FCC & ISED CANADA CERTIFICATION TEST REPORT

for the

GPS TAG SERIES 200

FCC ID: 2BKI8-201A

WLL REPORT# 18852-01 REV 2

Prepared for:

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Testing Certificate AT-1448

FCC & ISED Canada Certification Test Report

for the

United Mesh Solutions

GPS Tag Series 200

FCC ID: 2BKI8-201A

September 25, 2024

WLL Report# 18852-01 Rev 2

Prepared by:

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RF Test Engineer

Reviewed by:

Steven D. Koster
President

Abstract

This report has been prepared on behalf of United Mesh Solutions to support the attached Application for Equipment Authorization. The test report and application are submitted for a Digital Transmission System (DTS) transmitter under Part 15.247 of the FCC Rules and Regulations (current at the time of testing). This certification test report documents the test configuration and test results for the United Mesh Solutions, GPS Tag Series 200. The information provided in this report is only applicable to device herein documented as the EUT.

Radiated testing was performed on the Open Area Test Site (OATS) of Washington Laboratories, Ltd., located at: 4840 Winchester Boulevard, Suite #5., Frederick, MD 21703. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Certificate AT-1448 as an independent FCC test laboratory.

The United Mesh Solutions, GPS Tag Series 200 complies with the requirements for a Digital Transmission System (DTS) transmitter device under FCC Part 15.247.

Revision History	Description of Change	Date
Rev 0	Initial Release	September 25, 2024
Rev 1	ACB Comments; dated: 3/13/2025	March 14, 2025
Rev 2	Confidential Details Removed	August 11, 2025

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1 Introduction

1.1 Compliance Statement

The United Mesh Solutions, GPS Tag Series 200 complies with the requirements for a Digital Transmission System (DTS) hybrid transmitter device under FCC Part 15.247.

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with ANSI C63.10-2020 "ANSI Procedures for Compliance Testing of Unlicensed Wireless Devices". The measurement equipment conforms to ANSI C63.2 "Specifications for Electromagnetic Noise and Field Strength Instrumentation".

1.3 Contract Information

Customer:	United Mesh Solutions c/o MPR Associates, Inc
Purchase Order Number:	1758-0006-PO-003
Quotation Number:	74791A

1.4 Test and Support Personnel

Washington Laboratories, LTD	Ryan Mascaro
Customer Representative	David Evans (UMS)

1.5 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Frederick, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by ANAB under Testing Certificate AT-1448 as an independent FCC test laboratory.

2 Equipment Under Test

2.1 EUT Identification

Table 1: Device Summary

Grantee:	United Mesh Solutions (UMS)
EUT Manufacturer:	MPR Associates, Inc.
FCC ID:	2BKI8-201A
EUT Model:	GPS Tag Series 200
Part Number:	1758-2404-003
FCC Rule Parts:	§ 15.247
Frequency Range:	2405 to 2480 MHz
Peak Output Power:	5.46 dBm (0.0035 Watts)
FCC Emission Designator:	834KG1D
6dB Occupied Bandwidth:	834.1 kHz
Keying and Type of Information:	Automatic, Digital
Number of Channels:	16
Interface Cables:	None
Power Source & Voltage:	DC Battery (voltage not disclosed)
Worst-Case TX Spurious Emission:	9.62 GHz, 63.2dBuV/m (-14.5dB under the limit)
Software/Firmware Version:	*Declared Confidential by Applicant*
Testing Dates:	8/26/2024 & 8/27/2024

2.2 EUT Description

The UMS GPS Tag and Repeater devices receive signals and collect sensor data. The EUT is powered by a battery; the battery is not rechargeable.

2.3 Test Configuration and Algorithm

The GPS Tag Series 200 was provided in a variety of engineering samples that were configured for testing. The EUT samples were loaded with test-mode software/firmware to allow individual samples to dwell, hop, sweep, and/or receive only as needed for required testing. The EUT was tested in a powered on, steady state. The 2.4GHz ISM radio was exercised as necessary to meet the requirements of the testing. For conducted methods of measurement, the radio was observed through the uFl antenna port. For radiated emissions below 1GHz, the EUT was set to transmit at the low channel mode. For radiated emissions above 1GHz, the EUT was set to transmit at the each of the low, center, and high Channels. Only the worst-case emissions are provided throughout this report. Additionally, for transmit power setting, or transmit gain setting, please note that the test-mode software was set to a value of "70". This setting was maintained for all testing.

2.4 Customer Supplied Data or EUT Information

The customer has provided the information on the EUT contents and configuration of the EUT system during testing.

The customer has provided the information on the transmitting antenna (type and gain).

The test laboratory is not responsible for verifying the accuracy of this information.

2.5 Equipment Configuration

The EUT is comprised of the following equipment. (All Modules, PCBs, etc. listed were considered as part of the EUT, as tested.)

Table 2: Equipment Configuration

Description	Manufacturer	Part Number	Serial Number	Revision
GPS Tag	MPR Associates, Inc.	1758-2404-003	--	0

Table 3: Support Equipment

Item	Manufacturer	Model Number
Laptop Computer	--	--
Simulator Network	--	--
OTA Module w/ ISM Antenna	--	--

Table 4: EUT Ports and Cabling

Ref. ID	Port	Description	Qty.	Length
N/A	N/A	N/A	N/A	N/A

3 Test Results

The table below shows the results of testing for compliance with a Digital Transmission System in accordance with FCC Part 15.247. Full test results are shown in subsequent sub-sections.

Table 5: Testing and Results Summary

FCC Rule Part	Description	Result
15.247(a)(2)	Occupied Channel Bandwidth	Pass
15.247 (b)(3)	Transmit Output Power	Pass
15.247 (e)	Power Spectral Density	Pass
15.247 (d)	Out-of-Band Emissions (Band Edge @ 20dB below)	Pass
15.205 15.209	General Field Strength Limits (Restricted Bands & RE Limits)	Pass
15.207	AC Conducted Emissions	N/A *

* EUT is only powered by non-rechargeable battery

3.1 Deviations to the Test Standard

There were no deviations to the requirements of the standard(s).

3.2 Occupied Bandwidth, Digital Transmission System

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(a)(2) and RSS-247, 5.2(a) require the minimum 6dB bandwidth be at least 500 kHz.

The transmitter occupied bandwidth was measured conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.2.1 Measurement Method

This test was performed in accordance with Clause 11.8.2, Option 2, of ANSI C63.10-2020.

3.2.2 Test Data

The EUT test data is provided below.

The EUT was configured to transmit a modulated signal, with channel hopping disabled.

Table 6: Occupied Bandwidth Results

Frequency	6dB Bandwidth	Result
Low Channel, 2405 MHz	835.3 kHz	Pass
Center Channel, 2440 MHz	835.7 kHz	Pass
High Channel, 2480 MHz	834.1 kHz	Pass

Figure 1: Occupied Bandwidth, Low Channel

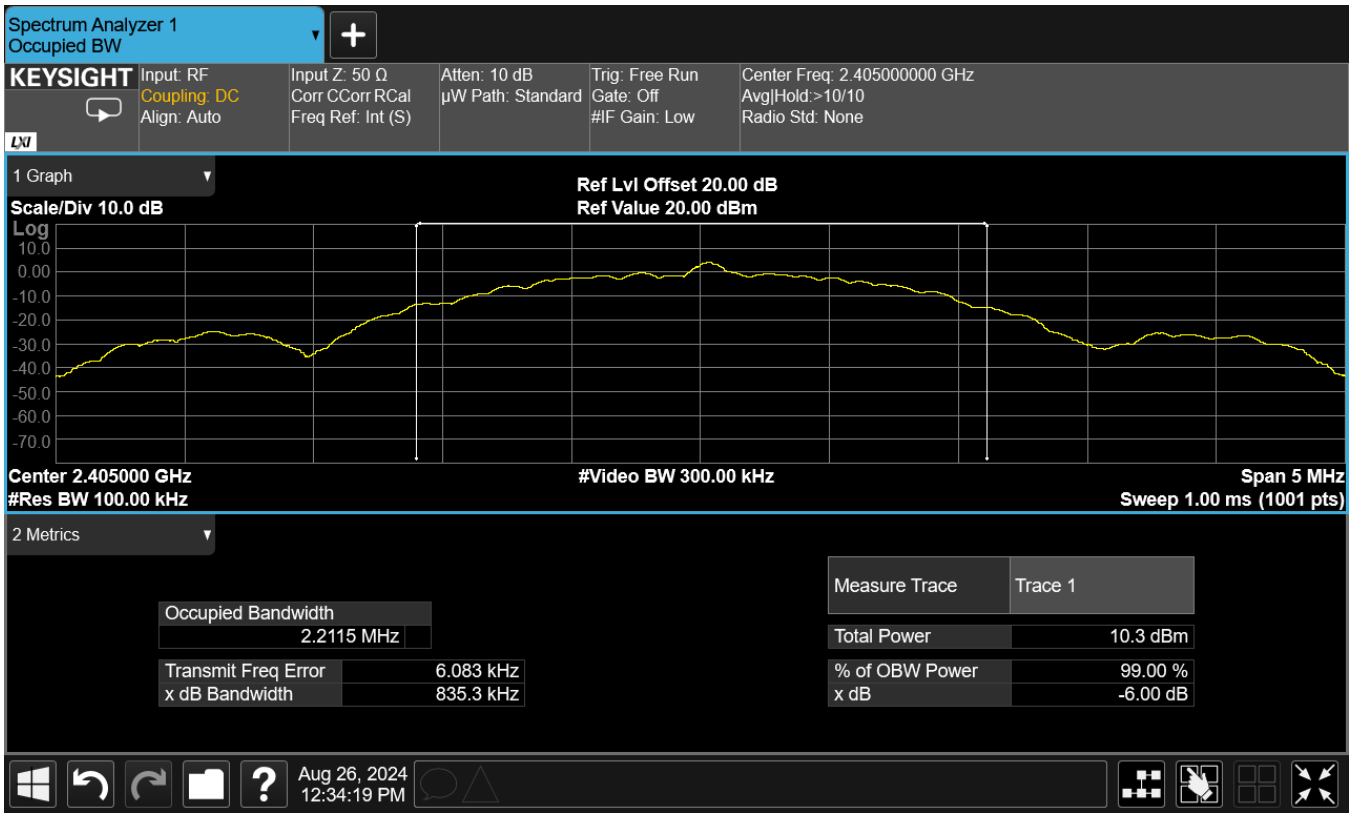


Figure 2: Occupied Bandwidth, Center Channel

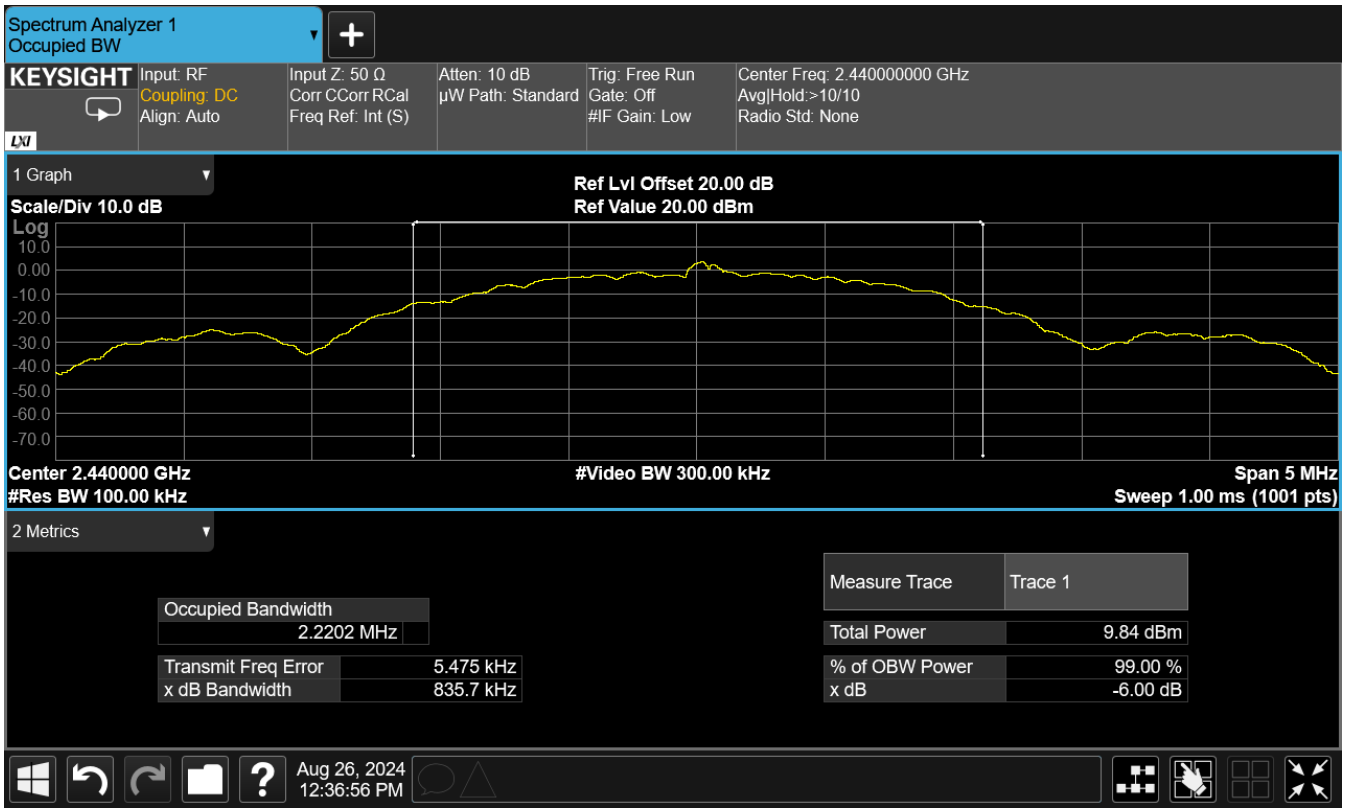
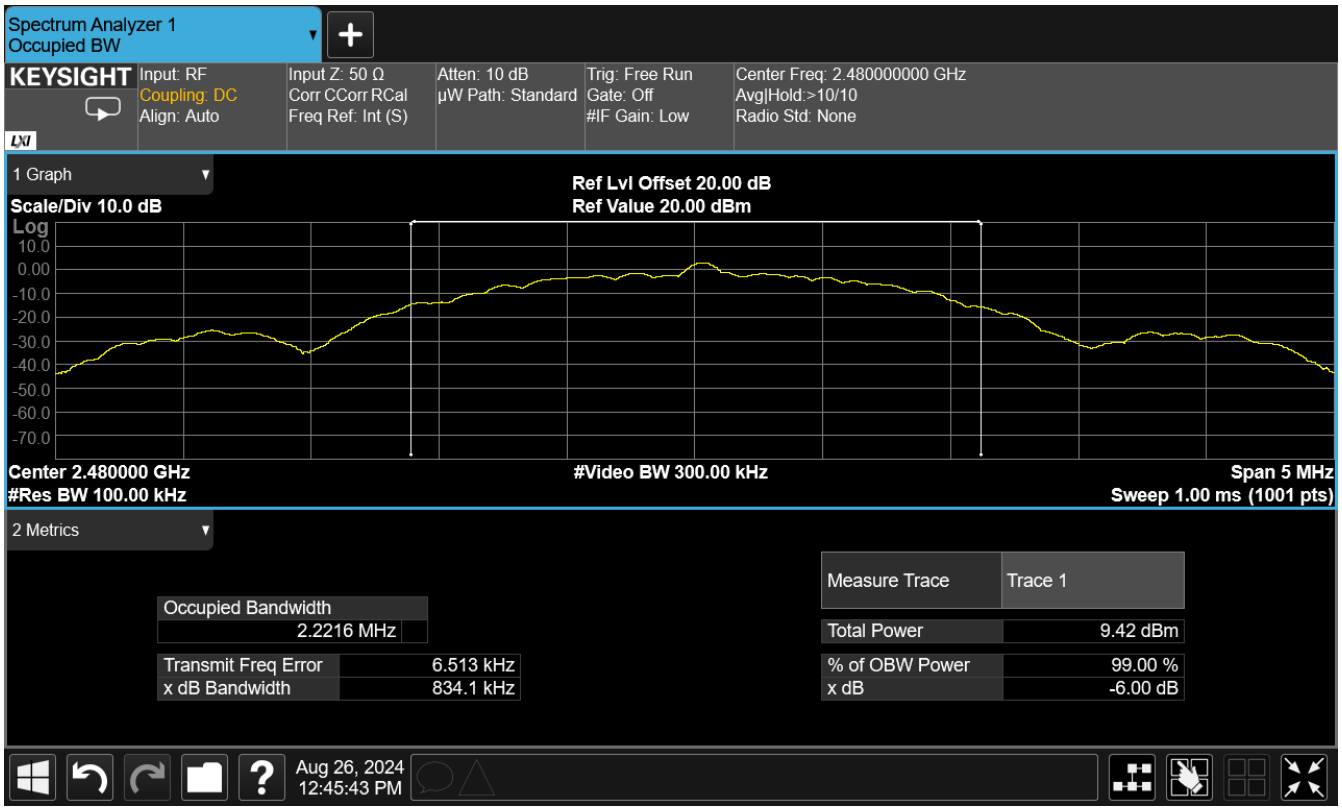


Figure 3: Occupied Bandwidth, High Channel



3.3 Conducted Peak Output Power

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(b)(3) requires that the maximum peak conducted output power shall not exceed 30 dBm, or 1W. Additionally, the EIRP shall not exceed 36 dBm, or 4W.

The transmitter power was measured conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.3.1 Measurement Method

This test was performed in accordance with Clause 11.9.1.1 of ANSI C63.10-2020.

3.3.2 Test Data

The EUT test data is provided below.

The EUT was configured to transmit a modulated signal, with channel hopping disabled.

The EUT employs a PCB-mounted chip antenna with a peak gain of + 2.3 dBi.

Table 7: Conducted Output Power Results

Frequency	Power (dBm)	EIRP (dBm)	Result
Low Channel, 2405 MHz	5.46	7.76	Pass
Center Channel, 2440 MHz	4.97	7.27	Pass
High Channel, 2480 MHz	4.33	6.63	Pass

Figure 4: Peak Output Power, Low Channel

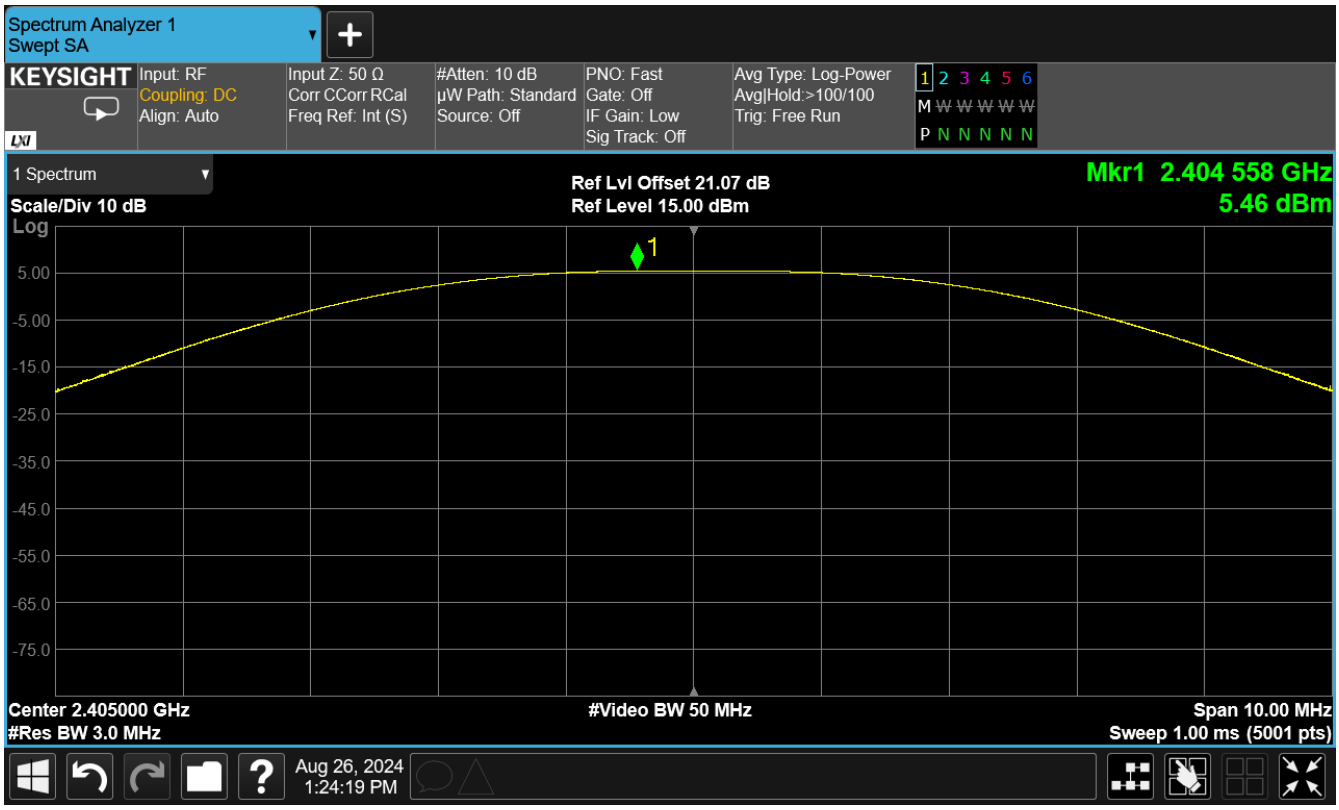


Figure 5: Peak Output Power, Center Channel

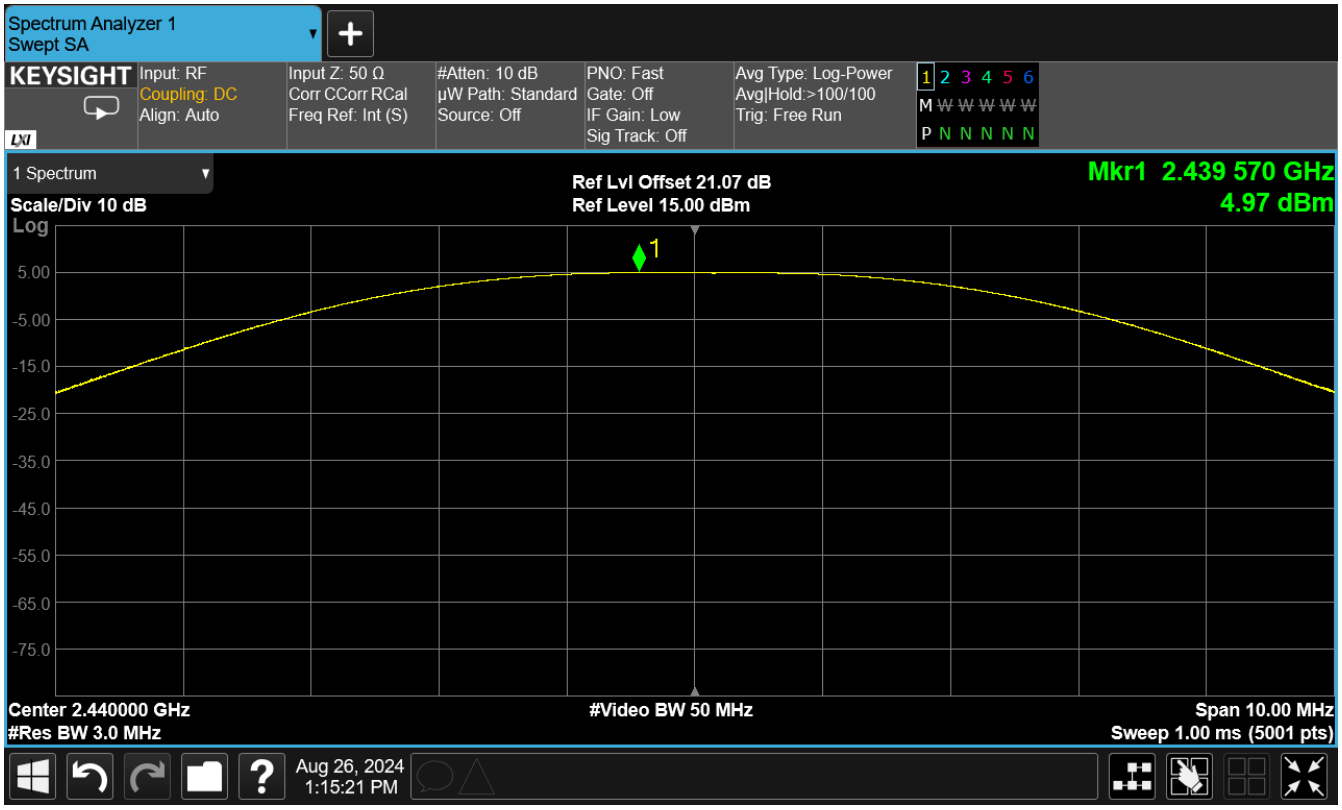
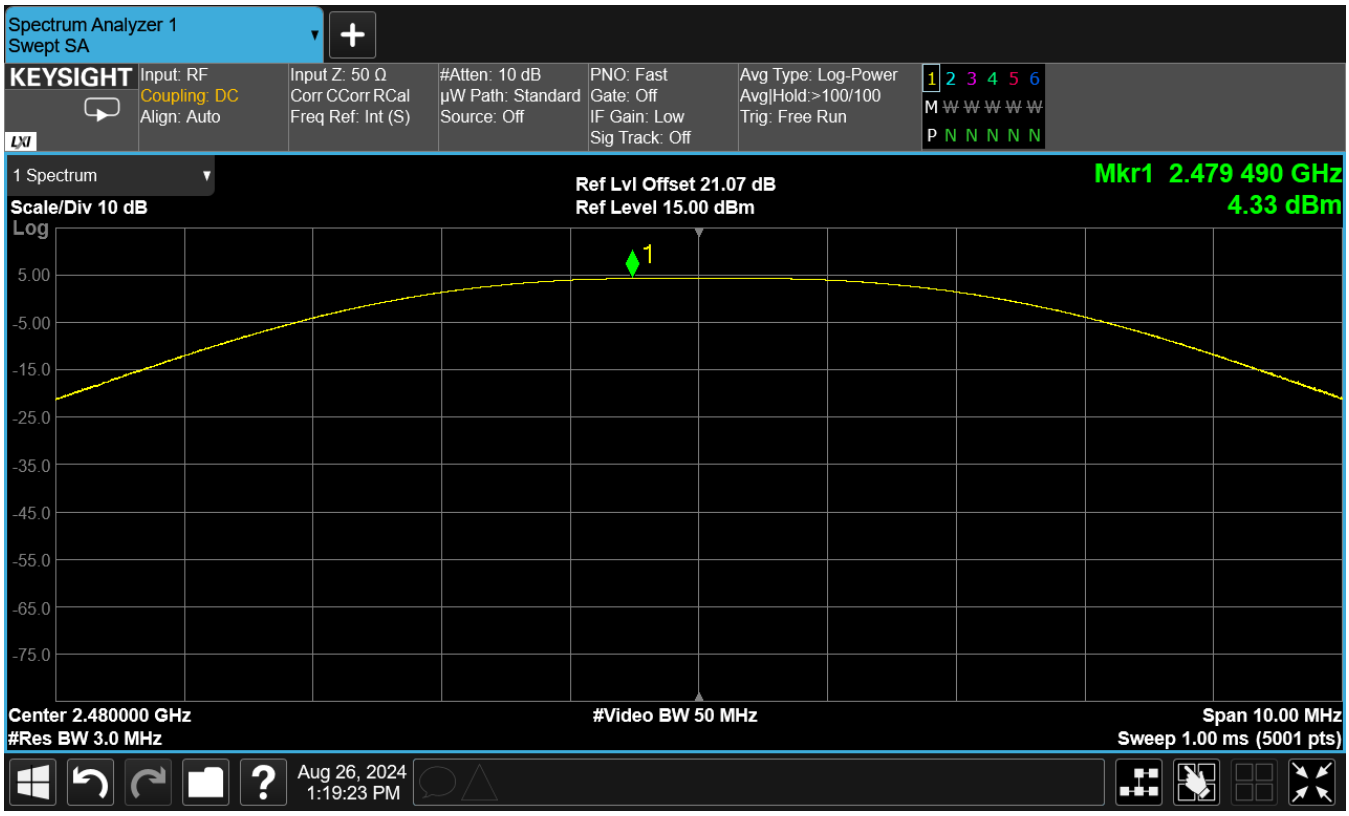


Figure 6: Peak Output Power, High Channel



3.4 Power Spectral Density

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(e) requires that the maximum peak power spectral density shall not exceed 8 dBm in any 3 kHz band.

The transmitter peak power spectral density was measured conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.4.1 Measurement Method

This test was performed in accordance with Clause 11.10.2 of ANSI C63.10-2020.

3.4.2 Test Data

The EUT test data is provided below.

The EUT was configured to transmit a modulated signal, with channel hopping disabled.

Table 8: Power Spectral Density

Frequency	Power (dBm)	Limit (dBm)	Result
Low Channel, 2405 MHz	-0.65	8.0	Pass
Center Channel, 2440 MHz	-0.99	8.0	Pass
High Channel, 2480 MHz	-1.66	8.0	Pass

Figure 7: Power Spectral Density, Low Channel

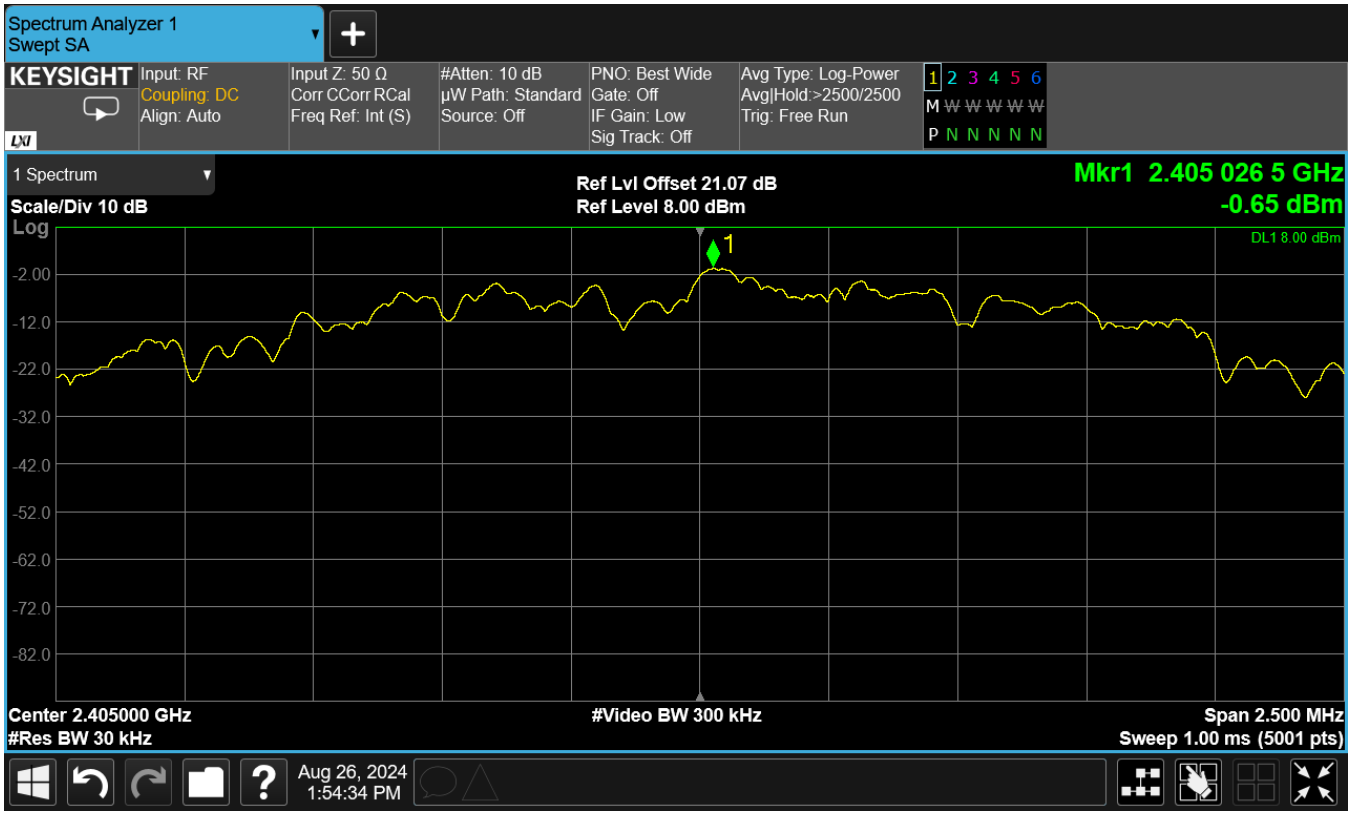


Figure 8: Power Spectral Density, Center Channel

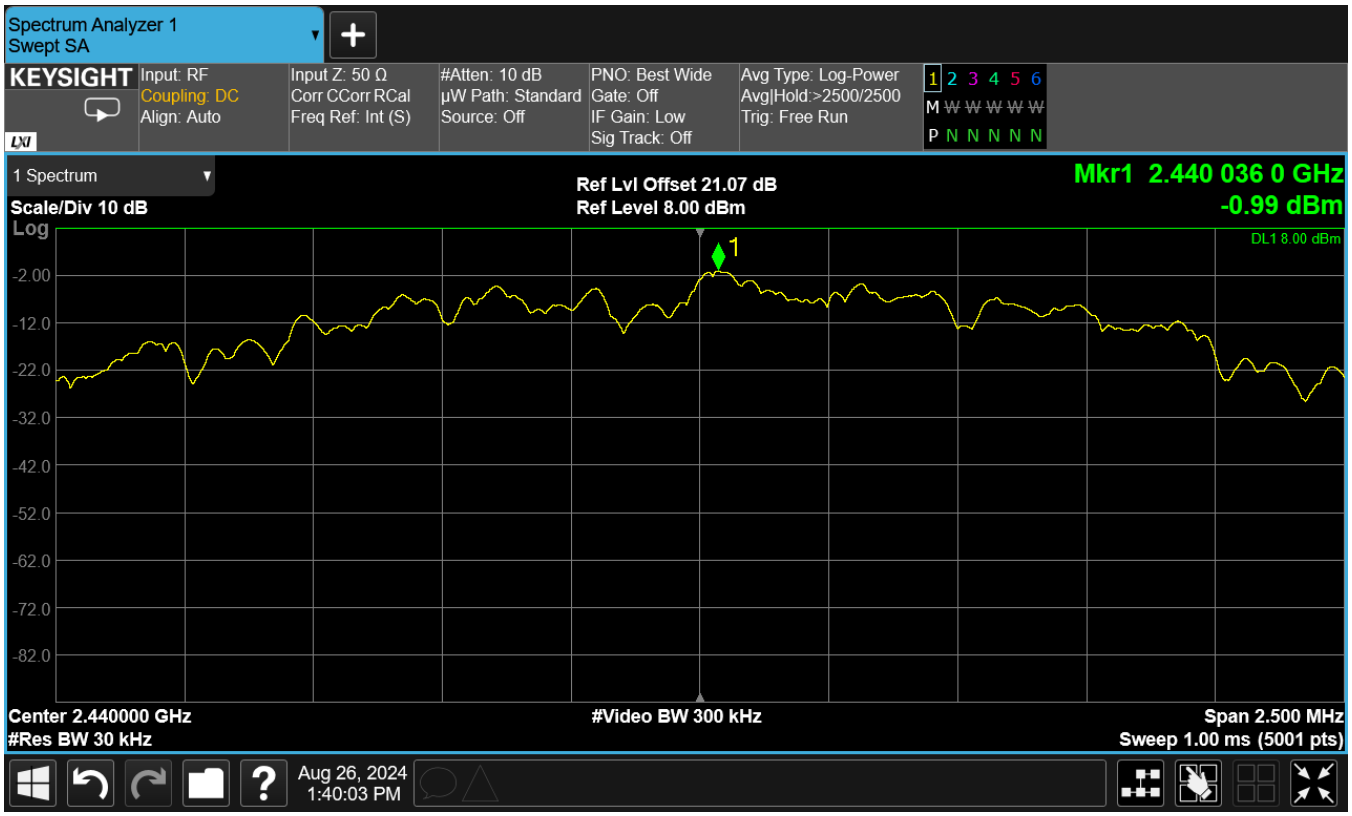
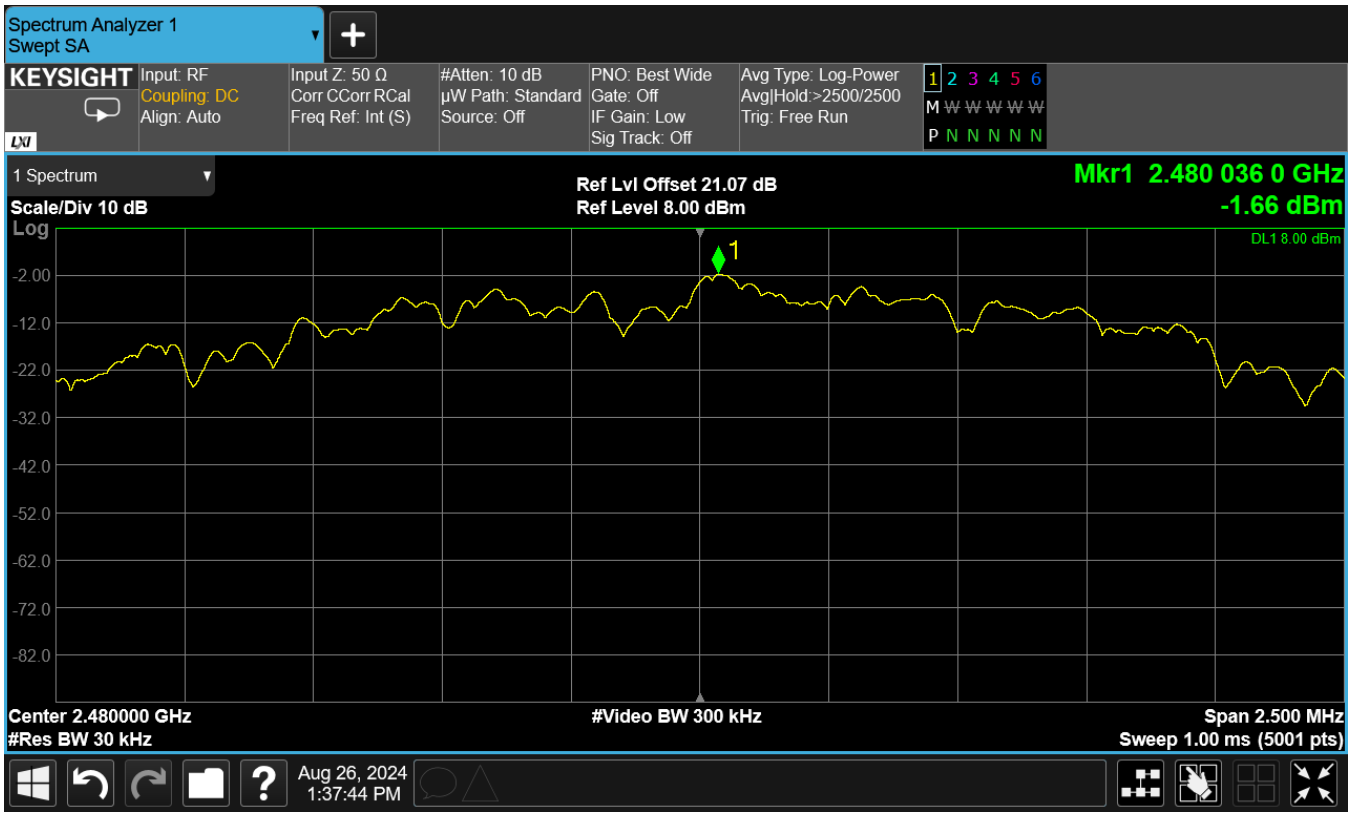


Figure 9: Power Spectral Density, High Channel



3.5 Conducted Band-edge Testing

This section provides close-up band-edge plots of the low and high channel, with respect to the nearest authorized band-edge.

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(d) requires that in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the unwanted radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

Band-edge measurements were made conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.5.1 Measurement Method

This test was performed in accordance with Clause 6.10 through Clause 6.10.4 of ANSI C63.10-2020.

3.5.2 Test Data

The EUT test data is provided below.

The EUT was configured to transmit a modulated signal. The EUT was evaluated in two modes, channel hopping enabled and channel hopping disabled. The hopping/sweeping function had no impact on the results of this test.

Figure 10: Low Channel Band-Edge

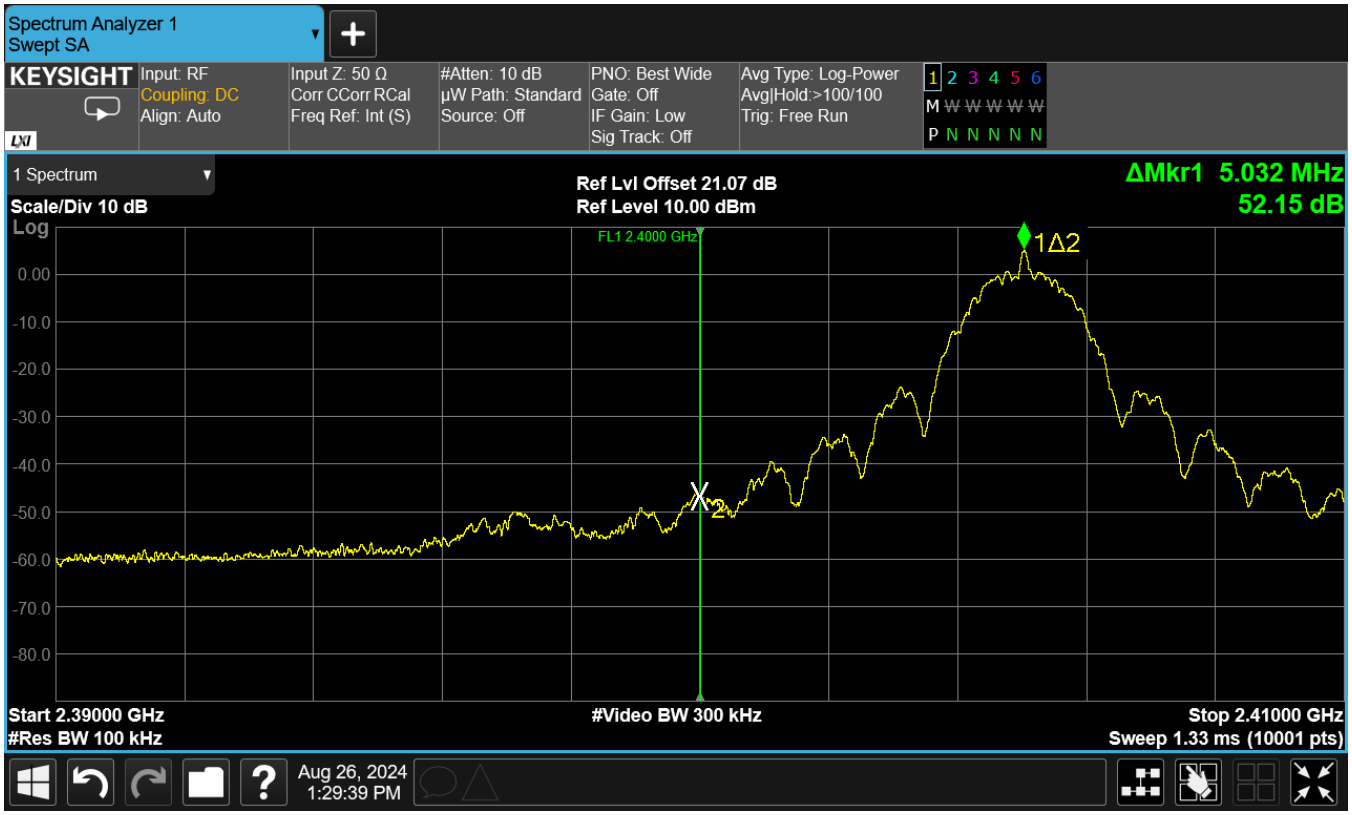
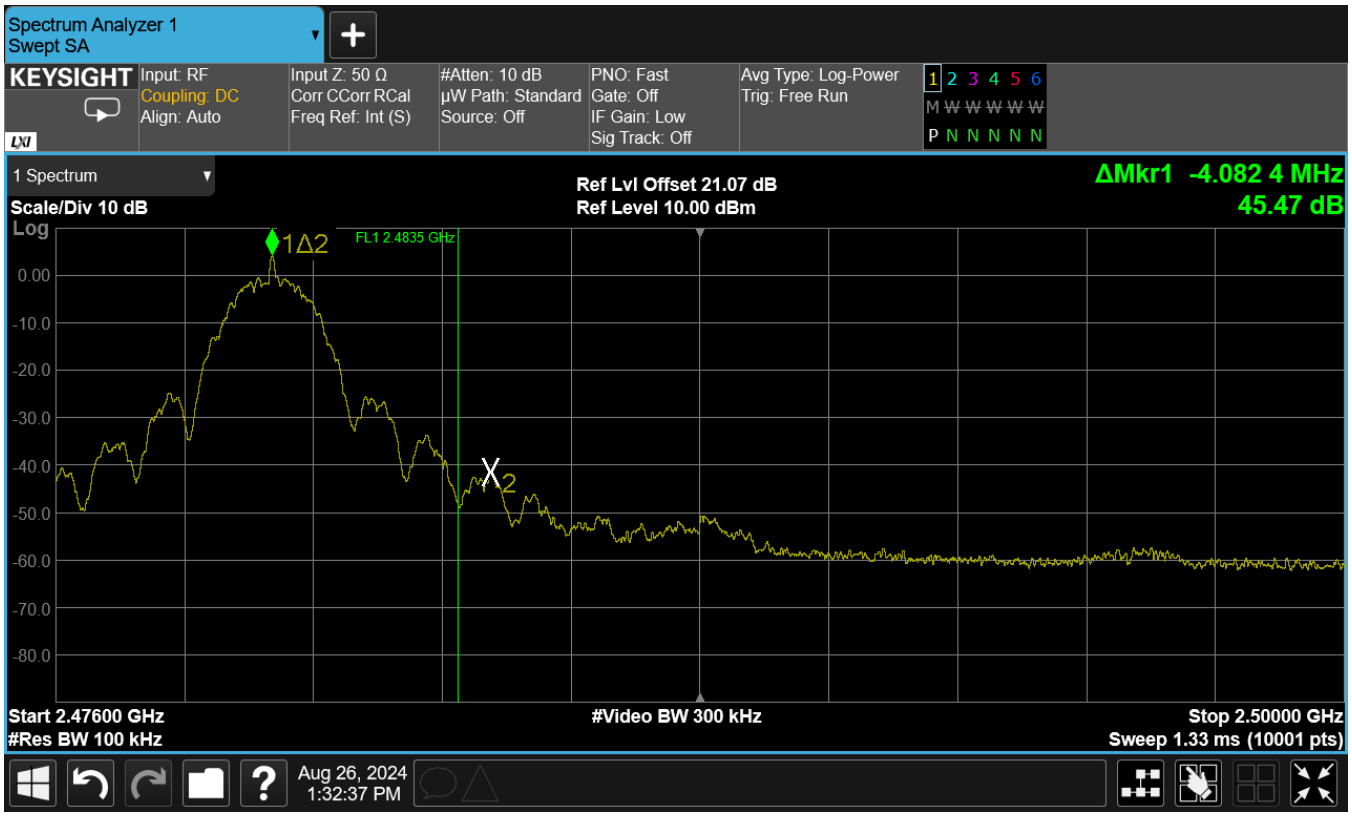


Figure 11: High Channel Band-Edge



3.6 Conducted Unwanted Spurious Emissions

For a DTS operating in the 2.4GHz band, FCC Rule Part 15.247(d) requires that in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the unwanted radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

The transmitter unwanted spurious emissions were evaluated and measured conducted at the antenna port, by coupling the output of the EUT transmitter to the input of a spectrum analyzer. The measurement level was corrected for any cable and attenuator losses.

3.6.1 Measurement Method

This test was performed in accordance with Clause 11.11 of ANSI C63.10-2020.

3.6.2 Test Data

The EUT test data for the low, center, and high channels are provided below.

The EUT was configured to transmit a modulated signal, at the low, center, and high channels.

Figure 12: Low Channel Conducted Spurious Plot 1

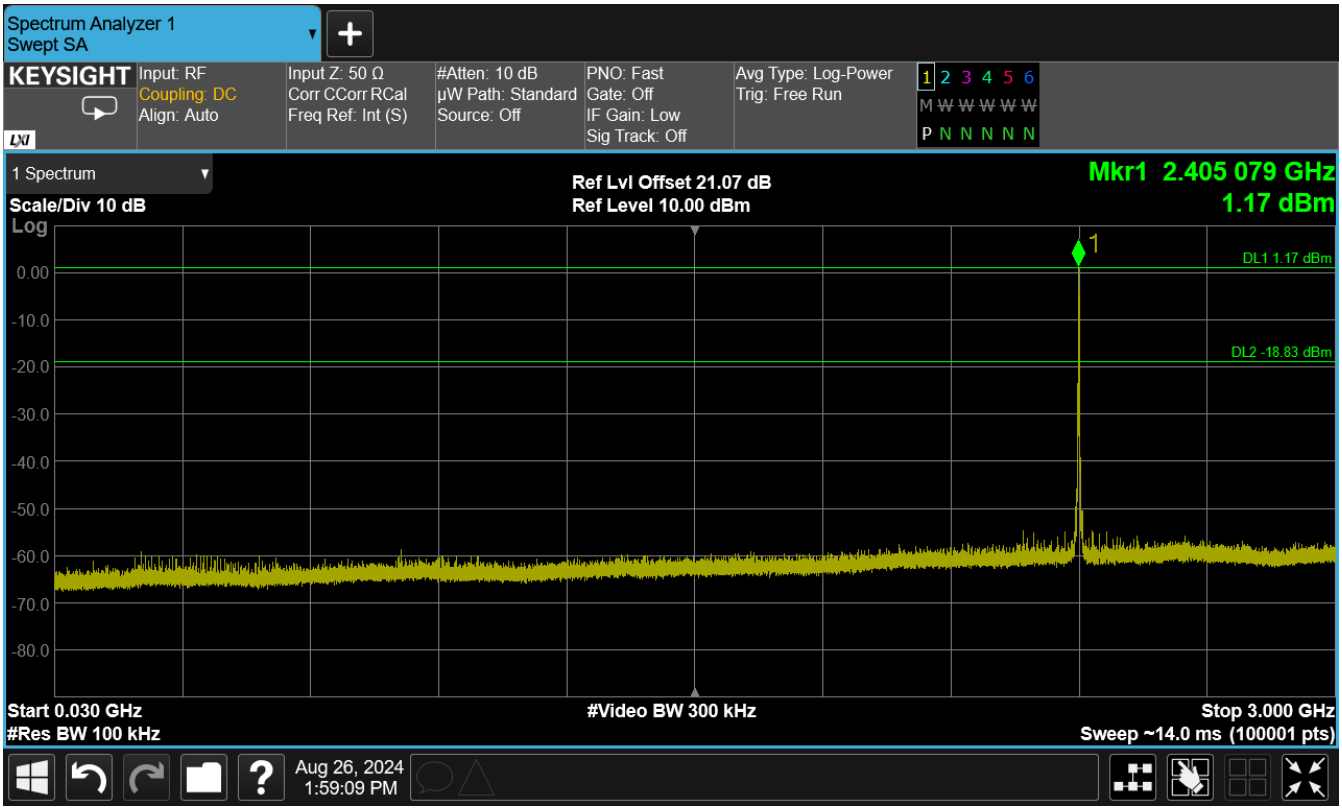


Figure 13: Low Channel Conducted Spurious Plot 2

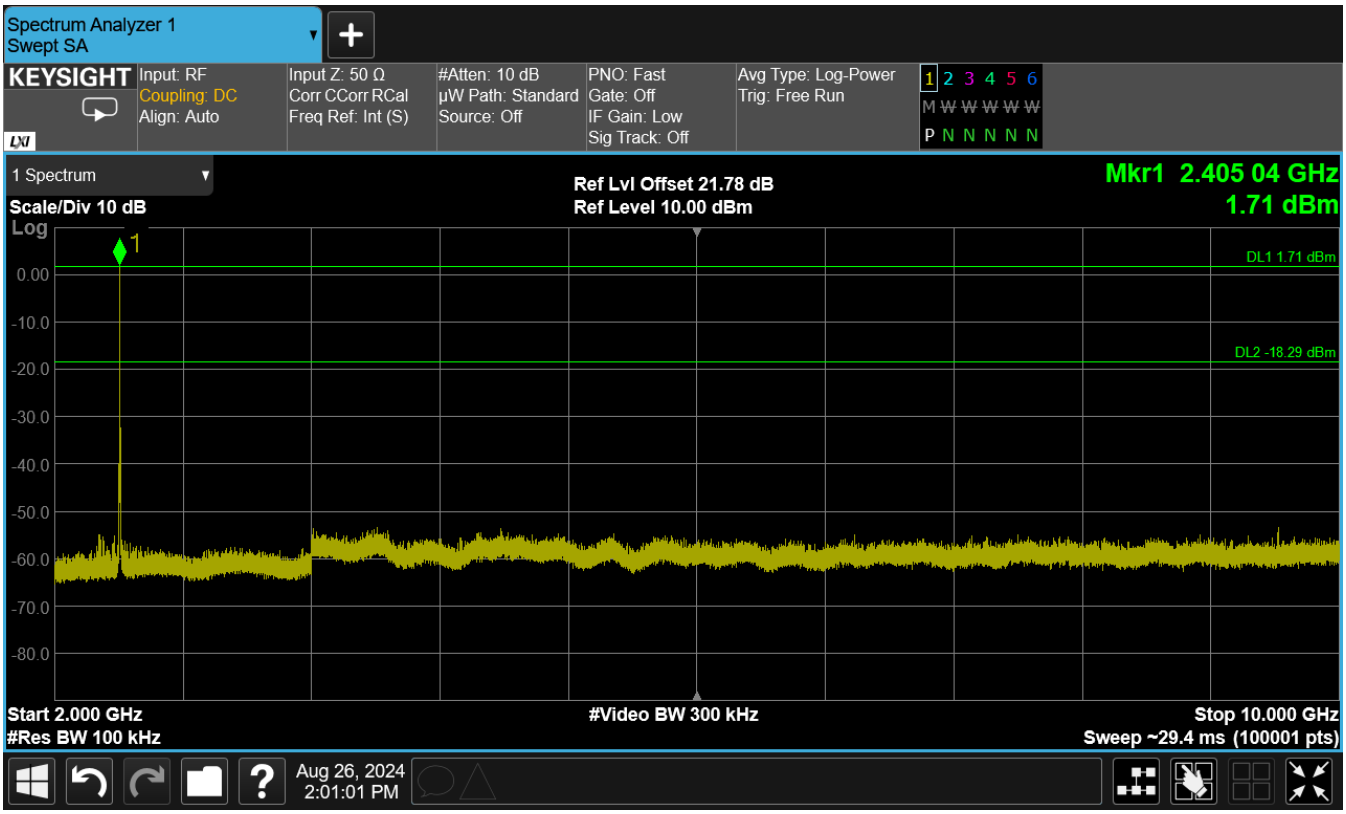


Figure 14: Low Channel Conducted Spurious Plot 3

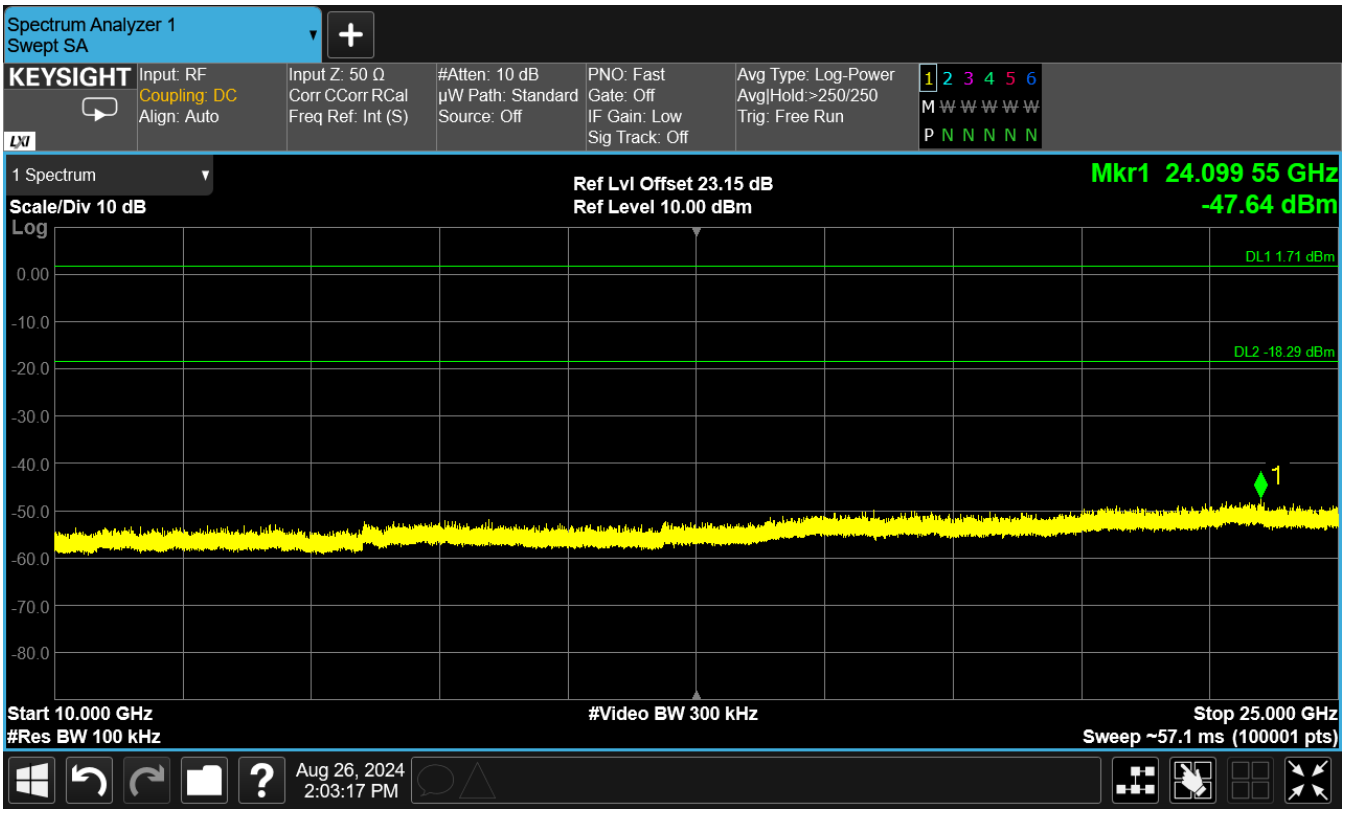


Figure 15: Center Channel Conducted Spurious Plot 1

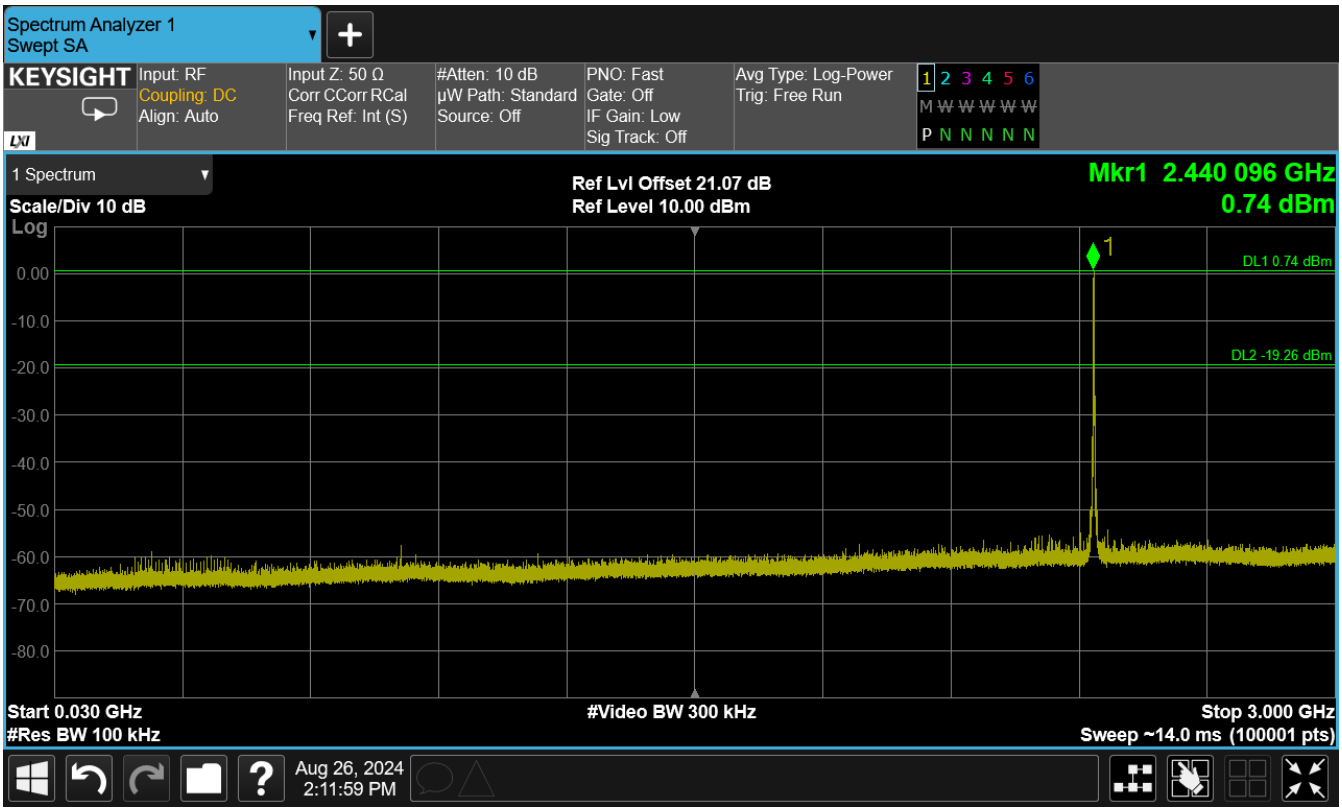


Figure 16: Center Channel Conducted Spurious Plot 2

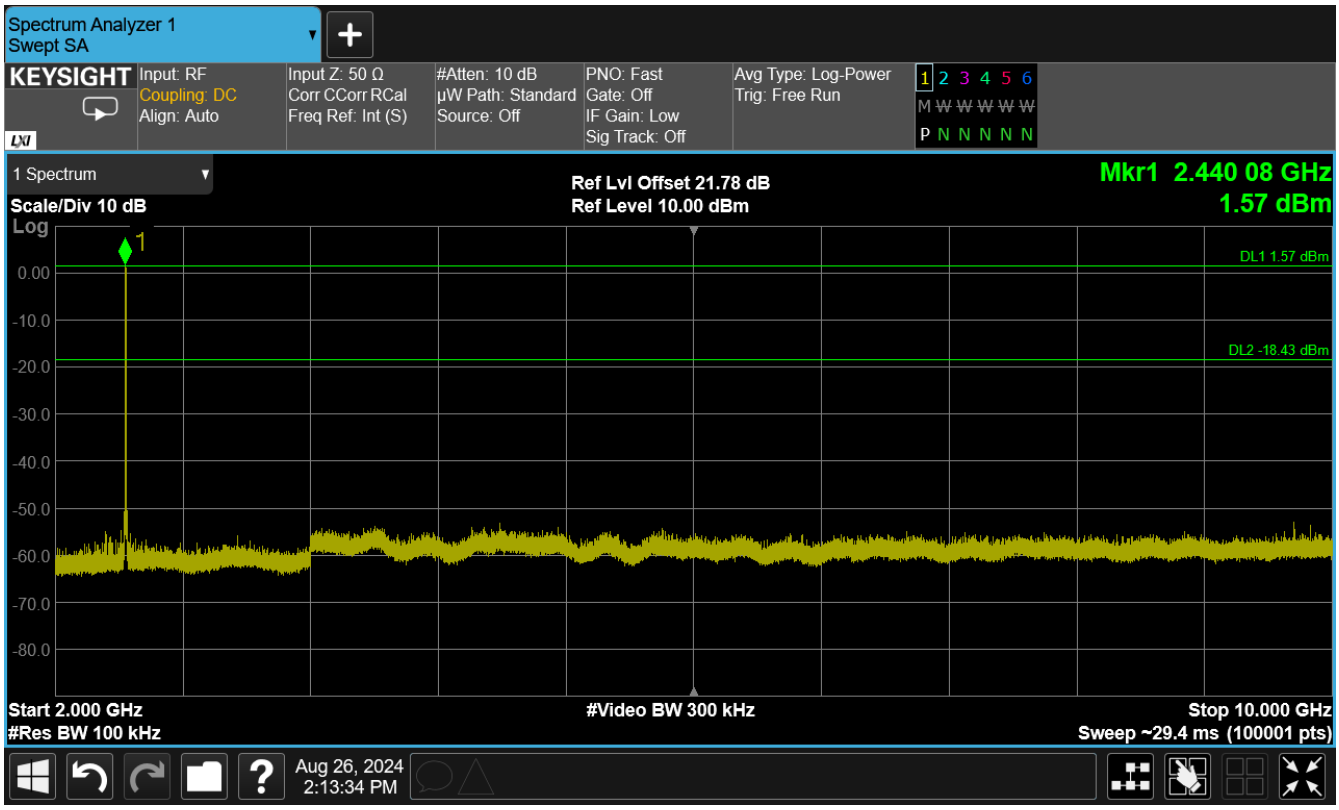


Figure 17: Center Channel Conducted Spurious Plot 3

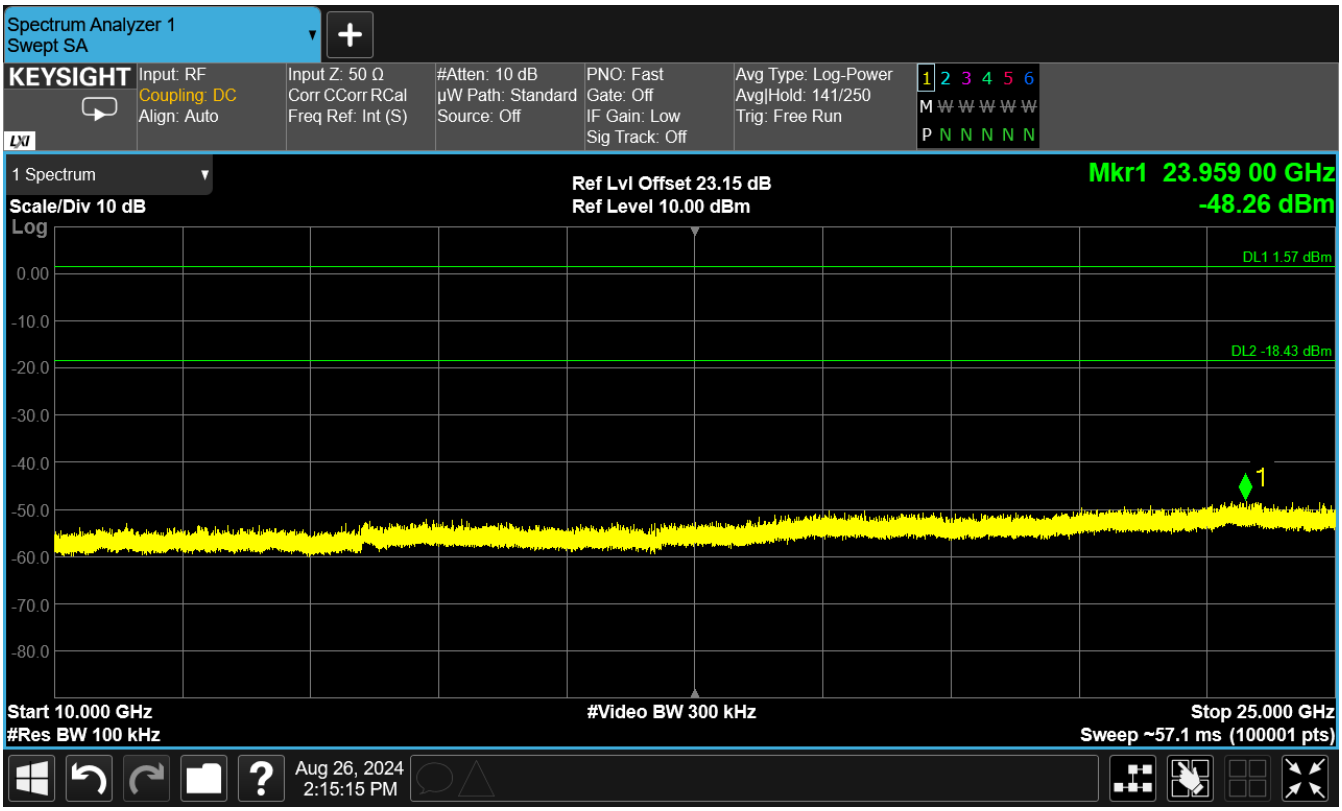


Figure 18: High Channel Conducted Spurious Plot 1

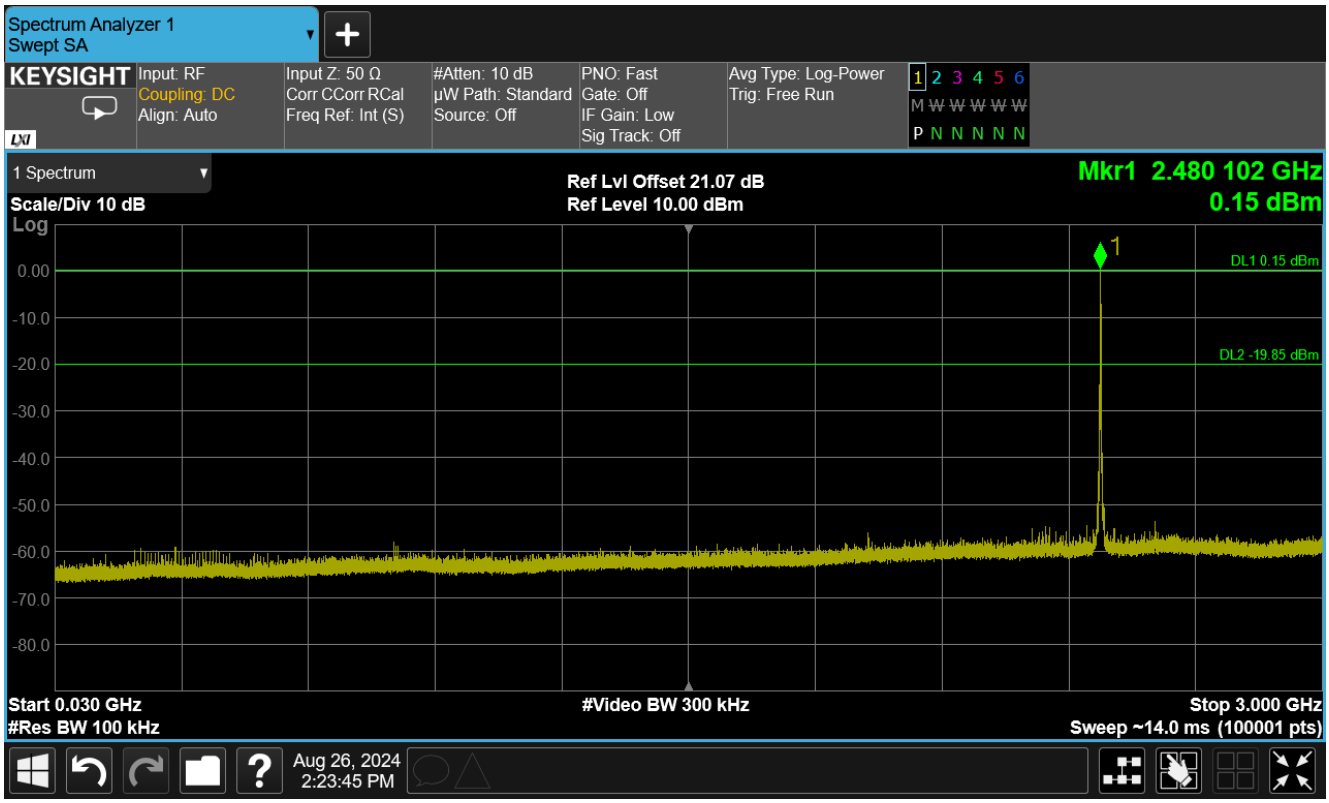


Figure 19: High Channel Conducted Spurious Plot 2

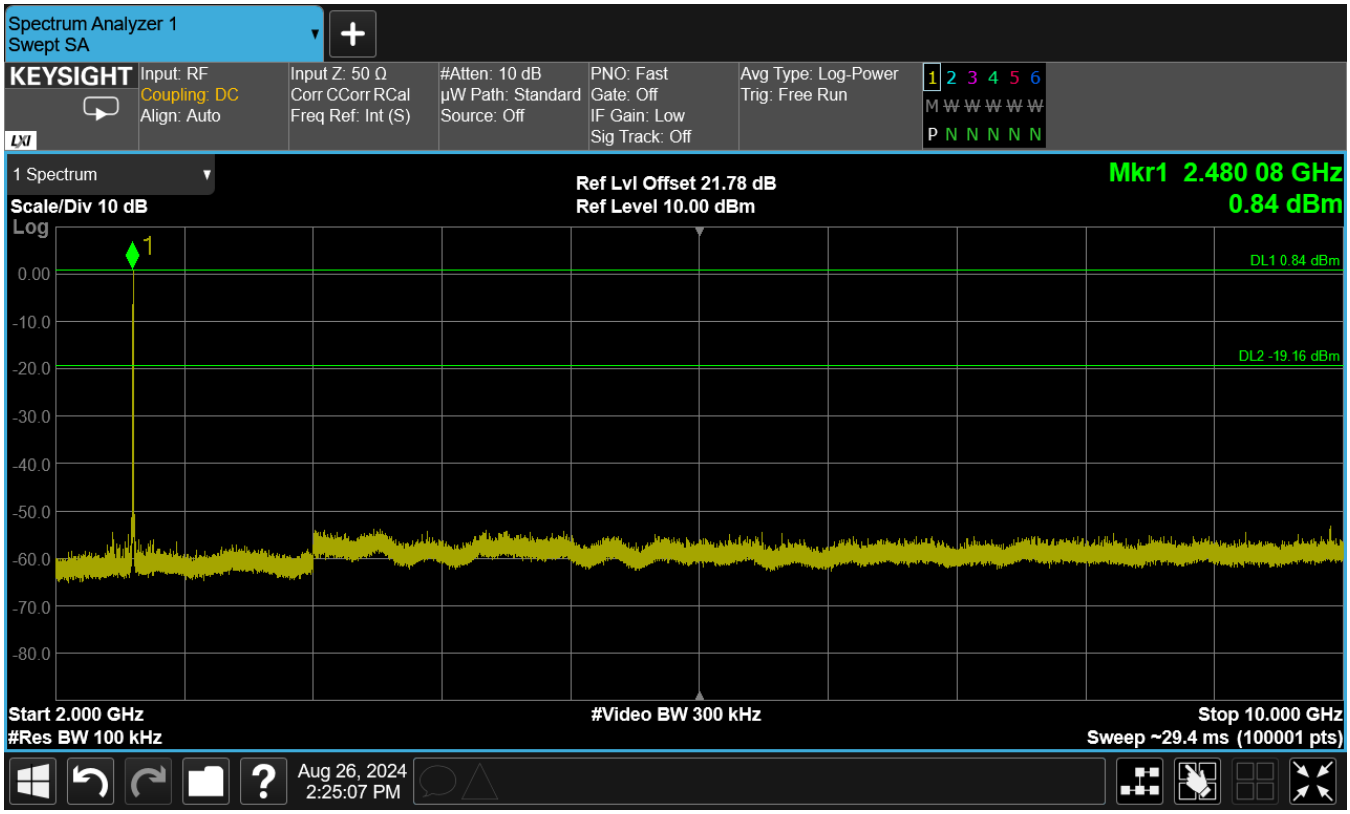
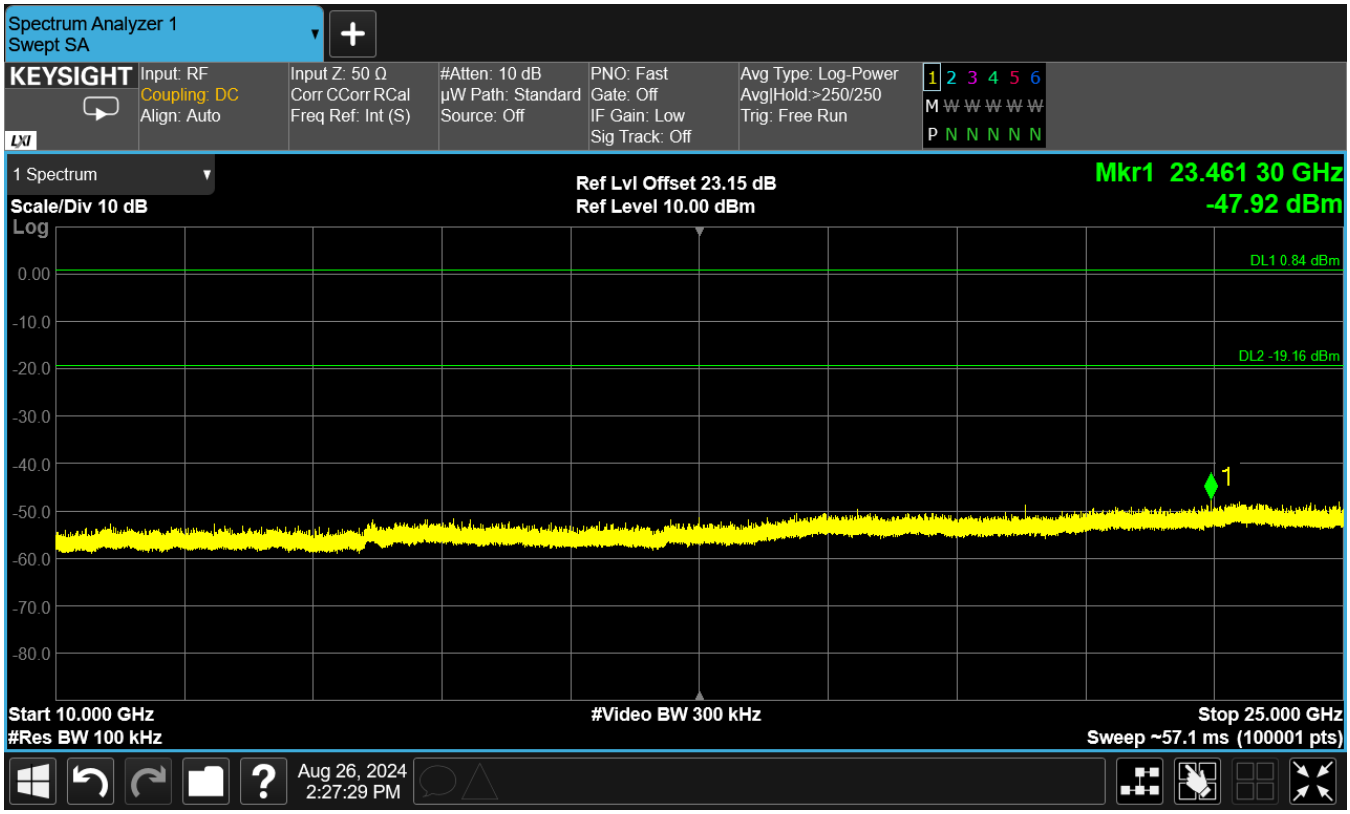


Figure 20: High Channel Conducted Spurious Plot 3



3.7 Radiated Emissions

3.7.1 Requirements

Compliance Standard: FCC Part 15.247, 15.209, 15.205

Radiated Emissions, Compliance Limits		
Frequency Range	Limit (distance)	
	Class A (10 meter)	Class B (3 meter)
30 – 88 MHz	90 µV/m	100 µV/m
88 – 216 MHz	150 µV/m	150 µV/m
216 – 960 MHz	210 µV/m	200 µV/m
> 960 MHz	300 µV/m	500 µV/m

3.7.2 Test Procedure

The requirements of FCC Part 15 and ICES-003 call for the EUT to be placed on a 1 X 1.5 meters non-conductive motorized turntable for radiated testing on a 3-meter open air test site. The height of the table was 80cm for testing of 30MHz to 1000MHz, and 150cm for testing above 1GHz.

The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Bi-conical and log periodic broadband antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The output of the antenna was connected to the input of the spectrum analyzer and the emissions in the frequency range of 30 MHz to 25 GHz were measured. Both the horizontal and vertical field components were measured.

The output from the antenna was connected, via a preamplifier, to the input of the spectrum analyzer. The detector function was set to quasi-peak or peak, as appropriate. Above 1GHz average measurement are recorded. The measurement bandwidth of the spectrum analyzer system was set to at least 120 kHz, with all post-detector filtering no less than 10 times the measurement bandwidth. Frequencies above 1GHz were performed using a measurement bandwidth of 1 MHz with a video bandwidth setting of 10 Hz for the average measurement.

3.7.3 Test Results Summary

The EUT complies with the Radiated Emissions requirements of 15.247(d), 15.209(a), and 15.205(a).

3.7.4 Radiated Data Reduction and Reporting

To convert the raw spectrum analyzer radiated data into a form that can be compared with the FCC limits, it is necessary to account for various calibration factors that are supplied with the antennas and other measurement accessories. These factors are included into the antenna factor (AF) column of the table and in the cable factor (CF) column of the table. The AF (in dB/m) and the CF (in dB) is algebraically added to the raw Spectrum Analyzer Voltage in dBµV to obtain the Radiated Electric Field in dBµV/m. This logarithm amplitude is converted to a linear amplitude, then compared to the FCC limit.

Example:

Spectrum Analyzer Voltage:	dBµV
Antenna Correction Factor:	AFdB/m
Cable Correction Factor:	CFdB
Pre-Amplifier Gain:	GdB
Electric Field:	dBµV/m = dBµV + AFdB/m + CFdB - GdB
Convert to linear Unit:	dBµV/m/20 Inv log

3.7.5 Test Data

The EUT is fully compliant, and the test data is provided on the pages below.

A complete investigation of the radiated fundamental field strength was performed. The EUT was evaluated in three orthogonal axes (x, y, z). The EUT position the produced the highest radiated power was maintained during all testing.

The EUT was configured to transmit a modulated signal as follows:

a) for testing of 30 MHz to 1 GHz, the EUT was set to a transmit at the low channel.

b) for testing of 1 GHz to 25 GHz, the EUT was set to transmit on the low, center, and high channels.

Except for within the restricted bands defined in FCC Part 15.205, where transmitter spurious radiation was detected, the peak field strength of the unwanted emission was compared to the 20dBc limit based on the highest field strength of the in-band fundamental.

Transmitter spurious emissions within the restricted bands of 15.205 shall be subject to the provisions of FCC Rule Part 15.209(a).

When measured at 3-meters, there are no EUT emissions detected in the range of 10GHz to 25GHz.

Table 9: Radiated Emissions Test Data, 30MHz to 1GHz

Frequency (MHz)	Polarity (H/V)	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Detector	Comment
31.88	V	0.0	1.2	22.4	-0.4	12.6	100.0	-18.0	QP	AMB
128.23	V	0.0	1.2	24.3	-4.1	10.3	150.0	-23.3	QP	AMB
383.91	V	0.0	1.2	26.6	-2.6	15.9	200.0	-22.0	QP	AMB
391.90	V	0.0	1.2	27.7	-2.2	18.9	200.0	-20.5	Peak	AMB
423.86	V	0.0	1.2	27.3	-1.1	20.4	200.0	-19.8	Peak	AMB
816.00	V	0.0	1.2	26.9	5.0	39.4	200.0	-14.1	Peak	AMB
996.74	V	0.0	1.2	21.2	7.3	26.7	500.0	-25.5	QP	AMB
31.88	H	0.0	1.2	21.6	-0.4	11.5	100.0	-18.8	QP	AMB
128.23	H	0.0	1.2	25.6	-4.1	11.8	150.0	-22.0	QP	AMB
383.91	H	0.0	1.2	21.6	-2.6	9.0	200.0	-27.0	QP	AMB
391.90	H	0.0	1.2	21.3	-2.2	9.1	200.0	-26.9	QP	AMB
423.86	H	0.0	1.2	21.4	-1.1	10.3	200.0	-25.7	QP	AMB
816.00	H	0.0	1.2	21.5	5.0	21.1	200.0	-19.5	QP	AMB
996.74	H	0.0	1.2	26.6	7.3	49.7	500.0	-20.1	Peak	AMB

These frequencies were identified via a near-field pre-scan investigation.

AMB indicates that the emission was not detected at 3-meters, and the measurement was made at the noise-floor.

Please accept the 30MHz to 1GHz data to cover the digital portion under the provisions of 15.109(a).

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Table 10: Radiated Emissions Test Data, Low Channel

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Detector	Comment
2390.00	V	0.0	1.6	47.6	0.6	258.1	5000.0	-25.7	Peak	AMB
2390.00	V	0.0	1.6	33.6	0.6	51.5	500.0	-19.7	AVG	AMB
2405.00	V	15.0	1.5	92.9	0.6	47111.3	--	--	Peak	TX
2405.00	V	15.0	1.5	--	--	--	--	--	AVG	TX
4810.00	V	15.0	1.5	44.9	4.7	300.8	5000.0	-24.4	Peak	EUT *
4810.00	V	15.0	1.5	35.0	4.7	96.2	500.0	-38.1	AVG	EUT *
7215.00	V	15.0	1.5	46.8	15.2	1263.6	7711.3	-15.7	Peak	EUT
7215.00	V	15.0	1.5	36.2	15.2	372.9	--	--	AVG	EUT
9620.00	V	15.0	1.5	44.8	18.1	1397.2	7711.3	-14.8	Peak	EUT
9620.00	V	15.0	1.5	33.0	18.1	359.1	500.0	-2.9	AVG	EUT
12025.00	V	15.0	1.5	43.0	21.4	1651.7	5000.0	-9.6	Peak	AMB
12025.00	V	15.0	1.5	30.5	21.4	391.7	500.0	-2.1	AVG	AMB
2390.00	H	0.0	1.6	47.6	0.6	258.1	5000.0	-25.7	Peak	AMB
2390.00	H	0.0	1.6	33.1	0.6	48.6	500.0	-20.2	AVG	AMB
2405.00	H	345.0	1.6	97.2	0.6	77112.6	--	--	Peak	TX
2405.00	H	345.0	1.6	--	--	--	--	--	AVG	TX
4810.00	H	345.0	1.6	45.3	4.7	315.0	5000.0	-24.0	Peak	EUT *
4810.00	H	345.0	1.6	35.3	4.7	99.6	500.0	-14.0	AVG	EUT *
7215.00	H	345.0	1.6	46.9	15.2	1278.3	7711.3	-15.6	Peak	EUT
7215.00	H	345.0	1.6	36.9	15.2	404.2	--	--	AVG	EUT
9620.00	H	345.0	1.6	45.1	18.1	1446.3	7711.3	-14.5	Peak	EUT
9620.00	H	345.0	1.6	33.1	18.1	363.3	--	--	AVG	EUT
12025.00	H	345.0	1.6	43.6	21.4	1769.8	5000.0	-9.0	Peak	AMB
12025.00	H	345.0	1.6	31.1	21.4	419.7	500.0	-1.5	AVG	AMB

EUT * indicates that the emission resides in a restricted band of 15.205.

AMB indicates that the measurement was made at the noise-floor.

Table 11: Radiated Emissions Test Data, Center Channel

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Detector	Comment
2440.00	V	350.0	1.6	89.3	0.2	29890.6	--	--	Peak	TX
2440.00	V	350.0	1.6	--	--	--	--	--	AVG	TX
4880.00	V	350.0	1.6	47.6	5.7	463.7	5000.0	-20.7	Peak	EUT *
4880.00	V	350.0	1.6	32.5	5.7	81.5	500.0	-15.8	AVG	EUT *
7320.00	V	350.0	1.6	43.0	14.9	789.2	5000.0	-16.0	Peak	EUT *
7320.00	V	350.0	1.6	30.0	14.9	176.7	500.0	-9.1	AVG	EUT *
9760.00	V	0.0	1.5	43.9	18.6	1329.7	5000.0	-11.5	Peak	AMB
9760.00	V	0.0	1.5	31.4	18.6	315.3	500.0	-4.0	AVG	AMB
12200.00	V	0.0	1.5	44.0	21.3	1850.9	5000.0	-8.6	Peak	AMB
12200.00	V	0.0	1.5	31.1	21.3	419.2	500.0	-1.5	AVG	AMB
2440.00	H	20.0	1.4	93.0	0.2	45765.2	--	--	Peak	TX
2440.00	H	20.0	1.4	--	--	--	--	--	AVG	TX
4880.00	H	20.0	1.4	48.0	5.7	485.6	5000.0	-20.3	Peak	EUT *
4880.00	H	20.0	1.4	33.0	5.7	86.3	500.0	-15.3	AVG	EUT *
7320.00	H	20.0	1.4	45.4	14.9	1040.4	5000.0	-13.6	Peak	EUT *
7320.00	H	20.0	1.4	31.9	14.9	219.9	500.0	-7.2	AVG	EUT *
9760.00	H	0.0	1.5	44.8	18.6	1474.9	5000.0	-10.6	Peak	AMB
9760.00	H	0.0	1.5	31.8	18.6	330.2	500.0	-3.6	AVG	AMB
12200.00	H	0.0	1.5	44.7	21.3	2006.2	5000.0	-7.9	Peak	AMB
12200.00	H	0.0	1.5	31.0	21.3	414.4	500.0	-1.6	AVG	AMB

EUT * indicates that the emission resides in a restricted band of 15.205.

AMB indicates that the measurement was made at the noise-floor.

Table 12: Radiated Emissions Test Data, High Channel

Frequency (MHz)	Polarity H/V	Azimuth (Degree)	Ant. Height (m)	SA Level (dBuV)	Corr Factors (dB)	Corr. Level (uV/m)	Limit (uV/m)	Margin (dB)	Detector	Comment
2480.00	V	180.0	150.0	83.6	0.3	15700.6	--	--	Peak	TX
2480.00	V	180.0	150.0	--	--	--	--	--	AVG	TX
2483.50	V	180.0	150.0	45.9	0.3	204.6	5000.0	-27.8	Peak	AMB
2483.50	V	180.0	150.0	32.8	0.3	45.3	500.0	-20.9	AVG	AMB
4960.00	V	180.0	150.0	44.0	6.9	351.8	5000.0	-23.1	Peak	EUT *
4960.00	V	180.0	150.0	31.0	6.9	78.7	500.0	-16.1	AVG	EUT *
7440.00	V	180.0	150.0	46.2	14.8	1120.6	5000.0	-13.0	Peak	EUT *
7440.00	V	180.0	150.0	35.0	14.8	308.7	500.0	-4.2	AVG	EUT *
9920.00	V	180.0	150.0	44.9	18.9	1543.5	5000.0	-10.2	Peak	AMB
9920.00	V	180.0	150.0	31.5	18.9	330.0	500.0	-3.6	AVG	AMB
12400.00	V	180.0	150.0	43.2	21.4	1704.2	5000.0	-9.3	Peak	AMB
12400.00	V	180.0	150.0	30.9	21.4	413.5	500.0	-1.6	AVG	AMB
2480.00	H	340.0	1.7	90.4	0.3	34349.2	--	--	Peak	TX
2480.00	H	340.0	1.7	--	--	--	--	--	AVG	TX
2483.50	H	340.0	1.7	49.5	0.3	310.5	5000.0	-24.1	Peak	AMB
2483.50	H	340.0	1.7	33.2	0.3	47.4	500.0	-20.5	AVG	AMB
4960.00	H	340.0	1.7	44.2	6.9	359.9	5000.0	-22.9	Peak	EUT *
4960.00	H	340.0	1.7	31.7	6.9	85.4	500.0	-15.4	AVG	EUT *
7440.00	H	340.0	1.7	46.6	14.8	1173.5	5000.0	-12.6	Peak	EUT *
7440.00	H	340.0	1.7	35.4	14.8	323.2	500.0	-3.8	AVG	EUT *
9920.00	H	340.0	1.7	45.5	18.9	1653.9	5000.0	-9.6	Peak	AMB
9920.00	H	340.0	1.7	32.6	18.9	374.5	500.0	-2.5	AVG	AMB
12400.00	H	0.0	1.5	43.0	21.4	1665.4	5000.0	-9.5	Peak	AMB
12400.00	H	0.0	1.5	31.0	21.4	418.3	500.0	-1.5	AVG	AMB

EUT * indicates that the emission resides in a restricted band of 15.205.

AMB indicates that the measurement was made at the noise-floor.

4 Test Equipment

The table below provides a list of the test equipment used for measurements along with the calibration information.

Table 13: Test Equipment List

Test Name:	**Radiated Emissions**	Test Date(s): 8/27/2024	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00942 [1]	AGILENT MXA-N9020A	SPECTRUM ANALYZER	12/19/2024
00644	SUNOL SCIENCES CORP.	ANTENNA, LOGPERIOD	11/7/2024
00004	ARA, DRG-118/A	ANTENNA, HORN	6/7/2027
00825	CABLE ASSOCIATES, MTC10	SMA COAXIAL CABLE	6/14/2025
00847	ASTROLABS, K-48TG	SMA COAXIAL CABLE	6/20/2025
00731	NARDA 4779-3	2W, 3DB ATTENUATOR	6/20/2025
00742	PENN ENGINEERING, WR284	BANDPASS FILTER	6/27/2025
00281	ITC, 21C-3A1	BANDPASS FILTER	6/27/2025

[1] A#00942 N9020A, MXA has the following instrument software version installed: A.25.08 (2019)

Test Name:	**Conducted RF Emissions**	Test Date: 8/26/2024	
Asset #	**Manufacturer/Model**	**Description**	**Cal. Due**
00993 [2]	KEYSIGHT N9020B	MXA SIGNAL ANALYZER	11/6/2025
00897	TELEDYNE DURATEST	SMA COAXIAL CABLE	6/25/2025
00992	KEYSIGHT N5173B	EXG SIGNAL GENERATOR	11/27/2024
N/A	WEINSCHEL, 3.5MM	20dB ATTENUATOR	Cal. Before Use

[2] A#00993 N9020B, MXA has the following instrument software version installed: A.33.03 (2023)

5 Measurements

5.1.1 References

ANSI C63.2 (Jan-2016) Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 (Jan 2014) American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

ANSI C63.10 (Sept 2020) American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

5.2 Measurement Uncertainty

All results reported herein relate only to the equipment tested. The basis for uncertainty calculation uses ANSI/NCSL Z540-2-1997 (R2002) with a type B evaluation of the standard uncertainty. Elements contributing to the standard uncertainty are combined using the method described in Equation 1. to arrive at the total standard uncertainty. The standard uncertainty is multiplied by the coverage factor to determine the expanded uncertainty which is generally accepted for use in commercial, industrial, and regulatory applications and when health and safety are concerned (see Equation 2). A coverage factor was selected to yield a 95% confidence in the uncertainty estimation.

Equation 1: Standard Uncertainty

$$u_c = \pm\sqrt{\frac{a^2}{div_a{}^2} + \frac{b^2}{div_b{}^2} + \frac{c^2}{div_c{}^2} + ...}$$

where,

uc	= standard uncertainty
a, b, c,..	= individual uncertainty elements
Diva, b, c	= the individual uncertainty element divisor based on the probability distribution
Divisor	= 1.732 for rectangular distribution
Divisor	= 2 for normal distribution
Divisor	= 1.414 for trapezoid distribution

Equation 2: Expanded Uncertainty

$$U = ku_c$$

where,

U = expanded uncertainty
k = coverage factor
k ≤ 2 for 95% coverage (ANSI/NCSL Z540-2 Annex G)
uc = standard uncertainty

The measurement uncertainty complies with the maximum allowed uncertainty from CISPR 16-4-2. Measurement uncertainty is not used to adjust the measurements to determine compliance. The expanded uncertainty values for the various scopes in the WLL accreditation are provided in the table below.

Table 14: Expanded Uncertainty List

Scope	Standard(s)	Expanded Uncertainty
Conducted Emissions	CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15	± 2.63 dB
Radiated Emissions	CISPR11, CISPR22, CISPR32, CISPR14, FCC Part 15	± 4.55 dB

5.3 Environmental Conditions

Environmental Conditions During All Measurements

Ambient Temperature:	Between 18.8 and 23.9 °C
Relative Humidity:	Between 45 and 60 %