

Report on the RF Testing of:

KYOCERA Corporation
Mobile Phone, Model: EB1173
FCC ID: JOYEB1173

In accordance with FCC Part15 Subpart E

Prepared for: KYOCERA Corporation
Yokohama Office 2-1-1 Kagahara, Tsuzuki-ku
Yokohama-shi, Kanagawa, Japan
Phone: +81-45-943-6253 Fax: +81-45-943-6314



Japan

**Add value.
Inspire trust.**

COMMERCIAL-IN-CONFIDENCE

Document Number: JPD-TR-23098-0

SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Hiroaki Suzuki	Deputy Manager of RF Group	Approved Signatory	2023.09.27

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Japan Ltd. document control rules.

EXECUTIVE SUMMARY – Result: Complied

A sample of this product was tested and the result above was confirmed in accordance with FCC Part15 Subpart E.



ACCREDITED
Certificate #3686.03

DISCLAIMER AND COPYRIGHT

The results in this report are applicable only to the equipment tested.

This report shall not be re-produced except in full without the written approval of TÜV SÜD Japan Ltd.

Client provided data, for which TÜV SÜD Japan Ltd. take no responsibility, which can affect validity of results within this report is clearly identified.

ACCREDITATION

This test report must not be used by the client to claim product certification, approval, or endorsement by A2LA or any agency of the U.S. Government.

TÜV SÜD Japan Ltd.
Yonezawa Testing Center
5-4149-7 Hachimanpara,
Yonezawa-shi, Yamagata,
992-1128 Japan

Phone: +81 (0) 238 28 2881
www.tuvsud.com/ja-jp

Contents

1	Summary of Test	3
1.1	Modification history of the test report	3
1.2	Standards	3
1.3	Test methods	3
1.4	Deviation from standards	3
1.5	List of applied test(s) of the EUT	3
1.6	Test information	3
1.7	Test set up	3
1.8	Test period	3
2	Equipment Under Test	4
2.1	EUT information	4
2.2	Modification to the EUT	5
2.3	Variation of family model(s)	6
2.4	Operating channels and frequencies	7
2.5	Description of test mode	8
2.6	Operating flow	9
3	Configuration of Equipment	10
3.1	Equipment used	10
3.2	Cable(s) used	10
3.3	System configuration	10
4	Test Result	11
4.1	26dB Bandwidth and 99% Occupied Bandwidth	11
4.2	Maximum Conducted Output Power	28
4.3	Peak Power Spectral Density	46
4.4	Radiated Emissions (Restricted Bands of Operation)	63
4.5	Frequency Stability	133
4.6	AC Power Line Conducted Emissions	137
4.7	Duty Cycle	142
5	Antenna requirement	150
6	Measurement uncertainty	151
7	Laboratory Information	152
	Appendix A. Test Equipment	153

1 Summary of Test

1.1 Modification history of the test report

Document Number	Modification History	Issue Date
JPD-TR-23098-0	First Issue	Refer to the cover page

1.2 Standards

CFR47 FCC Part 15 Subpart E

1.3 Test methods

ANSI C63.10-2013
KDB662911 D01 Multiple Transmitter Output v02r01
KDB789033 D02 General U-NII Test Procedures New Rules v02r01

1.4 Deviation from standards

None

1.5 List of applied test(s) of the EUT

Test item section	Test item	Condition	Result	Remark
15.407(a)	26dB Bandwidth	Conducted	Reporting Purposes only	-
15.407(a)	Maximum Conducted Output Power	Conducted	PASS	-
15.407(a)	Peak Power Spectral Density	Conducted	PASS	-
15.407(b) 15.205 15.209	Radiated emissions (Restricted Bands of Operation)	Radiated	PASS	-
15.407(g)	Frequency Stability	Conducted	PASS	-
15.207	AC Power Line Conducted Emissions	Conducted	PASS	-
ANSI C63.10, Section 12.2	Duty Cycle	Conducted	Reporting Purposes only	

1.6 Test information

None

1.7 Test set up

Table-top

1.8 Test period

27-July-2023 - 7-September-2023

2 Equipment Under Test

All information in this chapter was provided by the applicant.

2.1 EUT information

Applicant	KYOCERA Corporation Yokohama Office 2-1-1 Kagahara, Tsuzuki-ku Yokohama-shi, Kanagawa, Japan Phone: +81-45-943-6253 Fax: +81-45-943-6314
Equipment Under Test (EUT)	Mobile Phone
Model number	EB1173
Serial number	350614610004222, 350614610006623, 350614610006508
Trade name	Kyocera
Number of sample(s)	3
EUT condition	Pre-Production
Power rating	Battery: DC 3.87 V
Size	(W) 81.2 mm × (D) 17.5 mm × (H) 164.9 mm
Environment	Indoor and Outdoor use
Terminal limitation	-20 °C to 60 °C
Hardware version	DMT1
Software version	EB1173_nightly_20230713
Firmware version	Not applicable
RF Specification	
Protocol	IEEE802.11a, IEEE802.11n (HT20), IEEE802.11n (HT40) IEEE802.11ac (VHT20), IEEE802.11ac (VHT40), IEEE802.11ac (VHT80)
Frequency range	IEEE802.11a/n (HT20) / IEEE802.11ac (VHT20): 5180 MHz-5320 MHz, 5500 MHz-5720 MHz IEEE802.11n (HT40) / IEEE802.11ac (VHT40): 5190 MHz-5310 MHz, 5510 MHz-5710 MHz IEEE802.11ac (VHT80): 5210 MHz, 5290 MHz, 5530 MHz, 5610 MHz, 5690MHz
Number of RF Channels	IEEE802.11a/n (HT20) / IEEE802.11ac (VHT20): 20 Channels IEEE802.11n (HT40) / IEEE802.11ac (VHT40): 10 Channels IEEE802.11ac (VHT80): 5 Channels
Modulation type	IEEE802.11a/n/ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)

Data rate	IEEE802.11a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps IEEE802.11n (HT20 LGI): 6.5, 13, 19.5, 26, 39, 52, 58.5, 65, 78, 86.5Mbps IEEE802.11n (HT20 SGI): 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65, 72.2, 86.7, 96.1Mbps IEEE802.11ac (VHT20 LGI): 6.5, 13, 19.5, 26, 39, 52, 58.5, 65, 78, 86.5Mbps IEEE802.11ac (VHT20 SGI): 7.2, 14.4, 21.7, 28.9, 43.3, 57.8, 65, 72.2, 86.6, 96.1Mbps IEEE802.11n (HT40 LGI): 13.5, 27, 40.5, 54, 81, 108, 121.5, 135, 162, 180Mbps IEEE802.11n (HT40 SGI): 15, 30, 45, 60, 90, 120, 135, 150, 180, 200Mbps IEEE802.11ac (VHT40 LGI): 13.5, 27, 40.5, 54, 81, 108, 121.5, 135, 162, 180Mbps IEEE802.11ac (VHT40 SGI): 15, 30, 45, 60, 90, 120, 135, 150, 180, 200Mbps IEEE802.11ac (VHT80 LGI): 29.5, 58.5, 87.8, 117, 175.5, 234, 263.3, 292.5, 351, 390Mbps IEEE802.11ac (VHT80 SGI): 32.5, 65, 97.5, 130, 195, 260, 292.5, 325, 390, 433.3Mbps
Channel separation	IEEE802.11a/n(HT20) / IEEE802.11ac (VHT20): 20 MHz IEEE802.11n (HT40) / IEEE802.11ac (VHT40): 40 MHz IEEE802.11ac (VHT80): 80 MHz
Conducted power	12.531 mW (IEEE802.11a) 11.771 mW (IEEE802.11n: HT20) 12.334 mW (IEEE802.11n: HT40) 11.593 mW (IEEE802.11ac: VHT80)
Antenna type	Internal antenna
Antenna gain	5.15-5.35 GHz band: 0.3 dBi 5.47-5.725 GHz band: 2.0 dBi

2.2 Modification to the EUT

The table below details modifications made to the EUT during the test project.

Modification State	Description of Modification	Modification fitted by	Date of Modification
Model: EB1173, Serial Number: 350614610004222, 350614610006623, 350614610006508			
0	As supplied by the applicant	Not Applicable	Not Applicable

2.3 Variation of family model(s)

2.3.1 List of family model(s)

	EB1173		EB1169		EB1185		EB1205	
	Pattern1*	Pattern2	Pattern1	Pattern2	Pattern1	Pattern2	Pattern1	Pattern2
hybrid shield	without	with	without	with	without	with	without	with
Radio Function (Cellular)	4G:B2/B4/B5/B12/B41 3G:B2/B4/B5 2G:850/1900						no ※Components are mounted	
Radio Function (etc)	WiFi:2.4G/5G BT/NFC+FeliCa/GPS							
Size	164.9x81.2x17.5[mm]							

*: Tested

The hybrid shield is a resin, so there is no EMC impact.

The hybrid shield is mounted on top of the screen (tempered glass), but the enclosure size remains unchanged.

EB1205 does not use WWAN (2G/3G/4G) functionality. However, WWAN (2G/3G/4G) components are installed.

2.3.2 Reason for selection of EUT

The applicant decided that the differences between the hybrid shield and the design had no EMC impact and selected EB1173 Pattern1 with full function.

2.4 Operating channels and frequencies

[IEEE802.11a/n (HT20) / IEEE802.11ac (VHT20)]

Channel	Frequency [MHz]
36	5180
40	5200
44	5220
48	5240
52	5260
56	5280
60	5300
64	5320
100	5500
104	5520
108	5540
112	5560
116	5580
120	5600
124	5620
128	5640
132	5660
136	5680
140	5700
144	5720

[IEEE802.11n (HT40) / IEEE802.11ac (VHT40)]

Channel	Frequency [MHz]
38	5190
46	5230
54	5270
62	5310
102	5510
110	5550
118	5590
126	5630
134	5670
142	5710

[IEEE802.11ac (VHT80)]

Channel	Frequency [MHz]
42	5210
58	5290
106	5530
122	5610
138	5690

2.5 Description of test mode

The EUT had been tested under operating condition.
There are three channels have been tested as following:

Band	IEEE802.11a/n (HT20) IEEE802.11ac (VHT20)		IEEE802.11n (HT40) IEEE802.11ac (VHT40)		IEEE802.11ac (HT80)	
	Channel	Frequency [MHz]	Channel	Frequency [MHz]	Channel	Frequency [MHz]
5.2 GHz Band	36	5180	38	5190	42	5210
	40	5200	-	-	-	-
	48	5240	46	5230	-	-
5.3 GHz Band	52	5260	54	5270	58	5290
	56	5280	-	-	-	-
	64	5320	62	5310	-	-
5.6 GHz Band	100	5500	102	5510	106	5530
	116	5580	110	5550	122	5610
	140	5700	134	5670	138	5690
	144	5720	142	5710	-	-

The pre-test has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates.

Band	Modulation Type	Data Rate
5.2 GHz Band	IEEE802.11a: OFDM	6Mbps
	IEEE802.11n (HT20): OFDM	MCS0 (6.5Mbps)
	IEEE802.11n (HT40): OFDM	MCS0 (13.5Mbps)
	IEEE802.11ac (VHT80): OFDM	MCS0 (29.5Mbps)
5.3 GHz Band	IEEE802.11a: OFDM	6Mbps
	IEEE802.11n (HT20): OFDM	MCS0 (6.5Mbps)
	IEEE802.11n (HT40): OFDM	MCS0 (13.5Mbps)
	IEEE802.11ac (VHT80): OFDM	MCS0 (29.5Mbps)
5.6 GHz Band	IEEE802.11a: OFDM	6Mbps
	IEEE802.11n (HT20): OFDM	MCS0 (6.5Mbps)
	IEEE802.11n (HT40): OFDM	MCS0 (13.5Mbps)
	IEEE802.11ac (VHT80): OFDM	MCS0 (29.5Mbps)

The field strength of spurious emissions was measured at each position of all three axis X, Y and Z to compare the level, and the maximum noise.

The worst emission was found in Z-axis, and the worst case recorded.

Pre-scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports.



Japan

2.6 Operating flow

- Tx mode

- i) Test program setup to the Software
- ii) Select a Test mode
Operating frequency: 5.2GHz Band, 5.3GHz Band, 5.6GHz Band
- iii) Start test mode

- Rx mode

- i) Test program setup to the Software
- ii) Select a Test mode
Operating frequency: 5.2GHz Band, 5.3GHz Band, 5.6GHz Band
- iii) Start test mode

3 Configuration of Equipment

Numbers assigned to equipment on the diagram in “3.3 System configuration” correspond to the lists in “3.1 Equipment used” and “3.2 Cable(s) used”.

This test configuration is based on the manufacture’s instruction.

Cabling and setup(s) were taken into consideration and test data was taken under worse case condition.

3.1 Equipment used

No.	Equipment	Company	Model No.	Serial No.	FCC ID/DoC	Comment
1	Mobile Phone	KYOCERA	EB1173	350614610004222, 350614610006623, 350614610006508	JOYEB1173	EUT
2	AC Adapter	KDDI	0602PQA	N/A	N/A	*

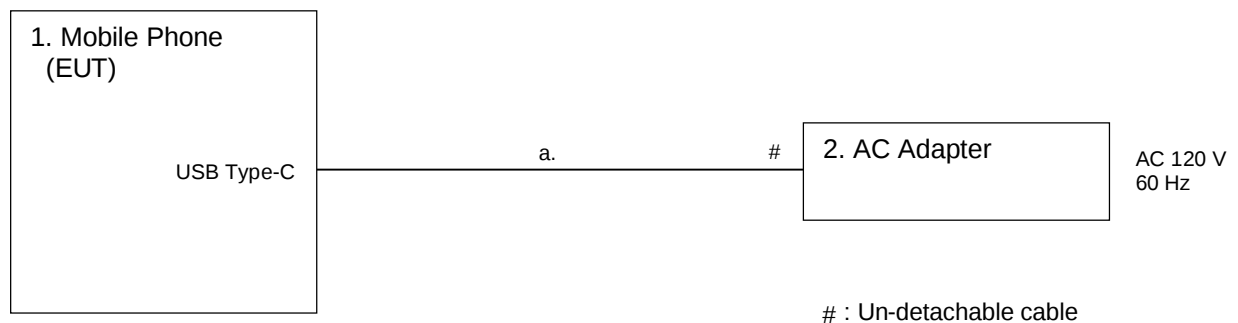
*: AC power line Conducted Emission Test.

3.2 Cable(s) used

No.	Equipment	Length[m]	Shield	Connector	Comment
a	USB cable (for AC Adapter)	1.5	No	Plastic	*

*: AC power line Conducted Emission Test.

3.3 System configuration



4 Test Result

4.1 26dB Bandwidth and 99% Occupied Bandwidth

4.1.1 Measurement procedure

[FCC 15.407(a), KDB 789033 D02, Section C, D]

The 26dB bandwidth and 99% occupied bandwidth is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

- RBW=200 kHz/430 kHz/820 kHz, VBW=620 kHz/1.3 MHz/2.4 MHz, Span=40 MHz/80 MHz/160 MHz
- Sweep=auto, Detector=Peak, Trace mode=Max hold

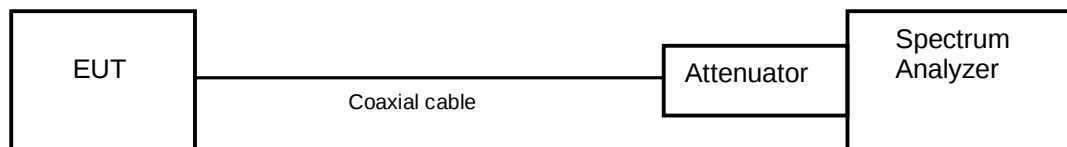
The EUT was set to operate with following conditions.

- 5.2 GHz Band, 5.3 GHz Band, 5.6 GHz Band

The test mode of EUT is as follows.

- Tx mode

- Test configuration



4.1.2 Limit

None

4.1.3 Measurement result

Date : 2-August-2023

Temperature : 24.6 [°C]

Humidity : 56.3 [%]

Test place : Shielded room No.4

Test engineer : Nobuyuki Toda

Mode	Band	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% Occupied bandwidth (MHz)
802.11a	5.2GHz Band	36	5180	19.658	16.4093
		40	5200	19.865	16.3971
		48	5240	19.843	16.3756
	5.3GHz Band	52	5260	19.909	16.4114
		56	5280	19.873	16.4244
		64	5320	19.874	16.4046
	5.6GHz Band	100	5500	19.862	16.4159
		116	5580	19.762	16.4405
		140	5700	19.675	16.4086
		144	5720	19.657	16.3807

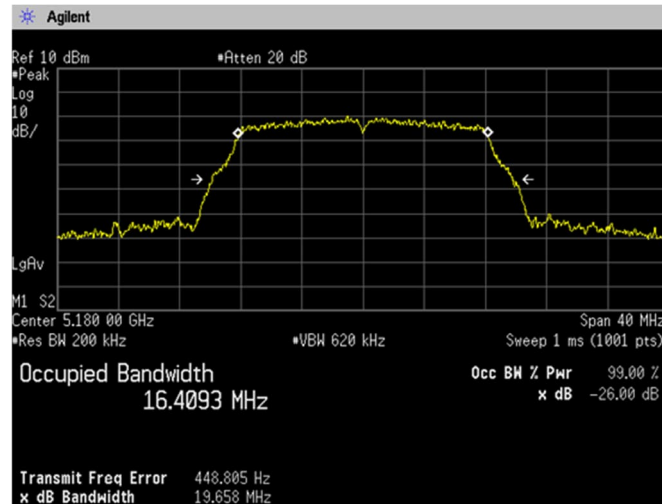
Mode	Band	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% Occupied bandwidth (MHz)
802.11n (20MHz)	5.2GHz Band	36	5180	20.013	17.5314
		40	5200	20.026	17.5426
		48	5240	20.075	17.5249
	5.3GHz Band	52	5260	20.321	17.5219
		56	5280	20.000	17.5546
		64	5320	20.037	17.5169
	5.6GHz Band	100	5500	20.136	17.5423
		116	5580	20.238	17.5091
		140	5700	20.056	17.5432
		144	5720	20.188	17.5523

Mode	Band	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% Occupied bandwidth (MHz)
802.11n (40MHz)	5.2GHz Band	38	5190	40.358	35.9866
		46	5230	40.382	35.9940
	5.3GHz Band	54	5270	40.375	35.9735
		62	5310	40.352	35.9688
	5.6GHz Band	102	5510	40.240	35.9693
		110	5550	40.635	35.9960
		134	5670	40.114	35.9721
		142	5710	40.555	35.9891

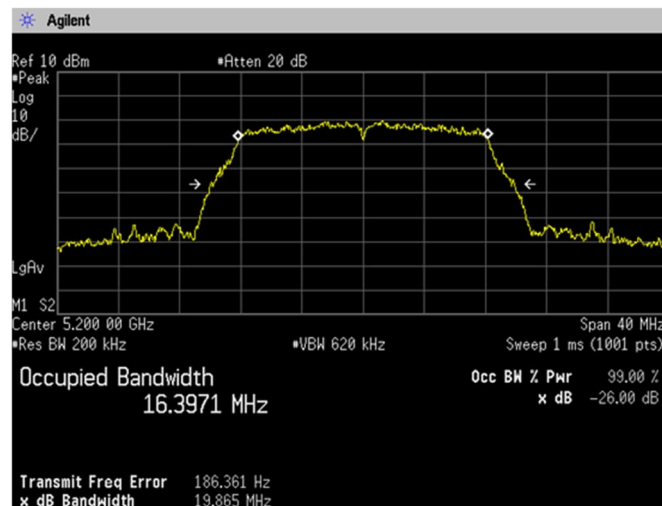
Mode	Band	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% Occupied bandwidth (MHz)
802.11ac (80MHz)	5.2GHz Band	42	5210	80.483	75.1776
	5.3GHz Band	58	5290	80.889	75.1325
	5.6GHz Band	106	5530	80.627	75.1207
		122	5610	80.540	75.1582
		138	5690	80.549	75.1446

4.1.4 Trace data

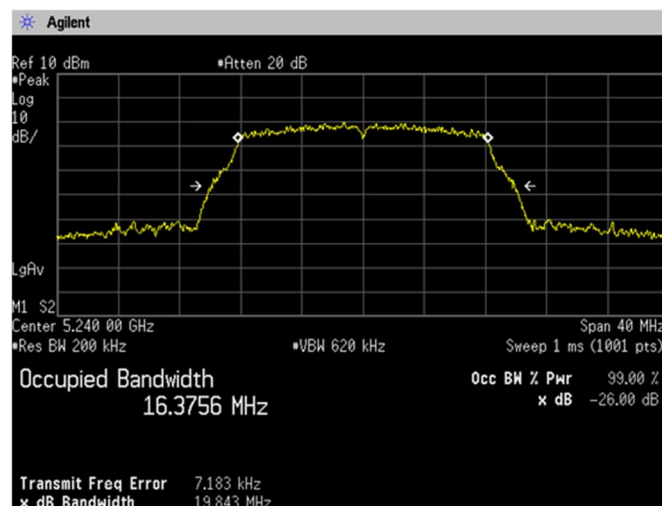
[IEEE802.11a]
(5.2 GHz Band)
Channel: 36



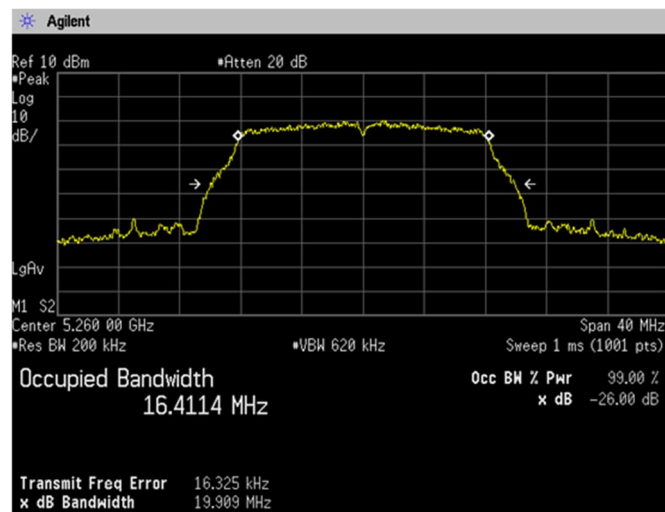
Channel: 40



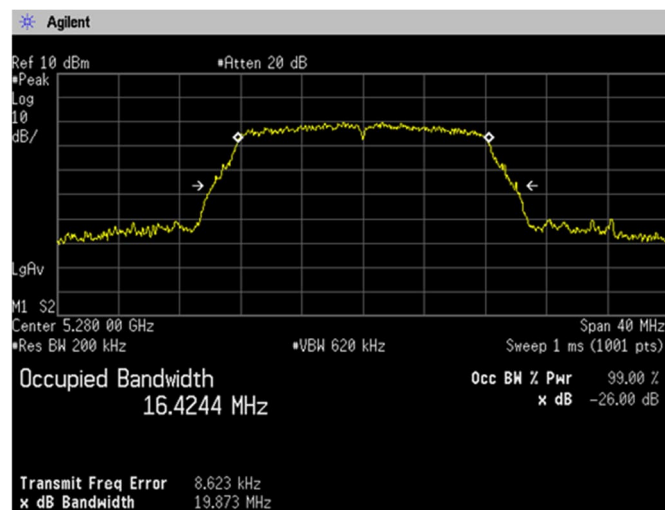
Channel: 48



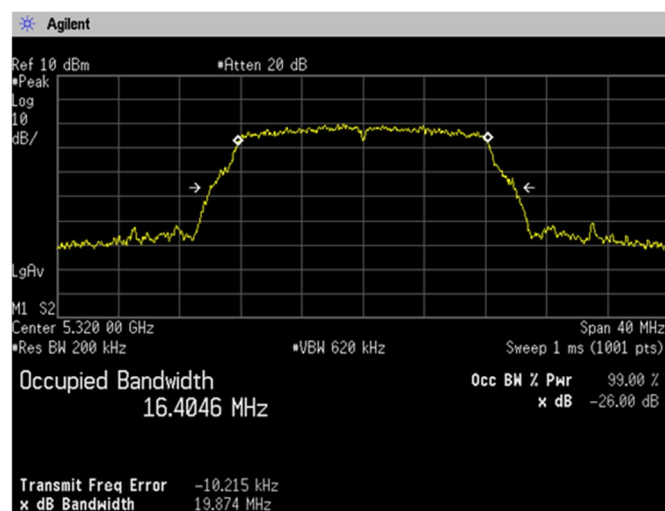
(5.3 GHz Band)
Channel: 52

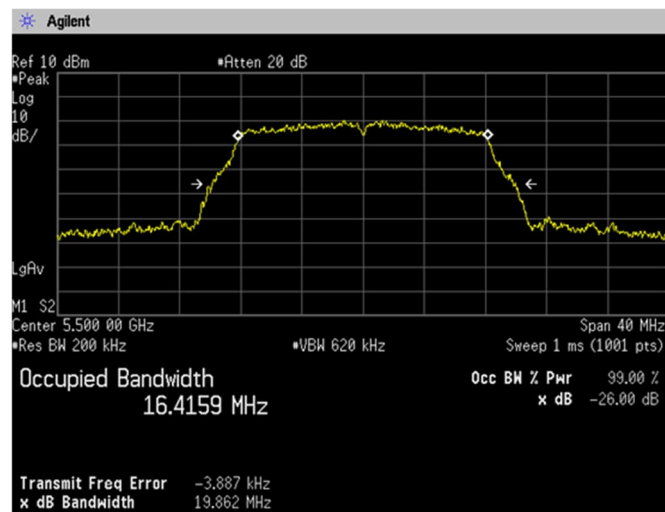
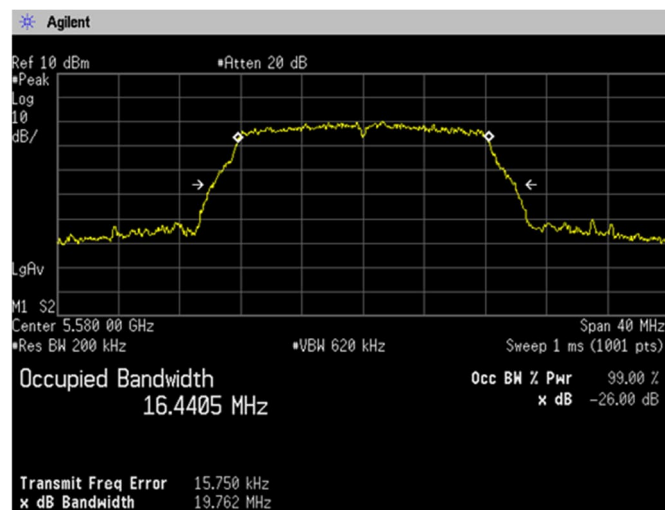
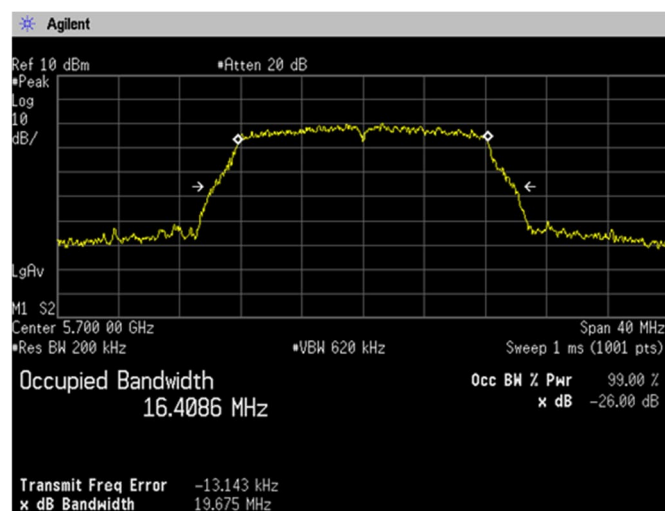


Channel: 56

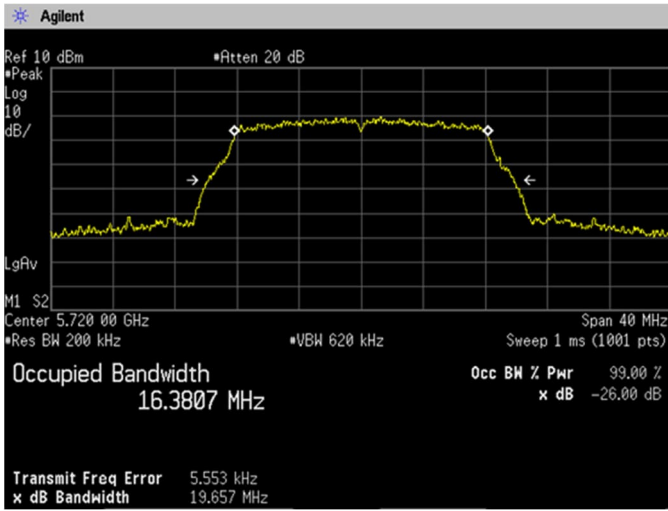


Channel: 64

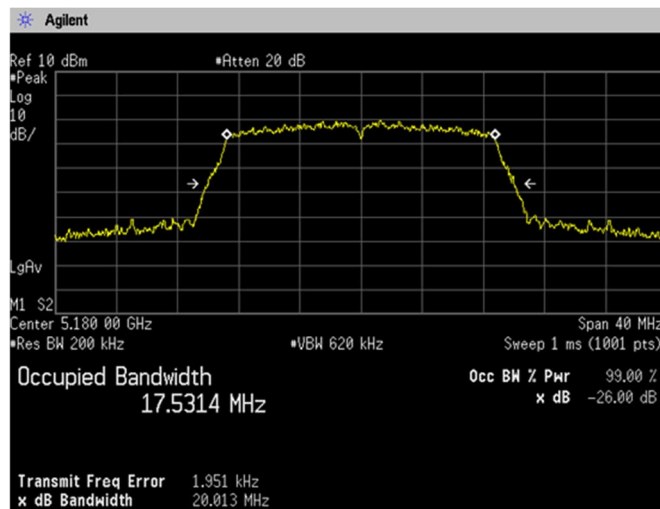


**(5.6 GHz Band)
Channel: 100****Channel: 116****Channel: 140**

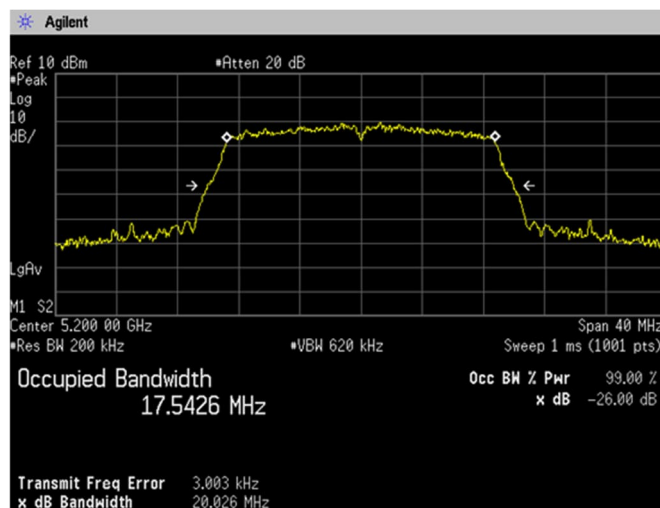
(5.6 GHz Band)
Channel: 144



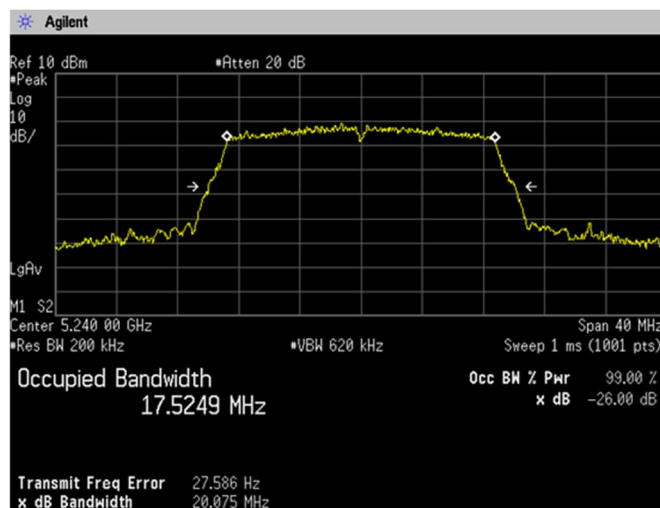
[IEEE802.11n (HT20)]
(5.2 GHz Band)
Channel: 36

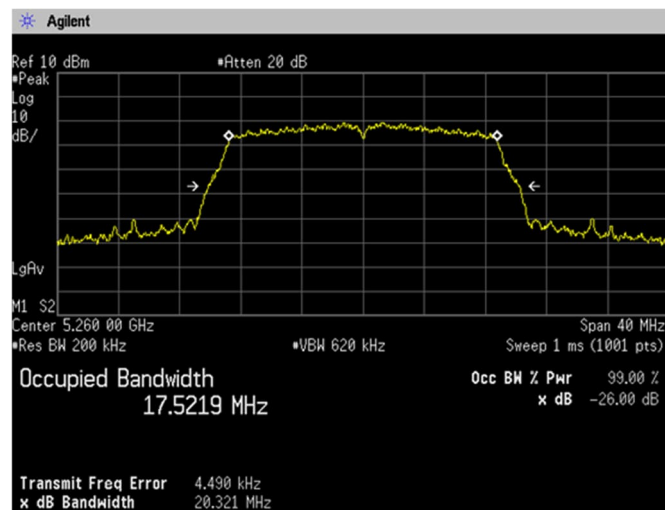
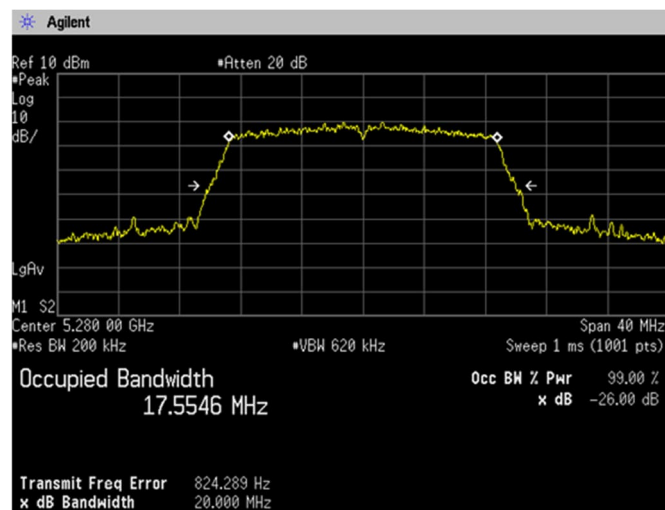
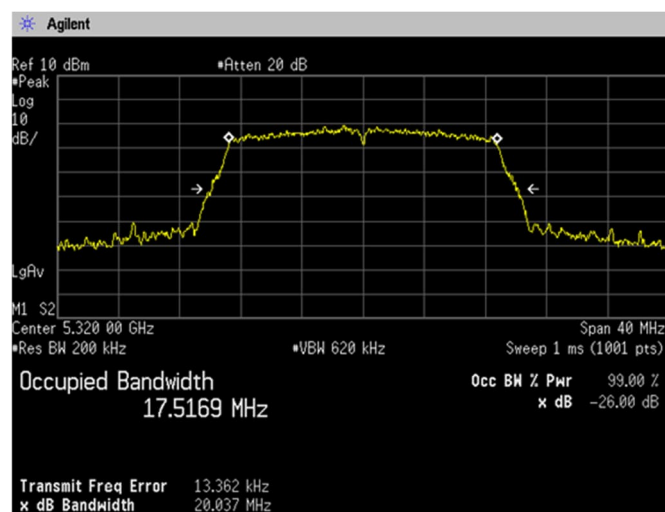


Channel: 40

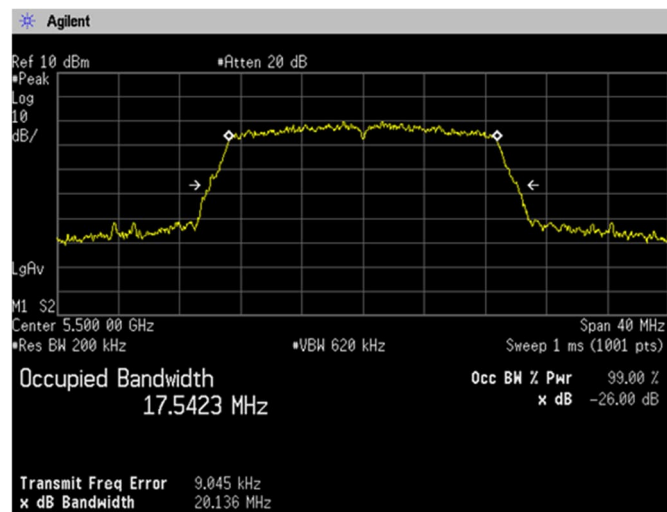


Channel: 48

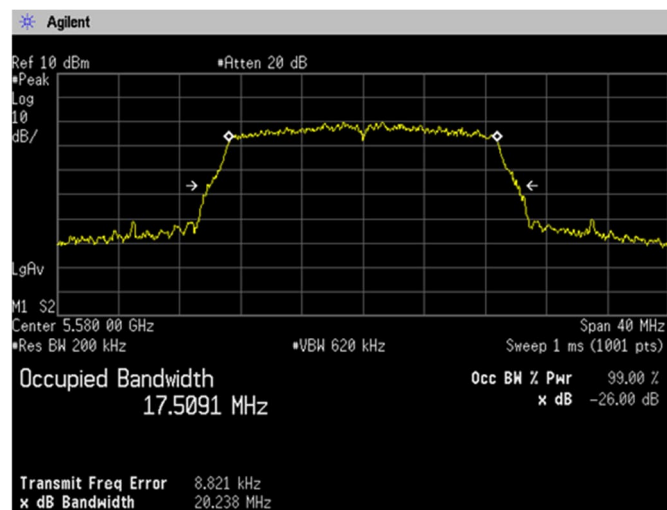


**(5.3 GHz Band)
Channel: 52****Channel: 56****Channel: 64**

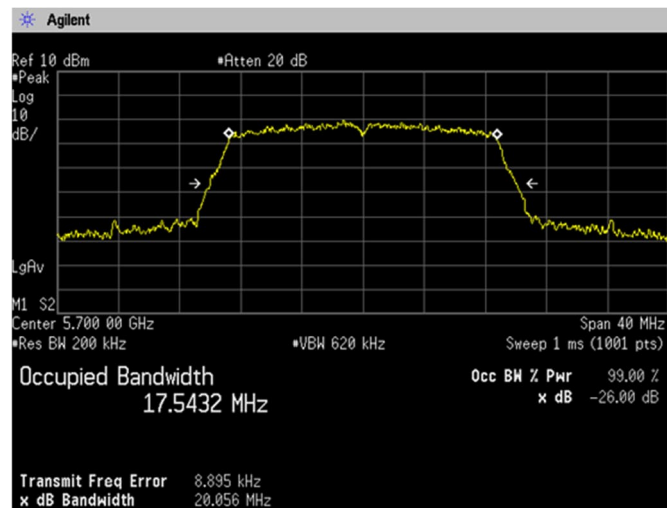
**(5.6 GHz Band)
Channel: 100**



Channel: 116

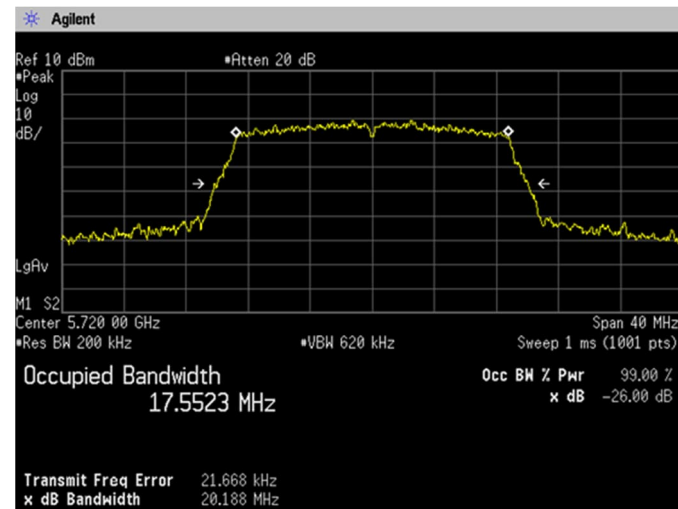


Channel: 140

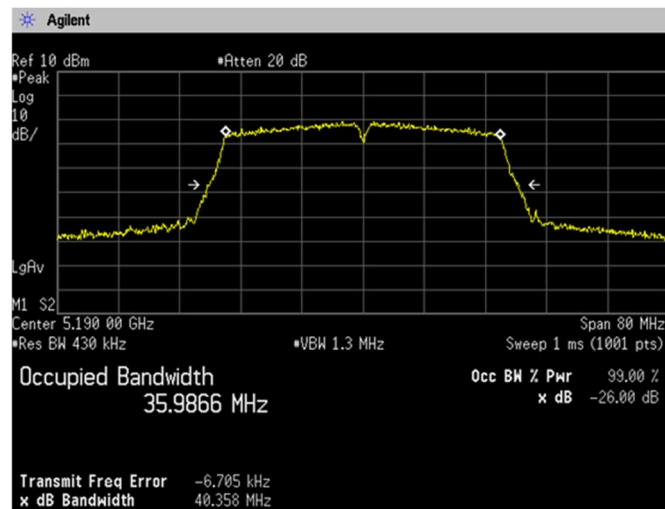


(5.6 GHz Band)

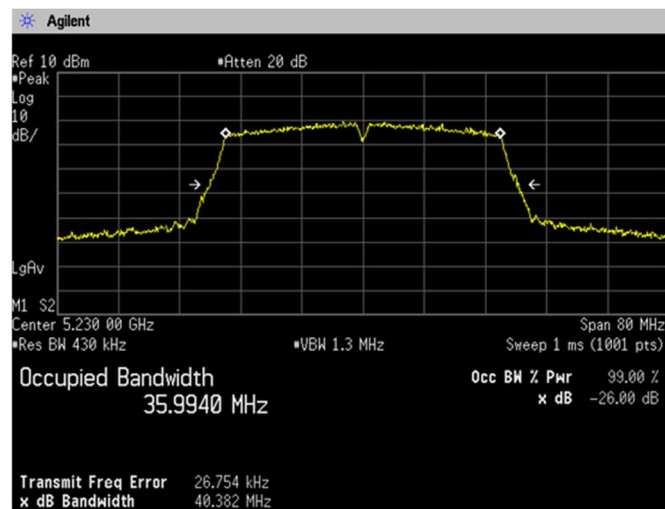
Channel: 144



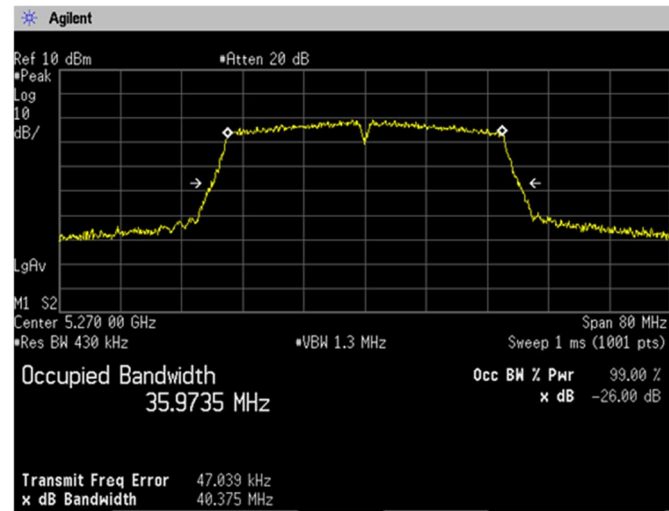
[IEEE802.11n (HT40)]
(5.2 GHz Band)
Channel: 38



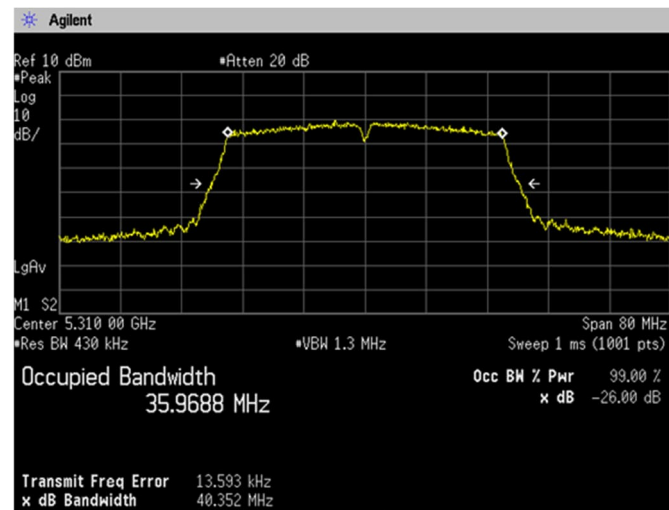
Channel: 46

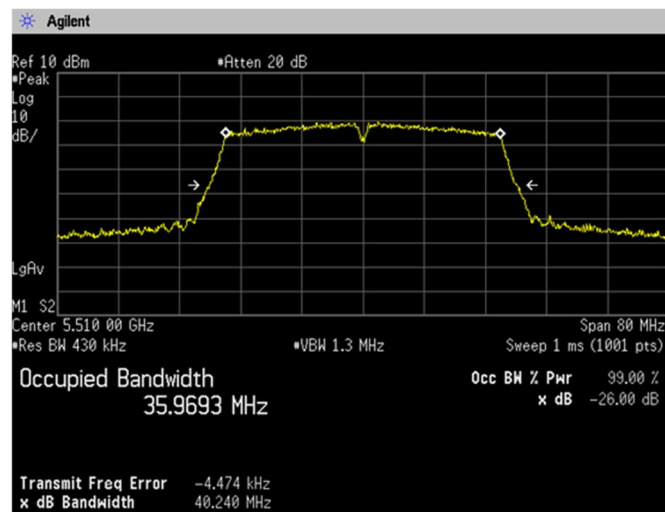
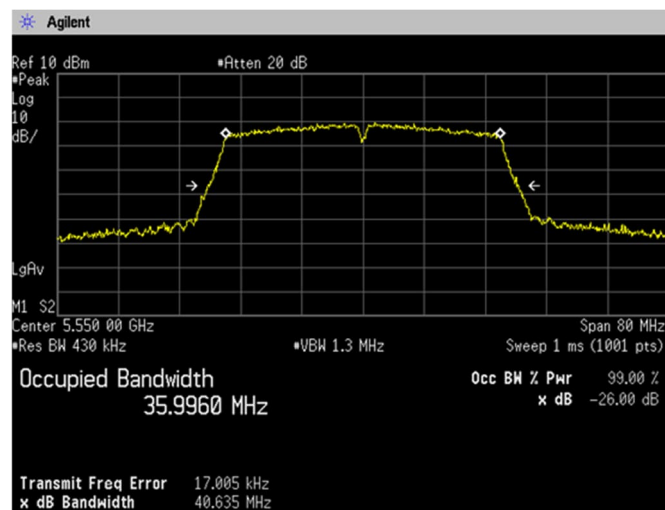
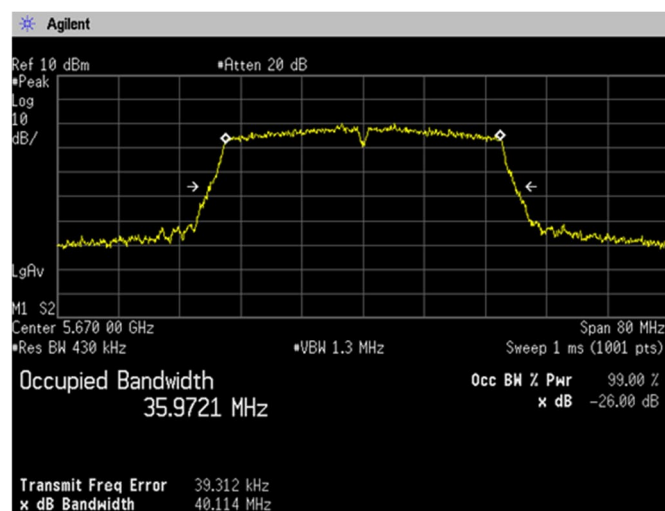


(5.3 GHz Band)
Channel: 54

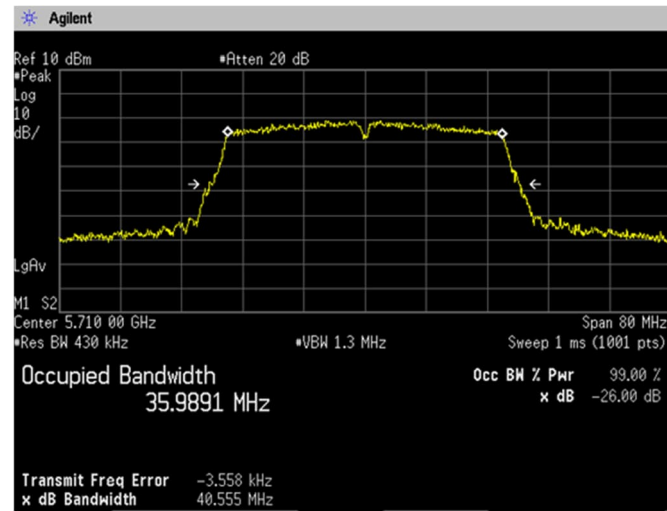


Channel: 62

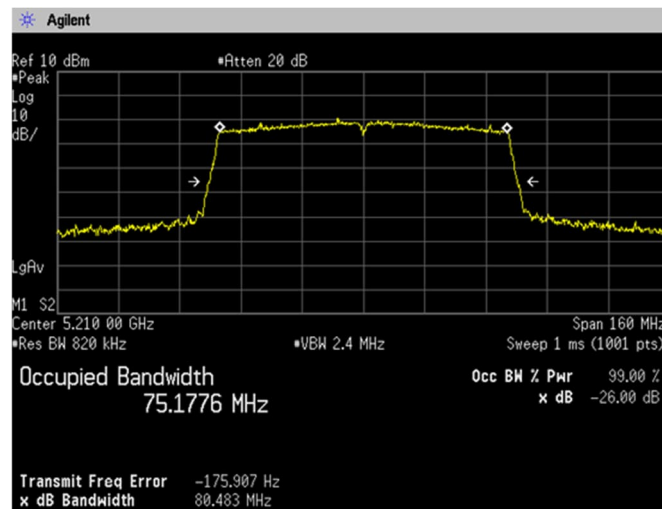


**(5.6 GHz Band)
Channel: 102****Channel: 110****Channel: 134**

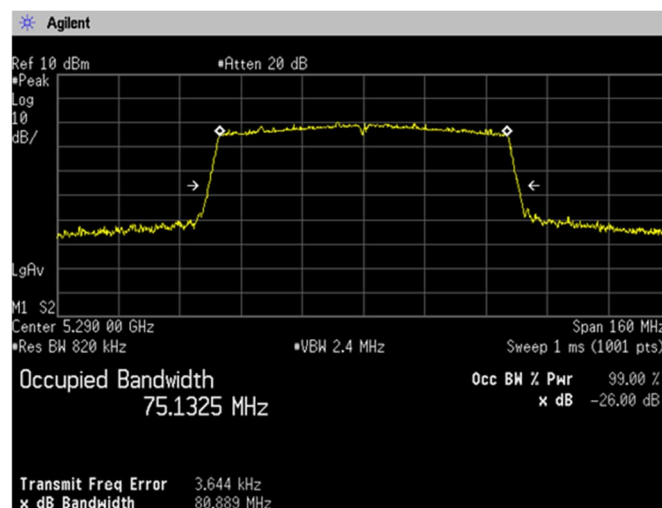
(5.6 GHz Band)
Channel: 142



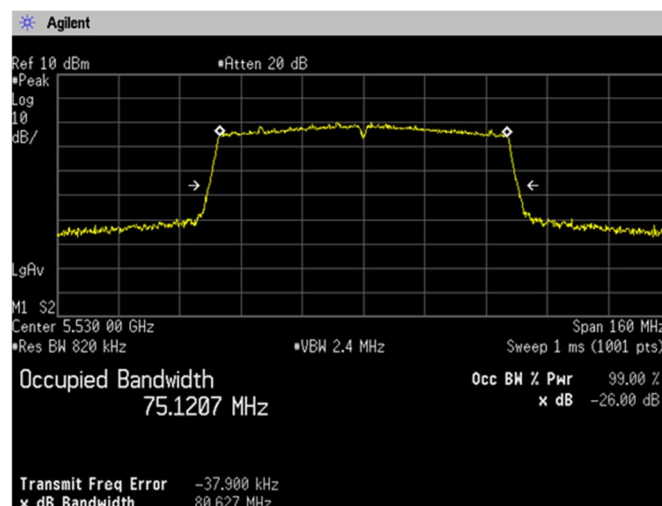
[IEEE802.11ac (HT80)]
(5.2 GHz Band)
Channel: 42



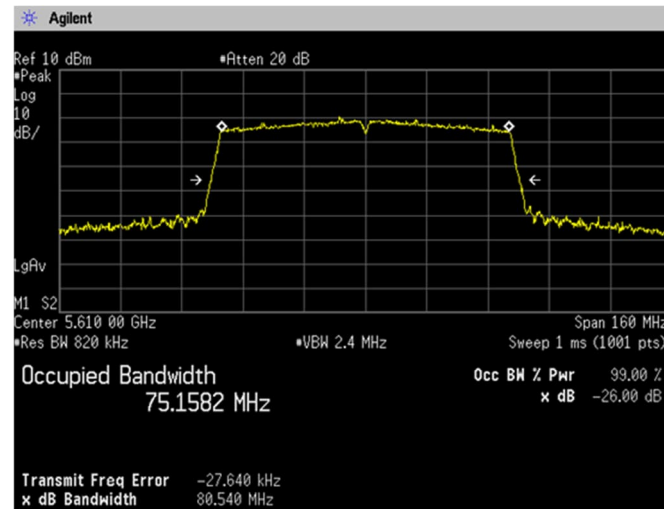
(5.3GHz Band)
Channel: 58



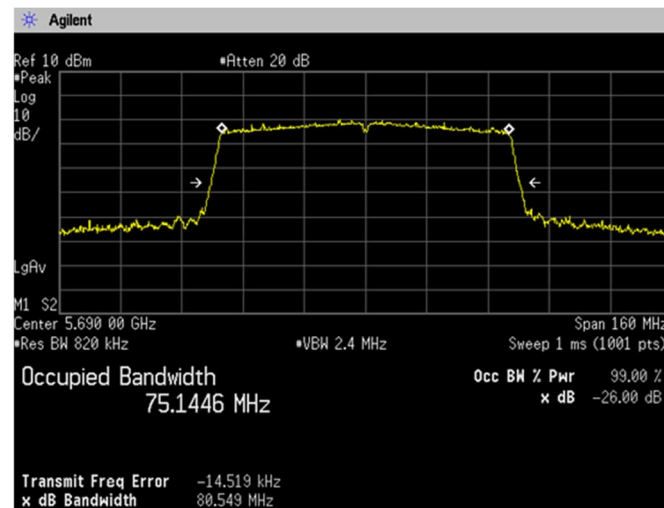
(5.6 GHz Band)
Channel: 106



(5.6 GHz Band)
Channel: 122



Channel: 138



4.2 Maximum Conducted Output Power

4.2.1 Measurement procedure

[FCC 15.407(a), KDB 789033 D02, Section E.2.b) Method SA-1, d) Method SA-2]

The peak power is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

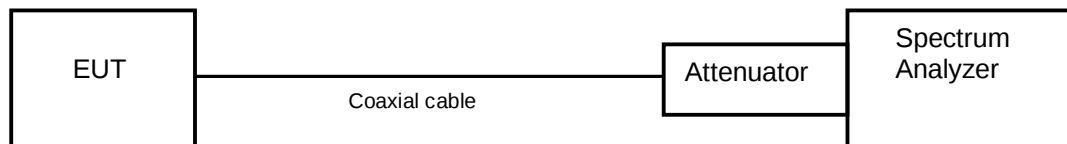
- RBW=1MHz, VBW=3MHz, Span=35MHz/70MHz/140MHz, Sweep=auto, Detector=RMS, Trace mode=Averaging

The EUT was set to operate with following conditions.

- 5.2GHz Band, 5.3GHz Band, 5.6GHz Band

The test mode of EUT is as follows.

- Tx mode
- Test configuration



4.2.2 Limit

- (1) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed 250mW provided the maximum antenna gain does not exceed 6 dBi.
- (2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250mW or $11\text{dBm} + 10\log B$, where B is the 26dB emission bandwidth in megahertz.
- (3) For the 5.725-5.85 GHz bands, the maximum conducted output power over the frequency band of operation shall not exceed 1 W.

<Output Power Limit Calculation>

Band	Mode	Power Limit (mW)	Calculated Limit (dBm)	Antenna Gain (dBi)	Determined Limit (dBm)
5.2GHz Band	802.11a	250	23.97	0.3	23.97
	802.11n HT20				
	802.11n HT20				
	802.11ac HT80				

Band	Mode	Power Limit (mW)	Calculated Limit (dBm)	Antenna Gain (dBi)	Determined Limit (dBm)
		Least 26dBc BW (MHz)			
5.3GHz Band	802.11a	250	23.97	0.3	23.97
		19.873	23.98		
	802.11n HT20	250	23.97		23.97
		20.000	24.01		
	802.11n HT20	250	23.97		23.97
		40.352	27.06		
	802.11ac HT80	250	23.97		23.97
		80.889	30.08		

Band	Mode	Power Limit (mW)	Calculated Limit (dBm)	Antenna Gain (dBi)	Determined Limit (dBm)
		Least 26dBc BW (MHz)			
5.6GHz Band	802.11a	250	23.97	2.0	23.94
		19.675	23.94		
	802.11n HT20	250	23.97		23.97
		20.056	24.02		
	802.11n HT20	250	23.97		23.97
		40.114	27.03		
	802.11ac HT80	250	23.97		23.97
		80.540	30.06		

4.2.3 Measurement result

Date : 2-August-2023

Temperature : 24.6 [°C]

Humidity : 56.3 [%]

Test place : Shielded room No.4

Test engineer :

Nobuyuki Toda

Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)	Test Result (mW)
				On Time(ms)	On+Off Time(ms)	X			
802.11a	36	5180	10.10	1.392	1.428	0.975	0.110	10.210	10.495
	40	5200	10.51					10.620	11.535
	58	5240	10.07					10.180	10.423
	52	5260	10.87	1.392	1.428	0.975	0.110	10.980	12.531
	56	5280	10.16					10.270	10.641
	64	5320	10.41					10.520	11.272
	100	5500	10.13	1.392	1.428	0.975	0.110	10.240	10.568
	116	5580	10.63					10.740	11.858
	140	5700	10.67					10.780	11.967
	144	5720	10.46					10.570	11.402

Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)	Test Result (mW)
				On Time(ms)	On+Off Time(ms)	X			
802.11n (20MHz)	36	5180	10.25	1.286	1.324	0.971	0.128	10.378	10.909
	40	5200	9.98					10.108	10.252
	58	5240	10.31					10.438	11.061
	52	5260	9.74	1.286	1.324	0.971	0.128	9.868	9.701
	56	5280	10.27					10.398	10.960
	64	5320	10.30					10.428	11.036
	100	5500	10.31	1.286	1.324	0.971	0.128	10.438	11.061
	116	5580	10.58					10.708	11.771
	140	5700	10.36					10.488	11.189
	144	5720	10.36					10.488	11.189

Note1: $X = \text{On time} / (\text{On} + \text{Off time})$, $\text{DCF} = 10 \log (1/x)$

Note2: Test Result=Reading + DCF

Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)	Test Result (mW)
				On Time(ms)	On+Off Time(ms)	X			
802.11n (40MHz)	38	5190	10.29	0.635	0.671	0.946	0.241	10.531	11.301
	46	5230	10.08					10.321	10.767
	54	5270	10.19	0.635	0.671	0.946	0.241	10.431	11.043
	62	5310	10.33					10.571	11.405
	102	5510	10.67	0.635	0.671	0.946	0.241	10.911	12.334
	110	5550	10.47					10.711	11.779
	134	5670	10.47					10.711	11.779
	142	5710	10.48					10.721	11.806

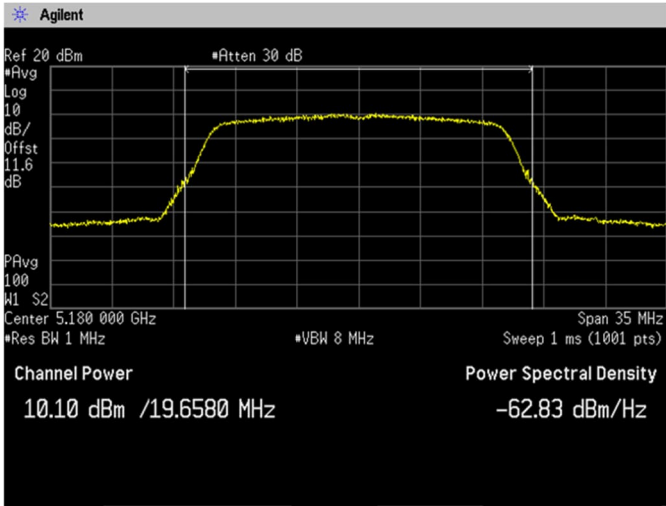
Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)	Test Result (mW)
				On Time(ms)	On+Off Time(ms)	X			
802.11ac (80MHz)	42	5210	9.81	0.323	0.360	0.897	0.472	10.282	10.671
	58	5290	10.04	0.323	0.360	0.897	0.472	11.412	13.842
	106	5530	10.17	0.323	0.360	0.897	0.472	10.642	11.593
	122	5610	10.07	0.323	0.360	0.897	0.472	10.542	11.329
	138	5690	10.16	0.323	0.360	0.897	0.472	10.632	11.566

Note1: $X = \text{On time} / (\text{On} + \text{Off time})$, $\text{DCF} = 10 \log (1/x)$

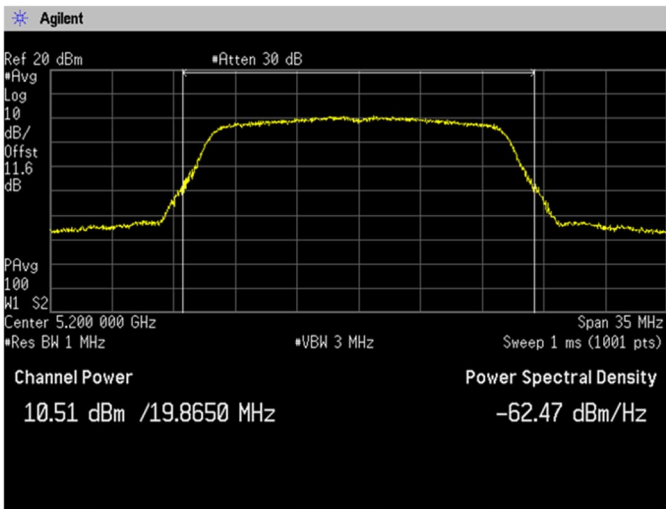
Note2: $\text{Test Result} = \text{Reading} + \text{DCF}$

4.2.4 Trace data

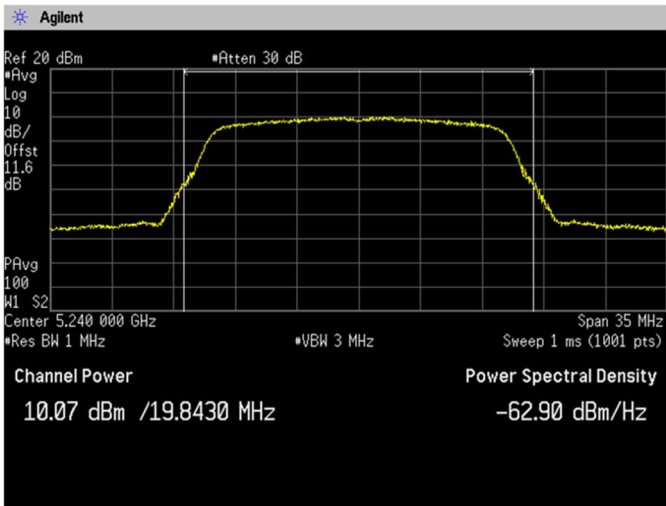
[IEEE802.11a]
(5.2 GHz Band)
Channel: 36

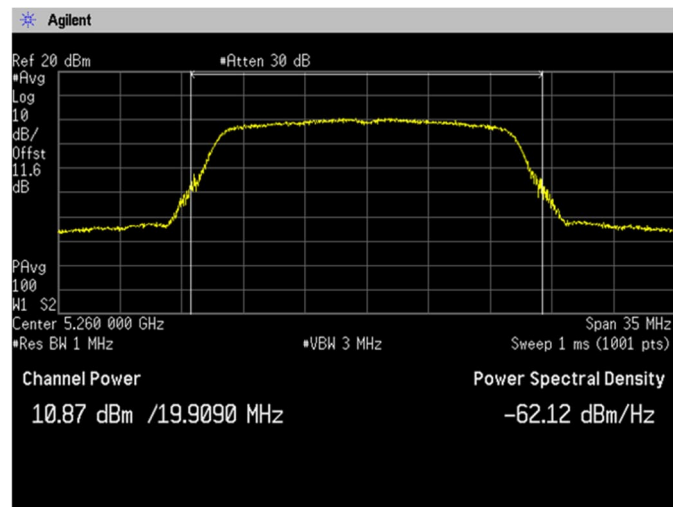
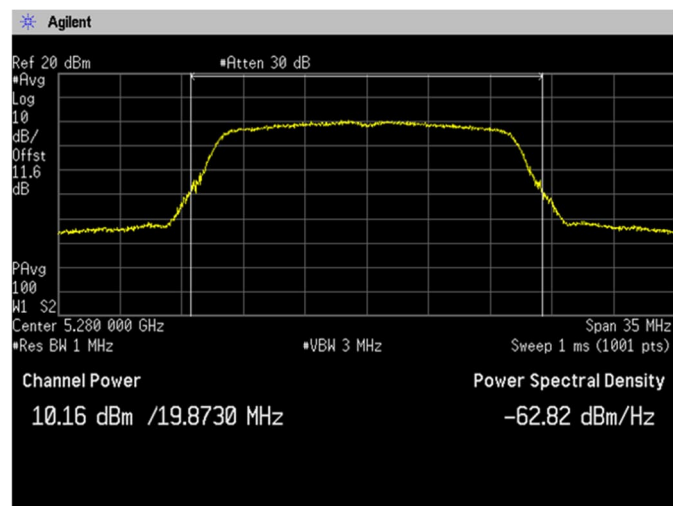
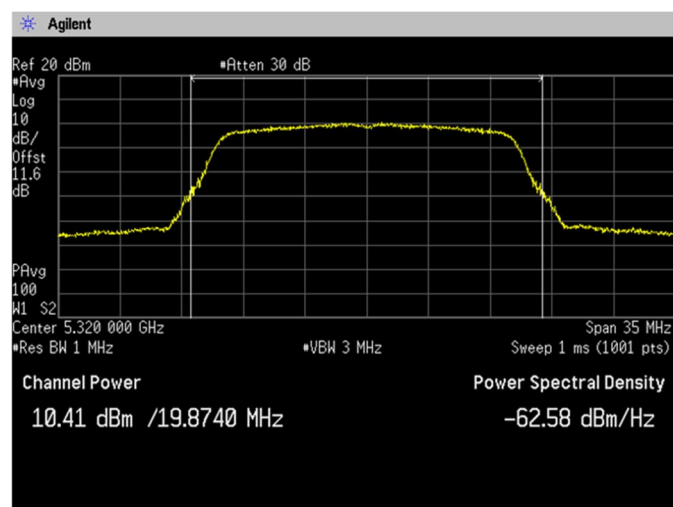


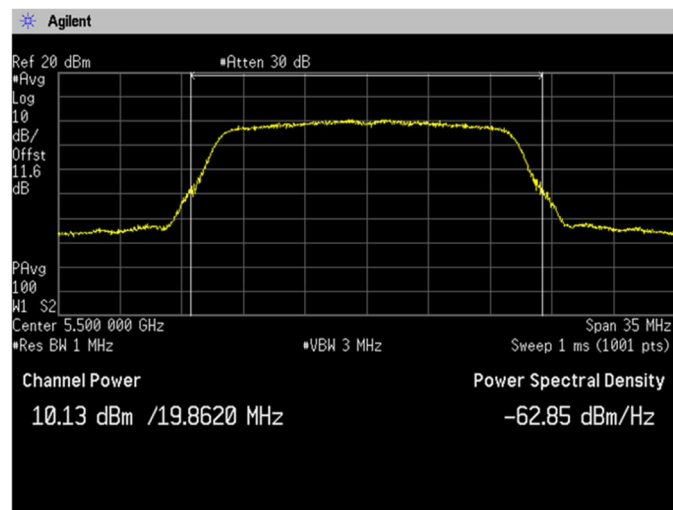
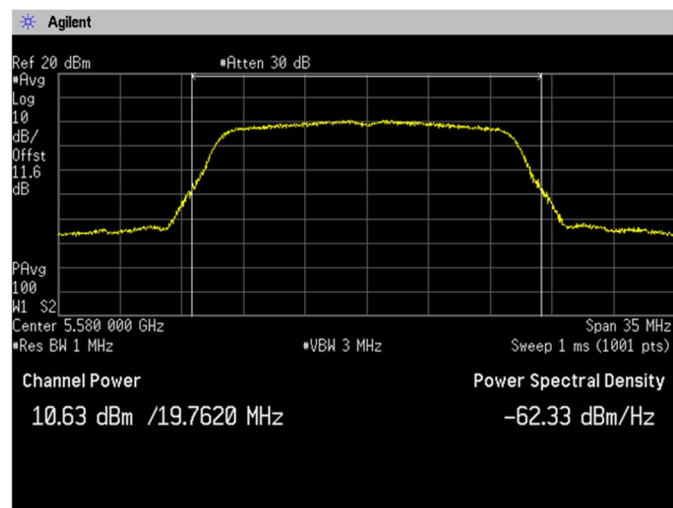
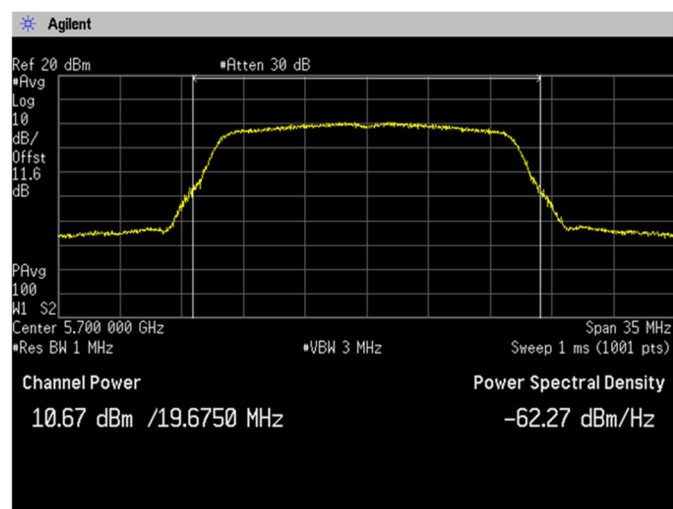
Channel: 40



Channel: 48



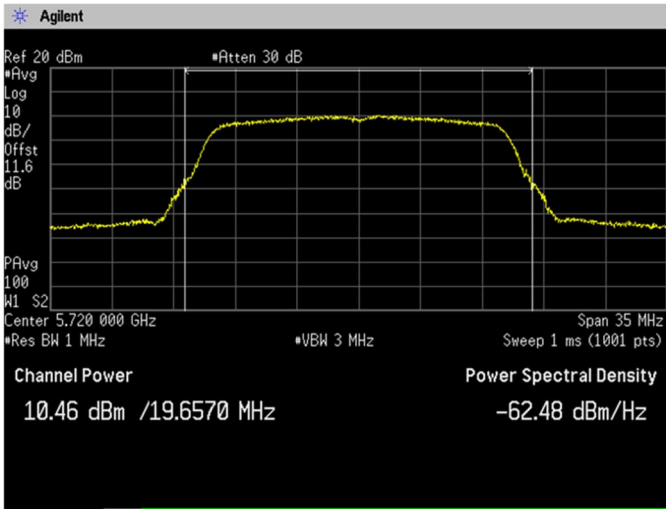
**(5.3 GHz Band)
Channel: 52****Channel: 56****Channel: 64**

**(5.6 GHz Band)
Channel: 100****Channel: 116****Channel: 140**

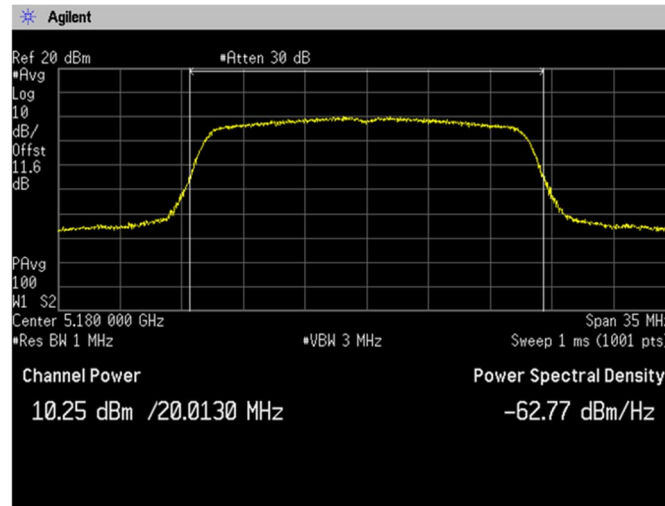


Japan

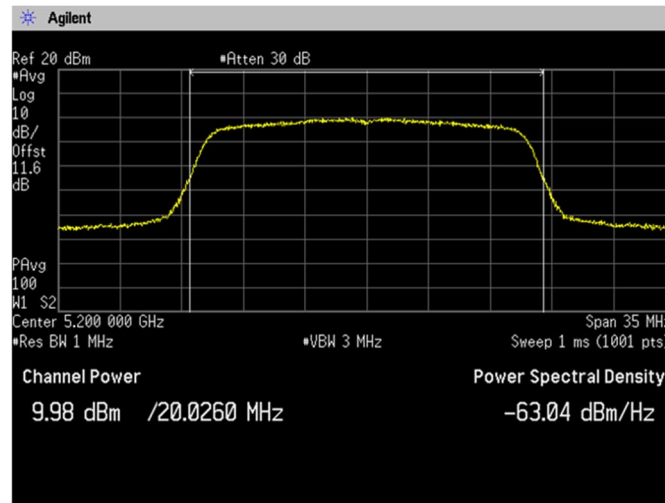
(5.6 GHz Band)
Channel: 144



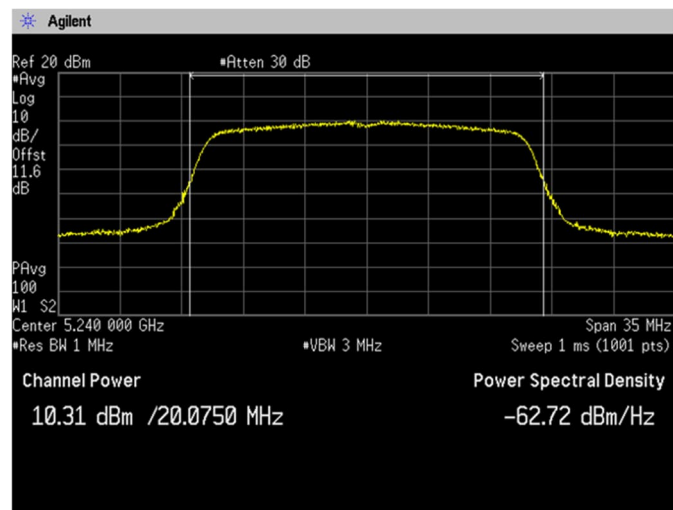
**[IEEE802.11n (HT20)]
(5.2 GHz Band)
Channel: 36**



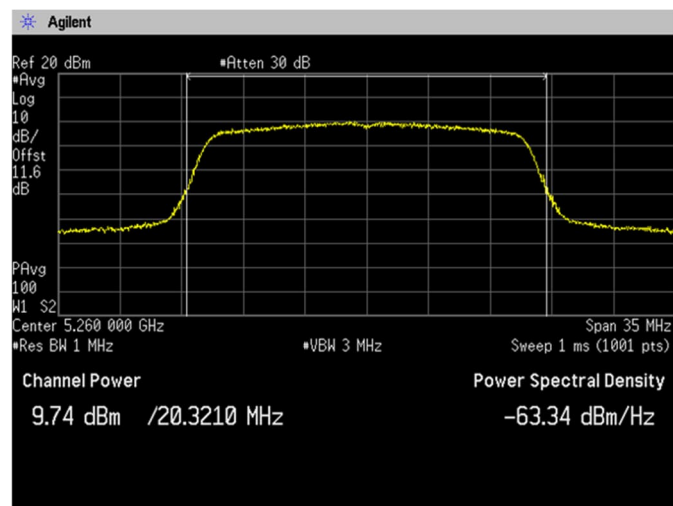
Channel: 40



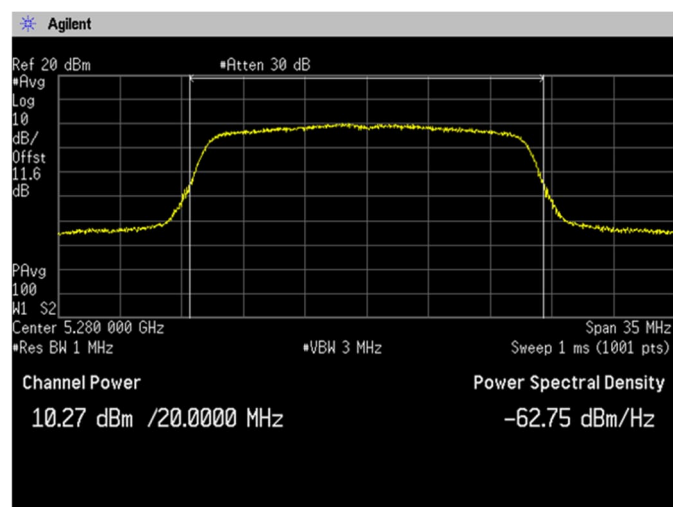
(5.2 GHz Band)
Channel: 48



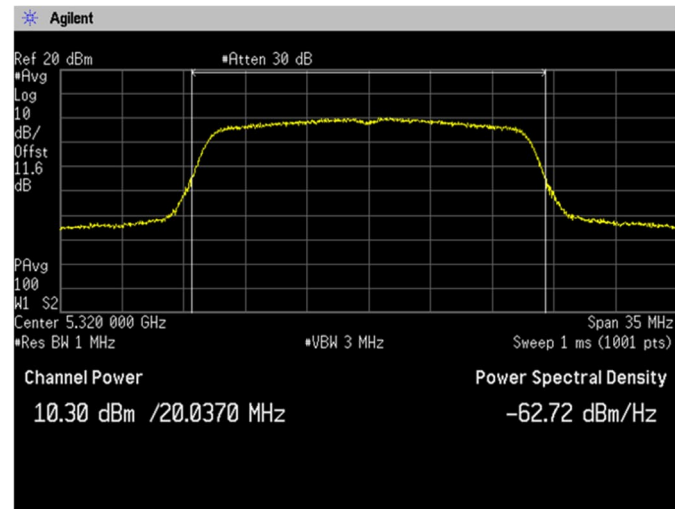
(5.3 GHz Band)
Channel: 52



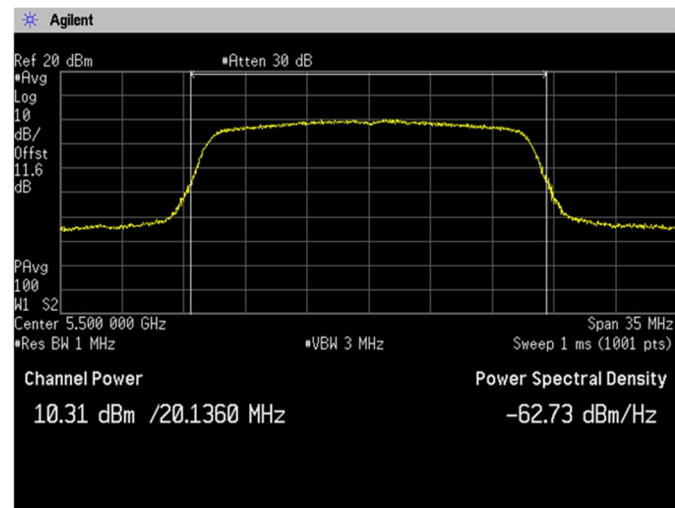
Channel: 56



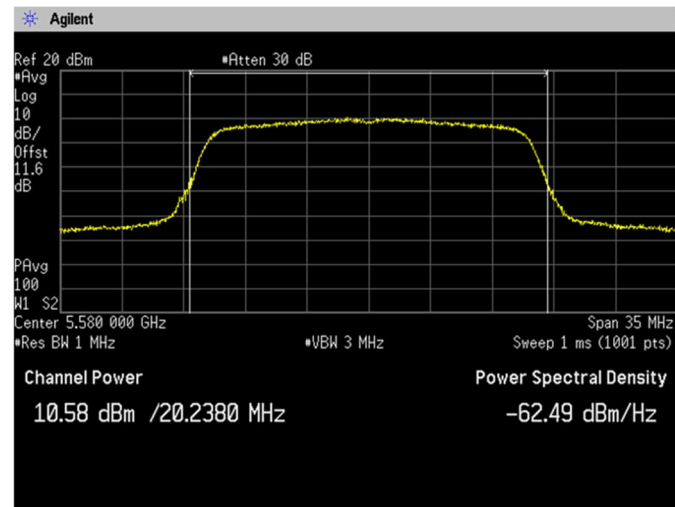
**(5.3 GHz Band)
Channel: 64**



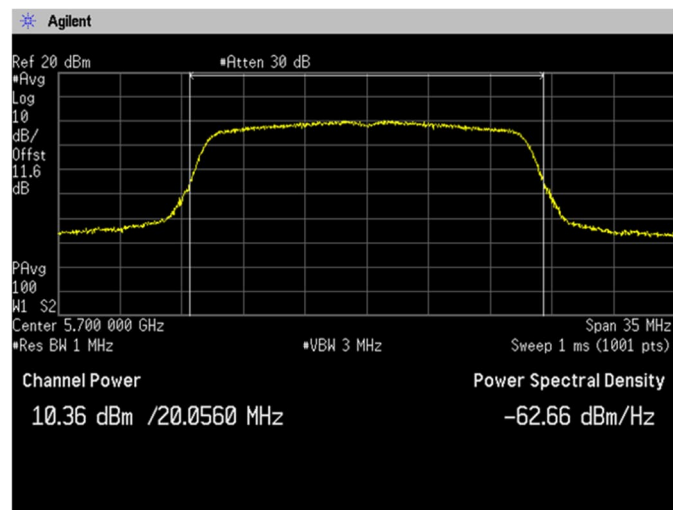
**(5.6 GHz Band)
Channel: 100**



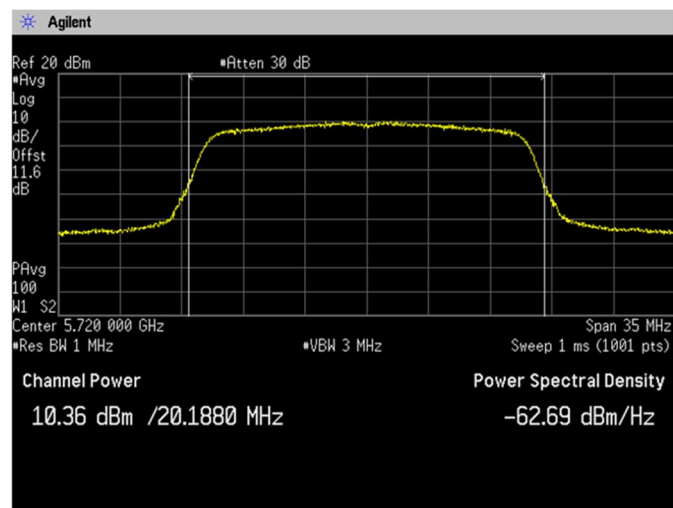
Channel: 116



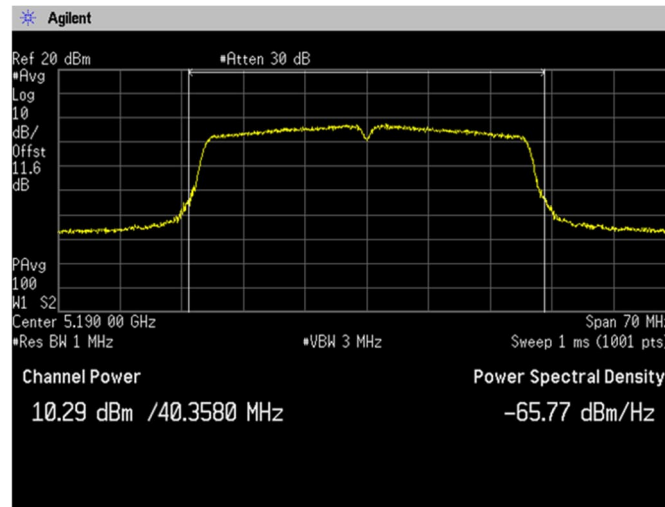
**(5.6 GHz Band)
Channel: 140**



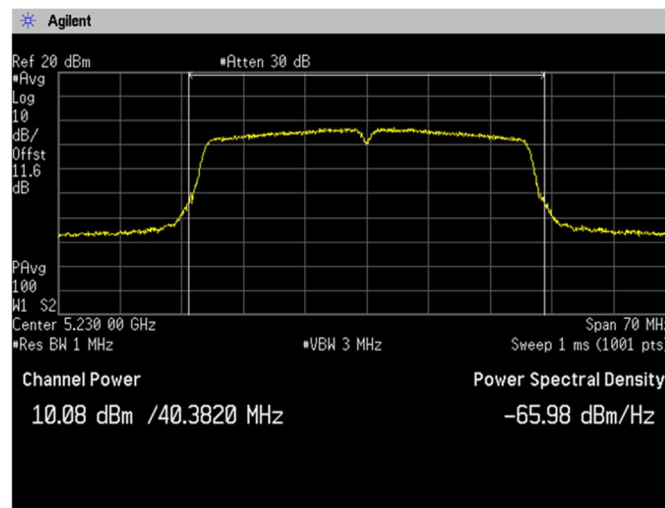
Channel: 144



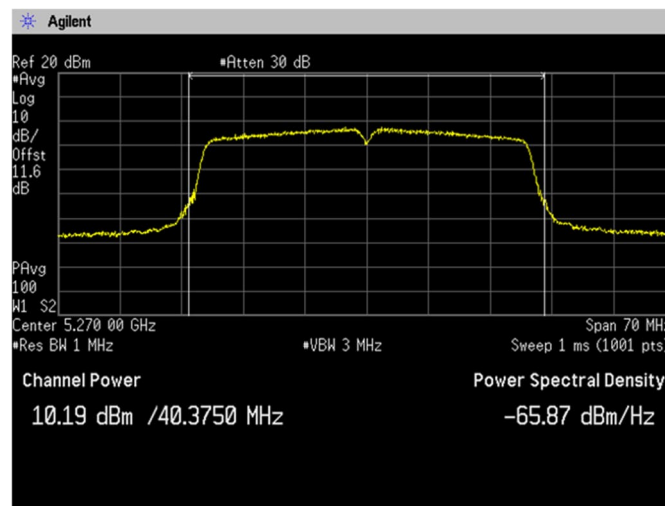
**[IEEE802.11n (HT40)]
(5.2 GHz Band)
Channel: 38**



**(5.2 GHz Band)
Channel: 46**



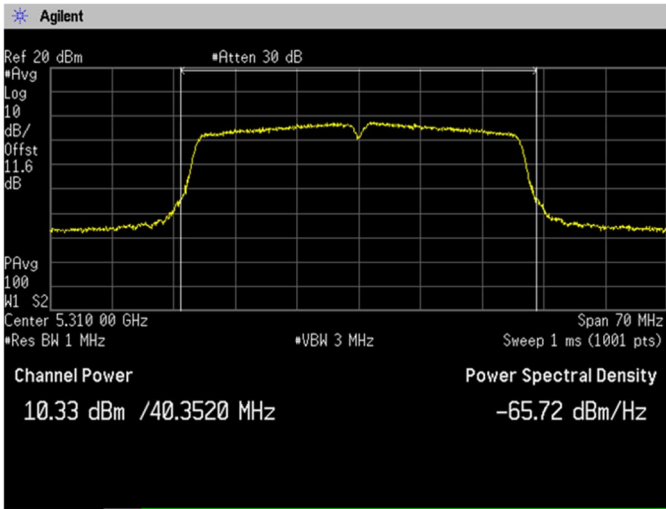
**(5.3 GHz Band)
Channel: 54**



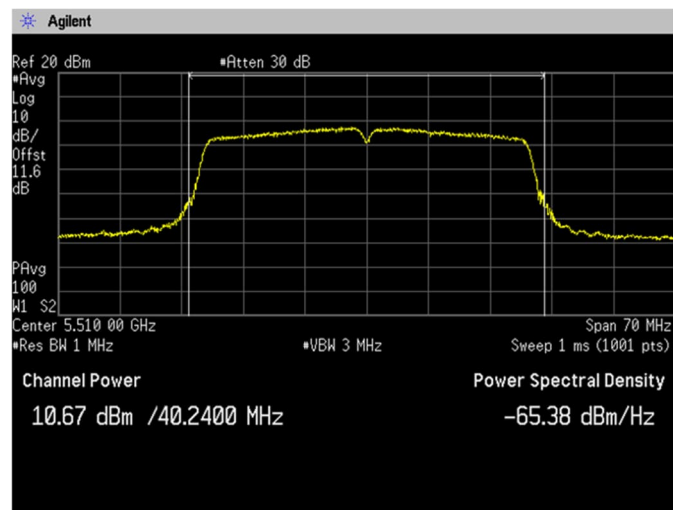


Japan

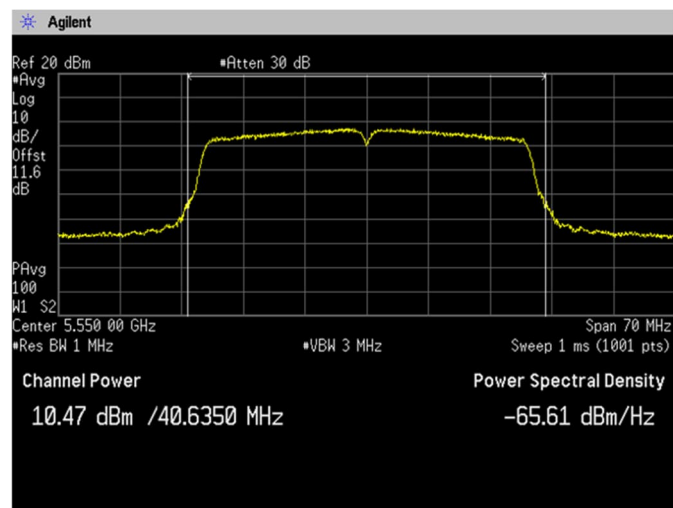
(5.3 GHz Band)
Channel: 62



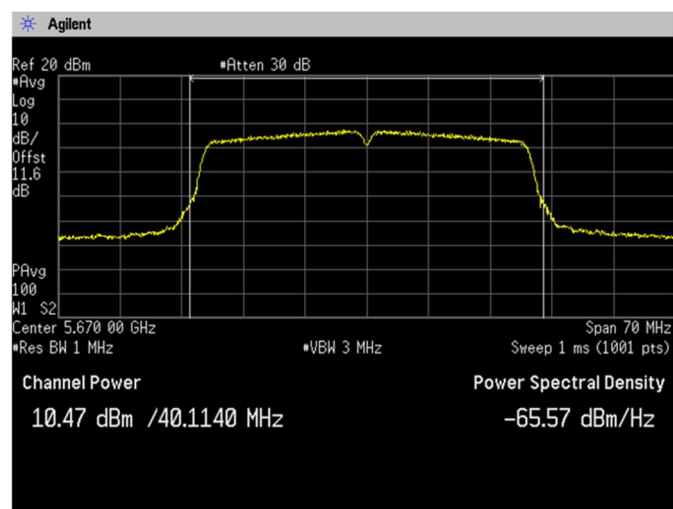
**(5.6 GHz Band)
Channel: 102**



Channel: 110



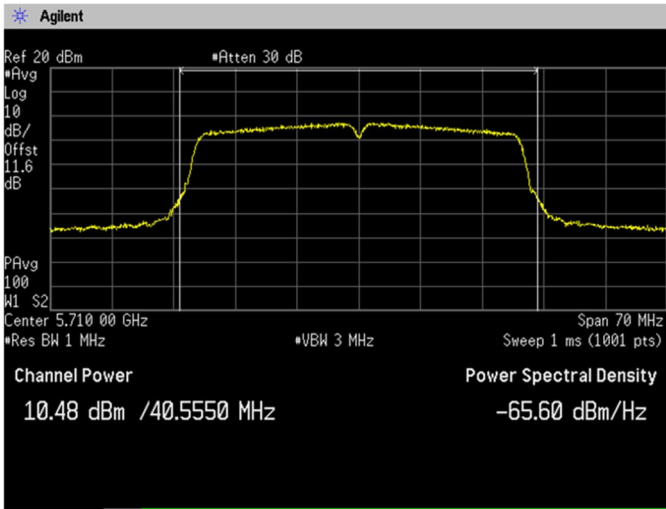
Channel: 134



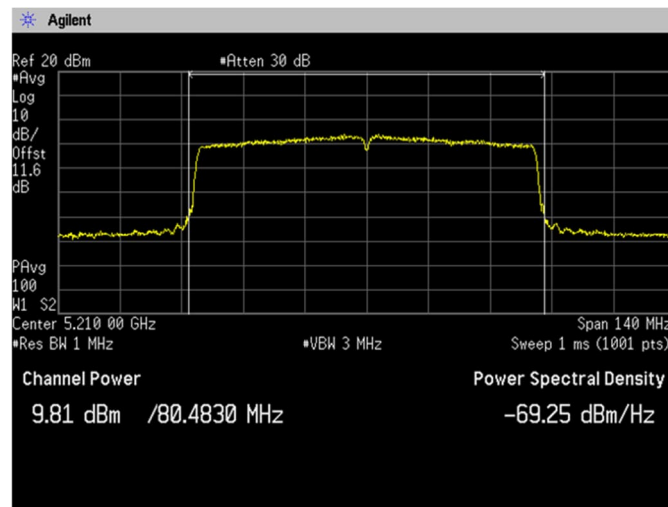


Japan

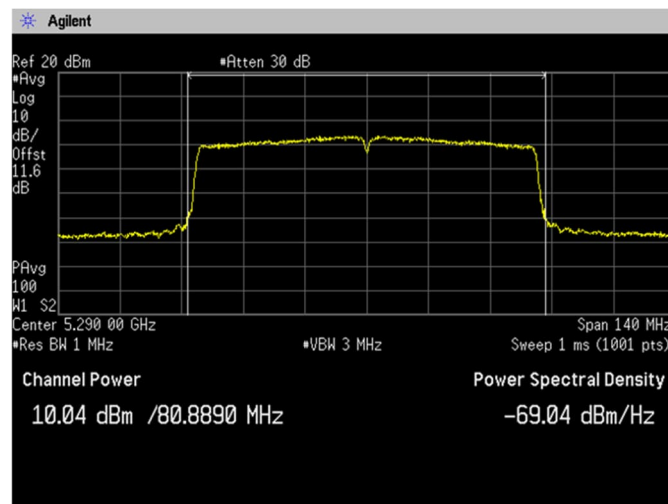
(5.6 GHz Band)
Channel: 142



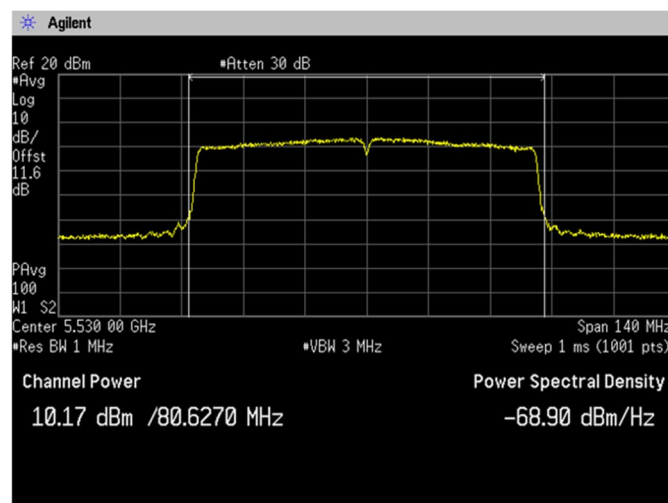
[IEEE802.11ac (HT80)]
(5.2 GHz Band)
Channel: 42



(5.3GHz Band)
Channel: 58



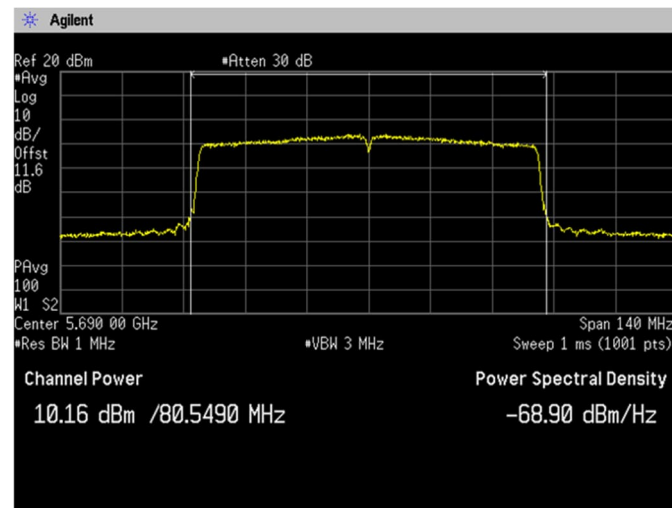
(5.6 GHz Band)
Channel: 106



**(5.6 GHz Band)
Channel: 122**



Channel: 138



4.3 Peak Power Spectral Density

4.3.1 Measurement procedure

[FCC 15.407(a), KDB 789033 D02, Section F]

The peak power spectral density is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

The spectrum analyzer is set to;

- RBW=1 MHz, VBW=3 MHz, Span=25 MHz/50 MHz/100 MHz, Sweep=Auto, Detector=RMS, Trace mode=Averaging

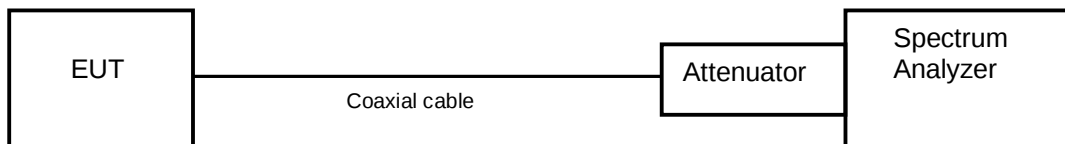
The EUT was set to operate with following conditions.

- 5.2 GHz Band, 5.3 GHz Band, 5.6 GHz Band

The test mode of EUT is as follows.

- Tx mode

- Test configuration



4.3.2 Limit

(1) For mobile and portable client devices in the 5.15-5.25 GHz band, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that directional gain of the antenna exceeds 6dBi.

(2) For the 5.25-5.35 GHz and 5.47-5.725 GHz bands, the maximum power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, the peak power spectral density shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

(3) For the 5.725-5.85 GHz bands, the maximum power spectral density shall not exceed 30 dBm in any 500-kHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the maximum power spectral density shall be reduced by the amount in dB that directional gain of the antenna exceeds 6 dBi.

However, fixed point-to-point U-NII devices operating in this band may employ transmitting antennas with directional gain greater than 6dBi without any corresponding reduction in transmitter conducted power. Fixed, point-to-point operations exclude the use of point-to-multipoint systems, omnidirection applications, and multiple collocated transmitters transmitting the same information. The operator of the U-NII device, or if the equipment is professionally installer, is responsible for ensuring that systems employing high gain directional antennas are used exclusively for fixed, point-to-point operations.

<Peak Power Spectral Density Limit Calculation>

Band	Limit (dBm)	Antenna Gain (dBi)	Determined Limit (dBm)
5.2 GHz Band	11	0.3	11.3 dBm/MHz
5.3 GHz Band	11	0.3	11.3 dBm/MHz
5.6 GHz Band	11	2.0	13.0 dBm/MHz

4.3.3 Measurement result

Date : 2-August-2023

Temperature : 24.6 [°C]

Humidity : 56.3 [%]

Test place : Shielded room No.4

Test engineer :

Nobuyuki Toda

Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)
				On Time(ms)	On+Off Time(ms)	X		
802.11a	36	5180	0.122	1.392	1.428	0.975	0.110	0.232
	40	5200	0.415					0.525
	48	5240	0.183					0.293
	52	5260	0.495	1.392	1.428	0.975	0.110	0.605
	56	5280	0.761					0.871
	64	5320	0.597					0.707
	100	5500	0.597	1.392	1.428	0.975	0.110	0.707
	116	5580	0.760					0.870
	140	5700	0.463					0.573
	144	5720	0.648					0.758

Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)
				On Time(ms)	On+Off Time(ms)	X		
802.11n (20MHz)	36	5180	-0.091	1.286	1.324	0.971	0.128	0.037
	40	5200	0.176					0.304
	48	5240	0.038					0.166
	52	5260	-0.128	1.286	1.324	0.971	0.128	0.000
	56	5280	0.069					0.197
	64	5320	-0.115					0.013
	100	5500	0.142	1.286	1.324	0.971	0.128	0.270
	116	5580	0.213					0.341
	140	5700	0.065					0.193
	144	5720	0.320					0.448

Note 1: X = On time / (On + Off time), DCF=10log (1/x)

Note 2: Test Result = Reading + DCF

Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)
				On Time(ms)	On+Off Time(ms)	X		
802.11n (40MHz)	38	5190	-2.997	0.635	0.671	0.946	0.241	-2.756
	46	5230	-2.762					-2.521
	54	5270	-2.822	0.635	0.671	0.946	0.241	-2.581
	62	5310	-2.661					-2.420
	102	5510	-2.318	0.635	0.671	0.946	0.241	-2.077
	110	5550	-2.484					-2.243
	134	5670	-2.890					-2.649
	142	5710	-2.776					-2.535

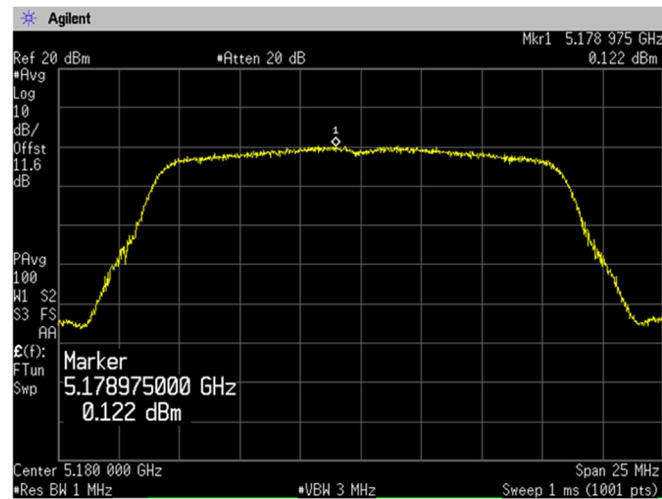
Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)
				On Time(ms)	On+Off Time(ms)	X		
802.11ac (80MHz)	42	5210	-6.445	0.323	0.360	0.897	0.472	-5.973
	58	5290	-6.232	0.323	0.360	0.897	0.472	-5.760
	106	5530	-6.164	0.323	0.360	0.897	0.472	-5.692
	122	5610	-6.055	0.323	0.360	0.897	0.472	-5.583
	138	5690	-6.186	0.323	0.360	0.897	0.472	-5.714

Note 1: $X = \text{On time} / (\text{On} + \text{Off time})$, $\text{DCF} = 10 \log (1/x)$

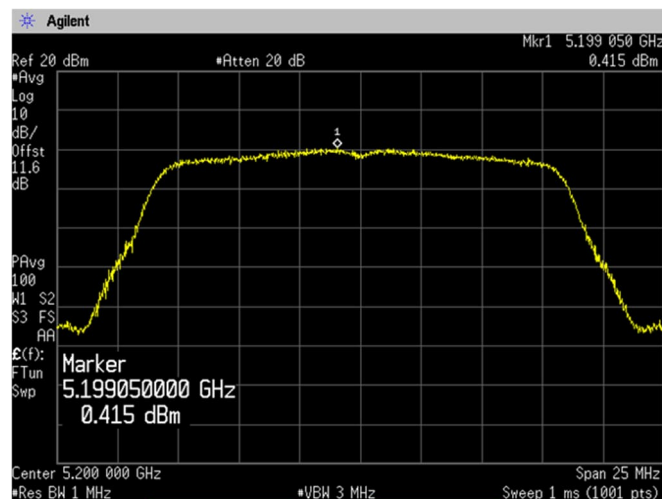
Note 2: $\text{Test Result} = \text{Reading} + \text{DCF}$

4.3.4 Trace data

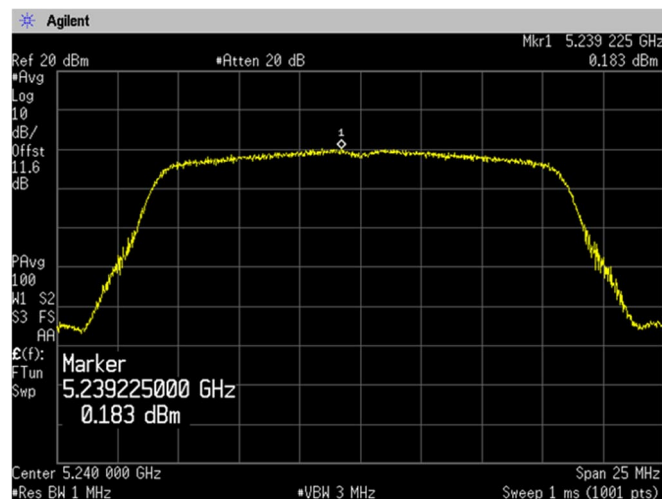
[IEEE802.11a]
(5.2 GHz Band)
Channel: 36

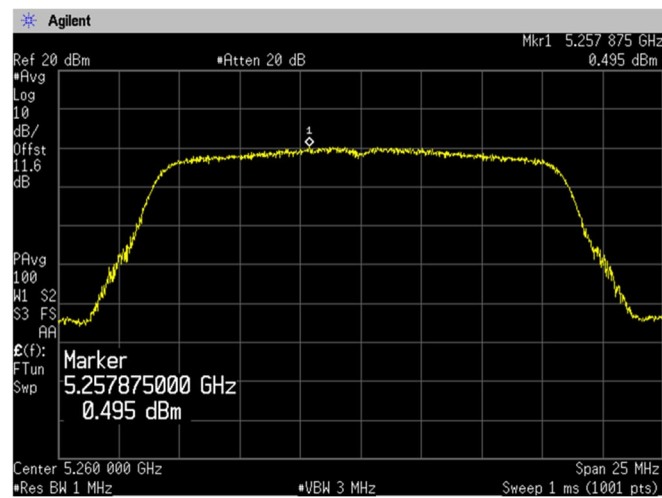
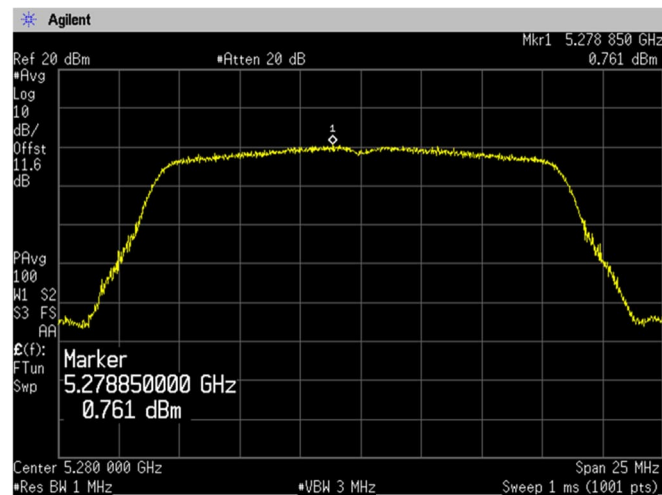
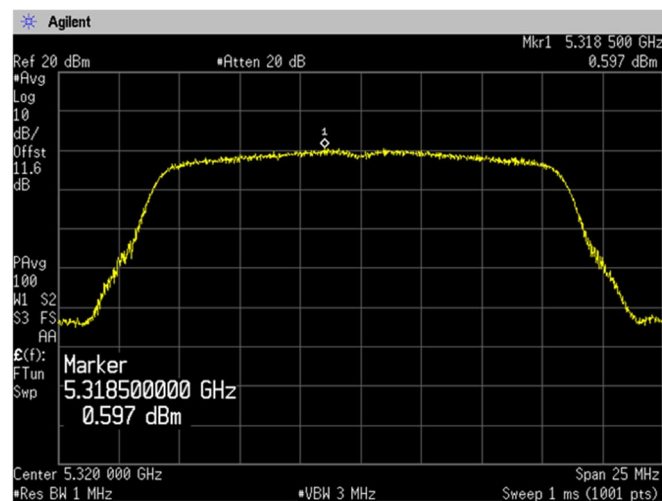


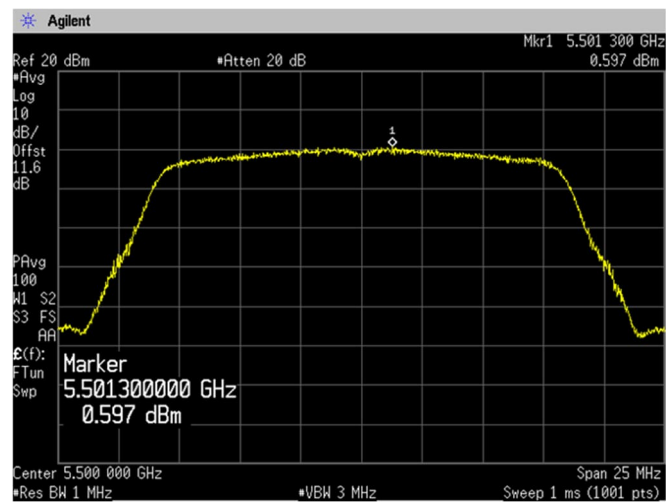
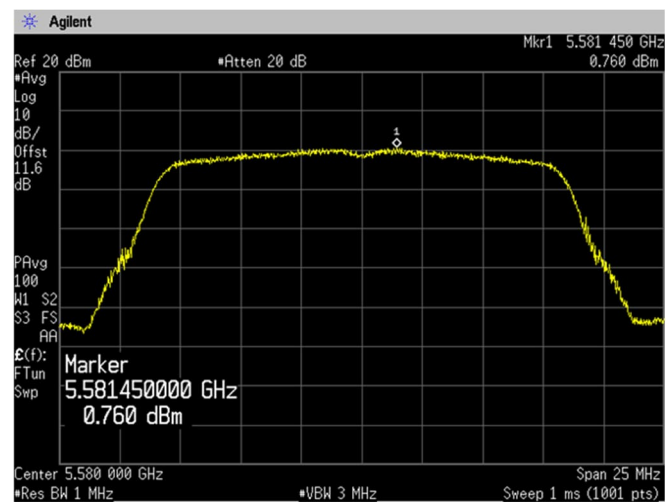
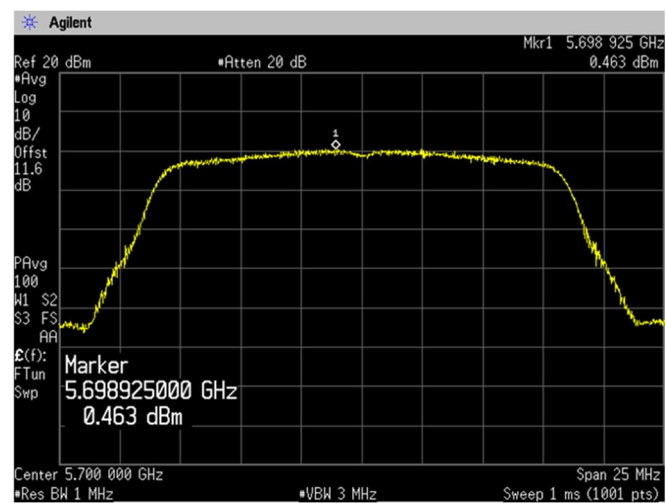
Channel: 40



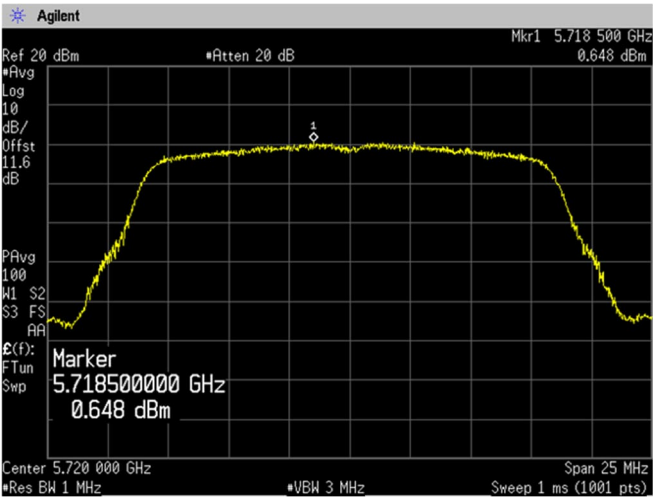
Channel: 48



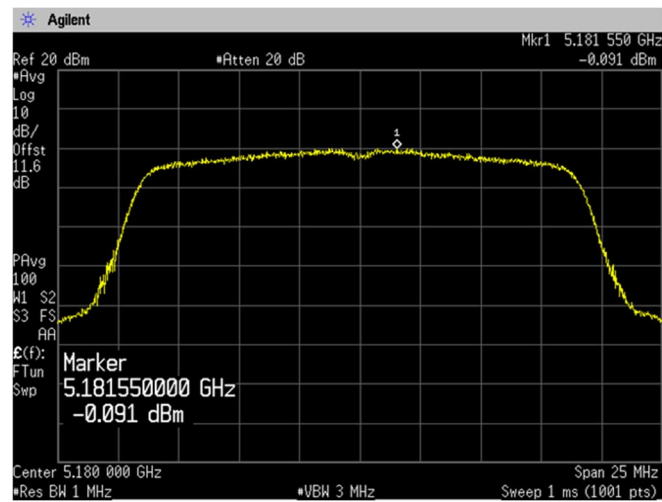
**(5.3 GHz Band)
Channel: 52****Channel: 56****Channel: 64**

**(5.6 GHz Band)
Channel: 100****Channel: 116****Channel: 140**

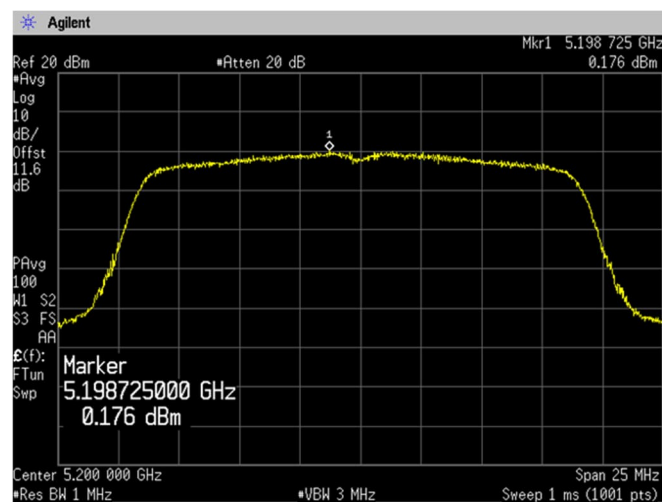
(5.6 GHz Band)
Channel: 144



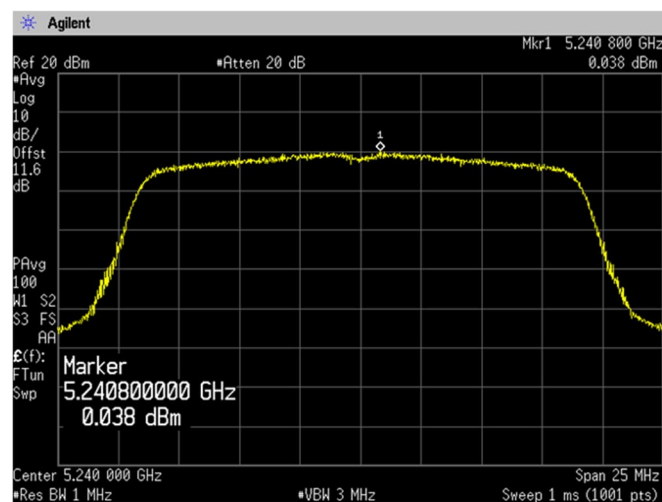
[IEEE802.11n (HT20)]
(5.2 GHz Band)
Channel: 36

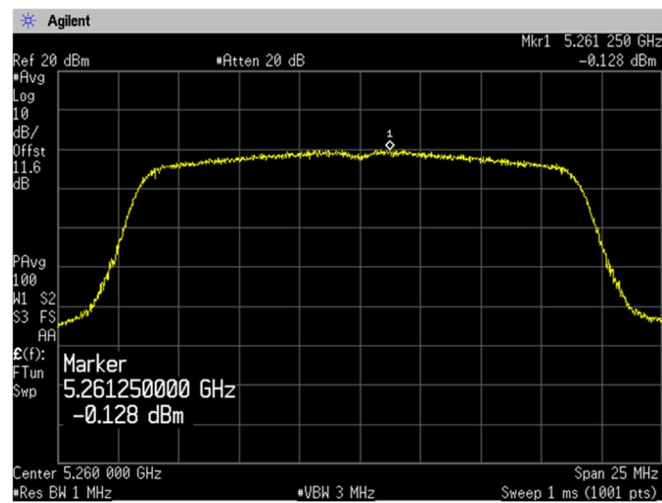
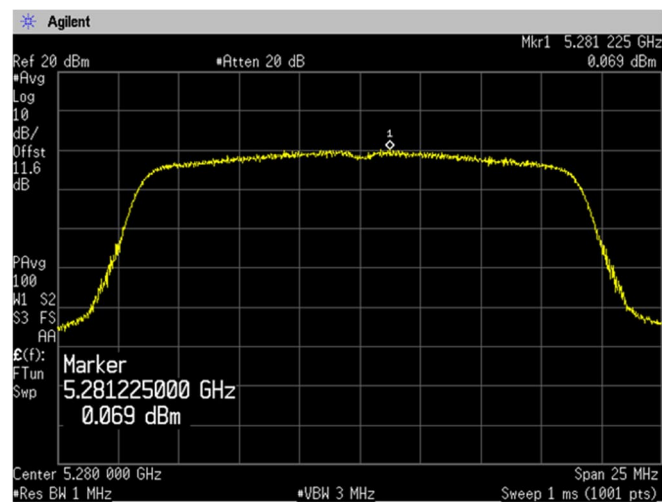
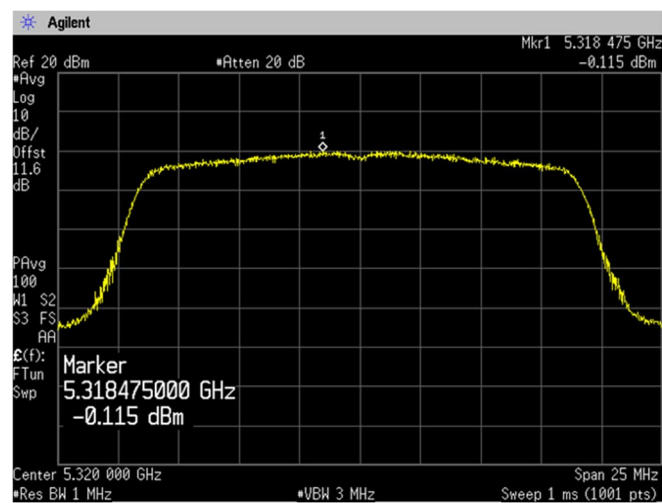


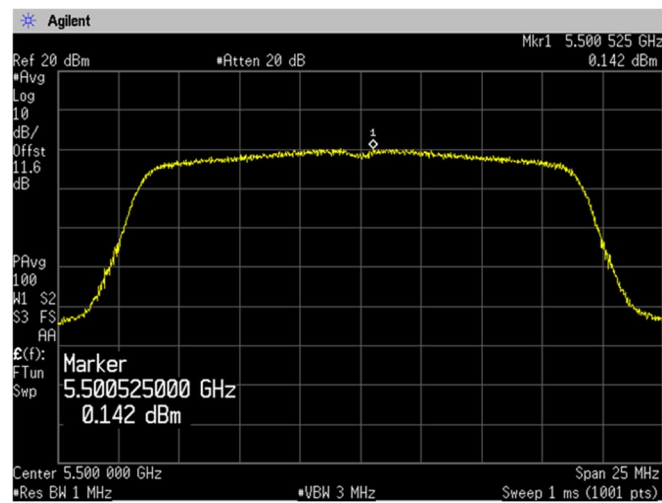
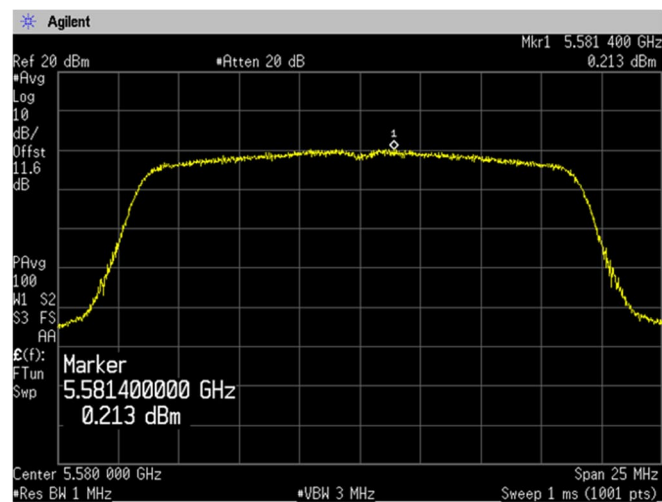
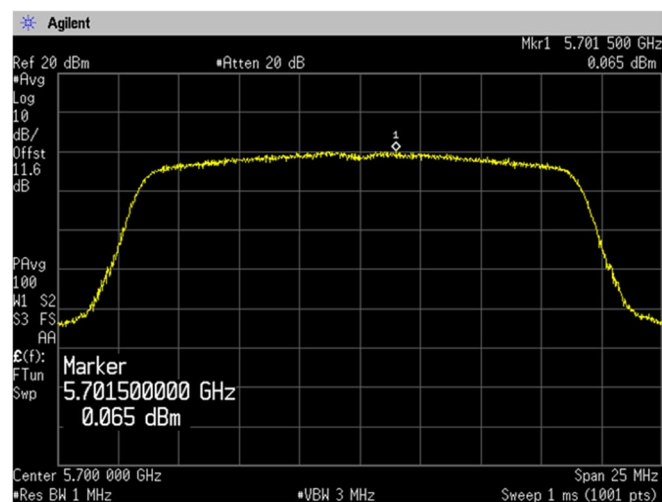
Channel: 40



Channel: 48



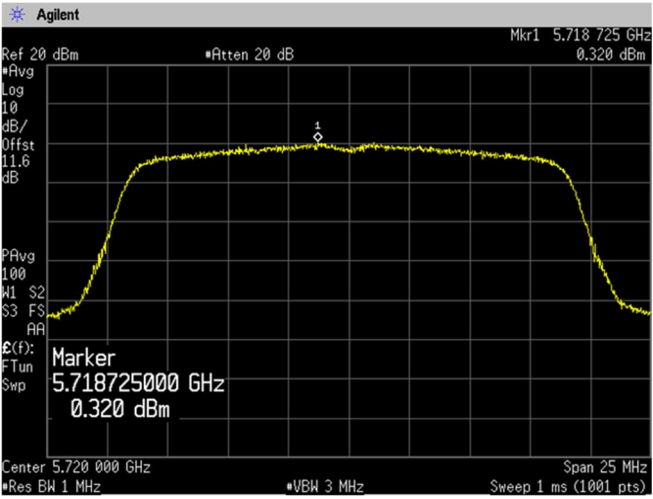
**(5.3 GHz Band)
Channel: 52****Channel: 56****Channel: 64**

**(5.6 GHz Band)
Channel: 100****Channel: 116****Channel: 140**

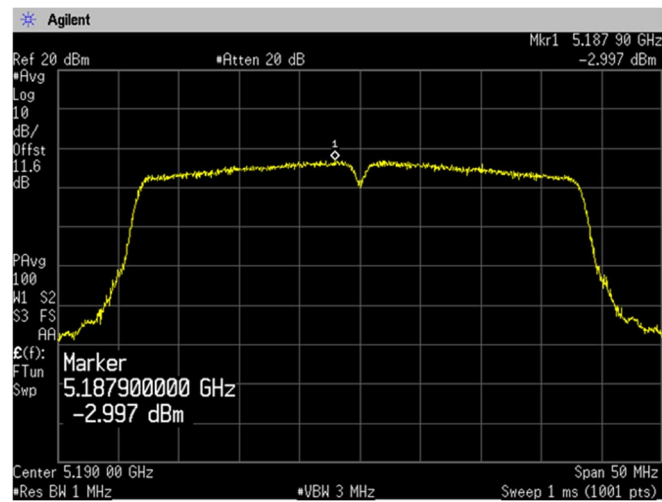


Japan

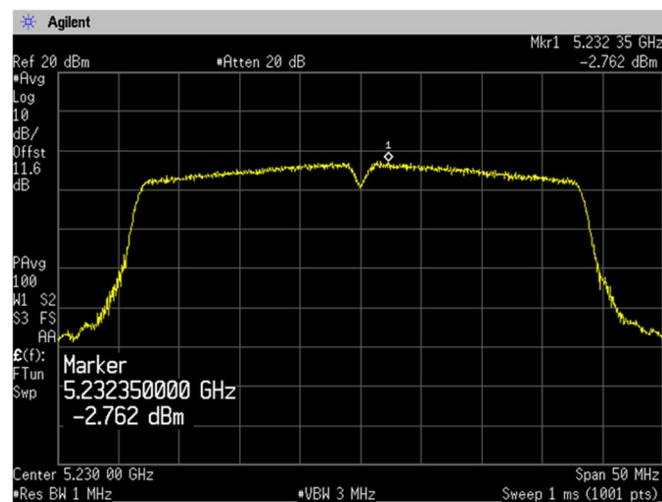
(5.6 GHz Band)
Channel: 144



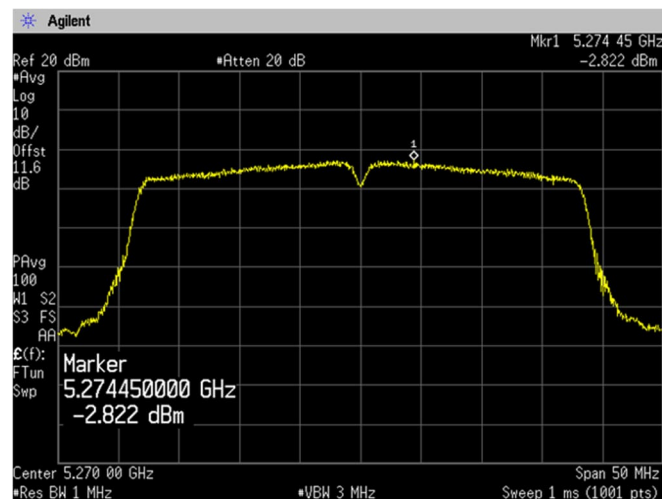
[IEEE802.11n (HT40)]
(5.2 GHz Band)
Channel: 38



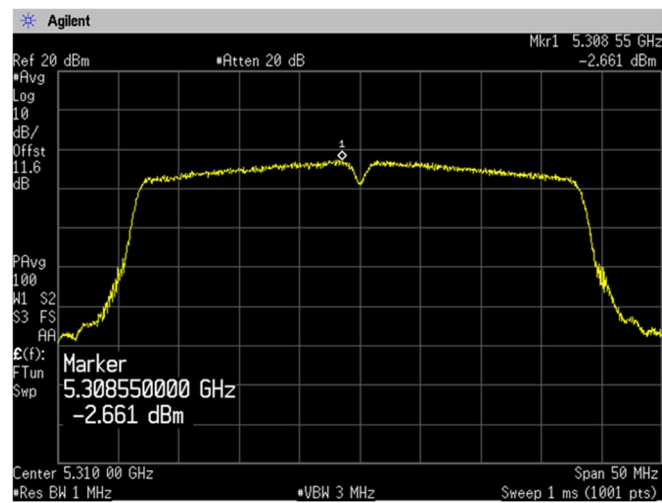
(5.2 GHz Band)
Channel: 46



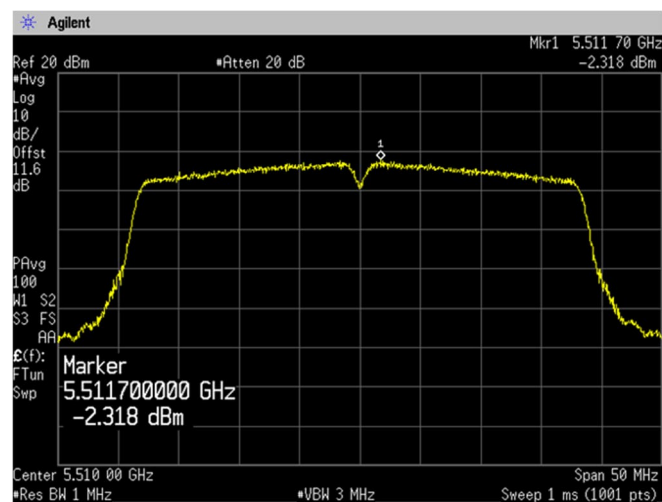
(5.3 GHz Band)
Channel: 54



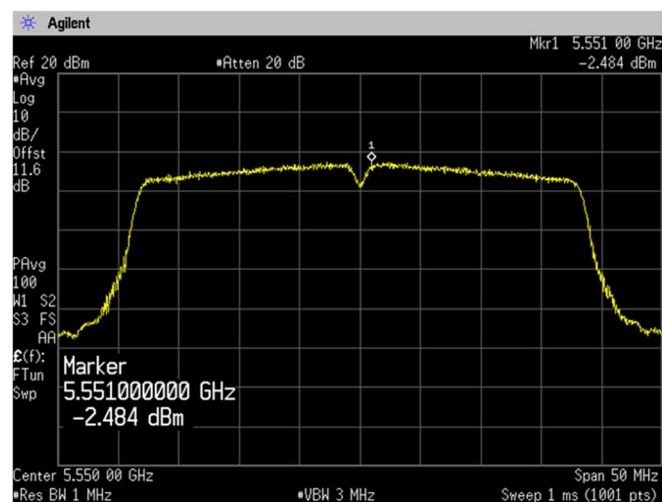
(5.3 GHz Band)
Channel: 62



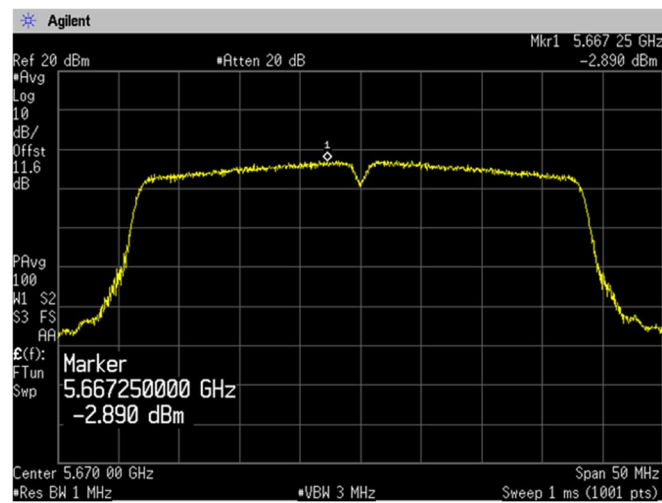
(5.6 GHz Band)
Channel: 102



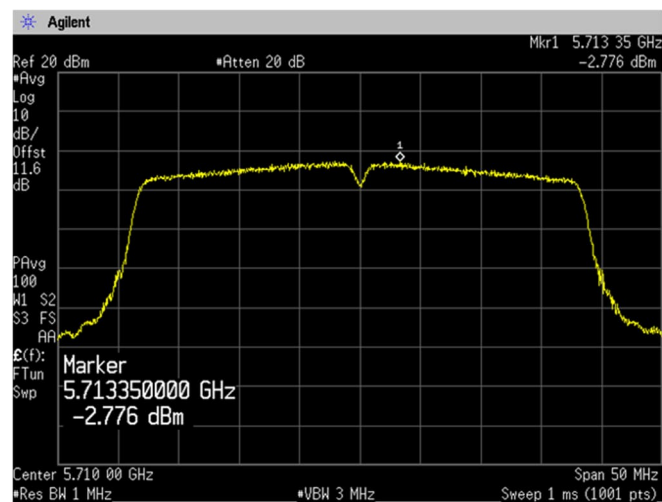
Channel: 110



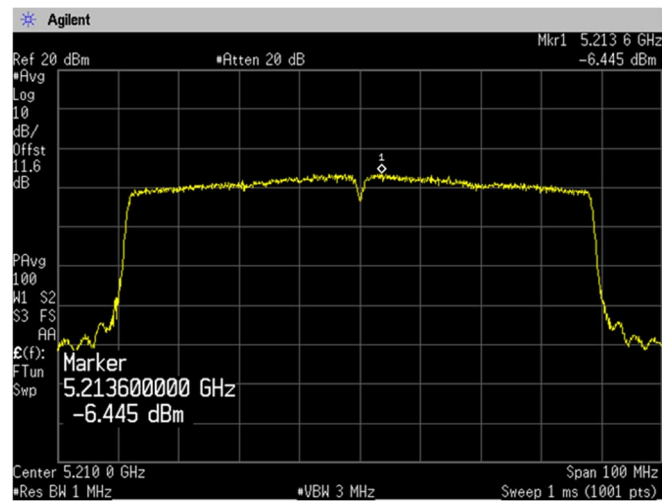
**(5.6 GHz Band)
Channel: 134**



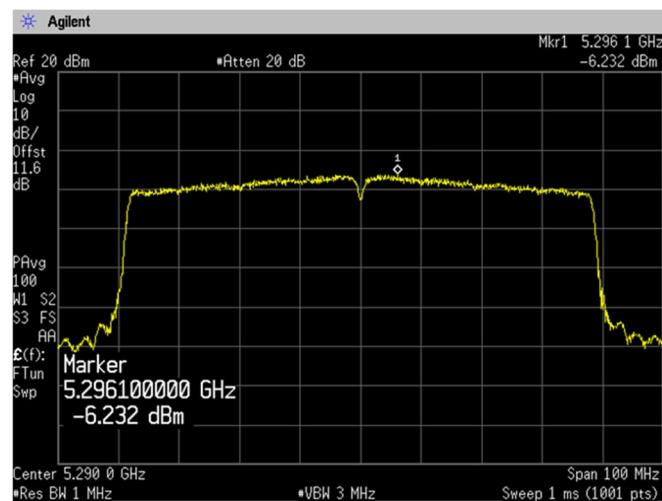
**(5.6 GHz Band)
Channel: 142**



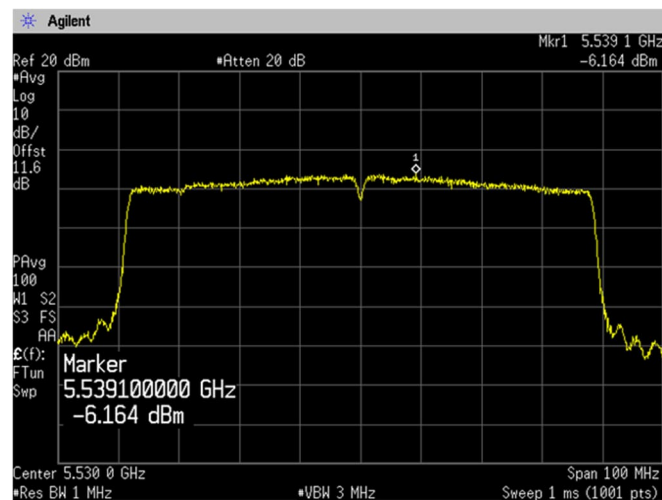
[IEEE802.11ac (HT80)]
(5.2 GHz Band)
Channel: 42

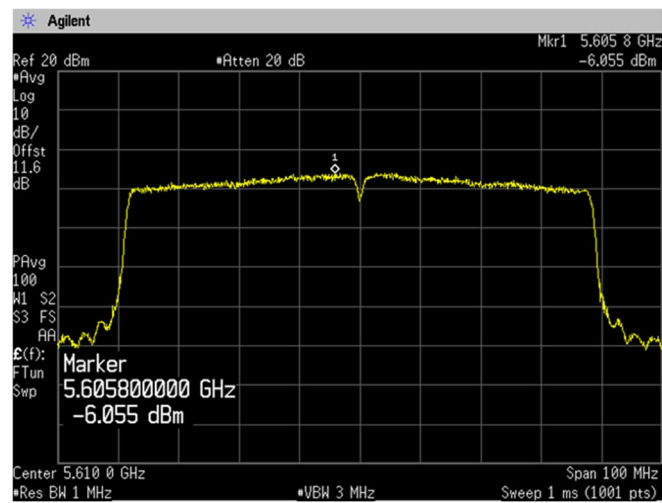
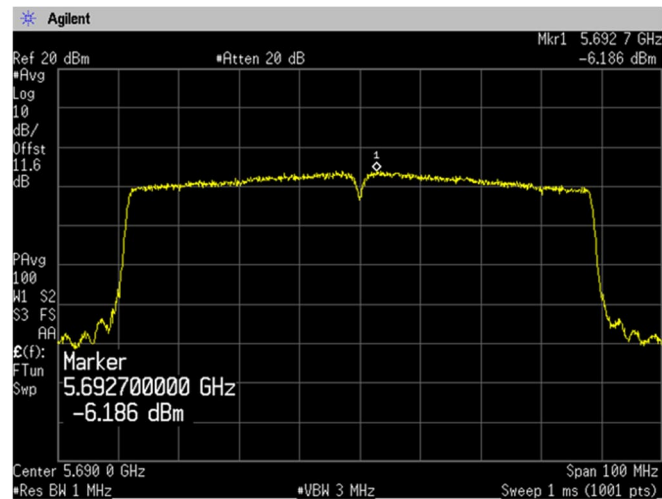


(5.3GHz Band)
Channel: 58



(5.6GHz Band)
Channel: 106



**(5.6GHz Band)
Channel: 122****Channel: 138**

4.4 Radiated Emissions (Restricted Bands of Operation)

4.4.1 Measurement procedure

[FCC 15.407(b), 15.205, 15.209, KDB 789033 D02, Section G.4, 5, 6.c) Method AD]

Test was applied by following conditions.

Test method	: ANSI C63.10
Frequency range	: 9 kHz to 40 GHz
Test place	: 3m Semi-anechoic chamber
EUT was placed on	: Styrofoam table / (W) 1.0 × (D) 0.8 × (H) 0.8 m (below 1 GHz) Styrofoam table / (W) 0.6 × (D) 0.6 × (H) 1.5 m (above 1 GHz)
Antenna distance	: 3m
Test receiver setting	Below 1 GHz
- Detector	: Quasi-peak
- Bandwidth	: 120 kHz
Spectrum analyzer setting	Above 1 GHz
- Peak	: RBW=1 MHz, VBW=3 MHz, Span=0 Hz, Sweep=auto, Detector=Peak Trace mode=Max hold
- Average	: RBW=1 MHz, VBW=3 MHz, Span=0 Hz, Sweep=auto, Detector=RMS Trace mode=Averaging (300 counts)

Radiated emission measurements are performed at 3m distance with the broadband antenna (Loop antenna, Biconical antenna, Log periodic antenna, Double ridged guide antenna and Broad-band horn Antenna). The antenna is positioned both the horizontal and vertical planes of polarization and height is varied 1m to 4m and stopped at height producing the maximum emission. As for the Loop antenna, it is positioned with its plane vertical, and the center of the Loop antenna is 1m above the ground plane.

The EUT is Placed on a turntable, which is 0.8m (below 1 GHz) and 1.5m (above 1 GHz) above ground plane. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level. The test results represent the worst case emission for each emission with manipulating the EUT, support equipment, interconnecting cables and varying the mode of operation. Sufficient time for the EUT, support equipment, and test equipment are allowed in order for them to warm up to their normal operating condition.

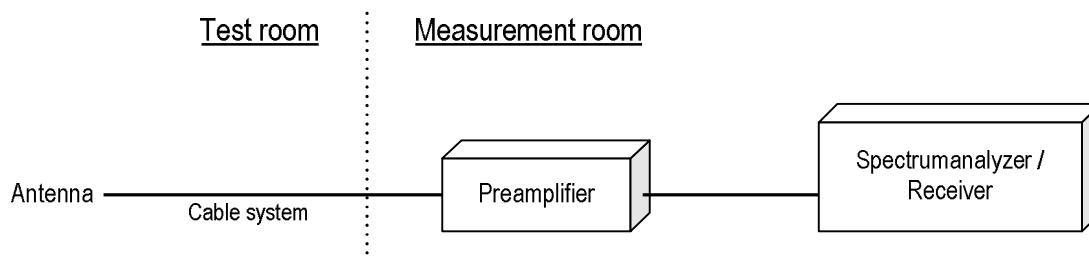
The EUT was set to operate with following conditions.

- 5.2 GHz Band, 5.3 GHz Band, 5.6 GHz Band

The test mode of EUT is as follows.

- Tx mode, Rx mode

- Test configuration



Duty cycle result

Mode	Band	On Time(ms)	On+Off Time(ms)	Duty Cycle (%)	DCF (dB)
802.11a	W52	1.392	1.428	97.5	0.110
	W53	1.392	1.428	97.5	0.110
	W56	1.392	1.428	97.5	0.110
802.11n (20MHz)	W52	1.286	1.324	97.1	0.128
	W53	1.286	1.324	97.1	0.128
	W56	1.286	1.324	97.1	0.128
802.11n (40MHz)	W52	0.635	0.671	94.6	0.241
	W53	0.635	0.671	94.6	0.241
	W56	0.635	0.671	94.6	0.241
802.11ac (80MHz)	W52	0.323	0.360	89.7	0.472
	W53	0.323	0.360	89.7	0.472
	W56	0.323	0.360	89.7	0.472

Note: DCF = $10\log(1/x)$

4.4.2 Calculation method

[150 kHz to 25 GHz]

Emission level = Reading + (Ant. factor + Cable system loss - Amp. Gain)

Margin = Limit - Emission level

Example:

Detector: Peak

Limit @ 5147.0 MHz: 74.0 dBuV/m (Peak Limit)

S.A Reading = 40.9 dBuV Cable system loss = 16.4 dB

Result = $40.9 + 16.4 = 57.3$ dBuV/m

Margin = $74.0 - 57.3 = 16.7$ dB

4.4.3 Limit

- (1) For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (2) For transmitters operating in the 5.25-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (3) For transmitters operating in the 5.47-5.725GHz band: all emissions outside of the 5.47 5-5.725 GHz band shall not exceed an EIRP of -27 dBm/MHz.
- (4) For transmitters operating in the 5.725-5.85 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

Frequency [MHz]	Field strength		Distance [m]
	[uV/m]	[dBuV/m]	
0.009-0.490	2400 / F [kHz]	20logE [uV/m]	300
0.490-1.705	24000 / F [kHz]	20logE [uV/m]	30
1.705-30	30	29.5	30
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Note:

1. The lower limit shall apply at the transition frequencies.
2. Emission level [dBuV/m] = 20log Emission [uV/m]
3. As shown in 15.35(b), for frequencies above 1000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition modulation.



Japan

4.4.4 Test data

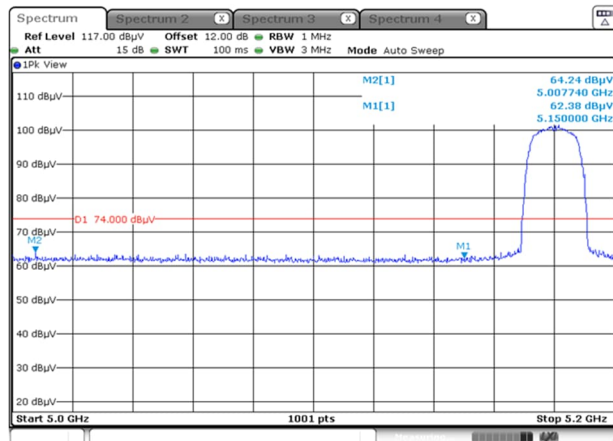
Date : 6-September-2023
Temperature : 23.6 [°C]
Humidity : 67.6 [%]
Test place : 3m Semi-anechoic chamber

Test engineer : Chiaki Kanno

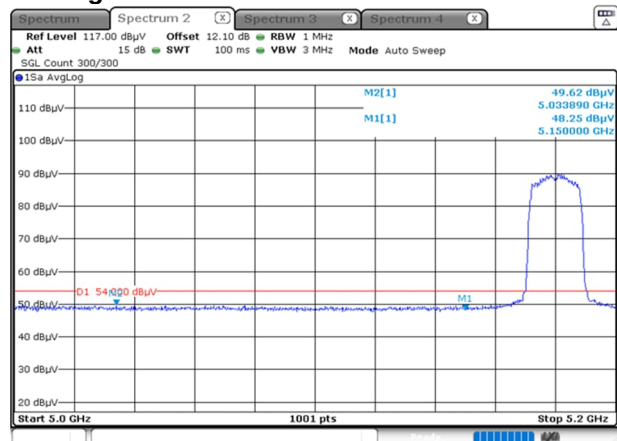
4.4.4.1 Restricted Bandedge

[IEEE802.11a]

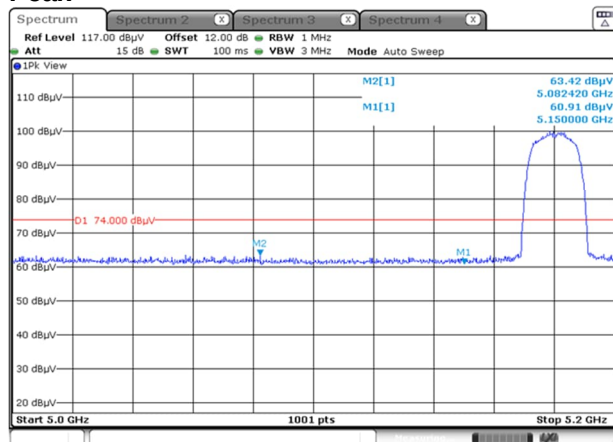
5.2 GHz Band, Channel Low Horizontal Peak



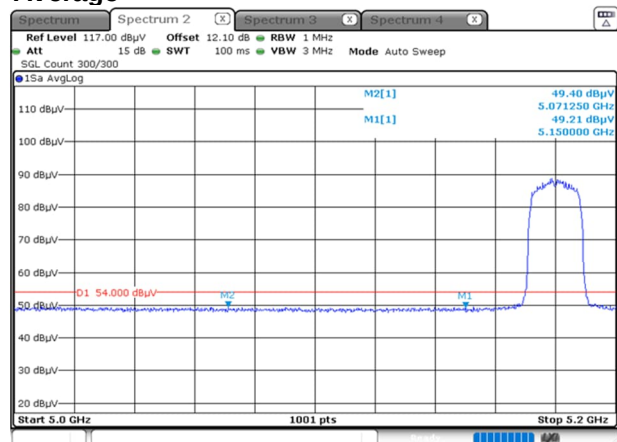
Average



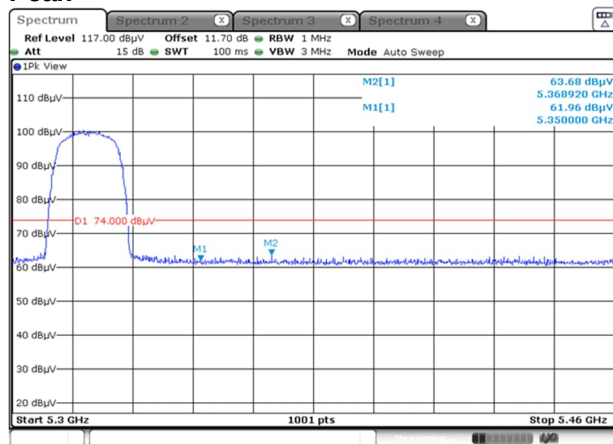
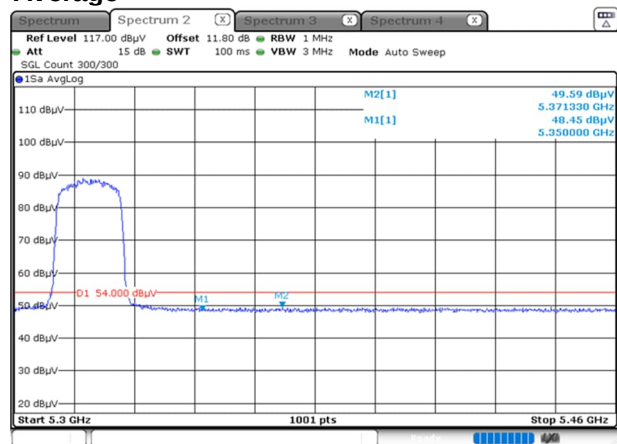
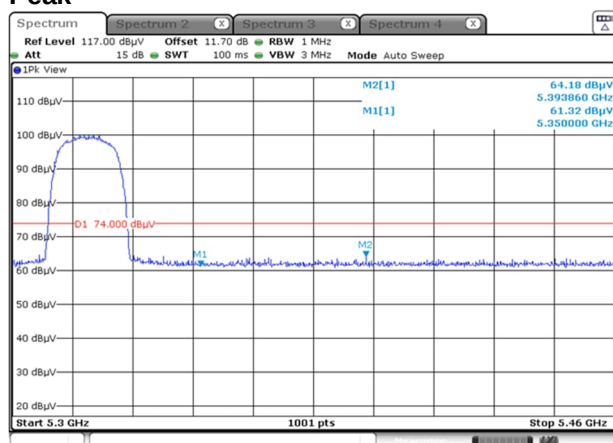
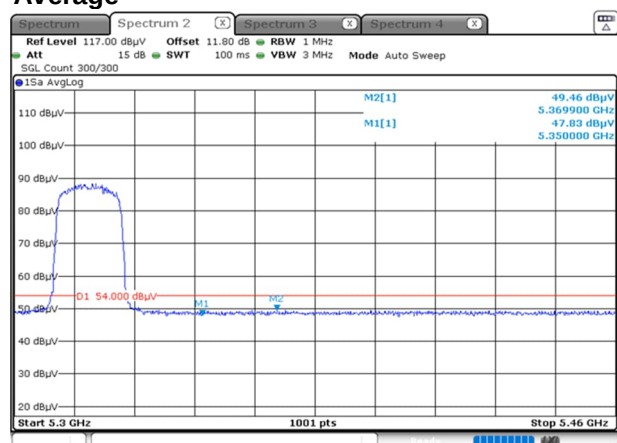
Vertical Peak



Average

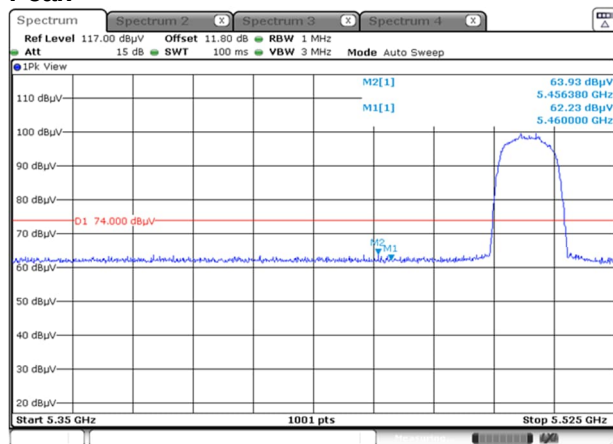


[IEEE802.11a]

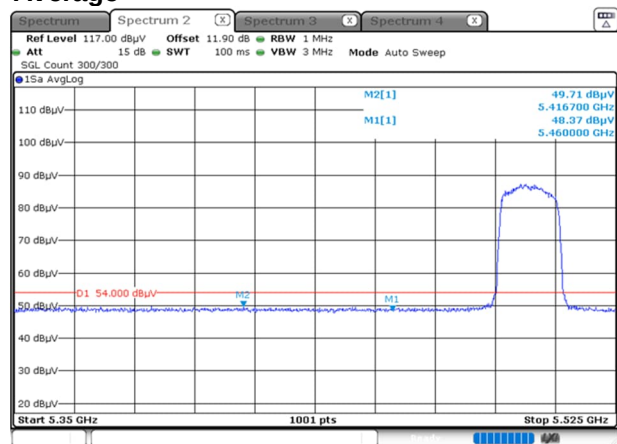
**5.3 GHz Band, Channel High
Horizontal
Peak****Average****Vertical
Peak****Average**

[IEEE802.11a]

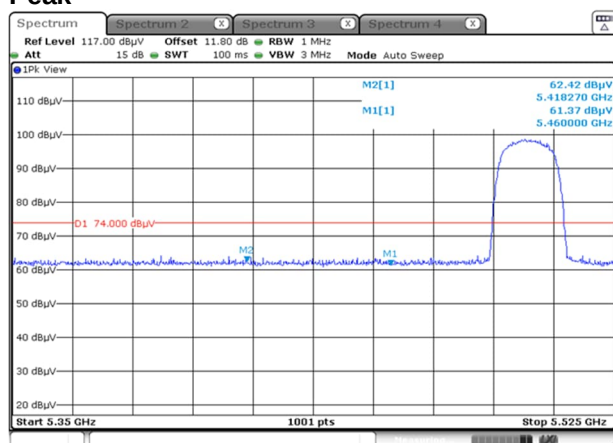
5.6 GHz Band, Channel Low Horizontal Peak



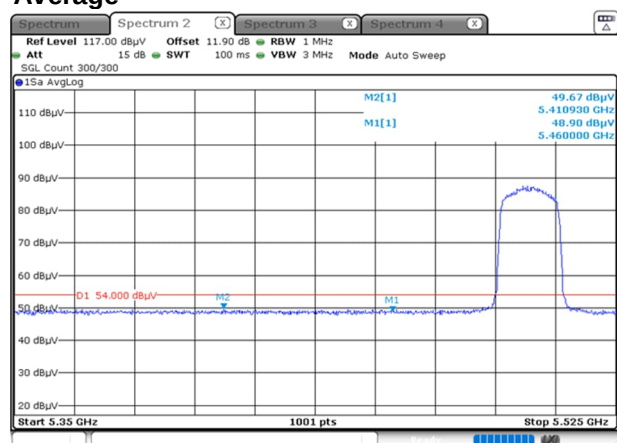
Average



Vertical Peak

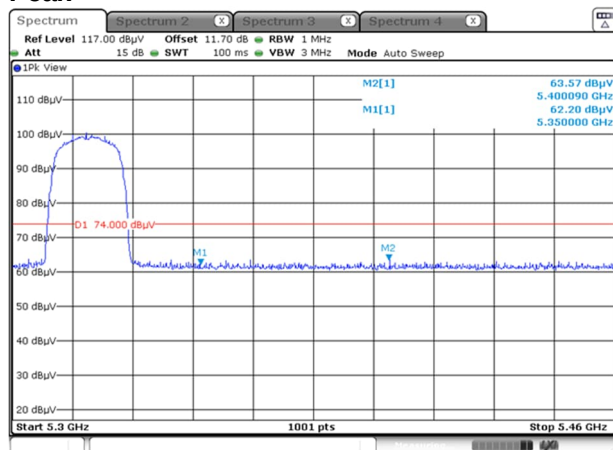


Average

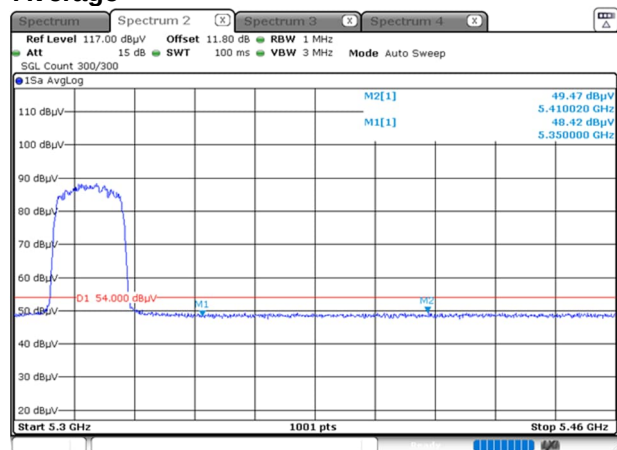


[IEEE802.11n (HT20)]

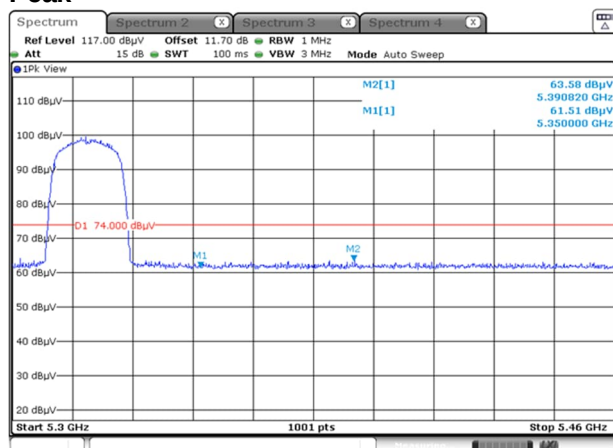
5.3 GHz Band, Channel High Horizontal Peak



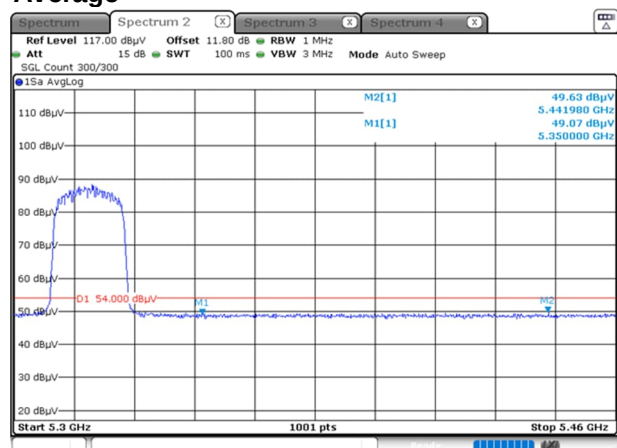
Average



Vertical Peak

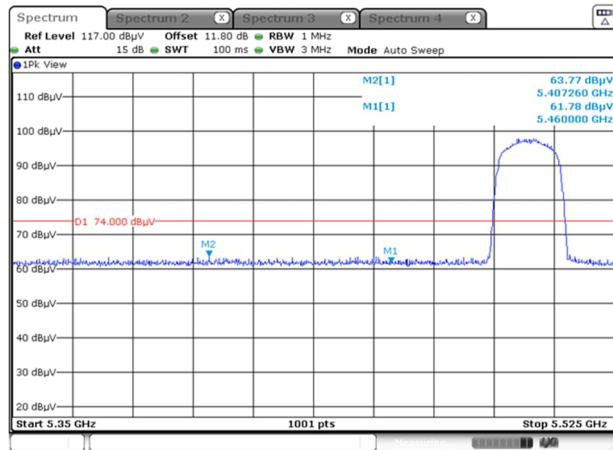


Average

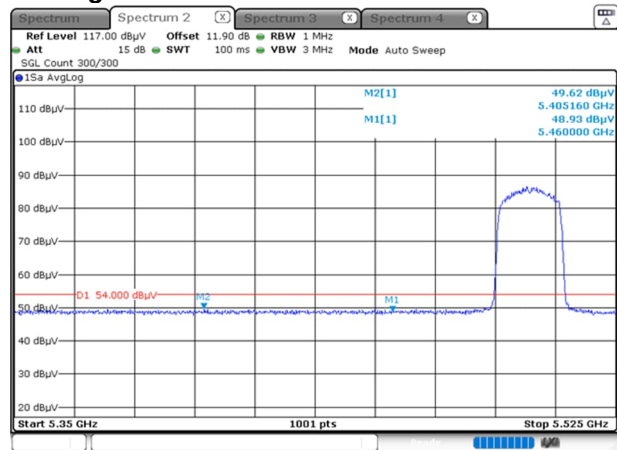


[IEEE802.11n (HT20)]

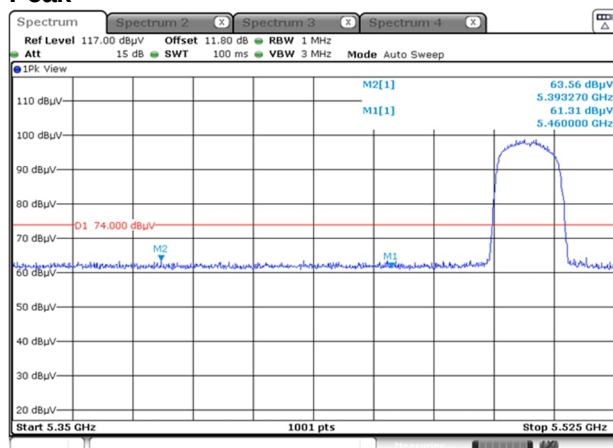
5.6 GHz Band, Channel Low Horizontal Peak



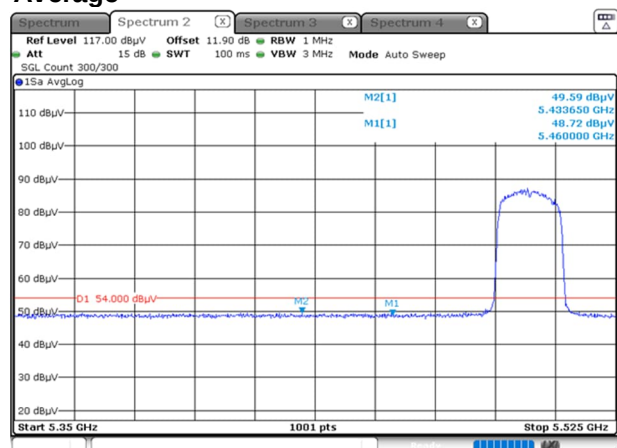
Average



Vertical Peak

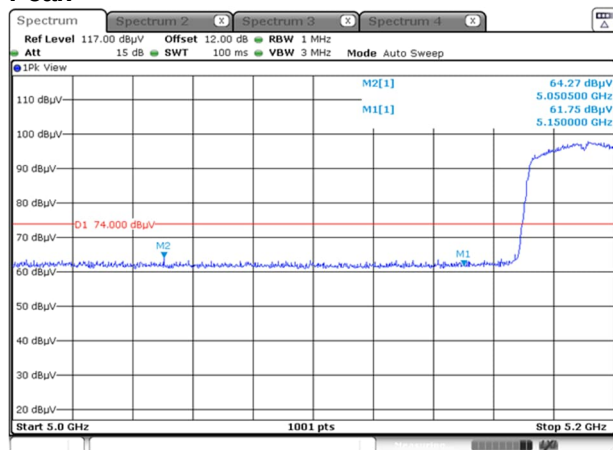


Average

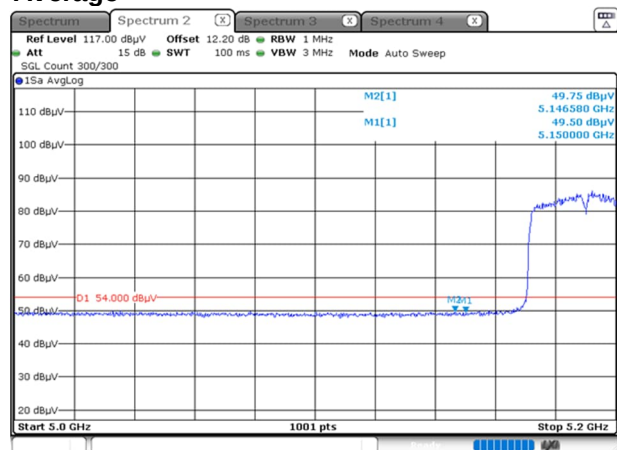


[IEEE802.11n (HT40)]

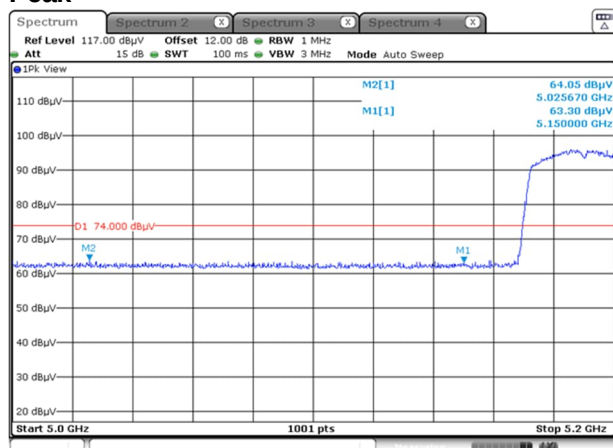
5.2 GHz Band, Channel Low Horizontal Peak



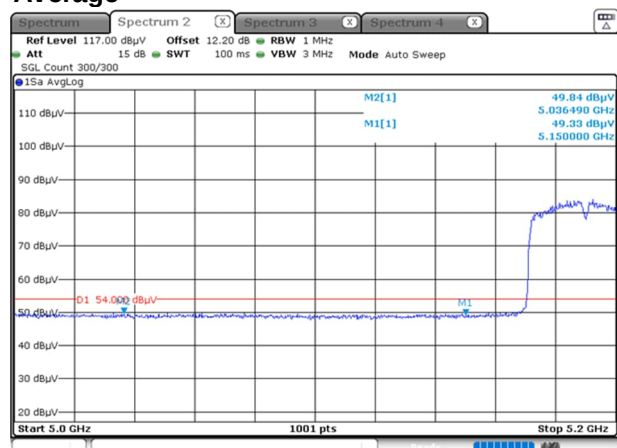
Average



Vertical Peak

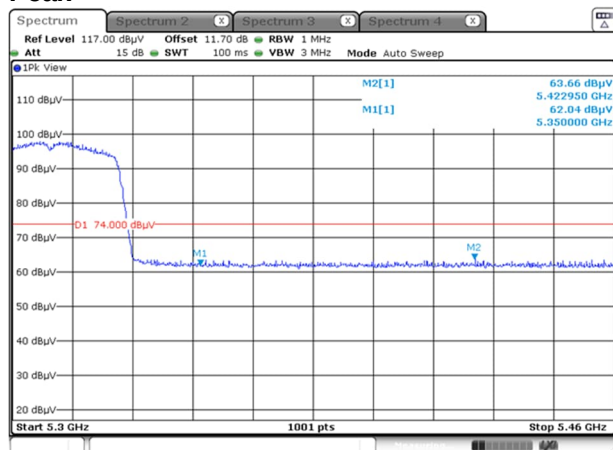


Average

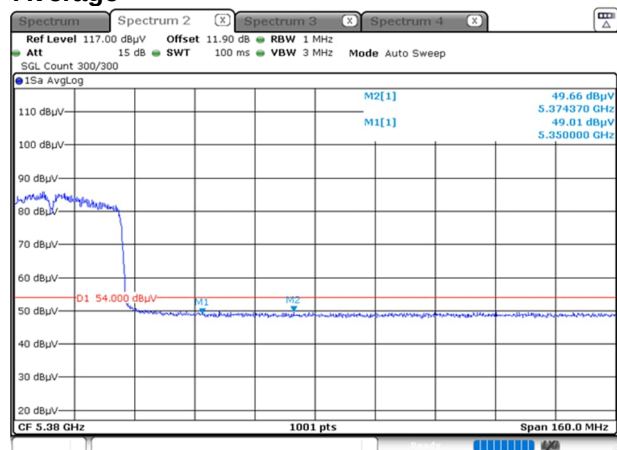


[IEEE802.11n (HT40)]

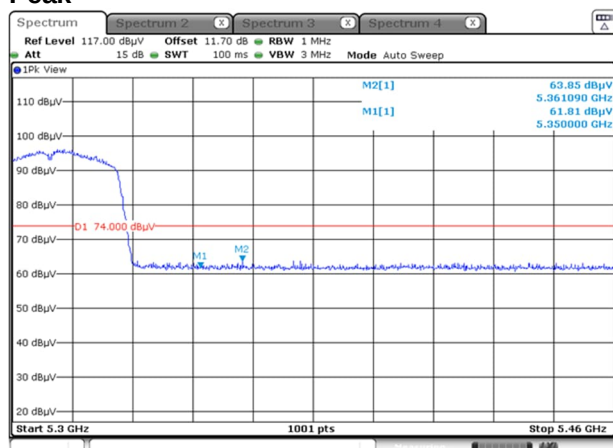
5.3 GHz Band, Channel High Horizontal Peak



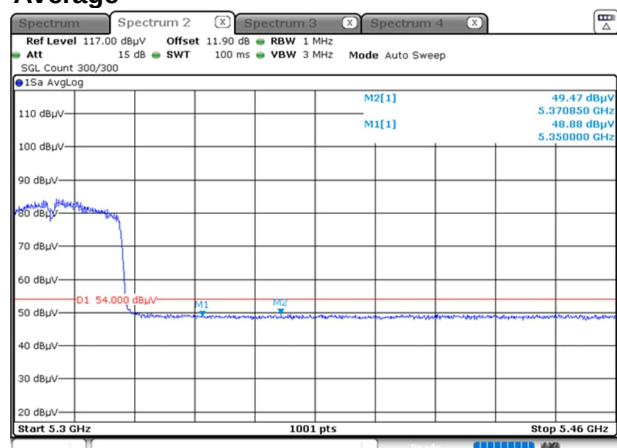
Average



Vertical Peak

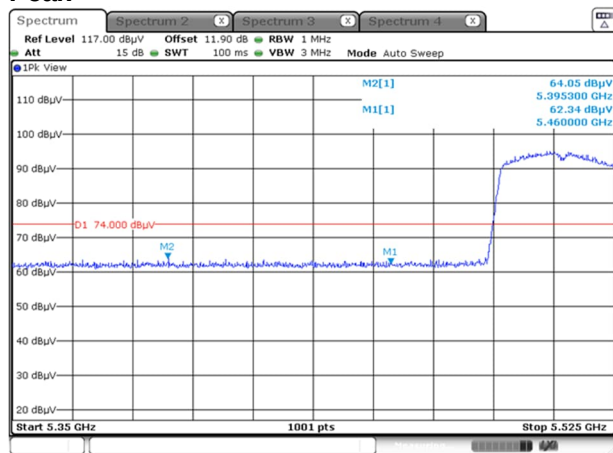


Average

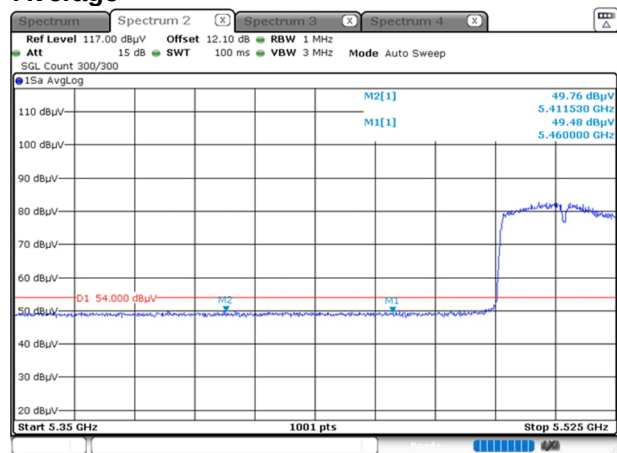


[IEEE802.11n (HT40)]

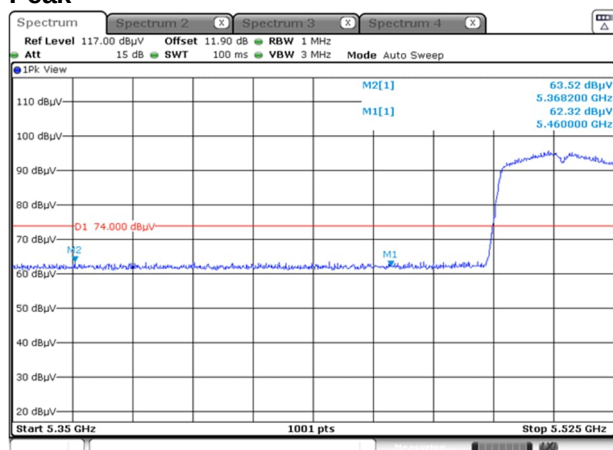
5.6 GHz Band, Channel Low Horizontal Peak



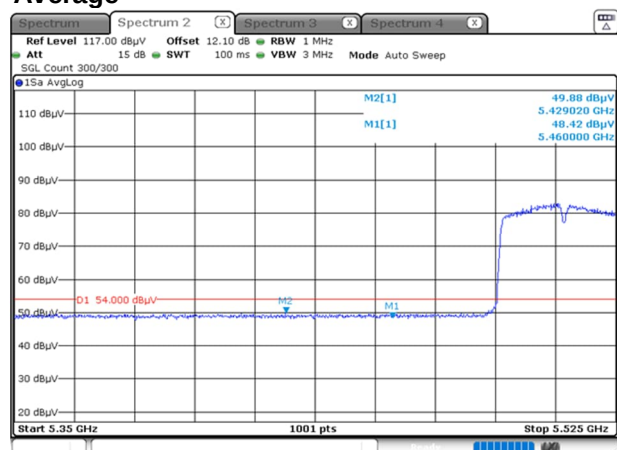
Average



Vertical Peak

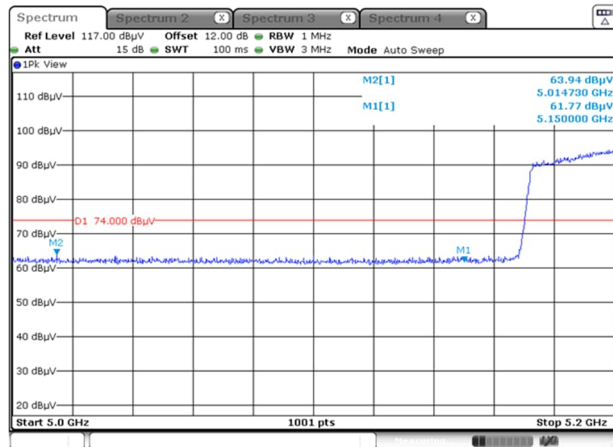


Average

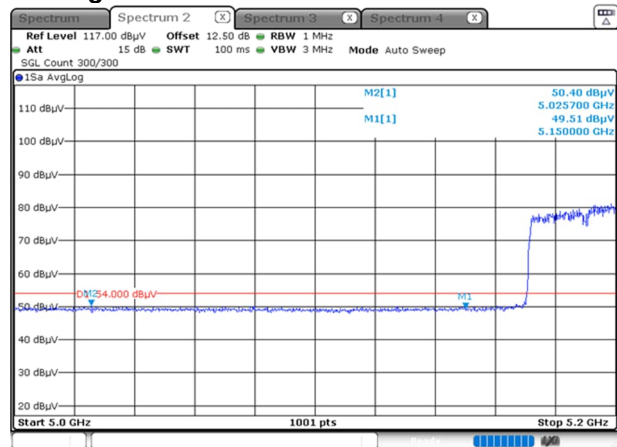


[IEEE802.11ac (VHT80)]

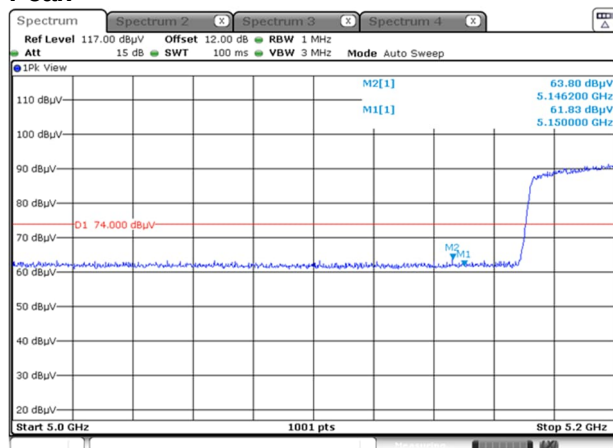
5.2 GHz Band, Channel Low Horizontal Peak



Average



Vertical Peak



Average

