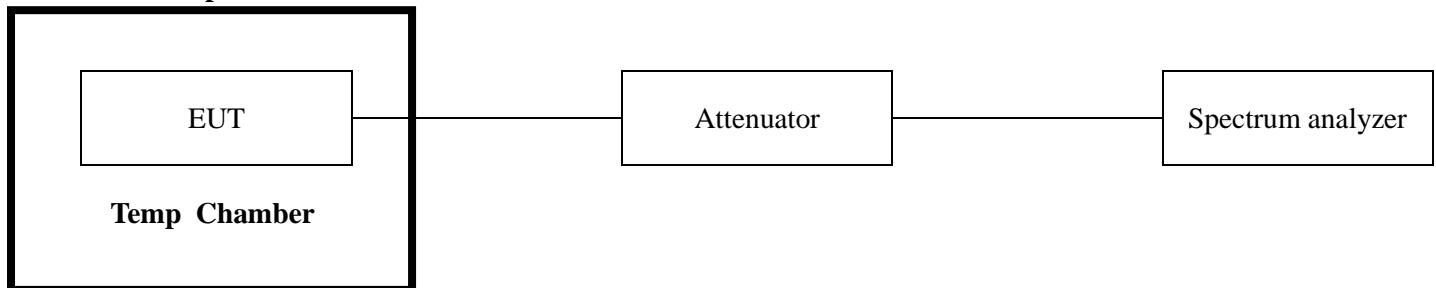


### 3.5. Frequency Stability

#### Test procedure

ANSI C63.10-2013, clause 6.8.1

#### Test setup



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

#### Limit

N/A

## Test results

Mode: UNII-1  
 Operating frequency: 5 180 MHz

Test voltage (%)	Test voltage (V)	Temperatur e (°C)	Maintaining time	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)	
100 %	AC 120 V	-20	Startup	5 180.028 385	28 385	0.000 548	
			2 minutes	5 180.027 981	27 981	0.000 540	
			5 minutes	5 180.027 141	27 141	0.000 524	
			10 minutes	5 180.026 930	26 930	0.000 520	
100 %		-10	Startup	5 180.024 261	24 261	0.000 468	
			2 minutes	5 180.024 179	24 179	0.000 467	
			5 minutes	5 180.023 701	23 701	0.000 458	
			10 minutes	5 180.023 432	23 432	0.000 452	
100 %		0	Startup	5 180.016 678	16 678	0.000 322	
			2 minutes	5 180.016 605	16 605	0.000 321	
			5 minutes	5 180.016 522	16 522	0.000 319	
			10 minutes	5 180.015 131	15 131	0.000 292	
100 %		10	Startup	5 180.009 385	9 385	0.000 181	
			2 minutes	5 180.009 295	9 295	0.000 179	
			5 minutes	5 180.00 9200	9 200	0.000 178	
			10 minutes	5 180.008 625	8 625	0.000 167	
100 %		20	Startup	5 180.008 043	8 043	0.000 155	
			2 minutes	5 180.007 448	7 448	0.000 144	
			5 minutes	5 180.007 161	7 161	0.000 138	
			10 minutes	5 180.006 464	6 464	0.000 125	
100 %		23	Startup	5 180.006 705	6 705	0.000 129	
			2 minutes	5 180.006 499	6 499	0.000 125	
			5 minutes	5 180.005 542	5 542	0.000 107	
			10 minutes	5 180.005 217	5 217	0.000 101	
100 %		30	Startup	5 180.005 845	5 845	0.000 113	
			2 minutes	5 180.006 417	6 417	0.000 124	
			5 minutes	5 180.006 103	6 103	0.000 118	
			10 minutes	5 180.005 155	5 155	0.000 100	
100 %		40	Startup	5 179.991 169	-8 831	-0.000 170	
			2 minutes	5 179.991 027	-8 973	-0.000 173	
			5 minutes	5 179.990 908	-9 092	-0.000 176	
			10 minutes	5 179.990 078	-9 922	-0.000 192	
100 %		50	Startup	5 179.987 722	-12 278	-0.000 237	
			2 minutes	5 179.987 579	-12 421	-0.000 240	
			5 minutes	5 179.987 231	-12 769	-0.000 247	
			10 minutes	5 179.986 937	-13 063	-0.000 252	
85 %	AC 102 V	23	Startup	5 180.008 186	8 186	0.000 158	
			2 minutes	5 180.007 868	7 868	0.000 152	
			5 minutes	5 180.007 584	7 584	0.000 146	
			10 minutes	5 180.007 545	7 545	0.000 146	
115 %	AC 138 V	23	Startup	5 180.008 797	8 797	0.000 170	
			2 minutes	5 180.008 289	8 289	0.000 160	
			5 minutes	5 180.008 277	8 277	0.000 160	
			10 minutes	5 180.007 435	7 435	0.000 144	

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](mailto:shchoi@kes.co.kr)

Mode: **UNII-2A**

Operating frequency: **5 260 MHz**

Test voltage (%)	Test voltage (V)	Temperatur e (°C)	Maintaining time	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)	
100 %	AC 120 V	-20	Startup	5 260.028 295	28 295	0.000 538	
			2 minutes	5 260.028 173	28 173	0.000 536	
			5 minutes	5 260.027 784	27 784	0.000 528	
			10 minutes	5 260.026 830	26 830	0.000 510	
100 %		-10	Startup	5 260.025 120	25 120	0.000 478	
			2 minutes	5 260.024 956	24 956	0.000 474	
			5 minutes	5 260.024 468	24 468	0.000 465	
			10 minutes	5 260.023 625	23 625	0.000 449	
100 %		0	Startup	5 260.016 263	16 263	0.000 309	
			2 minutes	5 260.015 557	15 557	0.000 296	
			5 minutes	5 260.015 159	15 159	0.000 288	
			10 minutes	5 260.015 044	15 044	0.000 286	
100 %		10	Startup	5 260.010 160	10 160	0.000 193	
			2 minutes	5 260.009 172	9 172	0.000 174	
			5 minutes	5 260.008 795	8 795	0.000 167	
			10 minutes	5 260.008 673	8 673	0.000 165	
100 %		20	Startup	5 260.007 733	7 733	0.000 147	
			2 minutes	5 260.007 719	7 719	0.000 147	
			5 minutes	5 260.006 921	6 921	0.000 132	
			10 minutes	5 260.006 277	6 277	0.000 119	
100 %		23	Startup	5 260.007 107	7 107	0.000 135	
			2 minutes	5 260.006 977	6 977	0.000 133	
			5 minutes	5 260.006 093	6 093	0.000 116	
			10 minutes	5 260.005 454	5 454	0.000 104	
100 %		30	Startup	5 260.004 528	4 528	0.000 086	
			2 minutes	5 260.005 335	5 335	0.000 101	
			5 minutes	5 260.005 097	5 097	0.000 097	
			10 minutes	5 260.004 105	4 105	0.000 078	
100 %		40	Startup	5 259.991 257	-8 743	-0.000 166	
			2 minutes	5 259.990 881	-9 119	-0.000 173	
			5 minutes	5 259.990 812	-9 188	-0.000 175	
			10 minutes	5 259.990 355	-9 645	-0.000 183	
100 %		50	Startup	5 259.988 344	-11 656	-0.000 222	
			2 minutes	5 259.988 224	-11 776	-0.000 224	
			5 minutes	5 259.987 563	-12 437	-0.000 236	
			10 minutes	5 259.987 293	-12 707	-0.000 242	
85 %	AC 102 V	23	Startup	5 260.008 708	8 708	0.000 166	
			2 minutes	5 260.008 241	8 241	0.000 157	
			5 minutes	5 260.008 145	8 145	0.000 155	
			10 minutes	5 260.007 877	7 877	0.000 150	
115 %	AC 138 V	23	Startup	5 260.009 264	9 264	0.000 176	
			2 minutes	5 260.008 514	8 514	0.000 162	
			5 minutes	5 260.008 448	8 448	0.000 161	
			10 minutes	5 260.008 413	8 413	0.000 160	

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](mailto:shchoi@kes.co.kr)

Mode: UNII-2C  
 Operating frequency: 5500 MHz

Test voltage (%)	Test voltage (V)	Temperatur e (°C)	Maintaining time	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)	
100 %	AC 120 V	-20	Startup	5 500.028 807	28 807	0.000 524	
			2 minutes	5 500.028 707	28 707	0.000 522	
			5 minutes	5 500.027 321	27 321	0.000 497	
			10 minutes	5 500.027 036	27 036	0.000 492	
100 %		-10	Startup	5 500.024 961	24 961	0.000 454	
			2 minutes	5 500.023 891	23 891	0.000 434	
			5 minutes	5 500.023 773	23 773	0.000 432	
			10 minutes	5 500.023 719	23 719	0.000 431	
100 %		0	Startup	5 500.016 738	16 738	0.000 304	
			2 minutes	5 500.016 322	16 322	0.000 297	
			5 minutes	5 500.016 265	16 265	0.000 296	
			10 minutes	5 500.014 990	14 990	0.000 273	
100 %		10	Startup	5 500.010 528	10 528	0.000 191	
			2 minutes	5 500.010 158	10 158	0.000 185	
			5 minutes	5 500.009 687	9 687	0.000 176	
			10 minutes	5 500.008 898	8 898	0.000 162	
100 %		20	Startup	5 500.007 707	7 707	0.000 140	
			2 minutes	5 500.007 163	7 163	0.000 130	
			5 minutes	5 500.006 787	6 787	0.000 123	
			10 minutes	5 500.006 395	6 395	0.000 116	
100 %		23	Startup	5 500.007 038	7 038	0.000 128	
			2 minutes	5 500.006 406	6 406	0.000 116	
			5 minutes	5 500.006 008	6 008	0.000 109	
			10 minutes	5 500.005 361	5 361	0.000 097	
100 %		30	Startup	5 500.005 946	5 946	0.000 108	
			2 minutes	5 500.006 083	6 083	0.000 111	
			5 minutes	5 500.006 081	6 081	0.000 111	
			10 minutes	5 500.004 990	4 990	0.000 091	
100 %		40	Startup	5 499.990 837	-9 163	-0.000 167	
			2 minutes	5 499.990 436	-9 564	-0.000 174	
			5 minutes	5 499.990 232	-9 768	-0.000 178	
			10 minutes	5 499.989 935	-10 065	-0.000 183	
100 %		50	Startup	5 499.988 198	-11 802	-0.000 215	
			2 minutes	5 499.988 015	-11 985	-0.000 218	
			5 minutes	5 499.987 686	-12 314	-0.000 224	
			10 minutes	5 499.987 663	-12 337	-0.000 224	
85 %	AC 102 V	23	Startup	5 500.008 375	8 375	0.000 152	
			2 minutes	5 500.007 763	7 763	0.000 141	
			5 minutes	5 500.007 623	7 623	0.000 139	
			10 minutes	5 500.007 468	7 468	0.000 136	
115 %	AC 138 V	23	Startup	5 500.008 257	8 257	0.000 150	
			2 minutes	5 500.007 890	7 890	0.000 143	
			5 minutes	5 500.007 822	7 822	0.000 142	
			10 minutes	5 500.007 592	7 592	0.000 138	

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](mailto:shchoi@kes.co.kr)

Mode: **UNII-3**

Operating frequency: **5 745 MHz**

Test voltage (%)	Test voltage (V)	Temperatur e (°C)	Maintaining time	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)	
100 %	AC 120 V	-20	Startup	5 745.028 509	28 509	0.000 496	
			2 minutes	5 745.028 291	28 291	0.000 492	
			5 minutes	5 745.027 075	27 075	0.000 471	
			10 minutes	5 745.026 919	26 919	0.000 469	
100 %		-10	Startup	5 745.025 371	25 371	0.000 442	
			2 minutes	5 745.024 696	24 696	0.000 430	
			5 minutes	5 745.024 032	24 032	0.000 418	
			10 minutes	5 745.023 996	23 996	0.000 418	
100 %		0	Startup	5 745.016 814	16 814	0.000 293	
			2 minutes	5 745.016 637	16 637	0.000 290	
			5 minutes	5 745.015 579	15 579	0.000 271	
			10 minutes	5 745.015 294	15 294	0.000 266	
100 %		10	Startup	5 745.010 578	10 578	0.000 184	
			2 minutes	5 745.010 517	10 517	0.000 183	
			5 minutes	5 745.009 084	9 084	0.000 158	
			10 minutes	5 745.008 907	8 907	0.000 155	
100 %		20	Startup	5 745.008 340	8 340	0.000 145	
			2 minutes	5 745.006 878	6 878	0.000 120	
			5 minutes	5 745.006 830	6 830	0.000 119	
			10 minutes	5 745.006 513	6 513	0.000 113	
100 %		23	Startup	5 745.007 032	7 032	0.000 122	
			2 minutes	5 745.006 499	6 499	0.000 113	
			5 minutes	5 745.006 485	6 485	0.000 113	
			10 minutes	5 745.006 337	6 337	0.000 110	
100 %		30	Startup	5 745.006 052	6 052	0.000 105	
			2 minutes	5 745.005 864	5 864	0.000 102	
			5 minutes	5 745.005 810	5 810	0.000 101	
			10 minutes	5 745.005 547	5 547	0.000 097	
100 %		40	Startup	5 744.991 748	-8 253	-0.000 144	
			2 minutes	5 744.991 603	-8 398	-0.000 146	
			5 minutes	5 744.989 995	-10 006	-0.000 174	
			10 minutes	5 744.989 818	-10 183	-0.000 177	
100 %		50	Startup	5 744.987 543	-12 458	-0.000 217	
			2 minutes	5 744.987 541	-12 460	-0.000 217	
			5 minutes	5 744.987 421	-12 580	-0.000 219	
			10 minutes	5 744.987 090	-12 911	-0.000 225	
85 %	AC 102 V	23	Startup	5 745.008 764	8 764	0.000 153	
			2 minutes	5 745.008 710	8 710	0.000 152	
			5 minutes	5 745.008 581	8 581	0.000 149	
			10 minutes	5 745.007 996	7 996	0.000 139	
115 %	AC 138 V	23	Startup	5 745.009 183	9 183	0.000 160	
			2 minutes	5 745.008 623	8 623	0.000 150	
			5 minutes	5 745.008 311	8 311	0.000 145	
			10 minutes	5 745.007 761	7 761	0.000 135	

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

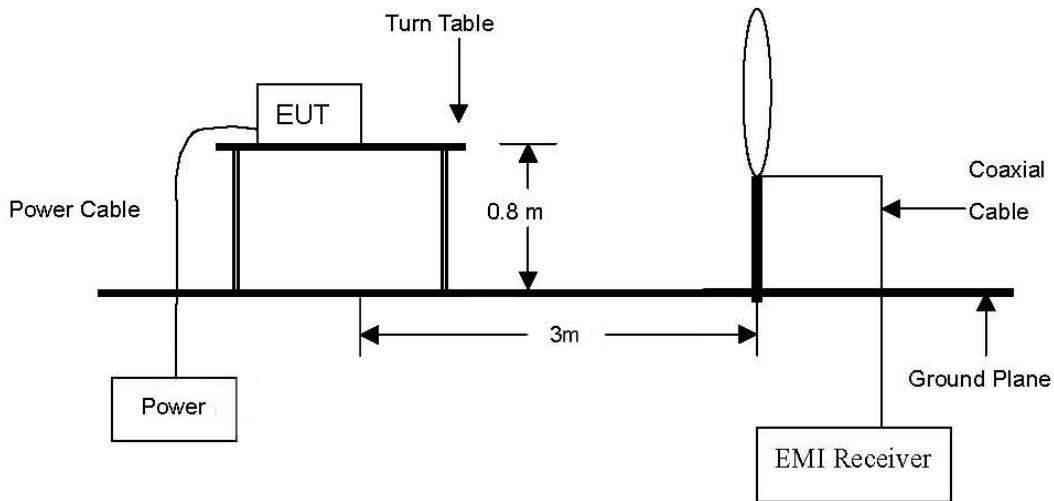
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact [shchoi@kes.co.kr](mailto:shchoi@kes.co.kr)

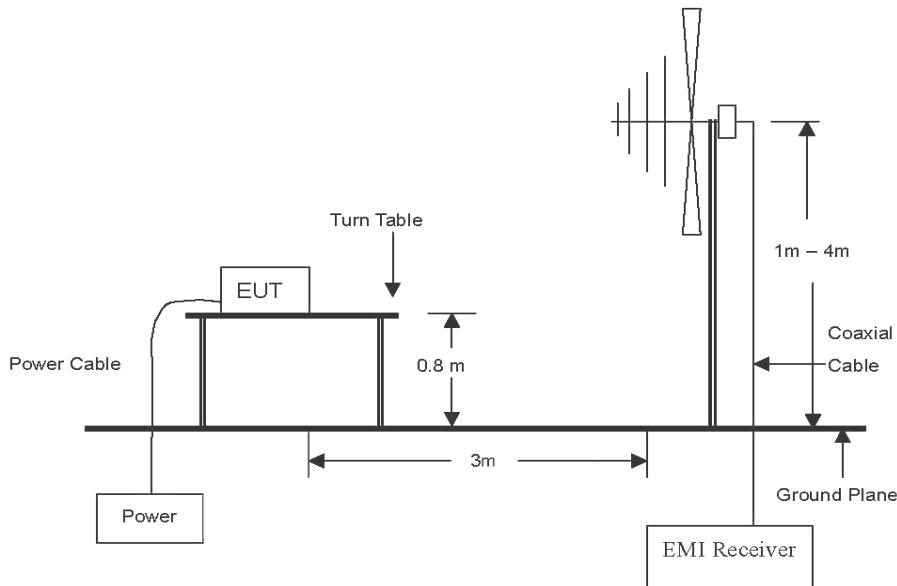
### 3.6. Radiated restricted band and emissions

#### Test setup

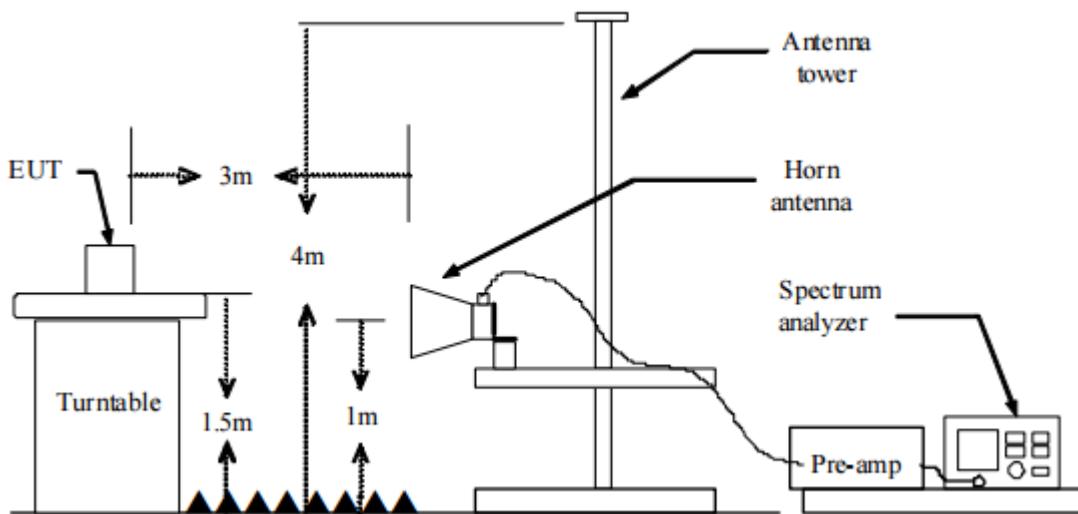
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



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



The diagram below shows the test setup that is utilized to make the measurements for emission from 1 GHz to the tenth harmonic of the highest fundamental frequency or to 40 GHz emissions, whichever is lower.



### Test procedure

Radiated emissions from the EUT were measured according to the dictates in section 11.11 & 11.12 of ANSI C63.10-2013.

#### Test procedure below 30 MHz

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

#### Test procedure above 30 MHz

1. The EUT was placed on the top of a rotating table 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.

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](mailto:shchoi@kes.co.kr)

5. Spectrum analyzer settings for  $f < 1 \text{ GHz}$ :

- ① Span = wide enough to fully capture the emission being measured
- ② RBW = 100 kHz
- ③ VBW  $\geq$  RBW
- ④ Detector = quasi peak
- ⑤ Sweep time = auto
- ⑥ Trace = max hold

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

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

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

- ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
- ② RBW = 1 MHz
- ③ VBW  $\geq 3 \times \text{RBW}$
- ④ Detector = RMS, if span/(# of points in sweep)  $\leq (\text{RBW}/2)$ . Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
- ⑤ Averaging type = power(i.e., RMS)
  - 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
  - 2) Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
- ⑥ Sweep = auto
- ⑦ Trace = max hold
- ⑧ Perform a trace average of at least 100 traces.
- ⑨ A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
  - 1) If power averaging (RMS) mode was used in step ⑤, then the applicable correction factor is  $10 \log(1/x)$ , where x is the duty cycle.
  - 2) If linear voltage averaging mode was used in step ⑤, then the applicable correction factor is  $20 \log(1/x)$ , where x is the duty cycle.
  - 3) If a specific emission is demonstrated to be continuous ( $\geq 98$  percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

**Note.**

1.  $f < 30 \text{ MHz}$ , extrapolation factor of 40 dB/decade of distance.  $F_d = 40 \log(D_m/D_s)$
- $f \geq 30 \text{ MHz}$ , extrapolation factor of 20 dB/decade of distance.  $F_d = 20 \log(D_m/D_s)$

Where:

$F_d$  = Distance factor in dB  
 $D_m$  = Measurement distance in meters  
 $D_s$  = Specification distance in meters

2. Field strength(dB $\mu$ V/m) = Level(dB $\mu$ V) + CF (dB) + or DCF(dB)
3. Margin(dB) = Limit(dB $\mu$ V/m) - Field strength(dB $\mu$ V/m)
4. Emissions below 18 GHz were measured at a 3 meter test distance while emissions above 18 GHz were measured at a 1 meter test distance with the application of a distance correction factor.
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 dB of respective limits were not reported.
9. According to exploratory test no any obvious emission were detected from 9 kHz to 30 MHz. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

**Limit**

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

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

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

According to 15.407(b), (b) Undesirable emission limits: Except as shown in paragraph (b)(7) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

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

### Duty cycle

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

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

For the band 5.15-5.25 GHz

Test mode	T <sub>on</sub> time (ms)	Period (ms)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (dB)
802.11a	2.03	3.03	0.67	67.11	1.73
802.11an_HT20	1.89	2.89	0.65	65.42	1.84
802.11ac_VHT20	1.90	2.90	0.66	65.61	1.83
802.11an_HT40	0.94	1.93	0.48	48.41	3.15
802.11ac_VHT40	0.94	1.94	0.48	48.33	3.16
802.11ac_VHT80	0.46	1.46	0.31	31.47	5.02

For the band 5.250-5.350 GHz

Test mode	T <sub>on</sub> time (ms)	Period (ms)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (dB)
802.11a	2.03	3.03	0.67	67.02	1.74
802.11an_HT20	1.89	2.89	0.65	65.46	1.84
802.11ac_VHT20	1.90	2.90	0.66	65.59	1.83
802.11an_HT40	0.93	1.93	0.48	48.40	3.15
802.11ac_VHT40	0.94	1.94	0.48	48.35	3.16
802.11ac_VHT80	0.46	1.46	0.32	31.63	5.00

For the band 5.470-5.725 GHz

Test mode	T <sub>on</sub> time (ms)	Period (ms)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (dB)
802.11a	2.03	3.03	0.67	66.99	1.74
802.11an_HT20	1.89	2.89	0.65	65.40	1.84
802.11ac_VHT20	1.90	2.89	0.66	65.72	1.82
802.11an_HT40	0.94	1.94	0.49	48.51	3.14
802.11ac_VHT40	0.94	1.94	0.48	48.32	3.16
802.11ac_VHT80	0.46	1.46	0.31	31.34	5.04

For the band 5.725-5.85 GHz

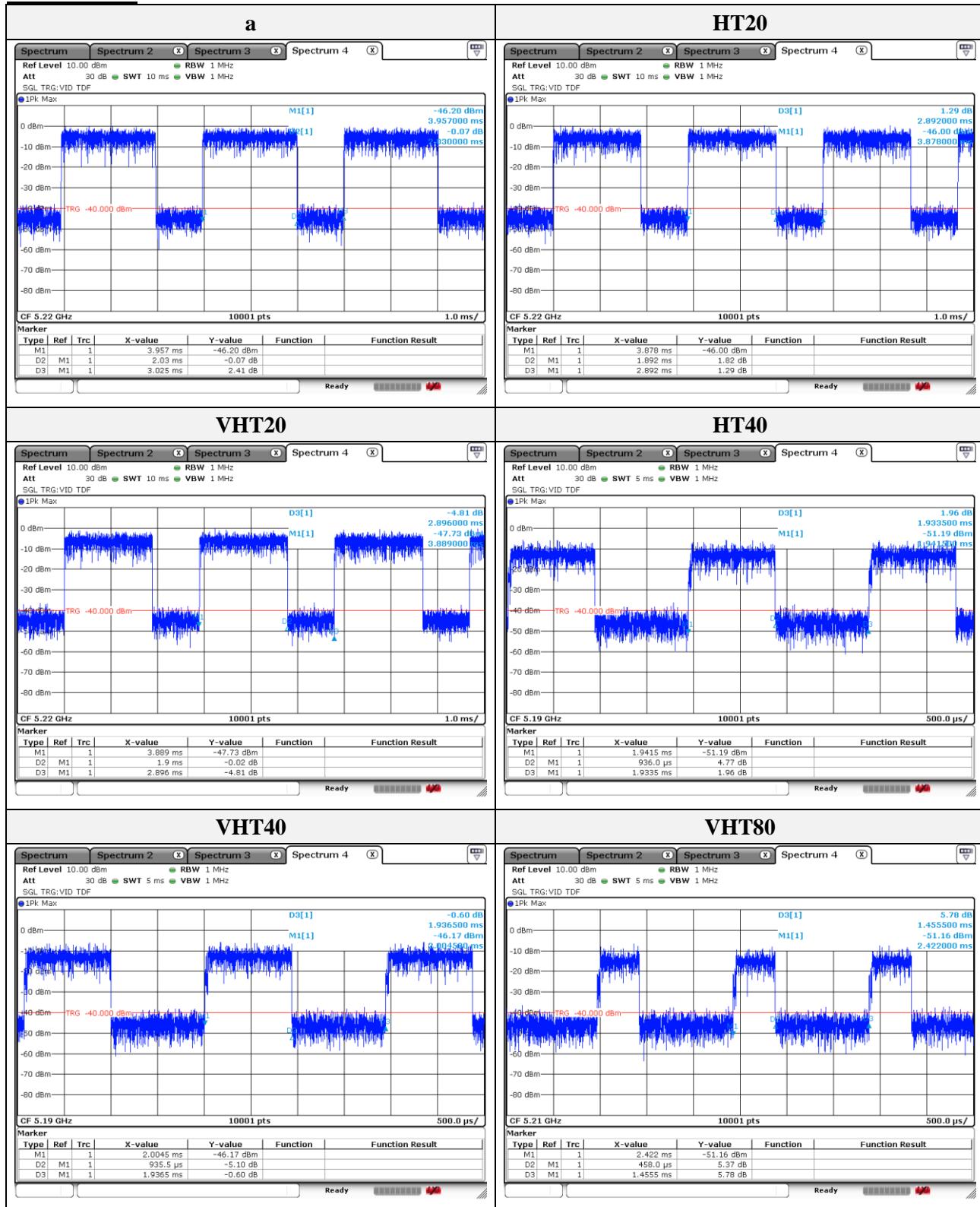
Test mode	T <sub>on</sub> time (ms)	Period (ms)	Duty cycle (Linear)	Duty cycle (%)	Duty cycle correction factor (dB)
802.11a	2.03	3.03	0.67	67.05	1.74
802.11an_HT20	1.90	2.89	0.66	65.54	1.84
802.11ac_VHT20	1.90	2.90	0.65	65.47	1.84
802.11an_HT40	0.93	1.93	0.48	48.22	3.17
802.11ac_VHT40	0.94	1.93	0.49	48.63	3.13
802.11ac_VHT80	0.46	1.46	0.31	31.47	5.02

**Note:**

Duty cycle (Linear) = T<sub>on</sub> time/Period

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

**Mode:UNII-1**

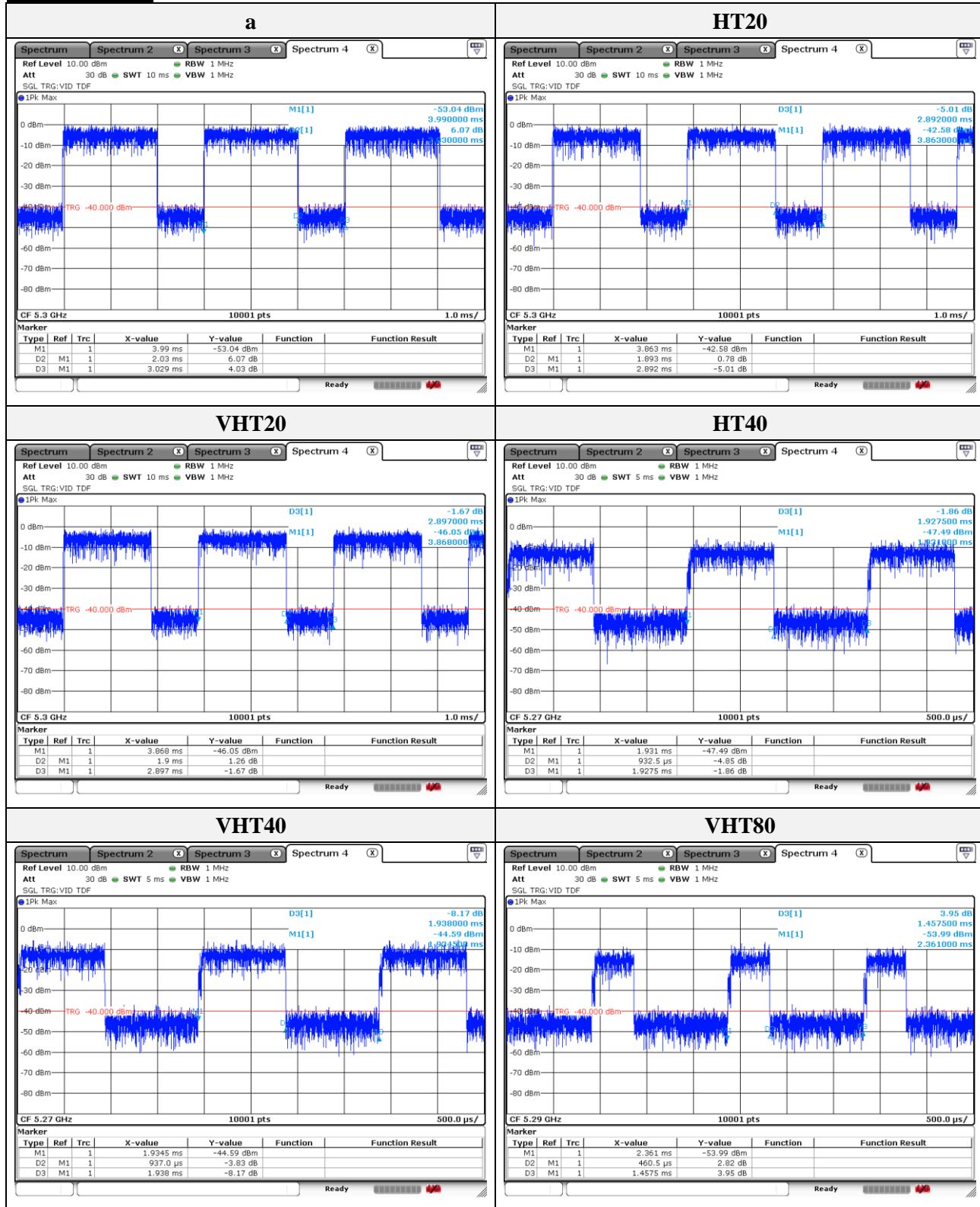


This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

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](mailto:shchoi@kes.co.kr)

**Mode:UNII-2A**

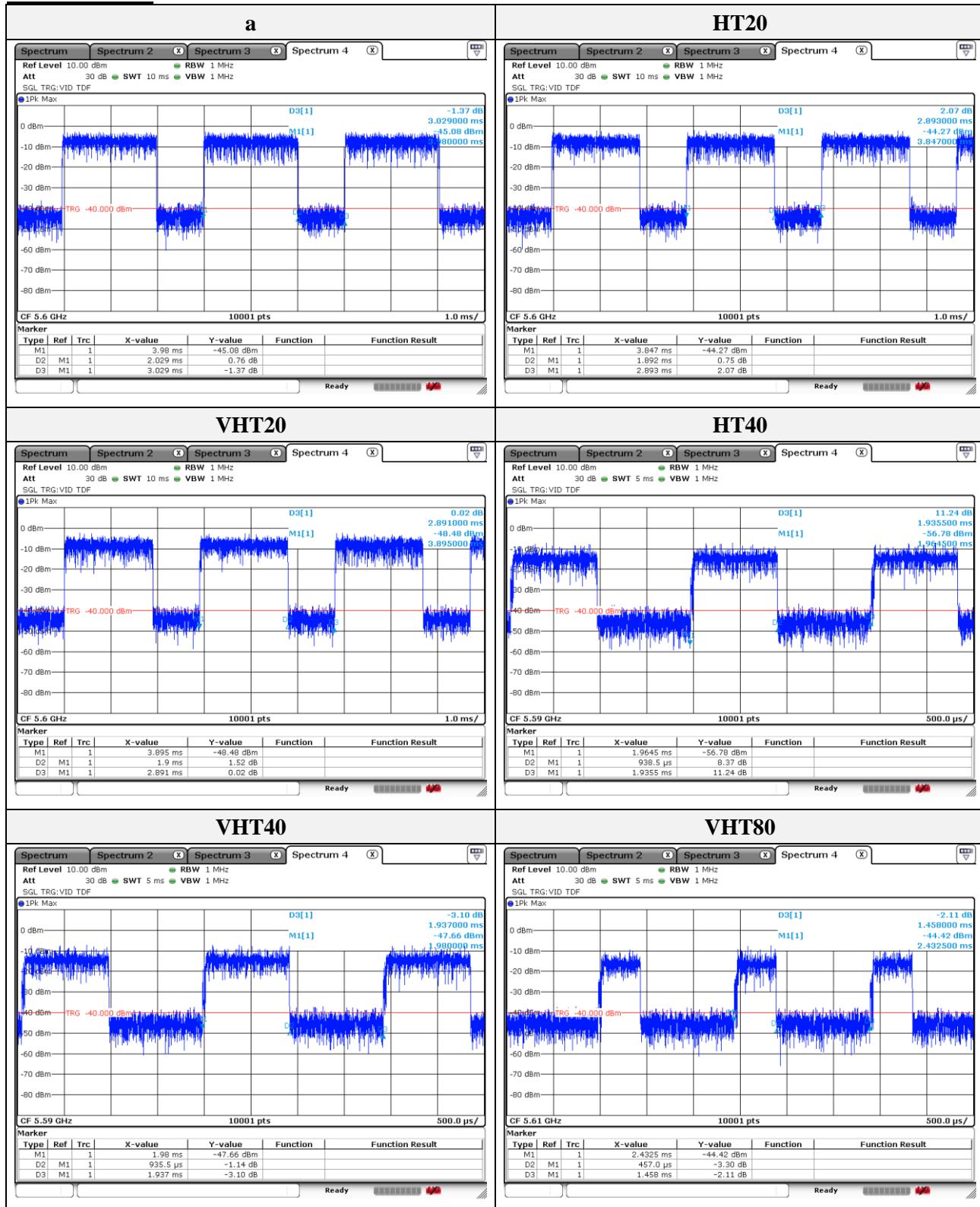


This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

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](mailto:shchoi@kes.co.kr)

**Mode:UNII-2C**

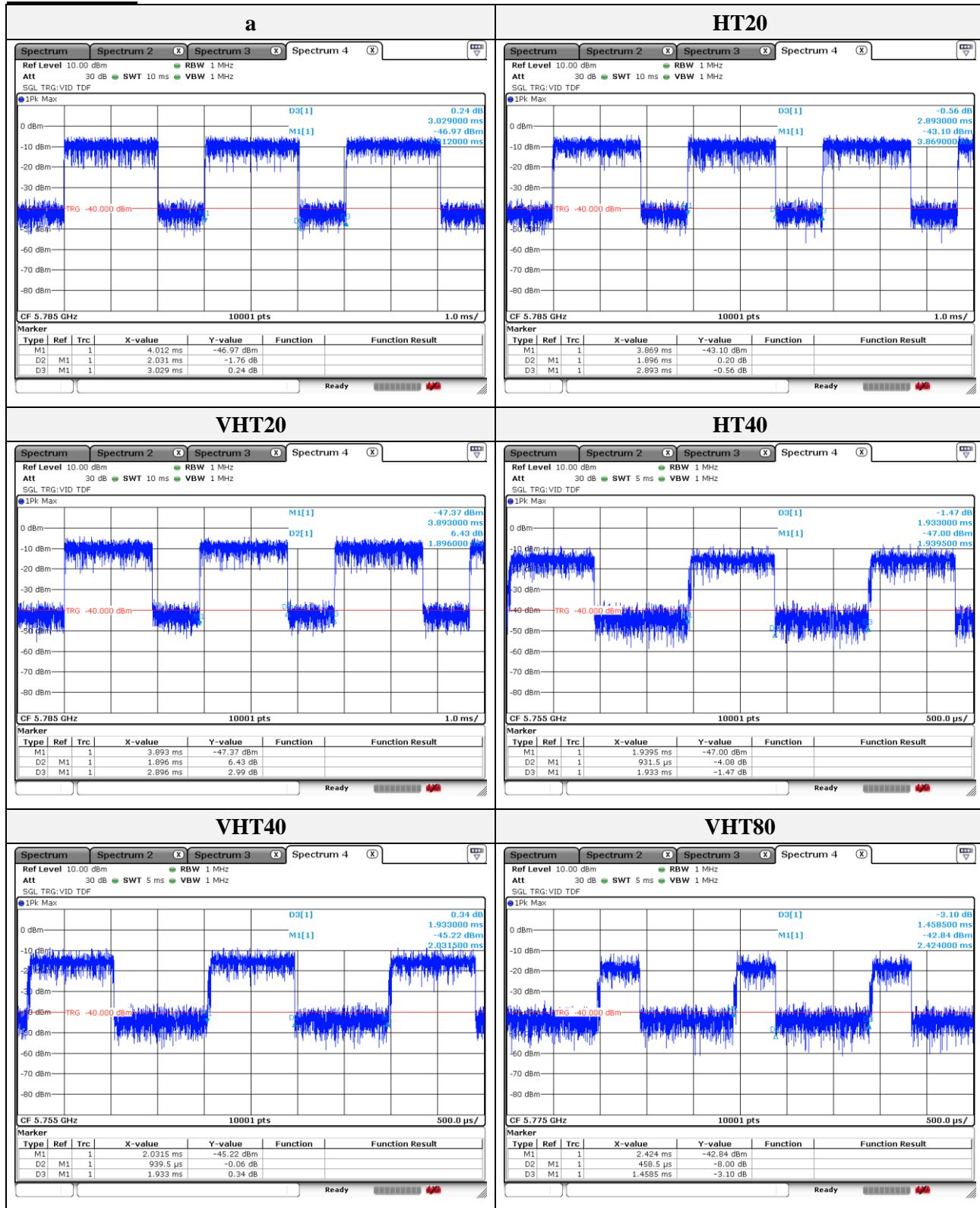


This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

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](mailto:shchoi@kes.co.kr)

**Mode:UNII-3**



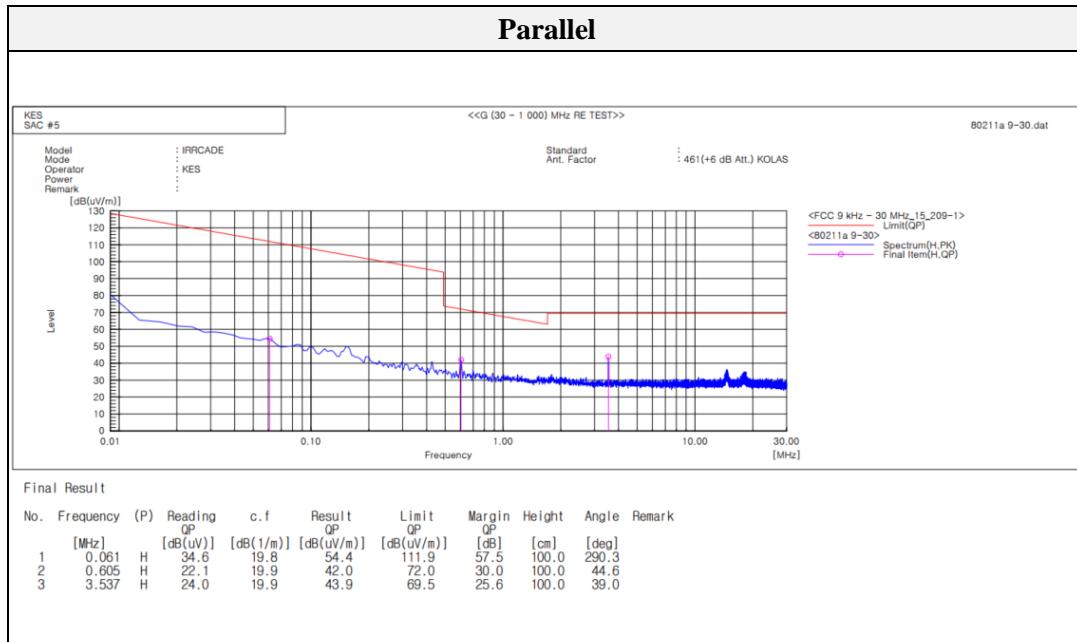
This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

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](mailto:shchoi@kes.co.kr)

**Test results (Below 30 MHz)**

Band	UNII-2A
Mode	802.11ac_VHT40
Channel	62 (Worst Case)
Distance of measurement:	3 meter

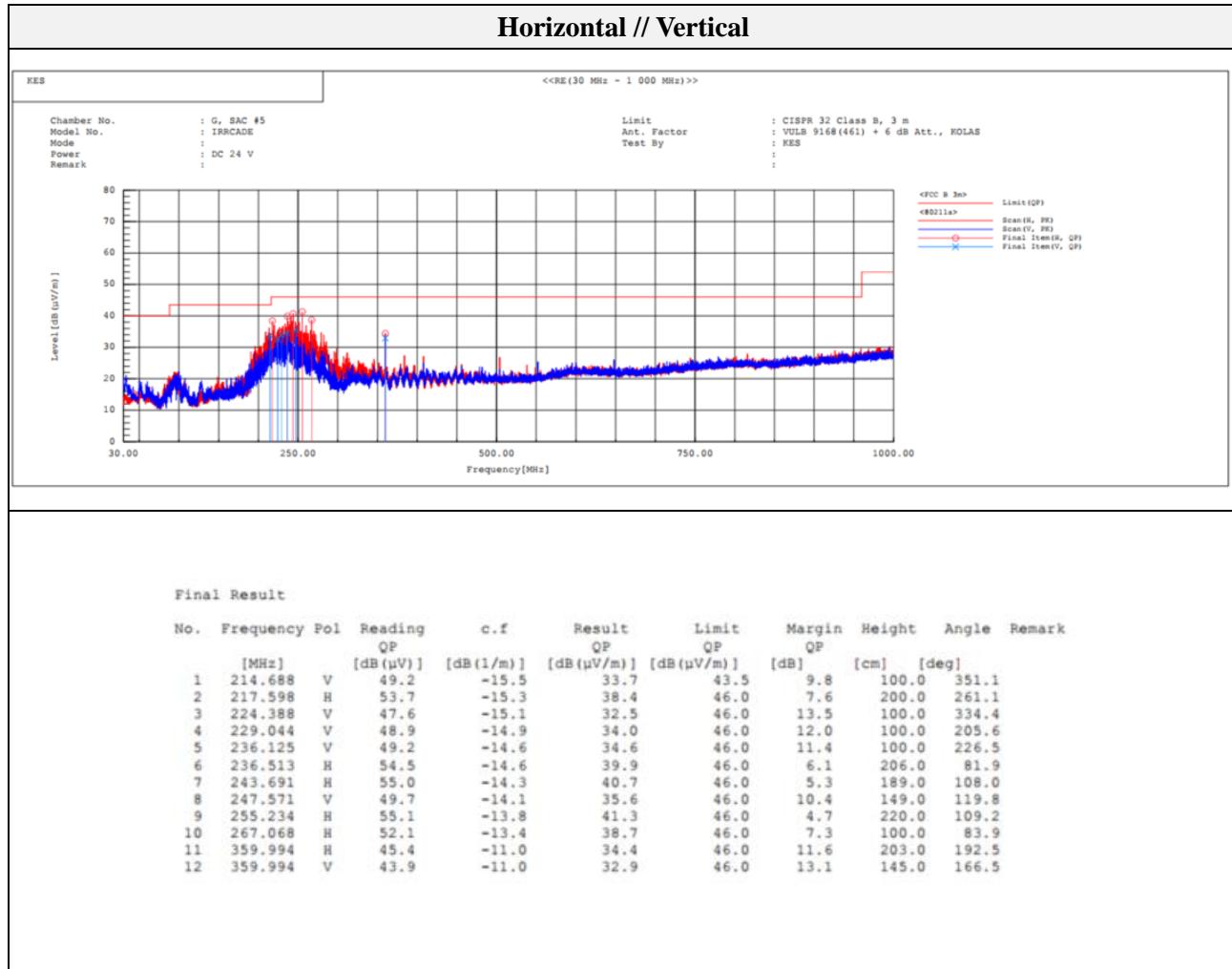


Note.

1. No spurious emission were detected under 30 MHz, the above test result is the peak result.

## Test results (Below 1 000 MHz) – Worst case

Band	UNII-2A
Mode	802.11ac_VHT40
Channel	62 (Worst Case)
Distance of measurement:	3 meter



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 (Above 1 000 MHz)

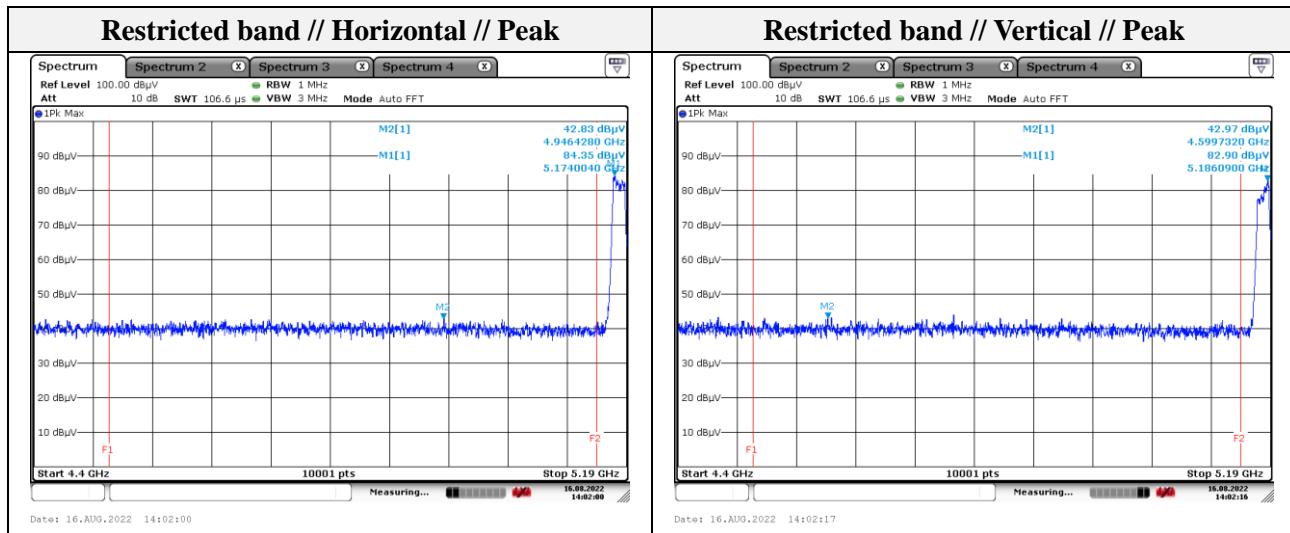
Mode: 802.11a  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 36

#### - Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1 000.25	48.42	Peak	V	-9.44		38.98	74.00	35.02
1 375.21	49.57	Peak	H	-9.00	-	40.57	74.00	33.43
1 500.20	49.20	Peak	H	-6.57	-	42.63	74.00	31.37

#### - Band edge

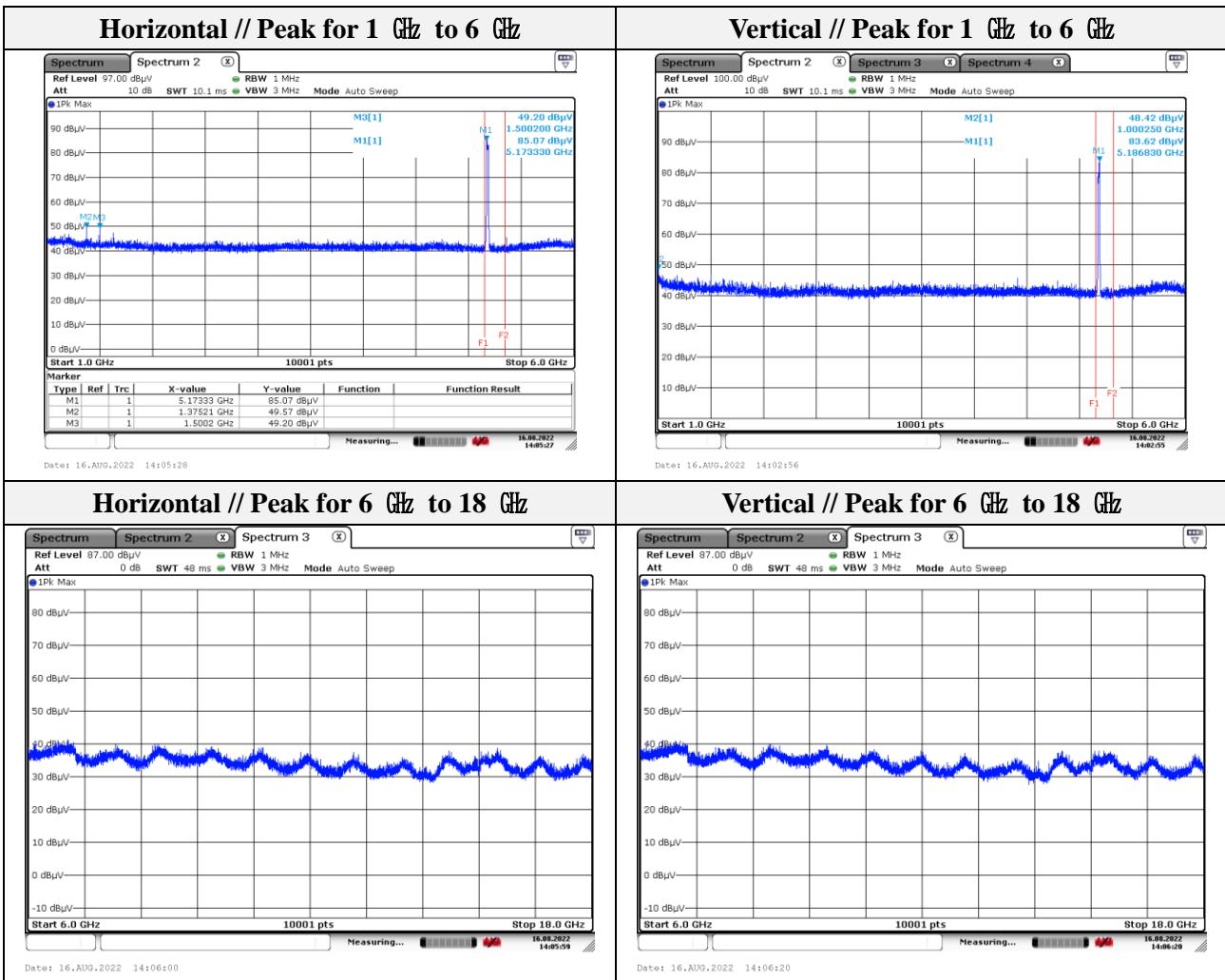
Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4 599.73	42.97	Peak	V	5.64	-	48.61	74.00	25.39
4 946.43	42.83	Peak	H	7.36	-	50.19	74.00	23.81



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](mailto:shchoi@kes.co.kr)



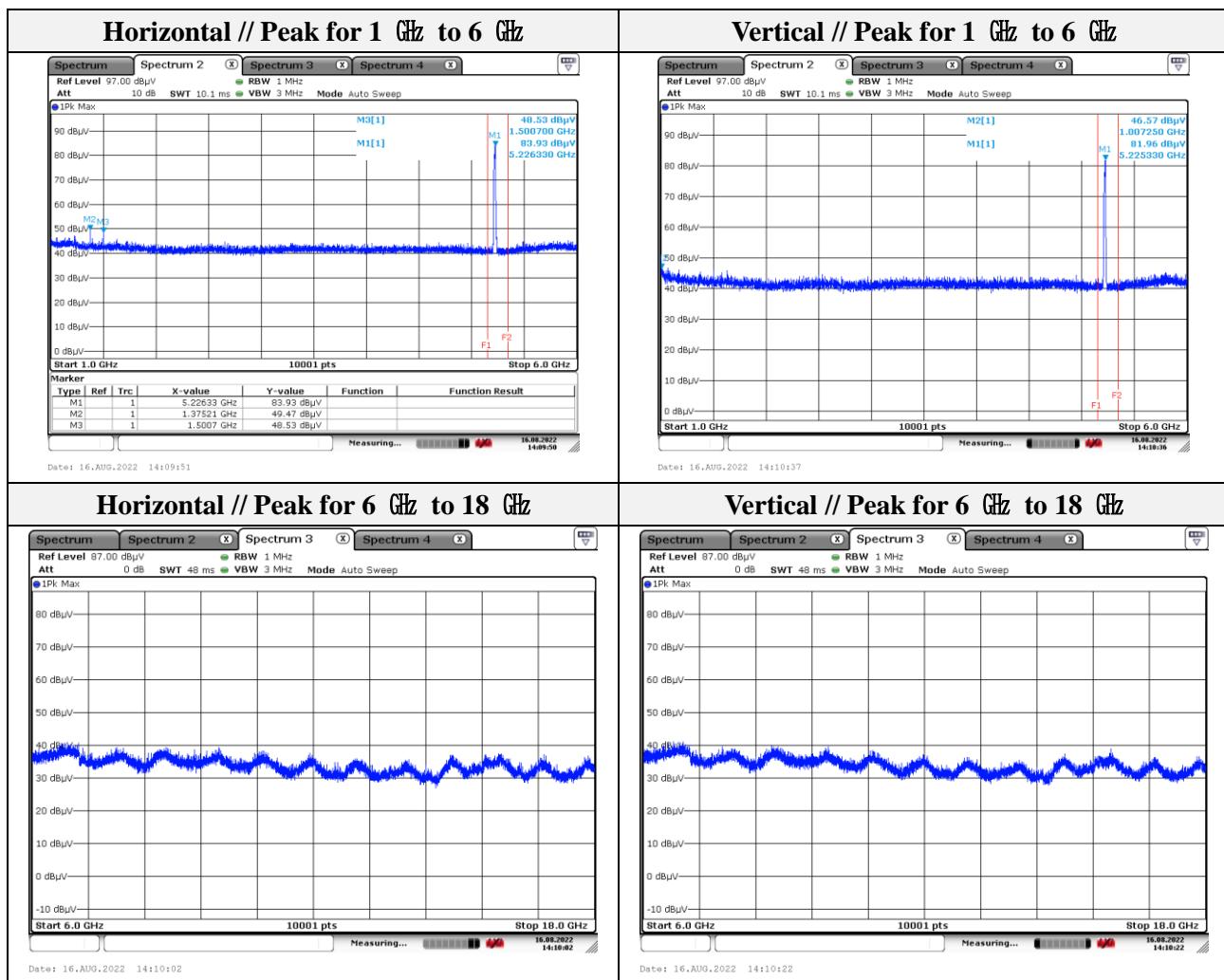
**Note.**

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

Mode: 802.11a  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 44

- Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1 007.25	46.57	Peak	V	-9.43	-	37.14	74.00	36.86
1 375.21	49.47	Peak	H	-9.00	-	40.47	74.00	33.53
1 500.70	48.53	Peak	H	-6.55	-	41.98	74.00	32.02



Note.

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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

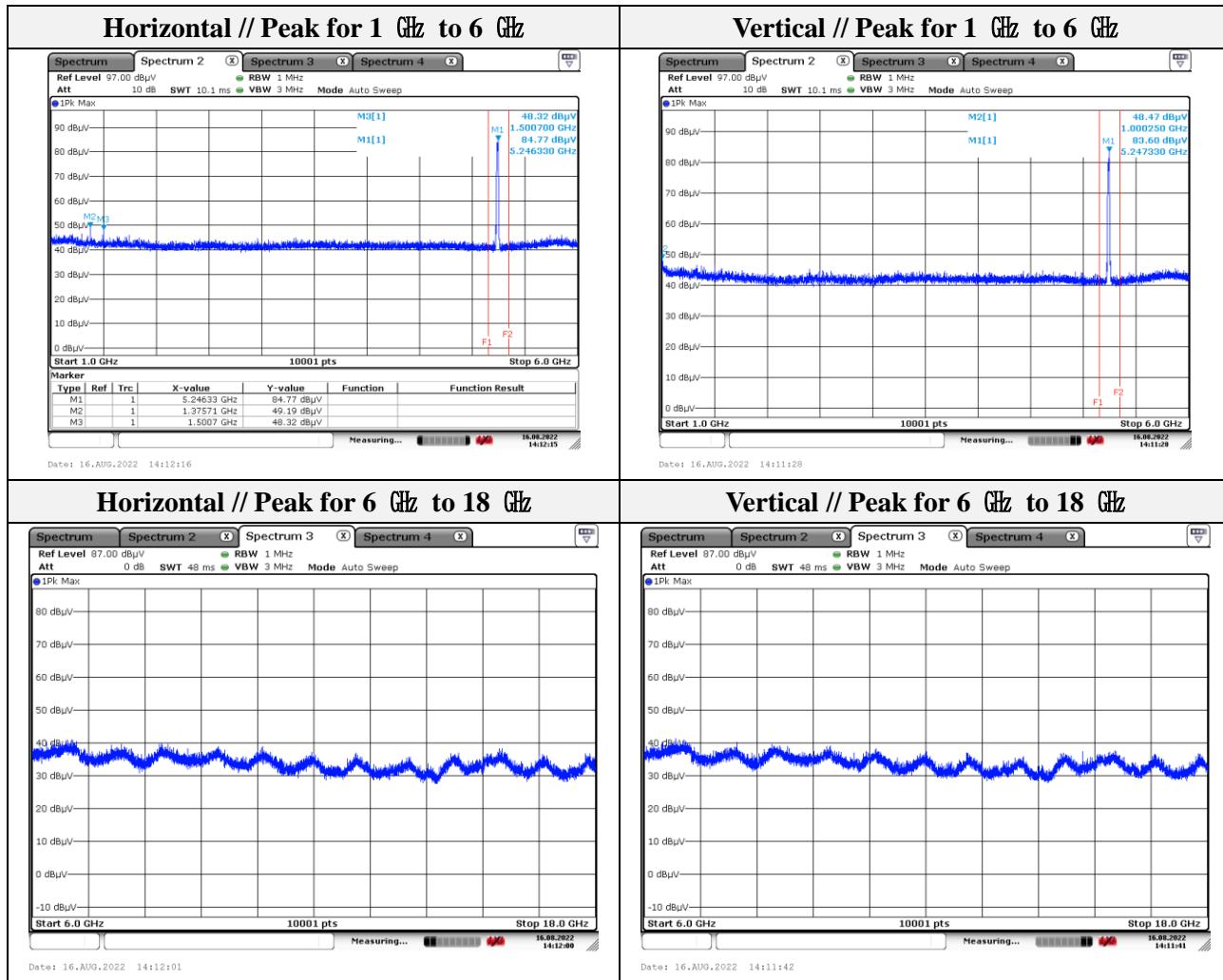
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact [shchoi@kes.co.kr](mailto:shchoi@kes.co.kr)

Mode: 802.11a  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 48

- Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1 000.25	48.47	Peak	V	-9.44	-	39.03	74.00	34.97
1 375.71	49.19	Peak	H	-9.00	-	40.19	74.00	33.81
1 500.70	48.32	Peak	H	-6.55	-	41.77	74.00	32.23



Note.

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

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](mailto:shchoi@kes.co.kr)

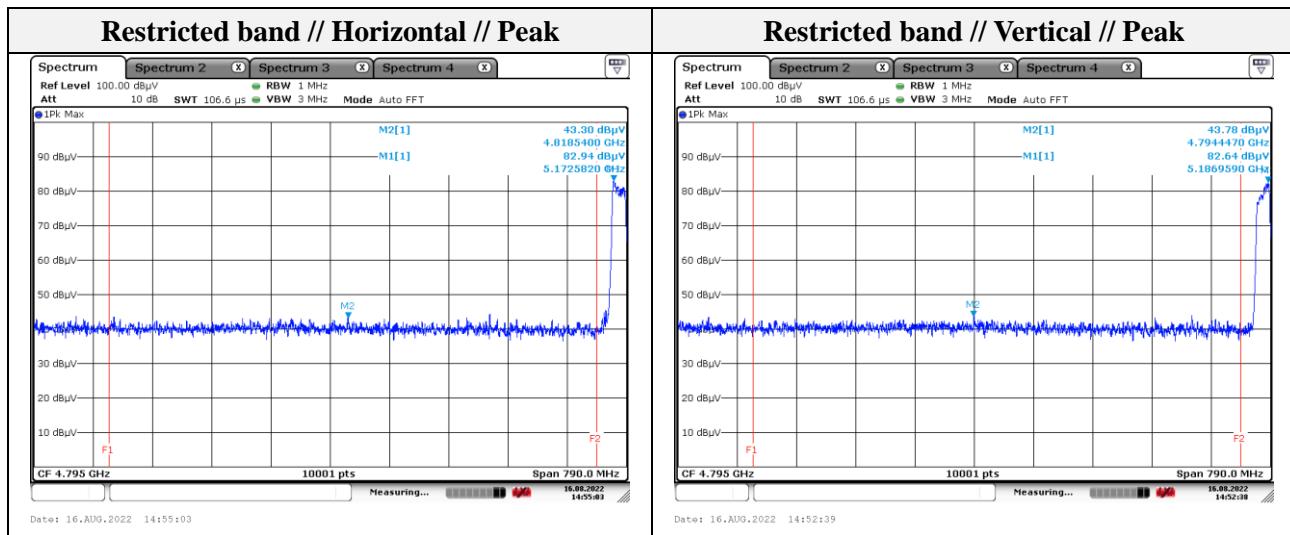
Mode: 802.11an\_HT20  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 36

- Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ N/m)	Limit (dB $\mu$ N/m)	Margin (dB)
1 005.75	46.65	Peak	V	-9.43	-	37.22	74.00	36.78
1 199.73	49.59	Peak	H	-9.24	-	40.35	74.00	33.65
1 375.21	49.75	Peak	H	-9.00	-	40.75	74.00	33.25

- Band edge

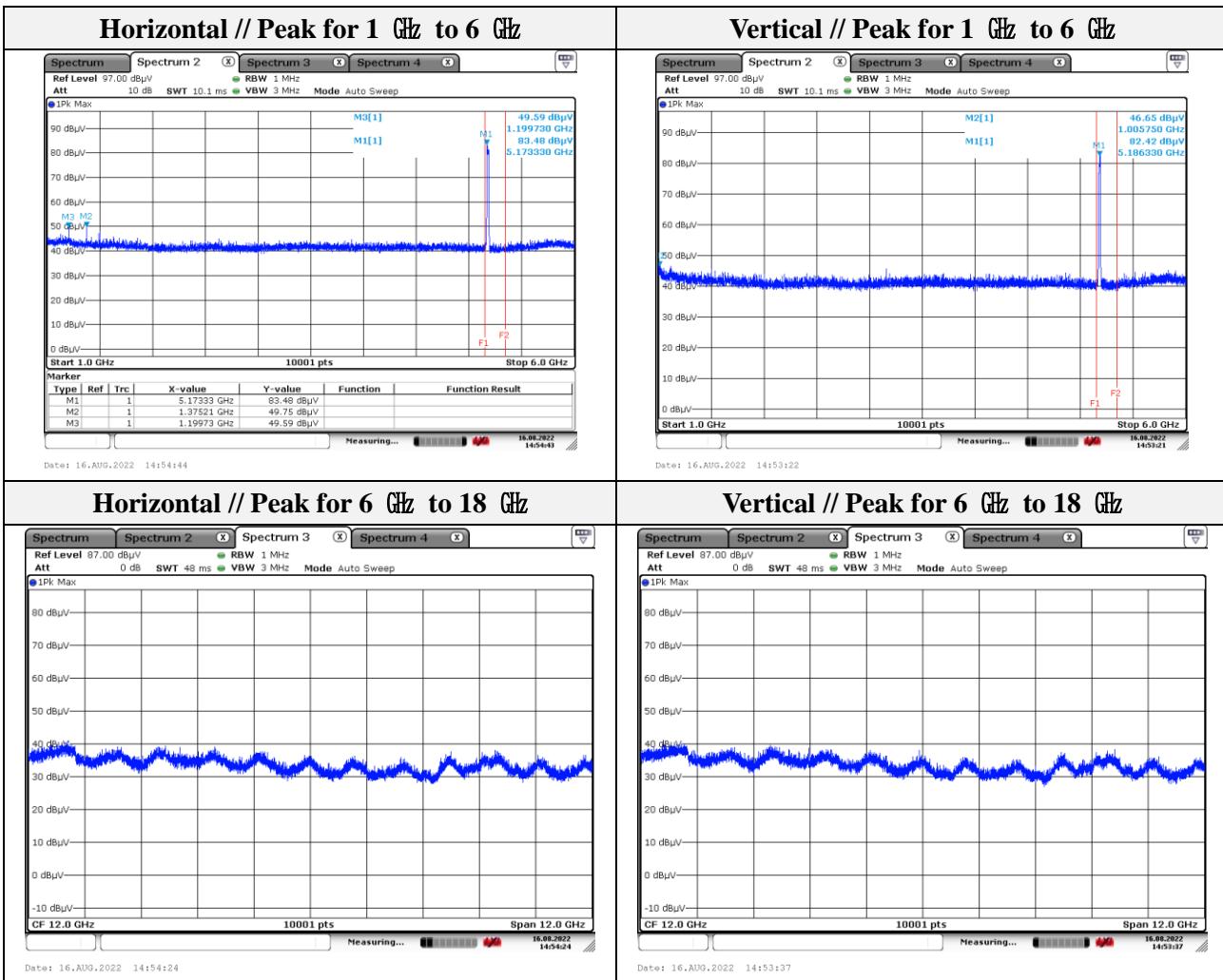
Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ N/m)	Limit (dB $\mu$ N/m)	Margin (dB)
4 794.45	43.78	Peak	V	6.48	-	50.26	74.00	23.74
4 818.54	43.30	Peak	H	6.61	-	49.91	74.00	24.09



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](mailto:shchoi@kes.co.kr)



**Note.**

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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

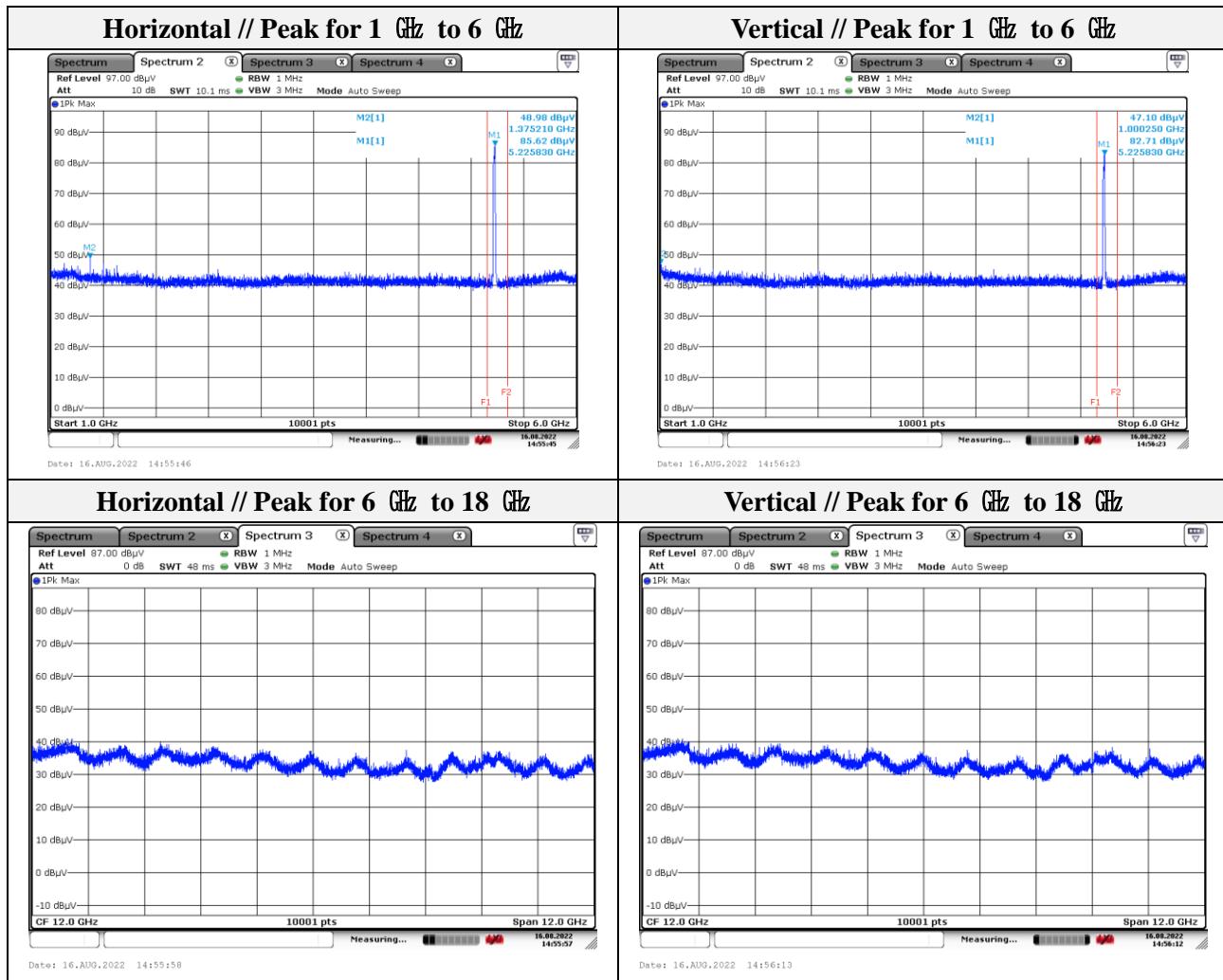
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact [shchoi@kes.co.kr](mailto:shchoi@kes.co.kr)

Mode: 802.11an\_HT20  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 44

- Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1 000.25	47.10	Peak	V	-9.44	-	37.66	74.00	36.34
1 375.21	48.98	Peak	H	-9.00	-	39.98	74.00	34.02



Note.

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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

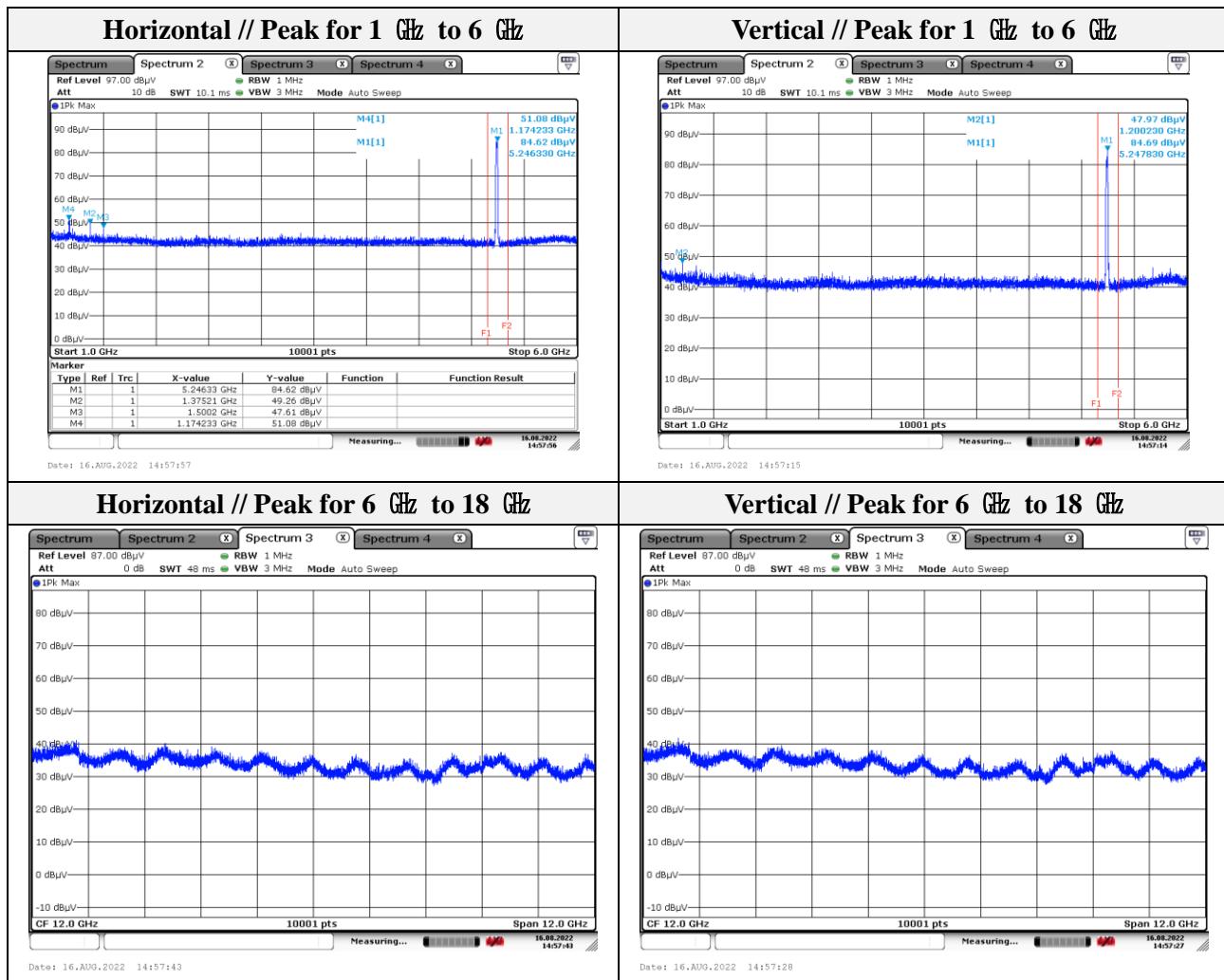
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact [shchoi@kes.co.kr](mailto:shchoi@kes.co.kr)

Mode: 802.11an\_HT20  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 48

- Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1 174.23	51.08	Peak	H	-9.26	-	41.82	74.00	32.18
1 200.23	47.97	Peak	V	-9.24	-	38.73	74.00	35.27
1 375.21	49.26	Peak	H	-9.00	-	40.26	74.00	33.74
1 500.20	47.61	Peak	H	-6.57	-	41.04	74.00	32.96



Note.

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

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

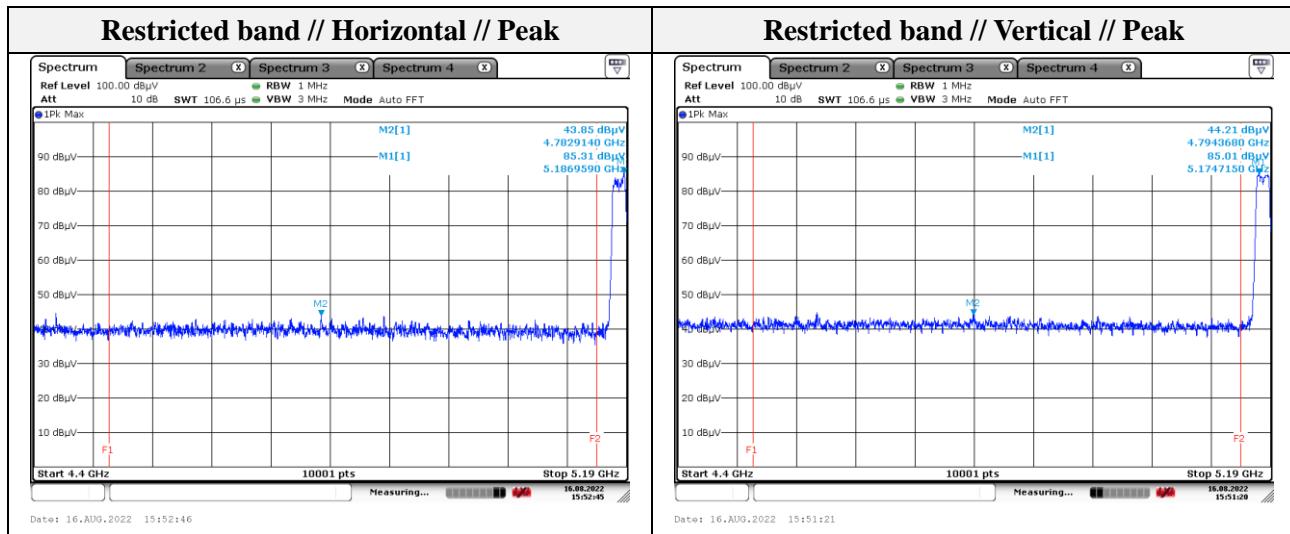
Mode: 802.11ac\_VHT20  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 36

- Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1 375.21	47.32	Peak	V	-9.00	-	38.32	74.00	35.68
1 500.70	48.29	Peak	H	-6.55	-	41.74	74.00	32.26

- Band edge

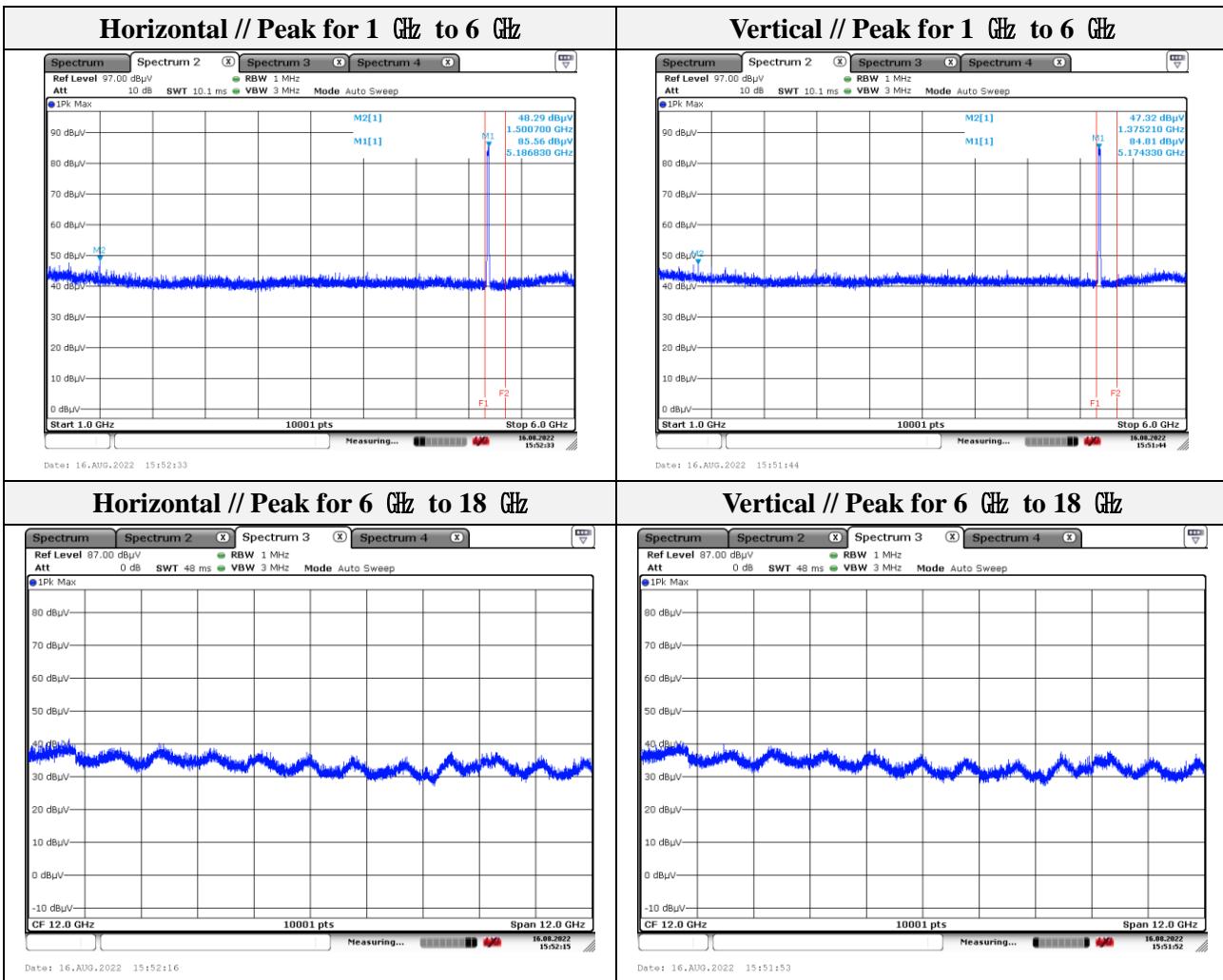
Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4 782.91	43.85	Peak	H	6.43	-	50.28	74.00	23.72
4 794.37	44.21	Peak	V	6.48	-	50.69	74.00	23.31



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](mailto:shchoi@kes.co.kr)



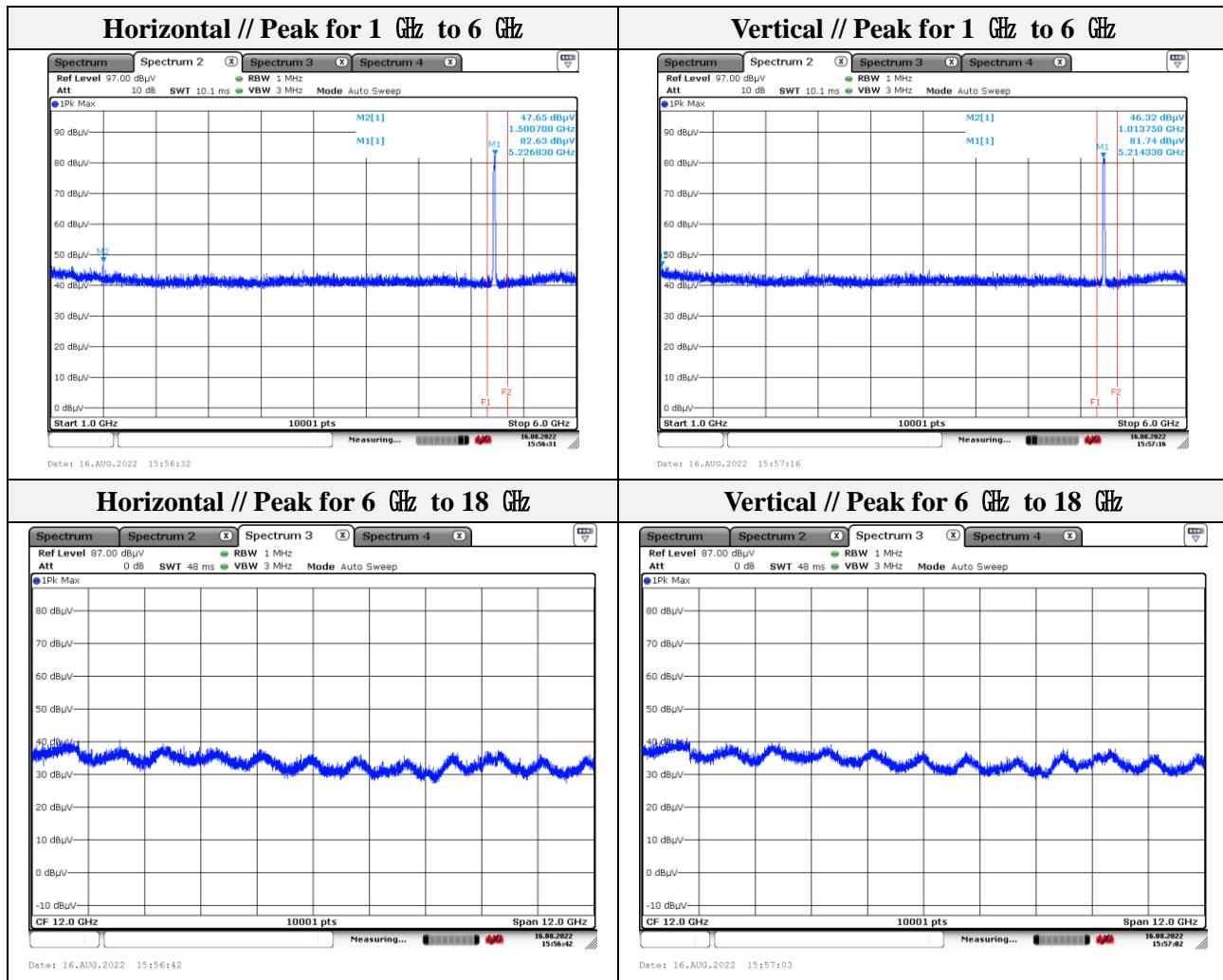
**Note.**

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

Mode: 802.11ac\_VHT20  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 44

- Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1 013.75	46.32	Peak	V	-9.43	-	36.89	74.00	37.11
1 500.70	47.65	Peak	H	-6.55	-	41.10	74.00	32.90



Note.

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

This report shall not be reproduced except in full, without the written approval of KES Co., Ltd.

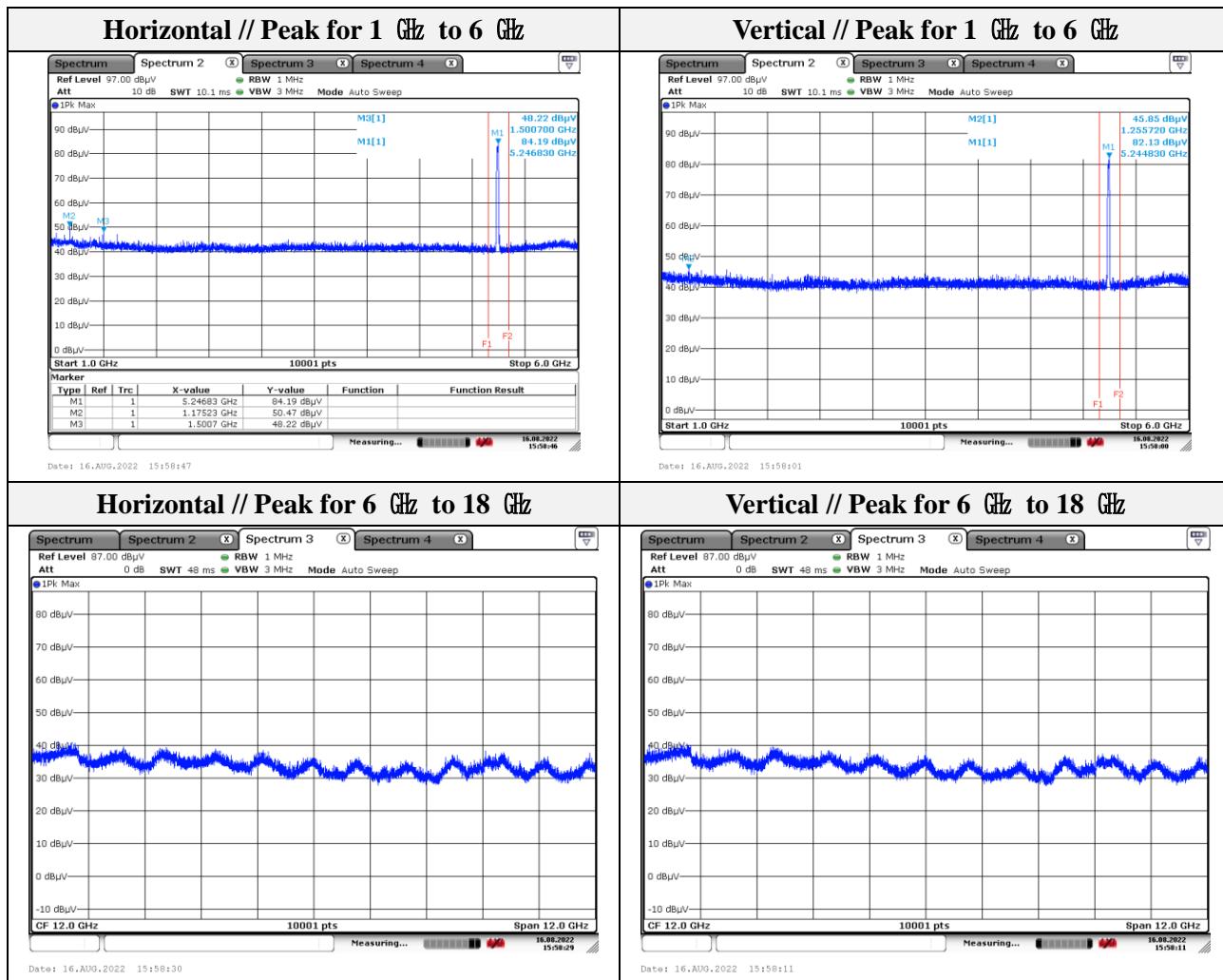
The results shown in this test report refer only to the sample(s) tested unless otherwise stated.

The authenticity of the test report, contact [shchoi@kes.co.kr](mailto:shchoi@kes.co.kr)

Mode: 802.11ac\_VHT20  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 48

- Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1 175.23	50.47	Peak	H	-9.26	-	41.21	74.00	32.79
1 255.72	45.85	Peak	V	-9.16	-	36.69	68.23	31.54
1 500.70	48.22	Peak	H	-6.55	-	41.67	74.00	32.33



Note.

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

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](mailto:shchoi@kes.co.kr)

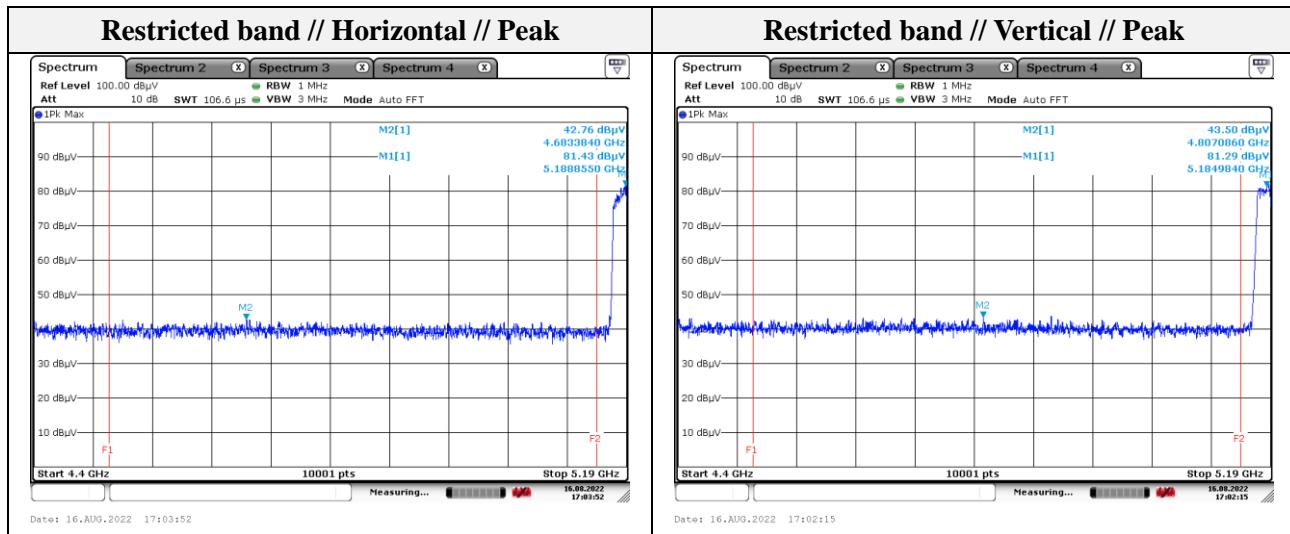
Mode: 802.11an\_HT40  
 Band: UNII-1  
 Distance of measurement: 3 meter  
 Channel: 38

- Spurious

Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
1 000.75	46.71	Peak	V	-9.44	-	37.27	74.00	36.73
1 500.20	48.27	Peak	H	-6.57	-	41.70	74.00	32.30

- Band edge

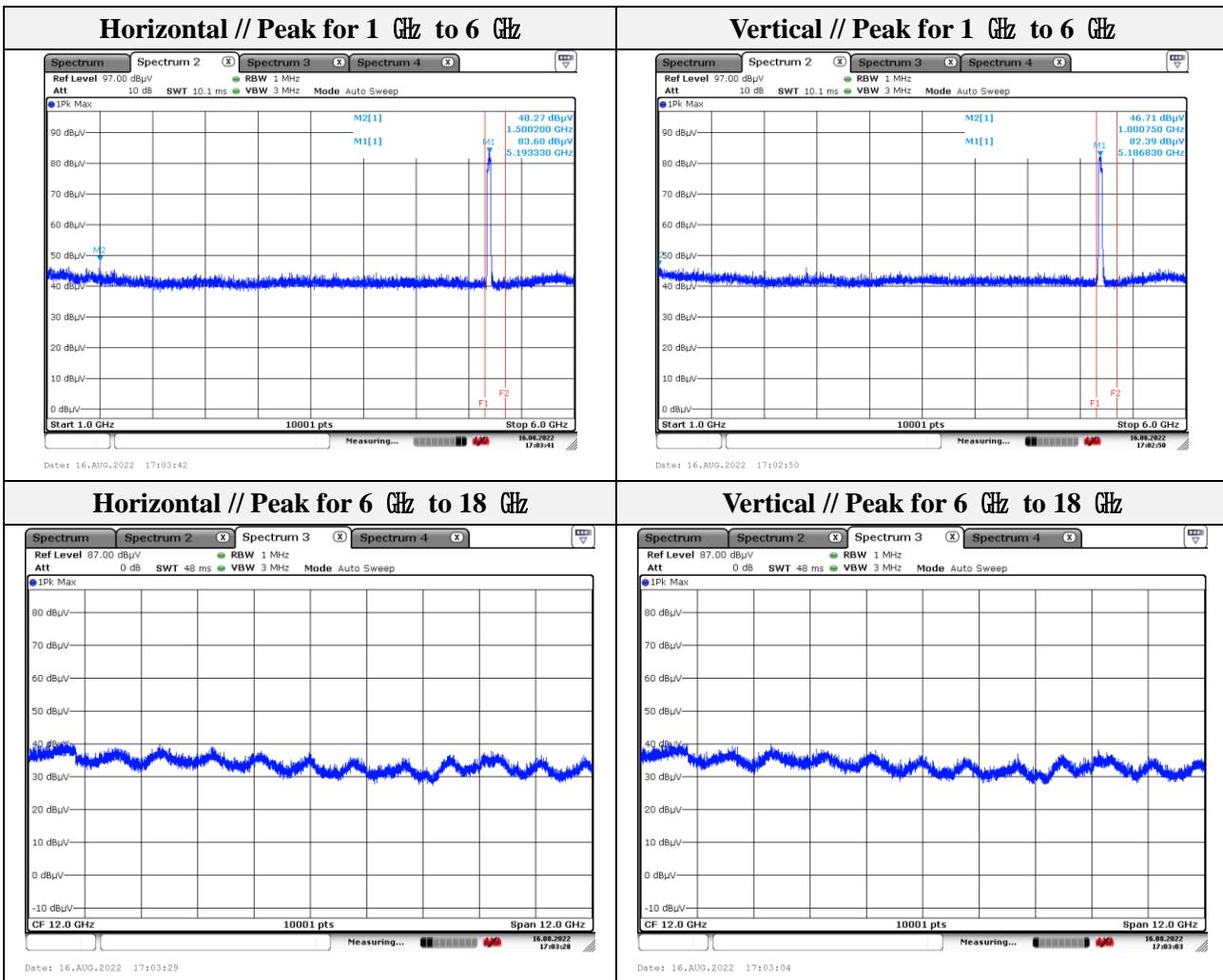
Frequency (MHz)	Level (dB $\mu$ V)	Detect mode	Ant. Pol. (H/V)	CF (dB)	DCF (dB)	Field strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
4 683.38	42.76	Peak	H	6.00	-	48.76	74.00	25.24
4 807.09	43.50	Peak	V	6.54	-	50.04	74.00	23.96



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](mailto:shchoi@kes.co.kr)



**Note.**

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