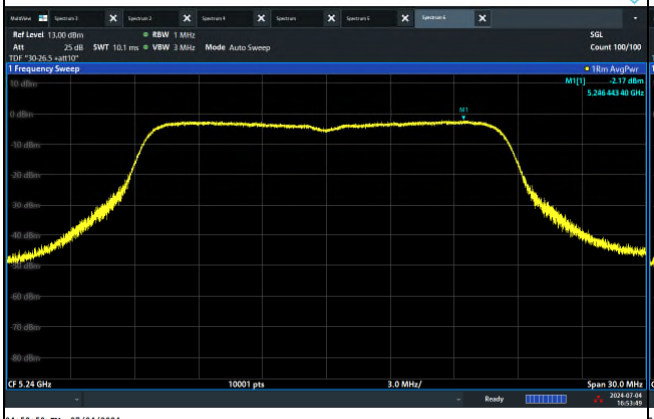
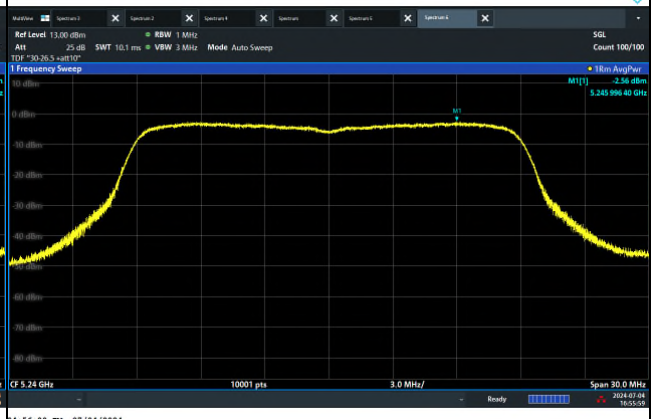
Test results

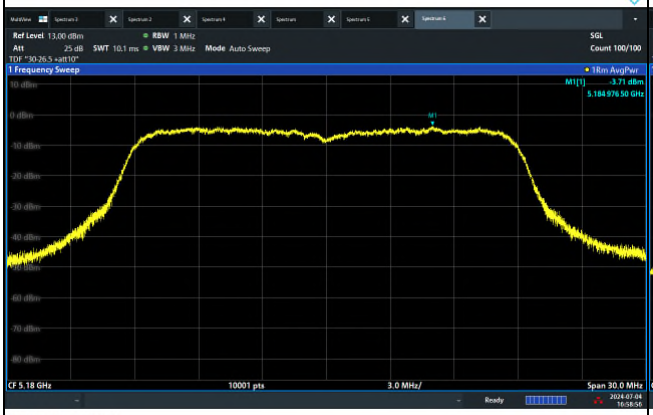
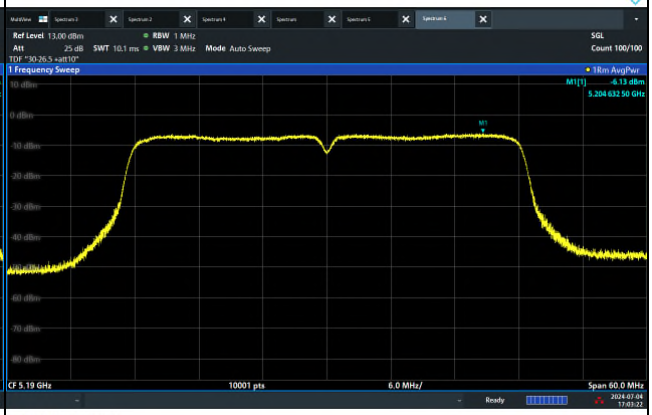
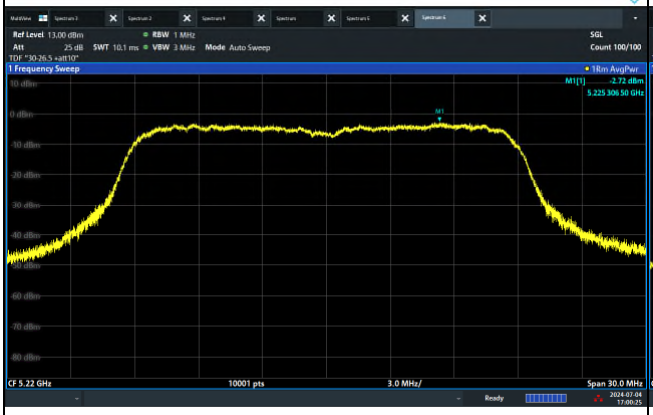
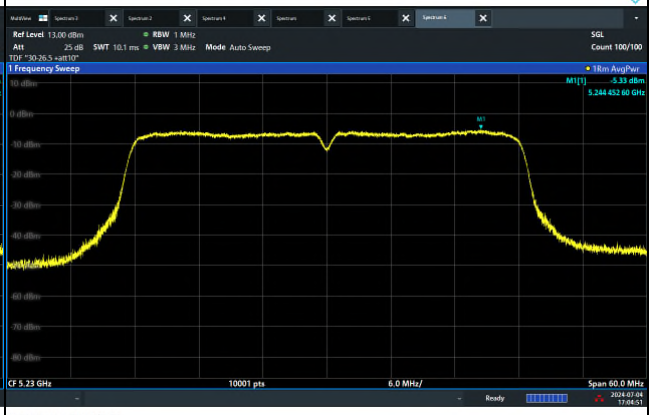
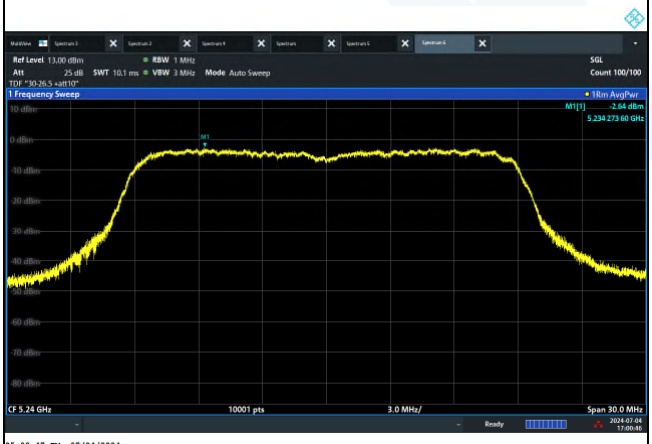
Mode	Frequency (㎒)	PSD (㏈m/㎒)	RBWF Note1	DCF Note2	Ant Gain	Sum Note3	FCC Limit	IC Limit
802.11a	5 180	-3.04	-	0.22	2.35	-0.47	17.00 (dB m/㎒)	10.00 (dB m/㎒)
	5 220	-2.54				0.03		
	5 240	-2.17				0.40		
802.11n _HT20	5 180	-3.43		0.13		-0.95		
	5 220	-2.38				0.10		
	5 240	-2.56				-0.08		
802.11ac _VHT20	5 180	-3.71		2.52		1.16		
	5 220	-2.72				2.15		
	5 240	-2.64				2.23		
802.11n _HT40	5 190	-6.13		0.56		-3.22		
	5 230	-5.33				-2.42		
802.11ac _VHT40	5 190	-6.60		2.60		-1.65		
	5 230	-5.84				-0.89		
802.11ac _VHT80	5 210	-11.51		3.37		-5.79		

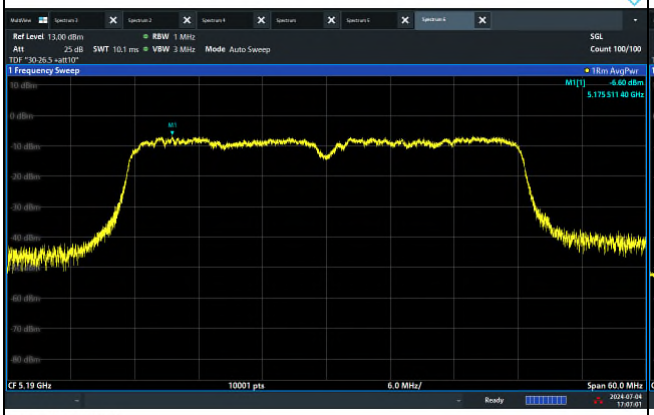
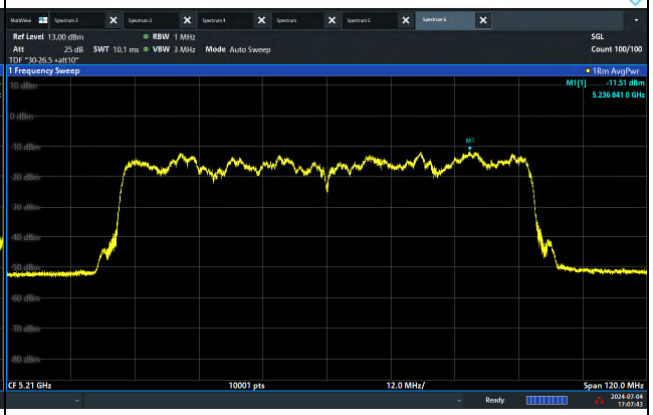
Note.

1. 10log(1 ㎒/1 ㎒) = 0
2. Refer to the page 33 on this report.
3. Sum(dBm) = PSD(dBm) + RBWF + Duty correction factor (dB)

Test Plot

802.11a	802.11n_HT20
	
	
	

802.11ac_VHT20	802.11n_HT40
	
	
	Blank

802.11ac_VHT40	802.11ac_VHT80
	
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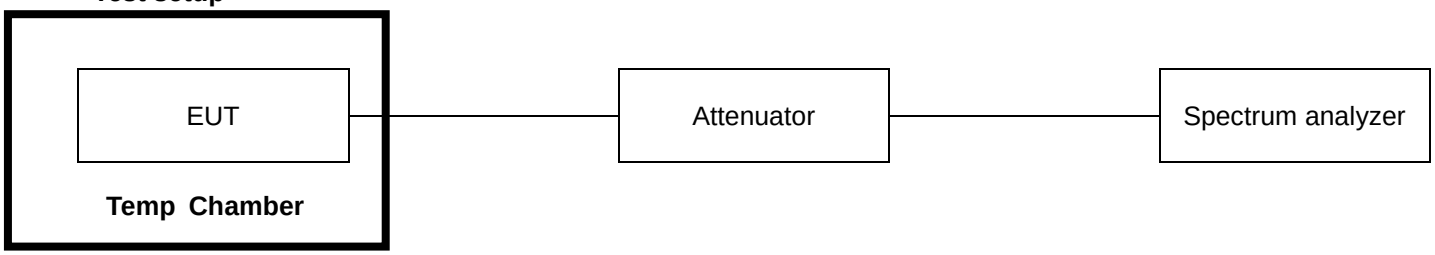
3.4. Frequency Stability

Test procedure

ANSI C63.10-2013, 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: 802.11a

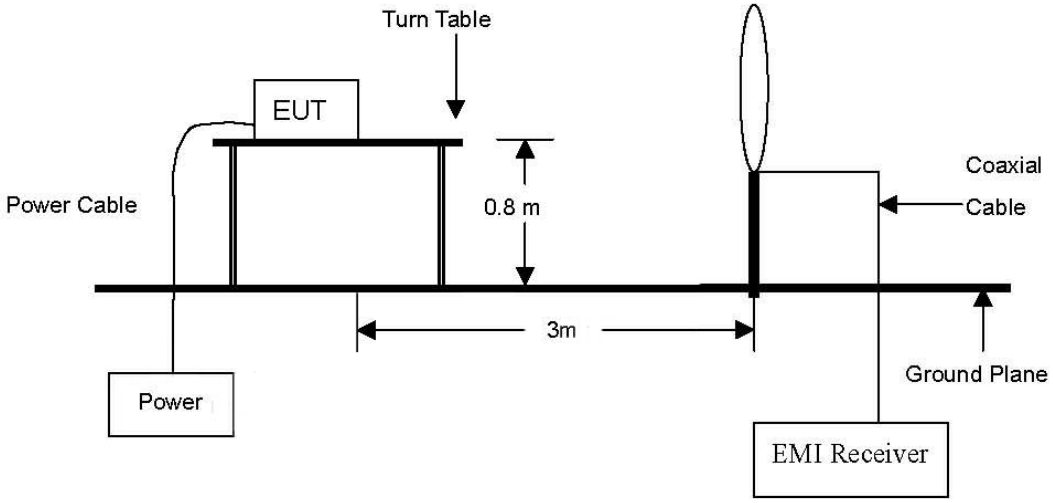
Operating frequency: 5 180 ㎒

Test voltage (%)	Test voltage (V)	Temperature (℃)	Maintaining time	Measure frequency (㎒)	Frequency deviation (㎐)	Deviation (%)
100 %	DC 24.0 V	-10.0	Startup	5 180.075000	75 000	0.00 145
			2 minutes	5 180.074000	74 000	0.00 143
			5 minutes	5 180.072500	72 500	0.00 140
			10 minutes	5 180.070000	70 000	0.00 135
100 %		0.0	Startup	5 180.068500	68 500	0.00 132
			2 minutes	5 180.065000	65 000	0.00 125
			5 minutes	5 180.066000	66 000	0.00 127
			10 minutes	5 180.069500	69 500	0.00 134
100 %		10.0	Startup	5 180.074000	74 000	0.00 143
			2 minutes	5 180.077000	77 000	0.00 149
			5 minutes	5 180.079000	79 000	0.00 153
			10 minutes	5 180.081000	81 000	0.00 156
100 %		20.0	Startup	5 180.073000	73 000	0.00 141
			2 minutes	5 180.075000	75 000	0.00 145
			5 minutes	5 180.077000	77 000	0.00 149
			10 minutes	5 180.081500	81 500	0.00 157
100 %		25.4	Startup	5 180.082500	82 500	0.00 159
			2 minutes	5 180.077500	77 500	0.00 150
			5 minutes	5 180.083000	83 000	0.00 160
			10 minutes	5 180.075000	75 000	0.00 145
100 %		30.0	Startup	5 180.065000	65 000	0.00 125
			2 minutes	5 180.067500	67 500	0.00 130
			5 minutes	5 180.083000	83 000	0.00 160
			10 minutes	5 180.077500	77 500	0.00 150
100 %		40.0	Startup	5 180.069500	69 500	0.00 134
			2 minutes	5 180.068000	68 000	0.00 131
			5 minutes	5 180.065000	65 000	0.00 125
			10 minutes	5 180.066500	66 500	0.00 128
100 %		50.0	Startup	5 180.055000	55 000	0.00 106
			2 minutes	5 180.057500	57 500	0.00 111
			5 minutes	5 180.060500	60 500	0.00 117
			10 minutes	5 180.063000	63 000	0.00 122
100 %		60.0	Startup	5 180.045000	45 000	0.00 087
			2 minutes	5 180.042500	42 500	0.00 082
			5 minutes	5 180.047000	47 000	0.00 091
			10 minutes	5 180.048500	48 500	0.00 094
85 %	DC 20.4 V	25.4	Startup	5 180.081000	81 000	0.00 156
			2 minutes	5 180.079500	79 500	0.00 153
			5 minutes	5 180.077000	77 000	0.00 149
			10 minutes	5 180.076000	76 000	0.00 147
115 %	DC 27.6 V	25.4	Startup	5 180.079500	79 500	0.00 153
			2 minutes	5 180.083000	83 000	0.00 160
			5 minutes	5 180.074000	74 000	0.00 143
			10 minutes	5 180.076500	76 500	0.00 148

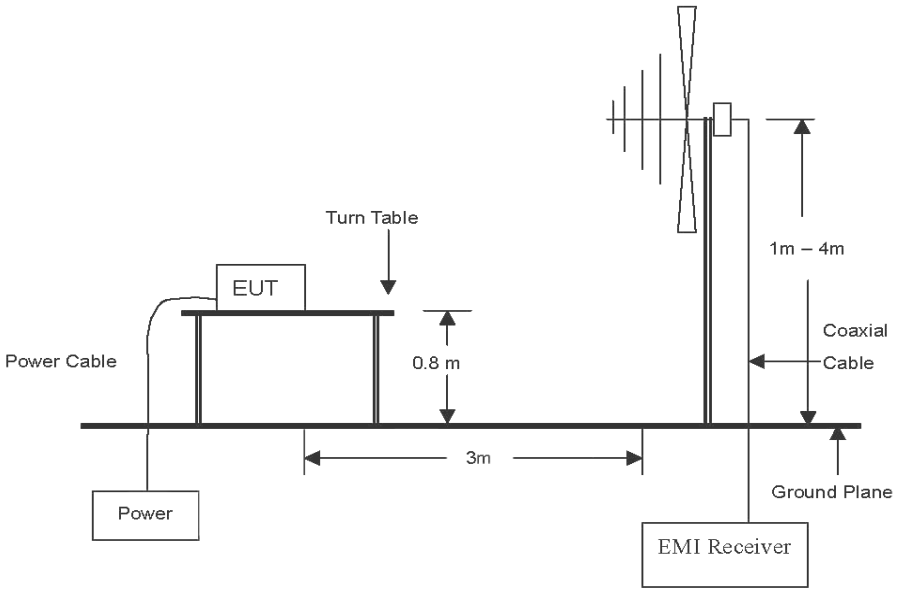
3.5. Radiated restricted band and emissions

Test setup

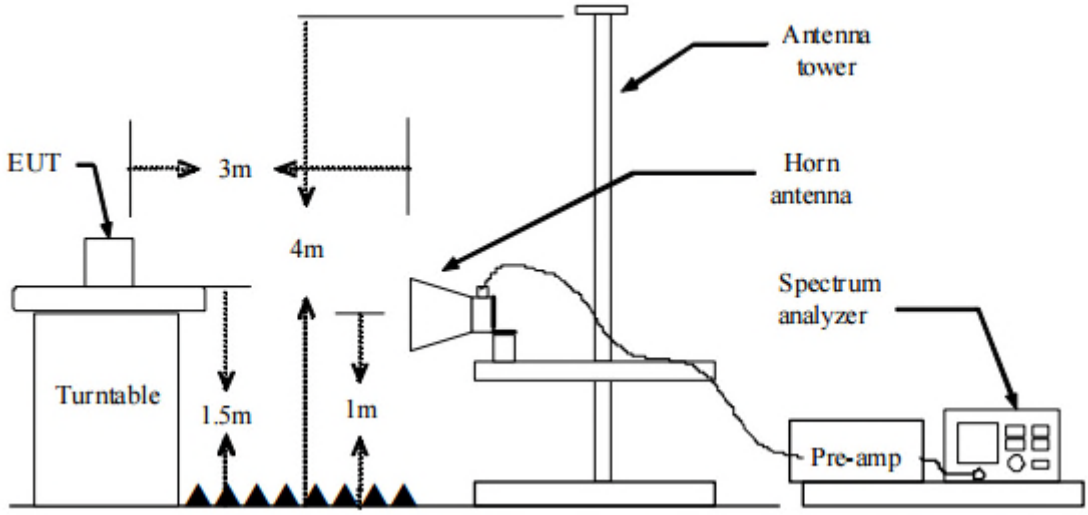
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



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 C63.10-2013.

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.

FCC 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.

IC Limit
According to RSS-Gen, Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits：

Frequency (㎒)	Distance (Meters)	Radiated (㎶/m)
0.009 ~ 0.490	300	2 400 / F(㎑)
0.490 ~ 1.705	30	24 000 / F(㎑)
1.705 ~ 30.0	30	30
30 ~ 88	3	100
88 ~ 216	3	150
216 ~ 960	3	200
Above 960*	3	500

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for licence-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 ㎒. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 ㏈ above the average limit.
Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

According to RSS-247 6.2, The equipment output power and e.i.r.p. shall be measured in terms of average value. If the transmission is in bursts, the provisions of RSS-Gen for pulsed operation shall apply.

(1) For transmitters with operating frequencies in the band 5150-5250 ㎒, all emissions outside the band 5150-5350 ㎒ shall not exceed -27 ㏈m/㎒ e.i.r.p. Any unwanted emissions that fall into the band 5250-5350 ㎒ shall be attenuated below the channel power by at least 26 ㏈, when measured using a resolution bandwidth between 1 and 5% of the occupied bandwidth (i.e. 99% bandwidth), above 5250 ㎒. The 26 ㏈ bandwidth may fall into the 5250-5350 ㎒ band; however, if the occupied bandwidth also falls within the 5250-5350 ㎒ band, the transmission is considered as intentional and the devices shall comply with all requirements in the band 5250-5350 ㎒ including implementing dynamic frequency selection (DFS) and TPC, on the portion of the emission that resides in the 5250-5350 ㎒ band.

(2) For transmitters operating in the band 5250-5350 ㎒ Devices shall comply with the following:
a) All emissions outside the band 5250-5350 ㎒ shall not exceed -27 ㏈m/㎒ e.i.r.p.; or
b) All emissions outside the band 5150-5350 ㎒ shall not exceed -27 ㏈m/㎒ e.i.r.p. and its power shall comply with the spectral power density for operation within the band 5150-5250 ㎒. The device, except devices installed in vehicles, shall be labelled or include in the user manual the following text “for indoor use only.”

(3) For transmitters operating in the band 5470-5600 ㎒ and 5650-5725 ㎒, Emissions outside the band 5470-5725 ㎒ shall not exceed -27 ㏈m/㎒ e.i.r.p. However, devices with bandwidth overlapping the band edge of 5725 ㎒ can meet the emission limit of -27 ㏈m/㎒ e.i.r.p. at 5850 ㎒ instead of 5725 ㎒.

(4) For the band 5725-5850 ㎒, Devices operating in the band 5725-5850 ㎒ with antenna gain greater than 10 ㏈i can have unwanted emissions that comply with either the limits in this section or in section 5.5 until six (6) months after the publication date of this standard for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2018.
Devices operating in the band 5725-5850 ㎒ with antenna gain of 10 ㏈i or less can have unwanted emissions that comply with either the limits in this section or in section 5.5 until April 1, 2018 for certification. Certified devices that do not comply with emission limits in this section shall not be manufactured, imported, distributed, leased, offered for sale or sold after April 1, 2020.
Devices operating in the band 5725-5850 ㎒ shall have e.i.r.p. of unwanted emissions comply with the following:
a) 27 ㏈m/㎒ at frequencies from the band edges decreasing linearly to 15.6 ㏈m/㎒ at 5 ㎒ above or below the band edges;
b) 15.6 ㏈m/㎒ at 5 ㎒ above or below the band edges decreasing linearly to 10 ㏈m/㎒ at 25 ㎒ above or below the band edges;
c) 10 ㏈m/㎒ at 25 ㎒ above or below the band edges decreasing linearly to -27 ㏈m/㎒ at 75 ㎒ above or below the band edges; and
d) -27 ㏈m/㎒ at frequencies more than 75 ㎒ above or below the band edges.

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 (㏈)
802.11a	2.08	2.18	0.95	95.41	0.22
802.11n_HT20	1.94	2.00	0.97	97.00	0.13
802.11ac_VHT20	0.20	0.36	0.56	55.56	2.52
802.11n_HT40	0.95	1.08	0.88	87.96	0.56
802.11ac_VHT40	0.11	0.20	0.55	55.00	2.60
802.11ac_VHT80	0.07	0.16	0.46	45.94	3.37

Note:

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

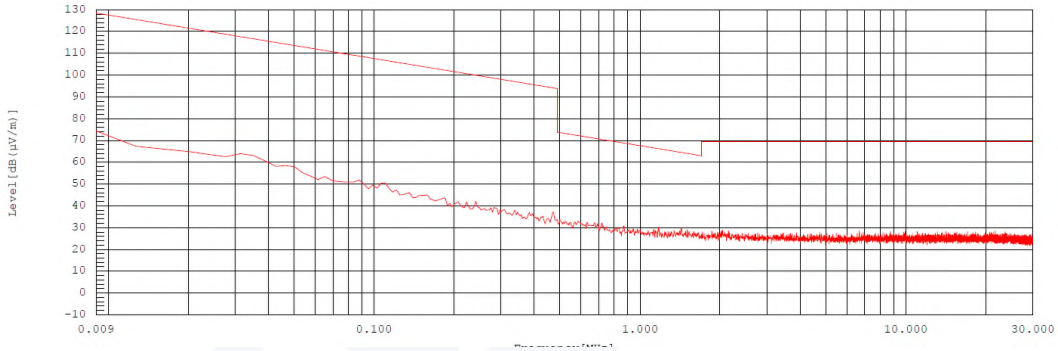
DCF(Duty cycle correction factor (㏈)) = 10log(1/duty cycle)

802.11a (6 Mbps)	802.11n_HT20 (MCS0)
	
802.11ac_VHT20 (MCS0)	**802.11n_HT40 (MCS0)**
	
802.11ac_VHT40 (MCS0)	**802.11ac_VHT80 (MCS0)**
	

Test results (Below 30 ㎒)

Band	802.11ac_VHT20 (Worst Case)_DC 12 V
Distance of measurement:	3 meter
Channel	48 (Worst Case)

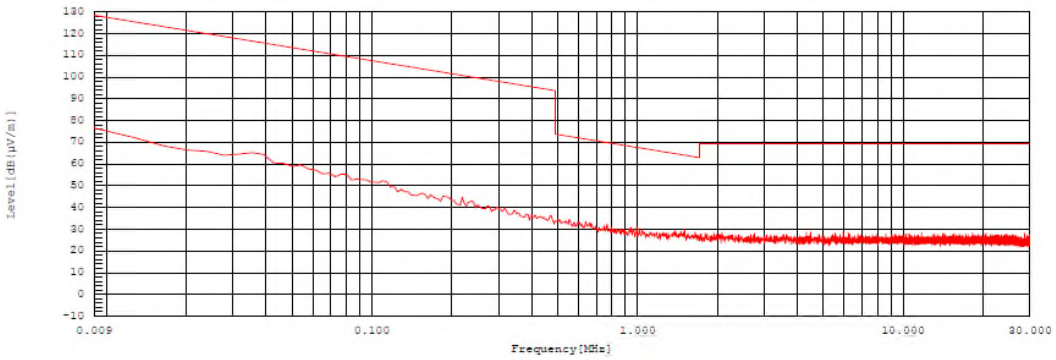
Parallel



Note.
1. No spurious emission were detected under 30 ㎒.

Band	802.11ac_VHT20 (Worst Case)_DC 24 V
Distance of measurement:	3 meter
Channel	48 (Worst Case)

Parallel



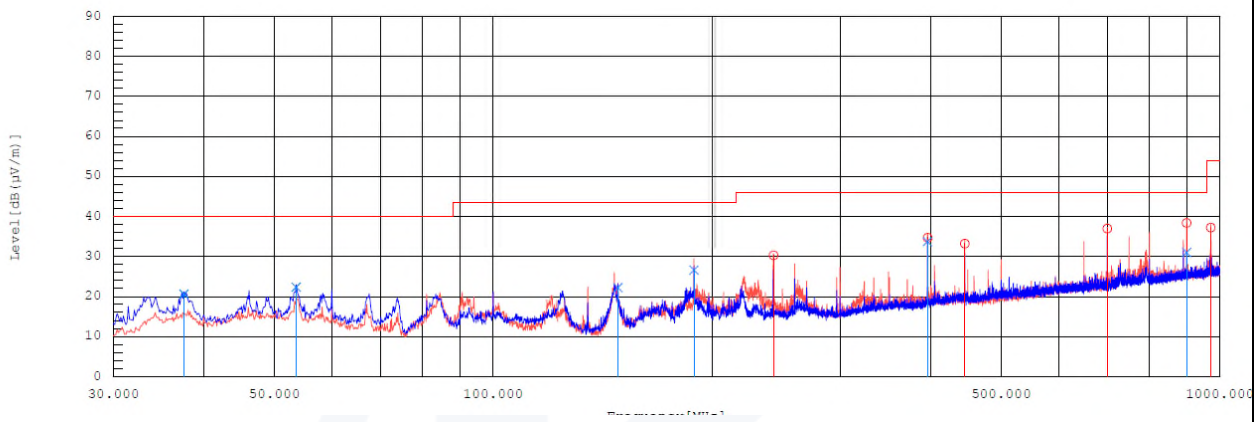
Note.

1. No spurious emission were detected under 30 ㎒.

Test results (Below 1 000 ㎒)

Band	802.11ac_VHT20 (Worst Case)_DC 12 V
Distance of measurement:	3 meter
Channel	48 (Worst Case)

Horizontal // Vertical

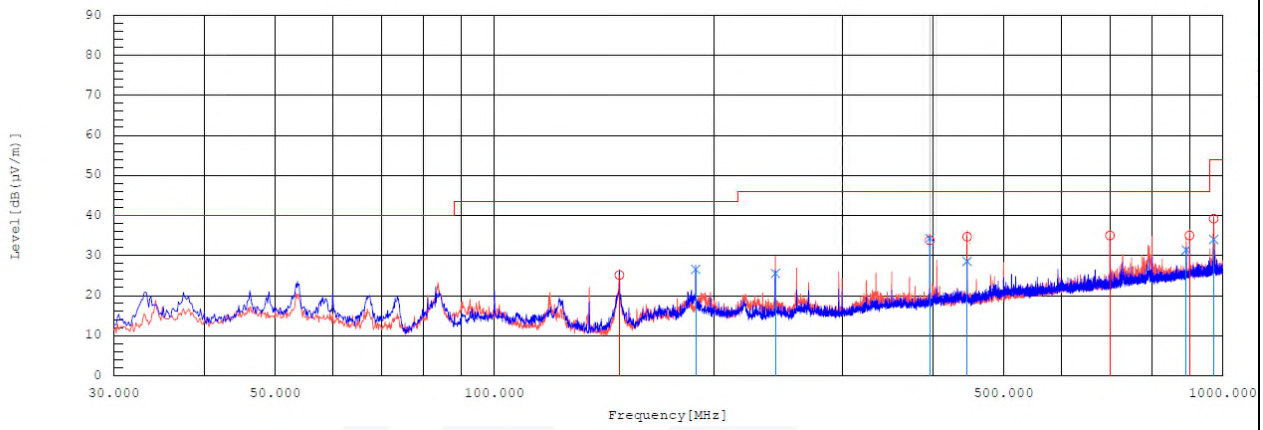


Final Result

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	37.518	V	34.7	-14.1	20.6	40.0	19.4	124.0	73.3	
2	53.523	V	34.6	-12.3	22.3	40.0	17.7	105.0	332.3	
3	148.461	V	39.2	-17.0	22.2	43.5	21.3	100.0	337.2	
4	188.959	V	40.7	-14.1	26.6	43.5	16.9	105.0	337.2	
5	243.036	H	42.4	-12.1	30.3	46.0	15.7	107.0	27.9	
6	395.933	V	42.1	-8.4	33.7	46.0	12.3	142.0	289.8	
7	396.054	H	43.1	-8.4	34.7	46.0	11.3	116.0	45.8	
8	445.524	H	41.0	-7.8	33.2	46.0	12.8	100.0	292.6	
9	700.028	H	40.2	-3.2	37.0	46.0	9.0	110.0	314.4	
10	900.090	H	37.4	1.0	38.4	46.0	7.6	107.0	292.6	
11	900.090	V	30.0	1.0	31.0	46.0	15.0	125.0	205.5	
12	972.113	H	35.1	2.1	37.2	54.0	16.8	100.0	22.9	

Band	802.11ac_VHT20 (Worst Case)_DC 24 V
Distance of measurement:	3 meter
Channel	48 (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	148.461	H	42.1	-17.0	25.1	43.5	18.4	241.0	251.8	
2	188.959	V	40.6	-14.1	26.5	43.5	17.0	107.0	332.5	
3	243.036	V	37.6	-12.1	25.5	46.0	20.5	159.0	310.4	
4	395.933	H	42.2	-8.4	33.8	46.0	12.2	108.0	241.7	
5	395.933	V	42.7	-8.4	34.3	46.0	11.7	142.0	266.7	
6	445.524	H	42.5	-7.8	34.7	46.0	11.3	100.0	286.6	
7	445.524	V	36.3	-7.8	28.5	46.0	17.5	106.0	0.0	
8	700.028	H	38.2	-3.2	35.0	46.0	11.0	124.0	286.6	
9	890.996	V	30.7	0.7	31.4	46.0	14.6	144.0	0.0	
10	900.090	H	34.0	1.0	35.0	46.0	11.0	106.0	359.9	
11	971.991	V	31.9	2.1	34.0	54.0	20.0	142.0	22.7	
12	972.113	H	37.1	2.1	39.2	54.0	14.8	100.0	264.6	

Test results (Above 1 000 ㎒)

Mode: 802.11a_DC 12 V

Distance of measurement: 3 meter

Channel: 36

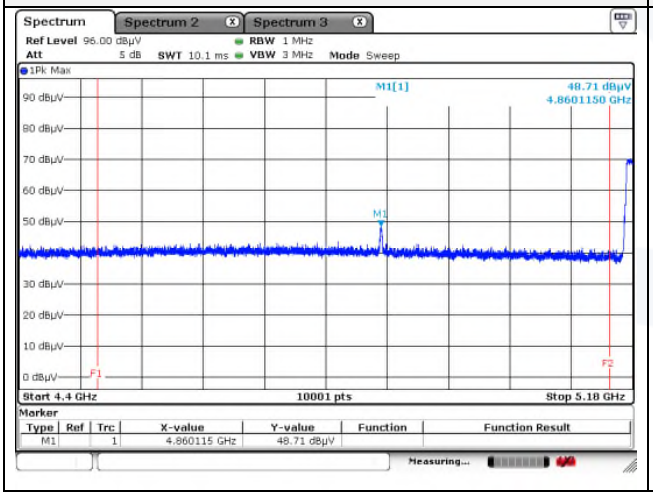
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 026.25	45.90	Peak	V	-9.24	-	36.66	74.00	37.34
1 250.22	44.93	Peak	H	-7.83	-	37.10	68.20	31.10

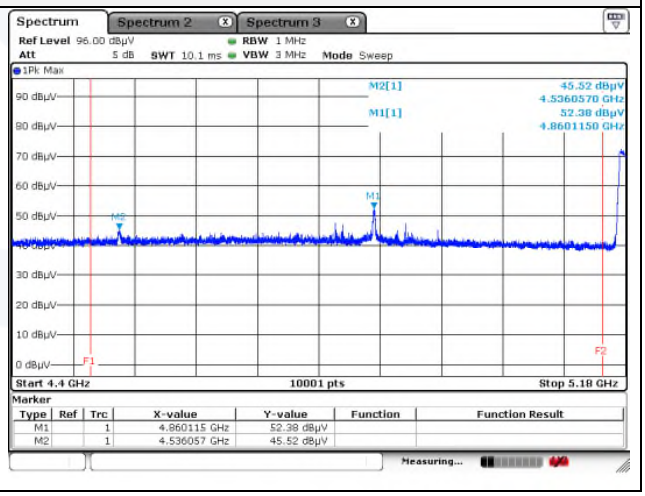
- **Band edge**

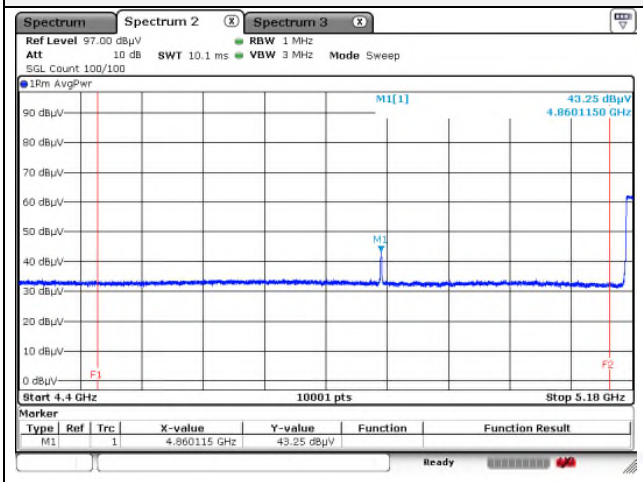
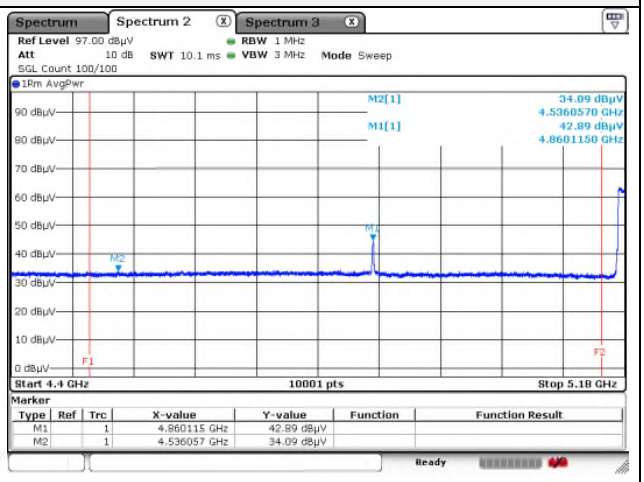
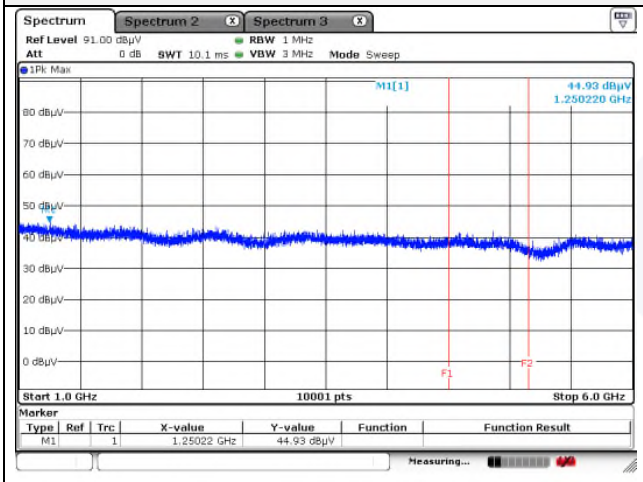
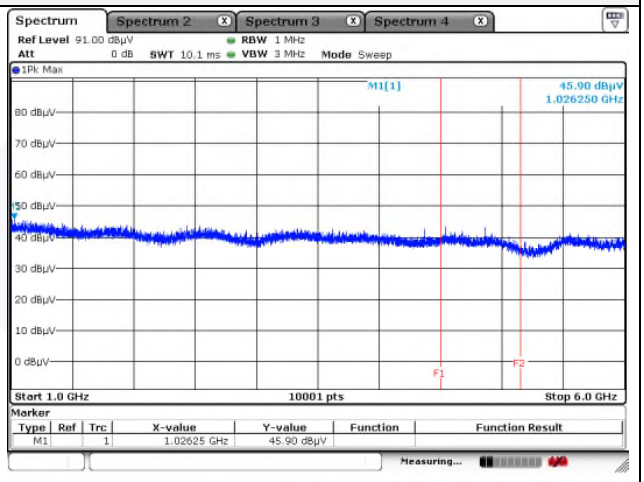
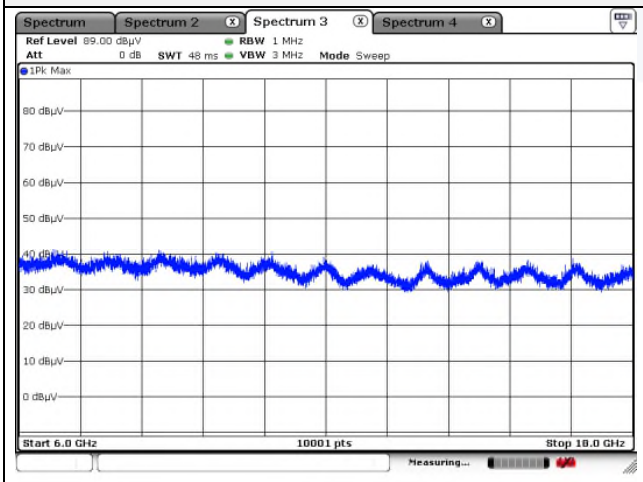
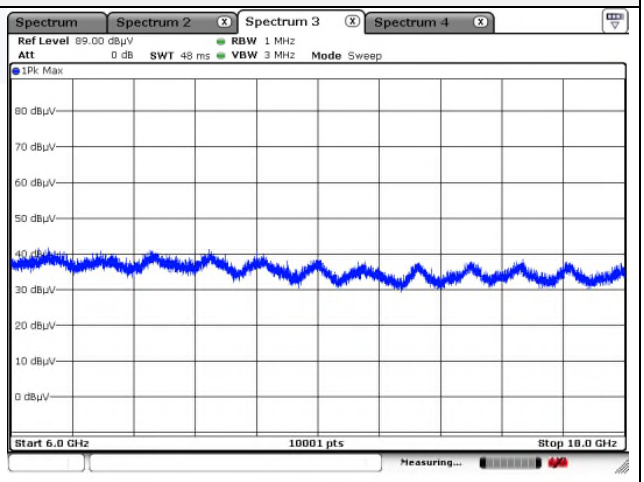
Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
4 536.06	45.52	Peak	V	4.70	-	50.22	74.00	23.78
4 536.06	34.09	Average	V	4.70	0.22	39.01	54.00	14.99
4 860.12	48.71	Peak	H	6.72	-	55.43	74.00	18.57
4 860.12	43.25	Average	H	6.72	0.22	50.19	54.00	3.81
4 860.12	52.38	Peak	V	6.72	-	59.10	74.00	14.90
4 860.12	42.89	Average	V	6.72	0.22	49.83	54.00	4.17

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.

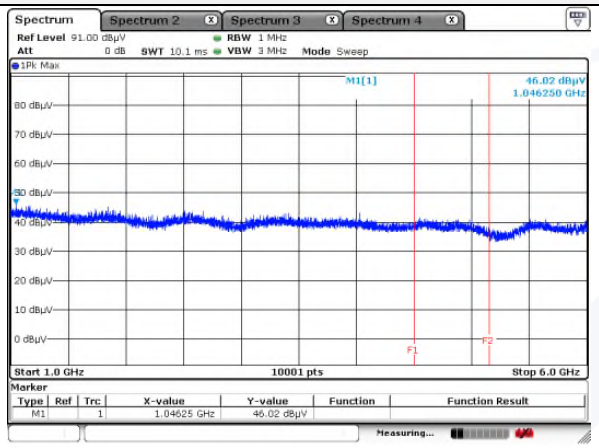
1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode:	802.11a_DC 12 V
Distance of measurement:	3 meter
Channel:	44

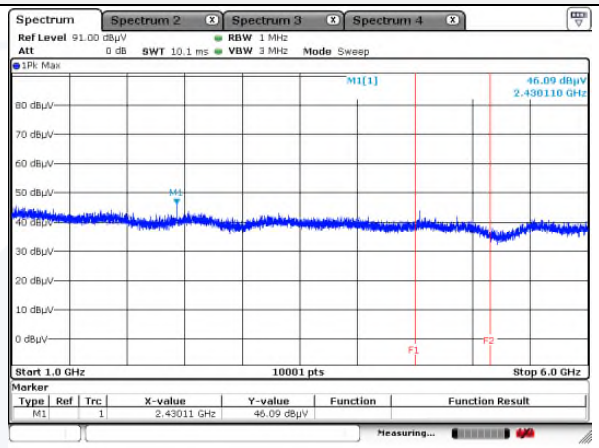
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 046.25	46.02	Peak	H	-9.11	-	36.91	74.00	37.09
2 430.11	46.09	Peak	V	-0.30	-	45.79	68.20	22.41

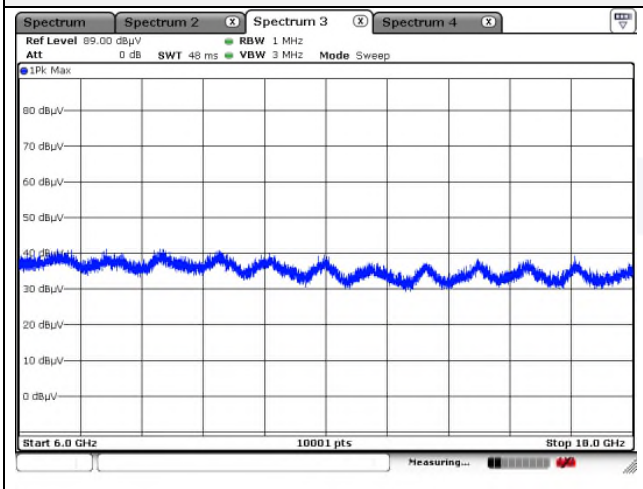
Horizontal // Peak for 1 ㎓ to 6 ㎓



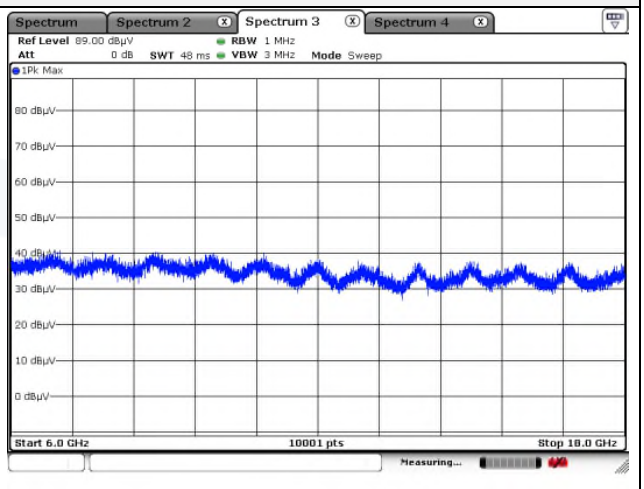
Vertical // Peak for 1 ㎓ to 6 ㎓



Horizontal // Peak for 6 ㎓ to 18 ㎓



Vertical // Peak for 6 ㎓ to 18 ㎓



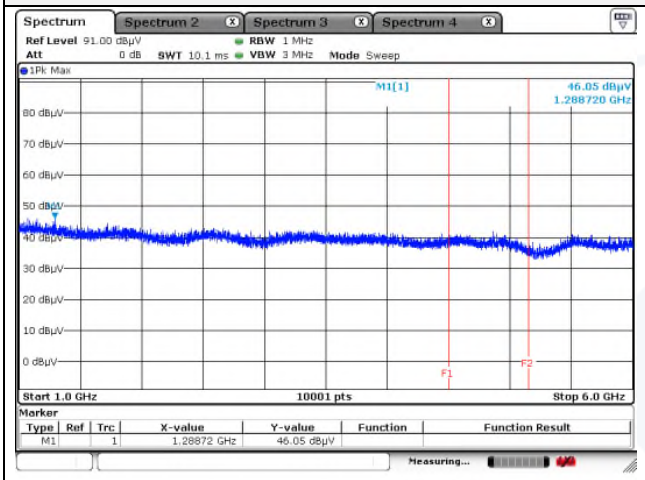
Note.
1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode:	802.11a_DC 12 V
Distance of measurement:	3 meter
Channel:	48

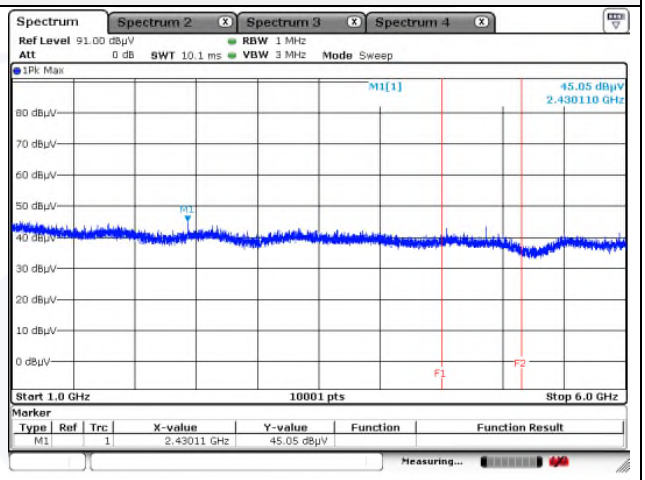
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 288.72	46.05	Peak	H	-7.59	-	38.46	74.00	35.54
2 430.11	45.05	Peak	V	-0.30	-	44.75	68.20	23.45

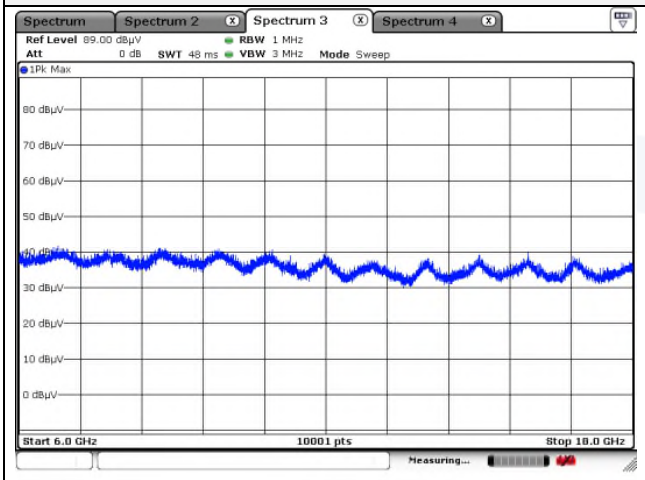
Horizontal // Peak for 1 ㎓ to 6 ㎓



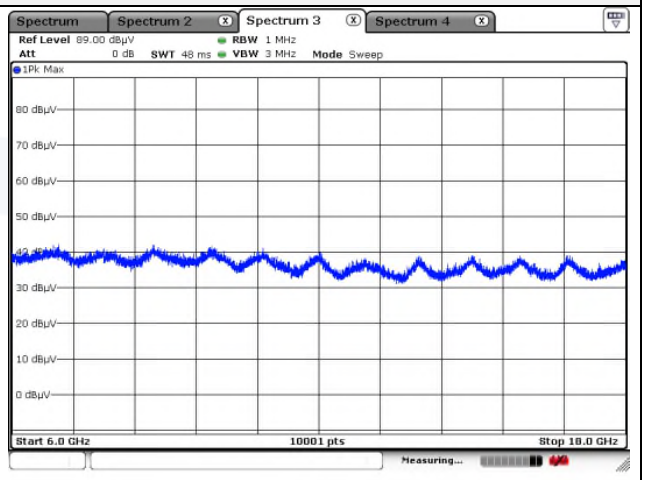
Vertical // Peak for 1 ㎓ to 6 ㎓



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.

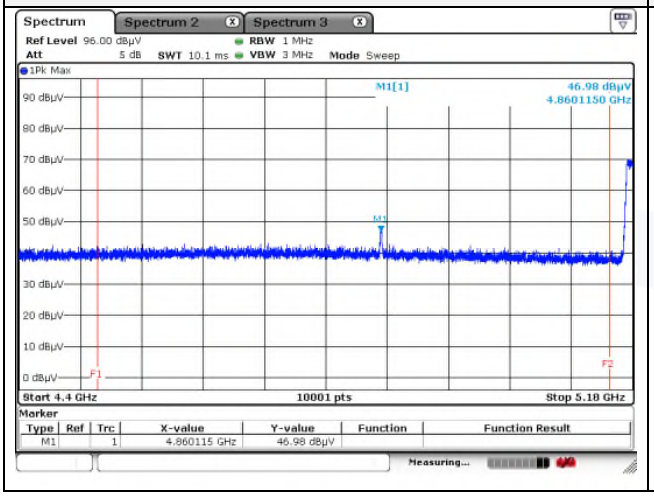
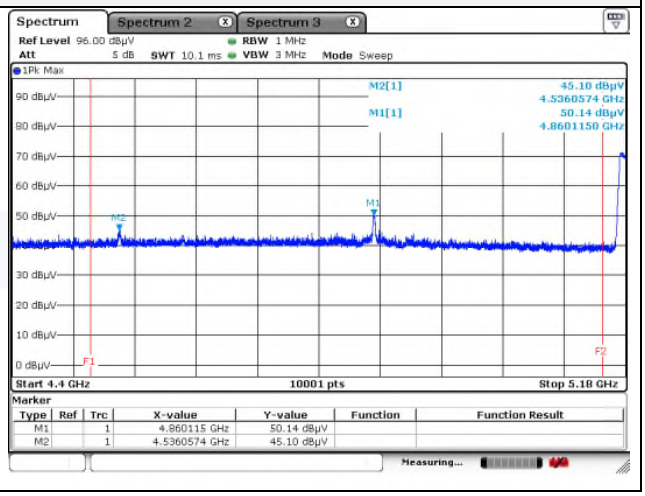
Mode:	802.11a_DC 24 V
Distance of measurement:	3 meter
Channel:	36

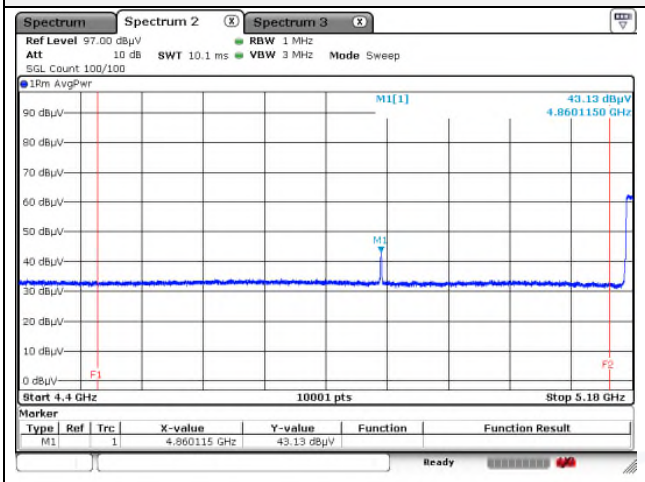
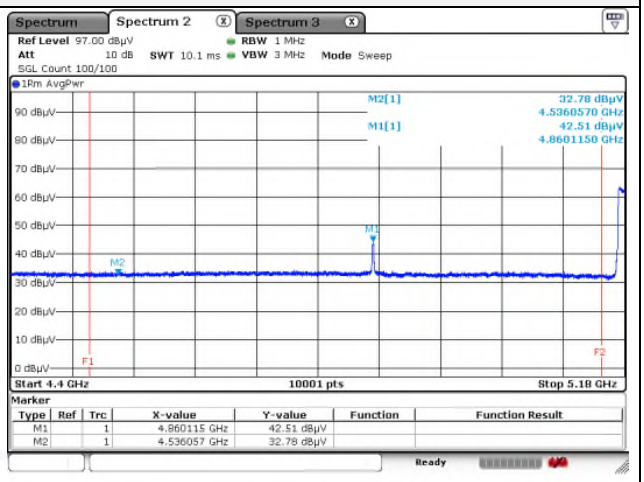
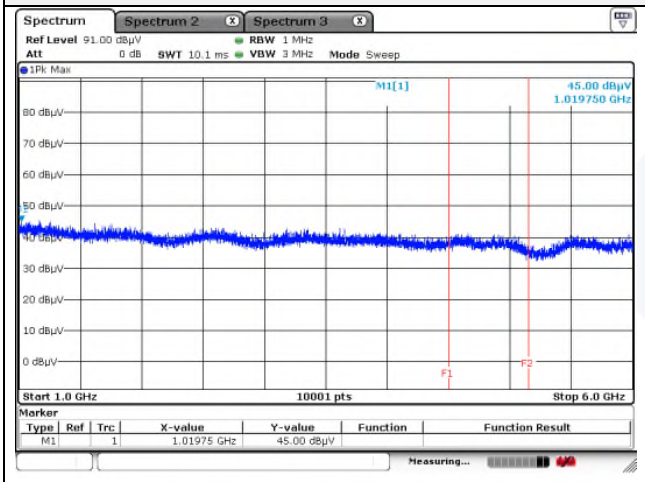
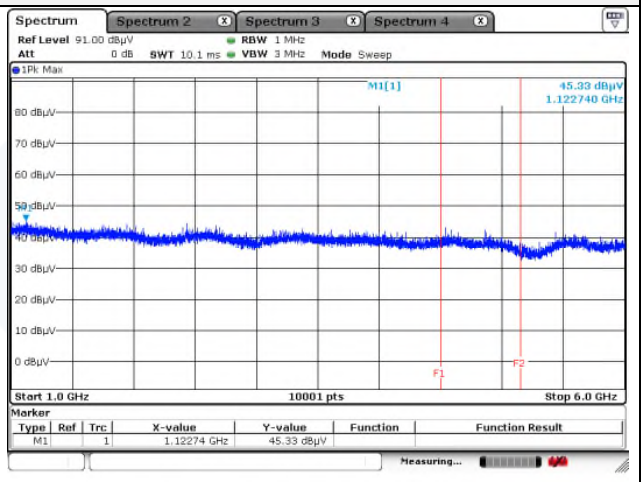
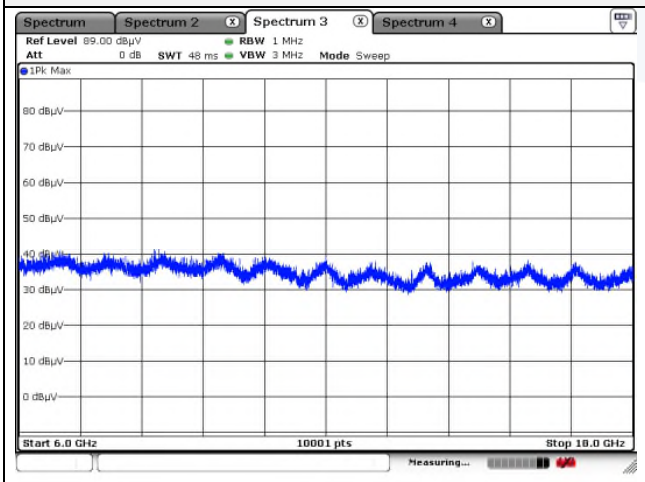
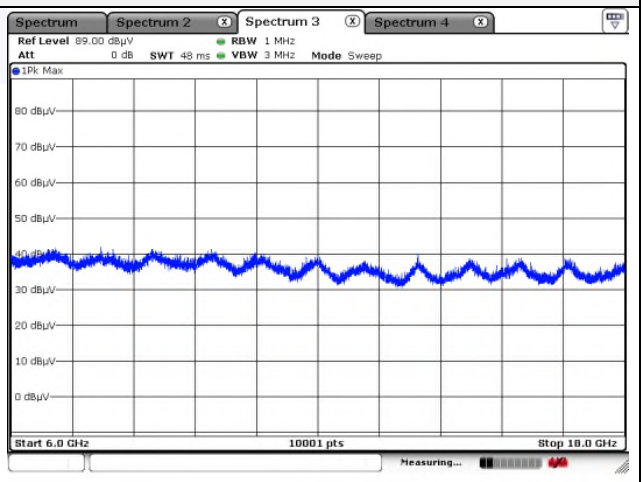
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 019.75	45.00	Peak	H	-9.28	-	35.72	74.00	38.28
1 122.74	45.33	Peak	V	-8.63	-	36.70	74.00	37.30

- **Band edge**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
4 536.06	45.10	Peak	V	4.70	-	49.80	74.00	24.20
4 536.06	32.78	Average	V	4.70	0.22	37.70	54.00	16.30
4 860.12	46.98	Peak	H	6.72	-	53.70	74.00	20.30
4 860.12	43.13	Average	H	6.72	0.22	50.07	54.00	3.93
4 860.12	50.14	Peak	V	6.72	-	56.86	74.00	17.14
4 860.12	42.51	Average	V	6.72	0.22	49.45	54.00	4.55

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.

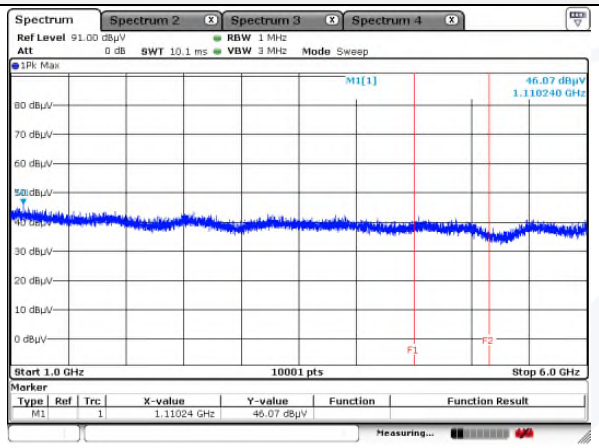
1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode:	802.11a_DC 24 V
Distance of measurement:	3 meter
Channel:	44

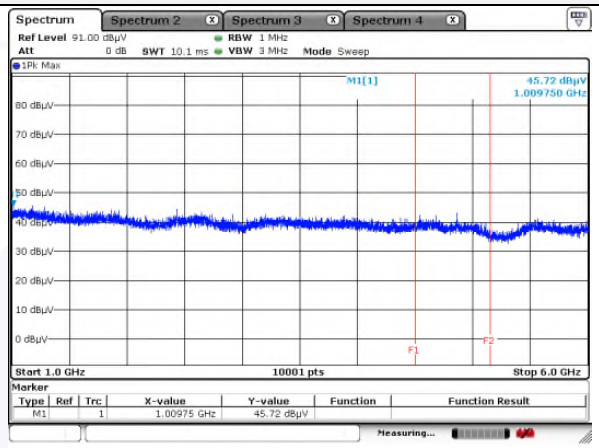
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 009.75	45.72	Peak	V	-9.34	-	36.38	74.00	37.62
1 110.24	46.07	Peak	H	-8.71	-	37.36	74.00	36.64

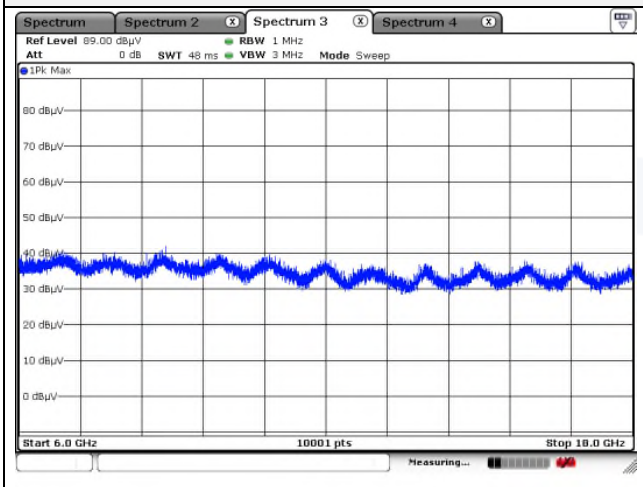
Horizontal // Peak for 1 ㎓ to 6 ㎓



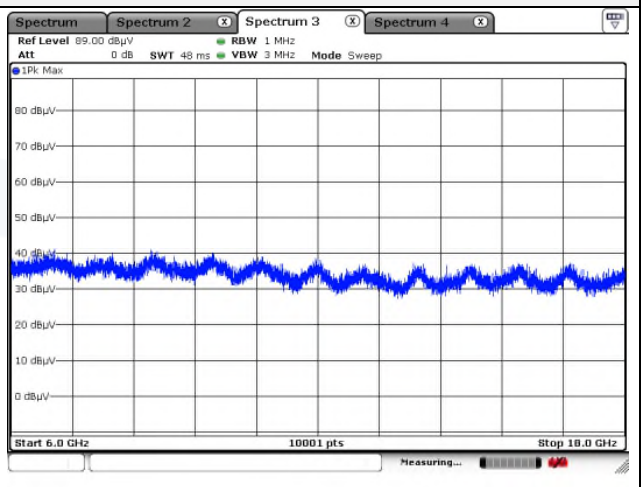
Vertical // Peak for 1 ㎓ to 6 ㎓



Horizontal // Peak for 6 ㎓ to 18 ㎓



Vertical // Peak for 6 ㎓ to 18 ㎓



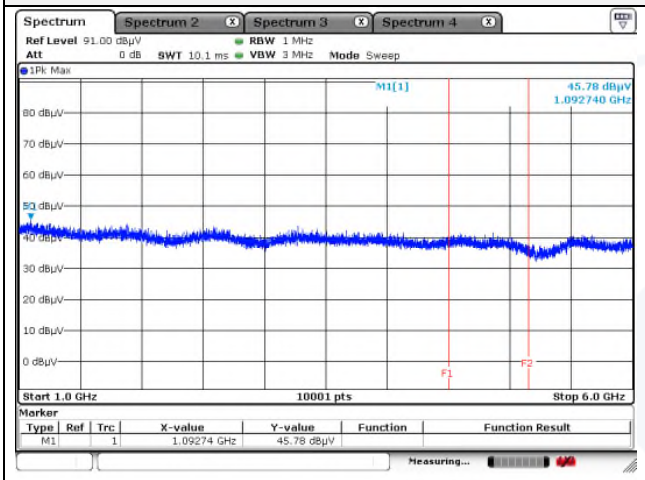
Note.
1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode:	802.11a_DC 24 V
Distance of measurement:	3 meter
Channel:	48

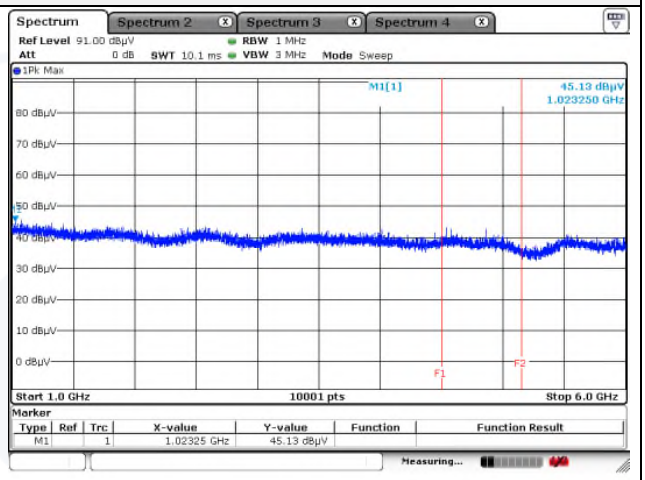
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 023.25	45.13	Peak	V	-9.26	-	35.87	74.00	38.13
1 092.74	45.78	Peak	H	-8.82	-	36.96	74.00	37.04

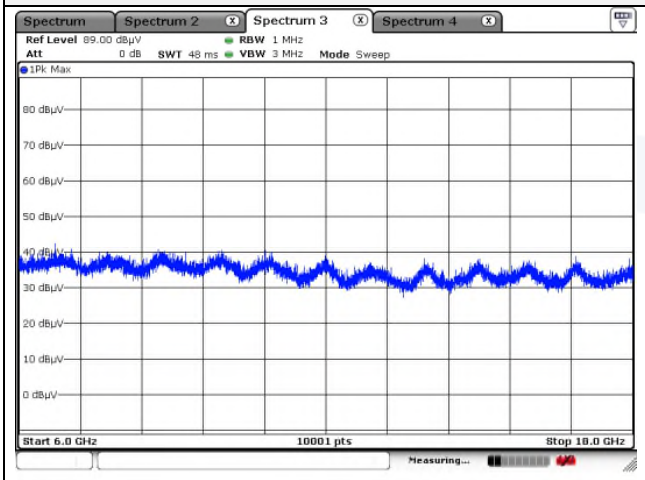
Horizontal // Peak for 1 ㎓ to 6 ㎓



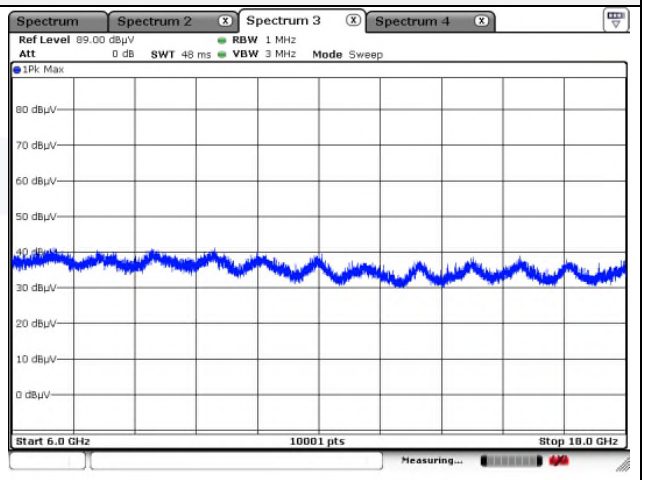
Vertical // Peak for 1 ㎓ to 6 ㎓



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:	802.11n_HT20_DC 12 V
Distance of measurement:	3 meter
Channel:	36

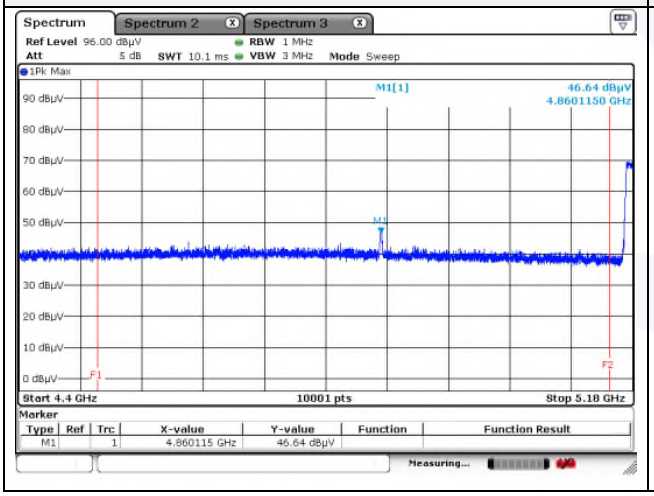
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 041.25	45.96	Peak	V	-9.14	-	36.82	74.00	37.18
1 993.15	45.62	Peak	H	-1.35	-	44.27	68.20	23.93

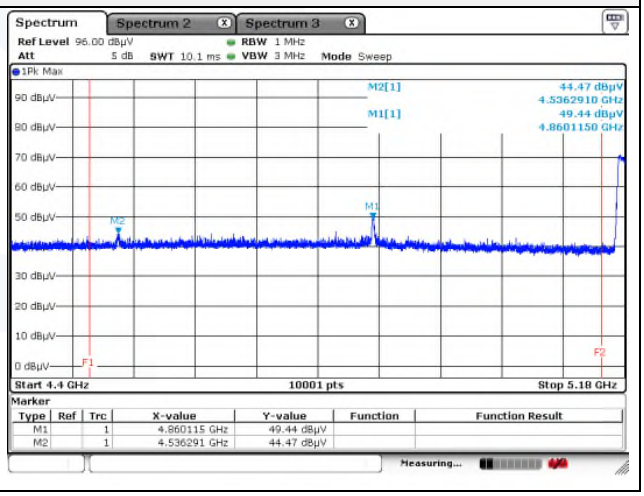
- **Band edge**

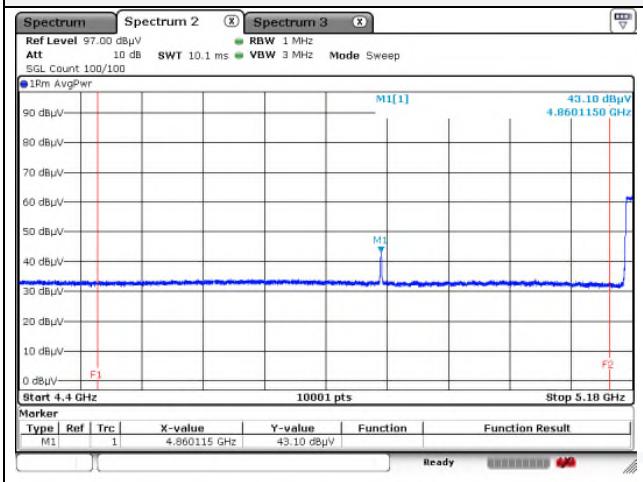
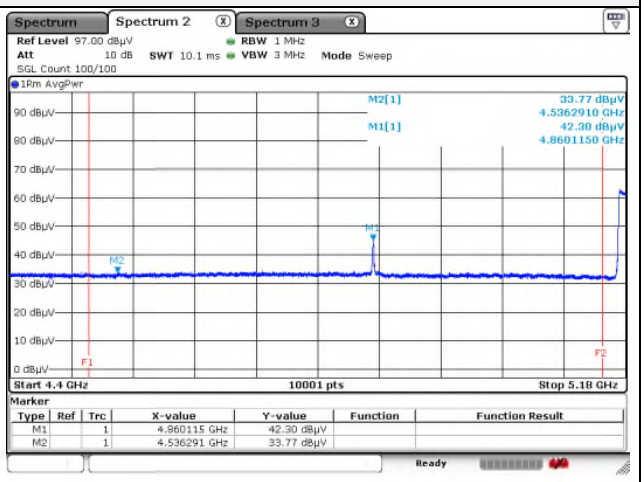
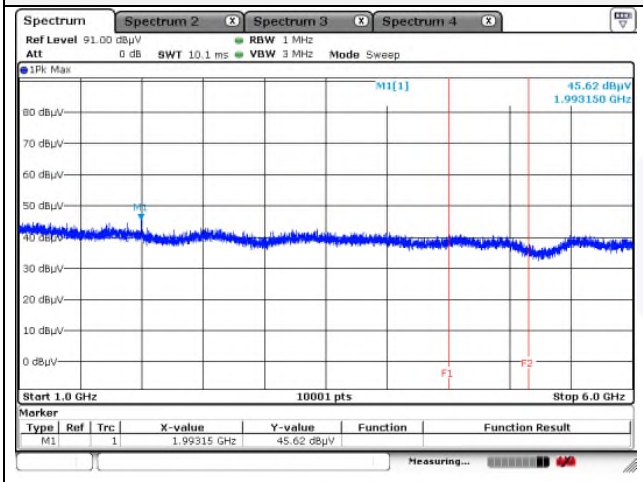
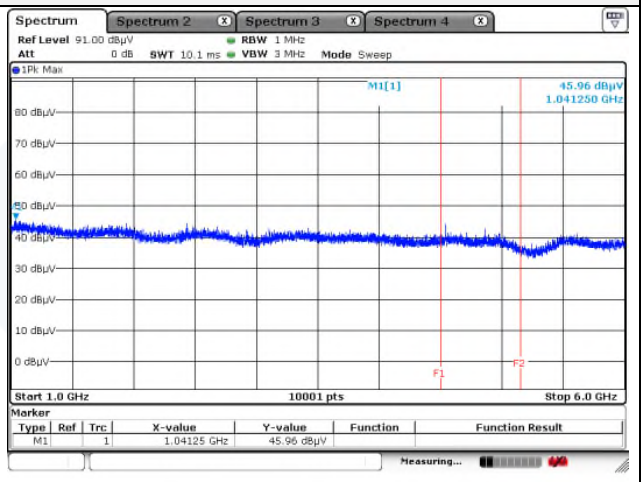
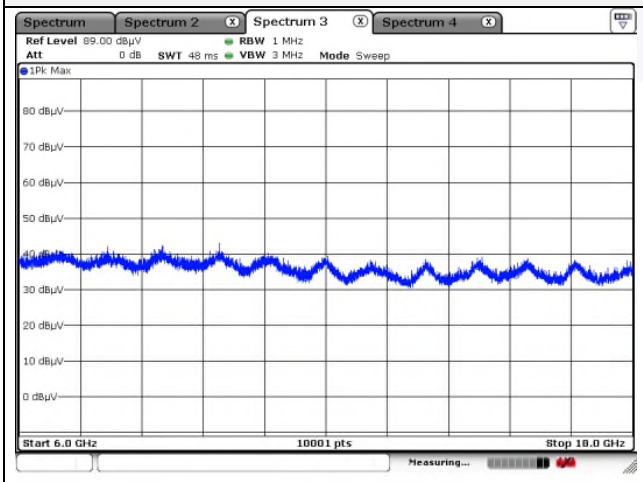
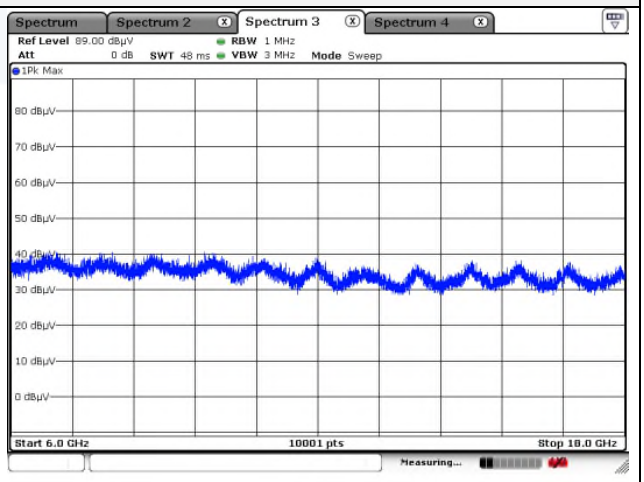
Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
4 536.29	44.47	Peak	V	4.70	-	49.17	74.00	24.83
4 536.29	33.77	Average	V	4.70	0.13	38.60	54.00	15.40
4 860.12	46.64	Peak	H	6.72	-	53.36	74.00	20.64
4 860.12	43.10	Average	H	6.72	0.13	49.95	54.00	4.05
4 860.12	49.44	Peak	V	6.72	-	56.16	74.00	17.84
4 860.12	42.30	Average	V	6.72	0.13	49.15	54.00	4.85

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: 802.11n_HT20_DC 12 V

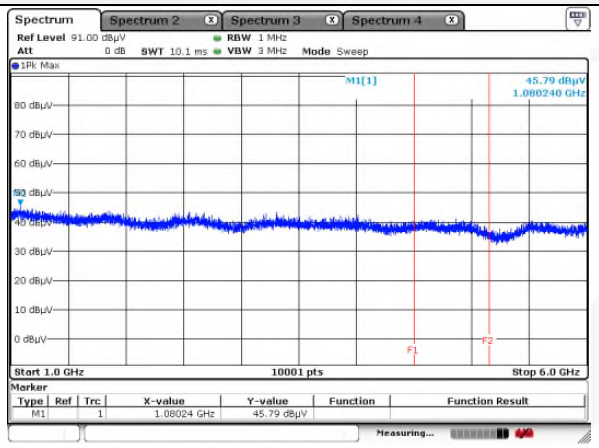
Distance of measurement: 3 meter

Channel: 44

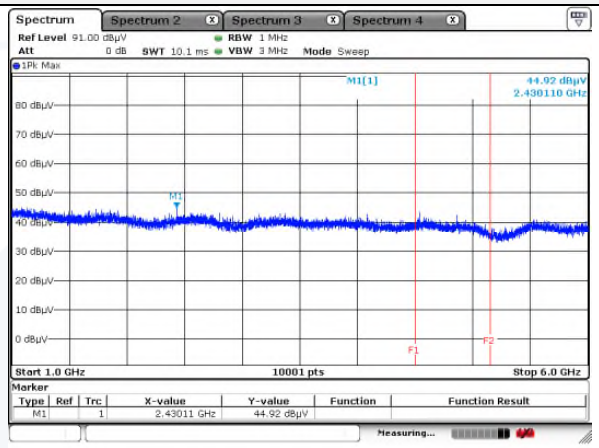
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 080.24	45.79	Peak	H	-8.90	-	36.89	74.00	37.11
2 430.11	44.92	Peak	V	-0.30	-	44.62	68.20	23.58

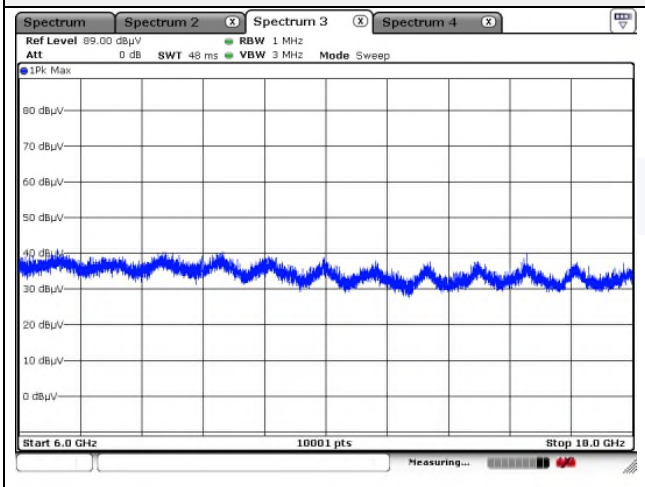
Horizontal // Peak for 1 ㎓ to 6 ㎓



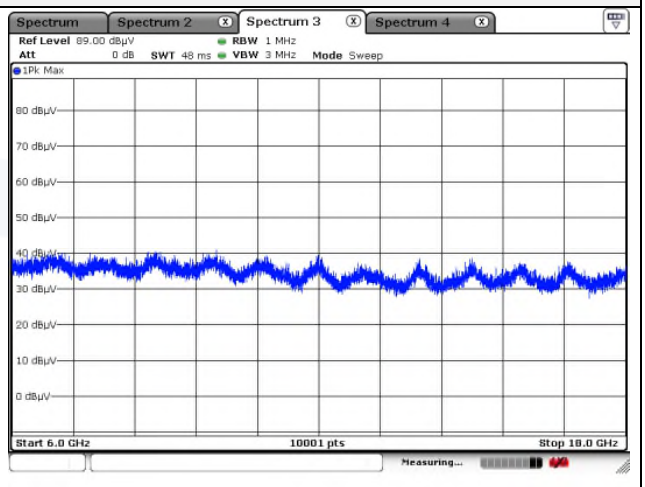
Vertical // Peak for 1 ㎓ to 6 ㎓



Horizontal // Peak for 6 ㎓ to 18 ㎓



Vertical // Peak for 6 ㎓ to 18 ㎓



Note.

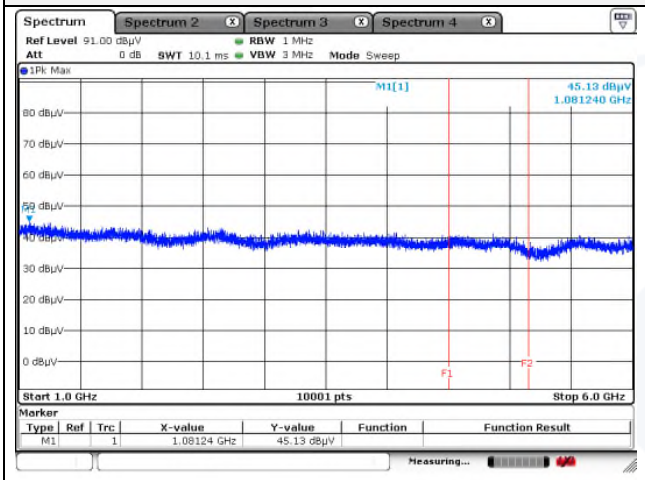
1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode:	802.11n_HT20_DC 12 V
Distance of measurement:	3 meter
Channel:	48

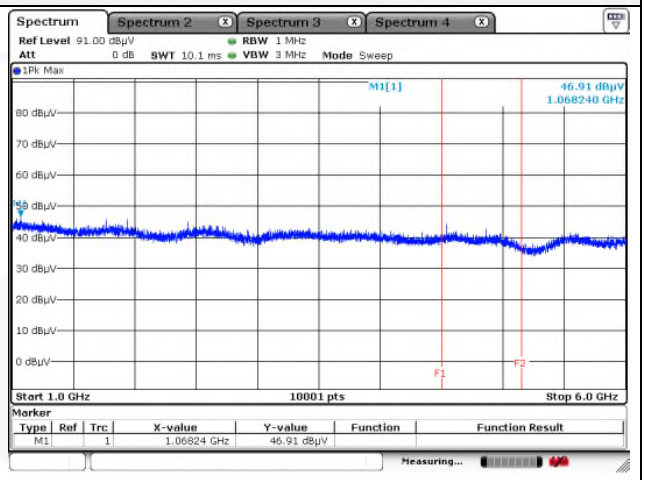
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 068.24	46.91	Peak	V	-8.97	-	37.94	74.00	36.06
1 081.24	45.13	Peak	H	-8.89	-	36.24	74.00	37.76

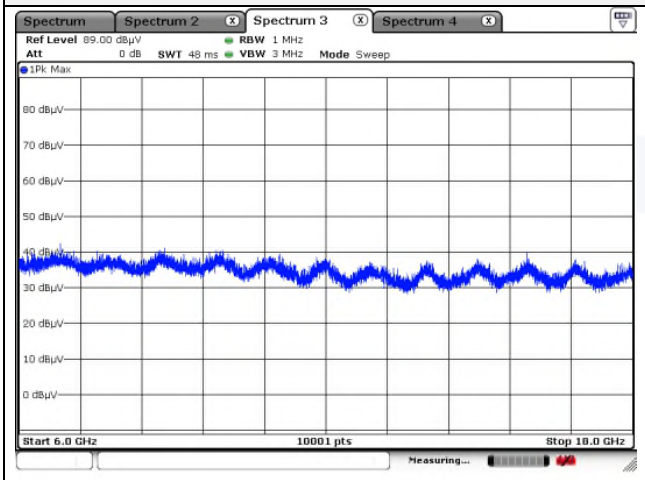
Horizontal // Peak for 1 ㎓ to 6 ㎓



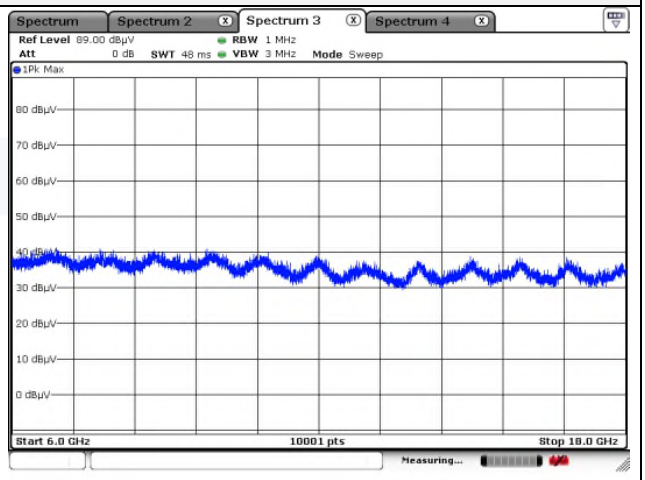
Vertical // Peak for 1 ㎓ to 6 ㎓



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:	802.11n_HT20_DC 24 V
Distance of measurement:	3 meter
Channel:	36

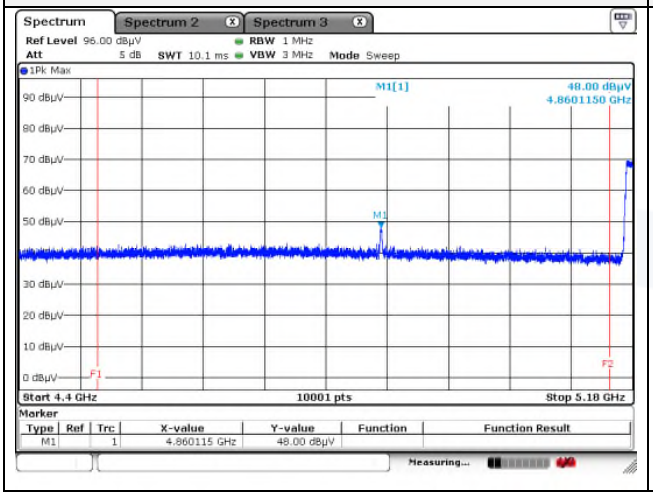
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 056.24	45.41	Peak	H	-9.05	-	36.36	74.00	37.64
1 331.72	45.11	Peak	V	-7.32	-	37.79	74.00	36.21

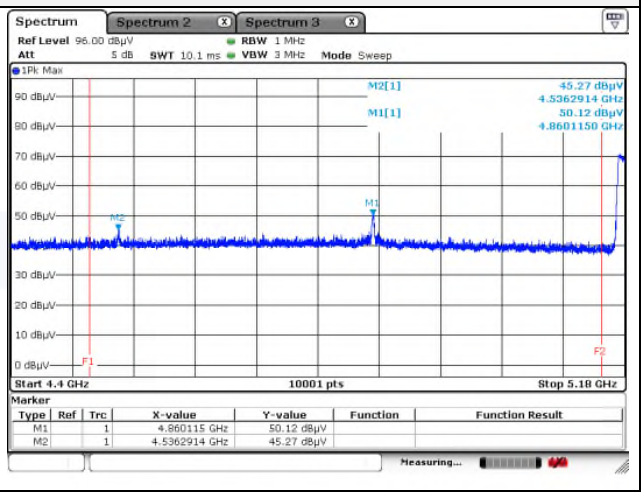
- **Band edge**

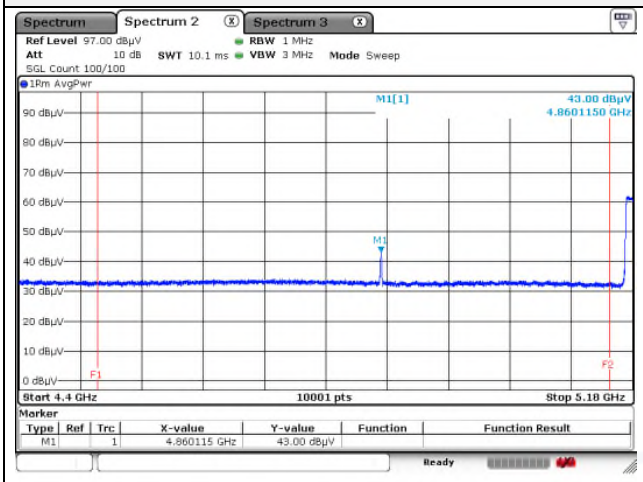
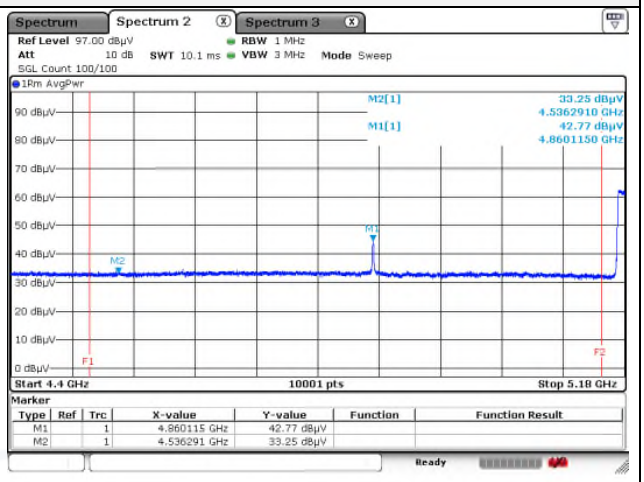
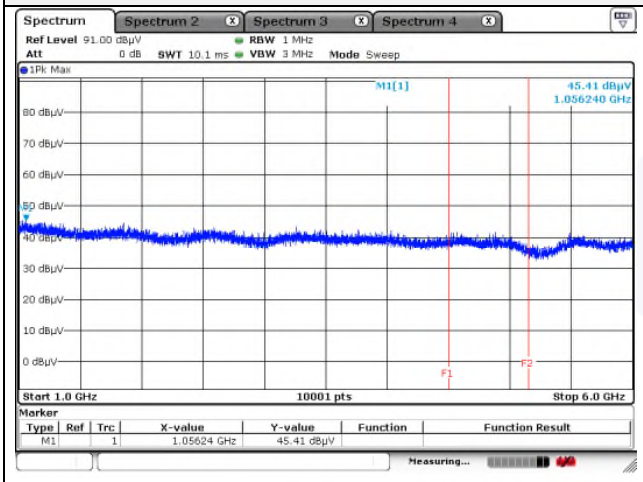
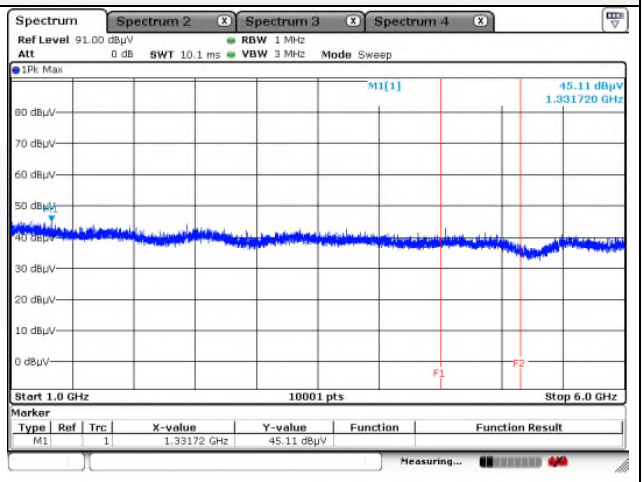
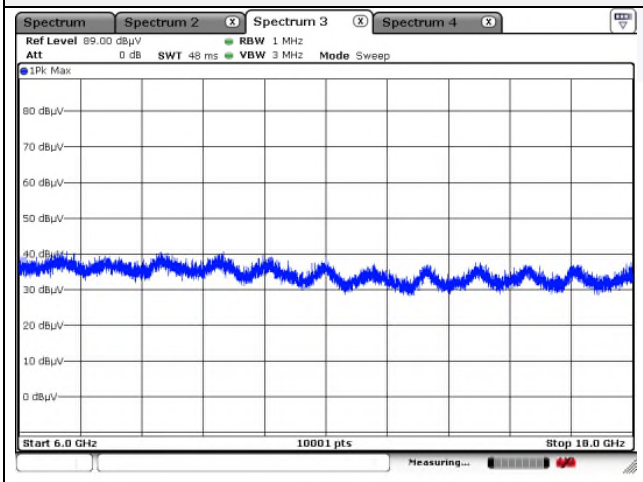
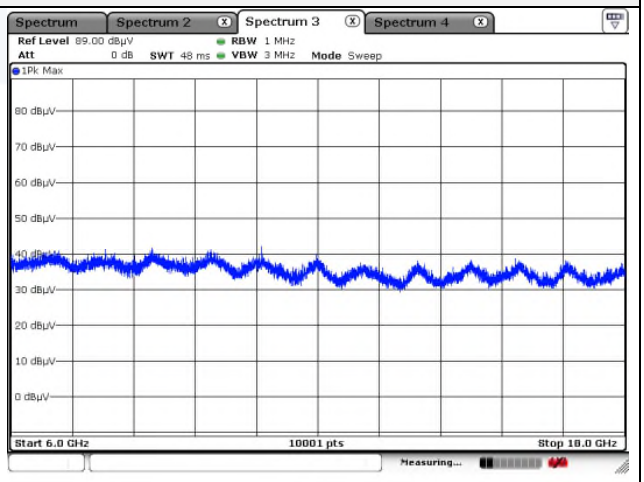
Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
4 536.29	45.27	Peak	V	4.70	-	49.97	74.00	24.03
4 536.29	33.25	Average	V	4.70	0.13	38.08	54.00	15.92
4 860.12	48.00	Peak	H	6.72	-	54.72	74.00	19.28
4 860.12	43.00	Average	H	6.72	0.13	49.85	54.00	4.15
4 860.12	50.12	Peak	V	6.72	-	56.84	74.00	17.16
4 860.12	42.77	Average	V	6.72	0.13	49.62	54.00	4.38

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.

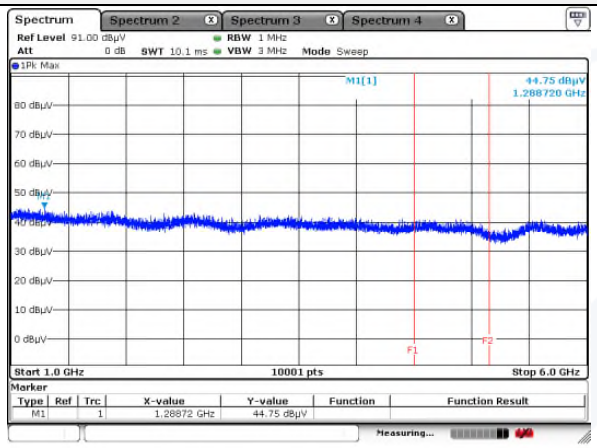
1. No spurious emission were detected above 6 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode:	802.11n_HT20_DC 24 V
Distance of measurement:	3 meter
Channel:	44

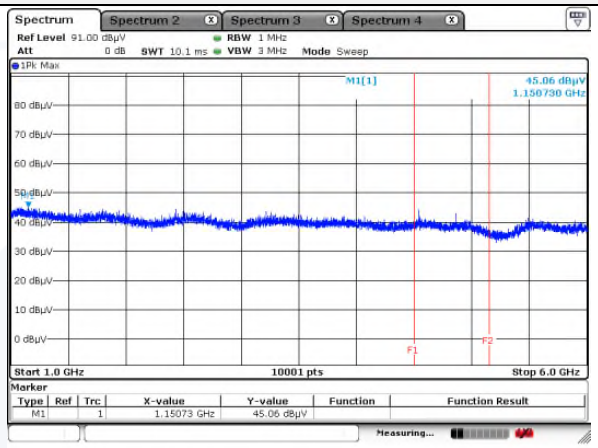
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1 150.73	45.06	Peak	V	-8.45	-	36.61	74.00	37.39
1 288.72	44.75	Peak	H	-7.59	-	37.16	68.20	31.04

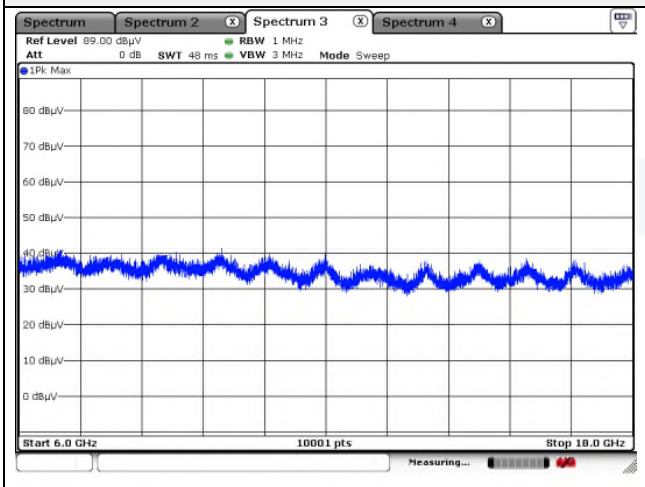
Horizontal // Peak for 1 ㎓ to 6 ㎓



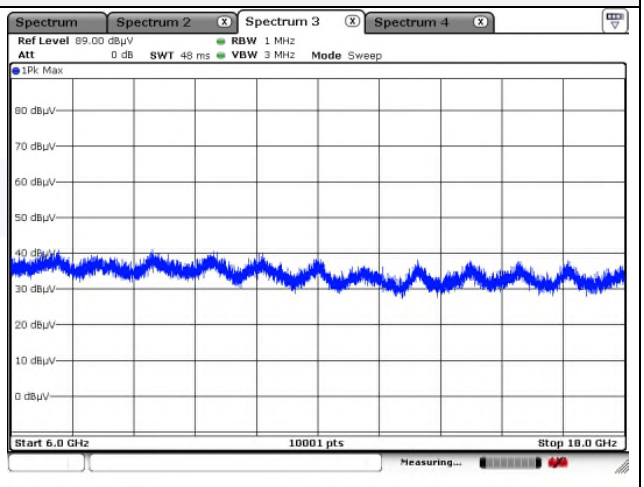
Vertical // Peak for 1 ㎓ to 6 ㎓



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.