Conducted Output Power

Test mode	Band	Frequency (MHz)	Measured output power			Limit (dBm)
			Reading (dBm)	DCF (dB)	Result (dBm)	
802.11a	UNII-2C	5 720	14.74	0.34	15.08	23.48
	UNII-3		8.48		8.82	30.00
802.11n HT20	UNII-2C	5 720	14.41	0.42	14.83	23.98
	UNII-3		8.91		9.33	30.00

Notes:

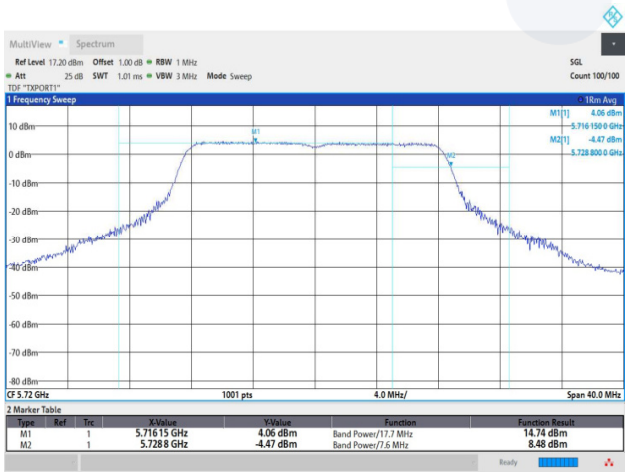
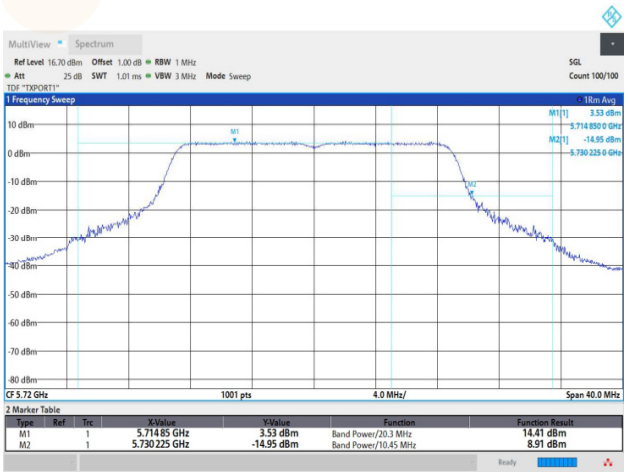
1. Average result(dBm) = Average Reading (dBm) + DCF(dB)

E.I.R.P

Test mode	Band	Frequency (MHz)	Measured output power			MAX. e.i.r.p Limit (dBm)
			Conducted output power (dBm)	ANT gain (dBi)	MAX. e.i.r.p (dBm)	
802.11a	UNII-2C	5 720	15.08	-3.60	11.48	28.50
	UNII-3		8.82	-3.60	5.22	30.00
802.11n HT20	UNII-2C	5 720	14.83	-3.60	11.23	28.80
	UNII-3		9.33	-3.60	5.73	30.00

Notes:

1. e.i.r.p. Calculation:
   e.i.r.p. (dBm) = Conducted output power (dBm) + Antenna gain (dBi)

802.11a	802.11n HT20
	

Power Spectral Density

Test mode	Band	Frequency (MHz)	Measured PSD (dBm/MHz)	DCF (dB)	Maximum PSD (dB m/MHz)	Limit (dBm/MHz)
802.11a	UNII-2C	5 720	5.57	0.34	5.91	11.00
802.11n HT20			5.48	0.42	5.90	

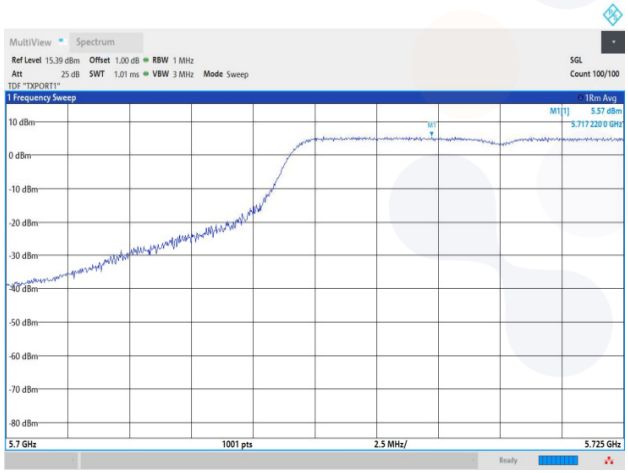
Test mode	Band	Frequency (MHz)	Measured PSD (dBm/ 500 kHz)	DCF (dB)	Maximum PSD (dBm/ 500 kHz)	Limit (dBm /500 kHz)
802.11a	UNII-3	5 720	2.40	0.34	2.74	30.00
802.11n HT20			2.35	0.42	2.77	

Notes:

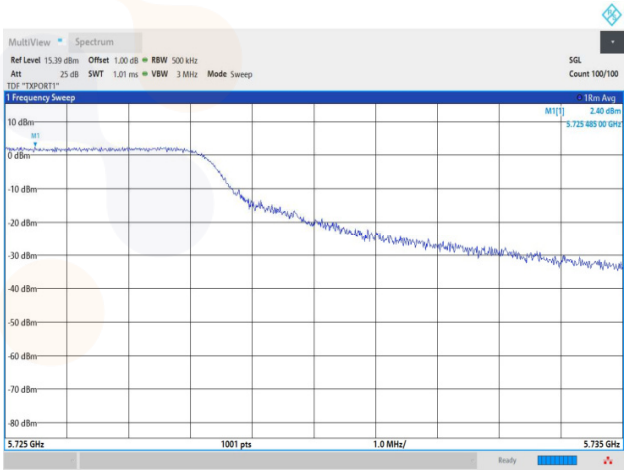
1. Maximum PSD calculation

- Maximum PSD = Measured PSD + D.C.F

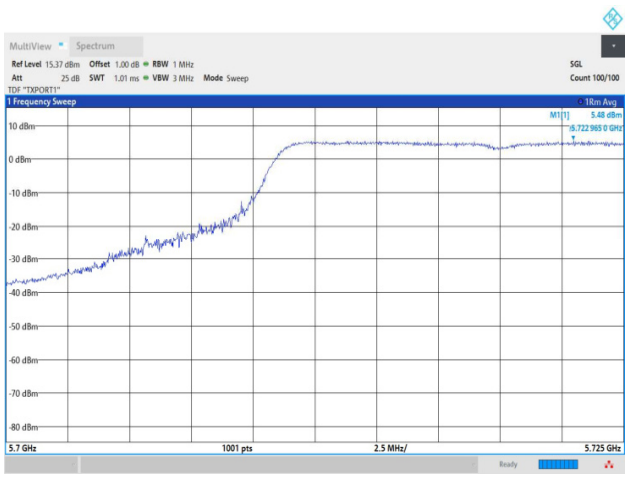
UNII-2C / 802.11a



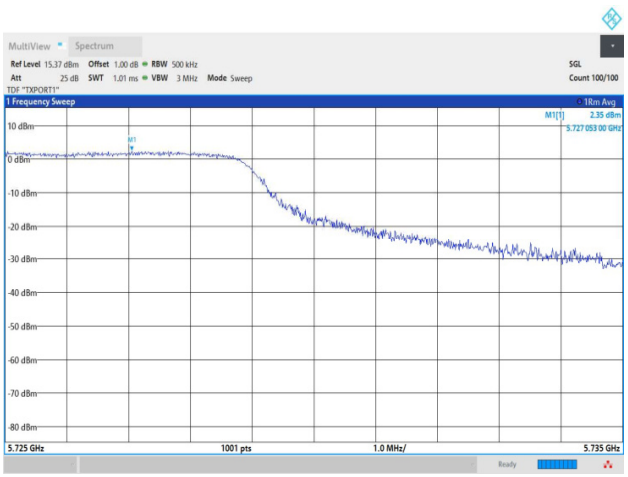
UNII-3 / 802.11a



UNII-2C / 802.11n HT20



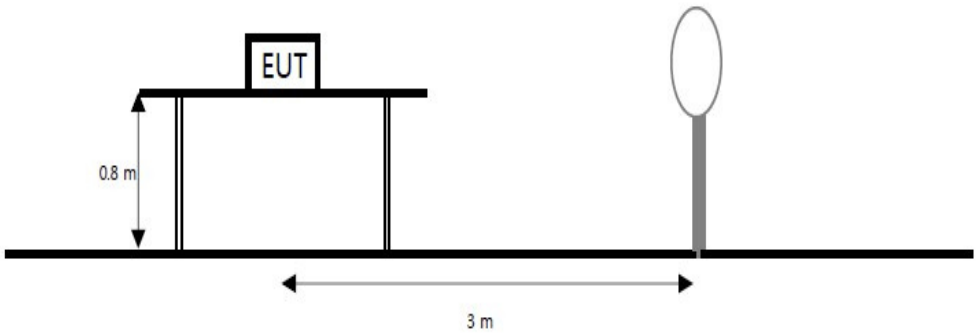
UNII-3 / 802.11n HT20



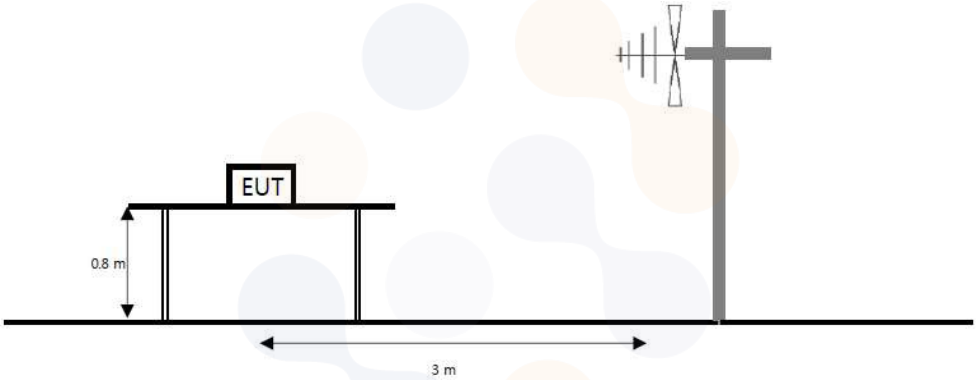
7.6. Spurious Emission, Band Edge and Restricted bands

Test setup

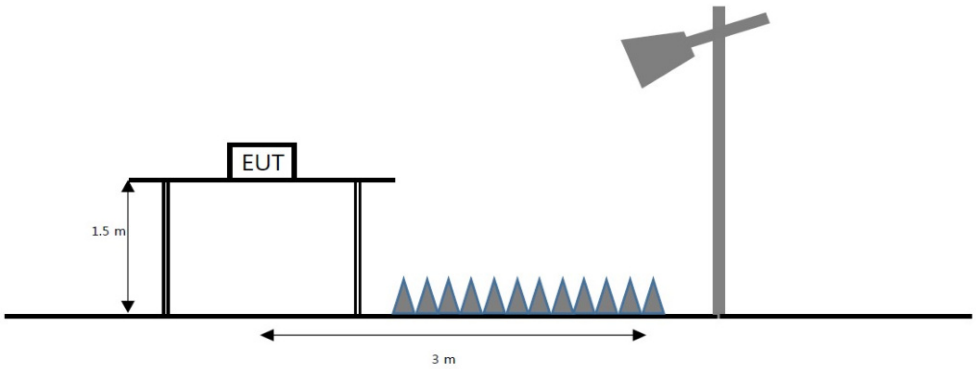
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions



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

FCC

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		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 ㎒, 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.

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 ㎓ 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 5.25-5.35 ㎓ 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.

IC

According to RSS-247(5.5), In any 100 ㎑ bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 ㏈ below that in the 100 ㎑ bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 5.4(d), the attenuation required shall be 30 ㏈ instead of 20 ㏈. Attenuation below the general field strength limits specified in RSS-Gen is not required.

According to RSS-Gen(8.9), Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5- General field strength limits at frequencies above 30 ㎒

Frequency(㎒)	Field strength (㎶/m at 3 m)
30 to 88	100
88 to 216	150
216 to 960	200
Above 960	500

Table 6- General field strength limits at frequencies below 30 ㎒

Frequency	Magnetic field strength (H-Field) (㎂/m)	Measurement distance(m)
9 – 490 ㎑ 1)	6.37/F (F in ㎑)	300
490 – 1705 ㎑	63.7/F (F in ㎑)	30
1.705 - 30 ㎒	0.08	30

According to RSS-Gen(8.10), Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

(a) The transmit frequency, including fundamental components of modulation, of licence-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).
(b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.
(c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7- Restricted frequency bands*

MHz	MHz	GHz
0.090 - 0.110	149.9 - 150.05	9.0 - 9.2
0.495 - 0.505	156.52475 - 156.52525	9.3 - 9.5
2.1735 - 2.1905	156.7 - 156.9	10.6 - 12.7
3.020 - 3.026	162.0125 - 167.17	13.25 - 13.4
4.125 - 4.128	167.72 - 173.2	14.47 - 14.5
4.17725 - 4.17775	240 - 285	15.35 - 16.2
4.20725 - 4.20775	322 - 335.4	17.7 - 21.4
5.677 - 5.683	399.9 - 410	22.01 - 23.12
6.215 - 6.218	608 - 614	23.6 - 24.0
6.26775 - 6.26825	960 - 1427	31.2 - 31.8
6.31175 - 6.31225	1435 - 1626.5	36.43 - 36.5
8.291 - 8.294	1645.5 - 1646.5	Above 38.6
8.362 - 8.366	1660 - 1710	
8.37625 - 8.38675	1718.8 - 1722.2	
8.41425 - 8.41475	2200 - 2300	
12.29 - 12.293	2310 - 2390	
12.51975 - 12.52025	2483.5 - 2500	
12.57675 - 12.57725	2655 - 2900	
13.36 - 13.41	3260 - 3267	
16.42 - 16.423	3332 - 3339	
16.69475 - 16.69525	3345.8 - 3358	
16.80425 - 16.80475	3500 - 4400	
25.5 - 25.67	4500 - 5150	
37.5 - 38.25	5350 - 5460	
73 - 74.6	7250 - 7750	
74.8 - 75.2	8025 - 8500	
108 - 138	--	

* Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

Test procedure

ANSI C63.10-2013 Section 12.7.7.2, 12.7.5, 12.7.6
KDB 789033 D02 v02r01 – Section G

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.

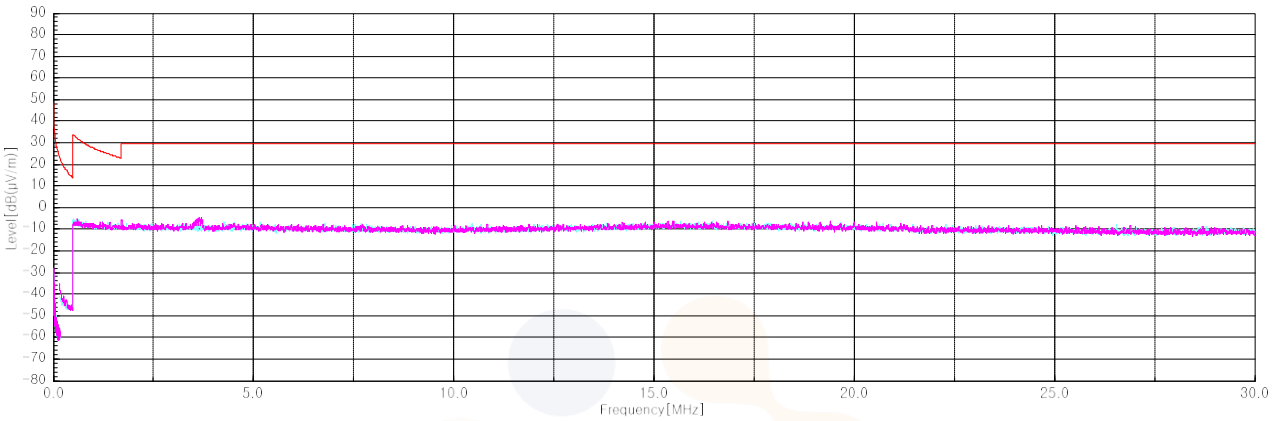
Notes:

1. f <30 MHz, extrapolation factor of 40 dB/decade of distance. $F_d = 40\log(D_m/D_s)$
   f ≥30 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. 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) means restricted band.
6. Below 30 MHz frequency range, In order to search for the worst result, all orientations about parallel, perpendicular, and ground-parallel were investigated then reported. when the emission level was higher than 20 dB of the limit, then the following statement shall be made: “No spurious emissions were detected within 20 dB of the limit.”
7. For above 1 GHz pre-scan to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 kHz for peak measurements.
8. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-GEN Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X kHz resulted in a level of Y dBμV/m, which is equivalent to Y - 51.5 = Z dBμA/m, which has the same margin, W dB, to the corresponding RSS-GEN Table 6 limit as it has to be 15.209(a) limit.

Test results (Below 30 ㎒) – Worst case: 802.11n HT20 / UNII-2A_5 280 ㎒

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

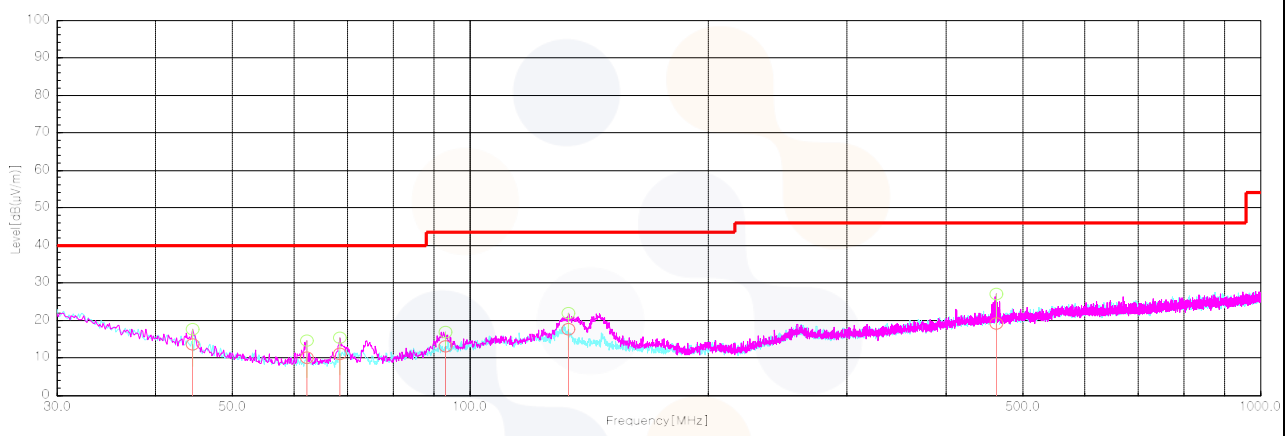
Horizontal/Vertical



Test results (Below 1 000 ㎒) – Worst case: 802.11n HT20 / UNII-2A_5 280 ㎒

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Quasi peak data								
44.55	H	28.10	16.43	-30.94	-	13.59	40.00	26.41
62.13	H	28.80	12.10	-30.81	-	10.09	40.00	29.91
68.56	H	29.80	12.10	-30.75	-	11.15	40.00	28.85
93.05	H	28.60	15.21	-30.68	-	13.13	43.50	30.37
133.31[1)]	H	30.30	17.80	-30.53	-	17.57	43.50	25.93
463.11	H	26.20	22.80	-30.05	-	18.95	46.00	27.05

Horizontal/Vertical



Test results (Above 1 000 ㎒)

802.11a UNII-1

Lowest Channel (5 180 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 147.78[1)]	V	47.70	33.20	-30.48	-	50.42	74.00	23.58
10 268.17	H	53.30	38.90	-42.80	-	49.40	68.20	18.80
15 812.70[1)]	H	51.80	37.70	-40.03	-	49.47	74.00	24.53
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Middle Channel (5 200 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 354.42	H	52.70	38.80	-42.62	-	48.88	68.20	19.32
15 772.07[1)]	V	51.30	37.70	-40.12	-	48.88	74.00	25.12
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

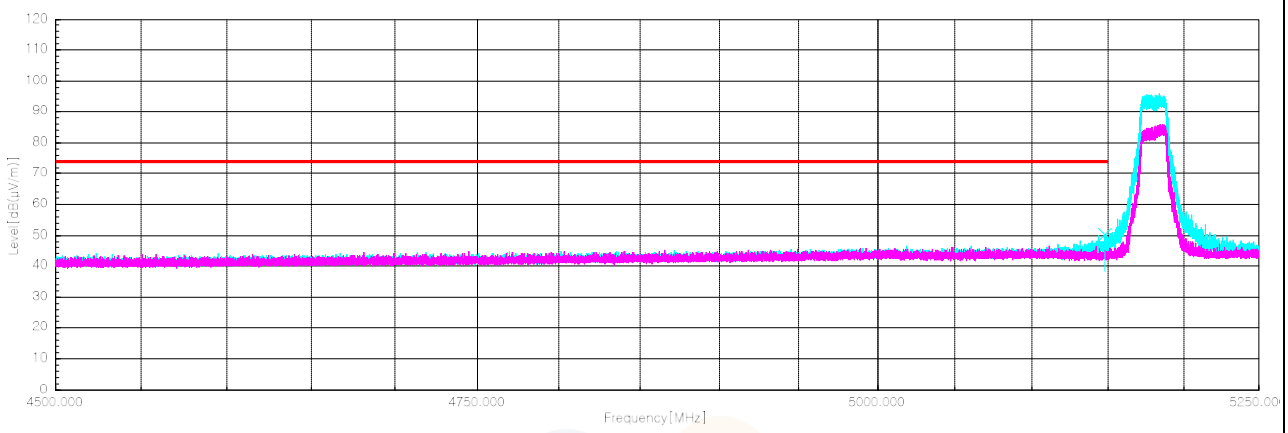
Highest Channel (5 240 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 520.02	H	53.00	38.80	-42.33	-	49.47	68.20	18.73
15 730.67[1)]	V	50.90	37.64	-40.21	-	48.33	74.00	25.67
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

802.11a_UNII-1

Lowest Channel (5 180 ㎒)

Horizontal/Vertical for Band-edge



802.11n HT20 UNII-1

Lowest Channel (5 180 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 148.65[1)]	V	46.30	33.20	-30.48	-	49.02	74.00	24.98
10 265.48	H	54.00	38.90	-42.81	-	50.09	68.20	18.11
15 461.95[1)]	V	52.00	38.15	-40.68	-	49.47	74.00	24.53
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Middle Channel (5 200 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 425.33	H	52.50	38.80	-42.47	-	48.83	68.20	19.37
15 786.63[1)]	H	51.80	37.70	-40.09	-	49.41	74.00	24.59
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

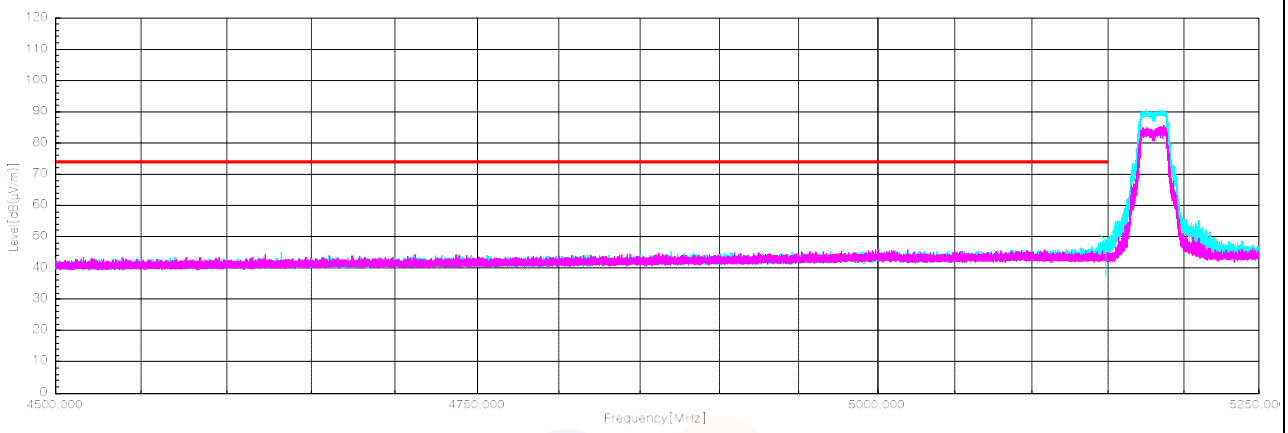
Highest Channel (5 240 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 572.53	H	52.80	38.80	-42.37	-	49.23	68.20	18.97
15 900.10[1)]	H	52.50	37.70	-39.84	-	50.36	74.00	23.64
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

802.11n HT20 UNII-1

Lowest Channel (5 180 ㎒)

Horizontal/Vertical for Band-edge

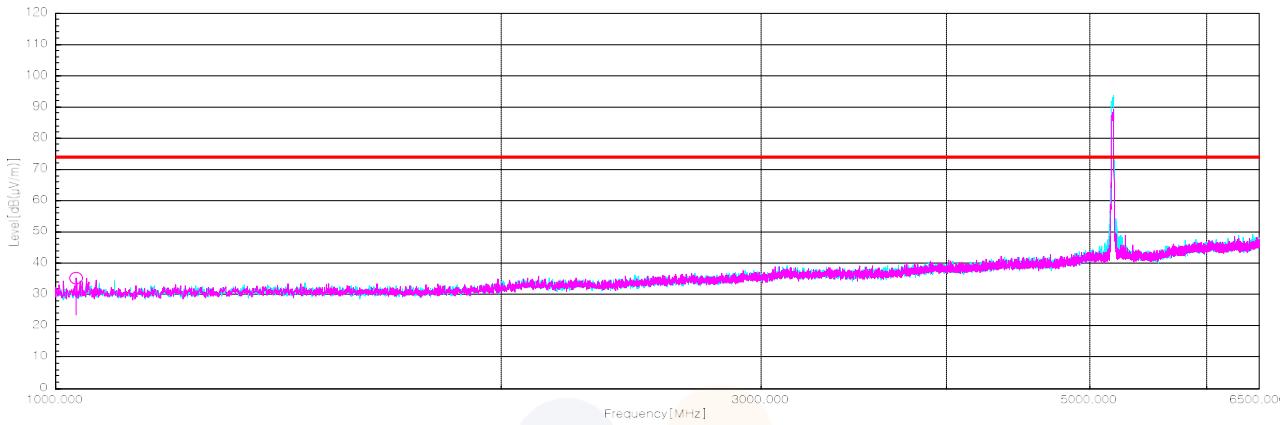


Plot of Harmonics and Spurious Emissions

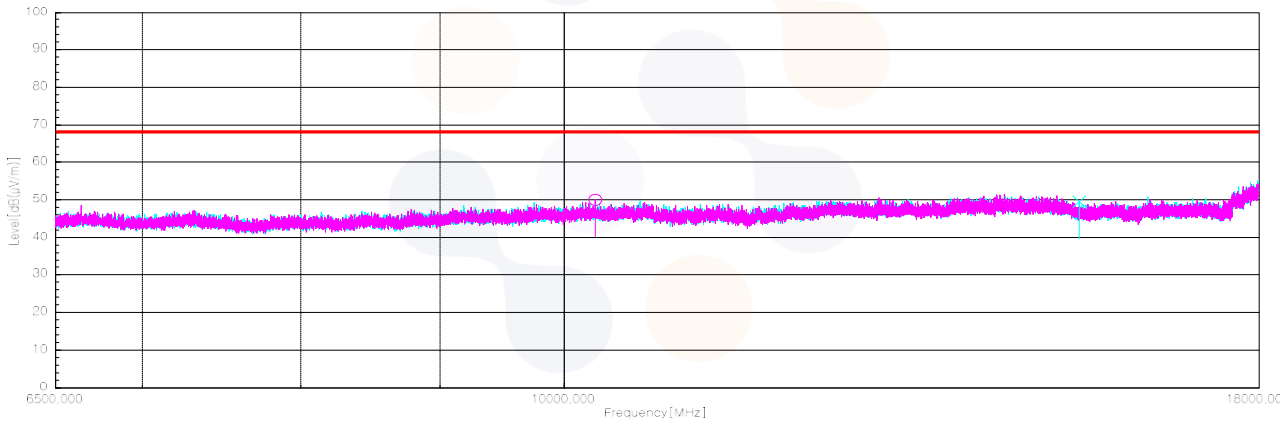
In order to simplify the report, attached plots were only the lowest margin condition

802.11n HT20 UNII-1_Highest Channel (5 180 ㎒)

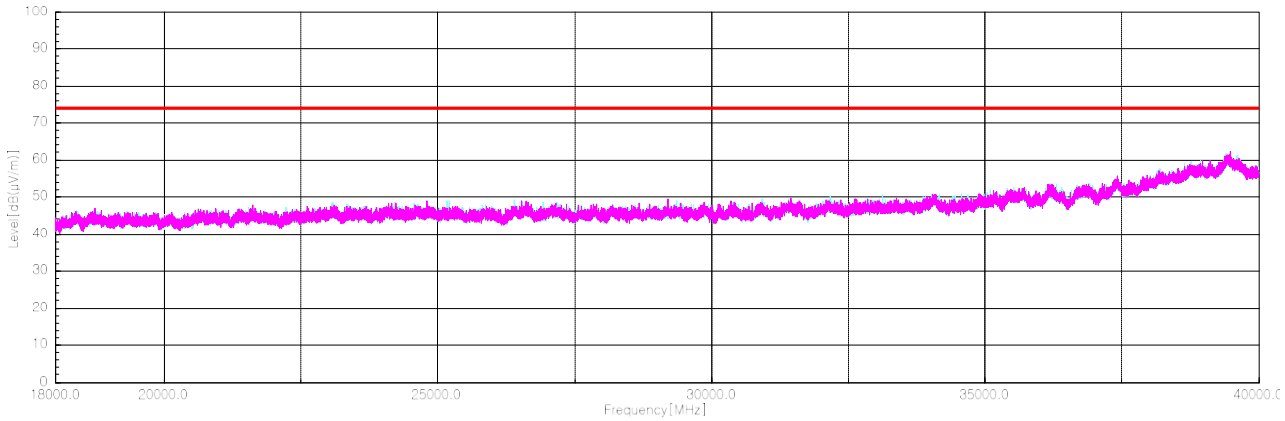
Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 40 ㎓



802.11a UNII-2A

Lowest Channel (5 260 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 589.02	V	52.90	38.80	-42.38	-	49.32	68.20	18.88
15 796.98[1)]	V	52.10	37.70	-40.06	-	49.74	74.00	24.26
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Middle Channel (5 280 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 544.55	V	53.50	38.80	-42.35	-	49.95	68.20	18.25
15 950.70[1)]	V	52.20	37.70	-39.74	-	50.16	74.00	23.84
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

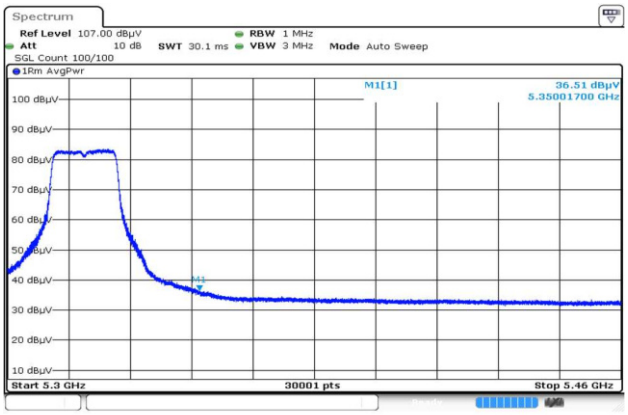
Highest Channel (5 320 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 350.02[1)]	V	48.40	33.00	-30.33	-	51.07	74.00	22.93
10 743.12[1)]	V	52.70	39.19	-42.50	-	49.39	74.00	24.61
15 934.98[1)]	H	51.80	37.77	-39.77	-	49.80	74.00	24.20
Average Data								
5 350.02[1)]	V	36.51	33.00	-30.33	0.34	39.52	54.00	14.48

802.11a UNII-2A

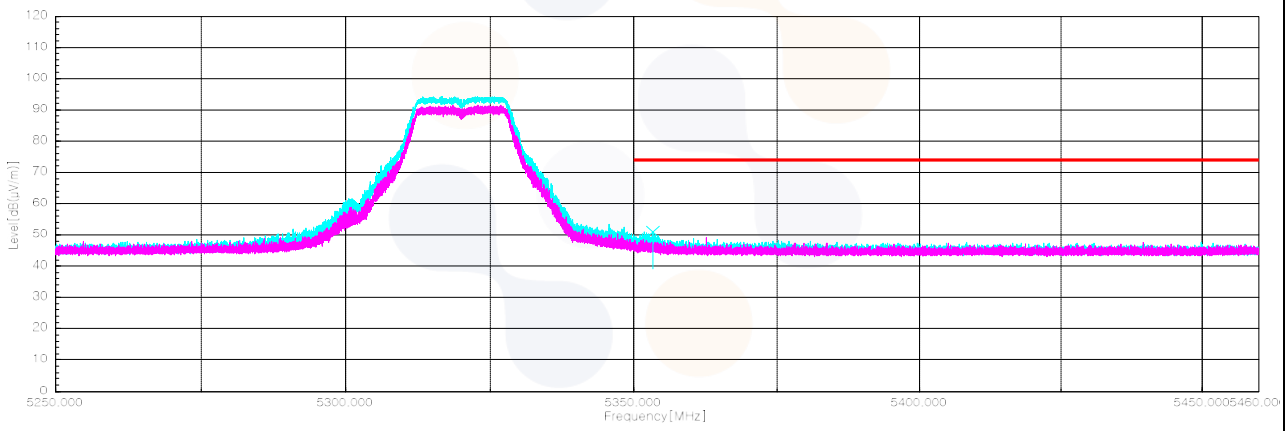
Highest Channel (5 320 ㎒)

Average data



Blank

Horizontal/Vertical for Band-edge



802.11n HT20_UNII-2A

Lowest Channel (5 260 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 594.38	H	52.50	38.80	-42.39	-	48.91	68.20	19.29
15 900.87[1)]	H	52.20	37.70	-39.84	-	50.06	74.00	23.94
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Middle Channel (5 280 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 531.52	V	52.80	38.80	-42.34	-	49.26	68.20	18.94
15 775.90[1)]	V	51.50	37.70	-40.11	-	49.09	74.00	24.91
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

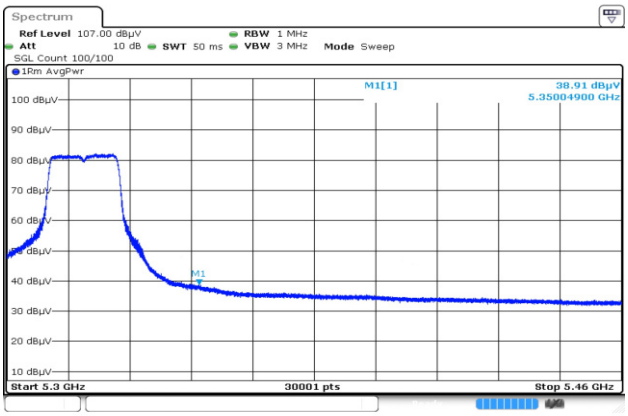
Highest Channel (5 320 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 350.05[1)]	V	51.50	33.00	-30.33	-	54.17	74.00	19.83
10 729.70[1)]	H	52.50	39.16	-42.49	-	49.17	74.00	24.83
15 615.67[1)]	V	53.20	37.74	-40.45	-	50.49	74.00	23.51
15 912.75[1)]	V	51.50	37.73	-39.82	-	49.41	74.00	24.59
Average Data								
5 350.05[1)]	V	38.91	33.00	-30.33	0.42	42.00	54.00	12.00

802.11n HT20_UNII-2A

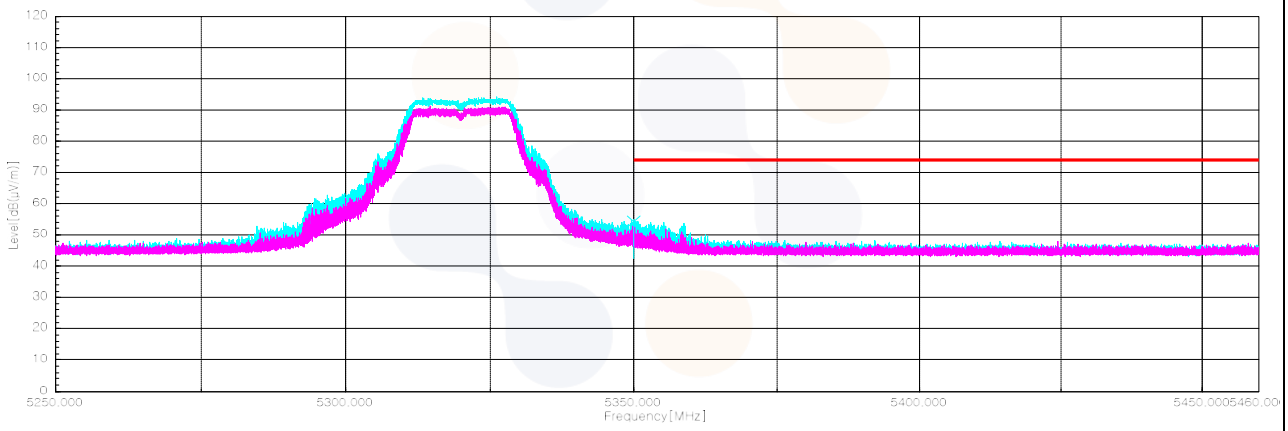
Highest Channel (5 320 ㎒)

Average data



Blank

Horizontal/Vertical for Band-edge

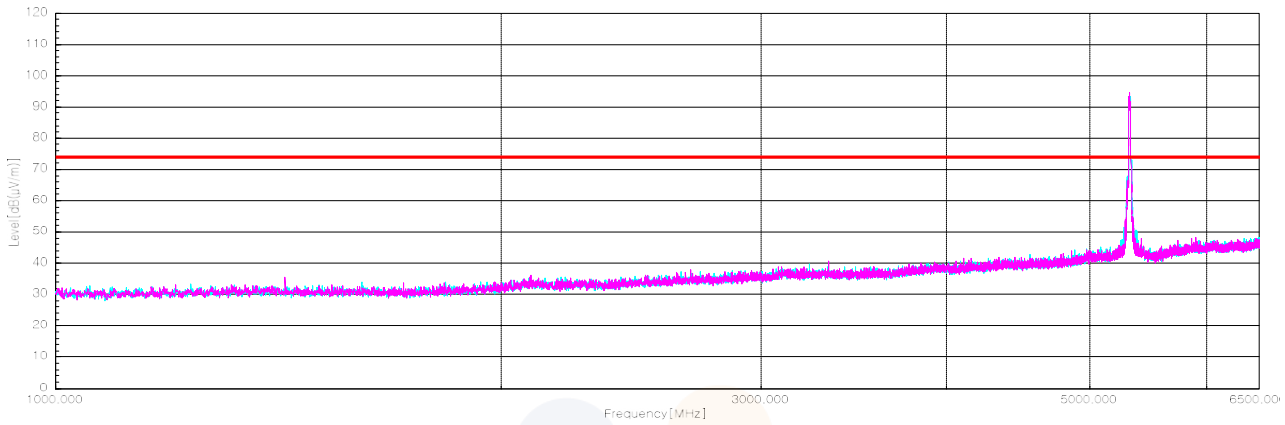


Plot of Harmonics and Spurious Emissions

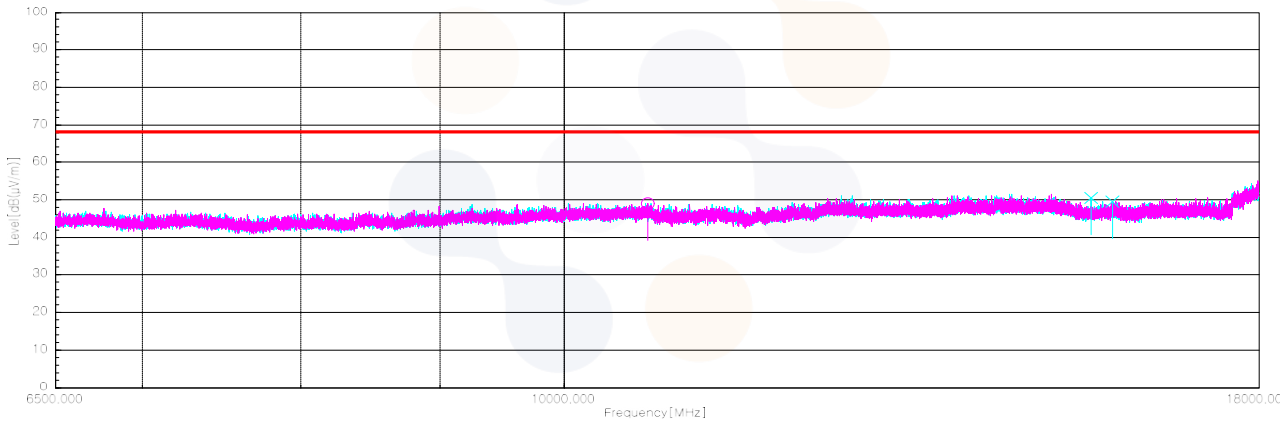
In order to simplify the report, attached plots were only the lowest margin condition

802.11n HT20_UNII-2A_Highest Channel (5 320 ㎒)

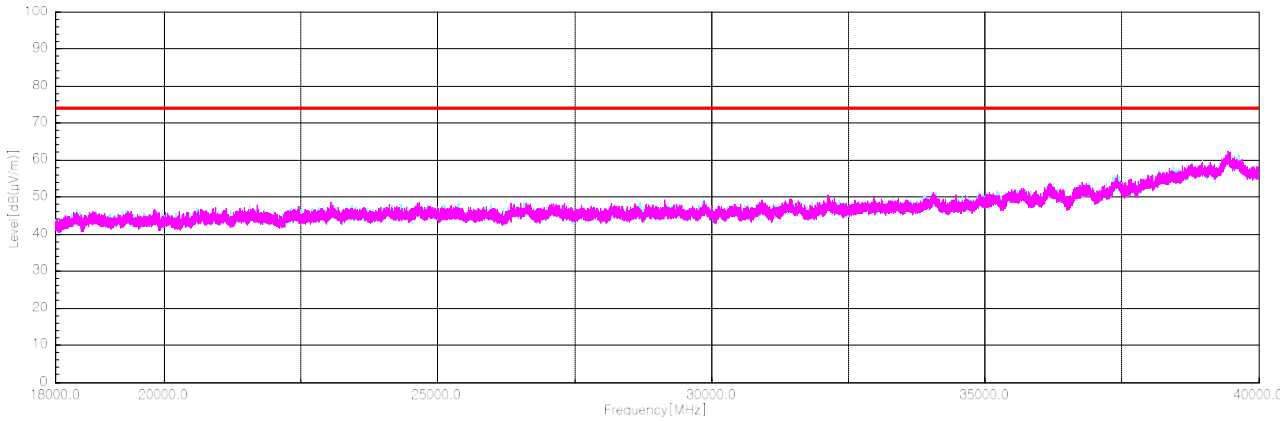
Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 40 ㎓



802.11a_UNII-2C

Lowest Channel (5 500 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 458.23[1)]	V	48.00	33.00	-30.12	-	50.88	74.00	23.12
11 056.30[1)]	V	52.20	38.69	-42.71	-	48.18	74.00	25.82
16 325.22	V	51.70	37.70	-39.38	-	50.02	68.20	18.18
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Middle Channel (5 600 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
10 947.05[1)]	H	52.90	38.81	-42.67	-	49.04	74.00	24.96
16 753.78	H	50.60	37.49	-38.25	-	49.84	68.20	18.36
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

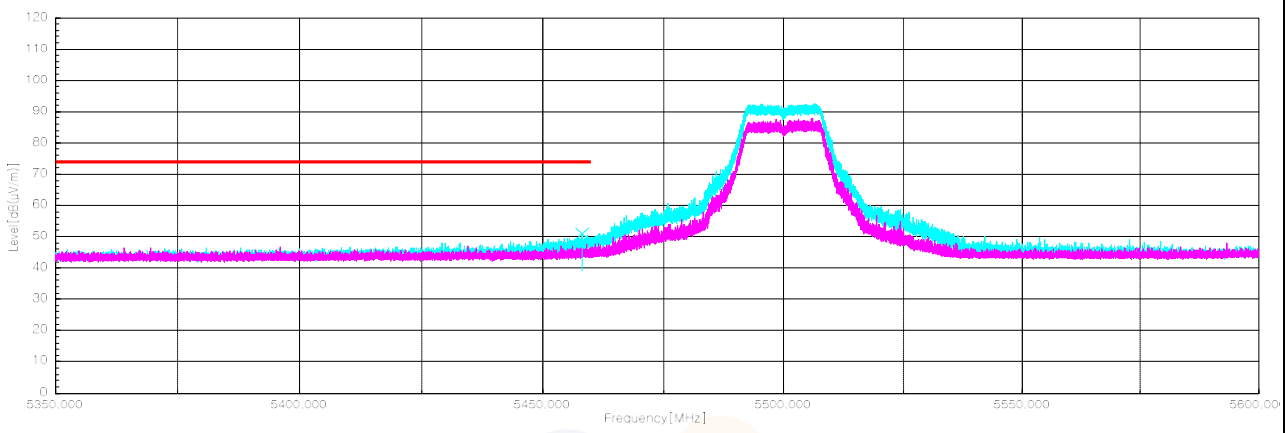
Highest Channel (5 700 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 725.96	V	48.30	33.60	-29.98	-	51.92	68.20	16.28
11 211.17[1)]	V	52.70	38.82	-42.71	-	48.81	74.00	25.19
16 551.00	V	51.30	37.70	-39.04	-	49.96	68.20	18.24
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

802.11a_UNII-2C

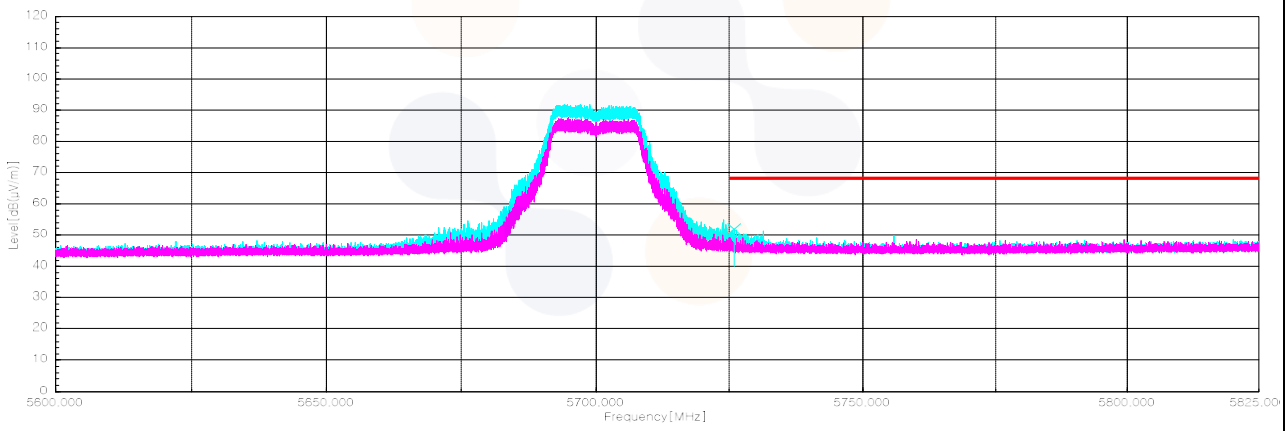
Lowest Channel (5 500 ㎒)

Horizontal/Vertical for Band-edge



Highest Channel (5 700 ㎒)

Horizontal/Vertical for Band-edge



802.11n HT20_UNII-2C

Lowest Channel (5 500 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 459.45[1)]	V	54.80	33.00	-30.11	-	57.69	74.00	16.31
10 998.42[1)]	V	52.80	38.70	-42.71	-	48.79	74.00	25.21
16 358.18	H	52.40	37.70	-39.35	-	50.75	68.20	17.45
Average Data								
5 459.45[1)]	V	38.71	33.00	-30.11	0.42	42.02	54.00	11.98

Middle Channel (5 600 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
11 504.42[1)]	H	53.40	38.79	-42.72	-	49.47	74.00	24.53
16 706.25	H	51.30	37.59	-38.43	-	50.46	68.20	17.74
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

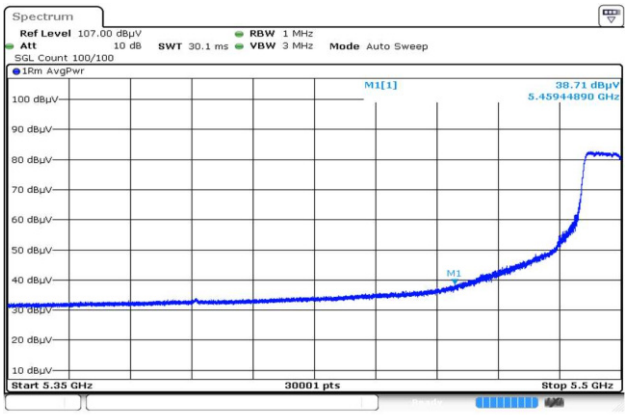
Highest Channel (5 700 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 729.30	V	47.70	33.62	-29.97	-	51.35	68.20	16.85
10 492.03	V	54.50	38.80	-42.33	-	50.97	68.20	17.23
11 528.18[1)]	H	53.50	38.74	-42.69	-	49.55	74.00	24.45
17 118.72	V	49.90	37.40	-37.21	-	50.09	68.20	18.11
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

802.11n HT20_UNII-2C

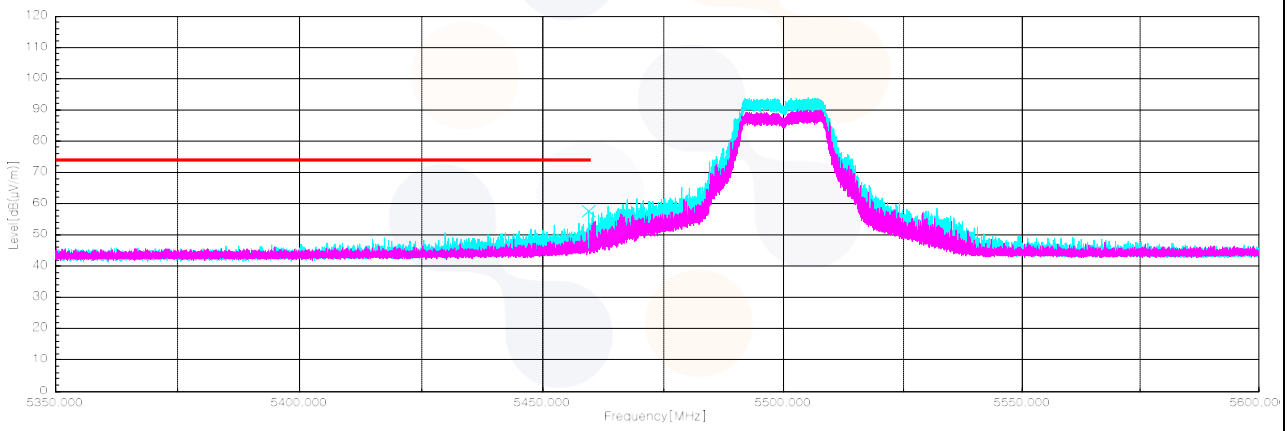
Lowest Channel (5 500 ㎒)

Average data



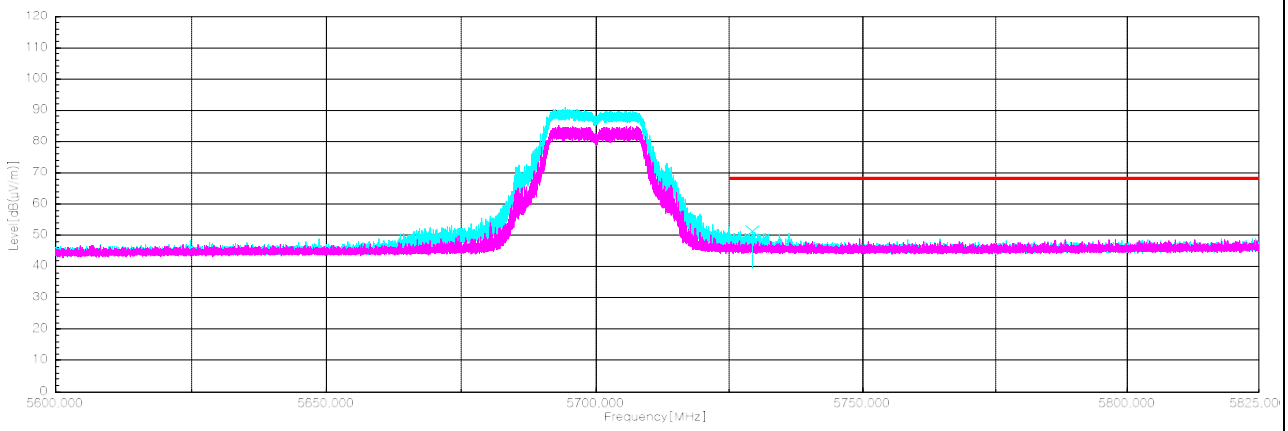
Blank

Horizontal/Vertical for Band-edge



Highest Channel (5 700 ㎒)

Horizontal/Vertical for Band-edge

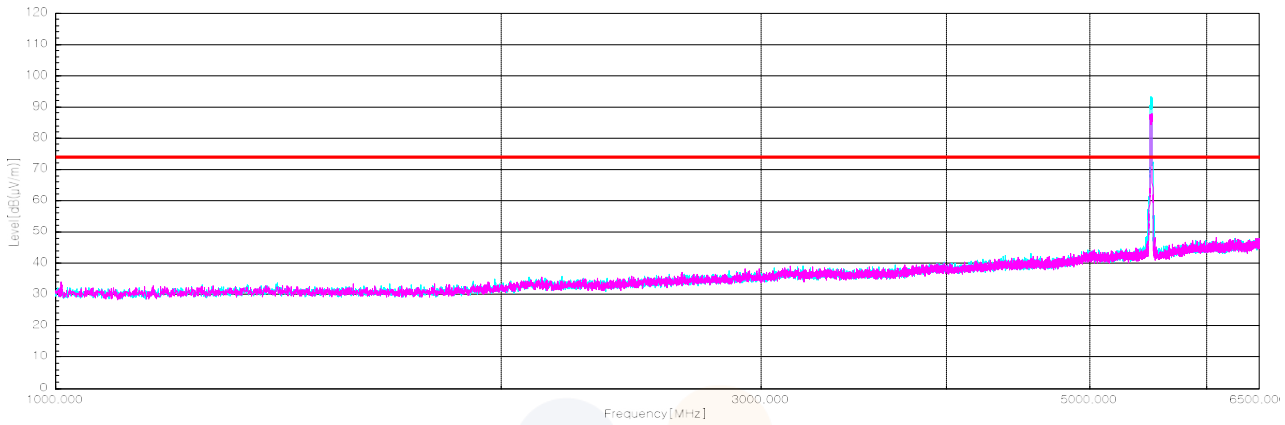


Plot of Harmonics and Spurious Emissions

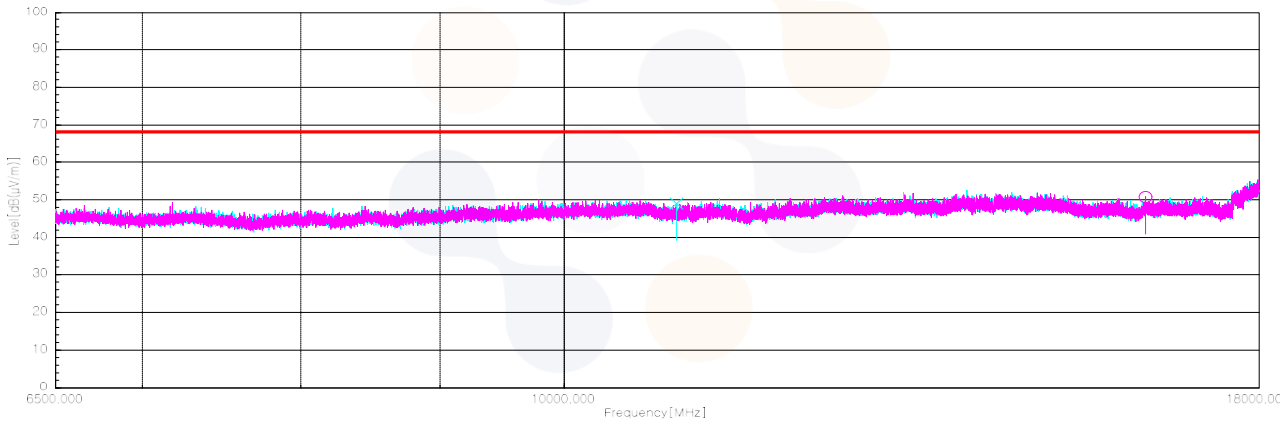
In order to simplify the report, attached plots were only the lowest margin condition

802.11n HT20_UNII-2C_ Lowest Channel (5 500 ㎒)

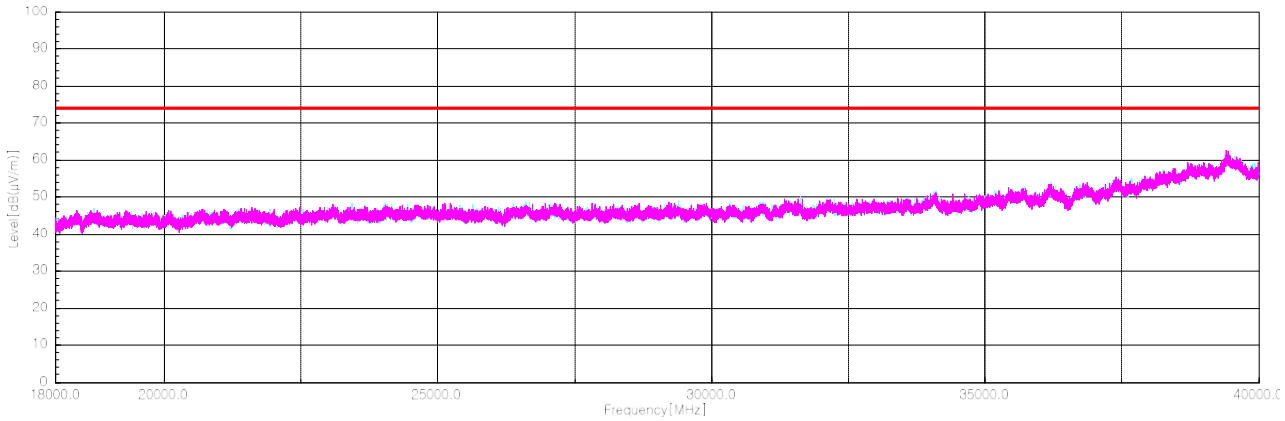
Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 40 ㎓



Straddle Channel

802.11a (5 720 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
11 438.48[1)]	V	53.70	39.00	-42.72	-	49.98	74.00	24.02
14 443.43	V	54.10	40.30	-41.33	-	53.07	68.20	15.13
17 036.30	V	51.10	37.30	-37.26	-	51.14	68.20	17.06
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

802.11n HT20 (5 720 ㎒)

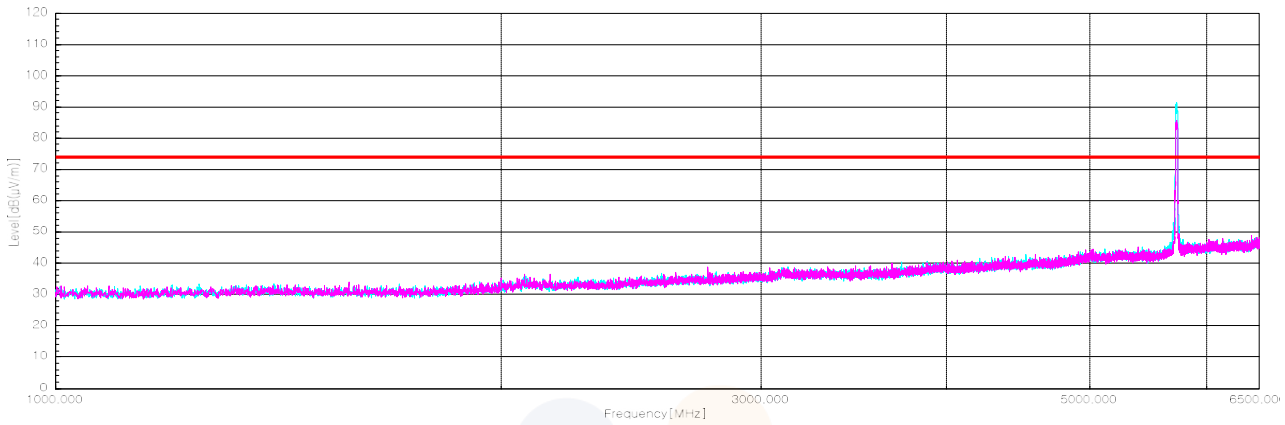
Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
11 463.02[1)]	V	53.00	38.87	-42.72	-	49.15	74.00	24.85
17 241.00	V	50.10	37.68	-37.15	-	50.63	68.20	17.57
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Plot of Harmonics and Spurious Emissions

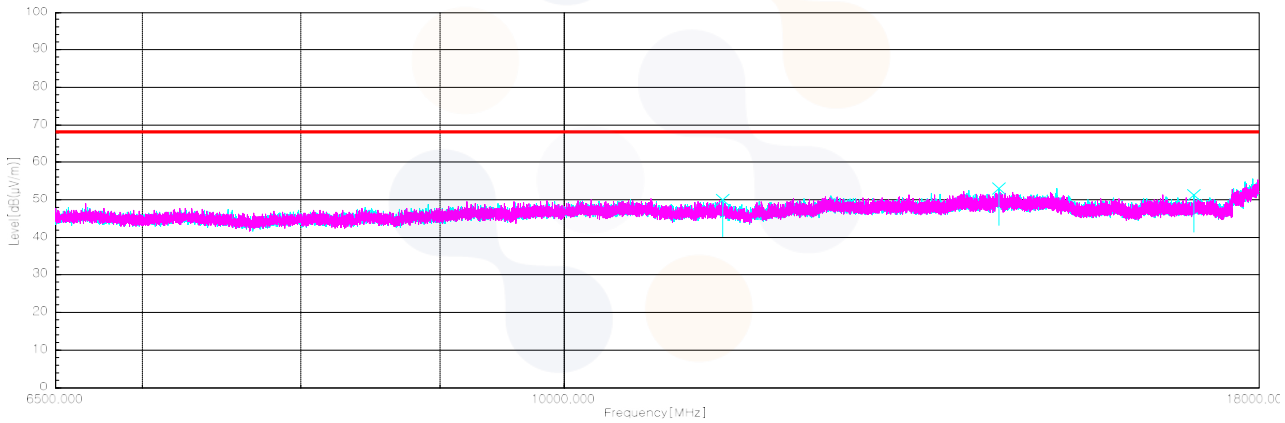
In order to simplify the report, attached plots were only the lowest margin condition

802.11a_Straddle Channel (5 720 ㎒)

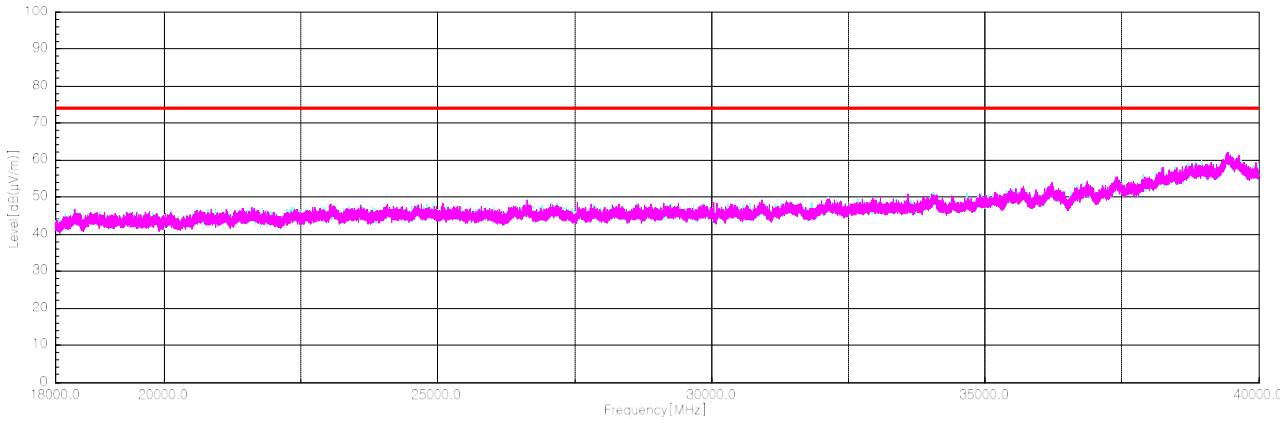
Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 40 ㎓



802.11a_UNII-3

Lowest Channel (5 745 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 720.67	V	47.40	33.58	-29.99	-	50.99	112.30	61.31
11 379.45[1)]	H	53.80	39.06	-42.72	-	50.14	74.00	23.86
14 108.78	H	54.10	40.40	-41.77	-	52.73	68.20	15.47
17 111.43	H	50.40	37.40	-37.22	-	50.58	68.20	17.62
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Middle Channel (5 785 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
11 394.40[1)]	H	53.70	39.09	-42.72	-	50.07	74.00	23.93
14 417.75	H	53.60	40.30	-41.37	-	52.53	68.20	15.67
17 045.88	V	50.90	37.30	-37.25	-	50.95	68.20	17.25
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

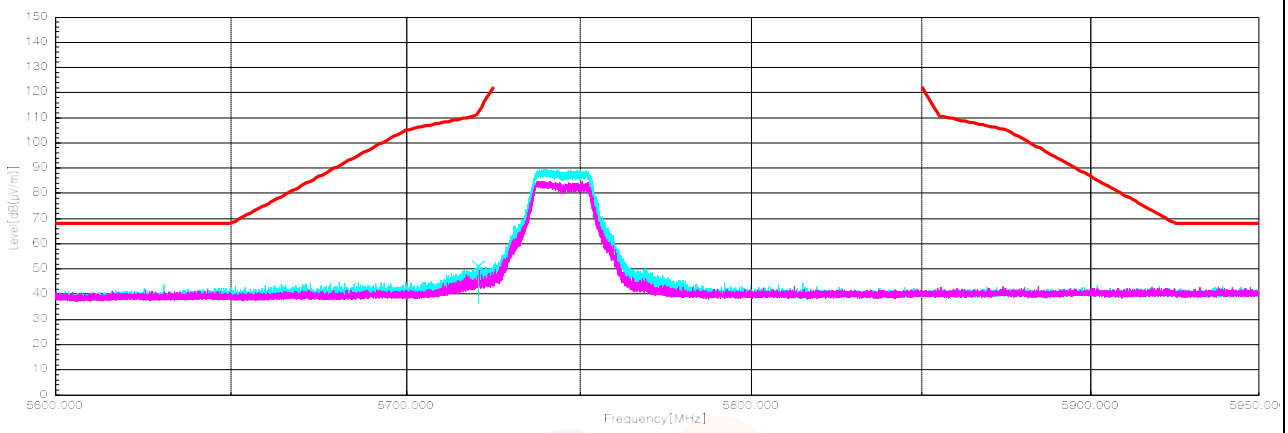
Highest Channel (5 825 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 853.47	V	40.40	34.21	-29.77	-	44.84	114.30	69.46
11 762.02[1)]	H	53.30	38.50	-42.45	-	49.35	74.00	24.65
17 327.63	V	49.20	37.96	-37.10	-	50.06	68.20	18.14
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

802.11a_UNII-3

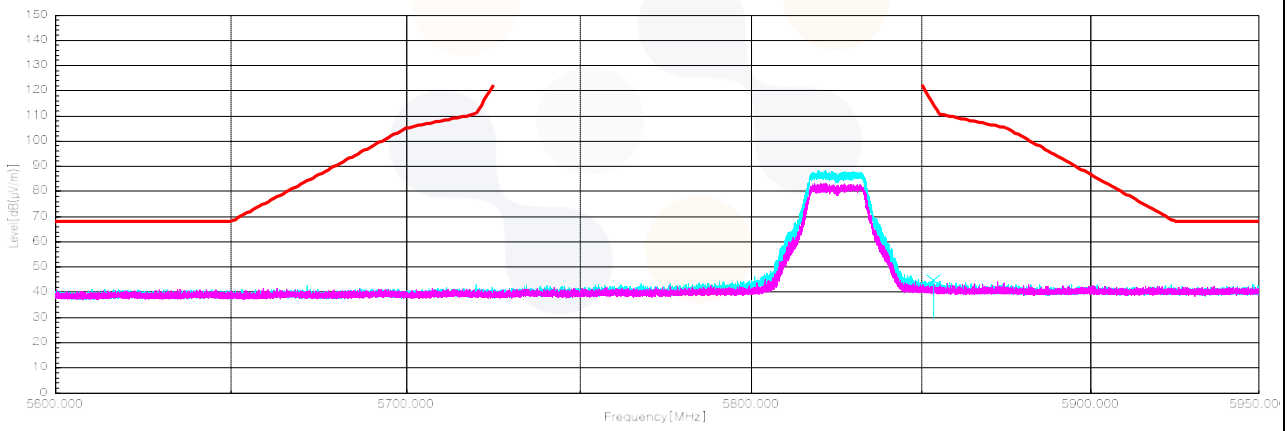
Lowest Channel (5 745 ㎒)

Horizontal/Vertical for Band-edge



Highest Channel (5 825 ㎒)

Horizontal/Vertical for Band-edge



802.11n HT20_UNII-3

Lowest Channel (5 745 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 724.13	V	55.90	33.60	-29.98	-	59.52	120.20	60.68
11 400.15[1)]	V	53.60	39.00	-42.72	-	49.88	74.00	24.12
14 029.05	V	53.40	40.36	-41.87	-	51.89	68.20	16.31
17 102.62	V	51.30	37.40	-37.22	-	51.48	68.20	16.72
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

Middle Channel (5 785 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
11 303.55[1)]	H	54.00	38.90	-42.72	-	50.18	74.00	23.82
17 219.15	V	49.50	37.64	-37.16	-	49.98	68.20	18.22
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

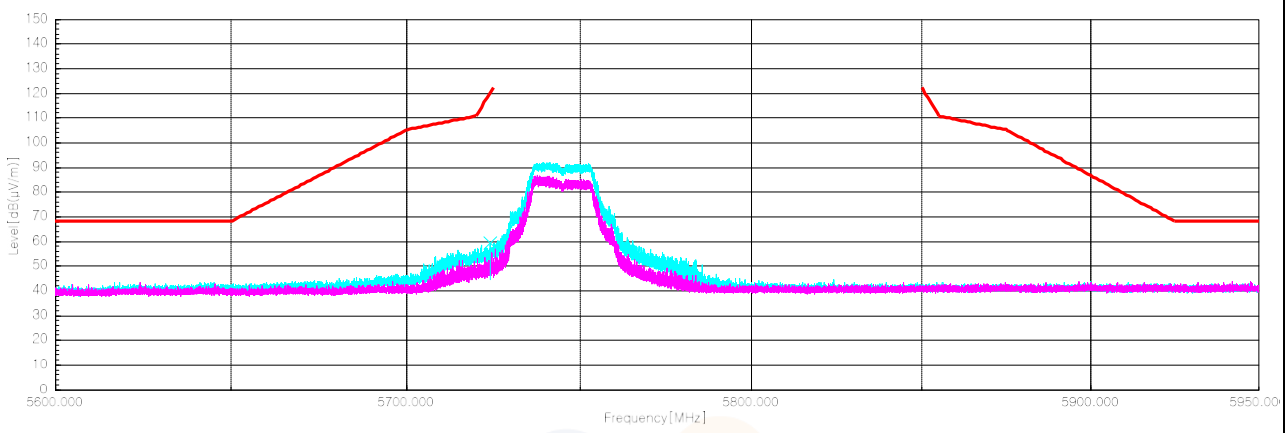
Highest Channel (5 825 ㎒)

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(㎒)	(V/H)	(dB(㎶))	(dB)	(dB)	(dB)	(dB(㎶/m))	(dB(㎶/m))	(dB)
Peak data								
5 851.27	V	41.30	34.21	-29.77	-	45.74	119.30	73.56
11 441.17[1)]	H	53.40	39.00	-42.72	-	49.68	74.00	24.32
15 147.23	V	54.10	39.31	-40.54	-	52.87	68.20	15.33
17 277.03	H	50.10	37.91	-37.12	-	50.89	68.20	17.31
Average Data								
No spurious emissions were detected within 20 ㏈ of the limit.								

802.11n HT20_UNII-3

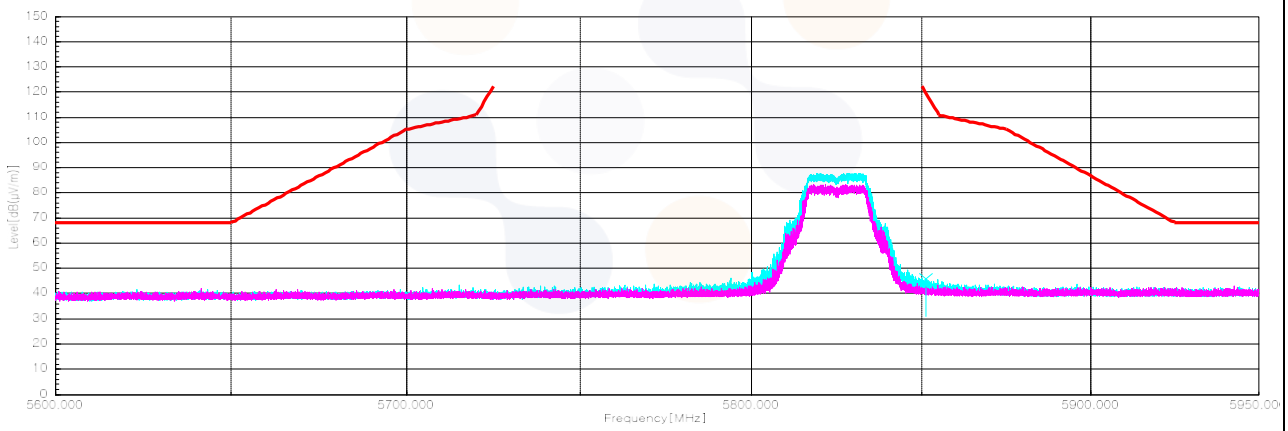
Lowest Channel (5 745 ㎒)

Horizontal/Vertical for Band-edge



Highest Channel (5 825 ㎒)

Horizontal/Vertical for Band-edge

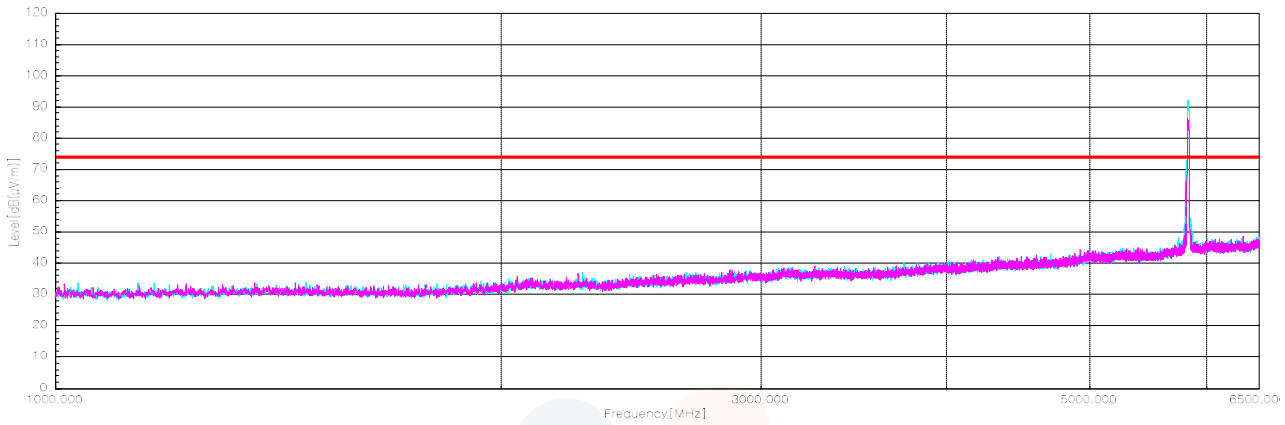


Plot of Harmonics and Spurious Emissions

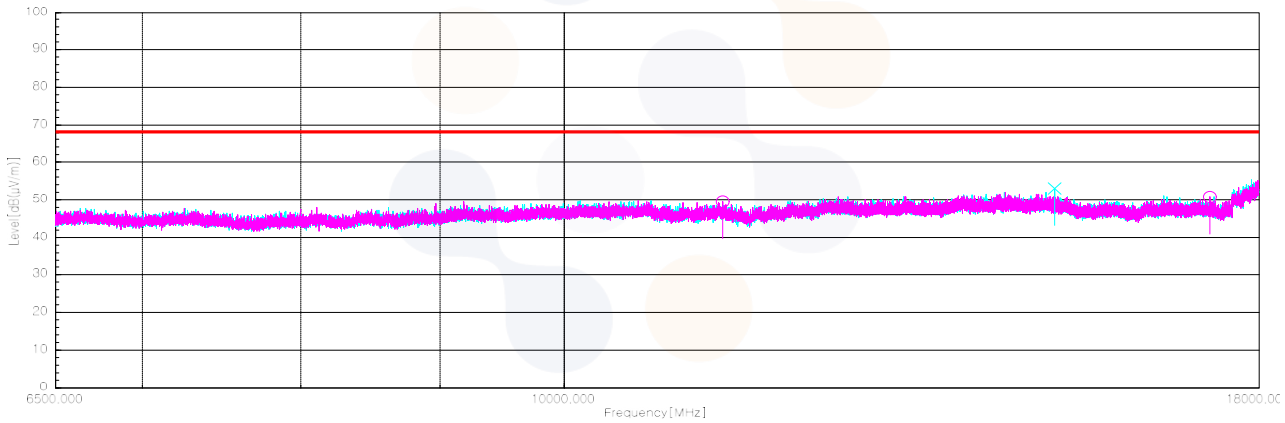
In order to simplify the report, attached plots were only the lowest margin condition

802.11n HT20_UNII-3: Highest Channel (5 825 ㎒)

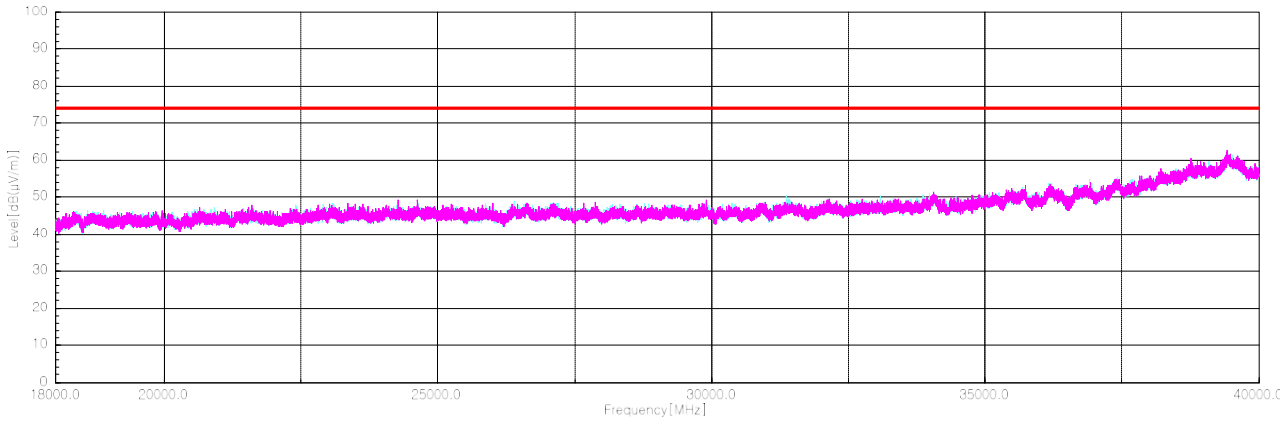
Horizontal/Vertical for 1 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓



Horizontal/Vertical for 18 ㎓ ~ 40 ㎓



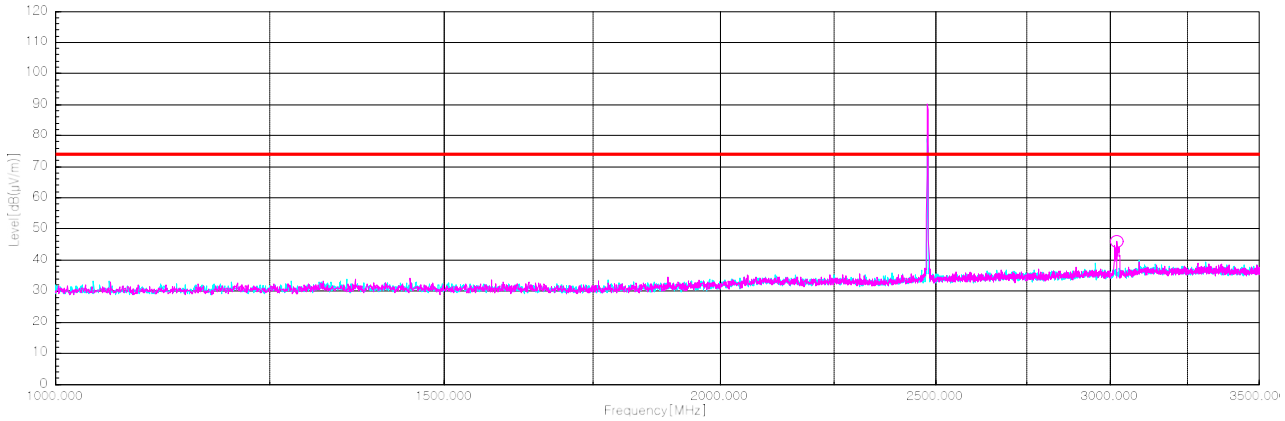
Spurious Emission for Simultaneous Tx Condition

Case	WLAN 5 GHz	Bluetooth
Mode	802.11n HT20	EDR
Channel	100	78
Frequency	5 500 MHz	2 480 MHz
Data Rate	MCS0	3-DH1

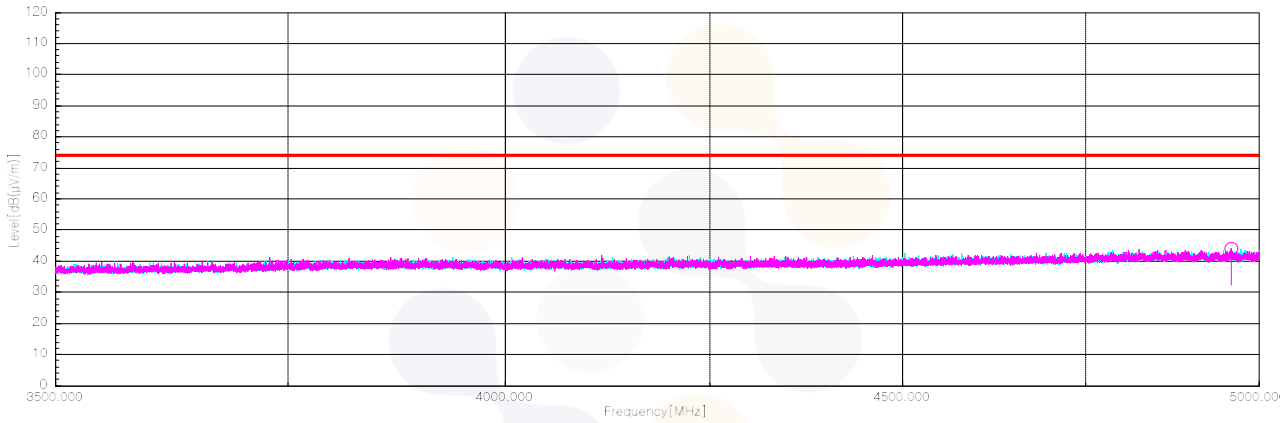
Notes.
The lowest margin condition among the channels and modes were selected for test.

Frequency	Pol.	Reading	Ant. Factor	Amp.+Cable	DCF	Result	Limit	Margin
(MHz)	(V/H)	(dB(μV))	(dB)	(dB)	(dB)	(dB(μV/m))	(dB(μV/m))	(dB)
Peak data								
3 020.73	H	63.30	29.34	-46.67	-	45.97	74.00	28.03
4 959.80[1)]	H	53.70	32.94	-42.47	-	44.17	74.00	29.83
7 434.18[1)]	V	51.60	36.43	-40.72	-	47.31	74.00	26.69
11 264.45[1)]	H	53.50	38.93	-42.72	-	49.71	74.00	24.29
16 576.30	H	51.20	37.70	-38.94	-	49.96	74.00	24.04
Average Data								
No spurious emissions were detected within 20 dB of the limit.								

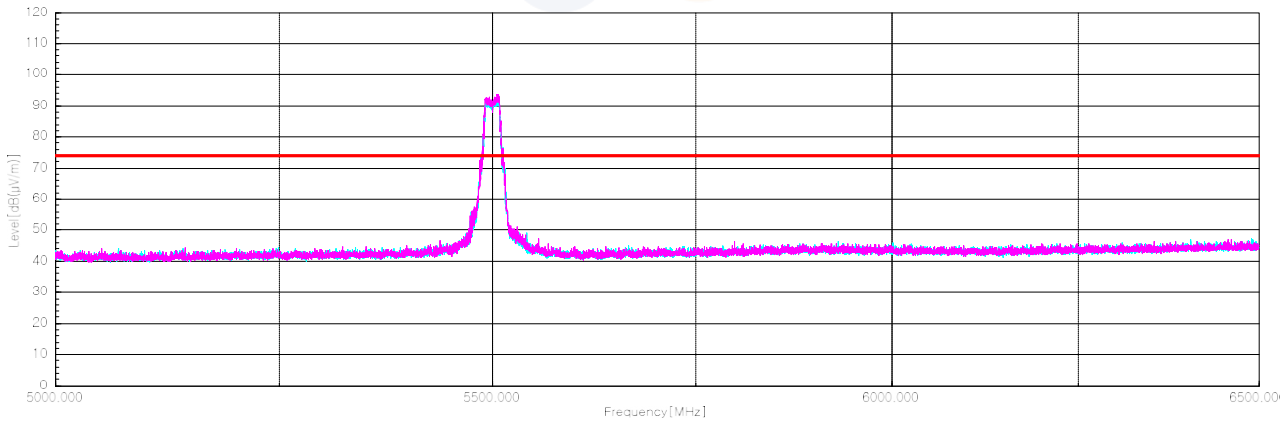
Horizontal/Vertical for 1 ㎓ ~ 3.5 ㎓



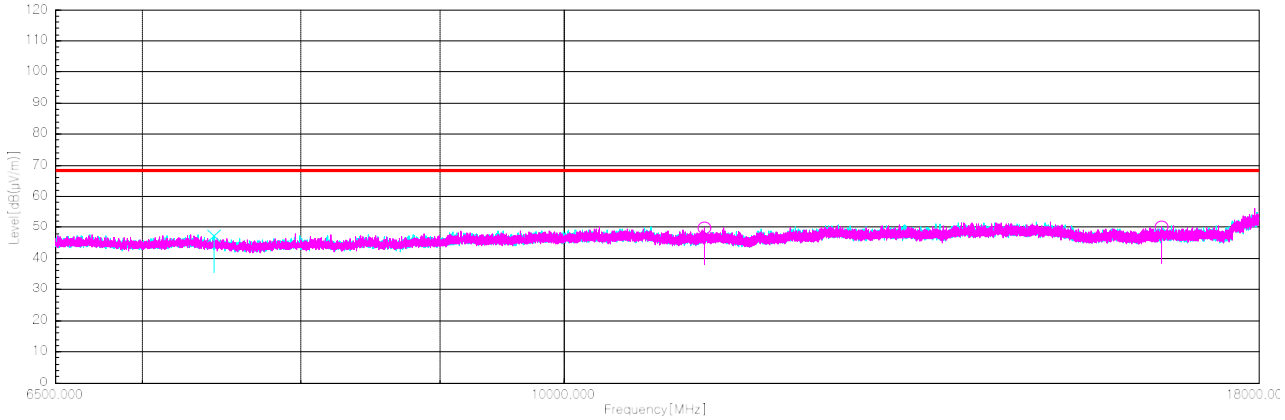
Horizontal/Vertical for 3.5 ㎓ ~ 5 ㎓



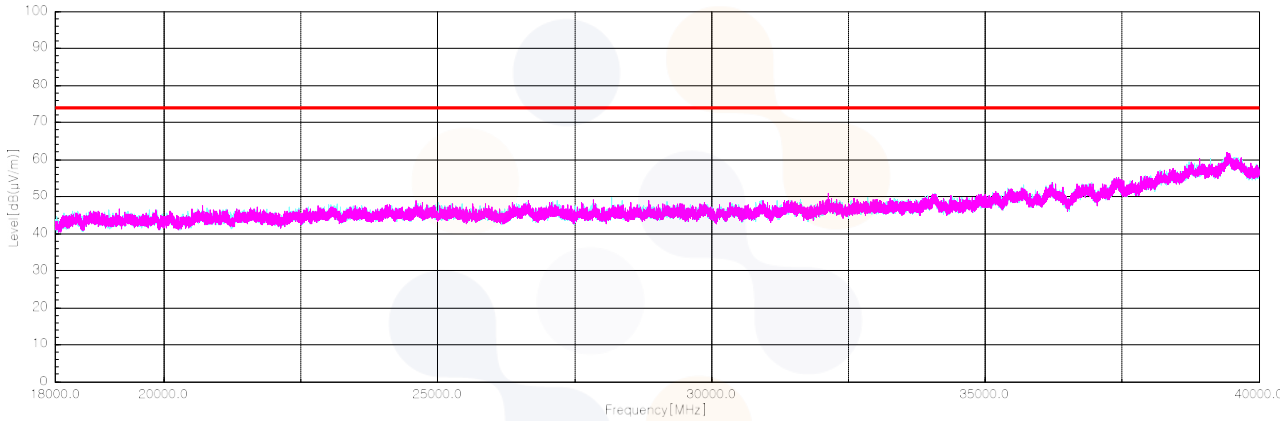
Horizontal/Vertical for 5 ㎓ ~ 6.5 ㎓



Horizontal/Vertical for 6.5 ㎓ ~ 18 ㎓

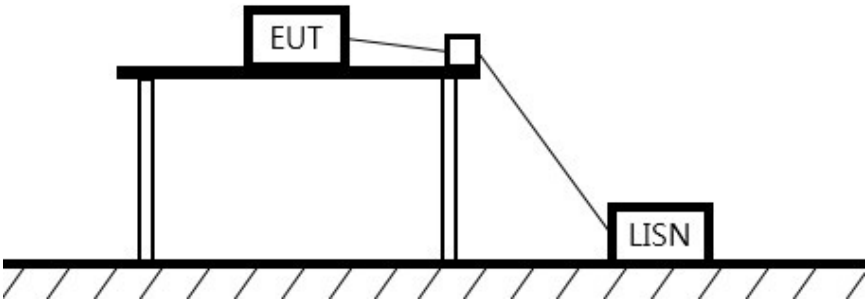


Horizontal/Vertical for 18 ㎓ ~ 40 ㎓



7.7. AC Conducted emission

Test setup



Limit

§15.407

According to 15.207(a) and RSS-Gen (8.8), 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.

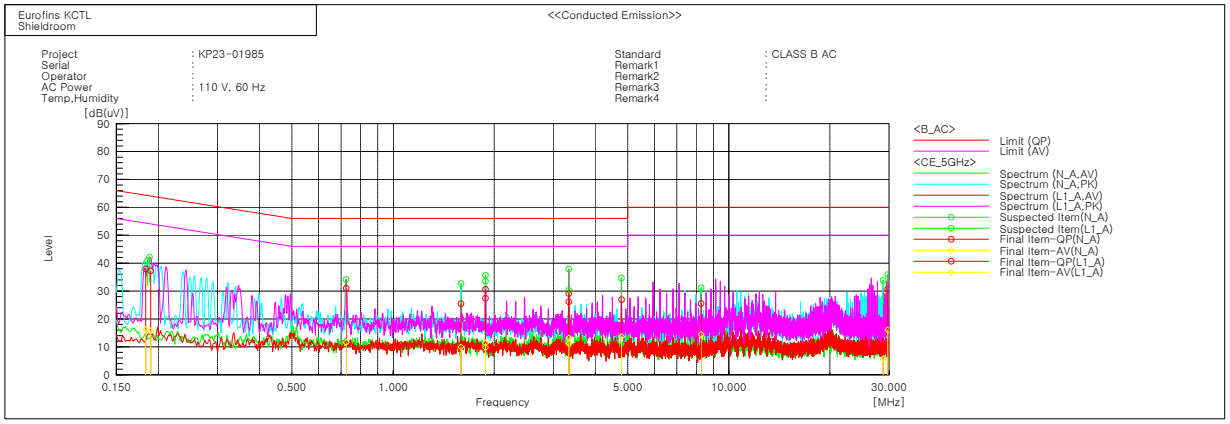
Frequency of Emission (㎒)	Conducted limit (dBμV/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

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

Worst case: 802.11n HT20 / UNII-2A_5 280 ㎒



Final Result

--- N_A 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	0.18984	27.1	5.7	10.1	37.2	15.8	64.0	54.0	26.8	38.2
2	1.59279	15.6	0.1	9.8	25.4	9.9	56.0	46.0	30.6	36.1
3	1.88528	17.6	0.0	9.8	27.4	9.8	56.0	46.0	28.6	36.2
4	3.33741	16.2	1.3	9.9	26.1	11.2	56.0	46.0	29.9	34.8
5	8.27132	15.4	4.4	10.1	25.5	14.5	60.0	50.0	34.5	35.5
6	28.81375	-0.6	-5.3	11.0	10.4	5.7	60.0	50.0	49.6	44.3

--- L1_A 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	0.18342	27.8	5.9	10.2	38.0	16.1	64.3	54.3	26.3	38.2
2	0.72548	21.1	1.7	9.9	31.0	11.6	56.0	46.0	25.0	34.4
3	1.88521	20.8	1.6	9.8	30.6	11.4	56.0	46.0	25.4	34.6
4	3.33772	19.2	3.3	9.9	29.1	13.2	56.0	46.0	26.9	32.8
5	4.79016	17.0	3.8	9.9	26.9	13.7	56.0	46.0	29.1	32.3
6	29.74553	19.6	4.9	11.1	30.7	16.0	60.0	50.0	29.3	34.0

8. Measurement equipment

Equipment Name	Manufacturer	Model No.	Serial No.	Next Cal. Date
Spectrum Analyzer	R&S	FSV3044	101427	24.03.28
Attenuator	HUBER+SUHNER	6610_SK-50-1/199_NE	ATT10	24.04.10*
DC Power Supply	AGILENT	E3632A	MY40000265	24.04.27*
Spectrum Analyzer	R&S	FSV40	100988	23.07.11
PSA Spectrum Analyzer	Agilent	E4440A	MY46186407	24.03.22
Broadband Pre Amplifier	SCHWARZBECK	BBV9718D	53	24.03.17
Low Noise Amplifier	TESTEK	TK-PA18H	220123-L	23.12.02
Low Noise Amplifier	TESTEK	TK-PA1840H	220133-L	23.12.02
Amplifier	SONOMA INSTRUMENT	310N	421821	23.12.14
Horn Antenna	SCHWARZBECK	BBHA9120D	2764	23.12.06
Horn Antenna	SCHWARZBECK	BBHA9170	1267	23.12.05
Bi-log Antenna	Teseq GmbH	CBL 6112D	63756	24.11.17
Loop Antenna	R&S	HFH2-Z2	100355	24.08.10
High Pass Filter	Wainwright Instruments GmbH	WHKX8-5655-6500-18000-40SS	SN7	23.12.14
TWO-LINE V-Network	R&S	ENV216	101358	23.09.29
EMI Test Receiver	R&S	ESCI3	100001	23.08.18
Signal Generator	R&S	SMB100A	176206	24.01.19

* Tests related to this equipment were progressed after the calibration was completed.

End of test report