



TEST REPORT



Report No. : KES-RF250616-R1

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KES Co., Ltd.

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■ FCC TEST REPORT

1. Client

- Name : THINKWARE CORPORATION
- Address : A, 9FL., Samwhan Hipex, 240, Pangyo-yeok-ro, Bundang-gu, Seongnam-si,
Gyeonggi-do, South Korea

2. Sample Description

- Product item : CAR DASH CAM
- Model name : U3000 PRO
- Manufacturer etc. : THINKWARE CORPORATION

3. Date of test : 2025.08.24 ~ 2025.09.05

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 : Gu-Bong, Kang (Signature)	Name : Young-Jin, Lee (Signature)

2025. 09. 19.

KES Co., Ltd.

Accredited by KOLAS, Republic of KOREA



REPORT REVISION HISTORY

Date	Test Report No.	Revision History
2025.09.11	KES-RF250616	Initial
2025.09.19	KES-RF250616-R1	Added module's FCC ID at page 4

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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, Pangyo-yeok-ro, Bundang-gu, Seongnam-si, Gyeonggi-do, South Korea
Test site: KES Co., Ltd.
Test site address: #3002, #3503, #3701, 40, Simin-daero 365beon-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: 2ADTG-U3000PRO
Module's FCC ID: 2AATL-8223A-SR
Test device serial No.: Production Pre-production Engineering

1.1. EUT description

Equipment under test	CAR DASH CAM	
Frequency range & Number of channels	2 402 MHz ~ 2 480 MHz (LE 1 Mbps) : 40 ch 2 412 MHz ~ 2 462 MHz (802.11b/g/n_HT20) : 11 ch UNII-1 5 180 MHz ~ 5 240 MHz (802.11a/n_HT20) : 4 ch for FCC 5 190 MHz ~ 5 230 MHz (802.11n_HT40) : 2 ch UNII-3 5 745 MHz ~ 5 825 MHz (802.11a/n_HT20) : 5 ch for IC 5 755 MHz ~ 5 795 MHz (802.11n_HT40) : 2 ch Radar 59 500 ~ 62 400 MHz : 1 ch	
Model	U3000 PRO	
Modulation technique	GFSK, DSSS, OFDM	
Antenna specification	2.4 GHz band	Chip Antenna // Peak gain: 1.47 dBi
	UNII-1	Chip Antenna // Peak gain: 2.54 dBi
	UNII-3	Chip Antenna // Peak gain: 3.36 dBi
	Radar	Integrated patch Antenna // Peak gain : 4.0 dBi
Power source	DC 12 V, 24 V	
H/W version	V4.0	
S/W version	V1.0	
Serial Number	VHWDAFND011051A	



1.2. Test configuration

The **THINKWARE CORPORATION // CAR DASH CAM // U3000 PRO // FCC ID: 2ADTG-U3000PRO // IC number : 12594A-U3000PRO** 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
Main unit (Front camera)	THINKWARE CORPORATION	-	-	DC 12 V, DC 24 V
Hardwiring cable	-	-	-	-
MicroSD memory card With adapter	-	-	-	-
CPL filter	-	-	-	-
Mount & Tape	-	-	-	-
Adhesive cable holder	-	-	-	-
Heat blocking film	-	-	-	-
Warranty & QSG	-	-	-	-

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.

$$\begin{aligned}\text{Offset(dB)} &= \text{RF cable loss(dB)} + \text{attenuator factor(dB)} \\ &= 1.32 + 20 = 21.32 \text{ (dB)}\end{aligned}$$

For Radiation test :

Field strength level (dB μ V/m) = Measured level (dB μ V) + Antenna factor (dB) + Cable loss (dB) - Amplifier gain (dB)

1.7. Worst case data rate

1. Worst-case data rates were:

802.11a : 6 Mbps

802.11n_HT20/40 : MCS0



1.8. Measurement Uncertainty

Test Item	Uncertainty	
Uncertainty for Conduction emission test		2.22 dB (SHIELD ROOM #6)
Uncertainty for Radiation emission test (include Fundamental emission)	Below 1 GHz	4.04 dB (SAC #6)
	Above 1 GHz	5.32 dB (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 (MHz)	Rate(Mbps)
00	2 402	LE 1 Mbps
..
20	2 442	LE 1 Mbps
..
39	2 480	LE 1 Mbps

Ch.	Frequency (MHz)	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 (MHz)	Mode
36	5 180	802.11a/an_HT20
..
44	5 220	802.11a/an_HT20
..
48	5 240	802.11a/an_HT20

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



2. Summary of tests

Section in FCC Part 15	Parameter	Test results
15.407(a)	26 dB bandwidth & 99 % bandwidth	N/T ^{Note.1}
15.407(a)	6 dB bandwidth	N/T ^{Note.1}
15.407(a)	Maximum conducted output power	Pass
15.407(a)	Power spectral density	N/T ^{Note.1}
15.407(g)	Frequency stability	N/T ^{Note.1}
15.205, 15.209, 15.407(b)	Radiated restricted band and emission	Pass
15.207(a)	AC power line conducted emissions	N/T ^{Note.2}
15.203	Antenna Requirement	Pass

*N/T: Not Tested

Note.

1. This product is equipped with an approved module, please refer to Module Report below for details.
Report No. TCT171018E032
2. This device is powered by DC 12 V or DC 24 V.
3. By the request of applicant, test is performed with power setting value below :

Mode	UNII-1	
	Frequency (MHz)	Setting value
802.11a (6 Mbps)	5 180 ~ 5 240	20
802.11n_HT20 (MCS0)		20
802.11n_HT40 (MCS0)	5 190 ~ 5 230	18



3. Test results

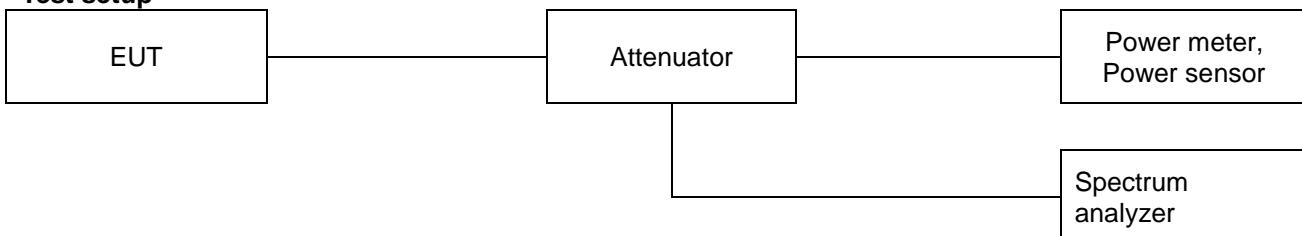
3.1. Maximum conducted output power

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**

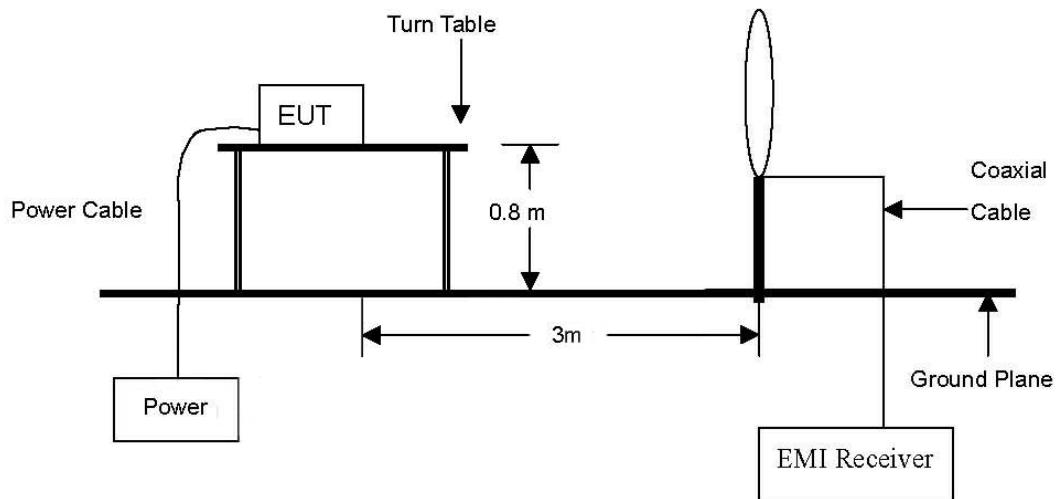
Mode	Frequency (MHz)	Detector mode	Ant Gain (dBi)	Output power (dBm)	FCC Limit (dBm)
802.11a DC 12 V	5 180	AV	2.54	11.70	30
	5 220			10.71	
	5 240			10.55	
802.11a DC 24 V	5 180			11.65	
	5 220			10.68	
	5 240			10.48	
802.11n_HT20 DC 12 V	5 180			11.35	
	5 220			10.74	
	5 240			10.54	
802.11n_HT20 DC 24 V	5 180			11.28	
	5 220			10.77	
	5 240			10.50	
802.11n_HT40 DC 12 V	5 190			8.39	
	5 230			7.52	
802.11n_HT40 DC 24 V	5 190			8.47	
	5 230			7.43	



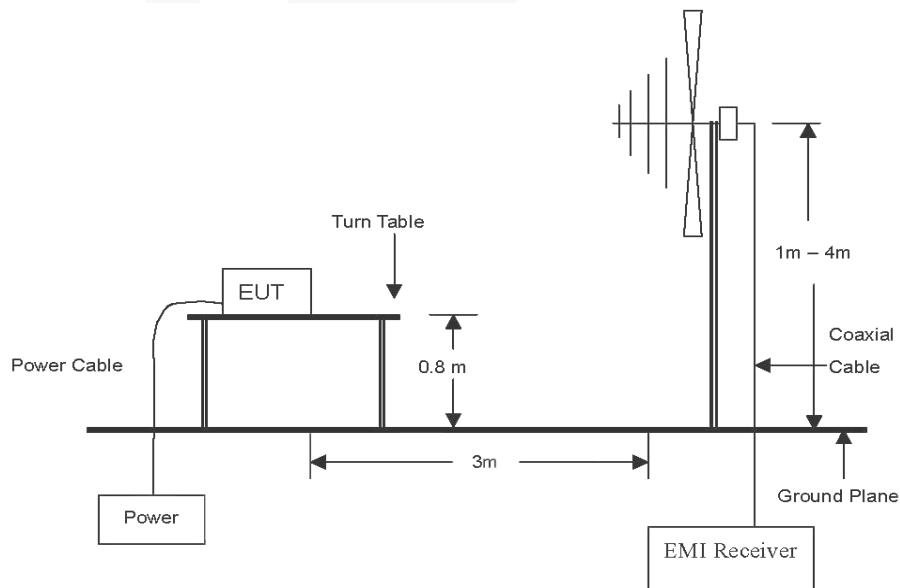
3.2. Radiated restricted band and emissions

Test setup

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

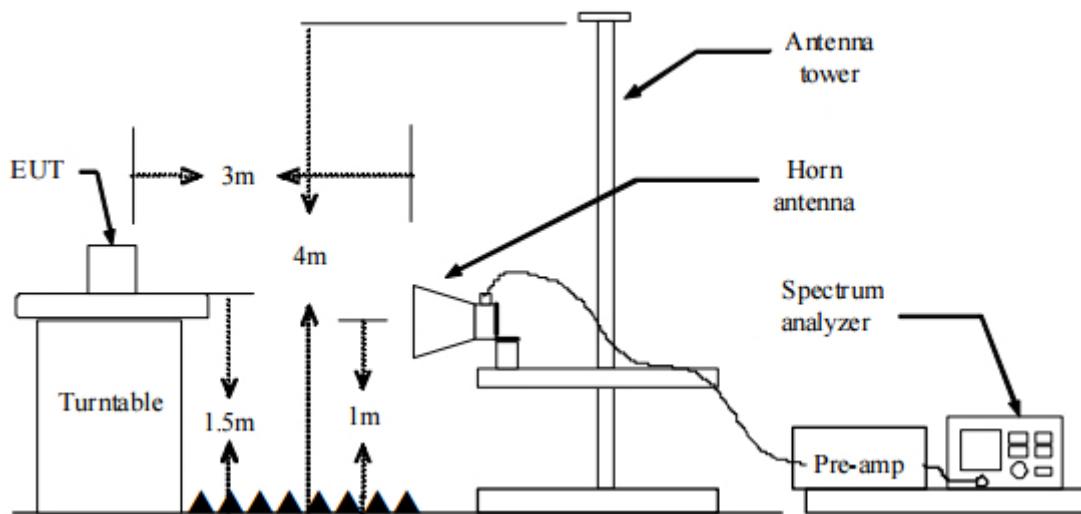


The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.





The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz 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 (FCC) & ANSI C63.10-2020 + Cor. 1-2023+C63.10a-2024 + Errata to C63.10a-2024 (IC).

Test procedure below 30 MHz

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 MHz

1. The EUT was placed on the top of a rotating table 0.8 meters above the ground for 30 MHz-1 GHz and 1.5 meters for above 1 GHz 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 $f < 1$ GHz:
 - ① Span = wide enough to fully capture the emission being measured
 - ② RBW = 120 kHz
 - ③ VBW \geq RBW
 - ④ Detector = quasi peak
 - ⑤ Sweep time = auto
 - ⑥ Trace = max hold

6. Spectrum analyzer settings for $f \geq 1 \text{ GHz}$: Peak

- ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- ② RBW = 1 MHz
- ③ VBW $\geq 3 \text{ MHz}$
- ④ Detector = peak
- ⑤ Sweep time = auto
- ⑥ Trace = max hold
- ⑦ Trace was allowed to stabilize

7. Spectrum analyzer settings for $f \geq 1 \text{ GHz}$: Average

- ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- ② RBW = 1 MHz
- ③ VBW $\geq 3 \times \text{RBW}$
- ④ Detector = RMS, if span/(# of points in sweep) $\leq (\text{RBW}/2)$. 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 dB 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. $f < 30 \text{ MHz}$, extrapolation factor of 40 dB/decade of distance. $F_d = 40 \log(D_m/D_s)$
 $f \geq 30 \text{ MHz}$, extrapolation factor of 20 dB/decade of distance. $F_d = 20 \log(D_m/D_s)$
Where:
 - F_d = Distance factor in dB
 - D_m = Measurement distance in meters
 - D_s = Specification distance in meters
2. Field strength(dB μ N/m) = Level(dB μ N) + CF (dB) + or DCF(dB)
3. Margin(dB) = Limit(dB μ N/m) - Field strength(dB μ N/m)
4. Emissions below 18 GHz were measured at a 3 meter test distance while emissions above 18 GHz 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 dB of respective limits were not reported.
7. According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. 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 (MHz)	Distance (Meters)	Radiated (μ N/m)
0.009 ~ 0.490	300	2400/F(kHz)
0.490 ~ 1.705	30	24000/F(kHz)
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 MHz, 76 ~ 88 MHz, 174 ~ 216 MHz or 470 ~ 806 MHz. 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 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an e.i.r.p of $-27 \text{ dBm}/\text{MHz}$.
- (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 $-27 \text{ dBm}/\text{MHz}$.
- (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 $-27 \text{ dBm}/\text{MHz}$.
- (4) For transmitters operating in the 5.725-5.85 GHz band:
 - i) All emissions shall be limited to a level of $-27 \text{ dBm}/\text{MHz}$ at 75 MHz or more above or below the band edge increasing linearly to $10 \text{ dBm}/\text{MHz}$ 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 $15.6 \text{ dBm}/\text{MHz}$ 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 $27 \text{ dBm}/\text{MHz}$ 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 MHz. 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 MHz.
- (6) Unwanted emissions below 1 GHz 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, B2)b), the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below.

Set RBW \geq 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.

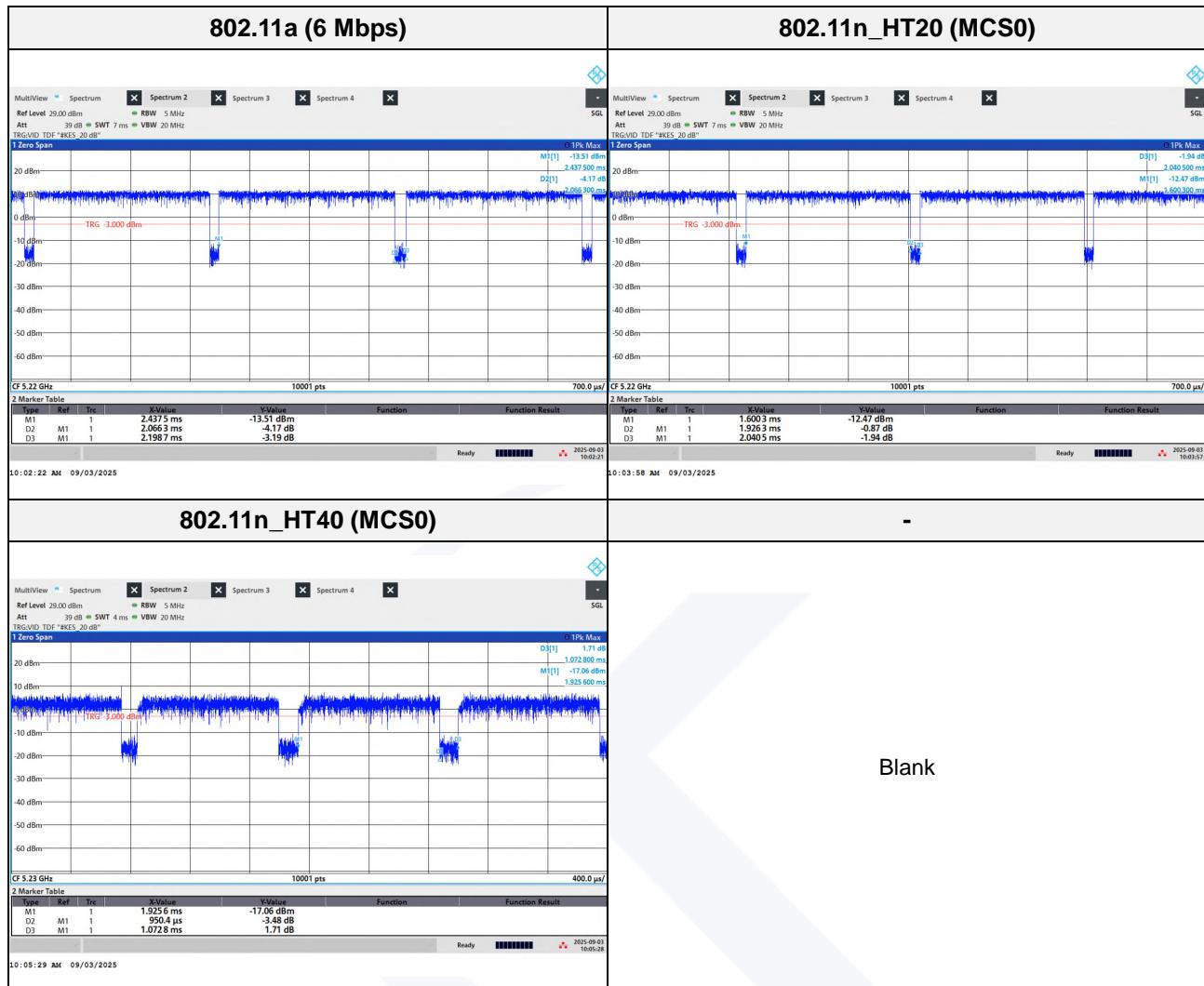
For the band 5.150-5.250 GHz

Test mode	T _{on} time (ms)	Period (ms)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (dB)
802.11a	2.066	2.199	0.94	93.95	0.27
802.11n_HT20	1.926	2.041	0.94	94.37	0.27
802.11n_HT40	0.950	1.073	0.89	88.54	0.51

Note:

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

DCF(Duty cycle correction factor (dB)) = $10\log(1/\text{duty cycle})$



Note.

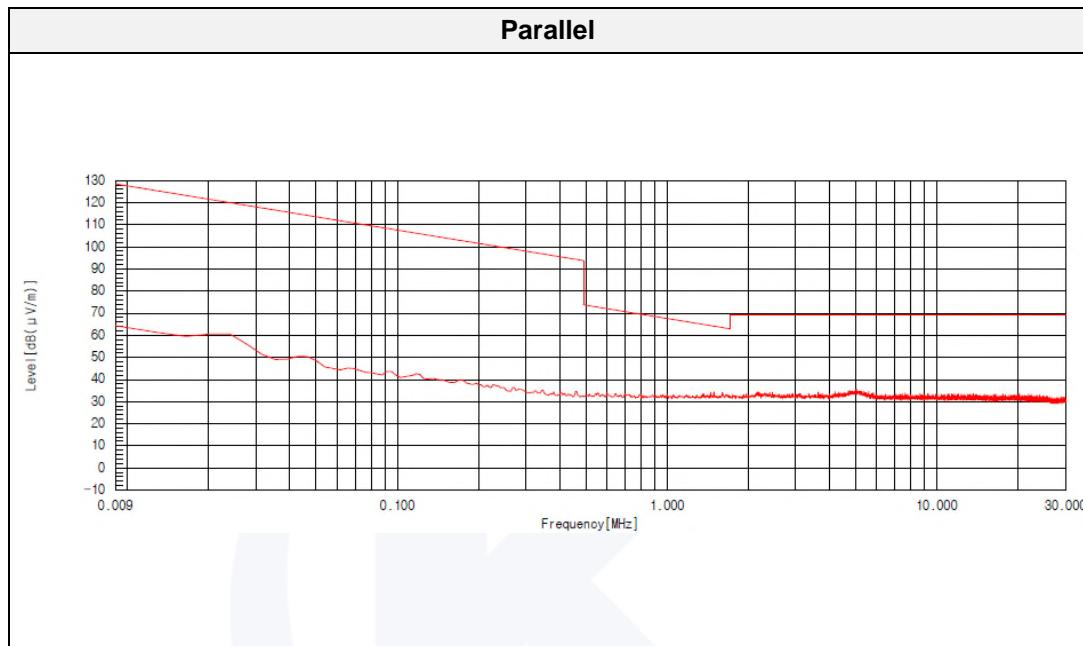
1. Tested with the maximum duty that can be set on the EUT.

**Test results (Below 30 MHz)**

Band 802.11a (Worst Case)_DC 12 V

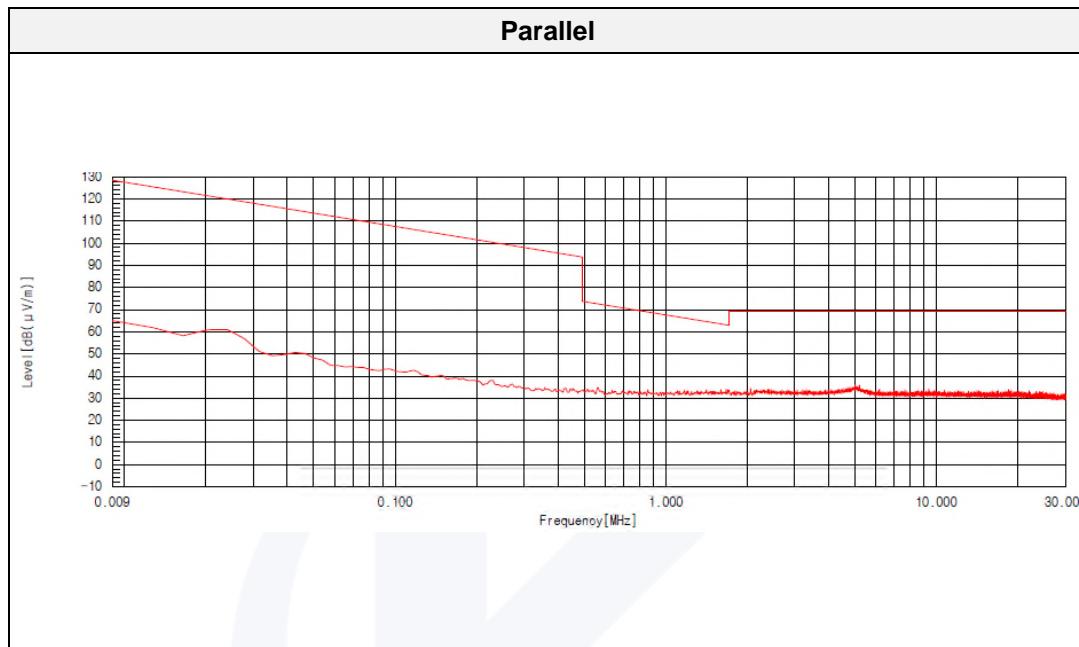
Distance of measurement: 3 meter

Channel 36 (Worst Case)





Band 802.11a (Worst Case)_DC 24 V
Distance of measurement: 3 meter
Channel 36 (Worst Case)



Note.

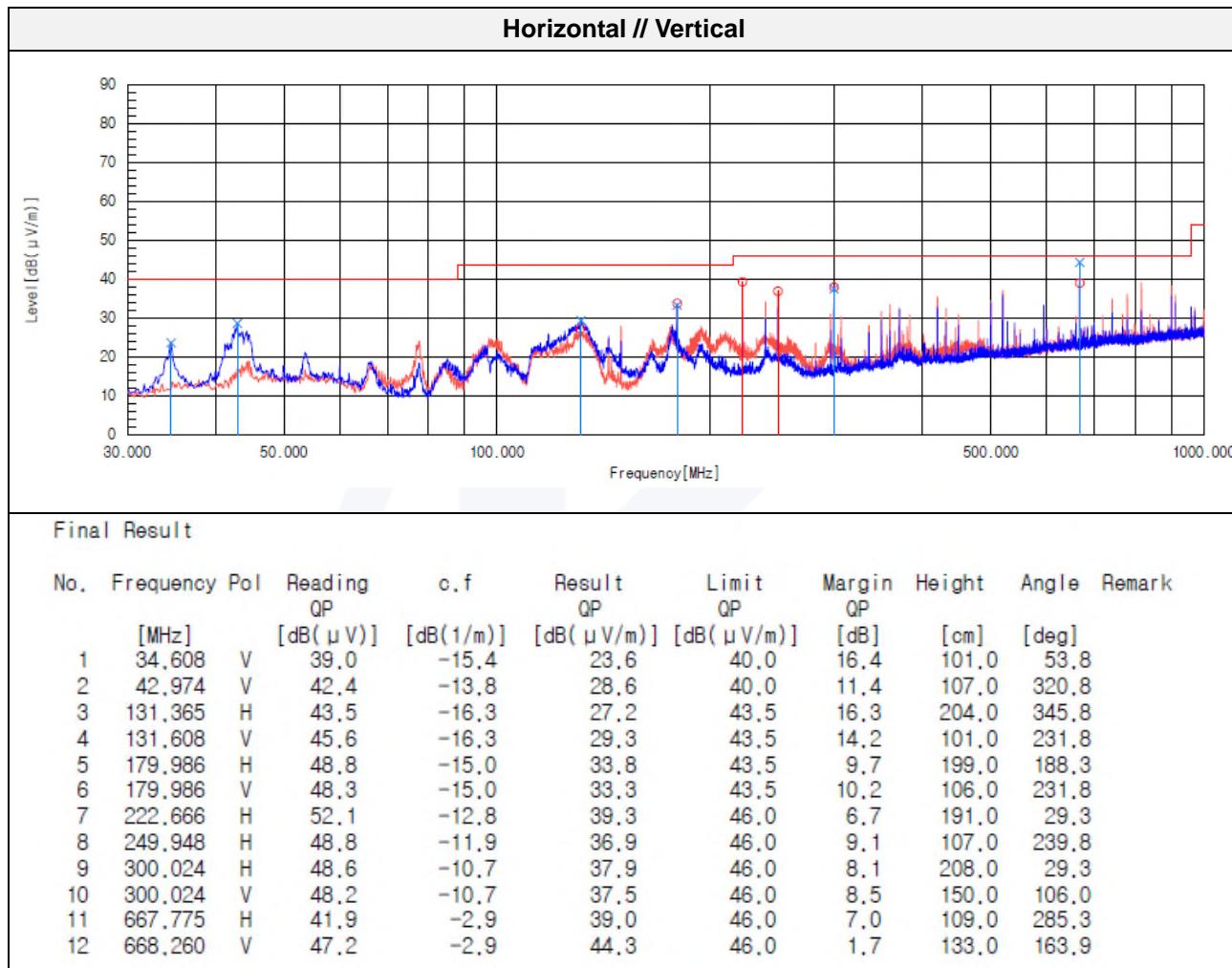
1. No spurious emission were detected under 30 MHz.

**Test results (Below 1 000 MHz)**

Band 802.11a (Worst Case)_DC 12 V

Distance of measurement: 3 meter

Channel 36 (Worst Case)

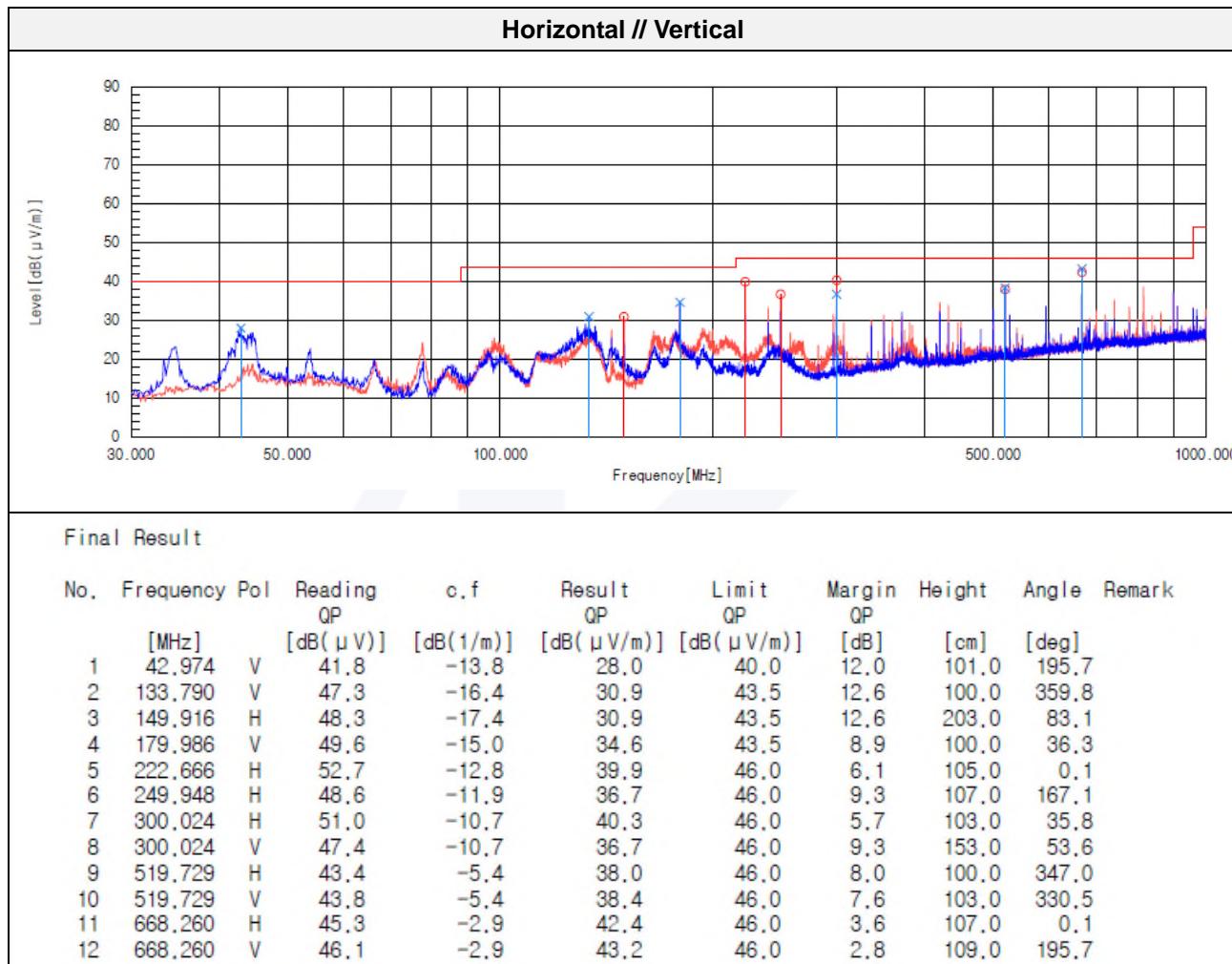




Band 802.11a (Worst Case)_DC 24 V

Distance of measurement: 3 meter

Channel 36 (Worst Case)



**Test results (Above 1 000 MHz)**

Mode: DC 12 V_802.11a (6 Mbps)

Distance of measurement: 3 meter

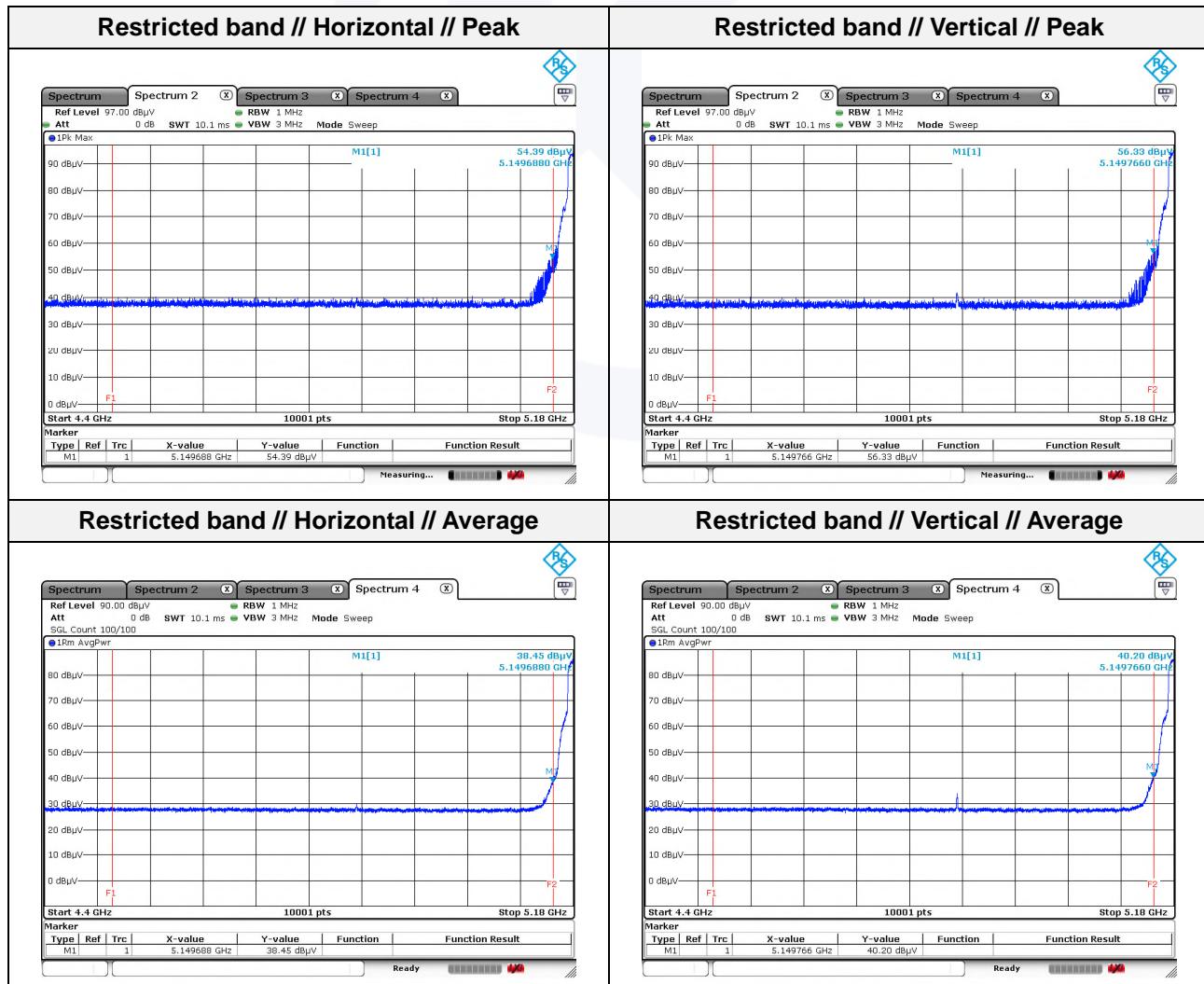
Channel: 36

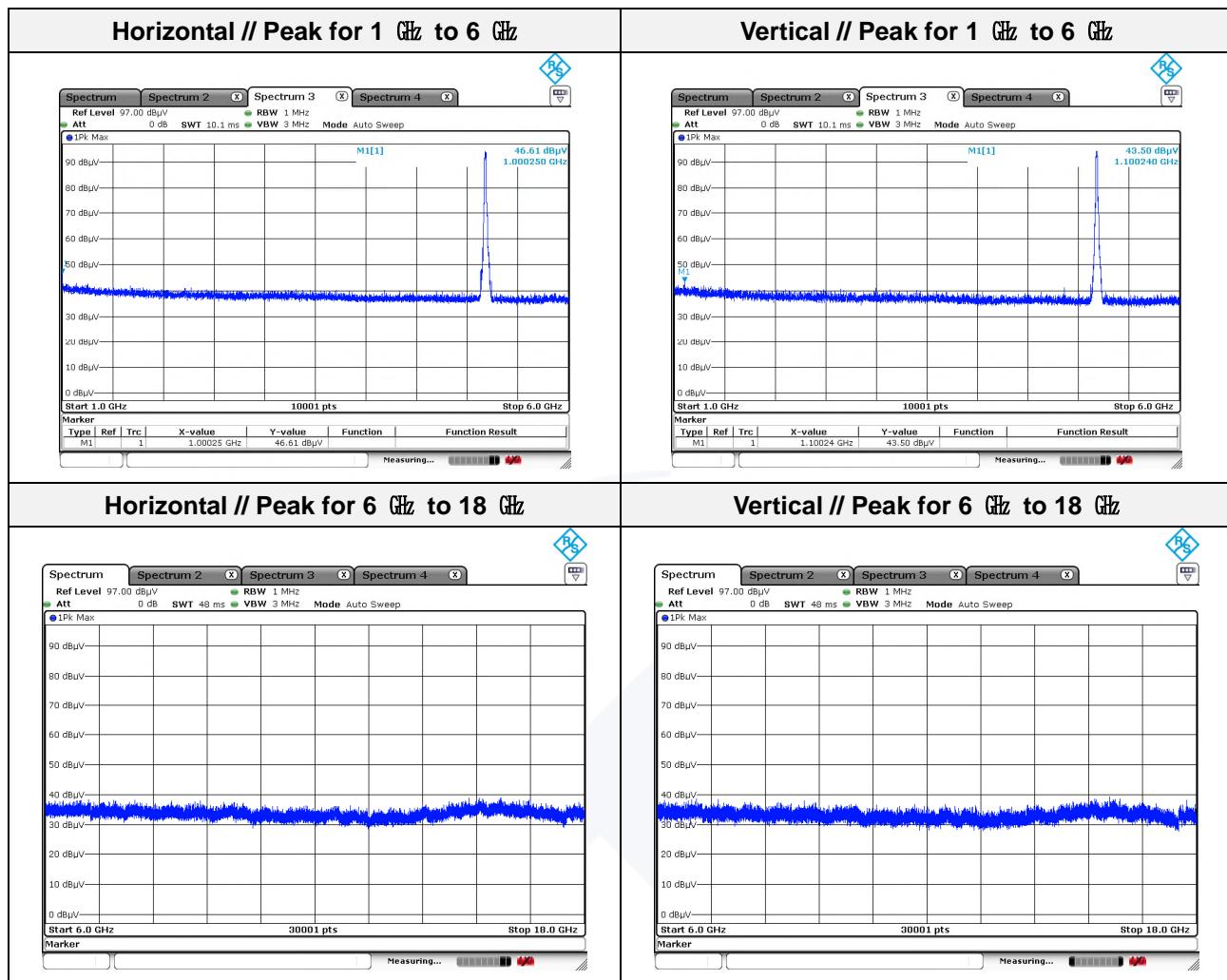
- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 000.25	46.61	Peak	H	-8.14	-	38.47	74.00	35.53
1 100.24	43.50	Peak	V	-7.55	-	35.95	74.00	38.05

- Band edge

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
5 149.69	54.39	Peak	H	7.54	-	61.93	74.00	12.07
5 149.69	38.45	Average	H	7.54	0.27	46.26	54.00	7.74
5 149.77	56.33	Peak	V	7.54	-	63.87	74.00	10.13
5 149.77	40.20	Average	V	7.54	0.27	48.01	54.00	5.99





Note.

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



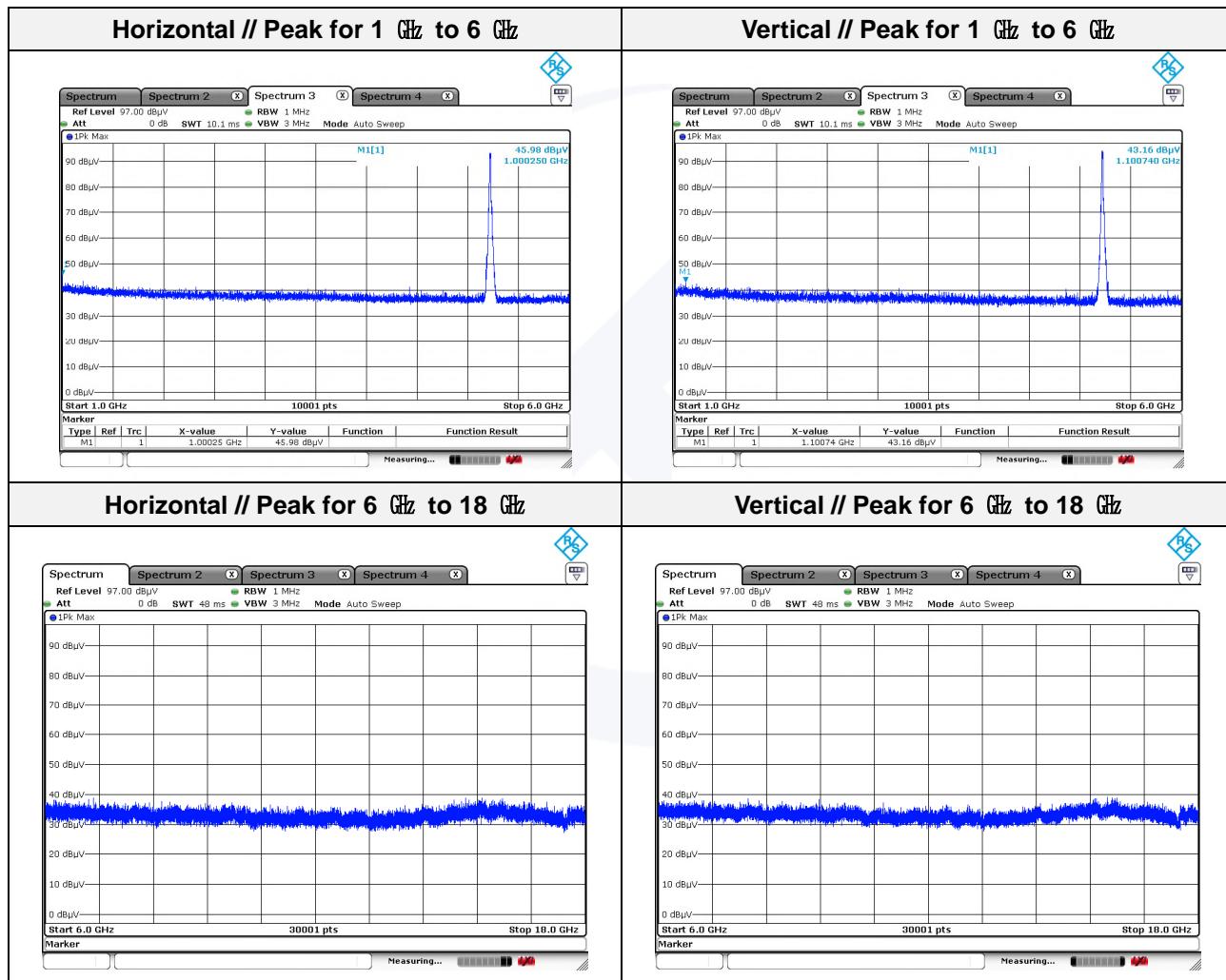
Mode: DC 12 V_802.11a (6 Mbps)

Distance of measurement: 3 meter

Channel: 44

- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 000.25	45.98	Peak	H	-8.14	-	37.84	74.00	36.16
1 100.74	43.16	Peak	V	-7.55	-	35.61	74.00	38.39



Note.

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



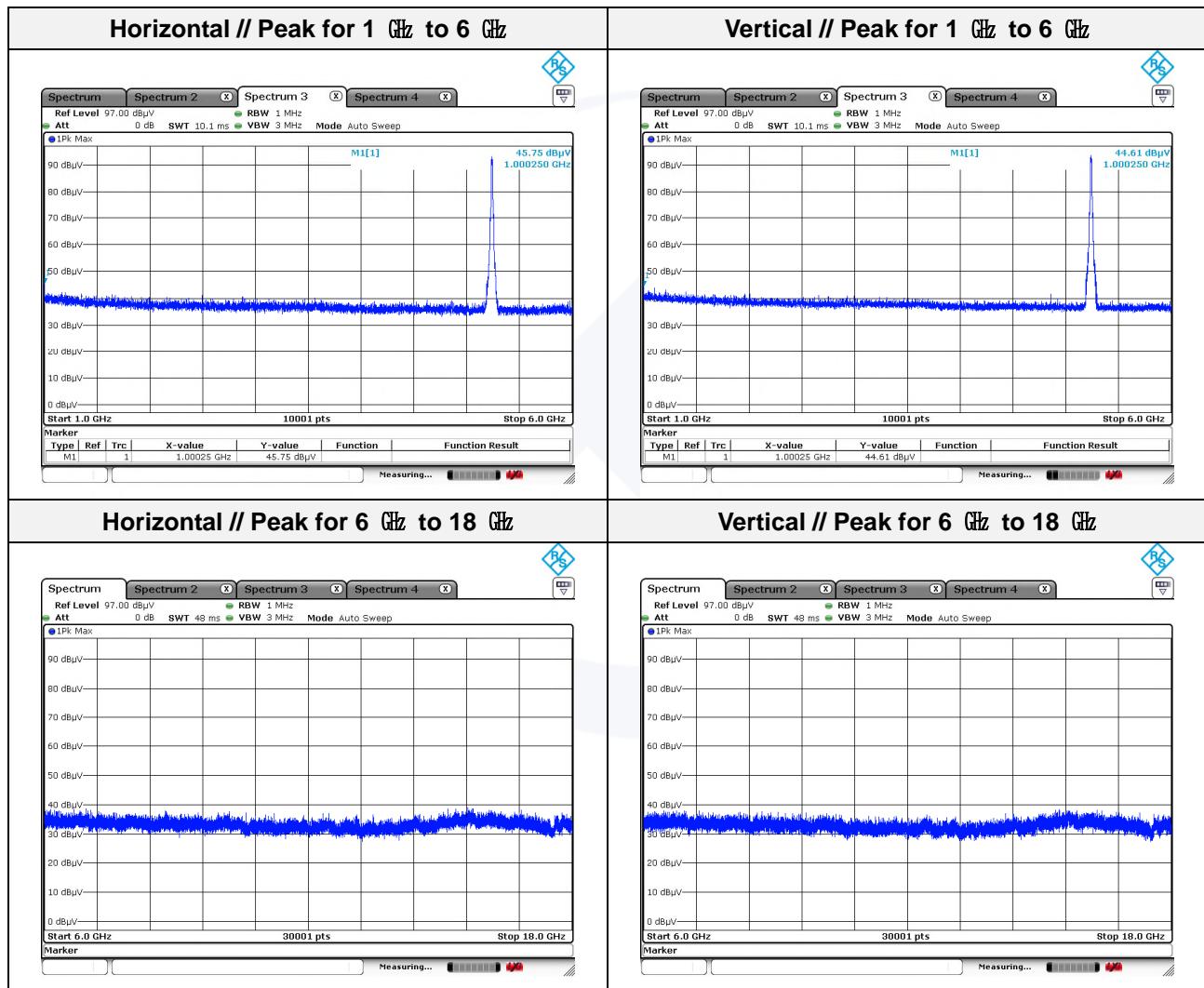
Mode: DC 12 V_802.11a (6 Mbps)

Distance of measurement: 3 meter

Channel: 48

- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 000.25	45.75	Peak	H	-8.14	-	37.61	74.00	36.39
1 000.25	44.61	Peak	V	-8.14	-	36.47	74.00	37.53



Note.

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



Mode: DC 24 V_802.11a (6 Mbps)

Distance of measurement: 3 meter

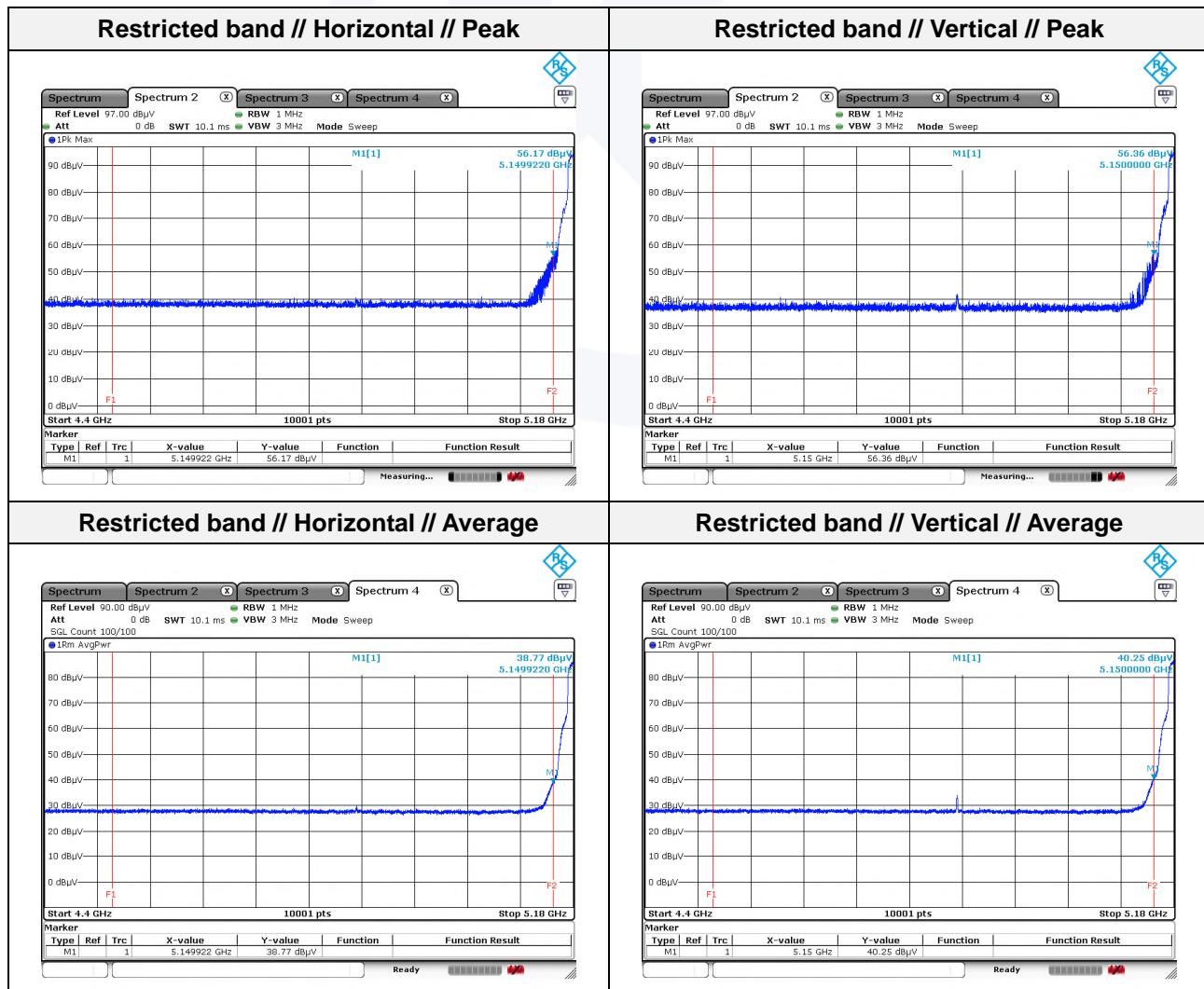
Channel: 36

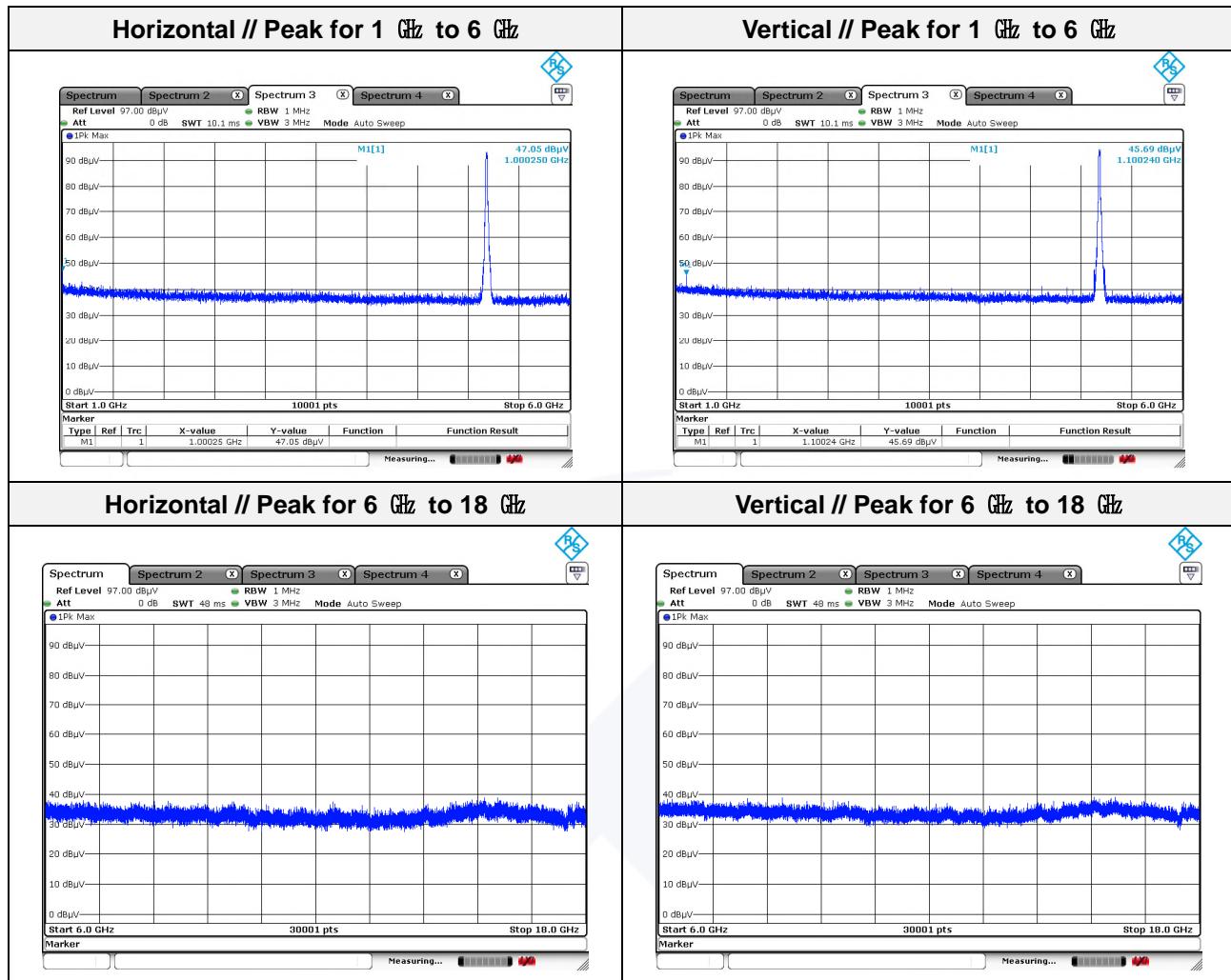
- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1 000.25	47.05	Peak	H	-8.14	-	38.91	74.00	35.09
1 100.24	45.69	Peak	V	-7.55	-	38.14	74.00	35.86

- Band edge

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 149.92	56.17	Peak	H	7.54	-	63.71	74.00	10.29
5 149.92	38.77	Average	H	7.54	0.27	46.58	54.00	7.42
5 150.00	56.36	Peak	V	7.54	-	63.90	74.00	10.10
5 150.00	40.25	Average	V	7.54	0.27	48.06	54.00	5.94





Note.

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



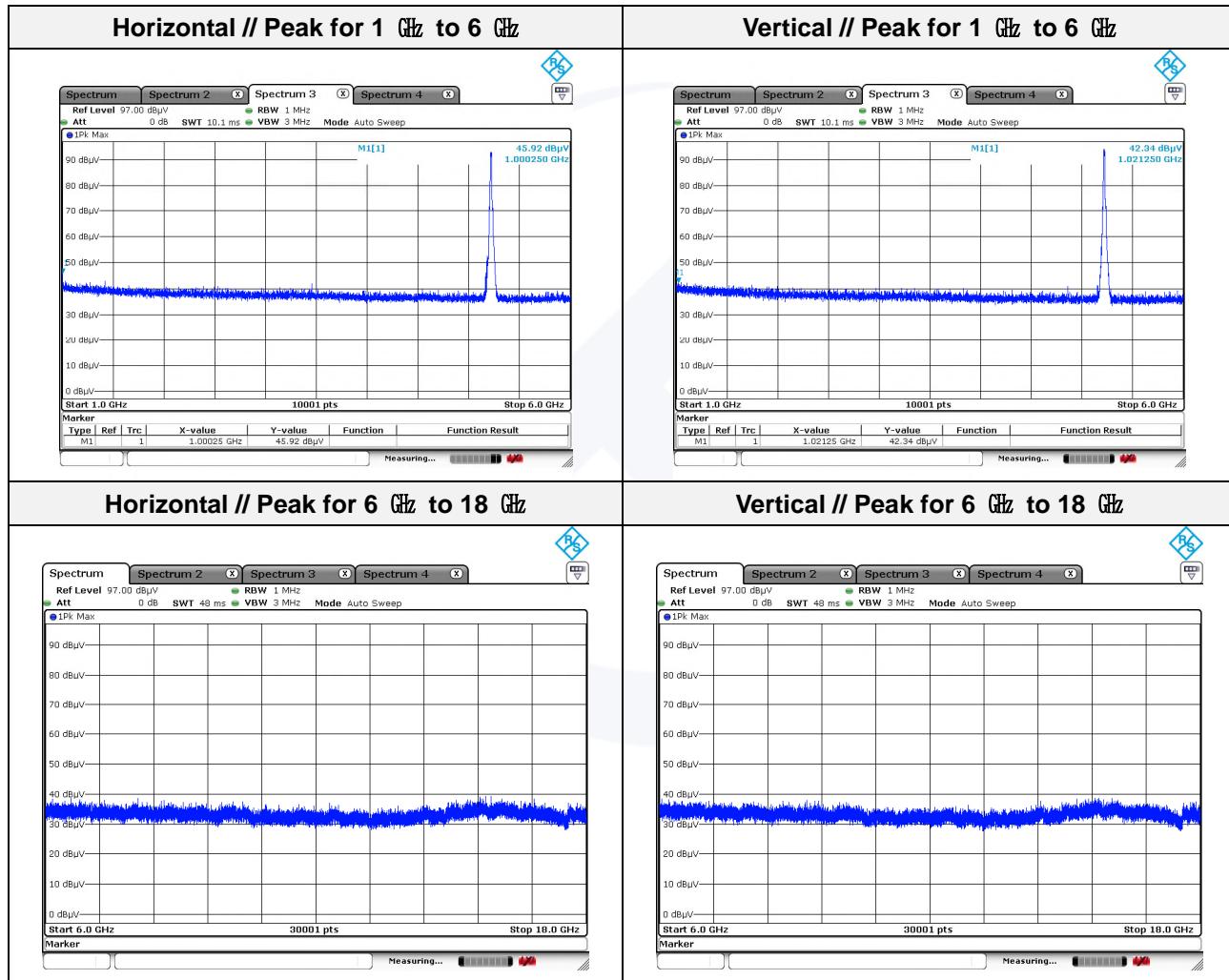
Mode: DC 24 V_802.11a (6 Mbps)

Distance of measurement: 3 meter

Channel: 44

- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 000.25	45.92	Peak	H	-8.14	-	37.78	74.00	36.22
1 021.25	42.34	Peak	V	-8.02	-	34.32	74.00	39.68



Note.

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



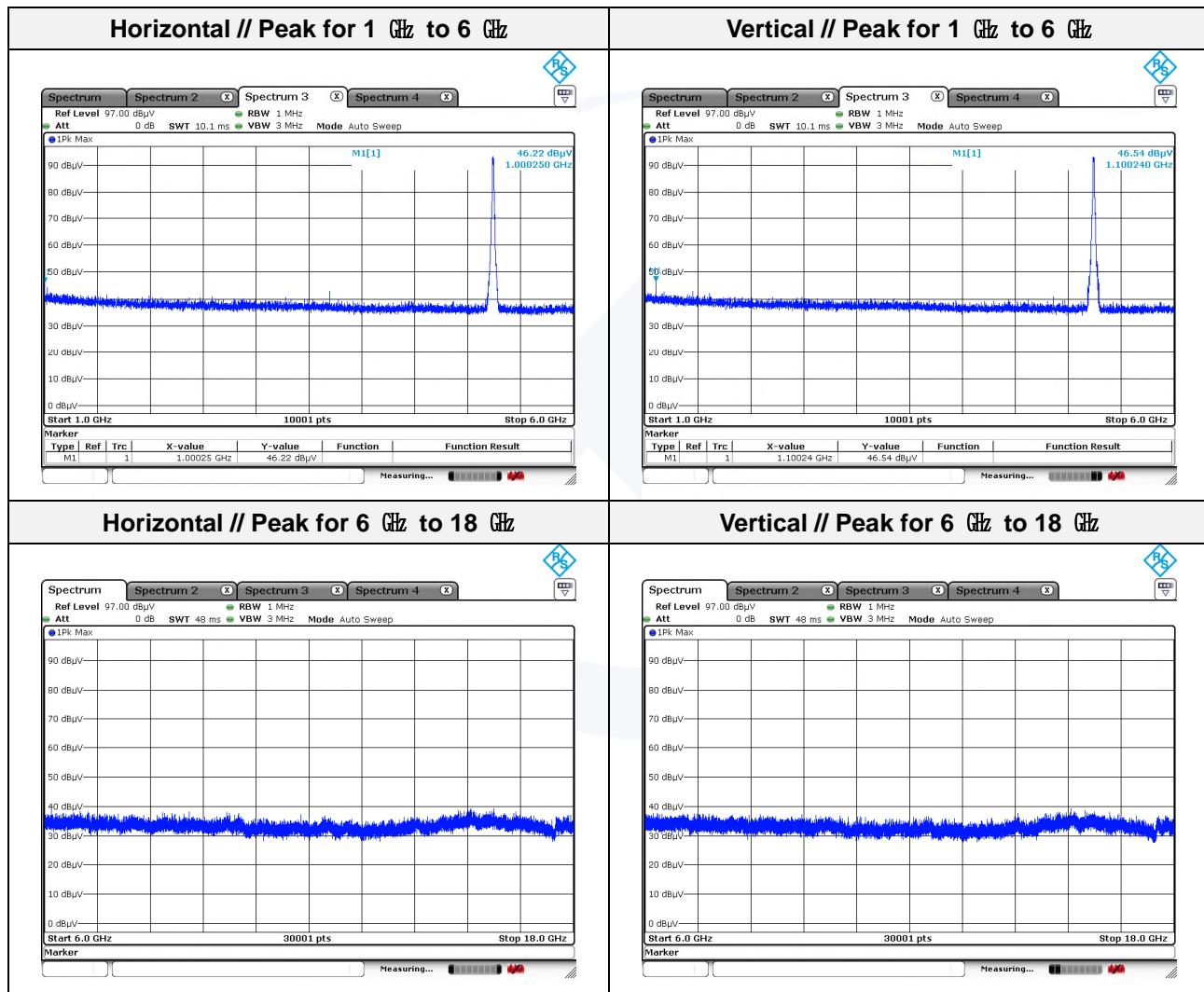
Mode: DC 24 V_802.11a (6 Mbps)

Distance of measurement: 3 meter

Channel: 48

- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 000.25	46.22	Peak	H	-8.14	-	38.08	74.00	35.92
1 100.24	46.54	Peak	V	-7.55	-	38.99	74.00	35.01



Note.

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



Mode: DC 12 V_802.11n_HT20 (MCS0)

Distance of measurement: 3 meter

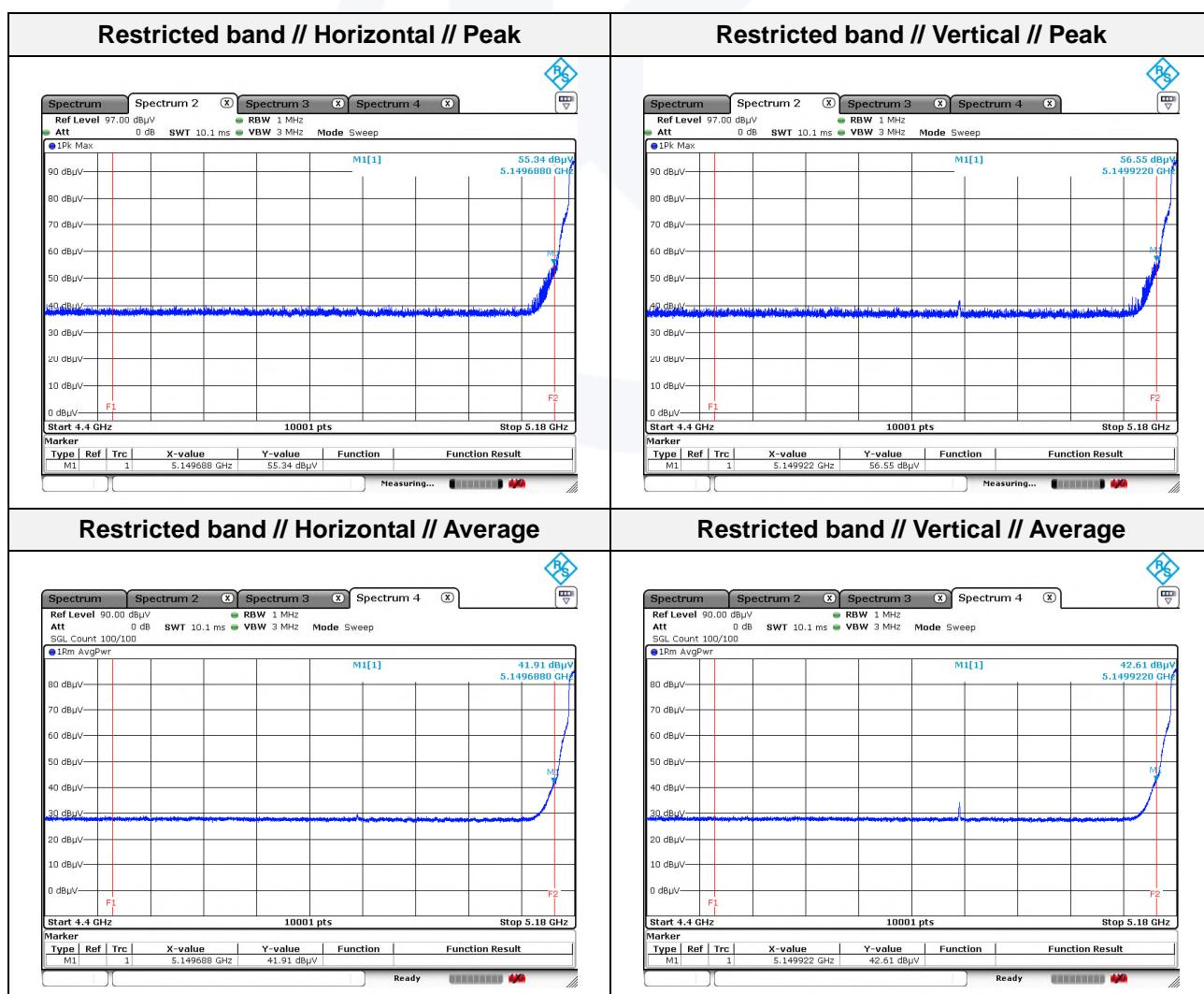
Channel: 36

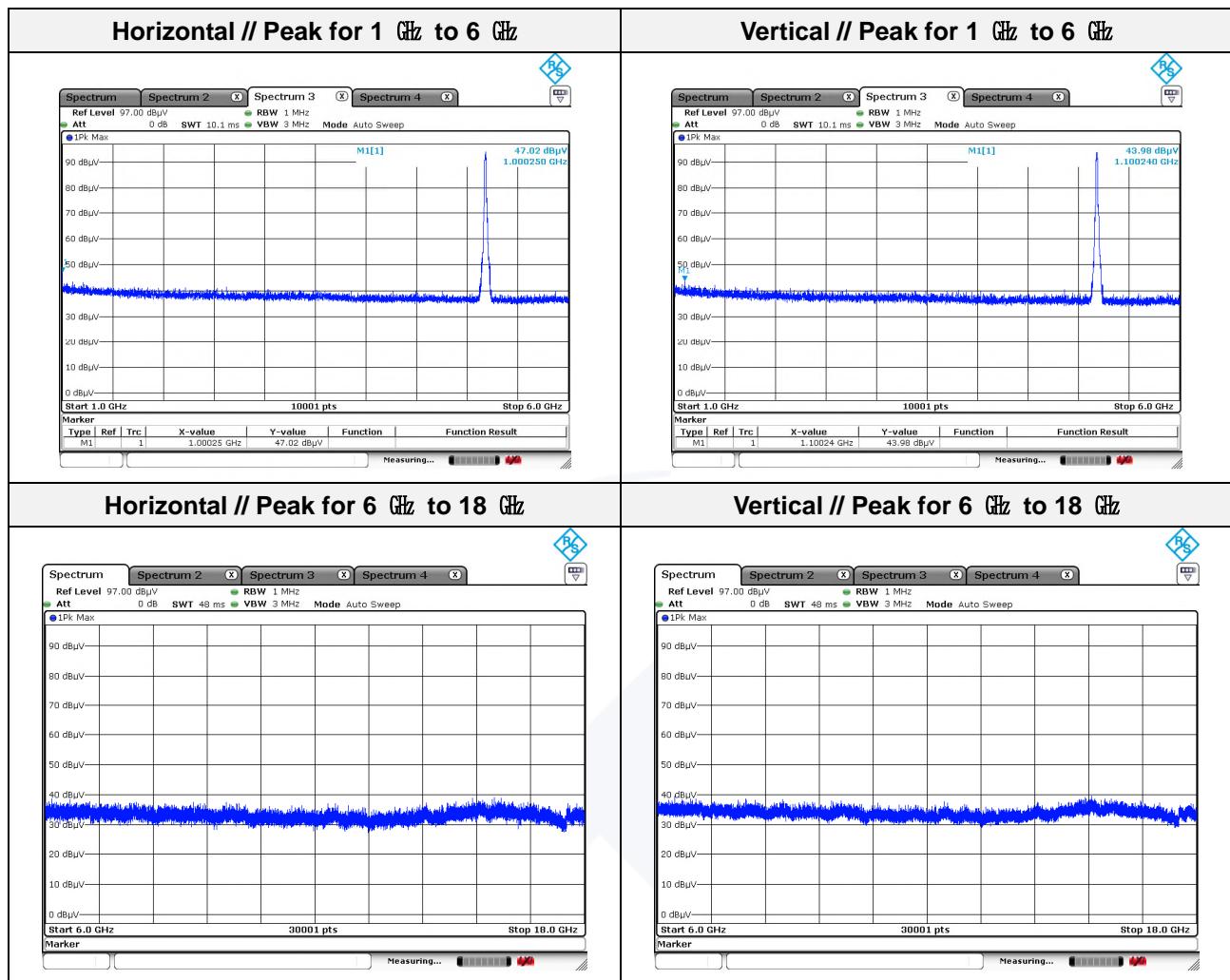
- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1 000.25	47.02	Peak	H	-8.14	-	38.88	74.00	35.12
1 100.24	43.98	Peak	V	-7.55	-	36.43	74.00	37.57

- Band edge

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 149.69	55.34	Peak	H	7.54	-	62.88	74.00	11.12
5 149.69	41.91	Average	H	7.54	0.27	49.72	54.00	4.28
5 149.92	56.55	Peak	V	7.54	-	64.09	74.00	9.91
5 149.92	42.61	Average	V	7.54	0.27	50.42	54.00	3.58





Note.

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



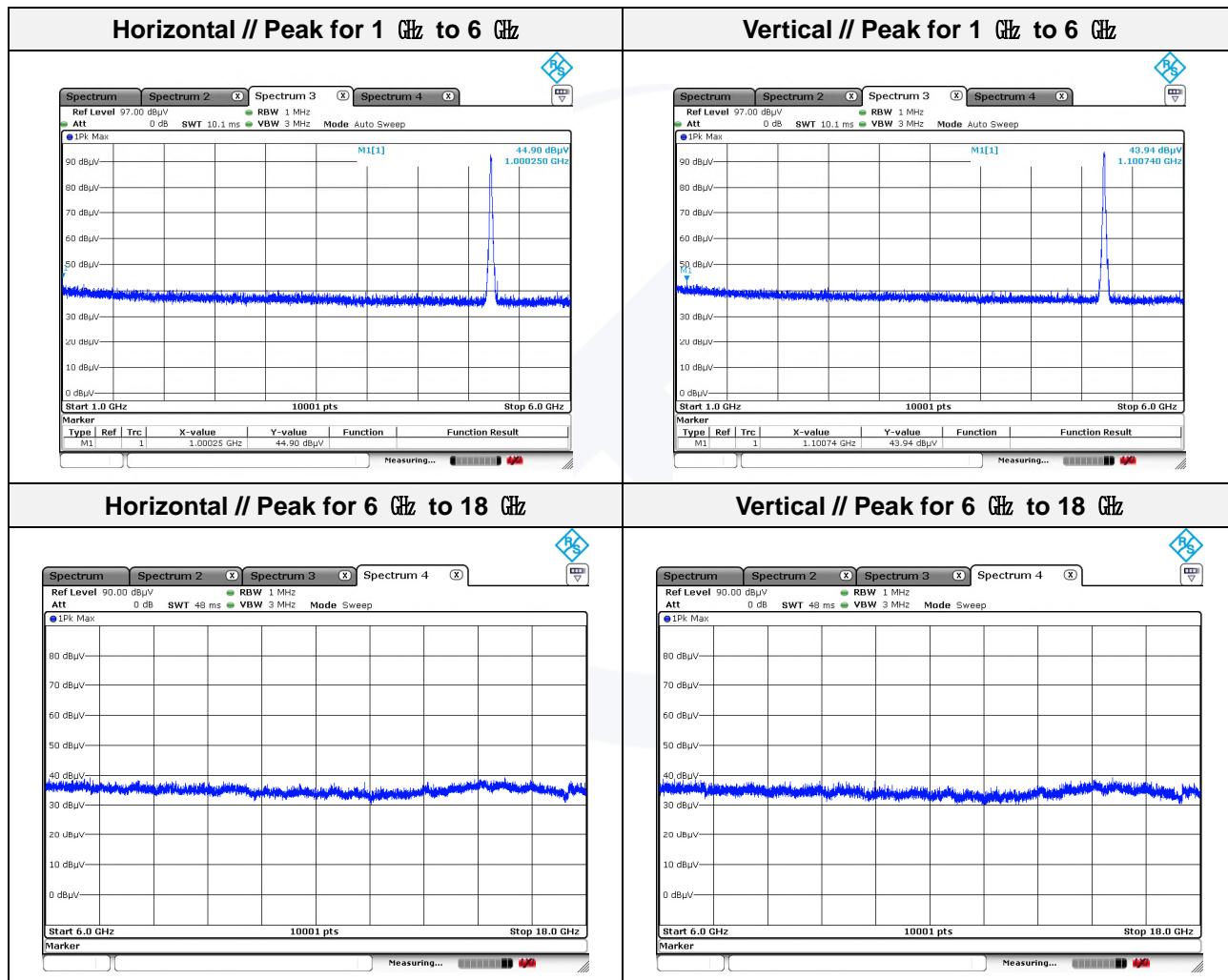
Mode: DC 12 V_802.11n_HT20 (MCS0)

Distance of measurement: 3 meter

Channel: 44

- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 000.25	44.90	Peak	H	-8.14	-	36.76	74.00	37.24
1 100.74	43.94	Peak	V	-7.55	-	36.39	74.00	37.61

**Note.**

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



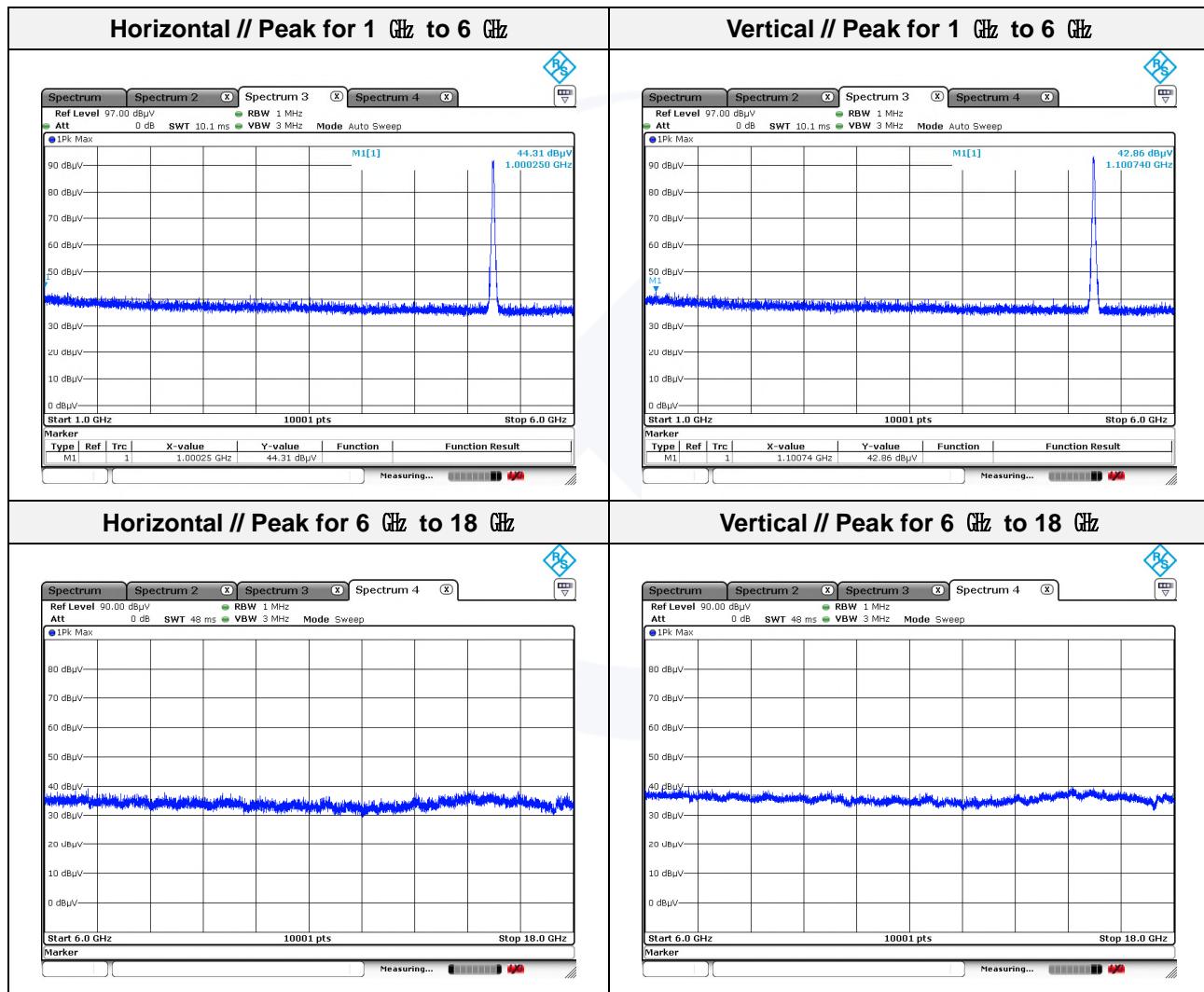
Mode: DC 12 V_802.11n_HT20 (MCS0)

Distance of measurement: 3 meter

Channel: 48

- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 000.25	44.31	Peak	H	-8.14	-	36.17	74.00	37.83
1 100.74	42.86	Peak	V	-7.55	-	35.31	74.00	38.69



Note.

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



Mode: DC 24 V_802.11n_HT20 (MCS0)

Distance of measurement: 3 meter

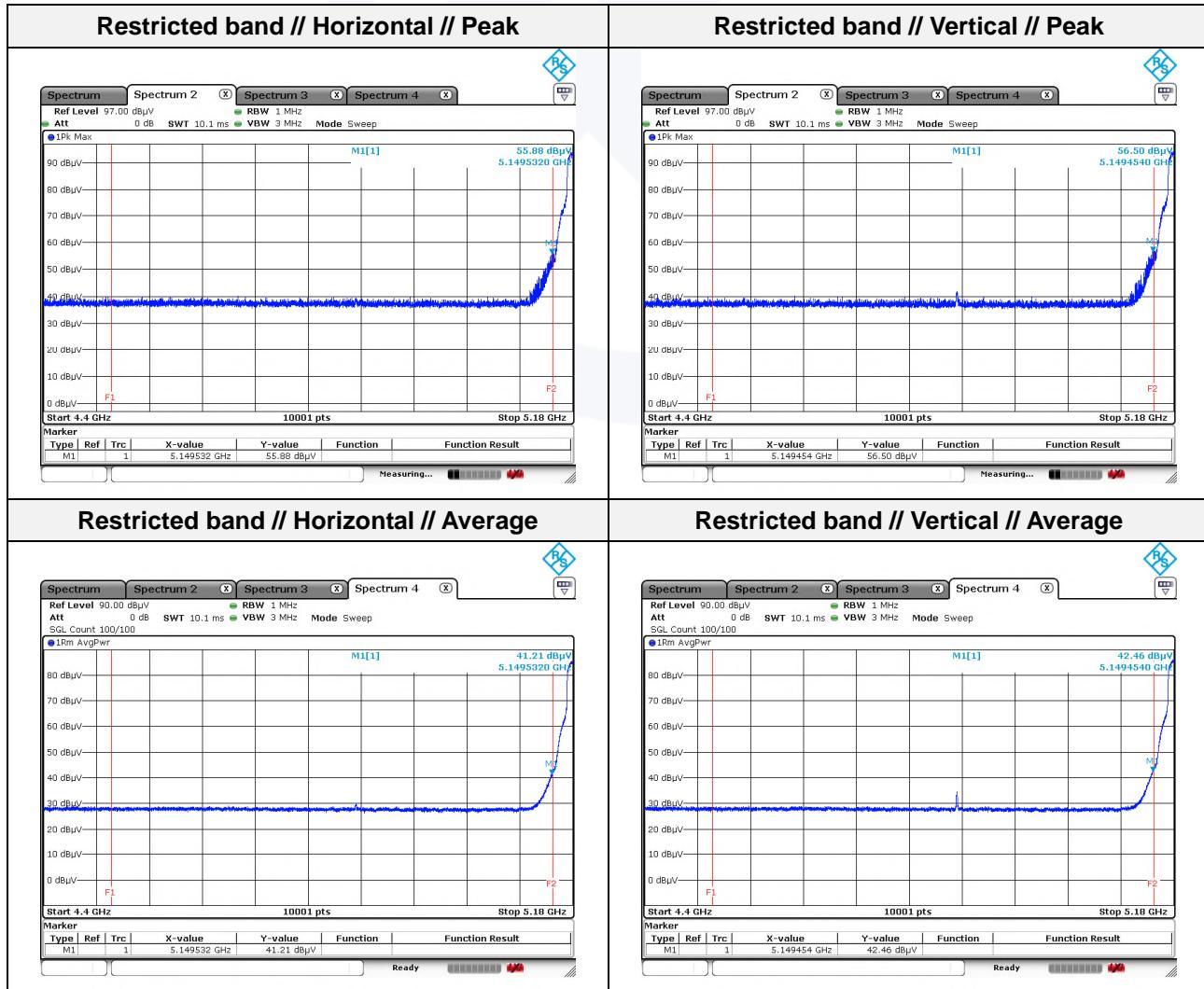
Channel: 36

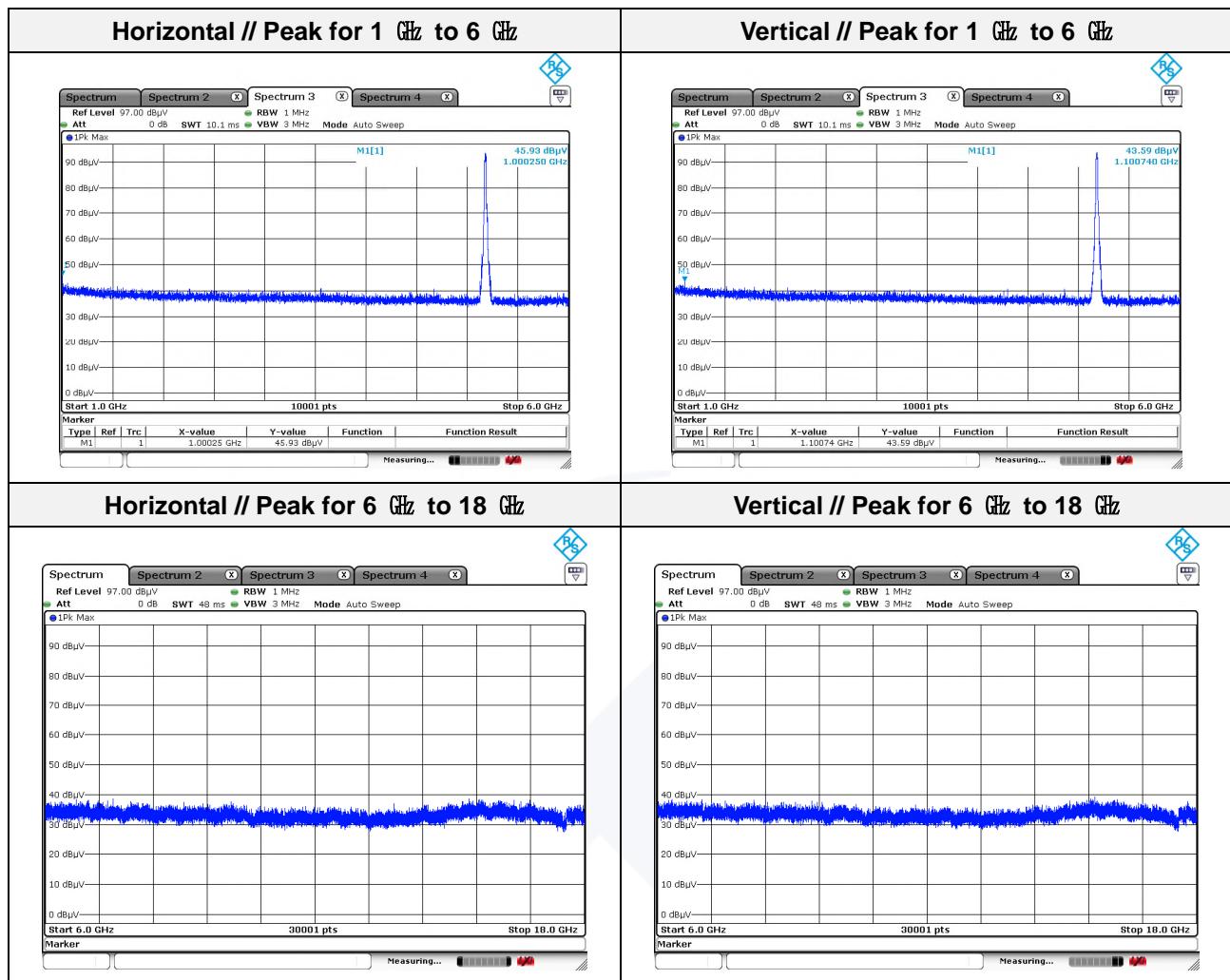
- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1 000.25	45.93	Peak	H	-8.14	-	37.79	74.00	36.21
1 100.74	43.59	Peak	V	-7.55	-	36.04	74.00	37.96

- Band edge

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 149.45	56.50	Peak	V	7.54	-	64.04	74.00	9.96
5 149.45	42.46	Average	V	7.54	0.27	50.27	54.00	3.73
5 149.53	55.88	Peak	H	7.54	-	63.42	74.00	10.58
5 149.53	41.21	Average	H	7.54	0.27	49.02	54.00	4.98





Note.

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



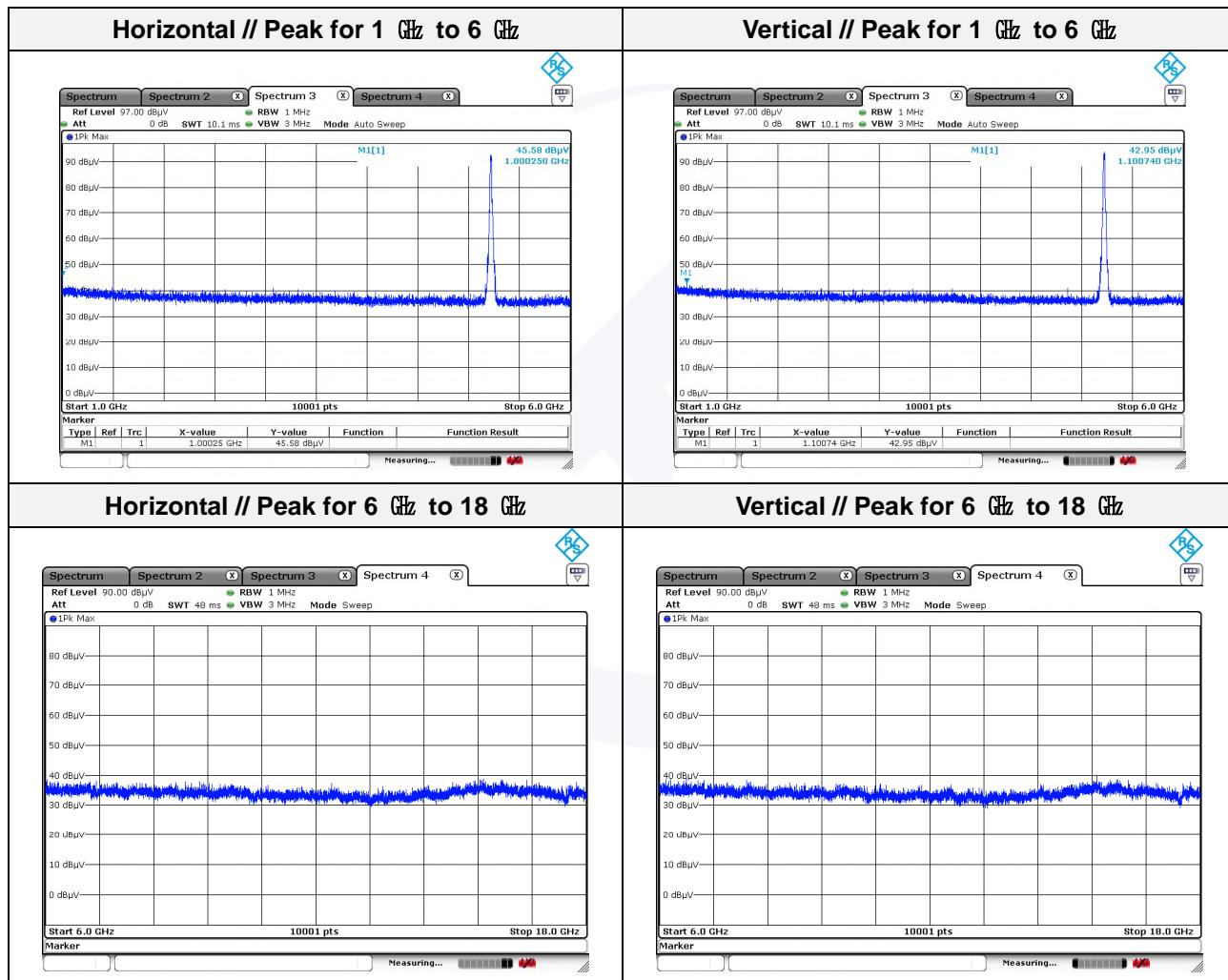
Mode: DC 24 V_802.11n_HT20 (MCS0)

Distance of measurement: 3 meter

Channel: 44

- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 000.25	45.58	Peak	H	-8.14	-	37.44	74.00	36.56
1 100.74	42.95	Peak	V	-7.55	-	35.40	74.00	38.60

**Note.**

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



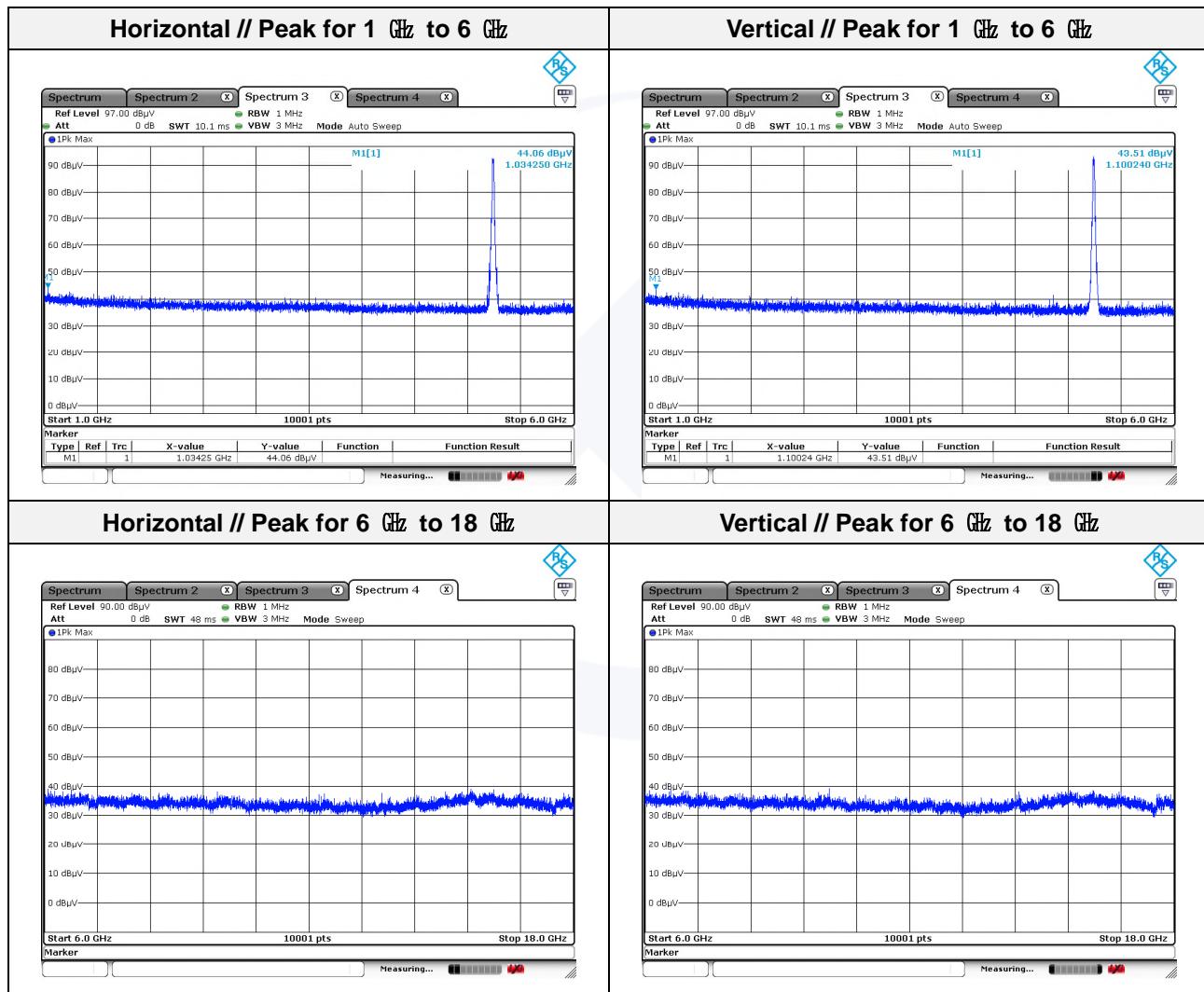
Mode: DC 24 V_802.11n_HT20 (MCS0)

Distance of measurement: 3 meter

Channel: 48

- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 034.25	44.06	Peak	H	-7.94	-	36.12	74.00	37.88
1 100.24	43.51	Peak	V	-7.55	-	35.96	74.00	38.04

**Note.**

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



Mode: DC 12 V_802.11n_HT40 (MCS0)

Distance of measurement: 3 meter

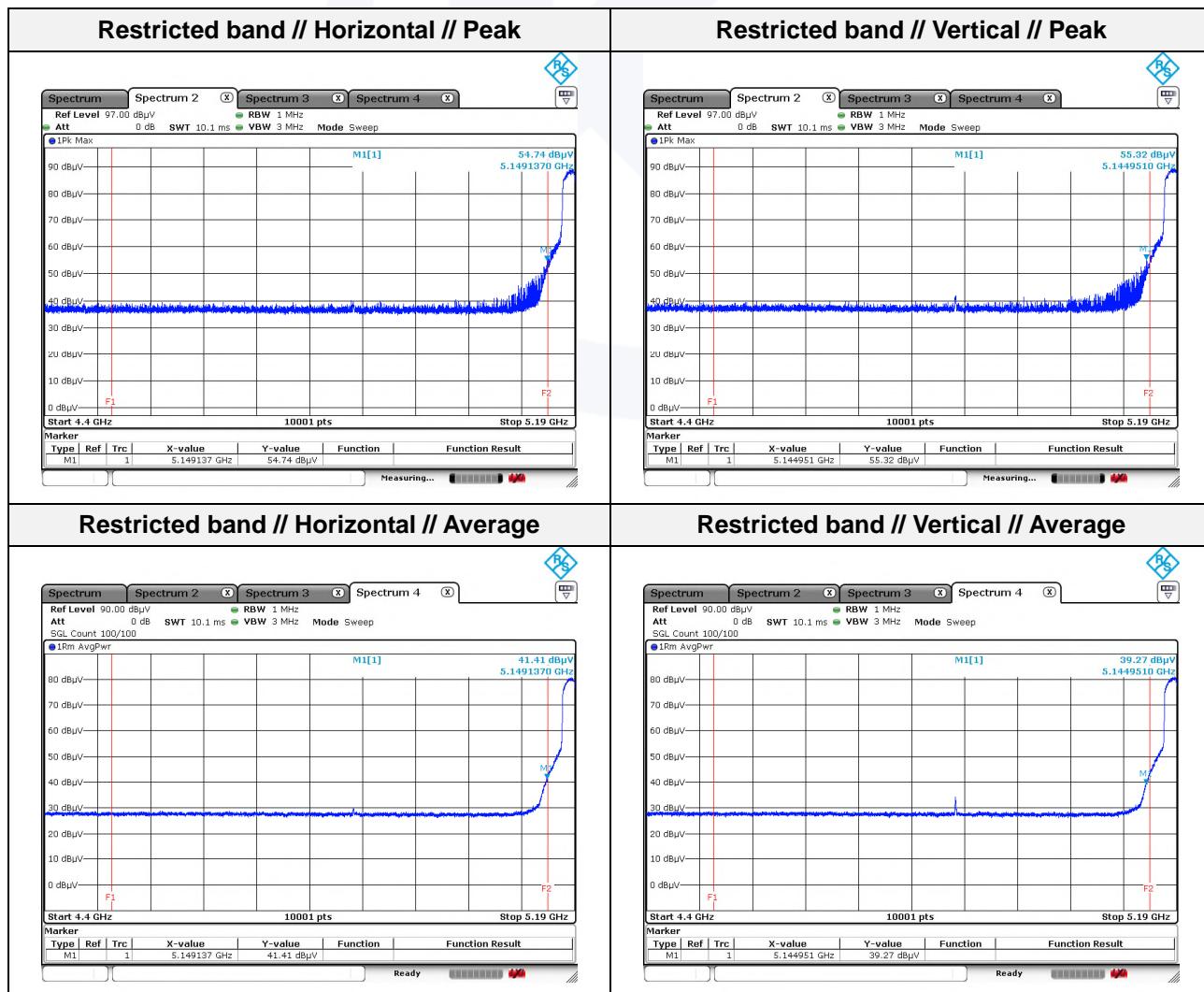
Channel: 38

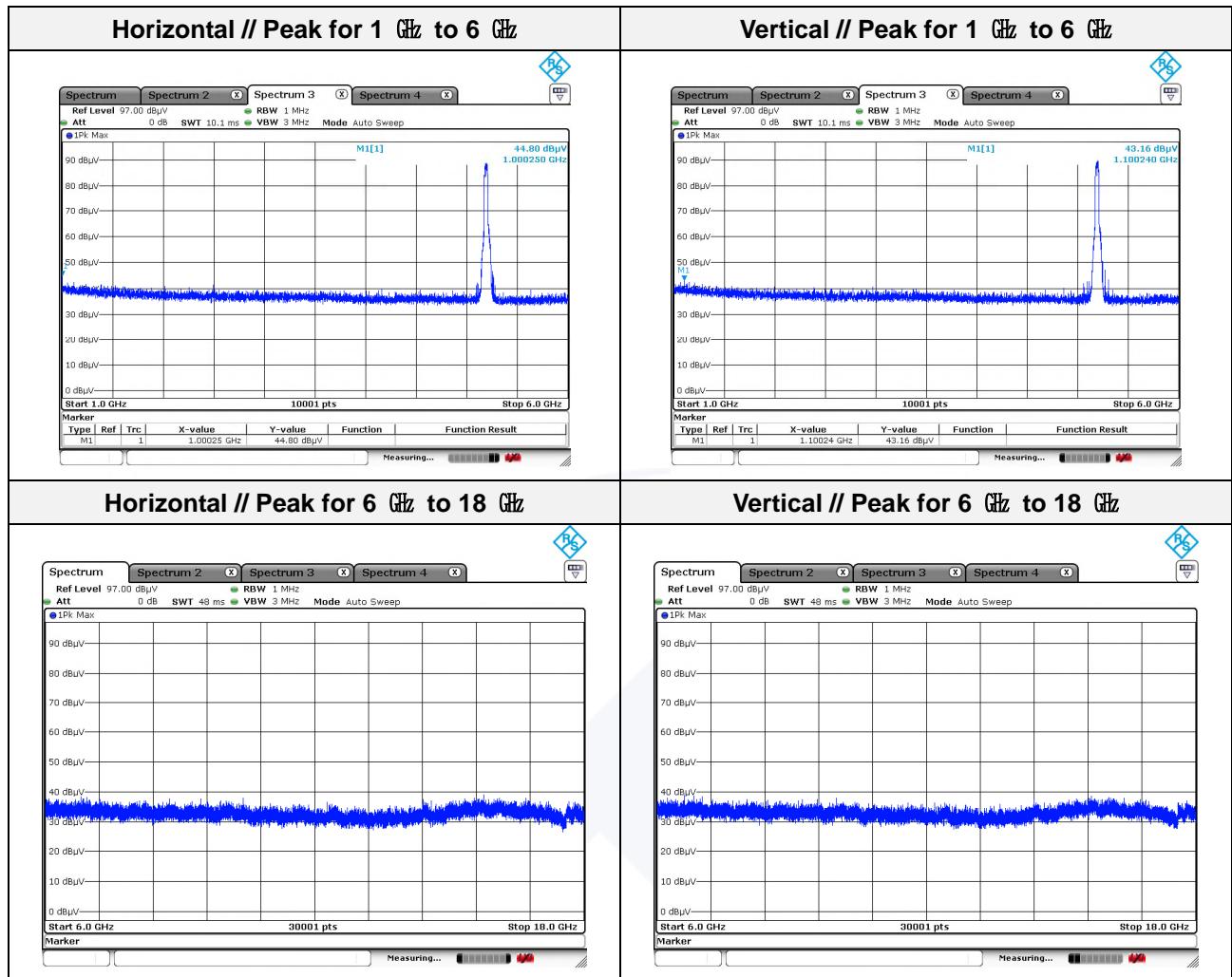
- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1 000.25	44.80	Peak	H	-8.14	-	36.66	74.00	37.34
1 100.24	43.16	Peak	V	-7.55	-	35.61	74.00	38.39

- Band edge

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 144.95	55.32	Peak	V	7.53	-	62.85	74.00	11.15
5 144.95	39.27	Average	V	7.53	0.51	47.31	54.00	6.69
5 149.14	54.74	Peak	H	7.54	-	62.28	74.00	11.72
5 149.14	41.41	Average	H	7.54	0.51	49.46	54.00	4.54





Note.

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



Mode: DC 12 V_802.11n_HT40 (MCS0)

Distance of measurement: 3 meter

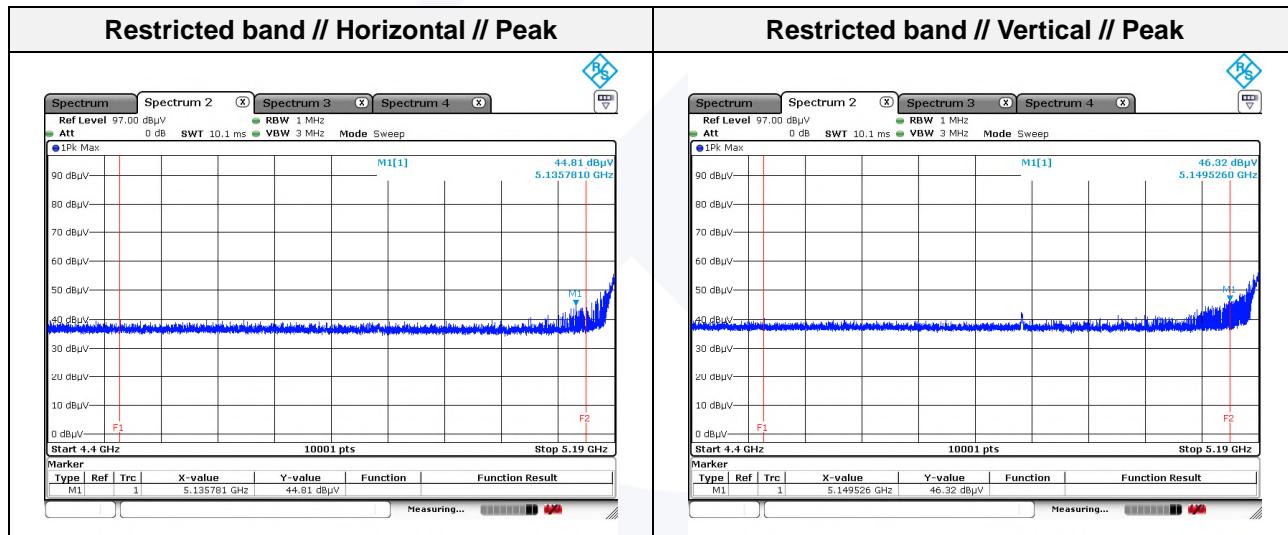
Channel: 46

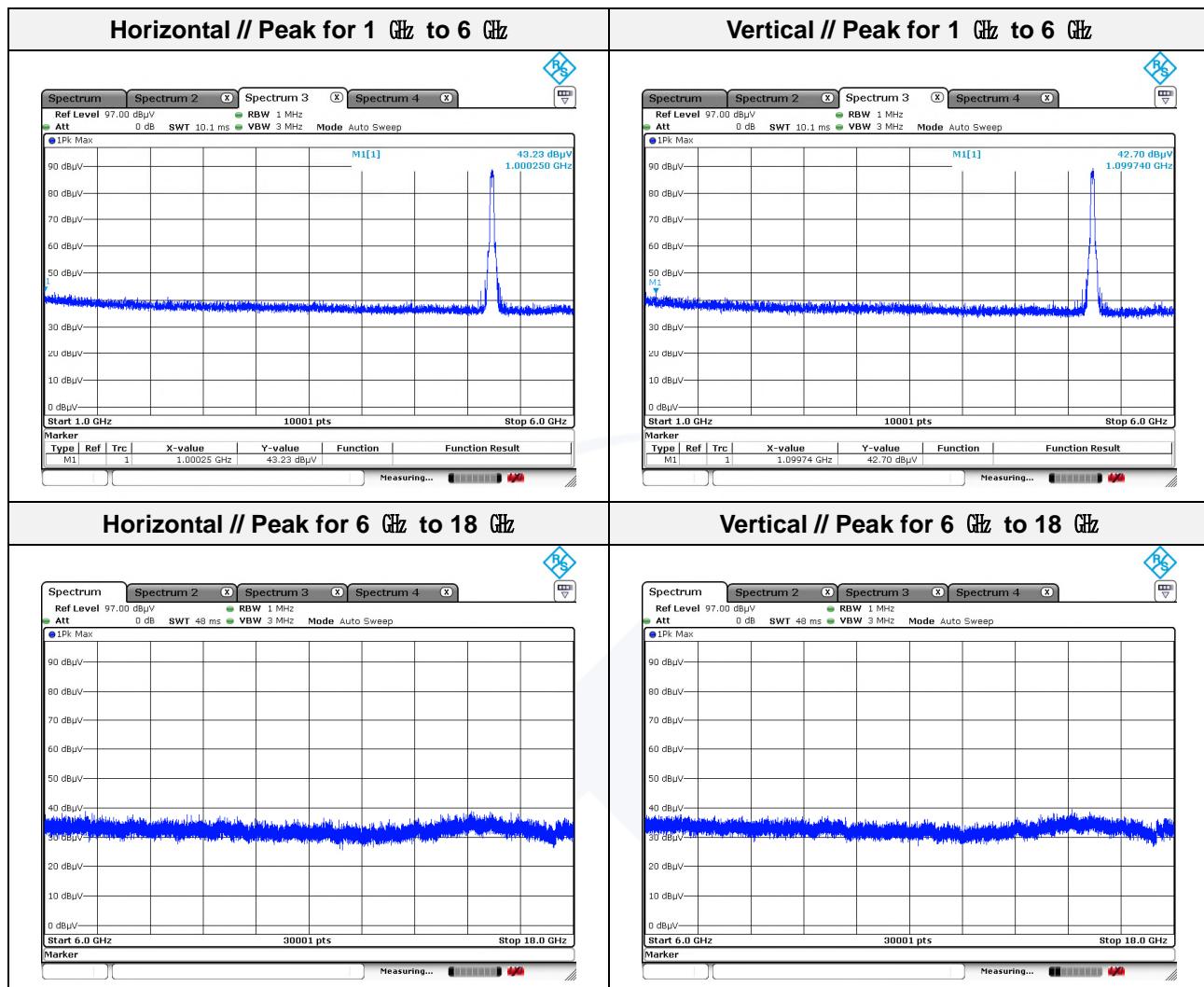
- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
1 000.25	43.23	Peak	H	-8.14	-	35.09	74.00	38.91
1 099.74	42.70	Peak	V	-7.55	-	35.15	74.00	38.85

- Band edge

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ N/m)	Limit (dB μ N/m)	Margin (dB)
5 135.78	44.81	Peak	V	7.51	-	52.32	74.00	21.68
5 149.53	46.32	Peak	H	7.54	-	53.86	74.00	20.14





Note.

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



Mode: DC 24 V_802.11n_HT40 (MCS0)

Distance of measurement: 3 meter

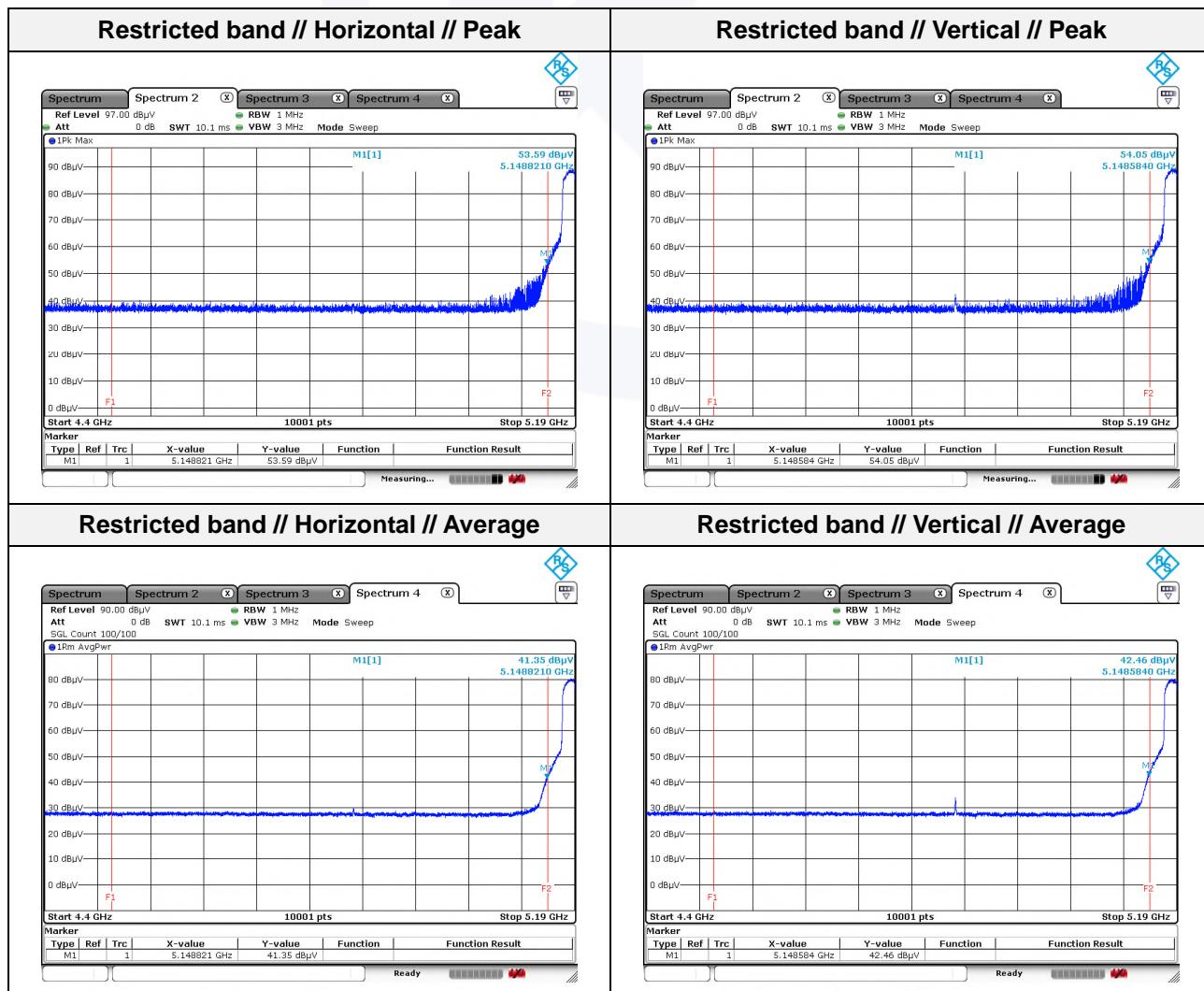
Channel: 38

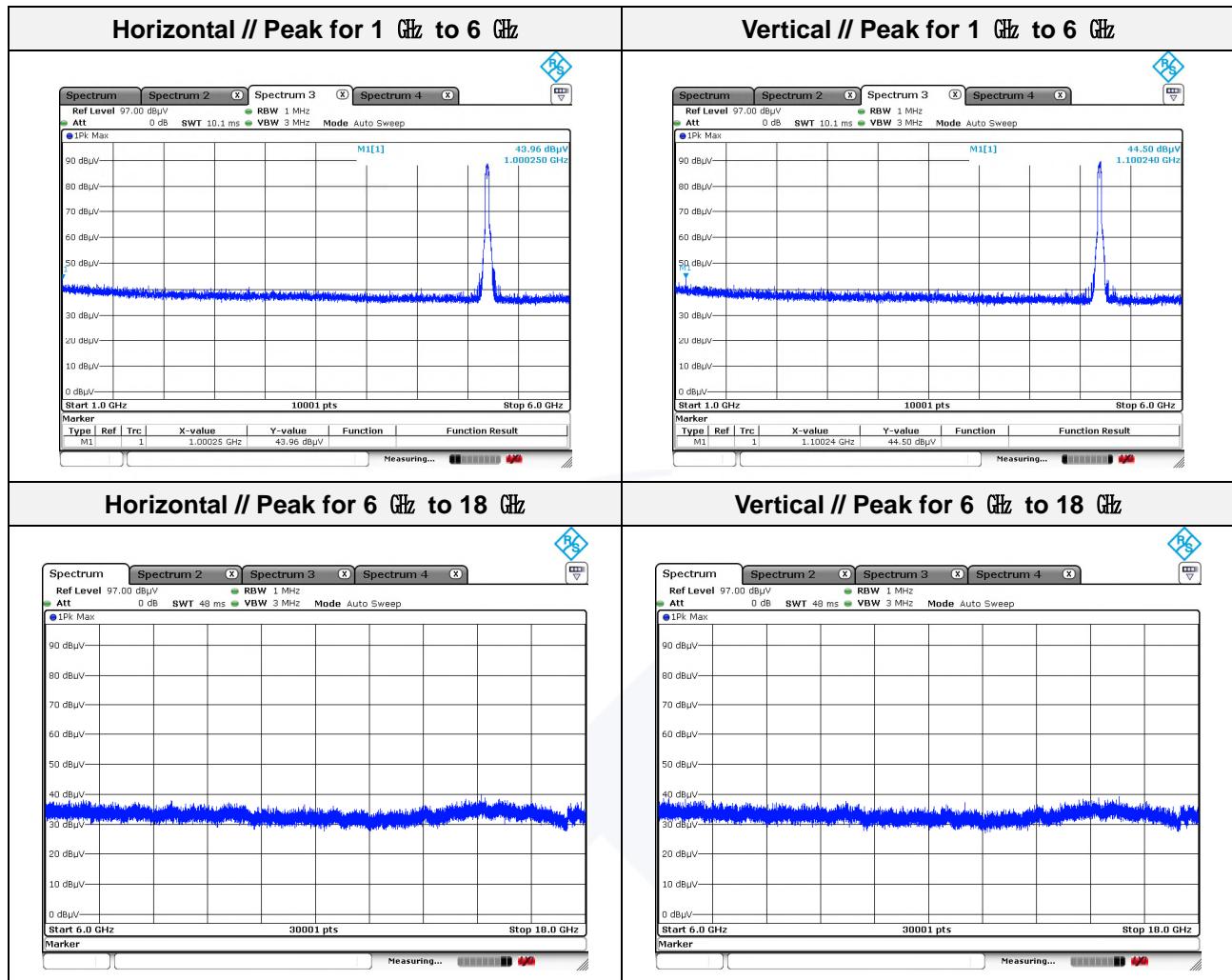
- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1 000.25	43.96	Peak	H	-8.14	-	35.82	74.00	38.18
1 100.24	44.50	Peak	V	-7.55	-	36.95	74.00	37.05

- Band edge

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 148.58	54.05	Peak	V	7.54	-	61.59	74.00	12.41
5 148.58	42.46	Average	V	7.54	0.51	50.51	54.00	3.49
5 148.82	53.59	Peak	H	7.54	-	61.13	74.00	12.87
5 148.82	41.35	Average	H	7.54	0.51	49.40	54.00	4.60





Note.

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



Mode: DC 24 V_802.11n_HT40 (MCS0)

Distance of measurement: 3 meter

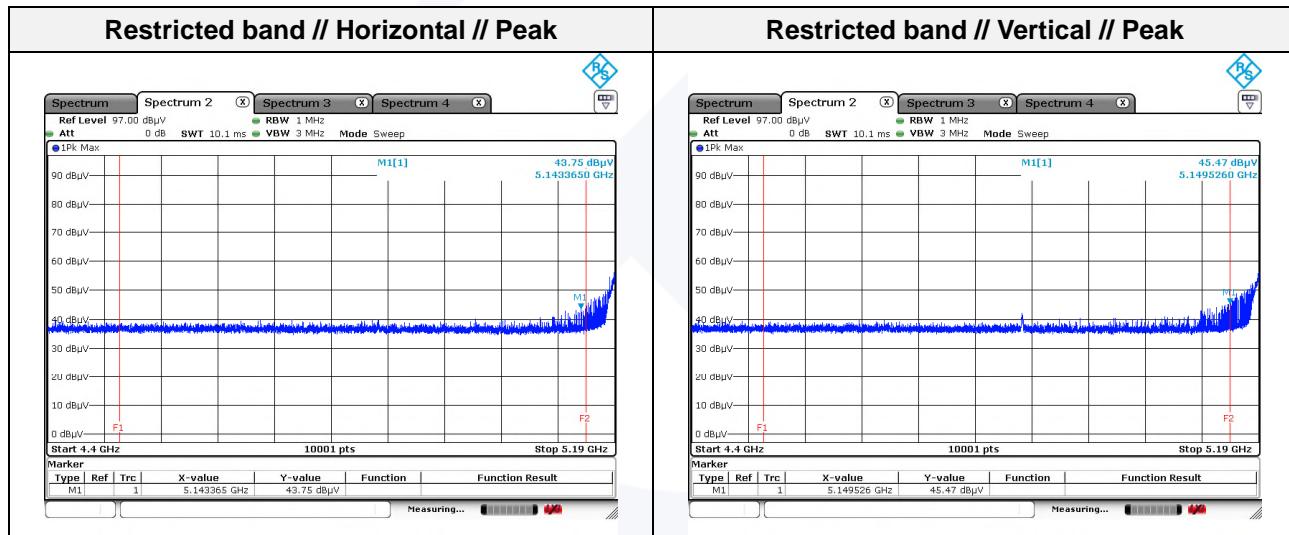
Channel: 46

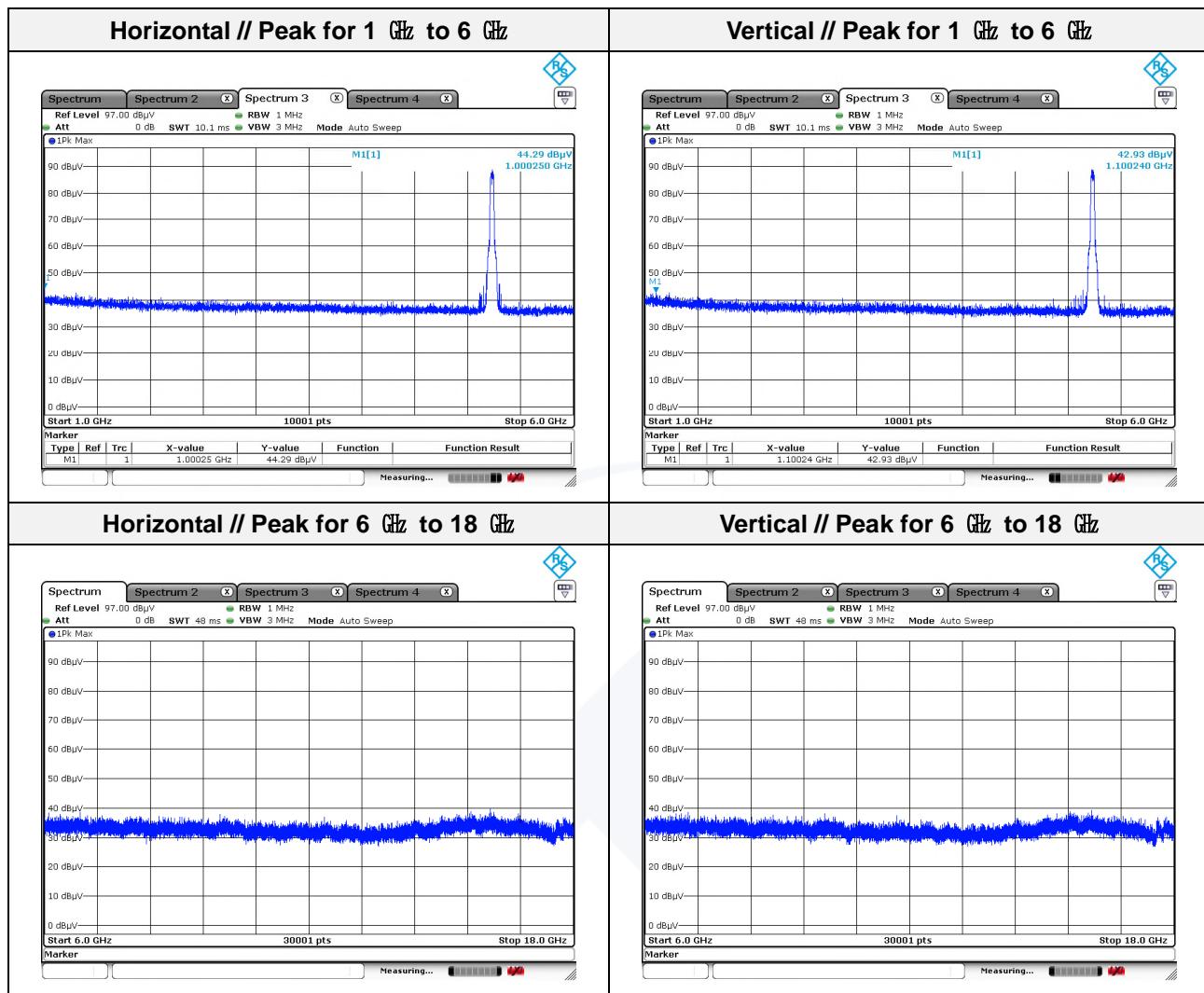
- Spurious

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
1 000.25	44.29	Peak	H	-8.14	-	36.15	74.00	37.85
1 100.24	42.93	Peak	V	-7.55	-	35.38	74.00	38.62

- Band edge

Frequency (MHz)	Level (dB μ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
5 143.37	43.75	Peak	H	7.53	-	51.28	74.00	22.72
5 149.53	45.47	Peak	V	7.54	-	53.01	74.00	20.99





Note.

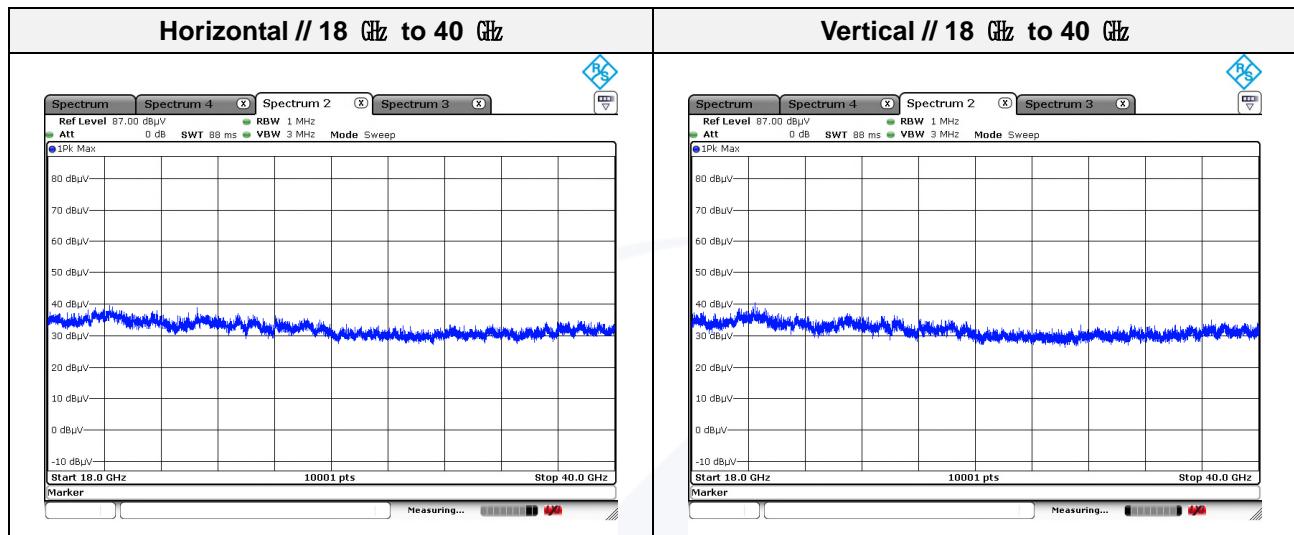
1. No spurious emission were detected above 6 GHz.
2. Average test would be performed if the peak result were greater than the average limit.

**Test results (18 GHz to 40 GHz)**

Band 802.11a (Worst Case)_DC 12 V

Distance of measurement: 3 meter

Channel 36 (Worst Case)



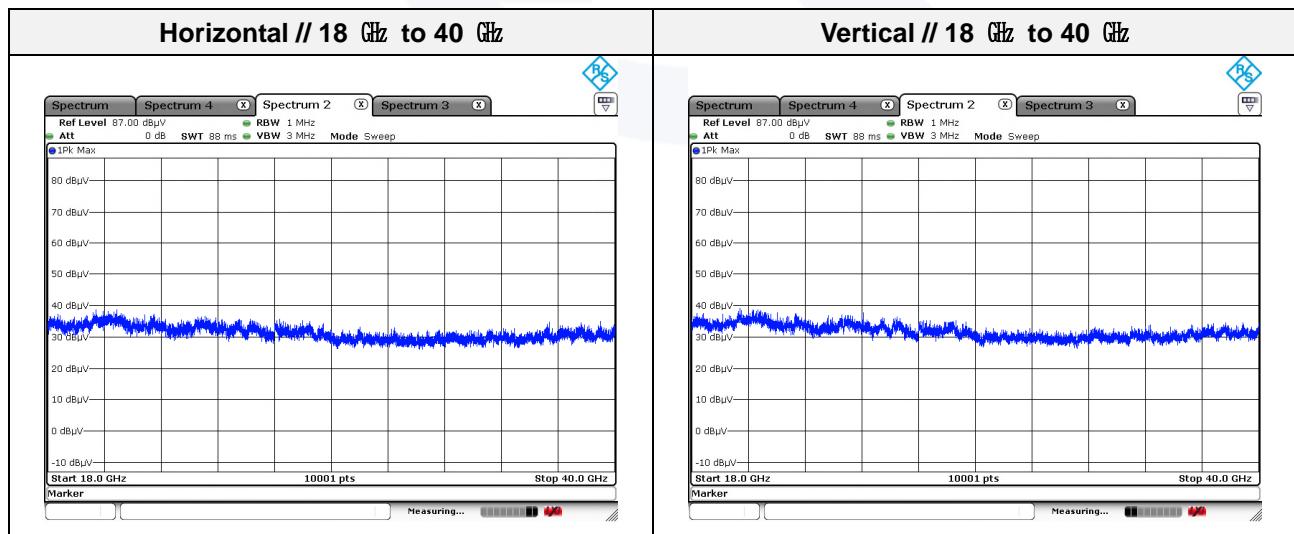
Note.

1. No spurious emission were detected above 18 GHz.

Band 802.11a (Worst Case)_DC 24 V

Distance of measurement: 3 meter

Channel 36 (Worst Case)



Note.

1. No spurious emission were detected above 18 GHz.



3.3. Antenna Requirement

According to 15.207(a), 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
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	BRM50702	G199	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
Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1802	1 year	2025.11.04
ATTENUATOR	HP	8491B	23094	1 year	2026.02.13
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	SORENSEN	DCS40-75E	1408A02745	1 year	2026.01.08
EMI Test Receiver	R&S	ESR3	101783	1 year	2025.11.06
Cable	-	-	#5	1 year	2025.11.01
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	LG Electronics Inc.,	LGS53	306QCZP560949
Test Jig Board	N/A	N/A	N/A

The End.