



Testing Tomorrow's Technology

**Application
For**

**Part 2, Subpart J, Paragraph 2.907 Equipment Authorization of Certification for an
Intentional Radiator per Part 15, Subpart C, paragraphs 15.207, 15.209 and 15.247**

For the

SwipeSense, Inc.

Model Number: HUB522

FCC ID: 2AB5RHUB522

UST Project: 26-0133A

Issue Date: August 24, 2026

Total Pages : 59

**3505 Francis Circle Alpharetta, GA 30004
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Testing Tomorrow's Technology

I certify that I am authorized to sign for the Test Agency and that all of the statements in this report and in the Exhibits attached hereto are true and correct to the best of my knowledge and belief:

US TECH (Agent Responsible For Test):

By: Alan Ghasiani

Name: Alan Ghasiani

Title: Compliance Engineer – President

Date: August 24, 2026



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MEASUREMENT TECHNICAL REPORT

COMPANY NAME: SwipeSense, Inc.
ADDRESS: 1355 Peachtree St. NE Ste. 700, Atlanta GA 30309 USA
MODEL: HUB522
FCC ID: 2AB5RHUB522
DATE: August 24, 2026

This report concerns (check one): ☒Original grant ☐Class II change

Equipment type: IEEE 802.15.4 Zigbee/Thread radio device

Technical:
IEEE 802.15.4
2405 MHz - 2480 MHz (Channels 11-26)
Type of modulation: O-QPSK
Data/Bit Rate: 250 kbps
Antenna Gain: See Table 4
Maximum Output Power: +14.32 dBm (Measured)
Software used to program EUT: Proprietary test firmware
EUT firmware number: N/A
Power setting: + 15 dBm

☒Disclaimer (check if applicable):

Unless otherwise noted, the information presented in this section has been provided by the client and is assumed to be accurate and complete. All calculations, assessments, and conclusions herein are based on the client-supplied data. The testing laboratory has not independently verified this information and shall not be held responsible for any inaccuracies or omissions in the client-provided content.

Report prepared by:	US Tech 3505 Francis Circle Alpharetta, GA 30004 FCC Lab Designation#: US5301 CANADA Lab Code: 9000A-1, CAB ID: US0031
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FCC Agency Agreement
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Schematic(s)

Test Configuration Photographs
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Internal Photographs
Theory of Operation
RF Exposure
User's Manual

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1. General Information

1.1. Purpose of this Report

This report is prepared as a means of conveying test results and information concerning the suitability of this exact product for public distribution according to FCC Rules and Regulations Part 15, Section 247.

1.2. Characterization of Test Sample

The sample used for testing was received by US Tech on June 22, 2026 in good operating condition.

1.3. Product Description

The Equipment under Test (EUT) is the SwipeSense, Inc. model HUB522. The EUT is part of the SwipeSense real-time hand hygiene data system. The integrated system provides real-time hand hygiene data from across the enterprise. The SwipeSense System creates a Thread network using Location Hubs that funnel all data back to a central Comm Hub device. The system is comprised of:

- Badges worn on individual employees
- Asset tags attached to assets that should be tracked
- Hygiene sensors mounted to hygiene dispensers tracks employee hand sanitation frequency
- Entry sensors installed in door thresholds to provide real time feedback
- Location hubs monitor employee presence in patient rooms and asset locations
- Communication hub located on each unit collects the data generated within the network and transmits to the cloud.

Once the data is uploaded to the cloud, it is accessible to all administrators.

The EUT contains two onboard radio circuits. One radio circuit for Thread network communication and one radio circuit for BLE communication.

The Thread radio circuit is evaluated in this test report.

Antenna Gain: See Table 4

Bandwidth: see 6 dB bandwidth measurement below.

Maximum Output Power: +14.32 dBm (measured)

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1.4. Configuration of Tested System

The Test Sample was tested per *ANSI C63.10:2020, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices* for the intentional radiator aspect of the device and *ANSI C63.4:2014, Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (2014)* for the unintentional radiator aspect of the device as well as FCC subpart B and C of Part 15 and per FCC KDB Publication number 558074 v05r02 for Digital Transmission Systems Operating Under section 15.247.

Digital RF conducted and radiated emissions data below 1 GHz were taken with the measuring receiver (or spectrum analyzer's) resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements performed above 1.0 GHz were made with a RBW of 1 MHz. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was set to 3 times the RBW or as required per the standard throughout the evaluation process.

A list of EUT and Peripherals is found in Table 1. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are provided in separate Appendices.

1.5. Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA 30004. This site has been fully described and registered with the FCC. Its designation number is US5301. Additionally, this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number 9900A-1.

1.6. Related Submittal(s)/Grant(s)

The EUT is subject to the following FCC Equipment Authorizations:

- a) Certification of the transmitter incorporated within the EUT, see test data presented herein.

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Table 1. EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC/IC ID	CABLES P/D
EUT/ SwipeSense, Inc.	HUB522	Sample 2	FCC ID: 2AB5RHUB522 (pending)	N/A
AC Adaptor ONN	WIAWHT100008137	Sample 2	Off-the-shelf approved PSU for testing purposes.	PU
DC Bench Supply TekPower	TP3005T	527564	Bench top supply used for testing purposes.	PU
Antenna See antenna details	--	--	--	--

S= Shielded, U= Unshielded, P= Power, D= Data

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2. Tests and Measurements

2.1. Test Equipment

The table below lists test equipment used to evaluate this product. Model numbers, serial numbers and their calibration status are included herein.

Table 2. Test Instruments

TEST INSTRUMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
Spectrum Analyzer	Agilent	E4407B	US41442935	4/20/2028 2 yr.
Spectrum Analyzer	Agilent	E4440A	MY45304803	9/04/2027 2 yr
RF Preamp 100 kHz To 1.3 Ghz	Hewlett-Packard	8447D	1937A01611	2/13/2027
RF Preamp 1.0 Ghz To 26.0 Ghz	Hewlett-Packard	8449B	3008A01275	2/12/2027
Loop Antenna	ETS Lindgren	6502	9810-3246	2/18/2028 2 yr.
Biconical Antenna	EMCO	3110B	9307-1431	2/24/2027 2 yr
Log Periodic Antenna	EMCO	3146	9110-3236	11/15/2026 2 yr
Horn Antenna	A.H. Systems	SAS-571	605	3/18/2027 2 yr.
High Pass Filter	Microwave Circuits	H3R020G2	001DC9528	6/01/2027
LISN X 2	Solar Electronics	9247-50- TS-50-N	955824 and 955825	4/29/2027
RF Cable	US Tech	LMR400	None	2/13/2027
RF Cable	US Tech	ULC-3F-T- SM-SM	2146	1/14/2027
RF Cable	Time Microwave Systems	LMR400	None	1/14/2027
RF Cable	Time Microwave Systems	LMR400	19424	2/13/2027
RF Cable	Harbor Industries	LL142	A13355-3036	2/13/2027
Attenuator	Mini-Circuits Inc.	VAT-8 15542	3 0519	6/01/2027

Note 1: The calibration interval of the above test instruments are 12 months unless stated otherwise and all calibrations are traceable to NIST/USA.

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2.2. Modifications to EUT Hardware

No modifications were made by US Tech to bring the EUT into compliance with FCC Part 15.247 requirements.

2.3. Number of Measurements for Intentional Radiators (15.31(m))

Measurements of intentional radiators or receivers shall be performed and reported for each band in which the device can be operated, with the device operating at the number of frequencies in each band specified in Table 3.

Table 3. Number of Test Frequencies for Intentional Radiators

Frequency Range over which the device operates	Number of Frequencies	Location in the Range of operation
1 MHz or less	1	Middle
1 to 10 MHz	2	1 near the top 1 near the bottom
Greater than 10 MHz	3	1 near top 1 near middle 1 near bottom

Because the EUT operates at 2405 MHz to 2480 MHz, 3 test frequencies were used.

2.4. Frequency Range of Radiated Measurements (Part 15.33)

2.4.1. Intentional Radiator

The spectrum shall be investigated for the intentional radiator from the lowest RF signal generated in the EUT, without going below 9 kHz to the 10th harmonic of the highest fundamental frequency generated or 40 GHz, whichever is the lowest.

2.4.2. Unintentional Radiator

For the digital device, an unintentional radiator, the frequency range shall be 30 MHz to 1000 MHz, or to the range specified in 2.4.1 above, whichever is the higher range of investigation.

2.5. Measurement Detector Function and Bandwidth (CFR 15.35)

The radiated and conducted emissions limits shown herein are based on the following:

2.5.1. Detector Function and Associated Bandwidth

On frequencies below 1000 MHz, the limits herein are based upon measurement equipment employing a CISPR Quasi-peak detector function and related measurement bandwidths (i.e. 9 kHz from 150 kHz to 30 MHz and 120 kHz from 30 MHz to 1000 MHz). Alternatively, measurements may be made with equipment employing a peak detector function as long as the same bandwidths specified for the Quasi-peak device are used.

2.5.2. Corresponding Peak and Average Requirements

Above 1000 MHz, radiated limits are based on measuring instrumentation employing an average detector function. When average radiated emissions are specified there is also a corresponding Peak requirement, as measured using a peak detector, of 20 dB greater than the average limit. For all measurements above 1000 MHz the Resolution Bandwidth shall be at least 1 MHz.

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2.5.3. Pulsed Transmitter Averaging

When the radiated emissions limit is expressed as an average value, and the transmitter is pulsed, the measured field strength shall be determined by applying a Duty Cycle Correction Factor based upon dividing the total ON time during the first 100 ms period by 100 ms (or by the period if less than 100 ms). The duty cycle may be expressed logarithmically in dB.

NOTE: If the transmitter was programmed to transmit at >98% duty cycle, then, wherever applicable (where the detection mode was AVG) the duty cycle factor calculated will be applied.

2.6. EUT Antenna Requirements (CFR 15.203)

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 sufficient to comply with the provisions of this section. Only the antenna(s) listed in Table 4 will be used with this module.

Table 4. Allowed Antenna(s)

REPORT REFERENCE	MANUFACTURER	TYPE OF ANTENNA	MODEL	GAIN dB _i	TYPE OF CONNECTOR
Antenna 1	SwipeSense, Inc.	PCB Trace	Inverted F type	+0.7	PCB Trace
Antenna 2	SwipeSense, Inc.	PCB Trace	Inverted F type	+0.7	PCB Trace

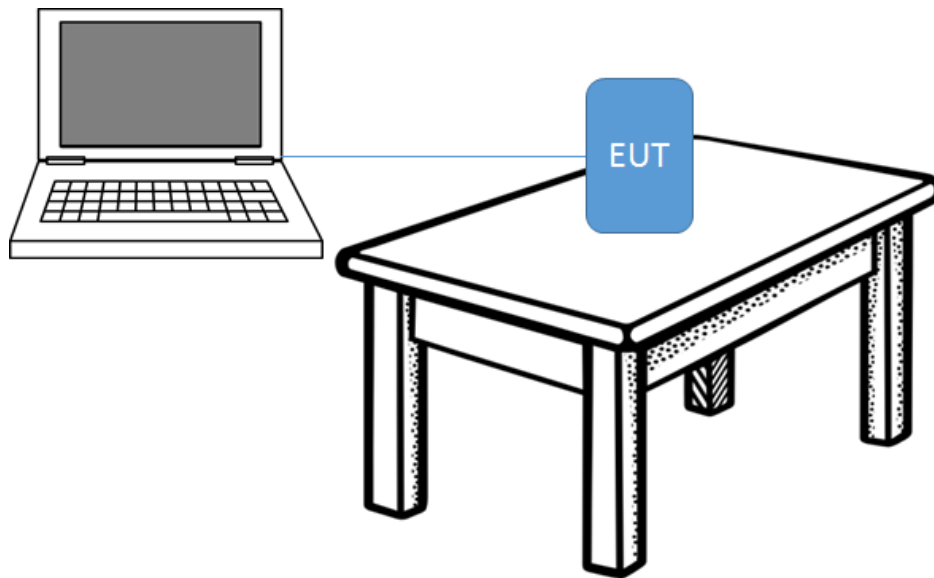


Figure 1. Block Diagram of Test Configuration

Note: PC used to program EUT for intentional spurious emissions

2.7. Restricted Bands of Operation (Part 15.205)

Only spurious emissions can fall in the frequency bands of CFR 15.205. The field strength of these spurious cannot exceed the limits of 15.209. Radiated harmonics and other Spurious are examined for this requirement see paragraph 2.10.

2.8. Transmitter Duty Cycle (Part 15.35 (c))

The EUT employs pulse transmission however for testing purpose the EUT was programmed to transmit at a rate >98%. The pulse transmission requirements of this subpart were acknowledged and considered during testing.

When the radiated emissions limit is expressed as an average value, and the transmitter is pulsed, the measured field strength shall be determined by applying a Duty Cycle Correction Factor based upon dividing the total ON time during the first 100 ms period by 100 ms (or by the period if less than 100 ms). The duty cycle may also be expressed logarithmically in dB.

2.9. Antenna Conducted Intentional and Spurious Emissions (CFR 15.209, 15.247(d))

The EUT was put into a continuous-transmit mode of operation and tested per ANSI C63.10:2020 for conducted out of band emissions emanating from the antenna port over the frequency range of 30 MHz to ten times the highest clock frequency generate or used in this case, 25 GHz. A conducted scan was performed on the EUT to identify and record spurious signals that were related to the transmitter. Antenna Conducted Emissions of a significant magnitude that fell within restricted bands were then measured as radiated emissions in the EMC Chamber. The conducted emissions graphs are found in the figures below. The limit for antenna conducted power is 1 Watt (30 dBm) per 15.247 (b)(3).

For Conducted RF antenna tests, the RBW was set to 100 kHz, video bandwidth (VBW) > RBW, scan up through the 10th harmonic of the fundamental frequency. All harmonics/spurs must be at least 20 dB down from the highest emission level within the authorized band.

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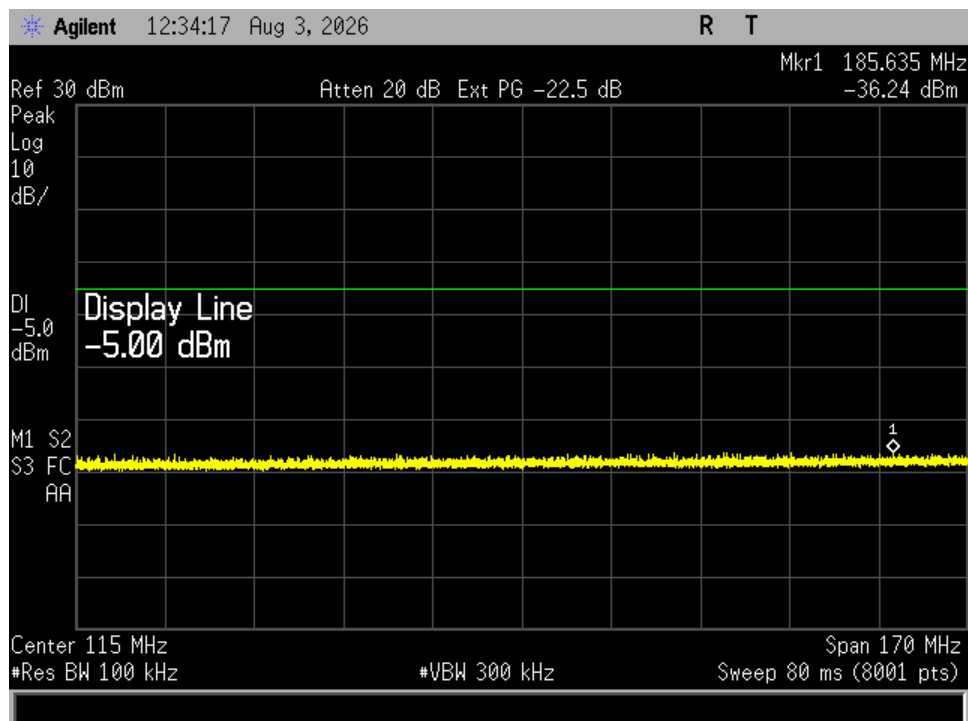


Figure 2. Antenna Conducted Emissions, Channel 11, 30-200 MHz

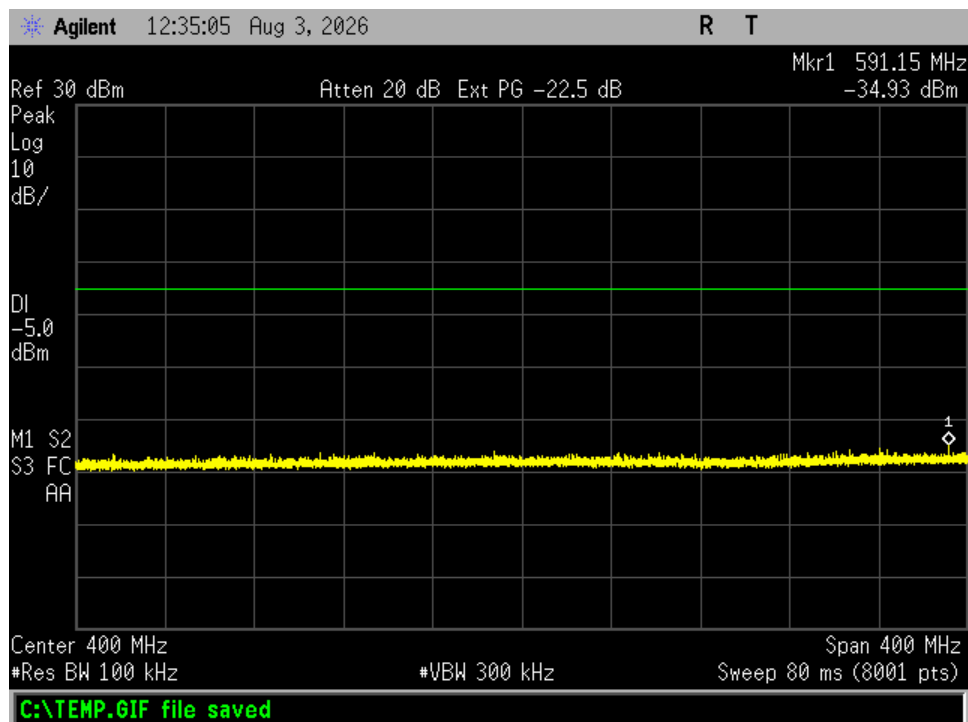


Figure 3. Antenna Conducted Emissions, Channel 11, 200-600 MHz

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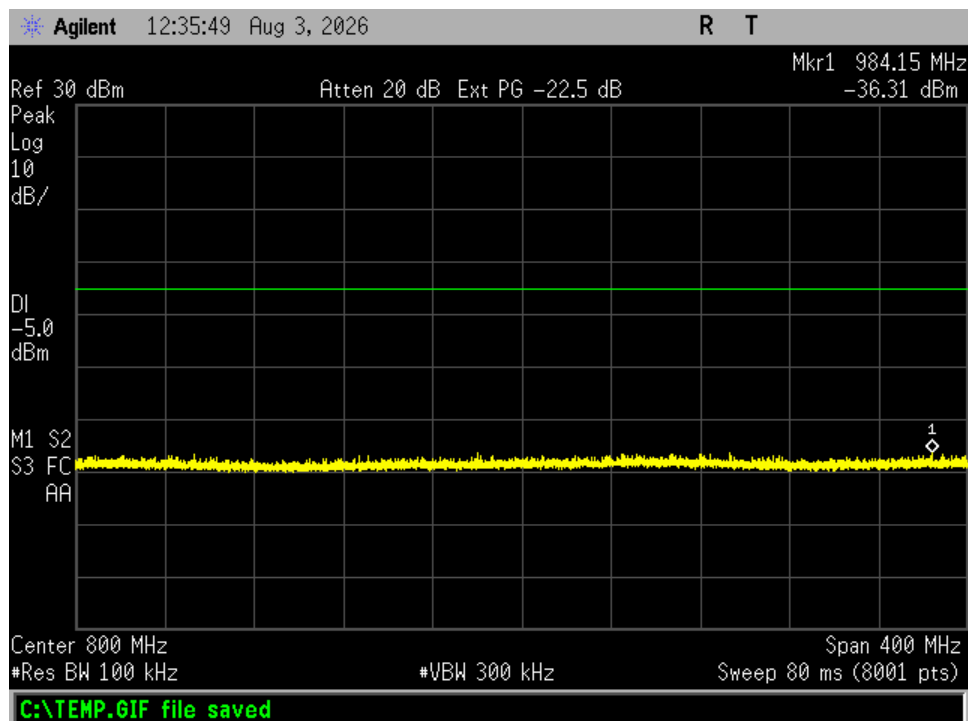


Figure 4. Antenna Conducted Emissions, Channel 11, 600-1000 MHz

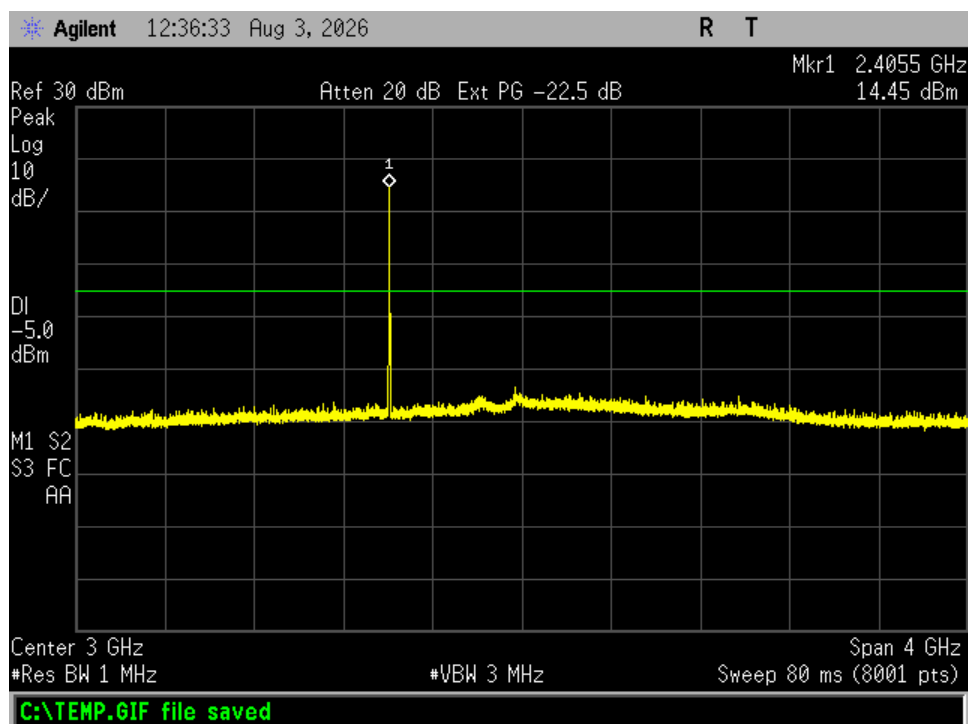


Figure 5. Antenna Conducted Emissions, Channel 11, 1 – 5 GHz

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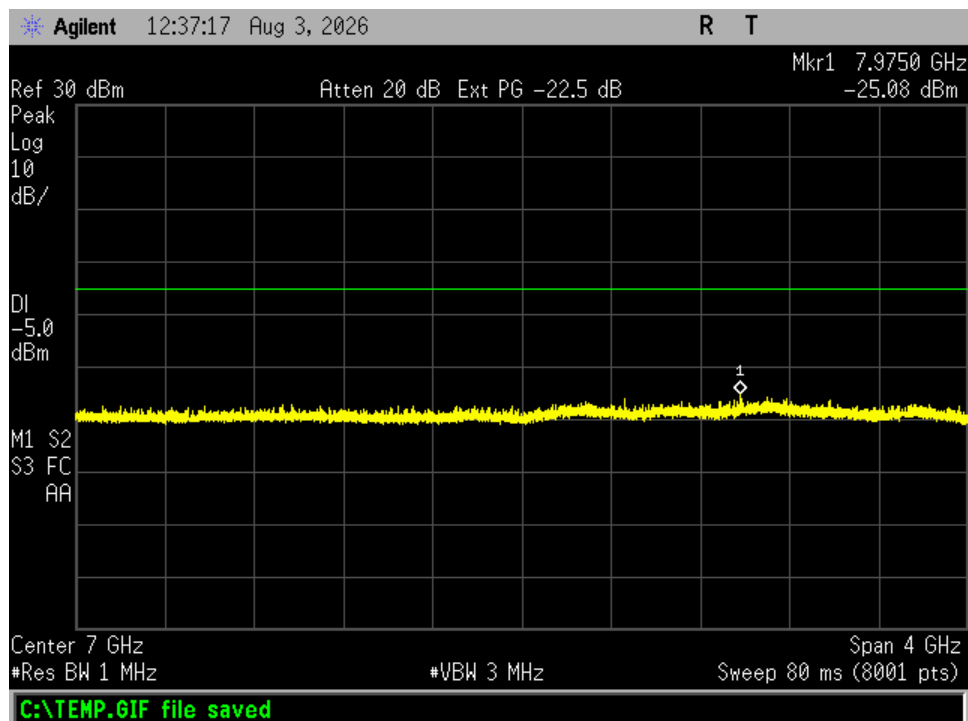


Figure 6. Antenna Conducted Emissions, Channel 11, 5 – 9 GHz

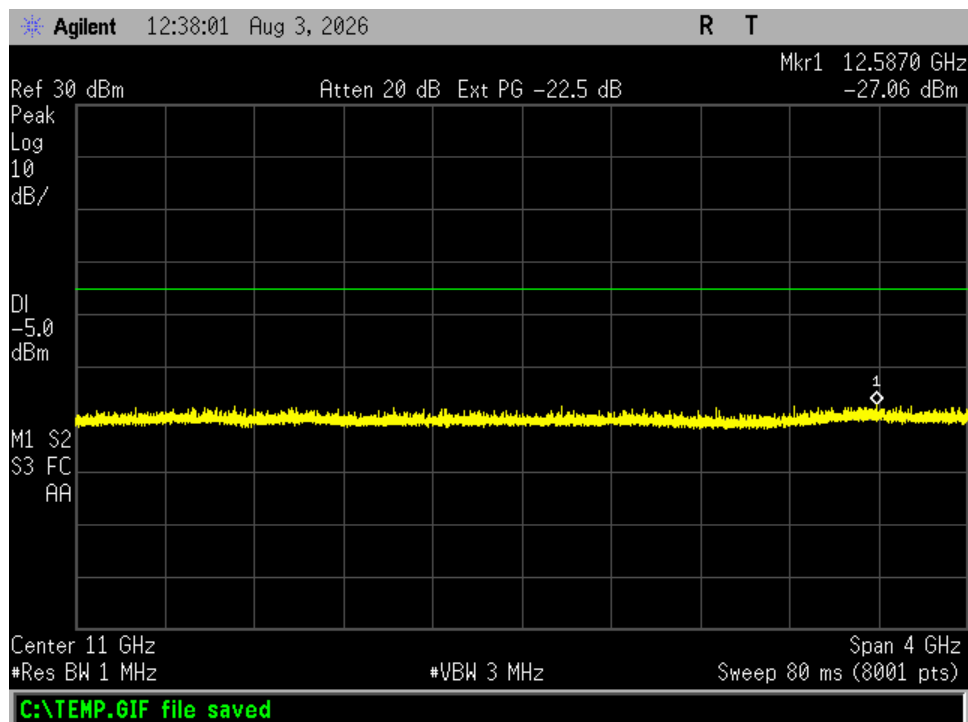


Figure 7. Antenna Conducted Emissions, Channel 11, 9 – 13 GHz

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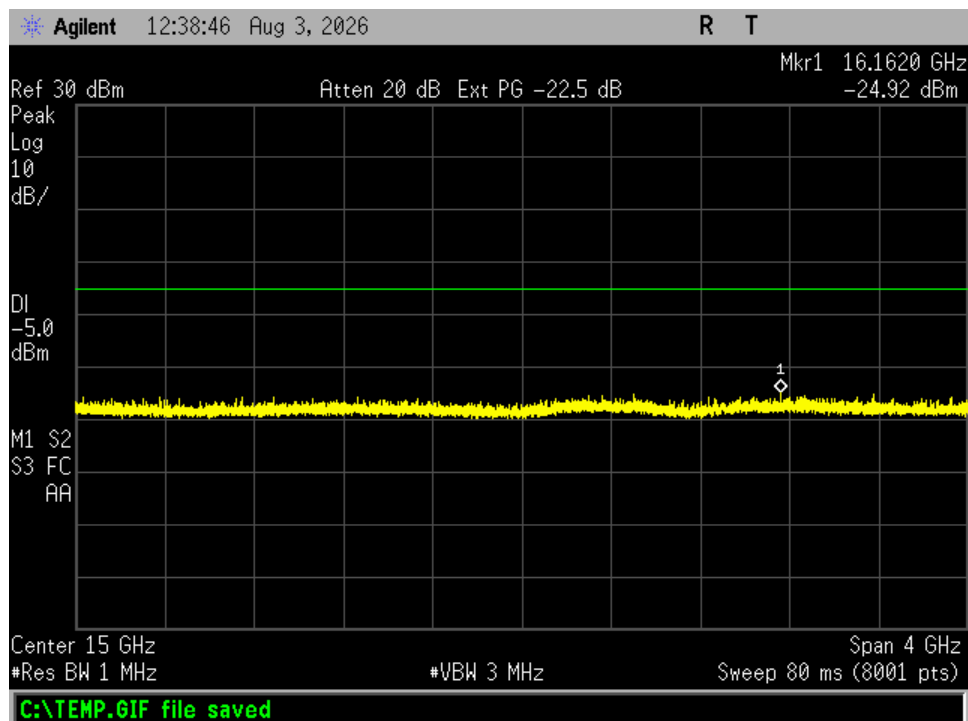


Figure 8. Antenna Conducted Emissions, Channel 11, 13 – 17 GHz

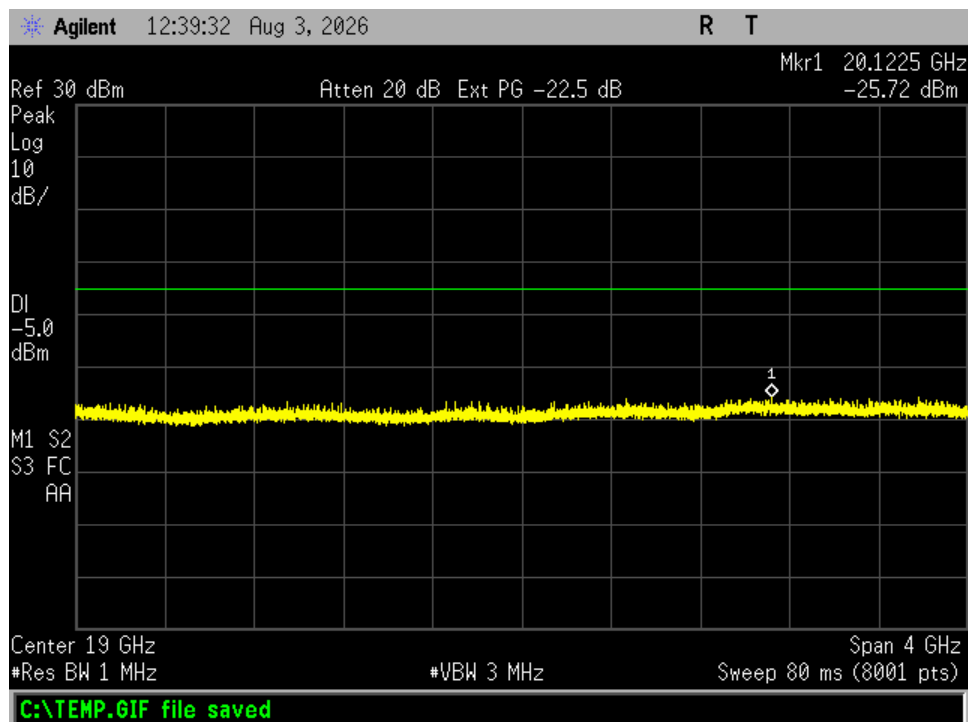


Figure 9. Antenna Conducted Emissions, Channel 11, 17 – 21 GHz

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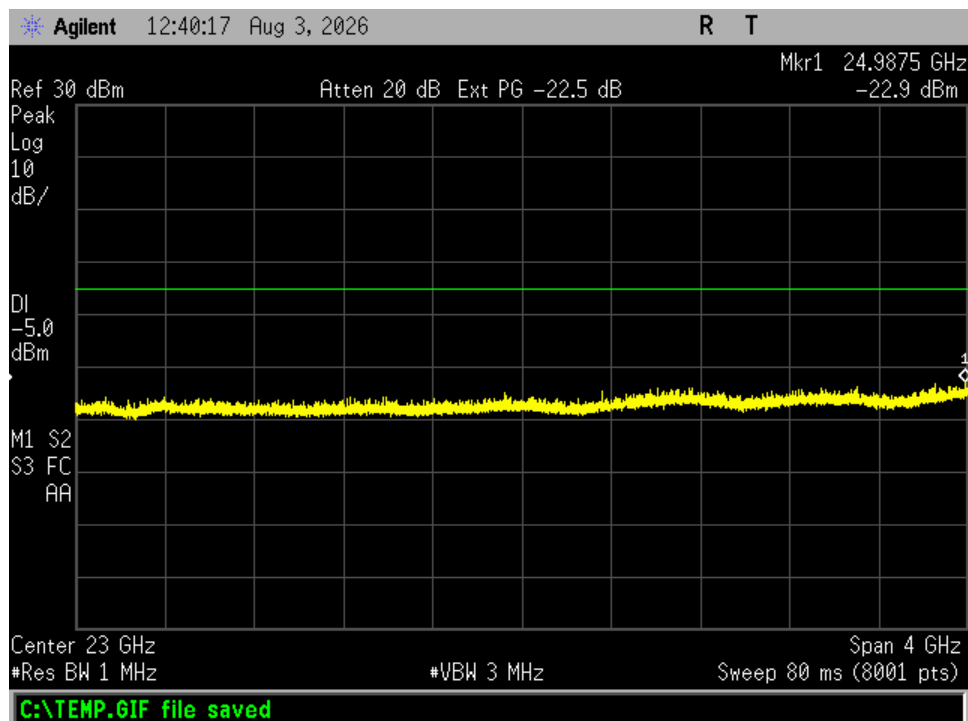


Figure 10. Antenna Conducted Emissions, Channel 11, 21 – 25 GHz

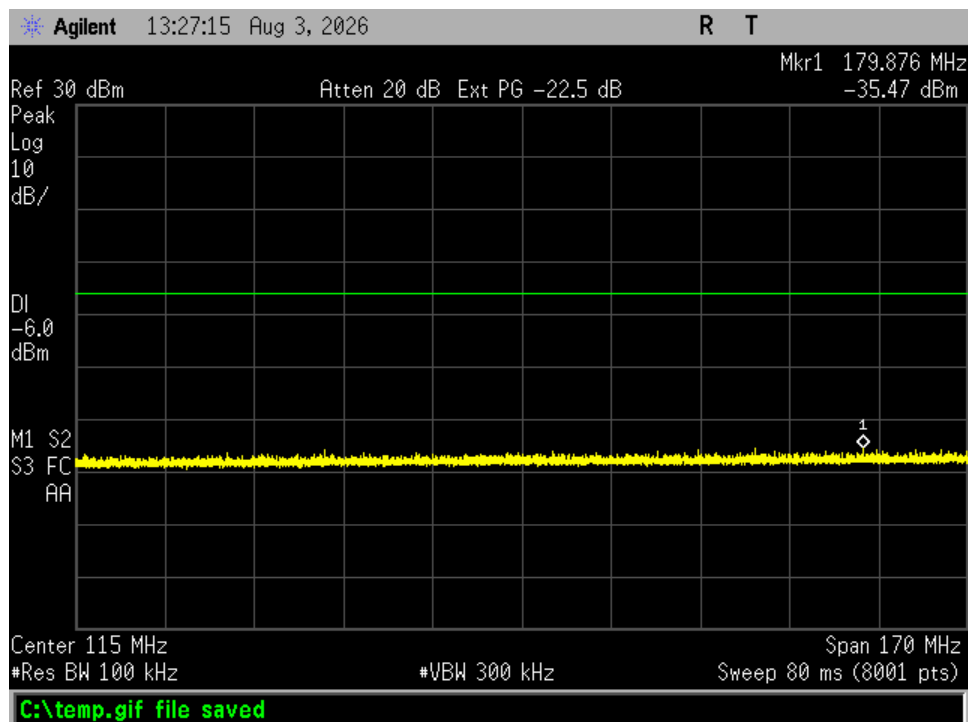


Figure 11. Antenna Conducted Emissions, Channel 18, 30-200 MHz

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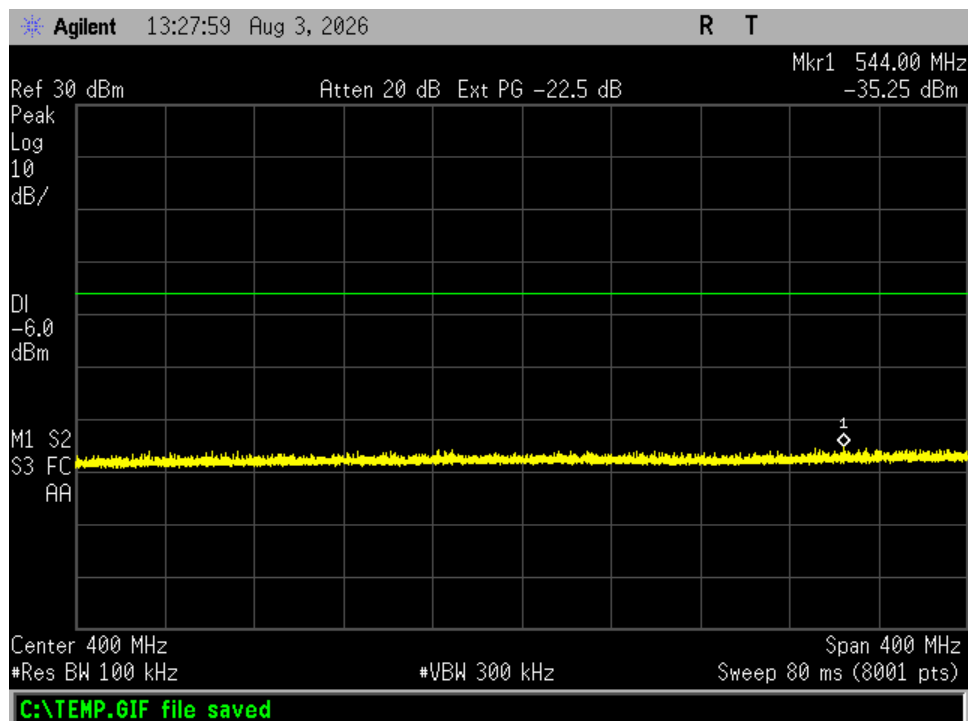


Figure 12. Antenna Conducted Emissions, Channel 18, 200-600 MHz

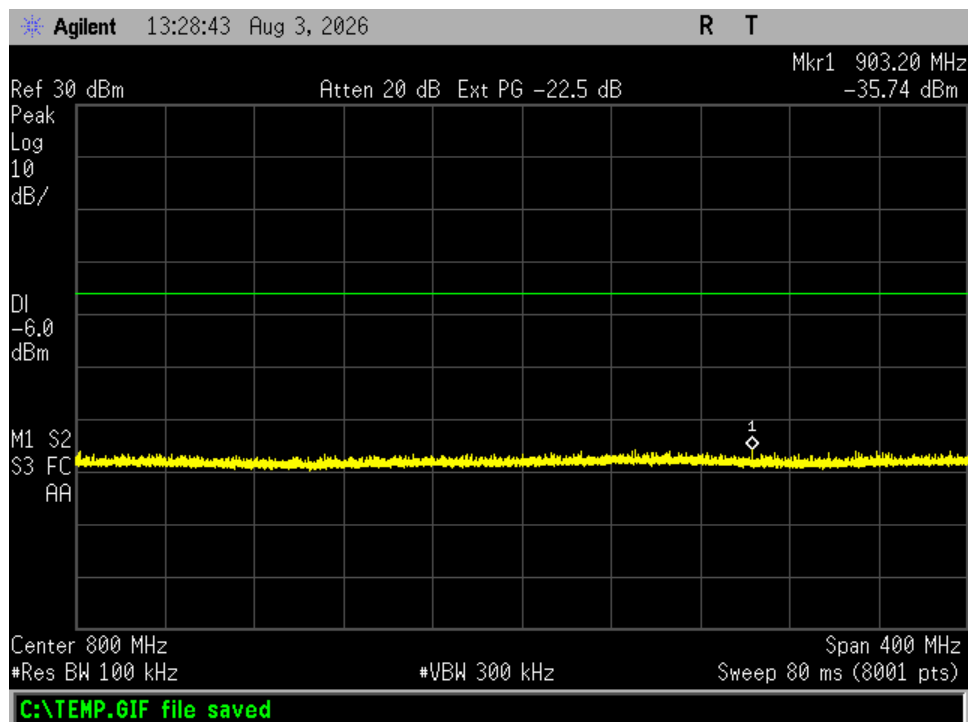


Figure 13. Antenna Conducted Emissions, Channel 18, 600-1000 MHz

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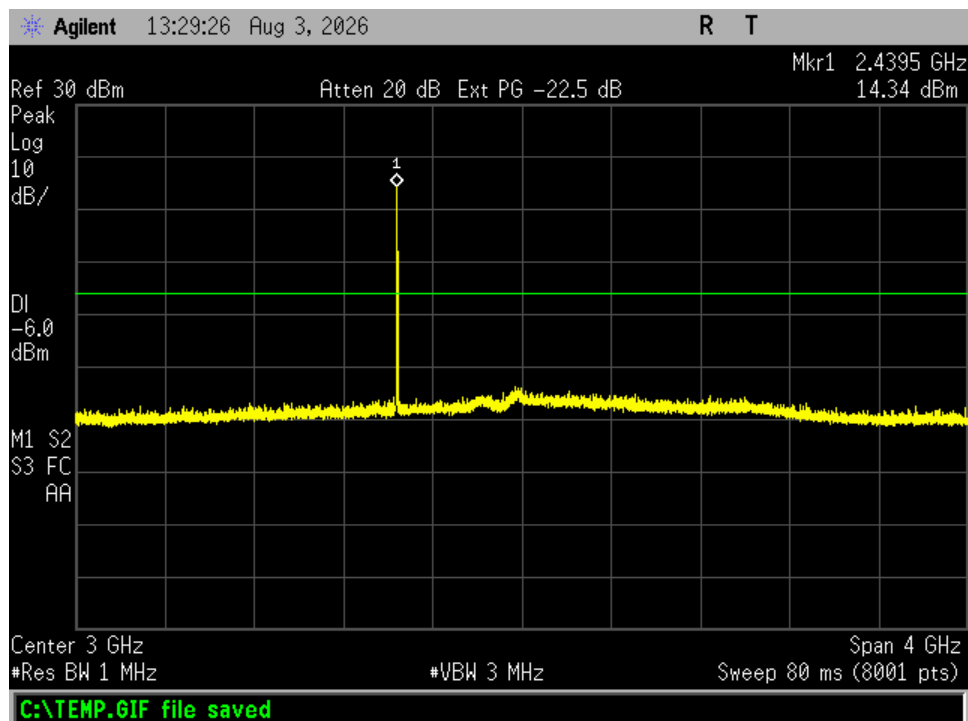


Figure 14. Antenna Conducted Emissions, Channel 18, 1 – 5 GHz

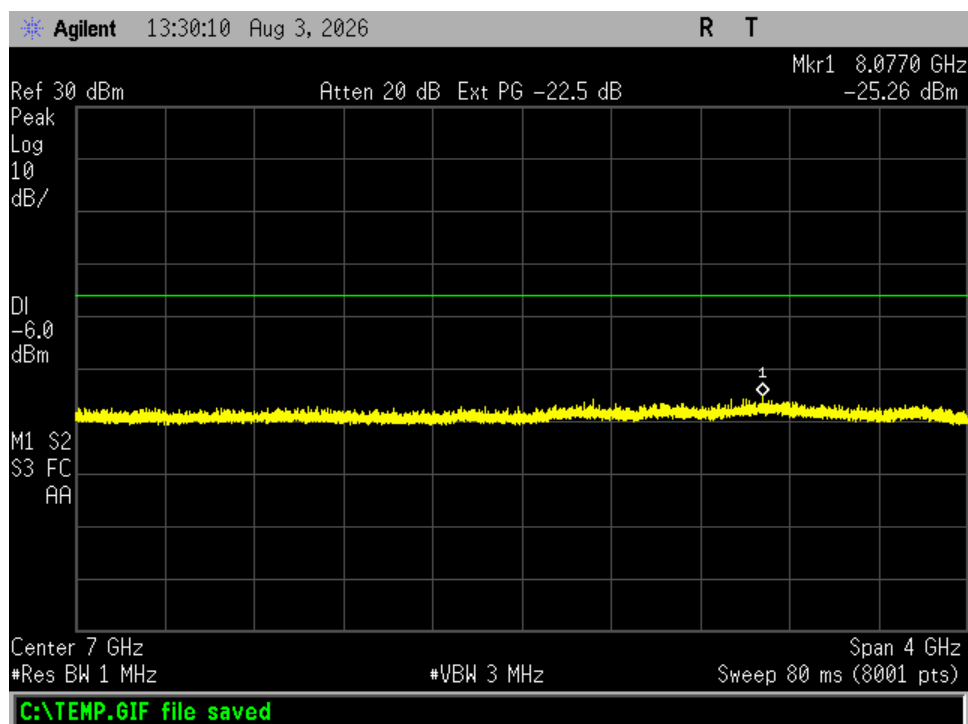


Figure 15. Antenna Conducted Emissions, Channel 18, 5 – 9 GHz

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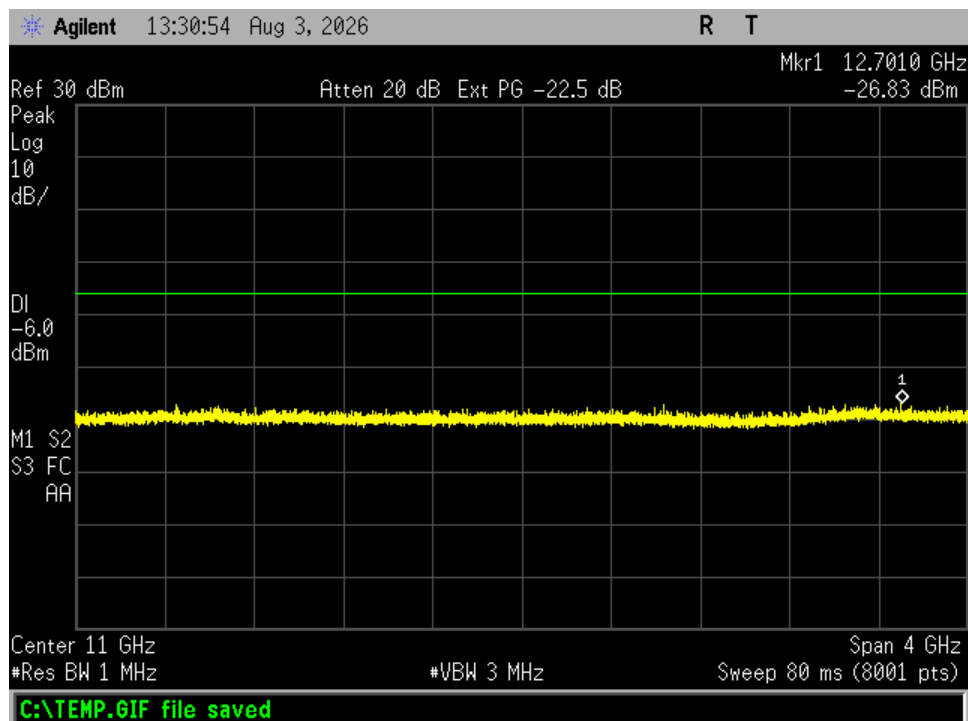


Figure 16. Antenna Conducted Emissions, Channel 18, 9 – 13 GHz

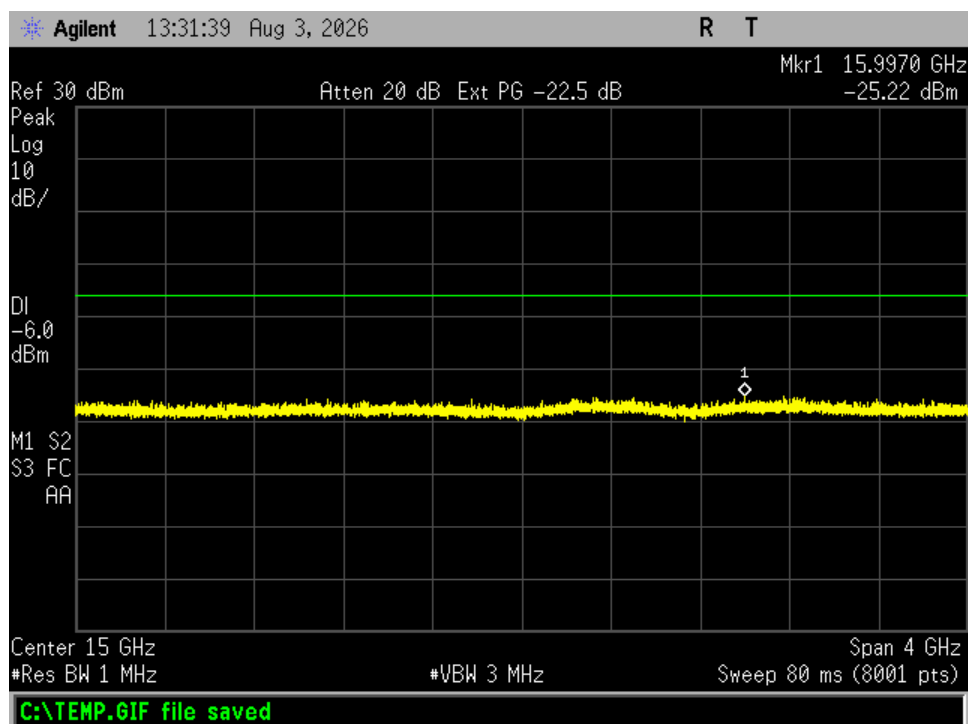


Figure 17. Antenna Conducted Emissions, Channel 18, 13 – 17 GHz

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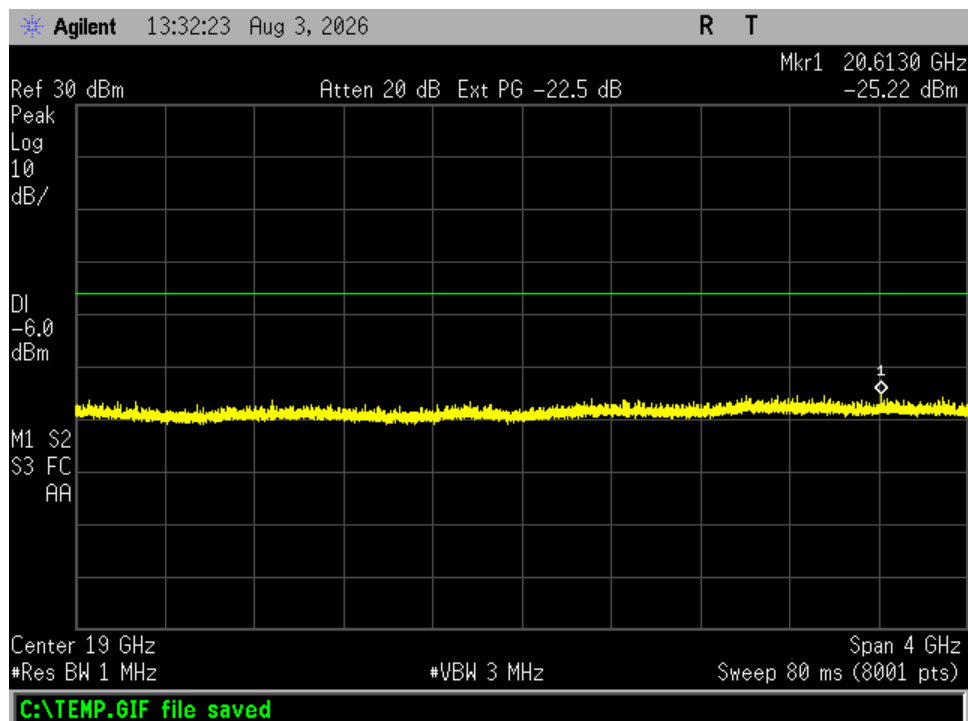


Figure 18. Antenna Conducted Emissions, Channel 18, 17 – 21 GHz

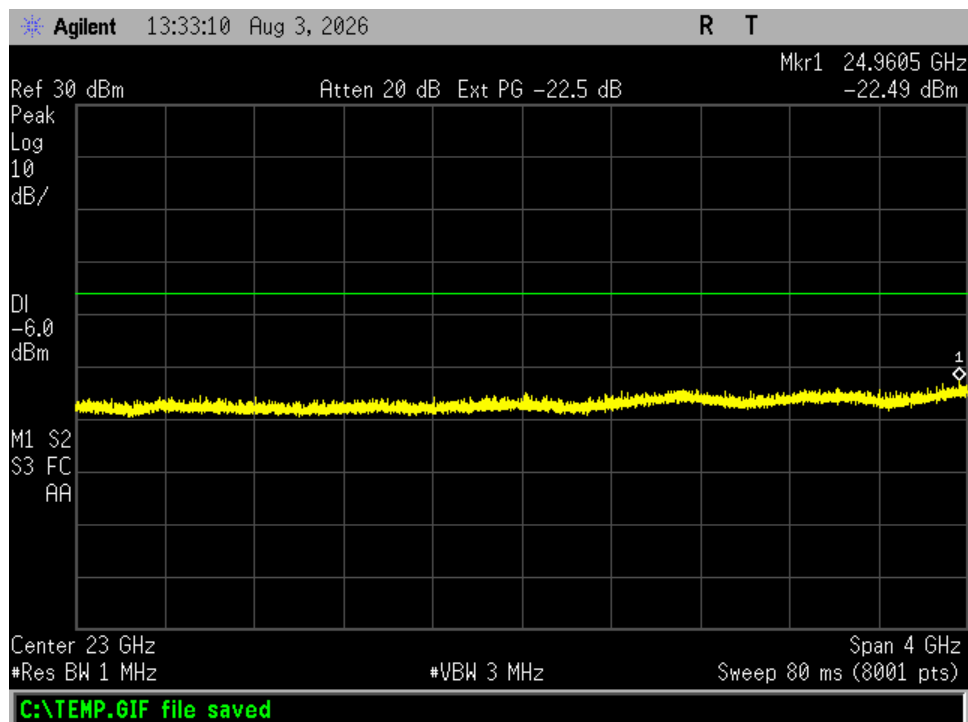


Figure 19. Antenna Conducted Emissions, Channel 18, 21 – 25 GHz

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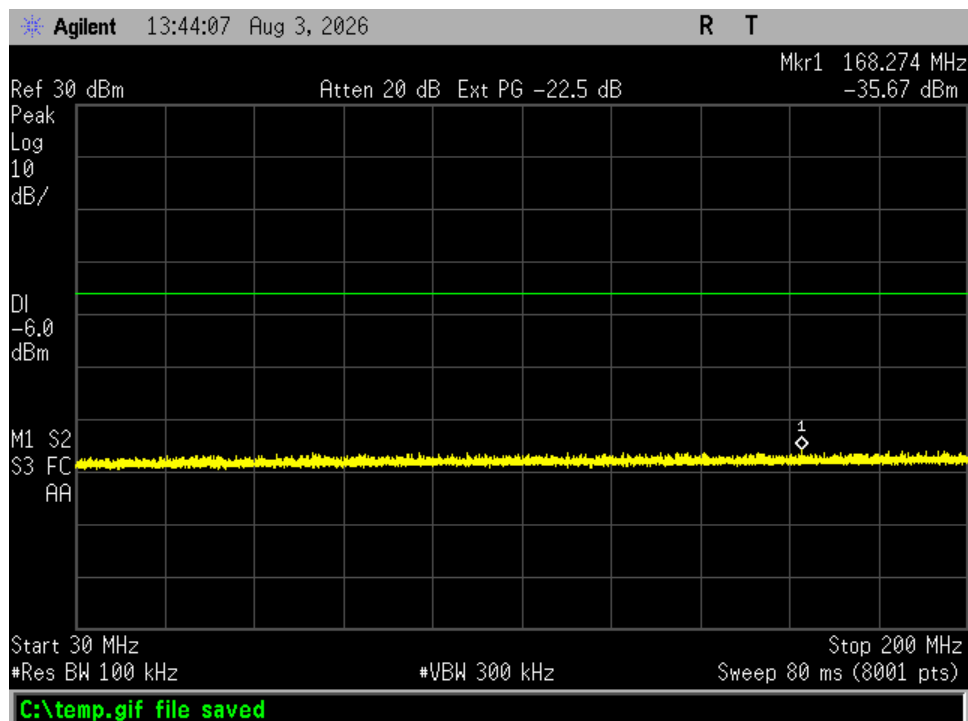


Figure 20. Antenna Conducted Emissions, Channel 26, 30-200 MHz

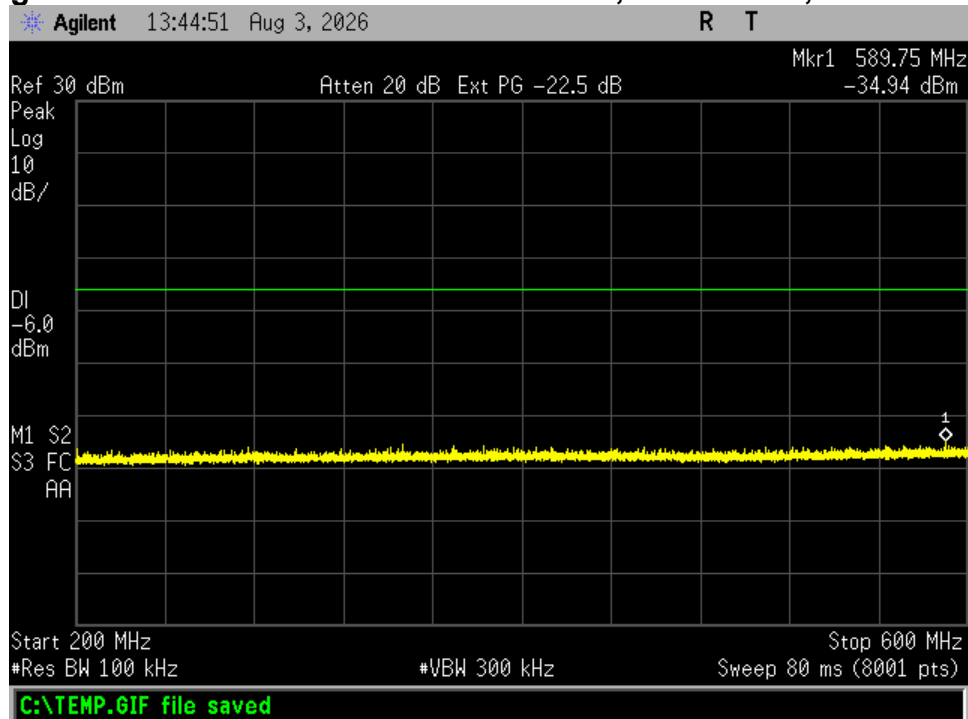


Figure 21. Antenna Conducted Emissions, Channel 26, 200-600 MHz

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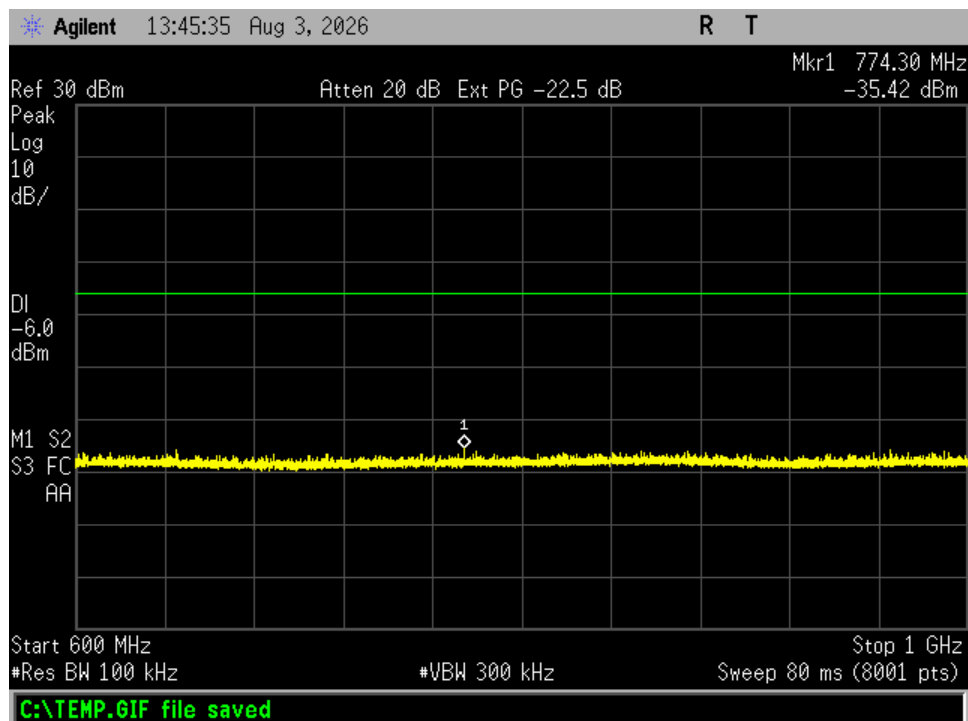


Figure 22. Antenna Conducted Emissions, Channel 26, 600-1000 MHz

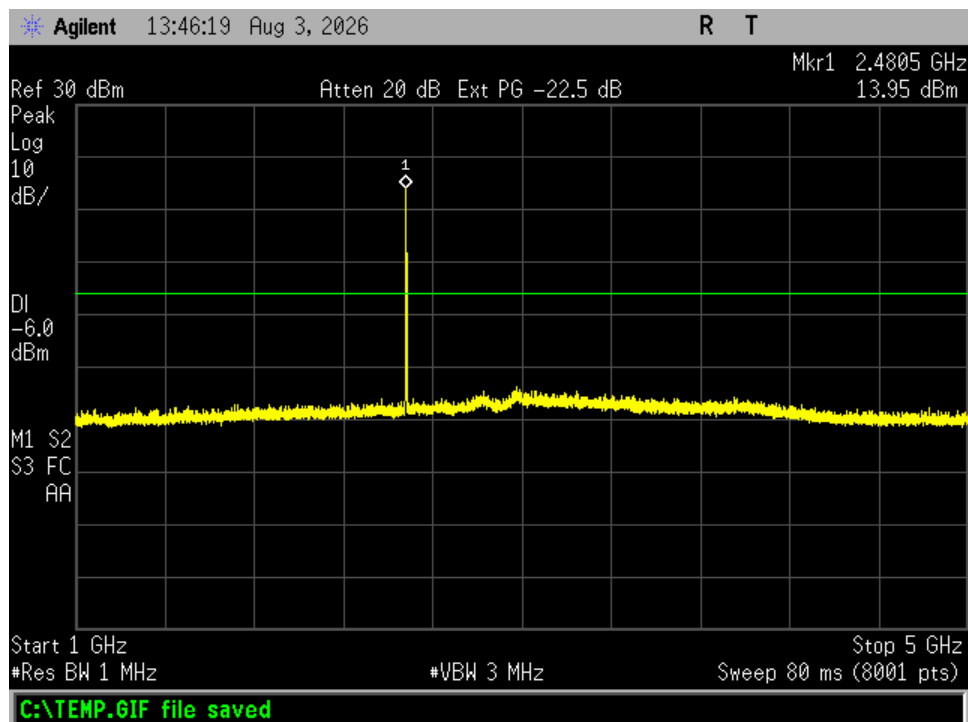


Figure 23. Antenna Conducted Emissions, Channel 26, 1 – 5 GHz

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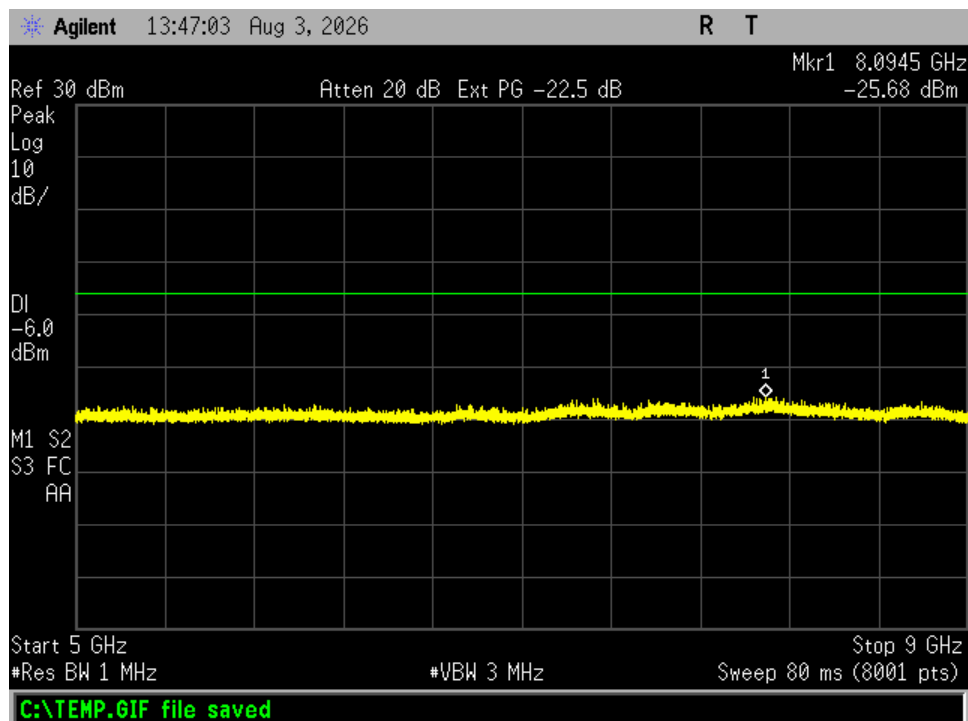


Figure 24. Antenna Conducted Emissions, Channel 26, 5 – 9 GHz

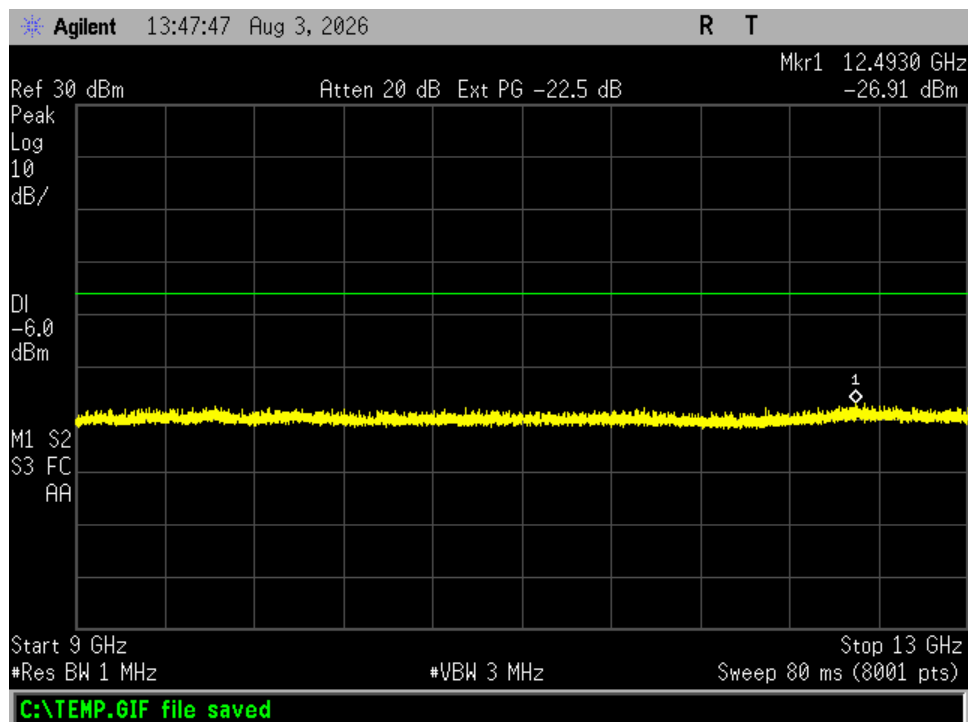


Figure 25. Antenna Conducted Emissions, Channel 26, 9 – 13 GHz

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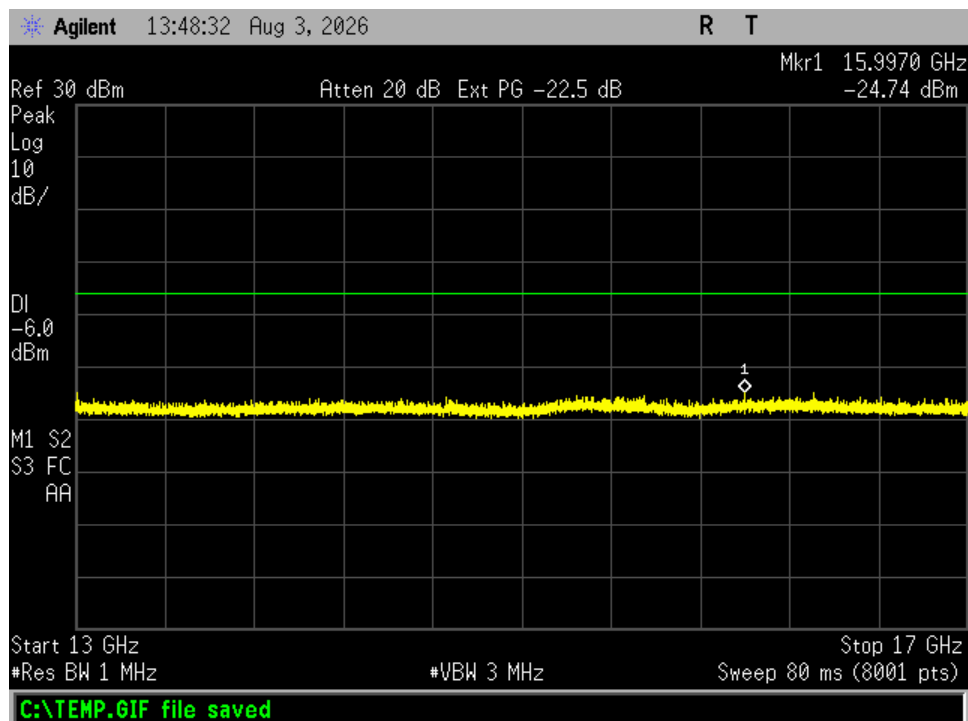


Figure 26. Antenna Conducted Emissions, Channel 26, 13 – 17 GHz

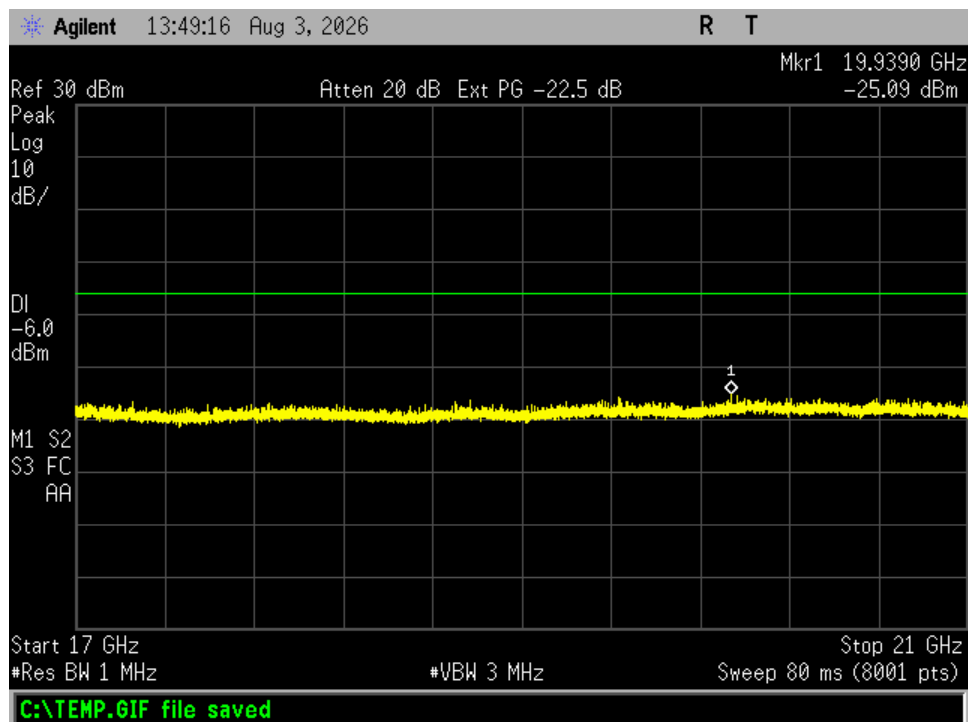


Figure 27. Antenna Conducted Emissions, Channel 26, 17 – 21 GHz

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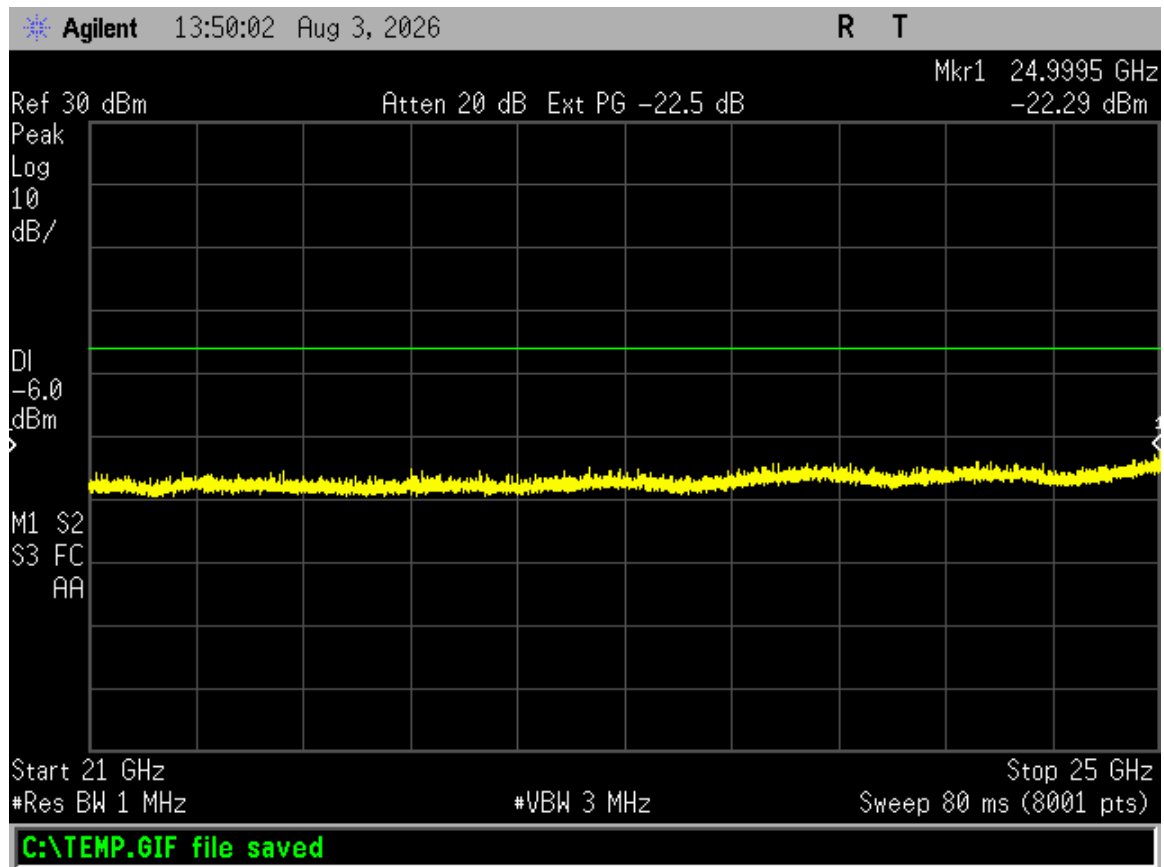


Figure 28. Antenna Conducted Emissions, Channel 26, 21 – 25 GHz

2.10. Intentional Radiator, Radiated Emissions (CFR 15.209, 15.247(d))

On the test site, the EUT was placed on top of a non-conductive table, 80 cm above the floor for measurements below 1 GHz and 150 cm above the floor for measurements > 1 GHz. The EUT was also evaluated in three orthogonal positions to determine the worst case position. The front of the EUT faced the measurement antenna located 3 meters away. Each signal measured was maximized by raising and lowering the receive antenna between 1 and 4 meters in height while monitoring the ever changing spectrum analyzer display (with channel A in the Clear-Write mode and channel B in the Max-Hold mode) for the largest signal visible. That exact antenna height where the signal was maximized was recorded for reproducibility purposes. Also, the EUT was rotated about its Y-axis while monitoring the Spectrum Analyzer display for maximum. The EUT azimuth was recorded for reproducibility purposes. The EUT was measured when both maxima were simultaneously satisfied.

For radiated measurements, the EUT was set into a continuous transmission mode. Below 1 GHz, the RBW of the measuring instrument was set equal to 120 kHz. Peak measurements above 1 GHz were measured using a RBW = 1 MHz, with a VBW $\geq$ RBW. The results of peak radiated spurious emissions falling within restricted bands are given in Table 6 below.

For Average measurements above 1 GHz, the emissions were measured using RBW = 1 MHz and VBW = 10 Hz or the duty cycle correction factor was applied to the Peak recorded value.

The test results for Antenna 1 testing is presented as the worst-case representative results for both Antenna 1 & 2. The EUT was programmed to output +15 dBm during testing. According to the Theory of Operation, Antenna 2 operation is limited to a maximum output of +0 dBm if enable. See Theory of Operation for details.

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Table 5. Peak Radiated Fundamental & Harmonic Emissions, Antenna 1

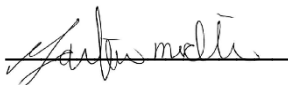
Test: FCC Part 15.247(d)							
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
Low Channel - PEAK							
2405.61	70.60	33.18	103.77	--	3m./VERT	--	PK
4803.45	44.32	4.32	48.64	74.0	3m./VERT	25.4	PK
7206.84	46.38	8.35	54.72	74.0	3m./VERT	19.3	PK
9609.87	37.31	9.36	46.67	74.0	3m./VERT	27.3	PK
12011.34	43.36	11.94	55.30	74.0	3m./VERT	18.7	PK
Mid Channel – PEAK							
2440.61	71.46	33.42	104.88	--	3m./VERT	--	PK
4880.83	38.23	3.35	41.58	74.0	3m./VERT	32.4	PK
7322.79	39.04	8.76	47.80	74.0	3m./VERT	26.2	PK
9758.45	36.82	8.83	45.65	74.0	3m./VERT	28.3	PK
12203.37	37.62	12.55	50.16	74.0	3m./VERT	23.8	PK
High Channel– PEAK							
2480.00	71.43	33.62	105.05	--	3m./VERT	--	PK
4961.16	45.59	4.35	49.94	74.0	3m./VERT	24.1	PK
7441.86	40.62	8.74	49.36	74.0	3m./VERT	24.6	PK
9917.31	38.66	8.47	47.13	74.0	3m./VERT	26.9	PK
12397.40	39.75	14.21	53.96	74.0	3m./VERT	20.0	PK

- (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209&15.247.
- No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
- The EUT was placed in three orthogonal positions, tested while broadcasting from each antenna, and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 2405.61 MHz:

Magnitude of Measured Frequency	70.60	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	33.18	dB/m
Corrected Result	103.77	dBuV/m

Test Date: June 25, 2026

Tested By
 Signature: 

Name: Gabriel Medina

US Tech Test Report:
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 Issue Date:
 Customer:
 Model:

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Table 6. Average Radiated Fundamental & Harmonic Emissions, Antenna 1

Test: FCC Part 15.247(d)							
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
Low Channel - Average							
2405.61	66.06	33.18	99.24	--	3m./VERT	--	AVG
4803.45	42.79	4.32	47.11	54.0	3m./VERT	6.9	AVG
7206.84	38.70	8.35	47.05	54.0	3m./VERT	6.9	AVG
9609.87	34.14	9.36	43.50	54.0	3m./VERT	10.5	AVG
12011.34	35.67	11.94	47.61	54.0	3m./VERT	6.4	AVG
Mid Channel-Average							
2440.61	66.95	33.42	100.37	--	3m./VERT	--	AVG
4880.83	42.37	3.35	45.73	54.0	3m./VERT	8.3	AVG
7322.79	34.55	8.76	43.31	54.0	3m./VERT	10.7	AVG
9758.45	34.93	8.83	43.76	54.0	3m./VERT	10.2	AVG
12203.37	31.43	12.55	43.98	54.0	3m./VERT	10.0	AVG
High Channel-Average							
2480.00	67.21	33.62	100.83	--	3m./VERT	--	AVG
4961.16	36.14	4.35	40.49	54.0	3m./VERT	13.5	AVG
7441.86	27.55	8.74	36.29	54.0	3m./VERT	17.7	AVG
9917.31	24.99	8.47	33.46	54.0	3m./VERT	20.5	AVG
12397.40	27.28	14.21	41.49	54.0	3m./VERT	12.5	AVG

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209&15.247.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. The EUT was placed in three orthogonal positions, tested while broadcasting from each antenna, and the transmitter was in constant broadcast mode, with a duty cycle of greater than 98%. The emissions were measured with the receive antenna in vertical and horizontal polarizations. The data listed in the above table was worst case.

Sample Calculation at 2405.61 MHz:

Magnitude of Measured Frequency	66.06	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	33.18	dB/m
Corrected Result	99.24	dBuV/m

Test Date: June 25, 2026

Tested By
 Signature: 

Name: Gabriel Medina

US Tech Test Report:
FCC ID:
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Customer:
Model:

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2.11. Band Edge Measurements (CFR 15.247(d))

Band Edge measurements are made following the guidelines in ANSI C63.10:2020 Clause 6.10 with the EUT initially operating on the Lowest Channel and then operating on the Highest Channel within its band of operation. Restricted band and band edge test is performed as radiated measurements. The test instrument used for testing has both Peak and Average detection. In consideration of Clause 5.8 of ANSI C63.10:2020, the EUT antenna is connected to its antenna port during testing. The EUT was set to its highest rated output power level during testing. The results are collected and presented below.

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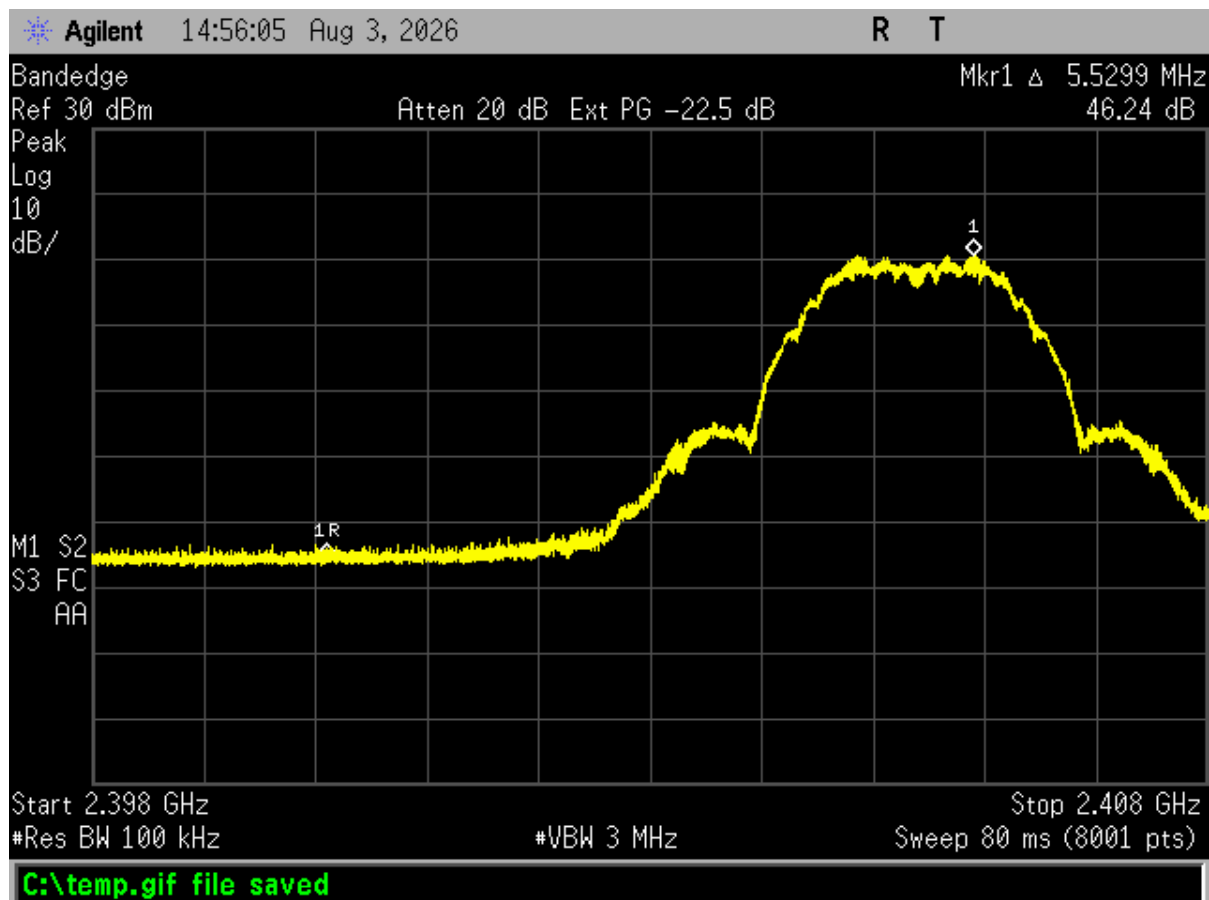


Figure 29. Band Edge Compliance – Low Channel Delta, Antenna 1- Peak

Lower band edge must be 20 dB below the fundamental. This requirement is met.

Measured Result	46.24	dB
Band Edge Limit	20.00	dB
Band Edge Margin	26.24	dB

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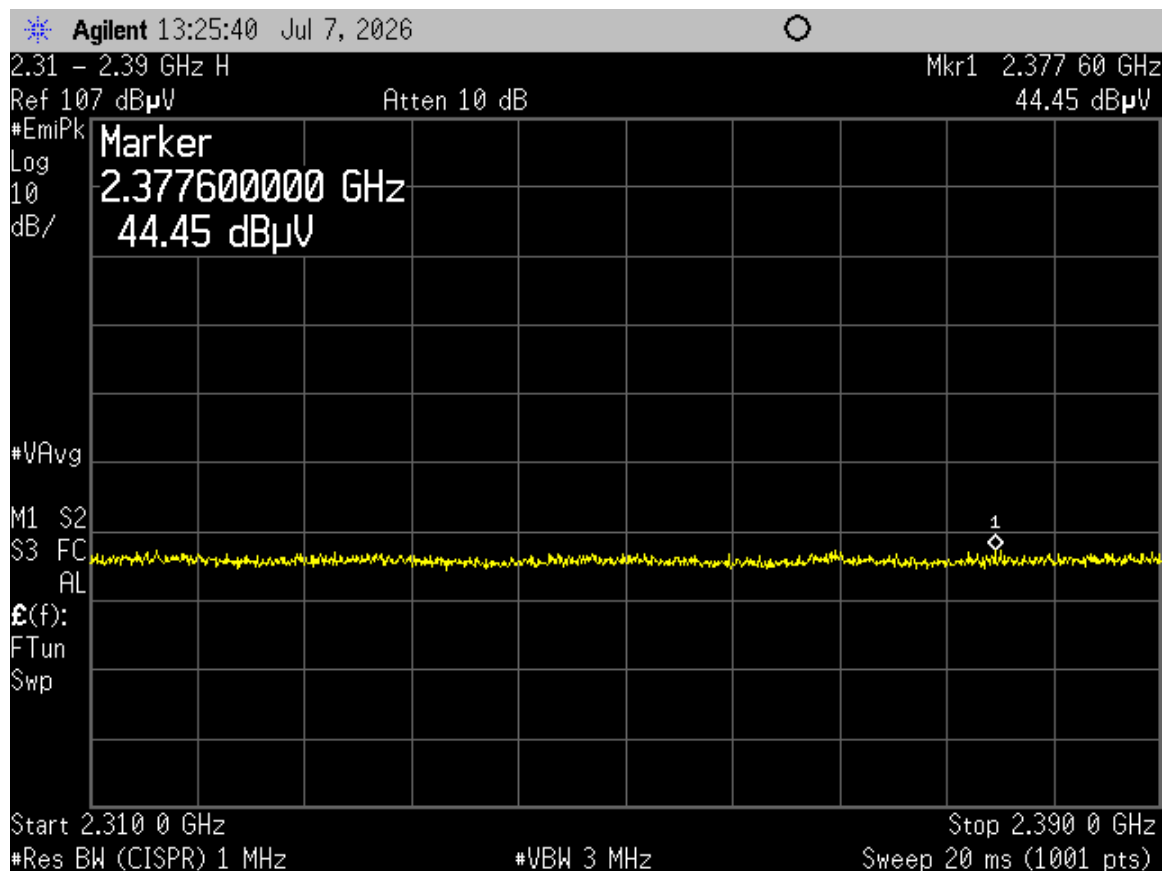


Figure 30. Low Channel Restricted Band Antenna 1 - Peak

Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
2377.60	44.45	3.48	47.93	54.0	3m./HORZ	6.1	PK

Note: Peak detection meets AVG limit.

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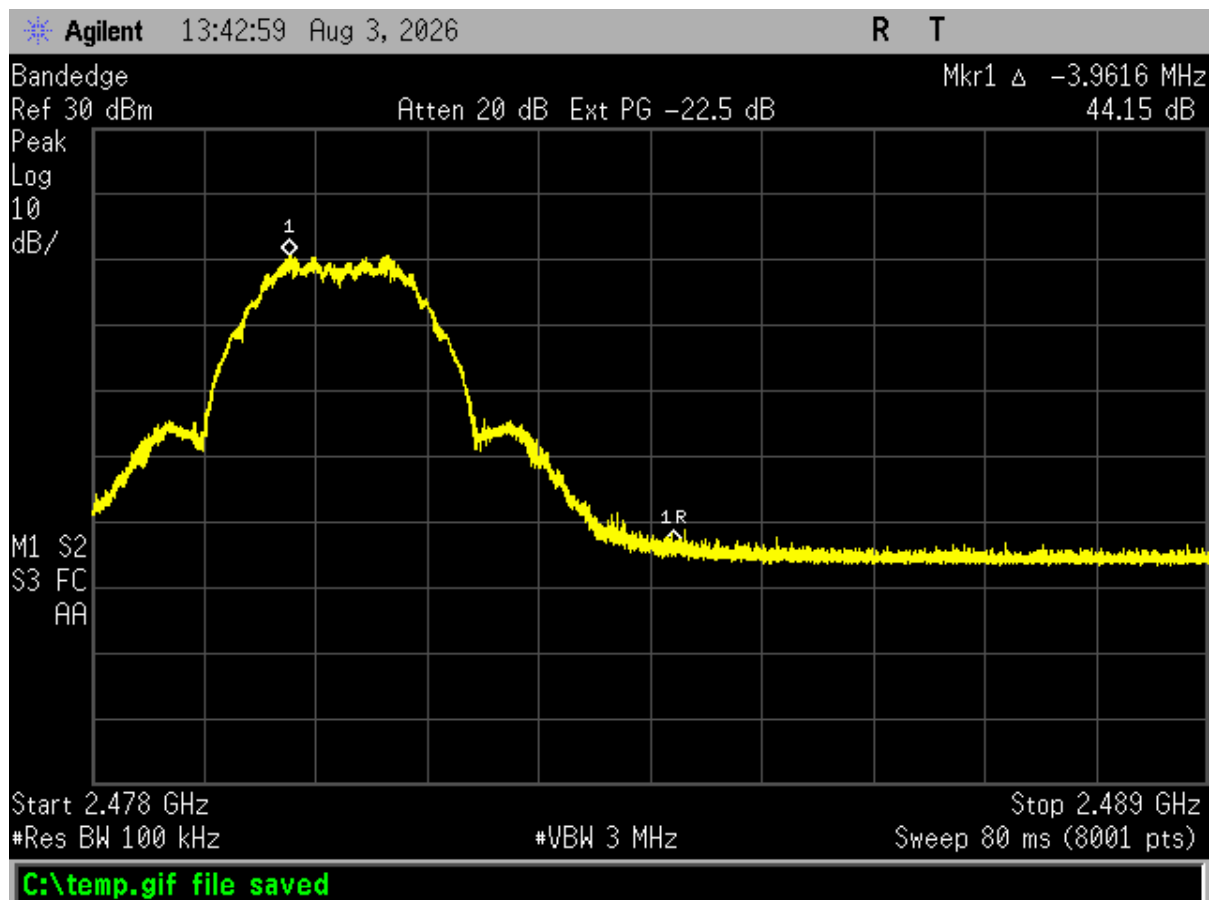


Figure 31. Band Edge Compliance – High Channel Delta - Peak

Higher band edge must be 20 dB below the fundamental. This requirement is met.

Measured Result	44.15	dB
Band Edge Limit	20.00	dB
Band Edge Margin	24.15	dB

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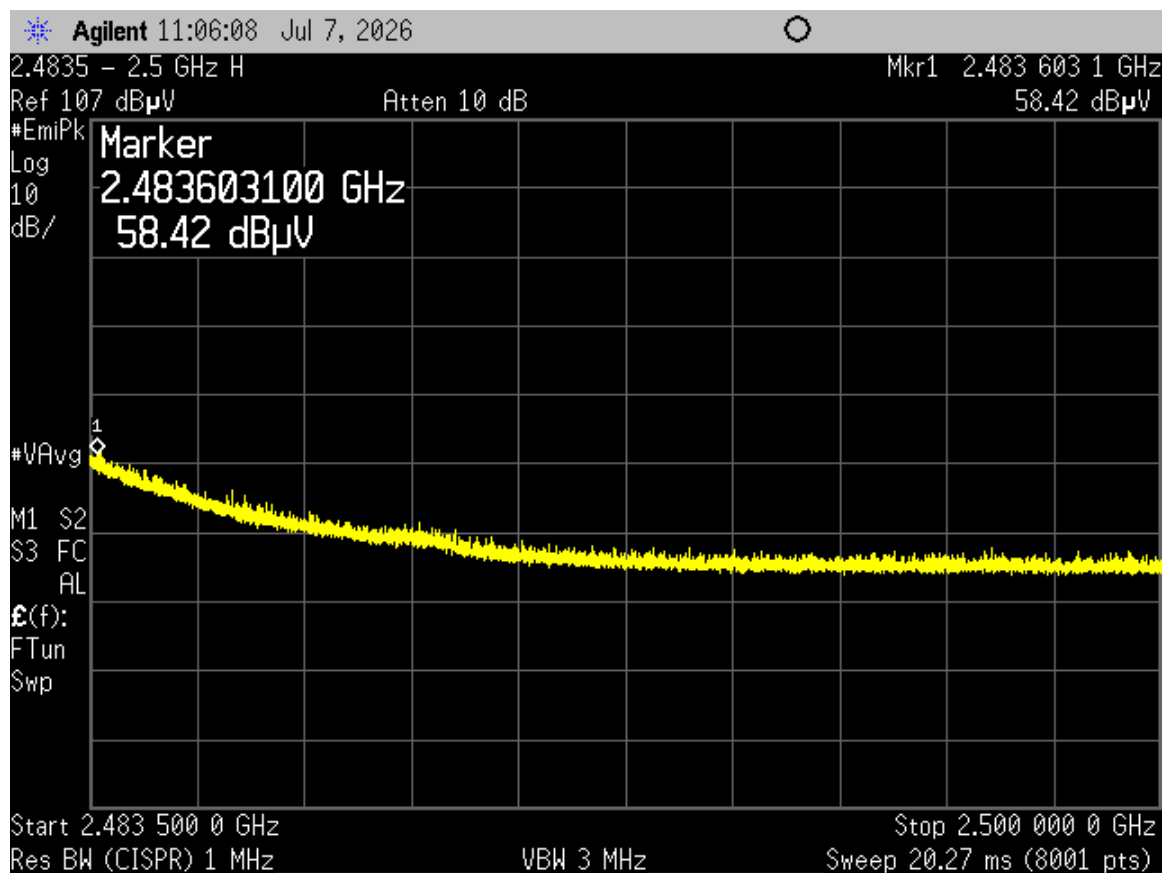


Figure 32. High Channel Restricted Band, Antenna 1 – Peak

Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
2483.60	58.42	4.26	62.68	74.0	3m./HORZ	11.3	PK

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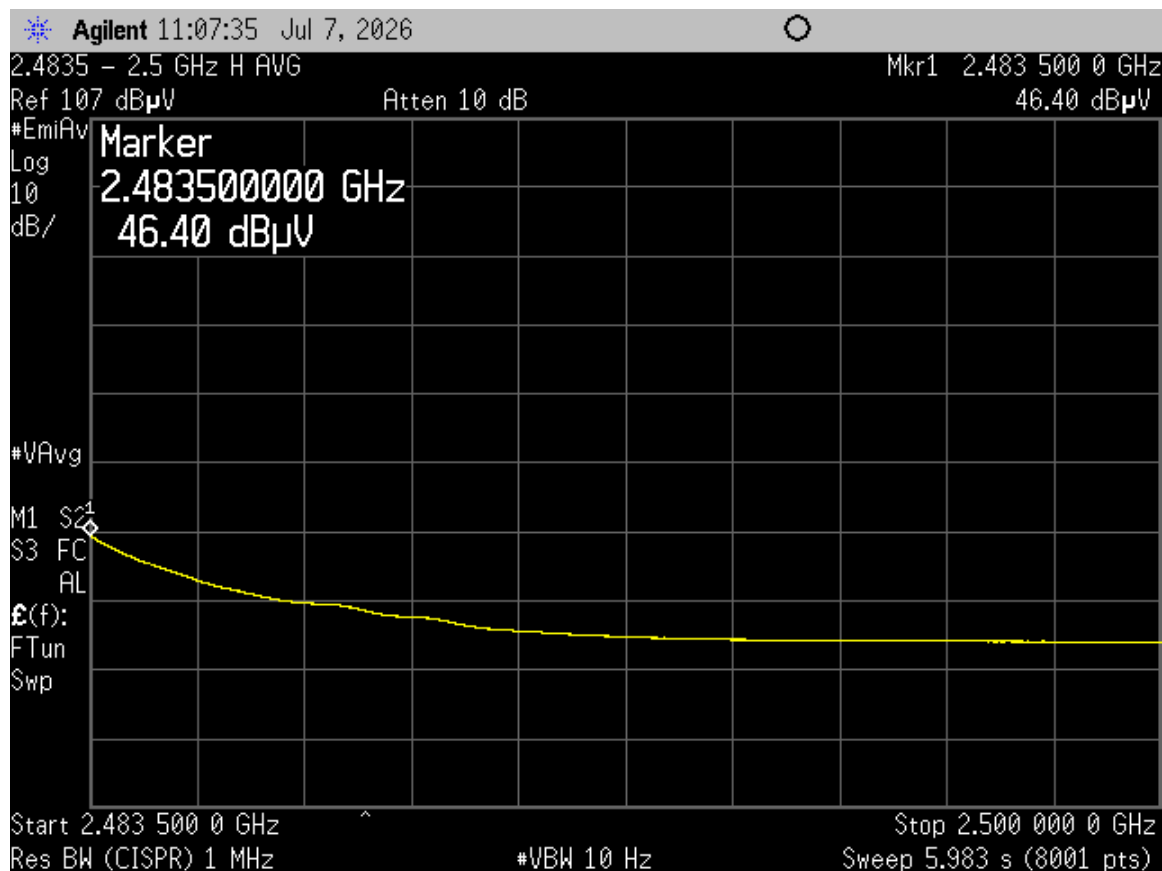


Figure 33. High Channel Restricted Band, Antenna 1 – Average

Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB/m)	Corrected Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector
2483.5	46.40	4.26	50.66	54.0	3m./HORZ	3.3	AVG

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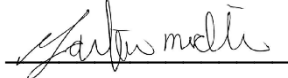
2.12. Six (6) dB Bandwidth (CFR 15.247(a)(2))

The EUT antenna port was connected to a spectrum analyzer having a 50 Ω input impedance. Measurements were performed per ANSI C63.10:2020, clause 11.8. The RBW was set to 100 kHz and the VBW $\geq$ RBW. The results of this test are given in the table below and figures below.

Table 7. Six (6) dB Bandwidth

Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum FCC Bandwidth (MHz)
2404	1.65	0.5
2440	1.66	0.5
2480	1.64	0.5

Test Date: August 3, 2026

Tested By
Signature: 

Name: Gabriel Medina

US Tech Test Report:
FCC ID:
Test Report Number:
Issue Date:
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Model:

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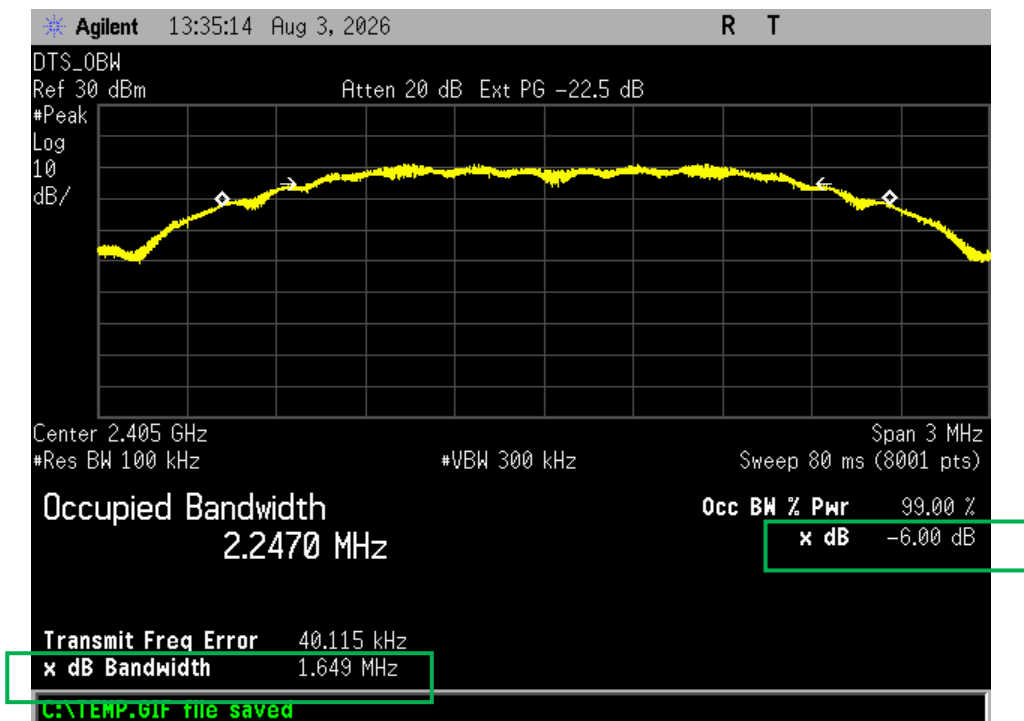


Figure 34. 6 dB Bandwidth Low Channel

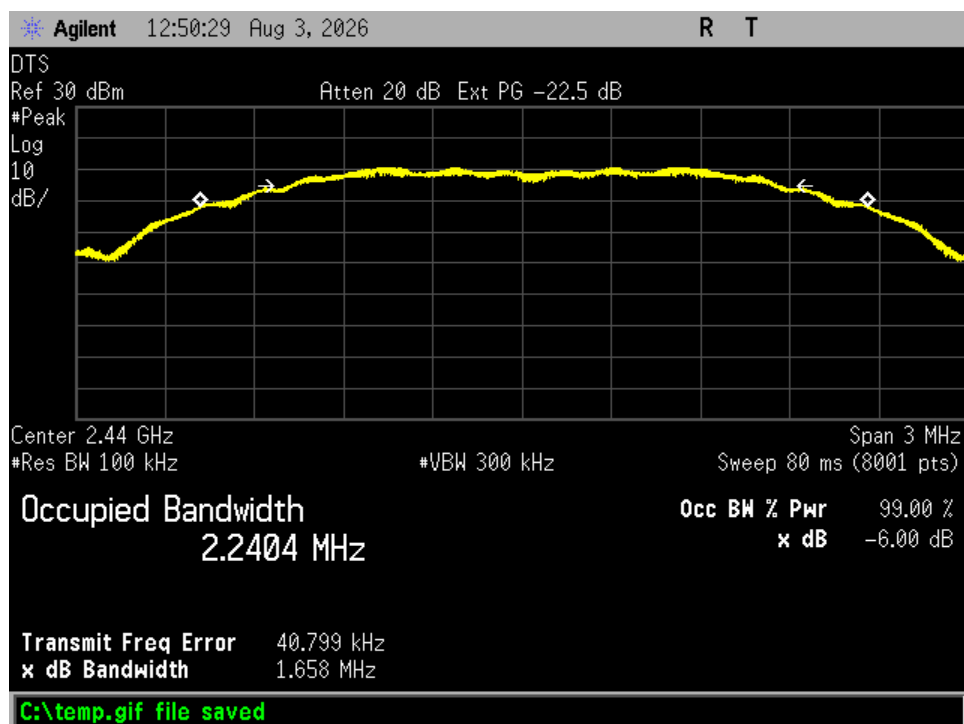


Figure 35. 6 dB Bandwidth Mid Channel

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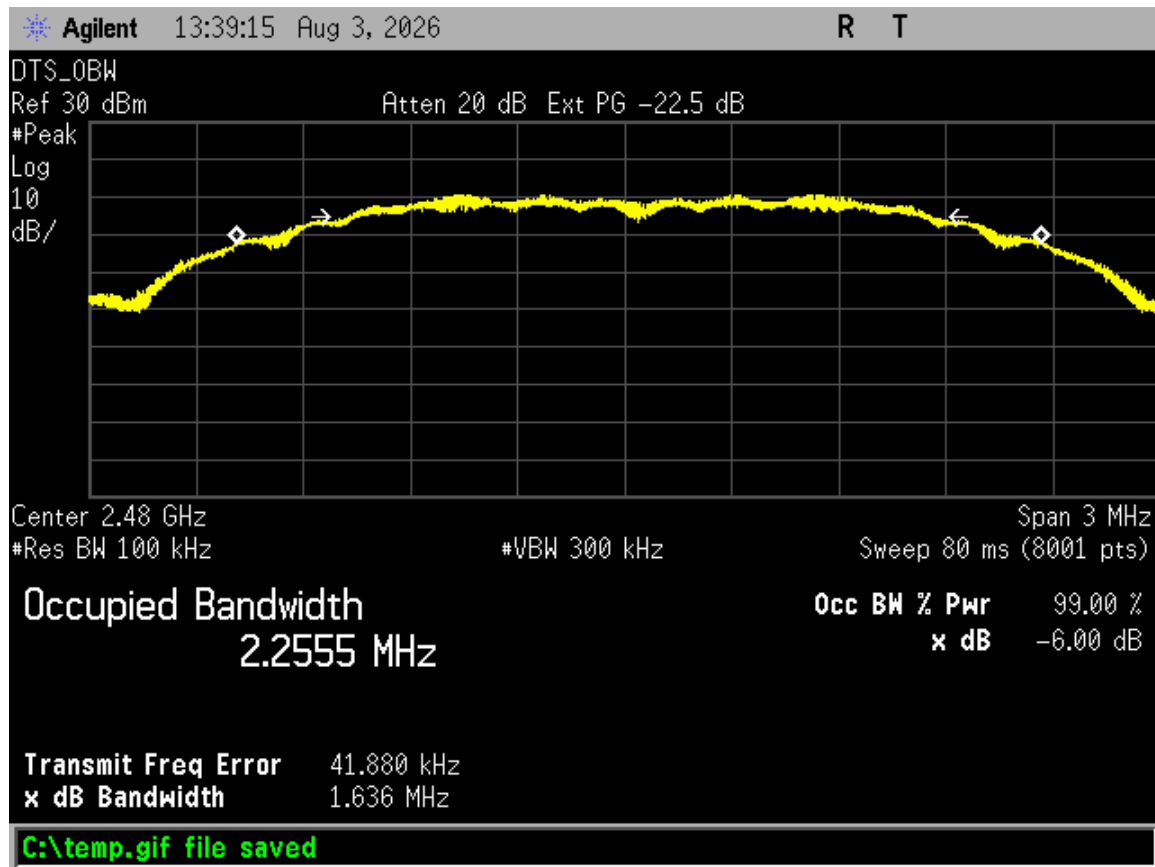


Figure 36. 6 dB Bandwidth High Channel

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2.13. Maximum Peak Conducted Output Power (CFR 15.247 (b) (3))

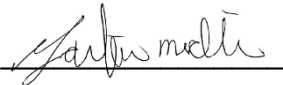
The transmitter was programmed to operate at a maximum output power across the bandwidth.

Peak power within the band 2400 MHz to 2483.5 MHz was measured per ANSI C63.10-2020 as an Antenna Conducted test with a spectrum analyzer by connecting the spectrum analyzer directly, via a short RF cable, and attenuators to the antenna output terminals on the EUT. The spectrum analyzer was set to a RBW of 1% to 5% of the OBW, and the VBW $\geq$ RBW. The integration method was used. Average antenna conducted output power is tabulated in the table below.

Table 8. Peak Antenna Conducted Output Power per Part 15.247 (b)(3)

Frequency of Fundamental (MHz)	Raw Test Data dBm	Converted Data (mW)	FCC (mW Maximum)
2402	14.22	26.42	1000
2450	14.32	27.04	1000
2480	14.06	25.47	1000

Test Date: August 3, 2026

Tested By
Signature: 

Name: Gabriel Medina

US Tech Test Report:
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Test Report Number:
Issue Date:
Customer:
Model:

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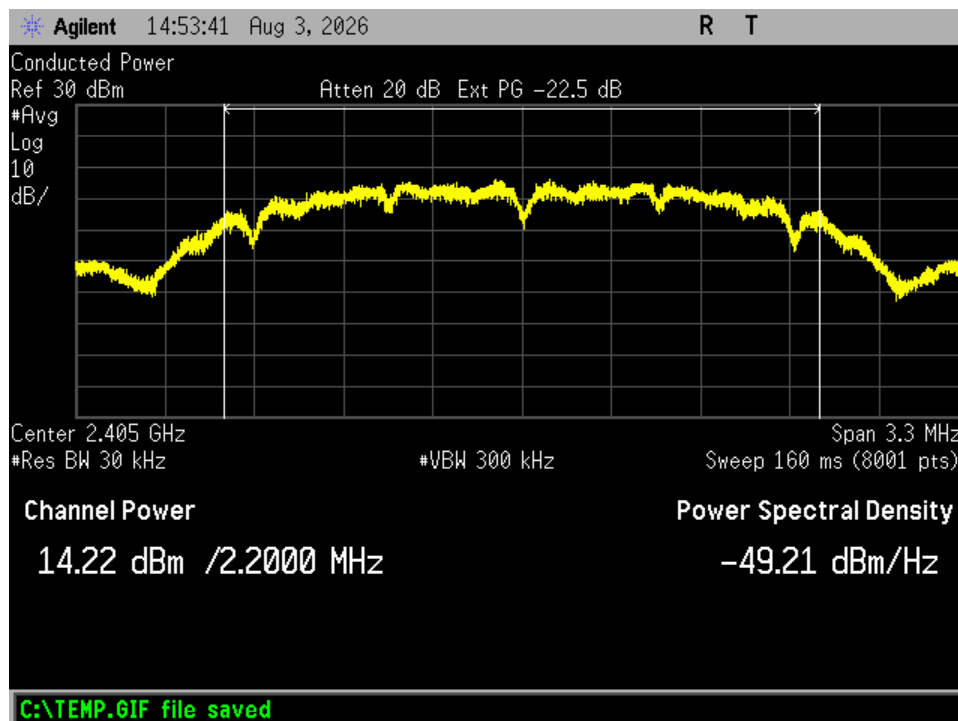


Figure 37. Peak Antenna Conducted Output Power, Low Channel

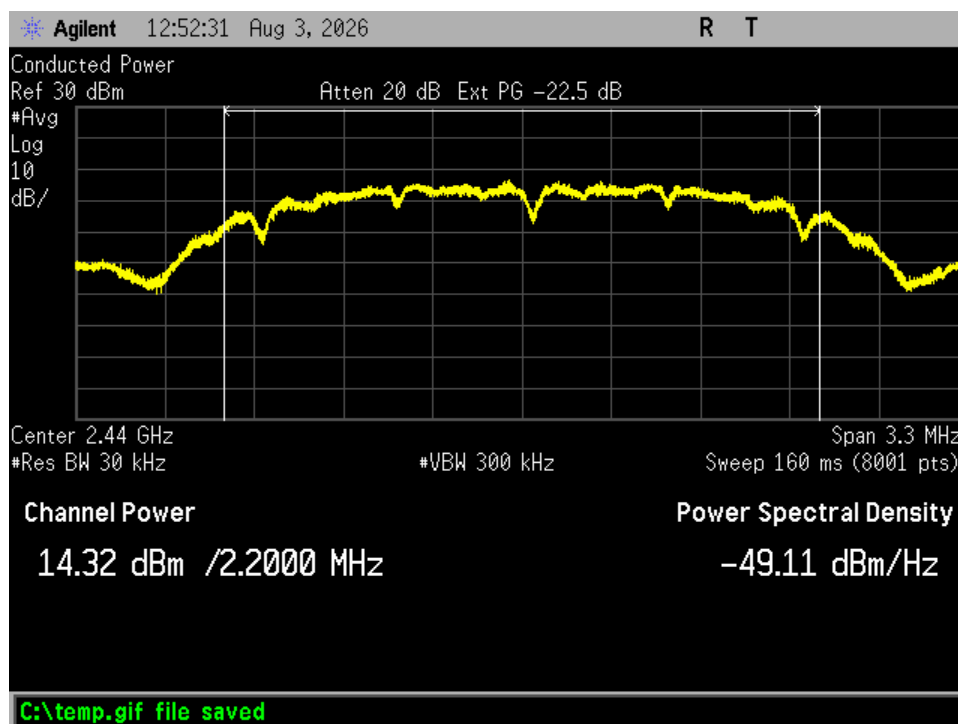


Figure 38. Peak Antenna Conducted Output Power, Mid Channel

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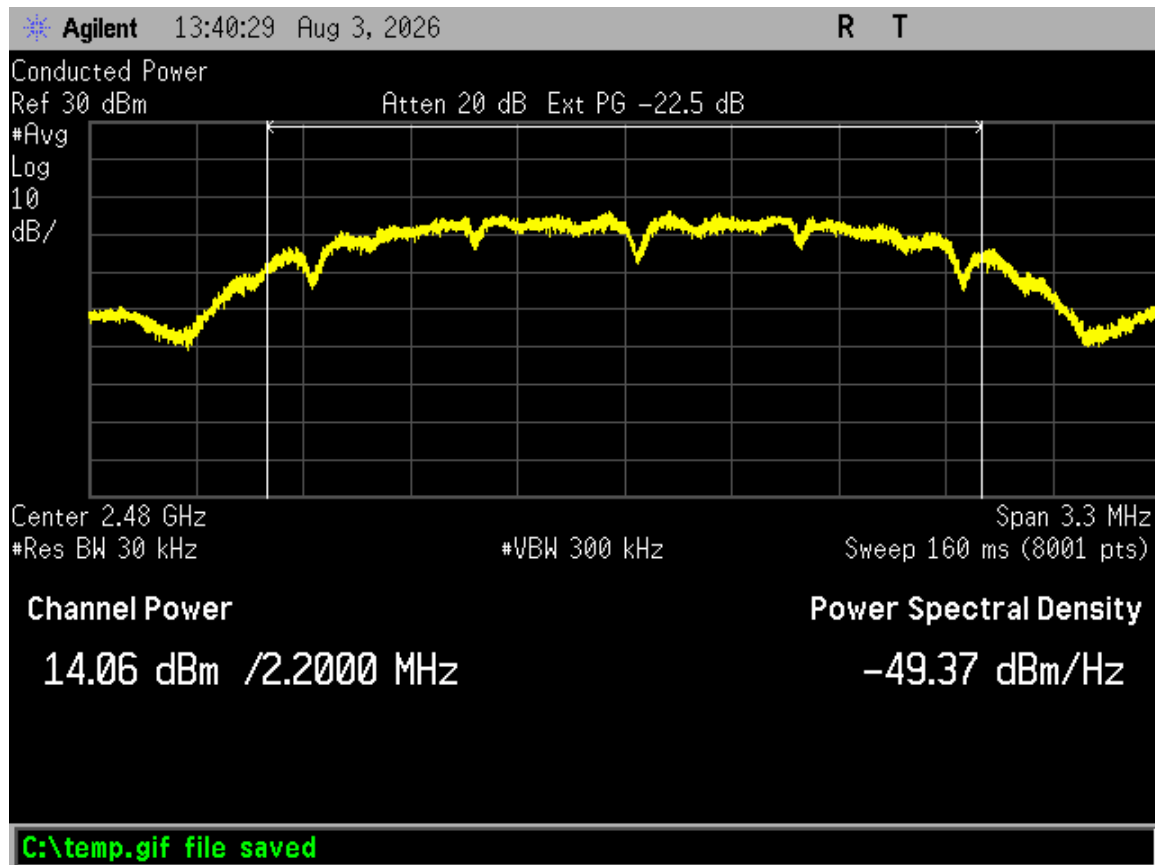


Figure 39. Peak Antenna Conducted Output Power, High Channel

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2.14. Power Spectral Density (CFR 15.247(e))

The transmitter was placed into a continuous mode of operation at all applicable frequencies. The measurements were performed per the procedures of ANSI C63.10:2020 clause 11.10. The RBW was set to 3 kHz and the Video Bandwidth was set to $\geq$ RBW. The trace capture time was set to (Span/3 kHz).

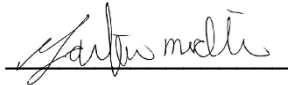
In accordance with 15.247 (e), the power spectral density shall be no greater than +8 dBm per any 3 kHz band.

Results are shown in the table below and figures below. All are less than +8 dBm per 3 kHz band. See figures below.

Table 9. Power Spectral Density for Low, Mid and High Bands

Frequency (MHz)	Measured Result (dBm/3kHz)	FCC and IC Limit (dBm/3 kHz)
2402	-0.63	+8.0
2450	-0.22	+8.0
2480	-1.01	+8.0

Test Date: August 3, 2026

Tested By
Signature: 

Name: Gabriel Medina

US Tech Test Report:
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Figure 40. Power Spectral Density, Low Channel



Figure 41. Power Spectral Density, Mid Channel

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Figure 42. Power Spectral Density, High Channel

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2.15. Intentional Radiator Power Lines Conducted Emissions (CFR 15.207)

The power line conducted voltage emission measurements have been carried out in accordance with CFR 15.207, per ANSI C63.10:2020, Clause 6.2, with a spectrum analyzer connected to an LISN and the EUT placed into a continuous mode of transmission.

The worst-case results for conducted emissions were determined to be produced when the EUT was operating under continuous transmission. The worst-case measurement occurred on the Neutral line at 0.4760 MHz. The emission level was 7.5 dB from the applicable limit. All other emissions were at least 8.8 dB from the limit. Those results are given in Table 10

NOTE: The test data provided in this section is to support the Verification and co-location requirement for the digital apparatus and the radios within.

The radios were configured in the following setup as it produced the worst-case emissions 2.4 GHz radio set to +15 dBm on Antenna 1 and the BLE radio was set to +5 dBm Antenna 1. Both radio in a continuous transmit with a duty cycle >98%

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Table 10. Power Line Conducted Emissions

Test: FCC Part 15.207						
Frequency (MHz)	Test Data (dBμV)	LISN+CL-PA (dB)	Results (dBμV)	AVG Limits (dBμV)	Margin (dB)	Detector PK, QP, or AVG
120 VAC, 60 Hz Phase						
0.288	35.48	0.31	35.79	50.6	14.8	PK
0.499	37.01	0.19	37.21	46.0	8.8	PK
0.741	42.10	0.17	42.27	56.0*	13.7	PK
0.741	32.99	0.17	33.16	46.0	12.8	AVG
1.17	33.38	0.21	33.59	46.0	12.4	PK
5.36	33.56	0.42	33.98	50.0	16.0	PK
9.77	32.70	0.81	33.51	50.0	16.5	PK
13.06	31.54	1.24	32.78	50.0	17.2	PK
16.79	29.29	1.55	30.84	50.0	19.2	PK
20.02	29.91	1.97	31.88	50.0	18.1	PK
24.87	30.38	2.62	33.00	50.0	17.0	PK
29.91	29.95	3.43	33.38	50.0	16.6	PK
120VAC, 60 Hz Neutral						
0.290	36.18	0.58	36.76	50.5	13.8	PK
0.476	38.46	0.46	38.92	46.4	7.5	PK
0.723	43.60	0.43	44.03	56.0*	12.0	PK
0.723	30.05	0.43	30.48	46.0	15.5	AVG
1.09	34.00	0.45	34.44	46.0	11.6	PK
3.06	33.63	0.50	34.14	46.0	11.9	PK
7.91	32.62	0.80	33.42	50.0	16.6	PK
10.32	33.07	0.98	34.05	50.0	16.0	PK
18.32	29.37	1.73	31.10	50.0	18.9	PK
21.97	29.67	2.16	31.83	50.0	18.2	PK
26.23	29.18	2.68	31.86	50.0	18.1	PK

Note: (*) Indicates that the limit used is Quasi-Peak (QP)

Sample Calculation at 0.2878 MHz:

Formula: $|M| + CF = CR$

$|M|$ = Magnitude of Measured Frequency [dBμV]

CF = Correction Factors [dB]

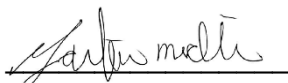
CR = Corrected Results [dBμV]

Calculation:

$$35.48\text{dB}\mu\text{V} - 0.31\text{ dB}/m = 35.79\text{ dB}\mu\text{V}$$

Test Date: August 6, 2026

Tested By

Signature: 

Name: Gabriel Medina

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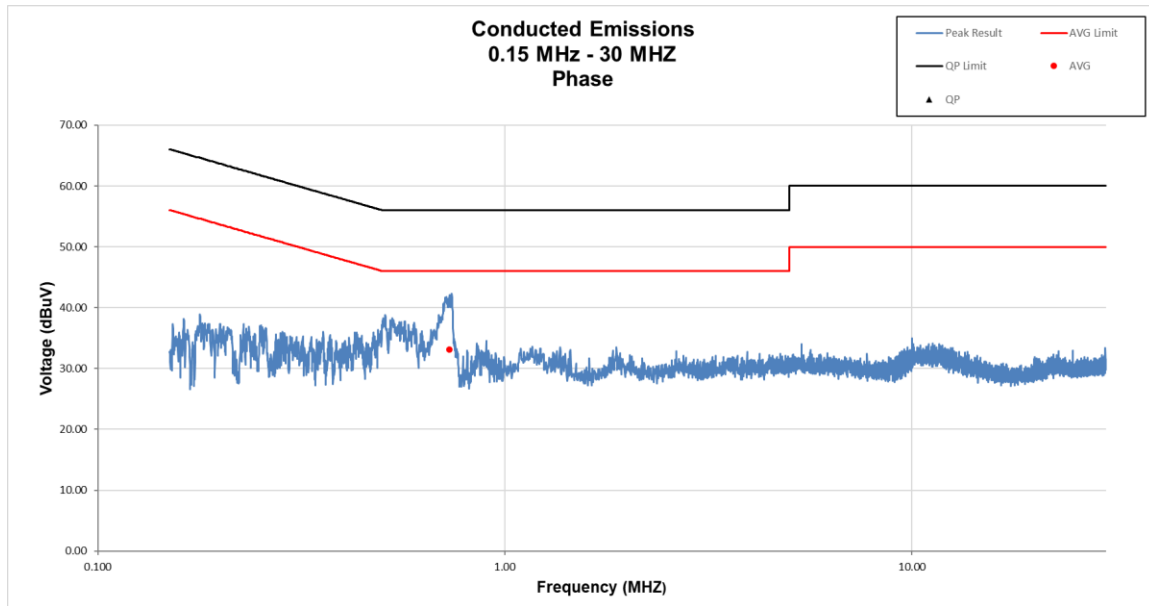


Figure 43. Conducted Emissions, Phase

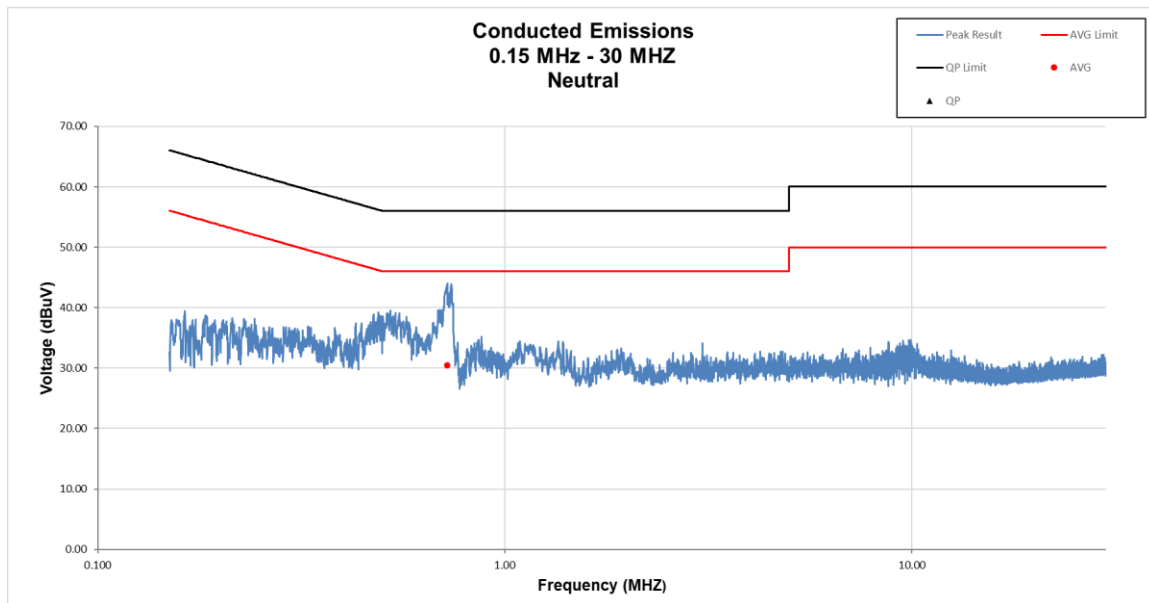


Figure 44. Conducted Emissions, Neutral

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2.16. Intentional Radiator, Radiated Emissions (CFR 15.209)

The test data provided herein is to support the verification requirement for radiated emissions coming for the EUT in a transmitting state per 15.209 and were investigated from 9kHz or the lowest operating clock frequency to 25 GHz and tested as detailed in ANSI C63.10:2020, Clause 6.4-6.6.

Radiated emissions within the band of 9 kHz to 30 MHz were investigated using a calibrated Loop Antenna and per the requirements of ANSI C63.10:2020.

Measurements were made with the analyzer's resolution bandwidth set to 120 kHz for measurements made below 1 GHz and 1 MHz for measurements made above 1 GHz. The video bandwidth was set to three times the resolution bandwidth; 1 MHz RBW and 3 MHz VBW. The test data were maximized for magnitude by rotating the turn-table through 360 degrees and raising and lowering the receiving antenna between 1 to 4 meters in height as a part of the measurement procedure.

NOTE: The test data provided in this section is to support the Verification and co-location requirement for the digital apparatus and the radios within.

The radios were configured in the following setup as it produced the worst-case emissions 2.4 GHz radio set to +15 dBm on Antenna 1 and the BLE radio was set to +5dBm Antenna 1. Both radio in a continuous transmit with a duty cycle >98%

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2.16.1. Intentional Radiated Emissions

Table 11. Spurious Radiated Emissions (150 kHz-30MHz)

Test: FCC Part 15.209							
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP/AVG
All emissions were more than 20 dB below the applicable limit.							

Sample Calculation: N/A

Test Date: July 29, 2026

Tested By

Signature: 

Name: Gabriel Medina

US Tech Test Report:
FCC ID:
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The worst-case radiated emission in the range of 30 MHz to 1 GHz was 2.3 dB below the limit at 175.60 MHz. This signal is found below. All other radiated emissions were 2.4 dB or more below the limit.

Table 12. Spurious Radiated Emissions (30 MHz – 1 GHz)

Test: FCC Part 15.209							
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP/AVG
147.24	42.25	-10.64	31.60	43.5	3m./HORZ	11.9	QP
175.62	47.18	-9.38	37.80	43.5	3m./HORZ	5.7	QP
179.78	46.79	-9.09	37.70	43.5	3m./HORZ	5.8	QP
191.03	45.80	-8.01	37.79	43.5	3m./HORZ	5.7	QP
197.24	44.34	-7.60	36.74	43.5	3m./HORZ	6.8	QP
199.43	46.41	-7.58	38.83	43.5	3m./HORZ	4.7	QP
201.76	48.02	-11.01	37.01	43.5	3m./HORZ	6.5	QP
209.94	46.66	-11.40	35.26	43.5	3m./HORZ	8.2	QP
252.35	49.71	-10.45	39.26	46.0	3m./HORZ	6.7	QP
259.76	43.87	-10.18	33.68	46.0	3m./HORZ	12.3	QP
322.27	45.58	-7.83	37.75	46.0	3m./HORZ	8.2	QP
328.99	44.30	-8.03	36.27	46.0	3m./HORZ	9.7	QP
395.96	43.62	-7.25	36.36	46.0	3m./HORZ	9.6	QP
404.32	42.89	-6.79	36.10	46.0	3m./HORZ	9.9	QP
412.26	42.50	-6.42	36.08	46.0	3m./HORZ	9.9	QP
422.52	41.62	-6.01	35.61	46.0	3m./HORZ	10.4	QP
156.00	48.39	-9.57	38.82	43.5	3m./VERT	4.7	QP
170.20	49.68	-8.83	40.85	43.5	3m./VERT	2.6	QP
175.60	49.54	-8.38	41.16	43.5	3m./VERT	2.3	QP
179.92	49.34	-8.19	41.15	43.5	3m./VERT	2.4	QP
189.94	44.01	-7.67	36.34	43.5	3m./VERT	7.2	QP
200.53	47.82	-11.11	36.70	43.5	3m./VERT	6.8	QP
210.04	45.17	-11.38	33.79	43.5	3m./VERT	9.7	QP
399.17	40.34	-7.30	33.04	46.0	3m./VERT	13.0	QP
423.62	41.13	-6.41	34.72	46.0	3m./VERT	11.3	QP

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Sample Calculation at 147.24 MHz:

Formula:

$$|M| + CF = CR$$

$|M|$ = *Magnitude of Measured Frequency* [dB μ V]

CF = *Correction Factors* [dB/m]

CR = *Corrected Results* [dB μ V]

Calculation:

$$42.25 \text{ dB}\mu\text{V} - 10.64 \text{ dB/m} = 31.60 \text{ dB}\mu\text{V}$$

Test Date: July 16-17, 2026

Tested By

Signature:



Name: Gabriel Medina

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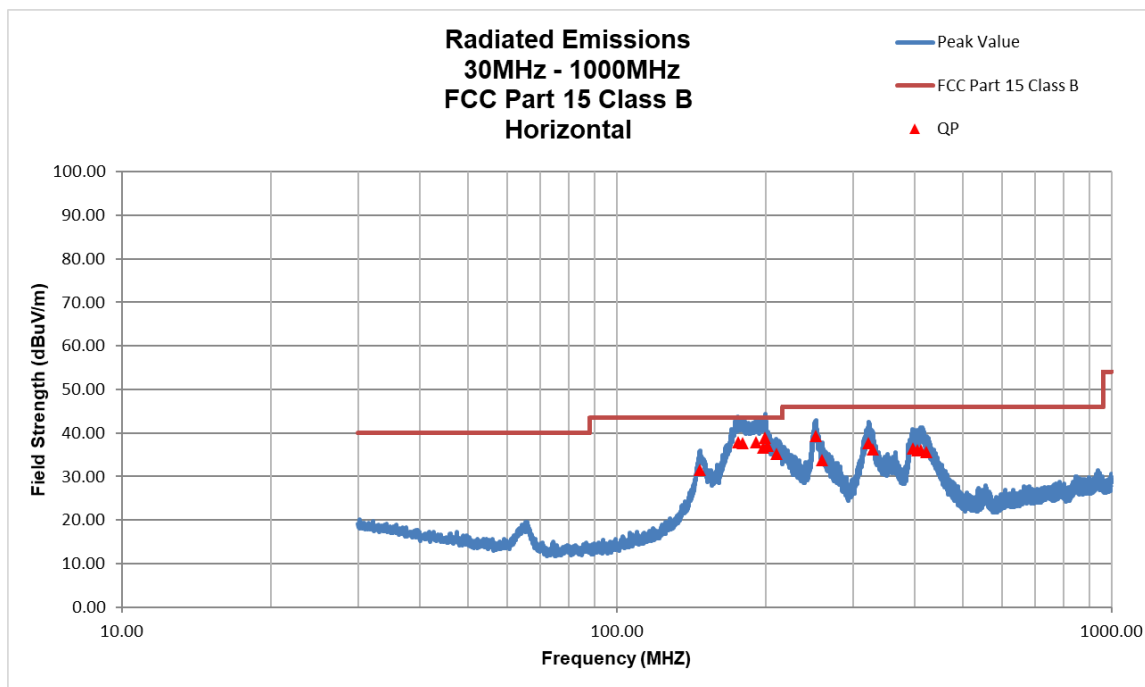


Figure 45. Radiated Spurious Emissions, 30 – 1000 MHz, Horizontal

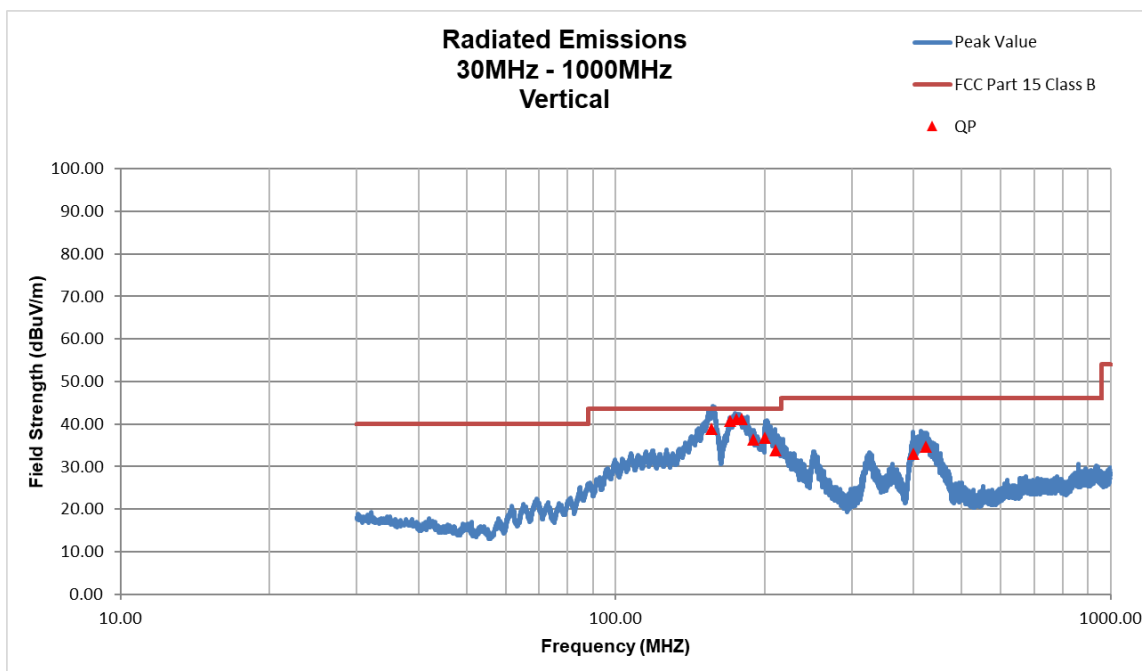


Figure 46. Radiated Spurious Emissions, 30 – 1000 MHz, Vertical

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Table 13. Spurious Radiated Emissions (1 GHz – 25 GHz)

Test: FCC Part 15.209							
Frequency (MHz)	Test Data (dBuV)	AF+CL-PA (dB)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	DETECTOR PK / QP/AVG
2323.97	53.58	-5.14	48.44	54.0	3m./HORZ	5.6	AVG
2559.10	48.48	-3.38	45.10	54.0	3m./HORZ	8.9	AVG
4803.58	42.72	2.07	44.79	54.0	3m./HORZ	9.2	PK
4961.07	44.40	2.46	46.86	54.0	3m./HORZ	7.1	PK
2323.93	51.50	-5.18	46.32	54.0	3m./VERT	7.7	AVG
2557.10	44.39	-3.25	41.14	54.0	3m./VERT	12.9	AVG
4804.05	39.80	2.08	41.89	54.0	3m./VERT	12.1	PK
4958.72	40.70	2.56	43.26	54.0	3m./VERT	10.7	PK
No Emissions were seen above 18 GHz.							

Sample Calculation at 2323.97 MHz:

Formula:

$$|M| + CF = CR$$

$|M|$ = *Magnitude of Measured Frequency* [dBμV]

CF = *Correction Factors* [dB/m]

CR = *Corrected Results* [dBμV]

Calculation:

$$53.58 \text{ dB}\mu\text{V} - 5.14 \text{ dB/m} = 48.44 \text{ dB}\mu\text{V}$$

Sample Calculation:

Test Date: July 16-17, 2026

Tested By

Signature: 

Name: Gabriel Medina

US Tech Test Report:
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Model:

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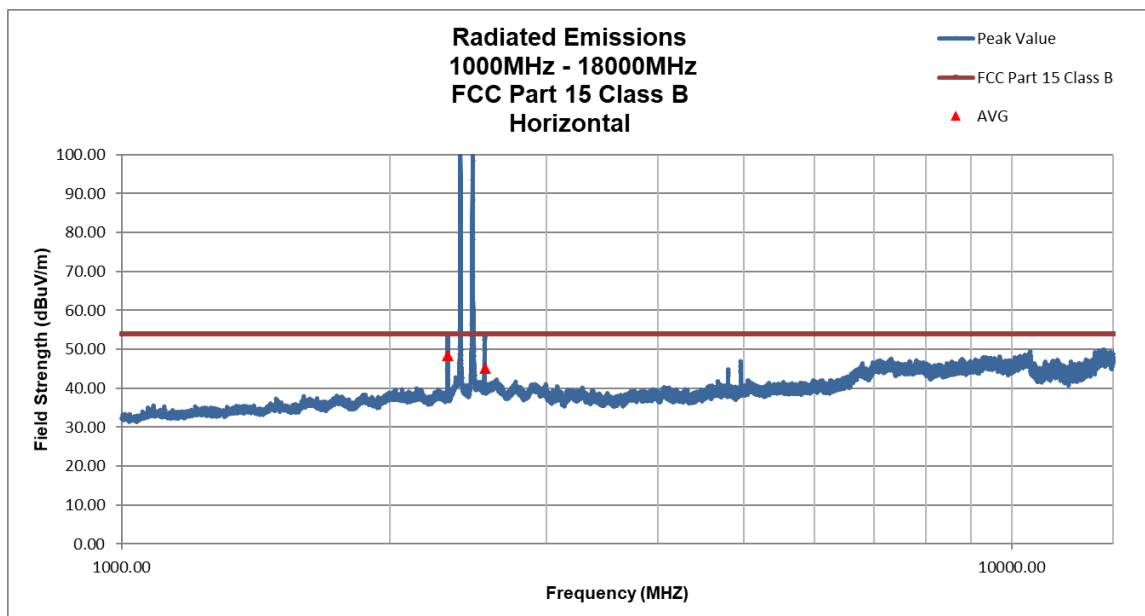


Figure 47. Radiated Spurious Emissions, 1 – 18 GHz, Horizontal

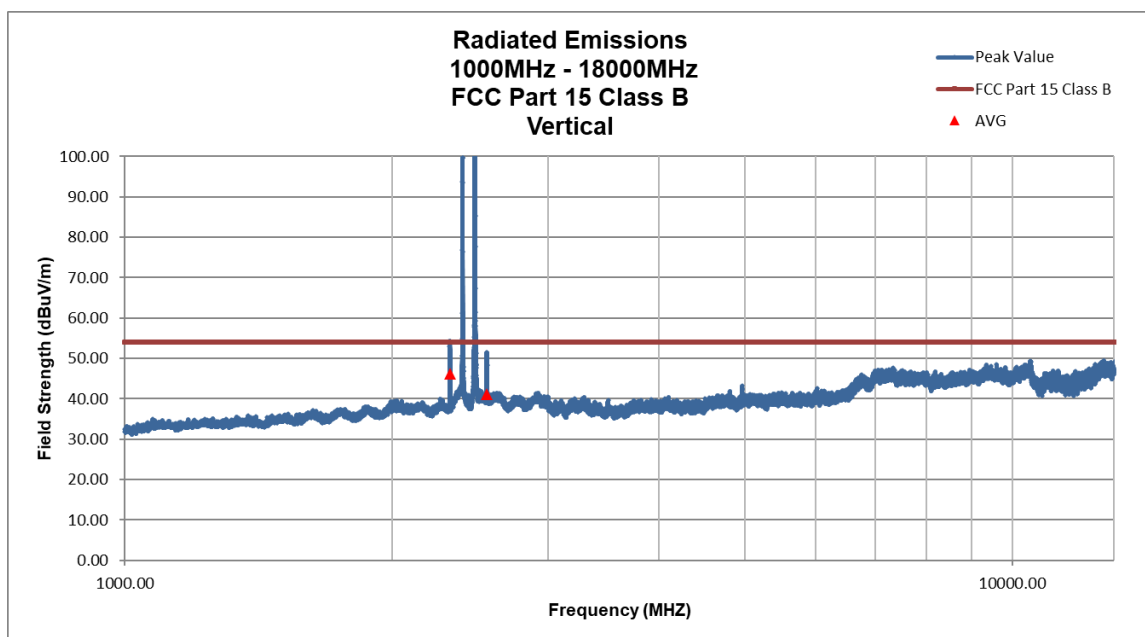


Figure 48. Radiated Spurious Emissions, 1 – 18 GHz, Vertical

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2.17. Measurement Uncertainty

The measurement uncertainties given were calculated using the method detailed in CISPR 16-4-2:2011. A coverage factor of $k=2$ was used to give a level of confidence of approximately 95%.

2.17.1. Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ± 2.85 dB.

2.17.2. Radiated Emissions Measurement Uncertainty

For a measurement distance of 3 m the measurement uncertainty (with a 95% confidence level) for this test using a Biconical Antenna (30 MHz to 200 MHz) is ± 5.2 dB. This value includes all elements of measurement.

The measurement uncertainty (with a 95% confidence level) for this test using a Log Periodic Antenna (200 MHz to 1000 MHz) is ± 5.2 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna is ± 5.2 dB.

3. Conclusions

The EUT is deemed to have met the requirements of the standards cited within the test report when tested as detailed in the present test report.