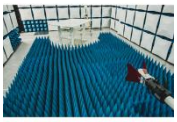
PCTEST
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctest.com



MEASUREMENT REPORT
Part 96 LTE

Applicant Name:
LG Electronics USA, Inc.
111 Sylvan Avenue, North Building
Englewood Cliffs, NJ 07632
United States

Date of Testing:
06/26/2020-08/18/2020
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2006150096-05.ZNF

FCC ID:	**ZNFF100VM**
APPLICANT:	**LG Electronics USA, Inc.**

Application Type:	Certification
Model:	LM-F100VM
Additional Models:	LMF100VM, F100VM, LM-F101V, LMF101V, F101V
EUT Type:	Portable Handset
FCC Classification:	Citizens Band End User Devices (CBE)
FCC Rule Part(s):	96
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01, KDB 648474 D03 v01r04, KDB 940660 D01 v02, WINNF-TS-0122 V1.0.0

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.

Randy Ortanez
President

ACCREDITED
CERT #2041.01

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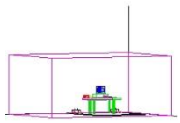
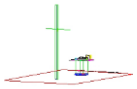


MEASUREMENT REPORT
FCC Part 96



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 48	20 MHz	QPSK	3560.0 - 3690.0	0.095	19.75	18M0G7D
		16QAM	3560.0 - 3690.0	0.073	18.62	17M9W7D
		64QAM	3560.0 - 3690.0	0.043	16.29	17M9W7D
	15 MHz	QPSK	3557.5 - 3692.5	0.091	19.60	13M5G7D
		16QAM	3557.5 - 3692.5	0.077	18.88	13M4W7D
		64QAM	3557.5 - 3692.5	0.058	17.64	13M5W7D
	10 MHz	QPSK	3555.0 - 3695.0	0.094	19.73	8M95G7D
		16QAM	3555.0 - 3695.0	0.068	18.30	8M98W7D
		64QAM	3555.0 - 3695.0	0.054	17.35	8M90W7D
	5 MHz	QPSK	3552.5 - 3697.5	0.091	19.60	4M52G7D
		16QAM	3552.5 - 3697.5	0.067	18.25	4M51W7D
		64QAM	3552.5 - 3697.5	0.051	17.04	4M52W7D

EUT Overview (LTE B48)

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

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 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility 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 PCTEST located in Columbia, MD 21046, U.S.A.

- PCTEST is a CBRS Alliance (OnGo) Approved Test Lab
- PCTEST is a WInnForum Approved Test Lab
- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for CBRS Alliance Certification Test Plan and WInnForum Conformance and Performance Test Technical Standard.
- PCTEST is an ISO 17025-2005 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.
- PCTEST 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).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFF100VM**. The test data contained in this report pertains only to the emissions due to the EUT's LTE Band 48 operation in the CBRS band. Per FCC Part 96, this device is evaluated under Citizens Band End User Devices (CBE).

Test Device Serial No.: 00229, 00328

2.2 Device Capabilities

This device contains the following capabilities:

CDMA, GSM/GPRS/EDGE, WCDMA/HSPA, LTE, NR, WLAN, UNII, BT(1x, EDR, LE), NFC

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT placed on an authorized wireless charging pad (WCP) Model: EP-N5100 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.4 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 document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT**.**

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. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then 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 $_{[dB]}$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -40dBm/MHz for End User Devices.

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.

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
-	LTx2	Licensed Transmitter Cable Set	4/9/2020	Annual	4/9/2021	LTx2
-	LTx3	Licensed Transmitter Cable Set	10/30/2019	Annual	10/30/2020	LTx3
Anritsu	MT8821C	Radio Communication Analyzer	3/10/2020	Annual	3/10/2021	6200901190
Anritsu	MS46322A	Vector Network Analyzer	8/19/2019	Annual	8/19/2020	1521001
Anritsu	MT8821C	Radio Communication Analyzer	6/15/2020	Annual	6/15/2021	6201381794
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Espec	ESX-2CA	Environmental Chamber	8/13/2019	Annual	8/13/2020	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/14/2019	Biennial	2/14/2021	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	128338
ETS-Lindgren	3115	Double Ridged Guide Horn 750MHz - 18GHz	3/12/2020	Biennial	3/12/2022	150693
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Rohde & Schwarz	CMU200	Base Station Simulator	N/A			107826
Rohde & Schwarz	CMU200	Base Station Simulator	N/A			836536/0005
Rohde & Schwarz	CMW500	Radio Communication Tester	8/26/2019	Annual	8/26/2020	100976
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	11/1/2019	Annual	11/1/2020	100040
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/10/2020	Annual	2/10/2021	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102133
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511

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

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: LG Electronics USA, Inc.

FCC ID: ZNFF100VM

FCC Classification: Citizens Band End User Devices (CBE)

Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1046	Transmitter Conducted Output Power	N/A		PASS	See RF Exposure Report
2.1051 96.41(e)(ii)	Out of Band Emissions	-13 dBm/MHz at frequencies within 0-B MHz of channel edge (where B is the bandwidth of the assigned channel) -25 dBm/MHz at frequencies greater than B MHz above and below channel edge -40 dBm/MHz at frequencies below 3530 MHz and above 3720 MHz		PASS	Section 7.3, 7.4
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 7.7
96.47	End User Device Additional Requirements (CBSD Protocol)	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.		PASS	Section 7.8

Table 7-1. Summary of Conducted Test Results

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
96.41(b)	Equivalent Isotropic Radiated Power (EIRP)	23 dBm/10MHz	RADIATED	PASS	Section 7.5
2.1053 96.41(e)	Undesirable Emissions	-40 dBm/MHz		PASS	Section 7.6

Table 7-2. Summary of Radiated 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 PCTEST "LTE Automation," Version 5.1.

7.2 Occupied Bandwidth

§2.1049

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

KDB 971168 D01 v03r01 – Section 4.2

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.

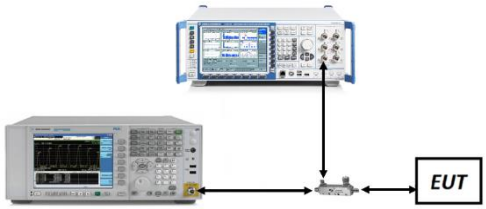
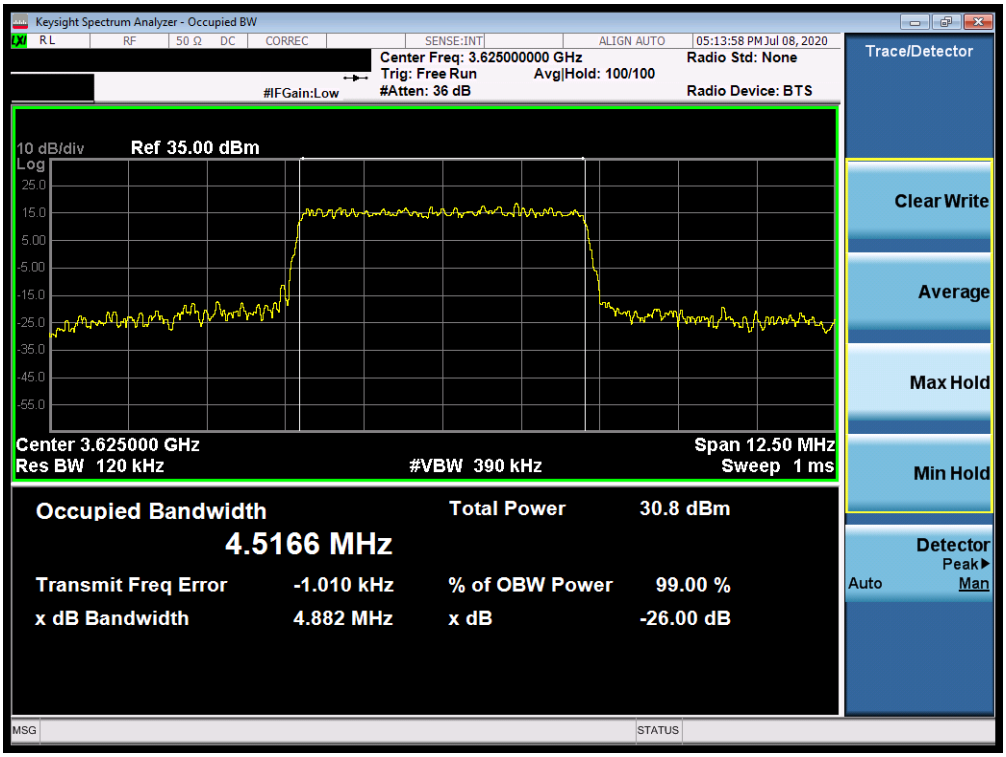
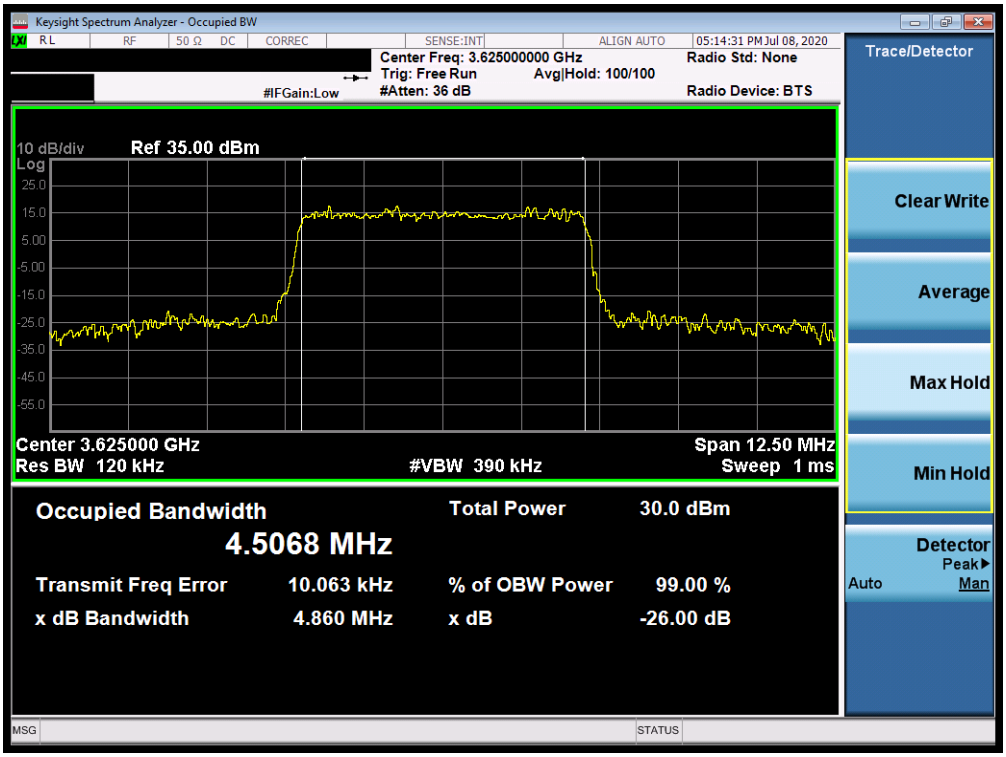


Figure 7-1. Test Instrument & Measurement Setup

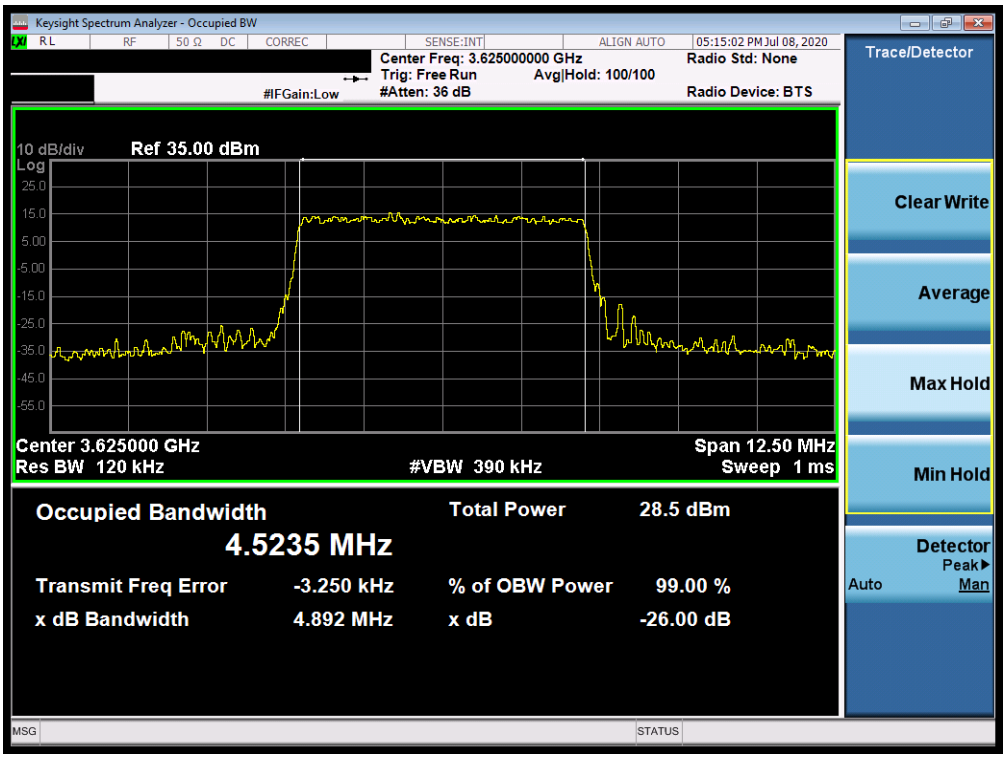
LTE Band 48



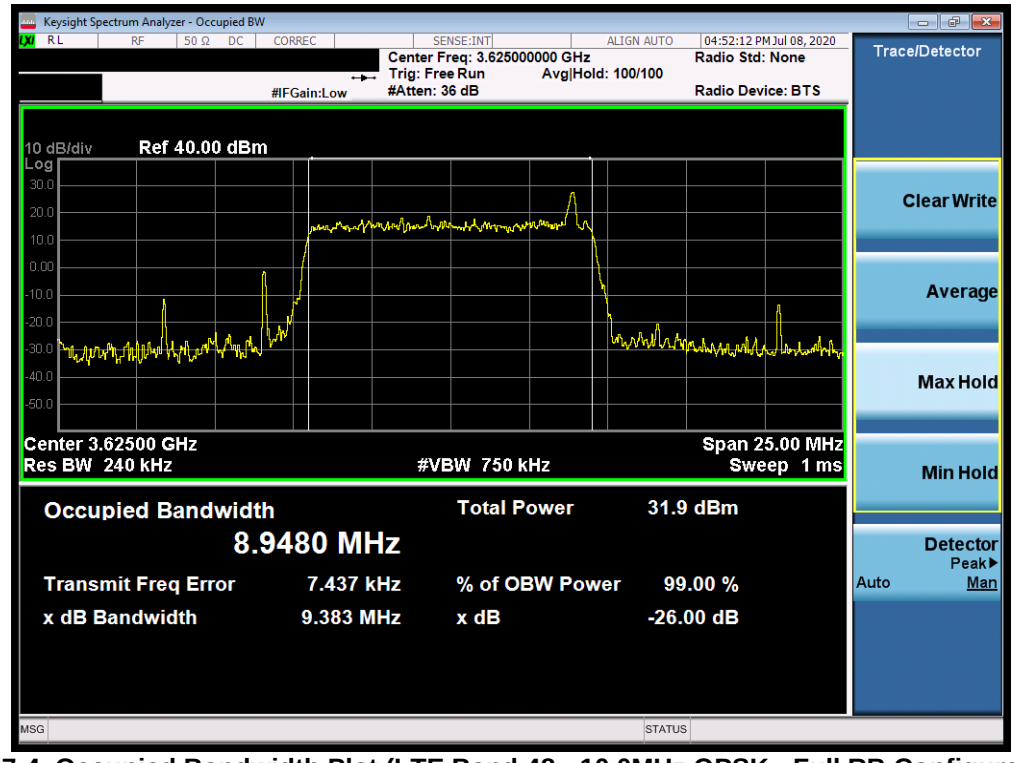
Plot 7-1. Occupied Bandwidth Plot (LTE Band 48 - 5.0MHz QPSK - Full RB Configuration)



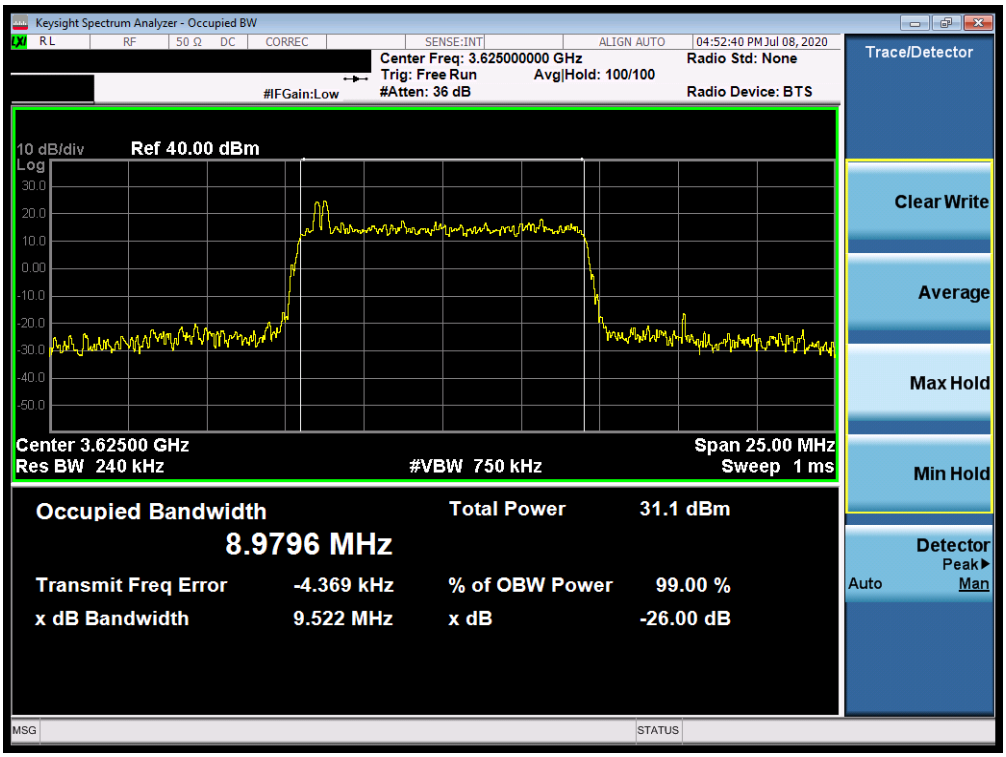
Plot 7-2. Occupied Bandwidth Plot (LTE Band 48 - 5.0MHz 16-QAM - Full RB Configuration)



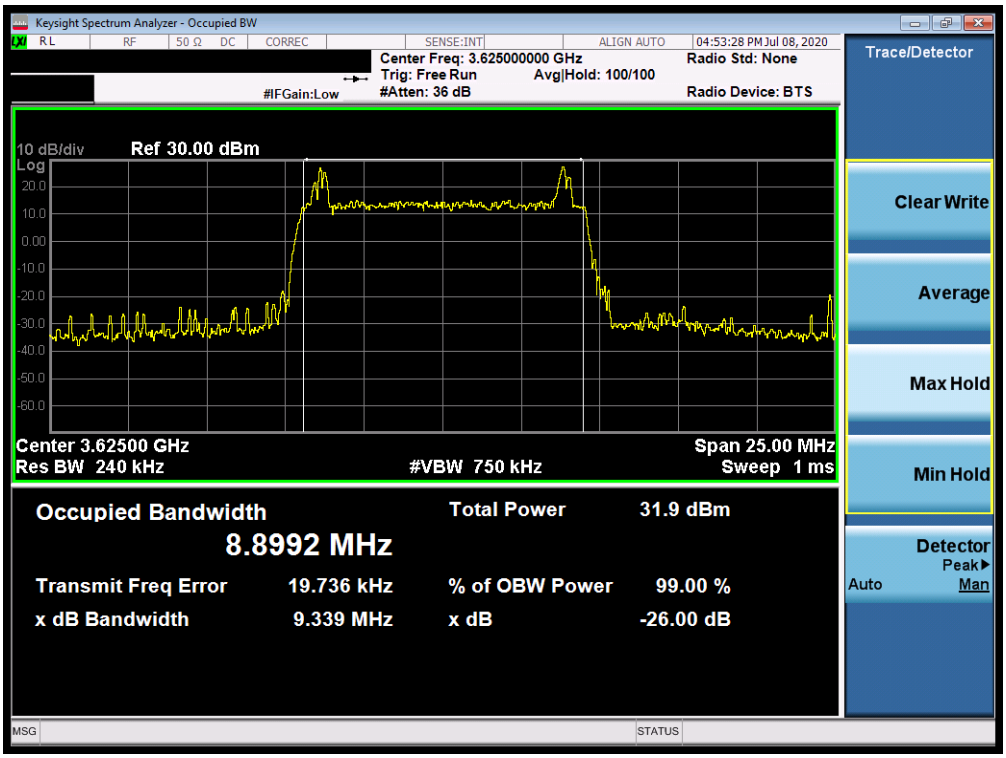
Plot 7-3. Occupied Bandwidth Plot (LTE Band 48 - 5.0MHz 64-QAM - Full RB Configuration)



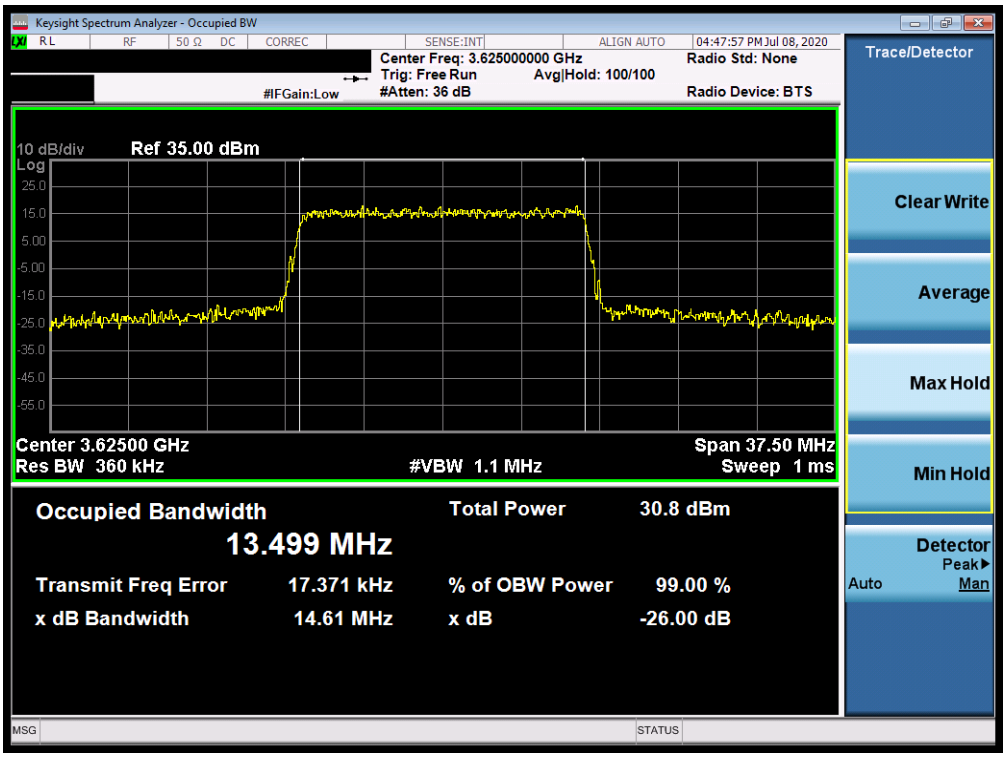
Plot 7-4. Occupied Bandwidth Plot (LTE Band 48 - 10.0MHz QPSK - Full RB Configuration)



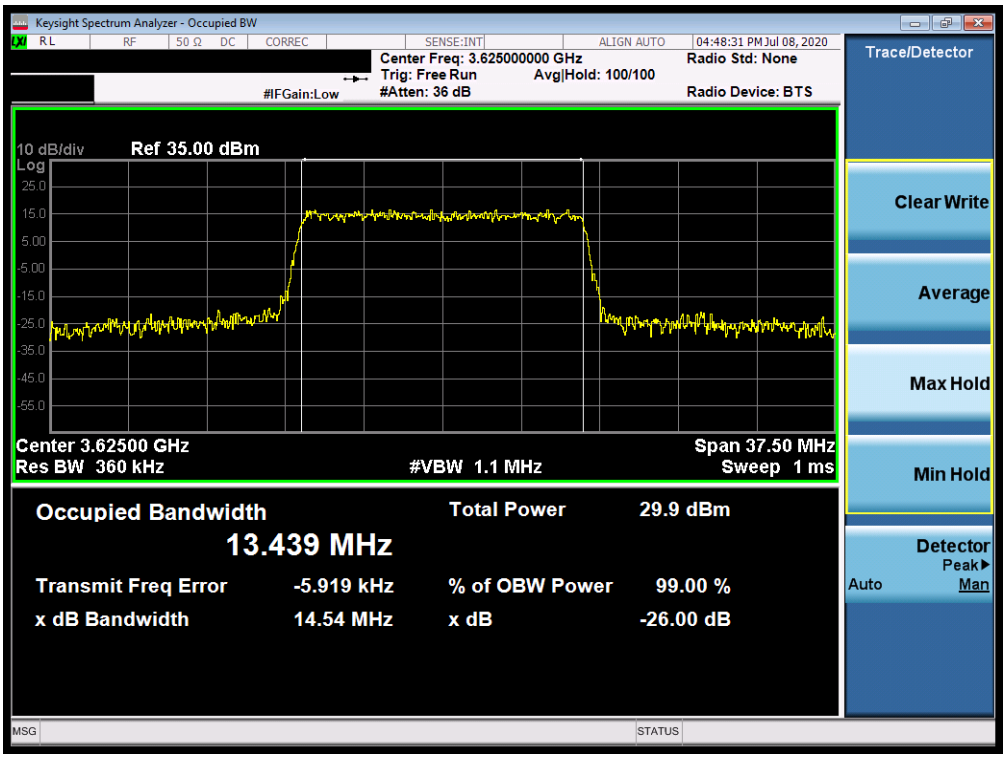
Plot 7-5. Occupied Bandwidth Plot (LTE Band 48 - 10.0MHz 16-QAM - Full RB Configuration)



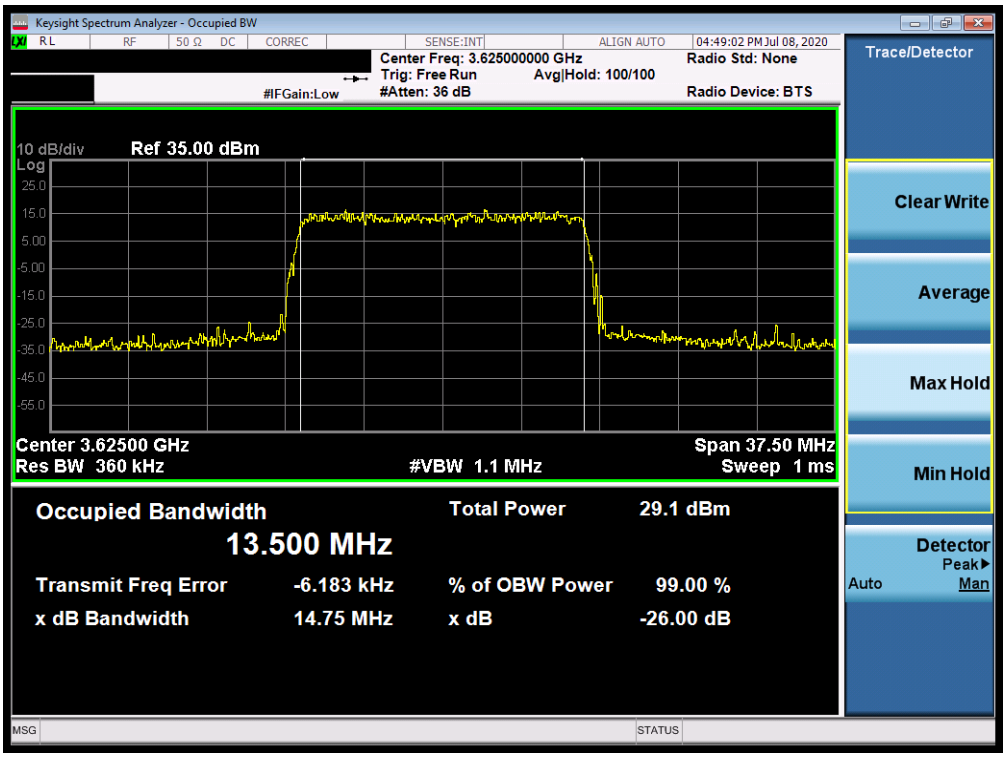
Plot 7-6. Occupied Bandwidth Plot (LTE Band 48 - 10.0MHz 64-QAM - Full RB Configuration)



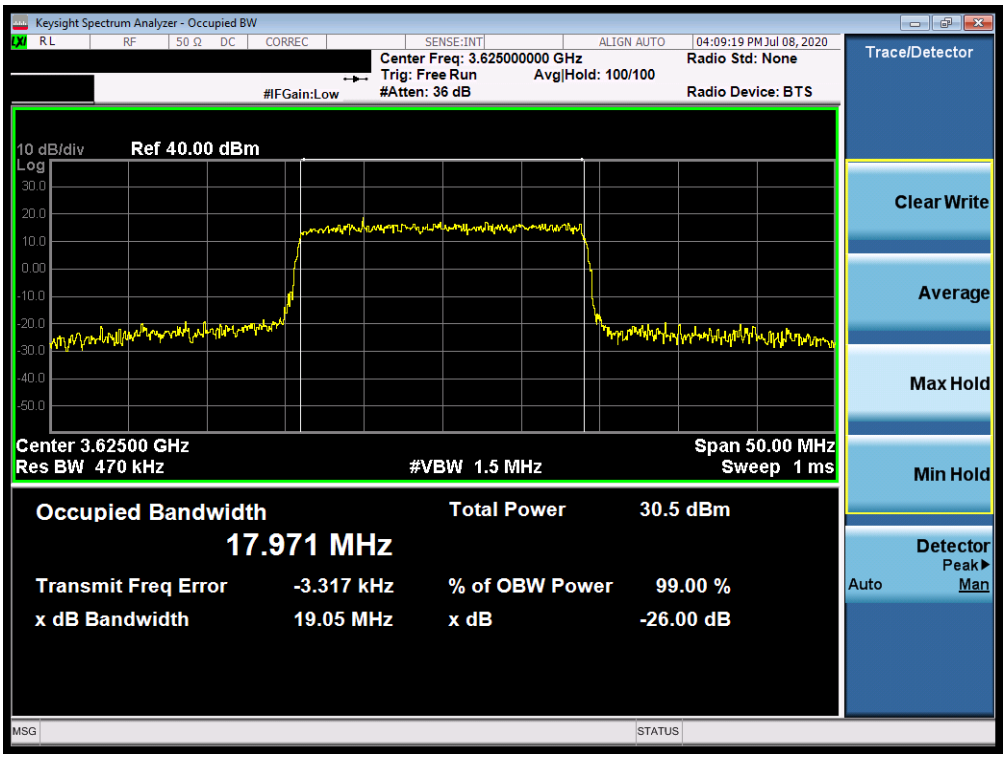
Plot 7-7. Occupied Bandwidth Plot (LTE Band 48 - 15.0MHz QPSK - Full RB Configuration)



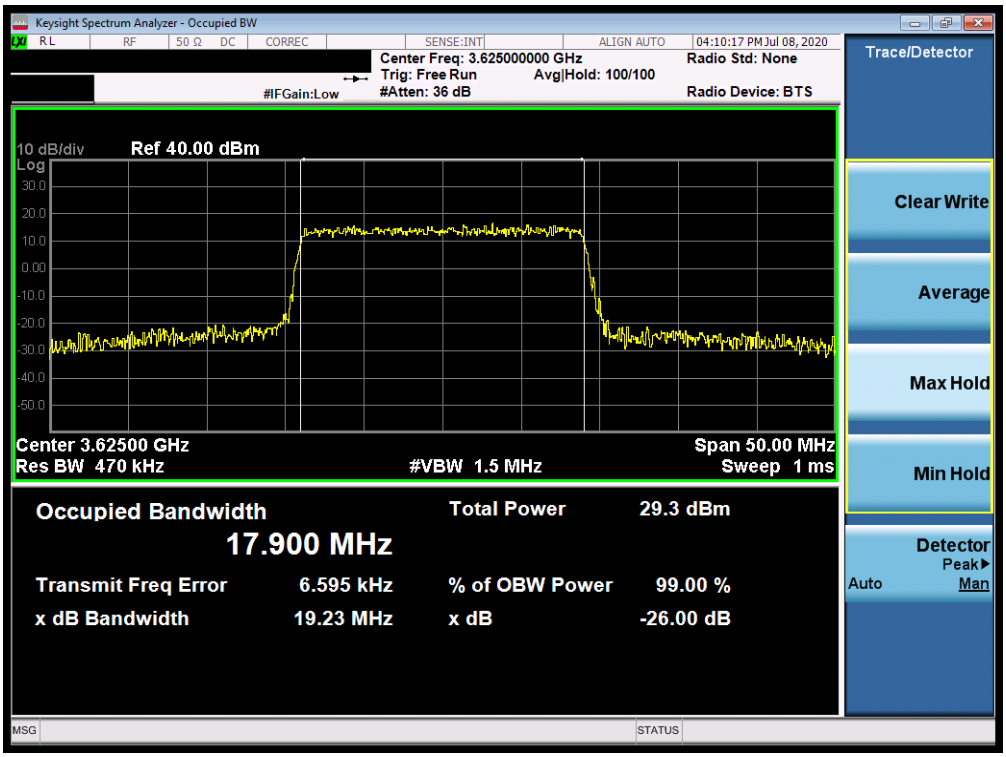
Plot 7-8. Occupied Bandwidth Plot (LTE Band 48 - 15.0MHz 16-QAM - Full RB Configuration)



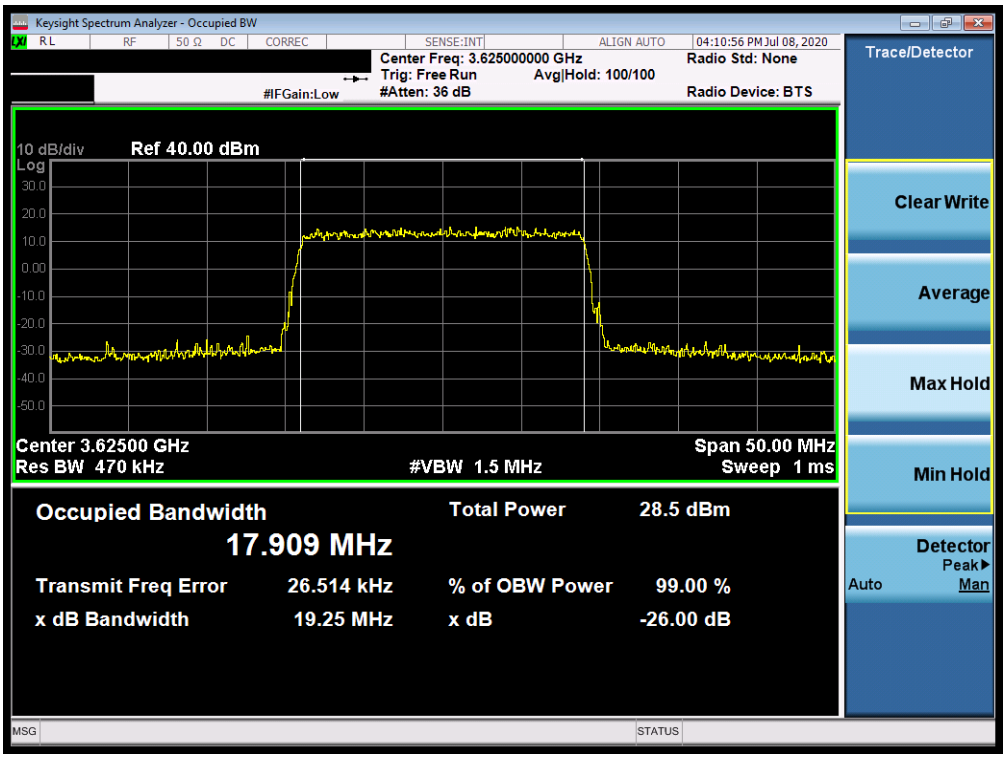
Plot 7-9. Occupied Bandwidth Plot (LTE Band 48 - 15.0MHz 64-QAM - Full RB Configuration)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 48 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-11. Occupied Bandwidth Plot (LTE Band 48 - 20.0MHz 16-QAM - Full RB Configuration)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 48 - 20.0MHz 64-QAM - Full RB Configuration)

7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §96.41(e)

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

KDB 971168 D01 v03r01 – Section 6.0

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.

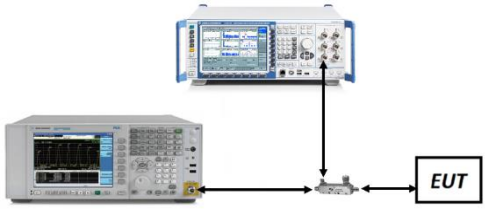
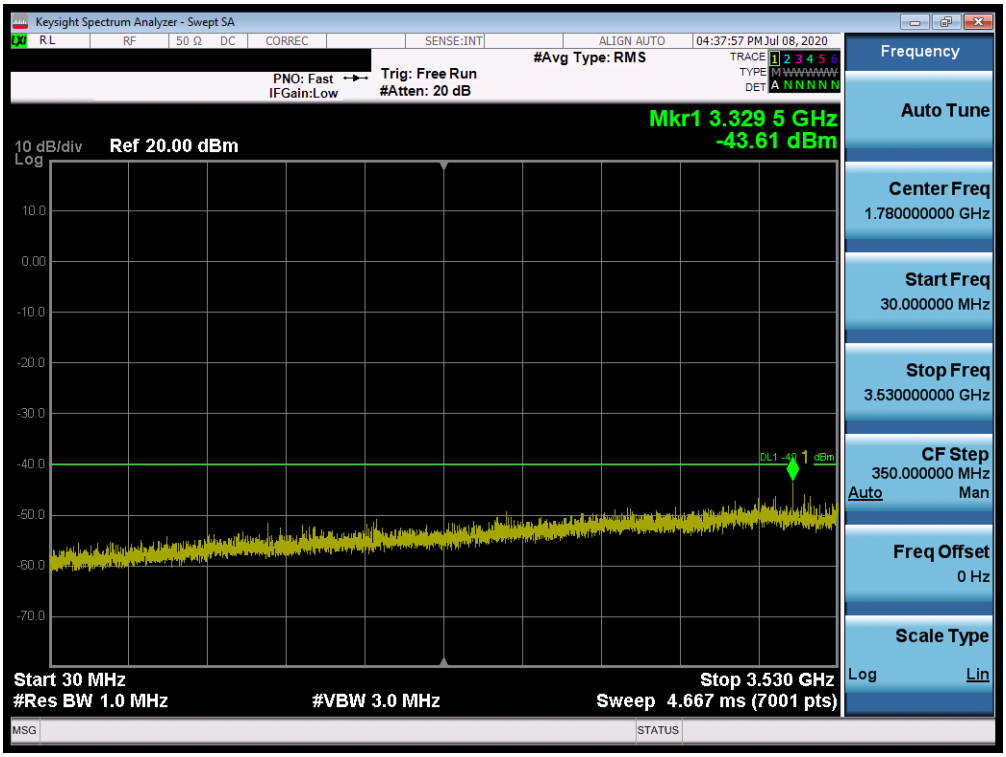


Figure 7-2. Test Instrument & Measurement Setup

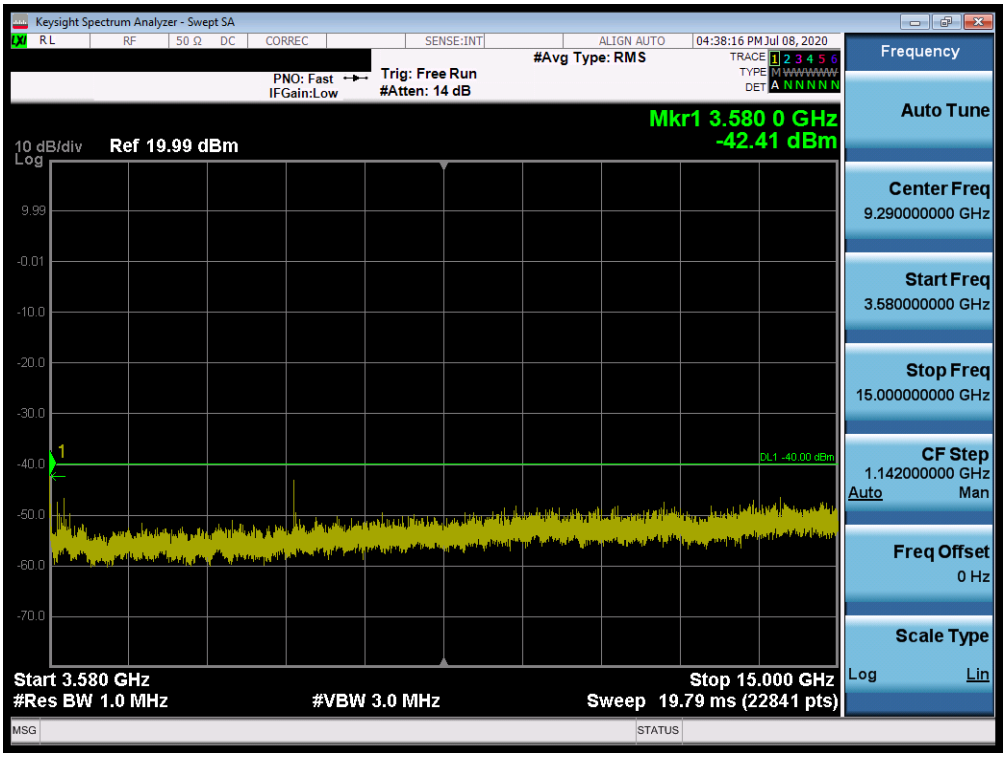
Test Notes

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, 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. 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.

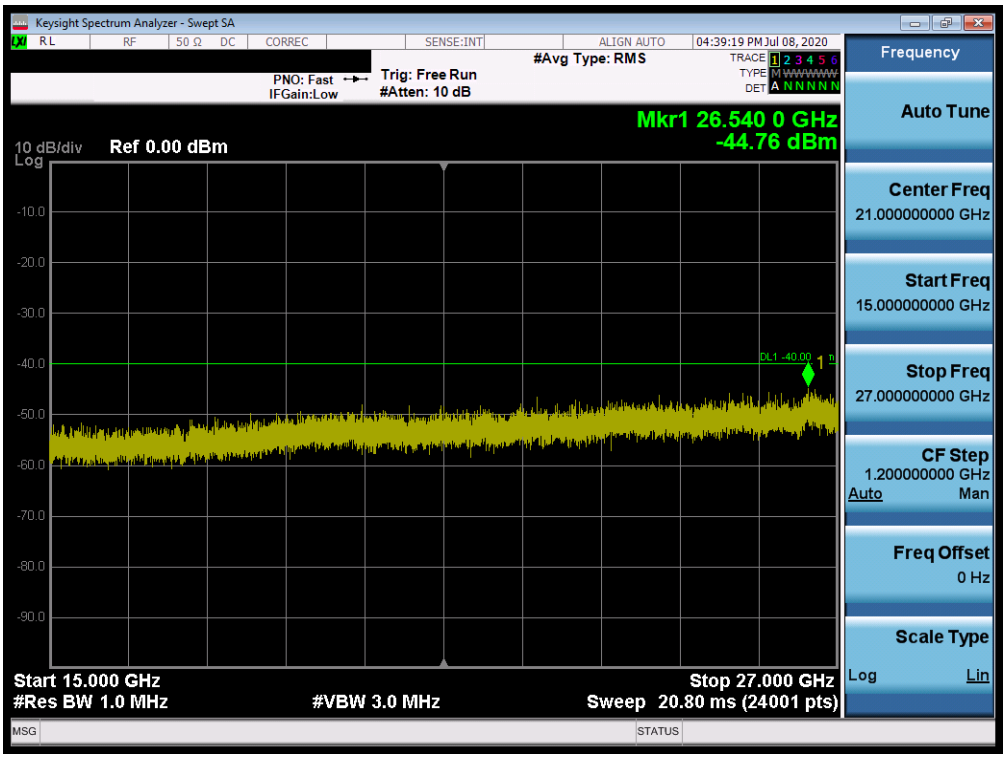
LTE Band 48



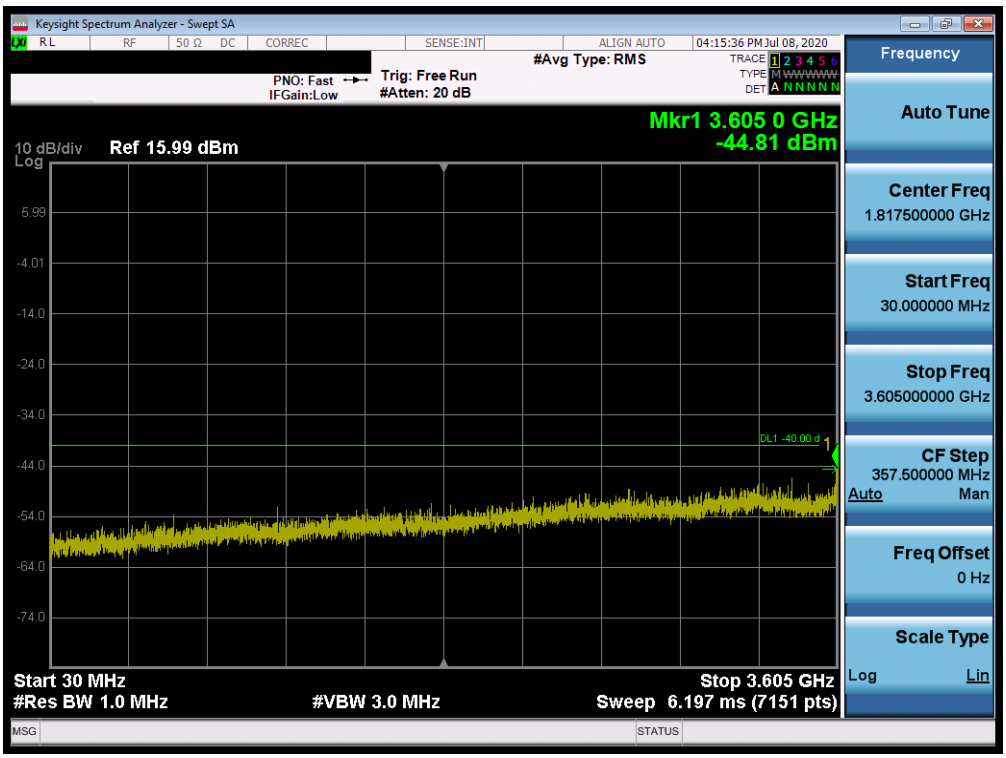
Plot 7-13. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



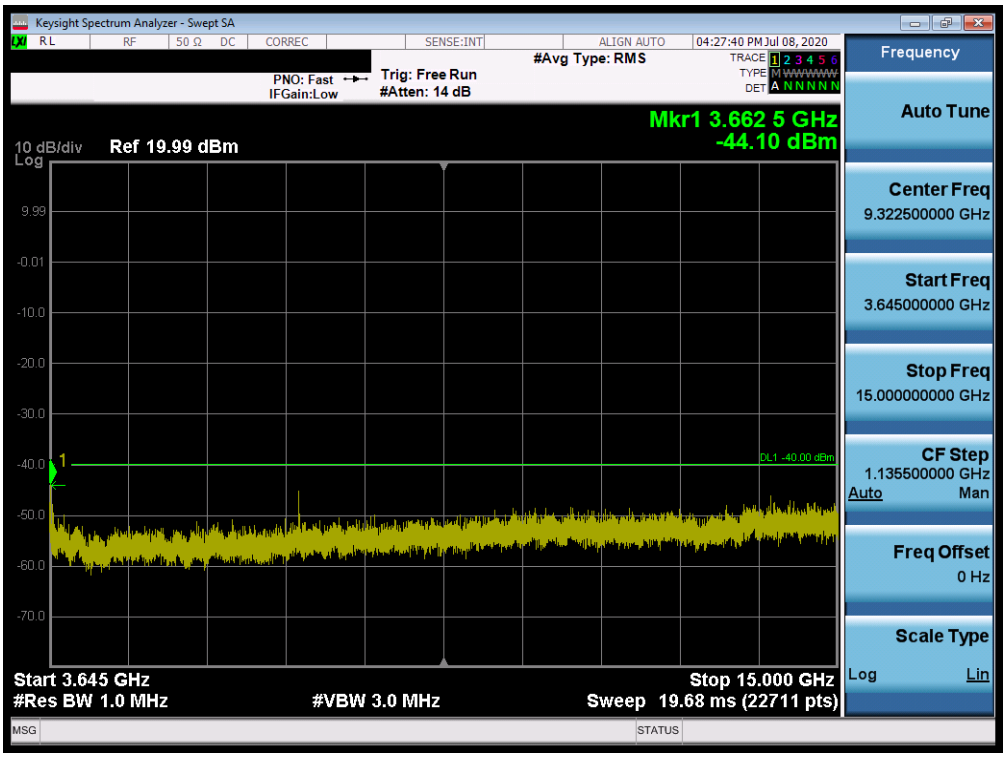
Plot 7-14. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



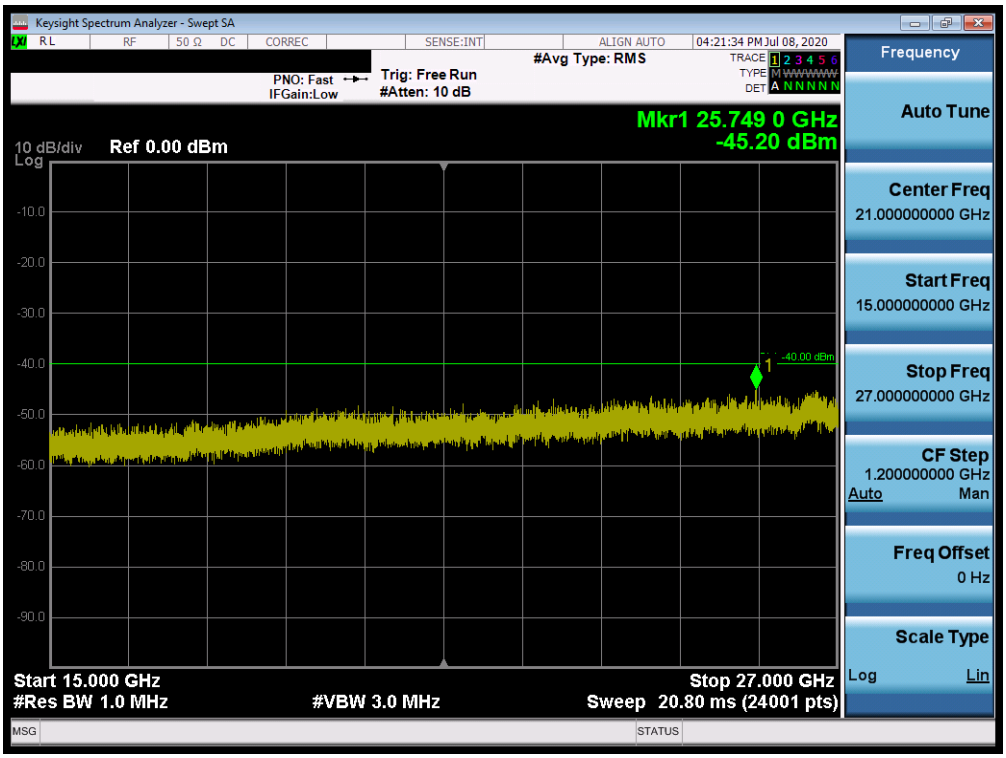
Plot 7-15. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



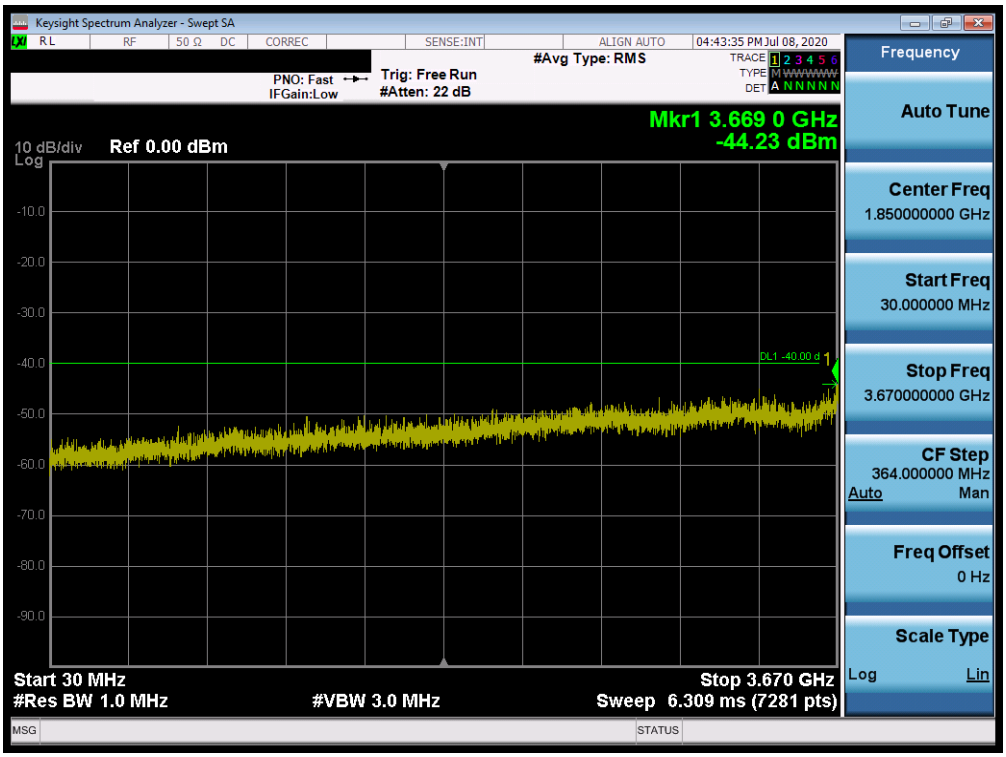
Plot 7-16. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



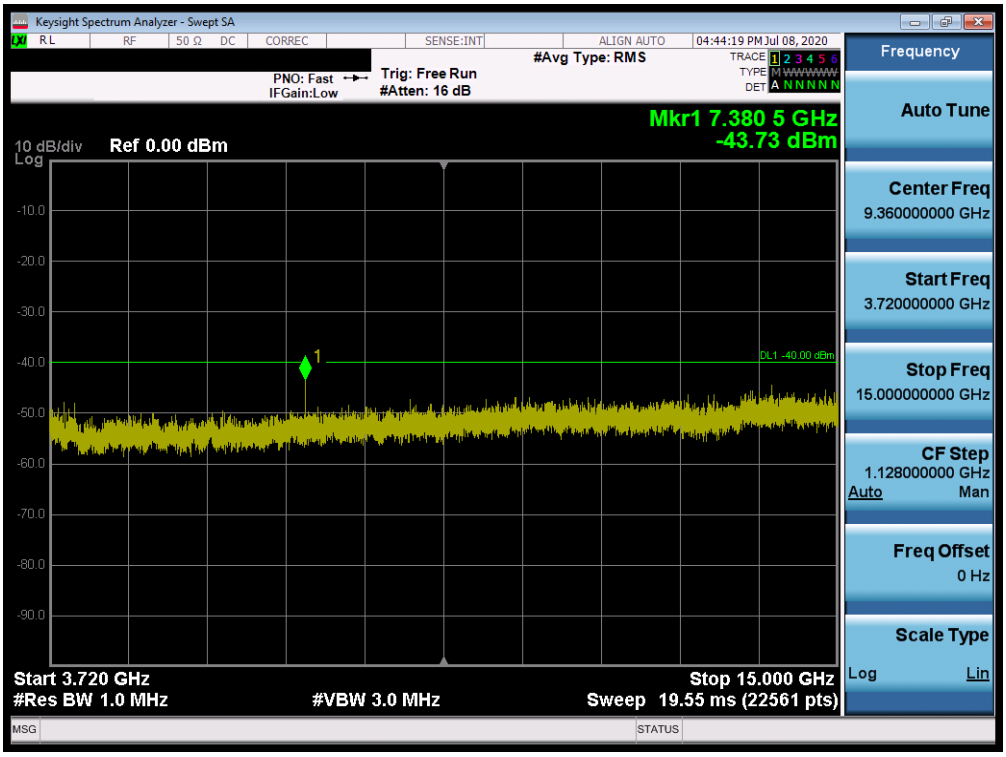
Plot 7-17. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



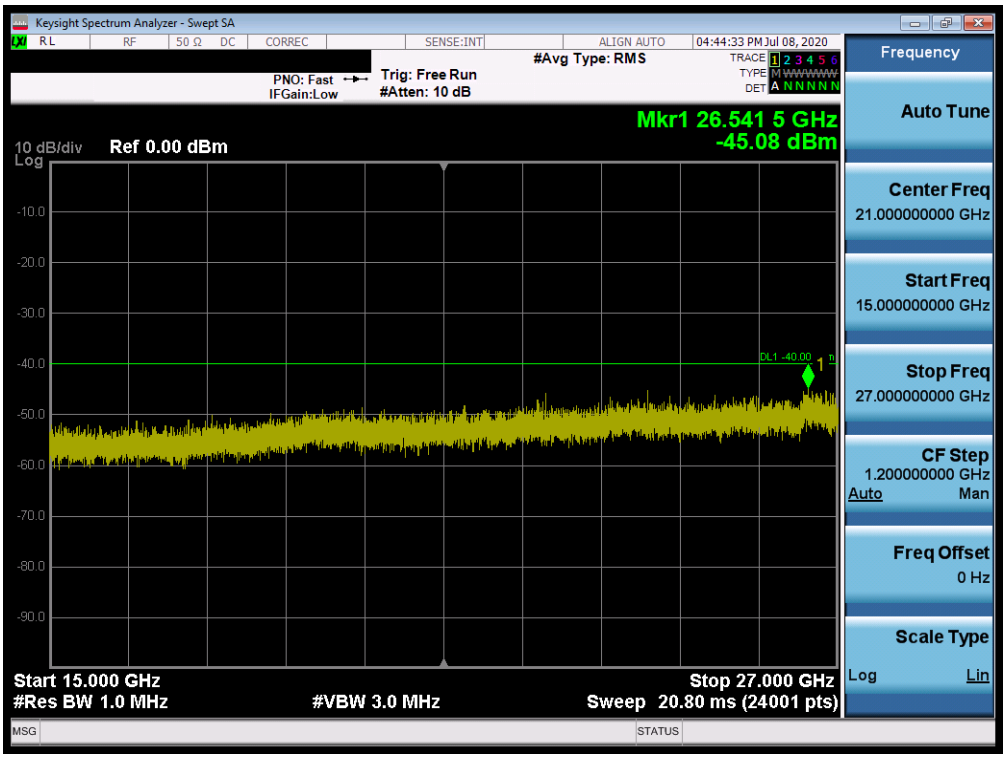
Plot 7-18. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-19. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-20. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-21. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §96.41(e)(ii)

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.

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

KDB 971168 D01 v03r01 – Section 6.0

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.

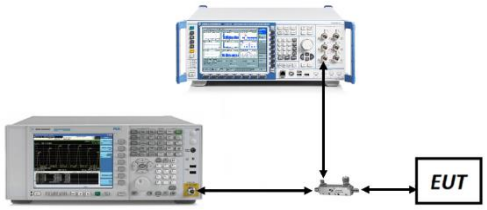
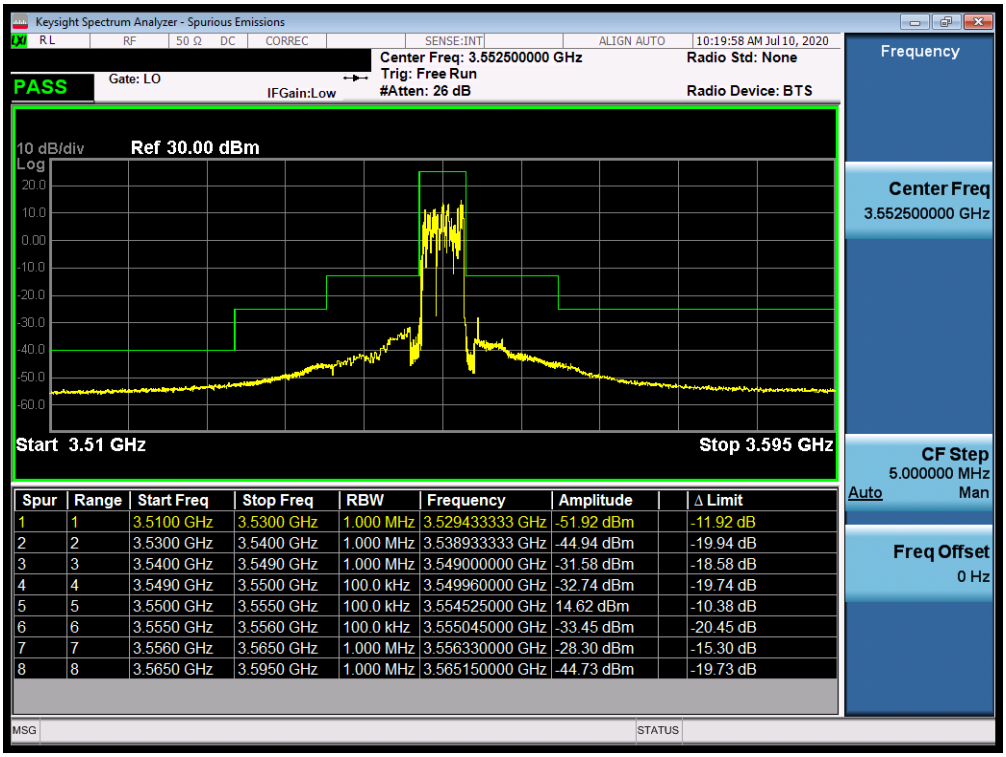


Figure 7-3. Test Instrument & Measurement Setup

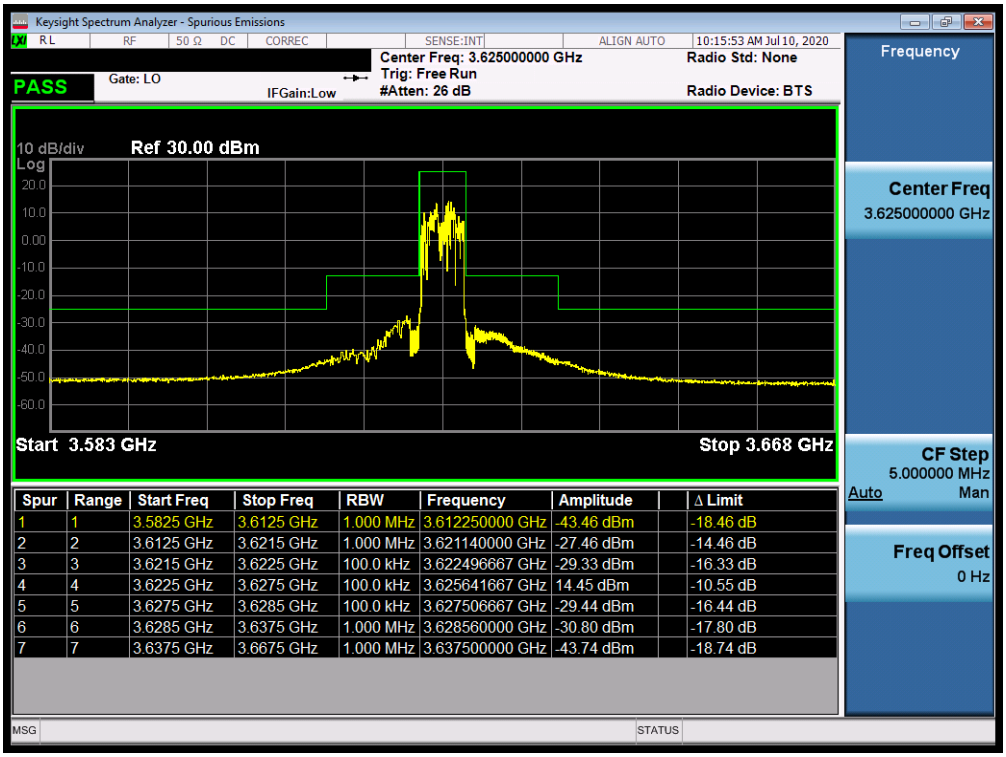
Test Notes

LTE Band 48



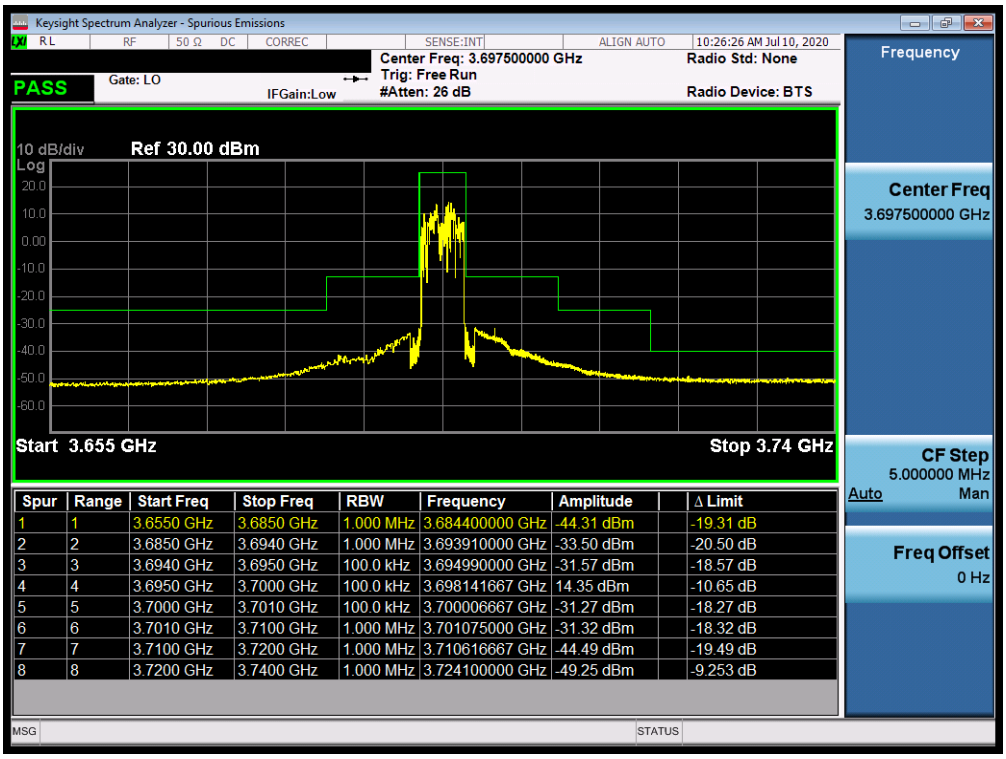
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.529433333 GHz	-51.92 dBm	-11.92 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.538933333 GHz	-44.94 dBm	-19.94 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.549000000 GHz	-31.58 dBm	-18.58 dB
4	4	3.5490 GHz	3.5500 GHz	100.0 kHz	3.549960000 GHz	-32.74 dBm	-19.74 dB
5	5	3.5500 GHz	3.5550 GHz	100.0 kHz	3.554525000 GHz	14.62 dBm	-10.38 dB
6	6	3.5550 GHz	3.5560 GHz	100.0 kHz	3.555045000 GHz	-33.45 dBm	-20.45 dB
7	7	3.5560 GHz	3.5650 GHz	1.000 MHz	3.556330000 GHz	-28.30 dBm	-15.30 dB
8	8	3.5650 GHz	3.5950 GHz	1.000 MHz	3.565150000 GHz	-44.73 dBm	-19.73 dB

Plot 7-22. Lower ACP Plot (LTE Band 48 - 5.0MHz QPSK - Full RB Configuration)



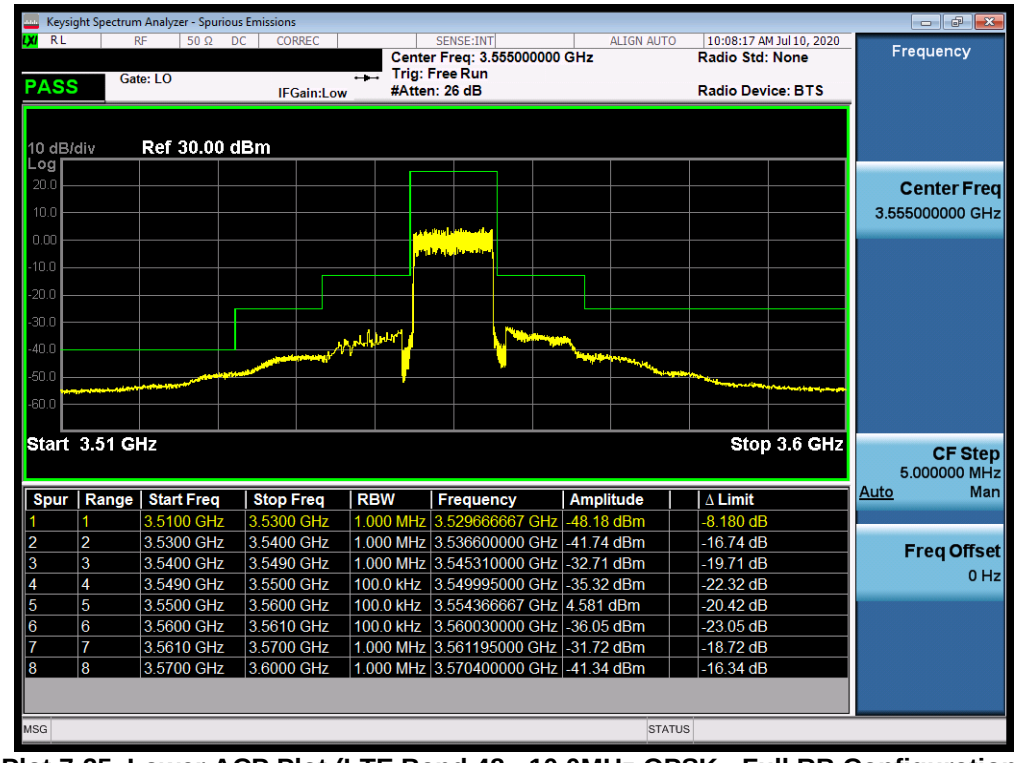
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5825 GHz	3.6125 GHz	1.000 MHz	3.612250000 GHz	-43.46 dBm	-18.46 dB
2	2	3.6125 GHz	3.6215 GHz	1.000 MHz	3.621140000 GHz	-27.46 dBm	-14.46 dB
3	3	3.6215 GHz	3.6225 GHz	100.0 kHz	3.622496667 GHz	-29.33 dBm	-16.33 dB
4	4	3.6225 GHz	3.6275 GHz	100.0 kHz	3.625641667 GHz	14.45 dBm	-10.55 dB
5	5	3.6275 GHz	3.6285 GHz	100.0 kHz	3.627506667 GHz	-29.44 dBm	-16.44 dB
6	6	3.6285 GHz	3.6375 GHz	1.000 MHz	3.628560000 GHz	-30.80 dBm	-17.80 dB
7	7	3.6375 GHz	3.6675 GHz	1.000 MHz	3.637500000 GHz	-43.74 dBm	-18.74 dB

Plot 7-23. Mid ACP Plot (LTE Band 48 - 5.0MHz QPSK - Full RB Configuration)



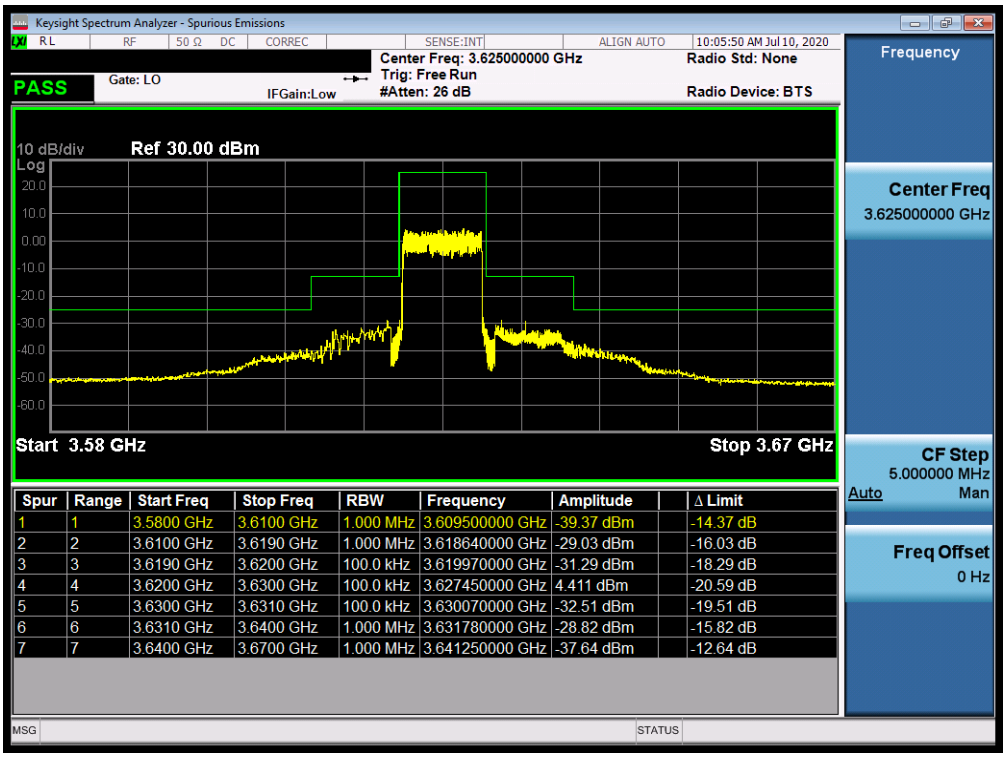
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6550 GHz	3.6850 GHz	1.000 MHz	3.684400000 GHz	-44.31 dBm	-19.31 dB
2	2	3.6850 GHz	3.6940 GHz	1.000 MHz	3.693910000 GHz	-33.50 dBm	-20.50 dB
3	3	3.6940 GHz	3.6950 GHz	100.0 kHz	3.694990000 GHz	-31.57 dBm	-18.57 dB
4	4	3.6950 GHz	3.7000 GHz	100.0 kHz	3.698141667 GHz	14.35 dBm	-10.65 dB
5	5	3.7000 GHz	3.7010 GHz	100.0 kHz	3.700006667 GHz	-31.27 dBm	-18.27 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701075000 GHz	-31.32 dBm	-18.32 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710616667 GHz	-44.49 dBm	-19.49 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.724100000 GHz	-49.25 dBm	-9.253 dB

Plot 7-24. Upper ACP Plot (LTE Band 48 - 5.0MHz QPSK - Full RB Configuration)



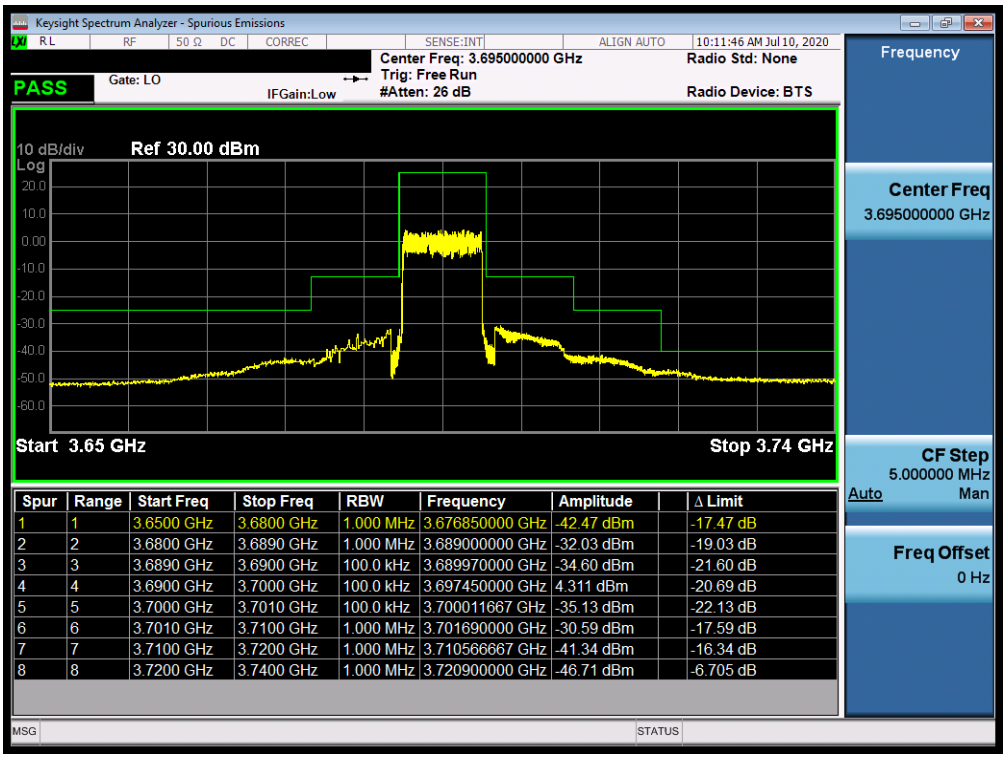
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.529666667 GHz	-48.18 dBm	-8.180 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.536600000 GHz	-41.74 dBm	-16.74 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.545310000 GHz	-32.71 dBm	-19.71 dB
4	4	3.5490 GHz	3.5500 GHz	100.0 kHz	3.549995000 GHz	-35.32 dBm	-22.32 dB
5	5	3.5500 GHz	3.5600 GHz	100.0 kHz	3.554366667 GHz	4.581 dBm	-20.42 dB
6	6	3.5600 GHz	3.5610 GHz	100.0 kHz	3.560030000 GHz	-36.05 dBm	-23.05 dB
7	7	3.5610 GHz	3.5700 GHz	1.000 MHz	3.561195000 GHz	-31.72 dBm	-18.72 dB
8	8	3.5700 GHz	3.6000 GHz	1.000 MHz	3.570400000 GHz	-41.34 dBm	-16.34 dB

Plot 7-25. Lower ACP Plot (LTE Band 48 - 10.0MHz QPSK - Full RB Configuration)



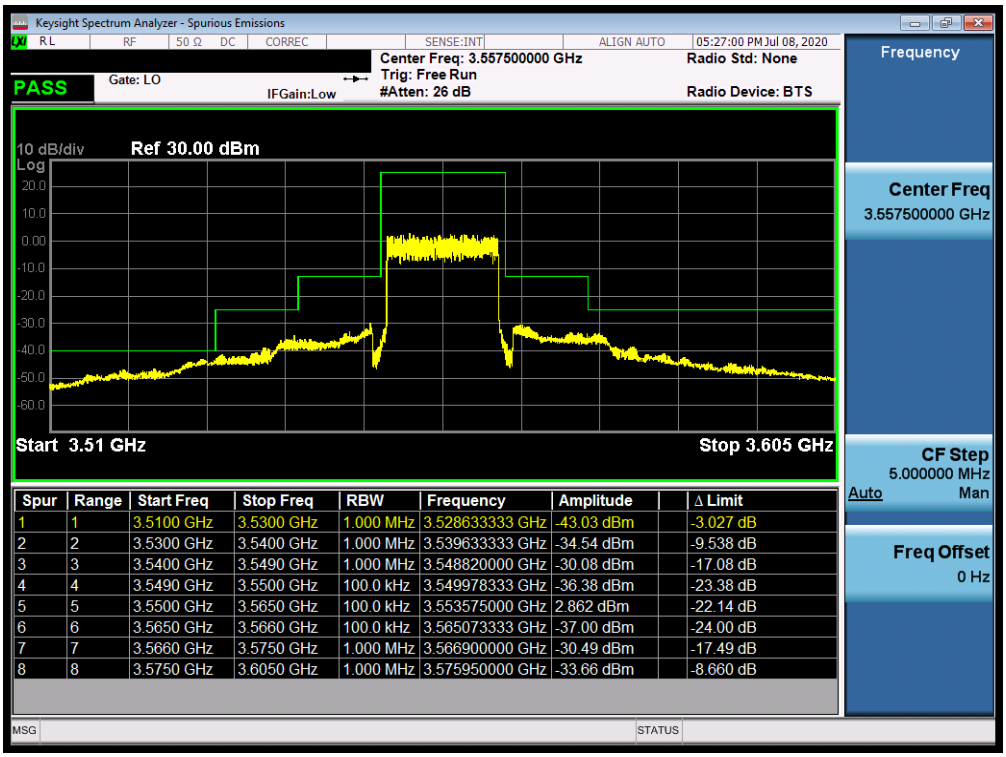
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5800 GHz	3.6100 GHz	1.000 MHz	3.609500000 GHz	-39.37 dBm	-14.37 dB
2	2	3.6100 GHz	3.6190 GHz	1.000 MHz	3.618640000 GHz	-29.03 dBm	-16.03 dB
3	3	3.6190 GHz	3.6200 GHz	100.0 kHz	3.619970000 GHz	-31.29 dBm	-18.29 dB
4	4	3.6200 GHz	3.6300 GHz	100.0 kHz	3.627450000 GHz	4.411 dBm	-20.59 dB
5	5	3.6300 GHz	3.6310 GHz	100.0 kHz	3.630070000 GHz	-32.51 dBm	-19.51 dB
6	6	3.6310 GHz	3.6400 GHz	1.000 MHz	3.631780000 GHz	-28.82 dBm	-15.82 dB
7	7	3.6400 GHz	3.6700 GHz	1.000 MHz	3.641250000 GHz	-37.64 dBm	-12.64 dB

Plot 7-26. Mid ACP Plot (LTE Band 48 - 10.0MHz QPSK - Full RB Configuration)



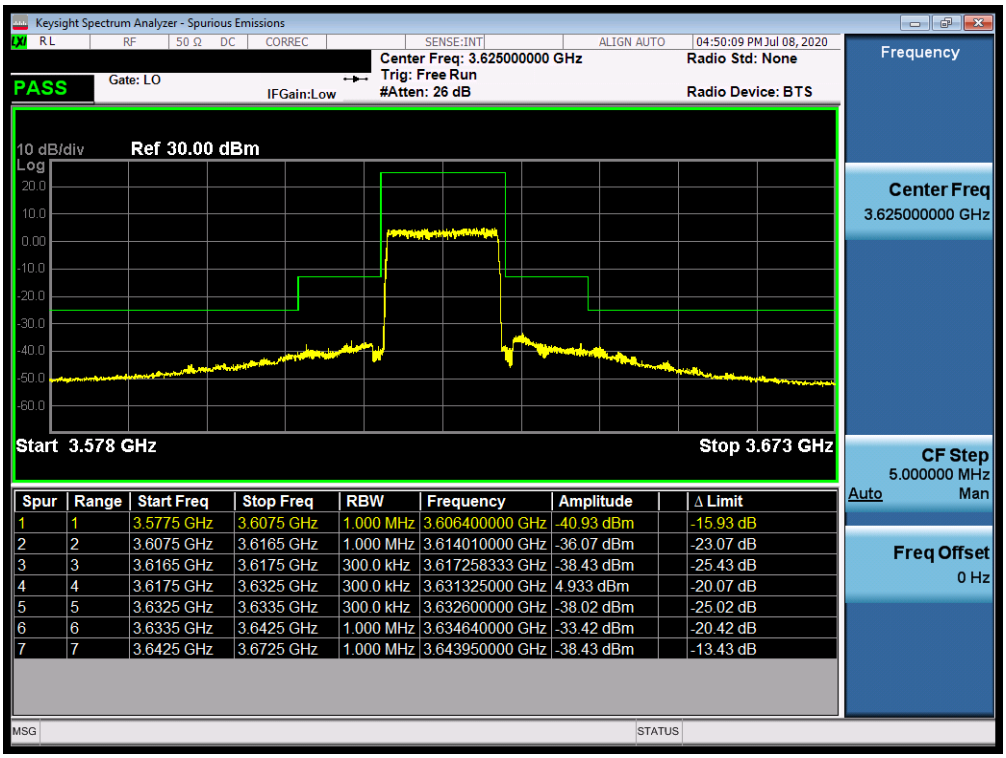
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6500 GHz	3.6800 GHz	1.000 MHz	3.676850000 GHz	-42.47 dBm	-17.47 dB
2	2	3.6800 GHz	3.6890 GHz	1.000 MHz	3.689000000 GHz	-32.03 dBm	-19.03 dB
3	3	3.6890 GHz	3.6900 GHz	100.0 kHz	3.689970000 GHz	-34.60 dBm	-21.60 dB
4	4	3.6900 GHz	3.7000 GHz	100.0 kHz	3.697450000 GHz	4.311 dBm	-20.69 dB
5	5	3.7000 GHz	3.7010 GHz	100.0 kHz	3.700011667 GHz	-35.13 dBm	-22.13 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701690000 GHz	-30.59 dBm	-17.59 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710566667 GHz	-41.34 dBm	-16.34 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720900000 GHz	-46.71 dBm	-6.705 dB

Plot 7-27. Upper ACP Plot (LTE Band 48 - 10.0MHz QPSK - Full RB Configuration)



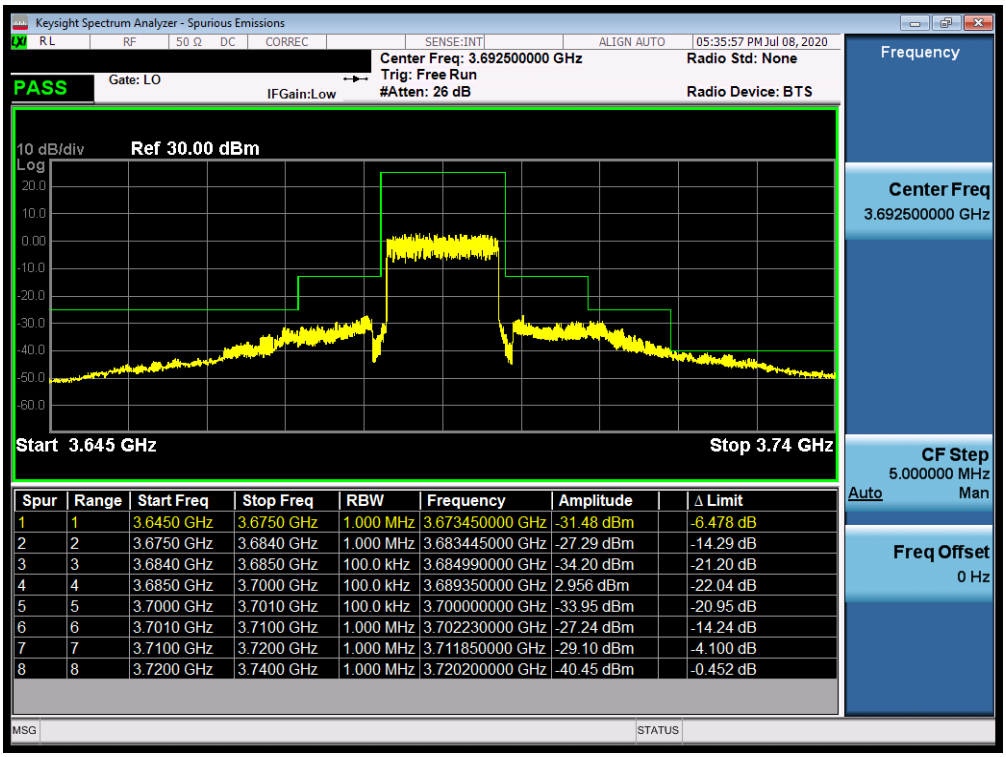
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.528633333 GHz	-43.03 dBm	-3.027 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539633333 GHz	-34.54 dBm	-9.538 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.548820000 GHz	-30.08 dBm	-17.08 dB
4	4	3.5490 GHz	3.5500 GHz	100.0 kHz	3.549978333 GHz	-36.38 dBm	-23.38 dB
5	5	3.5500 GHz	3.5650 GHz	100.0 kHz	3.553575000 GHz	2.862 dBm	-22.14 dB
6	6	3.5650 GHz	3.5660 GHz	100.0 kHz	3.565073333 GHz	-37.00 dBm	-24.00 dB
7	7	3.5660 GHz	3.5750 GHz	1.000 MHz	3.566900000 GHz	-30.49 dBm	-17.49 dB
8	8	3.5750 GHz	3.6050 GHz	1.000 MHz	3.575950000 GHz	-33.66 dBm	-8.660 dB

Plot 7-28. Lower ACP Plot (LTE Band 48 - 15.0MHz QPSK - Full RB Configuration)



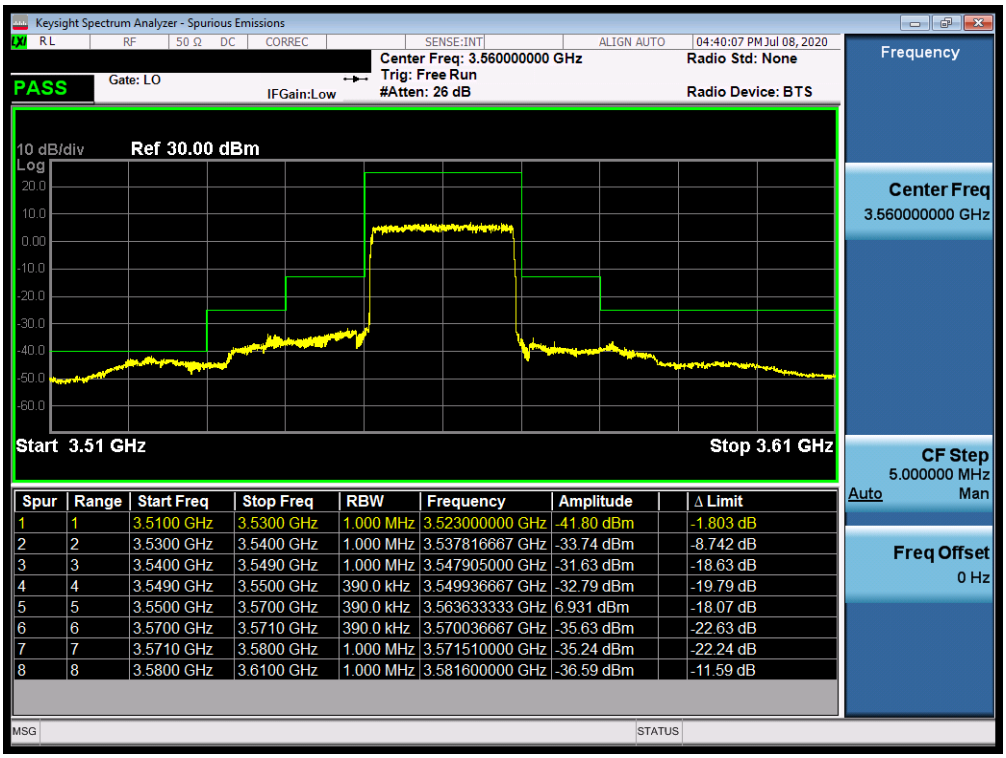
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5775 GHz	3.6075 GHz	1.000 MHz	3.606400000 GHz	-40.93 dBm	-15.93 dB
2	2	3.6075 GHz	3.6165 GHz	1.000 MHz	3.614010000 GHz	-36.07 dBm	-23.07 dB
3	3	3.6165 GHz	3.6175 GHz	300.0 kHz	3.617258333 GHz	-38.43 dBm	-25.43 dB
4	4	3.6175 GHz	3.6325 GHz	300.0 kHz	3.631325000 GHz	4.933 dBm	-20.07 dB
5	5	3.6325 GHz	3.6335 GHz	300.0 kHz	3.632600000 GHz	-38.02 dBm	-25.02 dB
6	6	3.6335 GHz	3.6425 GHz	1.000 MHz	3.634640000 GHz	-33.42 dBm	-20.42 dB
7	7	3.6425 GHz	3.6725 GHz	1.000 MHz	3.643950000 GHz	-38.43 dBm	-13.43 dB

Plot 7-29. Mid ACP Plot (LTE Band 48 - 15.0MHz QPSK - Full RB Configuration)



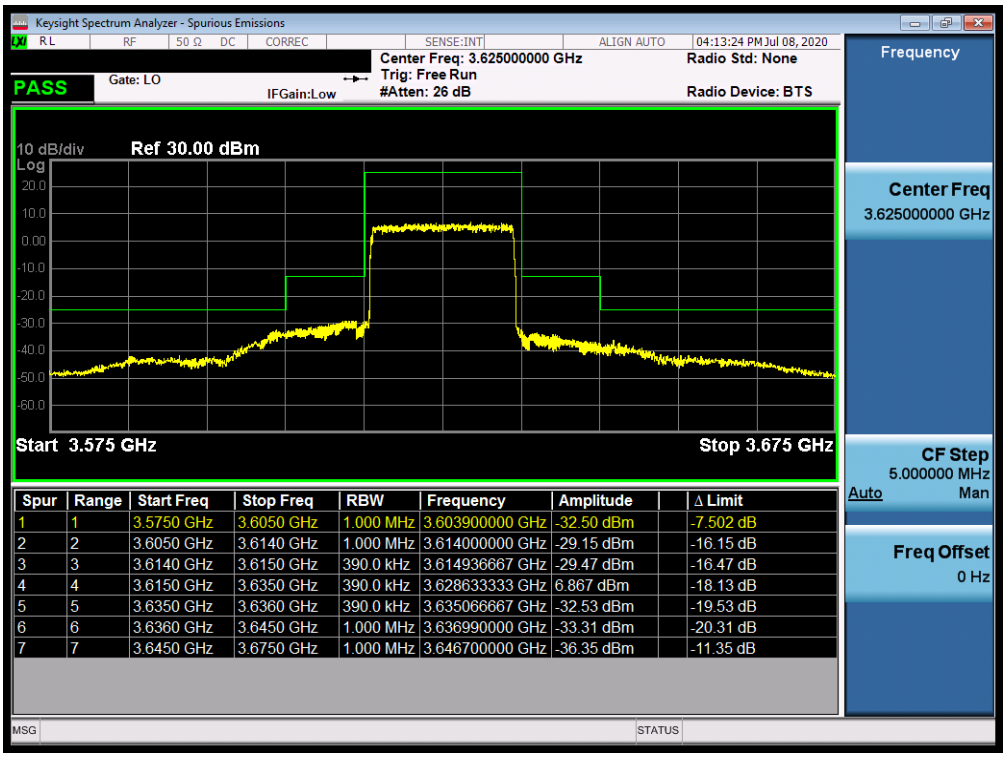
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6450 GHz	3.6750 GHz	1.000 MHz	3.673450000 GHz	-31.48 dBm	-6.478 dB
2	2	3.6750 GHz	3.6840 GHz	1.000 MHz	3.683445000 GHz	-27.29 dBm	-14.29 dB
3	3	3.6840 GHz	3.6850 GHz	100.0 kHz	3.684990000 GHz	-34.20 dBm	-21.20 dB
4	4	3.6850 GHz	3.7000 GHz	100.0 kHz	3.689350000 GHz	2.956 dBm	-22.04 dB
5	5	3.7000 GHz	3.7010 GHz	100.0 kHz	3.700000000 GHz	-33.95 dBm	-20.95 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.702230000 GHz	-27.24 dBm	-14.24 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.711850000 GHz	-29.10 dBm	-4.100 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720200000 GHz	-40.45 dBm	-0.452 dB

Plot 7-30. Upper ACP Plot (LTE Band 48 - 15.0MHz QPSK - Full RB Configuration)



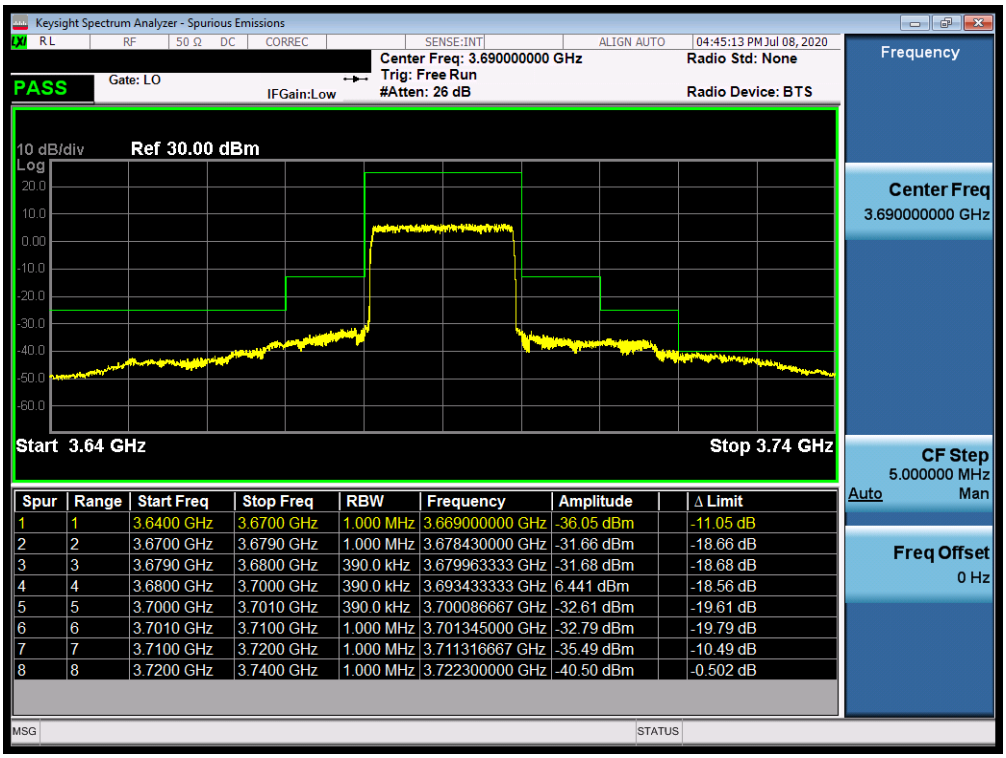
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.523000000 GHz	-41.80 dBm	-1.803 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.537816667 GHz	-33.74 dBm	-8.742 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.547905000 GHz	-31.63 dBm	-18.63 dB
4	4	3.5490 GHz	3.5500 GHz	390.0 kHz	3.549936667 GHz	-32.79 dBm	-19.79 dB
5	5	3.5500 GHz	3.5700 GHz	390.0 kHz	3.563633333 GHz	6.931 dBm	-18.07 dB
6	6	3.5700 GHz	3.5710 GHz	390.0 kHz	3.570036667 GHz	-35.63 dBm	-22.63 dB
7	7	3.5710 GHz	3.5800 GHz	1.000 MHz	3.571510000 GHz	-35.24 dBm	-22.24 dB
8	8	3.5800 GHz	3.6100 GHz	1.000 MHz	3.581600000 GHz	-36.59 dBm	-11.59 dB

Plot 7-31. Lower ACP Plot (LTE Band 48 - 20.0MHz QPSK - Full RB Configuration)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5750 GHz	3.6050 GHz	1.000 MHz	3.603900000 GHz	-32.50 dBm	-7.502 dB
2	2	3.6050 GHz	3.6140 GHz	1.000 MHz	3.614000000 GHz	-29.15 dBm	-16.15 dB
3	3	3.6140 GHz	3.6150 GHz	390.0 kHz	3.614936667 GHz	-29.47 dBm	-16.47 dB
4	4	3.6150 GHz	3.6350 GHz	390.0 kHz	3.628633333 GHz	6.867 dBm	-18.13 dB
5	5	3.6350 GHz	3.6360 GHz	390.0 kHz	3.635066667 GHz	-32.53 dBm	-19.53 dB
6	6	3.6360 GHz	3.6450 GHz	1.000 MHz	3.636990000 GHz	-33.31 dBm	-20.31 dB
7	7	3.6450 GHz	3.6750 GHz	1.000 MHz	3.646700000 GHz	-36.35 dBm	-11.35 dB

Plot 7-32. Mid ACP Plot (LTE Band 48 - 20.0MHz QPSK - Full RB Configuration)



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6400 GHz	3.6700 GHz	1.000 MHz	3.669000000 GHz	-36.05 dBm	-11.05 dB
2	2	3.6700 GHz	3.6790 GHz	1.000 MHz	3.678430000 GHz	-31.66 dBm	-18.66 dB
3	3	3.6790 GHz	3.6800 GHz	390.0 kHz	3.679963333 GHz	-31.68 dBm	-18.68 dB
4	4	3.6800 GHz	3.7000 GHz	390.0 kHz	3.693433333 GHz	6.441 dBm	-18.56 dB
5	5	3.7000 GHz	3.7010 GHz	390.0 kHz	3.700086667 GHz	-32.61 dBm	-19.61 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701345000 GHz	-32.79 dBm	-19.79 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.711316667 GHz	-35.49 dBm	-10.49 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.722300000 GHz	-40.50 dBm	-0.502 dB

Plot 7-33. Upper ACP Plot (LTE Band 48 - 20.0MHz QPSK - Full RB Configuration)

7.5 Radiated Power (EIRP)

§96.41(b)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
8. The integration bandwidth was set equal to 10MHz.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

Test Setup

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

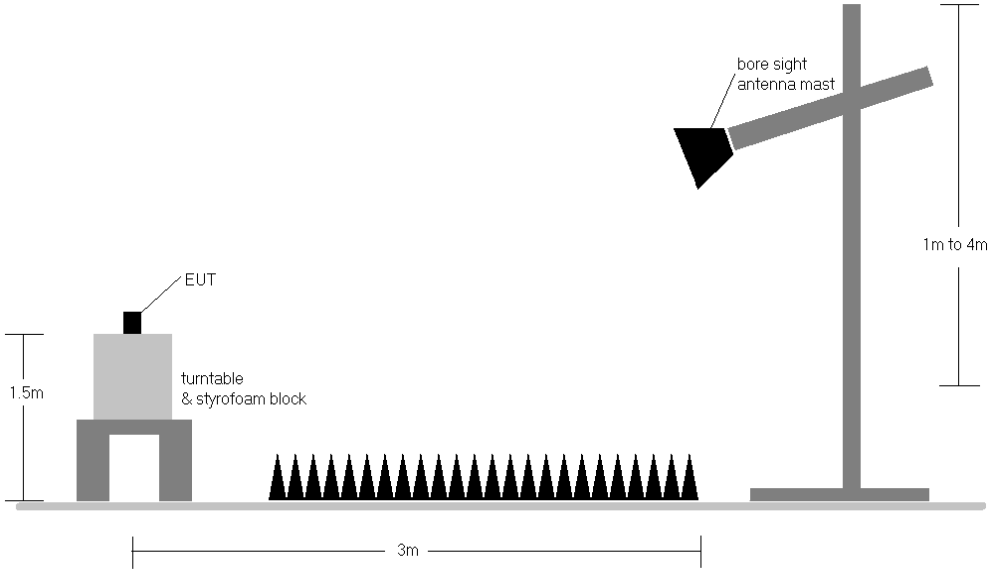


Figure 7-4. Radiated Test Setup >1GHz

Test Notes

1) 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.

2) This unit was tested with its standard battery.

3) The worst case EIRP shown in this section is found with LTE operating only using 1RB. As such, the EIRP/10MHz and full channel EIRP values will be identical since 1RB is fully contained within all available channel bandwidths for LTE Band 48 (i.e. 5, 10, 15, 20MHz).

Bandwidth	Modulation	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
20 MHz	QPSK	3560.0	H	110	221	7.16	1 / 99	12.17	19.33	0.086	23.00	-3.67
		3625.0	H	113	222	6.87	1 / 50	12.88	**19.75**	0.095	23.00	-3.25
		3690.0	H	106	212	6.30	1 / 0	11.71	18.01	0.063	23.00	-4.99
	16-QAM	3625.0	H	113	222	6.87	1 / 50	11.75	**18.62**	0.073	23.00	-4.38
	64-QAM	3625.0	H	113	222	6.87	1 / 50	9.42	**16.29**	0.043	23.00	-6.71
15 MHz	QPSK	3557.5	H	110	221	7.17	1 / 37	12.01	19.18	0.083	23.00	-3.82
		3625.0	H	113	222	6.87	1 / 37	12.72	**19.60**	0.091	23.00	-3.40
		3692.5	H	106	212	6.26	1 / 0	11.82	18.09	0.064	23.00	-4.91
	16-QAM	3625.0	H	113	222	6.87	1 / 37	12.01	**18.88**	0.077	23.00	-4.12
	64-QAM	3625.0	H	113	222	6.87	1 / 37	10.76	**17.64**	0.058	23.00	-5.36
10 MHz	QPSK	3555.0	H	110	221	7.18	1 / 49	11.35	18.53	0.071	23.00	-4.47
		3625.0	H	113	222	6.87	1 / 49	12.85	**19.73**	0.094	23.00	-3.27
		3695.0	H	106	212	6.23	1 / 49	11.96	18.20	0.066	23.00	-4.80
	16-QAM	3625.0	H	113	222	6.87	1 / 49	11.43	**18.30**	0.068	23.00	-4.70
	64-QAM	3625.0	H	113	222	6.87	1 / 49	10.47	**17.35**	0.054	23.00	-5.65
5 MHz	QPSK	3552.5	H	110	221	7.19	1 / 24	12.01	19.20	0.083	23.00	-3.80
		3625.0	H	113	222	6.87	1 / 12	12.72	**19.60**	0.091	23.00	-3.40
		3697.5	H	106	212	6.20	1 / 12	11.81	18.02	0.063	23.00	-4.98
	16-QAM	3625.0	H	113	222	6.87	1 / 12	11.38	**18.25**	0.067	23.00	-4.75
	64-QAM	3625.0	H	113	222	6.87	1 / 12	10.16	**17.04**	0.051	23.00	-5.96
	QPSK	3625.0	V	318	285	6.99	1 / 50	11.43	18.42	0.070	23.00	-4.58
	QPSK	3625.0	H-Swivel	113	222	6.87	1 / 50	12.85	19.72	0.094	23.00	-3.28
	QPSK (WCP)	3625.0	H	109	217	6.87	1 / 50	10.44	17.31	0.054	23.00	-5.69

Table 7-3. EIRP Data (Band 48)

7.6 Radiated Spurious Emissions Measurements

§2.1053 §96.41(e)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

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 = 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.

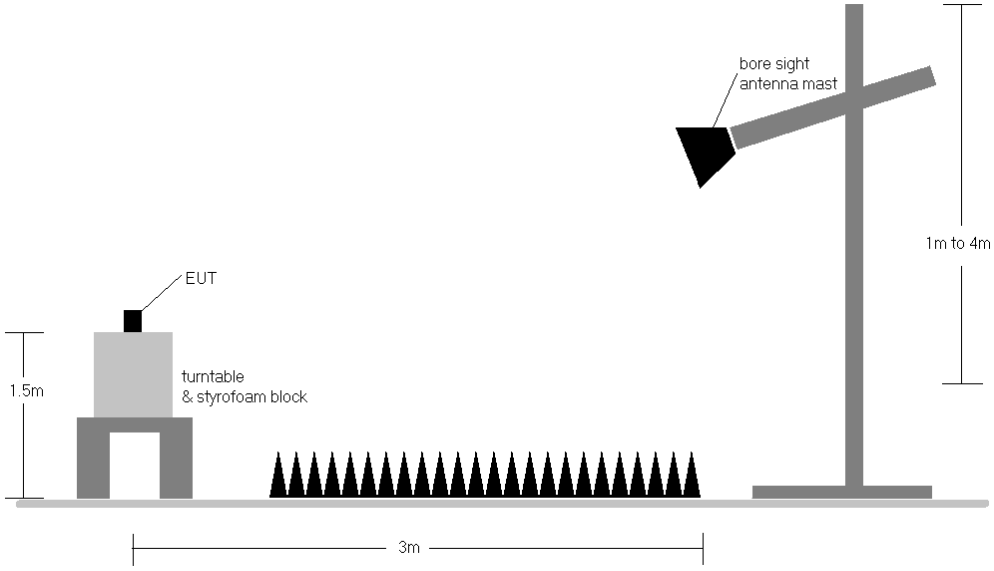


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

1) 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.

2) This unit was tested with its standard battery.

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

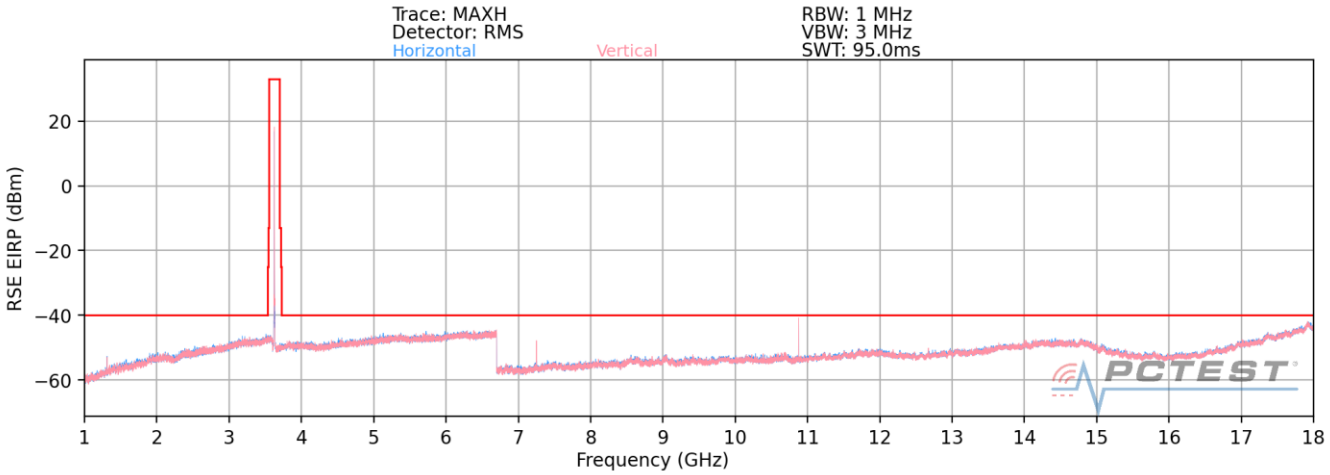
4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

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

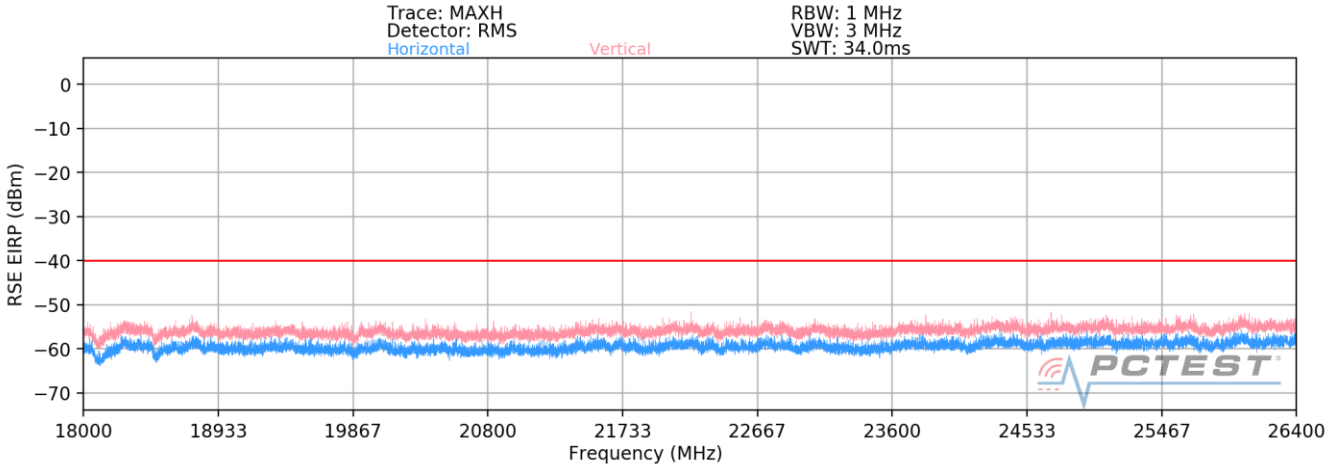
6) Per KDB 971168, Field Strength Level (dBµV/m) is converted to EIRP Spurious Emission Level (dBm) using the formula in Section 5.8.4 (d):

$$EIRP\ (dBm) = E\ (dB\mu V/m) + 20 \log D - 104.8;\ \text{where D is the measurement distance in meters}$$

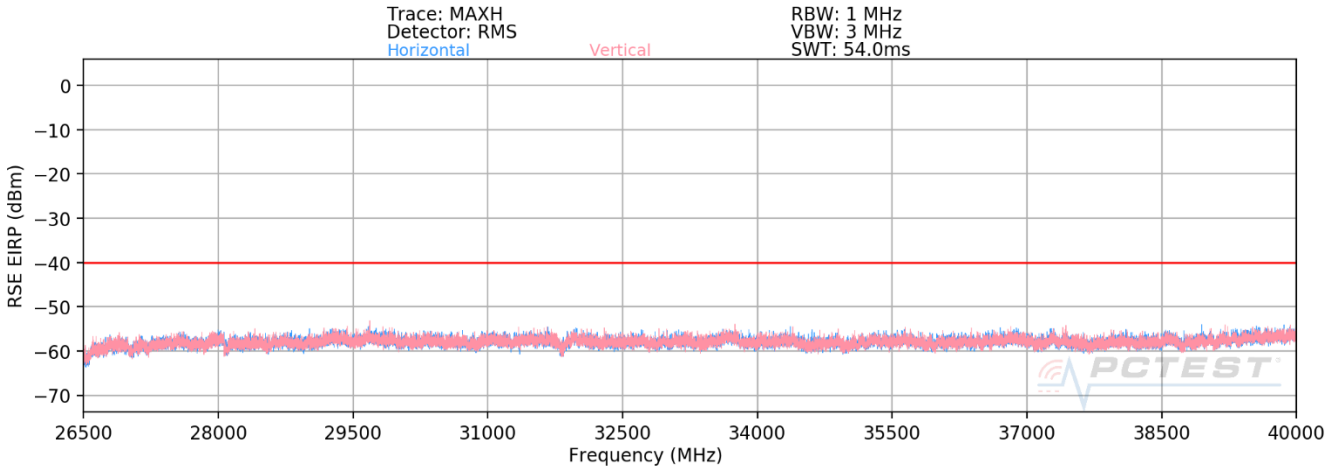
LTE Band 48



Plot 7-34. Radiated Spurious Plot 1 - 18GHz (Band 48)



Plot 7-35. Radiated Spurious Plot 18 - 26.5GHz (Band 48)



Plot 7-36. Radiated Spurious Plot 26.5 - 40GHz (Band 48)

OPERATING FREQUENCY:	3560.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-40	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7120.00	V	392	329	-67.01	11.74	-55.28	-15.3
10680.00	V	220	283	-53.04	12.61	-40.43	-0.4
14240.00	V	212	33	-58.85	11.40	-47.45	-7.5
17800.00	V	-	-	-58.44	10.04	-48.40	-8.4

Table 7-4. Radiated Spurious Data (Band 48 – Low Channel)

OPERATING FREQUENCY:	3625.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-40	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7250.00	V	396	333	-61.49	11.35	-50.14	-10.1
10875.00	V	191	281	-53.71	12.77	-40.94	-0.9
14500.00	V	195	28	-61.86	11.64	-50.22	-10.2

Table 7-5. Radiated Spurious Data (Band 48 – Mid Channel)

OPERATING FREQUENCY:	3690.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-40	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7380.00	V	226	352	-62.13	10.98	-51.15	-11.1
11070.00	V	286	275	-54.19	12.78	-41.41	-1.4
14760.00	V	188	28	-63.94	12.07	-51.87	-11.9

Table 7-6. Radiated Spurious Data (Band 48 – High Channel)

OPERATING FREQUENCY:	3560.00	MHz
MODULATION SIGNAL:	QPSK	
BANDWIDTH:	20.0	MHz
DISTANCE:	3	meters
LIMIT:	-40	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7120.00	V	335	299	-66.98	11.74	-55.25	-15.2
10680.00	V	236	59	-56.59	12.61	-43.98	-4.0
14240.00	V	160	335	-59.37	11.40	-47.97	-8.0
17800.00	V	-	-	-58.49	10.04	-48.45	-8.5

Table 7-7. Radiated Spurious Data with WCP (Band 48 – Low Channel)

7.7 Frequency Stability / Temperature Variation

§2.1055

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. 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/TIA-603-E-2016

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 48 Frequency Stability Measurements

OPERATING FREQUENCY:	3,625,000,000	Hz
CHANNEL:	55990	
REFERENCE VOLTAGE:	4.41	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.41	- 30	3,625,000,121	121	0.0000033
100 %		- 20	3,625,000,277	277	0.0000076
100 %		- 10	3,625,000,056	56	0.0000015
100 %		0	3,625,000,063	63	0.0000017
100 %		+ 10	3,624,999,724	-276	-0.0000076
100 %		+ 20	3,625,000,180	180	0.0000050
100 %		+ 30	3,625,000,145	145	0.0000040
100 %		+ 40	3,624,999,990	-10	-0.0000003
100 %		+ 50	3,625,000,123	123	0.0000034
BATT. ENDPOINT	3.51	+ 20	3,624,999,657	-343	-0.0000095

Table 7-8. Frequency Stability Data (LTE Band 48)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

LTE Band 48 Frequency Stability Measurements

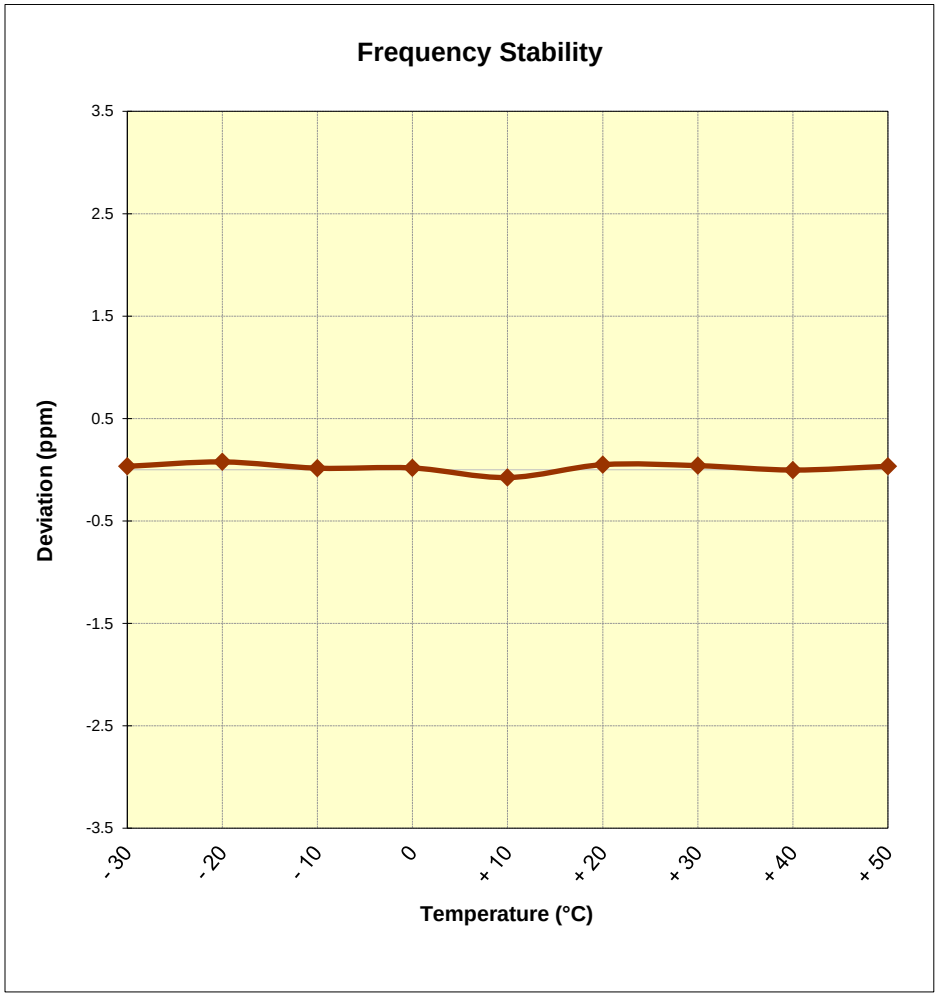


Figure 7-6. Frequency Stability Graph (LTE Band 48)

7.8 End User Device Additional Requirement (CBSD Protocol)

§96.47

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 CBSD (Ruckus FCC ID: S9GQ910US00) 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 v02, WINNF-TS-0122 V1.0.0.

Test Setup/Method

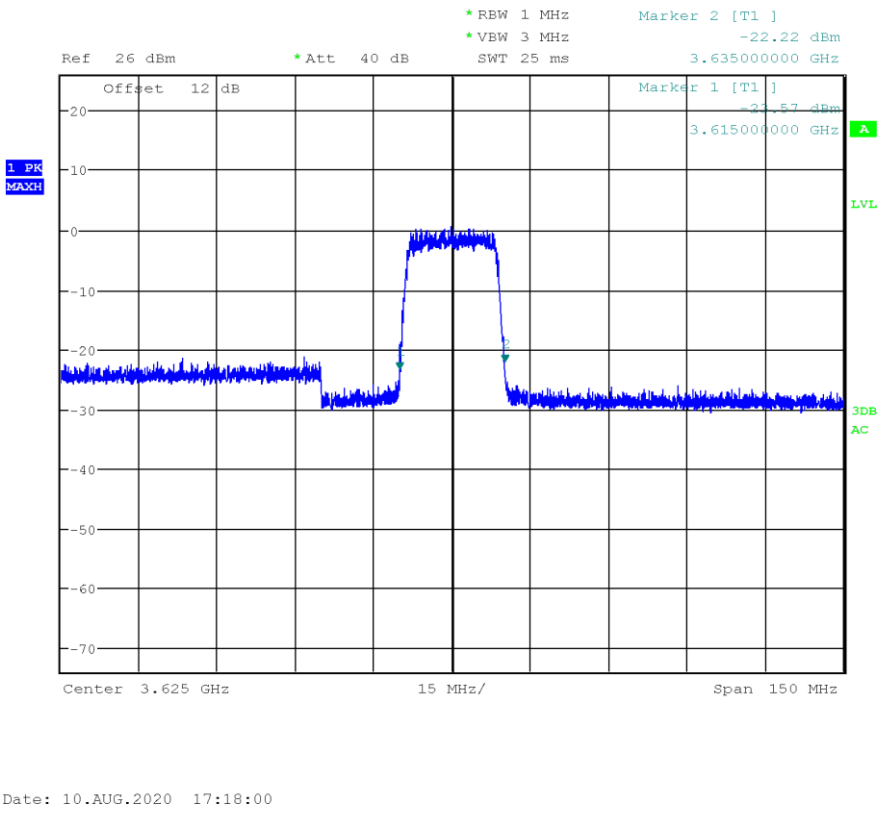
The EUT was connected via an RF cable to a certified CBSD and spectrum analyzer. The following procedure is performed by applying WINNF-TS-0122 CBRS CBSD Test Specification.

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

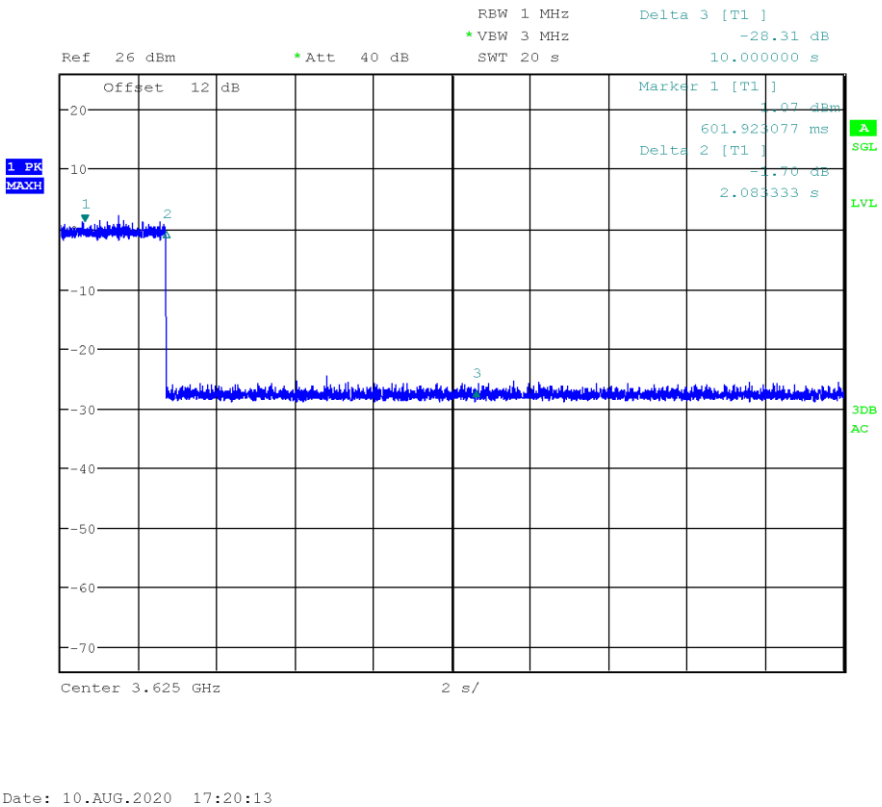
Test Notes

The EUT is an End User Device.

Run#1:



Plot 7-37. Run#1 End User Device Frequency of Operations

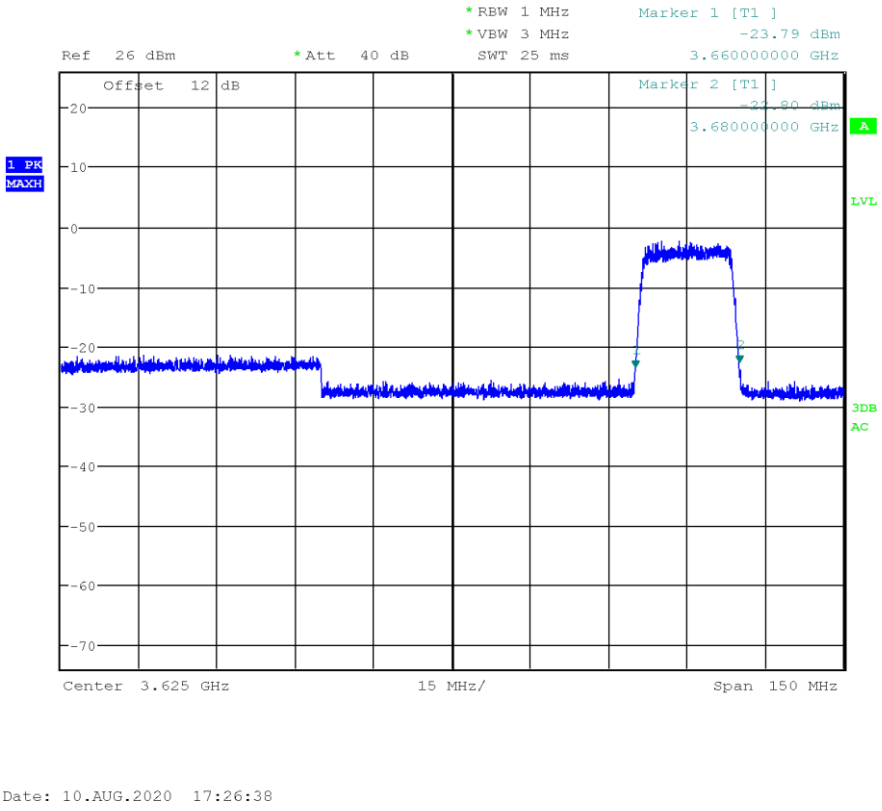


Plot 7-38. Run#1 End User Device Discontinues Operations within 10s

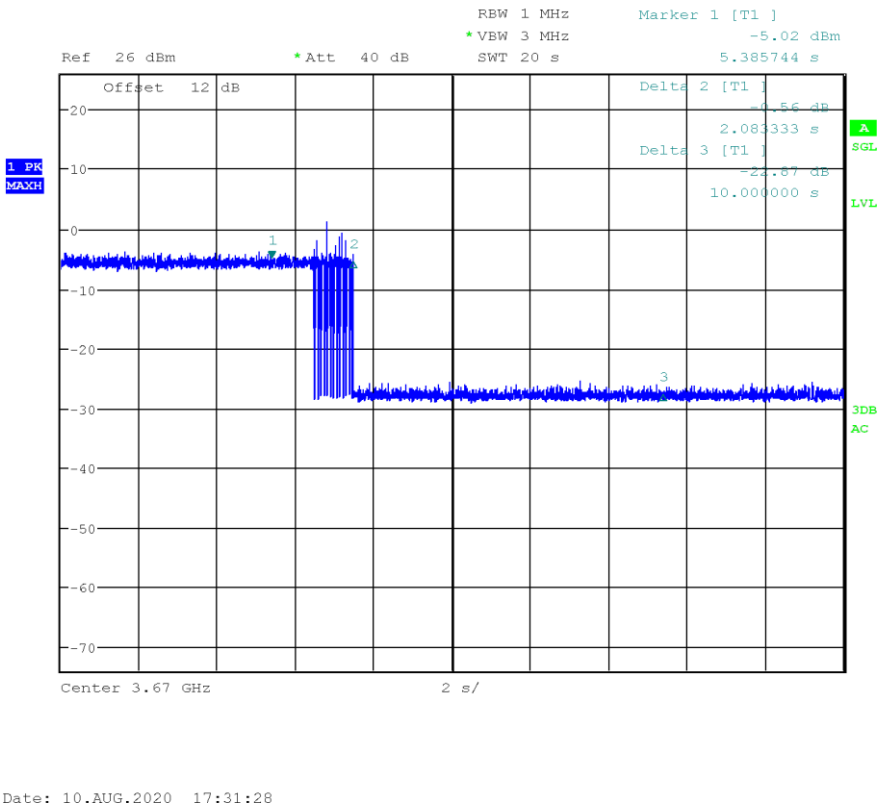
Note:

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

Run#2:



Plot 7-39. Run#2 End User Device Frequency of Operations



Plot 7-40. Run#2 End User Device Discontinues Operations within 10s

Note:

Marker 1: CBSD sends instructions to discontinue LTE 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 **LG Portable Handset FCC ID: ZNFF100VM** complies with all of the End User Device requirements of Part 96 of the FCC Rules for LTE operation only.