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PART 90 MEASUREMENT REPORT

Applicant Name:
Brinc Drones, Inc
1055 N. 38th St.
Seattle, WA 9810
United States

Date of Testing:
1/20/2024 - 6/19/2024
Test Report Issue Date:
10/7/2024
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2406100047-01.2BHDH

FCC ID:	**2BHDHBR00004**
APPLICANT:	**Brinc Drones, Inc**

Application Type:	Certification
Model:	LEMUR2
EUT Type:	Controller
FCC Classification:	Licensed Non-Broadcast Station Transmitter (TNB)
FCC Rule Part:	§90
Test Procedure(s):	ANSI C63.26-2015

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

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TABLE OF CONTENTS

1.0 INTRODUCTION 4
- 1.1 Scope 4
- 1.2 Element Test Location 4
- 1.3 Test Facility / Accreditations 4

2.0 PRODUCT INFORMATION 5
- 2.1 Equipment Description 5
- 2.2 Device Capabilities 5
- 2.3 Test Configuration 5
- 2.4 Software and Firmware 5
- 2.5 EMI Suppression Device(s)/Modifications 5
- 2.6 Antenna Description 5

3.0 DESCRIPTION OF TESTS 6
- 3.1 Evaluation Procedure 6
- 3.2 Radiated Power and Radiated Spurious Emissions 6

4.0 MEASUREMENT UNCERTAINTY 7

5.0 TEST EQUIPMENT CALIBRATION DATA 8

6.0 SAMPLE CALCULATIONS 9

7.0 TEST RESULTS 10
- 7.1 Summary 10
- 7.2 Conducted Output Power Data 11
- 7.3 Occupied Bandwidth 16
- 7.4 Spurious and Harmonic Emissions at Antenna Terminal 18
- 7.5 Band Edge Emissions at Antenna Terminal 29
- 7.6 Radiated Spurious Emissions Measurements 34
- 7.7 Frequency Stability / Temperature Variation 40

8.0 CONCLUSION 42

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MIMO						
Mode	**Bandwidth**	**Modulation**	**Tx Frequency Range [MHz]**	**Measurement**	**Max. Power [W]**	**Max. Power [dBm]**
2.4GHz - Transmitter	7 MHz	16QAM-BPSK	2455-2479	Conducted	0.296	24.71

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 Element Test Location

These measurement tests were conducted at the Element laboratory located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.

- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).

- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.

- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Brinc LEMUR 2 Controller FCC ID: 2BHDHBR00004**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitter that operates under the provisions of Part 90.

Test Device Serial No.: L2C-2404-00019

2.2 Device Capabilities

This device contains the following capabilities:

2.4GHz – Transceiver (7MHz BW only, 16QAM-BPSK modulation)

Ch.	Frequency (MHz)
Low	2455
:	:
Mid	2467
:	:
High	2479

Table 2-1. Frequency/Channel Operations

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version 1.6.0 installed on the EUT.

2.5 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

2.6 Antenna Description

The manufacturer is using an antenna from Taoglas (Model: GW.20.A151) with the following properties:

Antenna Type: Dipole antenna with RP-SMA(M) connector
Impedance: 50Ω
Peak Gain: 2dBi

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the "American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services" (ANSI C63.26-2015) were used in the measurement of the EUT**.**

Deviation from Measurement Procedure……..None

3.2 Radiated Power and Radiated Spurious Emissions

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

For radiated power measurements, substitution method is used per the guidance of ANSI C63.26-2015. For emissions below 1GHz, a half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

$$P_{d\,[dBm]} = P_{g\,[dBm]} - \text{cable loss}_{[dB]} + \text{antenna gain}_{[dBd/dBi]};$$

where P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\,[dBm]} - \text{cable loss}_{[dB]}$.

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. Field Strength (EIRP) is calculated using the following formulas:

$$E_{[dB\mu V/m]} = \text{Measured amplitude level}_{[dBm]} + 107 + \text{Cable Loss}_{[dB]} + \text{Antenna Factor}_{[dB/m]}$$

And

$$EIRP_{[dBm]} = E_{[dB\mu V/m]} + 20\log D - 104.8;$$ where D is the measurement distance in meters.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	ETS-001	EMC Cable and Switch System	11/15/2023	Annual	11/14/2024	ETS-001
-	ETS-001	EMC Cable and Switch System	11/15/2023	Annual	11/14/2024	ETS-001
-	LTx2	Licensed Transmitter Cable Set	11/15/2023	Annual	11/15/2024	LTx2
-	LTx3	LIcensed Transmitter Cable Set	11/15/2023	Annual	11/15/2024	LTx3
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	6/7/2024	Biennial	6/7/2026	00125518
Keysight Technologies	N9020A	MXA Signal Analyzer	4/11/2024	Annual	4/11/2025	MY54500644
Keysight Technologies	N9030A	50GHz PXA Signal Analyzer	4/23/2024	Annual	4/23/2025	US51350301
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/11/2023	Annual	9/11/2024	100348
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	8/30/2022	Biennial	8/30/2024	A051107

Table 5-1. Test Equipment

Notes:

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

BW = 8.62 MHz
G = Phase Modulation
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

BW = 8.45 MHz
W = Amplitude/Angle Modulated
7 = Quantized/Digital Info
D = Data transmission, telemetry, telecommand

Spurious Radiated Emission

Example: Middle Channel 2nd Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analzyer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of –30.9 dBm yielding –24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80) = 50.3 dBc.

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7.0 TEST RESULTS

7.1 Summary

Company Name: Brinc Drones, Inc

FCC ID: 2BHDHBR00004

FCC Classification: Licensed Non-Broadcast Station Transmitter (TNB)

Mode(s): 2.4GHz – Transceiver

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power	2.1046(a), 90.205(o)	< 5 Watts	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h), 90.209	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions	2.1051, 90.210(b)	> 25 dB for any frequency removed from the assigned frequency by more than 50 percent, but not more than 100 percent of the authorized bandwidth >35 dB for any frequency removed from the assigned frequency by more than 100 percent, but not more than 250 percent of the authorized bandwidth 43 + 10 log (P) dB for any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth	PASS	Sections 7.4, 7.5
	Frequency Stability	2.1055, 90.213	Frequency stability to be specified in the station authorization	PASS	Section 7.7
RADIATED	Radiated Spurious Emissions	2.1053, 90.210(b)	> 43 + 10 log10(P[Watts]) for all spurious emissions	PASS	Section 7.6

Table 7-1. Summary of Test Results

Notes:

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst-case emissions.
2) The analyzer plots shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v2.3.0.

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7.2 Conducted Output Power Data

Test Overview

All emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2
ANSI C63.26-2015 – Section 6.4.3.2.3

Test Settings

1. Span = 2 x OBW to 3 x OBW
2. RBW = 1% to 5% of OBW
3. VBW $\geq$ 3 x RBW
4. Detector = RMS
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-1. Test Instrument & Measurement Setup

Test Notes

1. The device was tested under 16QAM-BPSK modulation scheme and 7MHz channel bandwidth configurations.
2. Per the guidance of Section 6.4.3.2.3 of ANSI C63.26-2015, the output of each antenna is summed to determine the maximum MIMO power. This is accomplished by adding the output power of each antenna in linear terms (i.e. mW) and then determining the dBm value (e.g. $10\log(P_{(mW)})$ of the summed powers.

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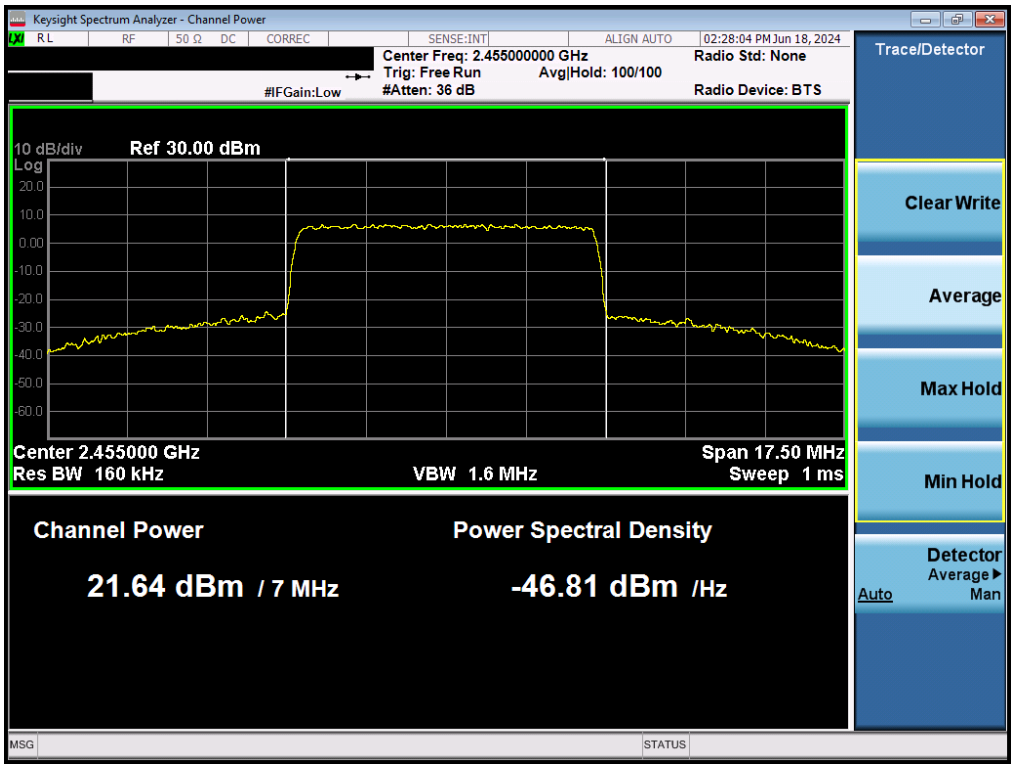
Frequency [MHz]	BW [MHz]	Ant1 Cond. Power [dBm]	Ant2 Cond. Power [dBm]	MIMO Cond. Power [dBm]
2455	7.0	21.64	21.75	24.71
2467	7.0	21.46	21.68	24.58
2479	7.0	21.25	21.22	24.25

Table 7-2. Transceiver Conducted Power



Plot 7-1. Conducted Power Plot (2.4GHz – Low Channel - Full RB – MIMO Ant1)

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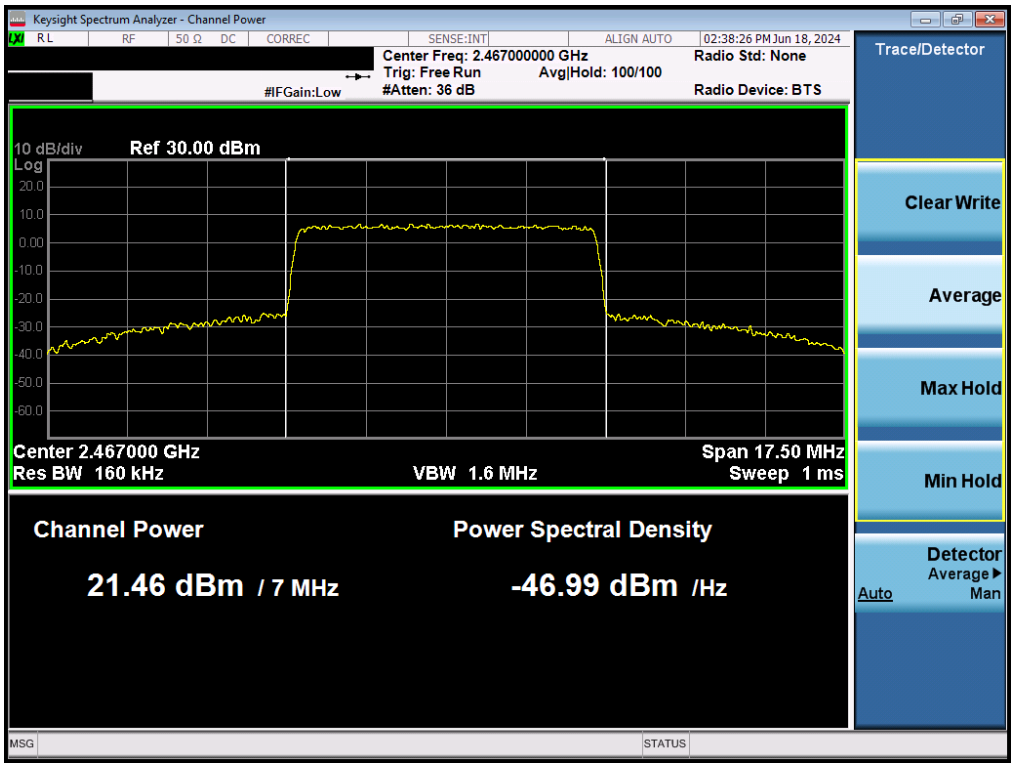
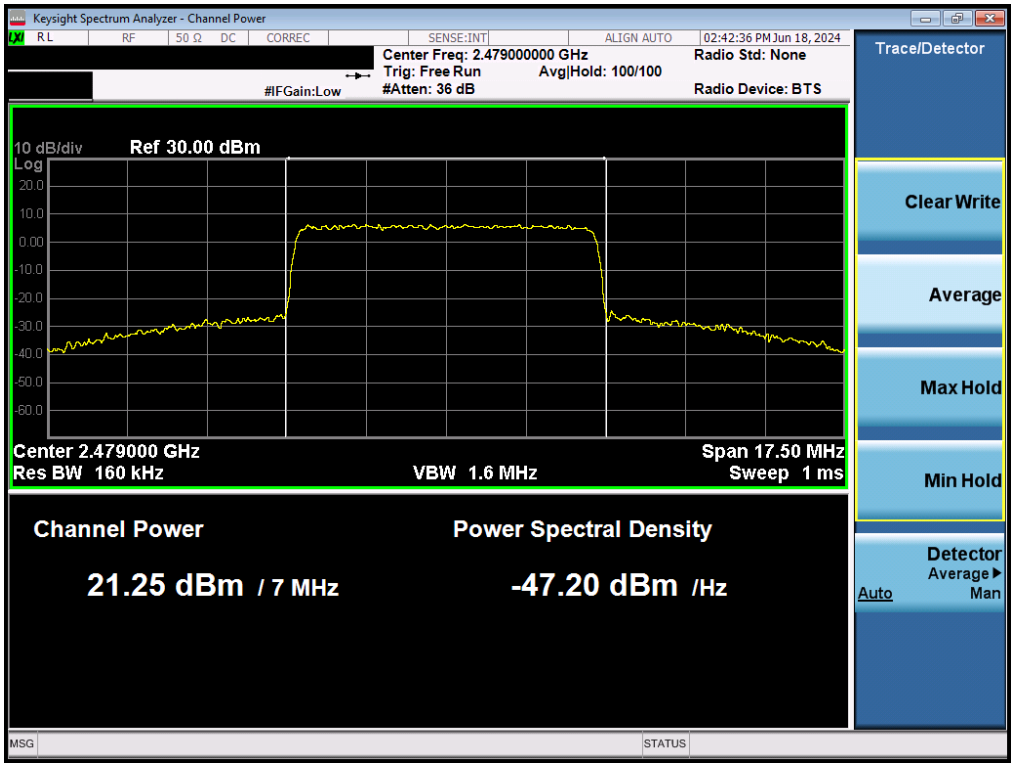


Plot 7-2. Conducted Power Plot (2.4GHz – Mid Channel - Full RB – MIMO Ant1)



Plot 7-3. Conducted Power Plot (2.4GHz – High Channel - Full RB – MIMO Ant1)

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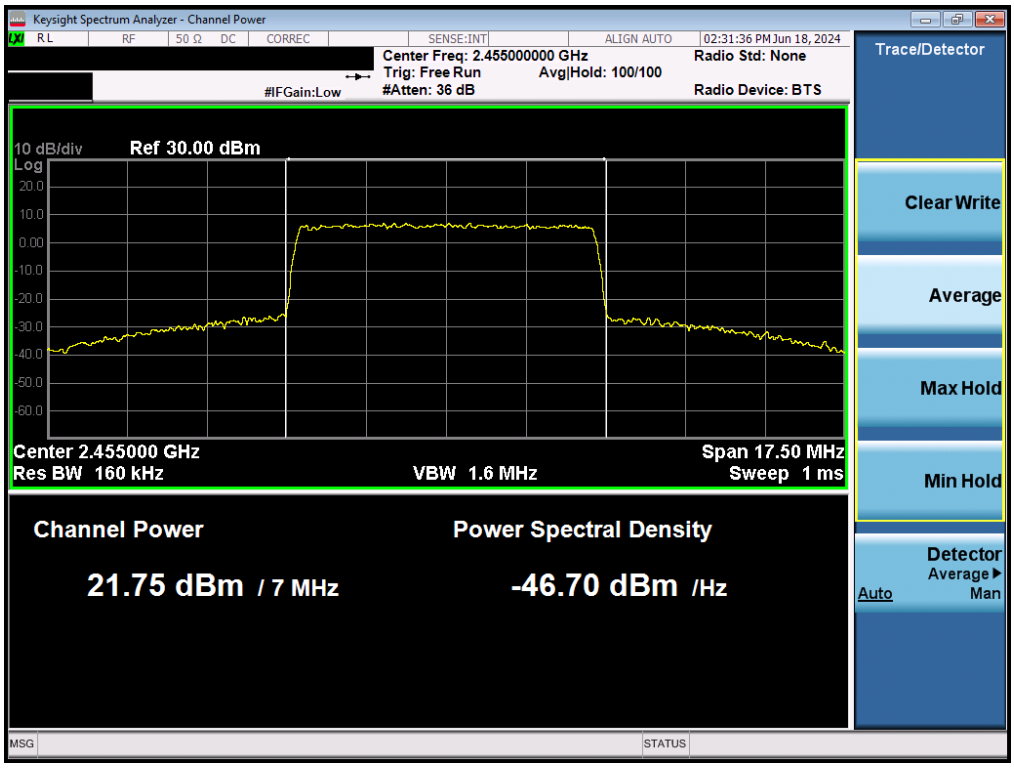
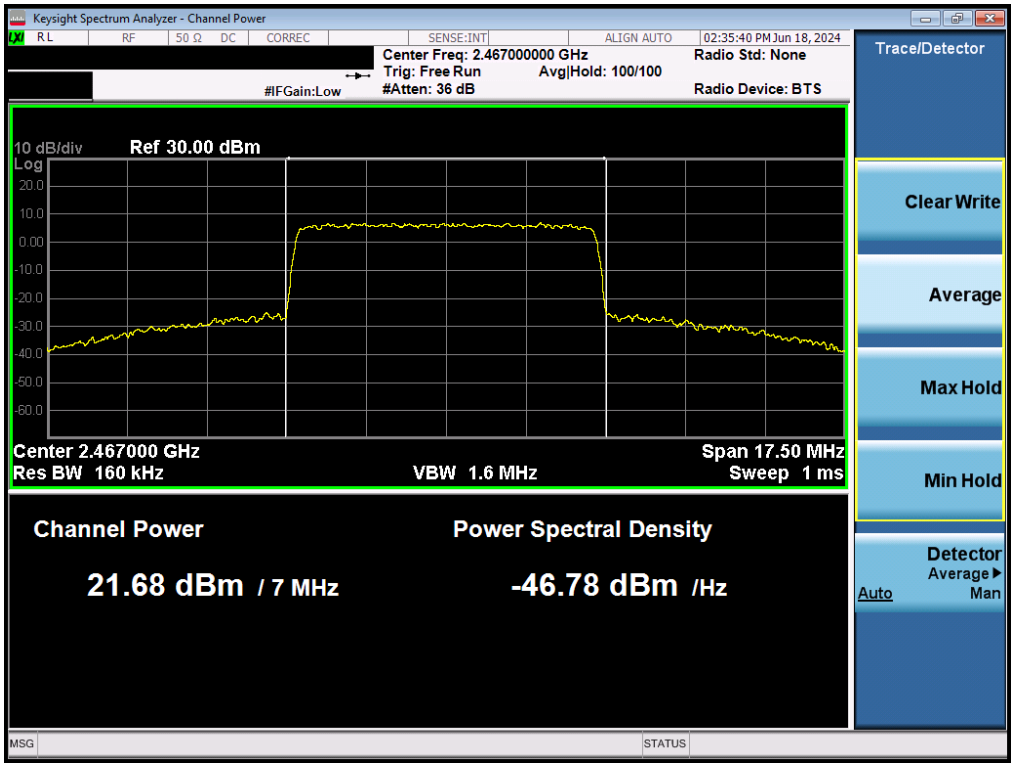


Plot 7-4. Conducted Power Plot (2.4GHz – Low Channel - Full RB – MIMO Ant2)



Plot 7-5. Conducted Power Plot (2.4GHz – Mid Channel - Full RB – MIMO Ant2)

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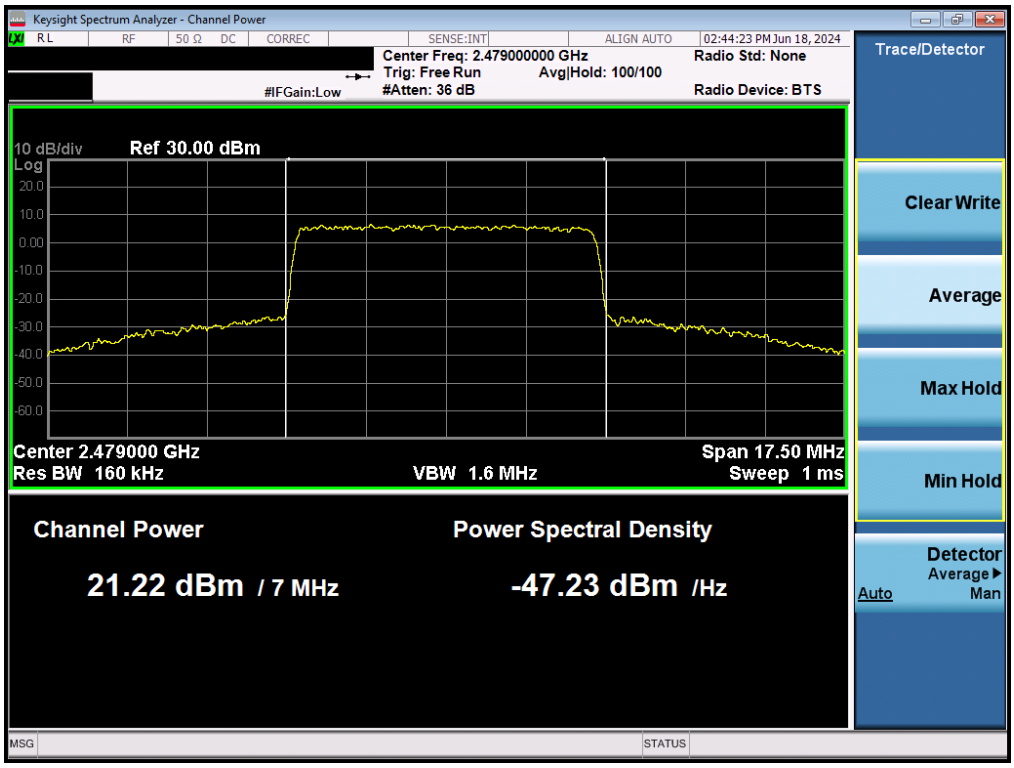

Plot 7-6. Conducted Power Plot (2.4GHz – High Channel - Full RB – MIMO Ant2)

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7.3 Occupied Bandwidth

Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst-case configuration results are reported in this section.

Test Procedure Used

ANSI C63.26-2015 – Section 5.4.4

Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW ≥ 3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

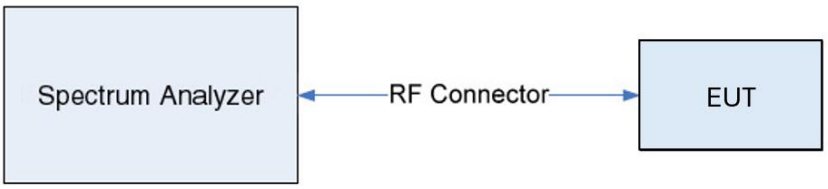

Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None

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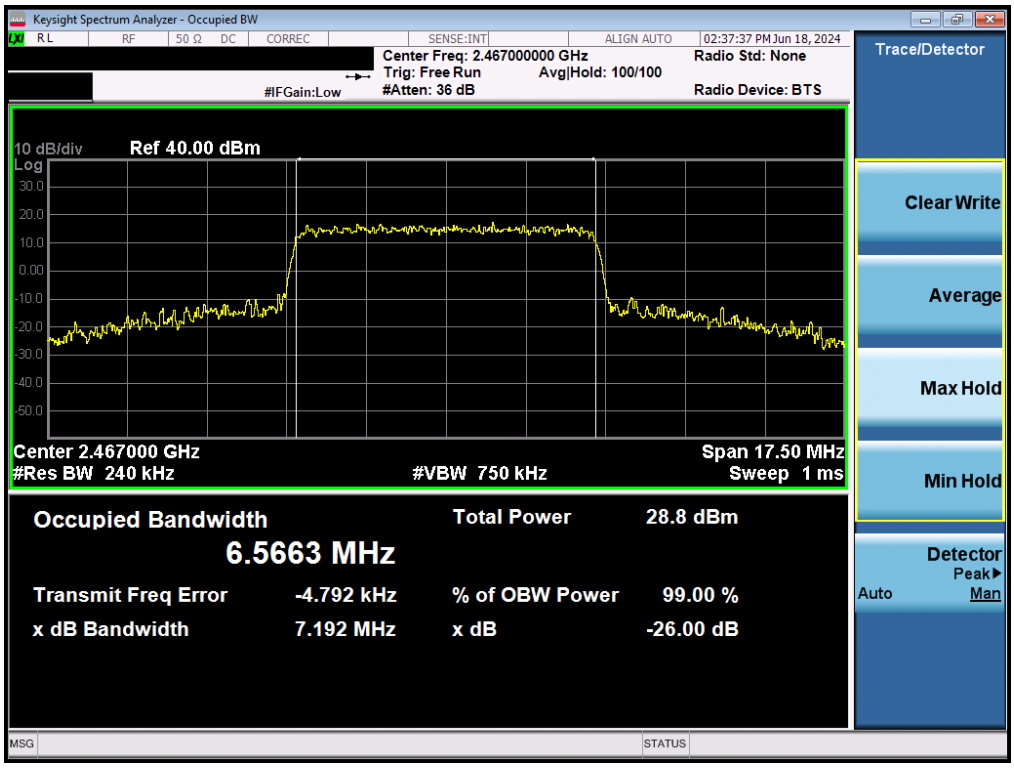

Plot 7-7. Occupied Bandwidth Plot (2.4GHz – Mid Channel - Full RB – MIMO Ant1)

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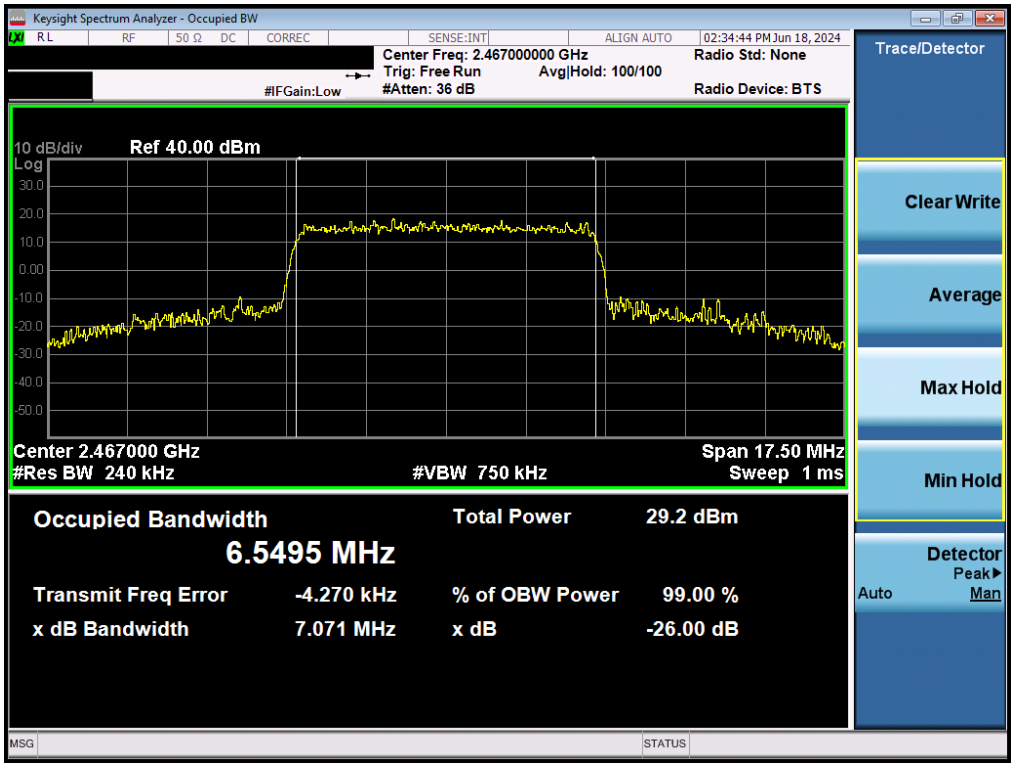

Plot 7-8. Occupied Bandwidth Plot (2.4GHz – Mid Channel - Full RB – MIMO Ant2)

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7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10th harmonic. All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

The minimum permissible attenuation level of any spurious emission is 43 + 10 $\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.4
ANSI C63.26-2015 – Section 6.4.4.1(c)

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz (separated into at least two plots per channel)
2. RBW ≥ 100kHz
3. VBW ≥ 3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

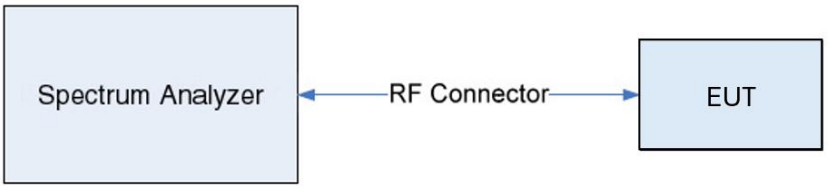

Figure 7-3. Test Instrument & Measurement Setup

Test Notes

1. Per Part 90, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.
2. Per the guidance in Section 6.4.4.1(c) of ANSI C63.26, the spurious emissions levels found greater than 250% of the authorized bandwidth from the center frequency shall apply a 3dB increase to each individual antenna output to assess compliance.
3. Based on the plots provided in this section, none of the spurious emissions found when adding 3dB are over the -13dBm limit specified in this rule part.

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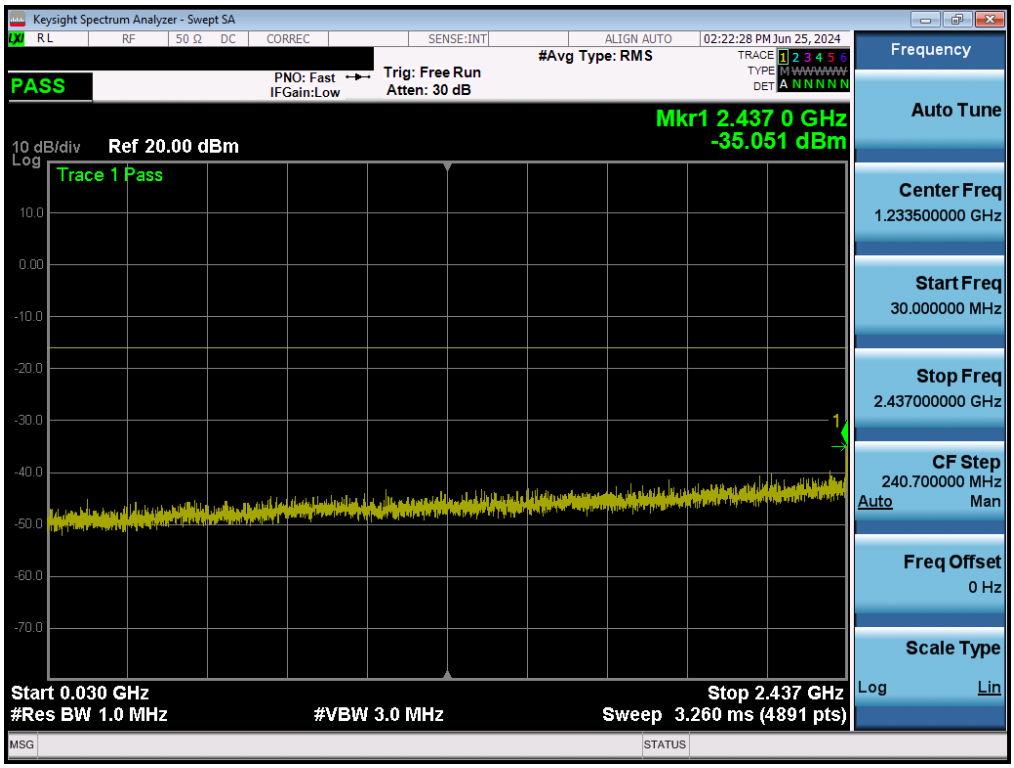
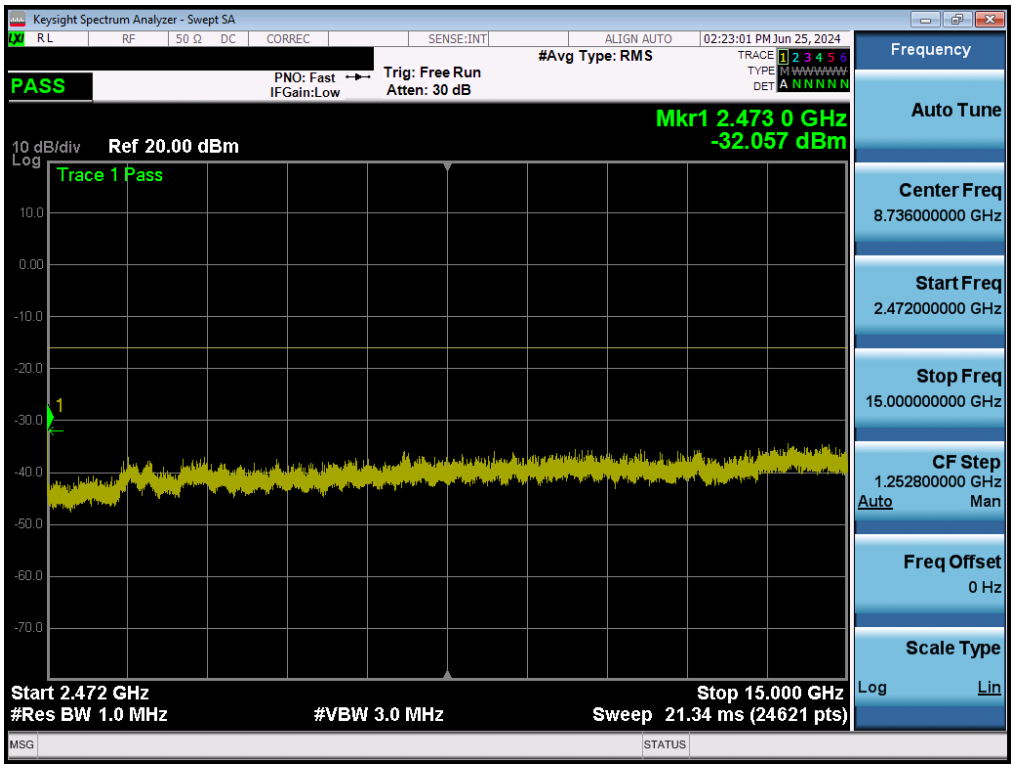
Antenna 1



Plot 7-9. Conducted Spurious Plot (2.4GHz – Low Channel – MIMO Ant1))



Plot 7-10. Conducted Spurious Plot (2.4GHz - Low Channel – MIMO Ant1))

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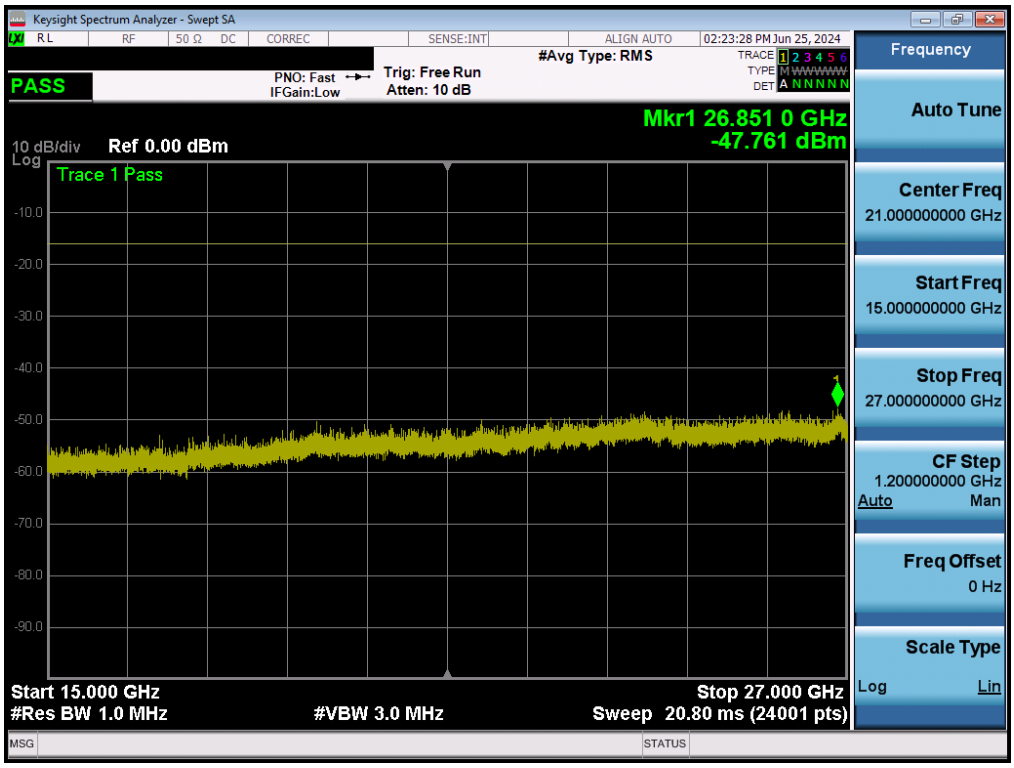
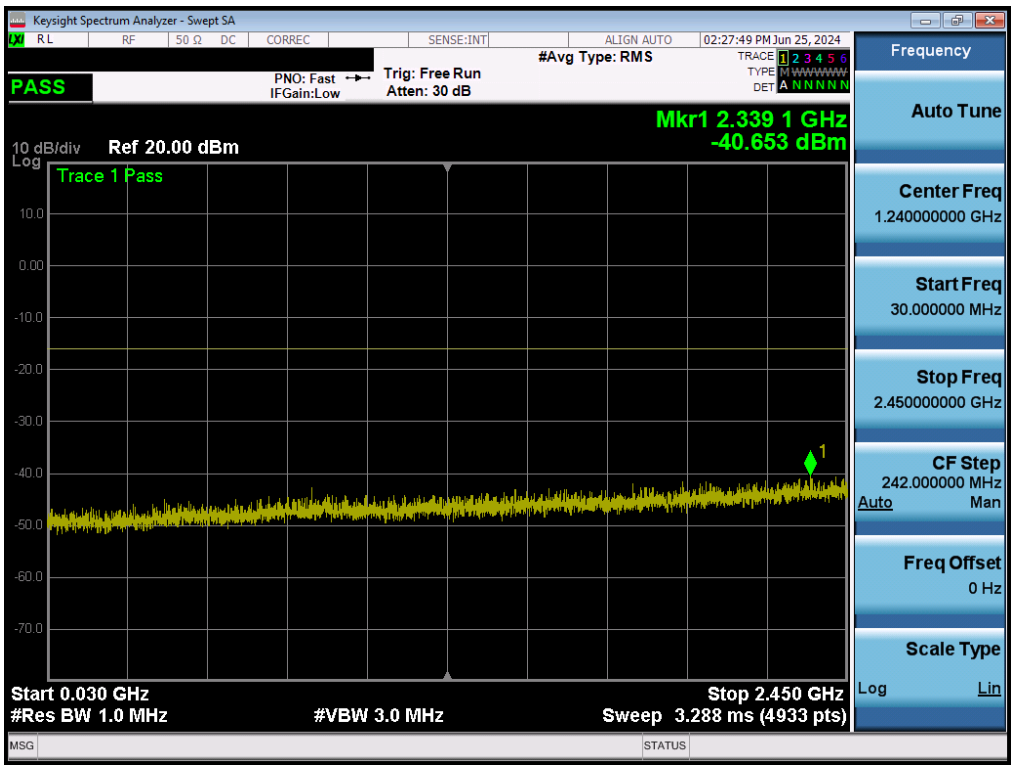


Plot 7-11. Conducted Spurious Plot (2.4GHz - Low Channel – MIMO Ant1))



Plot 7-12. Conducted Spurious Plot (2.4GHz - Mid Channel – MIMO Ant1))

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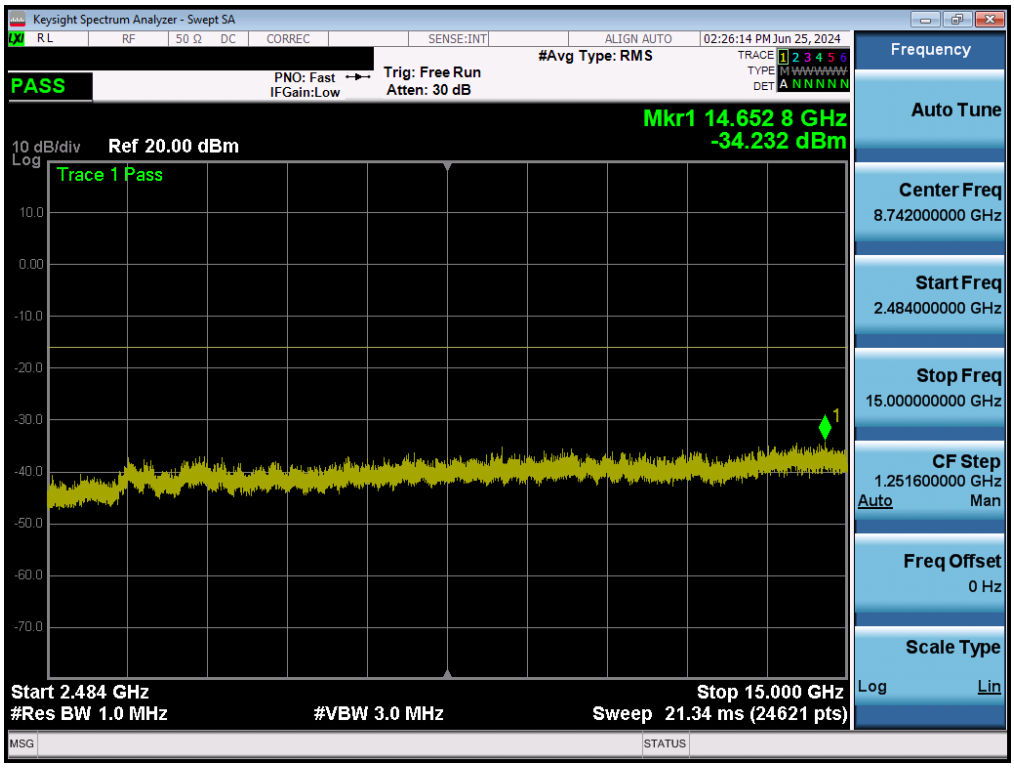
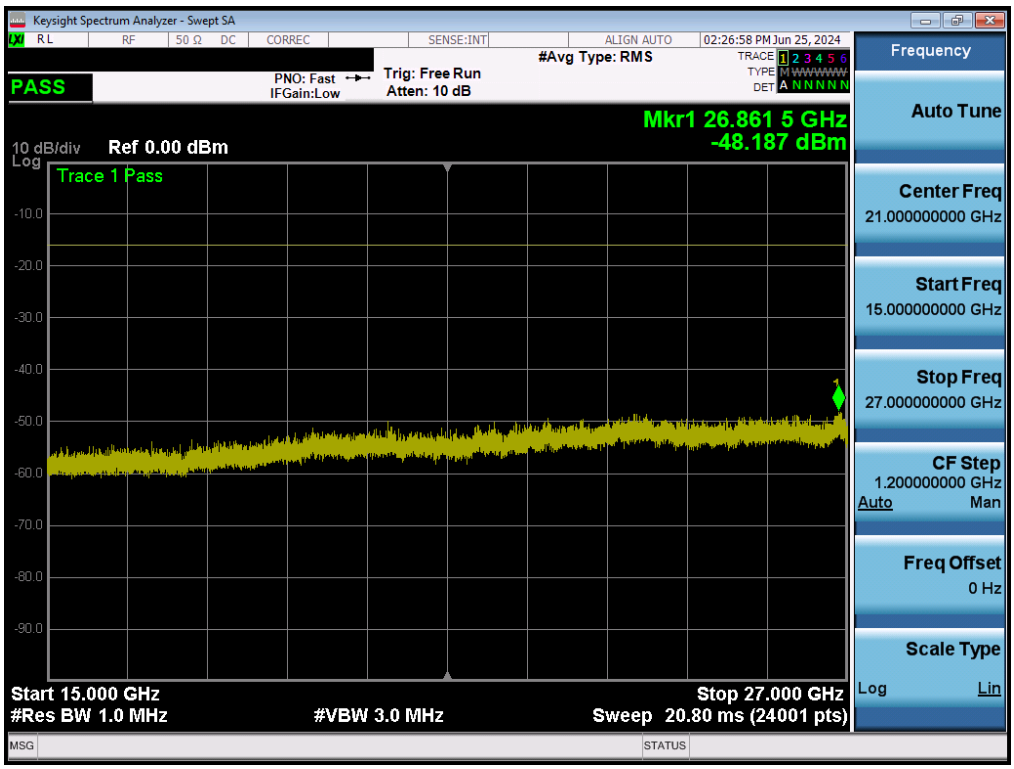


Plot 7-13. Conducted Spurious Plot (2.4GHz - Mid Channel – MIMO Ant1))



Plot 7-14. Conducted Spurious Plot (2.4GHz - Mid Channel – MIMO Ant1))

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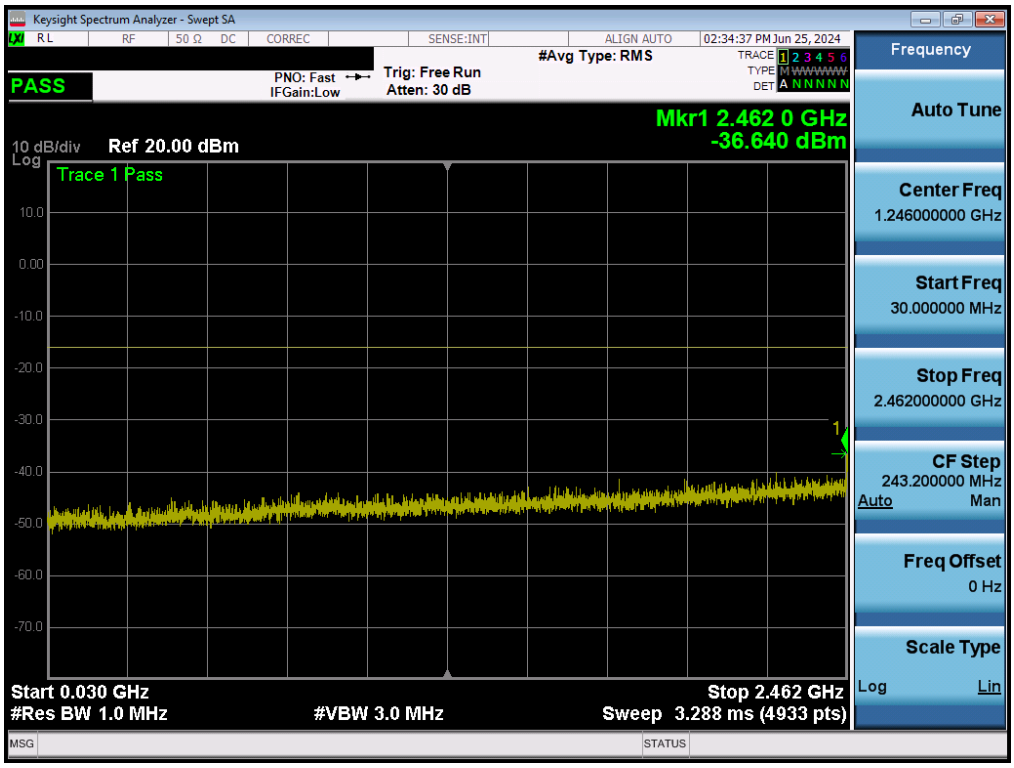
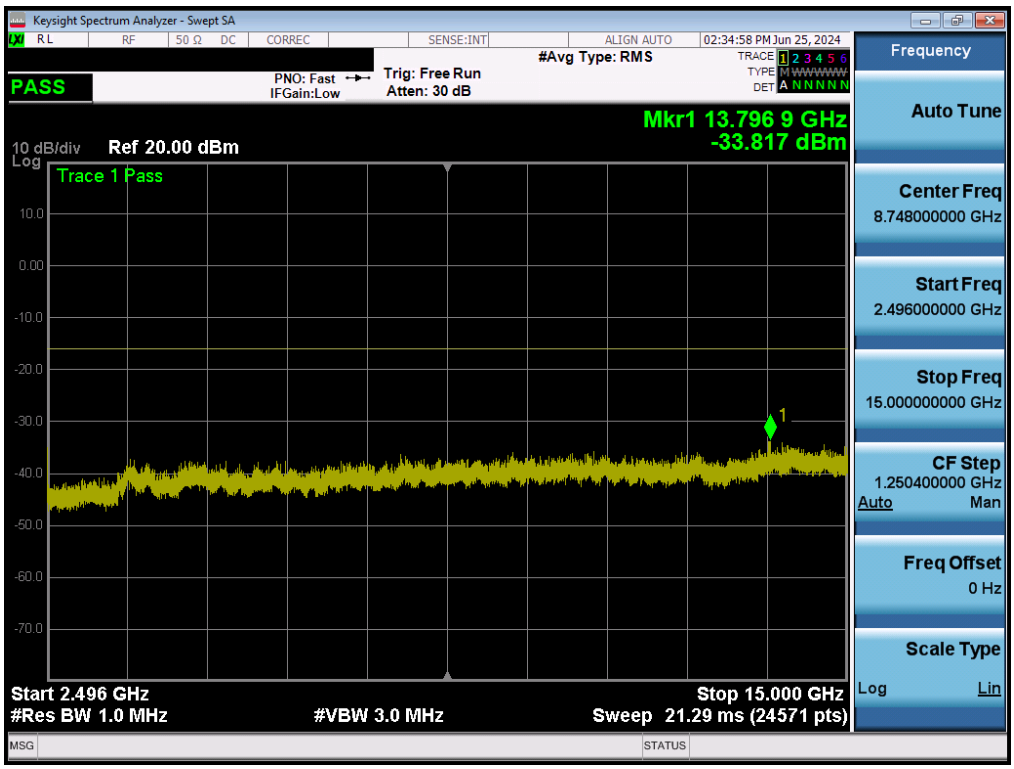


Plot 7-15. Conducted Spurious Plot (2.4GHz - High Channel – MIMO Ant1))



Plot 7-16. Conducted Spurious Plot (2.4GHz - High Channel – MIMO Ant1))

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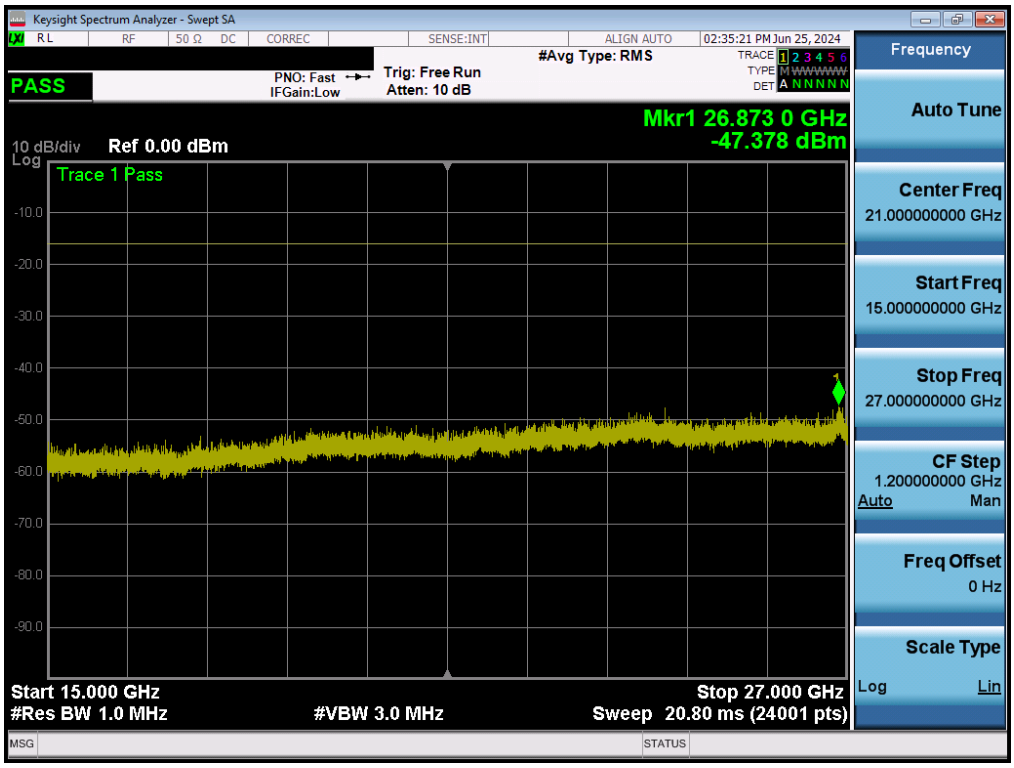

Plot 7-17. Conducted Spurious Plot (2.4GHz - High Channel – MIMO Ant1))

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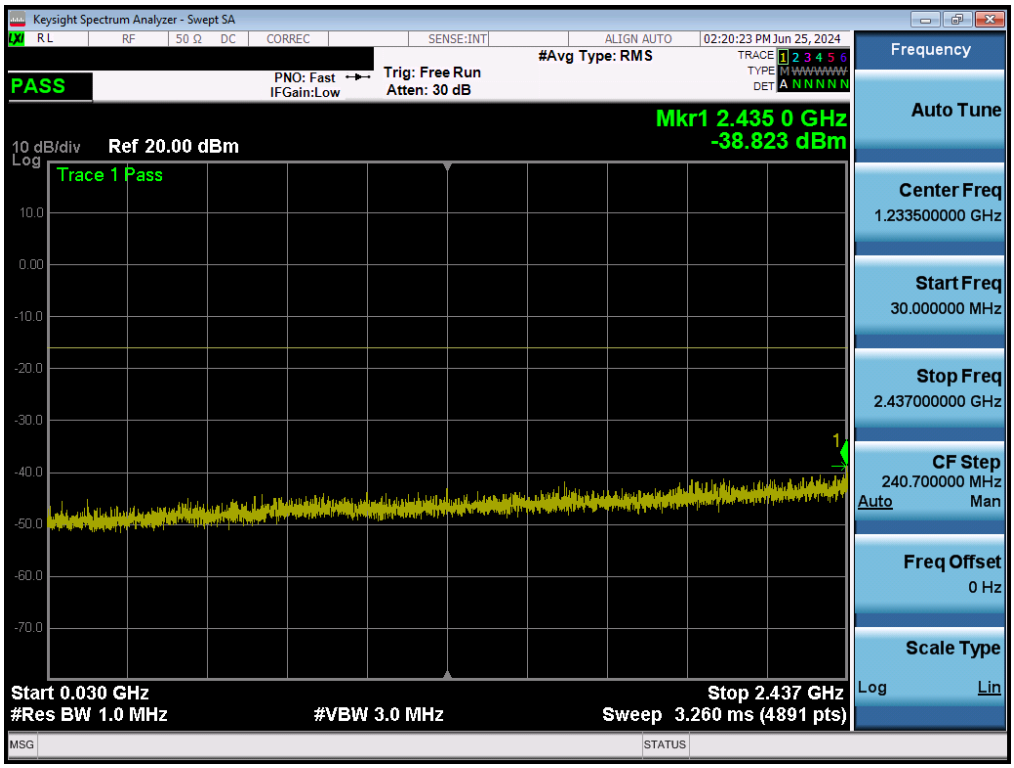
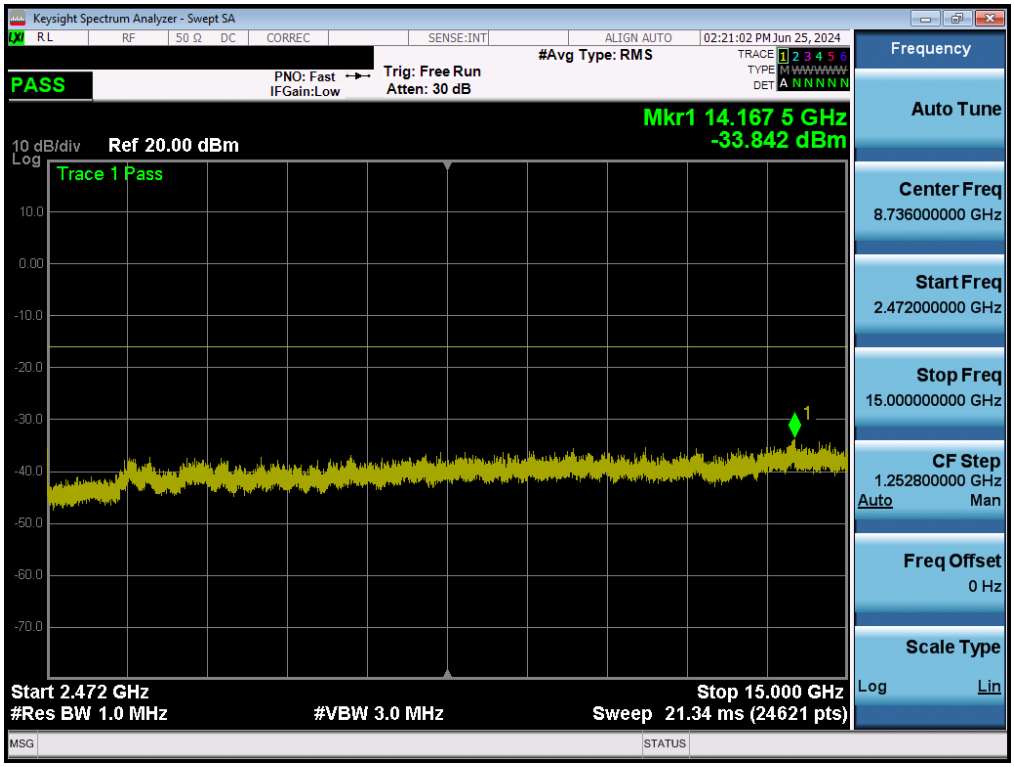
Antenna 2



Plot 7-18. Conducted Spurious Plot (2.4GHz - Low Channel – MIMO Ant2))



Plot 7-19. Conducted Spurious Plot (2.4GHz - Low Channel – MIMO Ant2))

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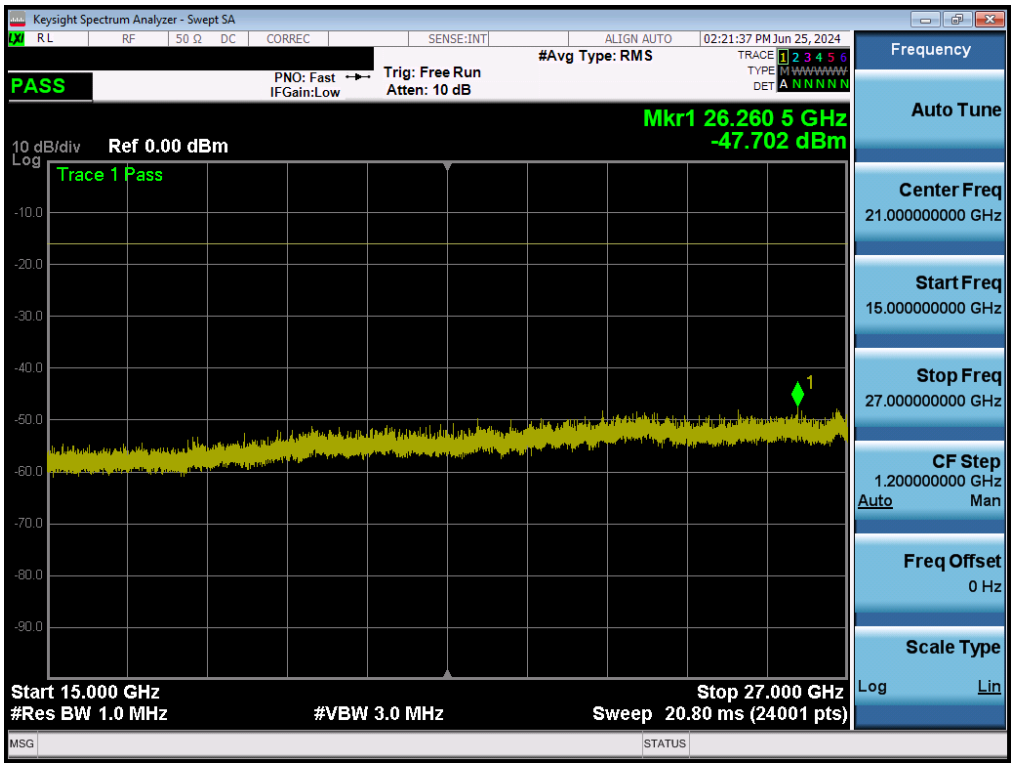
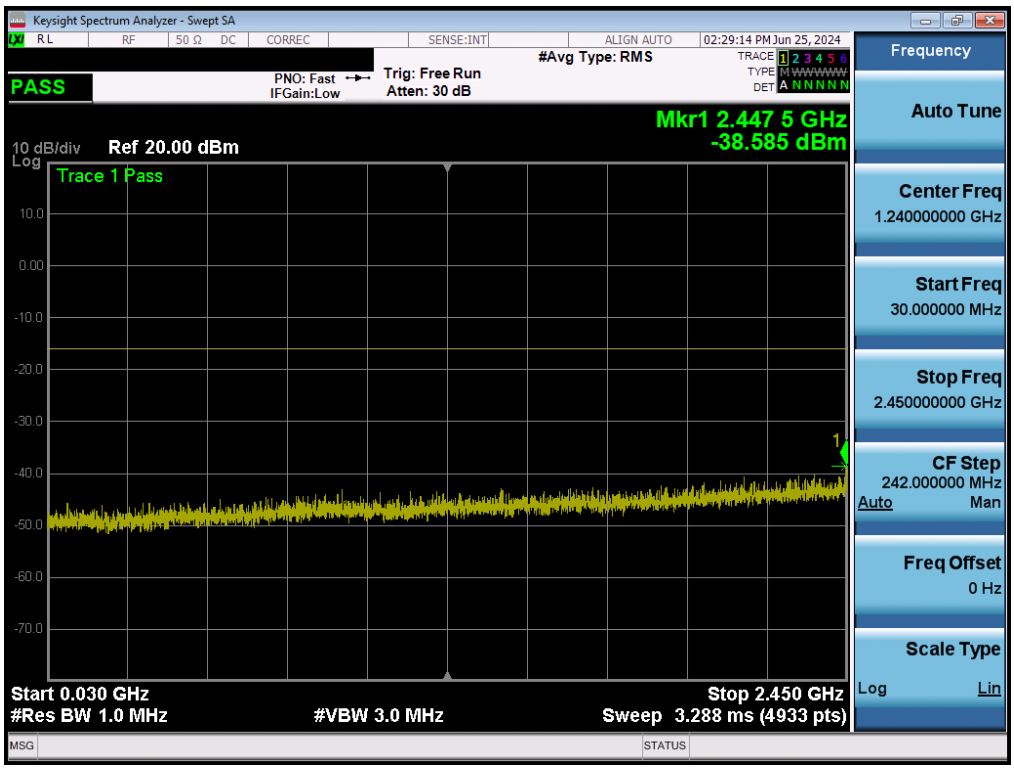


Plot 7-20. Conducted Spurious Plot (2.4GHz - Low Channel – MIMO Ant2))



Plot 7-21. Conducted Spurious Plot (2.4GHz - Mid Channel – MIMO Ant2))

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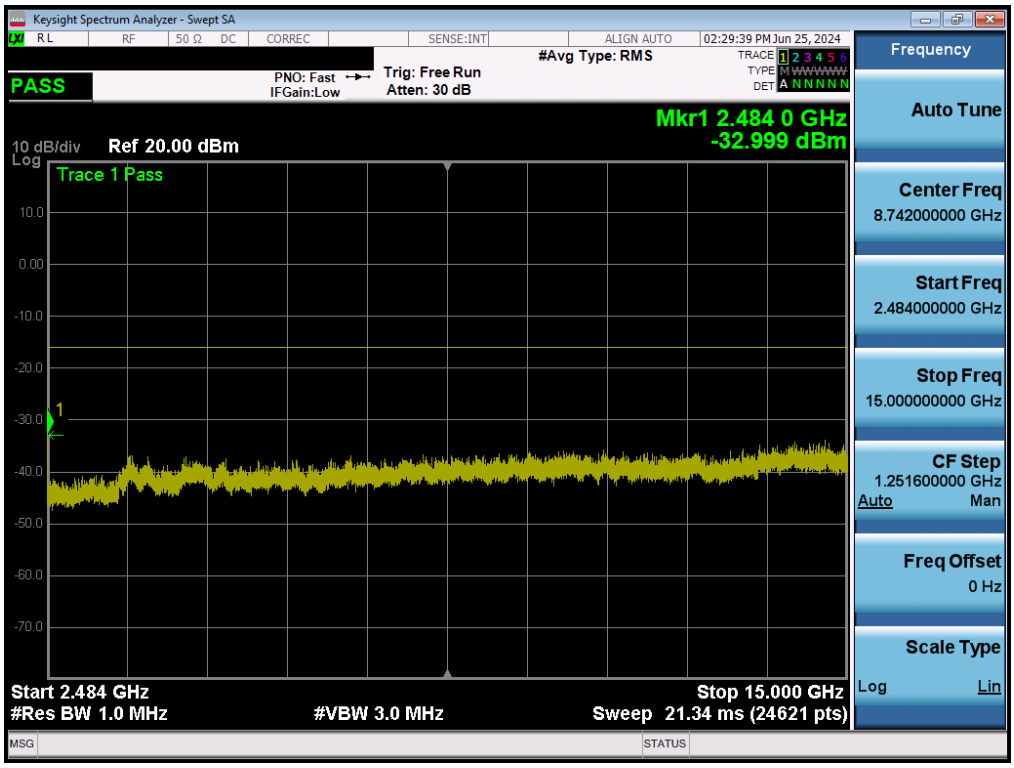
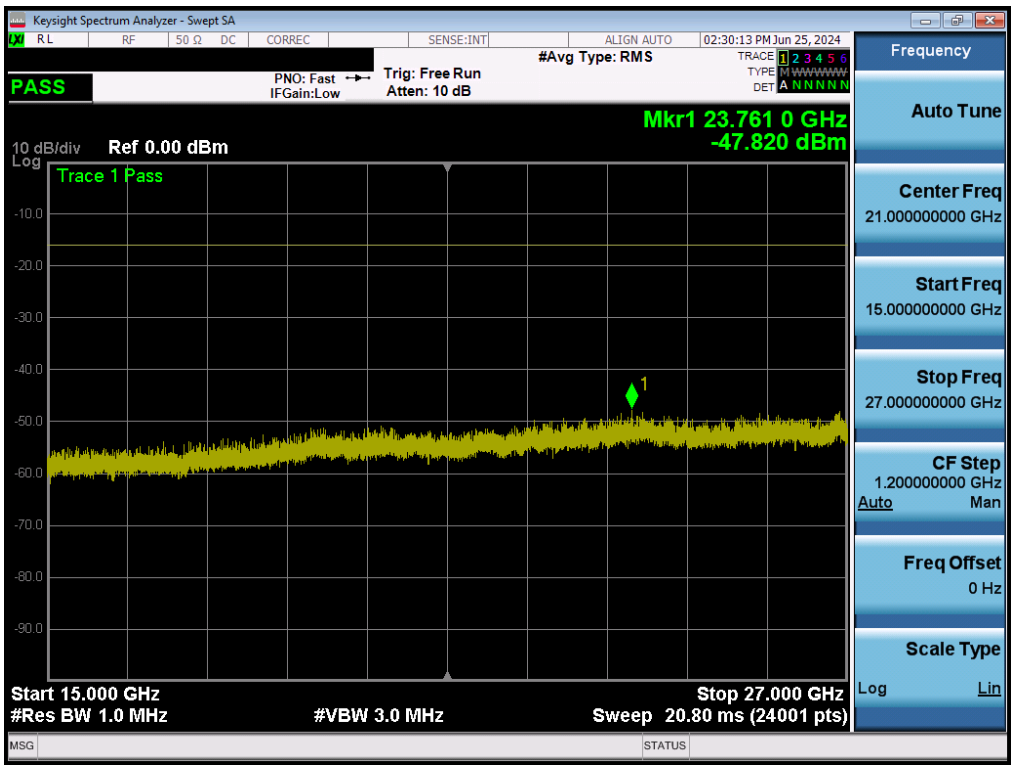


Plot 7-22. Conducted Spurious Plot (2.4GHz - Mid Channel – MIMO Ant2))



Plot 7-23. Conducted Spurious Plot (2.4GHz - Mid Channel – MIMO Ant2))

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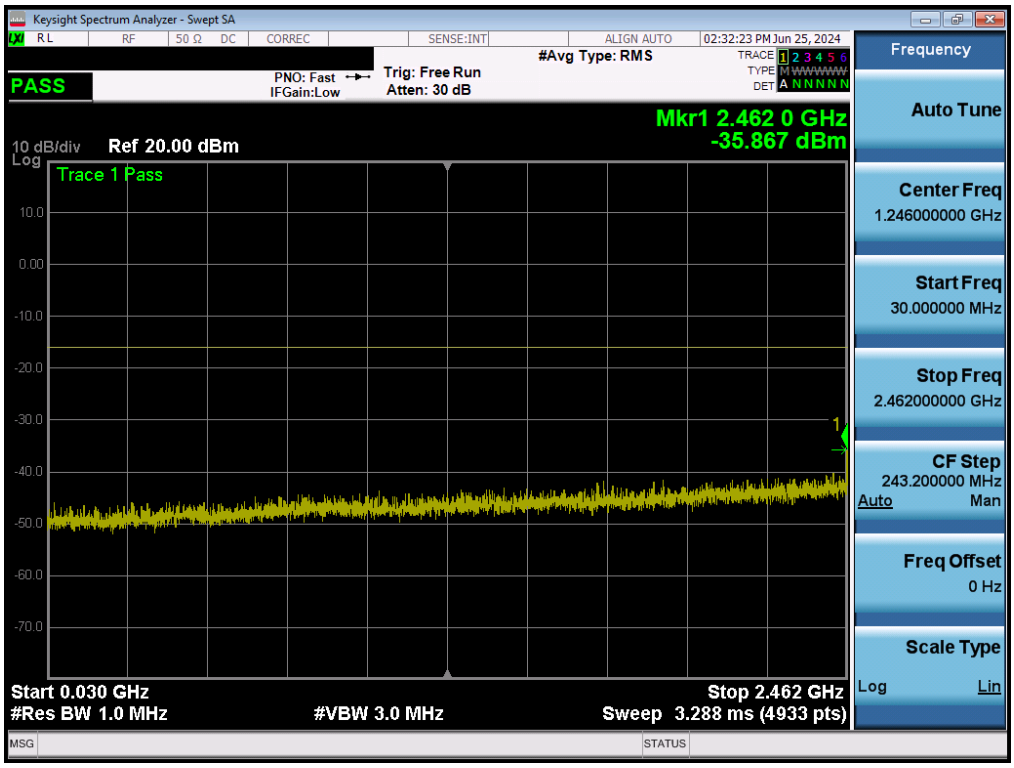
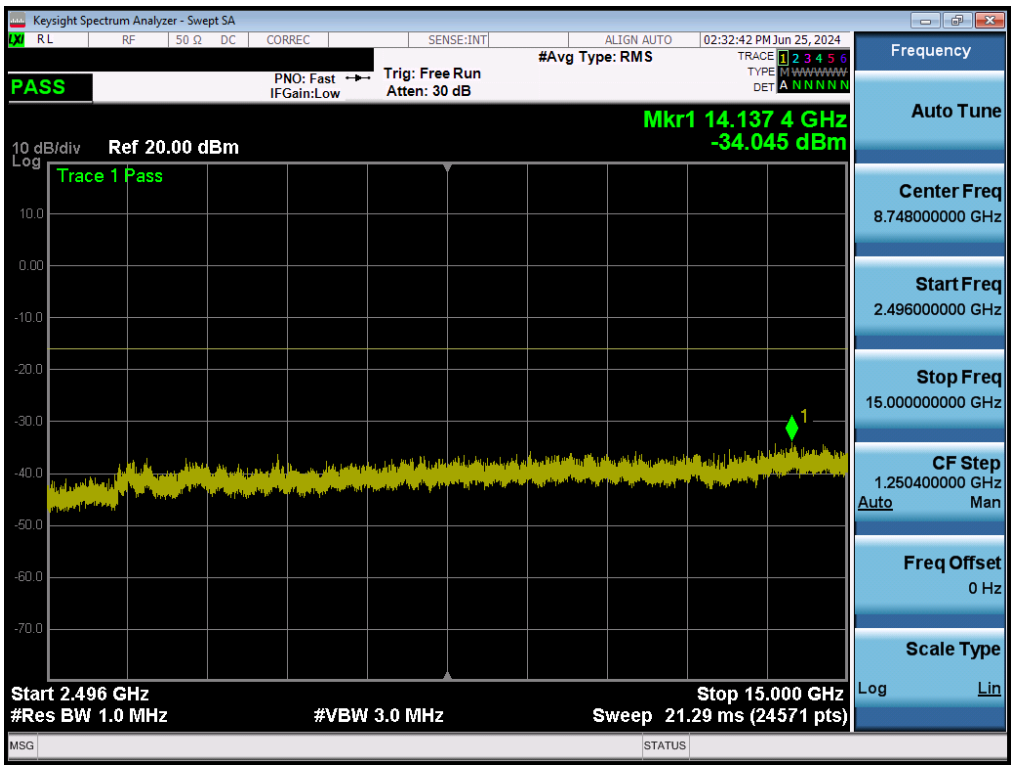


Plot 7-24. Conducted Spurious Plot (2.4GHz - High Channel – MIMO Ant2))



Plot 7-25. Conducted Spurious Plot (2.4GHz - High Channel – MIMO Ant2))

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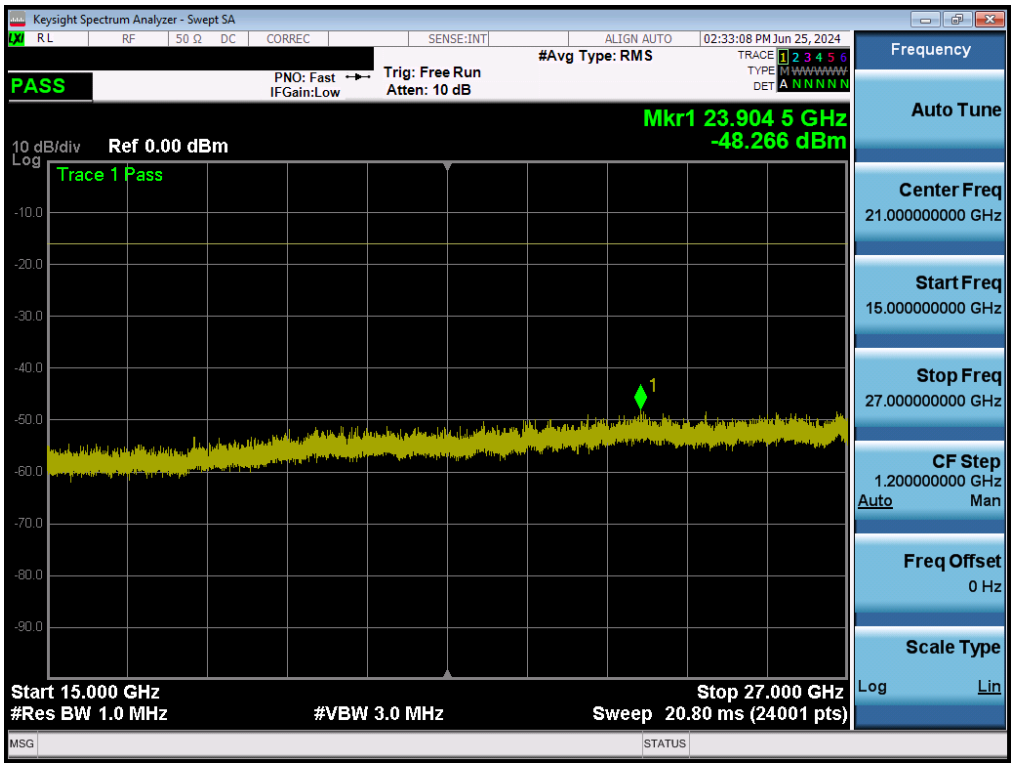

Plot 7-26. Conducted Spurious Plot (2.4GHz - High Channel – MIMO Ant2))

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7.5 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

The minimum permissible attenuation for this device is defined by Emission Mask B in Part 90.210(b).

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

Test Settings

1. Span was set large enough so as to capture all out of band emissions near the band edge
2. RBW = 75 kHz
3. VBW = 240 kHz
4. Detector = RMS
5. Trace mode = Max Hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

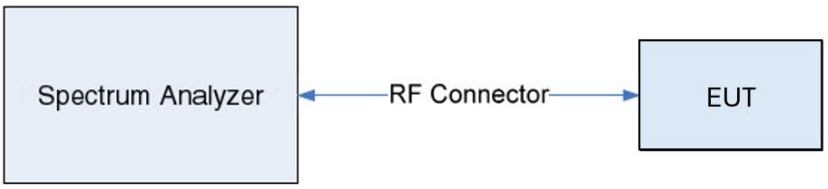

Figure 7-4. Test Instrument & Measurement Setup

Test Notes

For band edge emissions removed by < 250% of the authorized bandwidth from the center frequency, there are no MIMO considerations since the emission mask is treated as a relative emission limit when applied to each individual output.

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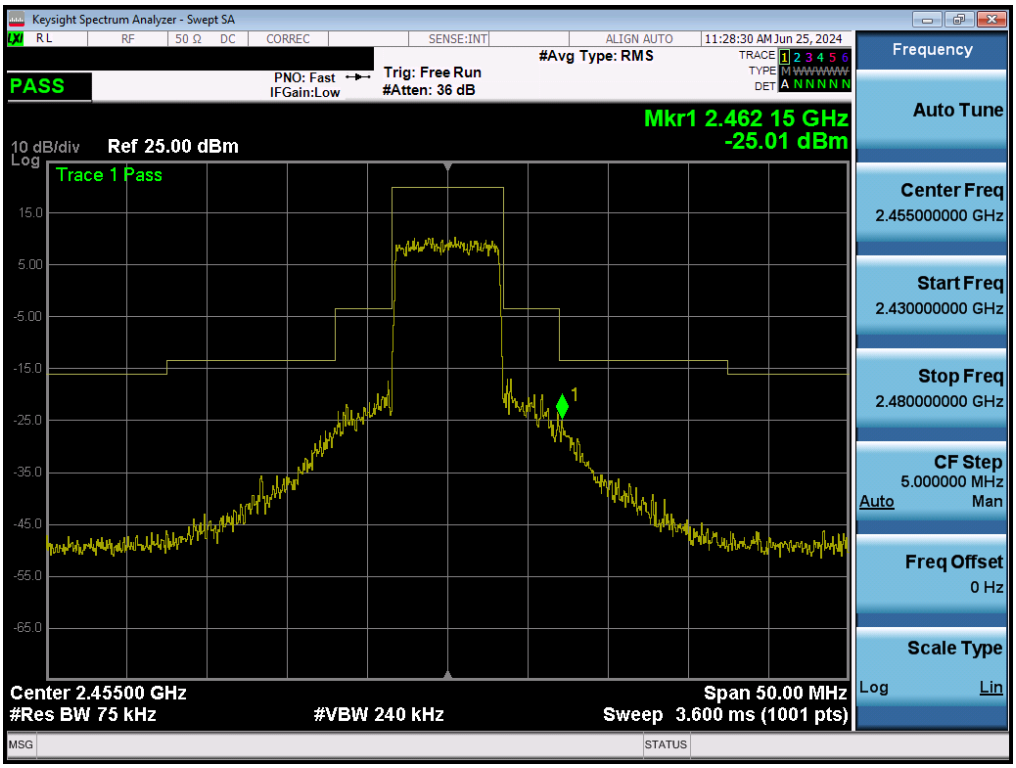
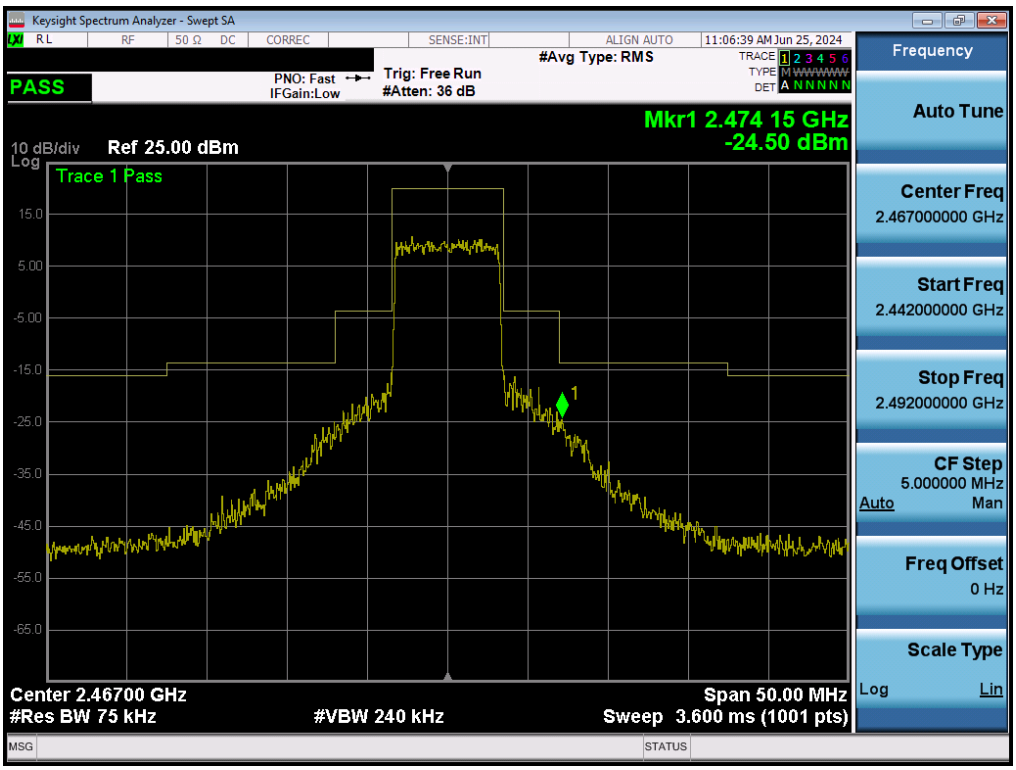
Antenna 1



Plot 7-27. Transmitter Mask (2.4GHz - Low Channel – MIMO Ant1)



Plot 7-28. Transmitter Mask (2.4GHz - Mid Channel – MIMO Ant1)

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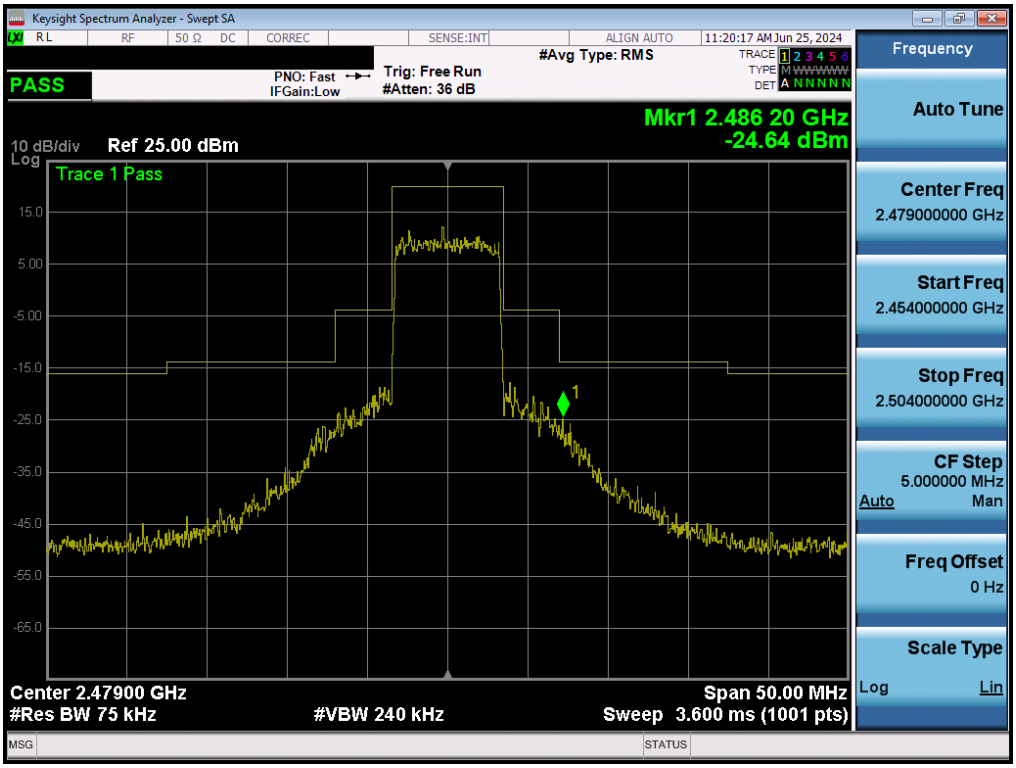

Plot 7-29. Transmitter Mask (2.4GHz - High Channel – MIMO Ant1)

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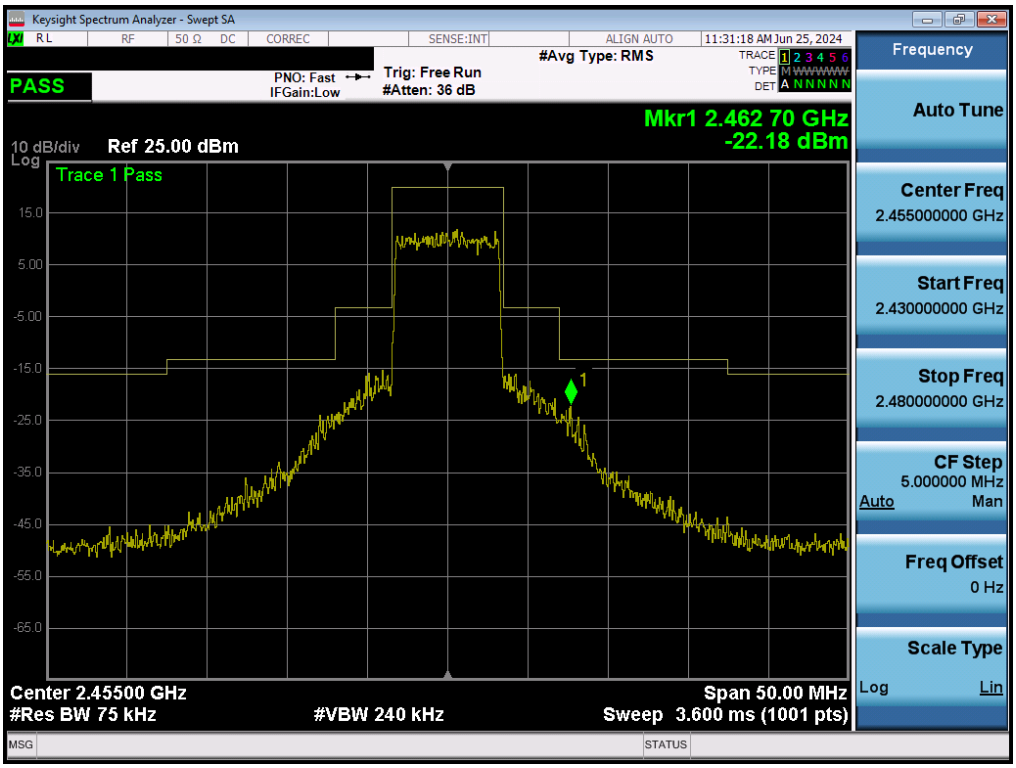
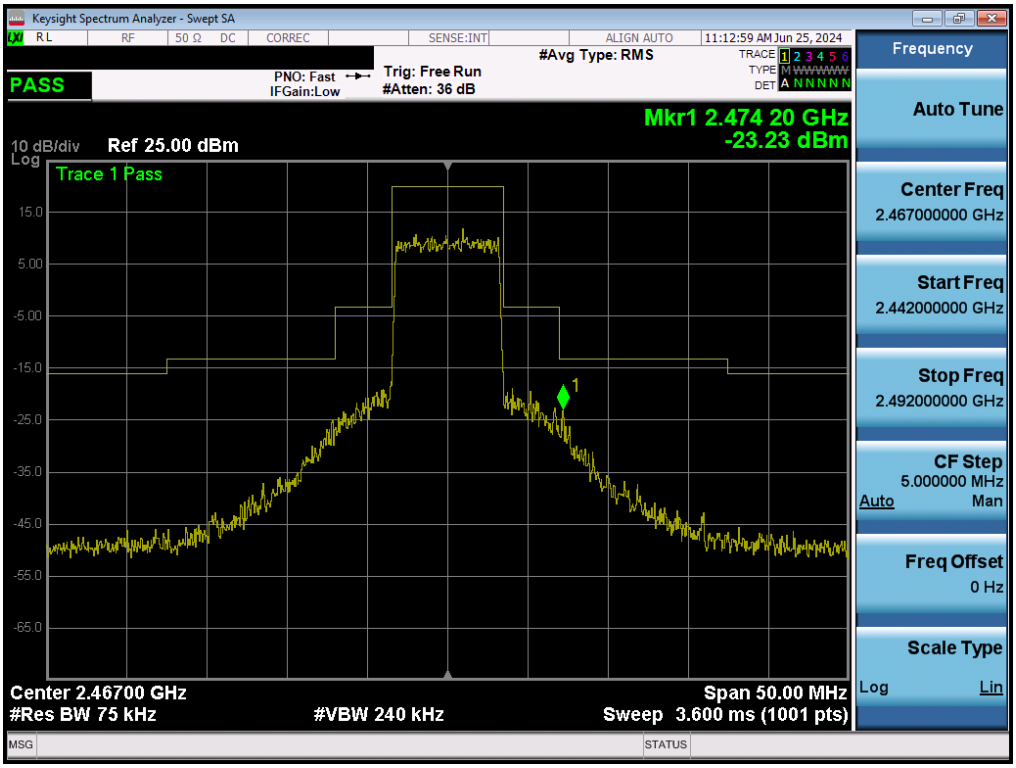
Antenna 2



Plot 7-30. Transmitter Mask (2.4GHz - Low Channel – MIMO Ant2)



Plot 7-31. Transmitter Mask (2.4GHz - Mid Channel – MIMO Ant2)

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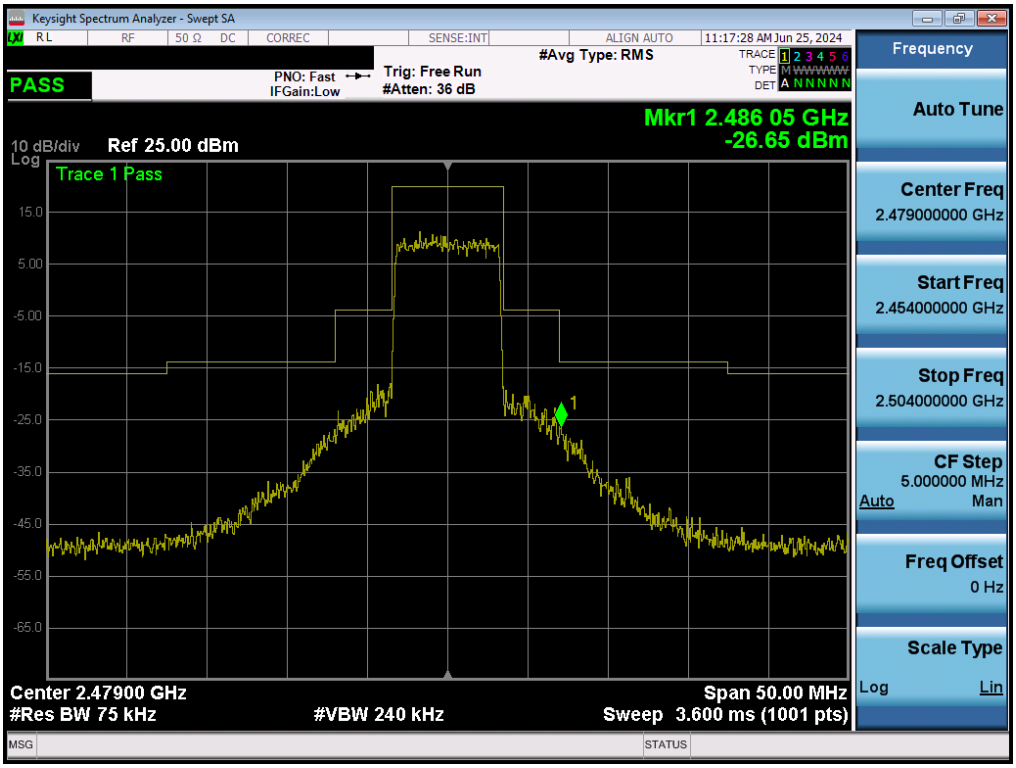

Plot 7-32. Transmitter Mask (2.4GHz - High Channel – MIMO Ant2)

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7.6 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an external antenna as described in Section 2.6 of this report. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

Test Settings

1. RBW = 1MHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

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Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

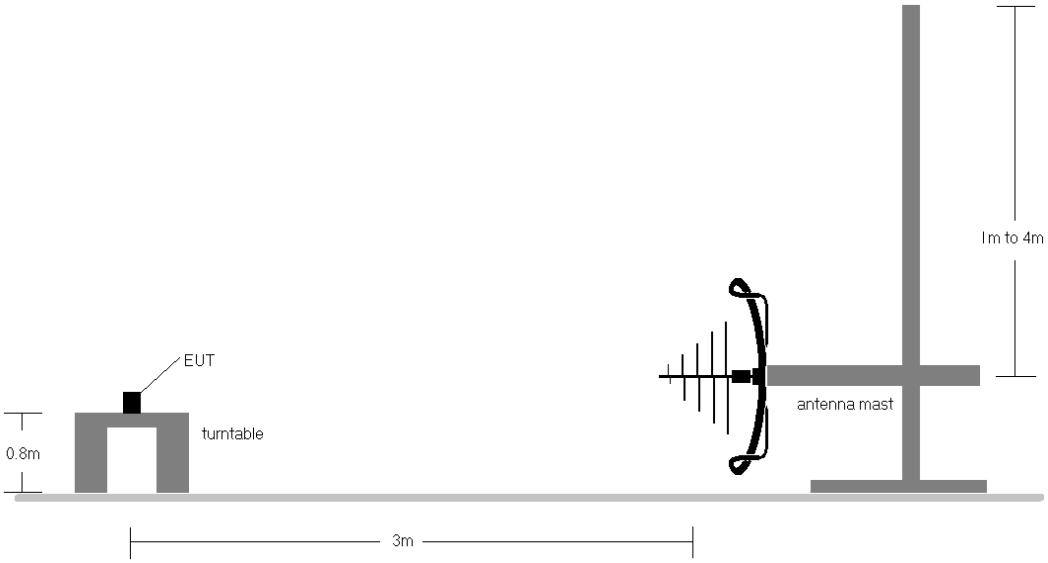

Figure 7-5. Test Instrument & Measurement Setup < 1GHz

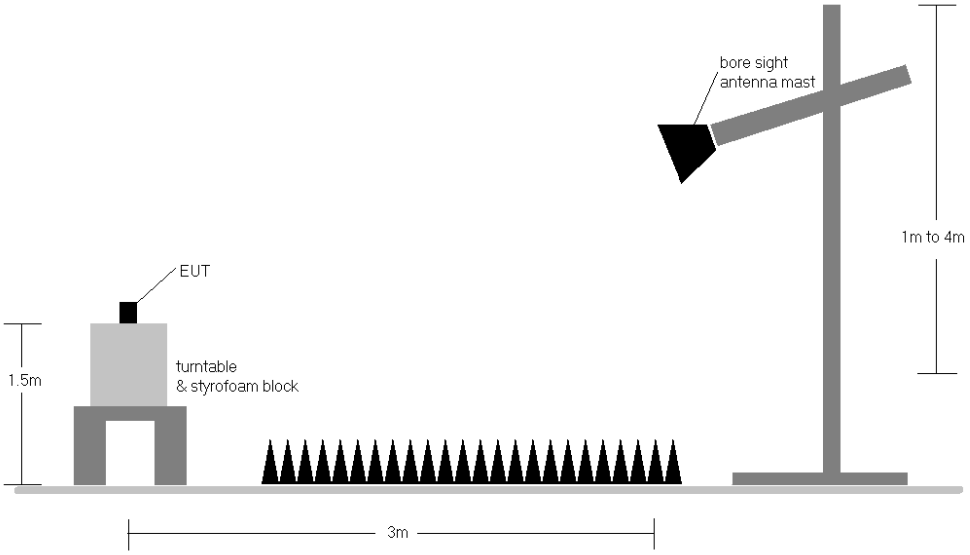

Figure 7-6. Test Instrument & Measurement Setup >1 GHz

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Test Notes

1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
   a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   b) EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

2) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.

3) This unit was tested with its standard battery.

4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

5) Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.

6) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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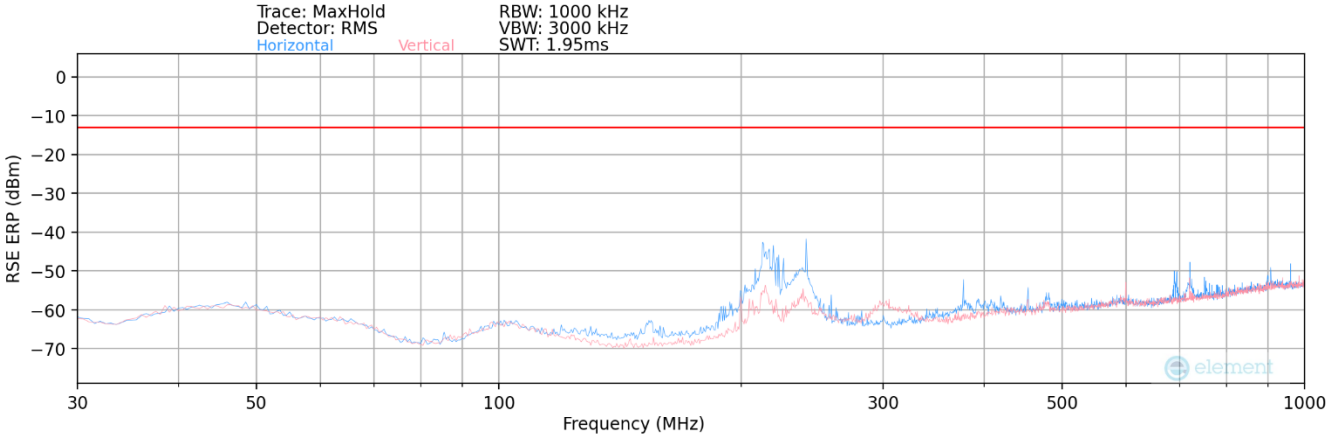
Radiated Spurious Emissions (<1GHz)



Plot 7-33. Radiated Spurious Plot Above 1GHz (2.4GHz)

Technology	COFDM
Bandwidth (MHz):	7
Frequency (MHz):	2479
Modulation Signal:	16QAM-BPSK
Detector / Trace Mode:	RMS / Max Hold
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
214.10	H	361	103	-46.75	-13.61	46.64	-50.77	-13.00	-37.77
378.09	H	157	136	-57.24	-9.11	40.65	-56.76	-13.00	-43.76
725.87	H	128	321	-58.14	-3.22	45.64	-51.77	-13.00	-38.77
893.06	H	-	-	-59.89	-0.85	46.26	-51.14	-13.00	-38.14
905.59	H	-	-	-60.12	-0.68	46.20	-51.20	-13.00	-38.20
913.24	H	-	-	-61.00	-0.52	45.48	-51.92	-13.00	-38.92

Table 7-3. Radiated Spurious Data Below 1GHz (2.4GHz – High Channel)

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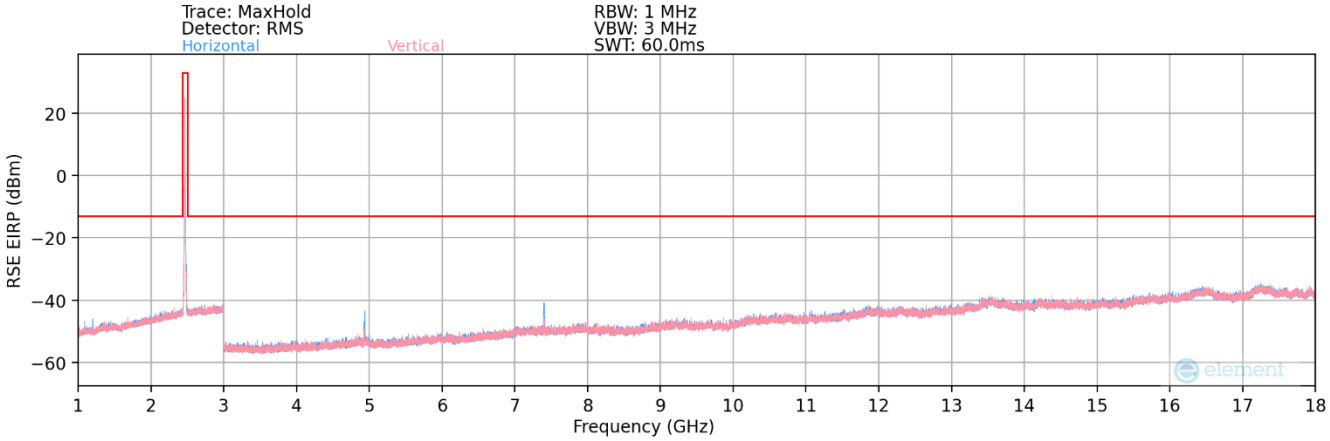
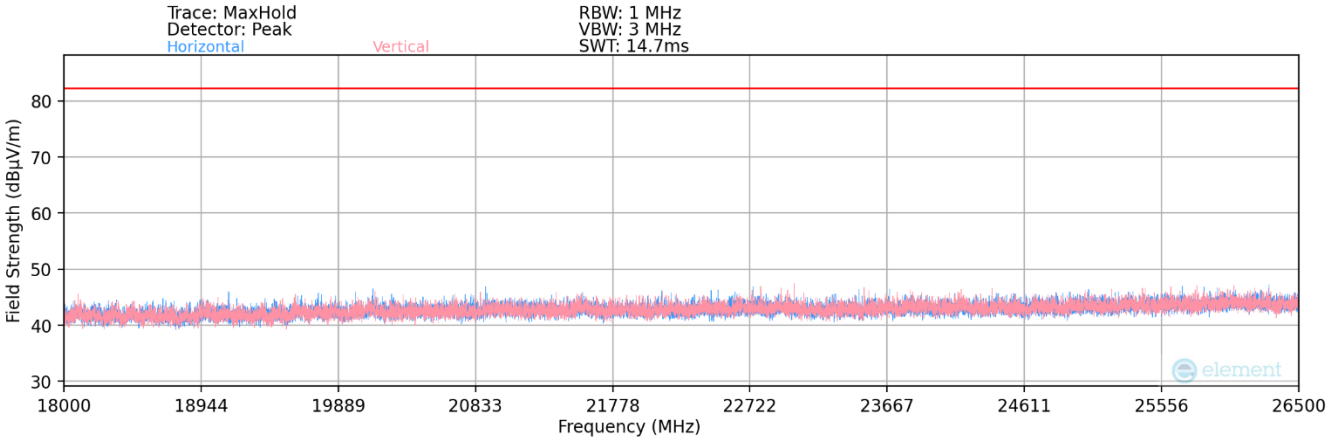
Radiated Spurious Emissions (>1GHz)



Plot 7-34. Radiated Spurious Plot Below 1GHz (2.4GHz)



Plot 7-35. Radiated Spurious Plot Below 1GHz (2.4GHz)

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Technology	COFDM
Bandwidth (MHz):	7
Frequency (MHz):	2455
Modulation Signal:	16QAM-BPSK
Detector / Trace Mode:	RMS / Max Hold
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
4910.00	H	171	317	-65.29	9.42	51.13	-44.13	-13.00	-31.13
7365.00	H	192	25	-68.42	15.62	54.20	-41.06	-13.00	-28.06
9820.00	H	123	22	-74.91	18.73	50.82	-44.44	-13.00	-31.44
12275.00	H	-	-	-80.60	23.00	49.40	-45.86	-13.00	-32.86
14730.00	H	-	-	-80.00	26.71	53.71	-41.55	-13.00	-28.55
17185.00	H	-	-	-79.82	29.24	56.42	-38.84	-13.00	-25.84

Table 7-4. Radiated Spurious Data (2.4GHz – Low Channel)

Technology	COFDM
Bandwidth (MHz):	7
Frequency (MHz):	2467
Modulation Signal:	16QAM-BPSK
Detector / Trace Mode:	RMS / Max Hold
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
4934.00	H	150	317	-62.44	9.85	54.41	-40.85	-13.00	-27.85
7401.00	H	186	78	-67.29	14.98	54.69	-40.57	-13.00	-27.57
9868.00	H	192	227	-76.02	18.26	49.24	-46.02	-13.00	-33.02
12335.00	H	-	-	-78.32	22.76	51.44	-43.82	-13.00	-30.82
14802.00	H	-	-	-78.19	26.03	54.84	-40.42	-13.00	-27.42
17269.00	H	-	-	-76.43	29.15	59.72	-35.54	-13.00	-22.54

Table 7-5. Radiated Spurious Data (2.4GHz – Mid Channel)

Technology	COFDM
Bandwidth (MHz):	7
Frequency (MHz):	2479
Modulation Signal:	16QAM-BPSK
Detector / Trace Mode:	RMS / Max Hold
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
4958.00	H	200	312	-63.27	10.32	54.05	-41.21	-13.00	-28.21
7437.00	H	191	25	-66.03	15.28	56.25	-39.01	-13.00	-26.01
9916.00	H	129	21	-74.72	18.49	50.77	-44.49	-13.00	-31.49
12395.00	H	-	-	-75.58	22.56	53.98	-41.28	-13.00	-28.28
14874.00	H	-	-	-76.63	26.51	56.88	-38.38	-13.00	-25.38
17353.00	H	-	-	-76.10	29.90	60.80	-34.46	-13.00	-21.46

Table 7-6. Radiated Spurious Data (2.4GHz – High Channel)

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7.7 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. The frequency stability of the transmitter is measured by:

a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.

b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

Test Procedure Used

ANSI C63.26-2015 – Section 5.6

Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None

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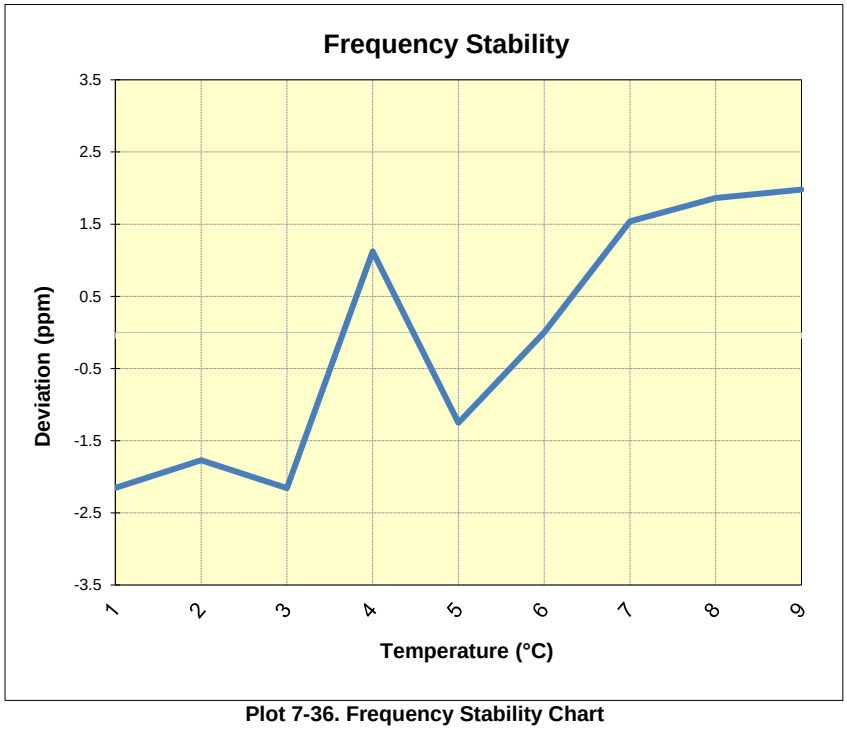
2.4GHz

Operating Frequency (Hz):	2,467,000,000
Ref. Voltage (VDC):	12.6

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	12.6	- 30	2,466,985,355	-5,316	-0.0002155
		- 20	2,466,986,301	-4,370	-0.0001771
		- 10	2,466,985,348	-5,322	-0.0002157
		0	2,466,993,439	2,769	0.0001122
		+ 10	2,466,987,579	-3,091	-0.0001253
		+ 20 (Ref)	2,466,990,671	0	0.0000000
		+ 30	2,466,994,466	3,796	0.0001539
		+ 40	2,466,995,263	4,593	0.0001862
		+ 50	2,466,995,553	4,882	0.0001979
Battery Endpoint	8.4	+ 20	2,466,992,562	1,892	0.0000767

Table 7-7. Frequency Stability Data



Plot 7-36. Frequency Stability Chart

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Brinc LEMUR 2 Controller FCC ID: 2BHDHBR00004** complies with all the requirements of Part 90 of the FCC rules.

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