C2PC Test Report

Prepared for: G-Way Solutions, LLC

Model: 1BOX-PS7W/PS8W-33/33-90-N

Description: Patented 1-BOX(tm) system which includes a Bi-Directional Amplifier (BDA), Annunciator, and Battery backup unit in a single enclosure

FCC ID: Q8KPS7W83790N

Serial Number:24101001

Project No: p2490008

Test Results: Pass

To

FCC Part 90

Date of Issue: December 16, 2024

On the behalf of the applicant:

G-Way Solutions, LLC
17-01 Pollitt Drive, Suite 6
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Attention of:

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Prepared By:

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ANAB Cert#: AT-2901
FCC Site Reg. #US2901
ISED Site Reg. #2044A-2

Reviewed / Authorized By:

Greg Corbin
Project Test Engineer

Test Result Summary

Test Date Range: December 9 – December12, 2024

Specification	Test Name	Pass, Fail, N/A	Comments
FCC			
KDB 935210 D05 (4.2) C63.26 (7.2.3.1 a)	AGC Threshold	Pass	
KDB 935210-D05 (4.3) C63.26 (7.2.3.2)	Out of Band Rejection	Pass	
90.219 (e)(1) 2.1046 KDB 935210 D05 (4.5) C63.26 (7.2.3.4)	Output Power (Conducted)	Pass	
90.219 (e)(4)(ii) 90.210 2.1049 KDB 935210 D05 (4.4) C63.26 (7.2.3.3)	Input vs Output_ Occupied Bandwidth (Emission Masks)	N/A	Not part of C2PC
90.219 (e)(3) 90.219 (e)(4)(iii) 2.1051 KDB 935210 D05 (4.7.3) C63.26 (7.2.3.7)	Spurious Emissions (Transmitter Conducted)	Pass	
2.1053 KDB 935210 D05 (4.9) C63.26 (7.2.3.9)	Radiated Spurious Emissions	Pass	
90.219 (e)(3) KDB 935210-D05 (4.7.2) C63.26 (7.2.3.6)	Intermodulation	Pass	
90.219(e)(2) KDB 935210-D05 (4.6) C63.26 (7.2.3.5)	Noise Figure	N/A	Not part of C2PC
90.219 (e)(4)(i) 90.213 KDB 935210-D05 (4.8) C63.26 (7.2.3.8)	Frequency Stability (Temperature Variation)	N/A	Not part of C2PC and No Freq translation
90.219 (e)(4)(i) 90.213 KDB 935210-D05 (4.8) C63.26 (7.2.3.8)	Frequency Stability (Voltage Variation)	N/A	Not part of C2PC and No Freq translation

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 C63.26:2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services
FCC KDB 935210 D05	Measurements Guidance For Industrial And Non-Consumer Signal Booster, Repeater, And Amplifier Devices v01r04
ISO/IEC 17025:2017	General requirements for the Competence of Testing and Calibrations Laboratories

Test Report Revision History

Revision	Date	Revised By	Reason for Revision
1.0	12/16/2024	Greg Corbin	Original Document

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ANAB

Compliance Testing, LLC, has been accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to the joint ISO-ILAC-IAF Communiqué dated January 2009).

The tests results contained within this test report all fall within our scope of accreditation, unless noted below.

Please refer to http://www.compliancetesting.com/labscope.html for current scope of accreditation.

FCC Site Reg. #349717

IC Site Reg. #2044A-2

Test and Measurement Data
All tests and measurement data shown were performed in accordance with FCC Rules and Regulations Part 90.219, Part 2, ANSI C63.26-2015, KDB 935210 D05, RSS-131, RSS-GEN where appropriate.

Standard Test Conditions and Engineering Practices

Except as noted herein, the following conditions and procedures were observed during the testing.

In accordance with ANSI/TIA 603C, and unless otherwise indicated in the specific measurement results, the ambient temperature of the actual EUT was maintained within the range of 10° to 40°C (50° to 104°F) unless the equipment requirements specify testing over a different temperature range. Also, unless otherwise indicated, the humidity levels were in the range of 10% to 90% relative humidity.

Environmental Conditions		
Temp (ºC)	**Humidity (%)**	**Pressure (mbar)**
20.9 – 24.8	22.2 – 30.1	967.7 – 985.1

Measurement results, unless otherwise noted, are worse case measurements.

EUT Description

Model:	1BOX-PS7W/PS8W-33/33-90-N
Serial:	24101001
Firmware:	GWY20190111
Software:	N/A
Description:	Public Safety 700/800 MHz Band Bi-Directional Amplifier Patented 1-BOX(tm) system which includes a Bi-Directional Amplifier (BDA), Annunciator, and Battery backup unit in a single enclosure
Additional Information:	This test report is to support a C2PC. The manufacturer installed a battery, battery monitoring circuitry and digital alarm circuitry. The RF portion of the EUT was not changed from the original design. Spot testing was performed to verify no change in RF performance. All tests were performed with the EUT gain set to maximum. Uplink gain = 86 dB Downlink Gain = 85 dB
Receipt of Sample(s):	October 24, 2024
EUT Condition:	**Visual Damage** No **State of Development** Production/Production Equivalent

Frequency of operation

The EUT is patented 1-BOX(tm) system which includes a B-Directional Amplifier(BDA), Annunciator, and Battery backup unit in a single enclosure,r that operates in the frequency range listed in Table 1..

The emission designators listed in Table 1 are representative emission designators used by transmitters whose signal is amplified by this booster.

Table 1

Frequency		Emission Designators
Base to Mobile	**Mobile to Base**	
758 – 775 851 - 869	788 - 824	F3E, G1D, G1E, W7W, F2D

Frequency Band	Test Frequency
MHz	**MHz**
758 - 775	766.5
788 - 824	806
851 - 869	860

Additional Information:

Accessories: None

Cables: None

Modifications: None

AGC Threshold

Engineer: Greg Corbin
Test Date: 11/23/2024

Test Procedure

The Equipment Under Test (EUT) was connected to a spectrum analyzer as shown in the test set-up diagram.

All cable and attenuator losses were input into the spectrum analyzer as a reference level offset to ensure accurate readings were obtained.

A signal generator producing a CW signal was connected to the input of the EUT.

A spectrum analyzer was connected to the EUT to monitor the output power levels.

The input power level was increased in 1 dB increments until the power no longer increased.

The input levels were recorded in the table below as the AGC Threshold level.

Spectrum Analyzer settings
RBW = 100 kHz
Video BW = 3x RBW

Test Setup

Frequency Band	Test Frequency	AGC Threshold
MHz	MHz	dBm
758 - 775	766.5	-49.0
788 - 824	806	-49.6
851 - 869	860	-50.4

Out of Band Rejection

Engineer: Greg Corbin
Test Date: 11/23/2024

Test Procedure

Out of Band Rejection was measured per ANSI C63.26 section 7.2.3.2

The Equipment Under Test (EUT) was connected to a spectrum analyzer as shown in the test set-up diagram.

All cable and attenuator losses were input into the spectrum analyzer as a reference level offset to ensure accurate readings were obtained.

A signal generator was utilized to produce a swept CW signal with the RF input level set to 3 dB below the AGC Threshold level.

The Uplink and Downlink filter response and the -20 dB bandwidth were measured.

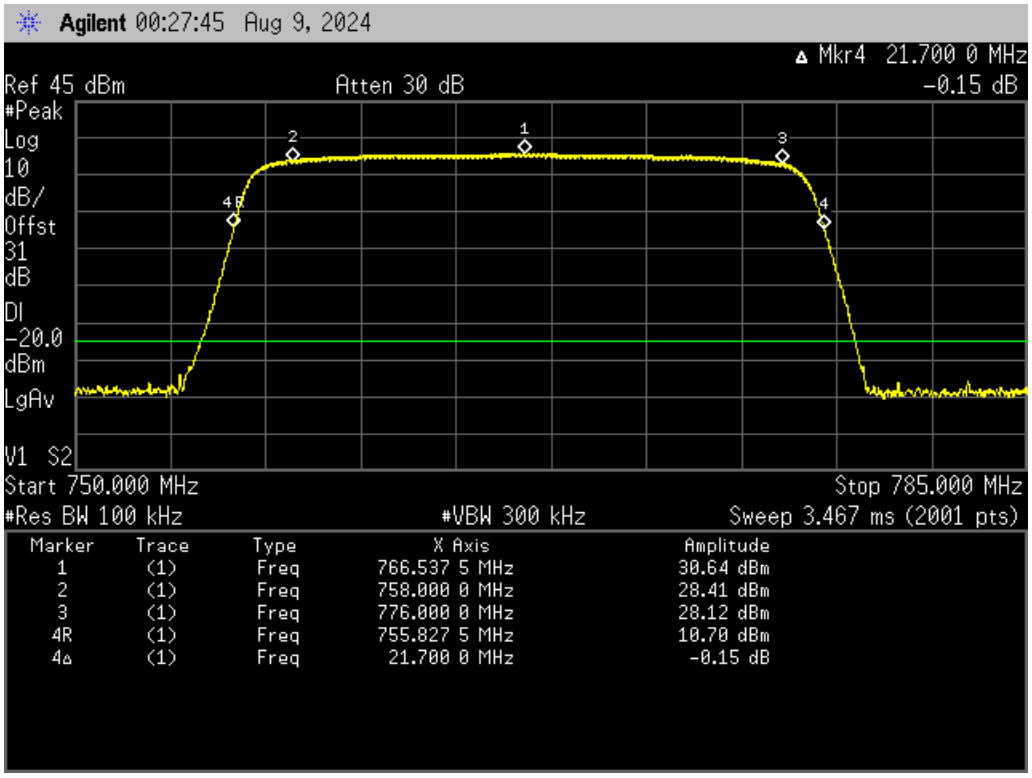
The marker table function of the spectrum analyzer was used to show the peak amplitude in the passband and the -20 dB bandwidth of the pass band filter.

RBW = 100 KHz
Video BW = 3x RBW

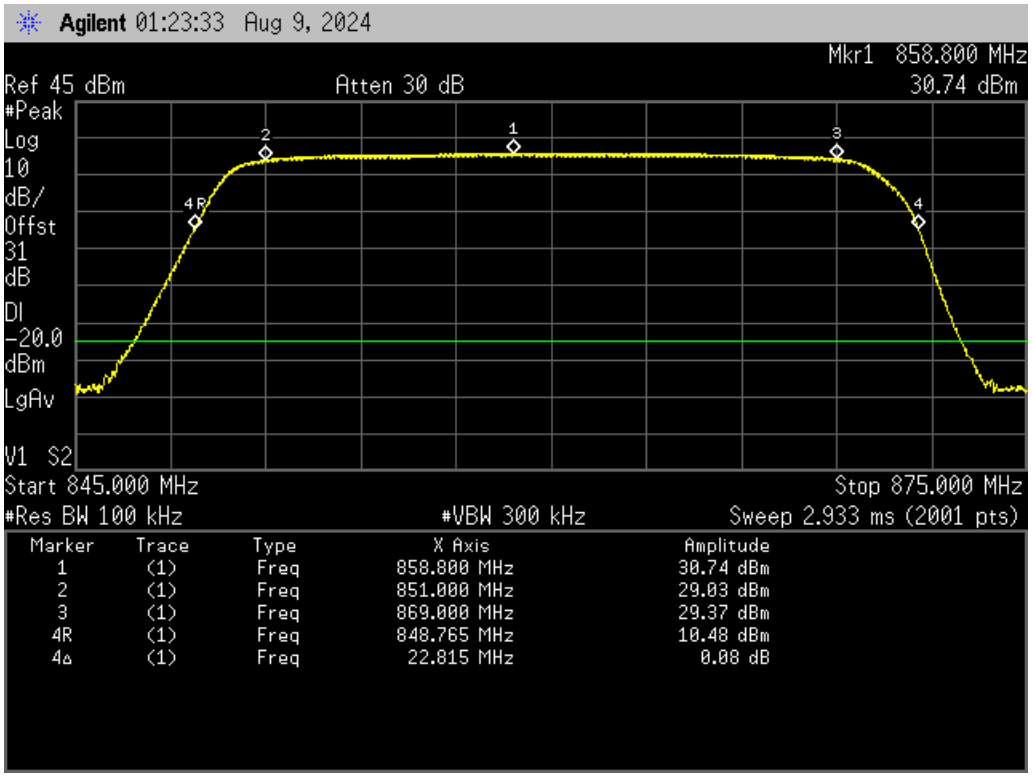
Test Setup

Out of Band Rejection Test Results

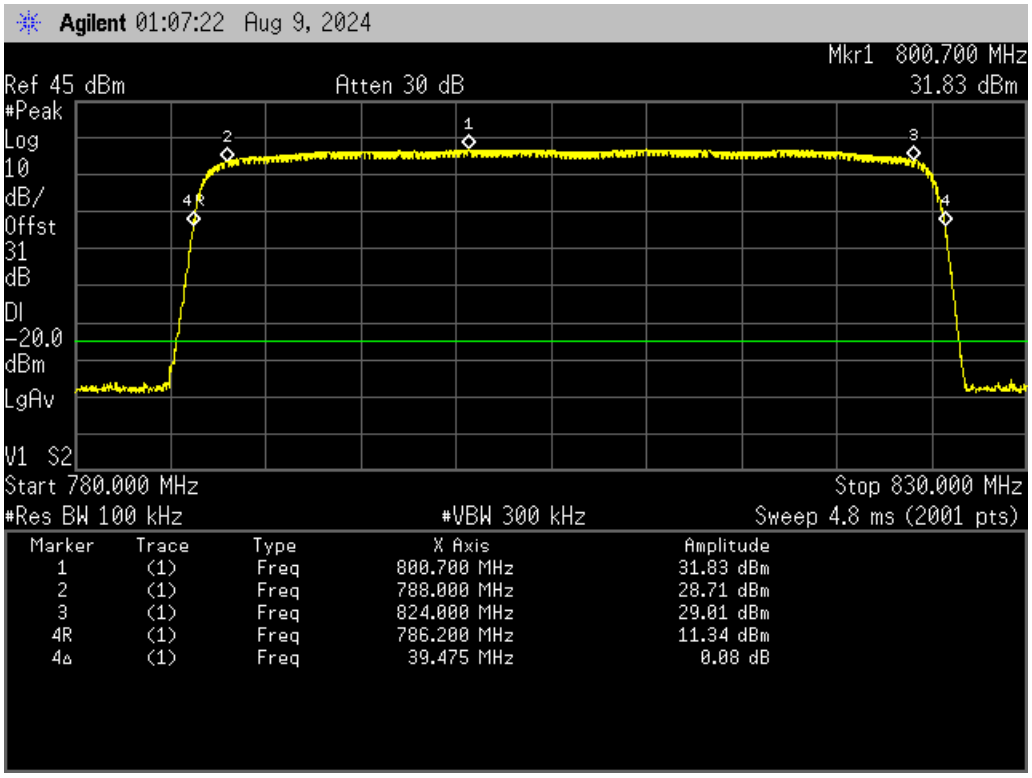
Base to Mobile_758 - 775 MHz



Base to Mobile_851 – 869 MHz



Mobile to Base 788 – 824 MHz



Conducted Output Power and Amplifier Gain

Engineer: Greg Corbin
Test Date: 11/23/2024

Test Procedure

The Equipment Under Test (EUT) was connected to a spectrum analyzer as shown in the test set-up diagram.

All cable and attenuator losses were input into the spectrum analyzer as a reference level offset to ensure accurate readings were obtained.

The EUT gain control was set to maximum gain.

Maximum Uplink Gain = 72 dB

Maximum Downlink Gain = 71 dB

The output power was recorded using a CW signal with the input power was set so that the output power was 0.2 dB below the AGC threshold.

The Input and Output power levels were recorded, and the gain was calculated using the following formula:

Gain (dB) = Output Power dBm – Input Power dBm

Output Power Limit = 5 watts (37 dBm).

Test Setup

Output Power and Gain Test Results

Frequency Band	Test Frequency	Input Power	Output Power	Gain
MHz	MHz	dBm	dBm	dB
758 - 775	766.54	-48.9	33.8	82.7
788 - 824	800.7	-49.5	34.5	84
851 - 869	858.8	-50.4	33.7	84.1

Conducted Spurious Emissions

Engineer: Greg Corbin
Test Date: 11/23/24

Test Procedure

The Equipment Under Test (EUT) was connected to a spectrum analyzer as shown in the test set-up diagram.

All cable and attenuator losses were input into the spectrum analyzer as a reference level offset to ensure accurate readings were obtained.

A CW signal was utilized, set to the frequencies listed in the test summary tables.

The RF input signal level was set to 0.2 dB below the AGC Threshold.

Conducted spurious emissions were recorded from 30 MHz to 9 GHz.

Spectrum analyzer plots were recorded, and the highest spurious level was recorded in the test summary tables.

Spectrum analyzer settings:

Detector: Peak, max hold

RBW = 100 kHz

VBW = 3 x RBW

Test Setup

Conducted Spurious Emissions Test Results

Frequency Band	Test Frequency	Spurious Frequency	Spurious Level	Limit	Margin
MHz	MHz	MHz	dBm	dBm	dB
758 - 775	758	853.5	-27.8	-13	-14.8
758 - 775	766.5	852.4	-26.2	-13	-13.2
758 - 775	775	864.5	-26.4	-13	-13.4
851 - 869	851	774.7	-28.9	-13	-15.9
851 - 869	860	767	-29.9	-13	-16.9
851 - 869	869	761.5	-29.1	-13	-16.1
788 - 824	788	7378.4	-37.2	-13	-24.2
788 - 824	806	7538.3	-36.6	-13	-23.6
788 - 824	824	6977.5	-36.5	-13	-23.5

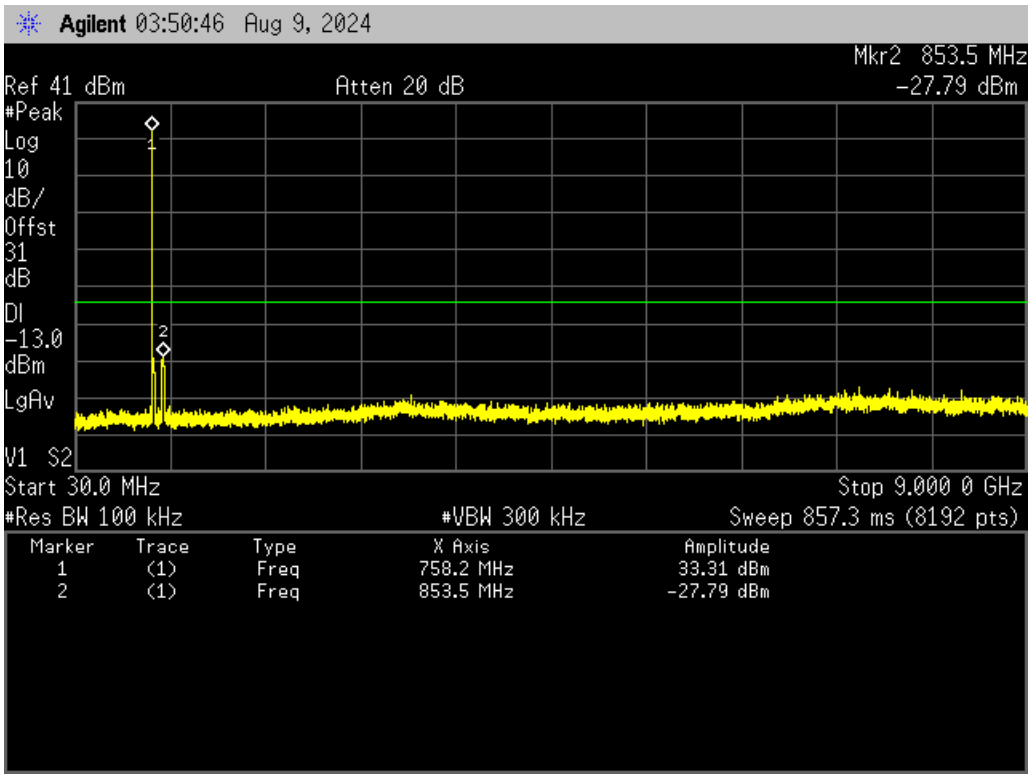
For all plots,

Marker 1 in the graphs is the test frequency and is exempt from the spurious limit.

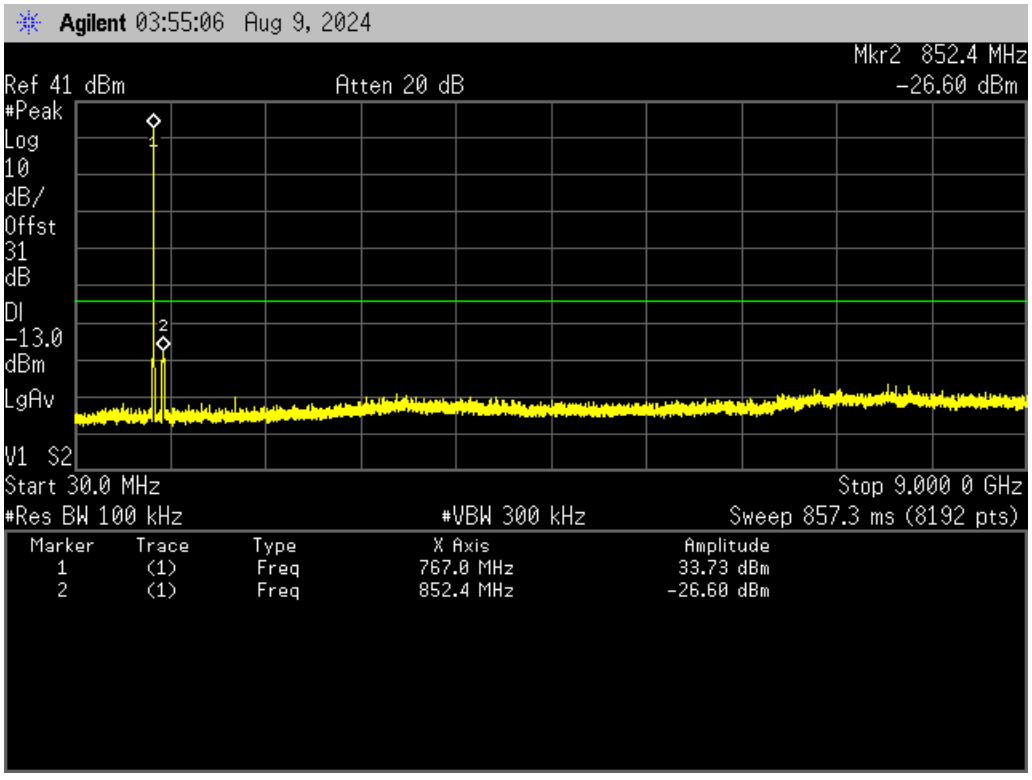
Marker 2 is the spurious signal level.

Conducted Spurious Emissions Plots

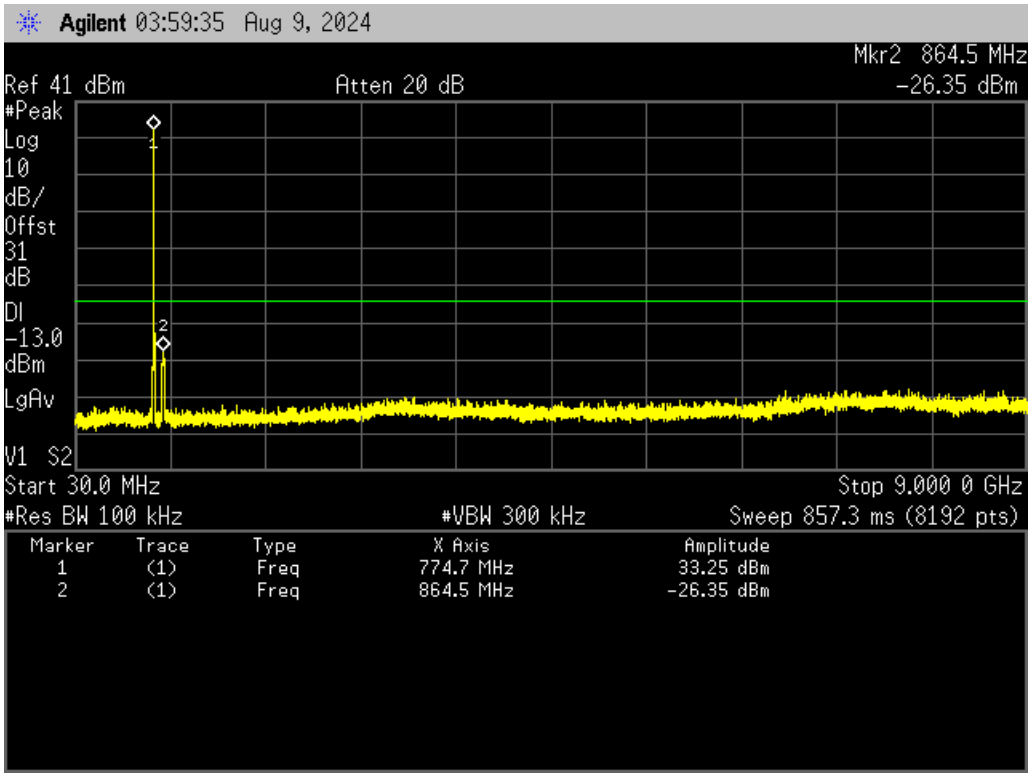
758 – 775 MHz_ Test Freq = 758 MHz



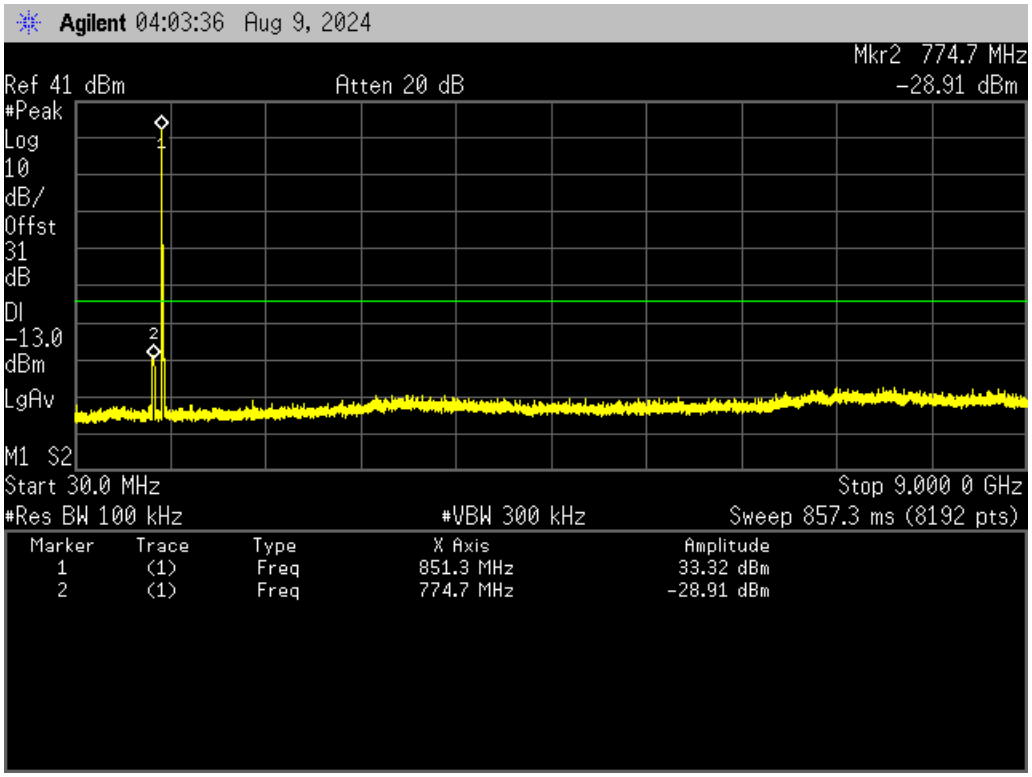
758 – 775 MHz_ Test Freq = 766 MHz



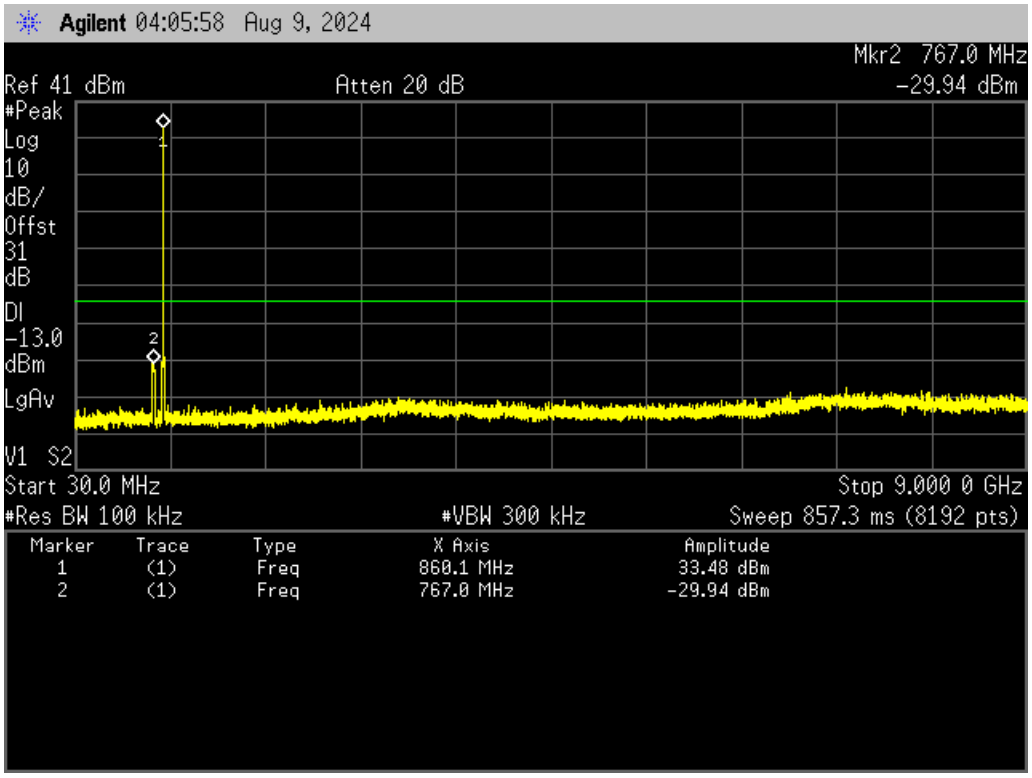
758 – 775 MHz_ Test Freq = 775 MHz



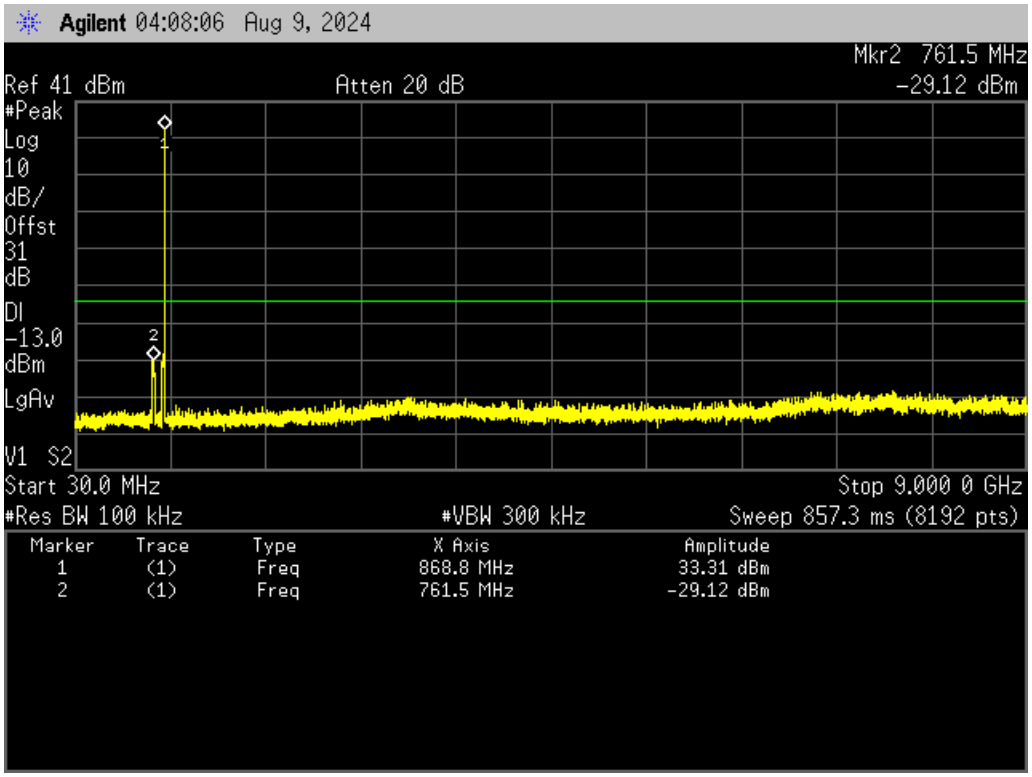
851 - 869 MHz_ Test Freq = 851 MHz



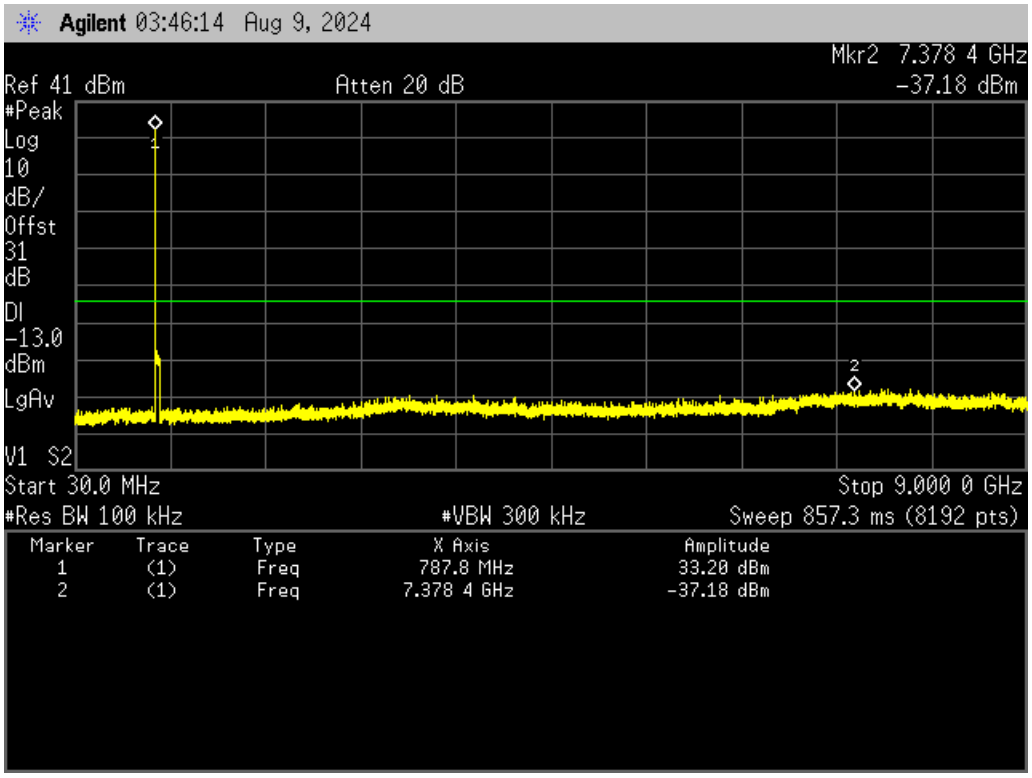
851 - 869 MHz_ Test Freq = 860 MHz



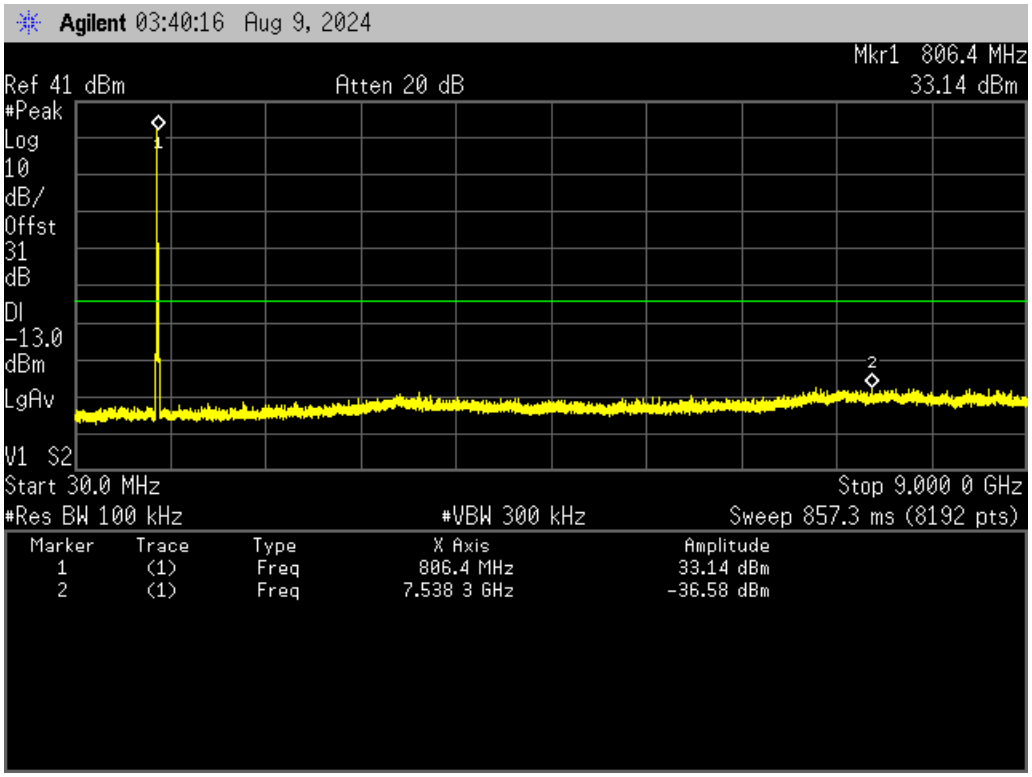
851 - 869 MHz_ Test Freq = 869 MHz



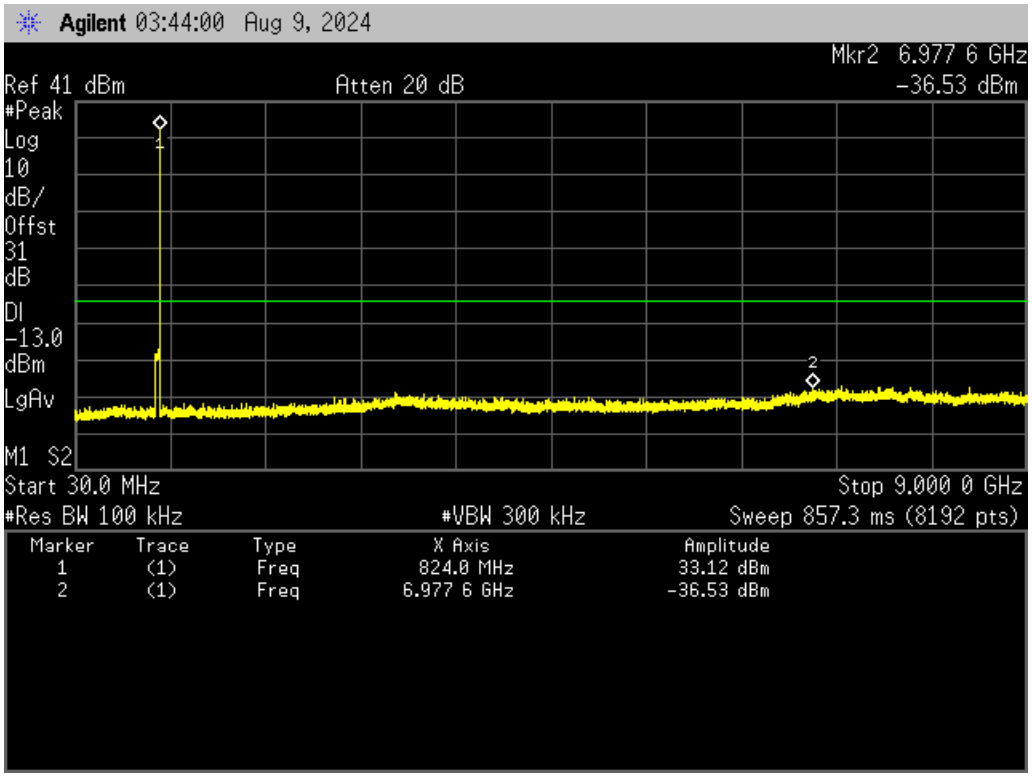
788 - 824 MHz_ Test Freq = 788 MHz



788 - 824 MHz_ Test Freq = 806 MHz



788 - 824 MHz_ Test Freq = 824 MHz



Radiated Spurious Emissions

Engineer: Greg Corbin
Test Date: 12/13/2024

Test Procedure

The EUT was tested in a semi-anechoic chamber with the turntable set 3m from the receiving antenna.

A spectrum analyzer was used to verify that the EUT met the requirements for Radiated Emissions.

The EUT was tested by rotating it 360 degrees with the antenna in both the vertical and horizontal orientation while raised from 1 to 4 meters to ensure that the signal levels were maximized.

All cable and antenna correction factors were input into the spectrum analyzer ensuring an accurate measurement in ERP/EIRP with the resultant power in dBm.

A signal generator was used to provide a CW signal.

The EUT output was terminated into a 50 Ohm non-radiating load.

The frequency range of 30 MHz to 9 GHz was recorded.

Spectrum analyzer settings:

Detector: Peak, max hold

RBW = 100 kHz from 30 – 1000 MHz

RBW = 1 MHz from 1 – 9 GHz.

VBW = 3 x RBW

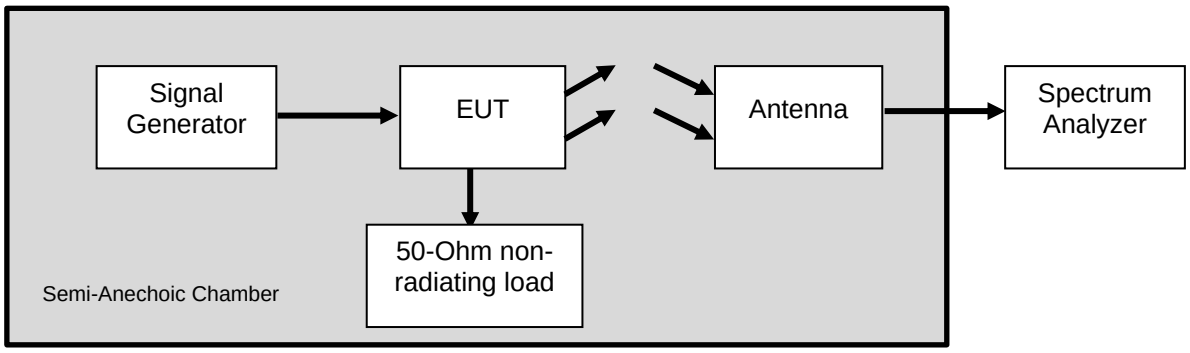
The following formula was used for calculating the limits:

Radiated Spurious Emissions Limit = P1 – (43+ 10Log(P2)) = -13 dBm

P1 = power in dBm

P2 = power in Watts

Test Setup



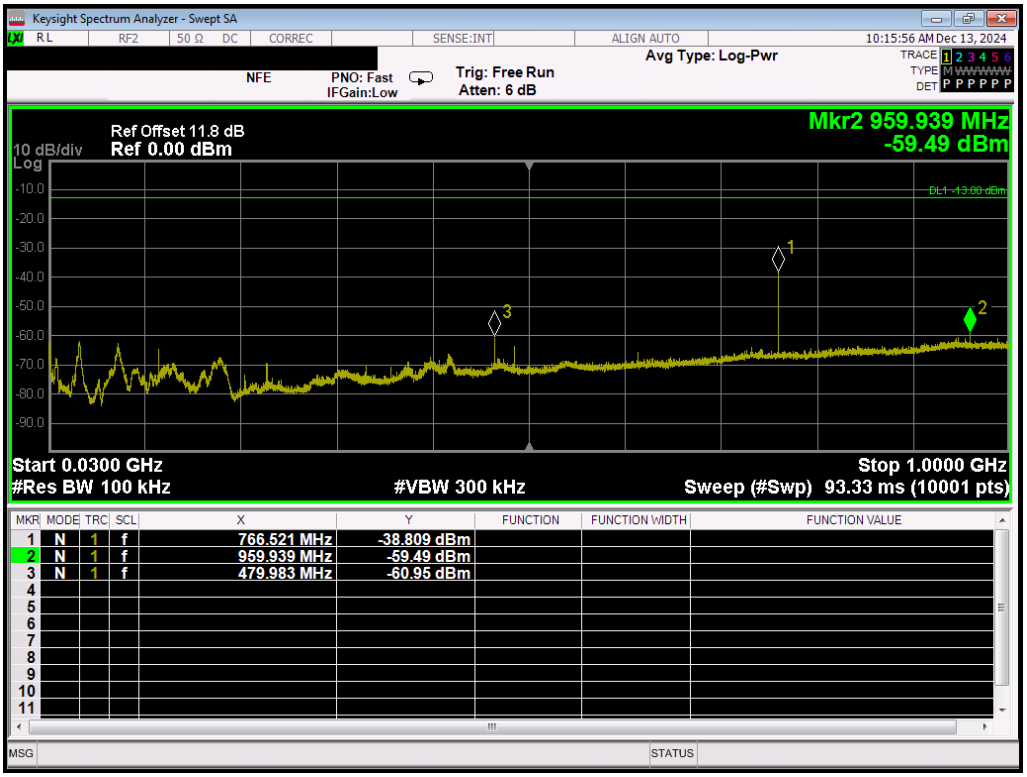
Radiated Spurious Emissions Test Results

Freq Range	Frequency Band	Test Frequency	Spurious Frequency	Spurious Level	Limit	Margin
GHz	MHz	MHz	MHz	dBm	dBm	dB
0.030 – 1000	758 - 775	766.5	959.939	-59.5	-13	-46.5
1 - 9	758 - 775	766.5	8875	-47.6	-13	-34.6
0.030 – 1000	851 - 869	860	57.354	-58.3	-13	-45.3
1 - 9	851 - 869	860	8983	-47.7	-13	-34.7
0.030 – 1000	788 - 824	806	57.548	-58.9	-13	-45.9
1 - 9	788 - 824	806	8858.4	-47.3	-13	-34.3

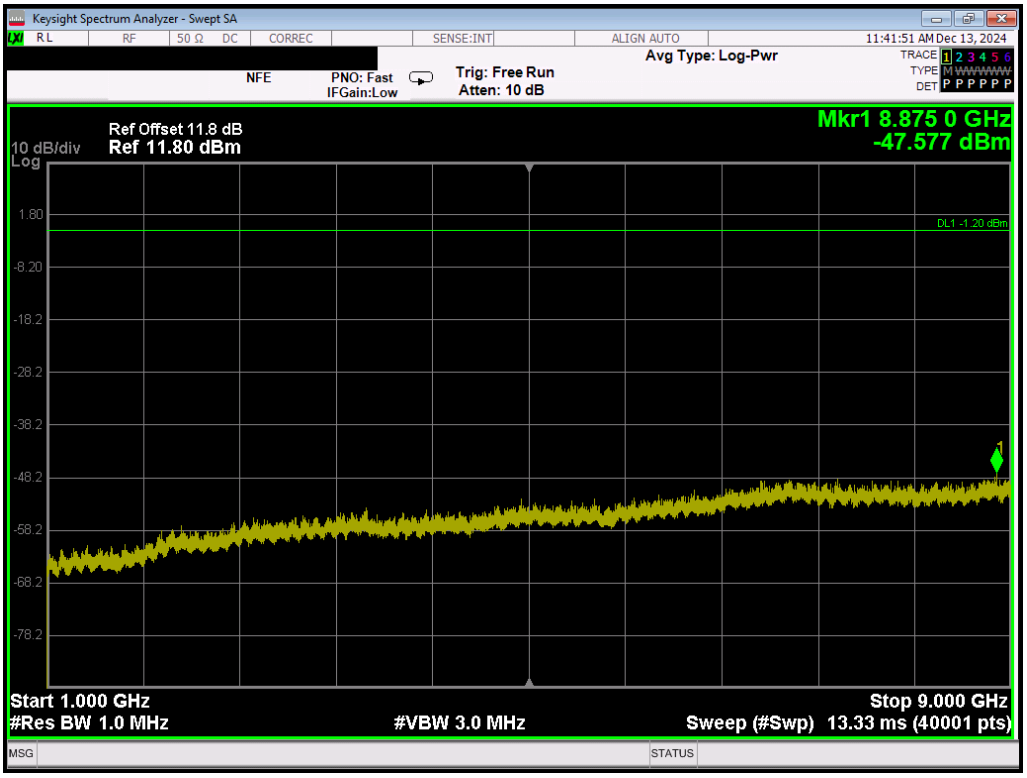
Marker 1 in the 30 – 1000 MHz graphs is the test frequency.
Marker 2 in the 30 – 1000 MHz graphs is the highest spurious signal level.

Radiated Spurious Emission Plots

Base to Mobile_30 - 1000 MHz_ Test Freq = 766.5 MHz

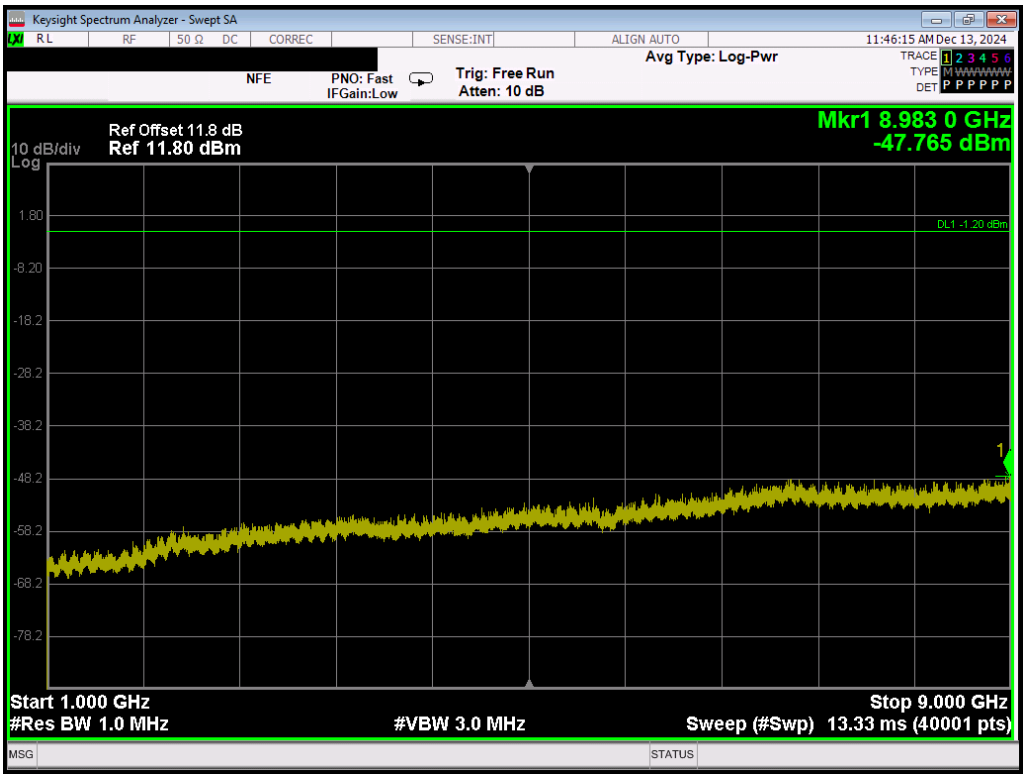


Base to Mobile_1 - 9 GHz_ Test Freq = 766.5 MHz

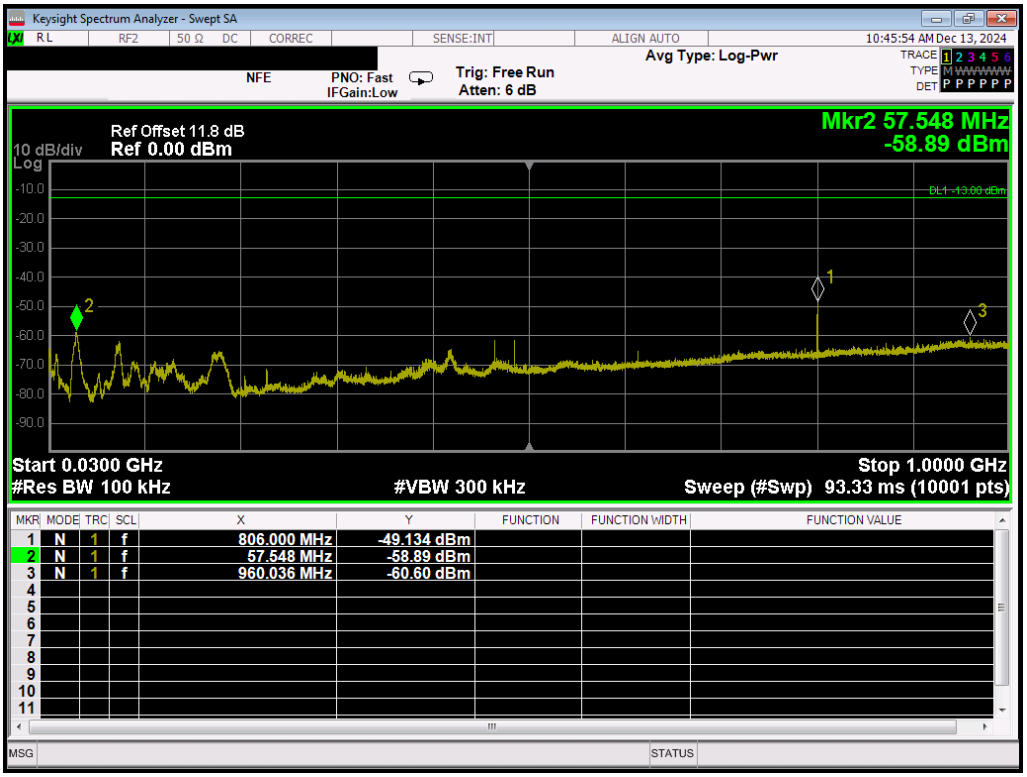


Mobile to Base_30 - 1000 MHz_ Test Freq = 860 MHz

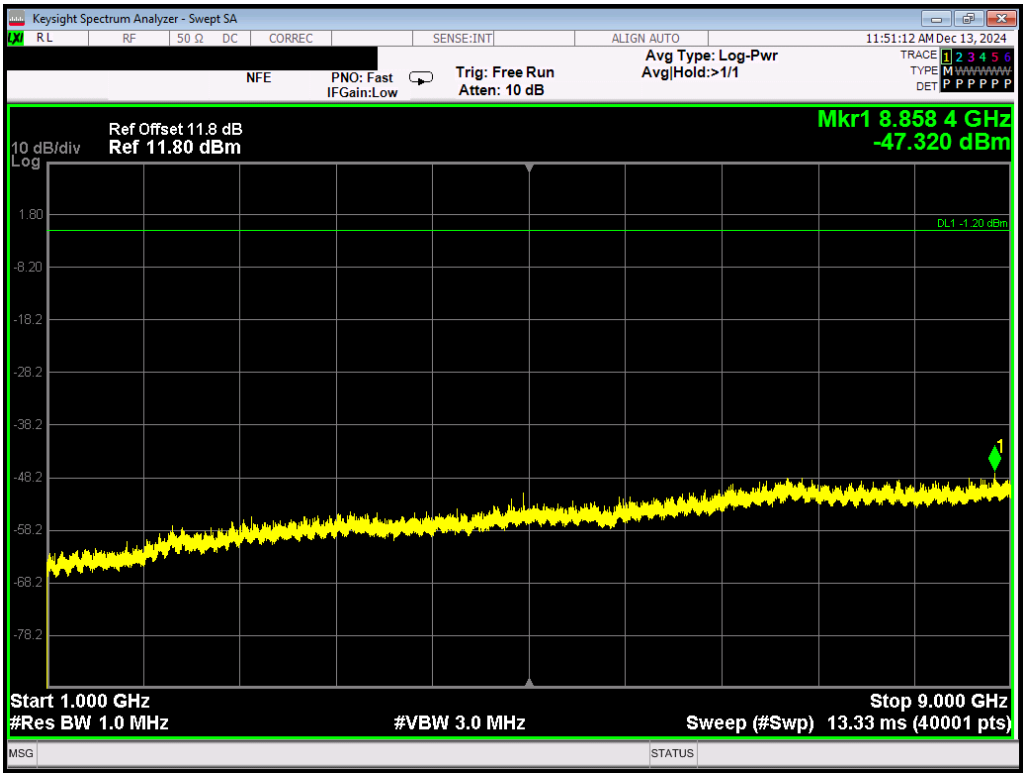
Mobile to Base_1 – 9 GHz_ Test Freq = 860 MHz



Mobile to Base_30 - 1000 MHz_ Test Freq = 806 MHz



Mobile to Base_1 - 9 GHz_ Test Freq = 806 MHz



Intermodulation

Engineer: Greg Corbin
Test Date: 11/23/2024

Test Procedure

The Equipment Under Test (EUT) was connected to a spectrum analyzer as shown in the test set-up diagram.

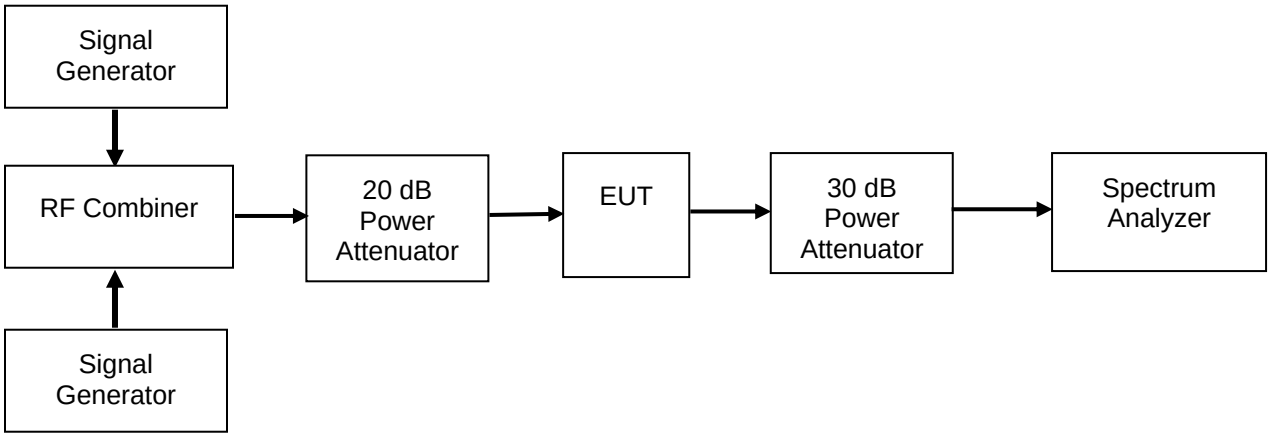
All cable and attenuator losses were input into the spectrum analyzer as a reference level offset to ensure accurate readings were obtained.

The RBW is set to 300 Hz, the channel spacing was set to 12.5 kHz.

The input power level of each signal was set so the output was within 0.2 dB of the AGC threshold.

The test was repeated with the input power increased 3 dB above the previous setting.

Test Set-up



Booster Intermodulation at 0.2 dB below AGC Threshold

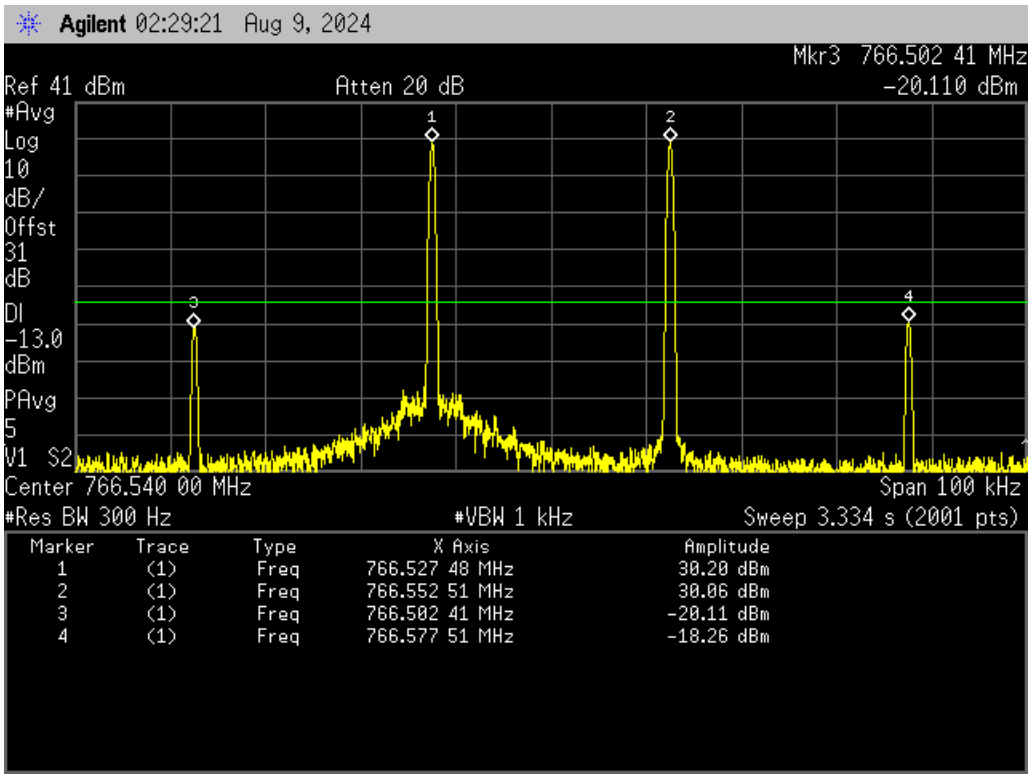
Frequency Band	Test Frequency		Intermodulation Frequency	Intermodulation Amplitude	Limit	Margin
MHz	MHz	MHz	MHz	dBm	dBm	
758 – 775	766.5275	766.5525	766.5775	-18.3	-13	-5.3
851 - 869	858.7875	858.8125	858.8376	-27.1	-13	-14.1
788 - 824	800.6875	800.7125	800.7375	-18.0	-13	-5

Booster Intermodulation at 3 dB above AGC Threshold

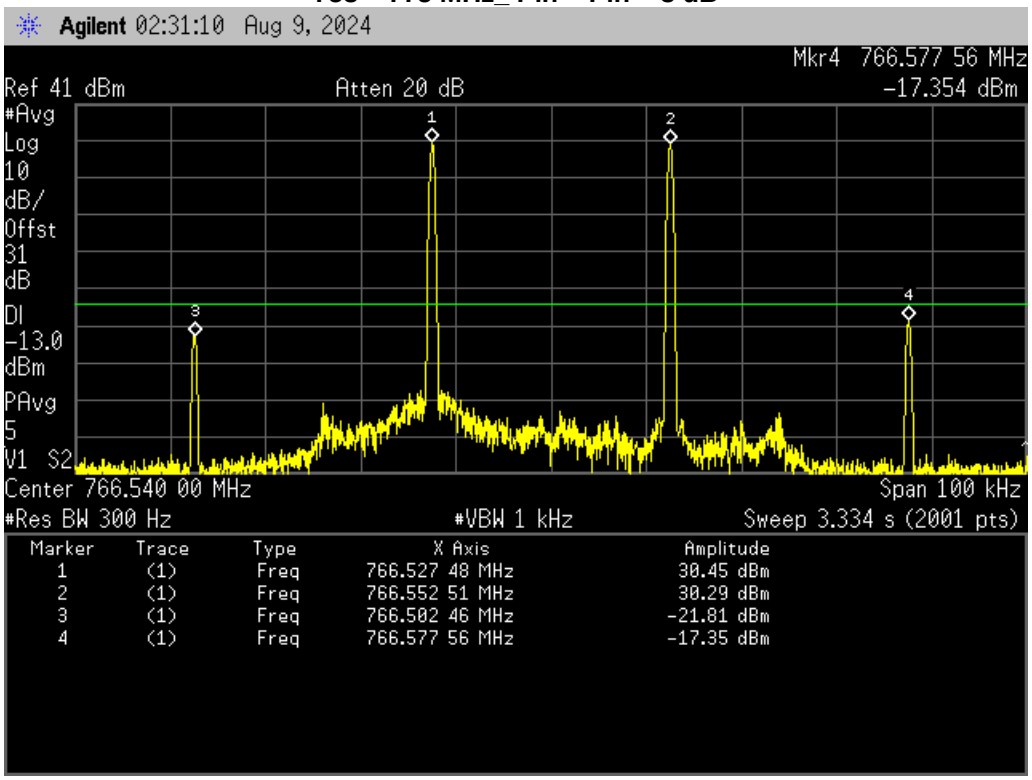
Frequency Band	Test Frequency		Intermodulation Frequency	Intermodulation Amplitude	Limit	Margin
MHz	MHz	MHz	MHz	dBm	dBm	
758 – 775	766.5275	766.5525	766.5775	-17.3	-13	-4.3
851 - 869	858.7875	858.8125	858.7624	-25.3	-13	-12.3
788 - 824	800.6875	800.7125	800.7375	-13.8	-13	-0.8

Intermodulation Plots

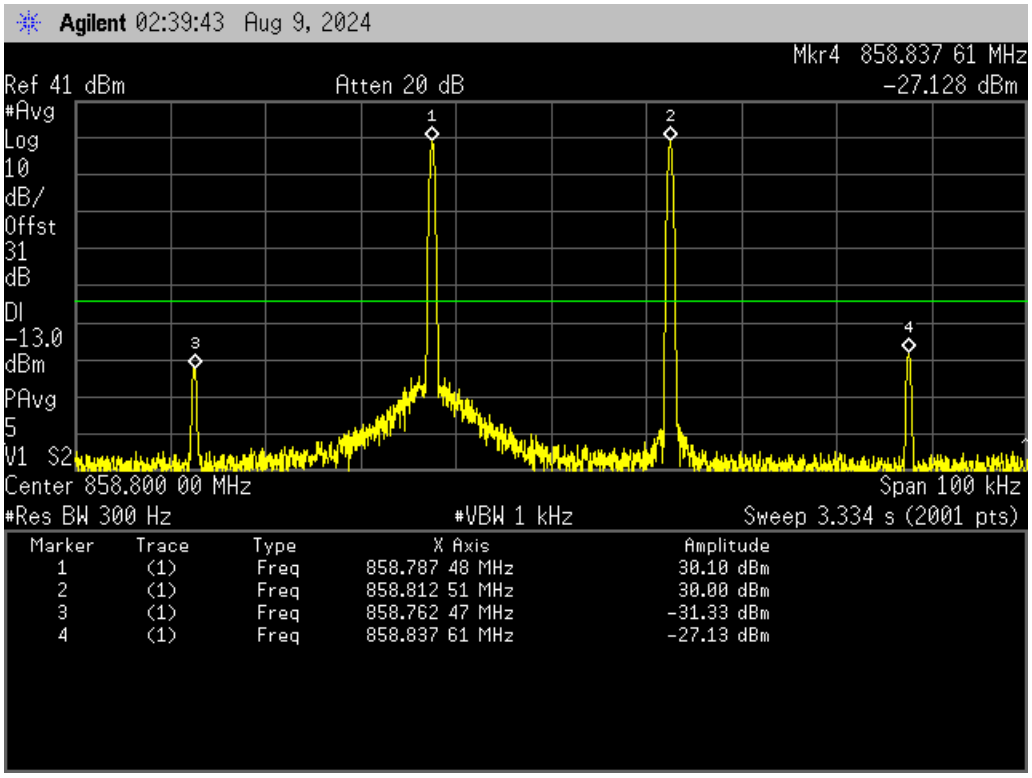
758 – 775 MHz_ Pin = -51.9 dBm



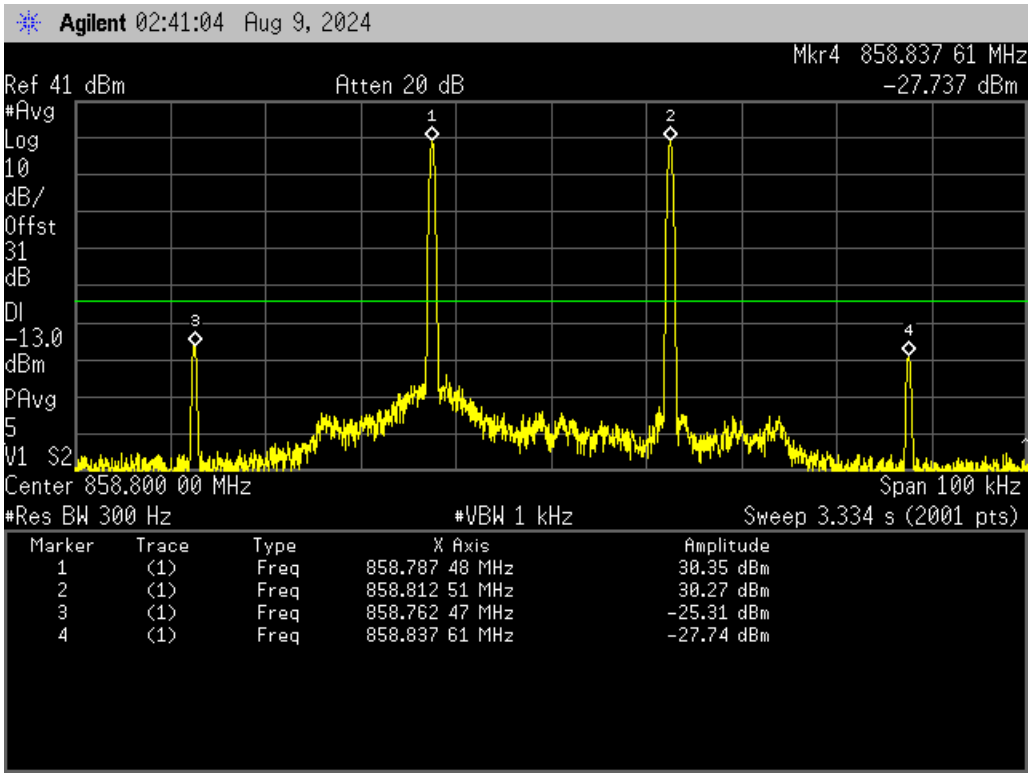
758 – 775 MHz_ Pin = Pin + 3 dB



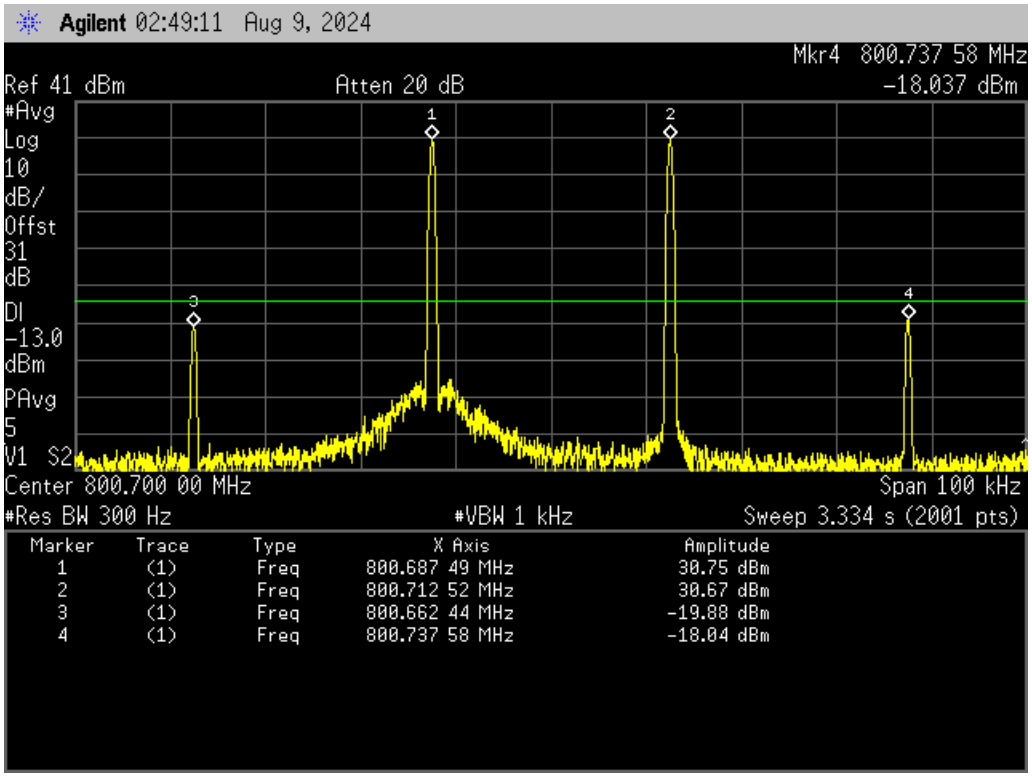
851 - 869 MHz_ Pin = --53.5 dBm



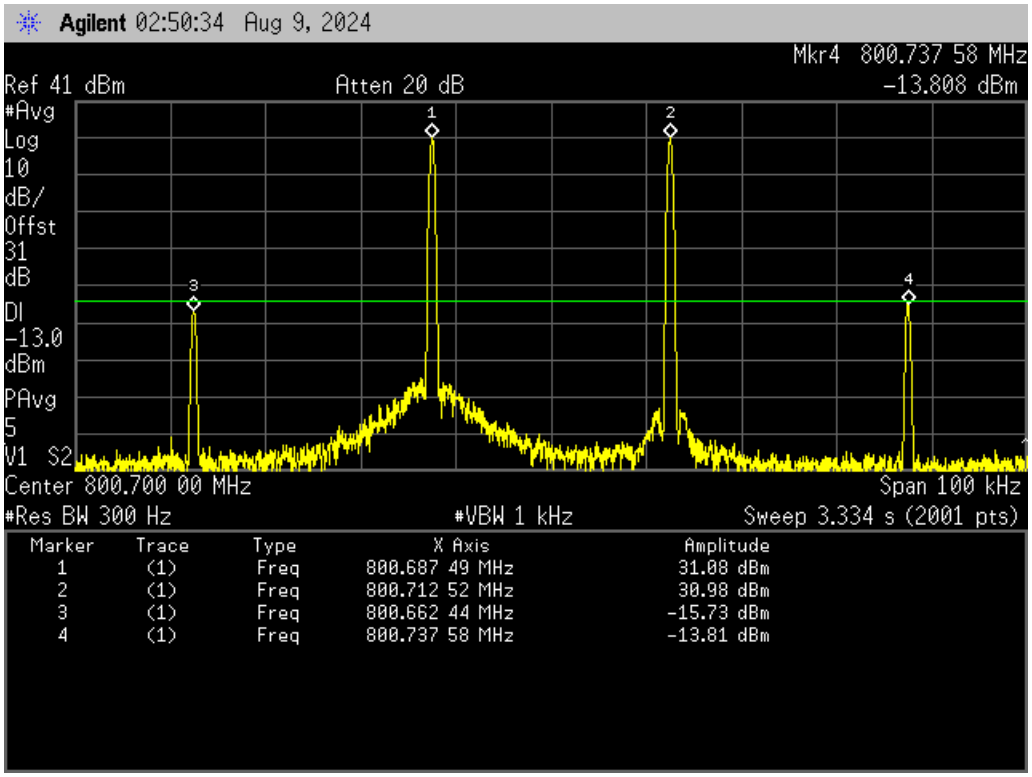
851 - 869 MHz_ Pin = Pin + 3 dB



788 - 824 MHz_ Pin = --52.9 dBm



788 - 824 MHz_ Pin = Pin + 3 dB



Measurement Uncertainty

Measurement Uncertainty (U_{lab}) for Compliance Testing is listed in the table below.

Measurement	U_{lab}
Radio Frequency	± 3.3 x 10^{-8}
RF Power, conducted	± 1.5 dB
RF Power Density, conducted	± 1.0 dB
Conducted Emissions	± 1.8 dB
Radiated Emissions	± 4.5 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_{ETSI} 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

Test Equipment Utilized

Description	Manufacturer	Model #	CT Asset #	Last Cal Date	Cal Due Date
Horn Antenna	ARA	DRG-118/A	i00271	8/9/24	8/9/26
Bi-Log Antenna	Schaffner	CBL 6111D	i00349	2/7/23	2/7/25
Signal Generator	Rohde & Schwarz	SMU200A	i00405	1/24/2024	1/24/25
3 Meter Semi-Anechoic Chamber	Panashield	3 Meter Semi-Anechoic Chamber	i00428	7/13/23	7/13/26
Attenuator, 30 dB, 50W	Mini-Circuits	BW- N30W50+	I00459	Verified on: 11/23/24	
PSA Spectrum Analyzer	Agilent	E4445A	i00471	1/5/24	1/5/25
Attenuator, 30 dB, 50W	Mini-Circuits	BW- N30W50+	I00479	Verified on: 11/23/24	
Voltmeter	Fluke	179	i00488	6/19/24	6/19/25
MXE EMI receiver	Keysight	N9038A	i00552	3/1/24	3/1/25
Attenuator, 20 dB, 50W	Bird	50-A-MFN-20	i00643	Verified on: 11/23/24	
Temp./humidity/pressure monitor	Omega Engineering	iBTHX-W-5	i00686	1/25/24	1/25/25
Preamplifier	Eravant	SBB-0115034019-2F2F-E3	i00722	Verified on: 12/10/24	
Preamplifier	Com-Power	PAM-103	i00734	Verified on: 9/25/24	

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

END OF TEST REPORT