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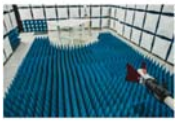

MEASUREMENT REPORT
Part 96 LTE

Applicant Name:
Samsung Electronics Co., Ltd.
129, Samsung-ro,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:
10/31/2018-1/09/2019
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M1810250193-16.A3L

FCC ID:	**A3LSMG975U**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-G975U
Additional Model(s):	SM-G975U1, SM-G975W, SM-G975XU
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 v01, 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

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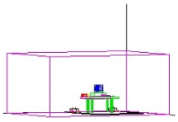
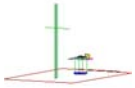


MEASUREMENT REPORT
FCC Part 96



Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm/10MHz)		
LTE Band 48	96	3552.5 - 3697.5	0.113	20.53	4M52G7D	QPSK
LTE Band 48	96	3552.5 - 3697.5	0.075	18.74	4M50W7D	16QAM
LTE Band 48	96	3552.5 - 3697.5	0.054	17.32	4M53W7D	64QAM
LTE Band 48	96	3552.5 - 3697.5	0.030	14.82	4M48W7D	256QAM
LTE Band 48	96	3555 - 3695	0.086	19.33	9M04G7D	QPSK
LTE Band 48	96	3555 - 3695	0.064	18.09	9M02W7D	16QAM
LTE Band 48	96	3555 - 3695	0.050	17.02	9M02W7D	64QAM
LTE Band 48	96	3555 - 3695	0.032	15.03	8M99W7D	256QAM
LTE Band 48	96	3557.5 - 3692.5	0.091	19.60	13M5G7D	QPSK
LTE Band 48	96	3557.5 - 3692.5	0.074	18.70	13M4W7D	16QAM
LTE Band 48	96	3557.5 - 3692.5	0.062	17.96	13M5W7D	64QAM
LTE Band 48	96	3557.5 - 3692.5	0.041	16.14	13M5W7D	256QAM
LTE Band 48	96	3560 - 3690	0.103	20.12	18M0G7D	QPSK
LTE Band 48	96	3560 - 3690	0.077	18.88	18M0W7D	16QAM
LTE Band 48	96	3560 - 3690	0.056	17.45	18M0W7D	64QAM
LTE Band 48	96	3560 - 3690	0.035	15.38	18M0W7D	256QAM

EUT Overview (B48 LTE)

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1.0 INTRODUCTION

1.1 Scope

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

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. 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 Engineering Lab 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.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMG975U**. 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.

Test Device Serial No.: 0547M, 0487M, 1323M, 0753M, 0547M

2.2 Device Capabilities

This device contains the following capabilities:

800/850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1, BC10), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC, ANT+

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.

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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 -13dBm which is equivalent to the required minimum attenuation of $43 + 10\log_{10}(\text{Power}_{\,[Watts]})$.

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 474788 D01.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of k = 2 to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{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

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5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx3	LIcensed Transmitter Cable Set	8/23/2018	Annual	8/23/2019	LTx3
Agilent	N9020A	MXA Signal Analyzer	1/24/2018	Annual	1/24/2019	US46470561
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2017	Biennial	10/10/2019	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	9/17/2018	Annual	9/17/2019	441119
Espec	ESX-2CA	Environmental Chamber	3/28/2018	Annual	3/28/2019	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/28/2018	Biennial	3/28/2020	128337
Mini Circuits	TVA-11-422	RF Power Amp	N/A		N/A	QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	PWR-SEN-4RMS	USB Power Sensor	3/30/2018	Annual	3/30/2019	11210140001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Rohde & Schwarz	CMW500	Radio Communication Tester	6/8/2018	Annual	6/8/2019	112347
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	1/24/2018	Annual	1/24/2019	100040
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	5/21/2018	Annual	5/21/2019	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	8/9/2018	Annual	8/9/2019	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	6/18/2018	Annual	6/18/2019	102134
Ruckus Wireless	Q710	SmartCell Q710 Access Point	N/A			511729000096
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	4/30/2018	Biennial	4/30/2020	9105-2404
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Tx	4/30/2018	Biennial	4/30/2020	9105-2403
Seekonk	NC-100	Torque Wrench (8" lb)	5/10/2018	Biennial	5/10/2020	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/11/2017	Biennial	8/11/2019	A042511

Table 5-1. Test Equipment

Notes:

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

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6.0 SAMPLE 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 (1564 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).

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMG975U

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
2.1051 96.41(e)	Out of Band Emissions	-13 dBm/Mhz at frequencies within 0-10MHz of channel edge -25 dBm/MHz at frequencies greater than 10MHz above and below channel edge -40 dBm/MHz at frequencies below 3530 MHz and above 3720 MHz			Section 7.3, 7.4
2.1046	Transmitter Conducted Output Power	N/A			See RF Exposure Report
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block			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.			Section 7.8

Table 7-1. Summary of Conducted Test Results

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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			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 4.8.

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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

Test Notes

None.

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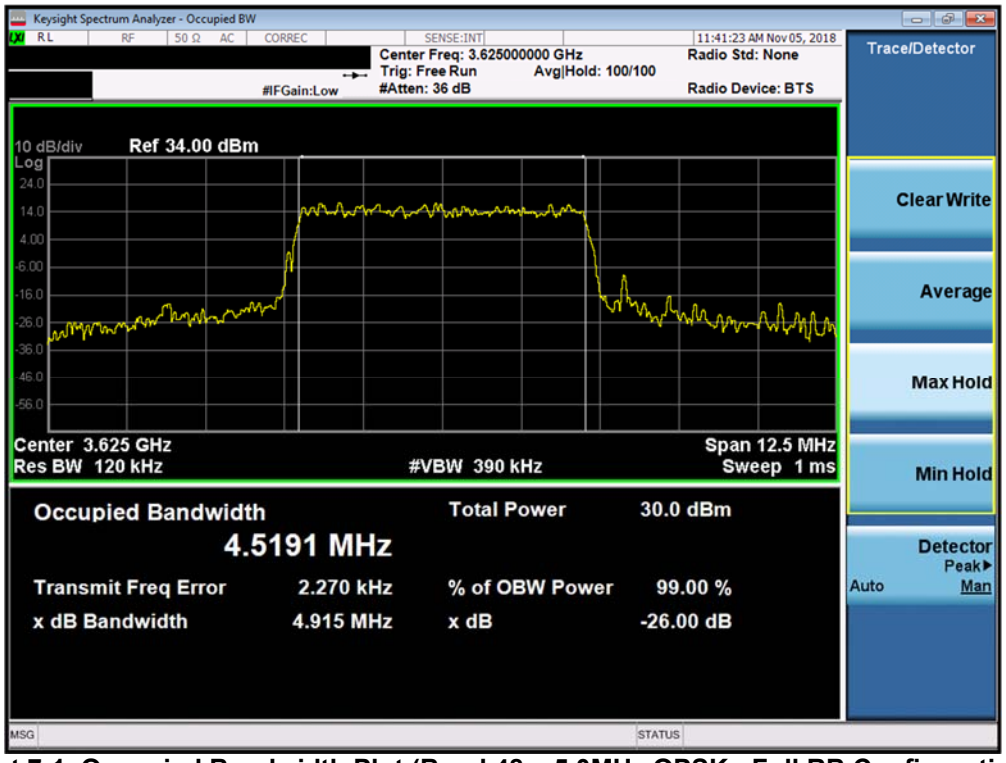
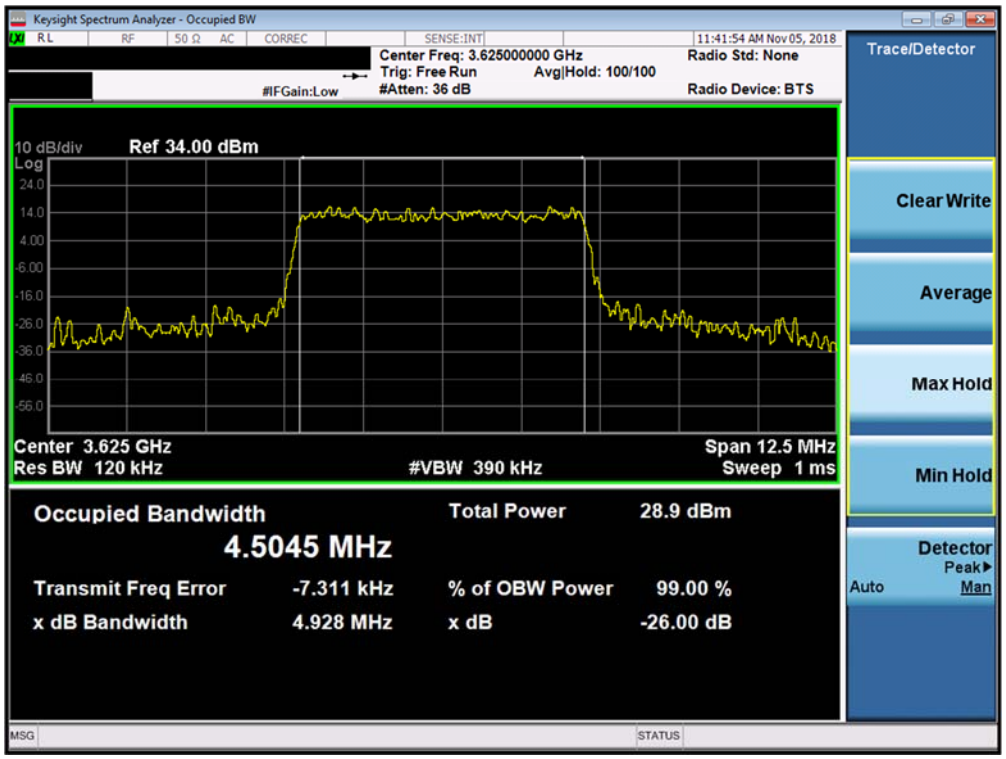
Band 48



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



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

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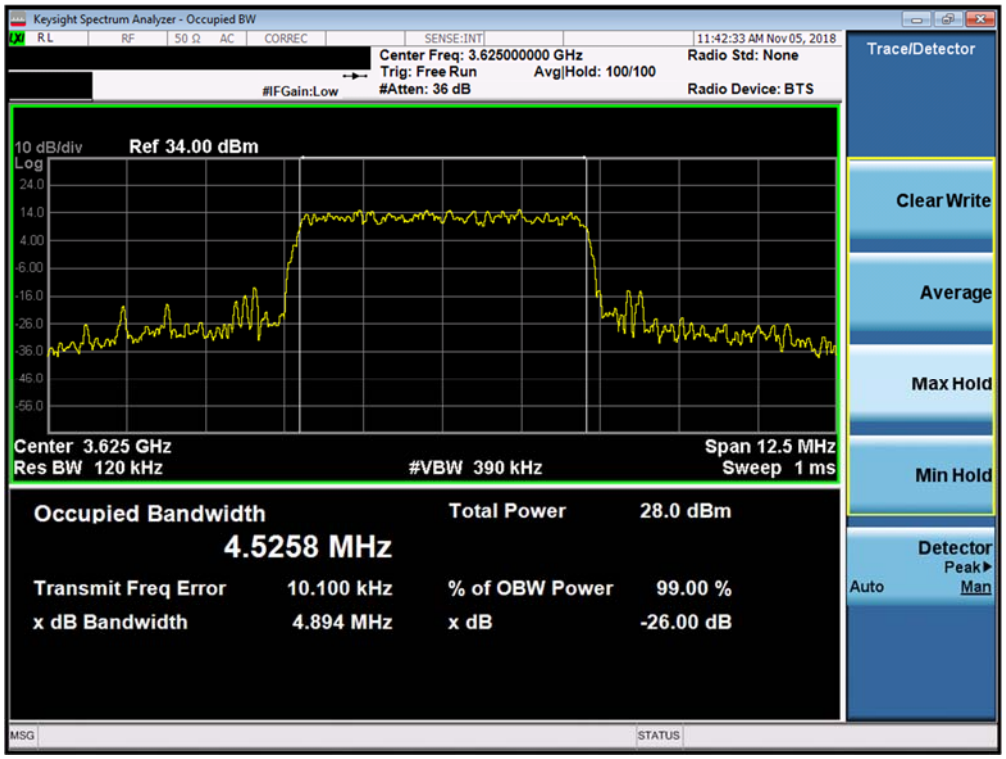
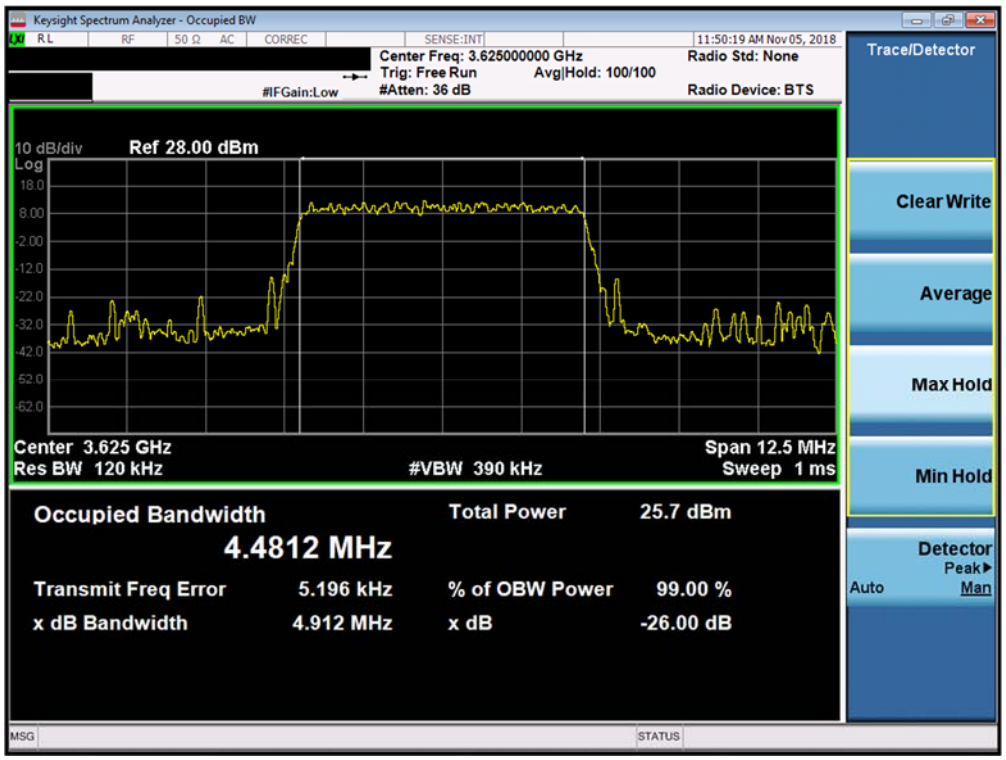


Plot 7-3. Occupied Bandwidth Plot (Band 48 – 5.0MHz 64-QAM - Full RB Configuration)



Plot 7-4. Occupied Bandwidth Plot (Band 48 – 5.0MHz 256-QAM - Full RB Configuration)

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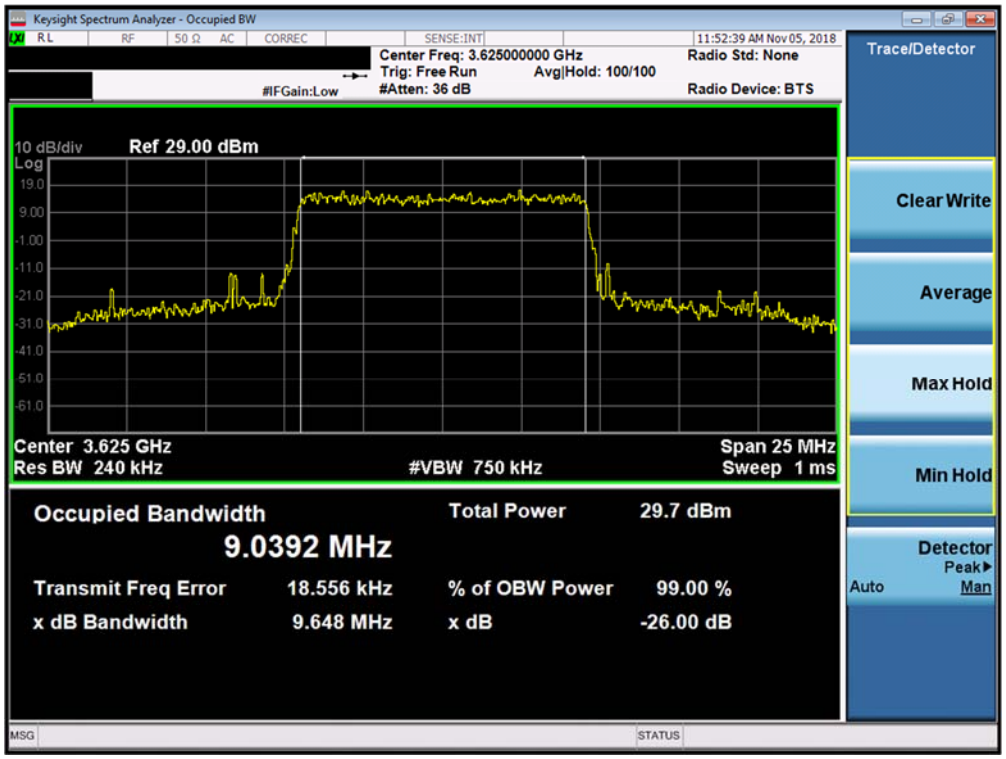
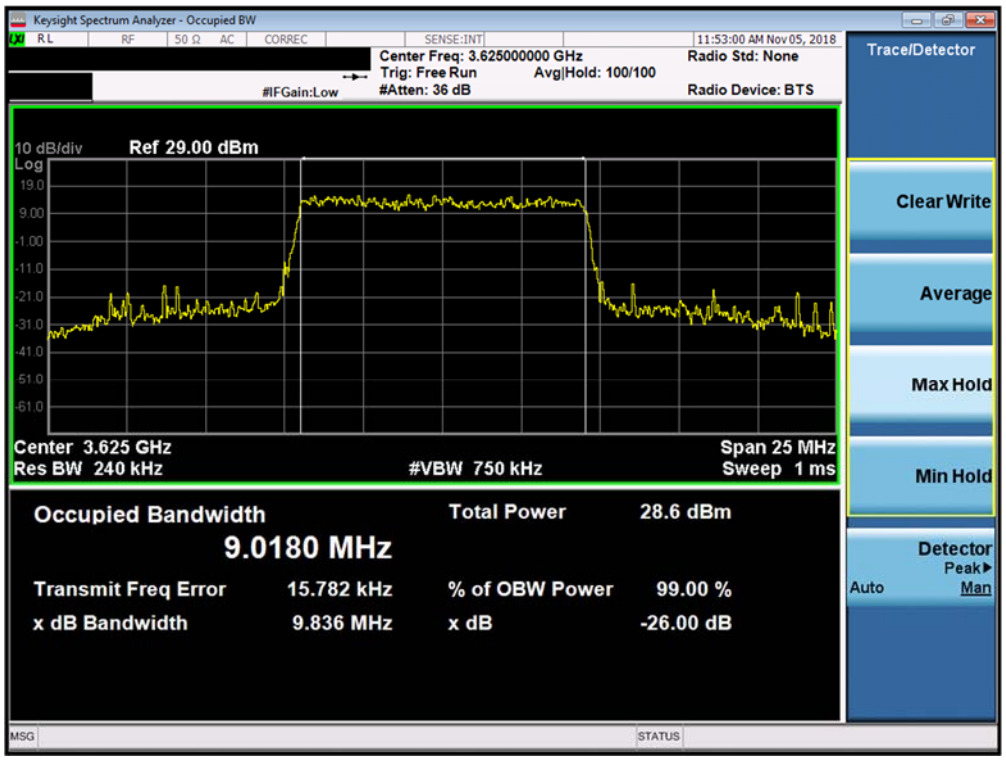


Plot 7-5. Occupied Bandwidth Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-6. Occupied Bandwidth Plot (Band 48 - 10.0MHz 16-QAM - Full RB Configuration)

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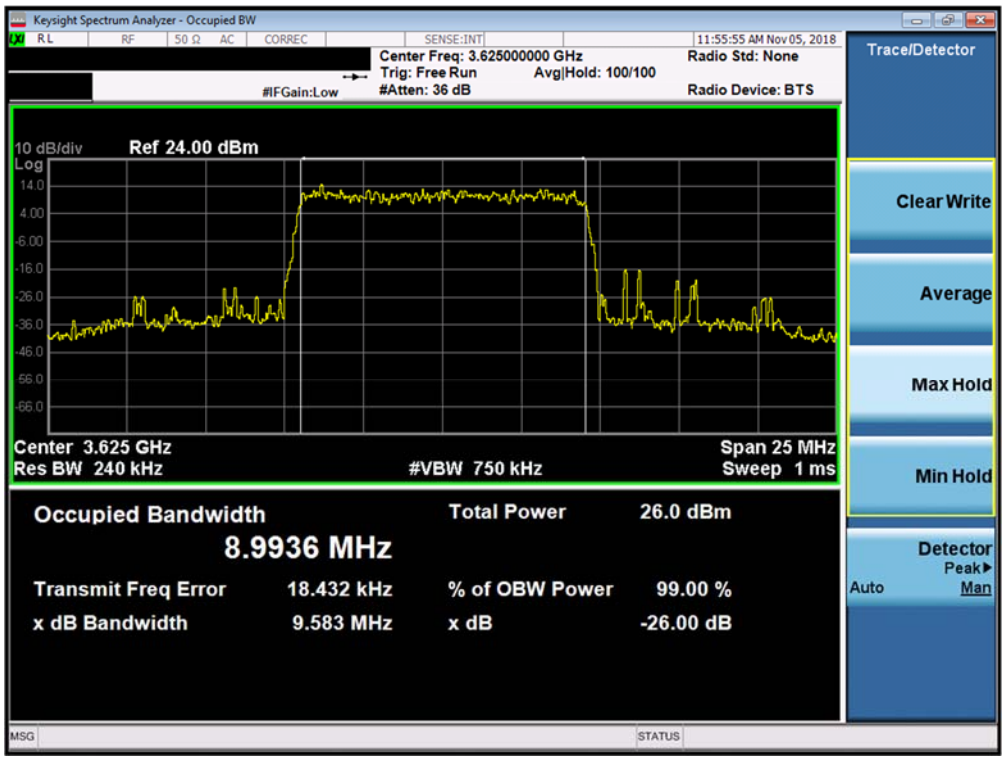
Plot 7-7. Occupied Bandwidth Plot (Band 48 - 10.0MHz 64-QAM - Full RB Configuration)



Plot 7-8. Occupied Bandwidth Plot (Band 48 - 10.0MHz 256-QAM - Full RB Configuration)

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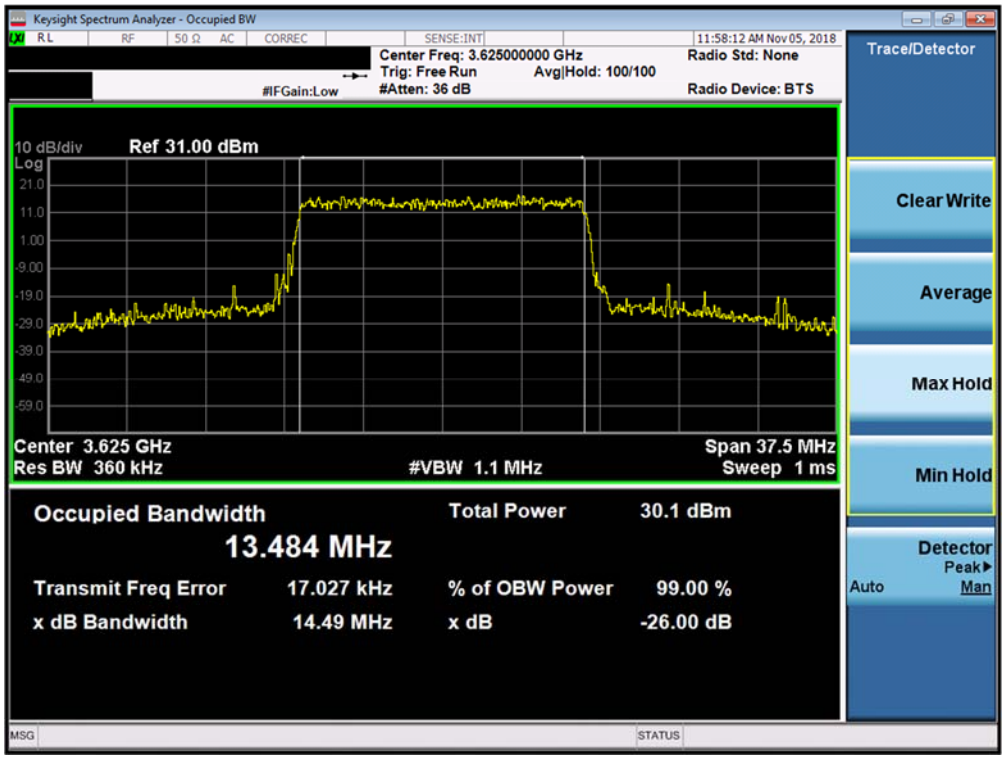
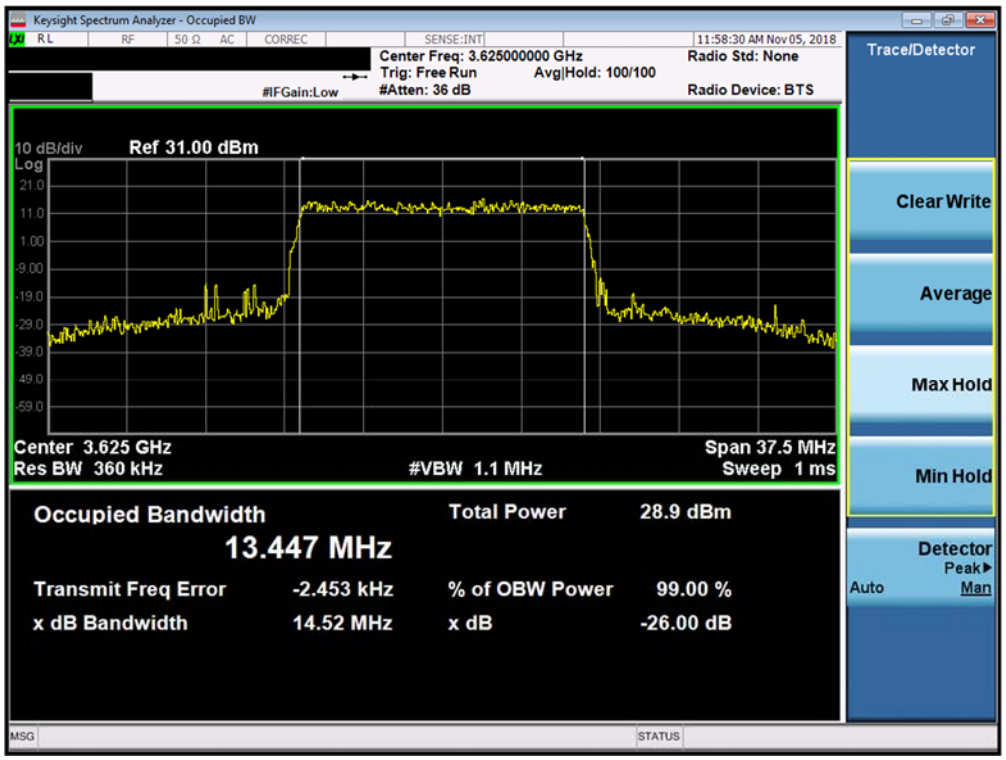


Plot 7-9. Occupied Bandwidth Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



Plot 7-10. Occupied Bandwidth Plot (Band 48 - 15.0MHz 16-QAM - Full RB Configuration)

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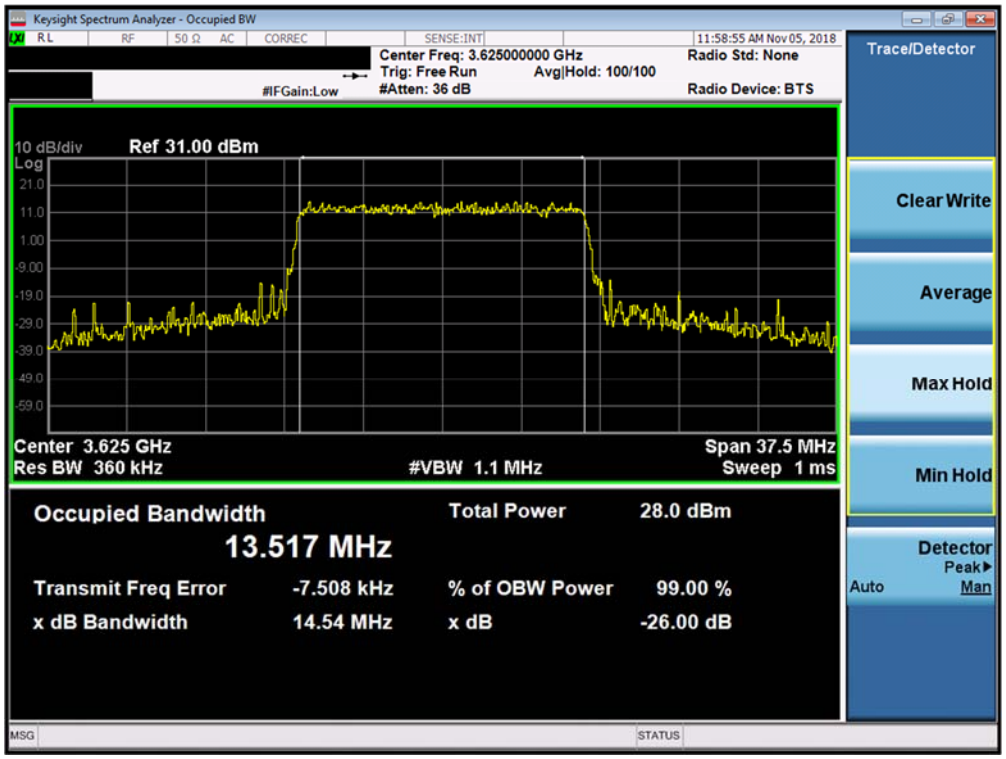
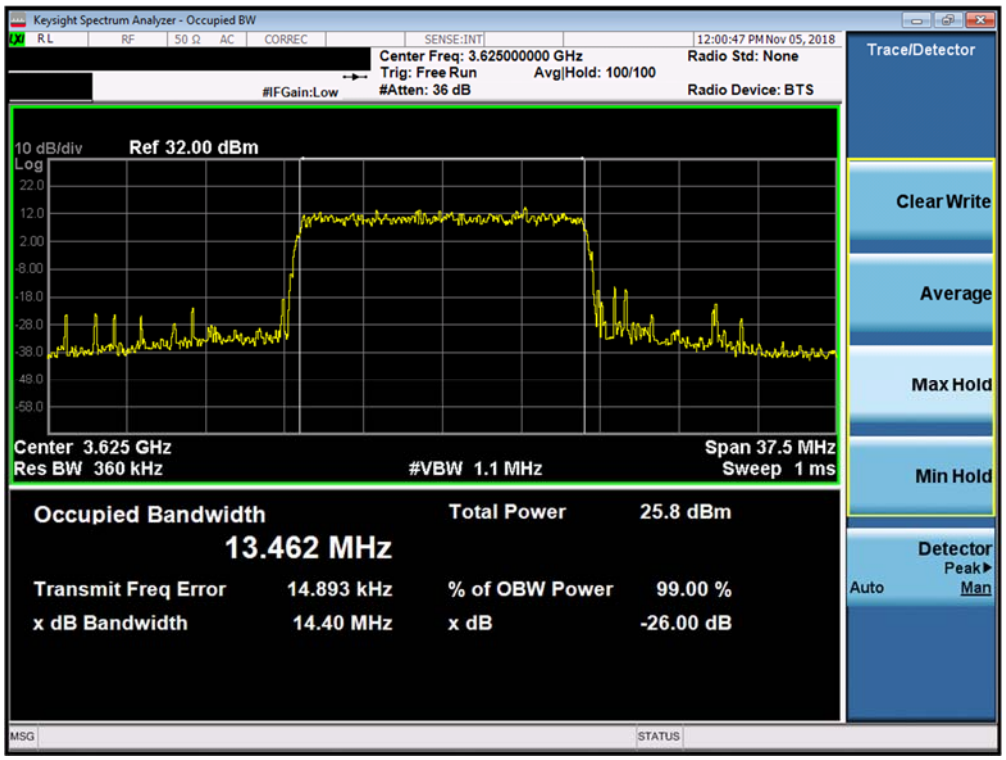


Plot 7-11. Occupied Bandwidth Plot (Band 48 - 15.0MHz 64-QAM - Full RB Configuration)



Plot 7-12. Occupied Bandwidth Plot (Band 48 - 15.0MHz 256-QAM - Full RB Configuration)

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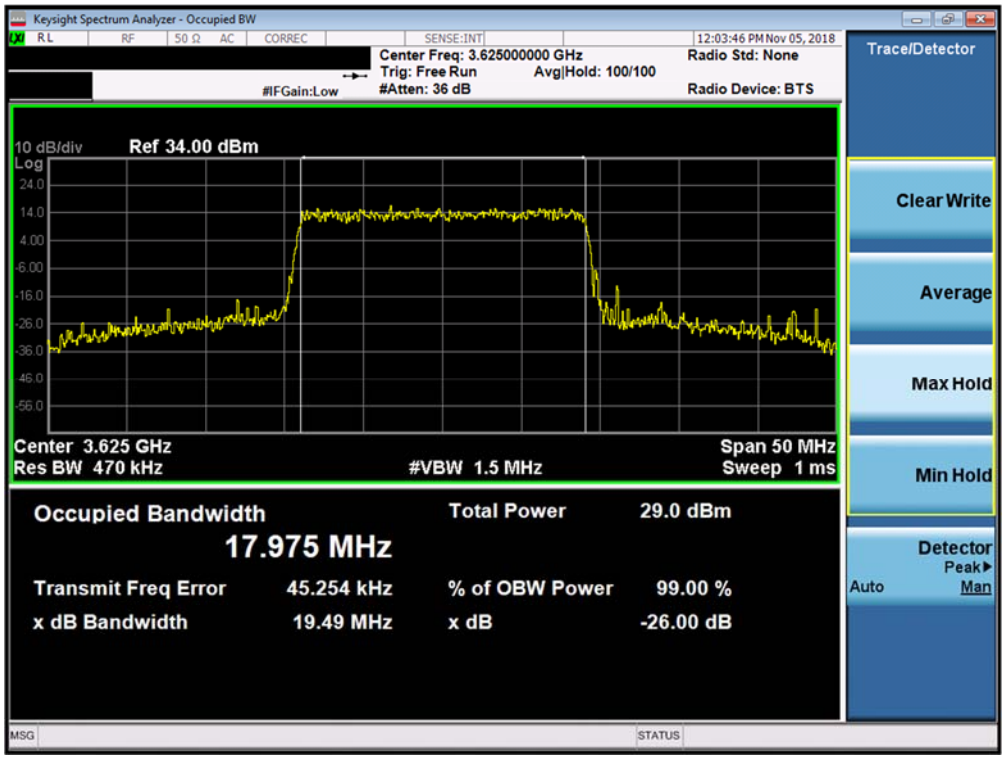
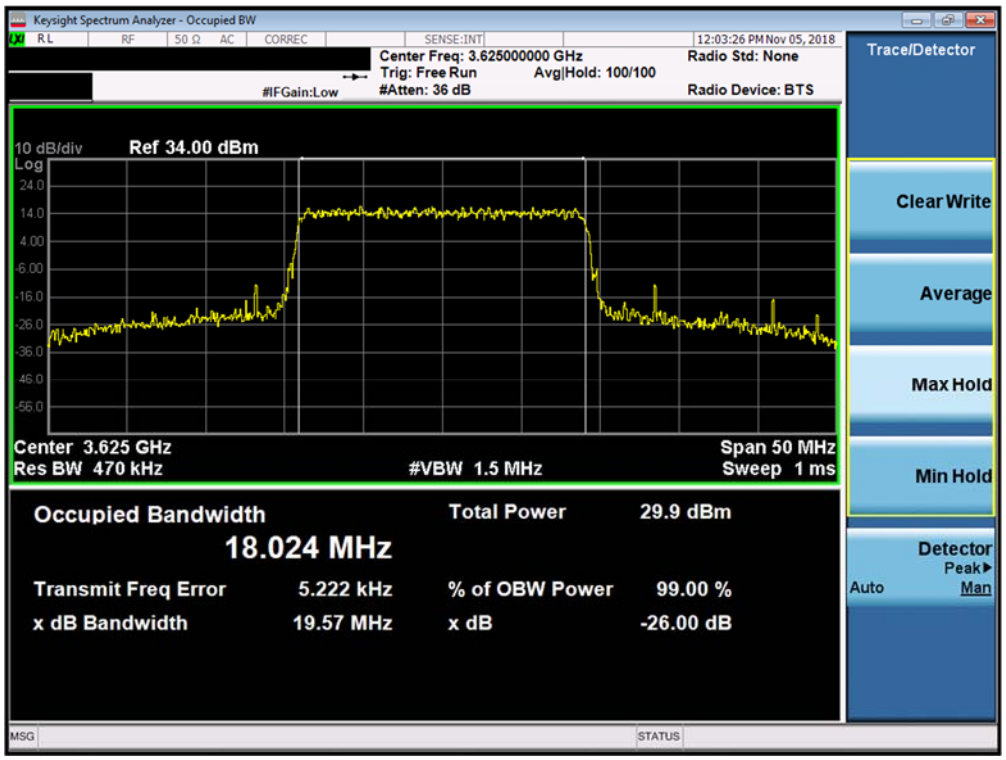


Plot 7-13. Occupied Bandwidth Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-14. Occupied Bandwidth Plot (Band 48 - 20.0MHz 16-QAM - Full RB Configuration)

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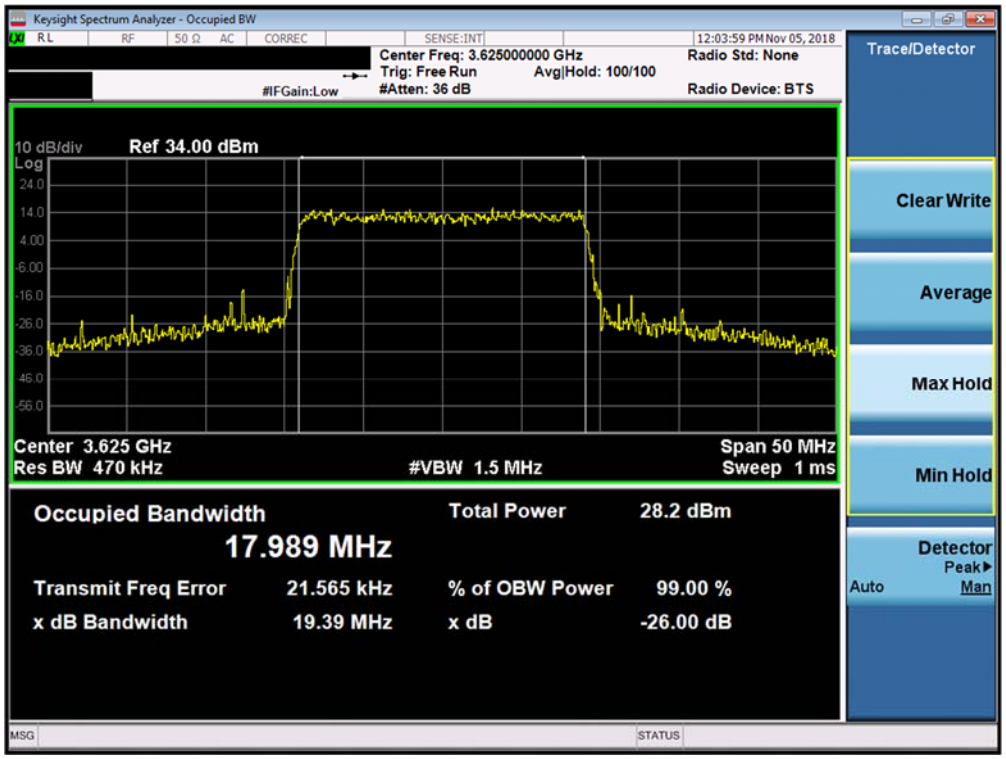
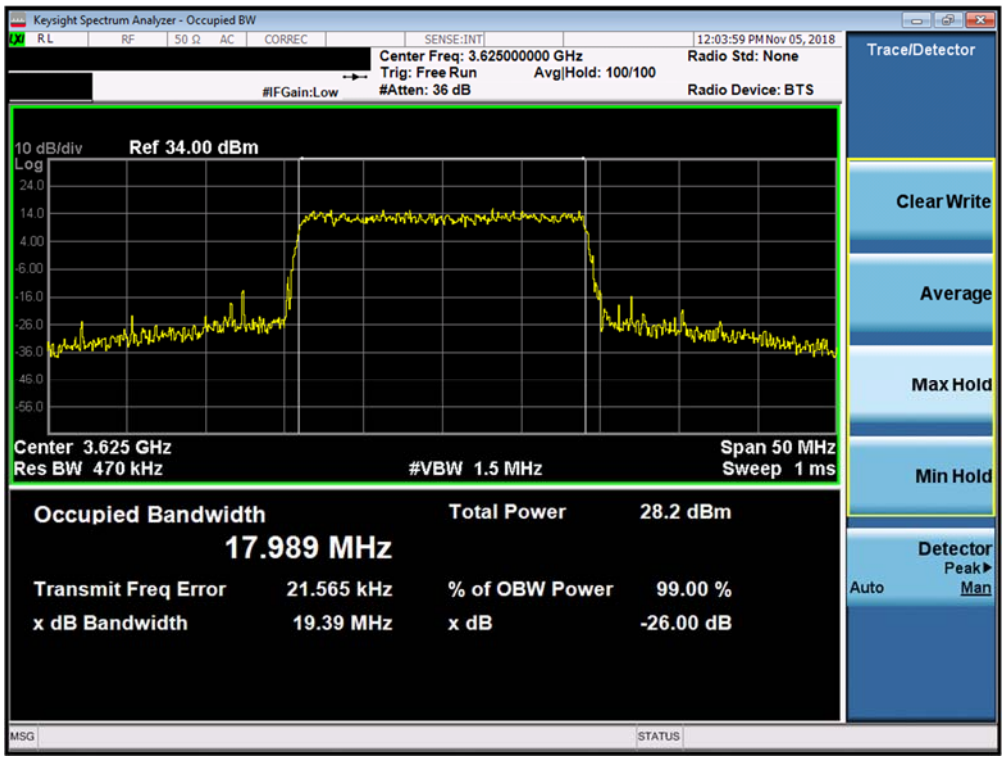


Plot 7-15. Occupied Bandwidth Plot (Band 48 - 20.0MHz 64-QAM - Full RB Configuration)



Plot 7-16. Occupied Bandwidth Plot (Band 48 - 20.0MHz 256-QAM - Full RB Configuration)

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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 = trace average
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

Figure 7-2. 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.

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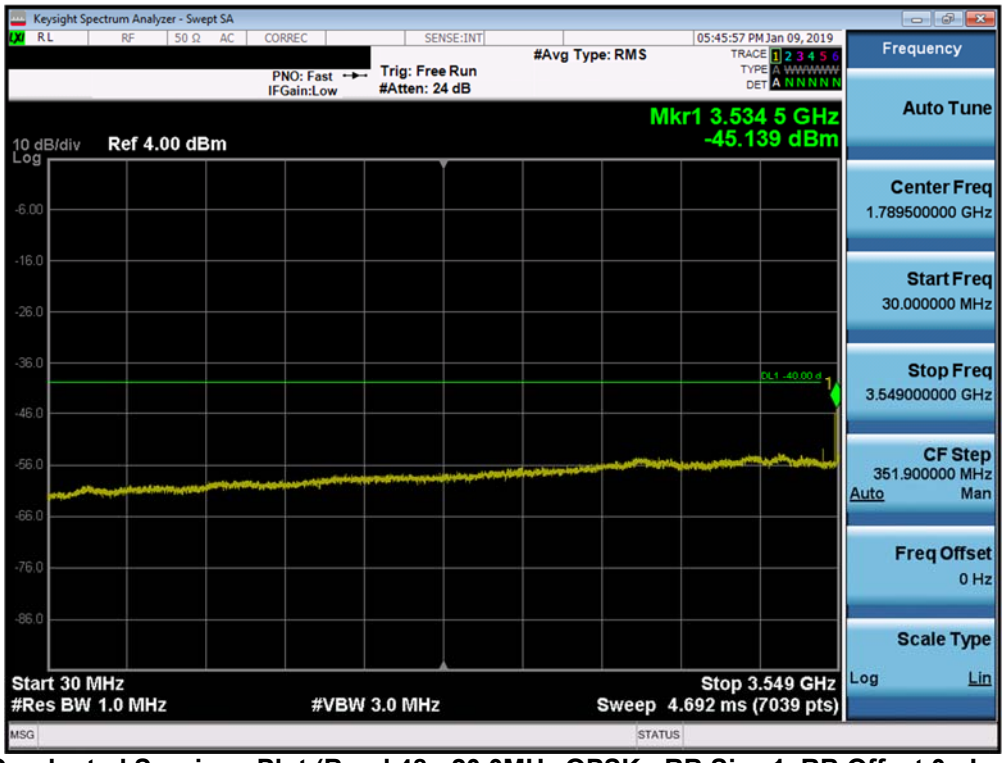
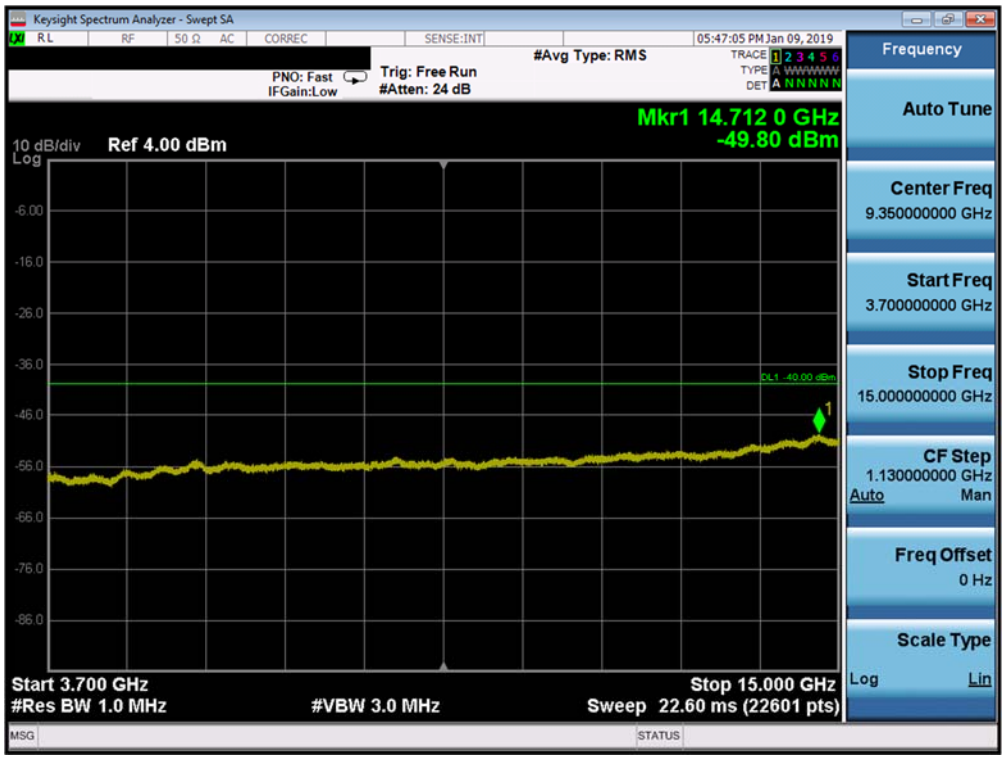
Band 48



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



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

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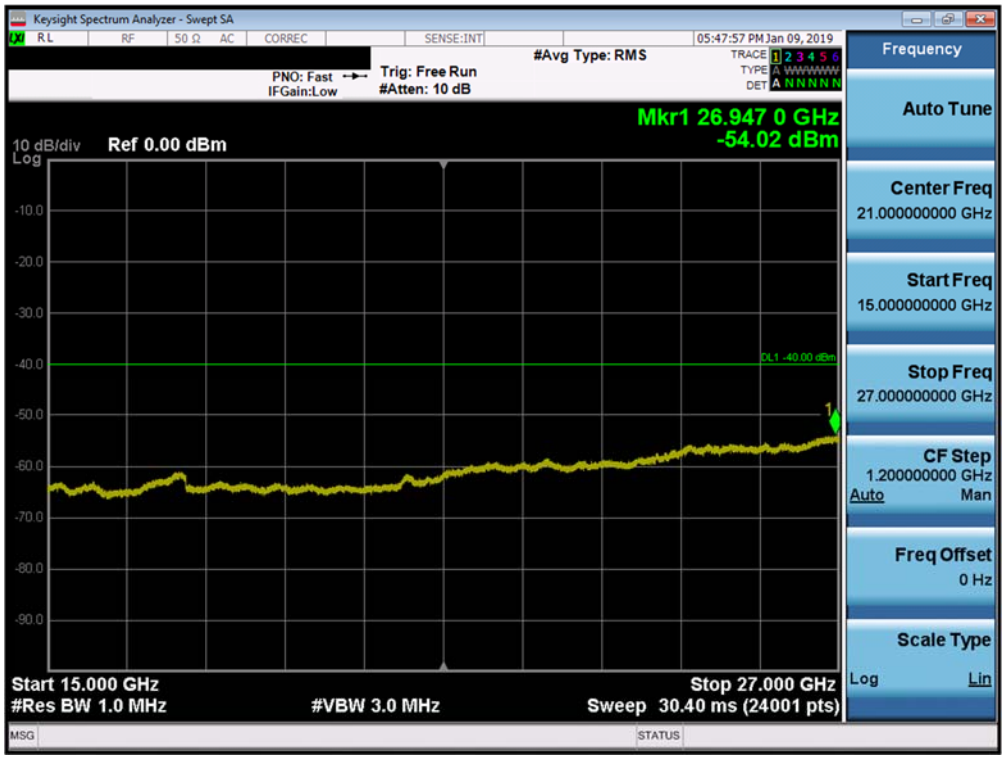
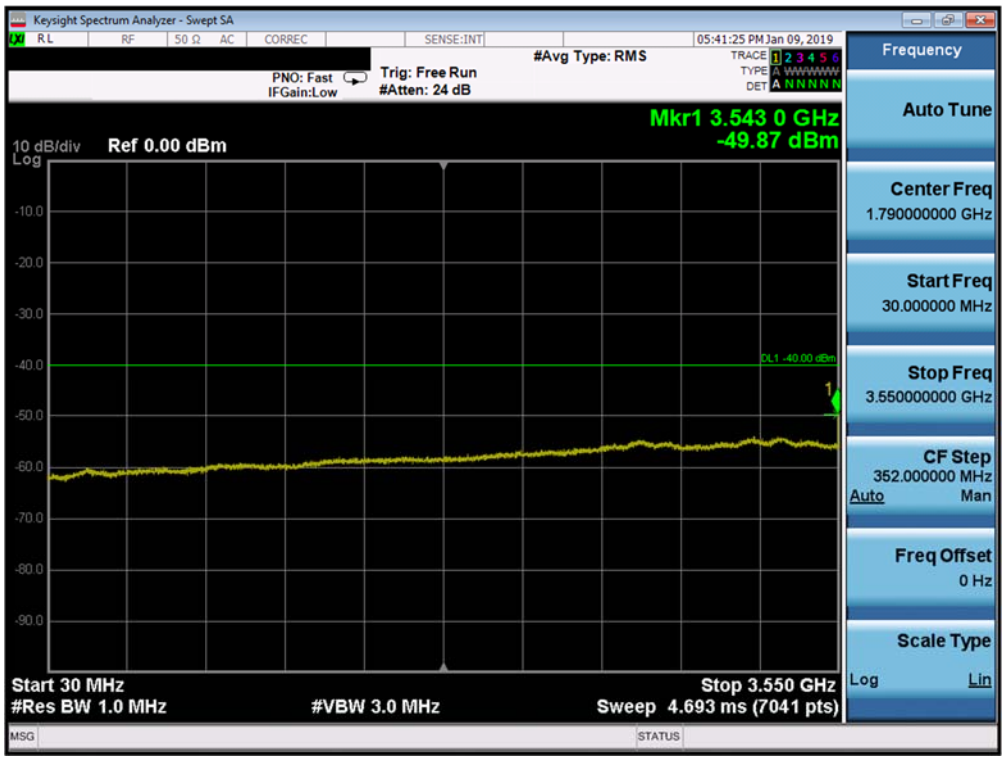


Plot 7-19. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



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

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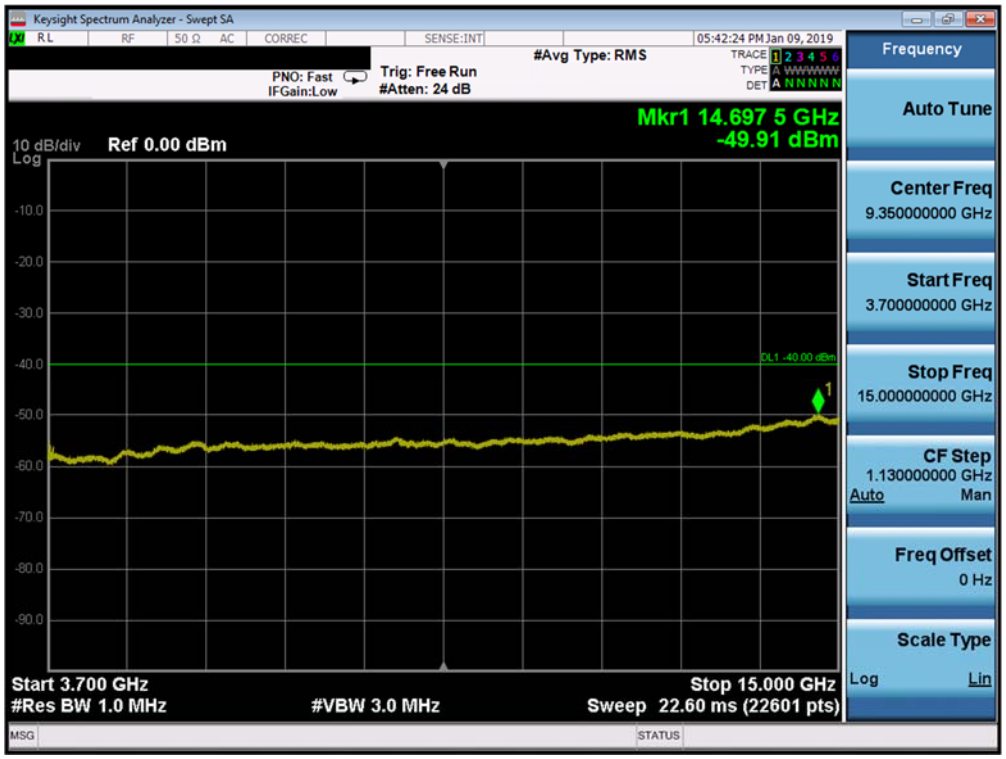

Plot 7-21. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

Plot 7-22. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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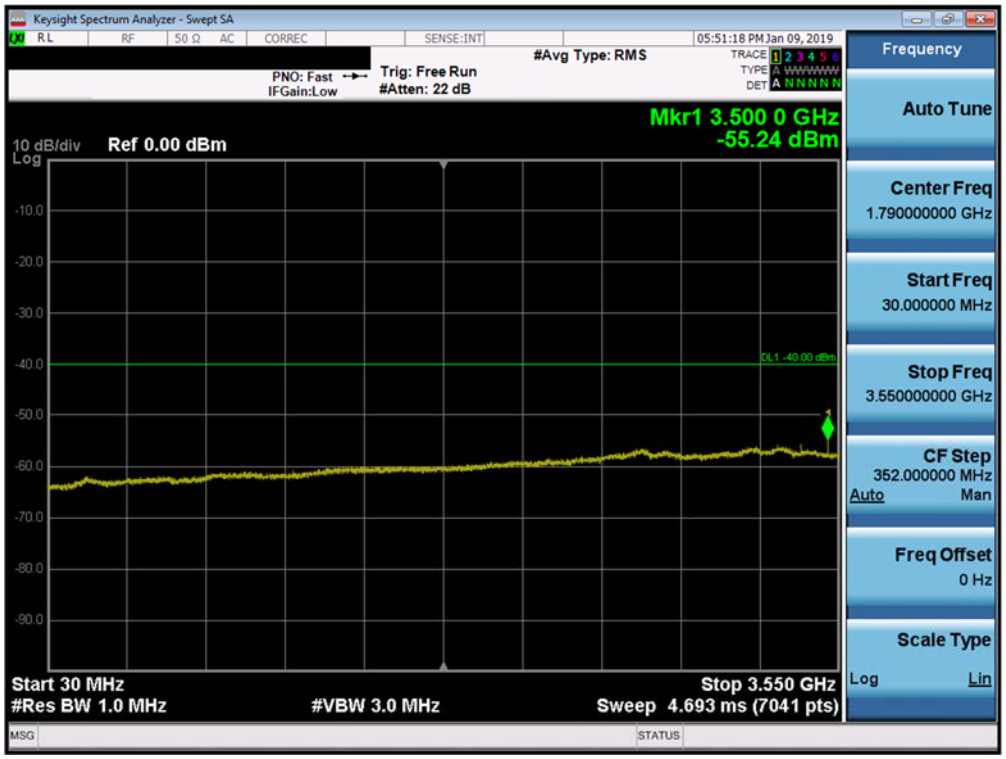
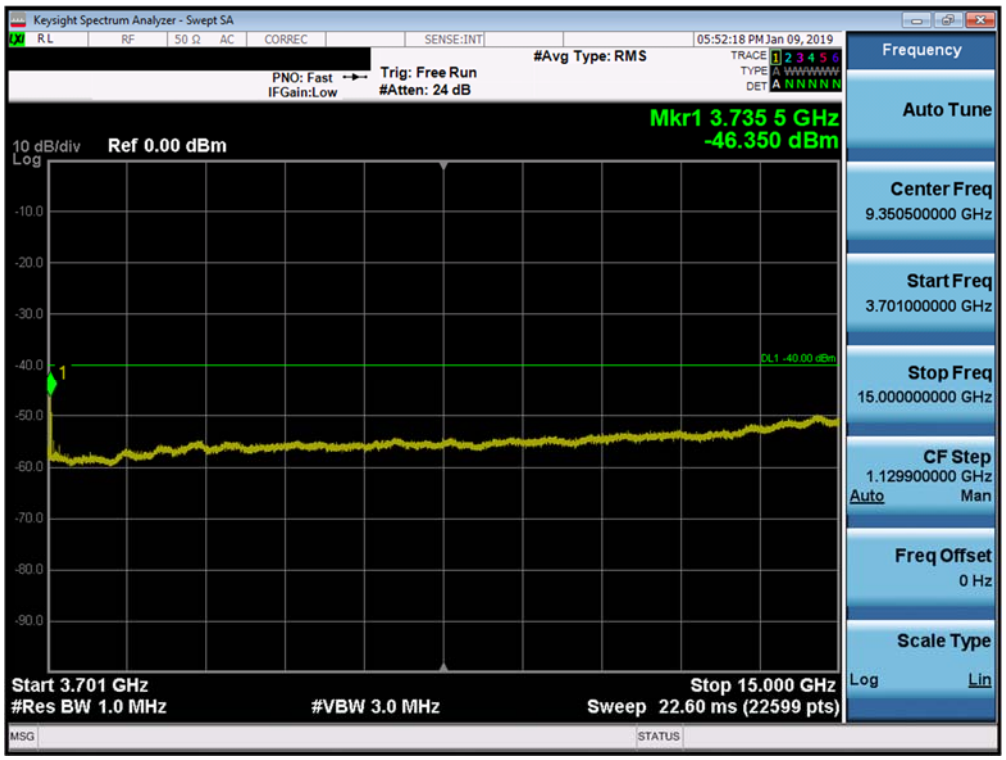


Plot 7-23. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-24. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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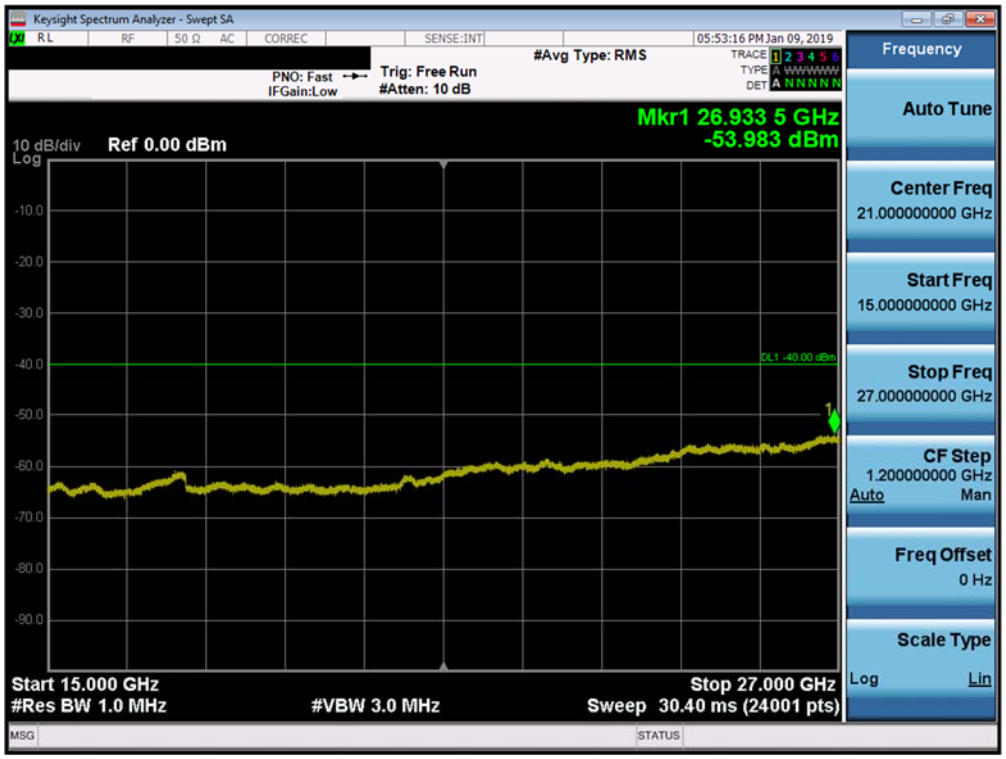

Plot 7-25. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §96.41(e)

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 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any emission shall not exceed −25 dBm/MHz.

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 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.

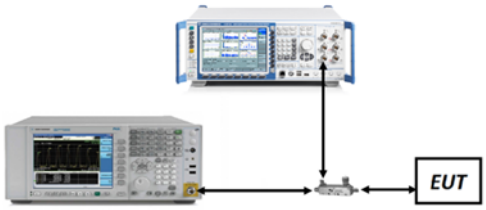

Figure 7-3. Test Instrument & Measurement Setup

Test Notes

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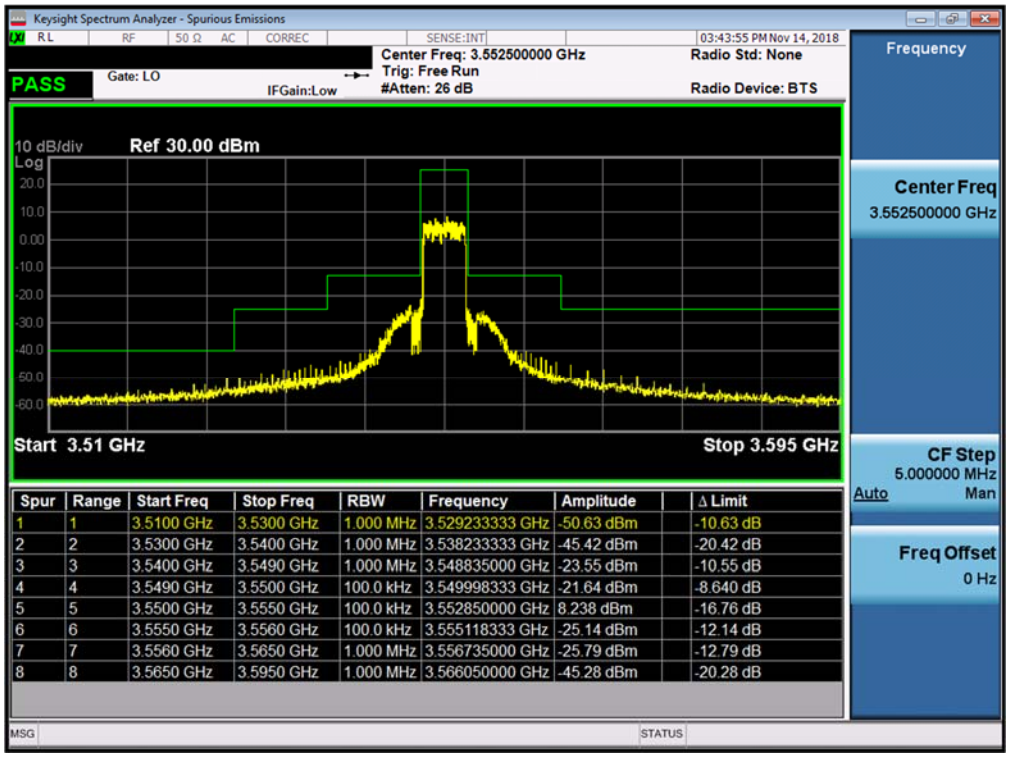
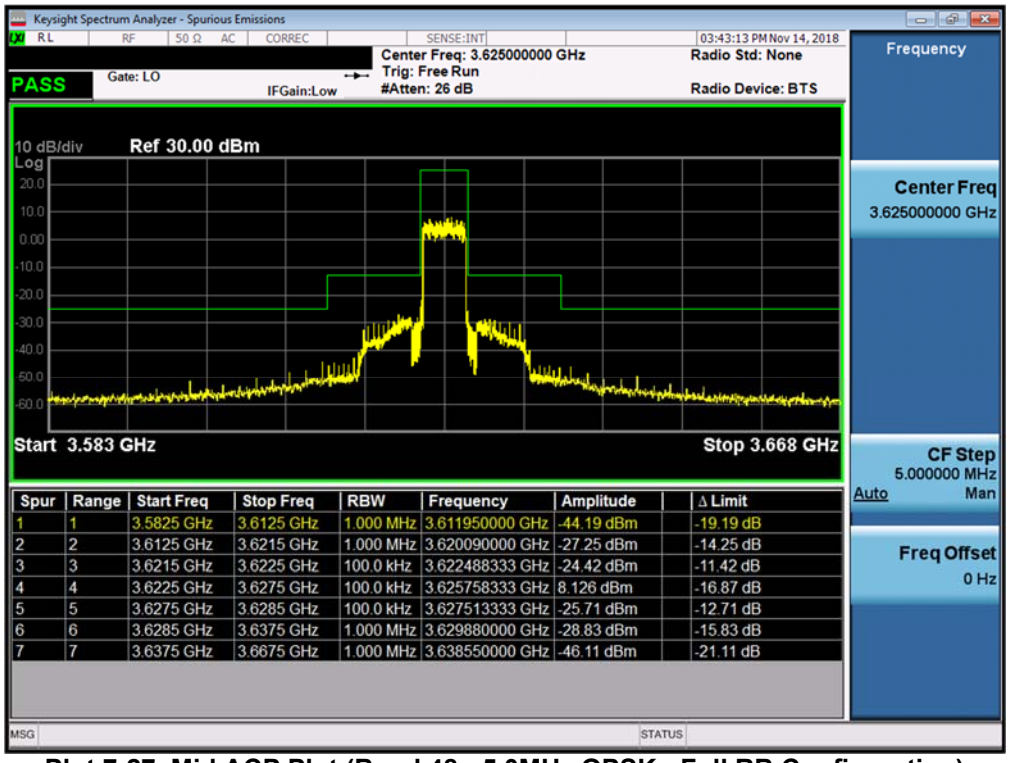
Band 48



Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.529233333 GHz	-50.63 dBm	-10.63 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.538233333 GHz	-45.42 dBm	-20.42 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.548835000 GHz	-23.55 dBm	-10.55 dB
4	4	3.5490 GHz	3.5500 GHz	100.0 kHz	3.549998333 GHz	-21.64 dBm	-8.640 dB
5	5	3.5500 GHz	3.5550 GHz	100.0 kHz	3.552850000 GHz	8.238 dBm	-16.76 dB
6	6	3.5550 GHz	3.5560 GHz	100.0 kHz	3.555118333 GHz	-25.14 dBm	-12.14 dB
7	7	3.5560 GHz	3.5650 GHz	1.000 MHz	3.556735000 GHz	-25.79 dBm	-12.79 dB
8	8	3.5650 GHz	3.5950 GHz	1.000 MHz	3.566050000 GHz	-45.28 dBm	-20.28 dB

Plot 7-26. Lower ACP Plot (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	3.611950000 GHz	-44.19 dBm	-19.19 dB
2	2	3.6125 GHz	3.6215 GHz	1.000 MHz	3.620090000 GHz	-27.25 dBm	-14.25 dB
3	3	3.6215 GHz	3.6225 GHz	100.0 kHz	3.622488333 GHz	-24.42 dBm	-11.42 dB
4	4	3.6225 GHz	3.6275 GHz	100.0 kHz	3.625758333 GHz	8.126 dBm	-16.87 dB
5	5	3.6275 GHz	3.6285 GHz	100.0 kHz	3.627513333 GHz	-25.71 dBm	-12.71 dB
6	6	3.6285 GHz	3.6375 GHz	1.000 MHz	3.629880000 GHz	-28.83 dBm	-15.83 dB
7	7	3.6375 GHz	3.6675 GHz	1.000 MHz	3.638550000 GHz	-46.11 dBm	-21.11 dB

Plot 7-27. Mid ACP Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

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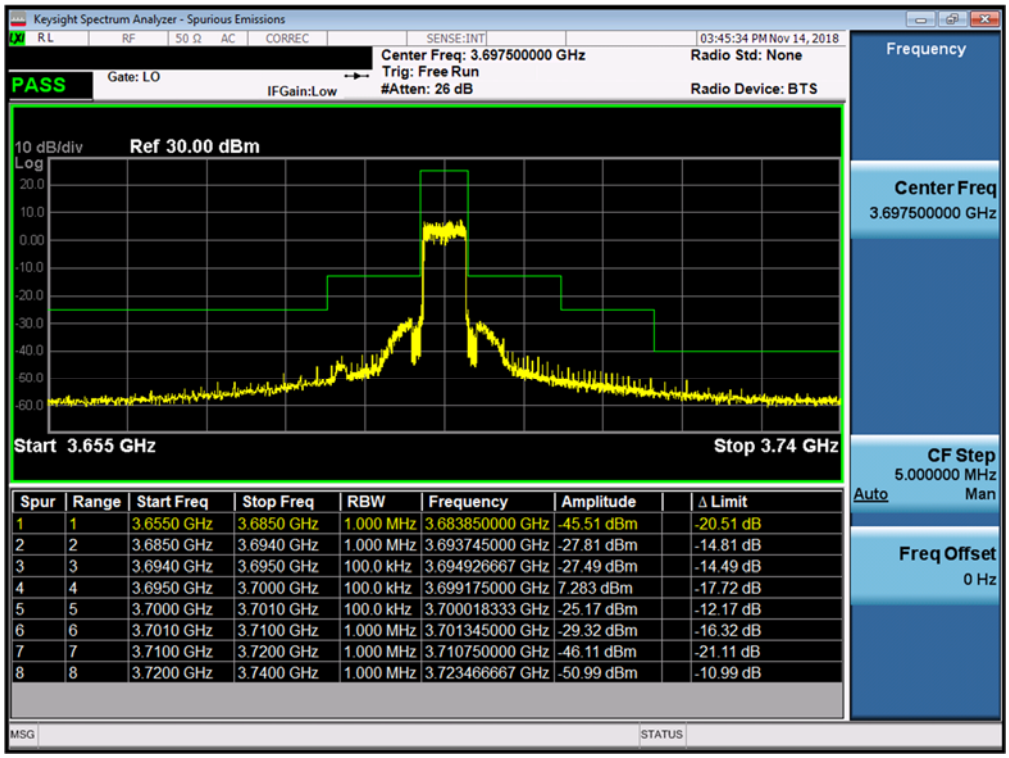
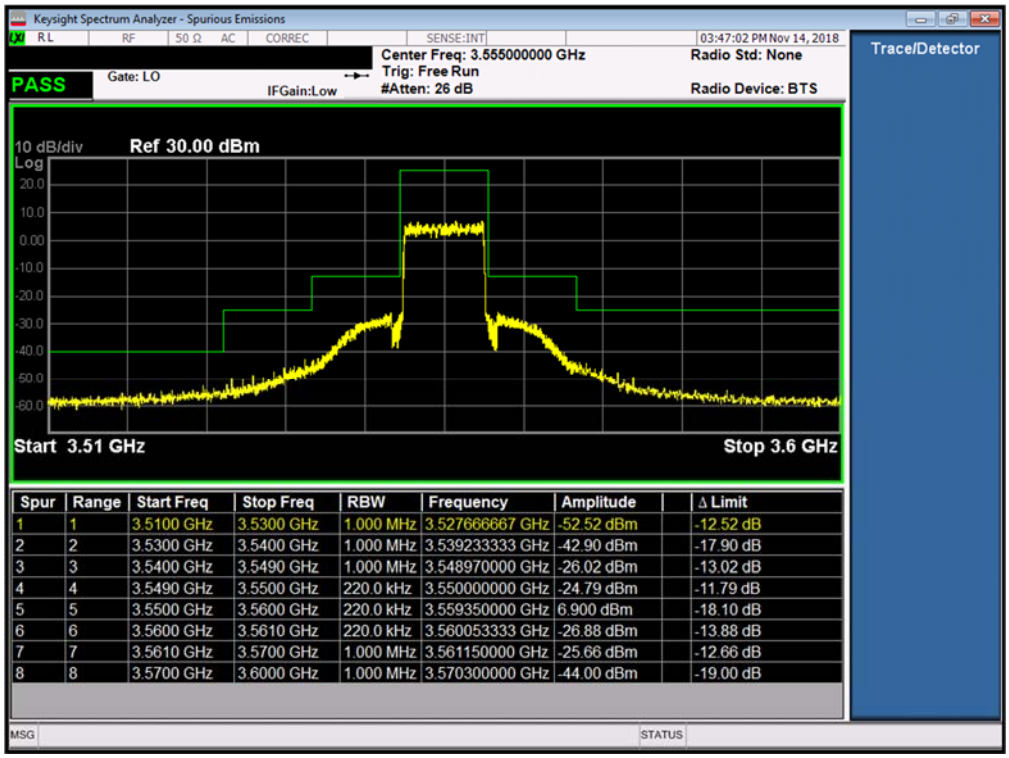


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6550 GHz	3.6850 GHz	1.000 MHz	3.683850000 GHz	-45.51 dBm	-20.51 dB
2	2	3.6850 GHz	3.6940 GHz	1.000 MHz	3.693745000 GHz	-27.81 dBm	-14.81 dB
3	3	3.6940 GHz	3.6950 GHz	100.0 kHz	3.694926667 GHz	-27.49 dBm	-14.49 dB
4	4	3.6950 GHz	3.7000 GHz	100.0 kHz	3.699175000 GHz	7.283 dBm	-17.72 dB
5	5	3.7000 GHz	3.7010 GHz	100.0 kHz	3.700018333 GHz	-25.17 dBm	-12.17 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701345000 GHz	-29.32 dBm	-16.32 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710750000 GHz	-46.11 dBm	-21.11 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.723466667 GHz	-50.99 dBm	-10.99 dB

Plot 7-28. Upper ACP Plot (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	3.527666667 GHz	-52.52 dBm	-12.52 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539233333 GHz	-42.90 dBm	-17.90 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.548970000 GHz	-26.02 dBm	-13.02 dB
4	4	3.5490 GHz	3.5500 GHz	220.0 kHz	3.550000000 GHz	-24.79 dBm	-11.79 dB
5	5	3.5500 GHz	3.5600 GHz	220.0 kHz	3.559350000 GHz	6.900 dBm	-18.10 dB
6	6	3.5600 GHz	3.5610 GHz	220.0 kHz	3.560053333 GHz	-26.88 dBm	-13.88 dB
7	7	3.5610 GHz	3.5700 GHz	1.000 MHz	3.561150000 GHz	-25.66 dBm	-12.66 dB
8	8	3.5700 GHz	3.6000 GHz	1.000 MHz	3.570300000 GHz	-44.00 dBm	-19.00 dB

Plot 7-29. Lower ACP Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

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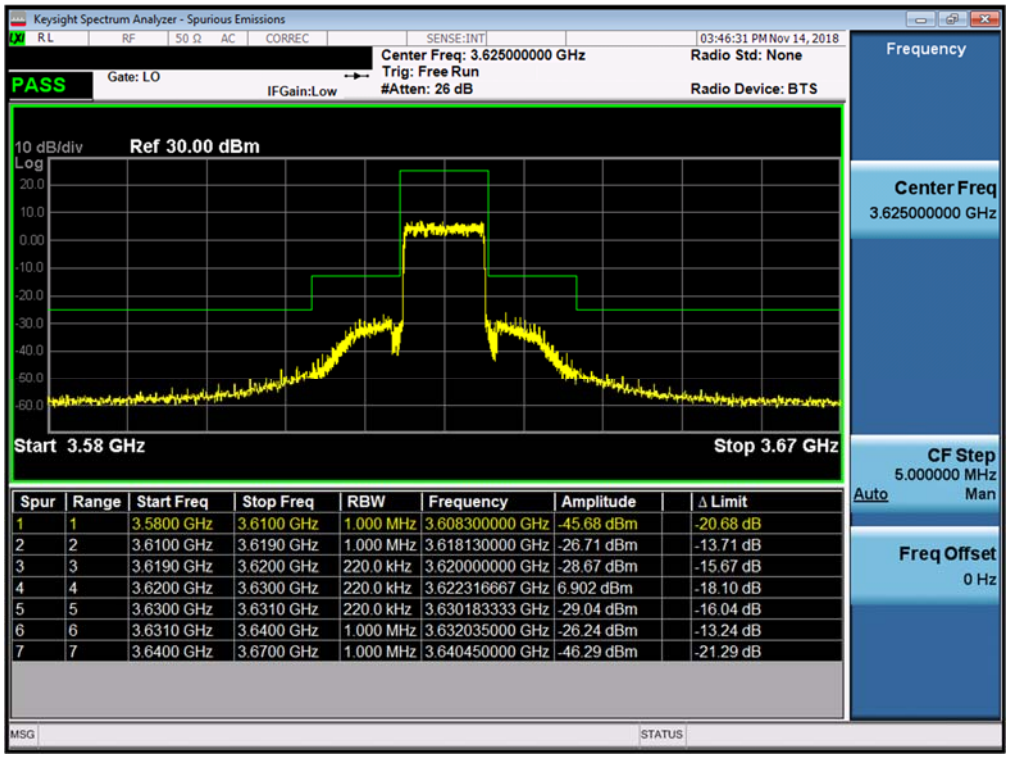
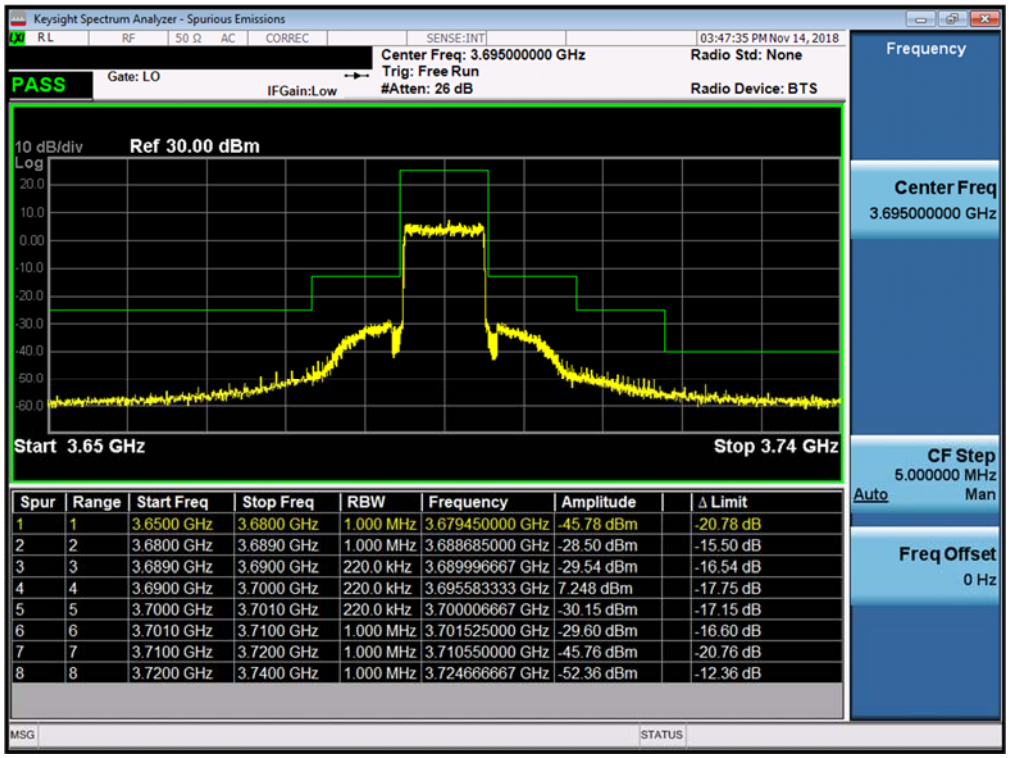


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5800 GHz	3.6100 GHz	1.000 MHz	3.608300000 GHz	-45.68 dBm	-20.68 dB
2	2	3.6100 GHz	3.6190 GHz	1.000 MHz	3.618130000 GHz	-26.71 dBm	-13.71 dB
3	3	3.6190 GHz	3.6200 GHz	220.0 kHz	3.620000000 GHz	-28.67 dBm	-15.67 dB
4	4	3.6200 GHz	3.6300 GHz	220.0 kHz	3.622316667 GHz	6.902 dBm	-18.10 dB
5	5	3.6300 GHz	3.6310 GHz	220.0 kHz	3.630183333 GHz	-29.04 dBm	-16.04 dB
6	6	3.6310 GHz	3.6400 GHz	1.000 MHz	3.632035000 GHz	-26.24 dBm	-13.24 dB
7	7	3.6400 GHz	3.6700 GHz	1.000 MHz	3.640450000 GHz	-46.29 dBm	-21.29 dB

Plot 7-30. Mid ACP Plot (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	3.679450000 GHz	-45.78 dBm	-20.78 dB
2	2	3.6800 GHz	3.6890 GHz	1.000 MHz	3.688685000 GHz	-28.50 dBm	-15.50 dB
3	3	3.6890 GHz	3.6900 GHz	220.0 kHz	3.689996667 GHz	-29.54 dBm	-16.54 dB
4	4	3.6900 GHz	3.7000 GHz	220.0 kHz	3.695583333 GHz	7.248 dBm	-17.75 dB
5	5	3.7000 GHz	3.7010 GHz	220.0 kHz	3.700006667 GHz	-30.15 dBm	-17.15 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701525000 GHz	-29.60 dBm	-16.60 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710550000 GHz	-45.76 dBm	-20.76 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.724666667 GHz	-52.36 dBm	-12.36 dB

Plot 7-31. Upper ACP Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

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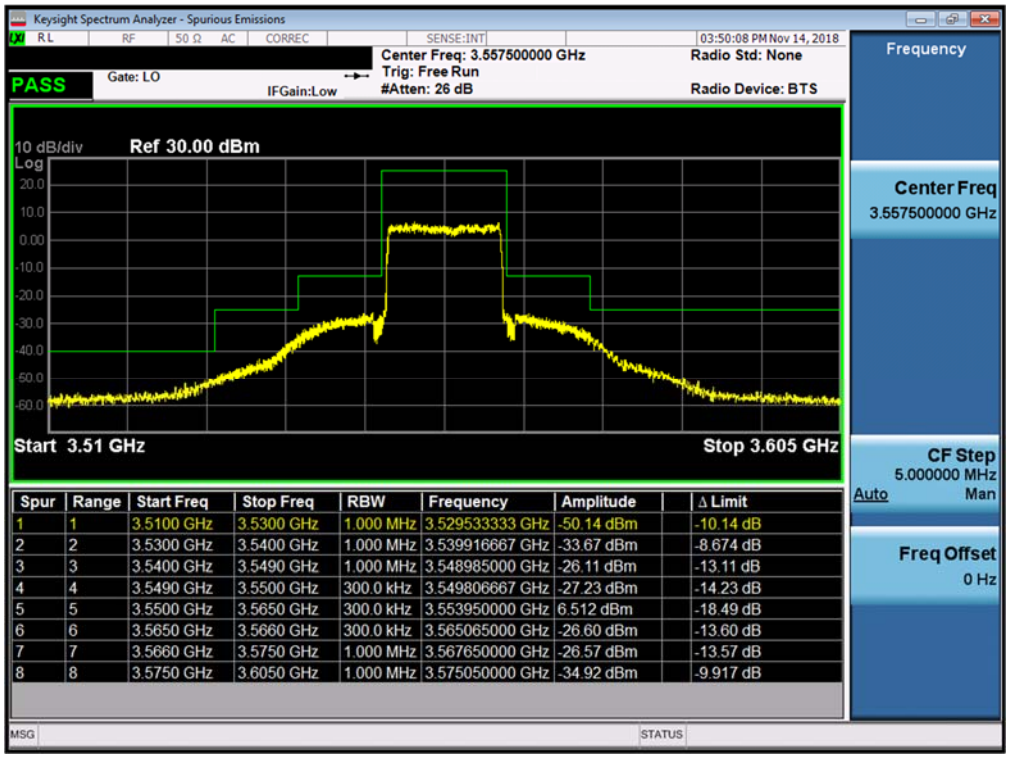
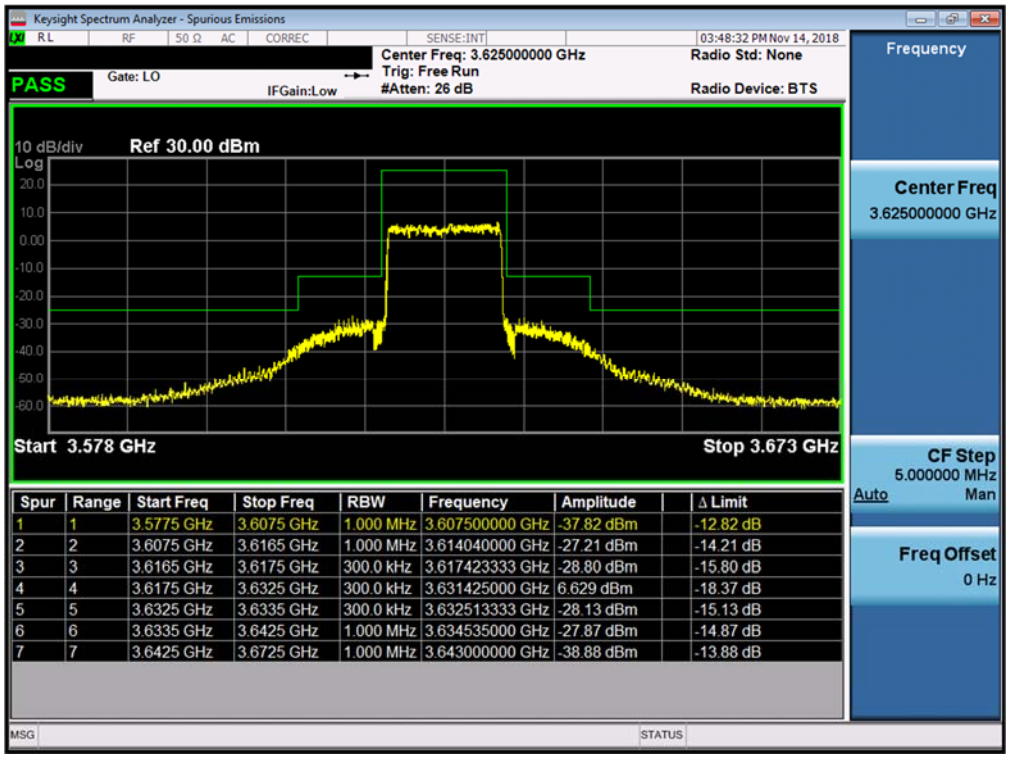


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.529533333 GHz	-50.14 dBm	-10.14 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539916667 GHz	-33.67 dBm	-8.674 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.548985000 GHz	-26.11 dBm	-13.11 dB
4	4	3.5490 GHz	3.5500 GHz	300.0 kHz	3.549806667 GHz	-27.23 dBm	-14.23 dB
5	5	3.5500 GHz	3.5650 GHz	300.0 kHz	3.553950000 GHz	6.512 dBm	-18.49 dB
6	6	3.5650 GHz	3.5660 GHz	300.0 kHz	3.565065000 GHz	-26.60 dBm	-13.60 dB
7	7	3.5660 GHz	3.5750 GHz	1.000 MHz	3.567650000 GHz	-26.57 dBm	-13.57 dB
8	8	3.5750 GHz	3.6050 GHz	1.000 MHz	3.575050000 GHz	-34.92 dBm	-9.917 dB

Plot 7-32. Lower ACP Plot (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	3.607500000 GHz	-37.82 dBm	-12.82 dB
2	2	3.6075 GHz	3.6165 GHz	1.000 MHz	3.614040000 GHz	-27.21 dBm	-14.21 dB
3	3	3.6165 GHz	3.6175 GHz	300.0 kHz	3.617423333 GHz	-28.80 dBm	-15.80 dB
4	4	3.6175 GHz	3.6325 GHz	300.0 kHz	3.631425000 GHz	6.629 dBm	-18.37 dB
5	5	3.6325 GHz	3.6335 GHz	300.0 kHz	3.632513333 GHz	-28.13 dBm	-15.13 dB
6	6	3.6335 GHz	3.6425 GHz	1.000 MHz	3.634535000 GHz	-27.87 dBm	-14.87 dB
7	7	3.6425 GHz	3.6725 GHz	1.000 MHz	3.643000000 GHz	-38.88 dBm	-13.88 dB

Plot 7-33. Mid ACP Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

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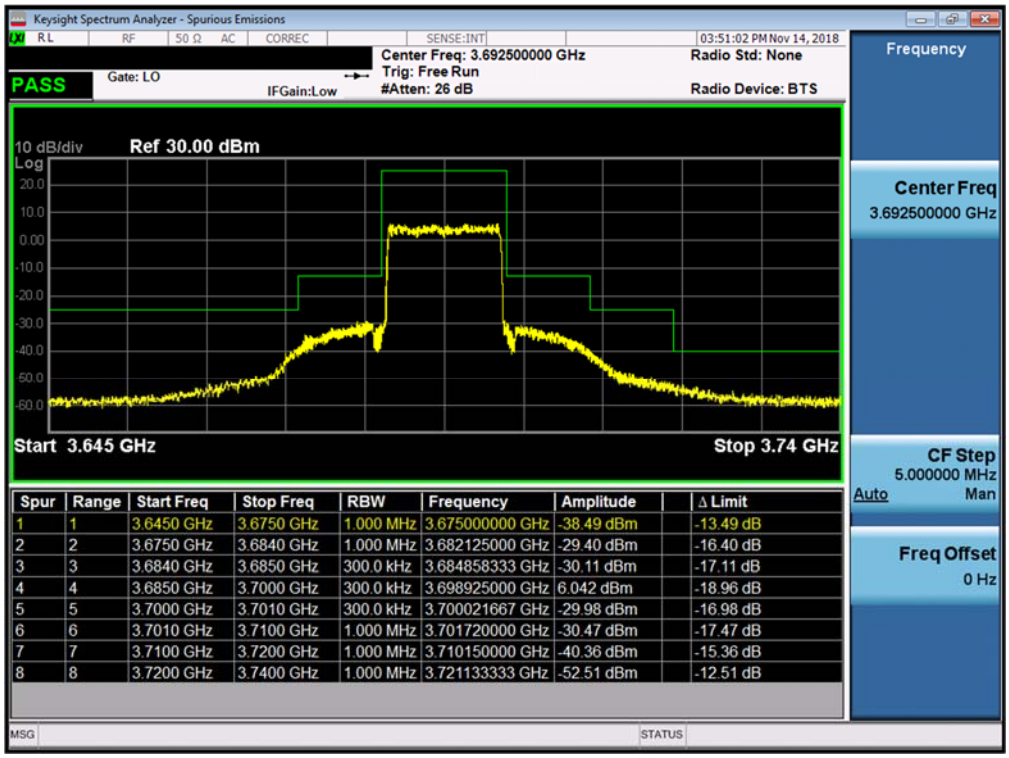
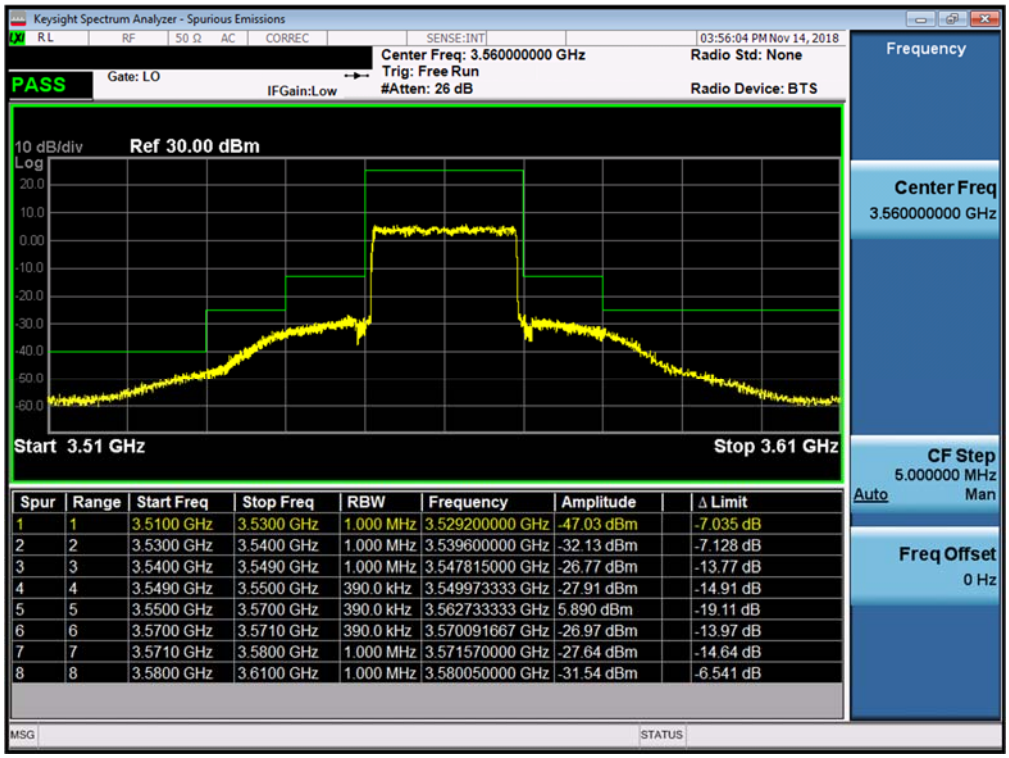


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6450 GHz	3.6750 GHz	1.000 MHz	3.675000000 GHz	-38.49 dBm	-13.49 dB
2	2	3.6750 GHz	3.6840 GHz	1.000 MHz	3.682125000 GHz	-29.40 dBm	-16.40 dB
3	3	3.6840 GHz	3.6850 GHz	300.0 kHz	3.684858333 GHz	-30.11 dBm	-17.11 dB
4	4	3.6850 GHz	3.7000 GHz	300.0 kHz	3.698925000 GHz	6.042 dBm	-18.96 dB
5	5	3.7000 GHz	3.7010 GHz	300.0 kHz	3.700021667 GHz	-29.98 dBm	-16.98 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701720000 GHz	-30.47 dBm	-17.47 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710150000 GHz	-40.36 dBm	-15.36 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.721133333 GHz	-52.51 dBm	-12.51 dB

Plot 7-34. Upper ACP Plot (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	3.529200000 GHz	-47.03 dBm	-7.035 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539600000 GHz	-32.13 dBm	-7.128 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.547815000 GHz	-26.77 dBm	-13.77 dB
4	4	3.5490 GHz	3.5500 GHz	390.0 kHz	3.549973333 GHz	-27.91 dBm	-14.91 dB
5	5	3.5500 GHz	3.5700 GHz	390.0 kHz	3.562733333 GHz	5.890 dBm	-19.11 dB
6	6	3.5700 GHz	3.5710 GHz	390.0 kHz	3.570091667 GHz	-26.97 dBm	-13.97 dB
7	7	3.5710 GHz	3.5800 GHz	1.000 MHz	3.571570000 GHz	-27.64 dBm	-14.64 dB
8	8	3.5800 GHz	3.6100 GHz	1.000 MHz	3.580050000 GHz	-31.54 dBm	-6.541 dB

Plot 7-35. Lower ACP Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

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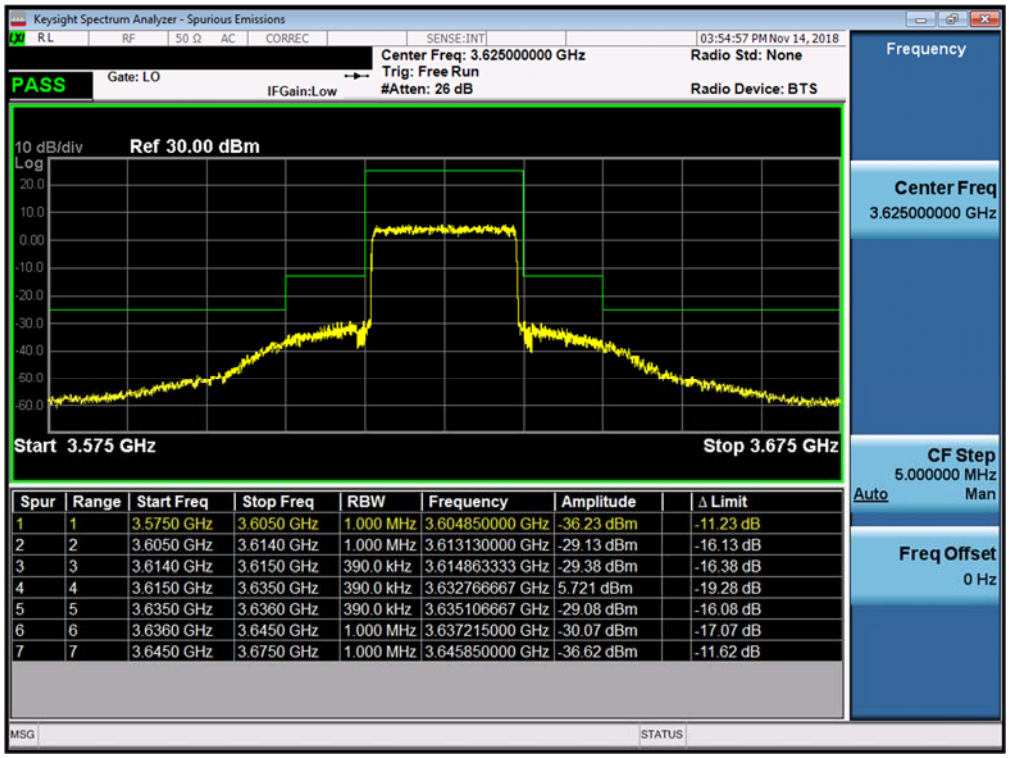
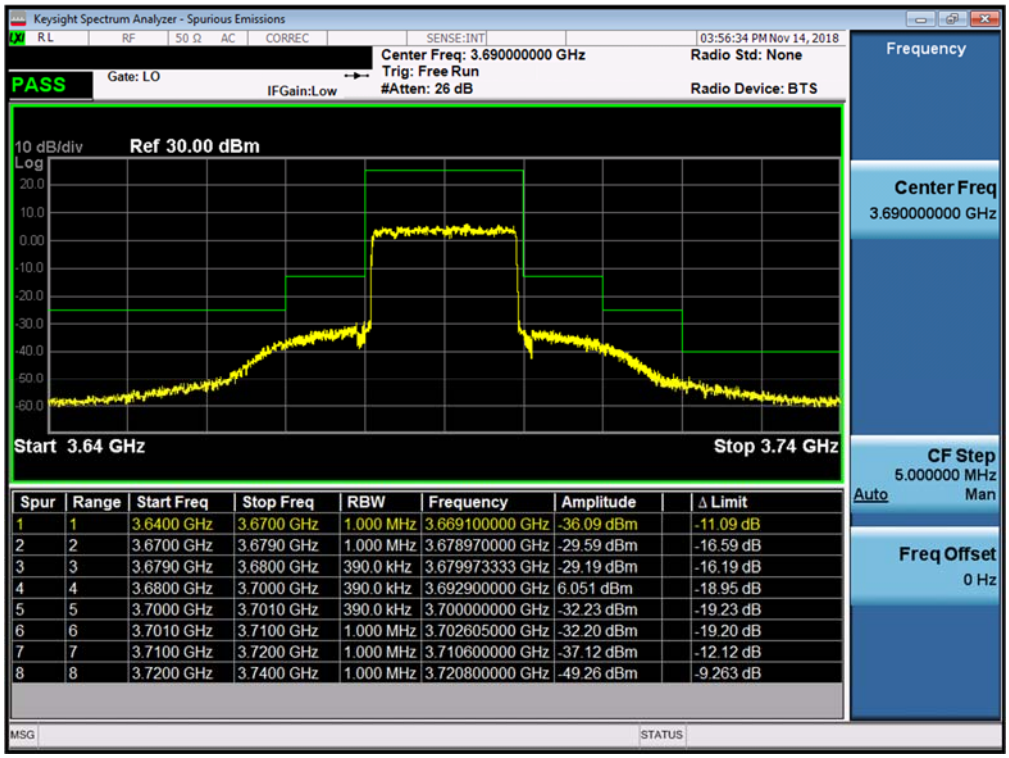


Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5750 GHz	3.6050 GHz	1.000 MHz	3.604850000 GHz	-36.23 dBm	-11.23 dB
2	2	3.6050 GHz	3.6140 GHz	1.000 MHz	3.613130000 GHz	-29.13 dBm	-16.13 dB
3	3	3.6140 GHz	3.6150 GHz	390.0 kHz	3.614863333 GHz	-29.38 dBm	-16.38 dB
4	4	3.6150 GHz	3.6350 GHz	390.0 kHz	3.632766667 GHz	5.721 dBm	-19.28 dB
5	5	3.6350 GHz	3.6360 GHz	390.0 kHz	3.635106667 GHz	-29.08 dBm	-16.08 dB
6	6	3.6360 GHz	3.6450 GHz	1.000 MHz	3.637215000 GHz	-30.07 dBm	-17.07 dB
7	7	3.6450 GHz	3.6750 GHz	1.000 MHz	3.645850000 GHz	-36.62 dBm	-11.62 dB

Plot 7-36. Mid ACP Plot (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	3.669100000 GHz	-36.09 dBm	-11.09 dB
2	2	3.6700 GHz	3.6790 GHz	1.000 MHz	3.678970000 GHz	-29.59 dBm	-16.59 dB
3	3	3.6790 GHz	3.6800 GHz	390.0 kHz	3.679973333 GHz	-29.19 dBm	-16.19 dB
4	4	3.6800 GHz	3.7000 GHz	390.0 kHz	3.692900000 GHz	6.051 dBm	-18.95 dB
5	5	3.7000 GHz	3.7010 GHz	390.0 kHz	3.700000000 GHz	-32.23 dBm	-19.23 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.702605000 GHz	-32.20 dBm	-19.20 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710600000 GHz	-37.12 dBm	-12.12 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720800000 GHz	-49.26 dBm	-9.263 dB

Plot 7-37. Upper ACP Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration

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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 roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

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Test Setup

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

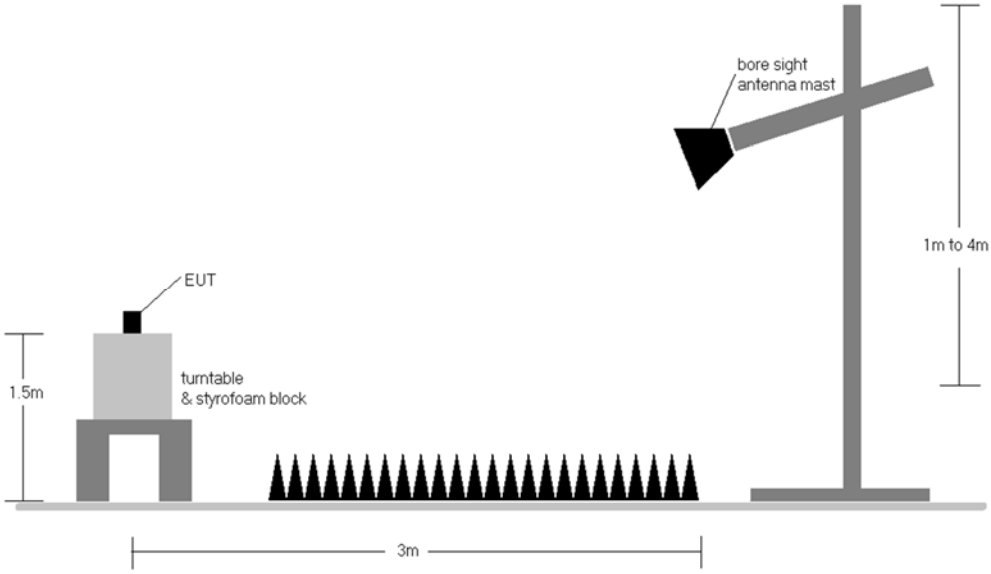

Figure 7-4. Radiated Test Setup >1GHz

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).

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [Watts]	EIRP Limit [dBm/10MHz]	Margin [dB]
3552.50	5	QPSK	V	155	243	1 / 0	11.45	9.08	**20.53**	**0.113**	23.00	-2.47
3625.00	5	QPSK	V	158	257	1 / 0	9.26	9.47	18.74	0.075	23.00	-4.26
3697.50	5	QPSK	V	167	230	1 / 0	7.10	9.57	16.67	0.046	23.00	-6.33
3552.50	5	16-QAM	V	155	243	1 / 0	9.66	9.08	**18.74**	0.075	23.00	-4.26
3552.50	5	64-QAM	V	155	243	1 / 0	8.24	9.08	**17.32**	0.054	23.00	-5.68
3552.50	5	256-QAM	V	155	243	1 / 0	5.74	9.08	**14.82**	**0.030**	23.00	-8.18
3555.00	10	QPSK	V	153	238	1 / 0	10.23	9.09	**19.33**	0.086	23.00	-3.67
3625.00	10	QPSK	V	150	227	1 / 0	9.32	9.47	18.80	0.076	23.00	-4.20
3695.00	10	QPSK	V	167	267	1 / 0	6.54	9.57	16.12	0.041	23.00	-6.88
3555.00	10	16-QAM	V	153	238	1 / 0	9.00	9.09	**18.09**	0.064	23.00	-4.91
3555.00	10	64-QAM	V	153	238	1 / 0	7.92	9.09	**17.02**	0.050	23.00	-5.98
3555.00	10	256-QAM	V	150	238	1 / 0	5.94	9.09	**15.03**	**0.032**	23.00	-7.97
3557.50	15	QPSK	V	149	245	1 / 0	10.50	9.10	**19.60**	0.091	23.00	-3.40
3625.00	15	QPSK	V	152	239	1 / 74	9.77	9.47	19.24	0.084	23.00	-3.76
3692.50	15	QPSK	V	167	228	1 / 74	7.62	9.58	17.20	0.053	23.00	-5.80
3557.50	15	16-QAM	V	149	245	1 / 0	9.60	9.10	**18.70**	0.074	23.00	-4.30
3557.50	15	64-QAM	V	149	245	1 / 0	8.85	9.10	**17.96**	0.062	23.00	-5.04
3557.50	15	256-QAM	V	149	245	1 / 0	7.03	9.10	**16.14**	**0.041**	23.00	-6.86
3560.00	20	QPSK	V	154	230	1 / 0	11.00	9.12	**20.12**	0.103	23.00	-2.88
3625.00	20	QPSK	V	148	223	1 / 0	9.40	9.47	18.87	0.077	23.00	-4.13
3690.00	20	QPSK	V	163	256	1 / 0	7.49	9.58	17.07	0.051	23.00	-5.93
3560.00	20	16-QAM	V	154	230	1 / 0	9.77	9.12	**18.88**	0.077	23.00	-4.12
3560.00	20	64-QAM	V	154	230	1 / 0	8.34	9.12	**17.45**	0.056	23.00	-5.55
3560.00	20	256-QAM	V	154	230	1 / 0	6.27	9.12	**15.38**	**0.035**	23.00	-7.62
3552.50	5	QPSK	H	135	57	1 / 0	7.66	6.59	14.25	0.027	23.00	-8.75
3552.50	5 (WCP)	QPSK	H	156	78	1 / 0	10.78	9.30	20.08	0.102	23.00	-2.92

Table 7-3. EIRP Data (Band 48)

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

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Test Setup

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

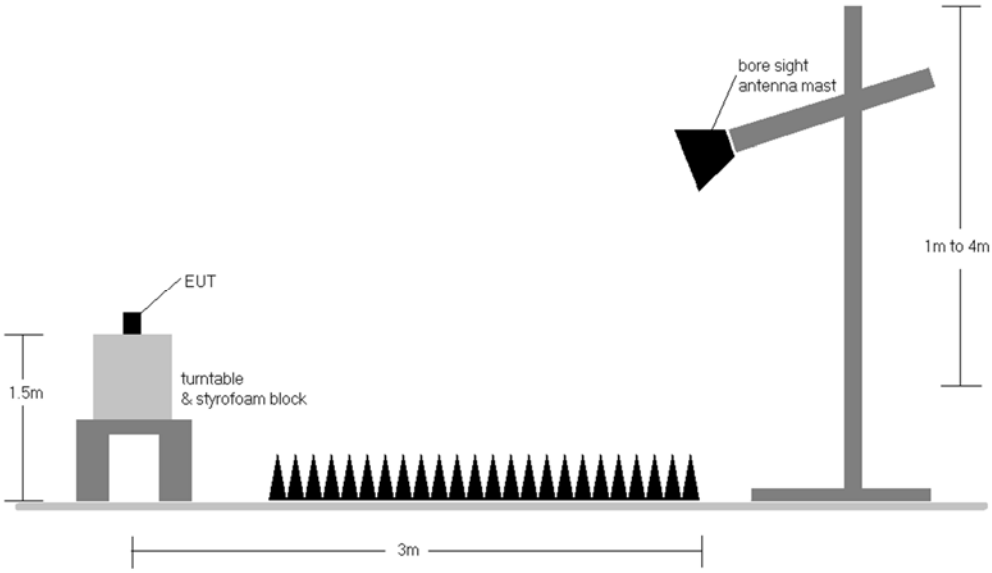

Figure 7-5. Test Instrument & Measurement Setup

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.

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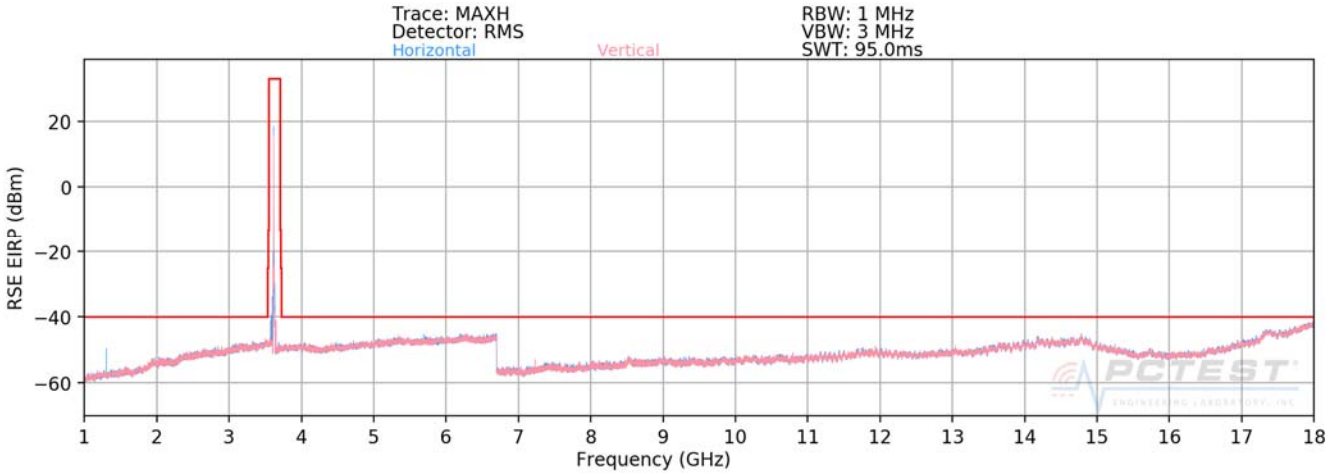
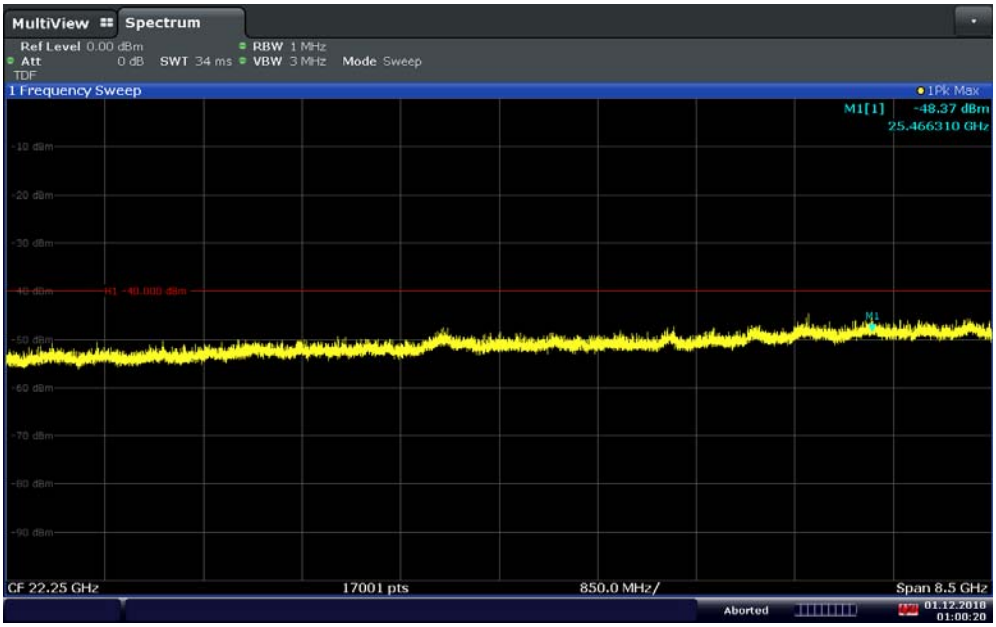
Band 48



Plot 7-38. Radiated Spurious Plot 1GHz - 18GHz (Band 48)



Plot 7-39. Radiated Spurious Plot 18GHz – 26.5GHz (Band 48)

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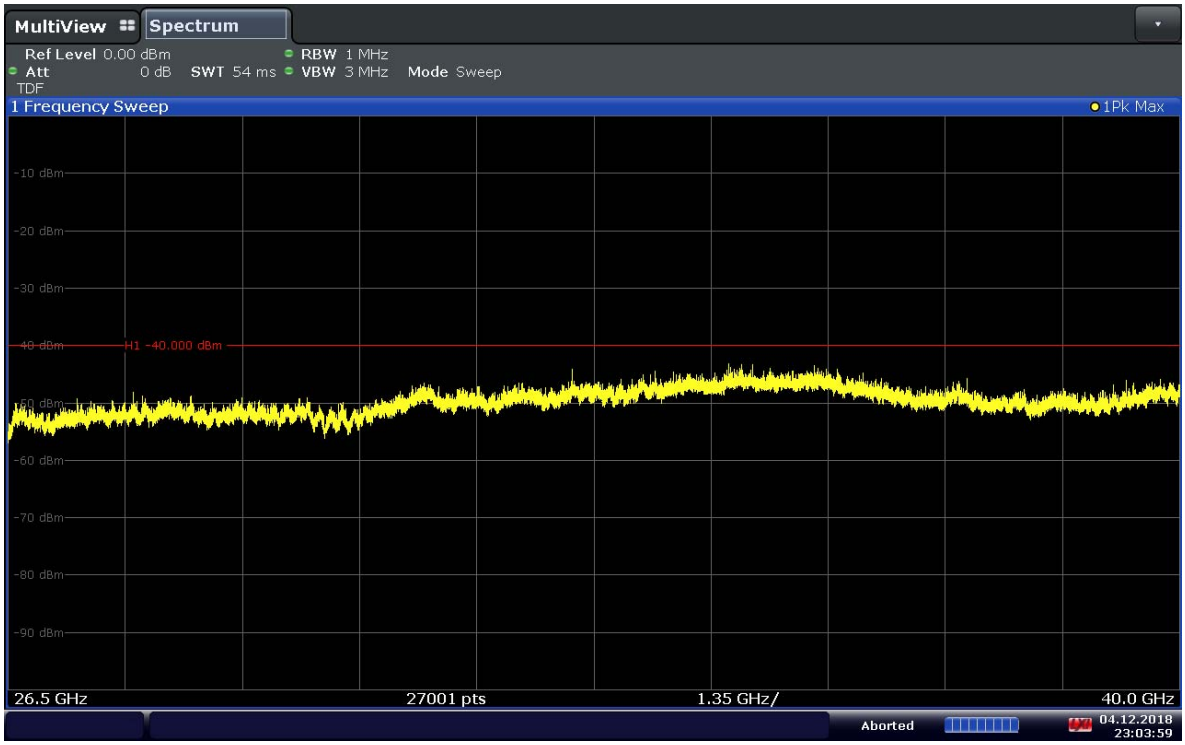

Plot 7-40. Radiated Spurious Plot 26.5GHz – 40GHz (Band 48)

OPERATING FREQUENCY:	3560.00	MHz
CHANNEL:	3625	
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	H	112	40	-64.78	11.71	-53.07	-13.1
10680.00	H	-	-	-68.59	12.55	-56.04	-16.0
14240.00	H	256	329	-55.67	11.35	-44.32	-4.3
17800.00	H	-	-	-56.41	10.01	-46.39	-6.4

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

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OPERATING FREQUENCY:	3625.00	MHz
CHANNEL:	3690	
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	H	118	35	-72.22	11.32	-60.91	-20.9
10875.00	H	-	-	-68.94	12.71	-56.23	-16.2
14500.00	H	263	329	-61.22	11.61	-49.61	-9.6

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

OPERATING FREQUENCY:	3690.00	MHz
CHANNEL:		
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	H	110	39	-65.73	10.96	-54.78	-14.8
11070.00	H	-	-	-68.94	12.72	-56.21	-16.2
14760.00	H	304	335	-56.05	12.02	-44.03	-4.0

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

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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	H	113	282	-70.01	11.71	-58.30	-18.3
11070.00	H	-	-	-70.01	12.55	-57.46	-17.5
14760.00	H	116	238	-60.20	11.35	-48.85	-8.8

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

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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

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Band 48 Frequency Stability Measurements

OPERATING FREQUENCY: 3,625,000,000 Hz

CHANNEL: 55900

REFERENCE VOLTAGE: 4.29 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %		+ 20 (Ref)	3,625,000,223	223	0.0000062
100 %	4.29	- 30	3,625,000,173	173	0.0000048
100 %		- 20	3,625,000,007	7	0.0000002
100 %		- 10	3,624,999,995	-5	-0.0000001
100 %		0	3,625,000,394	394	0.0000109
100 %		+ 10	3,624,999,870	-130	-0.0000036
100 %		+ 20	3,625,000,089	89	0.0000025
100 %		+ 30	3,625,000,337	337	0.0000093
100 %		+ 40	3,624,999,783	-217	-0.0000060
100 %		+ 50	3,625,000,182	182	0.0000050
BATT. ENDPOINT	3.67	+ 20	3,625,000,134	134	0.0000037

Table 7-8. Frequency Stability Data (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.

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Band 48 Frequency Stability Measurements

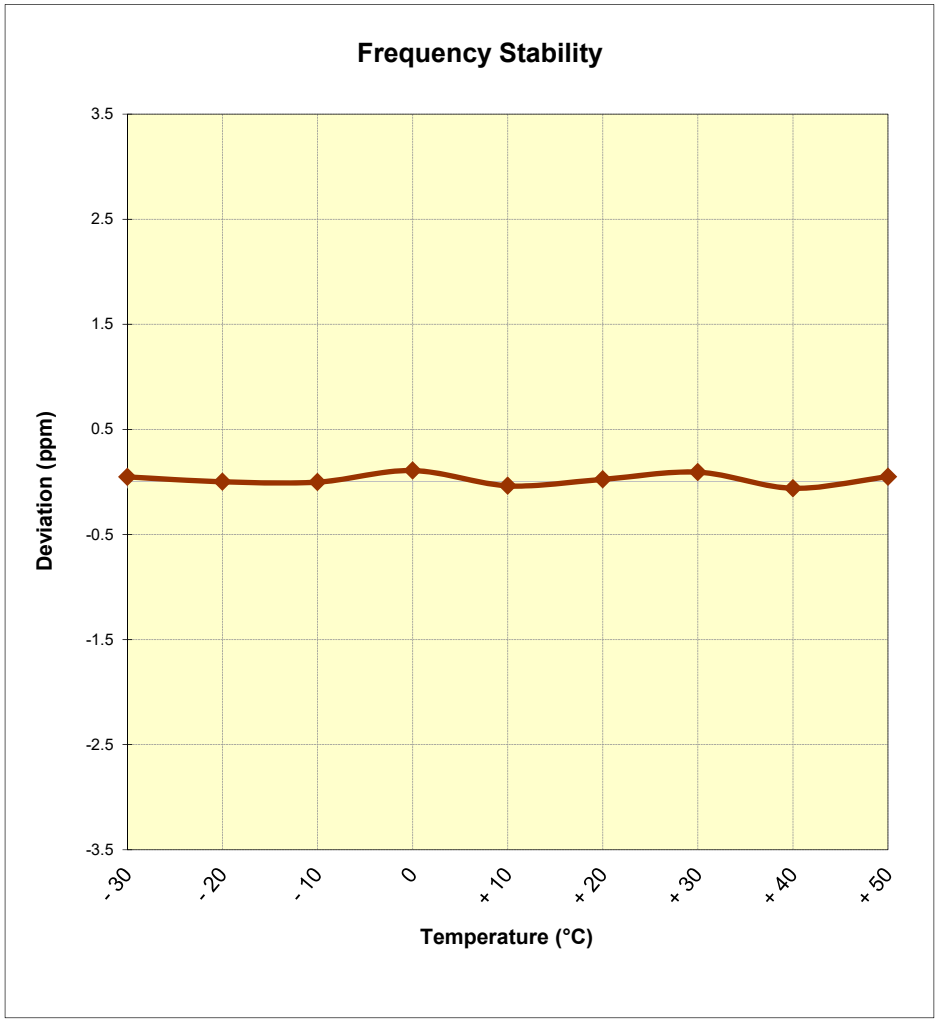

Figure 7-6. Frequency Stability Graph (Band 48)

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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 v01, 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 and power level at 13 dBm/MHz.
    b. Enable AP service from Ruckus Cloud management.
    c. Check EUT Tx frequency and power.
    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 – 3670MHz and power level at 8 dBm/MHz.
    b. Enable AP service from Ruckus Cloud management.
    c. Check EUT Tx frequency and power.
    d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.

Test Notes

The EUT is an End User Device.

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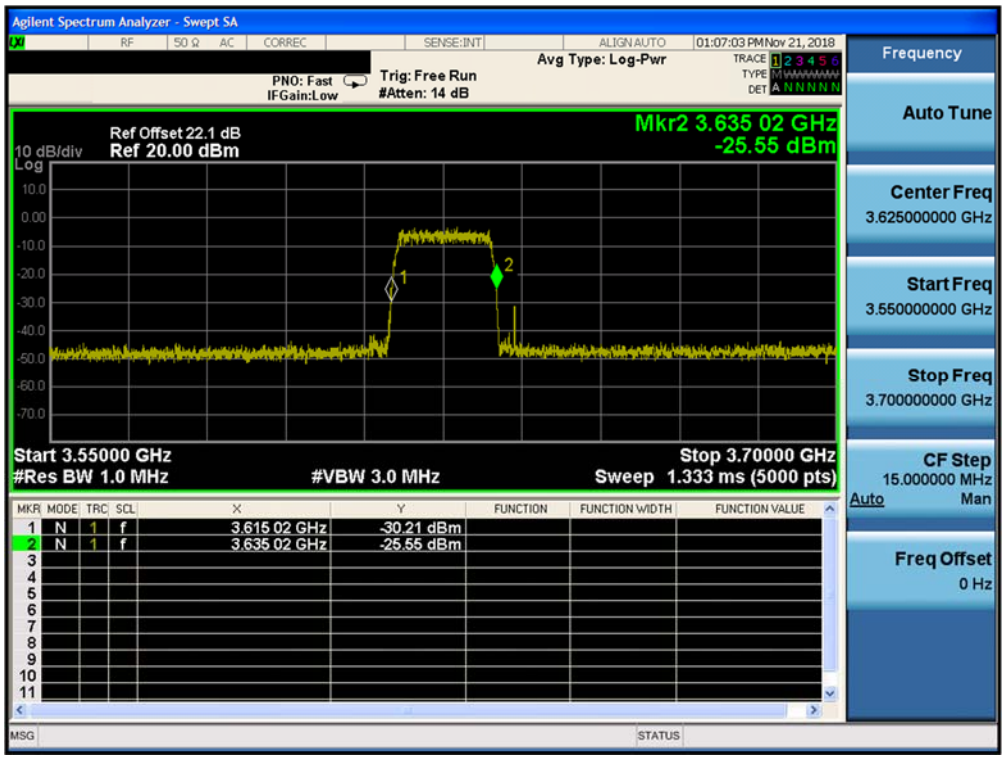
Run#1:

- Tx frequency set: 3615 – 3635MHz.
- MaxEIRP set: 13dBm/MHz



Plot 7-41. Run#1 End User Device Frequency of Operations

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Plot 7-42. 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.

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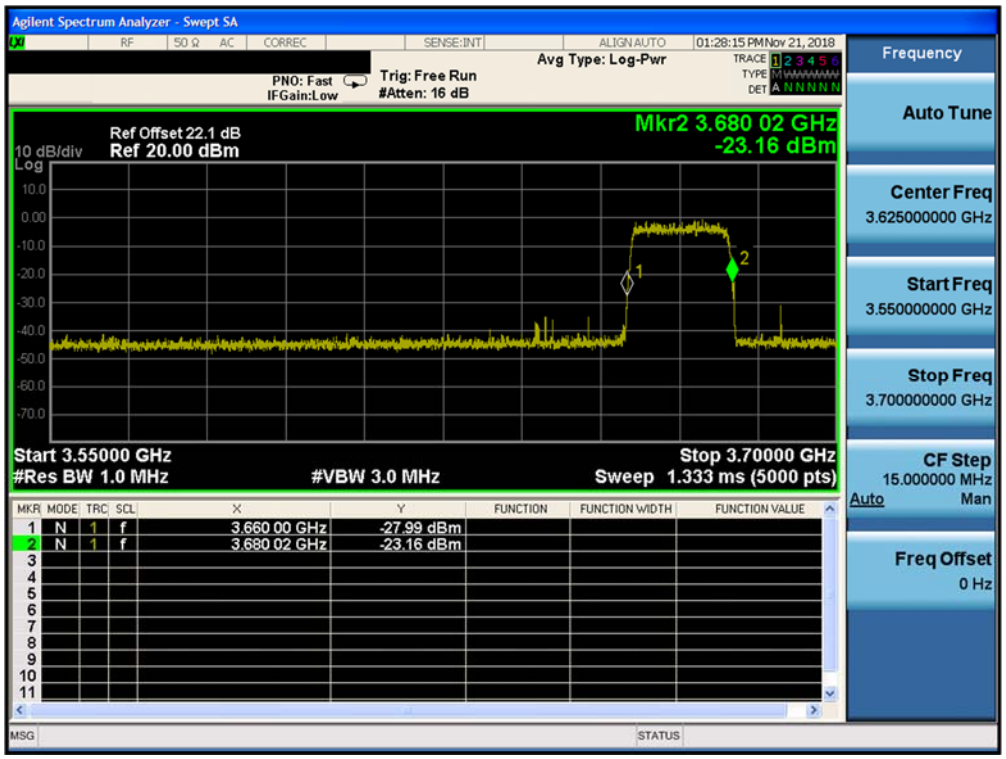
Run#2:

- Tx frequency set: 3660– 3670MHz.
- MaxEIRP set: 8dBm/MHz



Plot 7-43. Run#2 End User Device Frequency of Operations

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Plot 7-44. 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.

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG975U** complies with all of the End User Device requirements of Part 96 of the FCC Rules for LTE operation only.

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