ELEMENT WASHINGTON DC LLC
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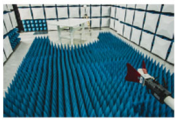


# Part 96 MEASUREMENT REPORT

**Applicant Name:**
Telit Communications S.p.A.
Viale Stazione di Prosecco 5/b
Trieste, 34010
Italy

**Date of Testing:**
09/23/2022 - 11/21/2022
**Test Report Issue Date:**
11/28/2022
**Test Site/Location:**
Element Lab., Columbia, MD, USA
**Test Report Serial No.:**
1M2209070102-01.RI7

| | |
|---|---|
| **FCC ID:** | **RI7FN980** |
| **APPLICANT:** | **Telit Communications S.p.A.** |

| | |
|---|---|
| **Application Type:** | Class II Permissive Change |
| **Model:** | FN980 |
| **EUT Type:** | Module |
| **FCC Classification:** | Citizens Band End User Devices (CBE) |
| **FCC Rule Part(s):** | 96 |
| **Test Procedure(s):** | ANSI C63.26-2015, KDB 940660 D01 v03, WINNF-18-IN-00178 v1.0.0.00, WINNF-TS-0122 v1.0.2 |
| **Class II Permissive Change:** | Adding 5G NR n48 capability |

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

# TABLE OF CONTENTS

# 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

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 a OnGo Alliance Approved Test Lab (ATL)
- Element Washington DC LLC is a WInnForum Approved Test Lab
- 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.

# 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Telit Module FCC ID: RI7FN980**. The test data contained in this report pertains only to the emissions due to the EUT's NR n48 operation in the CBRS band. Per FCC Part 96, this device is evaluated as a Citizens Band End User Device (CBE).

**Test Device Serial No.:** 49499

## 2.2 Device Capabilities

This device contains the following capabilities:

Multi-Band LTE and Multi-Band 5G NR, including n48 (Standalone and Non-Standalone operation)

## 2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015 and KDB 940660 D01 v03. 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 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.

# 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) and KDB 940660 D01 v03 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 $P_{g\ [dBm]}$ – 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.

# 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 |

# 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 |
|---|---|---|---|---|---|---|
| Agilent | N9038A | MXE EMI Receiver | 1/21/2022 | Annual | 1/21/2023 | MY51210133 |
| Emco | 3115 | Horn Antenna (1-18GHz) | 8/8/2022 | Biennial | 8/8/2024 | 9704-5182 |
| Rohde & Schwarz | ESU26 | EMI Test Receiver (26.5GHz) | 8/29/2022 | Annual | 8/29/2023 | 100342 |
| Rohde & Schwarz | ESU40 | EMI Test Receiver (40GHz) | 8/25/2022 | Annual | 8/25/2023 | 100348 |
| Sunol | JB5 | Bi-Log Antenna (30M - 5GHz) | 11/13/2020 | Biennial | 11/13/2022 | A051107 |
| Anritsu | MT8821C | Radio Communication Analyzer MT8821C | 5/2/2022 | Annual | 5/2/2023 | 6200901190 |
| Anritsu | MT8000A | Radio Communication Test Station | 3/30/2022 | Annual | 3/30/2023 | 6261914237 |
| Agilent | N9030A | 50GHz PXA Signal Analyzer | 9/9/2022 | Annual | 9/9/2023 | US51350301 |

**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.

# 6.0 SAMPLE CALCULATIONS

## 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

## Spurious Radiated Emission – LTE Band

**Example: Middle Channel LTE Mode 2nd Harmonic (7250 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).

# 7.0 TEST RESULTS

## 7.1 Summary

Company Name: Telit Communications S.p.A.

FCC ID: RI7FN980

FCC Classification: Citizens Band End User Devices (CBE)

Mode(s): NR

| Test Condition | Test Description | FCC Part Section(s) | Test Limit | Test Result | Reference |
|---|---|---|---|---|---|
| CONDUCTED | Conducted Power / EIRP | 2.1046, 96.41(b) | 23 dBm / 10 MHz EIRP | PASS | Section 7.2 |
| | Occupied Bandwidth | 2.1049(h) | N/A | PASS | Section 7.3 |
| | Conducted Band Edge / Spurious Emissions (EUD) | 2.1051, 96.41(e) | -13 dBm/MHz at frequencies within 0-B MHz of channel edge (where B is the bandwidth of the assigned channel)<br><br>-25 dBm/MHz at frequencies greater than B MHz above and below channel edge<br><br>-40 dBm/MHz at frequencies below 3530 MHz and above 3720 MHz | PASS | Sections 7.4, 7.5 |
| | Frequency Stability | 2.1055 | Fundamental emissions stay within authorized frequency block | PASS | Section 7.7 |
| | End User Device Additional Requirements (CBSD Protocol) | 96.47 | End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.<br><br>An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD. | PASS | Section 7.8 |
| RADIATED | Radiated Spurious Emissions | 2.1053, 96.41(e) | -40 dBm/MHz | 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 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 v1.1.

## 7.2 Conducted Output Power / EIRP Data

**Test Overview**

The EUT is set up to transmit at maximum power for NR. 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.

**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 ≥ 2 x span / 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.

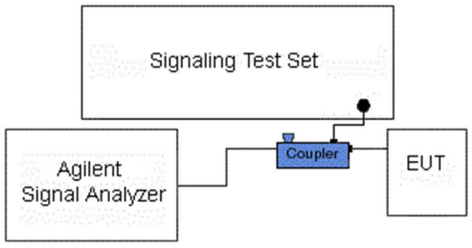



**Figure 7-1. Test Instrument & Measurement Setup**

**Test Notes**

1. Conducted power measurements were evaluated using various combinations of RB size, RB offset, 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.
2. The maximum EIRP is calculated based on a 0.5dBi gain. The 0.5dBi gain applied in this section is based on the maximum allowed antenna gain for RF Exposure compliance as shown in the MPE report in this filing.

## NR Conducted Output Power / EIRP

| Bandwidth | Modulation | Channel | Frequency [MHz] | RB Size/Offset | Conducted Power [dBm] | Ant Gain [dBi] | EIRP [dBm/10MHz] | EIRP Limit [dBm/10MHz] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 40 MHz | π/2 BPSK | 638000 | 3570.0 | 1 / 79 | 21.35 | 0.50 | 21.85 | 23.00 | -1.15 |
| | | 641666 | 3625.0 | 1 / 79 | 21.80 | 0.50 | 22.30 | 23.00 | -0.70 |
| | | 645332 | 3680.0 | 1 / 26 | 21.51 | 0.50 | 22.01 | 23.00 | -0.99 |
| | QPSK | 638000 | 3570.0 | 1 / 79 | 21.22 | 0.50 | 21.72 | 23.00 | -1.28 |
| | | 641666 | 3625.0 | 1 / 53 | 21.85 | 0.50 | 22.35 | 23.00 | -0.65 |
| | | 645332 | 3680.0 | 1 / 53 | 21.36 | 0.50 | 21.86 | 23.00 | -1.14 |
| | 16-QAM | 638000 | 3570.0 | 1 / 26 | 20.35 | 0.50 | 20.85 | 23.00 | -2.15 |
| | | 641666 | 3625.0 | 1 / 79 | 20.70 | 0.50 | 21.20 | 23.00 | -1.80 |
| | | 645332 | 3680.0 | 1 / 26 | 20.39 | 0.50 | 20.89 | 23.00 | -2.11 |
| | 64-QAM | 638000 | 3570.0 | 1 / 53 | 18.79 | 0.50 | 19.29 | 23.00 | -3.71 |
| | | 641666 | 3625.0 | 1 / 53 | 19.65 | 0.50 | 20.15 | 23.00 | -2.85 |
| | | 645332 | 3680.0 | 1 / 26 | 19.58 | 0.50 | 20.08 | 23.00 | -2.92 |
| | 256-QAM | 638000 | 3570.0 | 1 / 53 | 16.72 | 0.50 | 17.22 | 23.00 | -5.78 |
| | | 641666 | 3625.0 | 1 / 53 | 17.33 | 0.50 | 17.83 | 23.00 | -5.17 |
| | | 645332 | 3680.0 | 1 / 26 | 17.05 | 0.50 | 17.55 | 23.00 | -5.45 |
| 20 MHz | π/2 BPSK | 637334 | 3560.0 | 1 / 13 | 20.99 | 0.50 | 21.49 | 23.00 | -1.51 |
| | | 641666 | 3625.0 | 1 / 37 | 21.55 | 0.50 | 22.05 | 23.00 | -0.95 |
| | | 646000 | 3690.0 | 1 / 25 | 21.12 | 0.50 | 21.62 | 23.00 | -1.38 |
| | QPSK | 637334 | 3560.0 | 1 / 13 | 20.92 | 0.50 | 21.42 | 23.00 | -1.58 |
| | | 641666 | 3625.0 | 1 / 37 | 21.52 | 0.50 | 22.02 | 23.00 | -0.98 |
| | | 646000 | 3690.0 | 1 / 13 | 21.12 | 0.50 | 21.62 | 23.00 | -1.38 |
| | 16-QAM | 637334 | 3560.0 | 1 / 37 | 19.81 | 0.50 | 20.31 | 23.00 | -2.69 |
| | | 641666 | 3625.0 | 1 / 25 | 20.62 | 0.50 | 21.12 | 23.00 | -1.88 |
| | | 646000 | 3690.0 | 1 / 13 | 19.98 | 0.50 | 20.48 | 23.00 | -2.52 |
| | 64-QAM | 637334 | 3560.0 | 1 / 37 | 18.46 | 0.50 | 18.96 | 23.00 | -4.04 |
| | | 641666 | 3625.0 | 1 / 37 | 19.02 | 0.50 | 19.52 | 23.00 | -3.48 |
| | | 646000 | 3690.0 | 1 / 25 | 18.76 | 0.50 | 19.26 | 23.00 | -3.74 |
| | 256-QAM | 637334 | 3560.0 | 1 / 37 | 16.50 | 0.50 | 17.00 | 23.00 | -6.00 |
| | | 641666 | 3625.0 | 1 / 37 | 16.97 | 0.50 | 17.47 | 23.00 | -5.53 |
| | | 646000 | 3690.0 | 1 / 25 | 16.65 | 0.50 | 17.15 | 23.00 | -5.85 |
| 10 MHz | π/2 BPSK | 637000 | 3555.0 | 1 / 6 | 20.82 | 0.50 | 21.32 | 23.00 | -1.68 |
| | | 641666 | 3625.0 | 1 / 17 | 21.52 | 0.50 | 22.02 | 23.00 | -0.98 |
| | | 646332 | 3695.0 | 1 / 6 | 21.10 | 0.50 | 21.60 | 23.00 | -1.40 |
| | QPSK | 637000 | 3555.0 | 1 / 6 | 20.79 | 0.50 | 21.29 | 23.00 | -1.71 |
| | | 641666 | 3625.0 | 1 / 17 | 21.49 | 0.50 | 21.99 | 23.00 | -1.01 |
| | | 646332 | 3695.0 | 1 / 17 | 20.98 | 0.50 | 21.48 | 23.00 | -1.52 |
| | 16-QAM | 637000 | 3555.0 | 1 / 12 | 19.92 | 0.50 | 20.42 | 23.00 | -2.58 |
| | | 641666 | 3625.0 | 1 / 12 | 20.58 | 0.50 | 21.08 | 23.00 | -1.92 |
| | | 646332 | 3695.0 | 1 / 12 | 20.13 | 0.50 | 20.63 | 23.00 | -2.37 |
| | 64-QAM | 637000 | 3555.0 | 1 / 6 | 18.69 | 0.50 | 19.19 | 23.00 | -3.81 |
| | | 641666 | 3625.0 | 1 / 17 | 19.03 | 0.50 | 19.53 | 23.00 | -3.47 |
| | | 646332 | 3695.0 | 1 / 6 | 18.85 | 0.50 | 19.35 | 23.00 | -3.65 |
| | 256-QAM | 637000 | 3555.0 | 1 / 6 | 16.48 | 0.50 | 16.98 | 23.00 | -6.02 |
| | | 641666 | 3625.0 | 1 / 17 | 16.82 | 0.50 | 17.32 | 23.00 | -5.68 |
| | | 646332 | 3695.0 | 1 / 6 | 16.67 | 0.50 | 17.17 | 23.00 | -5.83 |

**Table 7-2. Conducted Output Power Spot Check Measurements**

## EN-DC Conducted Output Power

| NR (SCS 30kHz) | | | | | | LTE | | | | | | NR Conducted Power [dBm] | LTE Conducted Power [dBm] | EN-DC Total Tx. Power [dBm] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NR Band | NR Bandwidth [MHz] | NR Channel | NR Frequency [MHz] | Mod. | NR RB#/Offset | LTE Band | LTE Bandwidth [MHz] | LTE Channel | LTE Frequency [MHz] | Mod. | LTE RB#/Offset | | | |
| n48 | 40 | Mid | 3625 | QPSK | 100/0 | 2 | 20 | Mid | 1880 | QPSK | 1/0 | 17.20 | 22.64 | 23.73 |
| | | | | QPSK | 1/79 | | | | | QPSK | 100/0 | 17.72 | 21.79 | 23.23 |
| | | | | QPSK | 100/0 | | | | | QPSK | 100/0 | 19.65 | 21.82 | 23.88 |
| | | | | QPSK | 1/79 | | | | | QPSK | 1/0 | 17.25 | 22.61 | 23.72 |
| | | | | 16Q | 100/0 | | | | | 16Q | 1/0 | 20.97 | 20.80 | 23.90 |

**Table 7-3. EN-DC Conducted Output Power (NR n48 + LTE B2)**

| NR (SCS 30kHz) | | | | | | LTE | | | | | | NR Conducted Power [dBm] | LTE Conducted Power [dBm] | EN-DC Total Tx. Power [dBm] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NR Band | NR Bandwidth [MHz] | NR Channel | NR Frequency [MHz] | Mod. | NR RB#/Offset | LTE Band | LTE Bandwidth [MHz] | LTE Channel | LTE Frequency [MHz] | Mod. | LTE RB#/Offset | | | |
| n48 | 40 | Mid | 3625 | QPSK | 100/0 | 66 | 20 | Mid | 1745 | QPSK | 1/0 | 17.14 | 22.94 | 23.95 |
| | | | | QPSK | 1/79 | | | | | QPSK | 100/0 | 19.68 | 22.02 | 24.02 |
| | | | | QPSK | 100/0 | | | | | QPSK | 100/0 | 19.71 | 22.00 | 24.01 |
| | | | | QPSK | 1/79 | | | | | QPSK | 1/0 | 17.19 | 22.94 | 23.96 |
| | | | | 16Q | 1/79 | | | | | 16Q | 1/0 | 19.71 | 22.25 | 24.17 |

**Table 7-4. EN-DC Conducted Output Power (NR n48 + LTE B66)**

| NR (SCS 30kHz) | | | | | | LTE | | | | | | NR Conducted Power [dBm] | LTE Conducted Power [dBm] | EN-DC Total Tx. Power [dBm] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NR Band | NR Bandwidth [MHz] | NR Channel | NR Frequency [MHz] | Mod. | NR RB#/Offset | LTE Band | LTE Bandwidth [MHz] | LTE Channel | LTE Frequency [MHz] | Mod. | LTE RB#/Offset | | | |
| n48 | 40 | Mid | 3625 | QPSK | 100/0 | 5 | 10 | Mid | 836.5 | QPSK | 1/25 | 17.13 | 22.76 | 23.81 |
| | | | | QPSK | 1/79 | | | | | QPSK | 50/0 | 19.68 | 21.76 | 23.85 |
| | | | | QPSK | 100/0 | | | | | QPSK | 50/0 | 19.68 | 21.85 | 23.91 |
| | | | | QPSK | 1/79 | | | | | QPSK | 1/25 | 17.23 | 22.66 | 23.75 |
| | | | | 16Q | 100/0 | | | | | 16Q | 50/0 | 20.96 | 20.76 | 23.87 |

**Table 7-5. EN-DC Conducted Output Power (NR n48 + LTE B5)**

| NR (SCS 30kHz) | | | | | | LTE | | | | | | NR Conducted Power [dBm] | LTE Conducted Power [dBm] | EN-DC Total Tx. Power [dBm] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NR Band | NR Bandwidth [MHz] | NR Channel | NR Frequency [MHz] | Mod. | NR RB#/Offset | LTE Band | LTE Bandwidth [MHz] | LTE Channel | LTE Frequency [MHz] | Mod. | LTE RB#/Offset | | | |
| n48 | 40 | Mid | 3625 | QPSK | 100/0 | 13 | 10 | Mid | 782 | QPSK | 1/0 | 17.08 | 22.80 | 23.83 |
| | | | | QPSK | 1/0 | | | | | QPSK | 50/0 | 19.42 | 21.98 | 23.90 |
| | | | | QPSK | 100/0 | | | | | QPSK | 50/0 | 19.65 | 22.01 | 24.00 |
| | | | | QPSK | 1/0 | | | | | QPSK | 1/0 | 16.92 | 22.71 | 23.73 |
| | | | | 16Q | 100/0 | | | | | 16Q | 50/0 | 20.92 | 21.04 | 23.99 |

**Table 7-6. EN-DC Conducted Output Power (NR n48 + LTE B13)**

## 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.

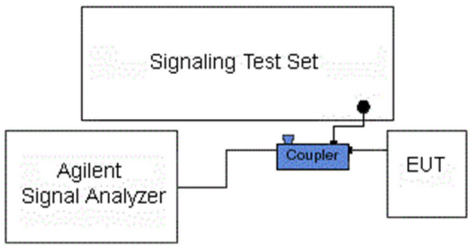
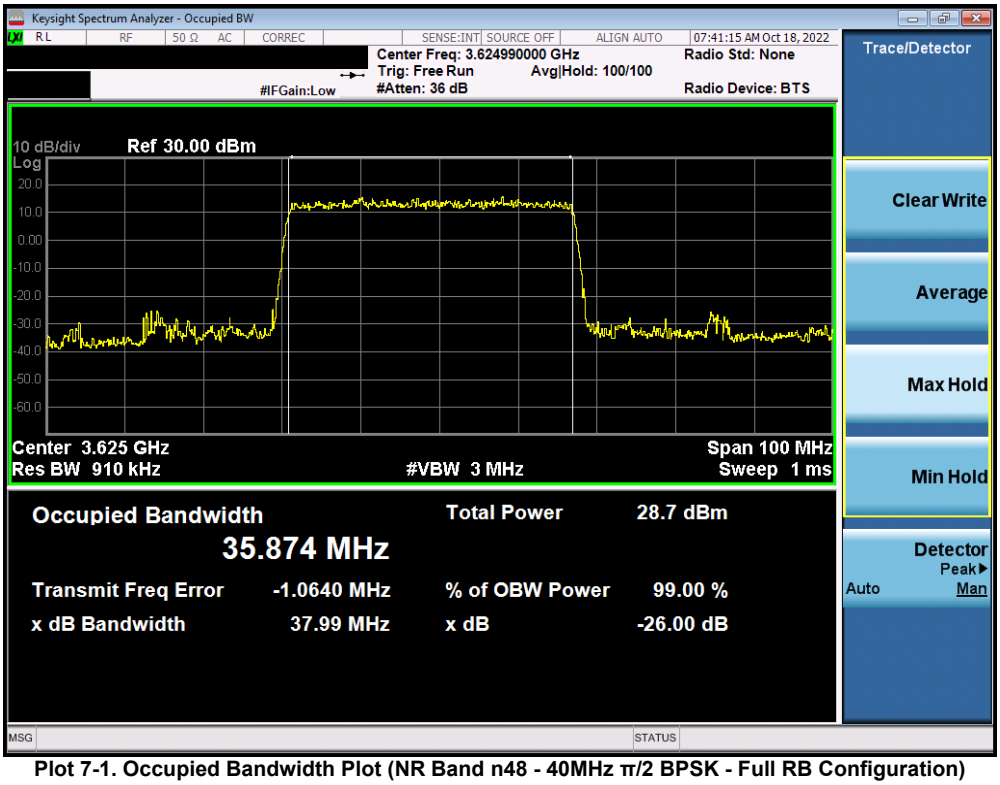



**Figure 7-2. Test Instrument & Measurement Setup**

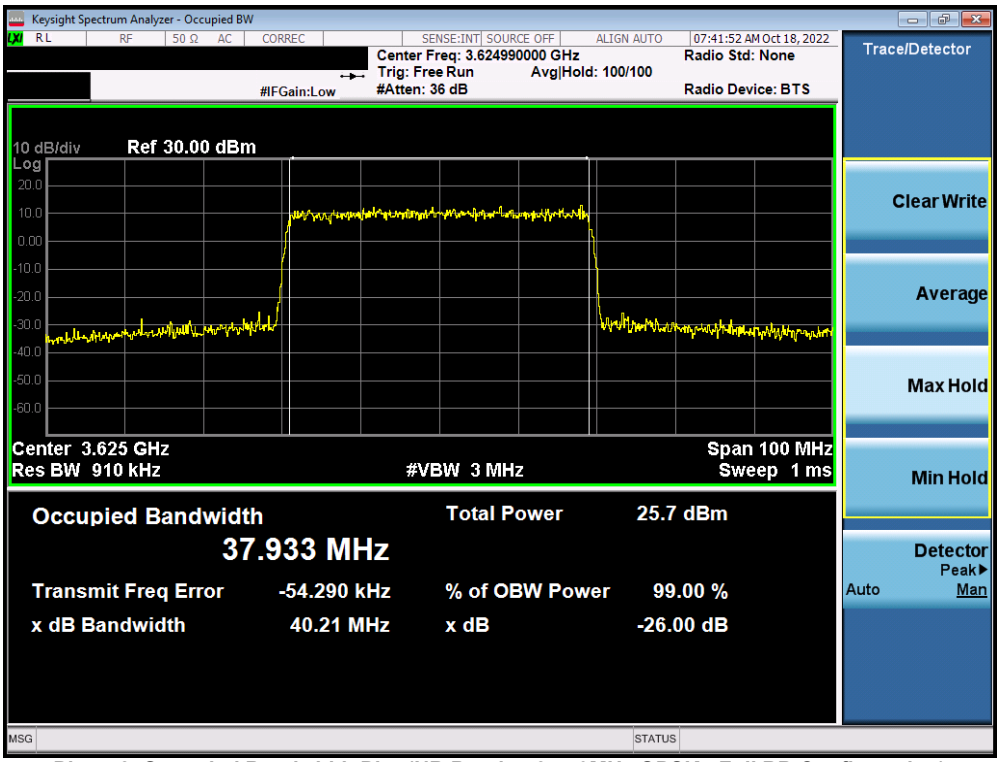
**Test Notes**

None

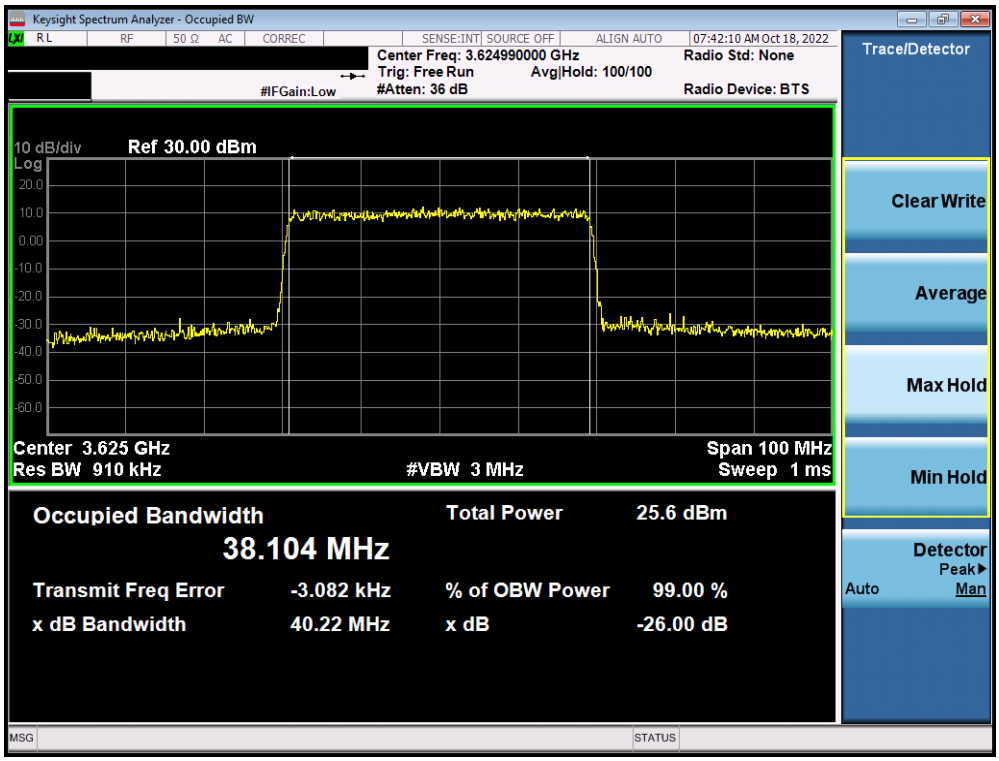
## NR Band n48



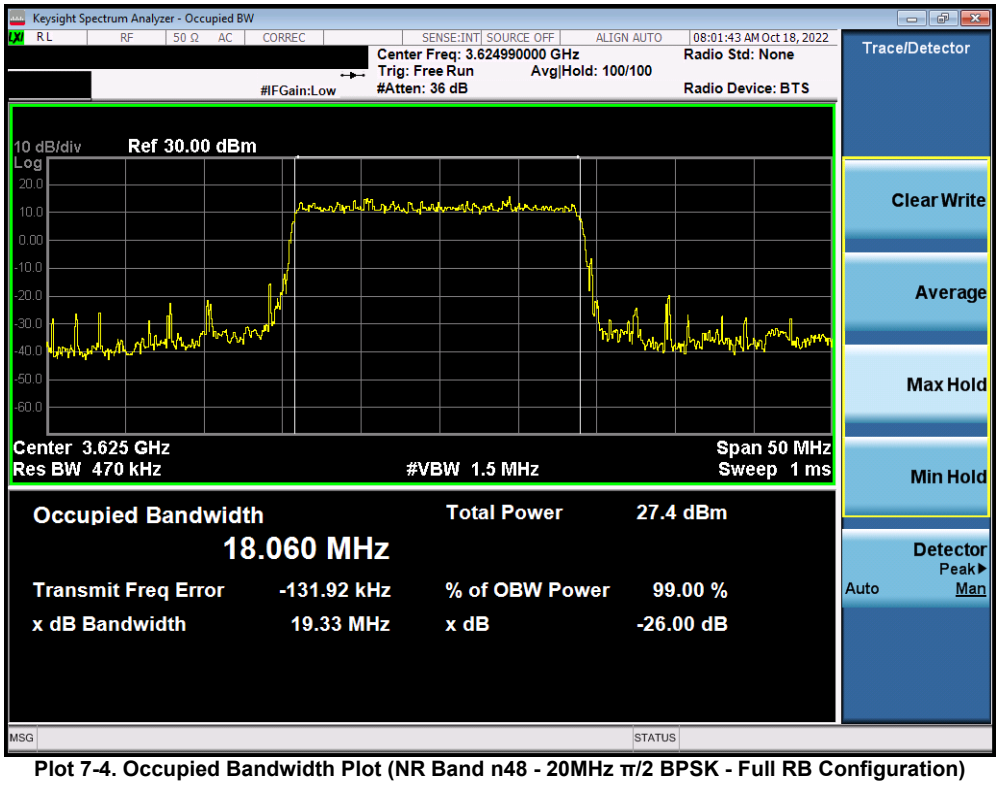

**Plot 7-1. Occupied Bandwidth Plot (NR Band n48 - 40MHz π/2 BPSK - Full RB Configuration)**



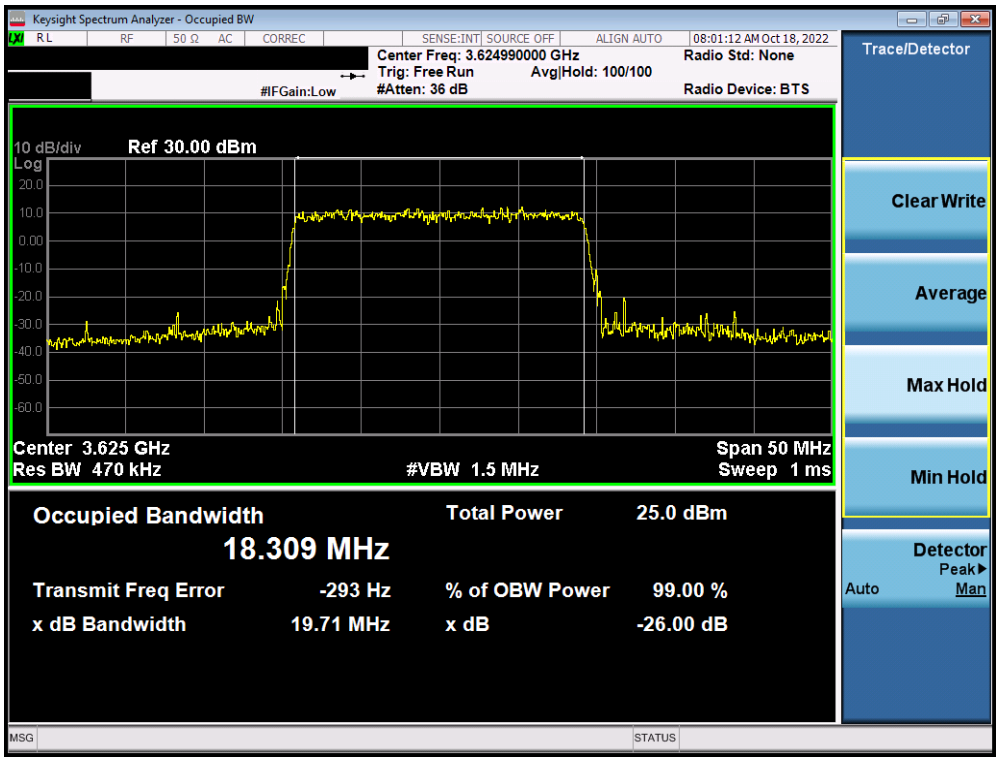

**Plot 7-2. Occupied Bandwidth Plot (NR Band n48 - 40MHz QPSK - Full RB Configuration)**



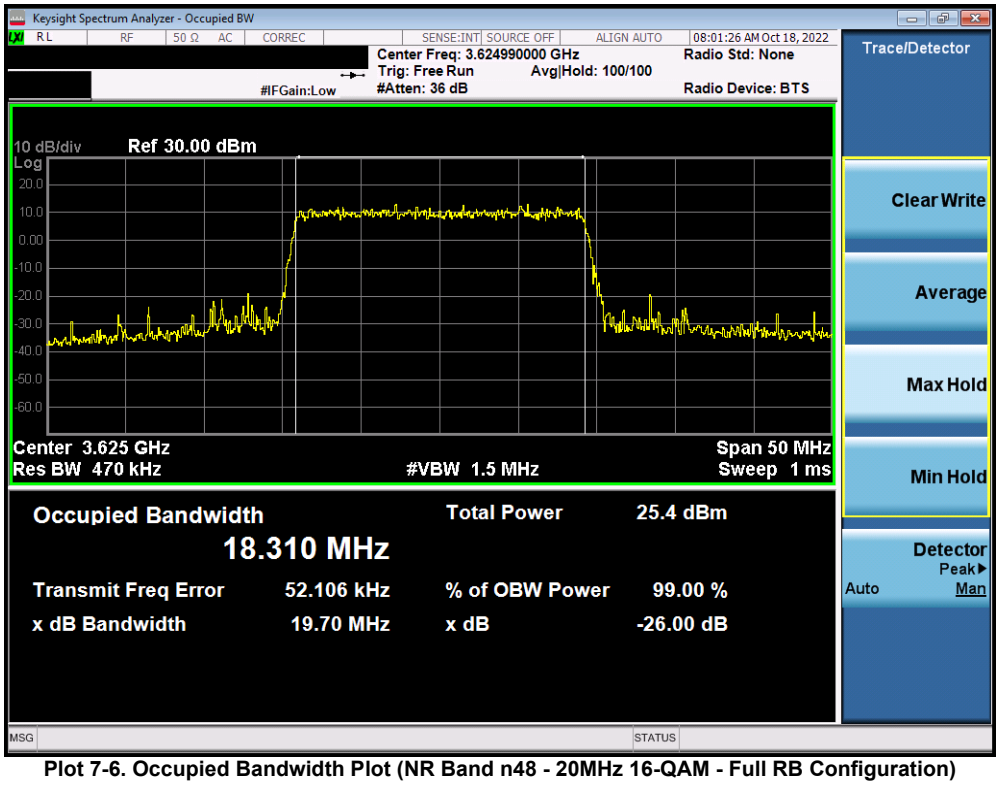

**Plot 7-3. Occupied Bandwidth Plot (NR Band n48 - 40MHz 16-QAM - Full RB Configuration)**



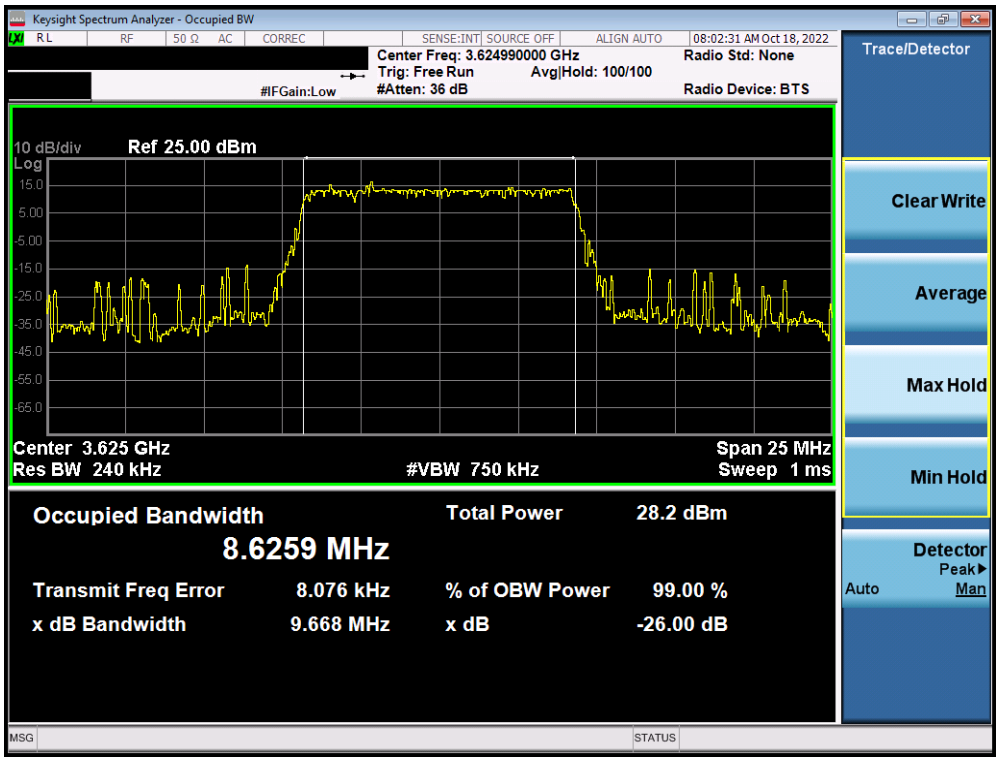

**Plot 7-4. Occupied Bandwidth Plot (NR Band n48 - 20MHz π/2 BPSK - Full RB Configuration)**



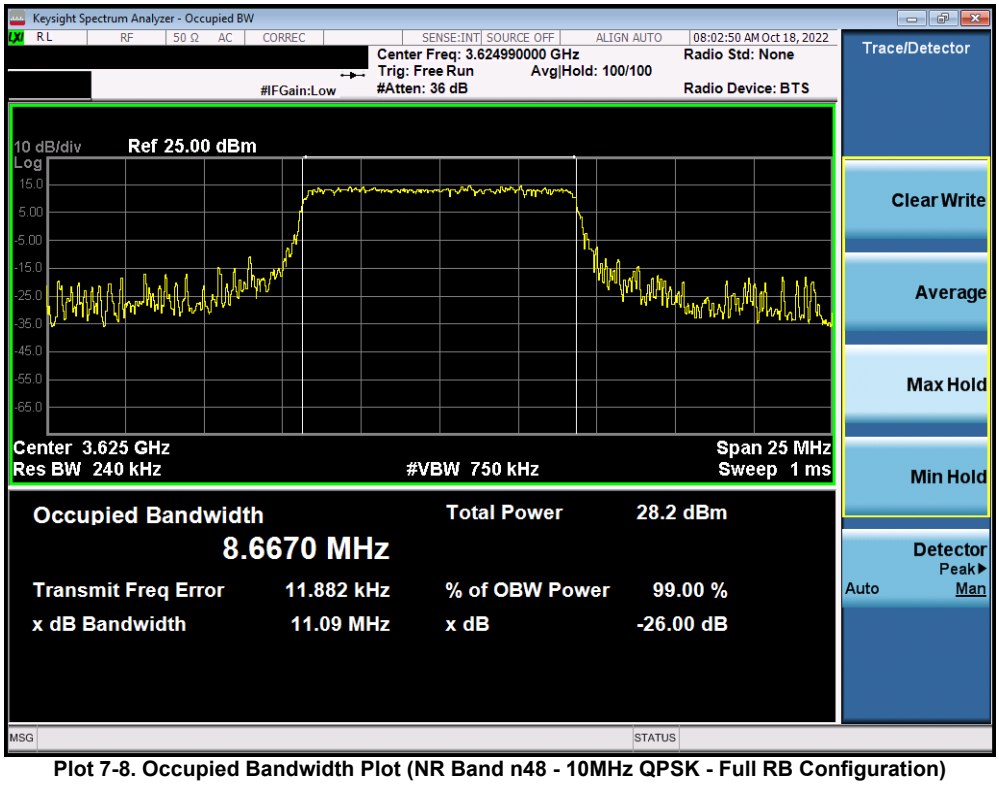

**Plot 7-5. Occupied Bandwidth Plot (NR Band n48 - 20MHz QPSK - Full RB Configuration)**



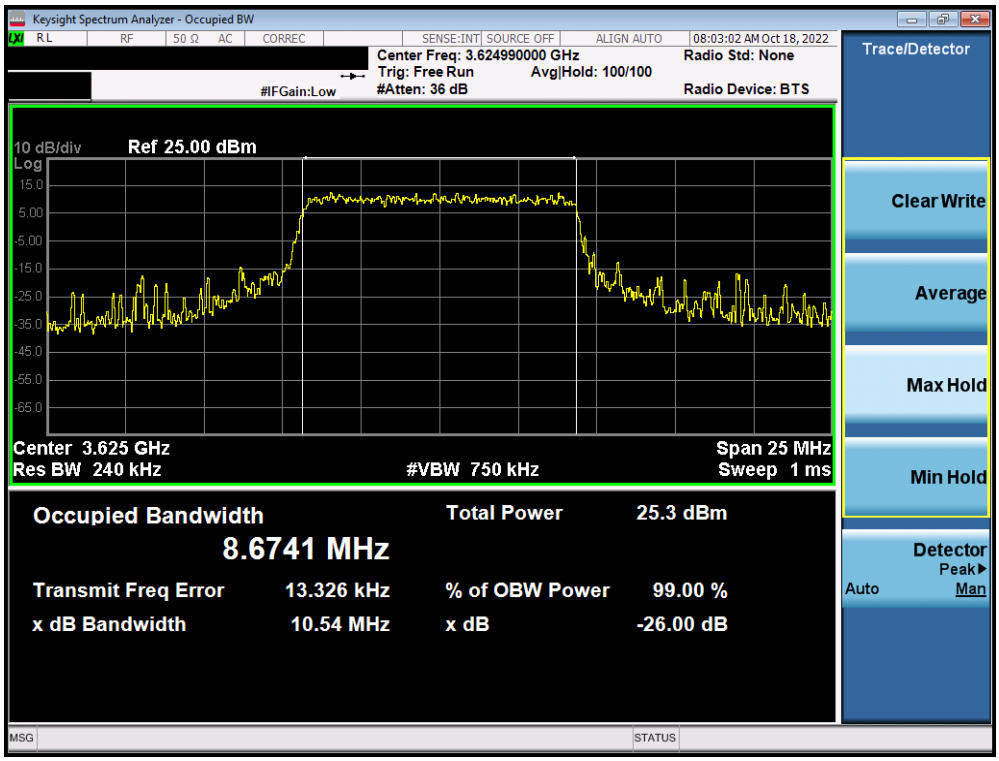

**Plot 7-6. Occupied Bandwidth Plot (NR Band n48 - 20MHz 16-QAM - Full RB Configuration)**




**Plot 7-7. Occupied Bandwidth Plot (NR Band n48 - 10MHz π/2 BPSK - Full RB Configuration)**




**Plot 7-8. Occupied Bandwidth Plot (NR Band n48 - 10MHz QPSK - Full RB Configuration)**




**Plot 7-9. Occupied Bandwidth Plot (NR Band n48 - 10MHz 16-QAM - Full RB Configuration)**

## 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 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 = Max Hold
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.

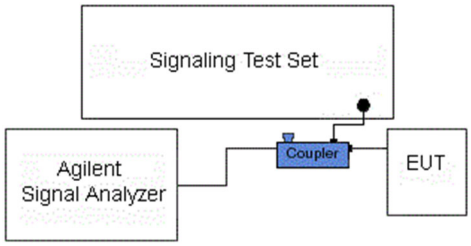



**Figure 7-3. Test Instrument & Measurement Setup**

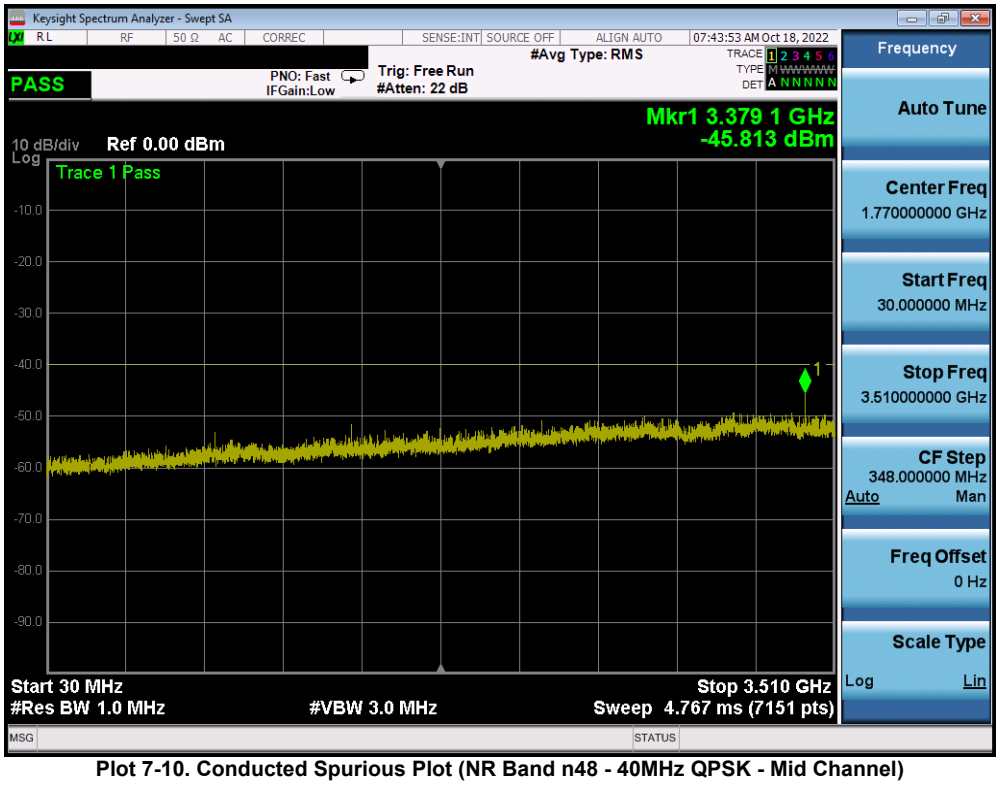
**Test Notes**

1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.

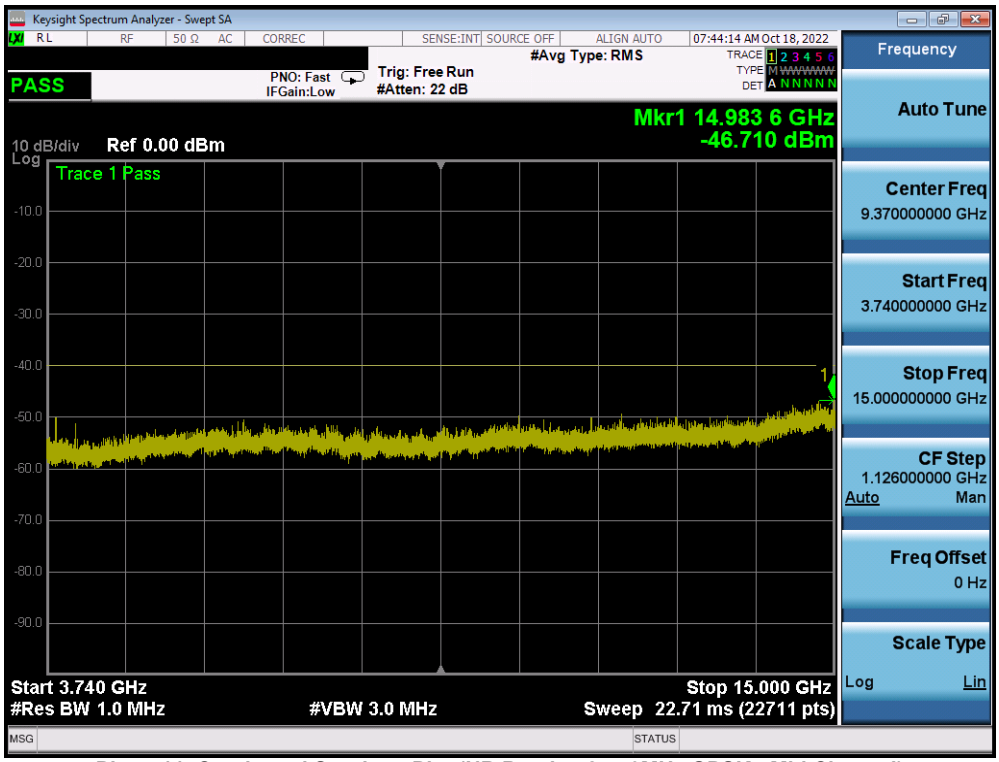
2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

3. Only the data for the widest bandwidth (40MHz) is shown in this section as all bandwidths operating at 1RB yield similar results.

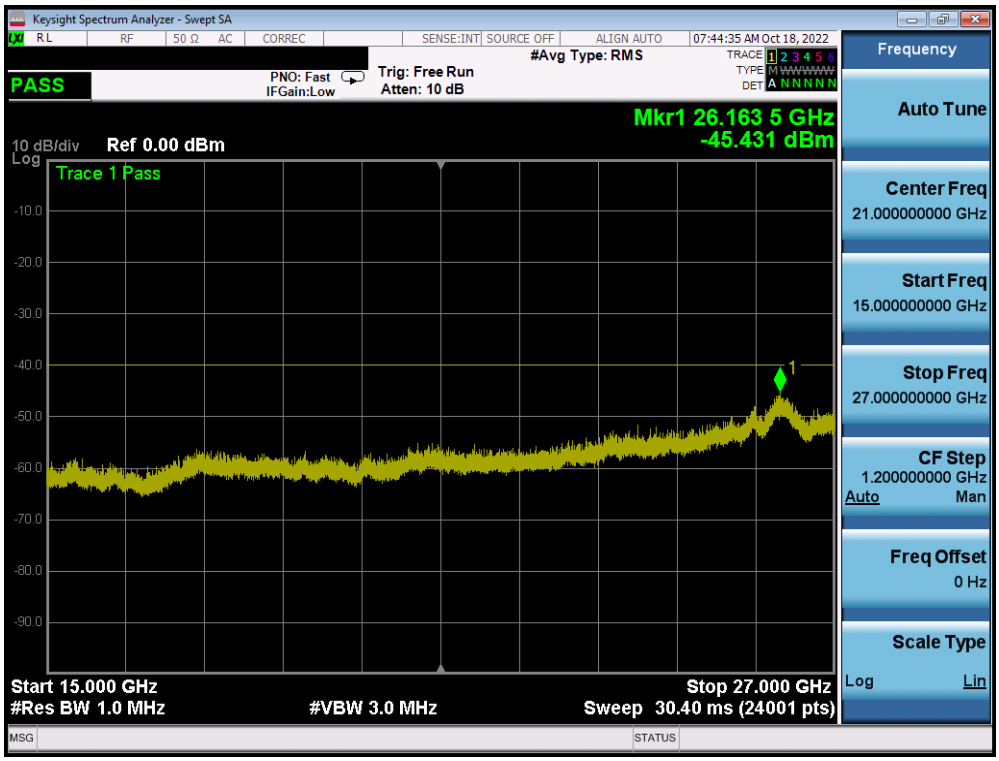
## NR Band n48




**Plot 7-10. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel)**




**Plot 7-11. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel)**




**Plot 7-12. Conducted Spurious Plot (NR Band n48 - 40MHz QPSK - Mid Channel)**

## 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 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 dBm/MHz within 0 to B 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 MHz below the lower CBSD-assigned channel edge. At all frequencies greater than B MHz above the upper CBSD assigned channel edge and less than B MHz below the lower CBSD-assigned channel edge, the conducted power of any end user device emission shall not exceed −25 dBm/MHz. The conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed −40dBm/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 ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x 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.

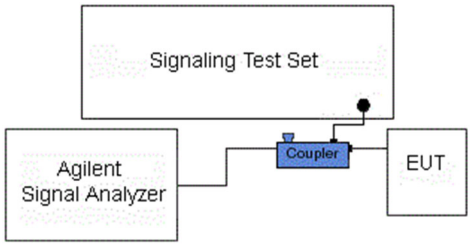


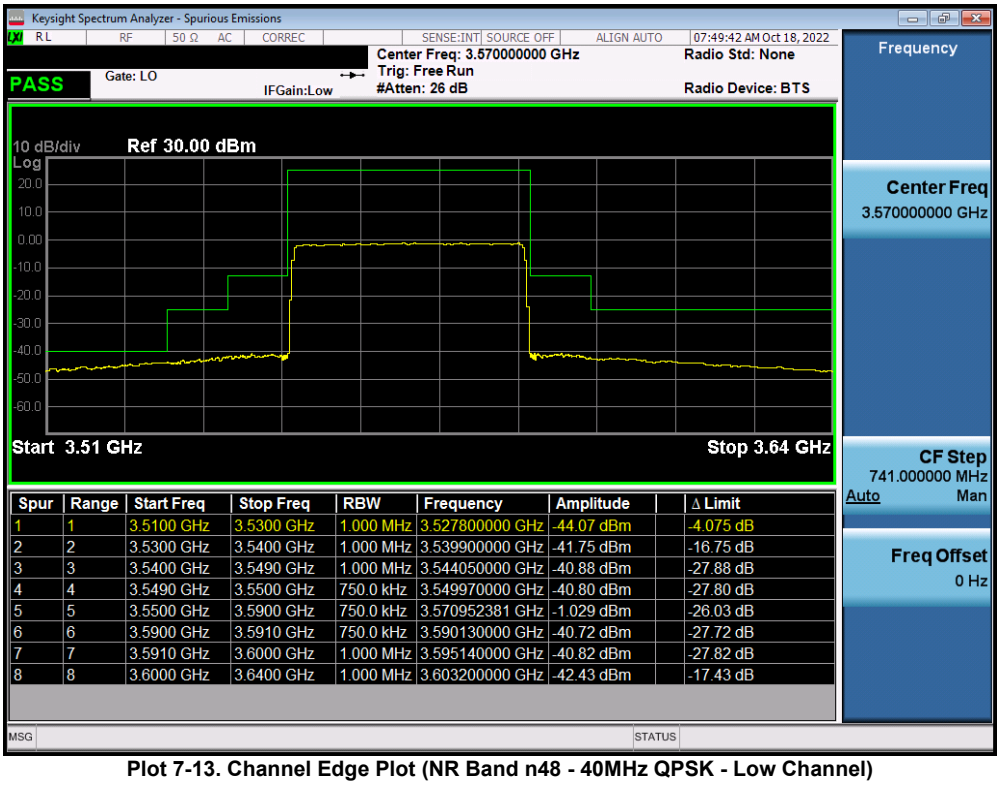

**Figure 7-4. Test Instrument & Measurement Setup**

## Test Notes

1. Per 96.41(e)(3)(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.

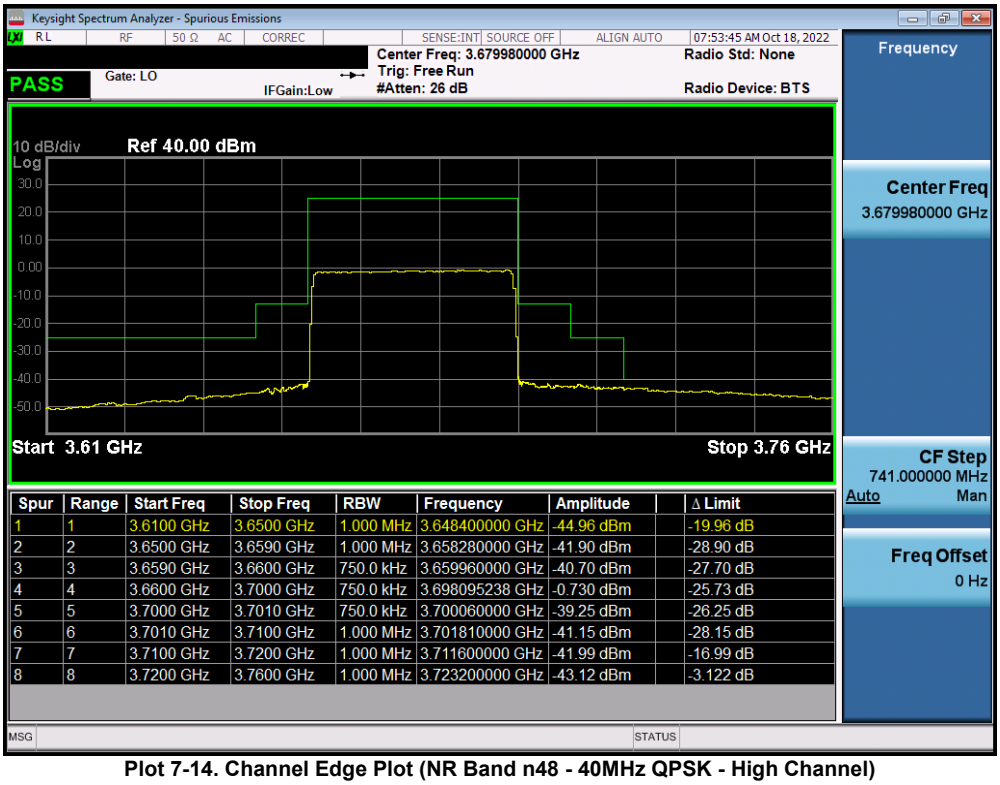
2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

## NR Band n48



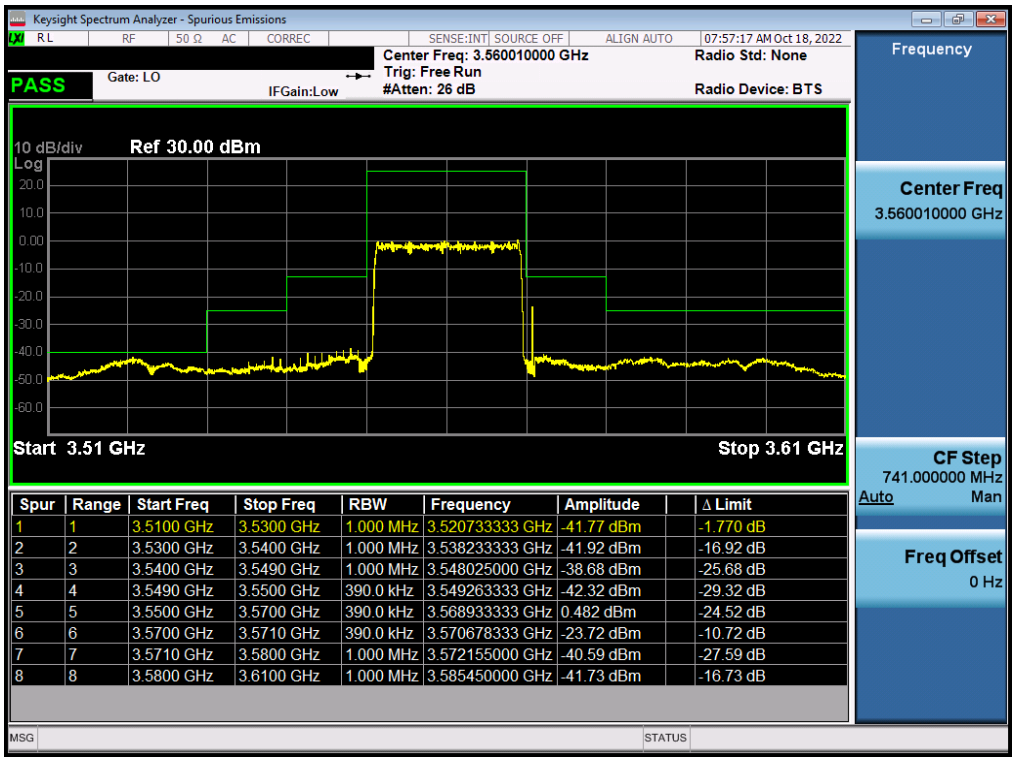

| Spur | Range | Start Freq | Stop Freq | RBW | Frequency | Amplitude | Δ Limit |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 3.5100 GHz | 3.5300 GHz | 1.000 MHz | 3.527800000 GHz | -44.07 dBm | -4.075 dB |
| 2 | 2 | 3.5300 GHz | 3.5400 GHz | 1.000 MHz | 3.539900000 GHz | -41.75 dBm | -16.75 dB |
| 3 | 3 | 3.5400 GHz | 3.5490 GHz | 1.000 MHz | 3.544050000 GHz | -40.88 dBm | -27.88 dB |
| 4 | 4 | 3.5490 GHz | 3.5500 GHz | 750.0 kHz | 3.549970000 GHz | -40.80 dBm | -27.80 dB |
| 5 | 5 | 3.5500 GHz | 3.5900 GHz | 750.0 kHz | 3.570952381 GHz | -1.029 dBm | -26.03 dB |
| 6 | 6 | 3.5900 GHz | 3.5910 GHz | 750.0 kHz | 3.590130000 GHz | -40.72 dBm | -27.72 dB |
| 7 | 7 | 3.5910 GHz | 3.6000 GHz | 1.000 MHz | 3.595140000 GHz | -40.82 dBm | -27.82 dB |
| 8 | 8 | 3.6000 GHz | 3.6400 GHz | 1.000 MHz | 3.603200000 GHz | -42.43 dBm | -17.43 dB |

**Plot 7-13. Channel Edge Plot (NR Band n48 - 40MHz QPSK - Low Channel)**



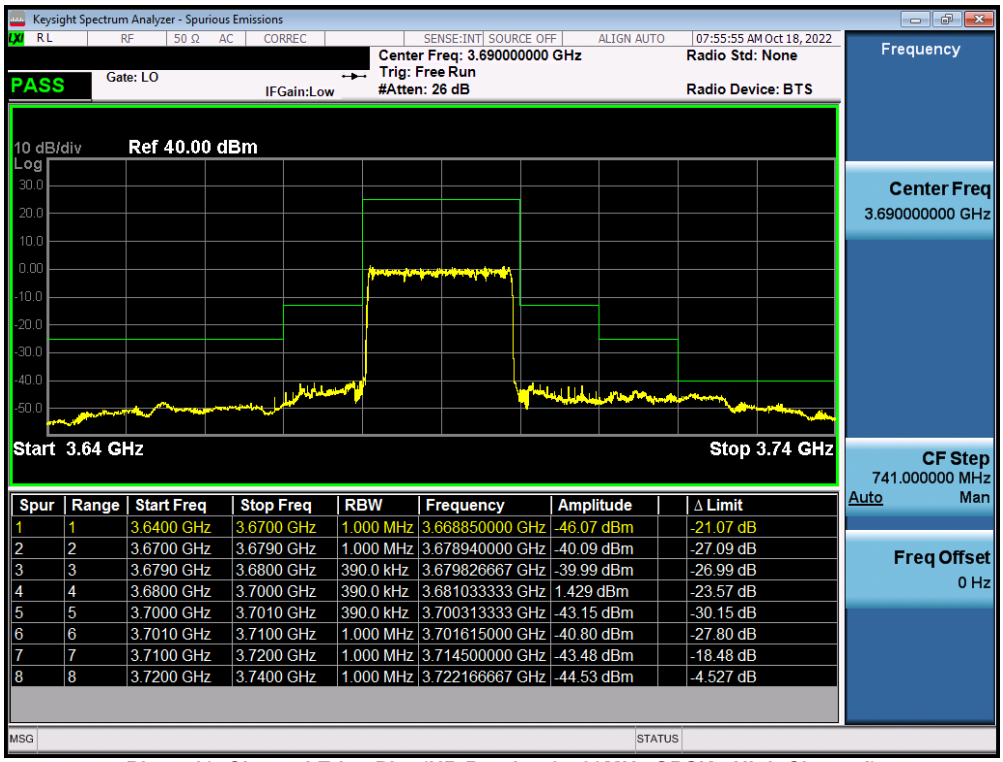

| Spur | Range | Start Freq | Stop Freq | RBW | Frequency | Amplitude | Δ Limit |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 3.6100 GHz | 3.6500 GHz | 1.000 MHz | 3.648400000 GHz | -44.96 dBm | -19.96 dB |
| 2 | 2 | 3.6500 GHz | 3.6590 GHz | 1.000 MHz | 3.658280000 GHz | -41.90 dBm | -28.90 dB |
| 3 | 3 | 3.6590 GHz | 3.6600 GHz | 750.0 kHz | 3.659960000 GHz | -40.70 dBm | -27.70 dB |
| 4 | 4 | 3.6600 GHz | 3.7000 GHz | 750.0 kHz | 3.698095238 GHz | -0.730 dBm | -25.73 dB |
| 5 | 5 | 3.7000 GHz | 3.7010 GHz | 750.0 kHz | 3.700060000 GHz | -39.25 dBm | -26.25 dB |
| 6 | 6 | 3.7010 GHz | 3.7100 GHz | 1.000 MHz | 3.701810000 GHz | -41.15 dBm | -28.15 dB |
| 7 | 7 | 3.7100 GHz | 3.7200 GHz | 1.000 MHz | 3.711600000 GHz | -41.99 dBm | -16.99 dB |
| 8 | 8 | 3.7200 GHz | 3.7600 GHz | 1.000 MHz | 3.723200000 GHz | -43.12 dBm | -3.122 dB |

**Plot 7-14. Channel Edge Plot (NR Band n48 - 40MHz QPSK - High Channel)**



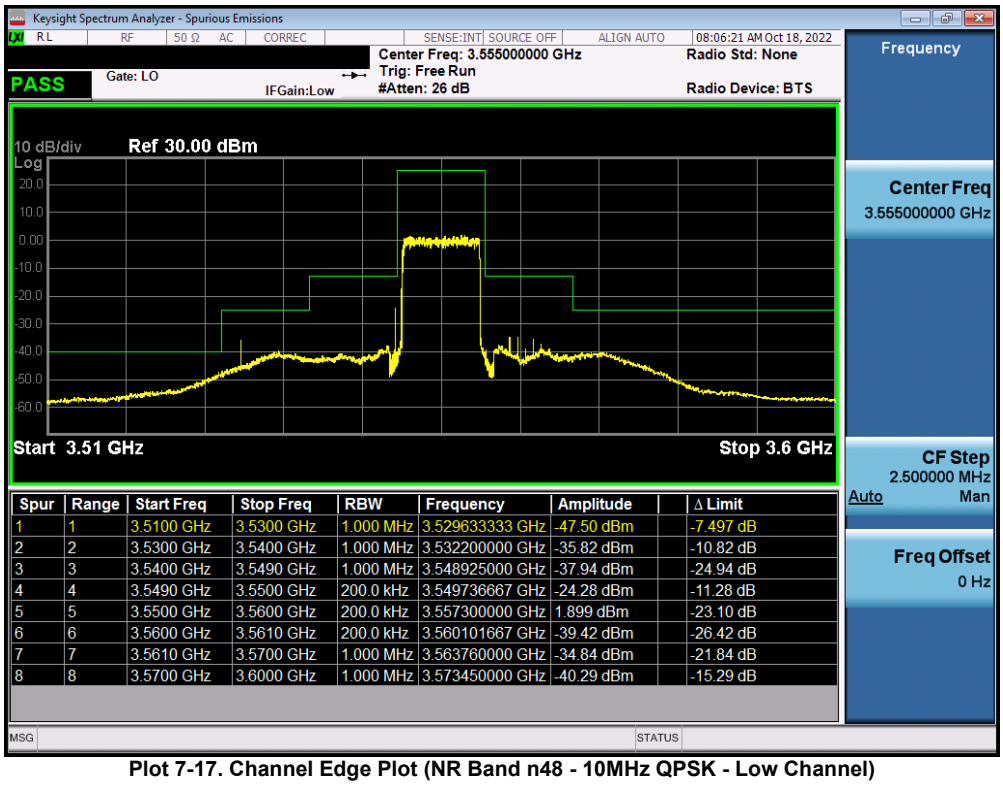

| Spur | Range | Start Freq | Stop Freq | RBW | Frequency | Amplitude | Δ Limit |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 3.5100 GHz | 3.5300 GHz | 1.000 MHz | 3.520733333 GHz | -41.77 dBm | -1.770 dB |
| 2 | 2 | 3.5300 GHz | 3.5400 GHz | 1.000 MHz | 3.538233333 GHz | -41.92 dBm | -16.92 dB |
| 3 | 3 | 3.5400 GHz | 3.5490 GHz | 1.000 MHz | 3.548025000 GHz | -38.68 dBm | -25.68 dB |
| 4 | 4 | 3.5490 GHz | 3.5500 GHz | 390.0 kHz | 3.549263333 GHz | -42.32 dBm | -29.32 dB |
| 5 | 5 | 3.5500 GHz | 3.5700 GHz | 390.0 kHz | 3.568933333 GHz | 0.482 dBm | -24.52 dB |
| 6 | 6 | 3.5700 GHz | 3.5710 GHz | 390.0 kHz | 3.570678333 GHz | -23.72 dBm | -10.72 dB |
| 7 | 7 | 3.5710 GHz | 3.5800 GHz | 1.000 MHz | 3.572155000 GHz | -40.59 dBm | -27.59 dB |
| 8 | 8 | 3.5800 GHz | 3.6100 GHz | 1.000 MHz | 3.585450000 GHz | -41.73 dBm | -16.73 dB |

**Plot 7-15. Channel Edge Plot (NR Band n48 - 20MHz QPSK - Low Channel)**



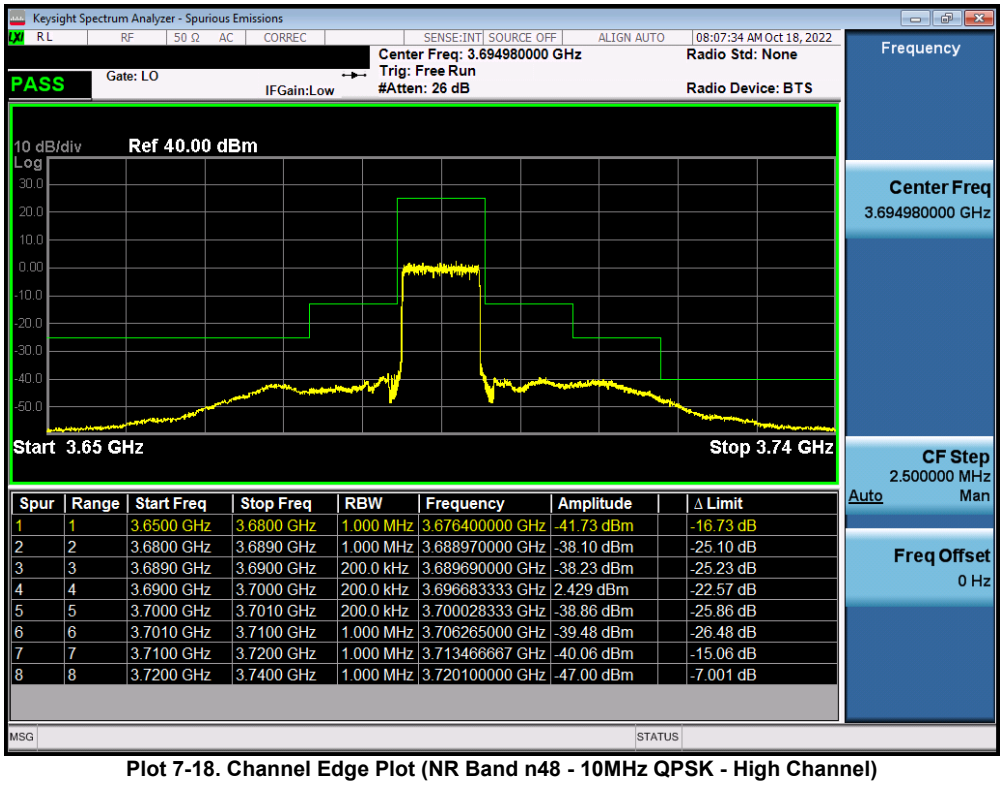

| Spur | Range | Start Freq | Stop Freq | RBW | Frequency | Amplitude | Δ Limit |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 3.6400 GHz | 3.6700 GHz | 1.000 MHz | 3.668850000 GHz | -46.07 dBm | -21.07 dB |
| 2 | 2 | 3.6700 GHz | 3.6790 GHz | 1.000 MHz | 3.678940000 GHz | -40.09 dBm | -27.09 dB |
| 3 | 3 | 3.6790 GHz | 3.6800 GHz | 390.0 kHz | 3.679826667 GHz | -39.99 dBm | -26.99 dB |
| 4 | 4 | 3.6800 GHz | 3.7000 GHz | 390.0 kHz | 3.681033333 GHz | 1.429 dBm | -23.57 dB |
| 5 | 5 | 3.7000 GHz | 3.7010 GHz | 390.0 kHz | 3.700313333 GHz | -43.15 dBm | -30.15 dB |
| 6 | 6 | 3.7010 GHz | 3.7100 GHz | 1.000 MHz | 3.701615000 GHz | -40.80 dBm | -27.80 dB |
| 7 | 7 | 3.7100 GHz | 3.7200 GHz | 1.000 MHz | 3.714500000 GHz | -43.48 dBm | -18.48 dB |
| 8 | 8 | 3.7200 GHz | 3.7400 GHz | 1.000 MHz | 3.722166667 GHz | -44.53 dBm | -4.527 dB |

**Plot 7-16. Channel Edge Plot (NR Band n48 - 20MHz QPSK - High Channel)**




| Spur | Range | Start Freq | Stop Freq | RBW | Frequency | Amplitude | Δ Limit |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 3.5100 GHz | 3.5300 GHz | 1.000 MHz | 3.529633333 GHz | -47.50 dBm | -7.497 dB |
| 2 | 2 | 3.5300 GHz | 3.5400 GHz | 1.000 MHz | 3.532200000 GHz | -35.82 dBm | -10.82 dB |
| 3 | 3 | 3.5400 GHz | 3.5490 GHz | 1.000 MHz | 3.548925000 GHz | -37.94 dBm | -24.94 dB |
| 4 | 4 | 3.5490 GHz | 3.5500 GHz | 200.0 kHz | 3.549736667 GHz | -24.28 dBm | -11.28 dB |
| 5 | 5 | 3.5500 GHz | 3.5600 GHz | 200.0 kHz | 3.557300000 GHz | 1.899 dBm | -23.10 dB |
| 6 | 6 | 3.5600 GHz | 3.5610 GHz | 200.0 kHz | 3.560101667 GHz | -39.42 dBm | -26.42 dB |
| 7 | 7 | 3.5610 GHz | 3.5700 GHz | 1.000 MHz | 3.563760000 GHz | -34.84 dBm | -21.84 dB |
| 8 | 8 | 3.5700 GHz | 3.6000 GHz | 1.000 MHz | 3.573450000 GHz | -40.29 dBm | -15.29 dB |

**Plot 7-17. Channel Edge Plot (NR Band n48 - 10MHz QPSK - Low Channel)**




| Spur | Range | Start Freq | Stop Freq | RBW | Frequency | Amplitude | Δ Limit |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 3.6500 GHz | 3.6800 GHz | 1.000 MHz | 3.676400000 GHz | -41.73 dBm | -16.73 dB |
| 2 | 2 | 3.6800 GHz | 3.6890 GHz | 1.000 MHz | 3.688970000 GHz | -38.10 dBm | -25.10 dB |
| 3 | 3 | 3.6890 GHz | 3.6900 GHz | 200.0 kHz | 3.689690000 GHz | -38.23 dBm | -25.23 dB |
| 4 | 4 | 3.6900 GHz | 3.7000 GHz | 200.0 kHz | 3.696683333 GHz | 2.429 dBm | -22.57 dB |
| 5 | 5 | 3.7000 GHz | 3.7010 GHz | 200.0 kHz | 3.700028333 GHz | -38.86 dBm | -25.86 dB |
| 6 | 6 | 3.7010 GHz | 3.7100 GHz | 1.000 MHz | 3.706265000 GHz | -39.48 dBm | -26.48 dB |
| 7 | 7 | 3.7100 GHz | 3.7200 GHz | 1.000 MHz | 3.713466667 GHz | -40.06 dBm | -15.06 dB |
| 8 | 8 | 3.7200 GHz | 3.7400 GHz | 1.000 MHz | 3.720100000 GHz | -47.00 dBm | -7.001 dB |

**Plot 7-18. Channel Edge Plot (NR Band n48 - 10MHz QPSK - High Channel)**

## 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. 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 (pre-scans may use lower than 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 = 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

## Test Setup

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

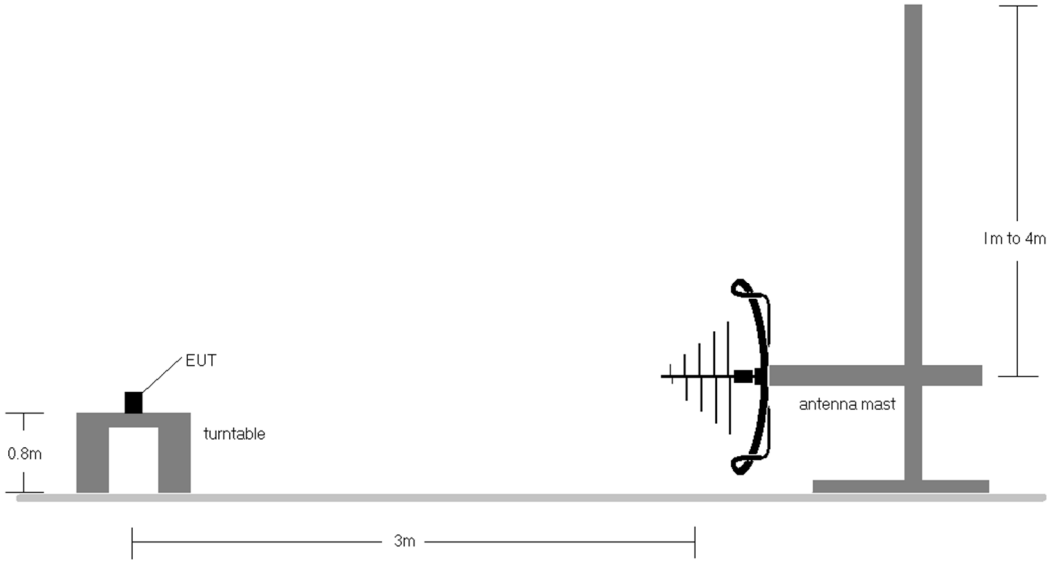



**Figure 7-5. Test Instrument & Measurement Setup < 1GHz**

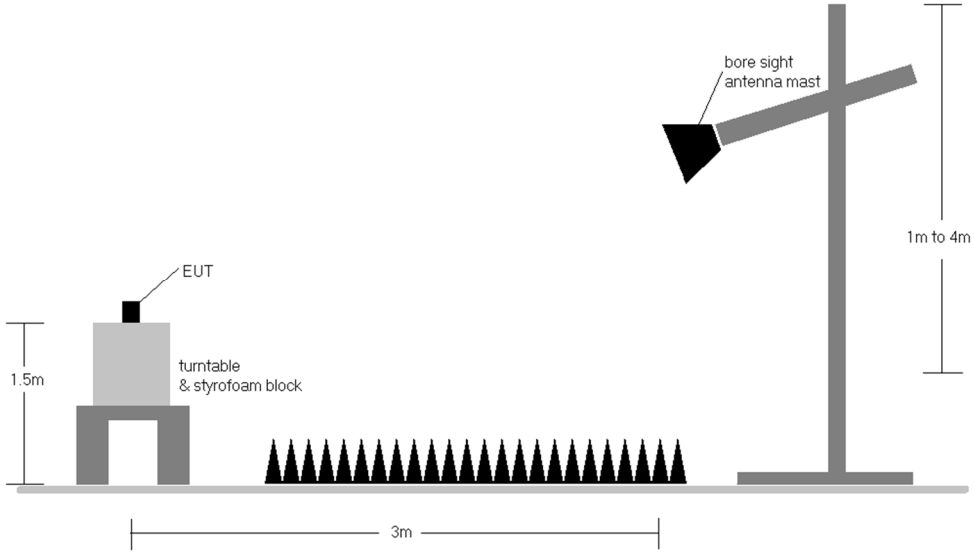



**Figure 7-6. Test Instrument & Measurement Setup >1 GHz**

## 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) The EUT was tested while connected to a DC power supply.

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

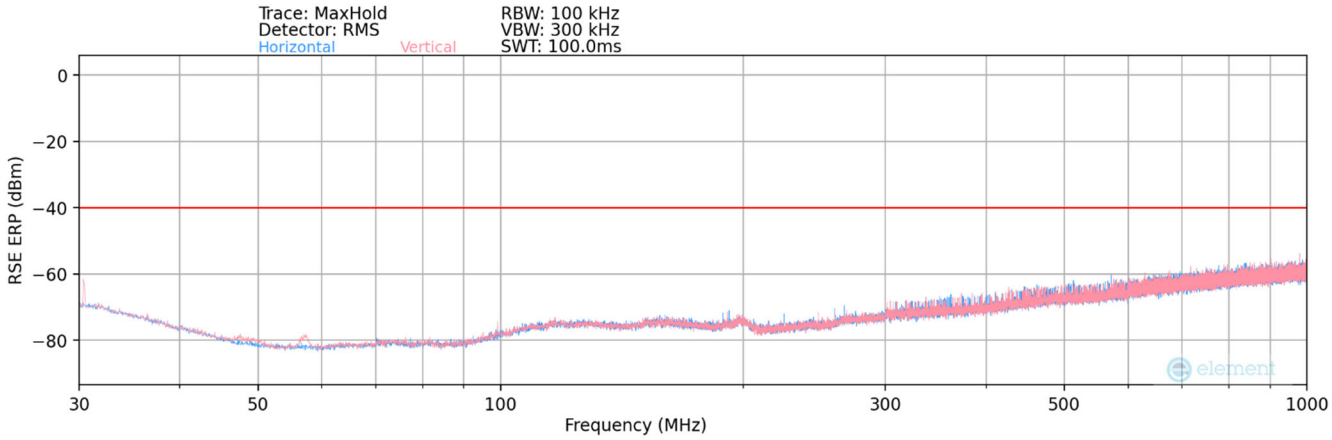
5) Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

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

7) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) 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.

## NR Band n48

### <1GHz



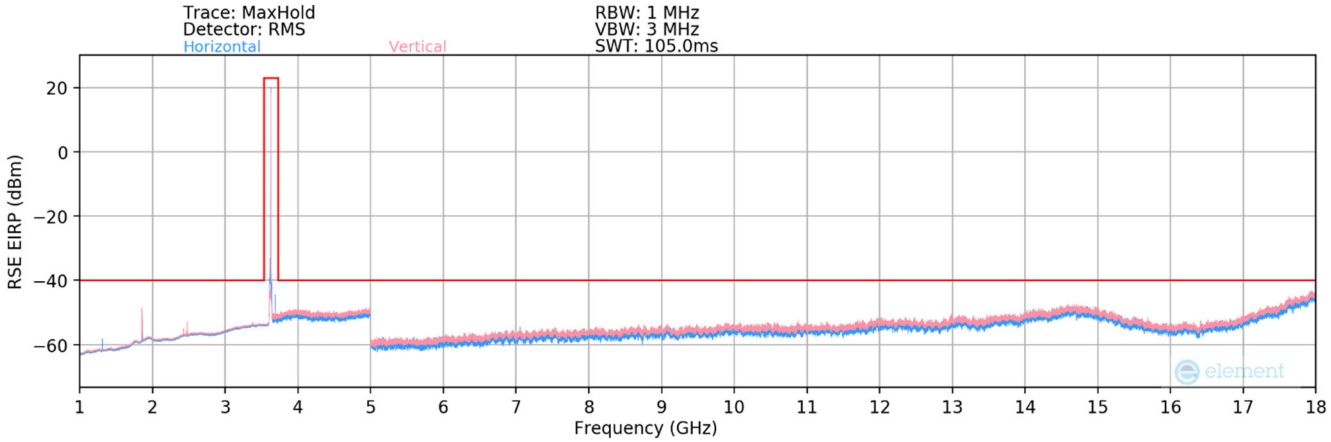

**Plot 7-19. Radiated Spurious Plot Below 1GHz (NR Band n48)**

| | |
|---|---|
| **Bandwidth (MHz):** | 40 |
| **Frequency (MHz):** | 3570.0 |
| **Modulation Signal:** | QPSK |
| **RB Config (Size / Offset):** | 1 / 53 |

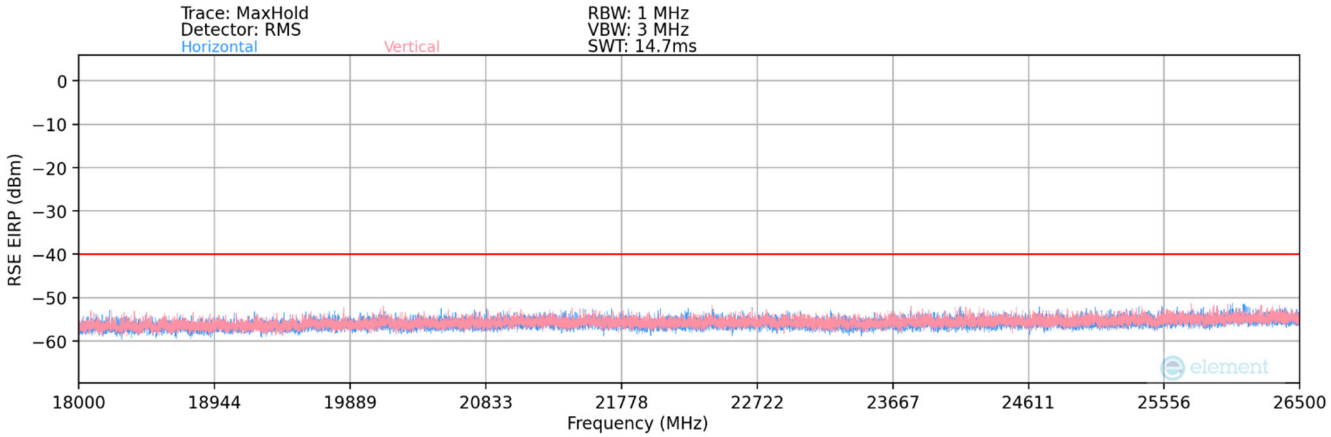
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBµV/m] | ERP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 31.00 | V | - | - | -102.59 | 26.68 | 31.09 | -66.32 | -40.00 | -26.32 |
| 58.00 | V | - | - | -102.20 | 14.21 | 19.01 | -78.40 | -40.00 | -38.40 |
| 99.00 | V | - | - | -103.47 | 16.96 | 20.49 | -76.92 | -40.00 | -36.92 |

**Table 7-7. Radiated Spurious Data Below 1GHz (NR Band n48 – Mid Channel)**

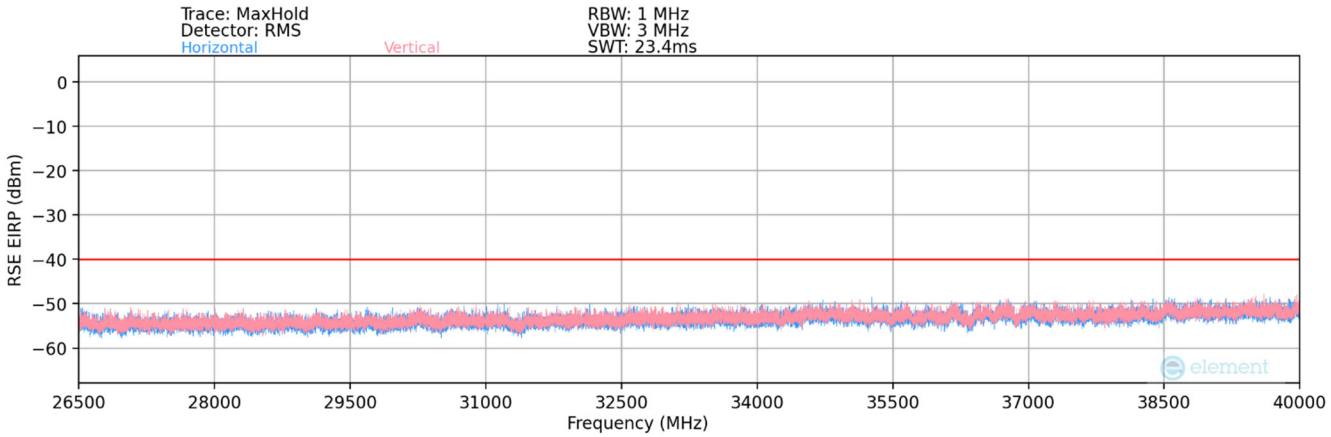
## >1GHz




**Plot 7-20. Radiated Spurious Plot Above 1GHz (NR Band n48)**




**Plot 7-21. Radiated Spurious Plot Above 18GHz – 26.5GHz (NR Band n48)**




**Plot 7-22. Radiated Spurious Plot Above 26.5GHz – 40GHz (NR Band n48)**

| | |
|---|---|
| **Bandwidth (MHz):** | 40 |
| **Frequency (MHz):** | 3570.0 |
| **Modulation Signal:** | QPSK |
| **RB Config (Size / Offset):** | 1 / 53 |

| 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] |
|---|---|---|---|---|---|---|---|---|---|
| 7140.00 | V | 236 | 261 | -73.52 | 4.18 | 37.66 | -57.60 | -40.00 | -17.60 |
| 10710.00 | V | - | - | -76.03 | 8.33 | 39.30 | -55.96 | -40.00 | -15.96 |
| 14280.00 | V | - | - | -76.21 | 12.66 | 43.45 | -51.81 | -40.00 | -11.81 |
| 17850.00 | V | - | - | -76.24 | 16.74 | 47.50 | -47.75 | -40.00 | -7.75 |
| 21420.00 | V | - | - | -55.27 | 3.84 | 55.57 | -49.23 | -40.00 | -9.23 |

**Table 7-8. Radiated Spurious Data (NR Band n48 – Low Channel)**

| | |
|---|---|
| **Bandwidth (MHz):** | 40 |
| **Frequency (MHz):** | 3625.0 |
| **Modulation Signal:** | QPSK |
| **RB Config (Size / Offset):** | 1 / 53 |

| 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] |
|---|---|---|---|---|---|---|---|---|---|
| 7250.00 | V | 231 | 256 | -73.22 | 3.95 | 37.73 | -57.52 | -40.00 | -17.52 |
| 10875.00 | V | - | - | -75.99 | 8.62 | 39.63 | -55.63 | -40.00 | -15.63 |
| 14500.00 | V | - | - | -75.90 | 13.66 | 44.76 | -50.50 | -40.00 | -10.50 |
| 18125.00 | V | - | - | -56.29 | 1.42 | 52.13 | -52.67 | -40.00 | -12.67 |
| 21750.00 | V | - | - | -57.61 | 3.83 | 53.22 | -51.58 | -40.00 | -11.58 |

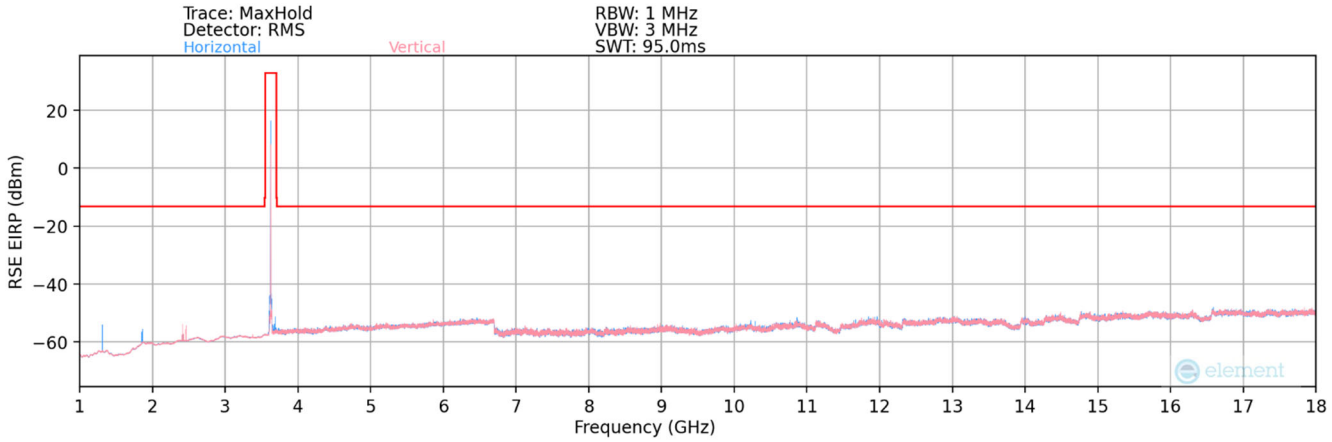
**Table 7-9. Radiated Spurious Data (NR Band n48 – Mid Channel)**

| | |
|---|---|
| **Bandwidth (MHz):** | 40 |
| **Frequency (MHz):** | 3680.0 |
| **Modulation Signal:** | QPSK |
| **RB Config (Size / Offset):** | 1 / 53 |

| 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] |
|---|---|---|---|---|---|---|---|---|---|
| 7360.00 | V | 123 | 175 | -73.21 | 4.31 | 38.10 | -57.15 | -40.00 | -17.15 |
| 11040.00 | V | - | - | -76.31 | 8.90 | 39.59 | -55.67 | -40.00 | -15.67 |
| 14720.00 | V | - | - | -76.60 | 14.13 | 44.53 | -50.73 | -40.00 | -10.73 |
| 18400.00 | V | - | - | -57.53 | 1.43 | 50.90 | -53.90 | -40.00 | -13.90 |
| 22080.00 | V | - | - | -57.98 | 3.75 | 52.77 | -52.03 | -40.00 | -12.03 |

**Table 7-10. Radiated Spurious Data (NR Band n48 – High Channel)**

## EN-DC: NR Band n48 + LTE Band 5



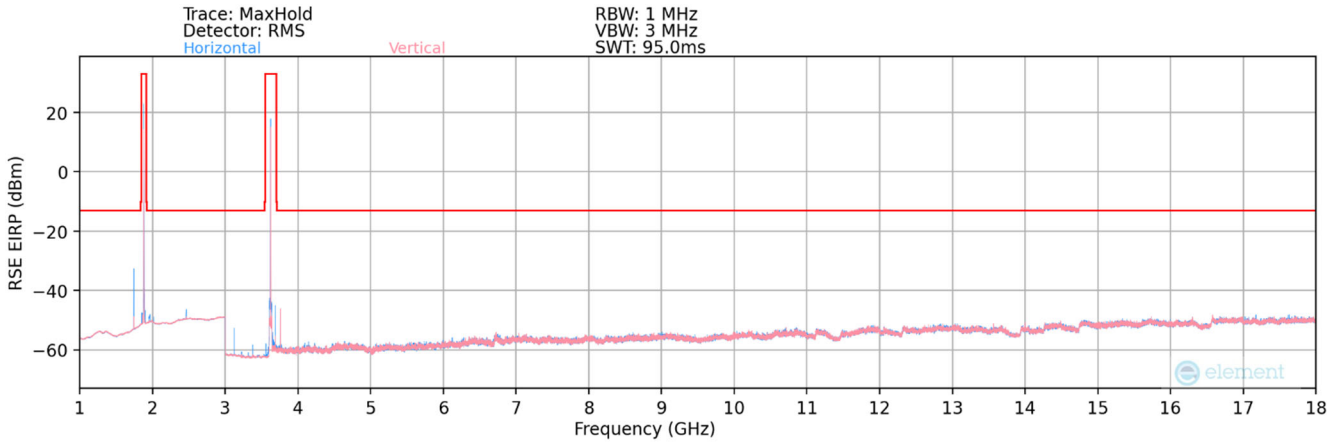

**Plot 7-23. Radiated Spurious Emissions Plot (EN-DC: n48 + B5)**

| | |
|---|---|
| **NR Bandwidth (MHz):** | 40 |
| **NR Frequency (MHz):** | 3625.0 |
| **NR RB / Offset:** | 1 / 53 |
| **LTE Bandwidth (MHz):** | 20 |
| **LTE Frequency (MHz):** | 1880.0 |
| **LTE RB / Offset:** | 1 / 50 |
| **Modulation Signal:** | QPSK |

| 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] |
|---|---|---|---|---|---|---|---|---|---|
| 1610.00 | H | - | - | -71.19 | 5.51 | 41.32 | -53.94 | -13.00 | -40.94 |
| 3355.00 | H | - | - | -73.84 | 2.53 | 35.69 | -59.57 | -13.00 | -46.57 |
| 5100.00 | H | - | - | -76.06 | 4.75 | 35.69 | -59.56 | -13.00 | -46.56 |
| 5370.00 | H | - | - | -78.51 | 4.89 | 33.38 | -61.88 | -13.00 | -48.88 |
| 7115.00 | H | - | - | -76.37 | 8.04 | 38.67 | -66.13 | -13.00 | -53.13 |
| 10605.00 | H | - | - | -78.84 | 12.41 | 40.57 | -64.23 | -13.00 | -51.23 |

**Table 7-11. Radiated Spurious Emissions Data (EN-DC: n48 + B5)**

## EN-DC: NR Band n48 + LTE Band 2




**Plot 7-24. Radiated Spurious Emissions Plot (EN-DC: n48 + B2)**

| | |
|---|---|
| **NR Bandwidth (MHz):** | 40 |
| **NR Frequency (MHz):** | 3625.0 |
| **NR RB / Offset:** | 1 / 53 |
| **LTE Bandwidth (MHz):** | 10 |
| **LTE Frequency (MHz):** | 836.5 |
| **LTE RB / Offset:** | 1/25 |
| **Modulation Signal:** | QPSK |

| 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] |
|---|---|---|---|---|---|---|---|---|---|
| 1952.00 | H | - | - | -72.92 | -0.43 | 33.65 | -61.61 | -13.00 | -48.61 |
| 4740.00 | H | - | - | -77.13 | 4.23 | 34.10 | -61.16 | -13.00 | -48.16 |
| 6413.00 | H | - | - | -77.80 | 22.57 | 51.77 | -43.49 | -13.00 | -30.49 |
| 7529.00 | H | - | - | -77.09 | 8.22 | 38.13 | -66.67 | -13.00 | -53.67 |
| 9202.00 | H | - | - | -77.19 | 8.70 | 38.51 | -66.29 | -13.00 | -53.29 |
| 10317.00 | H | - | - | -77.56 | 11.17 | 40.61 | -64.19 | -13.00 | -51.19 |

**Table 7-12. Radiated Spurious Emissions Data (EN-DC: n48 + B2)**

## 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.

***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**

In Table 7-13, some Frequency values are shown as "-". These are situations where the module was not able to transmit at that given temperature so no data was recorded.

## Frequency Stability / Temperature Variation

# NR Band n48

| | |
|---|---|
| Operating Frequency (Hz): | 3,625,000,000 |
| Ref. Voltage (VDC): | 3.30 |

| Voltage (%) | Power (VDC) | Temp (°C) | Frequency (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 3.30 | - 30 | - | - | - |
| | | - 20 | - | - | - |
| | | - 10 | - | - | - |
| | | 0 | 3,625,255,048 | 4,252 | 0.0001173 |
| | | + 10 | 3,625,252,394 | 1,598 | 0.0000441 |
| | | + 20 (Ref) | 3,625,250,796 | 0 | 0.0000000 |
| | | + 30 | 3,625,256,483 | 5,687 | 0.0001569 |
| | | + 40 | - | - | - |
| | | + 50 | - | - | - |
| 85 % | 2.81 | + 20 | 3,625,252,481 | 1,685 | 0.0000465 |
| 115 % | 3.80 | + 20 | 3,625,253,187 | 2,391 | 0.0000660 |

**Table 7-13. NR Band n48 Frequency Stability Data**

## 7.8 End User Device Additional Requirement (CBSD Protocol)

**Test Overview and Limit**

End user device additional requirements (CBSD Protocol) are tested per the test procedures listed below. During testing, the EUT is connected to a certified NR CBSD (Airspan FCC ID: PIDAV2700) as a companion device to show compliance with Part 96.47.

***End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.***

***An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.***

**Test Procedure Used**

KDB 940660 D01 v03, WINNF-18-IN-00178 v1.0.0.00, WINNF-TS-0122 v1.0.2

**Test Setup/Method**

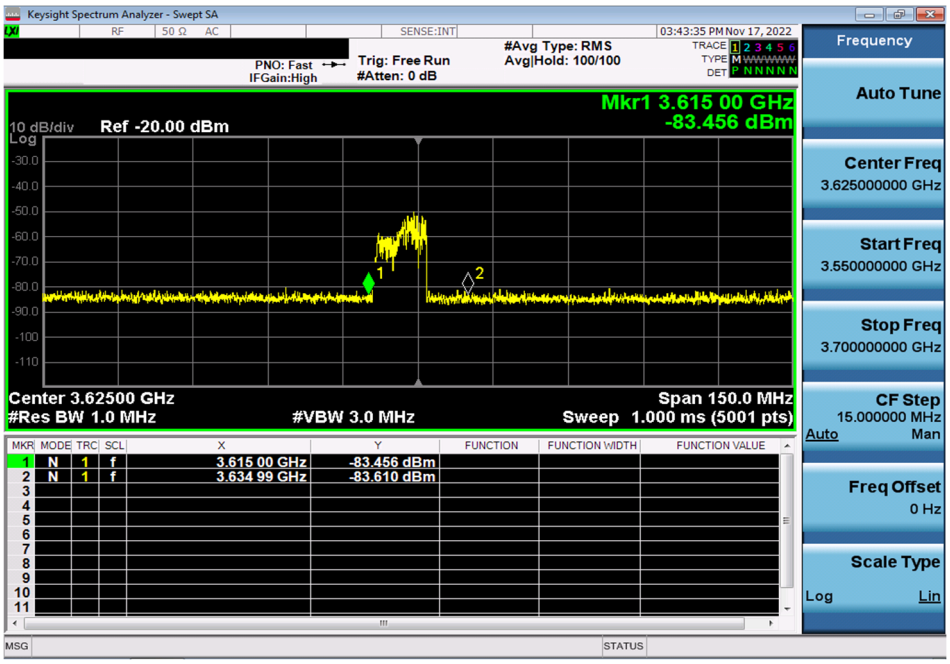
The EUT was connected via an RF cable to a certified CBSD and spectrum analyzer. The following procedure is performed by applying WINNF-TS-0122 CBRS CBSD Test Specification.

1. Run#1:
    a. Setup WINNF.PT.C.HBT.1 with 3615MHz – 3635MHz.
    b. Enable AP/CBSD service.
    c. Check EUT Tx frequency.
    d. Disable AP/CBSD service and check EUT stop transmission within 10s.
2. Run#2:
    a. Setup WINNF.PT.C.HBT.1 with 3660MHz – 3680MHz.
    b. Enable AP/CBSD service.
    c. Check EUT Tx frequency.
    d. Disable AP/CBSD service and check EUT stop transmission within 10s.

**Test Notes**

The EUT is an End User Device.

## NR Band n48 Run#1:



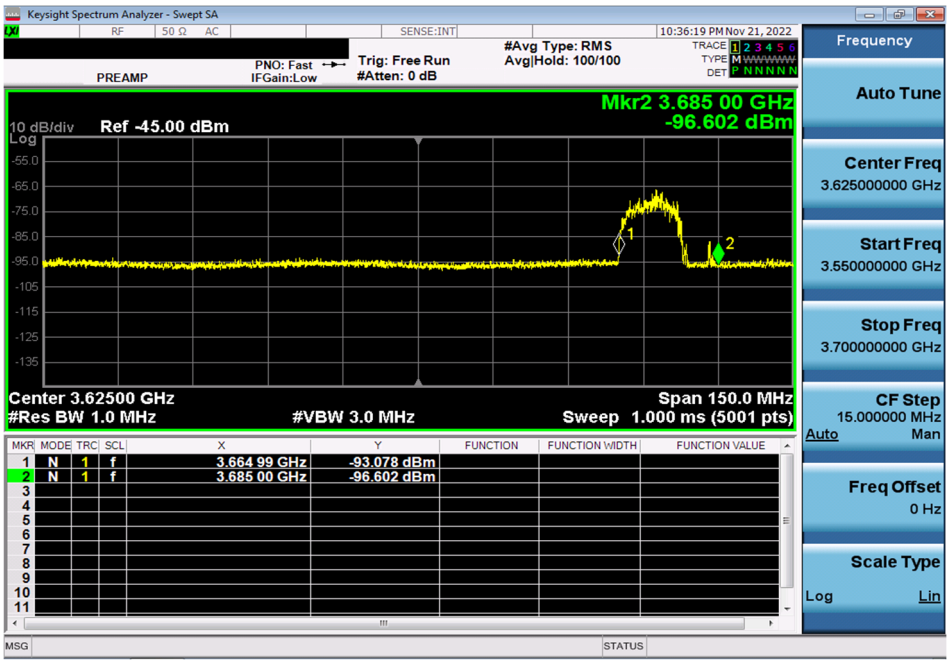

**Plot 7-25. Run#1 End User Device Frequency of Operations**


**Plot 7-26. Run#1 End User Device Discontinues Operations within 10s**

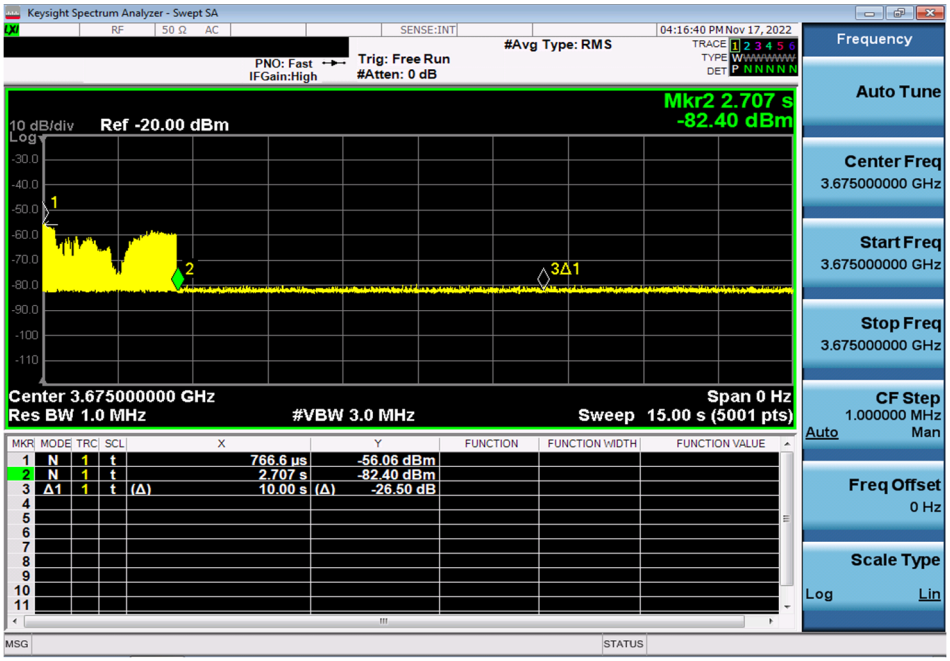
## Note:

Marker 1: CBSD sends instructions to discontinue NR operations.
Marker 2: EUT discontinues operation.
Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

## NR Band n48 Run#2:




**Plot 7-27. Run#2 End User Device Frequency of Operations**




**Plot 7-28. Run#2 End User Device Discontinues Operations within 10s**

## Note:

Marker 1: CBSD sends instructions to discontinue NR operations.
Marker 2: EUT discontinues operation.
Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Telit Module FCC ID: RI7FN980** complies with all of the End User Device requirements of Part 96 of the FCC Rules for NR operation.