TEST REPORT

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1. Client

- Name : ShinHeung Precision Co., Ltd.
- Address : 53, Je3gongdan3-gil, Seoun-myeon, Anseong-si, Gyeonggi-do, Korea
- Date of Receipt : 2019-10-04

2. Use of Report : Certification

3. Name of Product and Model : KIOSK / SK-161

4. Manufacturer and Country of Origin : ShinHeung Precision Co., Ltd. / Korea

5. FCC ID : O8HSK-161

6. Date of Test : 2019-11-15 to 2019-11-21

7. Test Standards : FCC Part 15 Subpart C, 15.247

8. Test Results : Refer to the test result in the test report

Affirmation	Tested by	Technical Manager
	Name : Euijung Kim (Signature)	Name : Heesu Ahn (Signature)

2020-03-03

KCTL Inc.

Report revision history

Date	Revision	Page No
2020-02-25	Initial report	-
2020-03-03	Updated	6,7,12,40

Note. The report No. KR20-SRF0079 is superseded by the report No. KR20-SRF0079-A.

CONTENTS

1. General information

Client	:	ShinHeung Precision Co., Ltd.
Address	:	53, Je3gongdan3-gil, Seoun-myeon, Anseong-si, Gyeonggi-do, Korea
Manufacturer	:	ShinHeung Precision Co., Ltd.
Address	:	53, Je3gongdan3-gil, Seoun-myeon, Anseong-si, Gyeonggi-do, Korea
Laboratory	:	KCTL Inc.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056 Industry Canada Registration No. : 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	KIOSK
Model	:	SK-161
Derivative Model	:	SK-361, SK-561
Modulation technique	:	WIFI(802.11a/b/g/n)_DSSS, OFDM
Power source	:	AC 120 V
Antenna specification	:	Dipole Antenna
Antenna gain	:	3.42 dBi
Operation temperature	:	21 ℃
Software version	:	Windows 10 Enterprise 2016 LTSB
Hardware version	:	VER1.0
Frequency range & Number of channels		
2 412 ㎒ ~ 2 462 ㎒	:	WIFI(802.11b/g/n_HT20)_11 ch
2 422 ㎒ ~ 2 452 ㎒	:	WIFI(802.11n_HT40)_09 ch

2.1. Information about derivative model

The difference between basic model and derivative models is:

Derivative models are for the different buyer code.

2.2. Frequency/channel operations

This device contains the following capabilities:
802.11b/g/n(HT20/40)

Ch.	Frequency (㎒)
01	2 412
.	.
.	.
06	2 437
.	.
.	.
11	2 462

Table 2.2.1. 802.11b/g/n(HT20) mode

Ch.	Frequency (㎒)
03	2 422
.	.
.	.
06	2 442
.	.
.	.
09	2 452

Table 2.2.2. 802.11n HT40 mode

2.3. Peak output power

PKPM1 Peak-reading power meter method

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 bandwidth* and shall utilize a fast-responding diode detector.

-Peak output power

Mode	Channel	Frequency [㎒]	Peak output power [dBm]	Average output power [dBm]
802.11 b	Lowest	2 412	18.10	16.20
	Middle	2 437	18.14	16.24
	Highest	2 462	18.26	16.35
802.11 g	Lowest	2 412	22.19	13.80
	Middle	2 437	**23.19**	15.72
	Highest	2 462	22.66	14.34
802.11 n HT20	Lowest	2 412	21.64	13.42
	Middle	2 437	23.18	15.86
	Highest	2 462	21.36	13.08
802.11 n HT40	Lowest	2 422	21.76	13.15
	Middle	2 437	23.04	15.31
	Highest	2 452	21.81	13.15

Note1) : The above peak output power were retested results.
Note2) : Duty Cycle Correction Factor = 0

3. Antenna requirement

Requirement of FCC part section 15.203:
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

- The transmitter has permanently female dipole antenna (external antenna).

4. Summary of tests

FCC Part section(s)	Parameter	Test results
15.247(b)(3)	Maximum peak output power	N/T(Note2)
15.247(e)	Peak power spectral density	N/T(Note2)
15.247(a)(2)	6 dB channel bandwidth	N/T(Note2)
15.247(d), 15.205(a), 15.209(a)	Spurious emission	Pass
	Band-edge, restricted band	Pass
15.207(a)	Conducted emissions	Pass

Notes: (N/T: Not Tested, N/A: Not Applicable)

1. The product was installed a Wi-Fi module (Brand name: Realtek Semiconductor Corp, Model name: RTL8723BE, FCC ID: TX2-RTL8723BE) during test.
2. This test item was performed by modular transmitter. (Please refer to Test report no. FR322105AA issued on Apr. 25, 2013 by SPORTON INTERNATIONAL INC.
3. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
4. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
5. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z. It was determined that X orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in X orientation
6. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 558074 D01 V05r02
7. The worst-case data rate was:
   802.11b mode : 1Mbps
   802.11g mode : 6Mbps
   802.11n HT20 mode : MCS0
   802.11n HT40 mode : MCS0

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

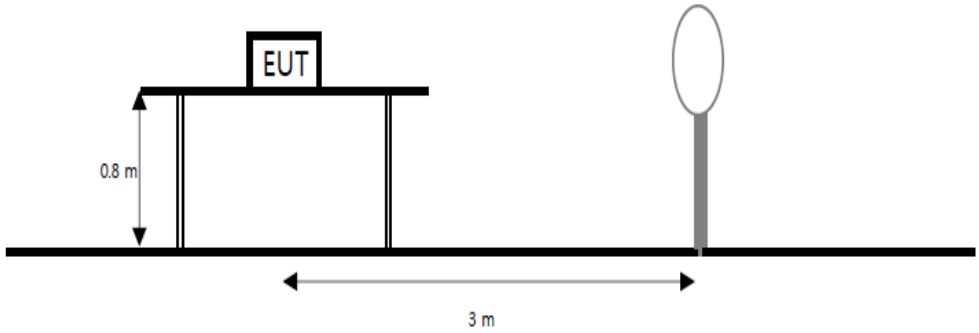
Parameter	Expanded uncertainty(±)	
Radiated spurious emissions	9 ㎑ ~ 30 ㎒:	2.28 ㏈
	30 ㎒ ~ 300 ㎒	4.98 ㏈
	300 ㎒ ~ 1 000 ㎒	5.14 ㏈
	1 ㎓ ~ 6 ㎓	6.70 ㏈
	Above 6 ㎓	6.60 ㏈
Conducted emissions	9 ㎑ ~ 150 ㎑	3.66 ㏈
	150 ㎑ ~ 30 ㎒	3.26 ㏈

6. Test results

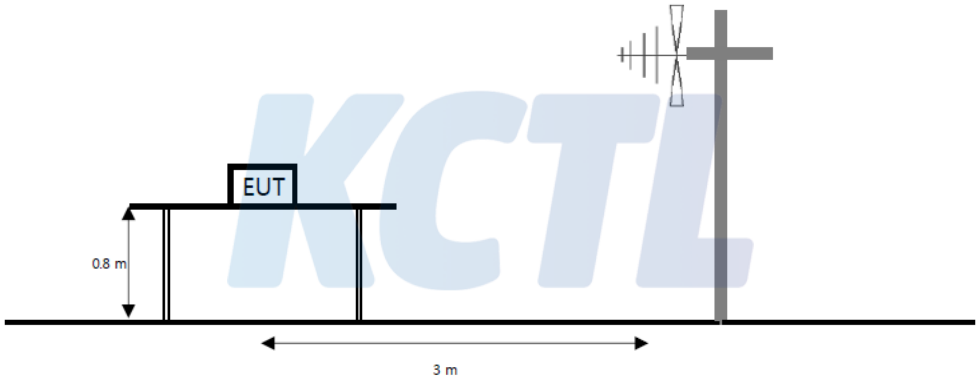
6.1. Spurious Emission, Band Edge and Restricted bands

Test setup

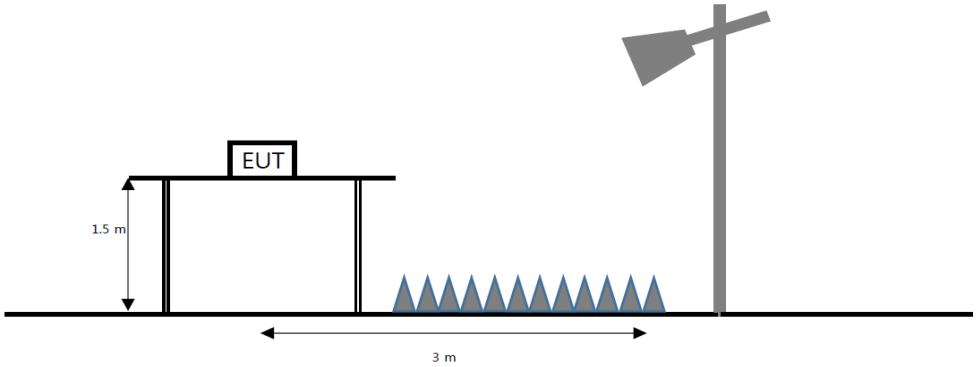
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



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.



Limit

According to section 15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (㎒)	Field strength (㎶/m)	Measurement distance (m)
0.009 - 0.490	2 400/F(㎑)	300
0.490 - 1.705	24 000/F(㎑)	30
1.705 - 30	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

**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., Section15.231 and 15.241.

According to section 15.205(a) and (b), only spurious emissions are permitted in any of the frequency bands listed below:

㎒	㎒	㎒	㎓
0.009 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 – 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 – 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 – 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 – 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 – 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 – 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 – 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 – 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.386 75	156.7 - 156.9	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 – 4 400	Above 38.6
13.36 - 13.41			

The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in section 15.209. At frequencies equal to or less than 1 000 ㎒, compliance with the limits in section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 ㎒, compliance with the emission limits in section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in section 15.35 apply to these measurements.

Test procedure
ANSI C63.10-2013

Test settings
Peak field strength measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = as specified in table
3. VBW ≥ (3×RBW)
4. Detector = peak
5. Sweep time = auto
6. Trace mode = max hold
7. Allow sweeps to continue until the trace stabilizes

Table. RBW as a function of frequency

Frequency	RBW
9 ㎑ to 150 ㎑	200 ㎐ to 300 ㎐
0.15 ㎒ to 30 ㎒	9 ㎑ to 10 ㎑
30 ㎒ to 1 000 ㎒	100 ㎑ to 120 ㎑
> 1 000 ㎒	1 ㎒

Average field strength measurements

Trace averaging with continuous EUT transmission at full power

If the EUT can be configured or modified to transmit continuously (D ≥ 98%), then the average emission levels shall be measured using the following method (with EUT transmitting continuously):

1. RBW = 1 ㎒ (unless otherwise specified).
2. VBW ≥ (3×RBW).
3. Detector = RMS (power averaging), 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.
4. 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 to use linear voltage averaging. Log or ㏈ averaging shall not be used.
5. Sweep time = auto.
6. Perform a trace average of at least 100 traces.

Trace averaging across ON and OFF times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (D ≥ 98%) cannot be achieved and the duty cycle is constant (duty cycle variations are less than ±2%), then the following procedure shall be used:

1. The EUT shall be configured to operate at the maximum achievable duty cycle.
2. Measure the duty cycle D of the transmitter output signal as described in 11.6.
3. RBW = 1 ㎒ (unless otherwise specified).
4. VBW ≥ [3 × RBW].
5. Detector = RMS (power averaging), 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.

6. 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 to use linear voltage averaging. Log or dB averaging shall not be used.
7. Sweep time = auto.
8. Perform a trace average of at least 100 traces.
9. A correction factor shall be added to the measurement results prior to comparing with the emission limit to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:
   1) If power averaging (rms) mode was used in step f), then the applicable correction factor is [10 log (1 / D)], where D is the duty cycle.
   2) If linear voltage averaging mode was used in step f), then the applicable correction factor is [20 log (1 / D)], where D is the duty cycle.
   3) If a specific emission is demonstrated to be continuous (D ≥ 98%) rather than turning ON and OFF with with the transmit cycle, then no duty cycle correction is required for that emission.

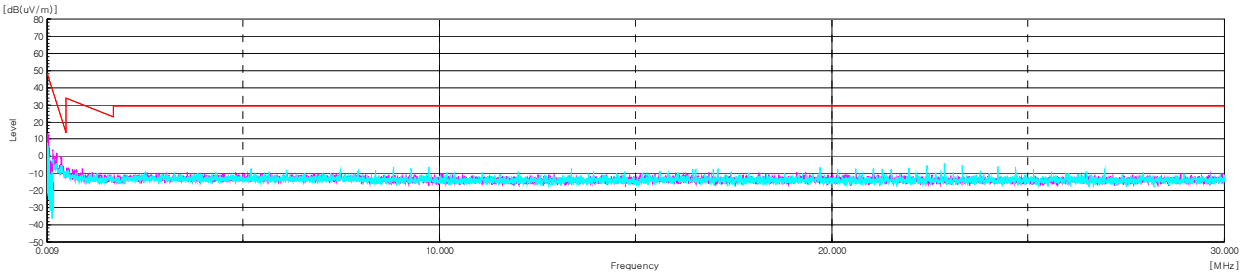
Notes:

1. *f* <30 ㎒, extrapolation factor of 40 dB/decade of distance. $F_d = 40\log(D_m/Ds)$
   f ≥30 ㎒, extrapolation factor of 20 dB/decade of distance. $F_d = 20\log(D_m/Ds)$
   Where:
   F_d= Distance factor in dB
   D_m= Measurement distance in meters
   D_s= Specification distance in meters
2. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or F_d(dB)
3. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
4. Average test would be performed if the peak result were greater than the average limit.
5. 1) mean is restricted band.
6. According to part 15.31(f)(2), an extrapolation factor of 40 dB/decade is applied because measured distance of radiated emission is 3 m.

Test results (Below 30 ㎒) – Worst case: 802.11b Low frequency

Frequency	Pol.	Reading	Cable Loss	Amp Gain	Antenna Factor	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
No spurious emissions were detected within 20 ㏈ of the limit.									

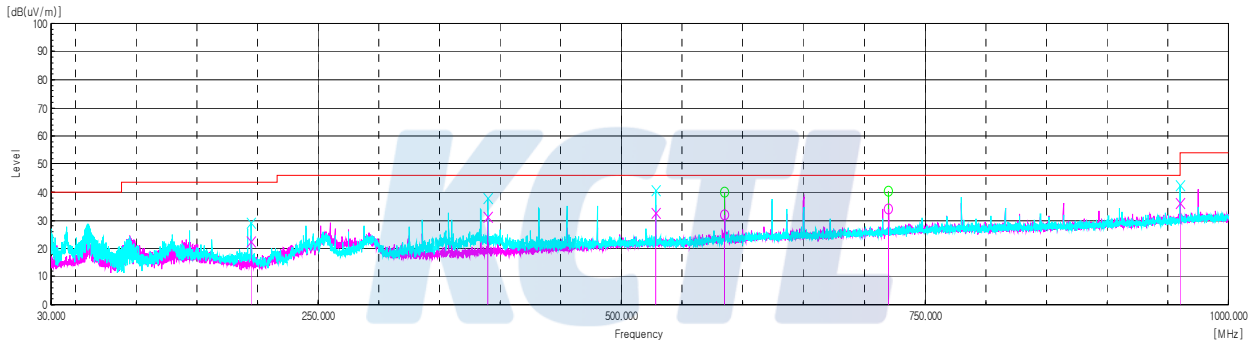
Horizontal/Vertical



Test results (Below 1 000 ㎒) – Worst case: 802.11b Low frequency

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
195.02	V	35.10	15.70	-28.20	-	22.60	43.50	20.90
389.99	V	36.80	21.50	-27.15	-	31.15	46.00	14.85
528.10	V	34.60	24.10	-26.21	-	32.49	46.00	13.51
585.08	H	32.70	25.40	-26.06	-	32.04	46.00	13.96
720.03	H	32.30	27.10	-25.21	-	34.19	46.00	11.81
960.11	V	29.70	30.00	-23.28	-	36.42	54.00	17.58

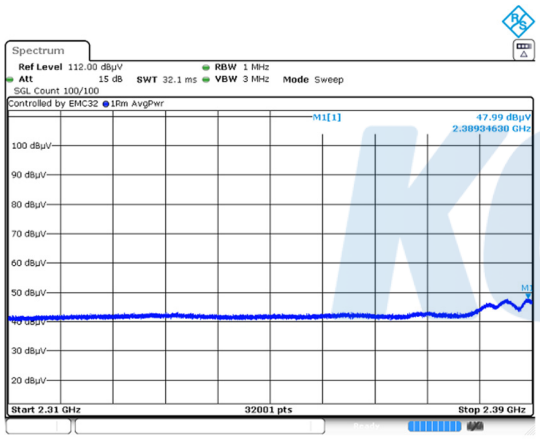
Horizontal/Vertical



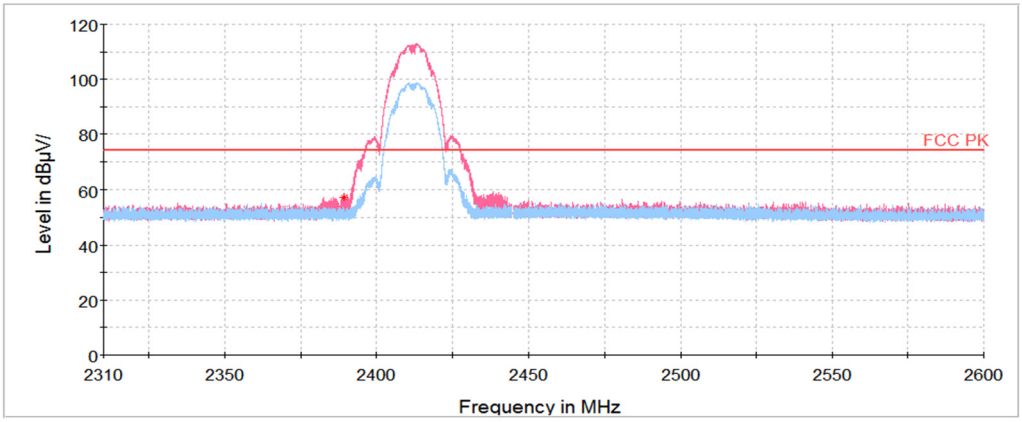
Test results (Above 1 000 ㎒)
802.11b

1 Channel

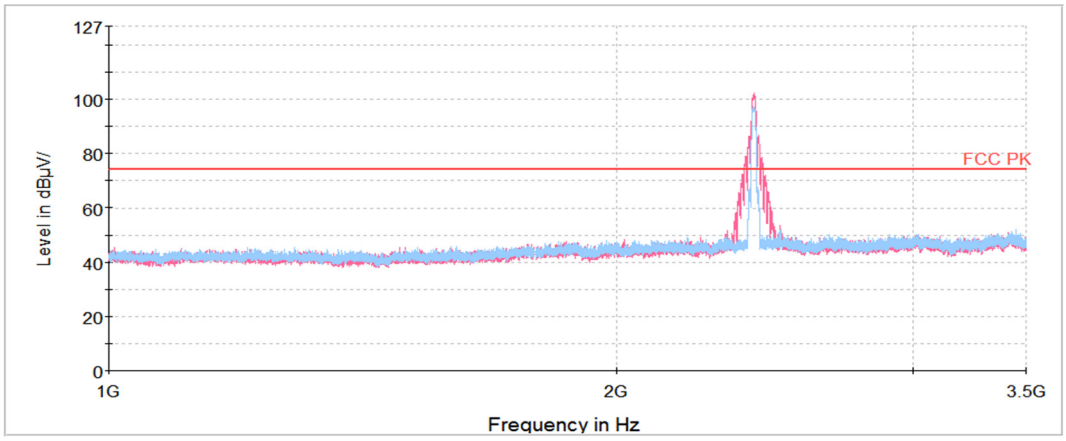
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
2 389.35[1)]	V	54.29	31.88	-29.04	-	57.13	74.00	16.87
4 823.13[1)]	V	60.91	33.93	-52.80	-	42.04	74.00	31.96
7 235.11	V	65.61	35.40	-51.87	-	49.14	74.00	24.86
Average Data								
2 389.35[1)]	V	47.99	31.88	-29.04	-	50.83	54.00	3.17

Average data	
	Blank

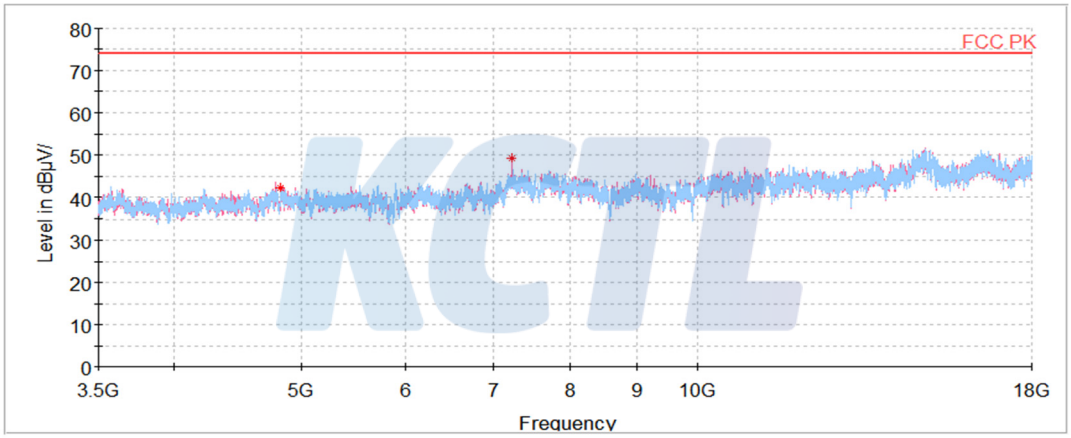
Horizontal/Vertical for Band-edge



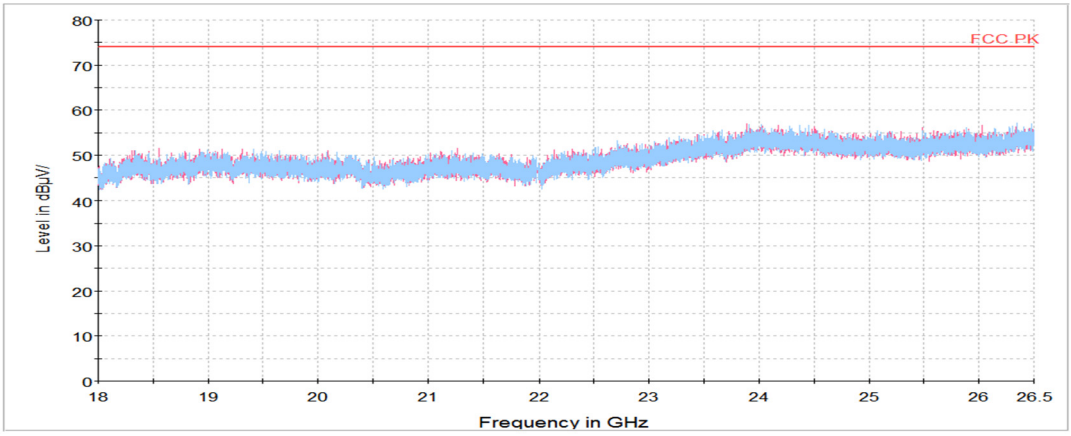
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



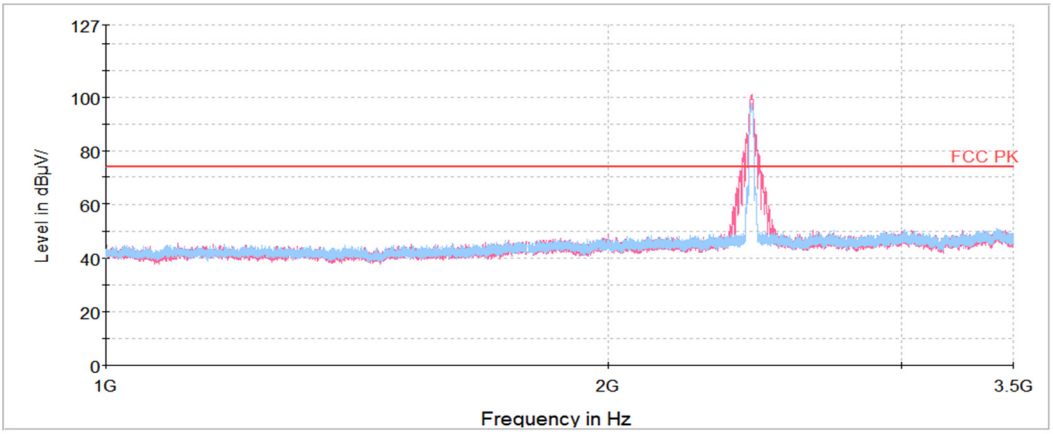
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



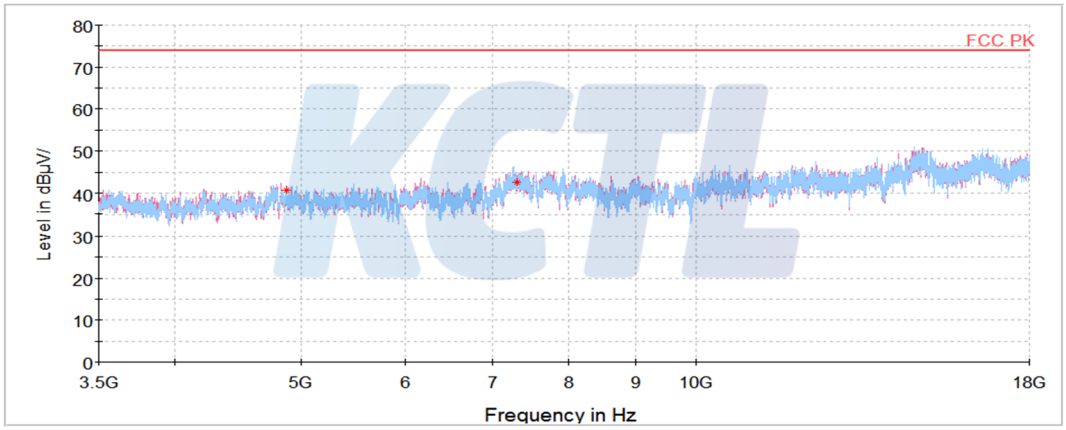
6 Channel

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
4 873.88[1)]	V	60.98	33.95	-54.20	-	40.73	74.00	33.27
7 311.23[1)]	V	58.78	35.40	-51.50	-	42.68	74.00	31.32
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

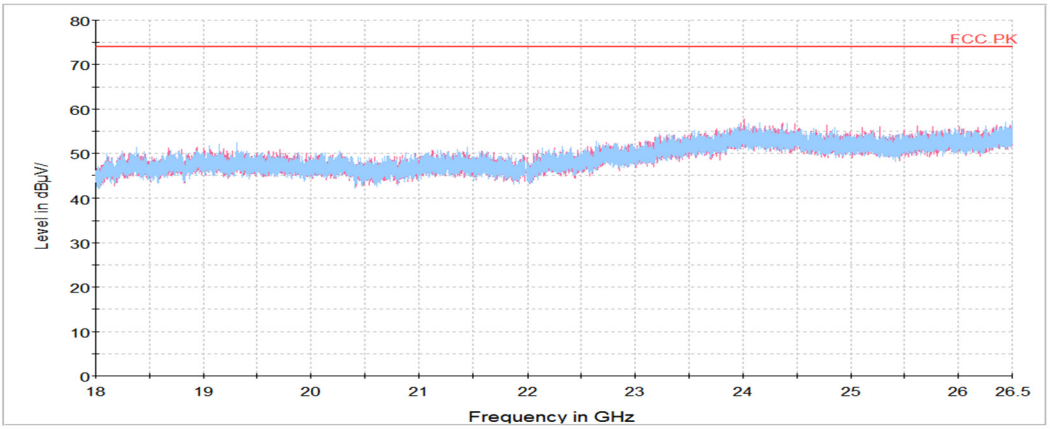
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓

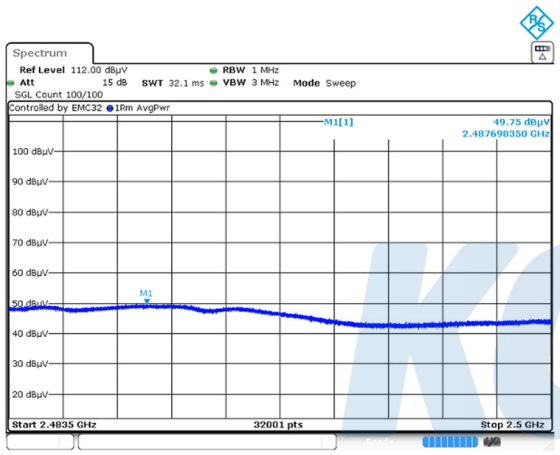


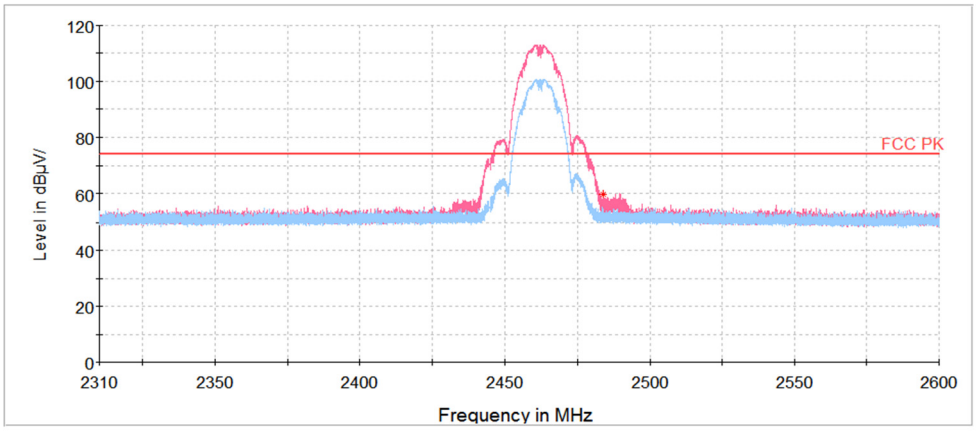
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



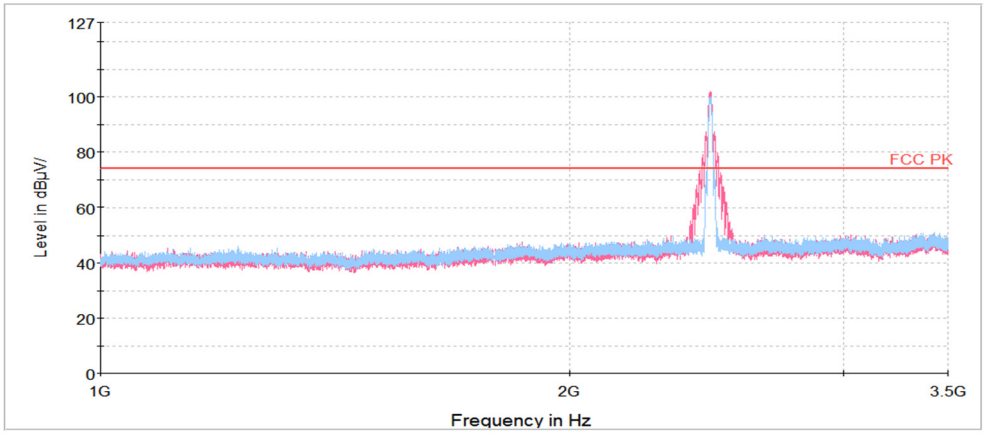
11 Channel

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
2 487.70[1)]	V	56.67	32.08	-29.23	-	59.52	74.00	14.48
4 924.63[1)]	V	61.71	33.97	-54.87	-	40.81	74.00	33.19
7 387.81[1)]	V	63.59	35.40	-51.12	-	47.87	74.00	26.13
Average Data								
2 487.70[1)]	V	49.75	32.08	-29.23	-	52.60	54.00	1.40

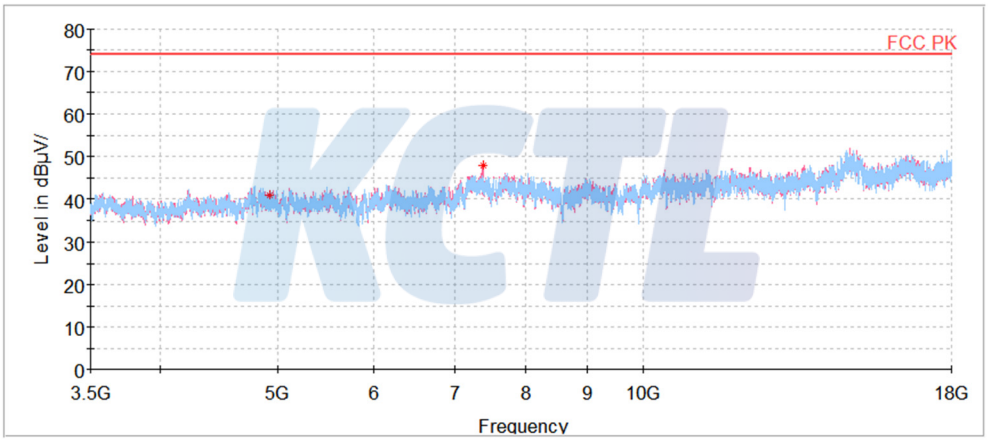
Average data	
	Blank

Horizontal/Vertical for Band-edge


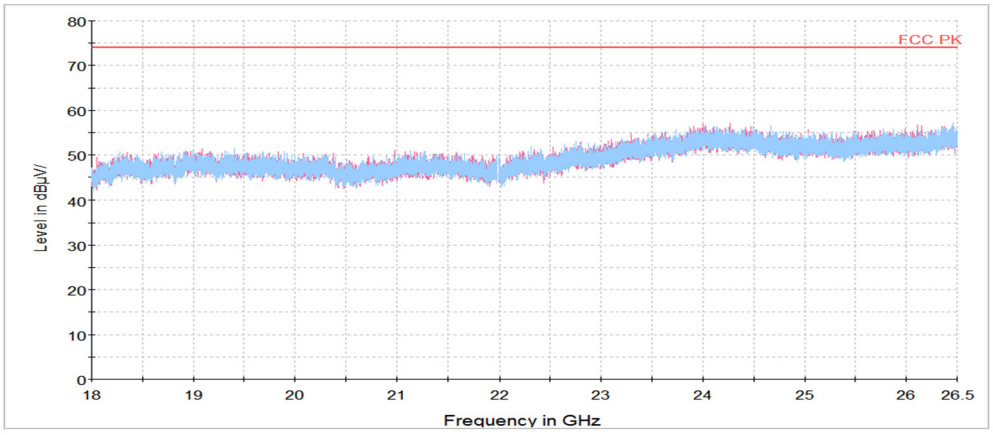
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



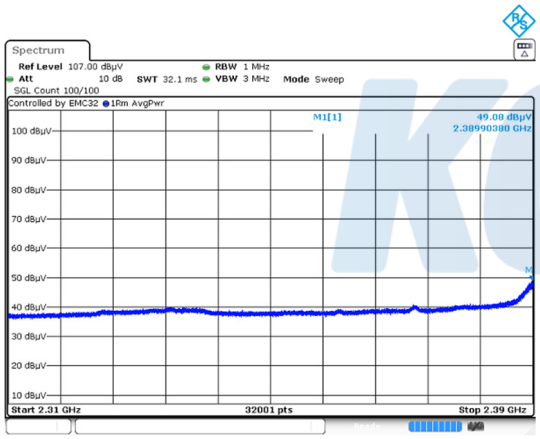
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓

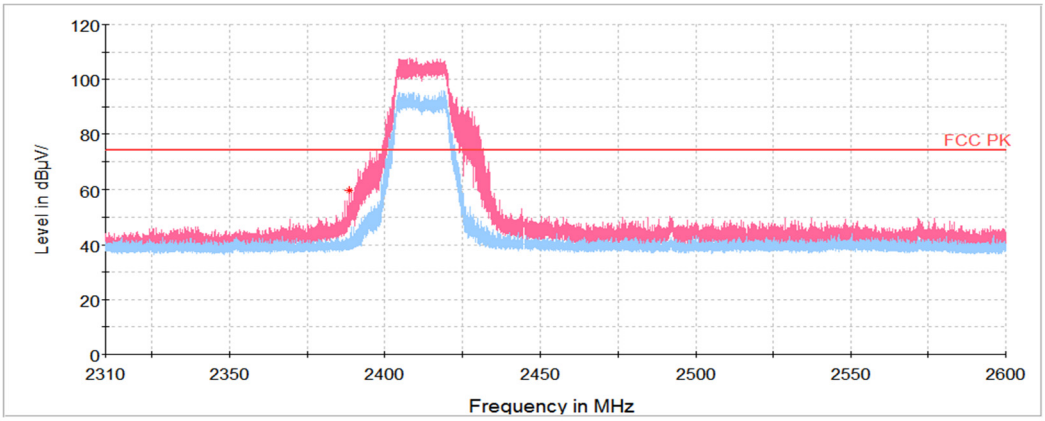


802.11g

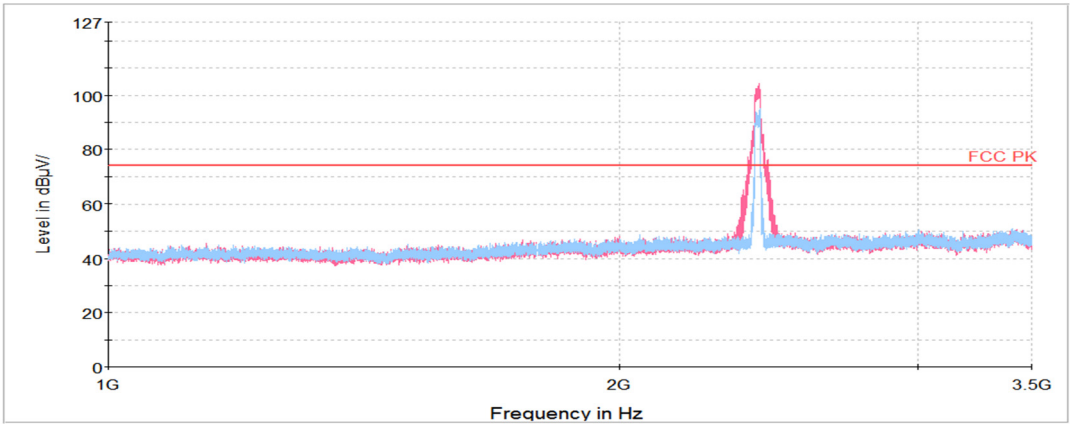
1 Channel

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
2 389.90[1)]	V	56.98	31.88	-29.04	-	59.64	74.00	14.36
4 823.13[1)]	H	65.05	33.93	-52.80	-	41.93	74.00	32.07
7 236.02	H	61.03	35.40	-51.87	-	43.71	74.00	30.29
Average Data								
2 389.90[1)]	V	49.08	31.88	-29.04	-	51.92	54.00	2.08

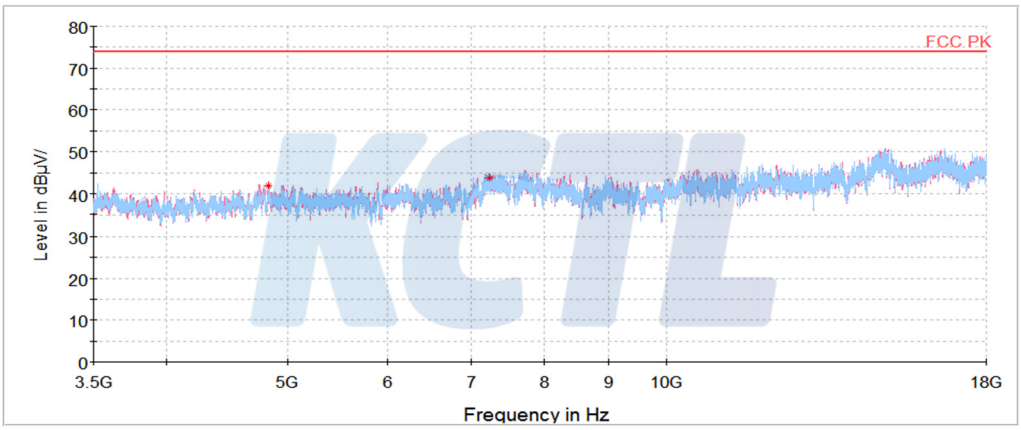
Average data	
	Blank

Horizontal/Vertical for Band-edge


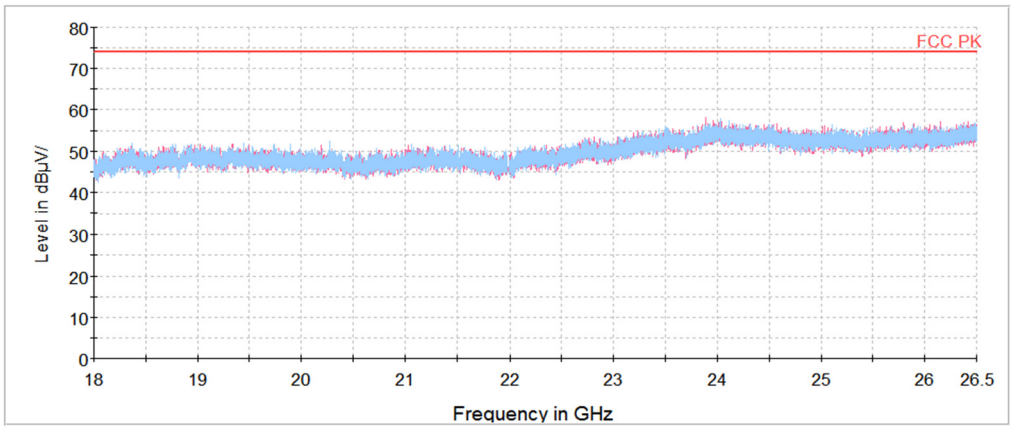
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



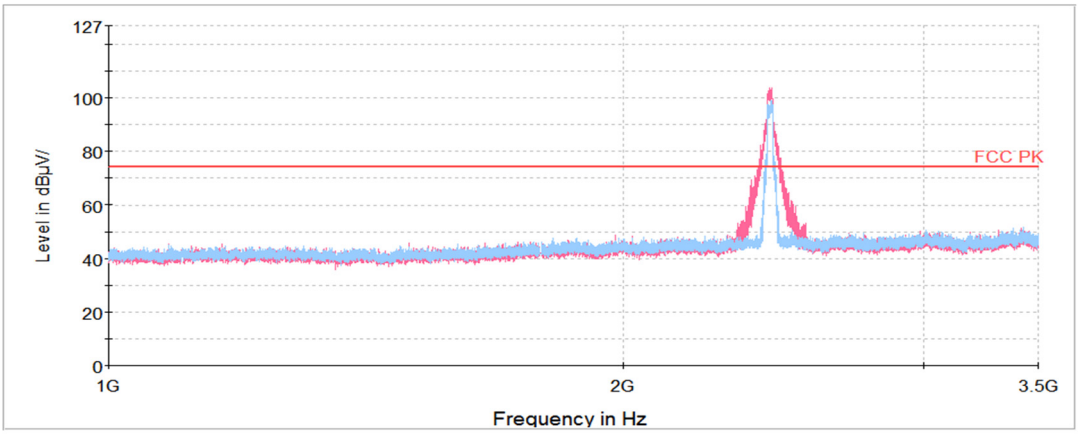
Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓



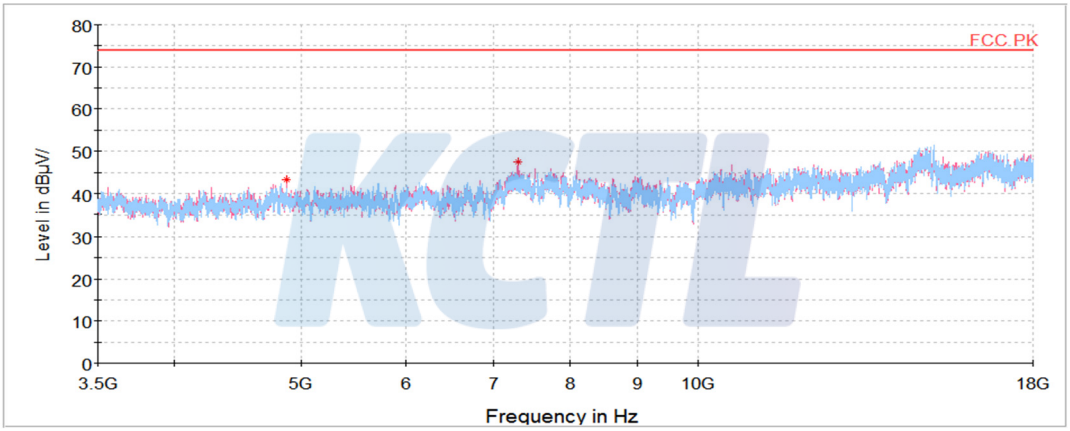
6 Channel

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
4 874.33[1)]	V	63.65	33.95	-54.22	-	43.38	74.00	30.62
7 315.31[1)]	V	63.45	35.40	-51.48	-	47.37	74.00	26.63
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



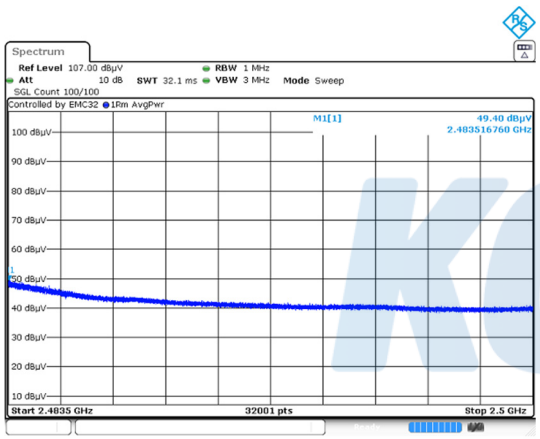
Horizontal/Vertical for 3.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 26.5 ㎓

11 Channel

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
2 483.52[1)]	V	63.77	32.07	-29.21	-	66.63	74.00	7.37
4 924.63[1)]	H	59.89	33.97	-54.87	-	38.99	74.00	35.01
7 387.36[1)]	H	59.35	35.40	-51.13	-	43.62	74.00	30.38
Average Data								
2 483.52[1)]	V	49.40	32.07	-29.21	-	52.26	54.00	1.74

Average data	
	Blank

Horizontal/Vertical for Band-edge