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## Test Report

### Certification

<b>FCC ID</b>	2AJACT4TS
<b>Equipment Under Test</b>	040-00460a
<b>Test Report Serial No</b>	V055390_01
<b>Dates of Test</b>	Radiated: July 13 – 14, & 20 – 23, August 10 – 13, August 17 – 19, 2020 Conducted at Antenna Port: November 13 – 16, 2020
<b>Report Issue Date</b>	December 7, 2020

<b>Test Specifications:</b>	<b>Applicant:</b>
FCC Part 15, Subpart E	Wirepath Home Systems, LLC. (dba SnapAv, dba Control4) 1800 Continental Blvd, Suite 200 Charlotte, NC 28273 U.S.A.



## Certification of Engineering Report

This report has been prepared by VPI Laboratories, Inc. to document compliance of the device described below with the requirements of Federal Communications Commission (FCC) Part 15, Subpart E. This report may be reproduced in full. Partial reproduction of this report may only be made with the written consent of the laboratory. The results in this report apply only to the sample tested.

<b>Applicant</b>	Wirepath Home Systems, LLC. (dba SnapAv, dba Control4)
<b>Manufacturer</b>	Wirepath Home Systems, LLC. (dba SnapAv, dba Control4)
<b>Brand Name</b>	Control4
<b>Model Number</b>	040-00460a
<b>FCC ID</b>	2AJACT4TS

On this 7<sup>th</sup> day of December 2020, I, individually and for VPI Laboratories, Inc., certify that the statements made in this engineering report are true, complete, and correct to the best of my knowledge, and are made in good faith.

Although NVLAP has accredited the VPI Laboratories, Inc. EMC testing facilities, this report must not be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government.

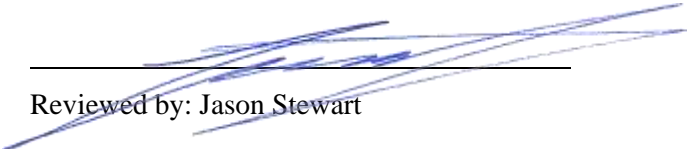
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Radiated Emissions Testing by: Norman P. Hansen



Direct Connect Measurements by: Benjamin N. Antczak



Reviewed by: Jason Stewart

<b>Revision History</b>		
<b>Revision</b>	<b>Description</b>	<b>Date</b>
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## Table of Contents

1	Client Information.....	5
1.1	Applicant.....	5
1.2	Manufacturer.....	5
2	Equipment Under Test (EUT).....	6
2.1	Identification of EUT.....	6
2.2	Description of EUT.....	6
2.3	EUT and Support Equipment.....	7
2.4	Interface Ports on EUT.....	7
2.5	Modification Incorporated/Special Accessories on EUT.....	7
2.6	Deviation from Test Standard.....	7
2.7	Scope of This Report.....	8
3	Test Specification, Methods and Procedures.....	9
3.1	Test Specification.....	9
3.2	Methods & Procedures.....	9
3.3	Test Procedure.....	14
4	Operation of EUT During Testing.....	15
4.1	Operating Environment.....	15
4.2	Operating Modes.....	15
4.3	EUT Exercise Software.....	15
5	Summary of Test Results.....	16
5.1	FCC Part 15, Subpart E.....	16
5.2	Result.....	16
6	Measurements, Examinations and Derived Results.....	17
6.1	General Comments.....	17
6.2	Test Results.....	17
7	Test Procedures and Test Equipment.....	60
7.1	Conducted Emissions at Mains Ports.....	60
7.2	Direct Connection at the Antenna Port Test.....	61
7.3	Radiated Emissions.....	62
7.4	Equipment Calibration.....	65
7.5	Measurement Uncertainty.....	65
8	Photographs.....	66

## 1 Client Information

### 1.1 Applicant

<b>Company Name</b>	Wirepath Home Systems, LLC. (dba SnapAV, dba Control4) 1800 Continental Blvd, Suite 200 Charlotte, NC 28273 U.S.A.
<b>Contact Name</b>	Roger Midgley
<b>Title</b>	Principle Compliance Engineer

### 1.2 Manufacturer

<b>Company Name</b>	Wirepath Home Systems, LLC. (dba SnapAV, dba Control4) 1800 Continental Blvd, Suite 200 Charlotte, NC 28273 U.S.A.
<b>Contact Name</b>	Roger Midgley
<b>Title</b>	Principle Compliance Engineer

## 2 Equipment Under Test (EUT)

### 2.1 Identification of EUT

<b>Brand Name</b>	Control4
<b>Model Number</b>	040-00460a
<b>Serial Number</b>	None
<b>Dimensions (cm)</b>	2.8 x 1.6 x 0.2

### 2.2 Description of EUT

The 040-00460a is a WiFi module that uses the 2.4 GHz ISM band and the UNII bands. The UNII-1 band transceiver operates on 4 channels and at the power setting as shown in the table below. The 040-00460a has 2 antennas installed, controlled by an RF switch, and only one antenna at a time is used for transmitting data. The 040-00460a receives power from the host device the module is installed in. This report covers the transmitter operating in the UNII-1 frequency band. Channel assignments, frequencies and maximum power settings are shown in the table below.

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Maximum Power Setting</b>
36	5180	13
40	5200	18
44	5220	20
48	5240	20

#### 2.2.1 Modes of Operation

EUT is intended to operate indoors as a client device. The EUT is not fixed and therefore incapable of fixed point-to-point architecture. EUT is additionally mobile and subject to lower power spectral density limits in the UNII-1 band.

#### 2.2.2 DFS Capabilities

This report covers the circuitry of the device operating in the UNII-1 band (5.15 GHz – 5.25 GHz). Operation in the UNII-1 band is not subject to DFS requirements.

## 2.3 EUT and Support Equipment

The EUT and support equipment used during the test are listed below.

Brand Name Model Number Serial Number	Description	Name of Interface Ports / Interface Cables
BN: Control4 MN: 040-00460a (Note 1) SN: None	WiFi Module	See Section 2.4
BN: Control4 MN: C4-T4IW10-XX SN: None	10" In-wall Touchscreen Display (Host System)	AC power/2 unshielded conductors Network/Cat 5e cable
BN: Control4 MN: C4-T4IW8-XX SN: None	8" In-wall Touchscreen Display (Host System)	AC power/2 unshielded conductors Network/Cat 5e cable
BN: Control4 MN: C4-T4T10-XX SN: None	10" Tabletop Touchscreen Display (Host System)	AC power/Direct connection to AC outlet
BN: Control4 MN: C4-T4IW8-XX SN: None	10" Tabletop Touchscreen Display (Host System)	AC power/Direct connection to AC outlet
BN: ASUS MN: WL-520G SN: A1IAAC051369	Network Router	Network/Cat 5e cable

Notes: (1) EUT

(2) Interface port connected to EUT (See Section 2.4)

The support equipment listed above was not modified in order to achieve compliance with this standard.

## 2.4 Interface Ports on EUT

Name of Ports	No. of Ports Fitted to EUT	Cable Description/Length
Host system interface	1	Direct connection to the host system

## 2.5 Modification Incorporated/Special Accessories on EUT

There were no modifications or special accessories required to comply with the specification.

## 2.6 Deviation from Test Standard

There were no deviations from the test specification.

## 2.7 Scope of This Report

This report covers the circuitry of the devices subject to FCC Part 15, Subpart E. with operation in the 5150 MHz to 5250 MHz frequency band. The circuitry of the device subject to FCC 15 Subpart B, FCC 15 Subpart C, and other requirements of FCC Part 15 Subpart E and was found to be compliant but covered in separate reports.



### 3 Test Specification, Methods and Procedures

#### 3.1 Test Specification

<b>Title</b>	FCC PART 15, Subpart E (47 CFR 15) 15.203, 15.207, 15.209, and 15.407
<b>Purpose of Test</b>	The tests were performed to demonstrate initial compliance
<b>UNII References</b>	KDB 789033 Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E KDB 905462 D02 UNII DFS Compliance Procedures New Rules v02

#### 3.2 Methods & Procedures

##### 3.2.1 §15.203 Antenna Requirement

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered in compliance with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

##### 3.2.2 §15.207 Conducted Limits

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency range (MHz)	Limit (dBμV)	
	Quasi-peak	Average
0.15 to 0.50*	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

\*Decreases with the logarithm of the frequency.

**Table 1: Limits for conducted emissions at mains ports of Class B ITE.**

##### 3.2.3 §15.407 Operation within the UNII Bands

Emission bandwidth is determined by measuring the width of the signal between points that are 26 dB down relative to the maximum level of the carrier center frequency.

Maximum conducted output power is the total transmit power delivered to all antennas, averaged across all symbols when operating at maximum power control level. If multiple modulation methods are possible, then the highest total transmit power in any mode is considered the maximum conducted output power.

Power spectral density is the total energy output per unit bandwidth from a transmitter operating at maximum power level divided by the total duration of transmission.

Measurements for UNII operation are taken over intervals of continuous transmissions. Measurements are taken using a minimum of resolution bandwidth of 1 MHz. If lower resolution bandwidths are used, measurement energies must be integrated to show the total power over 1 MHz. Emission limits are taken at the highest and lowest channels available to the manufacturer.

Although not covered in this test report, frequency stability must be ensured by manufacturer under all conditions of normal operation.

### **3.2.3.1 Power Limits in the Band 5150 – 5250 MHz (“UNII-1”)**

Access points operating either indoors or outdoors, maximum conducted output power over the frequency band 5.15 – 5.25 GHz (“UNII-1”) shall not exceed 1 W (30 dBm) as long as the maximum antenna gain does not exceed 6 dBi. In addition, maximum power spectral density shall not exceed 17 dBm in any 1 MHz band. If maximum antenna gain exceeds 6 dBi, then the maximum conducted output power and maximum power spectral density shall be reduced by the amount (in dB) that the directional gain of the antenna exceeds 6 dBi.

Outdoor access points additionally may not exceed 125 mW (21 dBm) maximum e.i.r.p. at any elevation angle above 30 degrees as measured from the horizon.

Only fixed point-to-point access points may employ antennas with directional gain of up to 23 dBi without reducing conducted output power. However, for every 1 dB gain over 23 dBi, maximum conducted output power and maximum power spectral density must be reduced by 1 dB. The 23 dBi exception is only applicable to fixed, point-to-point access points, and is not acceptable for point to multi-point, omnidirectional, or multi-point to point architectures.

Client devices shall not exceed conducted output power of 250 mW (24 dBm) as long as the maximum antenna gain does not exceed 6 dBi. In addition, maximum power spectral density shall not exceed 11 dBm for any 1 MHz band. If maximum antenna gain exceeds 6 dBi, then the maximum conducted output power and maximum power spectral density shall be reduced by the amount (in dB) that the directional gain of the antenna exceeds 6dBi.

Emissions outside the band 5.15 – 5.35 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz.

### **3.2.3.2 Power Limits in the Bands 5250 – 5350 MHz and 5470 – 5725 MHz (“UNII-2”)**

Maximum conducted output power over the frequency bands 5.25-5.35 GHz and 5.47-5.725 GHz (“UNII-2A” and “UNII-2C,” collectively, “UNII-2”) shall not exceed the lesser of: 250 mW (24 dBm); or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz (MHz). Maximum power spectral density shall additionally not exceed 11 dBm in any 1 MHz band. If maximum antenna gain exceeds 6 dBi, then the maximum conducted output power and maximum power spectral density shall be reduced by the amount (in dB) that the directional gain of the antenna exceeds 6 dBi.

For transmitters operating in the UNII-2A band, emissions outside the band 5.15 – 5.35 GHz shall not exceed an e.i.r.p. of -27 dBm/MHz. For those transmitters operating in the UNII-2C band, emissions outside the UNII-2C band shall not exceed an e.i.r.p. of -27 dBm/MHz.

Transmitters operating in the UNII-2 bands for which e.i.r.p. exceeds 500 mW (27 dBm) must employ a transmit power control (TPC) mechanism, giving the device the capability of operating at least 6 dB below the mean EIRP of 30 dBm.

### 3.2.3.3 Power Limits in the Band 5725 – 5850 MHz (“UNII-3”)

Maximum conducted output power over the frequency bands 5.725 – 5.85 GHz (“UNII-3”) shall not exceed 1 W (30 dBm). Maximum power spectral density shall not exceed 30 dBm in any 500 kHz band. If maximum antenna gain exceeds 6 dBi, then the maximum conducted output power and maximum power spectral density shall be reduced by the amount (in dB) that the directional gain of the antenna exceeds 6 dBi. Fixed point-to-point operations may utilize antennas exceeding 6 dBi without reducing the transmitter conducted power; this exception is only applicable to fixed, point-to-point transmitters, and is not acceptable for point to multi-point, omni-directional, or multi-point to point architectures.

For transmitters operating in the UNII-3 band, emissions 75 MHz above or below the band-edge shall not exceed an e.i.r.p. of -27 dBm/MHz. For those emissions within 75 MHz and 25 MHz of the band-edge the limit increases linearly to 10 dBm/MHz. For those emissions within 25 MHz and 5 MHz of the band-edge the limit increases linearly to 15.6 dBm/MHz. For those emissions within 5 MHz of the band-edge the limit increases linearly to the band-edge to 27 dBm/MHz.

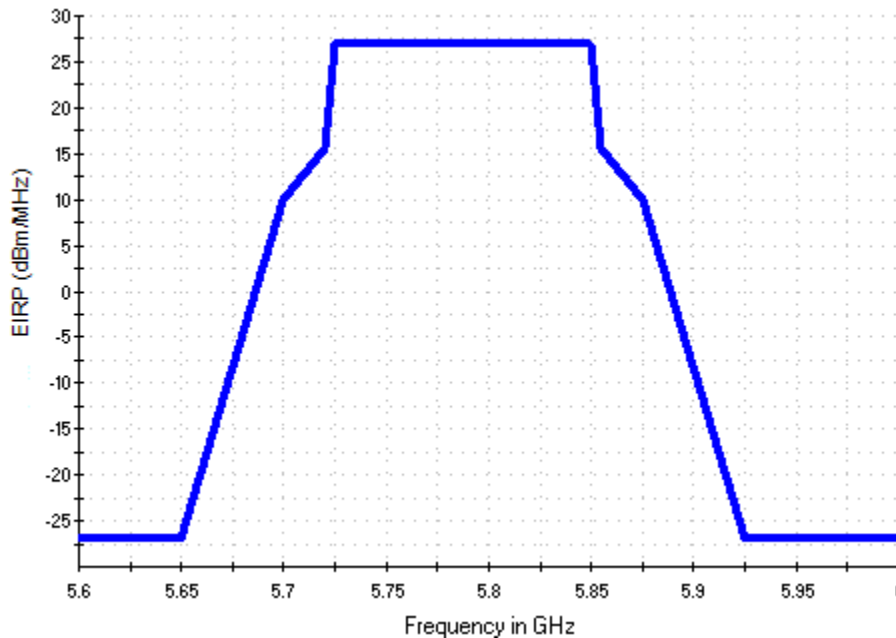


Figure 1. Emission limit for transmitters operating in the UNII-3 (5.725 – 5.850 GHz) band

Transmitters operating in the UNII-3 band shall also have a 6 dB bandwidth of at least 500 kHz.

### 3.2.3.4 Radar Detection Function of Dynamic Frequency Selection

UNII devices that operate with any part of their 26 dB emission bandwidth in the UNII-2 bands must employ a DFS radar detection mechanism to avoid co-channel operation with radar systems. Upon detection of radar signals, the channel must be flagged as containing a radar system and must not be utilized for at least 30 minutes (“Non-occupancy Period”).

All DFS devices must fulfil the Channel Move Time requirement, forcing all transmissions to cease operating on a channel within 10 seconds of detecting a radar signal. Transmissions may continue with normal traffic for a maximum of 200 ms after the detection of radar, but only control and management signals may exist after 200 ms to assist in the vacating of the occupied channel. Control and management signals are not allowed after 10 seconds.

Only DFS devices operating as a master device must fulfil the Channel Availability Check time requirement. Master devices must check if there are radar signals already operating on a channel before initiating transmission (or changing channels). If no radar signals are detected above the DFS detection threshold within 60 seconds, the channel may be utilized. Initial channel selection may be either randomly selected or manually selected.

The DFS detection threshold is -64 dBm for devices with a maximum e.i.r.p. between 200 mW and 1 W. Devices for which e.i.r.p. is less than 200 mW and for which maximum power spectral density is less than 10 dBm per 1 MHz band shall have a DFS threshold of -62 dBm.

Radar signals must be detected at 100 percent of the device's emission bandwidth. DFS detection threshold is the received power averaged over 1 $\mu$ s and referenced to a 0 dBi antenna.

Some standards such as IEEE 801.11.ax allow wideband transmissions that are “notched” or “punctured” upon radar detection (e.g., 160 MHz wideband transmissions wherein a 20 MHz portion of the bandwidth is not utilized). For such transmission schemes, the remaining emissions of the notched signal shall not bleed into the notch (i.e., 26 dB or 99% bandwidth is outside the notch). Channel closing and moving times must be met when notches are utilized.

### **3.2.4 UNII Band Channel Aggregation**

EUTs which utilize “straddle” channels (Channel 50 at 160 MHz BW, Channel 138 at 80 MHz BW, Channel 142 at 40 MHz BW, or Channel 144 at 20 MHz BW) are subject to the requirements of the bands they straddle. For example, Channel 42 + 138 (80 MHz + 80 MHz) are distributed over (and straddle) the UNII-1 and UNII-2 bands.

Straddle channel 50 is considered operating in both UNII-1 and UNII-2A; straddle channels 138, 142, and 144 are considered operating in both UNII-2C and UNII-3.

#### **3.2.4.1 Conducted Output Power in the Case of Channel Aggregation**

For such transmissions, conducted output power is calculated as the summed power of segments located within the band, where the band edge replaces the -26 dB point of the straddling signal. In the example shown in Figure 1, power requirements must be met for both UNII-2 and UNII-3. While it is acceptable to sum the power of the entire transmission in a band (e.g., top-line  $P_{U-NII-2C}$  and  $P_{U-NII-3}$ ), individual measurements over the 26 dB bandwidth of each carrier frequency (or to the band edge) may also be summed ( $P_A + P_B$  for UNII-2 band requirements and  $P_{U-NII-3}$  for UNII-3 band requirements).

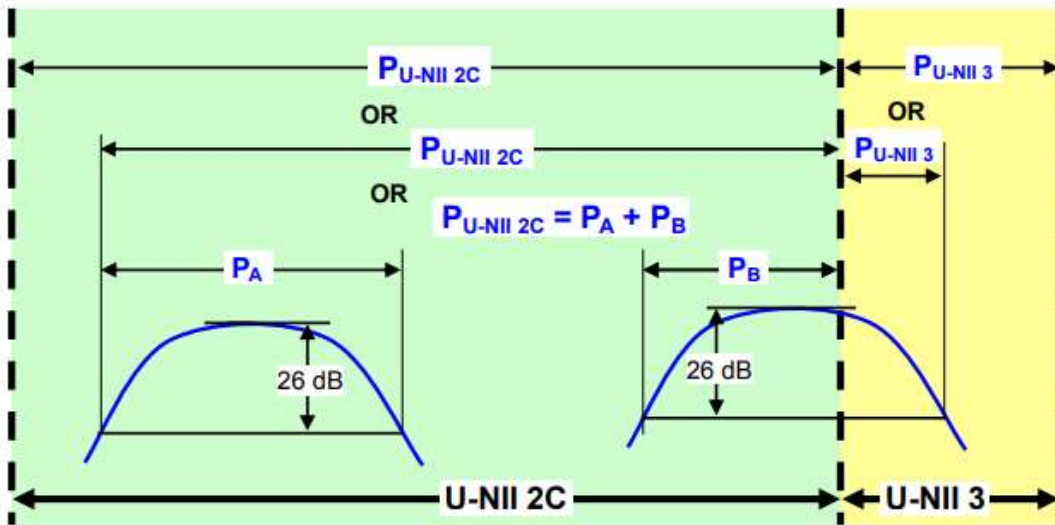


Figure 2. Conducted output power measurement examples (KDB 789033 D02 v02r01, p 21)

### 3.2.4.2 Emissions Bandwidths in the Case of Channel Aggregation

Emissions bandwidth is defined based upon overlap of the 26 dB bandwidths of each channel individually. For those transmissions where the 26 dB bandwidths overlap, the emission bandwidth (EWB) is the difference between the outer -26 dB points.

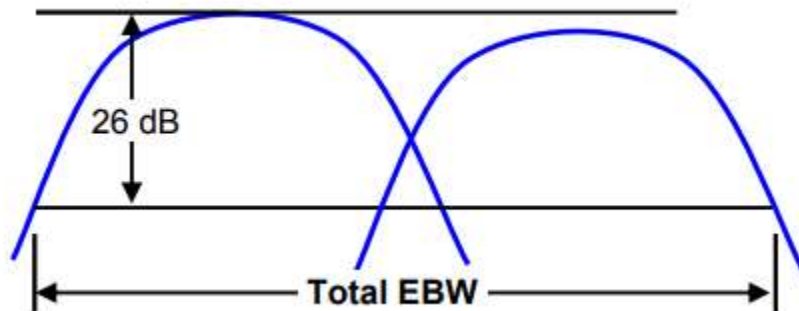


Figure 3. Overlapping emissions bandwidths (KDB 789033 D02 v02r01, p 18)

For those transmissions where the 26 dB bandwidths do not overlap, the emission bandwidth is the sum of the individual 26 dB bandwidths, and each segment is measured independently.

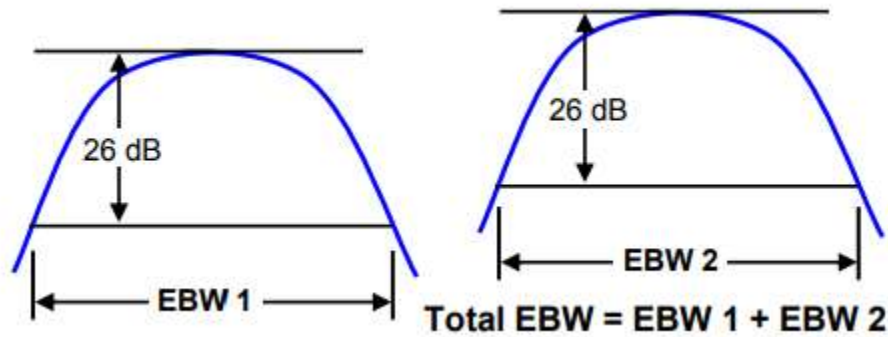


Figure 4. Non-overlapping emissions bandwidths (KDB 789033 D02 v02r01, p 18)

Finally, for those transmissions which cross into other UNII bands, the band boundary serves as one edge for that band, while the other edge is measured from the peak of the contiguous segment.

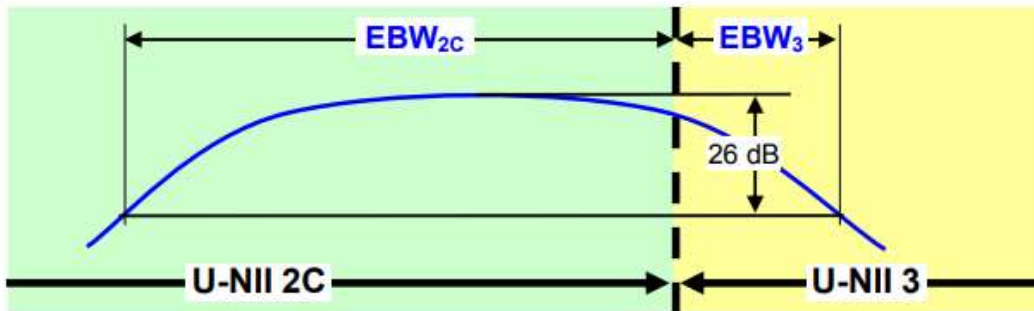


Figure 5. Non-overlapping emissions bandwidths (KDB 789033 D02 v02r01, p 19)

### 3.2.4.3 Additional Requirements for UNII Devices

UNII devices are subject to requirements imposed by the National Environmental Policy Act. Manufacturers are responsible for applying RF radiation exposure requirements specified in 47 CFR 1.1307(b), 2.1091, and 2.1093 as appropriate (47 CFR 15.407(f)). Such requirements include (but are not limited to) routine environmental evaluation for RF exposure prior to equipment authorization or use (47 CFR 1.1307(b)(2)(i)) and additional evaluation of RF radiation exposure for mobile and portable devices (47 CFR 2.1091 and 2.1093, respectively).

## 3.3 Test Procedure

VPI Laboratories, Inc. is accredited by National Voluntary Laboratory Accreditation Program (NVLAP); NVLAP Lab Code: 100272-0, which is effective until September 30, 2021. VPI Laboratories, Inc. carries FCC Accreditation Designation Number US5263. VPI Laboratories main office is located at 313 W 12800 S, Suite 311, Draper, UT 84020. The testing was performed according to the procedures in ANSI C63.10-2013, KDB 789033, and 47 CFR Part 15. Radiated testing was performed at the VPI Laboratories, Inc. Wanship Upper Open Area Test Site, located at 29145 Old Lincoln Highway, Wanship, UT. This location is listed on NVLAP scope under the lines for C63.4 and C63.10. Conducted testing was performed at VPI Laboratories main office.

## 4 Operation of EUT During Testing

### 4.1 Operating Environment

Power Supply	3.3 VDC from host device
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### 4.2 Operating Modes

The transmitter was tested in 4 host units as listed in section 2.2. The in-wall host systems were tested as if mounted in a wall. The tabletop host systems were test while on the charging base and on 3 orthogonal axes when off the charging base. The transmitter was in a constant transmit mode at the upper, middle, and lower channels. The voltage was varied as required by §15.31(e) with no change seen in the voltage supplied to the transmitter or in transmitter characteristics. The tabletop host systems when tested off the charging base had fully charged batteries.

### 4.3 EUT Exercise Software

Control4 firmware was used to exercise and control the transmitter for testing.



## 5 Summary of Test Results

### 5.1 FCC Part 15, Subpart E

#### 5.1.1 Summary of Tests

Section	Environmental Phenomena	Frequency Range (MHz)	Result
15.205 (15.407(b)(9))	Spurious Emissions in Restricted Bands	0.009 - 40000	Complied
15.207 (15.407(b)(8))	Conducted Disturbance at Mains Ports	0.15 to 30	Complied
15.209 (15.407(b)(6))	General Field Strength Limits	0.009 - 40000	Complied
15.403	Emissions Bandwidth	5150 – 5250	Complied
15.407(e)	Minimum Emission Bandwidth	5725 – 5850	Note 1
15.407(a)(4)(iv)	Maximum Conducted Output Power	5150 – 5250	Complied
15.407(a)(1)(i)	EIRP above 30 Degrees	5150 – 5250	Note 2
15.407(a)(1)(iv)	Maximum Power Spectral Density	5150 – 5250	Complied
15.407(b)(1)	Unwanted Emissions	0.009 - 40000	Complied
Note 1: EUT does not utilize UNII-3 band and therefore requirement is not applicable. Note 2: UNII-1 capable EUT does not operate outdoors and therefore requirement is not applicable.			

### 5.2 Result

In the configuration tested, the EUT complied with the requirements of the specification.



## 6 Measurements, Examinations and Derived Results

### 6.1 General Comments

This section contains the test results only. Details of the test methods used and a list of the test equipment used during the measurements can be found in Section 7 of this report.

### 6.2 Test Results

#### 6.2.1 §15.203 Antenna Requirements

A total of 7 antenna are used in the 4 devices covered in this testing. The antennas are located internal to the housings and are not user accessible. The table below shows the device, antenna port, antenna model, and maximum gain of the antenna in the UNII-1 band.

Device	Antenna Port	Model	Maximum Gain
C4-T4T10-XX	0	1005180	5.5
	1	1005179	7.5
C4-T4T8-XX	0	1005178	5.6
	1	1005179	7.5
C4-T4IW10-XX	0	1005097	7.2
	1	1005098	5.7
C4-T4IW8-XX	0	1005095	4.8
	1	1005096	5.9

#### Result

In the configurations tested the EUT complied with the requirements of the specification.

#### 6.2.2 §15.207 Conducted Emissions at AC Mains Ports

##### 040-00460a installed in C4-T4IW10-XX

Frequency (MHz)	AC Mains Lead	Detector	Measured Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
0.18	Hot Lead	Peak (Note 1)	51.1	54.5	-3.4
0.20	Hot Lead	Peak (Note 1)	47.7	53.5	-5.8
0.33	Hot Lead	Peak (Note 1)	43.9	49.3	-5.4
0.41	Hot Lead	Peak (Note 1)	44.0	47.6	-3.6
0.90	Hot Lead	Peak (Note 1)	39.8	46.0	-6.2
21.78	Hot Lead	Peak (Note 1)	44.0	50.0	-6.0
0.20	Neutral Lead	Quasi-Peak (Note 2)	52.9	63.5	-10.6
0.20	Neutral Lead	Average (Note 2)	41.4	53.5	-12.1
0.27	Neutral Lead	Peak (Note 1)	45.1	51.1	-6.0
0.33	Neutral Lead	Peak (Note 1)	45.5	49.3	-3.8
0.41	Neutral Lead	Peak (Note 1)	42.8	47.7	-4.9

Frequency (MHz)	AC Mains Lead	Detector	Measured Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
0.91	Neutral Lead	Peak (Note 1)	37.4	46.0	-8.6
1.32	Neutral Lead	Peak (Note 1)	37.7	46.0	-8.3

Note 1: The reference detector used for the measurements was Quasi-Peak or Peak and the data was compared to the average limit; therefore, the EUT was deemed to meet both the average and quasi-peak limits.  
 Note 2: The reference detector used for the measurements was quasi-peak and average and the data was compared to the respective limits.

### Result

The EUT complied with the specification limit by a margin of 3.4 dB.

#### 040-00460a installed in C4-T4IW8-XX

Frequency (MHz)	AC Mains Lead	Detector	Measured Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
0.15	Hot Lead	Peak (Note 1)	52.7	56.0	-3.3
0.20	Hot Lead	Quasi-Peak (Note 2)	51.6	63.6	-12.0
0.20	Hot Lead	Average (Note 2)	42.3	53.6	-11.3
0.33	Hot Lead	Peak (Note 1)	41.5	49.3	-7.8
0.39	Hot Lead	Peak (Note 1)	41.0	48.1	-7.1
2.80	Hot Lead	Peak (Note 1)	36.1	46.0	-9.9
3.07	Hot Lead	Peak (Note 1)	35.8	46.0	-10.2
0.20	Neutral Lead	Peak (Note 1)	46.6	53.6	-7.0
0.33	Neutral Lead	Peak (Note 1)	43.0	49.3	-6.3
0.41	Neutral Lead	Peak (Note 1)	40.7	47.7	-7.0
2.79	Neutral Lead	Peak (Note 1)	40.2	46.0	-5.8
2.96	Neutral Lead	Peak (Note 1)	40.9	46.0	-5.1
3.07	Neutral Lead	Peak (Note 1)	40.1	46.0	-5.9

Note 1: The reference detector used for the measurements was Quasi-Peak or Peak and the data was compared to the average limit; therefore, the EUT was deemed to meet both the average and quasi-peak limits.  
 Note 2: The reference detector used for the measurements was quasi-peak and average and the data was compared to the respective limits.

### Result

The EUT complied with the specification limit by a margin of 3.3 dB.

#### 040-00460a installed in C4-T4T10-XX

Frequency (MHz)	AC Mains Lead	Detector	Measured Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
0.20	Hot Lead	Quasi-Peak (Note 2)	53.0	63.5	-10.5
0.20	Hot Lead	Average (Note 2)	45.3	53.5	-8.2
0.39	Hot Lead	Quasi-Peak (Note 1)	43.5	48.1	-4.6

Frequency (MHz)	AC Mains Lead	Detector	Measured Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
0.69	Hot Lead	Quasi-Peak (Note 2)	45.8	56.0	-10.2
0.69	Hot Lead	Average (Note 2)	38.8	46.0	-7.2
0.77	Hot Lead	Quasi-Peak (Note 2)	45.3	56.0	-10.7
0.77	Hot Lead	Average (Note 2)	40.4	46.0	-5.6
0.91	Hot Lead	Quasi-Peak (Note 2)	43.8	56.0	-12.2
0.91	Hot Lead	Average (Note 2)	39.1	46.0	-6.9
1.22	Hot Lead	Quasi-Peak (Note 2)	42.5	56.0	-13.5
1.22	Hot Lead	Average (Note 2)	37.9	46.0	-8.1
1.49	Hot Lead	Quasi-Peak (Note 1)	41.3	46.0	-4.7
1.79	Hot Lead	Quasi-Peak (Note 1)	40.3	46.0	-5.7
0.16	Neutral Lead	Quasi-Peak (Note 2)	53.7	65.5	-11.8
0.16	Neutral Lead	Average (Note 2)	34.2	55.5	-21.3
0.22	Neutral Lead	Quasi-Peak (Note 2)	51.9	62.9	-11.0
0.22	Neutral Lead	Average (Note 2)	38.8	52.9	-14.1
0.28	Neutral Lead	Quasi-Peak (Note 1)	45.2	50.9	-5.7
0.41	Neutral Lead	Quasi-Peak (Note 1)	41.7	47.7	-6.0
0.46	Neutral Lead	Quasi-Peak (Note 1)	39.7	46.8	-7.1
0.64	Neutral Lead	Peak (Note 1)	42.9	46.0	-3.1
0.77	Neutral Lead	Quasi-Peak (Note 1)	41.9	46.0	-4.1
0.84	Neutral Lead	Quasi-Peak (Note 1)	40.7	46.0	-5.3
4.06	Neutral Lead	Quasi-Peak (Note 1)	39.0	46.0	-7.0
9.08	Neutral Lead	Peak (Note 1)	44.3	50.0	-5.7

Note 1: The reference detector used for the measurements was Quasi-Peak or Peak and the data was compared to the average limit; therefore, the EUT was deemed to meet both the average and quasi-peak limits.

Note 2: The reference detector used for the measurements was quasi-peak and average and the data was compared to the respective limits.

## Result

The EUT complied with the specification limit by a margin of 3.1 dB.

### 040-00460a installed in C4-T4T8-XX

Frequency (MHz)	AC Mains Lead	Detector	Measured Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
0.76	Hot Lead	Quasi-Peak (Note 2)	44.3	56.0	-11.7
0.76	Hot Lead	Average (Note 2)	42.6	46.0	-3.4
0.85	Hot Lead	Peak (Note 1)	38.8	46.0	-7.2
1.61	Hot Lead	Peak (Note 1)	37.6	46.0	-8.4

Frequency (MHz)	AC Mains Lead	Detector	Measured Level (dB $\mu$ V)	Limit (dB $\mu$ V)	Margin (dB)
2.37	Hot Lead	Peak (Note 1)	38.4	46.0	-7.6
3.22	Hot Lead	Peak (Note 1)	38.7	46.0	-7.3
4.04	Hot Lead	Peak (Note 1)	37.6	46.0	-8.4
0.16	Neutral Lead	Peak (Note 1)	50.7	55.5	-4.8
0.65	Neutral Lead	Quasi-Peak (Note 1)	41.4	46.0	-4.6
0.81	Neutral Lead	Quasi-Peak (Note 2)	44.3	56.0	-11.7
0.81	Neutral Lead	Average (Note 2)	42.1	46.0	-3.9
0.98	Neutral Lead	Peak (Note 1)	41.1	46.0	-4.9
1.42	Neutral Lead	Peak (Note 1)	40.9	46.0	-5.1
2.30	Neutral Lead	Peak (Note 1)	39.7	46.0	-6.3
2.68	Neutral Lead	Peak (Note 1)	38.1	46.0	-7.9
<p>Note 1: The reference detector used for the measurements was Quasi-Peak or Peak and the data was compared to the average limit; therefore, the EUT was deemed to meet both the average and quasi-peak limits.</p> <p>Note 2: The reference detector used for the measurements was quasi-peak and average and the data was compared to the respective limits.</p>					

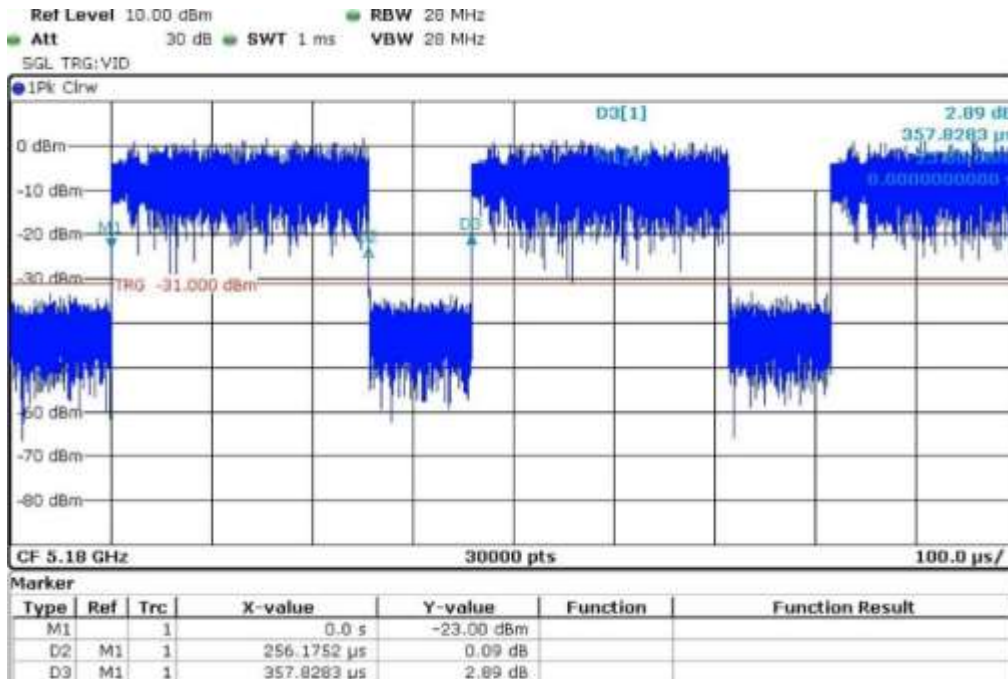
## Result

The EUT complied with the specification limit by a margin of 3.4 dB.

### 6.2.3 Duty Cycle, Transmission Duration, and Maximum Power Control

Where EUT was incapable of 100% duty cycle at maximum power control, correction factors are required. Duty cycle (DC) and transmission duration (“T”) was tested for these modes of operation. The Correction Factor (“CF”) is determined by the equation  $CF = 10 \times \log \frac{1}{DC}$ , wherein DC is a decimal value between 0 and 1. This report shall make note when the correction factor is utilized.

.Mode / Datarate	Duty Cycle	Transmission Duration	Correction Factor
N-Mode / DR: 4	72.2%	0.256 milliseconds	+1.41 dB



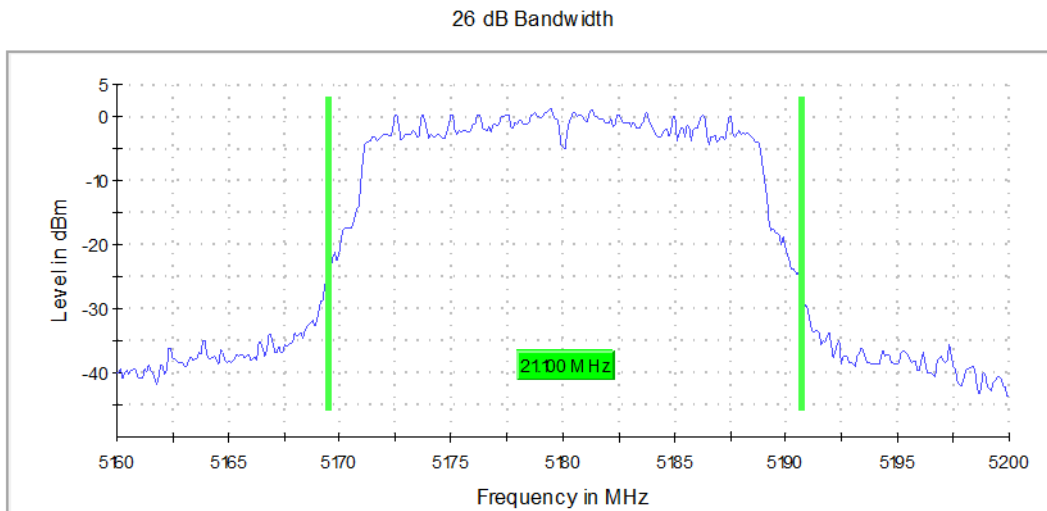
Graph 1: N-Mode Duty Cycle

## 6.2.4 26 dB Emission Bandwidth

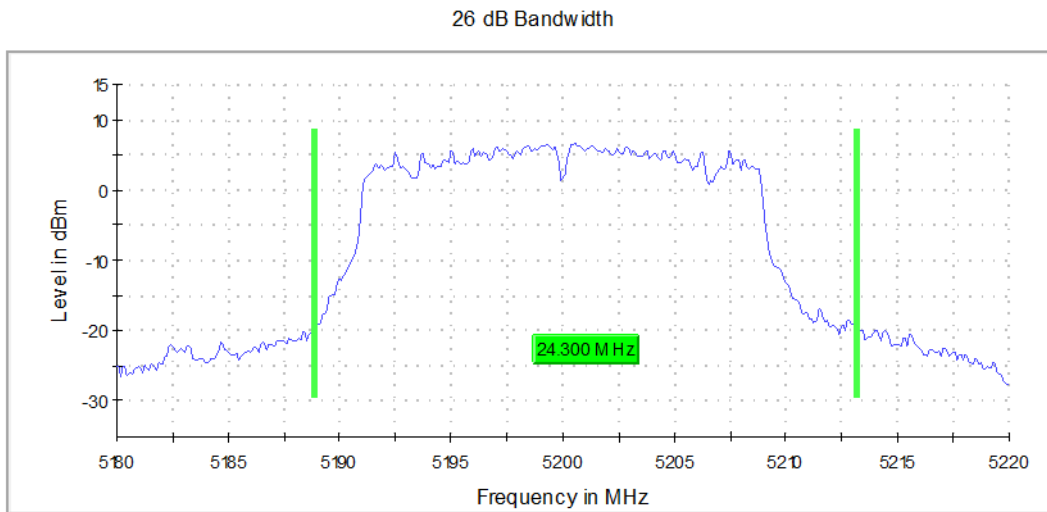
### Antenna 0 Measurements

Frequency (MHz)	Emissions 26 dB Bandwidth (MHz)
5180	21.1
5200	24.3
5220	31.3
5240	31.7

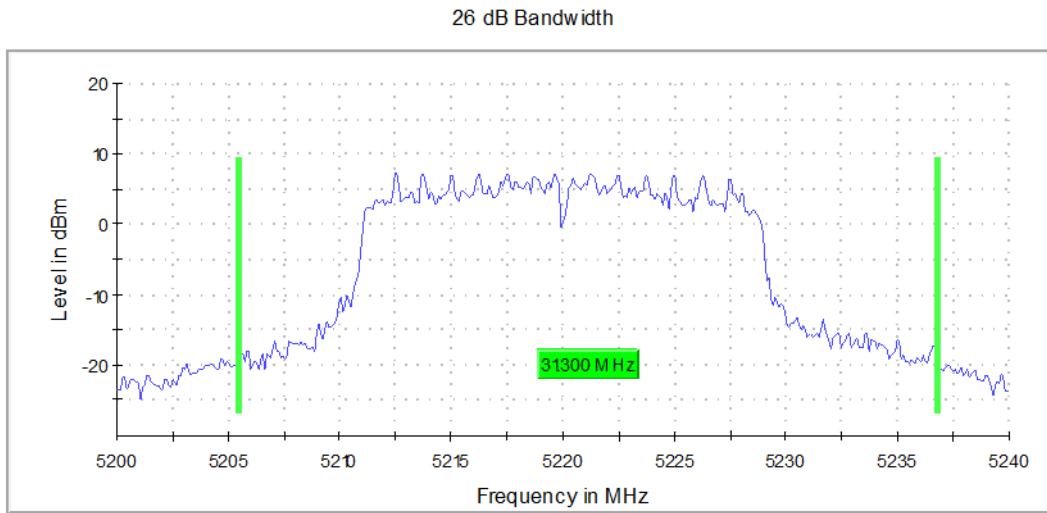
Table 2: Antenna 0 - 26 dB Emissions Bandwidth



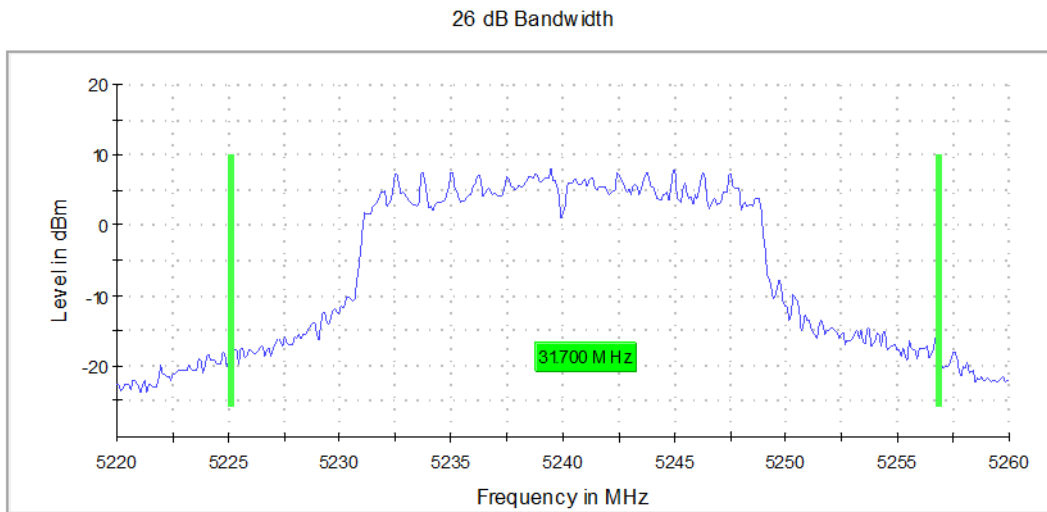
Graph 2: Antenna 0 – 26 dB Emissions Bandwidth Transmitting at 5180 MHz – Setting 13



**Graph 3: Antenna 0 – 26 dB Emissions Bandwidth Transmitting at 5200 MHz – Setting 18**



**Graph 4: Antenna 0 – 26 dB Emissions Bandwidth Transmitting at 5220 MHz – Setting 20**

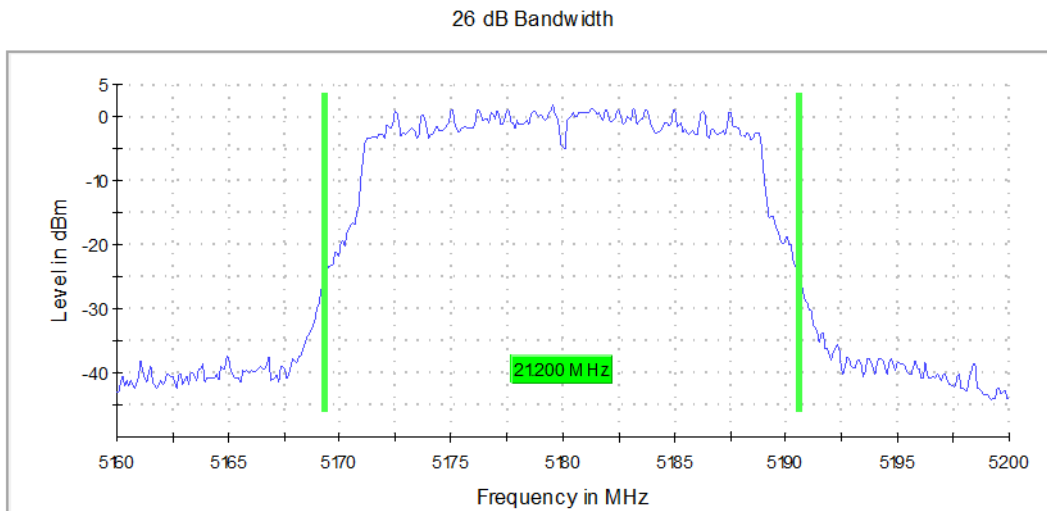


**Graph 5: Antenna 0 – 26 dB Emissions Bandwidth Transmitting at 5240 MHz – Setting 20**

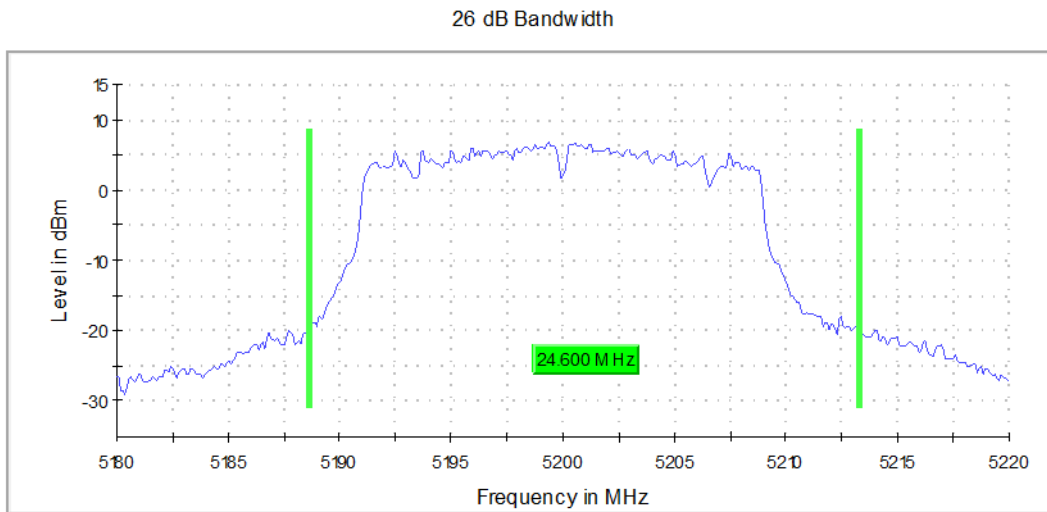
**Antenna 1 Measurements**

Frequency (MHz)	Emissions 26 dB Bandwidth (MHz)
5180	21.2
5200	24.6
5220	30.0
5240	33.2

**Table 3: Antenna 1 - 26 dB Emissions Bandwidth**

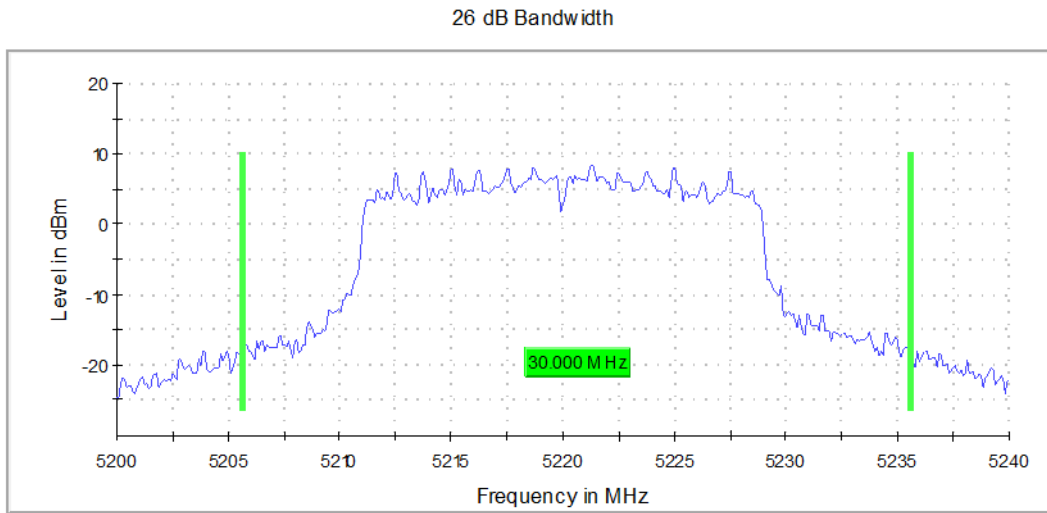


**Graph 6: Antenna 1 – 26 dB Emissions Bandwidth Transmitting at 5180 MHz – Setting 13**

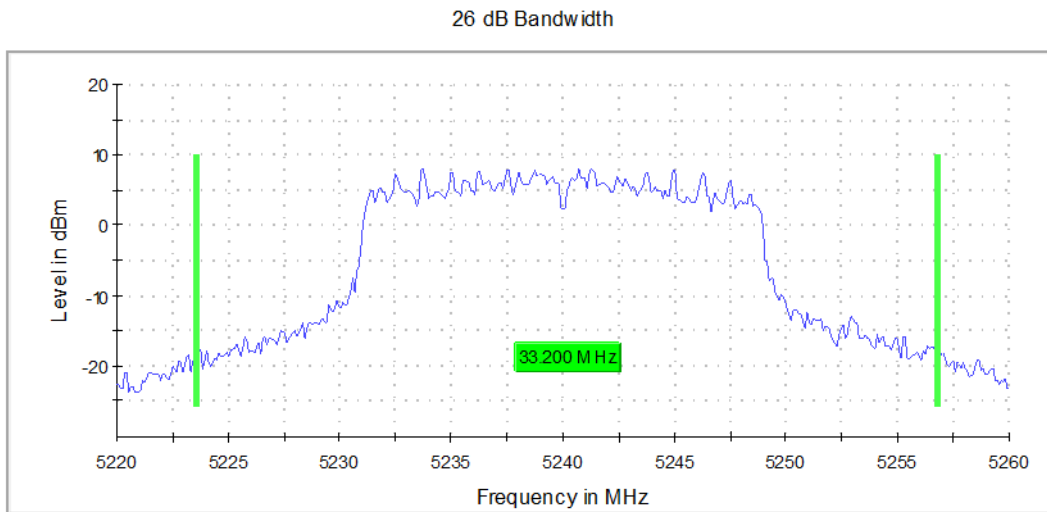




**Graph 7: Antenna 1 – 26 dB Emissions Bandwidth Transmitting at 5200 MHz – Setting 18**



**Graph 8: Antenna 1 – 26 dB Emissions Bandwidth Transmitting at 5220 MHz – Setting 20**



**Graph 9: Antenna 1 – 26 dB Emissions Bandwidth Transmitting at 5240 MHz – Setting 20**

### 6.2.5 §15.407(a) Power Limits: Maximum Conducted Output Power

The following tables show the adjusted conducted power limits and measurements.

#### UNII-1 Conducted Power Limits

Maximum conducted power limits for the UNII-1 band are adjusted based on the isotropic antenna gain, wireless architecture, and the mode of operation.

Wireless Architecture	Operating Mode	Antenna Gain (dBi)	Default Gain (dBi)	Limit Change (dB)	Default Limit (dBm)	Adjusted Limit (dBm)
AP	Master	7.5	6	-1.5	30	28.5
AP	Client	7.5	6	-1.5	24	22.5
Fixed P-t-P	N/A	7.5	23	N/A	30	30

Table 4: UNII-1 maximum conducted power limits based upon antenna gain and operational mode.

#### Antenna 0 Measurements

Frequency (MHz)	Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)
5180	11.8	22.5	-10.7
5200	16.9	22.5	-5.6
5220	17.9	22.5	-4.6
5240	18.5	22.5	-4.0

Table 5: Antenna 0 - UNII-1 Conducted Power Measurement (Method PM-G)

#### Antenna 1 Measurements

Frequency (MHz)	Conducted Power (dBm)	Conducted Power Limit (dBm)	Margin (dB)
5180	12.6	22.5	-9.9
5200	16.7	22.5	-5.8
5220	18.8	22.5	-3.7
5240	18.6	22.5	-3.9

Table 6: Antenna 1 - UNII-1 Conducted Power Measurement (Method PM-G)

#### Result: UNII-1 AP Architecture, Client Mode

In the configurations tested the EUT complied with the requirements of the specification with a margin of 3.7 dB.

### 6.2.6 §15.407(a) Power Limits: Maximum Power Spectral Density

The following tables show the adjusted power spectral density limits and measurements.

#### UNII-1 Power Spectral Density Limits

Power spectral density limits for the UNII-1 band are adjusted based on isotropic antenna gain, wireless architecture, and the mode of operation.

Wireless Architecture	Operational Mode	Antenna Gain (dBi)	Default Gain (dBi)	Limit Adjustment (dB)	Default Limit (dBm)	Adjusted Limit (dBm)
AP	Master	7.5	6	-1.5	17	15.5
AP	Client	7.5	6	-1.5	11	9.5
Fixed P-t-P	N/A	7.5	23	N/A	17	17

Table 7: UNII-1 Power spectral density limits based upon antenna gain and operational mode.

Frequency (MHz)	Spectral Power Density (dBm/MHz)	Spectral Density Limit (dBm/MHz)	Margin (dB)
5180	1.9	9.5	-7.6
5200	4.3	9.5	-5.2
5220	8.3	9.5	-1.2
5240	8.6	9.5	-0.9

Table 8: Antenna 0 - UNII-1 Power Spectral Density Measurements

Frequency (MHz)	Spectral Power Density (dBm/MHz)	Spectral Power Density Limit (dBm/MHz)	Margin (dB)
5180	2.7	9.5	-6.8
5200	4.3	9.5	-5.2
5220	9.1	9.5	-0.4
5240	8.8	9.5	-0.7

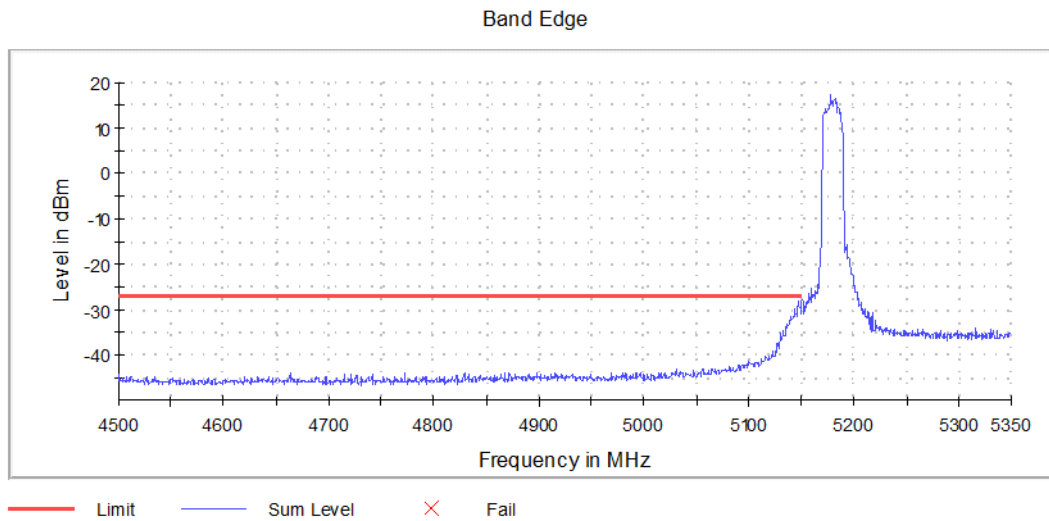
Table 9: Antenna 1 - UNII-1 Power Spectral Density Measurements

#### Result: UNII-1 AP Architecture, Client Mode

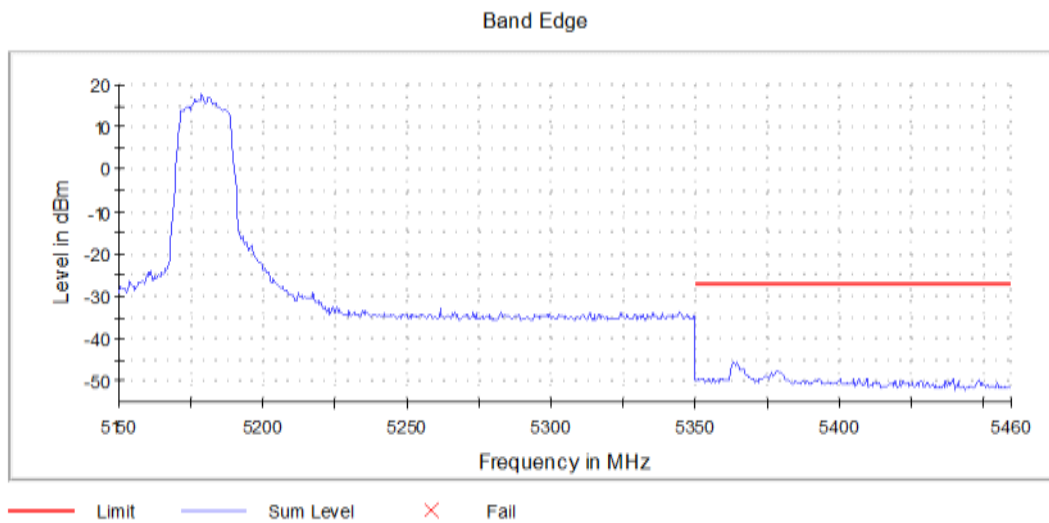
In the configurations tested the EUT complied with the requirements of the specification with a margin of 0.4 dB.

## 6.2.7 §15.407(b) Undesirable Emissions – Out-of-Band and Spurious Domain

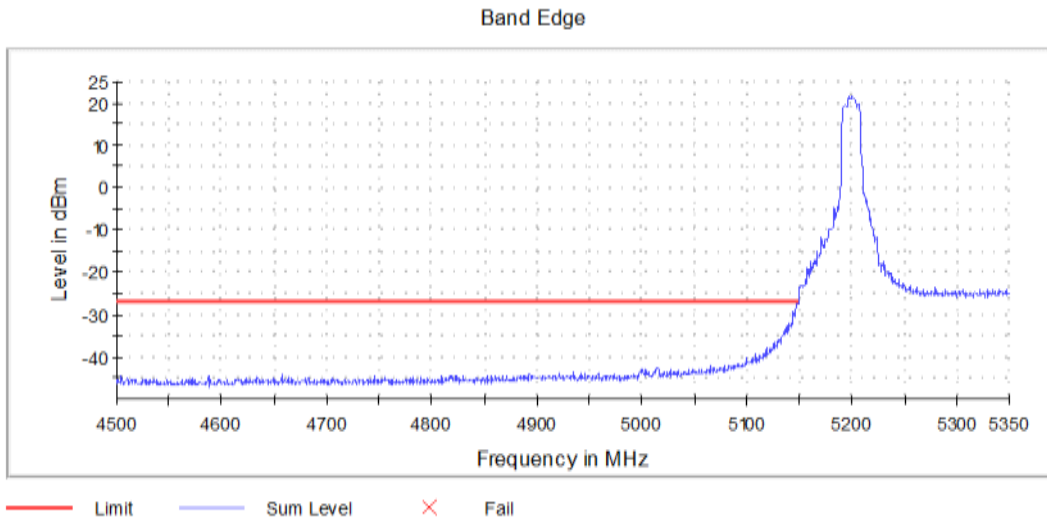
### Antenna 0 Out-Of-Band Domain Measurements



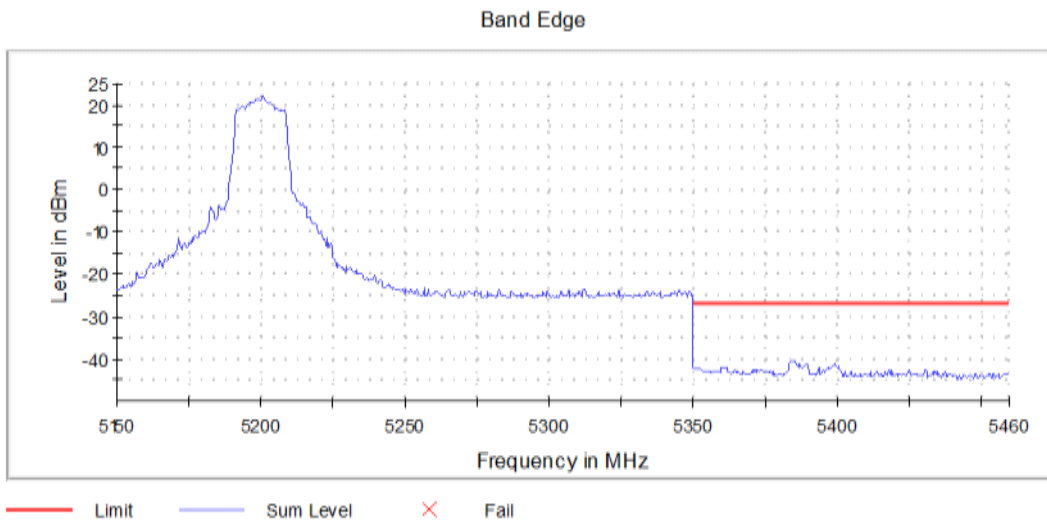
**Graph 10: Antenna 0 – Lower Band Edge Channel 36 Transmitting (5180MHz) - Setting 13**



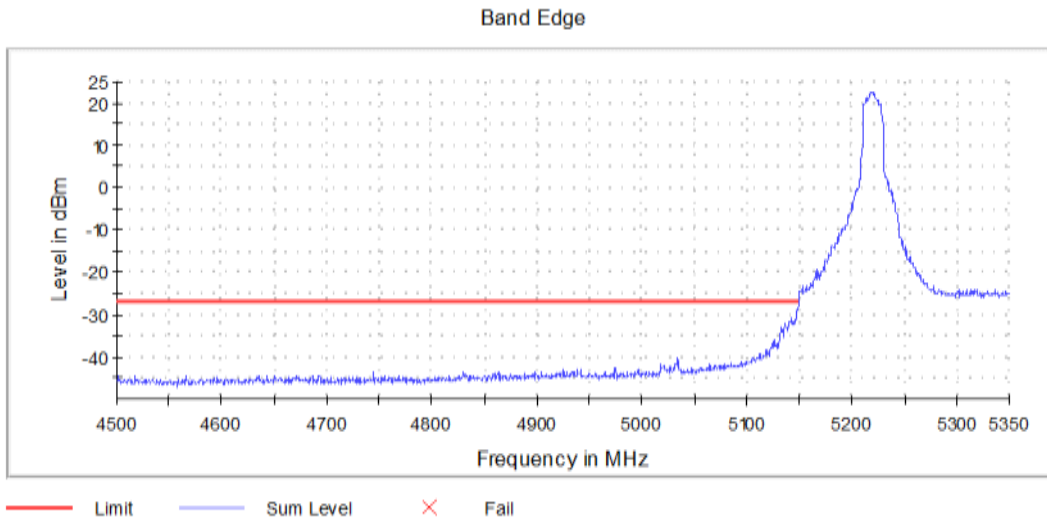
**Graph 11: Antenna 0 – Upper Band Edge Channel 36 Transmitting (5180MHz) - Setting 13**



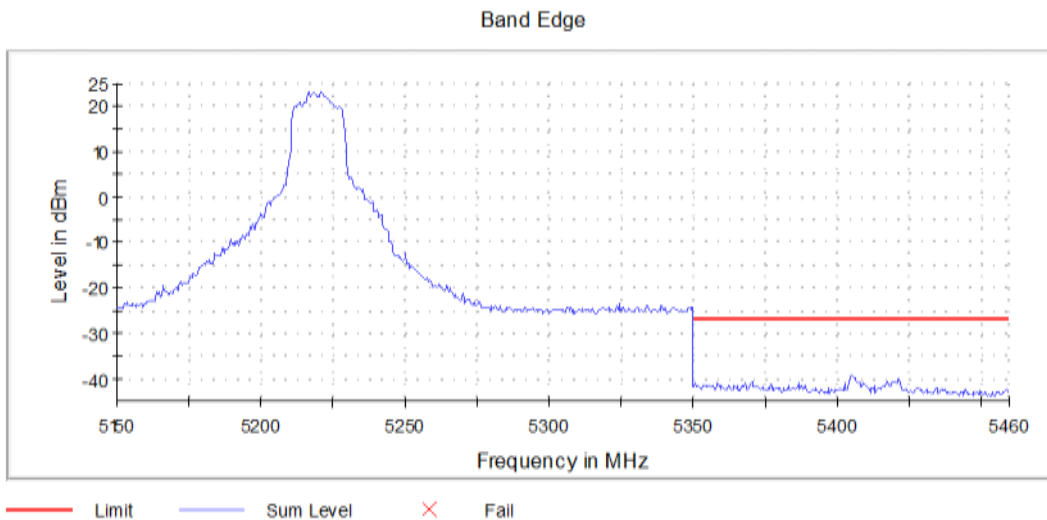
**Graph 12: Antenna 0 – Lower Band Edge Channel 40 Transmitting (5200MHz) - Setting 18**



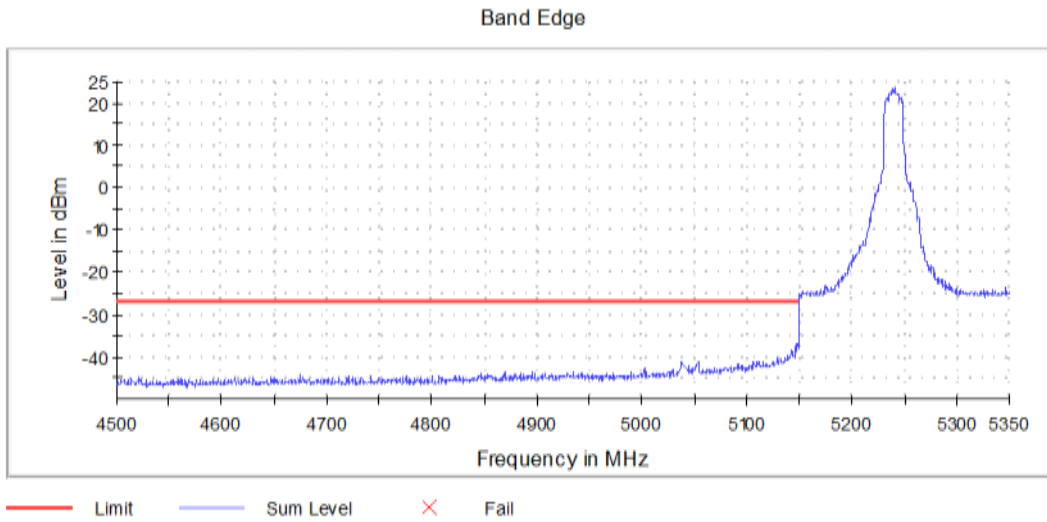
**Graph 13: Antenna 0 – Upper Band Edge Channel 40 Transmitting (5200MHz) - Setting 18**



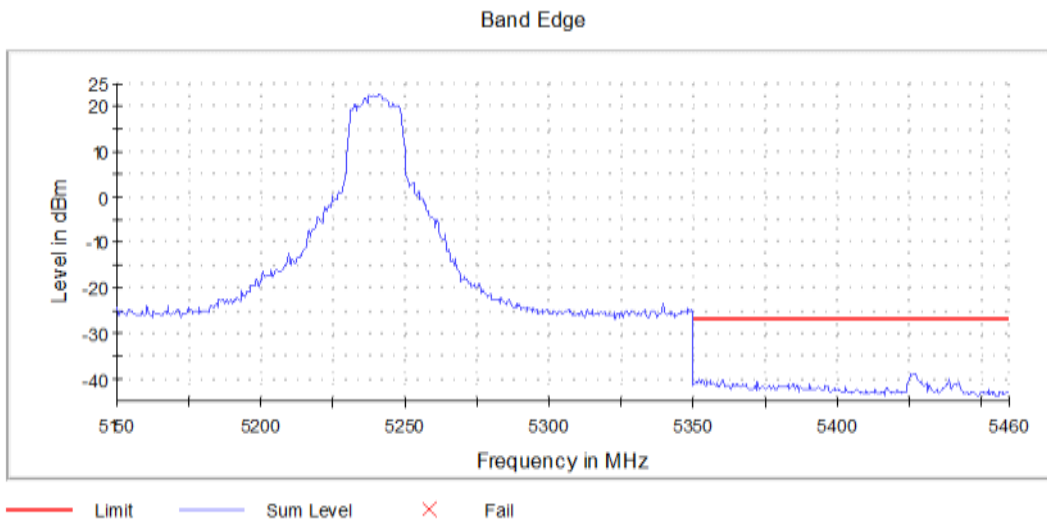
**Graph 14: Antenna 0 – Lower Band Edge Channel 44 Transmitting (5220MHz) – Setting 20**



**Graph 15: Antenna 0 – Upper Band Edge Channel 44 Transmitting (5220MHz) - Setting 20**

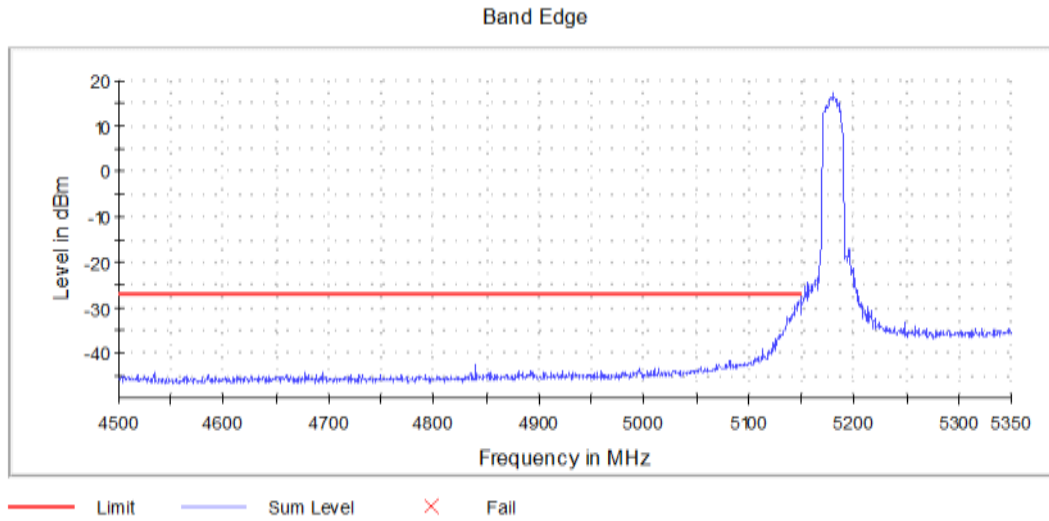


**Graph 16: Antenna 0 – Lower Band Edge Channel 48 Transmitting (5240MHz) - Setting 20**

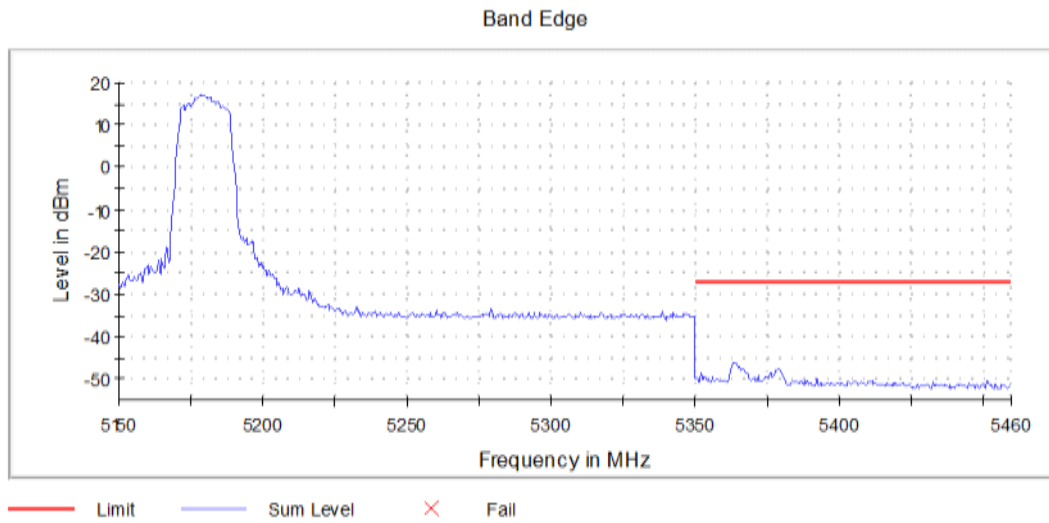


**Graph 17: Antenna 0 – Upper Band Edge Channel 48 Transmitting (5240MHz) - Setting 20**

### Antenna 1 Out-Of-Band Domain Measurements

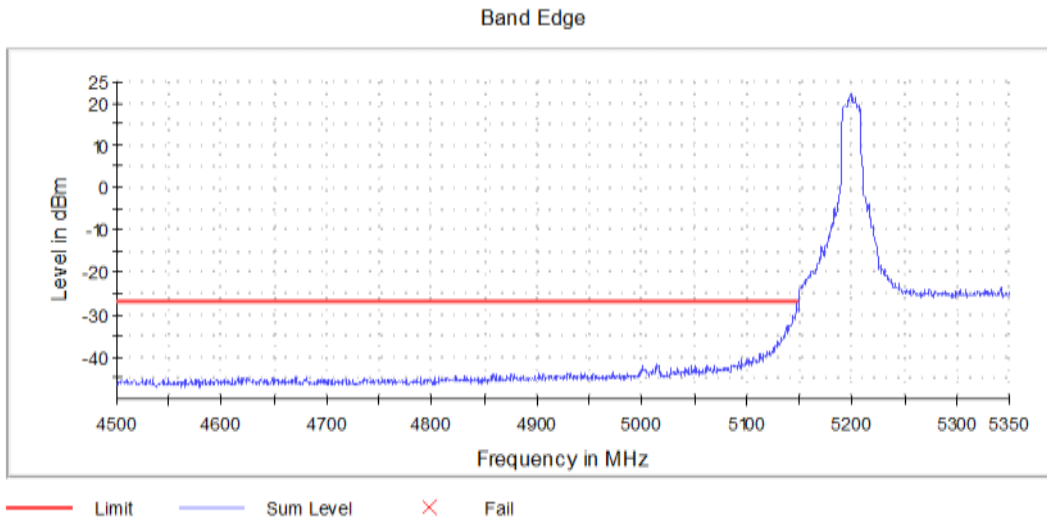


**Graph 18: Antenna 1 – Lower Band Edge Channel 36 Transmitting (5180MHz) - Setting 13**

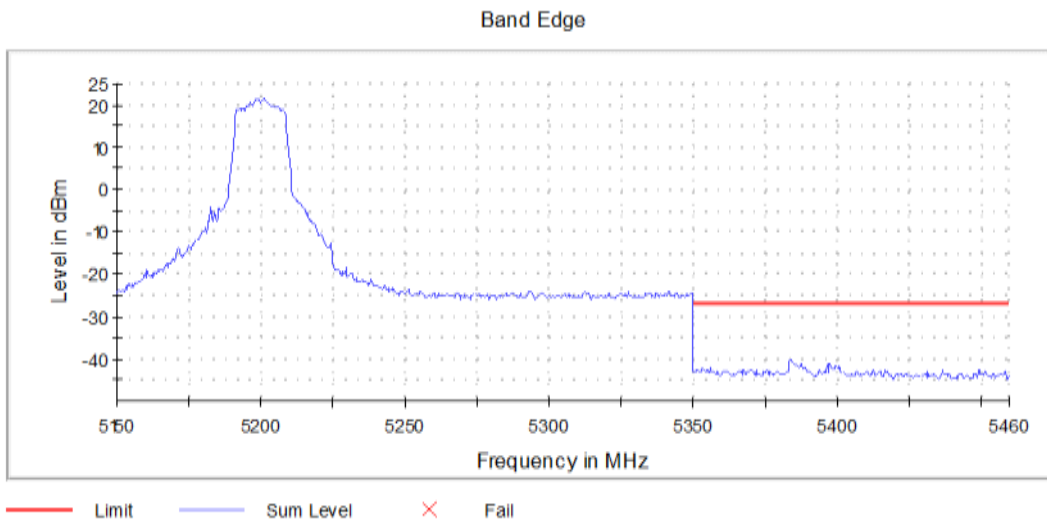


**Graph 19: Antenna 1 – Upper Band Edge Channel 36 Transmitting (5180MHz) - Setting 13**

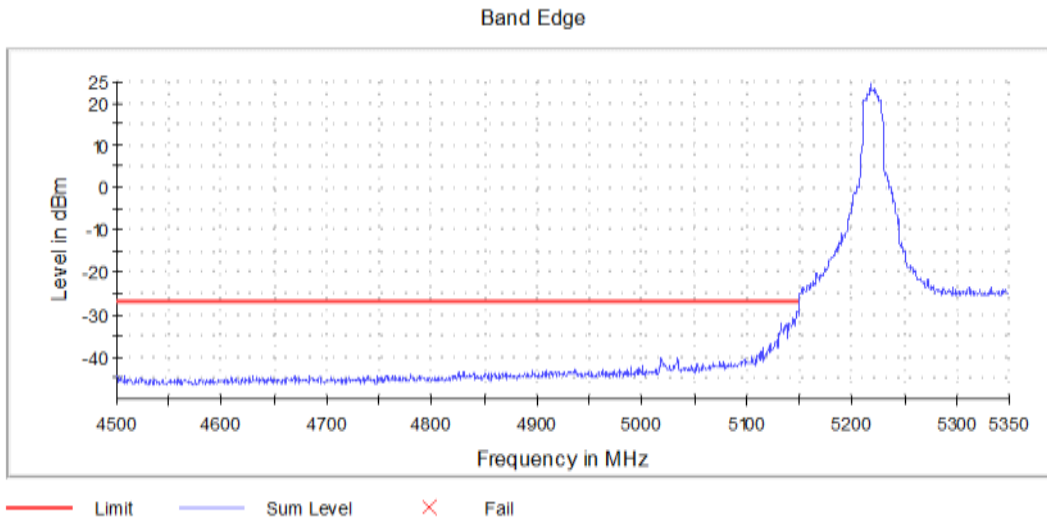




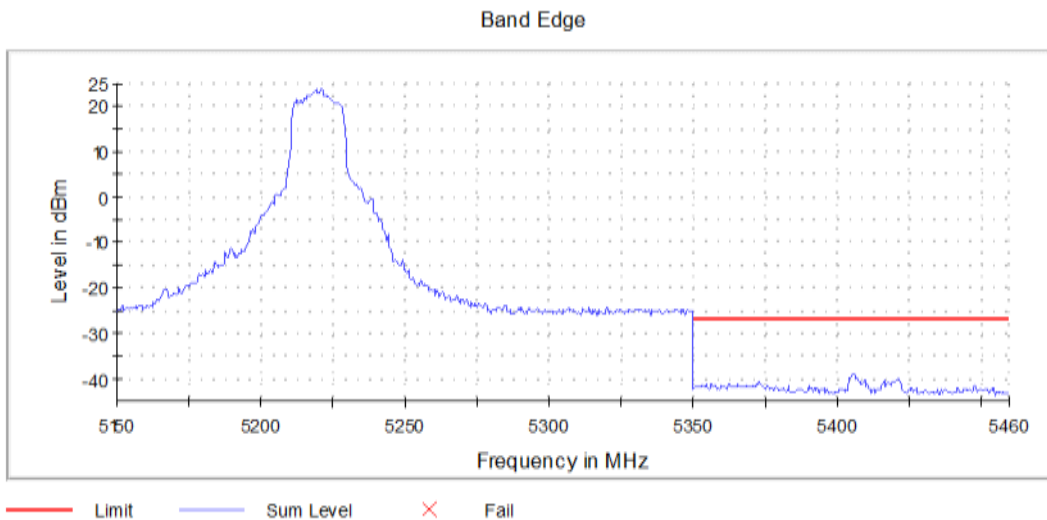
**Graph 20: Antenna 1 – Lower Band Edge Channel 40 Transmitting (5200MHz) - Setting 18**



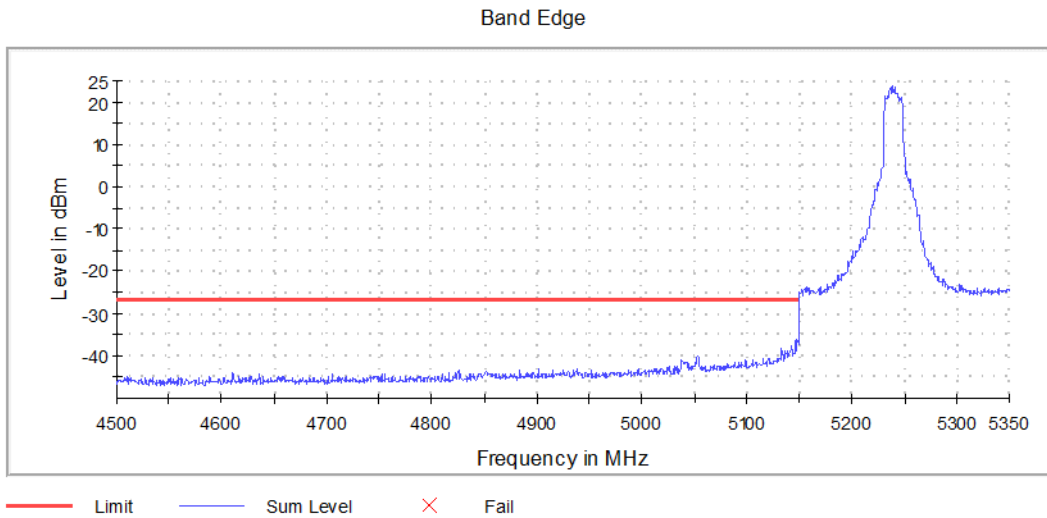
**Graph 21: Antenna 1 – Upper Band Edge Channel 40 Transmitting (5200MHz) - Setting 18**



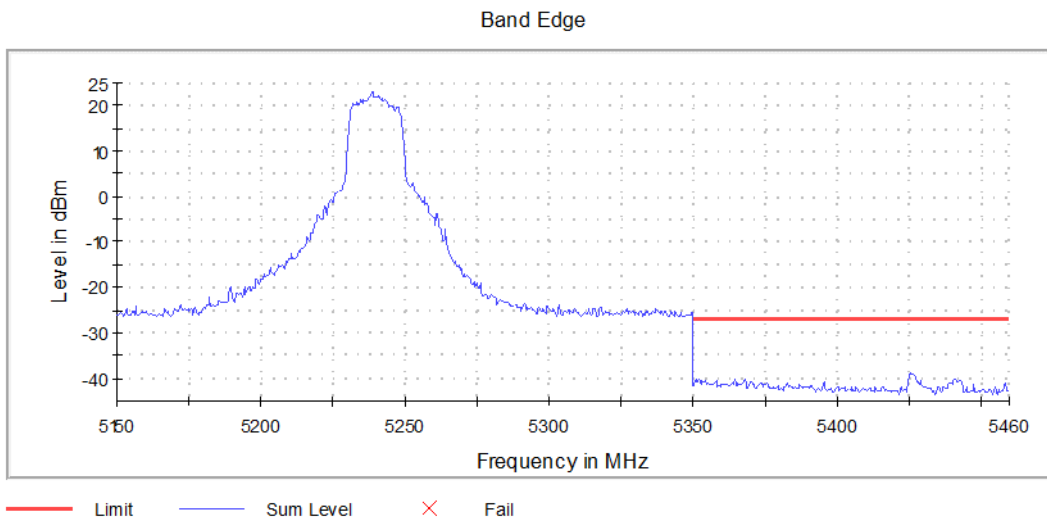
**Graph 22: Antenna 1 – Lower Band Edge Channel 44 Transmitting (5220MHz) – Setting 20**



**Graph 23: Antenna 1 – Upper Band Edge Channel 44 Transmitting (5220MHz) - Setting 20**

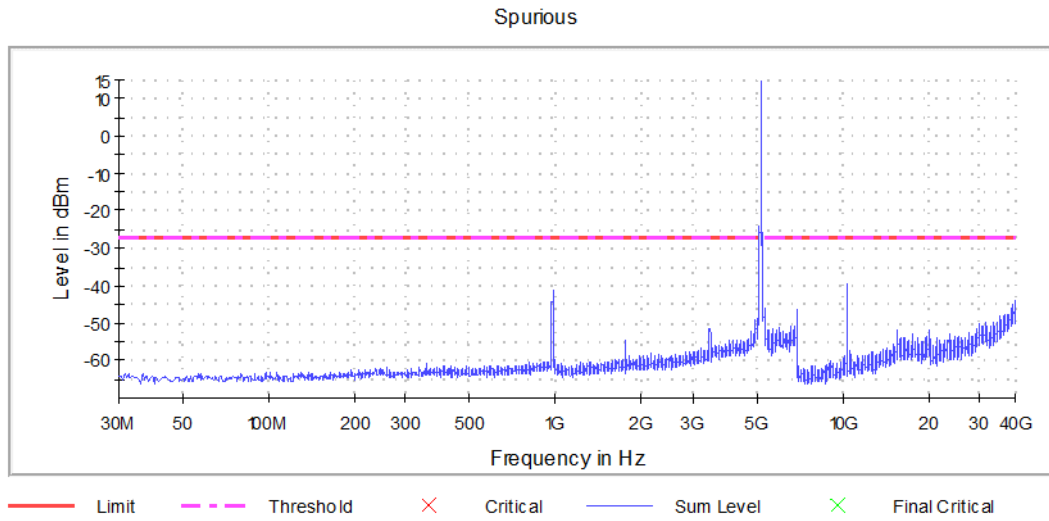


**Graph 24: Antenna 1 – Lower Band Edge Channel 48 Transmitting (5240MHz) - Setting 20**

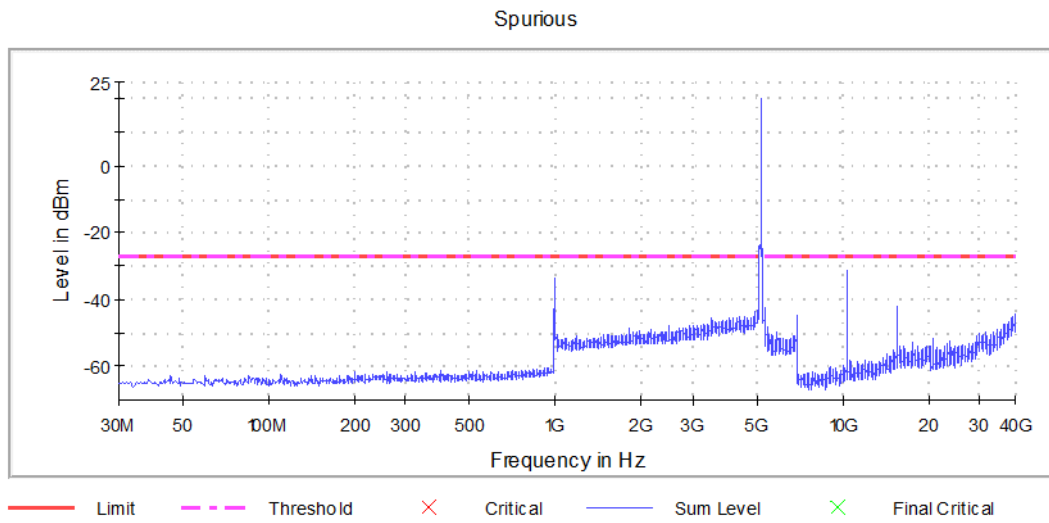


**Graph 25: Antenna 1 – Upper Band Edge Channel 48 Transmitting (5240MHz) - Setting 20**

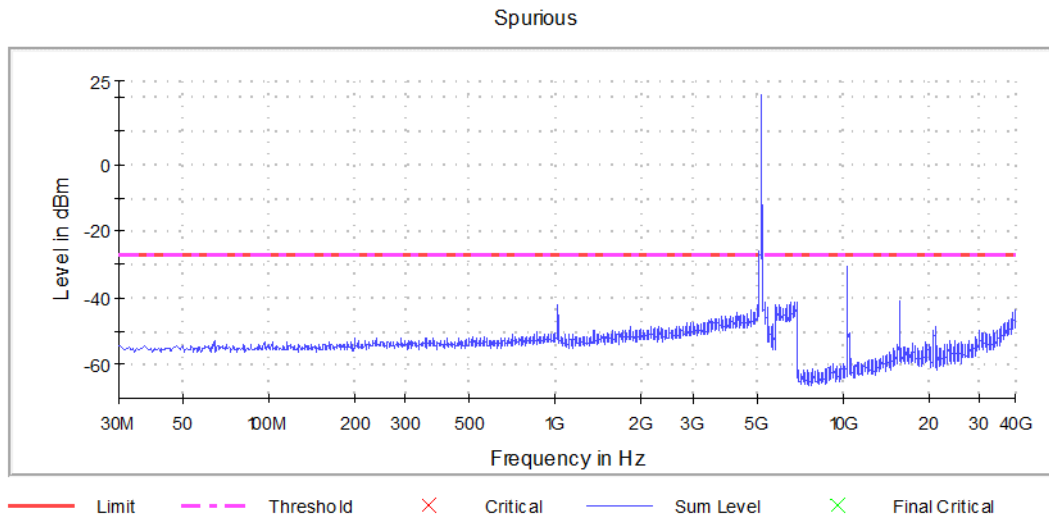
### Antenna 0 Spurious Domain Measurements



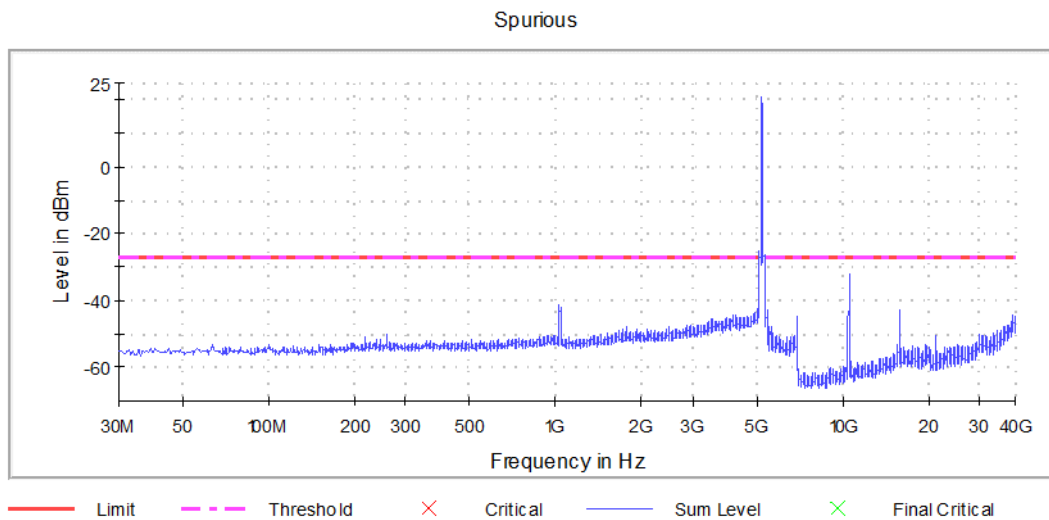
**Graph 26: Antenna 0 – Spurious Emissions Channel 36 Transmitting (5180MHz) - Setting 13**



**Graph 27: Antenna 0 – Spurious Emissions Channel 40 Transmitting (5200MHz) - Setting 18**

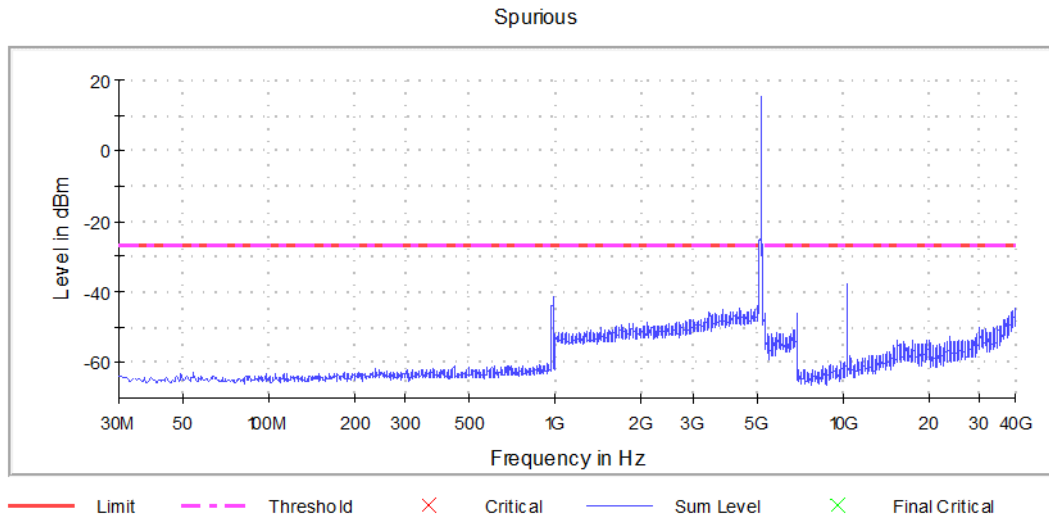


**Graph 28: Antenna 0 – Spurious Emissions Channel 44 Transmitting (5220MHz) – Setting 20**

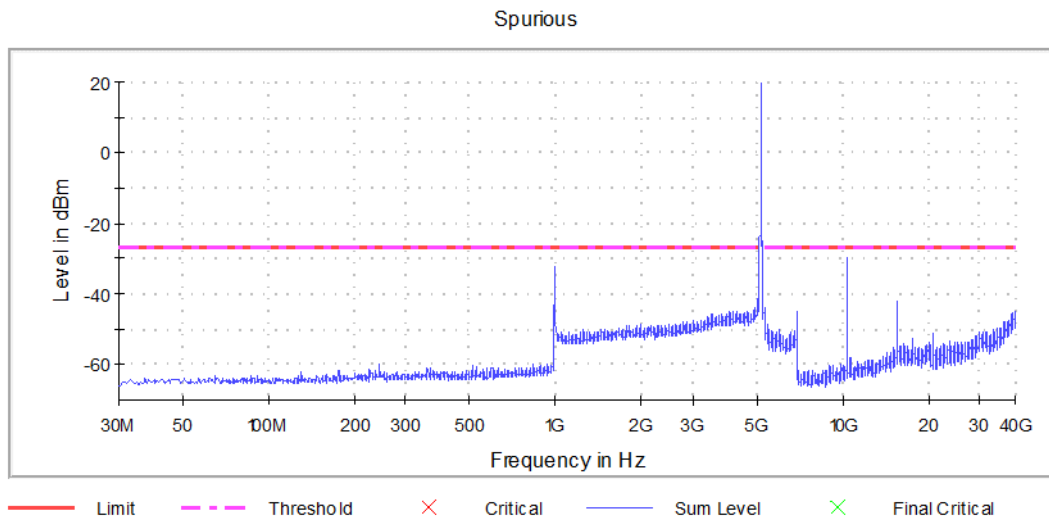


**Graph 29: Antenna 0 – Spurious Emissions Channel 48 Transmitting (5240MHz) - Setting 20**

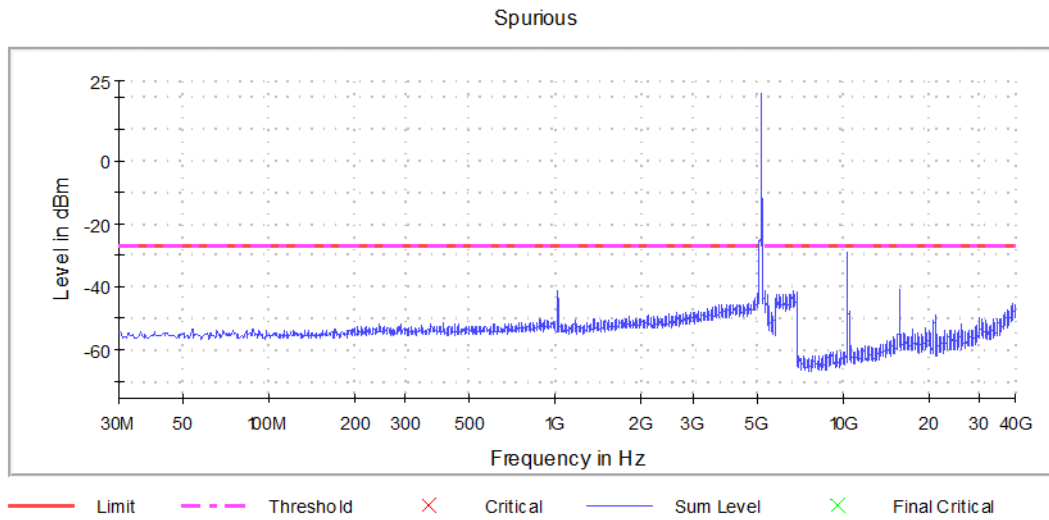
### Antenna 1 Spurious Domain Measurements



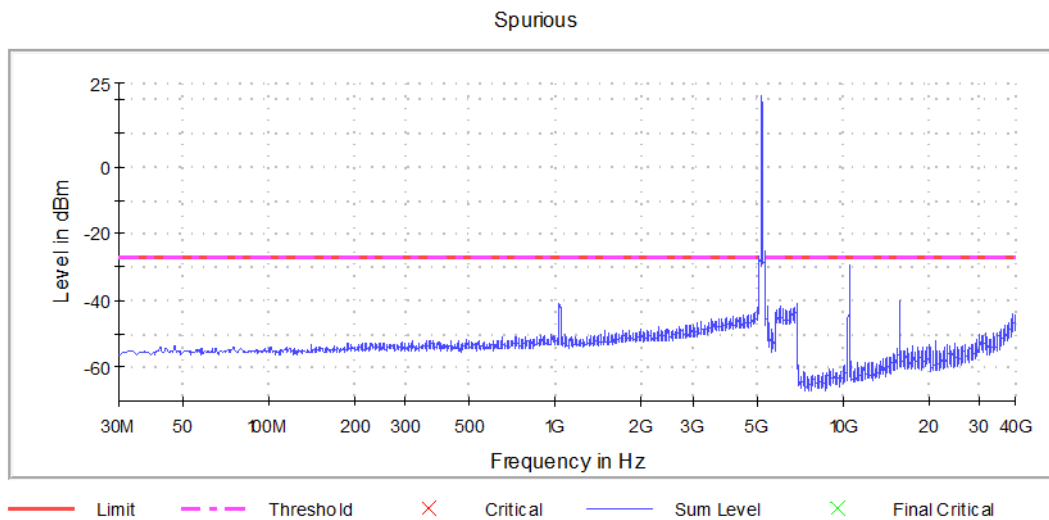
**Graph 30: Antenna 1 – Spurious Emissions Channel 36 Transmitting (5180MHz) - Setting 13**



**Graph 31: Antenna 1 – Spurious Emissions Channel 40 Transmitting (5200MHz) - Setting 18**



**Graph 32: Antenna 1 – Spurious Emissions Channel 44 Transmitting (5220MHz) - Setting 20**



**Graph 33: Antenna 1 – Spurious Emissions Channel 48 Transmitting (5240MHz) - Setting 20**

**Result**

The EUT complied with all undesirable emission requirements of 15.407(b).

### 6.2.1 §15.407(b)(9) Undesirable Emissions – Restricted Bands

The frequency range from the lowest frequency generated or used in the device to the tenth harmonic of the highest fundamental emission was investigated to measure any radiated emissions in the restricted bands. The following tables show measurements of any emission that fell into the restricted bands of §15.205. The tables show the worst-case emission measured from the EUT. For frequencies above 18.0 GHz, a measurement distance of 1 meter was used. The noise floor was a minimum of 6 dB below the limit. The emissions in the restricted bands must meet the limits specified in §15.209. The spurious emissions were tested at the highest power setting used by any channel in the band (setting of 20). The band edges at the restricted bands were measured using the power settings that will be used in manufacturing. Tabular data and plots are shown below.

#### Result

The EUT complied with the specification limit as all emissions met the limits of 15.209.

#### C4-T4T10-XX Antenna 0 (Model 1005180)

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15540.0	Peak	Vertical	1.1	47.7	48.8	74.0	-25.2
15540.0	Average	Vertical	-10.5	47.7	37.2	54.0	-16.8
15540.0	Peak	Horizontal	0.5	47.7	48.2	74.0	-25.8
15540.0	Average	Horizontal	-10.7	47.7	37.0	54.0	-17.0

**Table 10: Antenna 0 - Transmitting at the Lowest Frequency (Channel 36) – Setting 20**

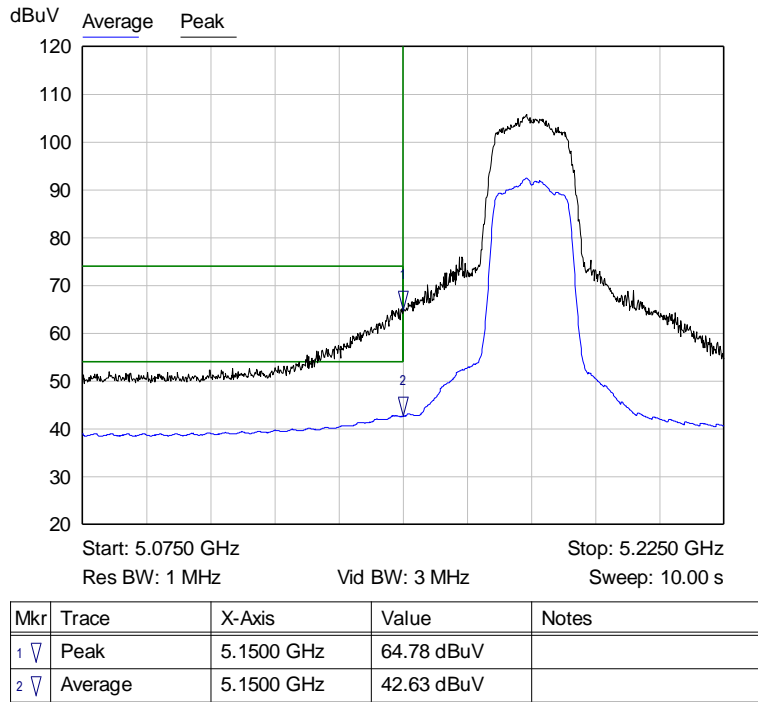
Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15600.0	Peak	Vertical	1.1	47.7	48.8	74.0	-25.2
15600.0	Average	Vertical	-10.4	47.7	37.3	54.0	-16.7
15600.0	Peak	Horizontal	1.2	47.7	48.9	74.0	-25.1
15600.0	Average	Horizontal	-10.3	47.7	37.4	54.0	-16.6

**Table 11: Antenna 0 - Transmitting at the Middle Frequency (Channel 40) – Setting 20**

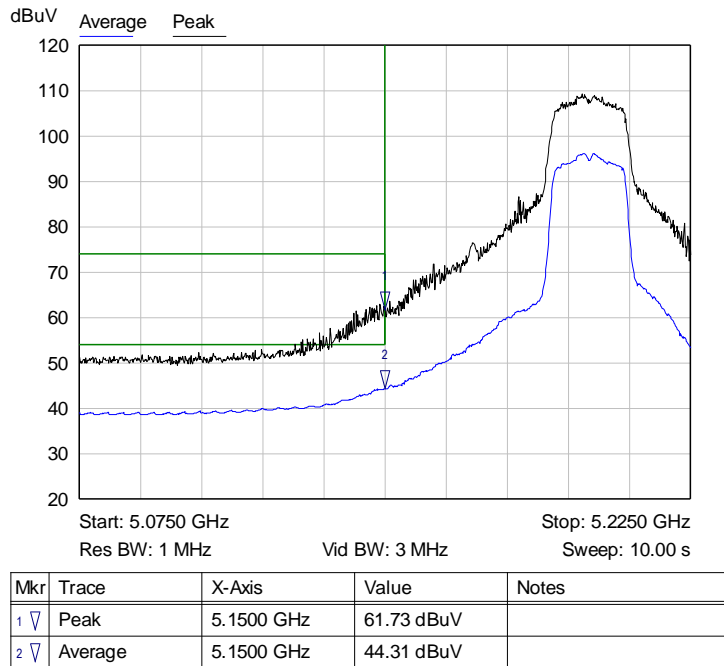
Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15720.0	Peak	Vertical	1.2	47.8	49.0	74.0	-25.0
15720.0	Average	Vertical	-10.5	47.8	37.3	54.0	-16.7
15720.0	Peak	Horizontal	0.9	47.8	48.7	74.0	-25.3
15720.0	Average	Horizontal	-10.4	47.8	37.4	54.0	-16.6

**Table 12: Antenna 0 - Transmitting at the Highest Frequency (Channel 48) – Setting 20**

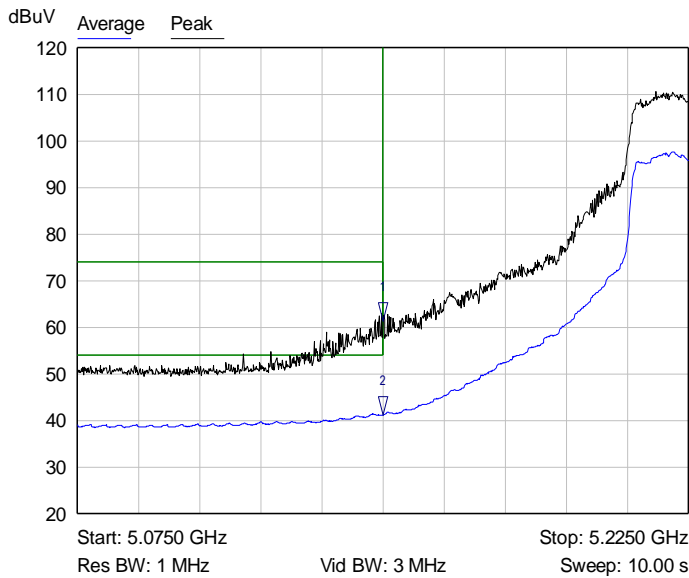




**Graph 34: Antenna 0 – Channel 36 Band Edge at the Restricted Band Plot – Setting 13**



**Graph 35: Antenna 0 – Channel 40 Band Edge at the Restricted Band Plot – Setting 18**



Mkr	Trace	X-Axis	Value	Notes
1 ▾	Peak	5.1500 GHz	61.41 dBuV	
2 ▾	Average	5.1500 GHz	41.23 dBuV	

**Graph 36: Antenna 0 – Channel 44 Band Edge at the Restricted Band Plot – Setting 20**

**C4-T4T10-XX Antenna 1 (Model 1005179)**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15540.0	Peak	Vertical	0.4	47.7	48.1	74.0	-25.9
15540.0	Average	Vertical	-10.8	47.7	36.9	54.0	-17.1
15540.0	Peak	Horizontal	1.0	47.7	48.7	74.0	-25.3
15540.0	Average	Horizontal	-10.9	47.7	36.8	54.0	-17.2

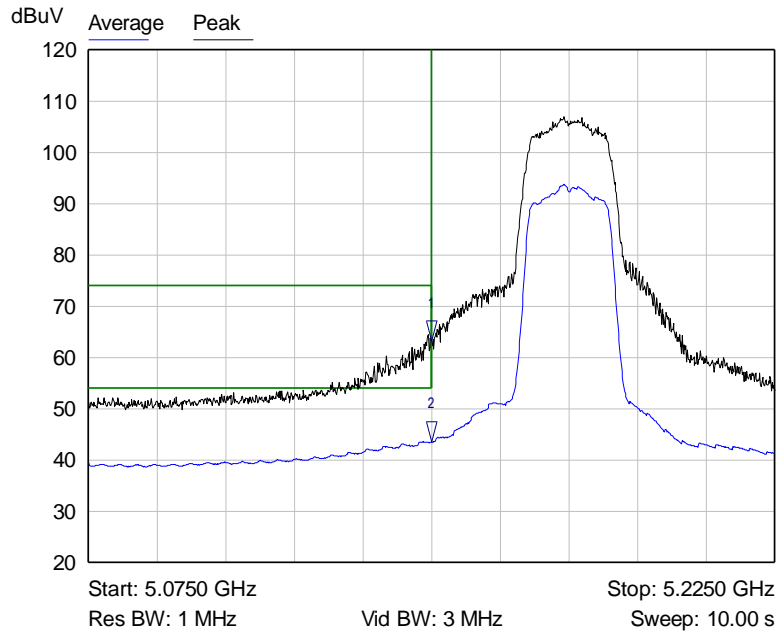
**Table 13: Antenna 1 - Transmitting at the Lowest Frequency (Channel 36) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15600.0	Peak	Vertical	1.5	47.7	49.2	74.0	-24.8
15600.0	Average	Vertical	-10.1	47.7	37.6	54.0	-16.4
15600.0	Peak	Horizontal	1.1	47.7	48.8	74.0	-25.2
15600.0	Average	Horizontal	-10.2	47.7	37.5	54.0	-16.5

**Table 14: Antenna 1 - Transmitting at the Middle Frequency (Channel 40) – Setting 20**

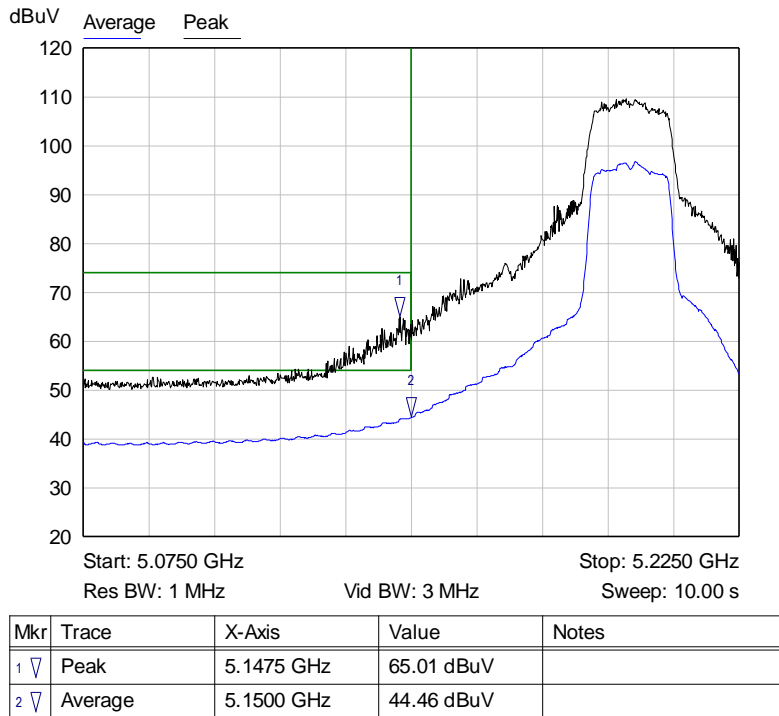
Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15720.0	Peak	Vertical	0.8	47.8	48.6	74.0	-25.4
15720.0	Average	Vertical	-10.2	47.8	37.6	54.0	-16.4
15720.0	Peak	Horizontal	1.3	47.8	49.1	74.0	-24.9
15720.0	Average	Horizontal	-10.2	47.8	37.6	54.0	-16.4

**Table 15: Antenna 1 - Transmitting at the Highest Frequency (Channel 48) – Setting 20**

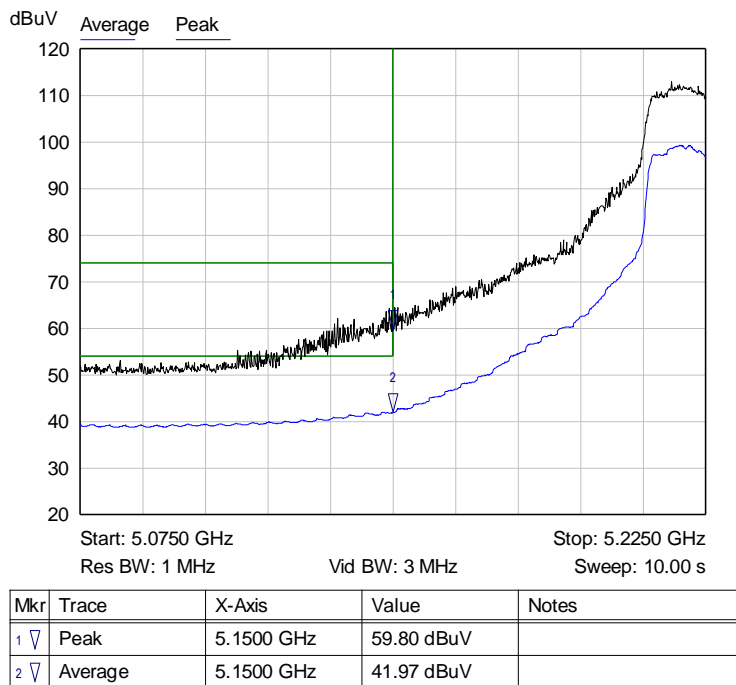


Mkr	Trace	X-Axis	Value	Notes
1	Peak	5.1500 GHz	63.08 dBuV	
2	Average	5.1500 GHz	43.47 dBuV	

**Graph 37: Antenna 1 – Channel 36 Band Edge at the Restricted Band Plot – Setting 13**



**Graph 38: Antenna 1 – Channel 40 Band Edge at the Restricted Band Plot – Setting 18**



**Graph 39: Antenna 1 – Channel 44 Band Edge at the Restricted Band Plot – Setting 20**

**C4-T4T8-XX Antenna 0 (Model 1005178)**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15540.0	Peak	Vertical	0.7	47.7	48.4	74.0	-25.6
15540.0	Average	Vertical	-11.1	47.7	36.6	54.0	-17.4
15540.0	Peak	Horizontal	1.0	47.7	48.7	74.0	-25.3
15540.0	Average	Horizontal	-10.9	47.7	36.8	54.0	-17.2

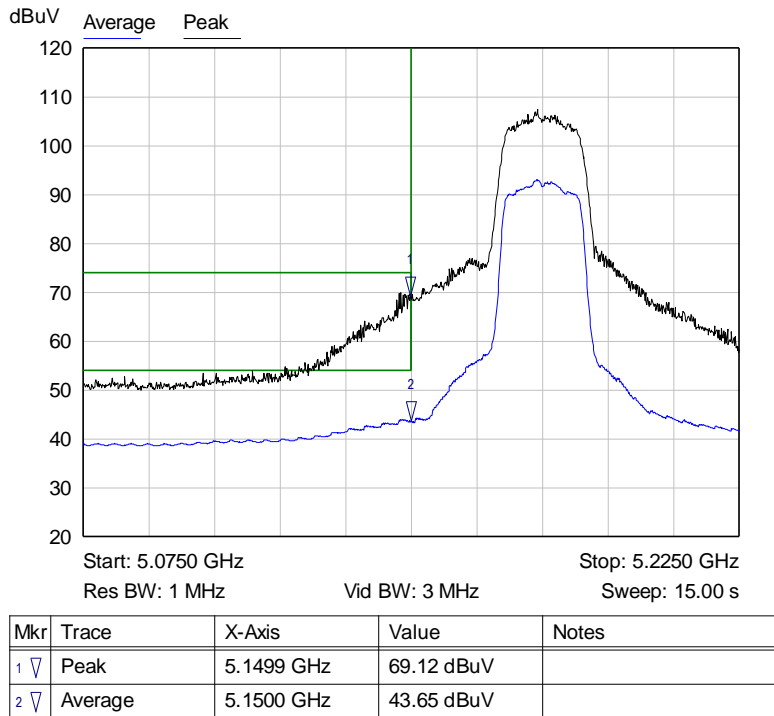
**Table 16: Antenna 0 - Transmitting at the Lowest Frequency (Channel 36) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15600.0	Peak	Vertical	0.5	47.7	48.2	74.0	-25.8
15600.0	Average	Vertical	-10.9	47.7	36.8	54.0	-17.2
15600.0	Peak	Horizontal	0.2	47.7	47.9	74.0	-26.1
15600.0	Average	Horizontal	-9.4	47.7	38.3	54.0	-15.7

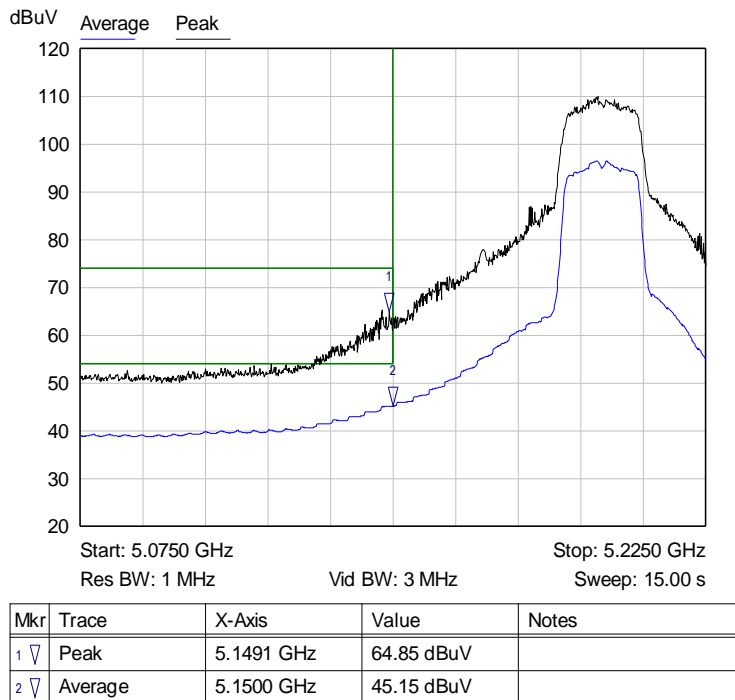
**Table 17: Antenna 0 - Transmitting at the Middle Frequency (Channel 40) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15720.0	Peak	Vertical	0.6	47.8	48.4	74.0	-25.6
15720.0	Average	Vertical	-11.0	47.8	36.8	54.0	-17.2
15720.0	Peak	Horizontal	0.5	47.8	48.3	74.0	-25.7
15720.0	Average	Horizontal	-11.2	47.8	36.6	54.0	-17.4

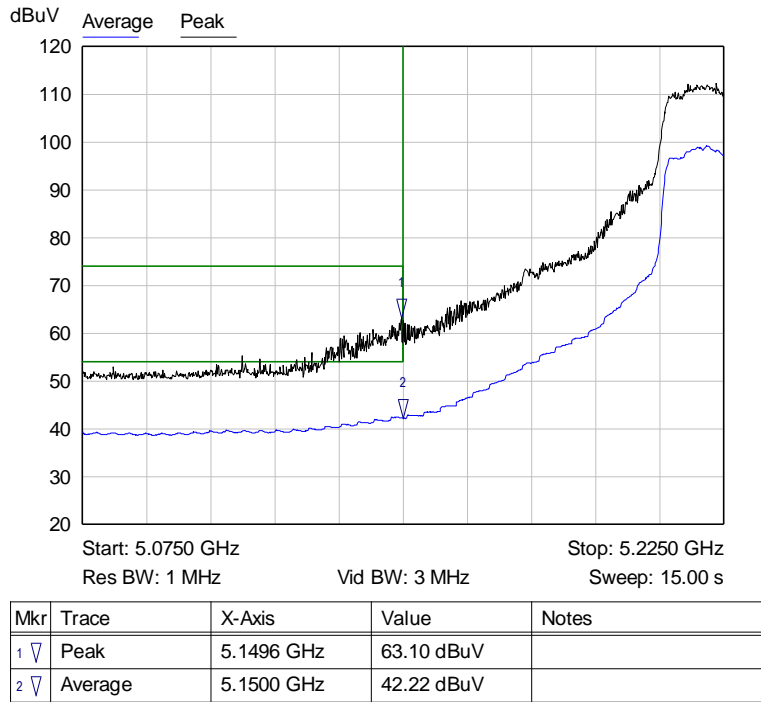
**Table 18: Antenna 0 - Transmitting at the Highest Frequency (Channel 48) – Setting 20**



**Graph 40: Antenna 0 – Channel 36 Band Edge at the Restricted Band Plot – Setting 13**



**Graph 41: Antenna 0 – Channel 40 Band Edge at the Restricted Band Plot – Setting 18**



**Graph 42: Antenna 0 – Channel 44 Band Edge at the Restricted Band Plot – Setting 20**

**C4-T4T8-XX Antenna 1 (Model 1005179)**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15540.0	Peak	Vertical	0.3	47.7	48.0	74.0	-26.0
15540.0	Average	Vertical	-11.0	47.7	36.7	54.0	-17.3
15540.0	Peak	Horizontal	0.2	47.7	47.9	74.0	-26.1
15540.0	Average	Horizontal	-11.1	47.7	36.6	54.0	-17.4

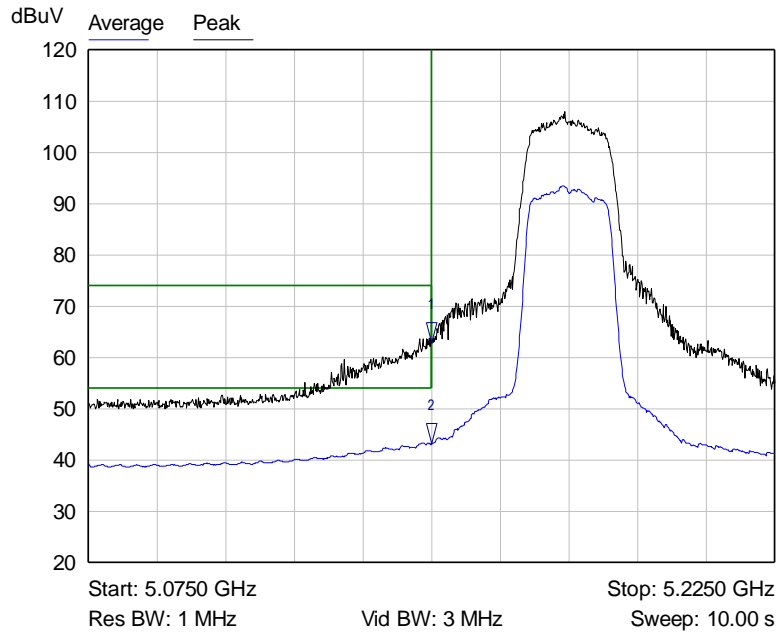
**Table 19: Antenna 1 - Transmitting at the Lowest Frequency (Channel 36) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15600.0	Peak	Vertical	0.2	47.7	47.9	74.0	-26.1
15600.0	Average	Vertical	-9.3	47.7	38.4	54.0	-15.6
15600.0	Peak	Horizontal	0.5	47.7	48.2	74.0	-25.8
15600.0	Average	Horizontal	-9.5	47.7	38.2	54.0	-15.8

**Table 20: Antenna 1 - Transmitting at the Middle Frequency (Channel 40) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15720.0	Peak	Vertical	0.4	47.8	48.2	74.0	-25.8
15720.0	Average	Vertical	-11.4	47.8	36.4	54.0	-17.6
15720.0	Peak	Horizontal	0.7	47.8	48.5	74.0	-25.5
15720.0	Average	Horizontal	-11.4	47.8	36.4	54.0	-17.6

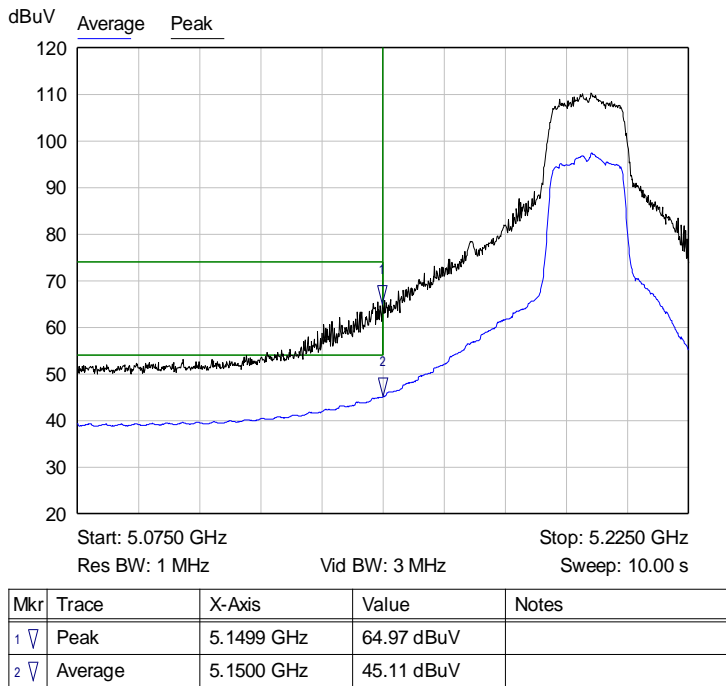
**Table 21: Antenna 1 - Transmitting at the Highest Frequency (Channel 48) – Setting 20**



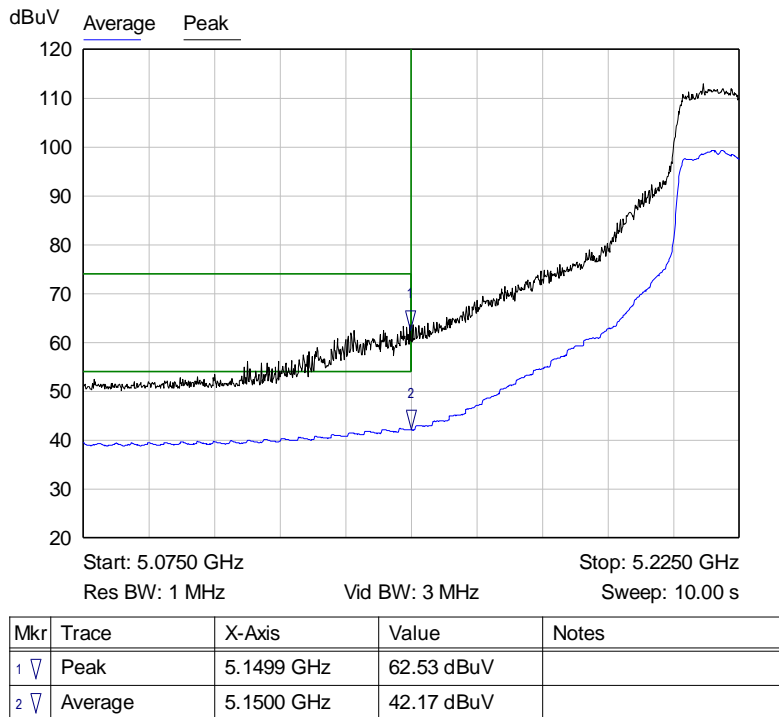
Mkr	Trace	X-Axis	Value	Notes
1	Peak	5.1500 GHz	62.86 dBuV	
2	Average	5.1500 GHz	43.13 dBuV	

**Graph 43: Antenna 1 – Channel 36 Band Edge at the Restricted Band Plot – Setting 13**





**Graph 44: Antenna 1 – Channel 40 Band Edge at the Restricted Band Plot – Setting 18**



**Graph 45: Antenna 1 – Channel 44 Band Edge at the Restricted Band Plot – Setting 20**

**C4-T4IW10-XX Antenna 0 (Model 1005097)**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15540.0	Peak	Vertical	0.5	47.7	48.2	74.0	-25.8
15540.0	Average	Vertical	-11.1	47.7	36.6	54.0	-17.4
15540.0	Peak	Horizontal	0.4	47.7	48.1	74.0	-25.9
15540.0	Average	Horizontal	-11.3	47.7	36.4	54.0	-17.6

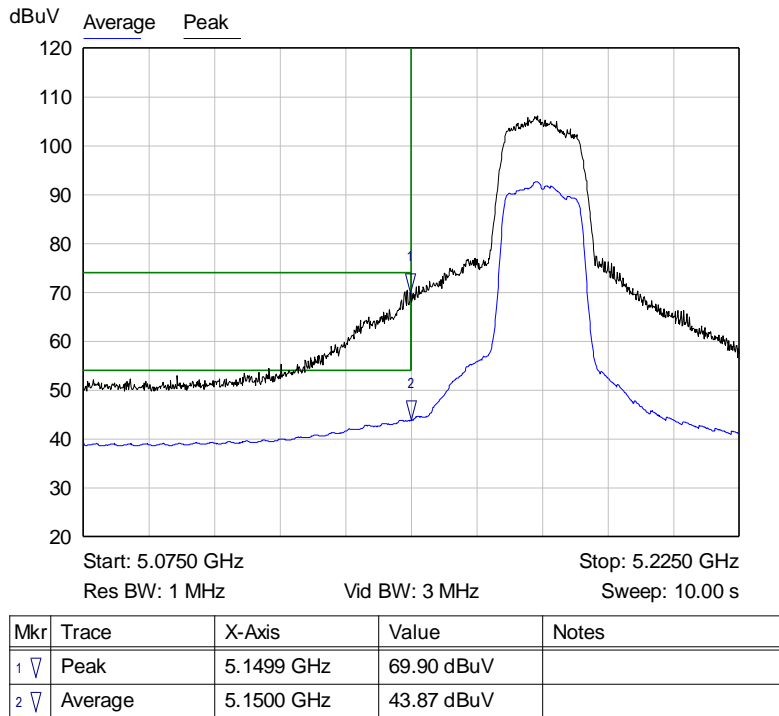
**Table 22: Antenna 0 - Transmitting at the Lowest Frequency (Channel 36) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15600.0	Peak	Vertical	0.2	47.7	47.9	74.0	-26.1
15600.0	Average	Vertical	-9.5	47.7	38.2	54.0	-15.8
15600.0	Peak	Horizontal	0.1	47.7	47.8	74.0	-26.2
15600.0	Average	Horizontal	-9.3	47.7	38.4	54.0	-15.6

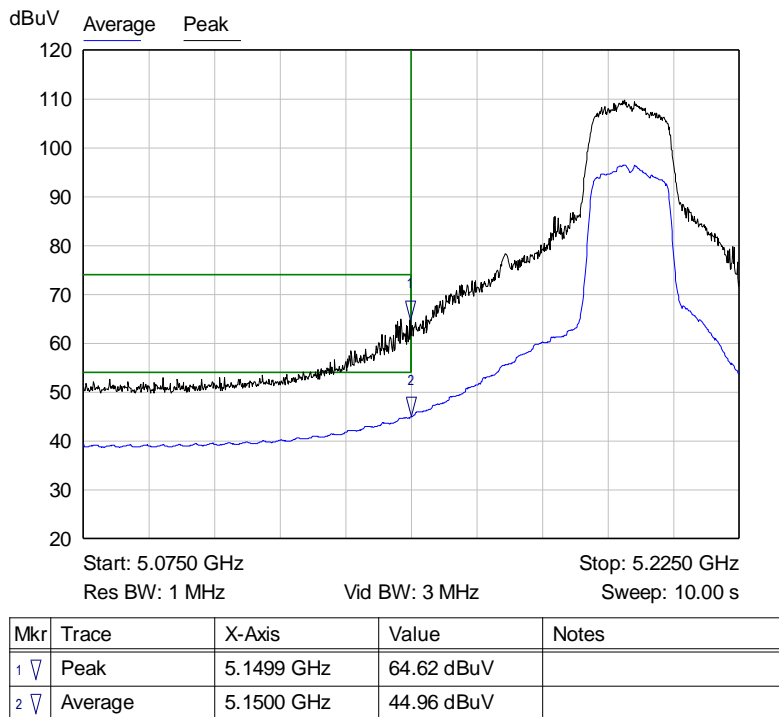
**Table 23: Antenna 0 - Transmitting at the Middle Frequency (Channel 40) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15720.0	Peak	Vertical	-0.2	47.8	47.6	74.0	-26.4
15720.0	Average	Vertical	-11.1	47.8	36.7	54.0	-17.3
15720.0	Peak	Horizontal	0.2	47.8	48.0	74.0	-26.0
15720.0	Average	Horizontal	-11.1	47.8	36.7	54.0	-17.3

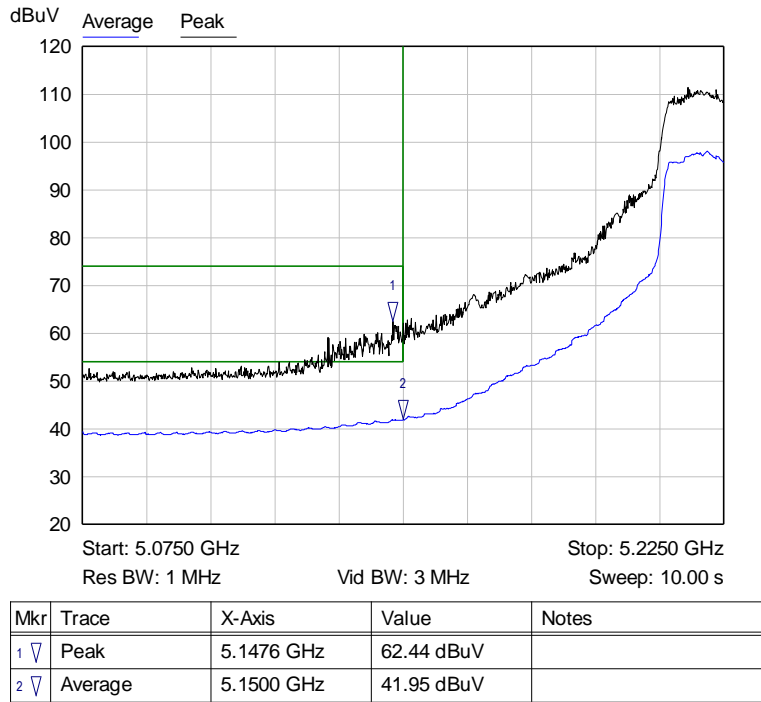
**Table 24: Antenna 0 - Transmitting at the Highest Frequency (Channel 48) – Setting 20**



**Graph 46: Antenna 0 – Channel 36 Band Edge at the Restricted Band Plot – Setting 13**



**Graph 47: Antenna 0 – Channel 40 Band Edge at the Restricted Band Plot – Setting 18**



**Graph 48: Antenna 0 – Channel 44 Band Edge at the Restricted Band Plot – Setting 20**

**C4-T4IW10-XX Antenna 1 (Model 1005098)**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15540.0	Peak	Vertical	0.3	47.7	48.0	74.0	-26.0
15540.0	Average	Vertical	-11.5	47.7	36.2	54.0	-17.8
15540.0	Peak	Horizontal	0.6	47.7	48.3	74.0	-25.7
15540.0	Average	Horizontal	-11.5	47.7	36.2	54.0	-17.8

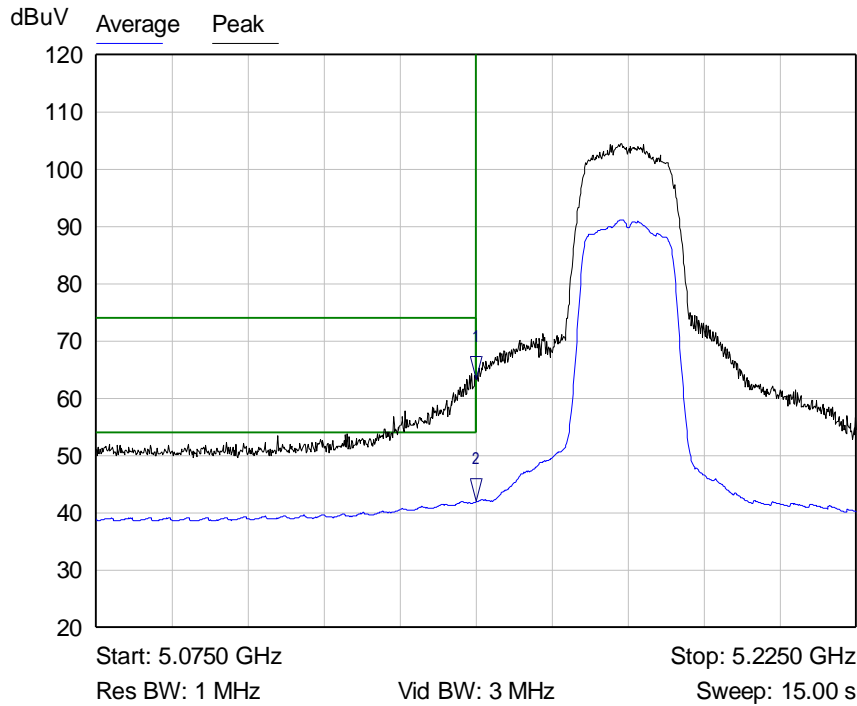
**Table 25: Antenna 1 - Transmitting at the Lowest Frequency (Channel 36) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15600.0	Peak	Vertical	-9.5	47.7	38.2	74.0	-35.8
15600.0	Average	Vertical	-0.5	47.7	47.2	54.0	-6.8
15600.0	Peak	Horizontal	-9.4	47.7	38.3	74.0	-35.7
15600.0	Average	Horizontal	-9.5	47.7	38.2	54.0	-15.8

**Table 26: Antenna 1 - Transmitting at the Middle Frequency (Channel 40) – Setting 20**

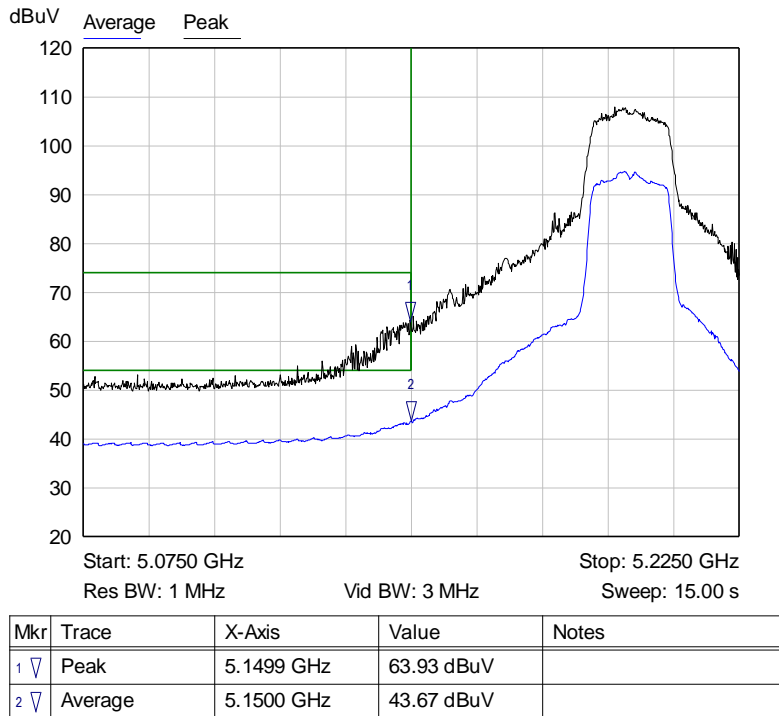
Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15720.0	Peak	Vertical	0.4	47.8	48.2	74.0	-25.8
15720.0	Average	Vertical	-11.2	47.8	36.6	54.0	-17.4
15720.0	Peak	Horizontal	-0.4	47.8	47.4	74.0	-26.6
15720.0	Average	Horizontal	-11.3	47.8	36.5	54.0	-17.5

**Table 27: Antenna 1 - Transmitting at the Highest Frequency (Channel 48) – Setting 20**

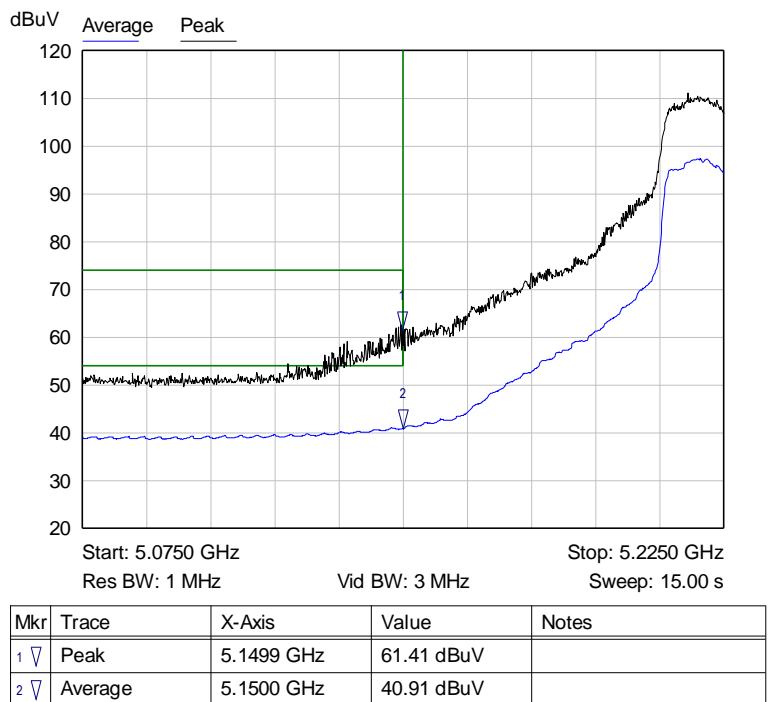


Mkr	Trace	X-Axis	Value	Notes
1 ▾	Peak	5.1500 GHz	63.41 dBuV	
2 ▾	Average	5.1500 GHz	41.93 dBuV	

**Graph 49: Antenna 1 – Channel 36 Band Edge at the Restricted Band Plot – Setting 13**



**Graph 50: Antenna 1 – Channel 40 Band Edge at the Restricted Band Plot – Setting 18**



**Graph 51: Antenna 1 – Channel 44 Band Edge at the Restricted Band Plot – Setting 20**

**C4-T4IW8-XX Antenna 0 (Model 1005095)**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15540.0	Peak	Vertical	-0.9	47.7	46.8	74.0	-27.2
15540.0	Average	Vertical	-11.9	47.7	35.8	54.0	-18.2
15540.0	Peak	Horizontal	-0.6	47.7	47.1	74.0	-26.9
15540.0	Average	Horizontal	-11.9	47.7	35.8	54.0	-18.2

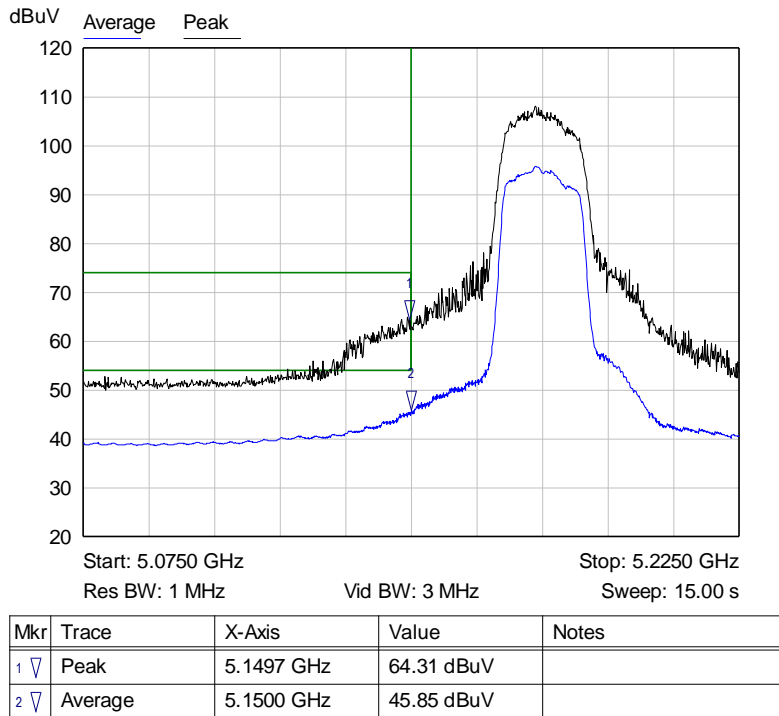
**Table 28: Antenna 0 - Transmitting at the Lowest Frequency (Channel 36) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15600.0	Peak	Vertical	-0.9	47.7	47.7	74.0	-26.3
15600.0	Average	Vertical	-11.8	47.7	47.7	54.0	-6.3
15600.0	Peak	Horizontal	-0.2	47.7	47.7	74.0	-26.3
15600.0	Average	Horizontal	-11.6	47.7	47.7	54.0	-6.3

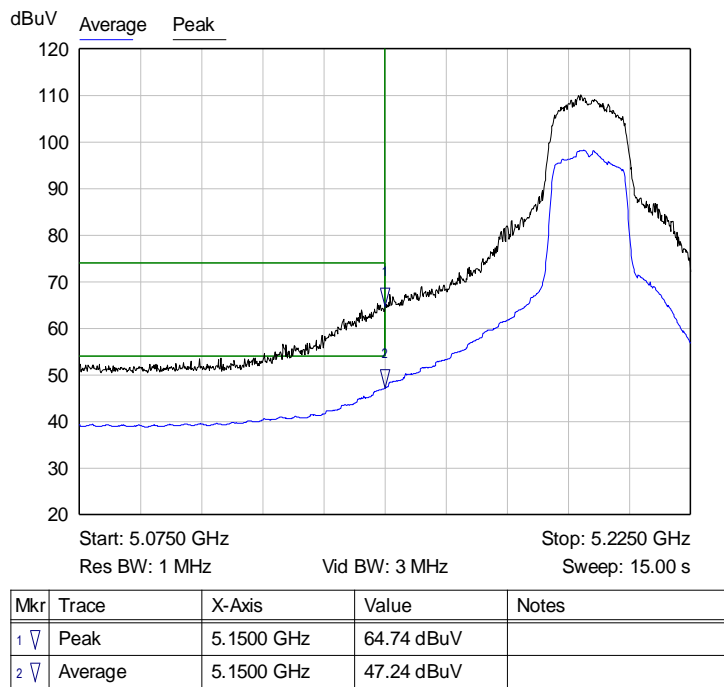
**Table 29: Antenna 0 - Transmitting at the Middle Frequency (Channel 40) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15720.0	Peak	Vertical	0.3	47.8	48.1	74.0	-25.9
15720.0	Average	Vertical	-11.4	47.8	36.4	54.0	-17.6
15720.0	Peak	Horizontal	-0.8	47.8	47.0	74.0	-27.0
15720.0	Average	Horizontal	-11.3	47.8	36.5	54.0	-17.5

**Table 30: Antenna 0 - Transmitting at the Highest Frequency (Channel 48) – Setting 20**

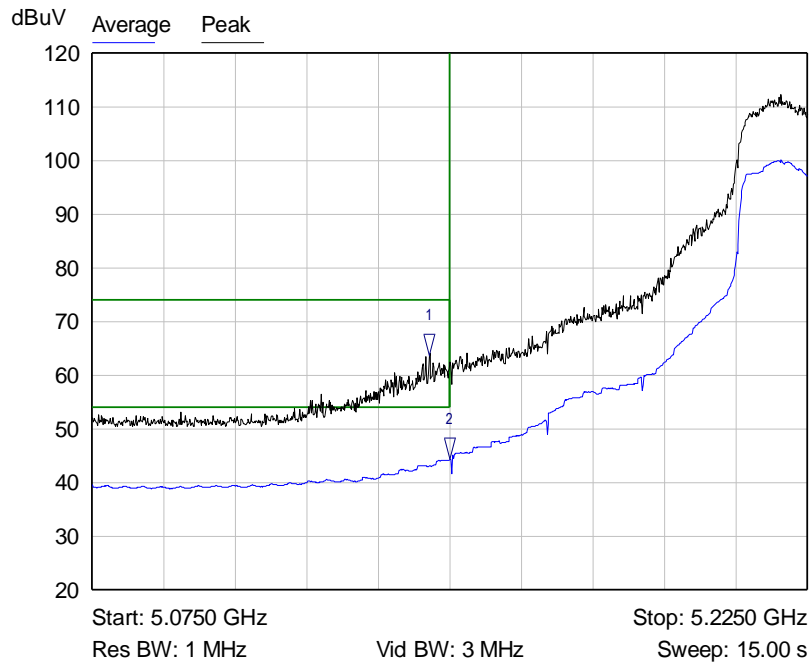


**Graph 52: Antenna 0 – Channel 36 Band Edge at the Restricted Band Plot – Setting 13**



**Graph 53: Antenna 0 – Channel 40 Band Edge at the Restricted Band Plot – Setting 18**





Mkr	Trace	X-Axis	Value	Notes
1 ▾	Peak	5.1457 GHz	63.73 dBuV	
2 ▾	Average	5.1500 GHz	44.25 dBuV	

**Graph 54: Antenna 0 – Channel 44 Band Edge at the Restricted Band Plot – Setting 20**

**C4-T4IW8-XX Antenna 1 (Model 1005096)**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15540.0	Peak	Vertical	0.5	47.7	47.7	74.0	-26.3
15540.0	Average	Vertical	-11.9	47.7	47.7	54.0	-6.3
15540.0	Peak	Horizontal	0.4	47.7	47.7	74.0	-26.3
15540.0	Average	Horizontal	-11.8	47.7	47.7	54.0	-6.3

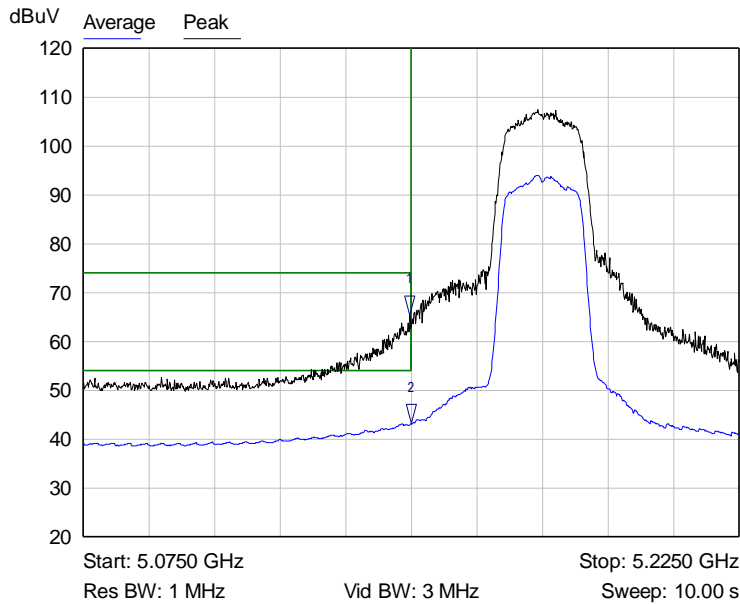
**Table 31: Antenna 1 - Transmitting at the Lowest Frequency (Channel 36) – Setting 20**

Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dBμV)	Correction Factor (dB)	Field Strength (dBμV/m)	Limit (dBμV/m)	Margin (dB)
15600.0	Peak	Vertical	-0.7	47.7	47.0	74.0	-27.0
15600.0	Average	Vertical	-12.0	47.7	35.7	54.0	-18.3
15600.0	Peak	Horizontal	-1.0	47.7	46.7	74.0	-27.3
15600.0	Average	Horizontal	-11.8	47.7	35.9	54.0	-18.1

**Table 32: Antenna 1 - Transmitting at the Middle Frequency (Channel 40) – Setting 20**

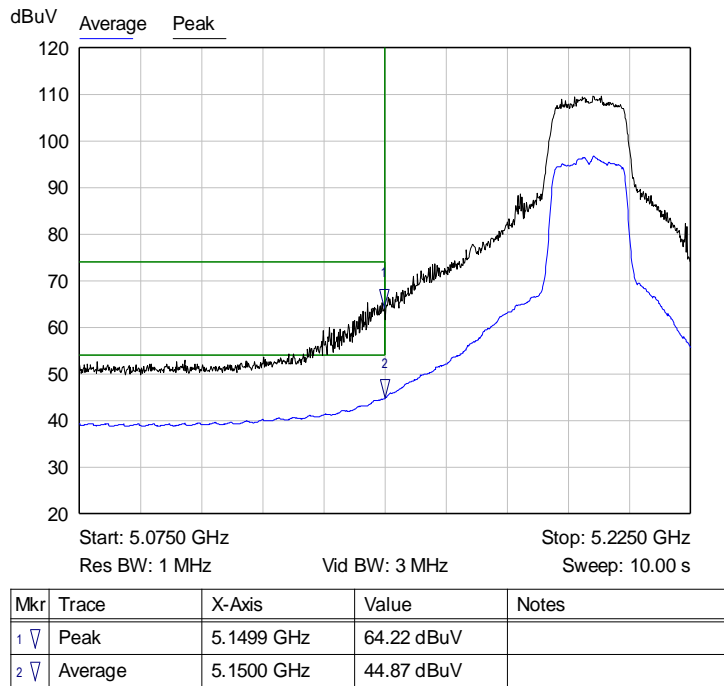
Frequency (MHz)	Detector	Antenna Polarity	Receiver Reading (dB $\mu$ V)	Correction Factor (dB)	Field Strength (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
15720.0	Peak	Vertical	-0.1	47.8	47.7	74.0	-26.3
15720.0	Average	Vertical	-12.2	47.8	35.6	54.0	-18.4
15720.0	Peak	Horizontal	-0.2	47.8	47.6	74.0	-26.4
15720.0	Average	Horizontal	-12.3	47.8	35.5	54.0	-18.5

**Table 33: Antenna 1 - Transmitting at the Highest Frequency (Channel 48) – Setting 20**

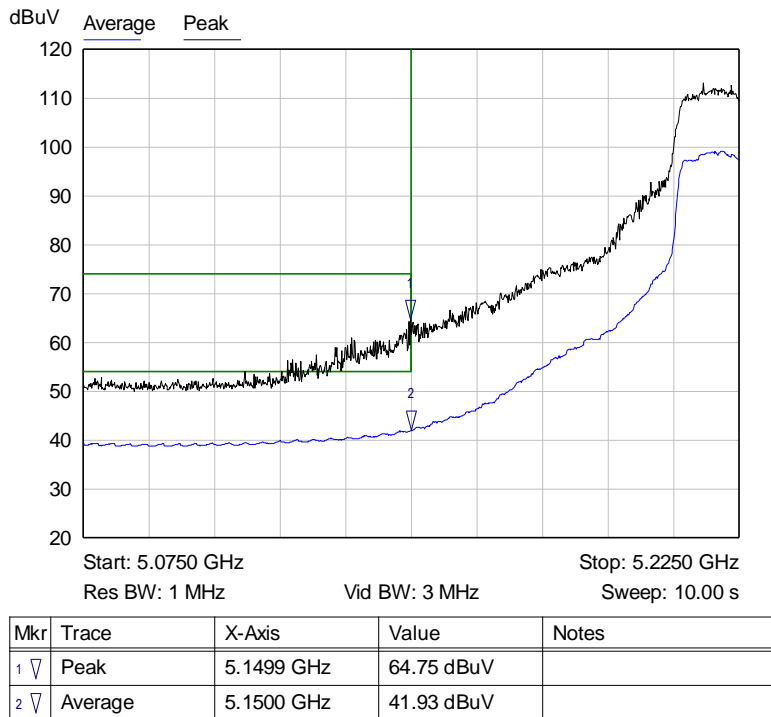


Mkr	Trace	X-Axis	Value	Notes
1 ▾	Peak	5.1497 GHz	65.28 dBuV	
2 ▾	Average	5.1500 GHz	43.15 dBuV	

**Graph 55: Antenna 1 – Channel 36 Band Edge at the Restricted Band Plot – Setting 13**



**Graph 56: Antenna 1 – Channel 40 Band Edge at the Restricted Band Plot – Setting 18**



**Graph 57: Antenna 1 – Channel 44 Band Edge at the Restricted Band Plot – Setting 20**

## 7 Test Procedures and Test Equipment

### 7.1 Conducted Emissions at Mains Ports

The conducted emissions at mains and telecommunications ports from the EUT were measured using a spectrum analyzer with a quasi-peak adapter for peak, quasi-peak and average readings. The quasi-peak adapter uses a bandwidth of 9 kHz, with the spectrum analyzer's resolution bandwidth set at 100 kHz, for readings in the 150 kHz to 30 MHz frequency ranges.

The conducted emissions at mains ports measurements are performed in a screen room using a (50 Ω/50 μH) Line Impedance Stabilization Network (LISN).

Where mains flexible power cords are longer than 1 m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4 m in length.

Where the EUT is a collection of devices with each device having its own power cord, the point of connection for the LISN is determined from the following rules:

- Each power cord, which is terminated in a mains supply plug, shall be tested separately.
- Power cords, which are not specified by the manufacturer to be connected via a host unit, shall be tested separately.
- Power cords which are specified by the manufacturer to be connected via a host unit or other power supplying equipment shall be connected to that host unit and the power cords of that host unit connected to the LISN and tested.
- Where a special connection is specified, the necessary hardware to effect the connection is supplied by the manufacturer for the testing purpose.
- When testing equipment with multiple mains cords, those cords not under test are connected to an artificial mains network (AMN) different than the AMN used for the mains cord under test.

For testing, desktop EUT are placed on a non-conducting table at least 0.8 meters from the metallic floor and placed 40 cm from the vertical coupling plane (copper plating in the wall behind EUT table). Floor standing equipment is placed directly on the earth grounded floor.

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer	Hewlett Packard	8566B	V034141	05/12/2020	05/12/2021
Quasi-Peak Detector	Hewlett Packard	85650A	V033345	05/11/2020	05/11/2022
LISN	Teseq	NNB 51	V045406	08/20/2020	08/20/2021
Conductance Cable Wanship Upper Site	VPI Labs	Cable J	V034832	01/09/2020	01/09/2021
Filter	VPI Labs	47038	V047038	01/09/2020	01/09/2021
Test Software (AC)	VPI Labs	Revision 01	V035674	N/A	N/A

**Table 34: List of equipment used for conducted emissions testing at mains ports.**

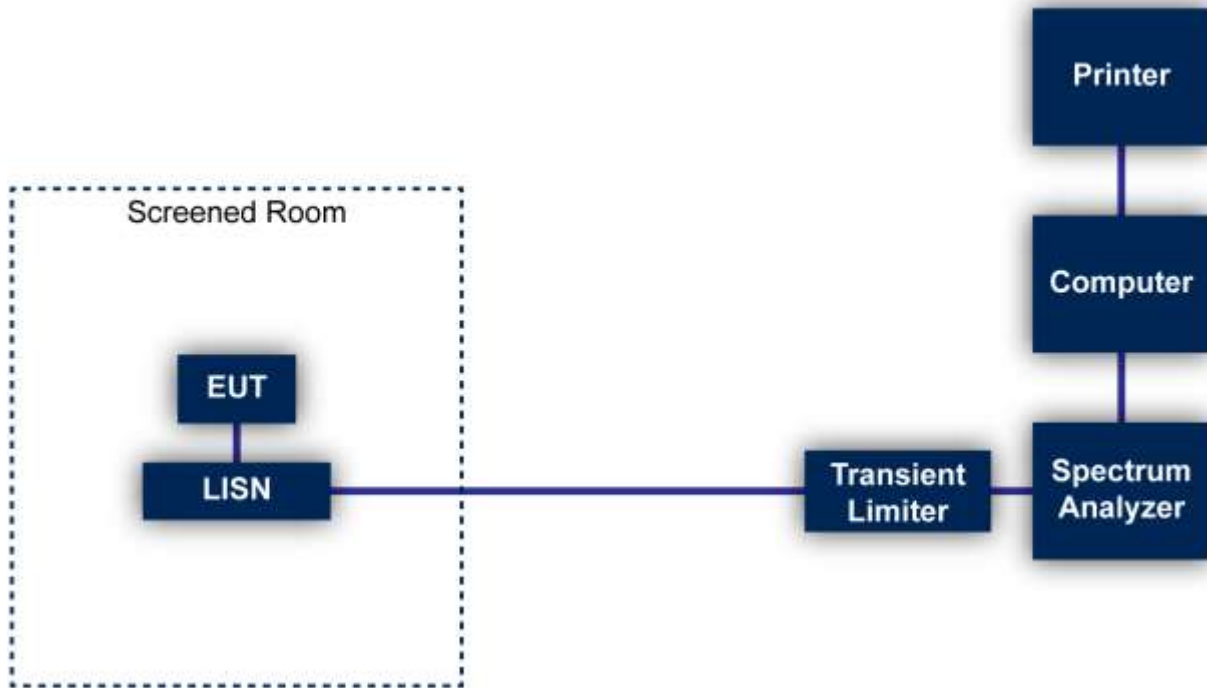


Figure 1: Mains Conducted Emissions Test

## 7.2 Direct Connection at the Antenna Port Test

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer	Rohde & Schwarz	FSU40	V044352	03/13/2020	03/13/2021
Signal Generator	Rohde & Schwarz	SMB100A	V044485	03/16/2020	03/16/2021
Vector Signal Generator	Rohde & Schwarz	SMBV100A	V044217	04/01/2019	04/01/2021
40GHz Switch Extension	Rohde & Schwarz	OSP-150	V044486	03/24/2020	03/24/2022
40GHz Switch Base Unite	Rohde & Schwarz	OSP-120	V044487	04/30/2020	04/30/2022

Table 35: List of equipment used for conducted emissions testing at antenna ports.

## 7.2.1 Test Configuration Block Diagram

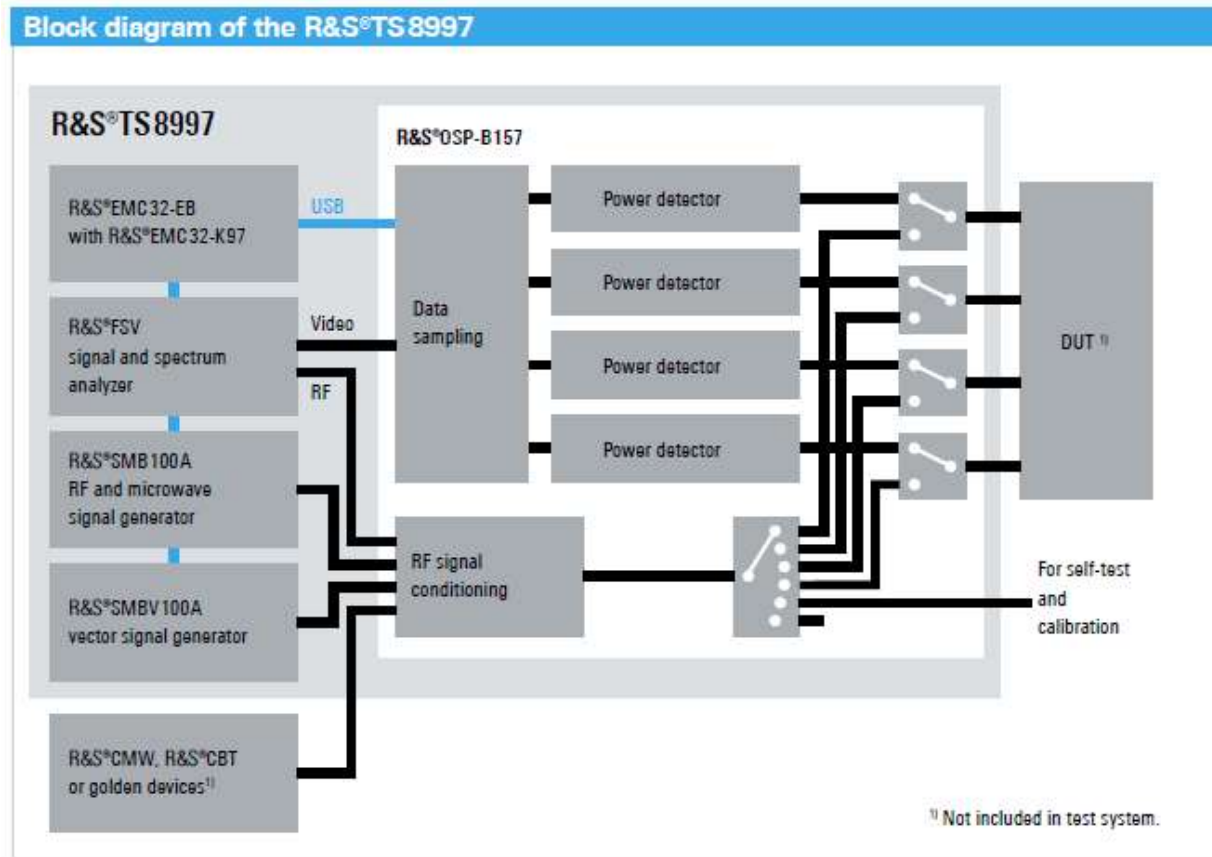


Figure 2: Direct Connection at the Antenna Port Test

## 7.3 Radiated Emissions

The radiated emissions from the EUT were measured using a spectrum analyzer with a quasi-peak adapter for peak and quasi-peak readings.

A preamplifier with a fixed gain of 51 dB was used to increase the sensitivity of the measuring instrumentation. The quasi-peak adapter uses a bandwidth of 120 kHz, with the spectrum analyzer's resolution bandwidth set at 1 MHz, for readings in the 30 to 1000 MHz frequency ranges. For frequencies below 30 MHz, a 9 kHz resolution Bandwidth was used.

A loop antenna was used to measure frequencies below 30 MHz. A biconilog antenna was used to measure the frequency range of 30 to 1000 MHz, at a distance of 3 meters from the EUT. The readings obtained by these antennas are correlated to the levels obtained with a tuned dipole antenna by adding antenna factors. A double-ridged guide antenna was used to measure the emissions at frequencies above 1000 MHz at a 3 meter or 1 meter distance from the EUT.

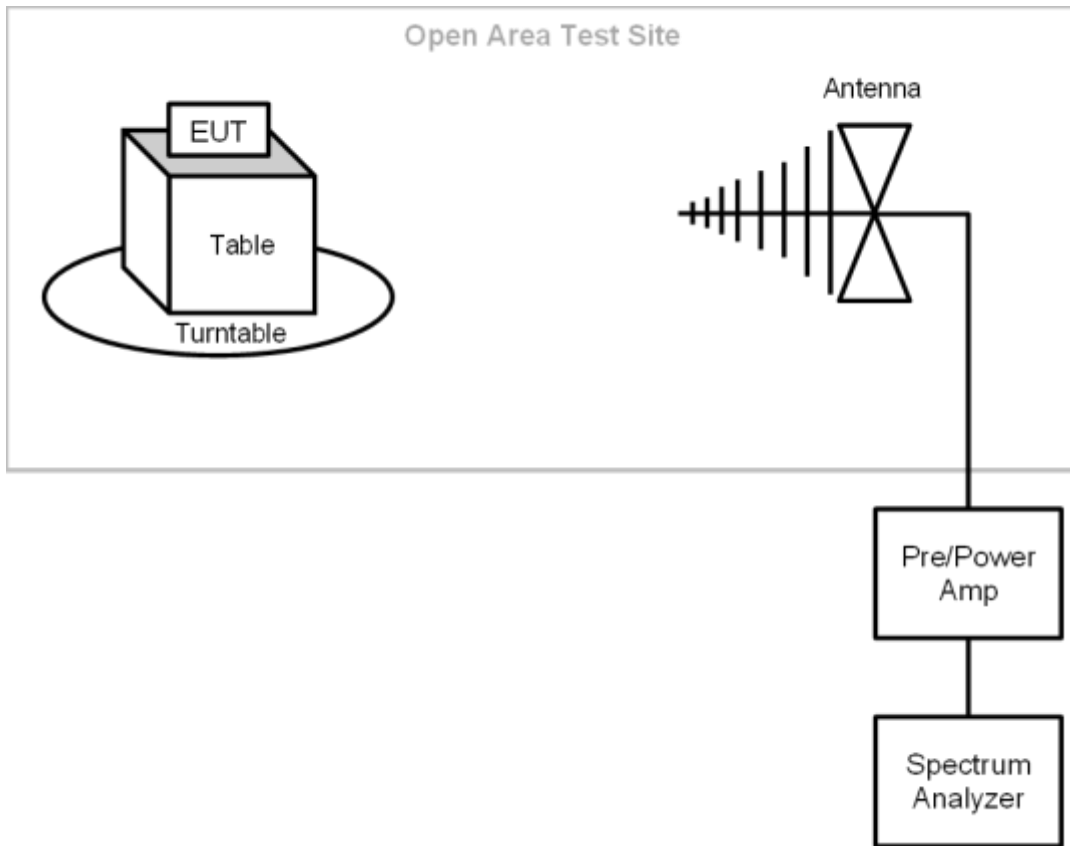
The configuration of the EUT was varied to find the maximum radiated emission. The EUT was connected to the peripherals listed in Section 2.3 via the interconnecting cables listed in Section 2.4. A technician manually manipulated these interconnecting cables to obtain worst-case radiated emissions. The EUT was rotated 360 degrees, and the antenna height was varied from 1 to 4 meters to find the maximum radiated emission. Where there were multiple interface ports all of the same type, cables are either placed on all of the ports or cables added to these ports until the emissions do not increase by more than 2 dB.

Desktop EUT are measured on a non-conducting table 0.8 meters above the ground plane. For frequencies above 1000 MHz, the EUT is placed on a table 1.5 meters above the ground plane. The table is placed on a turntable, which is level with the ground plane. For equipment normally placed on floors, the equipment shall be placed directly on the turntable.

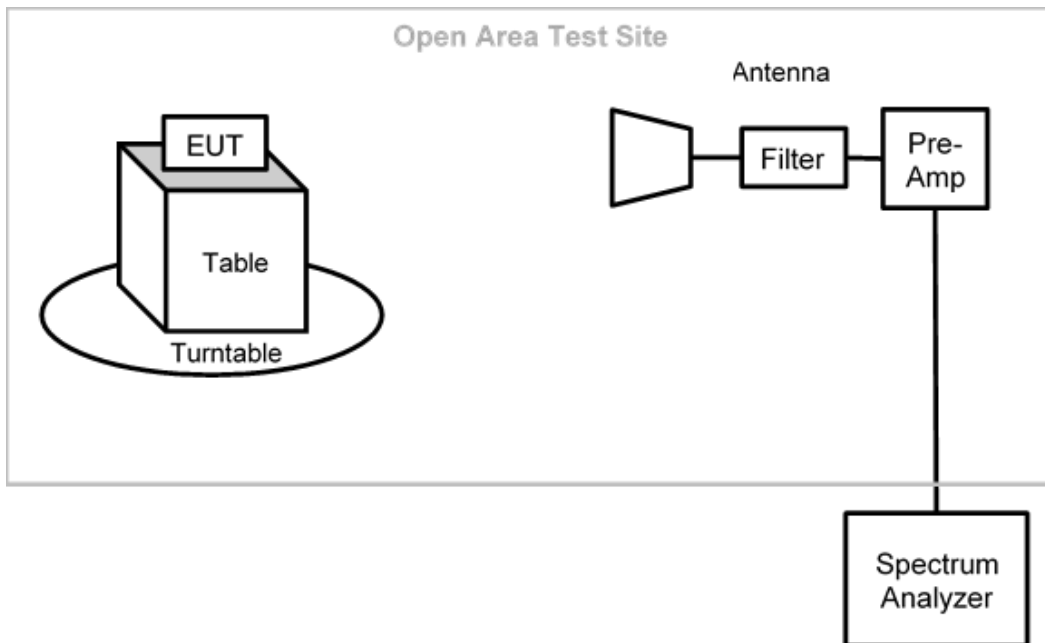
For radiated emissions testing that is performed at distances closer than the specified distance; an inverse proportionality factor of 20 dB per decade is used to normalize the measured data for determining compliance.

Type of Equipment	Manufacturer	Model Number	Asset Number	Date of Last Calibration	Due Date of Calibration
Spectrum Analyzer/Receiver	Rohde & Schwarz	ESU40	V033119	08/05/2020	08/05/2021
Spectrum Analyzer	Hewlett Packard	8566B	V034141	05/12/2020	05/12/2021
Quasi-Peak Detector	Hewlett Packard	85650A	V033345	05/11/2020	05/11/2022
Loop Antenna	EMCO	6502	V034216	02/11/2019	02/11/2021
Biconilog Antenna	EMCO	3142E-PA	V035736	06/24/2020	06/24/2022
Double Ridged Guide Antenna	EMCO	3115	V034194	03/09/2019	03/09/2021
Standard Gain Horn	ETS-Lindgren	3160-09	V034223	ICO	ICO
Standard Gain Horn	ETS-Lindgren	3160-10	V034224	ICO	ICO
High Frequency Amplifier	Miteq	AFS4-001018000-35-10P-4	V033997	01/09/2020	01/09/2021
High Frequency Amplifier	L3-Narda-Miteq	AMF-6F-18004000-37-8P	V042464	01/09/2020	01/09/2021
5.8 GHz High Pass Filter	Micro-Tronics	HPM50105	V034198	01/09/2020	01/09/2021
6' High Frequency Cable	Microcoax	UFB197C-0-0720-000000	V033638	01/09/2020	01/09/2021
20' High Frequency Cable	Microcoax	UFB197C-1-3120-000000	V033979	01/09/2020	01/09/2021
3 Meter Radiated Emissions Cable Wanship Upper Site	Microcoax	UFB205A-0-4700-000000	V033639	01/09/2020	01/09/2021
Test Software (FCC)	VPI Labs	Revision 01	V035673	N/A	N/A

**Table 36: List of equipment used for radiated emissions testing.**



**Figure 3: Radiated Emissions Below 1GHz Test**



**Figure 4: Radiated Emissions Above 1GHz Test**



## 7.4 Equipment Calibration

All applicable equipment is calibrated using either an independent calibration laboratory or VPI Laboratories, Inc. personnel at intervals defined in ANSI C63.4:2014 following outlined calibration procedures. All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Supporting documentation relative to tractability is on file and is available for examination upon request.

## 7.5 Measurement Uncertainty

Test	Uncertainty ( $\pm$ dB)	Confidence (%)
Conducted Emissions	2.8	95
Radiated Emission (9 kHz to 30 MHz)	3.3	95
Radiated Emissions (30 MHz to 1 GHz)	3.4	95
Radiated Emissions (1 GHz to 18 GHz)	5.0	95
Radiated Emissions (18 GHz to 40 GHz)	4.1	95

## 8 Photographs



**Photograph 1: Front View Radiated Emissions Configuration – Below 30 MHz – C4-T4IW10-XX Shown**



**Photograph 2: Back View Radiated Emissions Configuration – 30 to 1000 MHz – C4-T4IW10-XX Shown**



**Photograph 3: Front View Radiated Emissions Configuration – Above 1000 MHz – C4-T4IW10-XX Shown**



**Photograph 4: Back View Radiated Emissions Configuration – Above 1000 MHz – C4-T4IW10-XX Shown**



**Photograph 5: Radiated Emissions Configuration – Tabletop Unit Vertical Placement**



**Photograph 6: Back Radiated Emissions Configuration – Tabletop Unit Horizontal Placement**



**Photograph 7: Radiated Emissions Configuration – Tabletop Unit On Edge Placement**



**Photograph 8 – Front View Conducted Emissions Configuration – Tabletop Units**



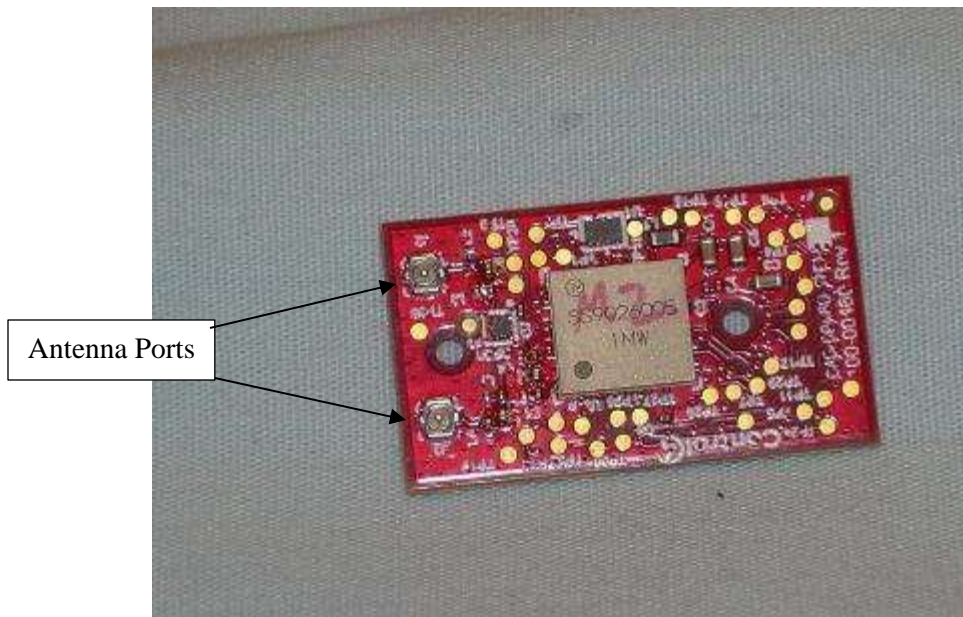
**Photograph 9 – Back View Conducted Emissions Configuration – Tabletop Units**



**Photograph 10 – Front View Conducted Emissions Configuration – In-Wall Units AC Powered**



**Photograph 11 – Back View Conducted Emissions Configuration – In-wall Units AC Powered**



**Photograph 12: Front View of the EUT**





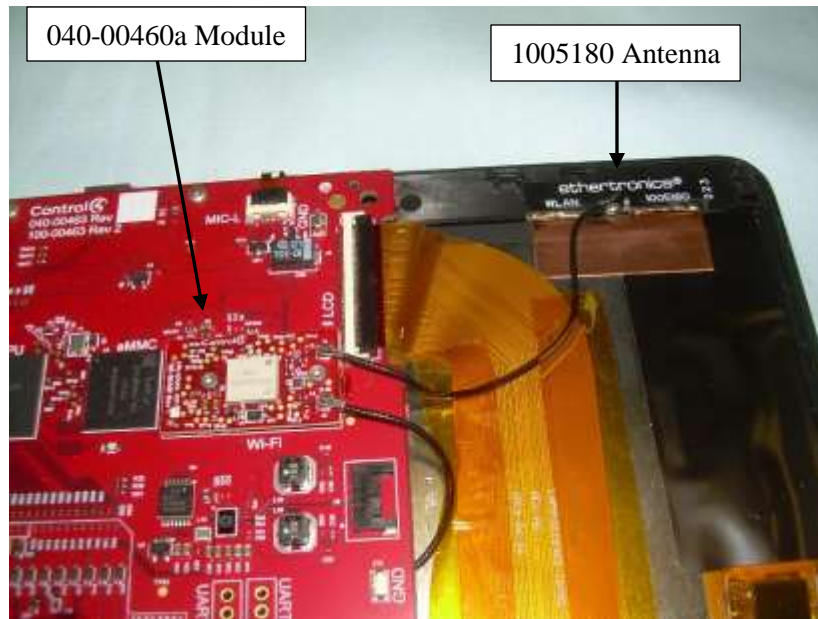
**Photograph 13: Back View of the EUT**

**Photograph 14: Back View of the EUT**

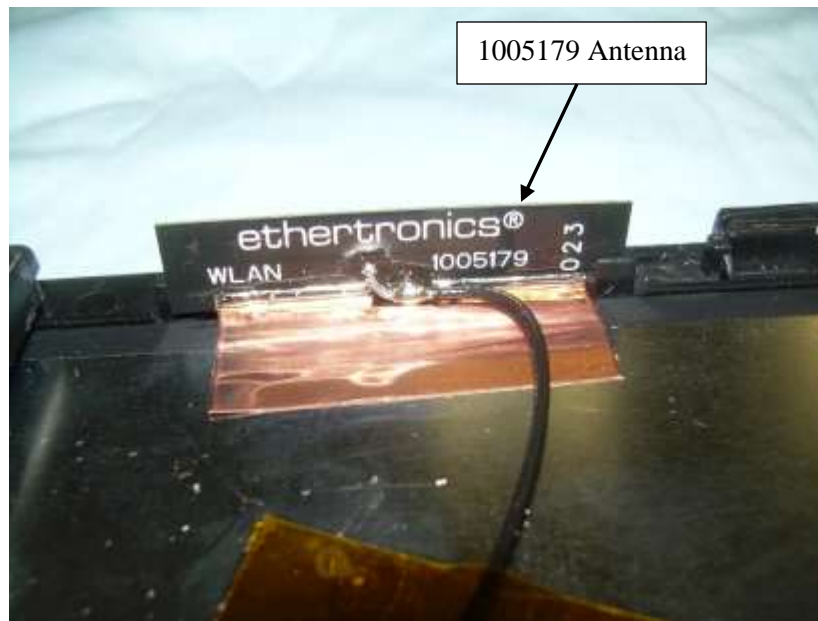


**Photograph 15: 040-00460a Installed in C4-T4T10-xxwith 1005180 and 1005179 Antennas Installed**





**Photograph 16: 040-00460a Installed in C4-T4T10-xxwith 1005180 Antennas Installed**



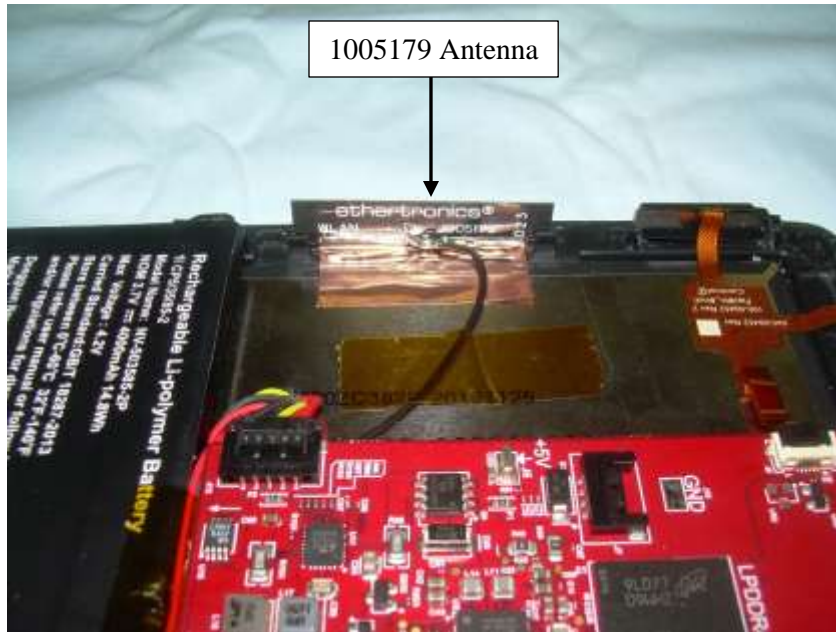
**Photograph 17: 040-00460a Installed in C4-T4T10-xxwith 1005179 Antennas Installed**



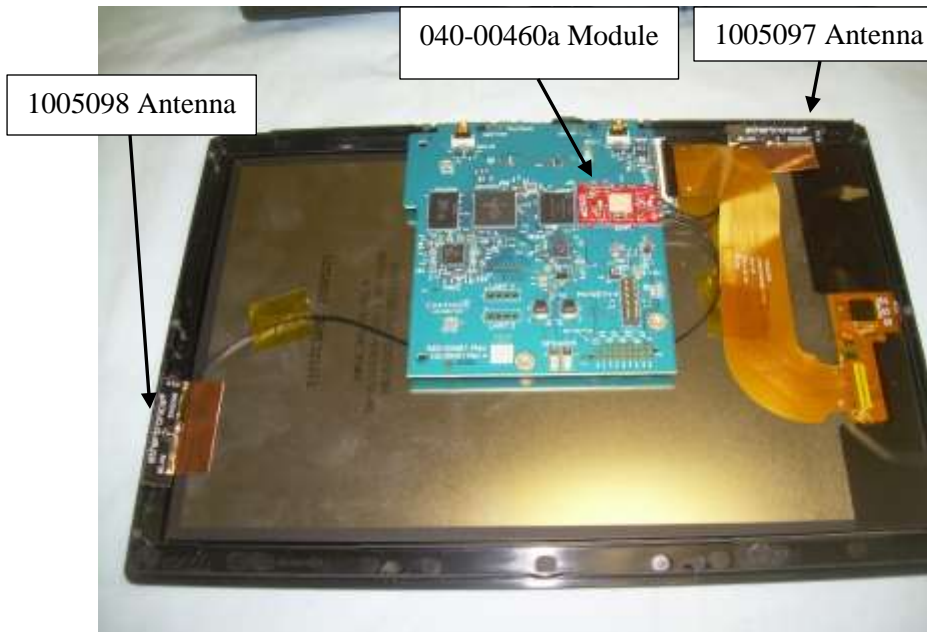
**Photograph 18: 040-00460a Installed in C4-T4T8-XX with 1005178 and 1005179 Antennas Installed**



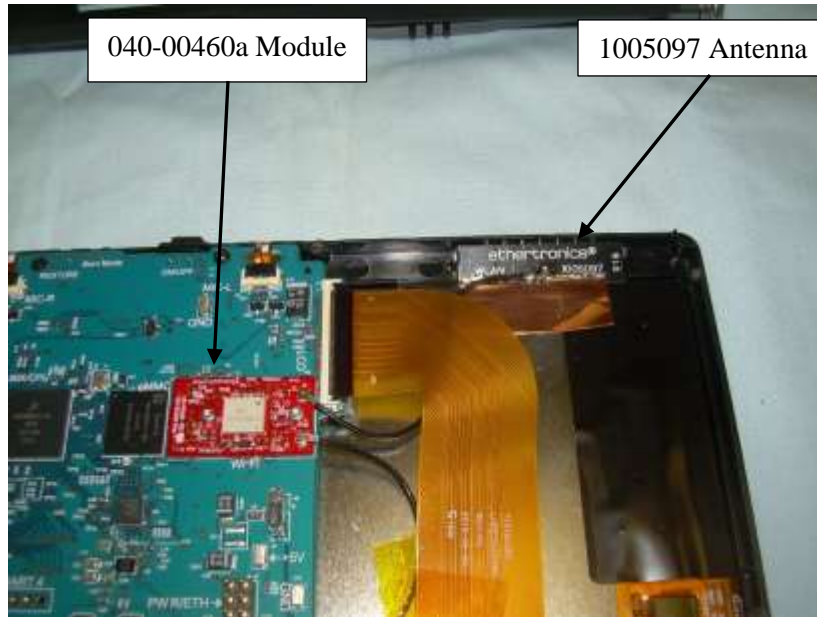
**Photograph 19: 040-00460a Installed in C4-T4T8-XX with 1005178 Antenna Installed**



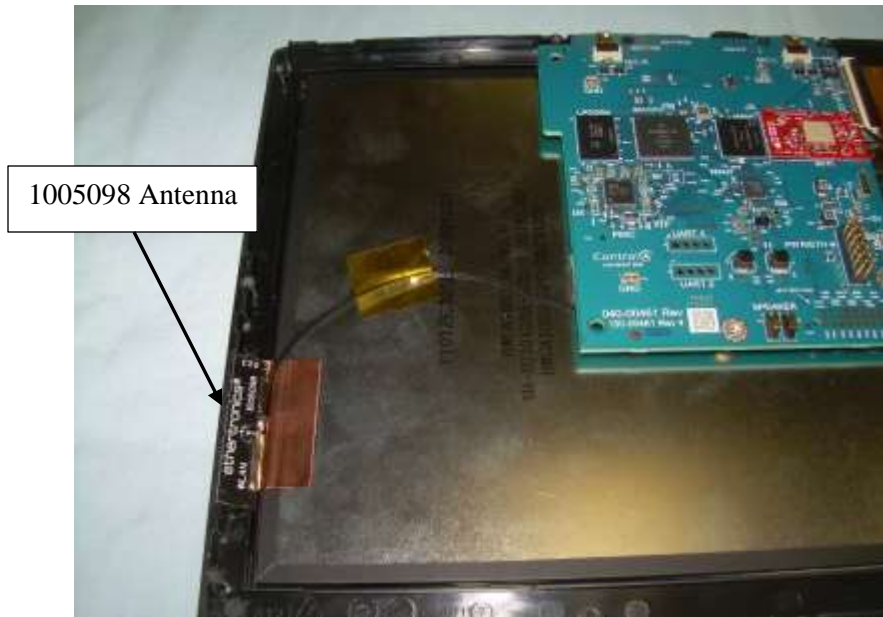
**Photograph 20: 040-00460a Installed in C4-T4T8-XX with 1005179 Antenna Installed**



**Photograph 21: 040-00460a Installed in C4-T4IW10-XX with 1005097 and 1005098 Antennas Installed**

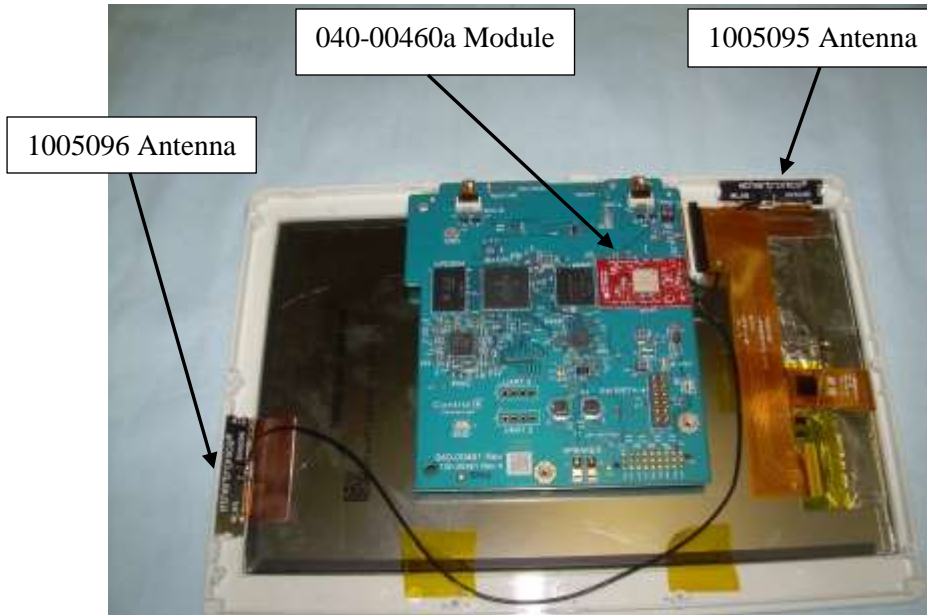


**Photograph 22: 040-00460a Installed in C4-T4IW10-XX with 1005097 Antenna Installed**

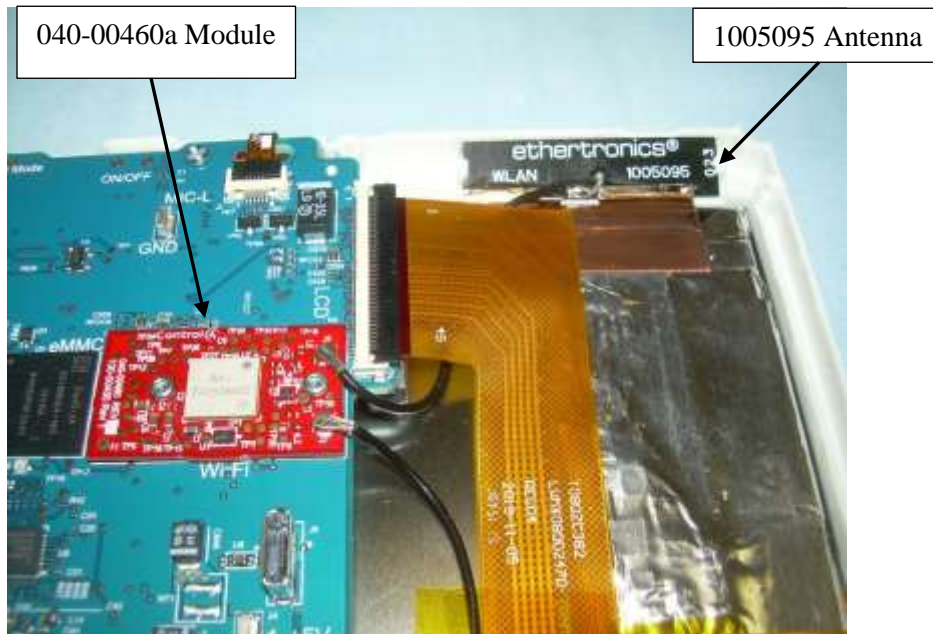


**Photograph 23: 040-00460a Installed in C4-T4IW10-XX with 1005098 Antenna Installed**

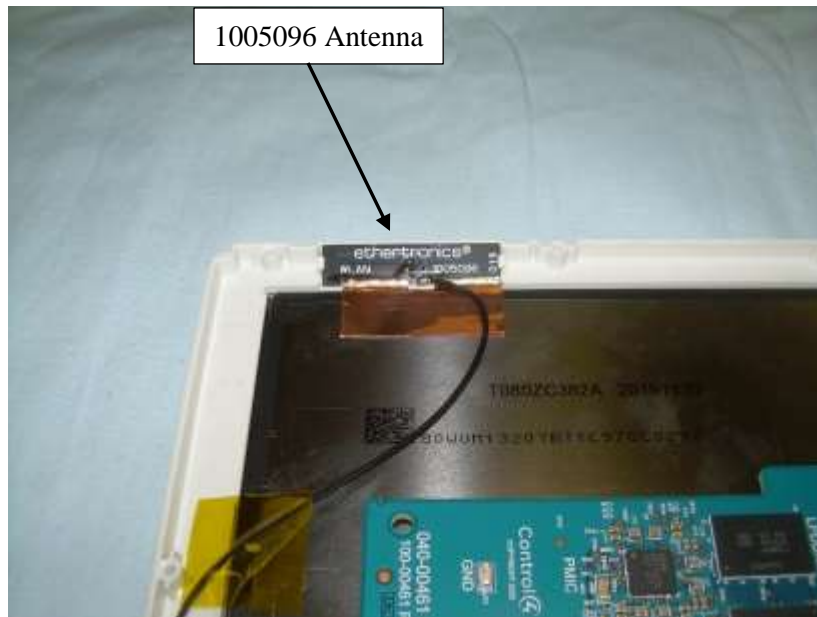




**Photograph 24: 040-00460a Installed in C4-T4IW-XX with 1005095 and 1005096 Antennas Installed**



**Photograph 25: 040-00460a Installed in C4-T4IW8-XX with 1005095 Antennas Installed**



**Photograph 26: 040-00460a Installed in C4-T4IW8-XX with 1005096 Antenna Installed**

**--- End of Report ---**