Tonal

TEST REPORT FOR

Trainer
Model: T1522

Tested to The Following Standards:

FCC Part 15 Subpart E Section(s)

15.207 & 15.407
(NII 5.15 – 5.25GHz)
Wi-Fi 5.1 GHz for Hydra Board for Main System

Report No.: 105488-28

Date of issue: February 15, 2022

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:

Tonal
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Representative: Lars Gilstrom
Customer Reference Number: PO1203

REPORT PREPARED BY:

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Project Number: 105488

DATE OF EQUIPMENT RECEIPT: December 6 ,2021
DATE(S) OF TESTING: December 6-10, 13,17-21, 23-24, 2021
January 3-5, 7, 25-26, 2022

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)

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(g)	Frequency Stability	NA	NA1
15.407(b)	Radiated Emissions & Band Edge	Mods. #1, #2, #3 #4, #5, #6	PASS
15.207	AC Conducted Emissions	NA	PASS

NA = Not Applicable
NA1 = Not Applicable because the EUT is a client device.

ISO/IEC 17025 Decision Rule
The declaration of pass or fail herein is based upon assessment to the specification(s) listed above, including where applicable, assessment 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
Radiated Emissions only; Configurations: 1 & 3 Mod. #1 = Copper tape between microphone PCBA gold-plated pads and chassis. Mod. #2 = Screws on hydra backplane mounting bracket. Mod. #3 = Copper tape on hydra backplane to display backplane. Mod. #4 = Ferrite (1 each) 742-712-21 on upper lead to shunt. Mod. #5 = Door bonding replaced with three (3) lug-to-lug wire strap. Mod. #6 = Set display mode into spread spectrum.

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
The Test Setup Photos are incorporated by reference 105488-28_Test Setup_Photos.

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 1

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

Device Name	Manufacturer	Model #	S/N
Trainer	Tonal System	T1522	02016558
Hydra Board	Tonal System	500-0801 Rev 008	080100702000476
Internal Power Supply	Artesyn Embedded Tech.	LCM1500W-T	K510UN001BBVC-8-416 Revision: BV Firmware 6/2/2021
Direct Bond 2312 Touch screen display	BOE	380-0015 Rev. 1-1 CJ238FSB-TG21	00000015

Support Equipment:

Device Name	Manufacturer	Model #	S/N
None			

Configuration 3

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

Device Name	Manufacturer	Model #	S/N
Trainer	Tonal System	T1522	02016558
Hydra Board	Tonal System	500-0801 Rev 008	080100702000476
Internal Power Supply	Artesyn Embedded Tech.	LCM1500W-T	K510UN001BBVC-8-416 Revision: BV Firmware 6/2/2021
Direct Bond 2312 Touch screen display	BOE	380-0015 Rev. 1-1 CJ238FSB-TG21	00000015

Support Equipment:

Device Name	Manufacturer	Model #	S/N
Laptop	Lenovo	X1 Carbon Gen 9	PF-37KBYM
Laptop Power Supply	Lenovo	SA10R16922	8SSA10R16922C2TJ-19M0G0G

Configuration 9

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

Device Name	Manufacturer	Model #	S/N
Hydra Board	Tonal System	500-0801 Rev 008	080100702000476

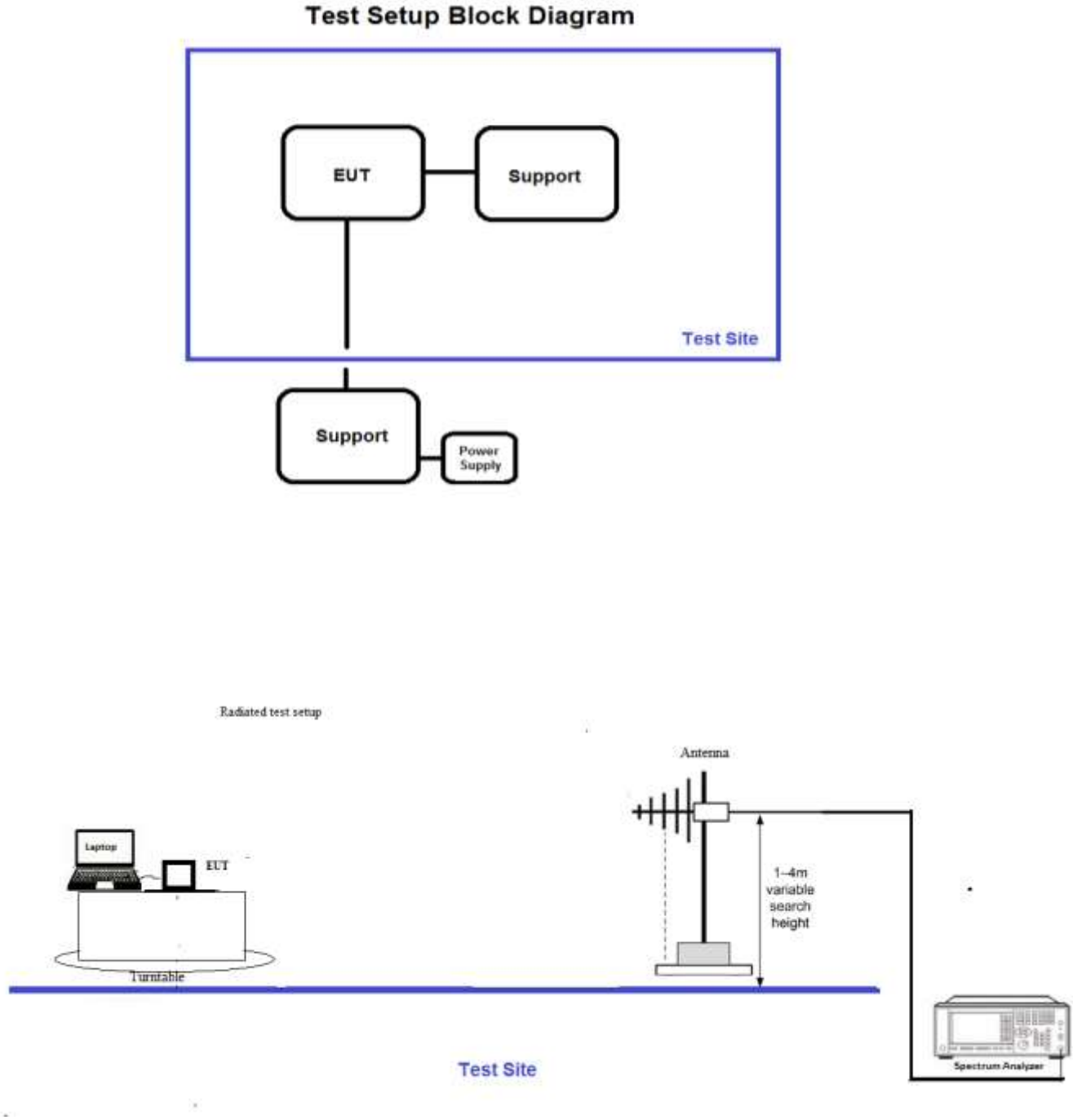
Support Equipment:

Device Name	Manufacturer	Model #	S/N
Laptop	Lenovo	X1 Carbon Gen 9	PF-37KBYM
Laptop Power Supply	Lenovo	SA10R16922	8SSA10R16922C2TJ-19M0G0G

General Product Information:

Product Information	Manufacturer-Provided Details
Equipment Type:	Stand-Alone Equipment
Type of Wideband System:	Wi-Fi 5.1GHz for Hydra Board for Main System
Operating Frequency Range:	5150-5250MHz
Modulation Type(s):	OFDM, HT20, HT40, HT80
Maximum Duty Cycle:	100%
Number of TX Chains:	2
Antenna Type(s) and Gain:	External 4.00dBi
Beamforming Type:	NA
Antenna Connection Type:	External Connector
Nominal Input Voltage:	15VDC
Firmware / Software used for Test:	QRCT (Qualcomm Radio Control Toolkit) Version 4
The validity of results is dependent on the stated product details, the accuracy of which the manufacturer assumes full responsibility.	

Block Diagram of Test Setup(s)



FCC Part 15 Subpart E

15.215 Occupied Bandwidth

Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hoang Cao
Test Method:	ANSI C63.10 (2013), KDB 789033	Test Date(s):	12/8/2021
Configuration:	9		
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)	22.5	Relative Humidity (%):	45

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03360	Cable	Astrolab	32022-2-29094-36TC	4/9/2020	4/9/2022
P06239	Attenuator	Weinschel	54A-10	6/17/2020	6/17/2022
03471	Spectrum Analyzer	Agilent	E4440A	2/11/2020	2/11/2022

26dB Occupied Bandwidth

Test Data Summary					
Frequency (MHz)	**Antenna Port**	**Modulation**	**Measured (kHz)**	**Limit (kHz)**	**Results**
5180	1	OFDM	24314	None	NA
5220	1	OFDM	24305		
5240	1	OFDM	25254		
5180	1	HT20	25636	None	NA
5220	1	HT20	25482		
5240	1	HT20	25629		
5190	1	HT40	41915	None	NA
5230	1	HT40	41607		
5210	1	HT80	83556	None	NA

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
5180	2	OFDM	24580	None	NA
5220	2	OFDM	24756		
5240	2	OFDM	24267		
5180	2	HT20	22895	None	NA
5220	2	HT20	22778		
5240	2	HT20	23008		
5190	2	HT40	41927	None	NA
5230	2	HT40	41797		
5210	2	HT80	84432	None	NA

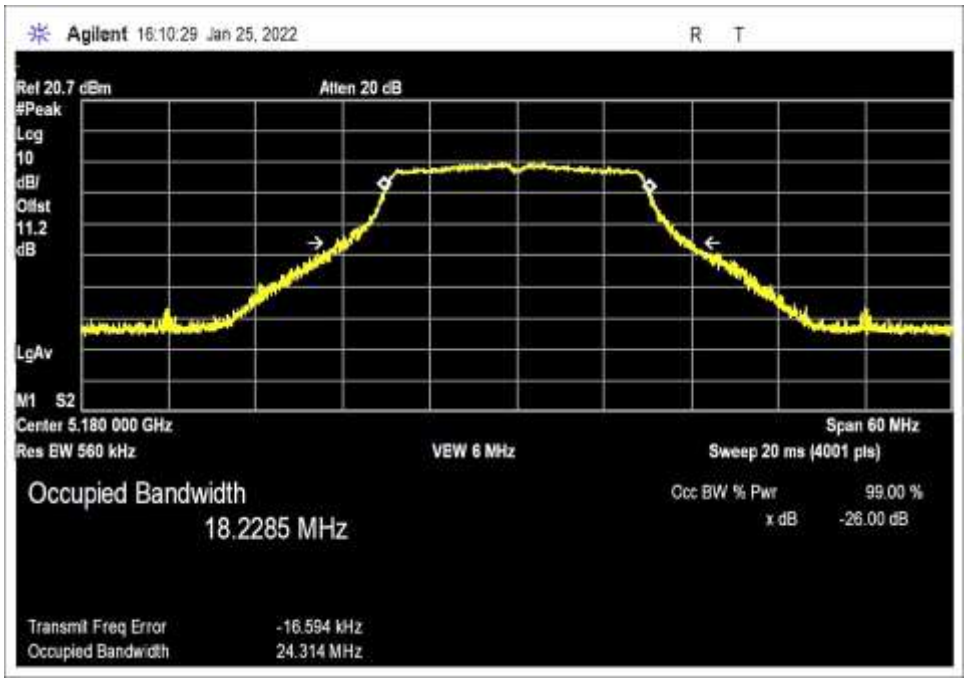
99% Occupied Bandwidth

Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
5180	1	OFDM	18228	None	NA
5220	1	OFDM	18408		
5240	1	OFDM	18376		
5180	1	HT20	18379	None	NA
5220	1	HT20	18407		
5240	1	HT20	18376		
5190	1	HT40	36322	None	NA
5230	1	HT40	36348		
5210	1	HT80	75650	None	NA

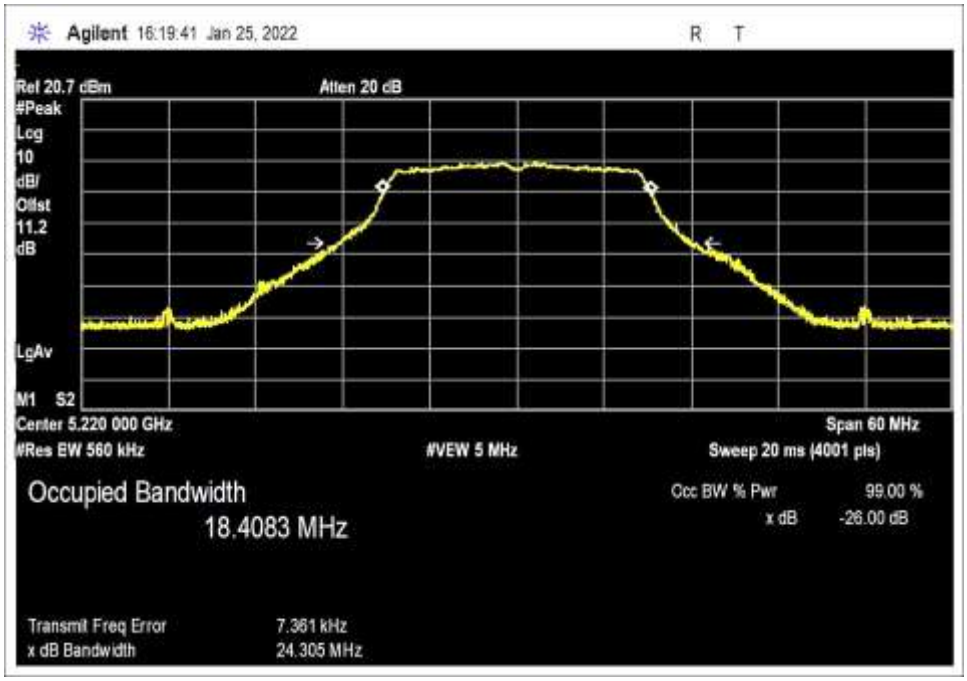
Test Data Summary					
Frequency (MHz)	Antenna Port	Modulation	Measured (kHz)	Limit (kHz)	Results
5180	2	OFDM	18332	None	NA
5220	2	OFDM	18235		
5240	2	OFDM	18245		
5180	2	HT20	18179	None	NA
5220	2	HT20	18176		
5240	2	HT20	18205		
5190	2	HT40	36344	None	NA
5230	2	HT40	36316		
5210	2	HT80	75608	None	NA

Plots

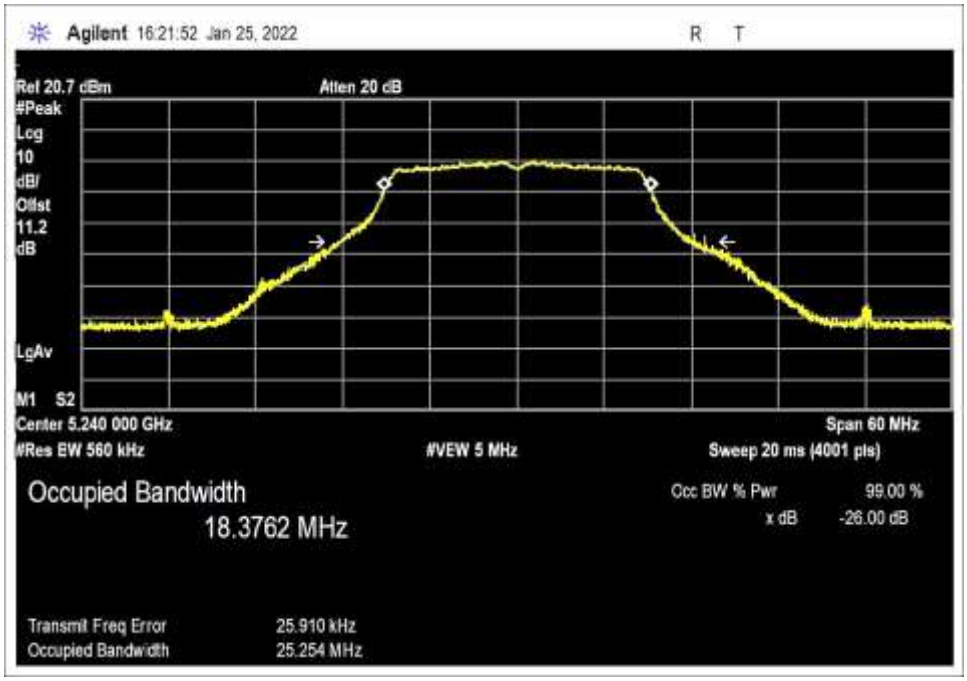
26dB Occupied Bandwidth – Chain 0 - OFDM



Low Channel

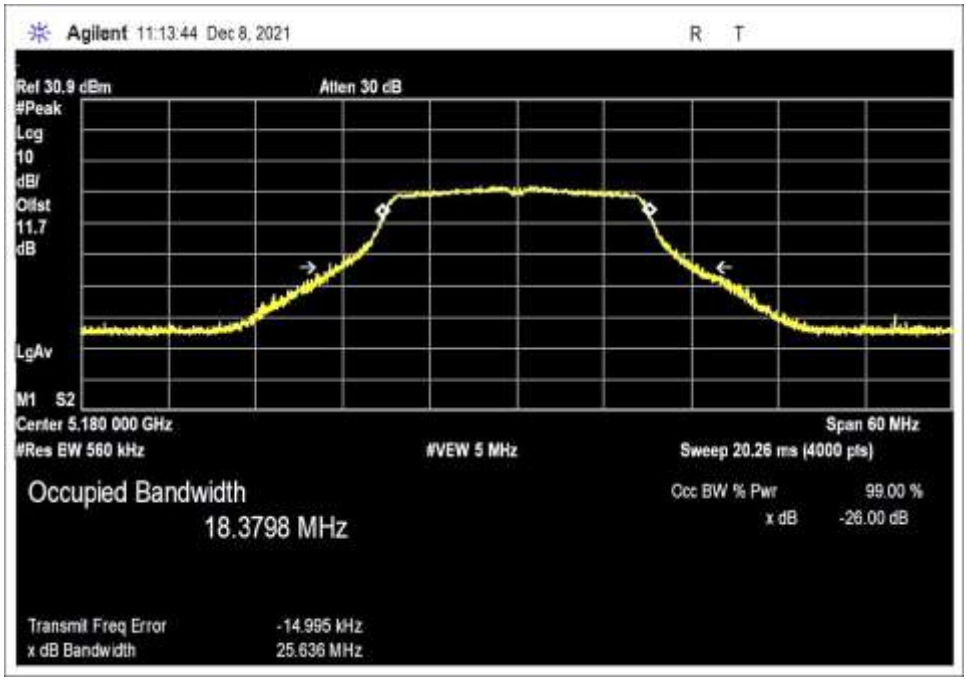


Middle Channel

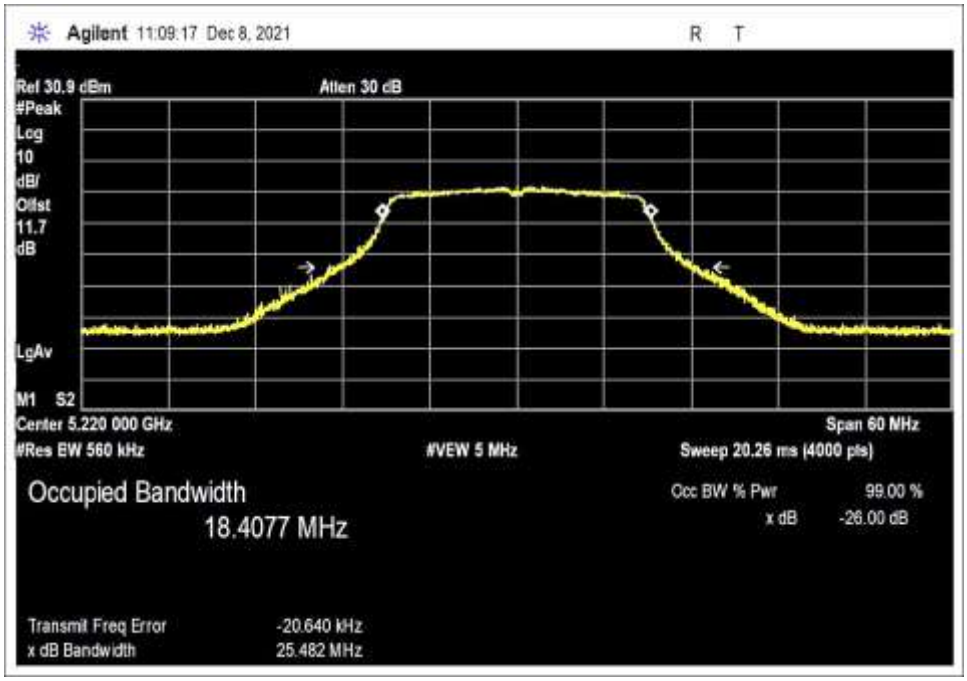


High Channel

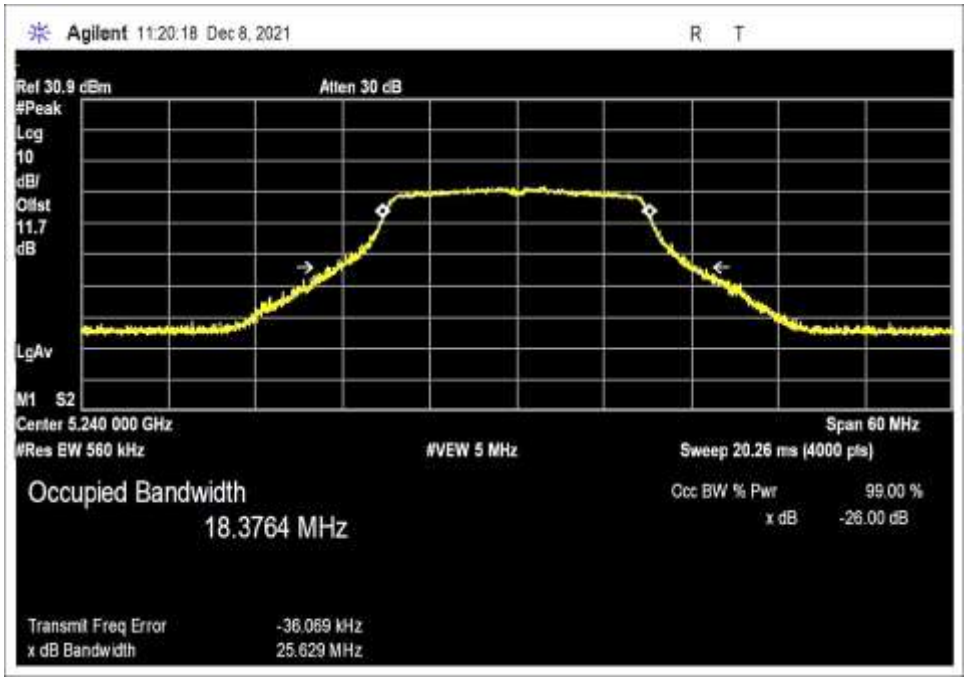
<u>26dB Occupied Bandwidth – Chain 0 - 20MHz</u>



Low Channel

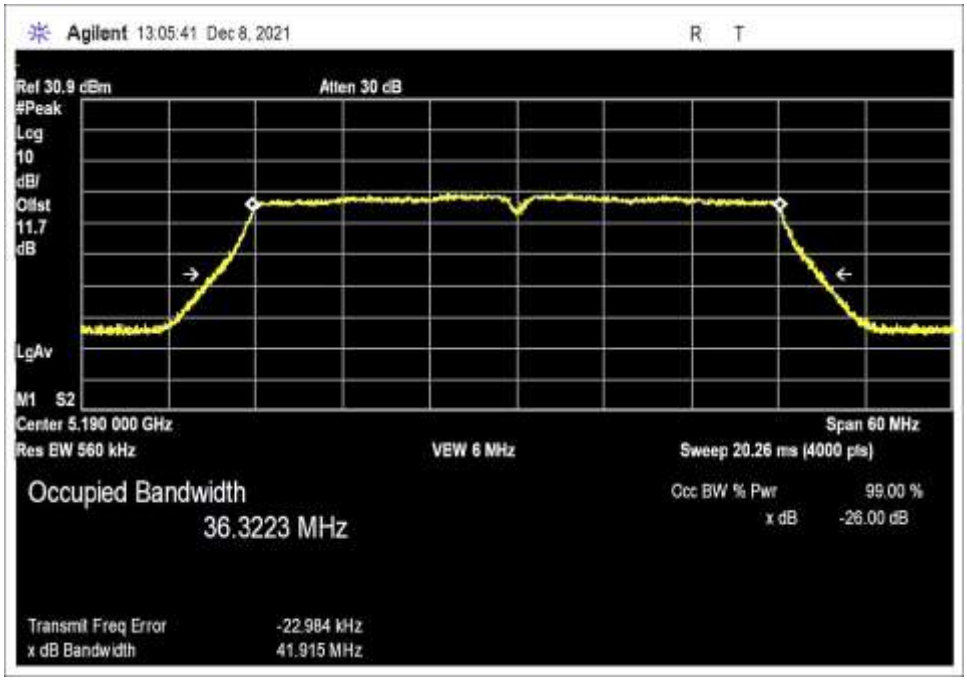


Middle Channel

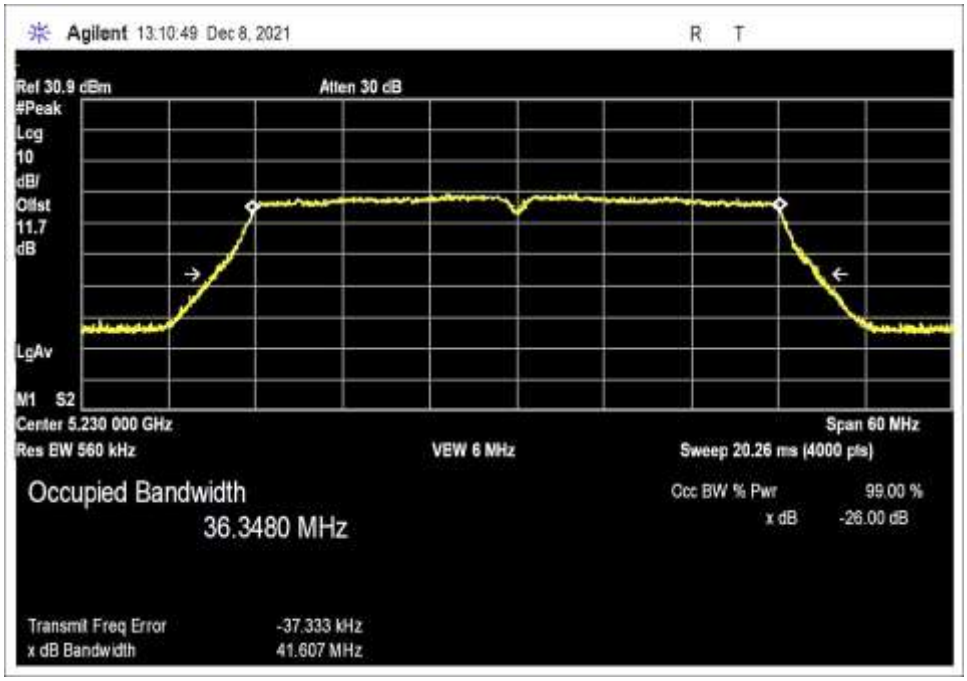


High Channel

26dB Occupied Bandwidth – Chain 0 - 40MHz

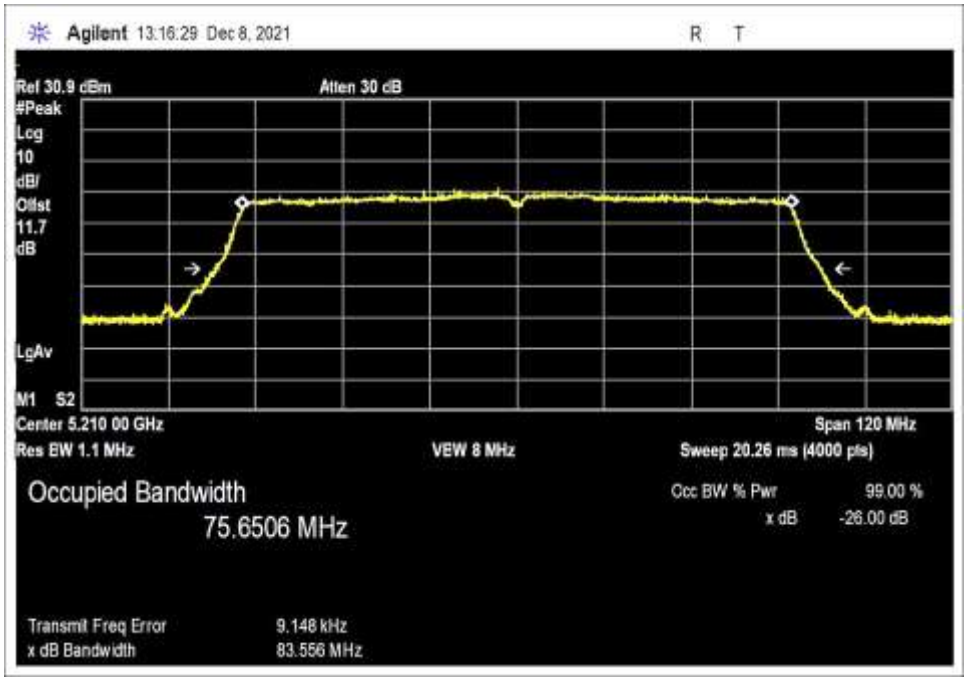


Low Channel

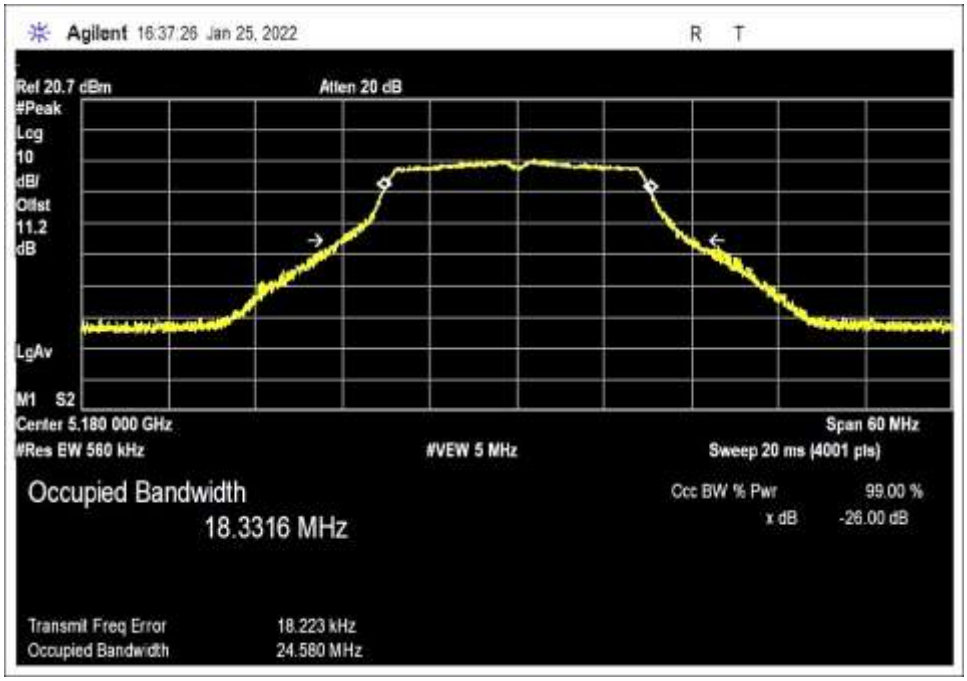


High Channel

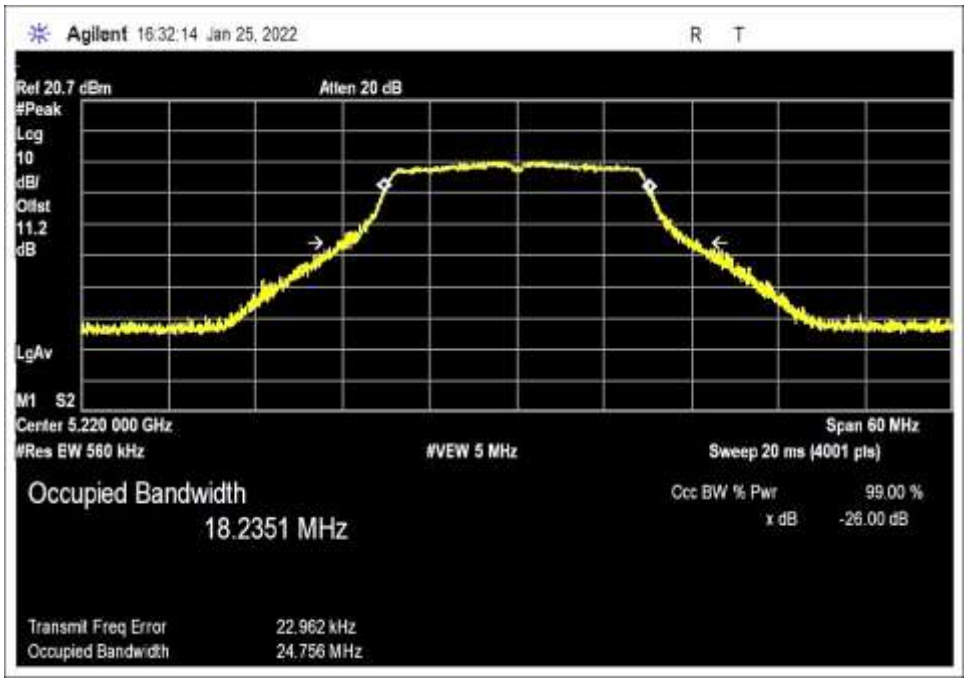
Chain 0, 80MHz



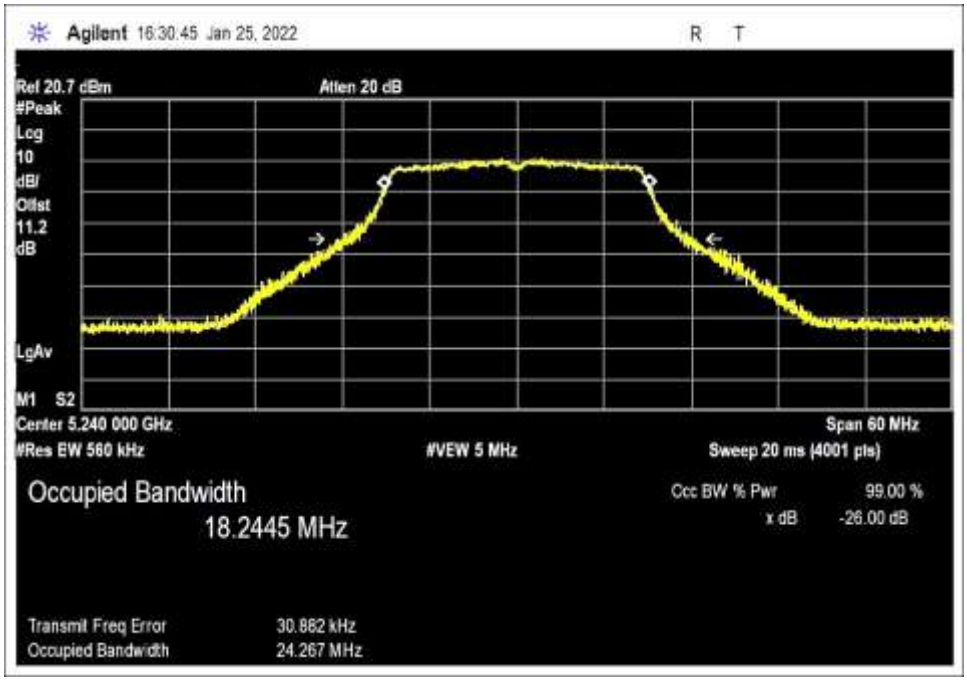
99% Occupied Bandwidth – Chain 1 - OFDM



Low Channel

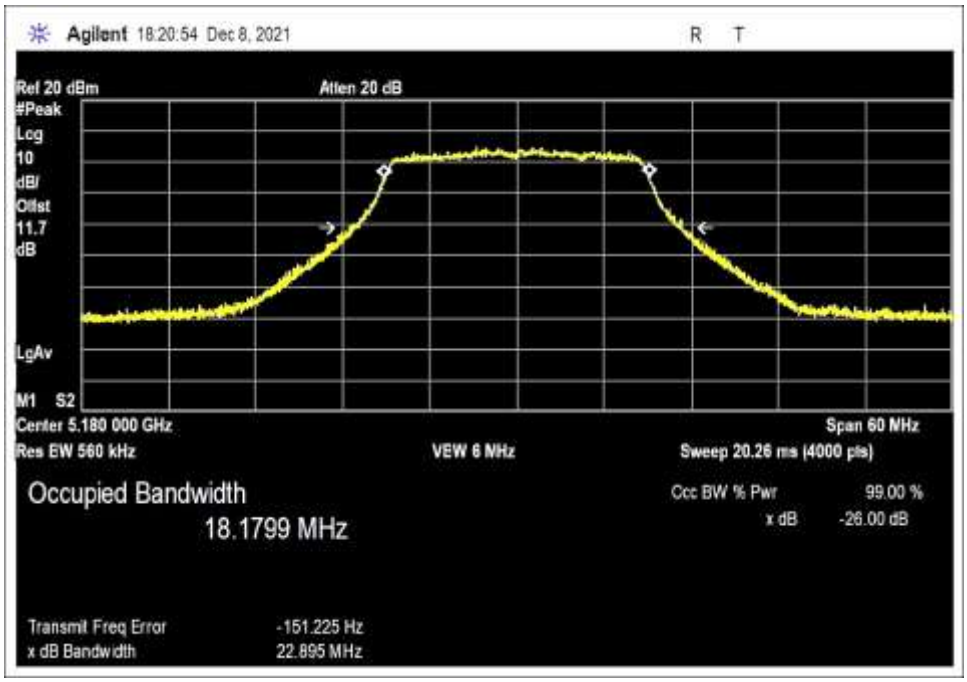


Middle Channel

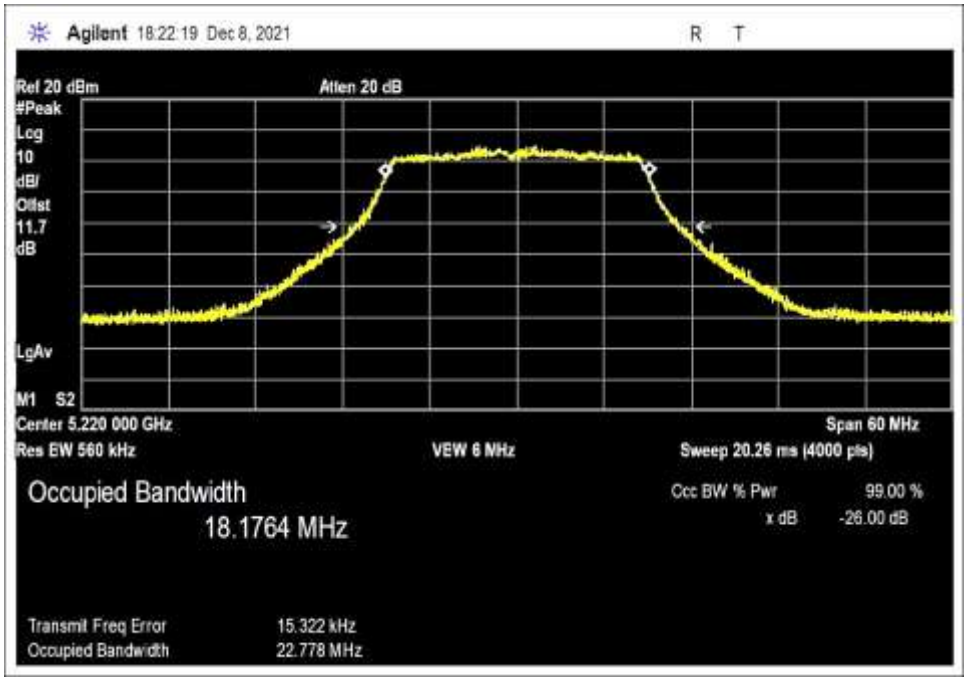


High Channel

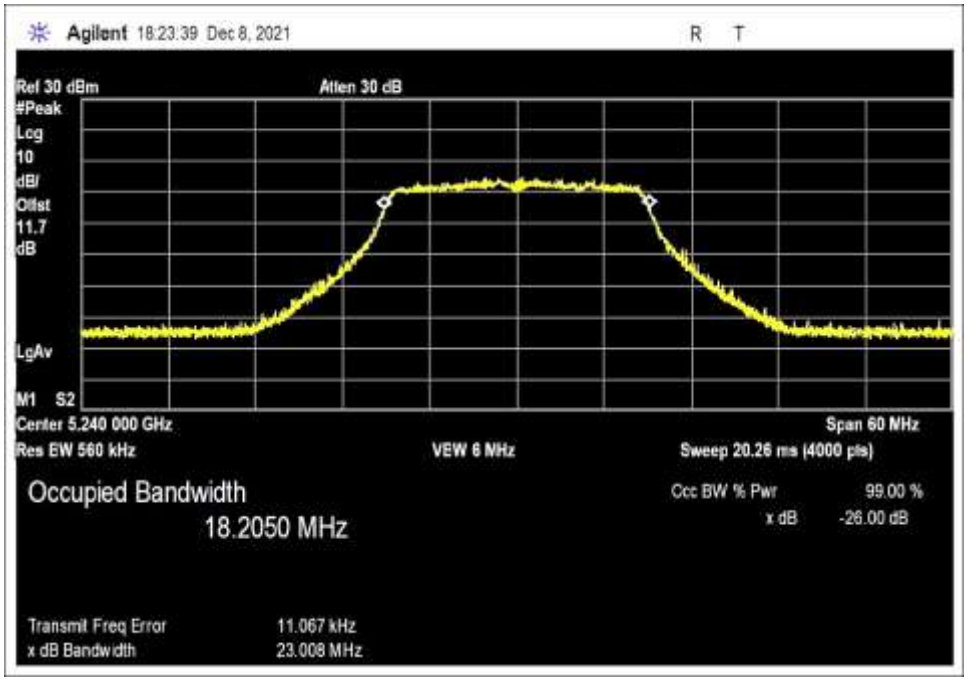
99% Occupied Bandwidth – Chain 1 - 20MHz



Low Channel

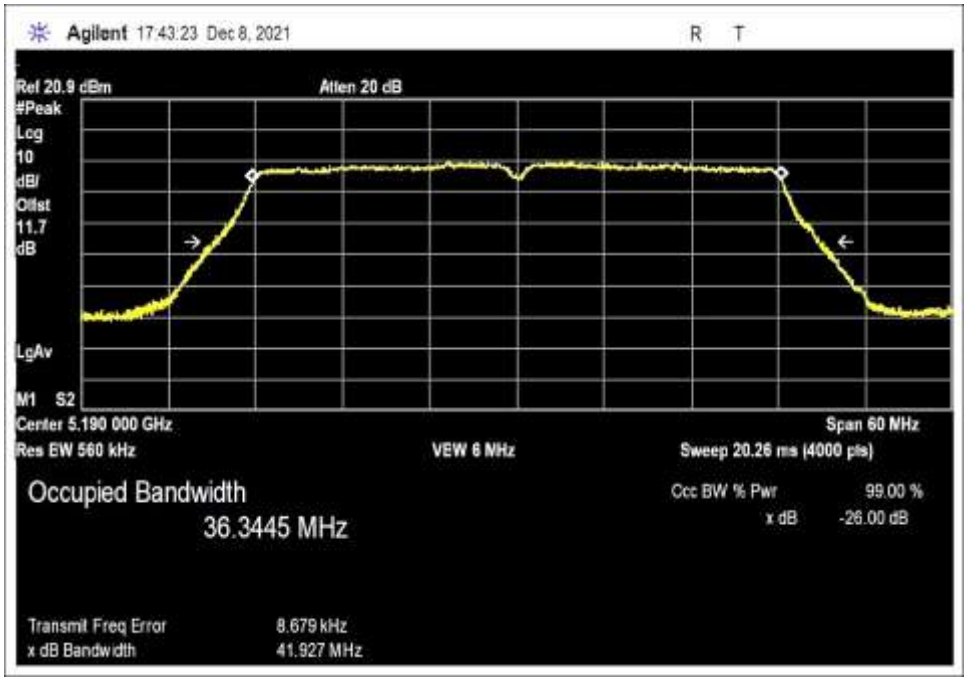


Middle Channel

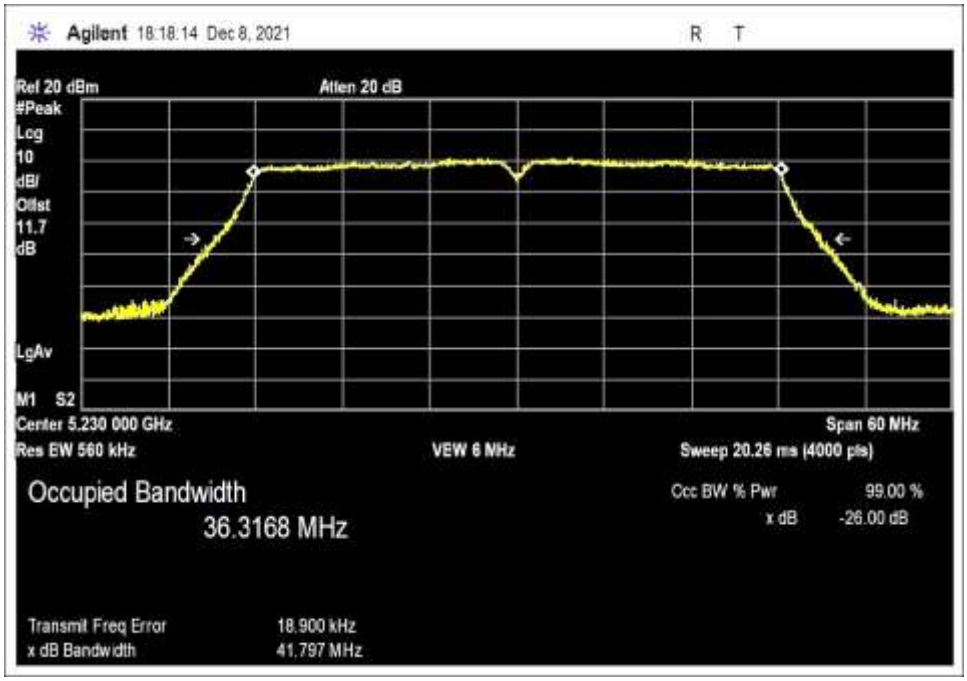


High Channel

<u>99% Occupied Bandwidth – Chain 1 - 40MHz</u>

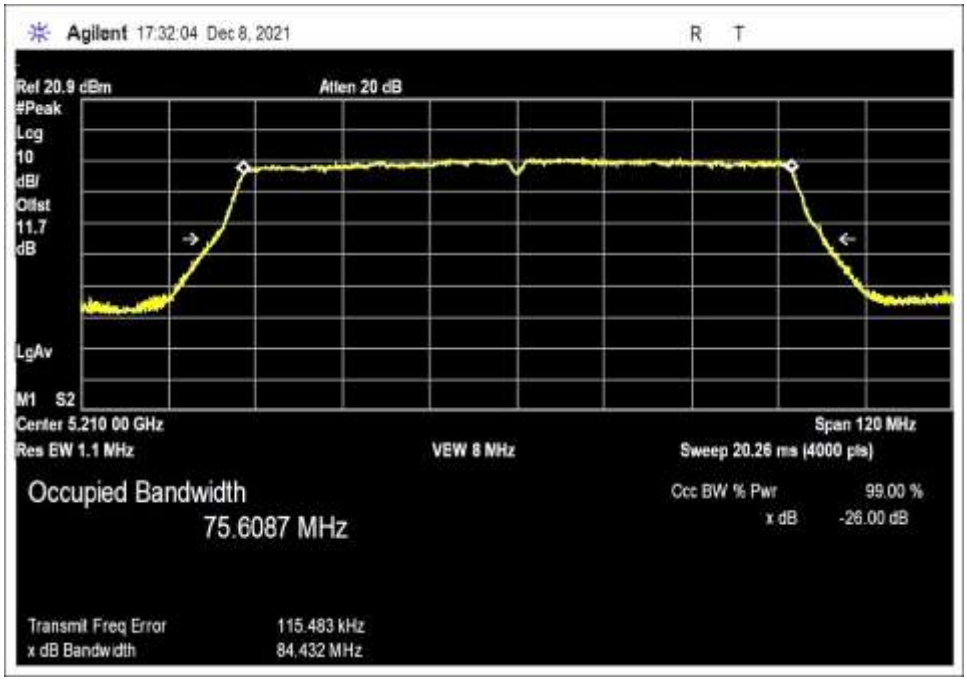


Low Channel



High Channel

<u>99% Occupied Bandwidth – Chain 1 - 80MHz</u>



15.407(a)(1) Output Power

Test Setup/Conditions			
Test Location:	Fremont Lab C3	Test Engineer:	Hoang Cao
Test Method:	ANSI C63.10 (2013), KDB 789033	Test Date(s):	12/8/2021
Configuration:	9		
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)	22.5	Relative Humidity (%):	45

Test Equipment					
Asset#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03360	Cable	Astrolab	32022-2-29094-36TC	4/9/2020	4/9/2022
P06239	Attenuator	Weinschel	54A-10	6/17/2020	6/17/2022
03471	Spectrum Analyzer	Agilent	E4440A	2/11/2020	2/11/2022

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	HT20/1	8.85	8.87	8.89	0.02
5220	HT20/1	9.00	9.00	9.03	0.03
5240	HT20/1	9.20	9.23	9.25	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
$V_{Nominal}$:	15VDC
$V_{Minimum}$:	12.75VDC
$V_{Maximum}$:	17.25VDC

Test Data Summary - RF Conducted Measurement – Chain 0					
Measurement Option: AVGSA-1					
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Measured (dBm)**	**Limit (dBm)**	**Results**
5180	OFDM	External 4.00dBi	6.28	≤23.9	Pass
5220	OFDM	External 4.00dBi	5.94	≤23.9	Pass
5240	OFDM	External 4.00dBi	6.34	≤23.9	Pass
5180	HT20	External 4.00dBi	8.19	≤23.9	Pass
5220	HT20	External 4.00dBi	8.10	≤23.9	Pass
5240	HT20	External 4.00dBi	8.03	≤23.9	Pass
5190	HT40	External 4.00dBi	8.69	≤23.9	Pass
5230	HT40	External 4.00dBi	8.42	≤23.9	Pass
5210	HT80	External 4.00dBi	8.17	≤23.9	Pass

Test Data Summary - RF Conducted Measurement – Chain 1					
Measurement Option: AVGSA-1					
Frequency (MHz)	**Modulation**	**Ant. Type / Gain (dBi)**	**Measured (dBm)**	**Limit (dBm)**	**Results**
5180	OFDM	External 4.00dBi	6.62	≤23.9	Pass
5220	OFDM	External 4.00dBi	6.93	≤23.9	Pass
5240	OFDM	External 4.00dBi	7.50	≤23.9	Pass
5180	HT20	External 4.00dBi	8.87	≤23.9	Pass
5220	HT20	External 4.00dBi	9.00	≤23.9	Pass
5240	HT20	External 4.00dBi	9.23	≤23.9	Pass
5190	HT40	External 4.00dBi	8.92	≤23.9	Pass
5230	HT40	External 4.00dBi	9.11	≤23.9	Pass
5210	HT80	External 4.00dBi	8.87	≤23.9	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):

$$Limit = 30 - Roundup(G - 6)$$

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

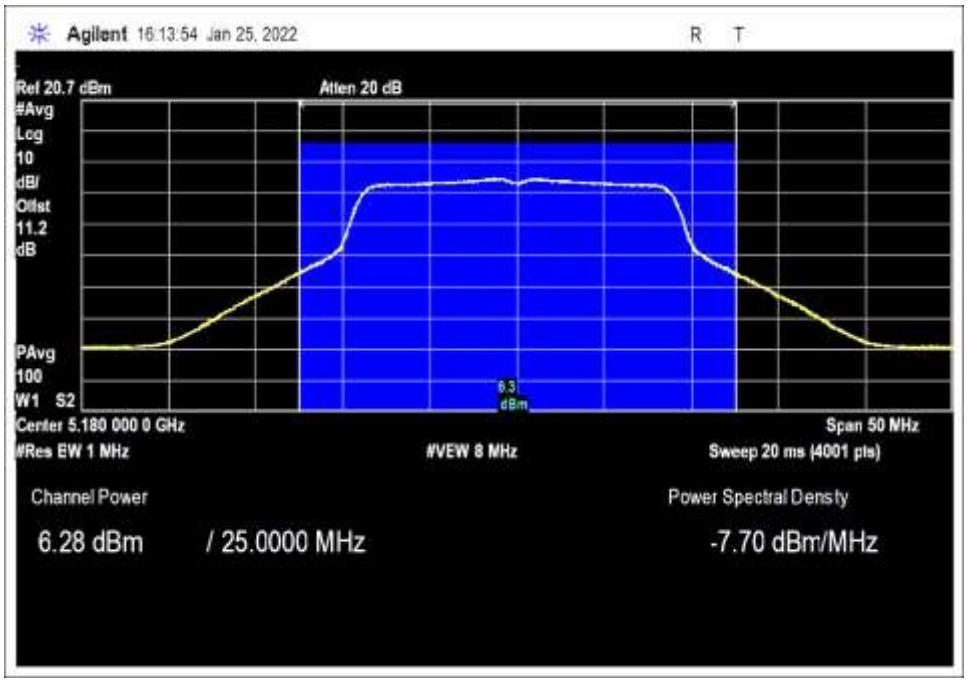
$$Limit = 30 - Roundup(G - 23)$$

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):

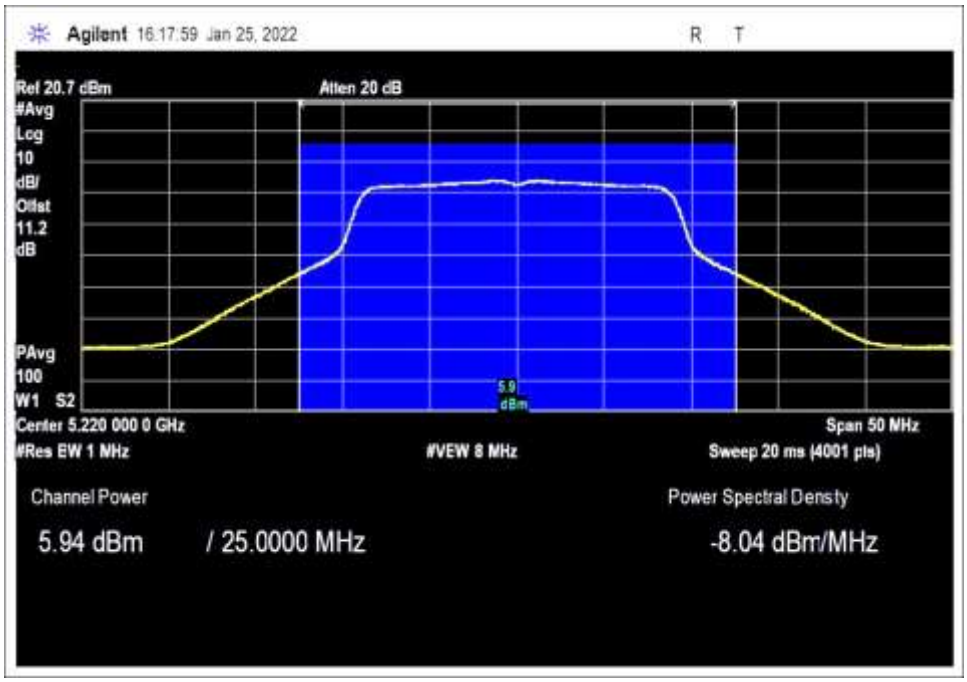
$$Limit = 24 - Roundup(G - 6)$$

Plots

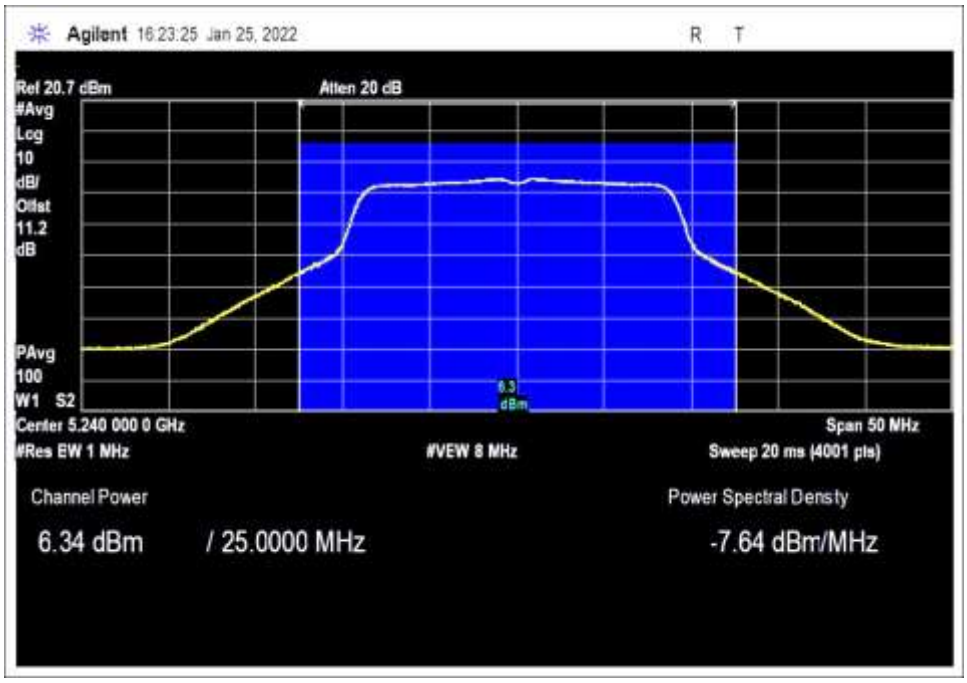
Chain 0, OFDM



Low Channel

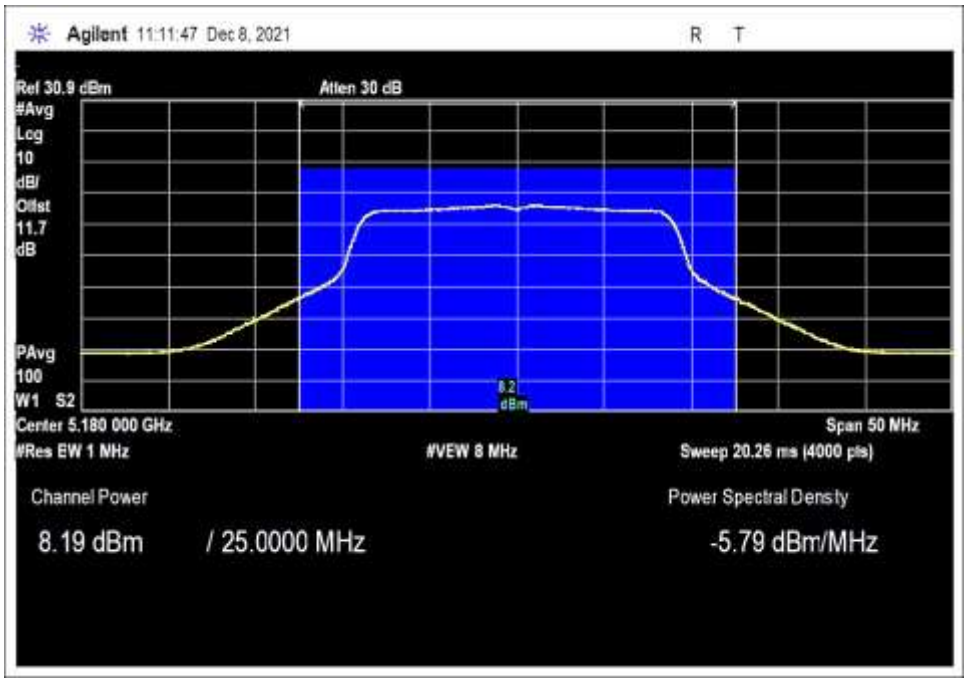


Middle Channel

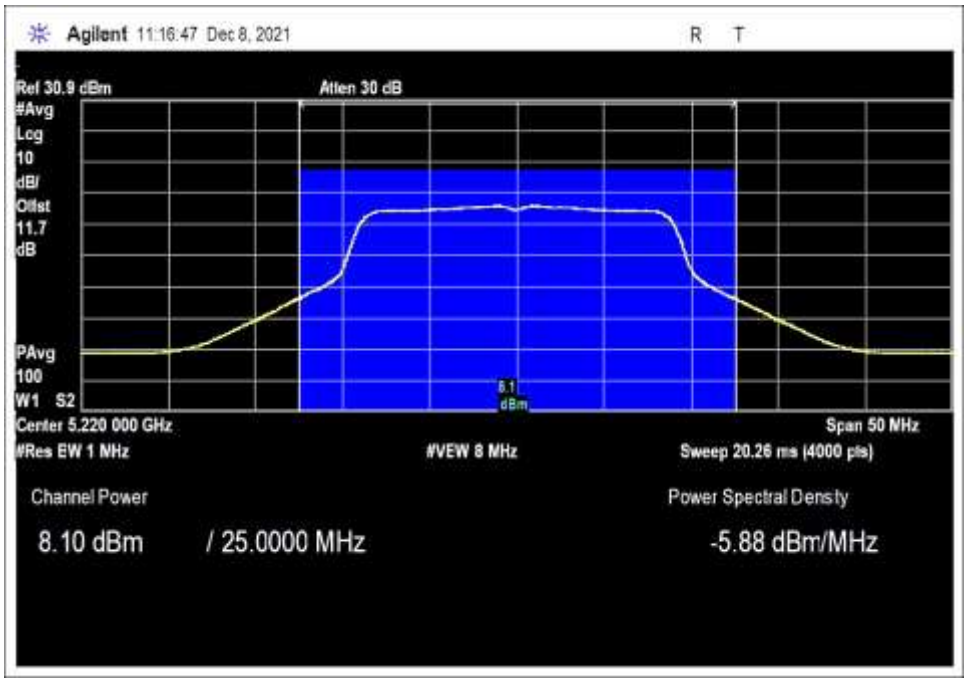


High Channel

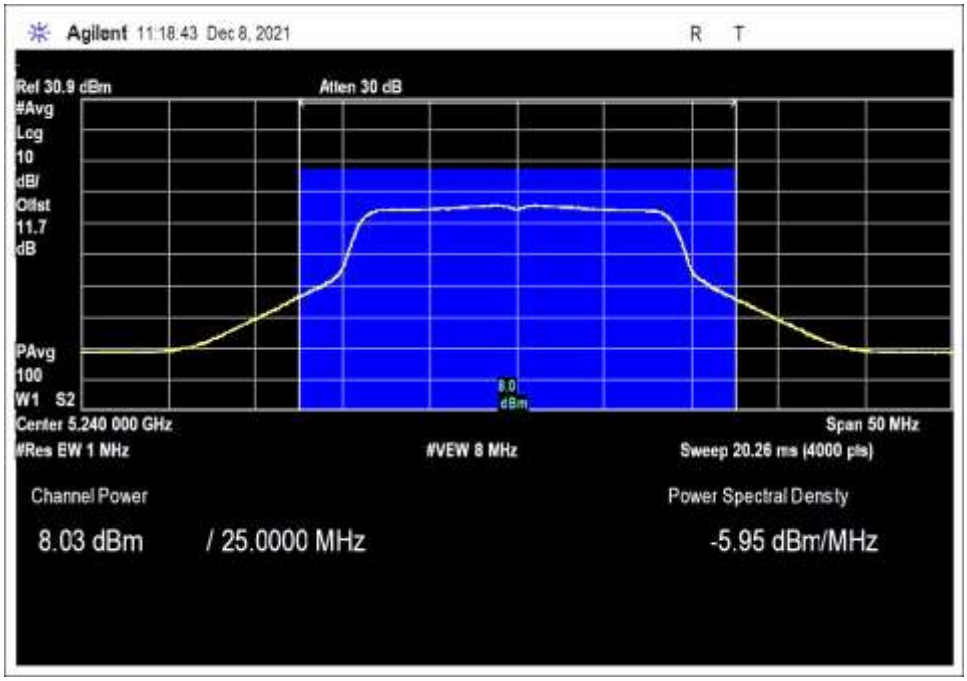
Chain 0, 20MHz



Low Channel

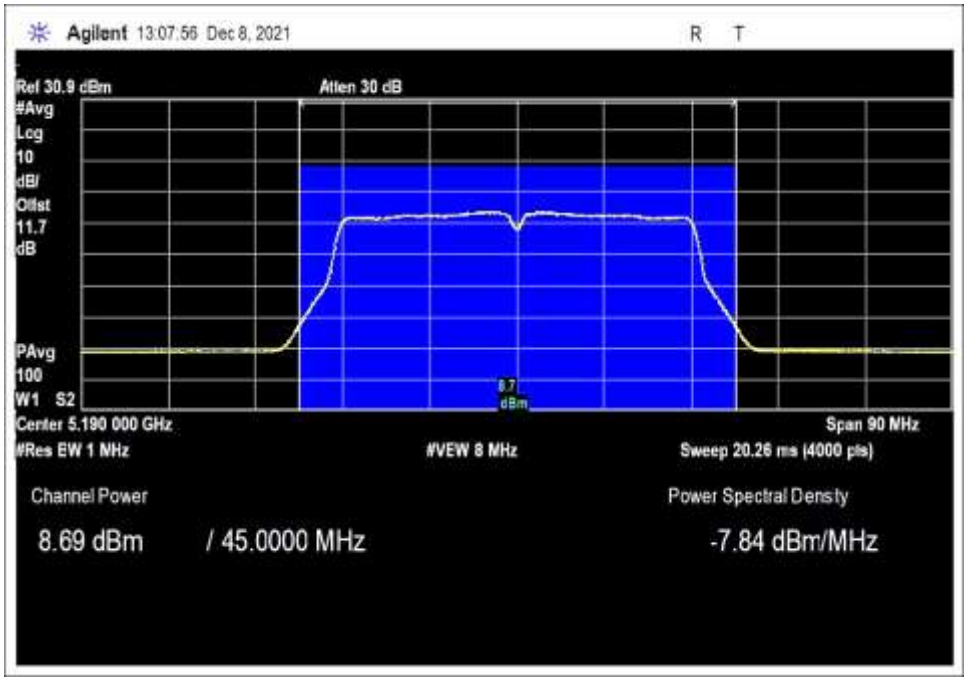


Middle Channel

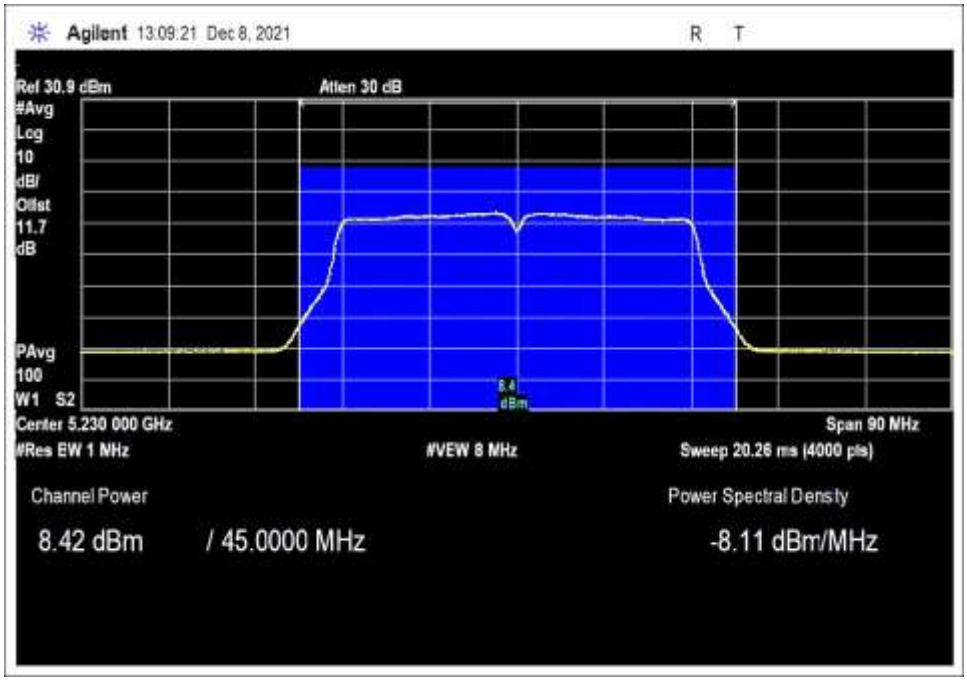


High Channel

Chain 0, 40MHz

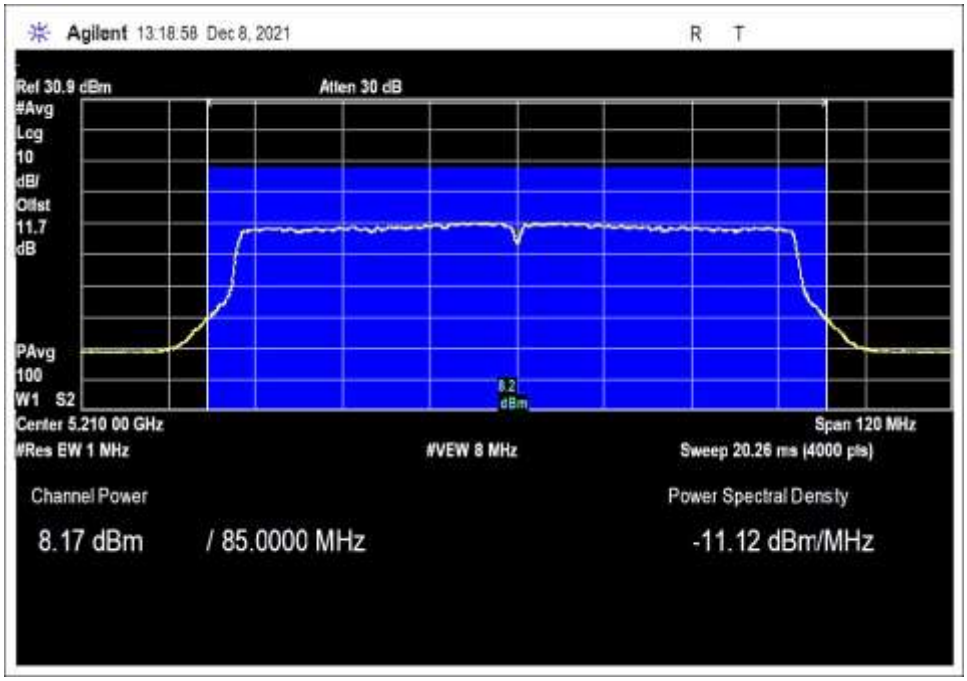


Low Channel

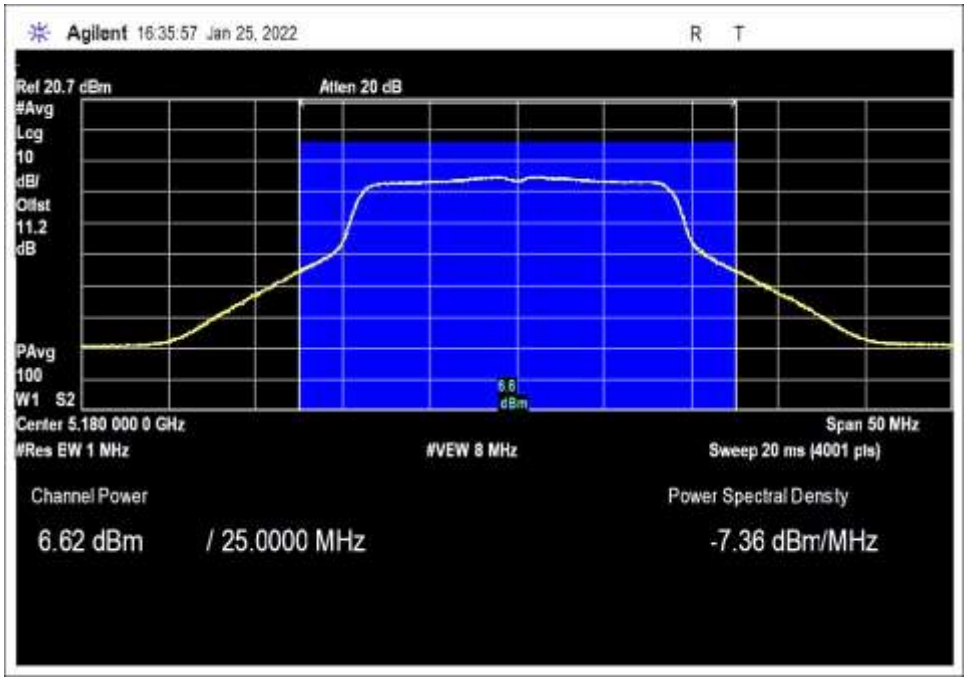


High Channel

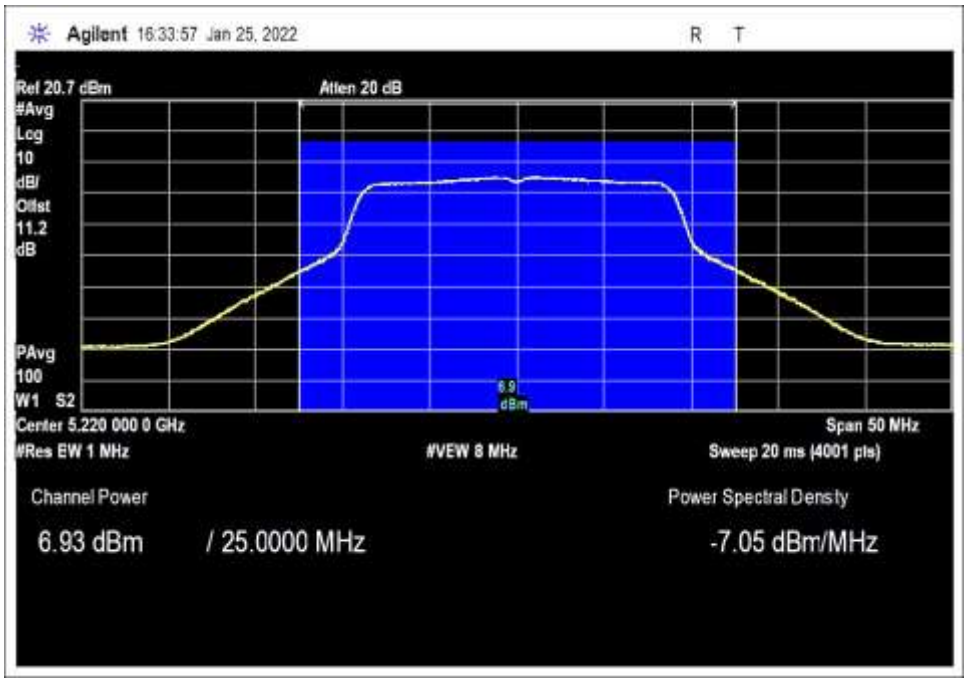
Chain 0, 80MHz



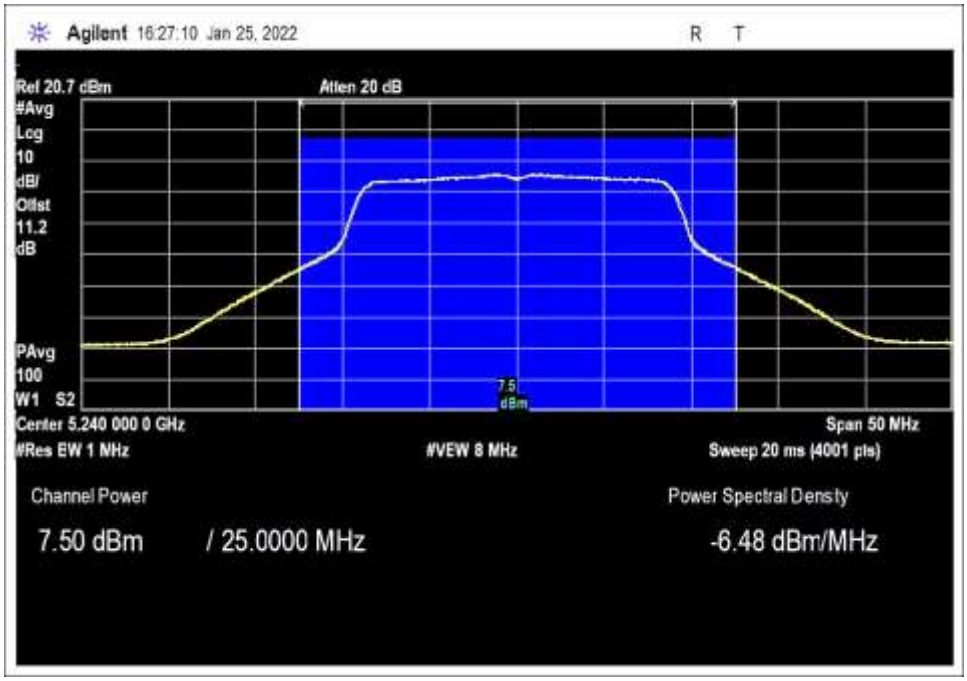
Chain 1, OFDM



Low Channel

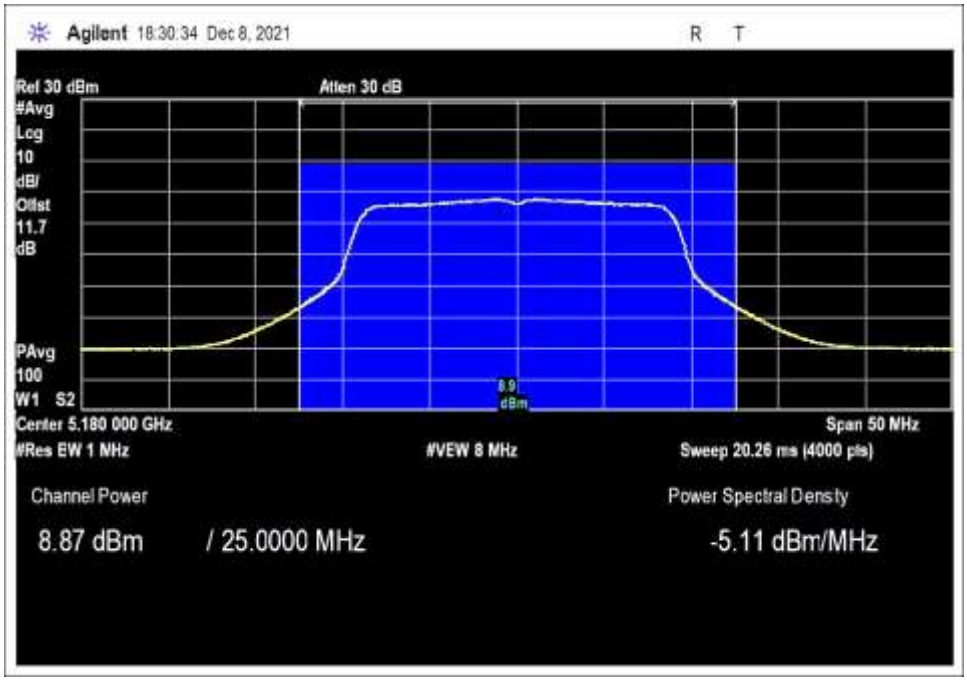


Middle Channel

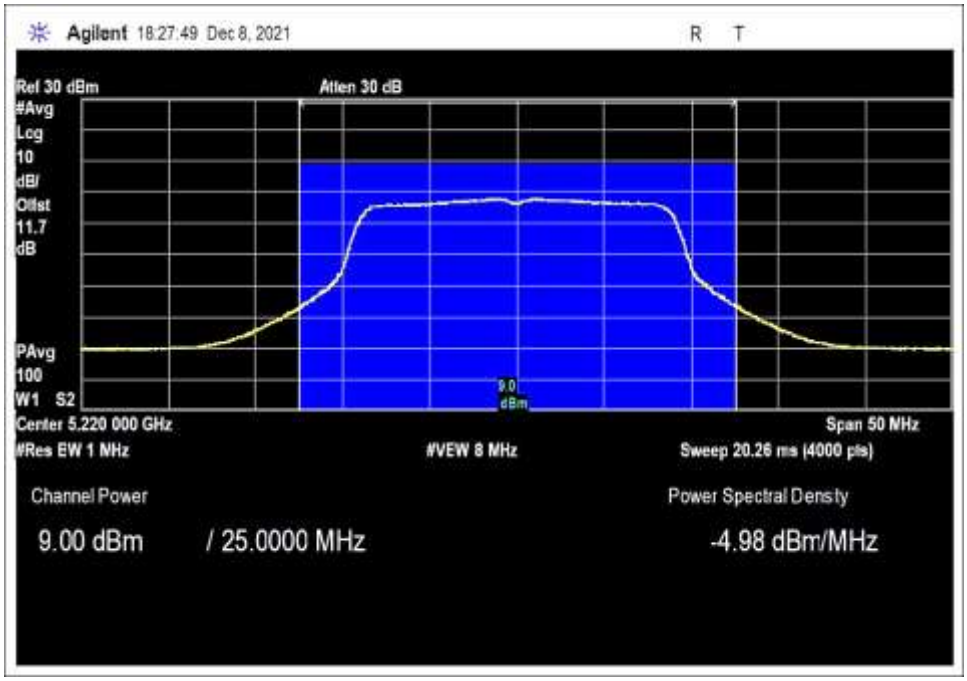


High Channel

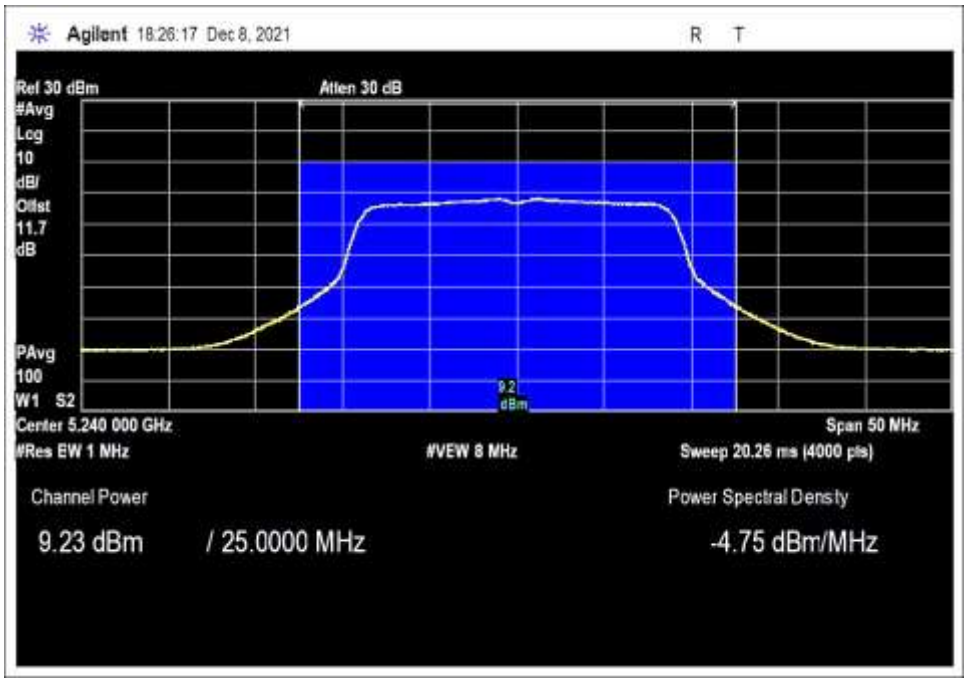
Chain 1, 20MHz



Low Channel

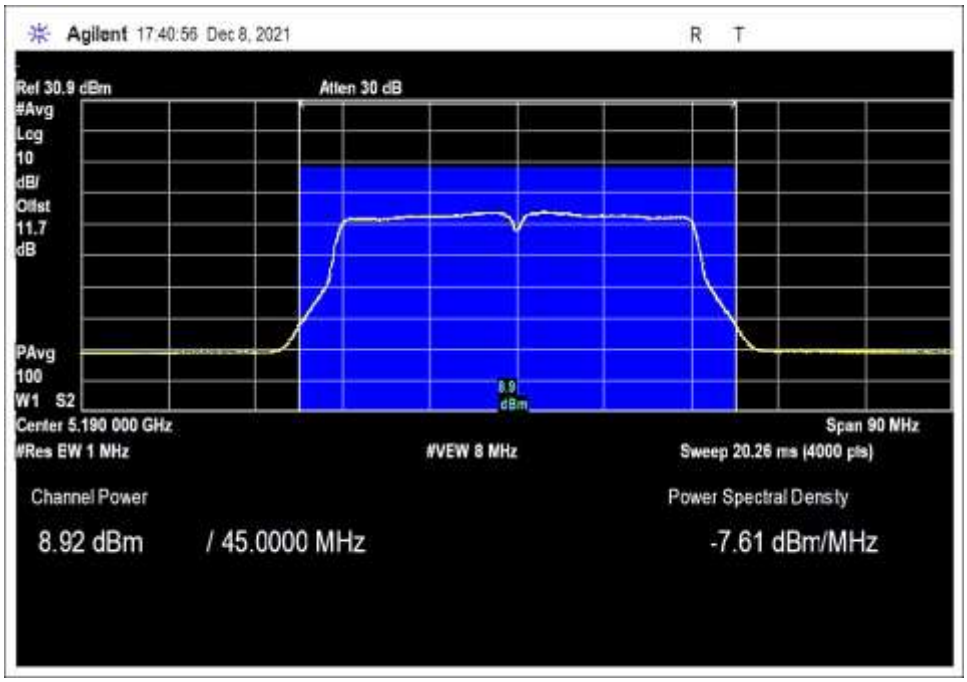


Middle Channel

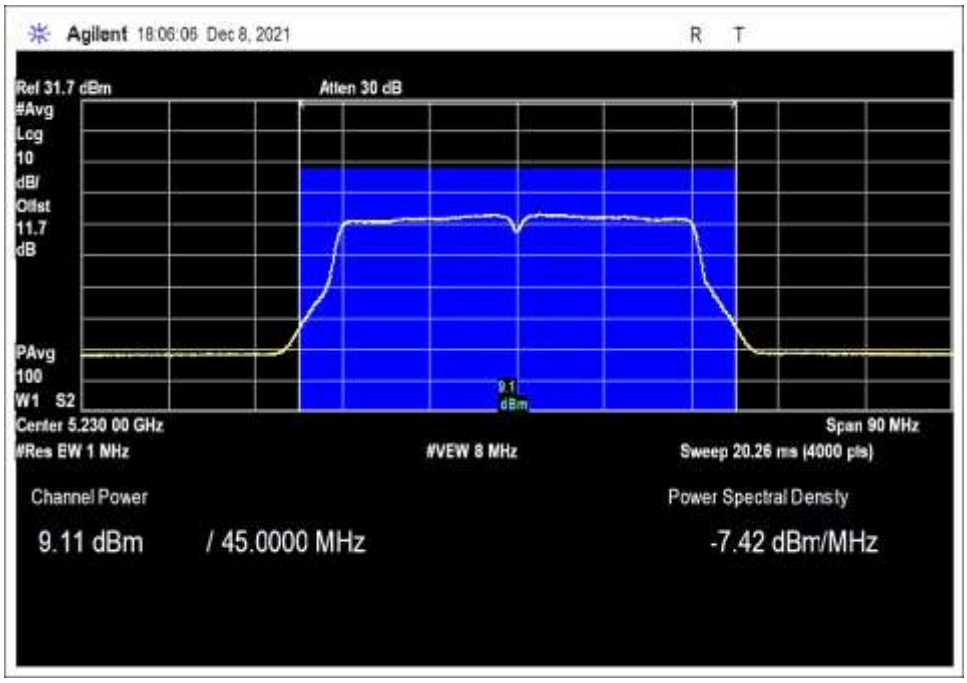


High Channel

Chain 1, 40MHz

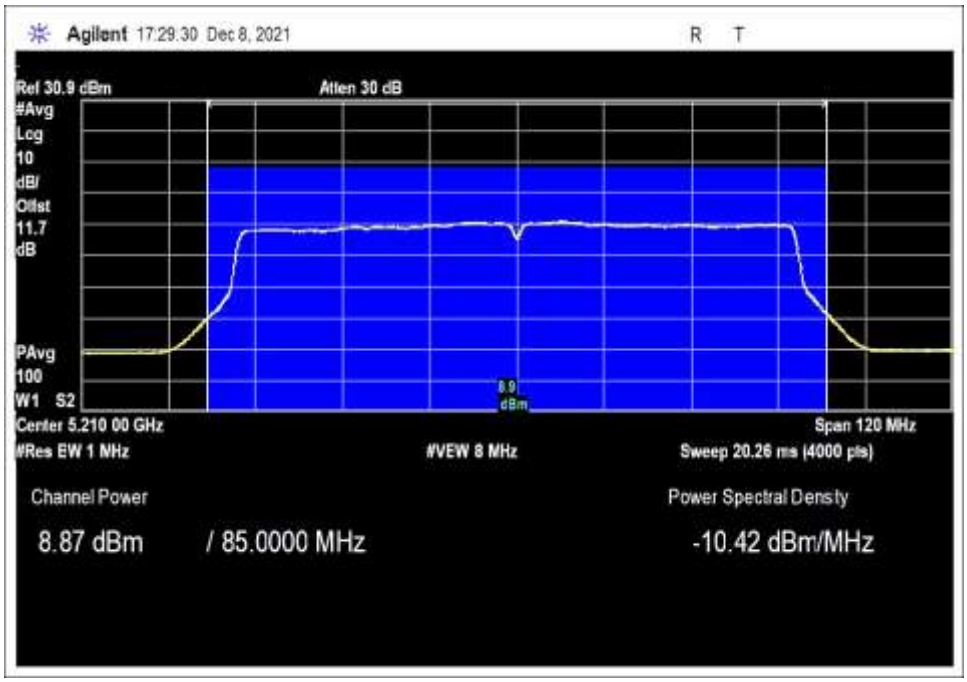


Low Channel



High Channel

Chain 1, 80MHz



15.407(a)(1) Power Spectral Density

Test Setup/Conditions – RF Conducted Measurement			
Test Location:	Fremont Lab C3	Test Engineer:	Hoang Cao
Test Method:	ANSI C63.10 (2013), KDB 789033	Test Date(s):	12/8/2021
Configuration:	9		
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)	22.5	Relative Humidity (%):	45

Test Equipment					
Asset# / Serial#	**Description**	**Manufacturer**	**Model**	**Cal Date**	**Cal Due**
03360	Cable	Astrolab	32022-2-29094-36TC	4/9/2020	4/9/2022
P06239	Attenuator	Weinschel	54A-10	6/17/2020	6/17/2022
03471	Spectrum Analyzer	Agilent	E4440A	2/11/2020	2/11/2022

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	OFDM	External 4.00dBi	-7.70	≤11	Pass
5220	OFDM	External 4.00dBi	-8.04	≤11	Pass
5240	OFDM	External 4.00dBi	-7.64	≤11	Pass
5180	HT20	External 4.00dBi	-5.79	≤11	Pass
5220	HT20	External 4.00dBi	-5.88	≤11	Pass
5240	HT20	External 4.00dBi	-5.95	≤11	Pass
5190	HT40	External 4.00dBi	-7.84	≤11	Pass
5230	HT40	External 4.00dBi	-8.11	≤11	Pass
5210	HT80	External 4.00dBi	-11.12	≤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	OFDM	External 4.00dBi	-7.36	≤11	Pass
5220	OFDM	External 4.00dBi	-7.05	≤11	Pass
5240	OFDM	External 4.00dBi	-6.48	≤11	Pass
5180	HT20	External 4.00dBi	-5.11	≤11	Pass
5220	HT20	External 4.00dBi	-4.98	≤11	Pass
5240	HT20	External 4.00dBi	-4.75	≤11	Pass
5190	HT40	External 4.00dBi	-7.61	≤11	Pass
5230	HT40	External 4.00dBi	-7.42	≤11	Pass
5210	HT80	External 4.00dBi	-10.42	≤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):

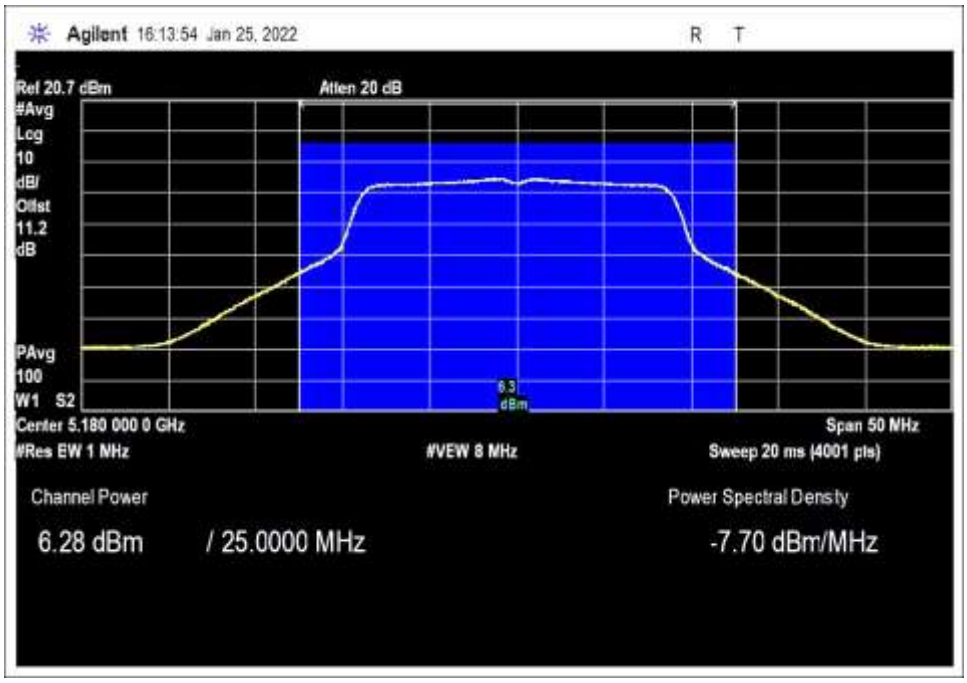
$$Limit = 17 - Roundup(G - 23)$$

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):

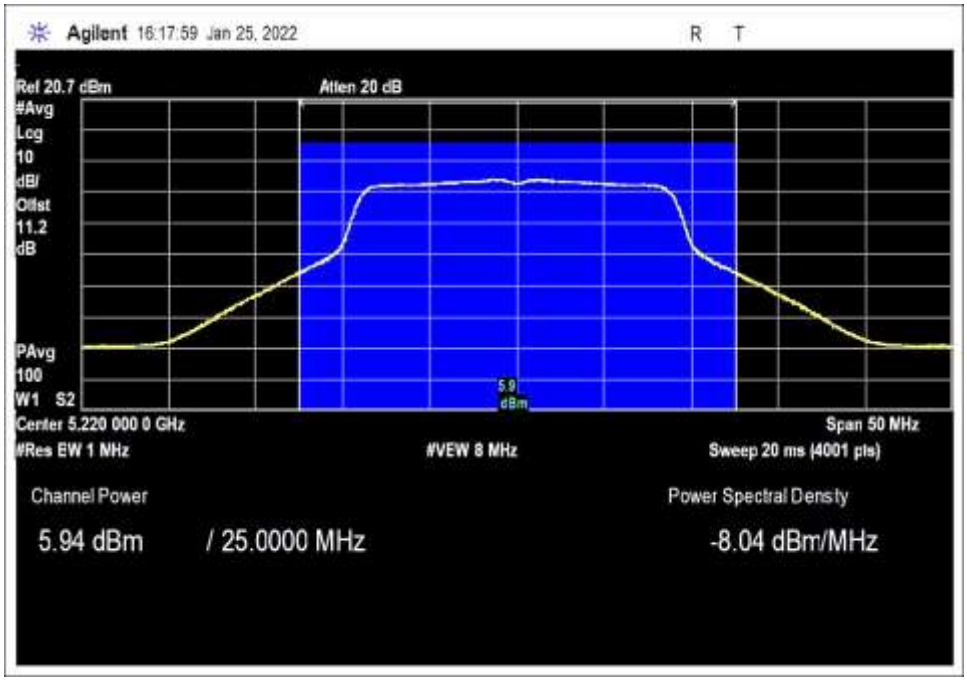
$$Limit = 11 - Roundup(G - 6)$$

Plots

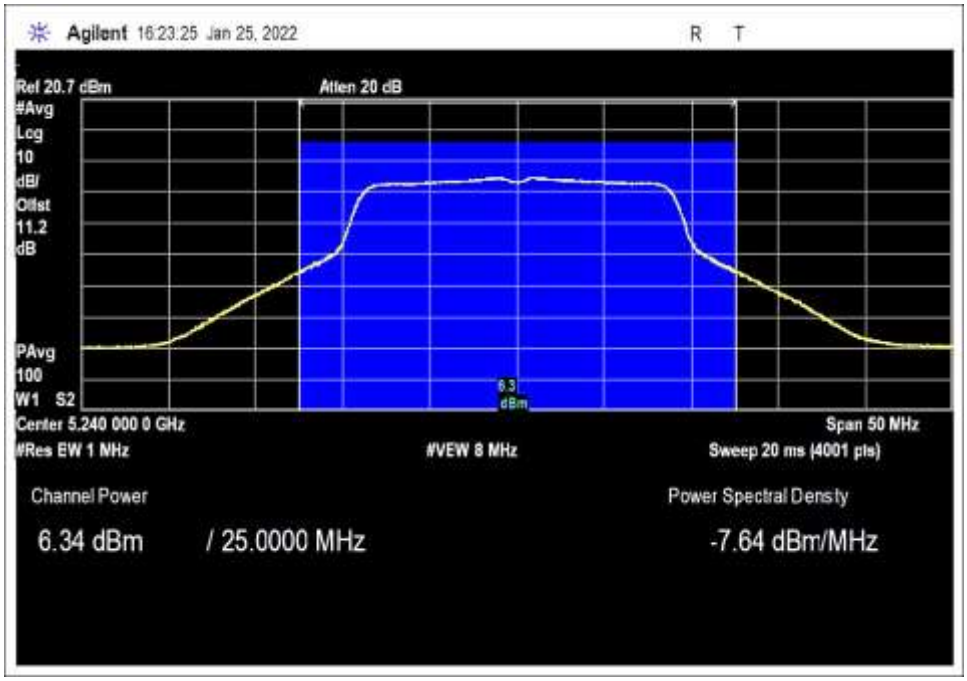
Chain 0, OFDM



Low Channel

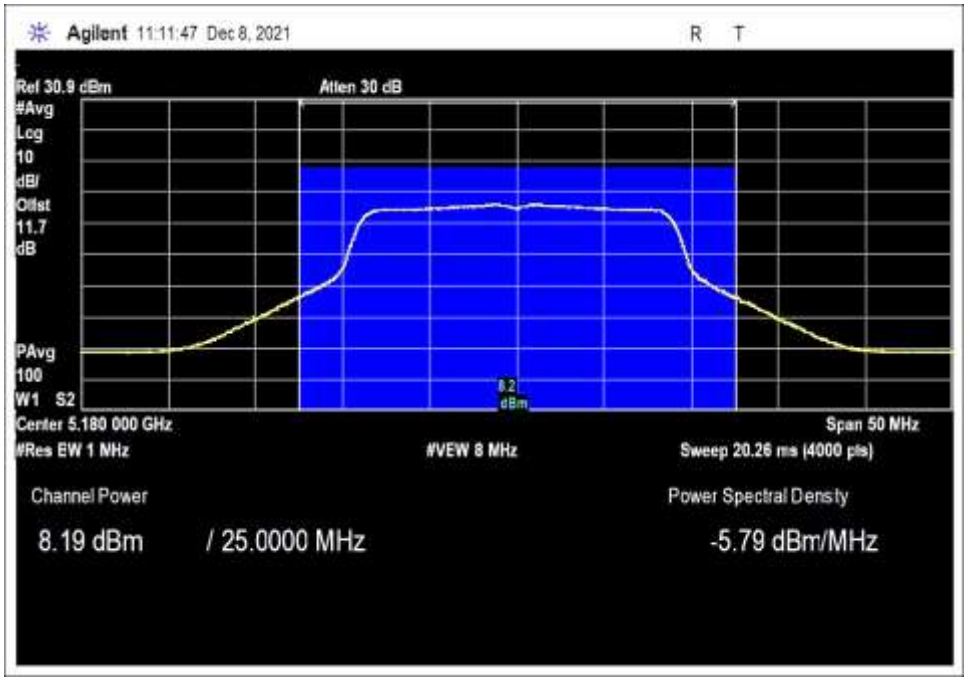


Middle Channel

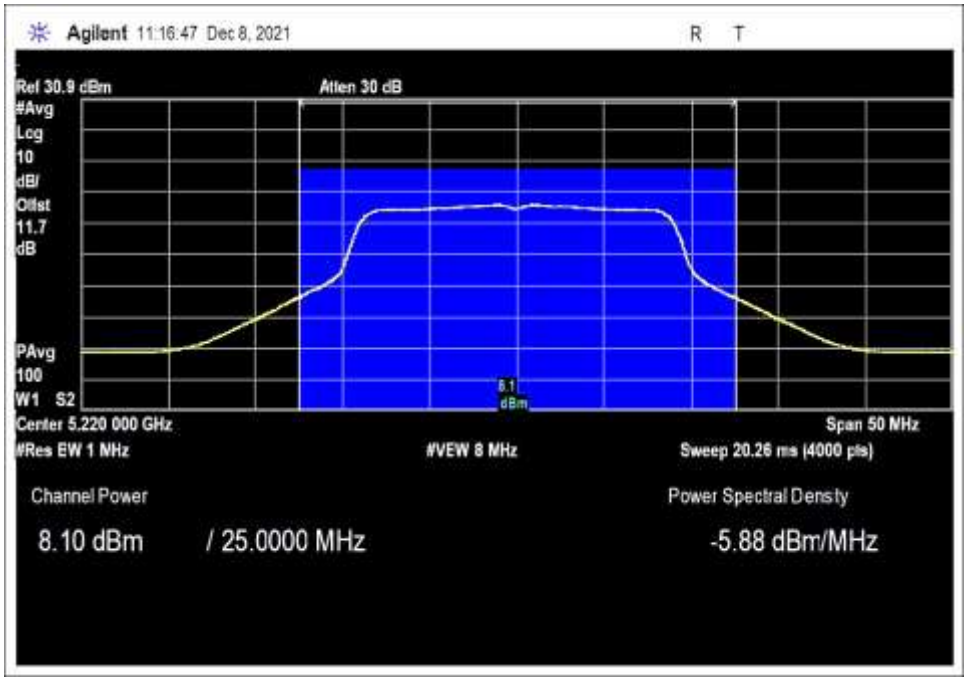


High Channel

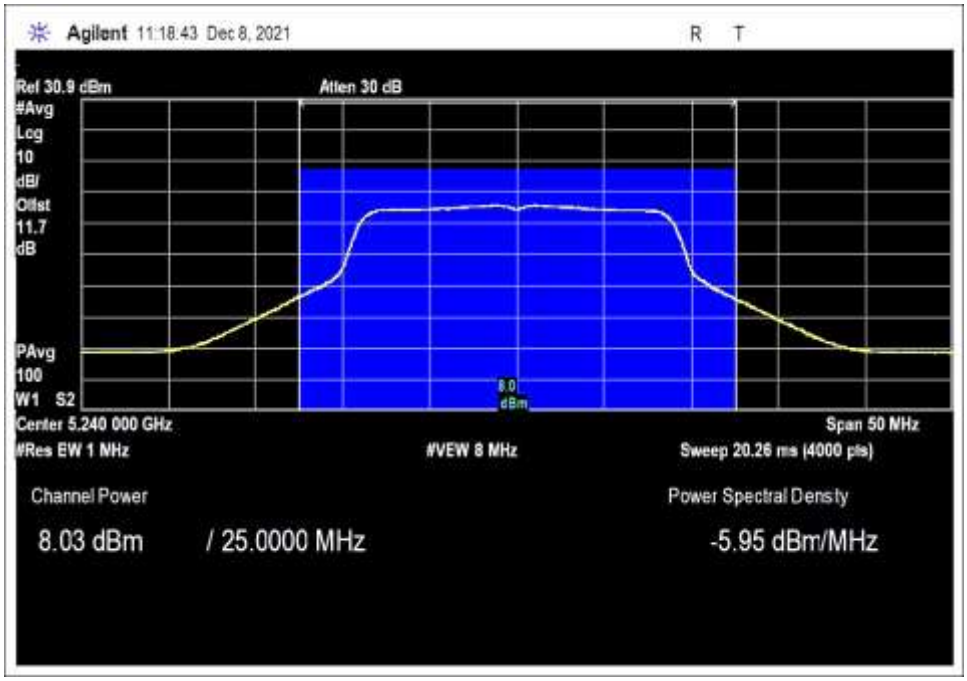
<u>Chain 0, 20MHz</u>



Low Channel

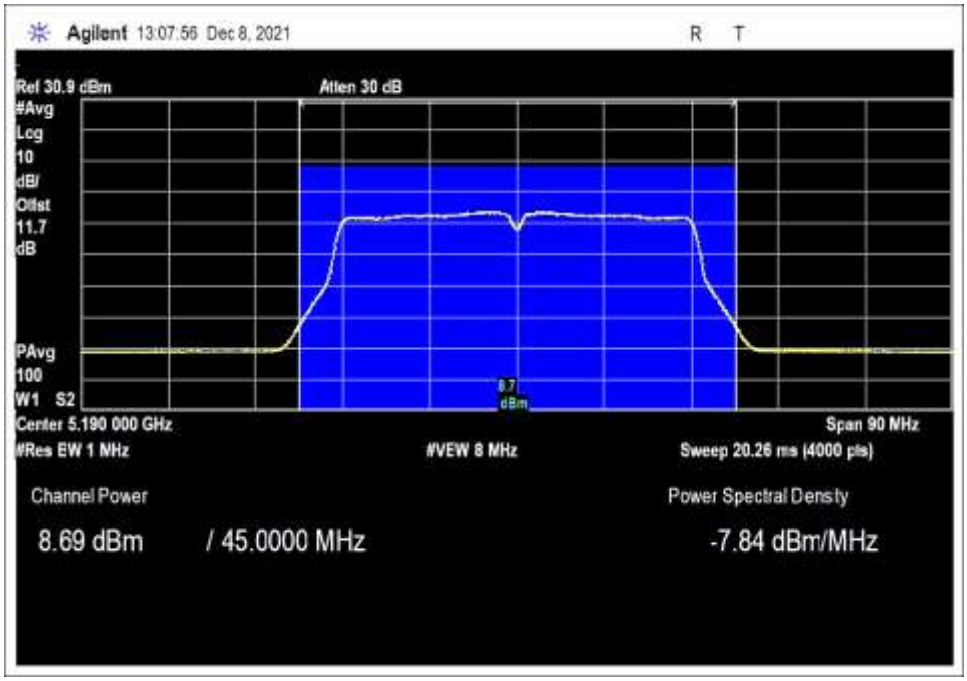


Middle Channel

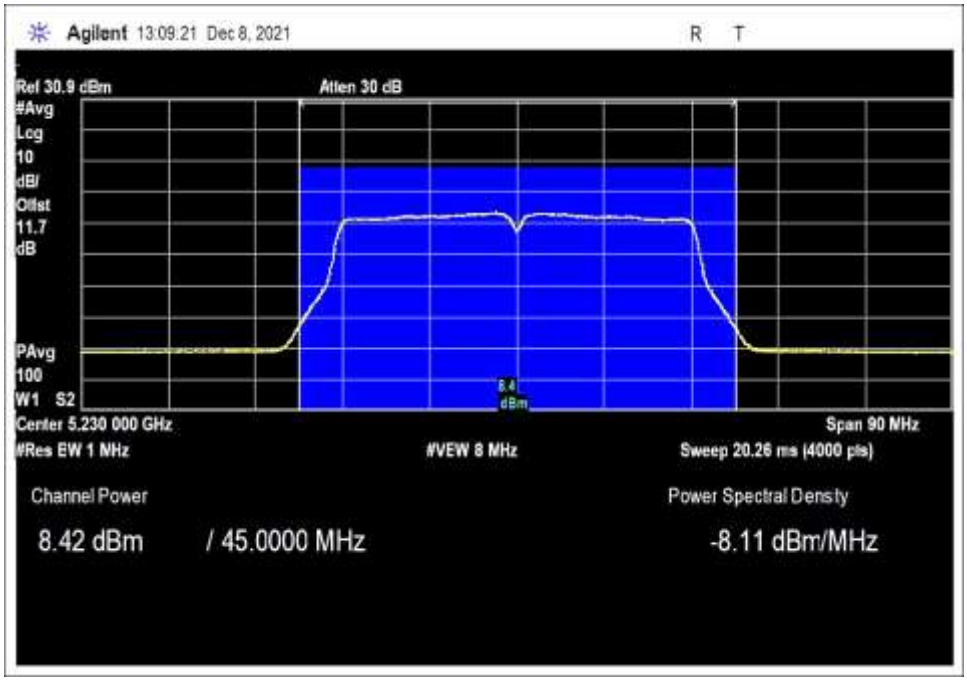


High Channel

Chain 0, 40MHz

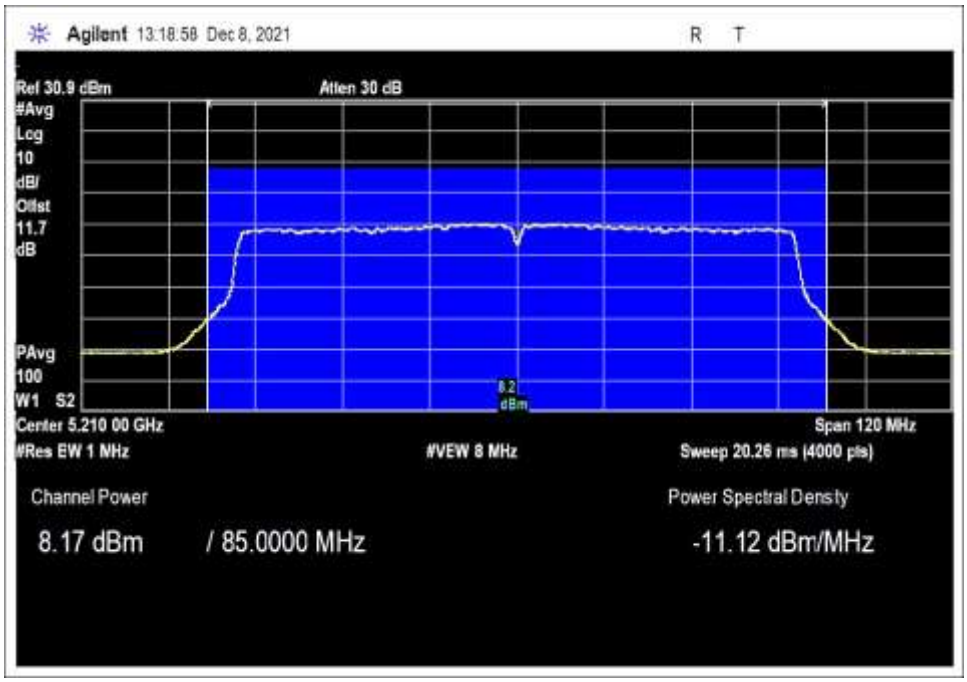


Low Channel

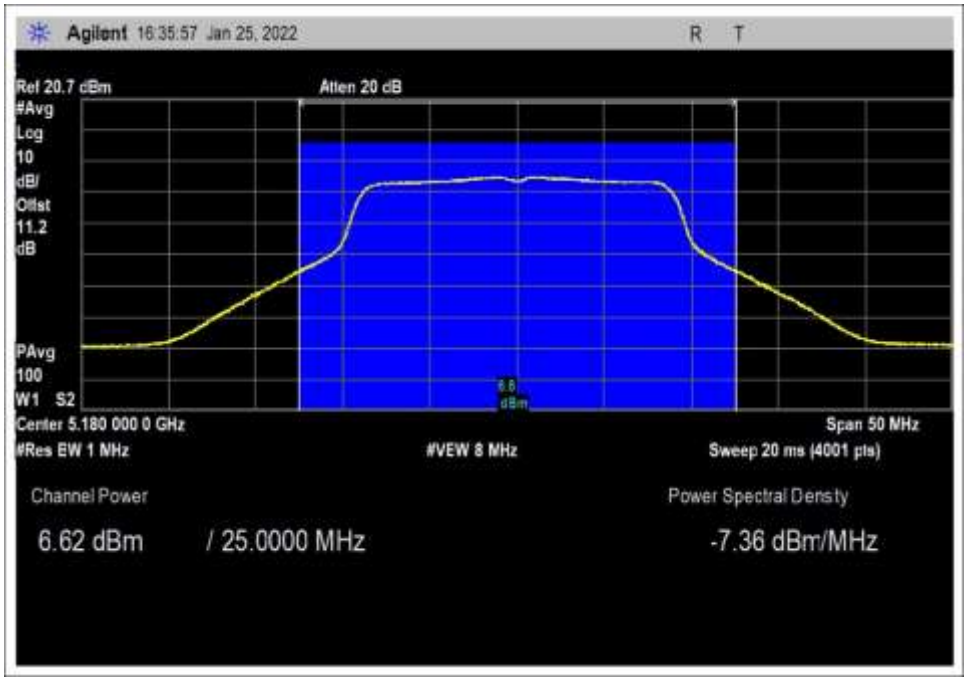


High Channel

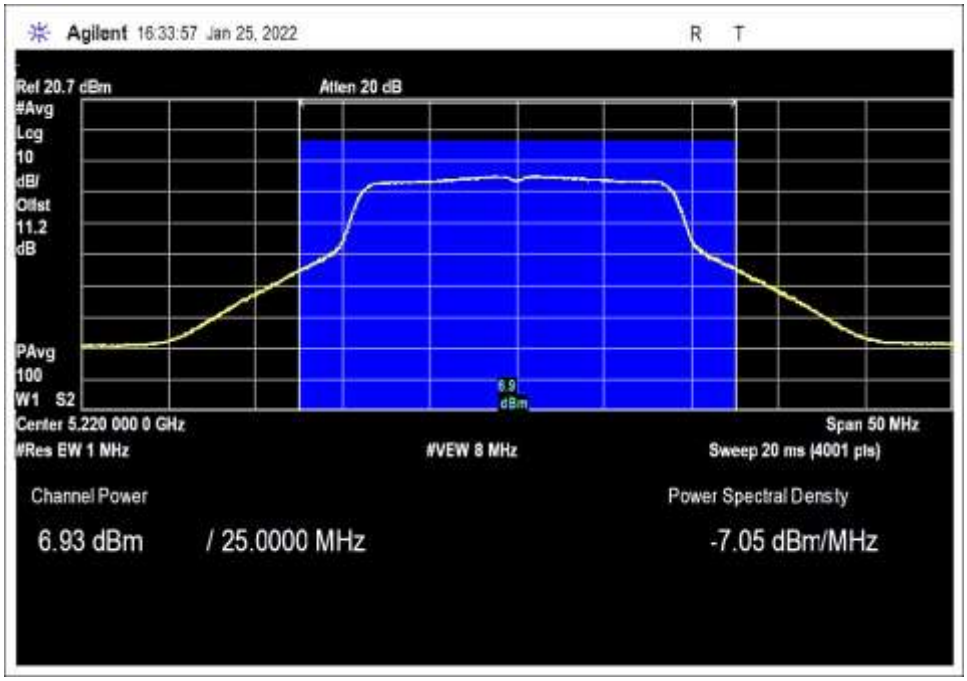
Chain 0, 80MHz



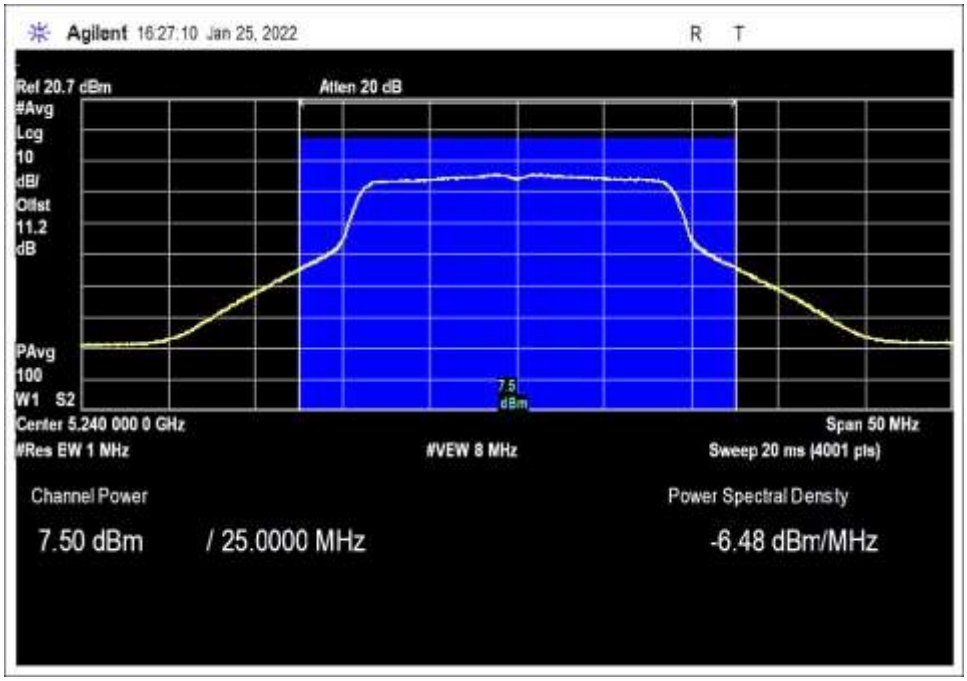
Chain 1, OFDM



Low Channel

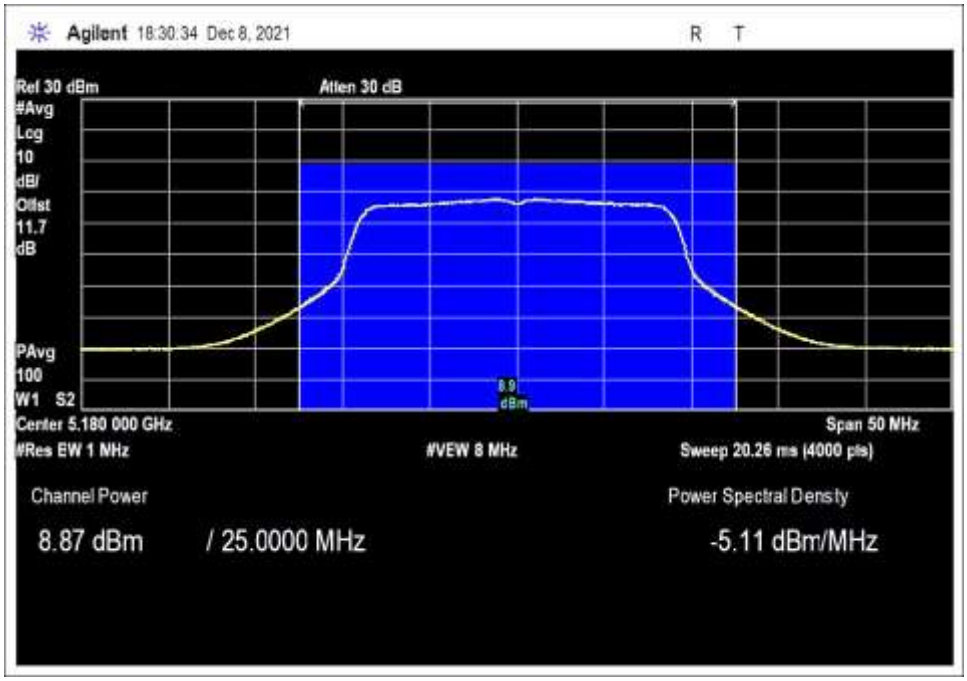


Middle Channel

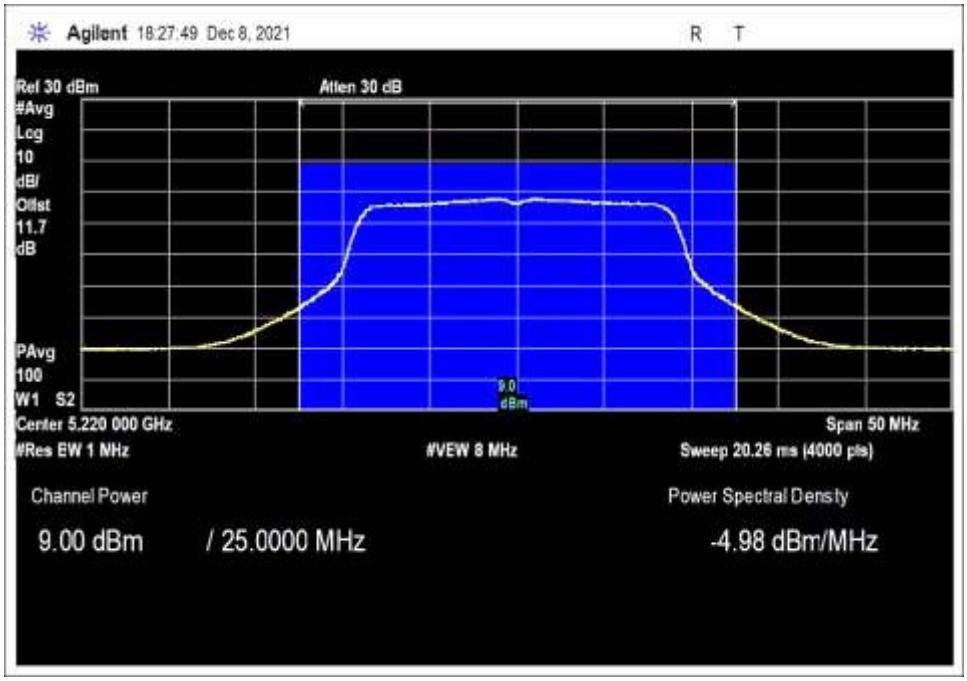


High Channel

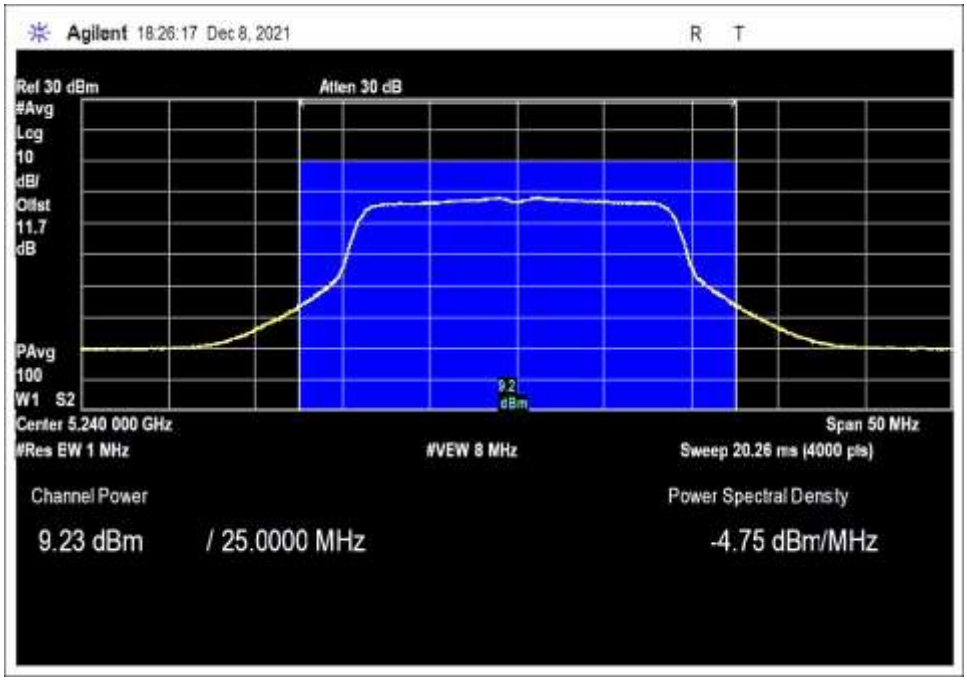
Chain 1, 20MHz



Low Channel

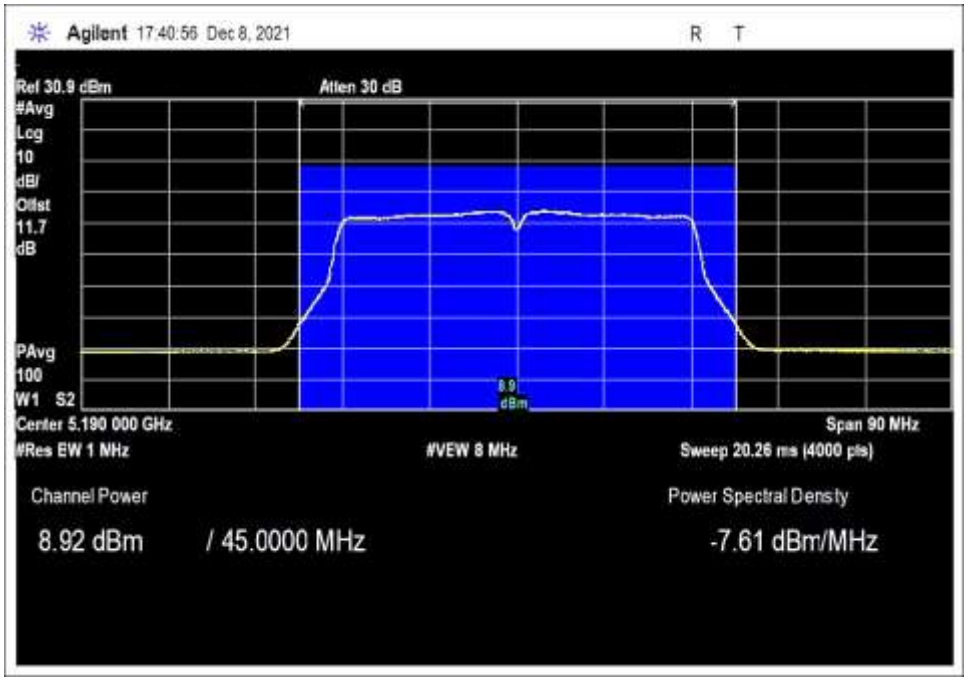


Middle Channel

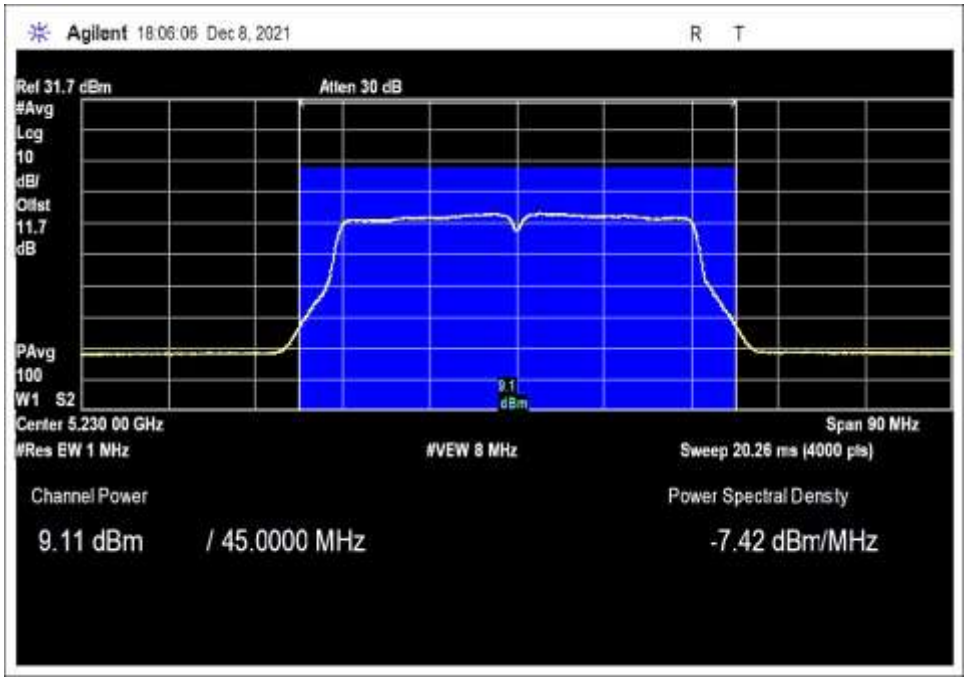


High Channel

Chain 1, 40MHz

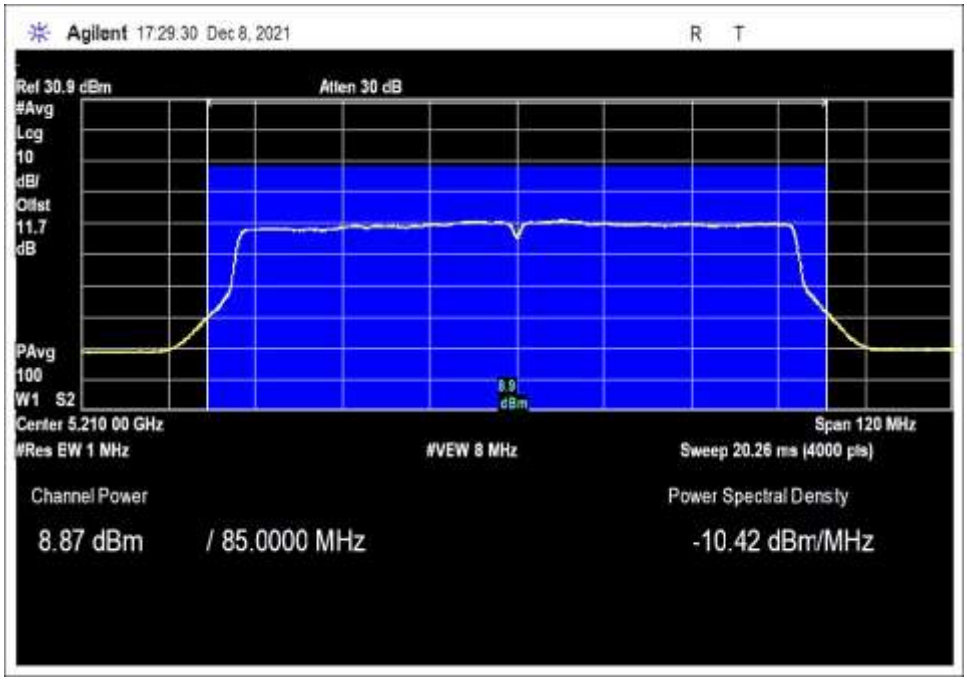


Low Channel



High Channel

Chain 1, 80MHz



15.407(b) Radiated Emissions & Band Edge

Test Setup / Conditions / Data

Note: Chain 0 is the worst case based on the investigation on RF output power before measuring Radiated Spurious Emissions.

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.209 Radiated Emissions**		
Work Order #:	**105488**	Date:	12/18/2021
Test Type:	**Radiated Scan**	Time:	10:05:16 PM
Tested By:	Randy Clark	Sequence#:	68
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

Environmental Conditions:
Temperature: 21.4ºC
Humidity: 36%
Atmospheric Pressure: 101.9kPa

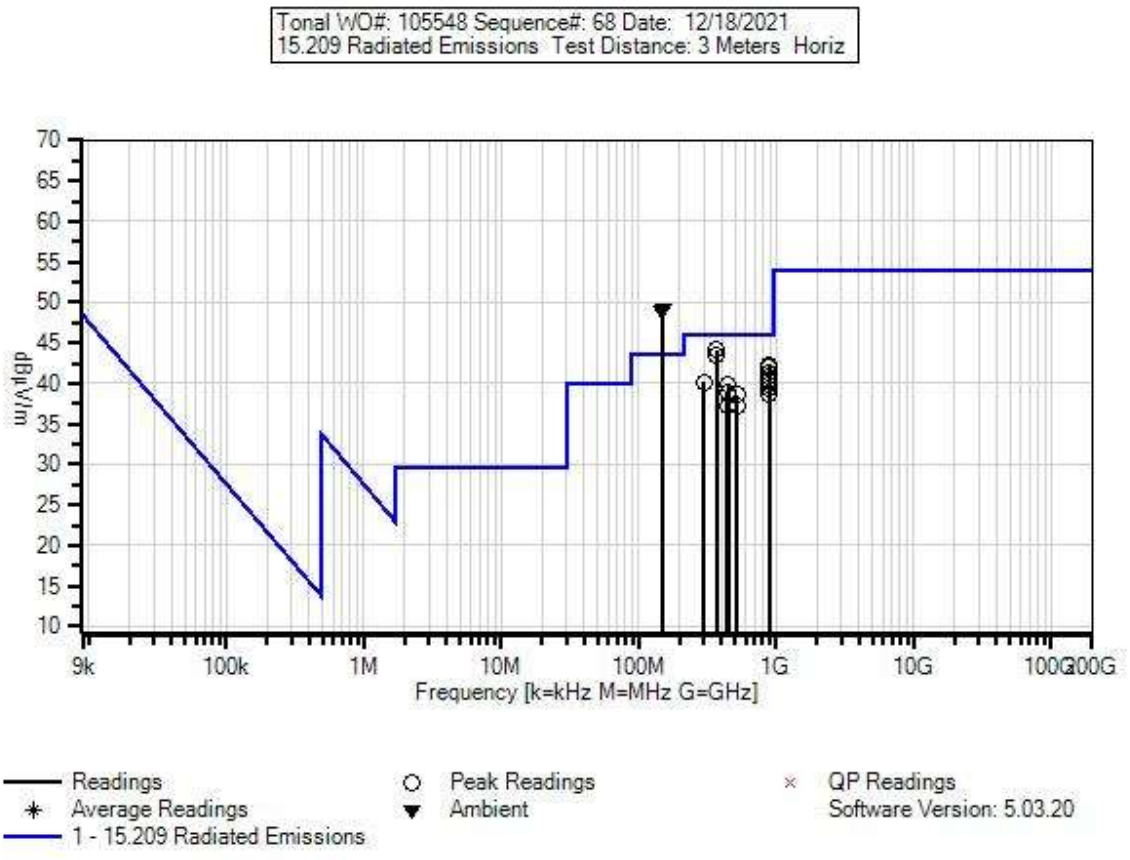
Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi is set to 5220 MHz with nonHT modulation type, 11MBPS at power level 10, chain 0 with repeating pattern of 0s and 1s with duty cycle at 98%.
Operational mode is representative of worst case.

Measurements marked as Unintentional have been evaluated with radios turned off and determined not to be radio emissions. Indicated emissions are ignored for the purposes of this report.

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications: #1, #2, #3 #4, #5, #6 were in place during testing.
No emissions from EUT has been found in 20dB tolerance in the frequency range 9kHz to 30MHz.



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP07508	Preamp	310N	7/9/2020	7/9/2022
T2	AN00852	Biconilog Antenna	CBL 6111C	4/14/2020	4/14/2022
T3	ANP06049	Attenuator	PE7002-6	5/11/2020	5/11/2022
T4	ANP01187	Cable	CNT-195	7/6/2020	7/6/2022
T5	ANP06691	Cable	PE3062-180	3/25/2020	3/25/2022
T6	ANP06694	Cable	PE3062-480	3/25/2020	3/25/2022
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
	AN00432	Loop Antenna	6502	7/19/2021	7/19/2023

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	149.402M Ambient	62.1	-32.0 +0.4	+11.5 +1.1	+5.9	+0.2	+0.0	49.2	43.5 Unintentional Emissions	+5.7	Horiz
2	147.600M Ambient	62.0	-32.0 +0.4	+11.5 +1.1	+5.9	+0.2	+0.0	49.1	43.5 Unintentional Emissions	+5.6	Horiz
3	370.302M	52.0	-31.9 +0.7	+15.0 +1.9	+6.0	+0.4	+0.0	44.1	46.0	-1.9	Horiz
4	372.104M	51.2	-31.9 +0.7	+15.1 +1.9	+6.0	+0.4	+0.0	43.4	46.0	-2.6	Horiz
5	888.740M	39.5	-31.4 +1.2	+23.1 +3.2	+5.9	+0.7	+0.0	42.2	46.0	-3.8	Horiz
6	884.656M	39.3	-31.4 +1.2	+23.1 +3.2	+5.9	+0.7	+0.0	42.0	46.0	-4.0	Horiz
7	888.260M	38.5	-31.4 +1.2	+23.1 +3.2	+5.9	+0.7	+0.0	41.2	46.0	-4.8	Horiz
8	885.257M	38.1	-31.4 +1.2	+23.1 +3.2	+5.9	+0.7	+0.0	40.8	46.0	-5.2	Horiz
9	893.185M	37.6	-31.4 +1.2	+23.2 +3.2	+5.9	+0.7	+0.0	40.4	46.0	-5.6	Horiz
10	297.750M	50.3	-31.9 +0.6	+13.2 +1.6	+6.0	+0.4	+0.0	40.2	46.0	-5.8	Horiz
11	448.621M	45.5	-31.9 +0.8	+17.0 +2.1	+5.9	+0.5	+0.0	39.9	46.0	-6.1	Horiz
12	446.579M	45.5	-31.9 +0.8	+16.9 +2.1	+5.9	+0.5	+0.0	39.8	46.0	-6.2	Horiz
13	896.428M	37.0	-31.4 +1.2	+23.2 +3.2	+5.9	+0.7	+0.0	39.8	46.0	-6.2	Horiz
14	897.269M	36.5	-31.4 +1.2	+23.2 +3.2	+5.9	+0.7	+0.0	39.3	46.0	-6.7	Horiz
15	444.416M	44.6	-31.9 +0.8	+16.9 +2.1	+5.9	+0.5	+0.0	38.9	46.0	-7.1	Horiz
16	894.866M	35.9	-31.4 +1.2	+23.2 +3.2	+5.9	+0.7	+0.0	38.7	46.0	-7.3	Horiz
17	518.530M	42.4	-31.9 +0.9	+18.5 +2.3	+5.9	+0.5	+0.0	38.6	46.0	-7.4	Horiz
18	895.347M	35.8	-31.4 +1.2	+23.2 +3.2	+5.9	+0.7	+0.0	38.6	46.0	-7.4	Horiz
19	443.215M	43.0	-31.9 +0.8	+16.8 +2.1	+5.9	+0.5	+0.0	37.2	46.0	-8.8	Horiz
20	516.128M	41.1	-31.9 +0.9	+18.4 +2.3	+5.9	+0.5	+0.0	37.2	46.0	-8.8	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.209 Radiated Emissions**		
Work Order #:	**105488**	Date:	12/18/2021
Test Type:	**Radiated Scan**	Time:	10:22:04 PM
Tested By:	Randy Clark	Sequence#:	69
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

Environmental Conditions:
Temperature: 21.4ºC
Humidity: 36%
Atmospheric Pressure: 101.9kPa

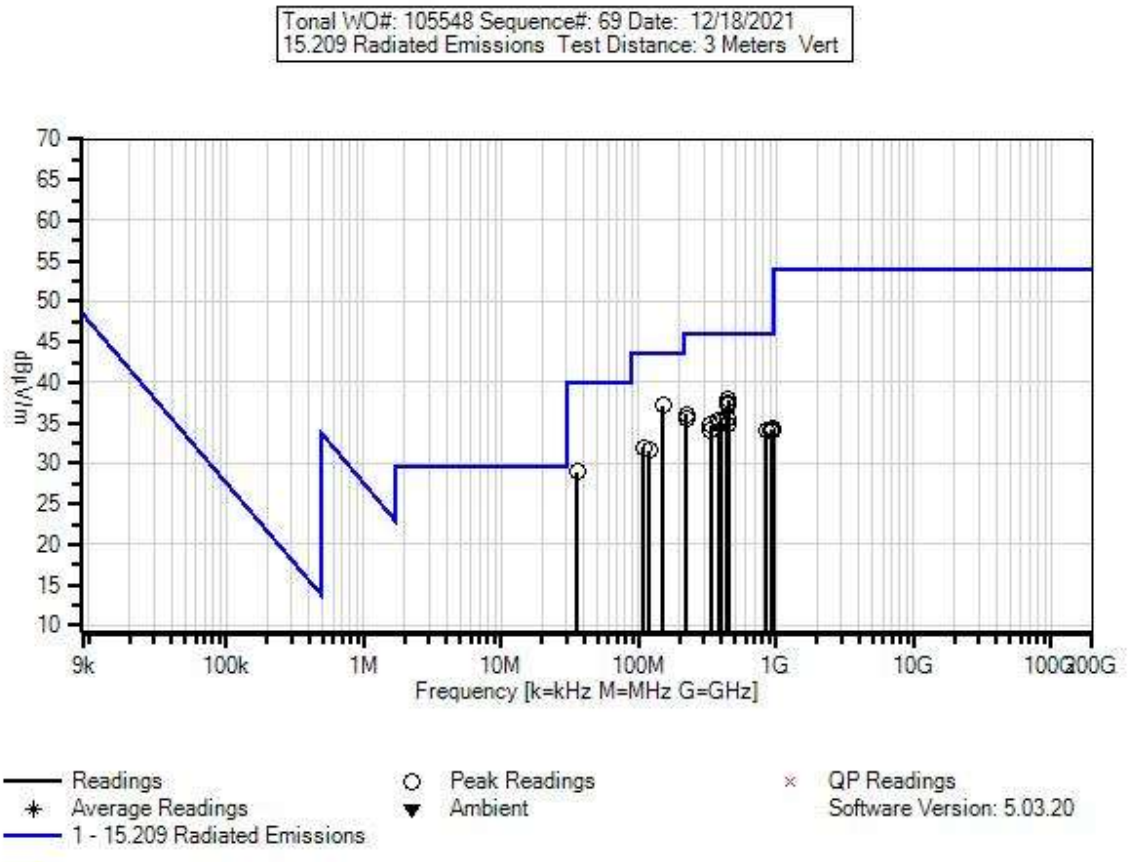
Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi is set to 5220 MHz with nonHT modulation type, 11MBPS at power level 10, chain 0 with repeating pattern of 0s and 1s with duty cycle at 98%.
Operational mode is representative of worst case.

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications: #1, #2, #3 #4, #5, #6 were in place during testing.

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



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
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T2	AN00852	Biconilog Antenna	CBL 6111C	4/14/2020	4/14/2022
T3	ANP06049	Attenuator	PE7002-6	5/11/2020	5/11/2022
T4	ANP01187	Cable	CNT-195	7/6/2020	7/6/2022
T5	ANP06691	Cable	PE3062-180	3/25/2020	3/25/2022
T6	ANP06694	Cable	PE3062-480	3/25/2020	3/25/2022
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
	AN00432	Loop Antenna	6502	7/19/2021	7/19/2023

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

#	Freq	Rdng	T1 T5	T2 T6	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	149.402M	50.0	-32.0 +0.4	+11.5 +1.1	+5.9	+0.2	+0.0	37.1	43.5	-6.4	Vert
2	446.579M	43.6	-31.9 +0.8	+16.9 +2.1	+5.9	+0.5	+0.0	37.9	46.0	-8.1	Vert
3	448.621M	43.1	-31.9 +0.8	+17.0 +2.1	+5.9	+0.5	+0.0	37.5	46.0	-8.5	Vert
4	444.416M	42.9	-31.9 +0.8	+16.9 +2.1	+5.9	+0.5	+0.0	37.2	46.0	-8.8	Vert
5	224.236M	49.0	-31.9 +0.5	+10.9 +1.4	+5.9	+0.3	+0.0	36.1	46.0	-9.9	Vert
6	442.495M	41.4	-31.9 +0.8	+16.8 +2.1	+5.9	+0.5	+0.0	35.6	46.0	-10.4	Vert
7	222.194M	48.5	-31.9 +0.5	+10.8 +1.4	+5.9	+0.3	+0.0	35.5	46.0	-10.5	Vert
8	379.071M	42.9	-31.9 +0.7	+15.2 +1.9	+6.0	+0.4	+0.0	35.2	46.0	-10.8	Vert
9	396.008M	42.2	-31.9 +0.7	+15.6 +1.9	+6.0	+0.5	+0.0	35.0	46.0	-11.0	Vert
10	35.590M	38.2	-32.0 +0.2	+16.2 +0.4	+5.9	+0.0	+0.0	28.9	40.0	-11.1	Vert
11	442.975M	40.6	-31.9 +0.8	+16.8 +2.1	+5.9	+0.5	+0.0	34.8	46.0	-11.2	Vert
12	336.909M	43.5	-31.9 +0.7	+14.2 +1.8	+6.0	+0.4	+0.0	34.7	46.0	-11.3	Vert
13	107.960M	45.8	-32.0 +0.3	+11.0 +0.9	+5.9	+0.1	+0.0	32.0	43.5	-11.5	Vert
14	950.162M	30.1	-30.9 +1.3	+23.8 +3.3	+5.9	+0.7	+0.0	34.2	46.0	-11.8	Vert
15	119.972M	44.4	-32.0 +0.3	+11.9 +1.0	+5.9	+0.1	+0.0	31.6	43.5	-11.9	Vert
16	928.500M	30.4	-31.1 +1.3	+23.6 +3.3	+5.9	+0.7	+0.0	34.1	46.0	-11.9	Vert
17	845.377M	32.0	-31.7 +1.2	+22.8 +3.1	+5.9	+0.7	+0.0	34.0	46.0	-12.0	Vert
18	336.429M	42.8	-31.9 +0.7	+14.2 +1.8	+6.0	+0.4	+0.0	34.0	46.0	-12.0	Vert
19	958.802M	29.8	-30.9 +1.3	+23.9 +3.3	+5.9	+0.7	+0.0	34.0	46.0	-12.0	Vert
20	922.494M	30.5	-31.2 +1.3	+23.5 +3.3	+5.9	+0.7	+0.0	34.0	46.0	-12.0	Vert

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**105488**	Date:	12/21/2021
Test Type:	**Radiated Scan**	Time:	15:55:47
Tested By:	Hoang Cao	Sequence#:	127
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1 to 40GHz

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa

Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0

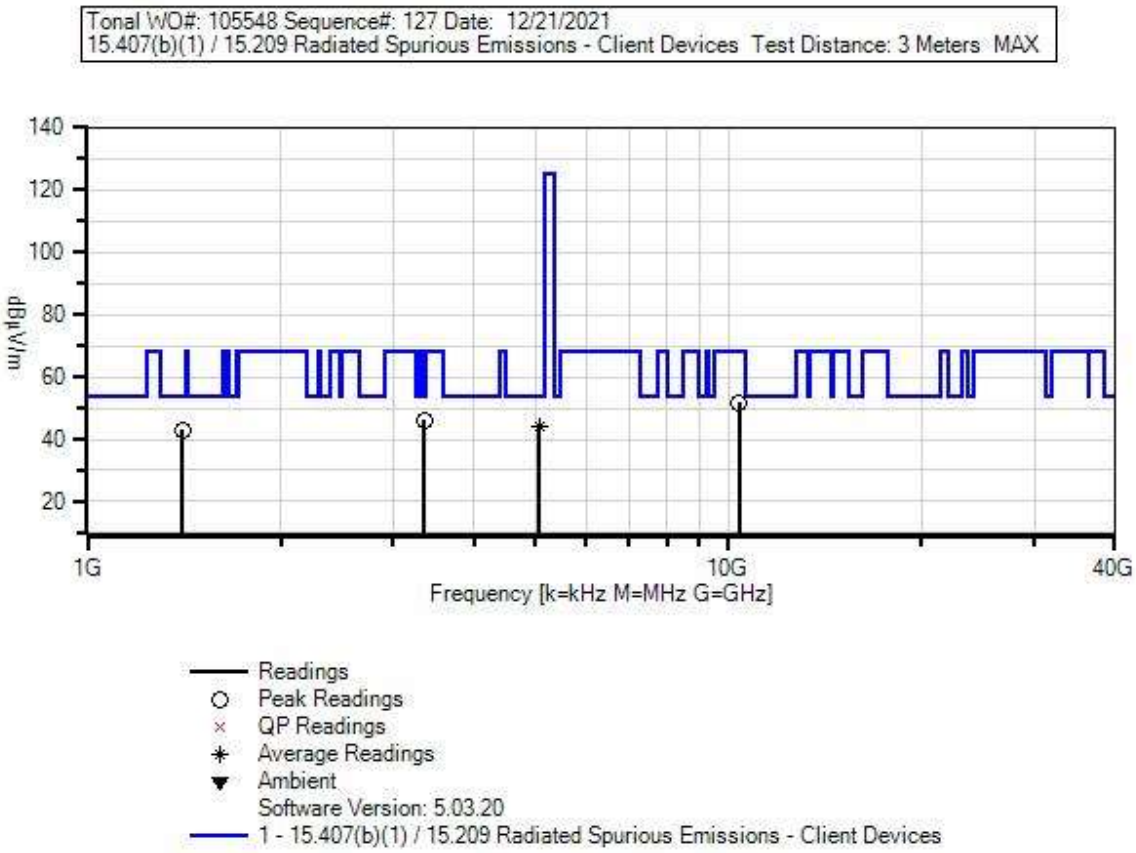
Operational mode is representative of worst case.

UNII1 - OFDM
Low Channel

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications: #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.


Tonal WO#: 105548 Sequence#: 127 Date: 12/21/2021
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices Test Distance: 3 Meters MAX
140
120
100
80
60
40
20
dBµV/m
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.20
1 - 15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T4	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	ANP00928	Cable	various	1/9/2020	1/9/2022
	ANP00929	Cable	various	1/9/2020	1/9/2022
	ANP00930	Cable	various	1/9/2020	1/9/2022

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	3351.899M	39.0	-29.3 +1.0	+30.8	+1.5	+3.1	+0.0	46.1	54.0	-7.9	Horiz
2	5068.087M Ave	34.6	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	44.4	54.0	-9.6	Horiz
^	5068.087M	44.8	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	54.6	54.0	+0.6	Horiz
4	1404.769M	46.3	-32.0 +0.6	+25.3	+0.9	+1.9	+0.0	43.0	54.0	-11.0	Horiz
5	10361.470 M	36.4	-31.7 +1.7	+37.0	+2.8	+5.6	+0.0	51.8	68.2	-16.4	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**105488**	Date:	12/21/2021
Test Type:	**Radiated Scan**	Time:	16:15:19
Tested By:	Hoang Cao	Sequence#:	130
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1 to 40GHz

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa

Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0

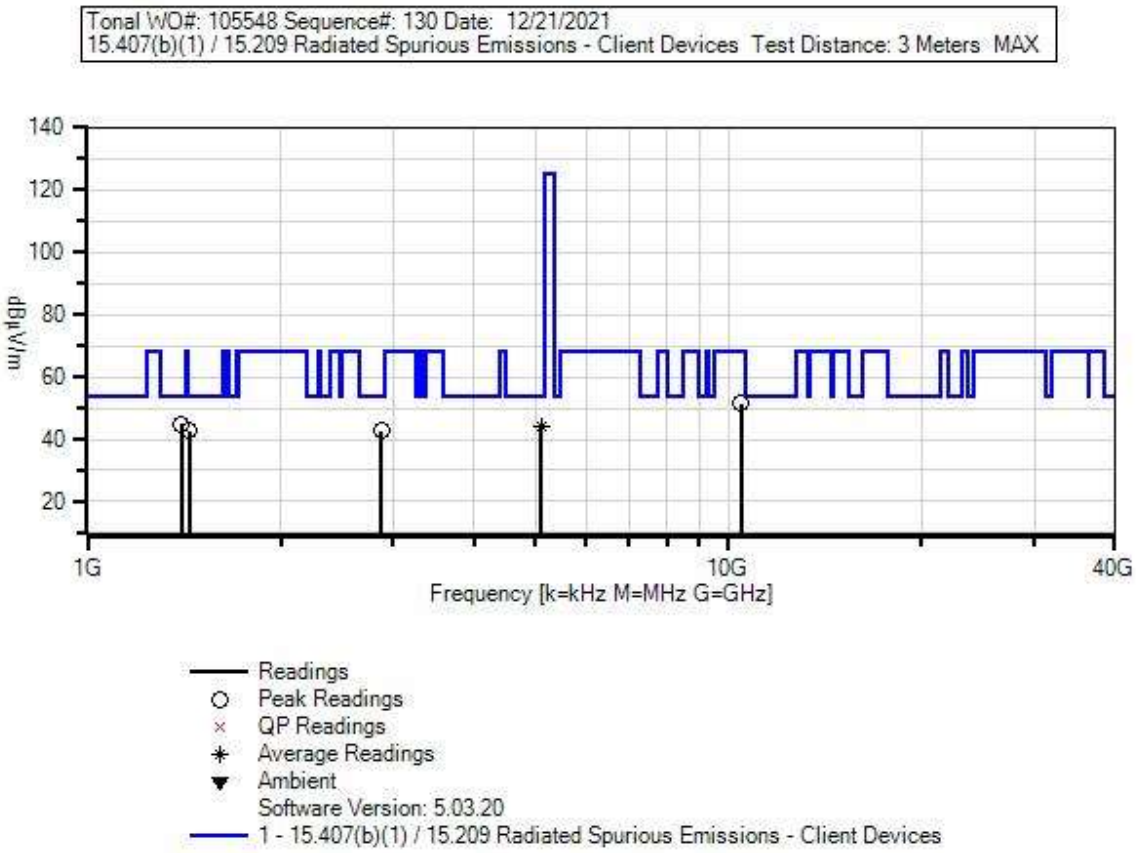
Operational mode is representative of worst case.

UNII1 - OFDM
Middle Channel

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications : #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.


Tonal WO#: 105548 Sequence#: 130 Date: 12/21/2021
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices Test Distance: 3 Meters MAX
140
120
100
80
60
40
20
dBµV/m
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.20
1 - 15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T4	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	ANP00928	Cable	various	1/9/2020	1/9/2022
	ANP00929	Cable	various	1/9/2020	1/9/2022
	ANP00930	Cable	various	1/9/2020	1/9/2022

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	1401.324M	48.1	-32.0 +0.6	+25.3	+0.9	+1.9	+0.0	44.8	54.0	-9.2	Vert
2	5107.971M Ave	34.4	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	44.2	54.0	-9.8	Horiz
^	5107.971M	45.0	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	54.8	54.0	+0.8	Horiz
4	1440.078M	45.8	-31.9 +0.6	+25.4	+0.9	+2.0	+0.0	42.8	54.0	-11.2	Horiz
5	2869.429M	38.7	-30.4 +0.9	+29.3	+1.4	+2.8	+0.0	42.7	54.0	-11.3	Vert
6	10440.000 M	35.8	-31.7 +1.8	+37.1	+2.8	+5.7	+0.0	51.5	68.2	-16.7	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**105488**	Date:	12/21/2021
Test Type:	**Radiated Scan**	Time:	16:34:18
Tested By:	Hoang Cao	Sequence#:	133
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1 to 40GHz

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa

Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0

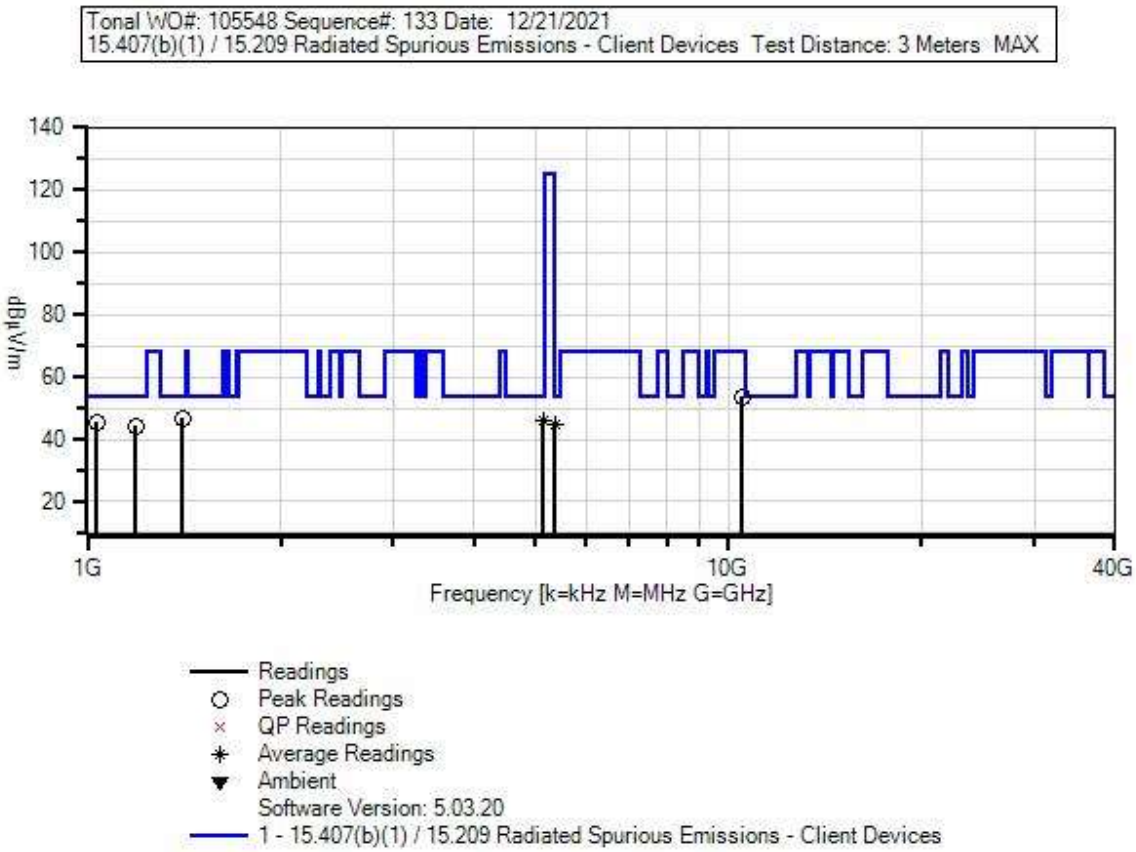
Operational mode is representative of worst case.

UNII1 - OFDM
High Channel

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn

Display is showing home screen
Modifications : #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.


Tonal WO#: 105548 Sequence#: 133 Date: 12/21/2021
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices Test Distance: 3 Meters MAX
140
120
100
80
60
40
20
dBµV/m
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.20
1 - 15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T4	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	ANP00928	Cable	various	1/9/2020	1/9/2022
	ANP00929	Cable	various	1/9/2020	1/9/2022
	ANP00930	Cable	various	1/9/2020	1/9/2022

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	1408.213M	50.2	-32.0 +0.6	+25.3	+0.9	+1.9	+0.0	46.9	54.0	-7.1	Horiz
2	5128.379M Ave	36.0	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	45.8	54.0	-8.2	Horiz
^	5128.379M	45.6	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	55.4	54.0	+1.4	Horiz
4	1034.448M	51.3	-33.5 +0.4	+24.5	+1.2	+1.6	+0.0	45.5	54.0	-8.5	Vert
5	5352.142M Ave	34.5	-29.9 +1.2	+33.1	+2.0	+3.9	+0.0	44.8	54.0	-9.2	Horiz
^	5352.142M	44.7	-29.9 +1.2	+33.1	+2.0	+3.9	+0.0	55.0	54.0	+1.0	Horiz
7	1189.466M	48.7	-32.8 +0.6	+24.9	+0.9	+1.8	+0.0	44.1	54.0	-9.9	Vert
8	10480.000 M	37.9	-31.7 +1.8	+37.1	+2.8	+5.7	+0.0	53.6	68.2	-14.6	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**105488**	Date:	12/21/2021
Test Type:	**Radiated Scan**	Time:	16:59:10
Tested By:	Hoang Cao	Sequence#:	136
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1 to 40GHz

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa

Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0

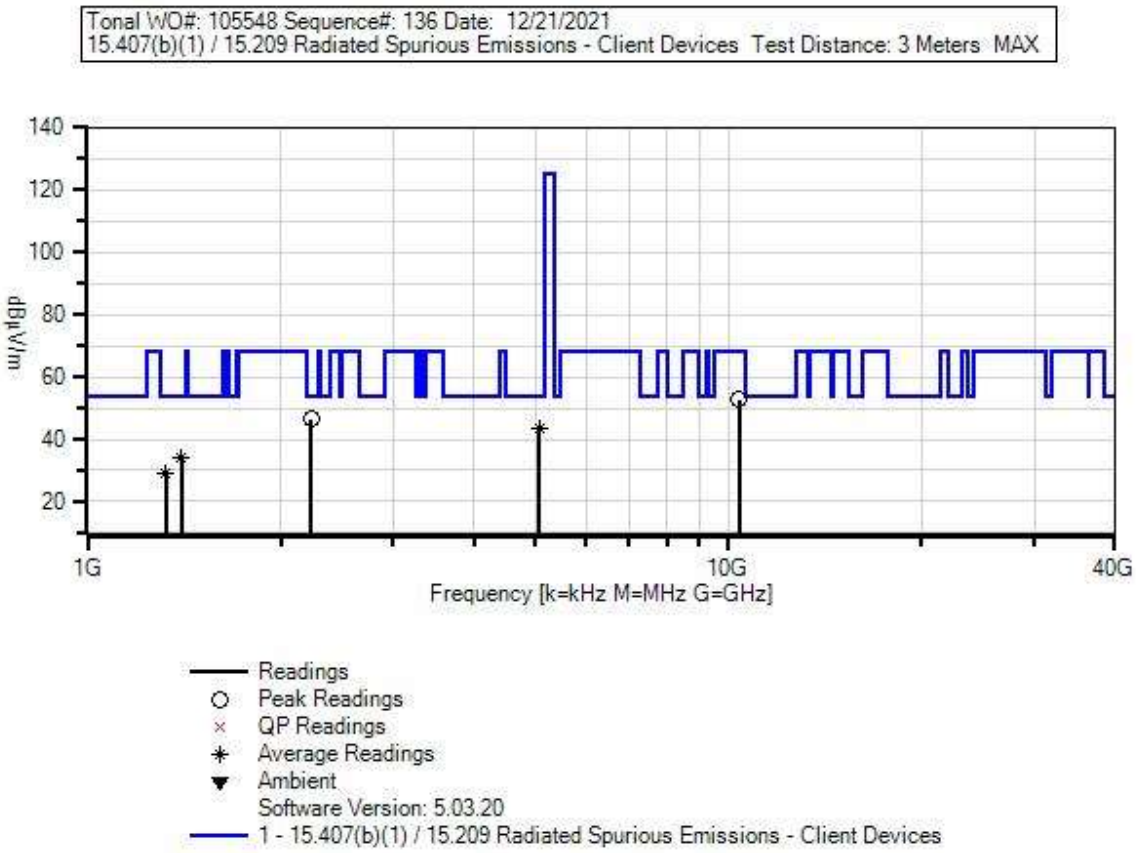
Operational mode is representative of worst case.

UNII1 - HT20
Low Channel

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications : #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.


Tonal WO#: 105548 Sequence#: 136 Date: 12/21/2021
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices Test Distance: 3 Meters MAX
140
120
100
80
60
40
20
dBµV/m
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.20
1 - 15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T4	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	ANP00928	Cable	various	1/9/2020	1/9/2022
	ANP00929	Cable	various	1/9/2020	1/9/2022
	ANP00930	Cable	various	1/9/2020	1/9/2022

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	2231.478M	45.0	-30.7 +0.8	+27.8	+1.2	+2.4	+0.0	46.5	54.0	-7.5	Vert
2	5067.967M Ave	33.4	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	43.2	54.0	-10.8	Horiz
^	5067.967M	44.5	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	54.3	54.0	+0.3	Horiz
4	10360.000 M	37.4	-31.8 +1.7	+37.0	+2.8	+5.6	+0.0	52.7	68.2	-15.5	Horiz
5	1400.565M Ave	37.3	-32.0 +0.6	+25.3	+0.9	+1.9	+0.0	34.0	54.0	-20.0	Horiz
^	1400.565M	59.2	-32.0 +0.6	+25.3	+0.9	+1.9	+0.0	55.9	54.0	+1.9	Horiz
7	1327.152M Ave	32.8	-32.3 +0.6	+25.2	+0.9	+1.9	+0.0	29.1	54.0	-24.9	Horiz
^	1327.152M	53.5	-32.3 +0.6	+25.2	+0.9	+1.9	+0.0	49.8	54.0	-4.2	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**105488**	Date:	12/21/2021
Test Type:	**Radiated Scan**	Time:	17:15:20
Tested By:	Hoang Cao	Sequence#:	139
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1 to 40GHz

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa

Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0

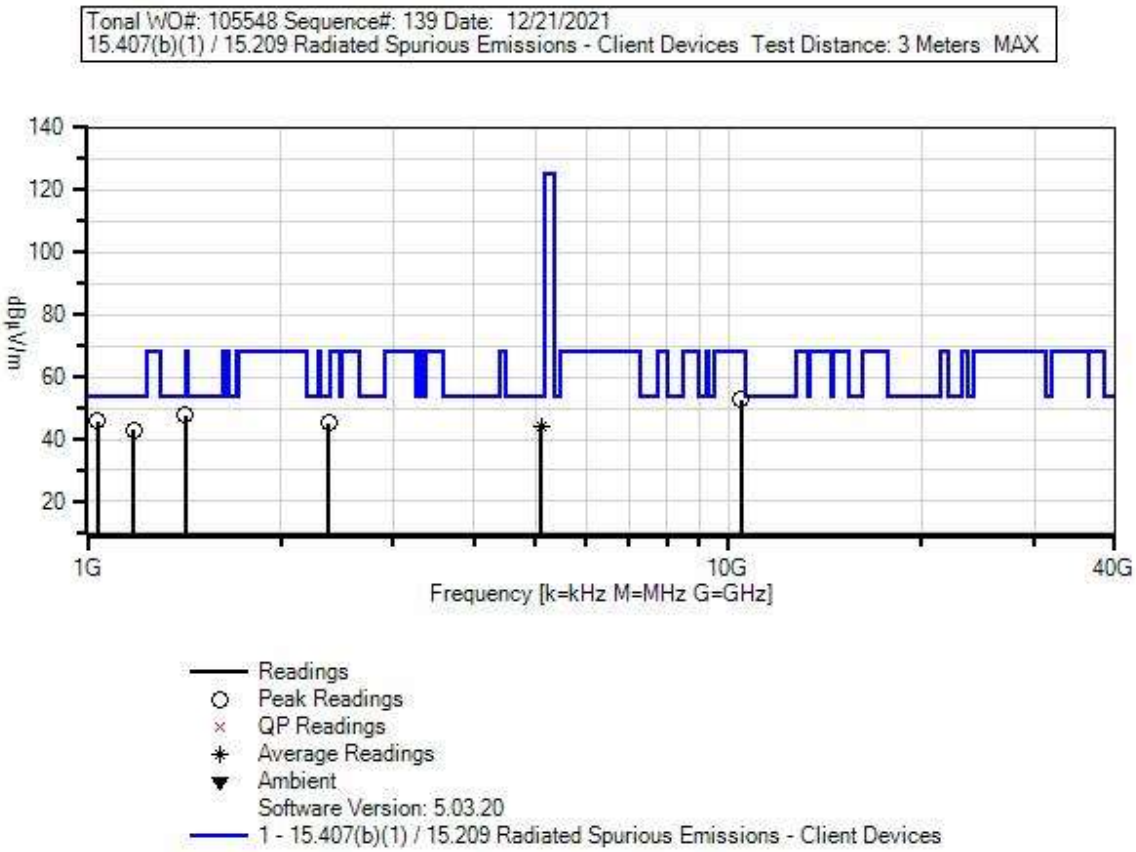
Operational mode is representative of worst case.

UNII1 - HT20
Middle Channel

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications : #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.


Tonal WO#: 105548 Sequence#: 139 Date: 12/21/2021
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices Test Distance: 3 Meters MAX
140
120
100
80
60
40
20
dBµV/m
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.20
1 - 15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T4	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	ANP00928	Cable	various	1/9/2020	1/9/2022
	ANP00929	Cable	various	1/9/2020	1/9/2022
	ANP00930	Cable	various	1/9/2020	1/9/2022

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	1419.409M	51.0	-32.0 +0.6	+25.4	+0.9	+1.9	+0.0	47.8	54.0	-6.2	Horiz
2	1037.893M	51.7	-33.5 +0.4	+24.5	+1.2	+1.6	+0.0	45.9	54.0	-8.1	Vert
3	2380.547M	43.4	-30.6 +0.8	+28.0	+1.2	+2.5	+0.0	45.3	54.0	-8.7	Horiz
4	5108.141M Ave	34.2	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	44.0	54.0	-10.0	Horiz
^	5108.141M	44.5	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	54.3	54.0	+0.3	Horiz
6	1179.993M	47.7	-32.8 +0.6	+24.8	+0.9	+1.8	+0.0	43.0	54.0	-11.0	Vert
7	10440.000 M	37.1	-31.7 +1.8	+37.1	+2.8	+5.7	+0.0	52.8	68.2	-15.4	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**105488**	Date:	12/21/2021
Test Type:	**Radiated Scan**	Time:	17:34:42
Tested By:	Hoang Cao	Sequence#:	142
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1 to 40GHz

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa

Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0

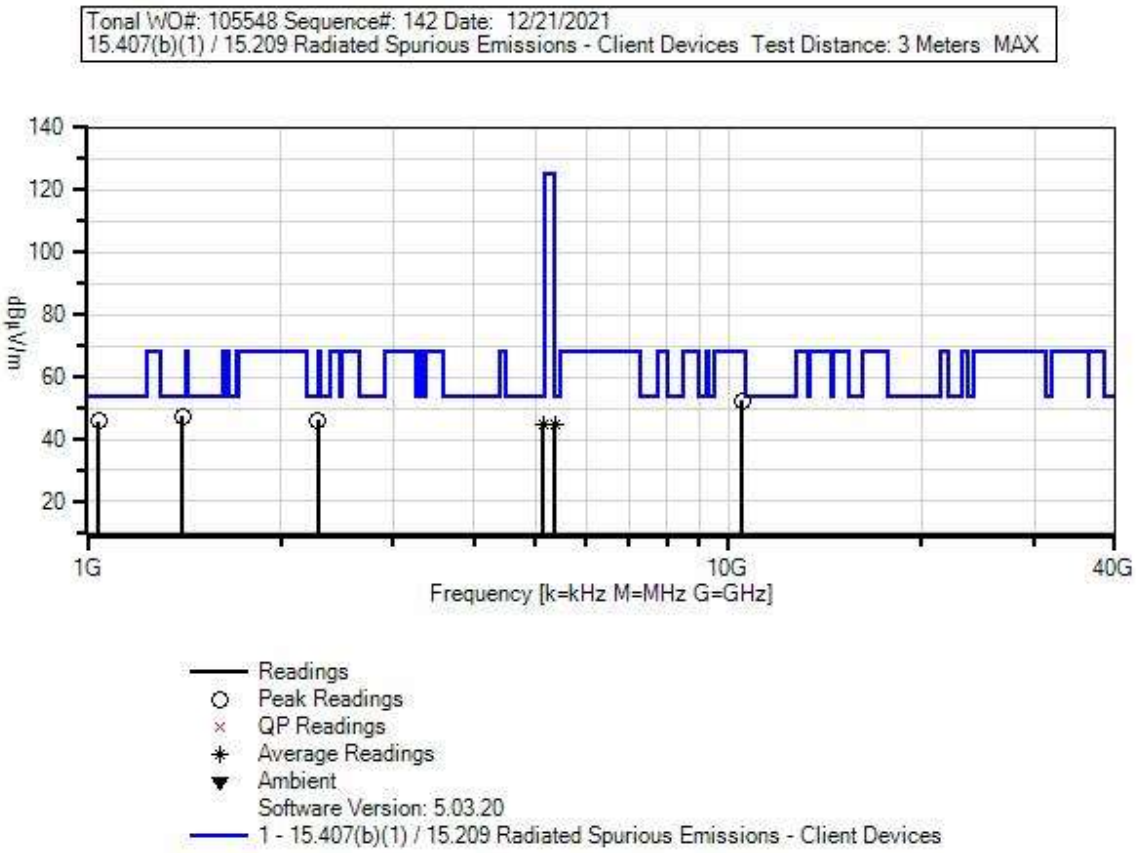
Operational mode is representative of worst case.

UNII1 - HT20
High Channel

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications : #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.


Tonal WO#: 105548 Sequence#: 142 Date: 12/21/2021
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices Test Distance: 3 Meters MAX
140
120
100
80
60
40
20
dBµV/m
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.20
1 - 15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T4	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	ANP00928	Cable	various	1/9/2020	1/9/2022
	ANP00929	Cable	various	1/9/2020	1/9/2022
	ANP00930	Cable	various	1/9/2020	1/9/2022

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	1405.630M	50.7	-32.0 +0.6	+25.3	+0.9	+1.9	+0.0	47.4	54.0	-6.6	Horiz
2	2285.976M	44.3	-30.7 +0.8	+27.9	+1.2	+2.5	+0.0	46.0	54.0	-8.0	Horiz
3	1042.199M	51.6	-33.5 +0.4	+24.5	+1.1	+1.7	+0.0	45.8	54.0	-8.2	Vert
4	5128.293M Ave	35.2	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	45.0	54.0	-9.0	Horiz
^	5128.293M	44.9	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	54.7	54.0	+0.7	Horiz
6	5352.109M Ave	34.5	-29.9 +1.2	+33.1	+2.0	+3.9	+0.0	44.8	54.0	-9.2	Horiz
^	5352.109M	44.5	-29.9 +1.2	+33.1	+2.0	+3.9	+0.0	54.8	54.0	+0.8	Horiz
8	10480.000 M	36.8	-31.7 +1.8	+37.1	+2.8	+5.7	+0.0	52.5	68.2	-15.7	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**105488**	Date:	12/21/2021
Test Type:	**Radiated Scan**	Time:	18:46:45
Tested By:	Hoang Cao	Sequence#:	146
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1 to 40GHz

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa

Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0

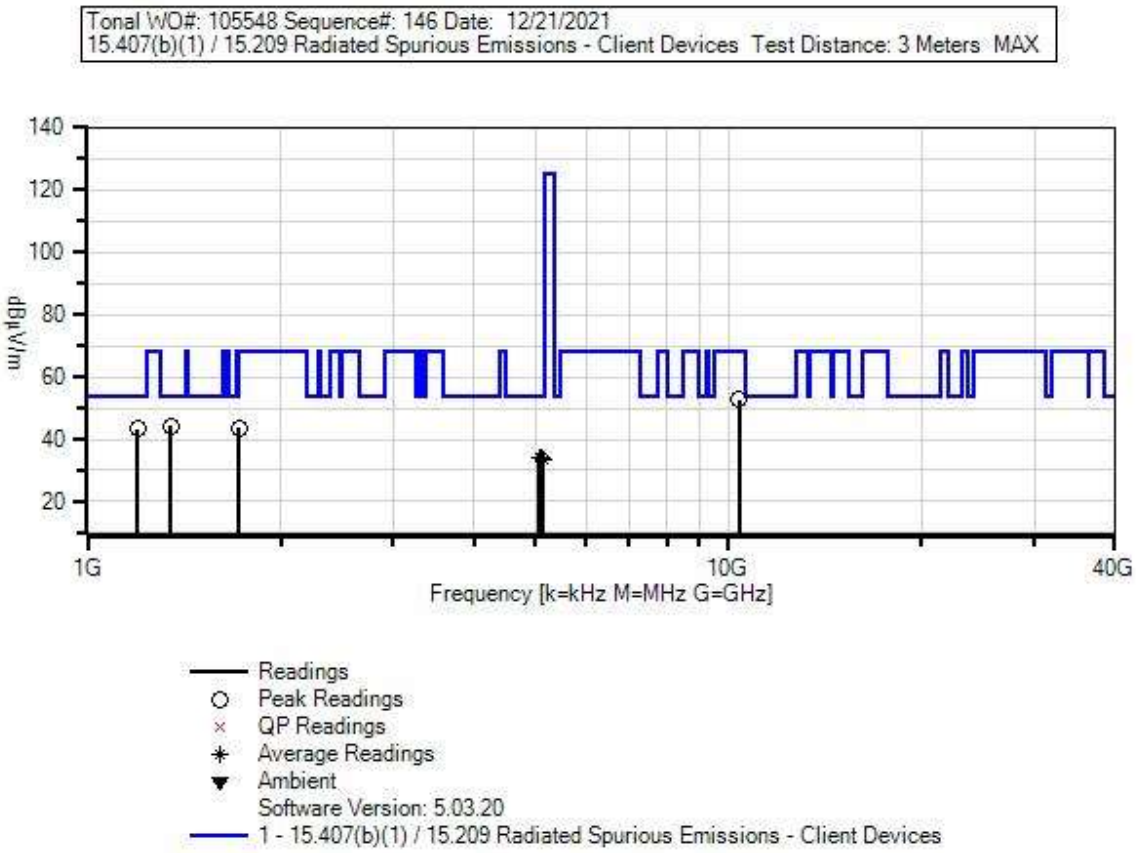
Operational mode is representative of worst case.

UNII1 - HT40
Low Channel

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications : #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.


Tonal WO#: 105548 Sequence#: 146 Date: 12/21/2021
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices Test Distance: 3 Meters MAX
140
120
100
80
60
40
20
dBµV/m
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.20
1 - 15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T4	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	ANP00928	Cable	various	1/9/2020	1/9/2022
	ANP00929	Cable	various	1/9/2020	1/9/2022
	ANP00930	Cable	various	1/9/2020	1/9/2022

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	1347.929M	48.0	-32.2 +0.6	+25.2	+0.9	+1.9	+0.0	44.4	54.0	-9.6	Vert
2	1721.694M	44.9	-31.4 +0.7	+26.4	+1.0	+2.1	+0.0	43.7	54.0	-10.3	Horiz
3	1198.078M	47.8	-32.8 +0.6	+24.9	+0.9	+1.8	+0.0	43.2	54.0	-10.8	Horiz
4	10380.000M	37.1	-31.7 +1.7	+37.0	+2.8	+5.7	+0.0	52.6	68.2	-15.6	Horiz
5	5070.017M Ave	24.5	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	34.3	54.0	-19.7	Horiz
^	5070.017M	49.2	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	59.0	54.0	+5.0	Horiz
7	5117.810M Ave	24.4	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	34.2	54.0	-19.8	Horiz
^	5117.810M	46.1	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	55.9	54.0	+1.9	Horiz
9	5141.886M Ave	23.9	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	33.7	54.0	-20.3	Horiz
^	5141.886M	43.9	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	53.7	54.0	-0.3	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**105488**	Date:	12/21/2021
Test Type:	**Radiated Scan**	Time:	19:00:35
Tested By:	Hoang Cao	Sequence#:	149
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1 to 40GHz

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa

Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0

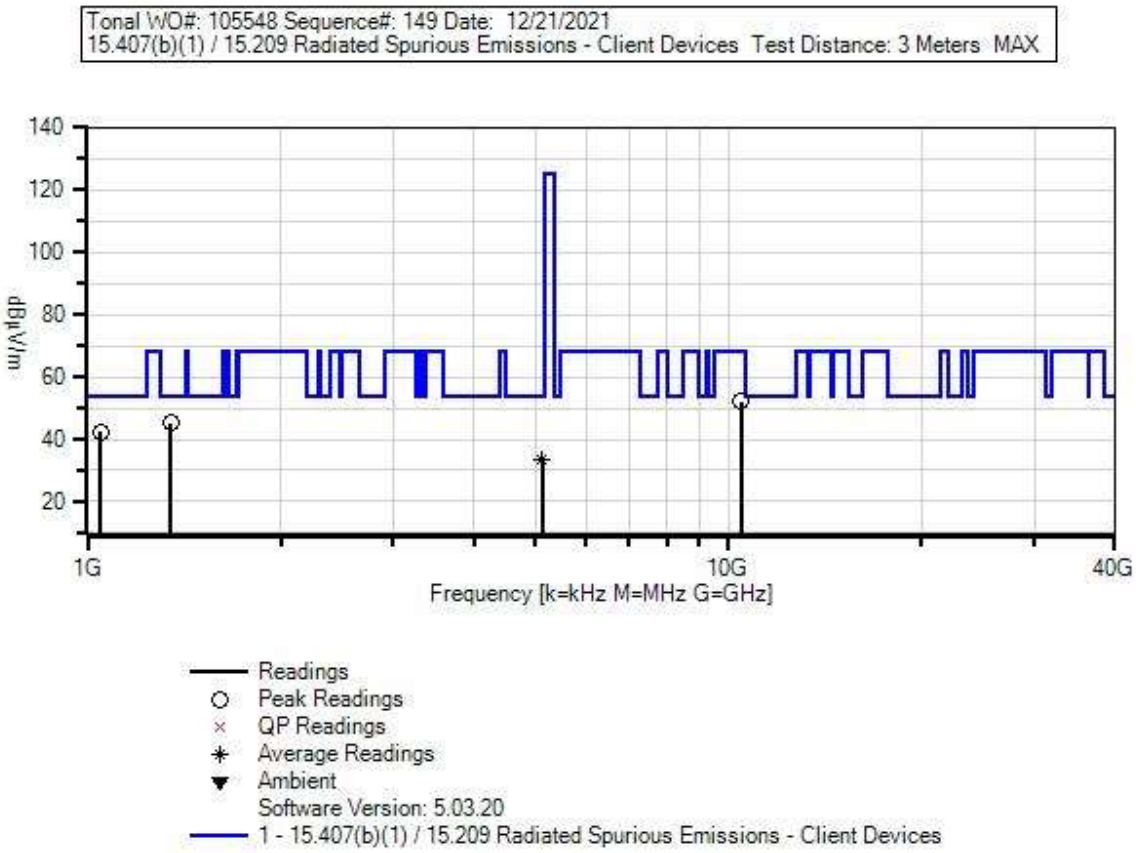
Operational mode is representative of worst case.

UNII1 - HT40
High Channel

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications : #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.


Tonal WO#: 105548 Sequence#: 149 Date: 12/21/2021
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices Test Distance: 3 Meters MAX
140
120
100
80
60
40
20
dBµV/m
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.20
1 - 15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T4	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	ANP00928	Cable	various	1/9/2020	1/9/2022
	ANP00929	Cable	various	1/9/2020	1/9/2022
	ANP00930	Cable	various	1/9/2020	1/9/2022

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	1347.929M	48.8	-32.2 +0.6	+25.2	+0.9	+1.9	+0.0	45.2	54.0	-8.8	Vert
2	1048.228M	48.1	-33.5 +0.5	+24.5	+1.1	+1.7	+0.0	42.4	54.0	-11.6	Vert
3	10460.000 M	36.5	-31.7 +1.8	+37.1	+2.8	+5.7	+0.0	52.2	68.2	-16.0	Horiz
4	5109.998M Ave	23.4	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	33.2	54.0	-20.8	Horiz
^	5109.998M	48.1	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	57.9	54.0	+3.9	Horiz

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices**		
Work Order #:	**105488**	Date:	12/21/2021
Test Type:	**Radiated Scan**	Time:	19:23:09
Tested By:	Hoang Cao	Sequence#:	152
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Radiated Emission
Frequency Range: 1 to 40GHz

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa

Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0

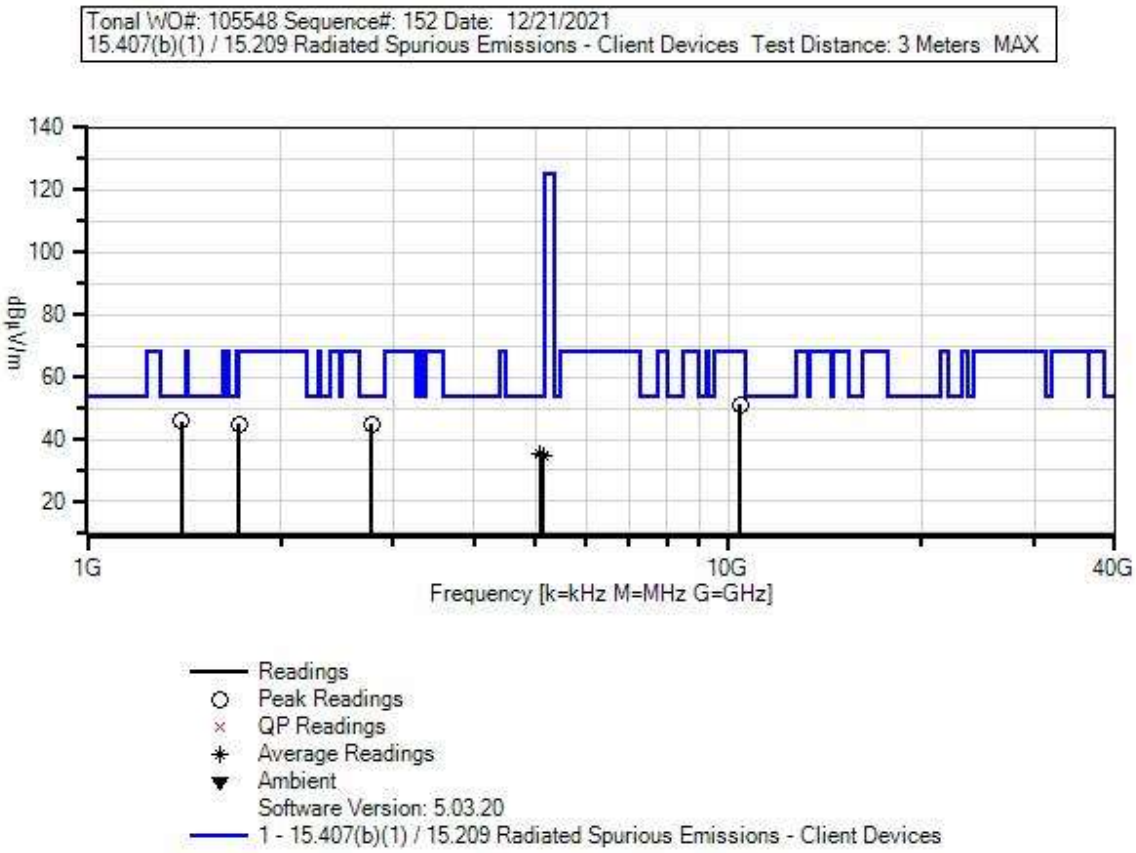
Operational mode is representative of worst case.

UNII1 - HT80

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn
Display is showing home screen

Modifications : #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.


Tonal WO#: 105548 Sequence#: 152 Date: 12/21/2021
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices Test Distance: 3 Meters MAX
140
120
100
80
60
40
20
dBµV/m
1G
10G
40G
Frequency [k=kHz M=MHz G=GHz]
Readings
Peak Readings
QP Readings
Average Readings
Ambient
Software Version: 5.03.20
1 - 15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T2	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T3	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T4	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022
	AN02693	Active Horn Antenna	AMFW-5F-12001800-20-10P	10/26/2021	10/26/2023
	AN02694	Horn Antenna	AMFW-5F-18002650-20-10P	10/26/2021	10/26/2023
	AN02695	Active Horn Antenna	AMFW-5F-260400-33-8P	10/26/2021	10/26/2023
	ANP00928	Cable	various	1/9/2020	1/9/2022
	ANP00929	Cable	various	1/9/2020	1/9/2022
	ANP00930	Cable	various	1/9/2020	1/9/2022

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

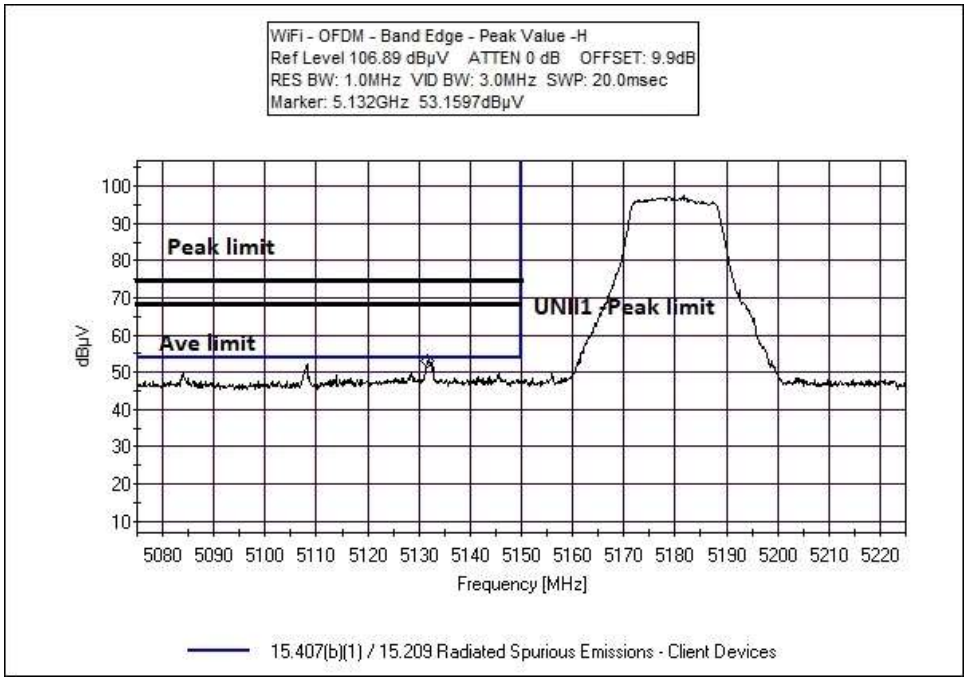
#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV/m	dBµV/m	dB	Ant
1	1403.046M	49.0	-32.0 +0.6	+25.3	+0.9	+1.9	+0.0	45.7	54.0	-8.3	Vert
2	1721.694M	46.0	-31.4 +0.7	+26.4	+1.0	+2.1	+0.0	44.8	54.0	-9.2	Horiz
3	2771.652M	41.4	-30.5 +0.9	+29.0	+1.3	+2.7	+0.0	44.8	54.0	-9.2	Horiz
4	10420.000 M	35.6	-31.7 +1.7	+37.1	+2.8	+5.7	+0.0	51.2	68.2	-17.0	Horiz
5	5089.935M Ave	25.3	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	35.1	54.0	-18.9	Horiz
^	5089.935M	50.5	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	60.3	54.0	+6.3	Horiz
7	5137.963M Ave	24.7	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	34.5	54.0	-19.5	Horiz
^	5137.963M	46.2	-29.9 +1.2	+32.8	+1.9	+3.8	+0.0	56.0	54.0	+2.0	Horiz

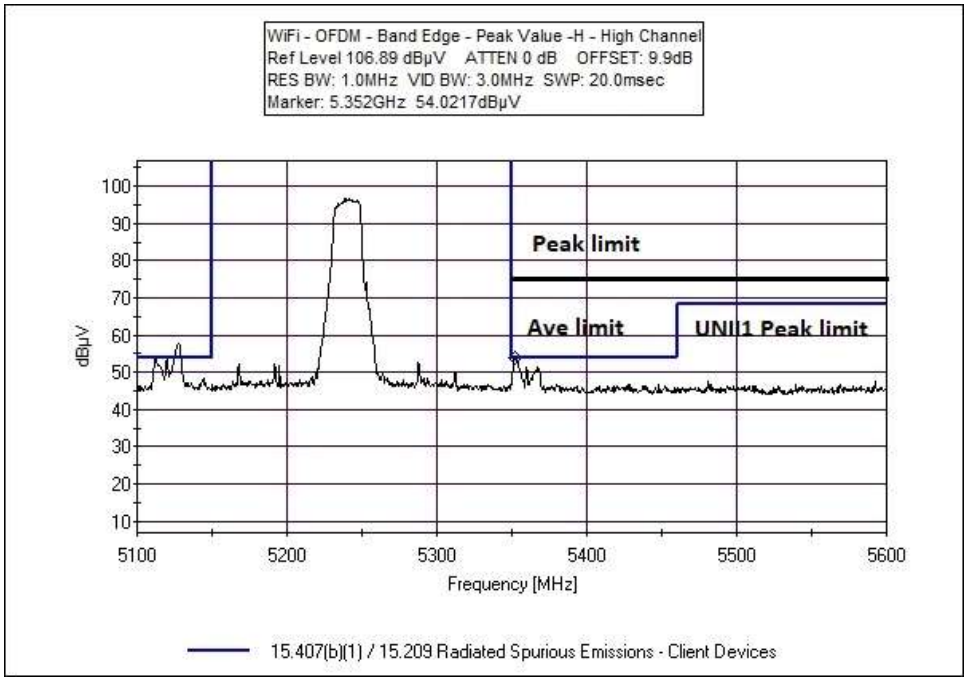
Note: Chain 0 is the worst case based on the investigation on RF output power before measuring Radiated Spurious Emissions.

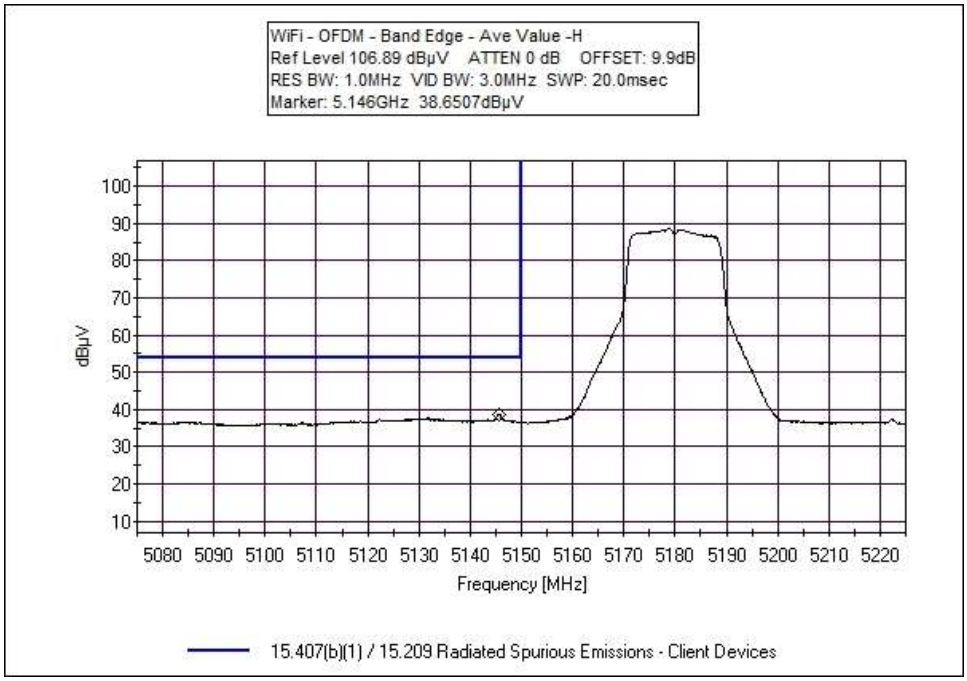
Band Edge

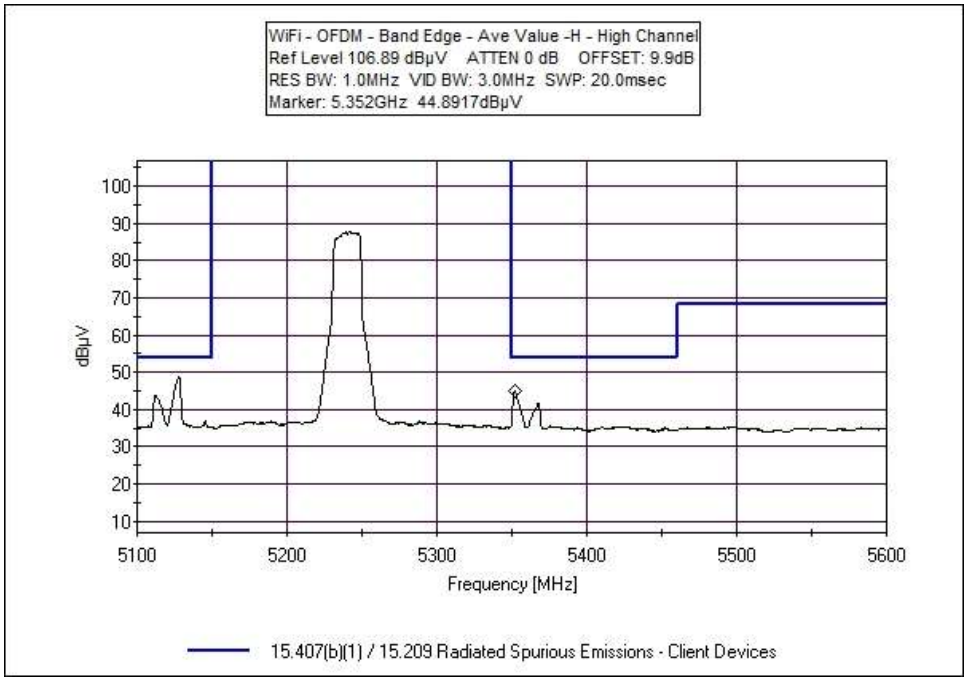
Band Edge Summary					
Frequency (MHz)	**Modulation**	**Ant. Type**	**Field Strength (dBuV/m @3m)**	**Limit (dBuV/m @3m)**	**Results**
5150	OFDM	External	38.6507	<54	Pass
5250	OFDM	External	44.8917	<54	Pass
5150	HT20	External	36.2767	<54	Pass
5250	HT20	External	44.8627	<54	Pass
5150	HT40	External	39.5017	<54	Pass
5250	HT40	External	36.5687	<54	Pass
5150	HT80	External	42.3127	<54	Pass
5250	HT80	External	35.1567	<54	Pass

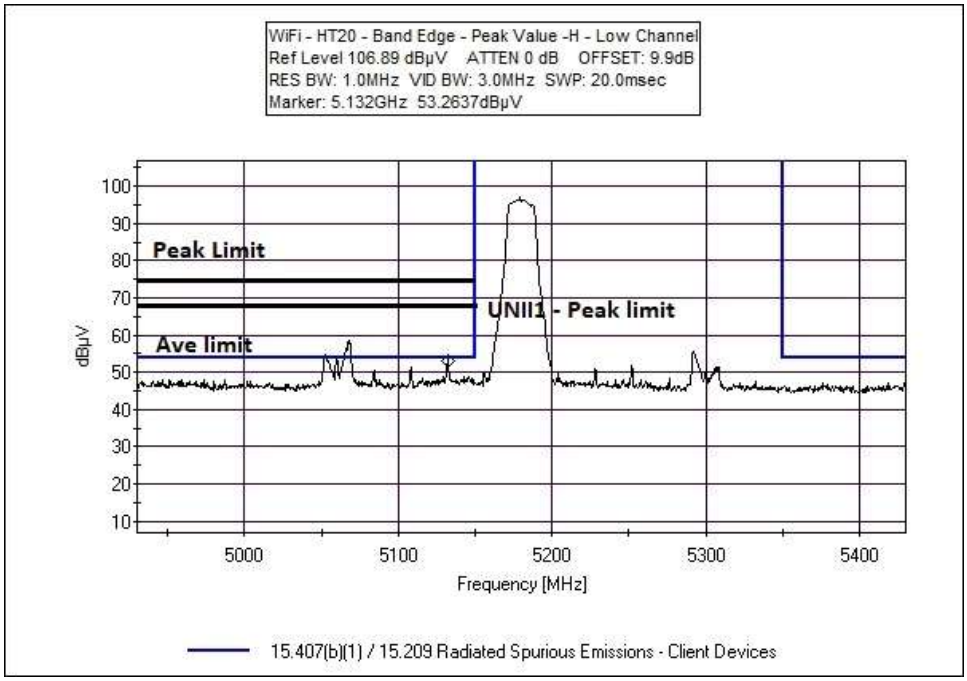
Band Edge Plots

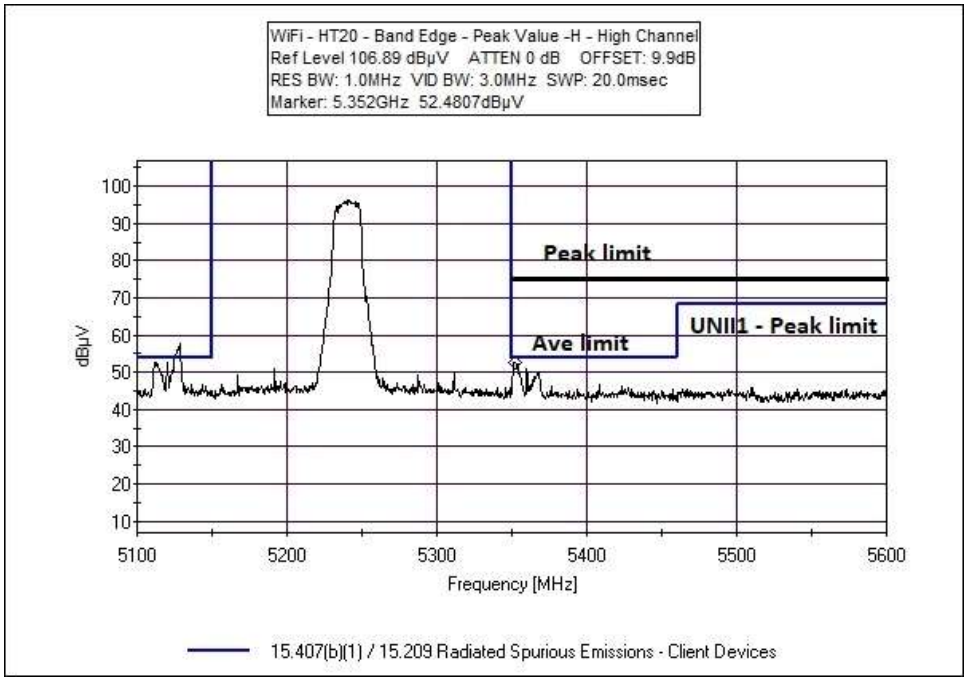


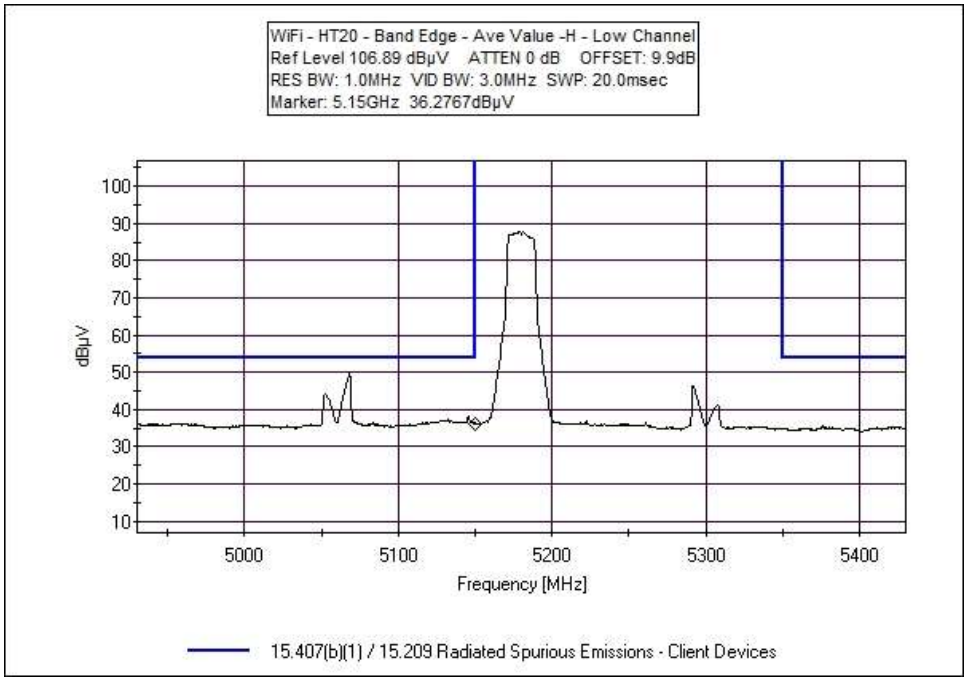

WiFi - OFDM - Band Edge - Peak Value -H - High Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.352GHz 54.0217dBµV
Peak limit
Ave limit
UNII1 Peak limit
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

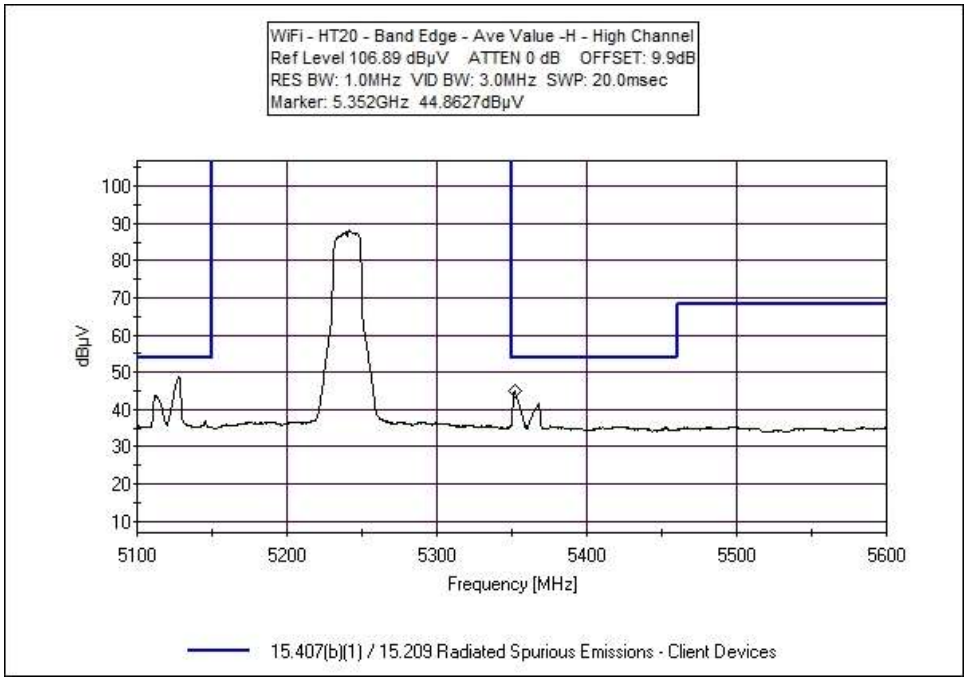

WiFi - OFDM - Band Edge - Ave Value -H
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.146GHz 38.6507dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

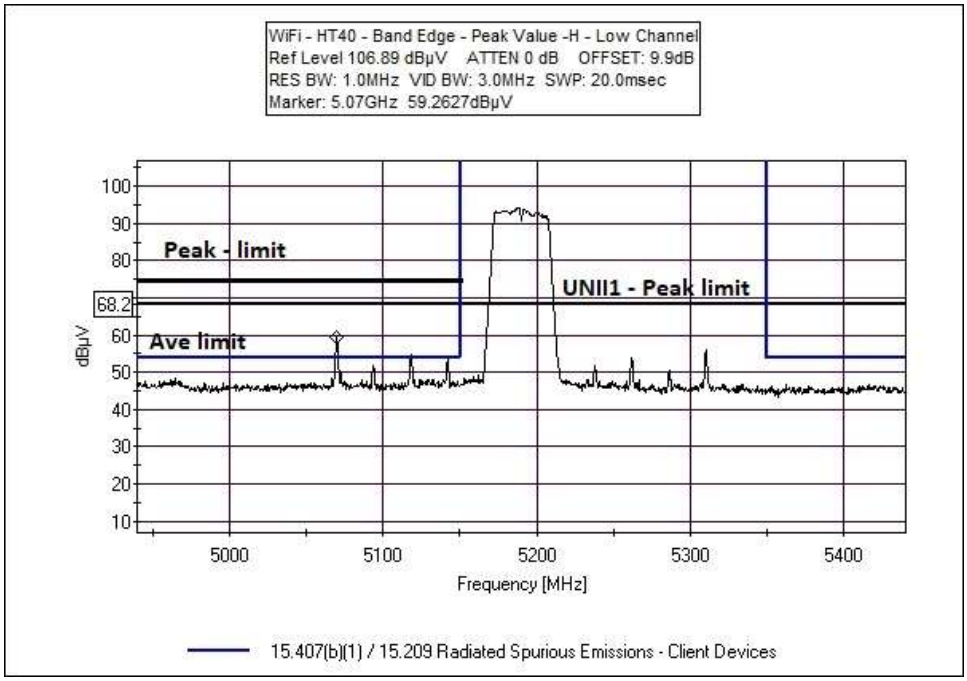

WiFi - OFDM - Band Edge - Ave Value -H - High Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.352GHz 44.8917dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

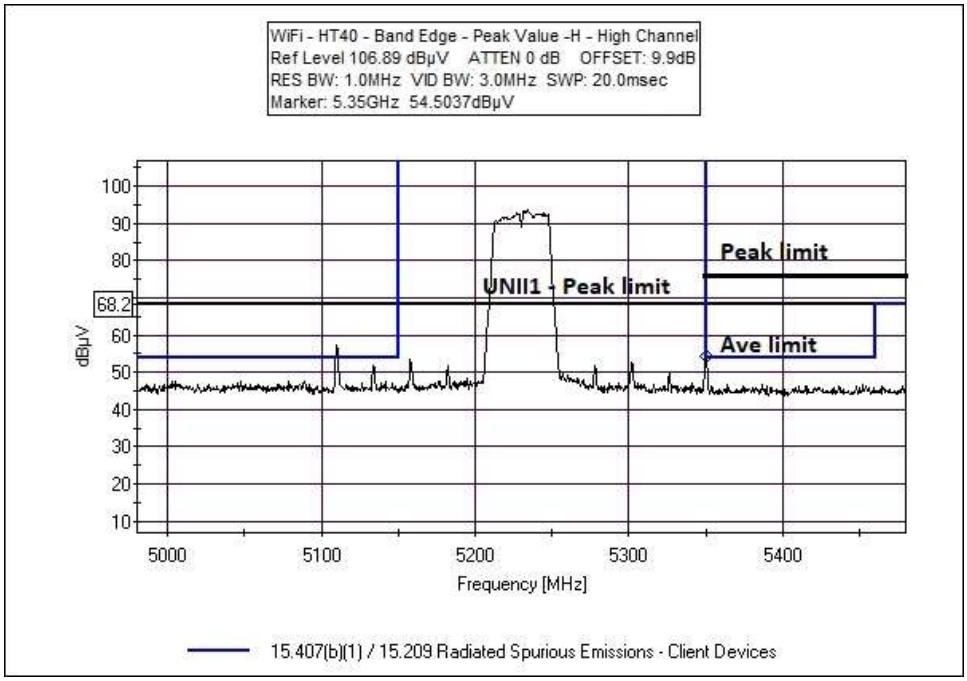

WiFi - HT20 - Band Edge - Peak Value -H - Low Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.132GHz 53.2637dBµV
Peak Limit
UNII1 - Peak limit
Ave limit
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

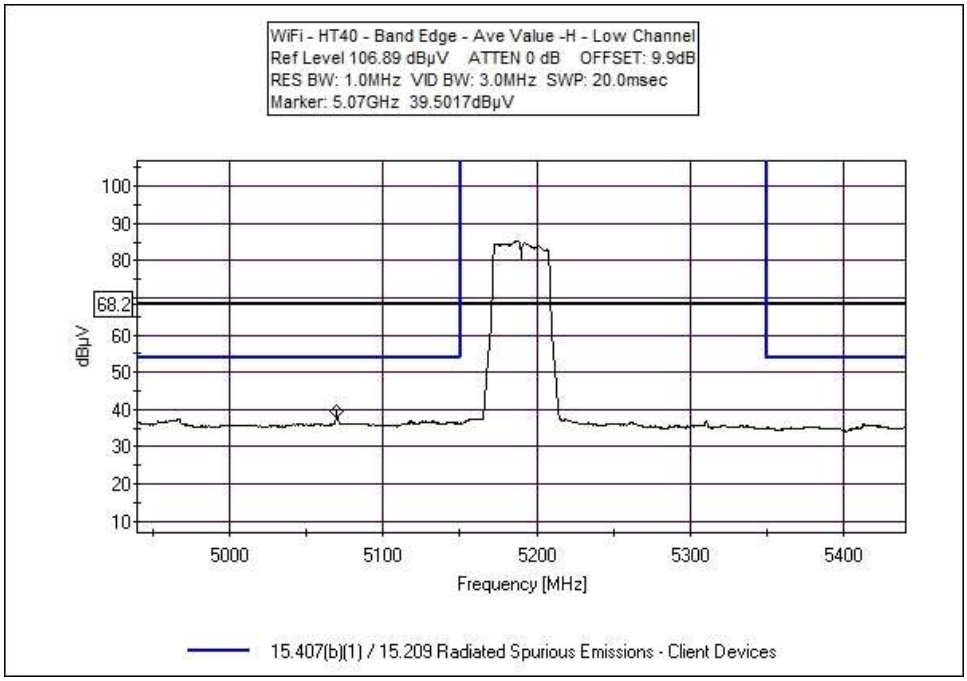

WiFi - HT20 - Band Edge - Peak Value -H - High Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.352GHz 52.4807dBµV
Peak limit
UNII1 - Peak limit
Ave limit
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

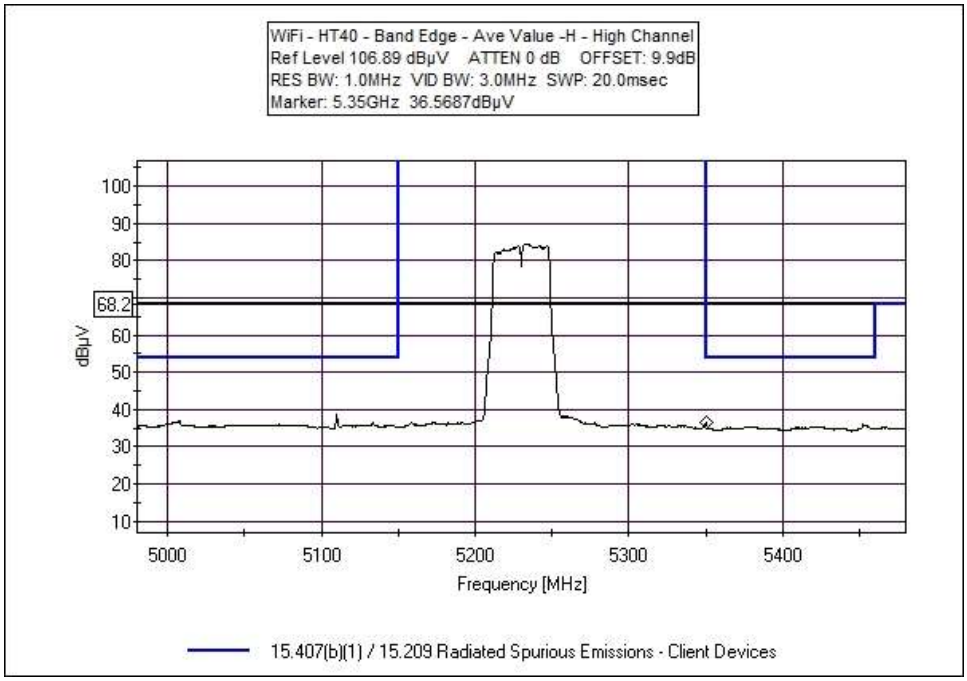

WiFi - HT20 - Band Edge - Ave Value -H - Low Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.15GHz 36.2767dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

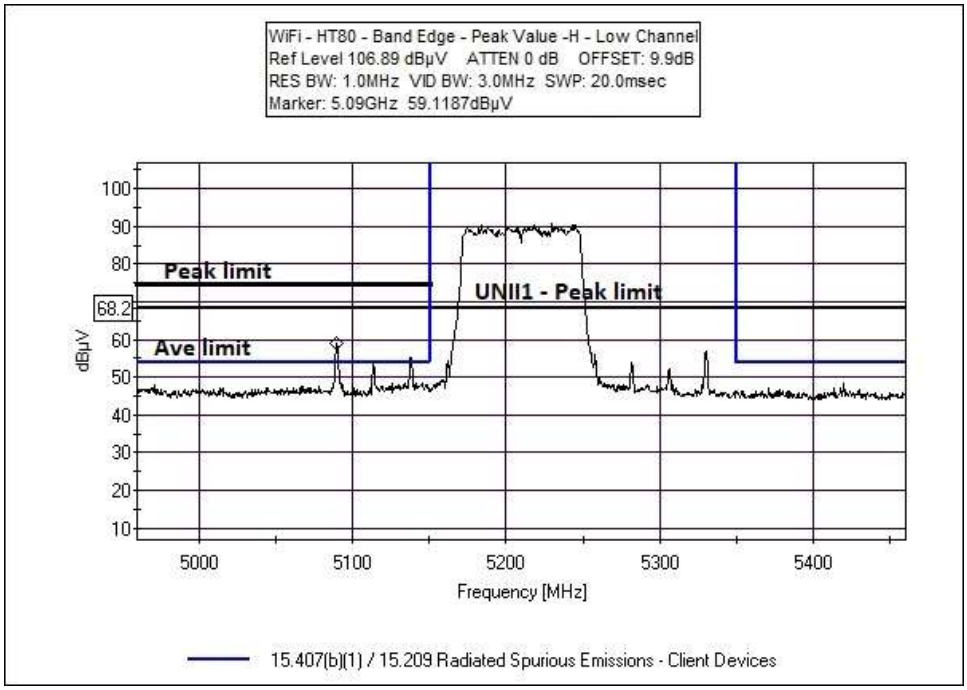

WiFi - HT20 - Band Edge - Ave Value -H - High Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.352GHz 44.8627dBµV
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

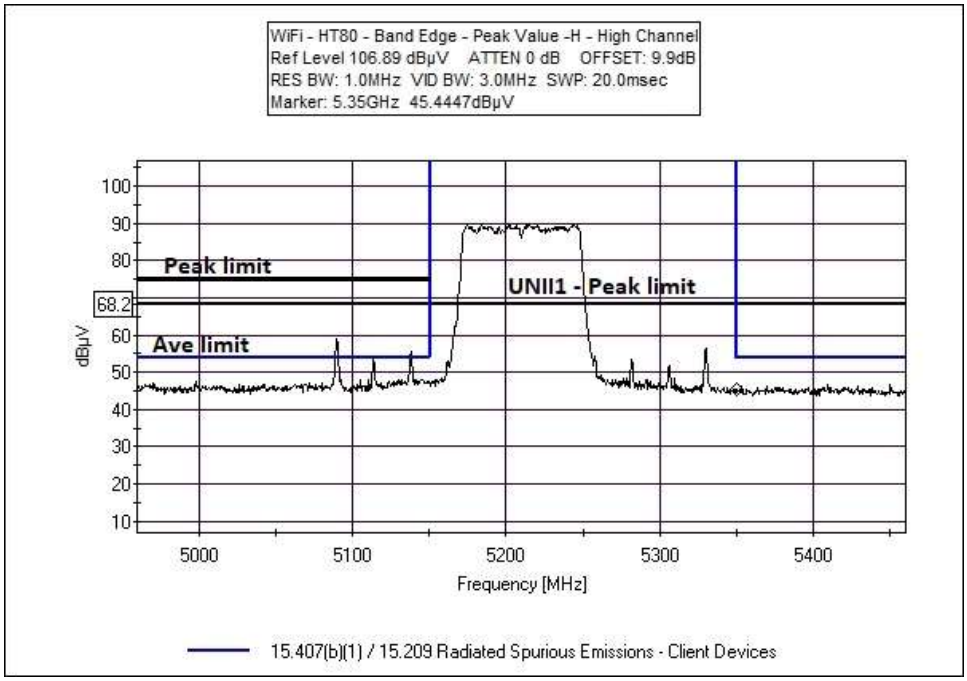

WiFi - HT40 - Band Edge - Peak Value -H - Low Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.07GHz 59.2627dBµV
Peak - limit
UNII1 - Peak limit
68.2
Ave limit
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

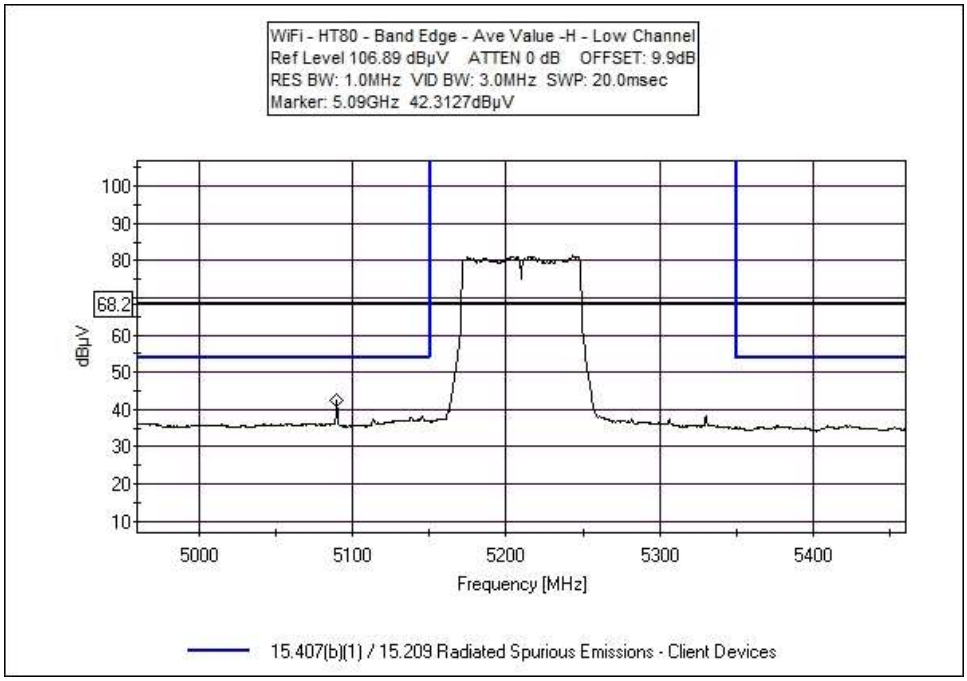

WiFi - HT40 - Band Edge - Peak Value -H - High Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.35GHz 54.5037dBµV
Peak limit
UNII1 - Peak limit
Ave limit
68.2
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

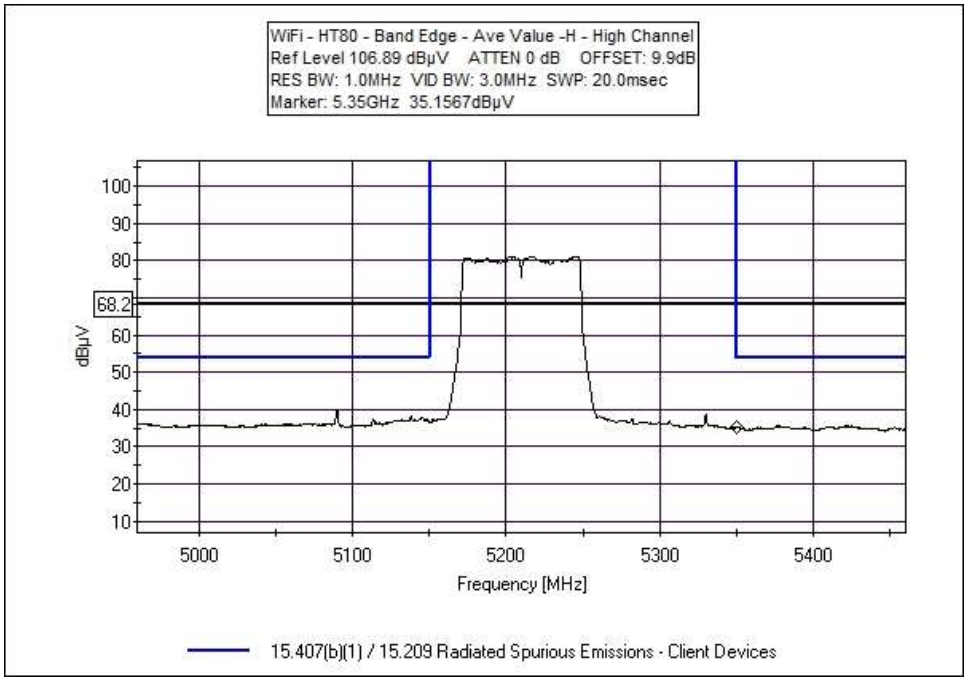

WiFi - HT40 - Band Edge - Ave Value -H - Low Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.07GHz 39.5017dBµV
68.2
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices


WiFi - HT40 - Band Edge - Ave Value -H - High Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.35GHz 36.5687dBµV
100
90
80
68.2
60
50
40
30
20
10
dBµV
5000
5100
5200
5300
5400
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices


WiFi - HT80 - Band Edge - Peak Value -H - Low Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.09GHz 59.1187dBµV
100
90
80
Peak limit
UNII1 - Peak limit
68.2
60
Ave limit
50
40
30
20
10
dBµV
5000
5100
5200
5300
5400
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices


WiFi - HT80 - Band Edge - Peak Value -H - High Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.35GHz 45.4447dBµV
Peak limit
UNII1 - Peak limit
Ave limit
68.2
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices


WiFi - HT80 - Band Edge - Ave Value -H - Low Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.09GHz 42.3127dBµV
68.2
dBµV
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices


WiFi - HT80 - Band Edge - Ave Value -H - High Channel
Ref Level 106.89 dBµV ATTEN 0 dB OFFSET: 9.9dB
RES BW: 1.0MHz VID BW: 3.0MHz SWP: 20.0msec
Marker: 5.35GHz 35.1567dBµV
100
90
80
68.2
60
50
40
30
20
10
dBµV
5000
5100
5200
5300
5400
Frequency [MHz]
15.407(b)(1) / 15.209 Radiated Spurious Emissions - Client Devices

Band Edge Data

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**Band Edge**		
Work Order #:	**105488**	Date:	12/20/2021
Test Type:	**Radiated Scan**	Time:	10:23:46
Tested By:	Hoang Cao	Sequence#:	79
Software:	EMITest 5.03.20		

Equipment Tested:

Device	Manufacturer	Model #	S/N
Configuration 3			

Support Equipment:

Device	Manufacturer	Model #	S/N
Configuration 3			

Test Conditions / Notes:

Band Edge

Environmental Conditions:
Temperature: 22.6ºC
Humidity: 33%
Atmospheric Pressure: 101.8kPa
Method: ANSI C63.10 2013

The unit is mounted to a floor standing rack as to simulate typical wall mounted setup. One weight line is extended to the floor.
WiFi transmitting continuously with modulation type as listed with pattern of 0s and 1s at power level 10.
MIMO not enabled, manufacturer declares chain 0 and chain 1 transmit uncorrelated data.
Chain 0
Operational mode is representative of worst case.

Notes:
Air gap touchscreen display
Display is showing home screen

Modifications : #1, #2, #3 #4, #5, #6 were in place during testing.

Support laptop included in this setup to control WiFi operating mode; port is internal to the equipment for configuration only.
Unintentional emissions related to display and display controller increased due to external cable to laptop.

Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T1	ANP01210	Cable	FSJ1P-50A-4A	11/2/2020	11/2/2022
T2	AN03302	Cable	32026-29094K-29094K-72TC	1/9/2020	1/9/2022
T3	AN02113	Horn Antenna-ANSI C63.5	3115	3/11/2021	3/11/2023
T4	AN02812	Preamp	83017-69004	9/22/2020	9/22/2022
T5	ANP06902	Cable	32022-29094K-29094K-36TC	8/13/2020	8/13/2022

15.207 AC Conducted Emissions

Test Setup / Conditions / Data

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**105488**	Date:	12/17/2021
Test Type:	**Conducted Emissions**	Time:	10:10:04
Tested By:	Hoang Cao	Sequence#:	46
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:

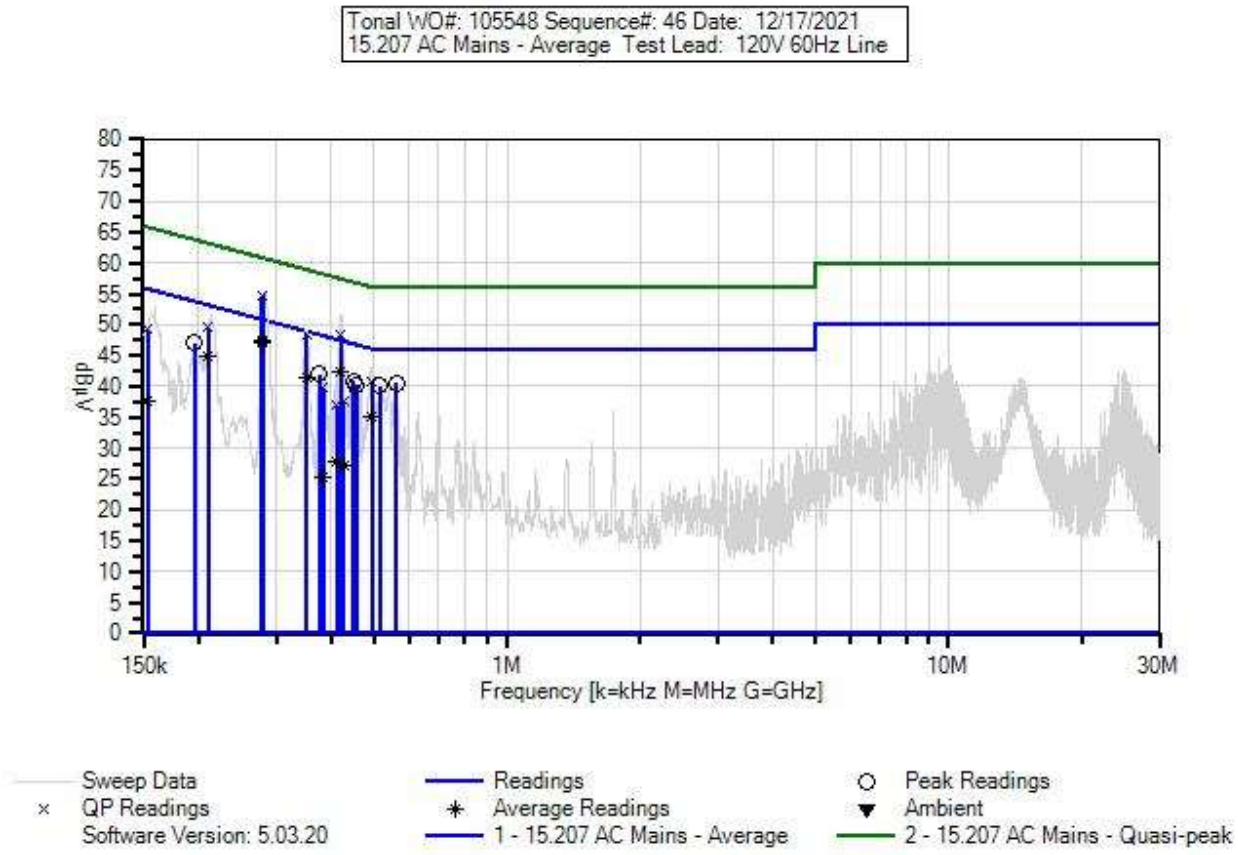
Conducted Emission
Frequency Range: 150kHz to 30MHz

Environmental Conditions:
Temperature: 21.8ºC
Humidity: 47%
Atmospheric Pressure: 101.5kPa

Highest Generation Frequency: 5.8GHz
Method: ANSI C63.10 2013

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.
All WIFI and Bluetooth modules are on.

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	2/25/2021	2/25/2023
T2	ANP06691	Cable	PE3062-180	3/25/2020	3/25/2022
T3	ANP06694	Cable	PE3062-480	3/25/2020	3/25/2022
T4	AN00494	50uH LISN-Line Loss (dB)	3816/NM	3/11/2021	3/11/2023
	AN00494	50uH LISN-Return Loss (dB)	3816/NM	3/11/2021	3/11/2023
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	ANP05258	High Pass Filter	HE9615-150K-50-720B	7/6/2020	7/6/2022

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	280.316k	37.3	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	47.4	50.8	-3.4	Line
	Ave										
2	278.856k	37.1	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	47.2	50.8	-3.6	Line
	Ave										
3	420.747k	32.4	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	42.4	47.4	-5.0	Line
	Ave										
4	562.324k	30.3	+9.9 +0.2	+0.0	+0.1	+0.1	+0.0	40.6	46.0	-5.4	Line
5	515.783k	29.7	+9.9 +0.2	+0.0	+0.1	+0.1	+0.0	40.0	46.0	-6.0	Line
6	280.316k	44.6	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	54.7	60.8	-6.1	Line
	QP										
7	448.880k	30.7	+9.9 +0.1	+0.0	+0.1	+0.0	+0.0	40.8	46.9	-6.1	Line
8	278.856k	44.5	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	54.6	60.8	-6.2	Line
	QP										
^	280.316k	46.6	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	56.7	50.8	+5.9	Line
^	278.856k	46.5	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	56.6	50.8	+5.8	Line
11	375.432k	31.8	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	41.9	48.4	-6.5	Line
12	454.698k	30.1	+9.9 +0.1	+0.0	+0.1	+0.0	+0.0	40.2	46.8	-6.6	Line
13	195.812k	36.8	+9.9 +0.2	+0.0	+0.0	+0.1	+0.0	47.0	53.8	-6.8	Line
14	351.428k	31.4	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	41.4	48.9	-7.5	Line
	Ave										
15	209.905k	34.9	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	45.0	53.2	-8.2	Line
	Ave										
16	420.747k	38.3	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	48.3	57.4	-9.1	Line
	QP										
^	420.747k	43.2	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	53.2	47.4	+5.8	Line
18	351.428k	38.5	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	48.5	58.9	-10.4	Line
	QP										
^	351.428k	42.2	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	52.2	48.9	+3.3	Line
20	493.040k	24.9	+9.9 +0.1	+0.0	+0.1	+0.1	+0.0	35.1	46.1	-11.0	Line
	Ave										
21	209.905k	39.5	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	49.6	63.2	-13.6	Line
	QP										
^	209.905k	43.1	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	53.2	53.2	+0.0	Line
23	493.040k	30.7	+9.9 +0.1	+0.0	+0.1	+0.1	+0.0	40.9	56.1	-15.2	Line
	QP										

^	493.040k	35.1	+9.9 +0.1	+0.0	+0.1	+0.1	+0.0	45.3	46.1	-0.8	Line
25	153.270k QP	37.7	+9.9 +1.6	+0.0	+0.0	+0.1	+0.0	49.3	65.8	-16.5	Line
26	153.270k Ave	25.9	+9.9 +1.6	+0.0	+0.0	+0.1	+0.0	37.5	55.8	-18.3	Line
^	153.270k	44.2	+9.9 +1.6	+0.0	+0.0	+0.1	+0.0	55.8	55.8	+0.0	Line
28	383.373k QP	29.6	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	39.7	58.2	-18.5	Line
29	427.092k QP	27.5	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	37.5	57.3	-19.8	Line
30	411.207k Ave	17.7	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	27.7	47.6	-19.9	Line
31	427.092k Ave	17.3	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	27.3	47.3	-20.0	Line
^	427.092k	37.0	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	47.0	47.3	-0.3	Line
33	411.207k QP	26.9	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	36.9	57.6	-20.7	Line
^	411.207k	35.2	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	45.2	47.6	-2.4	Line
^	409.611k	32.4	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	42.4	47.7	-5.3	Line
36	383.373k Ave	15.2	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	25.3	48.2	-22.9	Line
^	383.373k	35.4	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	45.5	48.2	-2.7	Line
^	385.613k	32.5	+9.9 +0.1	+0.0	+0.0	+0.1	+0.0	42.6	48.2	-5.6	Line

Test Location:	CKC Laboratories, Inc. • 1120 Fulton Pl • Fremont CA 94539 • 510-249-1170		
Customer:	**Tonal**		
Specification:	**15.207 AC Mains - Average**		
Work Order #:	**105488**	Date:	12/17/2021
Test Type:	**Conducted Emissions**	Time:	10:28:13
Tested By:	Hoang Cao	Sequence#:	47
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:

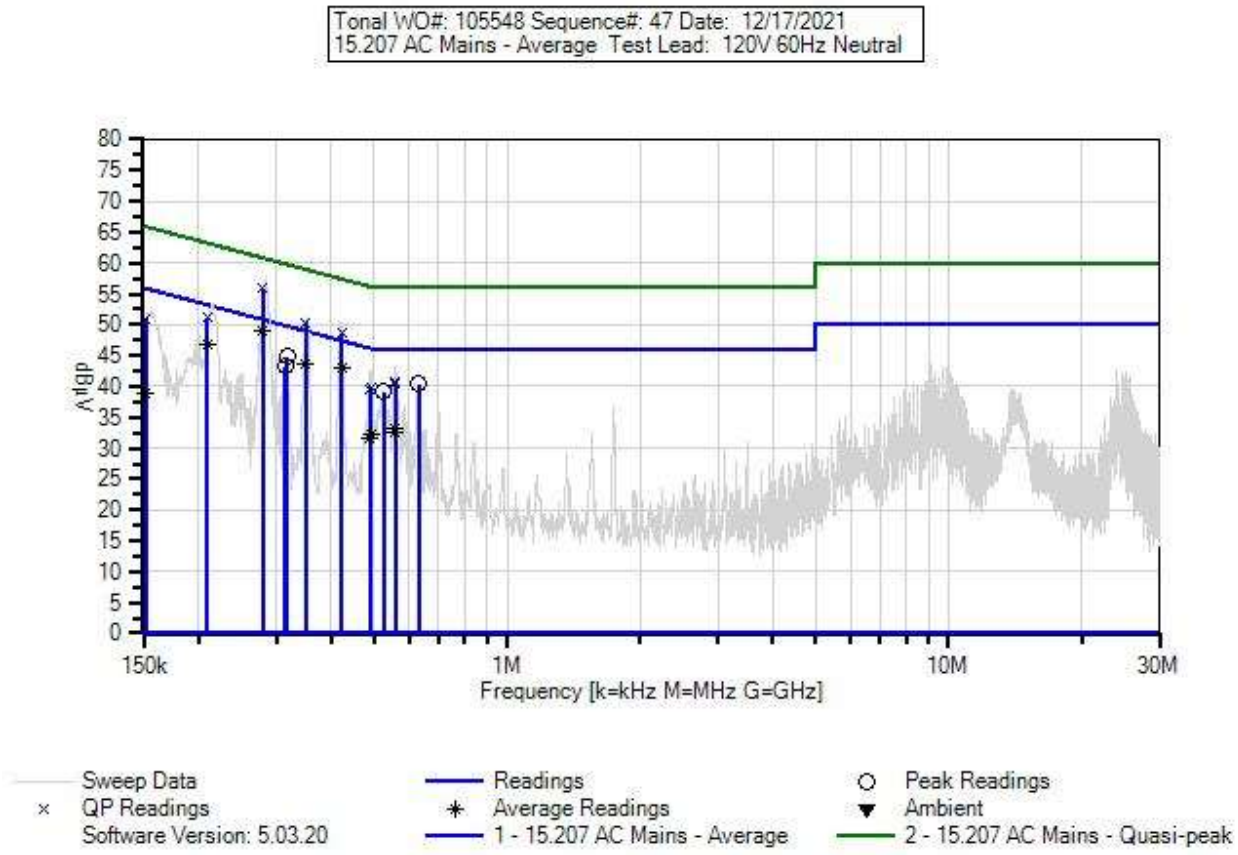
Conducted Emission
Frequency Range: 150kHz to 30MHz

Environmental Conditions:
Temperature: 21.8ºC
Humidity: 47%
Atmospheric Pressure: 101.5kPa

Highest Generation Frequency: 5.8GHz
Method: ANSI C63.10 2013

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.
All WIFI and Bluetooth modules are on.

Notes:
Touch screen display: Direct bond 2312
Power Supply: Artesyn



Test Equipment:

ID	Asset #	Description	Model	Calibration Date	Cal Due Date
T1	ANP01211	Attenuator	23-10-34	2/25/2021	2/25/2023
T2	ANP06691	Cable	PE3062-180	3/25/2020	3/25/2022
T3	ANP06694	Cable	PE3062-480	3/25/2020	3/25/2022
	AN00494	50uH LISN-Line Loss (dB)	3816/NM	3/11/2021	3/11/2023
T4	AN00494	50uH LISN-Return Loss (dB)	3816/NM	3/11/2021	3/11/2023
	AN02660	Spectrum Analyzer	E4446A	12/4/2020	12/4/2022
T5	ANP05258	High Pass Filter	HE9615-150K-50-720B	7/6/2020	7/6/2022

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

#	Freq	Rdng	T1 T5	T2	T3	T4	Dist	Corr	Spec	Margin	Polar
	MHz	dBµV	dB	dB	dB	dB	Table	dBµV	dBµV	dB	Ant
1	280.264k Ave	38.9	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	48.9	50.8	-1.9	Neutr
2	421.660k Ave	33.0	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	43.0	47.4	-4.4	Neutr
3	280.264k QP	45.9	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	55.9	60.8	-4.9	Neutr
^	280.264k	47.7	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	57.7	50.8	+6.9	Neutr
5	317.256k	34.8	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	44.8	49.8	-5.0	Neutr
6	350.035k Ave	33.5	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	43.5	49.0	-5.5	Neutr
7	630.682k	30.2	+9.9 +0.2	+0.0	+0.1	+0.0	+0.0	40.4	46.0	-5.6	Neutr
8	209.412k Ave	36.7	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	46.7	53.2	-6.5	Neutr
9	315.074k	33.3	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	43.3	49.8	-6.5	Neutr
10	525.237k	29.0	+9.9 +0.2	+0.0	+0.1	+0.0	+0.0	39.2	46.0	-6.8	Neutr
11	350.035k QP	40.4	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	50.4	59.0	-8.6	Neutr
^	350.035k	43.5	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	53.5	49.0	+4.5	Neutr
13	421.660k QP	38.6	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	48.6	57.4	-8.8	Neutr
^	421.660k	43.9	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	53.9	47.4	+6.5	Neutr
15	209.412k QP	41.1	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	51.1	63.2	-12.1	Neutr
^	209.412k	44.4	+9.9 +0.1	+0.0	+0.0	+0.0	+0.0	54.4	53.2	+1.2	Neutr
17	558.862k Ave	23.0	+9.9 +0.2	+0.0	+0.1	+0.0	+0.0	33.2	46.0	-12.8	Neutr
18	558.003k Ave	22.4	+9.9 +0.2	+0.0	+0.1	+0.0	+0.0	32.6	46.0	-13.4	Neutr
19	492.486k Ave	22.0	+9.9 +0.1	+0.0	+0.1	+0.0	+0.0	32.1	46.1	-14.0	Neutr
20	488.923k Ave	21.6	+9.9 +0.1	+0.0	+0.1	+0.0	+0.0	31.7	46.2	-14.5	Neutr
21	152.236k QP	38.8	+9.9 +2.1	+0.0	+0.0	+0.1	+0.0	50.9	65.9	-15.0	Neutr
22	558.862k QP	30.4	+9.9 +0.2	+0.0	+0.1	+0.0	+0.0	40.6	56.0	-15.4	Neutr
23	558.003k QP	30.3	+9.9 +0.2	+0.0	+0.1	+0.0	+0.0	40.5	56.0	-15.5	Neutr

^	558.003k	33.6	+9.9 +0.2	+0.0	+0.1	+0.0	+0.0	43.8	46.0	-2.2	Neutr
^	558.862k	33.4	+9.9 +0.2	+0.0	+0.1	+0.0	+0.0	43.6	46.0	-2.4	Neutr
26	492.486k QP	29.9	+9.9 +0.1	+0.0	+0.1	+0.0	+0.0	40.0	56.1	-16.1	Neutr
27	488.923k QP	29.5	+9.9 +0.1	+0.0	+0.1	+0.0	+0.0	39.6	56.2	-16.6	Neutr
^	488.923k	33.9	+9.9 +0.1	+0.0	+0.1	+0.0	+0.0	44.0	46.2	-2.2	Neutr
^	492.486k	33.6	+9.9 +0.1	+0.0	+0.1	+0.0	+0.0	43.7	46.1	-2.4	Neutr
^	485.968k	30.0	+9.9 +0.1	+0.0	+0.1	+0.0	+0.0	40.1	46.2	-6.1	Neutr
31	152.236k Ave	26.9	+9.9 +2.1	+0.0	+0.0	+0.1	+0.0	39.0	55.9	-16.9	Neutr
^	152.236k	44.8	+9.9 +2.1	+0.0	+0.0	+0.1	+0.0	56.9	55.9	+1.0	Neutr

SUPPLEMENTAL INFORMATION

Measurement Uncertainty

Uncertainty Value	Parameter
4.73 dB	Radiated Emissions
3.34 dB	Mains Conducted Emissions
3.30 dB	Disturbance Power

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.