

**Part 96 MEASUREMENT REPORT****Applicant Name:**

Wilson Electronics  
3301 E. Deseret Dr.  
St. George, UT 84790  
United States

**Date of Testing:**

3/24/2025 – 6/5/2025

**Test Report Issue Date:**

6/9/2025

**Test Site/Location:**

Element Lab., Columbia, MD, USA

**Test Report Serial No.:**

1M2503210033-01.UPO

**FCC ID:****UPO308-0007-1****APPLICANT:****Wilson Electronics****Application Type:**

Certification

**Model:**

308-0007-1

**EUT Type:**

Optical Radio Unit

**FCC Classification:**

Category A and B Citizens Broadband Radio Service

Devices (CBSD)

**FCC Rule Part(s):**

96

**Test Procedure(s):**

ANSI C63.26-2015, KDB 940660 D01 v03, WINNF-TS-0122

v1.0.2

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 Ortiz  
Executive Vice President



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## MEASUREMENT REPORT

### FCC Part 96

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 48	40 MHz	QPSK	3570.0 - 3680.0	0.139	21.42	38M5G7D
		16QAM	3570.0 - 3680.0	0.136	21.32	38M5W7D
		64QAM	3570.0 - 3680.0	0.136	21.33	38M5W7D
		256QAM	3570.0 - 3680.0	0.123	20.90	38M4W7D
	20 MHz	QPSK	3560.0 - 3690.0	0.104	20.19	18M1G7D
		16QAM	3560.0 - 3690.0	0.131	21.18	18M1W7D
		64QAM	3560.0 - 3690.0	0.116	20.64	18M1W7D
		256QAM	3560.0 - 3690.0	0.119	20.76	18M0W7D
	10 MHz	QPSK	3555.0 - 3695.0	0.151	21.78	9M01G7D
		16QAM	3555.0 - 3695.0	0.151	21.79	8M99W7D
		64QAM	3555.0 - 3695.0	0.146	21.64	9M03W7D
		256QAM	3555.0 - 3695.0	0.139	21.42	9M00W7D

**Note:** EIRP levels shown in the table above are measured over the full channel bandwidth. These values will appear on the Grant of Authorization.

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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.

### 1.2 Element Test Location

Measurements were conducted at the Element laboratory(ies) indicated in Section 1.3 below. All measurement facilities are compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

### 1.3 Test Facility / Accreditations

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

- 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 Agreements (MRAs).

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Wilson Electronics Optical Radio Unit FCC ID: UPO308-0007-1**. The test data contained in this report pertains only to the emissions due to the EUT's LTE Band 48 operation in the CBRS band. Per FCC Part 96, this device is evaluated as a Category A and B Citizens Broadband Radio Service Device (CBSD).

**Test Device Serial No.:** 900200000479

### 2.2 Device Capabilities

This device contains the following capabilities:

LTE Band 48

This device uses a tuner circuit that dynamically updates the antenna impedance parameters to optimize antenna performance for certain bands and modes of operation. The tuner for this device was set to simulate a "free space" condition where the transmit antenna is matched to the medium into which it is transmitting and, thus, the power is at its maximum level.

### 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 Antenna Description

The maximum antenna gain used by the EUT is 0.00dBi for the CBRS band.

### 2.5 Software and Firmware

Testing was performed on device(s) using hardware version 2.0 and software version 5.69 installed on the EUT.

### 2.6 EMI Suppression Device(s)/Modifications

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

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Measurement 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:

$$P_d [\text{dBm}] = P_g [\text{dBm}] - \text{cable loss } [\text{dB}] + \text{antenna gain } [\text{dBd}/\text{dBi}];$$

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  $P_g [\text{dBm}] - \text{cable loss } [\text{dB}]$ .

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:

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

And

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

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  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

**Table 4-1. Measurement Uncertainty Budget – MD**

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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	EMC Cable and Switch System	12/11/2024	Annual	12/11/2025	ETS-001
-	WL40-1	Licensed Transmitter Cable Set	2/25/2025	Annual	2/25/2026	WL40-1
Agilent	N9030A	50GHz PXA Signal Analyzer	4/23/2024	Annual	4/23/2025	US51350301
Emco	3115	Horn Antenna (1-18GHz)	6/7/2024	Biennial	6/7/2026	9704-5182
Emco	3116	Horn Antenna (18-40GHz)	7/5/2023	Triennial	7/5/2025	9203-2178
Keysight Technologies	N9020A	MXA Signal Analyzer	4/11/2024	Annual	4/11/2025	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/26/2024	Annual	8/26/2025	MY54490576
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	10/16/2024	Annual	10/16/2025	100342
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	5/12/2025	Annual	5/12/2026	103200
Sunol	JB5	Bi-Log Antenna (30MHz - 5GHz)	9/11/2024	Biennial	9/11/2026	A051107
Sunol	DRH-118	Horn Antenna (1-18GHz)	2/13/2024	Biennial	2/13/2026	A042511

**Table 5-1. Test Equipment Calibration Table – MD**

**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.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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## 6.0 SAMPLE EMISSION DESIGNATORS

### Emission Designator

#### QPSK Modulation

**Emission Designator = 8M62G7D**

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

#### QAM Modulation

**Emission Designator = 8M45W7D**

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

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## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Wilson Electronics

FCC ID: UPO308-0007-1

FCC Classification: Category A and B Citizens Broadband Radio Service Devices (CBSD)

Mode(s): Wilson Electronics

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Conducted Power	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions (CBSD)	2.1051, 96.41(e)(i)	-13 dBm/MHz at frequencies within 0-10 MHz of above the upper SAS-assigned channel edge and within 0-10MHz below the lower SAS-assigned channel edge -25 dBm/MHz at frequencies greater than 10 MHz above and below channel edge -emissions below 3530 MHz or above 3720 MHz shall not exceed -40dBm/MHz	PASS	Sections 7.6, 7.7
	Peak-Average Ratio	96.41(g)	≤13dBm	PASS	Section 7.8
	Frequency Stability	2.1055	Fundamental emissions stay within authorized frequency block	PASS	Section 7.10
	Category A CBSD Additional Requirements (CBSD Protocol)	96.43	Category A CBSDs shall not be deployed or operated outdoors with antennas exceeding 6 meters height above terrain. CBSDs deployed or operated outdoors with antennas exceeding 6 meters height above terrain will be classified as, and subject to, the operational requirements of Category B CBSDs.  When registering with an SAS, Category A CBSDs must transmit all information required under 96.39. This transmission shall also indicate whether the device will be operated indoors or outdoors.  And CBSD operated at higher power than specified for Category A CBSDs in 96.41 will be classified as, and subject to, the operational requirements of a Category B CBSD	PASS	SAS Protocol Report
	Category B CBSD Additional Requirements (CBSD Protocol)	96.45	Category B CBSDs must be professionally installed.  In the 3550-3650 MHz band, Category B CBSDs must be authorized consistent with information received from an ESC, as described in 96.15.  Category B CBSDs are limited to outdoor operations.  When registering with an SAS, Category B CBSDs must transmit all information required under 96.39 plus the following additional information: antenna gain, beamwidth, azimuth, downlink angle, and antenna height above ground level.	PASS	SAS Protocol Report
	Equivalent Isotropic Radiated Power (EIRP) (Category A CBSD)	96.41(b)	30 dBm/10MHz	PASS	Section 7.4
	Equivalent Isotropic Radiated Power (EIRP) (Category B CBSD)	96.41(b)	47 dBm/10MHz	PASS	Section 7.4
	Power Spectral Density (Category A CBSD)	96.41(b)	20 dBm/10MHz	PASS	Section 7.5
	Power Spectral Density (Category B CBSD)	96.41(b)	37 dBm/10MHz	PASS	Section 7.5
	Radiated Spurious Emissions	2.1053, 96.41(e)	-40 dBm/MHz	PASS	Section 7.9

Table 7-1. Summary of Test Results

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**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 were all 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 2.3.0.

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## 7.2 Conducted Output Power/EIRP Data

### Test Overview

The EUT is set up to transmit at maximum power for LTE. All power levels 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.

A-MPR is implemented in this device per the A-MPR specification in 3GPP TS 36.101. The conducted powers are shown herein to cover the different A-MPR levels specified in the standard. Measurement equipment was set up with triggering/gating on the spectrum analyzer such that powers were measured only during the on-time of the signal.

### Test Procedure Used

ANSI C63.26-2015 – Section 5.2

### Test Settings

1. Span = 2 x OBW to 3 x OBW
2. RBW = 1% to 5% of the OBW
3. Number of measurement points in sweep  $\geq 2 \times \text{span} / \text{RBW}$
4. Sweep = auto-couple (less than transmission burst duration)
5. Detector = RMS (power)
6. Trigger was set to enable power measurements only on full power bursts
7. Trace was allowed to stabilize
8. Spectrum analyzer's "Channel Power" function was used to compute the power by integrating the spectrum across the OBW of the signal

### Test Setup

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



**Figure 7-1. Test Instrument & Measurement Setup**

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**Test Notes**

1. 256QAM operations does not employ A-MPR.
2. Conducted power measurements were evaluated using various combinations of modulation and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.

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Bandwidth	Modulation	Channel	Frequency [MHz]	Conducted Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	EIRP [Watts]
20 MHz	QPSK	55340	3560.0	19.80	0.00	19.80	0.10
		55990	3625.0	19.74	0.00	19.74	0.09
		56640	3690.0	20.19	0.00	20.19	0.10
	16-QAM	55340	3560.0	19.91	0.00	19.91	0.10
		55990	3625.0	21.18	0.00	21.18	0.13
		56640	3690.0	20.22	0.00	20.22	0.11
	64-QAM	55340	3560.0	20.20	0.00	20.20	0.10
		55990	3625.0	20.64	0.00	20.64	0.12
		56640	3690.0	20.15	0.00	20.15	0.10
	256-QAM	55340	3560.0	20.02	0.00	20.02	0.10
		55990	3625.0	20.76	0.00	20.76	0.12
		56640	3690.0	20.12	0.00	20.12	0.10
10 MHz	QPSK	55290	3555.0	21.78	0.00	21.78	0.15
		55990	3625.0	20.93	0.00	20.93	0.12
		56690	3695.0	21.16	0.00	21.16	0.13
	16-QAM	55290	3555.0	21.79	0.00	21.79	0.15
		55990	3625.0	20.95	0.00	20.95	0.12
		56690	3695.0	21.05	0.00	21.05	0.13
	64-QAM	55290	3555.0	21.64	0.00	21.64	0.15
		55990	3625.0	20.66	0.00	20.66	0.12
		56690	3695.0	21.16	0.00	21.16	0.13
	256-QAM	55290	3555.0	21.42	0.00	21.42	0.14
		55990	3625.0	20.88	0.00	20.88	0.12
		56690	3695.0	21.02	0.00	21.02	0.13

**Table 7-2. Conducted Power/EIRP Results**

Bandwidth	Modulation	PCC		SCC		Conducted Power [dBm]	Antenna Gain [dBi]	EIRP [dBm]	EIRP [Watts]
		Bandwidth [MHz]	Frequency [MHz]	Bandwidth [MHz]	Frequency [MHz]				
40 MHz	QPSK	20	3560.0	20	3579.8	21.42	0.00	21.42	0.139
		20	3625.0	20	3644.8	20.92	0.00	20.92	0.124
		20	3690.0	20	3670.2	20.36	0.00	20.36	0.109
	16QAM	20	3560.0	20	3579.8	21.32	0.00	21.32	0.136
		20	3625.0	20	3644.8	20.73	0.00	20.73	0.118
		20	3690.0	20	3670.2	20.34	0.00	20.34	0.108
	64QAM	20	3560.0	20	3579.8	21.33	0.00	21.33	0.136
		20	3625.0	20	3644.8	20.65	0.00	20.65	0.116
		20	3690.0	20	3670.2	20.27	0.00	20.27	0.106
	256QAM	20	3560.0	20	3579.8	20.90	0.00	20.90	0.123
		20	3625.0	20	3644.8	20.56	0.00	20.56	0.114
		20	3690.0	20	3670.2	20.23	0.00	20.23	0.105

**Table 7-3. CA Conducted Power/EIRP Results**

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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  $\geq$  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.



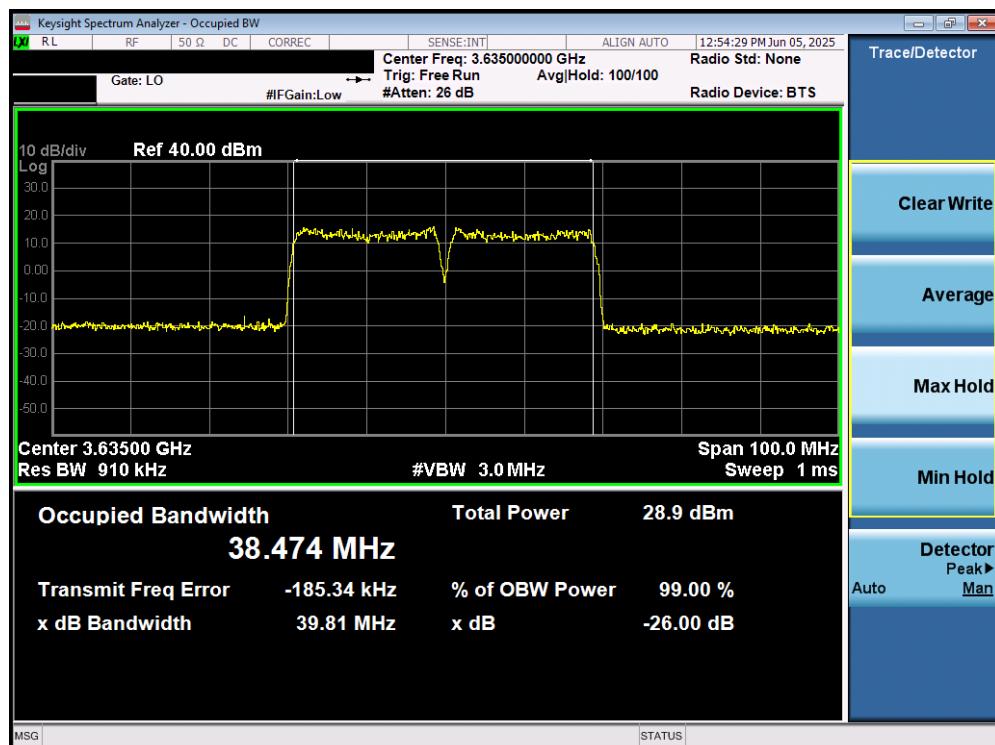
**Figure 7-2. Test Instrument & Measurement Setup**

### Test Notes

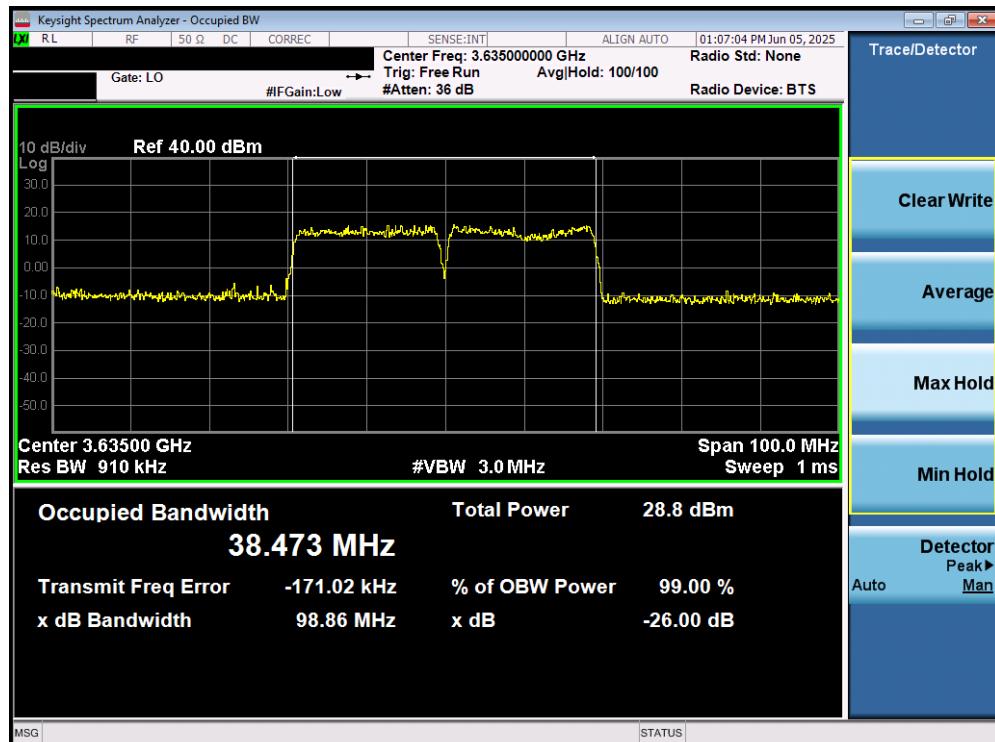
None

FCC ID: UPO308-0007-01		PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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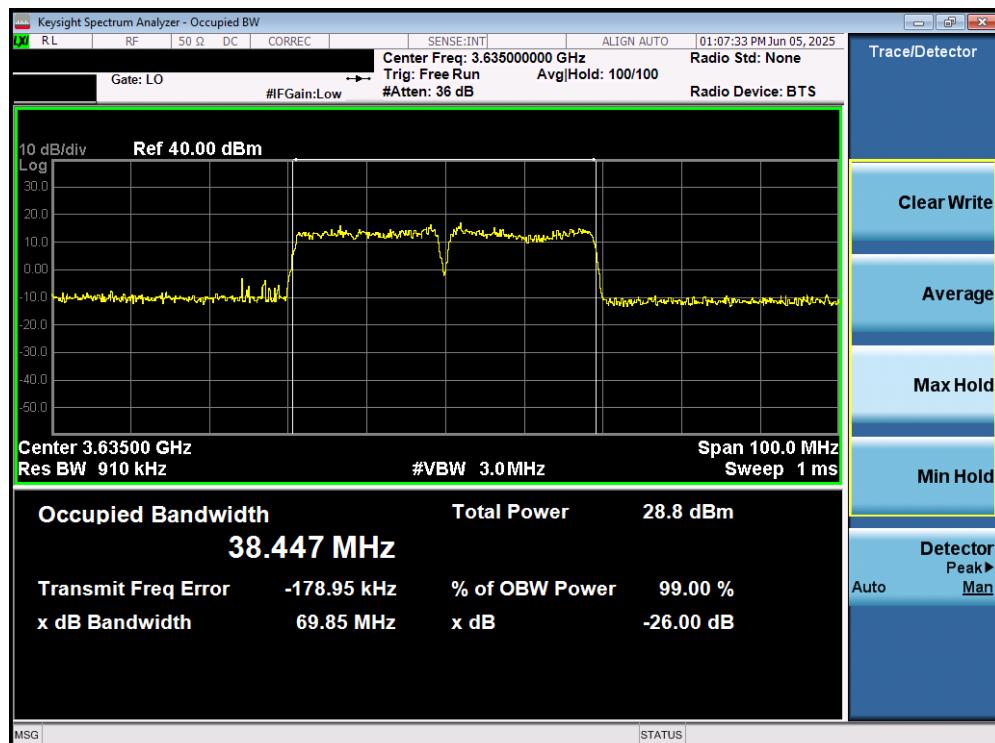
Mode	Bandwidth	Modulation	OBW [MHz]
LTE Band 48	40 MHz	QPSK	38.47
		16QAM	38.47
		64QAM	38.45
		256QAM	38.43
	20 MHz	QPSK	18.07
		16QAM	18.08
		64QAM	18.09
		256QAM	18.03
	10 MHz	QPSK	9.01
		16QAM	8.99
		64QAM	9.03
		256QAM	9.00

**Table 7-4. Occupied Bandwidth Results**

**Plot 7.1. Occupied Bandwidth Plot (20+20MHz QPSK)**

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
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Plot 7.2. Occupied Bandwidth Plot (20+20MHz 16QAM)

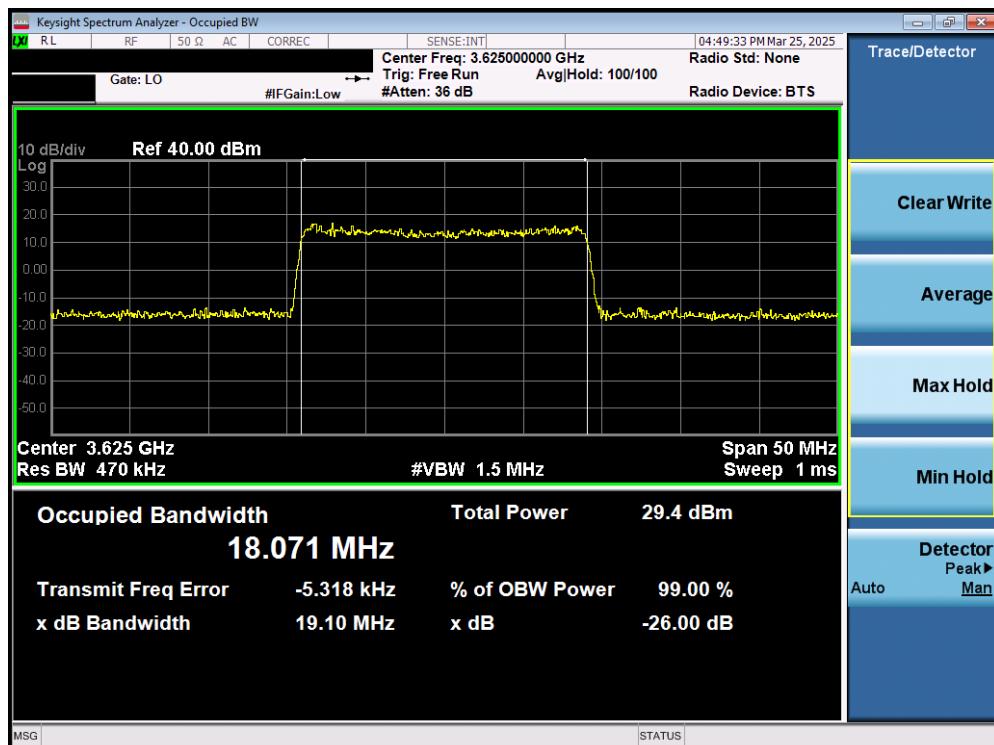


Plot 7.3. Occupied Bandwidth Plot (20+20MHz 64QAM)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit		Page 17 of 64

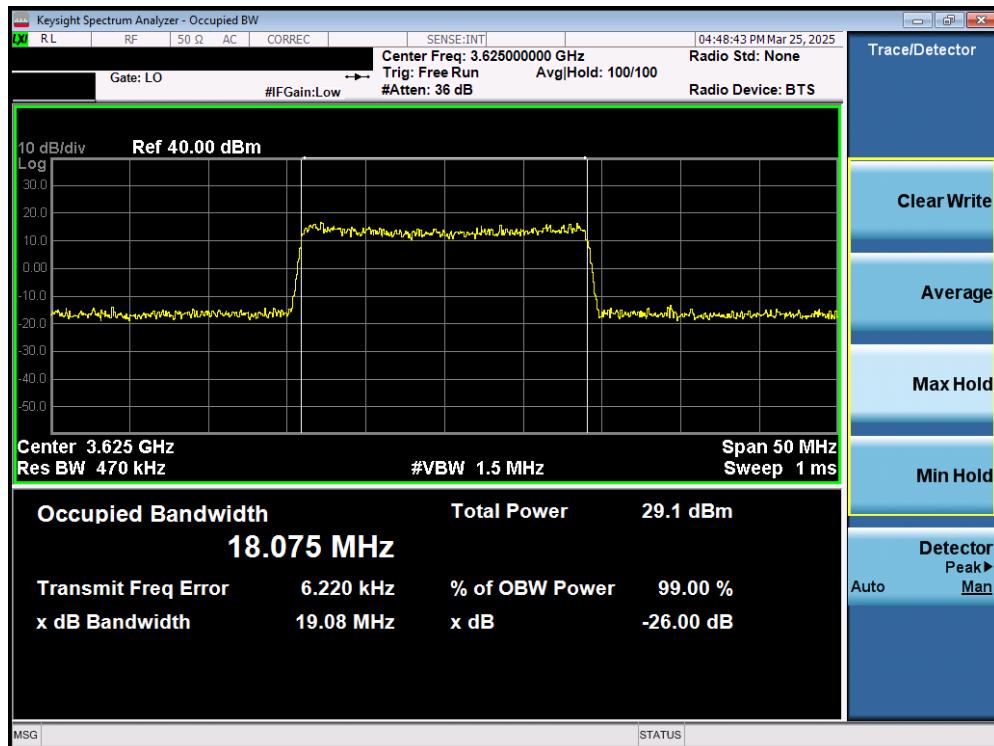


Plot 7.4. Occupied Bandwidth Plot (20+20MHz 256QAM)

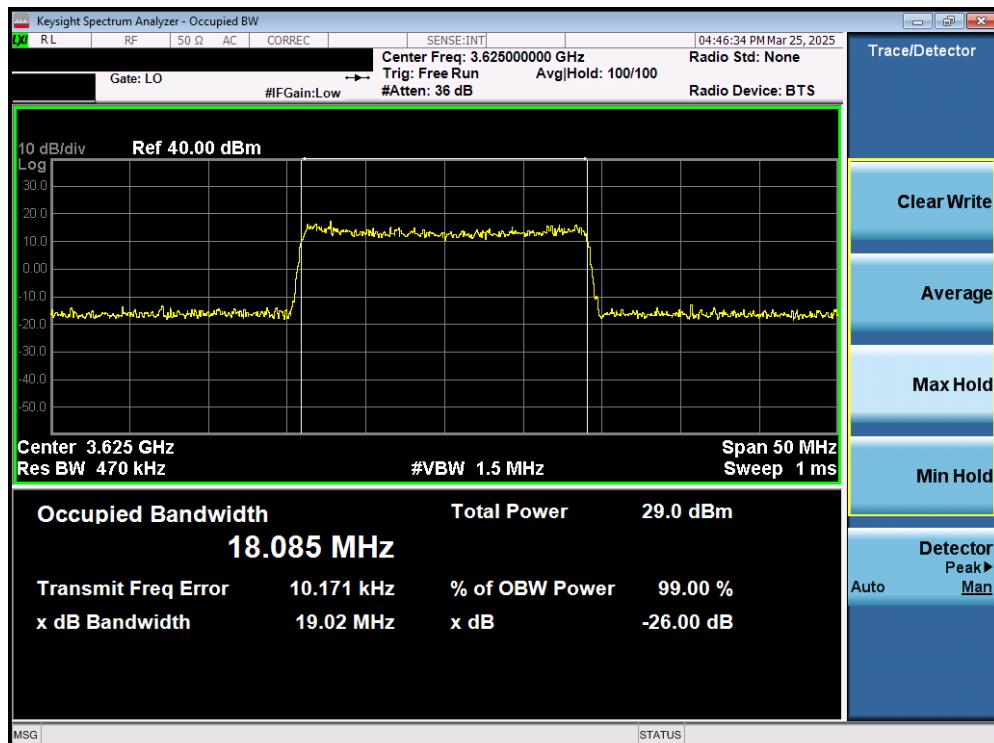


Plot 7.5. Occupied Bandwidth Plot (20MHz QPSK)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit		Page 18 of 64

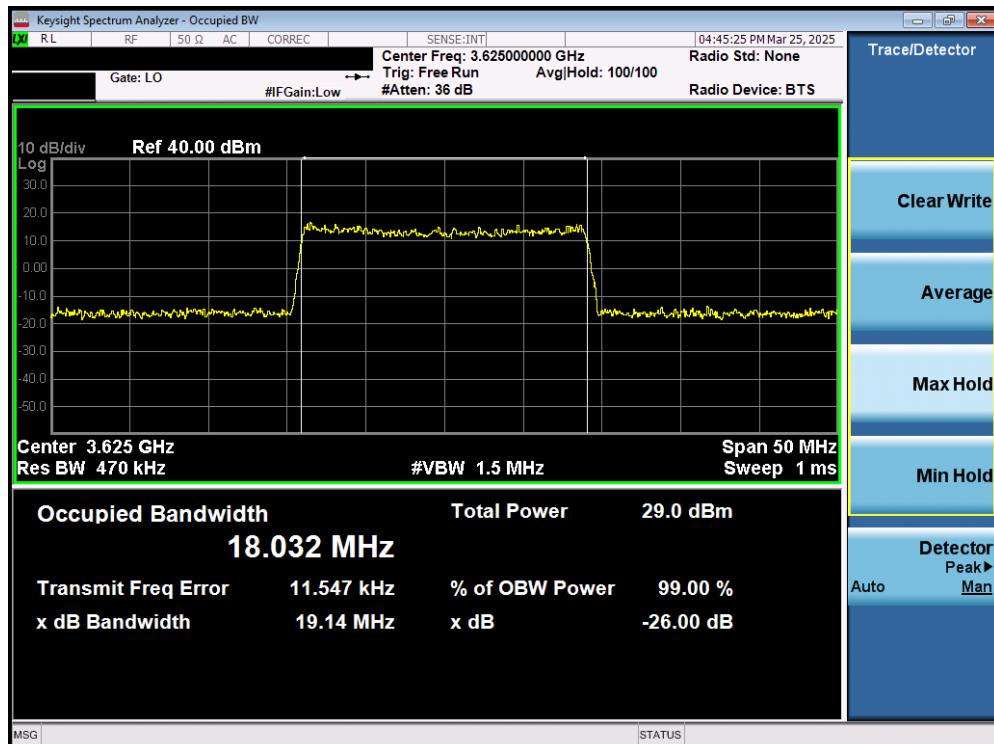


Plot 7.6. Occupied Bandwidth Plot (20MHz 16QAM)

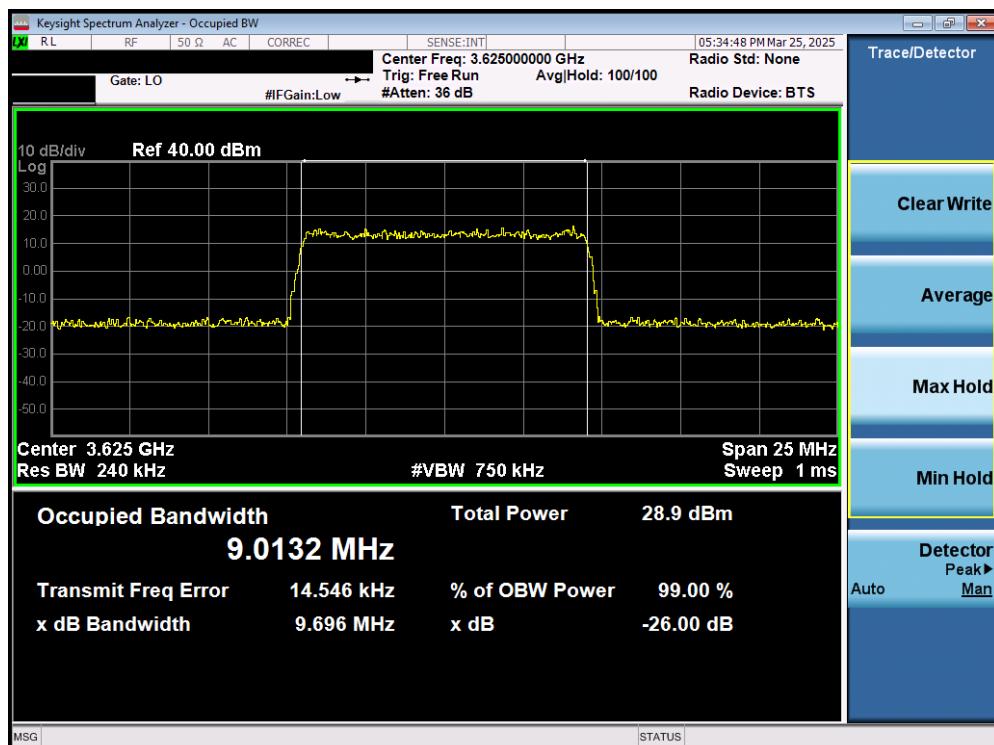


Plot 7.7. Occupied Bandwidth Plot (20MHz 64QAM)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
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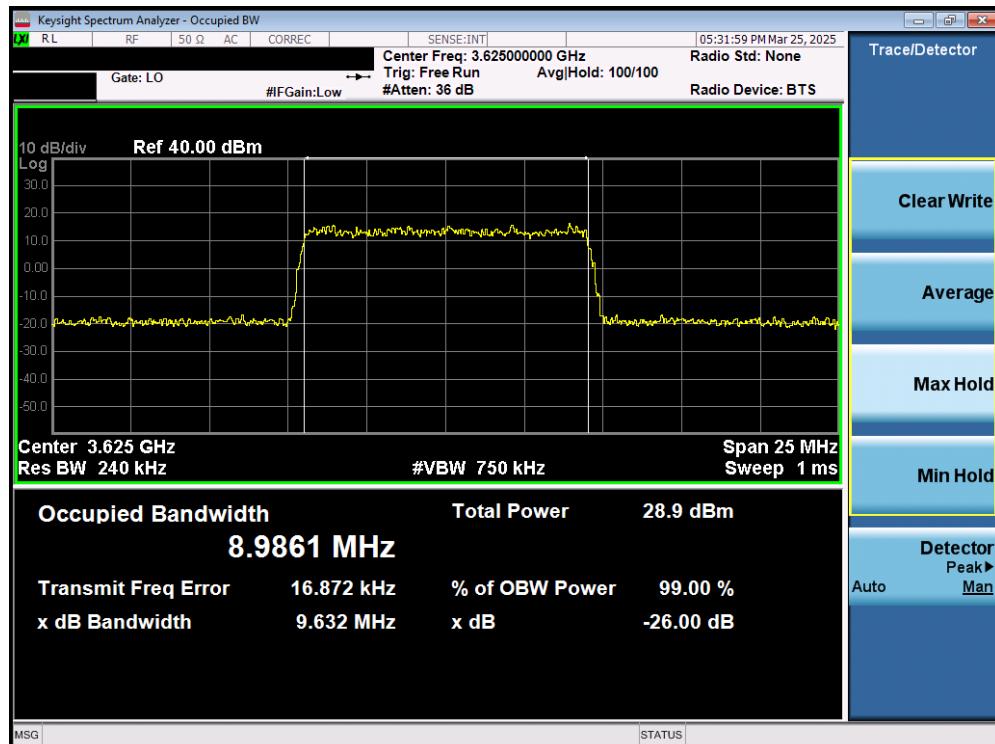


Plot 7.8. Occupied Bandwidth Plot (20MHz 256QAM)

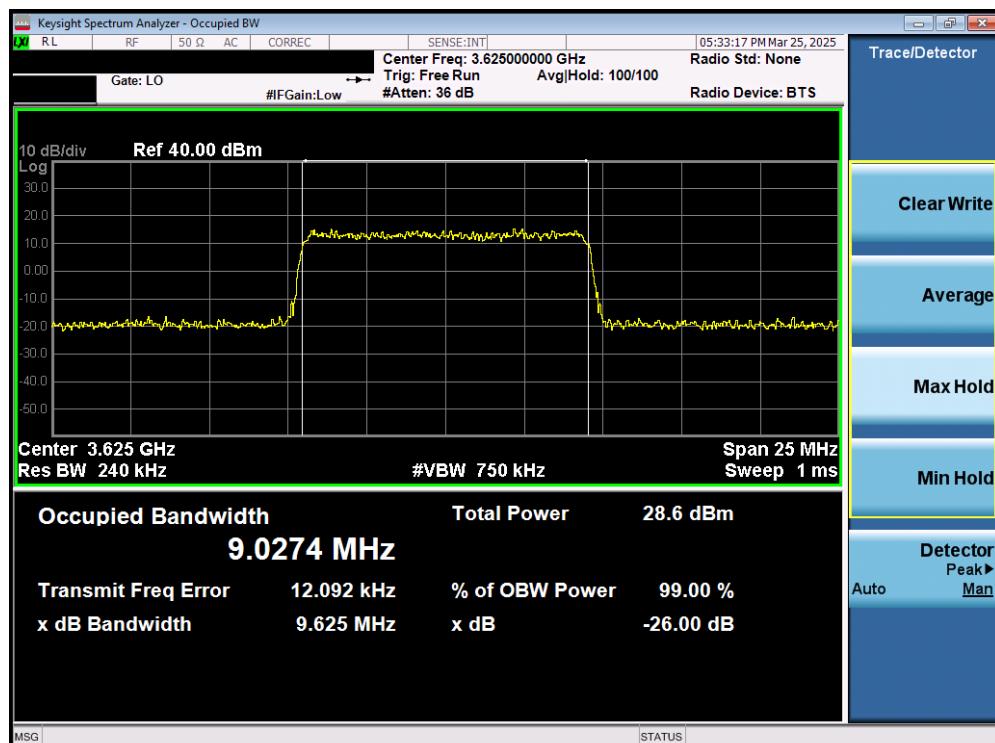


Plot 7.9. Occupied Bandwidth Plot (10MHz QPSK)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit		Page 20 of 64

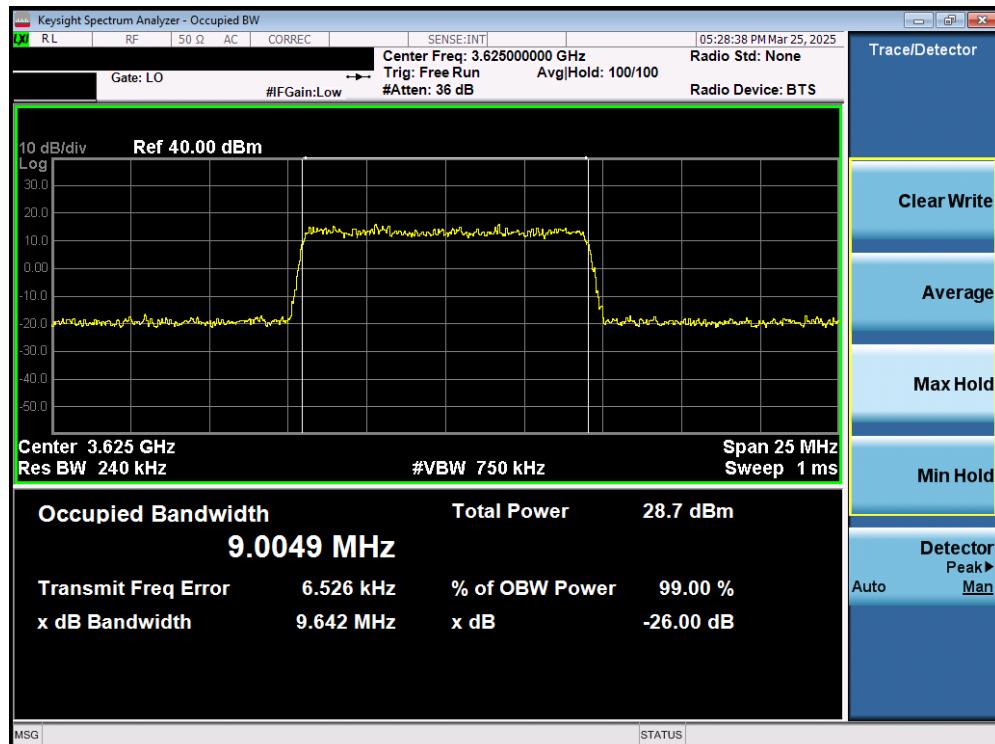


Plot 7.10. Occupied Bandwidth Plot (10MHz 16QAM)



Plot 7.11. Occupied Bandwidth Plot (10MHz 64QAM)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
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Plot 7.12. Occupied Bandwidth Plot (10MHz 256QAM)

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Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit		Page 22 of 64

## 7.4 Conducted Power / EIRP Per 10MHz

### Test Overview

The spectrum analyzer was connected to the antenna terminal while the EUT was operating at its maximum power control level, as defined in ANSI C63.26-2015, and at the appropriate frequencies. The spectrum analyzer was gated as to only measure during on periods.

***The e.i.r.p./10MHz for a Category B CBSD must be less than 47dBm/10MHz.***

***The e.i.r.p./10MHz for a Category A CBSD must be less than 30dBm/10MHz***

### Test Procedure Used

ANSI C63.26-2015 – Section 5.2.4.4.1

ANSI C63.26-2015 – Section 5.2.4.5

ANSI C63.26-2015 – Section 6.4.3.2.3

### Test Settings

1. Span = 2x to 3X the OBW
2. RBW = 10MHz
3. VBW  $\geq$  3 x RBW
4. Set number of sweep points  $\geq$  2 x span / RBW
5. Sweep Time = auto couple
6. Detector = RMS
7. Trace mode = average
8. Trigger = Level

### 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) Compliance with Category B limits is shown by comparison to the stricter Category A limit.

FCC ID: UPO308-0007-01		PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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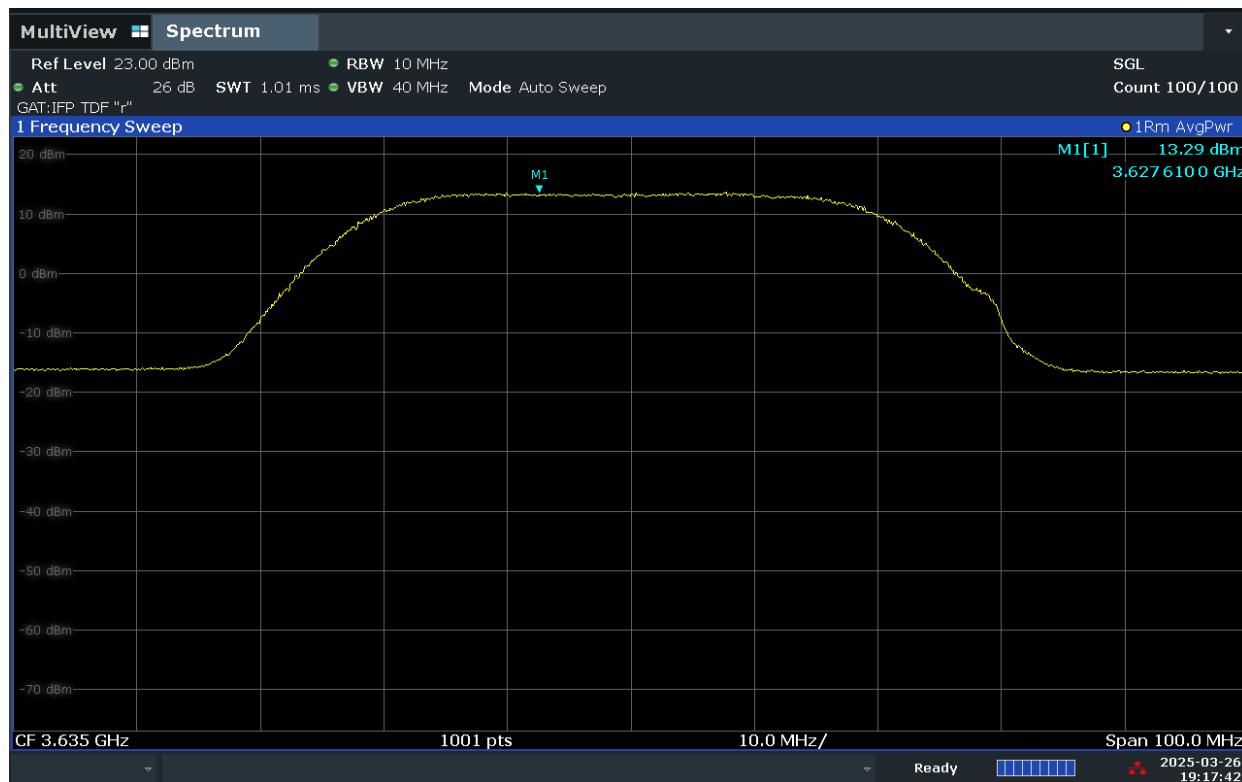
Bandwidth	Modulation	Channel	Frequency [MHz]	Conducted Power [dBm/10MHz]	Ant Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
20 MHz	QPSK	55340	3560.0	19.57	0.00	19.57	0.091	30.00	-10.43
		55990	3625.0	19.10	0.00	19.10	0.081	30.00	-10.90
		56640	3690.0	17.39	0.00	17.39	0.055	30.00	-12.61
	16-QAM	55340	3560.0	19.06	0.00	19.06	0.081	30.00	-10.94
		55990	3625.0	18.85	0.00	18.85	0.077	30.00	-11.15
		56640	3690.0	17.34	0.00	17.34	0.054	30.00	-12.66
	64-QAM	55340	3560.0	19.39	0.00	19.39	0.087	30.00	-10.61
		55990	3625.0	19.16	0.00	19.16	0.082	30.00	-10.84
		56640	3690.0	17.49	0.00	17.49	0.056	30.00	-12.51
	256-QAM	55340	3560.0	19.56	0.00	19.56	0.090	30.00	-10.44
		55990	3625.0	18.91	0.00	18.91	0.078	30.00	-11.09
		56640	3690.0	17.49	0.00	17.49	0.056	30.00	-12.51
10 MHz	QPSK	55290	3555.0	20.95	0.00	20.95	0.124	30.00	-9.05
		55990	3625.0	19.37	0.00	19.37	0.086	30.00	-10.63
		56690	3695.0	20.30	0.00	20.30	0.107	30.00	-9.70
	16-QAM	55290	3555.0	21.04	0.00	21.04	0.127	30.00	-8.96
		55990	3625.0	19.28	0.00	19.28	0.085	30.00	-10.72
		56690	3695.0	20.36	0.00	20.36	0.109	30.00	-9.64
	64-QAM	55290	3555.0	21.02	0.00	21.02	0.126	30.00	-8.98
		55990	3625.0	19.08	0.00	19.08	0.081	30.00	-10.92
		56690	3695.0	20.74	0.00	20.74	0.119	30.00	-9.26
	256-QAM	55290	3555.0	20.38	0.00	20.38	0.109	30.00	-9.62
		55990	3625.0	19.26	0.00	19.26	0.084	30.00	-10.74
		56690	3695.0	20.42	0.00	20.42	0.110	30.00	-9.58

**Table 7-5 E.I.R.P. / 10MHz Measurements**

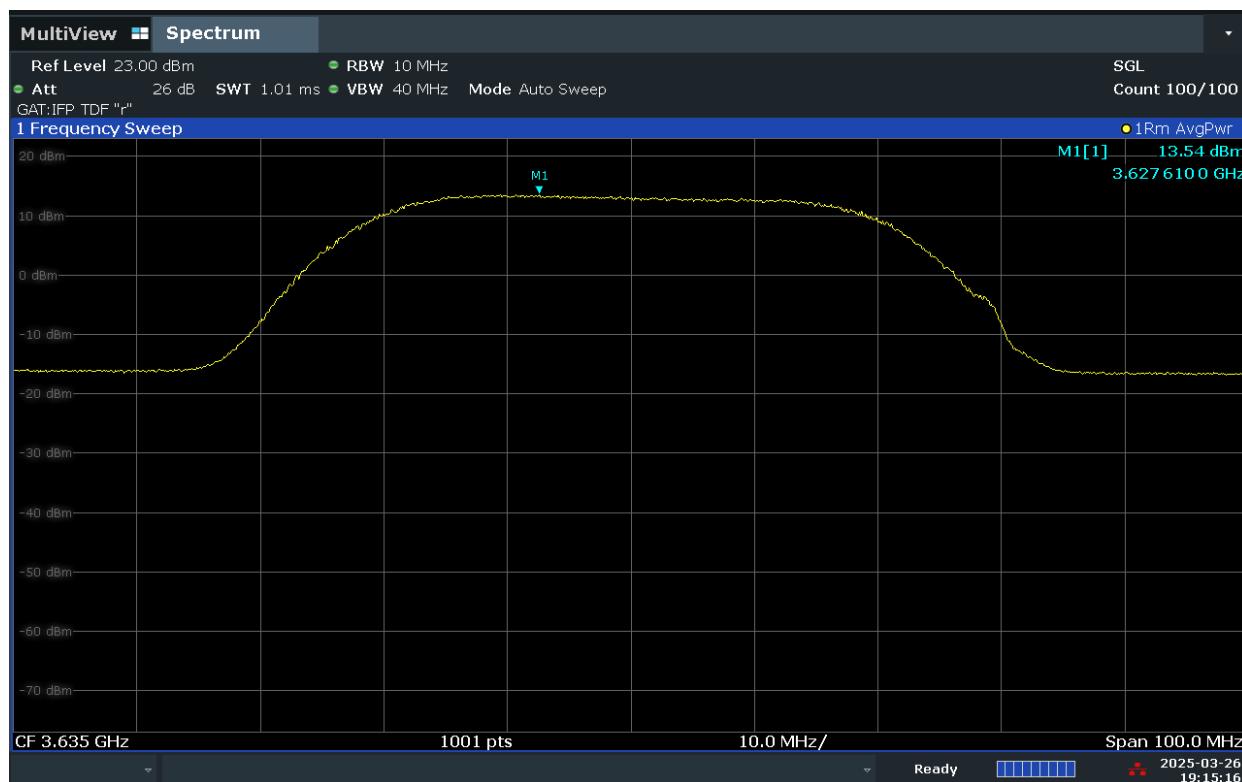
Bandwidth	Modulation	PCC		SCC		Conducted Power [dBm/10MHz]	Antenna Gain [dBi]	EIRP [dBm/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
		Bandwidth [MHz]	Frequency [MHz]	Bandwidth [MHz]	Frequency [MHz]					
40 MHz	QPSK	20	3560.0	20	3579.8	13.04	0.00	13.04	30.000	-16.96
		20	3625.0	20	3644.8	13.29	0.00	13.29	30.000	-16.71
		20	3690.0	20	3670.2	14.31	0.00	14.31	30.000	-15.69
	16QAM	20	3560.0	20	3579.8	15.71	0.00	15.71	30.000	-14.29
		20	3625.0	20	3644.8	13.54	0.00	13.54	30.000	-16.46
		20	3690.0	20	3670.2	14.35	0.00	14.35	30.000	-15.65
	64QAM	20	3560.0	20	3579.8	15.67	0.00	15.67	30.000	-14.33
		20	3625.0	20	3644.8	13.81	0.00	13.81	30.000	-16.19
		20	3690.0	20	3670.2	14.03	0.00	14.03	30.000	-15.97
	256QAM	20	3560.0	20	3579.8	15.09	0.00	15.09	30.000	-14.91
		20	3625.0	20	3644.8	13.70	0.00	13.70	30.000	-16.30
		20	3690.0	20	3670.2	14.35	0.00	14.35	30.000	-15.65

**Table 7-6 CA E.I.R.P. / 10MHz Measurements**

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT					Approved by: Technical Manager
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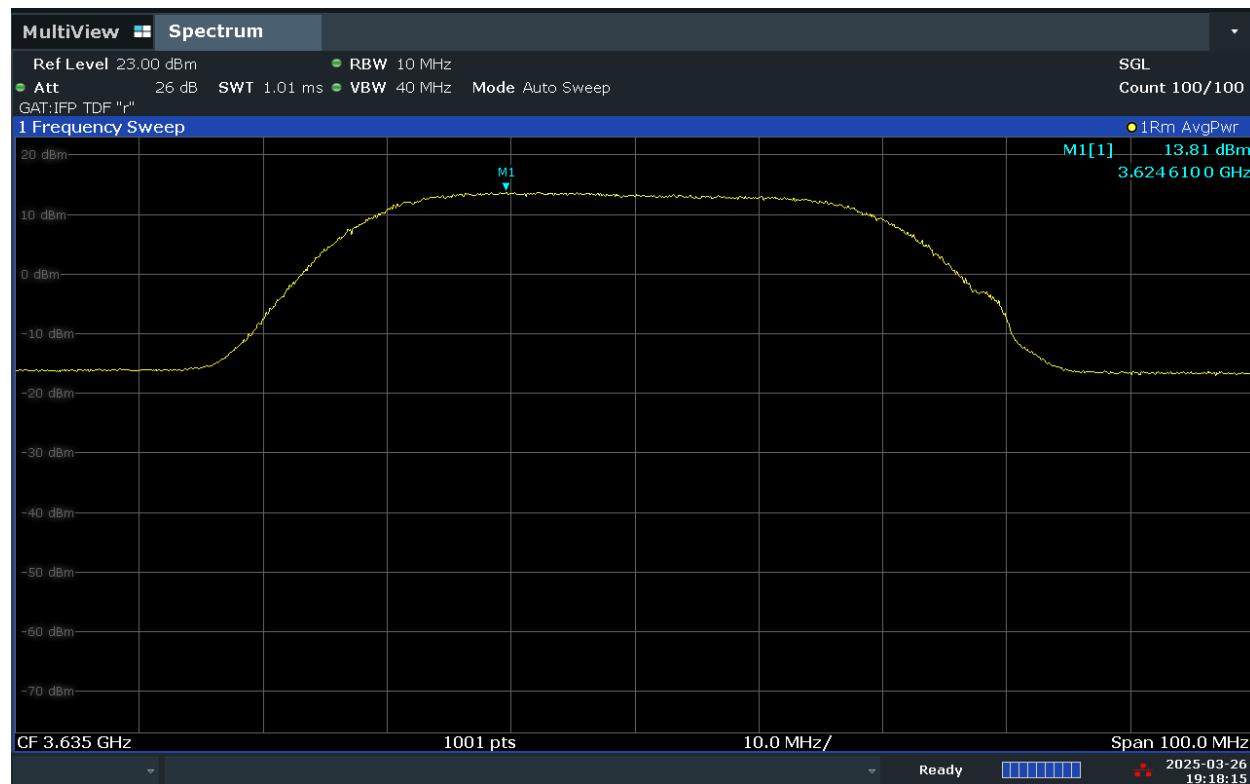


Plot 7.13. Power/10MHz Plot (20+20MHz QPSK – Mid Channel)

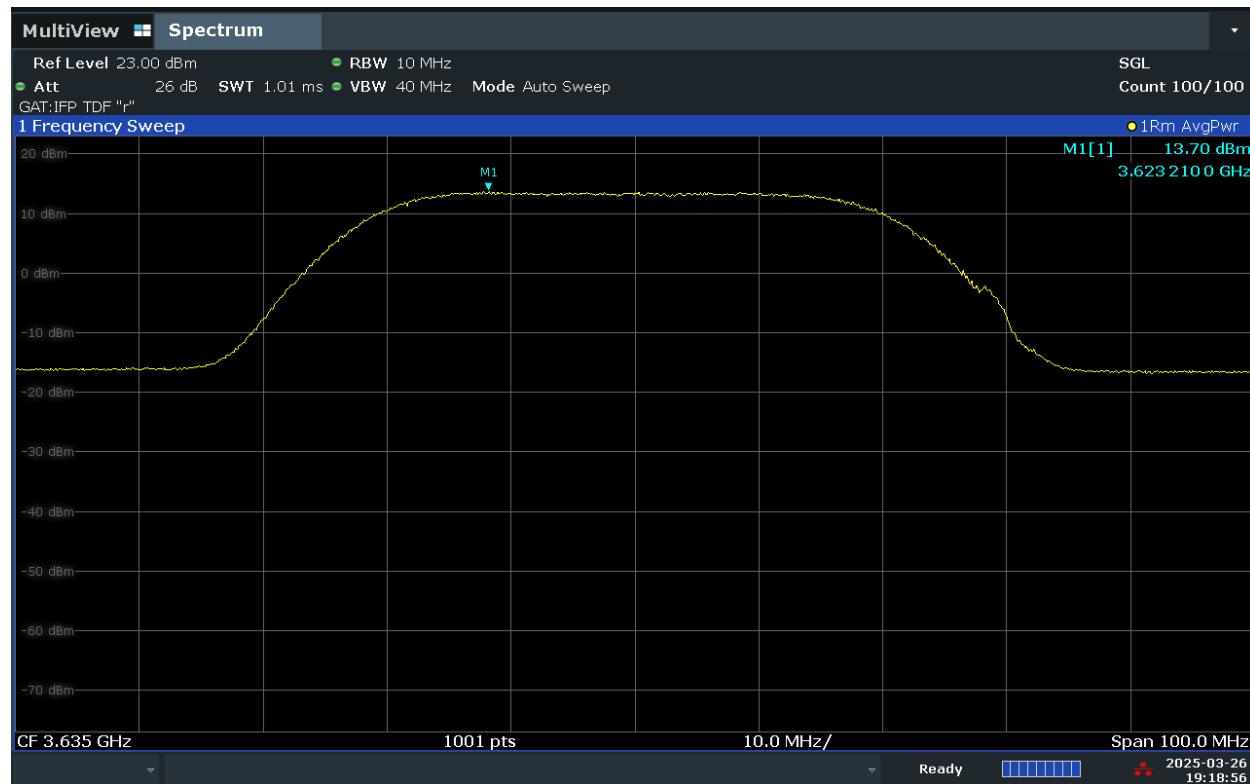


Plot 7.14. Power/10MHz Plot (20+20MHz 16QAM – Mid Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit	Page 25 of 64

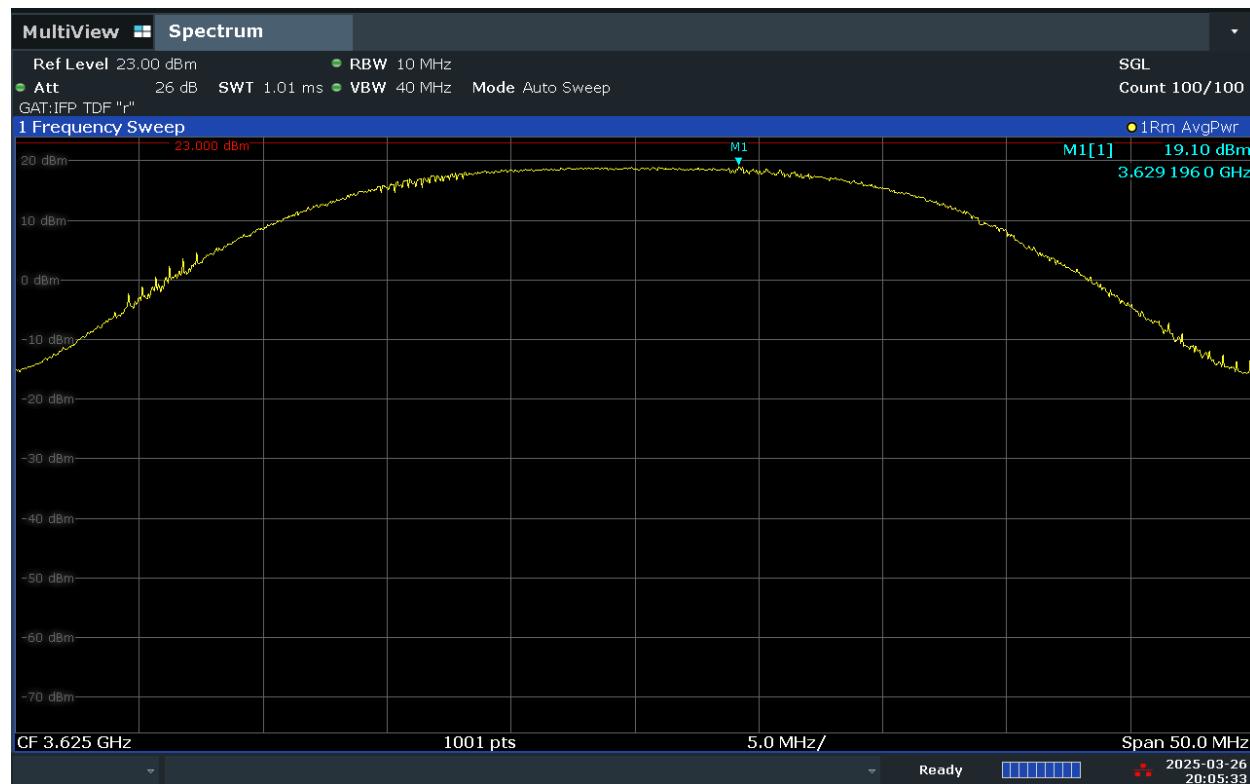


Plot 7.15. Power/10MHz Plot (20+20MHz 64QAM – Mid Channel)

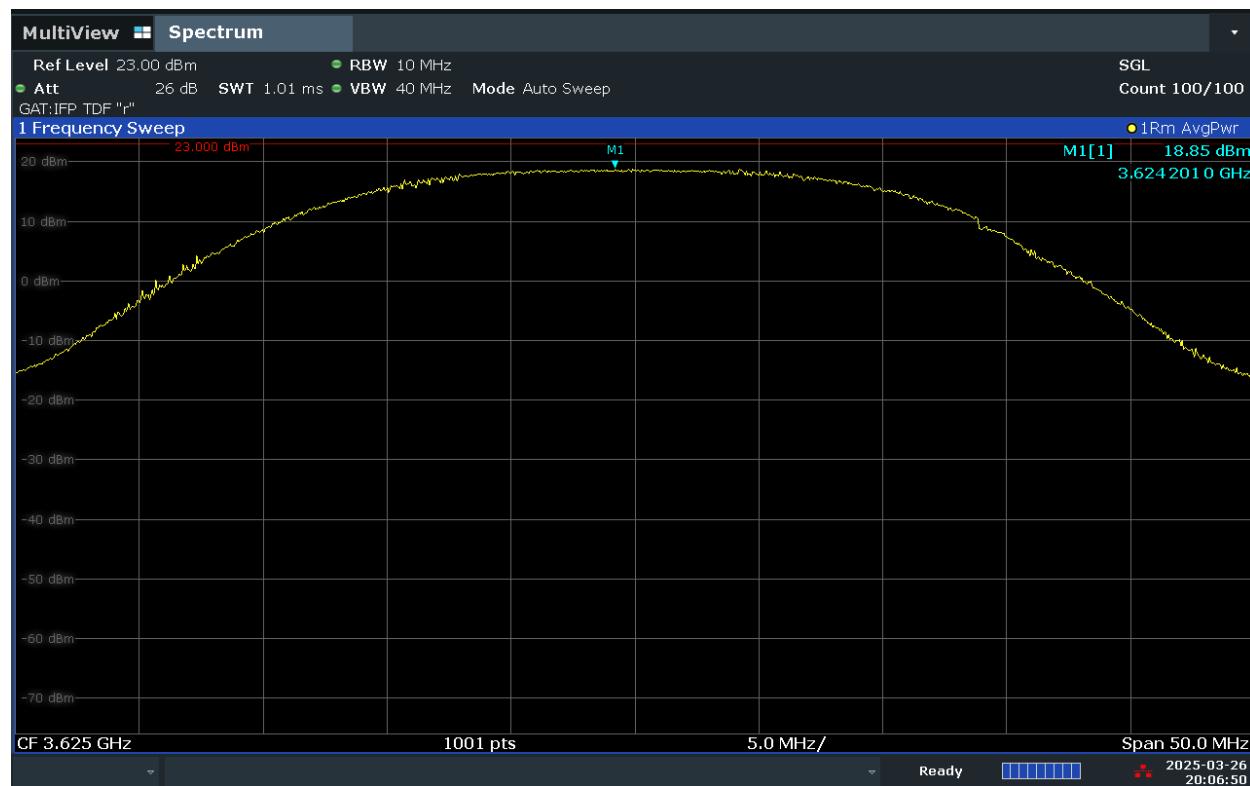


Plot 7.16. Power/10MHz Plot (20+20MHz 256QAM – Mid Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit	Page 26 of 64

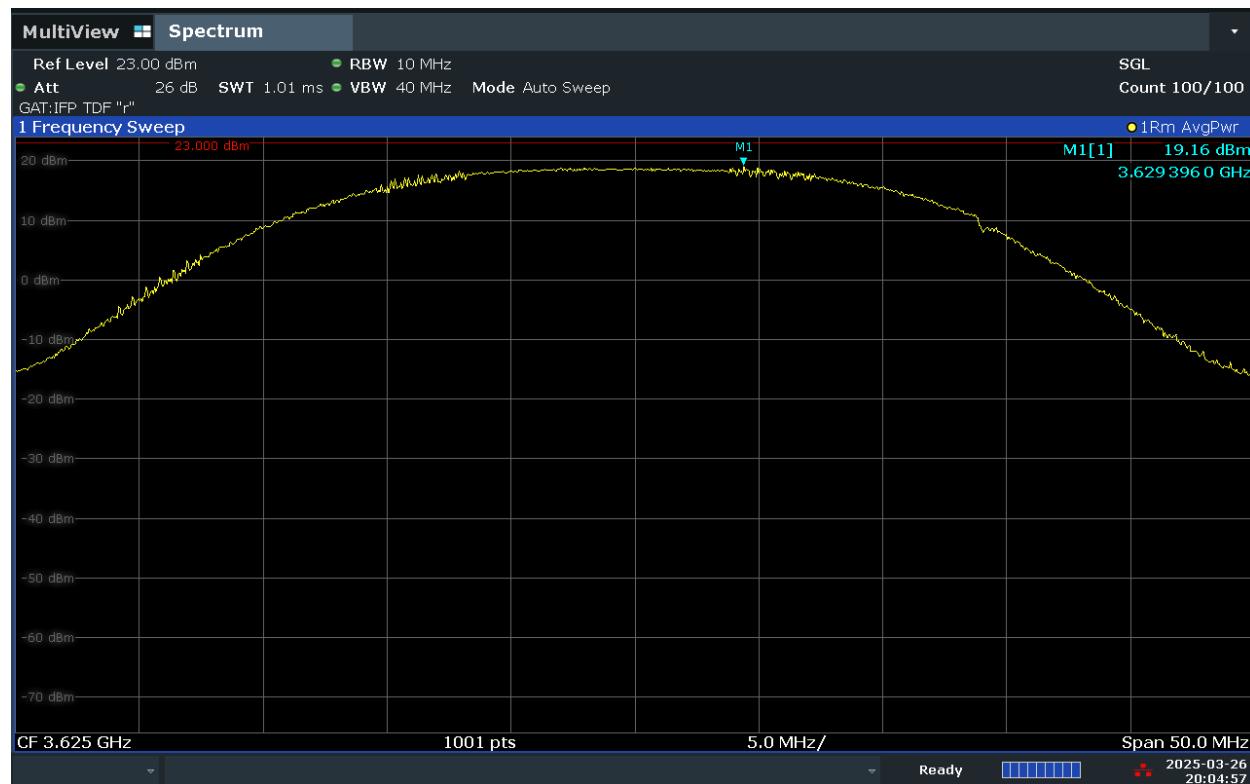


Plot 7.17. Power/10MHz Plot (20MHz QPSK – Mid Channel)

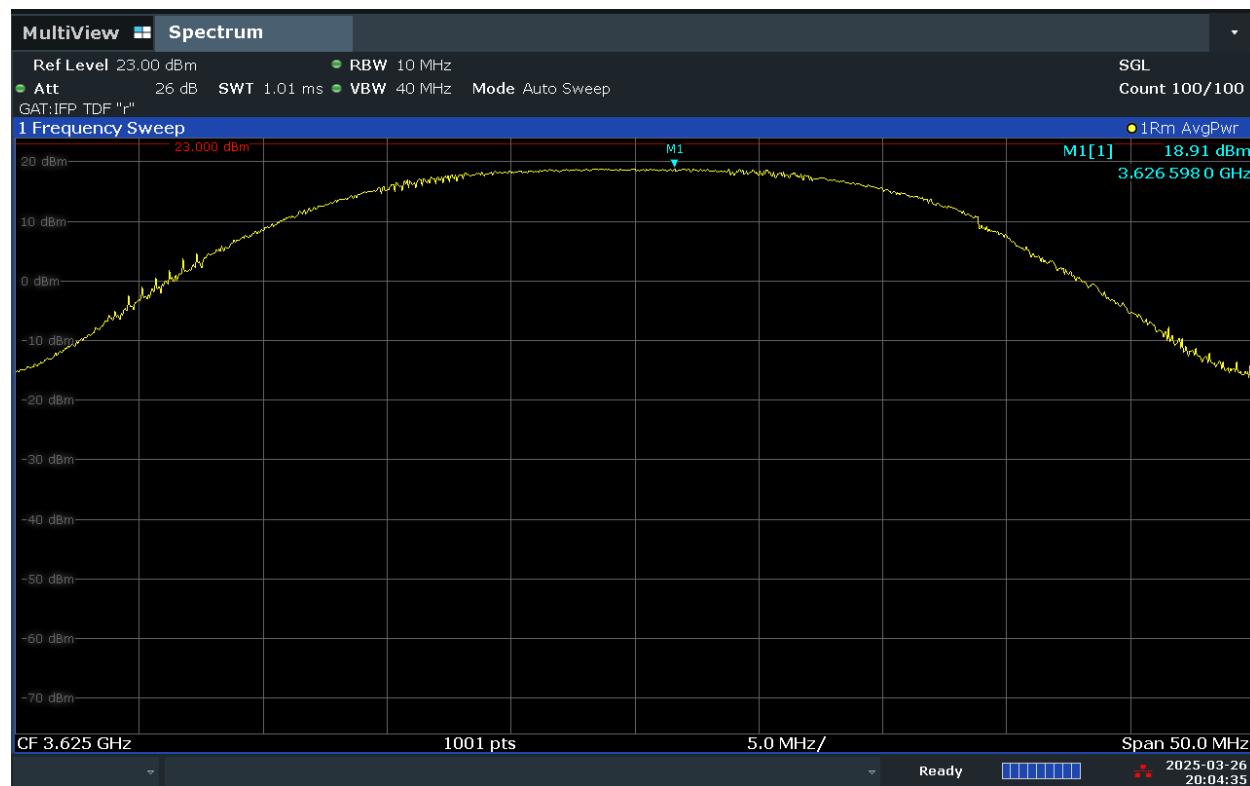


Plot 7.18. Power/10MHz Plot (20MHz 16QAM – Mid Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit	Page 27 of 64

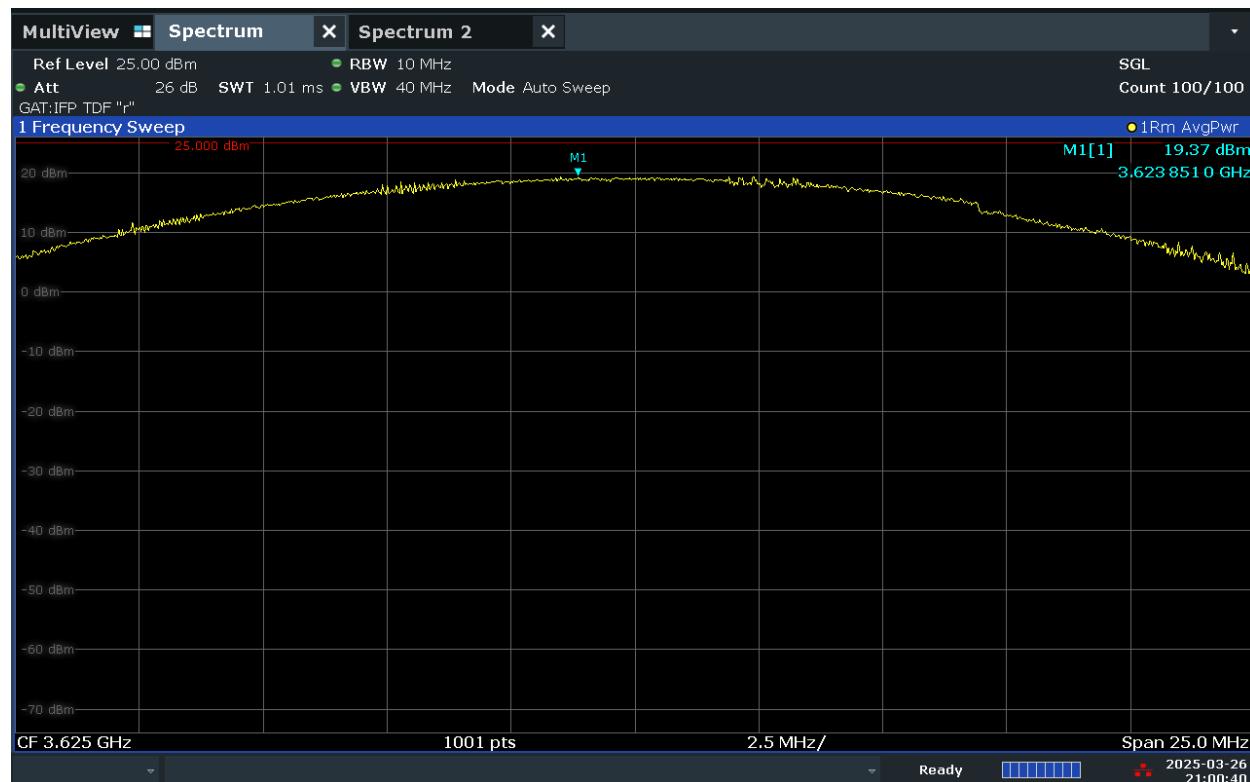


Plot 7.19. Power/10MHz Plot (20MHz 64QAM – Mid Channel)

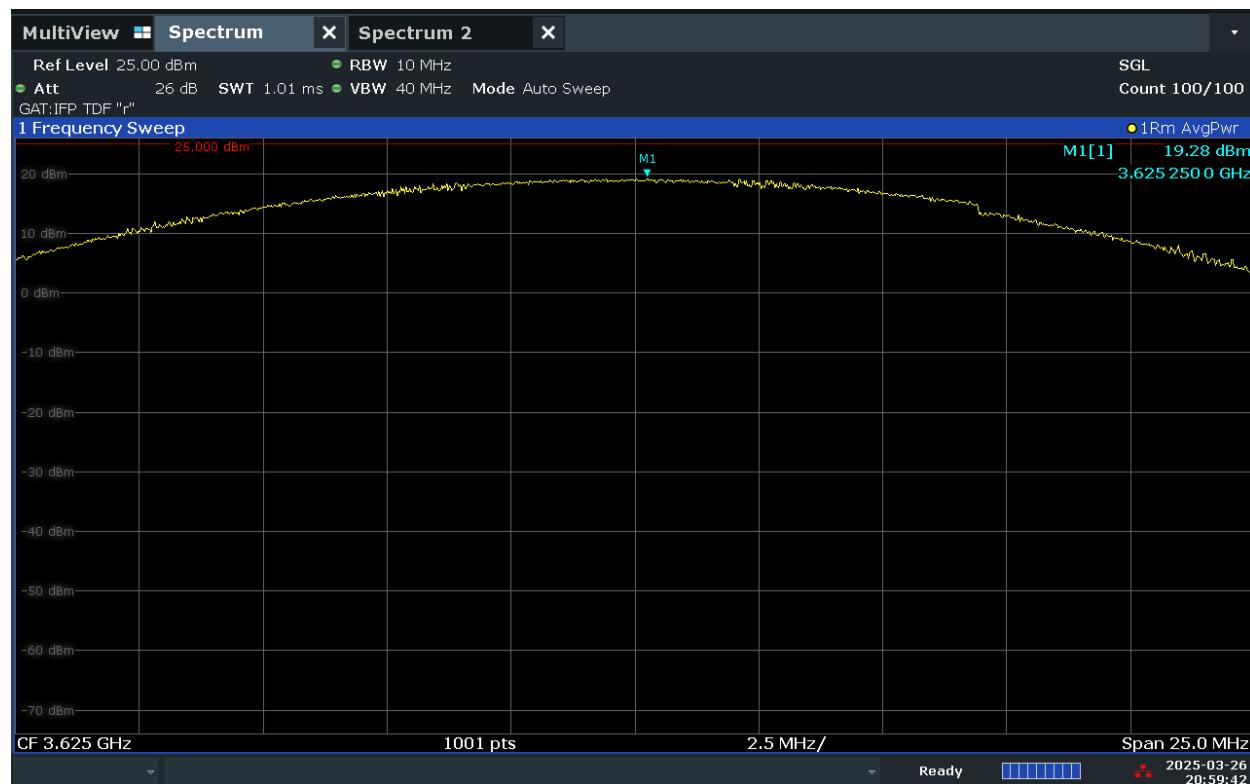


Plot 7.20. Power/10MHz Plot (20MHz 256QAM – Mid Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit	Page 28 of 64

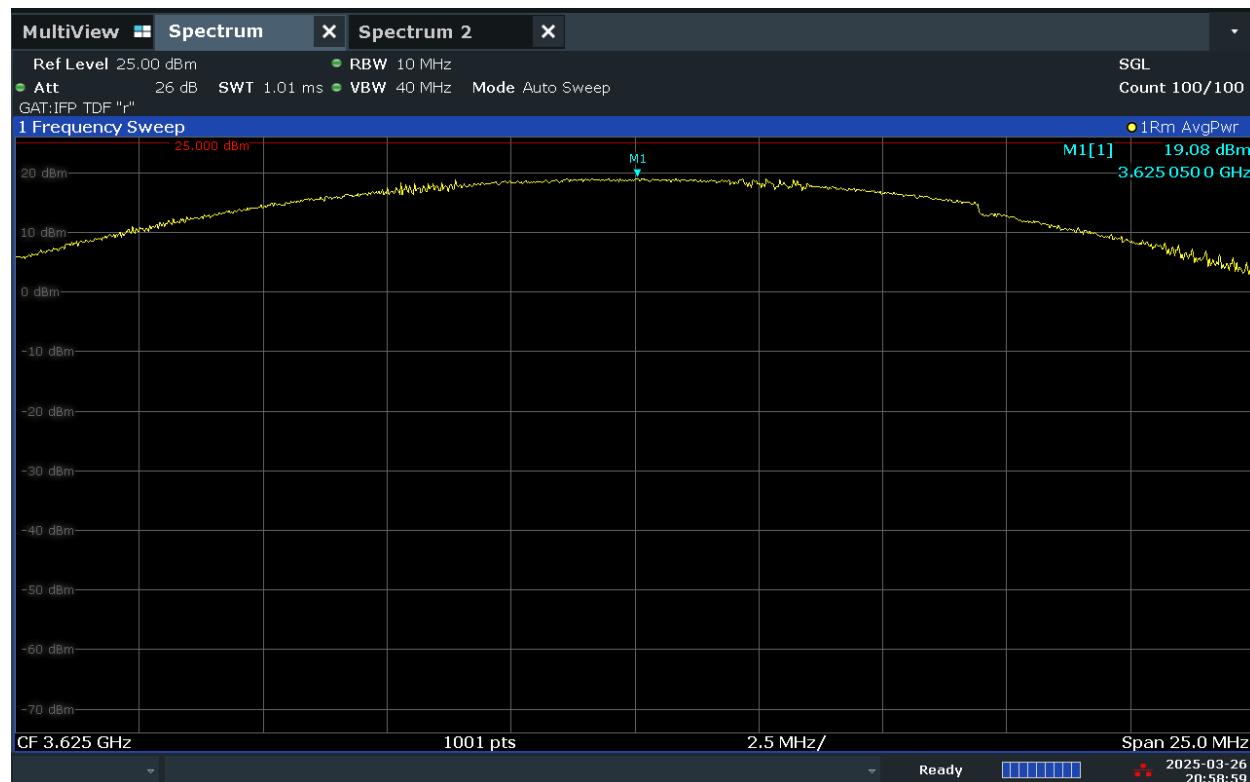


Plot 7.21. Power/10MHz Plot (10MHz QPSK – Mid Channel)

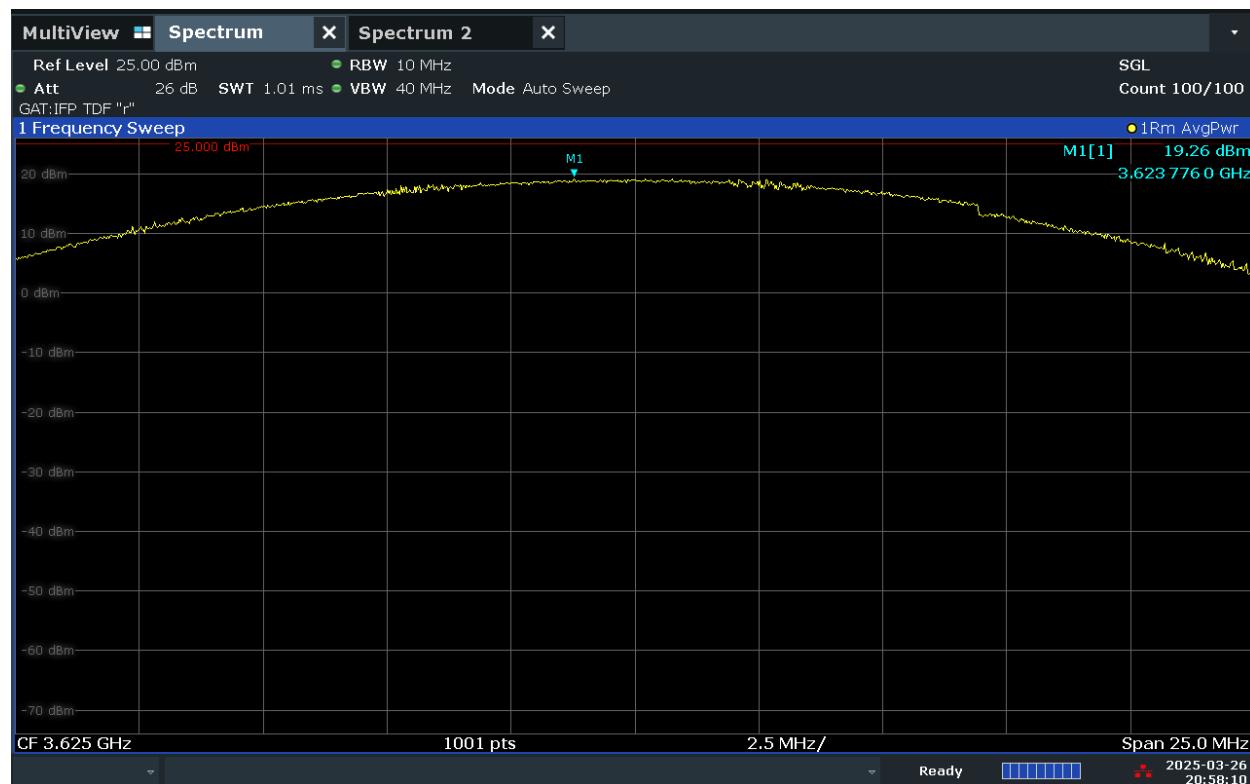


Plot 7.22. Power/10MHz Plot (10MHz 16QAM – Mid Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7.23. Power/10MHz Plot (10MHz 64QAM – Mid Channel)



Plot 7.24. Power/10MHz Plot (10MHz 256QAM – Mid Channel)

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Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit	Page 30 of 64

## 7.5 Power Spectral Density

### Test Overview

The spectrum analyzer was connected to the antenna terminal while the EUT was operating at its maximum power control level, as defined in ANSI C63.26-2015, and at the appropriate frequencies. The spectrum analyzer was gated as to only measure during on periods.

***The power spectral density for a Category B CBSD must be less than 37dBm/MHz.***

***The power spectral density for a Category A CBSD must be less than 20dBm/MHz***

### Test Procedure Used

ANSI C63.26-2015 – Section 5.2.4.4.1

ANSI C63.26-2015 – Section 5.2.4.5

ANSI C63.26-2015 – Section 6.4.3.2.3

### Test Settings

9. Span = 2x to 3X the OBW
10. RBW = 10MHz
11. VBW  $\geq$  3 x RBW
12. Set number of sweep points  $\geq$  2 x span / RBW
13. Sweep Time = auto couple
14. Detector = RMS
15. Trace mode = average
16. Trigger = Level

### 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

1. Compliance with Category B limits is shown by comparison to the stricter Category A limit.

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit	Page 31 of 64

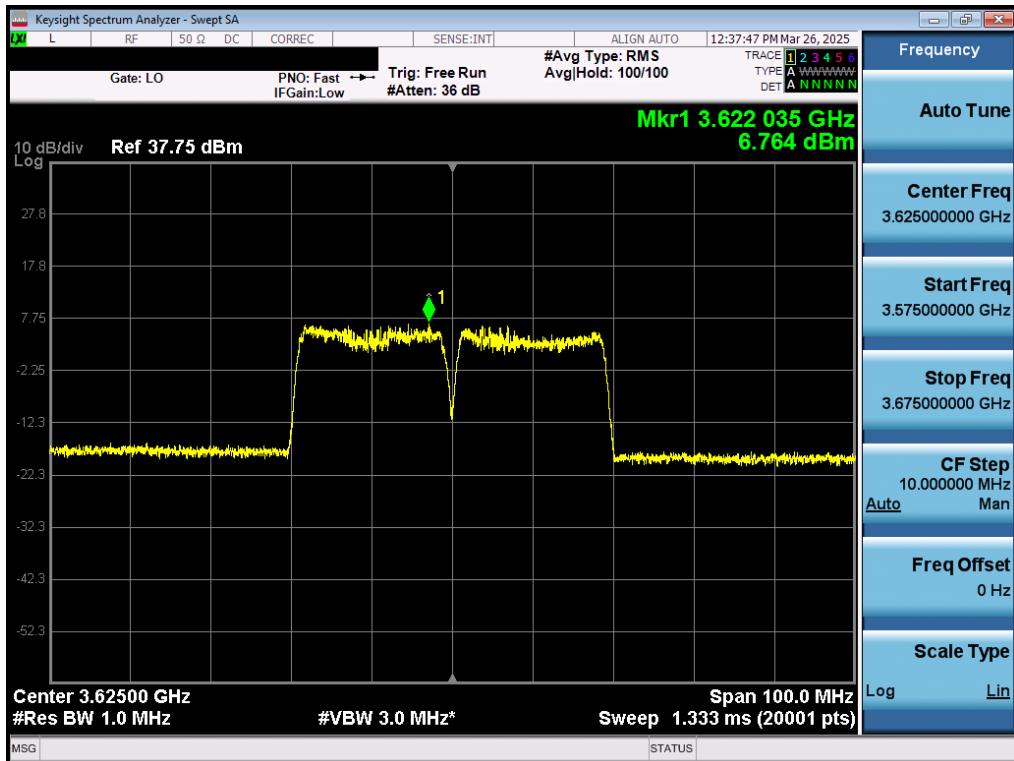
Bandwidth	Modulation	Channel	Frequency [MHz]	Conducted PSD [dBm/MHz]	Ant Gain [dBi]	EIRP PSD [dBm/MHz]	EIRP PSD [Watts/MHz]	EIRP PSD Limit [dBm/MHz]	Margin [dB]
20 MHz	QPSK	55340	3560.0	10.86	0.00	10.86	0.012	20.00	-9.14
		55990	3625.0	9.07	0.00	9.07	0.008	20.00	-10.93
		56640	3690.0	9.33	0.00	9.33	0.009	20.00	-10.67
	16-QAM	55340	3560.0	10.55	0.00	10.55	0.011	20.00	-9.45
		55990	3625.0	10.28	0.00	10.28	0.011	20.00	-9.72
		56640	3690.0	9.65	0.00	9.65	0.009	20.00	-10.35
	64-QAM	55340	3560.0	11.00	0.00	11.00	0.013	20.00	-9.00
		55990	3625.0	10.15	0.00	10.15	0.010	20.00	-9.85
		56640	3690.0	9.07	0.00	9.07	0.008	20.00	-10.93
	256-QAM	55340	3560.0	10.86	0.00	10.86	0.012	20.00	-9.14
		55990	3625.0	9.91	0.00	9.91	0.010	20.00	-10.09
		56640	3690.0	8.88	0.00	8.88	0.008	20.00	-11.13
10 MHz	QPSK	55290	3555.0	13.73	0.00	13.73	0.024	20.00	-6.27
		55990	3625.0	12.23	0.00	12.23	0.017	20.00	-7.77
		56690	3695.0	11.20	0.00	11.20	0.013	20.00	-8.80
	16-QAM	55290	3555.0	13.03	0.00	13.03	0.020	20.00	-6.97
		55990	3625.0	12.19	0.00	12.19	0.017	20.00	-7.81
		56690	3695.0	11.53	0.00	11.53	0.014	20.00	-8.47
	64-QAM	55290	3555.0	13.28	0.00	13.28	0.021	20.00	-6.72
		55990	3625.0	12.13	0.00	12.13	0.016	20.00	-7.87
		56690	3695.0	11.51	0.00	11.51	0.014	20.00	-8.49
	256-QAM	55290	3555.0	12.92	0.00	12.92	0.020	20.00	-7.08
		55990	3625.0	12.18	0.00	12.18	0.017	20.00	-7.82
		56690	3695.0	11.32	0.00	11.32	0.014	20.00	-8.68

**Table 7-7 Power Spectral Density Measurements**

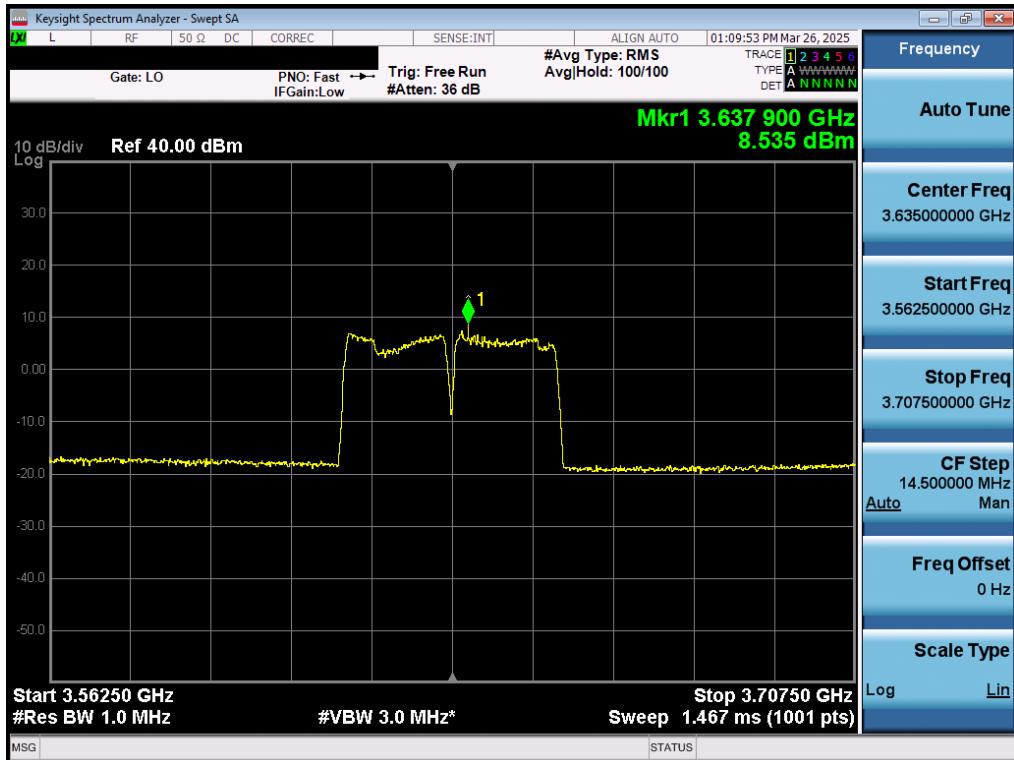
Bandwidth	Modulation	PCC		SCC		Conducted PSD [dBm/MHz]	Antenna Gain [dBi]	EIRP PSD [dBm/MHz]	EIRP PSD Limit [dBm/MHz]	Margin [dB]
		Bandwidth [MHz]	Frequency [MHz]	Bandwidth [MHz]	Frequency [MHz]					
40 MHz	QPSK	20	3560.0	20	3579.8	8.54	0.00	21.42	20.00	1.42
		20	3625.0	20	3644.8	6.76	0.00	20.92	20.00	0.92
		20	3690.0	20	3670.2	7.90	0.00	20.36	20.00	0.36
	16QAM	20	3560.0	20	3579.8	8.29	0.00	21.32	20.00	1.32
		20	3625.0	20	3644.8	8.54	0.00	20.73	20.00	0.73
		20	3690.0	20	3670.2	8.44	0.00	20.34	20.00	0.34
	64QAM	20	3560.0	20	3579.8	8.35	0.00	21.33	20.00	1.33
		20	3625.0	20	3644.8	7.73	0.00	20.65	20.00	0.65
		20	3690.0	20	3670.2	7.84	0.00	20.27	20.00	0.27
	256QAM	20	3560.0	20	3579.8	8.13	0.00	20.90	20.00	0.90
		20	3625.0	20	3644.8	7.42	0.00	20.56	20.00	0.56
		20	3690.0	20	3670.2	8.08	0.00	20.23	20.00	0.23

**Table 7-8 CA Power Spectral Density Measurements**

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT					Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit				Page 32 of 64

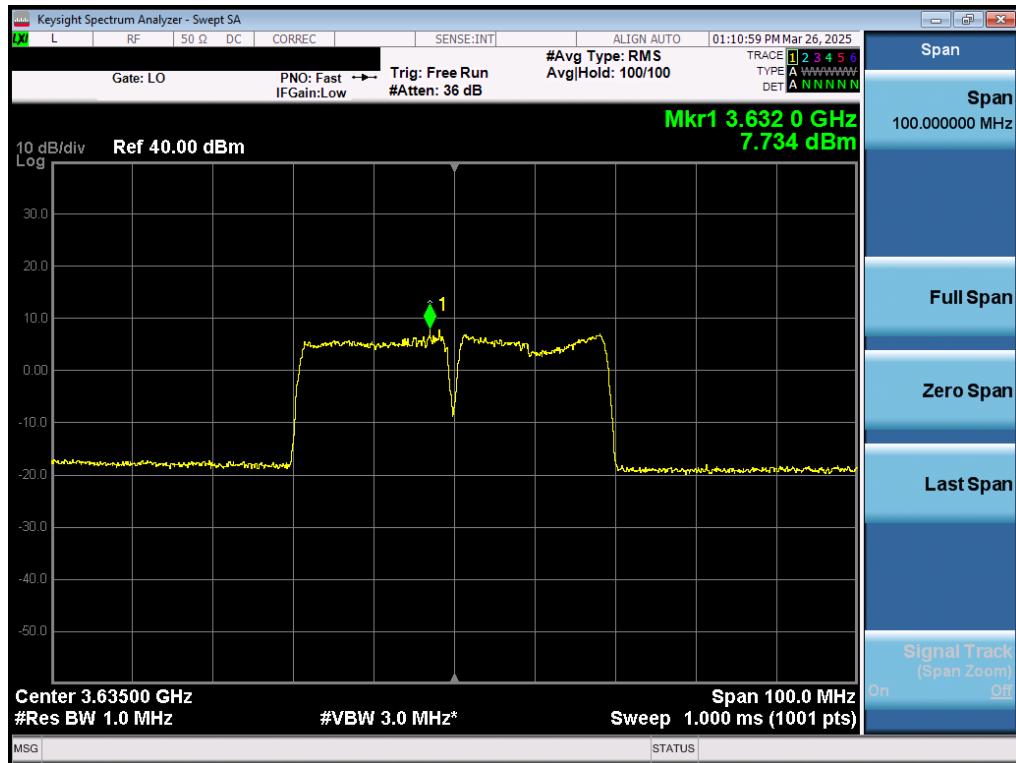


Plot 7.25. Power Spectral Density Plot (20+20MHz QPSK – Mid Channel)

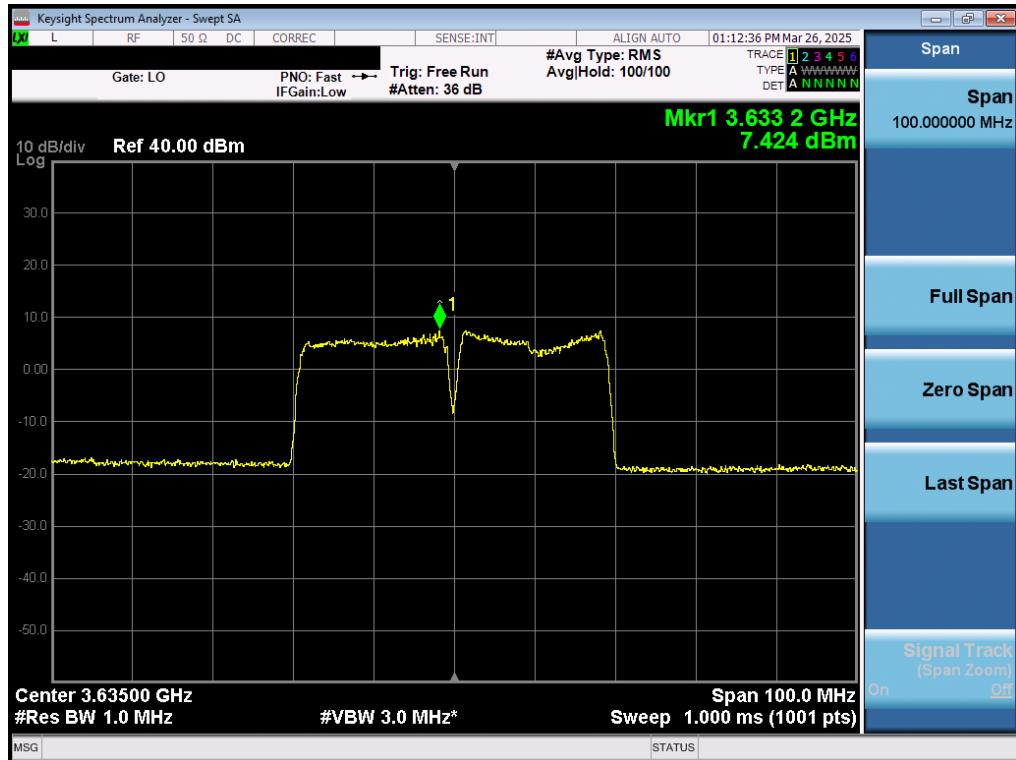


Plot 7.26. Power Spectral Density Plot (20+20MHz 16QAM – Mid Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit	Page 33 of 64

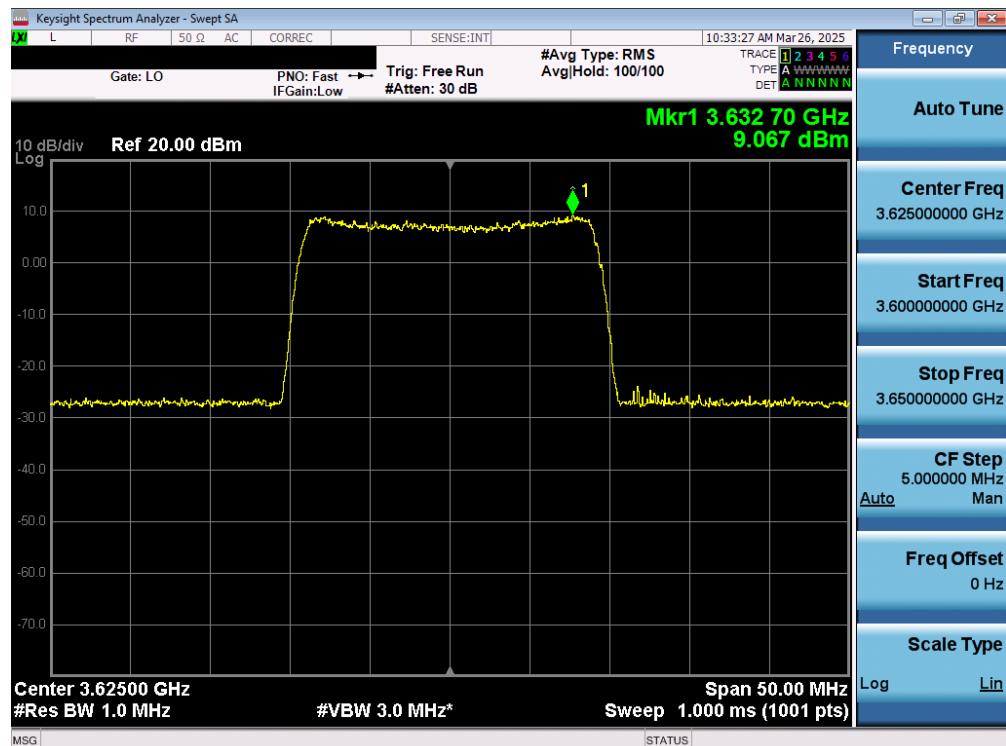


Plot 7.27. Power Spectral Density Plot (20+20MHz 64QAM- Mid Channel)

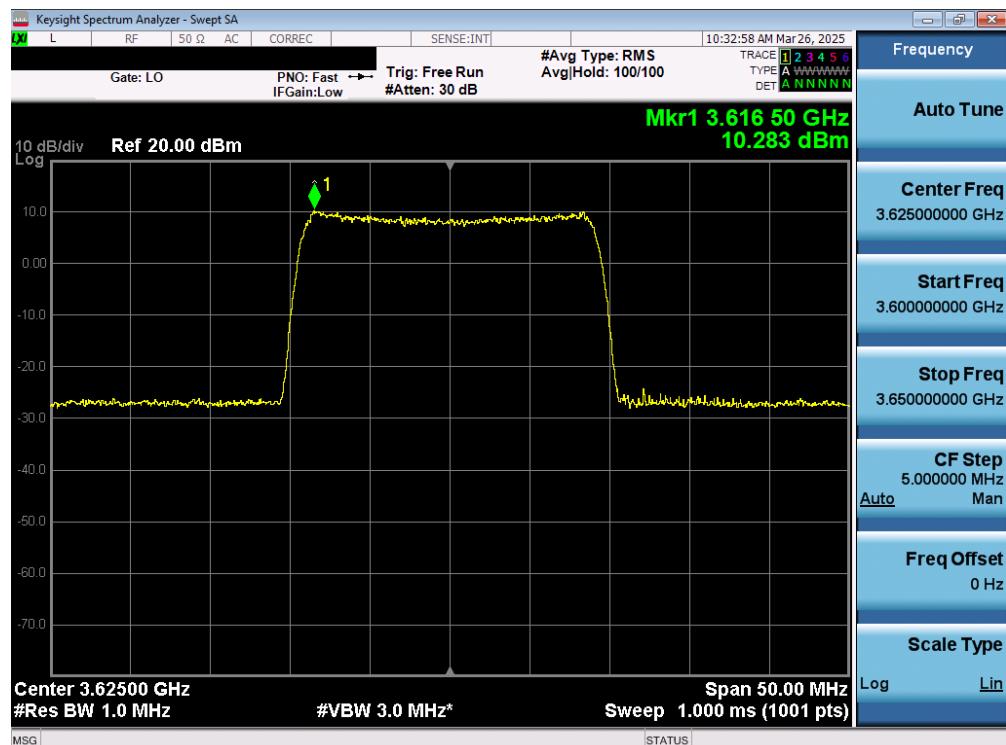


Plot 7.28. Power Spectral Density Plot (20+20MHz 256QAM- Mid Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit		Page 34 of 64

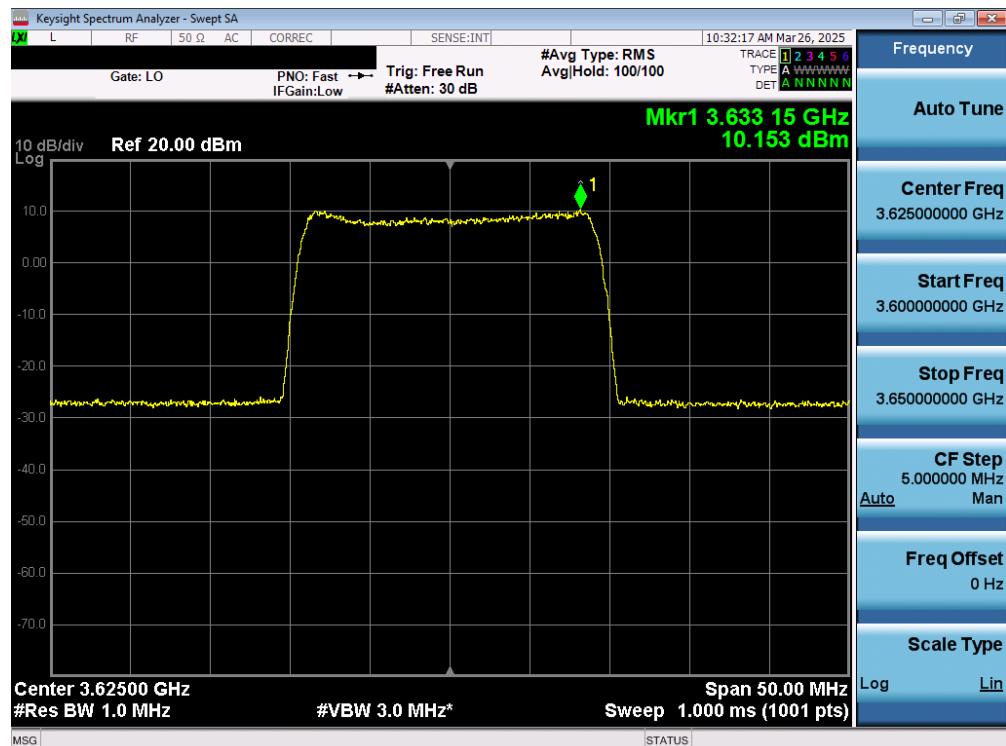


Plot 7.29. Power Spectral Density Plot (20MHz QPSK – Mid Channel)

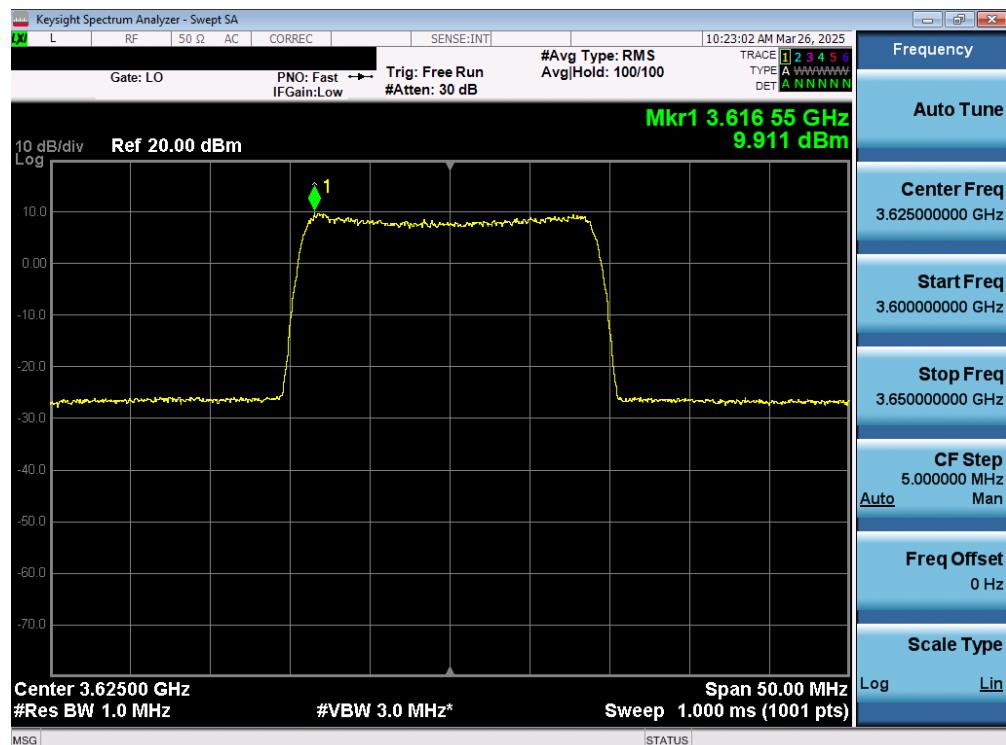


Plot 7.30. Power Spectral Density Plot (20MHz 16QAM – Mid Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit	Page 35 of 64

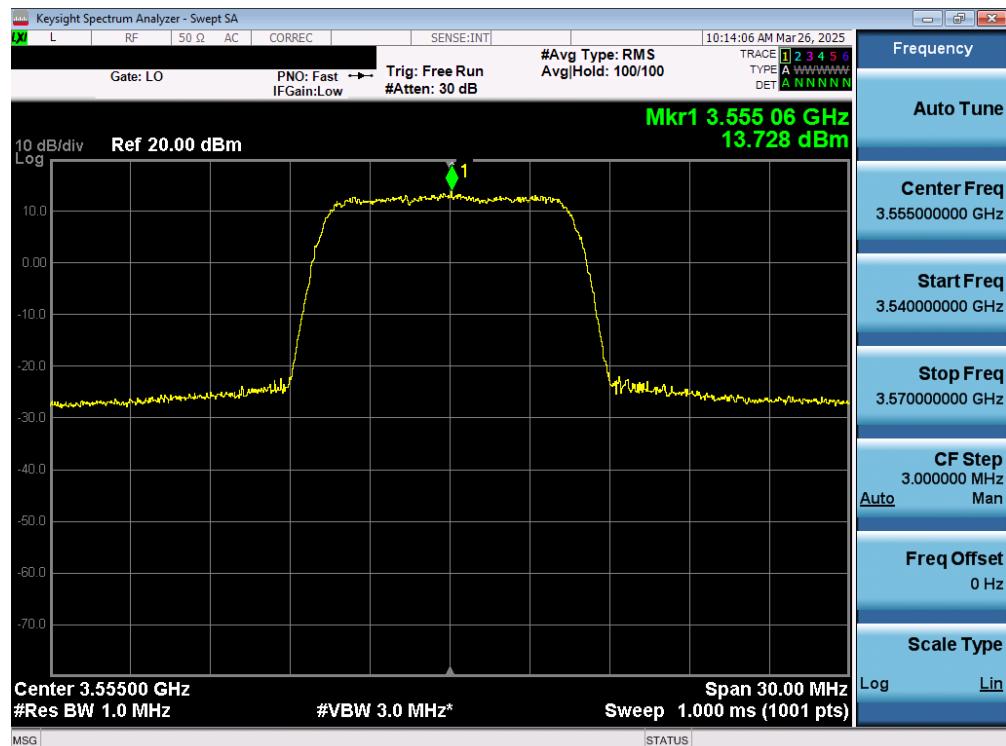


Plot 7.31. Power Spectral Density Plot (20MHz 64QAM – Mid Channel)

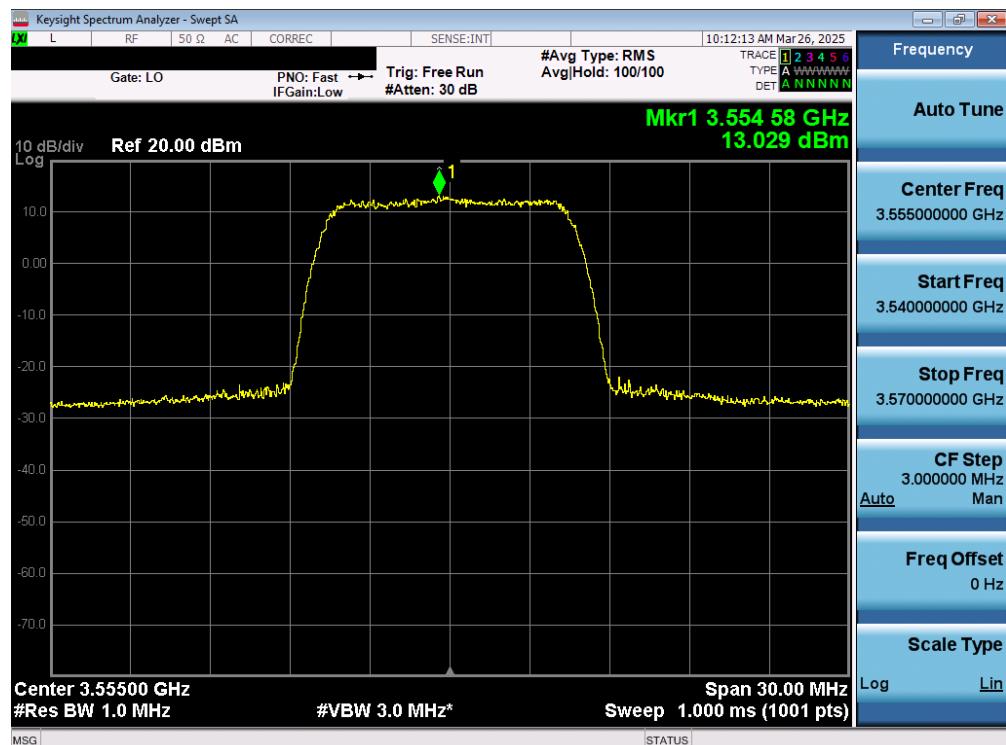


Plot 7.32. Power Spectral Density Plot (20MHz 256QAM – Mid Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
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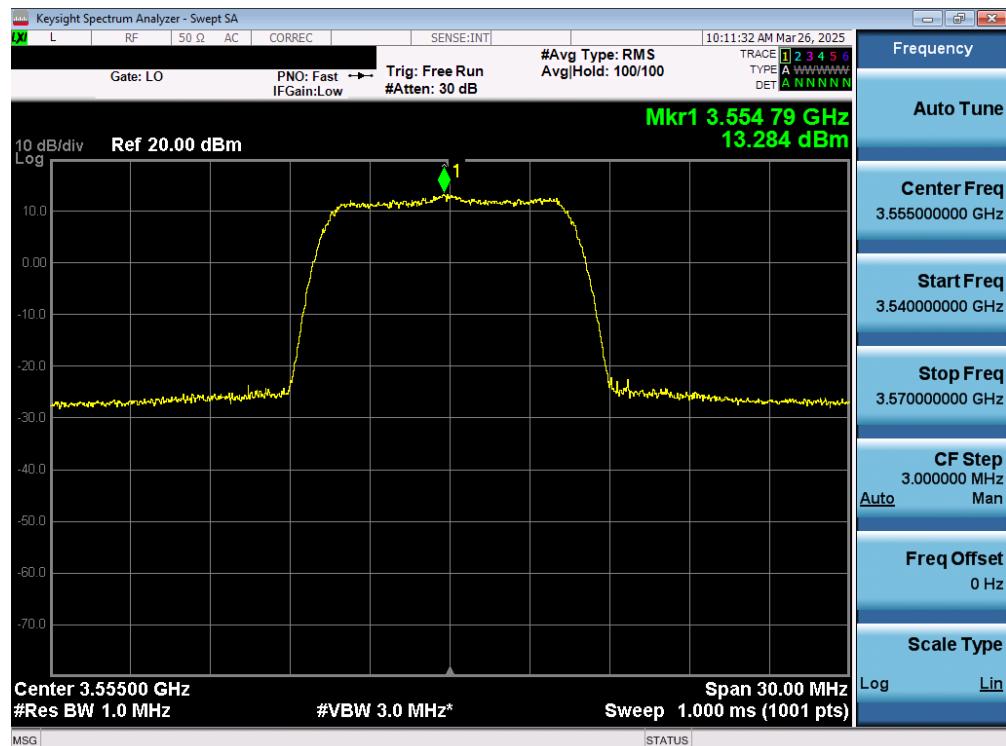


Plot 7.33. Power Spectral Density Plot (10MHz QPSK – Low Channel)

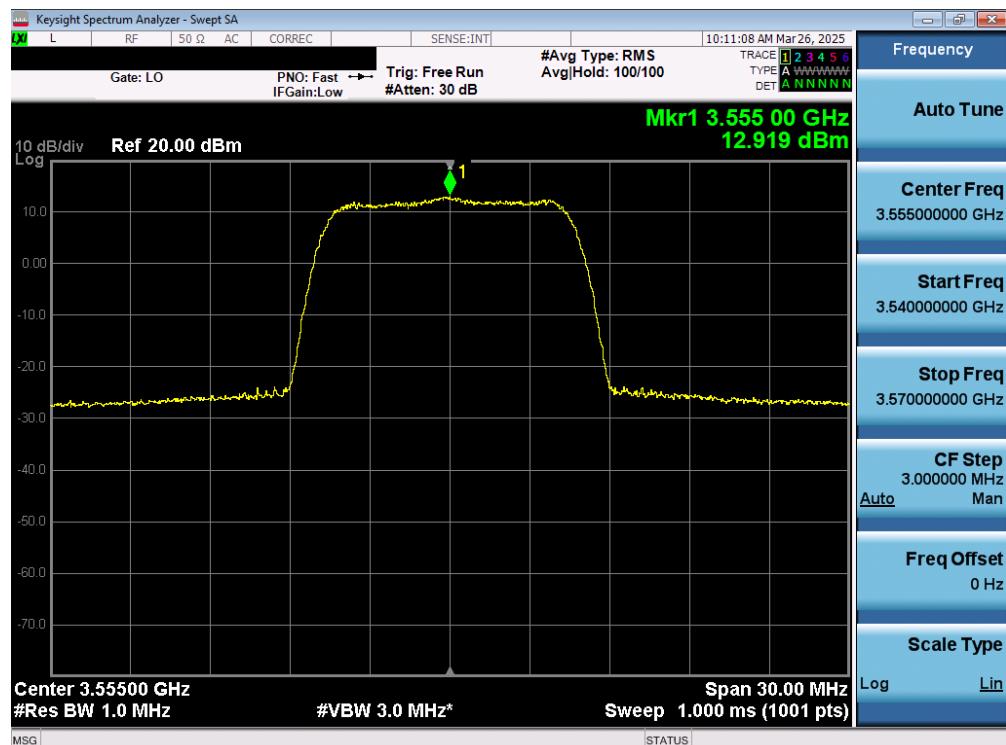


Plot 7.34. Power Spectral Density Plot (10MHz 16QAM – Low Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
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Plot 7.35. Power Spectral Density Plot (10MHz 64QAM – Low Channel)



Plot 7.36. Power Spectral Density Plot (10MHz 256QAM – Low Channel)

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## 7.6 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 10<sup>th</sup> 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 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.

***The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.***

### Test Procedure Used

ANSI C63.26-2015 – Section 5.7.4

### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 \* the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = Average
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

### Test Setup

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



**Figure 7-5. Test Instrument & Measurement Setup**

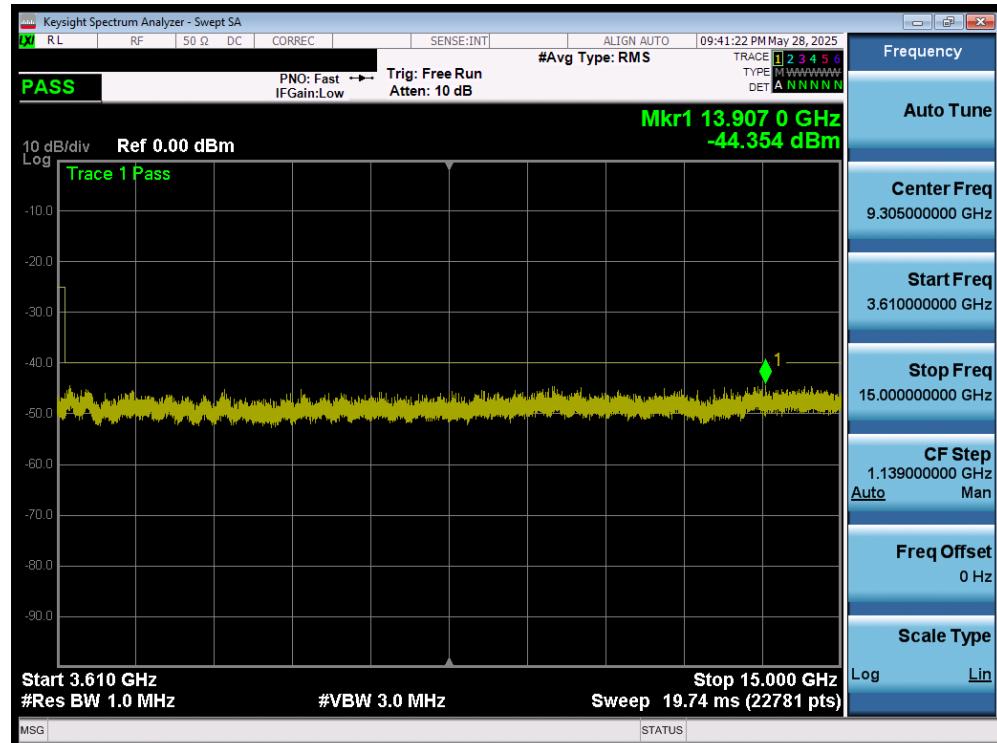
### Test Notes

1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.
2. For Spurious Emissions plots starting below 3530MHz or above 3720MHz, compliance in the omitted spectrum is verified by the Band Edge Emissions results in section 7.7.

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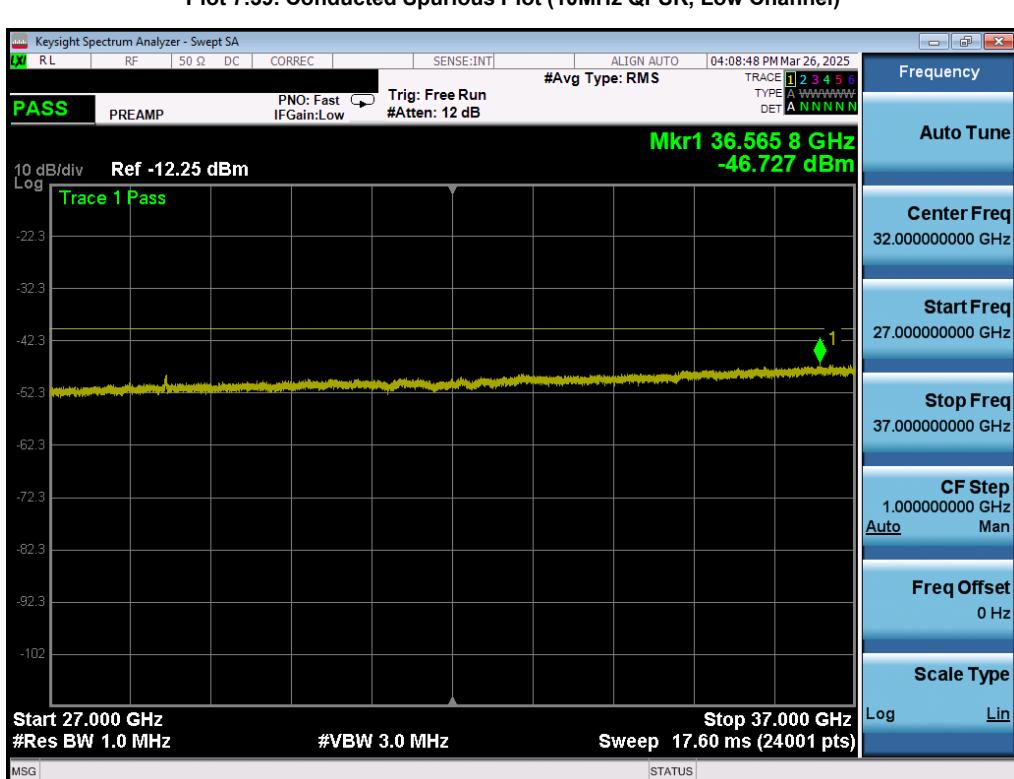


Plot 7.37. Conducted Spurious Plot (10MHz QPSK, Low Channel)

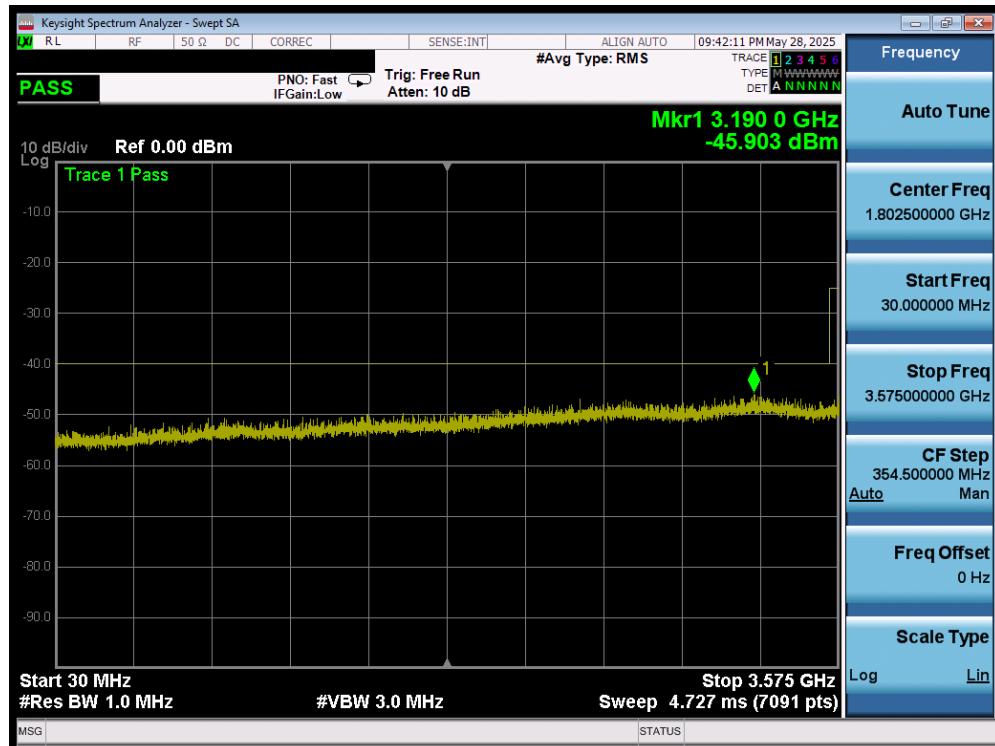


Plot 7.38. Conducted Spurious Plot (10MHz QPSK, Low Channel)

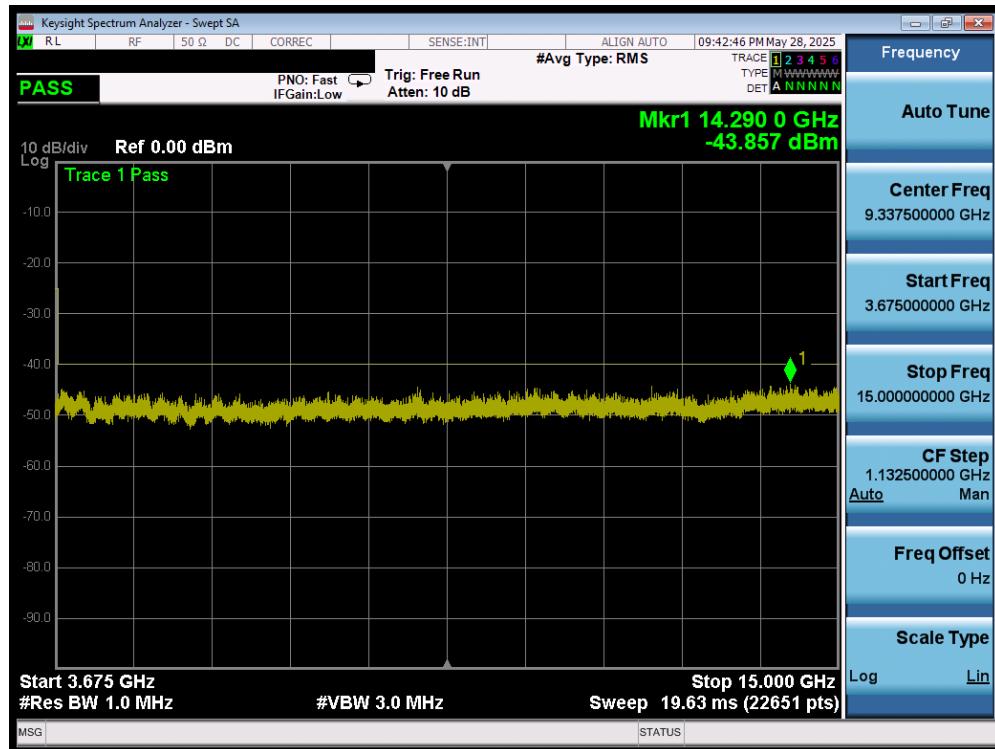
FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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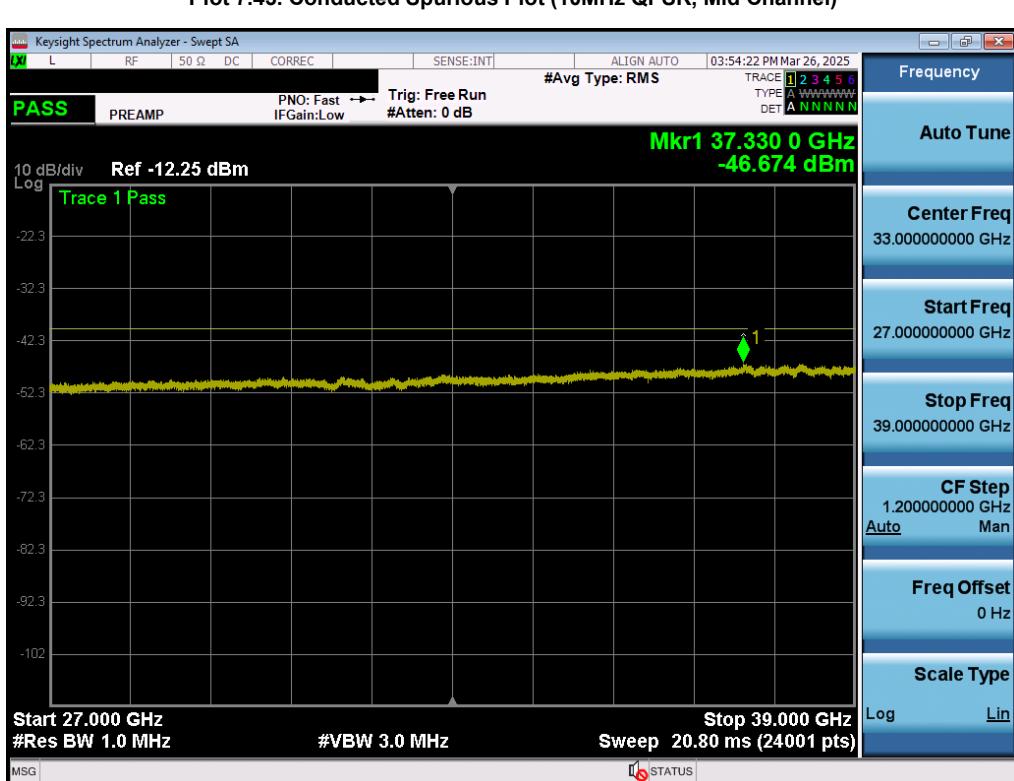


Plot 7.41. Conducted Spurious Plot (10MHz QPSK, Mid Channel)

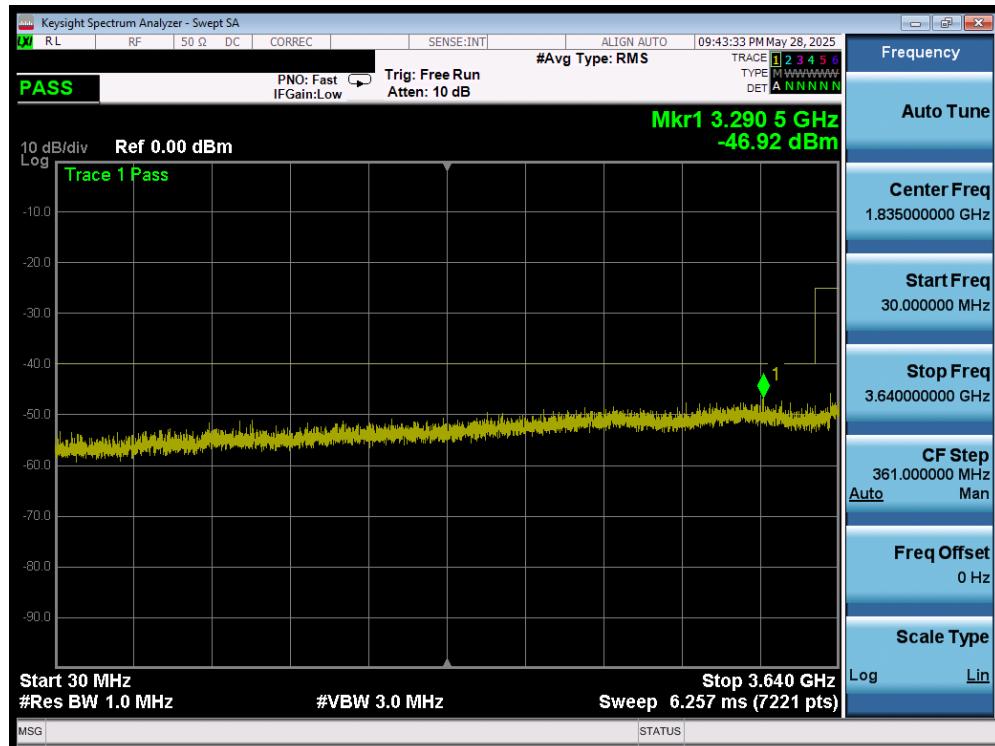


Plot 7.42. Conducted Spurious Plot (10MHz QPSK, Mid Channel)

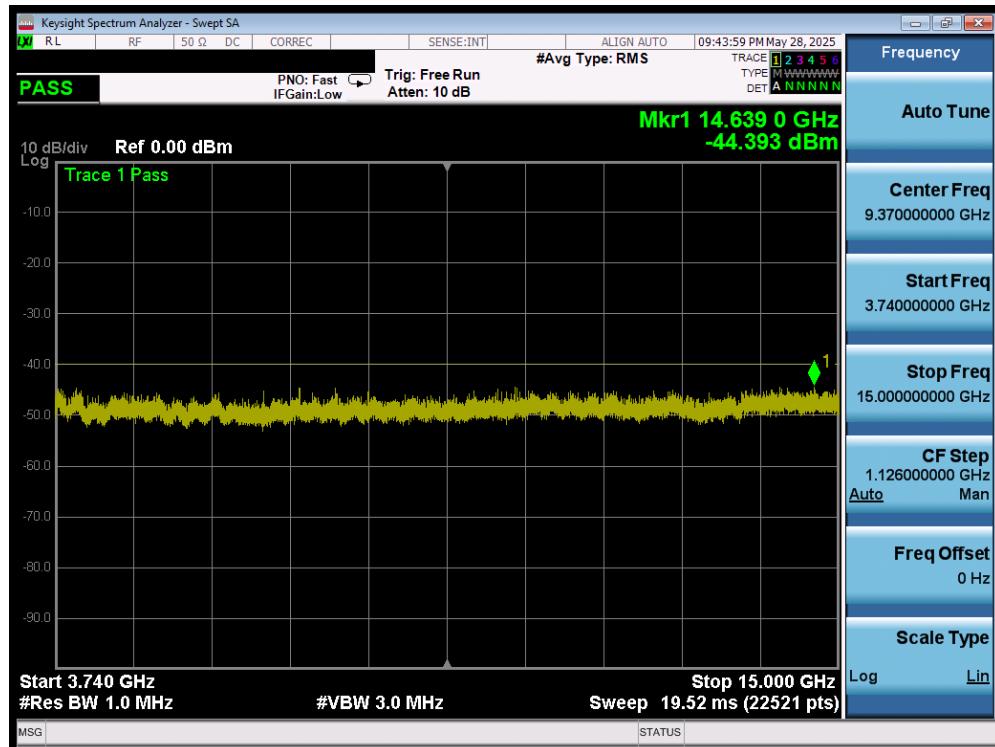
FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
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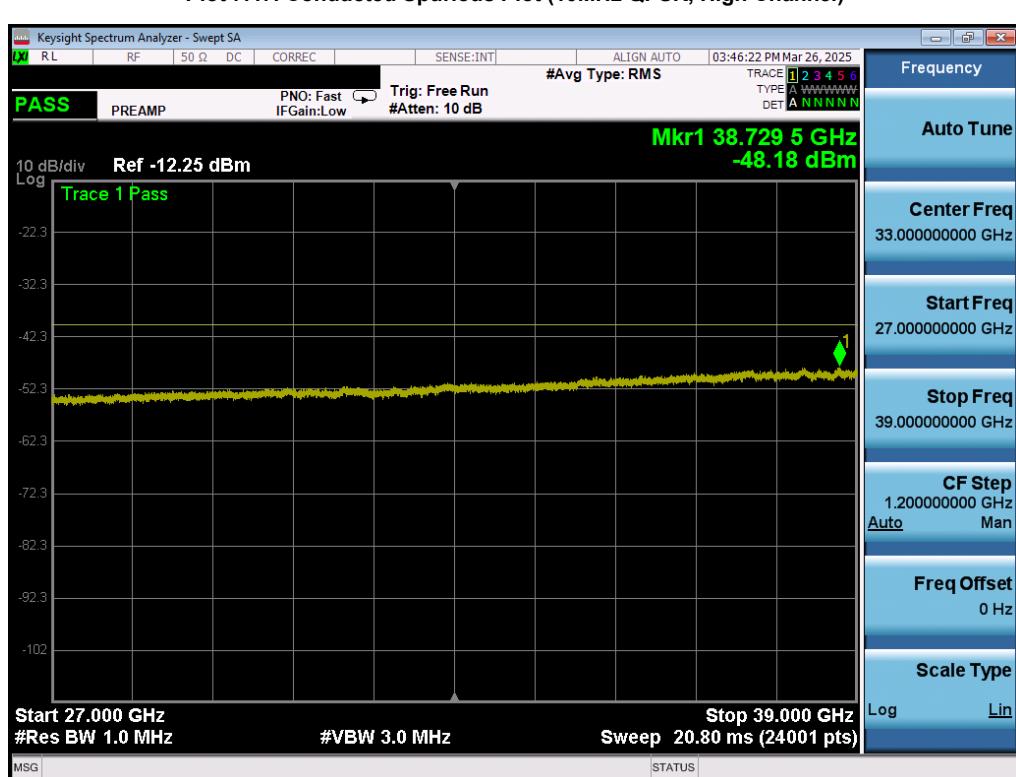


Plot 7.45. Conducted Spurious Plot (10MHz QPSK, High Channel)



Plot 7.46. Conducted Spurious Plot (10MHz QPSK, High Channel)

PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
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FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2503210033-01.UPO	Test Dates: 3/24/2025 – 6/5/2025	EUT Type: Optical Radio Unit	Page 45 of 64

## 7.7 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 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.

***For an End User Device, the conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed  $-13 \text{ dBm/MHz}$  within 0 to  $B \text{ MHz}$  (where  $B$  is the bandwidth in MHz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to  $B \text{ MHz}$  below the lower CBSD-assigned channel edge. At all frequencies greater than  $B \text{ MHz}$  above the upper CBSD assigned channel edge and less than  $B \text{ MHz}$  below the lower CBSD-assigned channel edge, the conducted power of any end user device emission shall not exceed  $-25 \text{ dBm/MHz}$ . The conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed  $-40 \text{ dBm/MHz}$ .***

### Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

### Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW  $\geq 1\%$  of the emission bandwidth
4. VBW  $\geq 3 \times \text{RBW}$
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span/RBW}$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

### Test Setup

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



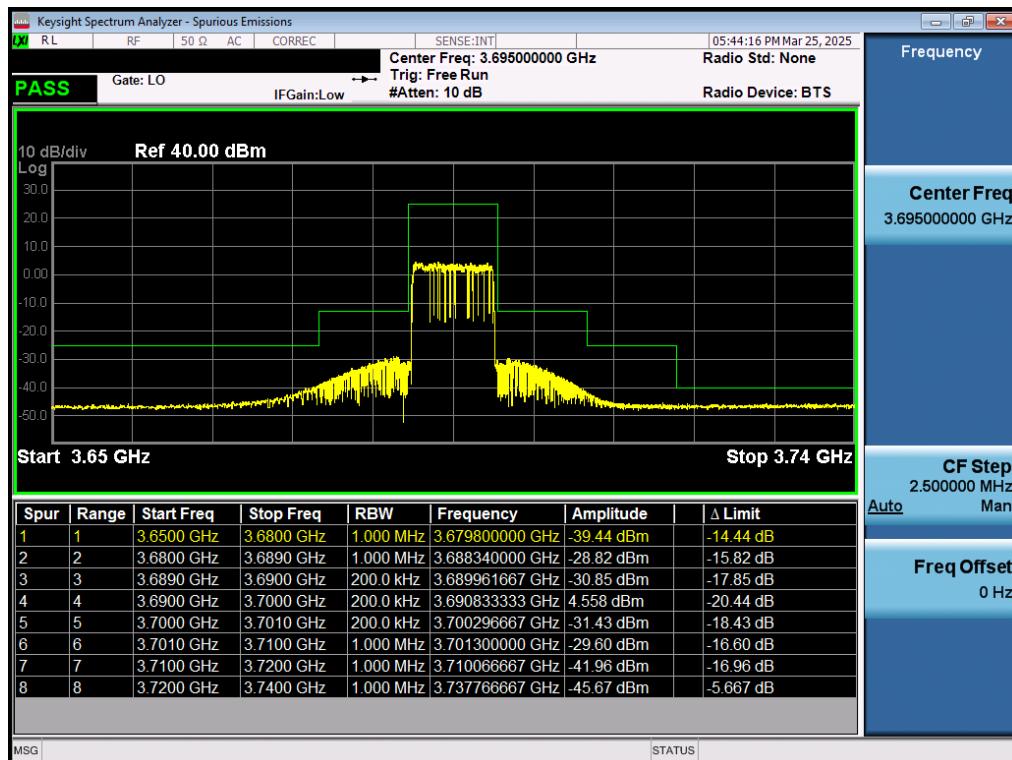
**Figure 7-6. Test Instrument & Measurement Setup**

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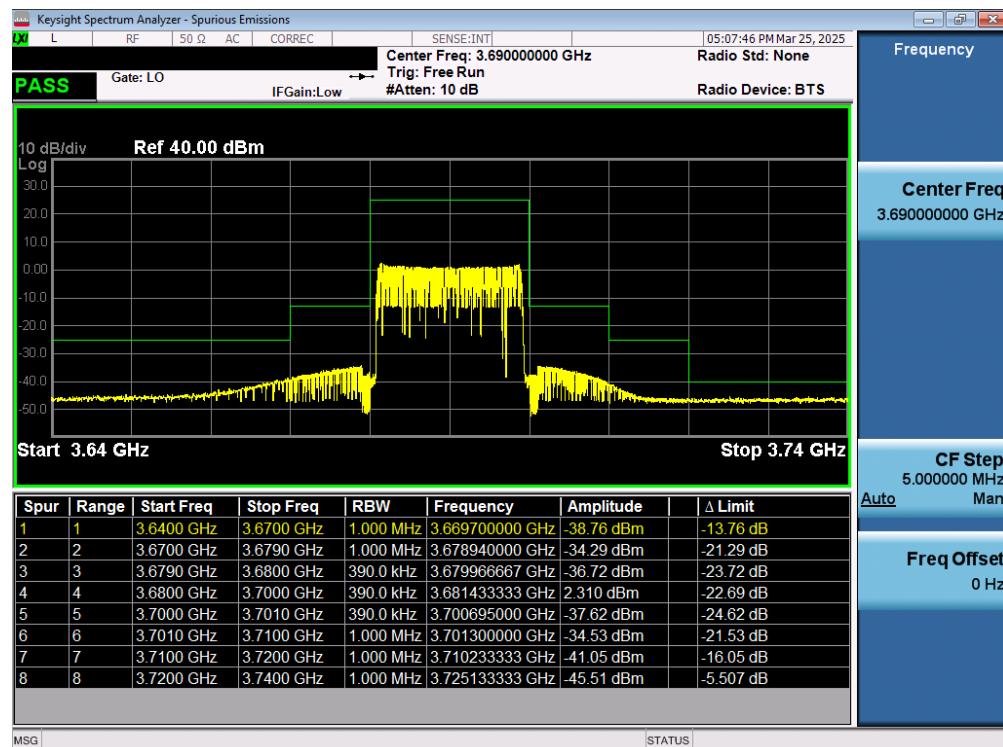
## Test Notes

1. Per 96.41(e)(i), compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full reference bandwidth (i.e., 1 MHz or 1 percent of emission bandwidth, as specified). The fundamental emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
2. Only plots for the worst case channel are included in this report.

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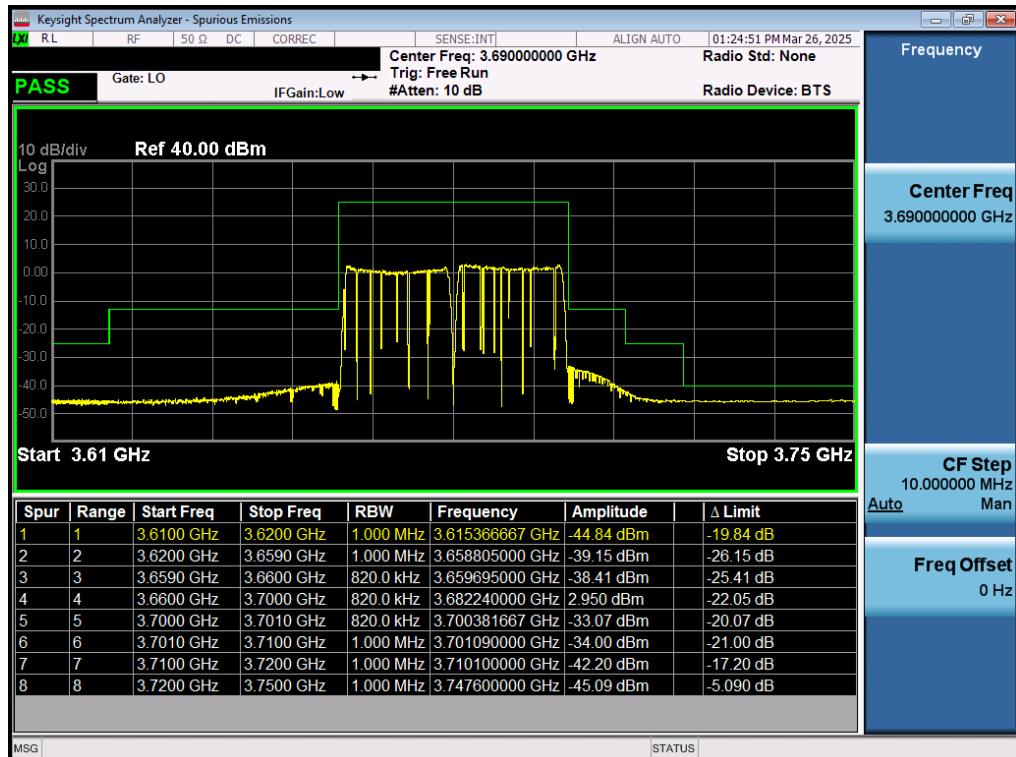


Plot 7.49. Conducted Band Edge Plot (10MHz, QPSK, High Channel)



Plot 7.50. Conducted Band Edge Plot (20MHz, QPSK, High Channel)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
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**Plot 7.51. Conducted Band Edge Plot (20+20MHz, QPSK, High Channel)**

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## 7.8 Peak-Average Ratio

### Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

### Test Procedure Used

ANSI C63.26-2015 – Section 5.2.3.4

### Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW  $\geq$  OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

### Test Setup

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



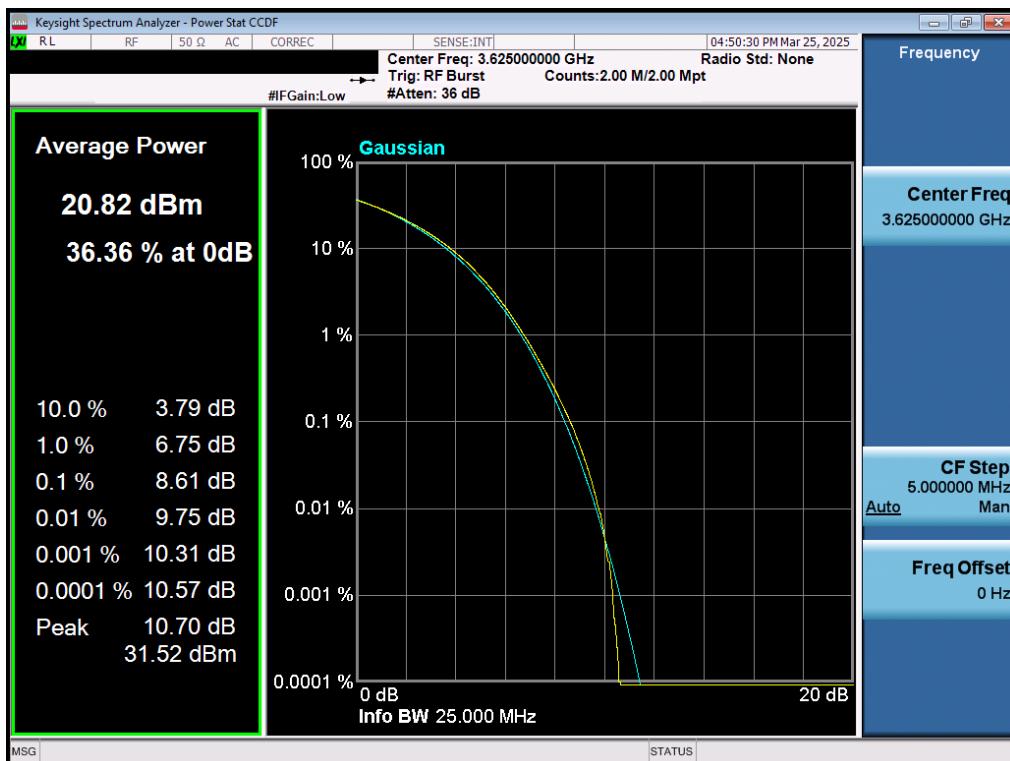
Figure 7-7. Test Instrument & Measurement Setup

### Test Notes

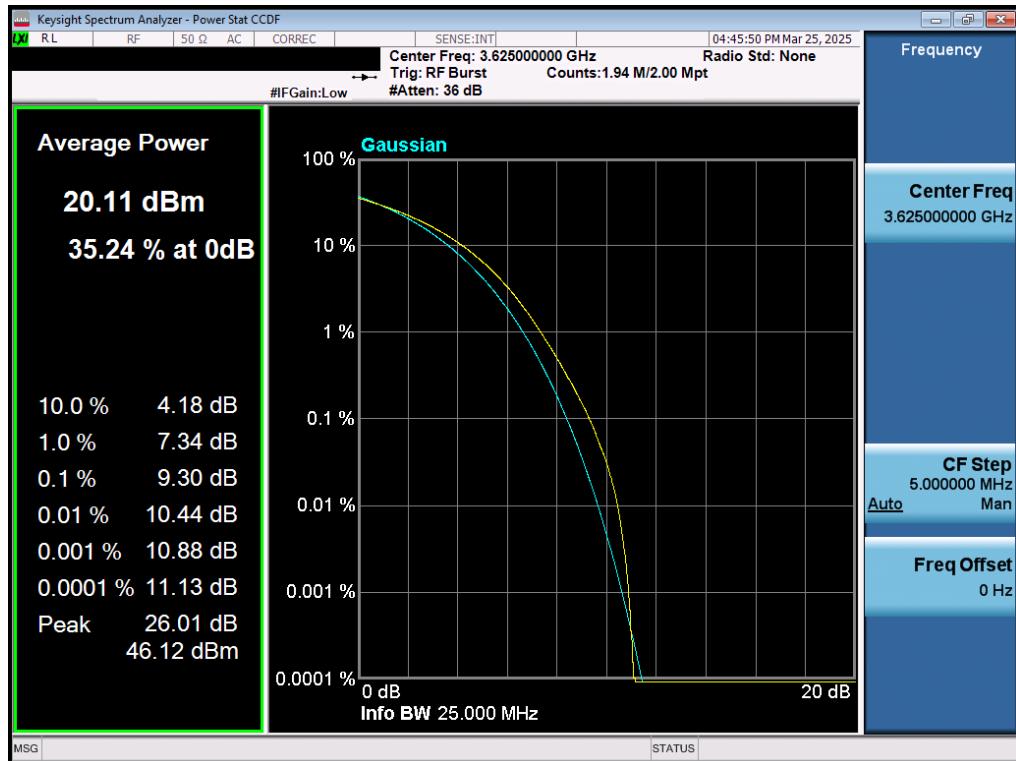
None.

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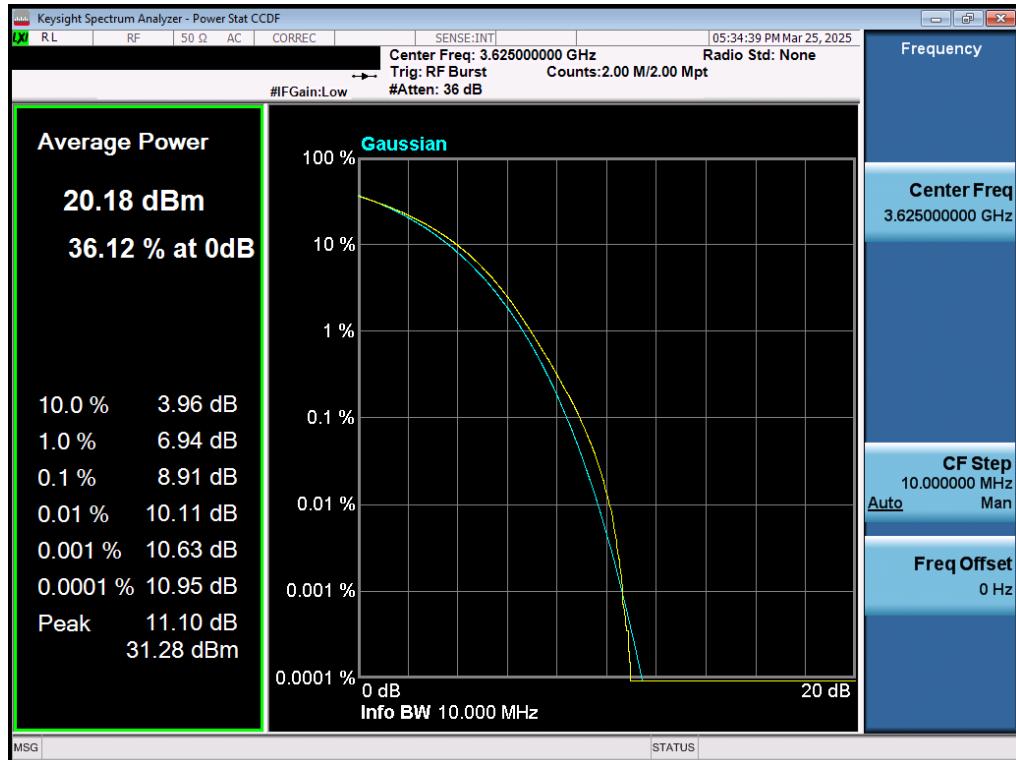
Mode	Bandwidth	Modulation	PAR at 0.1% [dB]	PAR Limit [dB]	Margin [dB]
LTE Band 48	20 MHz	QPSK	8.61	13.00	-4.39
		16QAM	9.21	13.00	-3.79
		64QAM	9.22	13.00	-3.78
		256QAM	9.30	13.00	-3.70
	10 MHz	QPSK	8.91	13.00	-4.09
		16QAM	9.01	13.00	-3.99
		64QAM	8.93	13.00	-4.07
		256QAM	9.06	13.00	-3.94

**Table 7-9 Peak to Average Power Ratio Measurements**

**Plot 7.52. Peak-Average Ratio Plot (20MHz QPSK)**

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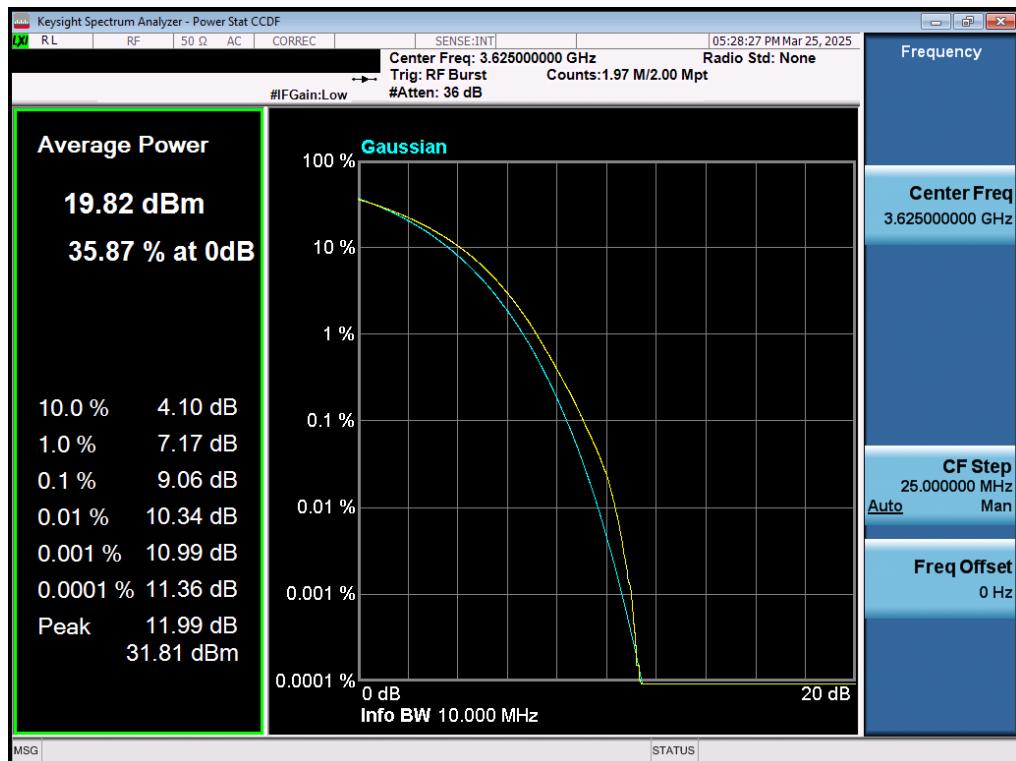


Plot 7.53. Peak-Average Ratio Plot (20MHz 256QAM)



Plot 7.54. Peak-Average Ratio Plot (10MHz QPSK)

FCC ID: UPO308-0007-01	PART 96 MEASUREMENT REPORT			Approved by: Technical Manager
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Plot 7.55. Peak-Average Ratio Plot (10MHz 256QAM)

FCC ID: UPO308-0007-01		PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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## 7.9 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 integral antenna. 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

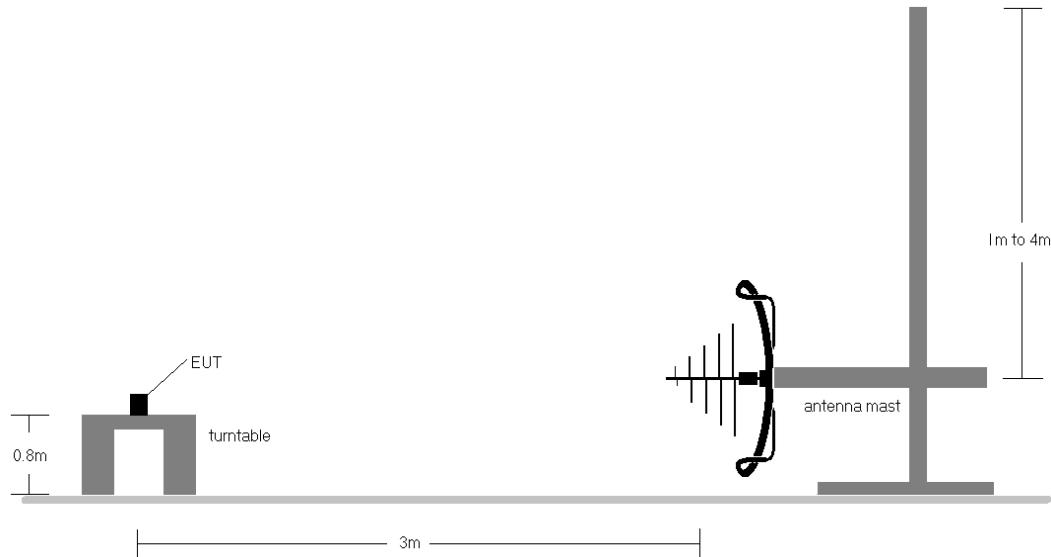
### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq$  3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $\geq$  2 x span / RBW
5. Detector = RMS
6. Trace mode = Max Hold (In cases where the level is within 2dB of the limit, the final measurement is taken using triggering/gating and trace averaging.)
7. The trace was allowed to stabilize

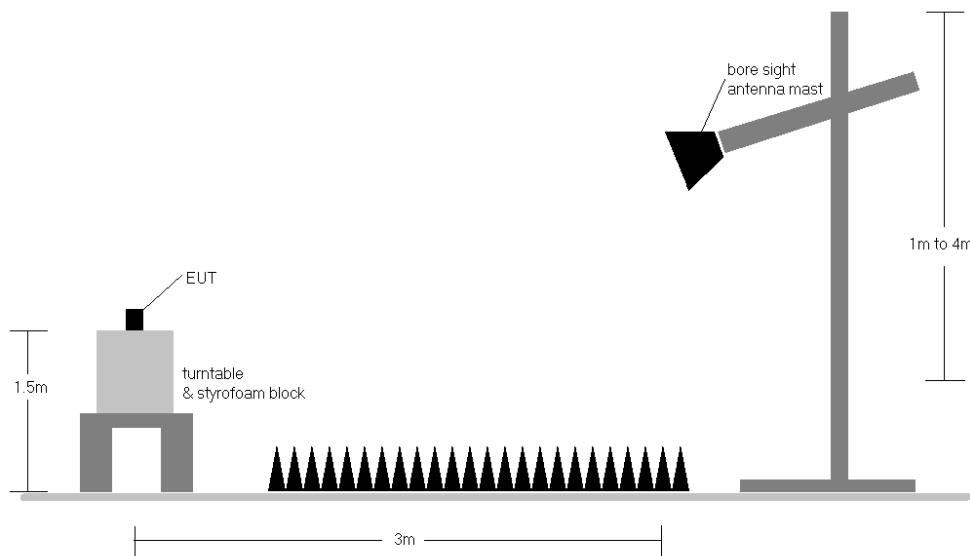
FCC ID: UPO308-0007-01		PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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## Test Setup

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



**Figure 7-8. Test Instrument & Measurement Setup < 1GHz**



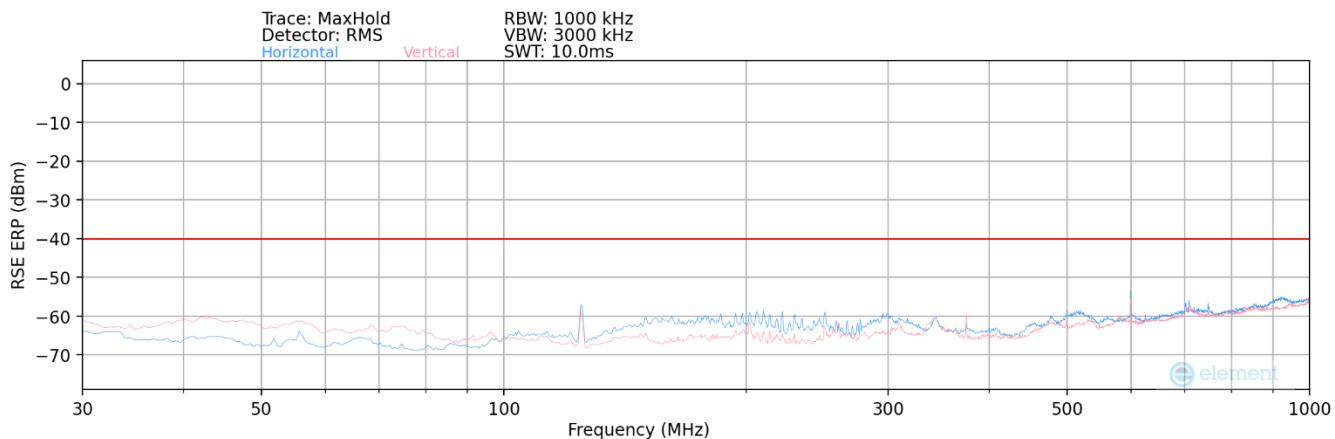
**Figure 7-9. Test Instrument & Measurement Setup > 1 GHz**

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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)  $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
  - b)  $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$ ; 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) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) 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.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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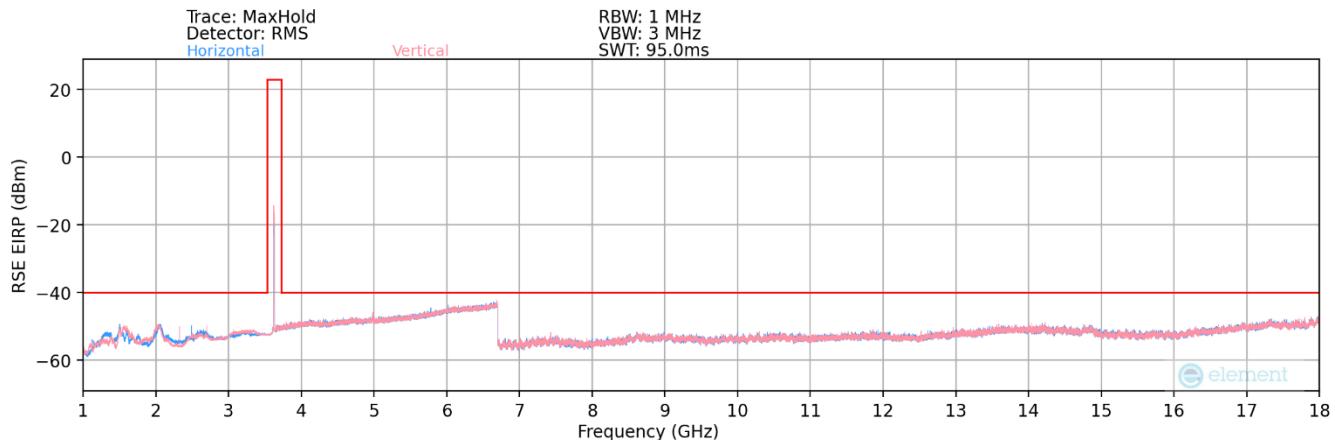


**Plot 7.56. Radiated Spurious Plot 30MHz-1GHz – Mid Channel**

Bandwidth (MHz):	10
Frequency (MHz):	3555.0
Modulation Signal:	256QAM
Detector / Trace Mode:	RMS / Max Hold
RBW / VBW:	1MHz / 3MHz

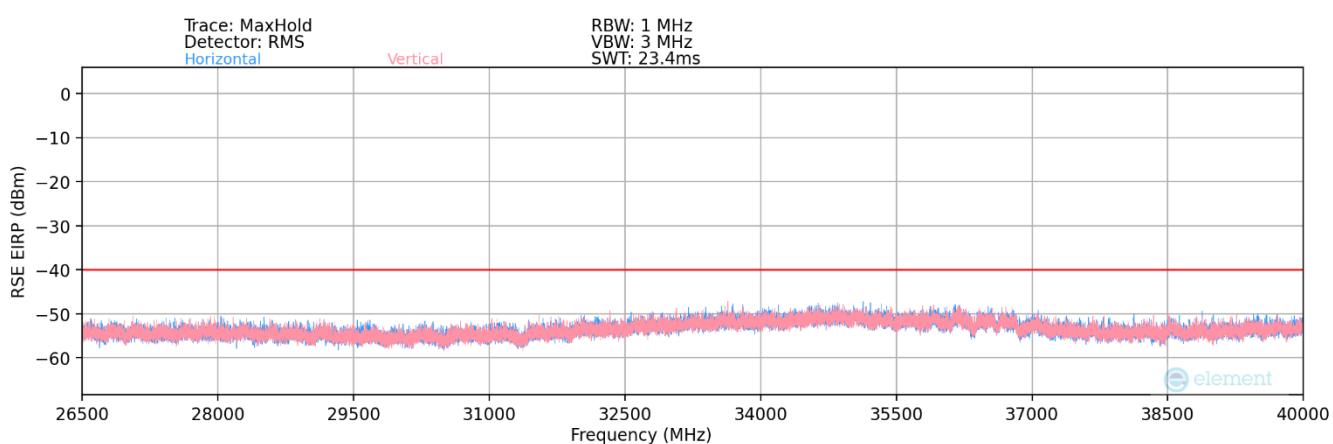
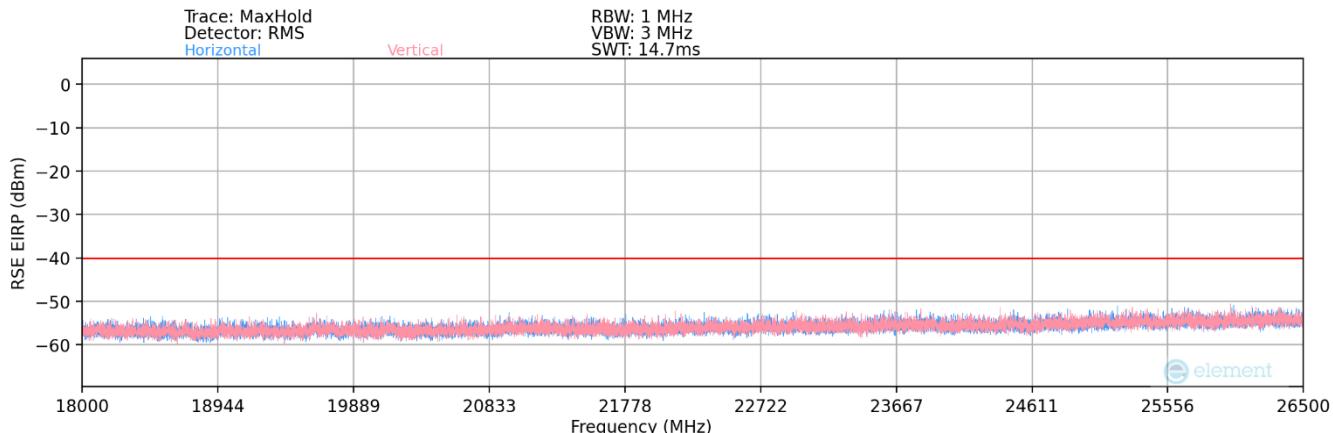
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
125.00	H	215	117	-83.49	20.52	44.03	-53.38	-40.00	-13.38
213.75	H	283	259	-79.10	17.76	45.66	-51.75	-40.00	-11.75

**Table 7-10. Radiated Spurious Data 30MHz-1GHz – Mid Channel**



**Plot 7.57. Radiated Spurious Plot 1-18GHz – Mid Channel**

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Bandwidth (MHz):	10
Frequency (MHz):	3555.0
Modulation Signal:	256QAM
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 [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7110.00	V	141	299	-63.23	9.56	53.33	-41.93	-40.00	-1.93
10665.00	V	126	102	-71.52	12.94	48.42	-46.84	-40.00	-6.84
14220.00	V	-	-	-79.56	15.46	42.90	-52.36	-40.00	-12.36
17775.00	V	-	-	-79.98	17.27	44.29	-50.97	-40.00	-10.97
21330.00	V	-	-	-58.79	2.88	51.09	-53.71	-40.00	-13.71

Table 7-11. Radiated Spurious Data 1-40GHz - Low Channel

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Bandwidth (MHz):	10
Frequency (MHz):	3625.0
Modulation Signal:	256QAM
Detector / Trace Mode:	RMS / Max Hold
RBW / VBW:	1MHz / 3MHz

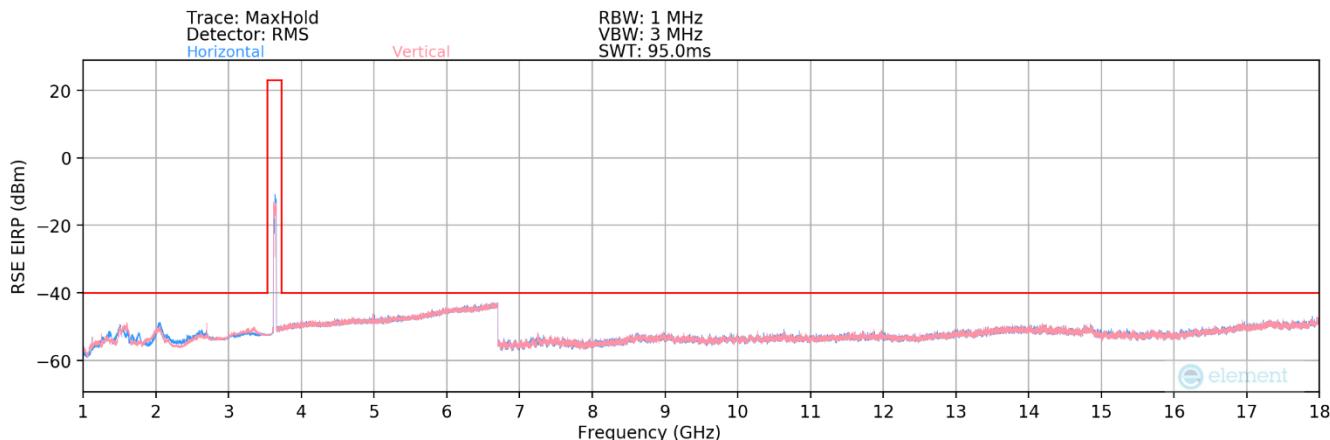
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1600.00	V	-	-	-74.00	9.31	42.31	-52.95	-40.00	-12.95
2000.00	V	-	-	-75.93	9.31	40.38	-54.88	-40.00	-14.88
7250.00	V	151	263	-73.90	9.31	42.41	-52.85	-40.00	-12.85
10875.00	V	-	-	-79.23	12.69	40.46	-54.80	-40.00	-14.80
14500.00	V	-	-	-80.03	15.58	42.55	-52.71	-40.00	-12.71
18125.00	V	-	-	-58.12	1.10	49.98	-54.82	-40.00	-14.82

Table 7-12. Radiated Spurious Data 1-40GHz - Mid Channel

Bandwidth (MHz):	10
Frequency (MHz):	3695.0
Modulation Signal:	256QAM
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 [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7390.00	V	-	-	-77.43	9.94	39.51	-55.75	-40.00	-15.75
11085.00	V	-	-	-79.31	12.80	40.49	-54.77	-40.00	-14.77
14780.00	V	-	-	-80.10	15.34	42.24	-53.02	-40.00	-13.02

Table 7-13. Radiated Spurious Data 1-40GHz – High Channel



Plot 7.60. Radiated Spurious Plot 1-18GHz – Mid Channel – Carrier Aggregation

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PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3560.0
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3579.8
Modulation Signal:	QPSK
Detector / Trace Mode:	RMS / MaxHold
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7120.00	V	129	278	-74.06	9.70	42.64	-52.62	-40.00	-12.62
10680.00	V	-	-	-79.44	13.08	40.64	-54.62	-40.00	-14.62
14240.00	V	-	-	-79.56	15.38	42.82	-52.44	-40.00	-12.44
17800.00	V	-	-	-80.02	17.11	44.09	-51.16	-40.00	-11.16

**Table 7-14. Radiated Spurious Data 1-40GHz - Low Channel – Carrier Aggregation**

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3625.0
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3644.8
Modulation Signal:	QPSK
Detector / Trace Mode:	RMS / MaxHold
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7250.00	V	163	207	-73.20	9.31	43.11	-52.15	-40.00	-12.15
10875.00	V	156	212	-76.57	12.69	43.12	-52.14	-40.00	-12.14
14500.00	V	-	-	-77.70	15.58	44.88	-50.38	-40.00	-10.38
18125.00	V	-	-	-58.92	1.10	49.18	-55.62	-40.00	-15.62
21750.00	V	-	-	-59.22	2.78	50.56	-54.24	-40.00	-14.24
25375.00	V	-	-	-58.82	4.84	53.02	-51.78	-40.00	-11.78

**Table 7-15. Radiated Spurious Data 1-40GHz - Mid Channel – Carrier Aggregation**

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3690.0
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3670.2
Modulation Signal:	QPSK
Detector / Trace Mode:	RMS / MaxHold
RBW / VBW:	1MHz / 3MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
7380.00	V	-	-	-75.65	10.14	41.49	-53.77	-40.00	-13.77
11070.00	V	160	198	-76.22	12.63	43.41	-51.85	-40.00	-11.85
14760.00	V	-	-	-80.19	15.48	42.29	-52.97	-40.00	-12.97
18450.00	V	-	-	-57.92	1.15	50.23	-54.57	-40.00	-14.57
22140.00	V	-	-	-58.90	3.27	51.37	-53.43	-40.00	-13.43

**Table 7-16. Radiated Spurious Data 1-40GHz - High Channel – Carrier Aggregation**

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## 7.10 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.

***For Part 96, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.***

### 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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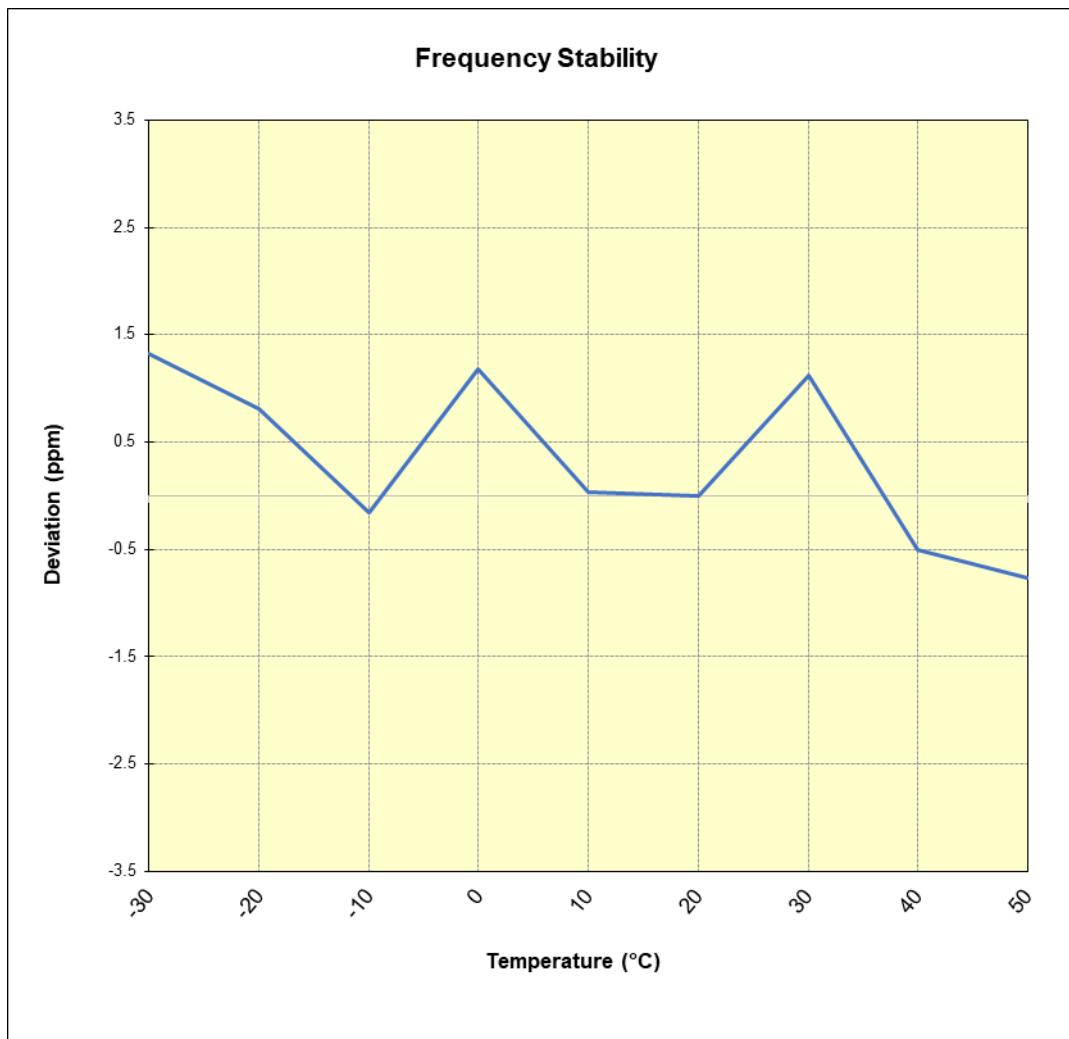
## LTE Band 48

Operating Frequency (Hz):	3,690,000,000
Ref. Voltage (VDC):	48.00

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	48.00	- 30	3,690,004,239	4,899	0.0001328
		- 20	3,690,002,345	3,005	0.0000814
		- 10	3,689,998,765	-575	-0.0000156
		0	3,690,003,679	4,339	0.0001176
		+ 10	3,689,999,456	116	0.0000031
		+ 20 (Ref)	3,689,999,340	0	0.0000000
		+ 30	3,690,003,479	4,139	0.0001122
		+ 40	3,689,997,498	-1,842	-0.0000499
		+ 50	3,689,996,510	-2,830	-0.0000767
85 %	40.80	+ 20	3,689,999,841	501	0.0000136
Battery Endpoint	55.20	+ 20	3,690,000,842	1,502	0.0000407

**Table 7-17. Frequency Stability Data**

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**Plot 7.61. Frequency Stability Chart**

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## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Wilson Electronics Optical Radio Unit FCC ID: UPO308-0007-1** complies with all of the CBSD Category A and B requirements of Part 96 of the FCC Rules for LTE operation only.

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