ELEMENT WASHINGTON DC LLC
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.element.com

PART 22 / RSS-132 MEASUREMENT REPORT

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

Date of Testing:
01/11/2024 - 01/21/2024
Test Report Issue Date:
01/24/2024
Test Site/Location:
Element Lab. Columbia, MD, USA
Test Report Serial No.:
1M2312260131-01.RI7

FCC ID:	**RI7LE910C1SNX**
IC:	**5131A-LE910C1SNX**
Applicant Name:	**Telit Communications S.p.A.**

Application Type:	Class II Permissive Change
ISED Application Type:	Class III Permissive Change
Model/HVIN:	LE910C4-SNX
Additional Model/HVIN:	LE910C4-SNXD
EUT Type:	Module
FCC Classification:	PCS Licensed Transmitter (PCB)
FCC Rule Part:	22
ISED Specification:	RSS-132 Issue 4
Test Procedure(s):	ANSI C63.26-2015
Permissive Change Description:	Software update to change LTE Cat. 1 to LTE Cat. 4
FCC Original Grant Date:	05/04/2023
ISED Original Grant Date:	05/17/2023

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

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

RJ Ortanez
Executive Vice President

ACCREDITED
CERT #2041.01

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PART 22 / RSS-132 MEASUREMENT REPORT

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 5	10 MHz	QPSK	829.0 - 844.0	0.204	23.09	9M02G7D
		16QAM	829.0 - 844.0	0.152	21.82	9M01W7D
	5 MHz	QPSK	826.5 - 846.5	0.202	23.06	4M52G7D
		16QAM	826.5 - 846.5	0.151	21.78	4M51W7D
	3 MHz	QPSK	825.5 - 847.5	0.193	22.86	2M70G7D
		16QAM	825.5 - 847.5	0.154	21.89	2M70W7D
	1.4 MHz	QPSK	824.7 - 848.3	0.198	22.97	1M09G7D
		16QAM	824.7 - 848.3	0.156	21.94	1M10W7D

EUT Overview

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.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Telit Module FCC ID: RI7LE910C1SNX / IC: 5131A-LE910C1SNX**. 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 22 and RSS-132. This device is tested as mobile equipment.

Test Device Serial No.: 350532429997438, 3505324299997875

2.2 Device Capabilities

This device contains the following capabilities:

LTE B2, B5, B12, B13, and B66/4

This device supports LTE Cat. 4 operations.

2.3 Test Configuration

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

2.4 Software and Firmware

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

Model Name	Modem FW Version
LE910C4-SNX	M0F.703007
LE910C4-SNXD	M0F.803007

2.5 EMI Suppression Device(s)/Modifications

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

2.6 Antenna Information:

The following antenna information is declared by the manufacturer:

Antenna Type: Dipole Antenna
Antenna Gain: 1.5 dBi
Antenna Input Impedance: 50 ohm

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

Deviation from Measurement Procedure……..……..None

3.2 Radiated Power and Radiated Spurious Emissions

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

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

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

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

where P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\ [dBm]}$ – 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
-	ETS-001	EMC Cable and Switch System	12/11/2023	Annual	12/11/2024	ETS-001
-	ETS-002	EMC Cable and Switch System	12/11/2023	Annual	12/11/2024	ETS-002
-	LTx4	Licensed Transmitter Cable Set	11/15/2023	Annual	11/15/2024	LTx4
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201525694
Espec	SCP-220	Environmental Chamber	5/25/2022	Annual	5/25/2024	OCPS5H0612K05
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/27/2023	Biennial	2/27/2025	00125518
Keysight Technologies	N9030A	PXA Signal Analyzer	8/7/2023	Annual	8/7/2024	MY54490576
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	9/25/2023	Annual	9/25/2024	100342
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/2/2023	Biennial	3/2/2025	A051107

Table 5-1. Test Equipment

Notes:

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

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

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.

7.0 TEST RESULTS

7.1 Summary

Company Name: Telit Communications S.p.A.

FCC ID: RI7LE910C1SNX

FCC Classification: PCS Licensed Transmitter (PCB)

Mode(s): LTE

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power & Effective Radiated Power	2.1046(a), 2.1046 22.913(a)(5)	RSS-Gen(6.12) RSS-132(5.4)	< 7 Watts max. ERP	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	RSS-Gen(6.7)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	RSS-Gen(6.13), RSS-132(5.5)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio	N/A	RSS-132(5.4)	≤ 13 dB	PASS	Section 7.6
	Frequency Stability	2.1055, 22.355	RSS-Gen(6.11), RSS-132(5.3)	The carrier frequency of the transmitter must be maintained within the 2.5ppm	PASS	Section 7.8
RADIATED	Radiated Spurious Emissions	2.1053, 22.917(a)	RSS-132(5.5)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions	PASS	Section 7.7

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 v1.2.2.

7.2 Conducted Power Output Data and ERP

Test Overview

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.2

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. ERP is calculated with conducted power and antenna gain.

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]	Ant Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
10 MHz	QPSK	20450	829.0	1 / 25	23.61	1.50	22.96	0.198	38.45	-15.49
		20525	836.5	1 / 49	23.67	1.50	23.02	0.200	38.45	-15.43
		20600	844.0	1 / 25	23.74	1.50	23.09	0.204	38.45	-15.36
	16-QAM	20450	829.0	1 / 25	22.42	1.50	21.77	0.150	38.45	-16.68
		20525	836.5	1 / 25	22.47	1.50	21.82	0.152	38.45	-16.63
		20600	844.0	1 / 0	22.43	1.50	21.78	0.151	38.45	-16.67
5 MHz	QPSK	20425	826.5	1 / 12	23.45	1.50	22.80	0.190	38.45	-15.65
		20525	836.5	1 / 12	23.40	1.50	22.75	0.188	38.45	-15.70
		20625	846.5	1 / 0	23.71	1.50	23.06	0.202	38.45	-15.39
	16-QAM	20425	826.5	1 / 12	22.42	1.50	21.77	0.150	38.45	-16.68
		20525	836.5	1 / 24	22.16	1.50	21.51	0.141	38.45	-16.94
		20625	846.5	1 / 12	22.43	1.50	21.78	0.151	38.45	-16.67
3 MHz	QPSK	20415	825.5	1 / 7	23.24	1.50	22.59	0.182	38.45	-15.86
		20525	836.5	1 / 7	23.51	1.50	22.86	0.193	38.45	-15.59
		20635	847.5	1 / 7	23.27	1.50	22.62	0.183	38.45	-15.83
	16-QAM	20415	825.5	1 / 0	22.34	1.50	21.69	0.147	38.45	-16.76
		20525	836.5	1 / 7	22.08	1.50	21.43	0.139	38.45	-17.02
		20635	847.5	1 / 14	22.54	1.50	21.89	0.154	38.45	-16.57
1.4 MHz	QPSK	20407	824.7	1 / 3	23.62	1.50	22.97	0.198	38.45	-15.49
		20525	836.5	1 / 3	23.14	1.50	22.49	0.177	38.45	-15.96
		20643	848.3	1 / 3	23.61	1.50	22.96	0.198	38.45	-15.50
	16-QAM	20407	824.7	1 / 5	22.59	1.50	21.94	0.156	38.45	-16.51
		20525	836.5	1 / 3	22.25	1.50	21.60	0.145	38.45	-16.85
		20643	848.3	1 / 3	22.38	1.50	21.73	0.149	38.45	-16.72

Table 7-2. Conducted Power Measurements

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.

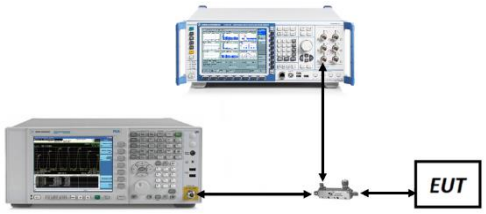
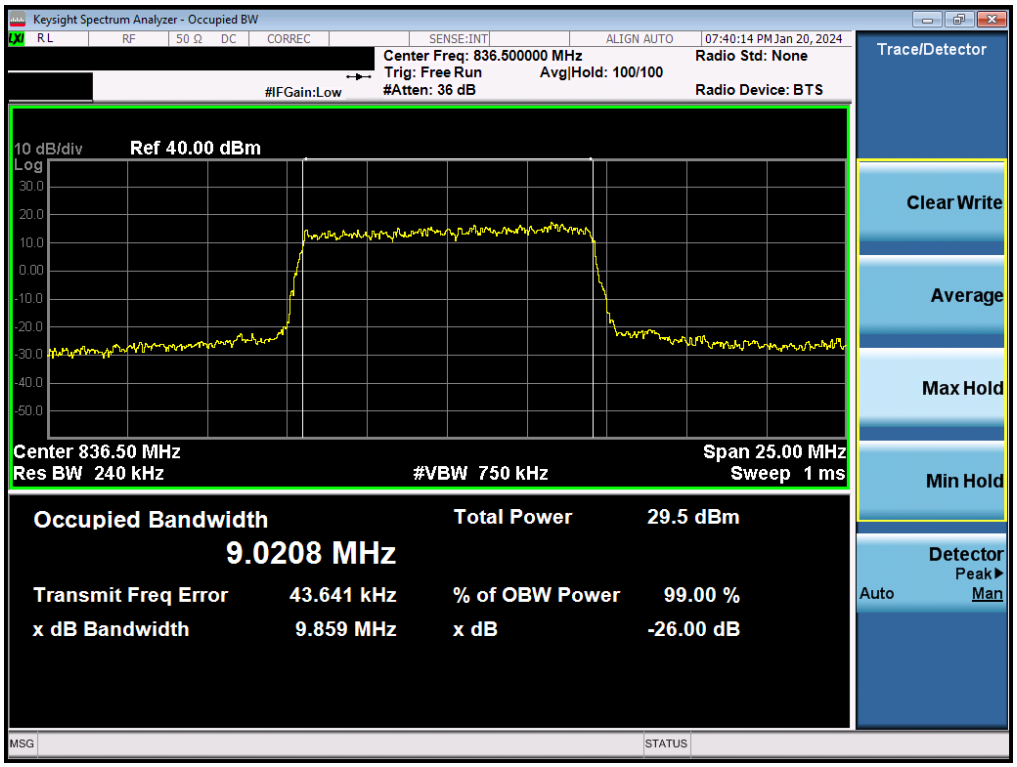


Figure 7-2. Test Instrument & Measurement Setup

Test Notes

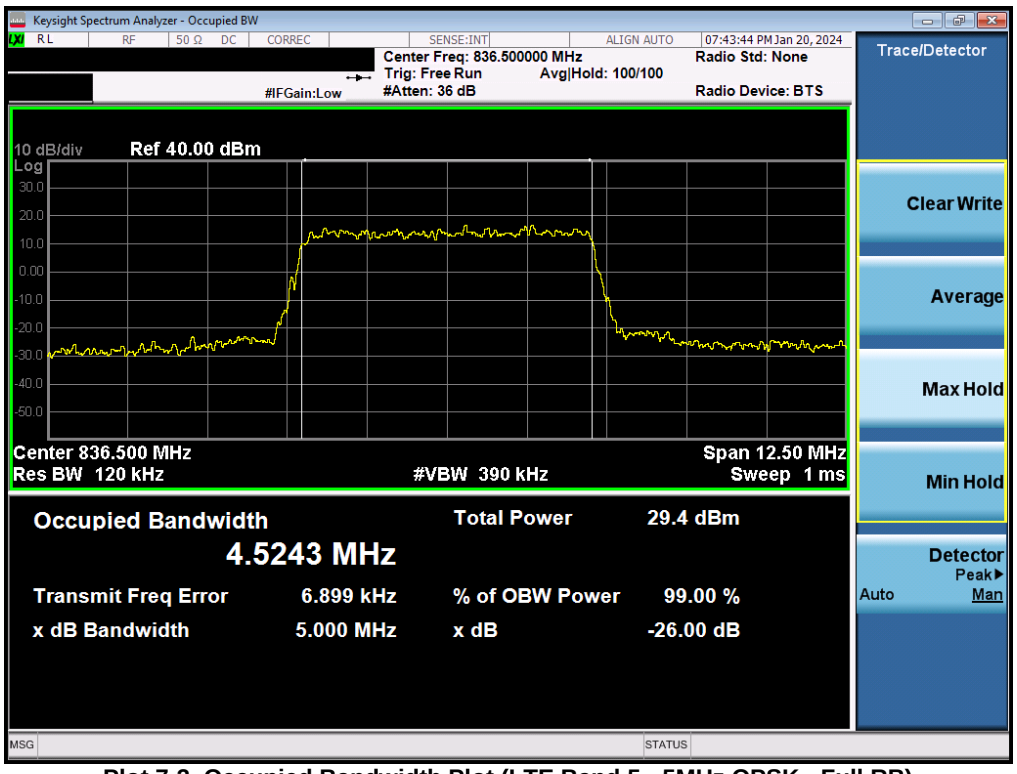
None.

LTE Band 5

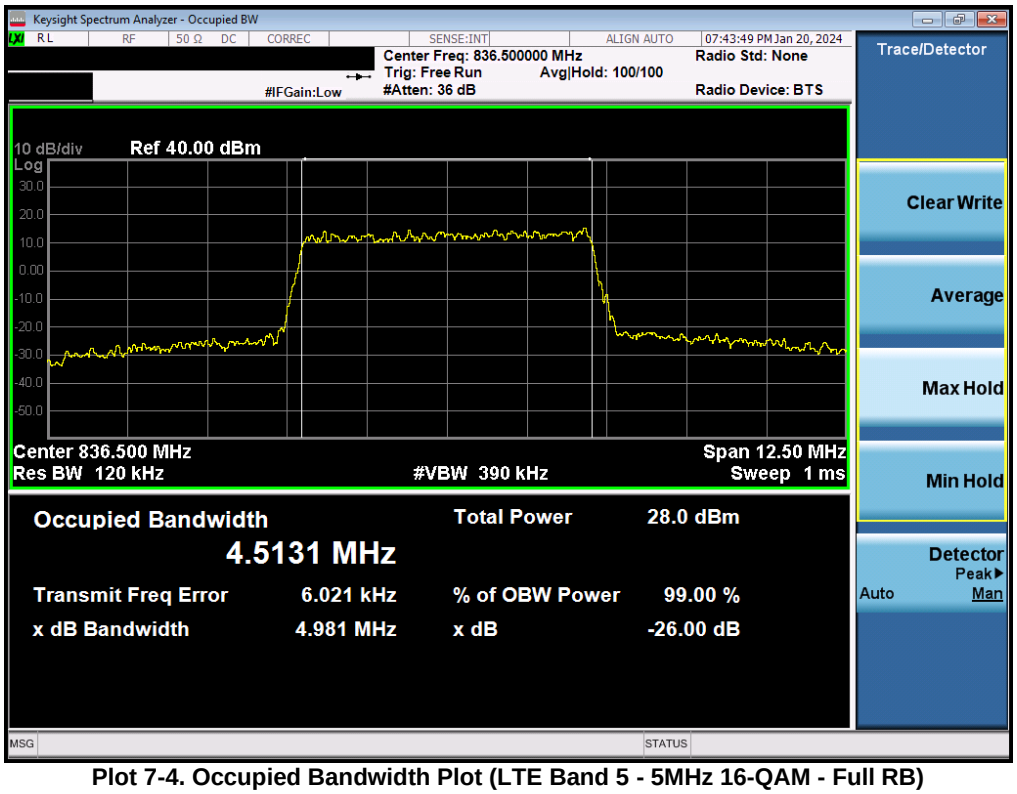


Plot 7-1. Occupied Bandwidth Plot (LTE Band 5 - 10MHz QPSK - Full RB)

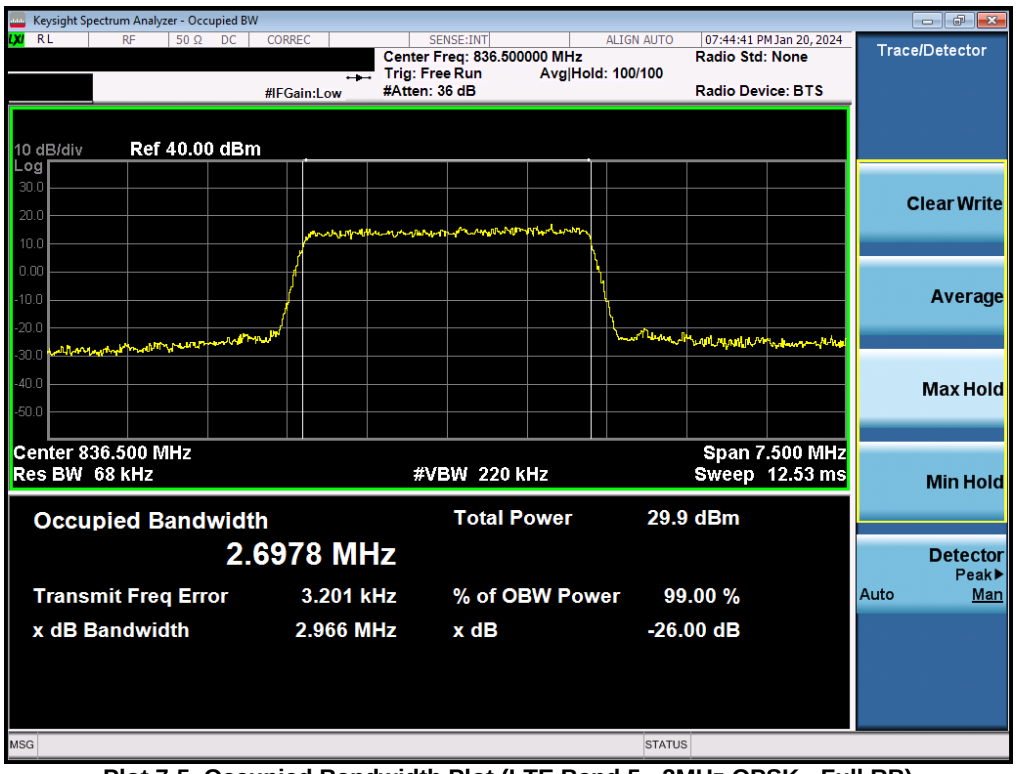
Plot 7-2. Occupied Bandwidth Plot (LTE Band 5 - 10MHz 16-QAM – Full RB)



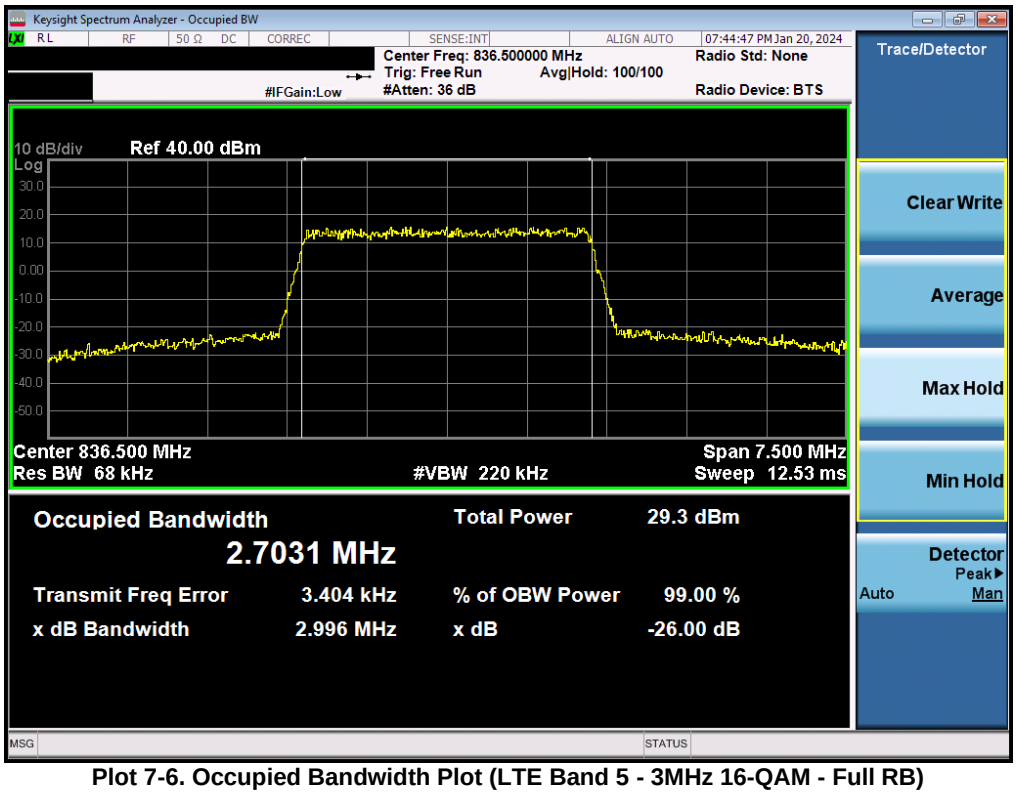
Plot 7-3. Occupied Bandwidth Plot (LTE Band 5 - 5MHz QPSK - Full RB)



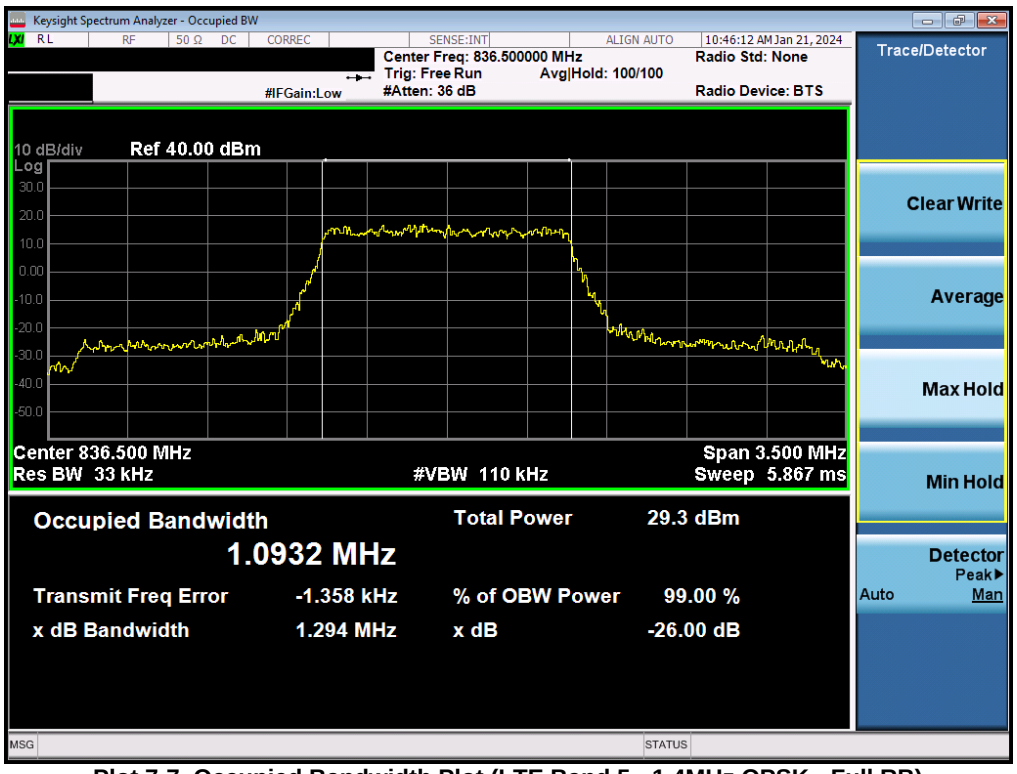
Plot 7-4. Occupied Bandwidth Plot (LTE Band 5 - 5MHz 16-QAM - Full RB)



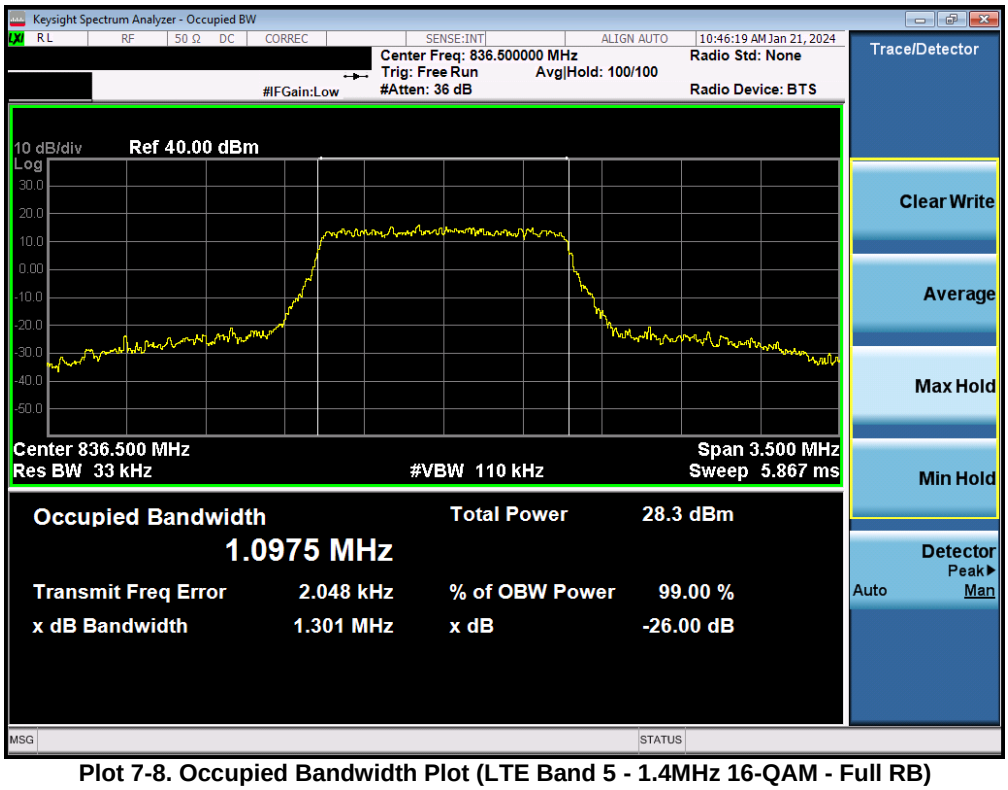
Plot 7-5. Occupied Bandwidth Plot (LTE Band 5 - 3MHz QPSK - Full RB)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 5 - 3MHz 16-QAM - Full RB)



Plot 7-7. Occupied Bandwidth Plot (LTE Band 5 - 1.4MHz QPSK - Full RB)



Plot 7-8. Occupied Bandwidth Plot (LTE Band 5 - 1.4MHz 16-QAM - Full RB)

7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.4

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.

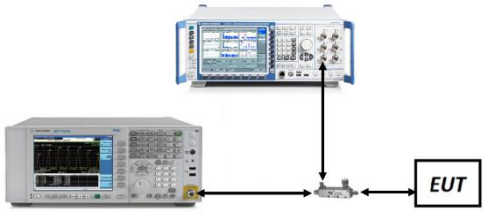
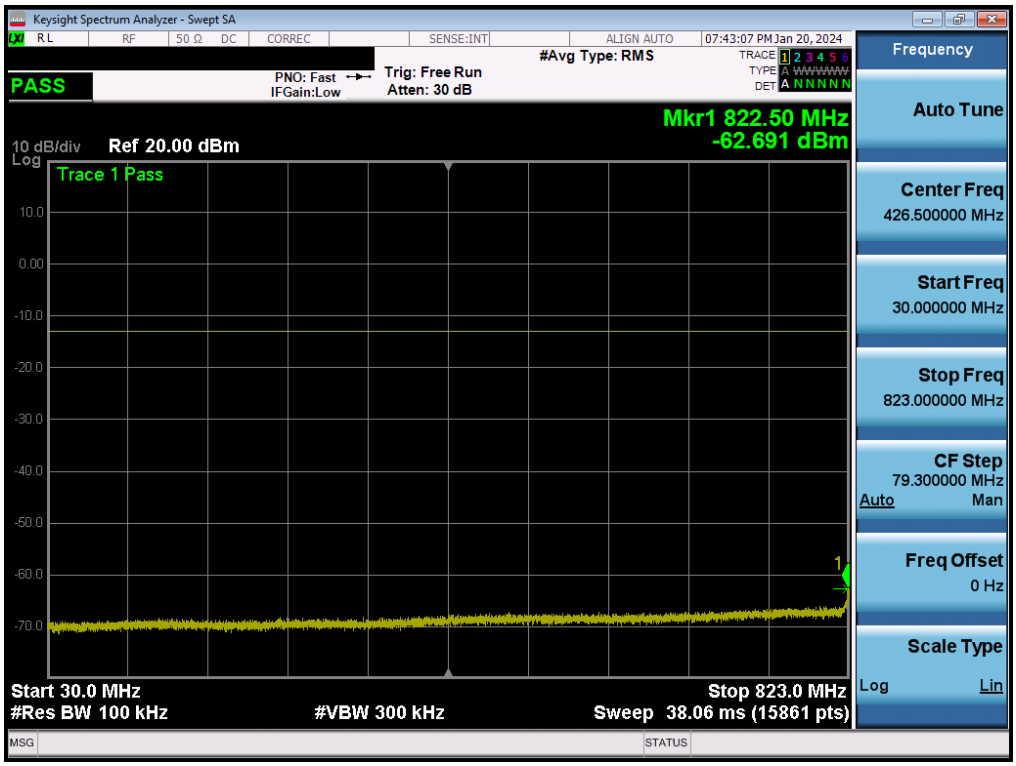


Figure 7-3. Test Instrument & Measurement Setup

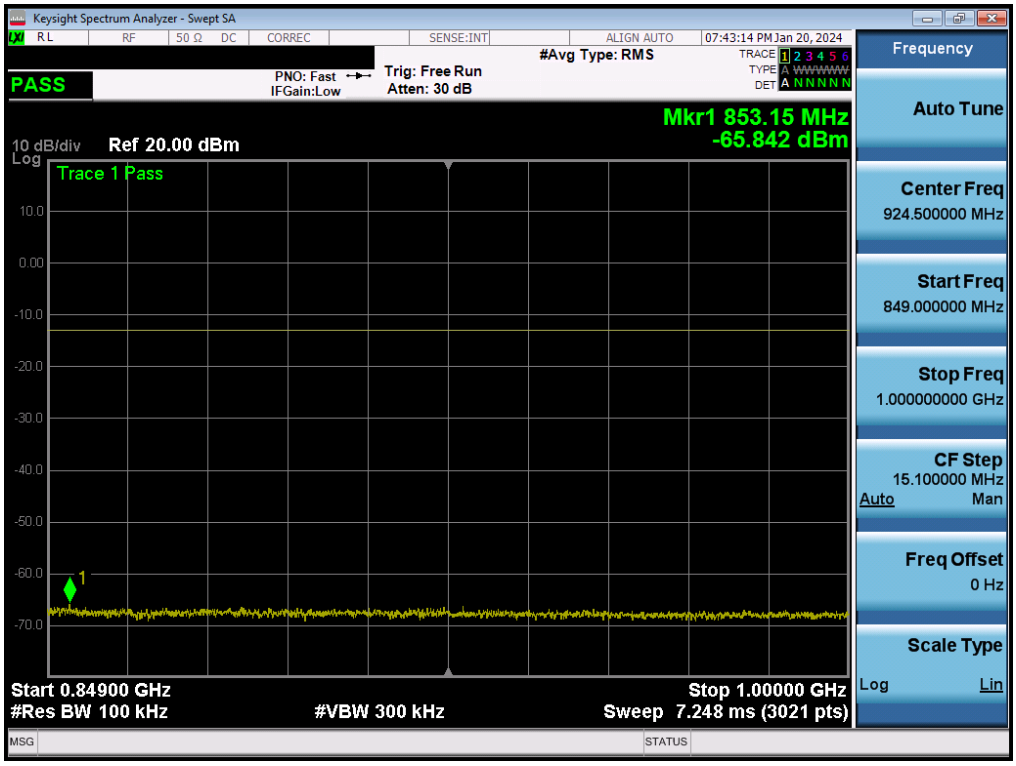
Test Notes

Per Part 22 and RSS-132, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater.

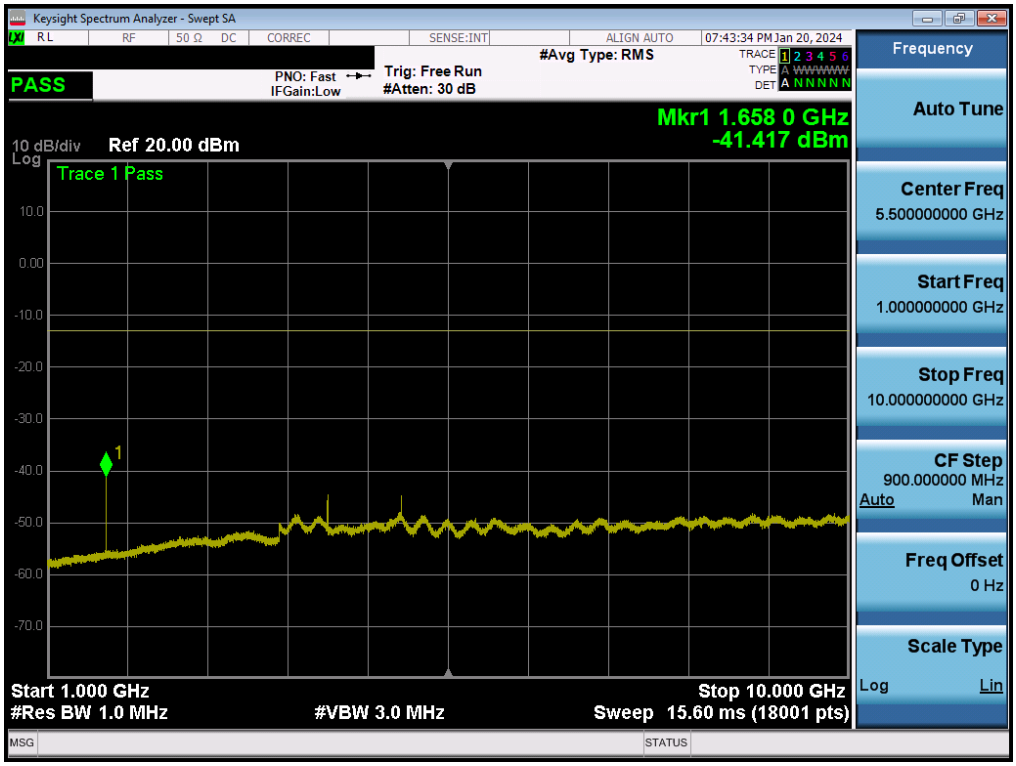
LTE Band 5



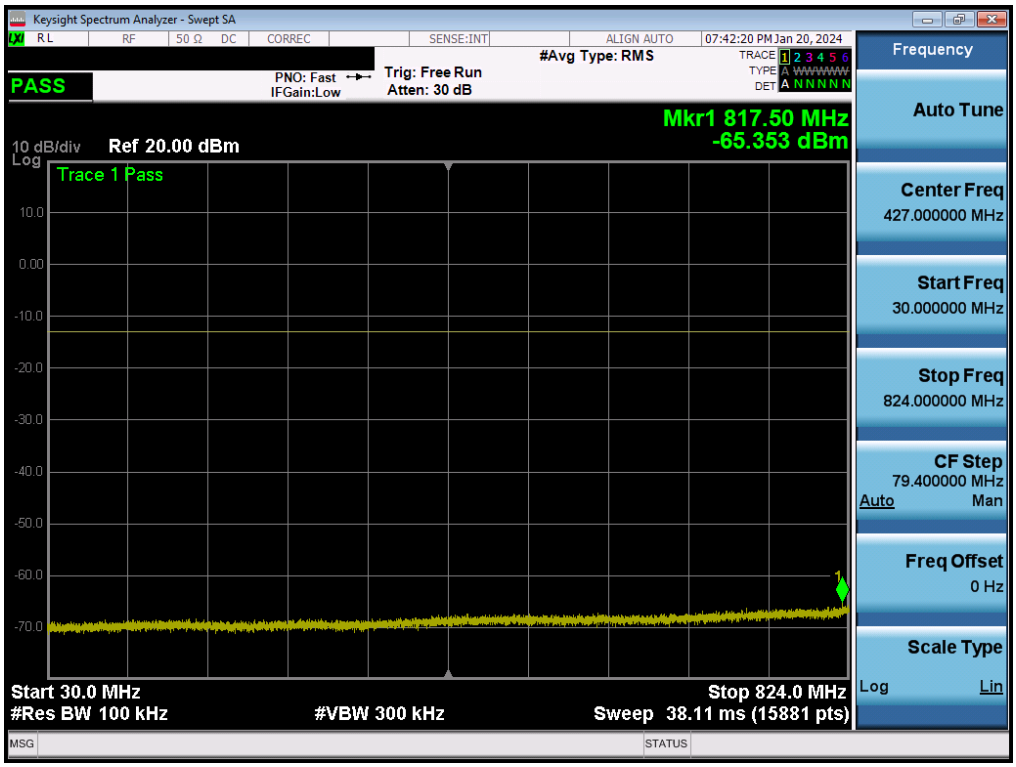
Plot 7-9. Conducted Spurious Plot (LTE Band 5 - 10MHz QPSK - 1 RB - Low Channel)



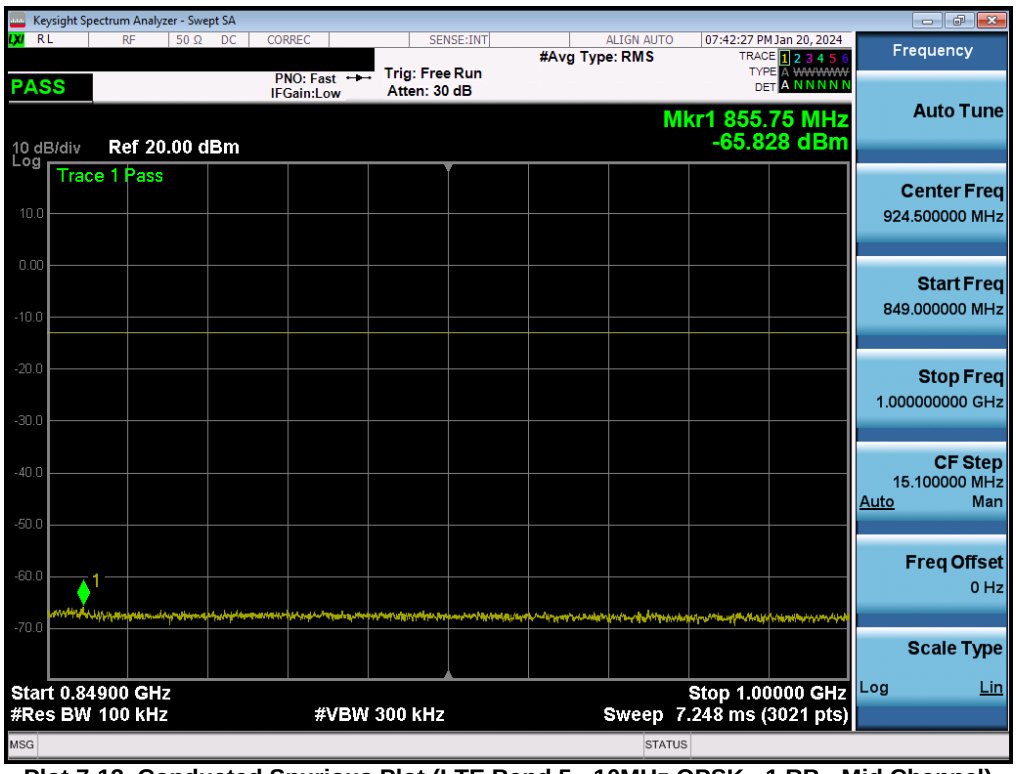
Plot 7-10. Conducted Spurious Plot (LTE Band 5 - 10MHz QPSK - 1 RB - Low Channel)



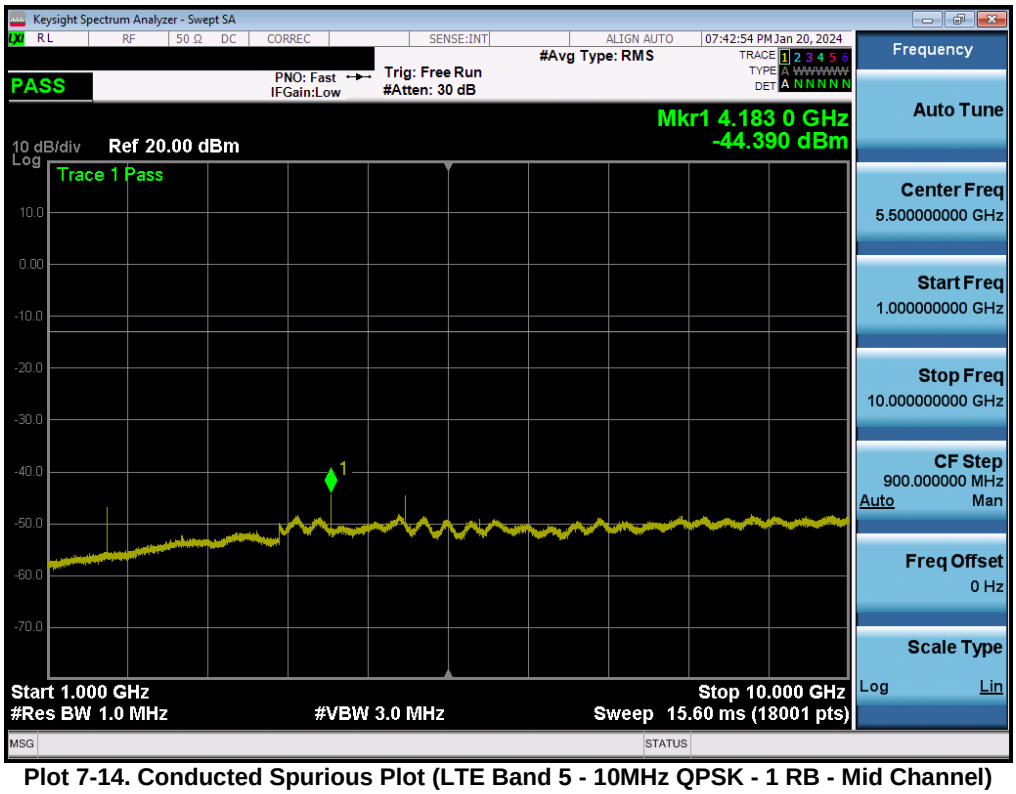
Plot 7-11. Conducted Spurious Plot (LTE Band 5 - 10MHz QPSK - 1 RB - Low Channel)



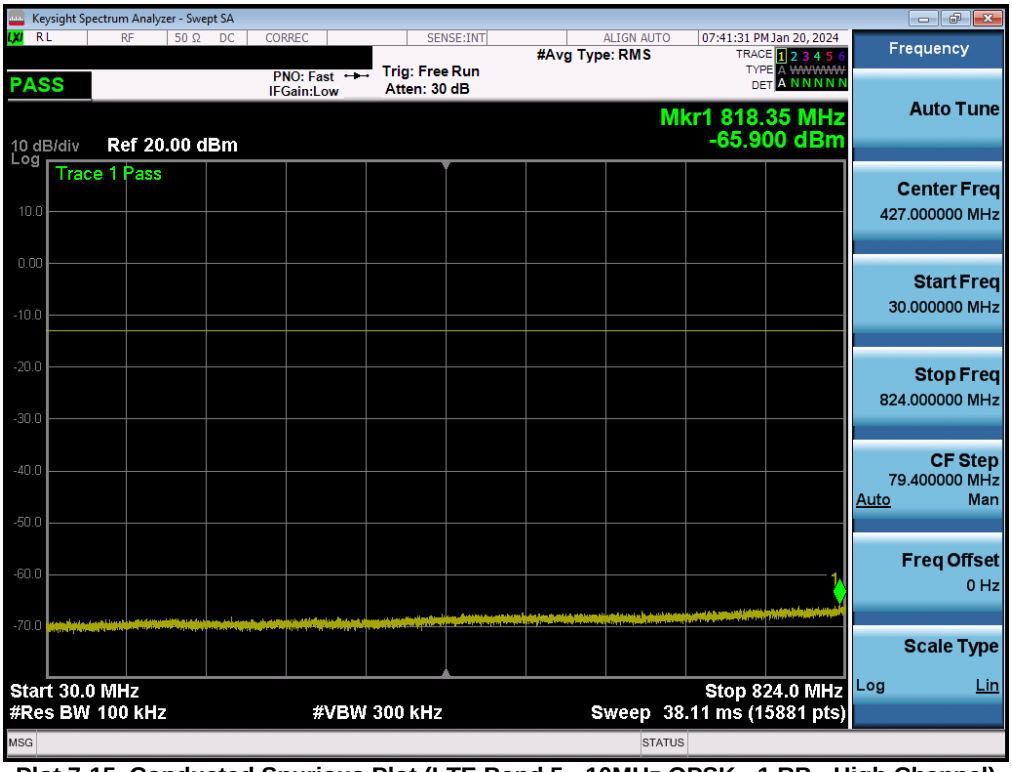
Plot 7-12. Conducted Spurious Plot (LTE Band 5 - 10MHz QPSK - 1 RB - Mid Channel)



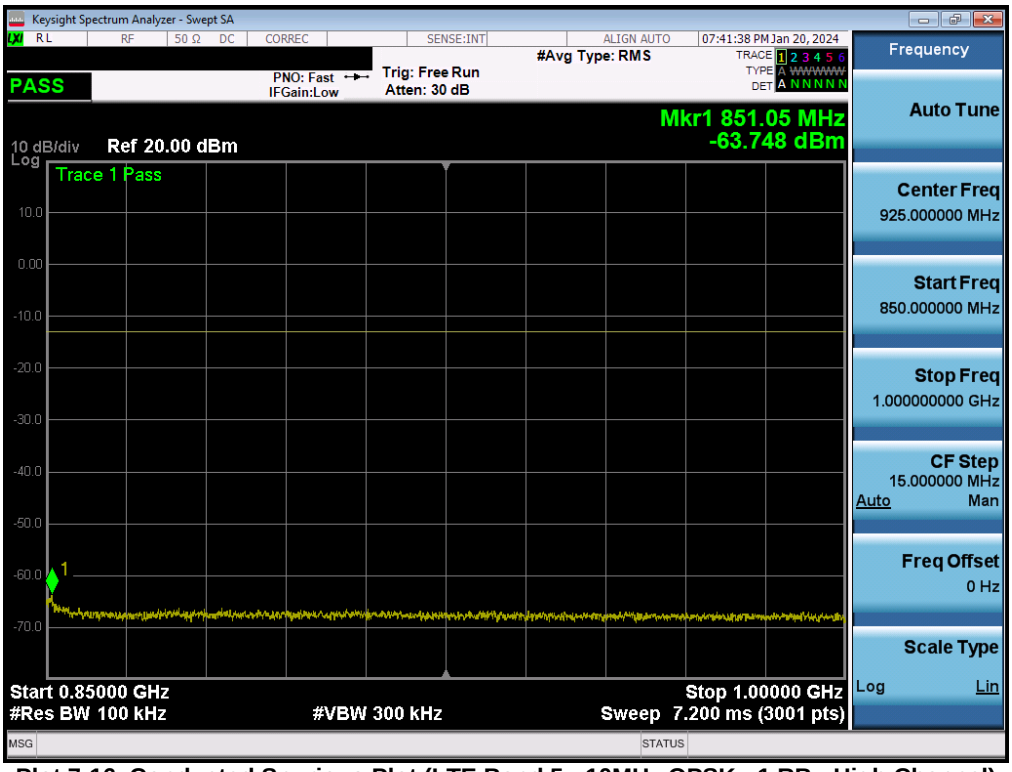
Plot 7-13. Conducted Spurious Plot (LTE Band 5 - 10MHz QPSK - 1 RB - Mid Channel)



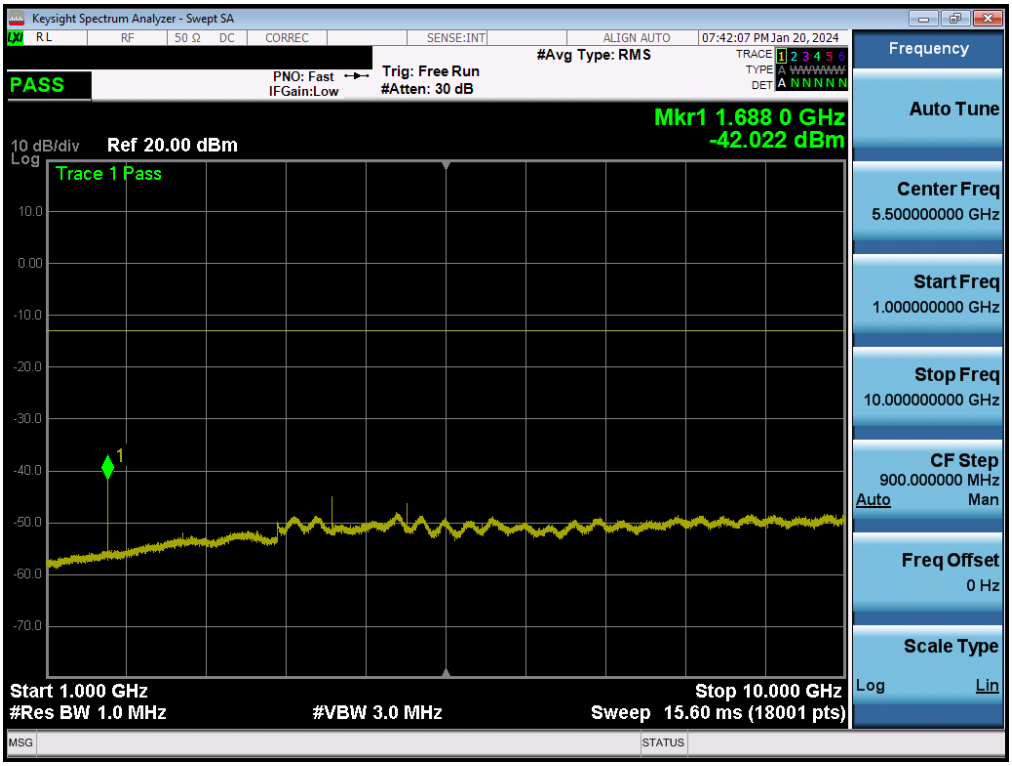
Plot 7-14. Conducted Spurious Plot (LTE Band 5 - 10MHz QPSK - 1 RB - Mid Channel)



Plot 7-15. Conducted Spurious Plot (LTE Band 5 - 10MHz QPSK - 1 RB - High Channel)



Plot 7-16. Conducted Spurious Plot (LTE Band 5 - 10MHz QPSK - 1 RB - High Channel)



Plot 7-17. Conducted Spurious Plot (LTE Band 5 - 10MHz QPSK - 1 RB - High 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 maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

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 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.

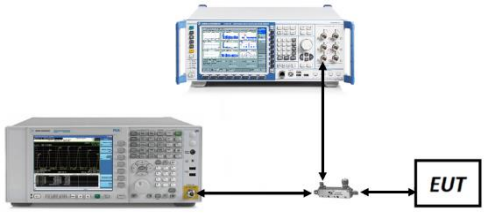


Figure 7-4. Test Instrument & Measurement Setup

Test Notes

Per 22.917(b) and RSS-132(5.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. 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 emission are attenuated at least 26 dB below the transmitter power.

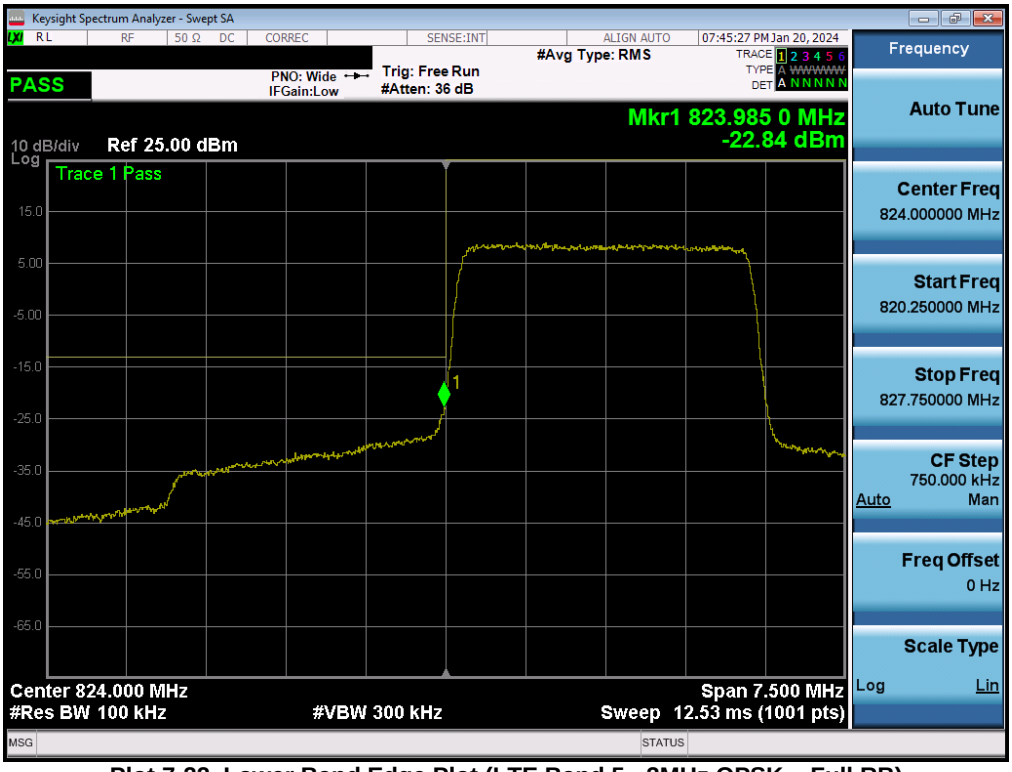
LTE Band 5

Plot 7-18. Lower Band Edge Plot (LTE Band 5 - 10MHz QPSK – Full RB)

Plot 7-19. Upper Band Edge Plot (LTE Band 5 - 10MHz QPSK – Full RB)

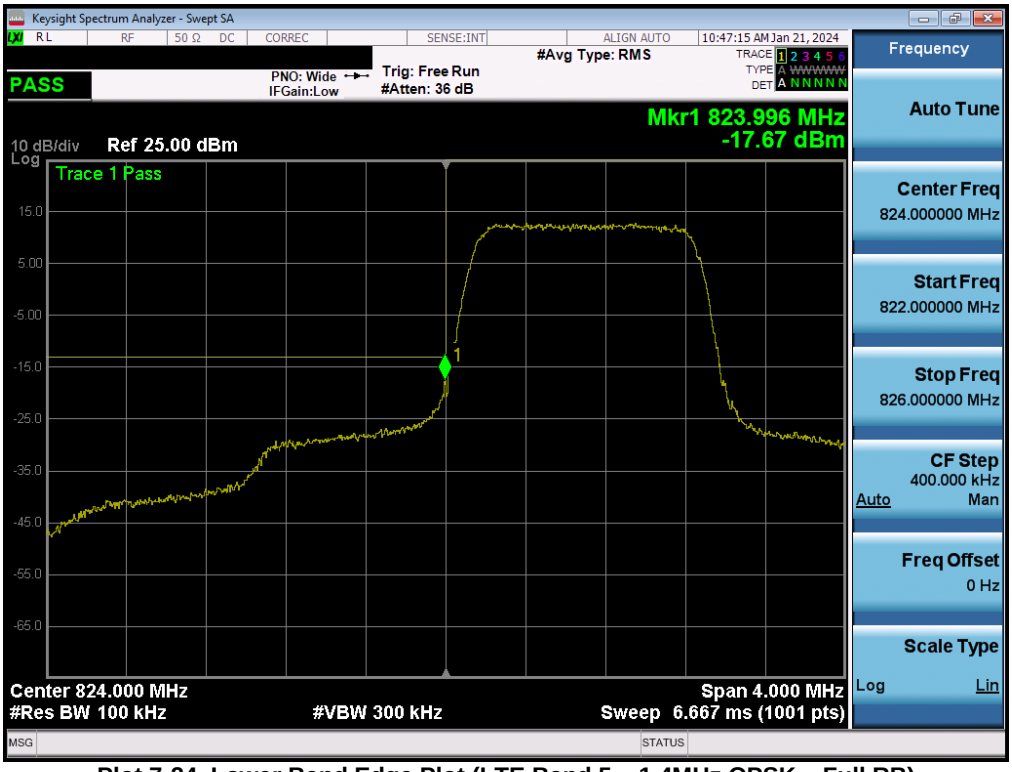
Plot 7-20. Lower Band Edge Plot (LTE Band 5 - 5MHz QPSK – Full RB)

Plot 7-21. Upper Band Edge Plot (LTE Band 5 - 5MHz QPSK – Full RB)



Plot 7-22. Lower Band Edge Plot (LTE Band 5 - 3MHz QPSK – Full RB)

Plot 7-23. Upper Band Edge Plot (LTE Band 5 - 3MHz QPSK – Full RB)



Plot 7-24. Lower Band Edge Plot (LTE Band 5 – 1.4MHz QPSK – Full RB)

Plot 7-25. Upper Band Edge Plot (LTE Band 5 – 1.4MHz QPSK – Full RB)

7.6 Peak-Average Ratio

Test Overview

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

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure Used

ANSI C63.26-2015 – Section 5.2.3.4

Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW ≥ OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

Test Setup

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

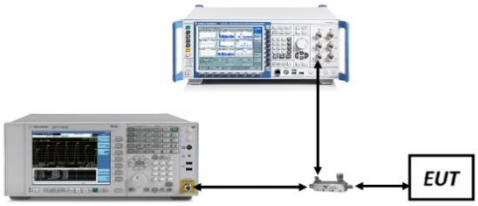
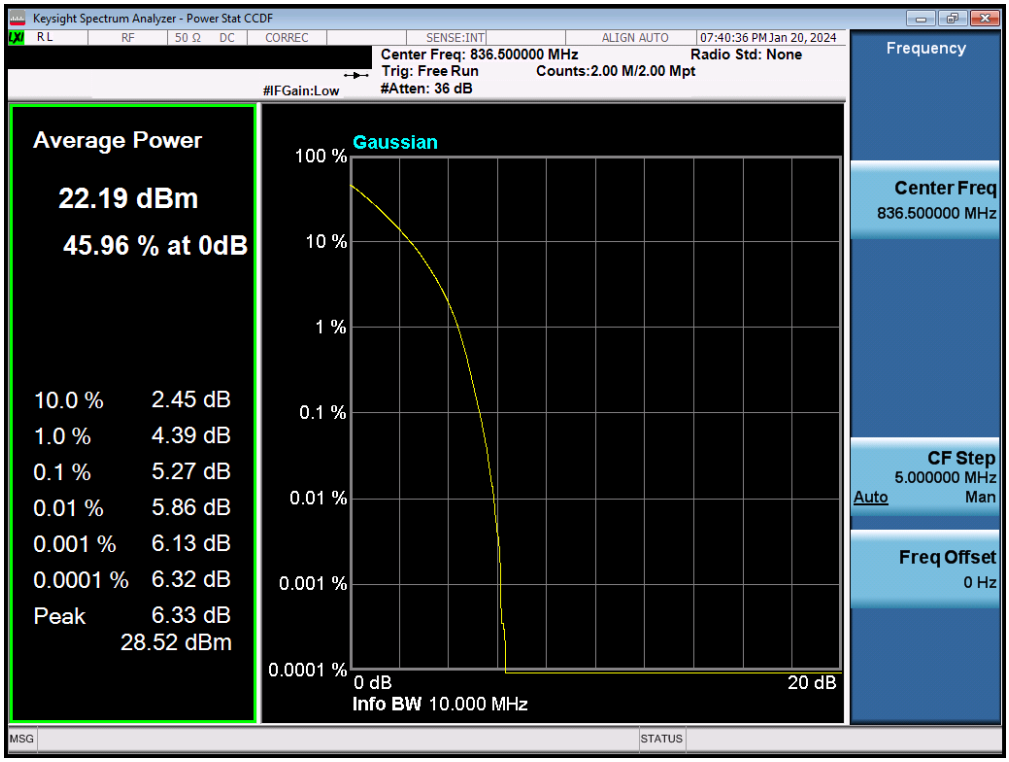


Figure 7-5. Test Instrument & Measurement Setup

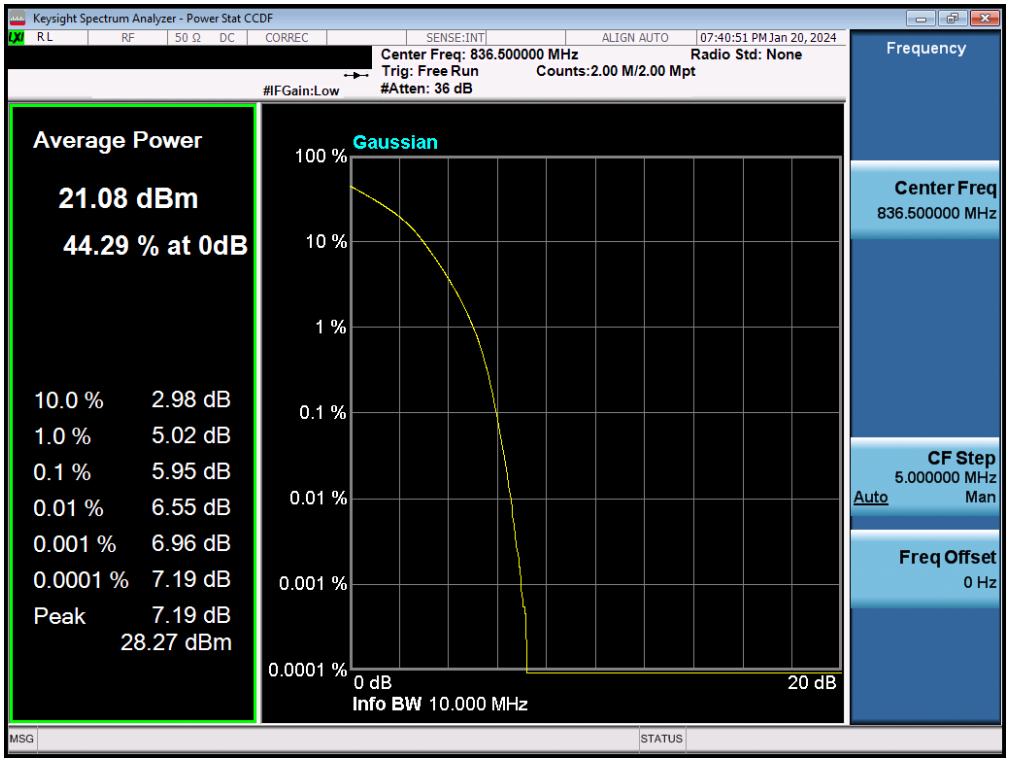
Test Notes

None.

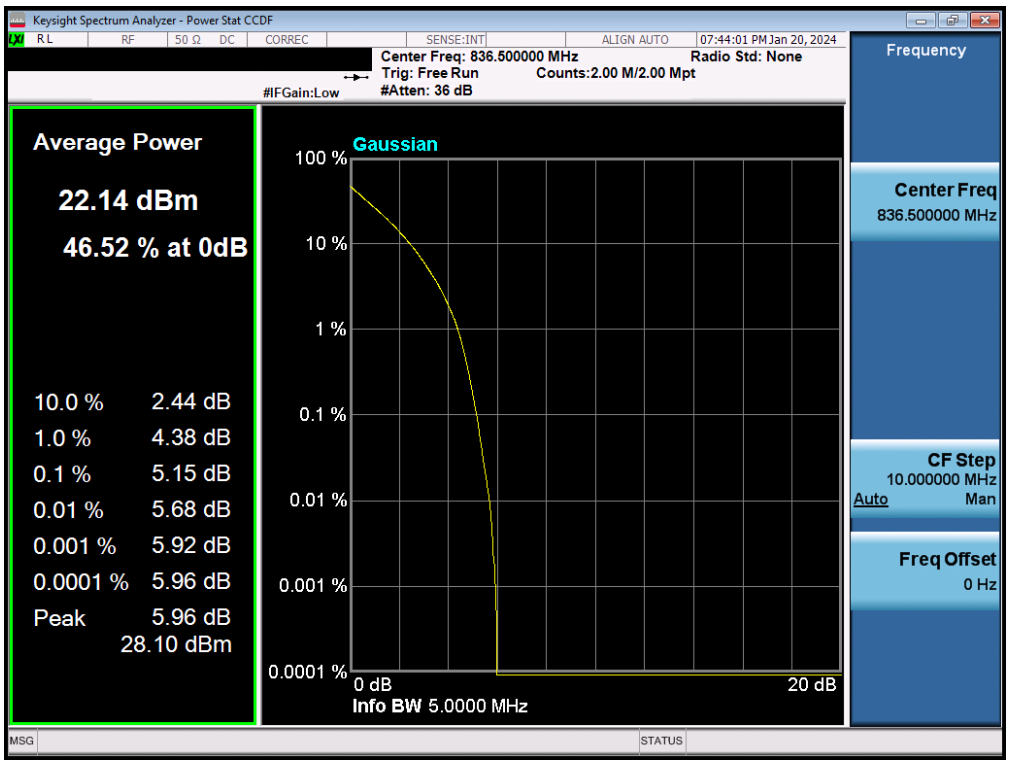
LTE Band 5



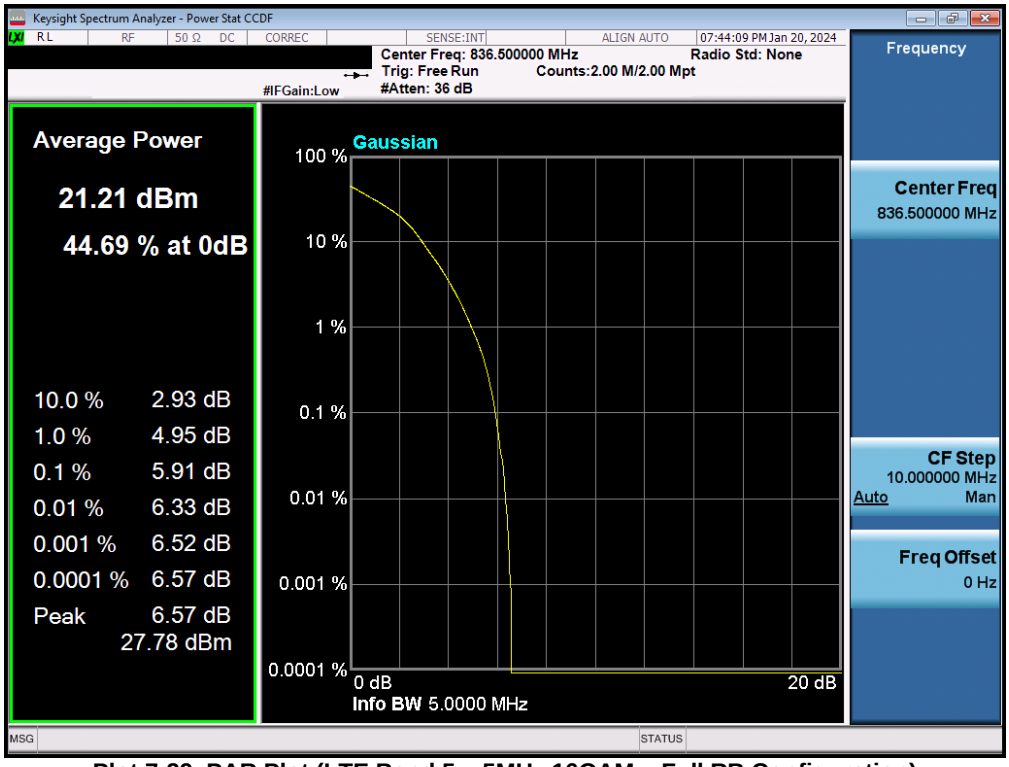
Plot 7-26. PAR Plot (LTE Band 5 – 10MHz QPSK – Full RB Configuration)



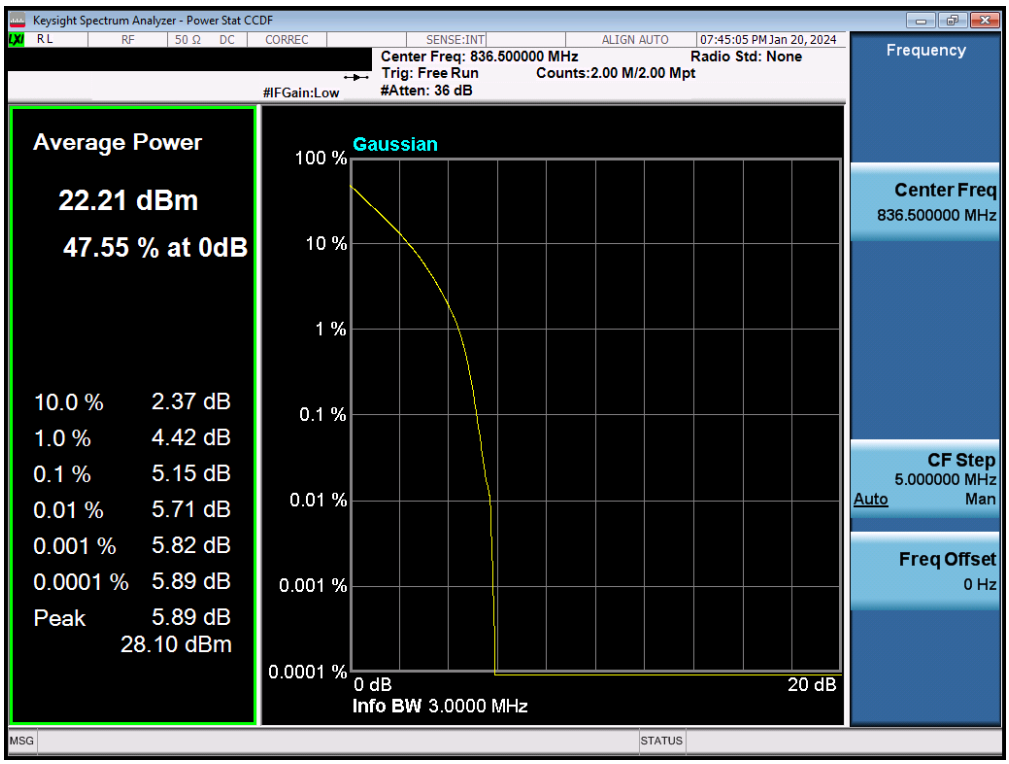
Plot 7-27. PAR Plot (LTE Band 5 – 10MHz 16QAM – Full RB Configuration)



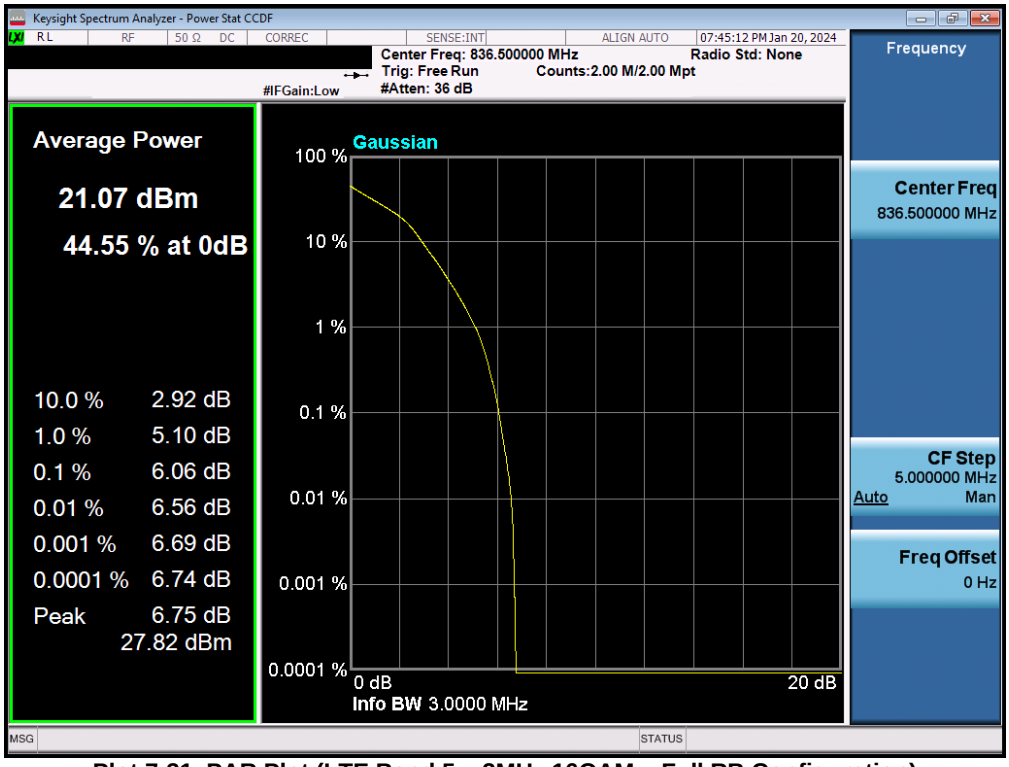
Plot 7-28. PAR Plot (LTE Band 5 – 5MHz QPSK – Full RB Configuration)



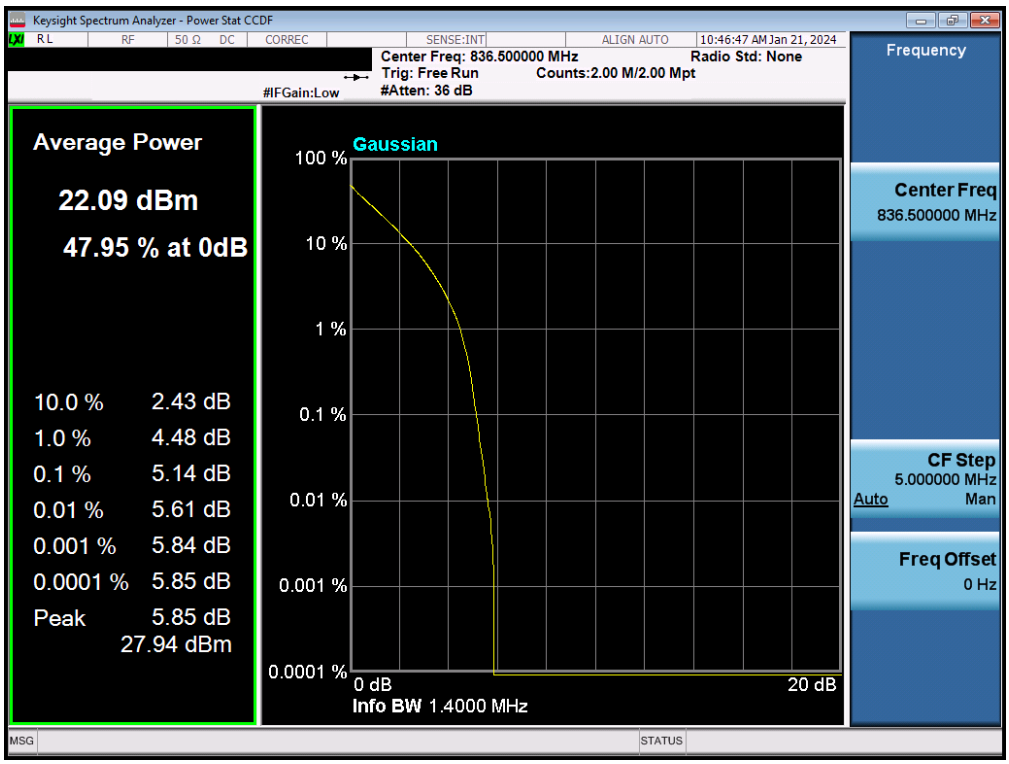
Plot 7-29. PAR Plot (LTE Band 5 – 5MHz 16QAM – Full RB Configuration)



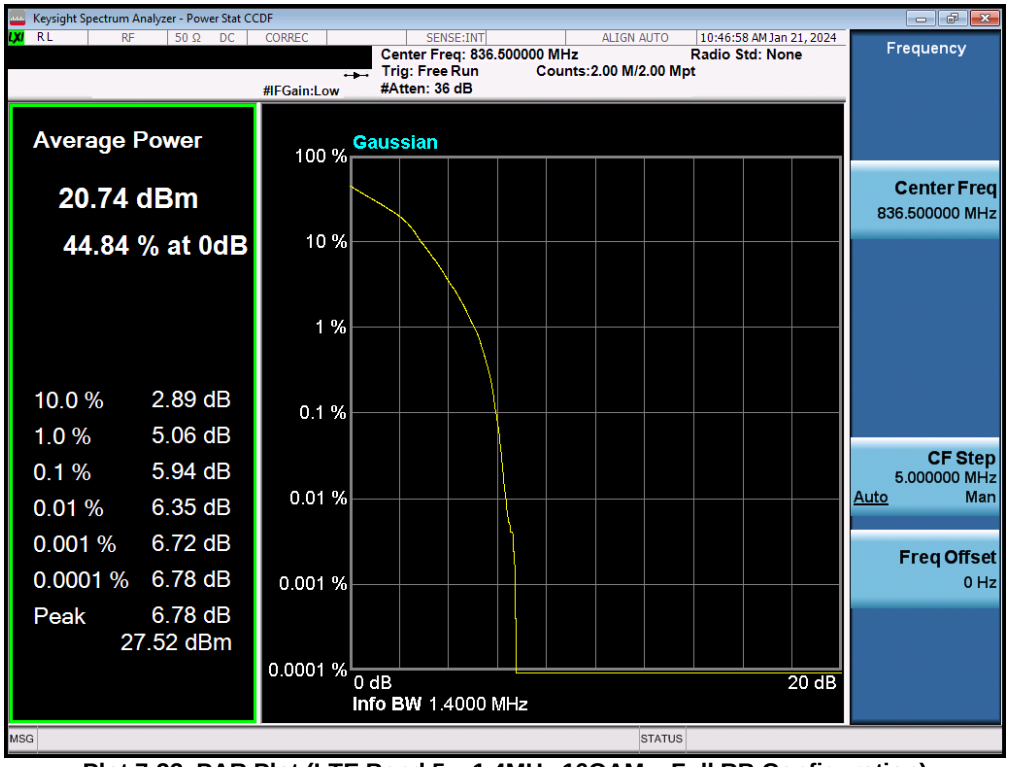
Plot 7-30. PAR Plot (LTE Band 5 – 3MHz QPSK – Full RB Configuration)



Plot 7-31. PAR Plot (LTE Band 5 – 3MHz 16QAM – Full RB Configuration)



Plot 7-32. PAR Plot (LTE Band 5 – 1.4MHz QPSK – Full RB Configuration)



Plot 7-33. PAR Plot (LTE Band 5 – 1.4MHz 16QAM – Full RB Configuration)

7.7 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 while all its antenna ports are terminated with 50 ohms. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points ≥ 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

Test Setup

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

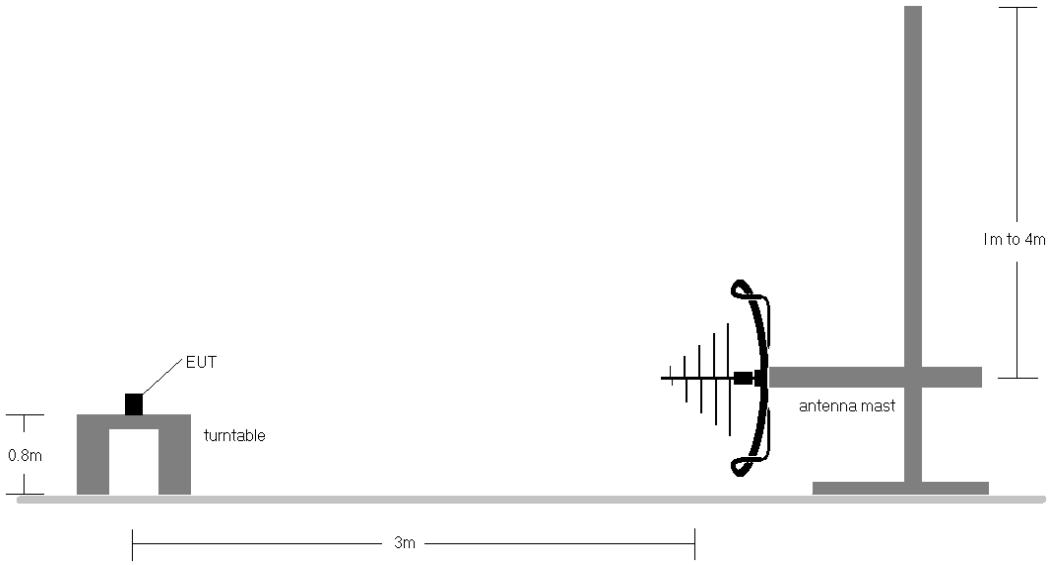


Figure 7-6. Test Instrument & Measurement Setup < 1GHz

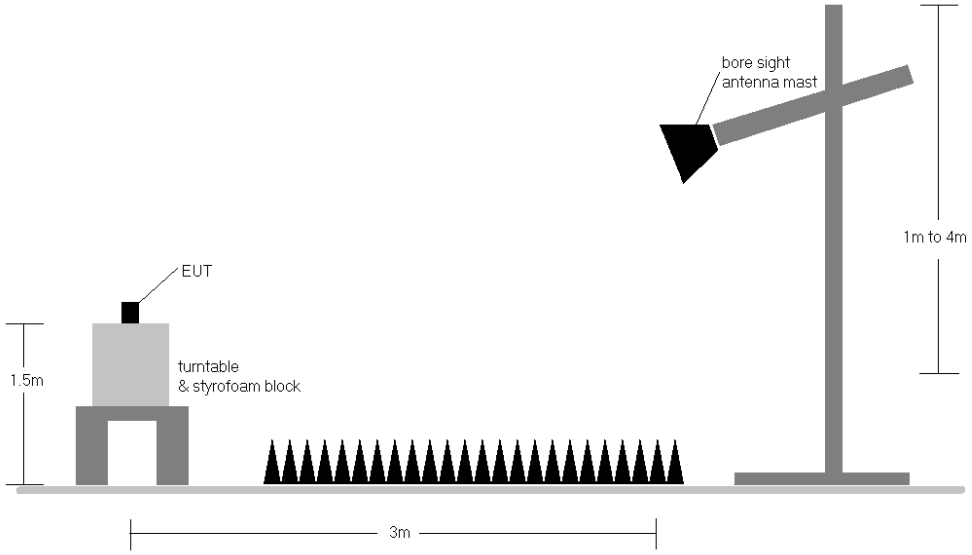


Figure 7-7. Test Instrument & Measurement Setup > 1GHz

Test Notes

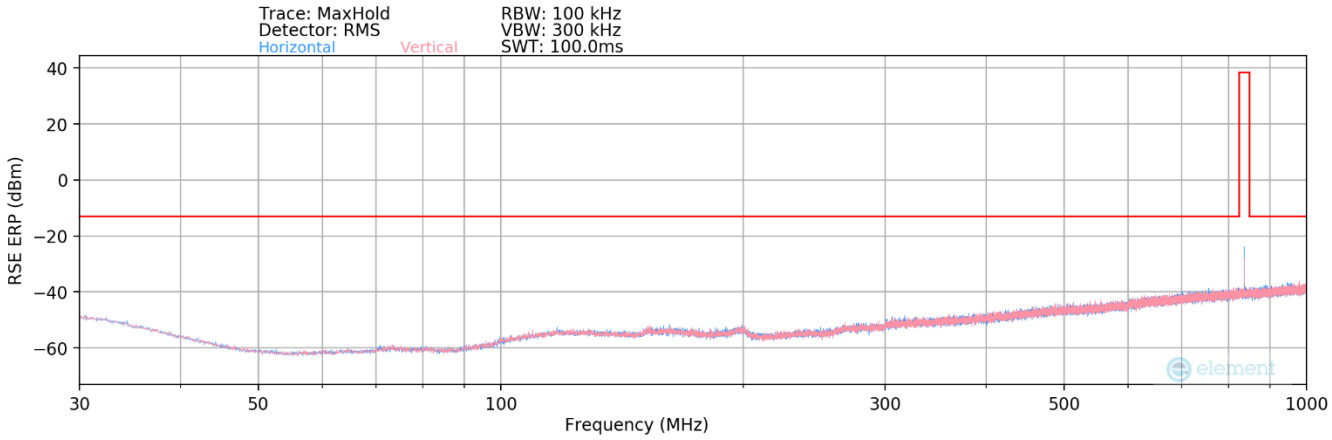
1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
   a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
   b) EIRP (dBm) = E(dBµV/m) + 20logD – 104.8; where D is the measurement distance in meters.

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

3) 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.

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

LTE Band 5

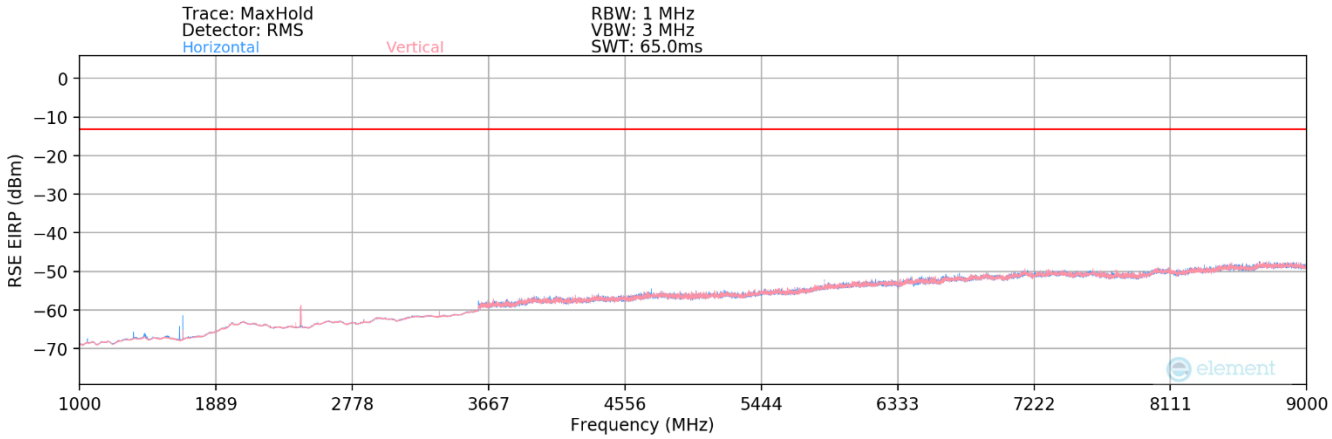


Plot 7-34. Radiated Spurious Plot Below 1GHz (LTE Band 5)

Bandwidth (MHz):	10
Frequency (MHz):	836.5
RB / Offset:	1 / 25

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]
95.67	H	-	-	-83.99	15.97	38.98	-58.42	-13.00	-45.42
195.84	H	-	-	-83.84	19.79	42.95	-54.45	-13.00	-41.45
489.42	H	-	-	-83.73	25.73	49.00	-48.41	-13.00	-35.41

Table 7-3. Radiated Spurious Data Below 1GHz (LTE Band 5 – Mid Channel)



Plot 7-35. Radiated Spurious Plot (LTE Band 5)

Bandwidth (MHz):	10
Frequency (MHz):	829
RB / Offset:	1 / 25

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]
1658.00	H	128	160	-62.93	-7.26	36.81	-58.44	-13.00	-45.44
2487.00	H	-	-	-76.16	-4.19	26.65	-68.61	-13.00	-55.61
3316.00	H	329	147	-68.70	-1.07	37.23	-58.02	-13.00	-45.02
4145.00	H	313	223	-70.49	1.73	38.24	-57.02	-13.00	-44.02
4974.00	H	260	167	-71.33	2.82	38.49	-56.77	-13.00	-43.77
5803.00	H	238	136	-72.01	5.31	40.30	-54.96	-13.00	-41.96
6632.00	H	322	214	-75.37	7.37	39.00	-56.26	-13.00	-43.26
7461.00	H	304	146	-75.79	9.02	40.23	-55.03	-13.00	-42.03

Table 7-4. Radiated Spurious Data (LTE Band 5 – Low Channel)

Bandwidth (MHz):	10
Frequency (MHz):	836.5
RB / Offset:	1 / 25

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]
1673.00	H	145	156	-66.22	-7.12	33.66	-61.59	-13.00	-48.59
2509.50	H	168	185	-75.82	-3.83	27.35	-67.91	-13.00	-54.91
3346.00	H	297	118	-72.00	-1.08	33.92	-61.33	-13.00	-48.33
4182.50	H	270	160	-73.31	1.57	35.26	-59.99	-13.00	-46.99
5019.00	H	269	163	-71.26	3.13	38.87	-56.39	-13.00	-43.39
5855.50	H	249	133	-72.37	5.59	40.22	-55.04	-13.00	-42.04
6692.00	H	-	-	-78.27	7.92	36.65	-58.61	-13.00	-45.61
7528.50	H	321	145	-75.70	9.13	40.43	-54.83	-13.00	-41.83

Table 7-5. Radiated Spurious Data (LTE Band 5 – Mid Channel)

Bandwidth (MHz):	10
Frequency (MHz):	844
RB / Offset:	1 / 25

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]
1688.00	H	133	155	-66.62	-6.88	33.50	-61.76	-13.00	-48.76
2532.00	H	-	-	-76.32	-3.27	27.41	-67.85	-13.00	-54.85
3376.00	H	318	150	-73.78	-1.04	32.18	-63.08	-13.00	-50.08
4220.00	H	302	209	-73.76	1.59	34.83	-60.42	-13.00	-47.42
5064.00	H	376	172	-75.01	3.34	35.33	-59.92	-13.00	-46.92
5908.00	H	242	213	-76.43	6.09	36.66	-58.60	-13.00	-45.60
6752.00	H	-	-	-77.95	7.97	37.02	-58.24	-13.00	-45.24
7596.00	H	306	153	-76.38	9.59	40.21	-55.04	-13.00	-42.04

Table 7-6. Radiated Spurious Data (LTE Band 5 – High Channel)

7.8 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 22 and RSS-132, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

Test Procedure Used

ANSI C63.26-2015 – Section 5.6

Test Settings

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

Test Setup

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

Test Notes

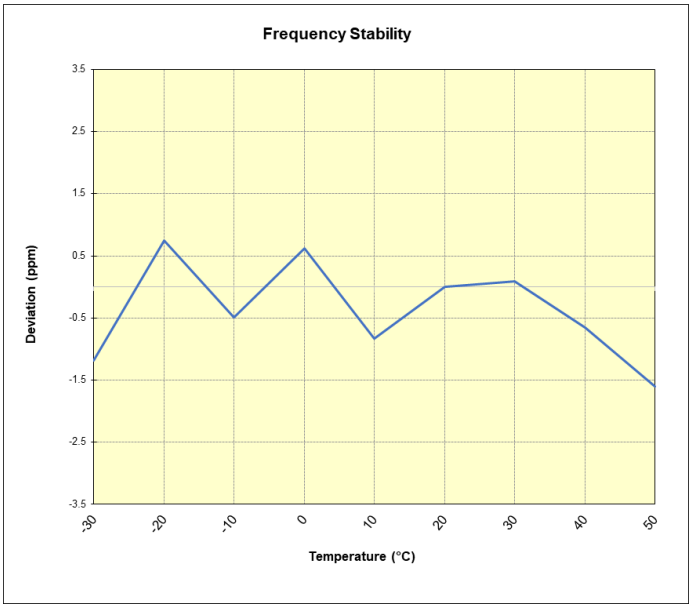
None

LTE Band 5

LTE Band 5	
Operating Frequency (Hz):	836,500,000
Ref. Voltage (VDC):	3.4
Deviation Limit:	± 0.00025% or 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.4	- 30	836,499,623	-996	-0.0001190
		- 20	836,501,244	625	0.0000748
		- 10	836,500,211	-408	-0.0000488
		0	836,501,143	524	0.0000626
		+ 10	836,499,926	-693	-0.0000828
		+ 20 (Ref)	836,500,619	0	0.0000000
		+ 30	836,500,690	71	0.0000085
		+ 40	836,500,070	-549	-0.0000657
		+ 50	836,499,283	-1,336	-0.0001598
85 %	2.89	+ 20	836,499,339	-1,280	-0.0001530
115 %	3.91	+ 20	836,499,787	-832	-0.0000995

Table 7-7. LTE Band 5 Frequency Stability Data



Plot 7-36. LTE Band 5 Frequency Stability Chart

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Telit Module FCC ID: RI7LE910C1SNX / IC: 5131A-LE910C1SNX** complies with all the requirements of Part 22 of the FCC rules and RSS-132 of the ISED rules.