Tonal

TEST REPORT FOR

Apollo Board
Model: 500-0806

Trainer
Model: T2

Tested to The Following Standards:

FCC Part 15 Subpart E Section(s)

15.207 & 15.407
(NII 5150 – 5250GHz)

Report No.: 110285-30

Date of issue: November 27, 2024

This test report bears the accreditation symbol indicating that the testing performed herein meets the test and reporting requirements of ISO/IEC 17025 under the applicable scope of testing for CKC Laboratories, Inc.

We strive to create long-term, trust based relationships by providing sound, adaptive, customer first testing services. We embrace each of our customers' unique EMC challenges, not as an interruption to set processes, but rather as the reason we are in business.

Test Certificate # 803.01

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Administrative Information

Test Report Information

REPORT PREPARED FOR:

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San Francisco, CA 94103

Representative: Lars Gilstrom
Customer Reference Number: PO3196

REPORT PREPARED BY:

Viviana Prado
CKC Laboratories, Inc.
5046 Sierra Pines Drive
Mariposa, CA 95338

Project Number: 110285

DATE OF EQUIPMENT RECEIPT: October 2, 2024
DATE(S) OF TESTING: October 7, 8, 9, 17, 24, and 25, 2024
And November 1 and 6, 2024

Report Authorization

The test data contained in this report documents the observed testing parameters pertaining to and are relevant for only the equipment provided by the client, tested in the agreed upon operational mode(s) and configuration(s) as identified herein. Compliance assessment remains the client's responsibility. This report may not be used to claim product endorsement by A2LA or any government agencies. This test report has been authorized for release under quality control from CKC Laboratories, Inc.

Steve Behm
Director of Quality Assurance & Engineering Services
CKC Laboratories, Inc.

Test Facility Information

Our laboratories are configured to effectively test a wide variety of product types. CKC utilizes first class test equipment, anechoic chambers, data acquisition and information services to create accurate, repeatable, and affordable test results.

TEST LOCATION(S):
CKC Laboratories, Inc.
1120 Fulton Place
Fremont, CA 94539

Software Versions

CKC Laboratories Proprietary Software	Version
EMITest Emissions	5.03.20

Site Registration & Accreditation Information

Location	*NIST CB #	FCC	Canada	Japan
Canyon Park, Bothell, WA	US0103	US1024	3082C	A-0136
Brea, CA	US0103	US1024	3082D	A-0136
Fremont, CA	US0103	US1024	3082B	A-0136
Mariposa, CA	US0103	US1024	3082A	A-0136

*CKC's list of NIST designated countries can be found at: https://standards.gov/cabs/designations.html

Summary of Results

Standard / Specification: FCC Part 15 Subpart E - 15.407 (NII 5150-5250 MHz)

Test Procedure	Description	Modifications	Results
15.215	Occupied Bandwidth	NA	Pass
15.407(a)(1)	Output Power	NA	Pass
15.407(a)(1)	Power Spectral Density	NA	Pass
15.407(a)(1)(iii)	EIRP at >30º Elevation	NA	NA1
15.407(b)	Radiated Emissions & Band Edge	Mod. #1	Pass
15.407(g)	Frequency Stability	NA	NA2
15.207	AC Conducted Emissions	Mod. #1	Pass

NA = Not Applicable
NA1 = Not applicable because the EUT is a client device.
NA2 = In accordance with KDB 789033, this test is not required.

ISO/IEC 17025 Decision Rule
The equipment sample utilized for testing is selected by the manufacturer. The declaration of pass or fail herein is a binary statement for simple acceptance rule (ILAC G8) based upon assessment to the specification(s) listed above, without consideration of measurement uncertainties. For performance related tests, equipment was monitored for specified criteria identified in that section of testing.

Modifications During Testing

This list is a summary of the modifications made to the equipment during testing.

Summary of Conditions
Modification #1: Added a ferrite (Wurth: 742 712 21) on lower resistor wire Green Resistor

Modifications listed above must be incorporated into all production units.

Conditions During Testing

This list is a summary of the conditions noted to the equipment during testing.

Summary of Conditions
Worst case tested: 802.11a 18Mbit/s 802.11n HT20 MSC2 802,11n HT40 MSC0 802.11ac VHT20 MSC2 802.11ac VHT40 MSC0 802.11ac VHT80 MSC1

Equipment Under Test (EUT)

During testing, numerous configurations may have been utilized. The configurations listed below support compliance to the standard(s) listed in the Summary of Results section.

Configuration A

***Equipment Under Test* (* = EUT):**

Device Name	Manufacturer	Model #	S/N
Apollo Board	Tonal	500-0806	080600030001263

Support Devices:

Device Name	Manufacturer	Model #	S/N
MCB Board	Tonal Systems	500-0131	500-0131_rev003_00001286_20240909_17
Laptop	Dell	XPS	22E00911
AC/DC Adapter for Laptop	Dell	DA130PM130	CN-06TTY6-48661-4CO-27M7-A00

Configuration 1

***Equipment Under Test* (* = EUT):**

Device Name	Manufacturer	Model #	S/N
Trainer	Tonal	T2	4000055

Support Devices:

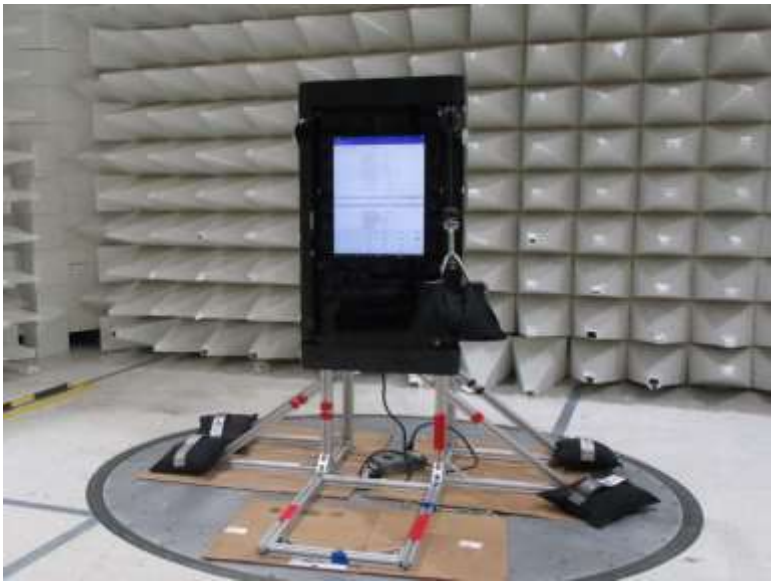
Device Name	Manufacturer	Model #	S/N
Laptop	Dell	XPS	22E00911
AC/DC Adapter for Laptop	Dell	DA130PM130	CN-06TTY6-48661-4CO-27M7-A00

General Product Information:

Description of EUT
Exercise Trainer

Product Information	Manufacturer-Provided Details
Operating Frequencies Tested:	5180-5240MHz
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	802.11
Maximum Duty Cycle:	100%
Modulation Type(s):	802.11a (BPSK, QPSK, 16QAM, 64QAM) 802.11n HT20 (BPSK, QPSK, 16QAM, 64QAM) 802.11n HT40 (BPSK, QPSK, 16QAM, 64QAM) 802.11ac VHT20 (BPSK, QPSK, 16QAM,64QAM, 256QAM) 802.11ac VHT40 (BPSK, QPSK, 16QAM,64QAM, 256QAM) 802.11ac VHT80 (BPSK, QPSK, 16QAM,64QAM, 256QAM)
Number of TX Chains:	2 Note: The manufacturer declared MIMO is not enabled, completely uncorrelated transmission.
Beamforming Type:	NA
Antenna Type(s) and Gain:	External/4.66dBi
Antenna Connection Type:	External Connector
Nominal Input Voltage:	12VDC
Firmware / Software Version(s):	QRCT (Qualcomm Radio Control Toolkit) Version 4.1
Firmware / Software Description:	Using C-Prompt and QRCT application to control all modulation types and frequencies to continuously transmit or receive as intended
Firmware / Software Setting(s):	NA
Tune-up or Adjustment(s):	NA
Declared Operational Configuration:	☐ Indoor Access Point ☐ Outdoor Access Point ☒ Indoor Client ☐ Outdoor Client ☐ Outdoor Fixed Equipment
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

EUT and Accessory Photo(s)

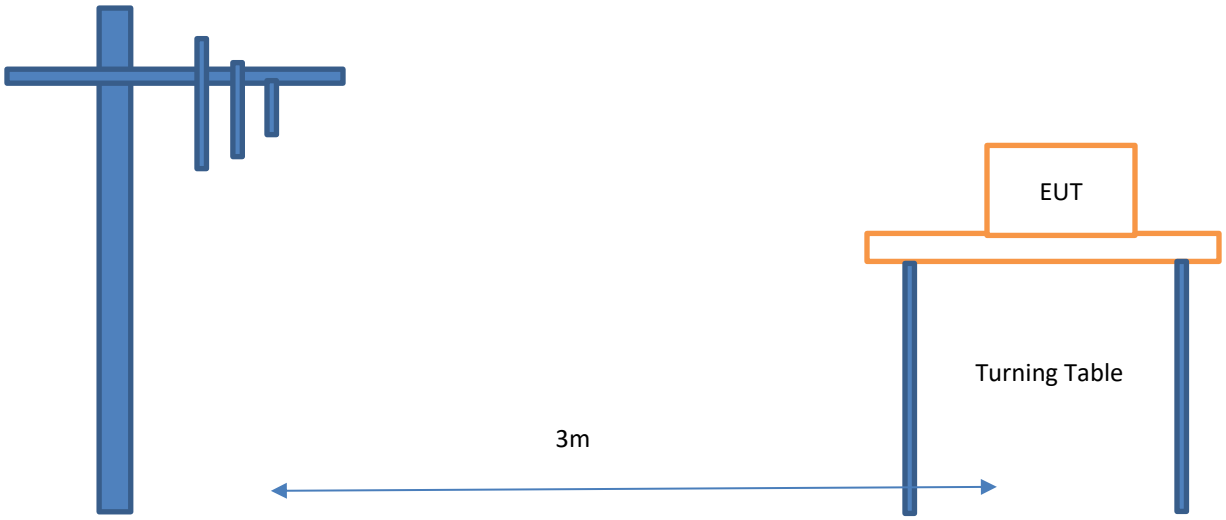


Support Equipment Photo(s)

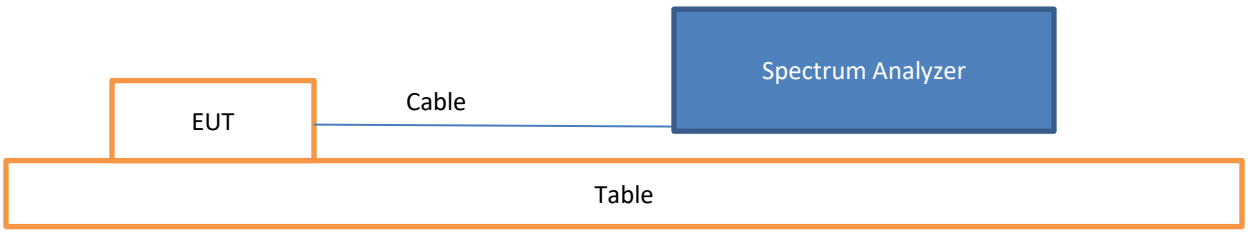
Block Diagram of Test Setup(s)

Config#	Setup Description of Block Diagram
1 & A	Radiated Measurement: The antenna is set up at 3meter distance from the EUT according to ANSI C63.10 2020. The EUT is set up and operated as intended. Conducted Measurement: The EUT is placed non-conducted table. It is operated as intended. It is connected straight to a Spectrum Analyzer.

Radiated Method Setup



Conducted Method Setup



FCC Part 15 Subpart E

15.215 Occupied Bandwidth

Test Setup/Conditions			
Test Location:	Fremont Lab Bench	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2020), KDB 789033	Test Date(s):	10/07-09/2024
Configuration:	A		
Test Setup:	The EUT is placed non-conducted table. It is operated as intended. It is connected straight to a Spectrum Analyzer.		

Environmental Conditions			
Temperature (ºC)	21.2-23.7	Relative Humidity (%):	39-45

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03013	Cable	Astrolab	32022-2-2909K-36TC	1/9/2024	1/9/2026
P07365	Attenuator	Weinschel	54A-10	5/26/2023	5/26/2025
03471	Spectrum Analyzer	Agilent	E4440A	2/23/2024	2/23/2026

26dB Occupied Bandwidth

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
5180	0	802.11a	20619	None	N/A
5220	0	802.11a	20334		
5240	0	802.11a	20293		
5180	0	802.11n HT20	21457		
5220	0	802.11n HT20	21521		
5240	0	802.11n HT20	20934		
5180	0	802.11ac 20MHz	21263		
5220	0	802.11ac 20MHz	21430		
5240	0	802.11ac 20MHz	21297		
5190	0	802.11n HT40	41098		
5230	0	802.11n HT40	41211		
5190	0	802.11ac 40MHz	41051		
5230	0	802.11ac 40MHz	40985		
5210	0	802.11ac 80MHz	83264		

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
5180	1	802.11a	20570	None	N/A
5220	1	802.11a	20096		
5240	1	802.11a	20413		
5180	1	802.11n HT20	21020		
5220	1	802.11n HT20	21620		
5240	1	802.11n HT20	21033		
5180	1	802.11ac 20MHz	21665		
5220	1	802.11ac 20MHz	21391		
5240	1	802.11ac 20MHz	20901		
5190	1	802.11n HT40	41003		
5230	1	802.11n HT40	41078		
5190	1	802.11ac 40MHz	41328		
5230	1	802.11ac 40MHz	41779		
5210	1	802.11ac 80MHz	83790		

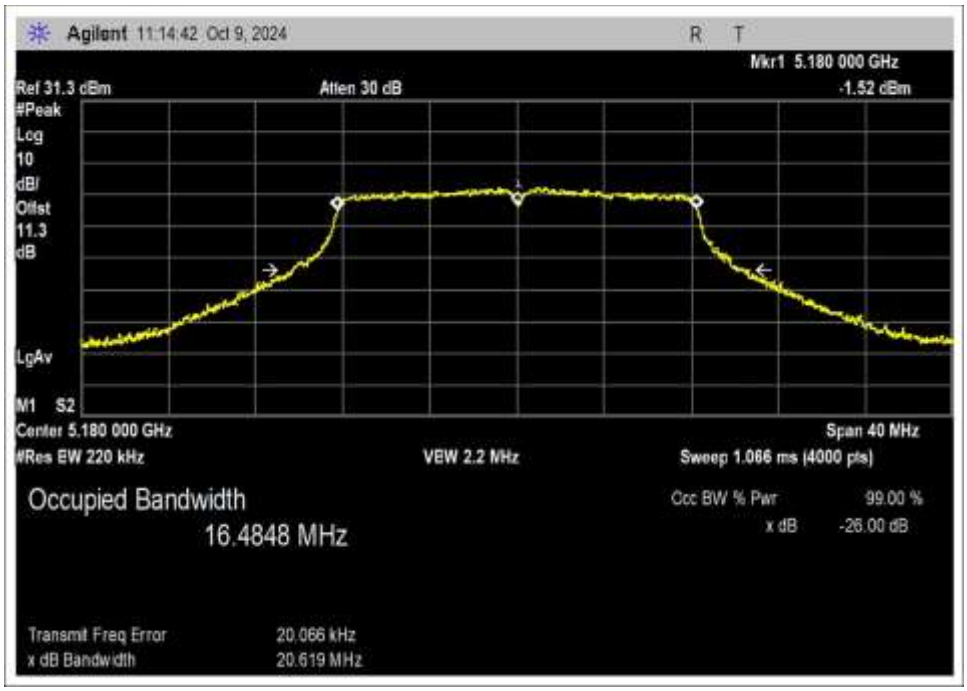
99% Occupied Bandwidth

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
5180	0	802.11a	16484.8	None	N/A
5220	0	802.11a	16443.5		
5240	0	802.11a	16460.2		
5180	0	802.11n HT20	17653.3		
5220	0	802.11n HT20	17669.8		
5240	0	802.11n HT20	17646.4		
5180	0	802.11ac 20MHz	17676.0		
5220	0	802.11ac 20MHz	17681.2		
5240	0	802.11ac 20MHz	17667.0		
5190	0	802.11n HT40	36194.5		
5230	0	802.11n HT40	36191.9		
5190	0	802.11ac 40MHz	36264.8		
5230	0	802.11ac 40MHz	36178.4		
5210	0	802.11ac 80MHz	75618.8		

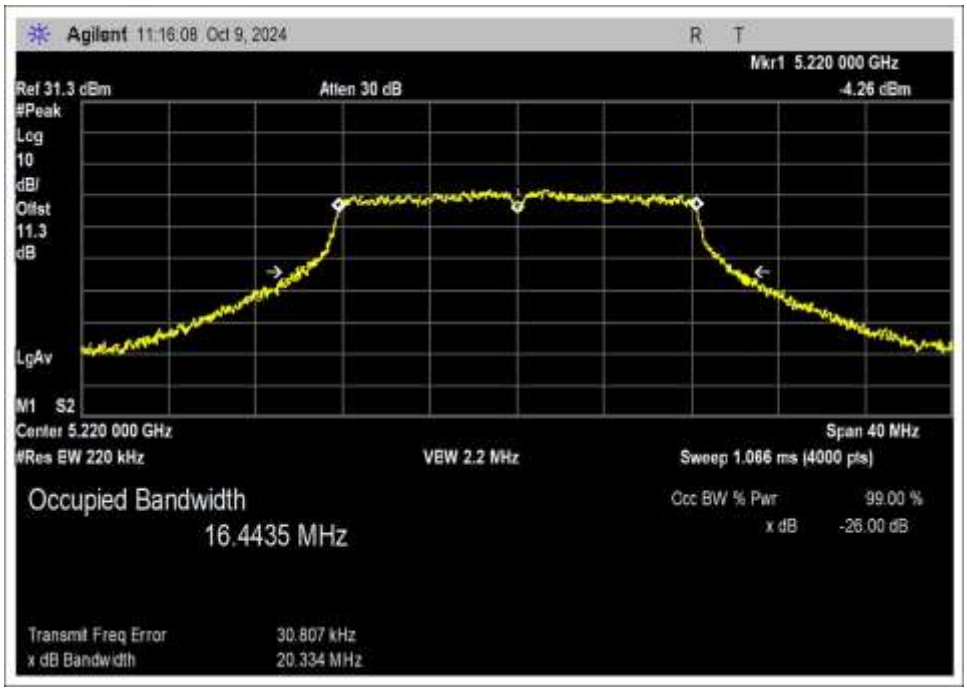
Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
5180	1	802.11a	16467.0	None	N/A
5220	1	802.11a	16440.4		
5240	1	802.11a	16443.3		
5180	1	802.11n HT20	17648.6		
5220	1	802.11n HT20	17668.8		
5240	1	802.11n HT20	17672.7		
5180	1	802.11ac 20MHz	17659.0		
5220	1	802.11ac 20MHz	17658.9		
5240	1	802.11ac 20MHz	17648.4		
5190	1	802.11n HT40	36243.0		
5230	1	802.11n HT40	36169.9		
5190	1	802.11ac 40MHz	36173.5		
5230	1	802.11ac 40MHz	36160.0		
5210	1	802.11ac 80MHz	75654.3		

Plot(s)

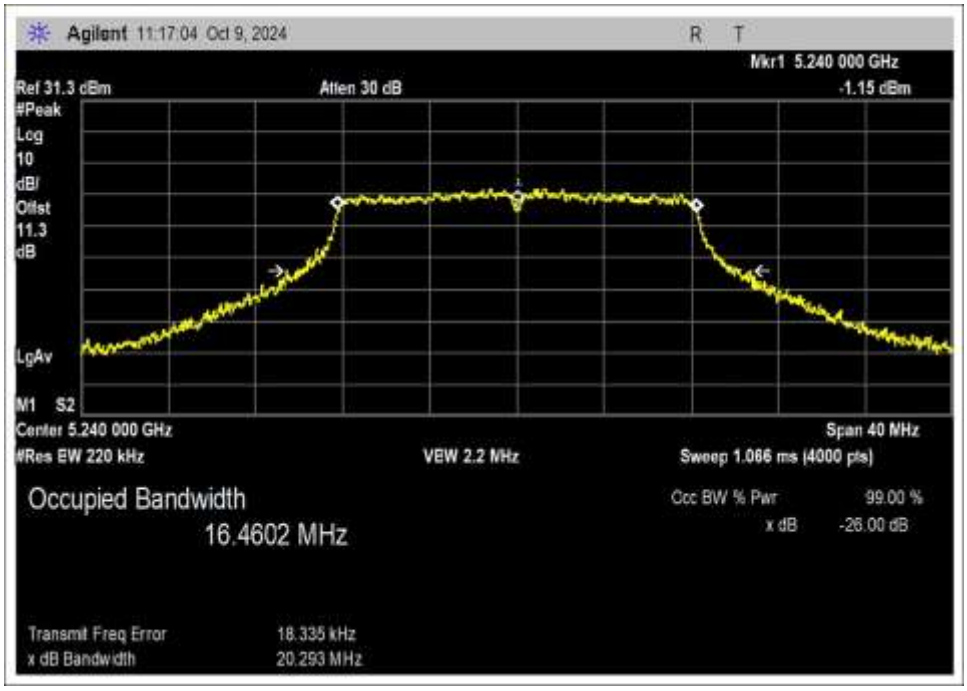
Chain 0
802.11a



Low Channel

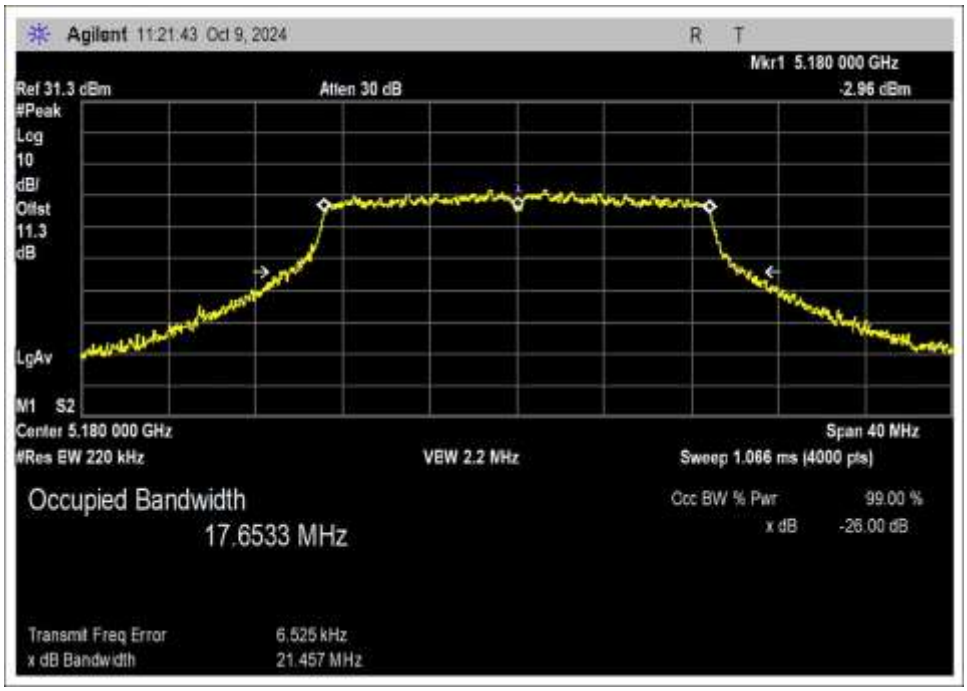


Middle Channel



High Channel

802.11n HT20



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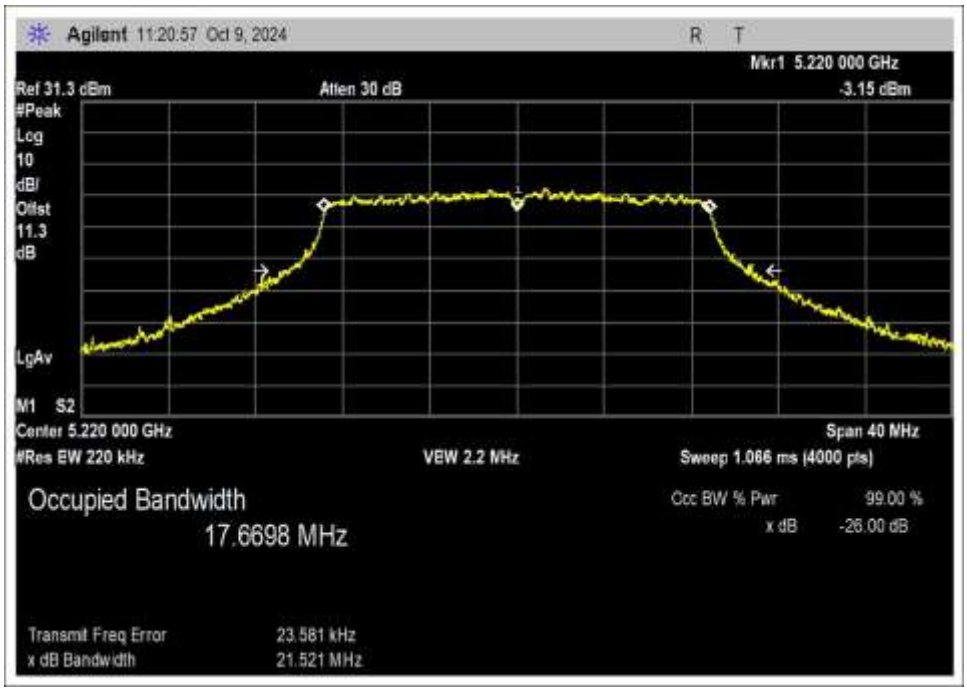

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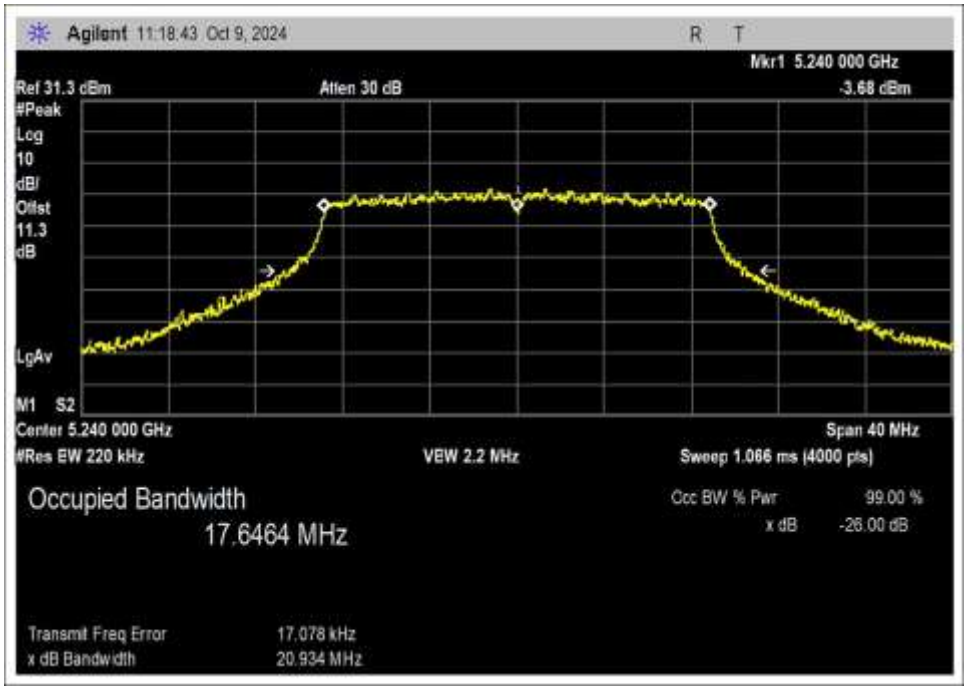
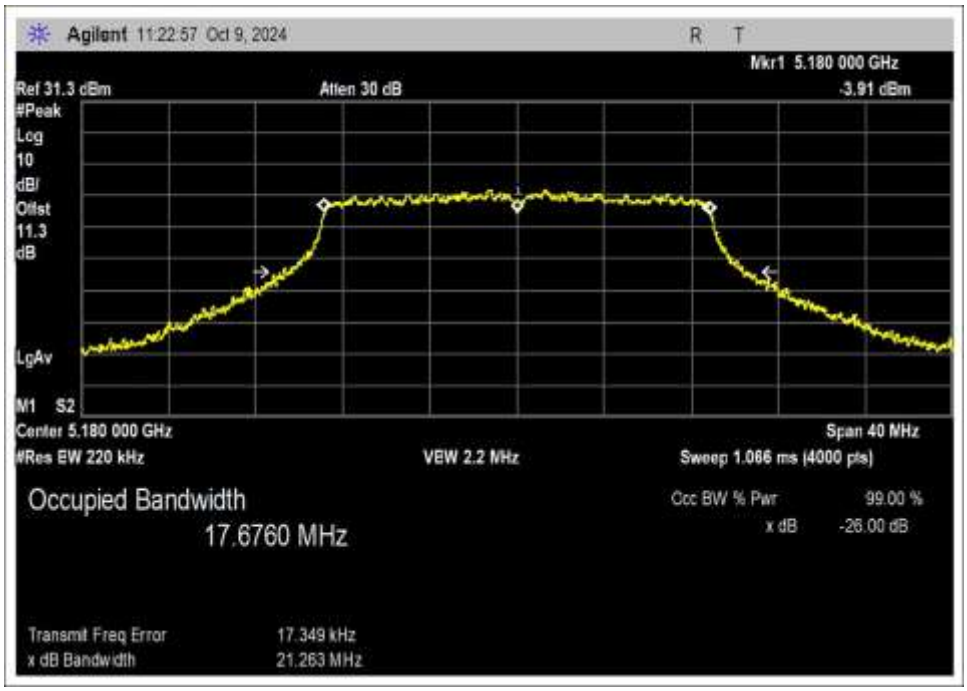


High Channel

802.11ac 20MHz



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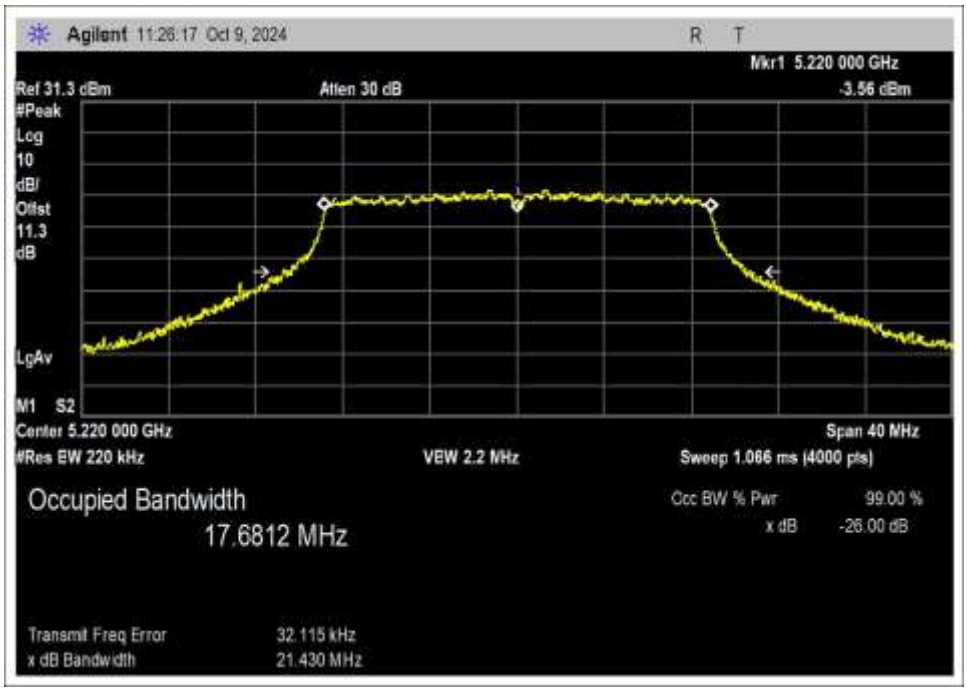

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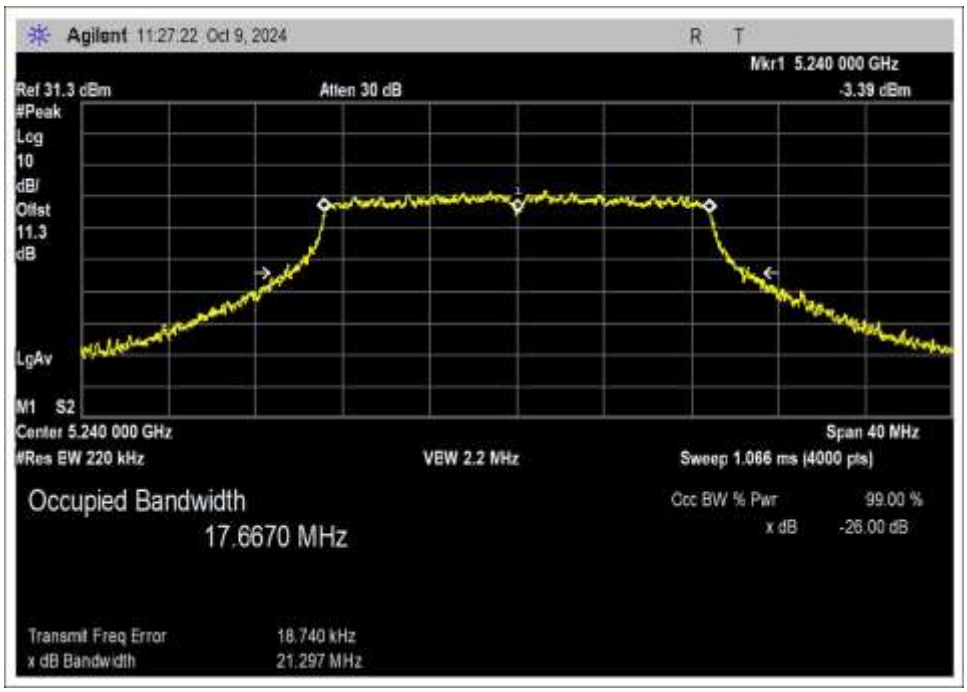
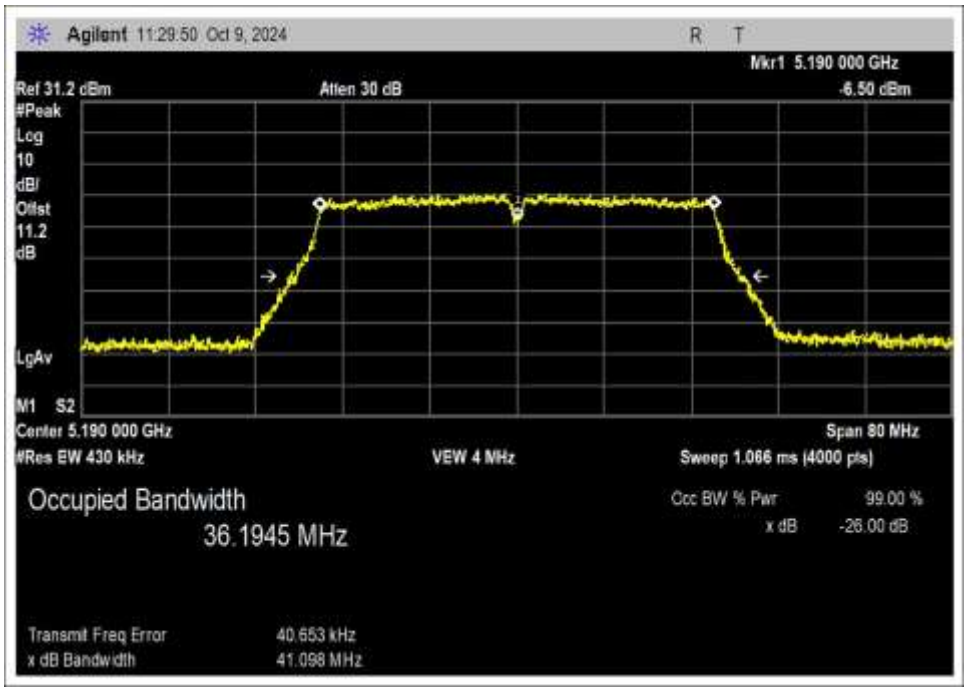
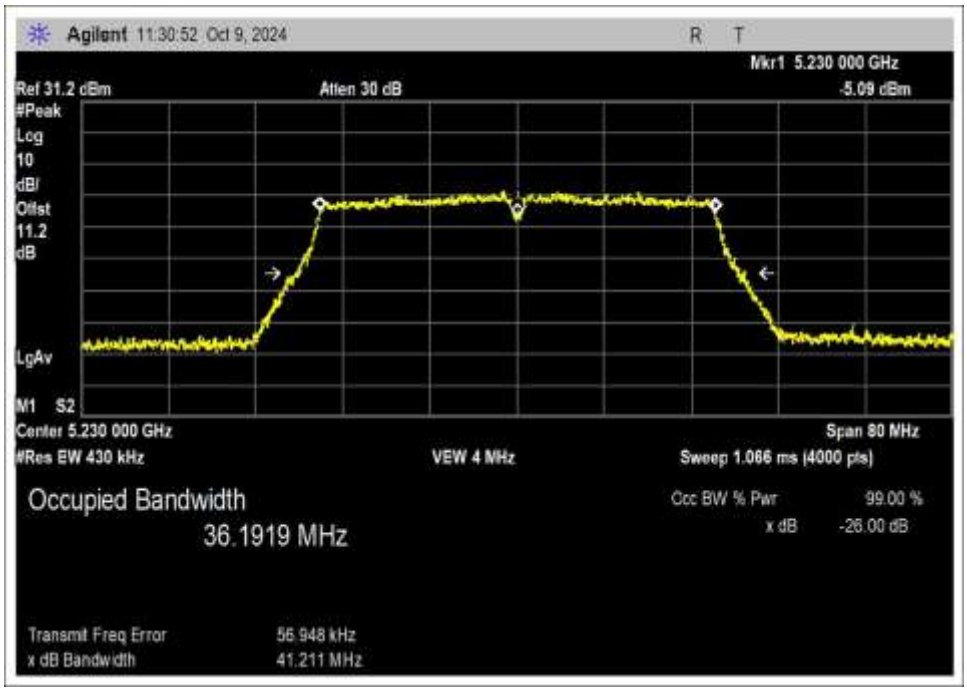


High Channel

802.11 n HT40

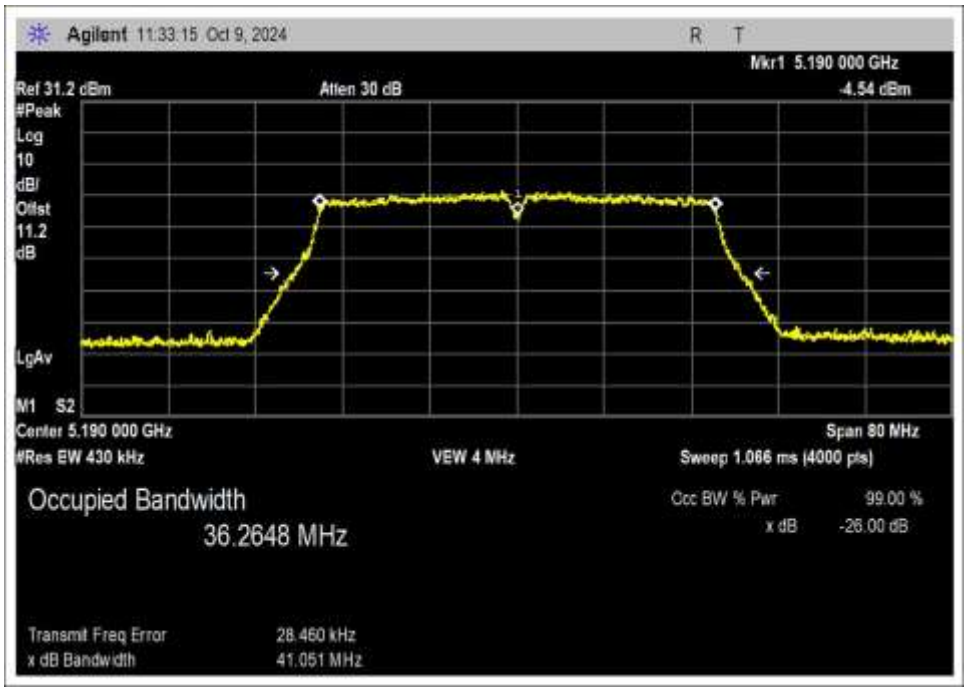


Low Channel



High Channel

802.11ac 40MHz



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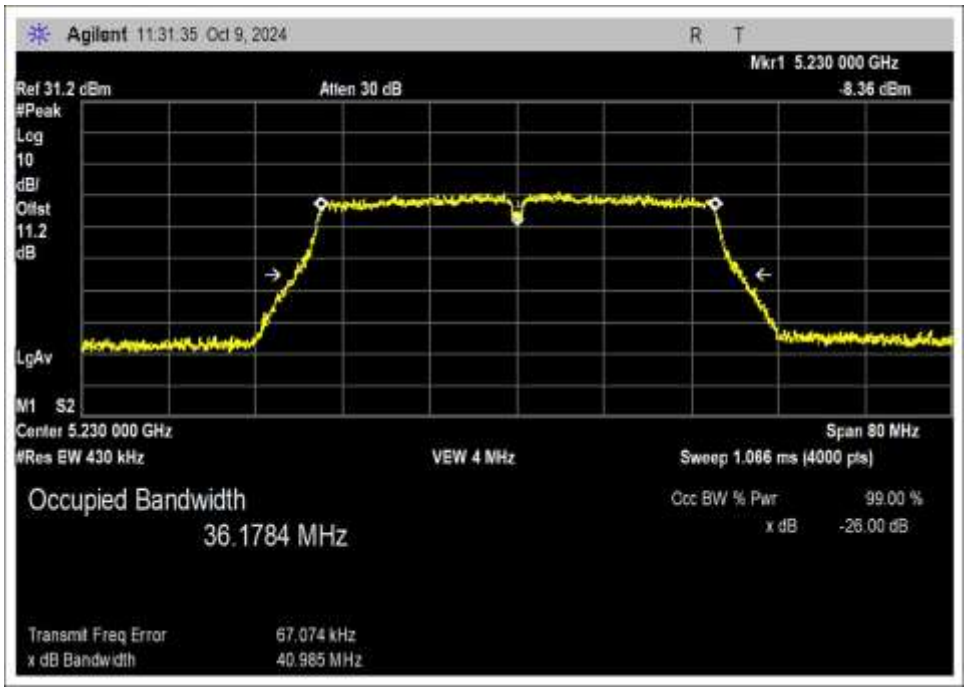
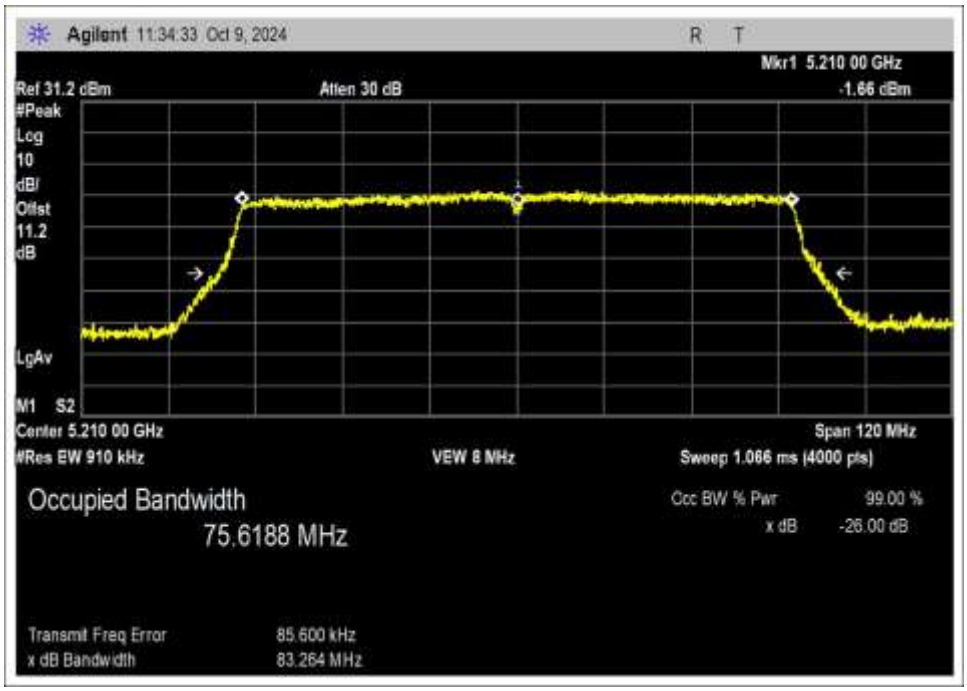


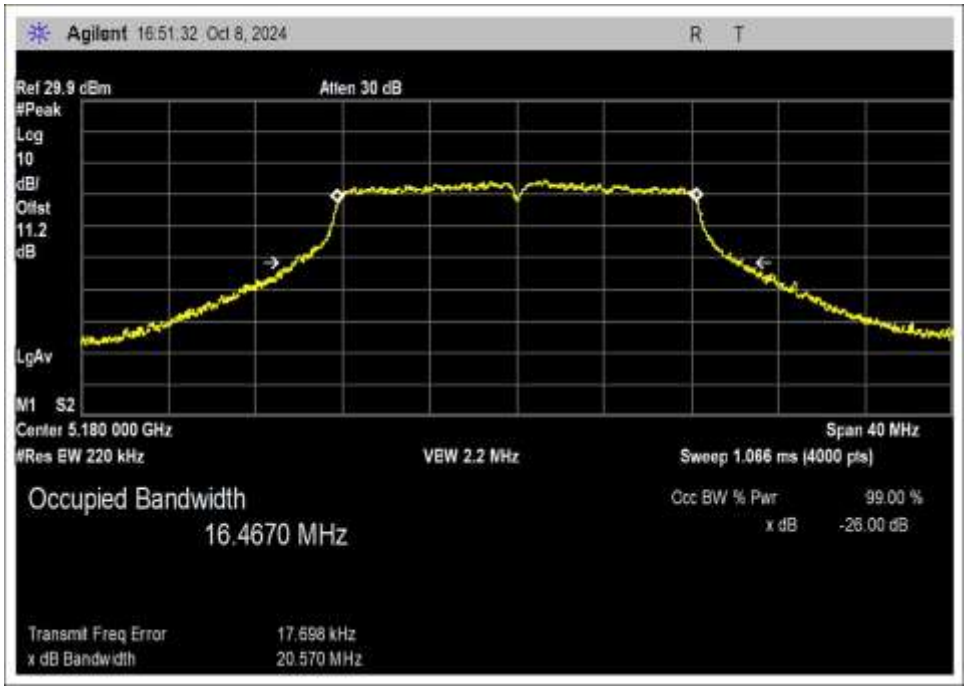
High Channel

802.11ac 80MHz



Occupied Bandwidth

Chain 1
802.11a



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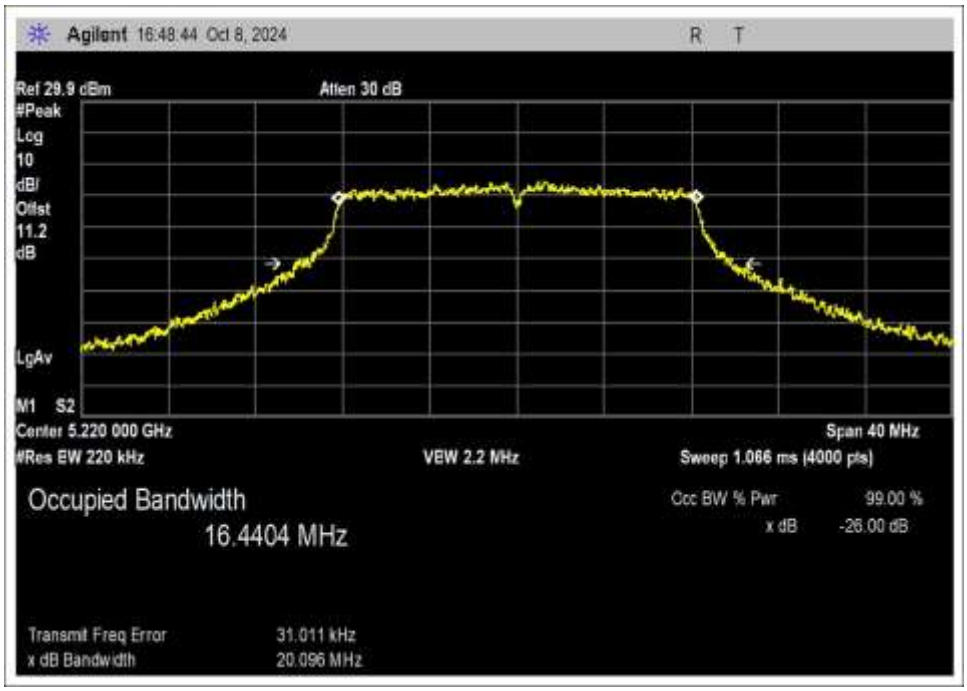
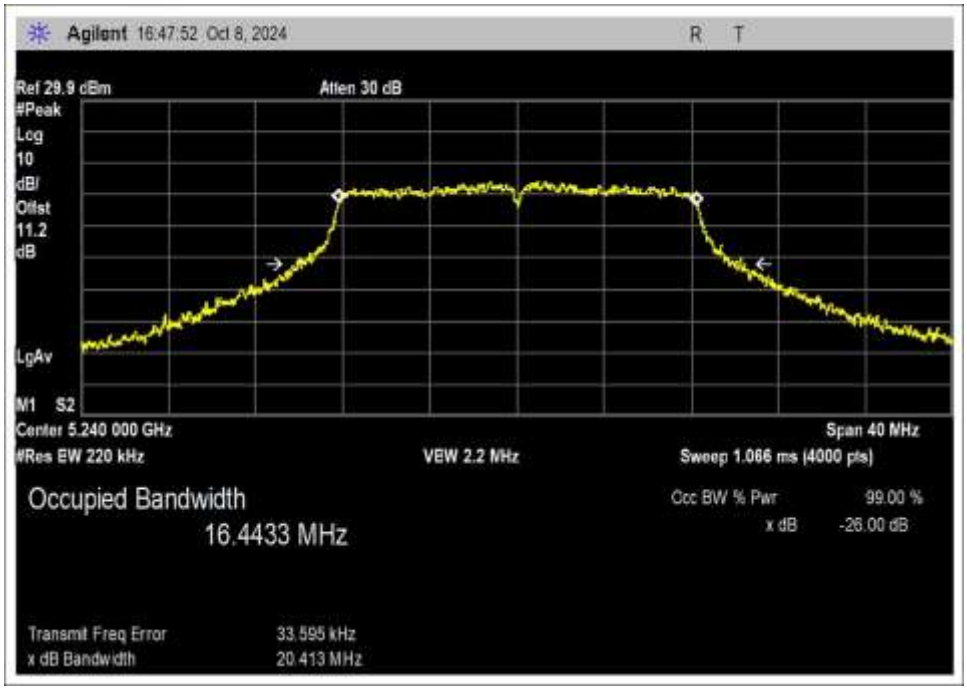
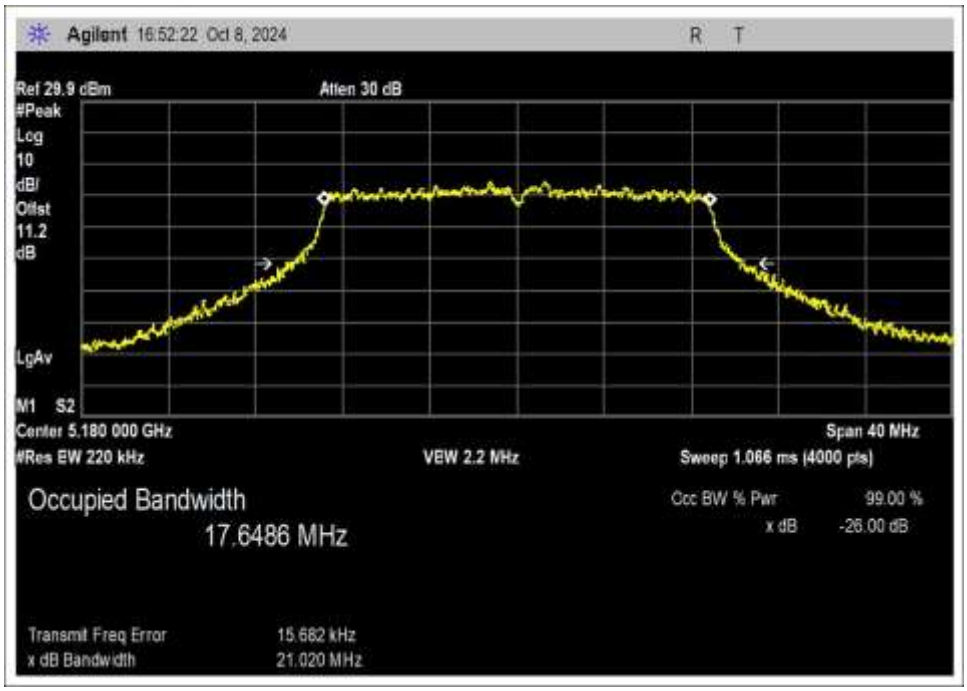


Middle Channel

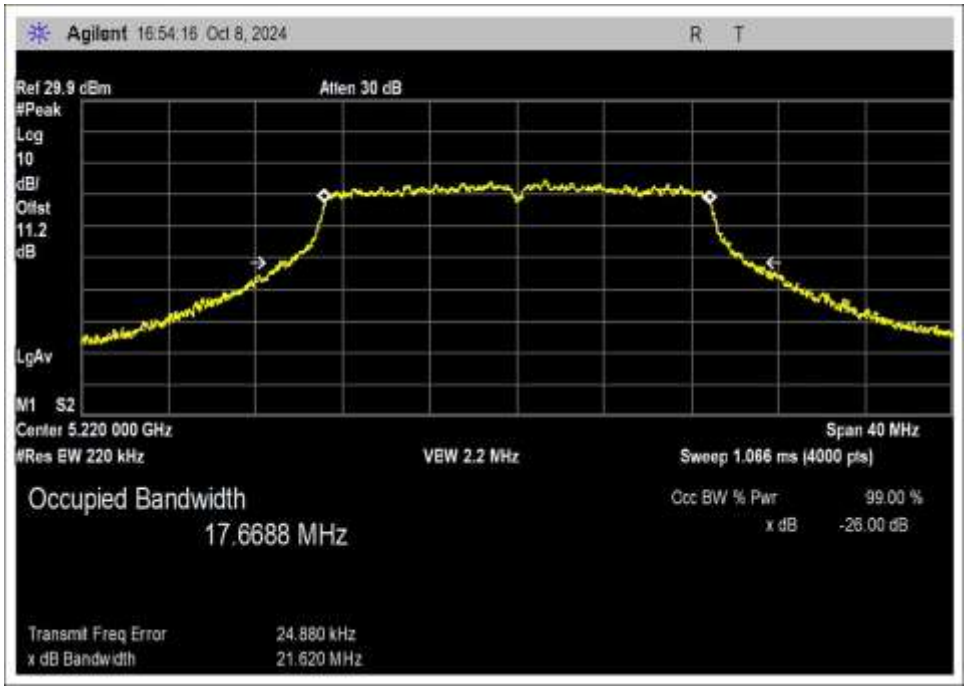


High Channel

802.11n HT20



Low Channel



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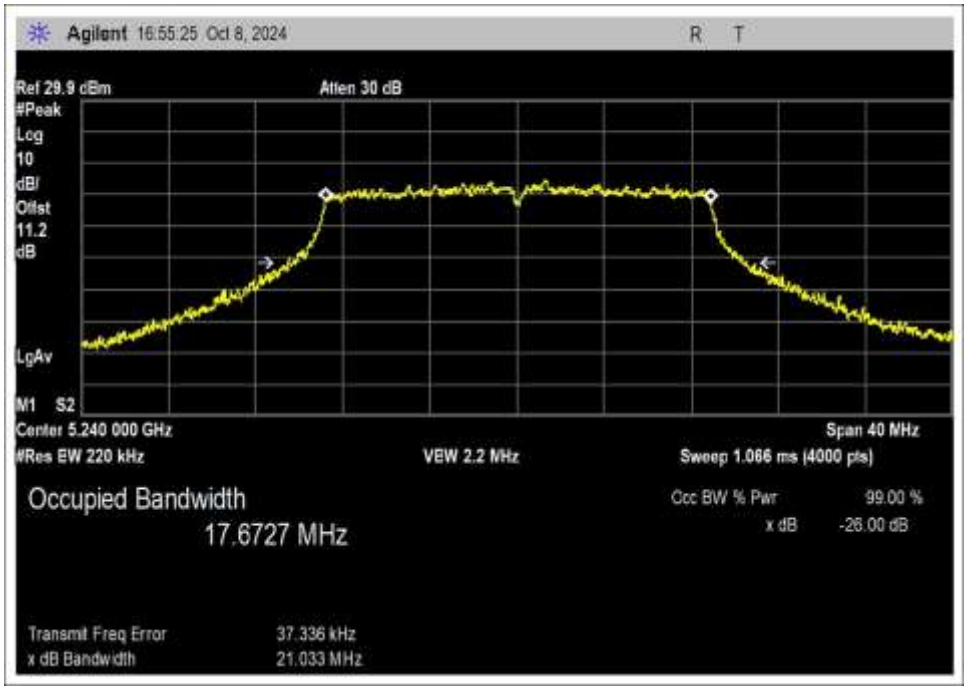
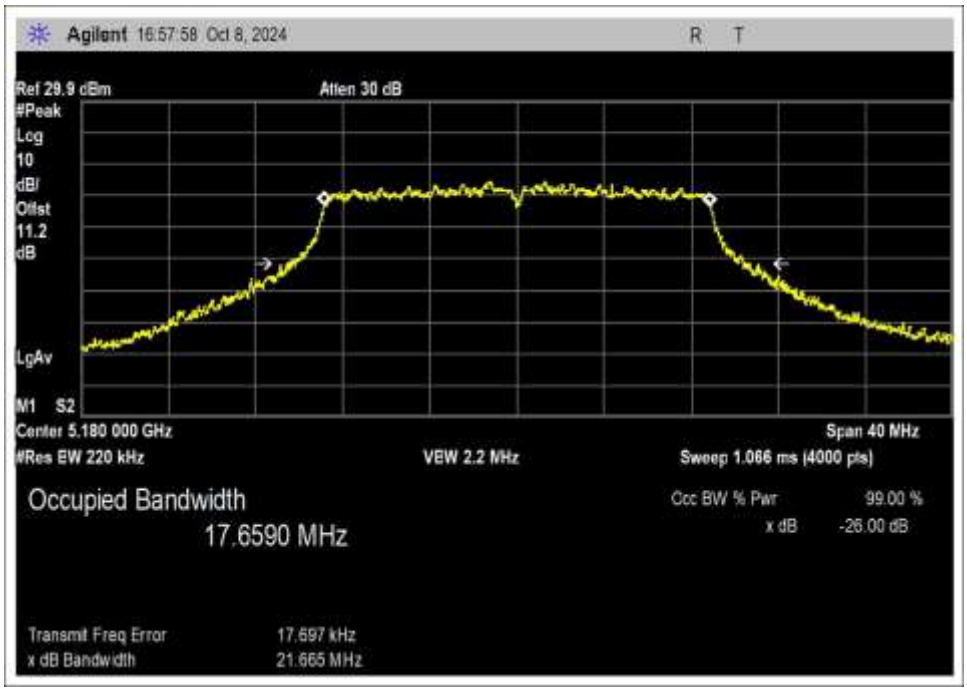


High Channel

802.11ac 20MHz



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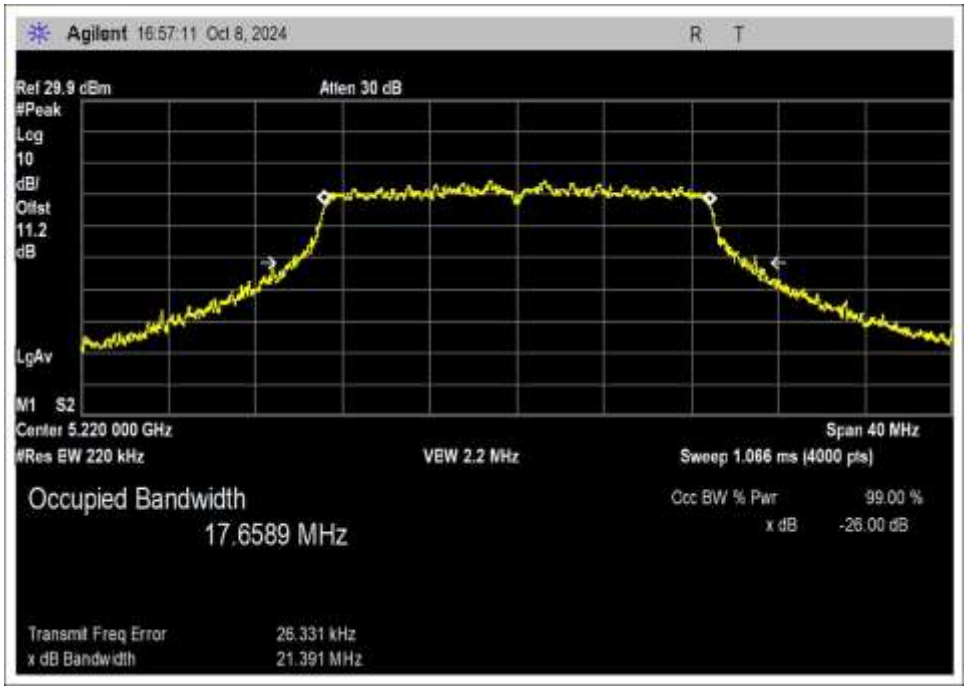

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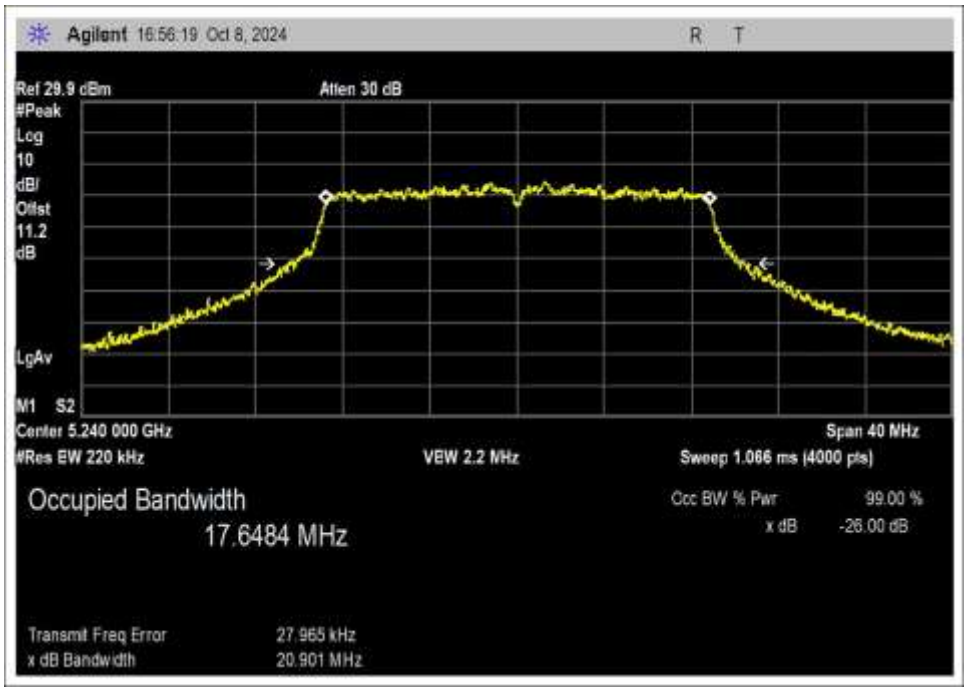
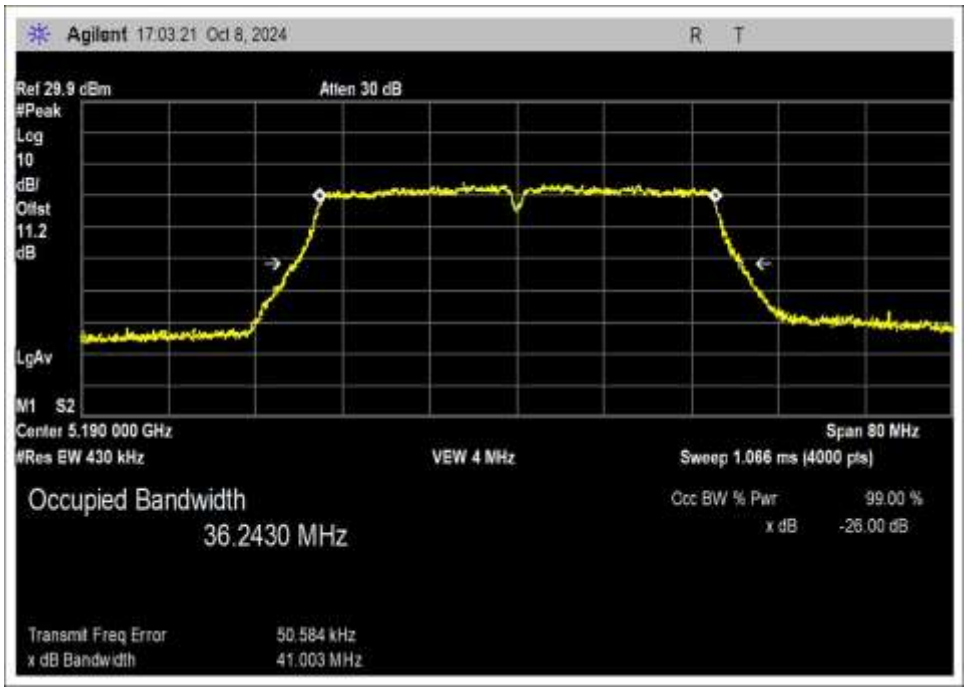


High Channel

802.11 n HT40



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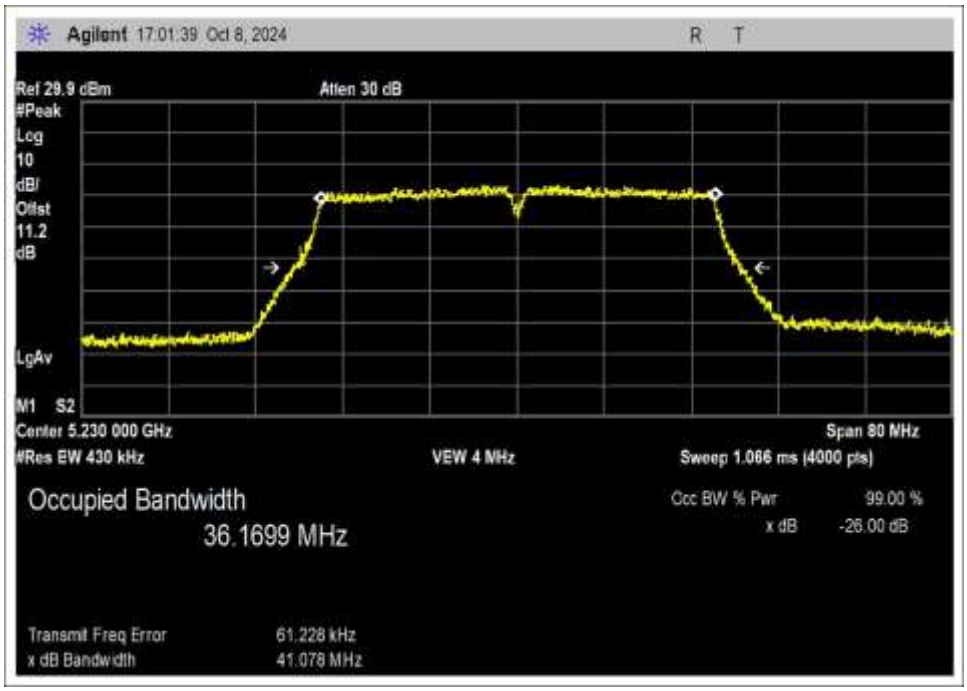
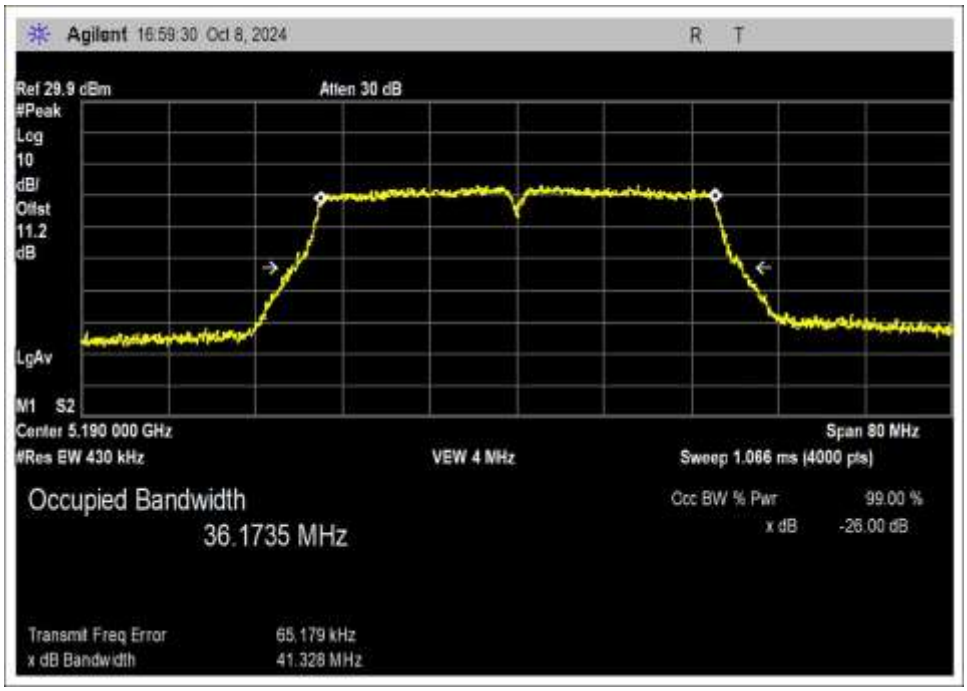
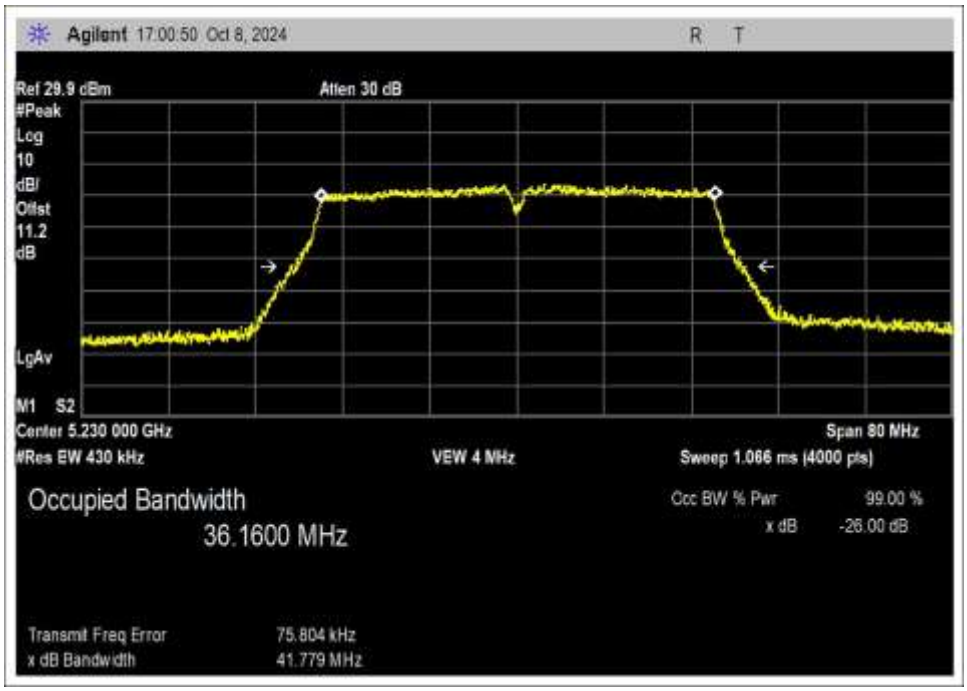


High Channel

802.11ac 40MHz

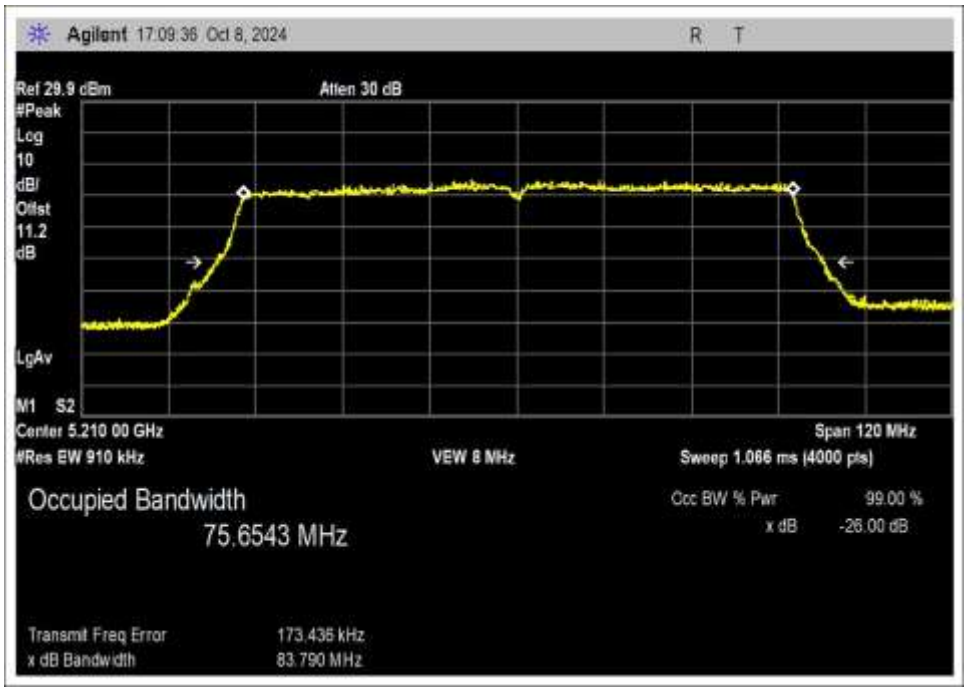


Low Channel



High Channel

802.11ac 80MHz



Occupied Bandwidth

Test Setup Photo(s)

Test Setup

Test Setup, Closeup View

15.407(a)(1) Output Power

Test Setup/Conditions			
Test Location:	Fremont Lab Bench	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2020), KDB 789033	Test Date(s):	10/07-09/2024
Configuration:	A		
Test Setup:	The EUT is placed non-conducted table. It is operated as intended. It is connected straight to a Spectrum Analyzer.		

Environmental Conditions			
Temperature (ºC)	21.2-23.7	Relative Humidity (%):	39-45

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03013	Cable	Astrolab	32022-2-2909K-36TC	1/9/2024	1/9/2026
P07365	Attenuator	Weinschel	54A-10	5/26/2023	5/26/2025
03471	Spectrum Analyzer	Agilent	E4440A	2/23/2024	2/23/2026

Test Data Summary - Voltage Variations					
Frequency (MHz)	**Modulation / Ant Port**	**$V_{Minimum}$ (dBm)**	**$V_{Nominal}$ (dBm)**	**$V_{Maximum}$ (dBm)**	**Max Deviation from $V_{Nominal}$ (dB)**
5180	802.11a/1	13.03	13.02	13.02	0.01
5220	802.11a/1	13.21	13.22	13.25	0.03
5240	802.11a/1	13.15	13.13	13.12	0.02

Test performed using operational mode with the highest output power, representing worst case.

Parameter Definitions:

Measurements performed at input voltage Vnominal ± 15%.

Parameter	Value
$V_{Nominal}$:	12VDC
$V_{Minimum}$:	10.2VDC
$V_{Maximum}$:	13.8VDC

Test Data Summary - RF Conducted Measurement-Chain 0							
Measurement Option: AVGSA-1							
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	RF Conducted (dBm)		EIRP (dBm)		Results
			Measured	Limit	Calculated	Limit	
5180	802.11a	External/4.66	12.25	≤24	16.91	≤30	Pass
5220	802.11a	External/4.66	12.28	≤24	16.84	≤30	Pass
5240	802.11a	External/4.66	12.34	≤24	17	≤30	Pass
5180	802.11n HT20	External/4.66	12.13	≤24	16.79	≤30	Pass
5220	802.11n HT20	External/4.66	12.24	≤24	16.9	≤30	Pass
5240	802.11n HT20	External/4.66	12.17	≤24	16.83	≤30	Pass
5180	802.11ac 20MHz	External/4.66	12.16	≤24	16.82	≤30	Pass
5220	802.11ac 20MHz	External/4.66	12.24	≤24	16.9	≤30	Pass
5240	802.11ac 20MHz	External/4.66	12.23	≤24	16.89	≤30	Pass
5190	802.11n HT40	External/4.66	12.04	≤24	16.7	≤30	Pass
5230	802.11n HT40	External/4.66	12.18	≤24	16.84	≤30	Pass
5190	802.11ac 40MHz	External/4.66	12.06	≤24	16.72	≤30	Pass
5230	802.11ac 40MHz	External/4.66	12.19	≤24	16.85	≤30	Pass
5210	802.11ac 80MHz	External/4.66	11.87	≤24	16.53	≤30	Pass

Test Data Summary - RF Conducted Measurement-Chain 1							
Measurement Option: AVGSA-1							
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	RF Conducted (dBm)		EIRP (dBm)		Results
			Measured	Limit	Calculated	Limit	
5180	802.11a	External/4.66	13.02	≤24	17.68	≤30	Pass
5220	802.11a	External/4.66	13.22	≤24	17.88	≤30	Pass
5240	802.11a	External/4.66	13.13	≤24	17.79	≤30	Pass
5180	802.11n HT20	External/4.66	13.04	≤24	17.7	≤30	Pass
5220	802.11n HT20	External/4.66	13.12	≤24	17.78	≤30	Pass
5240	802.11n HT20	External/4.66	12.97	≤24	17.63	≤30	Pass
5180	802.11ac 20MHz	External/4.66	12.76	≤24	17.42	≤30	Pass
5220	802.11ac 20MHz	External/4.66	12.97	≤24	17.63	≤30	Pass
5240	802.11ac 20MHz	External/4.66	12.80	≤24	17.46	≤30	Pass
5190	802.11n HT40	External/4.66	12.88	≤24	17.54	≤30	Pass
5230	802.11n HT40	External/4.66	13.03	≤24	17.69	≤30	Pass
5190	802.11ac 40MHz	External/4.66	12.59	≤24	17.25	≤30	Pass
5230	802.11ac 40MHz	External/4.66	12.76	≤24	17.42	≤30	Pass
5210	802.11ac 80MHz	External/4.66	12.72	≤24	17.38	≤30	Pass

EIRP is calculated as RF conducted power (dBm) + antenna gain (dBi)

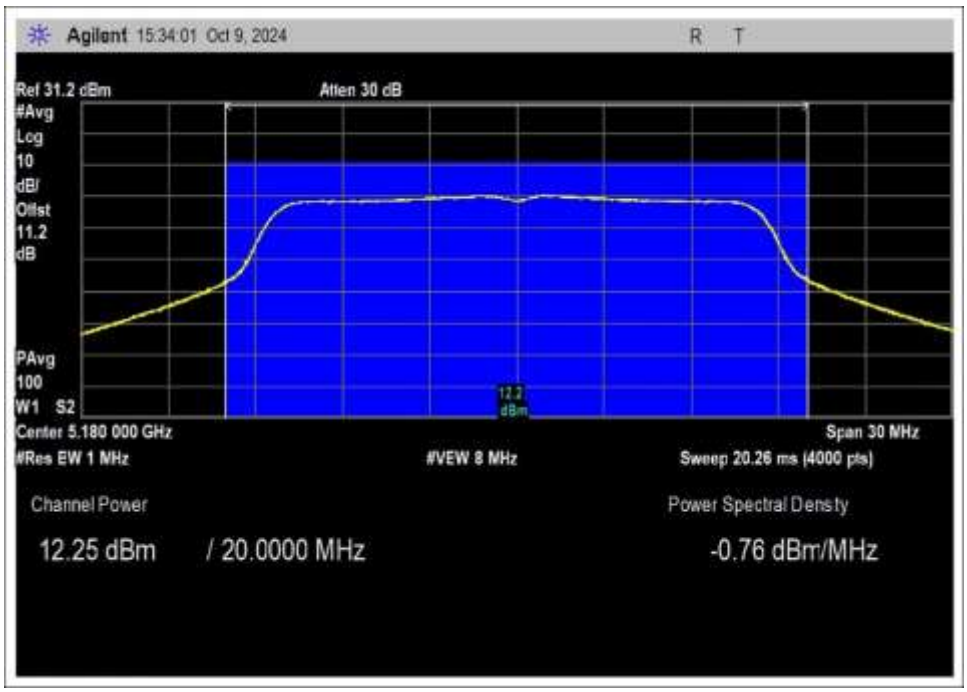
For access points using antennas other than in fixed point-to-point applications, the limit is calculated in accordance with 15.407(a)(1)(i):
$Limit = 30 - Roundup(G - 6)$

For access points using antennas in fixed point-to-point applications, the limit is calculated in accordance with 15.407(a)(1)(ii):
$Limit = 30 - Roundup(G - 23)$

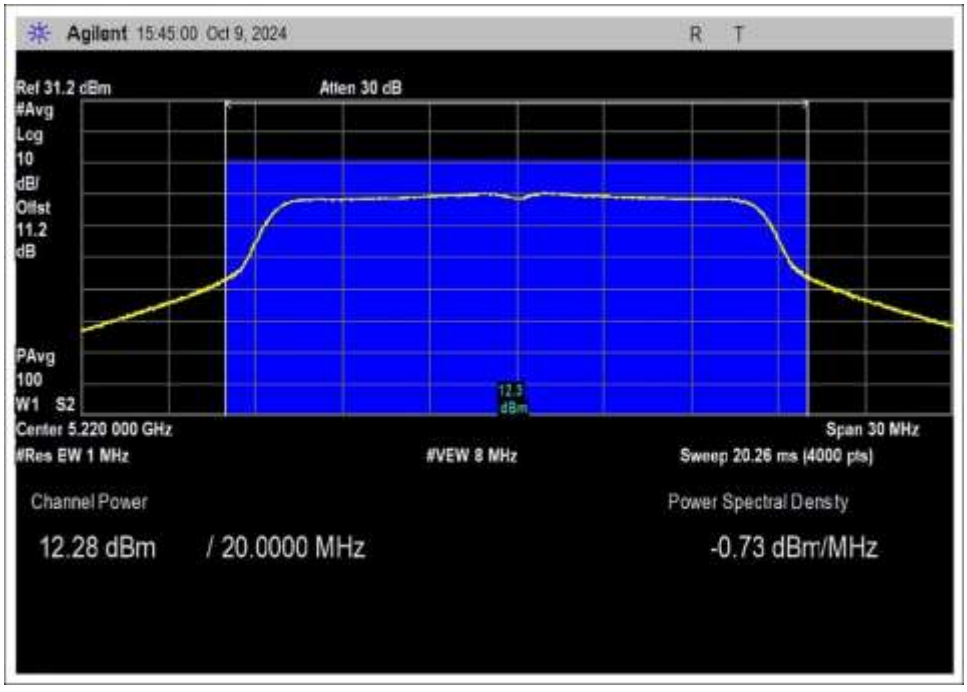
For client devices access points using antennas in fixed point-to-point applications, the limit is calculated in accordance with 15.407(a)(1)(iii):
$Limit = 24 - Roundup(G - 6)$

Plot(s)

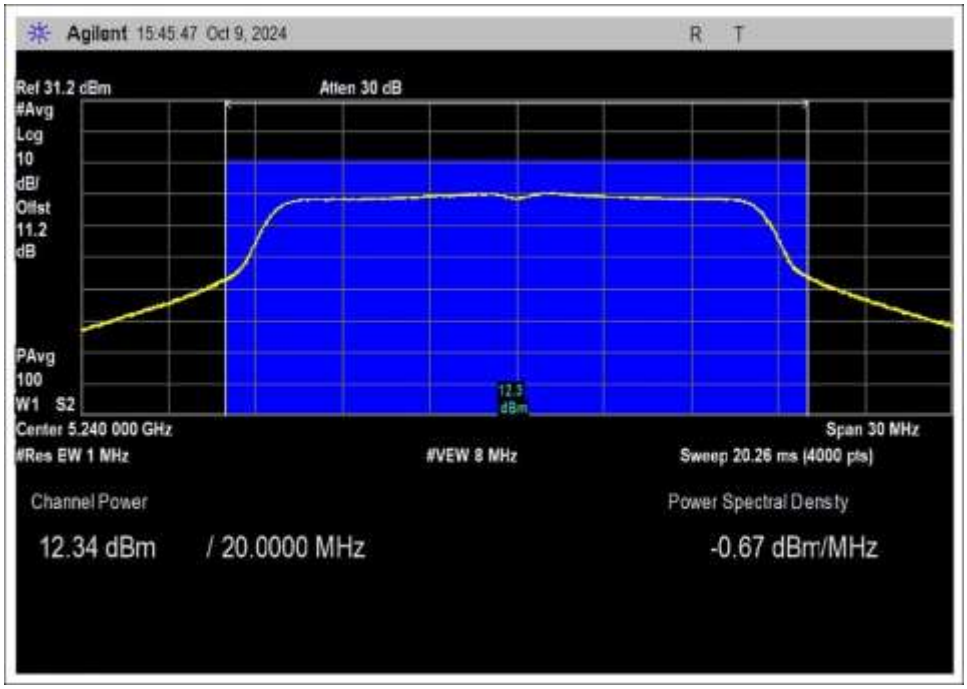
Chain 0
802.11a



Low Channel

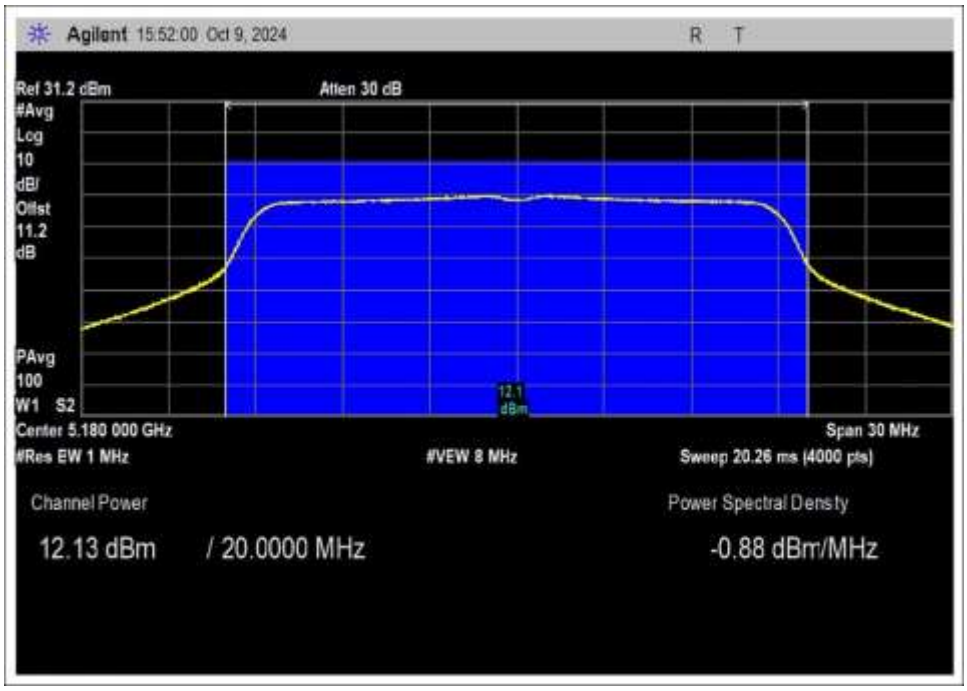


Middle Channel

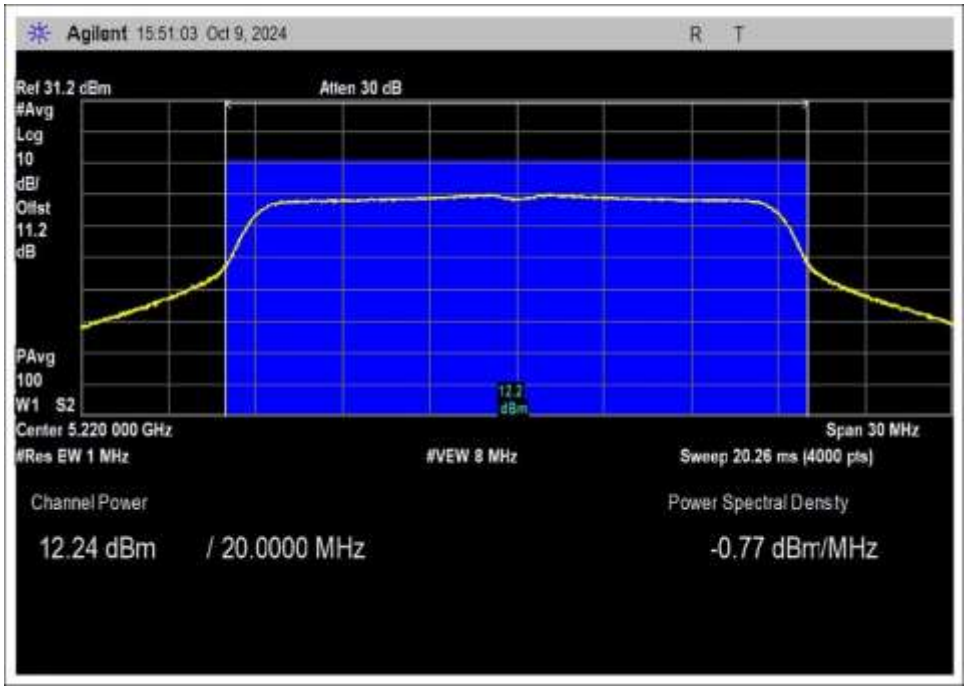


High Channel

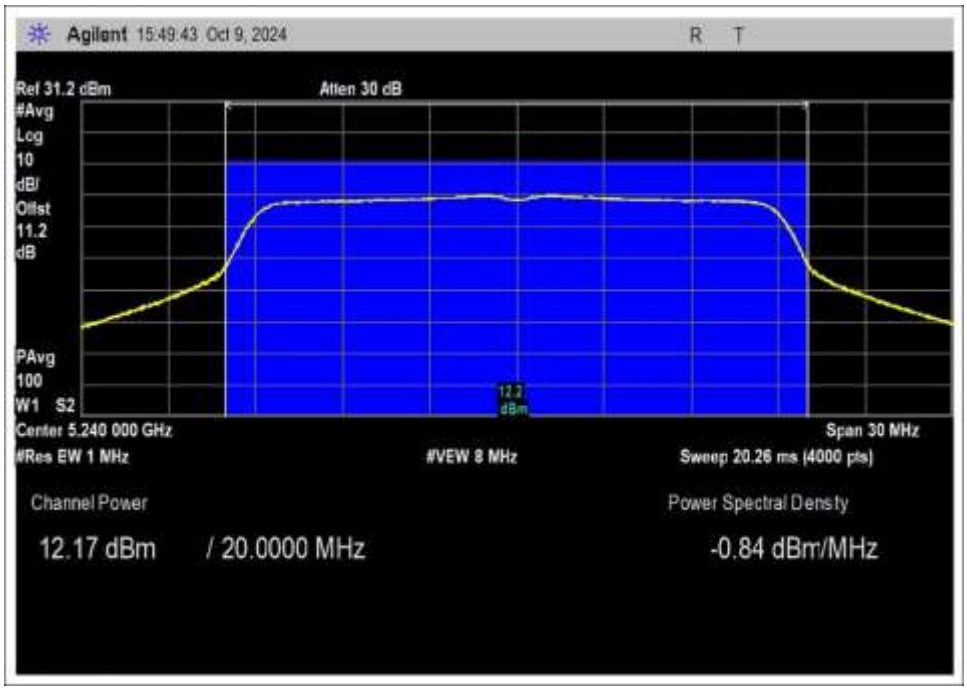
802.11n HT20



Low Channel

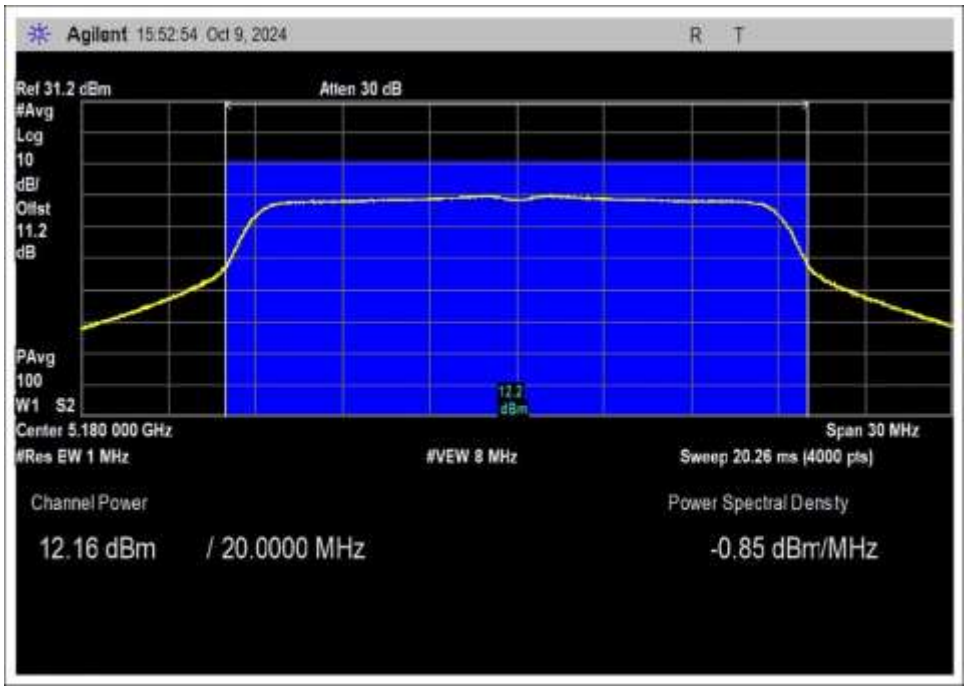


Middle Channel

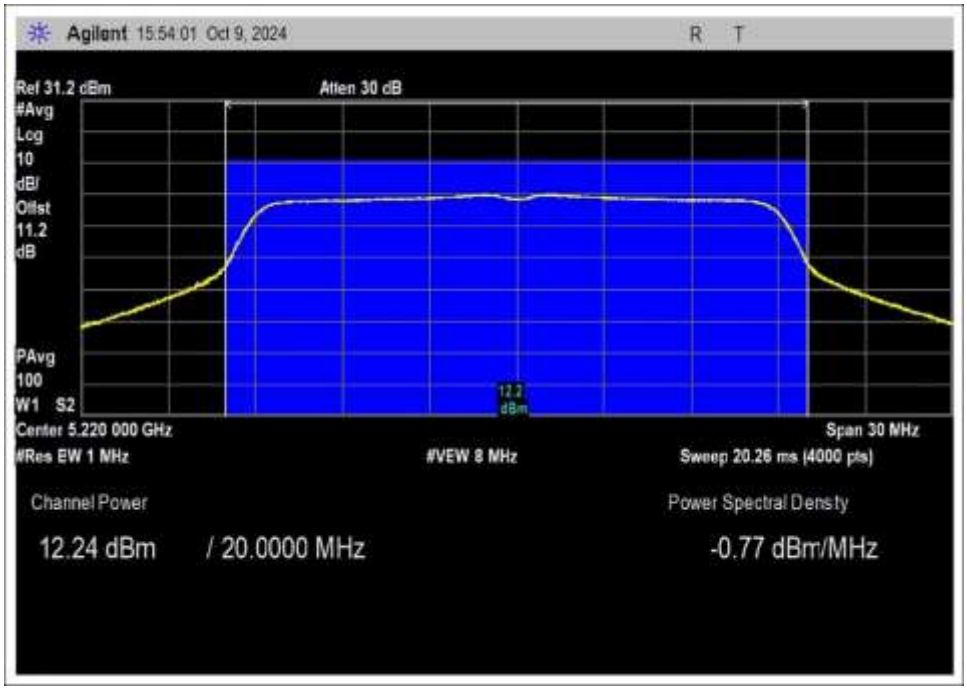


High Channel

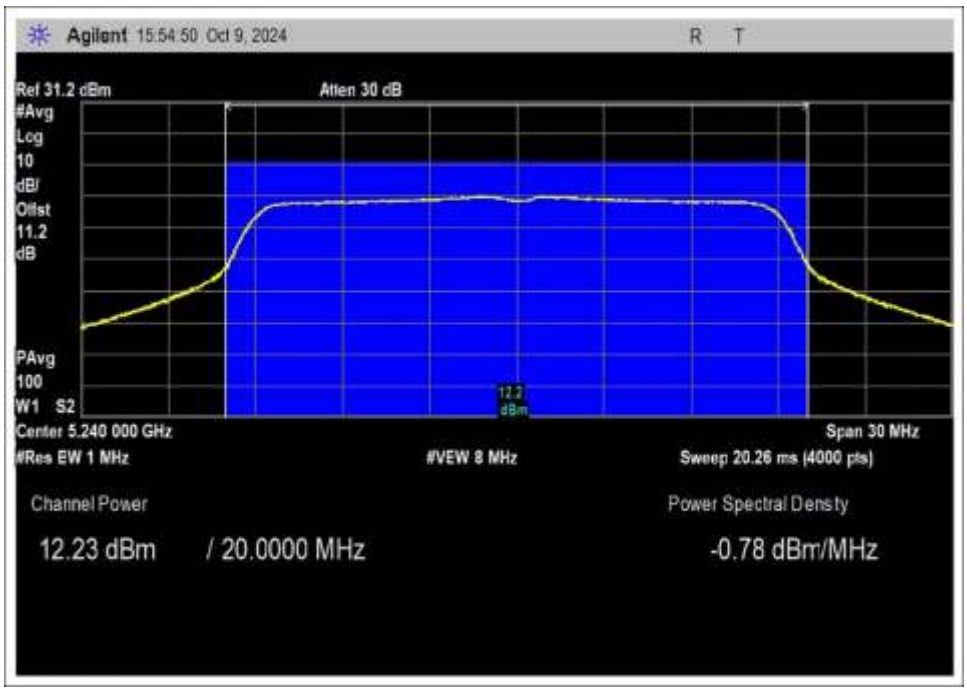
802.11ac 20MHz



Low Channel

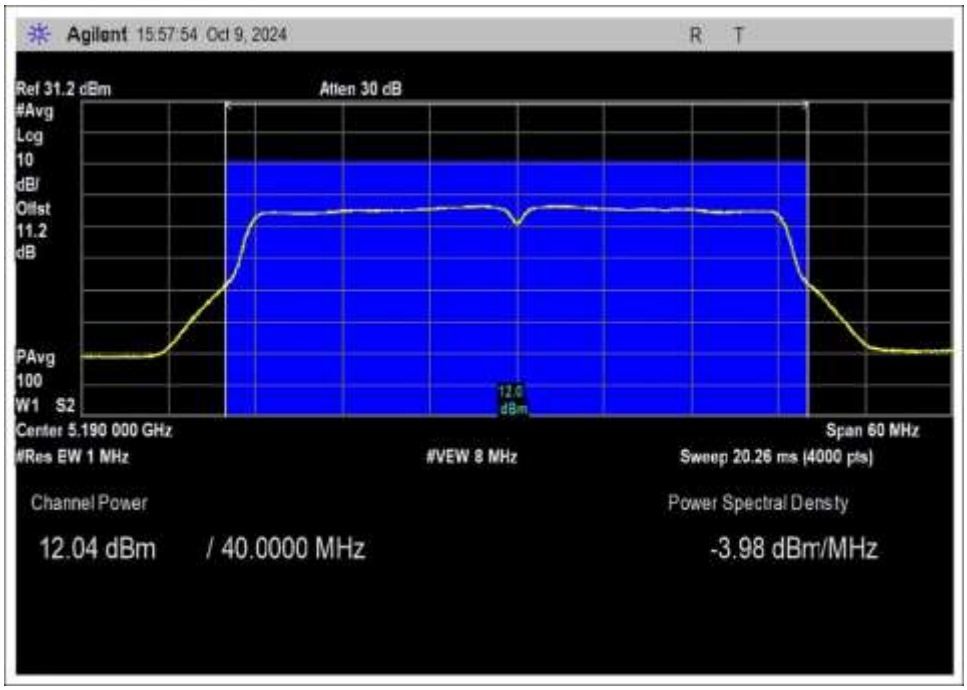


Middle Channel

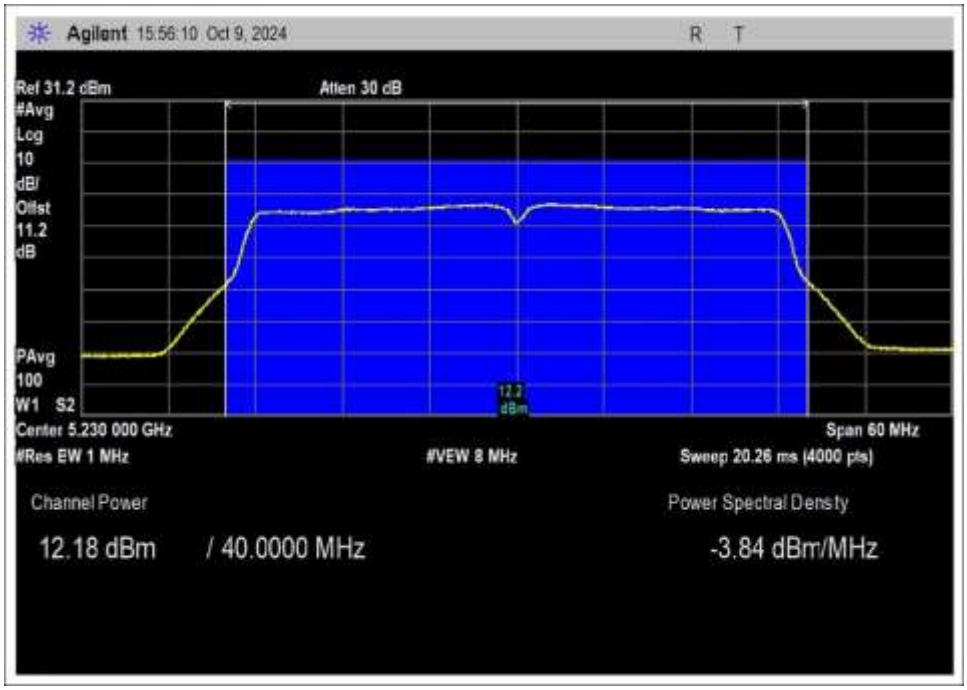


High Channel

802.11 n HT40

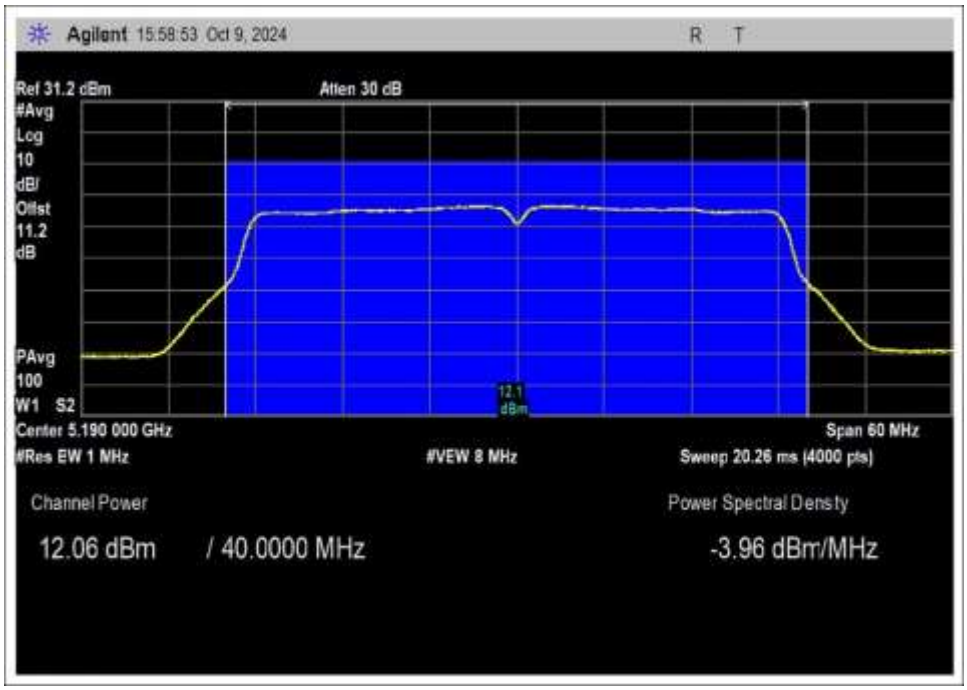


Low Channel

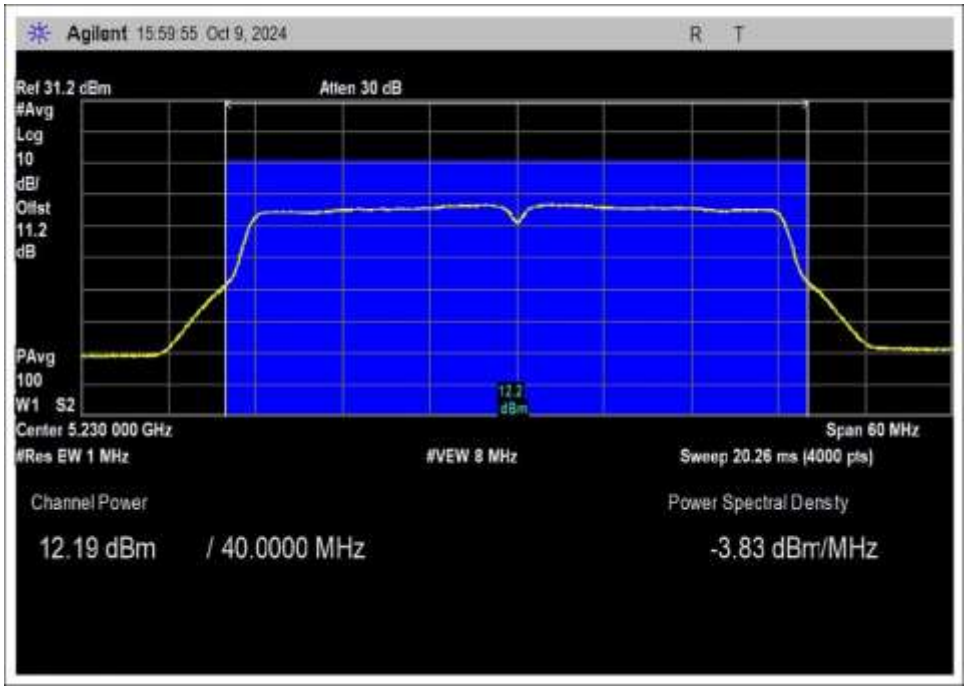


High Channel

802.11ac 40MHz

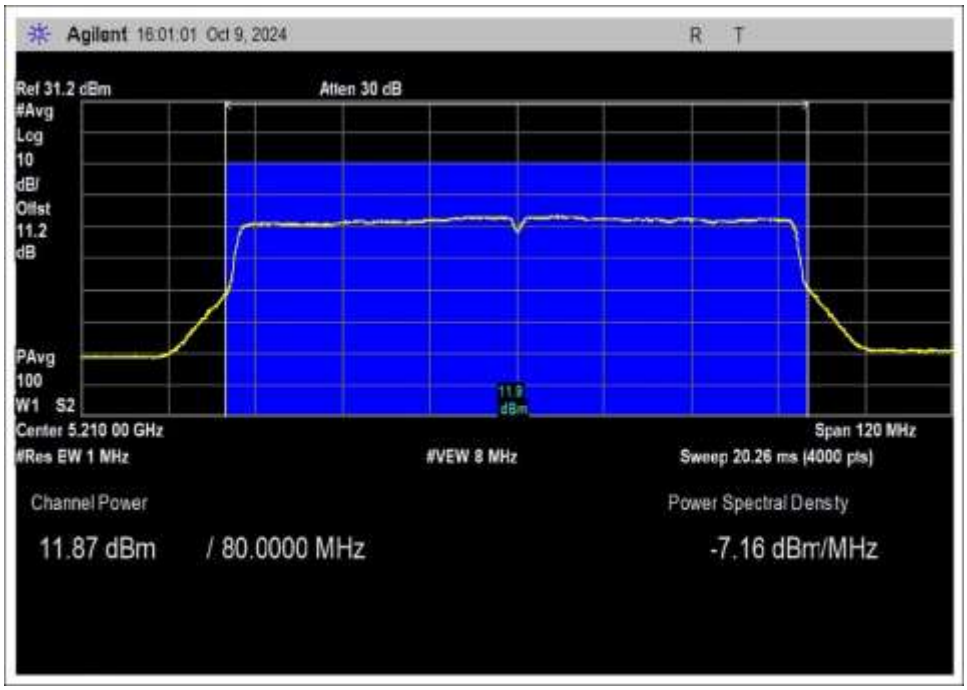


Low Channel

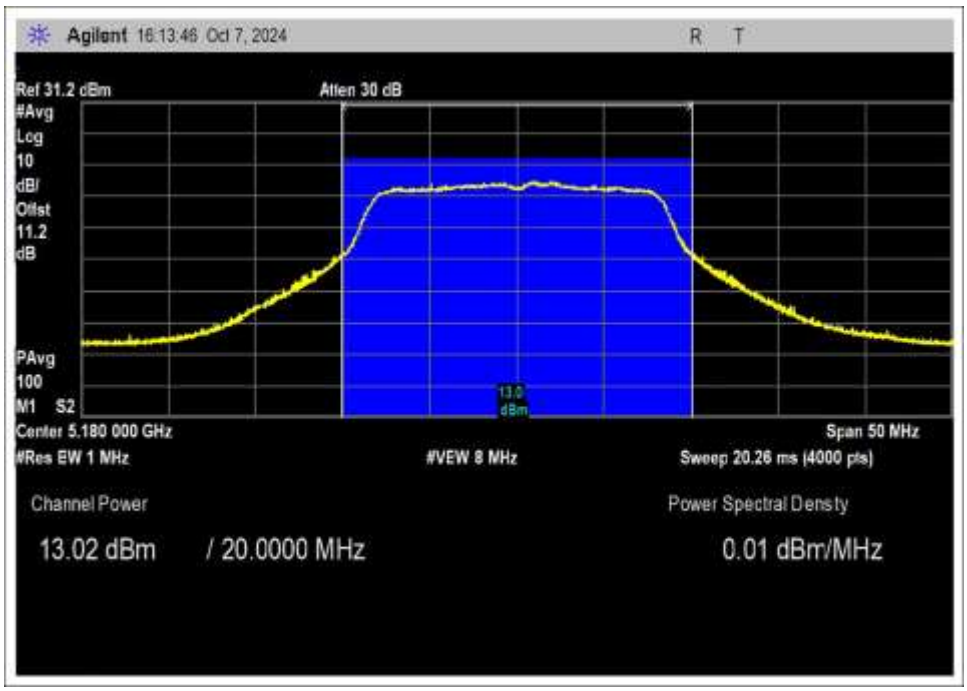


High Channel

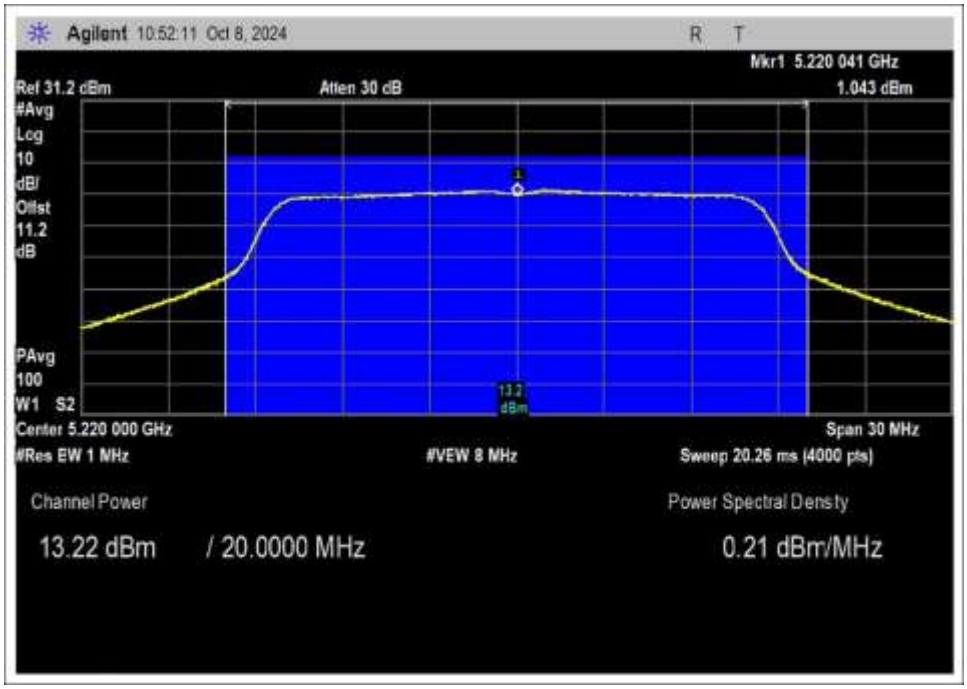
802.11ac 80MHz



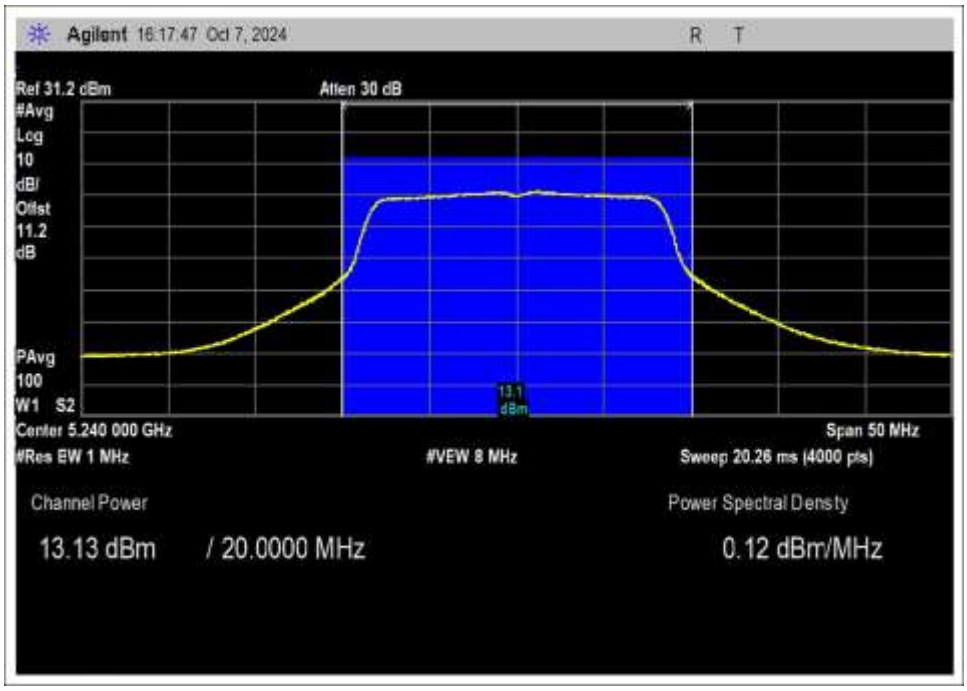
Chain 1
802.11a



Low Channel

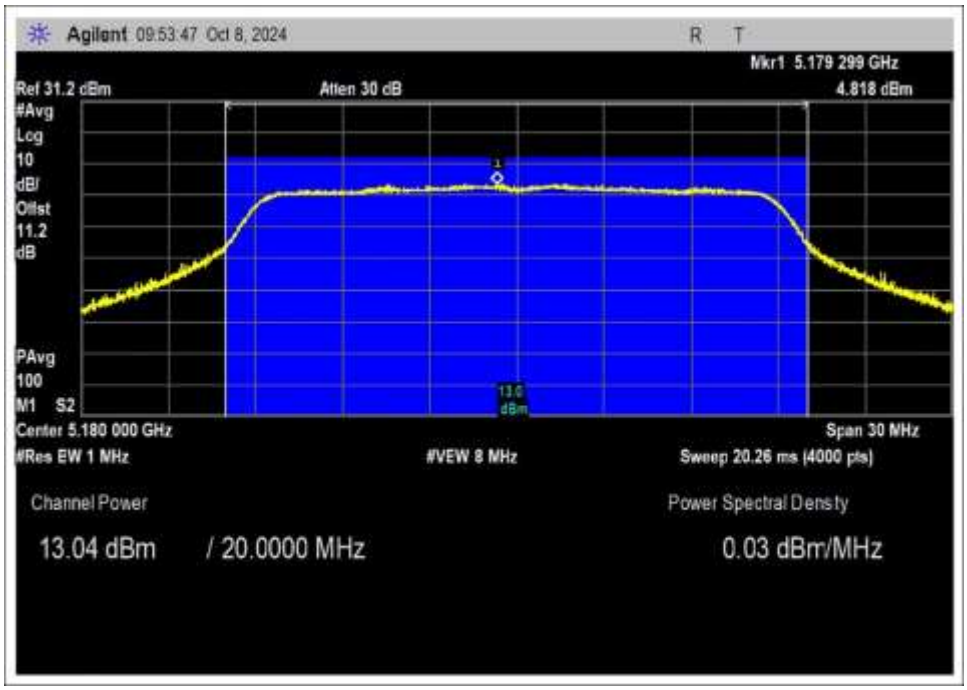


Middle Channel

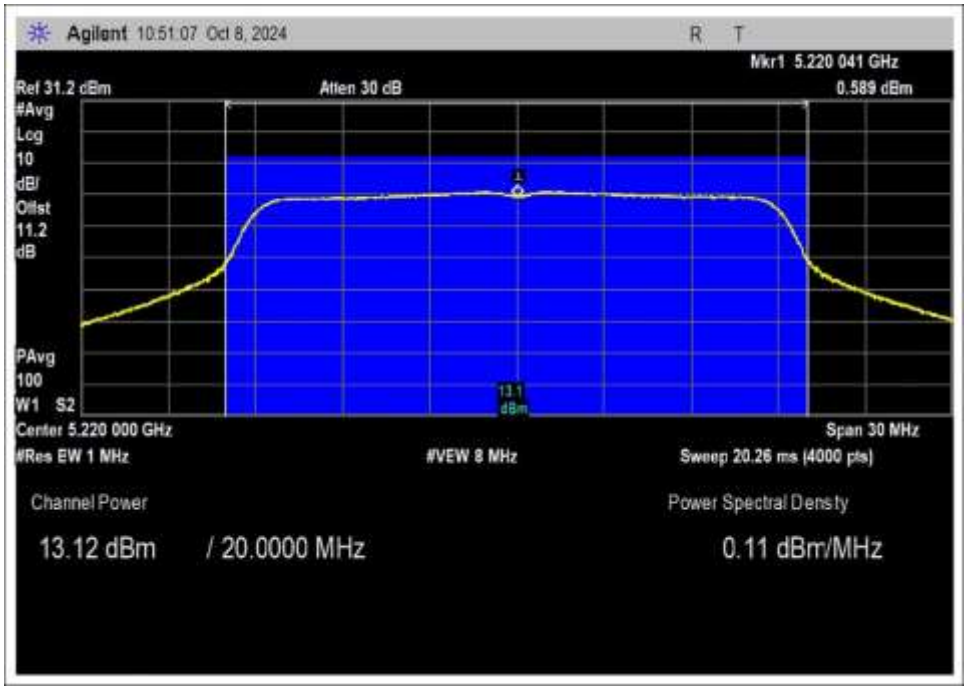


High Channel

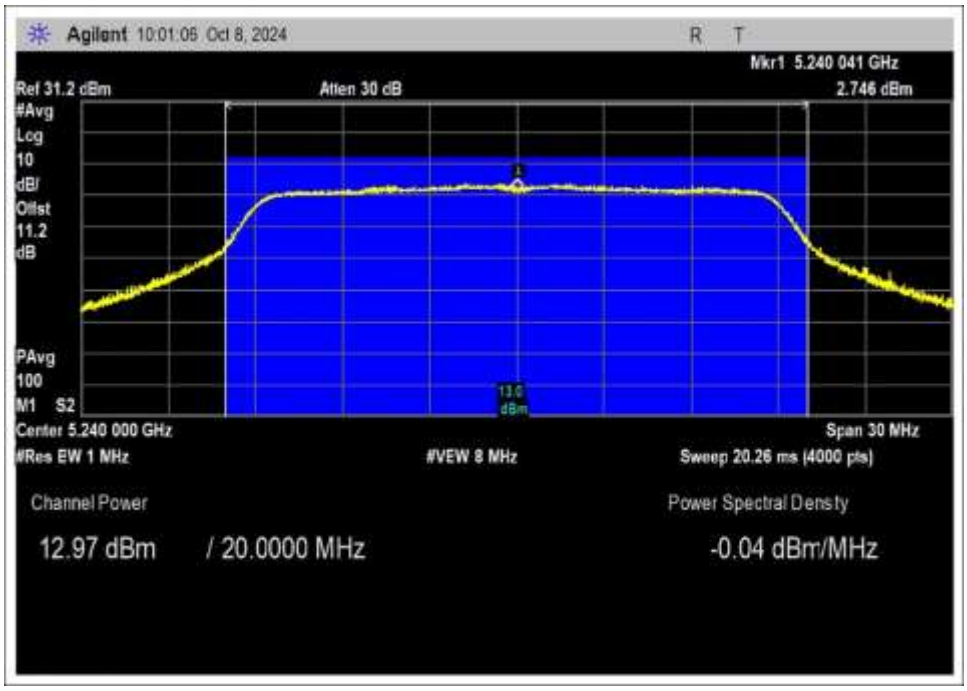
802.11n HT20



Low Channel

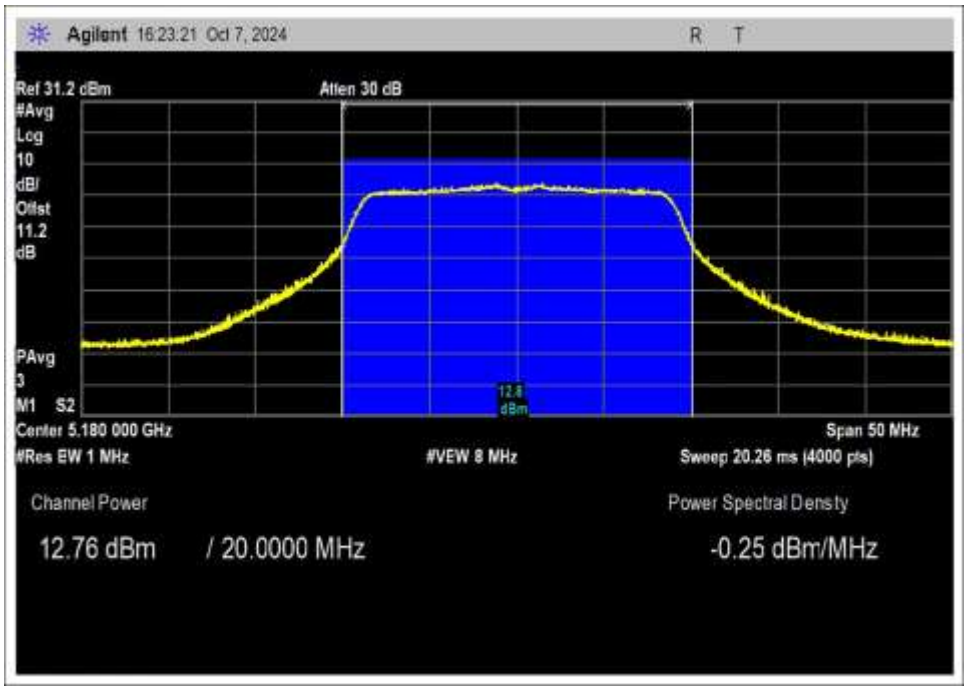


Middle Channel

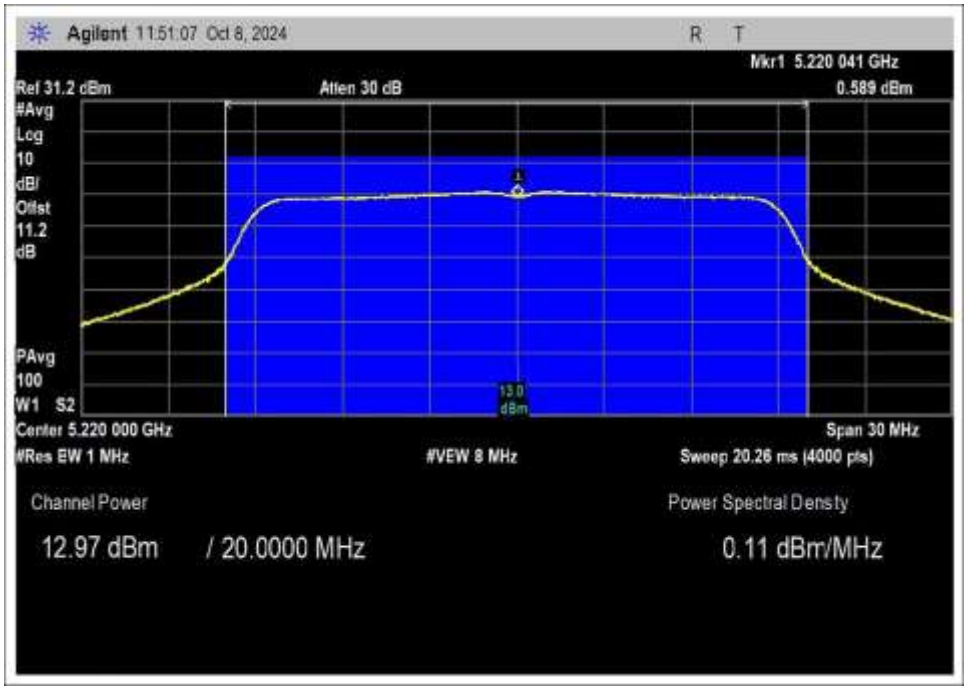


High Channel

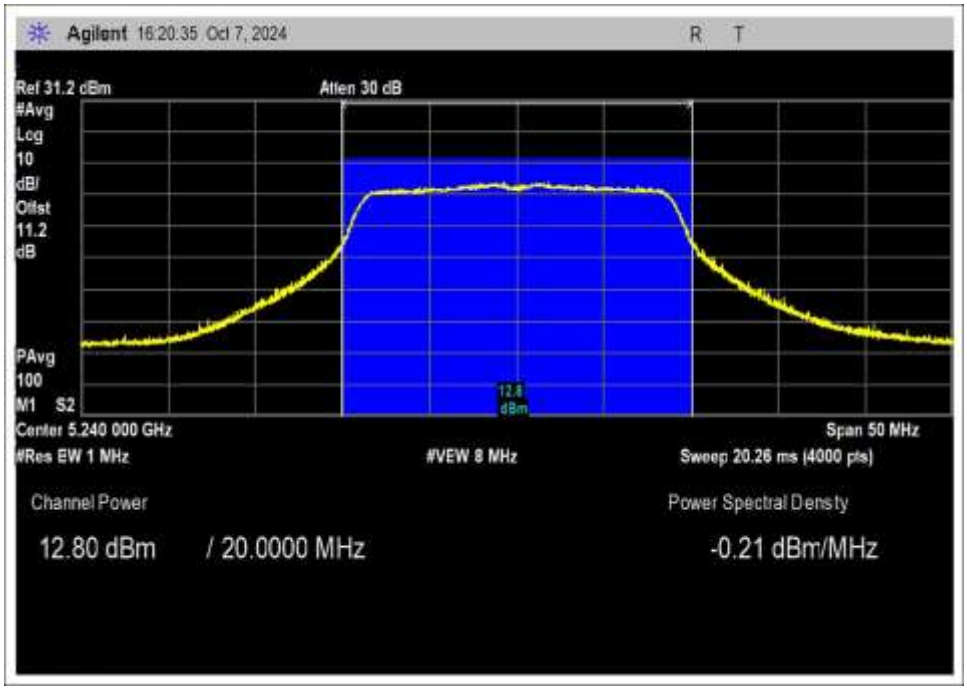
802.11ac 20MHz



Low Channel

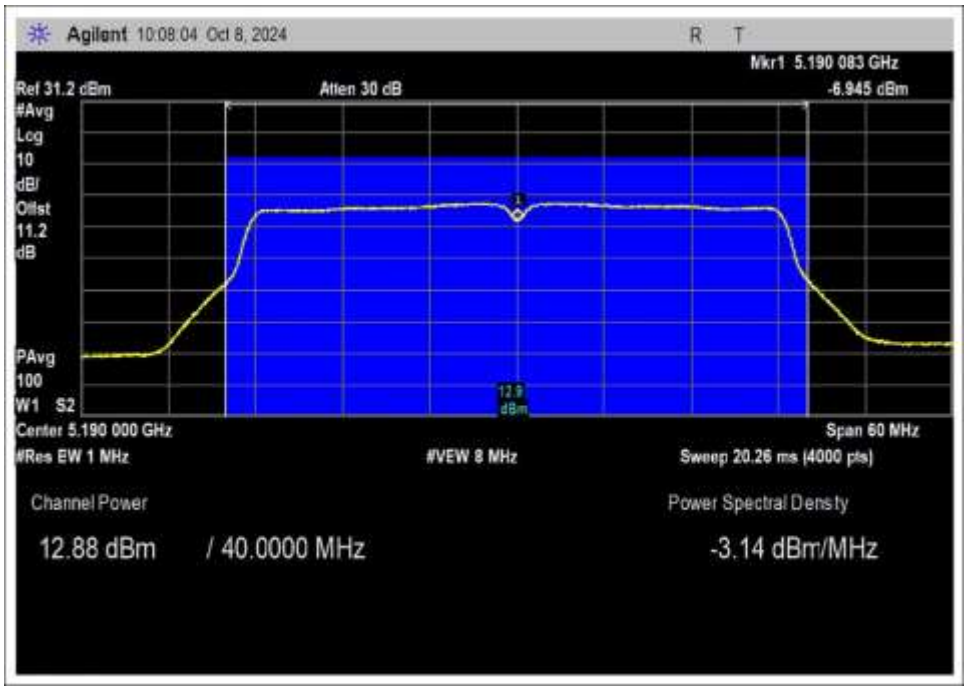


Middle Channel

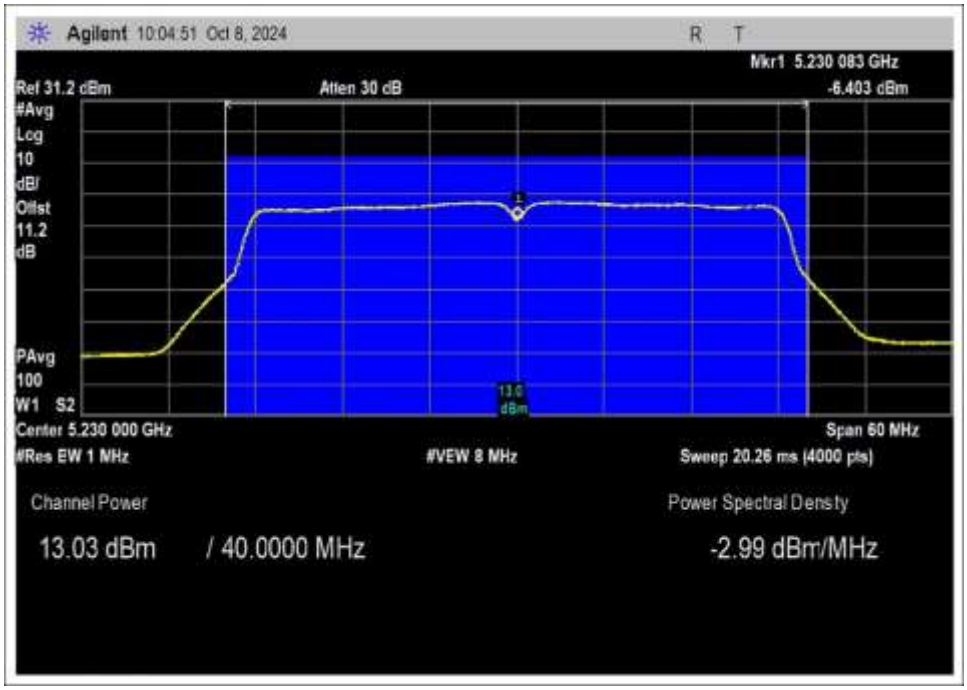


High Channel

802.11 n HT40

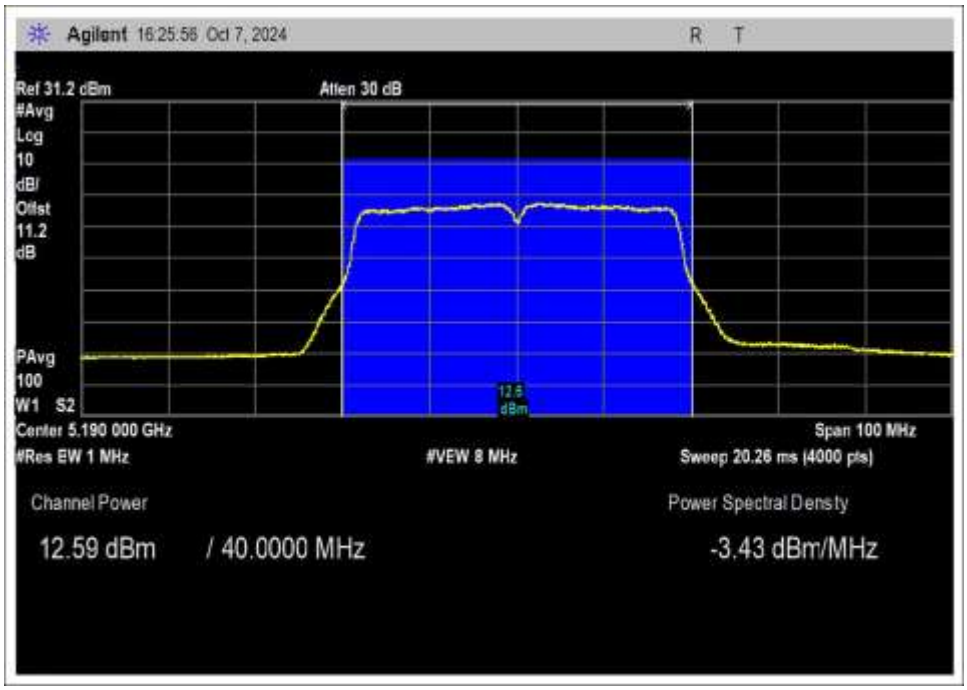


Low Channel

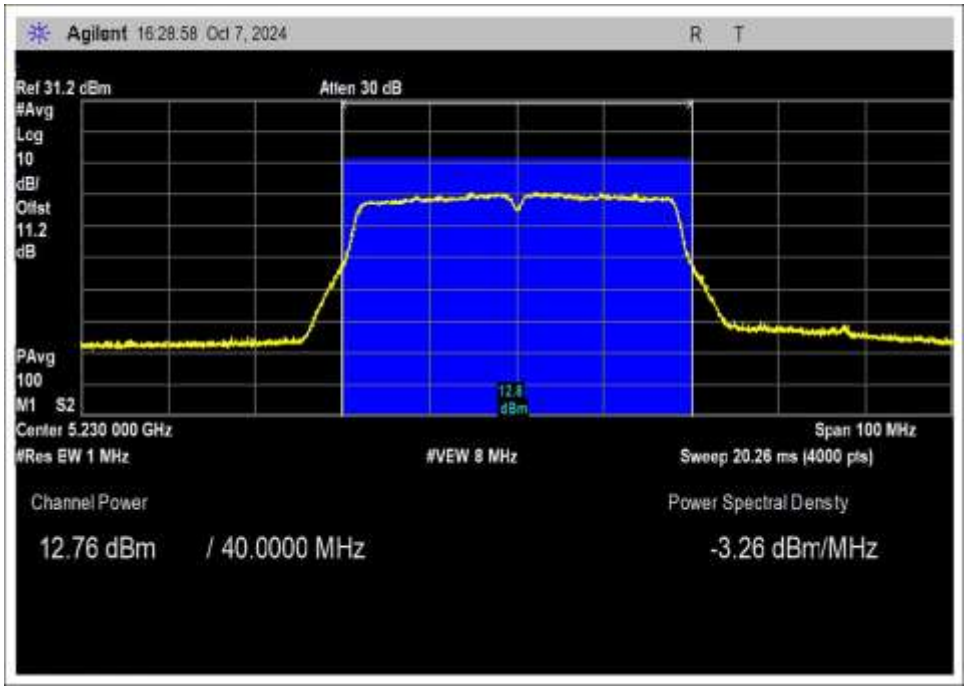


High Channel

802.11ac 40MHz

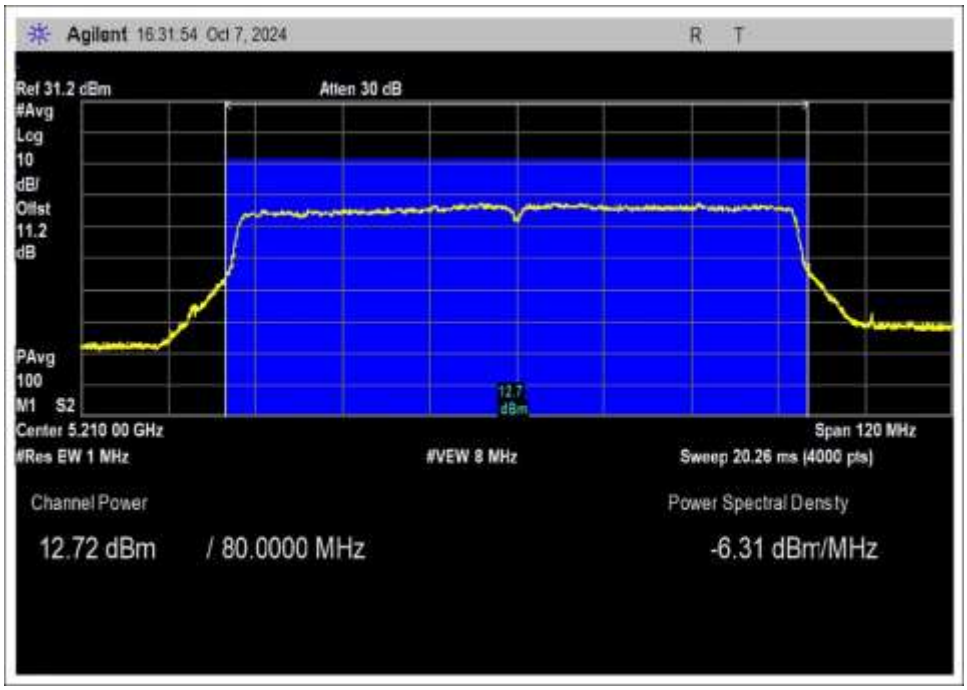


Low Channel



High Channel

802.11ac 80MHz



Test Setup Photo(s)

Test Setup

Test Setup, Closeup View

15.407(a)(1) Power Spectral Density

Test Setup/Conditions			
Test Location:	Fremont Lab Bench	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2020), KDB 789033	Test Date(s):	10/07-09/2024
Configuration:	A		
Test Setup:	The EUT is placed non-conducted table. It is operated as intended. It is connected straight to a Spectrum Analyzer.		

Environmental Conditions			
Temperature (ºC)	21.2-23.7	Relative Humidity (%):	39-45

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03013	Cable	Astrolab	32022-2-2909K-36TC	1/9/2024	1/9/2026
P07365	Attenuator	Weinschel	54A-10	5/26/2023	5/26/2025
03471	Spectrum Analyzer	Agilent	E4440A	2/23/2024	2/23/2026

Test Data Summary - RF Conducted Measurement-Chain 0					
Measurement Option: AVGSA-1					
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Measured (dBm/MHz)**	**Limit (dBm/MHz)**	**Results**
5180	802.11a	External/4.66	-0.76	≤11	Pass
5220	802.11a	External/4.66	-0.73	≤11	Pass
5240	802.11a	External/4.66	-0.67	≤11	Pass
5180	802.11n HT20	External/4.66	-0.88	≤11	Pass
5220	802.11n HT20	External/4.66	-0.77	≤11	Pass
5240	802.11n HT20	External/4.66	-0.84	≤11	Pass
5180	802.11ac 20MHz	External/4.66	-0.85	≤11	Pass
5220	802.11ac 20MHz	External/4.66	-0.77	≤11	Pass
5240	802.11ac 20MHz	External/4.66	-0.78	≤11	Pass
5190	802.11n HT40	External/4.66	-3.98	≤11	Pass
5230	802.11n HT40	External/4.66	-3.84	≤11	Pass
5190	802.11ac 40MHz	External/4.66	-3.96	≤11	Pass
5230	802.11ac 40MHz	External/4.66	-3.83	≤11	Pass
5210	802.11ac 80MHz	External/4.66	-7.16	≤11	Pass

Test Data Summary - RF Conducted Measurement-Chain 1					
Measurement Option: AVGSA-1					
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Measured (dBm/MHz)**	**Limit (dBm/MHz)**	**Results**
5180	802.11a	External/4.66	0.01	≤11	Pass
5220	802.11a	External/4.66	0.21	≤11	Pass
5240	802.11a	External/4.66	0.12	≤11	Pass
5180	802.11n HT20	External/4.66	0.03	≤11	Pass
5220	802.11n HT20	External/4.66	0.11	≤11	Pass
5240	802.11n HT20	External/4.66	-0.04	≤11	Pass
5180	802.11ac 20MHz	External/4.66	-0.25	≤11	Pass
5220	802.11ac 20MHz	External/4.66	0.11	≤11	Pass
5240	802.11ac 20MHz	External/4.66	-0.21	≤11	Pass
5190	802.11n HT40	External/4.66	-3.14	≤11	Pass
5230	802.11n HT40	External/4.66	-2.99	≤11	Pass
5190	802.11ac 40MHz	External/4.66	-3.43	≤11	Pass
5230	802.11ac 40MHz	External/4.66	-3.26	≤11	Pass
5210	802.11ac 80MHz	External/4.66	-6.31	≤11	Pass

For access points using antennas other than in fixed point-to-point applications, the limit is calculated in accordance with 15.407(a)(1)(i):

$$Limit = 17 - Roundup(G - 6)$$

For access points using antennas in fixed point-to-point applications, the limit is calculated in accordance with 15.407(a)(1)(ii):

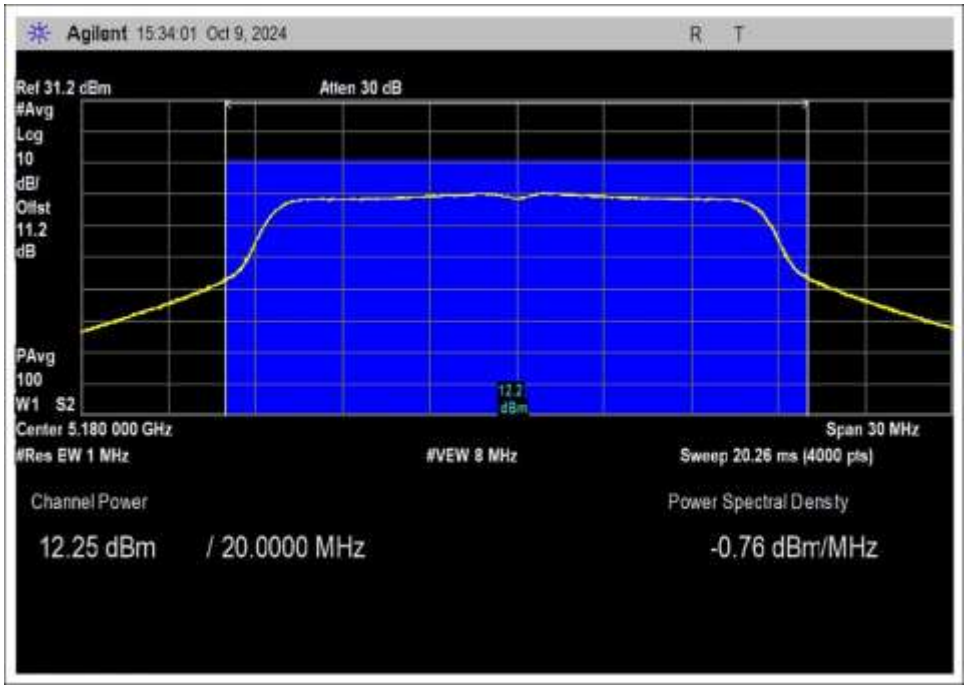
$$Limit = 17 - Roundup(G - 23)$$

For client devices access points using antennas in fixed point-to-point applications, the limit is calculated in accordance with 15.407(a)(1)(iii):

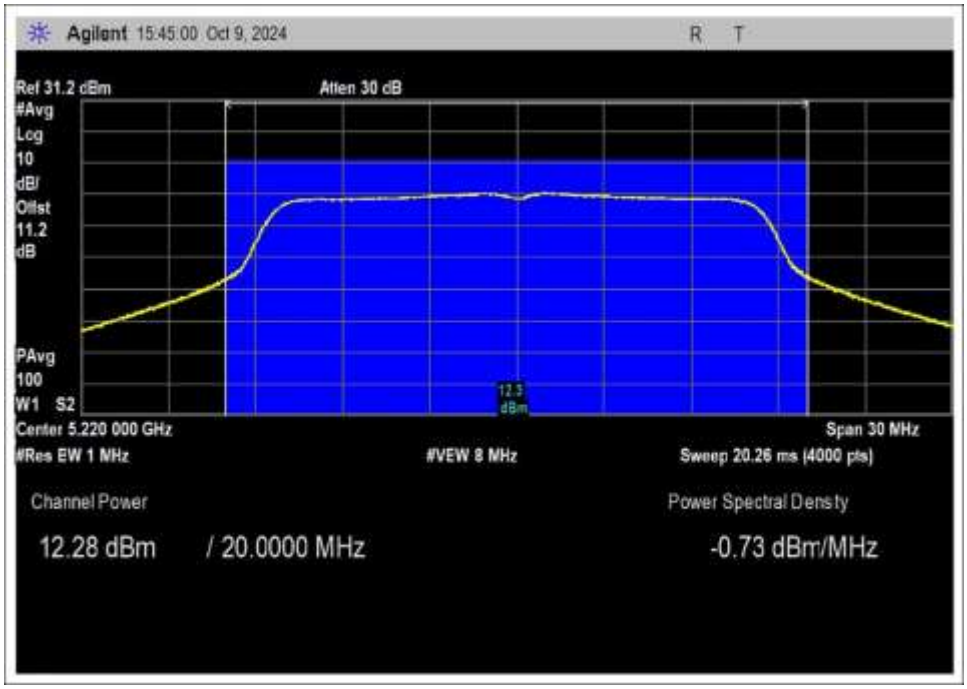
$$Limit = 11 - Roundup(G - 6)$$

Test Data - RF Conducted

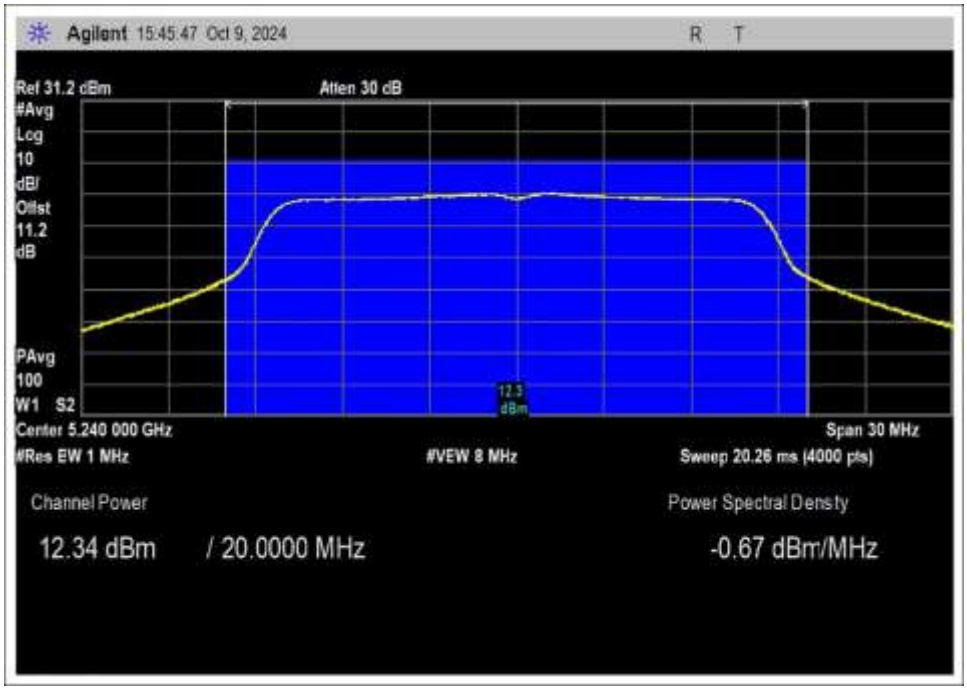
Chain 0
802.11a



Low Channel

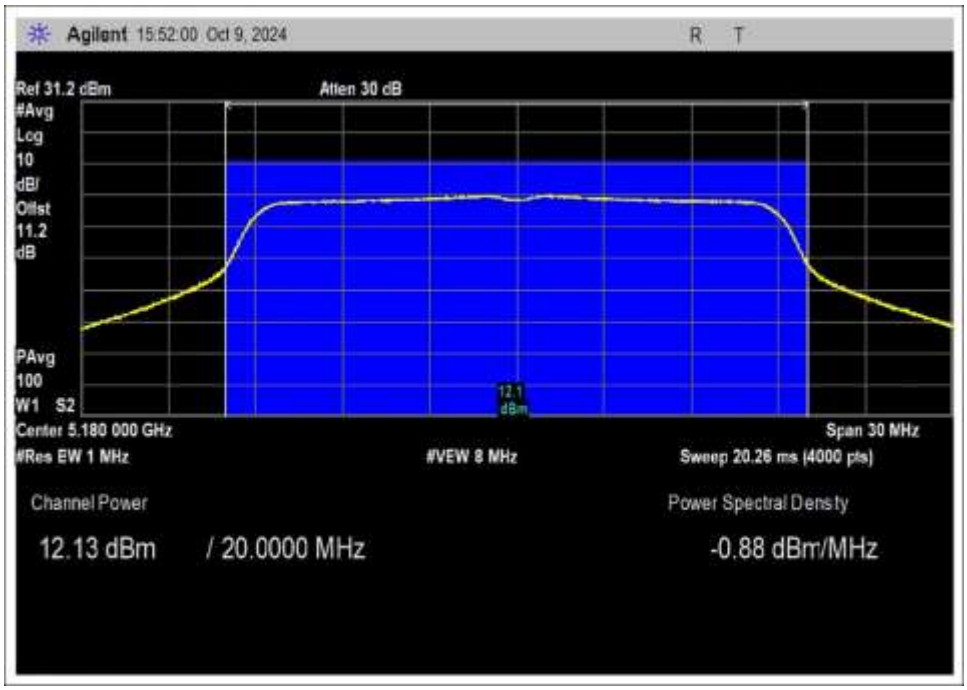


Middle Channel

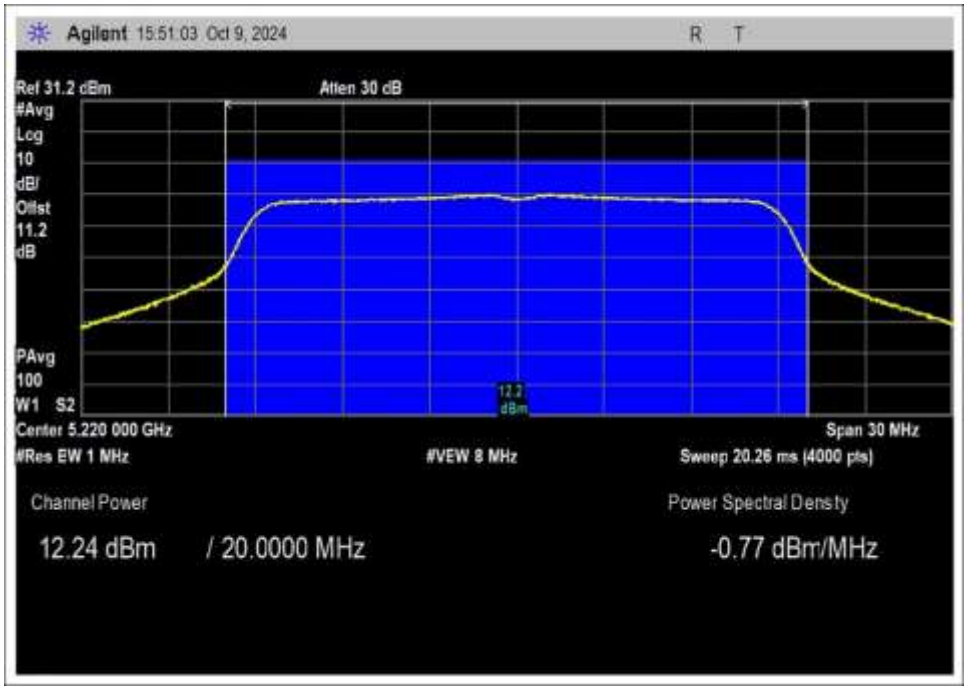


High Channel

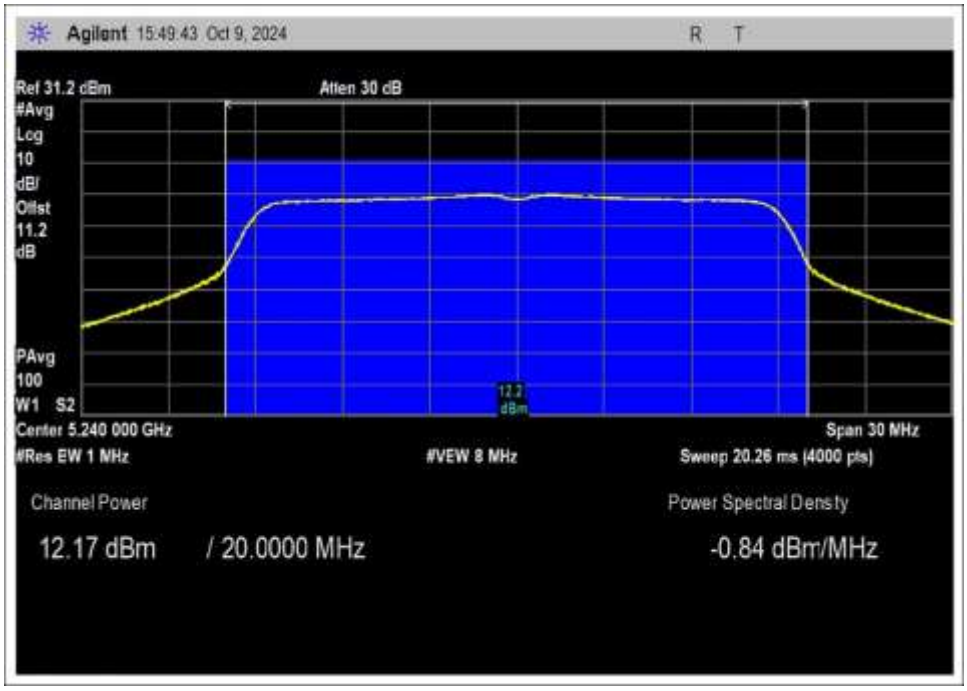
802.11n HT20



Low Channel

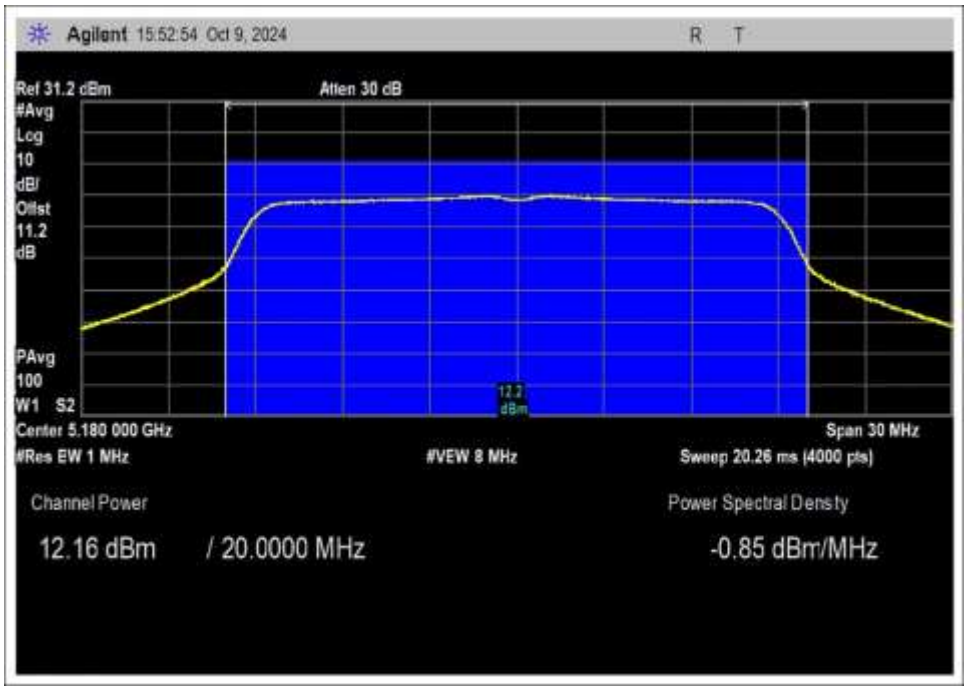


Middle Channel

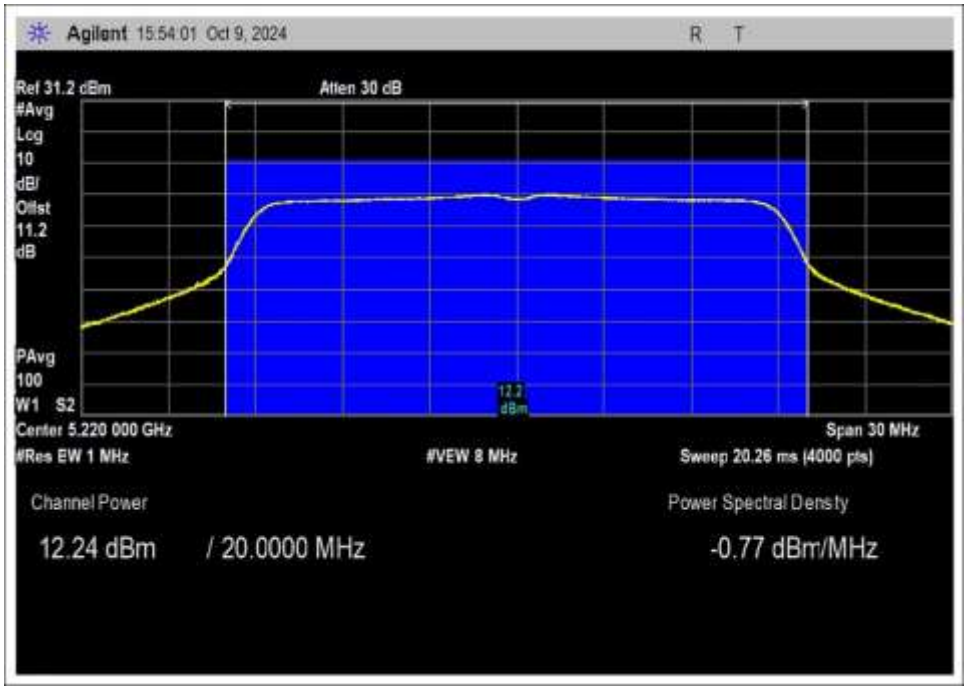


High Channel

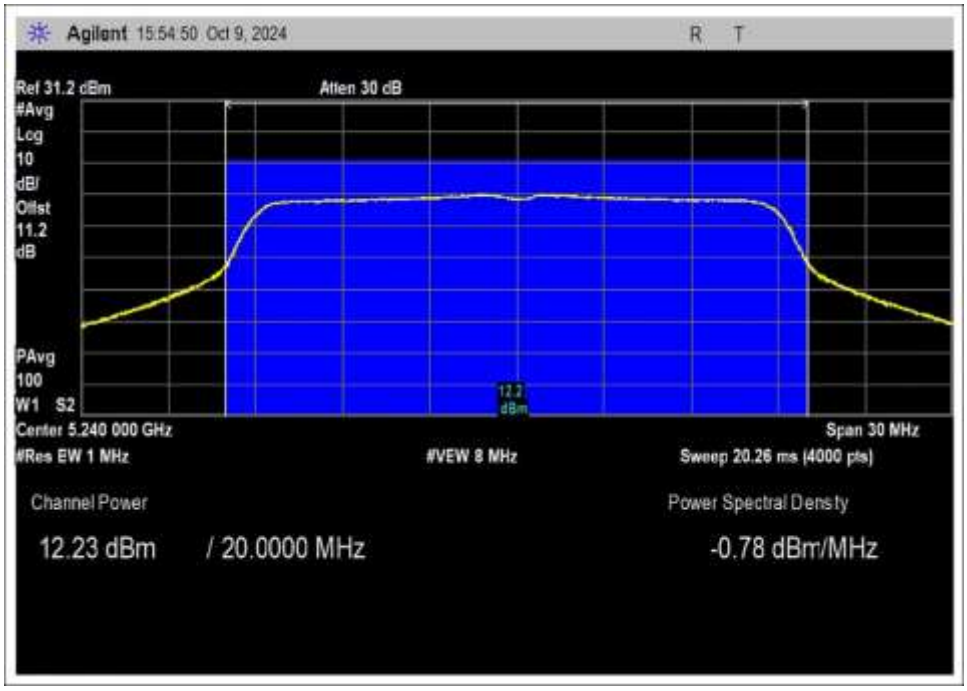
802.11ac 20MHz



Low Channel

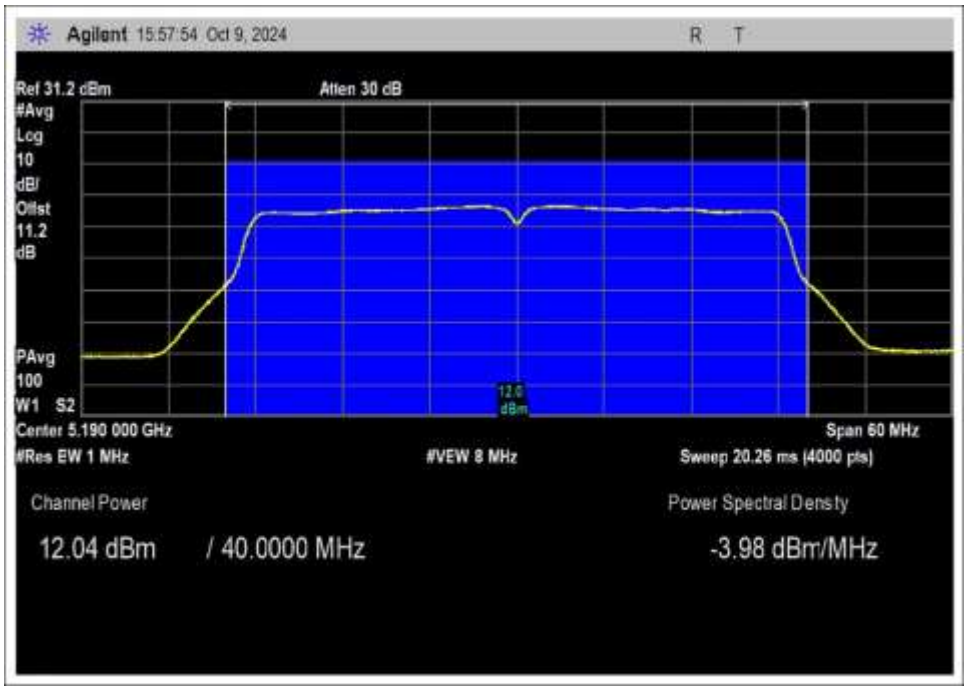


Middle Channel

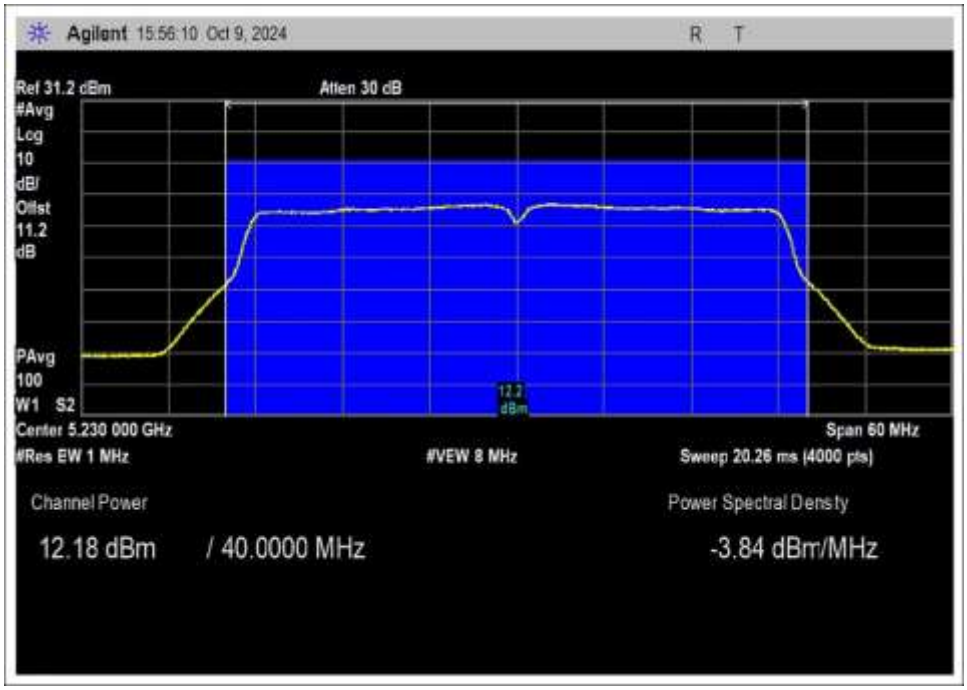


High Channel

802.11 n HT40

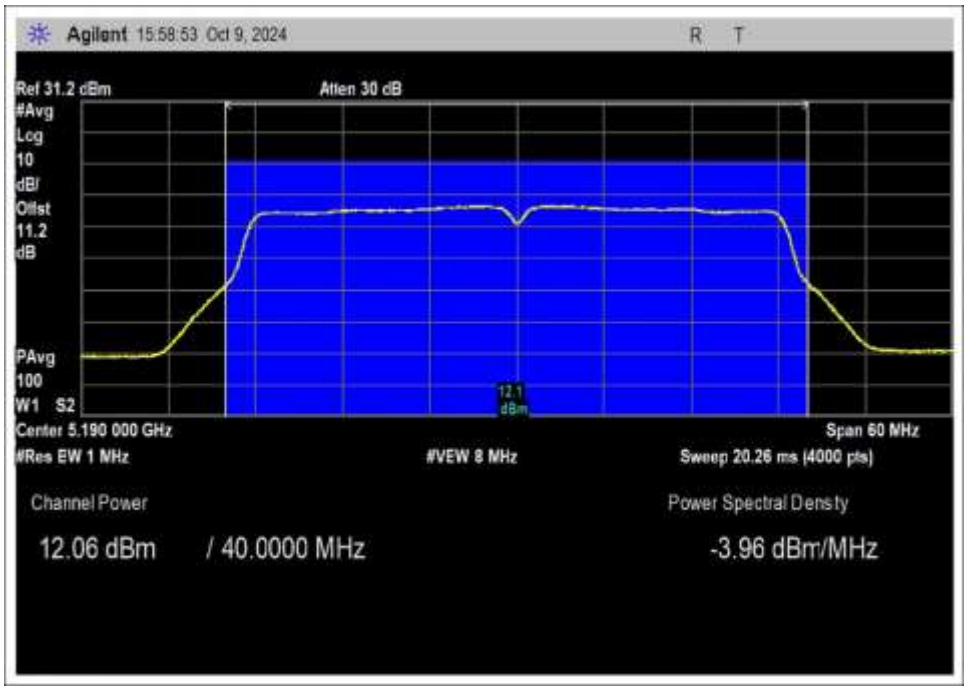


Low Channel

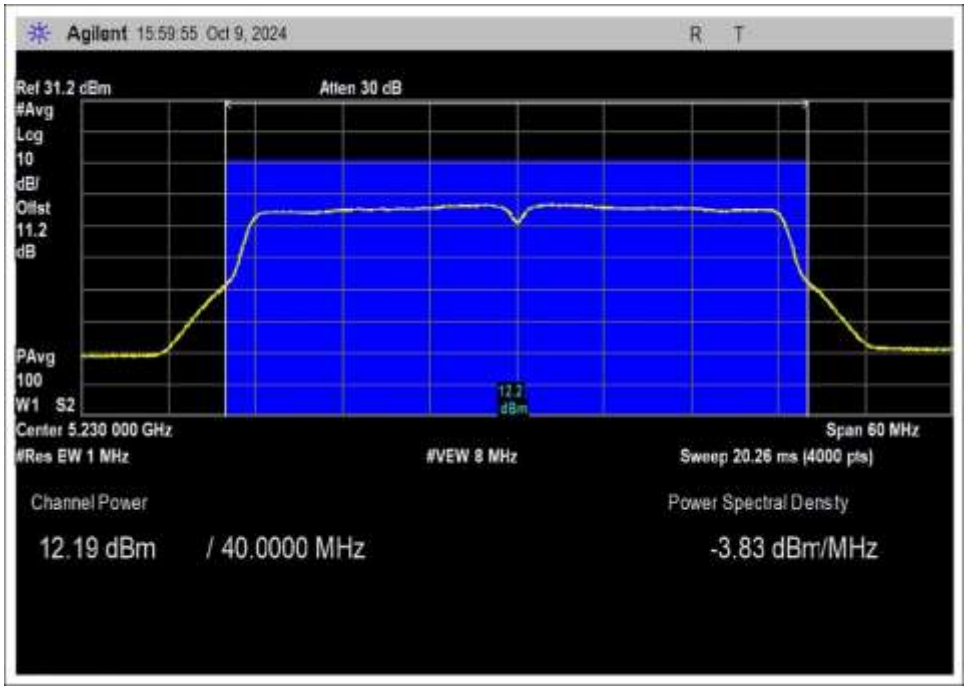


High Channel

802.11ac 40MHz

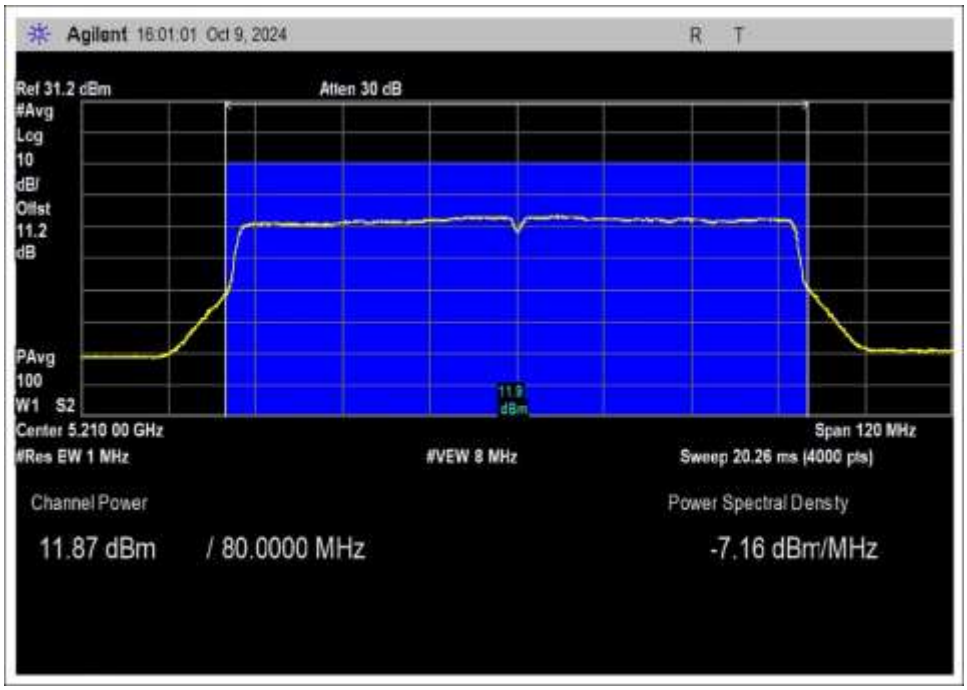


Low Channel

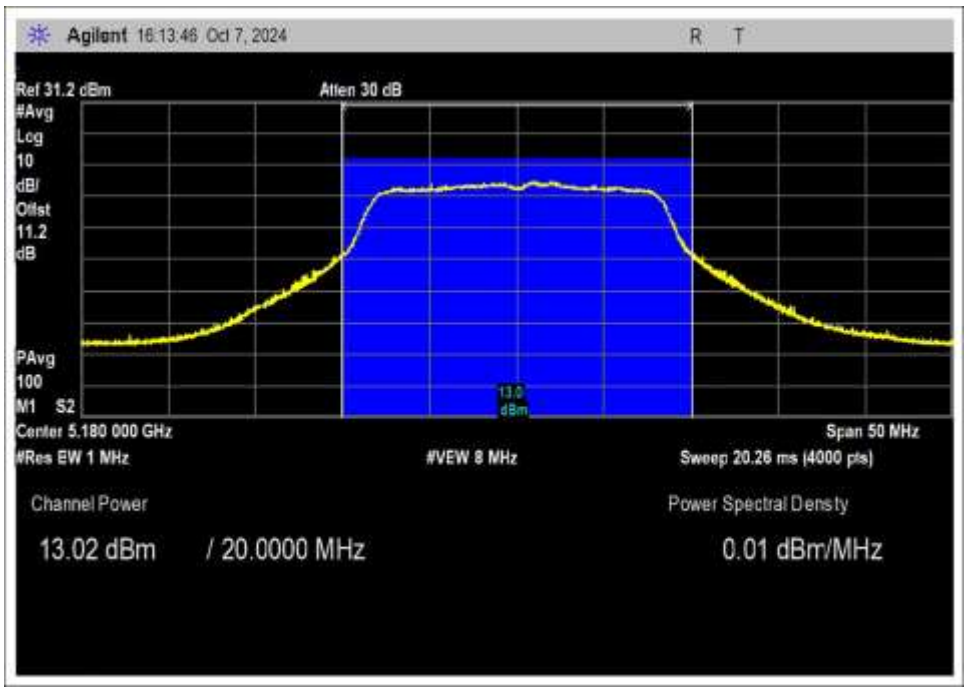


High Channel

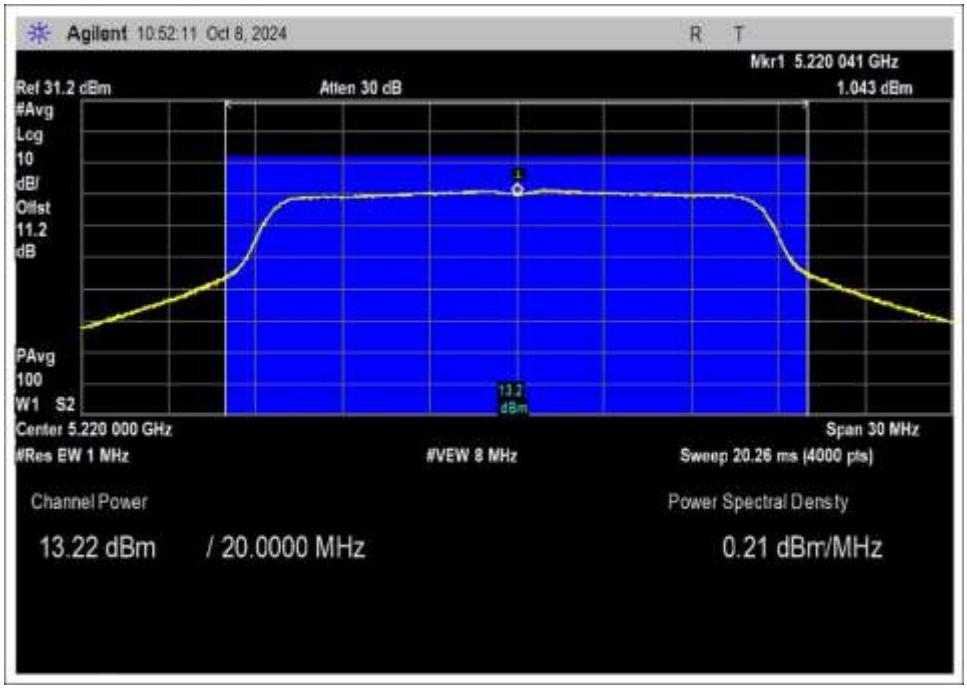
802.11ac 80MHz



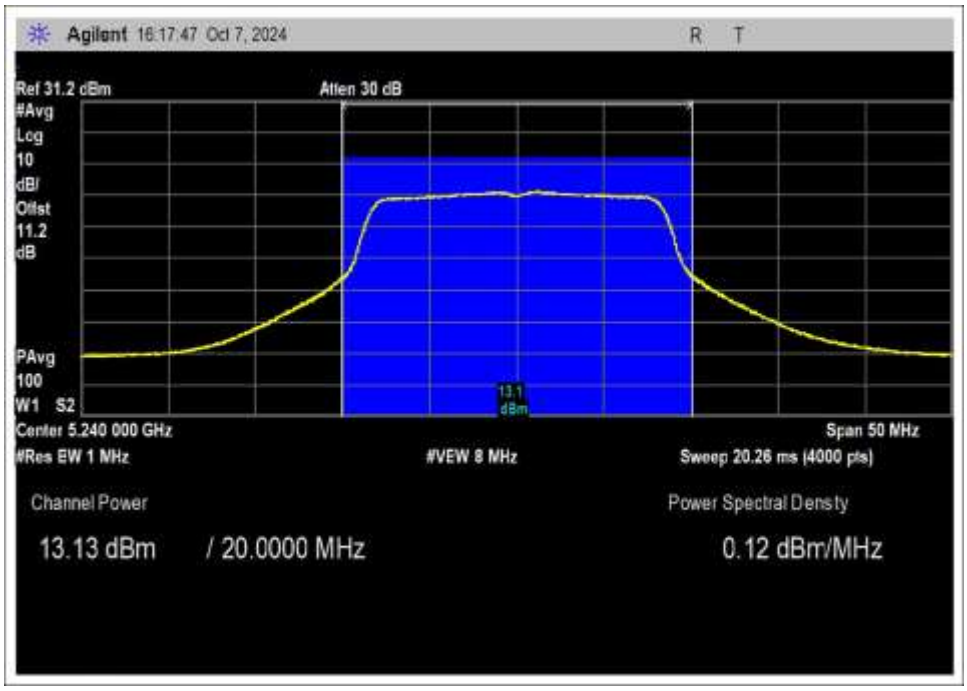
Chain 1
802.11a



Low Channel

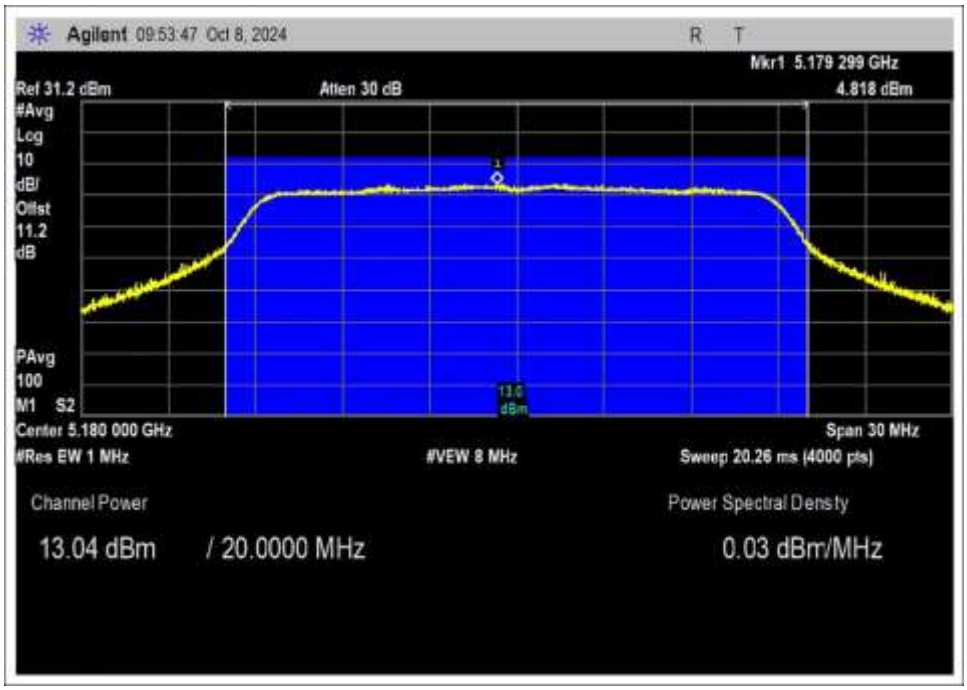


Middle Channel

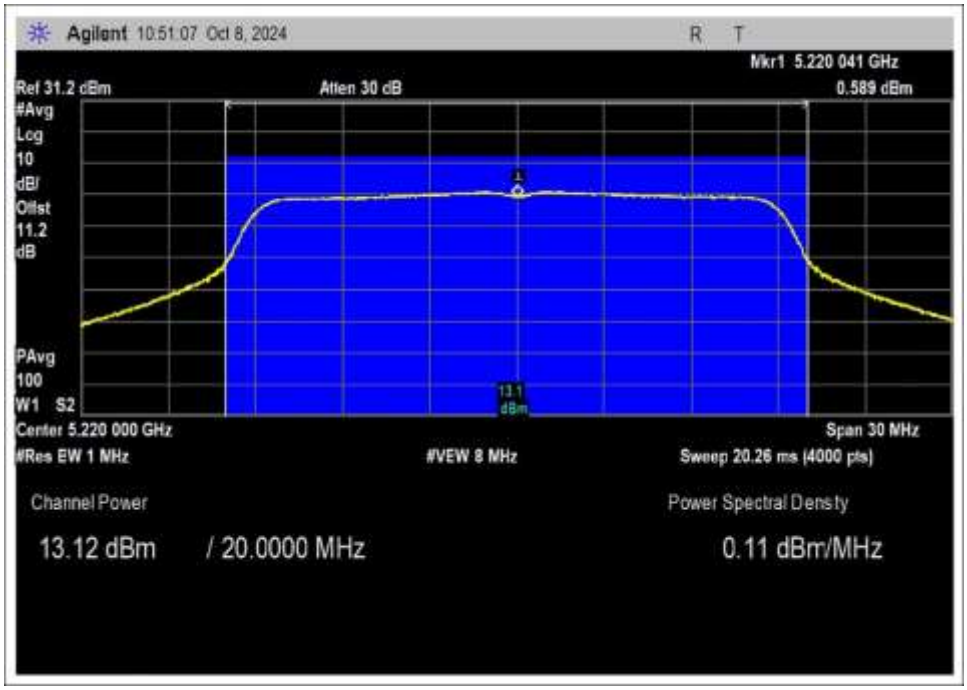


High Channel

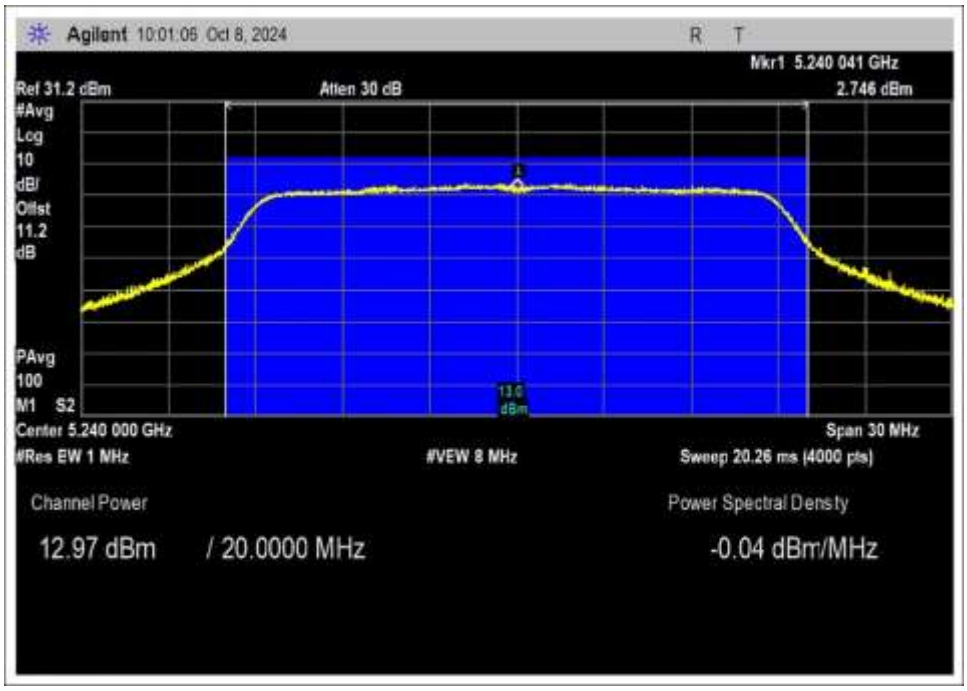
802.11n HT20



Low Channel

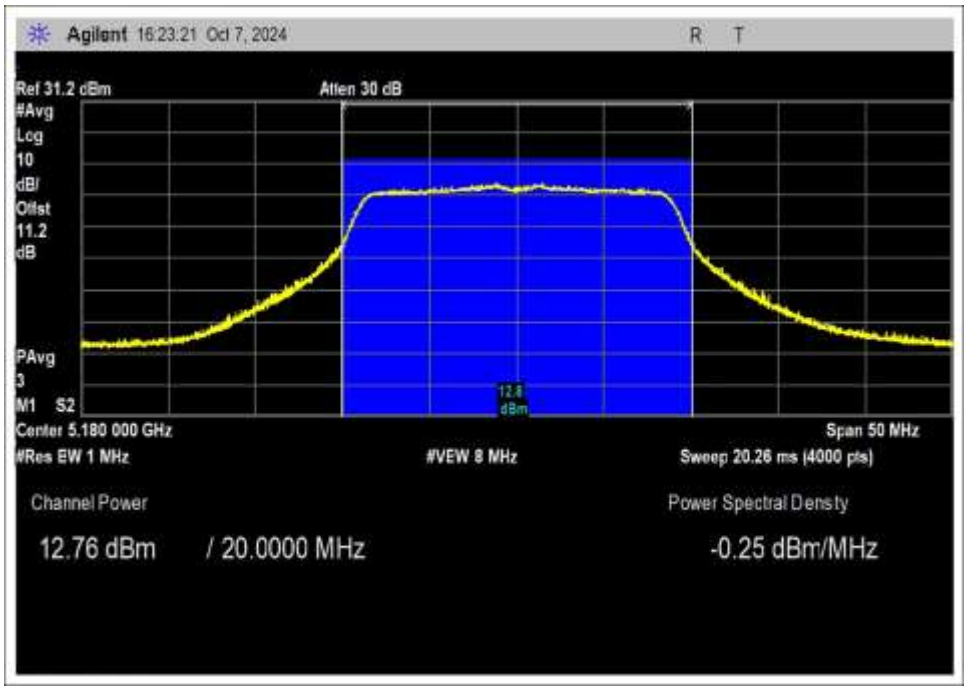


Middle Channel

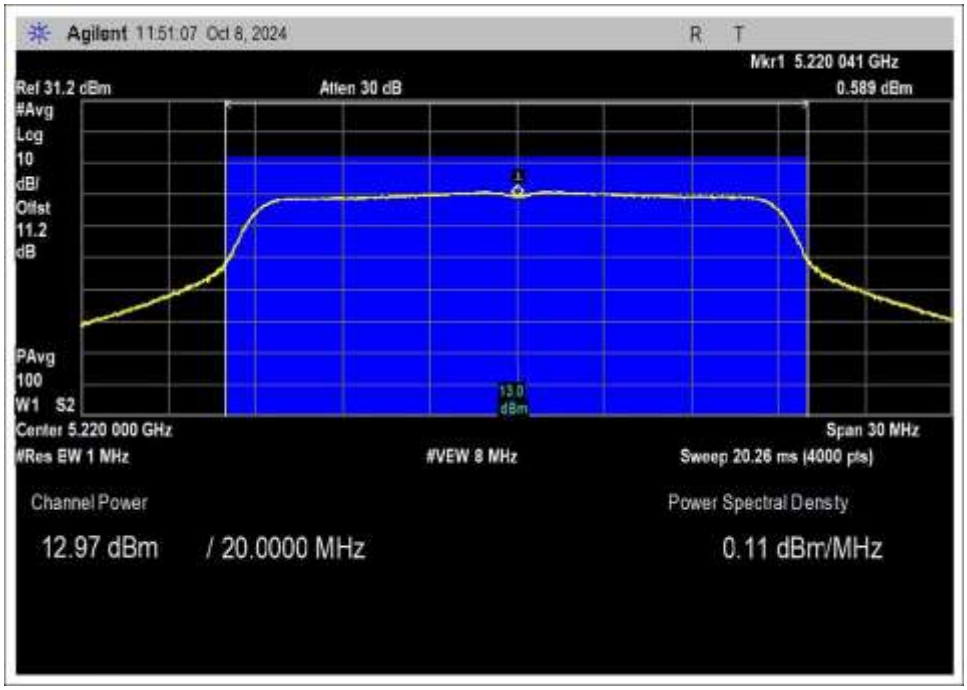


High Channel

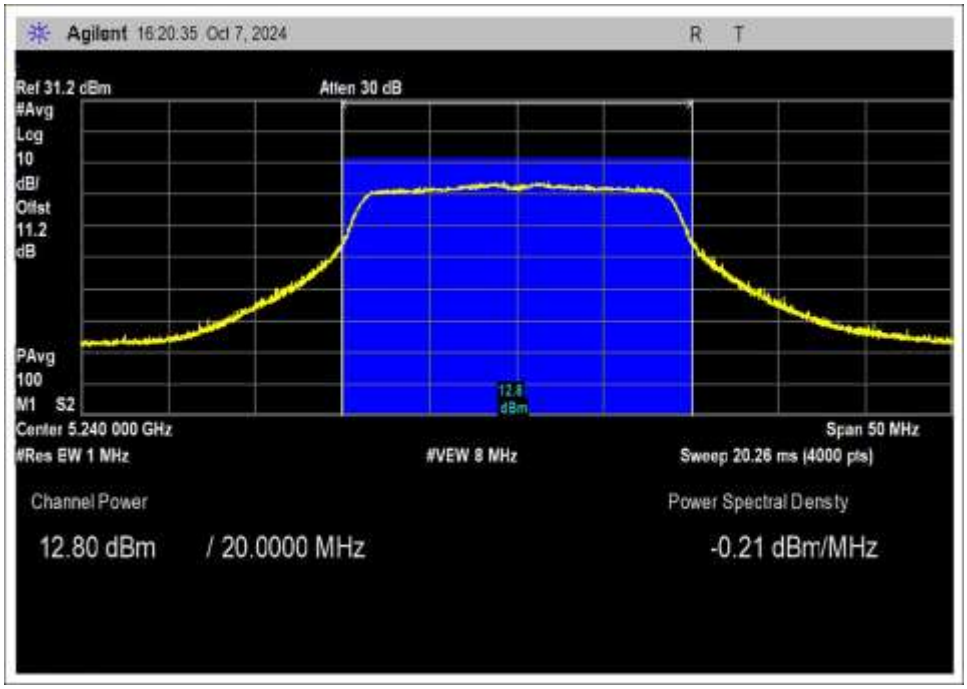
802.11ac 20MHz



Low Channel

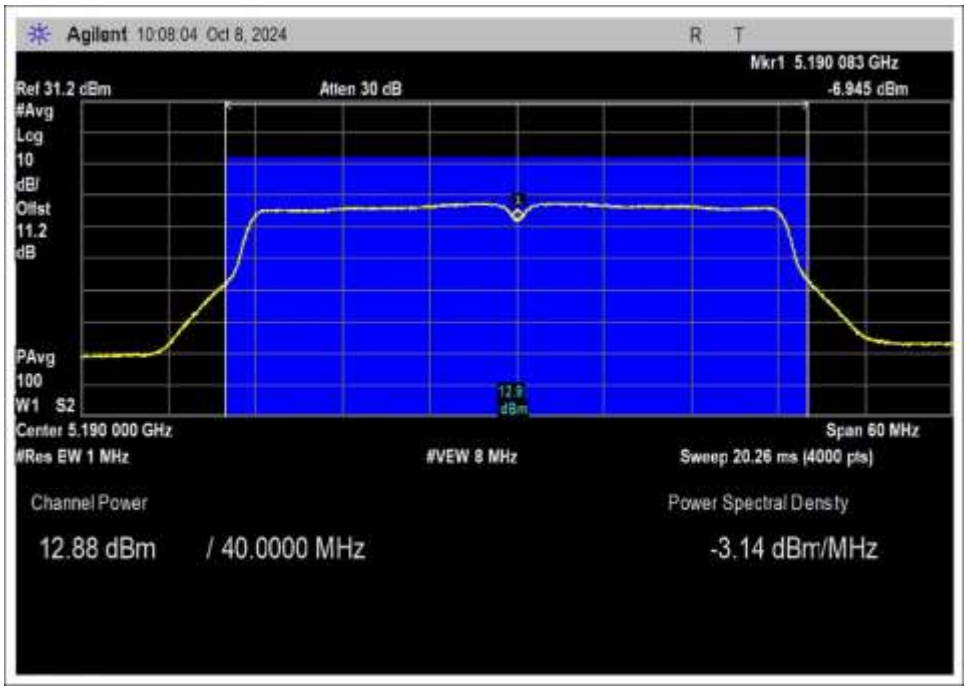


Middle Channel

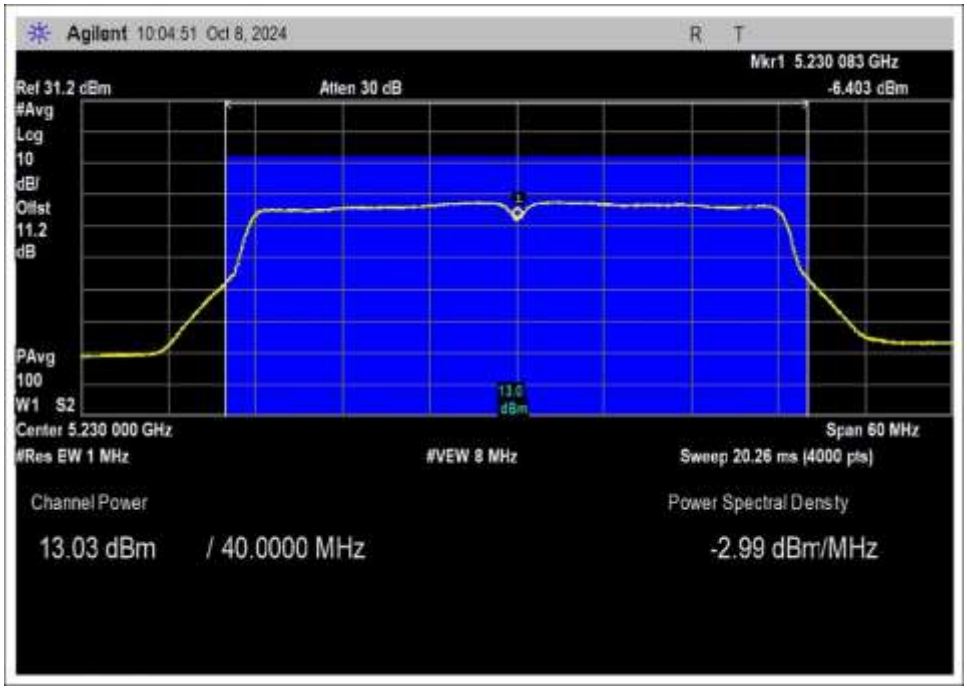


High Channel

802.11 n HT40

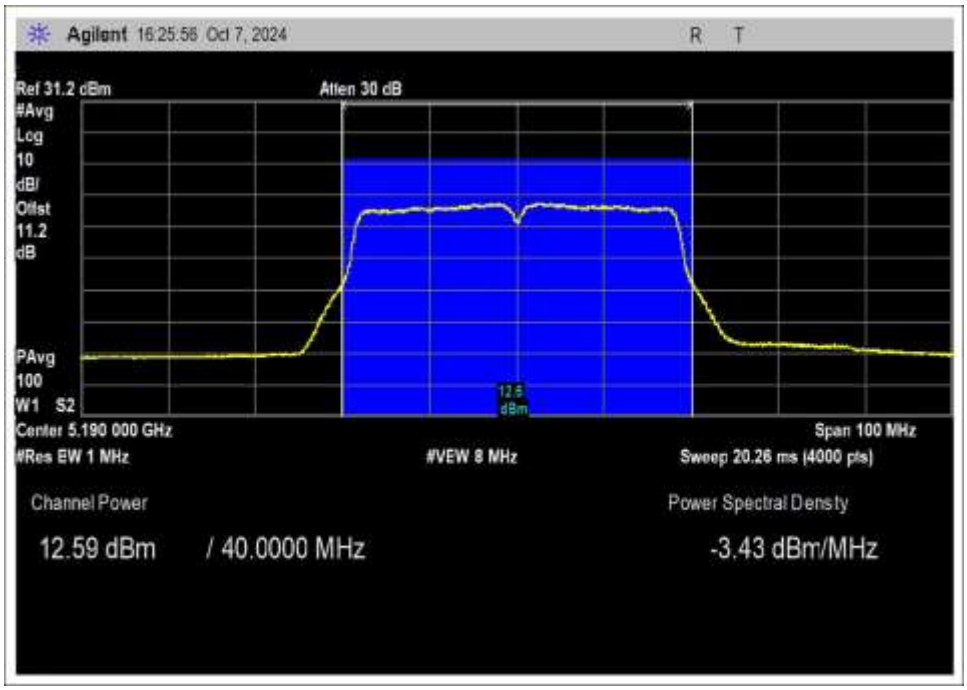


Low Channel

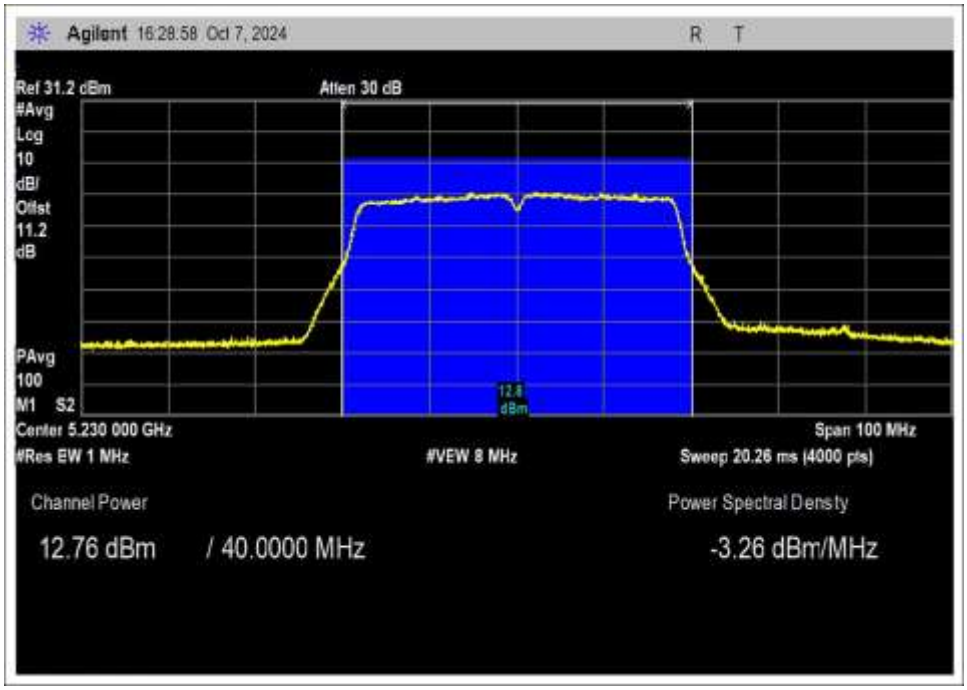


High Channel

802.11ac 40MHz

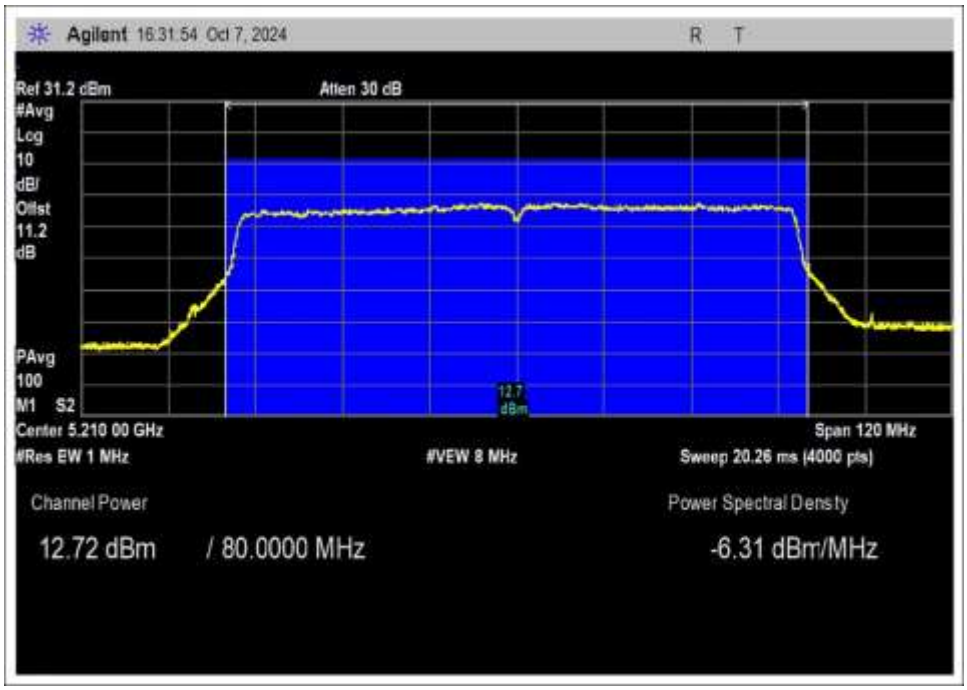


Low Channel



High Channel

802.11ac 80MHz



Test Setup Photo(s) – RF Conducted

Test Setup

Test Setup, Closeup View

15.407(b) Radiated Emissions & Band Edge

Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hieu Song Nguyenpham
Test Method:	ANSI C63.10 (2020), KDB 789033	Test Date(s):	10/24-25/2024 and 11/1/2024 and 11/6/2024
Configuration:	1		
Note	1: Perform Radiated Emission on the Chain 0 only since Chain 0 is the worst case based on the investigation on RF output power for the band edge before measuring Radiated Spurious Emission. 2: The maximum emission is measured close to bandedge. The emission at bandedge is below limit as indicated in the plots below.		

Environmental Conditions			
Temperature (ºC)	21.3-23.5	Relative Humidity (%):	39-48

Test Setup / Conditions / Data

Test Location: CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170
Customer: **Tonal**
Specification: **15.407(b) / 15.209 Radiated Spurious Emissions**
Work Order #: **110285** Date: 11/6/2024
Test Type: **Radiated Scan** Time: 16:49:23
Tested By: Hieu Song Nguyenpham Sequence#: 155
Software: EMITest 5.03.20

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 9kHz to 1GHz

Test Environment Conditions:
Temperature: 22.7°C
Humidity: 36%
Atmospheric Pressure: 101.8kPa

Highest Generated Frequency: 5.825GHz
Test Method: ANSI C63.10 (2020), KDB 789033

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor. Camera is on.
Wi-Fi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 14 with duty cycle at 100%.

802.11a (18Mbps)-OFDM-5220MHz-Middle Channel

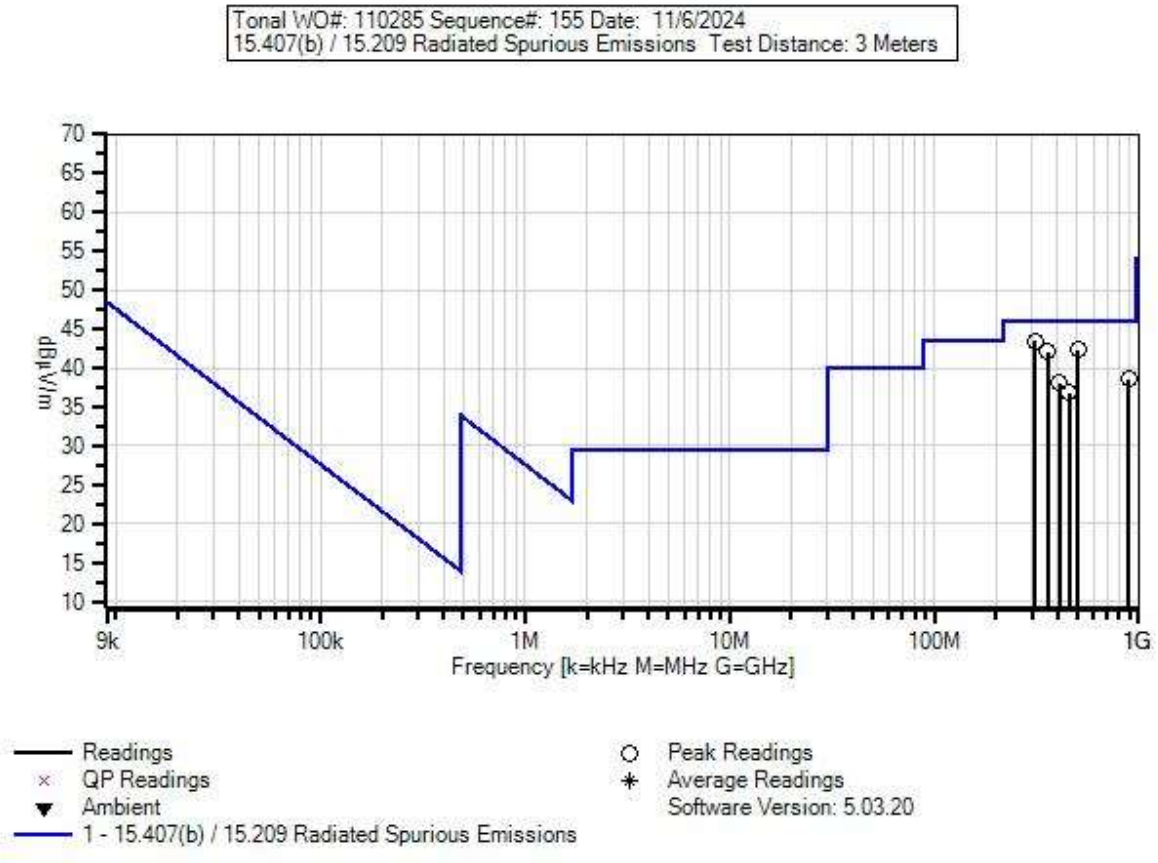
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.

Chain 0

Operational mode is representative of worst case.

No emissions from EUT has been found in 20dB tolerance in the frequency range 9kHz to 30MHz.

Modification #1 was in place during testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07508	Preamp	310N	4/5/2024	4/5/2026
	AN00432	Loop Antenna	6502	7/10/2023	7/10/2025
T2	AN01995	Biconilog Antenna	CBL6111C	5/16/2024	5/16/2026
T3	ANP00880	Cable	RG214U	3/26/2024	3/26/2026
T4	ANP01187	Cable	CNT-195	7/3/2024	7/3/2026
T5	ANP06691	Cable	PE3062-180	3/20/2024	3/20/2026
	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	312.044M	53.1	-31.9 +0.6	+19.4	+1.8	+0.5	+0.0	43.5	46.0	-2.5	Horiz
2	503.996M	46.0	-32.0 +0.8	+24.5	+2.3	+0.7	+0.0	42.3	46.0	-3.7	Horiz
3	359.972M	50.3	-31.9 +0.7	+20.5	+1.9	+0.6	+0.0	42.1	46.0	-3.9	Horiz
4	891.143M	35.5	-31.5 +1.2	+29.1	+3.3	+1.0	+0.0	38.6	46.0	-7.4	Vert
5	408.020M	44.3	-31.9 +0.7	+22.2	+2.0	+0.7	+0.0	38.0	46.0	-8.0	Vert
6	455.948M	41.7	-32.0 +0.8	+23.4	+2.2	+0.7	+0.0	36.8	46.0	-9.2	Vert

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**110285**	Date:	11/6/2024
Test Type:	**Radiated Scan**	Time:	09:05:50
Tested By:	Hieu Song Nguyenpham	Sequence#:	132
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1GHz to 40GHz

Test Environment Conditions:
Temperature: 22.7°C
Humidity: 36%
Atmospheric Pressure: 101.8kPa

Highest Generated Frequency: 5.825GHz
Test Method: ANSI C63.10 (2020), KDB 789033

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor. Camera is on.
Wi-Fi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 14

802.11a-OFDM-5.1GHz Band

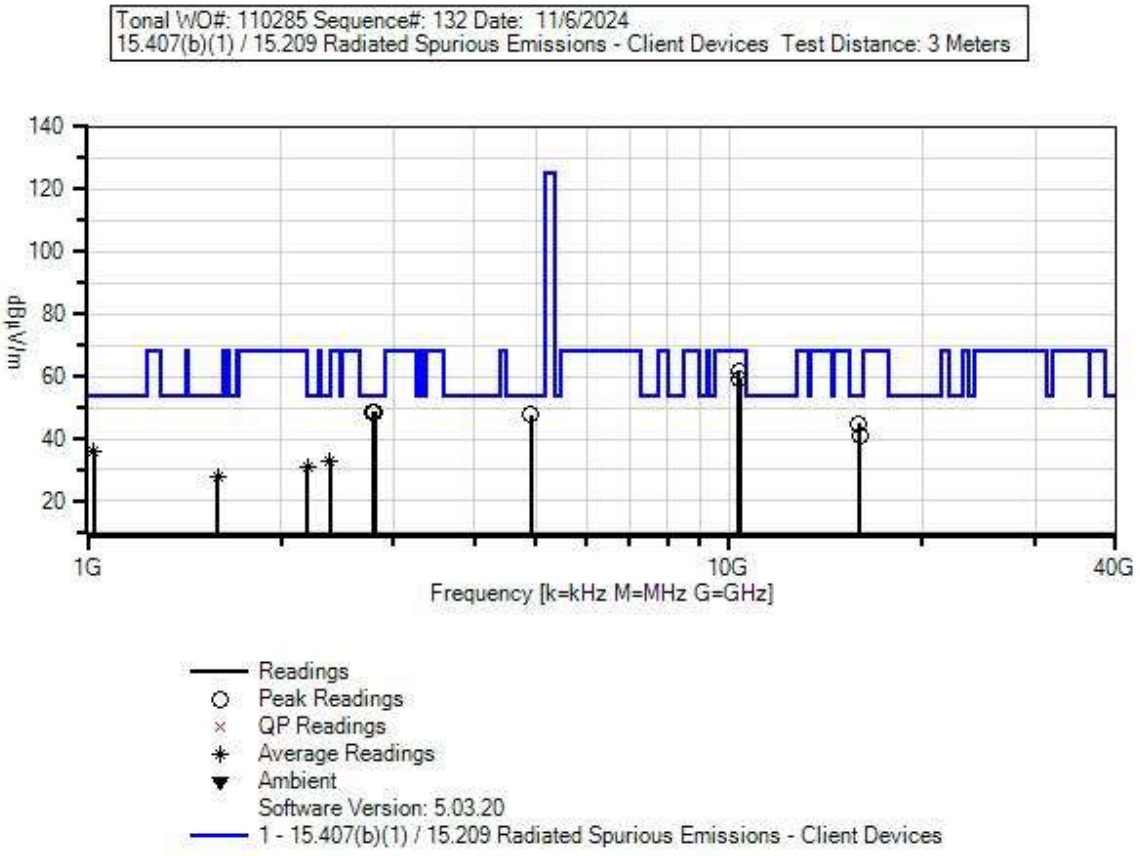
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.

Chain 0

Operational mode is representative of worst case.

Low Channel

Modification #1 was in place during testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/11/2023	1/11/2025
T2	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2024	1/9/2026
T3	ANP01210	Cable	FSJ1P-50A-4A	1/9/2024	1/9/2026
	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024
T4	AN02810	Preamp	83051A	4/6/2023	4/6/2025
T5	AN03013	Cable	32022-2-2909K-36TC	1/9/2024	1/9/2026
T6	ANP07701	Cable	32022-29094K-29094K-120TC	8/16/2024	8/16/2026
T7	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	1/9/2024	1/9/2026
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	1/9/2024	1/9/2026
T8	ANP00928	Cable	various	1/26/2024	1/26/2026

	ANP00929	Cable	various	1/26/2024	1/26/2026
T9	ANP07698	Cable	32022-29094K-29094K-72TC	8/16/2024	8/16/2026
	AN03011	Cable	32022-2-2909K-24TC	3/23/2023	3/23/2025
	AN03209	Preamp	83051A	8/22/2023	8/22/2025
	ANP07646	High Pass Filter	11SH10-6000/T1800-0/0	11/5/2024	11/5/2026
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	1/9/2024	1/9/2026
	ANP00930	Cable	various	1/26/2024	1/26/2026
T10	ANP07365	Attenuator	54A-10	5/26/2023	5/26/2025

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	2788.053M	41.0	+29.4 +0.8 +0.0	+1.5 +0.0 +0.0	+2.7 +0.0	-26.8 +0.0	+0.0	48.6	54.0	-5.4	Horiz
2	2800.065M	41.0	+29.4 +0.8 +0.0	+1.5 +0.0 +0.0	+2.7 +0.0	-26.8 +0.0	+0.0	48.6	54.0	-5.4	Horiz
3	4914.467M	33.6	+33.7 +1.2 +0.0	+2.0 +0.0 +0.0	+3.6 +0.0	-26.4 +0.0	+0.0	47.7	54.0	-6.3	Horiz
4	10357.100 M	30.8	+39.5 +1.6 +0.0	+3.1 +0.0 +10.0	+5.7 +0.0	-29.3 +0.0	+0.0	61.4	68.2	-6.8	Horiz
5	10362.500 M	28.6	+39.5 +1.7 +0.0	+3.1 +0.0 +10.0	+5.7 +0.0	-29.3 +0.0	+0.0	59.3	68.2	-8.9	Vert
6	15930.000 M	49.5	+0.0 +0.0 +3.3	+0.0 +5.7 +0.0	+0.0 -14.2	+0.0 +0.5	+0.0	44.8	54.0	-9.2	Vert
7	15975.000 M	45.6	+0.0 +0.0 +3.3	+0.0 +5.7 +0.0	+0.0 -14.3	+0.0 +0.5	+0.0	40.8	54.0	-13.2	Horiz
8	1021.299M Ave	36.9	+24.3 +0.6 +0.0	+1.0 +0.0 +0.0	+1.6 +0.0	-28.7 +0.0	+0.0	35.7	54.0	-18.3	Vert
^	1021.299M	57.1	+24.3 +0.6 +0.0	+1.0 +0.0 +0.0	+1.6 +0.0	-28.7 +0.0	+0.0	55.9	54.0	+1.9	Vert
10	2389.655M Ave	27.2	+28.3 +0.8 +0.0	+1.3 +0.0 +0.0	+2.5 +0.0	-27.1 +0.0	+0.0	33.0	54.0	-21.0	Vert
^	2389.655M	56.5	+28.3 +0.8 +0.0	+1.3 +0.0 +0.0	+2.5 +0.0	-27.1 +0.0	+0.0	62.3	54.0	+8.3	Vert
12	2200.466M Ave	25.4	+28.2 +0.8 +0.0	+1.3 +0.0 +0.0	+2.4 +0.0	-27.2 +0.0	+0.0	30.9	54.0	-23.1	Vert
^	2200.466M	52.5	+28.2 +0.8 +0.0	+1.3 +0.0 +0.0	+2.4 +0.0	-27.2 +0.0	+0.0	58.0	54.0	+4.0	Vert
14	1597.090M Ave	26.2	+26.1 +0.6 +0.0	+1.1 +0.0 +0.0	+2.0 +0.0	-28.0 +0.0	+0.0	28.0	54.0	-26.0	Vert
^	1597.090M	53.2	+26.1 +0.6 +0.0	+1.1 +0.0 +0.0	+2.0 +0.0	-28.0 +0.0	+0.0	55.0	54.0	+1.0	Vert

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**110285**	Date:	11/6/2024
Test Type:	**Radiated Scan**	Time:	09:29:04
Tested By:	Hieu Song Nguyenpham	Sequence#:	133
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1GHz to 40GHz

Test Environment Conditions:
Temperature: 22.7°C
Humidity: 36%
Atmospheric Pressure: 101.8kPa

Highest Generated Frequency: 5.825GHz
Test Method: ANSI C63.10 (2020), KDB 789033

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor. Camera is on.
Wi-Fi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 14

802.11a-OFDM-5.1GHz Band

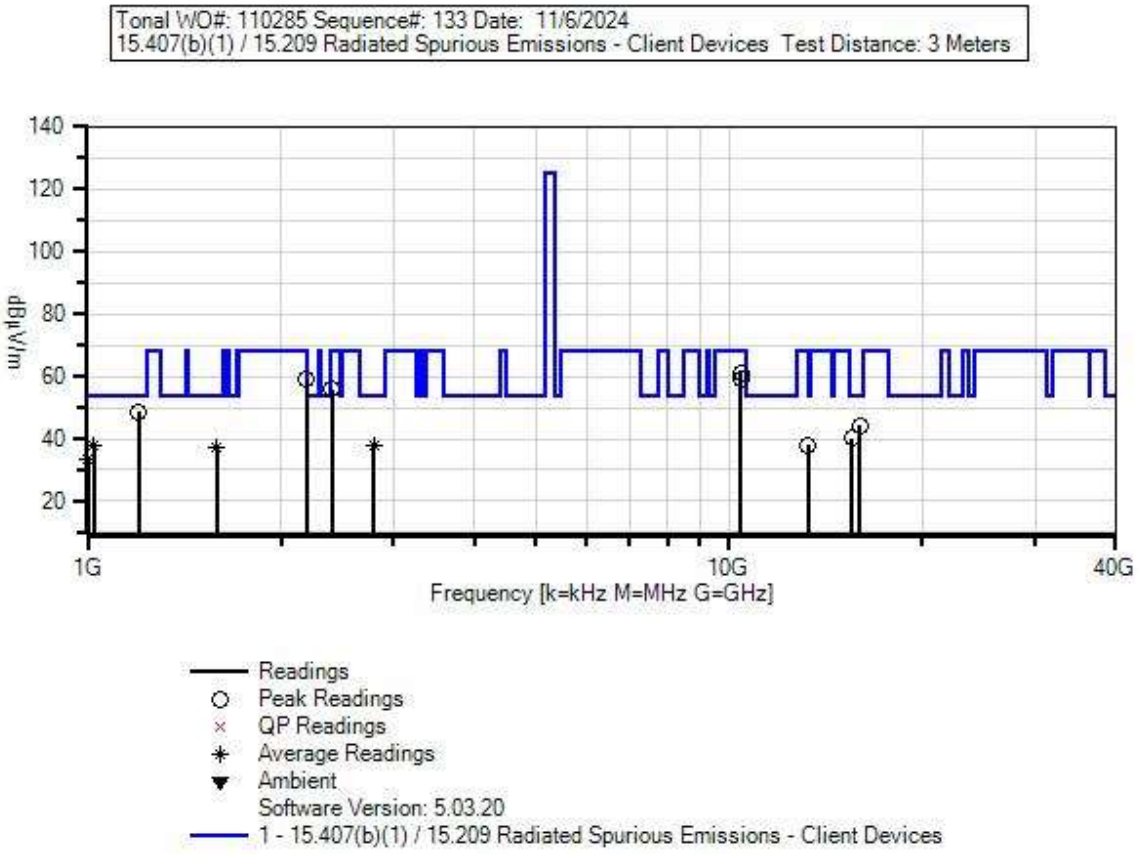
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.

Chain 0

Operational mode is representative of worst case.

Middle Channel

Modification #1 was in place during testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/11/2023	1/11/2025
T2	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2024	1/9/2026
T3	ANP01210	Cable	FSJ1P-50A-4A	1/9/2024	1/9/2026
	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024
T4	AN02810	Preamp	83051A	4/6/2023	4/6/2025
T5	AN03013	Cable	32022-2-2909K-36TC	1/9/2024	1/9/2026
T6	ANP07701	Cable	32022-29094K-29094K-120TC	8/16/2024	8/16/2026
T7	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	1/9/2024	1/9/2026
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	1/9/2024	1/9/2026
T8	ANP00928	Cable	various	1/26/2024	1/26/2026

	ANP00929	Cable	various	1/26/2024	1/26/2026
T9	ANP07698	Cable	32022-29094K-29094K-72TC	8/16/2024	8/16/2026
	AN03011	Cable	32022-2-2909K-24TC	3/23/2023	3/23/2025
	AN03209	Preamp	83051A	8/22/2023	8/22/2025
	ANP07646	High Pass Filter	11SH10-6000/T1800-0/0	11/5/2024	11/5/2026
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	1/9/2024	1/9/2026
	ANP00930	Cable	various	1/26/2024	1/26/2026
T10	ANP07365	Attenuator	54A-10	5/26/2023	5/26/2025

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1200.000M	39.3	+24.8 +0.6 +0.0	+0.9 +0.0 +9.9	+1.7 +0.0	-28.5 +0.0	+0.0	48.7	54.0	-5.3	Horiz
2	10400.500 M	30.4	+39.5 +1.7 +0.0	+3.1 +0.0 +10.0	+5.7 +0.0	-29.3 +0.0	+0.0	61.1	68.2	-7.1	Horiz
3	2196.000M	43.9	+28.2 +0.8 +0.0	+1.3 +0.0 +9.9	+2.4 +0.0	-27.2 +0.0	+0.0	59.3	68.2	-8.9	Vert
4	10400.500 M	28.4	+39.5 +1.7 +0.0	+3.1 +0.0 +10.0	+5.7 +0.0	-29.3 +0.0	+0.0	59.1	68.2	-9.1	Vert
5	15972.000 M	49.1	+0.0 +0.0 +3.3	+0.0 +5.7 +0.0	+0.0 -14.3	+0.0 +0.5	+0.0	44.3	54.0	-9.7	Vert
6	2400.000M	40.1	+28.3 +0.8 +0.0	+1.4 +0.0 +9.9	+2.5 +0.0	-27.1 +0.0	+0.0	55.9	68.2	-12.3	Horiz
7	15537.000 M	44.3	+0.0 +0.0 +3.3	+0.0 +5.6 +0.0	+0.0 -13.7	+0.0 +0.6	+0.0	40.1	54.0	-13.9	Horiz
8	13269.000 M	43.8	+0.0 +0.0 +3.1	+0.0 +5.1 +0.0	+0.0 -14.6	+0.0 +0.5	+0.0	37.9	54.0	-16.1	Vert
9	1024.000M Ave	29.1	+24.3 +0.6 +0.0	+1.0 +0.0 +9.8	+1.6 +0.0	-28.7 +0.0	+0.0	37.7	54.0	-16.3	Vert
^	1024.000M	48.1	+24.3 +0.6 +0.0	+1.0 +0.0 +9.8	+1.6 +0.0	-28.7 +0.0	+0.0	56.7	54.0	+2.7	Vert
11	2796.000M Ave	20.1	+29.4 +0.8 +0.0	+1.5 +0.0 +9.9	+2.7 +0.0	-26.8 +0.0	+0.0	37.6	54.0	-16.4	Vert
^	2796.000M	40.7	+29.4 +0.8 +0.0	+1.5 +0.0 +9.9	+2.7 +0.0	-26.8 +0.0	+0.0	58.2	54.0	+4.2	Vert

13	1592.412M Ave	25.2	+26.1 +0.6 +0.0	+1.1 +0.0 +9.9	+2.0 +0.0	-28.0 +0.0	+0.0	36.9	54.0	-17.1	Vert
^	1592.412M	43.3	+26.1 +0.6 +0.0	+1.1 +0.0 +9.9	+2.0 +0.0	-28.0 +0.0	+0.0	55.0	54.0	+1.0	Vert
15	1000.100M Ave	25.1	+24.2 +0.6 +0.0	+1.0 +0.0 +9.8	+1.6 +0.0	-28.8 +0.0	+0.0	33.5	54.0	-20.5	Horiz
^	1000.100M	46.8	+24.2 +0.6 +0.0	+1.0 +0.0 +9.8	+1.6 +0.0	-28.8 +0.0	+0.0	55.2	54.0	+1.2	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**110285**	Date:	11/6/2024
Test Type:	**Radiated Scan**	Time:	09:38:12
Tested By:	Hieu Song Nguyenpham	Sequence#:	134
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1GHz to 40GHz

Test Environment Conditions:
Temperature: 22.7°C
Humidity: 36%
Atmospheric Pressure: 101.8kPa

Highest Generated Frequency: 5.825GHz
Test Method: ANSI C63.10 (2020), KDB 789033

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor. Camera is on.
Wi-Fi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 14.

802.11a-OFDM-5.1GHz Band

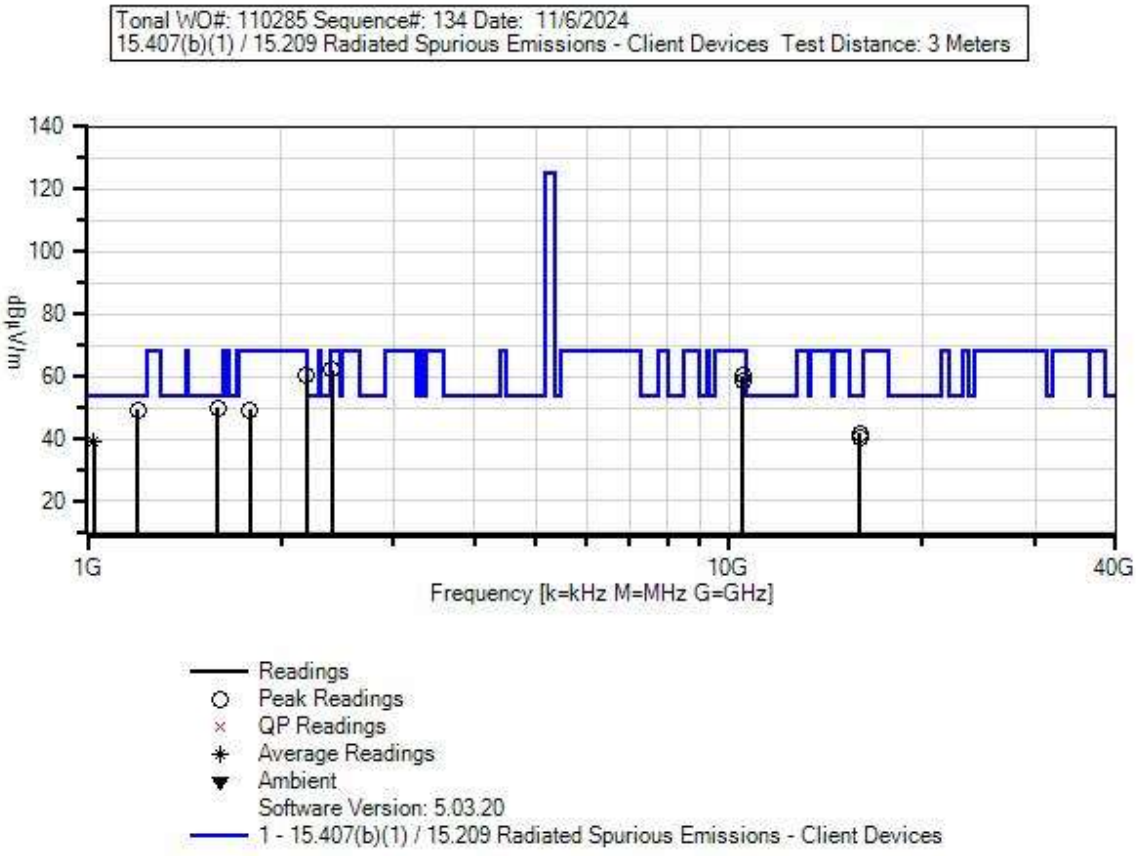
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.

Chain 0

Operational mode is representative of worst case.

High Channel

Modification #1 was in place during testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/11/2023	1/11/2025
T2	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2024	1/9/2026
T3	ANP01210	Cable	FSJ1P-50A-4A	1/9/2024	1/9/2026
	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024
T4	AN02810	Preamp	83051A	4/6/2023	4/6/2025
T5	AN03013	Cable	32022-2-2909K-36TC	1/9/2024	1/9/2026
T6	ANP07701	Cable	32022-29094K-29094K-120TC	8/16/2024	8/16/2026
T7	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	1/9/2024	1/9/2026
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	1/9/2024	1/9/2026
T8	ANP00928	Cable	various	1/26/2024	1/26/2026

	ANP00929	Cable	various	1/26/2024	1/26/2026
T9	ANP07698	Cable	32022-29094K-29094K-72TC	8/16/2024	8/16/2026
	AN03011	Cable	32022-2-2909K-24TC	3/23/2023	3/23/2025
	AN03209	Preamp	83051A	8/22/2023	8/22/2025
	ANP07646	High Pass Filter	11SH10-6000/T1800-0/0	11/5/2024	11/5/2026
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	1/9/2024	1/9/2026
	ANP00930	Cable	various	1/26/2024	1/26/2026
T10	ANP07365	Attenuator	54A-10	5/26/2023	5/26/2025

Measurement Data: Reading listed by margin. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5 T9	T2 T6 T10	T3 T7	T4 T8	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1596.000M	38.3	+26.1 +0.6 +0.0	+1.1 +0.0 +9.9	+2.0 +0.0	-28.0 +0.0	+0.0	50.0	54.0	-4.0	Horiz
2	1196.000M	39.9	+24.8 +0.6 +0.0	+0.9 +0.0 +9.9	+1.7 +0.0	-28.5 +0.0	+0.0	49.3	54.0	-4.7	Horiz
3	2400.000M	46.2	+28.3 +0.8 +0.0	+1.4 +0.0 +9.9	+2.5 +0.0	-27.1 +0.0	+0.0	62.0	68.2	-6.2	Vert
4	2196.000M	45.3	+28.2 +0.8 +0.0	+1.3 +0.0 +9.9	+2.4 +0.0	-27.2 +0.0	+0.0	60.7	68.2	-7.5	Vert
5	10480.000 M	29.5	+39.4 +1.7 +0.0	+3.1 +0.0 +10.0	+5.8 +0.0	-29.4 +0.0	+0.0	60.1	68.2	-8.1	Horiz
6	10480.000 M	28.0	+39.4 +1.7 +0.0	+3.1 +0.0 +10.0	+5.8 +0.0	-29.4 +0.0	+0.0	58.6	68.2	-9.6	Vert
7	15966.000 M	46.4	+0.0 +0.0 +3.3	+0.0 +5.7 +0.0	+0.0 -14.2	+0.0 +0.5	+0.0	41.7	54.0	-12.3	Vert
8	15960.000 M	44.8	+0.0 +0.0 +3.3	+0.0 +5.7 +0.0	+0.0 -14.2	+0.0 +0.5	+0.0	40.1	54.0	-13.9	Horiz
9	1024.000M Ave	30.2	+24.3 +0.6 +0.0	+1.0 +0.0 +9.8	+1.6 +0.0	-28.7 +0.0	+0.0	38.8	54.0	-15.2	Vert
^	1024.000M	48.4	+24.3 +0.6 +0.0	+1.0 +0.0 +9.8	+1.6 +0.0	-28.7 +0.0	+0.0	57.0	54.0	+3.0	Vert
11	1792.000M	35.8	+27.2 +0.7 +0.0	+1.2 +0.0 +9.9	+2.1 +0.0	-27.7 +0.0	+0.0	49.2	68.2	-19.0	Horiz

Band Edge

Band Edge Summary-Chain 0							
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Average (dBuV/m @3m)		Peak (dBuV/m @3m)		Results
			Measured	Limit	Measured	Limit	
5131.8*	802.11a	External/4.66	43.6	≤54	57.3	≤74	Pass
5287.6**	802.11a	External/4.66	NA2	NA2	59.7	<68.2	Pass
5360*	802.11a	External/4.66	43.5	≤54	59.9	≤74	Pass
5131.98*	802.11n HT20	External/4.66	43.4	≤54	57.0	≤74	Pass
5287.6**	802.11n HT20	External/4.66	NA2	NA2	60.4	<68.2	Pass
5359.9*	802.11n HT20	External/4.66	43.1	≤54	60.1	≤74	Pass
5132.3*	802.11ac 20MHz	External/4.66	43.1	≤54	55.9	≤74	Pass
5287.6**	802.11ac 20MHz	External/4.66	NA2	NA2	61.6	<68.2	Pass
5359.9*	802.11ac 20MHz	External/4.66	43.7	≤54	60.2	≤74	Pass
5070.2*	802.11n HT40	External/4.66	43.3	≤54	60.3	≤74	Pass
5291.6**	802.11n HT40	External/4.66	NA2	NA2	64.4	<68.2	Pass
5350.7*	802.11n HT40	External/4.66	43.6	≤54	62.6	≤74	Pass
5070.0*	802.11ac 40MHz	External/4.66	43.9	≤54	59.2	≤74	Pass
5302.3**	802.11ac 40MHz	External/4.66	NA2	NA2	62.2	<68.2	Pass
5350.3*	802.11ac 40MHz	External/4.66	43.9	≤54	65.5	≤74	Pass
5090.0*	802.11ac 80MHz	External/4.66	42.7	≤54	60.8	≤74	Pass
5334.6**	802.11ac 80MHz	External/4.66	NA2	NA2	66.5	<68.2	Pass
5350*	802.11ac 80MHz	External/4.66	42.4	≤54	53.2	≤74	Pass

*Restricted band edge

**Limit between 5250 and 5350MHz is <26dB below fundamental using RBW = 1% to 5% of 99% OBW, or any portion of 26dB bandwidth is required to meet DFS and TPC

Notes:

NA1	No Unintentional Peak Emission has been found in 5250MHz to 5350MHz
NA2	Average limit not applicable when applying -27dBm/MHz limit.

Band Edge Summary-Chain 1							
Frequency (MHz)	Modulation	Ant. Type / Gain (dBi)	Average (dBuV/m @3m)		Peak (dBuV/m @3m)		Results
			Measured	Limit	Measured	Limit	
5150*	802.11a	External/4.66	42.0	≤54	53.5	≤74	Pass
5250**	802.11a	External/4.66	NA2	NA2	NA1	<68.2	Pass
5350*	802.11a	External/4.66	42.9	≤54	53.3	≤74	Pass
5150*	802.11n HT20	External/4.66	42.2	≤54	52.8	≤74	Pass
5250**	802.11n HT20	External/4.66	NA2	NA2	NA1	<68.2	Pass
5350*	802.11n HT20	External/4.66	42.9	≤54	54.7	≤74	Pass
5150*	802.11ac 20MHz	External/4.66	42.1	≤54	53.1	≤74	Pass
5250**	802.11ac 20MHz	External/4.66	NA2	NA2	NA1	<68.2	Pass
5350*	802.11ac 20MHz	External/4.66	42.7	≤54	53.7	≤74	Pass
5150*	802.11n HT40	External/4.66	42.1	≤54	51.8	≤74	Pass
5250**	802.11n HT40	External/4.66	NA2	NA2	NA1	<68.2	Pass
5453*	802.11n HT40	External/4.66	48.6	≤54	57.8	≤74	Pass
5150*	802.11ac 40MHz	External/4.66	42.1	≤54	52.5	≤74	Pass
5250**	802.11ac 40MHz	External/4.66	NA2	NA2	NA1	<68.2	Pass
5453.2*	802.11ac 40MHz	External/4.66	48.4	≤54	58.4	≤74	Pass
5150*	802.11ac 80MHz	External/4.66	41.8	≤54	52.6	≤74	Pass
5250**	802.11ac 80MHz	External/4.66	NA2	NA2	NA1	<68.2	Pass
5350*	802.11ac 80MHz	External/4.66	42.5	≤54	52.2	≤74	Pass

*Restricted band edge

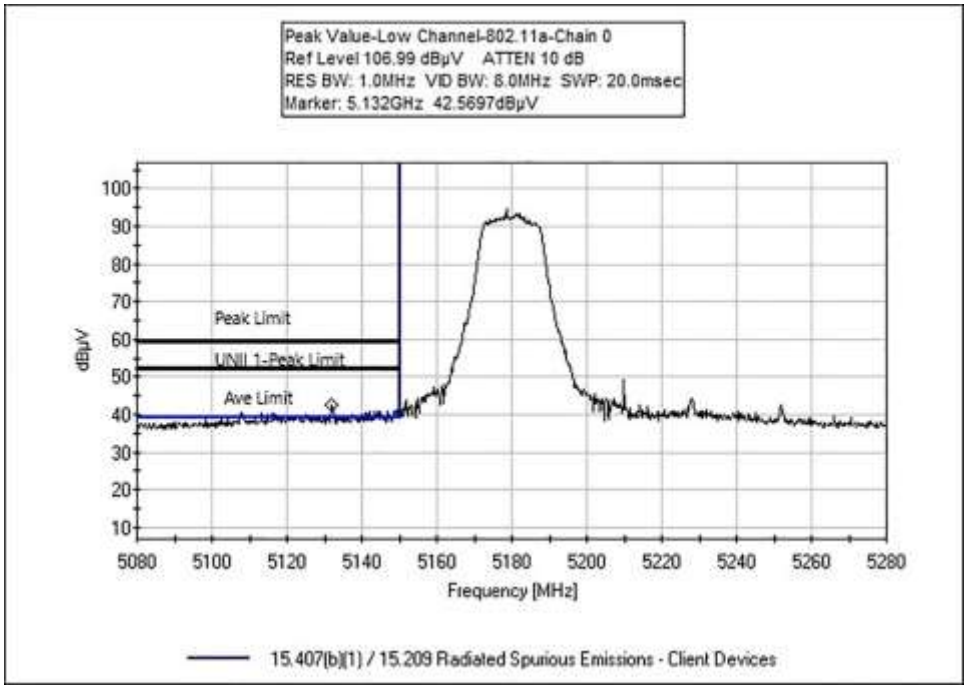
**Limit between 5250 and 5350MHz is <26dB below fundamental using RBW = 1% to 5% of 99% OBW, or any portion of 26dB bandwidth is required to meet DFS and TPC

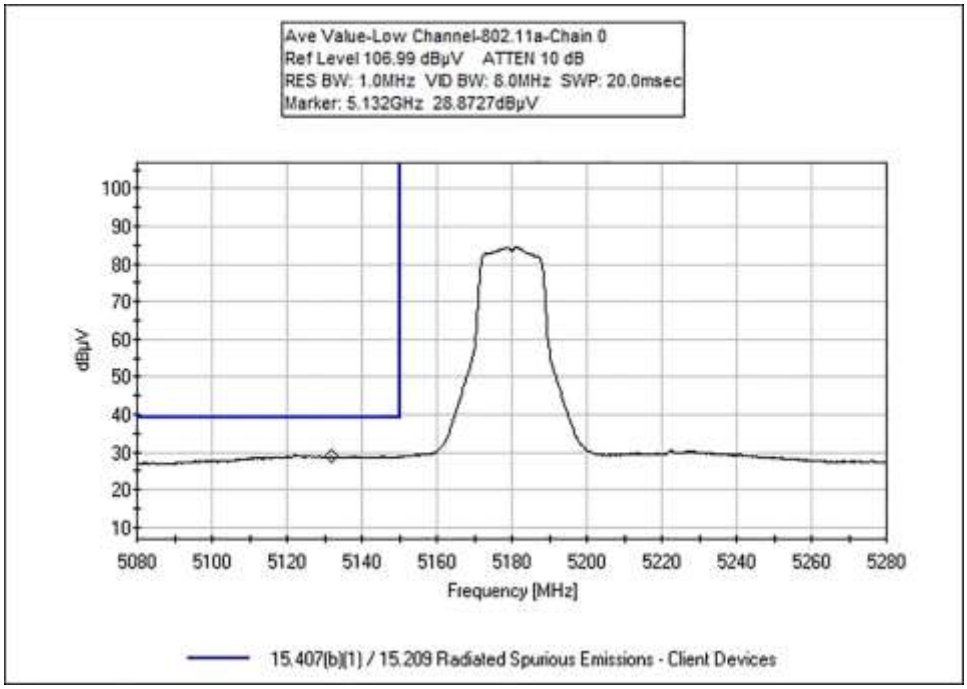
Notes:

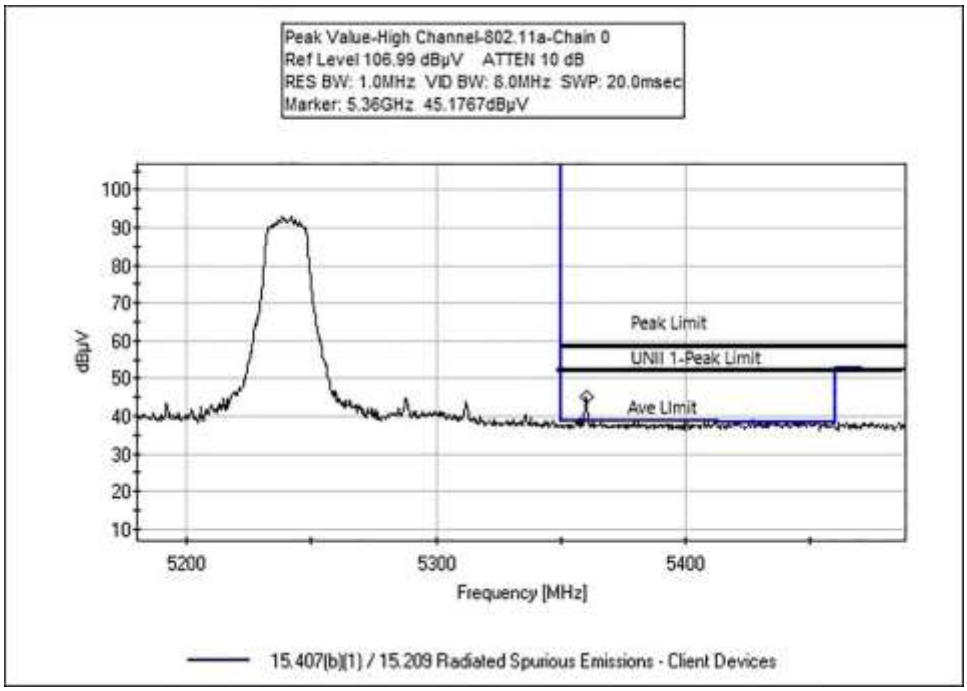
NA1	No Unintentional Peak Emission has been found in 5250MHz to 5350MHz
NA2	Average limit not applicable when applying -27dBm/MHz limit.

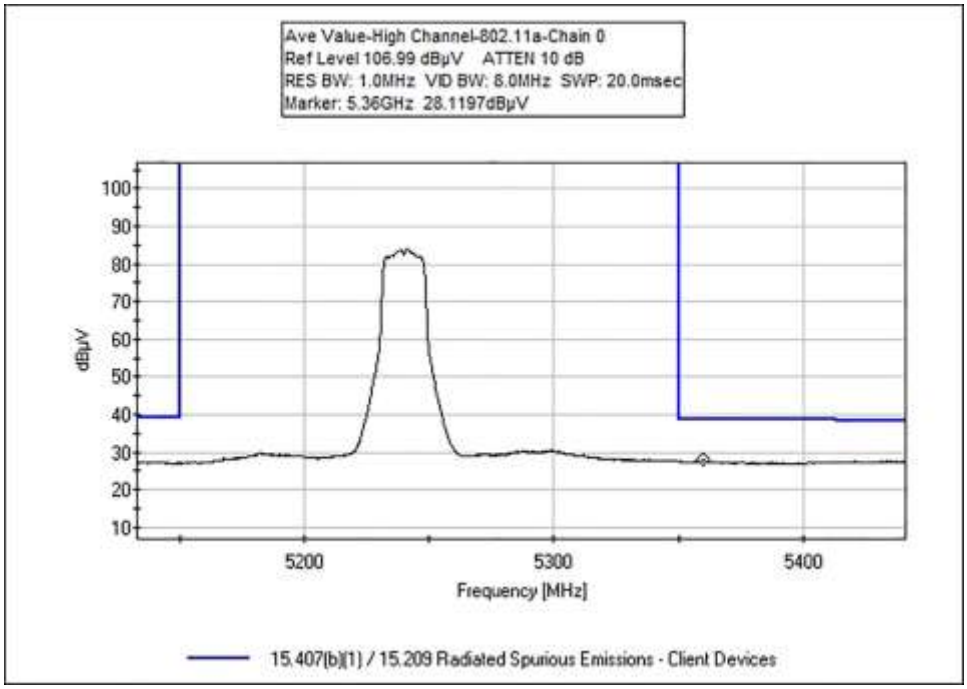
Band Edge Plots

Chain 0
802.11a

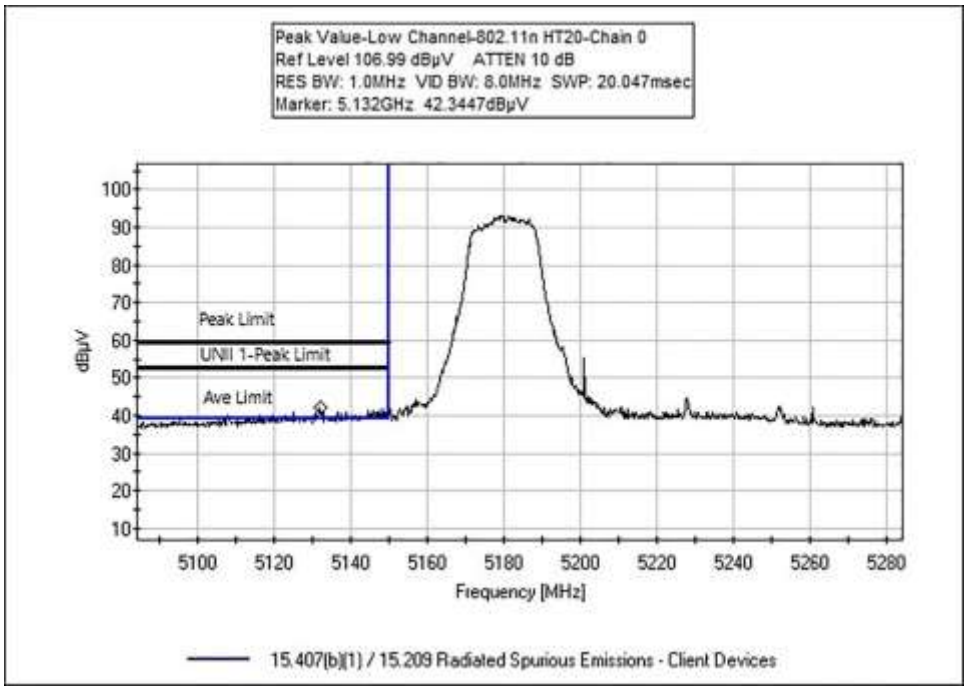


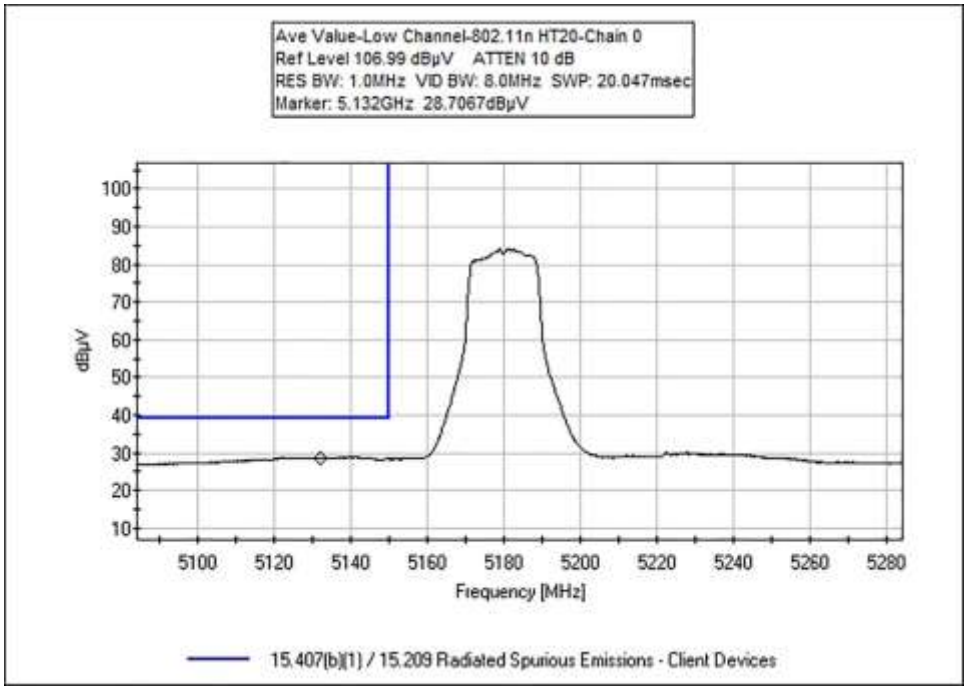


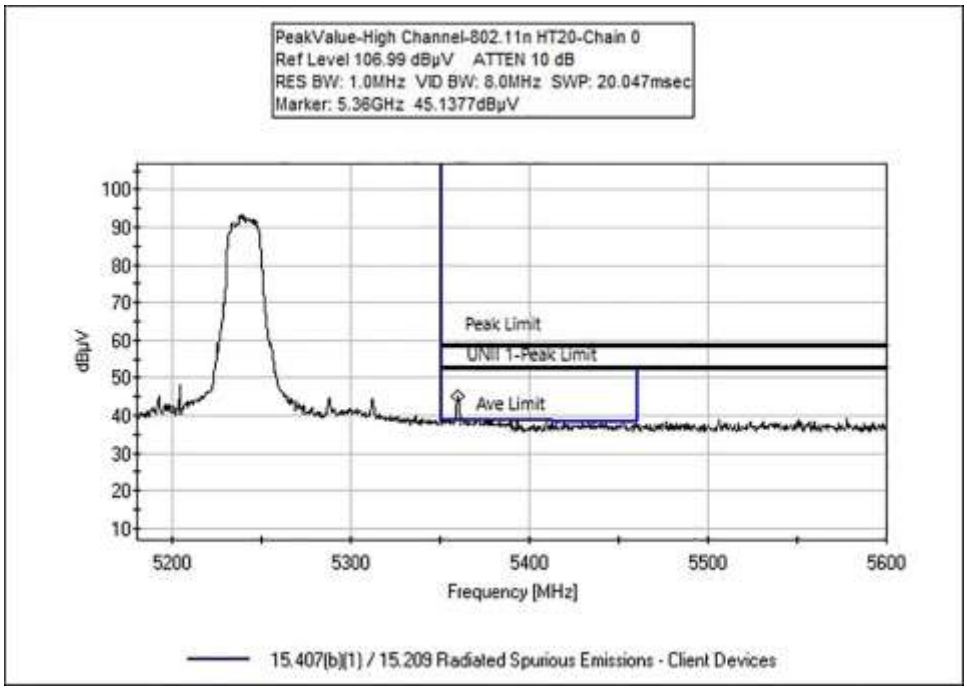

Peak Value-High Channel-802.11a-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.0msec
Marker: 5.36GHz 45.1767dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
5200
5300
5400
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

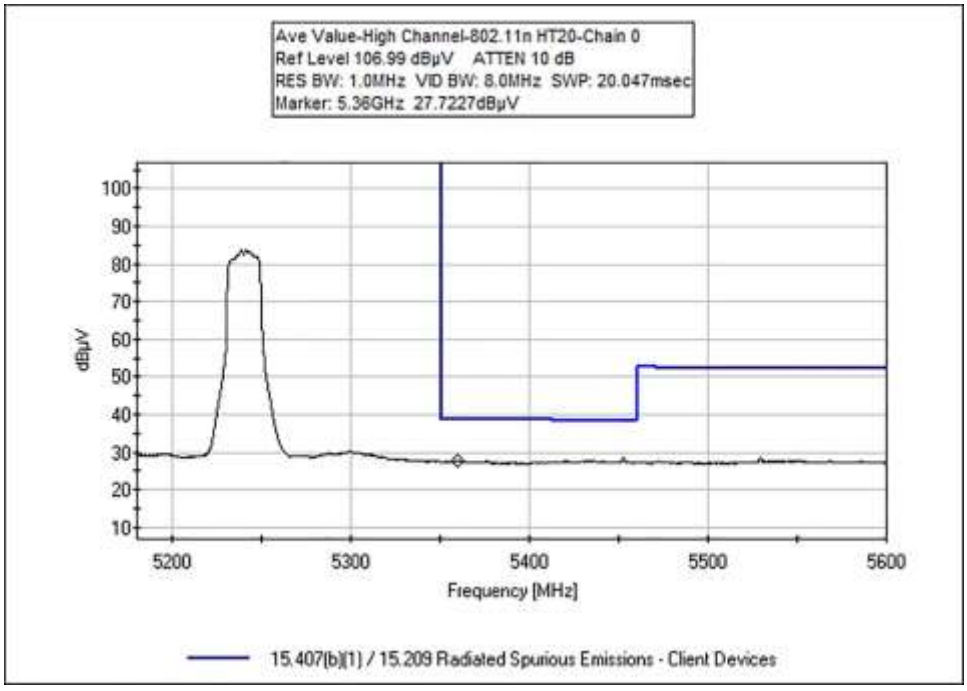

Ave Value-High Channel-802.11a-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.0msec
Marker: 5.36GHz 28.1197dBµV
dBµV
5200
5300
5400
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11n HT20

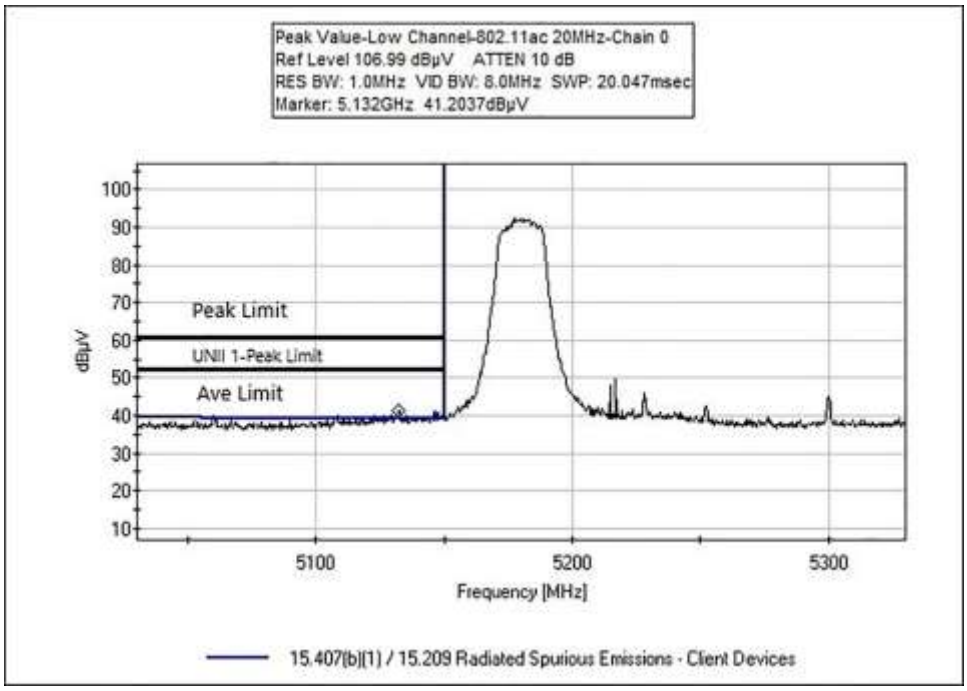

Peak Value-Low Channel-802.11n HT20-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.132GHz 42.3447dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

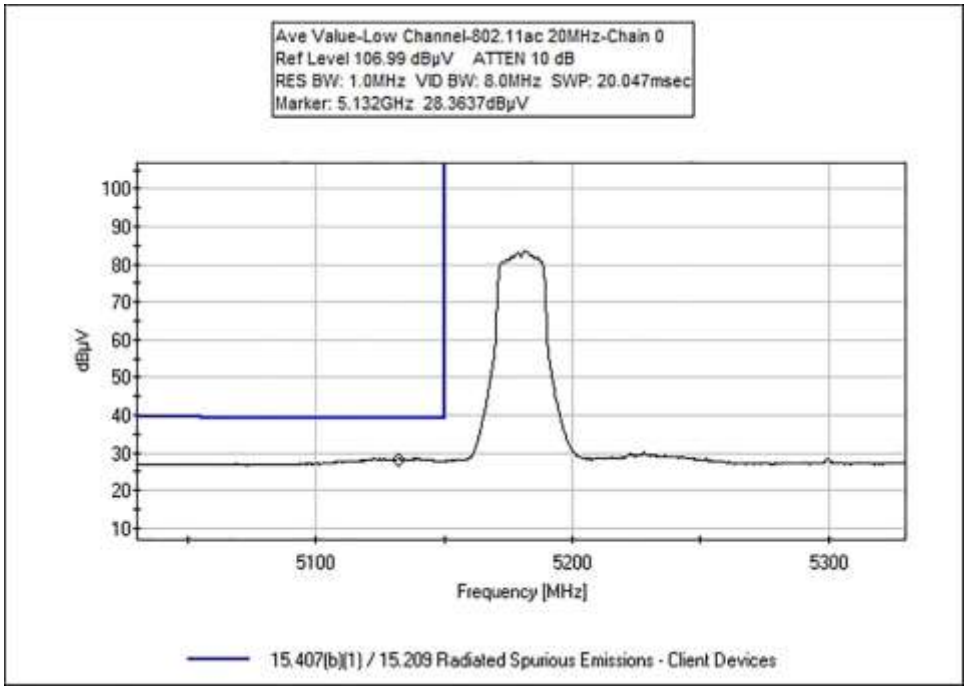

Ave Value-Low Channel-802.11n HT20-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.132GHz 28.7067dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

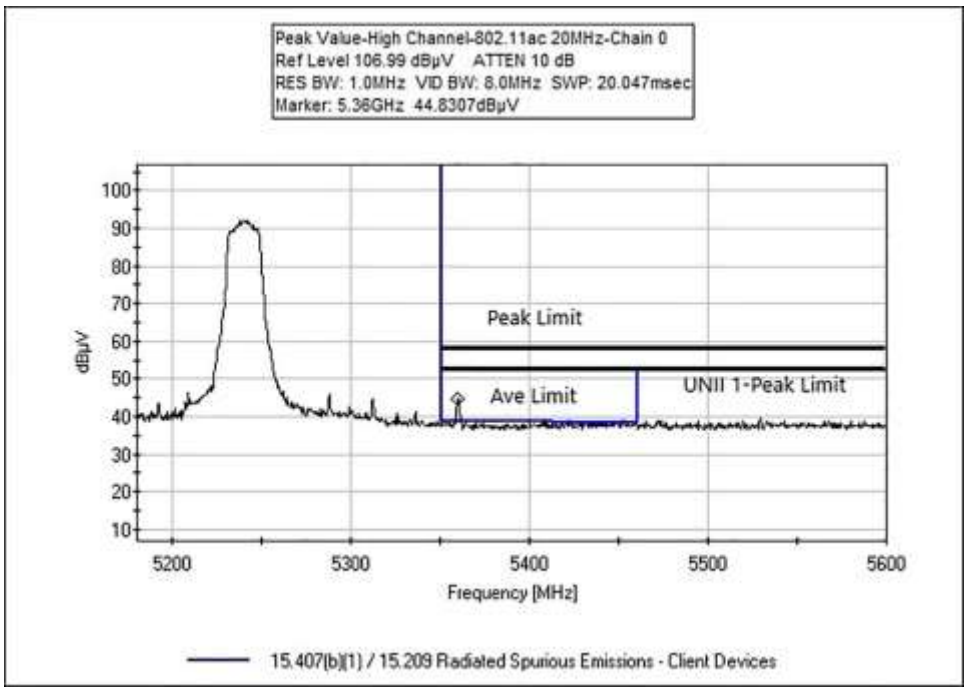

PeakValue-High Channel-802.11n HT20-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.36GHz 45.1377dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

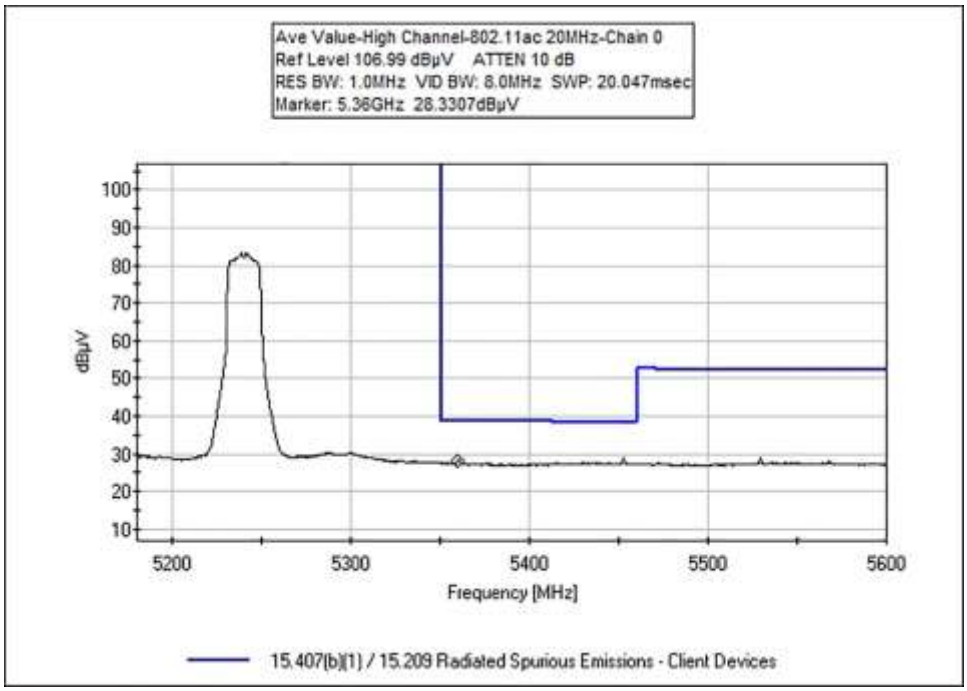

Ave Value-High Channel-802.11n HT20-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.36GHz 27.7227dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11ac 20MHz

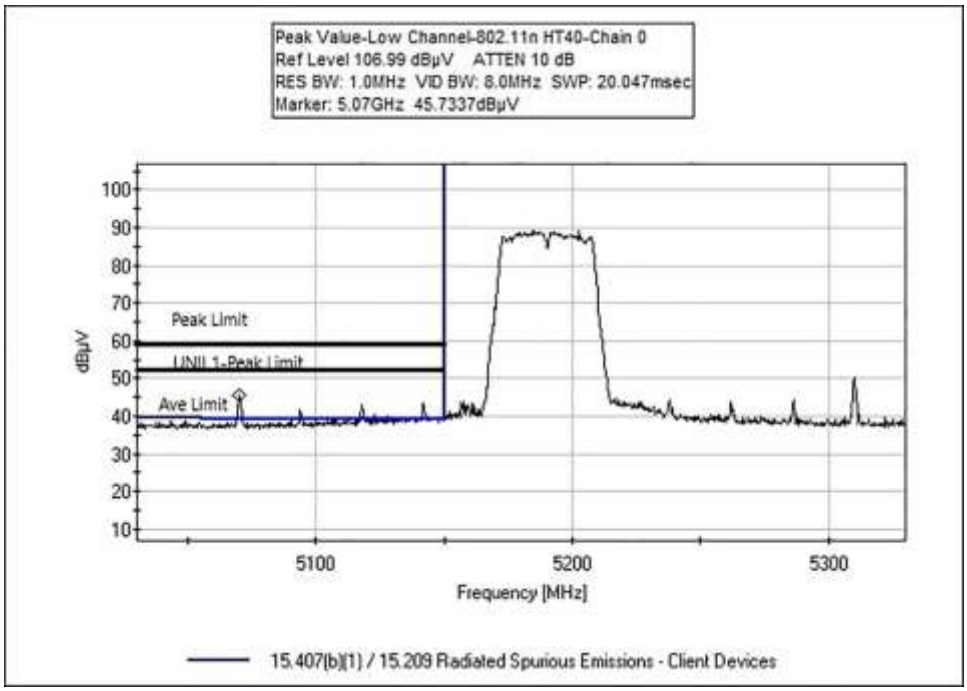


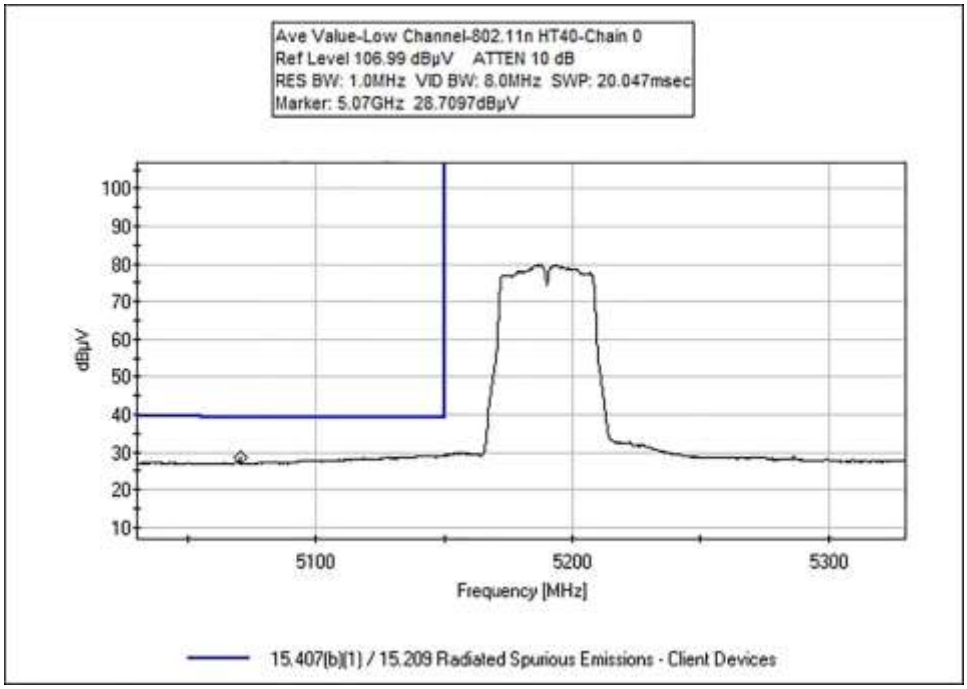


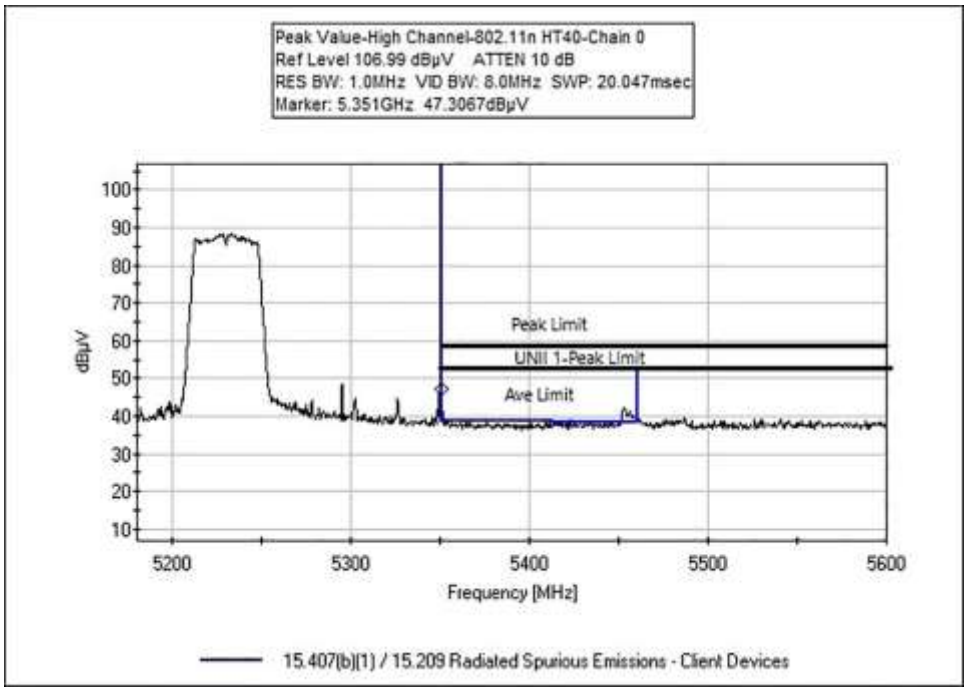

Peak Value-High Channel-802.11ac 20MHz-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.36GHz 44.8307dBµV
dBµV
Peak Limit
Ave Limit
UNII 1-Peak Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

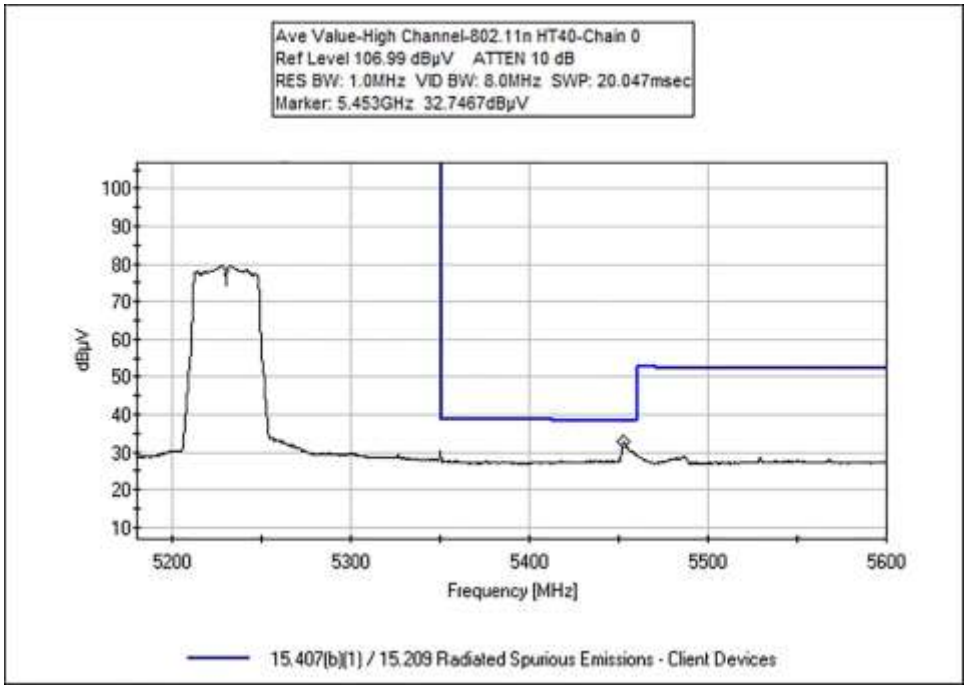

Ave Value-High Channel-802.11ac 20MHz-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.36GHz 28.3307dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11 n HT40

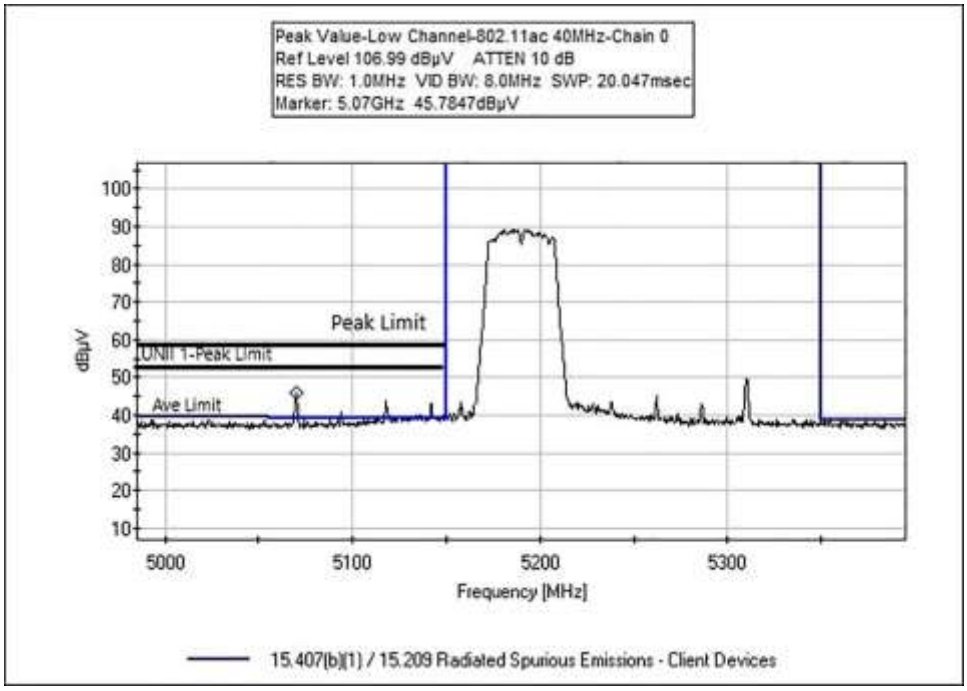

Peak Value-Low Channel-802.11n HT40-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.07GHz 45.7337dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
dBµV
Frequency [MHz]
5100
5200
5300
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

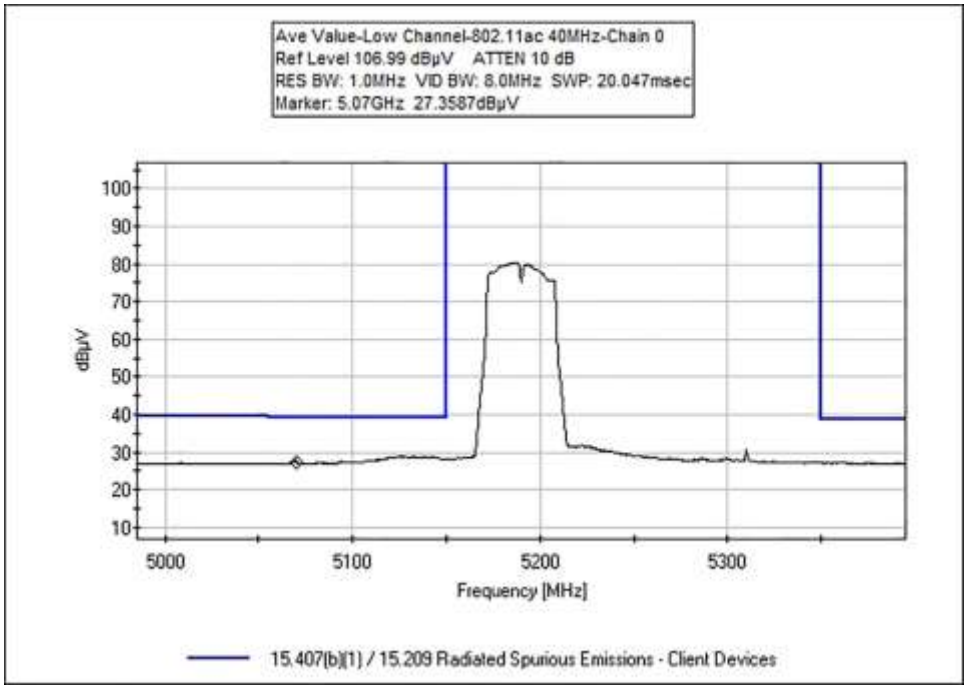

Ave Value-Low Channel-802.11n HT40-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.07GHz 28.7097dBµV
dBµV
Frequency [MHz]
5100
5200
5300
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

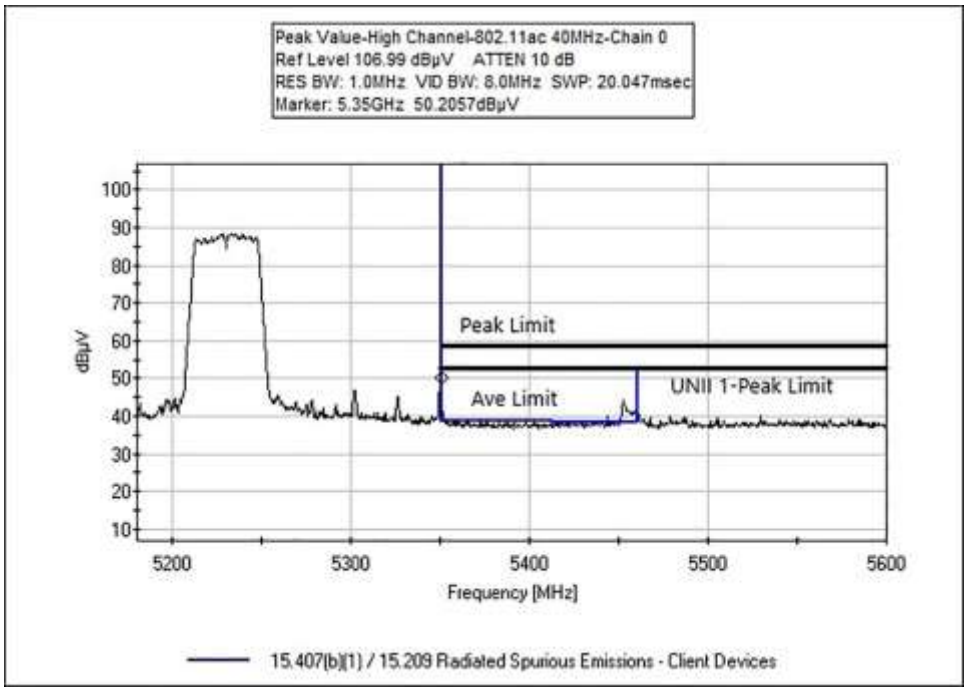

Peak Value-High Channel-802.11n HT40-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.351GHz 47.3067dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

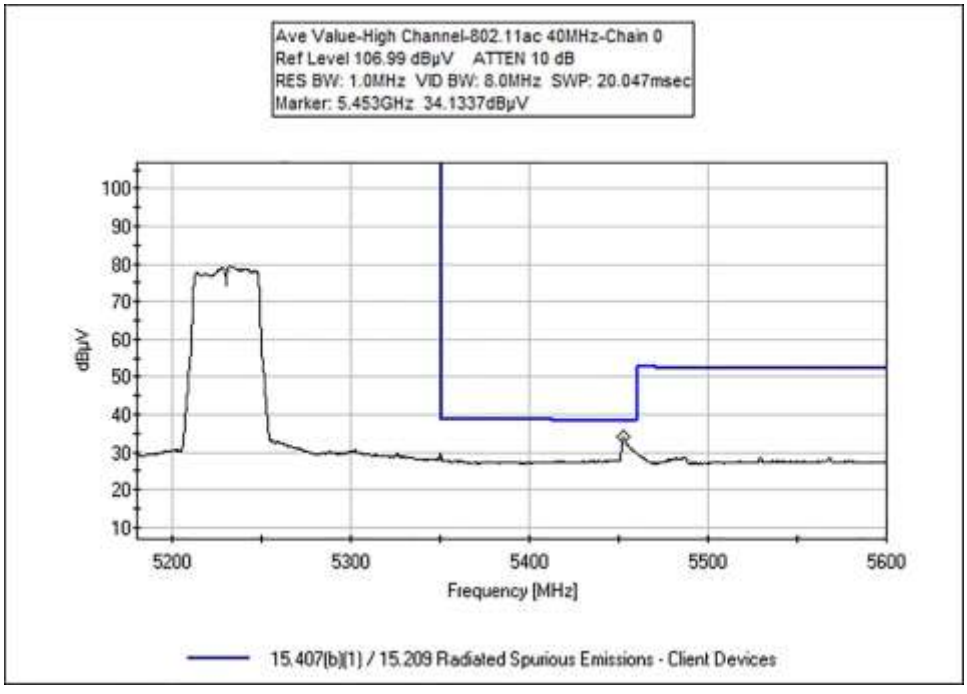

Ave Value-High Channel-802.11n HT40-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.453GHz 32.7467dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11ac 40MHz

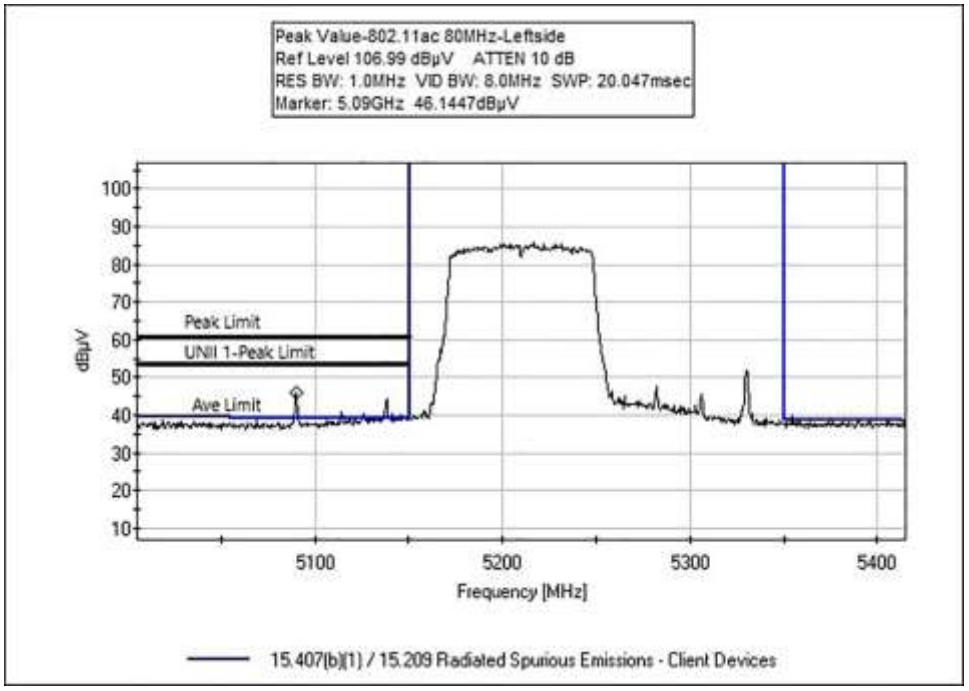


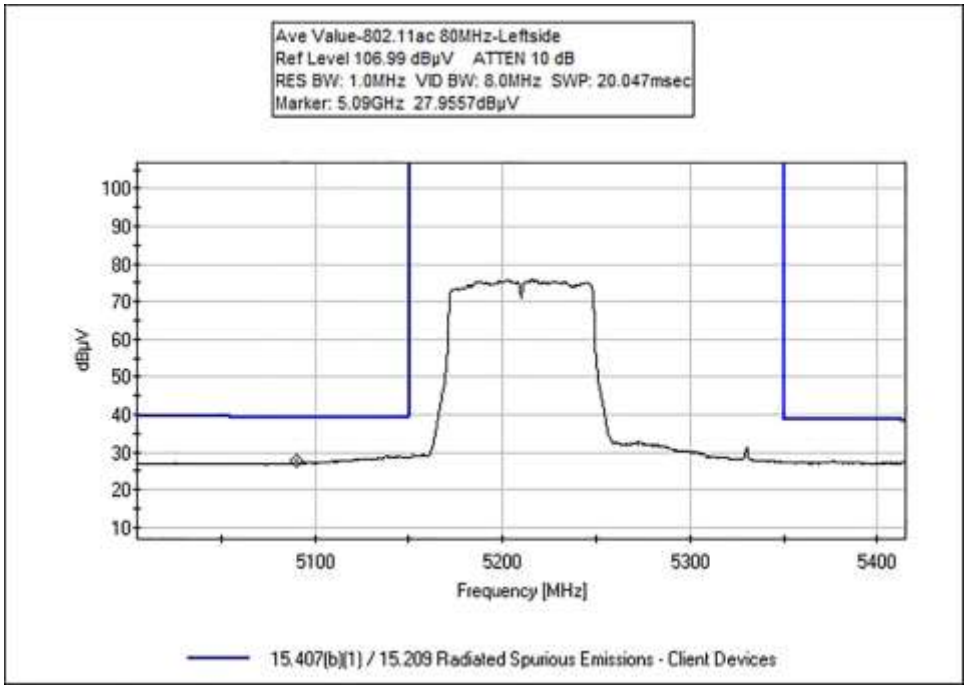


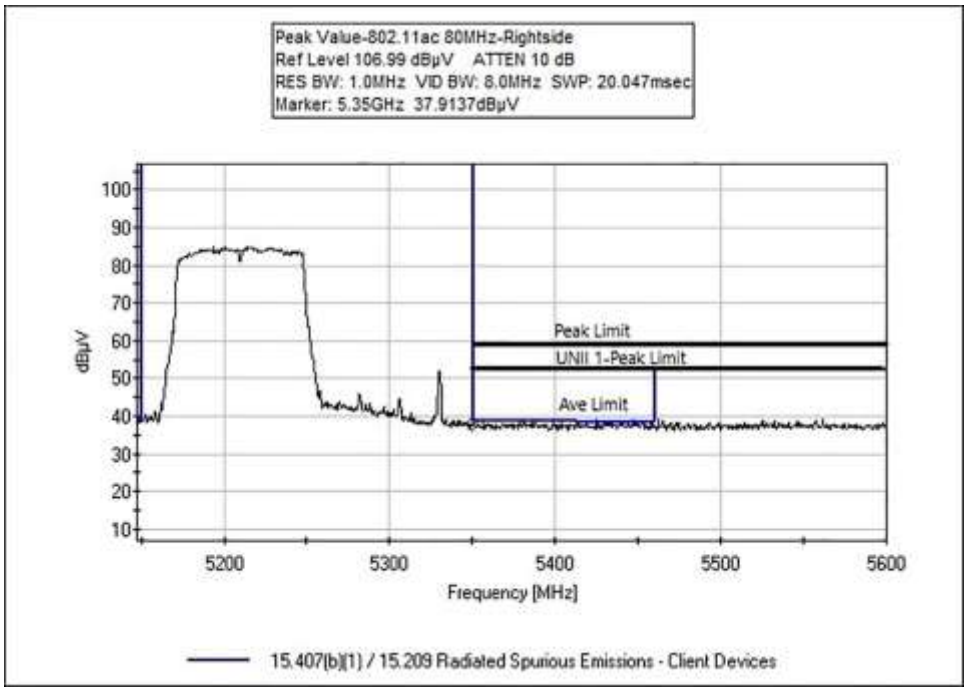

Peak Value-High Channel-802.11ac 40MHz-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 50.2057dBµV
dBµV
Peak Limit
Ave Limit
UNII 1-Peak Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

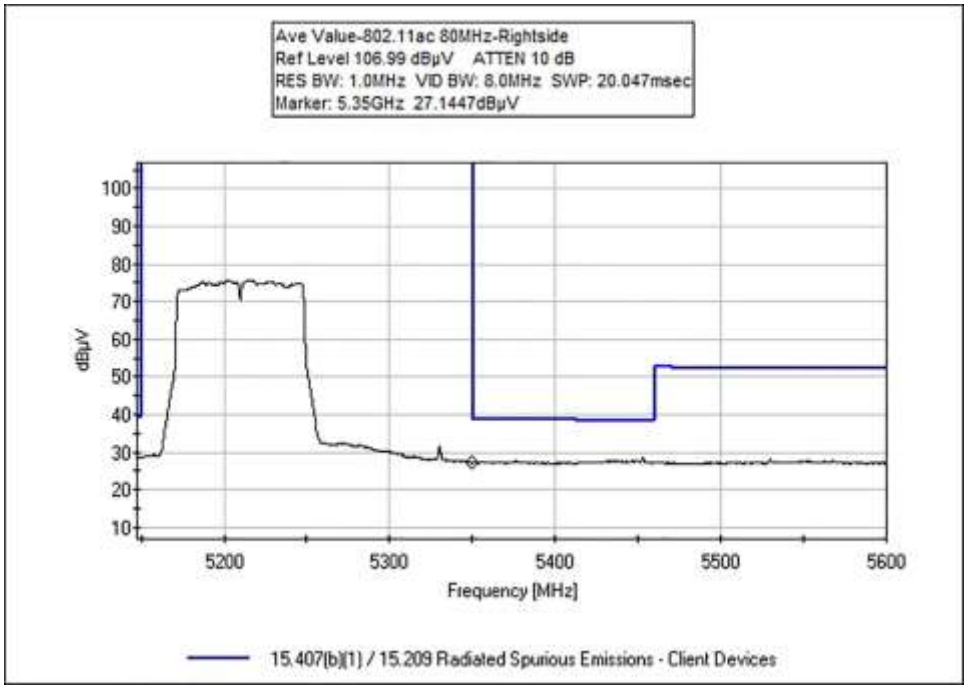

Ave Value-High Channel-802.11ac 40MHz-Chain 0
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.453GHz 34.1337dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11ac 80MHz

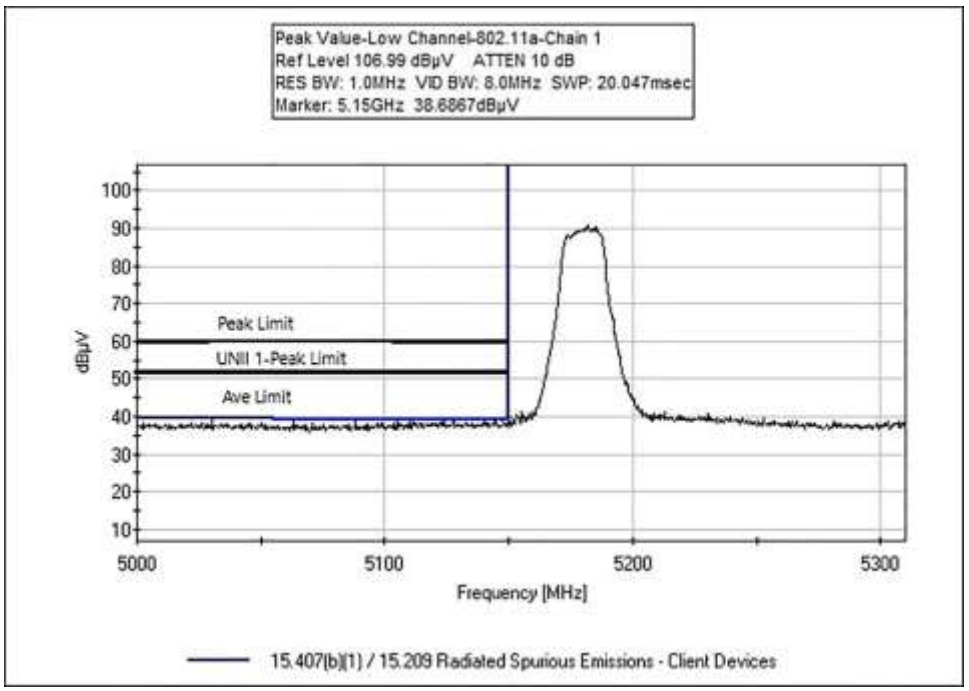


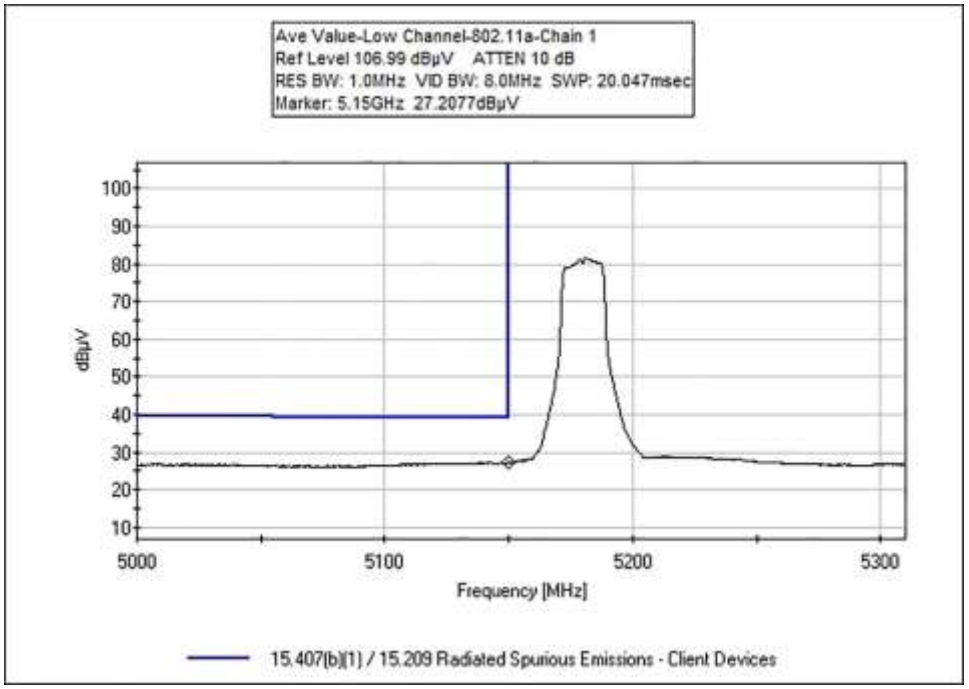


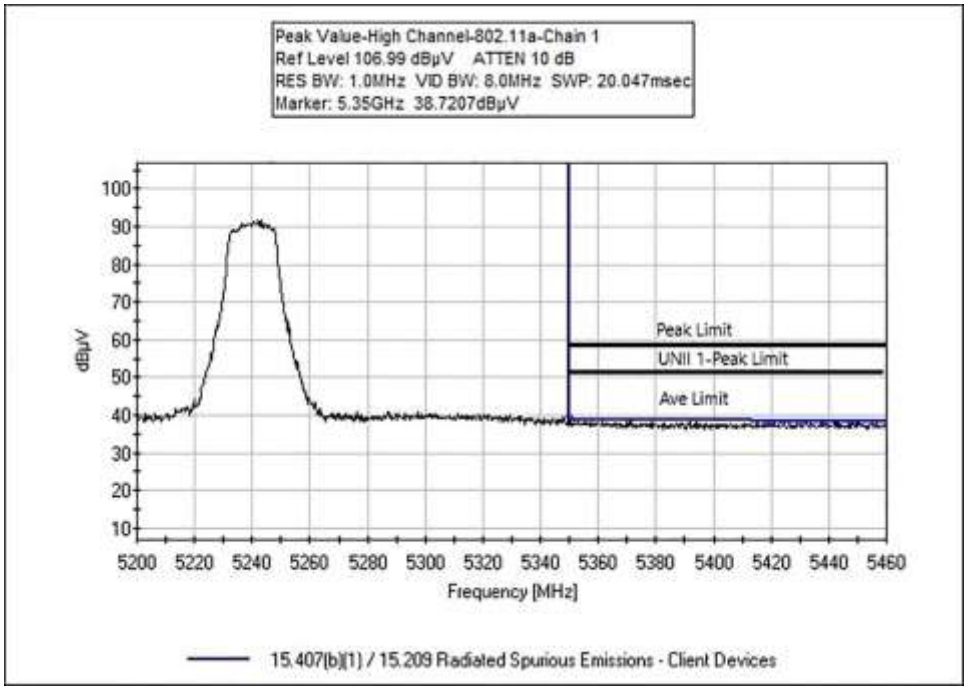

Peak Value-802.11ac 80MHz-Rightside
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 37.9137dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

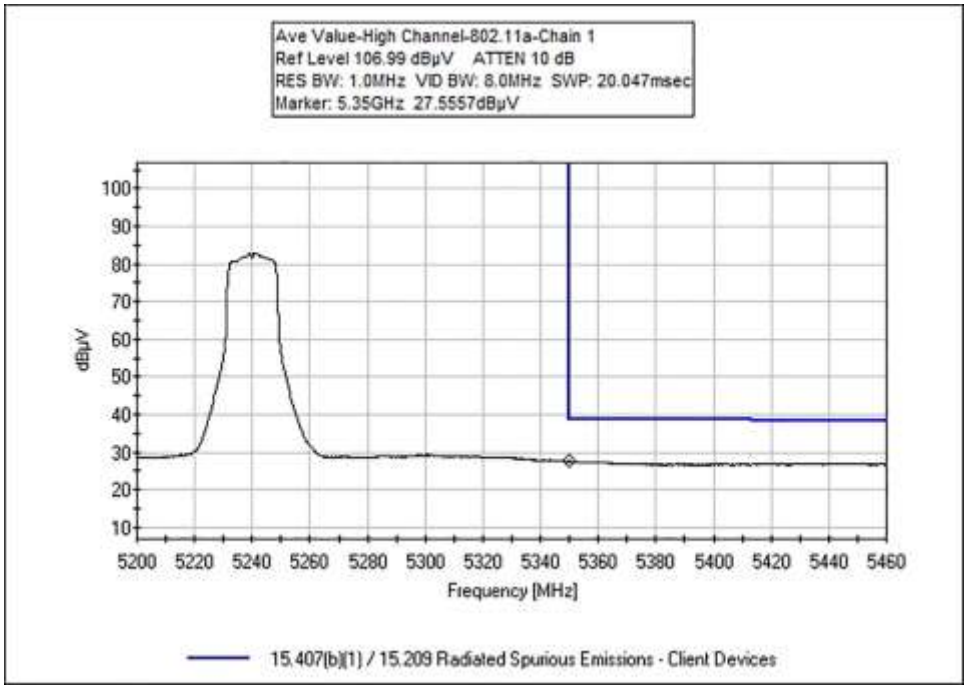

Ave Value-802.11ac 80MHz-Rightside
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 27.1447dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Chain 1
802.11a

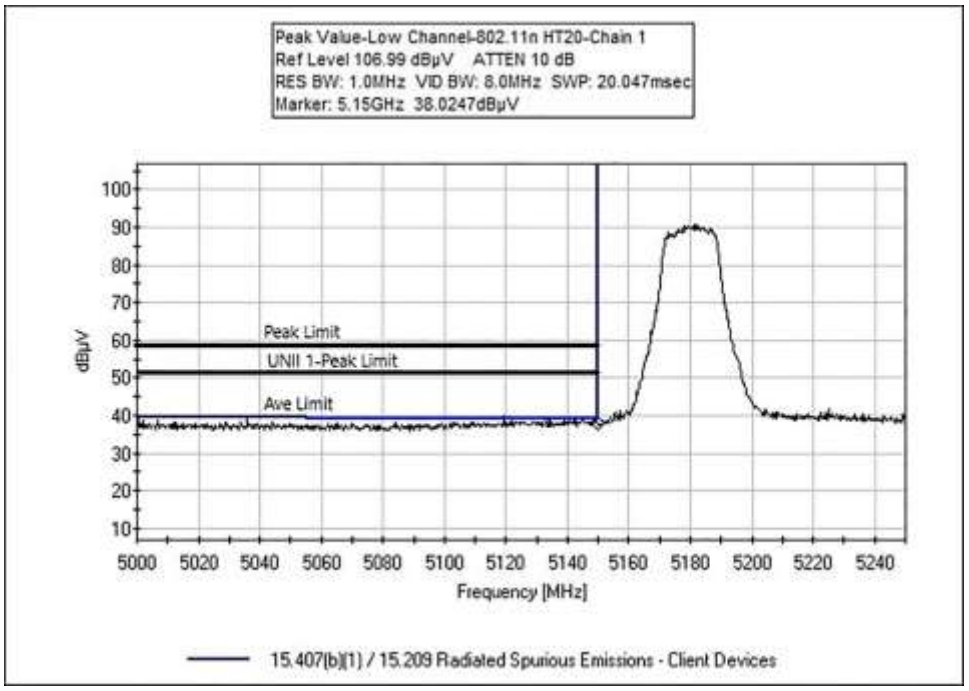


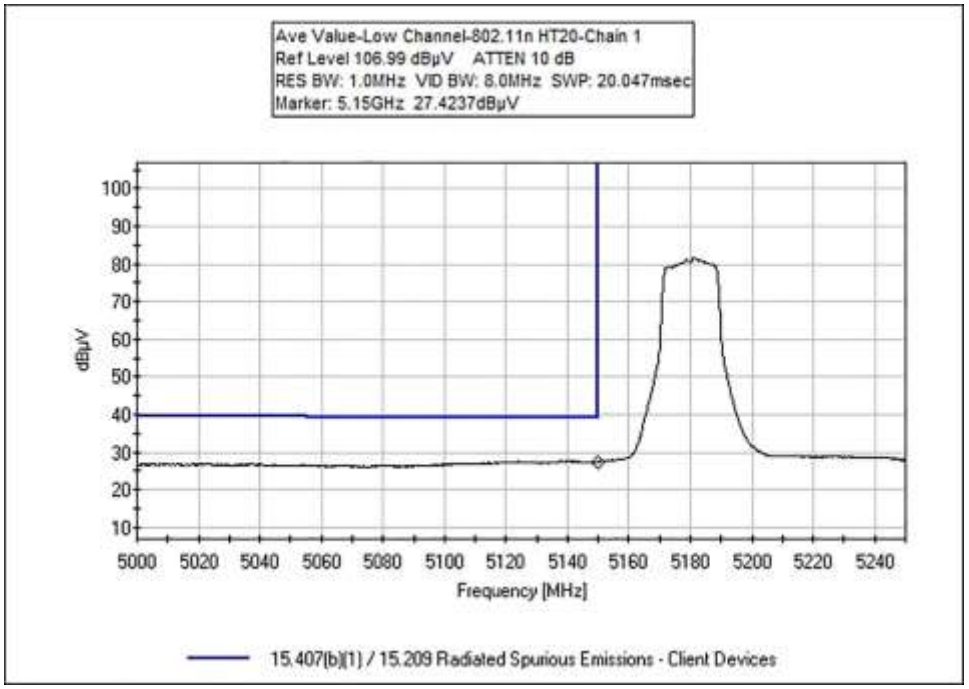


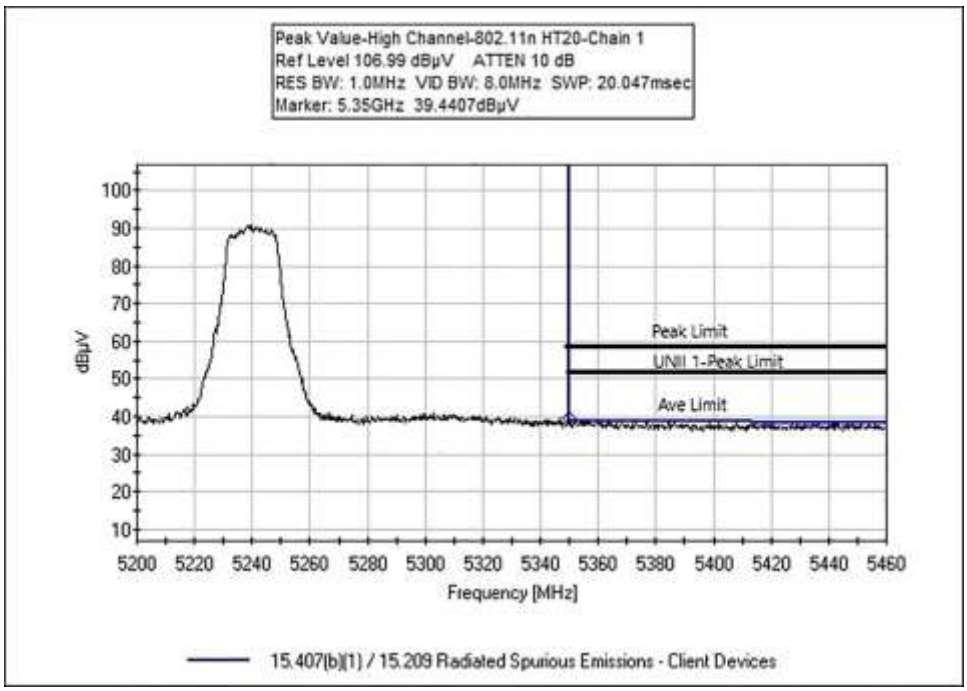

Peak Value-High Channel-802.11a-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 38.7207dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

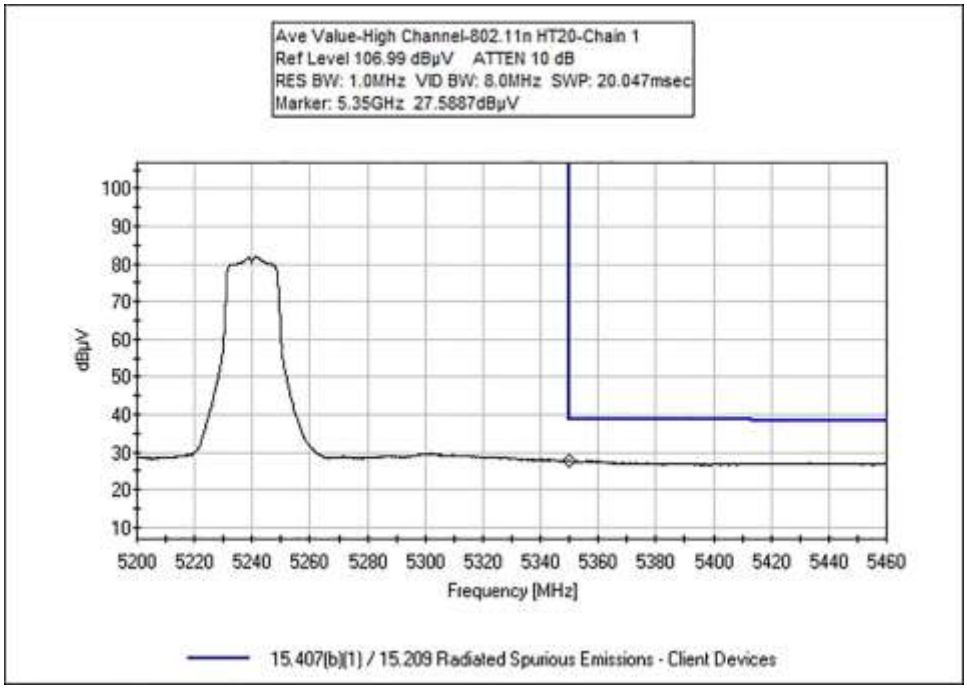

Ave Value-High Channel-802.11a-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 27.5557dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11n HT20

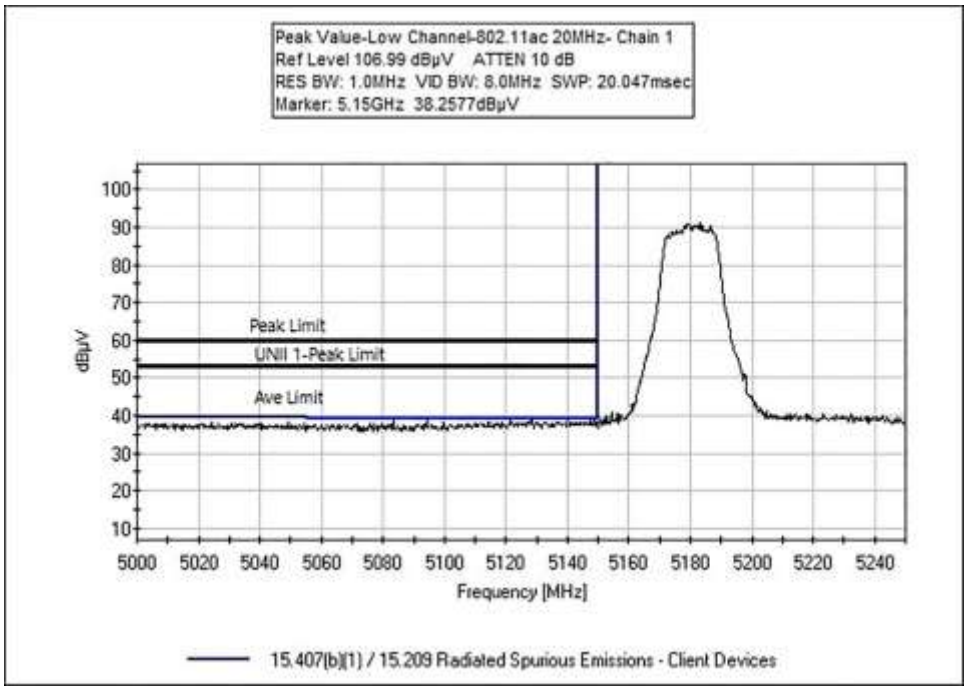

Peak Value-Low Channel-802.11n HT20-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.15GHz 38.0247dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

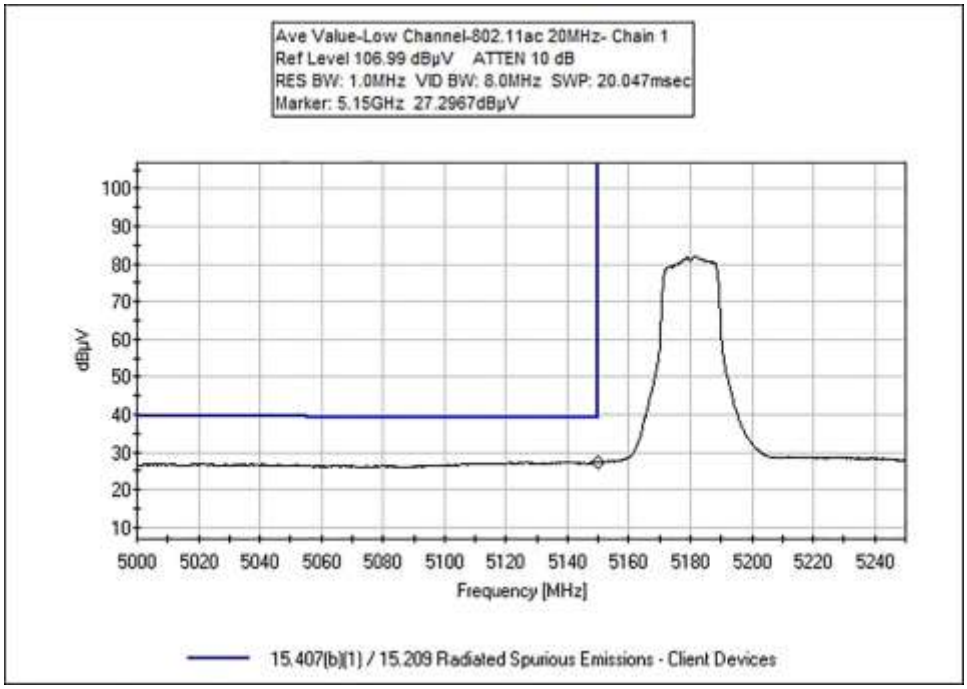

Ave Value-Low Channel-802.11n HT20-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.15GHz 27.4237dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

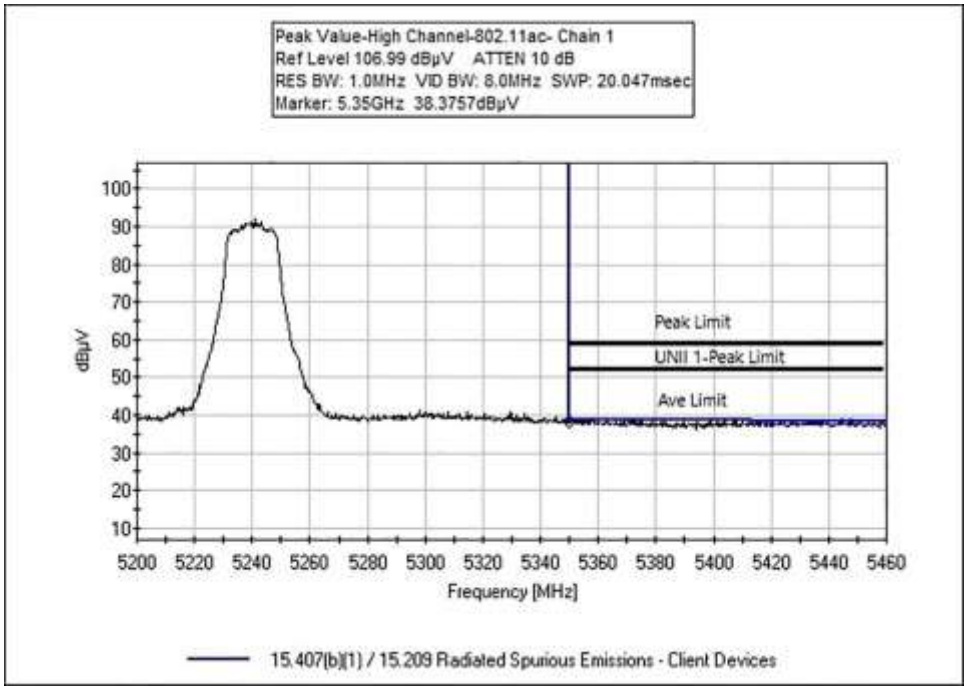

Peak Value-High Channel-802.11n HT20-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 39.4407dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

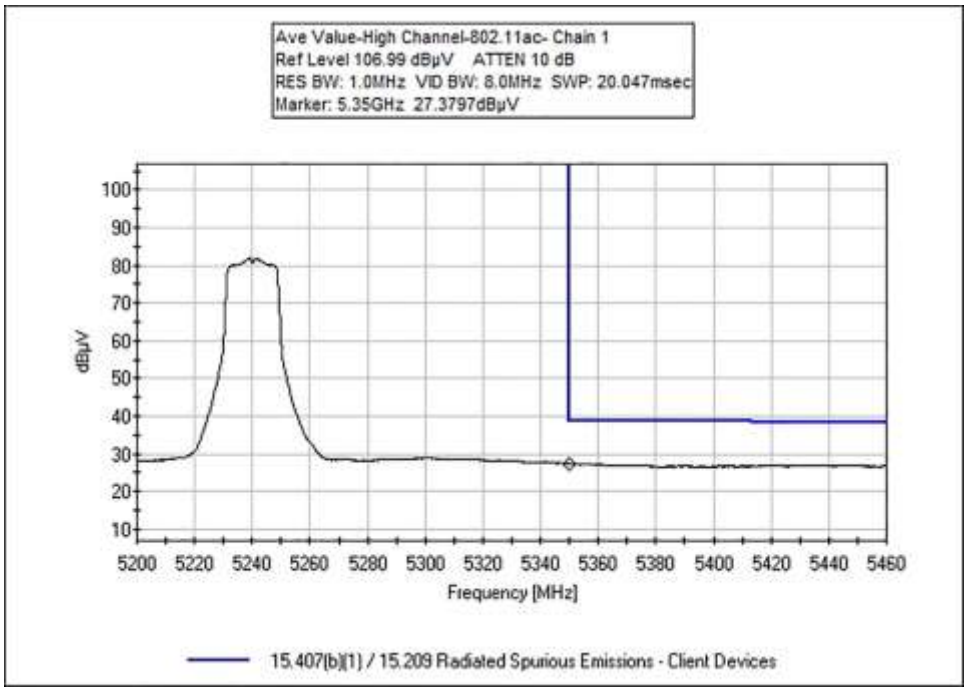

Ave Value-High Channel-802.11n HT20-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 27.5887dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11ac 20MHz

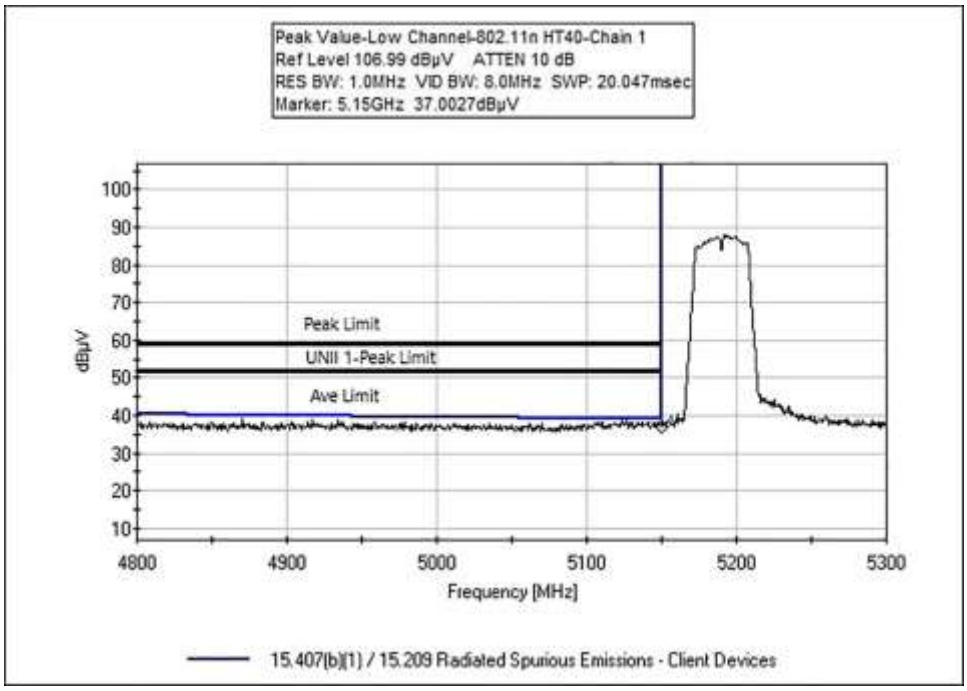


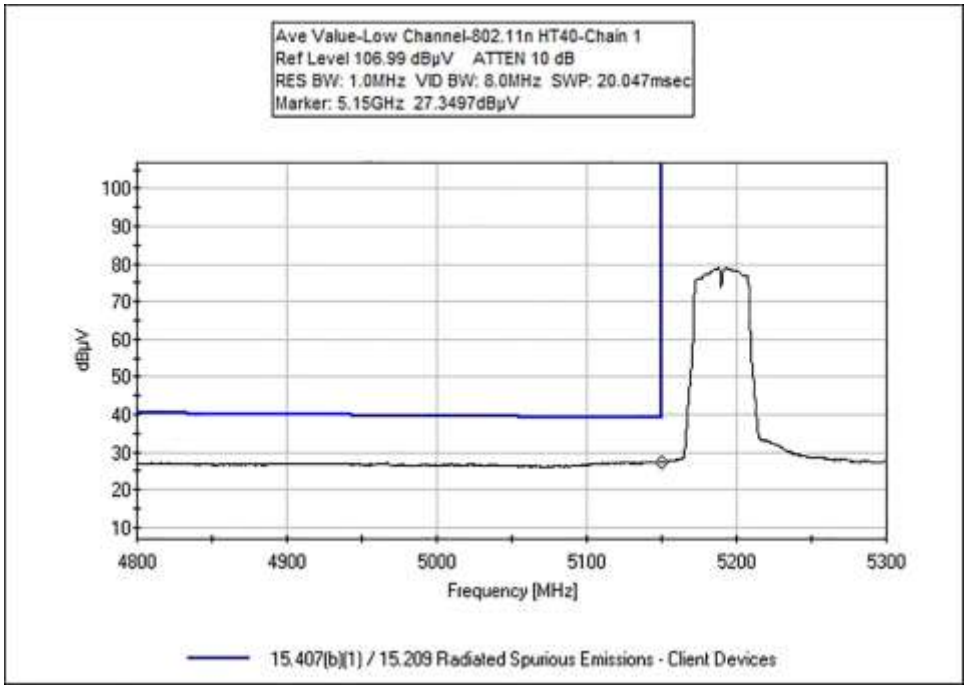


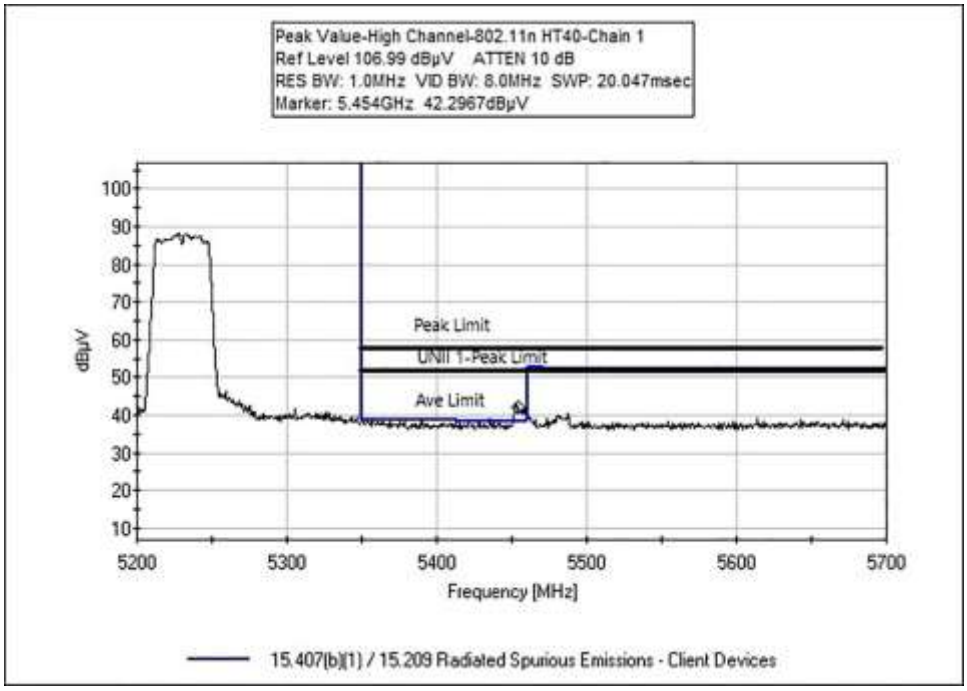

Peak Value-High Channel-802.11ac- Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 38.3757dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

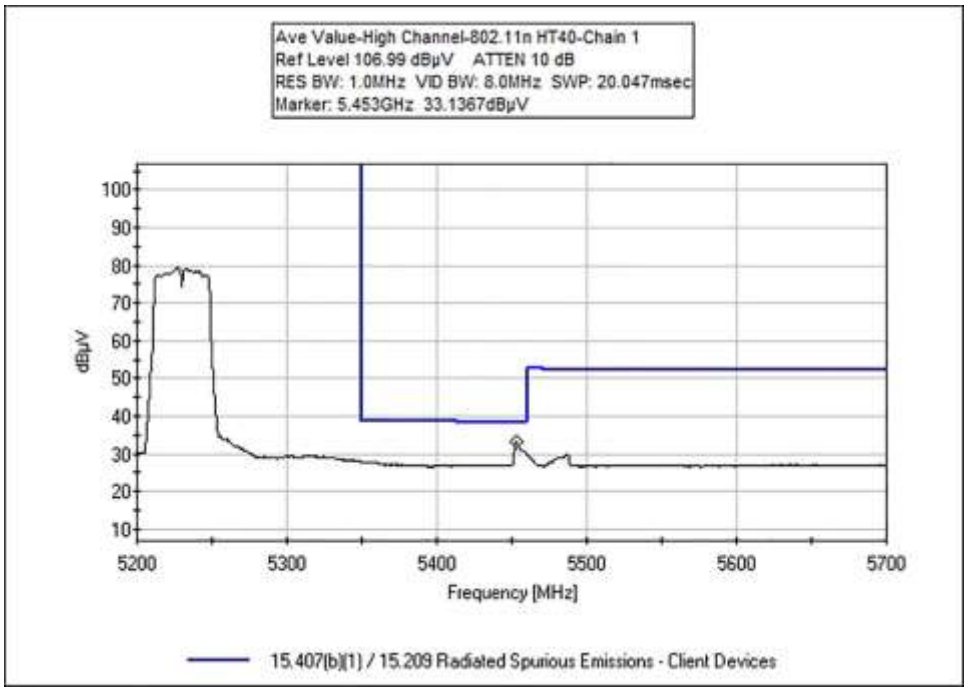

Ave Value-High Channel-802.11ac- Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 27.3797dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11 n HT40

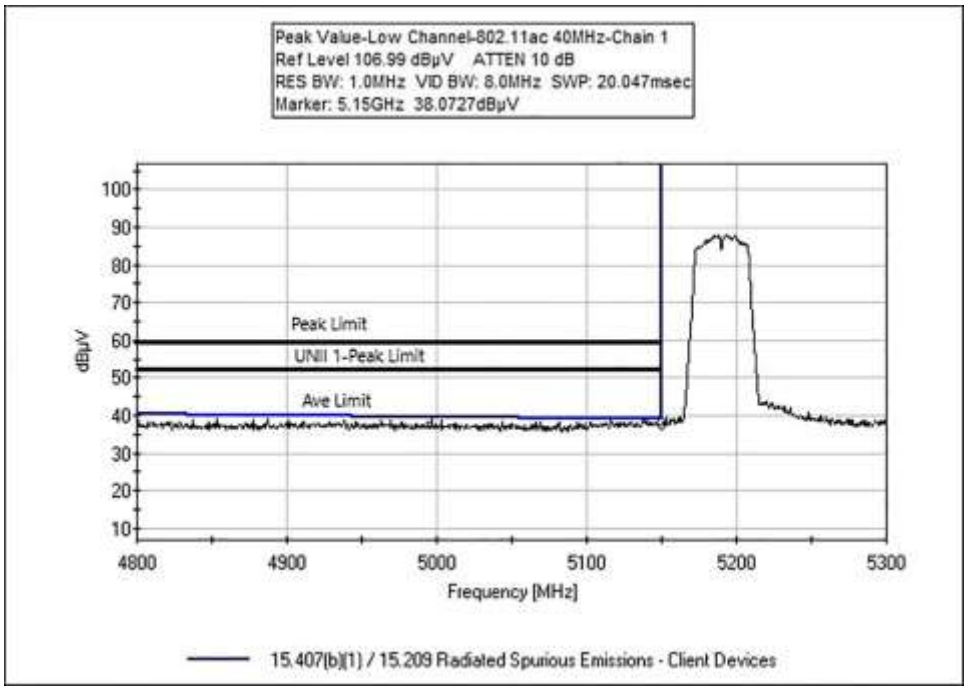

Peak Value-Low Channel-802.11n HT40-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.15GHz 37.0027dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

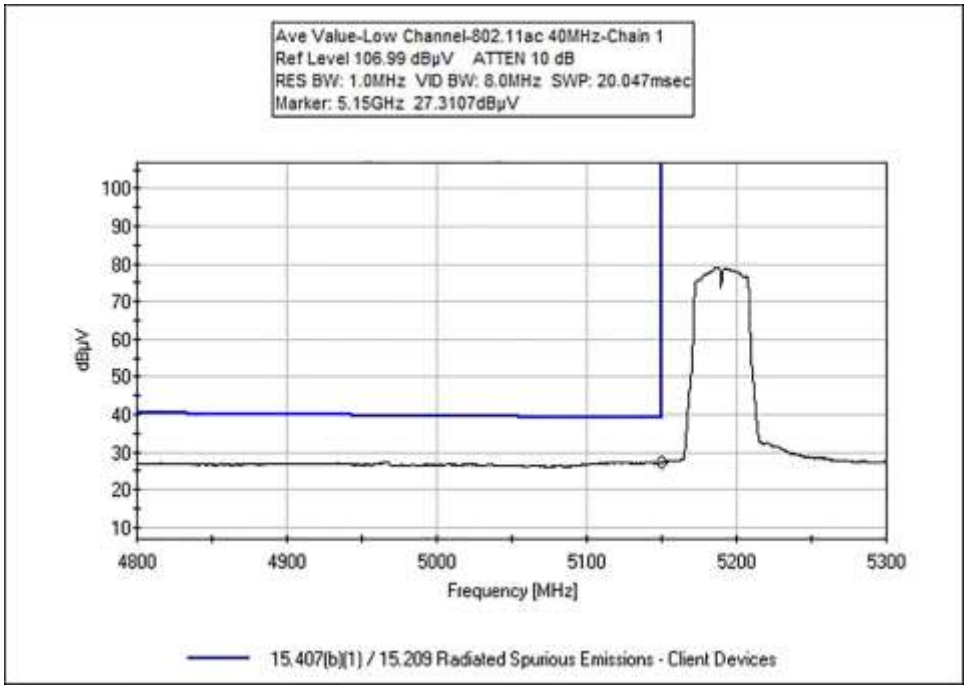

Ave Value-Low Channel-802.11n HT40-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.15GHz 27.3497dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

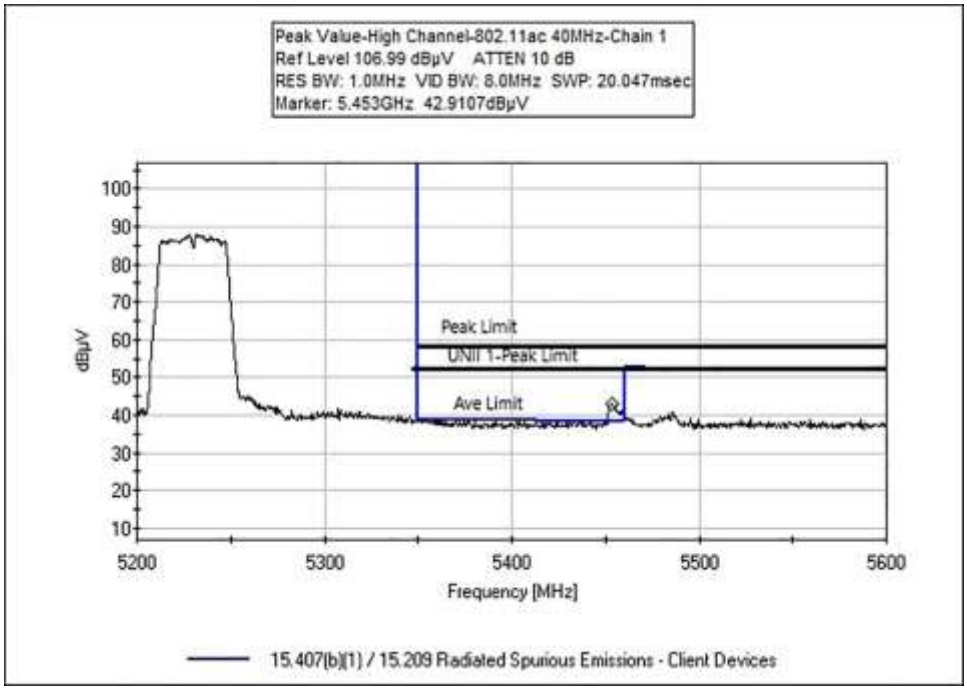

Peak Value-High Channel-802.11n HT40-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.454GHz 42.2967dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

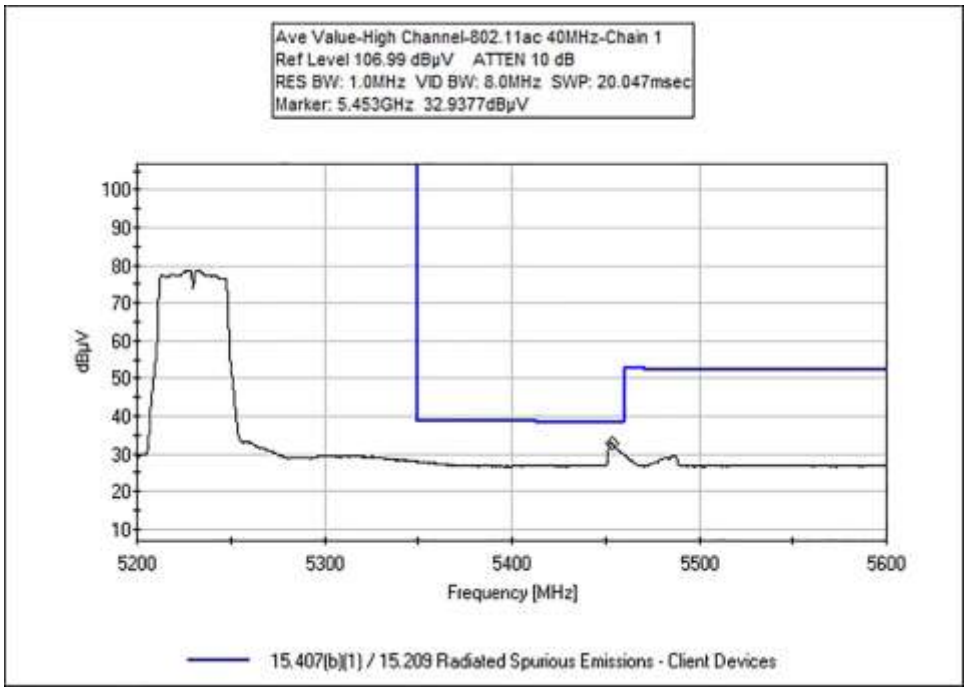

Ave Value-High Channel-802.11n HT40-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.453GHz 33.1367dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11ac 40MHz

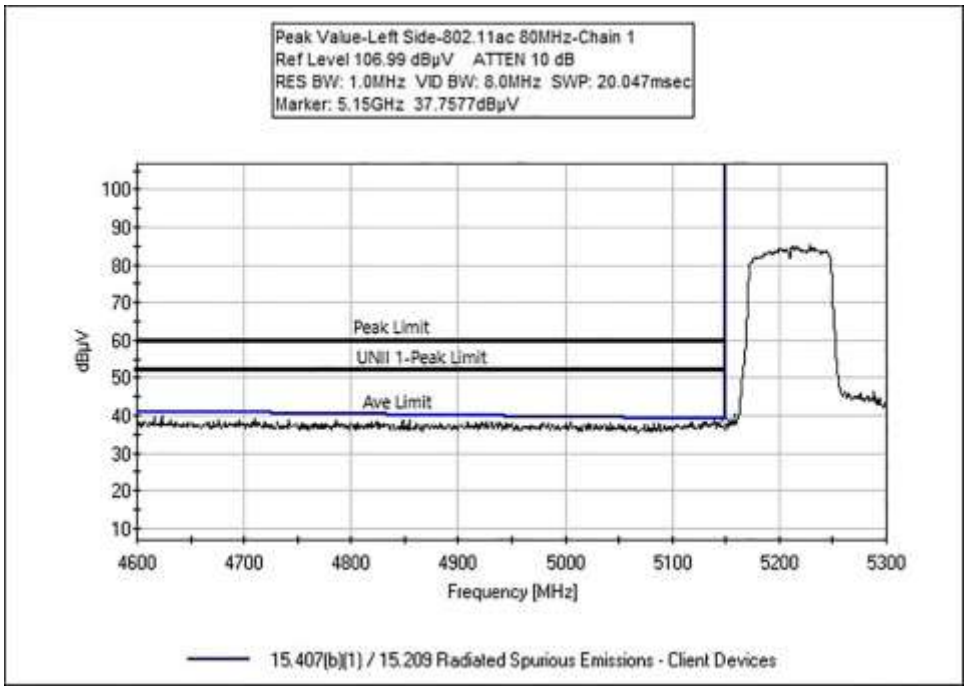


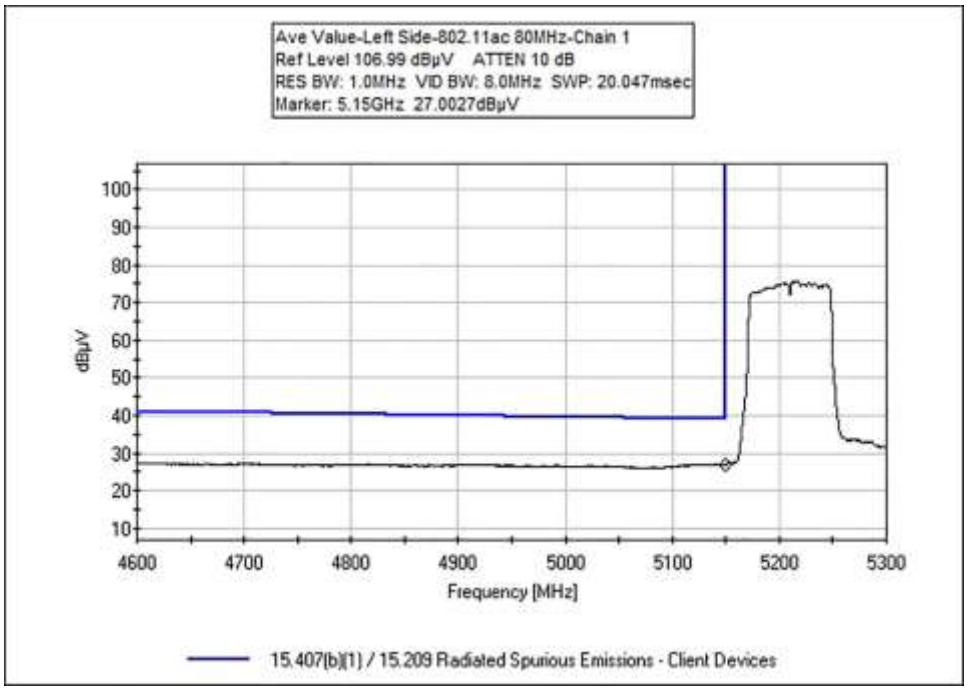


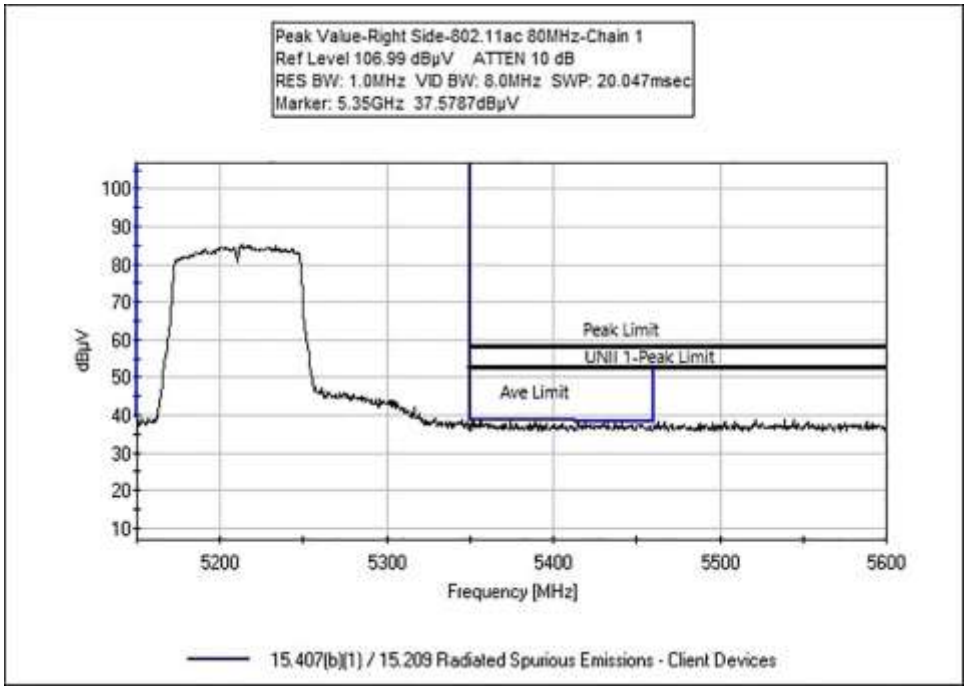

Peak Value-High Channel-802.11ac 40MHz-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.453GHz 42.9107dBµV
dBµV
Peak Limit
UNII 1-Peak Limit
Ave Limit
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

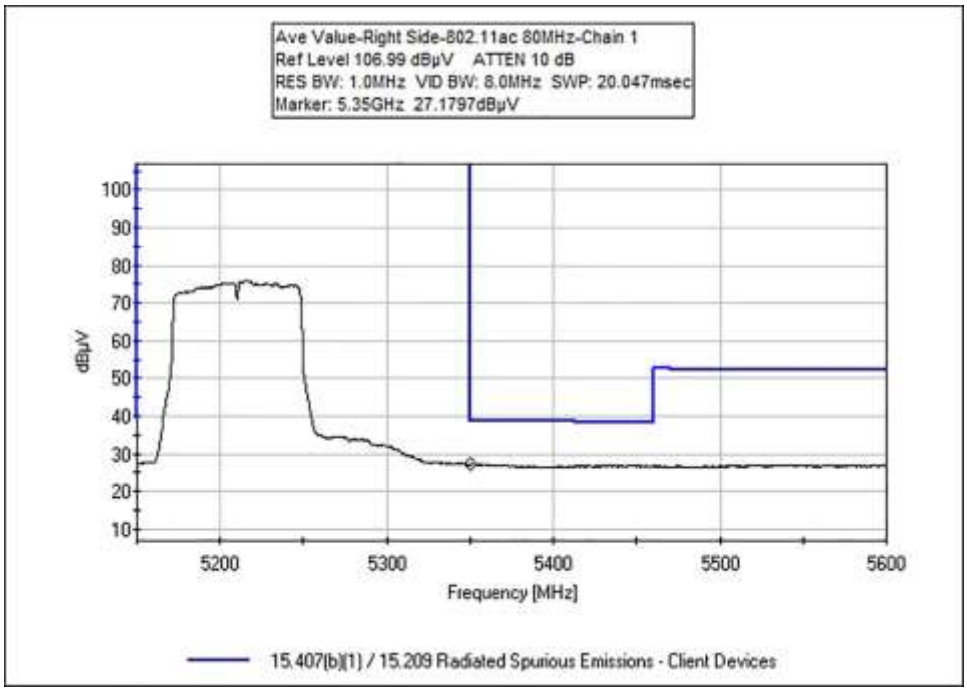

Ave Value-High Channel-802.11ac 40MHz-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.453GHz 32.9377dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

802.11ac 80MHz






Peak Value-Right Side-802.11ac 80MHz-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 37.5787dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
Peak Limit
UNII 1-Peak Limit
Ave Limit
5200
5300
5400
5500
5600
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices


Ave Value-Right Side-802.11ac 80MHz-Chain 1
Ref Level 106.99 dBµV ATTEN 10 dB
RES BW: 1.0MHz VID BW: 8.0MHz SWP: 20.047msec
Marker: 5.35GHz 27.1797dBµV
dBµV
100
90
80
70
60
50
40
30
20
10
5200
5300
5400
5500
5600
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Tonal**		
Specification:	**Band Edge**		
Work Order #:	**110285**	Date:	10/25/2024
Test Type:	**Radiated Scan**	Time:	10:38:46
Tested By:	Hieu Song Nguyenpham	Sequence#:	14
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Band Edge

Test Environment Conditions:
Temperature: 21.8°C
Humidity: 47%
Atmospheric Pressure: 101.5kPa

Highest Generated Frequency: 5.825GHz
Test Method: ANSI C63.10 (2020), KDB 789033

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor. Camera is on.

Note:
Chain 0

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/11/2023	1/11/2025
T2	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2024	1/9/2026
T3	ANP01210	Cable	FSJ1P-50A-4A	1/9/2024	1/9/2026
	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024
T4	AN02810	Preamp	83051A	4/6/2023	4/6/2025
T5	AN03013	Cable	32022-2-2909K-36TC	1/9/2024	1/9/2026

Measurement Data: Reading listed by order taken. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	5131.800M	42.6	+34.1 +1.2	+2.1	+3.7	-26.4	+0.0	57.3	54.0 802.11a	+3.3	Horiz
2	5131.800M Ave	28.9	+34.1 +1.2	+2.1	+3.7	-26.4	+0.0	43.6	54.0 802.11a	-10.4	Horiz
3	5360.000M	44.5	+34.6 +1.2	+2.2	+3.8	-26.4	+0.0	59.9	54.0 802.11a	+5.9	Horiz
4	5360.000M Ave	28.1	+34.6 +1.2	+2.2	+3.8	-26.4	+0.0	43.5	54.0 802.11a	-10.5	Horiz
5	5131.980M	42.3	+34.1 +1.2	+2.1	+3.7	-26.4	+0.0	57.0	54.0 802.11n HT20	+3.0	Horiz
6	5131.980M Ave	28.7	+34.1 +1.2	+2.1	+3.7	-26.4	+0.0	43.4	54.0 802.11n HT20	-10.6	Horiz
7	5359.880M	44.7	+34.6 +1.2	+2.2	+3.8	-26.4	+0.0	60.1	54.0 802.11n HT20	+6.1	Horiz
8	5359.900M Ave	27.7	+34.6 +1.2	+2.2	+3.8	-26.4	+0.0	43.1	54.0 802.11n HT20	-10.9	Horiz
9	5359.900M	44.8	+34.6 +1.2	+2.2	+3.8	-26.4	+0.0	60.2	54.0 802.11ac 20MHz	+6.2	Horiz
10	5359.900M Ave	28.3	+34.6 +1.2	+2.2	+3.8	-26.4	+0.0	43.7	54.0 802.11ac 20MHz	-10.3	Horiz
11	5132.300M	41.2	+34.1 +1.2	+2.1	+3.7	-26.4	+0.0	55.9	54.0 802.11ac 20MHz	+1.9	Horiz
12	5132.300M Ave	28.4	+34.1 +1.2	+2.1	+3.7	-26.4	+0.0	43.1	54.0 802.11ac 20MHz	-10.9	Horiz
13	5070.200M	45.7	+34.0 +1.2	+2.1	+3.7	-26.4	+0.0	60.3	54.0 802.11n HT40	+6.3	Horiz
14	5070.200M Ave	28.7	+34.0 +1.2	+2.1	+3.7	-26.4	+0.0	43.3	54.0 802.11n HT40	-10.7	Horiz
15	5350.700M	47.3	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	62.6	54.0 802.11n HT40	+8.6	Horiz
16	5350.700M Ave	28.3	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	43.6	54.0 802.11n HT40	-10.4	Horiz

17	5350.300M	50.2	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	65.5	54.0	+11.5	Horiz	802.11ac 40MHz
18	5350.300M Ave	28.6	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	43.9	54.0	-10.1	Horiz	802.11ac 40MHz
19	5070.000M	44.6	+34.0 +1.2	+2.1	+3.7	-26.4	+0.0	59.2	54.0	+5.2	Horiz	802.11ac 40MHz
20	5070.000M Ave	27.4	+34.0 +1.2	+2.1	+3.7	-26.4	+0.0	42.0	54.0	-12.0	Horiz	802.11ac 40MHz
21	5090.000M	46.1	+34.1 +1.2	+2.1	+3.7	-26.4	+0.0	60.8	54.0	+6.8	Horiz	802.11ac 80MHz
22	5090.000M Ave	28.0	+34.1 +1.2	+2.1	+3.7	-26.4	+0.0	42.7	54.0	-11.3	Horiz	802.11ac 80MHz
23	5350.000M	37.9	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	53.2	54.0	-0.8	Horiz	802.11ac 80MHz
24	5350.000M Ave	27.1	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	42.4	54.0	-11.6	Horiz	802.11ac 80MHz
25	5334.600M	51.2	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	66.5	68.2	-1.7	Horiz	802.11ac 80MHz
26	5287.600M	44.6	+34.4 +1.2	+2.1	+3.8	-26.4	+0.0	59.7	68.2	-8.5	Horiz	802.11a
27	5287.600M	45.3	+34.4 +1.2	+2.1	+3.8	-26.4	+0.0	60.4	68.2	-7.8	Horiz	802.11n HT20
28	5278.600M	46.5	+34.4 +1.2	+2.1	+3.8	-26.4	+0.0	61.6	68.2	-6.6	Horiz	802.11ac 20MHz
29	5291.600M	49.3	+34.4 +1.2	+2.1	+3.8	-26.4	+0.0	64.4	68.2	-3.8	Horiz	802.11n HT40
30	5302.300M	47.0	+34.5 +1.2	+2.1	+3.8	-26.4	+0.0	62.2	68.2	-6.1	Horiz	802.11ac 40MHz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Tonal**		
Specification:	Band Edge		
Work Order #:	**110285**	Date:	11/1/2024
Test Type:	**Radiated Scan**	Time:	11:58:12
Tested By:	Hieu Song Nguyenpham	Sequence#:	21
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

Band Edge

Test Environment Conditions:
Temperature: 21.8°C
Humidity: 47%
Atmospheric Pressure: 101.5kPa

Highest Generated Frequency: 5.825GHz
Test Method: ANSI C63.10 (2020), KDB 789033

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor. Camera is on.

Note:
Chain 1

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	AN02157	Horn Antenna-ANSI C63.5	3115	1/11/2023	1/11/2025
T2	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2024	1/9/2026
T3	ANP01210	Cable	FSJ1P-50A-4A	1/9/2024	1/9/2026
	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024
T4	AN02810	Preamp	83051A	4/6/2023	4/6/2025
T5	AN03013	Cable	32022-2-2909K-36TC	1/9/2024	1/9/2026

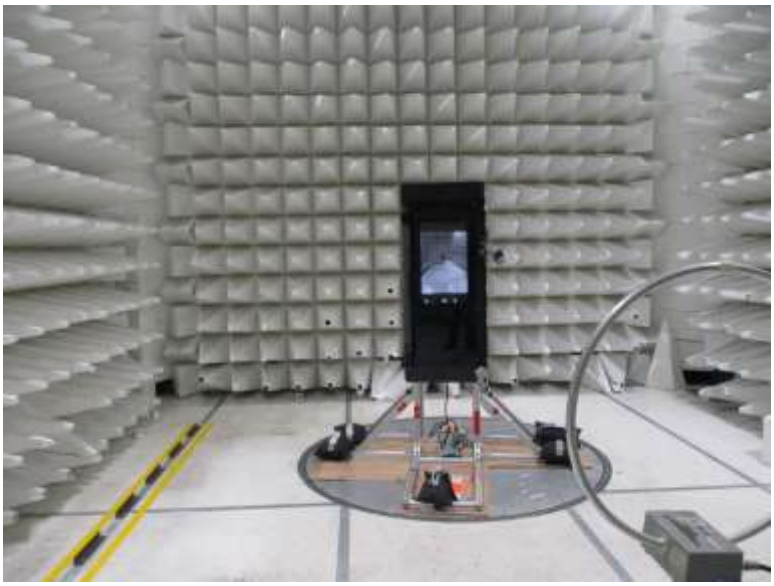
Measurement Data: Reading listed by order taken. Test Distance: 3 Meters

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	5150.000M	38.7	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	53.5	54.0 802.11a	-0.5	Horiz
2	5150.000M Ave	27.2	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	42.0	54.0 802.11a	-12.0	Horiz
3	5350.000M	38.0	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	53.3	54.0 802.11a	-0.7	Horiz
4	5350.000M Ave	27.6	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	42.9	54.0 802.11a	-11.1	Horiz
5	5350.000M	39.4	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	54.7	54.0 802.11n HT20	+0.7	Horiz
6	5350.000M Ave	27.6	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	42.9	54.0 802.11n HT20	-11.1	Horiz
7	5150.000M	38.0	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	52.8	54.0 802.11n HT20	-1.2	Horiz
8	5150.000M Ave	27.4	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	42.2	54.0 802.11n HT20	-11.8	Horiz
9	5150.000M	38.3	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	53.1	54.0 802.11ac 20MHz	-0.9	Horiz
10	5150.000M Ave	27.3	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	42.1	54.0 802.11ac 20MHz	-11.9	Horiz
11	5350.000M	38.4	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	53.7	54.0 802.11ac 20MHz	-0.3	Horiz
12	5350.000M Ave	27.4	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	42.7	54.0 802.11ac 20MHz	-11.3	Horiz
13	5453.000M	42.3	+34.7 +1.2	+2.2	+3.8	-26.4	+0.0	57.8	54.0 802.11n HT40	+3.8	Horiz
14	5453.000M Ave	33.1	+34.7 +1.2	+2.2	+3.8	-26.4	+0.0	48.6	54.0 802.11n HT40	-5.4	Horiz
15	5150.000M	37.0	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	51.8	54.0 802.11n HT40	-2.2	Horiz
16	5150.000M Ave	27.3	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	42.1	54.0 802.11n HT40	-11.9	Horiz

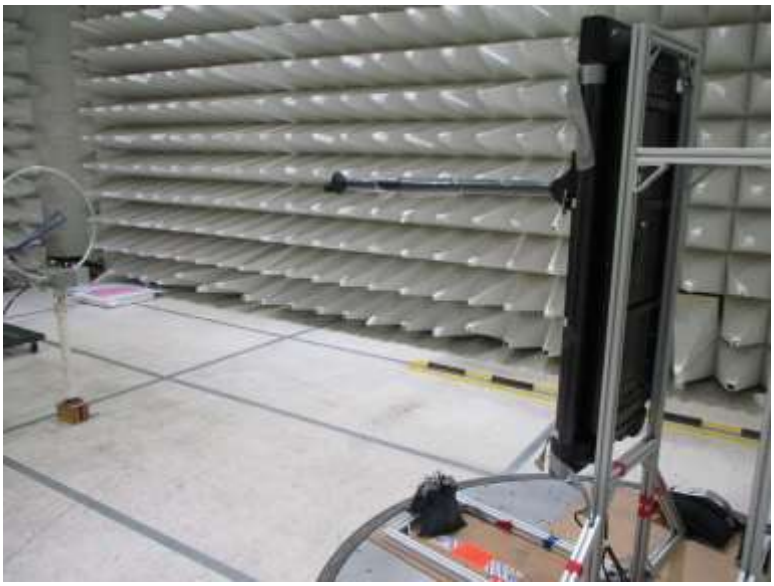
17	5150.000M	37.7	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	52.5	54.0 802.11ac 40MHz	-1.5		Horiz
18	5150.000M Ave	27.3	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	42.1	54.0 802.11ac 40MHz	-11.9		Horiz
19	5453.200M	42.9	+34.7 +1.2	+2.2	+3.8	-26.4	+0.0	58.4	54.0 802.11ac 40MHz	+4.4		Horiz
20	5453.200M Ave	32.9	+34.7 +1.2	+2.2	+3.8	-26.4	+0.0	48.4	54.0 802.11ac 40MHz	-5.6		Horiz
21	5350.000M	36.9	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	52.2	54.0 802.11ac 80MHz	-1.8		Horiz
22	5350.000M Ave	27.2	+34.5 +1.2	+2.2	+3.8	-26.4	+0.0	42.5	54.0 802.11ac 80MHz	-11.5		Horiz
23	5150.000M	37.8	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	52.6	54.0 802.11ac 80MHz	-1.4		Horiz
24	5150.000M Ave	27.0	+34.2 +1.2	+2.1	+3.7	-26.4	+0.0	41.8	54.0 802.11ac 80MHz	-12.2		Horiz

Test Setup Photo(s)

9kHz-1GHz

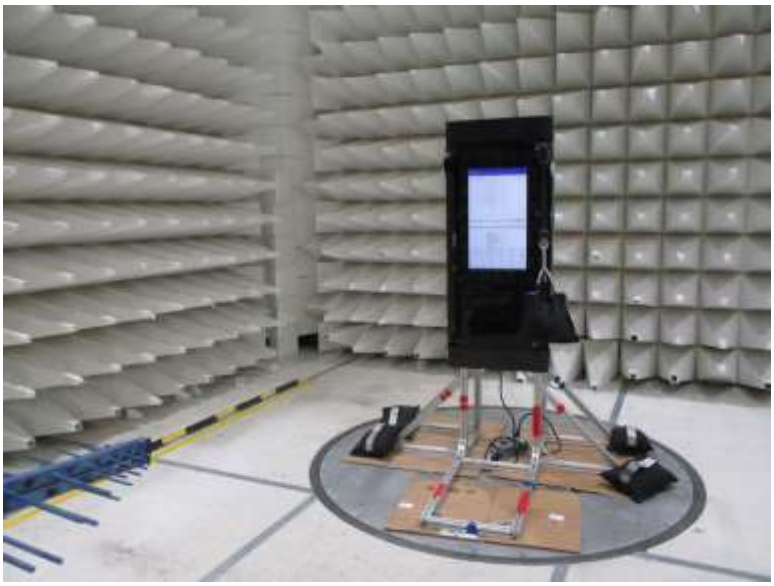


Front View



Back View

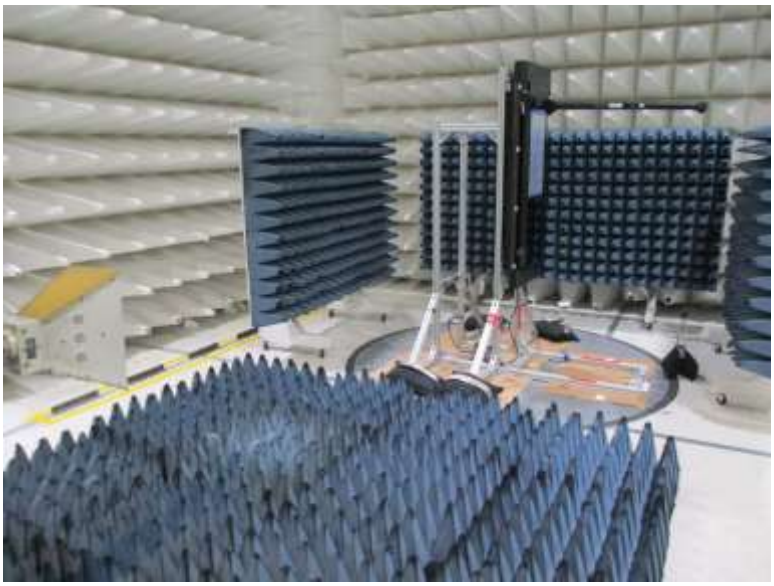
30MHz-1GHz



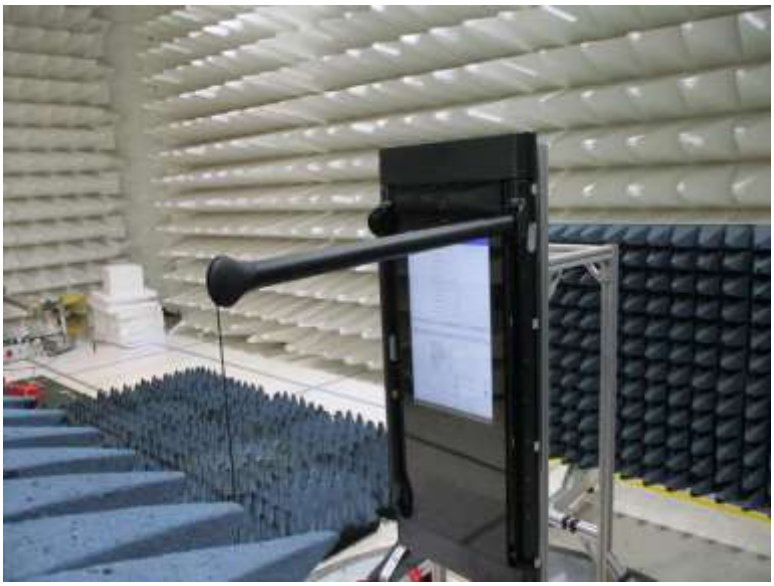
Front View

Back View

1GHz-12GHz

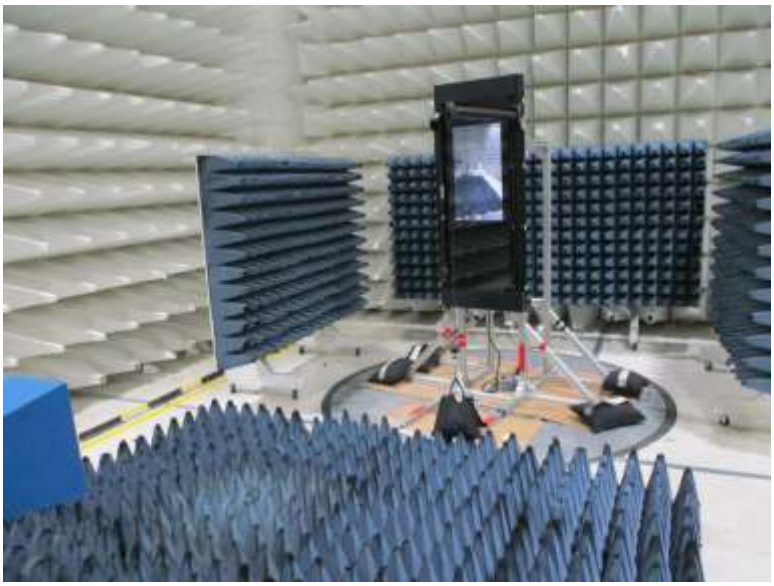


Front View

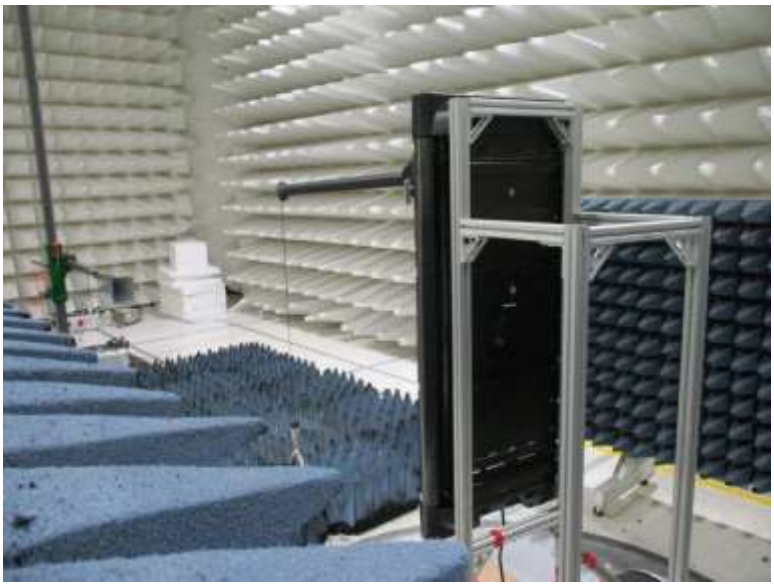


Back View

12GHz-40GHz



Front View



Back View

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Tonal**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**110285**	Date:	10/17/2024
Test Type:	**Conducted Emissions**	Time:	13:46:52
Tested By:	Hieu Song Nguyenpham	Sequence#:	170
Software:	EMITest 5.03.20		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

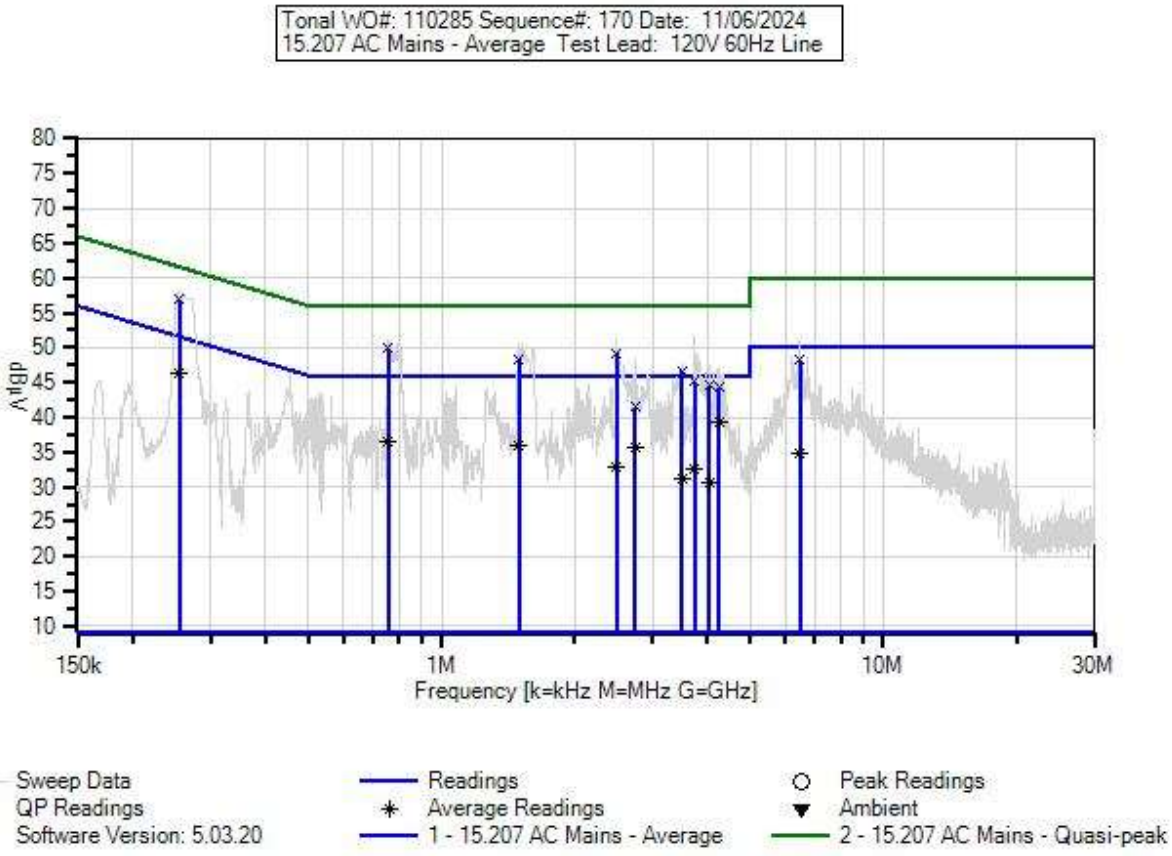
Conducted Emission
Frequency Range: 150kHz to 30MHz

Test Environment Conditions:
Temperature: 21.6°C
Humidity: 49%
Atmospheric Pressure: 101.4kPa

Highest Generation Frequency: 5.825GHz
Test Method: ANSI C63.10 (2020)

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. It is set in a testing mode, lifting a weight on a loop. Video and Camera are On.
All WIFI and Bluetooth modules are on.

Modification #1 was in place during testing.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	12/2/2022	12/2/2024
T2	ANP00880	Cable	RG214U	3/26/2024	3/26/2026
T3	ANP06691	Cable	PE3062-180	3/20/2024	3/20/2026
T4	AN03814	50uH LISN-1PH-Line (dB)	NSLK 8126	1/4/2023	1/4/2025
	AN03814	50uH LISN-1PH-Neutral (dB)	NSLK 8126	1/4/2023	1/4/2025
	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024
T5	ANP05258	High Pass Filter	HE9615-150K-50-720B	5/6/2024	5/6/2026

Measurement Data: Reading listed by margin. Test Lead: Line

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	254.718k QP	46.8	+9.9 +0.1	+0.1	+0.0	+0.0	+0.0	56.9	61.6	-4.7	Line
2	254.718k Ave	36.2	+9.9 +0.1	+0.1	+0.0	+0.0	+0.0	46.3	51.6	-5.3	Line
^	254.718k	48.1	+9.9 +0.1	+0.1	+0.0	+0.0	+0.0	58.2	51.6	+6.6	Line
4	758.671k QP	39.7	+9.9 +0.2	+0.1	+0.0	+0.1	+0.0	50.0	56.0	-6.0	Line
5	4.237M Ave	29.0	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	39.4	46.0	-6.6	Line
6	2.485M QP	39.0	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	49.2	56.0	-6.8	Line
7	1.494M QP	38.2	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	48.4	56.0	-7.6	Line
8	3.501M QP	36.2	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	46.6	56.0	-9.4	Line
9	758.671k Ave	26.2	+9.9 +0.2	+0.1	+0.0	+0.1	+0.0	36.5	46.0	-9.5	Line
^	758.671k	41.9	+9.9 +0.2	+0.1	+0.0	+0.1	+0.0	52.2	46.0	+6.2	Line
11	1.494M Ave	25.7	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	35.9	46.0	-10.1	Line
^	1.494M	41.0	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	51.2	46.0	+5.2	Line
13	2.744M Ave	25.6	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	35.8	46.0	-10.2	Line
14	3.739M QP	34.7	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	45.1	56.0	-10.9	Line
15	4.041M QP	34.1	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	44.5	56.0	-11.5	Line
16	4.237M QP	33.9	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	44.3	56.0	-11.7	Line
^	4.237M	41.2	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	51.6	46.0	+5.6	Line
18	6.463M QP	37.8	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	48.2	60.0	-11.8	Line
19	2.485M Ave	22.7	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	32.9	46.0	-13.1	Line
^	2.485M	41.1	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	51.3	46.0	+5.3	Line
21	3.739M Ave	22.2	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	32.6	46.0	-13.4	Line
^	3.739M	42.0	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	52.4	46.0	+6.4	Line

23 QP	2.744M	31.3	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	41.5	56.0	-14.5	Line
^	2.744M	36.6	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	46.8	46.0	+0.8	Line
25 Ave	3.501M	20.9	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	31.3	46.0	-14.7	Line
^	3.501M	39.8	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	50.2	46.0	+4.2	Line
27 Ave	6.463M	24.3	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	34.7	50.0	-15.3	Line
^	6.463M	41.7	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	52.1	50.0	+2.1	Line
29 Ave	4.041M	20.2	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	30.6	46.0	-15.4	Line
^	4.041M	39.1	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	49.5	46.0	+3.5	Line

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Place • Fremont, CA 94539 • (510) 249-1170		
Customer:	**Tonal**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**110285**	Date:	10/17/2024
Test Type:	**Conducted Emissions**	Time:	14:16:33
Tested By:	Hieu Song Nguyenpham	Sequence#:	171
Software:	EMITest 5.03.20		120V 60Hz

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 1			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 1			

Test Conditions / Notes:

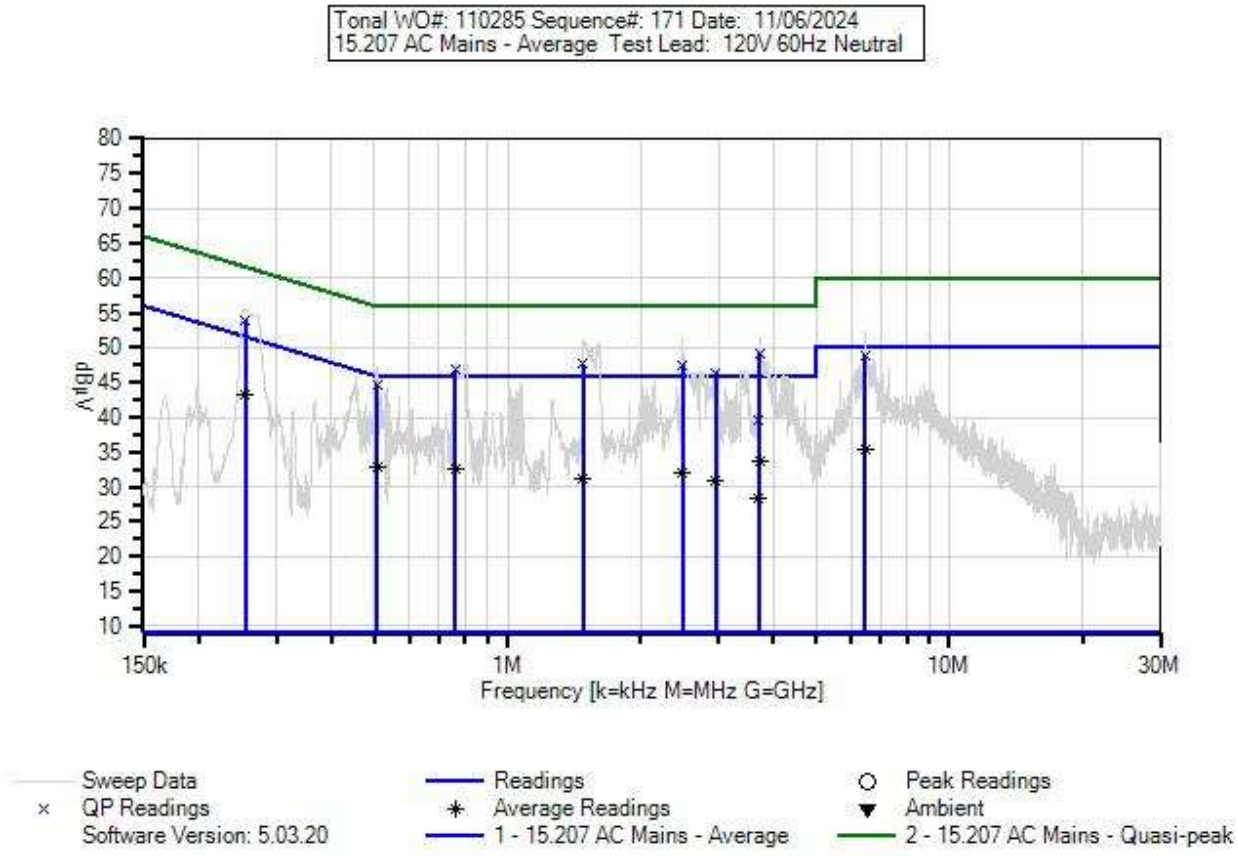
Conducted Emission
Frequency Range: 150kHz to 30MHz

Test Environment Conditions:
Temperature: 21.6°C
Humidity: 49%
Atmospheric Pressure: 101.4kPa

Highest Generation Frequency: 5.825GHz
Test Method: ANSI C63.10 (2020)

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. It is set in a testing mode, lifting a weight on a loop. Video and Camera are On.
All WIFI and Bluetooth modules are on.

Modification #1 was in place during testing.



Test Equipment:

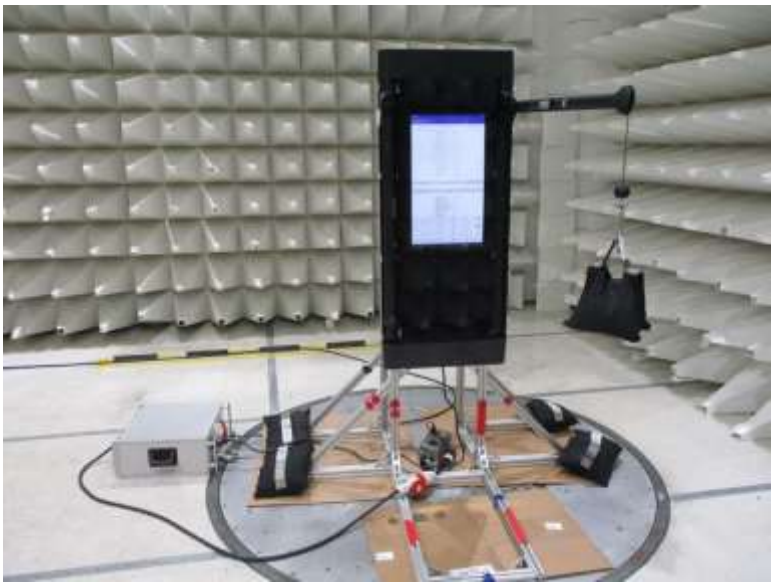
ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	12/2/2022	12/2/2024
T2	ANP00880	Cable	RG214U	3/26/2024	3/26/2026
T3	ANP06691	Cable	PE3062-180	3/20/2024	3/20/2026
	AN03814	50uH LISN-1PH-Line (dB)	NSLK 8126	1/4/2023	1/4/2025
T4	AN03814	50uH LISN-1PH-Neutral (dB)	NSLK 8126	1/4/2023	1/4/2025
	AN02660	Spectrum Analyzer	E4446A	12/6/2022	12/6/2024
T5	ANP05258	High Pass Filter	HE9615-150K-50-720B	5/6/2024	5/6/2026

Measurement Data: Reading listed by margin. Test Lead: Neutral

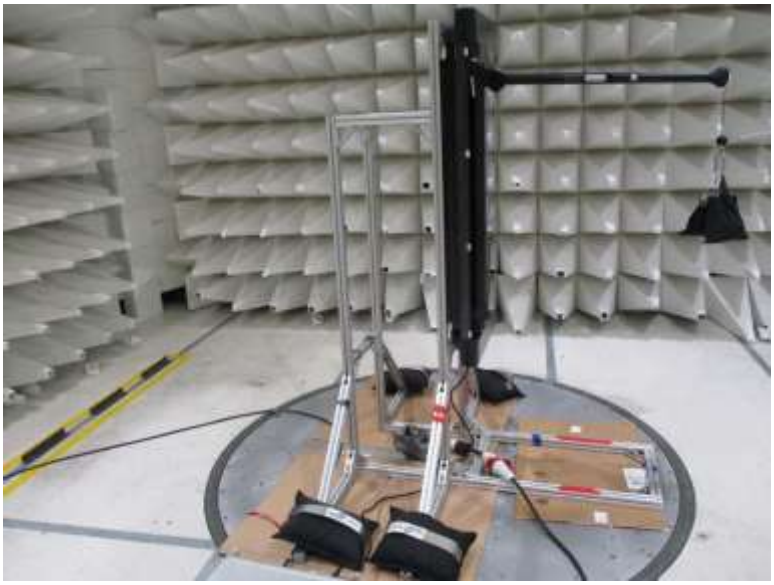
#	Freq	Rdng	T1	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
			T5								
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	3.722M	38.8	+9.9	+0.2	+0.1	+0.1	+0.0	49.2	56.0	-6.8	Neutr
	QP		+0.1								
2	255.445k	44.0	+9.8	+0.1	+0.0	+0.0	+0.0	54.0	61.6	-7.6	Neutr
	QP		+0.1								
3	255.445k	33.3	+9.8	+0.1	+0.0	+0.0	+0.0	43.3	51.6	-8.3	Neutr
	Ave		+0.1								
^	255.445k	44.9	+9.8	+0.1	+0.0	+0.0	+0.0	54.9	51.6	+3.3	Neutr
			+0.1								
5	1.485M	37.4	+9.9	+0.1	+0.0	+0.1	+0.0	47.6	56.0	-8.4	Neutr
	QP		+0.1								
6	2.489M	37.3	+9.9	+0.1	+0.0	+0.1	+0.0	47.5	56.0	-8.5	Neutr
	QP		+0.1								
7	761.580k	36.7	+9.9	+0.1	+0.0	+0.0	+0.0	46.9	56.0	-9.1	Neutr
	QP		+0.2								
8	2.961M	36.2	+9.9	+0.1	+0.0	+0.1	+0.0	46.4	56.0	-9.6	Neutr
	QP		+0.1								
9	6.449M	38.5	+9.9	+0.2	+0.1	+0.1	+0.0	48.9	60.0	-11.1	Neutr
	QP		+0.1								
10	506.032k	34.5	+9.9	+0.1	+0.0	+0.0	+0.0	44.7	56.0	-11.3	Neutr
	QP		+0.2								
11	3.722M	23.3	+9.9	+0.2	+0.1	+0.1	+0.0	33.7	46.0	-12.3	Neutr
	Ave		+0.1								
^	3.722M	42.2	+9.9	+0.2	+0.1	+0.1	+0.0	52.6	46.0	+6.6	Neutr
			+0.1								
13	506.032k	22.6	+9.9	+0.1	+0.0	+0.0	+0.0	32.8	46.0	-13.2	Neutr
	Ave		+0.2								
^	506.032k	38.9	+9.9	+0.1	+0.0	+0.0	+0.0	49.1	46.0	+3.1	Neutr
			+0.2								
15	761.580k	22.4	+9.9	+0.1	+0.0	+0.0	+0.0	32.6	46.0	-13.4	Neutr
	Ave		+0.2								
^	761.580k	39.4	+9.9	+0.1	+0.0	+0.0	+0.0	49.6	46.0	+3.6	Neutr
			+0.2								
17	2.489M	21.8	+9.9	+0.1	+0.0	+0.1	+0.0	32.0	46.0	-14.0	Neutr
	Ave		+0.1								
^	2.489M	41.5	+9.9	+0.1	+0.0	+0.1	+0.0	51.7	46.0	+5.7	Neutr
			+0.1								
19	6.449M	25.0	+9.9	+0.2	+0.1	+0.1	+0.0	35.4	50.0	-14.6	Neutr
	Ave		+0.1								
^	6.449M	42.2	+9.9	+0.2	+0.1	+0.1	+0.0	52.6	50.0	+2.6	Neutr
			+0.1								
21	1.485M	21.0	+9.9	+0.1	+0.0	+0.1	+0.0	31.2	46.0	-14.8	Neutr
	Ave		+0.1								
^	1.485M	41.5	+9.9	+0.1	+0.0	+0.1	+0.0	51.7	46.0	+5.7	Neutr
			+0.1								

23	2.961M Ave	20.6	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	30.8	46.0	-15.2	Neutr
^	2.961M	38.9	+9.9 +0.1	+0.1	+0.0	+0.1	+0.0	49.1	46.0	+3.1	Neutr
25	3.705M QP	29.2	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	39.6	56.0	-16.4	Neutr
26	3.705M Ave	17.9	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	28.3	46.0	-17.7	Neutr
^	3.705M	39.7	+9.9 +0.1	+0.2	+0.1	+0.1	+0.0	50.1	46.0	+4.1	Neutr

Test Setup Photo(s)



Front View



Side View

APPENDIX A: MODIFICATIONS MADE DURING TESTING

This list is a summary of the conditions noted for or modifications made to the equipment during testing.

Summary of Conditions
Modification #1 (Mod#1) = Added a ferrite (Wurth: 742 712 21) on lower resistor wire. Green Resistor

Modifications listed above must be incorporated into all production units.

Modification #1

Supplemental Information

Measurement Uncertainty

Uncertainty Value	Parameter
5.77 dB	Radiated Emissions
0.673 dB	RF Conducted Measurements
5.77 x 10^{-10}	Frequency Deviation
0.00005 s	Time Deviation
3.18 dB	Mains Conducted Emissions

Uncertainties reported are worst case for all CKC Laboratories' sites and represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k=2. Compliance is deemed to occur provided measurements are below the specified limits.

Emissions Test Details

TESTING PARAMETERS

Unless otherwise indicated, the following configuration parameters are used for equipment setup: The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. Cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the setup photographs. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables.

The emissions data was taken with a spectrum analyzer or receiver. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in the table below. The corrected data was then compared to the applicable emission limits. Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dBµV/m, the spectrum analyzer reading in dBµV was corrected by using the following formula. This reading was then compared to the applicable specification limit. Individual measurements were compared with the displayed limit value in the margin column. The margin was calculated based on subtracting the limit value from the corrected measurement value; a positive margin represents a measurement exceeding the limit, while a negative margin represents a measurement less than the limit.

SAMPLE CALCULATIONS		
	Meter reading	(dBµV)
+	Antenna Factor	(dB/m)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dBµV/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed were used to collect the emissions data. A spectrum analyzer or receiver was used for all measurements. Unless otherwise specified, the following table shows the measuring equipment bandwidth settings that were used in designated frequency bands. For testing emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used.

MEASURING EQUIPMENT BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz
RADIATED EMISSIONS	1000 MHz	>1 GHz	1 MHz

SPECTRUM ANALYZER/RECEIVER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the emissions tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "positive peak" detector mode. Whenever a "quasi-peak" or "average" reading was recorded, the measurement was annotated with a "QP" or an "Ave" on the appropriate rows of the data sheets. In cases where quasi-peak or average limits were employed and data exists for multiple measurement types for the same frequency then the peak measurement was retained in the report for reference, however the numbering for the affected row was removed and an arrow or caret ("^") was placed in the far left-hand column indicating that the row above takes precedence for comparison to the limit. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the spectrum analyzer or receiver recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature called "peak hold," the measurement device had the ability to measure intermittent or low duty cycle transient emission peak levels. In this mode the measuring device made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

Quasi-peak measurements were taken using the quasi-peak detector when the true peak values exceeded or were within 2 dB of a quasi-peak specification limit. Additional QP measurements may have been taken at the discretion of the operator.

Average

Average measurements were taken using the average detector when the true peak values exceeded or were within 2 dB of an average specification limit. Additional average measurements may have been taken at the discretion of the operator. If the specification or test procedure requires trace averaging, then the averaging was performed using 100 samples or as required by the specification. All other average measurements are performed using video bandwidth averaging. To make these measurements, the test engineer reduces the video bandwidth on the measuring device until the modulation of the signal is filtered out. At this point, the measuring device is set into the linear mode and the scan time is reduced.

End of Report