TEST REPORT

Part 15 Subpart C 15.247

Equipment under test SMARTCAM

Model name SNH-P6412BN

Derivative model SNH-C6410/SD

FCC ID NLMSNHP6412BN

Applicant Hanwha Techwin Co., Ltd.

Manufacturer Tianjin Samsung Techwin Opto-Electronic Co., Ltd.

Date of test(s) 2016.06.01 ~ 2016.12.12

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Revision history

Revision	Date of issue	Test report No.	Description
-	2016.12.07	KES-RF-16T0113	Initial
1	2016.12.13	KES-RF-16T0113-R1	Retest radiated emissions & AC conducted emissions
2	2016.12.14	KES-RF-16T0113-R2	Added derivative model

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1. General information

Applicant:	Hanwha Techwin Co., Ltd.
Applicant address:	1204, Changwon-daero, Seongsan-gu, Changwon-si, Gyeongsangnam-do, Korea
Test site:	KES Co., Ltd.
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FCC rule part(s):	15.247
FCC ID:	NLMSNHP6412BN
Test device serial No.:	☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test	SMARTCAM
Frequency range	2 412 ㎒ ~ 2 462 ㎒(802.11b/g/n_HT20) 5 745 ㎒ ~ 5 825 ㎒(802.11a/n_HT20), 5 755 ㎒ ~ 5 795 ㎒(802.11n_HT40) 5 180 ㎒ ~ 5 240 ㎒(802.11a/n_HT20), 5 190 ㎒ ~ 5 230 ㎒(802.11n_HT40) 5 260 ㎒ ~ 5 320 ㎒(802.11a/n_HT20), 5 270 ㎒ ~ 5 310 ㎒(802.11n_HT40) 5 500 ㎒ ~ 5 700 ㎒(802.11a/n_HT20), 5 510 ㎒ ~ 5 670 ㎒(802.11n_HT40)
Model:	SNH-P6412BN
Derivative model	SNH-C6410/SD
Modulation technique	DSSS, OFDM
Number of channels	2 412 ㎒ ~ 2 462 ㎒(802.11 b/g/n_HT20) : 11ch 5 745 ㎒ ~ 5 825 ㎒(802.11a/n_HT20) : 5ch 5 755 ㎒ ~ 5 795 ㎒(802.11n_HT40) : 2ch 5 180 ㎒ ~ 5 240 ㎒(802.11a/n_HT20) : 4ch 5 190 ㎒ ~ 5 230 ㎒(802.11n_HT40) : 2ch 5 260 ㎒ ~ 5 320 ㎒(802.11a/n_HT20) : 4ch 5 270 ㎒ ~ 5 310 ㎒(802.11n_HT40) : 2ch 5 500 ㎒ ~ 5 700 ㎒(802.11a/n_HT20) : 11ch 5 510 ㎒ ~ 5 670 ㎒(802.11n_HT40) : 5ch
Antenna specification	Antenna type: PIFA Antenna
Power source	AC 120V Adapter (Output : DC 5V / 2 A)

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Note:
1. Certificated module is mounted in the EUT as following
   - Applicant: Hanwha Techwin Co., Ltd.
   - Contains FCC ID : NLMSWLQ93T
   - Model: SWL-Q93T
2. The installed module is completed identical as original.

1.2. Test configuration

The **Hanwha Techwin Co., Ltd.** **FCC ID: NLMSNHP6412BN** was tested per the guidance of KDB 558074 D01 v03r05. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing and AC line conducted testing.

1.3. Device modifications

N/A

1.4. Derivation model information

The circuit diagram and software of the basic model and derivative are fundamentally the same.
It is for model management purpose.

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1.5. Frequency/channel operations

Ch.	Frequency (㎒)	Mode
01	2412	802.11b/g/n_HT20
⋮	⋮	⋮
06	2437	802.11b/g/n_HT20
⋮	⋮	⋮
11	2462	802.11b/g/n_HT20

1.6. Worst case data rate

1. Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.
2. Worst-case data rates were:
   802.11b: **1 Mbps**
   802.11g: **6 Mbps**
   802.11n_HT20: **MCS0 (SISO), MCS8 (MIMO)**

1.7. Using antenna information

Mode	Bandwidth (㎒)	Antenna 0	Antenna 1	Antenna 0+1
802.11b	20	✓	✓	×
802.11g	20	✓	✓	×
802.11n	20	✓	✓	✓

Antenna 0 gain(dBi)	Antenna 1 gain(dBi)	Total gain(dBi)[Note1]
-2.69	-2.22	0.56

Note.

1. Ant Gain = $10\log[(10^{G1/20}+10^{G2/20}+\ldots+10^{GN/20})^2/N_{ANT}]$

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2. Summary of tests

Reference	Parameter	Test results
15.205 15.209	Radiated spurious emission	Pass
15.207	AC conducted emissions	Pass

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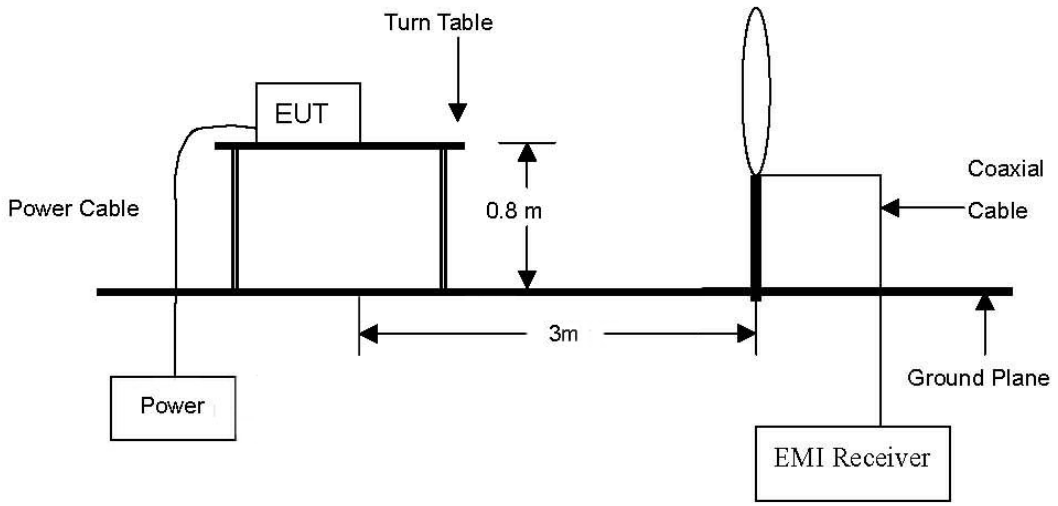
3. Test results

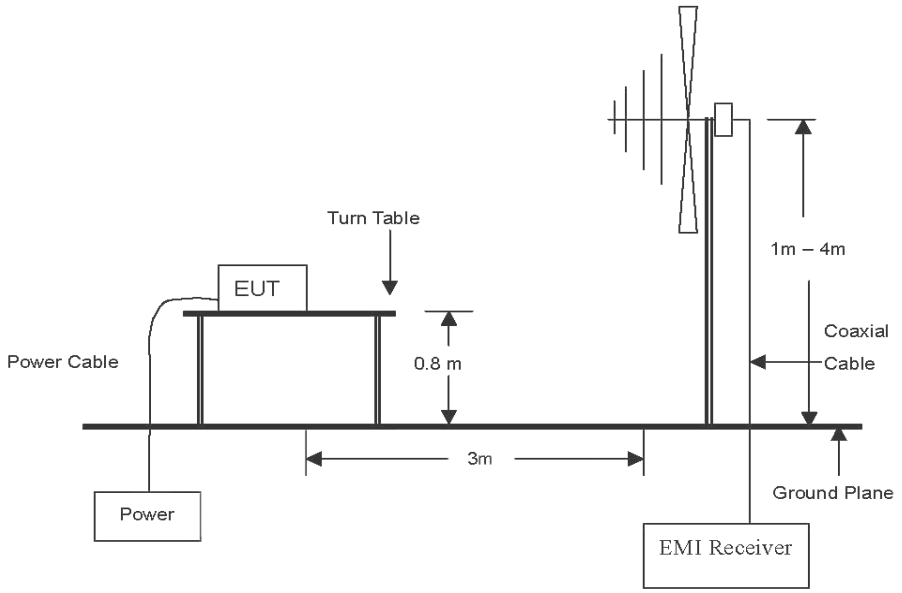
3.1. Radiated restricted band and emissions

Test setup

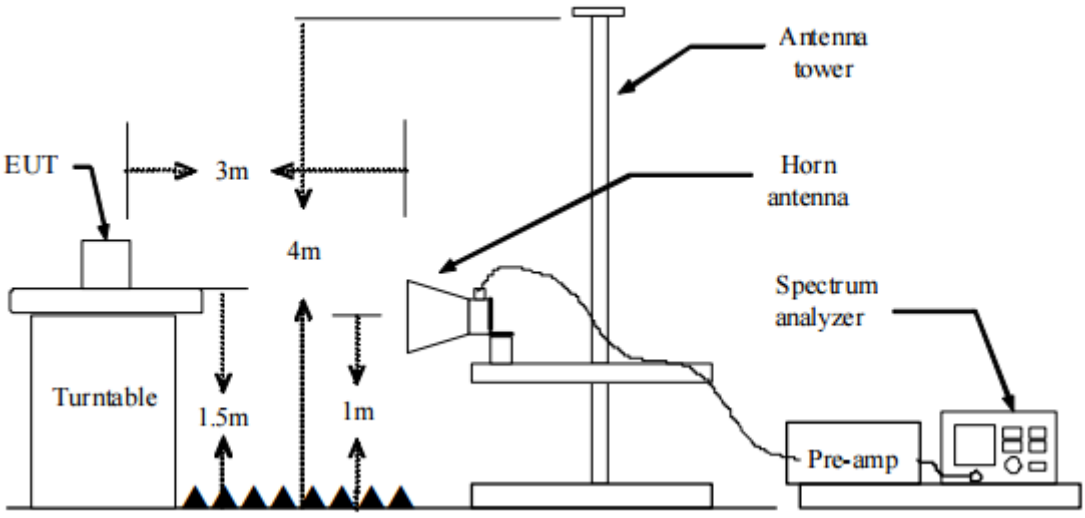
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



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 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 and perpendicular 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 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. 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
2. 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

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3. Spectrum analyzer settings for $f \geq 1$ ㎓: 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. $F_d = 40\log(D_m/Ds)$
   $f \geq 30$ ㎒, 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
3. CF(Correction factors(㏈)) = Antenna factor(㏈/m) + Cable loss(㏈) + or Amp. gain(㏈) + or F_d(㏈)
4. Field strength(㏈㎶/m) = Level(㏈㎶) + CF (㏈) + or DCF(㏈)
5. Margin(㏈) = Limit(㏈㎶/m) - Field strength(㏈㎶/m)
6. 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.
7. 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.**
8. The worst-case emissions are reported however emissions whose levels were not within 20 ㏈ of respective limits were not reported.

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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.

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Duty cycle

Regarding to KDB 558074 D01_v03r05, 6.0, 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 and the number of sweep points across duration T exceeds 100.

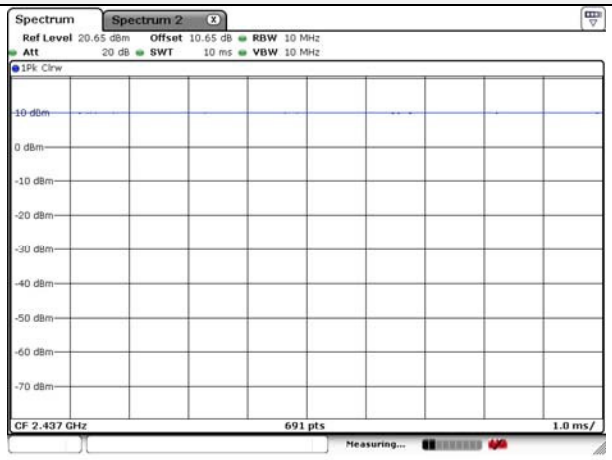
Test mode	T_{on} time (㎳)	Period (㎳)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (㏈)
802.11b	10.00	10.00	1	100	0
802.11g	10.00	10.00	1	100	0
802.11n(HT20)	10.00	10.00	1	100	0

`.

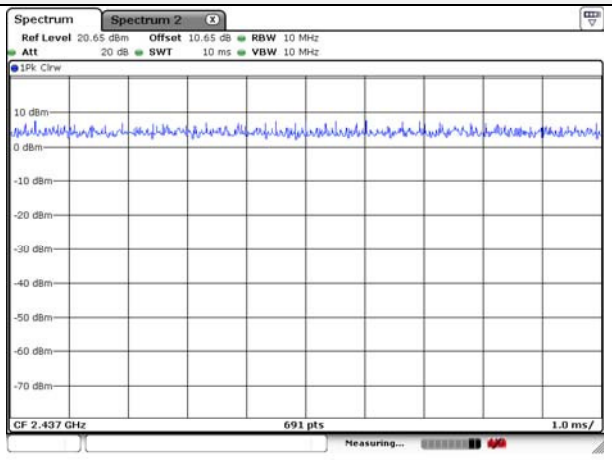
Duty cycle (Linear) = T_{on} time/Period

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

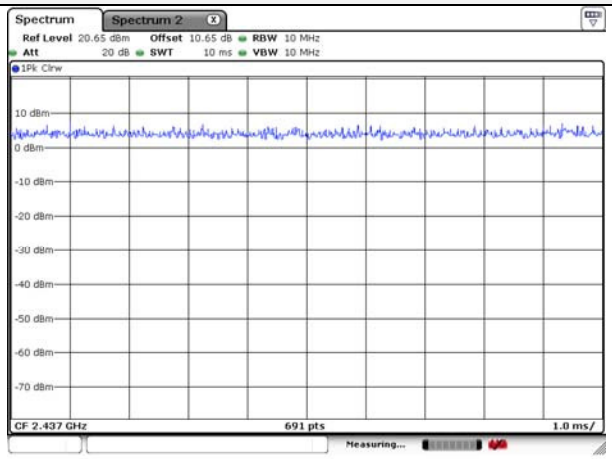
802.11b // Middle channel



802.11g // Middle channel



802.11n(HT20) // Middle channel



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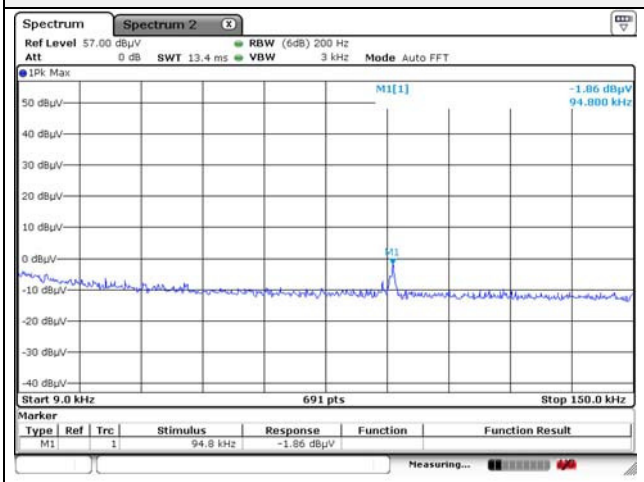
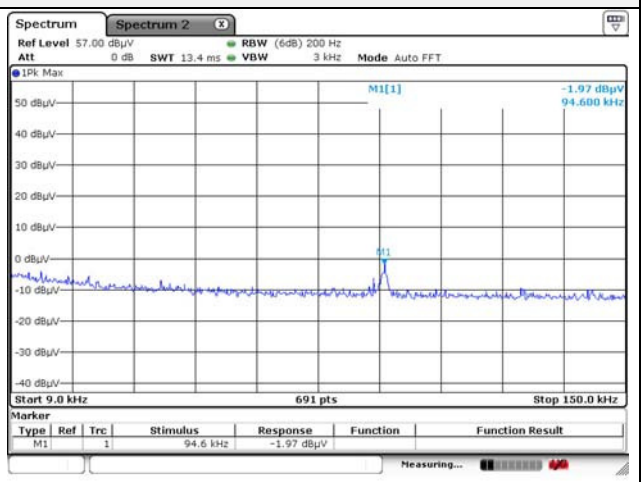
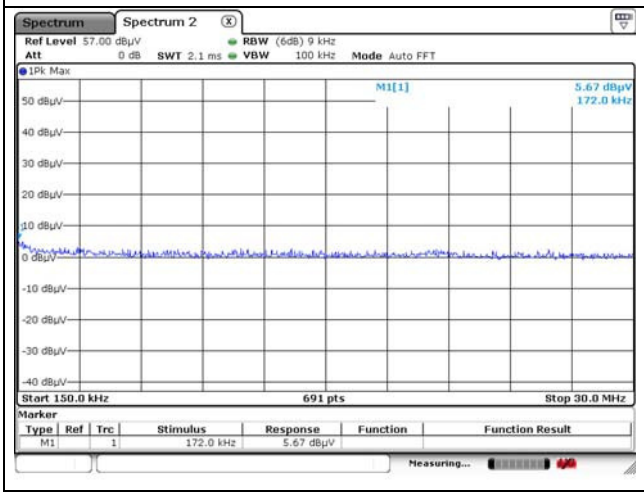
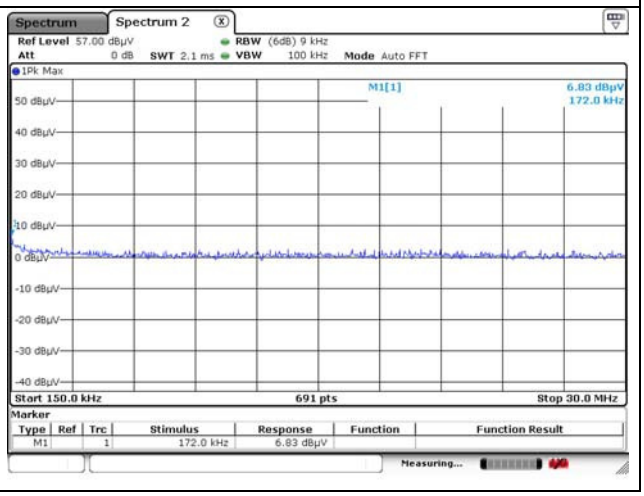
Test results (Below 30 ㎒) – Worst case

Mode: 802.11n_HT20(MIMO)

Distance of measurement: 3 meter

Channel: 1

Frequency (㎒)	Level (dBμV)	Ant. Pol. (H/V)	CF (dB)	F_d (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No spurious emissions were detected within 20 dB of the limit							

Horizontal	Vertical
	
	

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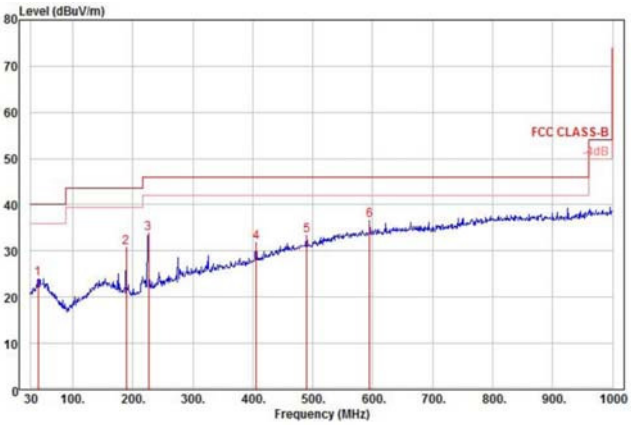
Test results (Below 1 000 ㎒) – Worst case

Mode: 802.11n_HT20(MIMO)

Distance of measurement: 3 meter

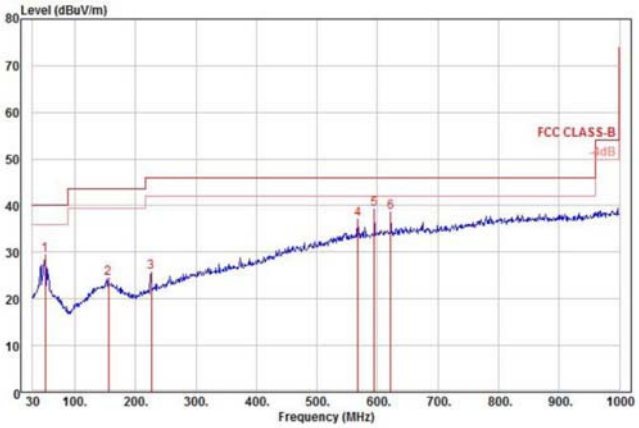
Channel: 6

Horizontal



	Freq	Level	Read Level	Ant Factor	Cable Loss	Preamp Factor	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV/m	dBuV	dB/m	dB	dB	dBuV/m	dB		
1	42.61	23.97	9.93	13.64	0.40	0.00	40.00	-16.03		horizontal
2	189.08	30.65	19.20	10.67	0.78	0.00	43.50	-12.85		horizontal
3	225.94	33.86	21.89	11.09	0.88	0.00	46.00	-12.14		horizontal
4	405.39	31.87	14.41	16.20	1.26	0.00	46.00	-14.13		horizontal
5	489.78	33.36	13.94	18.07	1.35	0.00	46.00	-12.64		horizontal
6 pp	594.54	36.73	14.95	20.26	1.52	0.00	46.00	-9.27		horizontal

Vertical



	Freq	Level	Read Level	Ant Factor	Cable Loss	Preamp Factor	Limit Line	Over Limit	Remark	Pol/Phase
	MHz	dBuV/m	dBuV	dB/m	dB	dB	dBuV/m	dB		
1	50.37	29.39	15.26	13.64	0.49	0.00	40.00	-10.61		vertical
2	155.13	24.41	10.64	13.03	0.74	0.00	43.50	-19.09		vertical
3	225.94	25.82	13.85	11.09	0.88	0.00	46.00	-20.18		vertical
4	567.38	37.15	15.90	19.69	1.56	0.00	46.00	-8.85		vertical
5 pp	594.54	39.23	17.45	20.26	1.52	0.00	46.00	-6.77		vertical
6	621.70	38.56	16.37	20.60	1.59	0.00	46.00	-7.44		vertical

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Test results (Above 1 000 ㎒)

Ant 1

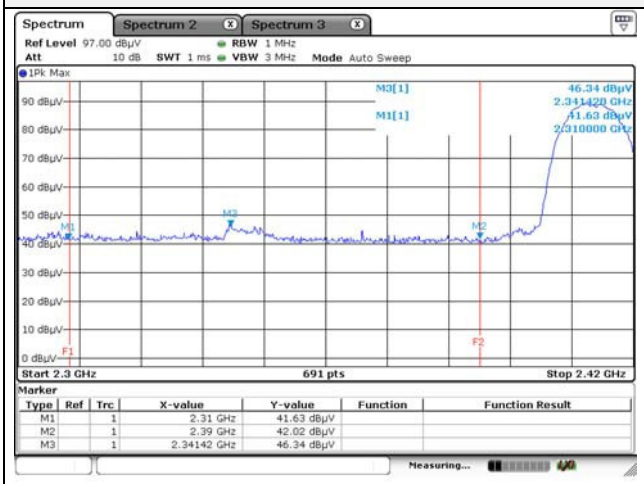
Mode: 802.11b

Distance of measurement: 3 meter

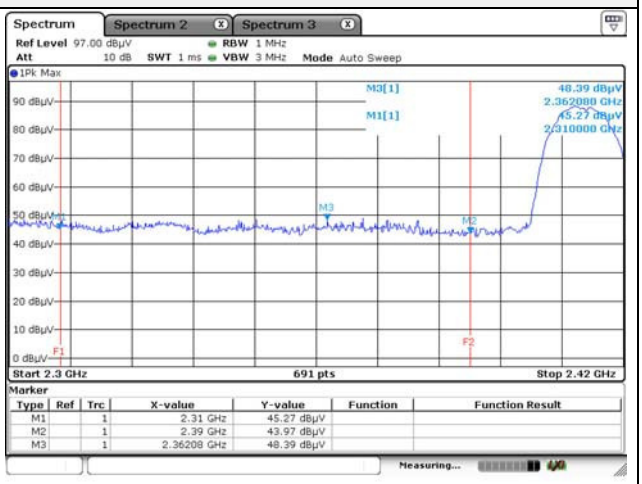
Channel: 01

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2341.42	46.34	Peak	H	-9.92	-	36.42	74.00	37.58
2362.08	48.39	Peak	V	-9.85	-	38.54	74.00	35.46

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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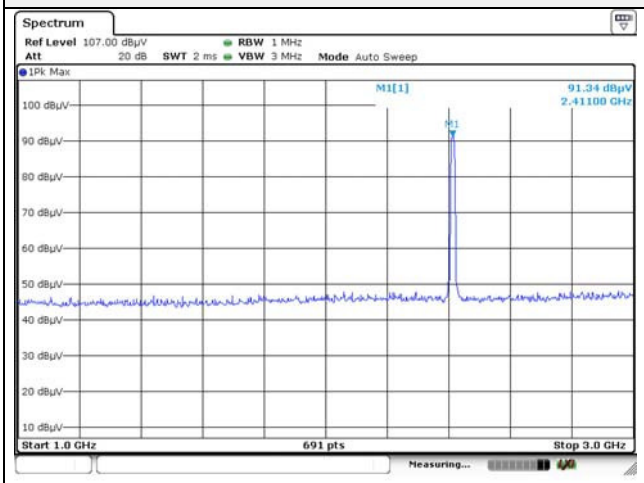
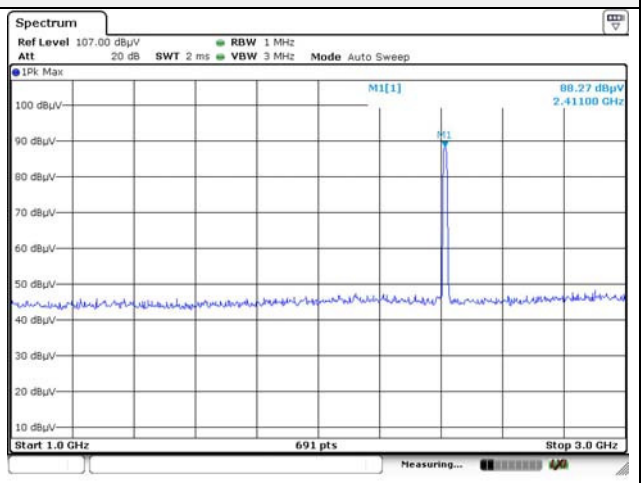
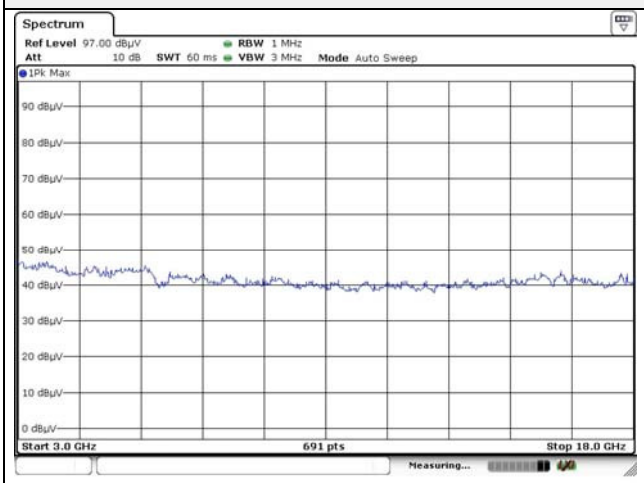
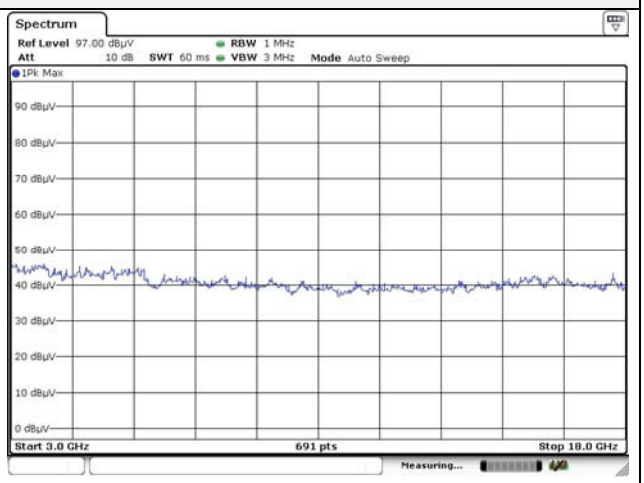
Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

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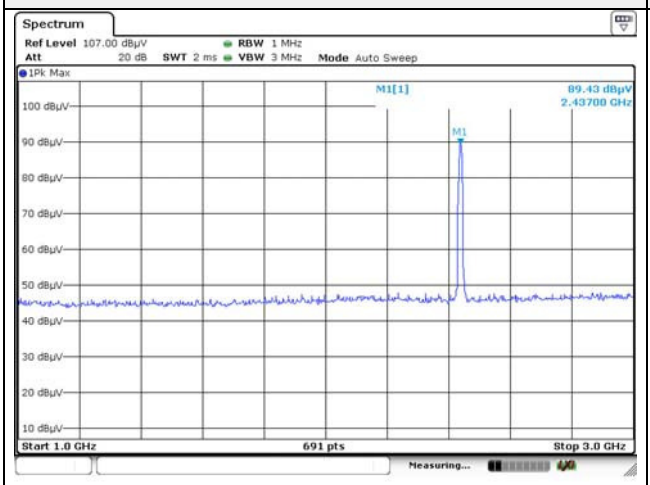
Mode: 802.11b

Distance of measurement: 3 meter

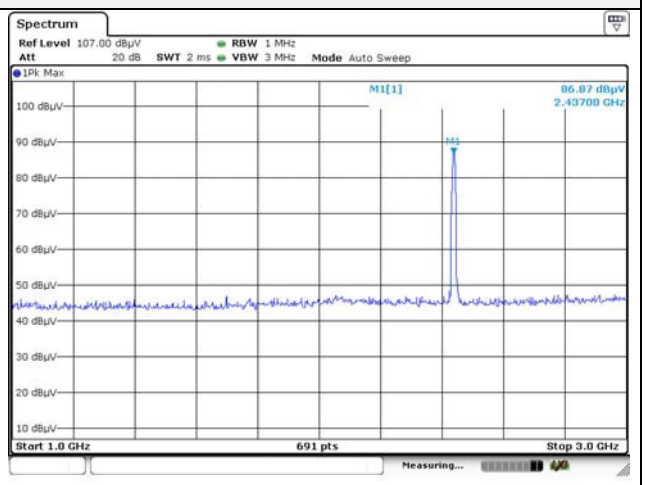
Channel: 06

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No spurious emission were detected above 3 ㎓.								

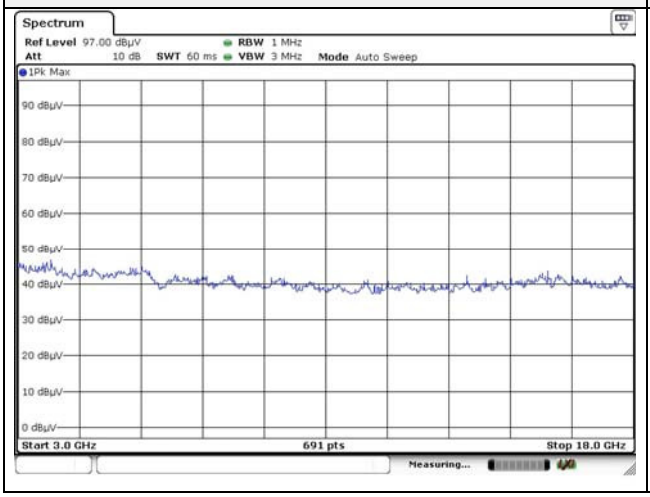
Horizontal // Peak for 1 ㎓ to 3 ㎓



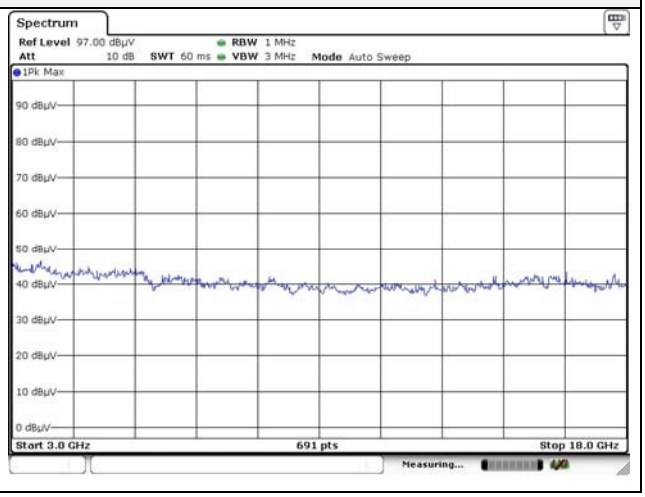
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



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The test results in the report only apply to the tested sample.

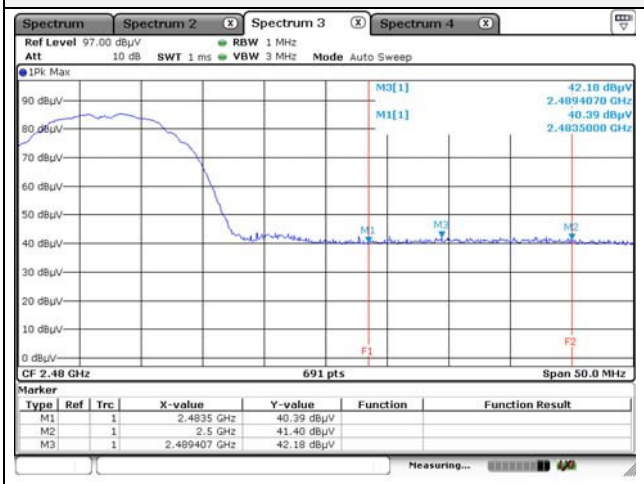
Mode: 802.11b

Distance of measurement: 3 meter

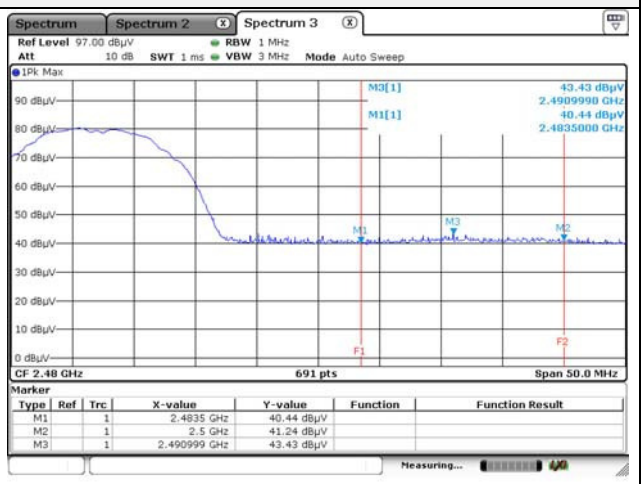
Channel: 11

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2489.41	42.18	Peak	H	-9.38	-	32.80	74.00	41.20
2491.00	43.43	Peak	V	-9.38	-	34.05	74.00	39.95

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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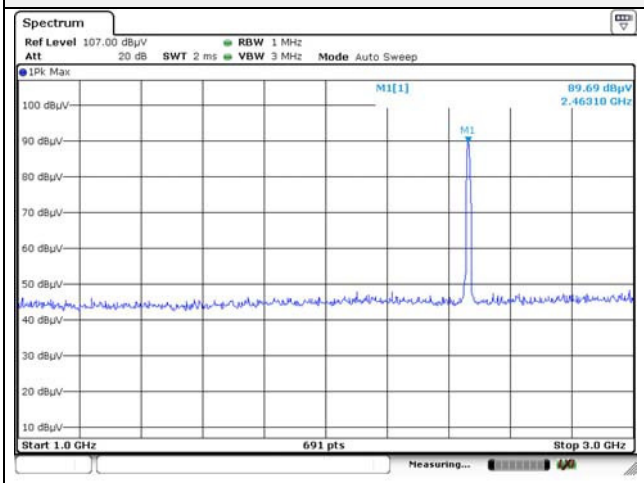
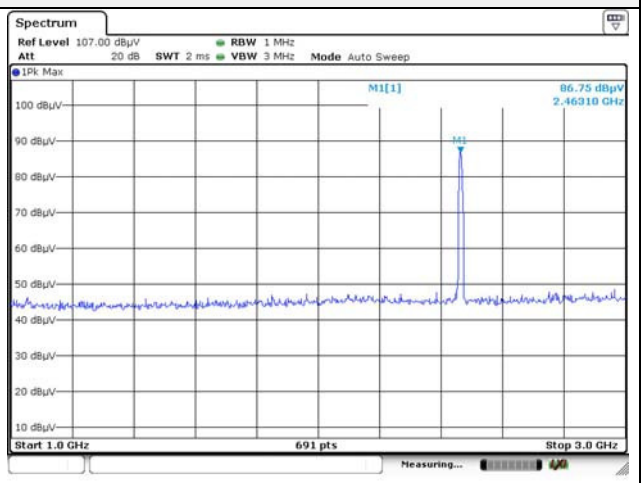
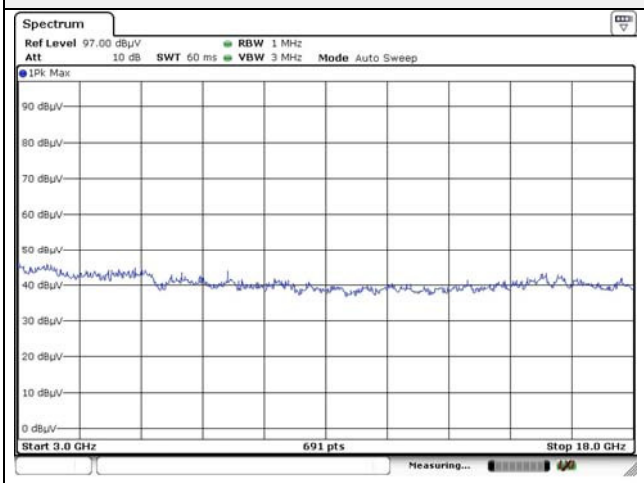
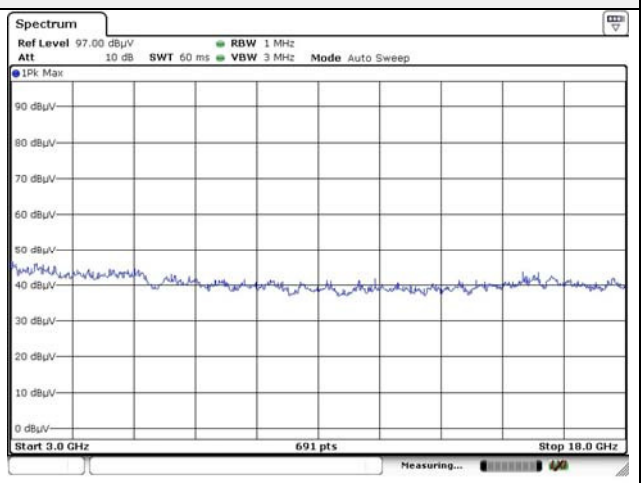
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.
1. No spurious emission were detected above 3 ㎓.

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The test results in the report only apply to the tested sample.

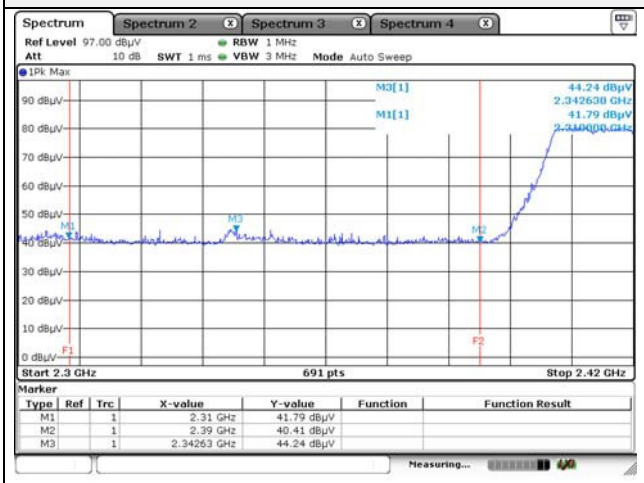
Mode: 802.11g

Distance of measurement: 3 meter

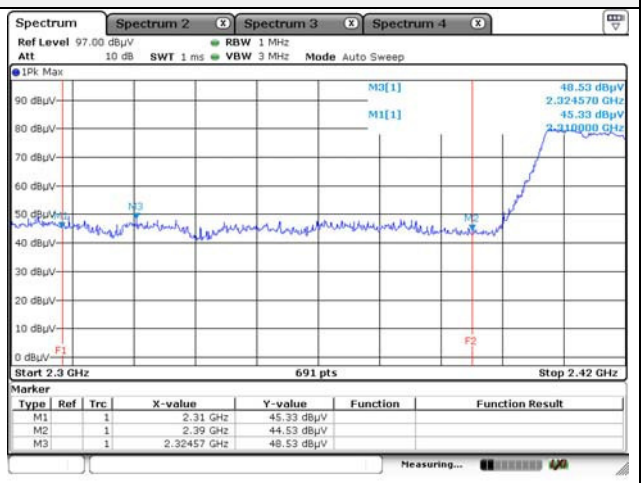
Channel: 01

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2342.63	44.24	Peak	H	-9.91	-	34.33	74.00	39.67
2324.57	48.53	Peak	V	-9.97	-	38.56	74.00	35.44

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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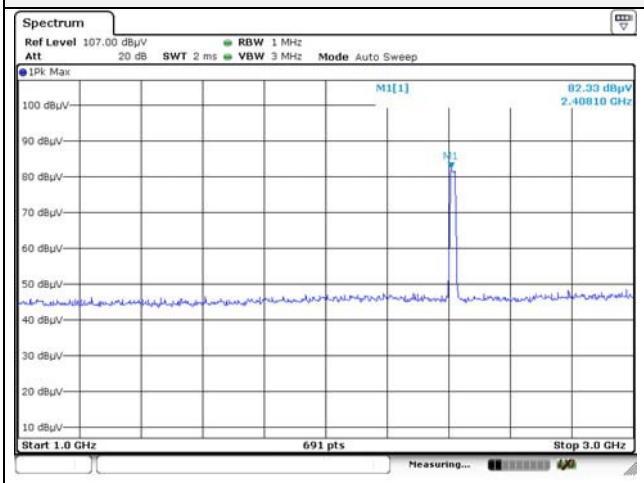
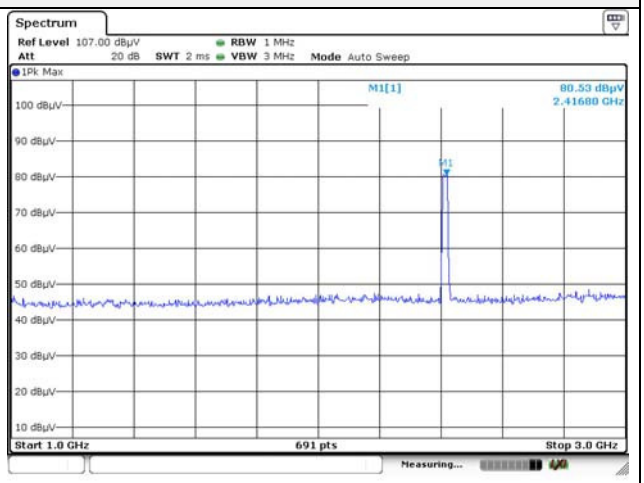
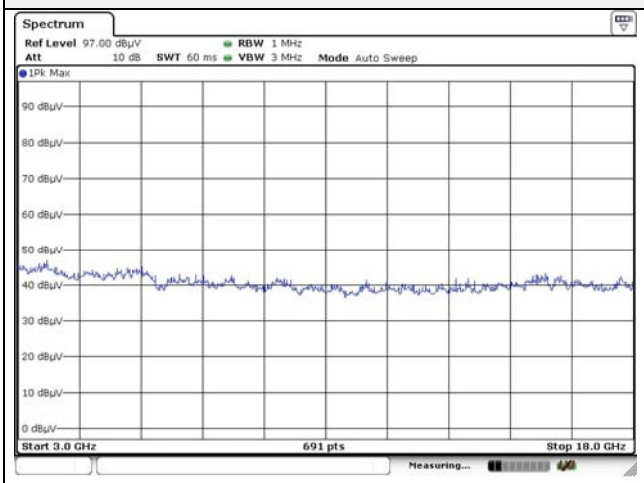
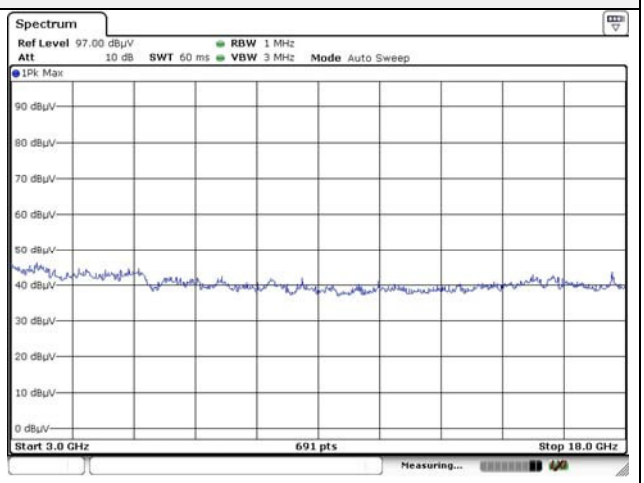
Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.

1. No spurious emission were detected above 3 ㎓.

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The test results in the report only apply to the tested sample.

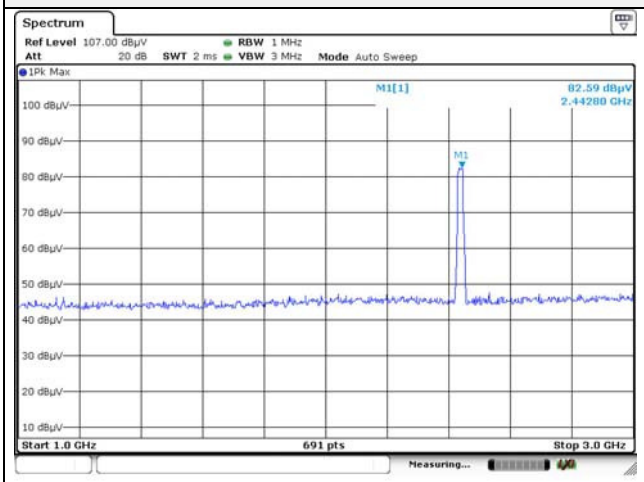
Mode: 802.11g

Distance of measurement: 3 meter

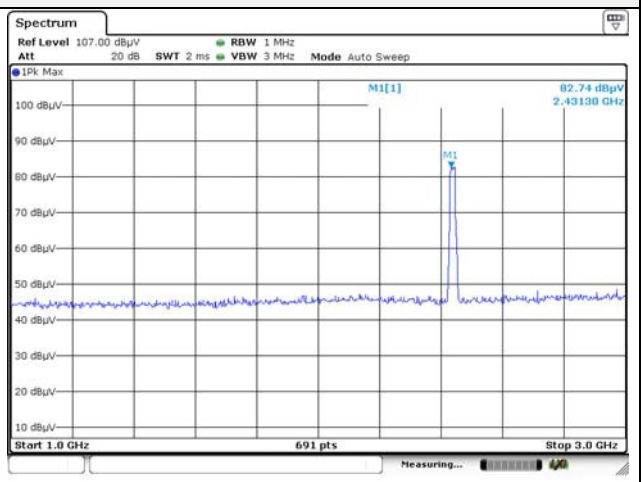
Channel: 06

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No spurious emission were detected above 3 ㎓.								

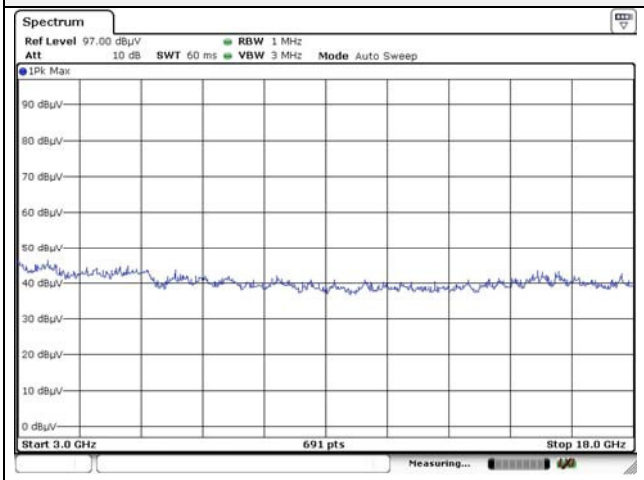
Horizontal // Peak for 1 ㎓ to 3 ㎓



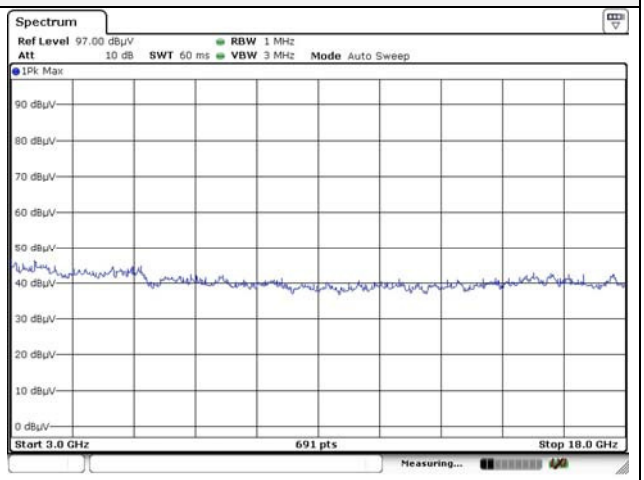
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



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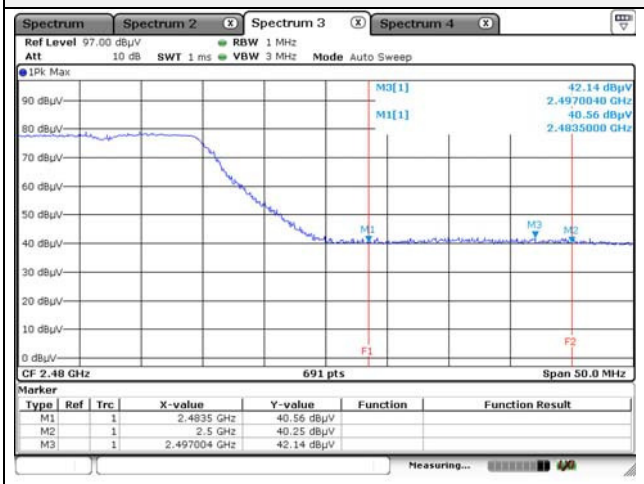
Mode: 802.11g

Distance of measurement: 3 meter

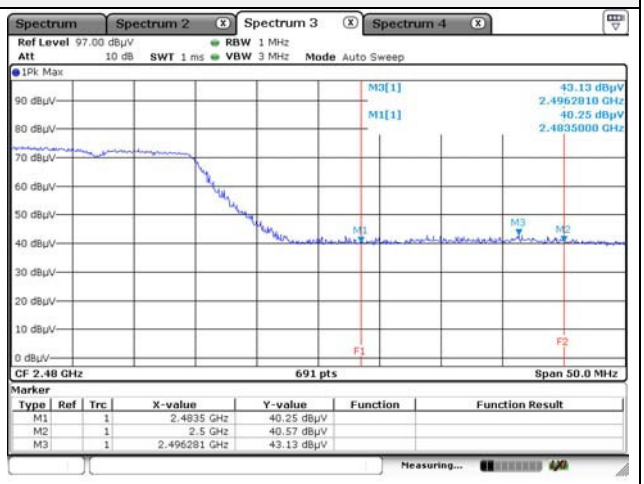
Channel: 11

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2497.00	42.14	Peak	H	-9.35	-	32.79	74.00	41.21
2496.28	43.13	Peak	V	-9.35	-	33.78	74.00	40.22

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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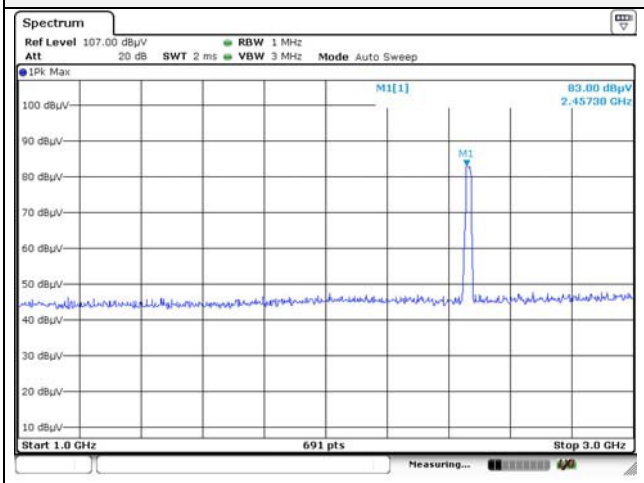
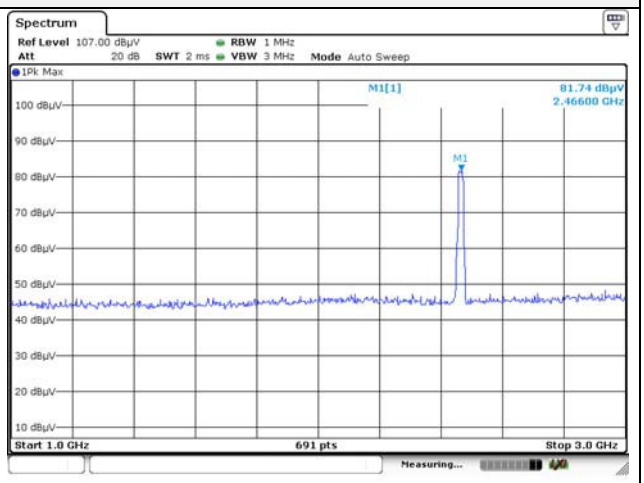
The test results in the report only apply to the tested sample.

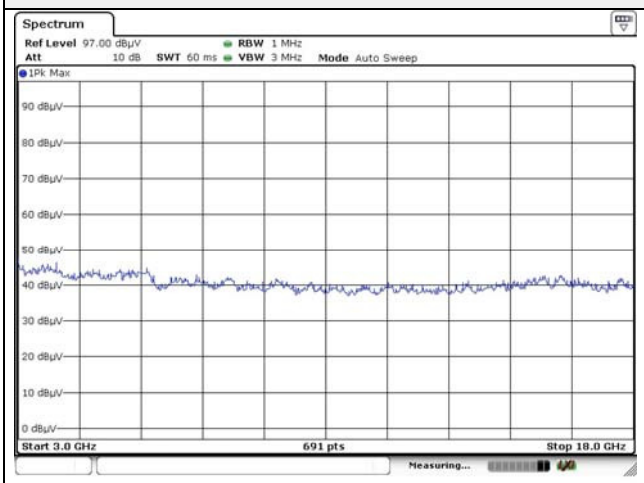
Horizontal // Peak for 1 ㎓ to 3 ㎓



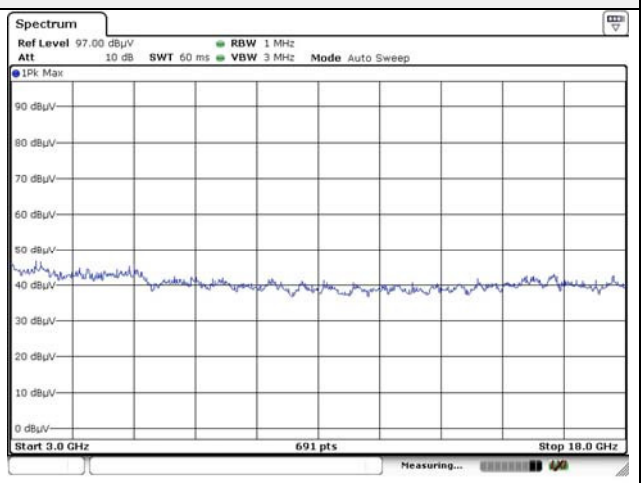
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.

1. No spurious emission were detected above 3 ㎓.

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The test results in the report only apply to the tested sample.

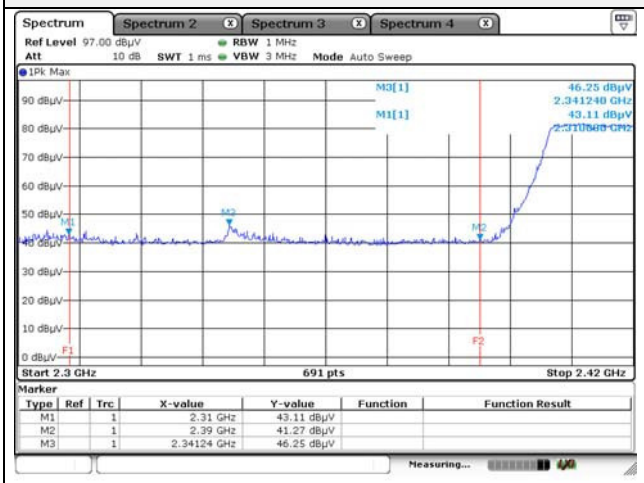
Mode: 802.11n(HT20)

Distance of measurement: 3 meter

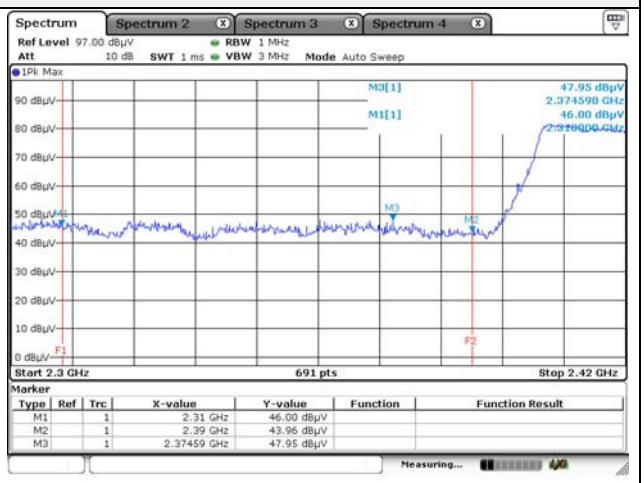
Channel: 01

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2341.24	46.25	Peak	H	-9.92	-	36.33	74.00	37.67
2374.59	47.95	Peak	V	-9.81	-	38.14	74.00	35.86

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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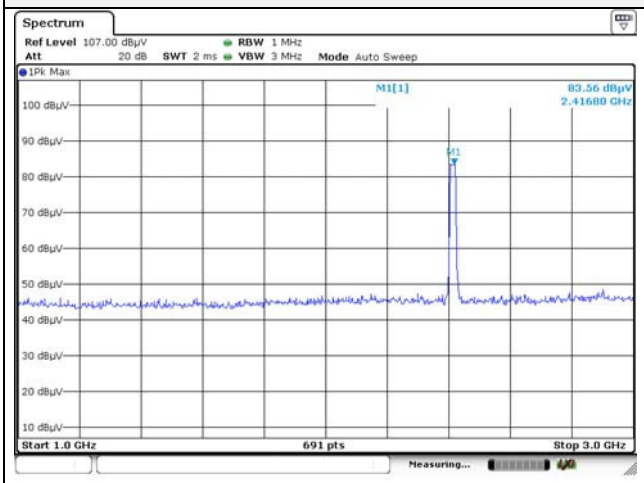
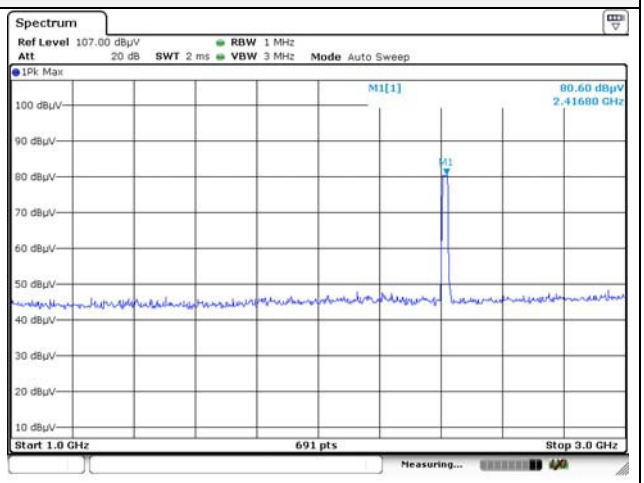
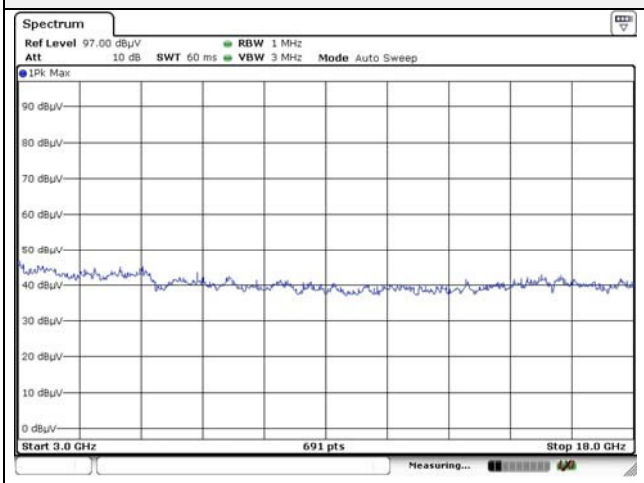
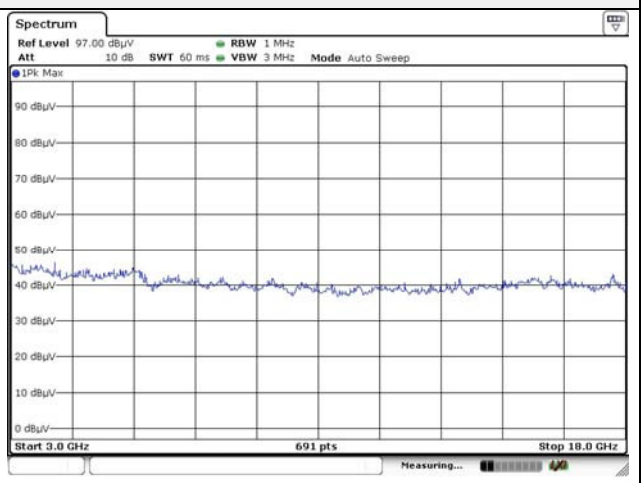
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.
1. No spurious emission were detected above 3 ㎓.

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The test results in the report only apply to the tested sample.

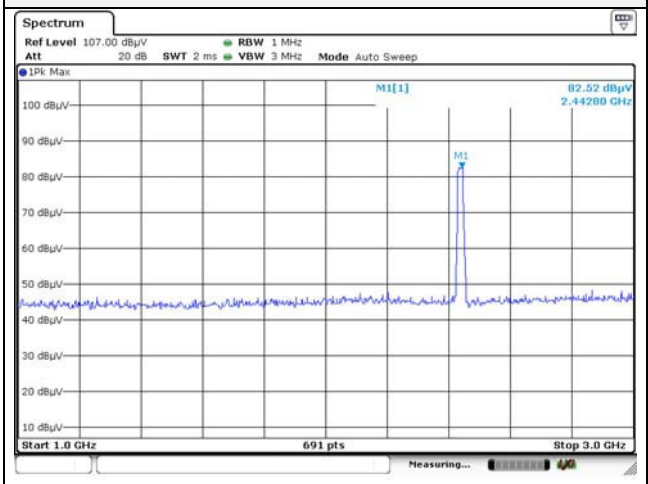
Mode: 802.11n(HT20)

Distance of measurement: 3 meter

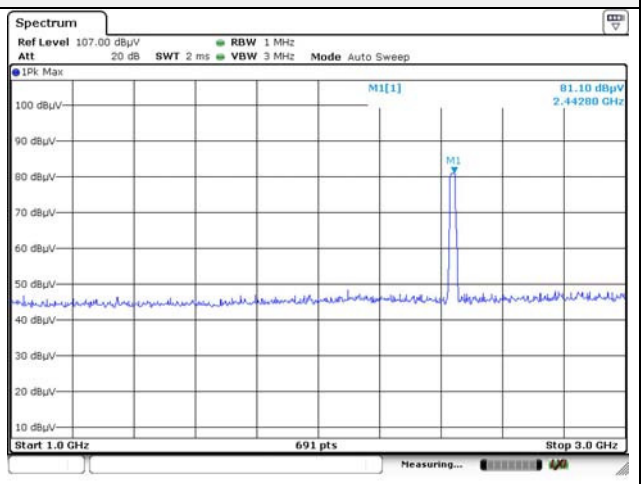
Channel: 06

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No spurious emission were detected above 3 ㎓.								

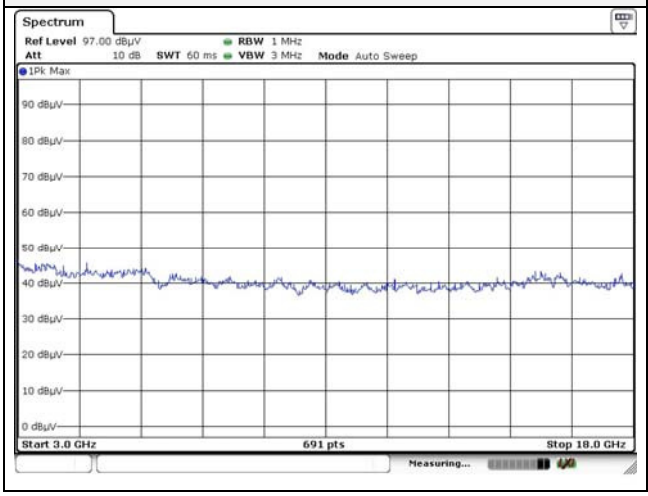
Horizontal // Peak for 1 ㎓ to 3 ㎓



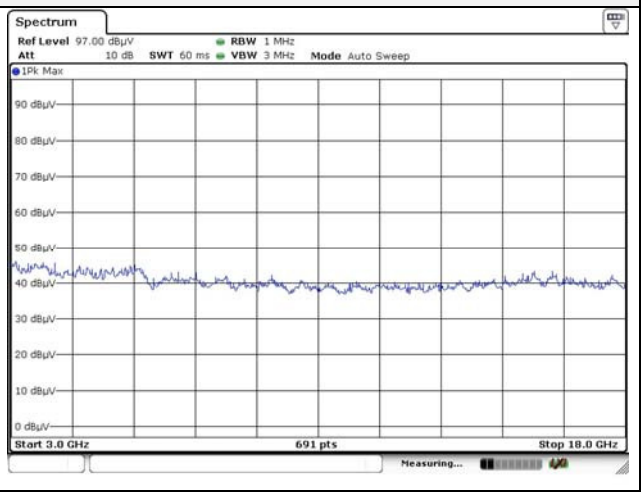
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



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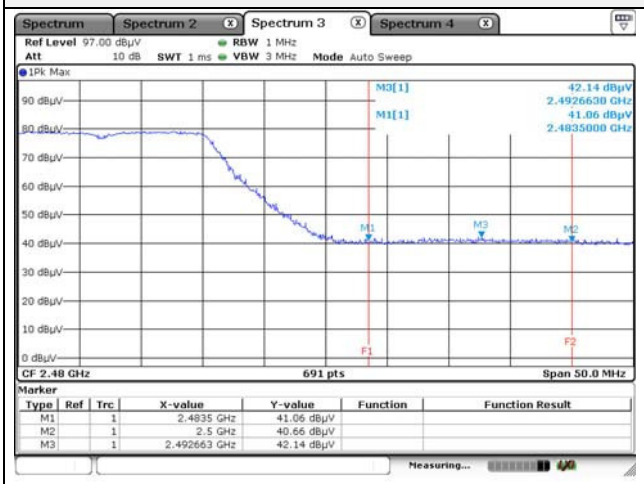
Mode: 802.11n(HT20)

Distance of measurement: 3 meter

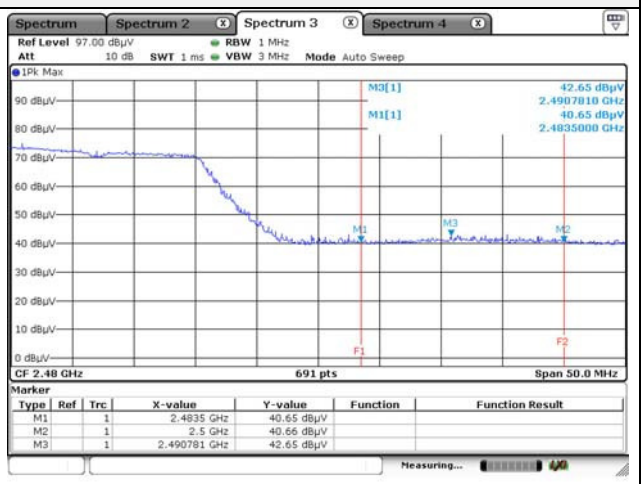
Channel: 11

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2492.66	42.14	Peak	H	-9.37	-	32.77	74.00	41.23
2490.78	42.65	Peak	V	-9.38	-	33.27	74.00	40.73

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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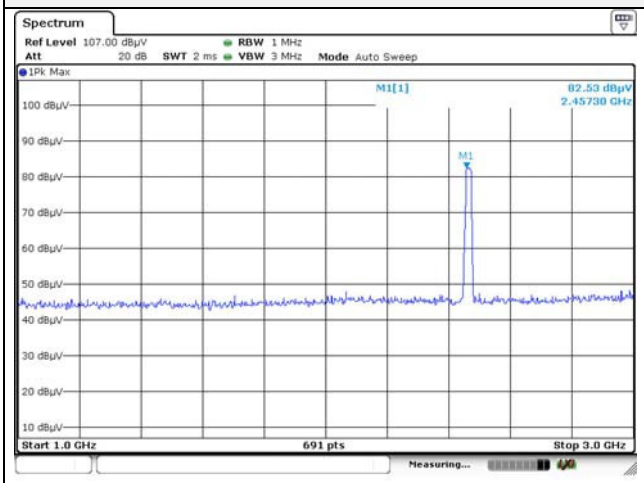
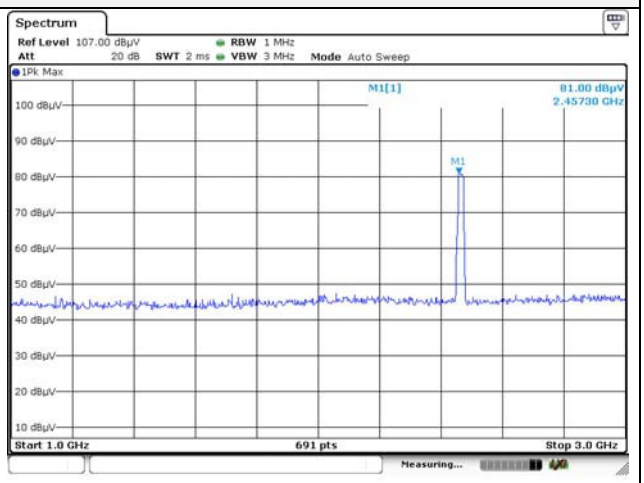
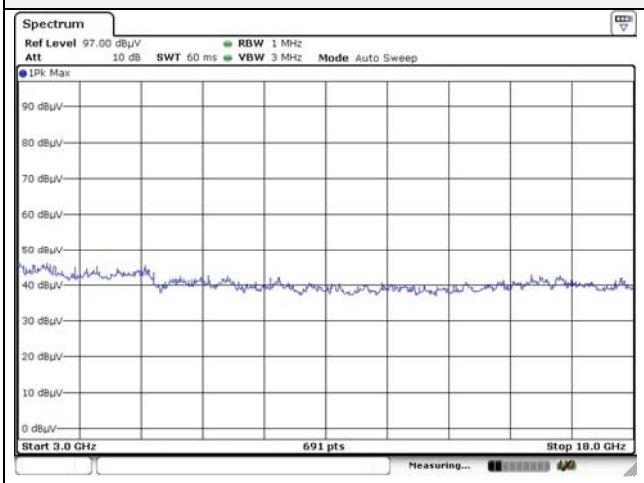
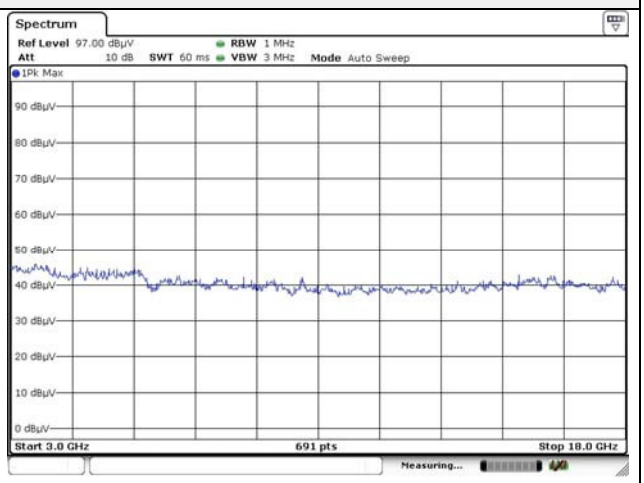
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.
1. No spurious emission were detected above 3 ㎓.

Ant 2

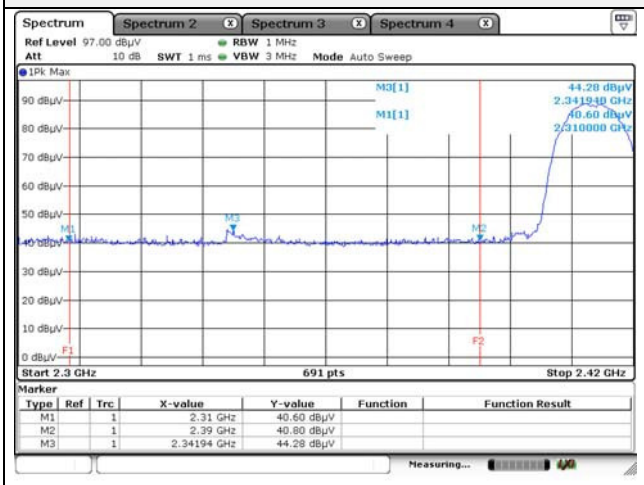
Mode: 802.11b

Distance of measurement: 3 meter

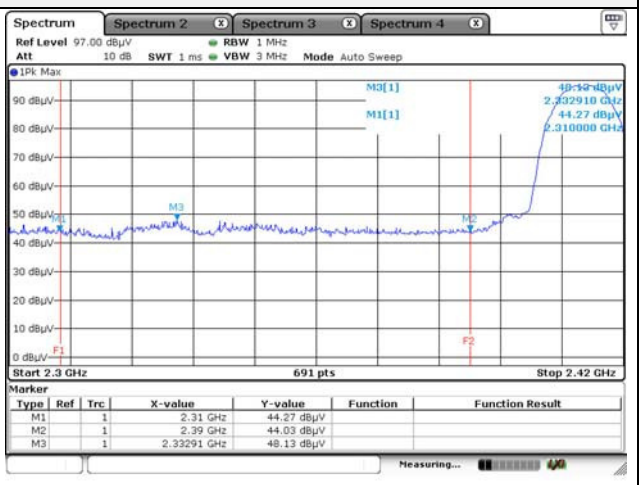
Channel: 01

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2341.94	44.28	Peak	H	-9.91	-	34.37	74.00	39.63
2332.91	48.13	Peak	V	-9.94	-	38.19	74.00	35.81

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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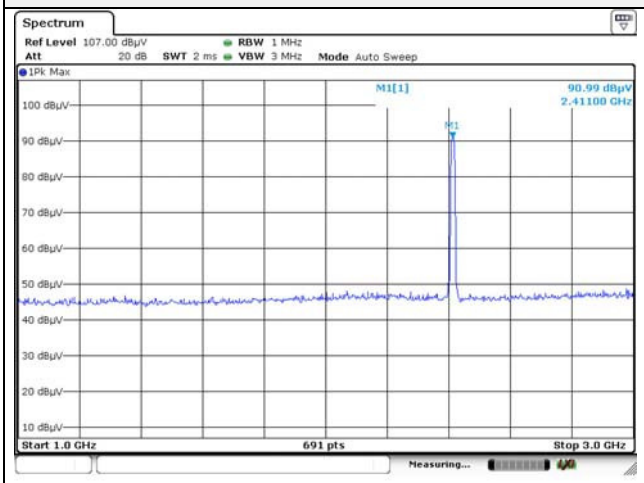
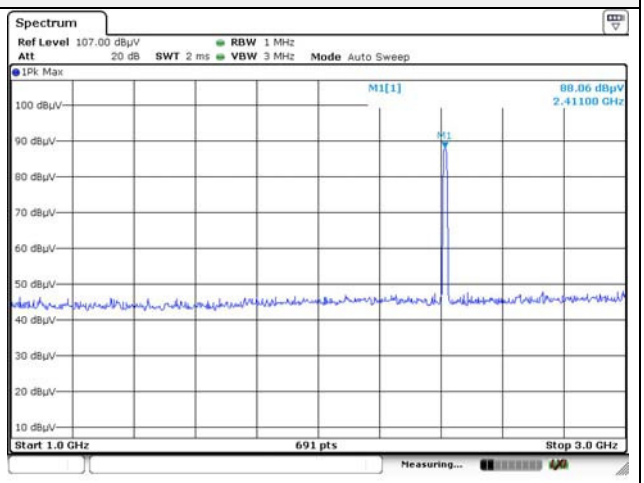
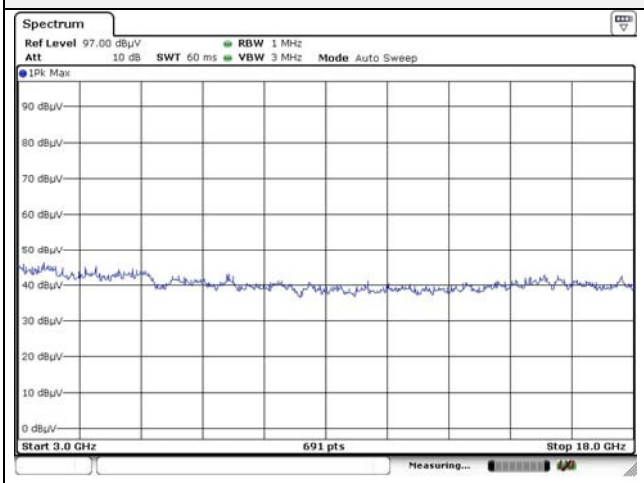
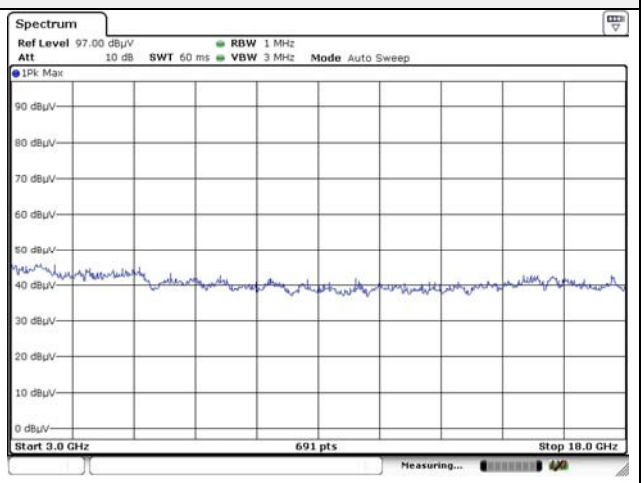
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

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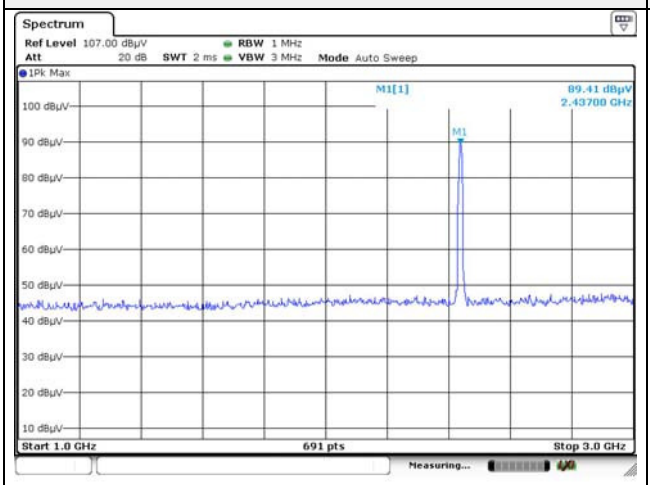
Mode: 802.11b

Distance of measurement: 3 meter

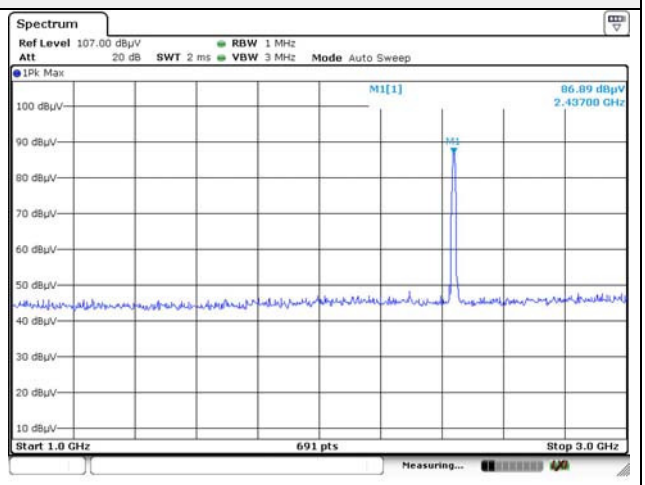
Channel: 06

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No spurious emission were detected above 3 ㎓.								

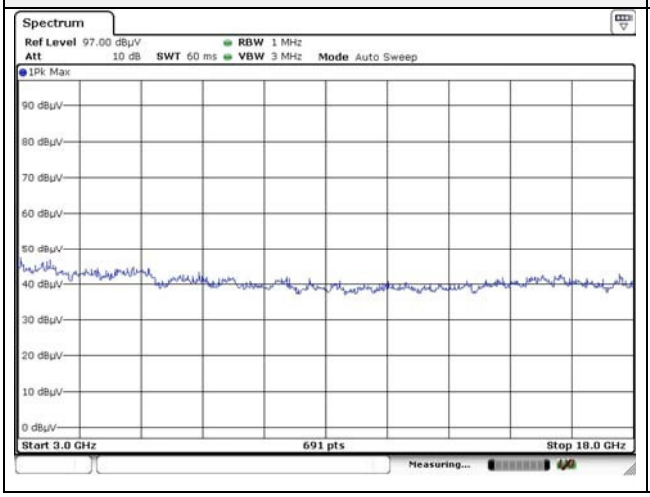
Horizontal // Peak for 1 ㎓ to 3 ㎓



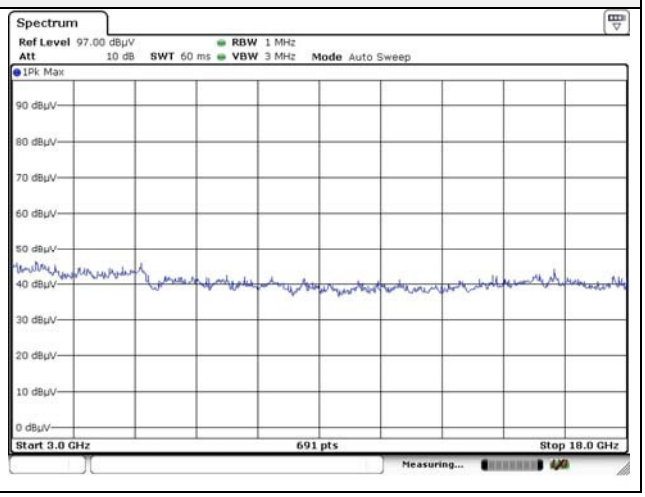
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



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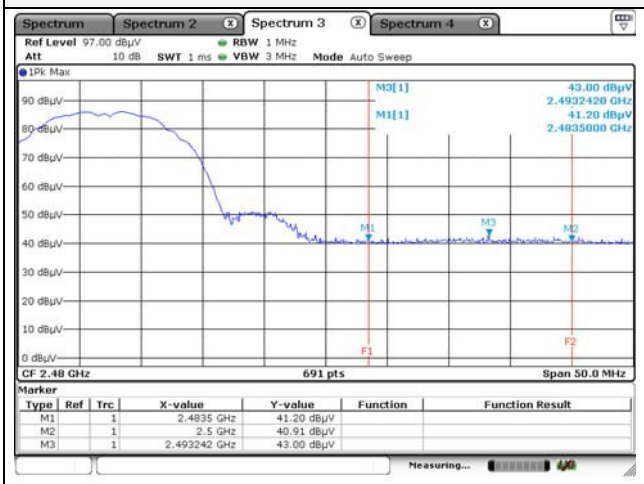
Mode: 802.11b

Distance of measurement: 3 meter

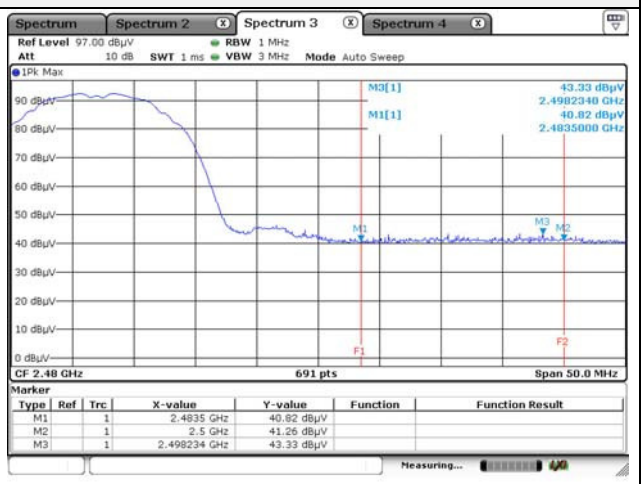
Channel: 11

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2493.24	43.00	Peak	H	-9.37	-	33.63	74.00	40.37
2498.23	43.33	Peak	V	-9.35	-	33.98	74.00	40.02

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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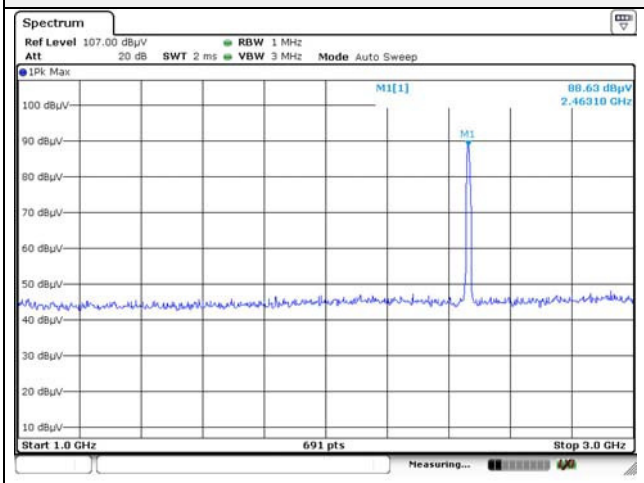
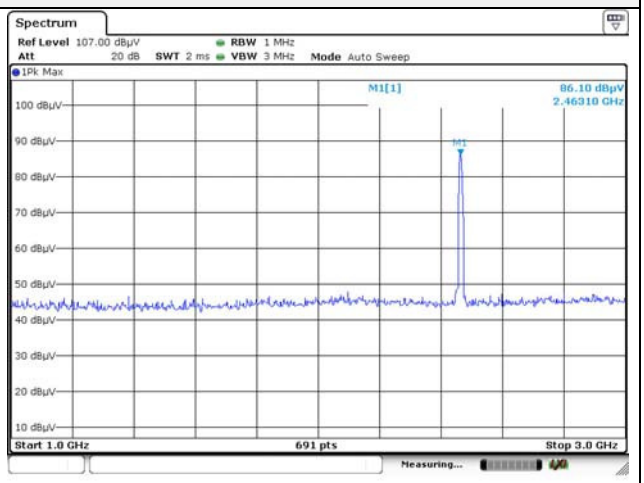
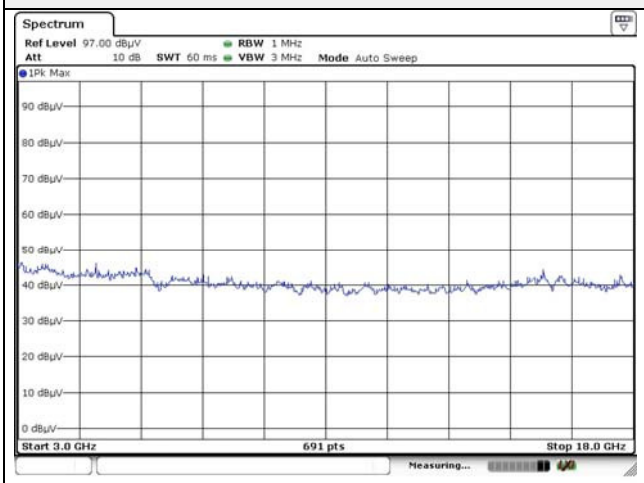
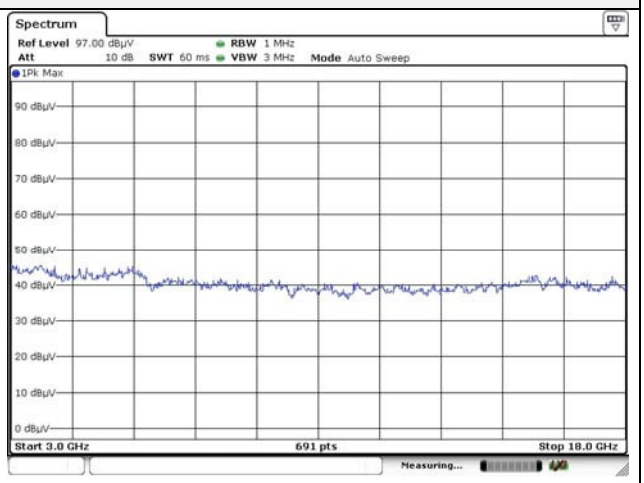
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.

1. No spurious emission were detected above 3 ㎓.

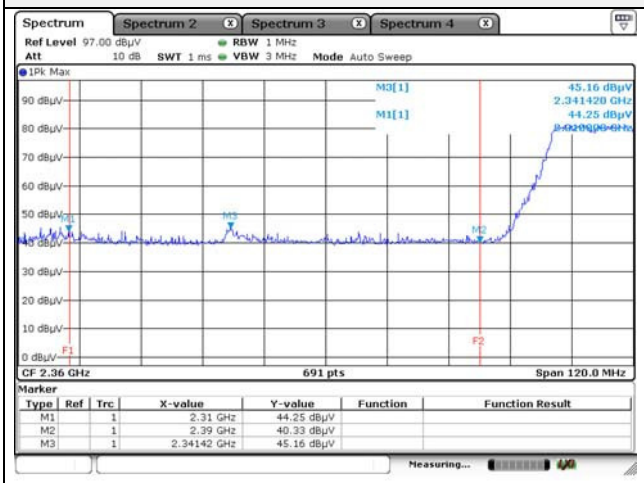
Mode: 802.11g

Distance of measurement: 3 meter

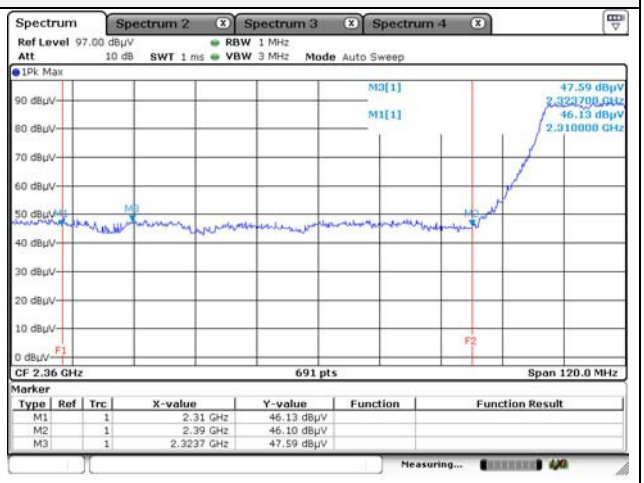
Channel: 01

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2341.42	45.16	Peak	H	-9.92	-	35.24	74.00	38.76
2323.70	47.59	Peak	V	-9.97	-	37.62	74.00	36.38

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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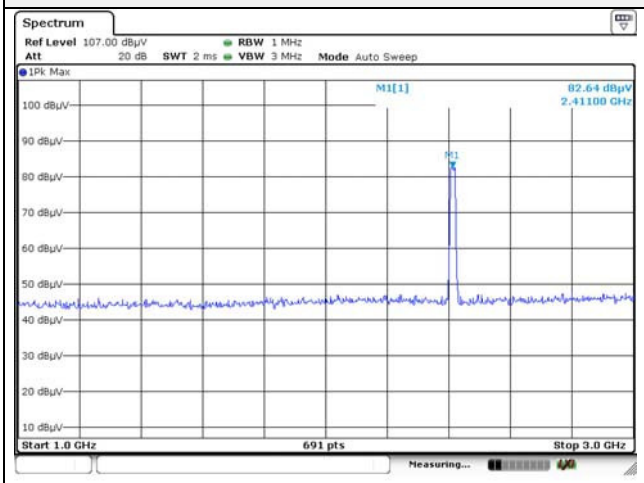
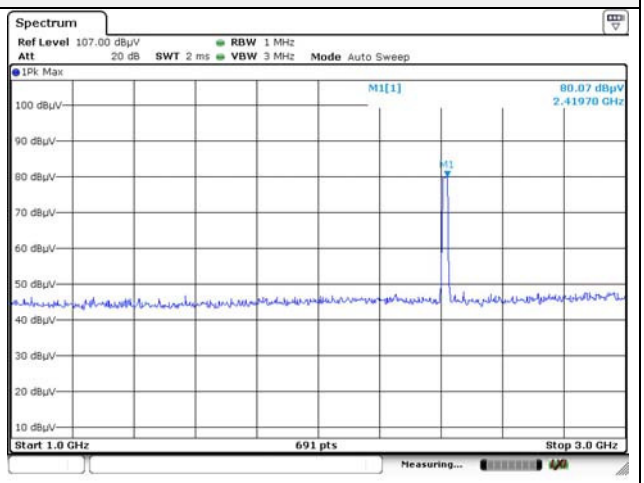
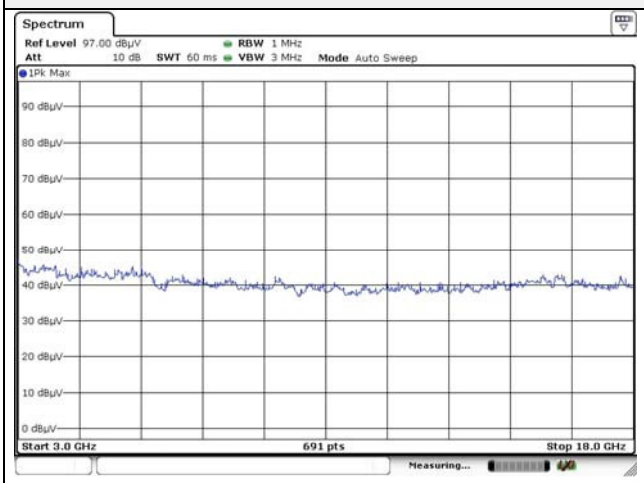
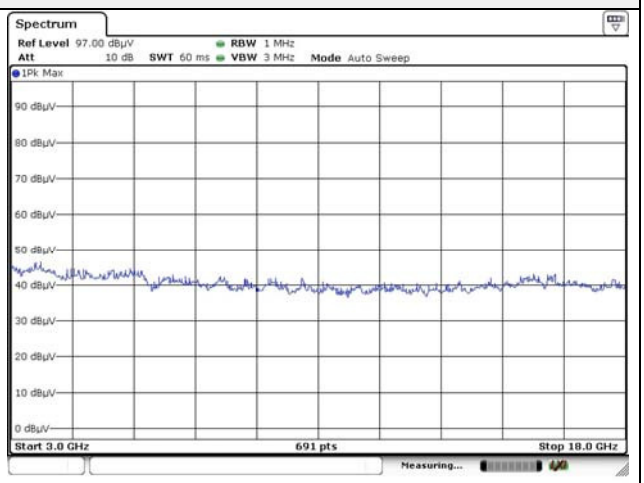
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.
1. No spurious emission were detected above 3 ㎓.

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The test results in the report only apply to the tested sample.

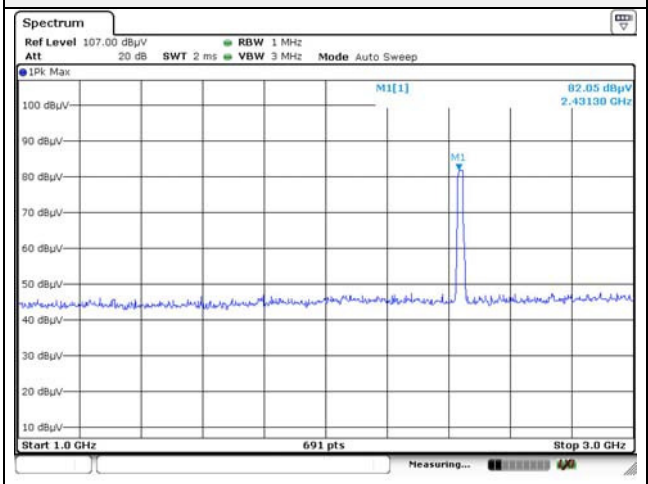
Mode: 802.11g

Distance of measurement: 3 meter

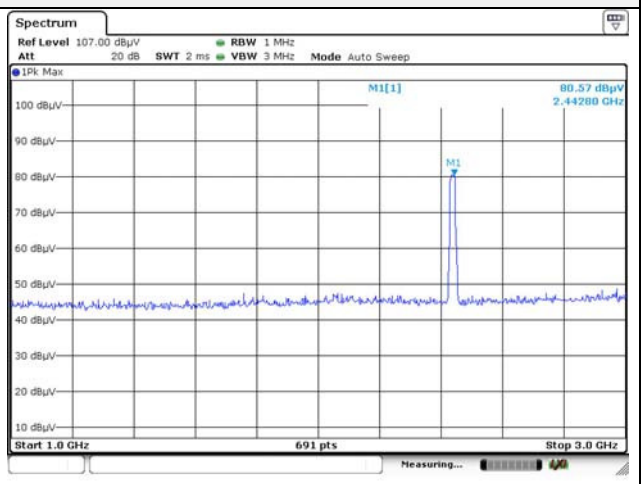
Channel: 06

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No spurious emission were detected above 3 ㎓.								

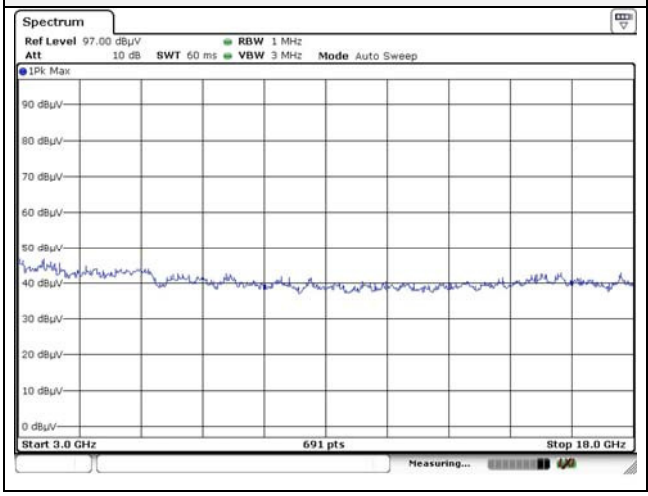
Horizontal // Peak for 1 ㎓ to 3 ㎓



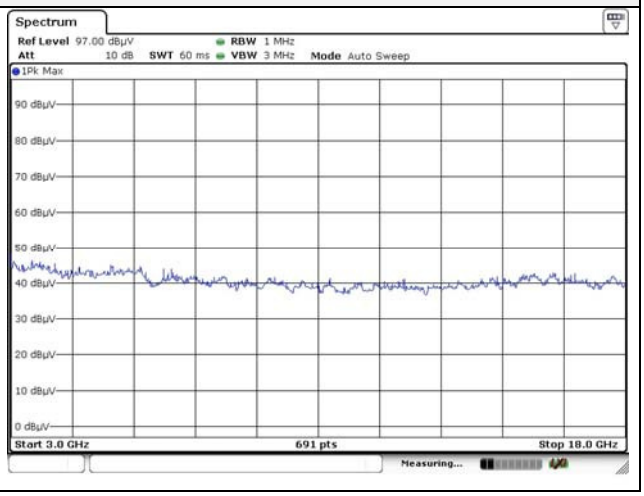
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



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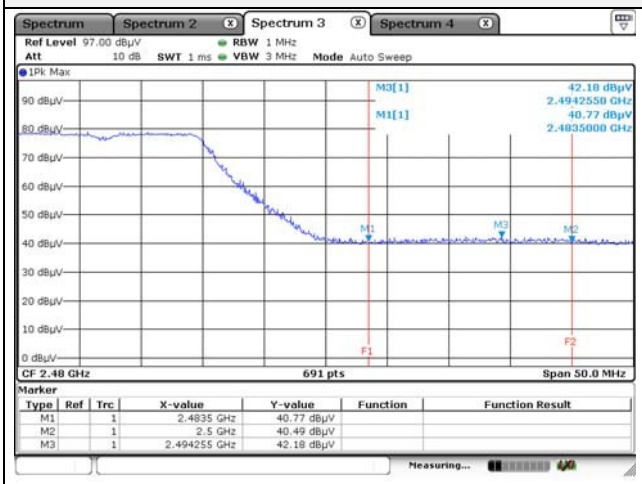
Mode: 802.11g

Distance of measurement: 3 meter

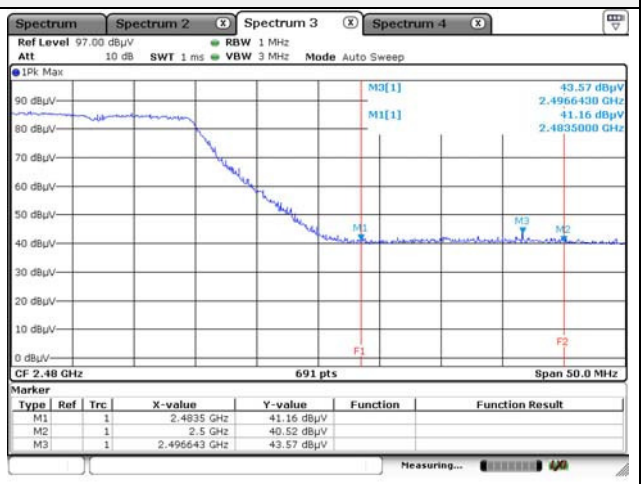
Channel: 11

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2494.26	42.18	Peak	H	-9.36	-	32.82	74.00	41.18
2496.64	43.57	Peak	V	-9.35	-	34.22	74.00	39.78

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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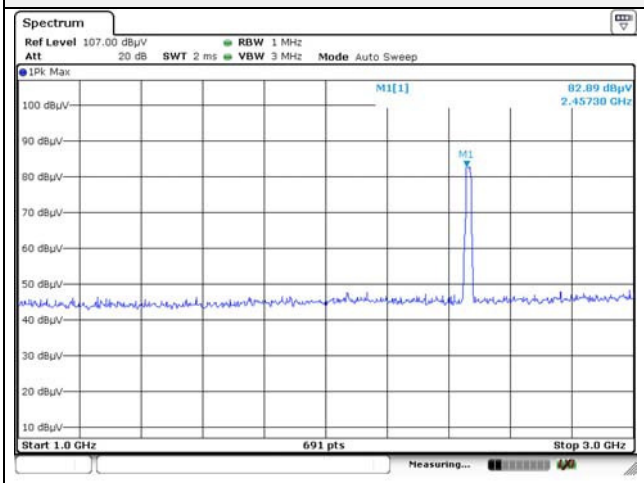
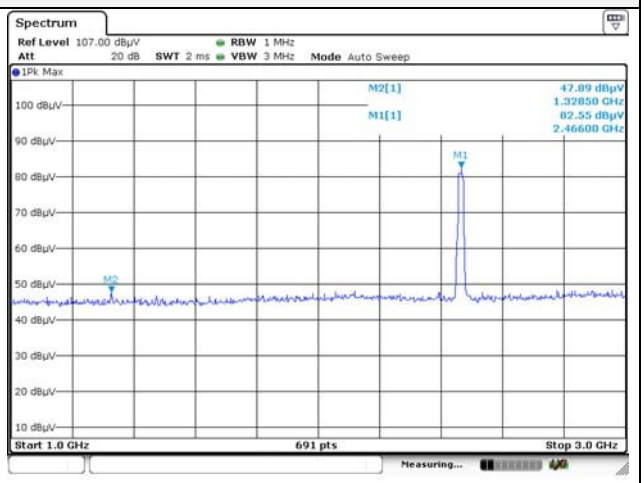
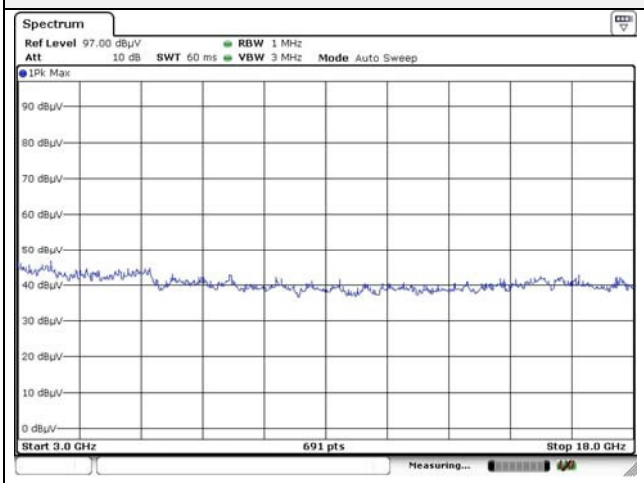
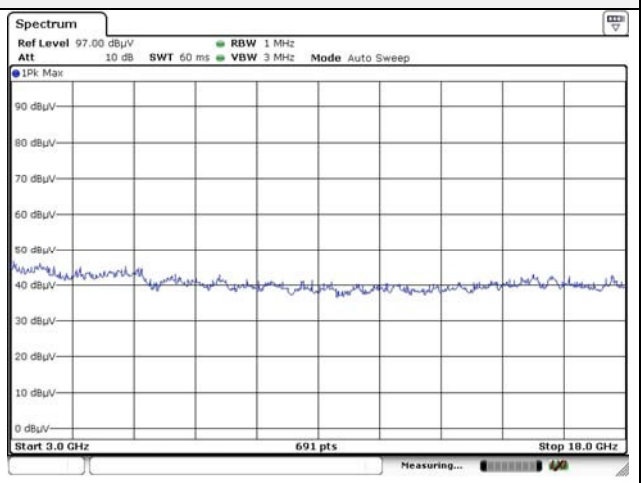
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.

1. No spurious emission were detected above 3 ㎓.

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The test results in the report only apply to the tested sample.

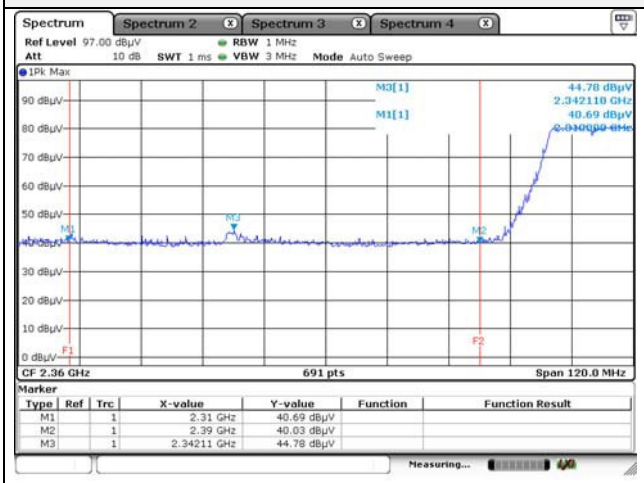
Mode: 802.11n(HT20)

Distance of measurement: 3 meter

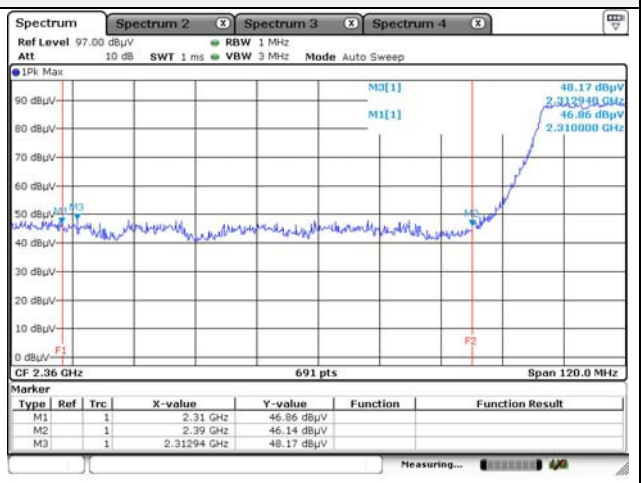
Channel: 01

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2342.11	44.78	Peak	H	-9.91	-	34.87	74.00	39.13
2312.94	48.17	Peak	V	-10.00	-	38.17	74.00	35.83

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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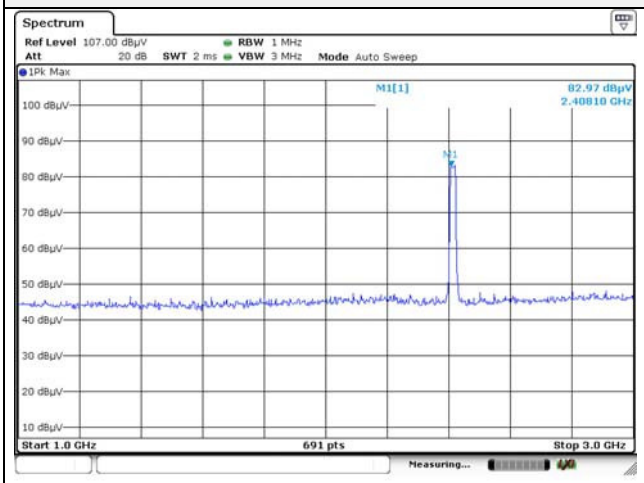
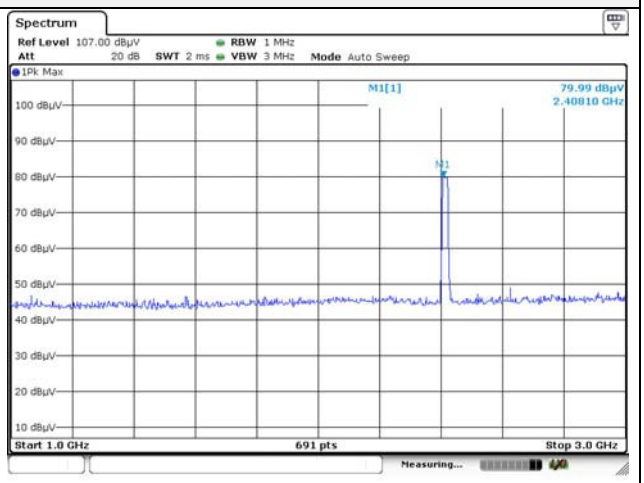
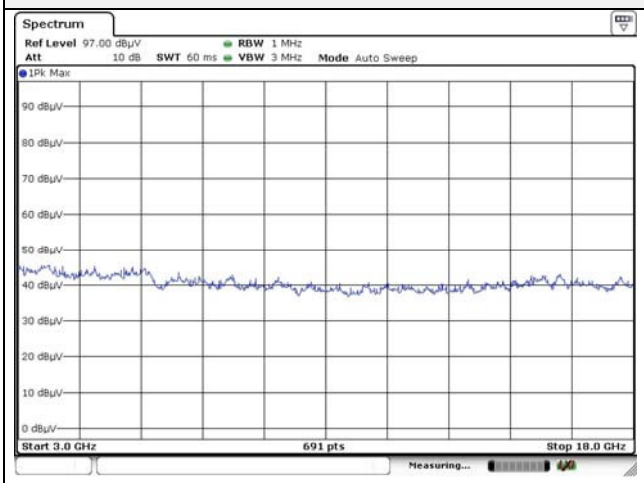
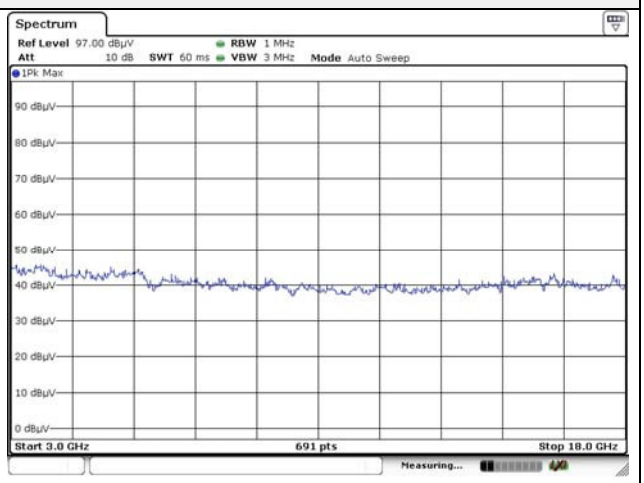
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.
1. No spurious emission were detected above 3 ㎓.

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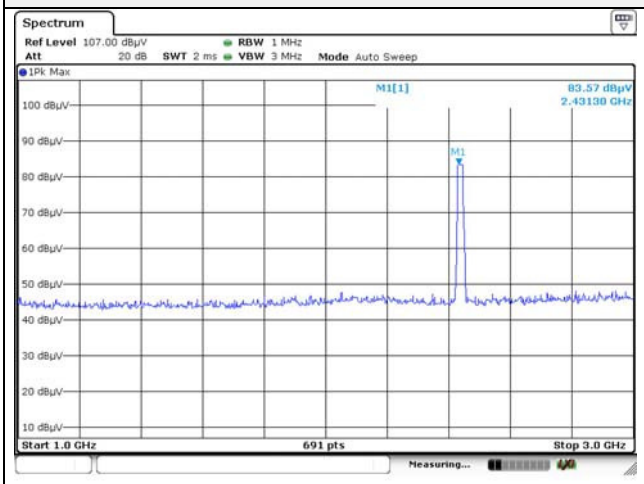
Mode: 802.11n(HT20)

Distance of measurement: 3 meter

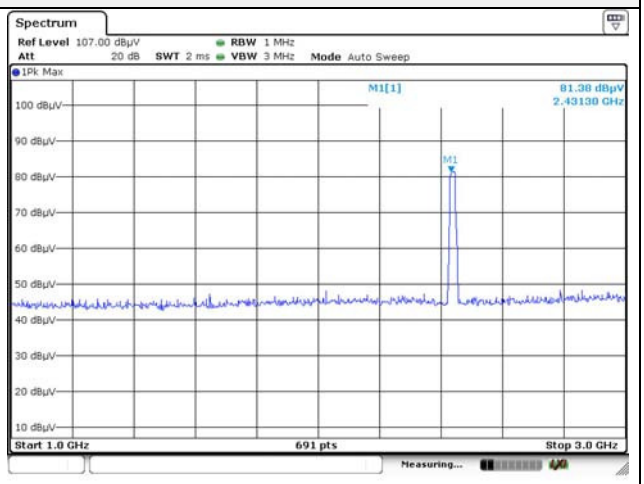
Channel: 06

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No spurious emission were detected above 3 ㎓.								

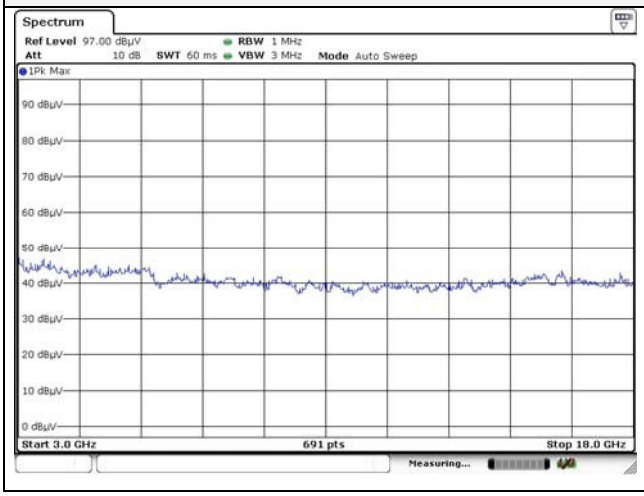
Horizontal // Peak for 1 ㎓ to 3 ㎓



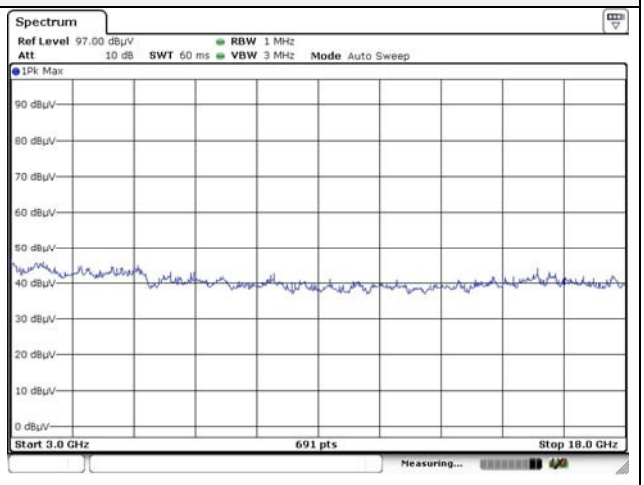
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



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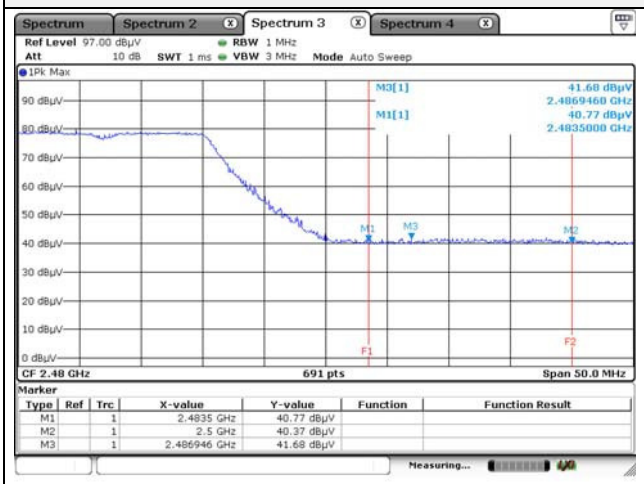
Mode: 802.11n(HT20)

Distance of measurement: 3 meter

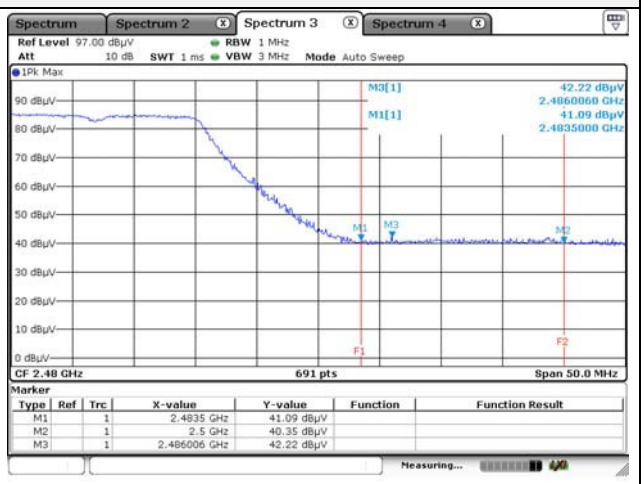
Channel: 11

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2486.95	41.68	Peak	H	-9.39	-	32.29	74.00	41.71
2486.01	42.22	Peak	V	-9.40	-	32.82	74.00	41.18

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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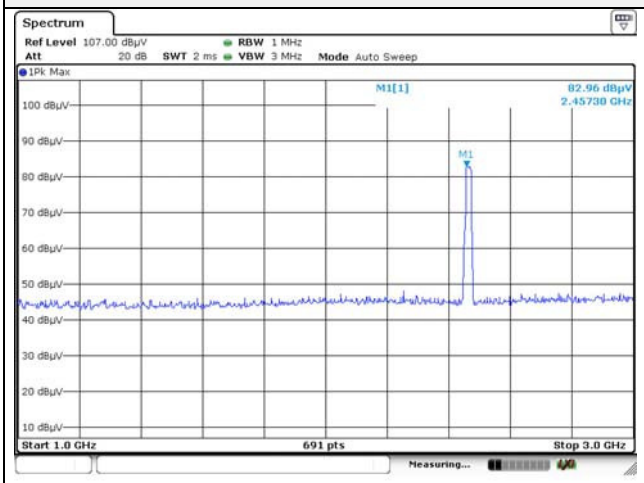
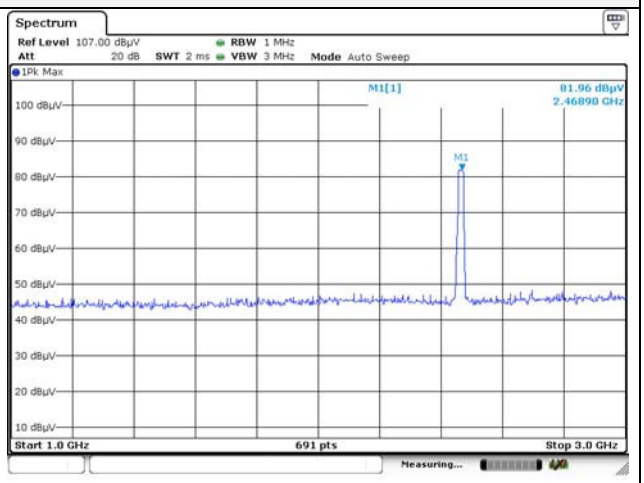
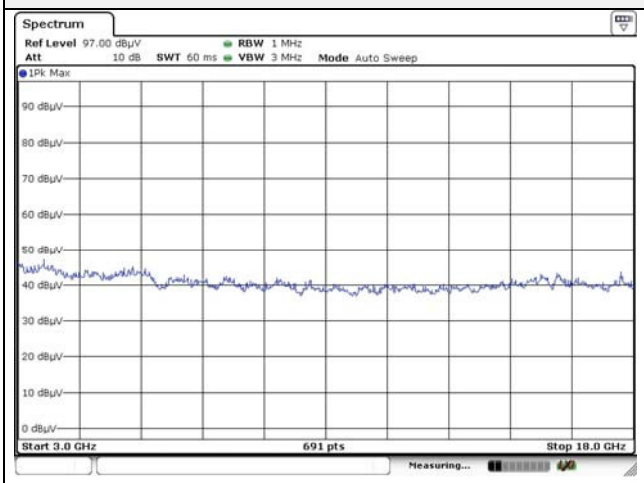
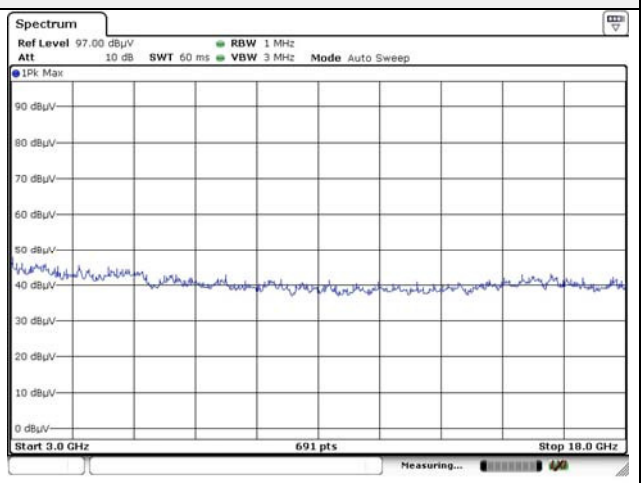
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.
1. No spurious emission were detected above 3 ㎓.

MIMO

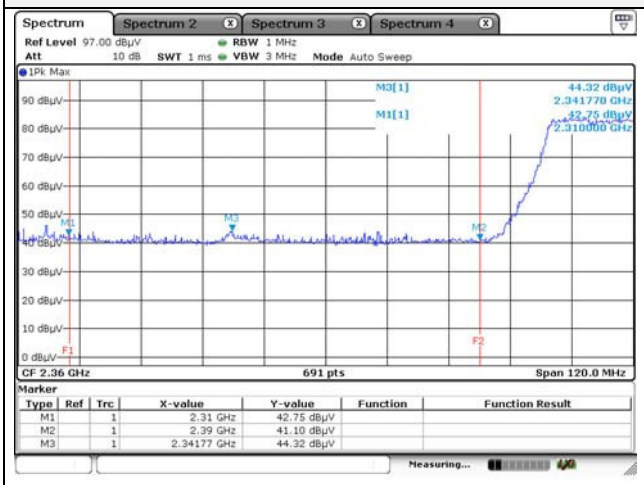
Mode: 802.11n(HT20)

Distance of measurement: 3 meter

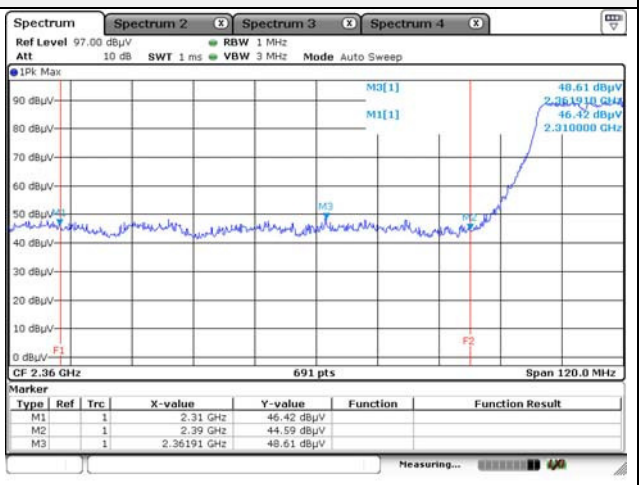
Channel: 01

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2341.77	44.32	Peak	H	-9.91	-	34.41	74.00	39.59
2361.91	48.61	Peak	V	-9.85	-	38.76	74.00	35.24

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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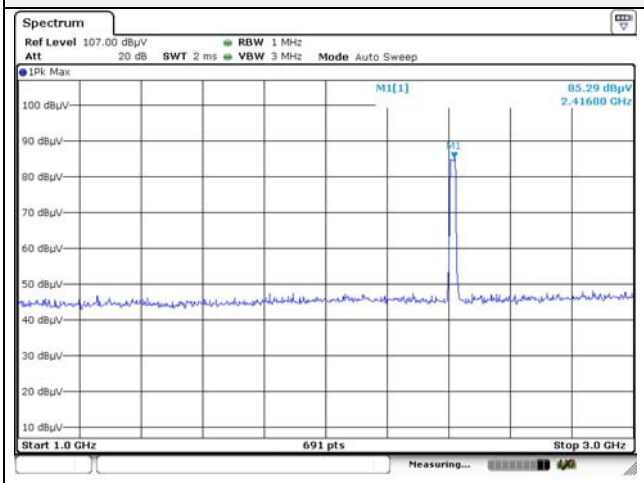
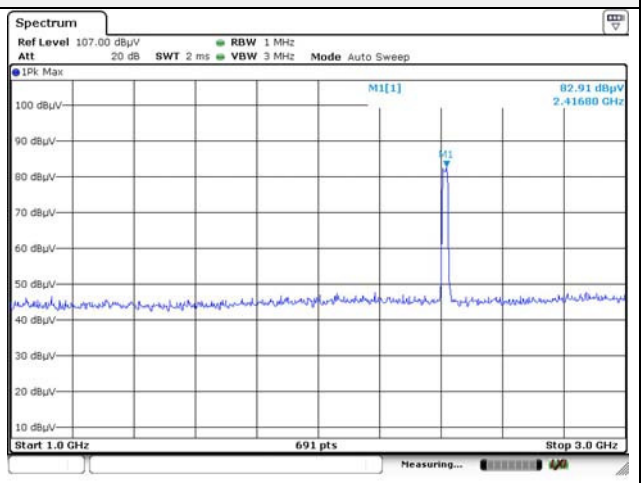
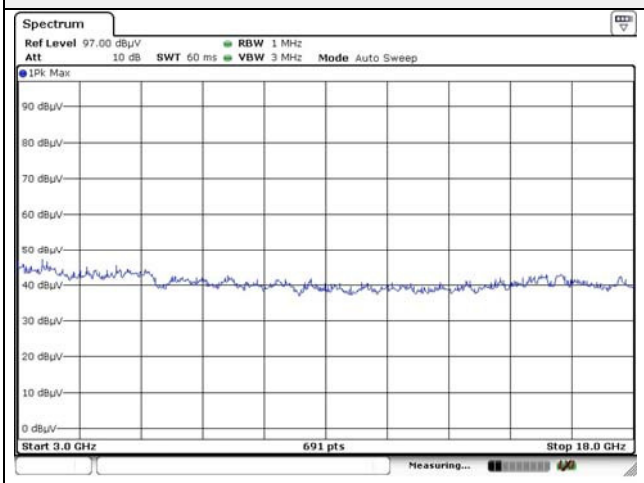
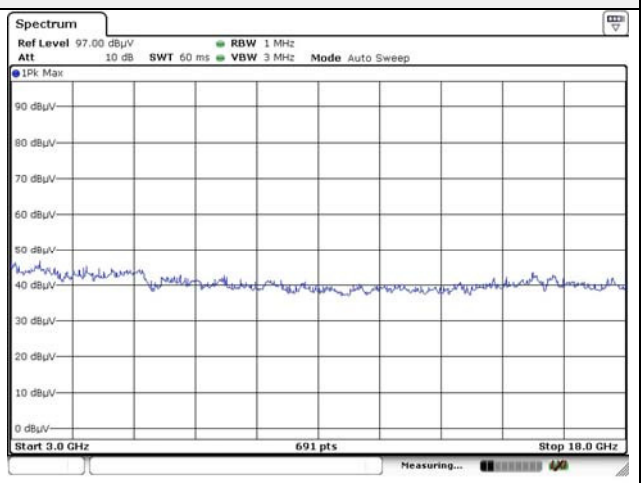
Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.
1. No spurious emission were detected above 3 ㎓.

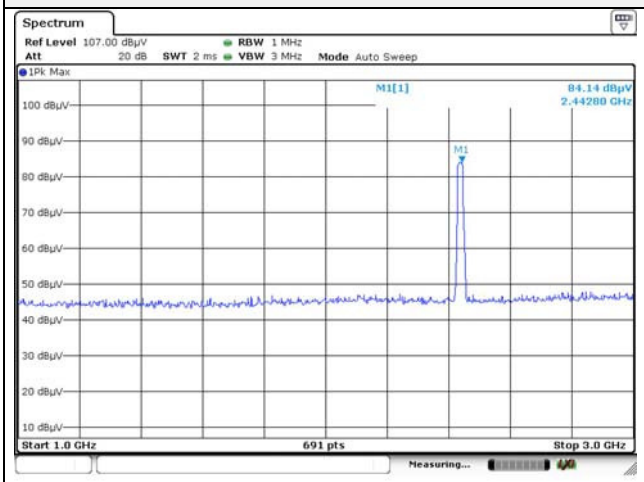
802.11n(HT20) MIMO 802.11n(HT20)

Distance of measurement: 3 meter

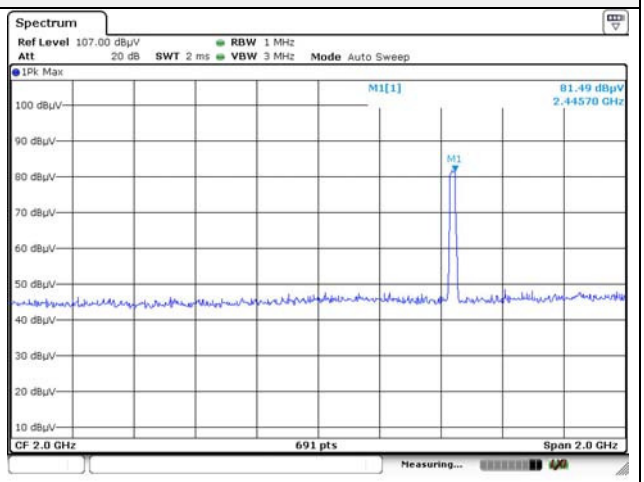
Channel: 06

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
No spurious emission were detected above 3 GHz.								

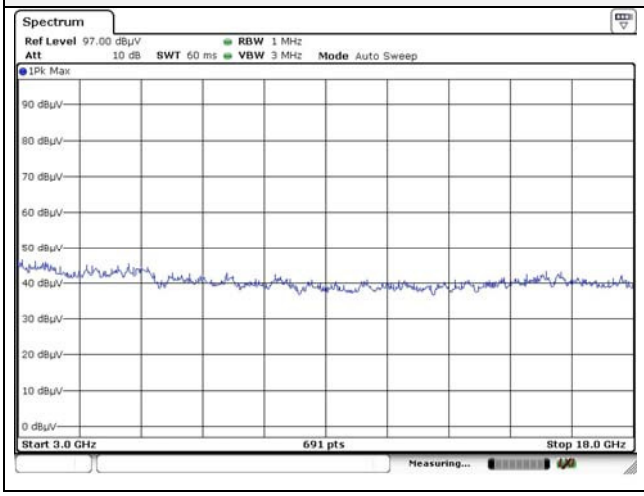
Horizontal // Peak for 1 GHz to 3 GHz



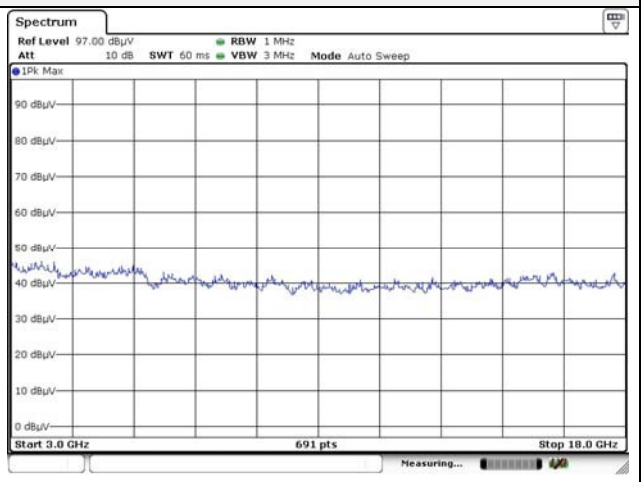
Vertical // Peak for 1 GHz to 3 GHz



Horizontal // Peak for 3 GHz to 18 GHz



Vertical // Peak for 3 GHz to 18 GHz



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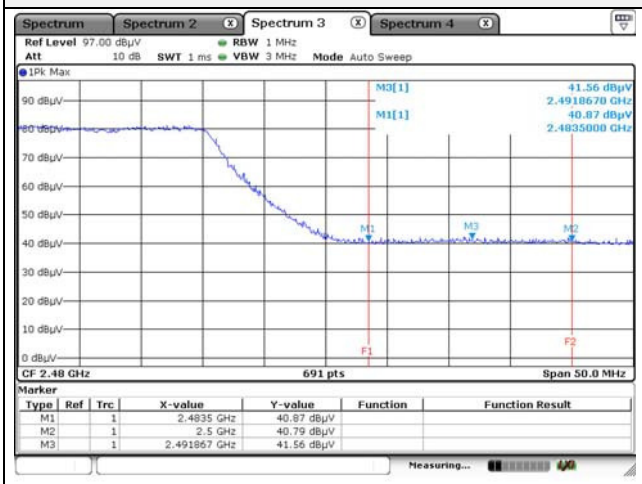
Mode: 802.11n(HT20)

Distance of measurement: 3 meter

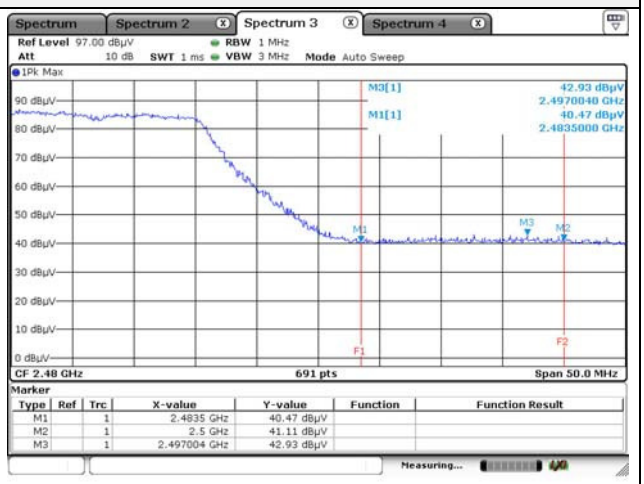
Channel: 11

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2491.87	41.56	Peak	H	-9.37	-	32.19	74.00	41.81
2497.00	42.93	Peak	V	-9.35	-	33.58	74.00	40.42

Restricted band // Horizontal // Peak



Restricted band // Vertical // Peak



Restricted band // Horizontal // Average

N/A

Restricted band // Vertical // Average

N/A

Note.
1. Average test was not performed because peak result is lower than the average limit.

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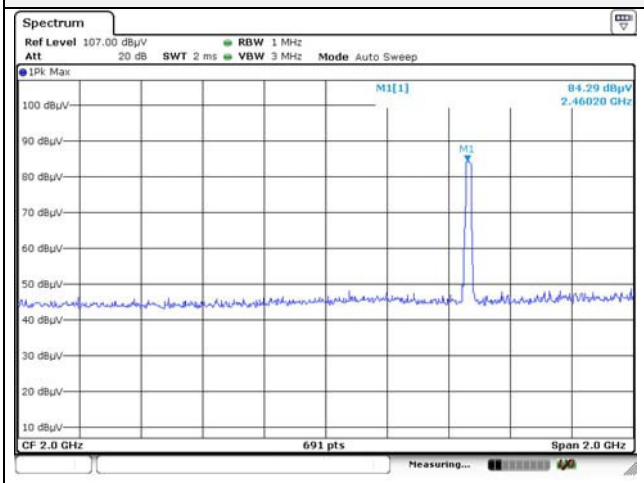
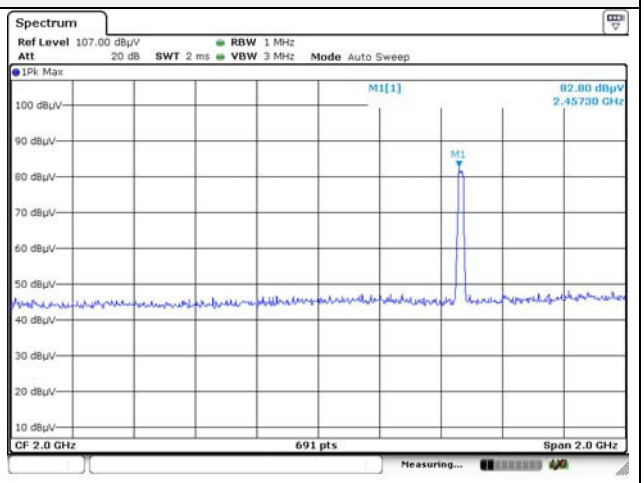
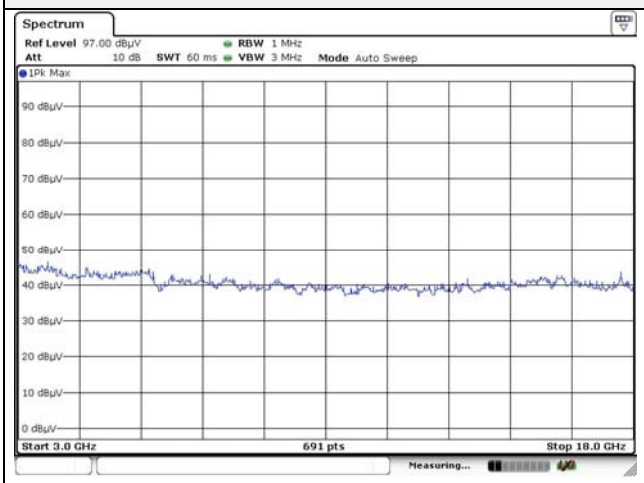
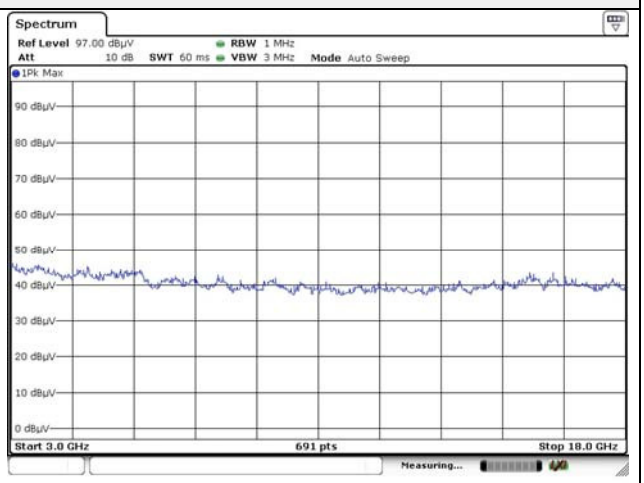
The test results in the report only apply to the tested sample.

Horizontal // Peak for 1 ㎓ to 3 ㎓	Vertical // Peak for 1 ㎓ to 3 ㎓
	
Horizontal // Peak for 3 ㎓ to 18 ㎓	**Vertical // Peak for 3 ㎓ to 18 ㎓**
	

Note.

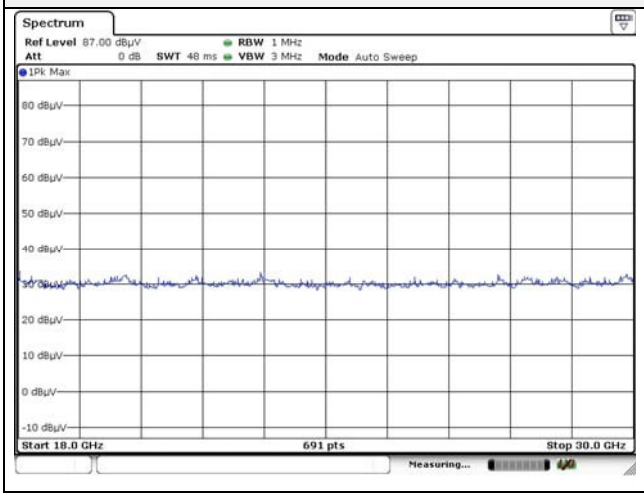
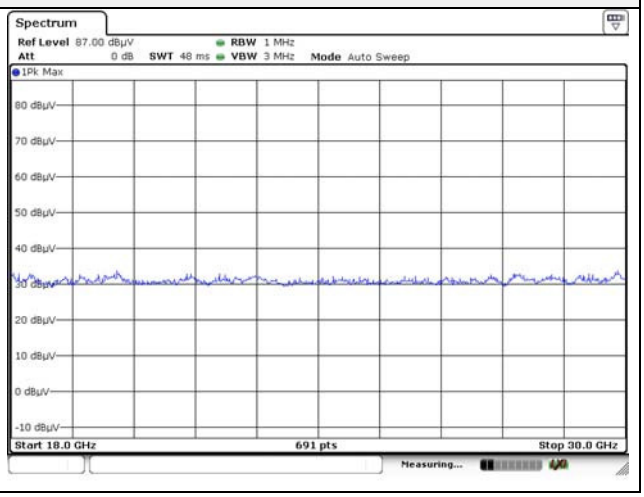
1. No spurious emission were detected above 3 ㎓.

Test results (18 ㎓ to 30 ㎓) – Worst case

Mode: 802.11n_HT20(MIMO)

Distance of measurement: 3 meter

Channel: 1

Horizontal	Vertical
	

Note.

1. No spurious emission were detected above 18 ㎓.

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3.2. AC conducted emissions

Limit

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

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

Note.

1. All AC line conducted spurious emission are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and the appropriate frequencies. All data rates and modes were investigated for conducted spurious emission. Only the conducted emissions of the configuration that produced the worst case emissions are reported in this section.
3. Both Cable loss and LISN factor are included in measurement level(QP Level or AV Level).

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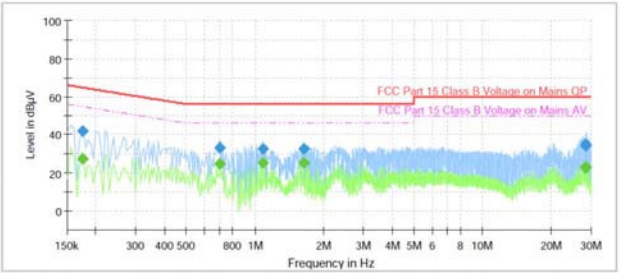
Test results

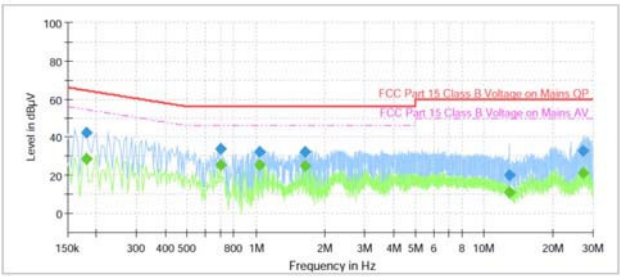
Hot Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.175000	---	27.50	54.72	27.22	1000.0	9.000	L1	9.7
0.175000	41.75	---	64.72	22.97	1000.0	9.000	L1	9.7
0.700000	---	25.04	46.00	20.96	1000.0	9.000	L1	9.9
0.700000	33.35	---	56.00	22.65	1000.0	9.000	L1	9.9
1.080000	---	25.25	46.00	20.75	1000.0	9.000	L1	9.9
1.080000	32.89	---	56.00	23.11	1000.0	9.000	L1	9.9
1.645000	---	25.47	46.00	20.53	1000.0	9.000	L1	10.0
1.645000	32.84	---	56.00	23.16	1000.0	9.000	L1	10.0
28.400000	---	22.88	50.00	27.12	1000.0	9.000	L1	10.3
28.400000	34.46	---	60.00	25.54	1000.0	9.000	L1	10.3
28.525000	---	23.12	50.00	26.88	1000.0	9.000	L1	10.3
28.525000	34.81	---	60.00	25.19	1000.0	9.000	L1	10.3

Neutral Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	CAverage (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.180000	---	28.79	54.49	25.70	1000.0	9.000	N	9.7
0.180000	42.15	---	64.49	22.34	1000.0	9.000	N	9.7
0.700000	---	25.19	46.00	20.81	1000.0	9.000	N	9.8
0.700000	33.66	---	56.00	22.34	1000.0	9.000	N	9.8
1.035000	---	25.32	46.00	20.68	1000.0	9.000	N	9.9
1.035000	32.57	---	56.00	23.43	1000.0	9.000	N	9.9
1.645000	---	25.14	46.00	20.86	1000.0	9.000	N	10.0
1.645000	32.57	---	56.00	23.43	1000.0	9.000	N	10.0
13.000000	---	11.06	50.00	38.94	1000.0	9.000	N	9.9
13.000000	20.24	---	60.00	39.76	1000.0	9.000	N	9.9
27.185000	---	21.23	50.00	28.77	1000.0	9.000	N	10.3
27.185000	32.69	---	60.00	27.31	1000.0	9.000	N	10.3

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Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
Spectrum Analyzer	R&S	FSV40	101002	1 year	2016.07.25 2017.07.06
Spectrum Analyzer	R&S	FSV30	100736	1 year	2016.07.25 2017.07.06
8360B Series Swept Signal Generator	HP	83630B	3844A00786	1 year	2017.01.25
PSG Analog Signal Generator	AGILENT	E8257C	US42340237	1 year	2017.07.05
Power Meter	Anritsu	ML2495A	1438001	1 year	2017.01.25
Pulse Power Sensor	Anritsu	MA2411B	1339205	1 year	2017.01.25
Loop Antenna	R&S	HFH2-Z2.335.4711.52	826532	2 years	2017.03.03
Trilog-broadband antenna	SCHWARZBECK	VULB 9163	9168-713	2 years	2017.05.15
Horn Antenna	A.H.	SAS-571	781	2 years	2017.05.07
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170550	2 years	2017.04.30
High Pass Filter	WAINWRIGHT INSTRUMENT	WHJS3000-10TT	1	1 year	2016.07.24 2017.07.04
High Pass Filter	WAINWRIGHT INSTRUMENT	WHKX6.0/26.5G-6SS	1	1 year	2016.07.24 2017.07.05
Low Pass Filter	WEINSCHEL	WLK1.0/18G-10TT	1	1 year	2016.07.24 2017.07.04
Attenuator	KEYSIGHT	8493C	82509	1 year	2017.01.25
Preamplifier	SCHWARZBECK	BBV-9718	9718-246	1 year	2016.10.23 2017.10.14
Broadband Amplifier	SCHWARZBECK	BBV-9721	PS9721-003	1 year	2017.01.25
EMI Test Receiver	R&S	ESR3	101781	1 year	2017.05.03
EMI Test Receiver	R&S	ESU26	100552	1 year	2017.04.24
EMI Test Receiver	R&S	ESR3	101783	1 year	2017.05.03
LISN	R&S	ENV216	101137	1 year	2017.02.04

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook Computer	Samsung Electronics Co., Ltd.	NT-R530	ZWC493BZC00014H
Test Board	N/A	N/A	N/A
AC Adapter	SOLU M	SLU10	H37H3XPGK01SE3
Speaker	Britz	BR-1000A	N/A

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