TEST REPORT

Part 15 Subpart E 15.407

Equipment under test Wireless Bridge

Model name PTP-5440

FCC ID 2AL83PTP-5440

Applicant SAWWAVE Co.,Ltd

Manufacturer SAWWAVE Co.,Ltd

Date of test(s) 2017.05.18 ~ 2017.05.25

Date of issue 2017.05.26

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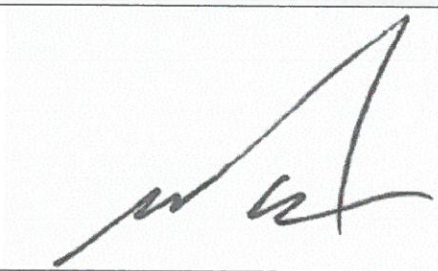	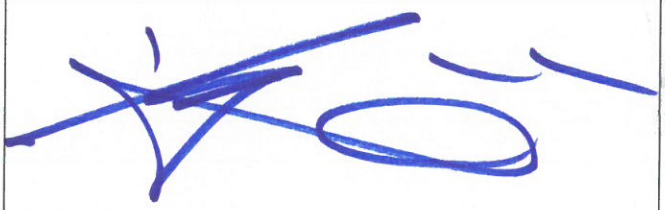
Kwang-yeol Choo Test engineer	Jeff Do Technical manager

Revision history

Revision	Date of issue	Test report No.	Description
-	2017.05.26	KES-RF-17T0053	Initial

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1. General information

Applicant: SAWWAVE Co.,Ltd

Applicant address: 1206, SKnTechnopark, 124, Sagimakgol-ro, Jungwon-gu, Seongnam-si, Gyeonggi-do, Republic of Korea

Test site: KES Co., Ltd.

Test site address: C-3701, 40, Simin-daero 365beon-gil, Dongan-gu, Anyang-si, Gyeonggi-do, Korea
473-29, Gayeo-ro, Yeoju-si, Gyeonggi-do, Korea

FCC rule part(s): 15.407

FCC ID: 2AL83PTP-5440

Test device serial No.: ☒ Production ☐ Pre-production ☐ Engineering

1.1. EUT description

Equipment under test: Wireless Bridge

Frequency range: 5 745 ㎒ ~ 5 825 ㎒ (11ac_VHT20)
5 755 ㎒ ~ 5 795 ㎒ (11ac_VHT40)
5 775 ㎒ (11ac_VHT80)

Model: PTP-5440

Modulation technique: OFDM

Number of channels: 5ch : 5 745 ㎒ ~ 5 825 ㎒, 2ch : 5 755 ㎒ ~ 5795 ㎒, 1ch : 5 775 ㎒

Antenna specification: Patch Antenna & 23.23 ㏈i

Power source: AC 120V Adapter (Output : PoE 55V / 0.6 A)

1.2. Information about derivative model

N/A

1.3. Test configuration

The **SAWWAVE Co.,Ltd Wireless Bridge FCC ID: 2AL83PTP-5440** was tested per the guidance of KDB 789033 D02 v01r04 and KDB 644545 D03 v01. ANSI C63.10-2013 was used to reference the appropriate EUT setup for radiated spurious emissions testing
This report contains the worst-case data from the following mode of the test in bandwidth 20/40/80 ㎒.

1.4. Antenna information

Mode	SISO				MIMO	
	Antenna 0	Antenna 1	Antenna 2	Antenna 3	Antenna 2 + 3	Antenna 0 + 3
Module 1	×	×	×	×	✔	×
Module 2	×	×	×	×	×	✔

✔ = Support; × = Not support

Note.

1. This devices employs MIMO technology using two UNII-3 band output port as module 1 is using antenna port 2 and 3 and module 2 is using antenna port 0 and 3.
2. Module 1 and 2 cannot be transmitted simultaneously.
3. To reference Antenna 0, Antenna 1, Antenna 2 and Antenna 3 to RF front end 0, RF front end 1, RF front end 2 and RF front end 3.

1.5. Accessory information

Equipment	Manufacturer	Model	Serial No.	Power source
PoE Adapter	Any Electronics co.,ltd	ANY5506C-LK1	15L500489	AC 120V (Output : DC 55V / 0.6 A)

1.6. Device modifications

N/A

1.7. Frequency/channel operations

802.11ac_VHT20 mode		802.11ac_VHT40 mode		802.11ac_VHT80 mode	
Ch.	Frequency (㎒)	Ch.	Frequency (㎒)	Ch.	Frequency (㎒)
149	5 745	151	5 755	155	5 775
157	5 785	159	5 795		
165	5 825				

1.7. Maximum average output power

Refer to the average output power

Note.

1. Radiated emission and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.
2. Worst-case data rates as provided by the client were: VHT20/40/80 : **MCS8**

2. Summary of tests

Reference	Parameter	Test results
N/A	26 ㏈ bandwidth	Pass
15.407(e)	6 ㏈ bandwidth	Pass
15.407(a)	Maximum conducted output power	Pass
15.407(a)	Power spectral density	Pass
15.407(g)	Frequency stability	Pass
15.205 15.209	Radiated restricted band and emission	Pass
15.407(d)	General field strength limit (Restricted bands and radiated emission limit)	Pass
15.207	AC power line conducted emissions	Pass

3. Test results

3.1. Emission bandwidth (26 dB bandwidth)

Test procedure

KDB 789033 D02 v01r04– Section C.1

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set the VBW > RBW.
3. Detector = Peak.
4. Trace mode = max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

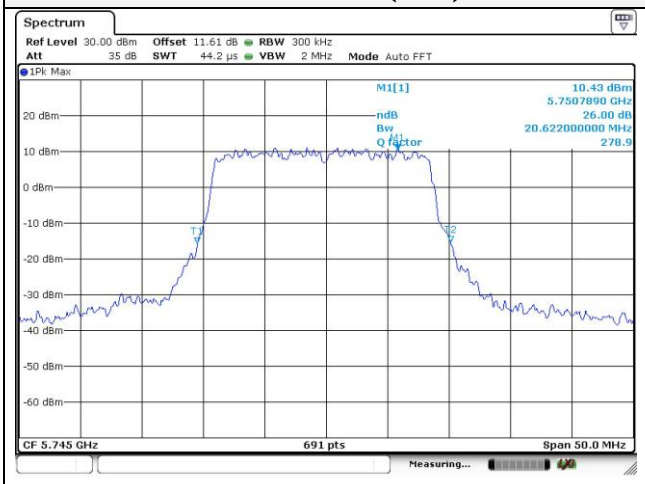
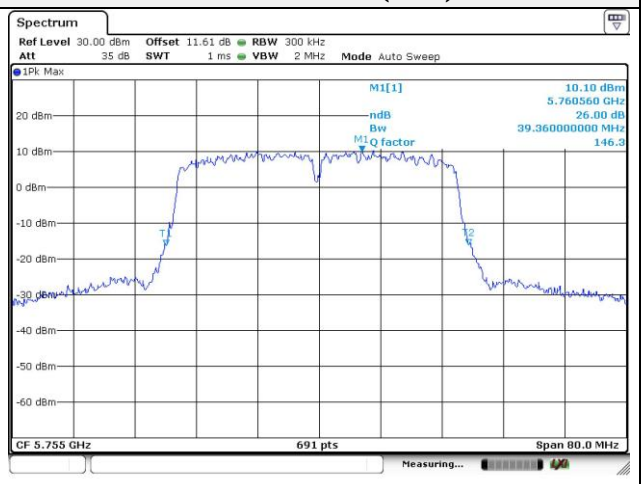
Limit

N/A

Test results

Antenna port	Frequency(㎒)	Mode	26 dB bandwidth(㎒)
0	5 745	VHT20	20.622
	5 785		20.333
	5 825		20.550
	5 755	VHT40	39.360
	5 795		39.590
	5 775	VHT80	84.230
2	5 745	VHT20	20.695
	5 785		20.116
	5 825		20.839
	5 755	VHT40	39.710
	5 795		39.830
	5 775	VHT80	82.630
3	5 745	VHT20	20.622
	5 785		20.333
	5 825		20.550
	5 755	VHT40	39.590
	5 795		39.830
	5 775	VHT80	82.920

Antenna port 0

UNII-3_VHT20(Low)	UNII-3_VHT40(Low)
	
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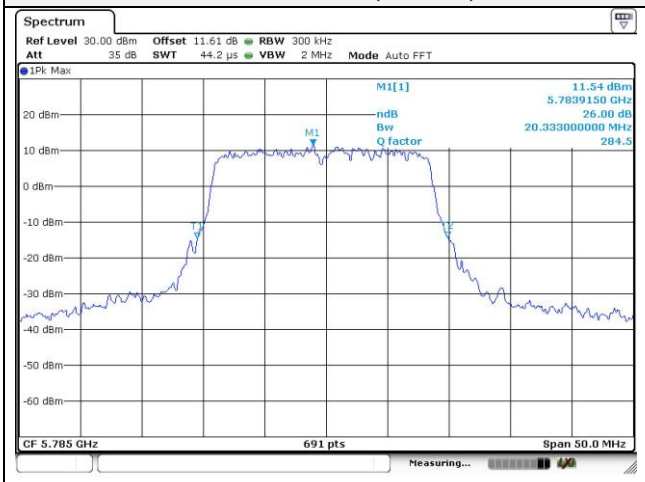
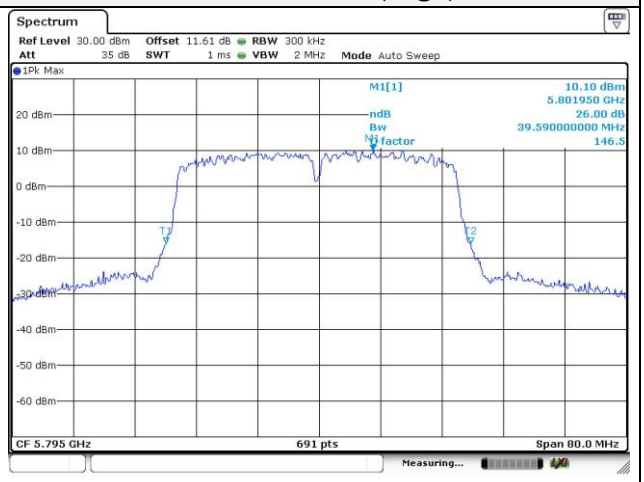
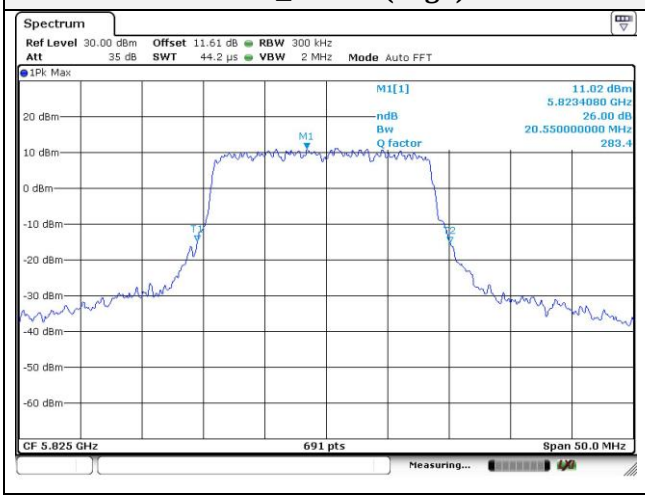
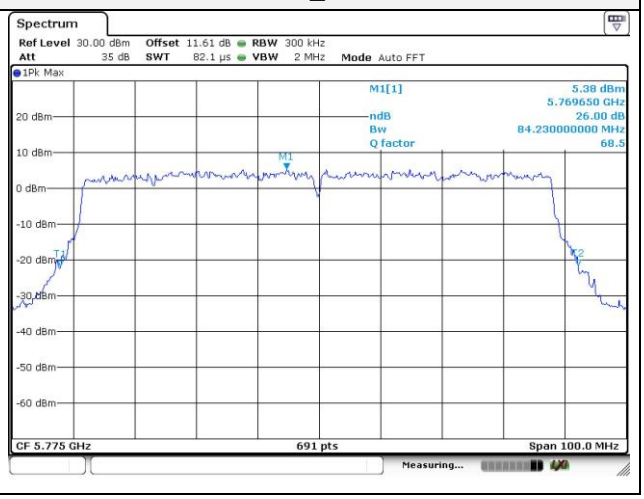
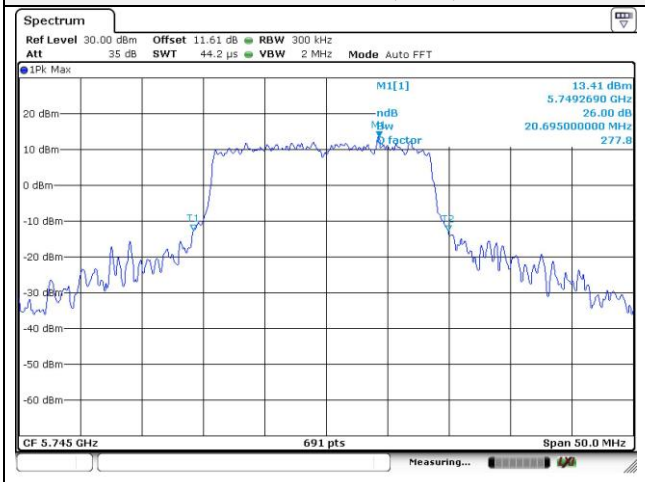
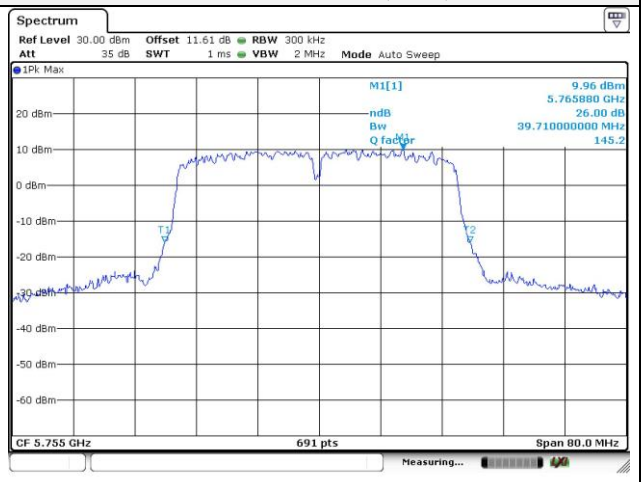
	
UNII-3_VHT20(High)	**UNII-3_VHT80**
	

Antenna port 2

UNII-3_VHT20(Low)



UNII-3_VHT40(Low)



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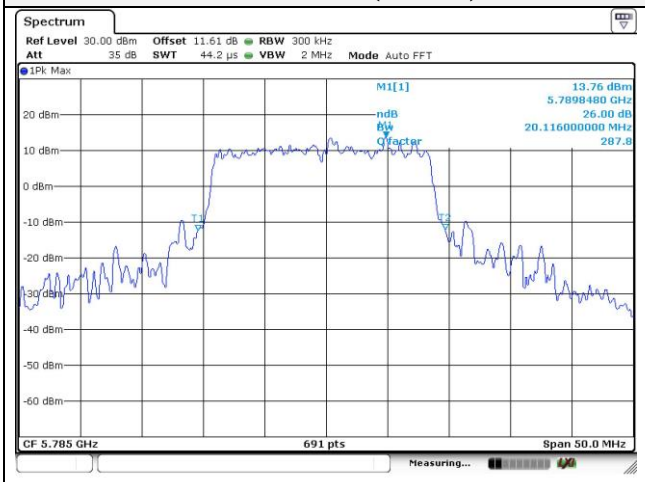
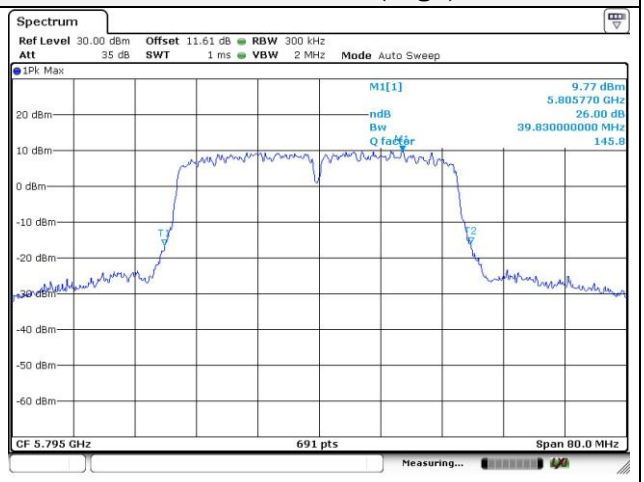
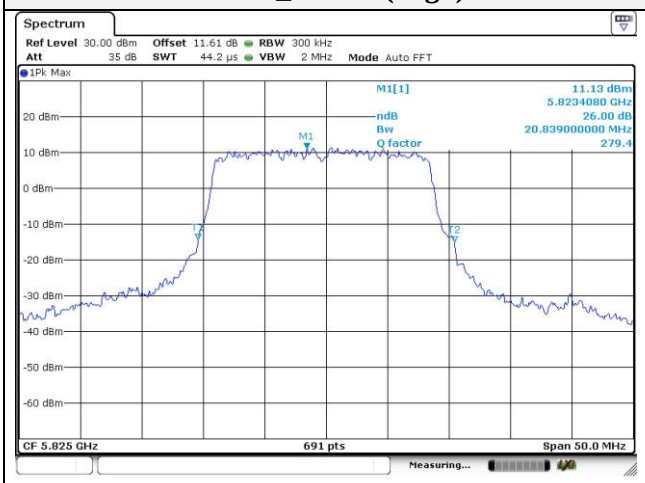


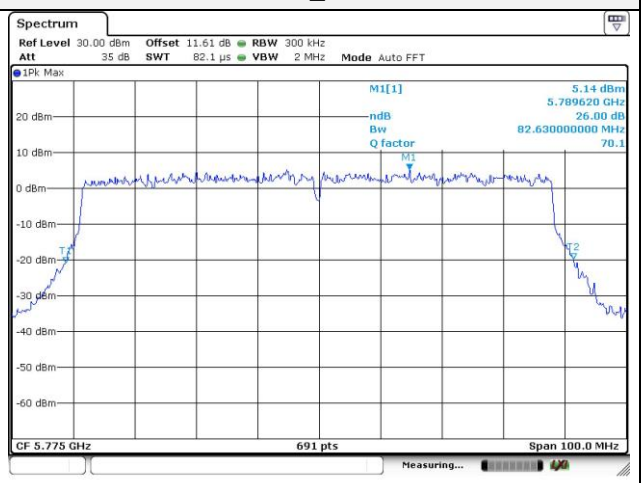
UNII-3_VHT40(High)



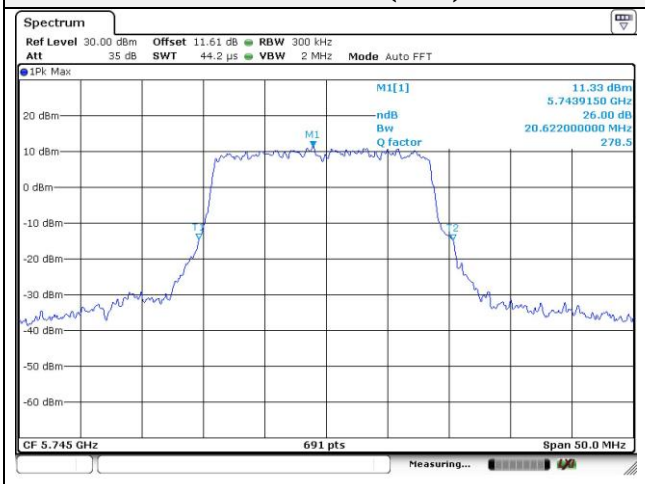
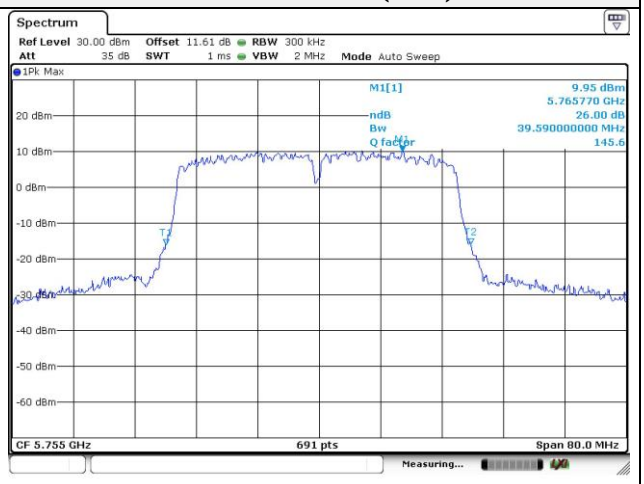
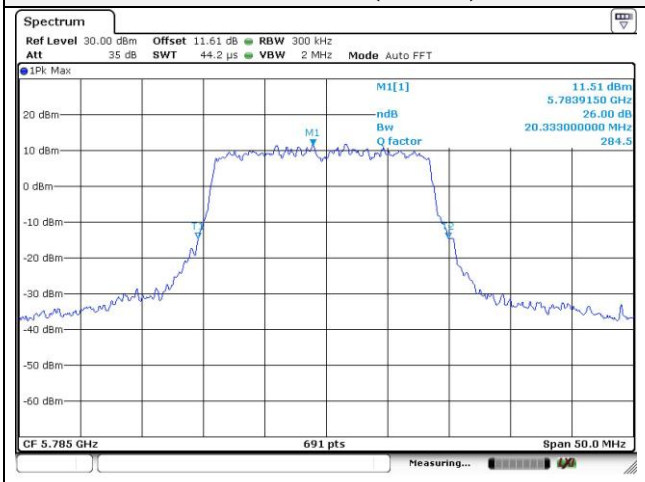
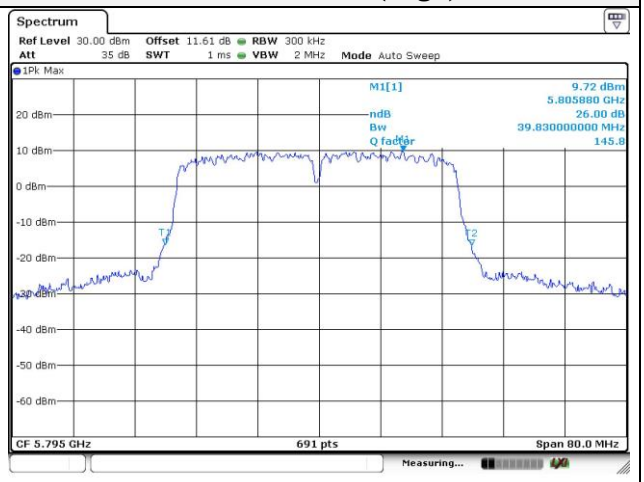
UNII-3_VHT20(High)



UNII-3_VHT80



Antenna port 3

UNII-3_VHT20(Low)	UNII-3_VHT40(Low)
	
UNII-3_VHT20(Middle)	**UNII-3_VHT40(High)**
	
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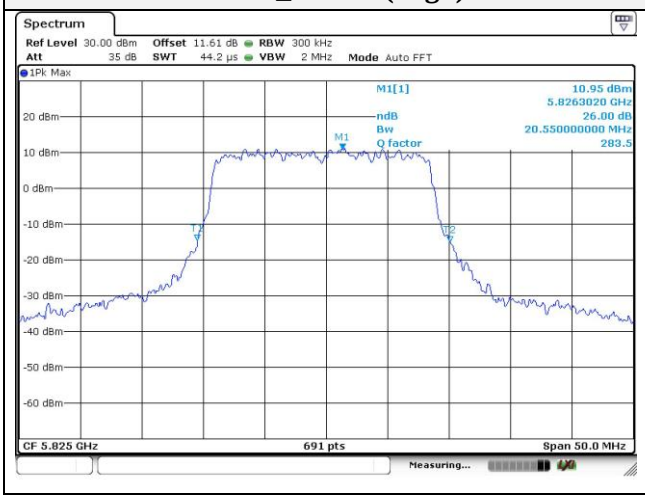
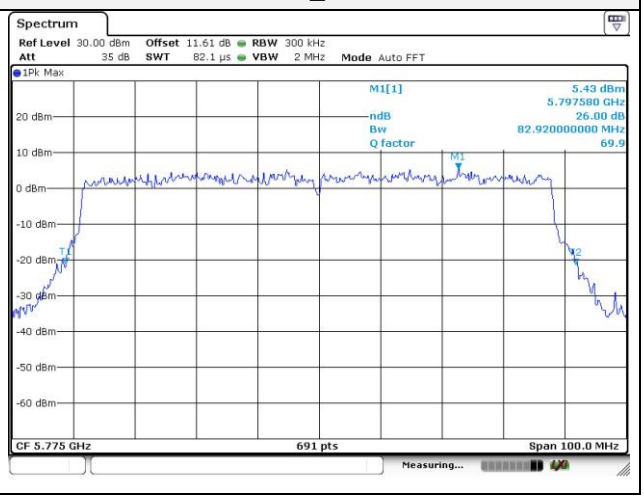
	

3.2. 6 dB bandwidth

Test procedure

KDB 789033 D02 v01r04– Section C.2, KDB 644545 D03 v01

1. Set RBW = 100 ㎑
2. Set the video bandwidth (VBW) ≥ 3 × RBW.
3. Detector = peak.
4. Sweep = auto couple.
5. Allow the trace to stabilize
6. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 ㏈ relative to the maximum level measured in the fundamental emission.

Limit

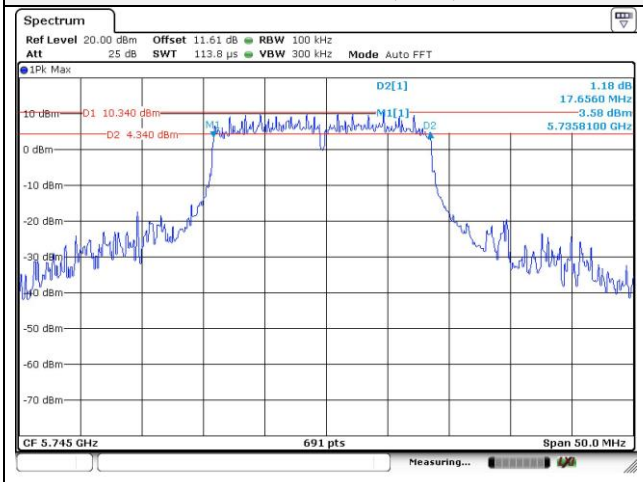
Within the 5.725-5.85 ㎓ band, the minimum 6 ㏈ bandwidth of U-NII devices shall be at least 500 ㎑.

Test results

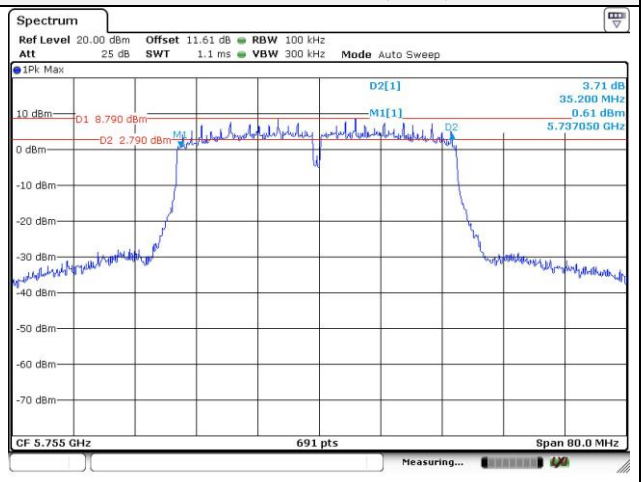
Antenna port	Frequency(㎒)	Mode	6 ㏈ bandwidth(㎒)
0	5 745	VHT20	17.656
	5 785		17.438
	5 825		17.700
	5 755	VHT40	35.200
	5 795		35.660
	5 775	VHT80	75.400
2	5 745	VHT20	17.511
	5 785		17.511
	5 825		17.511
	5 755	VHT40	35.540
	5 795		35.890
	5 775	VHT80	75.400
3	5 745	VHT20	17.511
	5 785		17.221
	5 825		17.511
	5 755	VHT40	35.540
	5 795		36.240
	5 775	VHT80	75.400

Antenna port 0

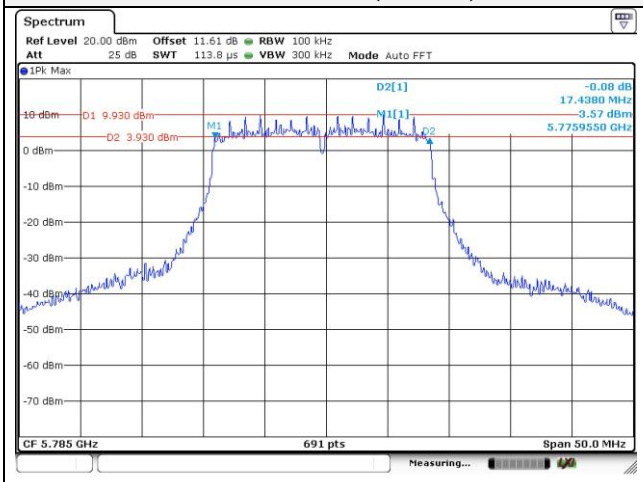
UNII-3_VHT20(Low)



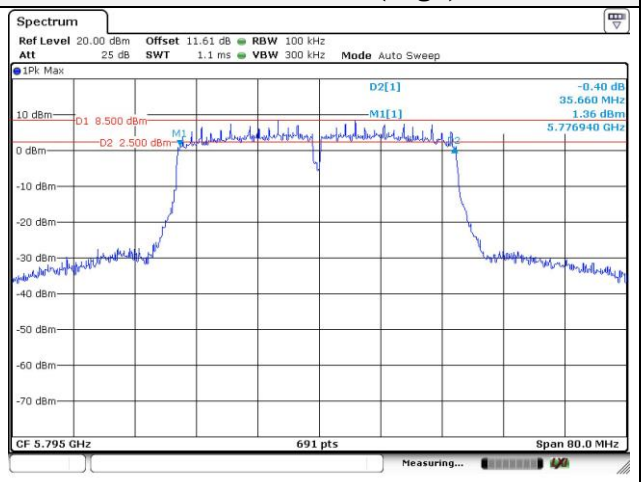
UNII-3_VHT40(Low)



UNII-3_VHT20(Middle)



UNII-3_VHT40(High)



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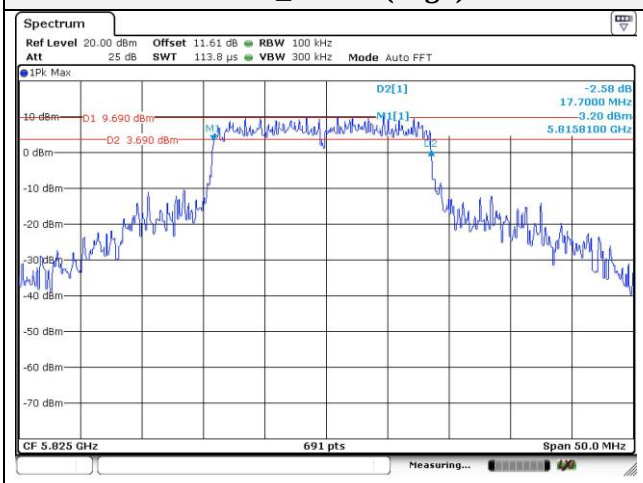
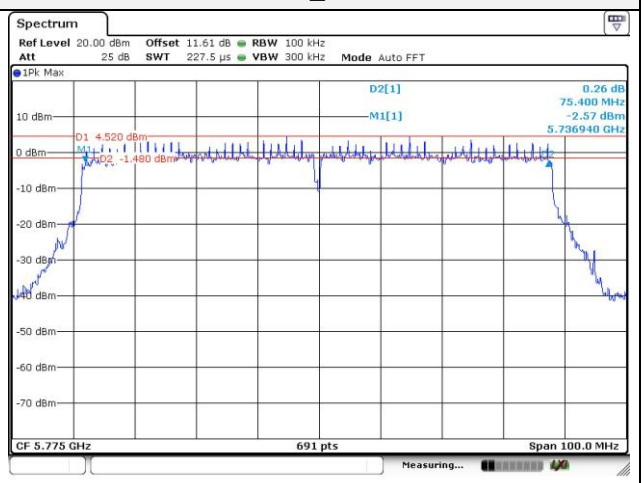


UNII-3_VHT80



Antenna port 2

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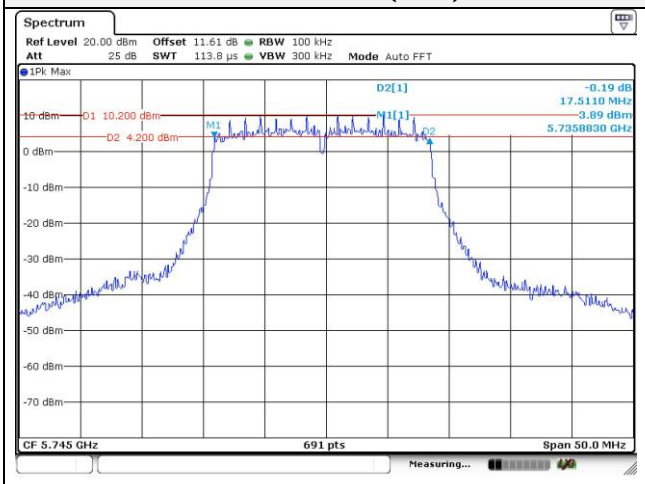	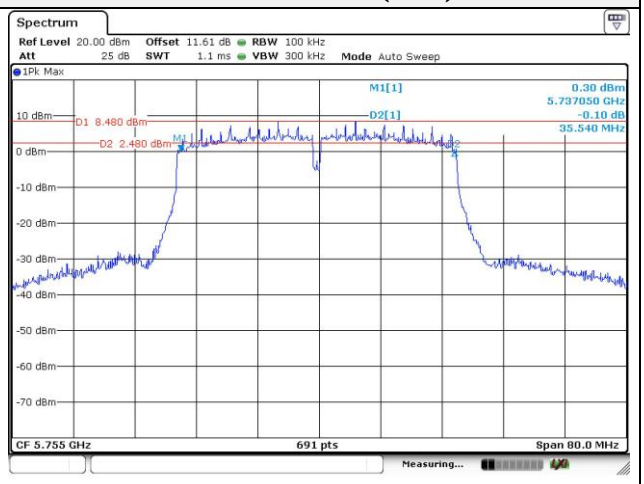
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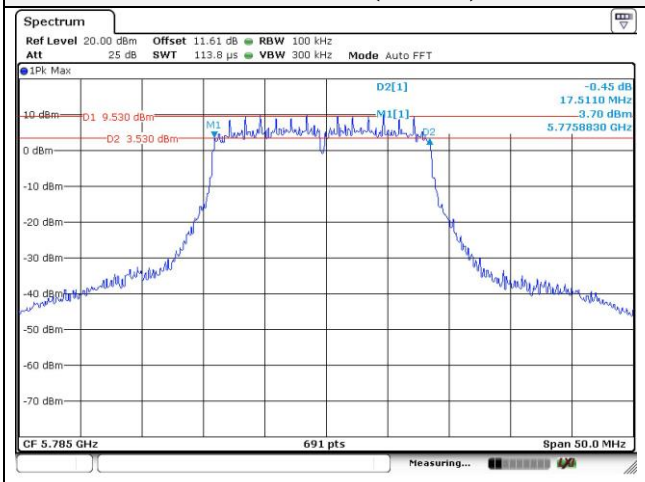	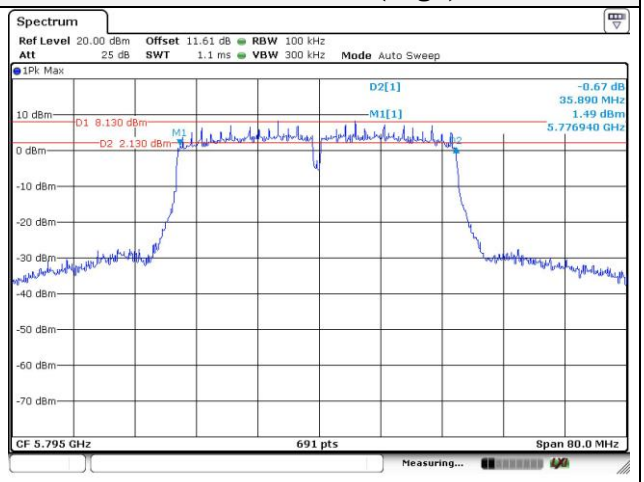
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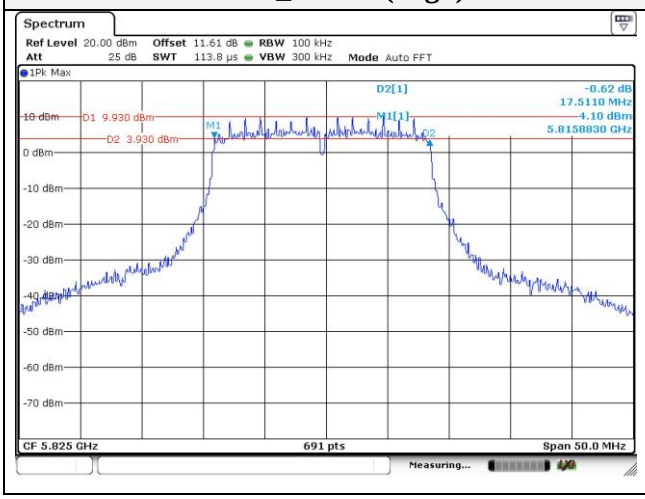
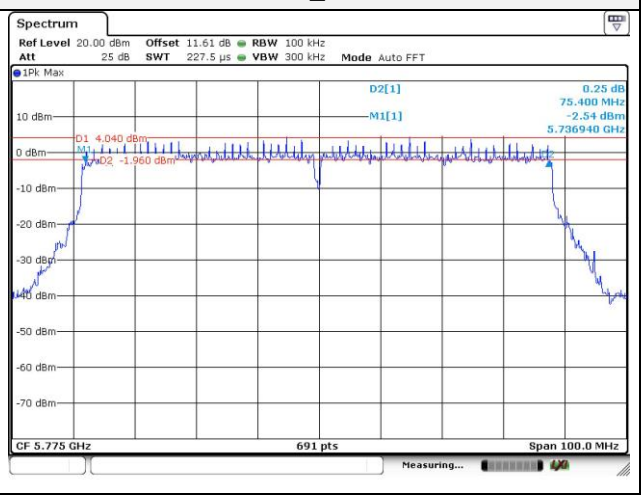
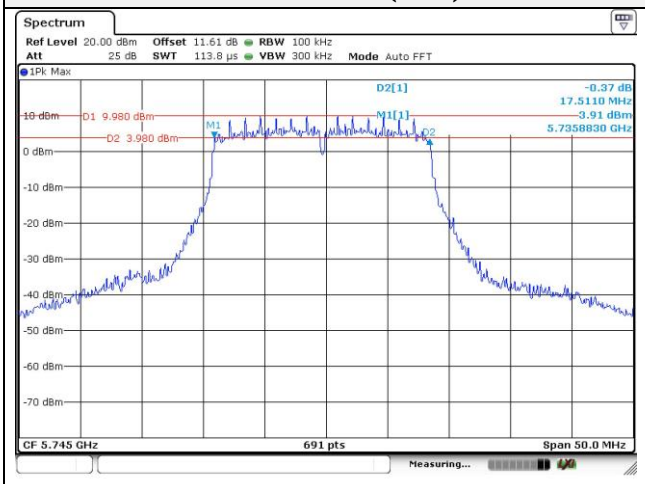
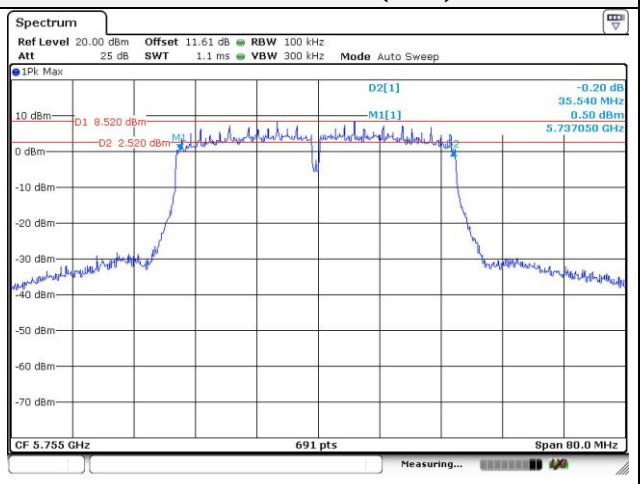
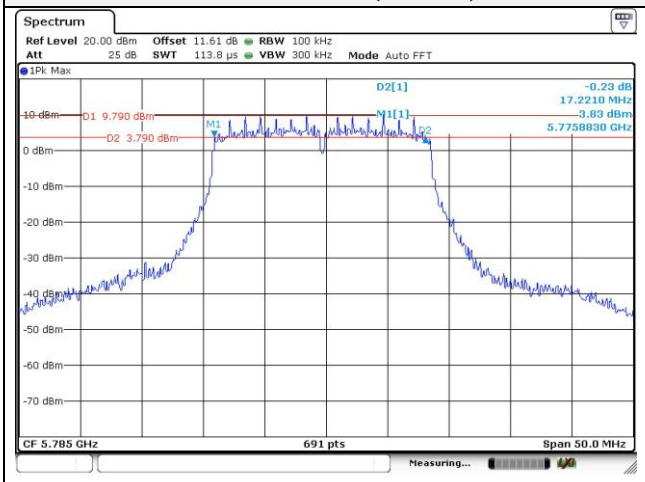
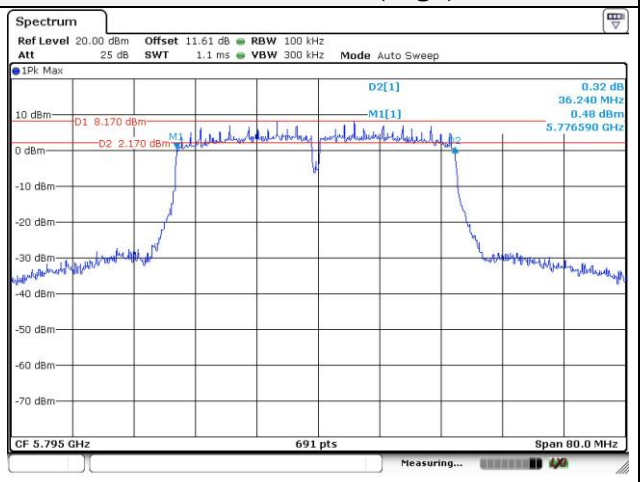
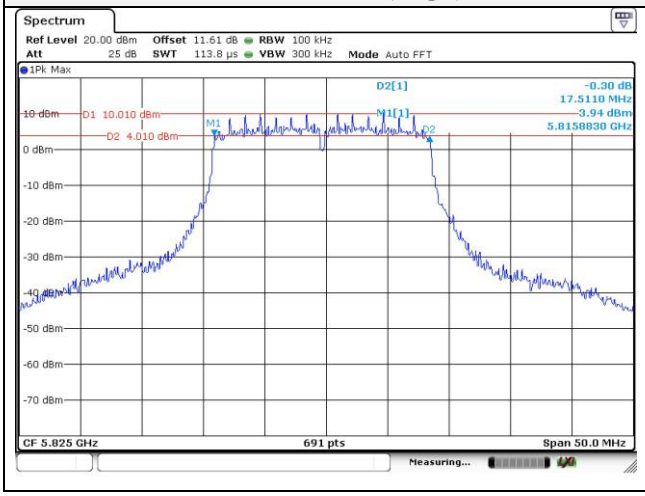
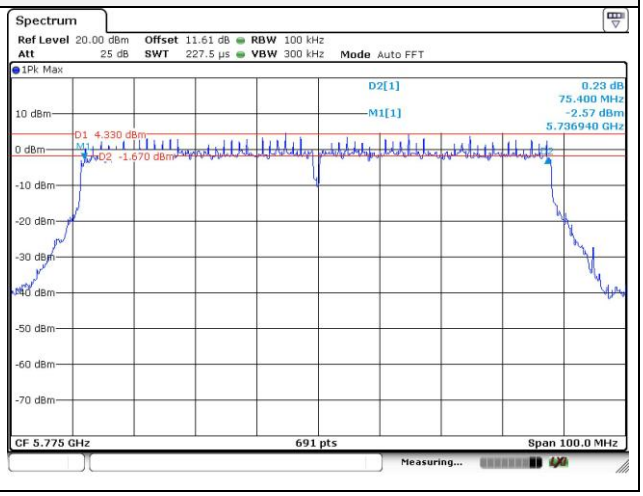
	

Antenna port 3

UNII-3_VHT20(Low)	UNII-3_VHT40(Low)
	
UNII-3_VHT20(Middle)	**UNII-3_VHT40(High)**
	
UNII-3_VHT20(High)	**UNII-3_VHT80**
	

3.3. Maximum conducted output power

Test procedure

KDB 789033 D02 v01r04– Section E.3.a) or b), KDB 644545 D03 v01

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 section II.B.

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 %).

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.

Limit

Band	EUT Category		Limit
UNII-1		Outdoor access point	1 W (30 dBm)
		Indoor access point	
		Fixed point-to-point access point	
		Mobile and portable client device	250 mW(24 dBm)
UNII-2A			250 mW or 11 dBm + 10logB Note1
UNII-2C			250 mW or 11 dBm + 10logB Note1
UNII-3	✓		1 W (30 dBm)

Note.

1. B is the 26 dB emission bandwidth.

Test results

Frequency (㎒)	Detector mode	Output power(㏈m)					
		Antenna port					
		0	2	3	DCF Note1	Sum 2+3 Note2	Sum 0+3 Note2
5 745	AV	20.242	19.209	19.122	-	22.176	22.728
5 785	AV	20.049	19.330	19.330		22.340	22.715
5 825	AV	20.317	19.367	19.403		22.395	22.894
5 755	AV	21.320	20.434	20.396		23.425	23.893
5 795	AV	21.162	20.419	20.365		23.402	23.792
5 775	AV	19.626 Note3	18.545 Note3	18.510 Note3	0.18	21.538	22.114

Note.

1. Refer to the page 28 on this report.
2. Sum = $10\log(10^{Ant0/10}+10^{Ant1/10}\cdots 10^{Ant\ N/10})$
3. DCF in Measured value is included.

3.4. Power spectral density

Test procedure

KDB 789033 D02 v01r04 – Section F, KDB 644545 D03 v01

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in section II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled, "Compute power…." (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Use the peak search function on the instrument to find the peak of the spectrum and record its value.
3. Make the following adjustments to the peak value of the spectrum, if applicable:
   a) If Method SA-2 or SA-2 Alternative was used, add 10 log (1/x), where x is the duty cycle, to the peak of the spectrum.
   b) If Method SA-3 Alternative was used and the linear mode was used in step II.E.2.g)(viii), add 1 ㏈ to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1 ㎒ reference bandwidth.
5. For devices operating in the bands 5.15-5.25 ㎓, 5.25-5.35 ㎓, and 5.47-5.725 ㎓, the above procedures make use of 1 ㎒ RBW to satisfy directly the 1 ㎒ reference bandwidth specified in § 15.407(a)(5). For devices operating in the band 5.725-5.85 ㎓, the rules specify a measurement bandwidth of 500 ㎑. Many spectrum analyzers do not have 500 ㎑ RBW, thus a narrower RBW may need to be used. The rules permit the use of a RBWs less than 1 ㎒, or 500 ㎑, "provided that the measured power is integrated over the full reference bandwidth" to show the total power over the specified measurement bandwidth (i.e., 1 ㎒, or 500 ㎑). If measurements are performed using a reduced resolution bandwidth (< 1 ㎒, or < 500 ㎑) and integrated over 1 ㎒, or 500 ㎑ bandwidth, the following adjustments to the procedures apply:

   a) Set RBW ≥ 1/T, where T is defined in section II.B.l.a)
   b) Set VBW ≥ 3 RBW.
   c) If measurement bandwidth of Maximum PSD is specified in 500 ㎑, add 10 log (500 ㎑/RBW) to the measured result, whereas RBW (< 500 ㎑) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
   d) If measurement bandwidth of Maximum PSD is specified in 1 ㎒, add 10 log (1 ㎒/RBW) to the measured result, whereas RBW (< 1 ㎒) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
   e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.
6. In case of band crossing channels 138, 142 and 144, the measurement is complied with section D of KDB 644545_D03 v01.

Note.

As a practical matter, it is recommended to use reduced RBW of 100 ㎑ for the sections 5.c) and 5.d) above, since RBW=100 ㎑ is available on nearly all spectrum analyzers.

Limit

Band	EUT Category		Limit
UNII-1		Outdoor access point	17 dBm/㎒
		Indoor access point	
		Fixed point-to-point access point	
		Mobile and portable client device	11 dBm/㎒
UNII-2A			11 dBm/㎒
UNII-2C			11 dBm/㎒
UNII-3	✓		30 dBm/500 ㎑

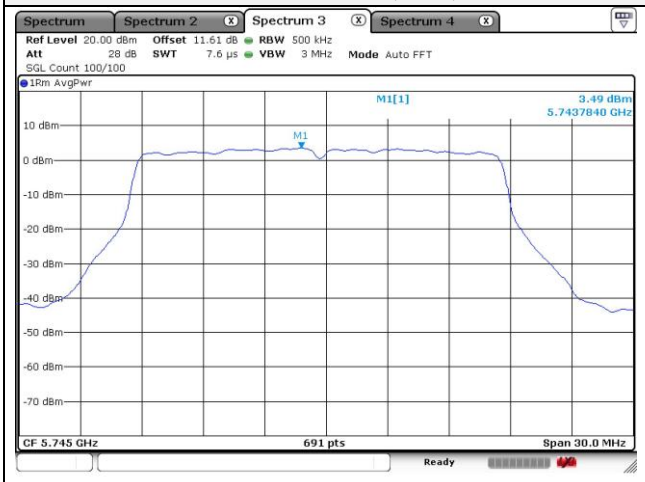
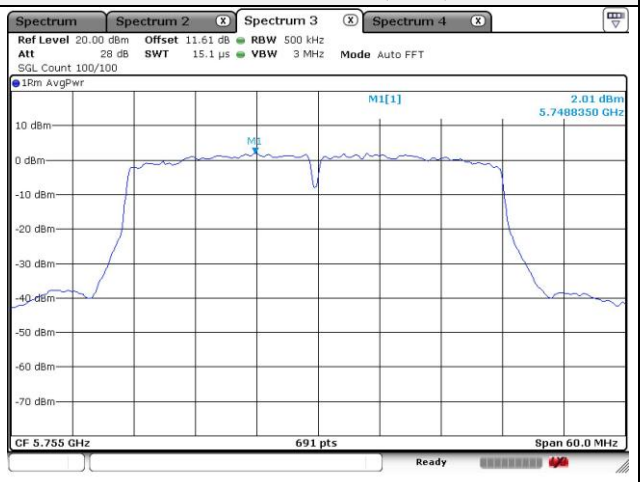
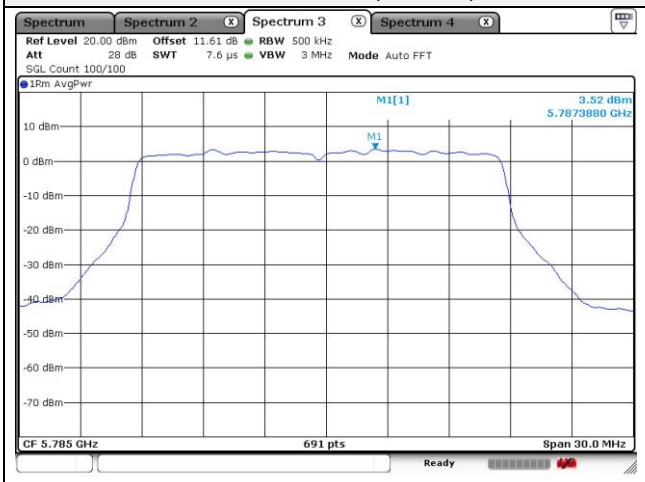
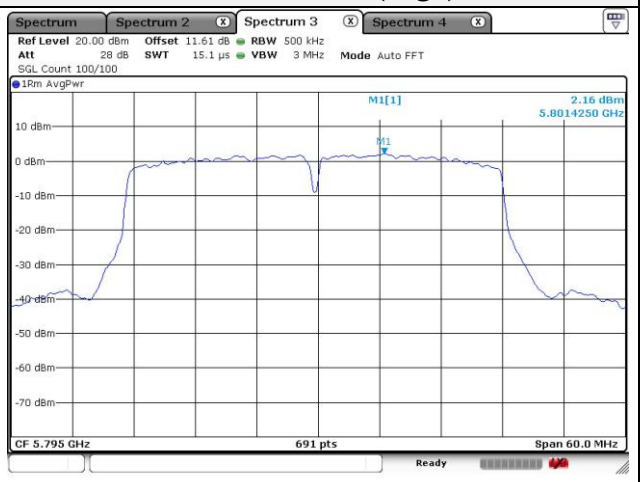
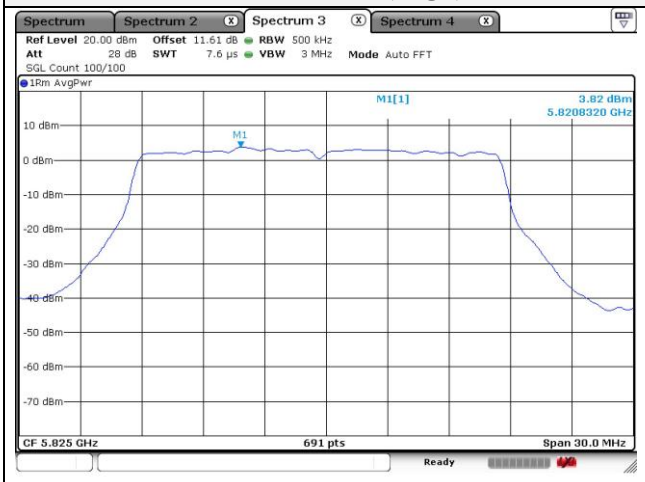
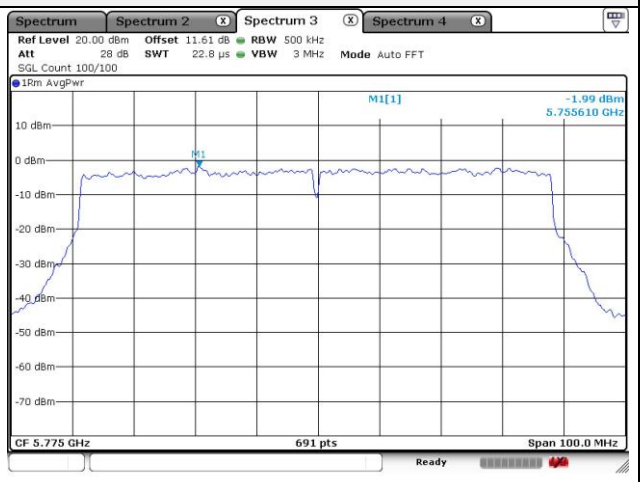
Test results

Frequency (㎒)	Detector mode	Power spectral density(dBm)						
		Antenna port						
		0	2	3	RBWF Note1	DCF Note2	Sum 2+3 Note3	Sum 0+3 Note3
5 745	AV	3.49	3.40	3.04	-	-	6.23	6.28
5 785	AV	3.52	3.18	3.17			6.19	6.36
5 825	AV	3.82	3.30	3.59			6.46	6.72
5 755	AV	2.01	1.91	1.90			4.92	4.97
5 795	AV	2.16	2.34	1.86			5.12	5.02
5 775	AV	-1.81Note4	-2.14Note4	-2.27Note4		0.18	0.81	0.98

Note.

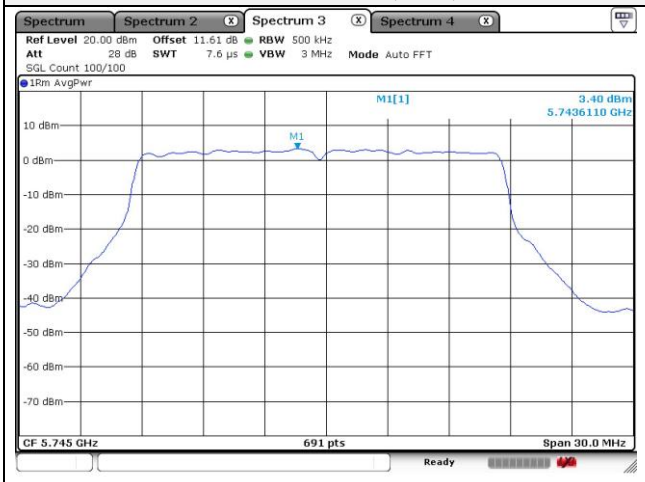
1. RBWF = 10log(500 ㎑ /500 ㎑)
2. Refer to the page 28 on this report.
3. Sum = 10log($10^{Ant0/10}+10^{Ant1/10}\cdots 10^{Ant N/10}$)
4. DCF in Measured value is included.

Antenna port 0

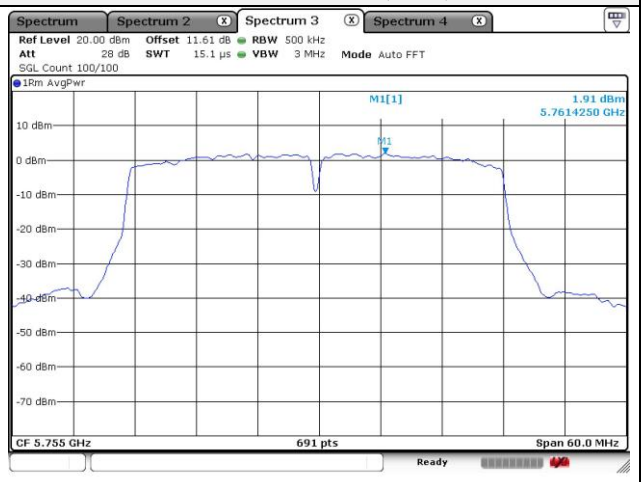
UNII-3_VHT20(Low)	UNII-3_VHT40(Low)
	
UNII-3_VHT20(Middle)	**UNII-3_VHT40(High)**
	
UNII-3_VHT20(High)	**UNII-3_VHT80**
	

Antenna port 2

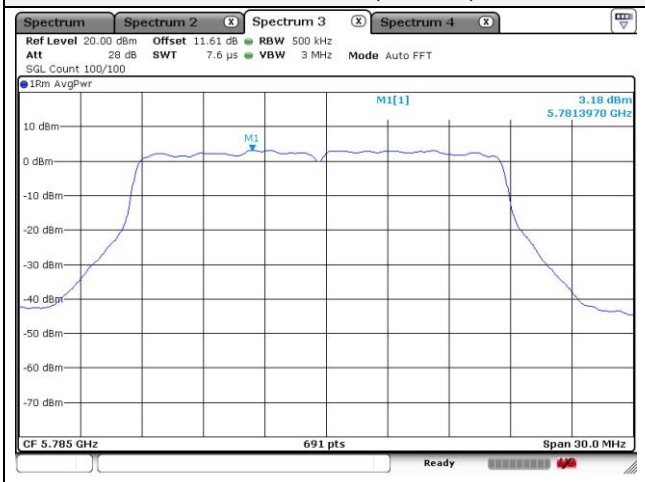
UNII-3_VHT20(Low)



UNII-3_VHT40(Low)



UNII-3_VHT20(Middle)



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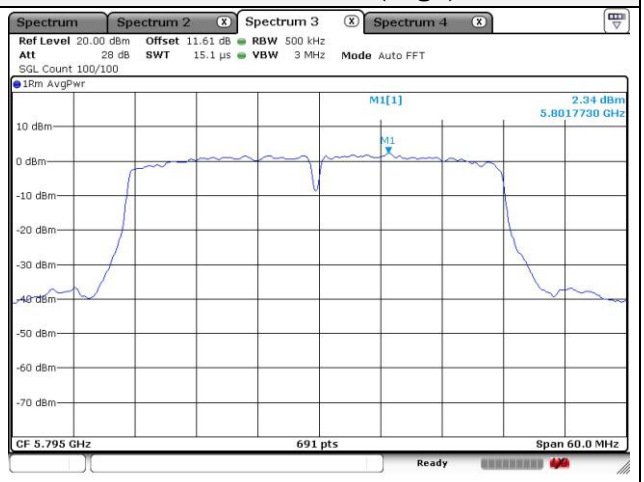

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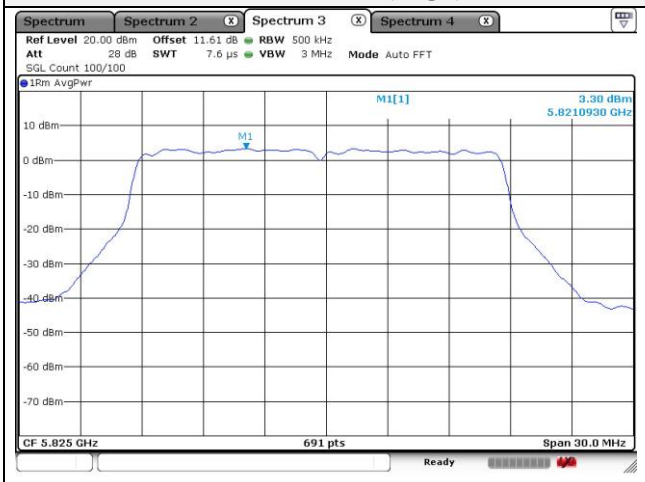
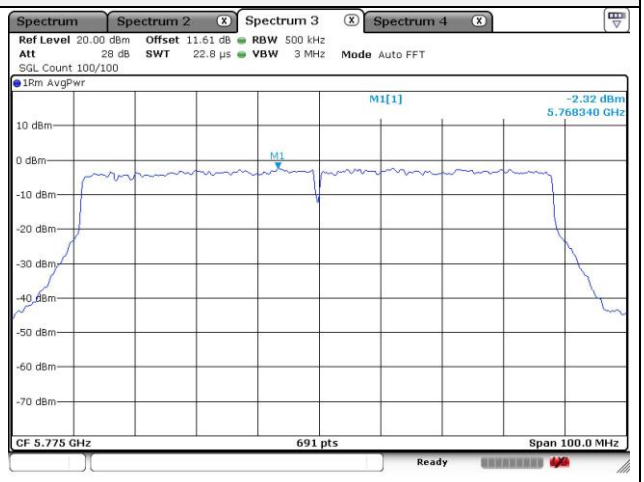
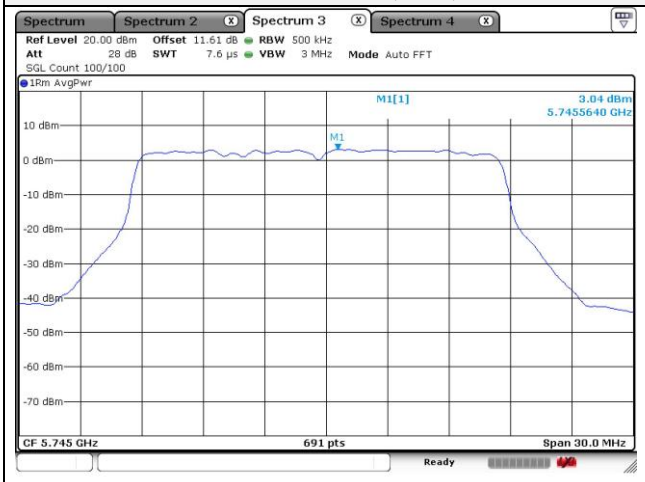


UNII-3_VHT80



Antenna port 3

UNII-3_VHT20(Low)



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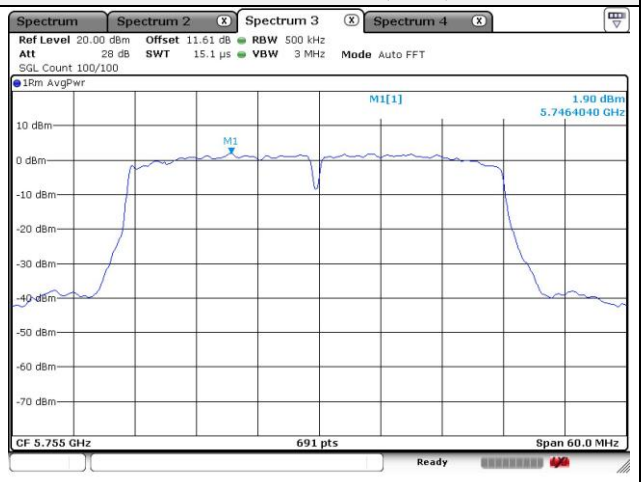
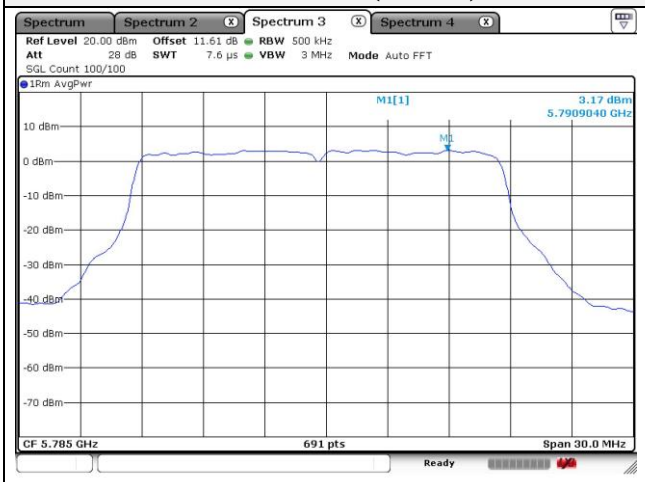
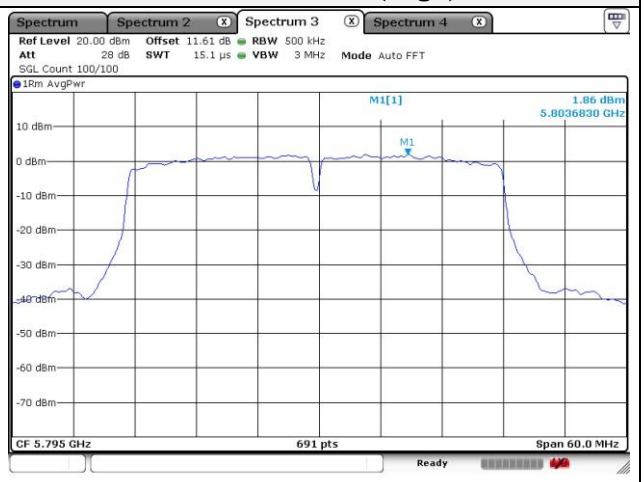


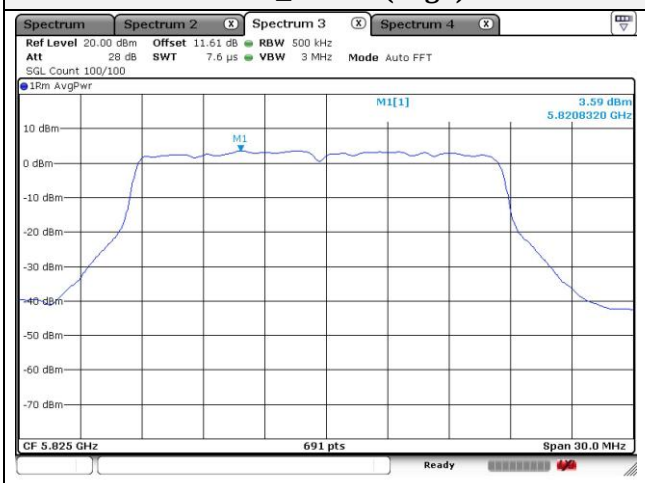
UNII-3_VHT20(Middle)



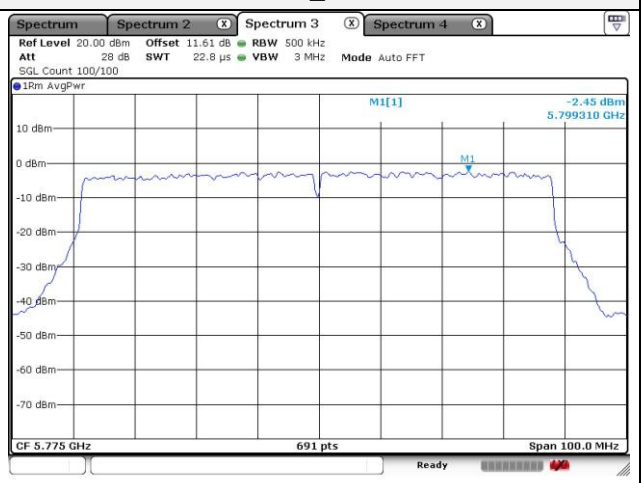
UNII-3_VHT40(High)



UNII-3_VHT20(High)



UNII-3_VHT80



3.5. Frequency Stability

Test procedure

ANSI C63.10-2013, clause 6.8.1

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

Limit

N/A

Mode: UNII-3

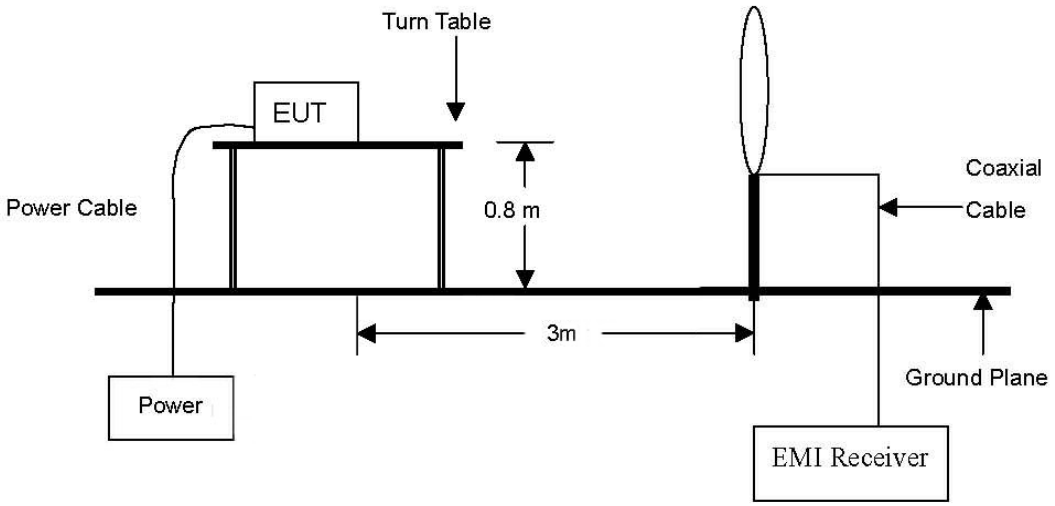
Operating frequency: 5 745 ㎒

Test voltage (%)	Test voltage (V)	Temperature (℃)	Maintaining time	Measure frequency (㎒)	Frequency deviation (㎐)	Deviation (%)
100 %	AC 120	-20	Startup	5 744.475 336	-524 664	-0.009 133
			2 minutes	5 744.763 841	-236 159	-0.004 111
			5 minutes	5 744.764 480	-235 520	-0.004 100
			10 minutes	5 744.763 841	-236 159	-0.004 111
100 %		-10	Startup	5 744.761 935	-238 065	-0.004 144
			2 minutes	5 744.760 199	-239 801	-0.004 174
			5 minutes	5 744.758 607	-241 393	-0.004 202
			10 minutes	5 744.757 159	-242 841	-0.004 227
100 %		0	Startup	5 744.729 401	-270 599	-0.004 710
			2 minutes	5 744.729 813	-270 187	-0.004 703
			5 minutes	5 744.728 267	-271 733	-0.004 730
			10 minutes	5 744.728 402	-271 598	-0.004 728
100 %		10	Startup	5 744.725 199	-274 801	-0.004 783
			2 minutes	5 744.724 801	-275 199	-0.004 790
			5 minutes	5 744.724 306	-275 694	-0.004 799
			10 minutes	5 744.722 404	-277 596	-0.004 832
100 %		20	Startup	5 744.719 456	-280 544	-0.004 883
			2 minutes	5 744.718 392	-281 608	-0.004 902
			5 minutes	5 744.715 459	-284 541	-0.004 953
			10 minutes	5 744.714 518	-285 482	-0.004 969
100 %		23	Startup	5 744.713 291	-286 709	-0.004 991
			2 minutes	5 744.710 841	-289 159	-0.005 033
			5 minutes	5 744.709 114	-290 886	-0.005 063
			10 minutes	5 744.705 208	-294 792	-0.005 131
100 %		30	Startup	5 744.702 403	-297 597	-0.005 180
			2 minutes	5 744.689 311	-310 689	-0.005 408
			5 minutes	5 744.685 486	-314 514	-0.005 475
			10 minutes	5 744.683 612	-316 388	-0.005 507
100 %		40	Startup	5 744.682 059	-317 941	-0.005 534
			2 minutes	5 744.680 548	-319 452	-0.005 561
			5 minutes	5 744.679 021	-320 979	-0.005 587
			10 minutes	5 744.677 968	-322 032	-0.005 605
100 %		50	Startup	5 744.670 418	-329 582	-0.005 737
			2 minutes	5 744.669 029	-330 971	-0.005 761
			5 minutes	5 744.668 249	-331 751	-0.005 775
			10 minutes	5 744.665 956	-334 044	-0.005 815
85 %	AC 102	23	Startup	5 744.712 325	-287 675	-0.005 007
			2 minutes	5 744.711 784	-288 216	-0.005 017
			5 minutes	5 744.709 261	-290 739	-0.005 061
			10 minutes	5 744.706 018	-293 982	-0.005 117
115 %	AC 138	23	Startup	5 744.712 315	-287 685	-0.005 008
			2 minutes	5 744.711 861	-288 139	-0.005 015
			5 minutes	5 744.709 251	-290 749	-0.005 061
			10 minutes	5 744.705 222	-294 778	-0.005 131

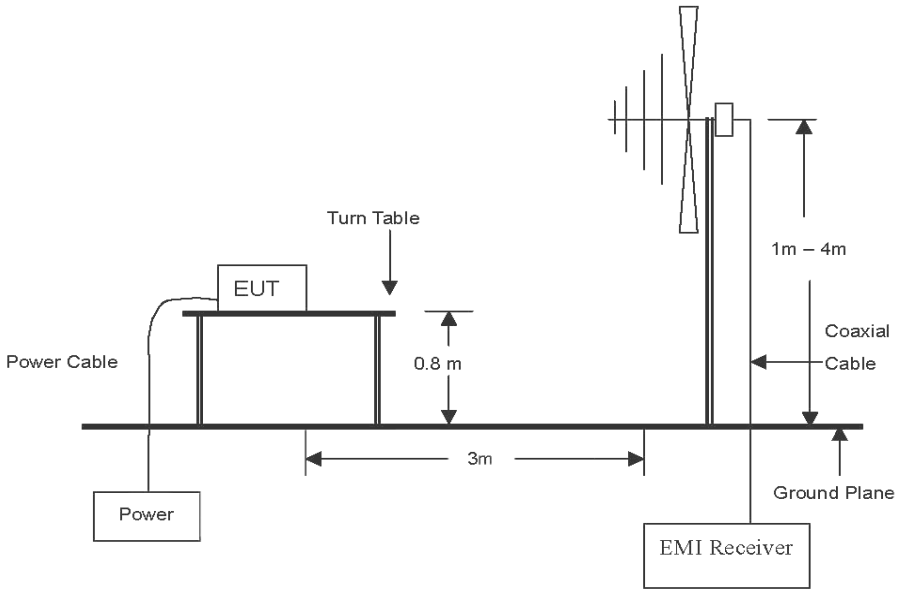
3.6. Radiated restricted band and emissions

Test setup

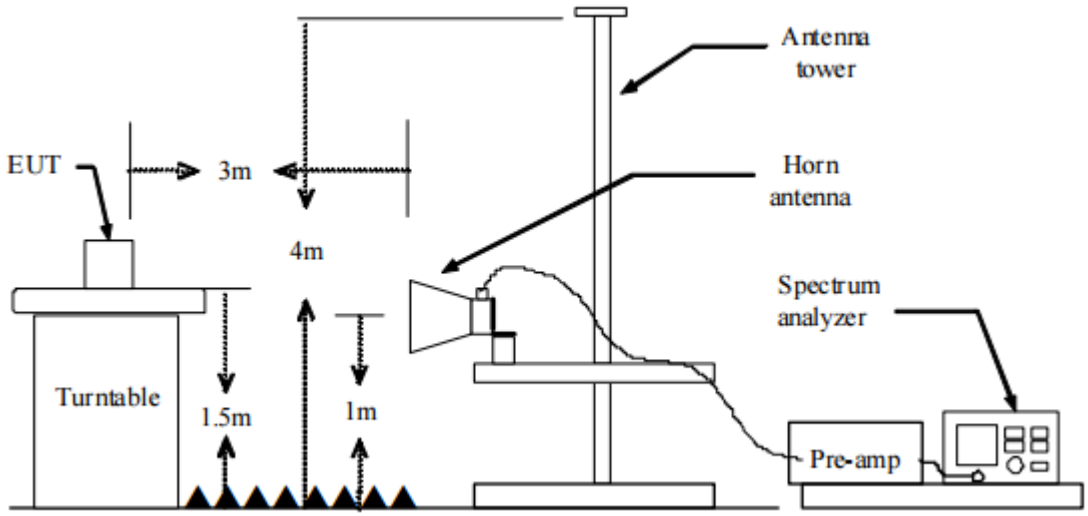
The diagram below shows the test setup that is utilized to make the measurements for emission from 9 ㎑ to 30 ㎒ Emissions.



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



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



Test procedure below 30 ㎒

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

Test procedure above 30 ㎒

1. Spectrum analyzer settings for f < 1 ㎓:
   ① Span = wide enough to fully capture the emission being measured
   ② RBW = 120 ㎑
   ③ VBW ≥ RBW
   ④ Detector = quasi peak
   ⑤ Sweep time = auto
   ⑥ Trace = max hold
2. Spectrum analyzer settings for f ≥1 ㎓: Peak
   ① Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
   ② RBW = 1 ㎒
   ③ VBW = 3 ㎒ (≥ 3 x RBW)
   ④ Detector = peak
   ⑤ Sweep time = auto
   ⑥ Trace = max hold
   ⑦ Trace was allowed to stabilize

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

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

Note.

1. f <30 ㎒, extrapolation factor of 40 ㏈/decade of distance. $F_d = 40\log(D_m/Ds)$
   f ≥30 ㎒, extrapolation factor of 20 ㏈/decade of distance. $F_d = 20\log(D_m/Ds)$
   Where:
   F_d = Distance factor in ㏈
   D_m = Measurement distance in meters
   D_s = Specification distance in meters
2. CF(Correction factors(㏈)) = Antenna factor(㏈/m) + Cable loss(㏈) + or Amp. gain(㏈) + or F_d(㏈)
4. Field strength(㏈㎶/m) = Level(㏈㎶) + CF (㏈) + or DCF(㏈)
5. Margin(㏈) = Limit(㏈㎶/m) - Field strength(㏈㎶/m)
6. Emissions below 18 ㎓ were measured at a 3 meter test distance while emissions above 18 ㎓ were measured at a 1 meter test distance with the application of a distance correction factor.
7. The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z, it was determined that **X orientation** was worst-case orientation; therefore, all final radiated testing was performed with the EUT in **X orientation.**
8. The worst-case emissions are reported however emissions whose levels were not within 20 ㏈ of respective limits were not reported.
9. All channels, modes (e.g. 802.11a, 802.11n (20 ㎒/40 ㎒ BW), 802.11ac (20 ㎒/40 ㎒ /80 ㎒)), and modulations/data rates were investigated among all UNII bands. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

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

Limit

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

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

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

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

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