

**PART 27 MEASUREMENT REPORT**

**Applicant Name:**

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

**Date of Testing:**

08/21/2023 – 09/20/2023

**Test Report Issue Date:**

09/25/2023

**Test Site/Location:**

Element lab., Columbia, MD, USA

**Test Report Serial No.:**

1M2306220084-01.R17

<b>FCC ID:</b>	<b>RI7FN990A28</b>
<b>Applicant Name:</b>	<b>Telit Communications S.p.A.</b>

**Application Type:**

Class II Permissive Change

**Model:**

FN990A28

**EUT Type:**

Module

**FCC Classification:**

PCS Licensed Transmitter (PCB)

**FCC Rule Part:**

27(D)

**Test Procedure(s):**

ANSI C63.26-2015

**Class II Permissive Change:**

Adding 5MHz bandwidth Support for 5G NR n30 band

**Original Grant Date:**

12/19/2022

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**



<b>FCC ID:</b> RI7FN990A28	<b>PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2306220084-01.R17	<b>Test Dates:</b> 08/21/2023 – 09/20/2023	<b>EUT Type:</b> Module	Page 1 of 32

## T A B L E O F C O N T E N T S

1.0	INTRODUCTION .....	4
1.1	Scope .....	4
1.2	Element Test Location.....	4
1.3	Test Facility / Accreditations.....	4
2.0	PRODUCT INFORMATION.....	5
2.1	Equipment Description .....	5
2.2	Device Capabilities.....	5
2.3	Test Configuration .....	5
2.4	Software and Firmware .....	5
2.5	EMI Suppression Device(s)/Modifications .....	5
3.0	DESCRIPTION OF TESTS .....	6
3.1	Evaluation Procedure .....	6
3.2	Radiated Power and Radiated Spurious Emissions .....	6
4.0	MEASUREMENT UNCERTAINTY .....	7
5.0	TEST EQUIPMENT CALIBRATION DATA .....	8
6.0	SAMPLE CALCULATIONS .....	9
7.0	TEST RESULTS .....	10
7.1	Summary.....	10
7.2	Conducted Output Power Data and EIRP .....	11
7.3	Occupied Bandwidth .....	13
7.4	Spurious and Harmonic Emissions at Antenna Terminal .....	16
7.5	Band Edge Emissions at Antenna Terminal .....	22
7.6	Radiated Spurious Emissions Measurements.....	26
8.0	CONCLUSION.....	32

<b>FCC ID:</b> RI7FN990A28	<b>PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2306220084-01.R17	<b>Test Dates:</b> 08/21/2023 – 09/20/2023	<b>EUT Type:</b> Module	Page 2 of 32

## PART 27 MEASUREMENT REPORT

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
NR Band n30	5 MHz	$\pi/2$ BPSK	2307.5 - 2312.5	0.239	23.78	4M55G7D
		QPSK	2307.5 - 2312.5	0.235	23.71	4M54G7D
		16QAM	2307.5 - 2312.5	0.187	22.71	4M55W7D
		64QAM	2307.5 - 2312.5	0.142	21.51	4M52W7D
		256QAM	2307.5 - 2312.5	0.078	18.93	4M55W7D

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 3 of 32

## 1.0 INTRODUCTION

### 1.1 Scope

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

### 1.2 Element Test Location

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

### 1.3 Test Facility / Accreditations

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

- Element Washington DC LLC is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 4 of 32

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Telit Module FCC ID: RI7FN990A28**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 27.

**Test Device Serial No.:** MD12

### 2.2 Device Capabilities

The following capabilities were assessed in this report for this permissive change filing:

5G NR (n30)

### 2.3 Test Configuration

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

### 2.4 Software and Firmware

Testing was performed on device(s) using software version M0R.000003 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.

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 5 of 32

## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

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

**Deviation from Measurement Procedure.....None**

### 3.2 Radiated Power and Radiated Spurious Emissions

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

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

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

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

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

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

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

And

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

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.

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 6 of 32

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

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 7 of 32

## 5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	ETS-001	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-001
-	LTx6	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTx6
-	WL25-1	Conducted Cable Set (25GHz)	1/12/2023	Annual	1/12/2024	WL25-1
Anritsu	MT8000A	Radio Communication Test Station	6/15/2023	Annual	6/15/2024	6261914237
Emco	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	2/27/2023	Biennial	2/27/2025	9203-2178
Espec	SCP-220	Environmental Chamber	5/25/2022	Biennial	5/25/2024	OCPS5H0612K05
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	3/15/2023	Annual	3/15/2024	MY52350166
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/29/2022	Annual	8/29/2023	100342
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	8/30/2022	Biennial	8/30/2024	A051107
Sunol	JB6	LB6 Antenna	3/2/2023	Biennial	3/2/2025	A082816

**Table 5-1. Test Equipment**

**Notes:**

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

FCC ID: RI7FN990A28	<b>PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 8 of 32



## 6.0 SAMPLE CALCULATIONS

### 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

#### Example: Spurious emission at 3700.40 MHz

The receive 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 analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is  $2.0$  dB at  $3700.40$  MHz. So  $6.1$  dB is added to the signal generator reading of  $-30.9$  dBm yielding  $-24.80$  dBm. The fundamental EIRP was  $25.50$  dBm so this harmonic was  $25.50$  dBm  $- (-24.80) = 50.3$  dBc.

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 9 of 32

## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Telit Communications S.p.A.  
 FCC ID: RI7FN990A28  
 FCC Classification: PCS Licensed Transmitter (PCB)  
 Mode(s): NR

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power Equivalent Isotropic Radiated Power (NR Band n30)	2.1046(a), 2.1046(c), 27.50(a)(3)(i)	≤ 250mW / 5MHz max. EIRP	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions (NR Band n30)	2.1051, 27.53(a)(4)	Undesirable emissions must meet the limits detailed in 27.53(a)(4)	PASS	Sections 7.4, 7.5
RADIATED	Radiated Spurious Emissions (NR Band n30)	2.1053, 27.53(a)(4)	Undesirable emissions must meet the limits detailed in 27.53(a)(4)	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) All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.1.

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 10 of 32

## 7.2 Conducted Output Power Data and EIRP

### Test Overview

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

A-MPR is implemented in this device when operating at Power Class 2 in LTE Band 41 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

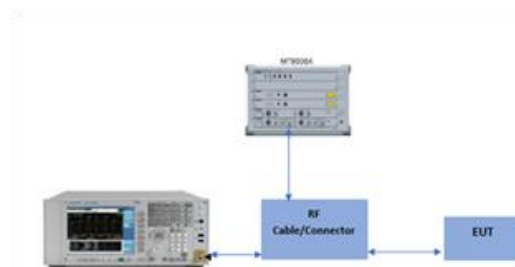
ANSI C63.26-2015 – Section 5.2

### Test Settings

1. Span = 2 x OBW to 3 x OBW
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
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 7-1. 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. NR Band n30 EIRP is calculated with conducted power and antenna gain.

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 11 of 32

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]	Ant Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
5 MHz	π/2 BPSK	27685	2307.5	1 / 23	22.68	1.00	23.68	0.233	23.98	-0.30
		27710	2310.0	1 / 12	22.77	1.00	23.77	0.238	23.98	-0.21
		27735	2312.5	1 / 1	22.78	1.00	23.78	0.239	23.98	-0.20
	QPSK	27685	2307.5	1 / 23	22.65	1.00	23.65	0.232	23.98	-0.33
		27710	2310.0	1 / 12	22.60	1.00	23.60	0.229	23.98	-0.38
		27735	2312.5	1 / 1	22.71	1.00	23.71	0.235	23.98	-0.27
	16-QAM	27685	2307.5	1 / 23	21.65	1.00	22.65	0.184	23.98	-1.33
		27710	2310.0	1 / 12	21.62	1.00	22.62	0.183	23.98	-1.36
		27735	2312.5	1 / 1	21.71	1.00	22.71	0.187	23.98	-1.27
	64-QAM	27685	2307.5	1 / 23	20.22	1.00	21.22	0.132	23.98	-2.76
		27710	2310.0	1 / 12	20.51	1.00	21.51	0.141	23.98	-2.47
		27735	2312.5	1 / 1	20.27	1.00	21.27	0.134	23.98	-2.71
256-QAM	27685	2307.5	1 / 23	17.93	1.00	18.93	0.078	23.98	-5.05	
	27710	2310.0	1 / 12	17.62	1.00	18.62	0.073	23.98	-5.35	
	27735	2312.5	1 / 1	17.77	1.00	18.77	0.075	23.98	-5.21	

Table 7-2. Conducted Power Output Data and EIRP Data (NR Band n30)

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 12 of 32

### 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  $\geq 3 \times$  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.

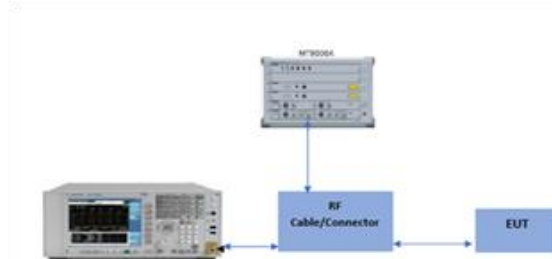


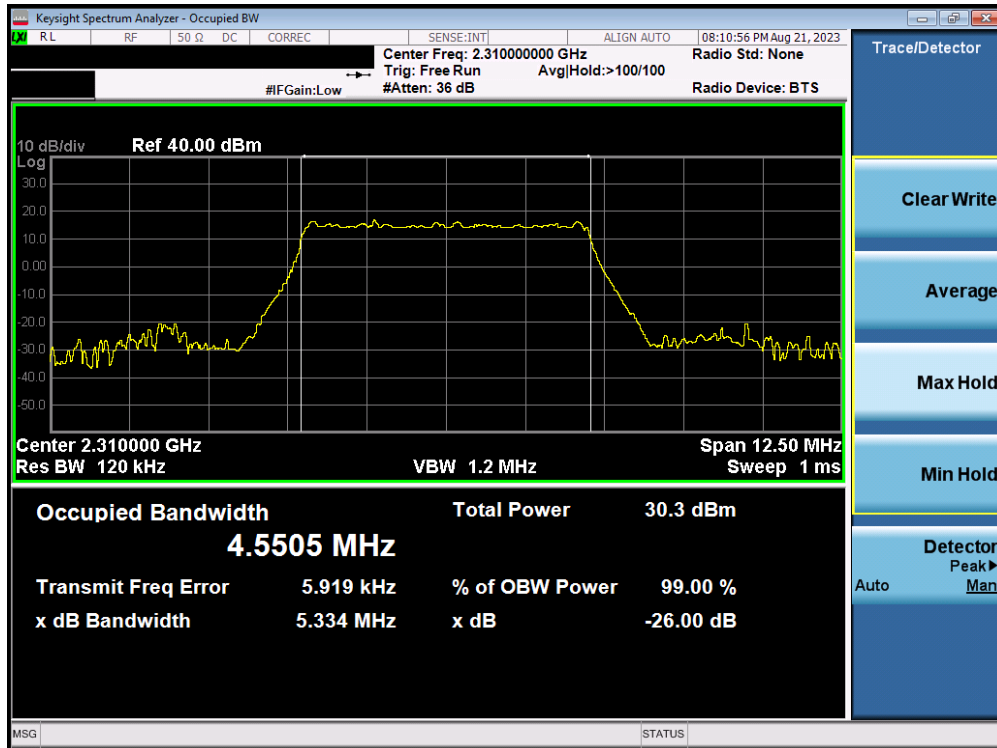
Figure 7-2. Test Instrument & Measurement Setup

#### Test Notes

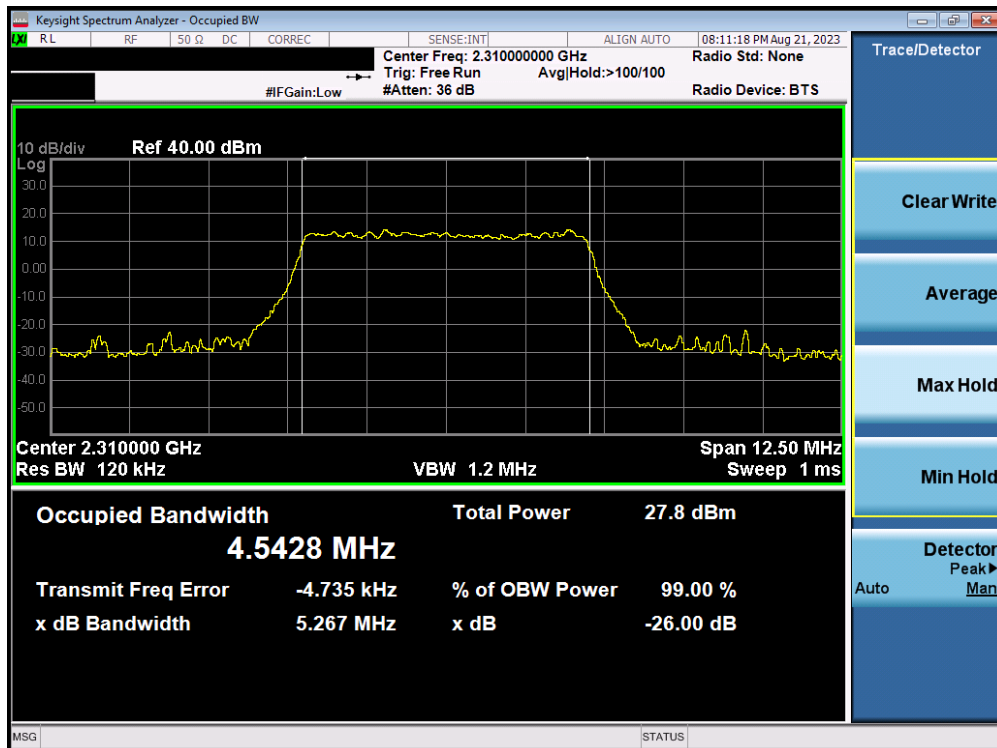
None.

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 13 of 32

# NR Band n30

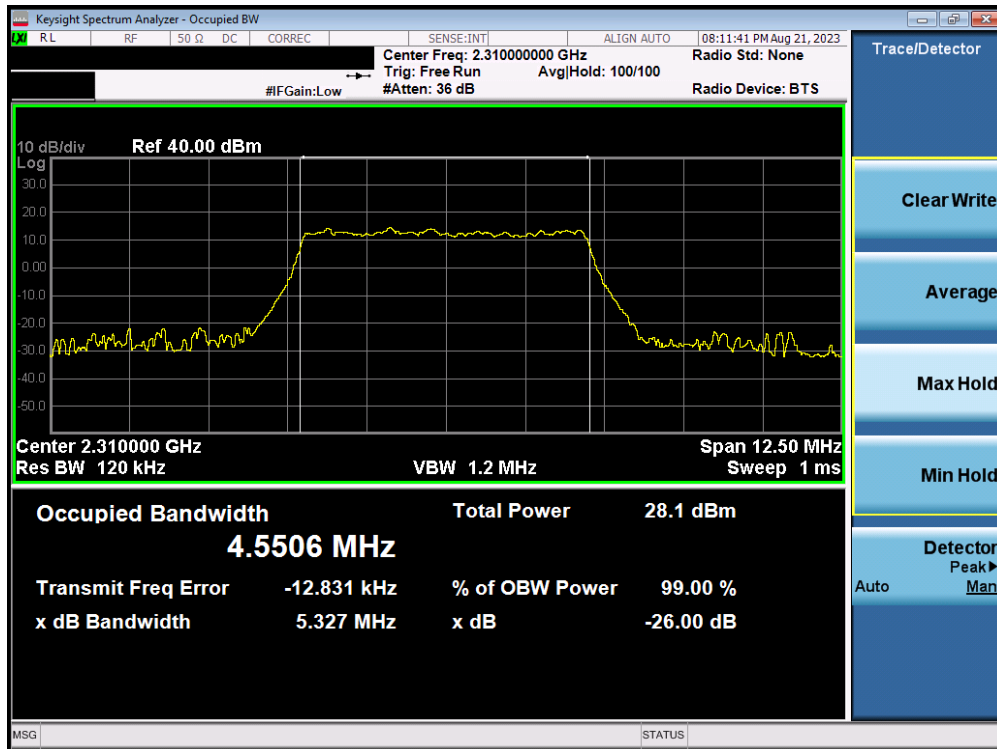


Plot 7-1. Occupied Bandwidth Plot (NR Band n30 - 5MHz  $\pi/2$  BPSK - Full RB)



Plot 7-2. Occupied Bandwidth Plot (NR Band n30 - 5MHz QPSK - Full RB)

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 14 of 32



Plot 7-3. Occupied Bandwidth Plot (NR Band n30 - 5MHz 16-QAM - Full RB)

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 15 of 32

## 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 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 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 Band 30, the minimum permissible attenuation level of any spurious emission <2288MHz and >2365MHz is  $70 + 10 \log_{10}(P_{[Watts]})$ .***

### Test Procedure Used

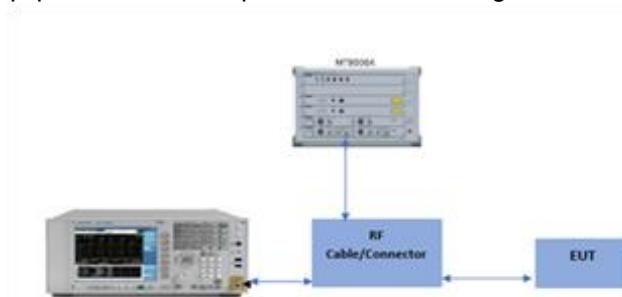
ANSI C63.26-2015 – Section 5.7.4

### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
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. Per Part 27, 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.

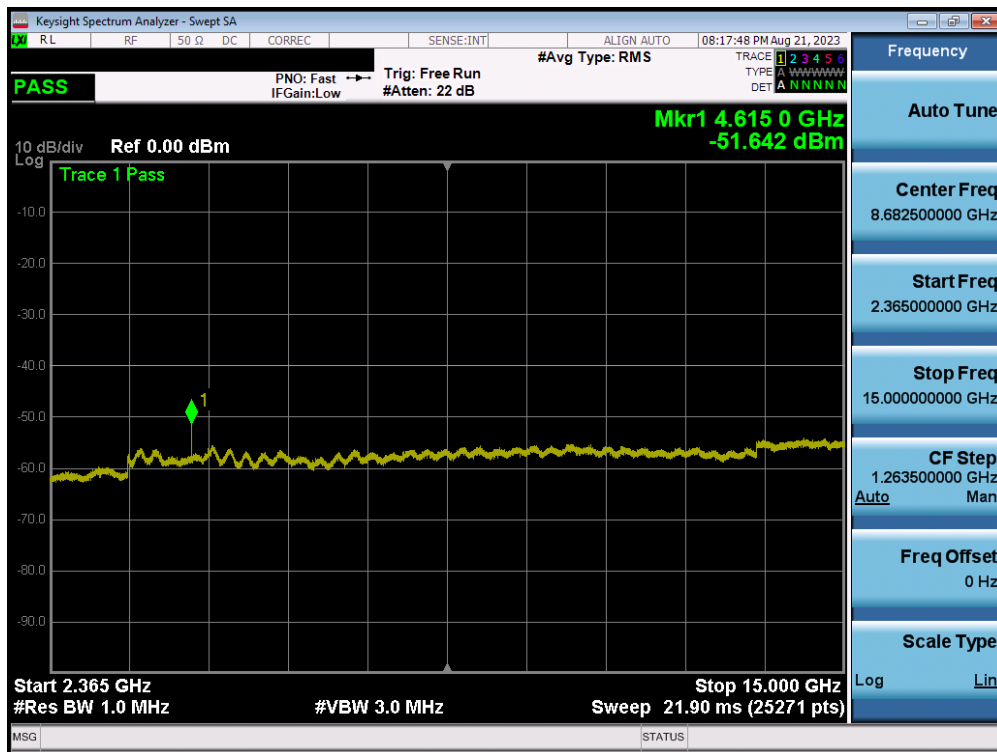
FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 16 of 32



### NR Band n30

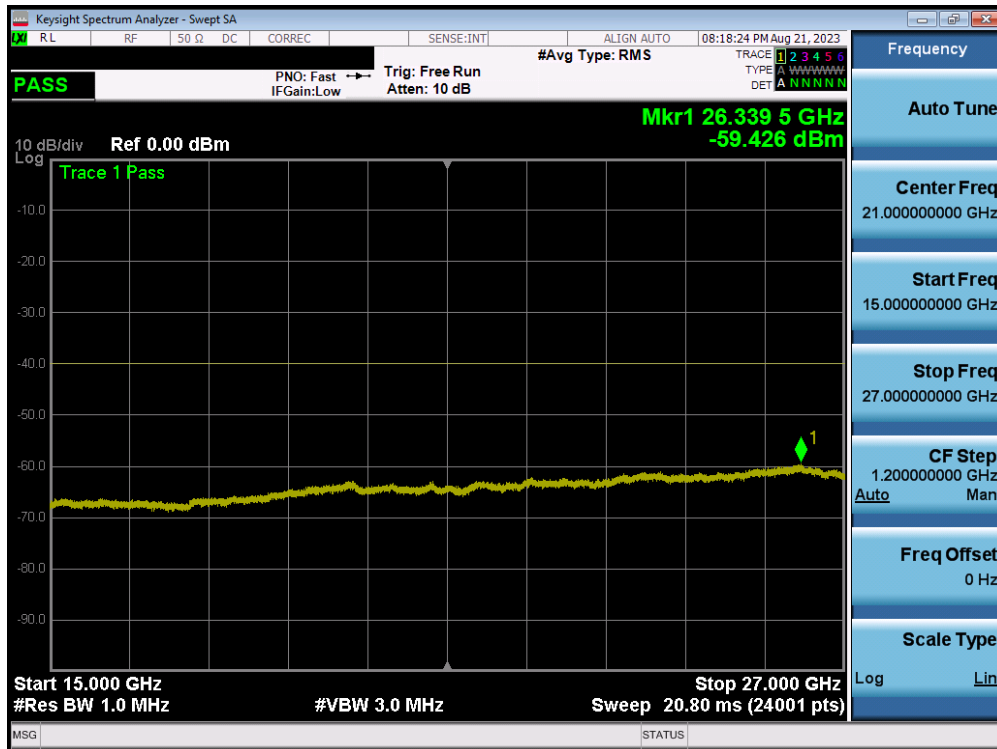


Plot 7-4. Conducted Spurious Plot (NR Band n30 - 5MHz QPSK - Low Channel)

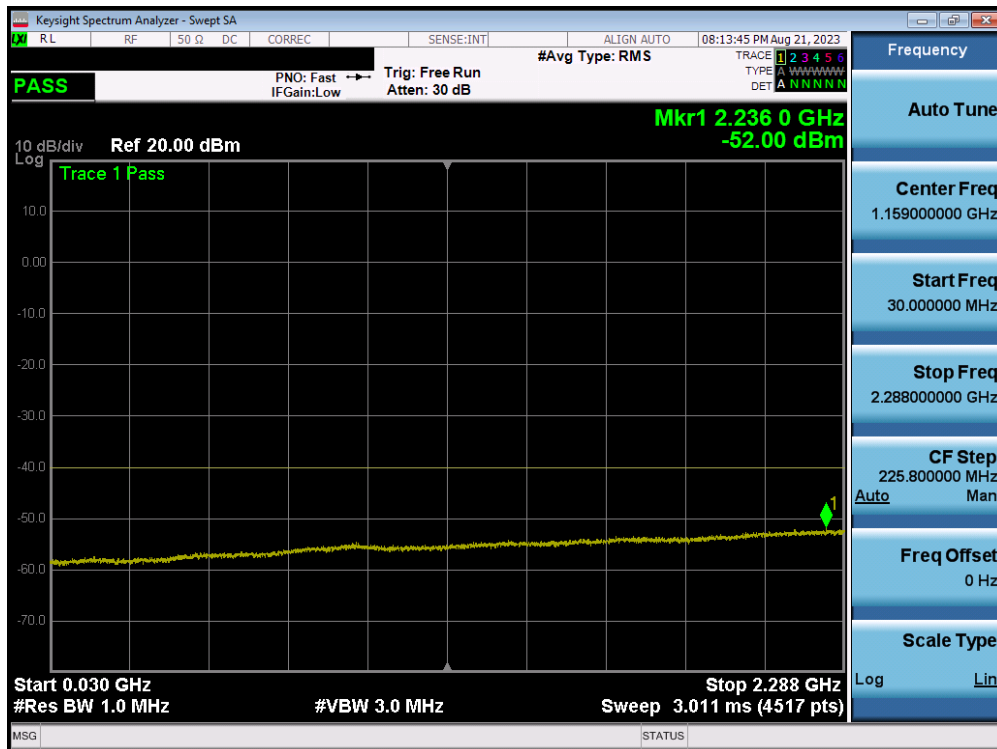


Plot 7-5. Conducted Spurious Plot (NR Band n30 - 5MHz QPSK - Low Channel)

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 17 of 32

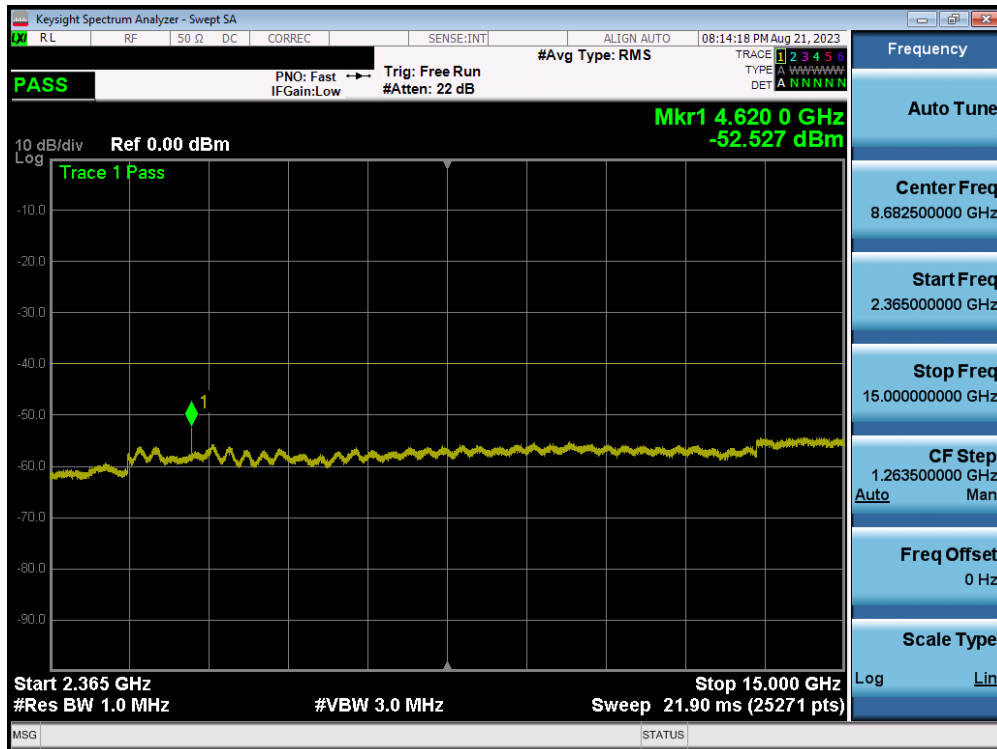


Plot 7-6. Conducted Spurious Plot (NR Band n30 - 5MHz QPSK - Low Channel)

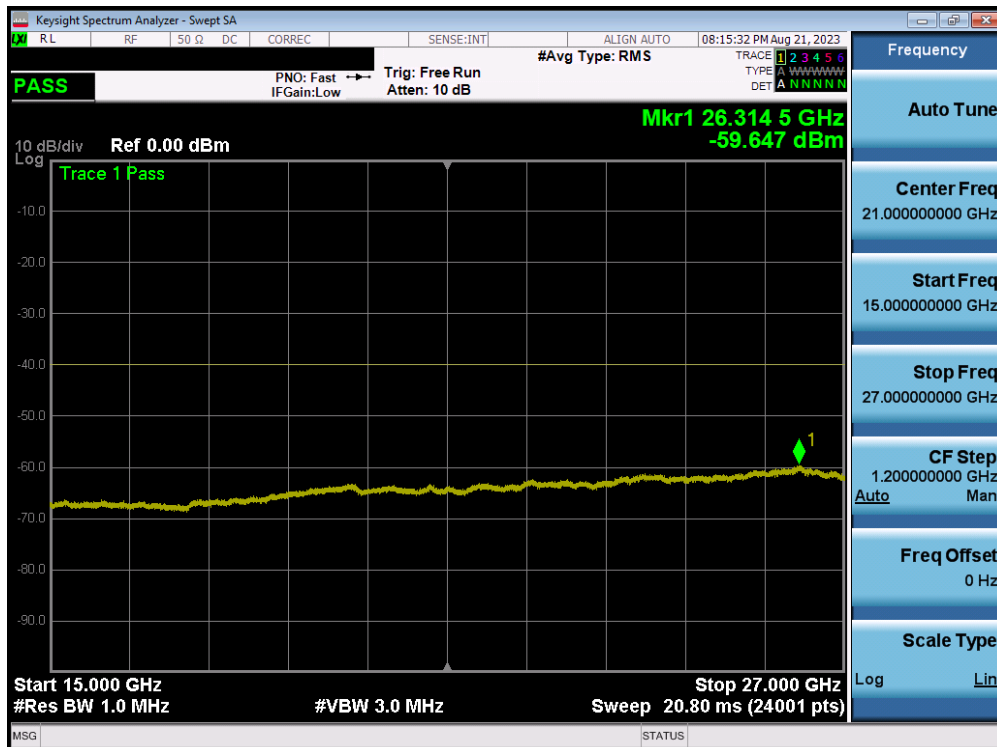


Plot 7-7. Conducted Spurious Plot (NR Band n30 - 5MHz QPSK - Mid Channel)

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 18 of 32



Plot 7-8. Conducted Spurious Plot (NR Band n30 - 5MHz QPSK - Mid Channel)

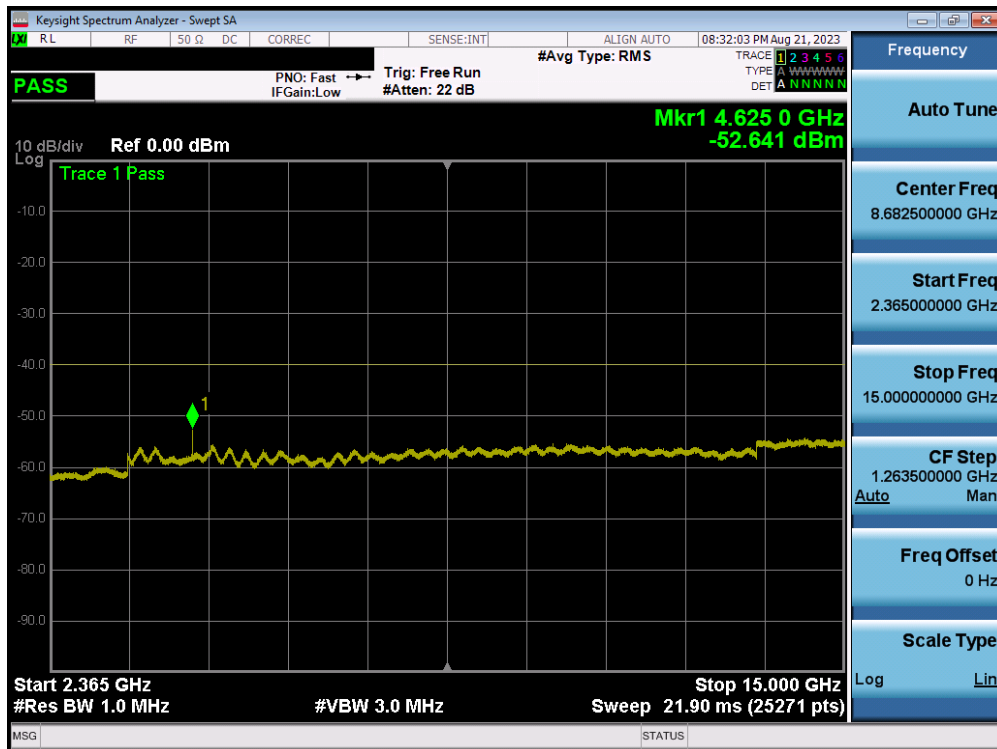


Plot 7-9. Conducted Spurious Plot (NR Band n30 - 5MHz QPSK - Mid Channel)

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 19 of 32

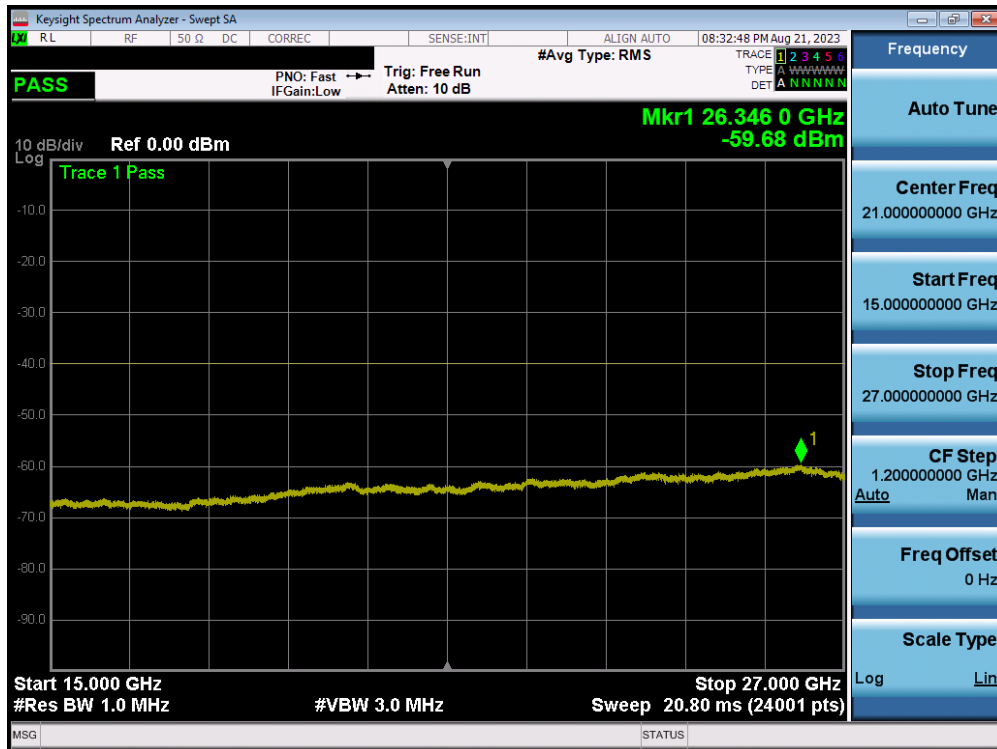


Plot 7-10. Conducted Spurious Plot (NR Band n30 - 5MHz QPSK - High Channel)



Plot 7-11. Conducted Spurious Plot (NR Band n30 - 5MHz QPSK - High Channel)

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 20 of 32



Plot 7-12. Conducted Spurious Plot (NR Band n30 - 5MHz QPSK - High Channel)

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 21 of 32

## 7.5 Band Edge Emissions at Antenna Terminal

### Test Overview

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

***The minimum permissible attenuation level for Band 30 is  $> 43 + 10 \log_{10}(P[\text{Watts}]$  at 2300-2305MHz & 2345-2360MHz,  $> 55 + 10 \log_{10}(P[\text{Watts}]$  at 2320-2324MHz & 2341-2345MHz,  $> 61 + 10 \log_{10}(P[\text{Watts}]$  at 2324-2328MHz & 2337-2341MHz,  $> 67 + 10 \log_{10}(P[\text{Watts}]$  at 2288-2292MHz & 2328-2337MHz, and  $> 70 + 10 \log_{10}(P[\text{Watts}]$  at frequencies  $< 2288\text{MHz}$  &  $> 2365\text{MHz}$ .***

### Test Procedure Used

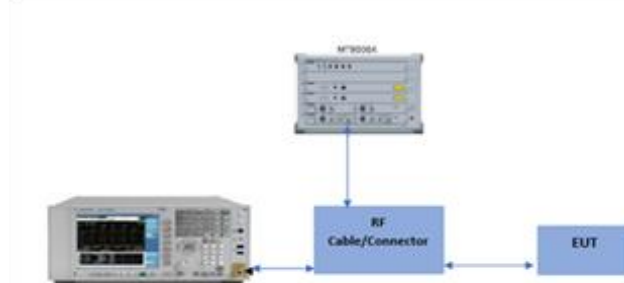
ANSI C63.26-2015 – Section 5.7.3

### 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 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq$  2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
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**

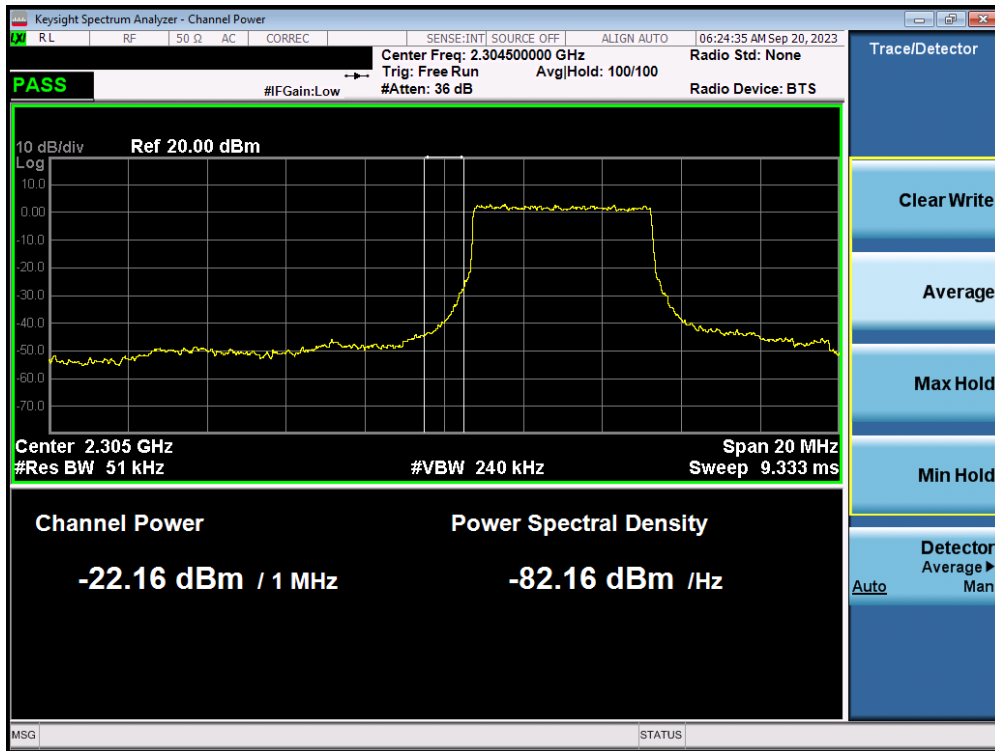
FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 22 of 32

**Test Notes**

1. Per 27.53(a)(5) in the 1 MHz bands immediately outside and adjacent to the channel blocks at 2305, 2310, 2315, 2320, 2345, 2350, 2355, and 2360 MHz, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter 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 required measurement bandwidth (i.e., 1 MHz). The 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.

FCC ID: RI7FN990A28	<b>PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2306220084-01.R17	<b>Test Dates:</b> 08/21/2023 – 09/20/2023	<b>EUT Type:</b> Module	Page 23 of 32

### NR Band n30



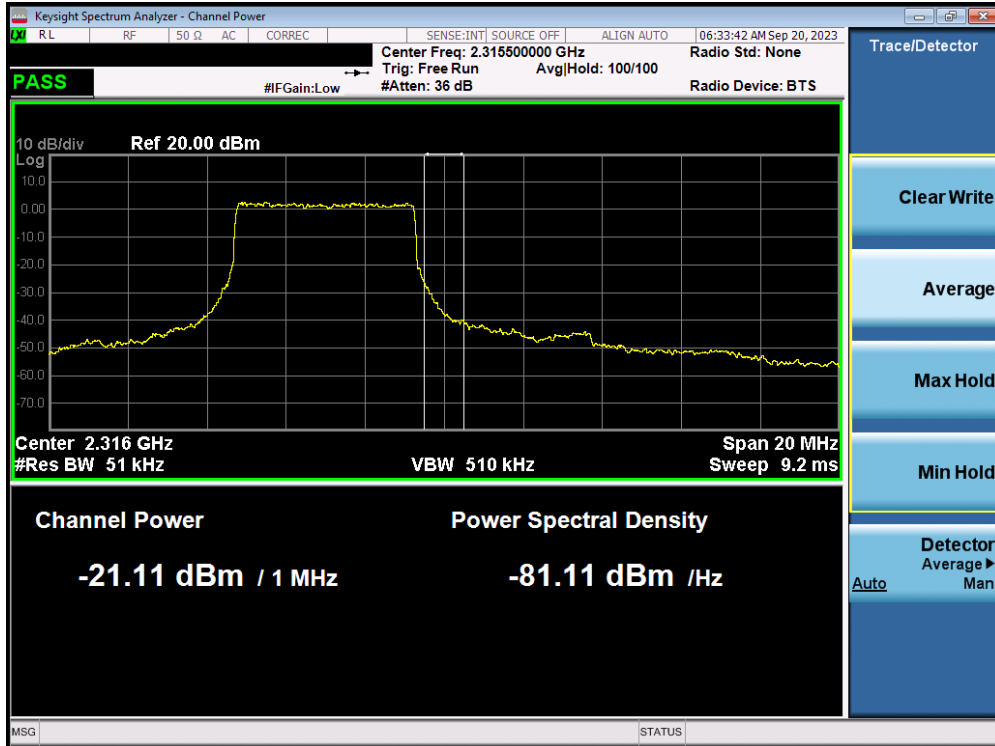
Plot 7-13. Lower Band Edge Plot (NR Band n30 - 5MHz QPSK – Full RB - Ant1)



Plot 7-14. Extended Lower Band Edge Plot (NR Band n30 - 5MHz QPSK – Full RB - Ant1)

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 24 of 32





Plot 7-15. Upper Band Edge Plot (NR Band n30 - 5MHz QPSK – Full RB)



Plot 7-16. Extended Upper Band Edge Plot (NR Band n30 - 5MHz QPSK – Full RB)

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 25 of 32

## 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

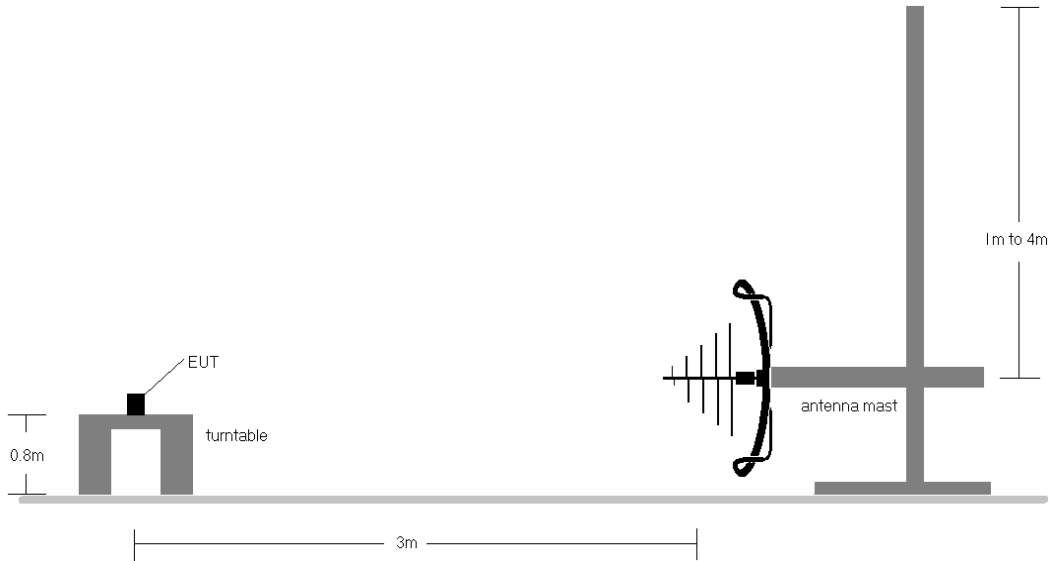
### Test Settings

1. RBW = 1MHz
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 = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

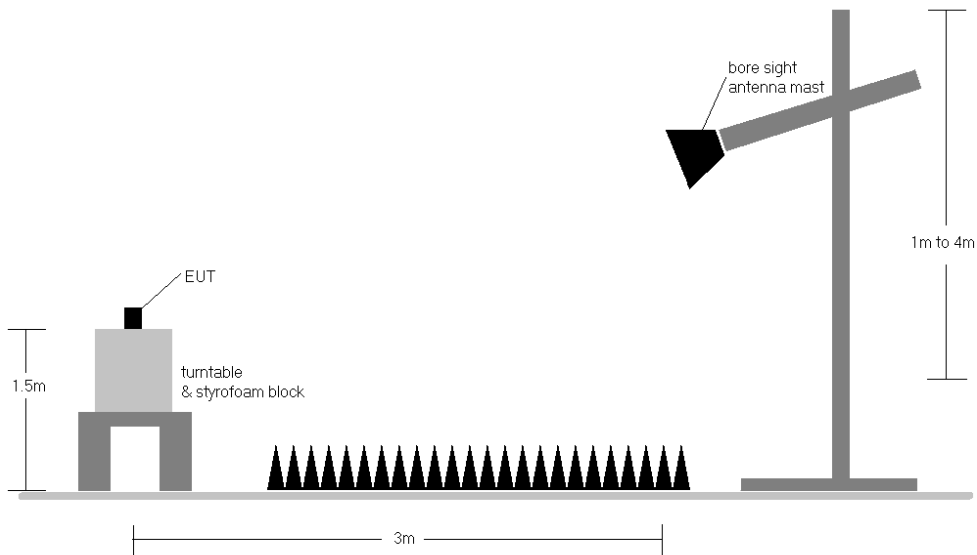
FCC ID: RI7FN990A28	<b>PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 26 of 32

**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**

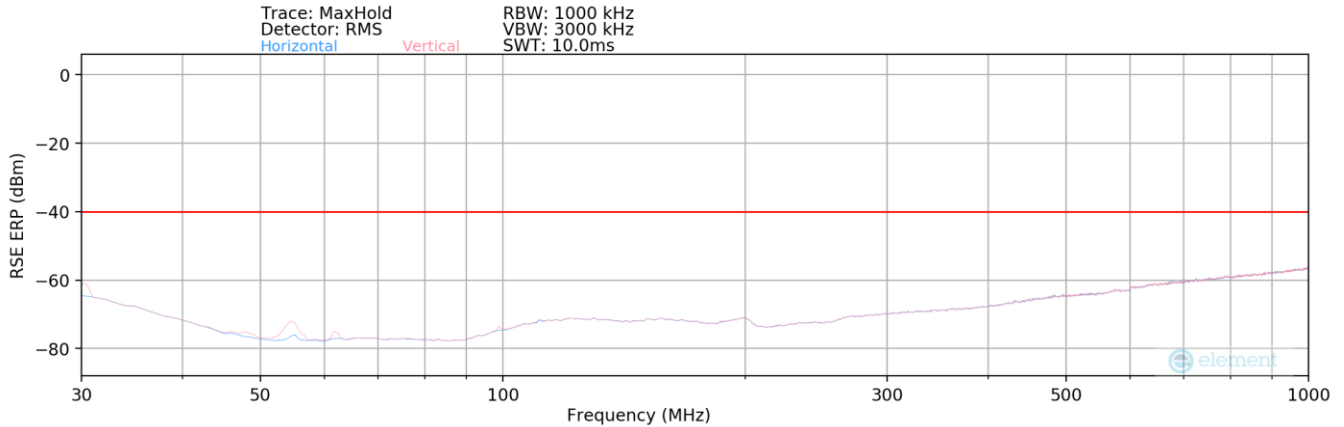
FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 27 of 32

**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 unit was tested while powered by a DC power source.
- 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.
- 6) 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.

FCC ID: RI7FN990A28	<b>PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2306220084-01.R17	<b>Test Dates:</b> 08/21/2023 – 09/20/2023	<b>EUT Type:</b> Module	Page 28 of 32

### NR Band n30



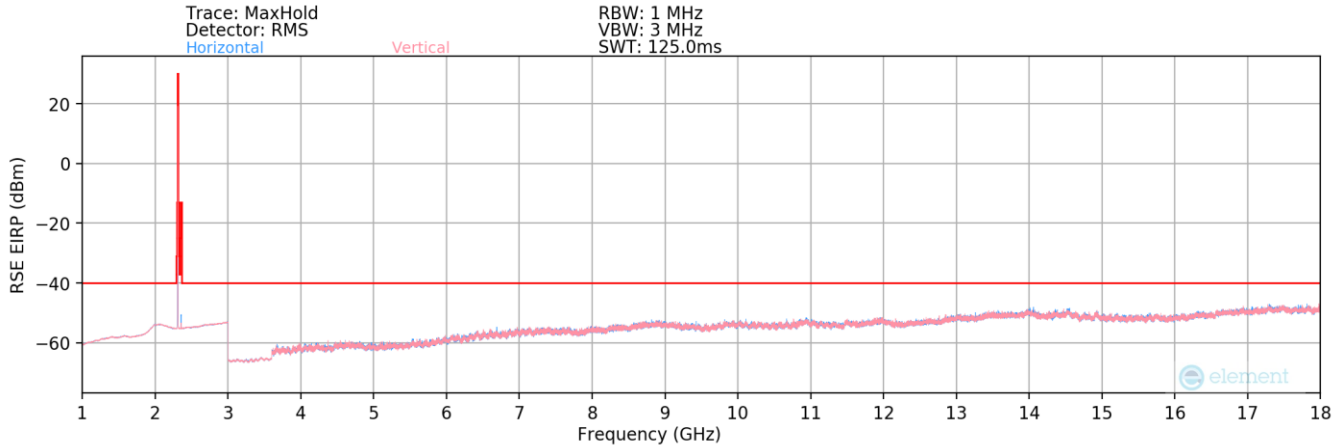
Plot 7-17. Radiated Spurious Plot Below 1GHz (NR Band 30)

Bandwidth (MHz):	5
Frequency (MHz):	2310.0
RB / Offset:	1 / 12
Mode:	Stand Alone

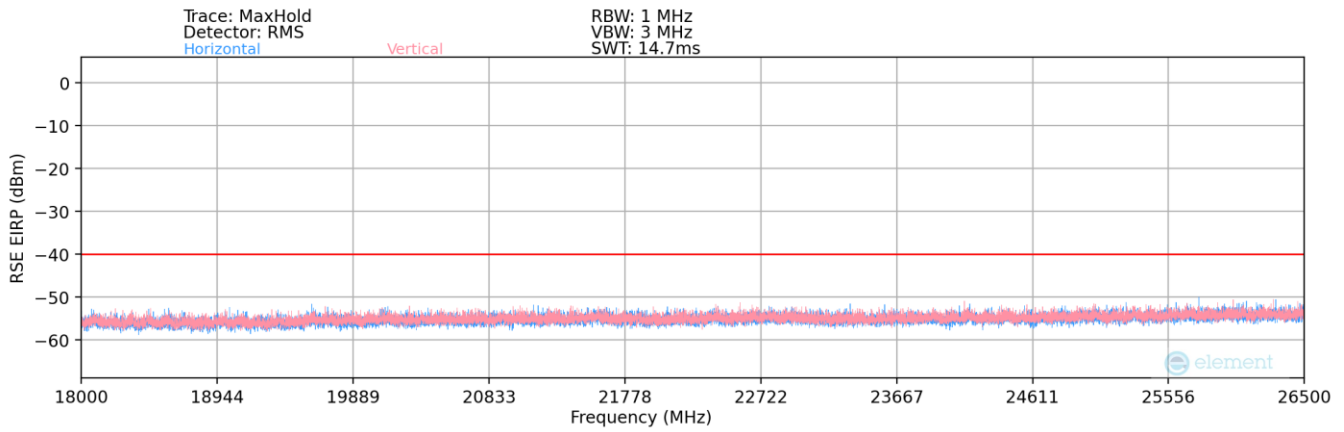
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
32.00	V	-	-	-101.46	26.22	31.76	-65.64	-40.00	-25.64
54.70	V	395	270	-97.96	14.13	23.17	-74.23	-40.00	-34.23
63.00	V	-	-	-100.98	14.71	20.73	-76.68	-40.00	-36.68
98.00	V	395	315	-101.02	16.86	22.84	-74.57	-40.00	-34.57
118.00	V	-	-	-101.55	19.90	25.35	-72.06	-40.00	-32.06
752.70	H	-	-	-99.17	29.29	37.12	-60.28	-40.00	-20.28

Table 7-3. Radiated Spurious Data (NR Band n30)

FCC ID: RI7FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 29 of 32



**Plot 7-18. Radiated Spurious Plot Above 1GHz (NR Band 30)**



**Plot 7-19. Radiated Spurious Plot Above 18GHz (NR Band 30)**

<b>FCC ID:</b> RI7FN990A28	<b>PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2306220084-01.R17	<b>Test Dates:</b> 08/21/2023 – 09/20/2023	<b>EUT Type:</b> Module	Page 30 of 32



Bandwidth (MHz):	5
Frequency (MHz):	2307.5
RB / Offset:	1 / 12
Mode:	Stand Alone

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]
4615.00	H	275	159	-78.82	2.89	31.07	-64.18	-40.00	-24.18
6922.50	H	-	-	-80.75	8.33	34.58	-60.68	-40.00	-20.68
9230.00	H	-	-	-80.65	10.54	36.89	-58.37	-40.00	-18.37
11537.50	H	-	-	-81.96	12.76	37.80	-57.46	-40.00	-17.46

Table 7-4. Radiated Spurious Data (NR Band n30 - Low Channel)

Bandwidth (MHz):	5
Frequency (MHz):	2310.0
RB / Offset:	1 / 12
Mode:	Stand Alone

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]
4620.00	H	277	91	-78.38	2.79	31.41	-63.84	-40.00	-23.84
6930.00	H	-	-	-80.44	8.25	34.81	-60.45	-40.00	-20.45
9240.00	H	-	-	-80.81	10.63	36.82	-58.44	-40.00	-18.44
11550.00	H	-	-	-82.17	12.70	37.53	-57.73	-40.00	-17.73

Table 7-5. Radiated Spurious Data (NR Band n30 - Mid Channel)

Bandwidth (MHz):	5
Frequency (MHz):	2312.5
RB / Offset:	1 / 12
Mode:	Stand Alone

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]
4625.00	H	124	94	-78.23	2.69	31.46	-63.79	-40.00	-23.79
6937.50	H	-	-	-80.07	8.08	35.01	-60.24	-40.00	-20.24
9250.00	H	-	-	-80.72	10.71	36.99	-58.27	-40.00	-18.27
11562.50	H	-	-	-82.05	12.79	37.74	-57.52	-40.00	-17.52

Table 7-6. Radiated Spurious Data (NR Band n30 - High Channel)

FCC ID: R17FN990A28	PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Technical Manager
Test Report S/N: 1M2306220084-01.R17	Test Dates: 08/21/2023 – 09/20/2023	EUT Type: Module	Page 31 of 32

## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Telit Module FCC ID: RI7FN990A28** complies with all the requirements of Part 27 of the FCC rules.

<b>FCC ID:</b> RI7FN990A28	<b>PART 27 MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2306220084-01.R17	<b>Test Dates:</b> 08/21/2023 – 09/20/2023	<b>EUT Type:</b> Module	Page 32 of 32