

Report on the RF Testing of:

KYOCERA Corporation
Mobile Phone, Model: EB1190EM
FCC ID: JOYPC9699



In accordance with FCC Part15 Subpart E

Prepared for: KYOCERA Corporation
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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.



Certificate #3686.03

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1 Summary of Test

1.1 Modification history of the test report

Document Number	Modification History	Issue Date
JPD-TR-24111-0	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

6-June-2024 - 13-June-2024

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	EB1190EM
Serial number	353343640002991, 353343640002918, 353343640002926
Trade name	Kyocera
Number of sample(s)	3
EUT condition	Pre-Production
Power rating	Battery: DC 3.87 V
Size	(W) 73.0 mm × (D) 157.0 mm × (H) 11.43 mm
Environment	Indoor and Outdoor use
Terminal limitation	-20 °C to 60 °C
Hardware version	DMT1
Software version	0.151BX.0025.a
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	28.035 mW (IEEE802.11a) 28.708 mW (IEEE802.11n: HT20) 30.040 mW (IEEE802.11n: HT40) 28.629 mW (IEEE802.11ac: VHT80)
Antenna type	Internal antenna
Antenna gain	5.15-5.35 GHz band: 4.8 dBi 5.47-5.725 GHz band: 5.4 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: EB1190EM, Serial Number: 353343640002991, 353343640002918, 353343640002926			
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)

EUT

Model number	EB1190EM *1	EB1201	EB1190	EB1190NC
Memory	expansion	standard	standard	standard
Camera	with	with	with	without
Fingerprint Sensor	with	with	without	without
NFC	with	with	without	without
size	73.0 × 157.0 × 11.43 [mm]			

*1:Tested model

2.3.2 Reason for selection of EUT

The applicant decided that the differences between the design had no EMC impact and selected EB1190EM 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.

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	EB1190EM	353343640002991, 353343640002918, 353343640002926	JOYPC9699	EUT
2	AC Adapter	KDDI	0602PQA	N/A	N/A	*

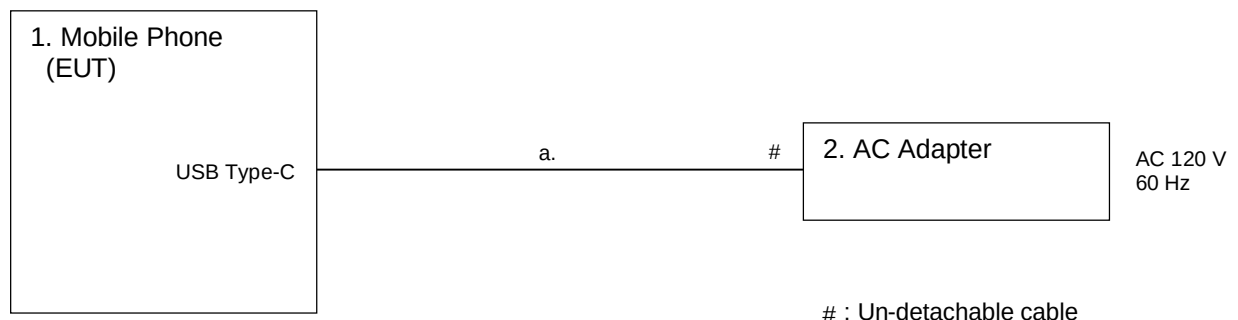
*: AC power line Conducted Emission Test.

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

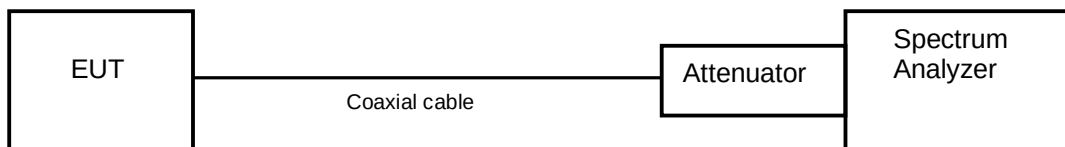
The EUT was set to operate with following conditions.

- 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 : 6-June-2024

Temperature : 20.2 [°C]

Humidity : 52.3 [%]

Test place : Shielded room No.4

Test engineer :

Kazunori Saito

Mode	Band	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% Occupied bandwidth (MHz)
802.11a	5.2GHz Band	36	5180	19.857	16.4466
		40	5200	19.828	16.4054
		48	5240	19.906	16.4285
	5.3GHz Band	52	5260	19.957	16.4017
		56	5280	19.749	16.4293
		64	5320	19.845	16.4060
	5.6GHz Band	100	5500	19.991	16.3916
		116	5580	19.739	16.4109
		140	5700	19.782	16.3913
		144	5720	19.729	16.3976

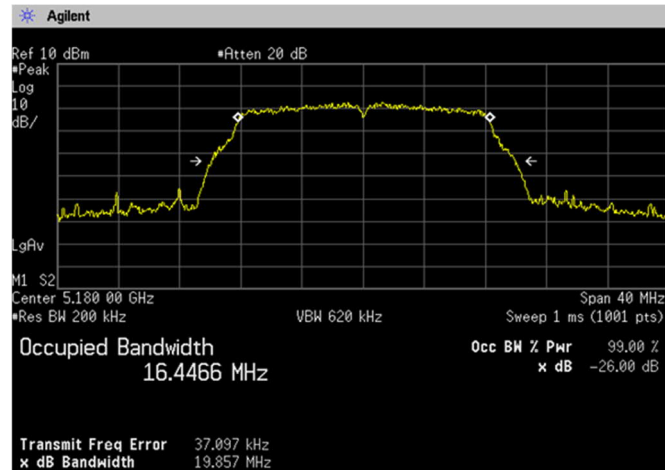
Mode	Band	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% Occupied bandwidth (MHz)
802.11n (20MHz)	5.2GHz Band	36	5180	20.384	17.5436
		40	5200	20.083	17.5287
		48	5240	20.119	17.5209
	5.3GHz Band	52	5260	19.989	17.5734
		56	5280	20.077	17.5604
		64	5320	19.985	17.5345
	5.6GHz Band	100	5500	20.180	17.5649
		116	5580	20.213	17.5241
		140	5700	19.936	17.5118
		144	5720	20.026	17.5315

Mode	Band	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% Occupied bandwidth (MHz)
802.11n (40MHz)	5.2GHz Band	38	5190	40.353	35.9887
		46	5230	40.453	35.9416
	5.3GHz Band	54	5270	40.383	35.9764
		62	5310	40.033	36.0180
	5.6GHz Band	102	5510	40.282	36.0471
		110	5550	40.254	36.0091
		134	5670	40.514	35.9383
		142	5710	40.290	35.9879

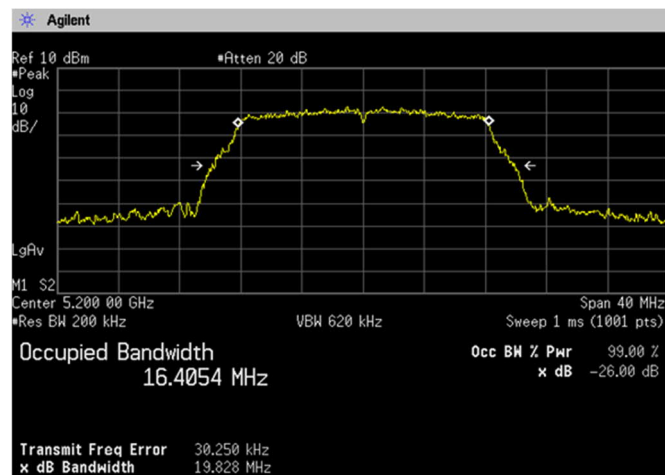
Mode	Band	Channel	Frequency (MHz)	26dB bandwidth (MHz)	99% Occupied bandwidth (MHz)
802.11ac (80MHz)	5.2GHz Band	42	5210	80.483	75.1341
	5.3GHz Band	58	5290	80.738	75.1405
	5.6GHz Band	106	5530	80.586	75.1406
		122	5610	80.560	75.1609
		138	5690	80.866	75.1123

4.1.4 Trace data

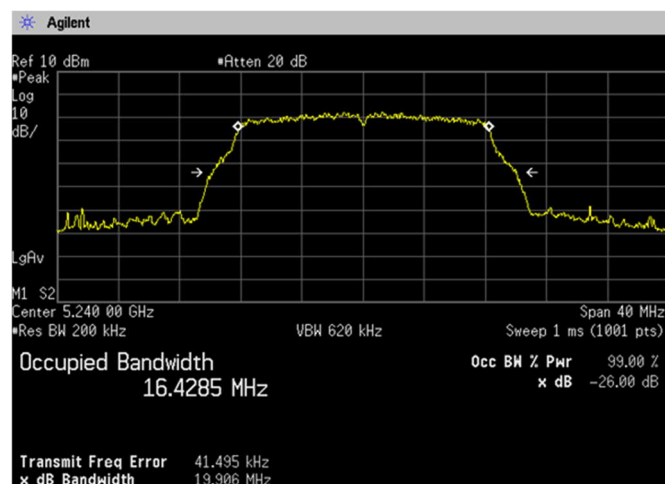
[IEEE802.11a]
(5.2 GHz Band)
Channel: 36



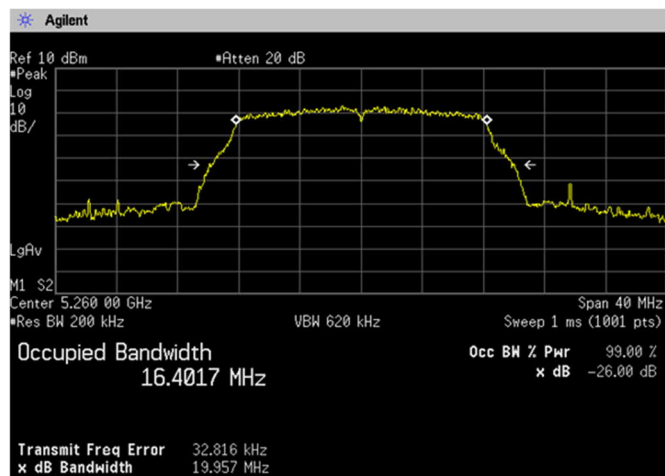
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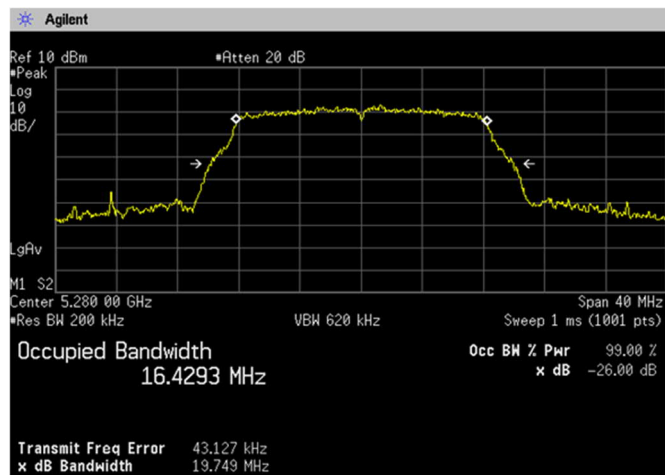
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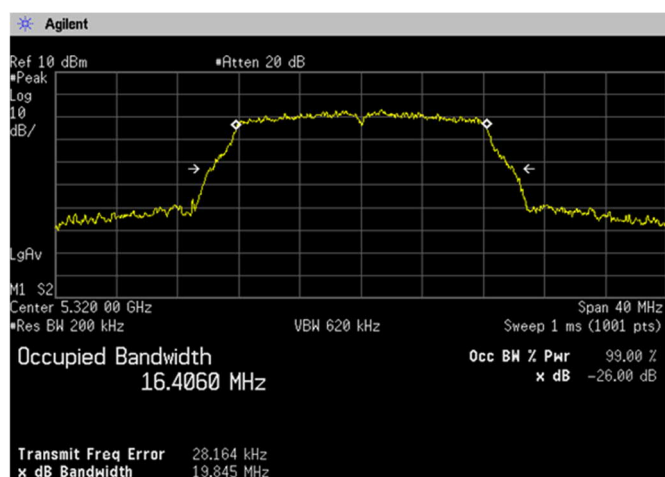
(5.3 GHz Band)
Channel: 52



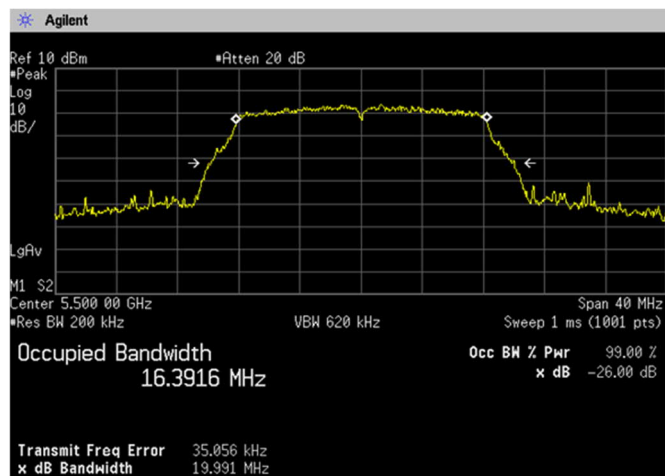
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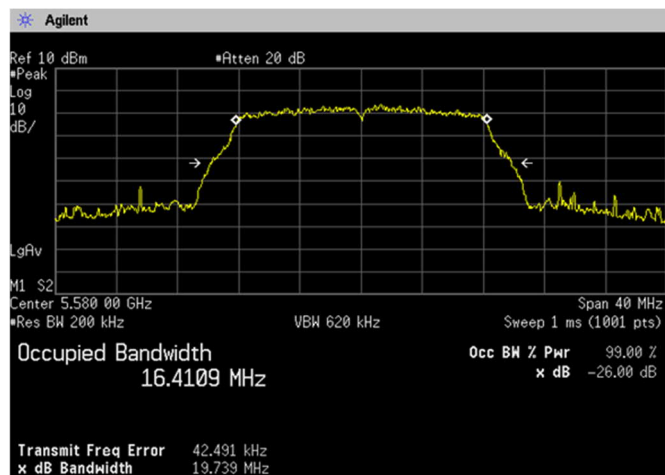
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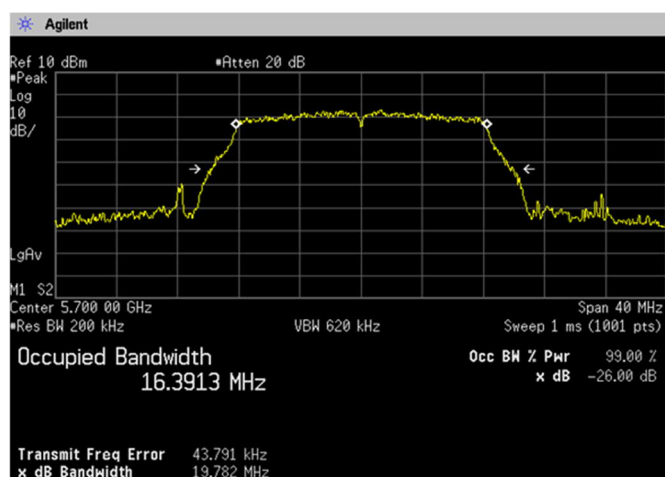
(5.6 GHz Band)
Channel: 100



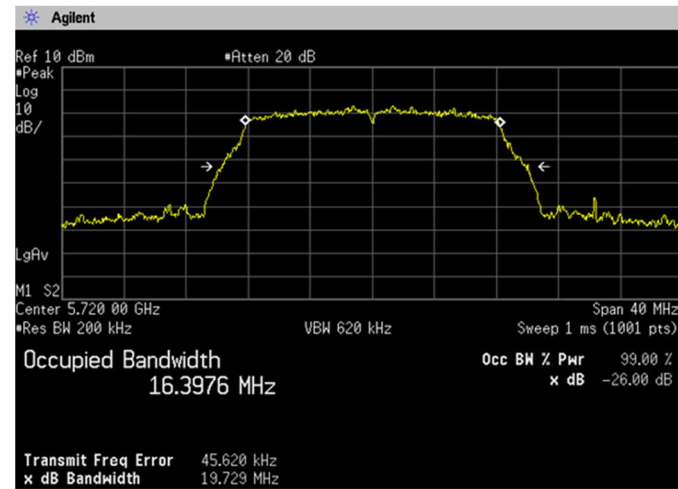
Channel: 116



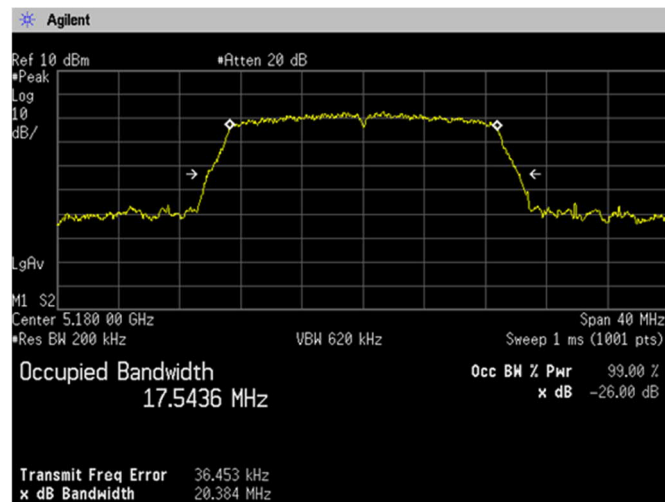
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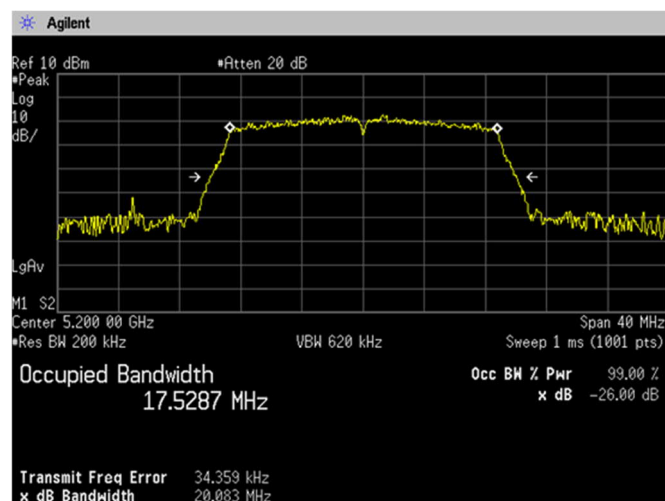
(5.6 GHz Band)
Channel: 144



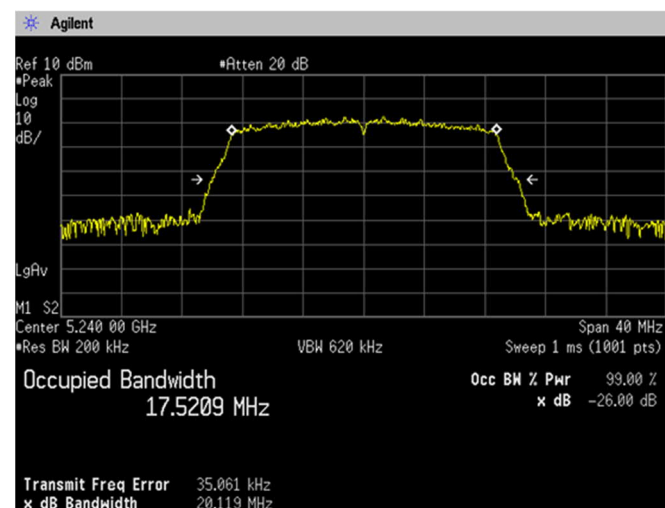
[IEEE802.11n (HT20)]
(5.2 GHz Band)
Channel: 36



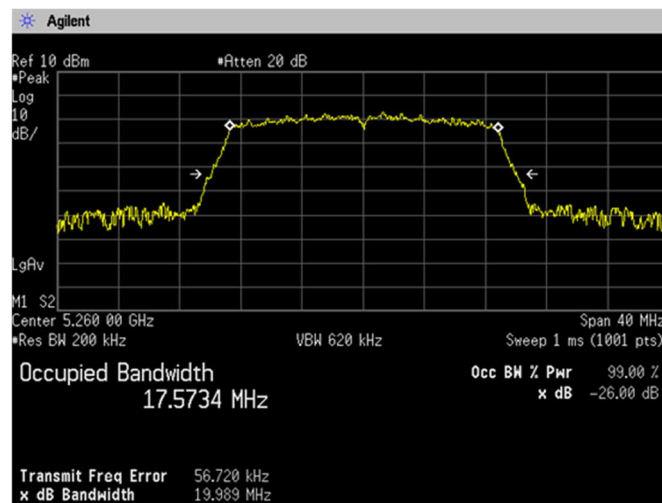
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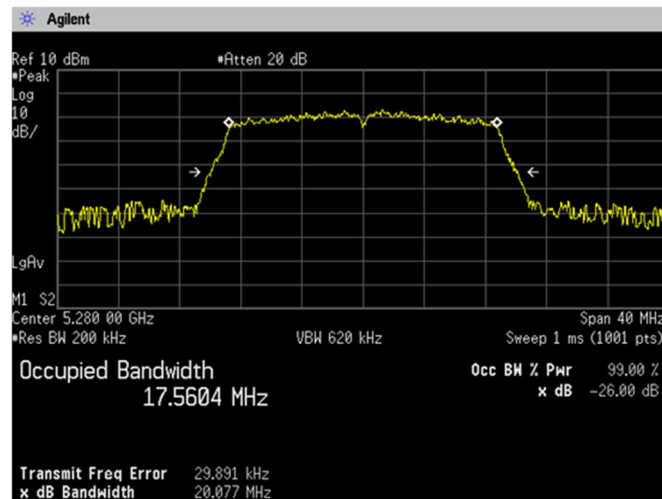
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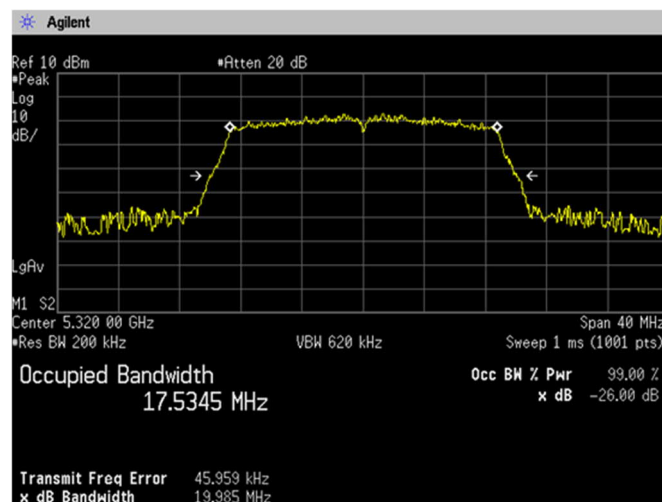
(5.3 GHz Band)
Channel: 52



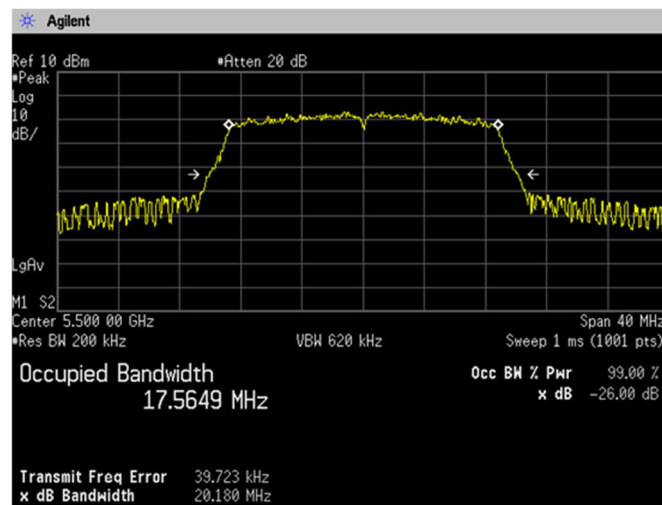
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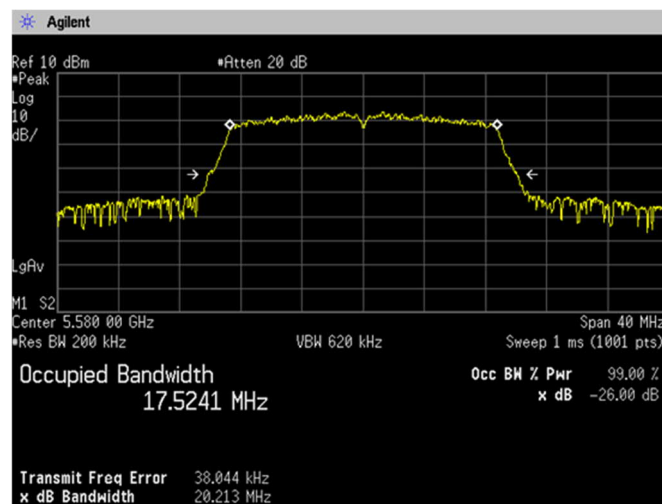
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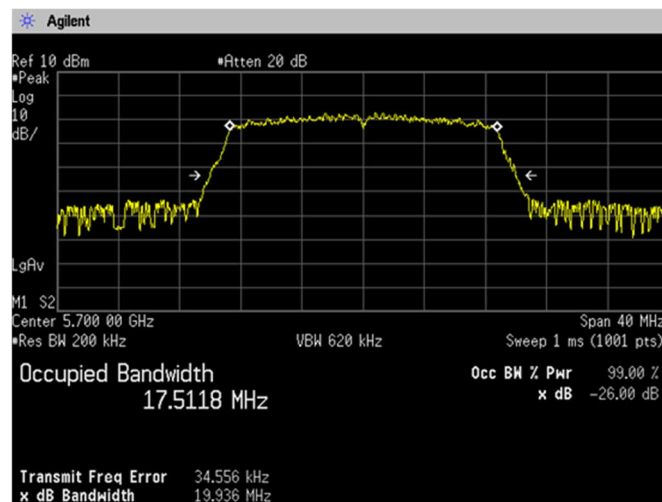
**(5.6 GHz Band)
Channel: 100**



Channel: 116

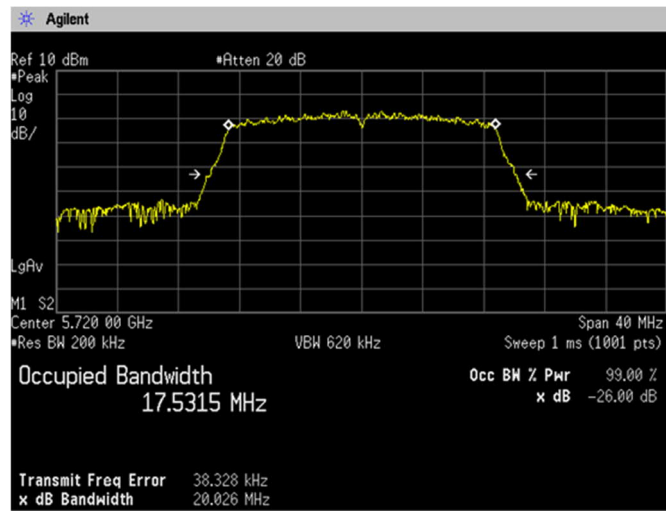


Channel: 140

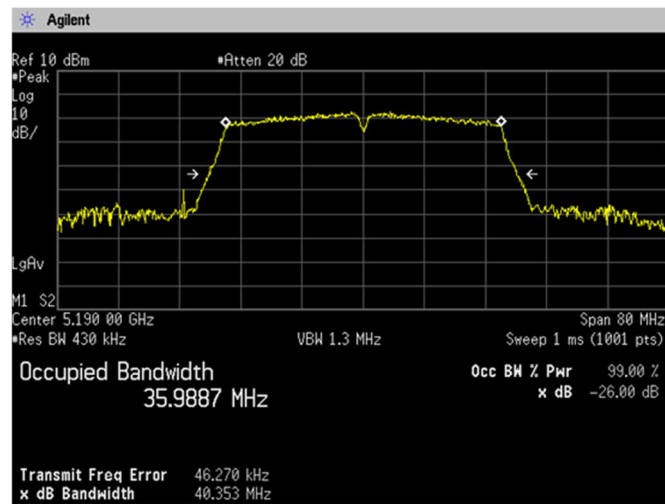


(5.6 GHz Band)

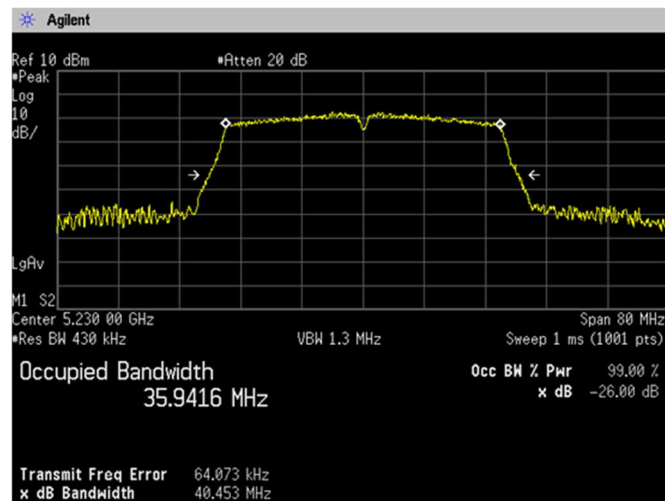
Channel: 144



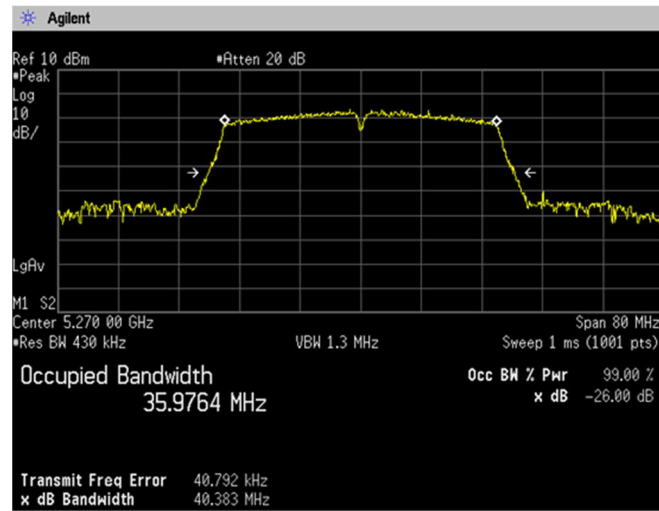
[IEEE802.11n (HT40)]
(5.2 GHz Band)
Channel: 38



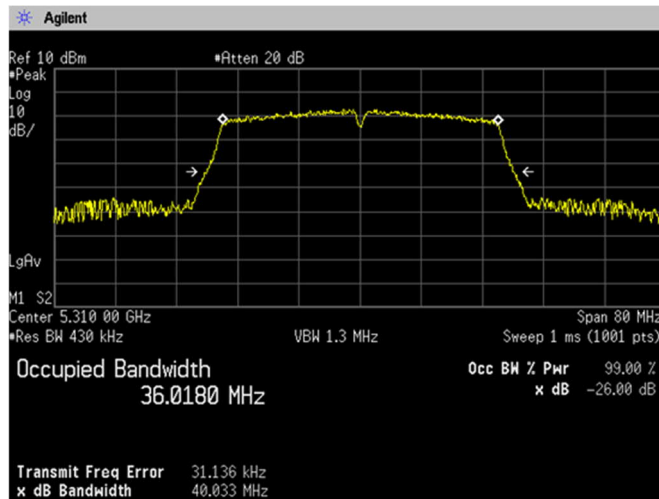
Channel: 46



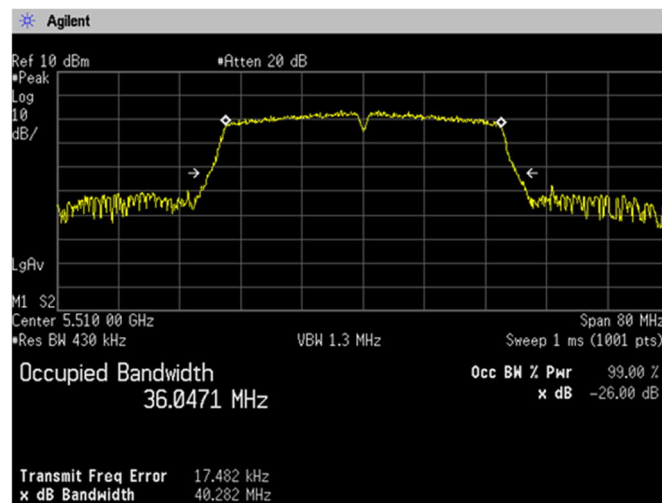
(5.3 GHz Band)
Channel: 54



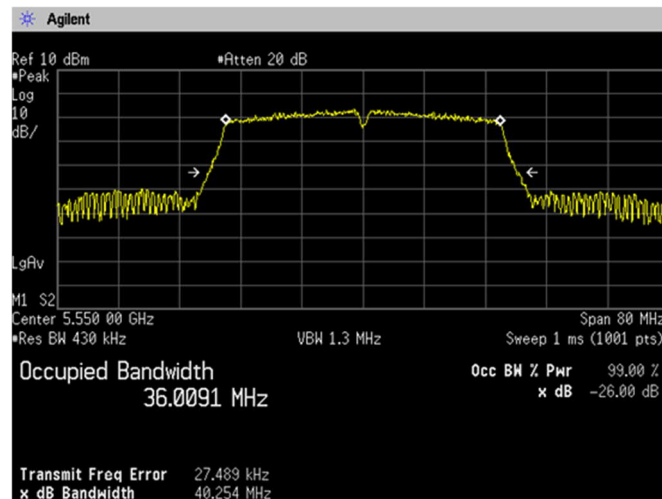
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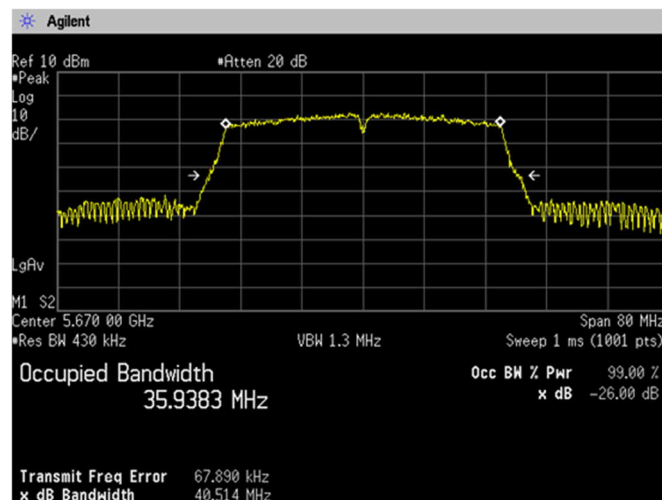
(5.6 GHz Band)
Channel: 102



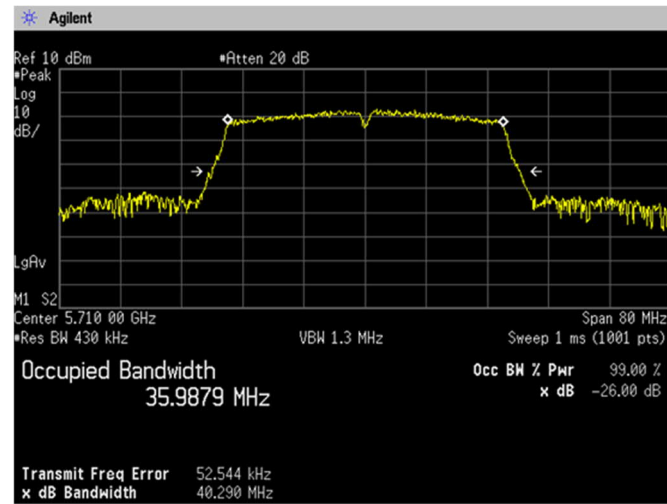
Channel: 110



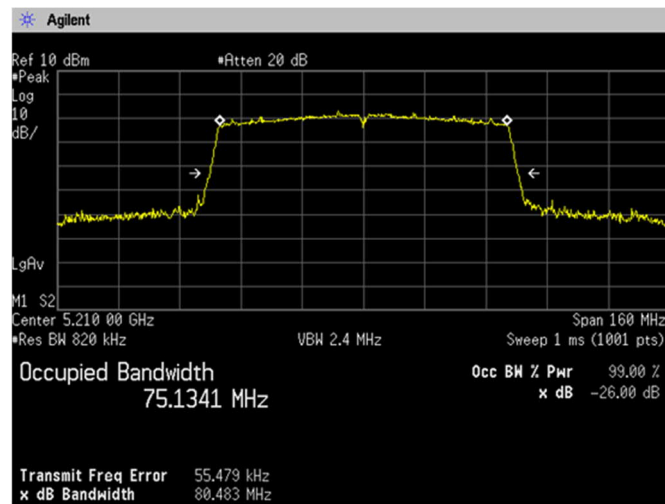
Channel: 134



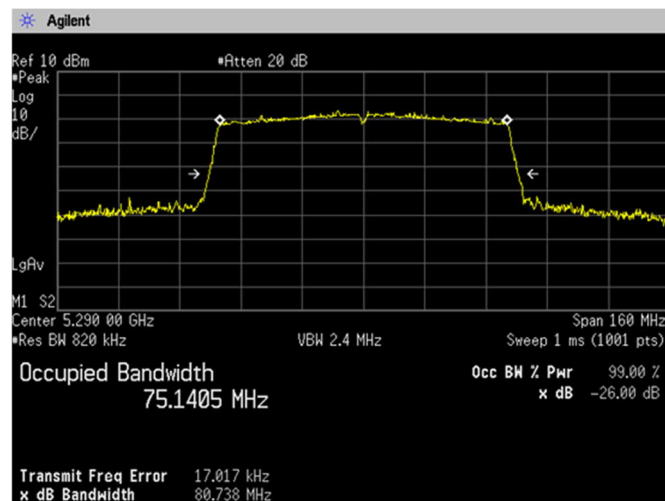
**(5.6 GHz Band)
Channel: 142**



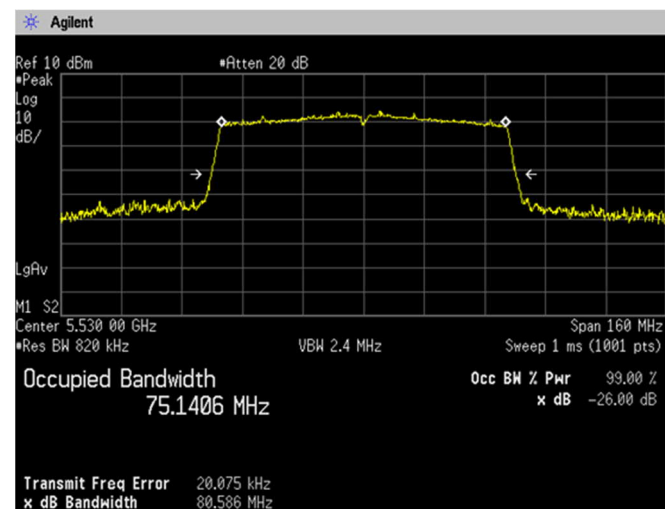
[IEEE802.11ac (HT80)]
(5.2 GHz Band)
Channel: 42



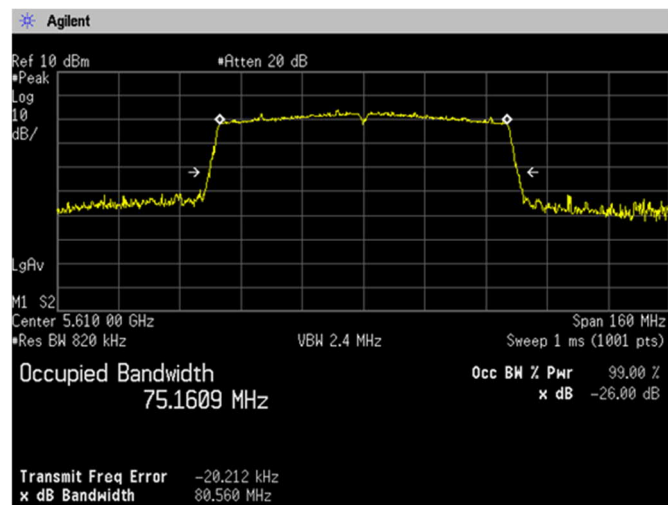
(5.3GHz Band)
Channel: 58



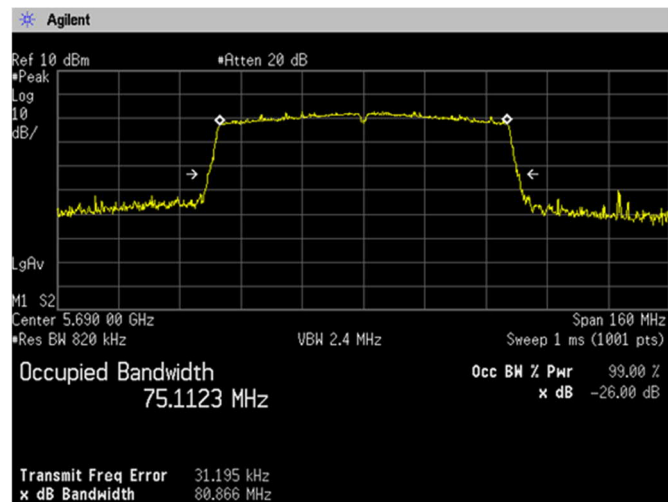
(5.6 GHz Band)
Channel: 106



(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;

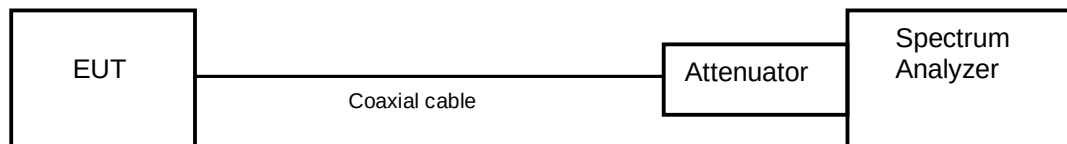
- RBW=1MHz, VBW=3MHz, Span=35MHz/70MHz/140MHz, Sweep=auto, Detector=RMS, Trace mode=Averaging

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	4.8	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	4.8	23.96
		19.749	23.96		
	802.11n HT20	250	23.97		23.97
		19.985	24.01		
	802.11n HT20	250	23.97		23.97
		40.033	27.02		
	802.11ac HT80	250	23.97		23.97
		80.738	30.07		

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	5.4	23.95
		19.739	23.95		
	802.11n HT20	250	23.97		23.97
		19.936	24.00		
	802.11n HT20	250	23.97		23.97
		40.254	27.05		
	802.11ac HT80	250	23.97		23.97
		80.560	30.06		

4.2.3 Measurement result

Date : 6-June-2024

Temperature : 20.2 [°C]

Humidity : 52.3 [%]

Test place : Shielded room No.4

Test engineer :

Kazunori Saito

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	13.34	1.384	1.429	0.969	0.137	13.477	22.269
	40	5200	13.41					13.547	22.631
	58	5240	13.15					13.287	21.316
	52	5260	13.60	1.384	1.429	0.969	0.137	13.737	23.643
	56	5280	13.54					13.677	23.318
	64	5320	13.53					13.667	23.265
	100	5500	14.34	1.384	1.429	0.969	0.137	14.477	28.035
	116	5580	14.31					14.447	27.842
	140	5700	13.97					14.107	25.745
	144	5720	13.91					14.047	25.392

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	13.17	1.279	1.324	0.966	0.150	13.320	21.478
	40	5200	13.12					13.270	21.232
	58	5240	13.00					13.150	20.654
	52	5260	13.56	1.279	1.324	0.966	0.150	13.710	23.496
	56	5280	13.57					13.720	23.550
	64	5320	13.49					13.640	23.121
	100	5500	14.43	1.279	1.324	0.966	0.150	14.580	28.708
	116	5580	14.38					14.530	28.379
	140	5700	13.70					13.850	24.266
	144	5720	13.68					13.830	24.155

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

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

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	13.27	0.627	0.670	0.936	0.287	13.557	22.683
	46	5230	13.11					13.397	21.863
	54	5270	13.48	0.627	0.670	0.936	0.287	13.767	23.807
	62	5310	13.46					13.747	23.697
	102	5510	14.49	0.627	0.670	0.936	0.287	14.777	30.040
	110	5550	14.48					14.767	29.971
	134	5670	13.62					13.907	24.587
	142	5710	13.72					14.007	25.159

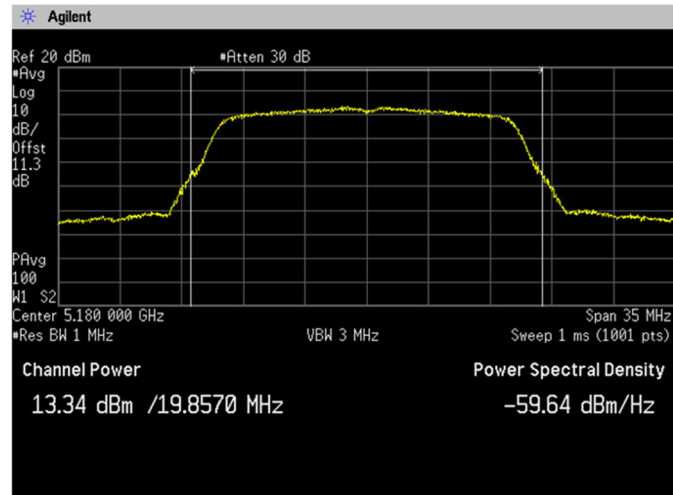
Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)	Test Result (mW)
				On Time(ms)	On+Off Time(ms)	X			
802.11ac (80MHz)	42	5210	13.05	0.323	0.358	0.902	0.448	13.498	22.377
	58	5290	13.28	0.323	0.358	0.902	0.448	13.728	23.594
	106	5530	14.12	0.323	0.358	0.902	0.448	14.568	28.629
	122	5610	14.06	0.323	0.358	0.902	0.448	14.508	28.236
	138	5690	13.24	0.323	0.358	0.902	0.448	13.688	23.378

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

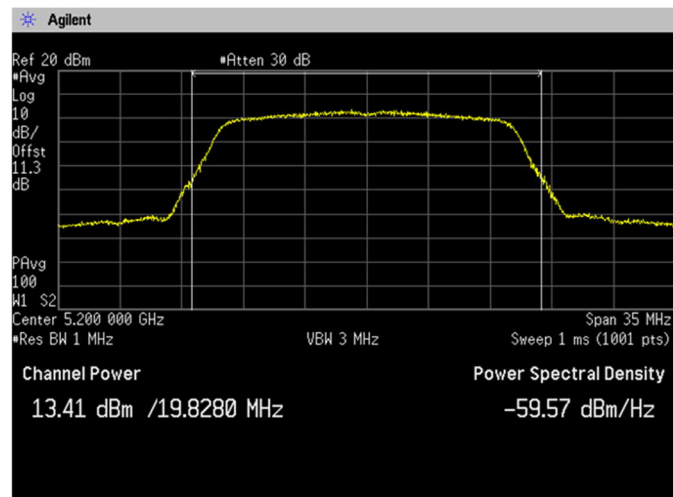
Note2: $\text{Test Result} = \text{Reading} + \text{DCF}$

4.2.4 Trace data

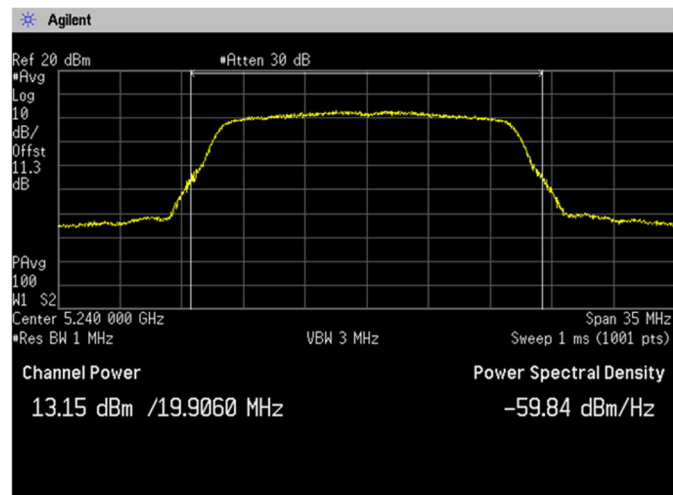
[IEEE802.11a]
(5.2 GHz Band)
Channel: 36



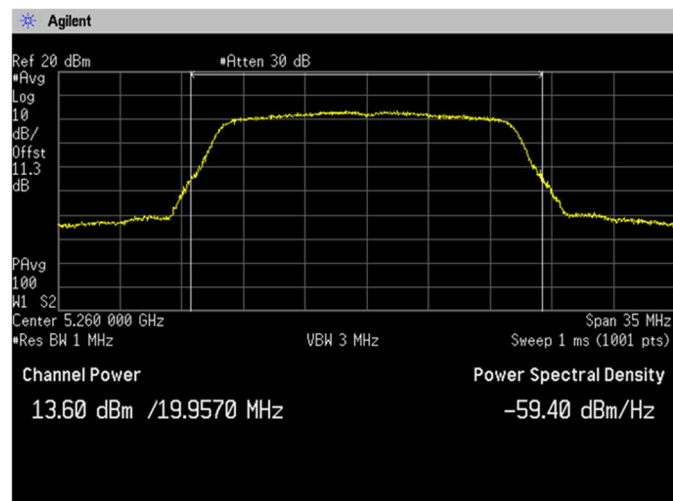
Channel: 40



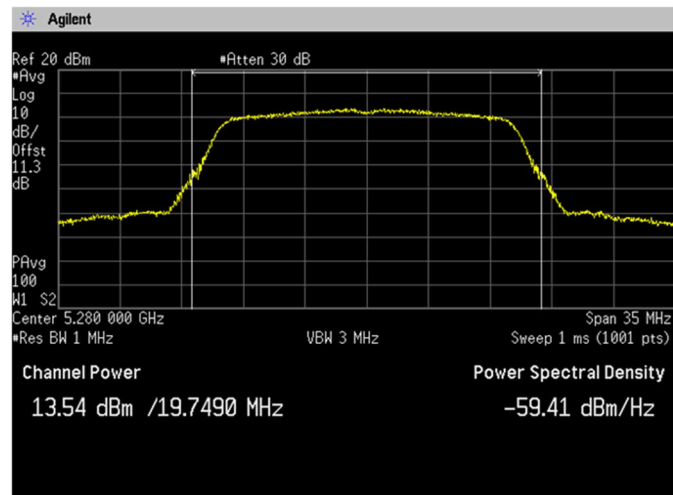
Channel: 48



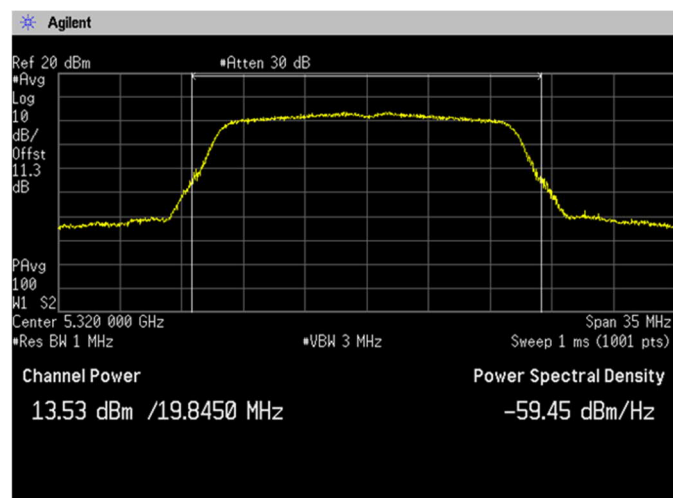
(5.3 GHz Band)
Channel: 52



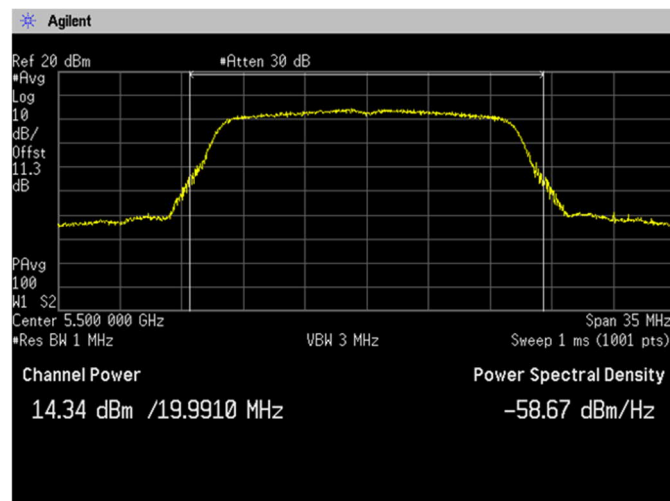
Channel: 56



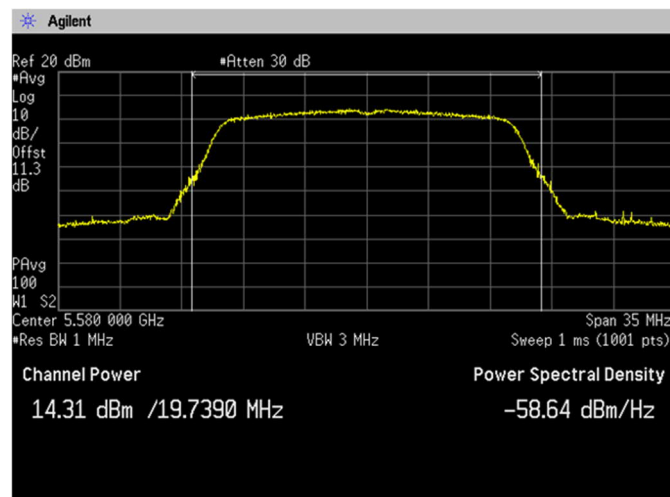
Channel: 64



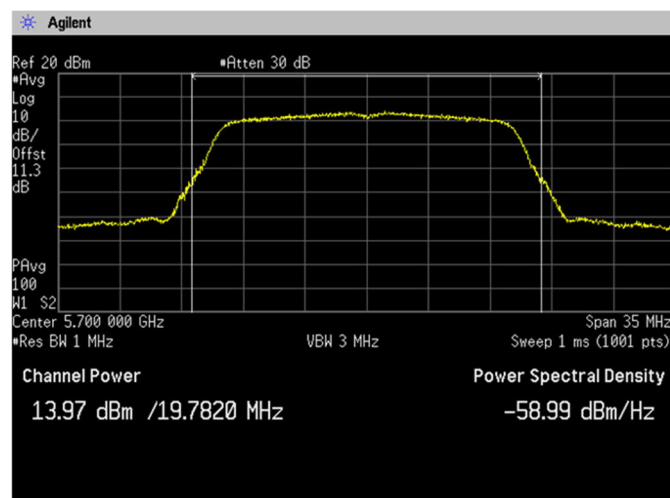
(5.6 GHz Band)
Channel: 100



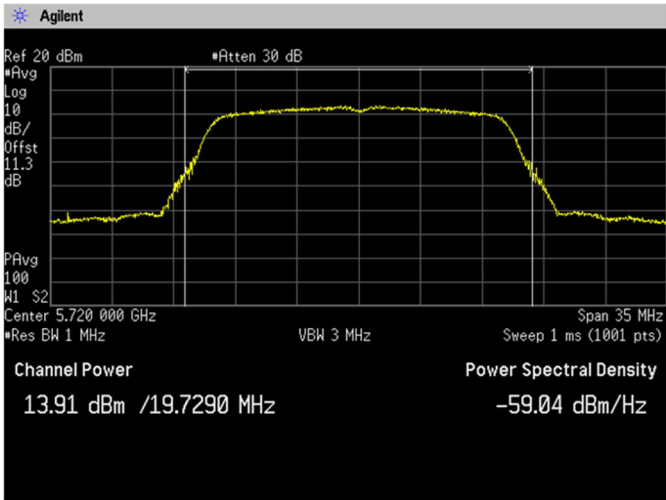
Channel: 116



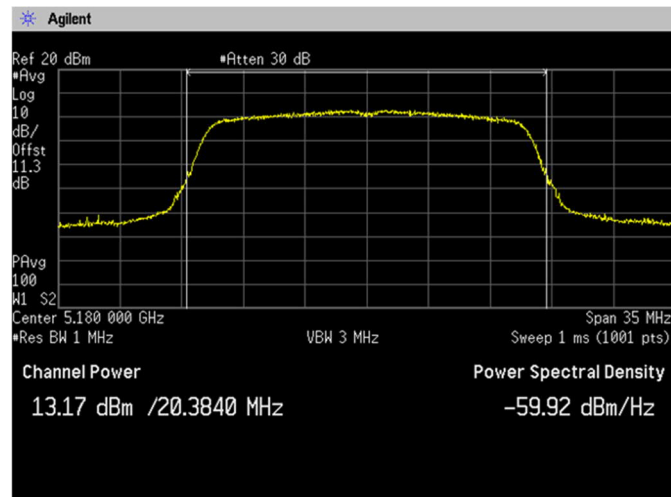
Channel: 140



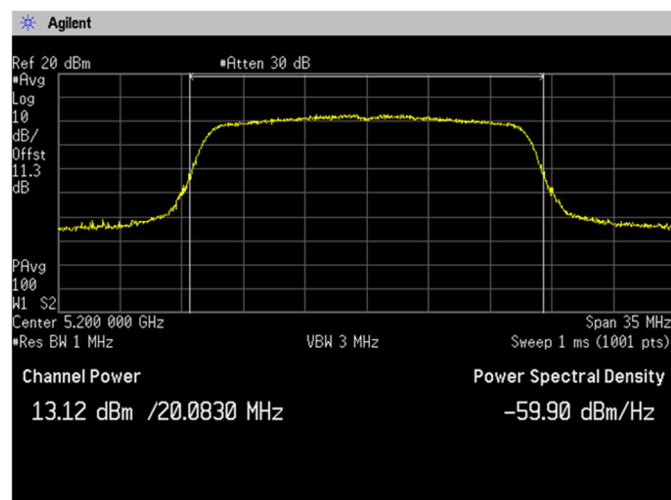
(5.6 GHz Band)
Channel: 144



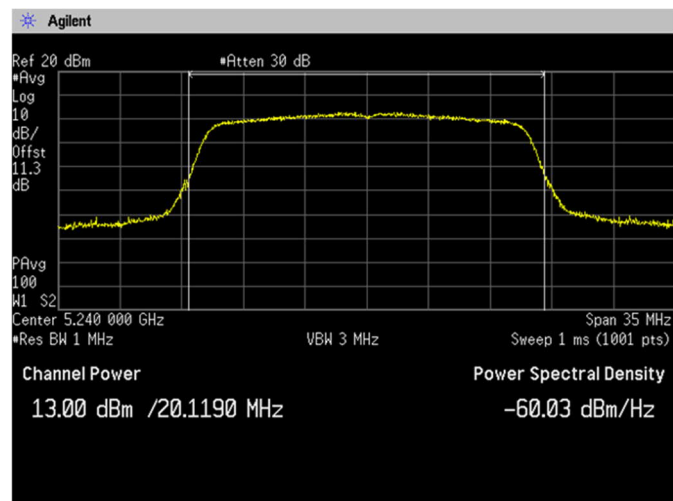
[IEEE802.11n (HT20)]
(5.2 GHz Band)
Channel: 36



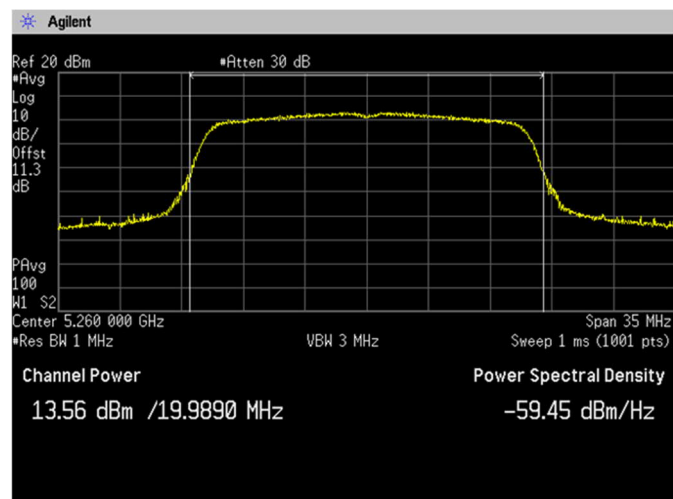
Channel: 40



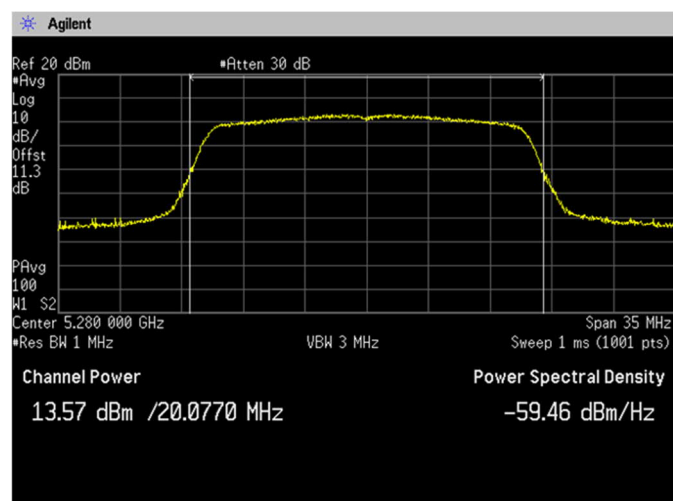
**(5.2 GHz Band)
Channel: 48**



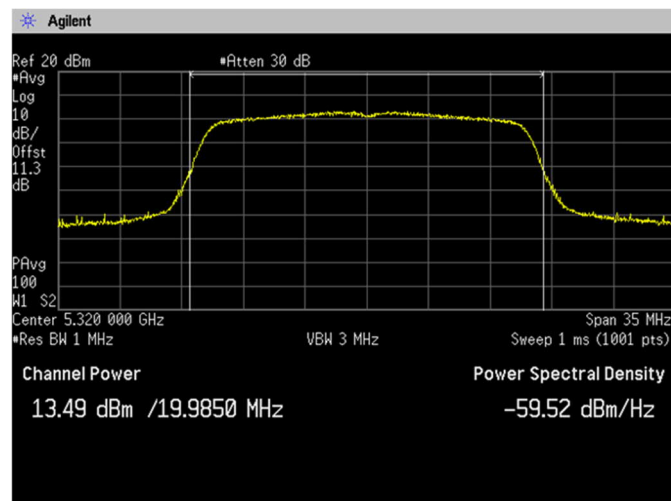
**(5.3 GHz Band)
Channel: 52**



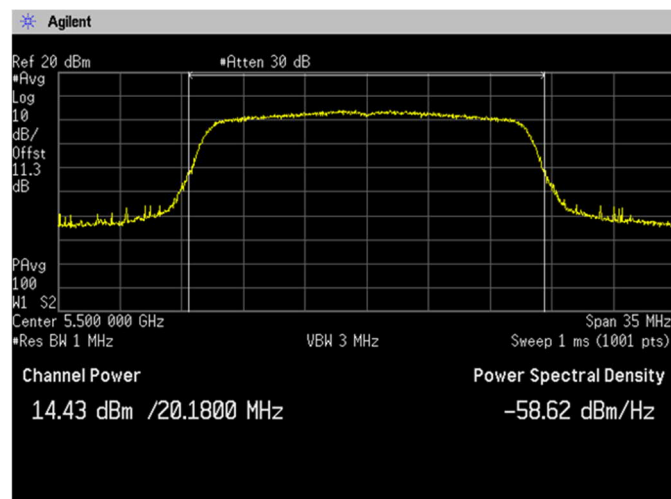
Channel: 56



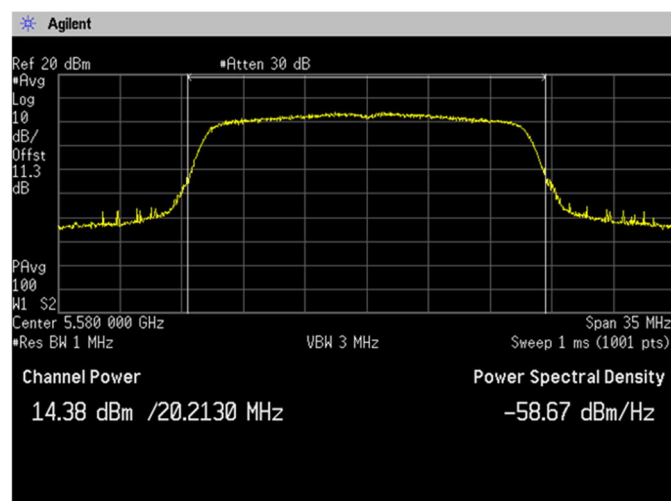
**(5.3 GHz Band)
Channel: 64**



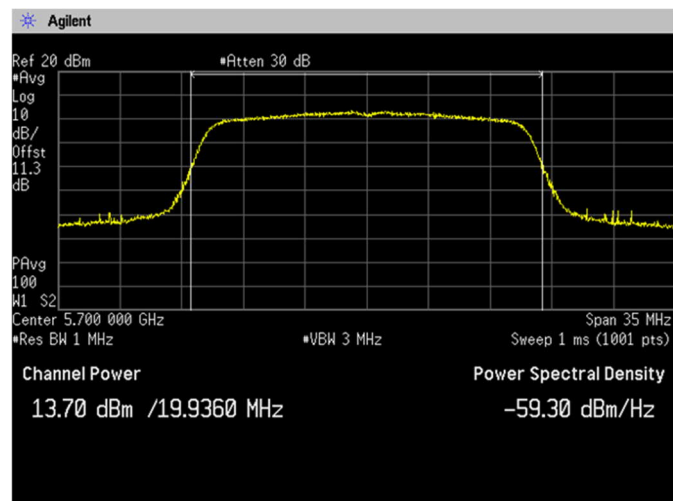
**(5.6 GHz Band)
Channel: 100**



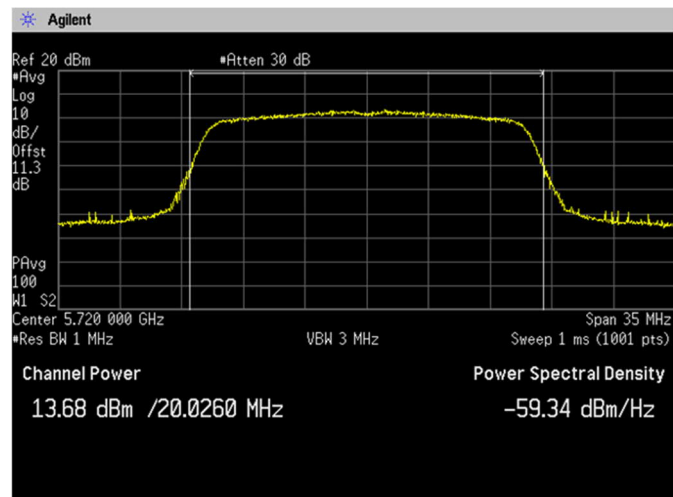
Channel: 116



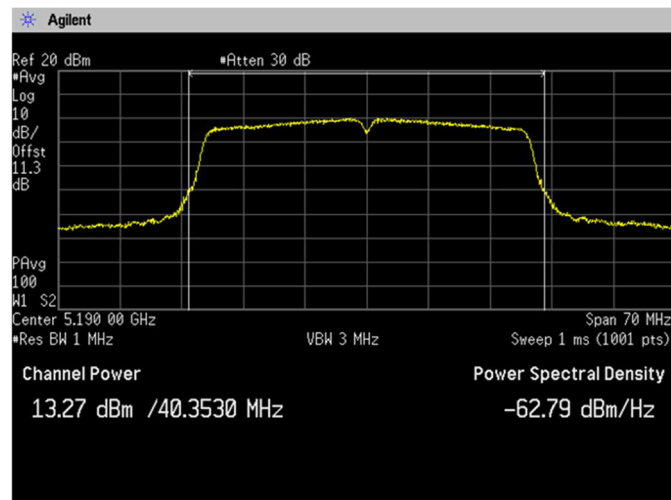
(5.6 GHz Band)
Channel: 140



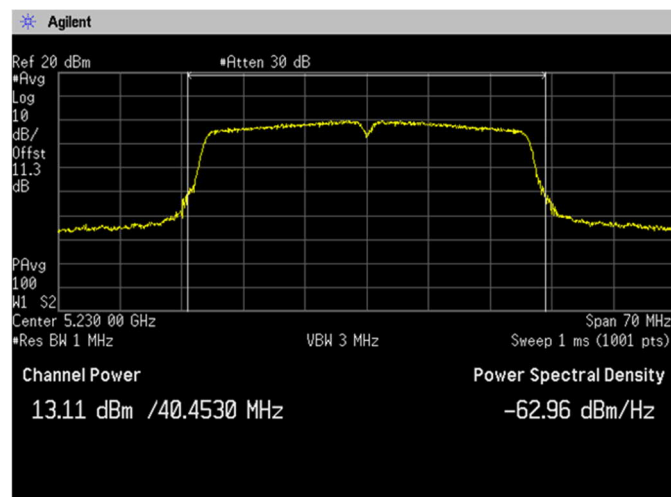
Channel: 144



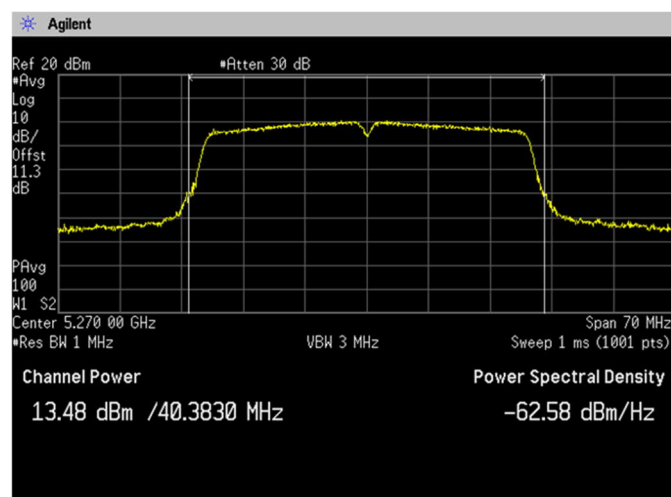
[IEEE802.11n (HT40)]
(5.2 GHz Band)
Channel: 38



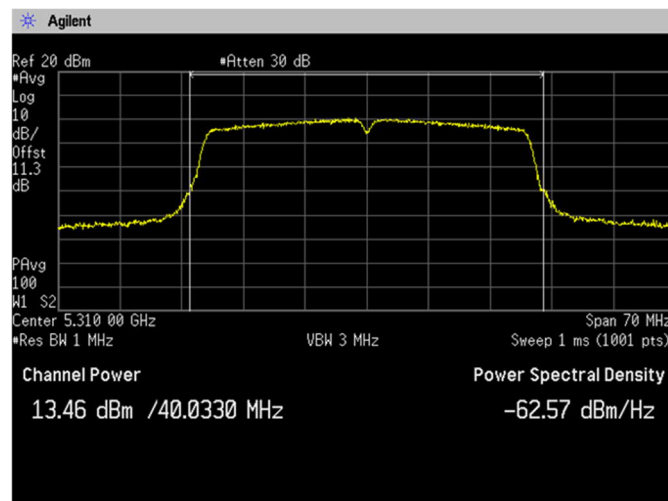
(5.2 GHz Band)
Channel: 46



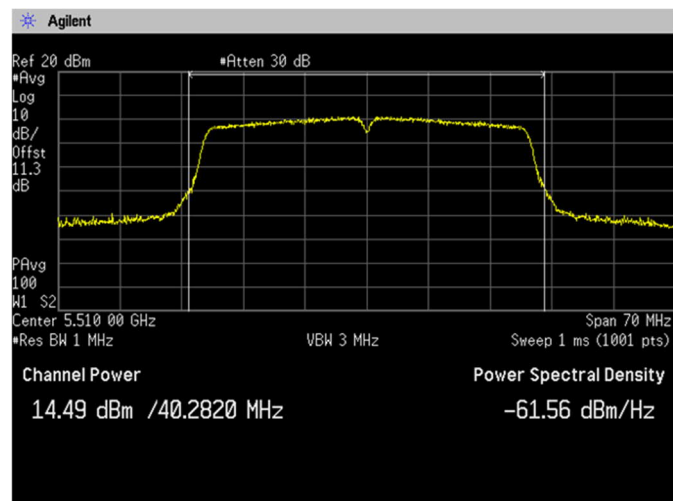
(5.3 GHz Band)
Channel: 54



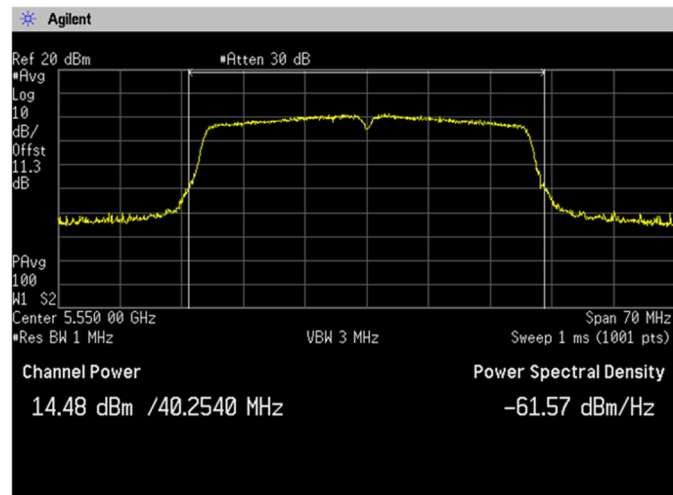
(5.3 GHz Band)
Channel: 62



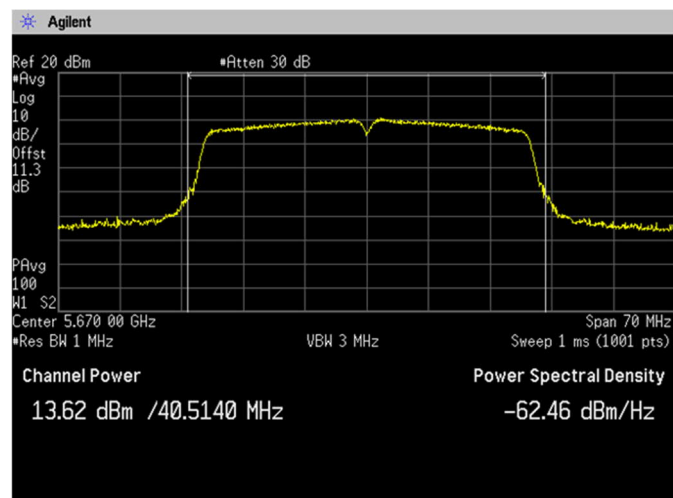
**(5.6 GHz Band)
Channel: 102**



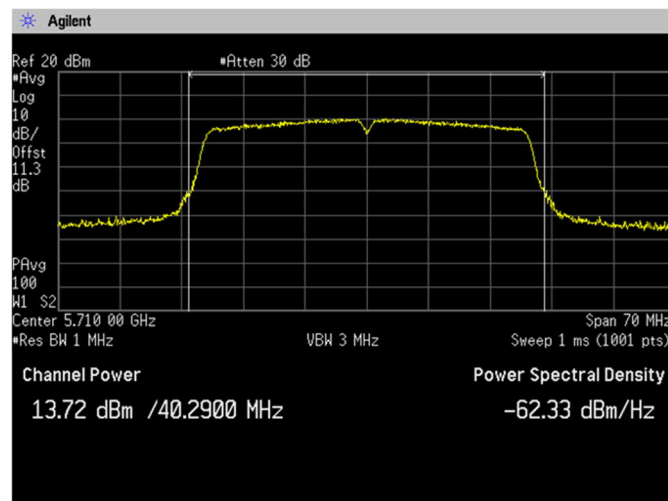
Channel: 110



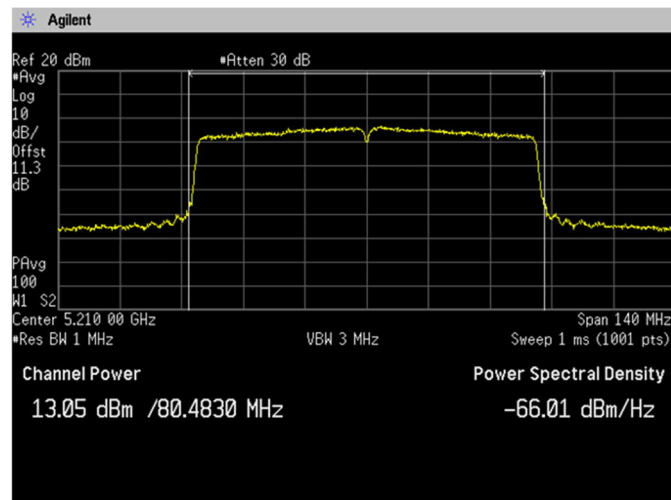
Channel: 134



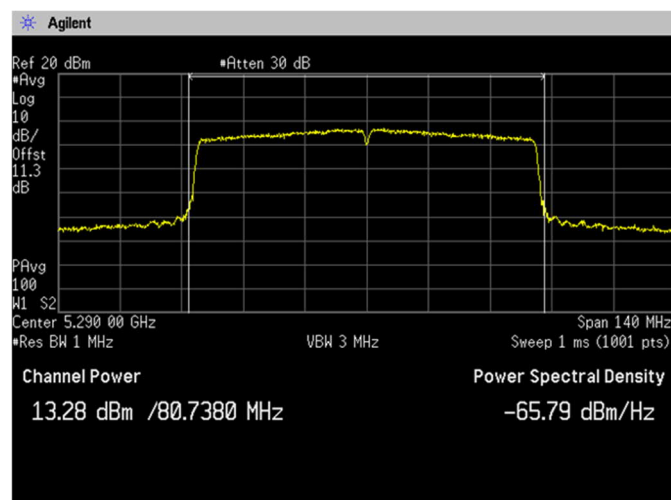
**(5.6 GHz Band)
Channel: 142**



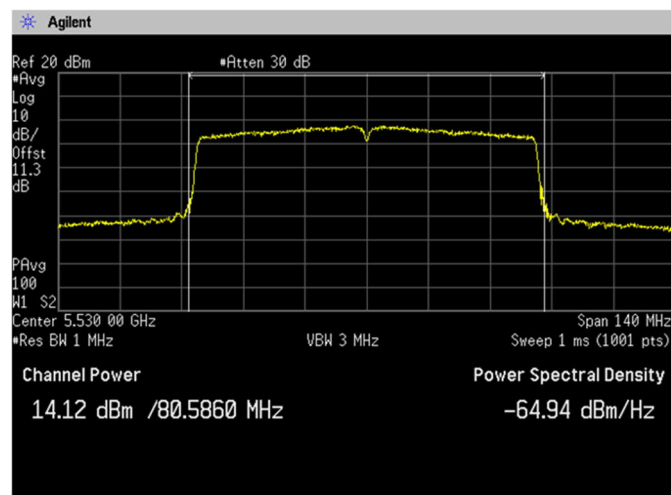
[IEEE802.11ac (HT80)]
(5.2 GHz Band)
Channel: 42



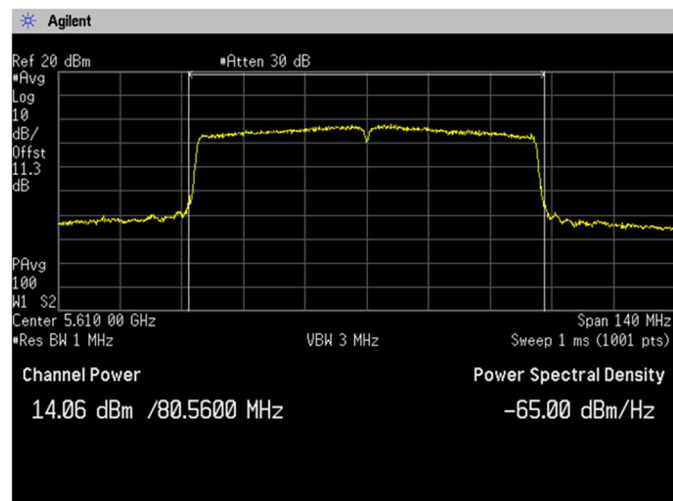
(5.3GHz Band)
Channel: 58



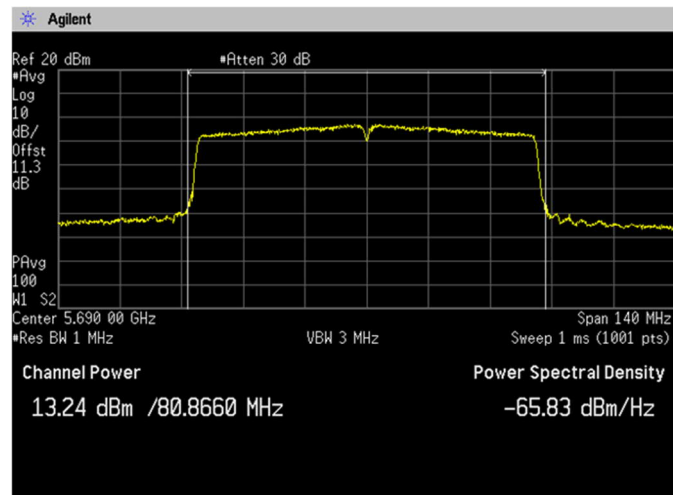
(5.6 GHz Band)
Channel: 106



(5.6 GHz Band)
Channel: 122



Channel: 138



4.3 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

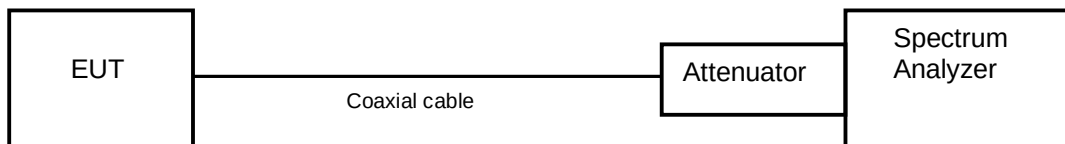
The EUT was set to operate with following conditions.

- 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	4.8	15.8 dBm/MHz
5.3 GHz Band	11	4.8	15.8 dBm/MHz
5.6 GHz Band	11	5.4	16.4 dBm/MHz

4.3.3 Measurement result

Date : 6-June-2024

Temperature : 20.2 [°C]

Humidity : 52.3 [%]

Test place : Shielded room No.4

Test engineer :

Kazunori Saito

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	3.111	1.384	1.429	0.969	0.137	3.248
	40	5200	3.643					3.780
	48	5240	3.651					3.788
	52	5260	3.555	1.384	1.429	0.969	0.137	3.692
	56	5280	3.551					3.688
	64	5320	3.423					3.560
	100	5500	4.720	1.384	1.429	0.969	0.137	4.857
	116	5580	5.131					5.268
	140	5700	3.629					3.766
	144	5720	3.599					3.736

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	2.885	1.279	1.324	0.966	0.150	3.035
	40	5200	3.169					3.319
	48	5240	3.466					3.616
	52	5260	3.582	1.279	1.324	0.966	0.150	3.732
	56	5280	3.817					3.967
	64	5320	3.063					3.213
	100	5500	4.024	1.279	1.324	0.966	0.150	4.174
	116	5580	4.551					4.701
	140	5700	3.792					3.942
	144	5720	4.009					4.159

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

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	0.074	0.627	0.670	0.936	0.287	0.361
	46	5230	0.340					0.627
	54	5270	1.148	0.627	0.670	0.936	0.287	1.435
	62	5310	1.043					1.330
	102	5510	1.762	0.627	0.670	0.936	0.287	2.049
	110	5550	1.720					2.007
	134	5670	0.898					1.185
	142	5710	1.143					1.430

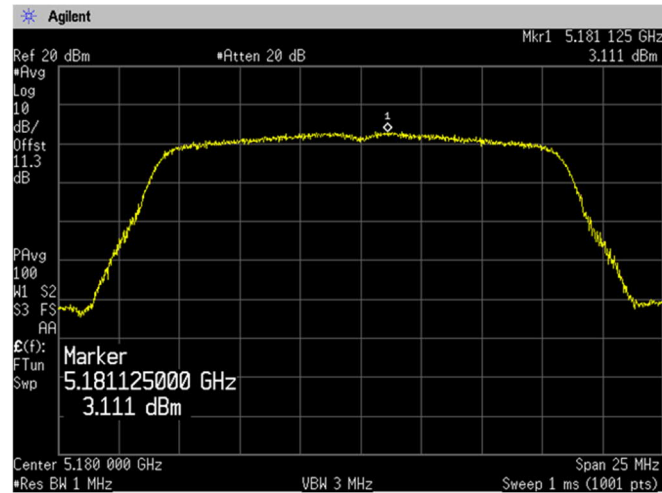
Mode	Channel	Frequency (MHz)	Reading (dBm)	Duty Cycle			DCF (dB)	Test Result (dBm)
				On Time(ms)	On+Off Time(ms)	X		
802.11ac (80MHz)	42	5210	-3.020	0.323	0.358	0.902	0.448	-2.572
	58	5290	-2.377	0.323	0.358	0.902	0.448	-1.929
	106	5530	-1.444	0.323	0.358	0.902	0.448	-0.996
	122	5610	-1.731	0.323	0.358	0.902	0.448	-1.283
	138	5690	-2.485	0.323	0.358	0.902	0.448	-2.037

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

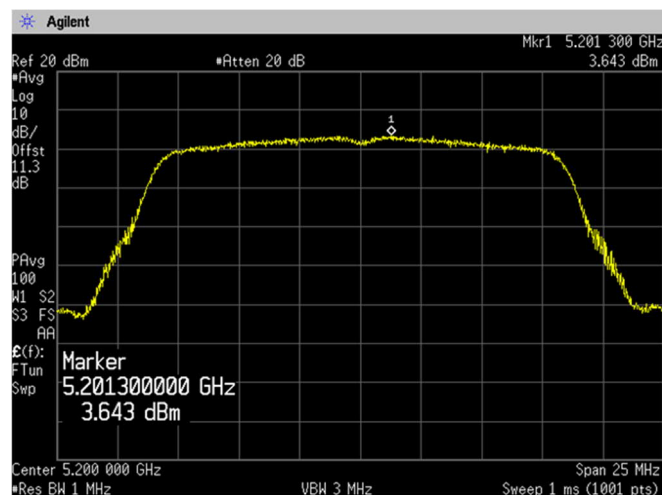
Note 2: $\text{Test Result} = \text{Reading} + \text{DCF}$

4.3.4 Trace data

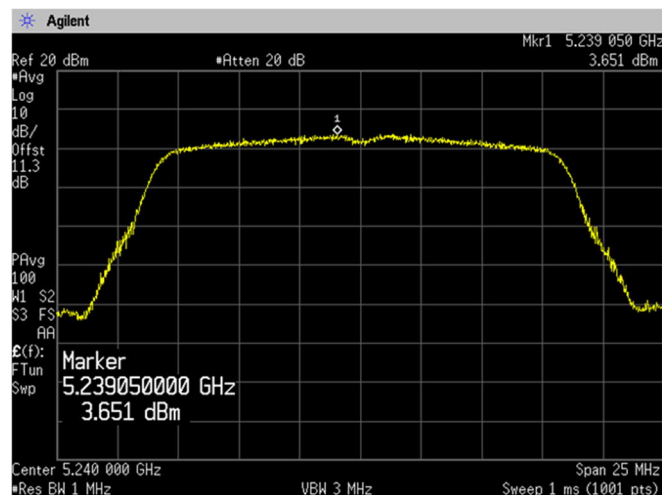
[IEEE802.11a]
(5.2 GHz Band)
Channel: 36



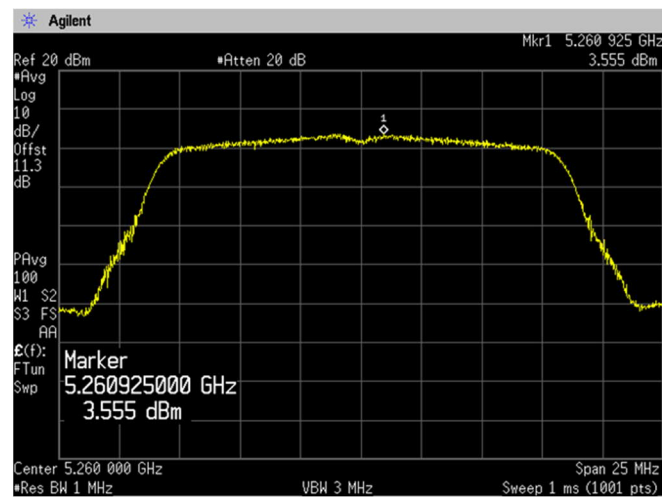
Channel: 40



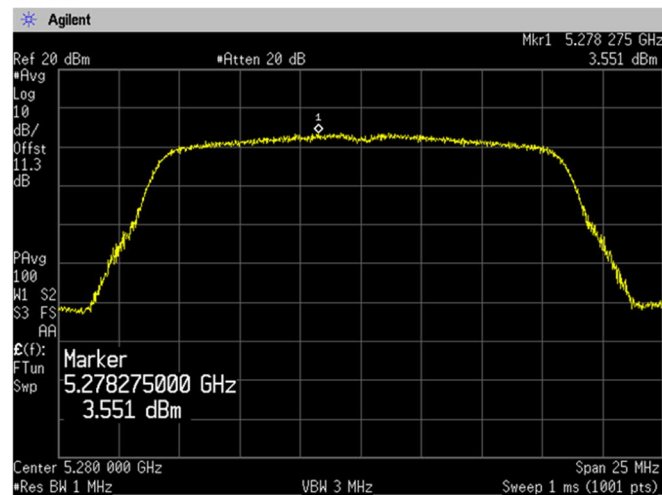
Channel: 48



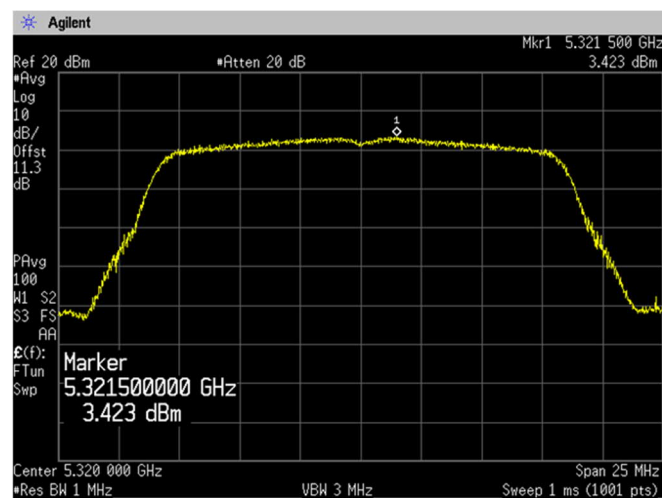
(5.3 GHz Band)
Channel: 52



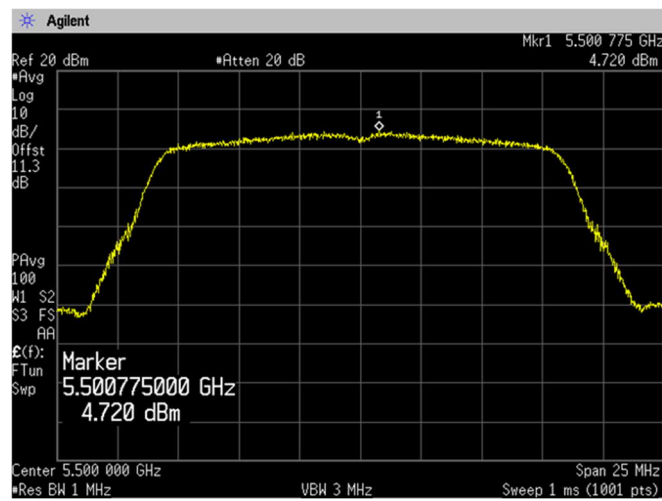
Channel: 56



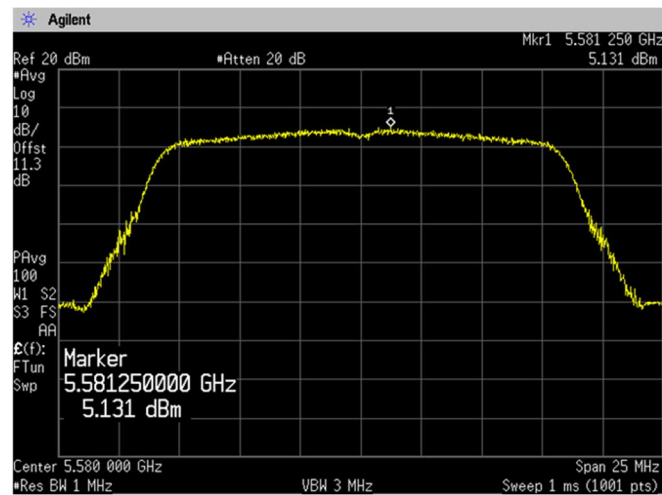
Channel: 64



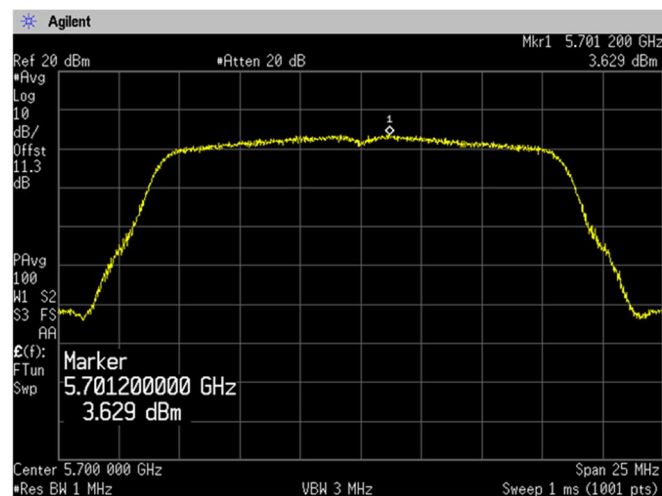
(5.6 GHz Band)
Channel: 100



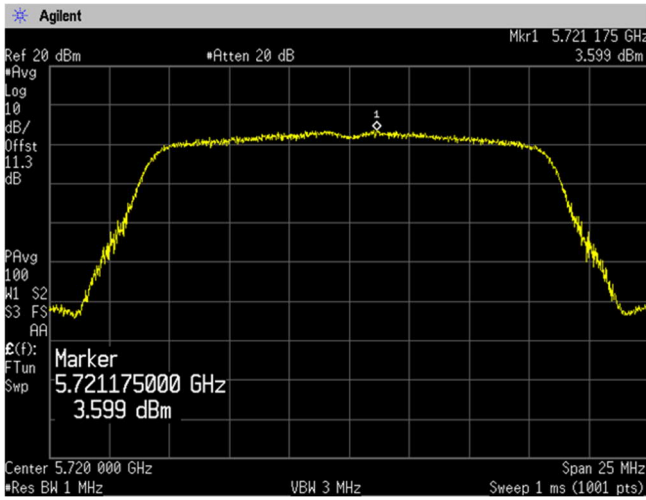
Channel: 116



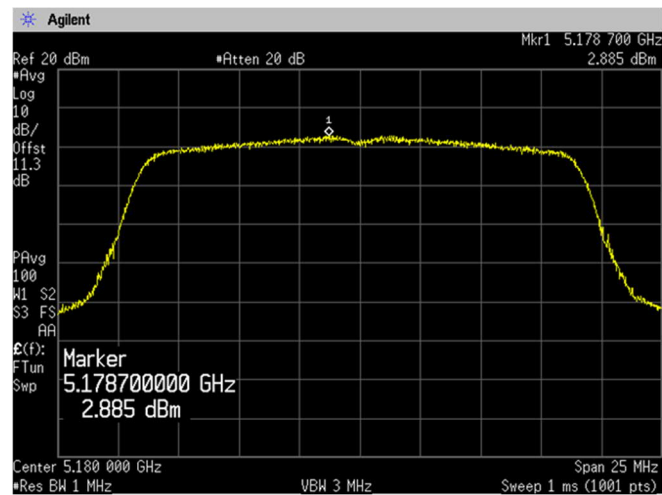
Channel: 140



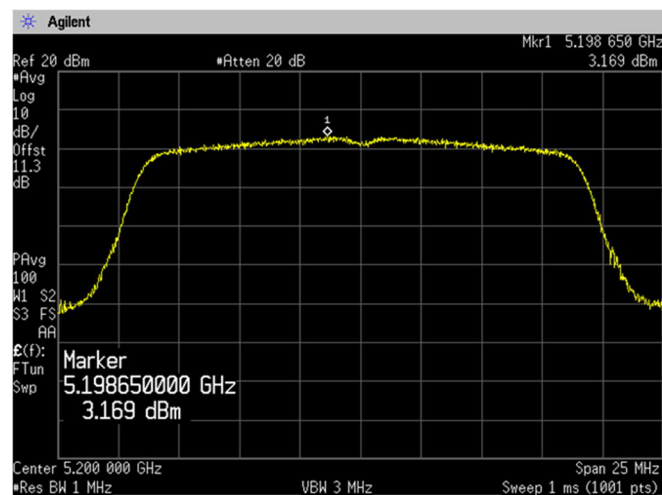
(5.6 GHz Band)
Channel: 144



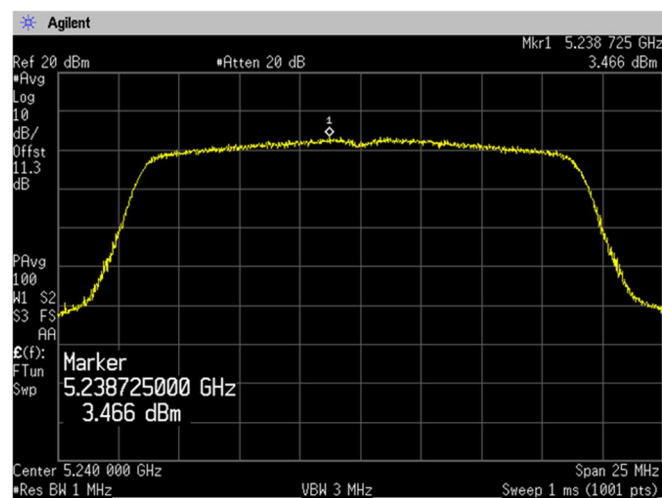
[IEEE802.11n (HT20)]
(5.2 GHz Band)
Channel: 36



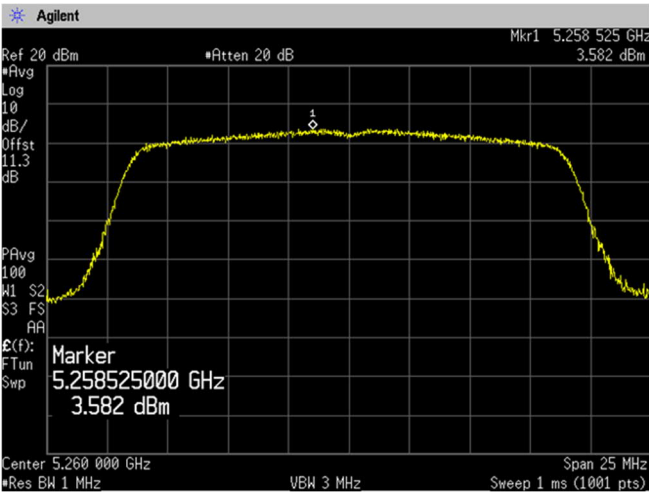
Channel: 40



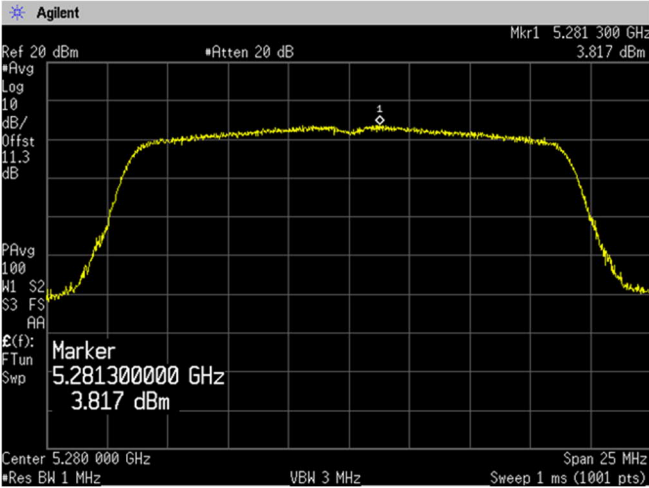
Channel: 48



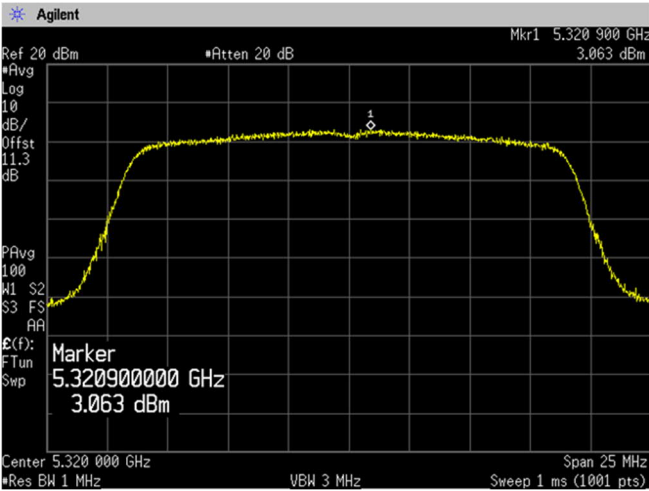
(5.3 GHz Band)
Channel: 52



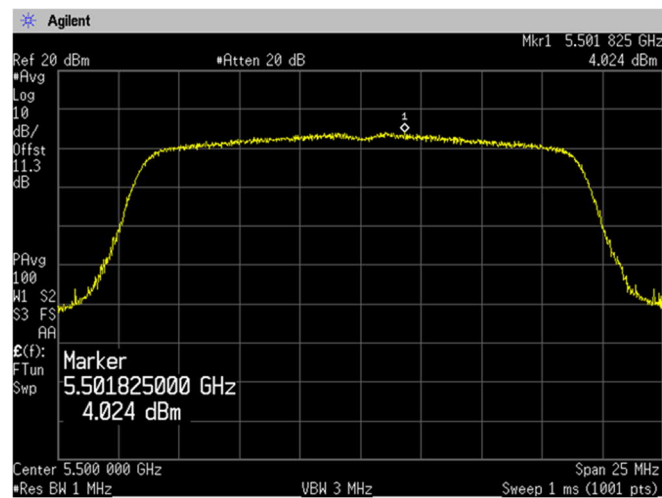
Channel: 56



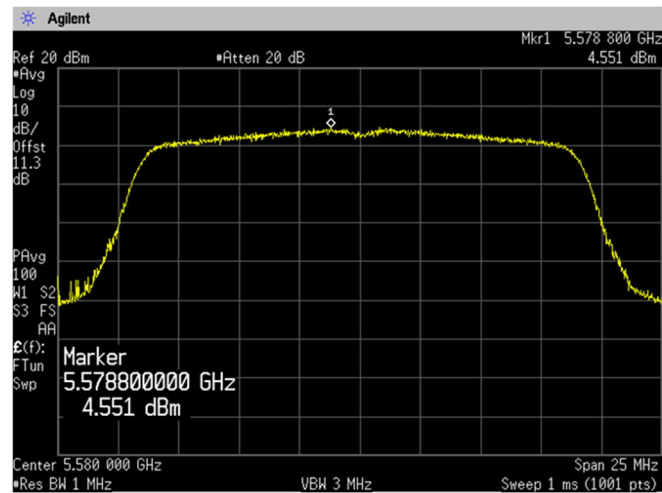
Channel: 64



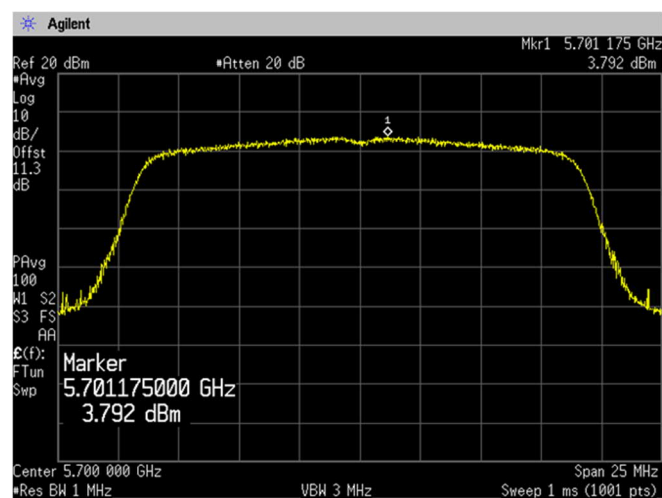
(5.6 GHz Band)
Channel: 100



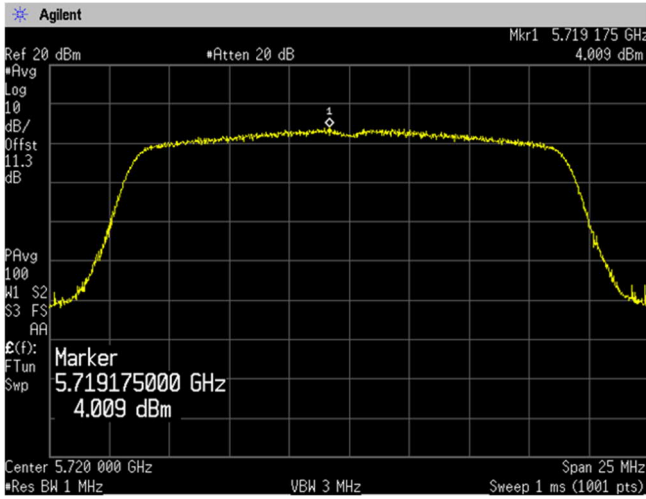
Channel: 116



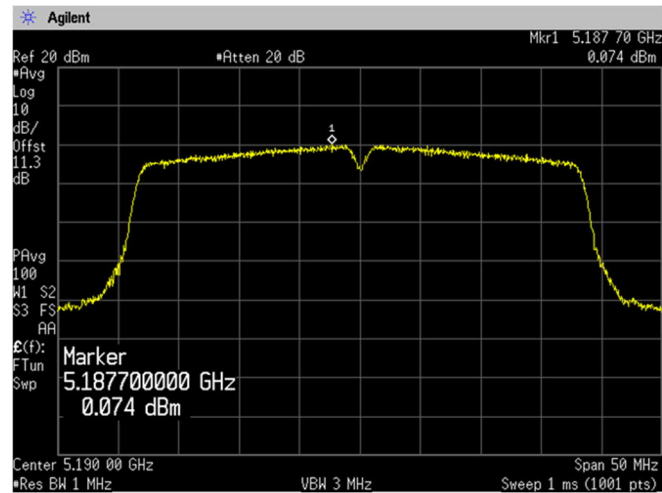
Channel: 140



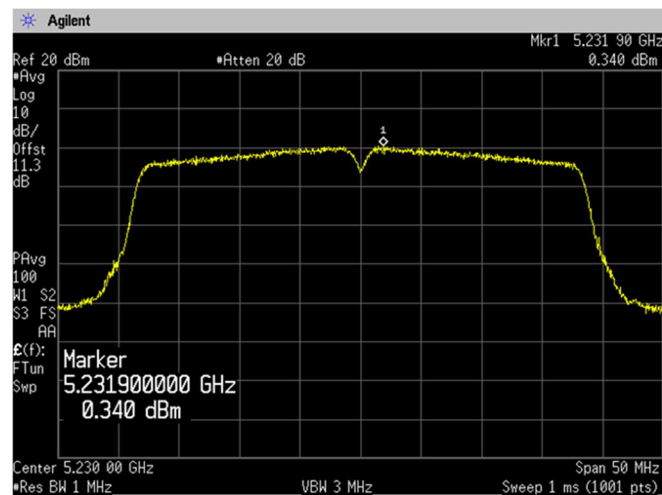
(5.6 GHz Band)
Channel: 144



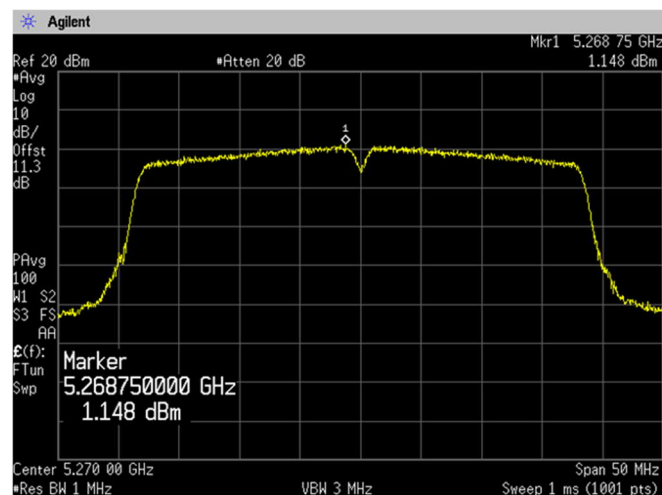
[IEEE802.11n (HT40)]
(5.2 GHz Band)
Channel: 38



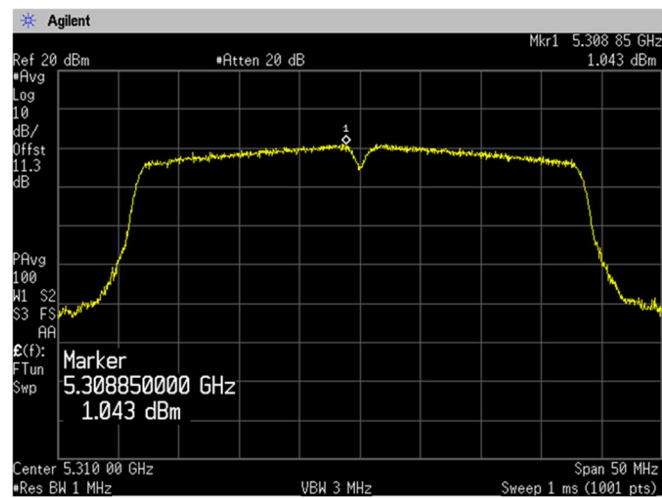
(5.2 GHz Band)
Channel: 46



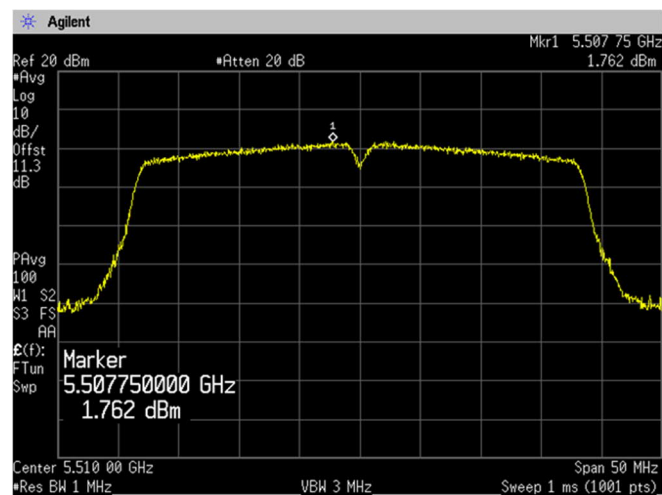
(5.3 GHz Band)
Channel: 54



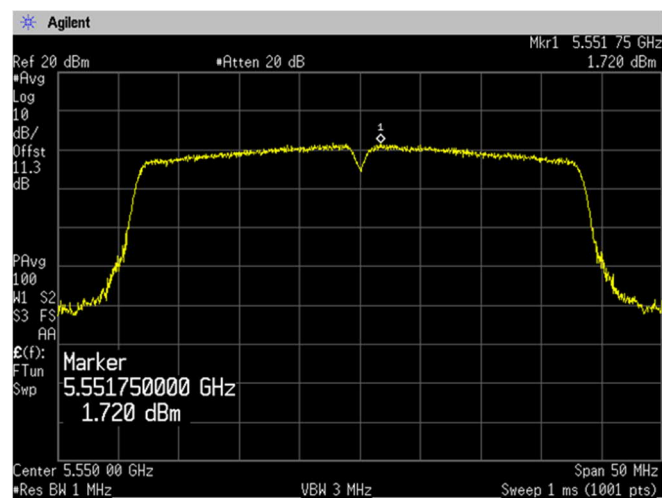
(5.3 GHz Band)
Channel: 62



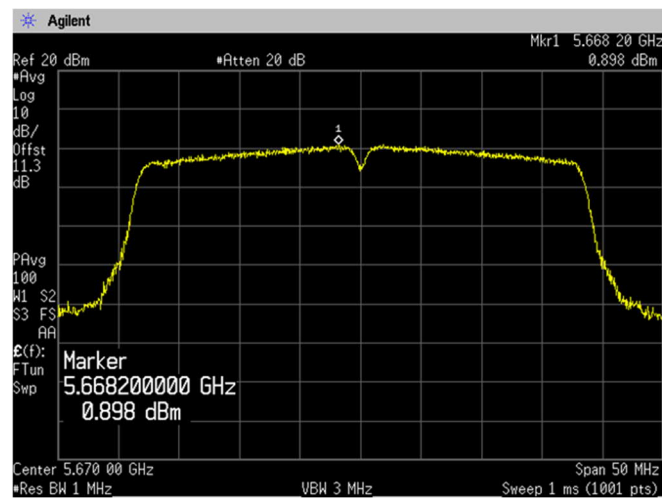
(5.6 GHz Band)
Channel: 102



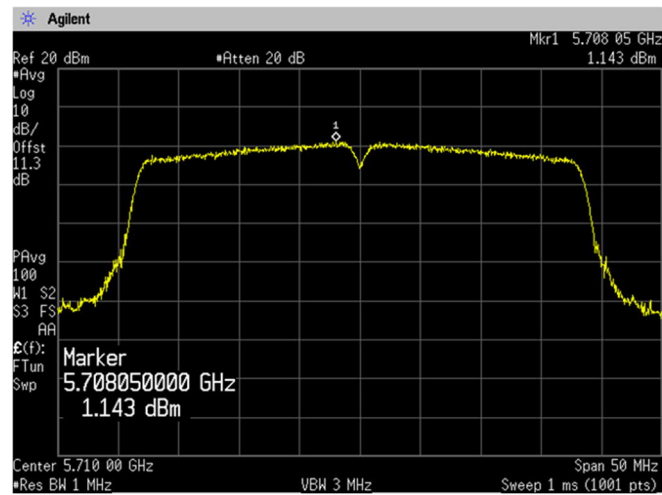
Channel: 110



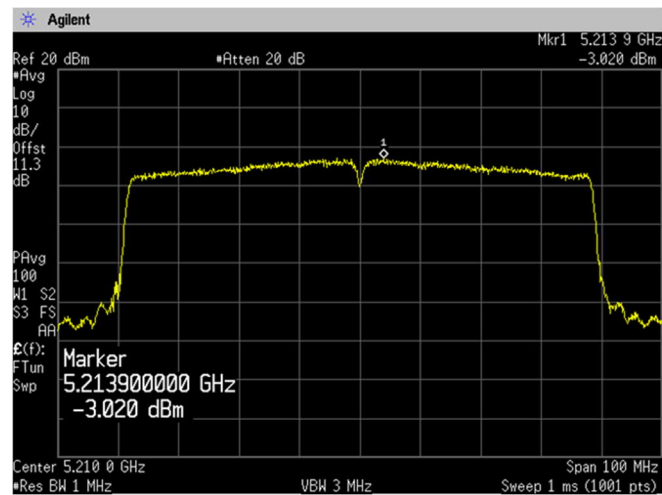
(5.6 GHz Band)
Channel: 134



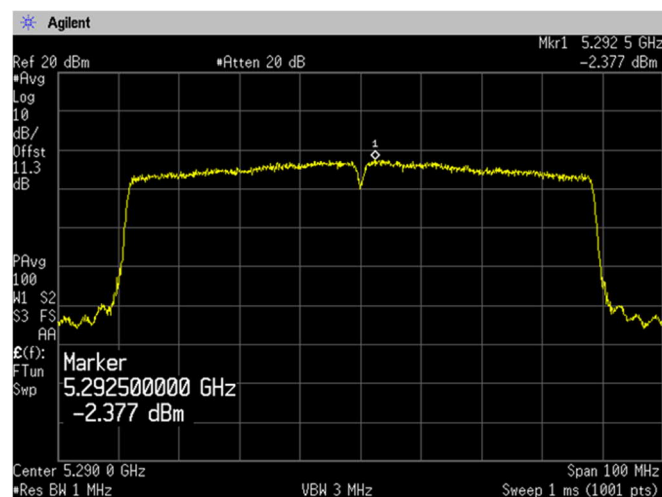
(5.6 GHz Band)
Channel: 142



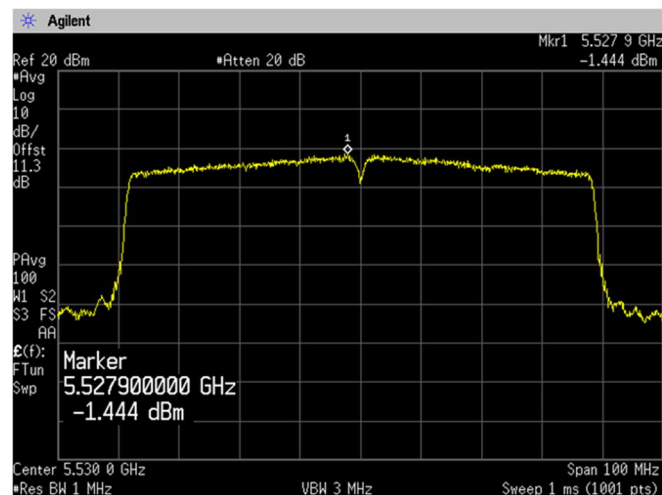
[IEEE802.11ac (HT80)]
(5.2 GHz Band)
Channel: 42



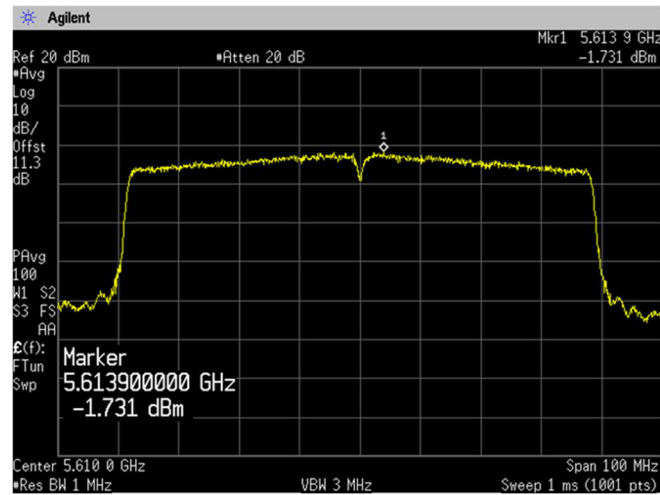
(5.3GHz Band)
Channel: 58



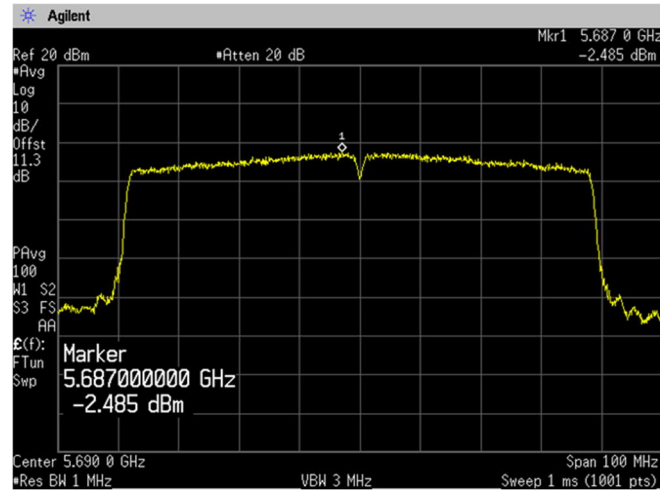
(5.6GHz Band)
Channel: 106



(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.

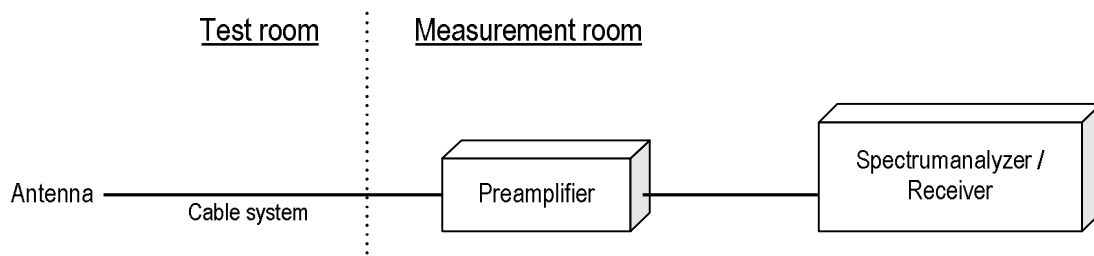
The EUT was set to operate with following conditions.

- 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	1.384	1.429	96.9	0.137
	W53	1.384	1.429	96.9	0.137
	W56	1.384	1.429	96.9	0.137
802.11n (20MHz)	W52	1.279	1.324	96.6	0.150
	W53	1.279	1.324	96.6	0.150
	W56	1.279	1.324	96.6	0.150
802.11n (40MHz)	W52	0.627	0.670	93.6	0.287
	W53	0.627	0.670	93.6	0.287
	W56	0.627	0.670	93.6	0.287
802.11ac (80MHz)	W52	0.323	0.358	90.2	0.448
	W53	0.323	0.358	90.2	0.448
	W56	0.323	0.358	90.2	0.448

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.

4.4.4 Test data

Date : 7-June-2024
 Temperature : 21.3 [°C]
 Humidity : 54.1 [%]
 Test place : 3m Semi-anechoic chamber

Test engineer : Tadahiro Seino

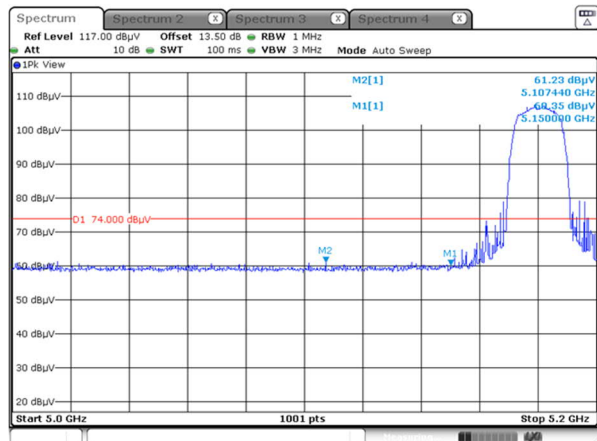
Date : 7-June-2024
 Temperature : 22.4 [°C]
 Humidity : 47.9 [%]
 Test place : 3m Semi-anechoic chamber

Test engineer : Chiaki Kanno

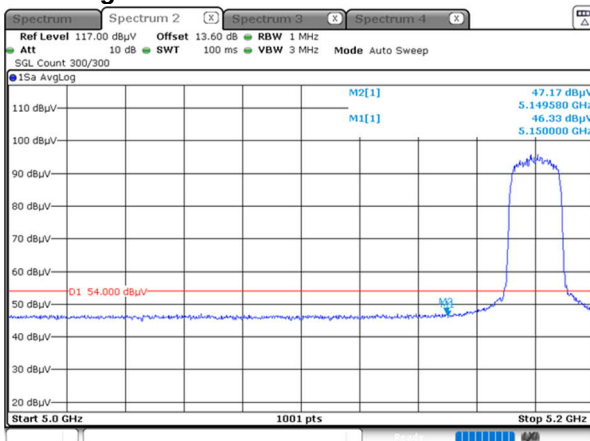
4.4.4.1 Restricted Bandedge

[IEEE802.11a]

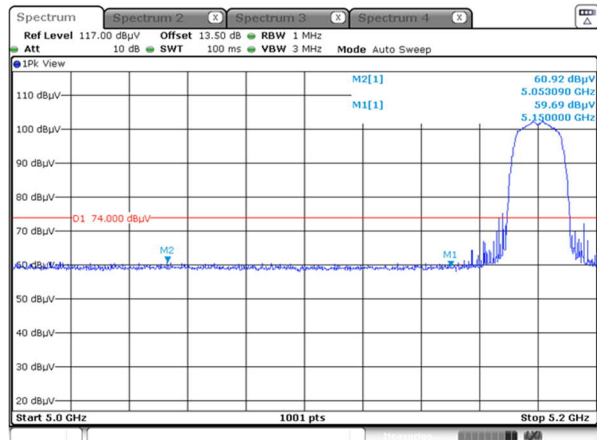
5.2 GHz Band, Channel Low Horizontal Peak



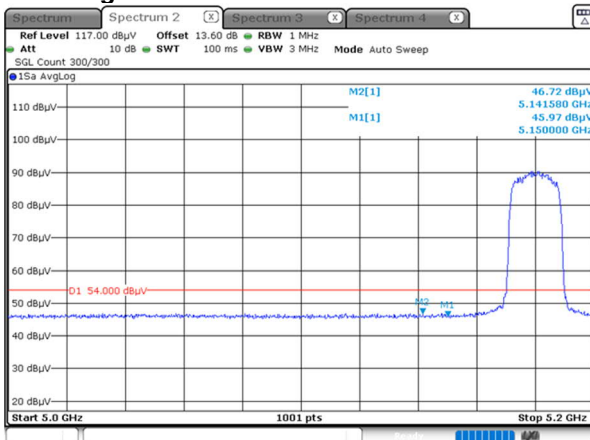
Average



Vertical Peak

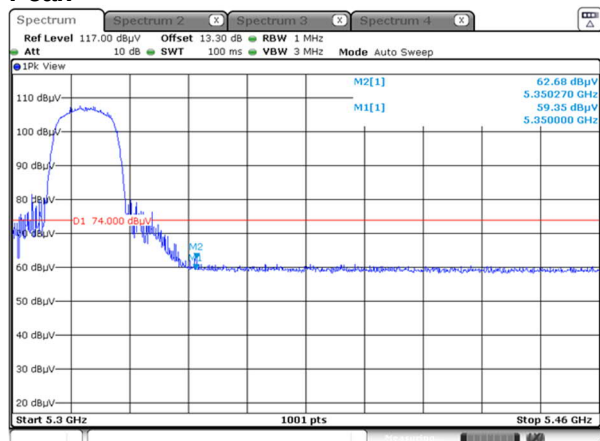


Average

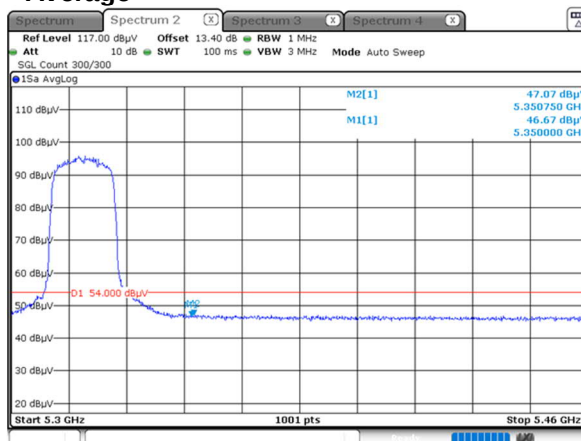


[IEEE802.11a]

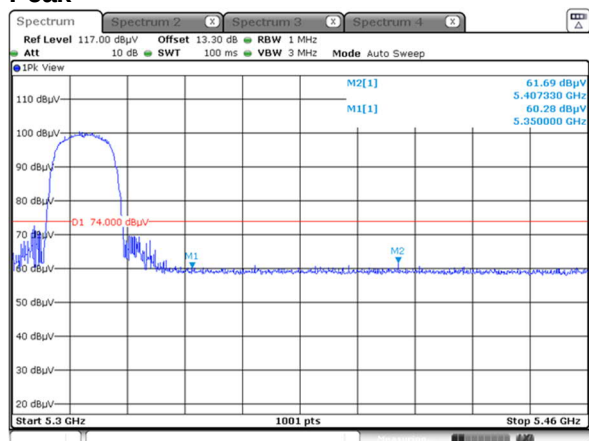
5.3 GHz Band, Channel High Horizontal Peak



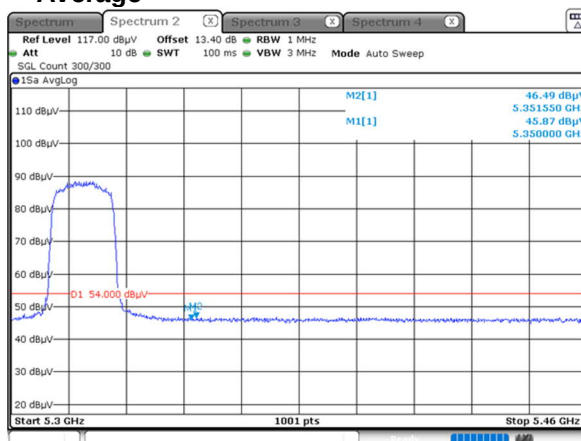
Average



Vertical Peak

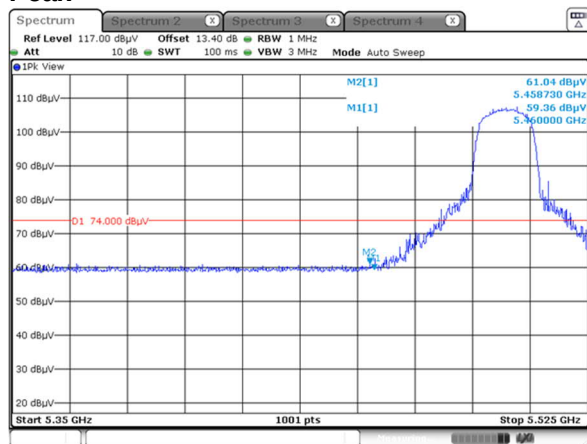


Average

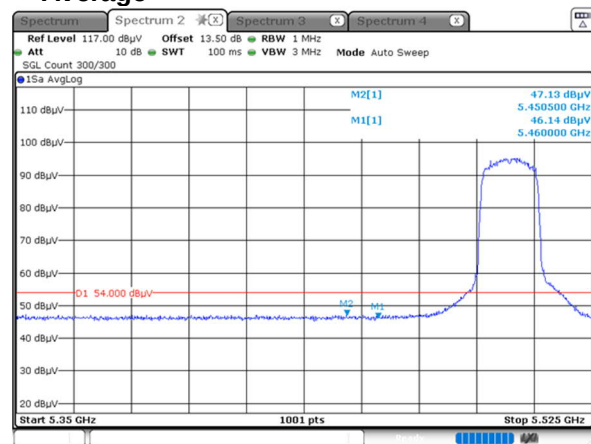


[IEEE802.11a]

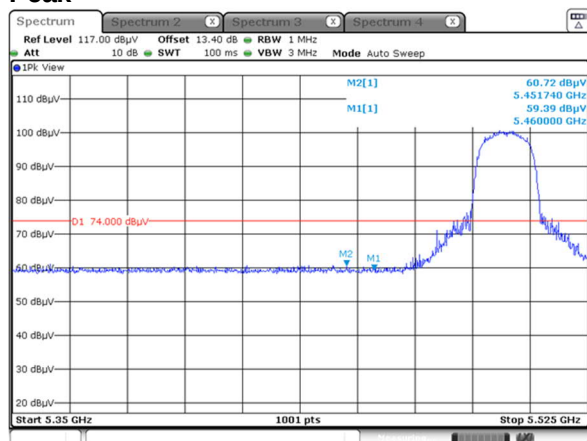
5.6 GHz Band, Channel Low Horizontal Peak



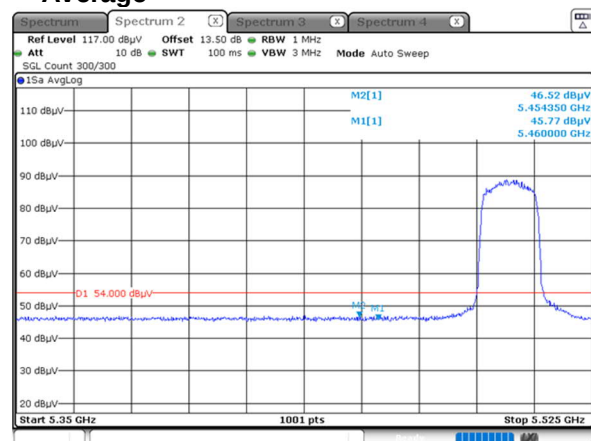
Average



Vertical Peak

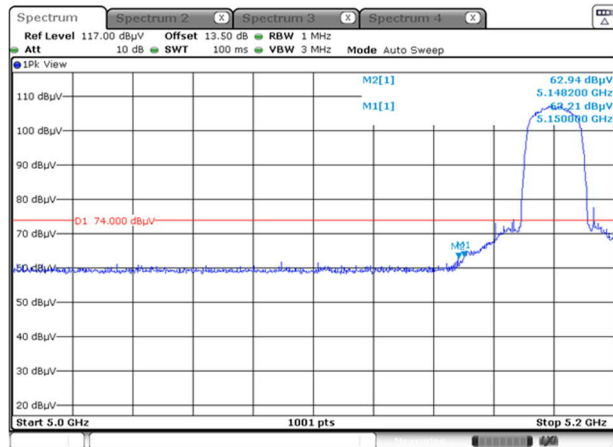


Average

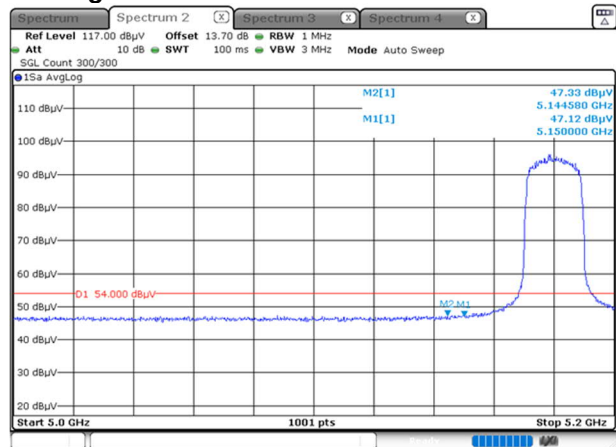


[IEEE802.11n (HT20)]

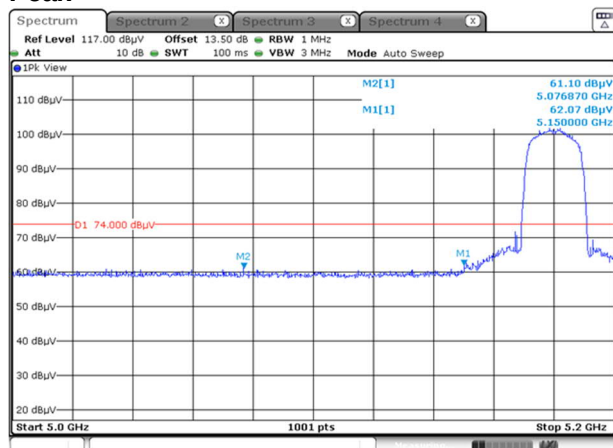
5.2 GHz Band, Channel Low Horizontal Peak



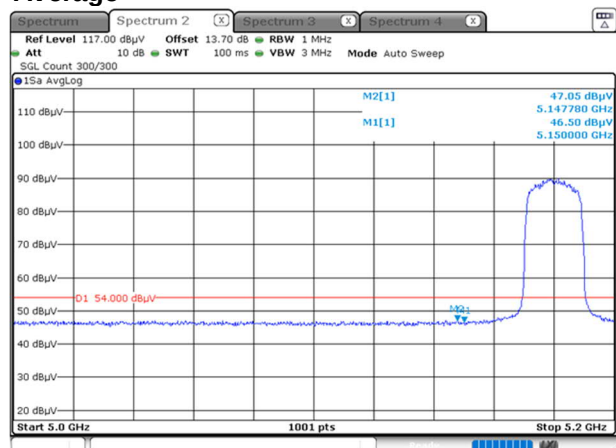
Average



Vertical Peak

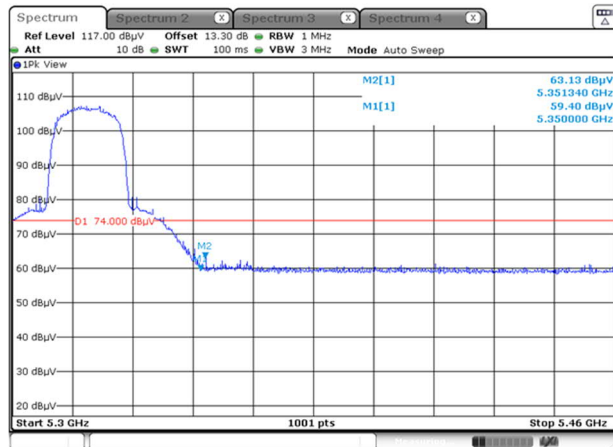


Average



[IEEE802.11n (HT20)]

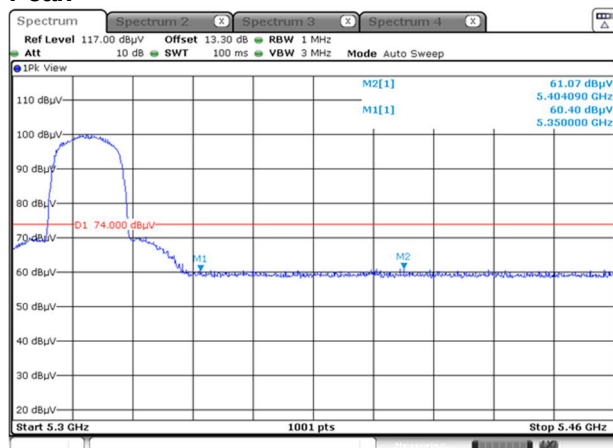
5.3 GHz Band, Channel High Horizontal Peak



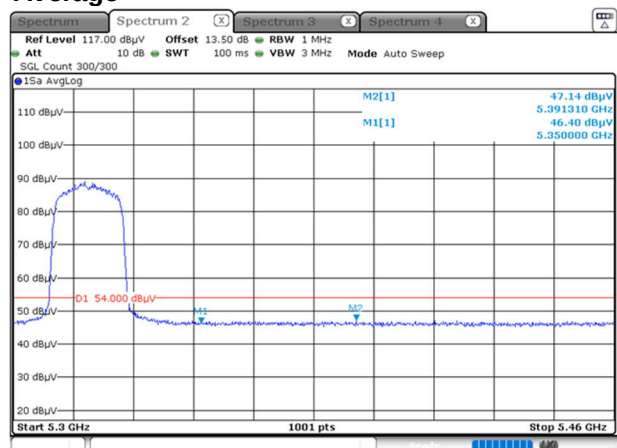
Average



Vertical Peak

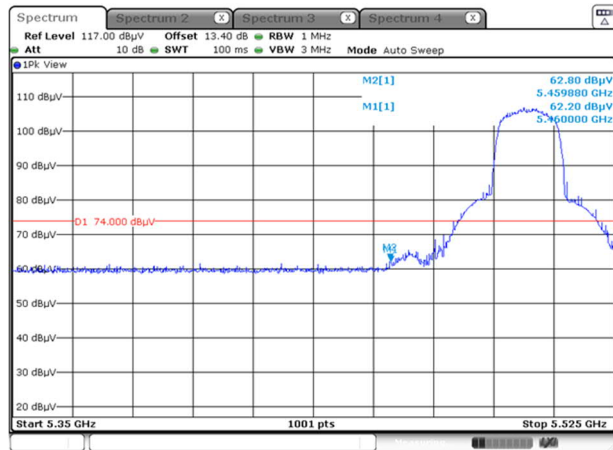


Average

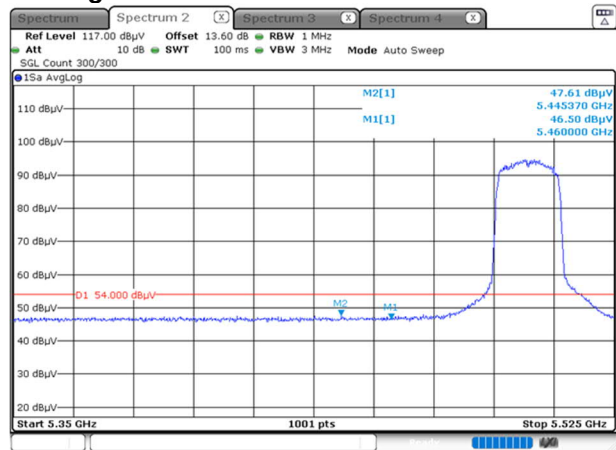


[IEEE802.11n (HT20)]

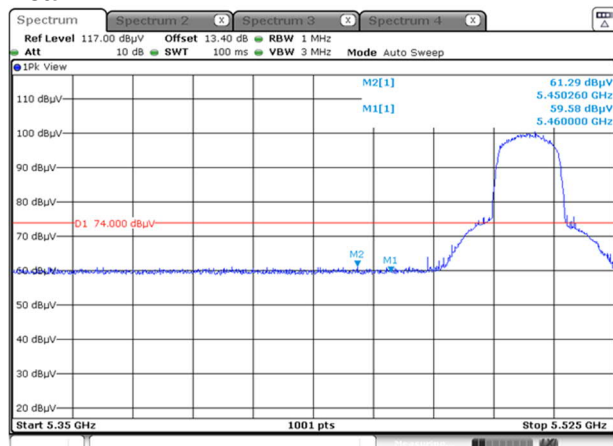
5.6 GHz Band, Channel Low Horizontal Peak



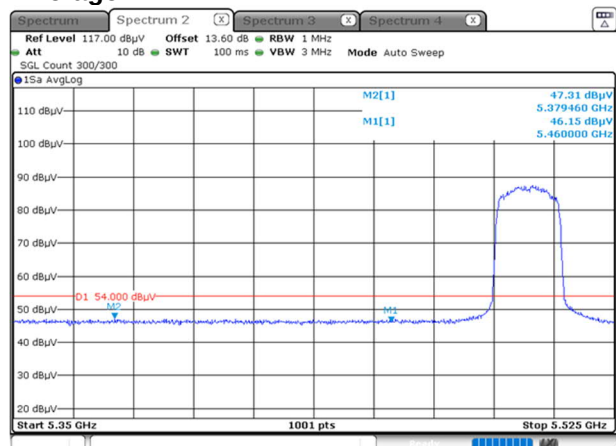
Average



Vertical Peak

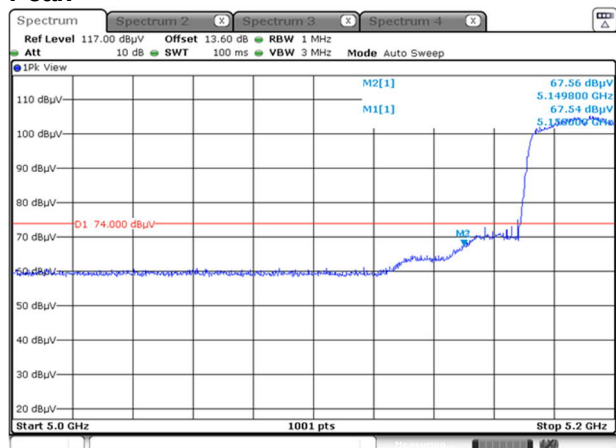


Average

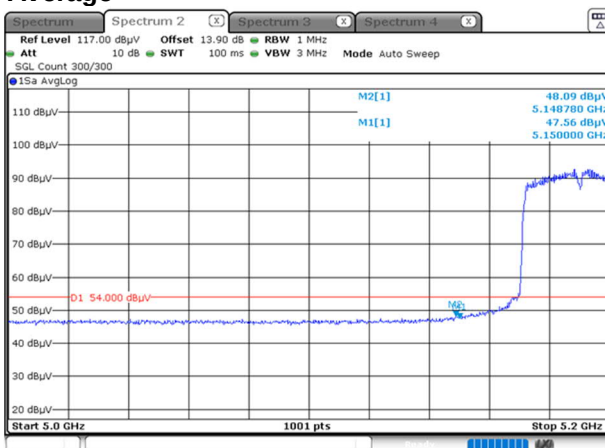


[IEEE802.11n (HT40)]

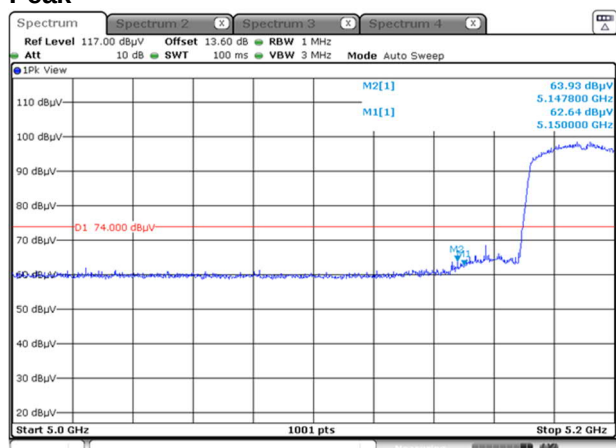
5.2 GHz Band, Channel Low Horizontal Peak



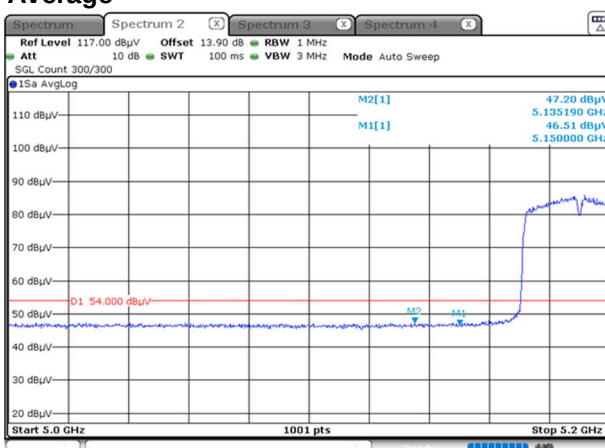
Average



Vertical Peak

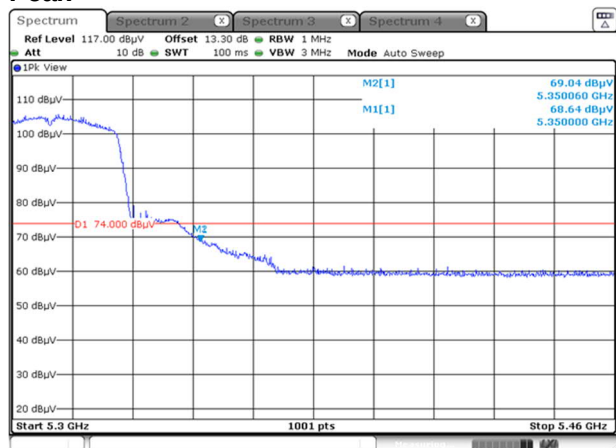


Average

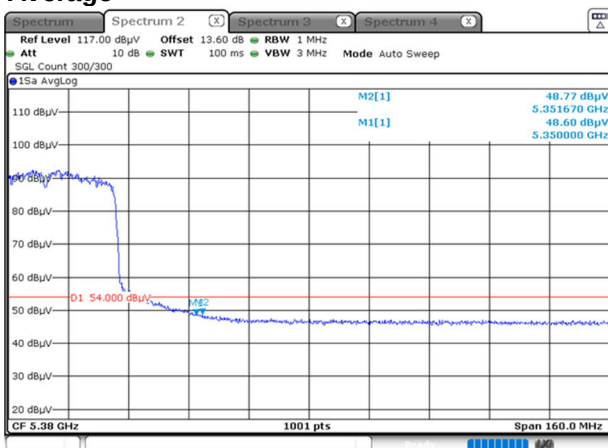


[IEEE802.11n (HT40)]

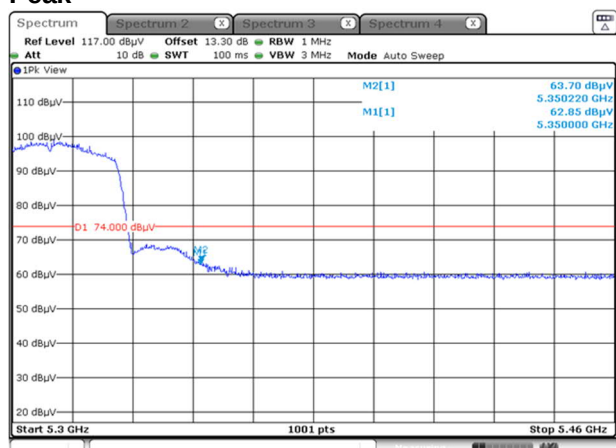
5.3 GHz Band, Channel High Horizontal Peak



Average



Vertical Peak



Average

