TEST REPORT

KCTL Inc.
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-31-285-0894 FAX: 82-505-299-8311
www.kctl.co.kr

1. Client

- Name : DREAMUS COMPANY
- Address : 5, Bangbae-ro 18gil, Seocho-gu, Seoul, Republic of Korea
- Date of Receipt : 2020-04-03

2. Use of Report : Class II Permissive change

3. Name of Product and Model : SP2000 / PPF33

4. Manufacturer and Country of Origin : DREAMUS COMPANY / Korea

5. FCC ID : QDMPPF33

6. Date of Test : 2020-04-10 to 2020-04-13

7. Test Standards : FCC Part 15 Subpart E, 15.407

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

Affirmation	Tested by Name : Hosung Lee (Signature)	Technical Manager Name : Heesu Ahn (Signature)

2020-04-29

KCTL Inc.

Report revision history

Date	Revision	Page No
2020-04-29	Initial report	-

CONTENTS

1. General information

Client	:	DREAMUS COMPANY
Address	:	5, Bangbae-ro 18gil, Seocho-gu, Seoul, Republic of Korea
Manufacturer	:	DREAMUS COMPANY
Address	:	5, Bangbae-ro 18gil, Seocho-gu, Seoul, Republic of 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	:	SP2000
Model	:	PPF33
Frequency range	:	2 402 ㎒ ~ 2 480 ㎒ (Bluetooth(BDR/EDR)) 2 412 ㎒ ~ 2 462 ㎒ (802.11b/g/n HT20) 2 422 ㎒ ~ 2 452 ㎒ (802.11n HT40) 5 180 ㎒ ~ 5 240 ㎒ (802.11a/n HT20) 5 190 ㎒ ~ 5 230 ㎒ (802.11n HT40) 5 210 ㎒ (802.11ac VHT80) 5 745 ㎒ ~ 5 825 ㎒ (802.11a/n HT20) 5 755 ㎒ ~ 5 795 ㎒ (802.11n HT40) 5 775 ㎒ (802.11ac VHT80)
Modulation technique	:	GFSK, π/4DQPSK, 8DPSK (Bluetooth(BDR/EDR)) DSSS, OFDM (802.11a/b/g/n(HT20/40)/ac(VHT80))
Number of channels	:	2.4 ㎓: 11 ch (802.11b/g/n HT20), 7 ch (802.11n HT40) 79 ch (Bluetooth(BDR/EDR)) 5 ㎓ (UNII 1): 4 ch (802.11a/n HT20) 2 ch (802.11n HT40) 1 ch (802.11ac VHT80) 5.8 ㎓ (UNII 3): 5 ch (802.11a/n HT20) 2 ch (802.11n HT40) 1 ch (802.11ac VHT80)
Power source	:	DC 3.8 V
Antenna specification	:	Carrier LPS Antenna
Antenna gain	:	-2.059 dBi (Bluetooth, WIFI 2.4 ㎓), 2.054 dBi (WIFI 5 ㎓) 0.004 dBi (WIFI 5.8 ㎓)
Software version	:	1.0

Hardware version : Mp
Test device serial No. : N/A
Operation temperature : 23 ℃

2.1. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
Battery	HYPERPOWER BATTERIES INC.	PR-596073G	-	DC 3.8 V, 3 700 ㎃ /24 ㎒

2.2. Frequency/channel operations

This device contains the following capabilities:
WIFI(802.11a/b/g/n(HT20/HT40)/ac(VHT80) , Bluetooth(BDR, EDR)

UNII-1 (5 150 ㎒ – 5 250 ㎒)			
Mode	Lowest frequency	Middle frequency	Highest frequency
802.11a/n HT20	5 180 ㎒	5 200 ㎒	5 240 ㎒
802.11n HT40	5 190 ㎒	-	5 230 ㎒
802.11ac VHT80	5 210 ㎒		
UNII-3 (5 725 ㎒ – 5 850 ㎒)			
802.11a/n HT20	5 745 ㎒	5 785 ㎒	5 825 ㎒
802.11n HT40	5 755 ㎒	-	5 795 ㎒
802.11ac VHT80	-	5 775 ㎒	-

Table 2.2.1. WIFI(802.11a/n(HT20/HT40)/ac(VHT80) mode

2.3. Duty Cycle Factor

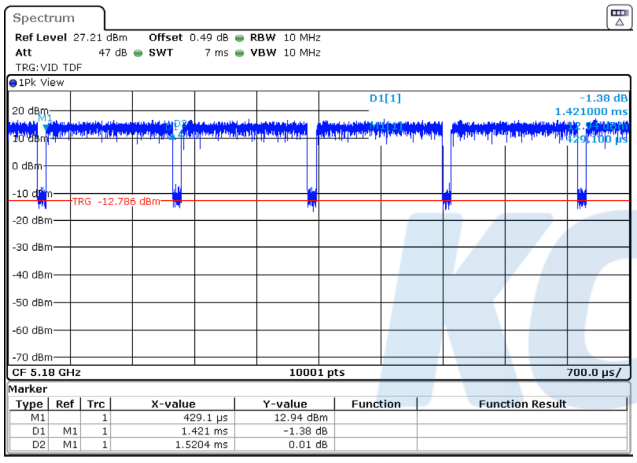
- **UNII-1**

Test mode	T_{on} time (ms)	Period (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.421	1.520	0.935	93.500	0.294
802.11n_HT20	1.332	1.432	0.930	93.000	0.313
802.11n_HT40	0.664	0.764	0.870	87.000	0.607
802.11ac_VHT80	0.332	0.432	0.769	76.900	1.142

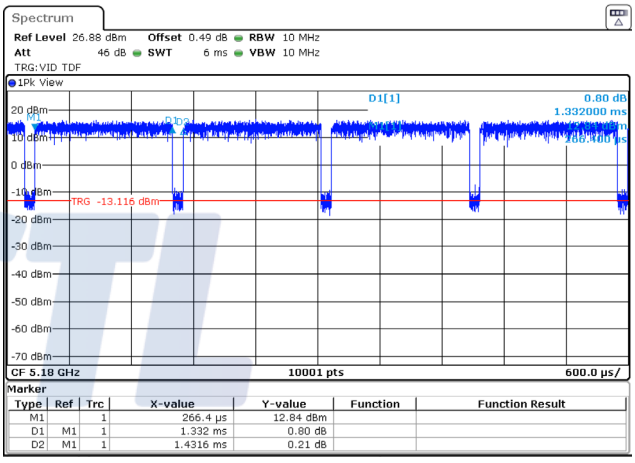
Notes.

1. Duty cycle (Linear) = T_{on} time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)

802.11a



802.11n_HT20



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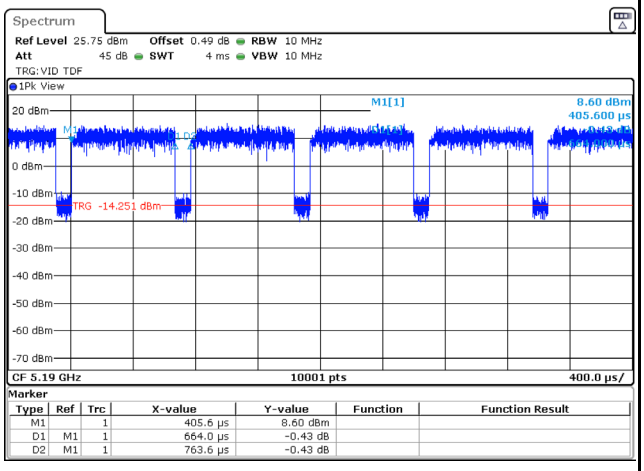
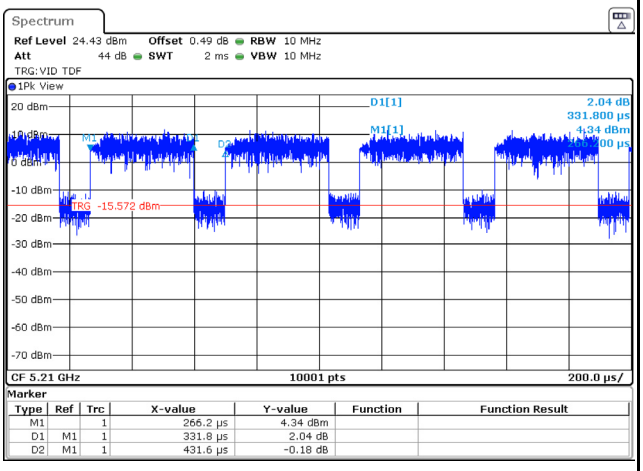


802.11ac_VHT80



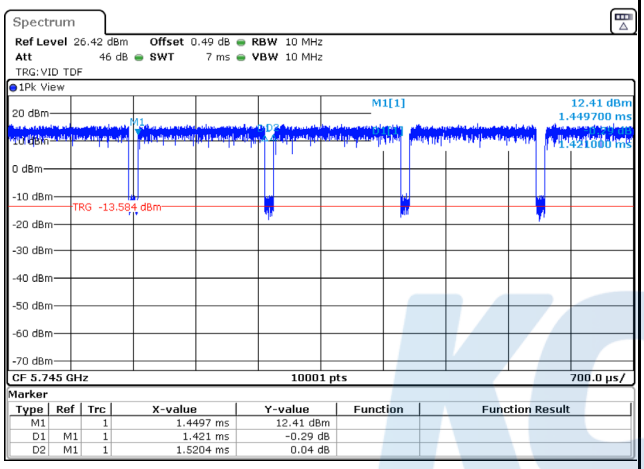
- **UNII-3**

Test mode	T_{on} time (ms)	Period (ms)	Duty cycle		Duty cycle factor (dB)
			(Linear)	(%)	
802.11a	1.421	1.520	0.935	93.50	0.294
802.11n_HT20	1.332	1.432	0.930	93.00	0.313
802.11n_HT40	0.664	0.764	0.870	87.00	0.607
802.11ac_VHT80	0.332	0.432	0.769	76.90	1.142

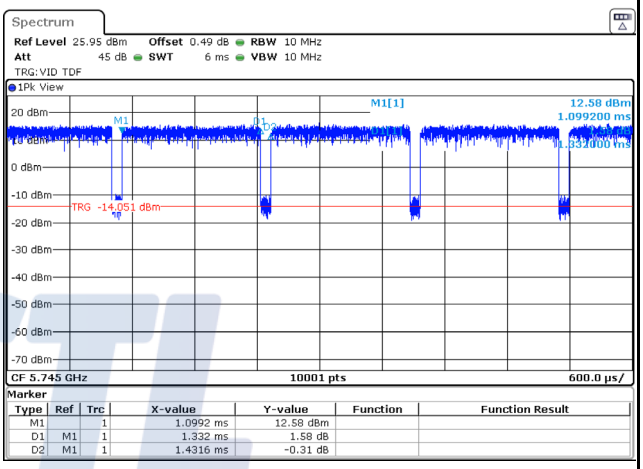
Notes.

1. Duty cycle (Linear) = T_{on} time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)

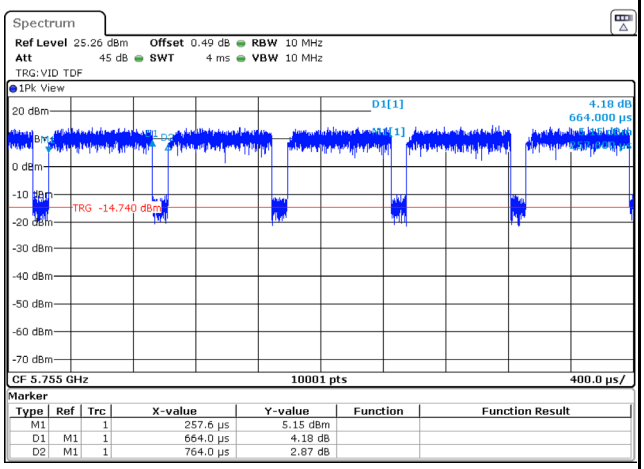
802.11a



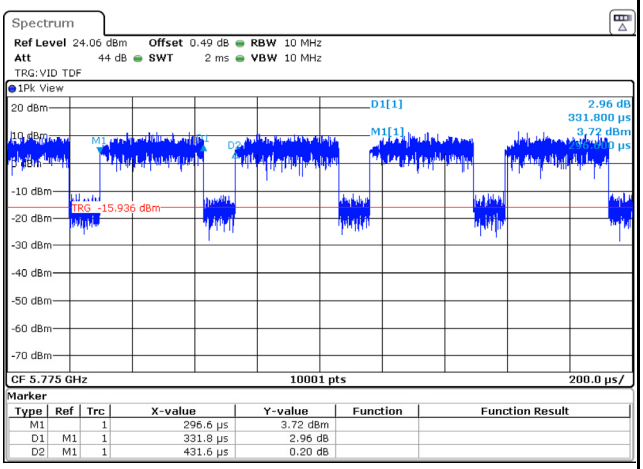
802.11n_HT20



802.11n_HT40



802.11ac_VHT80



3. Antenna requirement

According to §15.203, §15.407

"An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can 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 attached Carrier LPS Antenna on board.
- The E.U.T Complies with the requirement of §15.203, §15.407

4. Summary of tests

FCC Part section(s)	Parameter	Test results
15.407(a)	Maximum conducted output power	Pass
15.407(a)	Maximum power spectral density	N/T(Note1)
15.407(a)	26 dB bandwidth & 99% Occupied bandwidth	N/T(Note1)
15.407(e)	6 dB bandwidth	N/T(Note1)
15.407(g)	Frequency stability	N/T(Note1)
15.407(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. These test item was performed. (FCC ID: QDMPPF33)
   Test Report No. KR19-SRF0070 issued on 30, May, 2019 by KCTL Inc.)
2. The data from that application has been verified through appropriate spot checks to demonstrate compliance for this device as shown in the test result of section 7.
3. Output power was verified to be within the expected tune up tolerances prior to performing the spot checks for radiated spurious emissions and band edge to confirm that the proposed changes to the digital circuitry had not adversely affected the previously reported values in the original filing.
4. The test scenario for spot check is based on the worst-case of original report results.

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	
Conducted RF power	1.76 dB	
Conducted spurious emissions	4.03 dB	
Radiated spurious emissions	9 kHz ~ 30 MHz:	2.28 dB
	30 MHz ~ 300 MHz	4.98 dB
	300 MHz ~ 1 000 MHz	5.14 dB
	1 GHz ~ 6 GHz	6.70 dB
	Above 6 GHz	6.60 dB
Conducted emissions	9 kHz ~ 150 kHz	3.66 dB
	150 kHz ~ 30 MHz	3.26 dB

6. Measurement results explanation example

The offset level is set in the spectrum analyzer to compensate the RF cable loss 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.

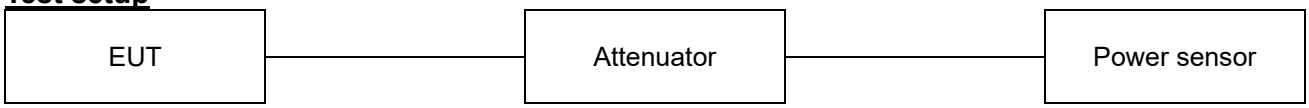
Frequency (㎒)	Factor(㏈)	Frequency (㎒)	Factor(㏈)
30	10.02	16 000	11.56
100	10.04	17 000	11.58
200	10.05	18 000	11.56
300	10.07	19 000	11.63
400	10.07	20 000	11.72
500	10.08	21 000	11.74
600	10.09	22 000	11.74
700	10.09	23 000	11.92
800	10.09	24 000	11.79
900	10.09	25 000	11.88
1 000	10.09	26 000	11.99
2 000	10.52	27 000	12.05
3 000	10.68	28 000	12.16
4 000	10.81	29 000	12.27
5 000	10.90	30 000	12.09
6 000	10.96	31 000	12.27
7 000	11.03	32 000	12.26
8 000	11.10	33 000	12.30
9 000	11.17	34 000	12.30
10 000	11.21	35 000	12.33
11 000	11.24	36 000	12.43
12 000	11.32	37 000	12.58
13 000	11.36	38 000	12.67
14 000	11.35	39 000	12.71
15 000	11.54	40 000	12.70

Note.
Offset(㏈) = RF cable loss(㏈) + Attenuator(㏈)

7. Test results

7.1. Maximum conducted output power

Test setup



Limit

According to §15.407(a)

Band	EUT category		Limit
UNII-1		Outdoor access point	1 W (30 dBm)
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	250 mW (23.98 dBm)
UNII-2A	-		250 mW or 11 dBm + 10logB*
UNII-2C	-		250 mW or 11 dBm + 10logB*
UNII-3	√		1 W (30 dBm)

Notes:

*FCC Limit B is the 26 dB emission bandwidth.

Test procedure

ANSI C63.10-2013-Section 12.3.3.2 and 14.2
KDB 789033 D02 v02r01 - Section E.3.a) or b)

Test settings

◆ **KDB 789033 D02 v02r01**

Section E.3.a)
Method PM (Measurement using an RF average power meter):

(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

- The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
- At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
- The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five

(ii) If the transmitter does not transmit continuously, measure the duty cycle, x, of the transmitter output signal as described in II

(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

(iv) Adjust the measurement in dBm by adding 10 log (1/x) where x is the duty cycle (e.g., 10 log (1/0.25) if the duty cycle is 25%).

Section E.3.b)
Method PM-G (Measurement using a gated RF average power meter):
Measurements may be performed using a wideband gated RF power meter provided that the gate parameters are adjusted such that the power is measured only when the EUT is transmitting at its maximum power control level. Since the measurement is made only during the ON time of the transmitter, no duty cycle correction factor is required.

Notes:
A peak responding power sensor is used, where the power sensor system video bandwidth is greater than the occupied bandwidth of the EUT.

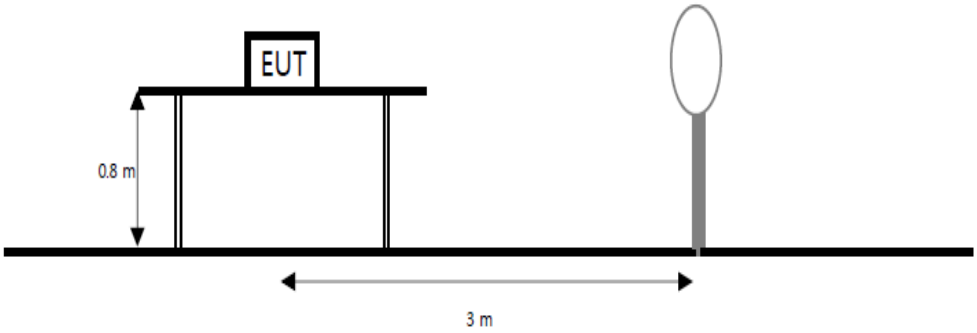
Test results

Test mode	Band	Frequency (㎒)	Measured output power			Limit (dBm)
			Reading (dBm)	Duty Factor (dB)	Result (dBm)	
11a	UNII 1	5 180	13.15	0.29	13.44	24
		5 200	13.08	0.29	13.37	
		5 240	13.05	0.29	13.34	
	UNII 3	5 745	12.26	0.29	12.55	30
		5 785	12.42	0.29	12.71	
		5 825	12.43	0.29	12.72	
11n HT20	UNII 1	5 180	13.02	0.31	13.33	24
		5 200	13.03	0.31	13.34	
		5 240	12.95	0.31	13.26	
	UNII 3	5 745	11.21	0.31	11.52	30
		5 785	11.48	0.31	11.79	
		5 825	11.43	0.31	11.74	
11n HT40	UNII 1	5 190	12.32	0.61	12.93	24
		5 230	12.24	0.61	12.85	
	UNII 3	5 755	10.52	0.61	11.13	30
		5 795	10.61	0.61	11.22	
11ac VHT80	UNII 1	5 210	12.03	1.14	13.17	24
	UNII 3	5 775	10.61	1.14	11.75	30

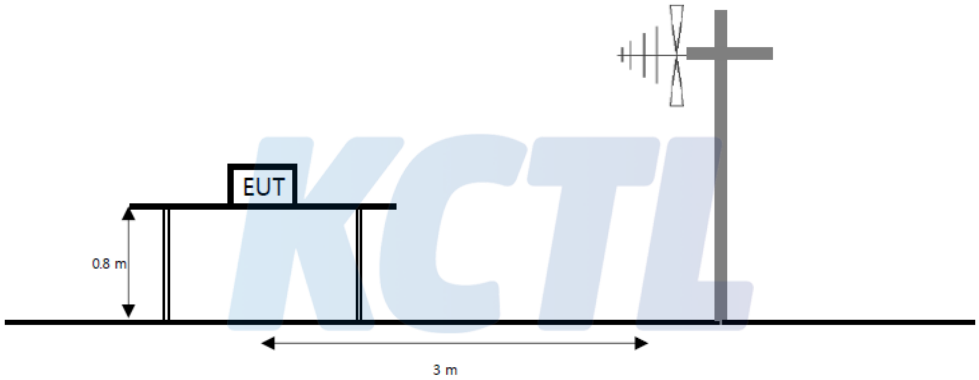
7.2. Spurious Emission, Band Edge and Restricted bands

Test setup

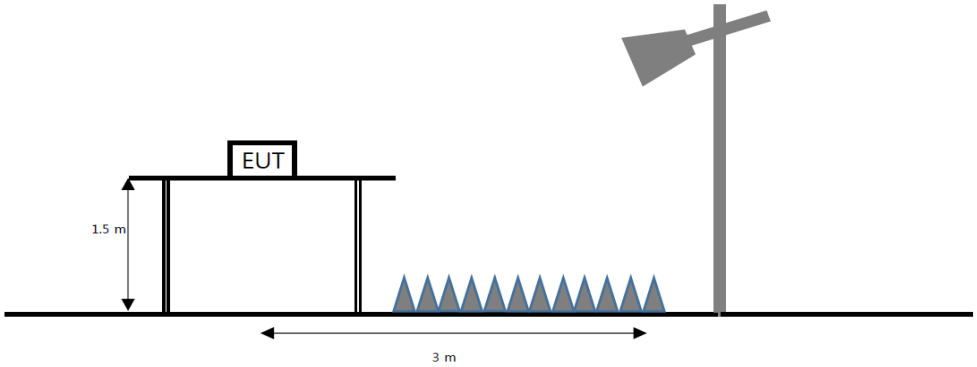
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



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 (MHz)	Field strength (μV/m)	Measurement distance (m)
0.009 - 0.490	2 400/F(kHz)	300
0.490 - 1.705	24 000/F(kHz)	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 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., 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:

MHz	MHz	MHz	GHz
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	2 483.5 – 2 500	17.7 - 21.4
8.376 25 - 8.386 75	25	2 690 – 2 900	22.01 - 23.12
8.414 25 - 8.414 75	156.7 - 156.9	3 260 – 3 267	23.6 - 24.0
12.29 - 12.293	162.012 5 - 167.17	3 332 – 3 339	31.2 - 31.8
12.519 75 - 12.520 25	167.72 - 173.2	3 345.8 – 3 358	36.43 - 36.5
12.576 75 - 12.577 25	240 - 285	3 600 – 4 400	Above 38.6
13.36 - 13.41	322 - 335.4		

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 MHz, compliance with the limits in section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 MHz, 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.

According to section 15.407(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:

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

For transmitters operating in the 5.25-5.35 ㎓ band: All emissions outside of the 5.15-5.35 ㎓ band shall not exceed an e.i.r.p. of −27 ㏈m/㎒.

For transmitters operating in the 5.725-5.85 ㎓ band: All emissions shall be limited to a level of -27 ㏈m/㎒ at 75 ㎒ or more above or below the band edge increasing linearly to 10 ㏈m/㎒ at 25 ㎒ above or below the band edge, and form 25 ㎒ above or below the band edge increasing linearly to a level of 15.6 ㏈m/㎒ at 5 ㎒ above or below the band edge, and from 5 ㎒ above or below the band edge increasing linearly to a level of 27 ㏈m/㎒ at the band edge.

Test procedure

ANSI C63.10-2013 Section 6.4.6
KDB 558074 D01 V05r02

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. Factors(dB) = Antenna factor(dB/m) + Cable loss(dB) + or Amp. gain(dB) + or F_d(dB)
2. The worst-case emissions are reported however emissions whose levels were not within 20 dB of respective limits were not reported.
3. Average test would be performed if the peak result were greater than the average limit.
4. 1) means restricted band.

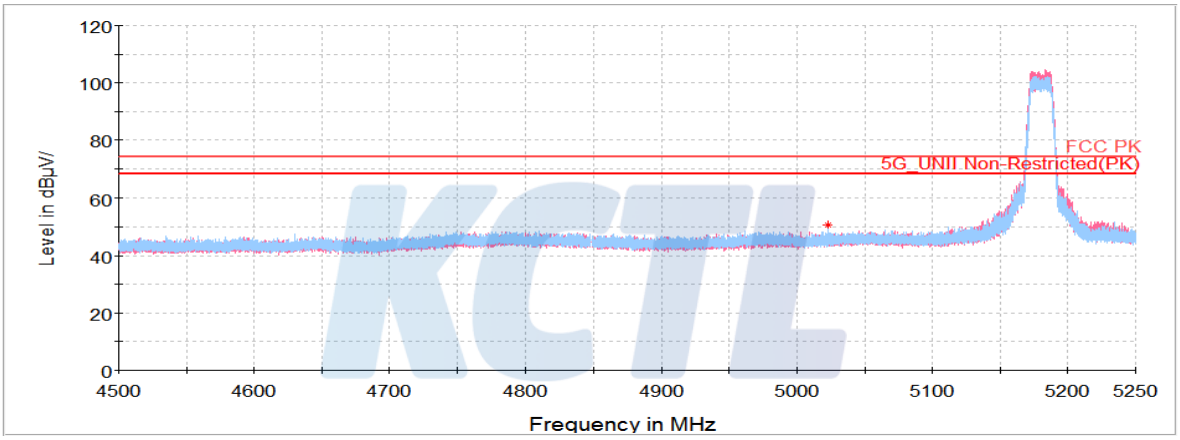
Test Plot

802.11a UNII 1 / Band-edge

Lowest Channel (5 180 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 022.73[1)]	H	43.32	34.04	-26.61	-	50.75	74.00	23.25
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for Band-edge

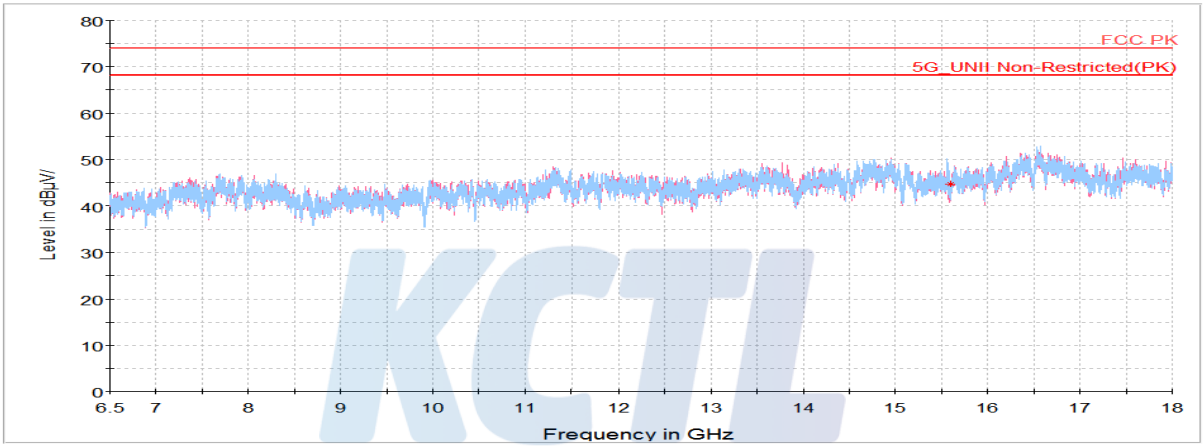


802.11a UNII 1 / RSE

Lowest Channel (5 180 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
15 601.17[1)]	V	53.93	40.02	-49.29	-	44.66	74.00	29.34
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

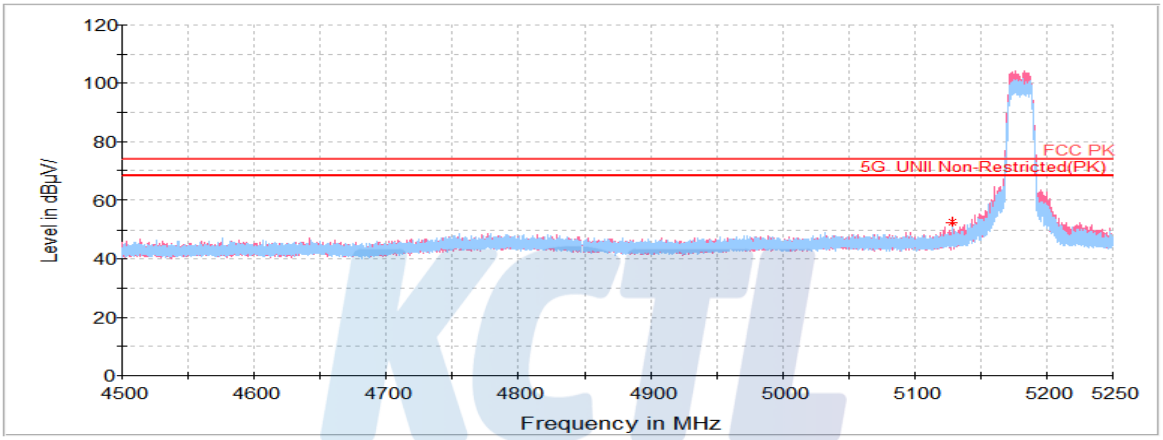


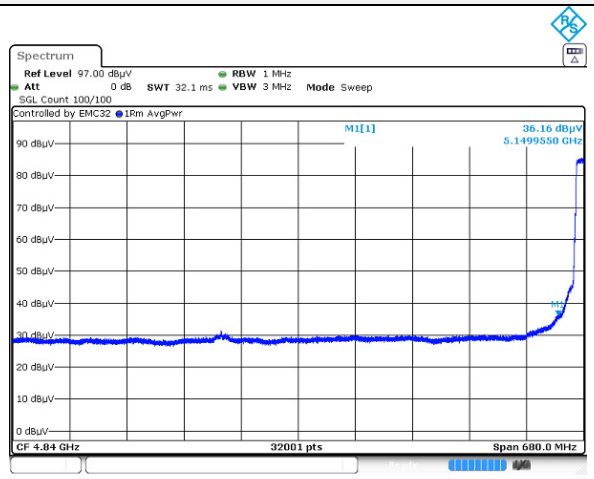
802.11n HT20 UNII 1 / Band-edge

Lowest Channel (5 180 ㎒)

Frequency	Pol.	Reading	Amp. + Cable	Antenna Factor	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 149.96[1)]	H	45.25	34.24	-27.12	-	52.37	74.00	21.63
Average Data								
5 149.96[1)]	H	36.16	34.24	-27.12	0.31	43.59	54.00	10.41

Horizontal/Vertical for Band-edge



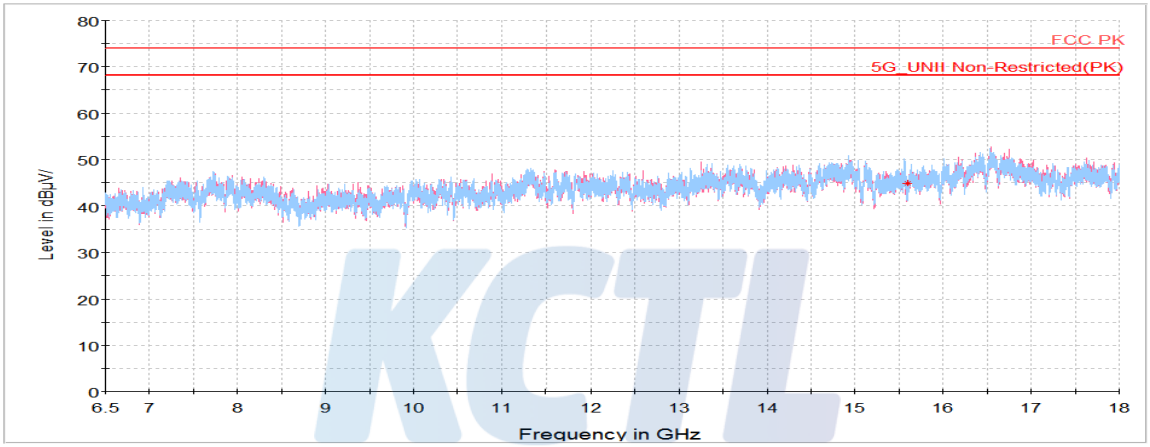
Average data	Average data
	Blank

802.11n HT20_UNII 1 / RSE

Lowest Channel (5 200 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
15 601.17[1)]	H	54.09	40.02	-49.29	-	44.82	74.00	29.18
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

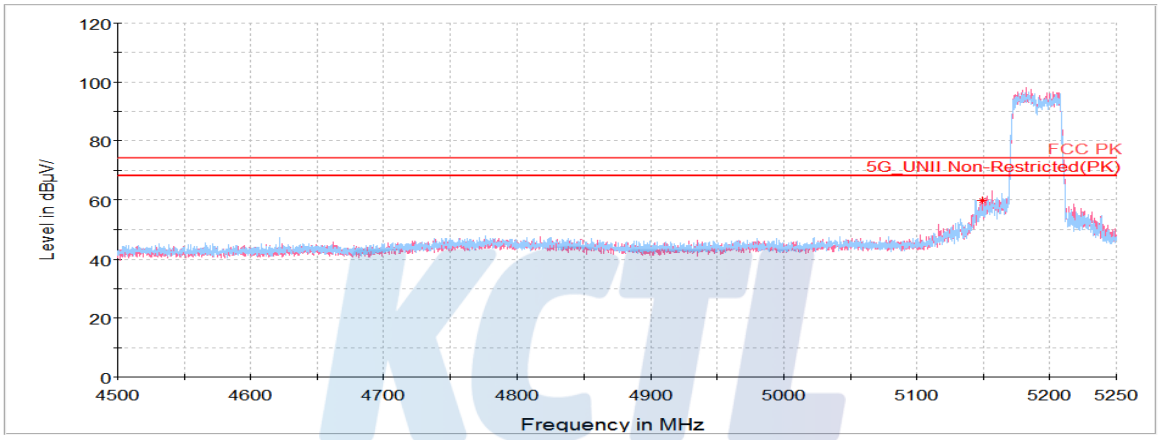


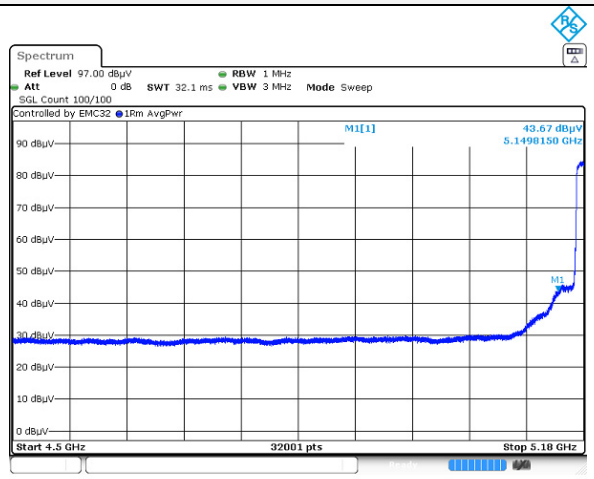
802.11n HT40_UNII 1 / Band-edge

Lowest Channel (5 190 ㎒)

Frequency	Pol.	Reading	Amp. + Cable	Antenna Factor	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 149.82[1)]	V	52.65	34.24	-27.12	-	59.77	74.00	14.23
Average Data								
5 149.82[1)]	V	43.67	34.24	-27.12	0.61	51.40	54.00	2.60

Horizontal/Vertical for Band-edge



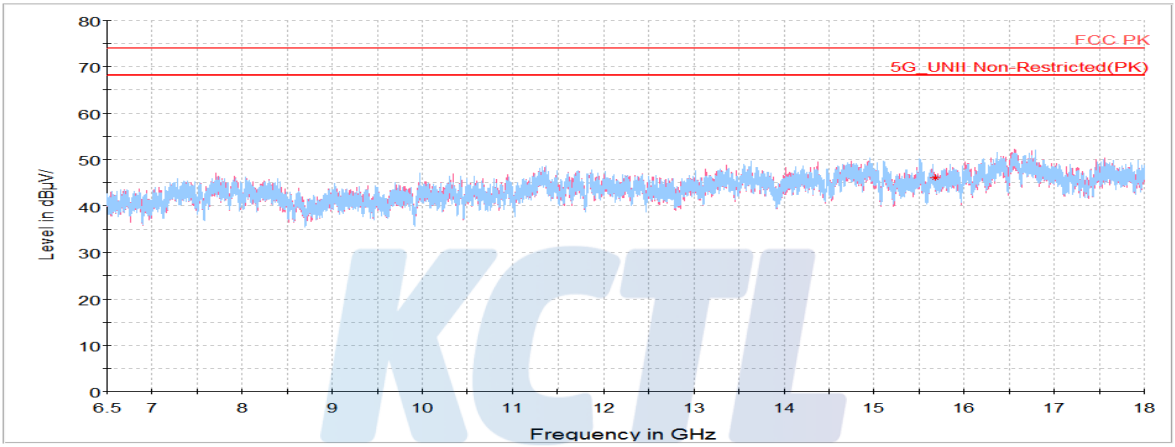
Average data	Average data
	Blank

802.11n HT40_UNII 1 / RSE

Highest Channel (5 230 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
15 684.55[1)]	H	55.08	40.04	-49.07	-	46.05	74.00	27.95
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

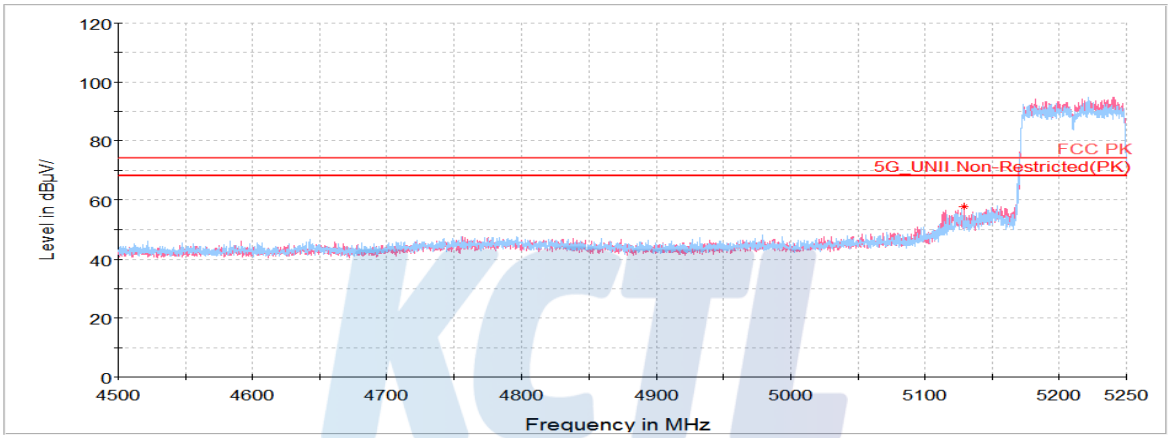


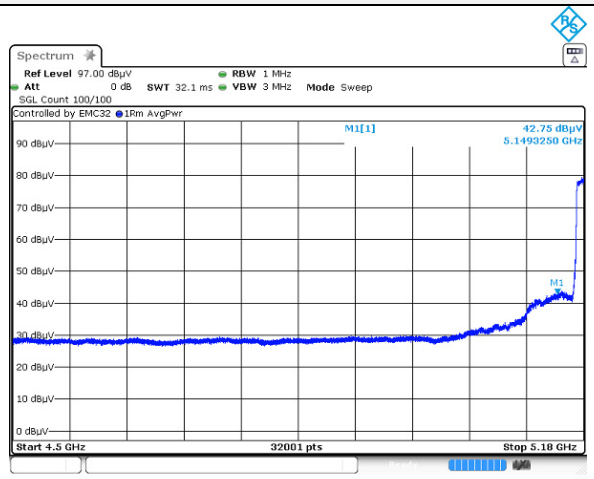
802.11ac VHT80_UNII 1 / Band-edge

Lowest Channel (5 210 ㎒)

Frequency	Pol.	Reading	Amp. + Cable	Antenna Factor	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 149.33[1)]	V	50.47	34.24	-27.11	-	57.60	74.00	16.40
Average Data								
5 149.33[1)]	V	42.75	34.24	-27.11	1.14	51.02	54.00	2.98

Horizontal/Vertical for Band-edge



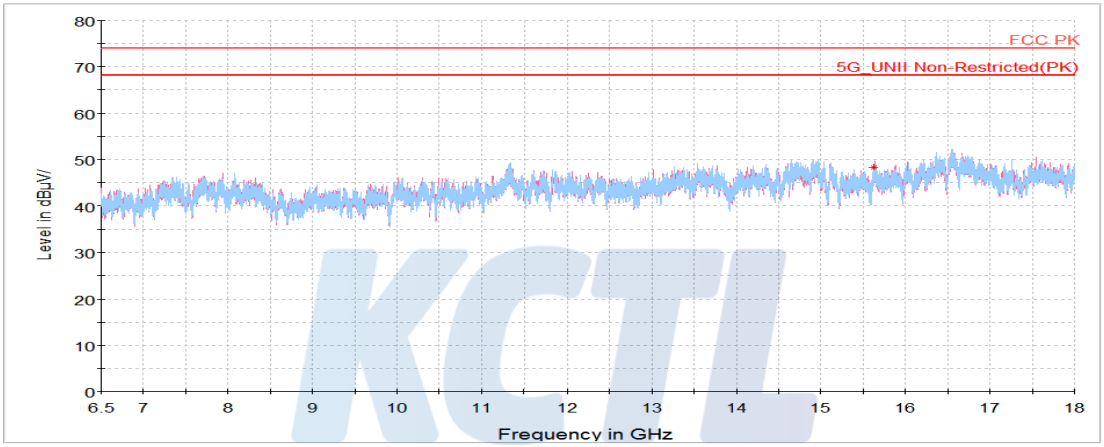
Average data	Average data
	Blank

802.11ac VHT80_UNII 1 / RSE

Lowest Channel (5 210 ㎒)

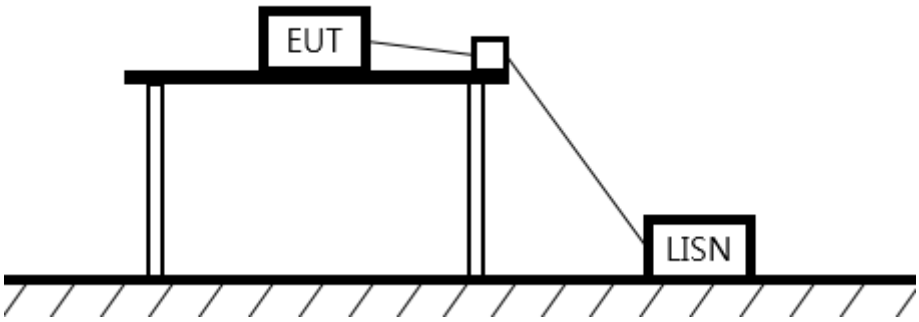
Frequency	Pol.	Reading	Ant. Factor	Amp. + Cable	DCCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
15 631.36[1)]	H	57.43	40.03	-49.21	-	48.25	74.00	25.75
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



7.3. AC Conducted emission

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.

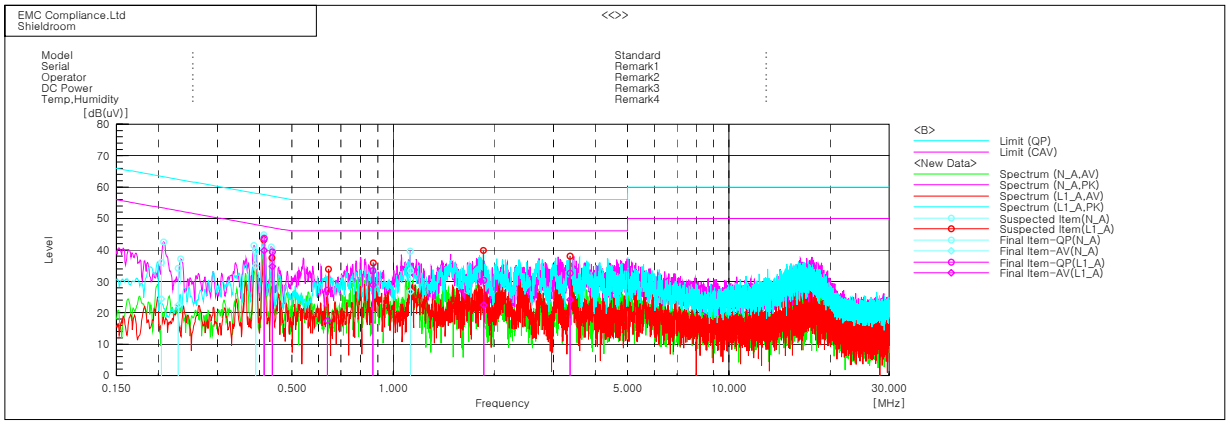
Frequency of Emission (㎒)	Conducted limit (dBμV/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

Measurement procedure

1. The EUT was placed on a wooden table of size, 1 m by 1.5 m, raised 80 ㎝ in which is located 40 ㎝ away from the vertical wall and 1.5m away from the side wall of the shielded room.
2. Each current-carrying conductor of the EUT power cord was individually connected through a 50Ω/50μH LISN, which is an input transducer to a spectrum analyzer or an EMI/Field Intensity Meter, to the input power source.
3. Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement.
4. The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 ㎒ to 30 ㎒.
5. The measurements were made with the detector set to peak amplitude within a bandwidth of 10 ㎑ or to quasi-peak and average within a bandwidth of 9 ㎑. The EUT was in transmitting mode during the measurements.

Test results

802.11a_UNII 1 / Lowest Channel (5 180 ㎒)



Final Result

--- L2 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.20433	25.9	14.4	10.1	36.0	24.5	63.4	53.4	27.4	28.9
2	0.22921	24.1	12.4	10.0	34.1	22.4	62.5	52.5	28.4	30.1
3	0.38932	29.6	24.9	10.1	39.7	35.0	58.1	48.1	18.4	13.1
4	0.41249	33.9	30.3	10.1	44.0	40.4	57.6	47.6	13.6	7.2
5	0.4372	29.4	24.7	10.2	39.6	34.9	57.1	47.1	17.5	12.2
6	1.12659	23.3	16.6	10.1	33.4	26.7	56.0	46.0	22.6	19.3

--- L3 Phase ---

No.	Frequency [MHz]	Reading QP [dB(uV)]	Reading CAV [dB(uV)]	c.f [dB]	Result QP [dB(uV)]	Result CAV [dB(uV)]	Limit QP [dB(uV)]	Limit AV [dB(uV)]	Margin QP [dB]	Margin CAV [dB]
1	0.41317	33.8	29.9	9.9	43.7	39.8	57.6	47.6	13.9	7.8
2	0.43716	29.5	24.8	9.9	39.4	34.7	57.1	47.1	17.7	12.4
3	0.63826	17.3	7.5	9.9	27.2	17.4	56.0	46.0	28.8	28.6
4	0.87157	23.5	18.9	9.9	33.4	28.8	56.0	46.0	22.6	17.2
5	1.86167	20.4	12.5	9.9	30.3	22.4	56.0	46.0	25.7	23.6
6	3.36498	22.7	14.2	9.9	32.6	24.1	56.0	46.0	23.4	21.9

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV40	100988	21.01.03
Horn antenna	ETS.lindgren	3117	155787	20.10.24
Horn antenna	ETS.lindgren	3116	00086632	21.02.17
Attenuator	API Inmet	40AH2W-10	12	20.05.15
Broadband PreAmplifier	SCHWARZBECK	BBV9718	216	20.07.30
AMPLIFIER	L-3 Narda-MITEQ	AMF-7D-01001800 -22-10P	2031196	21.02.12
AMPLIFIER	L-3 Narda-MITEQ	JS44-18004000-33-8P	2000996	21.01.22
Antenna Mast	Innco Systems	MA4640-XP-ET	-	-
Turn Table	Innco Systems	DT2000	79	-
Highpass Filter	WT	WT-A1699-HS	WT160411002	20.05.14
TWO-LINE V - NETWORK	R&S	ENV216	101358	20.10.02
EMI TEST RECEIVER	R&S	ESCI	100001	20.08.22
Vector Signal Generator	R&S	SMBV100A	257566	20.07.16
Signal Generator	R&S	SMR40	100007	20.05.13
Cable Assembly	RadiAll	2301761768000PJ	1724.659	-
Cable Assembly	gigalane	RG-400	-	-
Cable Assembly	HUER+SUHNER	SUCOFLEX 104	MY4342/4	-

End of test report