PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
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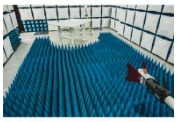


MEASUREMENT REPORT
Part 96 LTE

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

Date of Testing:
01/22 - 05/08/2019
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M1903060032-04.A3L

FCC ID:	**A3LSMG977T**
APPLICANT:	**Samsung Electronics Co., Ltd.**

Application Type:	Certification
Model:	SM-G977T
Additional Model(s):	SM-G977P
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.

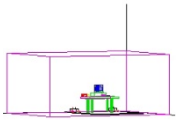
I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking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

Randy Ortanez
President

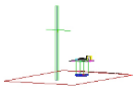
Authorized Test Lab

ACCREDITED
TESTING CERT#2041.01

TABLE OF CONTENTS



MEASUREMENT REPORT
FCC Part 96



Mode	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)		
LTE Band 48	27	3552.5 - 3697.5	0.079	18.97	4M53G7D	QPSK
LTE Band 48	27	3552.5 - 3697.5	0.062	17.95	4M52W7D	16QAM
LTE Band 48	27	3552.5 - 3697.5	0.046	16.59	4M53W7D	64QAM
LTE Band 48	27	3552.5 - 3697.5	0.026	14.17	4M51W7D	256QAM
LTE Band 48	27	3555 - 3695	0.081	19.11	9M05G7D	QPSK
LTE Band 48	27	3555 - 3695	0.063	18.00	9M03W7D	16QAM
LTE Band 48	27	3555 - 3695	0.046	16.66	9M04W7D	64QAM
LTE Band 48	27	3555 - 3695	0.027	14.27	9M03W7D	256QAM
LTE Band 48	27	3557.5 - 3692.5	0.080	19.05	13M5G7D	QPSK
LTE Band 48	27	3557.5 - 3692.5	0.063	18.01	13M5W7D	16QAM
LTE Band 48	27	3557.5 - 3692.5	0.046	16.67	13M5W7D	64QAM
LTE Band 48	27	3557.5 - 3692.5	0.027	14.36	13M5W7D	256QAM
LTE Band 48	27	3560 - 3690	0.088	19.46	18M1G7D	QPSK
LTE Band 48	27	3560 - 3690	0.067	18.25	18M0W7D	16QAM
LTE Band 48	27	3560 - 3690	0.050	16.98	18M0W7D	64QAM
LTE Band 48	27	3560 - 3690	0.031	14.94	18M0W7D	256QAM

EUT Overview (LTE B48)

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.

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMG977T**. 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.: 9878B, 2581B, 2573B, 0263M, 0244M.

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1, BC10), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n41, n260, n261, EN-DC), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC, Wireless Phone Transfer

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 which is equivalent to the required minimum attenuation of 16 + $10\log_{10}$(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.

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
-	LTx3	LIcensed Transmitter Cable Set	8/23/2018	Annual	8/23/2019	LTx3
Agilent	N9030A	PXA Signal Analyzer (44GHz)	5/25/2018	Annual	5/25/2019	MY52350166
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	4/25/2019	Annual	4/25/2020	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			QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	PWR-SEN-4RMS	USB Power Sensor	4/19/2019	Annual	4/19/2020	11401010036
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	9/19/2018	Annual	9/19/2019	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.

2. 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.

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).

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.

FCC ID: A3LSMG977T

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)	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		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.

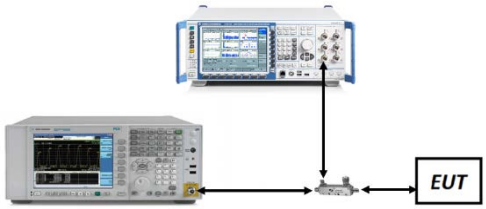
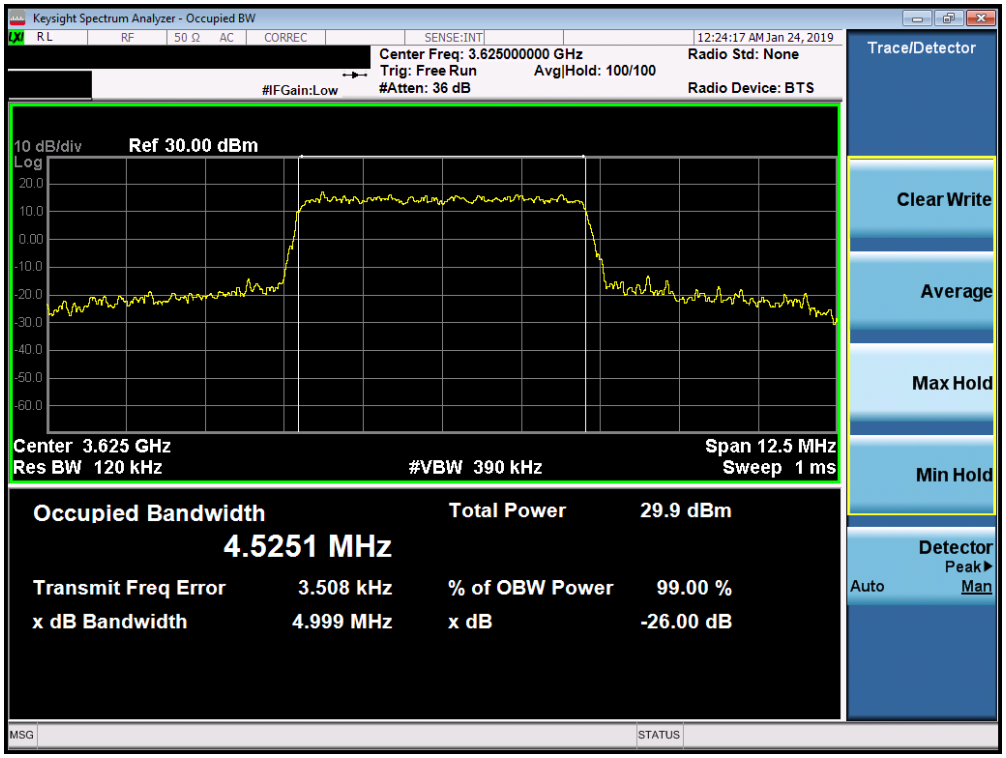


Figure 7-1. Test Instrument & Measurement Setup

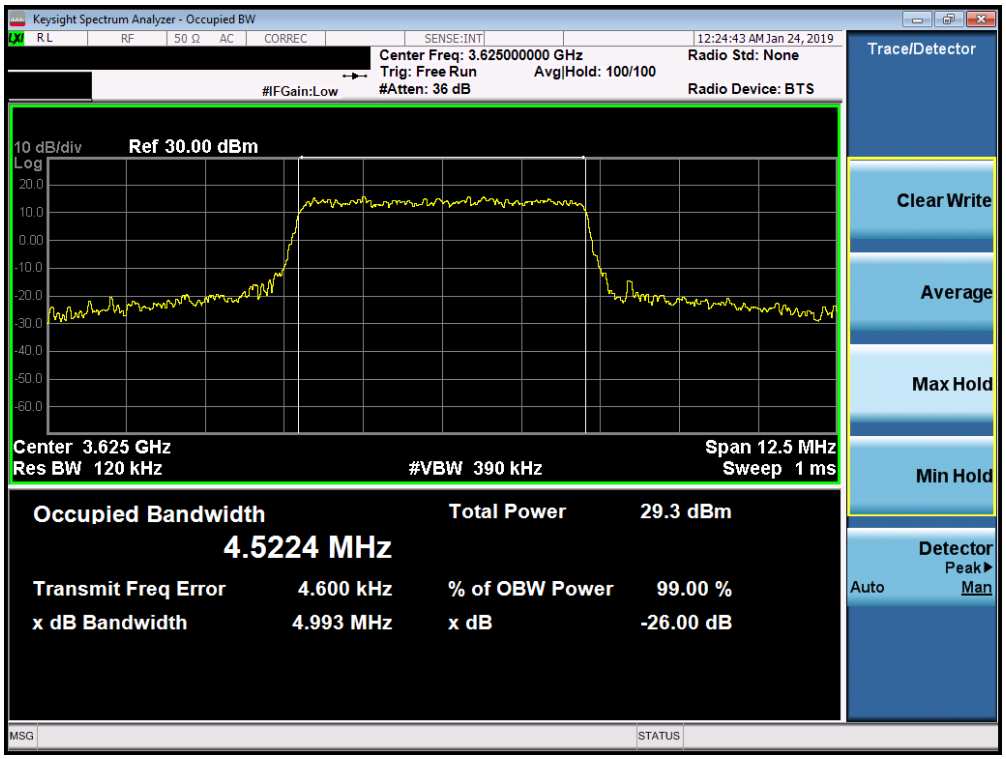
Test Notes

None.

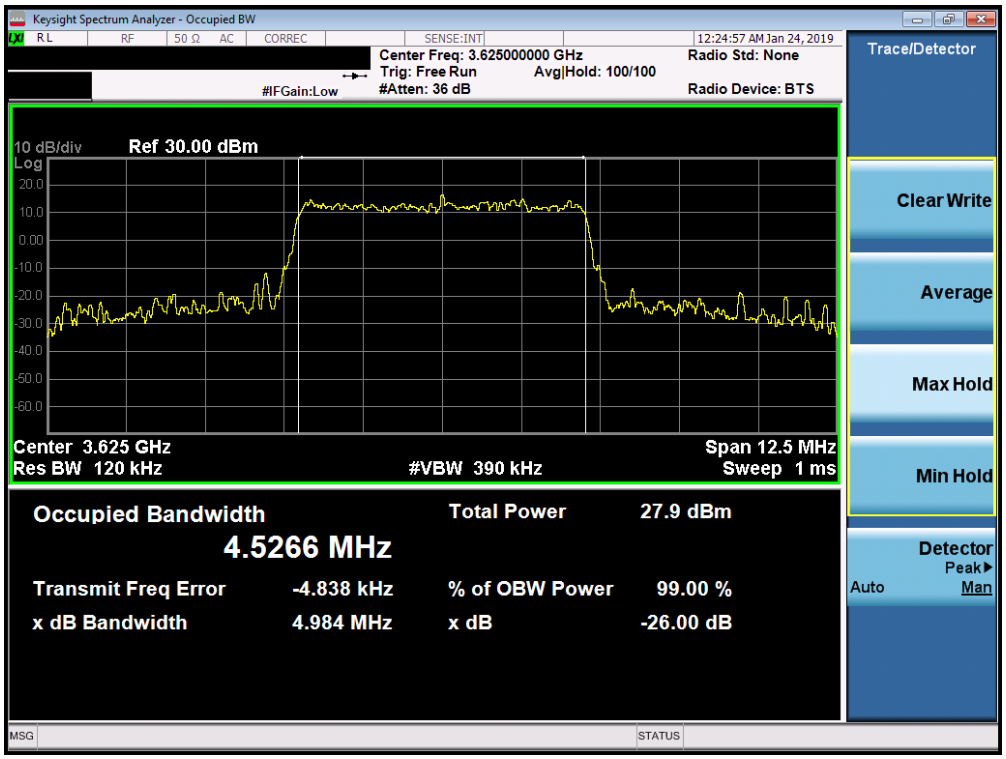
Band 48



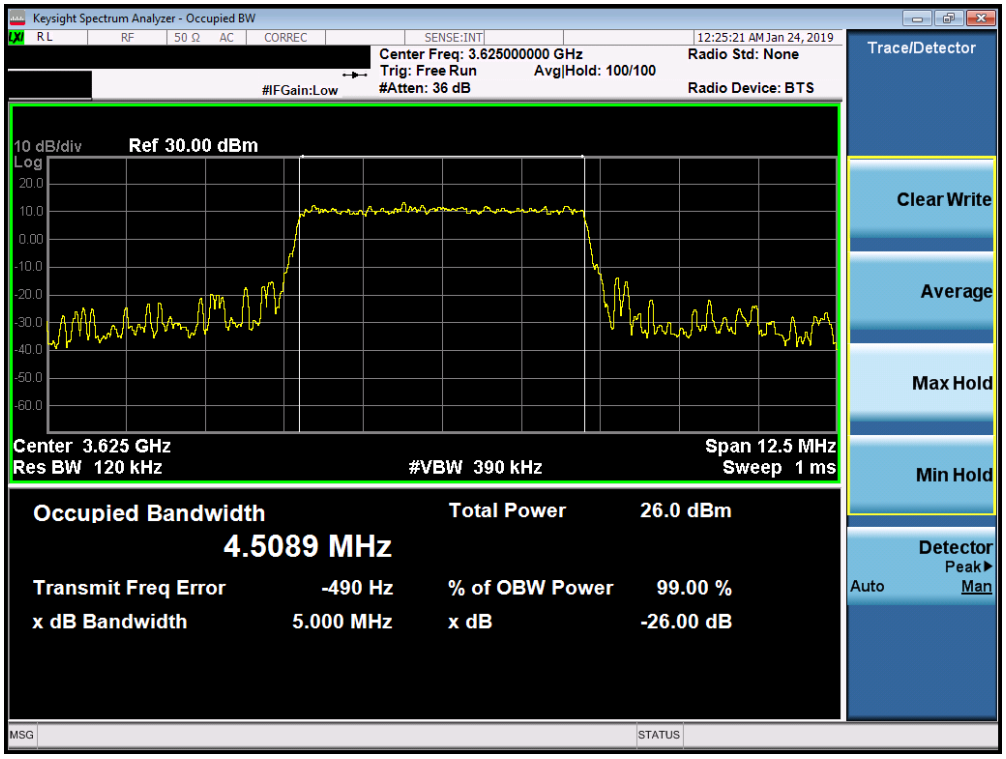
Plot 7-1. Occupied Bandwidth Plot (Band 48 – 5.0MHz QPSK - Full RB Configuration)



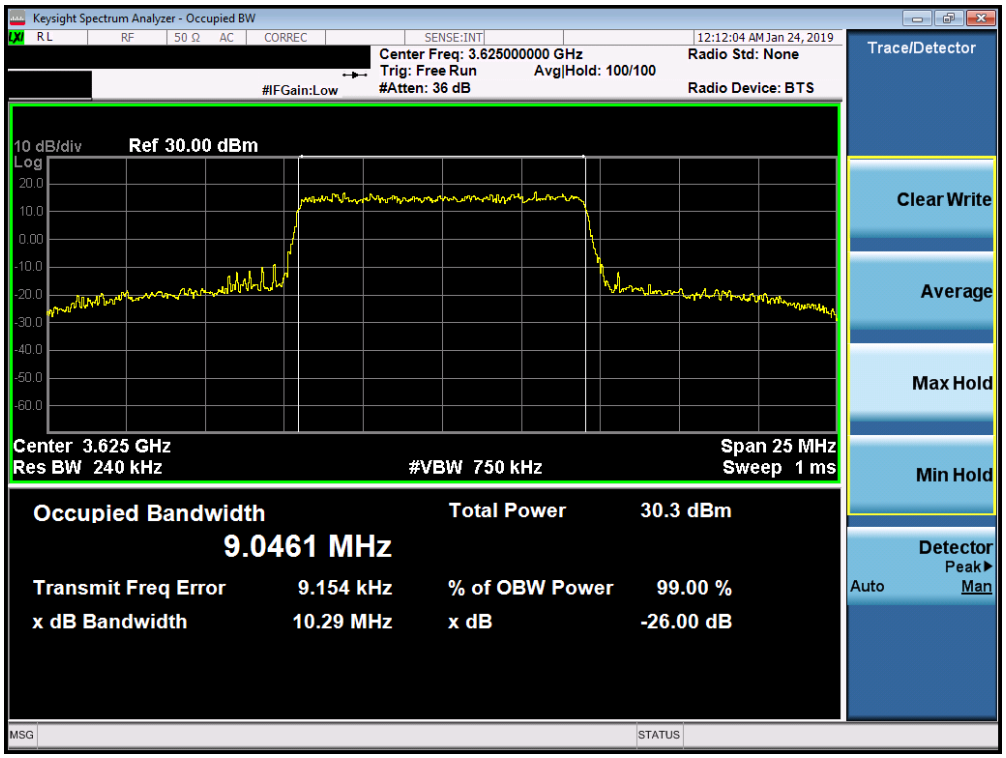
Plot 7-2. Occupied Bandwidth Plot (Band 48 – 5.0MHz 16-QAM - Full RB Configuration)



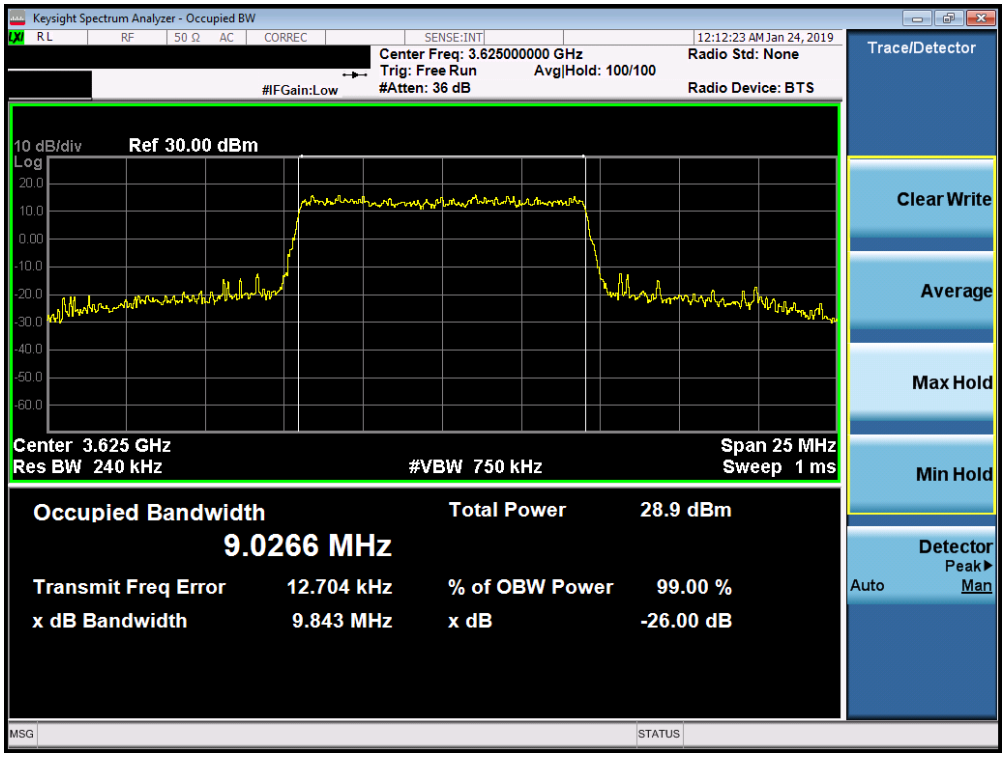
Plot 7-3. Occupied Bandwidth Plot (Band 48 – 5.0MHz 64-QAM - Full RB Configuration)



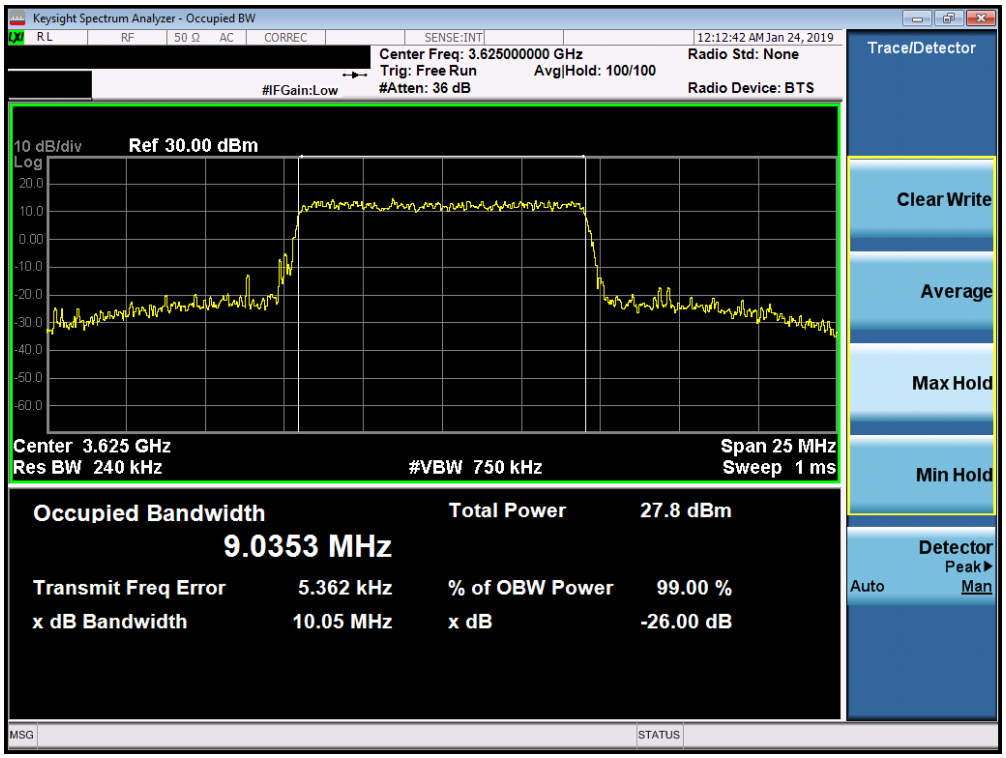
Plot 7-4. Occupied Bandwidth Plot (Band 48 – 5.0MHz 256-QAM - Full RB Configuration)



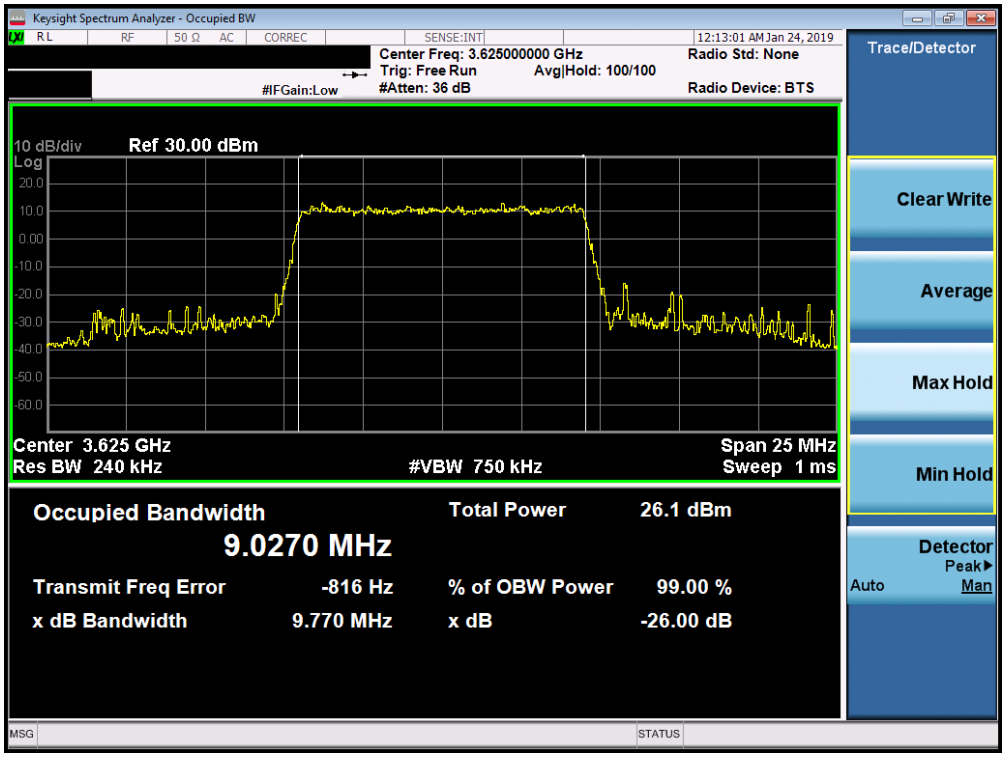
Plot 7-5. Occupied Bandwidth Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)



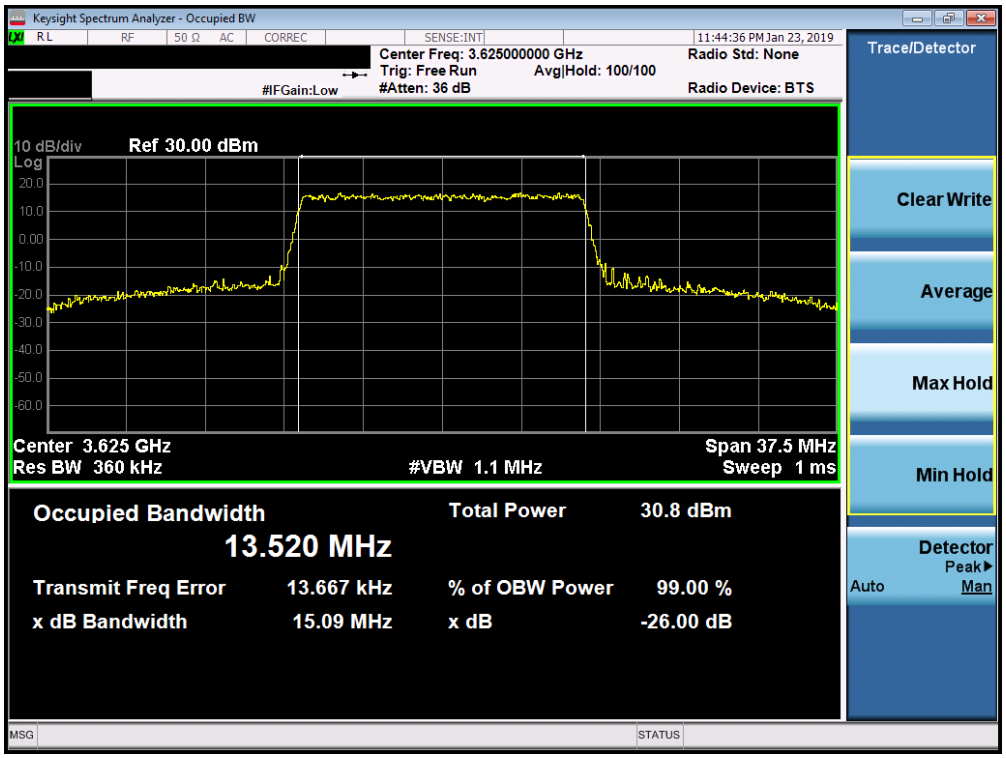
Plot 7-6. Occupied Bandwidth Plot (Band 48 - 10.0MHz 16-QAM - Full RB Configuration)



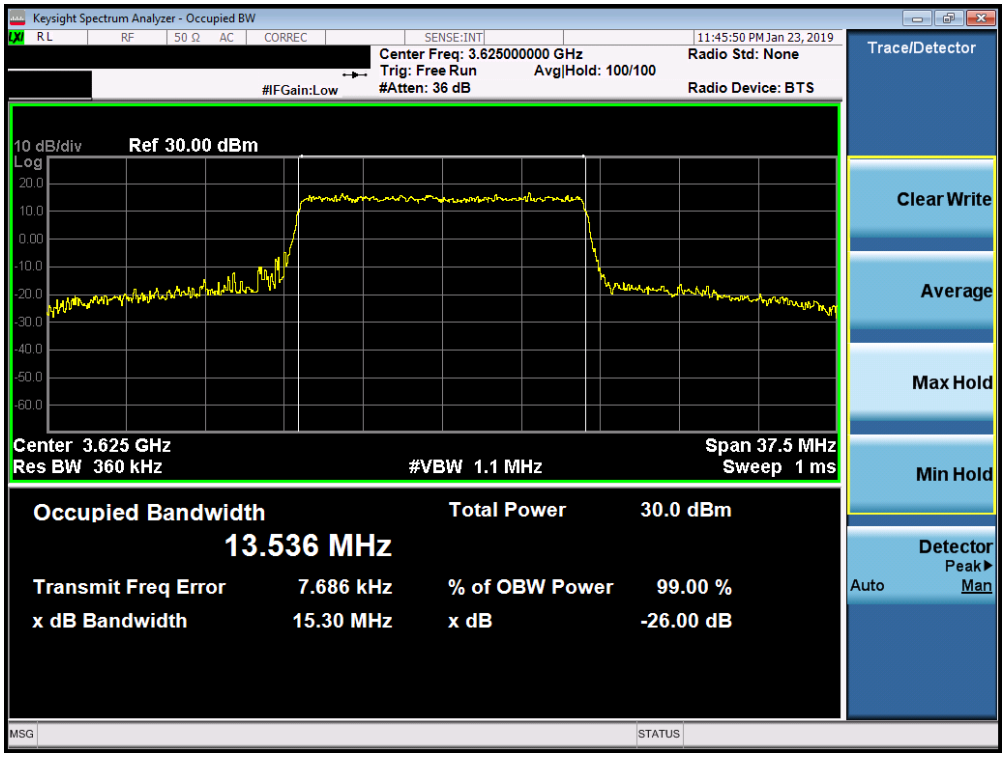
Plot 7-7. Occupied Bandwidth Plot (Band 48 - 10.0MHz 64-QAM - Full RB Configuration)



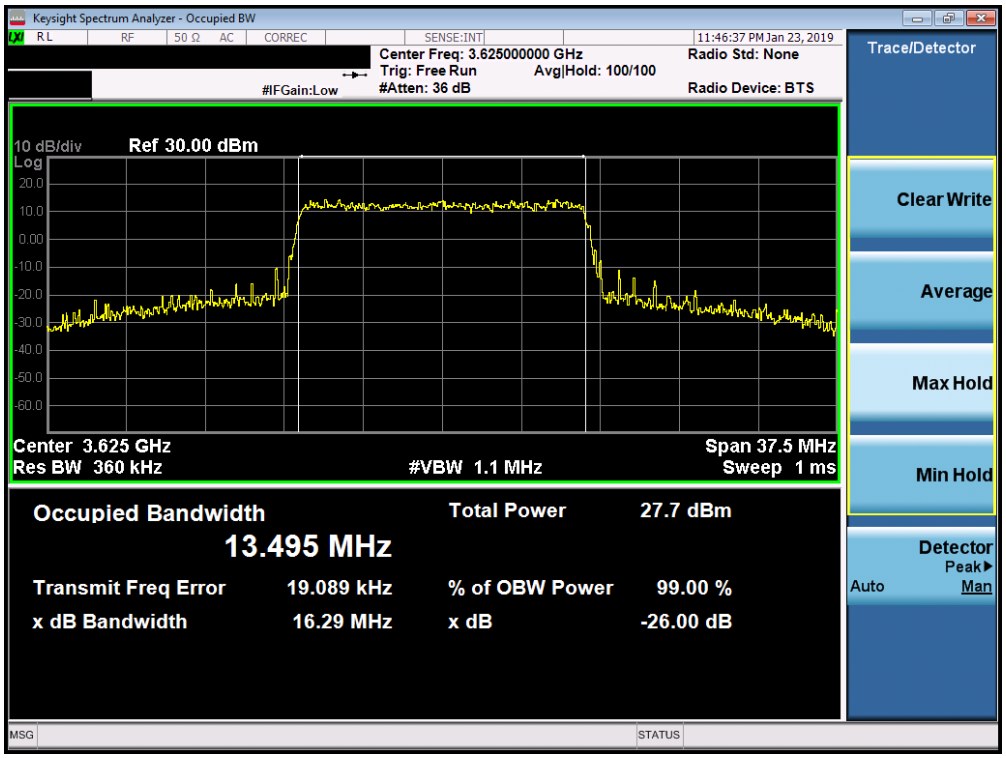
Plot 7-8. Occupied Bandwidth Plot (Band 48 - 10.0MHz 256-QAM - Full RB Configuration)



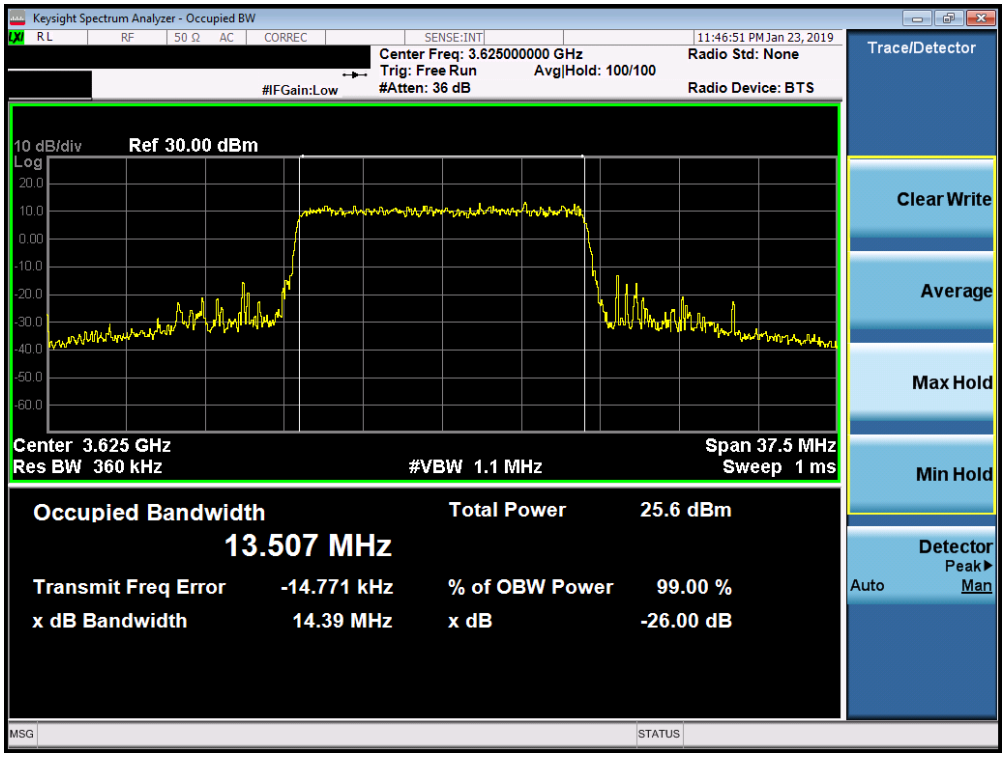
Plot 7-9. Occupied Bandwidth Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



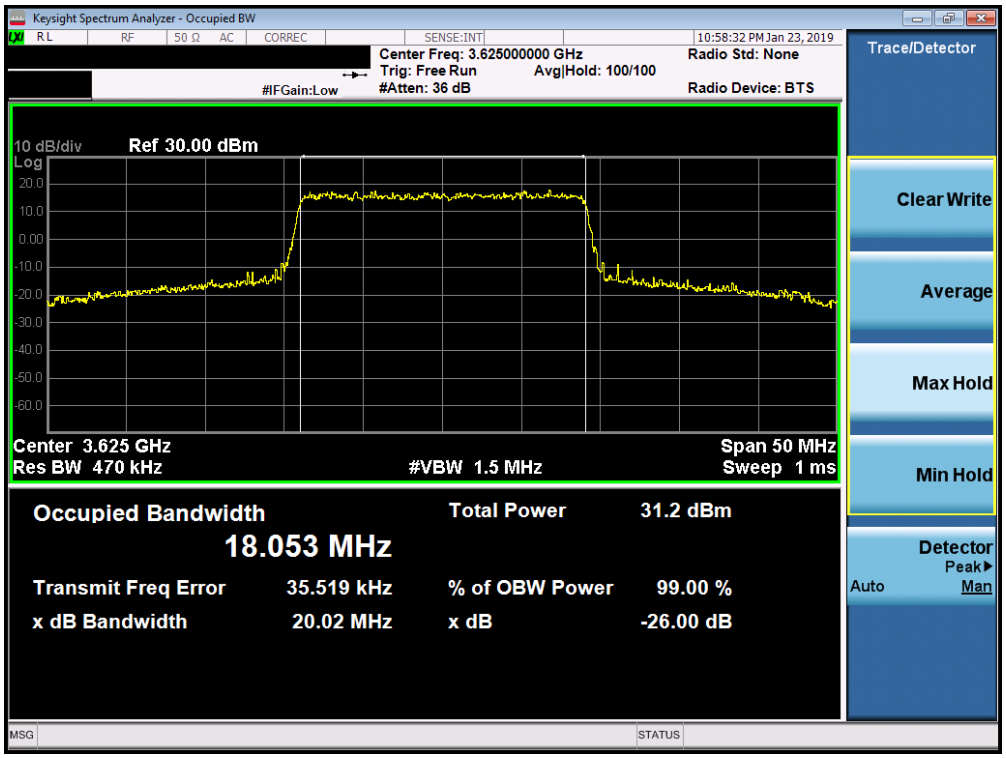
Plot 7-10. Occupied Bandwidth Plot (Band 48 - 15.0MHz 16-QAM - Full RB Configuration)



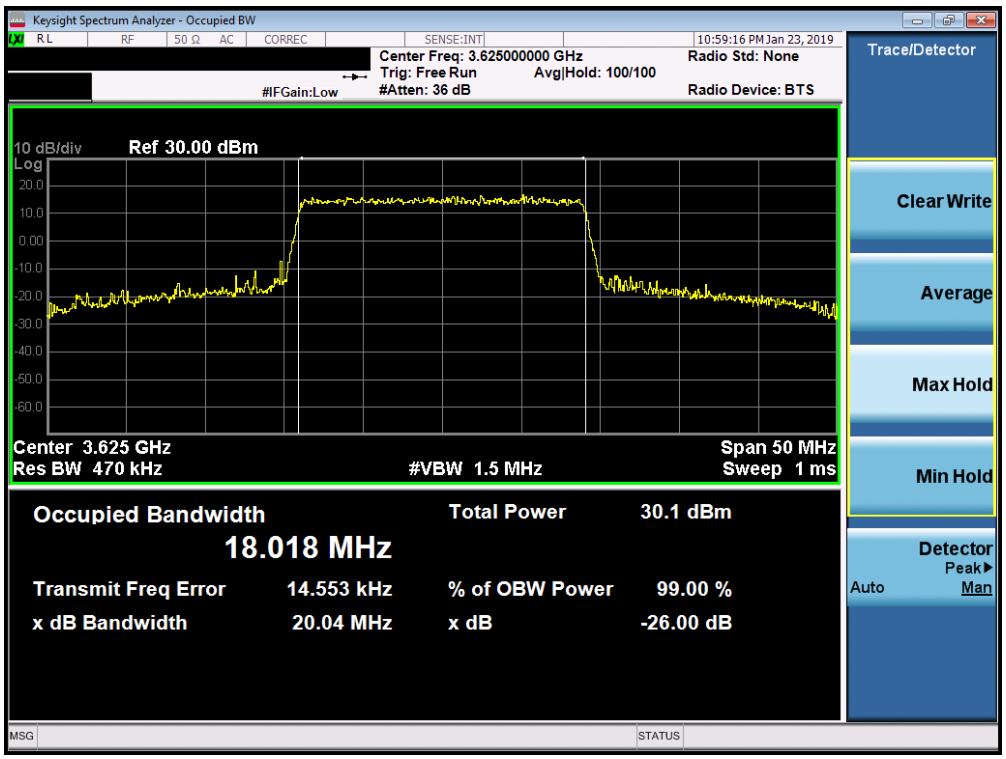
Plot 7-11. Occupied Bandwidth Plot (Band 48 - 15.0MHz 64-QAM - Full RB Configuration)



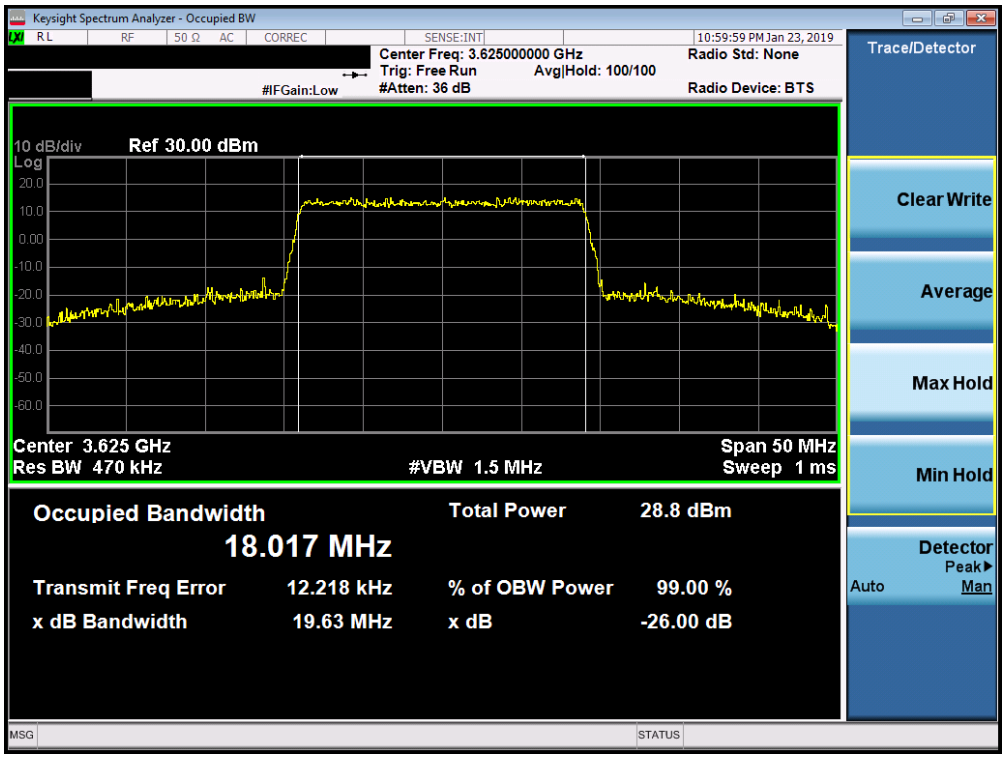
Plot 7-12. Occupied Bandwidth Plot (Band 48 - 15.0MHz 256-QAM - Full RB Configuration)



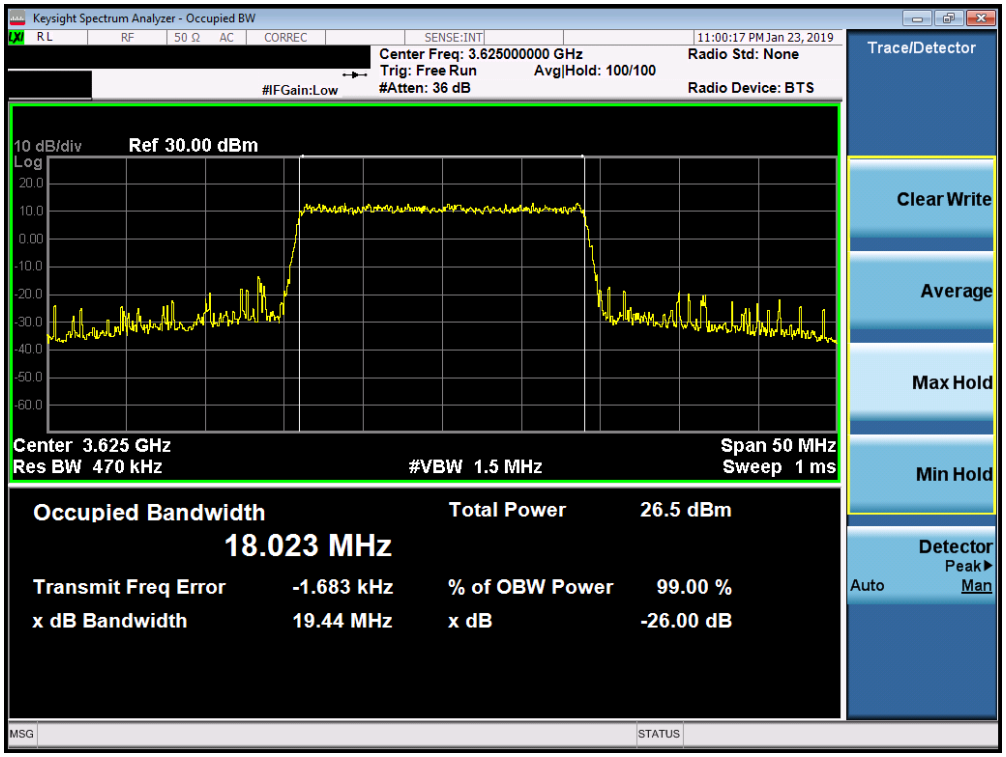
Plot 7-13. Occupied Bandwidth Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



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



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)

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.

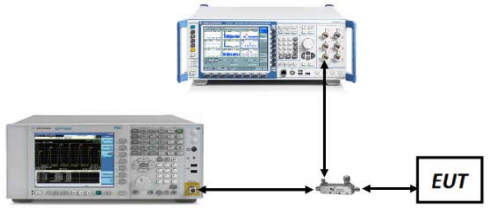
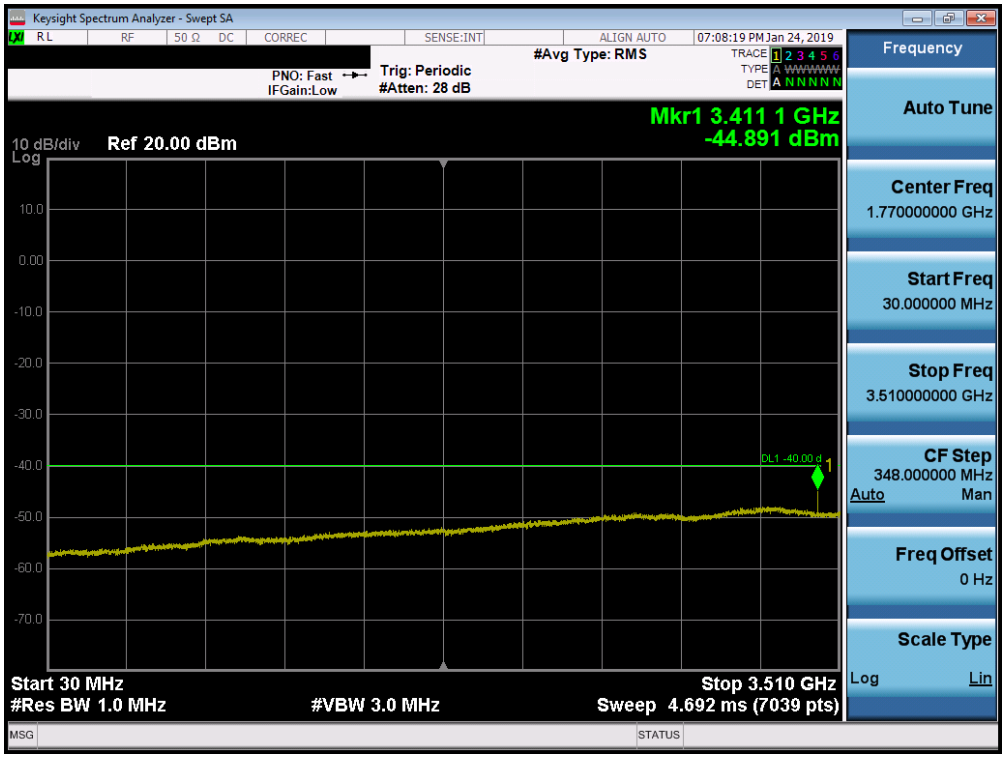


Figure 7-2. Test Instrument & Measurement Setup

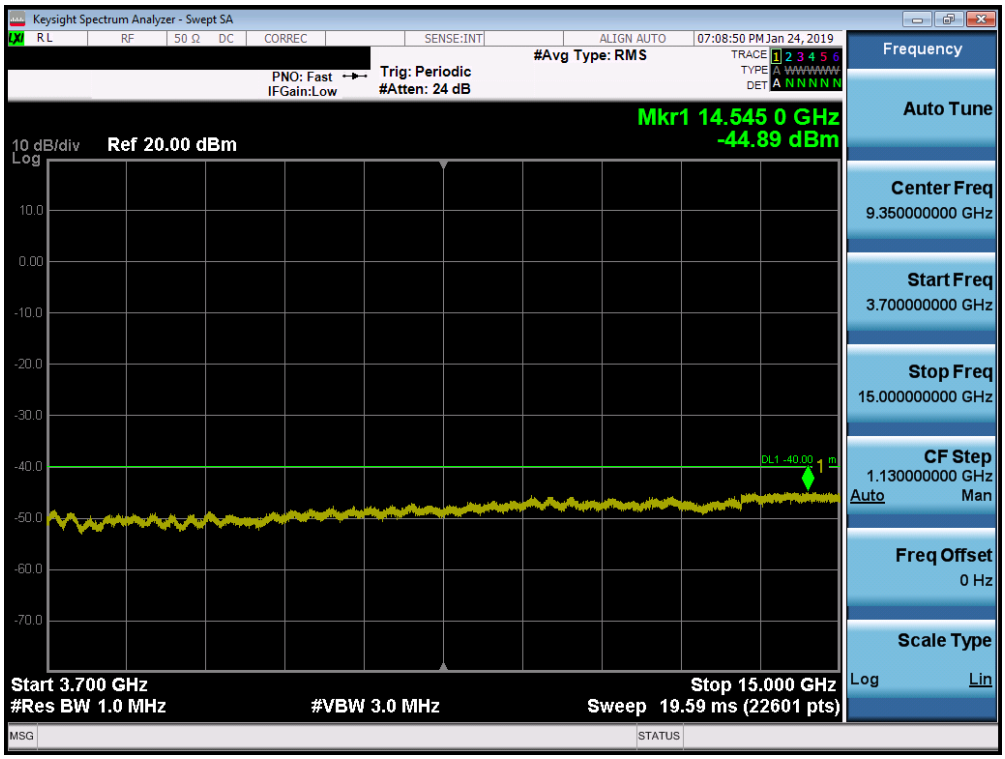
Test Notes

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.

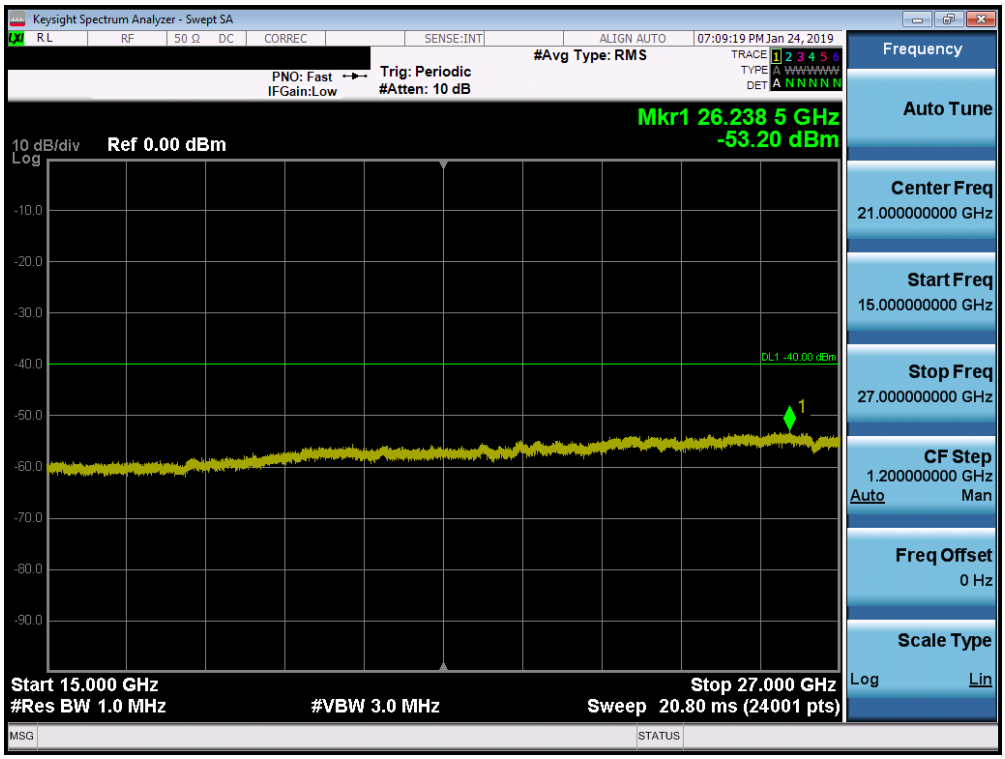
Band 48



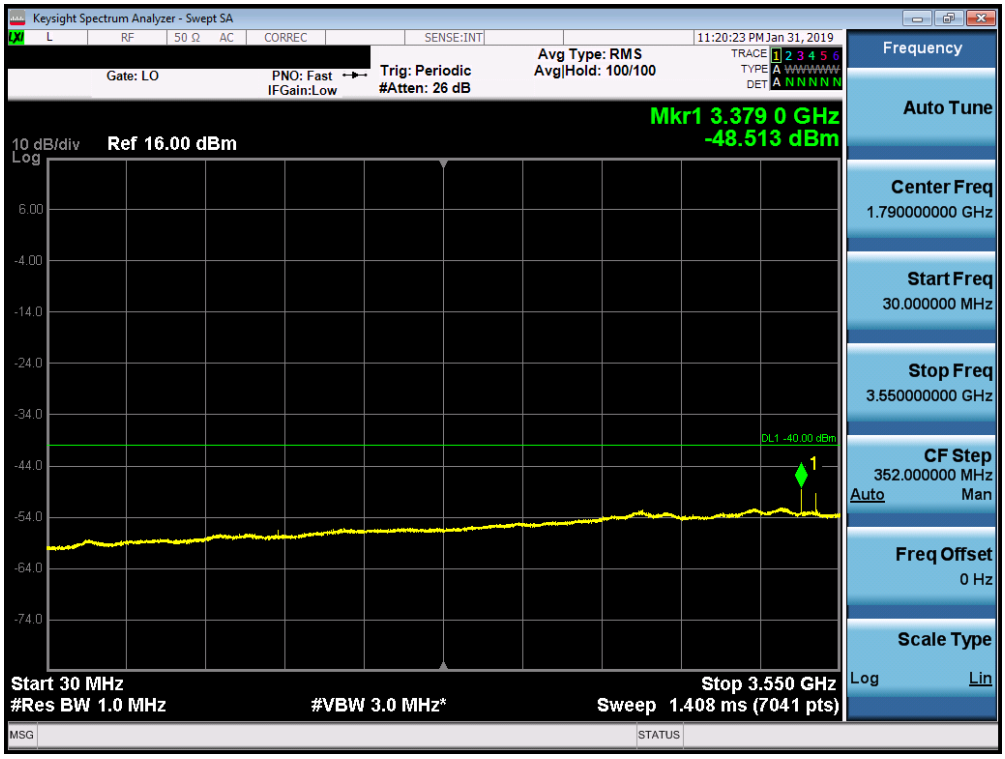
Plot 7-17. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



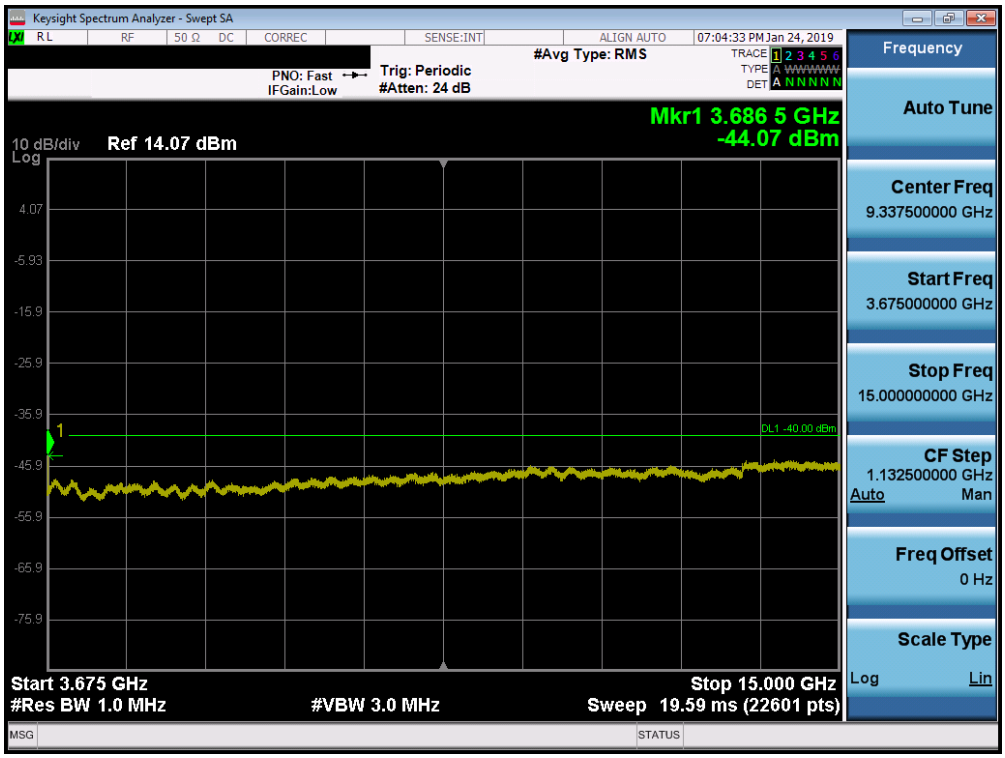
Plot 7-18. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



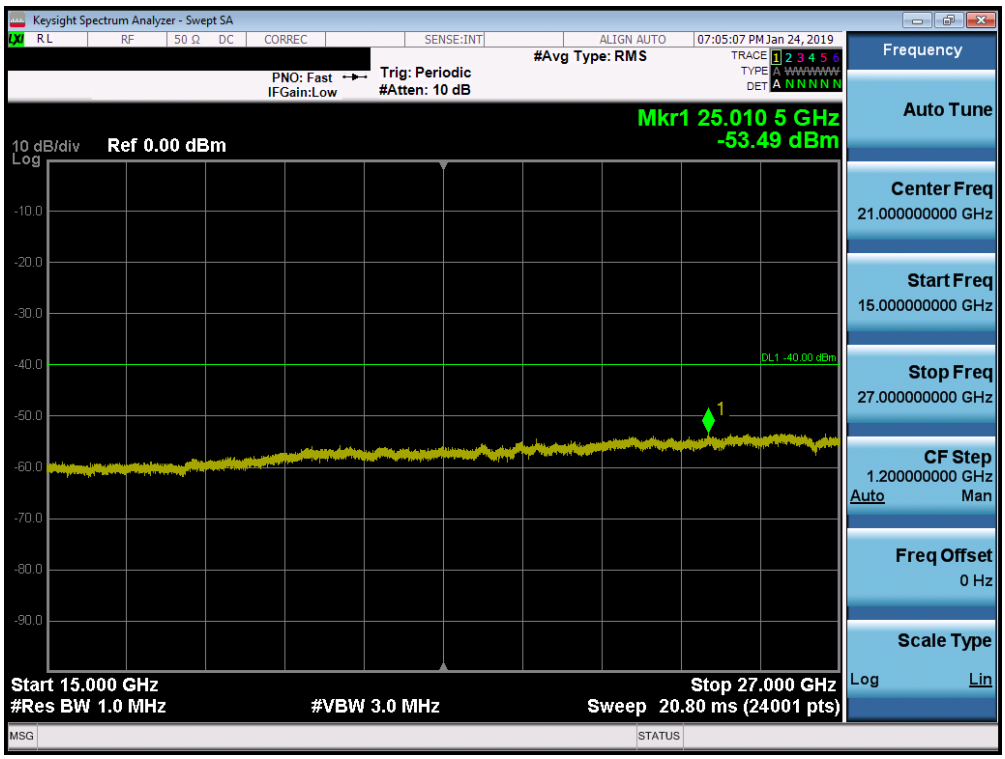
Plot 7-19. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



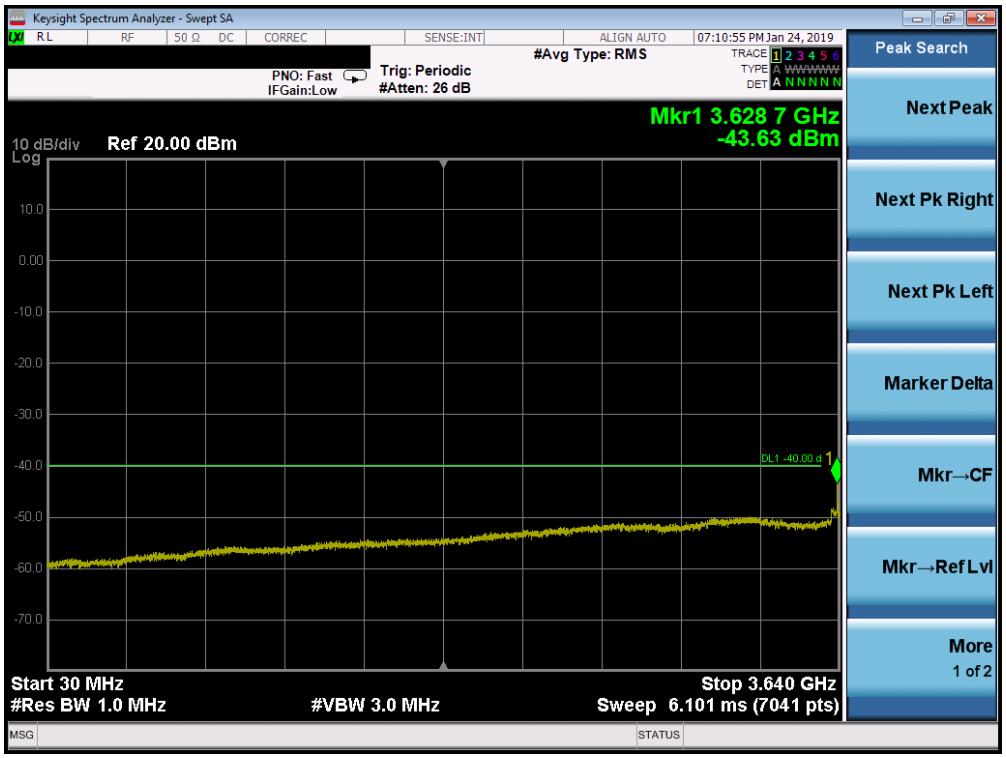
Plot 7-20. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



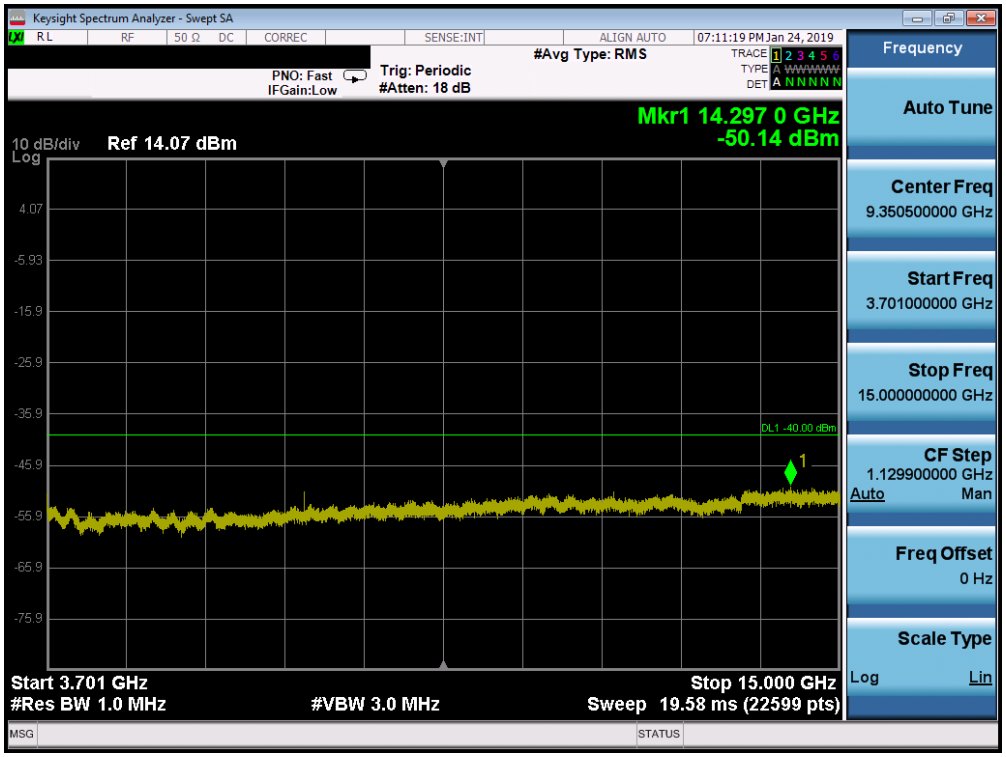
Plot 7-21. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



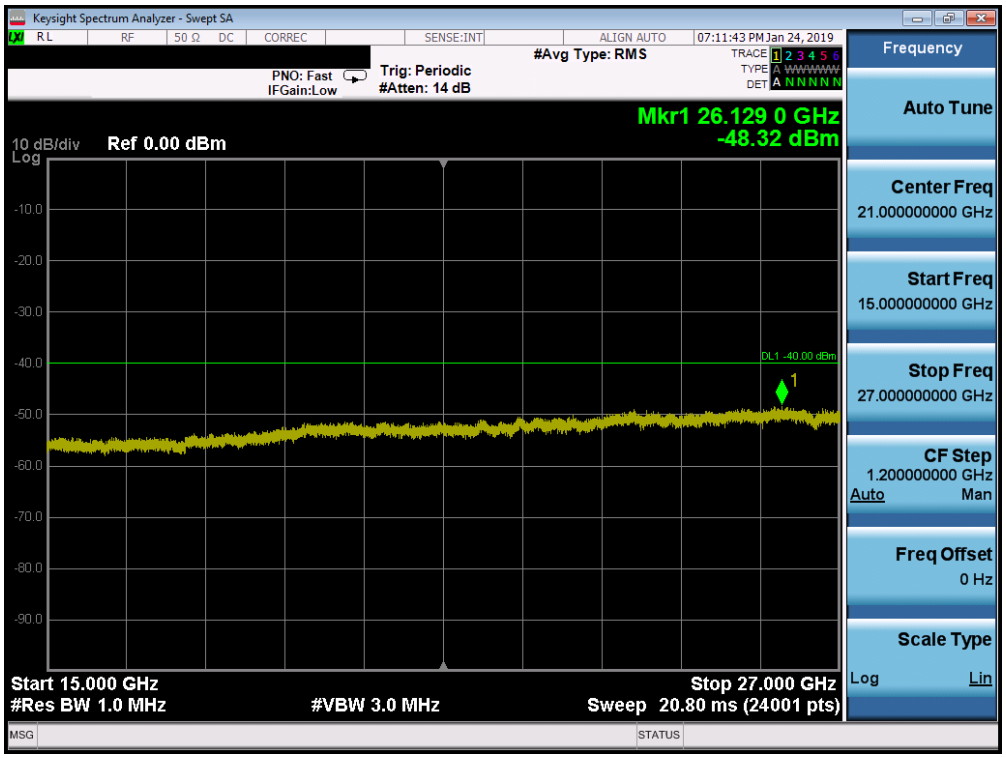
Plot 7-22. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



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)



Plot 7-25. Conducted Spurious Plot (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)

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.

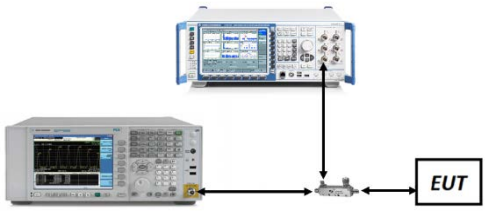
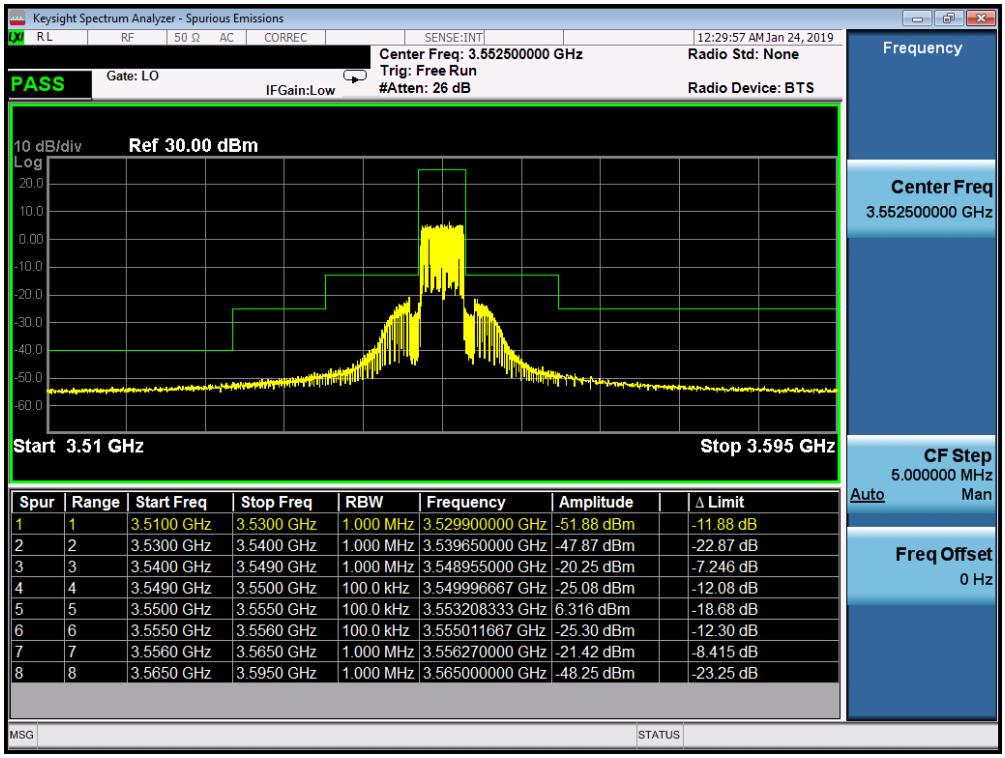


Figure 7-3. Test Instrument & Measurement Setup

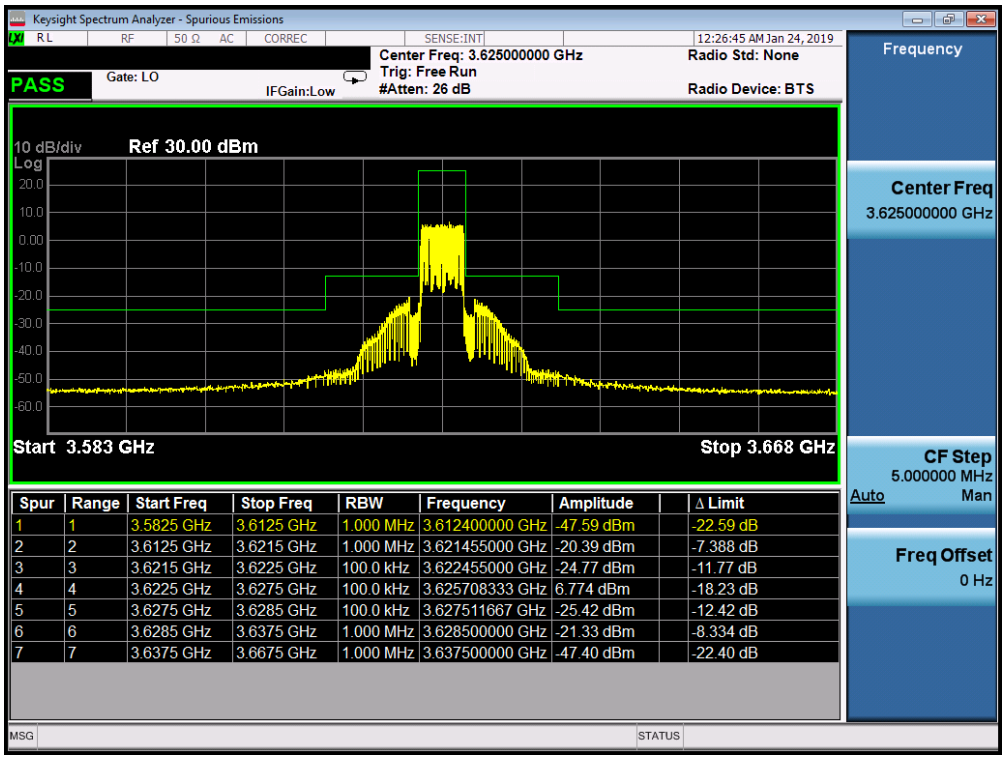
Test Notes

Band 48



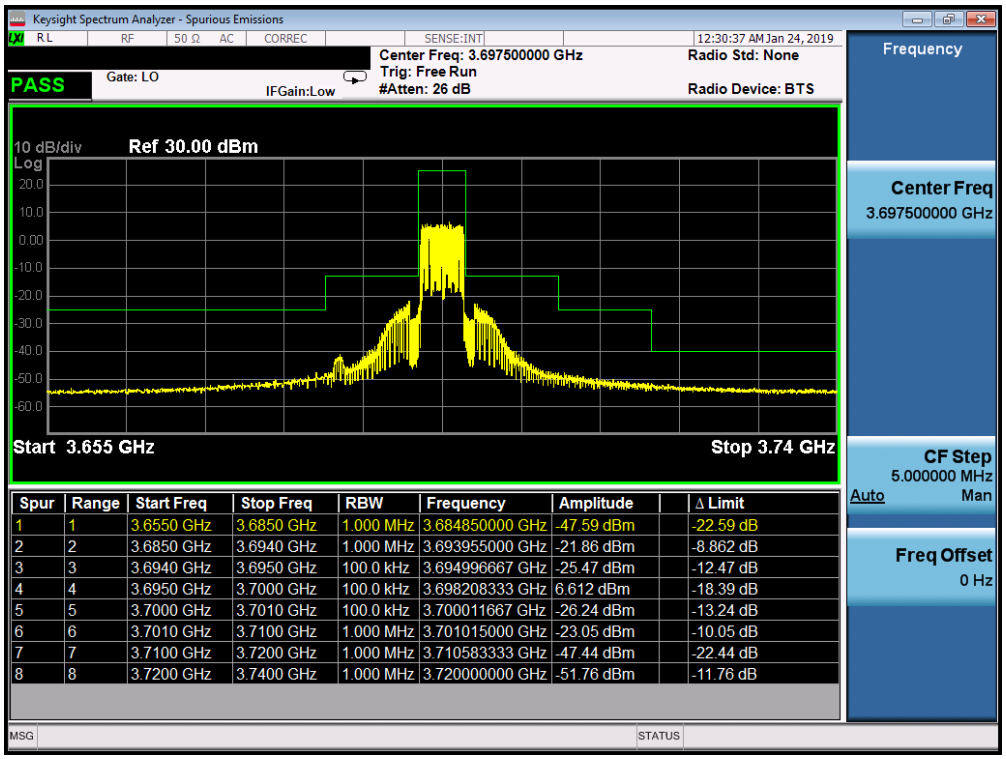
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.529900000 GHz	-51.88 dBm	-11.88 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539650000 GHz	-47.87 dBm	-22.87 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.548955000 GHz	-20.25 dBm	-7.246 dB
4	4	3.5490 GHz	3.5500 GHz	100.0 kHz	3.549996667 GHz	-25.08 dBm	-12.08 dB
5	5	3.5500 GHz	3.5550 GHz	100.0 kHz	3.553208333 GHz	6.316 dBm	-18.68 dB
6	6	3.5550 GHz	3.5560 GHz	100.0 kHz	3.555011667 GHz	-25.30 dBm	-12.30 dB
7	7	3.5560 GHz	3.5650 GHz	1.000 MHz	3.556270000 GHz	-21.42 dBm	-8.415 dB
8	8	3.5650 GHz	3.5950 GHz	1.000 MHz	3.565000000 GHz	-48.25 dBm	-23.25 dB

Plot 7-26. Lower Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)



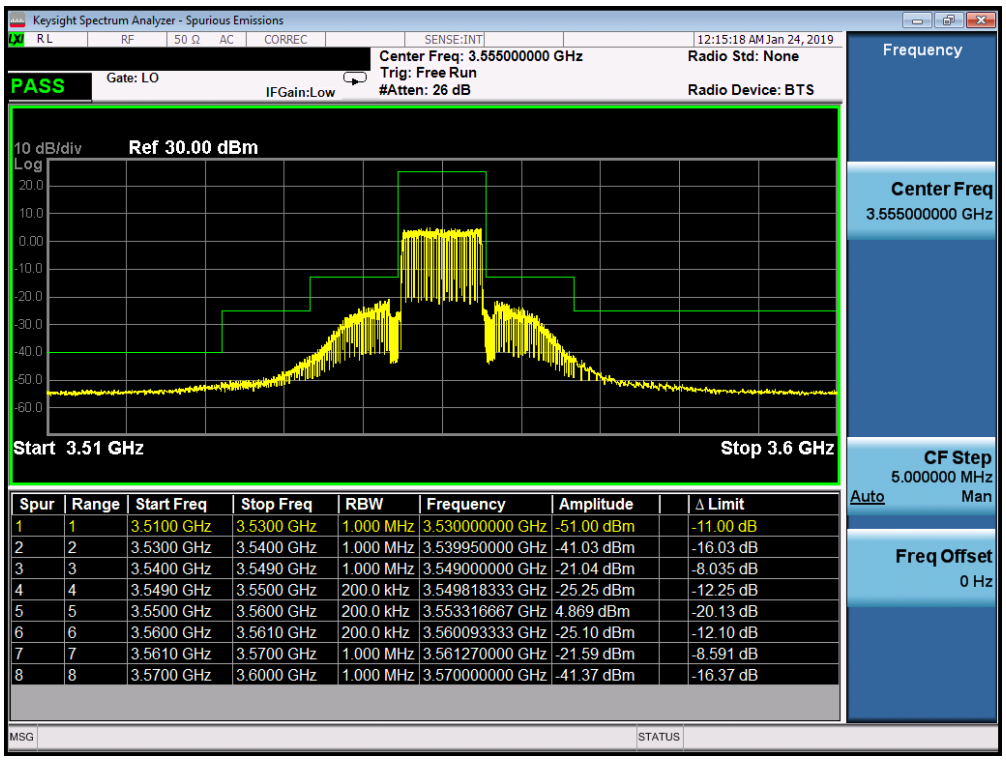
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5825 GHz	3.6125 GHz	1.000 MHz	3.612400000 GHz	-47.59 dBm	-22.59 dB
2	2	3.6125 GHz	3.6215 GHz	1.000 MHz	3.621455000 GHz	-20.39 dBm	-7.388 dB
3	3	3.6215 GHz	3.6225 GHz	100.0 kHz	3.622455000 GHz	-24.77 dBm	-11.77 dB
4	4	3.6225 GHz	3.6275 GHz	100.0 kHz	3.625708333 GHz	6.774 dBm	-18.23 dB
5	5	3.6275 GHz	3.6285 GHz	100.0 kHz	3.627511667 GHz	-25.42 dBm	-12.42 dB
6	6	3.6285 GHz	3.6375 GHz	1.000 MHz	3.628500000 GHz	-21.33 dBm	-8.334 dB
7	7	3.6375 GHz	3.6675 GHz	1.000 MHz	3.637500000 GHz	-47.40 dBm	-22.40 dB

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



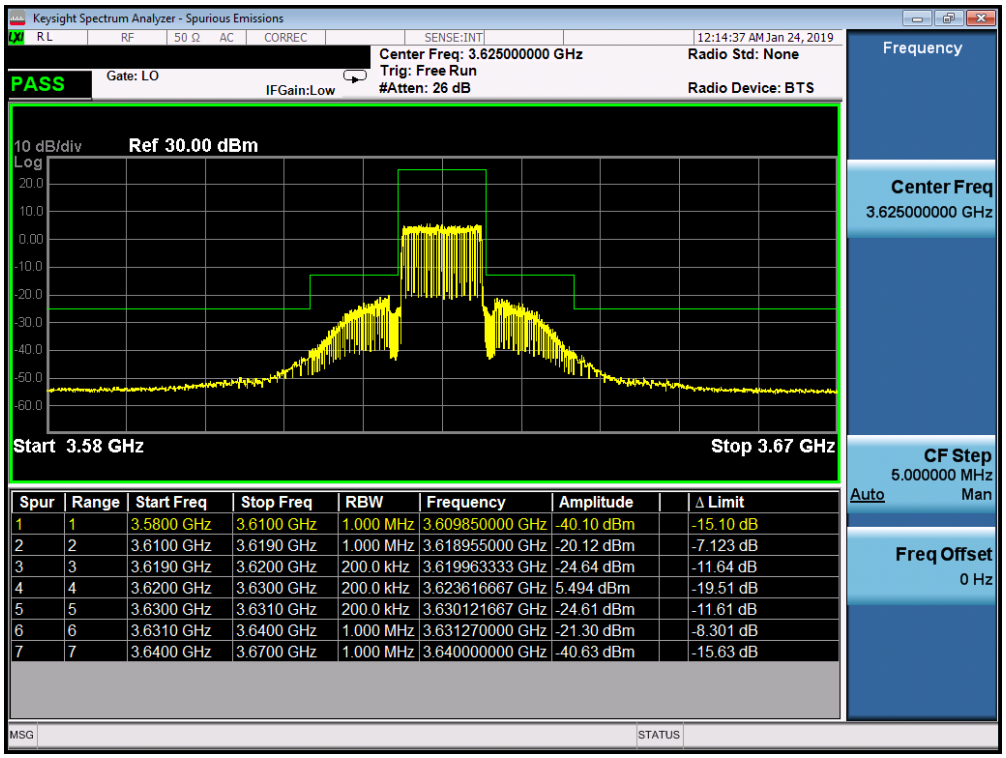
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6550 GHz	3.6850 GHz	1.000 MHz	3.684850000 GHz	-47.59 dBm	-22.59 dB
2	2	3.6850 GHz	3.6940 GHz	1.000 MHz	3.693955000 GHz	-21.86 dBm	-8.862 dB
3	3	3.6940 GHz	3.6950 GHz	100.0 kHz	3.694996667 GHz	-25.47 dBm	-12.47 dB
4	4	3.6950 GHz	3.7000 GHz	100.0 kHz	3.698208333 GHz	6.612 dBm	-18.39 dB
5	5	3.7000 GHz	3.7010 GHz	100.0 kHz	3.700011667 GHz	-26.24 dBm	-13.24 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701015000 GHz	-23.05 dBm	-10.05 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710583333 GHz	-47.44 dBm	-22.44 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720000000 GHz	-51.76 dBm	-11.76 dB

Plot 7-28. Upper Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)



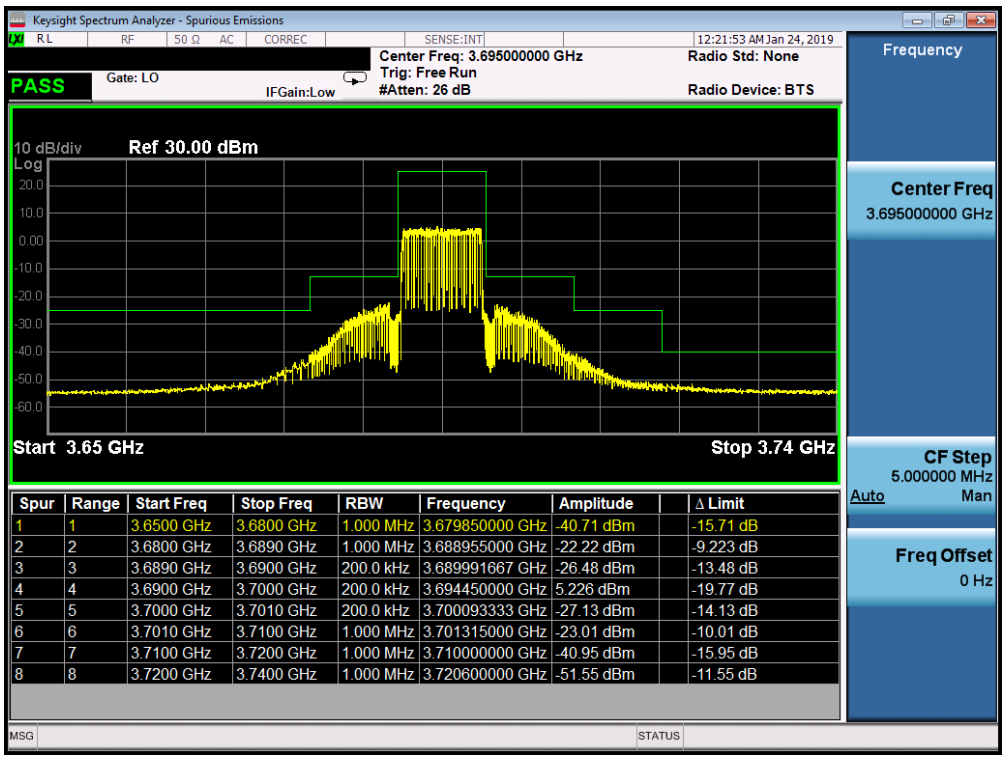
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.530000000 GHz	-51.00 dBm	-11.00 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539950000 GHz	-41.03 dBm	-16.03 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.549000000 GHz	-21.04 dBm	-8.035 dB
4	4	3.5490 GHz	3.5500 GHz	200.0 kHz	3.549818333 GHz	-25.25 dBm	-12.25 dB
5	5	3.5500 GHz	3.5600 GHz	200.0 kHz	3.553316667 GHz	4.869 dBm	-20.13 dB
6	6	3.5600 GHz	3.5610 GHz	200.0 kHz	3.560093333 GHz	-25.10 dBm	-12.10 dB
7	7	3.5610 GHz	3.5700 GHz	1.000 MHz	3.561270000 GHz	-21.59 dBm	-8.591 dB
8	8	3.5700 GHz	3.6000 GHz	1.000 MHz	3.570000000 GHz	-41.37 dBm	-16.37 dB

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



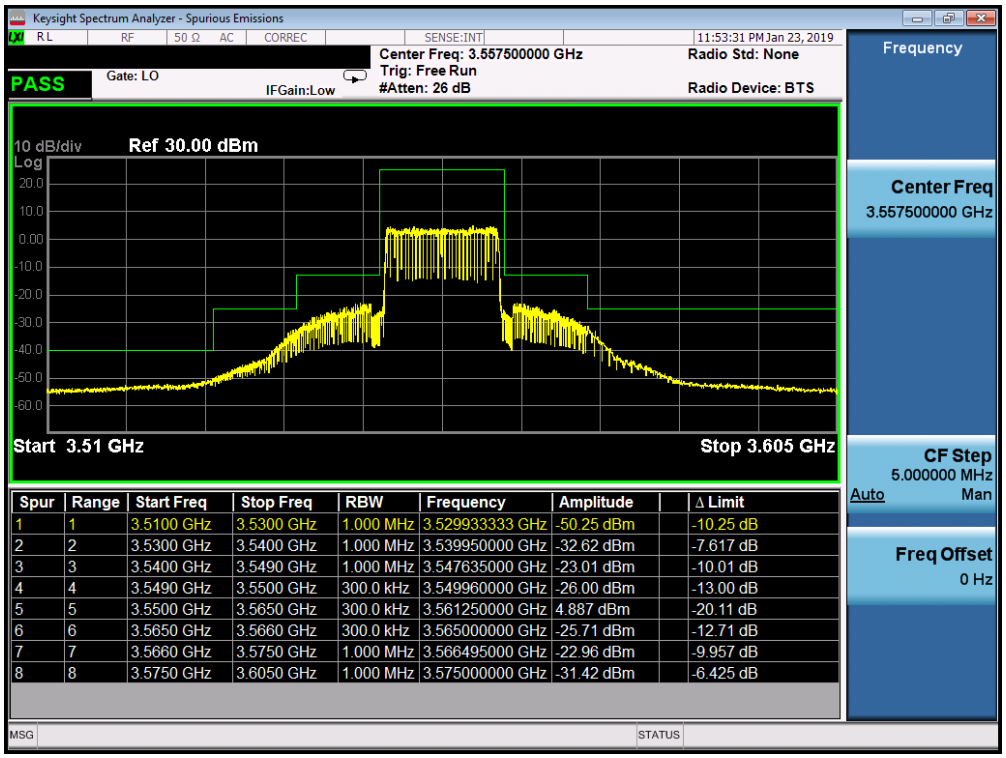
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5800 GHz	3.6100 GHz	1.000 MHz	3.609850000 GHz	-40.10 dBm	-15.10 dB
2	2	3.6100 GHz	3.6190 GHz	1.000 MHz	3.618955000 GHz	-20.12 dBm	-7.123 dB
3	3	3.6190 GHz	3.6200 GHz	200.0 kHz	3.619963333 GHz	-24.64 dBm	-11.64 dB
4	4	3.6200 GHz	3.6300 GHz	200.0 kHz	3.623616667 GHz	5.494 dBm	-19.51 dB
5	5	3.6300 GHz	3.6310 GHz	200.0 kHz	3.630121667 GHz	-24.61 dBm	-11.61 dB
6	6	3.6310 GHz	3.6400 GHz	1.000 MHz	3.631270000 GHz	-21.30 dBm	-8.301 dB
7	7	3.6400 GHz	3.6700 GHz	1.000 MHz	3.640000000 GHz	-40.63 dBm	-15.63 dB

Plot 7-30. Mid Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)



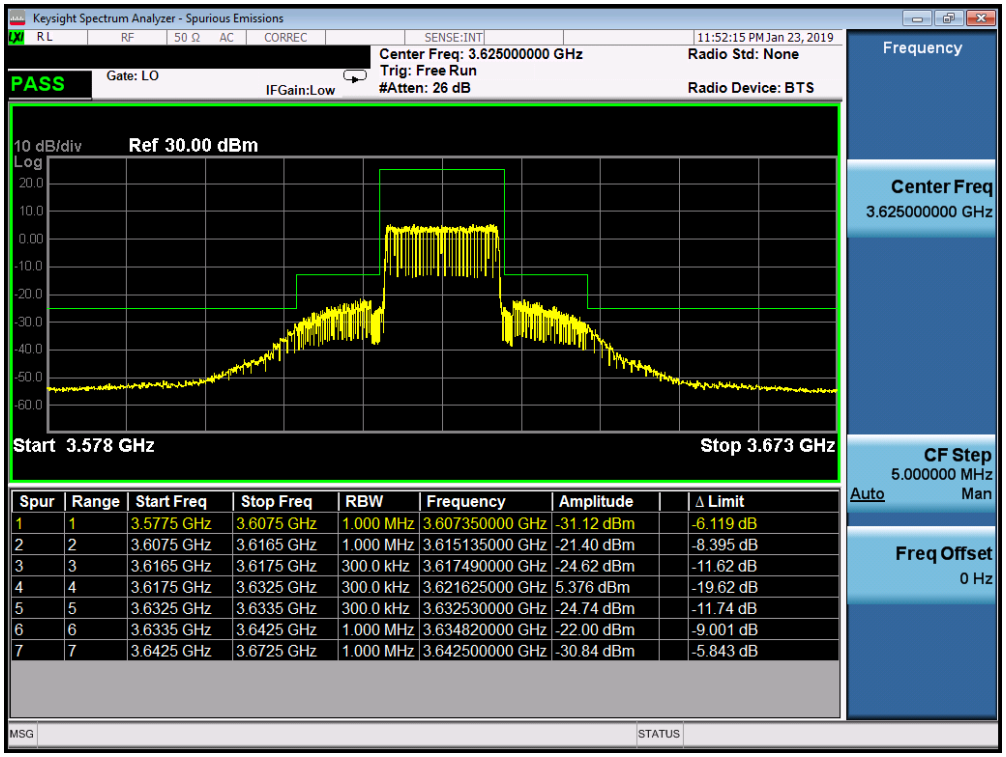
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6500 GHz	3.6800 GHz	1.000 MHz	3.679850000 GHz	-40.71 dBm	-15.71 dB
2	2	3.6800 GHz	3.6890 GHz	1.000 MHz	3.688955000 GHz	-22.22 dBm	-9.223 dB
3	3	3.6890 GHz	3.6900 GHz	200.0 kHz	3.689991667 GHz	-26.48 dBm	-13.48 dB
4	4	3.6900 GHz	3.7000 GHz	200.0 kHz	3.694450000 GHz	5.226 dBm	-19.77 dB
5	5	3.7000 GHz	3.7010 GHz	200.0 kHz	3.700093333 GHz	-27.13 dBm	-14.13 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701315000 GHz	-23.01 dBm	-10.01 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710000000 GHz	-40.95 dBm	-15.95 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720600000 GHz	-51.55 dBm	-11.55 dB

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



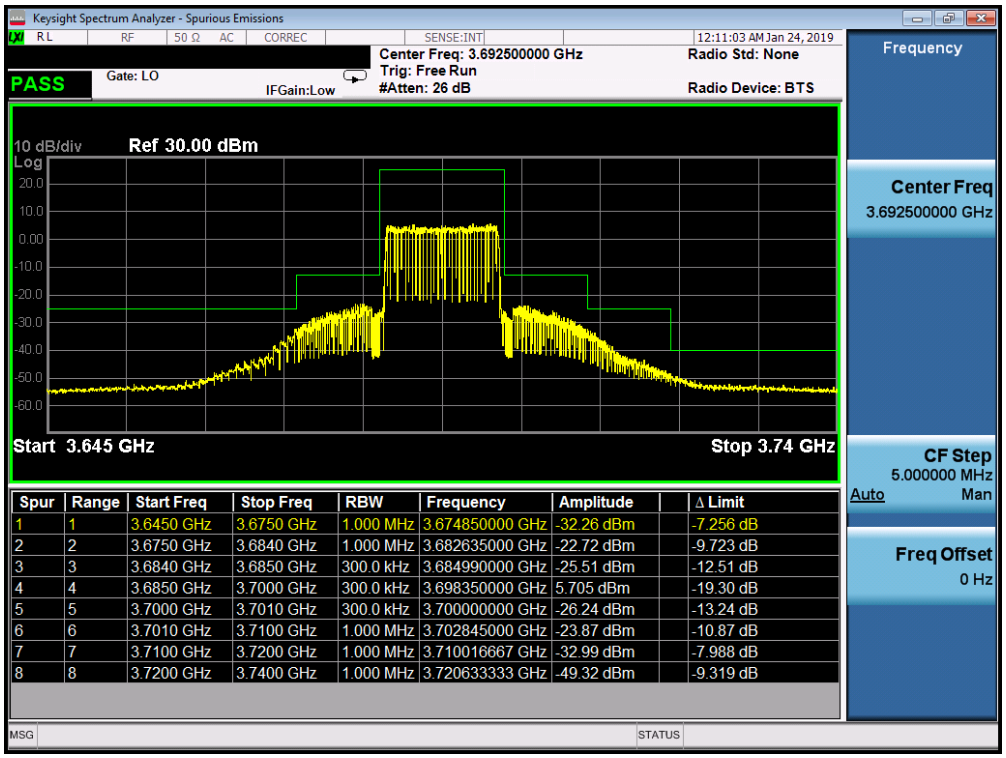
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.529933333 GHz	-50.25 dBm	-10.25 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539950000 GHz	-32.62 dBm	-7.617 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.547635000 GHz	-23.01 dBm	-10.01 dB
4	4	3.5490 GHz	3.5500 GHz	300.0 kHz	3.549960000 GHz	-26.00 dBm	-13.00 dB
5	5	3.5500 GHz	3.5650 GHz	300.0 kHz	3.561250000 GHz	4.887 dBm	-20.11 dB
6	6	3.5650 GHz	3.5660 GHz	300.0 kHz	3.565000000 GHz	-25.71 dBm	-12.71 dB
7	7	3.5660 GHz	3.5750 GHz	1.000 MHz	3.566495000 GHz	-22.96 dBm	-9.957 dB
8	8	3.5750 GHz	3.6050 GHz	1.000 MHz	3.575000000 GHz	-31.42 dBm	-6.425 dB

Plot 7-32. Lower Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



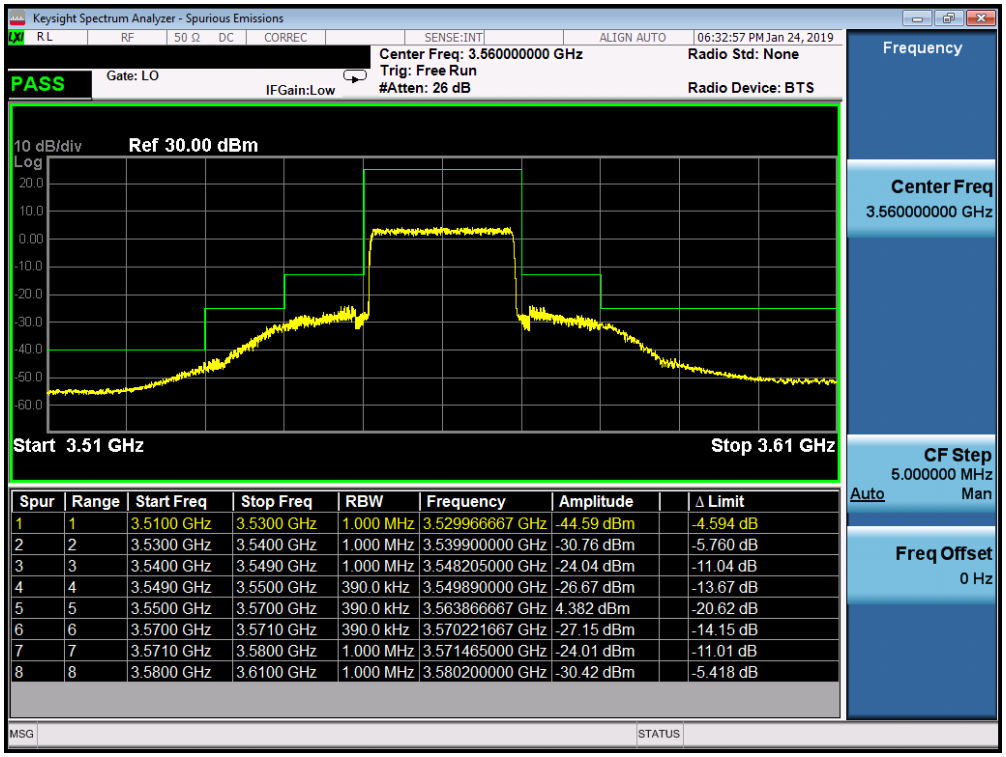
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5775 GHz	3.6075 GHz	1.000 MHz	3.607350000 GHz	-31.12 dBm	-6.119 dB
2	2	3.6075 GHz	3.6165 GHz	1.000 MHz	3.615135000 GHz	-21.40 dBm	-8.395 dB
3	3	3.6165 GHz	3.6175 GHz	300.0 kHz	3.617490000 GHz	-24.62 dBm	-11.62 dB
4	4	3.6175 GHz	3.6325 GHz	300.0 kHz	3.621625000 GHz	5.376 dBm	-19.62 dB
5	5	3.6325 GHz	3.6335 GHz	300.0 kHz	3.632530000 GHz	-24.74 dBm	-11.74 dB
6	6	3.6335 GHz	3.6425 GHz	1.000 MHz	3.634820000 GHz	-22.00 dBm	-9.001 dB
7	7	3.6425 GHz	3.6725 GHz	1.000 MHz	3.642500000 GHz	-30.84 dBm	-5.843 dB

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



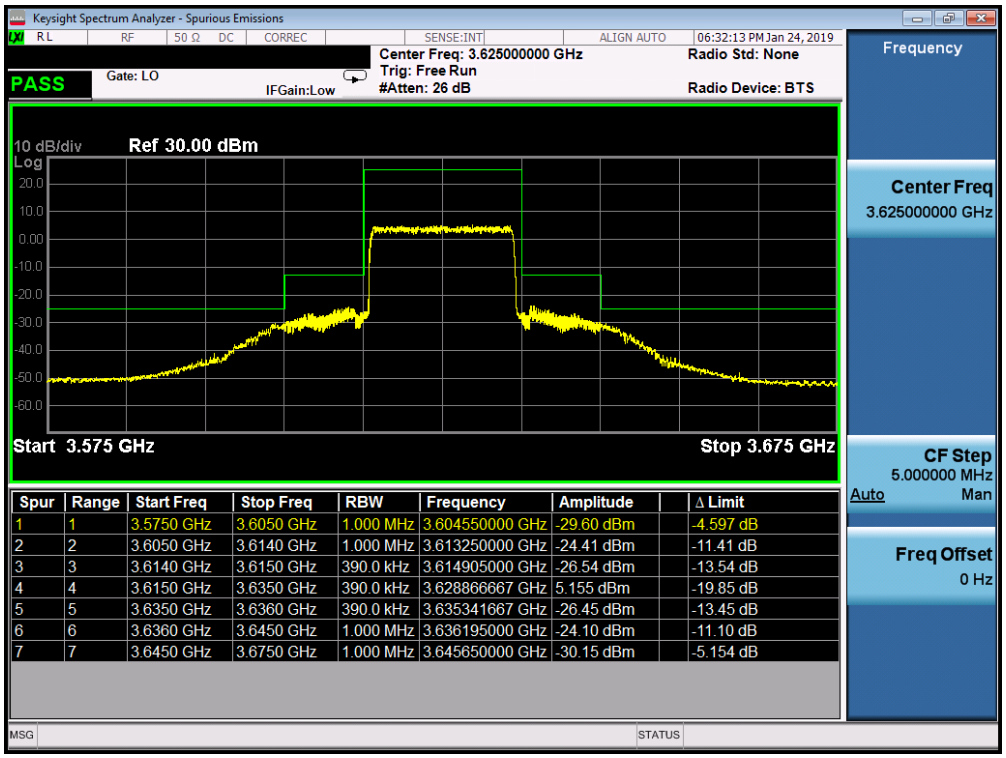
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.6450 GHz	3.6750 GHz	1.000 MHz	3.674850000 GHz	-32.26 dBm	-7.256 dB
2	2	3.6750 GHz	3.6840 GHz	1.000 MHz	3.682635000 GHz	-22.72 dBm	-9.723 dB
3	3	3.6840 GHz	3.6850 GHz	300.0 kHz	3.684990000 GHz	-25.51 dBm	-12.51 dB
4	4	3.6850 GHz	3.7000 GHz	300.0 kHz	3.698350000 GHz	5.705 dBm	-19.30 dB
5	5	3.7000 GHz	3.7010 GHz	300.0 kHz	3.700000000 GHz	-26.24 dBm	-13.24 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.702845000 GHz	-23.87 dBm	-10.87 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710016667 GHz	-32.99 dBm	-7.988 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720633333 GHz	-49.32 dBm	-9.319 dB

Plot 7-34. Upper Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)



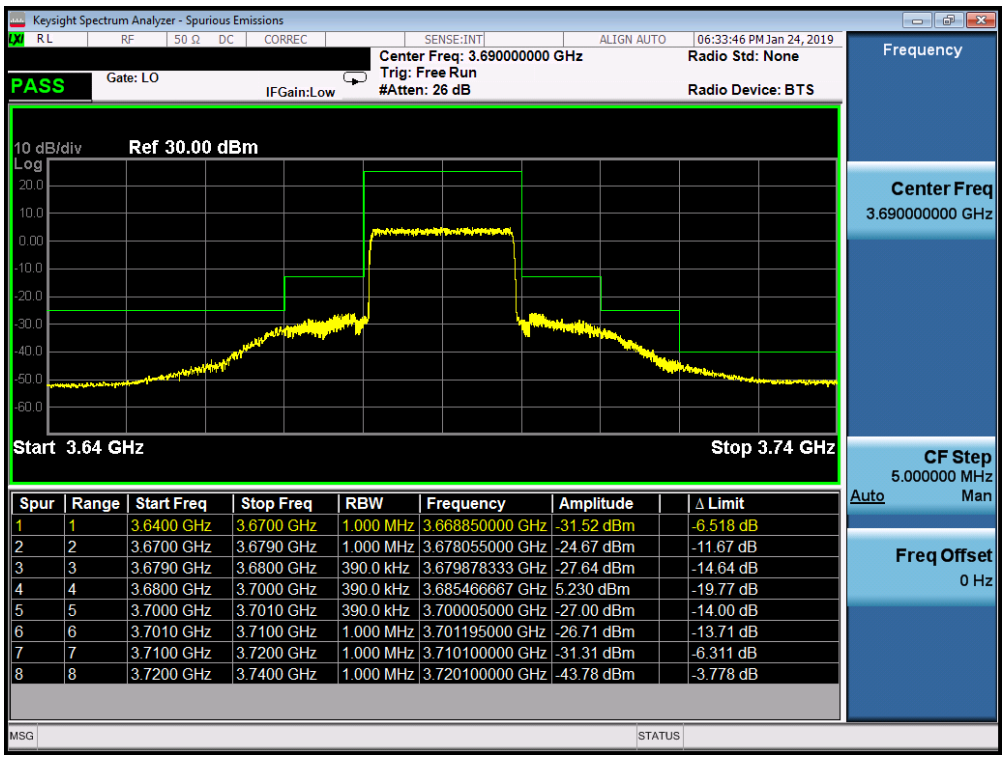
Spur	Range	Start Freq	Stop Freq	RBW	Frequency	Amplitude	Δ Limit
1	1	3.5100 GHz	3.5300 GHz	1.000 MHz	3.529966667 GHz	-44.59 dBm	-4.594 dB
2	2	3.5300 GHz	3.5400 GHz	1.000 MHz	3.539900000 GHz	-30.76 dBm	-5.760 dB
3	3	3.5400 GHz	3.5490 GHz	1.000 MHz	3.548205000 GHz	-24.04 dBm	-11.04 dB
4	4	3.5490 GHz	3.5500 GHz	390.0 kHz	3.549890000 GHz	-26.67 dBm	-13.67 dB
5	5	3.5500 GHz	3.5700 GHz	390.0 kHz	3.563866667 GHz	4.382 dBm	-20.62 dB
6	6	3.5700 GHz	3.5710 GHz	390.0 kHz	3.570221667 GHz	-27.15 dBm	-14.15 dB
7	7	3.5710 GHz	3.5800 GHz	1.000 MHz	3.571465000 GHz	-24.01 dBm	-11.01 dB
8	8	3.5800 GHz	3.6100 GHz	1.000 MHz	3.580200000 GHz	-30.42 dBm	-5.418 dB

Plot 7-35. Lower Channel Edge Plot (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	3.604550000 GHz	-29.60 dBm	-4.597 dB
2	2	3.6050 GHz	3.6140 GHz	1.000 MHz	3.613250000 GHz	-24.41 dBm	-11.41 dB
3	3	3.6140 GHz	3.6150 GHz	390.0 kHz	3.614905000 GHz	-26.54 dBm	-13.54 dB
4	4	3.6150 GHz	3.6350 GHz	390.0 kHz	3.628866667 GHz	5.155 dBm	-19.85 dB
5	5	3.6350 GHz	3.6360 GHz	390.0 kHz	3.635341667 GHz	-26.45 dBm	-13.45 dB
6	6	3.6360 GHz	3.6450 GHz	1.000 MHz	3.636195000 GHz	-24.10 dBm	-11.10 dB
7	7	3.6450 GHz	3.6750 GHz	1.000 MHz	3.645650000 GHz	-30.15 dBm	-5.154 dB

Plot 7-36. Mid Channel Edge 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	3.668850000 GHz	-31.52 dBm	-6.518 dB
2	2	3.6700 GHz	3.6790 GHz	1.000 MHz	3.678055000 GHz	-24.67 dBm	-11.67 dB
3	3	3.6790 GHz	3.6800 GHz	390.0 kHz	3.679878333 GHz	-27.64 dBm	-14.64 dB
4	4	3.6800 GHz	3.7000 GHz	390.0 kHz	3.685466667 GHz	5.230 dBm	-19.77 dB
5	5	3.7000 GHz	3.7010 GHz	390.0 kHz	3.700005000 GHz	-27.00 dBm	-14.00 dB
6	6	3.7010 GHz	3.7100 GHz	1.000 MHz	3.701195000 GHz	-26.71 dBm	-13.71 dB
7	7	3.7100 GHz	3.7200 GHz	1.000 MHz	3.710100000 GHz	-31.31 dBm	-6.311 dB
8	8	3.7200 GHz	3.7400 GHz	1.000 MHz	3.720100000 GHz	-43.78 dBm	-3.778 dB

Plot 7-37. Upper Channel Edge Plot (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.

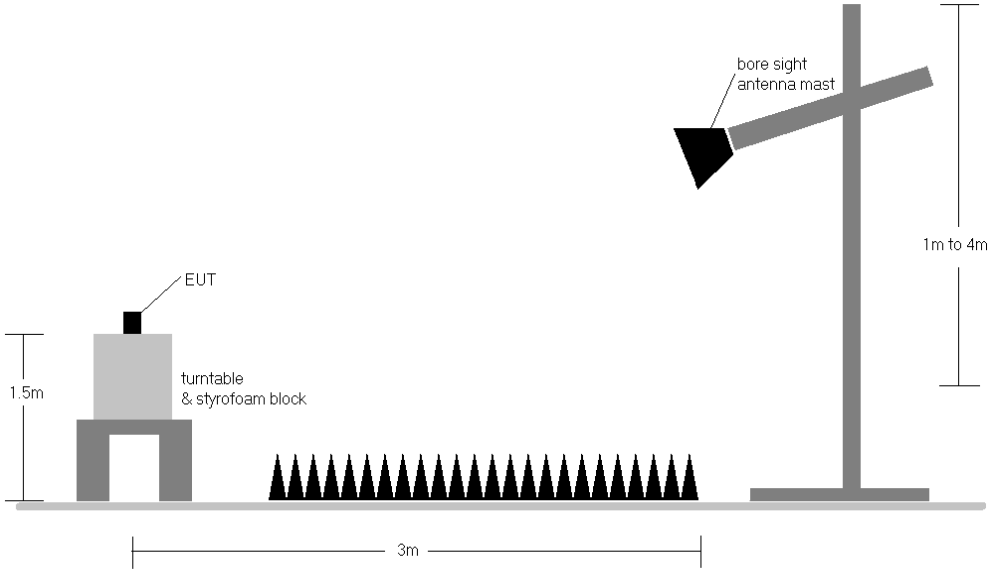


Figure 7-4. Radiated Test Setup >1GHz

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).

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	H	168	271	1 / 0	10.22	8.71	18.93	0.078	23.00	-4.07
3625.00	5	QPSK	H	183	253	1 / 24	10.71	8.26	**18.97**	0.079	23.00	-4.03
3697.50	5	QPSK	H	165	294	1 / 24	10.02	8.68	18.70	0.074	23.00	-4.30
3625.00	5	16-QAM	H	183	253	1 / 24	9.69	8.26	**17.95**	0.062	23.00	-5.05
3625.00	5	64-QAM	H	183	253	1 / 24	8.33	8.26	**16.59**	0.046	23.00	-6.41
3625.00	5	256-QAM	H	183	253	1 / 24	5.91	8.26	**14.17**	**0.026**	23.00	-8.83
3555.00	10	QPSK	H	170	305	1 / 0	10.35	8.69	19.04	0.080	23.00	-3.96
3625.00	10	QPSK	H	174	241	1 / 0	10.72	8.26	18.98	0.079	23.00	-4.02
3695.00	10	QPSK	H	156	284	1 / 0	10.45	8.66	**19.11**	0.081	23.00	-3.89
3695.00	10	16-QAM	H	156	284	1 / 0	9.34	8.66	**18.00**	0.063	23.00	-5.00
3695.00	10	64-QAM	H	156	284	1 / 0	8.00	8.66	**16.66**	0.046	23.00	-6.34
3695.00	10	256-QAM	H	156	284	1 / 0	5.61	8.66	**14.27**	**0.027**	23.00	-8.73
3557.50	15	QPSK	H	155	321	1 / 74	10.38	8.67	**19.05**	0.080	23.00	-3.95
3625.00	15	QPSK	H	161	304	1 / 0	10.72	8.26	18.98	0.079	23.00	-4.02
3692.50	15	QPSK	H	152	280	1 / 0	9.85	8.64	18.49	0.071	23.00	-4.51
3557.50	15	16-QAM	H	155	321	1 / 74	9.34	8.67	**18.01**	0.063	23.00	-4.99
3557.50	15	64-QAM	H	155	321	1 / 74	8.00	8.67	**16.67**	0.046	23.00	-6.33
3557.50	15	256-QAM	H	155	321	1 / 74	5.69	8.67	**14.36**	**0.027**	23.00	-8.64
3560.00	20	QPSK	H	128	317	1 / 0	10.37	8.65	19.02	0.080	23.00	-3.98
3625.00	20	QPSK	H	138	315	1 / 0	11.07	8.26	19.33	0.086	23.00	-3.67
3690.00	20	QPSK	H	144	260	1 / 0	10.85	8.61	**19.46**	**0.088**	23.00	-3.54
3690.00	20	16-QAM	H	144	260	1 / 0	9.64	8.61	**18.25**	0.067	23.00	-4.75
3690.00	20	64-QAM	H	144	260	1 / 0	8.37	8.61	**16.98**	0.050	23.00	-6.02
3690.00	20	256-QAM	H	144	260	1 / 0	6.33	8.61	**14.94**	**0.031**	23.00	-8.06
3690.00	QPSK	H	V	144	44	10.85	7.43	8.61	16.04	0.040	23.00	-6.96
3690.00	QPSK (WCP)	H	H	238	304	10.85	7.29	8.61	15.90	0.039	23.00	-7.10

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

Test Setup

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

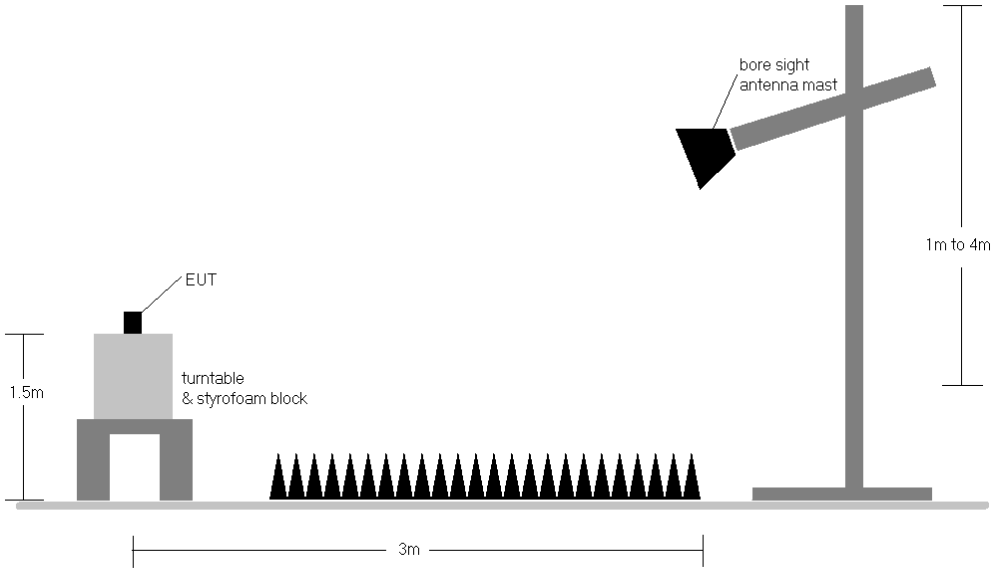


Figure 7-5. Test Instrument & Measurement Setup

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.

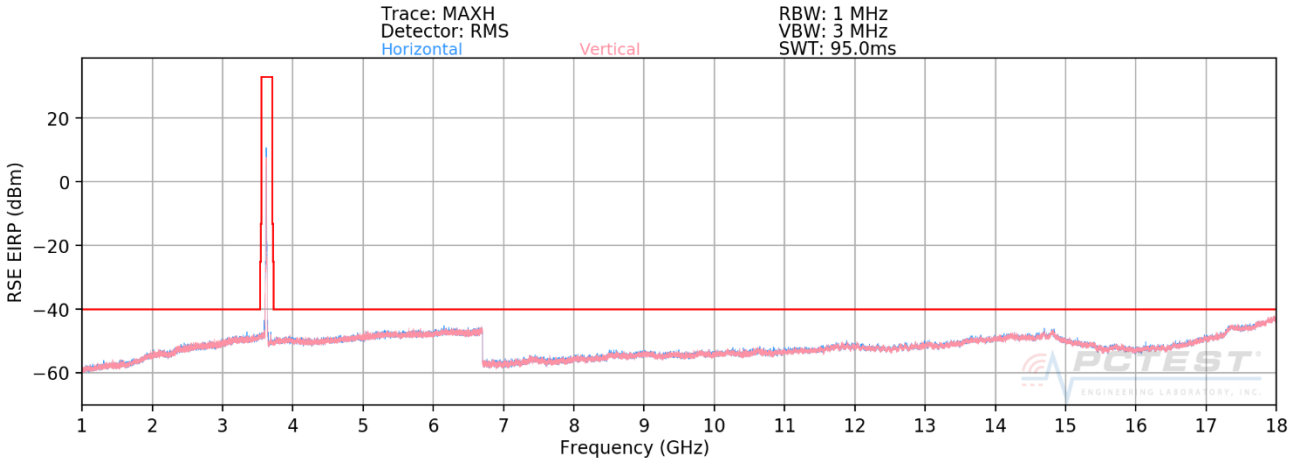
2) This unit was tested with its standard battery.

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

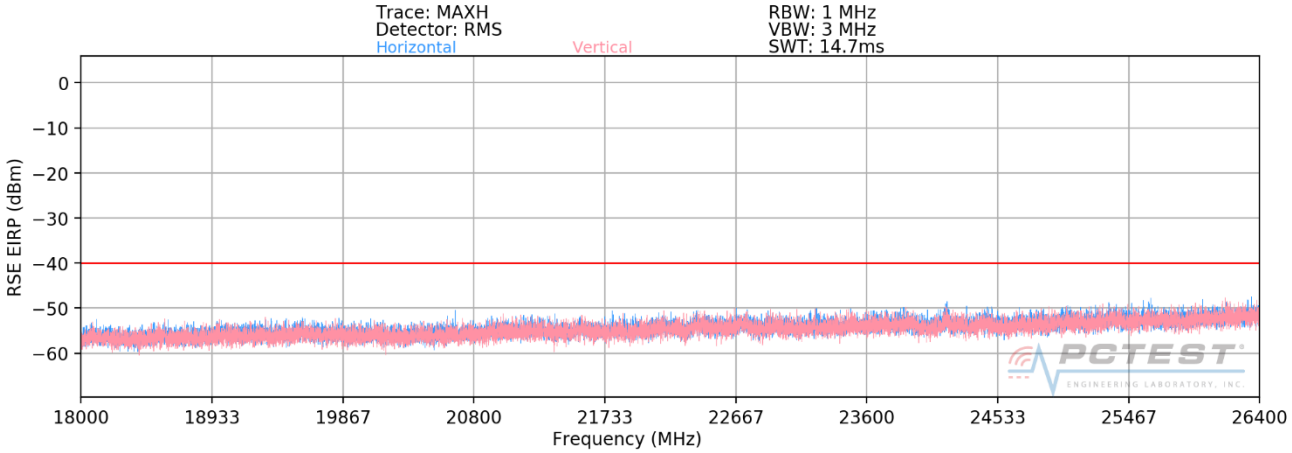
4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

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

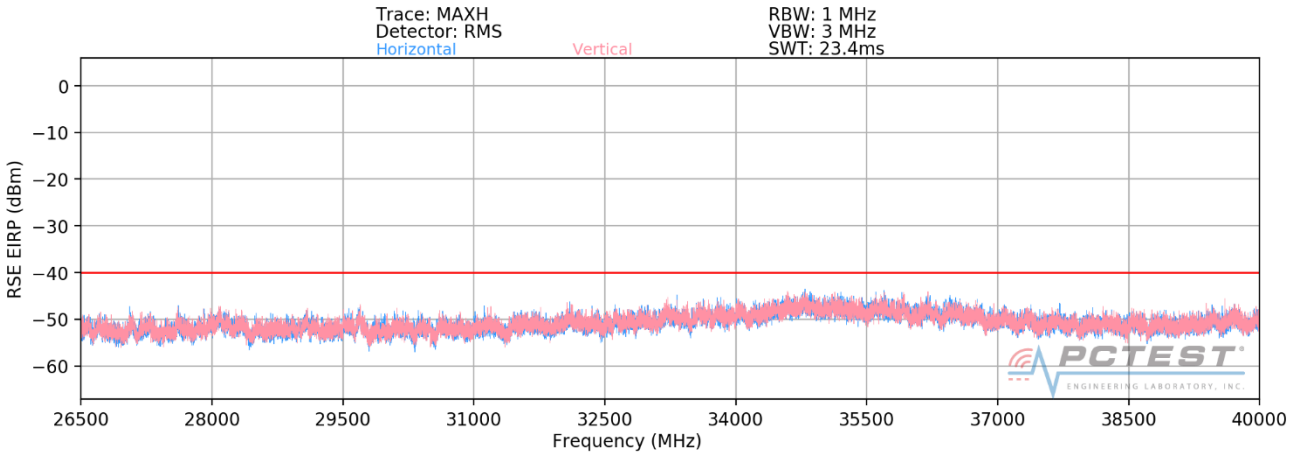
Band 48



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



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



Plot 7-40. 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	372	320	-67.25	11.71	-55.54	-15.5
10680.00	V	-	-	-70.25	12.55	-57.70	-17.7
14240.00	V	-	-	-64.05	11.35	-52.70	-12.7
17800.00	V	-	-	-59.75	10.01	-49.73	-9.7

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	349	196	-65.83	11.32	-54.51	-14.5
10875.00	V	-	-	-70.56	12.71	-57.85	-17.9
14500.00	V	-	-	-64.63	11.61	-53.01	-13.0

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	116	169	-64.26	10.96	-53.30	-13.3
11070.00	V	116	182	-68.56	12.72	-55.84	-15.8
14760.00	V	-	-	-65.43	12.02	-53.40	-13.4

Table 7-6. Radiated Spurious Data (Band 48 – High 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	153	201	-67.26	10.96	-56.30	-16.3
11070.00	V	-	-	-69.75	12.72	-57.03	-17.0
14760.00	V	-	-	-65.62	12.02	-53.59	-13.6

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

Band 48 Frequency Stability Measurements

OPERATING FREQUENCY:	3,625,000,000	Hz
CHANNEL:	55990	
REFERENCE VOLTAGE:	4.31	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.31	- 30	3,625,000,135	135	#########
100 %		- 20	3,625,000,213	213	#########
100 %		- 10	3,624,999,992	-8	#########
100 %		0	3,624,999,773	-227	#########
100 %		+ 10	3,625,000,066	66	#########
100 %		+ 20	3,624,999,985	-15	#########
100 %		+ 30	3,625,000,125	125	#########
100 %		+ 40	3,625,000,005	5	#########
100 %		+ 50	3,625,000,066	66	#########
BATT. ENDPOINT	3.44	+ 20	3,625,000,318	318	#########

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.

Band 48 Frequency Stability Measurements

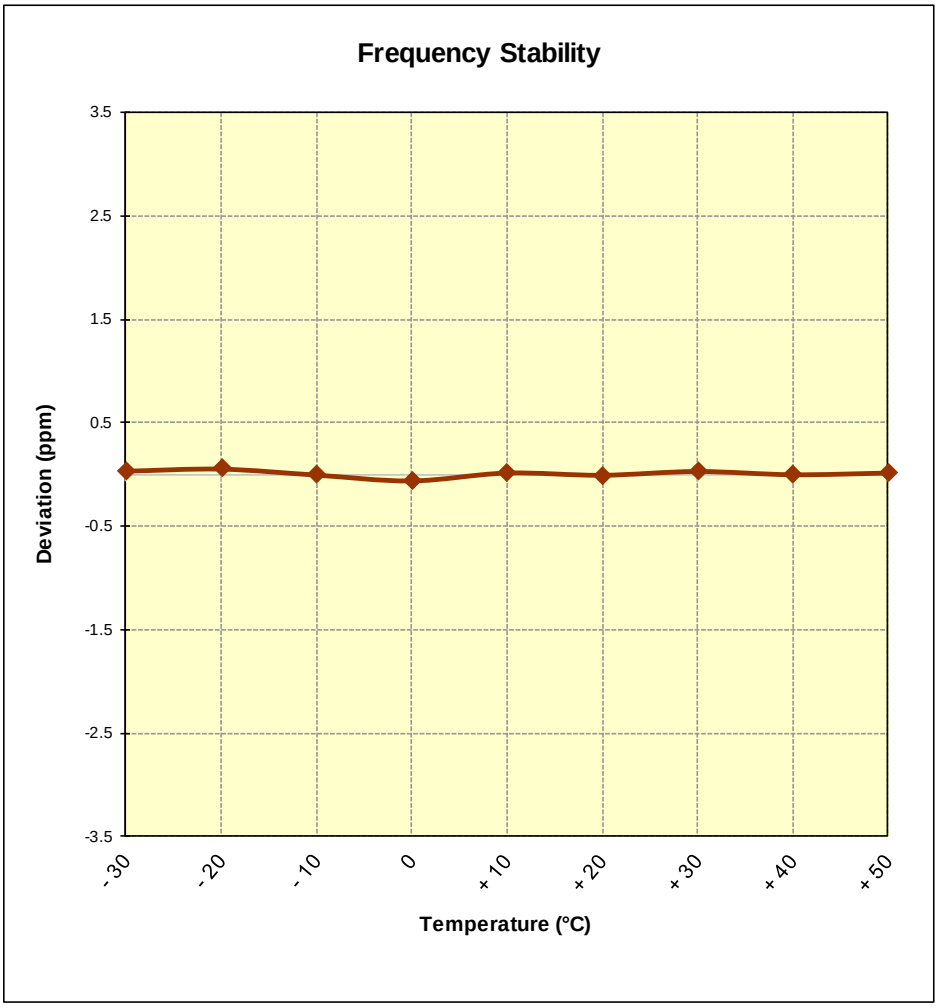


Figure 7-6. Frequency Stability Graph (Band 48)

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 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.

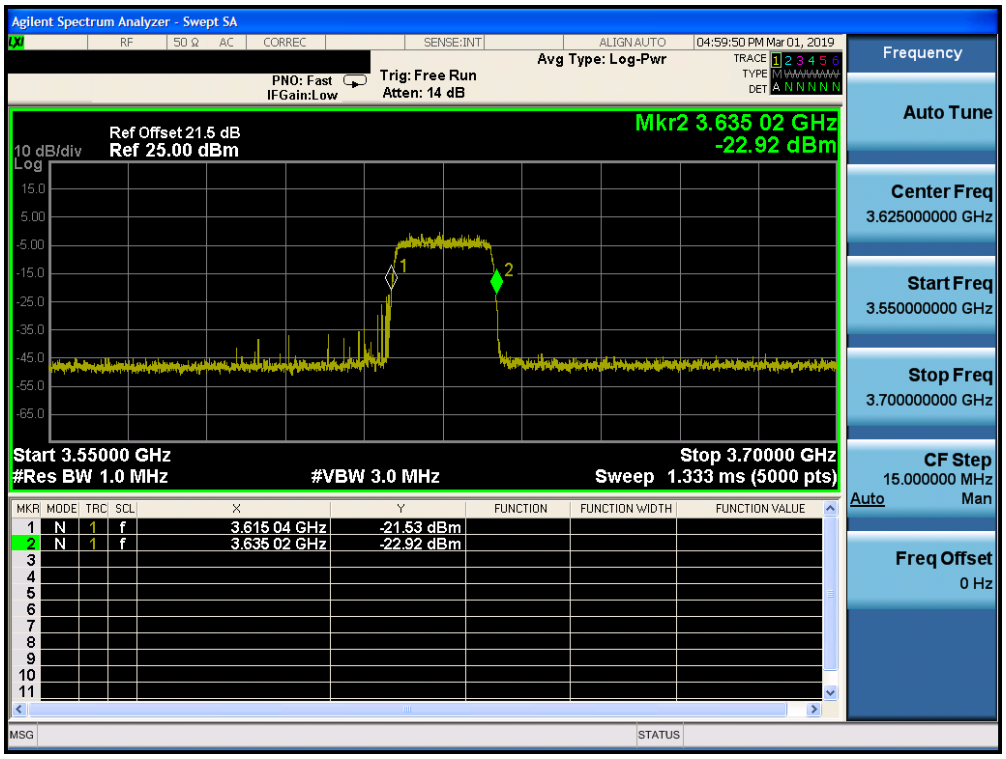
1. Run#1:
    a. Setup WINNF.PT.C.HBT.1 with 3615MHz – 3635MHz and power level at 13 dBm/MHz.
    b. Enable AP service from Ruckus Cloud management.
    c. Check EUT Tx frequency and power.
    d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.
2. Run#2:
    a. Setup WINNF.PT.C.HBT.1 with 3660MHz – 3680MHz 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

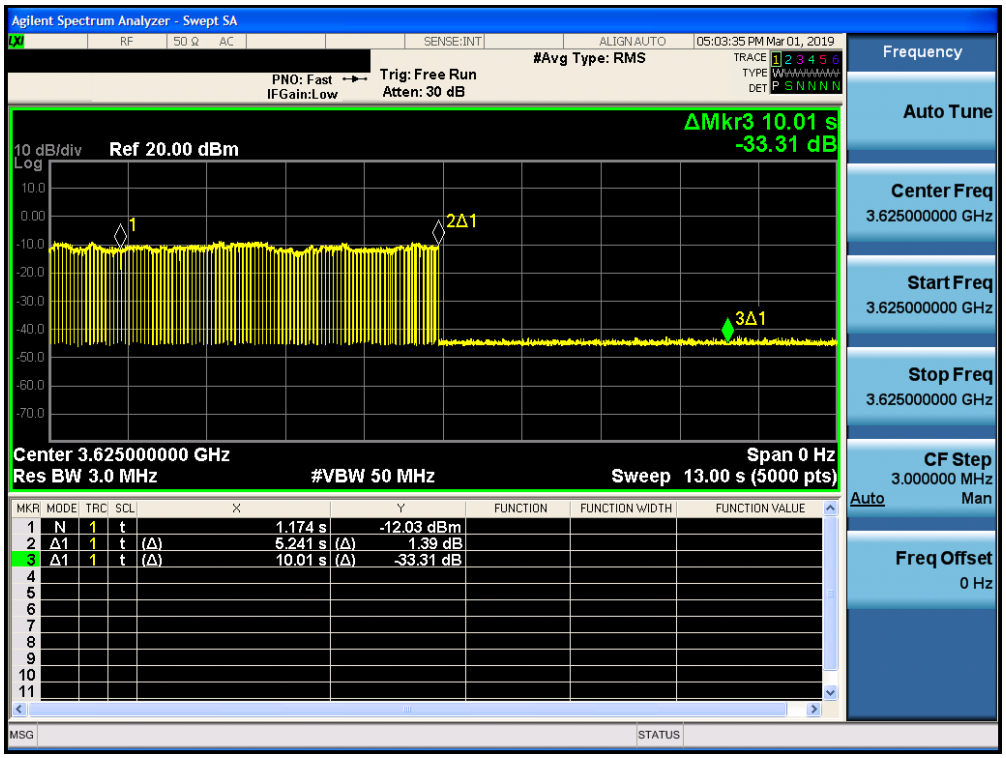
The EUT is an End User Device.

Run#1:

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



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



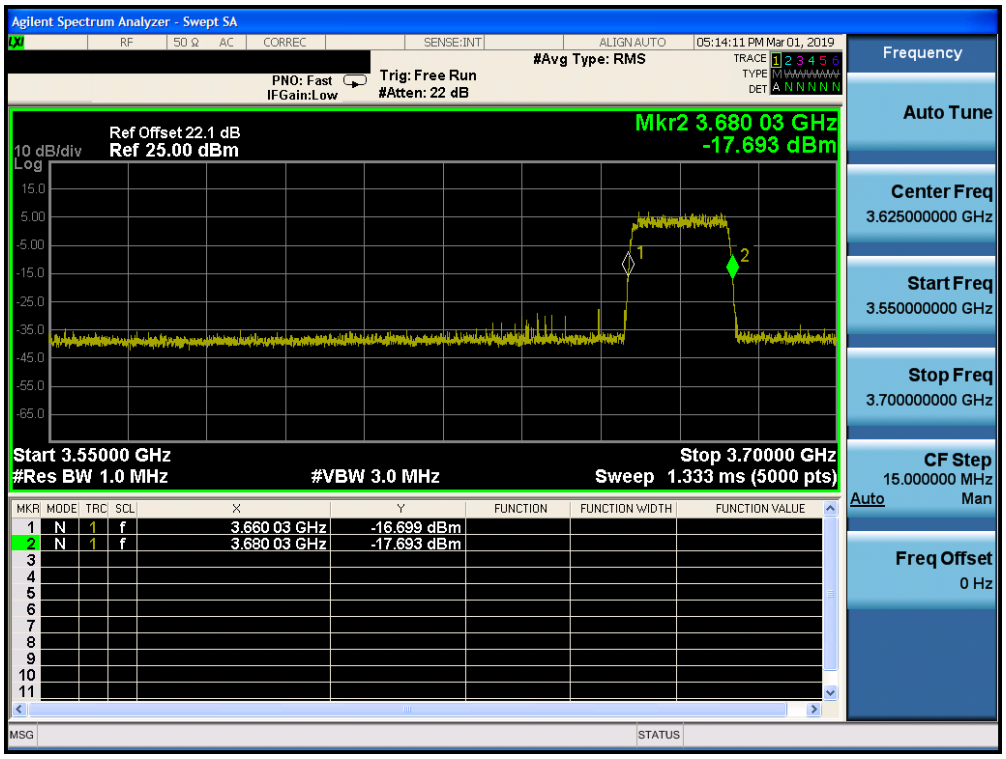
Plot 7-42. Run#1 End User Device Discontinues Operations within 10s

Note:

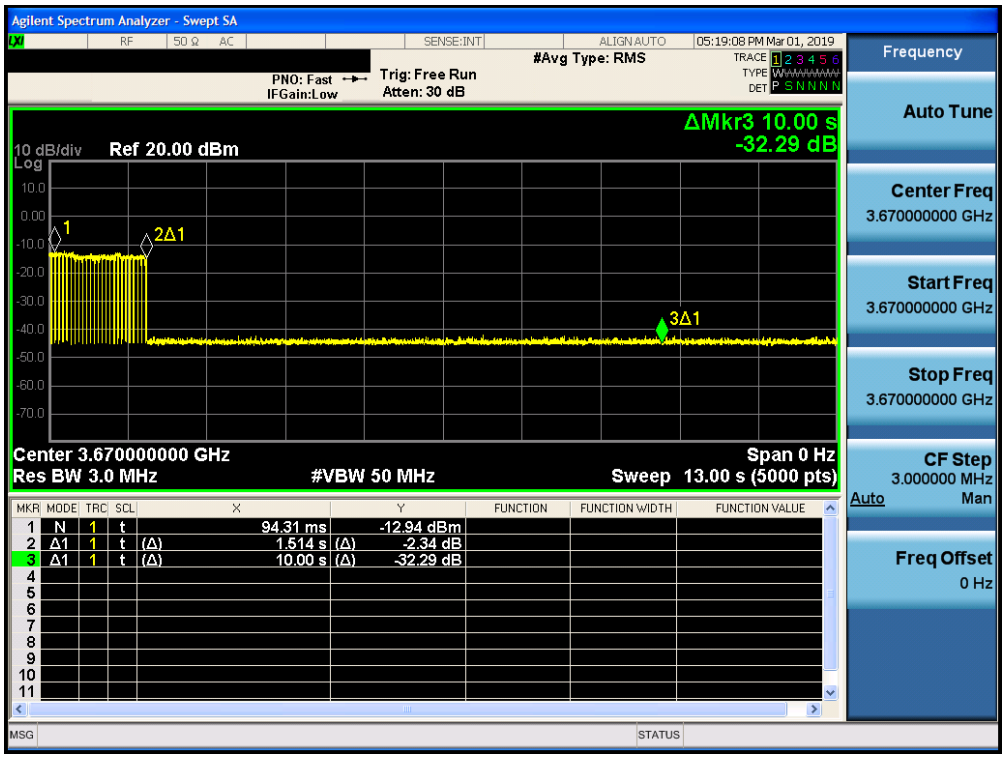
Marker 1: CBSD sends instructions to discontinue LTE operations.
Marker 2: EUT discontinues operation.
Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

Run#2:

- Tx frequency set: 3660– 3680MHz.
- MaxEIRP set: 8dBm/MHz



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



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.

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG977T** complies with all of the End User Device requirements of Part 96 of the FCC Rules for LTE operation only.