TEST REPORT

Part 15 Subpart C 15.247

Equipment under test	Digital Flat Panel X-ray Detector
Model name	PEDRA-1417MC
Variant Model name	PEDRA-1417MG, DET14-MCD1, DET14-MGD1
FCC ID	2AXRZPEDRA-1417M
Applicant	RADISEN CO., LTD
Manufacturer	RADISEN CO., LTD
Factory	RADISEN CO., LTD / Marketech International Corp.
Date of test(s)	2020.09.07. ~ 2020.09.15
Date of issue	2020.09.16

Issued to
RADISEN CO., LTD
14F Gongduk B/D, 11, Saechang-ro, Mapo-gu,
Seoul, 04168,Republic of Korea
Tel: +82-31-8084-9762 / Fax: +82-31-8084-9763

Issued by
KES Co., Ltd.
3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si,
Gyeonggi-do, 14057, Korea
473-21, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450

Test and report completed by :	**Report approval by :**
Young-Jun, Cho Test engineer	Young-Jin, Lee Technical manager

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Revision history

Revision	Date of issue	Test report No.	Description
-	2020.09.16	KES-RF1-20T0154	Initial

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

TABLE OF CONTENTS

1. General information 4
1.1. EUT description 5
1.2. Test configuration 6
1.3. Device modifications 6
1.4. Frequency/channel operations 6
1.5. Worst case data rate 6
1.6. Accessory information 6
1.7. Information about Variant Model name 7
1.8. Antenna information 7
1.9. Measurement results explanation example 8
1.10. Measurement Uncertainty 8
2. Summary of tests 9
3. Test results 10
3.1. Radiated restricted band and emissions 12
3.2 AC conducted emissions 40
Appendix A. Measurement equipment 42
Appendix B. Test setup photos 43

1. General information

Applicant:	RADISEN CO., LTD
Applicant address:	14F Gongduk B/D, 11, Saechang-ro, Mapo-gu, Seoul, 04168,Republic of Korea
Factory 1:	RADISEN CO., LTD
Factory 1 address:	B/602ho, Beolmal-ro, Dongan-gu, Anyang-si, Gyeonggi-do, Republic of Korea
Factory 2:	Marketech International Corp.
Factory 2 address:	No. 35, Guangfu S. Rd., Hukou Township, Hsinchu County 30351, Taiwan
Test site:	KES Co., Ltd.
Test site address:	3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, 14057, Korea 473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea
Test Facility	FCC Accreditation Designation No.: KR0100, Registration No.: 444148
FCC rule part(s):	15.247
FCC ID:	2AXRZPEDRA-1417M
Test device serial No.:	☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test	Digital Flat Panel X-ray Detector	
Frequency range &		**2 412 ㎒ ~ 2 462 ㎒ (802.11b/g/n_HT20) : 11 ch**
Number of channels		**2 422 ㎒ ~ 2 452 ㎒ (802.11n_HT40) : 7 ch**
	UNII-1	5 180 ㎒ ~ 5 240 ㎒ (802.11a/n_HT20) : 4 ch
		5 190 ㎒ ~ 5 230 ㎒ (802.11n_HT40) : 2 ch
		5 210 ㎒ (802.11ac_VHT80) : 1 ch
	UNII-3	5 745 ㎒ ~ 5 825 ㎒ (802.11a/n_HT20) : 5 ch
		5 755 ㎒ ~ 5 795 ㎒ (802.11n_HT40) : 2 ch
		5 775 ㎒ (802.11ac_VHT80) : 1 ch
Model:	PEDRA-1417MC	
Variant Model name	PEDRA-1417MG, DET14-MCD1, DET14-MGD1	
Modulation technique	WIFI : DSSS, OFDM	
Antenna specification		
ANT0	2.4 ㎓ Antenna type : PCB antenna,	Peak gain : 1.9 ㏈i
ANT1	2.4 ㎓ Antenna type : PCB antenna,	Peak gain : -1.6 ㏈i
ANT0	5 ㎓ Antenna type : : PCB antenna,	Peak gain(UNII-1) : -1.8 ㏈i
		Peak gain(UNII-3) : -2.9 ㏈i
ANT1	5 ㎓ Antenna type : : PCB antenna,	Peak gain(UNII-1) : -1.1 ㏈i
		Peak gain(UNII-3) : -2.0 ㏈i
Power source	AC 120 V (AC/DC adaptor output 15 V)	
H/W version	1.1.0	
S/W version	1.0.x.x	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

1.2. Test configuration

The **RADISEN CO., LTD // PEDRA-1417MC // FCC ID: 2AXRZPEDRA-1417M** was tested per the guidance of KDB 558074 D01 v05r02, 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. 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

Ch.	Frequency (㎒)	Mode
03	2422	802.11n_HT40
· ·	· ·	· ·
06	2437	802.11n_HT40
· ·	· ·	· ·
09	2452	802.11n_HT40

1.5. Worst case data rate

1. Radiated emission was performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.
2. Worst-case data rates were:
3. 802.11b: **1.0 Mbps**
4. 802.11g_HT20: **6.0 Mbps**
   802.11n_HT20: **7.2 Mbps**
   802.11n_HT40: **15.0 Mbps**

1.6. Accessory information

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

1.7. Information about Variant Model name

Model name	Scintillator type
PEDRA-1417MC	CsI:Tl (Direct)
PEDRA-1417MG	GD2O2S:Tb
DET14-MCD1	CsI:Tl (Direct)
DET14-MGD1	GD2O2S:Tb

1.8. Antenna information

Mode	SISO		MIMO
	Antenna 0	Antenna 1	Antenna 0+1
802.11b	✔	✔	×
802.11g	✔	✔	×
802.11n_HT20	✔	✔	✔
802.11n_HT40	✔	✔	✔
802.11a	✔	✔	×
802.11an_HT20	✔	✔	✔
802.11an_HT40	✔	✔	✔
802.11ac_VHT80	✔	✔	✔

✔ = Support; × = Not support

WiFi Antenna Model :

WIFI DUAL BAND ANTENNA_1 (ANT0), WIFI DUAL BAND ANTENNA_2(ANT1),

Ant0 Gain (dBi)	Ant1 Gain (dBi)	Note
1.9	-1.6	2 412 to 2 462 MHz
-1.8	-1.1	5 180 to 5 240 MHz
-2.9	-2.0	5 745 to 5 825 MHz

1.9. Measurement results explanation example

For all conducted test items

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).
= 0.87 + 10 = 10.87 (dB)

1.10. Measurement Uncertainty

Test Item		Uncertainty
Uncertainty for Conduction emission test		2.46 dB
Uncertainty for Radiation emission test (include Fundamental emission)	Below 1㎓	4.40 dB
	Above 1㎓	5.94 dB
Note. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.		

2. Summary of tests

Reference	Parameter	Test results
15.247(a)(2)	6 dB bandwidth	N/A(Note1)
15.247(b)(3)	Output power	Pass
15.247(e)	Power spectral density	N/A(Note1)
15.205 15.209	Radiated restricted band and emission	Pass
15.247(d)	Conducted spurious emission and band edge	N/A(Note1)
15.207(a)	AC conducted emissions	Pass

Note :

1) Please Refer to the approved Module Report (Report No.: RF180828C26A) for result of existing test items.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

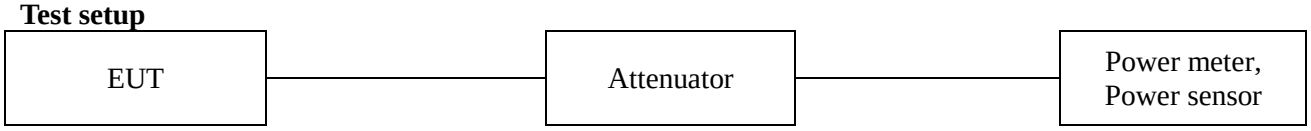
3. Test results

3.1. Output power

Test procedure

ANSI C63.10 –section 11.9.1.3 and 11.9.2.3.2

Test setup



ANSI C63.10 - section 11.9.1.3

The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the DTS ba ndwidth and shall utilize a fast-responding diode detector.

ANSI C63.10 - section 11.9.2.3.2

Alternatively, 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 this measurement is made only during the ON time of the transmitter, no duty cycle correction is required.

Limit

According to §15.247(b)(3), For systems using digital modulation in the 902~928 ㎒, 2 400~2 483.5 ㎒, and 5 725~5 850 ㎒ bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted out-put power. Maximum Conducted Out-put Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

According to §15.247(b)(4), The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 ㏈i. Except as shown in paragraph (c) of this section, if transmit-ting antennas of directional gain greater than 6 ㏈i are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 ㏈i.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Test results

Measured output power (dBm)							
Mode	**Ant. Port**	**2412 ㎒**		**2437 ㎒**		**2462 ㎒**	
		Average (dBm)	**Peak (dBm)**	**Average (dBm)**	**Peak (dBm)**	**Average (dBm)**	**Peak (dBm)**
802.11b	Ant 0	16.13	18.80	16.70	19.31	16.74	19.30
	Ant 1	16.79	19.37	16.71	19.22	16.61	19.13
802.11g	Ant 0	12.32	21.21	13.07	21.64	13.42	21.84
	Ant 1	13.10	22.06	13.25	22.15	13.17	22.05
802.11n _HT20	Ant 0	9.49	18.79	9.78	18.93	9.35	17.99
	Ant 1	10.90	19.62	9.59	18.27	10.11	18.50
	SUM	13.26	22.24	12.70	21.62	12.76	21.26

Measured output power (dBm)							
Mode		**2422 ㎒**		**2437 ㎒**		**2452 ㎒**	
		Average (dBm)	**Peak (dBm)**	**Average (dBm)**	**Peak (dBm)**	**Average (dBm)**	**Peak (dBm)**
802.11n _HT40	Ant 0	7.70	16.45	8.32	17.13	8.04	17.10
	Ant 1	8.53	17.36	8.22	16.92	8.47	17.24
	SUM	11.15	19.94	11.28	20.04	11.27	20.18

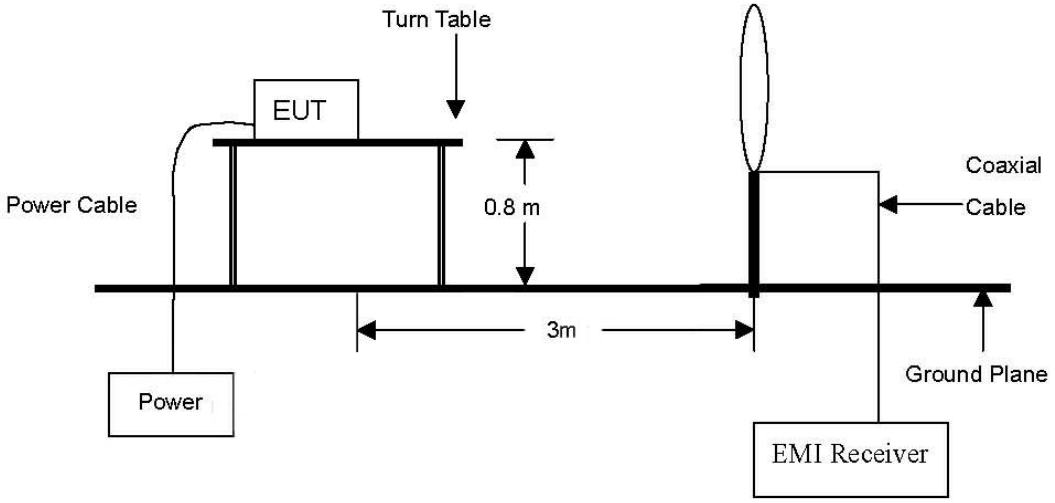
Note.

1. Sum = 10log($10^{Ant0/10} + 10^{Ant1/10} \ldots 10^{Ant\ N/10}$)

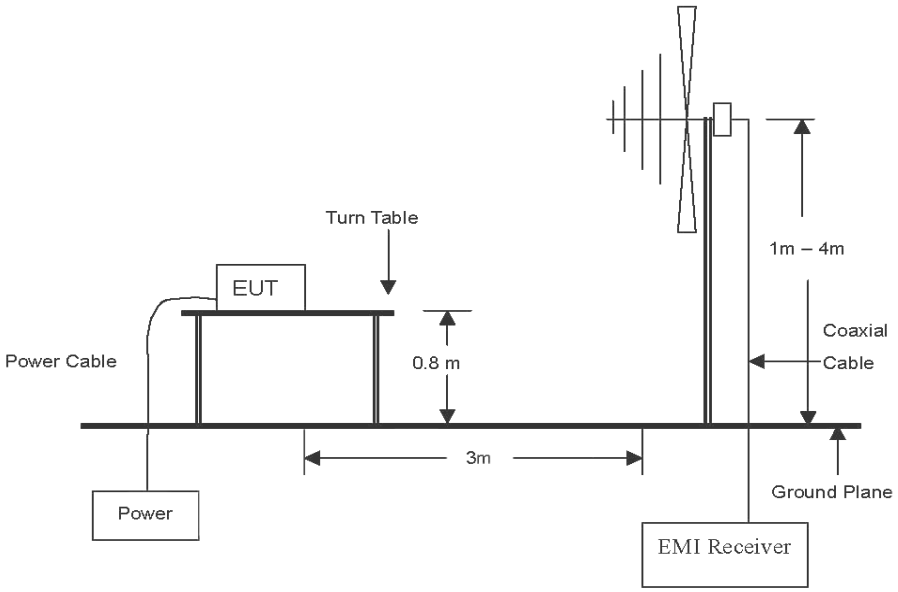
3.2. Radiated restricted band and emissions

Test setup

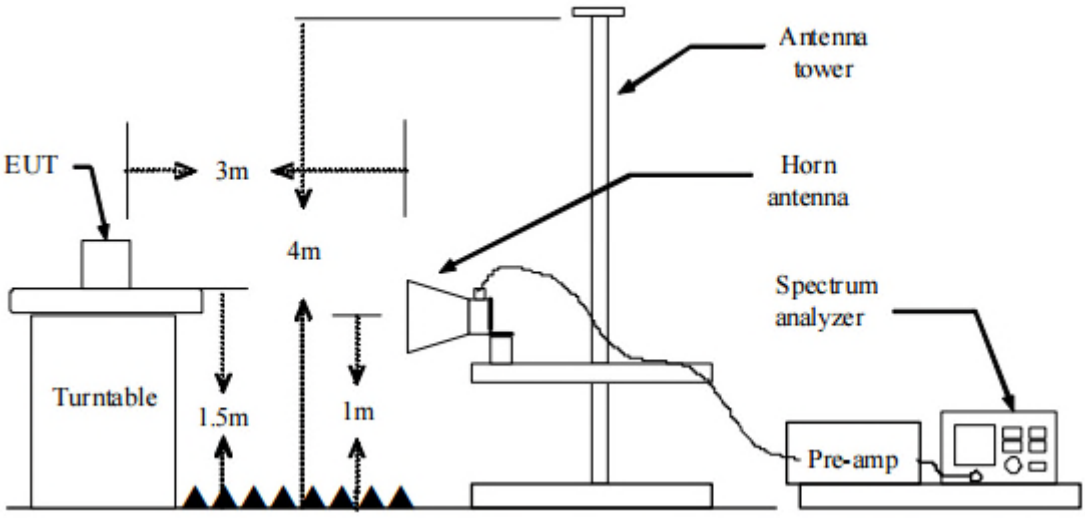
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



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. We have done x, y, z planes in EUT and horizontal and vertical polarization and Parallel to the ground plane in detecting antenna.
4. 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.
5. The test-receiver system was set to average or quasi peak detect function and Specified Bandwidth with Maximum hold mode.

Test procedure above 30 ㎒

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter anechoic chamber test site. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The antenna is a bi-log antenna, a horn antenna ,and its height are varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
3. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
4. The test receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
5. Spectrum analyzer settings for $f < 1$ ㎓:
   ① Span = wide enough to fully capture the emission being measured
   ② RBW = 100 ㎑
   ③ VBW ≥ RBW
   ④ Detector = quasi peak

⑤ Sweep time = auto
⑥ Trace = max hold

6. Spectrum analyzer settings for f ≥1 ㎓: Peak
   ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
   ② RBW = 1 ㎒
   ③ VBW ≥ 3 ㎒
   ④ Detector = peak
   ⑤ Sweep time = auto
   ⑥ Trace = max hold
   ⑦ Trace was allowed to stabilize
7. Spectrum analyzer settings for f ≥1 ㎓: Average
   ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
   ② RBW = 1 ㎒
   ③ VBW ≥ 3 × RBW
   ④ Detector = RMS, if span/(# of points in sweep) ≤ (RBW/2). Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
   ⑤ Averaging type = power(i.e., RMS)
      1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
      2) Some instruments require linear display mode in order to use linear voltage averaging. Log or ㏈ averaging shall not be used.
   ⑥ Sweep = auto
   ⑦ Trace = max hold
   ⑧ Perform a trace average of at least 100 traces.
   ⑨ A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:

      1) If power averaging (RMS) mode was used in step ⑤, then the applicable correction factor is 10 log(1/x), where x is the duty cycle.
      2) If linear voltage averaging mode was used in step ⑤, then the applicable correction factor is 20 log(1/x), where x is the duty cycle.
      3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

Note.

1. f <30 ㎒, extrapolation factor of 40 ㏈/decade of distance. $F_d = 40\log(D_m/Ds)$
   f ≥30 ㎒, extrapolation factor of 20 ㏈/decade of distance. $F_d = 20\log(D_m/Ds)$
   Where:
   F_d = Distance factor in ㏈
   D_m = Measurement distance in meters
   D_s = Specification distance in meters
3. CF(Correction factors(㏈)) = Antenna factor(㏈/m) + Cable loss(㏈) + or Amp. gain(㏈) + or F_d(㏈)
8. Field strength(㏈㎶/m) = Level(㏈㎶) + CF (㏈) + or DCF(㏈)
9. Margin(㏈) = Limit(㏈㎶/m) - Field strength(㏈㎶/m)
10. 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.
9. All channels, modes (e.g. 802.11b/g/n (20 ㎒ BW)), and modulations/data rates were investigated among DTS band. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

10. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

Limit

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

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

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 ~ 72 ㎒, 76 ~ 88 ㎒, 174 ~ 216 ㎒ or 470 ~ 806 ㎒. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

Duty cycle

Regarding to KDB 558074 D01_v04, 6.0, the maximum duty cycles of all modes were investigated and set the spectrum analyzer as below.

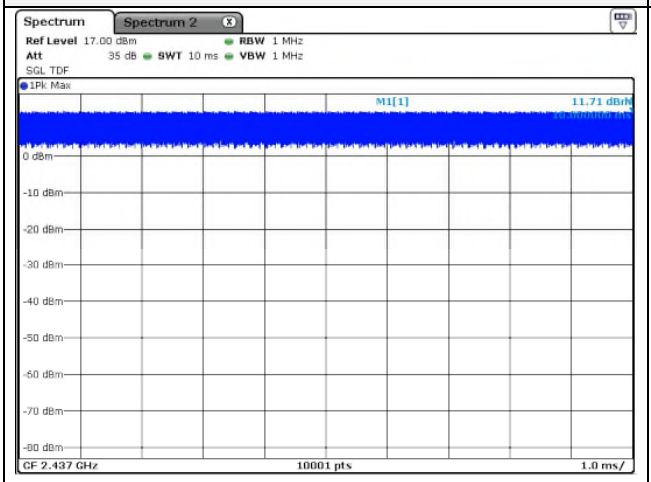
Set RBW ≥ OBW if possible; otherwise, set RBW to the largest available value. Set detector = peak or average. The zero-span measurement method shall not be used unless both RBW and VBW are > 50/T and the number of sweep points across duration T exceeds 100.

Test mode	T_{on} time (㎳)	Period (㎳)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (㏈)
802.11b	10	10	1	100	0.00
802.11g	10	10	1	100	0.00
802.11n(HT20)	10	10	1	100	0.00
802.11n(HT40)	10	10	1	100	0.00

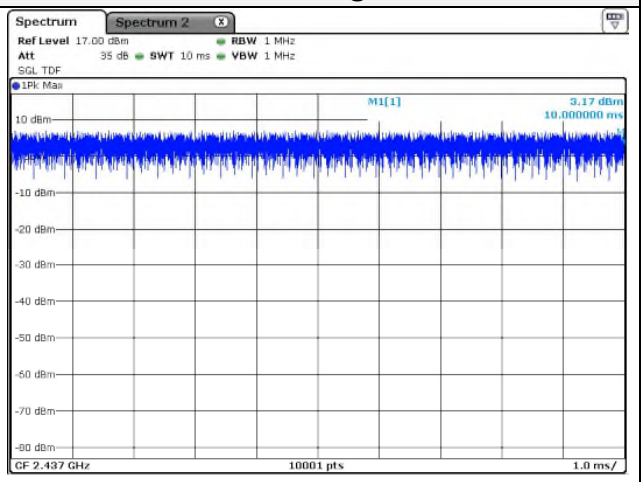
Duty cycle (Linear) = T_{on} time/Period

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

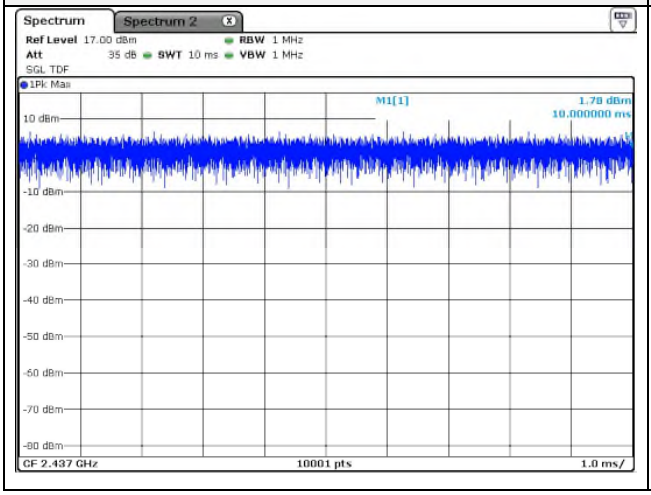
802.11b



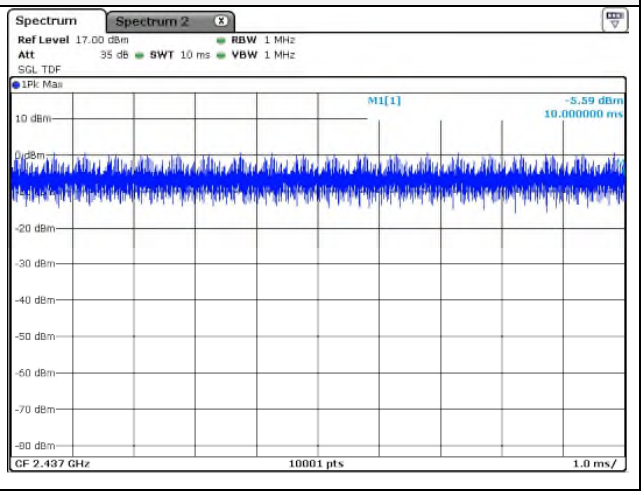
802.11g



802.11n(HT20)



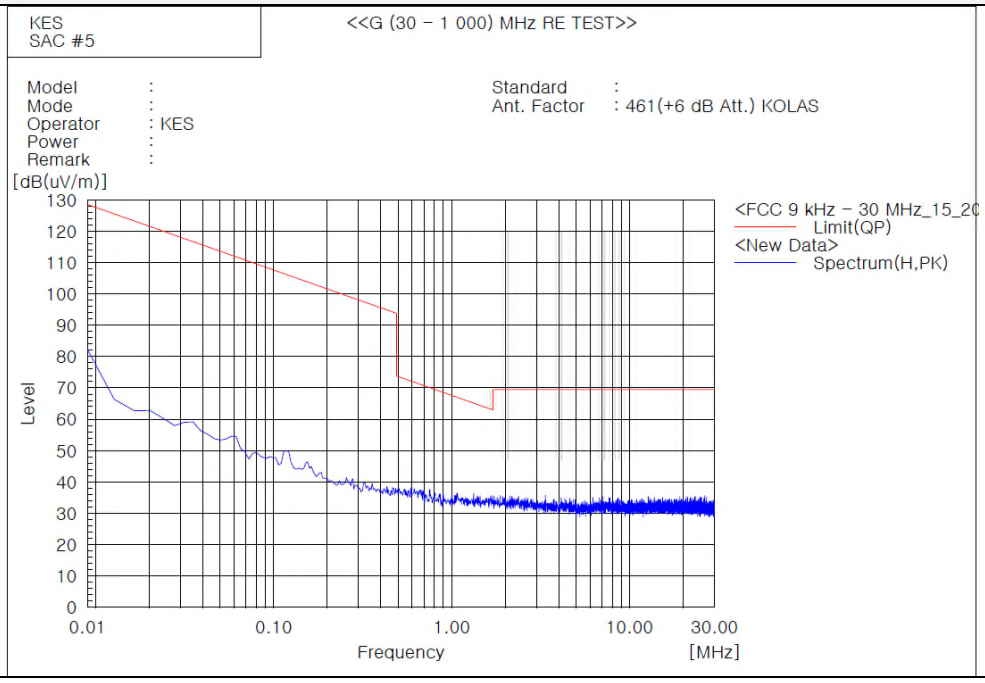
802.11n(HT40)



Test results (Below 30 ㎒)

Mode:	802.11n_HT20 (Worst case)
Distance of measurement:	3 meter
Channel:	1 (Worst case)

Horizontal

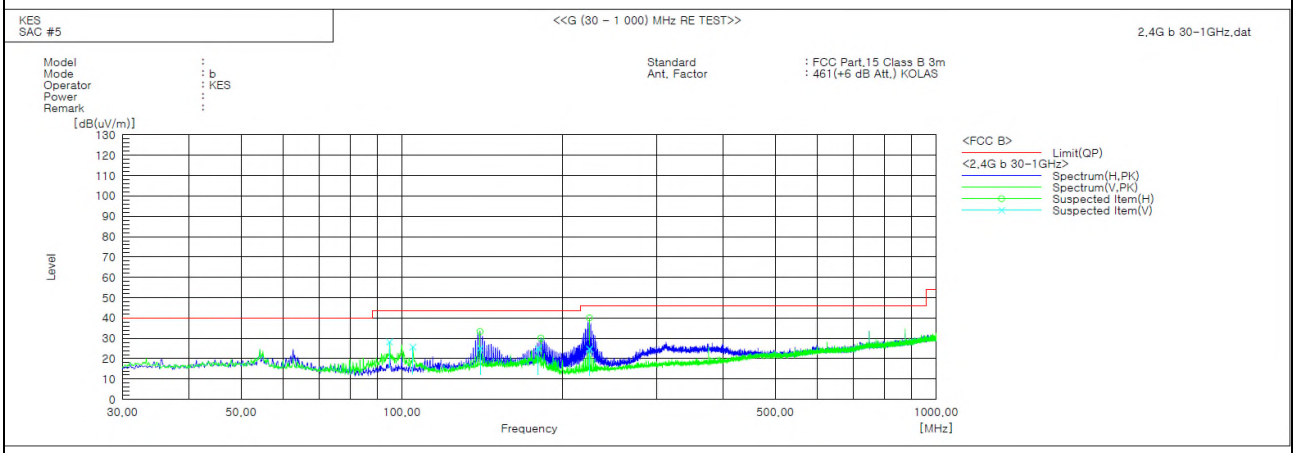


No spurious emission were detected below 30 ㎒.

Test results (Below 1 000 ㎒) – Worst case

Mode:	802.11n_HT20 (Worst case)
Distance of measurement:	3 meter
Channel:	1 (Worst case)

Horizontal // Vertical



Spectrum Selection

No.	Frequency [MHz]	(P)	Reading [dB(uV)]	c.f [dB(1/m)]	Result PK [dB(uV/m)]	Limit QP [dB(uV/m)]	Margin QP [dB]	Height [cm]	Angle [deg]	Remark
1	94.869	V	46.6	-18.4	28.2	43.5	15.3	150.0	74.9	
2	104.933	V	42.5	-16.8	25.7	43.5	17.8	100.0	357.0	
3	140.095	H	46.4	-13.0	33.4	43.5	10.1	400.0	347.5	
4	140.216	V	38.1	-13.0	25.1	43.5	18.4	400.0	70.1	
5	180.108	V	39.4	-14.3	25.1	43.5	18.4	100.0	358.3	
6	182.048	H	44.7	-14.5	30.2	43.5	13.3	200.0	353.5	
7	224.606	H	55.4	-15.3	40.1	46.0	5.9	200.0	12.5	
8	224.606	V	40.0	-15.3	24.7	46.0	21.3	100.0	134.3	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Mode: 802.11b

Distance of measurement: 3 meter

Channel: 01

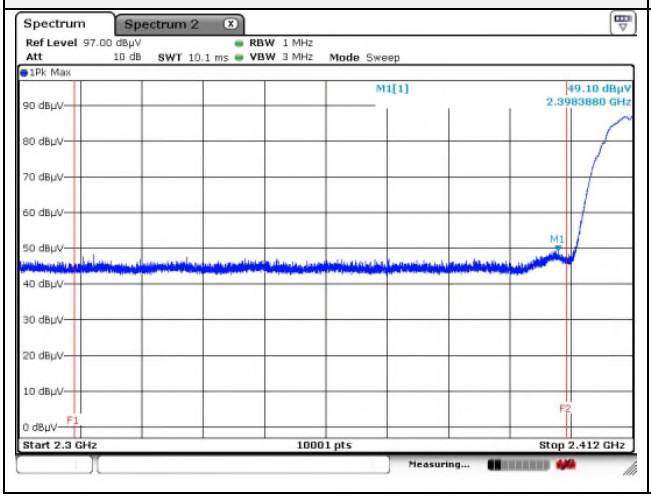
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1125.09	50.58	Peak	H	-11.27	-	39.31	74.00	34.69
1124.69	49.16	Peak	V	-11.28	-	37.88	74.00	36.12

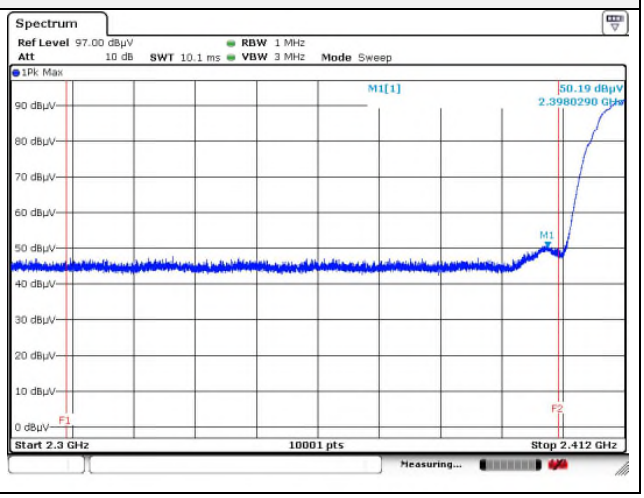
- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2398.39	49.10	Peak	H	-7.13	-	41.97	74.00	32.03
2398.03	50.19	Peak	V	-7.14	-	43.05	74.00	30.95

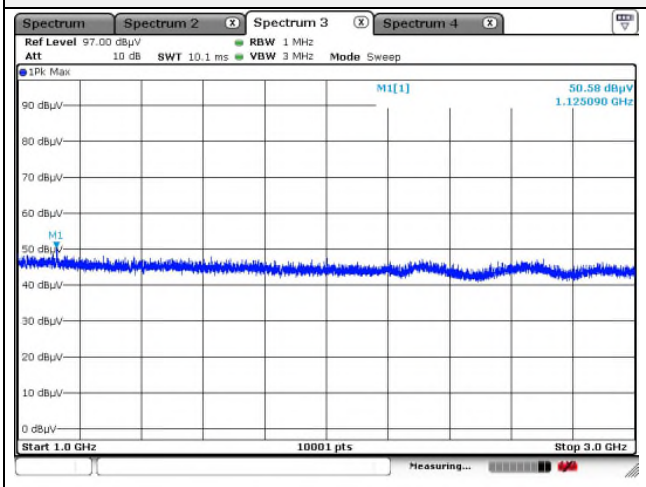
Restricted band // Horizontal // Peak



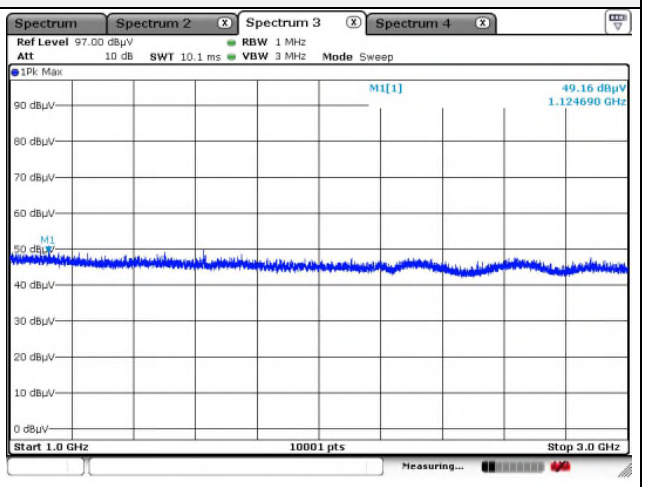
Restricted band // Vertical // Peak



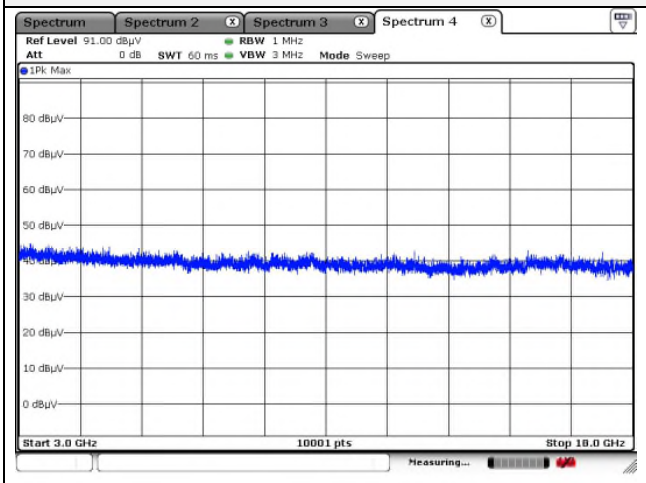
Horizontal // Peak for 1 ㎓ to 3 ㎓



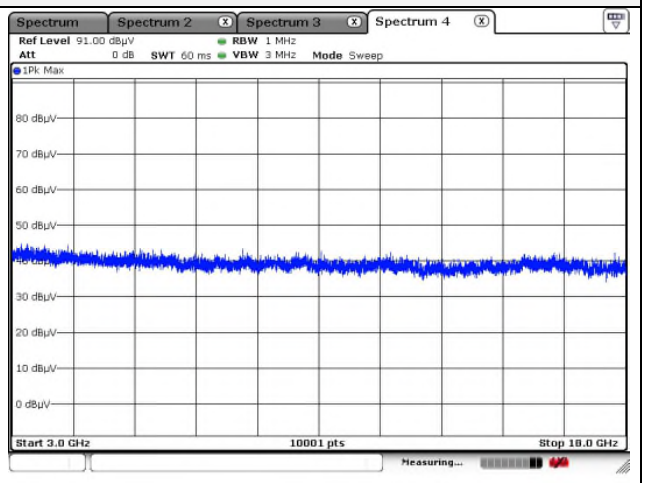
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.

1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode: 802.11b

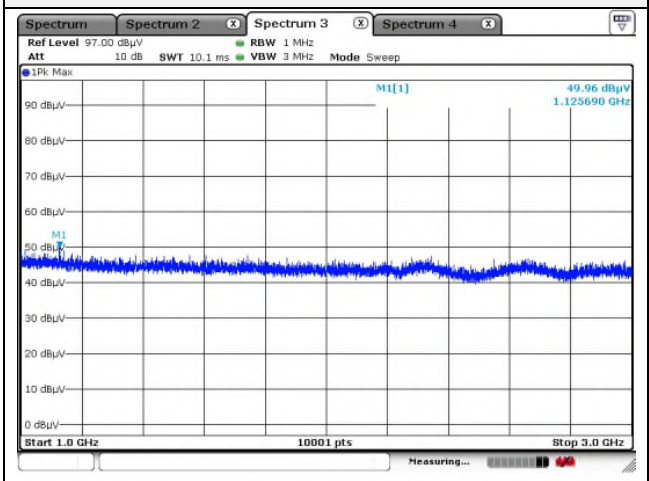
Distance of measurement: 3 meter

Channel: 06

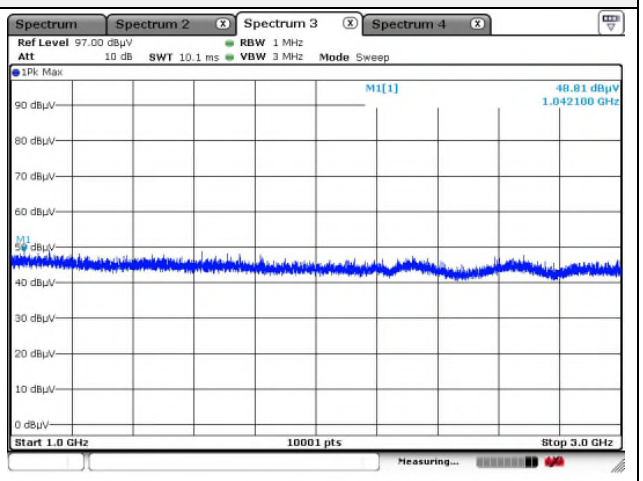
- **Spurious**

Frequency (㎒)	Level (dB㎶)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
1125.69	49.96	Peak	H	-11.27	-	38.69	74.00	35.31
1042.10	48.81	Peak	V	-11.31	-	37.50	74.00	36.50

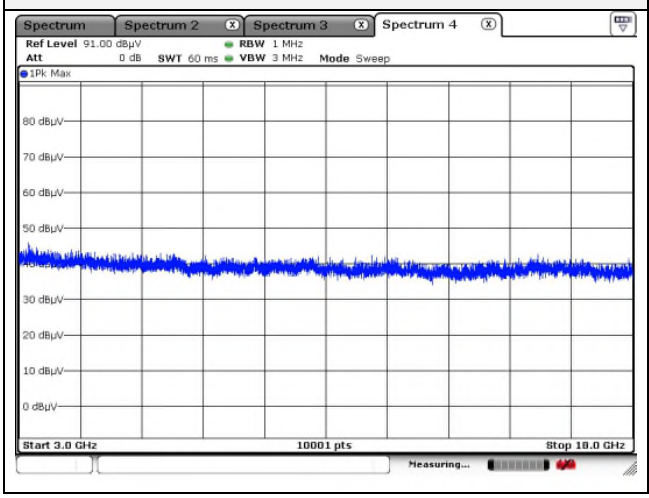
Horizontal // Peak for 1 ㎓ to 3 ㎓



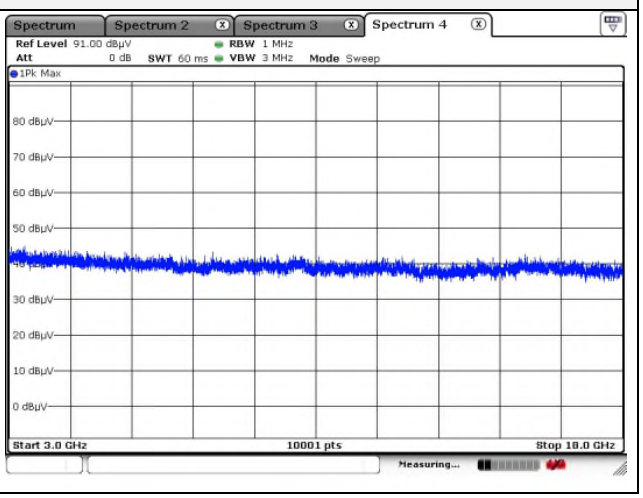
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.
1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Mode: 802.11b

Distance of measurement: 3 meter

Channel: 11

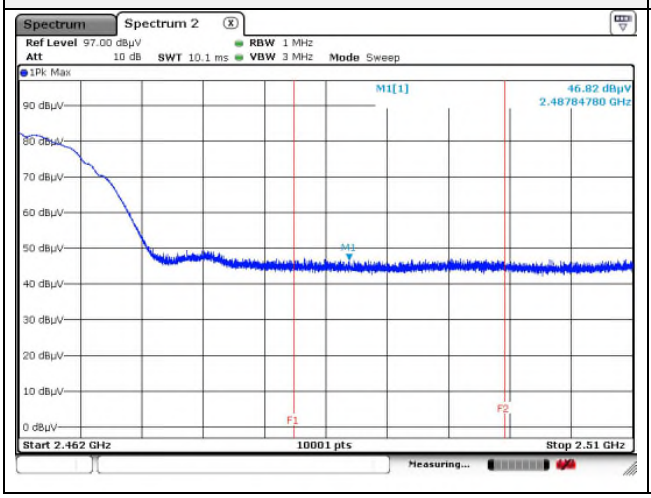
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1125.09	50.08	Peak	H	-11.27	-	38.81	74.00	35.19
1125.49	48.39	Peak	V	-11.27	-	37.12	74.00	36.88

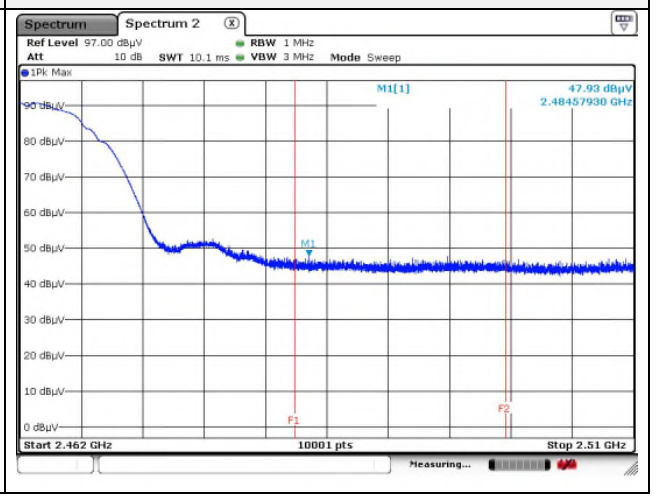
- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2487.85	46.82	Peak	H	-7.57	-	39.25	74.00	34.75
2484.58	47.93	Peak	V	-7.55	-	40.38	74.00	33.62

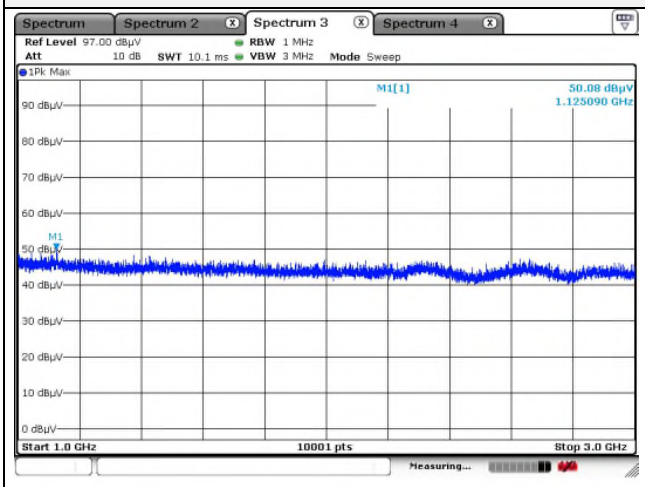
Restricted band // Horizontal // Peak



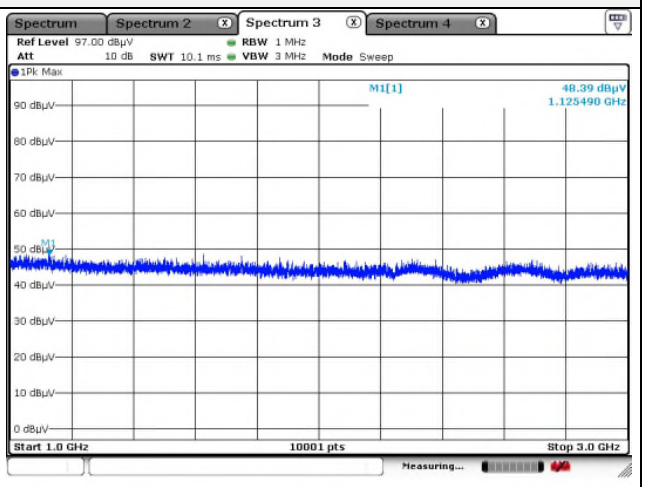
Restricted band // Vertical // Peak



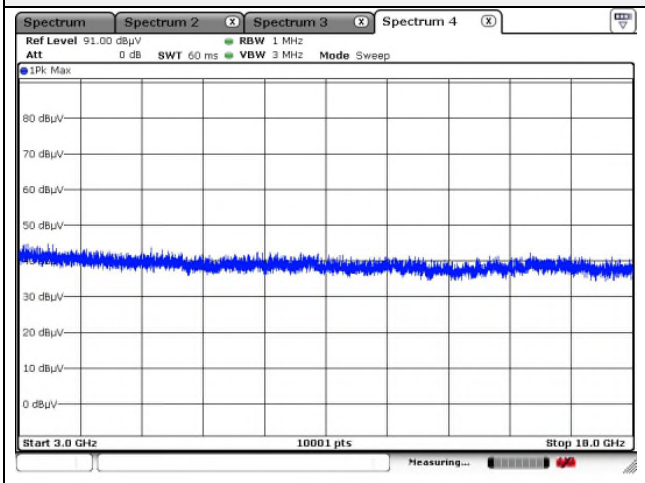
Horizontal // Peak for 1 ㎓ to 3 ㎓



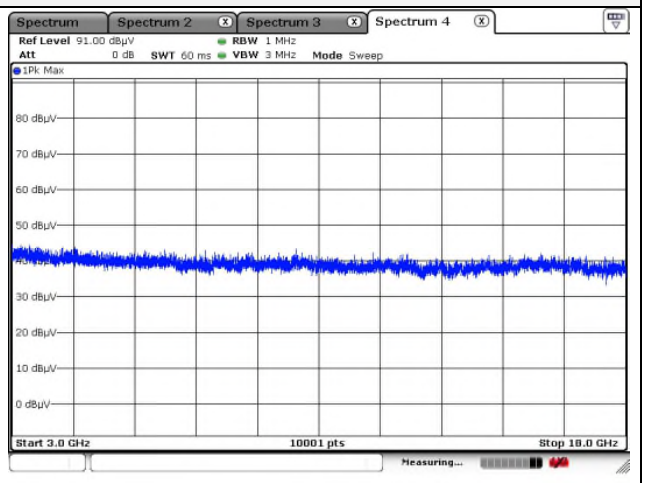
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.

1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode: 802.11g

Distance of measurement: 3 meter

Channel: 01

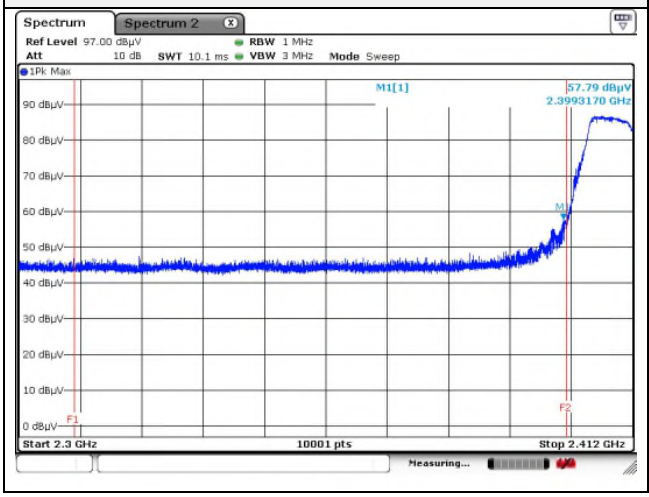
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1125.09	51.14	Peak	H	-11.27	-	39.87	74.00	34.13
1019.50	50.35	Peak	V	-11.32	-	39.03	74.00	34.97

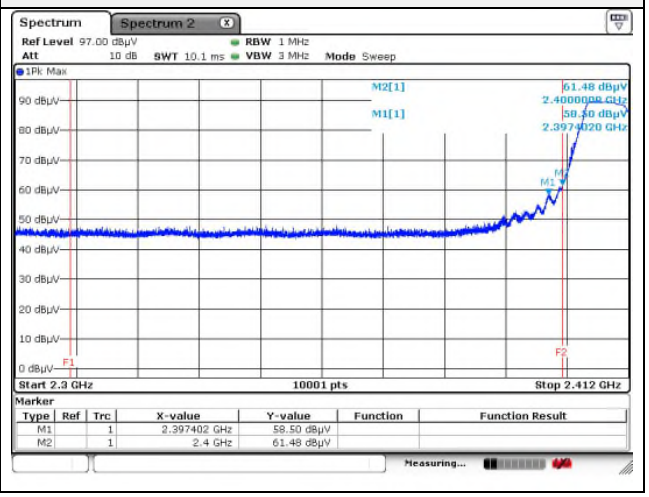
- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2399.32	57.79	Peak	H	-7.14	-	50.65	74.00	23.35
2397.40	58.50	Peak	V	-7.13	-	51.37	74.00	22.63
2397.40	41.13	Average	V	-7.13	-	34.00	54.00	20.00
2400.00	61.48	Peak	V	-7.14	-	54.34	74.00	19.66
2400.00	46.19	Average	V	-7.14	-	39.05	54.00	14.95

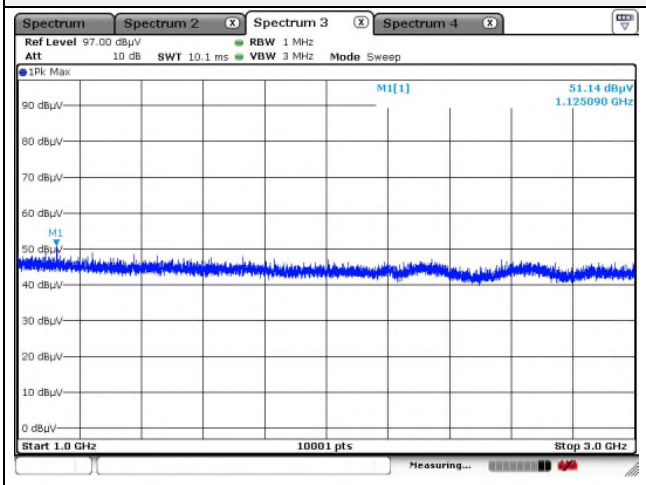
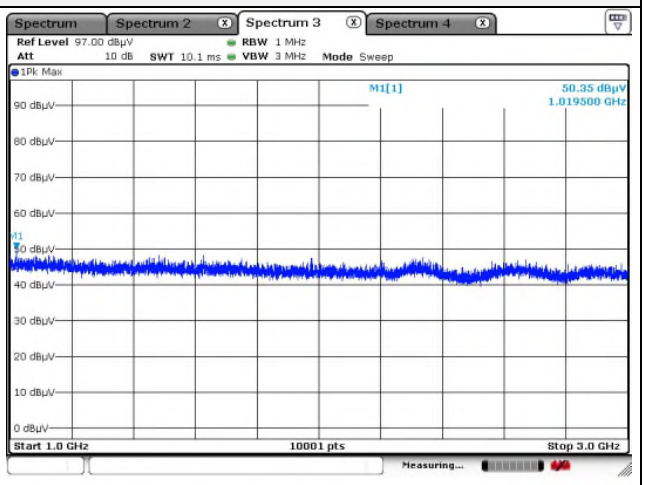
Restricted band // Horizontal // Peak

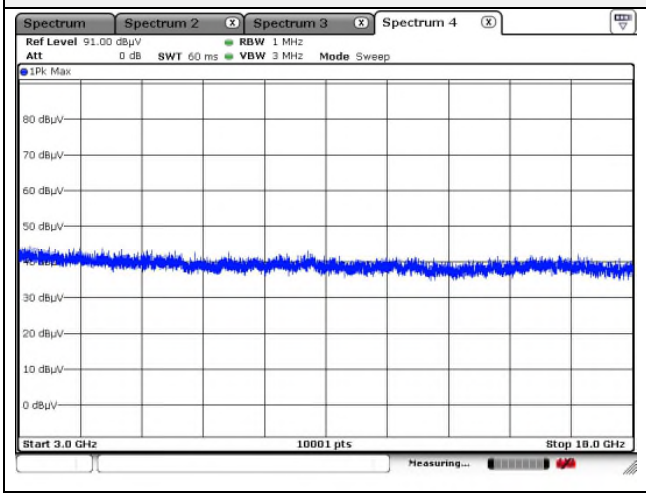
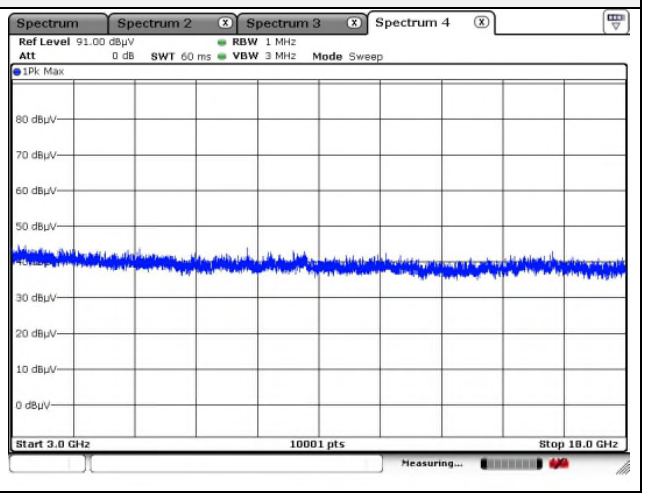


Restricted band // Vertical // Peak



Restricted band // Horizontal // Average	Restricted band // Vertical // Average
N/A	

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

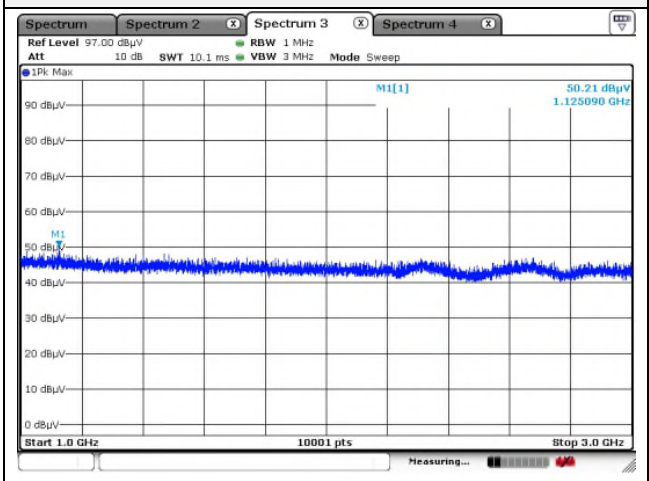
Distance of measurement: 3 meter

Channel: 06

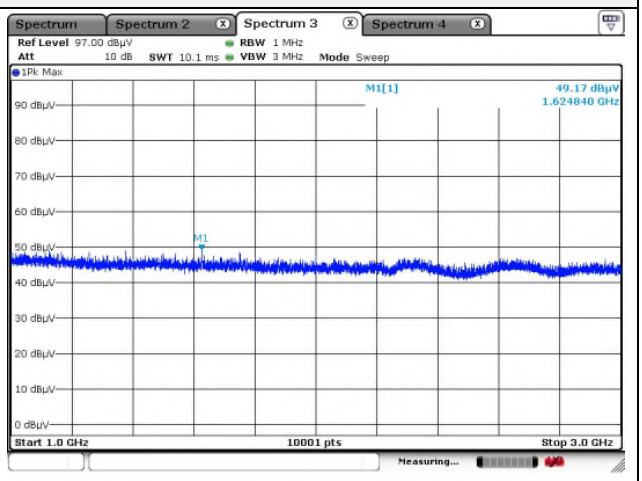
- **Spurious**

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1125.09	50.21	Peak	H	-11.27	-	38.94	74.00	35.06
1624.84	49.17	Peak	V	-7.15	-	42.02	74.00	31.98

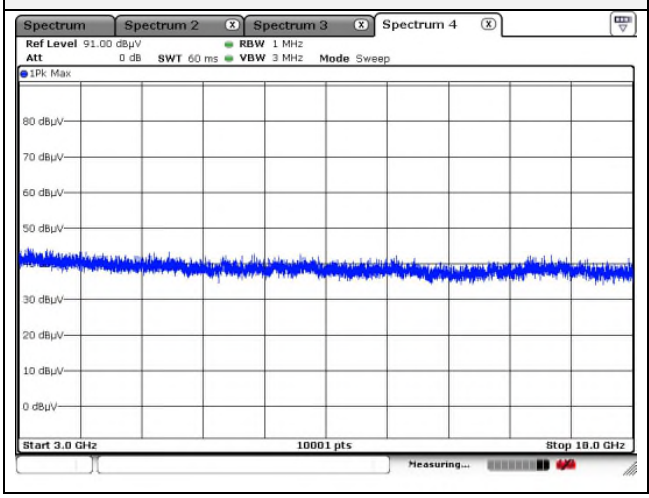
Horizontal // Peak for 1 ㎓ to 3 ㎓



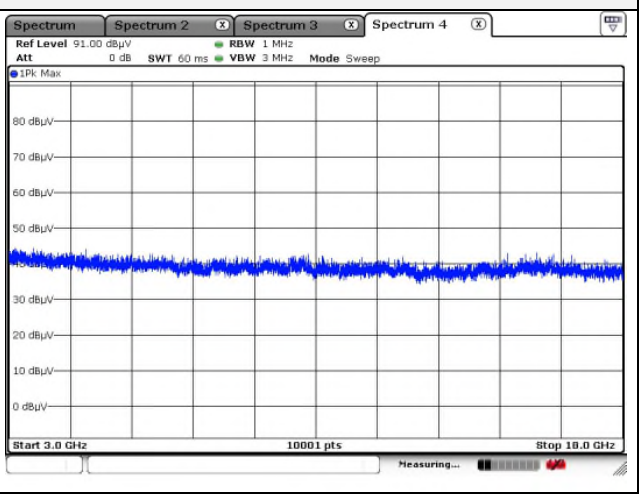
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.
1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Mode: 802.11g

Distance of measurement: 3 meter

Channel: 11

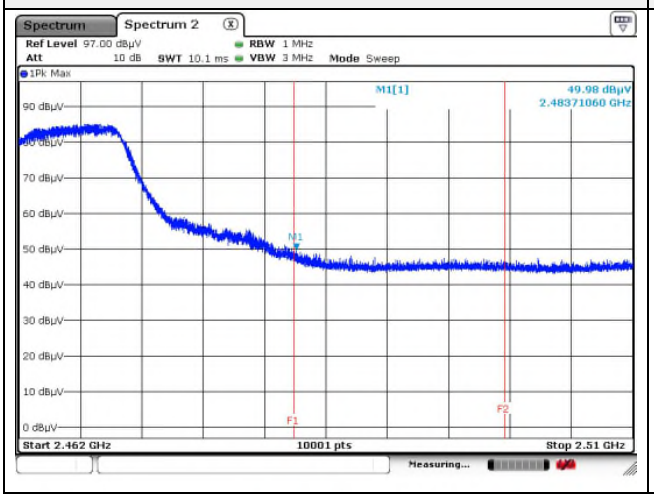
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1125.29	49.74	Peak	H	-11.27	-	38.47	74.00	35.53
1078.49	48.89	Peak	V	-11.30	-	37.59	74.00	36.41

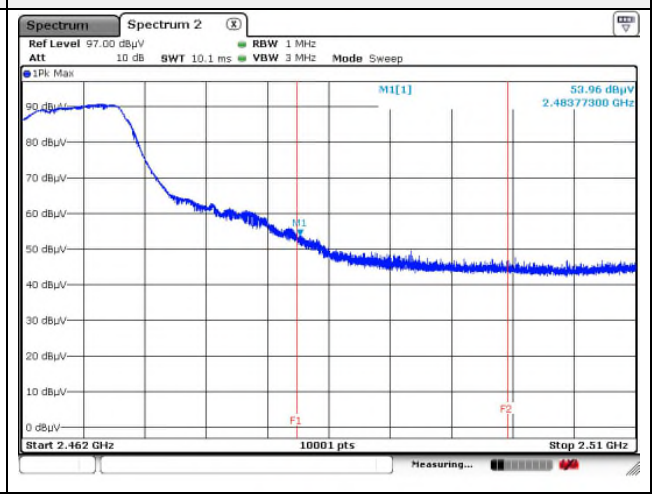
- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2483.71	49.98	Peak	H	-7.55	-	42.43	74.00	31.57
2483.77	53.96	Peak	V	-7.55	-	46.41	74.00	27.59

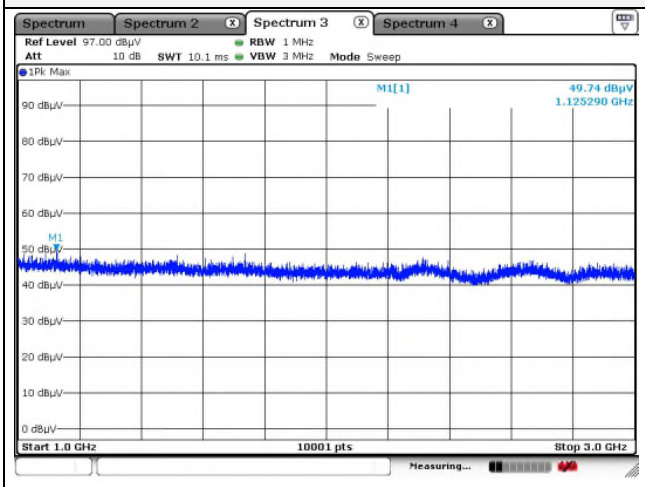
Restricted band // Horizontal // Peak



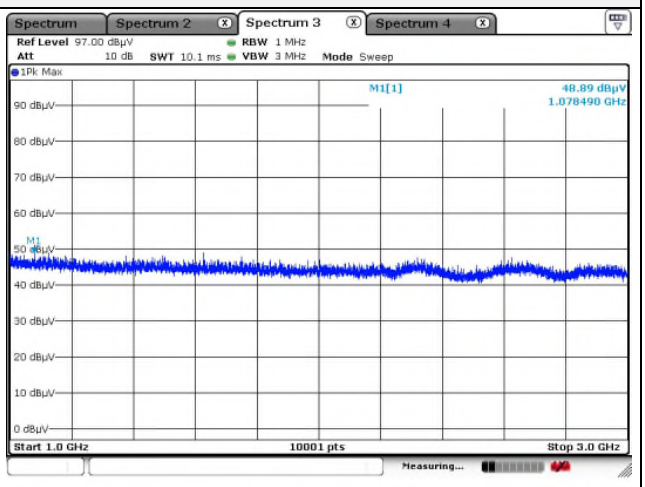
Restricted band // Vertical // Peak



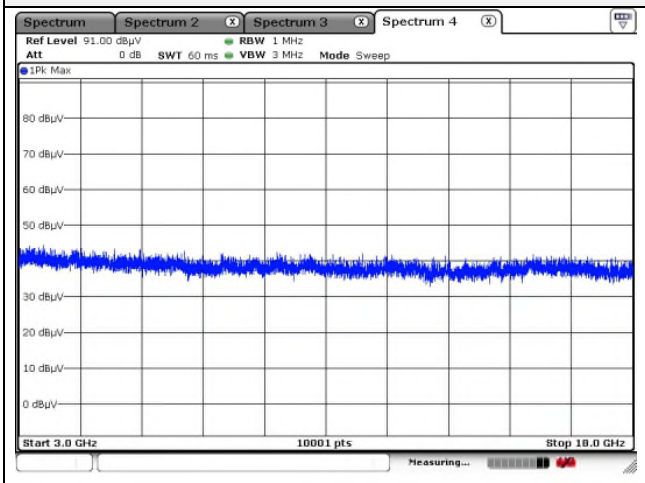
Horizontal // Peak for 1 ㎓ to 3 ㎓



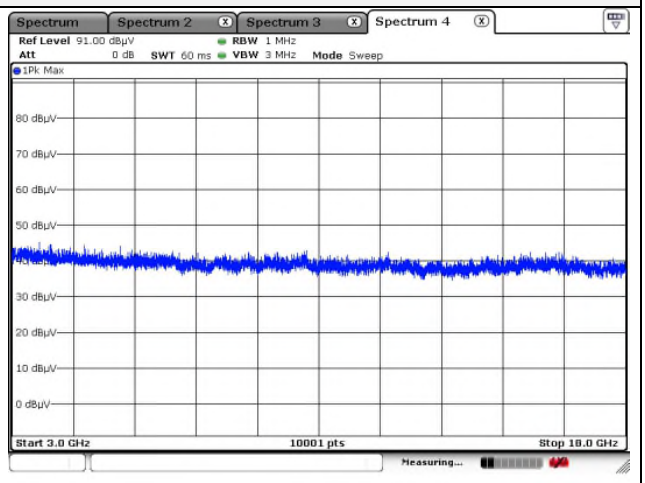
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.

1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode: 802.11n(HT20)

Distance of measurement: 3 meter

Channel: 01

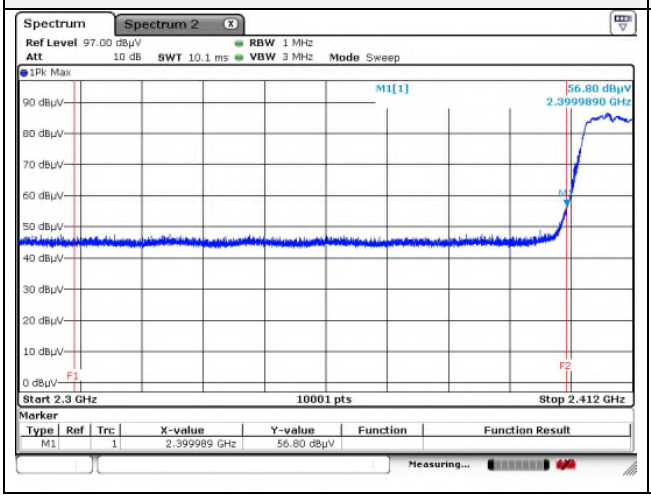
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1124.89	50.81	Peak	H	-11.28	-	39.53	74.00	34.47
1625.24	49.25	Peak	V	-7.15	-	42.10	74.00	31.90

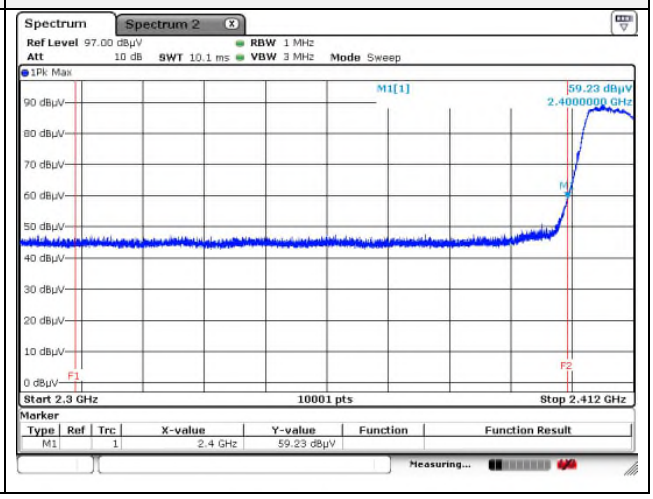
- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2399.99	56.80	Peak	H	-7.14	-	49.66	74.00	24.34
2400.00	59.23	Peak	V	-7.14	-	52.09	74.00	21.91

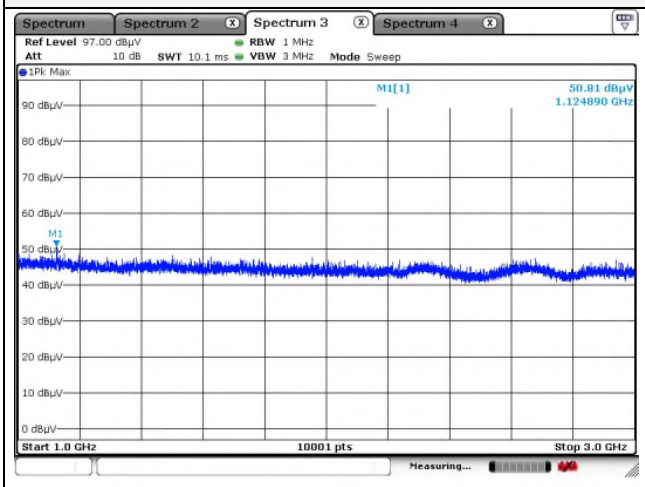
Restricted band // Horizontal // Peak



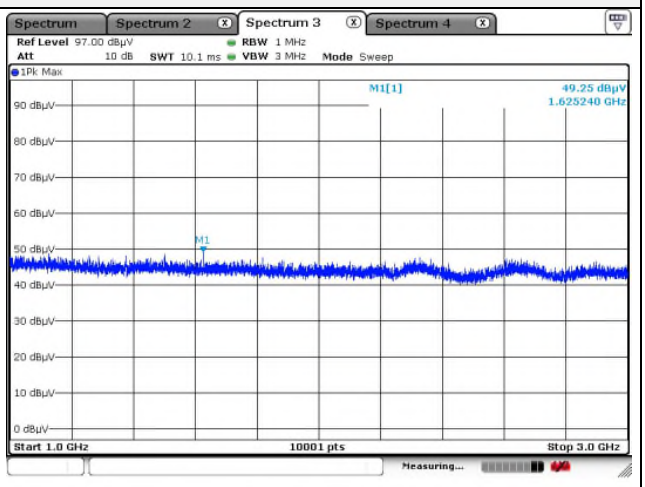
Restricted band // Vertical // Peak



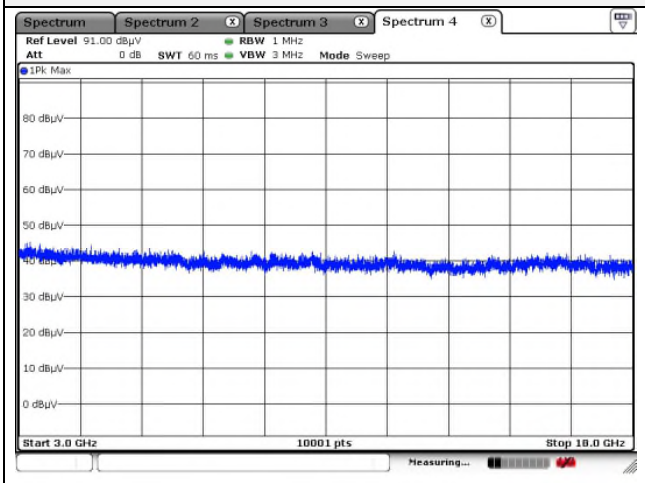
Horizontal // Peak for 1 ㎓ to 3 ㎓



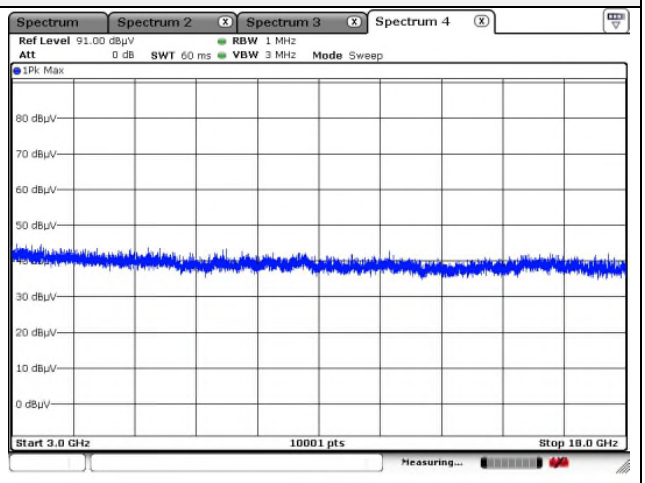
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.

1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode: 802.11n(HT20)

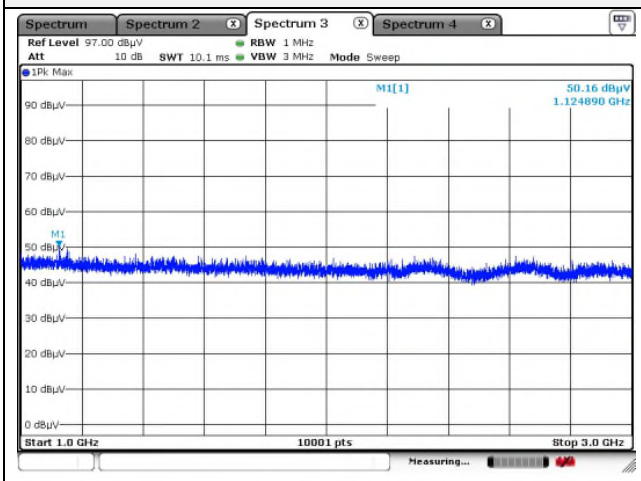
Distance of measurement: 3 meter

Channel: 06

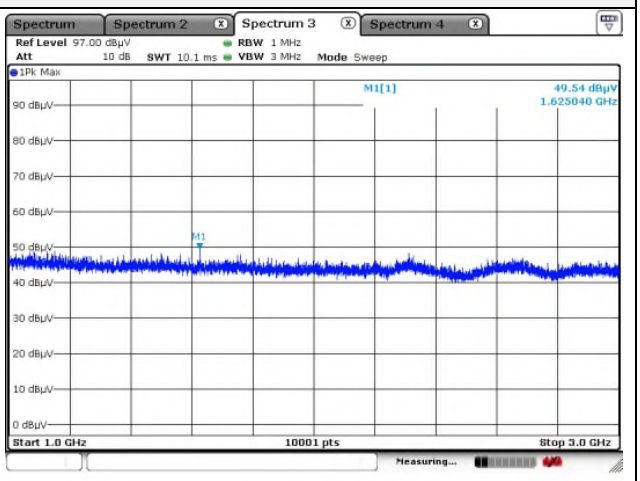
- **Spurious**

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1124.89	50.16	Peak	H	-11.28	-	38.88	74.00	35.12
1625.04	49.54	Peak	V	-7.15	-	42.39	74.00	31.61

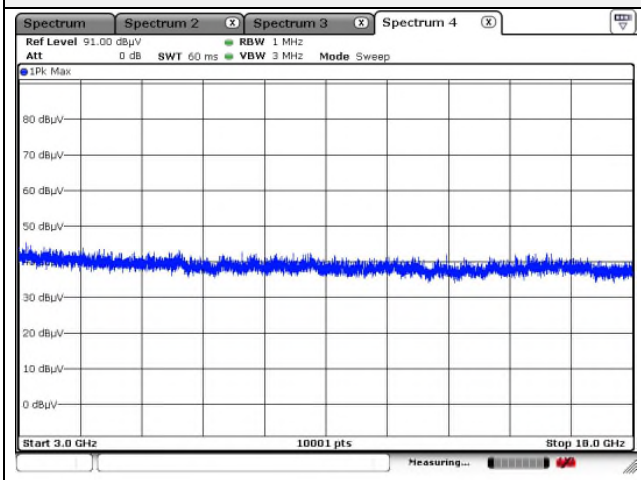
Horizontal // Peak for 1 ㎓ to 3 ㎓



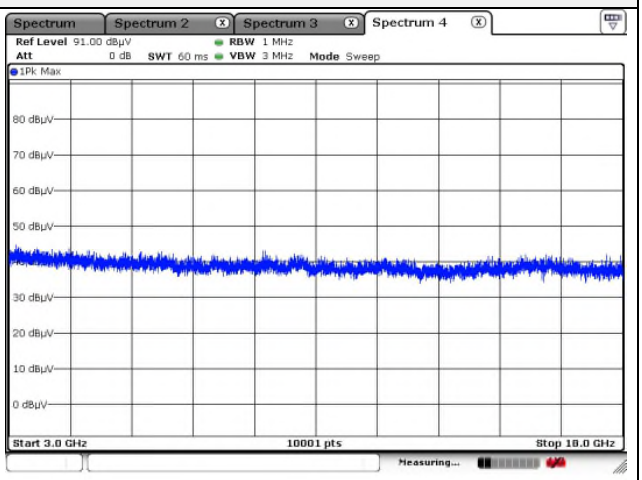
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.
1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Mode: 802.11n(HT20)

Distance of measurement: 3 meter

Channel: 11

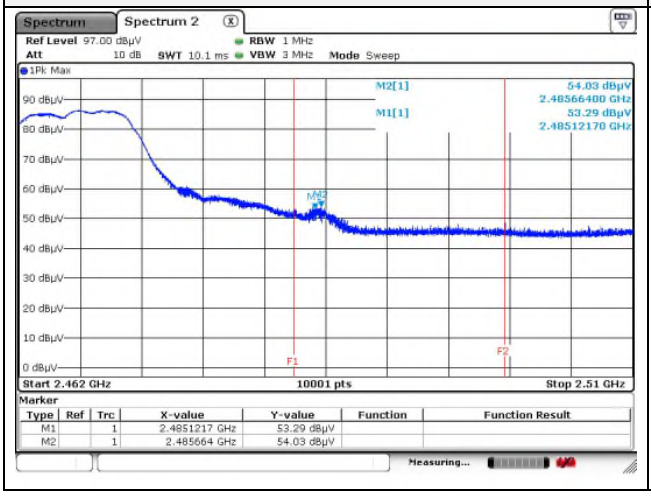
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1124.69	50.12	Peak	H	-11.28	-	38.84	74.00	35.16
1125.69	48.97	Peak	V	-11.27	-	37.70	74.00	36.30

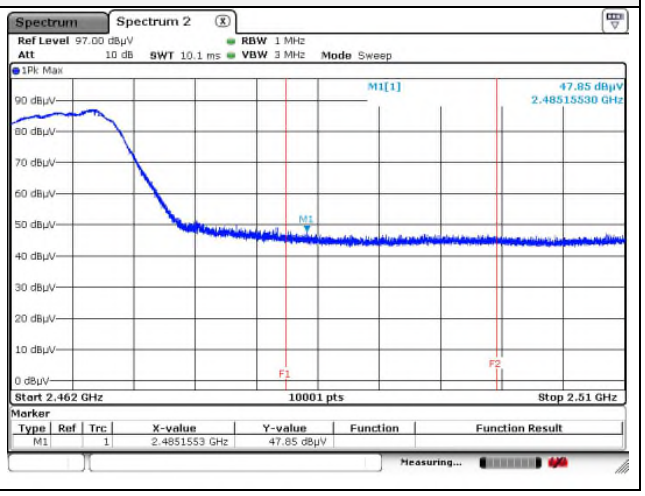
- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2485.12	53.29	Peak	H	-7.55	-	45.74	74.00	28.26
2485.66	54.03	Peak	H	-7.55	-	46.48	74.00	27.52
2485.16	47.85	Peak	V	-7.55	-	40.30	74.00	33.70

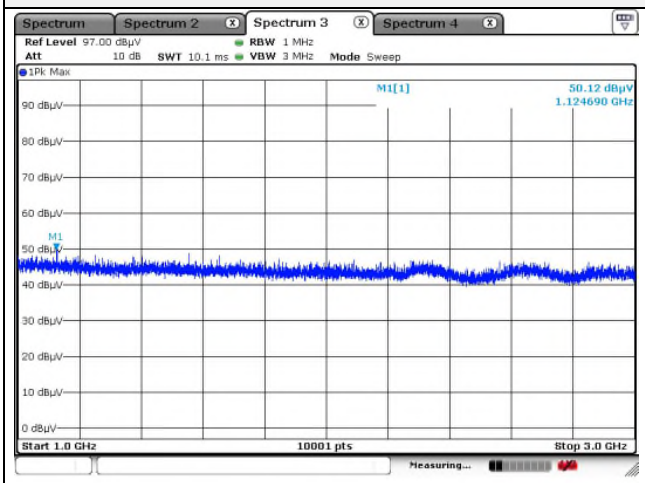
Restricted band // Horizontal // Peak



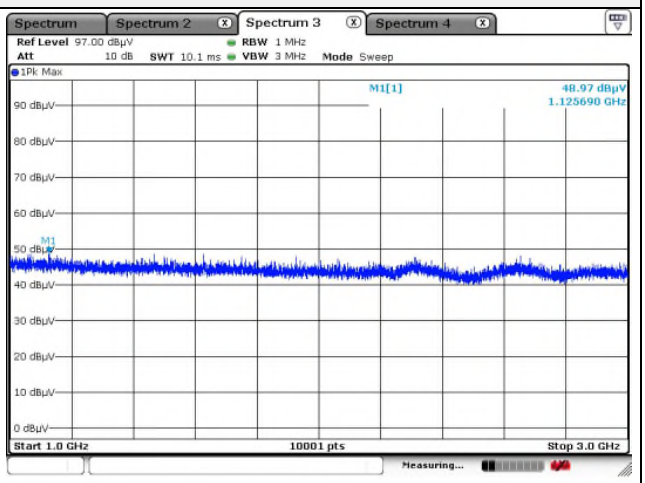
Restricted band // Vertical // Peak



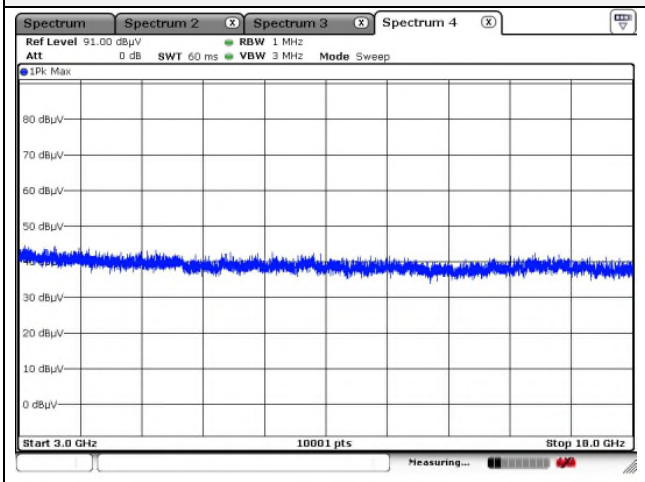
Horizontal // Peak for 1 ㎓ to 3 ㎓



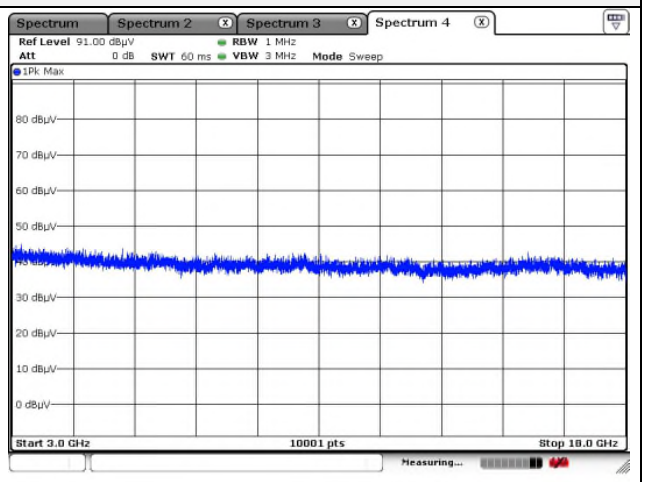
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.
1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode: 802.11n(HT40)

Distance of measurement: 3 meter

Channel: 03

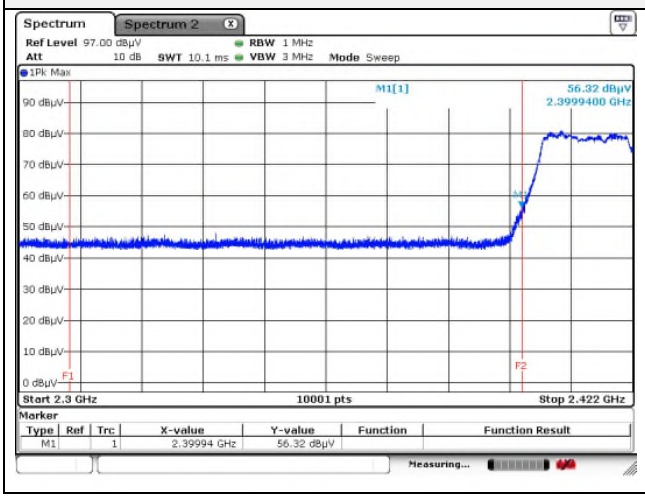
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1125.09	50.02	Peak	H	-11.27	-	38.75	74.00	35.25
1625.04	48.89	Peak	V	-7.15	-	41.74	74.00	32.26

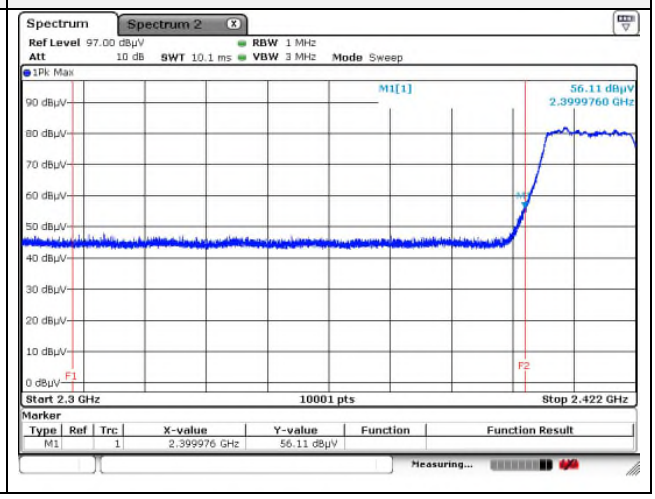
- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2399.94	56.32	Peak	H	-7.14	-	49.18	74.00	24.82
2399.98	56.11	Peak	V	-7.14	-	48.97	74.00	25.03

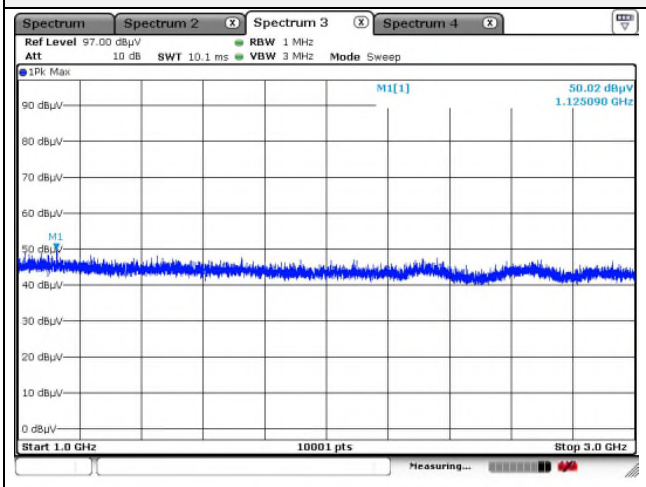
Restricted band // Horizontal // Peak



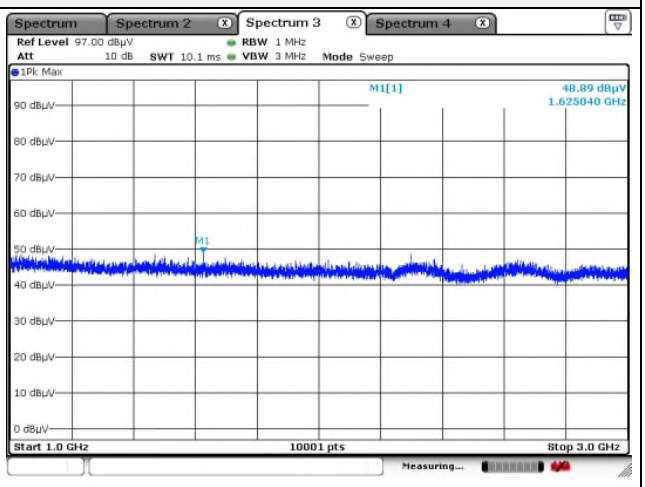
Restricted band // Vertical // Peak



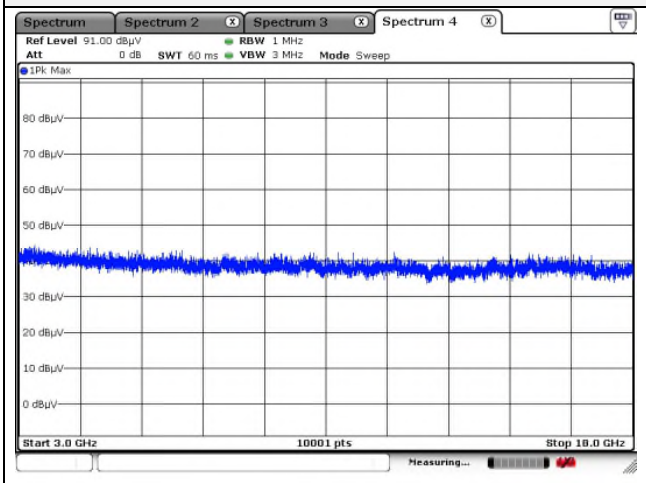
Horizontal // Peak for 1 ㎓ to 3 ㎓



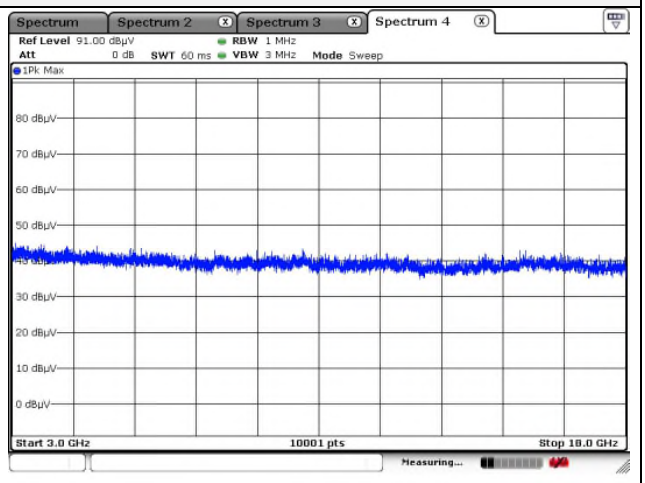
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.

1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

Mode: 802.11n(HT40)

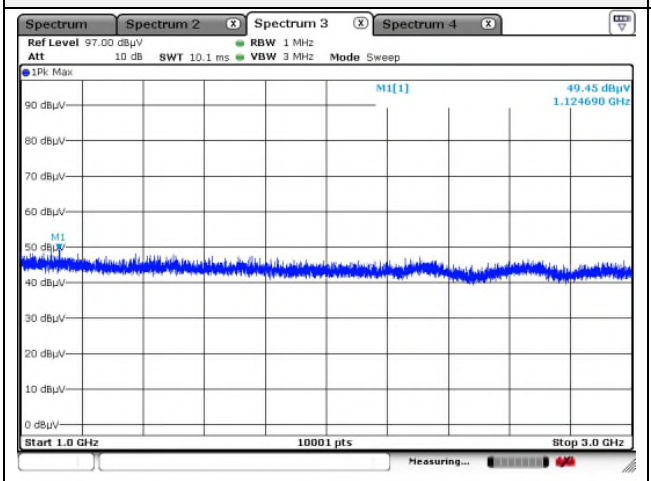
Distance of measurement: 3 meter

Channel: 06

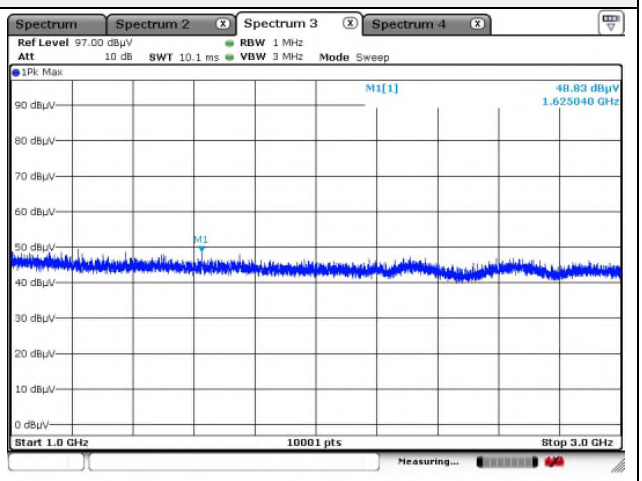
- **Spurious**

Frequency (㎒)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1124.69	49.45	Peak	H	-11.28	-	38.17	74.00	35.83
1625.04	48.83	Peak	V	-7.15	-	41.68	74.00	32.32

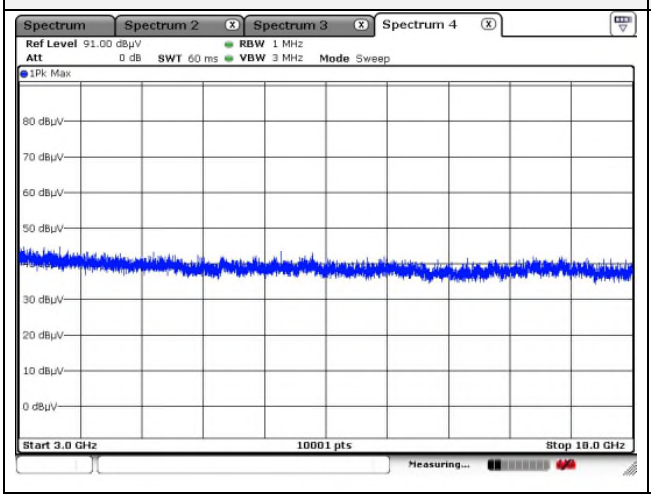
Horizontal // Peak for 1 ㎓ to 3 ㎓



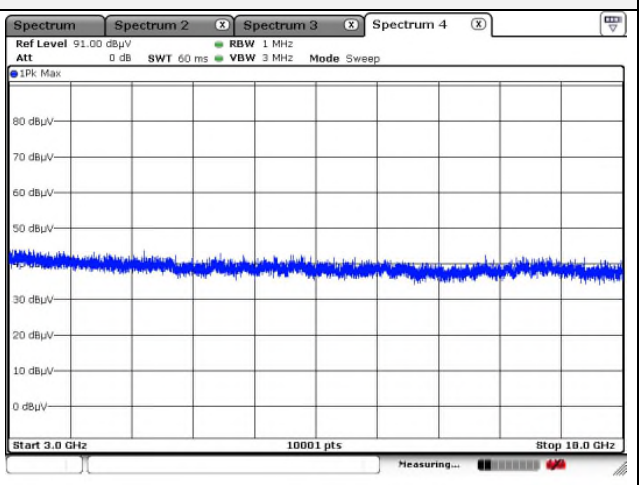
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓



Note.
1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Mode: 802.11n(HT40)

Distance of measurement: 3 meter

Channel: 09

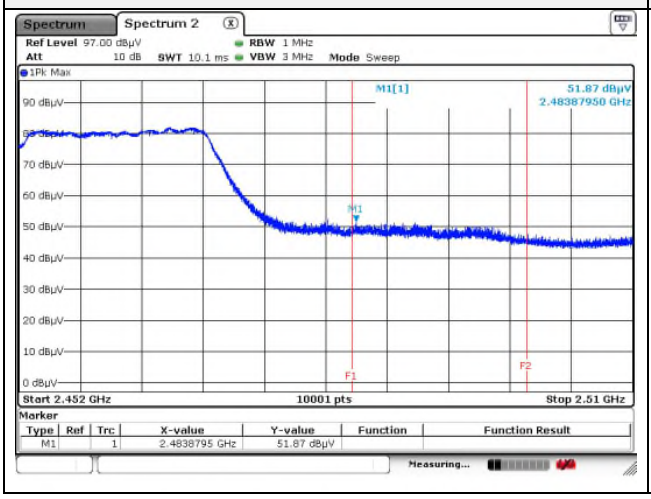
- **Spurious**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
1124.29	50.07	Peak	H	-11.28	-	38.79	74.00	35.21
1500.25	49.23	Peak	V	-9.05	-	40.18	74.00	33.82

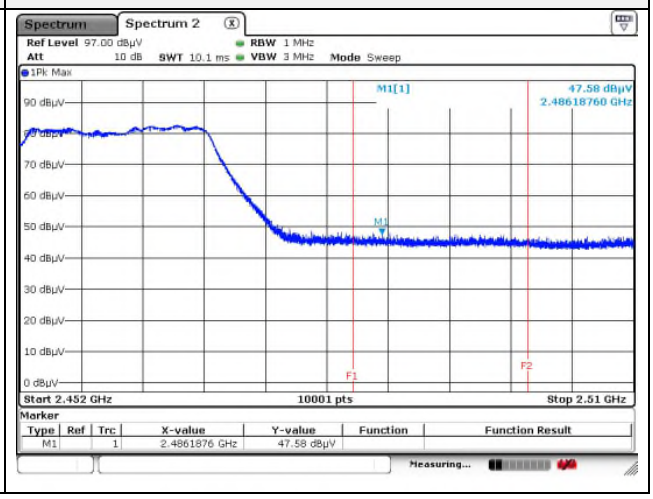
- **Band edge**

Frequency (MHz)	Level (dBμV)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
2483.88	51.87	Peak	H	-7.55	-	44.32	74.00	29.68
2486.19	47.58	Peak	V	-7.56	-	40.02	74.00	33.98

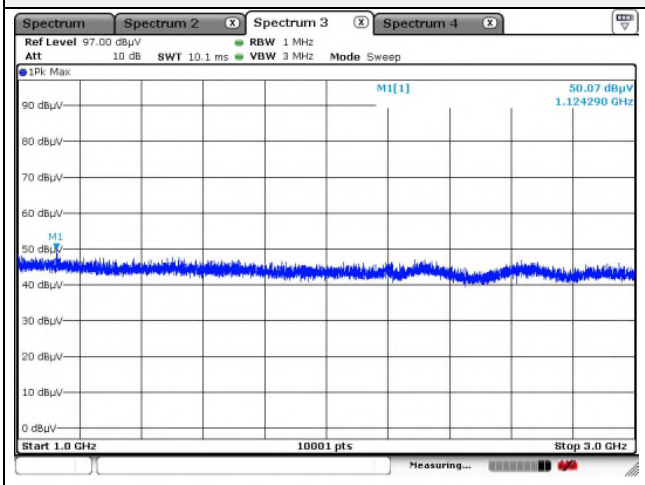
Restricted band // Horizontal // Peak



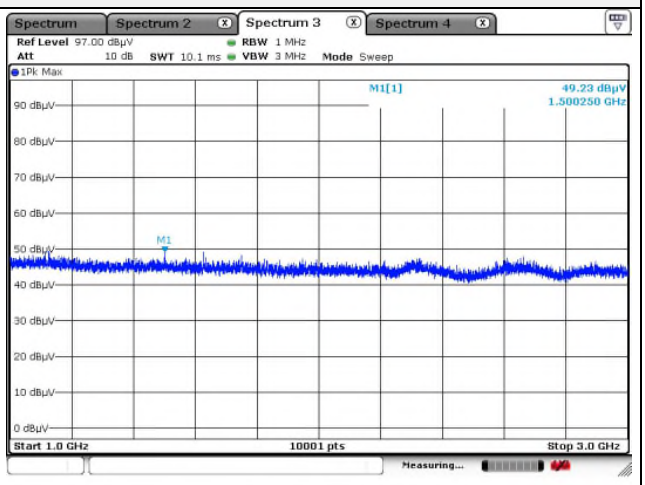
Restricted band // Vertical // Peak



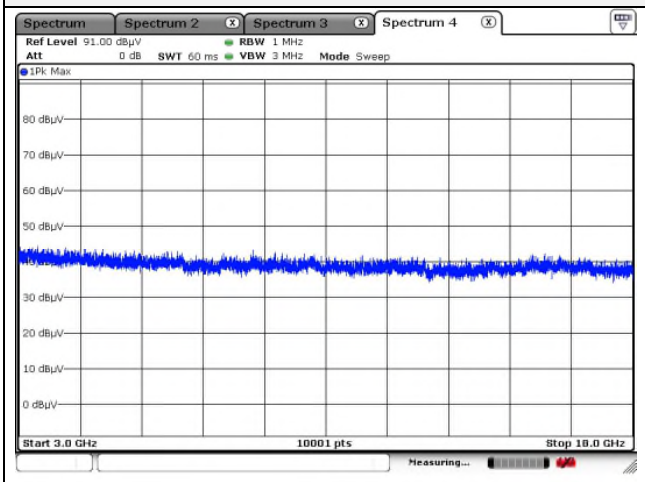
Horizontal // Peak for 1 ㎓ to 3 ㎓



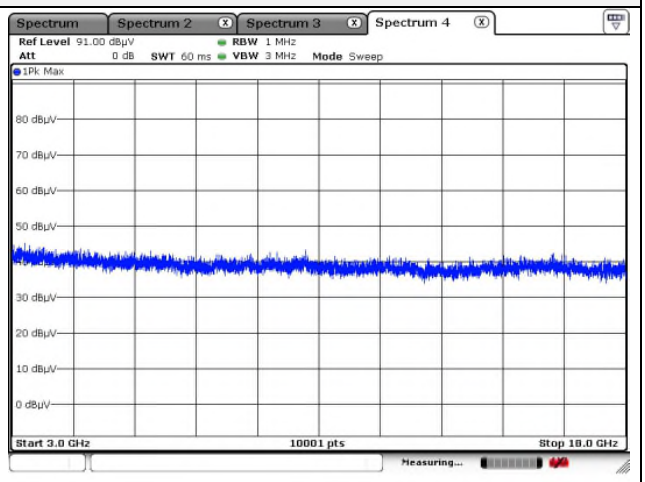
Vertical // Peak for 1 ㎓ to 3 ㎓



Horizontal // Peak for 3 ㎓ to 18 ㎓



Vertical // Peak for 3 ㎓ to 18 ㎓

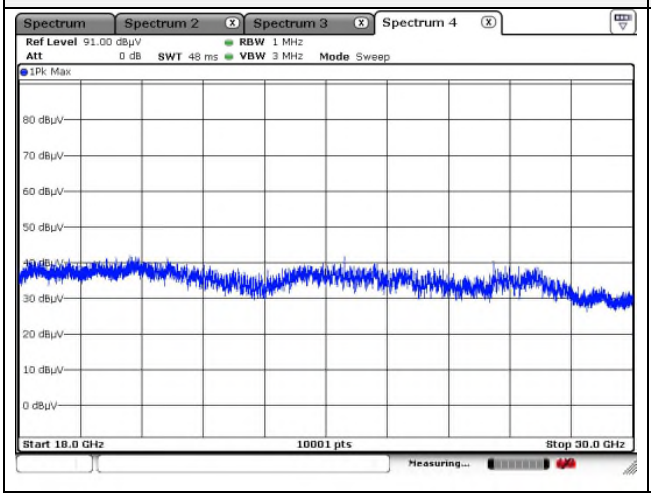
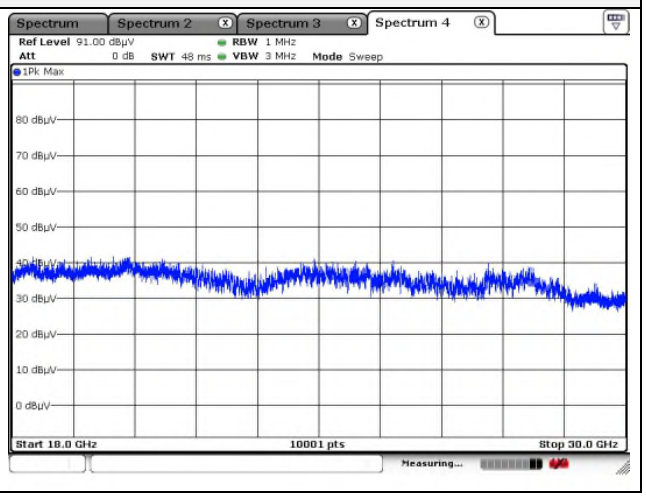


Note.
1. No spurious emission were detected above 3 ㎓.
2. Average test would be performed if the peak result were greater than the average limit.

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

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

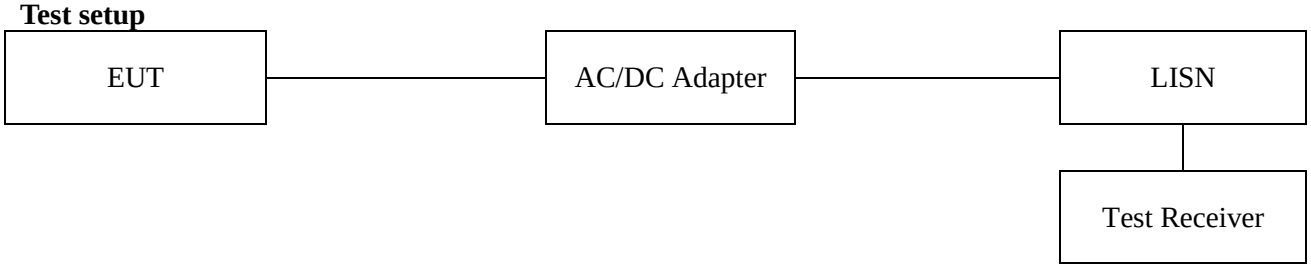
Mode:	802.11n_HT20
Distance of measurement:	3 meter
Channel:	1 (Worst case)

Horizontal	Vertical
	

Note.
1. No spurious emission were detected above 18 ㎓.

3.2 AC conducted emissions

Test setup



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:

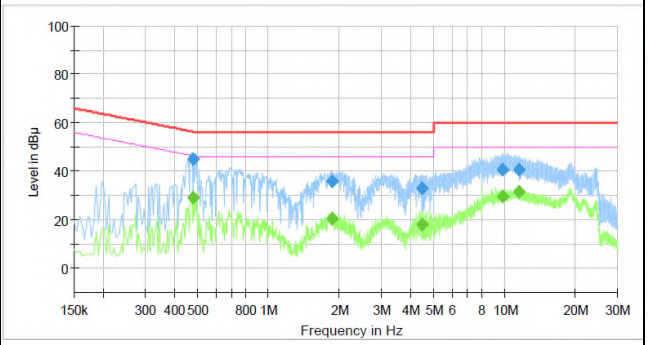
1. All AC line conducted spurious emission are measured with a receiver connected to a grounded LISN while the EUT is operating at its maximum duty cycle, at maximum power, and the appropriate frequencies. All data rates and modes were investigated for conducted spurious emission. Only the conducted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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Test results

Mode:	802.11b (Worst case)
Distance of measurement:	3 meter
Channel:	1 (Worst case)

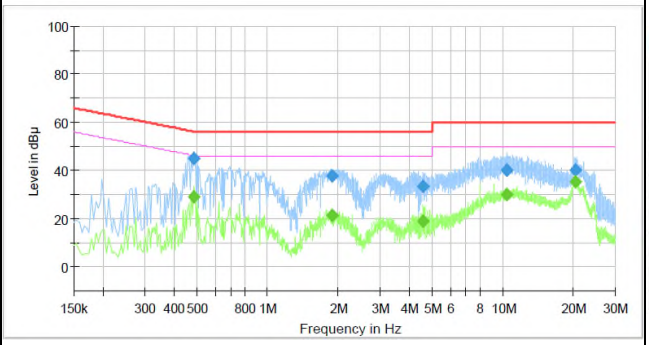
Hot Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.482000	---	29.05	46.30	17.25	1000.0	9.000	L1	19.8
0.482000	44.98	---	56.30	11.32	1000.0	9.000	L1	19.8
1.866000	---	20.24	46.00	25.76	1000.0	9.000	L1	20.4
1.866000	36.01	---	56.00	19.99	1000.0	9.000	L1	20.4
4.482000	---	17.87	46.00	28.13	1000.0	9.000	L1	19.8
4.482000	32.81	---	56.00	23.19	1000.0	9.000	L1	19.8
9.870000	---	29.52	50.00	20.48	1000.0	9.000	L1	20.3
9.870000	40.64	---	60.00	19.36	1000.0	9.000	L1	20.3
11.466000	---	31.64	50.00	18.36	1000.0	9.000	L1	20.4
11.466000	40.72	---	60.00	19.28	1000.0	9.000	L1	20.4

Neutral Line



Final_Result

Frequency (MHz)	QuasiPeak (dBµV)	Average (dBµV)	Limit (dBµV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.486000	---	29.10	46.24	17.14	1000.0	9.000	N	19.8
0.486000	45.05	---	56.24	11.19	1000.0	9.000	N	19.8
1.874000	---	21.34	46.00	24.66	1000.0	9.000	N	20.4
1.874000	37.53	---	56.00	18.47	1000.0	9.000	N	20.4
4.578000	---	18.89	46.00	27.11	1000.0	9.000	N	19.8
4.578000	33.51	---	56.00	22.49	1000.0	9.000	N	19.8
10.406000	---	29.83	50.00	20.17	1000.0	9.000	N	20.4
10.406000	40.30	---	60.00	19.70	1000.0	9.000	N	20.4
20.314000	---	35.54	50.00	14.46	1000.0	9.000	N	21.0
20.314000	40.13	---	60.00	19.87	1000.0	9.000	N	21.0

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr

Appendix A. Measurement equipment

Equipment	Manufacturer	Model	Serial No.	Calibration interval	Calibration due.
EMI TEST RECEIVER	ESU26	Rohde & Schwarz	100552	1 year	2021.04.01
SPECTRUM ANALYZ ER	R&S	FSV40	101725	1 year	2021.06.22
8360B Series Swept Signal Generator	HP	83630B	3844A00786	1 year	2021.01.15
SIGNAL GENERATOR	KEYSIGHT	N5182B	MY59100115	1 year	2021.05.12
Power Meter	Anritsu	ML2495A	1438001	1 year	2021.05.12
Pulse Power Sensor	Anritsu	MA2411B	1339205	1 year	2021.05.12
DC POWER SUPPLY	SORENSEN	DCS40-75E	1408A02745	1 year	2021.01.15
ATTENUATOR	Mini-Circuits	BW-S10-2W263+	1	1 year	2021.01.17
Loop Antenna	Schwarzbeck	FMZB1513	225	2 years	2021.02.15
BILOG ANTENNA	VULB 9168	SCHWARZBECK	9168-461	2 years	2022.05.26
HORN ANTENNA	A.H.	SAS-571	414	1 years	2021.01.31
BAND REJECT FILTER	MICRO-TRONICS	BRM50702	G272	1 year	2021.01.15
BAND REJECT FILTER	MICRO-TRONICS	BRM50716	G199	1 year	2021.01.15
AMPLIFIER	310N	SONOMA INSTRUMENT	401123	1 year	2021.06.08
PREAMPLIFIER	8449B	AGILENT	8008A01640	1 year	2021.04.01
ATTENUATOR	F04-C1206-01	SRT	20022403	1 year	2021.05.06
EMI Test Receiver	R&S	ESR3	101781	1 year	2021.01.20
EMI Test Receiver	R&S	ESU26	100552	1 year	2021.04.01
Pulse Limiter	R&S	ESH3-Z2	101915	1 year	2021.01.02
LISN	R&S	ENV216	101787	1 year	2021.01.02

Peripheral devices

Device	Manufacturer	Model No.	Serial No.
Notebook computer	LG Electronics Inc.,	15UD590	904QCSF564006
Test Jig Board	N/A	N/A	N/A

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.
The authenticity of the test report, contact shchoi@kes.co.kr