Test Report

Prepared for: Thermaco Inc.

Model: Big Dipper

Serial Number: NA

FCC ID: 2BPIM0037031747

Project No: p2550002

Test Results: Pass

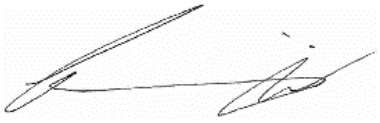
To

FCC Part 15.247: 2025
and
RSS-247: Issue 3 (August 2023)

Date of Issue: July 24, 2025

On the behalf of the applicant:	**Thermaco Inc.** **646 Greensboro St.** **Asheboro, NC 27203**
Attention of:	**Jan Fischer** **Ph: (336)629-4651** **E-mail: janf@thermaco.com**
Prepared By:	**Compliance Testing, LLC** **Mesa, AZ 85204** **(480) 926-3100 phone / (480) 926-3598 fax** **www.compliancetesting.com** **ANAB Cert#: AT-2901** **FCC Site Reg. #US2901** **ISED Site Reg. #2044A-2**

Reviewed / Authorized By:



John Michalowicz, Test Engineer

Test Results Summary

Test Date Range: July 9th 2025 – July 21st 2025

Specification		Test Name	Pass, Fail, N/A	Comments
FCC	**RSS**			
15.247(b)	Section 5.4(d)	Output Power	Pass	
15.247(d)	Section 5.5	Conducted Spurious Emissions	Pass	
15.247(d), 15.209(a), 15.205	Section 5.5 / RSS-GEN Section 8.9	Radiated Spurious Emissions	Pass	
15.247(d), 15.209(a), 15.205	Section 5.5	Emissions At Band Edges	Pass	
15.247(a)(2)	Sections 5.2(a)	Occupied Bandwidth	Pass	
15.247(e)	Section 5.2(b)	Transmitter Power Spectral Density	Pass	
15.247(a)	Section 5.1 (c)	Dwell Time	N/A	EUT is a DTS device
15.247(a)	Section 5.1 (c)	Number of Hopping Channels	N/A	EUT is a DTS device
15.247(a)	Section 5.1 (b)	Channel Separation	N/A	EUT is a DTS device
15.207	RSS-GEN Section 8.8	A/C Powerline Conducted Emissions	Pass	
Method Deviations/Additions: No				

Statements of conformity are reported as:

- Pass - the measured value is below the acceptance limit, *acceptance limit = test limit*.
- Fail - the measured value is above the acceptance limit, *acceptance limit = test limit*.

References/Methods	Description
ANSI C63.4-2014	Method and Measurements of Radio-Noise Emissions from low-Voltage Electrical and Electronic Equipment in the range 9kHz to 40GHz.
ANSI C63.10:2020	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
558074 D01 15.247 Meas Guidance v05r02	Guidance for Compliance Measurements on DTS, FHSS, and Hybrid System Devices Operating Under Section 15.247 of the FCC Rules
ISO/IEC 17025:2017	General requirements for the Competence of Testing and Calibrations Laboratories

Table of Contents

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	July 24, 2025	John Michalowicz	Original Document

Current revision of the test report replaces any prior versions. Only the current version of the test report is valid.

EUT Description

Model:	**Big Dipper**
Serial:	**NA**
Firmware:	**NBGD-v1.0.27-wifiradiotest.hex**
Software:	**NBGD-v1.0.27-wifiradiotest.hex**
Description:	**Commercial Grease Interceptor**
Additional Information:	**Radio Frequency Range and Operational Info:** 2412 – 2462 WiFi 802.11b/g/n **Usage: Fixed-Use/Mobile**
Receipt of Sample(s):	**June 10th 2025**
EUT Condition:	**Visual Damage** No **State of Development** Production/Production Equivalent

The applicant has been cautioned as to the following

15.21 - Information to User

The user's manual or instruction manual for an intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

15.27(a) - Special Accessories

Equipment marked to a consumer must be capable of complying with the necessary regulations in the configuration in which the equipment is marketed. Where special accessories, such as shielded cables and/or special connectors are required to enable an unintentional or intentional radiator to comply with the emission limits in this part, the equipment must be marketed with, i.e. shipped and sold with, those special accessories. However, in lieu of shipping or packaging the special accessories with the unintentional or intentional radiator, the responsible party may employ other methods of ensuring that the special accessories are provided to the consumer without an additional charge.

Information detailing any alternative method used to supply the special accessories for a grant of equipment authorization or retained in the verification records, as appropriate. The party responsible for the equipment, as detailed in § 2.909 of this chapter, shall ensure that these special accessories are provided with the equipment. The instruction manual for such devices shall include appropriate instructions on the first page of text concerned with the installation of the device that these special accessories must be used with the device. It is the responsibility of the user to use the needed special accessories supplied with the equipment.

Authorization Requirements

Intentional Radios may require authorization covered under the following rule parts or standards:

-47 CFR Part 2 Subpart J

-RSS-Gen — General Requirements for Compliance of Radio Apparatus

Note: These notices are specific to the methods and standards related to the testing within this report. Customers should also consider and review additional legal regulations for import/export documentation and labeling for the countries and geographies under consideration by the manufacturer.

Test and Measurement Data

Subpart 2.1033(b)

All tests and measurement data shown were performed in accordance with FCC Rule Parts: 15.247.

All tests and measurement data shown are deemed satisfactory evidence of compliance with Industry Canada Radio Standards Specification RSS-Gen and RSS-247.

Standard Engineering Practices

Unless otherwise indicated, the procedures contained in ANSI C63.10 and ANSI C63.4 were observed during testing.

Prior to testing, the EUT was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing. Measurement results, unless otherwise noted, are worst case measurement.

Standard Test Conditions and Engineering Practices

Unless otherwise indicated in the specific measurement results, the ambient temperature was maintained within the range of 10º to 40ºC (50º to 104ºF) and the relative humidity levels were in the range of 10% to 90%.

Environmental Conditions		
Temperature (ºC)	**Humidity (%)**	**Barometric Pressure (mbar)**
25.7 – 26.7	34.2 – 42.6	964.2 – 971.2

Test Setup and Modes of Operation

EUT Operation during Tests
The EUT was set into a constant transmit mode using the PuTTy program and manufacturer provided test scripts. >98% duty cycle was attainable for 802.11b/g modes and 63% duty cycle was attainable with 802.11n mode.

Accessories: NA

Cables:

Qty	Description	Length (M)	Shielding Y/N	Shielded Hood Y/N	Ferrite Y/N
1	USB	1	N	Y	N

Modifications to EUT(s) (Y/N): N

15.203: Antenna Requirement:

X	The antenna is permanently attached to the EUT
	The antenna uses a unique coupling
	The EUT must be professionally installed
	The antenna requirement does not apply

The antenna gain stated by the manufacturer is 6 dBi

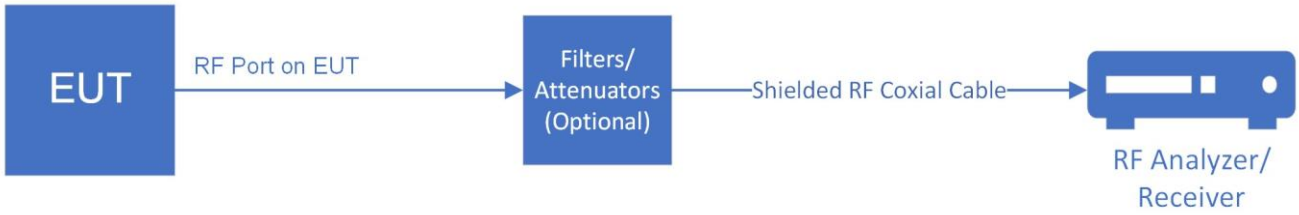
Output Power

Engineer: John Michalowicz
Test Date: 7/09/25

Test Procedure

CONDUCTED METHOD
A spectrum analyzer was directly connected to the EUT's RF port. The EUT was set to transmit on the lowest, middle and highest frequencies at the maximum power level. A spectrum analyzer was used to verify that the EUT met the requirements for Output Power.

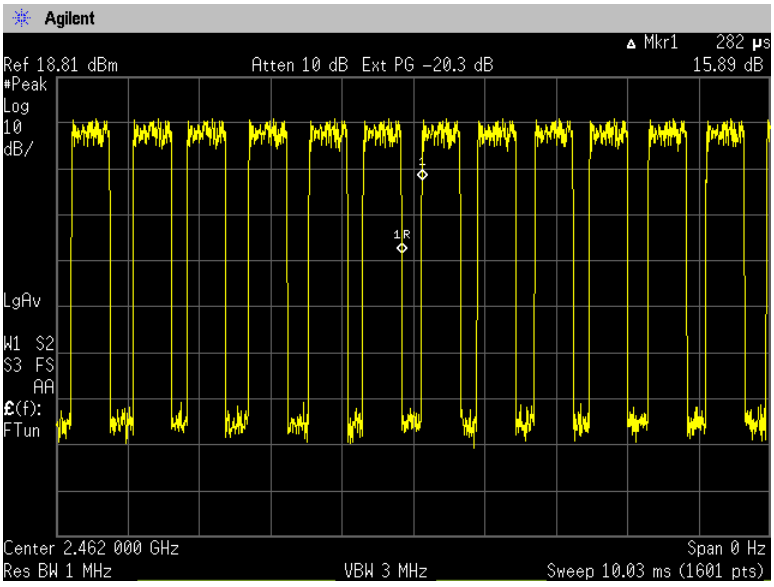
Test Setup



The Spectrum Analyzer was set to the following:

RBW = 1-5% of the OBW, not to exceed 1MHz
VBW ≥ 3 x RBW
RMS Detector
Number of points in sweep ≥ 2 x span / RBW
Trace average at least 100 traces in power averaging mode
Sweep = auto
Span = 1.5 x EBW

The RF output power was measured using the spectrum analyzer's channel power function. A duty cycle correction was add when applicable.



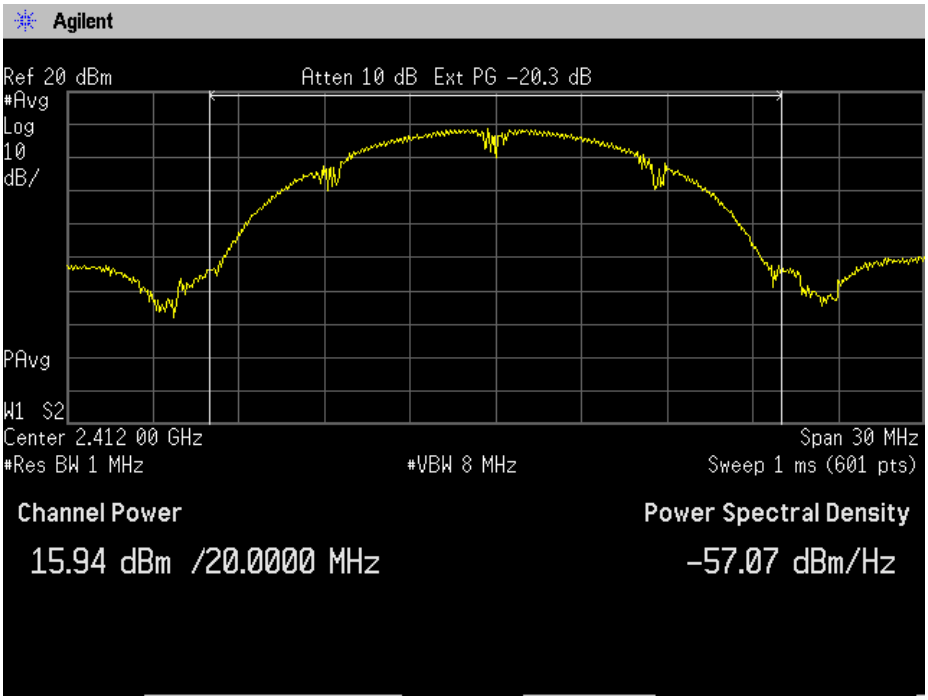
0.282 * 13 = 3.66ms
3.66/10.03 = 0.365

DCF = 20*log(0.635) = +3.94dB

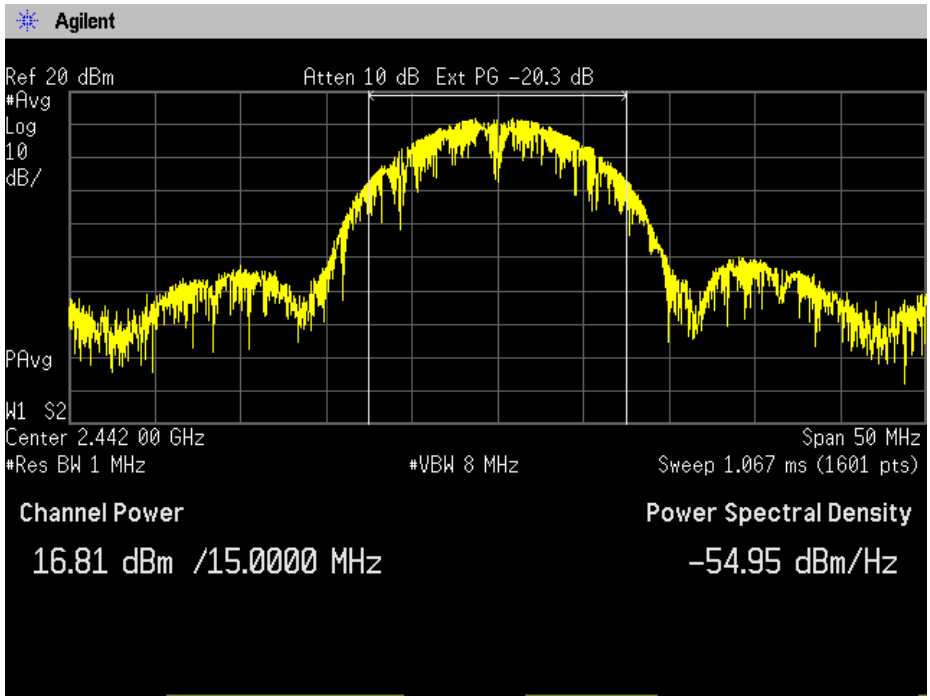
Transmitter Output Power Summary Table

Tuned Frequency (MHz)	Mode of Operation	Measured Value (dBm)	Duty Cycle Corr.	Conducted Power (dBm)	Specification Limit	Result
2412	802.11 b	15.94	0	15.94	1 W (30 dBm)	Pass
	802.11 g	11.95	0	11.95	1 W (30 dBm)	Pass
	802.11 n	11.04	3.94	14.98	1 W (30 dBm)	Pass
2442	802.11 b	16.81	0	16.81	1 W (30 dBm)	Pass
	802.11 g	11.86	0	11.86	1 W (30 dBm)	Pass
	802.11 n	11.39	3.94	15.33	1 W (30 dBm)	Pass
2462	802.11 b	15.40	0	15.40	1 W (30 dBm)	Pass
	802.11 g	11.97	0	11.97	1 W (30 dBm)	Pass
	802.11 n	11.72	3.94	15.66	1 W (30 dBm)	Pass

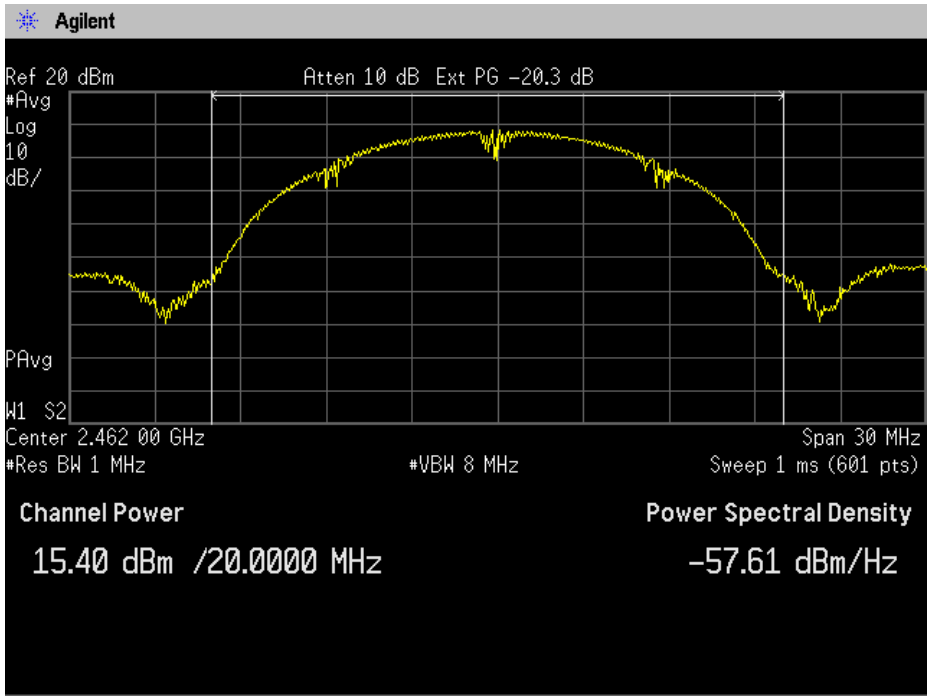
Output Power Plots



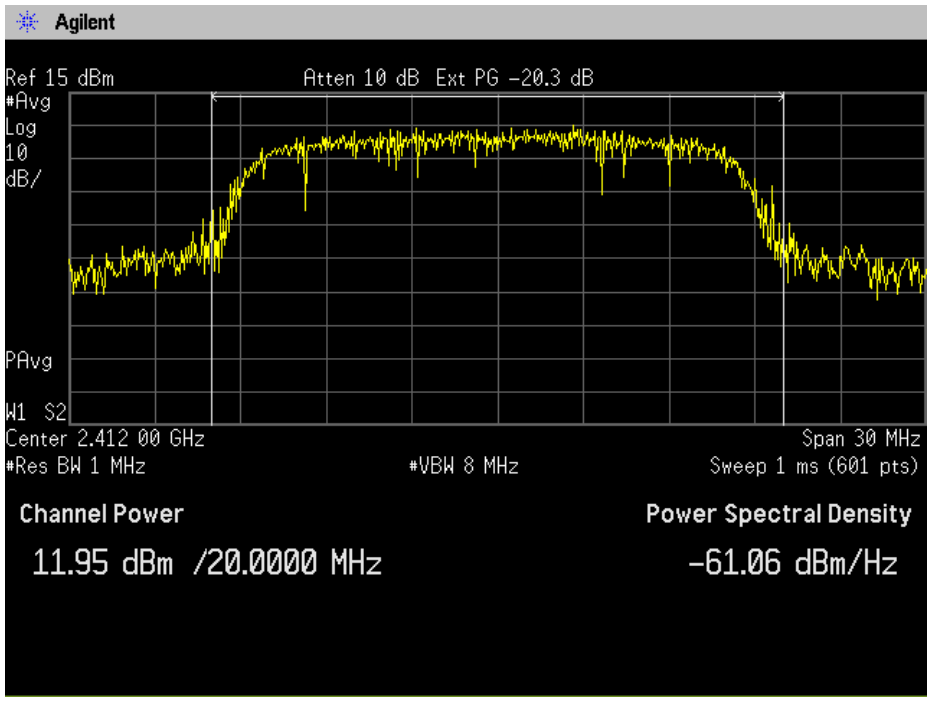
Low Channel B Mode



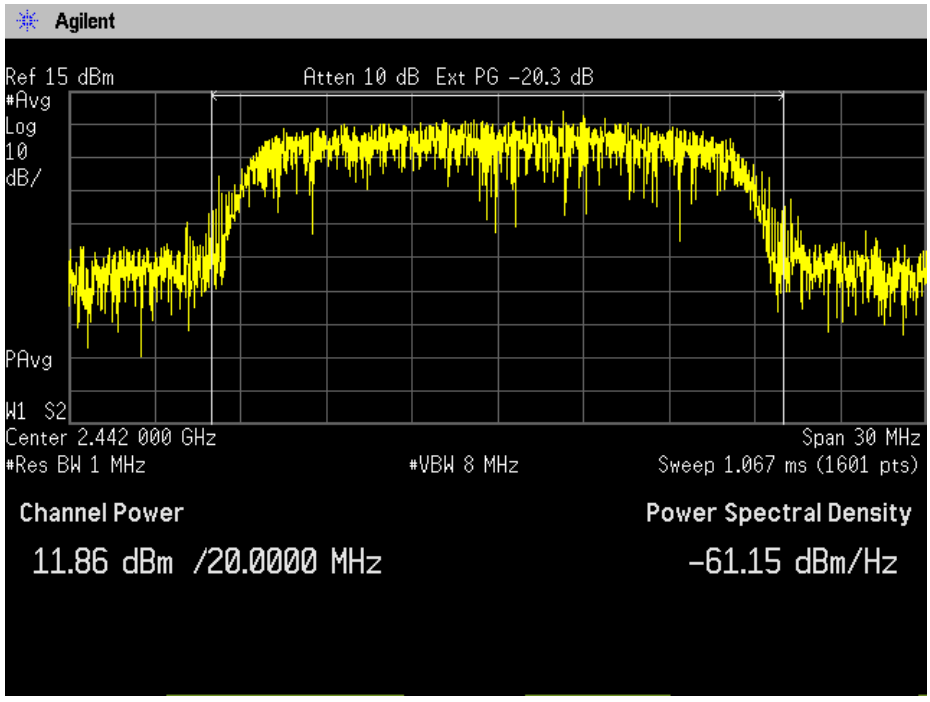
Mid Channel B Mode



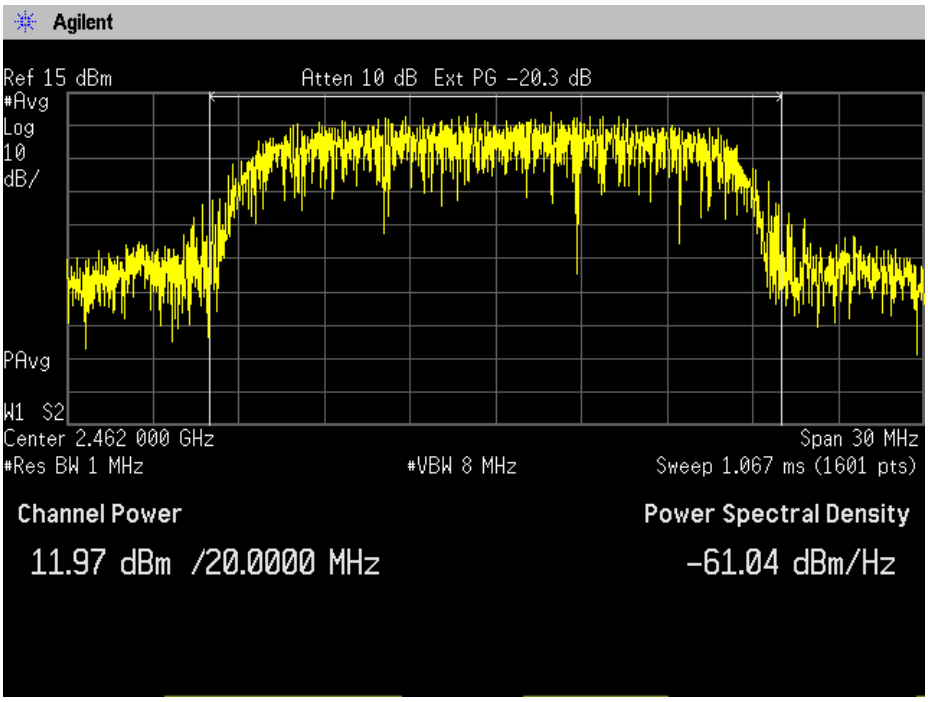
High Channel B Mode



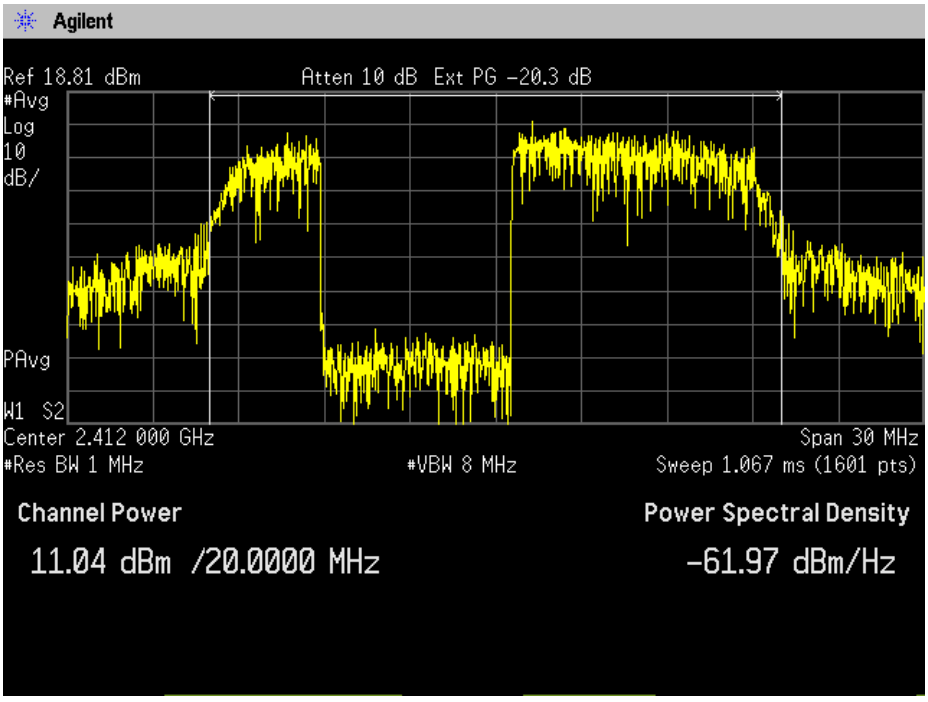
Low Channel G Mode



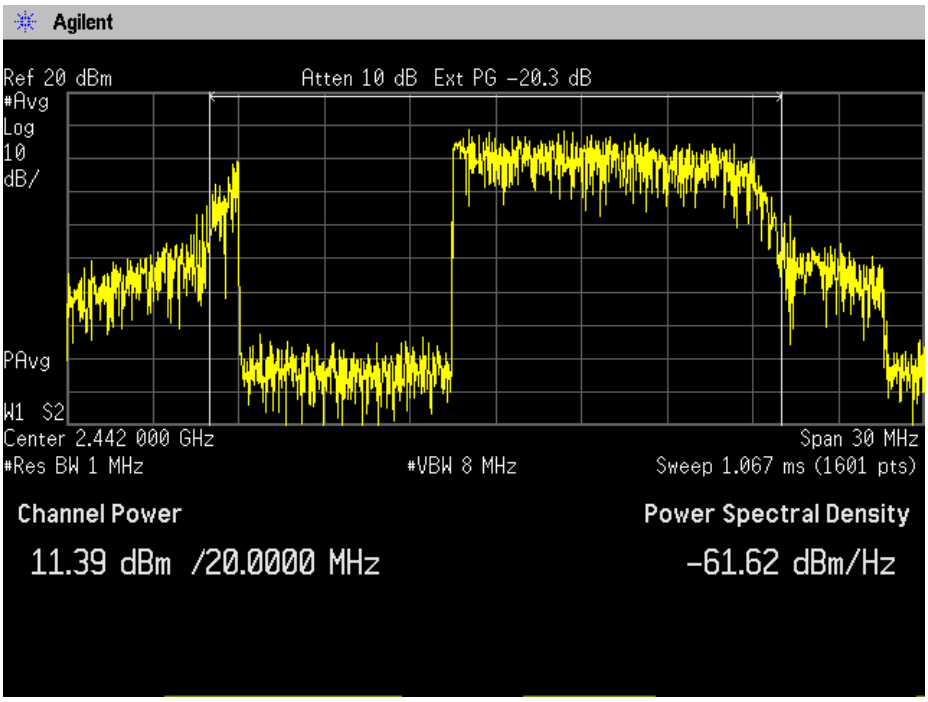
Mid Channel G Mode



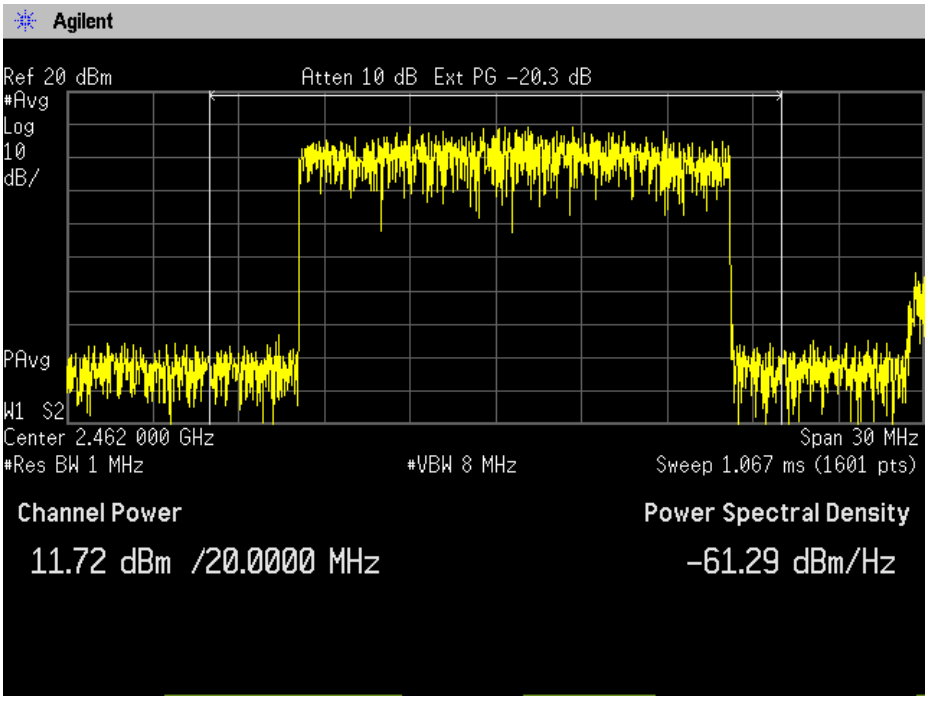
High Channel G Mode



Low Channel N Mode



Mid Channel N Mode



High Channel N Mode

Radiated Spurious Emissions

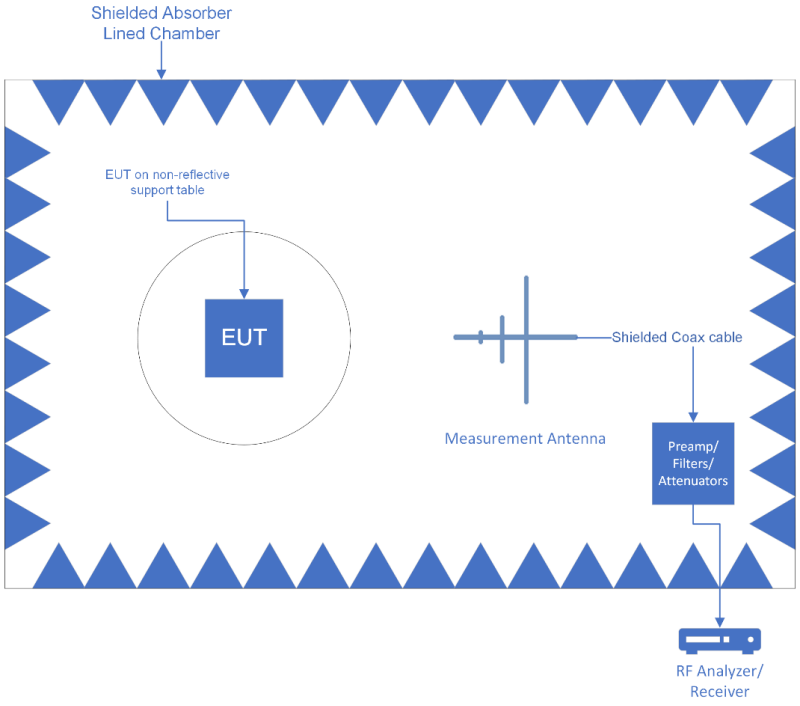
Engineer: John Michalowicz
Test Date: 7/12/25

Test Procedure
Radiated Spurious Emissions: 30 – 1000 MHz and Above 1GHz

The EUT was setup in a semi-anechoic test chamber set 3m from the receiving antenna. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level into a 50 ohm load. The EUT was tested, in 3 orthogonal axis, by rotating it 360° with the receive antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure the TX signal levels were maximized. A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Spurious Emissions. All emissions across the required range were evaluated.

The emissions below 100 MHz are attributed to the digital circuitry of the device and are subject to 15B Class a Limits which are 10 dB higher than those seen in the plots below.

Basic Test Setup



	Settings Below 1GHz	Settings Above 1GHz
RBW	120 kHz	1 MHz
VBW	300 kHz	3 MHz
Detector	Quasi Peak	Peak / Average

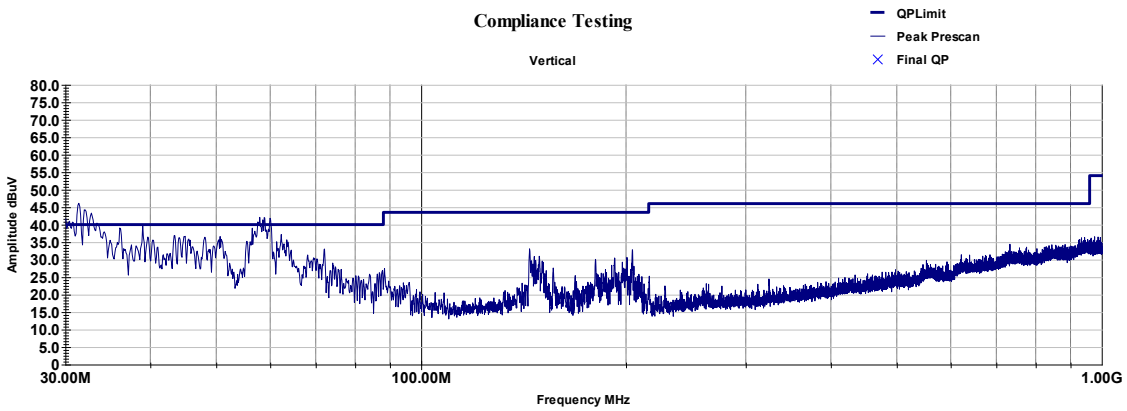
Sample Calculations

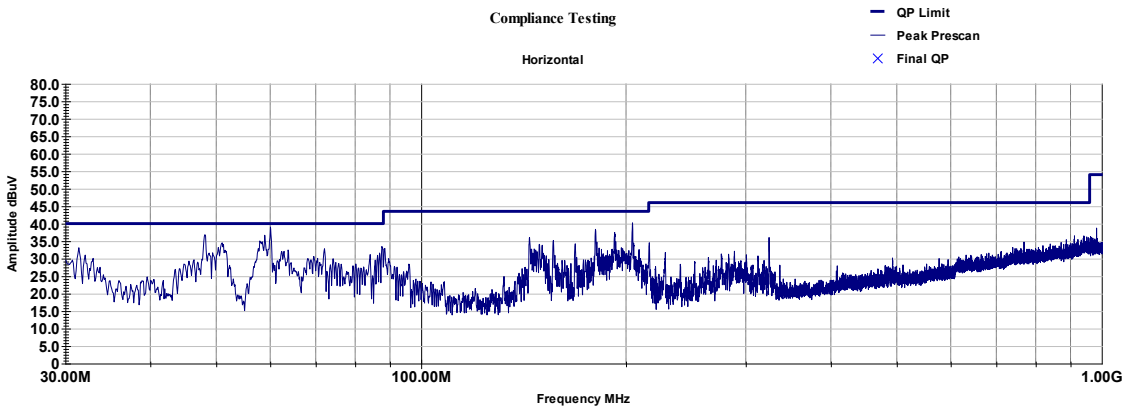
Corrected Value = Measured Value + Correction factor

Correction factor = Antenna Correction Factor + Cable loss + Preamp/Attenuator Factor

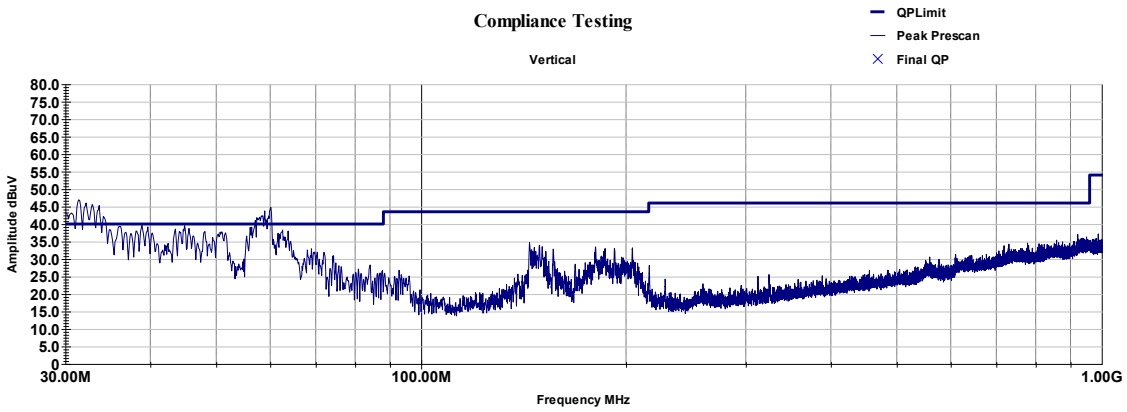
Radiated Emissions 30-1000MHz

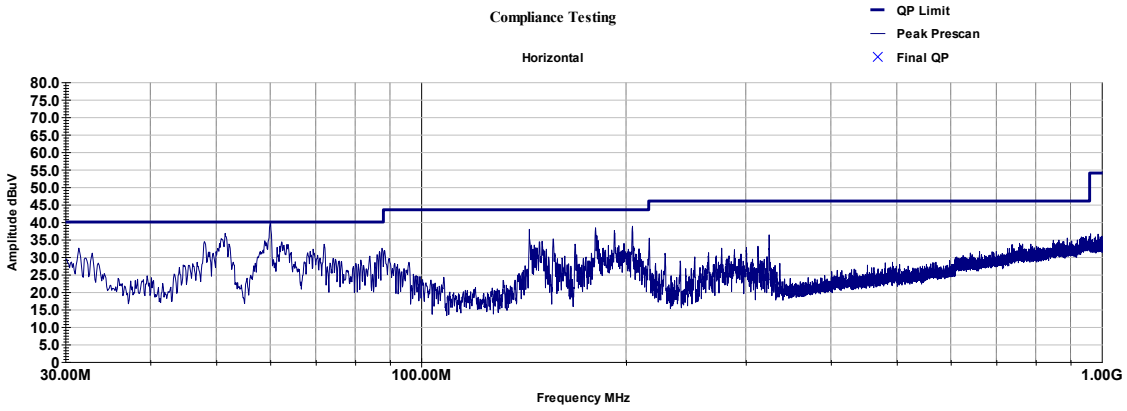
2.4 GHz_Low Channel_30 - 1000 MHz



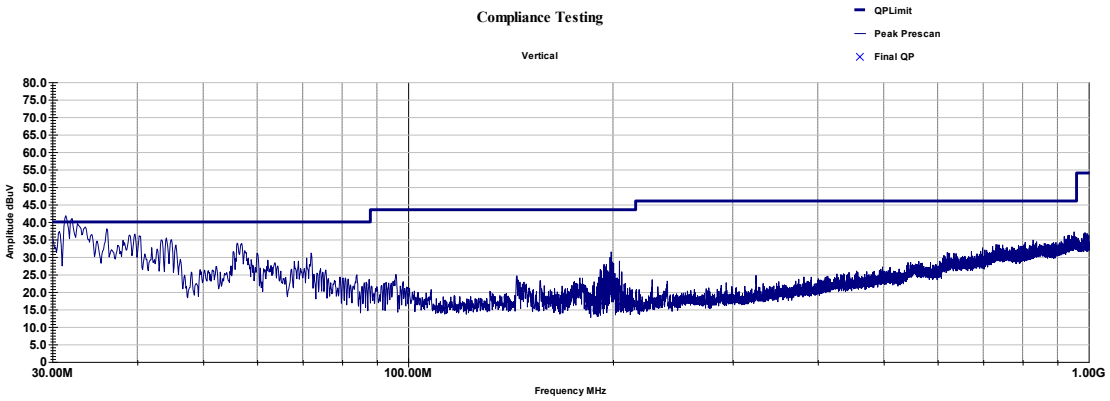


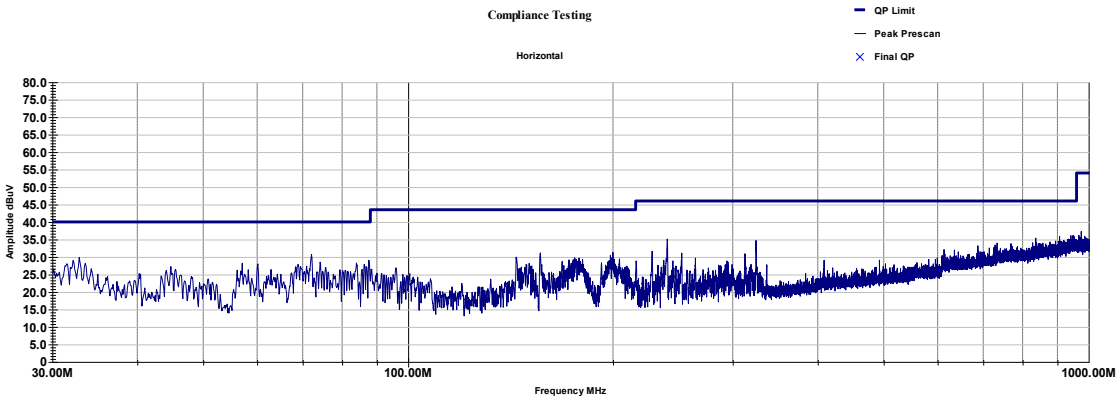
2.4 GHz_Mid Channel_30 - 1000 MHz





2.4 GHz_High Channel_30 - 1000 MHz

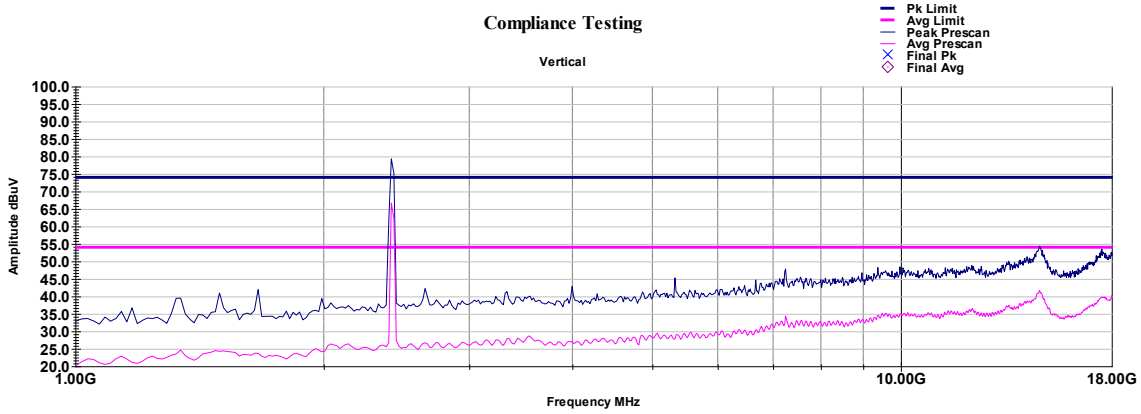


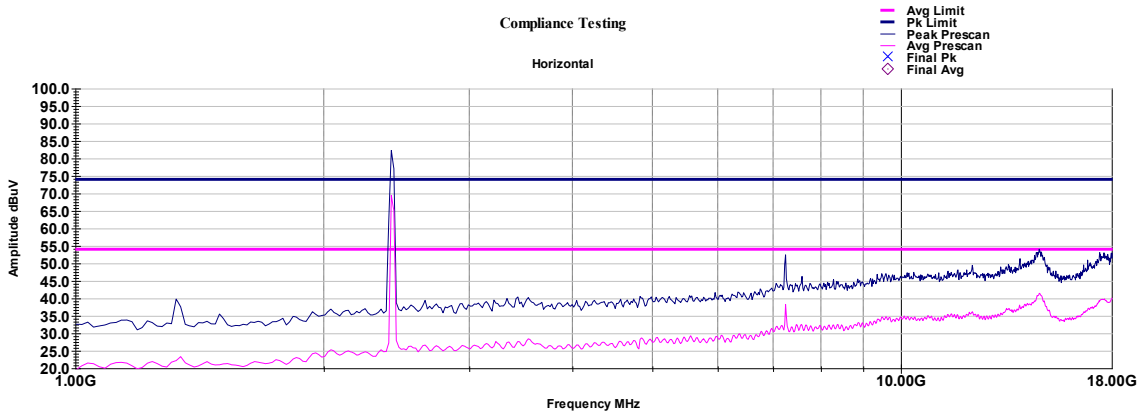


Radiated Emissions Above 1000MHz

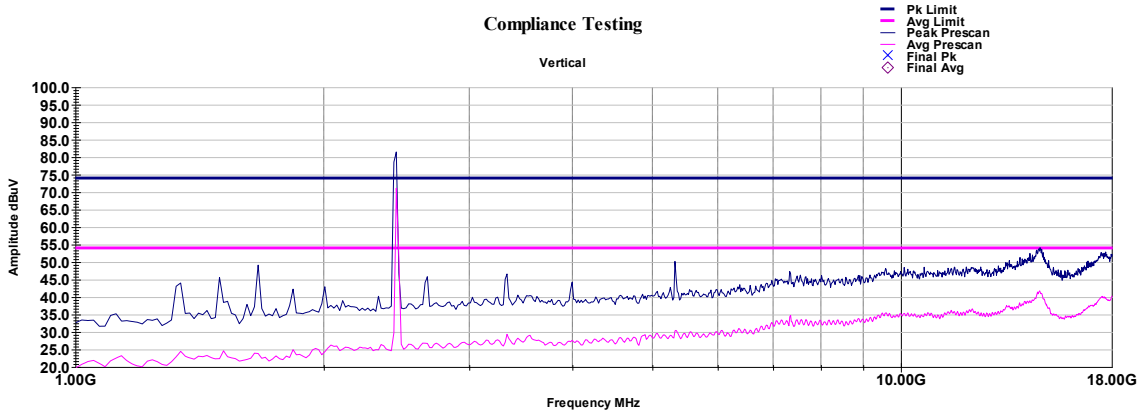
The emissions which exceed the limit is the fundamental frequency.

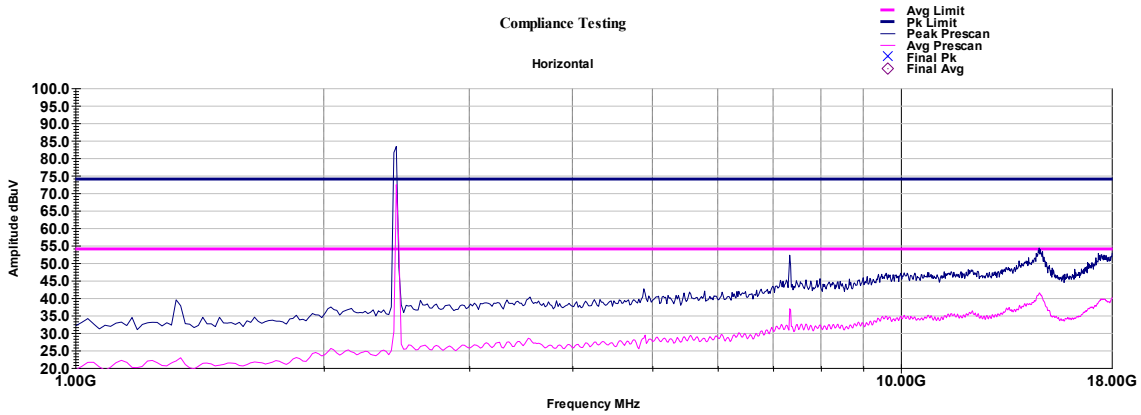
2.4 GHz_Low Channel_1 - 18 GHz



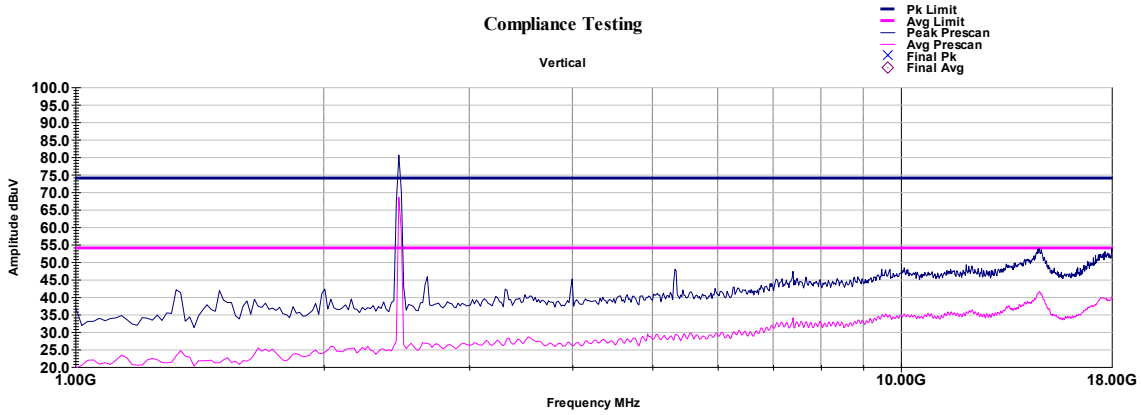


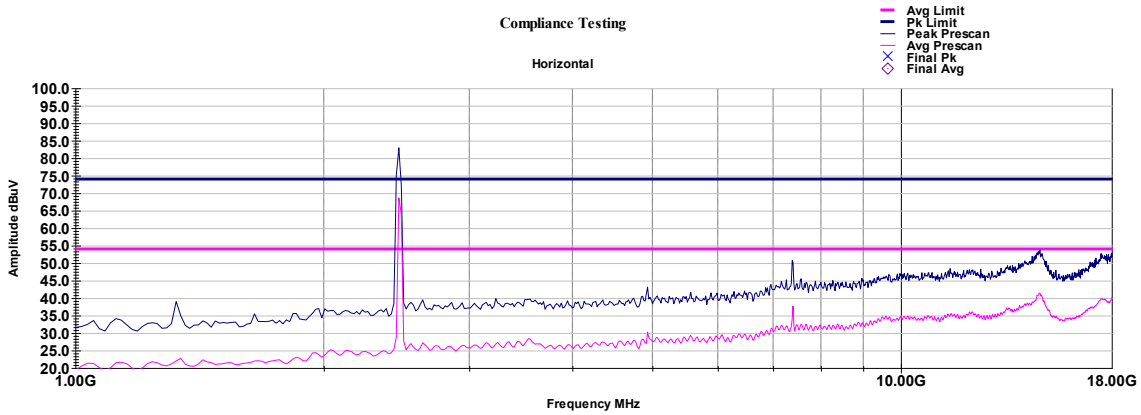
2.4 GHz_Mid Channel_1 - 18 GHz





2.4 GHz_High Channel_1 - 18 GHz





Conducted RF Measurements (15.209)

Engineer: John Michalowicz
Test Date: 7/09/25

Test Procedure

Antenna-port conducted measurements were performed as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands for 15.209.

The following offsets were added to the measurements:
The maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level
A maximum ground reflection factor to the EIRP level, 6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000MHz.

The following equations were used to determine the field strength from the conducted values.
E[dBµV/m] = EIRP[dBm] - 20 log(d[meters]) + 104.77, where E = field strength and d = 3m
E[dBµV/m] = EIRP[dBm] + 95.2, for d = 3 meters.

The Spectrum Analyzer was set to the following:

The Spectrum Analyzer was set to the following for emissions > 1000MHz:

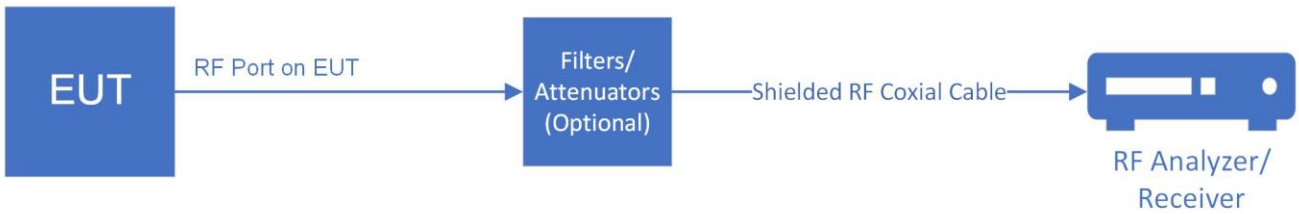
a. RBW = 1 MHz
b. VBW ≥ 3 MHz
c. Detector = Peak.
d. Sweep time = auto
e. Trace mode = max hold
    1. Note: For emissions where the peak exceeded that of the average 15.209 emission limit the following was performed.
f. RBW = 1 MHz
g. VBW ≤ RBW/100 (i.e., 10 kHz) but not less than 10 Hz

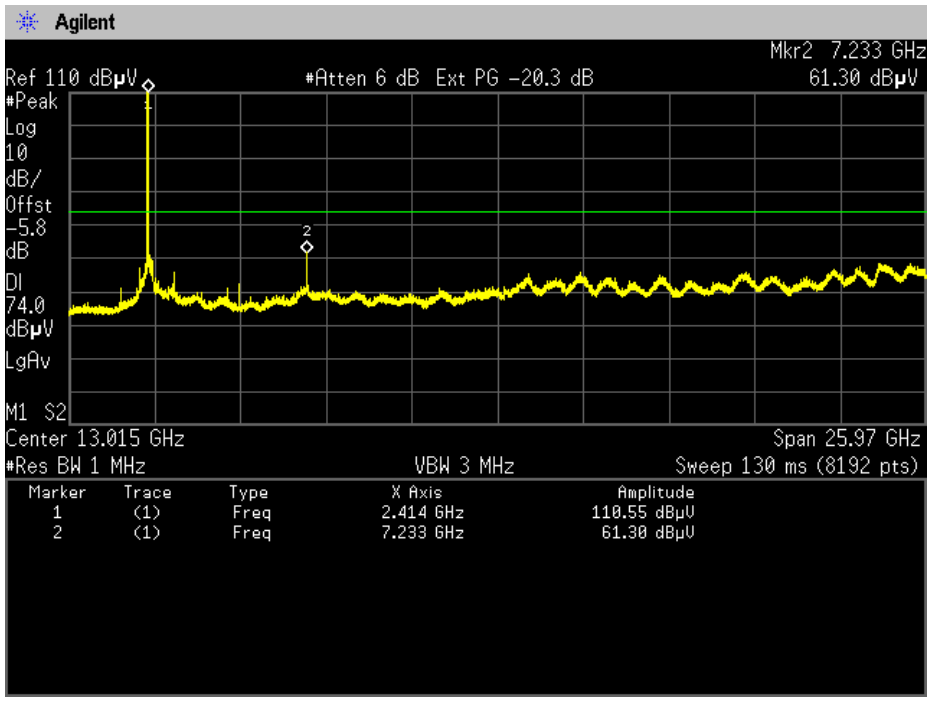
For emissions below 1000MHz the Spectrum Analyzer settings were as follows:

a. RBW = 100 kHz
b. VBW ≥ 300 kHz
c. Detector = Peak
d. Sweep time = auto
e. Trace mode = max hold

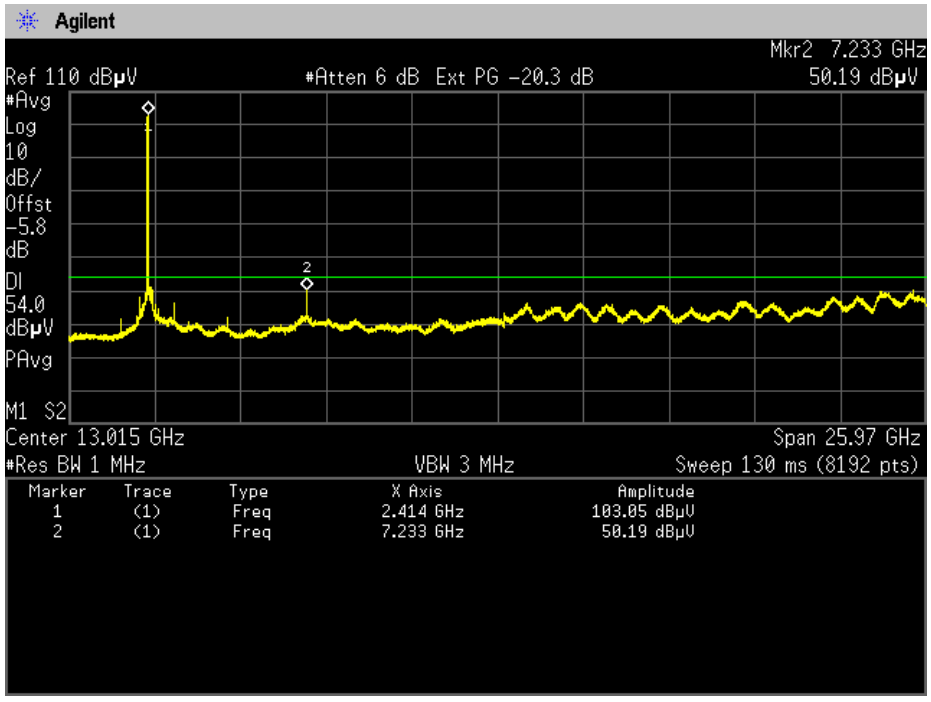
The EUT was connected to a spectrum analyzer to verify that the EUT met the requirements for spurious emissions. The EUT was set to transmit on the lowest, middle and highest frequencies at the maximum power level. The frequency range from 30 MHz to the 10th harmonic of the fundamental transmitter was investigated. required range were evaluated.

Basic Test Setup

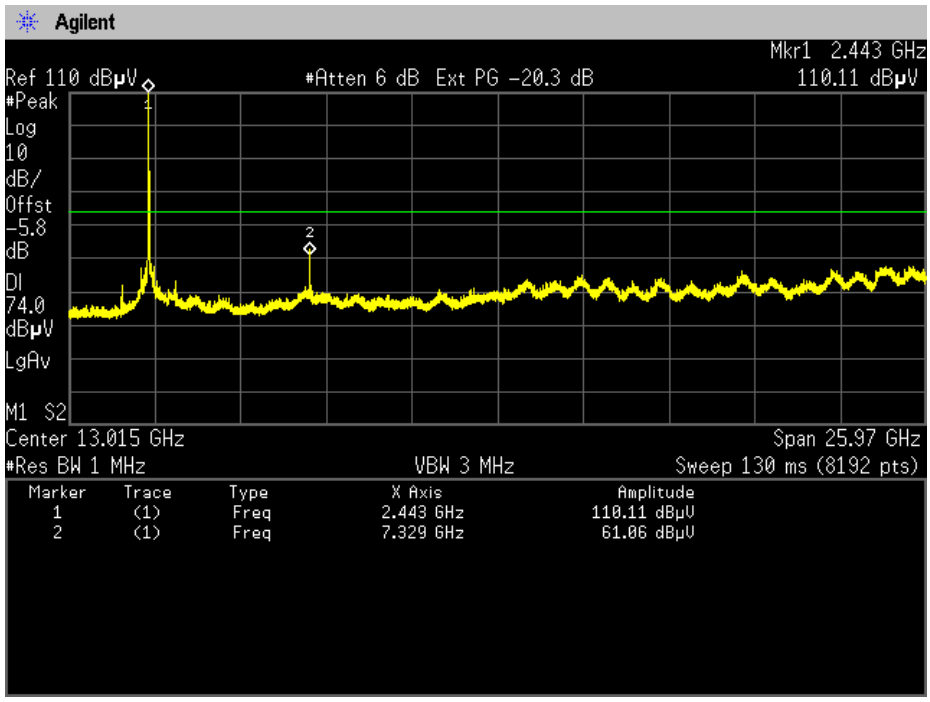




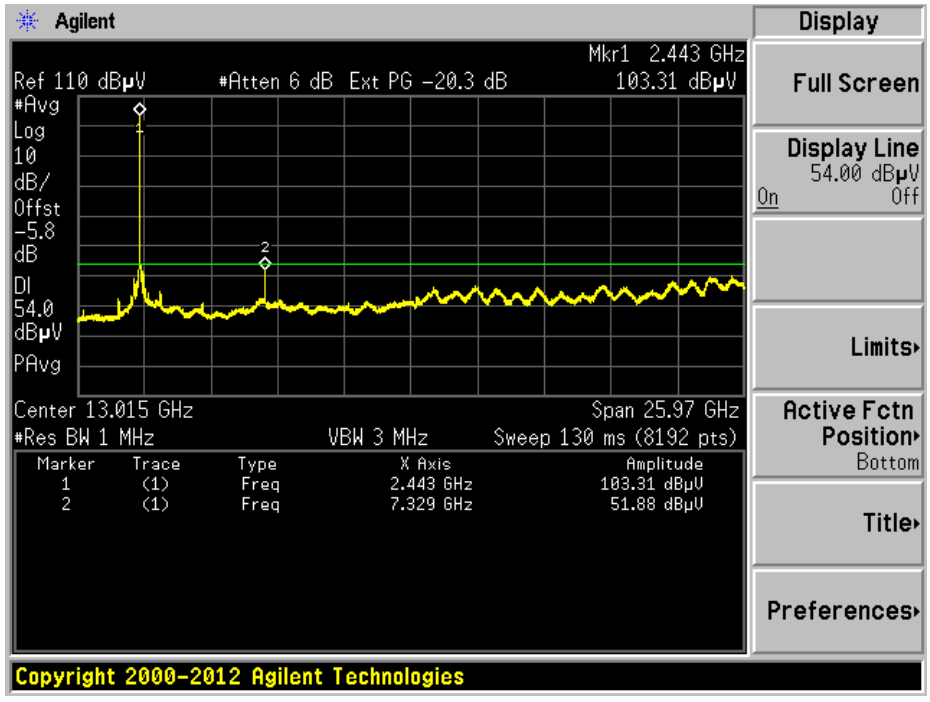
Low Channel 30 -26000 MHz Peak



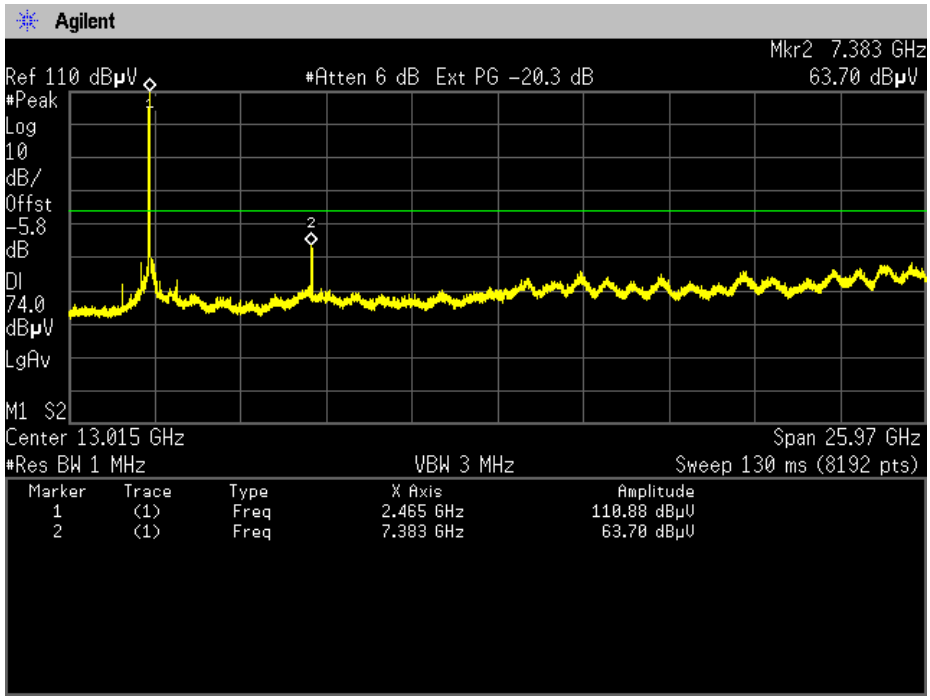
Low Channel 30 -26000 MHz AVG



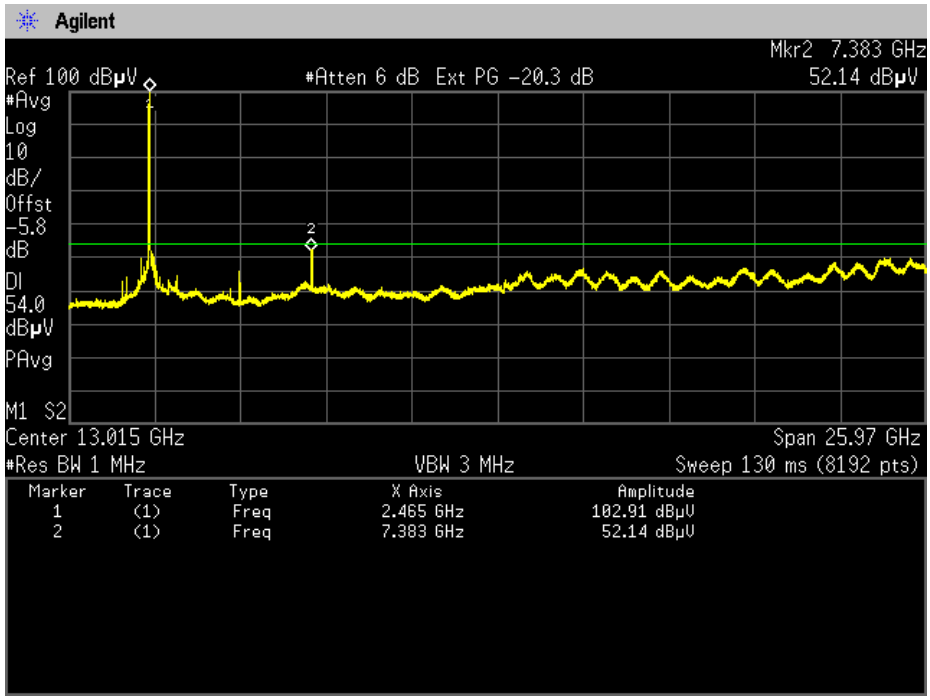
Mid Channel 30 -26000 MHz Peak



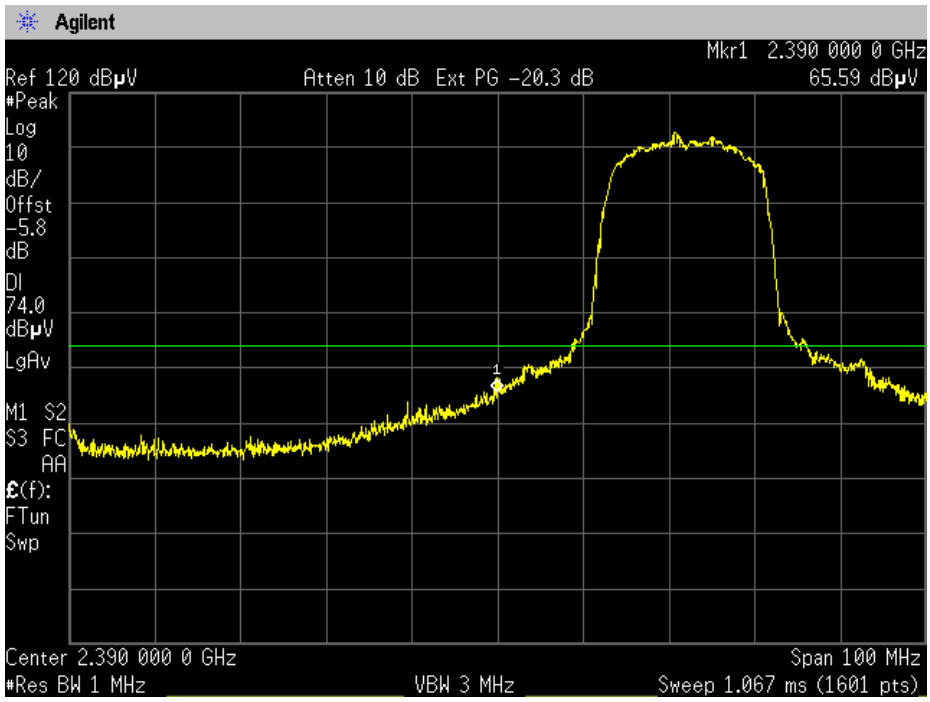
Mid Channel 30 -26000 MHz AVG



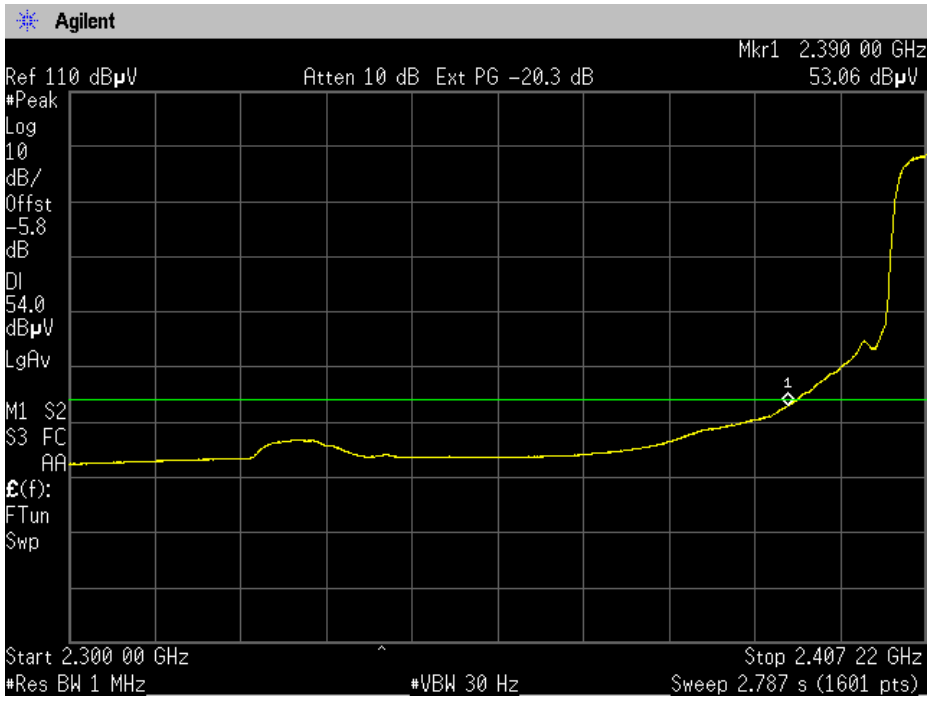
High Channel 30 -26000 MHz Peak



High Channel 30 -26000 MHz AVG

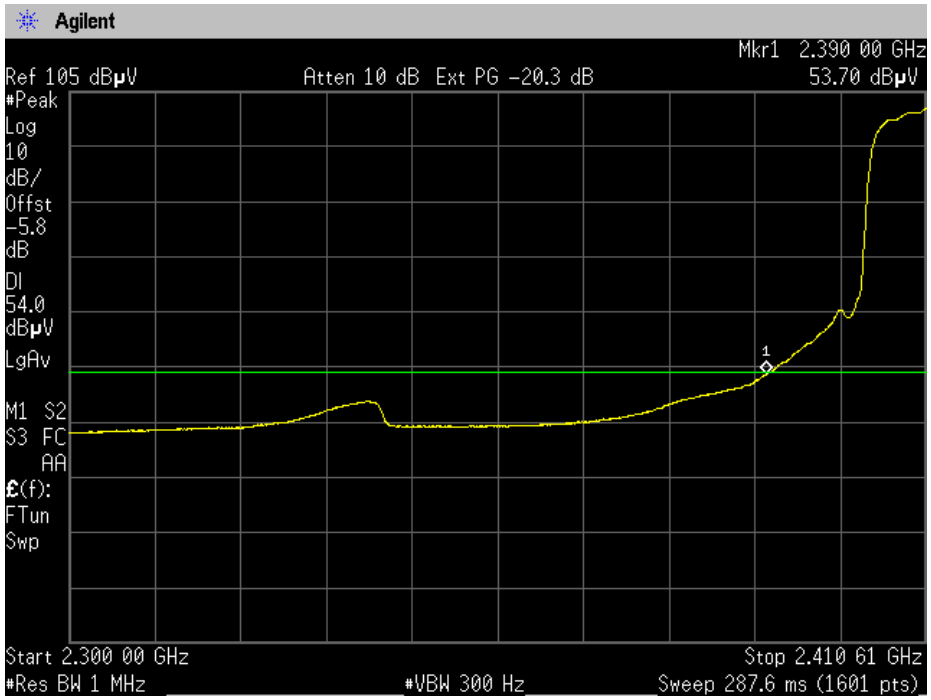


Low Channel_N Mode_Restricted Band Edge_Peak

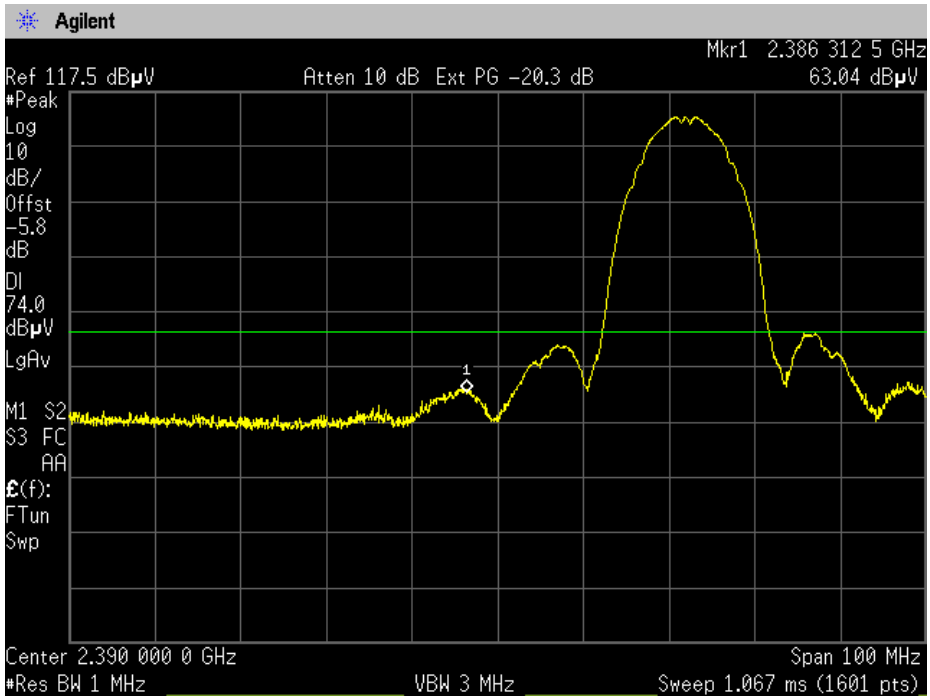


Low Channel_N Mode_Restricted Band Edge_AVG

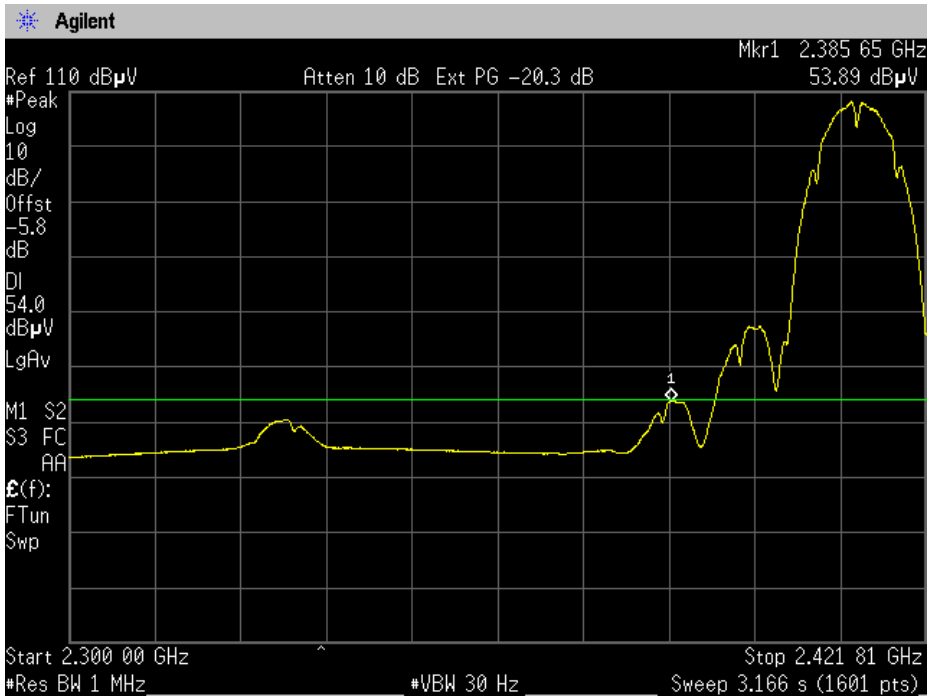
Low Channel_G Mode_Restricted Band Edge_Peak



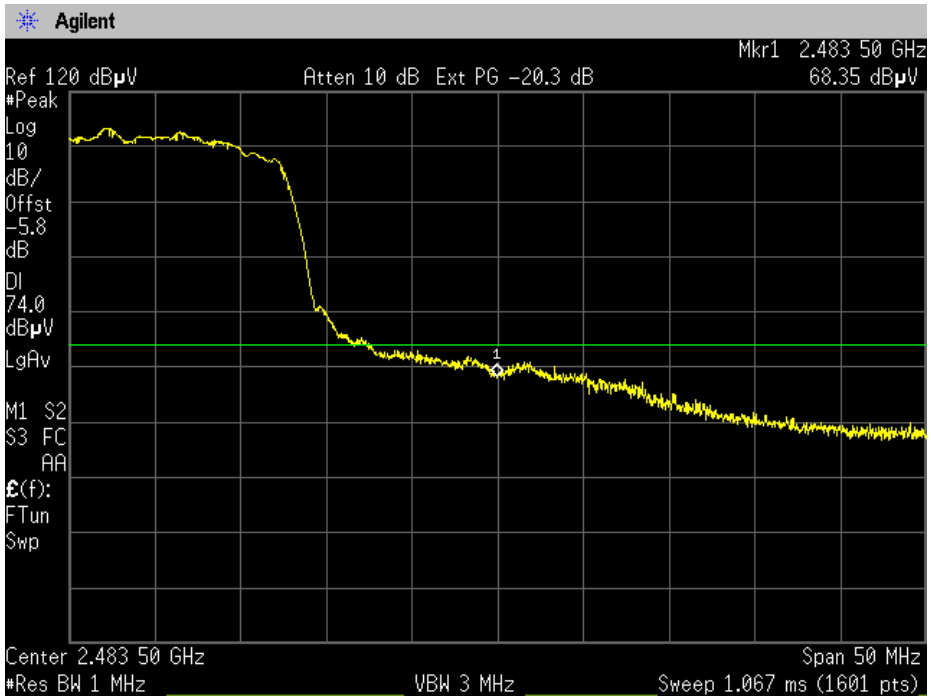
Low Channel_G Mode_Restricted Band Edge_Average



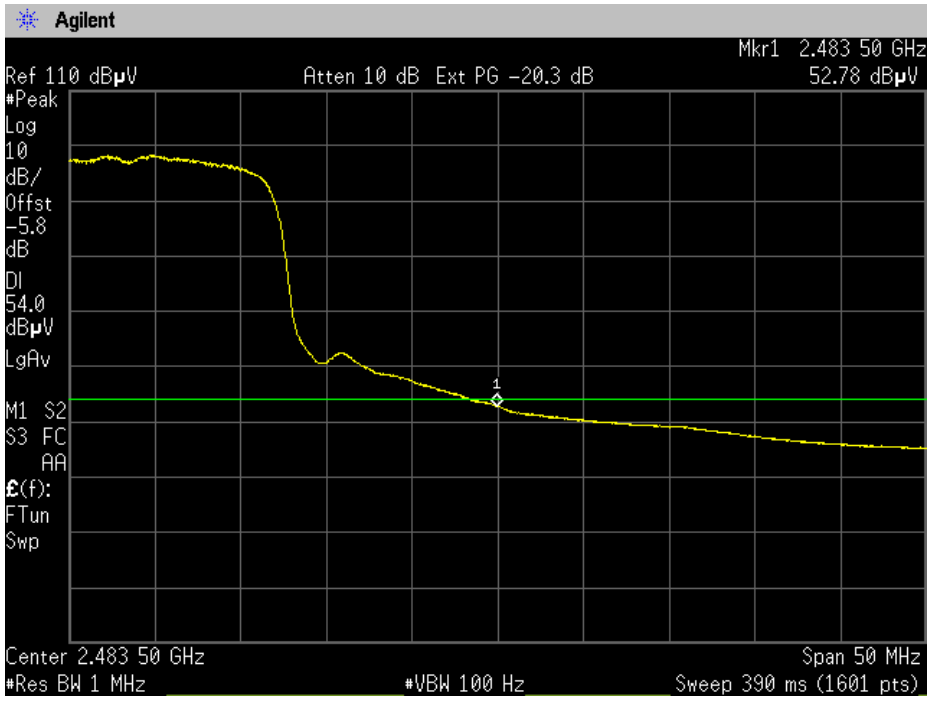
Low Channel_B Mode_Restricted Band Edge_Peak



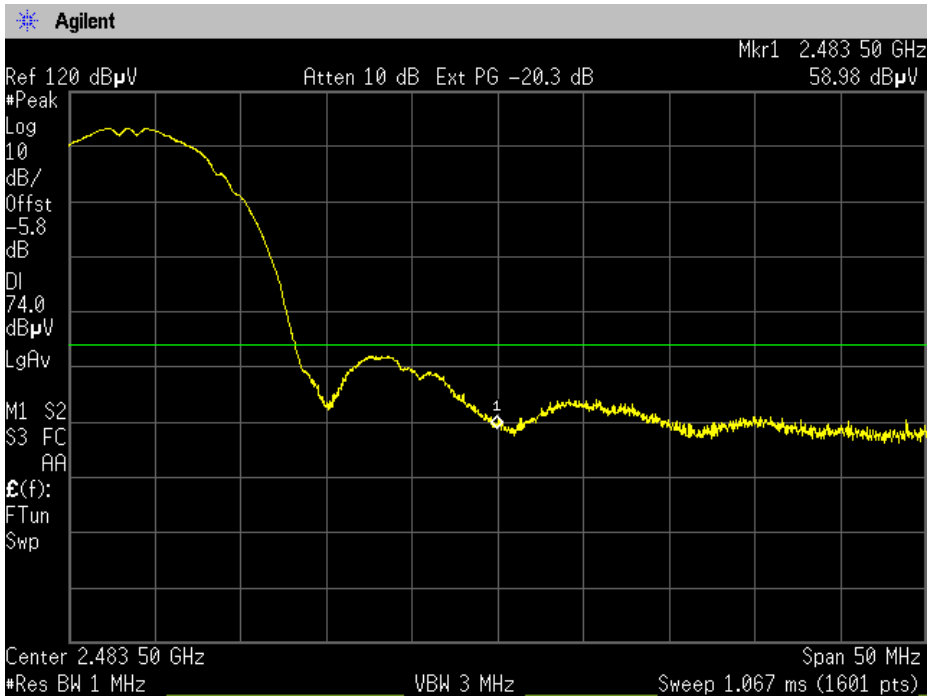
Low Channel_B Mode_Restricted Band Edge_Average



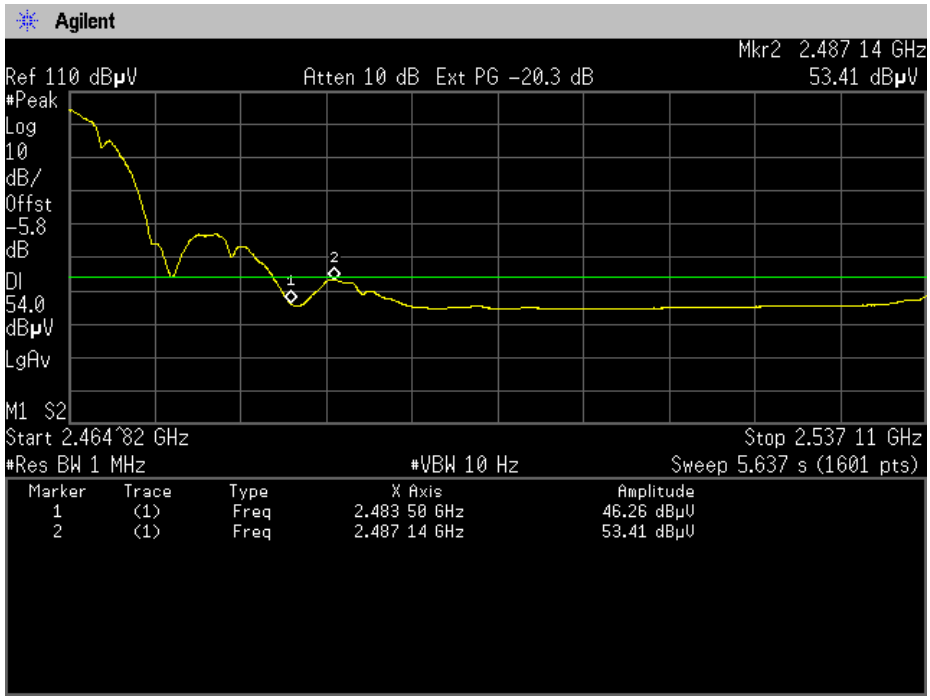
High Channel_N Mode_Restricted Band Edge_Peak



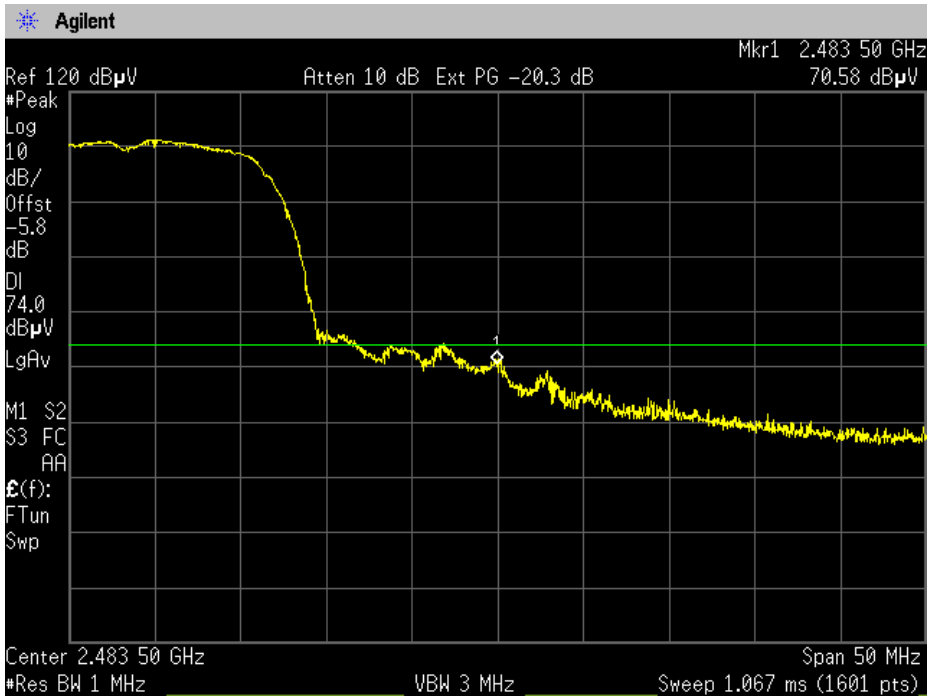
High Channel_N Mode_Restricted Band Edge_Average



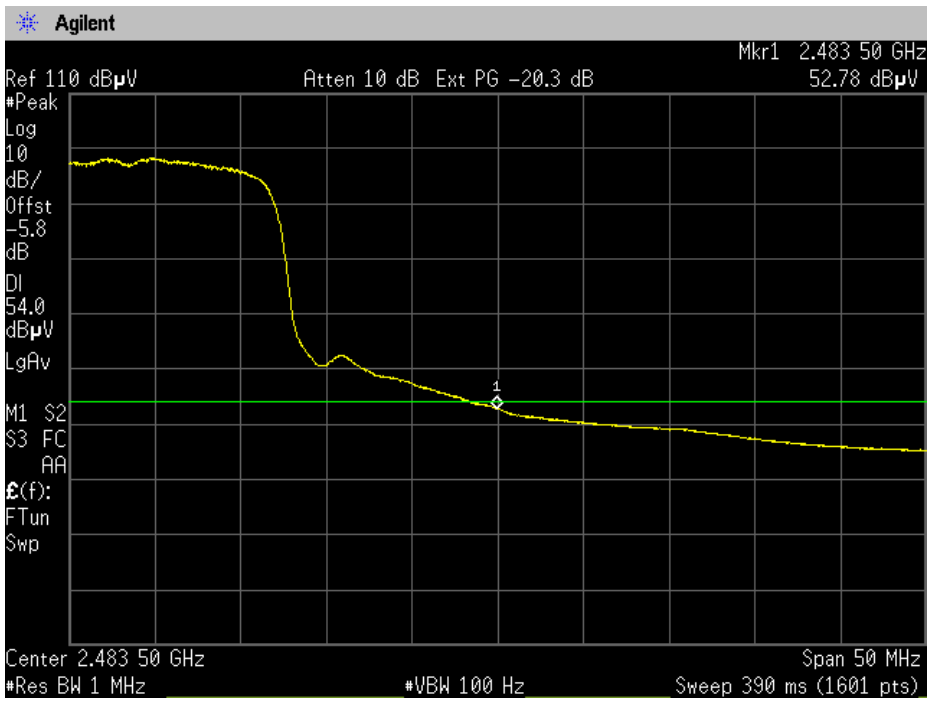
High Channel_B Mode_Restricted Band Edge_Peak



High Channel_B Mode_Restricted Band Edge_AVG



High Channel_G Mode_Restricted Band Edge_Peak



High Channel_G Mode_Restricted Band Edge_Average

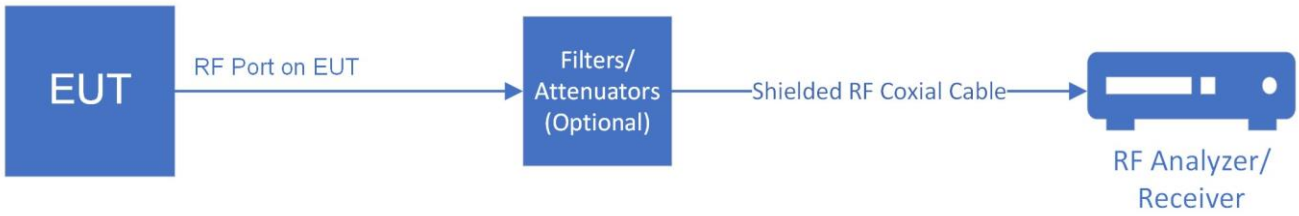
Emissions at Band Edges

Engineer: John Michalowicz
Test Date: 7/09/25

Test Procedure

CONDUCTED METHOD
A spectrum analyzer was directly connected to the EUT's RF port. The EUT was set to transmit on the lowest an highest frequencies at the maximum power level. A spectrum analyzer was used to verify that the EUT met the requirements for band edges.

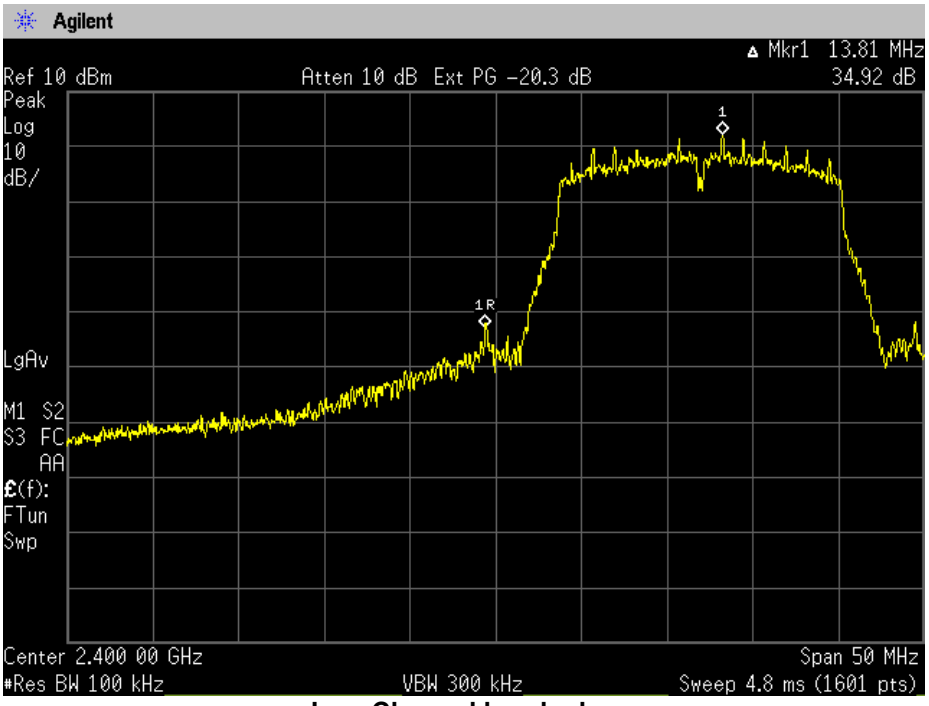
Test Setup



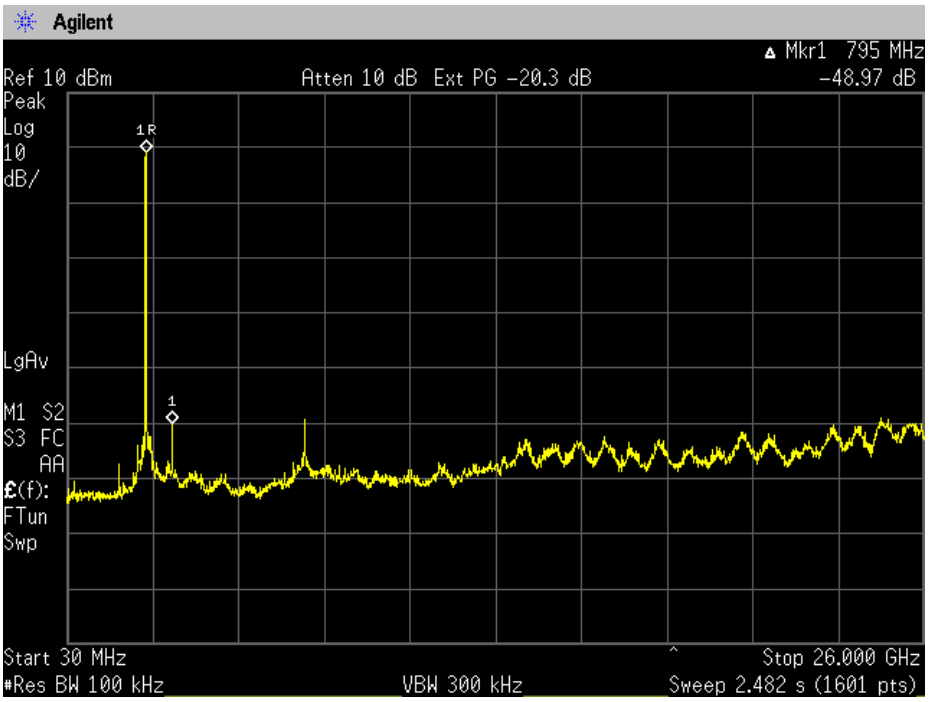
Band Edge Emissions Summary

Tuned Frequency (MHz)	Emission Frequency (MHz)	Monitored Level	Detector	Limit	Result
2412	2400	34.92	Peak	-30 dBc	Pass
2462	2483.5	45.5	Peak	-30 dBc	Pass

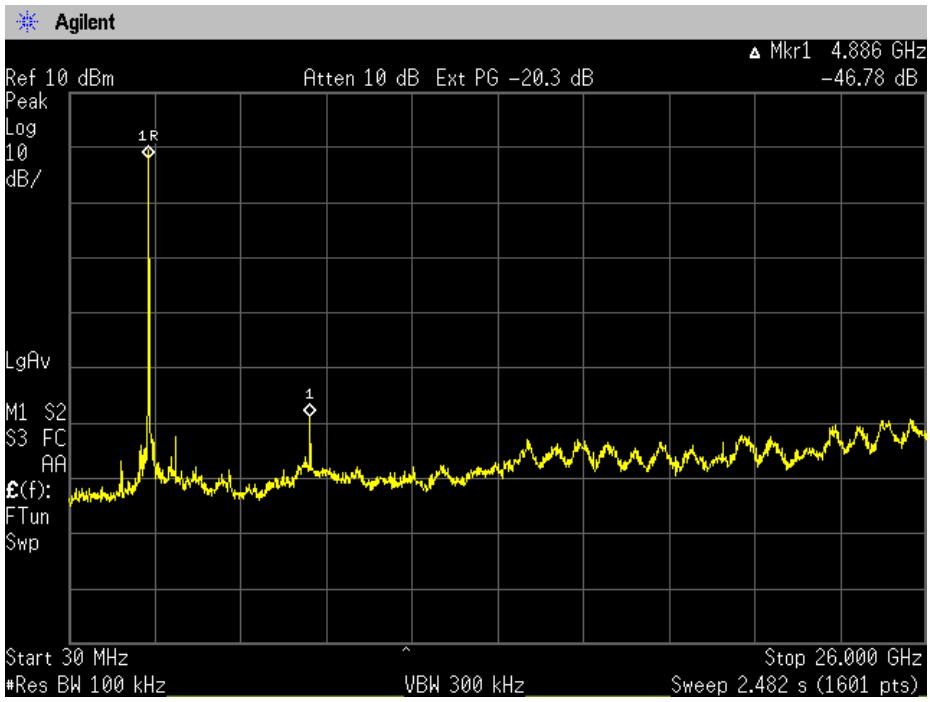
Band Edge Plots



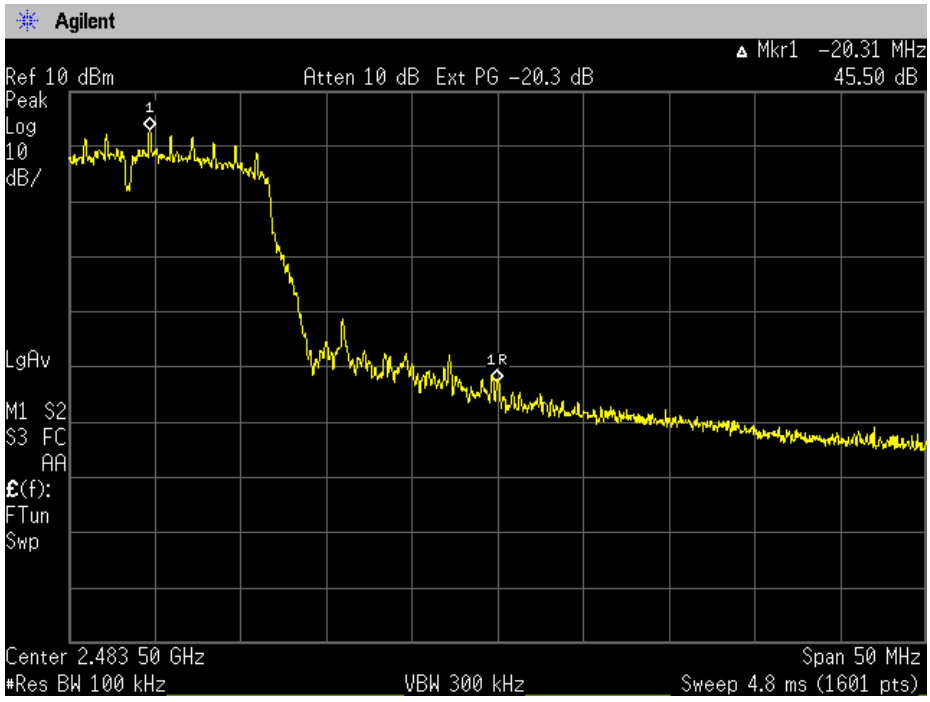
Low Channel band edge



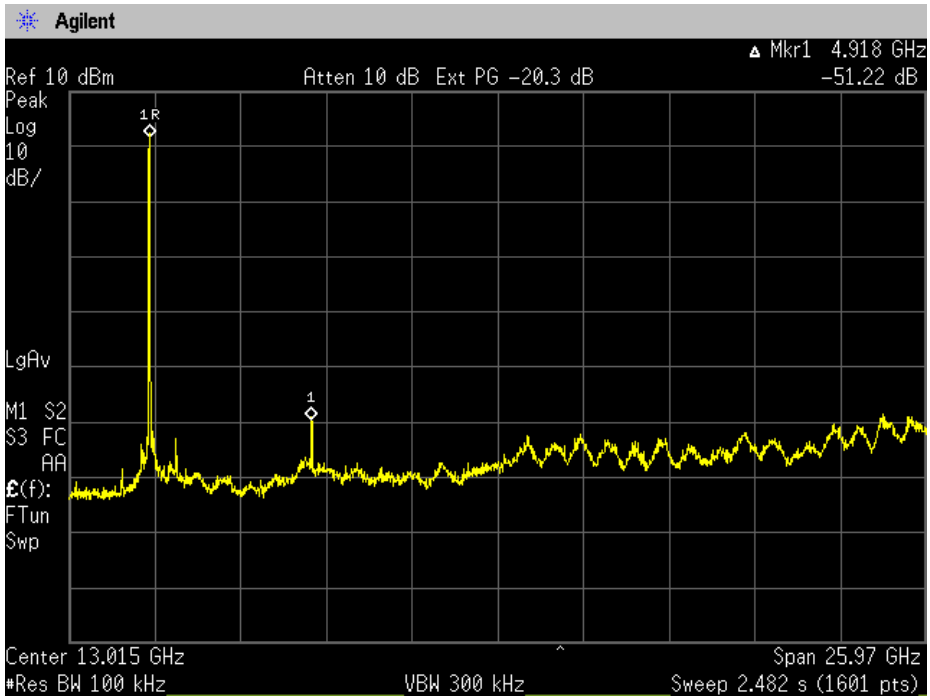
Low Channel 15.247(d)



Mid Channel 15.247(d)



High Channel band edge



High Chanel 15.247(d)

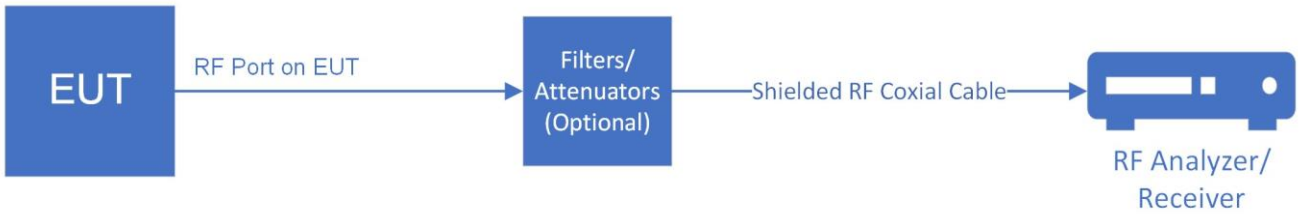
DTS Bandwidth

Engineer: John Michalowicz
Test Date: 7/09/25

Test Procedure

CONDUCTED METHOD
A spectrum analyzer was directly connected to the EUT's RF port. The EUT was set to transmit on the low, mid and high frequencies at the maximum power level. A spectrum analyzer was used to verify that the EUT met the Bandwidth requirements.

Test Setup



The Spectrum Analyzer was set to the following:

RBW = 100 kHz
VBW ≥ 3 x RBW
Peak Detector
Trace mode = max hold
Sweep = auto couple
Span = 1.5 x EBW

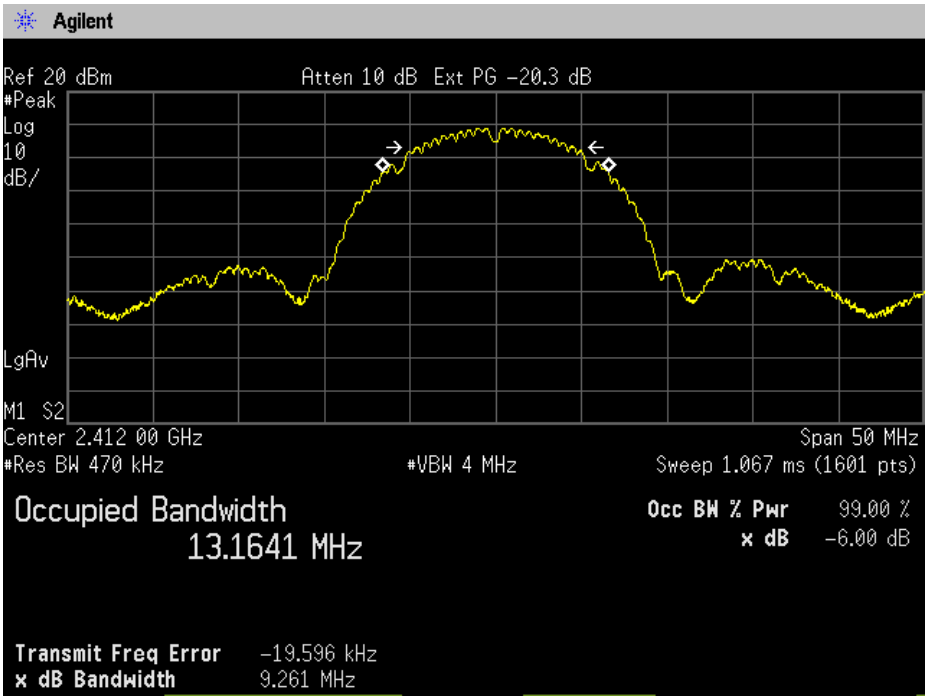
6 dB Occupied Bandwidth Summary

Frequency (MHz)	Mode of Operation	Measured Bandwidth (MHz)	Specification Limit (kHz)	Result
2412	802.11 b	9.26	≥ 500	Pass
	802.11 g	16.32	≥ 500	Pass
	802.11 n	16.85	≥ 500	Pass
2442	802.11 b	9.25	≥ 500	Pass
	802.11 g	17.13	≥ 500	Pass
	802.11 n	17.74	≥ 500	Pass
2462	802.11 b	13.22	≥ 500	Pass
	802.11 g	17.08	≥ 500	Pass
	802.11 n	17.80	≥ 500	Pass

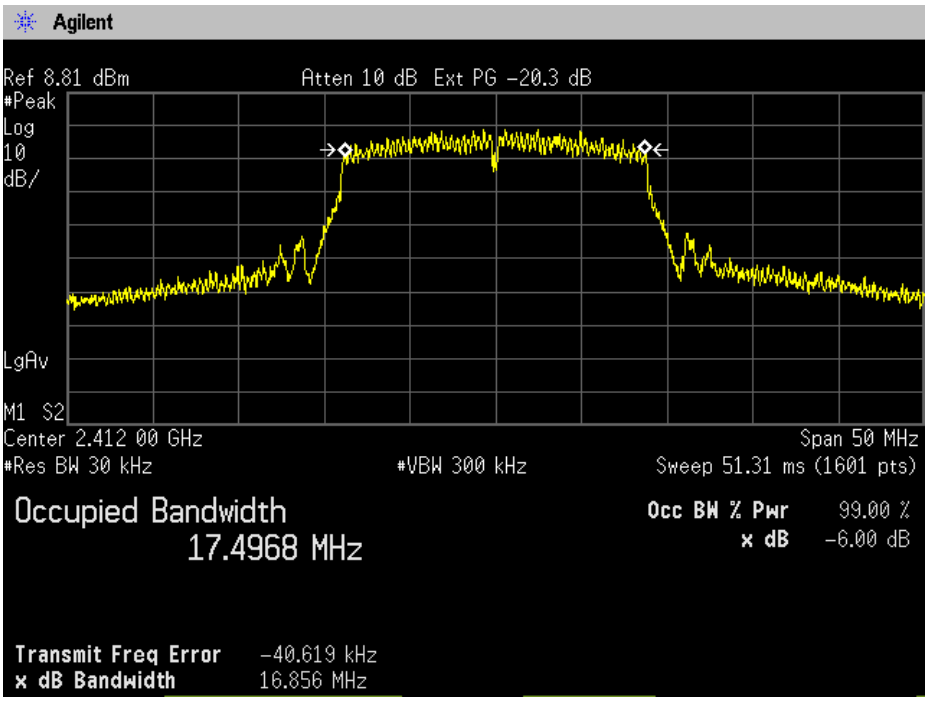
99% Bandwidth Summary

Frequency (MHz)	Mode of Operation	Measured Bandwidth (MHz)	Result
2412	802.11 b	13.16	Pass
	802.11 g	16.30	Pass
	802.11 n	17.50	Pass
2442	802.11 b	13.20	Pass
	802.11 g	16.10	Pass
	802.11 n	17.13	Pass
2462	802.11 b	8.16	Pass
	802.11 g	15.90	Pass
	802.11 n	17.14	Pass

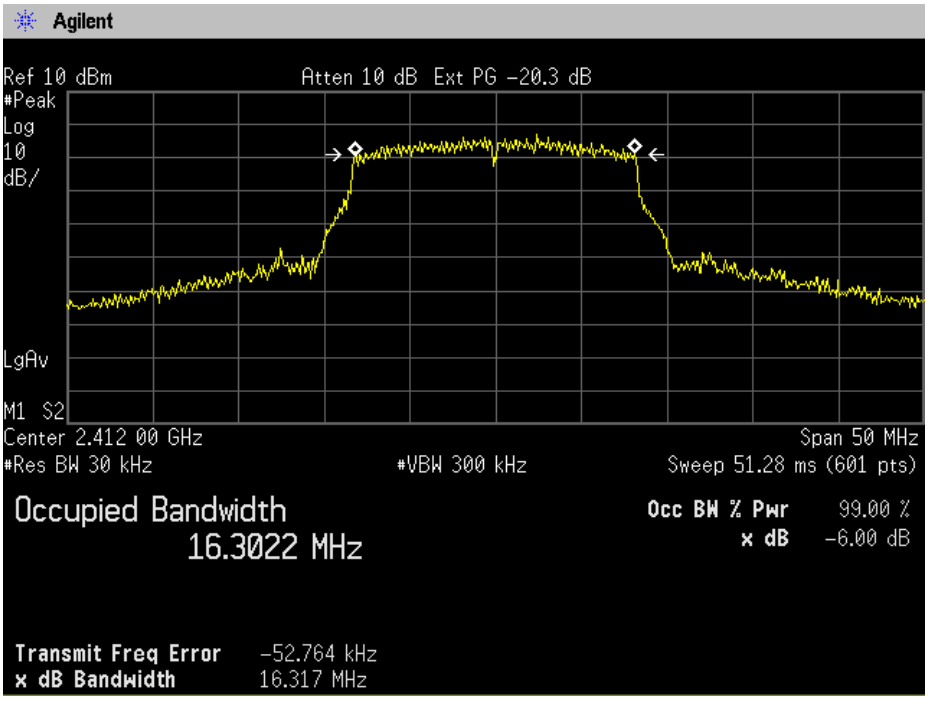
Bandwidth Plots



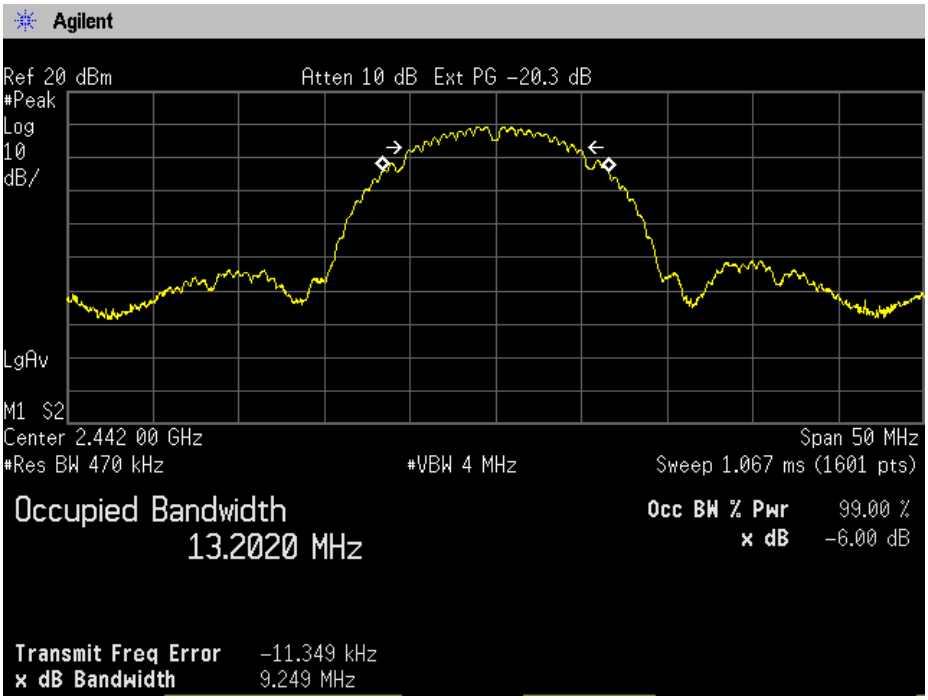
Low Channel_B Mode



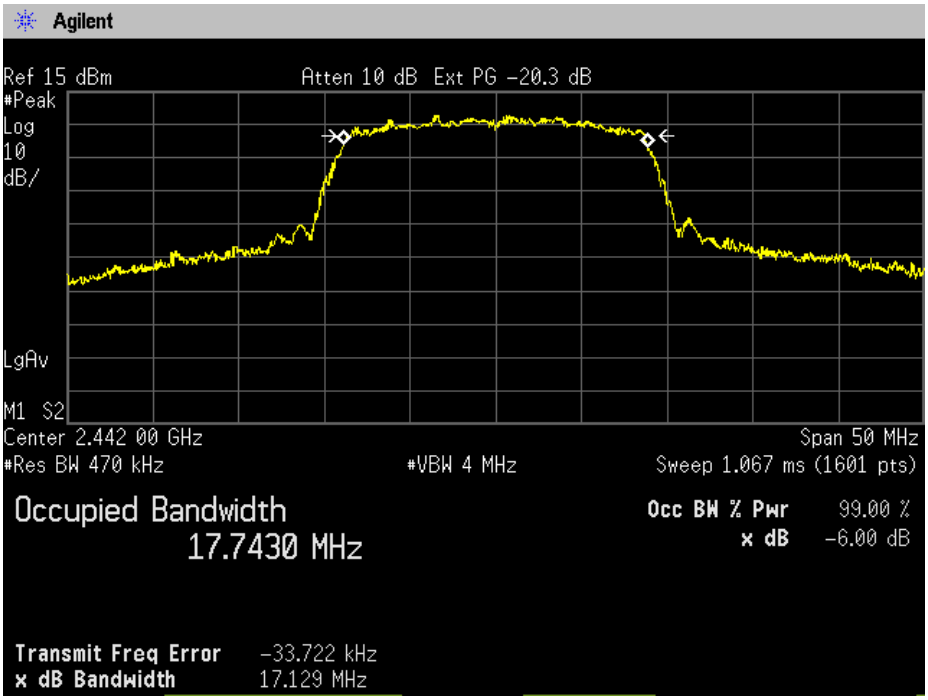
Low Channel_N Mode



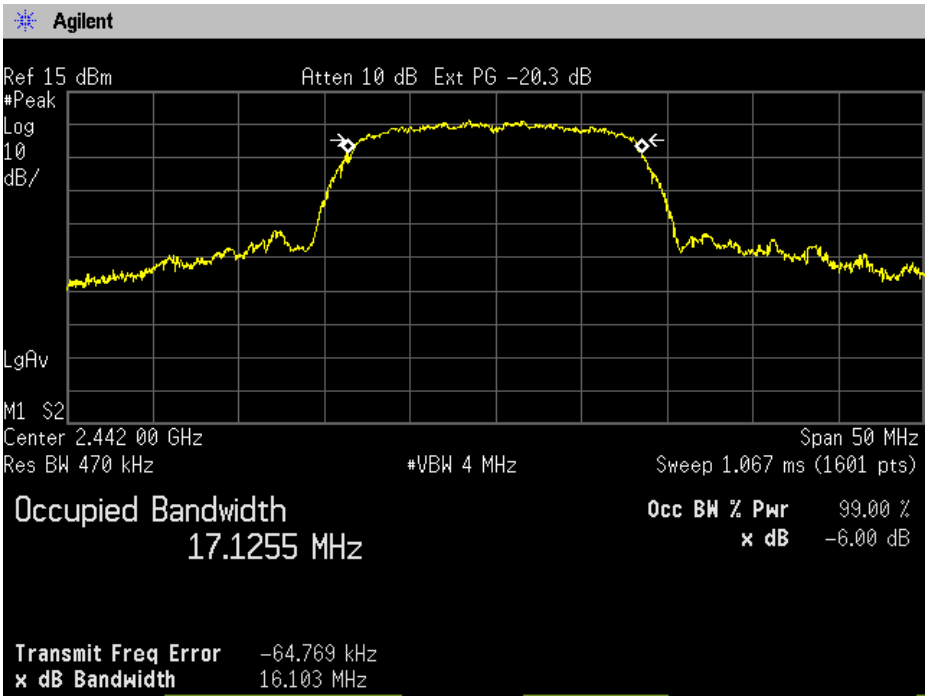
Low Channel_G Mode



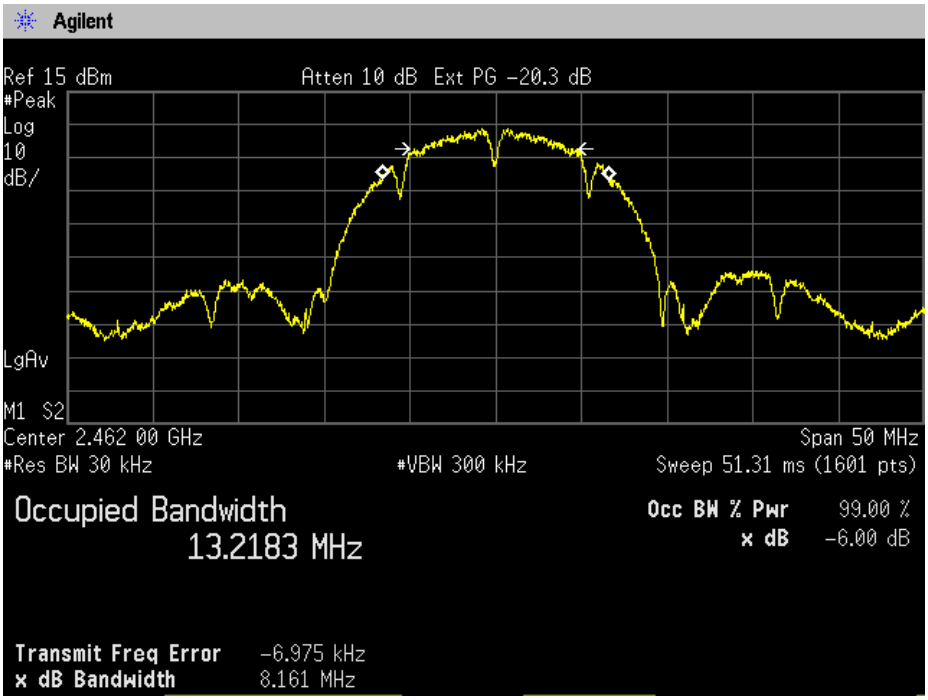
Mid Channel_B Mode



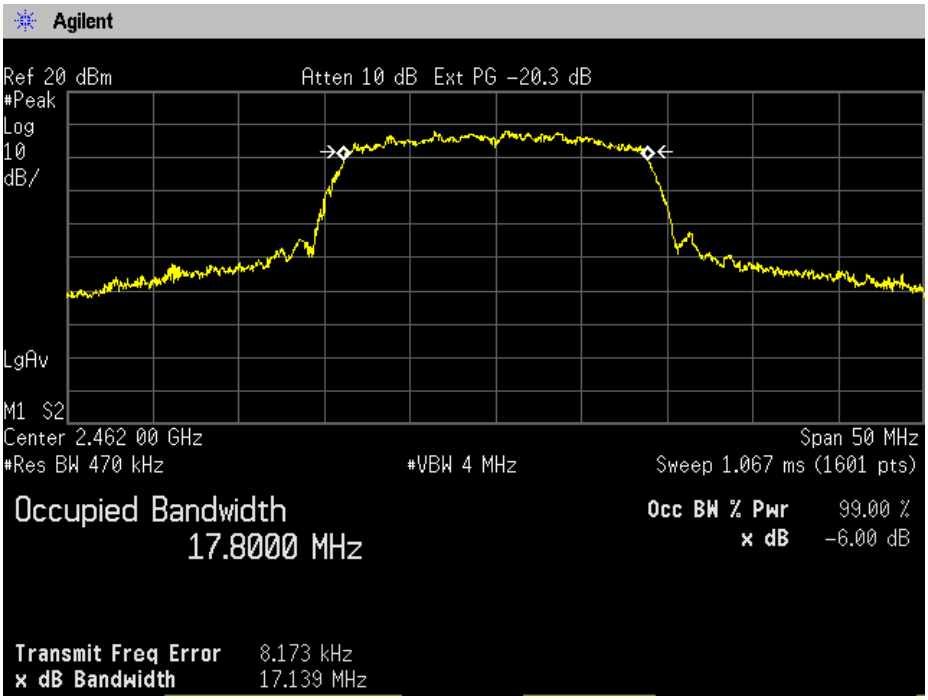
Mid Channel_N Mode



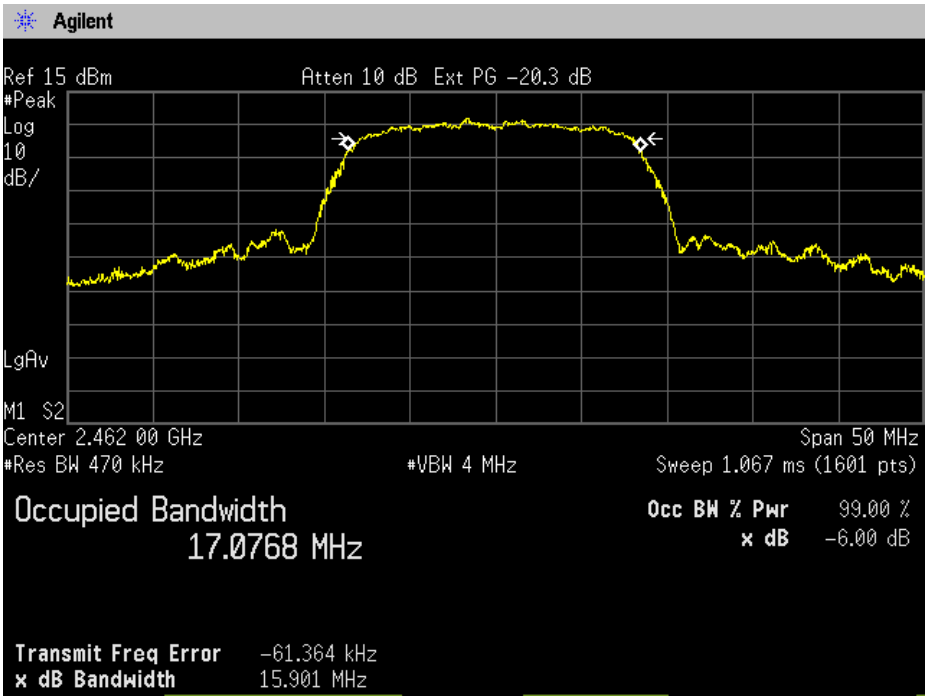
Mid Channel_G Mode



High Channel_B Mode



High Channel_N Mode



High Channel_G Mode

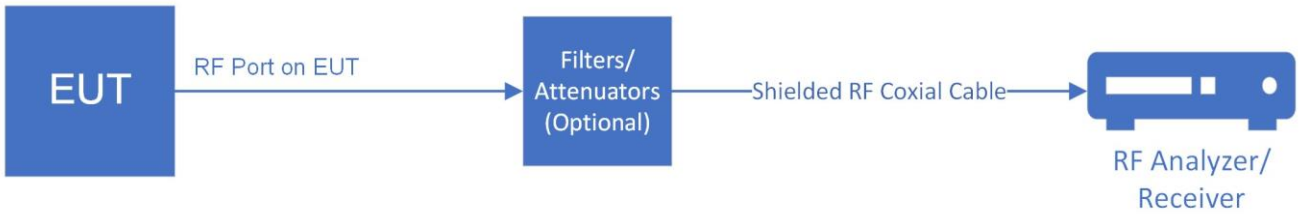
Transmitter Power Spectral Density (PSD)

Engineer: John Michalowicz
Test Date: 7/09/25

Test Procedure

A spectrum analyzer was directly connected to the EUT's RF port. The EUT was set to transmit on the lowest, middle and highest frequency of operation at the maximum power level. A spectrum analyzer was used to verify that the EUT met the power spectral density requirements.

Test Setup



The Spectrum Analyzer was set to the following:

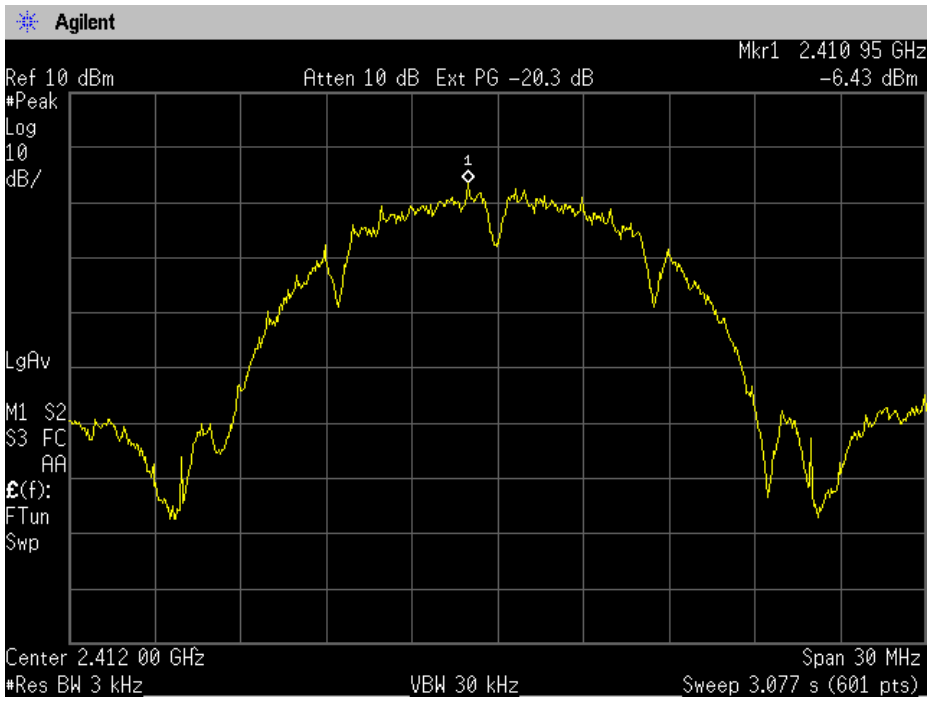
DTS channel center frequency
RBW =3 kHz ≤ RBW ≤ 100 kHz
VBW ≥ 3 x RBW
Peak Detector
Sweep time = auto couple
Trace mode = max hold

Once the trace has stabilized the peak marker was used to determine the power spectral density.

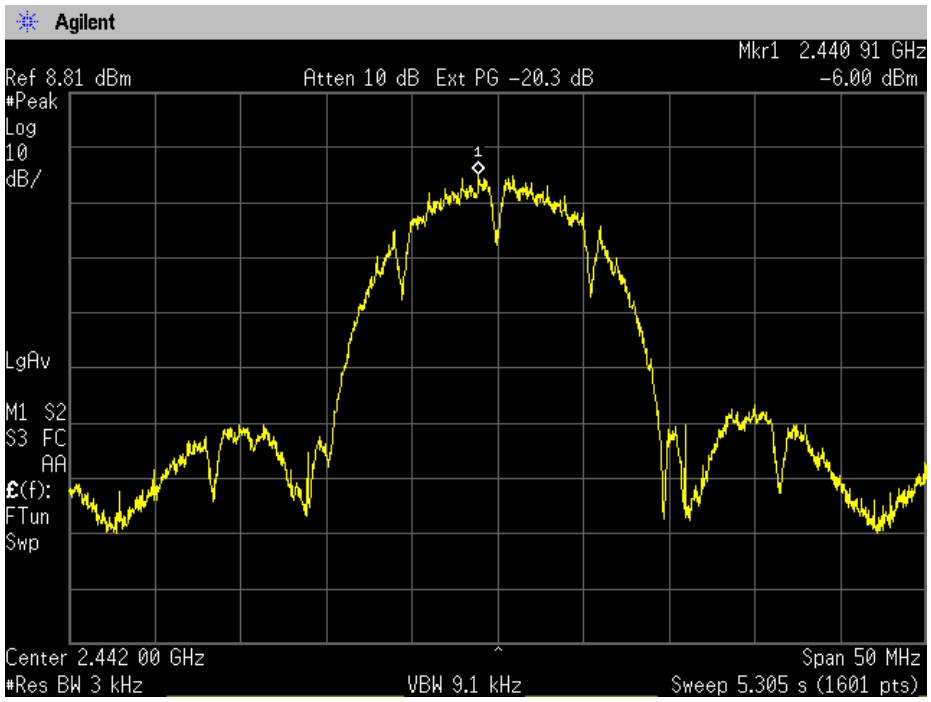
PSD Summary

Frequency (MHz)	Mode of Operation	Measured Data (dBm)	Specification Limit (dBm)	Result
2412	802.11 b	-6.43	8	Pass
	802.11 g	-14.08	8	Pass
	802.11 n	-13.90	8	Pass
2440	802.11 b	-6.0	8	Pass
	802.11 g	-13.78	8	Pass
	802.11 n	-13.90	8	Pass
2462	802.11 b	-7.80	8	Pass
	802.11 g	-13.62	8	Pass
	802.11 n	-12.77	8	Pass

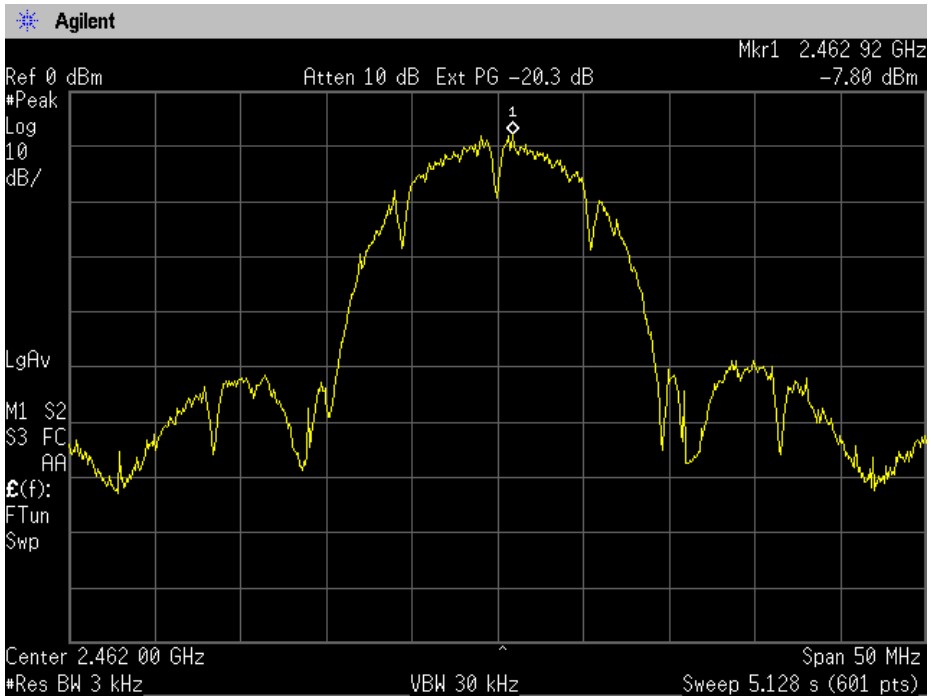
PSD Plots



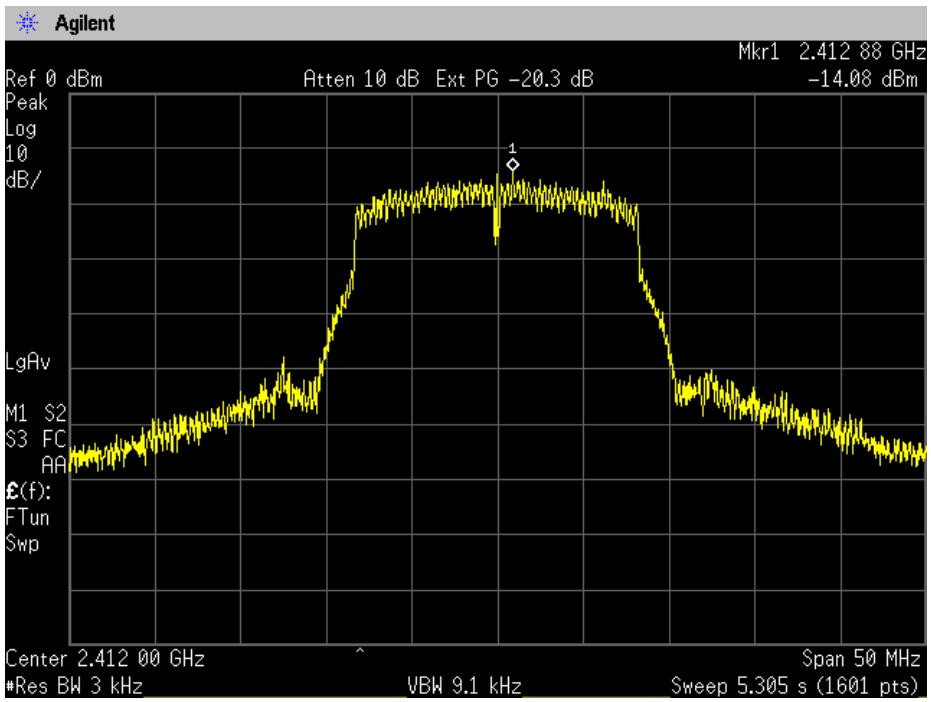
Low Channel B Mode



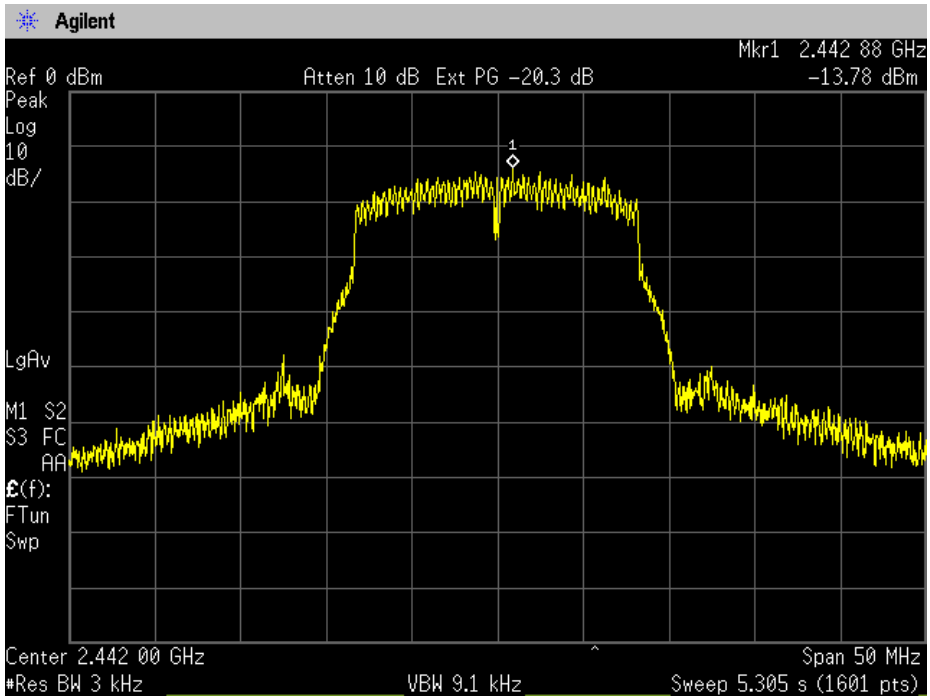
Mid Channel B Mode



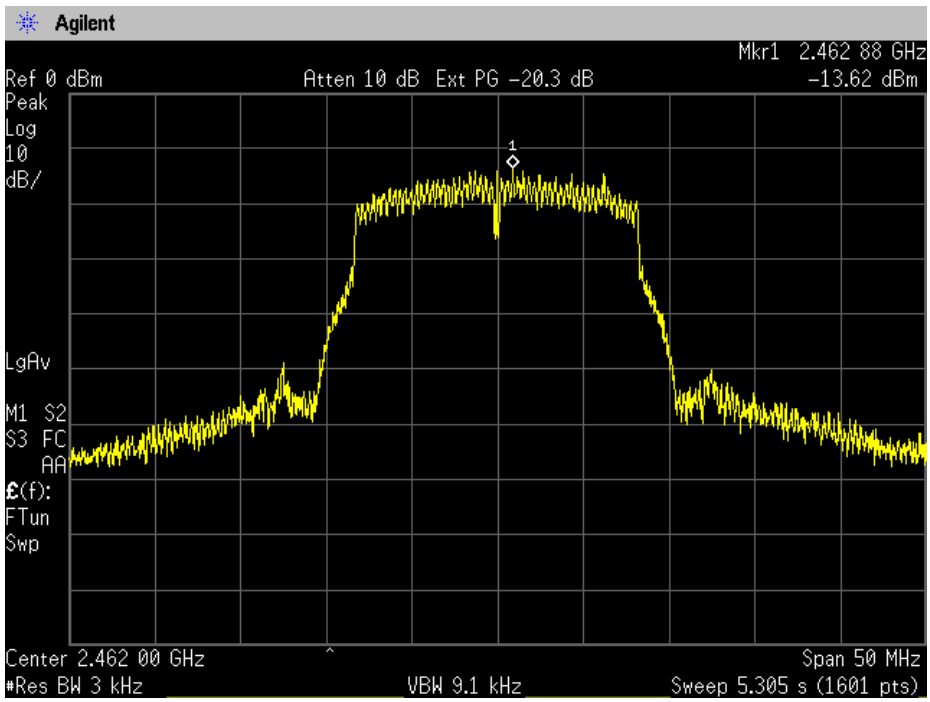
High Channel B Mode



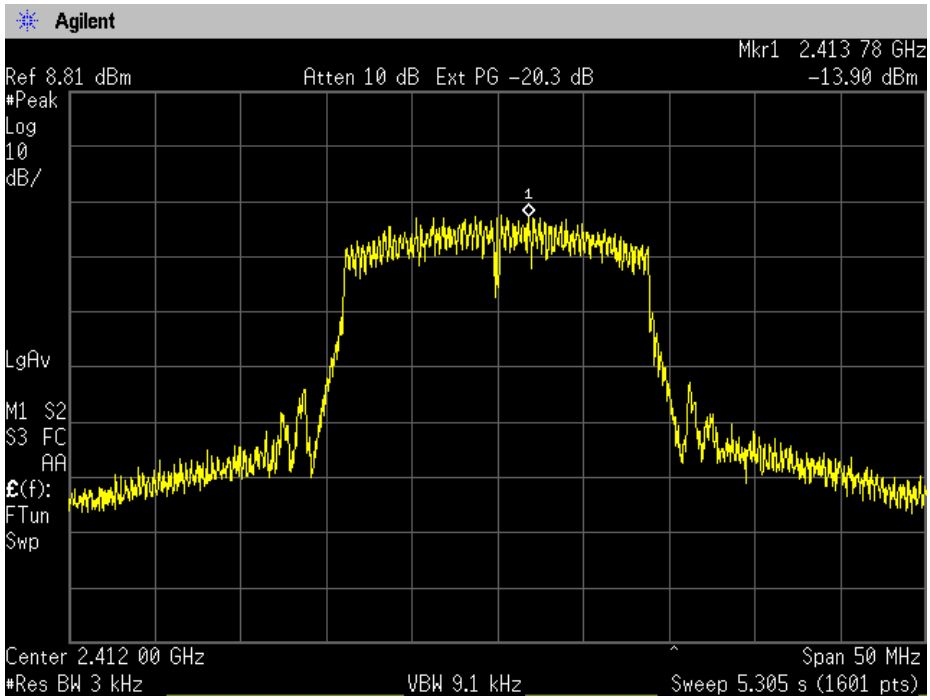
Low Channel G Mode



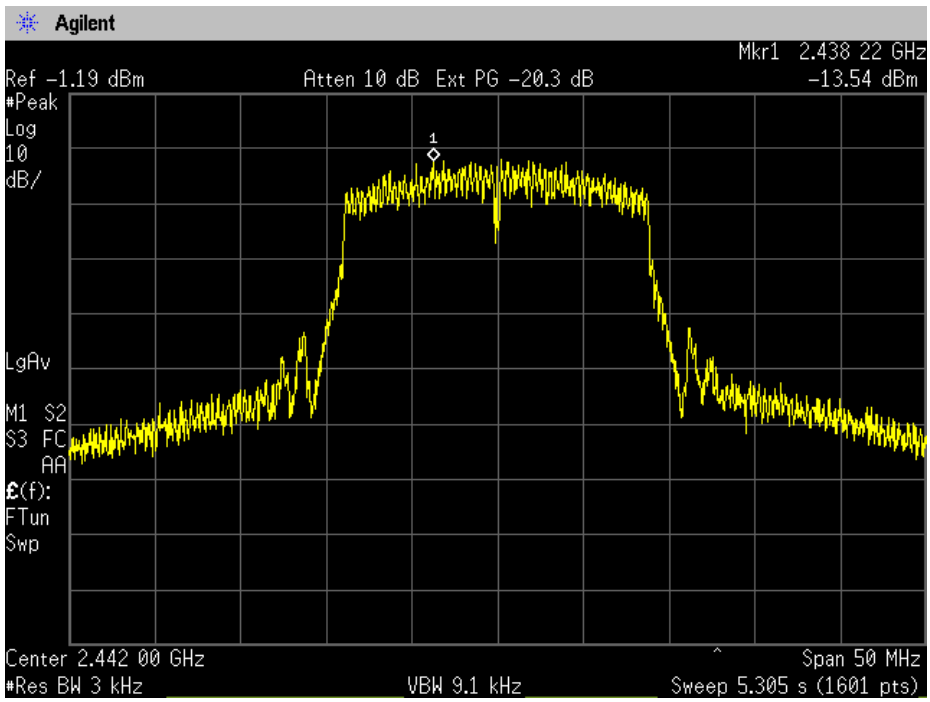
Mid Channel G Mode



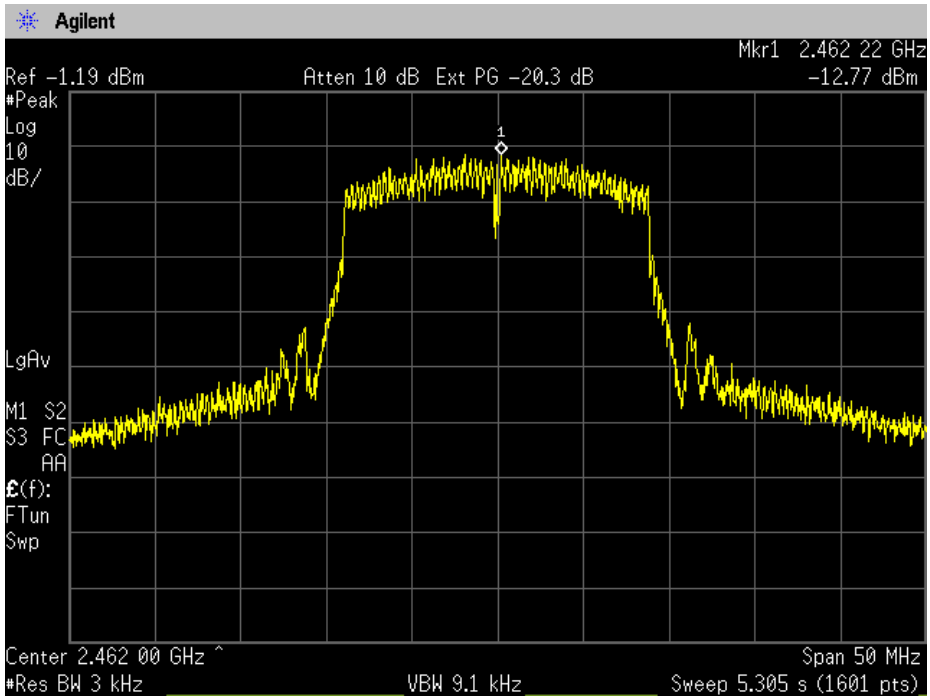
High Channel G Mode



Low Channel N Mode



Mid Channel N Mode



High Channel N Mode

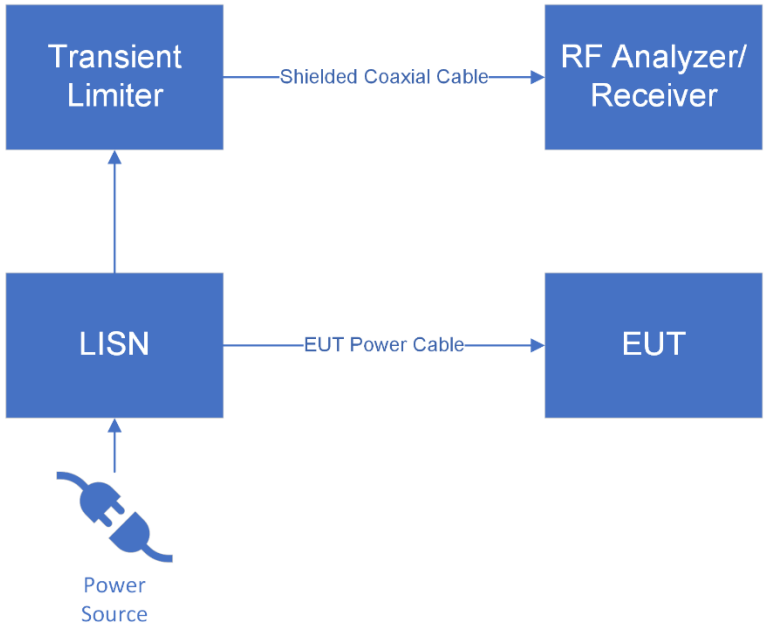
A/C Powerline Conducted Emissions

Engineer: John Michalowicz
Test Date: 7/22/25

Test Procedure

The EUT power cable was connected to a LISN and the monitored output of the LISN was connected to a transient limiter, which then connected directly to a spectrum analyzer. The conducted emissions from 150 kHz to 30 MHz were measured and compared to the specification limits.

Basic Test Setup



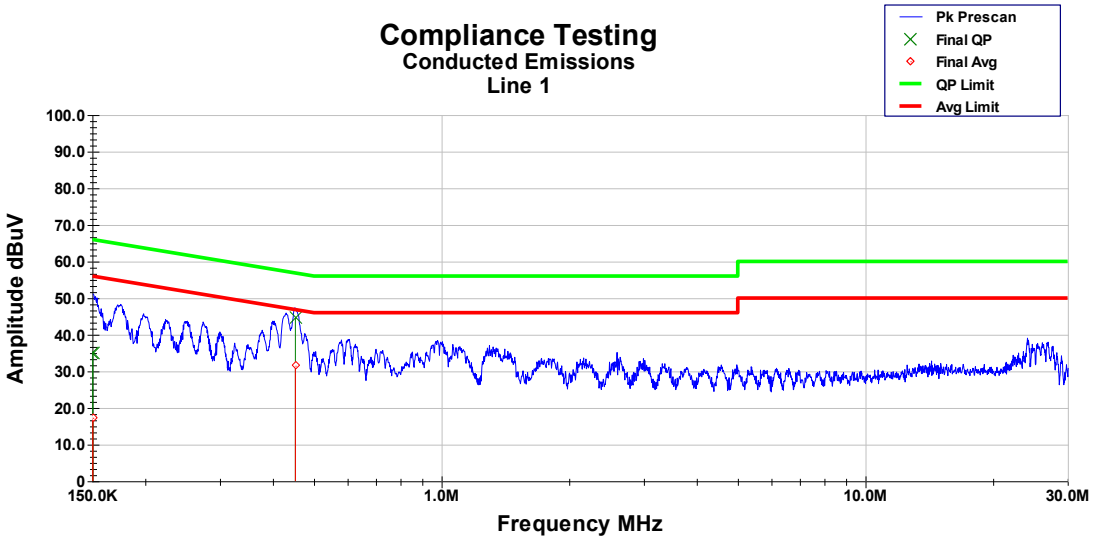
	Settings 150kHz-30MHz
RBW	9kHz
VBW	30kHz
Detector	QP/AV or PK

Sample Calculations

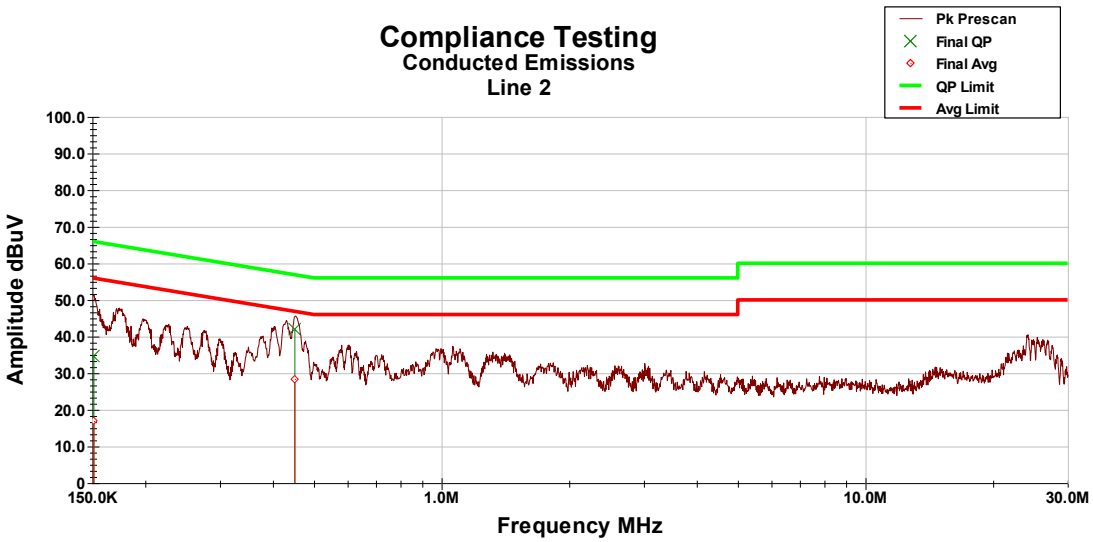
Corrected Value = Measured Value + Correction factor

Correction factor = Cable loss + Attenuator Factor

120 VAC_CE



Frequency	Raw QP	Raw Avg	Path Loss	Final QP	Final Avg	QP Limit	QP Margin	Avg Limit	Avg Margin
(MHz)	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dB	dBuV	dB
150.0 KHz	25.10	7.40	9.90	35.00	17.30	66.00	-31.00	56.00	-38.70
150.56 KHz	25.00	7.50	9.90	34.90	17.30	66.00	-31.10	56.00	-38.70
452.08 KHz	34.50	21.40	10.10	44.60	31.50	57.40	-12.80	47.40	-15.90
Final = Raw + Path Loss									
Margin = Final - Limit									



Frequency	Raw QP	Raw Avg	Path Loss	Final QP	Final Avg	QP Limit	QP Margin	Avg Limit	Avg Margin
(MHz)	dBuV	dBuV	dB	dBuV	dBuV	dBuV	dB	dBuV	dB
151.38 KHz	24.70	7.10	9.80	34.50	16.90	66.00	-31.40	56.00	-39.00
450.88 KHz	31.79	18.40	10.00	41.80	28.40	57.40	-15.60	47.40	-19.00
Final = Raw + Path Loss									
Margin = Final - Limit									

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna (18-40GHz)	EMCO	3116	i00085	3/18/25	3/18/27
Temp./humidity/pressure monitor (Main Lab)	Omega Engineering	iBTHX-W-5	i00686	1/25/25	1/25/26
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/13/23	7/13/26
44GHz EMI receiver	Keysight	N9038A	i00552	3/17/25	3/17/26
PSA Spectrum Analyzer	Agilent	E4448A	i00688	10/26/24	10/26/25
Bi-Log antenna	Chase	CBL6111C	i00267	3/5/24	3/5/26
Horn Antenna (1-18GHz)	ARA	DRG-118/A	i00271	8/9/24	8/9/26
Preamplifier	COM-Power	PAM-103	i00734	Verified on: 6/27/24	
Preamplifier	Eravant	SBB-0115034019-2F2F-E3	i00722	Verified on: 12/4/24	
EMI Receiver	HP	85462A	i00033	6/25/25	6/25/26
Transient Limiter	Com-Power	LIT-153	i00123	Verified on: PTV	
AC Power Source	Behlman	BL 6000	i00362	NCR	
LISN	COM-Power	LI-125A	i00446	3/18/24	3/18/26
LISN	COM-Power	LI-125A	i00448	3/18/24	3/18/26

In addition to the above listed equipment standard RF connectors and cables were utilized in the testing of the described equipment. Prior to testing these components were tested to verify proper operation.

Measurement Uncertainty

Measurement Uncertainty for Compliance Testing is listed in the table below.

Measurement	U_{lab}
Radio Frequency	± 3.3 x 10^{-8}
RF Power, conducted	± .54 dB
RF Power Density, conducted	± 1.0 dB
Conducted Emissions	± 0.94 dB
Radiated Emissions 9kHz-30MHz	± 2.76 dB
Radiated Emissions 30MHz-1000MHz	± 4.25 dB
Radiated Emissions – 1GHz-18GHz	± 4..49 dB
Temperature	± 1.5 deg C
Humidity	± 4.3 %
DC voltage	± 0.20 VDC
AC Voltage	± 1.2 VAC

The reported expanded uncertainty +/- U_{lab}(dB) has been estimated at a 95% confidence level (k=2)
U_{lab} is less than or equal to U_{EMC} therefore;

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit.
- Non-Compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

END OF TEST REPORT