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 Intentional Radiator, paragraphs 15.207, 15.209 and 15.247 Operation within the bands 902–928 MHz, 2400–2483.5 MHz, and 5725–5850 MHz.

And

ISED Radio Standards Specification: RSS-Gen Issue 5 and RSS-247 Issue 3

For the

YARDARM TECHNOLOGIES, INC

Model: YHA-020

FCC ID: 2AJ3810242
IC: 22055-10242

UST Project: 24-0352
Issue Date: February 4, 2025

Total Pages in This Report: 72

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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: 

Title: Compliance Engineer – President

Date February 4, 2025

NVLAP LAB CODE 200162-0

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MEASUREMENT TECHNICAL REPORT

Company Name:	YARDARM TECHNOLOGIES, INC
Address:	1111 Alderman Dr. Suite 200 Alpharetta, GA 30005
Model:	YHA-020
FCC ID:	2AJ3810242
IC ID:	22055-10242
Date:	January 29, 2025

This report concerns (check one): Original grant [X]
Class II change

Equipment type: Bluetooth Low Energy (BLE)

FCC Rule	Description of Test	Result
15.247(b)(3)	Peak Output Power	PASS
15.247(a)(2)	6 dB Bandwidth	PASS
15.247(d)	Conducted & Radiated Spurious Emissions	PASS
15.247 (e)	Power Spectral Density	PASS
15.247(b)	Output power	PASS
15.209	Spurious Radiated Emissions	PASS
15.207	Power line Conducted Emissions	PASS

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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 the FCC Rules and Regulations Part 15, Section 247 and IC RSS 247 Issue 2.

1.2 Characterization of Test Sample

The sample used for testing was received by US Tech on December 11, 2024 in good operating condition.

1.3 Product Description

The Equipment under Test (EUT) is the YARDARM TECHNOLOGIES, INC model YHA-020. The YHA-020 is a smart device that is mounted on a pistol holster and reports or turns on the body camera of the law enforcement officer whenever the weapon is withdrawn from the holster. The reporting is done using Bluetooth technology. The EUT has a USB port mainly used for charging the internal rechargeable battery.

Radio Technology:	Bluetooth Low Energy
Frequency of Operation (MHz):	2402 MHz – 2480 MHz
Output Power (dBm):	+4 dBm
Type of Modulation:	GFSK
Data/Bit Rate (M)bps:	1 Mbps
Antenna Gain (dBi):	-2.6
Test Software version #:	1.02.00
EUT normal firmware:	0.0.23.2
Power setting:	+4 dBm

1.4 Configuration of Tested System

The Test Sample was tested per ANSI C63.10:2013, Methods of Measurement of Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz for FCC subpart A Digital equipment Verification requirements and per ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices for FCC subpart C Intentional Radiators.

A list of EUT and Peripherals is found in Table 1 below. A block diagram of the tested system is shown in Figure 1. Test configuration photographs 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 (ISED), and has been approved under file number 9900A-1.

1.6 Related Submittals

1.6.1 The EUT is subject to the following FCC authorizations:

a) Certification under section 15.247 as a transmitter.
b) Verification under 15.101 as a digital device and receiver.

1.6.2 Verification of the Digital apparatus

The EUT has been verified to Part 15 Subpart B requirements in a separate test report.

Table 1. EUT and Peripherals

PERIPHERAL MANUFACTURER.	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
EUT/ YARDARM TECHNOLOGIES, INC.	YHA-020	Engineering Sample	Pending: FCC ID: 2AJ3810242 Pending IC: 22055-10242	N/A

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

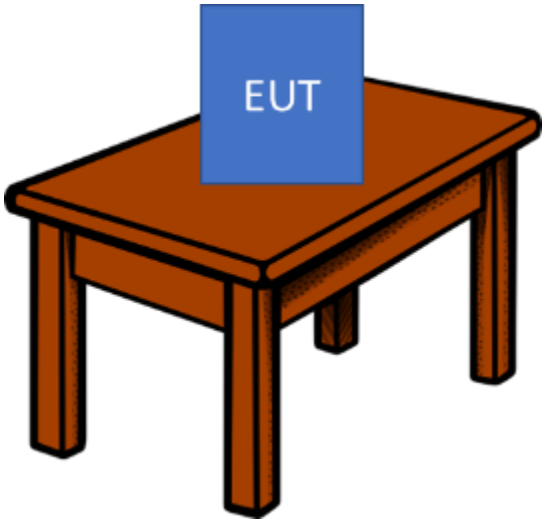


Figure 1. Test Configuration

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 indicated.

Table 2. Test Instruments

TEST INSTRUMENT	MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
Spectrum Analyzer	Agilent	E4440A	MY45304803	7/21/2025 2 yr. cal
Spectrum Analyzer	Rigol	DSA815	DSA8A180300138	2/22/2026 2 yr. cal
Loop Antenna	ETS Lindgren	6502	9810-3246	11/15/2026 2 yr. cal
Biconical Antenna	EMCO	3110B	9306-1708	1/27/2025 2 yr. cal
Log Periodic Antenna	EMCO	3146	9110-3236	11/15/2026 2 yr. cal
Horn Antenna	EMCO	3115	9107-3723	3/13/2025 2 yr. cal
Preamp 100 kHz to 1.3 GHz	Hewlett-Packard	8447D	1937A02980	6/17/2025
Preamp 1.0 GHz to 26.0 GHz	Hewlett-Packard	8449B	3008A00914	3/04/2025
EMC RF Cable	Times Microwave Systems	LMR-600	N/A	3/05/2025
EMC RF Cable (short)	US Tech	N/N 60cm	N/A	7/23/2025
High Pass Filter	Microwave Circuits	H3R020G2	001DC9528	7/02/2025
Attenuator	Mini-Circuits	VAT-8/15542	30519	8/30/2025
LISN	Solar Electronics	9247-50-TS-50-N	955824 and 955825	4/28/2025

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

2.2 Modifications to EUT Hardware

No modifications were made by US Tech in order to bring the EUT into compliance with FCC Part 15, Subpart C Intentional Radiator Limits for the transmitter portion of the EUT or the Subpart B Unintentional Radiator Limits (Receiver and Digital Device) 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 below.

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 over 10 MHz span, 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.

2.5 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 .

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 Transmitter Duty Cycle (CFR 15.35 (c))

When the radiated emissions limits are expressed in terms of AVERAGE values and pulse operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

In this case the Duty Cycle factor was assumed to be zero since the EUT was programmed to transmit continuously with a duty cycle rated of > 98%.

2.7 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	Tier One Design	Trace Antenna	N/A	-2.6	PCB trace antenna

2.8 Power Line Conducted Emissions (CFR 15.207)

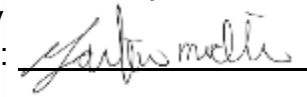
The worst-case line conducted emission for the EUT was 6.1 dB below the limit at 0.1873 MHz on the neutral lead. All other conducted emissions were at least 8.1 dB below the FCC Part 15.207 limits. This worst-case emission is found in the table below.

Table 5. Conducted Emissions Data

0.15 MHz to 30 MHz						
Frequency (MHz)	**Test Data (dBuv)**	**LISN+CL-PA (dB)**	**Results (dBuV)**	**AVG Limits (dBuV)**	**Margin (dB)**	**Detector PK, QP, or AVG**
120 VAC, 60 Hz Phase						
0.2810	37.70	0.47	38.17	50.8	12.6	PK
0.4747	36.13	0.28	36.41	46.4	10.0	PK
0.6242	36.12	0.23	36.35	46.0	9.7	PK
2.2467	31.68	0.24	31.92	46.0	14.1	PK
7.9950	30.30	0.40	30.70	50.0	19.3	PK
9.7467	33.66	0.43	34.09	50.0	15.9	PK
13.3700	39.69	0.33	40.01	50.0	10.0	PK
18.2450	24.72	0.52	25.24	50.0	24.8	PK
24.6200	24.41	0.90	25.30	50.0	24.7	PK
27.2450	25.02	0.92	25.94	50.0	24.1	PK
120VAC, 60 Hz Neutral						
0.1873	47.02	1.13	48.15	54.2	6.1	PK
0.4997	38.50	0.47	38.97	46.0	7.1	PK
0.6867	37.32	0.43	37.75	46.0	8.3	PK
1.2467	37.81	0.40	38.21	46.0	7.8	PK
4.4967	33.87	0.47	34.34	46.0	11.7	PK
5.3700	32.96	0.50	33.46	50.0	16.5	PK
9.9967	38.10	0.63	38.73	50.0	11.3	PK
12.9950	41.51	0.41	41.92	50.0	8.1	PK
16.3700	25.71	0.41	26.12	50.0	23.9	PK
20.8700	24.43	0.41	24.84	50.0	25.2	PK
26.4950	24.63	0.41	25.04	50.0	25.0	PK

Sample Calculation at 0.2810 MHz:

Magnitude of Measured Frequency	37.70	dBuV
+Correction Factors	0.47	dB
Corrected Result	38.17	dBuV

Test Date: February 4, 2025
Tested by
Signature:  Name: Gabriel Medina

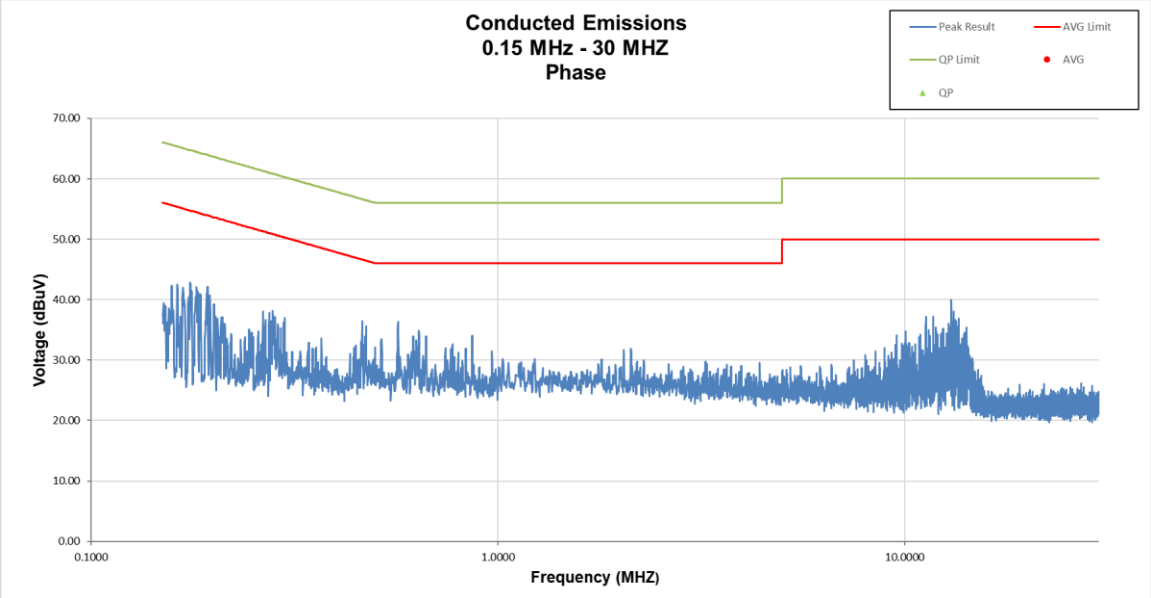


Figure 2. Conducted Emissions 0.15 MHz – 30 MHz - Phase

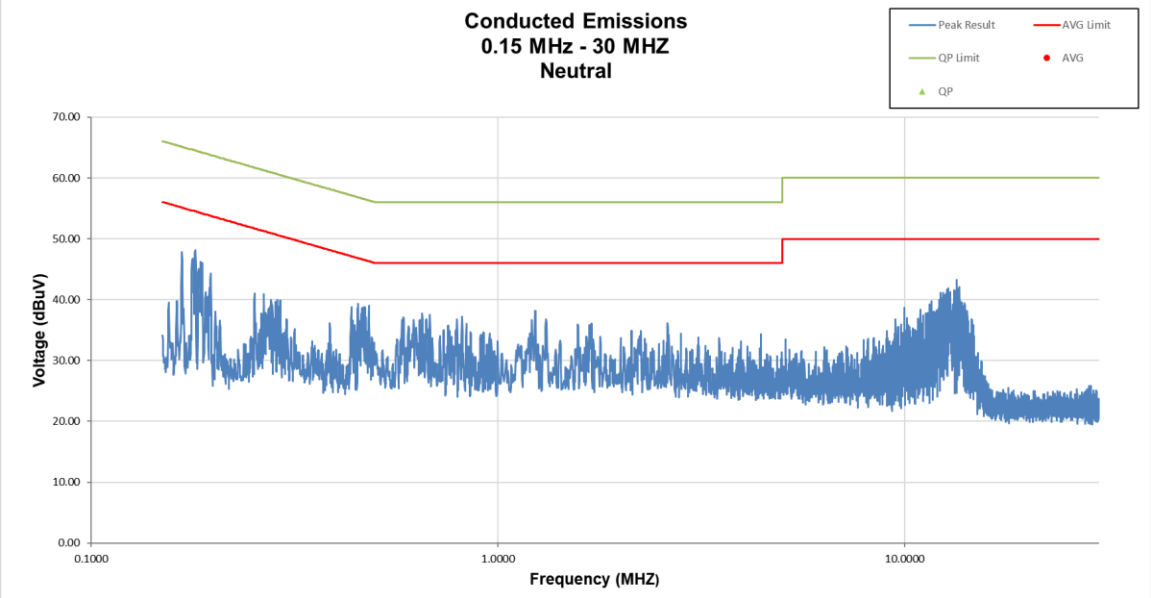


Figure 3. Conducted Emissions 0.15 MHz – 30 MHz - Neutral

2.9 Intentional Radiator, Conducted Emissions (CFR 15.209, 15.247(d)) (IC RSS 247 5.1 & 5.2)

The EUT was investigated to CFR 15.209, General requirements for unwanted spurious emissions. The conducted spurious method as described below was used to investigate all other emissions emanating from the antenna port.

Conducted Spurious measurements: The EUT was put into a continuous-transmit mode of operation (>98% duty cycle) and tested per FCC Public Notice DA 00-705 for conducted out of band emissions emanating from the antenna port over the frequency range of 30 MHz to 25 GHz. A conducted scan was performed on the EUT to identify and record the spurious signals that were related to the transmitter.

The test results for both conducted and radiated spurious emissions are presented in the following pages.

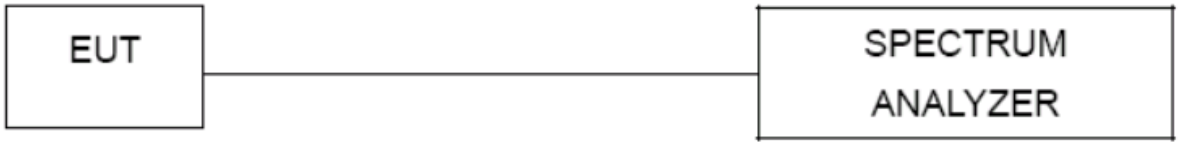


Figure 4. Bench Test Setup

Test Date: January 30, 2025

Tested By
Signature: _____ Name: Gabriel Medina

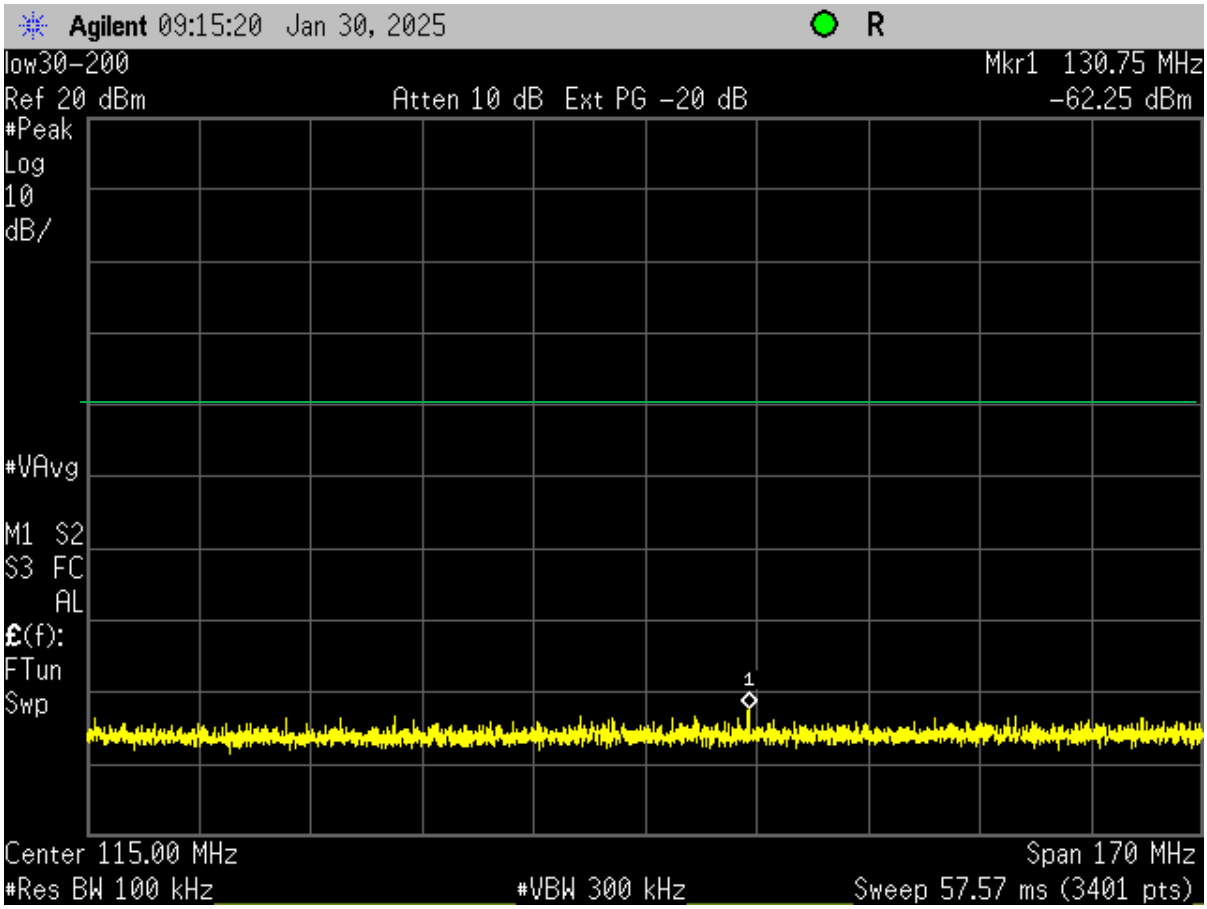


Figure 5. Low Channel, 30 - 200 MHz

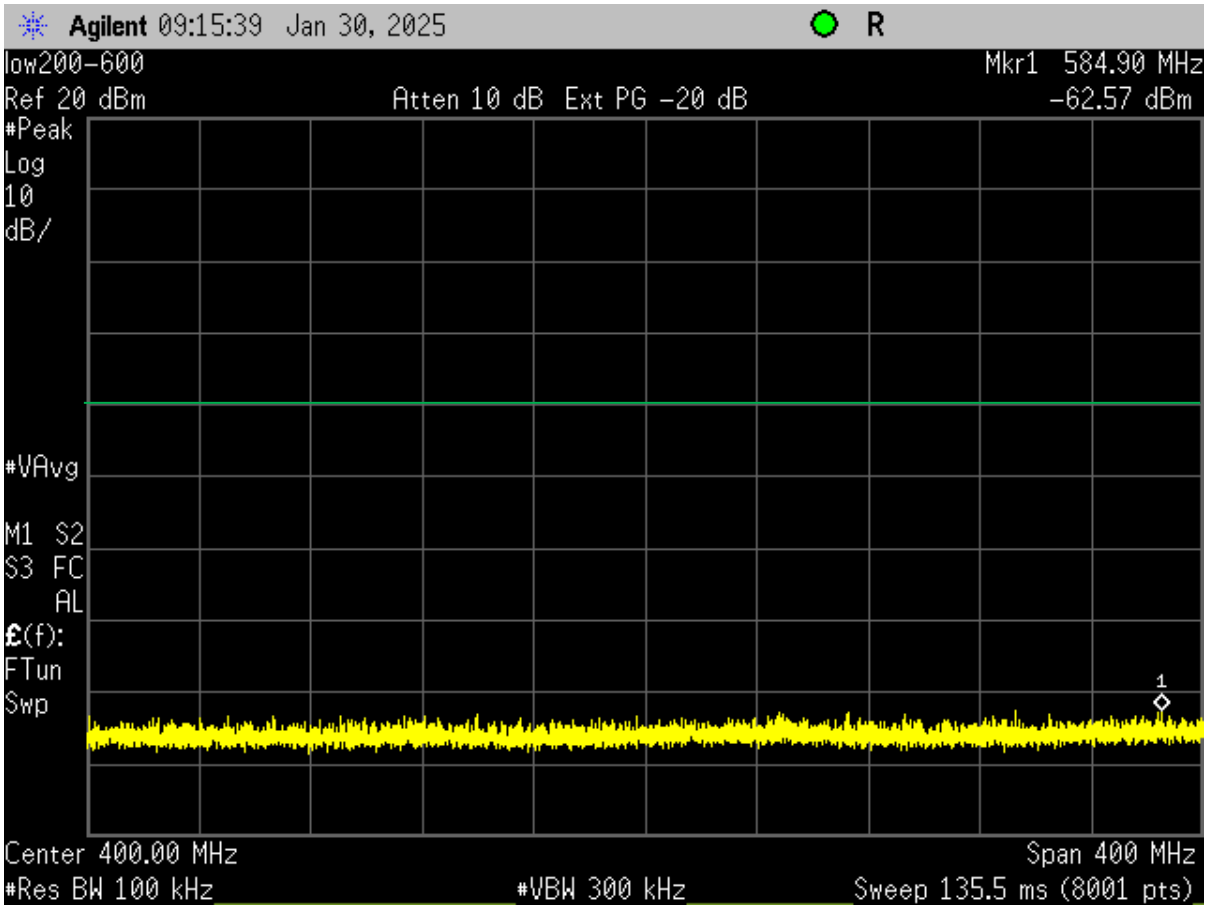


Figure 6. Low Channel, 200 - 600 MHz

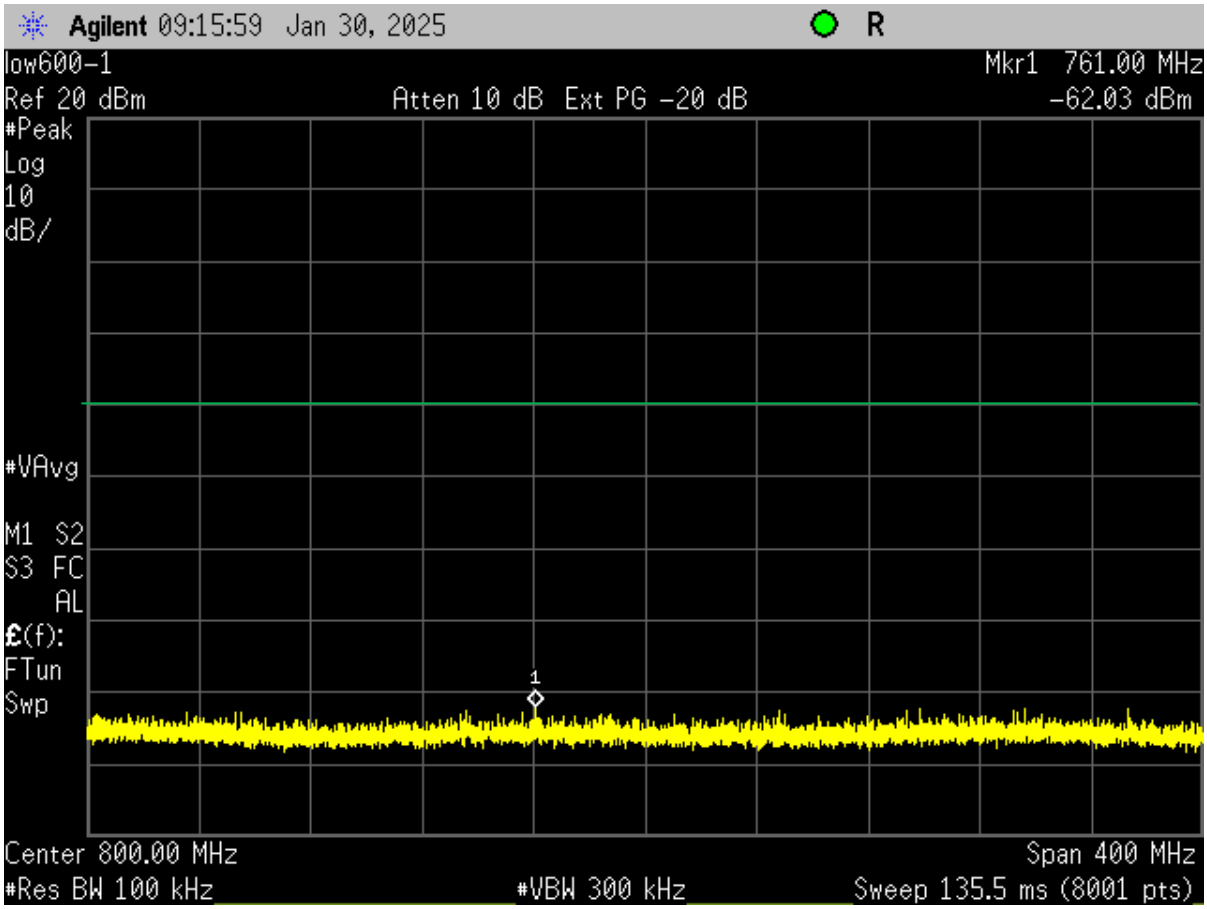


Figure 7. Low Channel, 600 - 1000 MHz

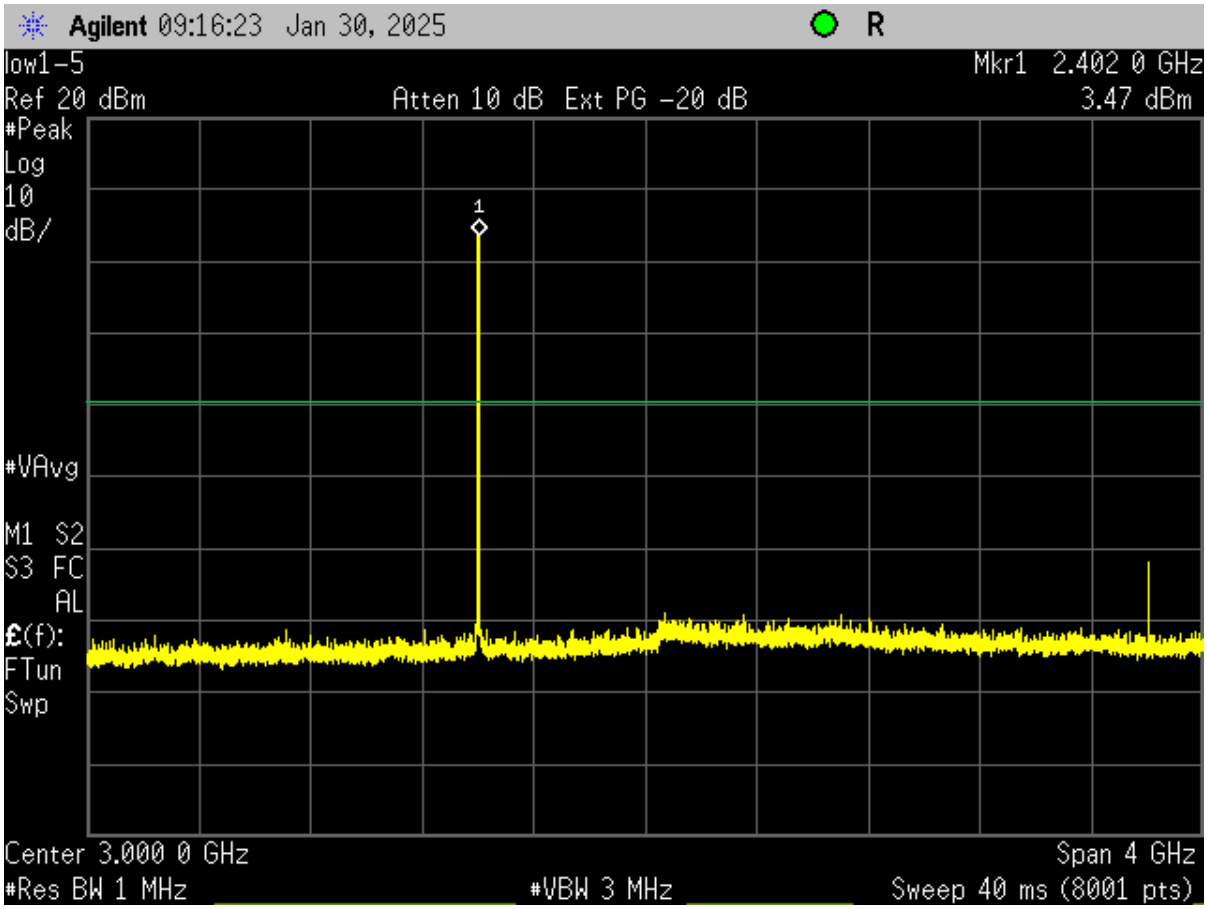


Figure 8. Low Channel, 1 - 5 GHz

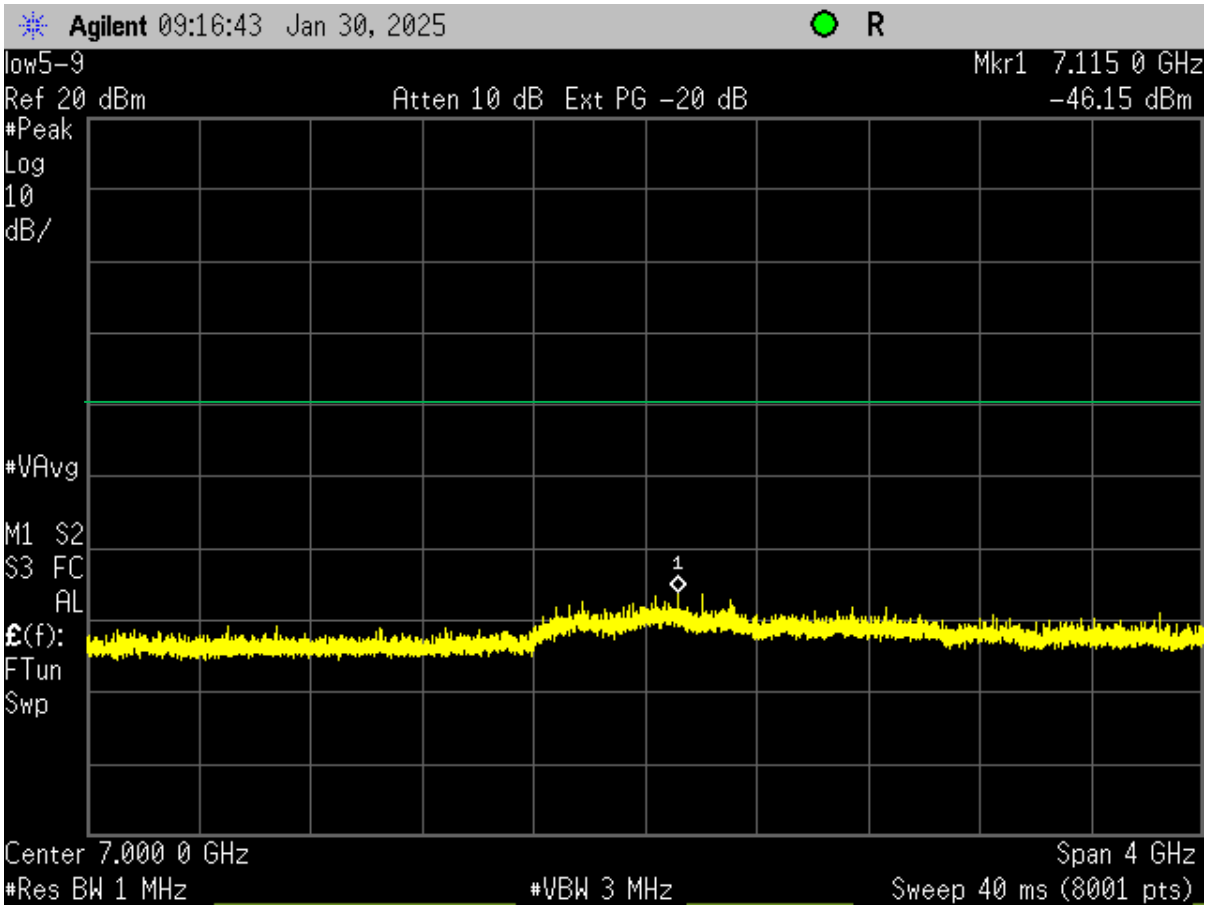


Figure 9. Low Channel, 5 - 9 GHz

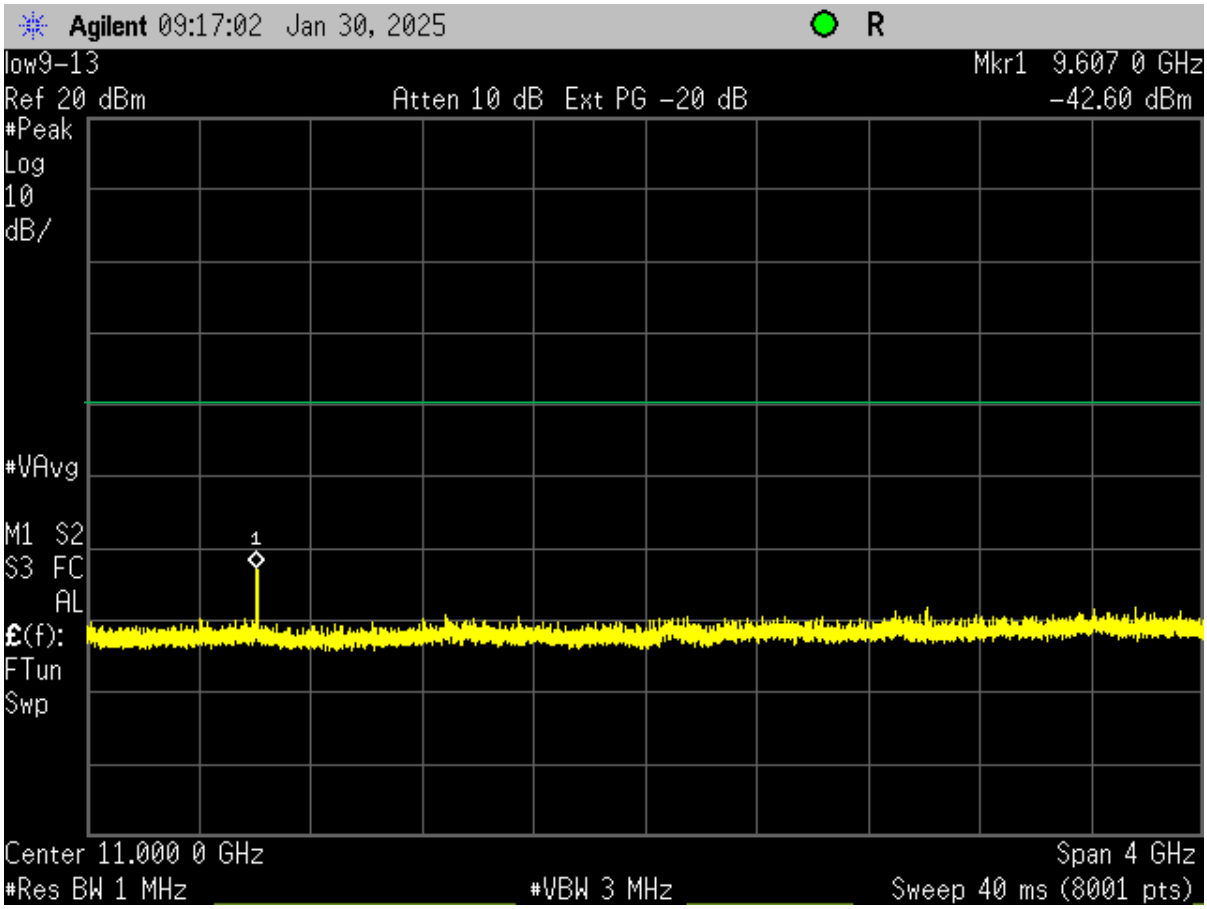


Figure 10. Low Channel, 9 - 13 GHz

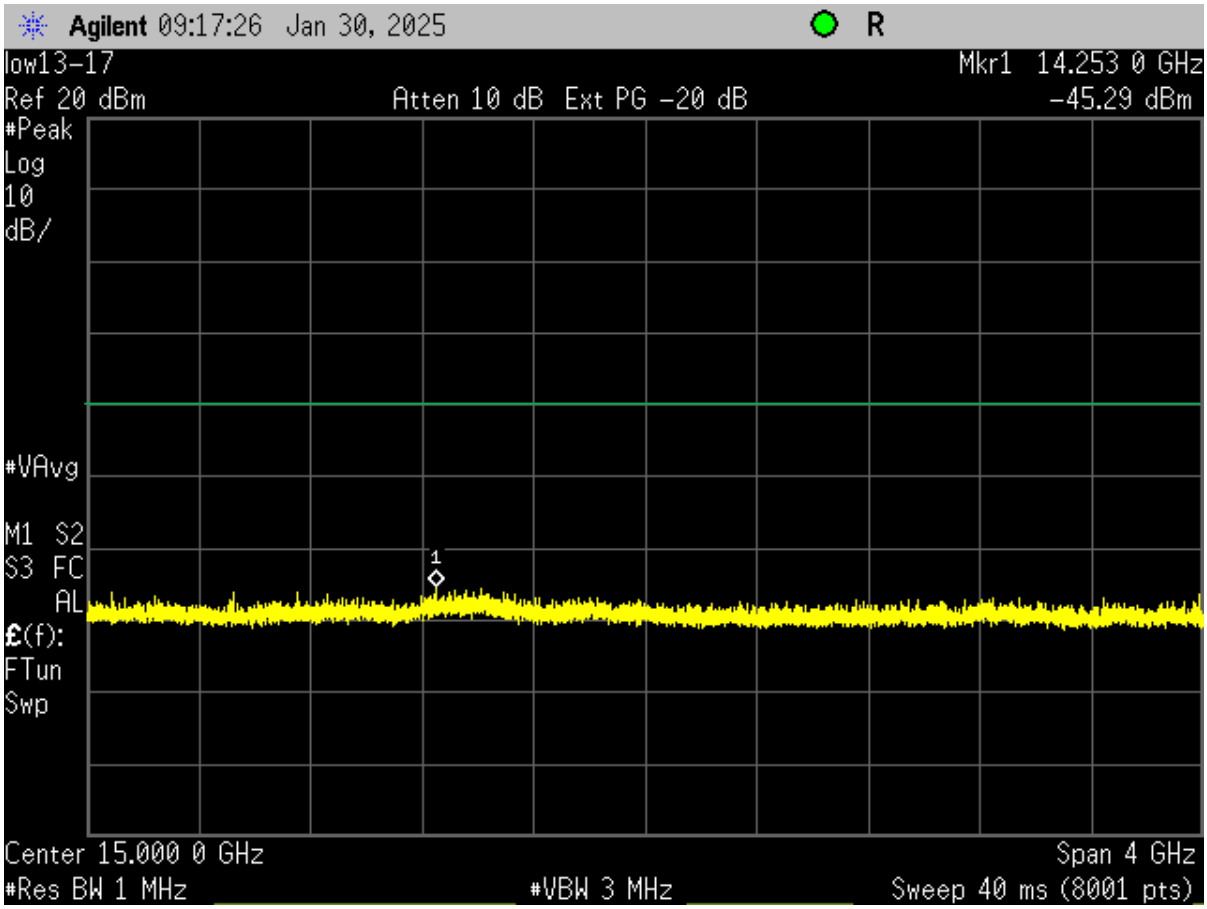


Figure 11. Low Channel, 13 - 17 GHz

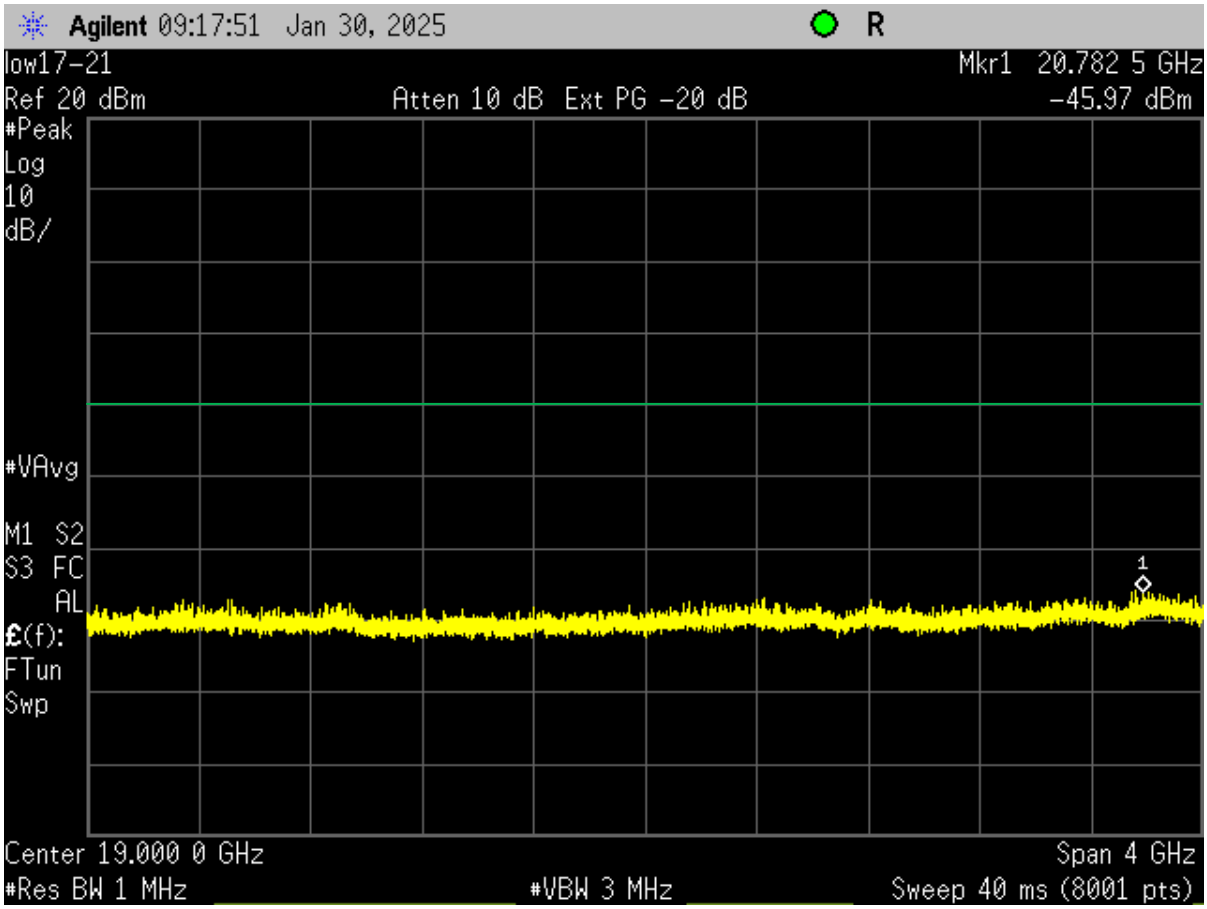


Figure 12. Low Channel, 17 - 21 GHz

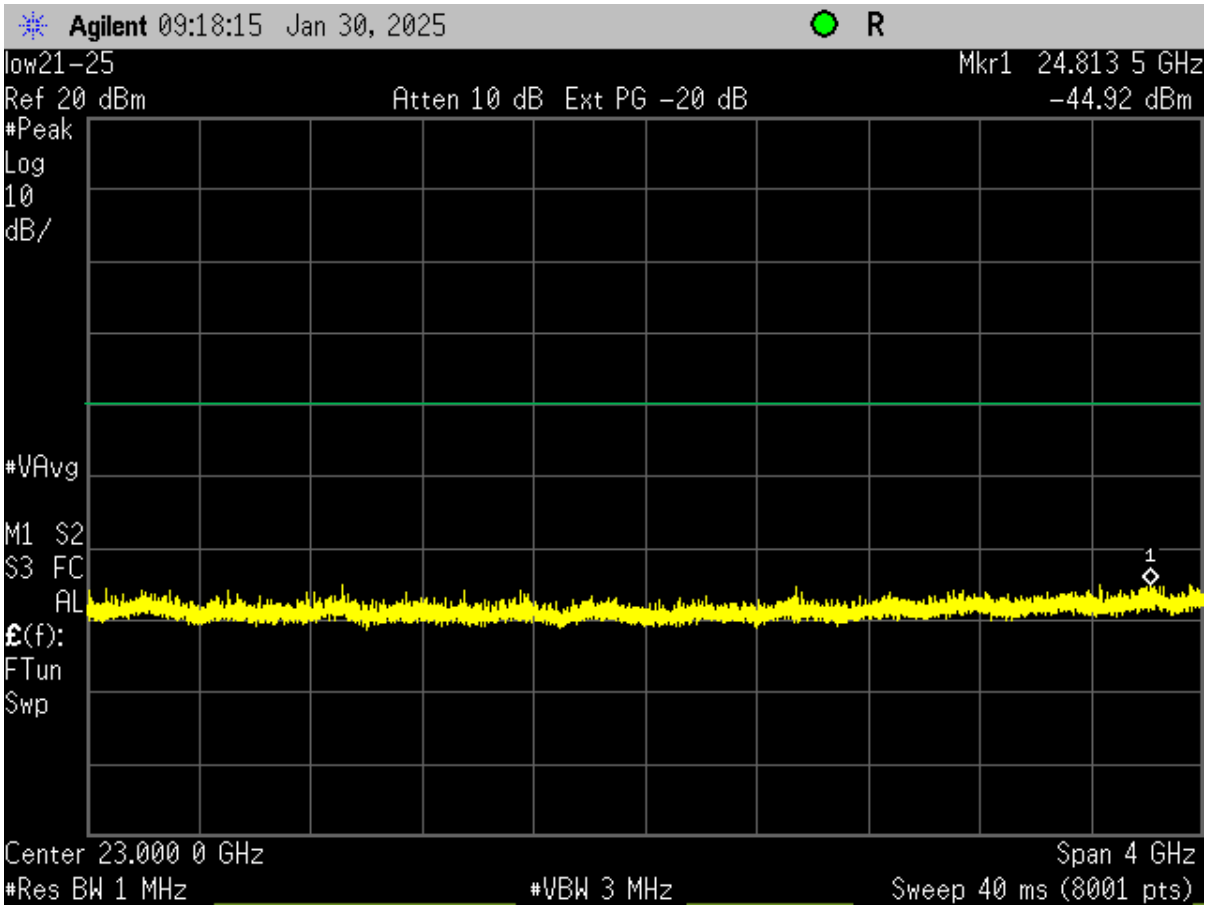


Figure 13. Low Channel, 21 - 25 GHz

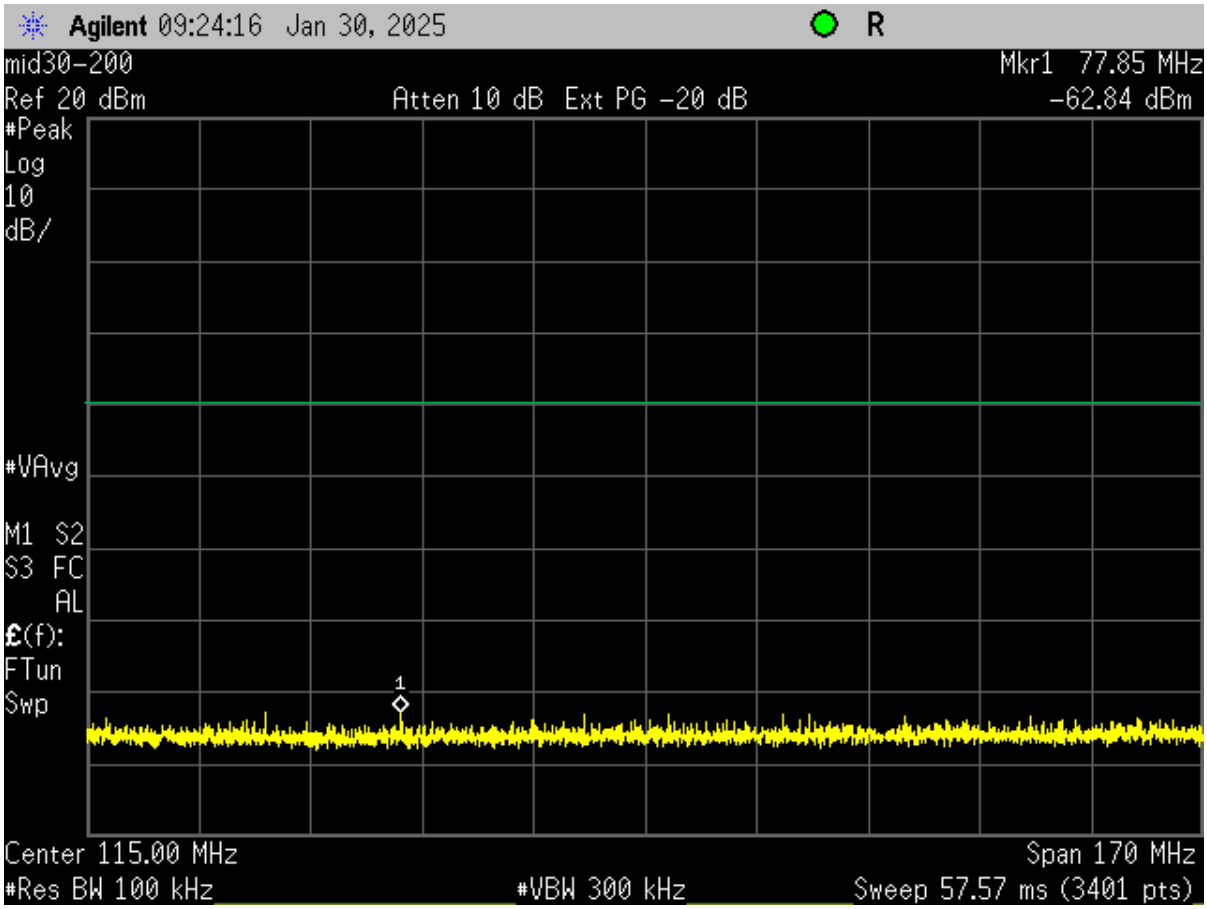


Figure 14. Mid Channel, 30 - 200 MHz

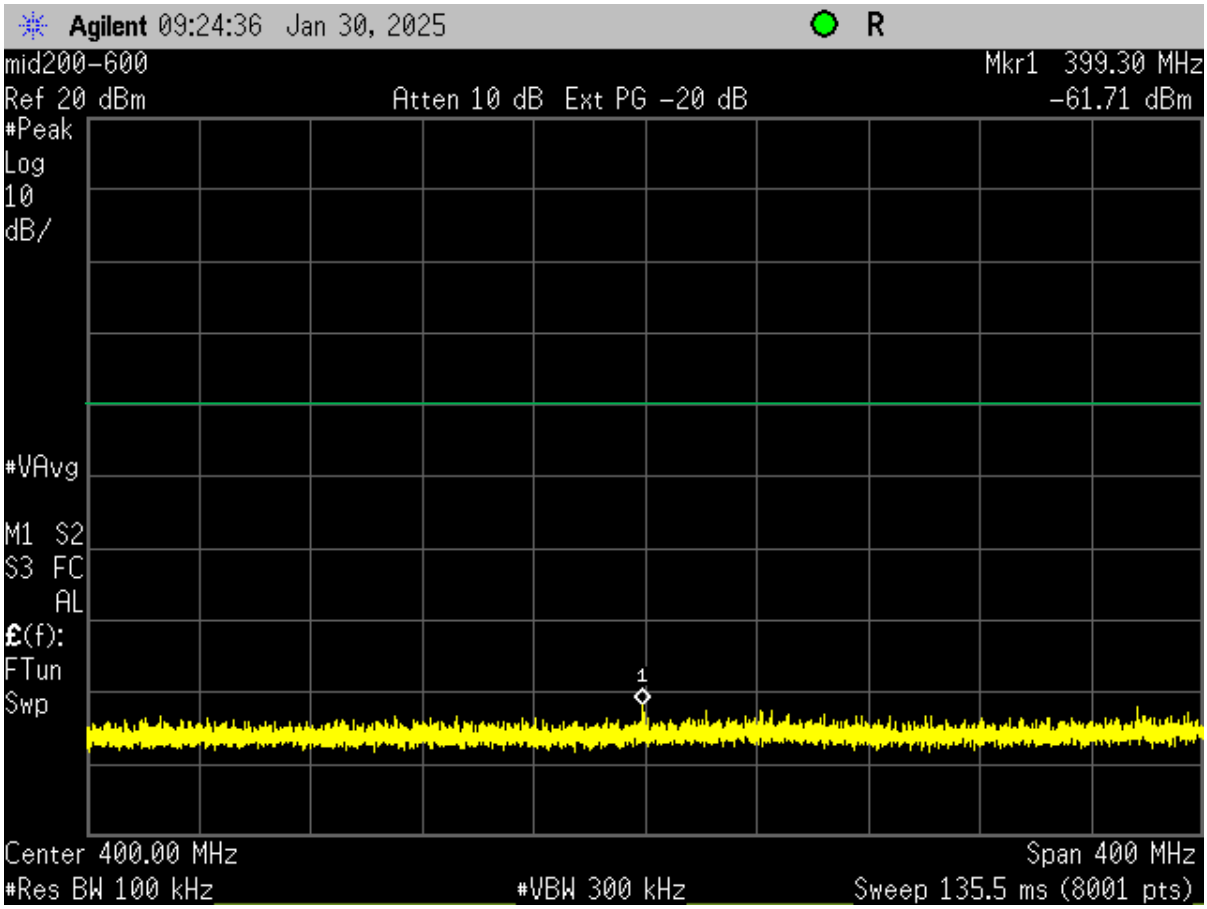


Figure 15. Mid Channel, 200 - 600 MHz

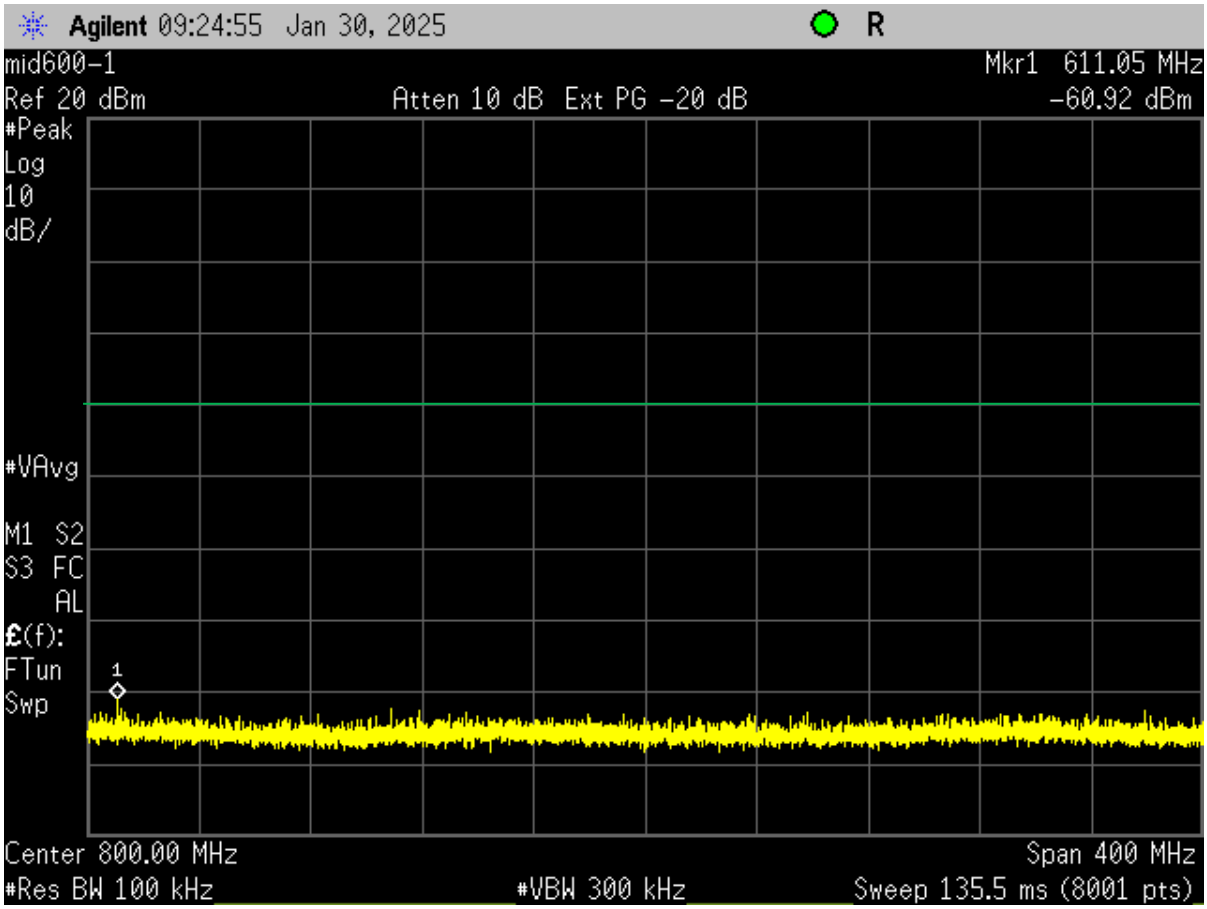


Figure 16. Mid Channel, 600 - 1000 MHz

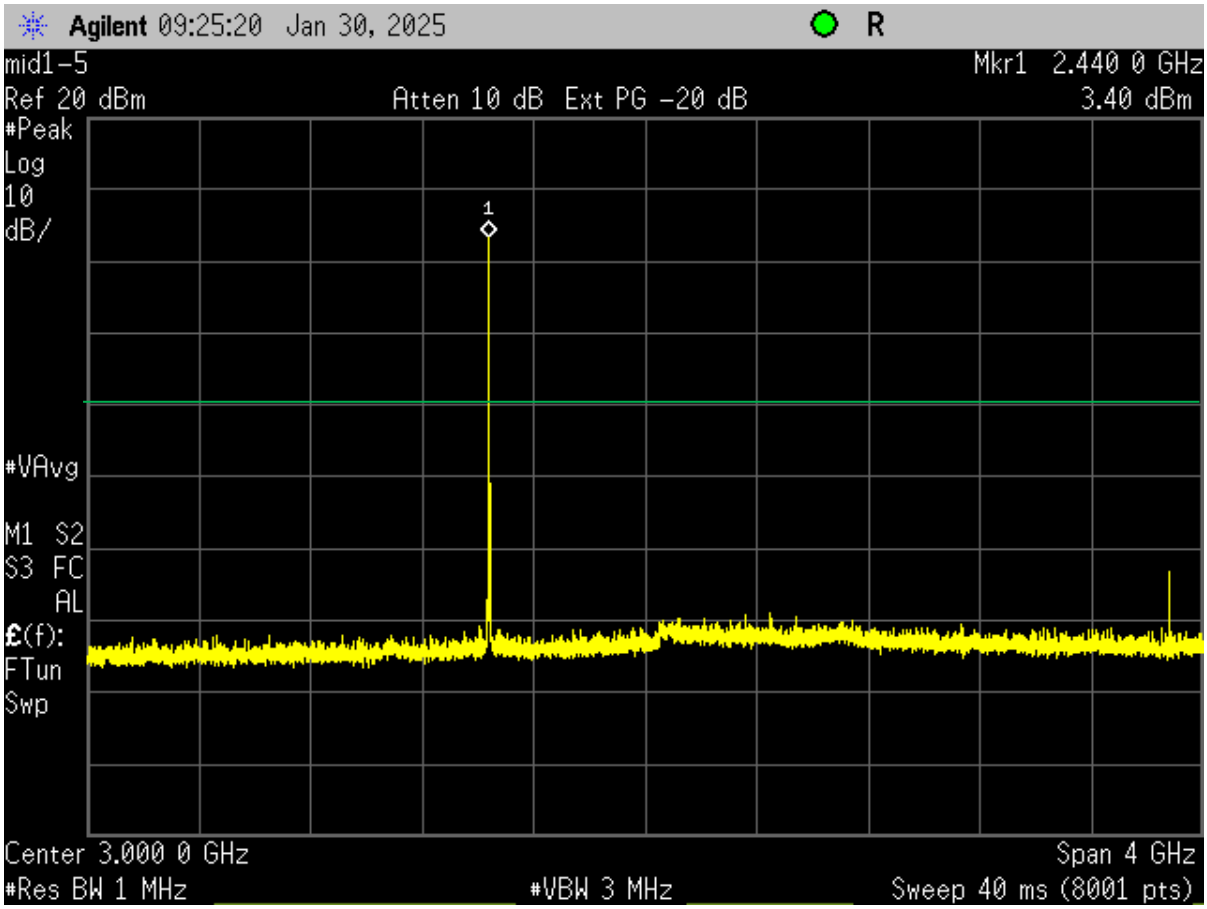


Figure 17. Mid Channel, 1 - 5 GHz

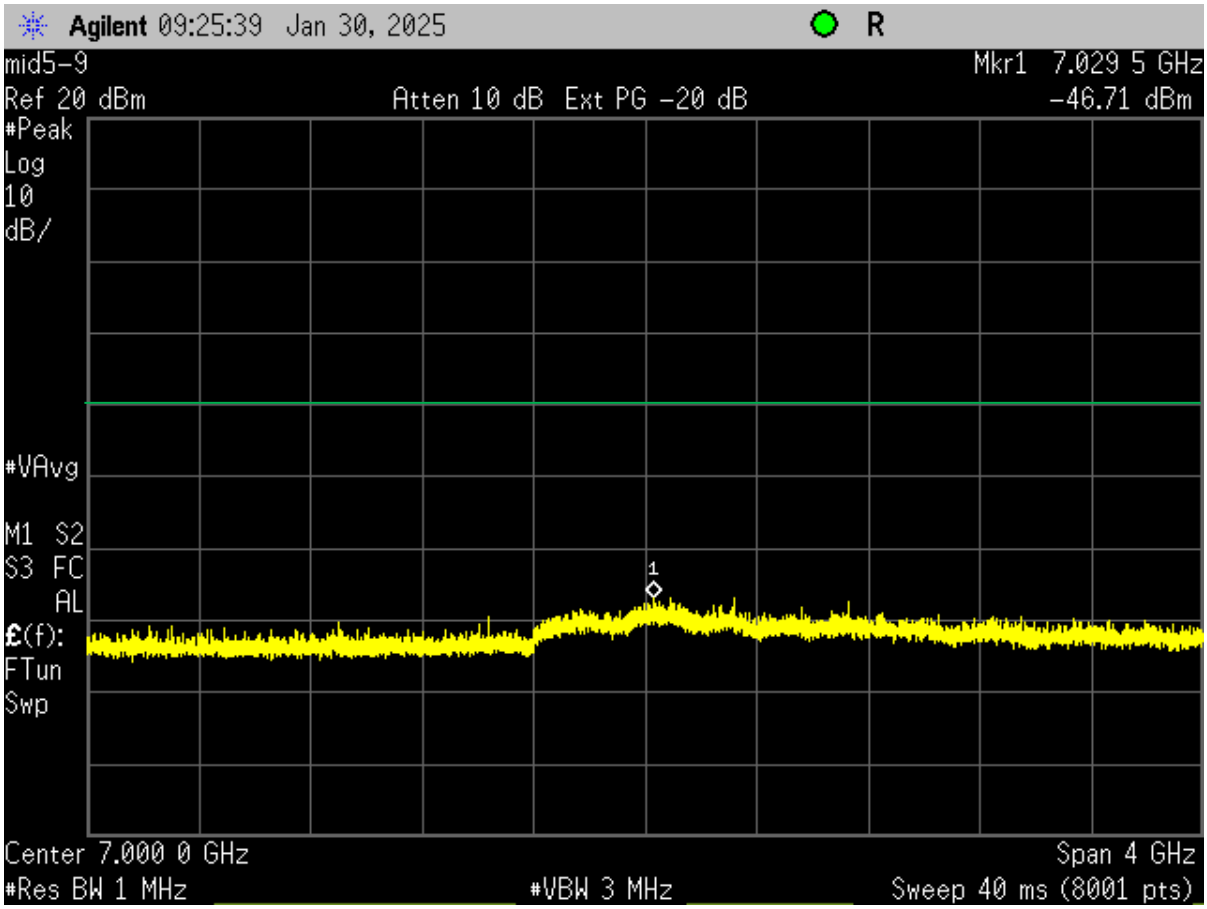


Figure 18. Mid Channel, 5 - 9 GHz

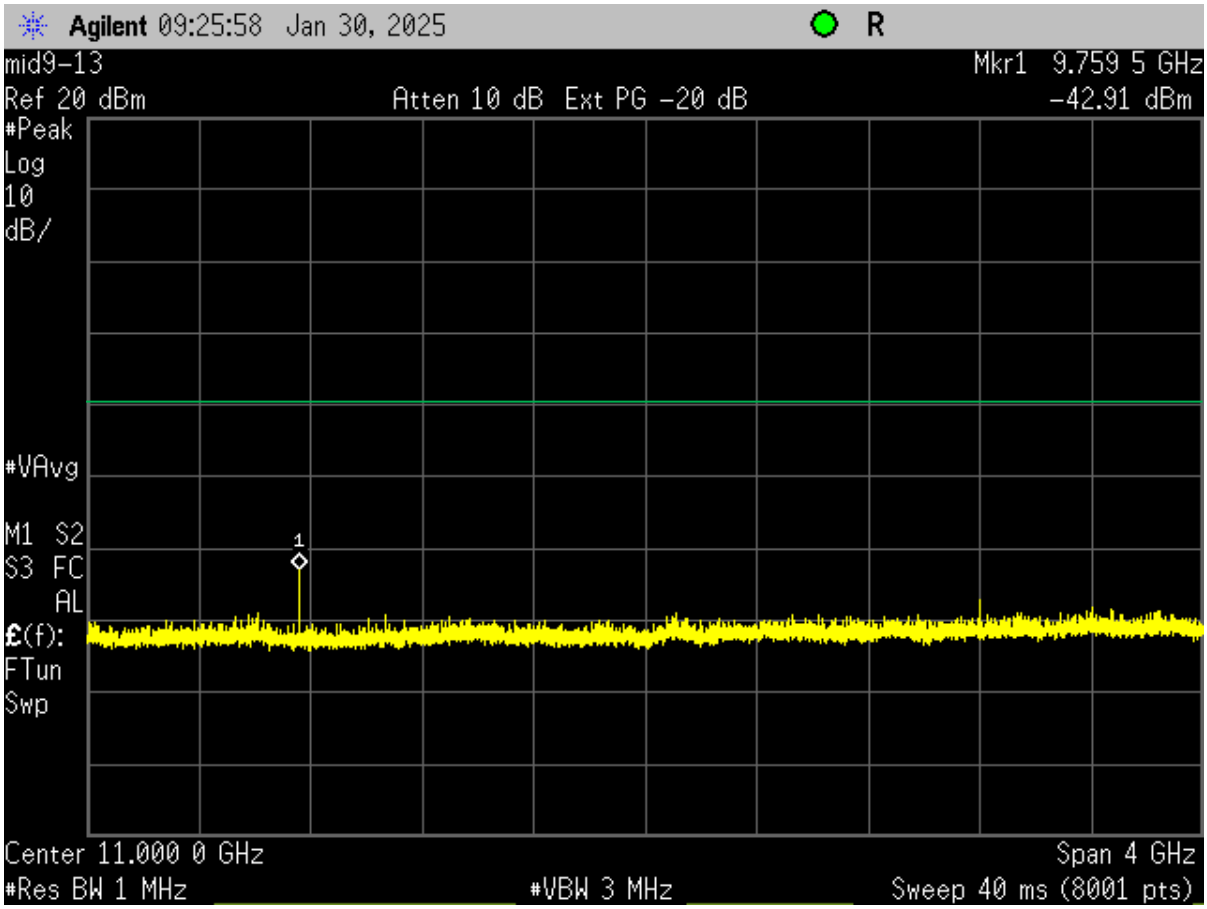


Figure 19. Mid Channel, 9 - 13 GHz

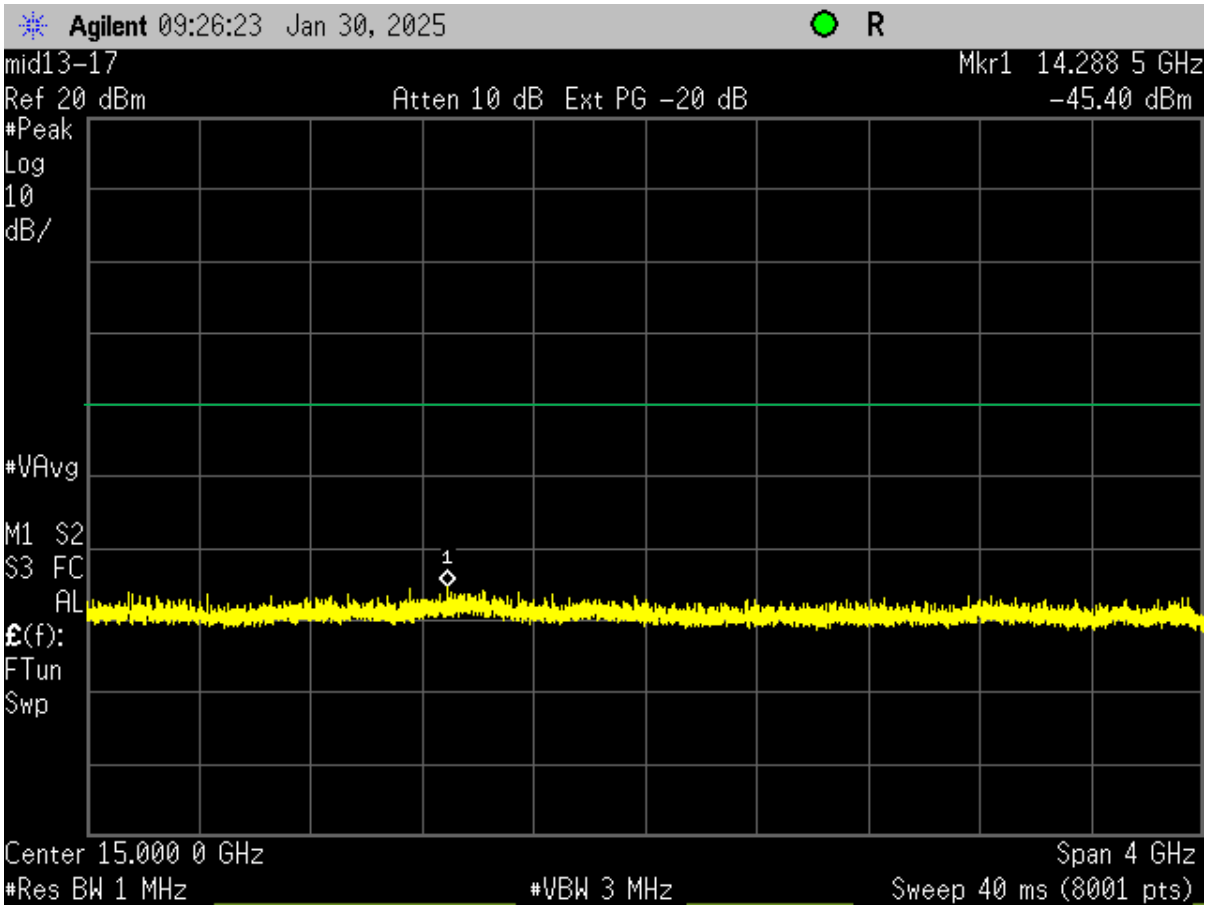


Figure 20. Mid Channel, 13 - 17 GHz

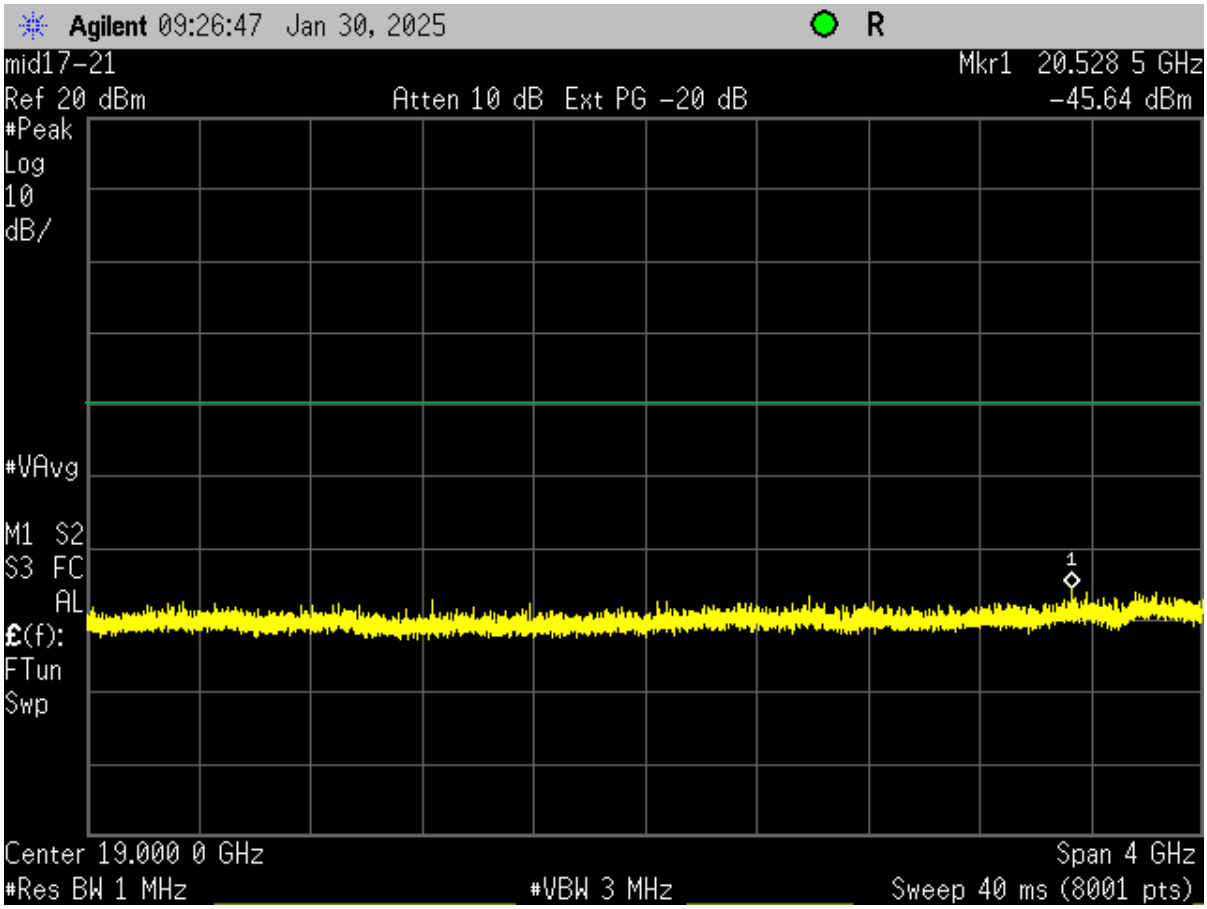


Figure 21. Mid Channel, 17 - 21 GHz

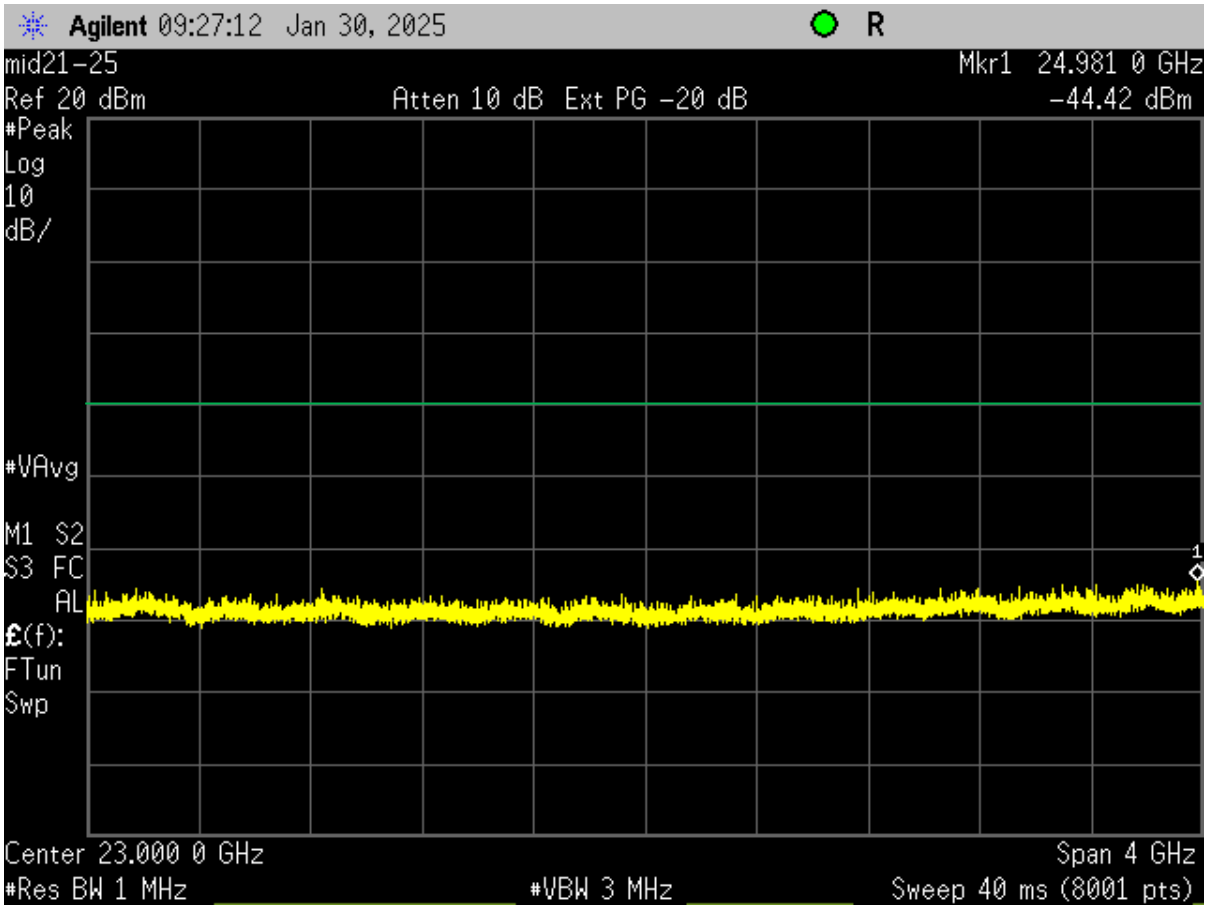


Figure 22. Mid Channel, 21 - 25 GHz

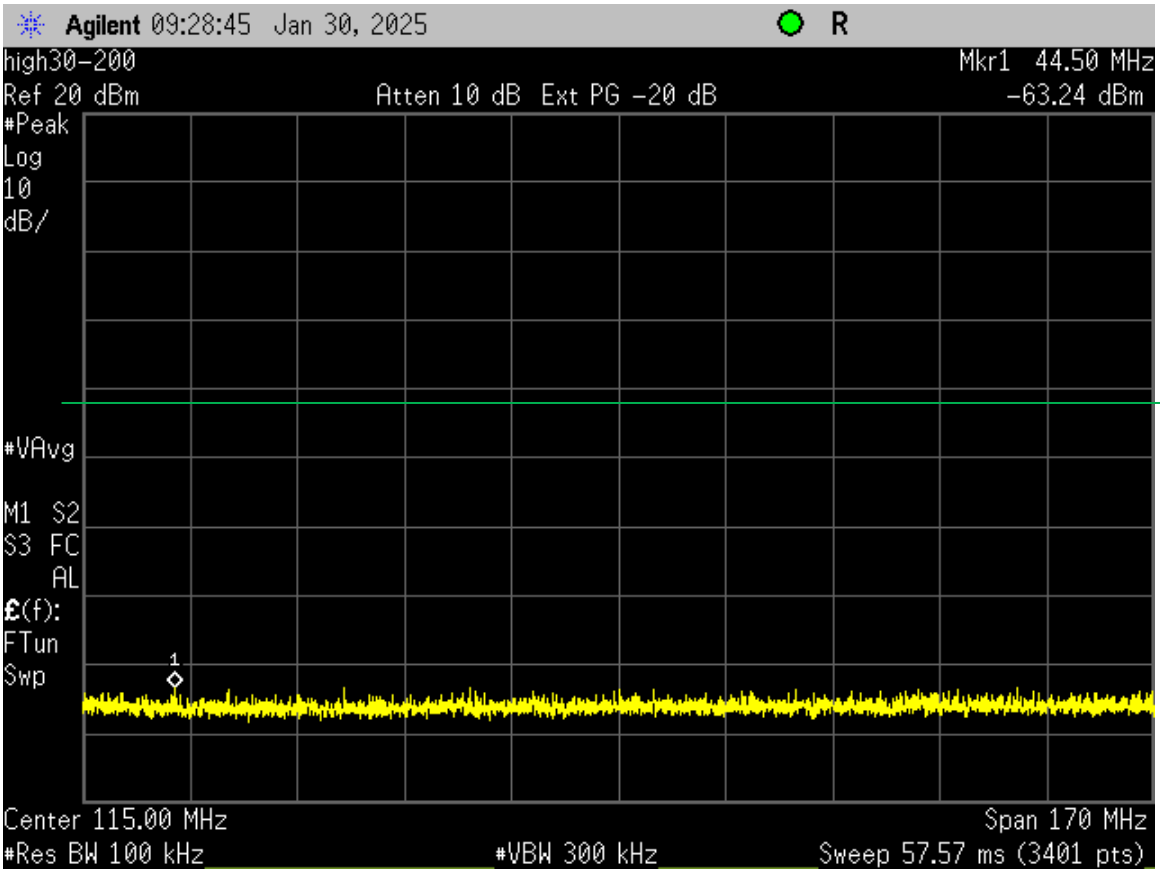


Figure 23. High Channel, 30 - 200 MHz

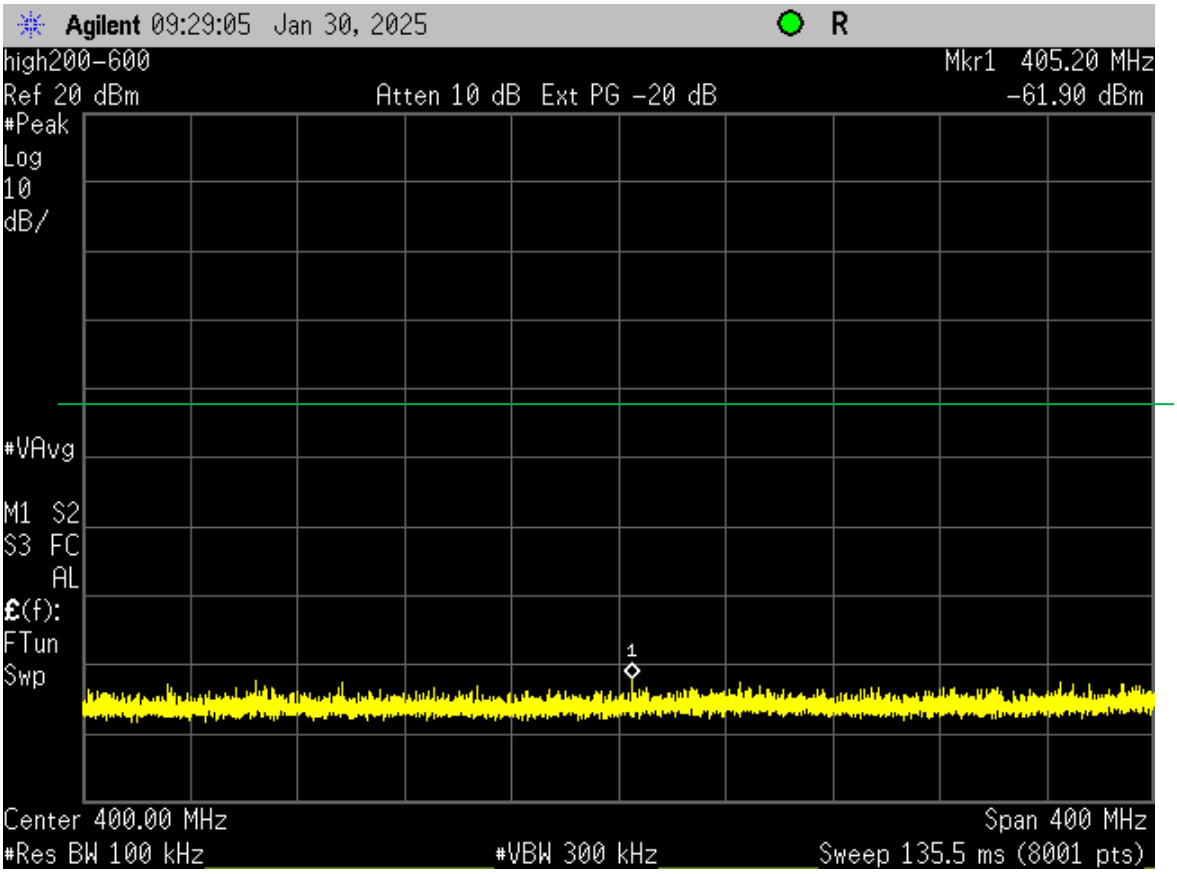


Figure 24. High Channel, 200 - 600 MHz

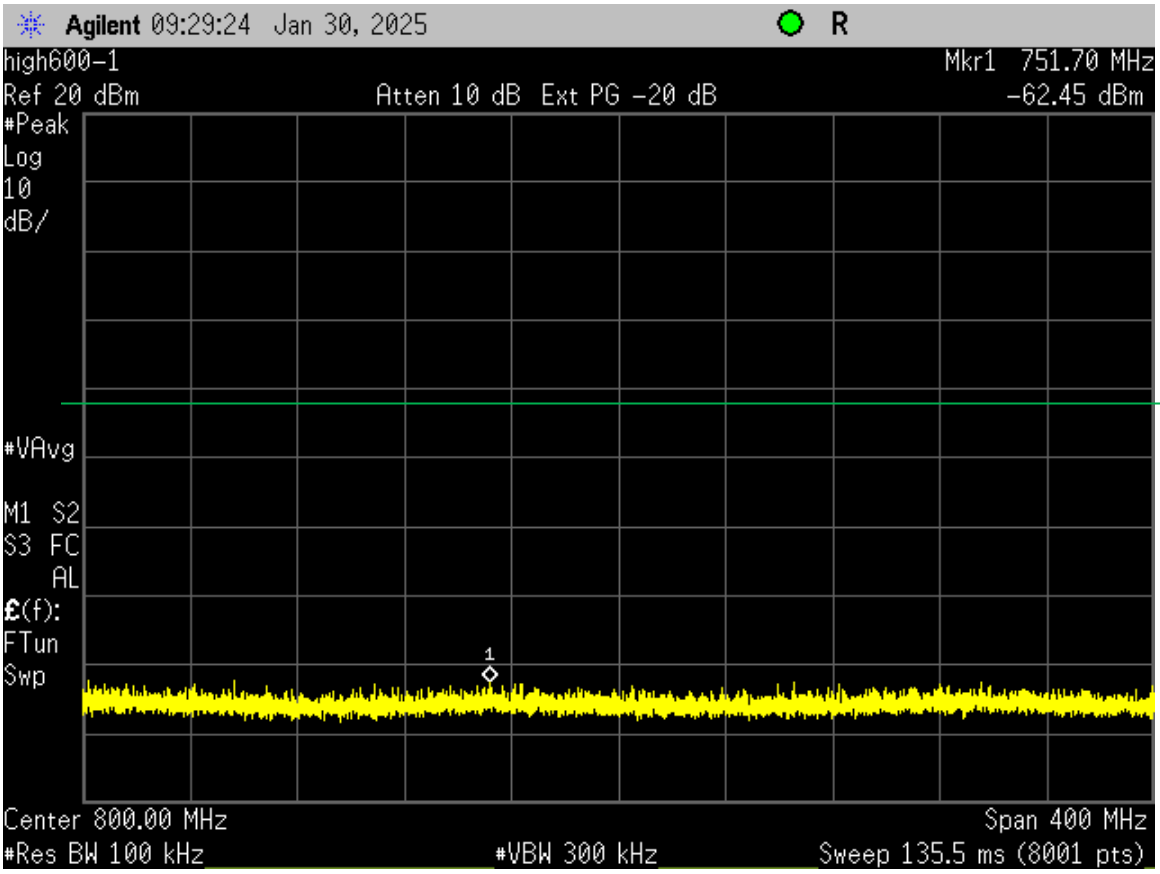


Figure 25. High Channel, 600 - 1000 MHz

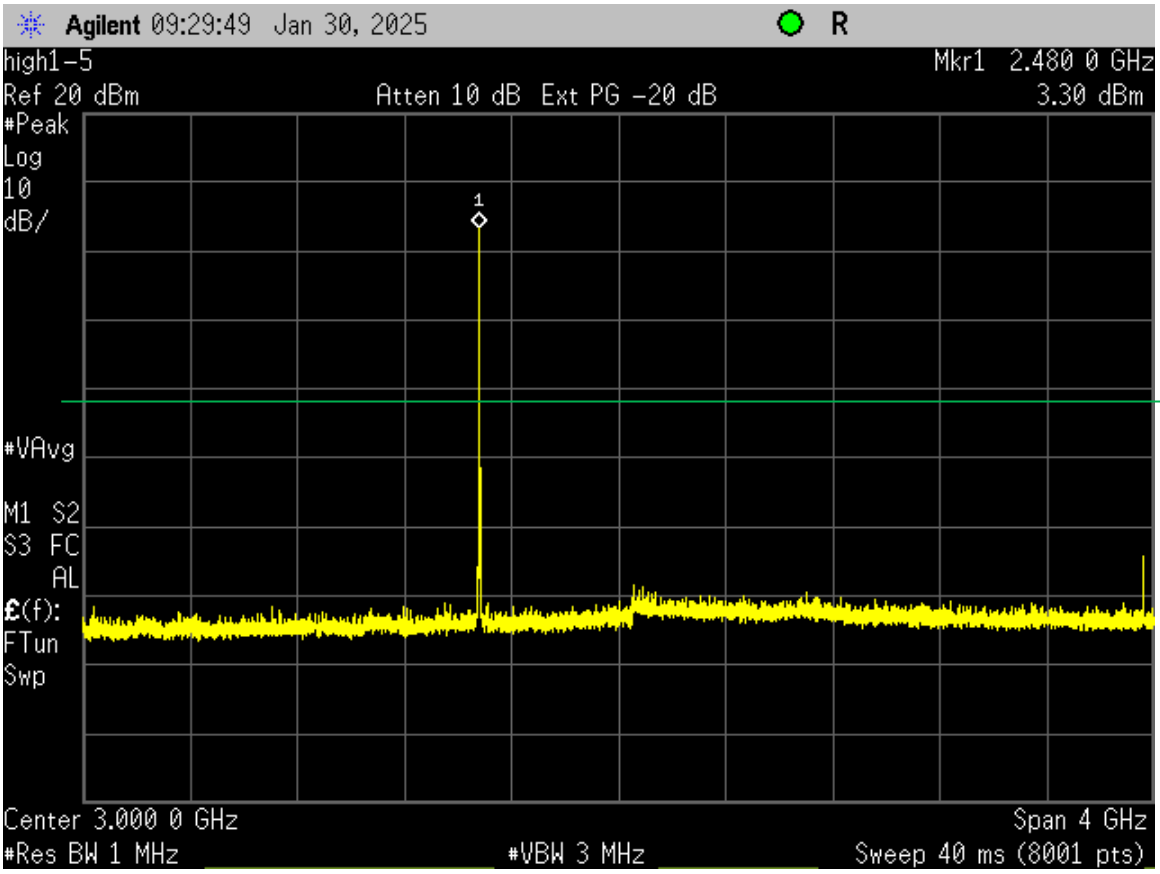


Figure 26. High Channel, 1 - 5 GHz

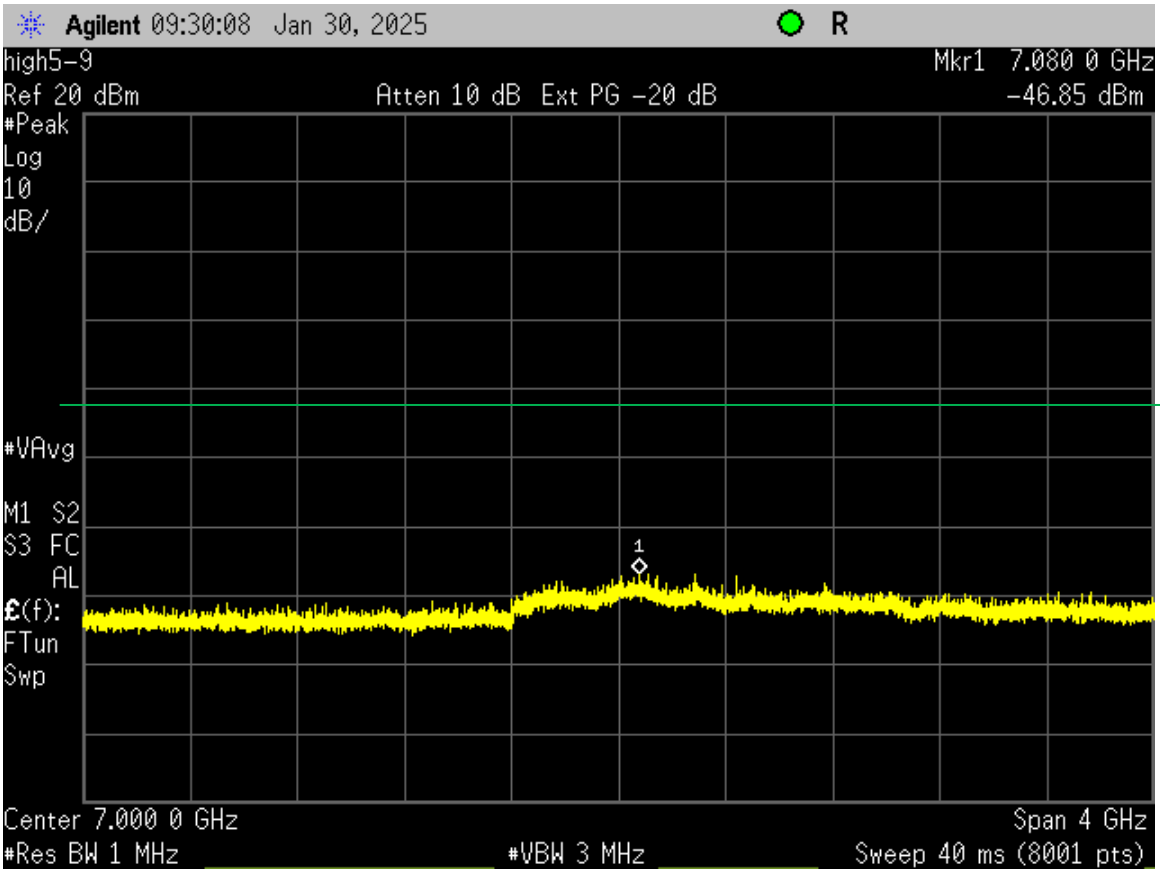


Figure 27. High Channel, 5 - 9 GHz

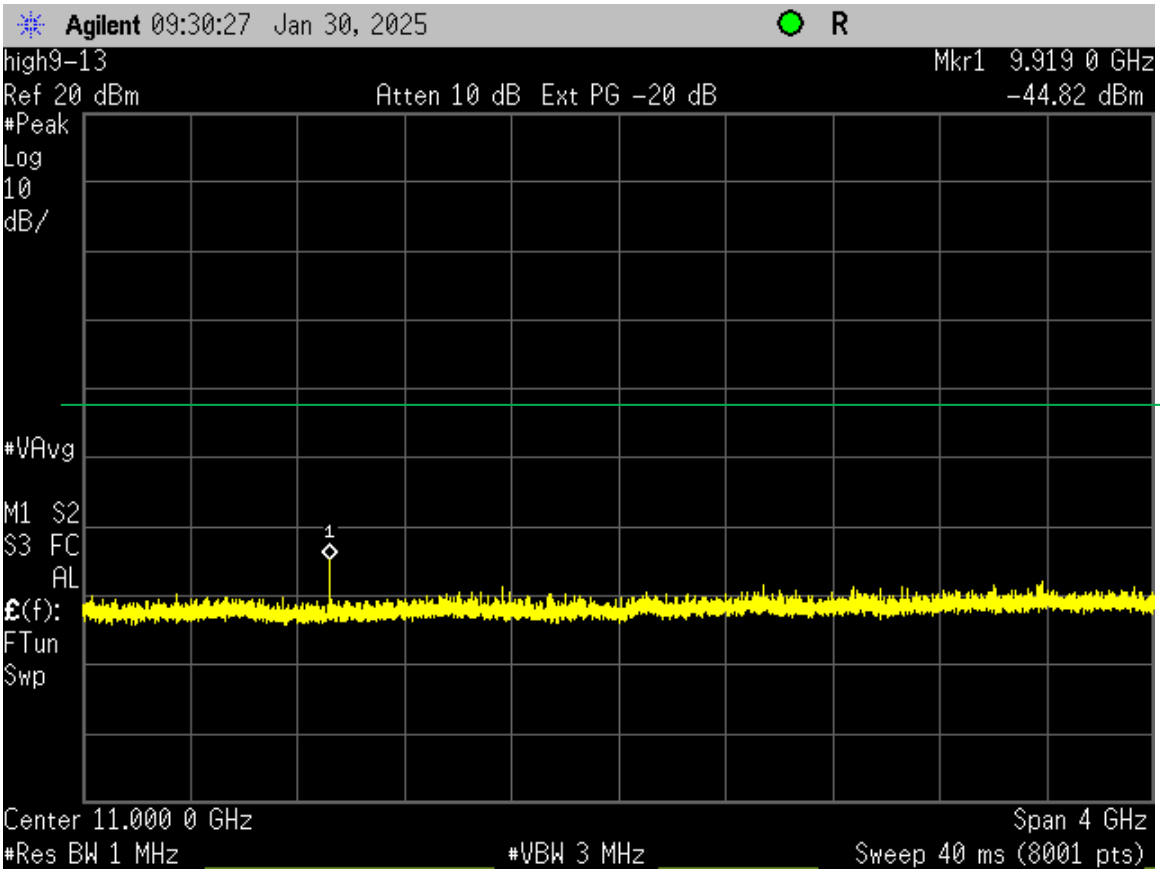


Figure 28. High Channel, 9 - 13 GHz

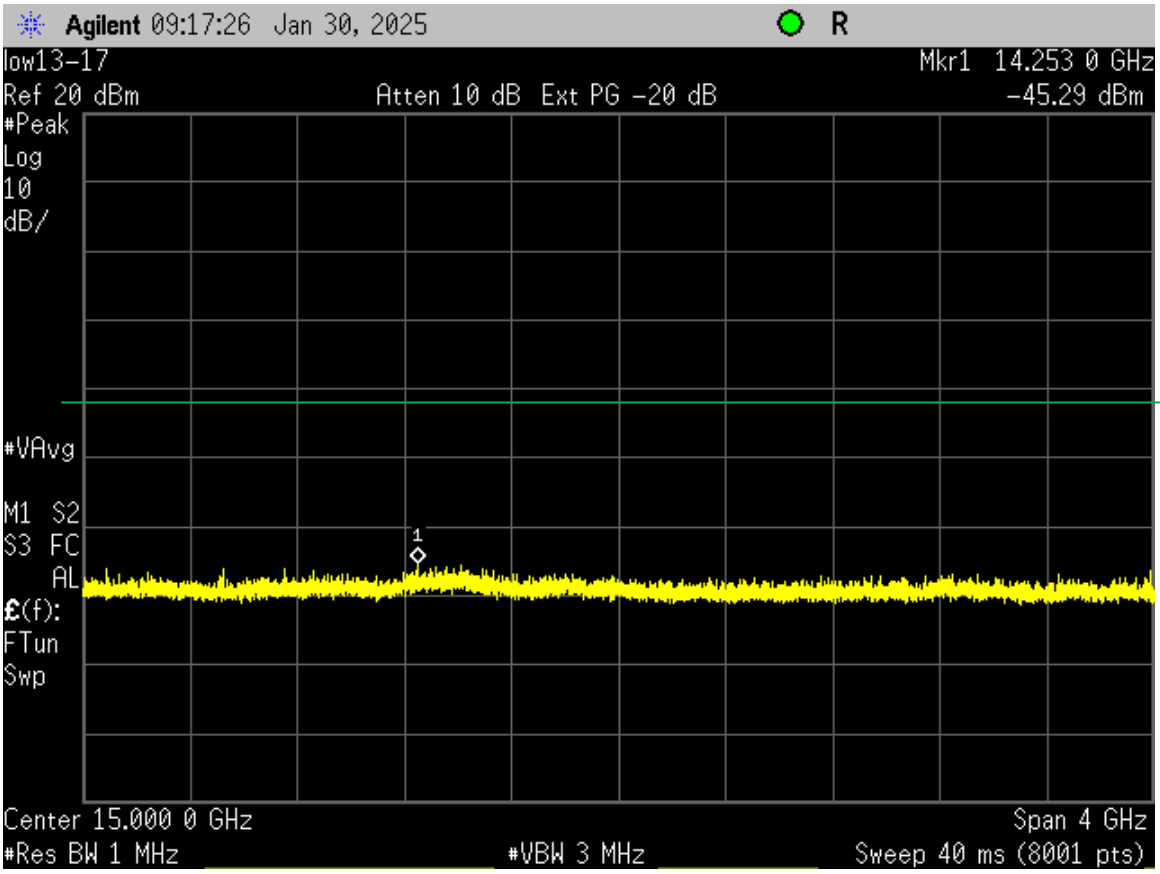


Figure 29. High Channel, 13 - 17 GHz

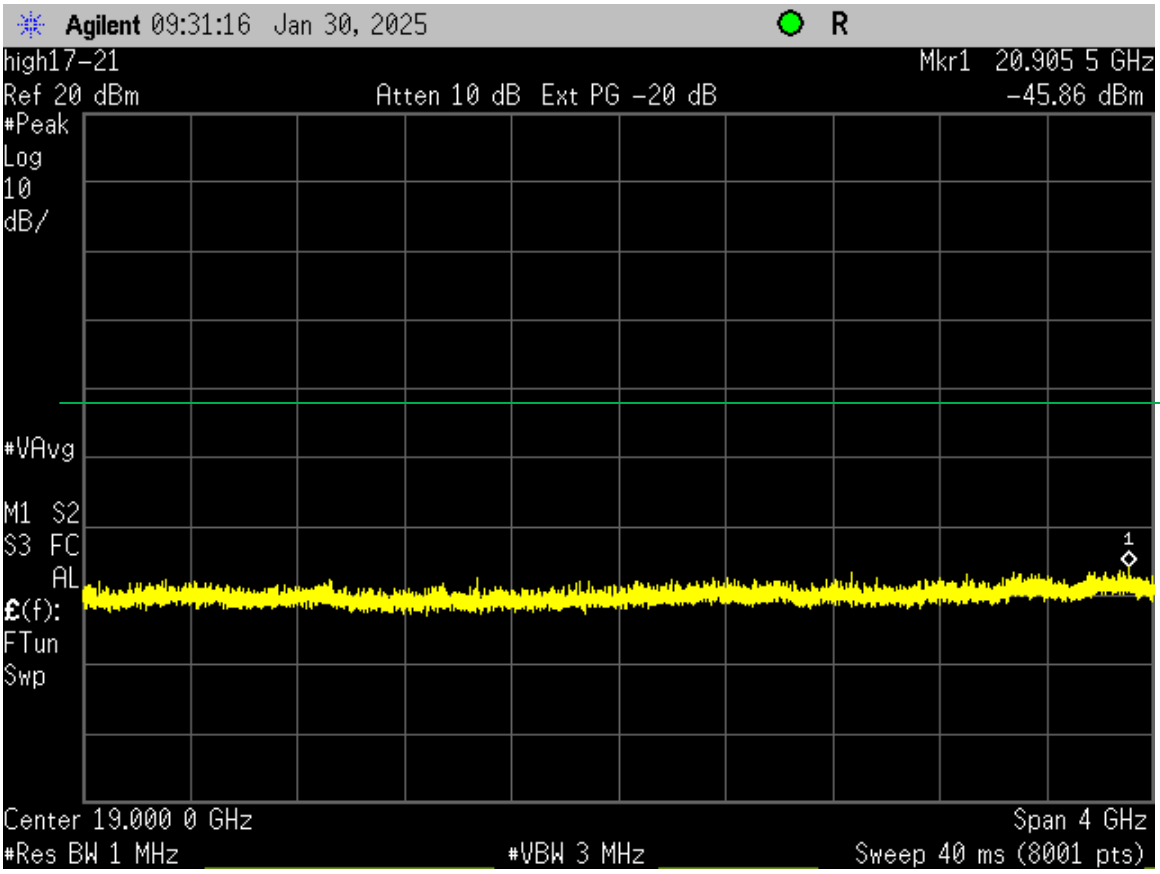


Figure 30. High Channel, 17 - 21 GHz

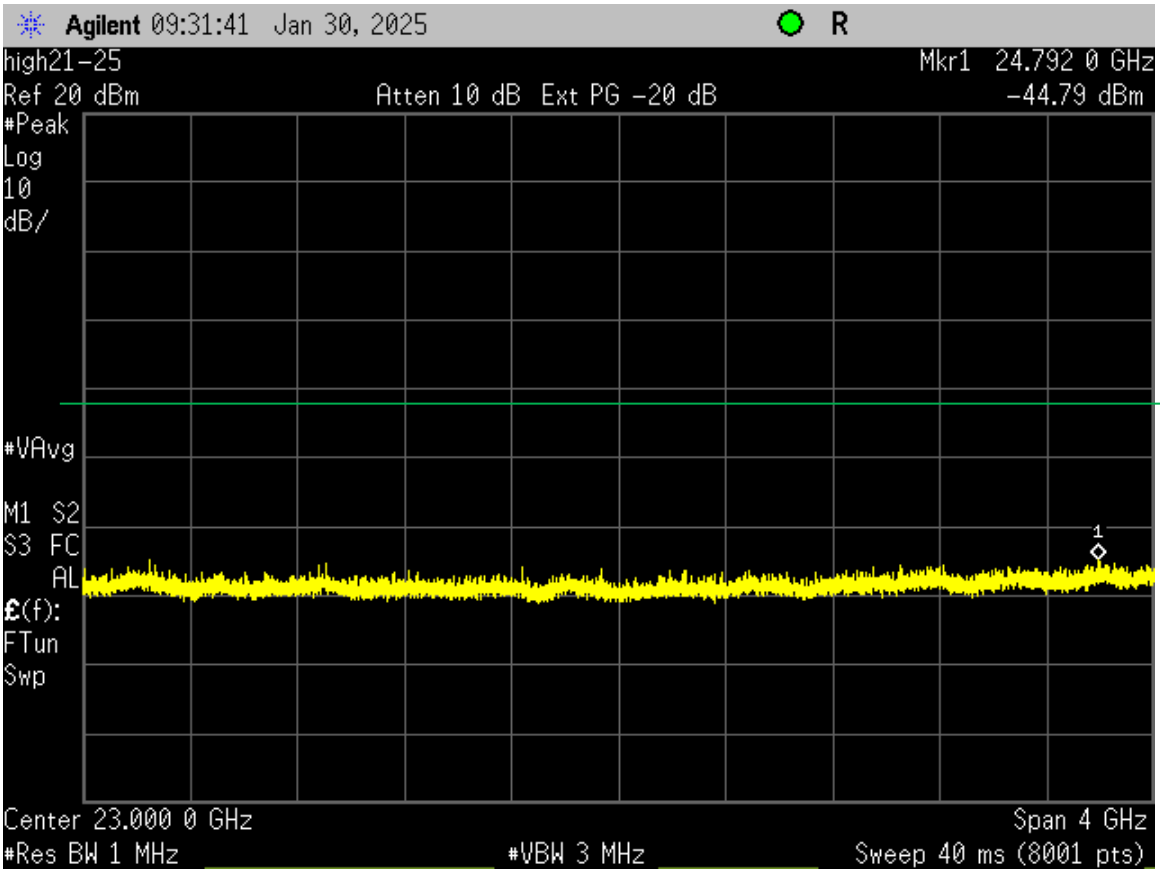


Figure 31. High Channel, 21 - 25 GHz

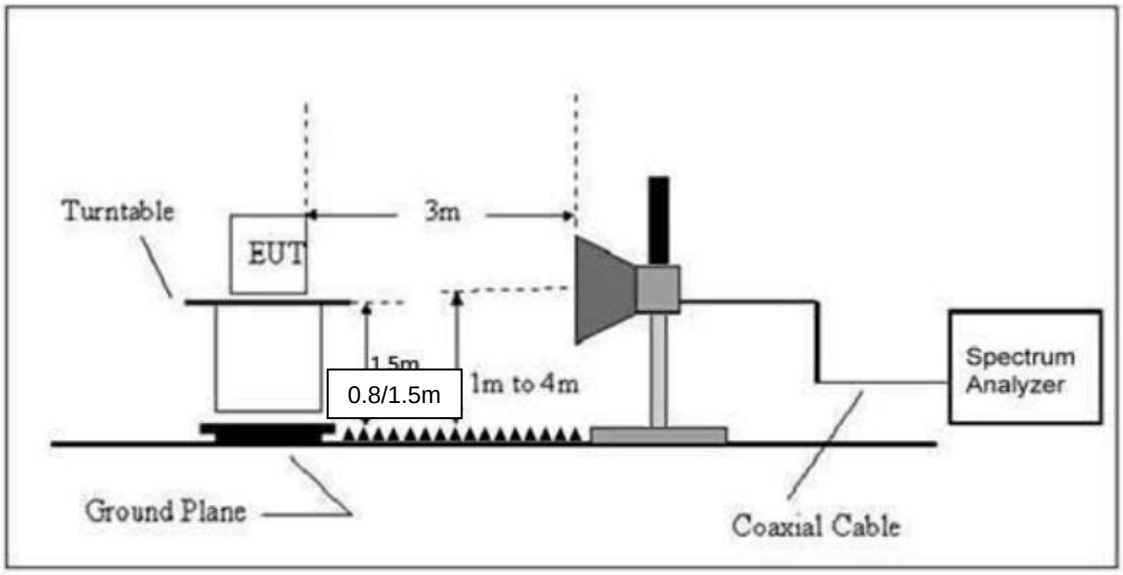


Figure 32. Radiated Emissions Setup (Fundamental and Harmonics)

Note: measurements below 1 GHz were performed at a EUT height of 80cm from the GRP while measurements above 1 GHz were performed at a EUT height of 1.5m from the GRP.

Table 6. Peak Radiated Fundamental & Harmonic Emissions- HORZ

Test: FCC Part 15, Para 15.209, 15.247(d)								
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Low Channel								
2402.00	84.83	--	-6.46	78.37	--	3.0m./Horz	--	**PK**
*4804.00	34.52	--	0.69	35.21	54.0	3.0m./Horz	18.8	**PK**
*7206.00	36.40	--	6.29	42.69	54.0	3.0m./Horz	11.3	**PK**
Mid Channel								
2440.00	84.25	--	-6.53	77.72	--	3.0m./Horz	--	**PK**
*4880.00	35.94	--	1.17	37.11	54.0	3.0m./Horz	16.9	**PK**
*7320.00	36.98	--	7.20	44.18	54.0	3.0m./Horz	9.8	**PK**
High Channel								
2480.00	90.85	--	-6.51	84.34	--	3.0m./Horz	--	**PK**
*4960.00	37.17	--	0.73	37.90	54.0	3.0m./Horz	16.1	**PK**
*7440.00	35.06	--	6.78	41.84	54.0	3.0m./Horz	12.2	**PK**

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. The EUT was placed in the worst-case orientation 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 is the worst case data used as the representative test data.
4. All measurements were collected at a 3 meter test distance.

Sample Calculation at 4804.00 MHz:

Magnitude of Measured Frequency	34.52	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	0.69	dB/m
Corrected Result	35.21	dBuV/m

Test Date: December 9 & 10, 2024

Tested By
Signature: _____ Name: Gabriel Medina

Table 7. Peak Radiated Fundamental & Harmonic Emissions- VERT

Test: FCC Part 15, Para 15.209, 15.247(d)								
Frequency (MHz)	**Test Data (dBuV)**	**Factor (dB)**	**AF+CA -AMP (dB/m)**	**Results (dBuV/m)**	**Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector Mode**
Low Channel								
2402.00	84.17	--	-6.46	77.71	--	3.0m./VERT	--	**PK**
*4804.00	34.89	--	0.69	35.58	54.0	3.0m./VERT	18.4	**PK**
7206.00	36.76	--	6.17	42.93	54.0	3.0m./VERT	11.1	**PK**
Mid Channel								
2440.00	84.14	--	-6.53	77.61	--	3.0m./VERT	--	**PK**
*4880.00	35.46	--	1.16	36.62	54.0	3.0m./VERT	17.4	**PK**
*7320.00	37.04	--	7.27	44.31	54.0	3.0m./VERT	9.7	**PK**
High Channel								
2480.00	89.24	--	-6.62	82.62	--	3.0m./VERT	--	**PK**
*4960.00	35.21	--	0.79	36.00	54.0	3.0m./VERT	18.0	**PK**
*7440.00	35.97	--	6.73	42.70	54.0	3.0m./VERT	11.3	**PK**

1. (*) Falls within the restricted bands of CFR 15.205. Limits based on CFR15.209 & 20 dB relaxation for peak measurements of CFR 15.35.
2. No other signals detected within 20 dB of specification limit. Harmonics investigated up to the 10th harmonic
3. The EUT was placed in the worst-case orientation 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 is the worst case data used as the representative test data.
4. All measurements were collected at a 3 meter test distance.

Sample Calculation at 4804.00 MHz:

Magnitude of Measured Frequency	34.89	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	0.69	dB/m
Corrected Result	35.58	dBuV/m

Test Date: December 9 & 10, 2024

Tested By
Signature: _____ Name: Gabriel Medina

2.10 Band Edge Measurements – (CFR 15.247 (d))

Band Edge measurements are made following the guidelines in FCC KDB 558074 D01 v05r02 and ANSI C63.10:2013 with the EUT initially operating on the Lowest Channel and then operating on the Highest Channel within its band of operation. Antenna port conducted measurements are performed to demonstrate compliance with the requirement of 15.247(d) that all emissions outside of the band edges be attenuated by at least 20 dB when compared to its highest in-band value (contained in a 100 kHz band).

To capture the band edge set the Spectrum Analyzer frequency span large enough (usually around 3 MHz) to capture the peak level of the emission operating on the channel closest to the band edge as well as any modulation products falling outside of the authorized band of operation. Conducted measurements are performed with RBW ≥1% of the frequency span. In all cases, the VBW is set ≥ RBW. See figure and calculations below for more detail. This measurement was performed with the EUT continuously transmitting on the low and high channels as well as in normal use mode (frequency hopping ON).

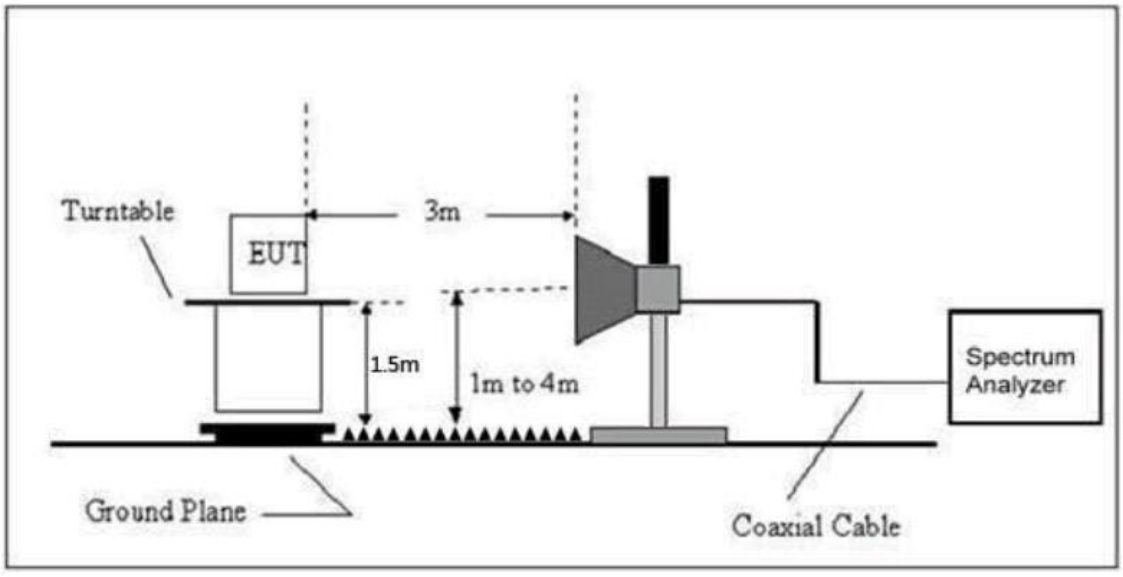


Figure 33. Radiated Emissions Setup (Restricted Band)

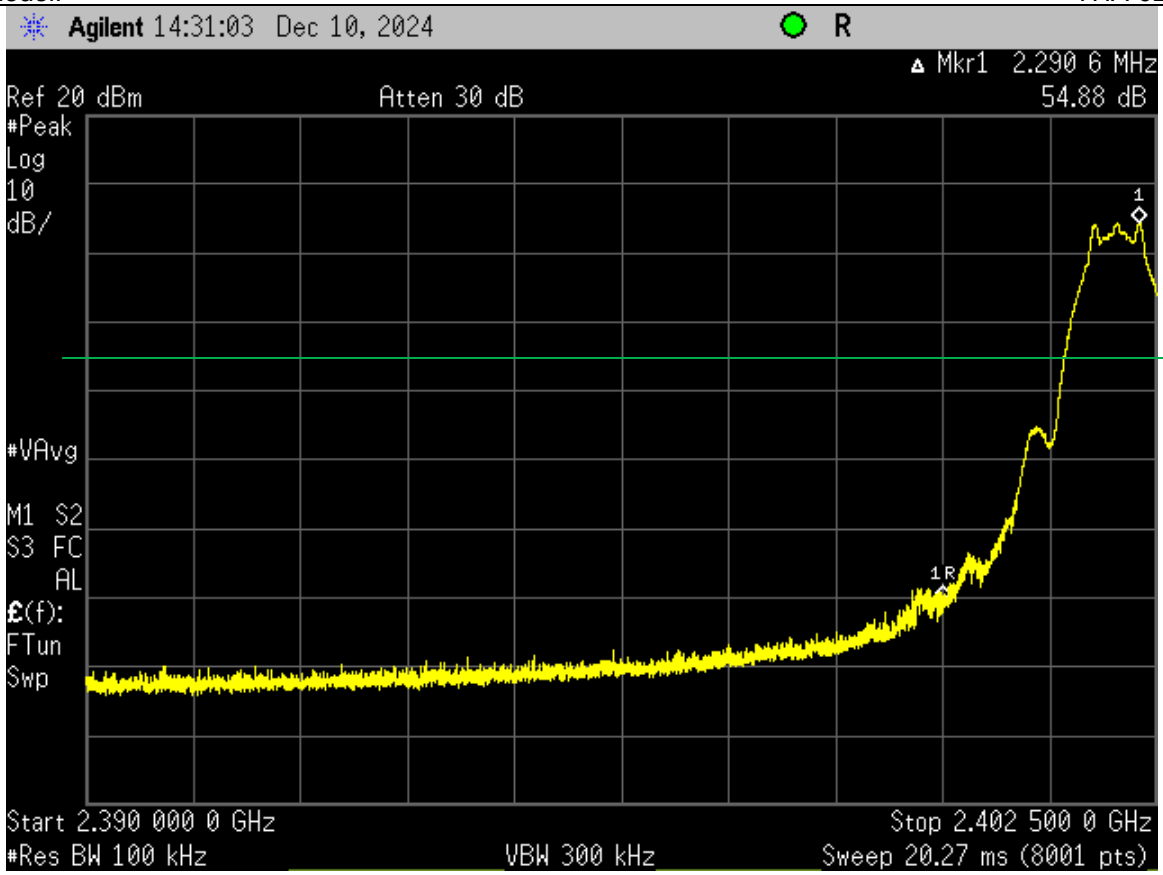


Figure 34. Band Edge Compliance, Low Channel Delta - Peak

All emissions greater than 100 kHz bandwidth outside the frequency band in which the DTS intentional radiator is operating is at least 20 dB below the fundamental.

Test Date: December 9 & 10, 2024

Tested By
Signature: _____ Name: Gabriel Medina

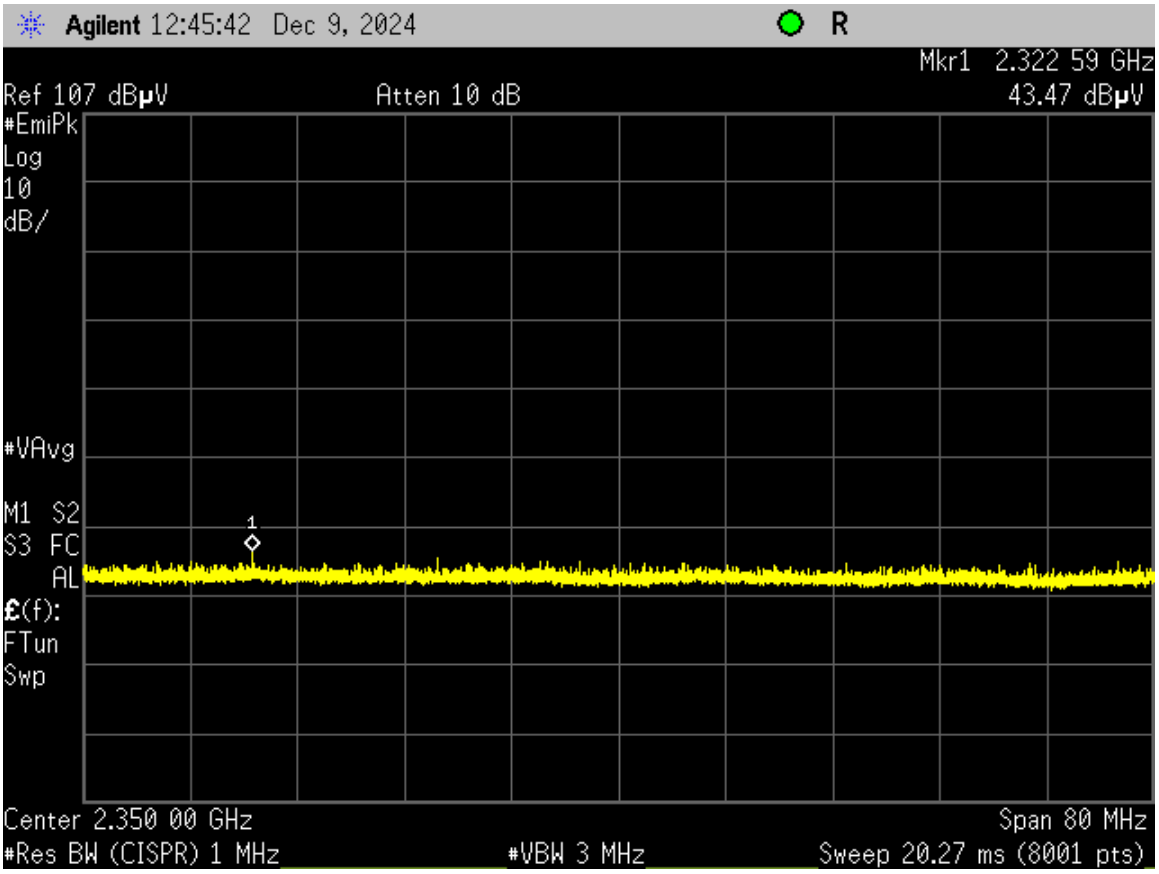


Figure 35. Low Channel Restricted Band - Peak

Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP+DC (dB/m)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector PK/QP/AVG
2322.54	43.47	-6.87	36.60	54.0	3.0m./HORZ	17.4	**PK**

Horizontal polarity was the worse case position.

Test Date: December 9 & 10, 2024

Tested By
Signature: _____ Name: Gabriel Medina

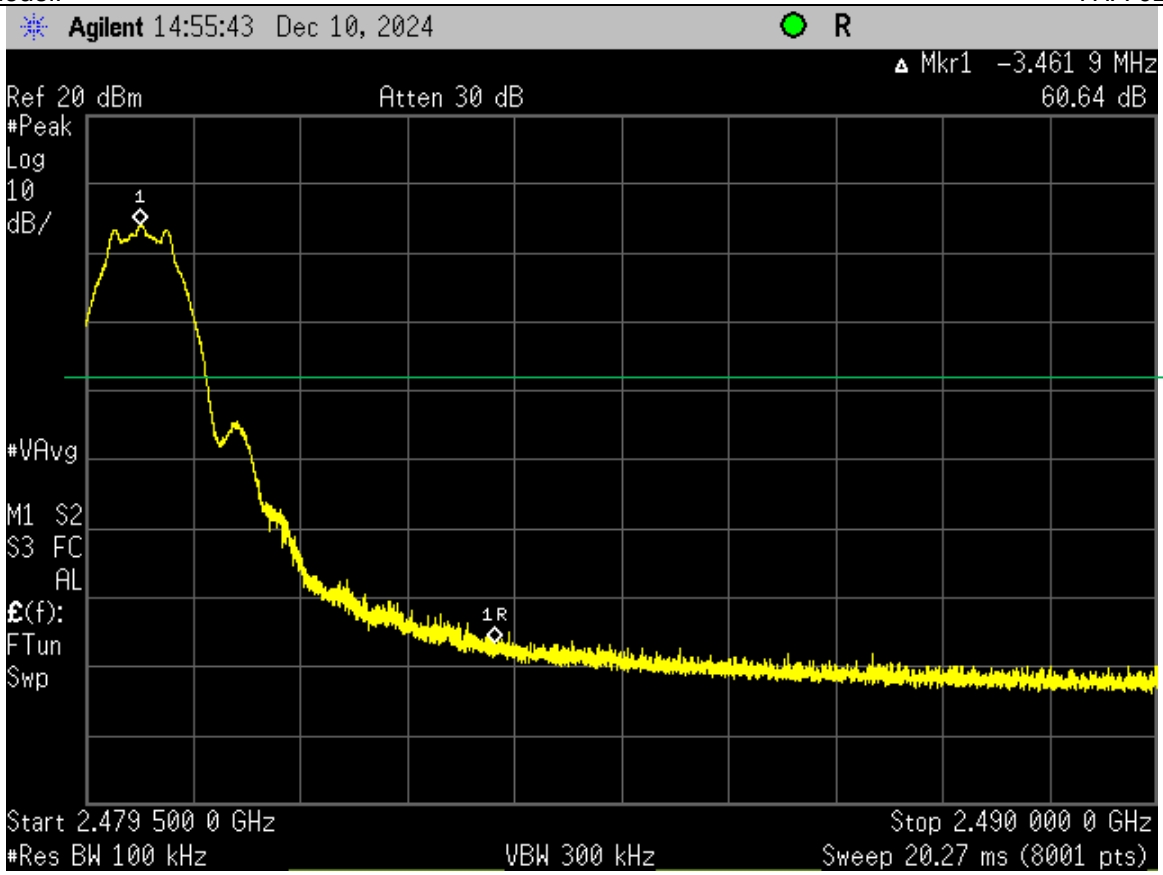


Figure 36. Band Edge Compliance, High Channel Delta – Peak

All emissions greater than 100 kHz bandwidth outside the frequency band in which the DTS intentional radiator is operating is at least 20 dB below the fundamental.
Test Date: December 9 & 10, 2024

Tested By
Signature: _____ Name: Gabriel Medina

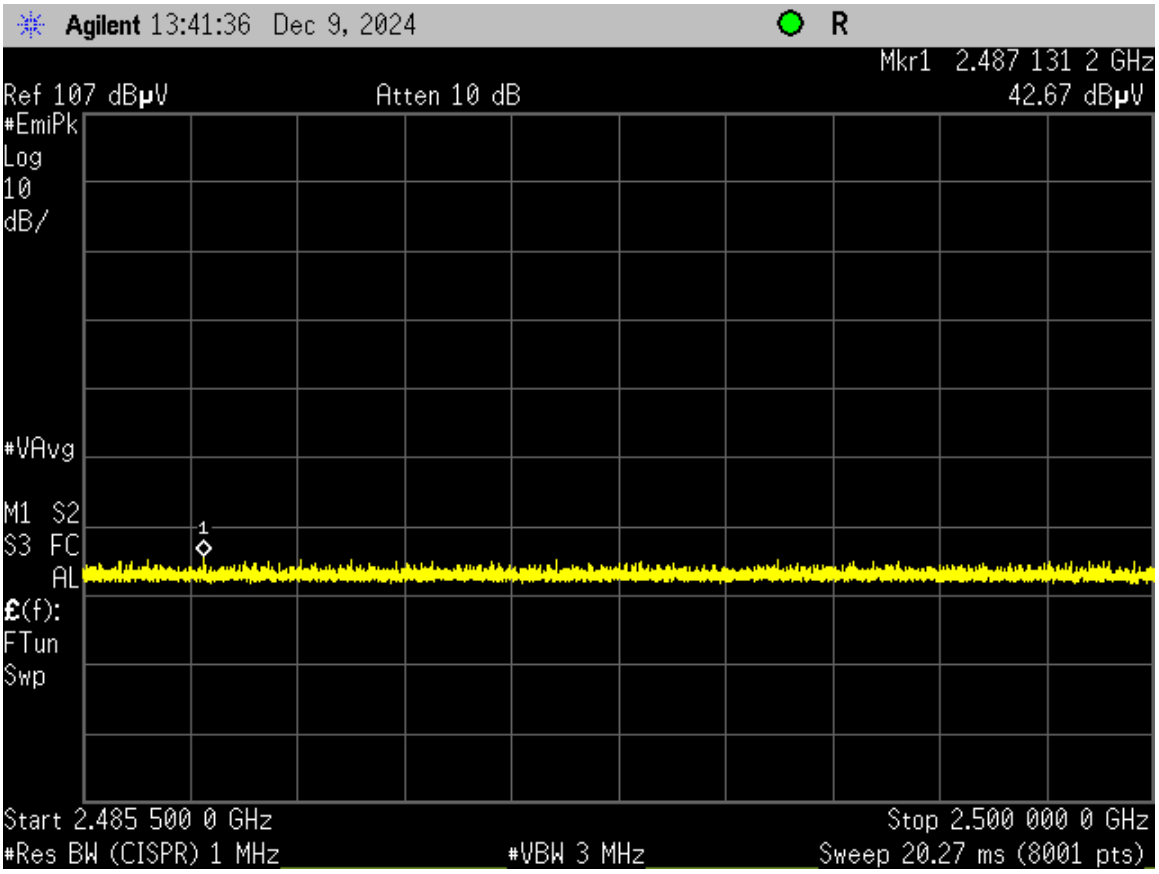


Figure 37. High Channel Restricted Band – Peak

Frequency (MHz)	Test Data (dBuV)	AF+CA-AMP+DC (dB/m)	Results (dBuV/m)	Limits (dBuV/m)	Distance / Polarization	Margin (dB)	Detector PK/QP/AVG
2487.13	42.67	-6.51	36.16	54.0	3.0m./HORZ	17.8	**PK**

Horizontal polarity was the worst case position.

Test Date: December 9 & 10, 2024

Tested By
Signature: _____ Name: Gabriel Medina

2.11 DTS Bandwidth (IC RSS 247 5.2,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 C63.10-2013, clause 11.8. The RBW was set to 100 kHz and the VBW ≥ 3 times RBW. The results of this test are given in the table below and figures below.

Figure 38. Bench Test Setup

Table 8. 6 dB Bandwidth

Frequency (MHz)	99% Bandwidth (MHz)	6 dB Bandwidth (MHz)
2402.00	1.0527	0.585
2440.00	1.0657	0.628
2480.00	1.0639	0.632

Test Date: December 10, 2024

Tested By
Signature: _____ Name: Gabriel Medina

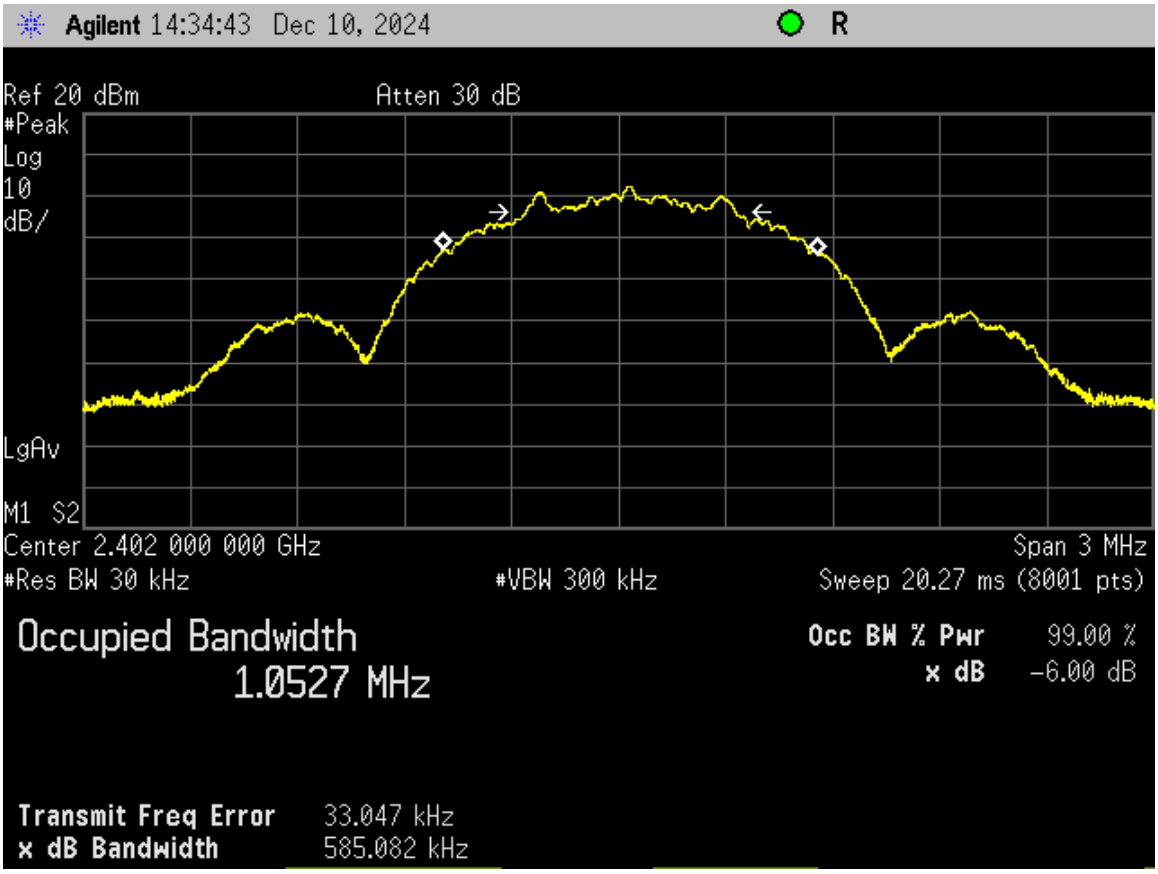


Figure 39. Bandwidth – Low Channel 99% & 6 dB

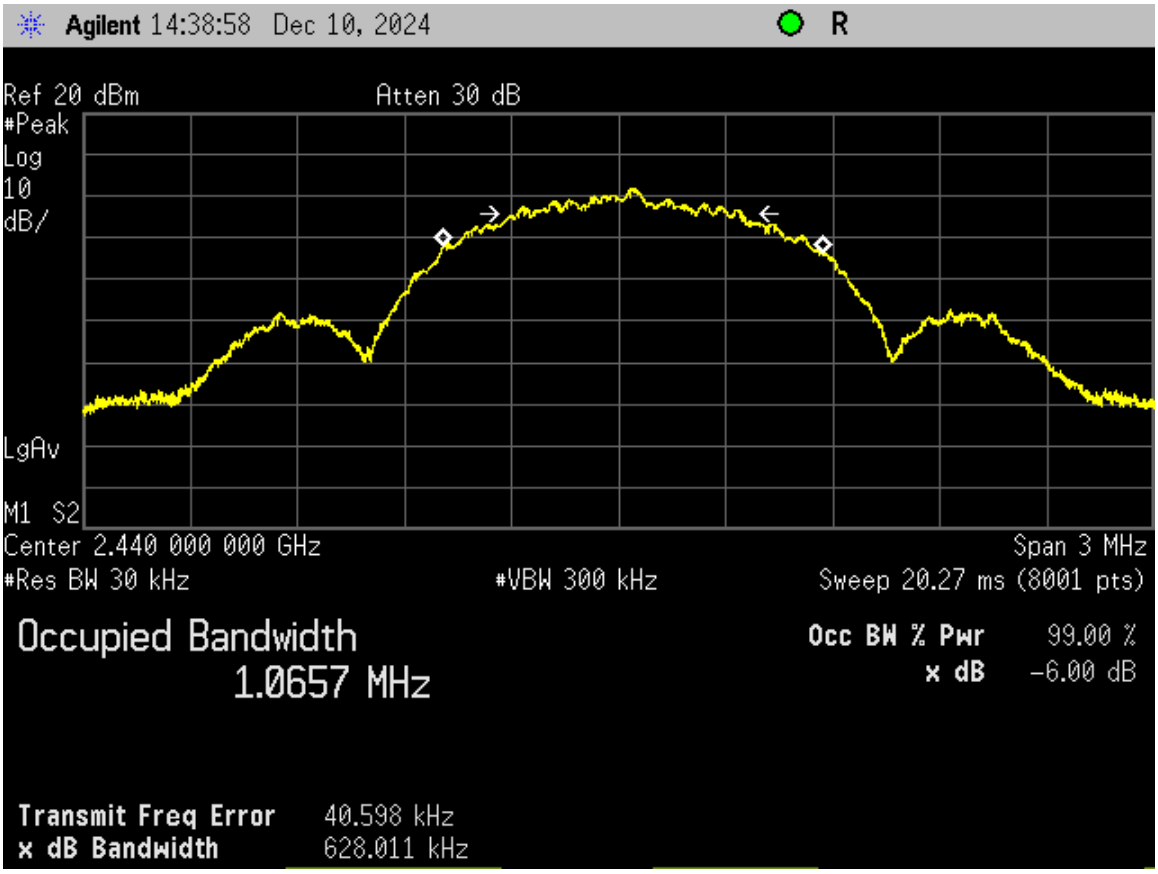


Figure 40. Bandwidth – Mid Channel 99% & 6 dB

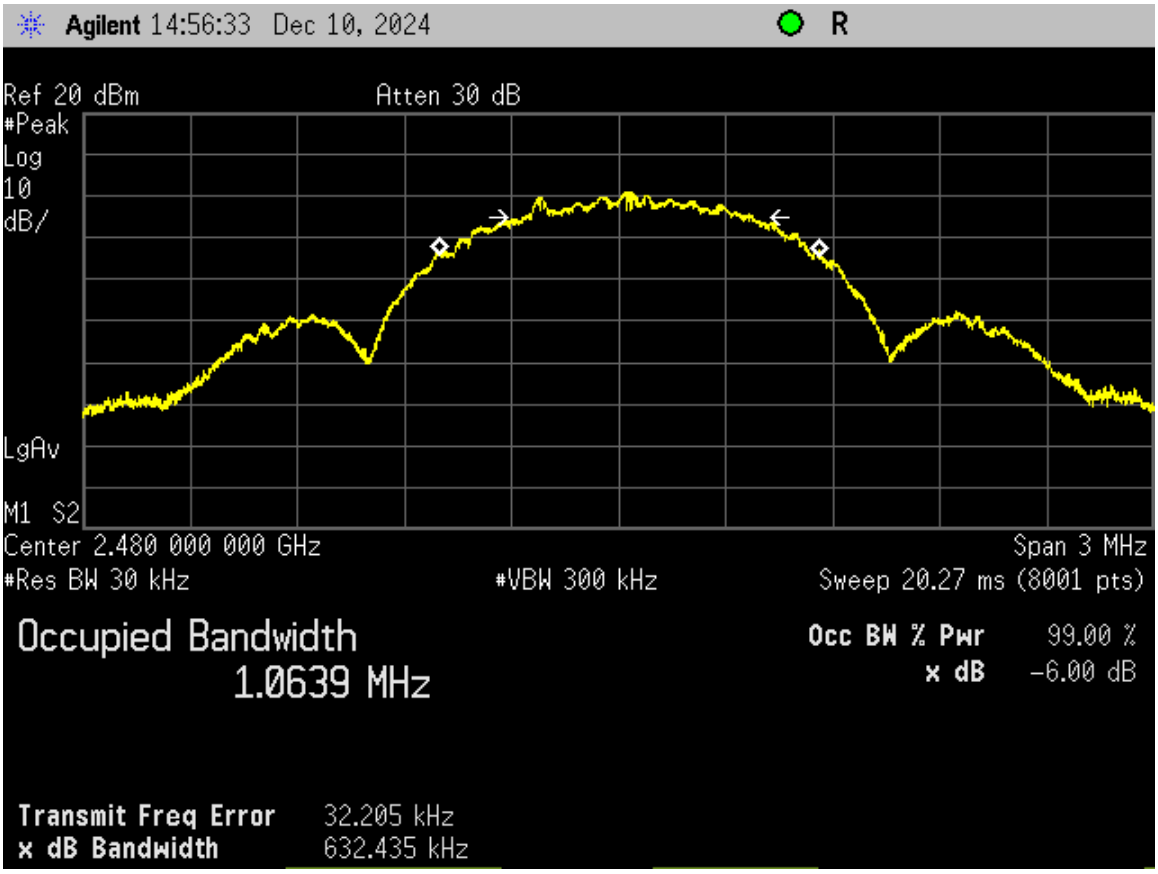


Figure 41. Bandwidth – High Channel 99% & 6 dB

2.12 Maximum Peak Conducted Output Power (CFR 15.247 (b) (3))

For systems using digital modulation in the 902–928 MHz, 2400–2483.5 MHz, or 5725–5850 MHz bands, the maximum peak conducted output power of the intentional radiator shall not exceed 1 watt.

Peak power within the band 2400 MHz to 2483.5 MHz was measured per ANSI C63.10-2013 as an Antenna Conducted test with a spectrum analyzer by connecting the spectrum analyzer directly, via a short RF cable, output terminals on the EUT. The spectrum analyzer was set to a RBW of1 MHz, and the VBW ≥ 3 times RBW. The integration method was used. Peak antenna conducted output power is tabulated in the table below.

Figure 42. Bench Test Setup

Table 9. Peak Antenna Conducted Output Power per Part 15.247 (b) (3)

Frequency of Fundamental (MHz)	Measured Test Data dBm	Converted Data (mW)	FCC Limit (mW Maximum)
2402.00	4.35	2.72	1,000.00
2440.00	4.25	2.66	1,000.00
2480.00	4.18	2.62	1,000.00

Test Date: December 10, 2024

Tested By
Signature: _____ Name: Gabriel Medina

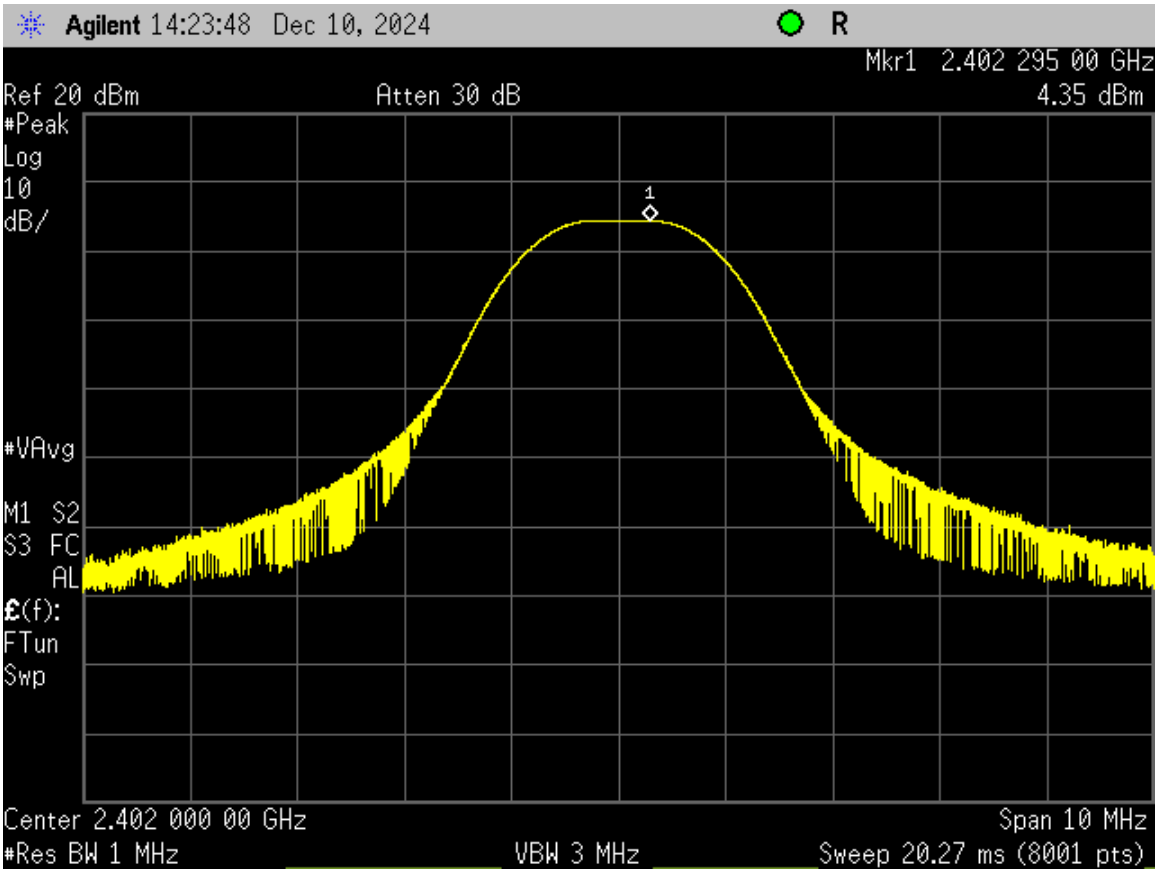


Figure 43. Peak Antenna Conducted Output Power, Low Channel

Note: RF cable loss less than 0.5 dB.

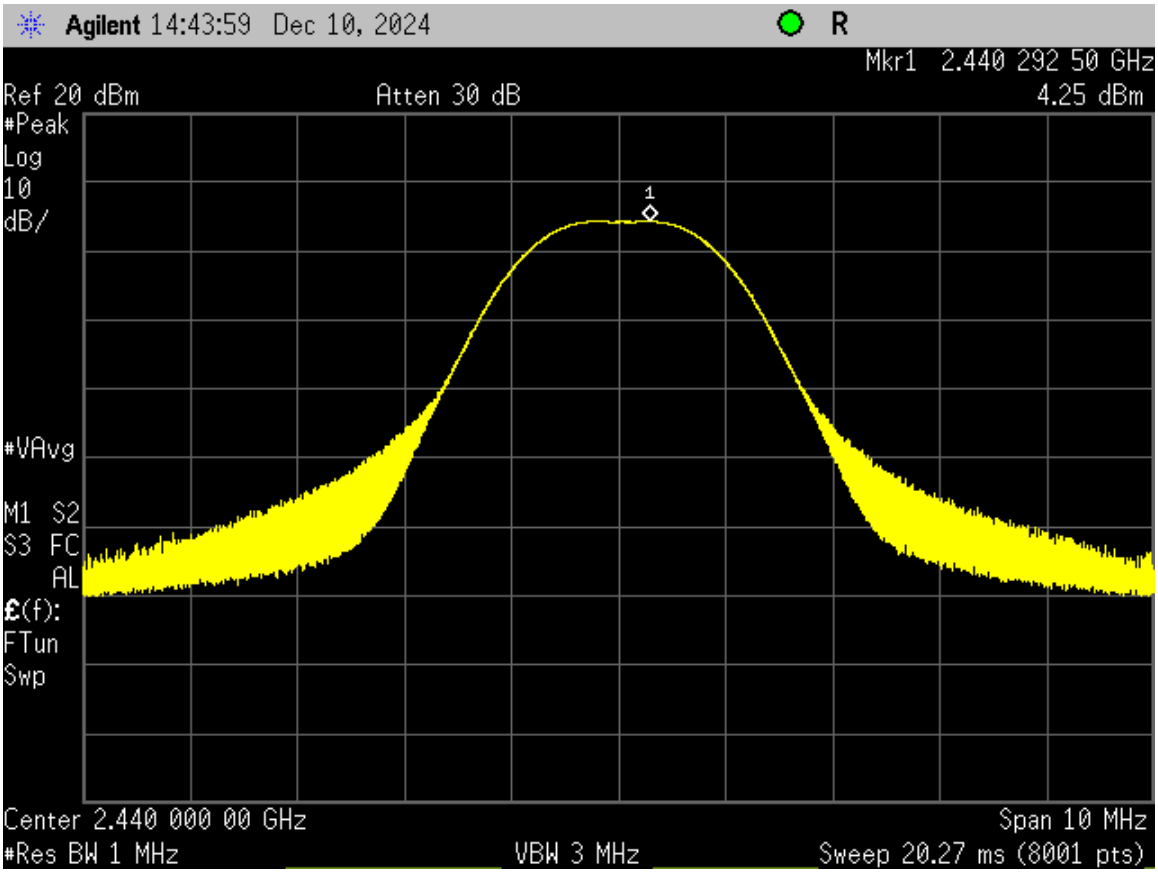


Figure 44. Peak Antenna Conducted Output Power, MId Channel

Note: RF cable loss less than 0.5 dB.

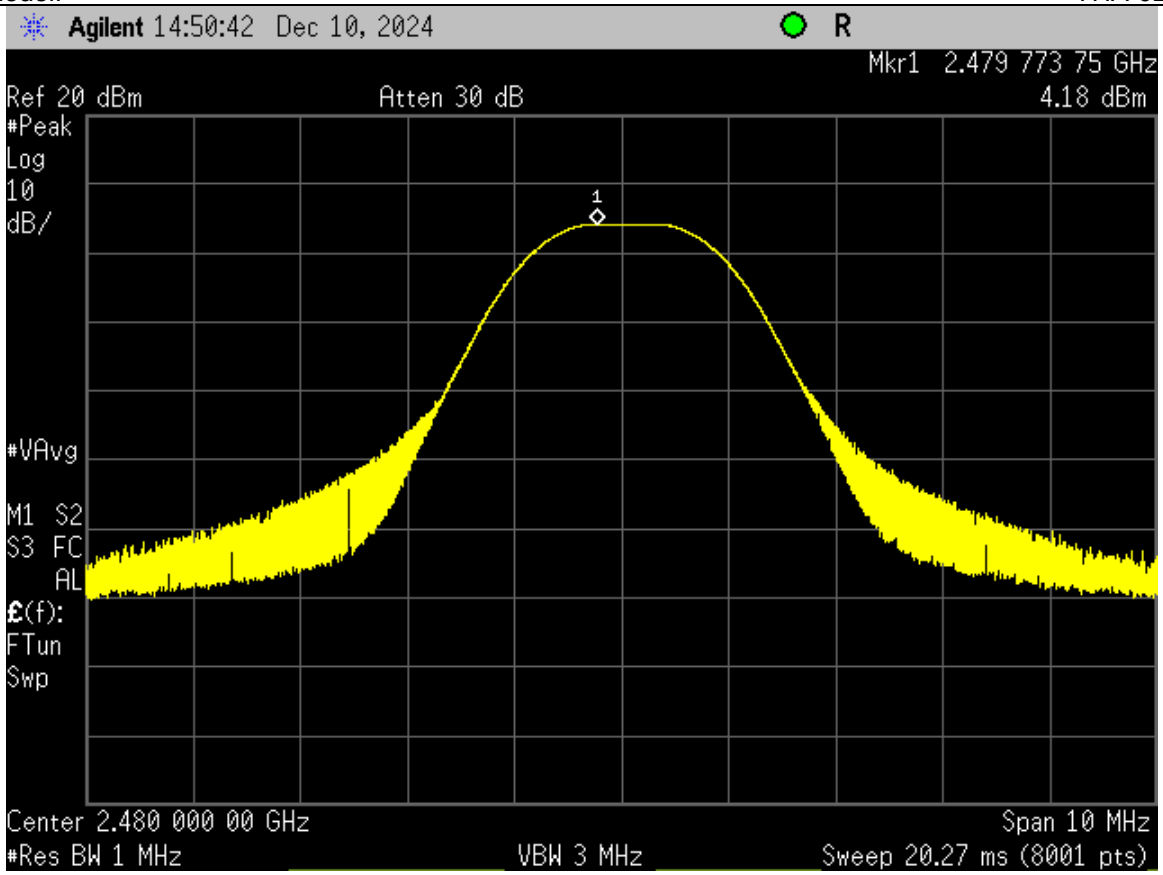


Figure 45. Peak Antenna Conducted Output Power, High Channel

Note: RF cable loss less than 0.5 dB.

2.13 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 C63.10-2013. The RBW was set to 3 kHz and the Video Bandwidth was set to ≥ 3 times 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.

Figure 46. Bench Test Setup

Table 10. Power Spectral Density for Low, Mid and High Bands

Frequency (MHz)	Measured Result (dBm/3kHz)	FCC Limit (dBm/3 kHz)
2402.00	-9.99	+8.0
2440.00	-9.38	+8.0
2480.00	-7.75	+8.0

Note: dBm/Hz correct to dBm/kHz using the following formula, 10 log RBW ref/RBW measured.

Test Date: December 10, 2024

Tested By
Signature: _____ Name: Gabriel Medina

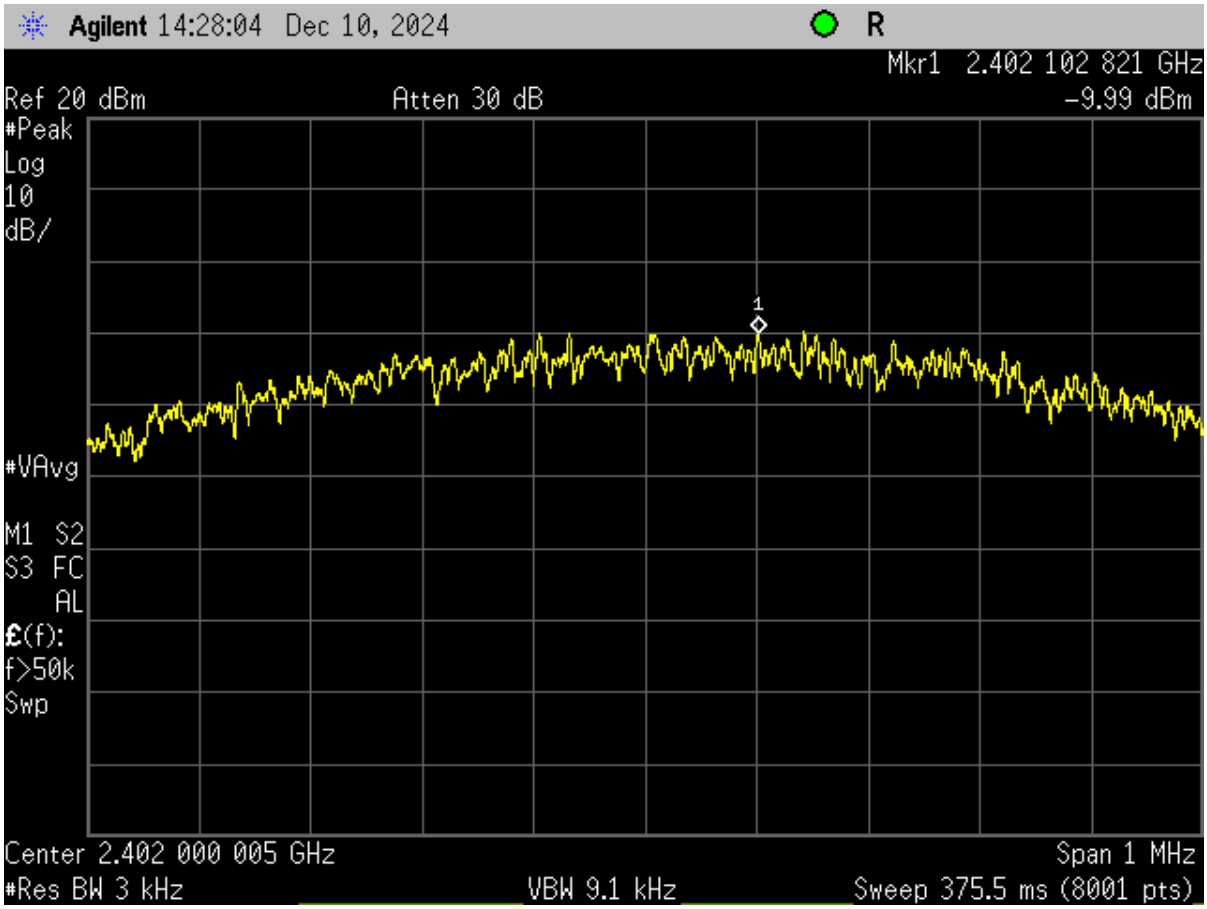


Figure 47. Power Spectral Density, Low Channel

Note: RF cable loss less than 0.5 dB.

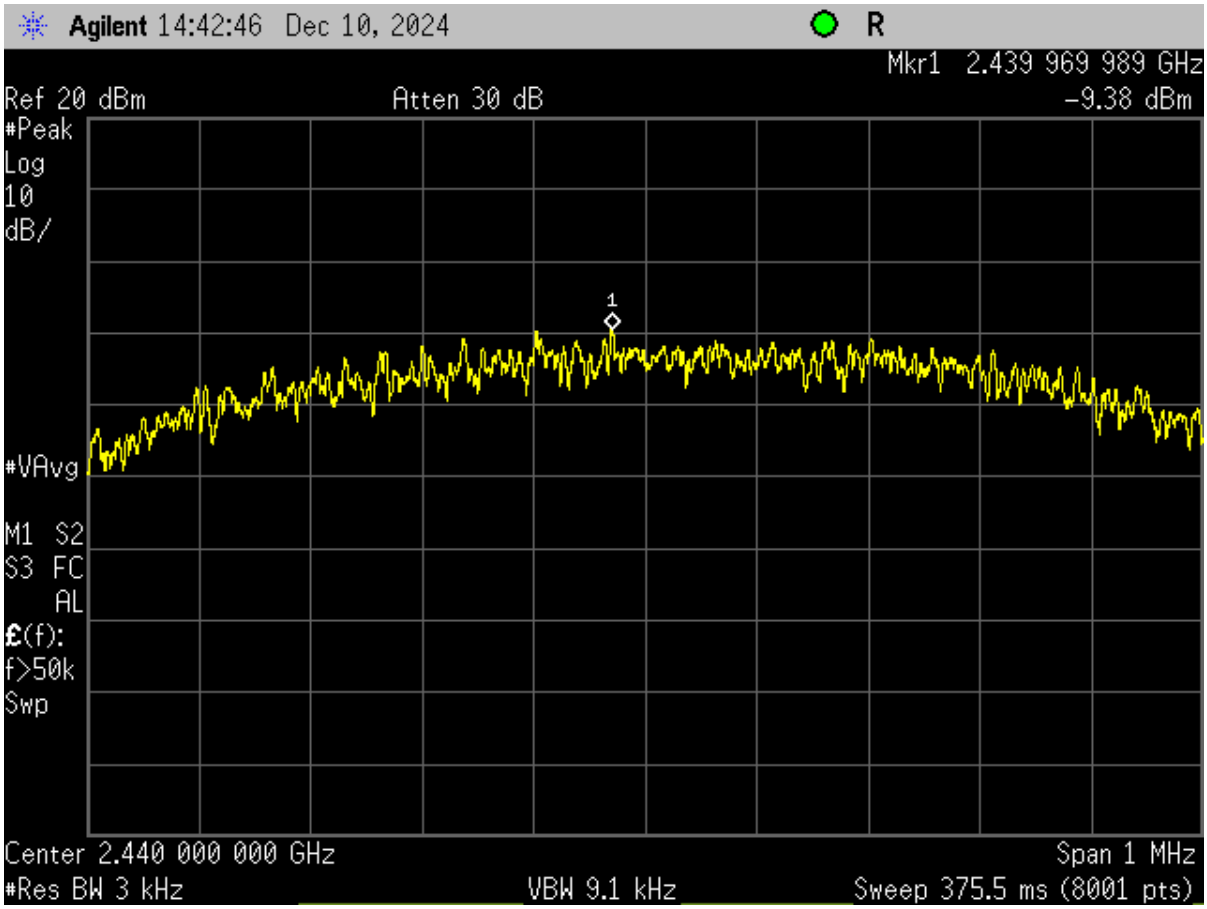


Figure 48. Power Spectral Density, Mid Channel

Note: RF cable loss less than 0.5 dB.

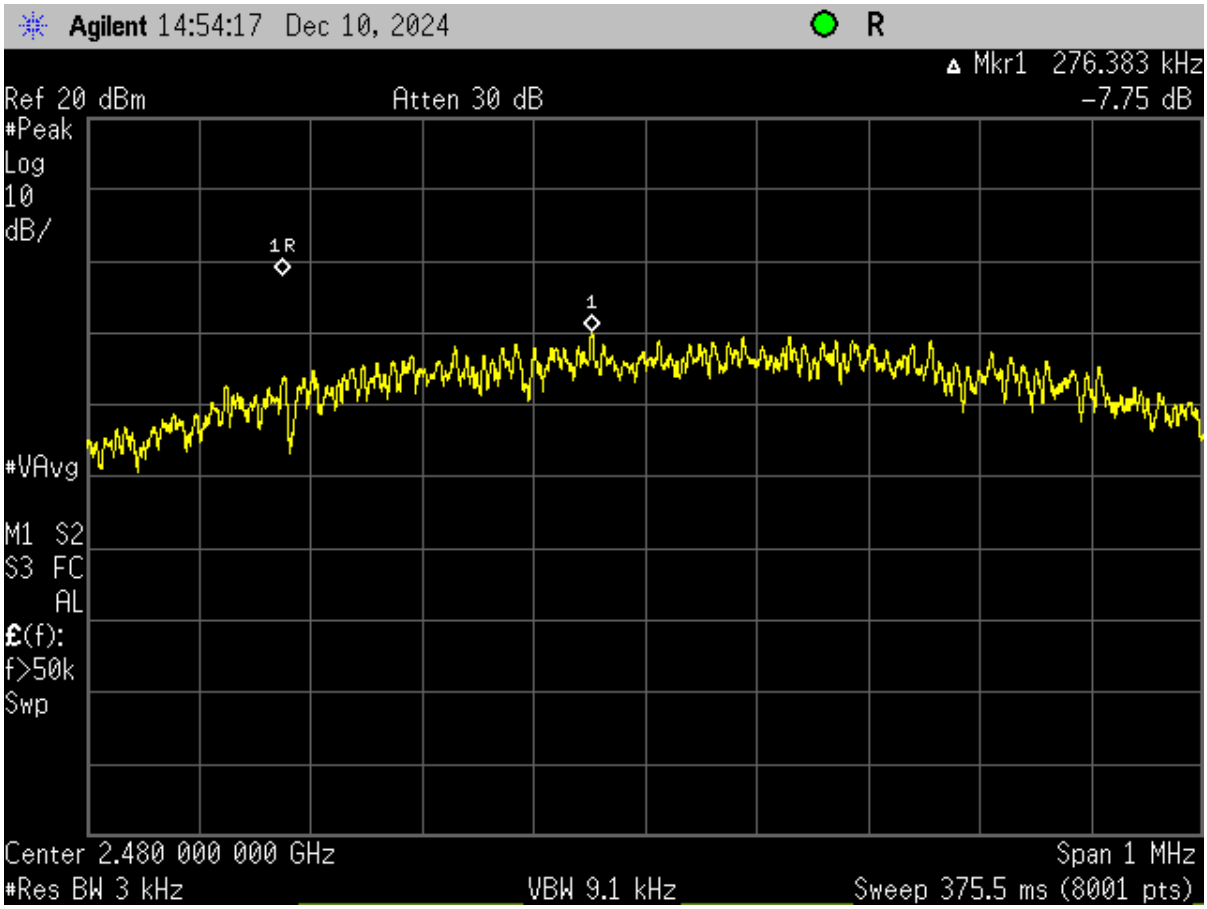


Figure 49. Power Spectral Density, High Channel

Note: RF cable loss less than 0.5 dB.

2.14 Intentional Radiator, Radiated Emissions (CFR 15.209)

Radiated Spurious measurements: The EUT was placed into a continuous transmit mode of operation (>98%) duty cycle) and tested per FCC Public Notice DA 00-705 and ANSI C63.10:2013. A preliminary scan was performed on the EUT to find signal frequencies that were caused by the transmitter part of the device. A preliminary scan was performed on the EUT to find the worst case results the EUT was tested in X, Y, and Z axes or in the orientation of normal operation if the device is designed to operate in a fixed position.

Radiated measurements were then conducted between the frequency range of 9 kHz (or lowest frequency used/generated by the device) up to the tenth harmonic of the device (no greater than 40 GHz). In the band below 30 MHz a resolution bandwidth (RBW) of 9 kHz was used, emissions below 1 GHz were tested with a RBW of 120 kHz and emissions above 1 GHz were tested with a RBW of 1 MHz . All video bandwidth settings were at least three times the RBW value.

Radiated emissions disturbance Measurements were performed with an instrument having both peak and quasi-peak detectors over the frequency range of 9 KHz to 10 GHz. Measurements of the radiated emissions were made with the receiver antenna at a distance of 3 m from the boundary of the test unit.

The test antenna was varied from 1 m to 4 m in height while watching the analyzers' display for the maximum magnitude of the signal at the test frequency. The antenna polarization (horizontal or vertical) and test sample azimuth were varied during the measurements to find the maximum field strength readings to record.

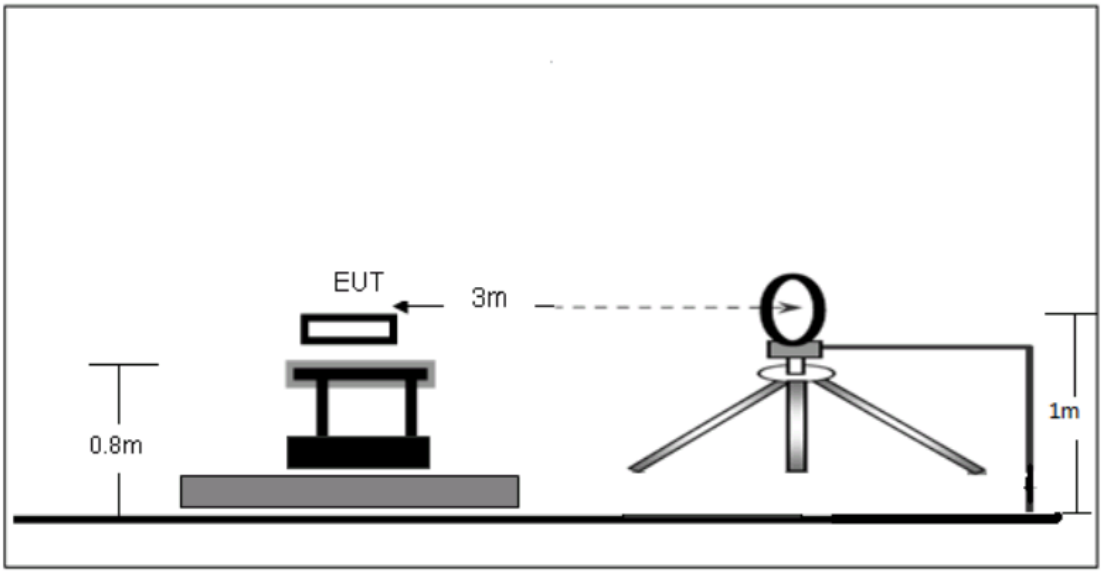


Figure 50. Test Configuration below 30 MHz

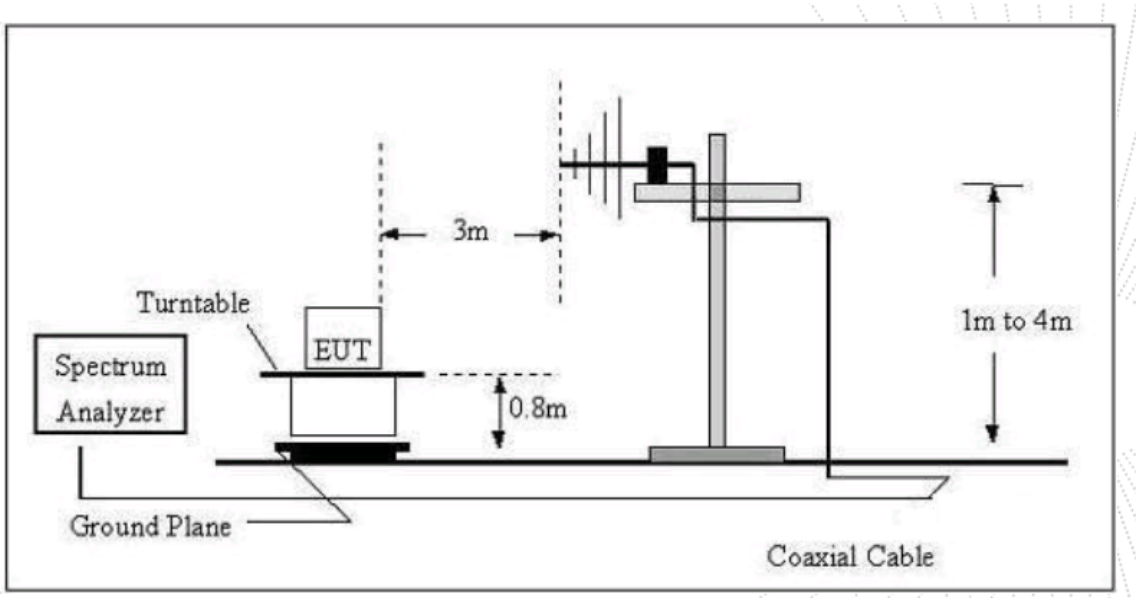


Figure 51. Test Configuration below 1000 MHz

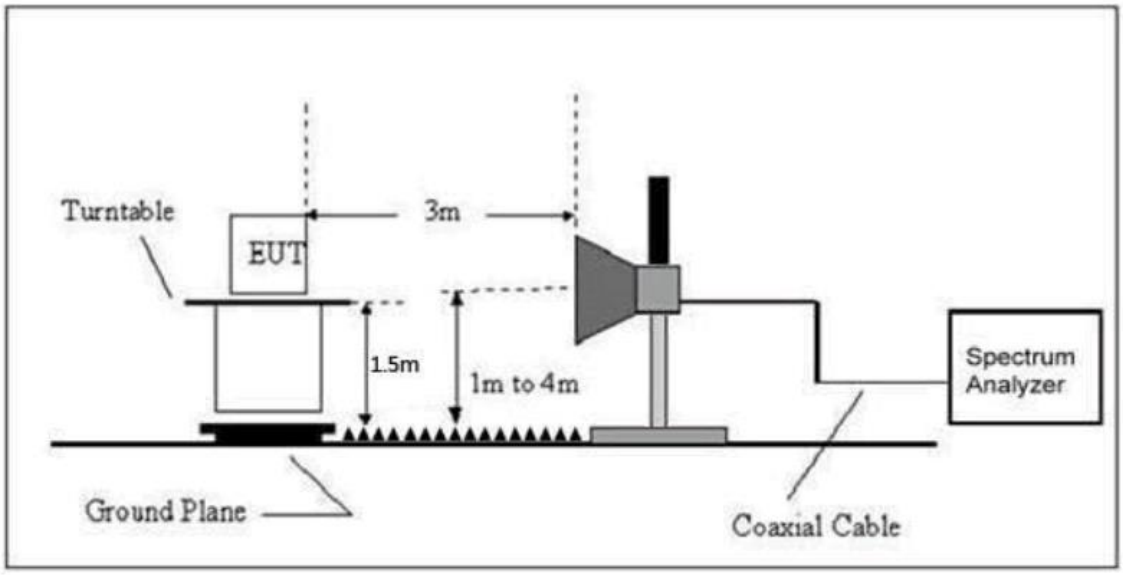


Figure 52. Test Configuration above 1000 MHz

Table 11. Radiated Emissions, 9 kHz - 30 MHz

9 kHz to 30 MHz, 15.209 limits							
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**QP Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
All emissions were greater than 20 dB below the limit							

Sample Calculation: N/A

Test Date: December 10, 2024

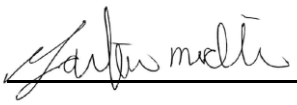
Tested By
Signature:  Name: Gabriel Medina

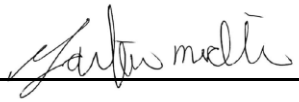
Table 12. Radiated Emissions 30 MHz to 1000 MHz (CFR 15.209)

30 MHz to 1000 MHz, 15.209 limits							
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**QP Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or QP**
105.00	38.41	-13.75	24.66	43.5	3m./HORZ	18.8	PK
234.89	30.90	-11.64	19.26	46.0	3m./HORZ	26.7	PK
611.32	28.76	-2.61	26.15	46.0	3m./HORZ	19.8	PK
47.50	37.66	-13.04	24.62	40.0	3m./VERT	15.4	PK
359.04	29.50	-8.13	21.37	46.0	3m./VERT	24.6	PK
677.57	29.21	-0.93	28.28	46.0	3m./VERT	17.7	PK
All other emissions are more than 20 dB below the applicable limit.							

Sample Calculation at 105.00 MHz:

Magnitude of Measured Frequency	38.41	dBuV
+Antenna Factor + Cable Loss+ Amplifier Gain	-13.75	dB/m
Corrected Result	24.66	dBuV/m

Test Date: December 9 & 10, 2024

Tested By
Signature:  Name: Gabriel Medina

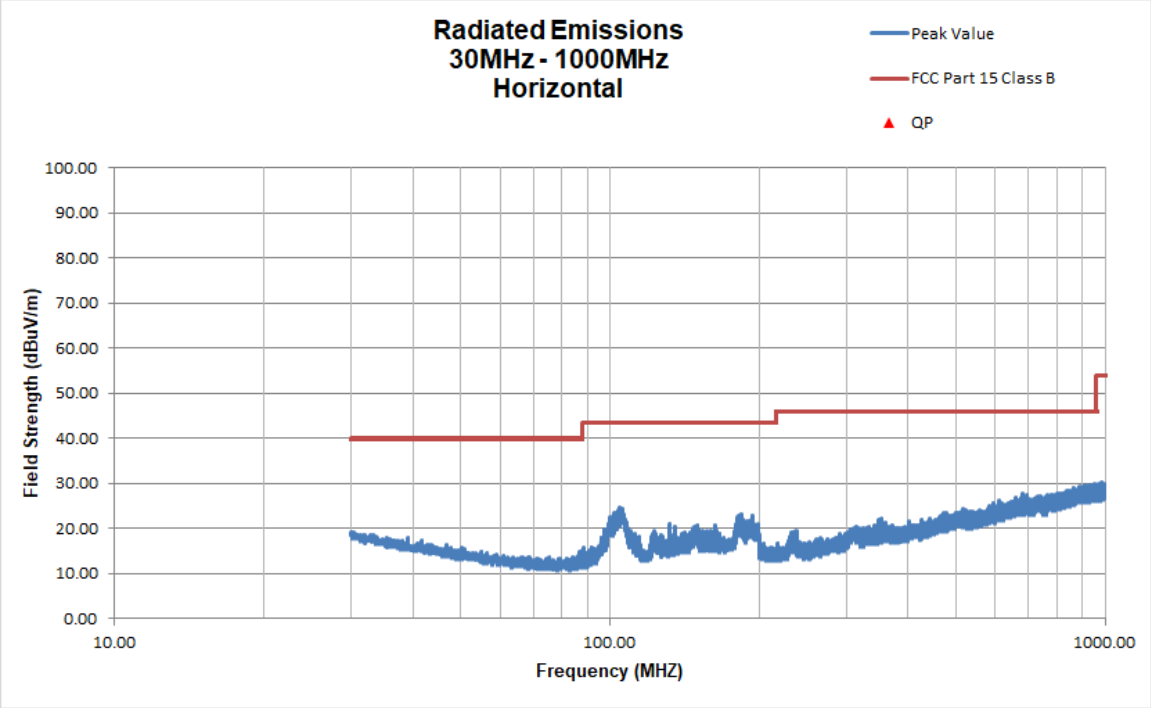


Figure 53. Radiated Emissions TX, 30 MHz - 1000 MHz – Horizontal

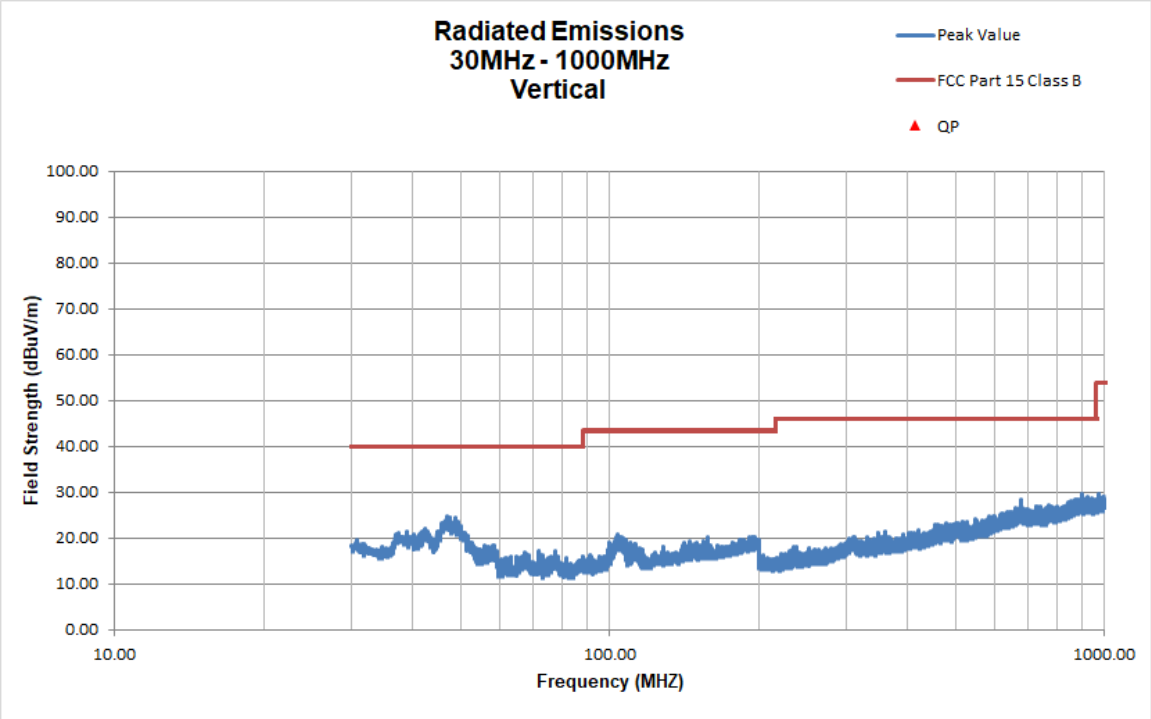


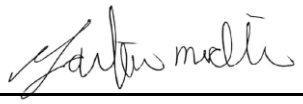
Figure 54. Radiated Emissions TX, 30 MHz - 1000 MHz - Vertical

Table 13. Radiated Emissions Above 1 GHz (CFR 15.209)

Above 1 GHz, 15.209 limits							
Frequency (MHz)	**Test Data (dBuv)**	**AF+CA-AMP (dB/m)**	**Results (dBuV/m)**	**AVG Limits (dBuV/m)**	**Antenna Distance/ Polarization**	**Margin (dB)**	**Detector PK, or AVG**
Other than the fundamental emission, all other emissions seen were more than 20 dB below the limit.							

Sample calculation: N/A

Test Date: December 10, 2024

Tested By
Signature:  Name: Gabriel Medina

2.15 Measurement Uncertainty

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

2.15.1 Conducted Emissions Measurement Uncertainty

Measurement Uncertainty (within a 95% confidence level) for this test is ± 2.78 dB.

2.15.2 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 ± 5.39 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 ± 5.18 dB.

The measurement uncertainty (with a 95% confidence level) for this test using a Horn Antenna (1 GHz to 18 GHz) is ± 5.21 dB.

3 Conclusion

The EUT is deemed to have met the requirements of this subpart as tested and presented in this test report.