



MEASUREMENT REPORT

Part 96 LTE

Applicant Name:

Apple Inc.
One Apple Park Way
Cupertino, CA 95014
United States

Date of Testing:

07/16/2020 - 8/31/2020

Test Site/Location:

PCTEST Morgan Hill, CA, USA

Test Report Serial No.:

1C2004270029-05.BCG

FCC ID:

BCGA2324

APPLICANT:

Apple Inc.

Application Type:

Certification

Model:

A2324

EUT Type:

Tablet Device

FCC Classification:

Citizens Band End User Devices (CBE)

FCC Rule Part(s):

96

Test Procedure(s):

ANSI C63.26-2015, TIA-603-E-2016, KDB 971168 D01 v03r01,
KDB 940660 D01 v02, WINNF-TS-0122 V1.0.0

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

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

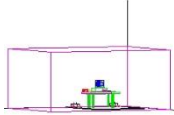

Randy Ortanez
President

FCC ID: BCGA2324	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device
		Page 1 of 51

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

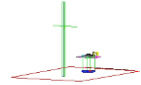
1.0	INTRODUCTION.....	4
1.1	Scope.....	4
1.2	PCTEST Test Location	4
1.3	Test Facility / Accreditations.....	4
2.0	PRODUCT INFORMATION.....	5
2.1	Equipment Description.....	5
2.2	Device Capabilities	5
2.3	Antenna Description.....	5
2.4	Test Support Equipment.....	5
2.5	Test Configuration	6
2.6	Software and Firmware	6
2.7	EMI Suppression Device(s)/Modifications	6
3.0	DESCRIPTION OF TESTS.....	7
3.1	Measurement Procedure.....	7
3.2	Radiated Spurious Emissions.....	7
4.0	MEASUREMENT UNCERTAINTY.....	8
5.0	TEST EQUIPMENT CALIBRATION DATA	9
6.0	SAMPLE CALCULATIONS.....	10
7.0	TEST RESULTS	11
7.1	Summary.....	11
7.2	Occupied Bandwidth.....	13
7.3	Spurious and Harmonic Emissions at Antenna Terminal.....	20
7.4	Band Edge Emissions at Antenna Terminal	27
7.5	Radiated Power (EIRP).....	32
7.6	Radiated Spurious Emissions.....	36
7.7	Frequency Stability / Temperature Variation.....	43
7.8	End User Device Additional Requirement (CBSD Protocol)	46
8.0	CONCLUSION	51

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 2 of 51



MEASUREMENT REPORT

FCC Part 96



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator	Modulation
				Max. Power [W]	Max. Power [dBm]		
LTE Band 48	20 MHz	QPSK	3560.0 - 3690.0	0.139	21.43	18M1G7W	QPSK
		16QAM	3560.0 - 3690.0	0.111	20.47	18M1D7W	16QAM
		64QAM	3560.0 - 3690.0	0.086	19.35	18M0D7W	64QAM
	15 MHz	QPSK	3557.5 - 3692.5	0.138	21.40	13M6G7W	QPSK
		16QAM	3557.5 - 3692.5	0.112	20.50	13M5D7W	16QAM
		64QAM	3557.5 - 3692.5	0.087	19.38	13M6D7W	64QAM
	10 MHz	QPSK	3555.0 - 3695.0	0.138	21.39	9M05G7W	QPSK
		16QAM	3555.0 - 3695.0	0.111	20.46	9M06D7W	16QAM
		64QAM	3555.0 - 3695.0	0.085	19.28	9M06D7W	64QAM
	5 MHz	QPSK	3552.5 - 3697.5	0.140	21.45	4M53G7W	QPSK
		16QAM	3552.5 - 3697.5	0.105	20.22	4M53D7W	16QAM
		64QAM	3552.5 - 3697.5	0.082	19.15	4M55D7W	64QAM

EUT Overview (LTE B48)

FCC ID: BCGA2324	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device
		Page 3 of 51

1.0 INTRODUCTION

1.1 Scope

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

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility located at 18855 Adams Court, Morgan Hill, CA 95037. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014 and KDB 414788 D01 v01r01.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST located in Morgan Hill, CA 95037, 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 2041.02 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 2041.02 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 ISSED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISSED.

FCC ID: BCGA2324		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 4 of 51

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID: BCGA2324**. The test data contained in this report pertains only to the emissions due to the EUT's LTE Band 48 operation in the CBRS band. Per FCC Part 96, this device is evaluated under Citizens Band End User Devices (CBE).

Test Device Serial No.: DLXCN00WQ50J, DLXD101FQ8MX, DLX018400MYPWT71Q

2.2 Device Capabilities

This device contains the following capabilities:

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, HDR4, HDR8), WPT

This device supports BT Beamforming.

2.3 Antenna Description

Following antennas were used for the testing.

Frequency [MHz]	Antenna Gains (dBi)	
	Antenna 4	Antenna 3b
3550 - 3700	-4.0	-2.3

Table 2-1. Highest Antenna Gain

2.4 Test Support Equipment

1	Apple MacBook	Model:	A1398	S/N:	C2QKP008F6F3
	w/AC/DC Adapter	Model:	A1435	S/N:	N/A
2	Apple USB-C Cable	Model:	Chimp	S/N:	420A57
3	USB-C Cable	Model:	A146	S/N:	N/A
	w/ AC Adapter	Model:	A2305	S/N:	N/A
4	Apple Pencil	Model:	N/A	S/N:	GQX91220J13LL6U7AS
5	DC Power Supply	Model:	KPS3010D	S/N:	N/A

Table 2-2. Test Support Equipment Used

FCC ID: BCGA2324		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 5 of 51

2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015, 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.

For emissions from 1GHz – 18GHz, low, mid, and high channels were tested with highest power and worst case configuration. The emissions below 1GHz and above 18GHz were tested with the highest transmitting power and the worst case channel.

The EUT was manipulated through three orthogonal planes of X-orientation (flatbed), Y-orientation (landscape), and Z-orientation (portrait) during the testing. Only the worst case emissions were reported in this test report.

2.6 Software and Firmware

The test was conducted with firmware version 18A325 installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

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

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 6 of 51

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 C63.26-2015, 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 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 C63.26-2015, 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:

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

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g [\text{dBm}] - \text{cable loss} [\text{dB}]$.

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

Per KDB 414788 D01 v01r01, radiated emission test sites other than open-field test sites (e.g., shielded anechoic chambers), may be employed for emission measurements below 30MHz if characterized so that the measurements correspond to those obtained at an open-field test site. To determine test site equivalency, a reference sample transmitting at 149kHz was measured on an open field test site (asphalt with no ground plane) and then measured in the 3m semi-anechoic chamber. A calibrated 60cm loop antenna was used while the reference device was rotated through the X, Y and Z axis in order to capture the worst case level. A maximum deviation of 2.77dB at 149kHz was measured when comparing the 3 meter semi-anechoic chamber to the open field site.

FCC ID: BCGA2324	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device
		Page 7 of 51

4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ($\pm$ dB)
Conducted Bench Top Measurements	1.30
Radiated Disturbance (<1GHz)	4.15
Radiated Disturbance (>1GHz)	4.59
Radiated Disturbance (>18GHz)	4.96

FCC ID: BCGA2324	 PCTEST Proud to be part of  element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 8 of 51

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
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/4/2020	Annual	3/4/2021	MY49430244
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	10/29/2019	Annual	10/29/2020	T058701-02
ESPEC	SU-241	Tabletop Temperature Chamber	9/3/2019	Annual	9/3/2020	92009574
ETS-Lindgren	3142E-PA	Pre-Amplifier (30MHz - 6GHz)	9/19/2019	Annual	9/19/2020	213236
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	1/6/2020	Annual	1/6/2021	224569
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	4/21/2020	Annual	4/21/2021	205956
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/2/2020	Annual	3/2/2021	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	6/1/2020	Annual	6/1/2021	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	9/13/2019	Annual	9/13/2020	101570
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/16/2019	Annual	11/16/2020	164715
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/16/2020	Annual	4/16/2021	166869
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	9/19/2019	Annual	9/19/2020	100051
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	11/14/2019	Annual	11/14/2020	101057
Rohde & Schwarz	HFH2-Z2	Loop Antenna	3/12/2020	Annual	3/12/2021	100546

Table 5-1. Test Equipment List

Notes:

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.

FCC ID: BCGA2324	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device
		Page 9 of 51

6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7W

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination of Any

QAM Modulation

Emission Designator = 8M45D7W

LTE BW = 8.45 MHz

D = Amplitude/Angle Modulated

7 = Quantized/Digital Info

W = Combination of Any

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (7250 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was –81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of –81.0 dBm on the spectrum analyzer. 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).

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 10 of 51

7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
FCC ID: BCGA2324
FCC Classification: Citizens Band End User Devices (CBE)
Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1046	Transmitter Conducted Output Power	N/A		PASS	See RF Exposure Report
2.1051 96.41(e)(ii)	Out of Band Emissions	-13 dBm/MHz at frequencies within 0-B MHz of channel edge (where B is the bandwidth of the assigned channel) -25 dBm/MHz at frequencies greater than B MHz above and below channel edge -40 dBm/MHz at frequencies below 3530 MHz and above 3720 MHz		PASS	Section 7.3, 7.4
96.41(b)	Equivalent Isotropic Radiated Power (EIRP)	23 dBm/10MHz		PASS	Section 7.5
2.1053 96.41(e)	Undesirable Emissions	-40 dBm/MHz	RADIATED	PASS	Section 7.6
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block	CONDUCTED	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 Test Results

FCC ID: BCGA2324		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 11 of 51

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.

FCC ID: BCGA2324	 Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 12 of 51

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 $\geq 3 \times$ RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

Test Setup

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

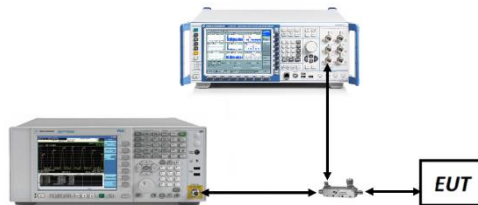


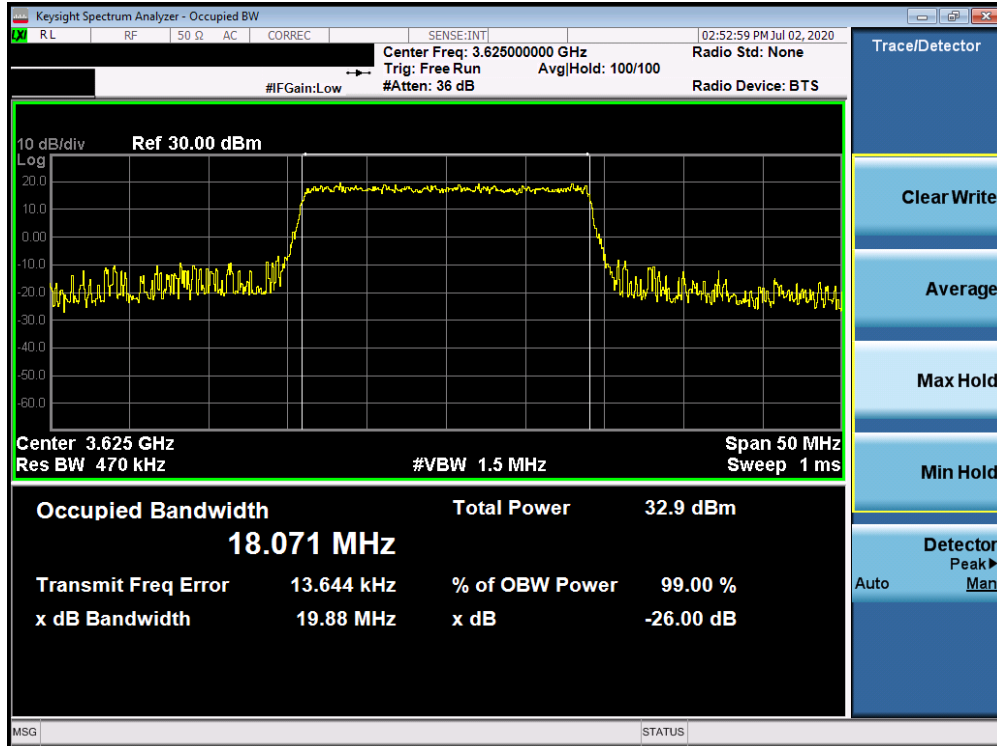
Figure 7-1. Test Instrument & Measurement Setup

Test Notes

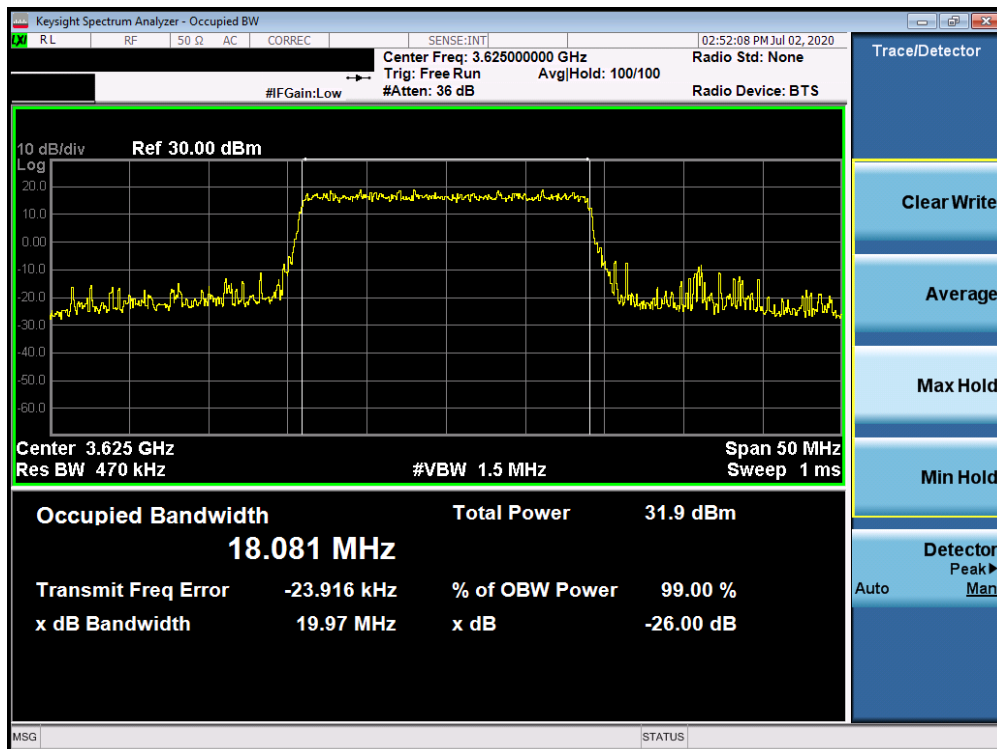
All ports were tested and only the worst case data were reported

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 13 of 51

LTE Band 48

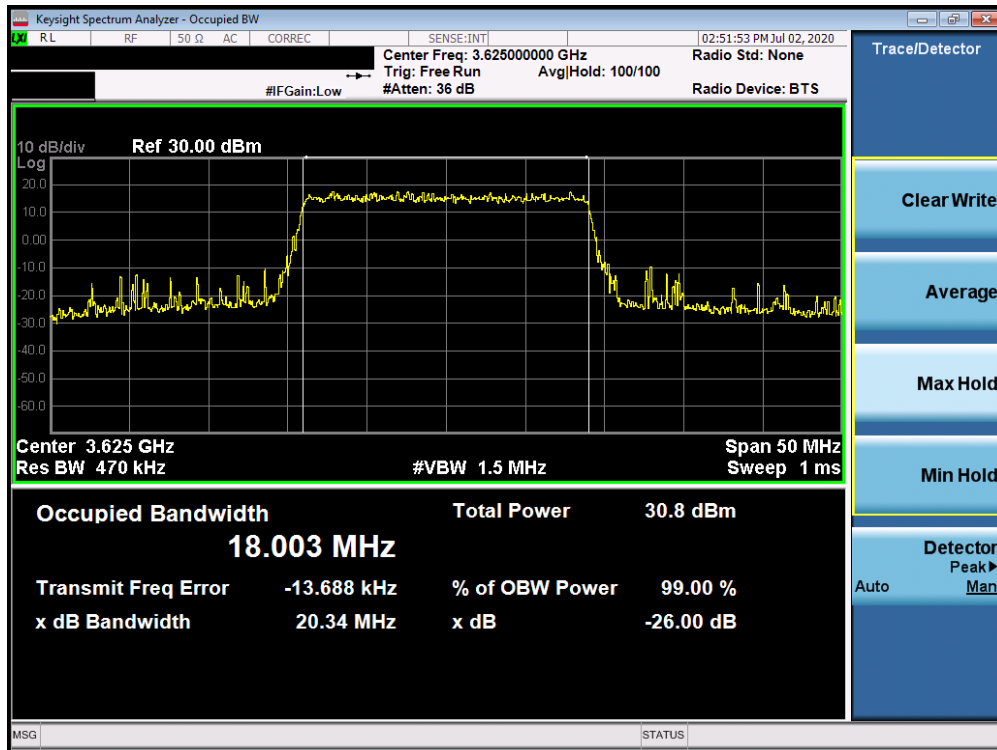


Plot 7-1. Occupied Bandwidth Plot (LTE Band 48 - 20MHz QPSK - Full RB Configuration)

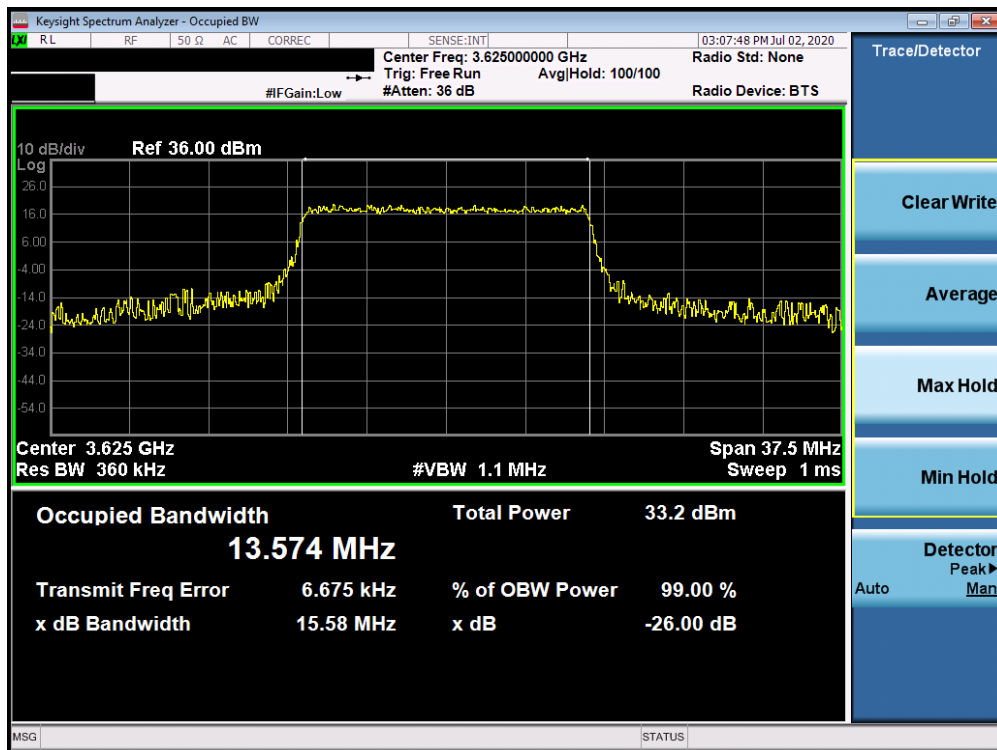


Plot 7-2. Occupied Bandwidth Plot (LTE Band 48 - 20MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 14 of 51

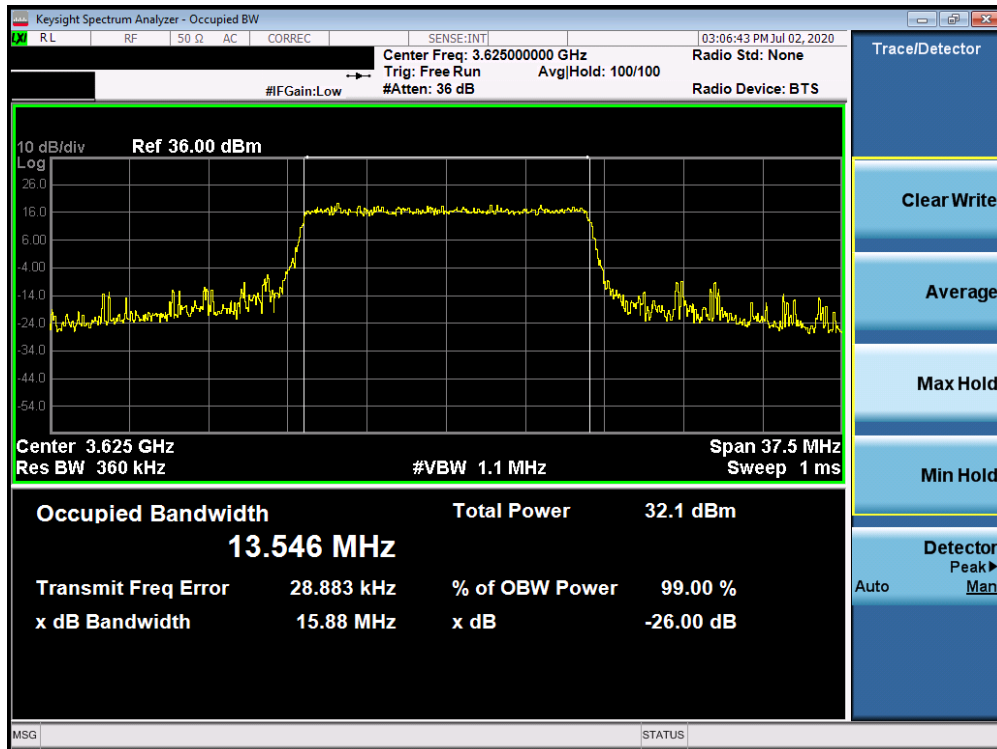


Plot 7-3. Occupied Bandwidth Plot (LTE Band 48 - 20MHz 64-QAM - Full RB Configuration)

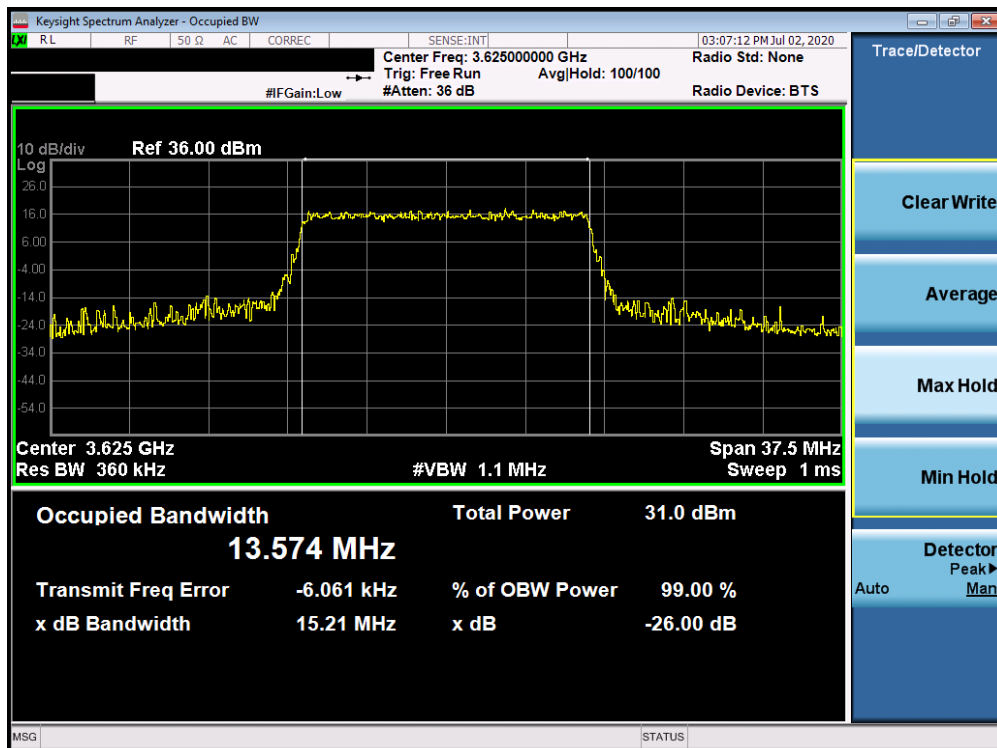


Plot 7-4. Occupied Bandwidth Plot (LTE Band 48 - 15MHz QPSK - Full RB Configuration)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 15 of 51

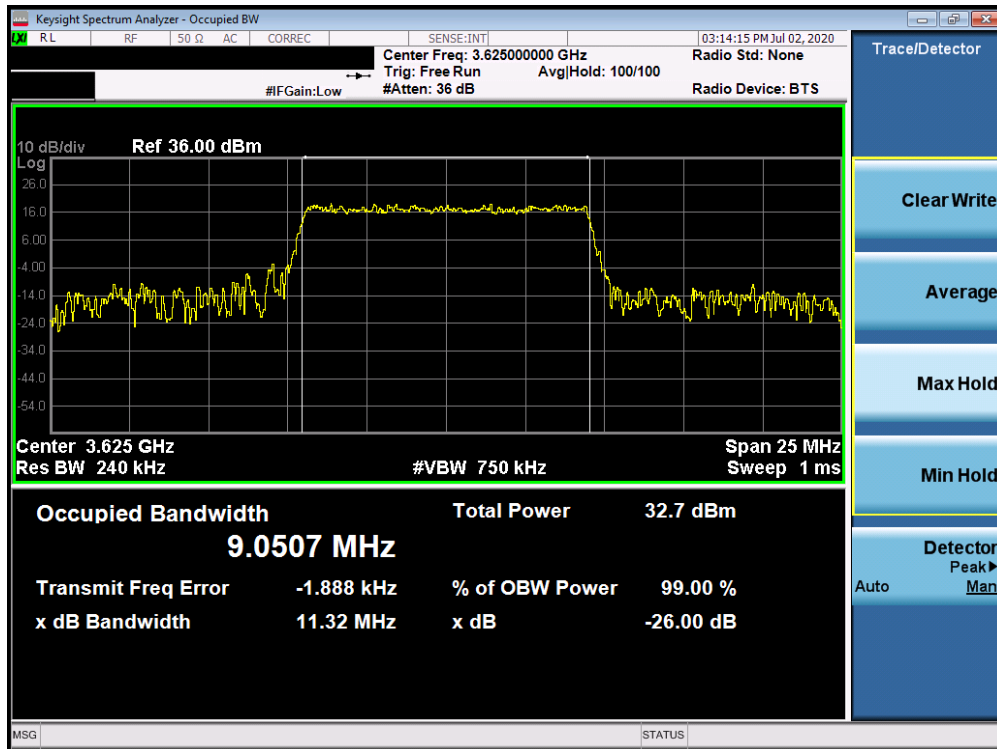


Plot 7-5. Occupied Bandwidth Plot (LTE Band 48 - 15MHz 16-QAM - Full RB Configuration)

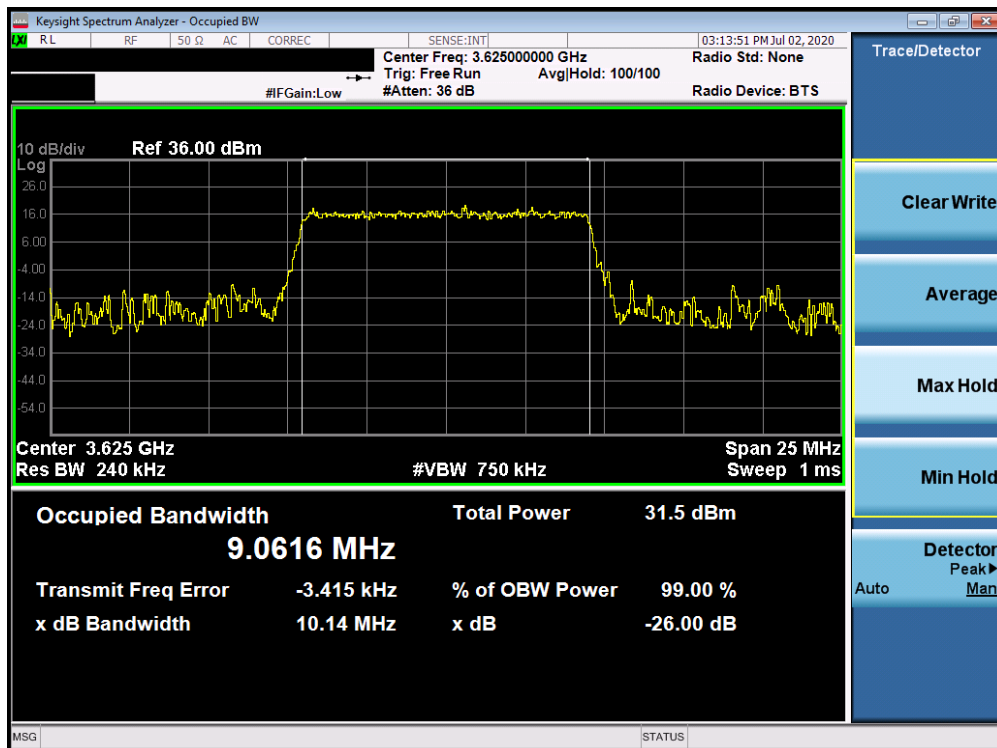


Plot 7-6. Occupied Bandwidth Plot (LTE Band 48 - 15MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 16 of 51

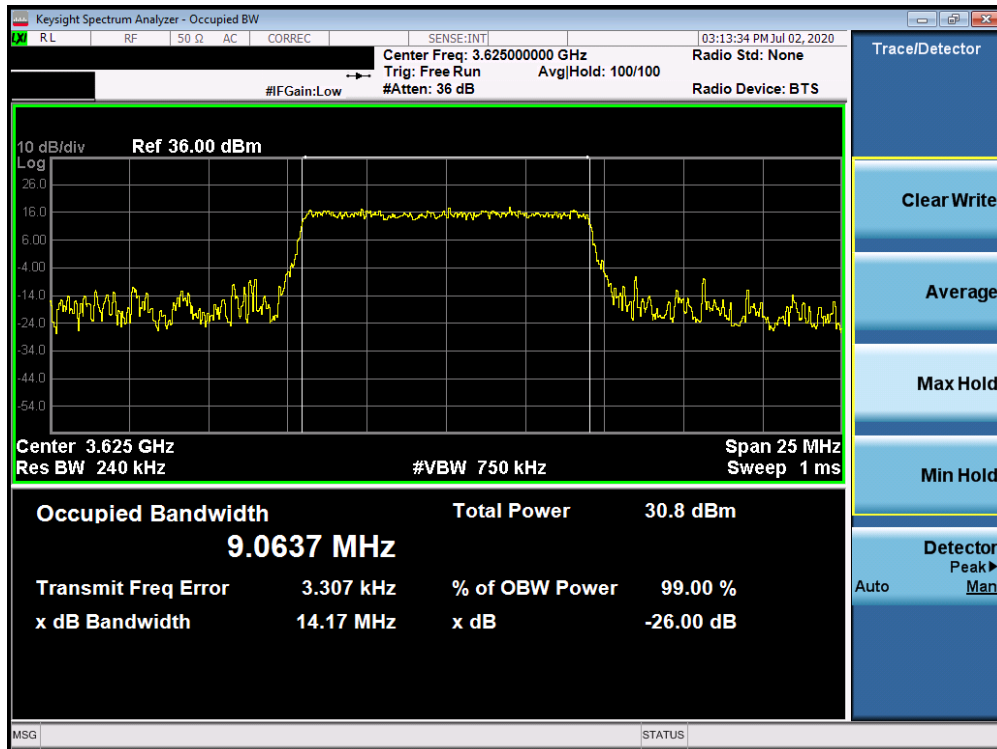


Plot 7-7. Occupied Bandwidth Plot (LTE Band 48 - 10MHz QPSK - Full RB Configuration)

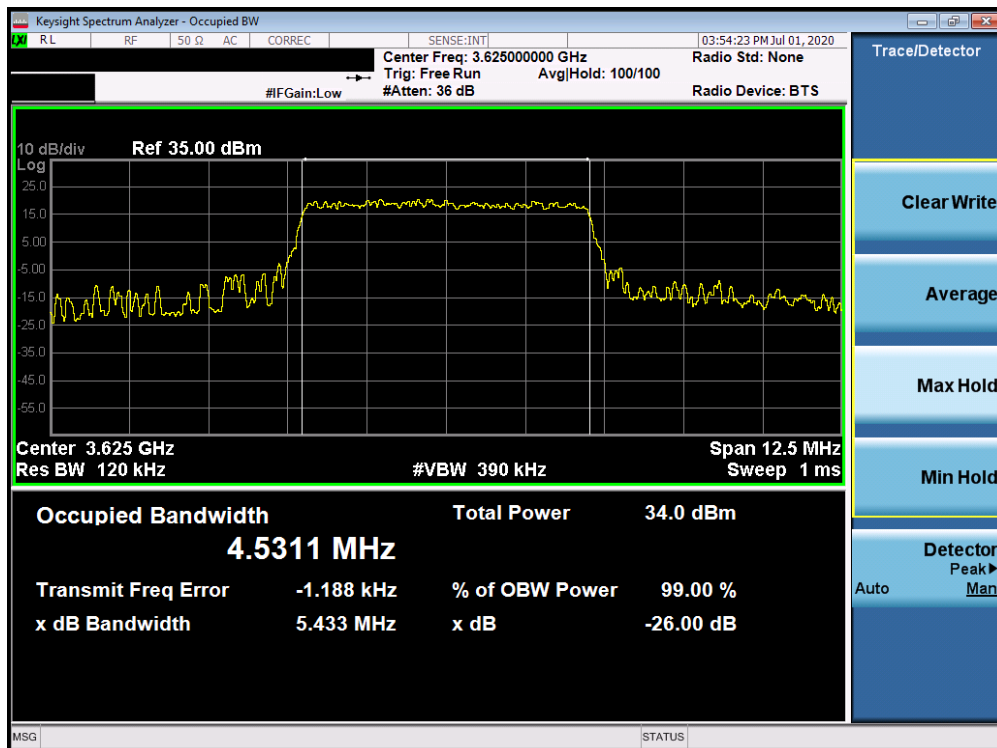


Plot 7-8. Occupied Bandwidth Plot (LTE Band 48 - 10MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 17 of 51

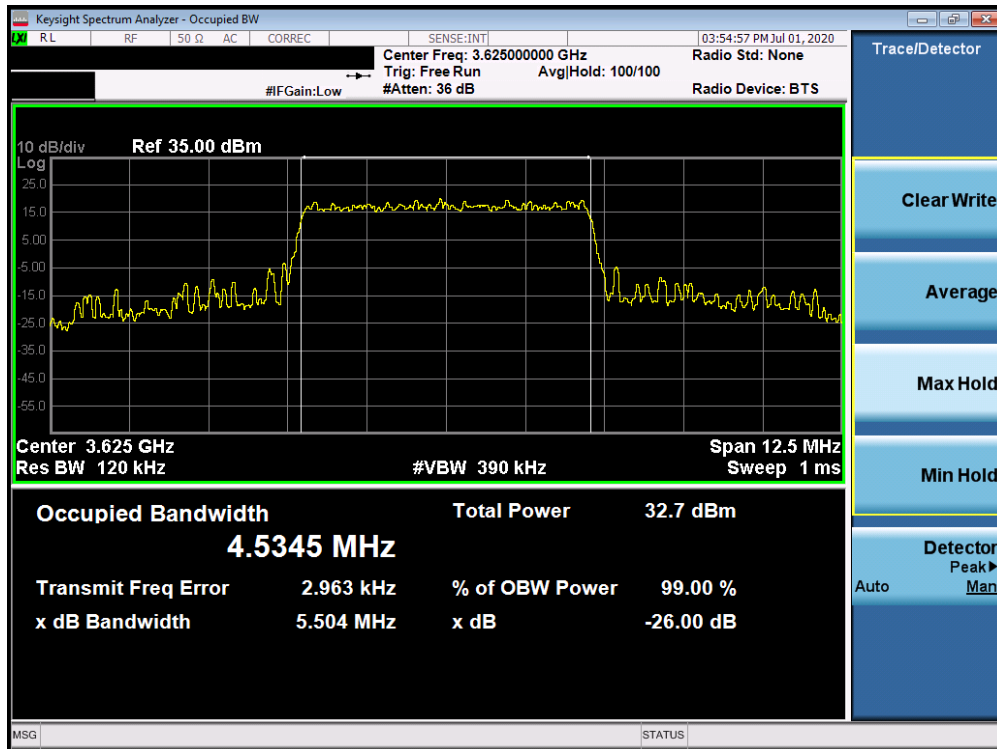


Plot 7-9. Occupied Bandwidth Plot (LTE Band 48 - 10MHz 64-QAM - Full RB Configuration)

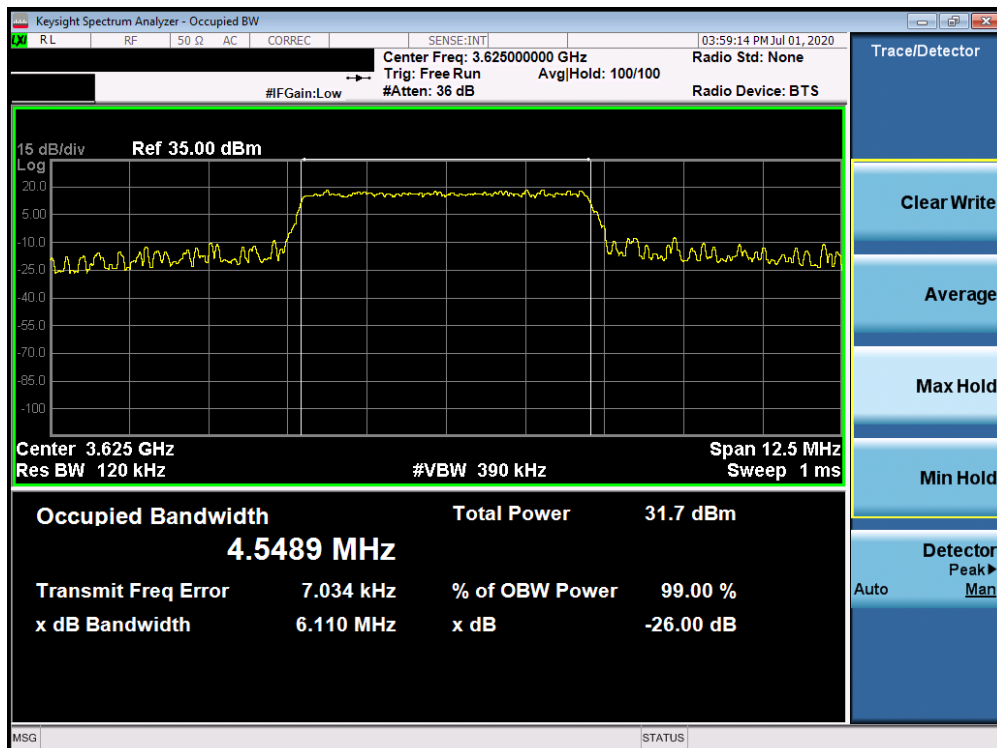


Plot 7-10. Occupied Bandwidth Plot (LTE Band 48 - 5MHz QPSK - Full RB Configuration)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 18 of 51



Plot 7-11. Occupied Bandwidth Plot (LTE Band 48 - 5MHz 16-QAM - Full RB Configuration)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 48 - 5MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 19 of 51

7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §96.41(e)

Test Overview

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

The conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/Mhz.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 * the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = Max Hold
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

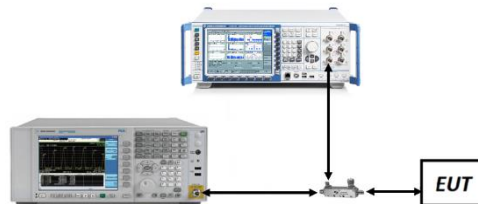


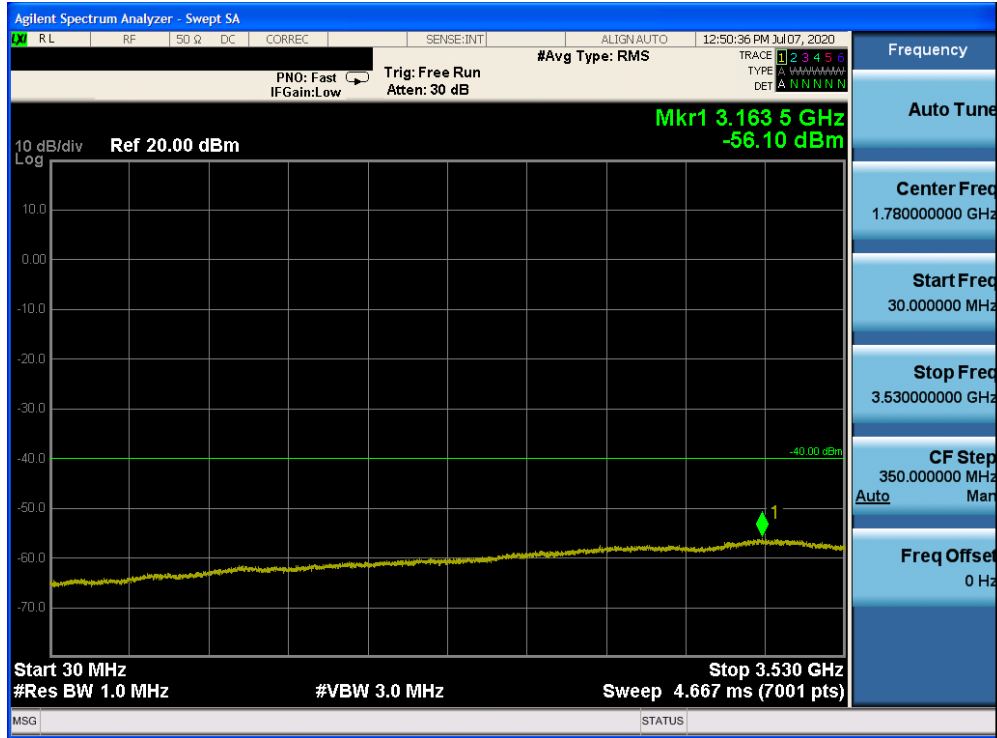
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

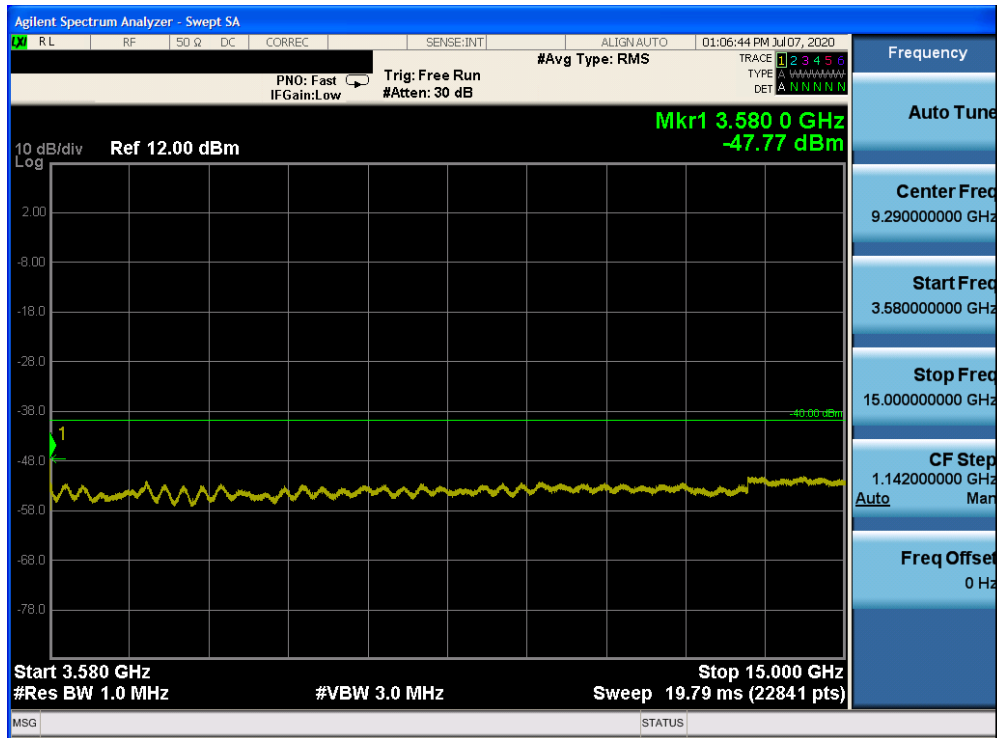
1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the 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.
2. All ports were tested and only the worst case data were reported.

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 20 of 51

LTE Band 48

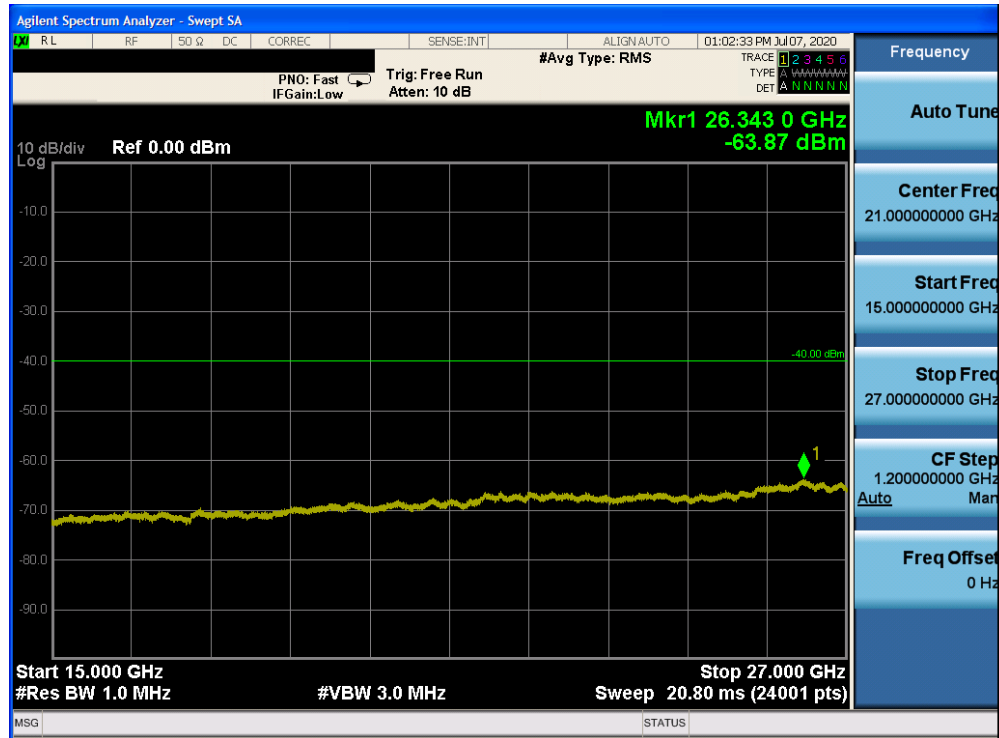


Plot 7-13. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

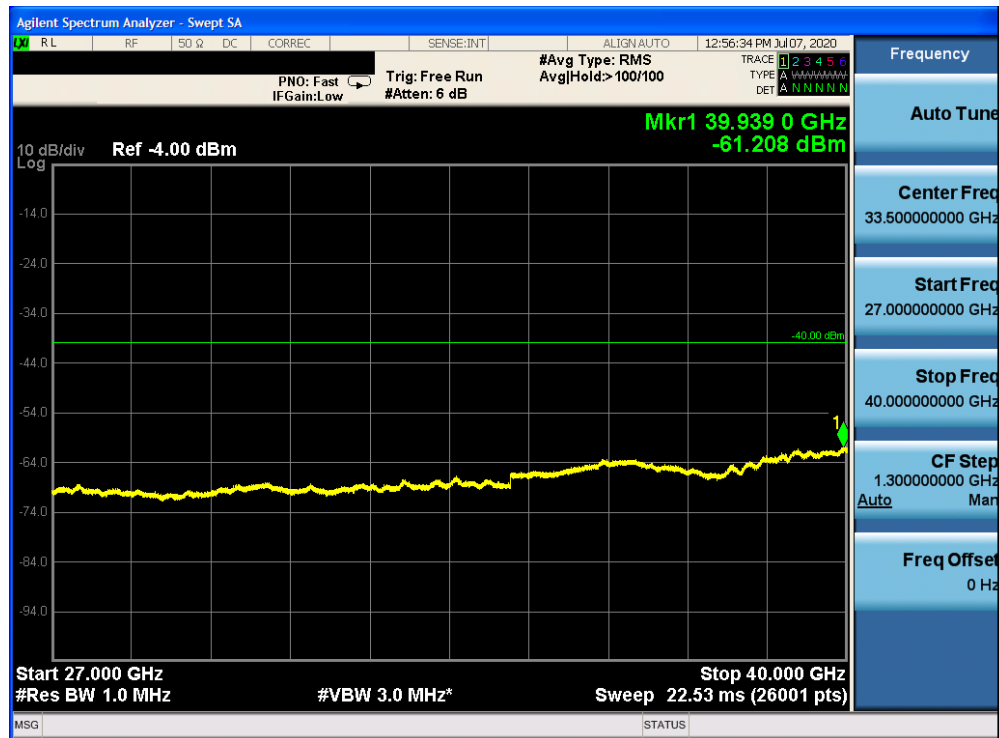


Plot 7-14. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 21 of 51

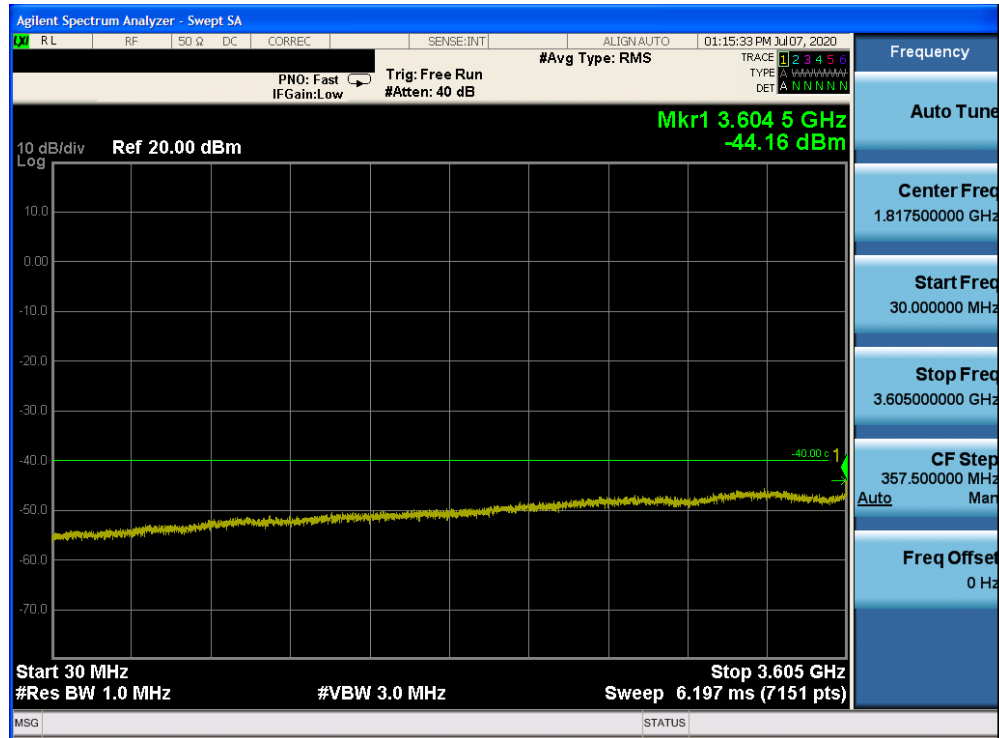


Plot 7-15. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

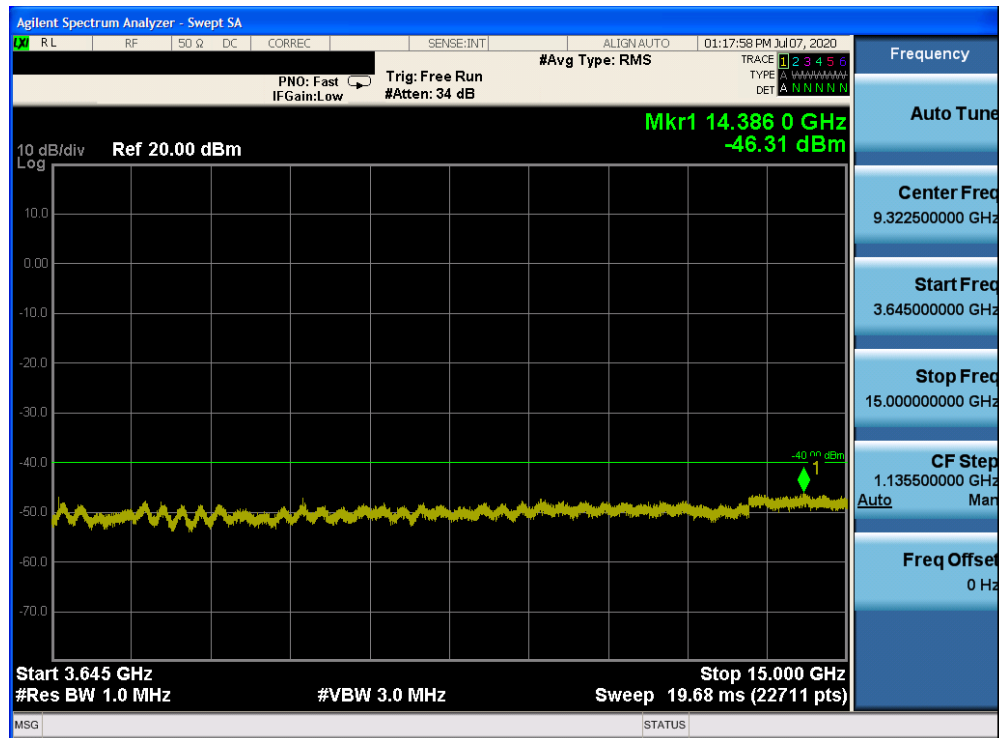


Plot 7-16. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 22 of 51

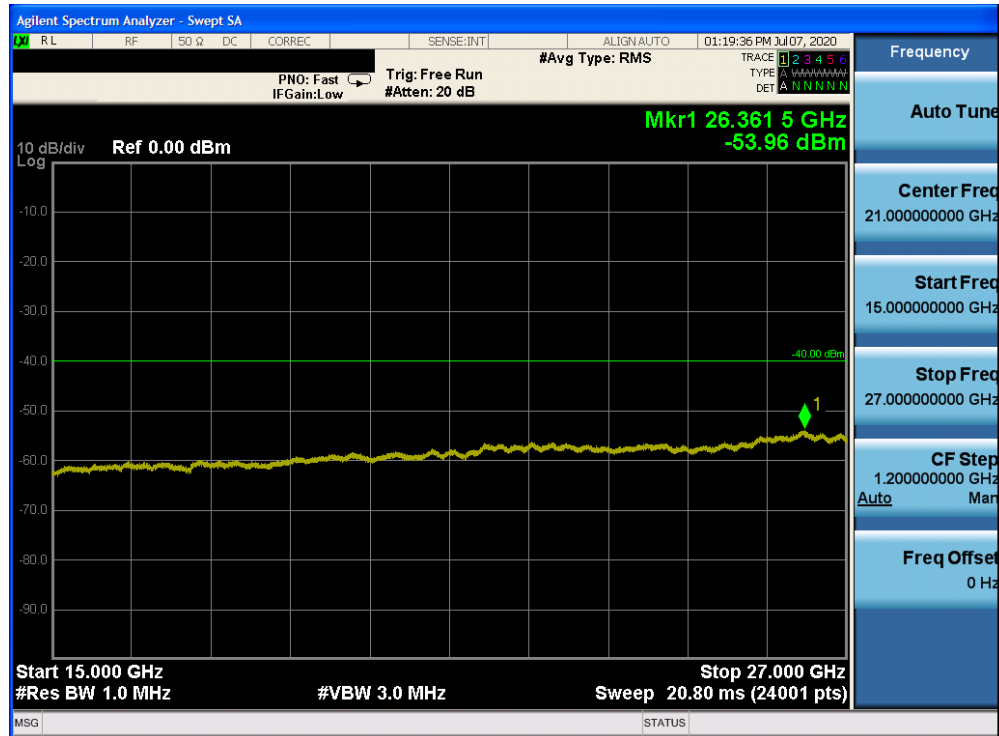


Plot 7-17. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

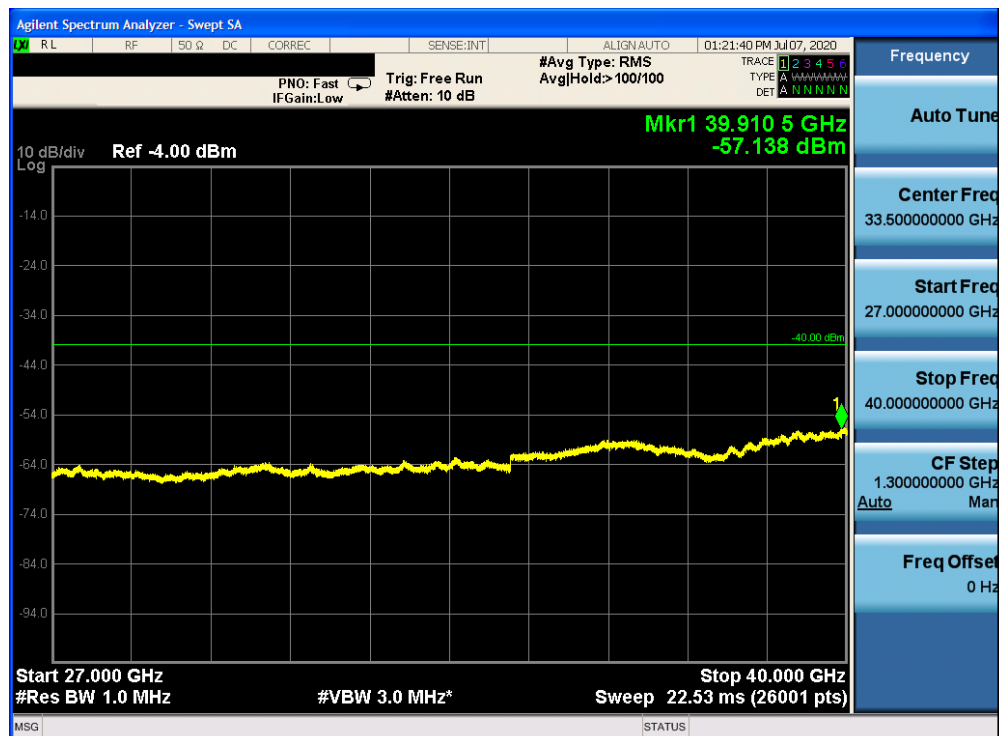


Plot 7-18. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 23 of 51

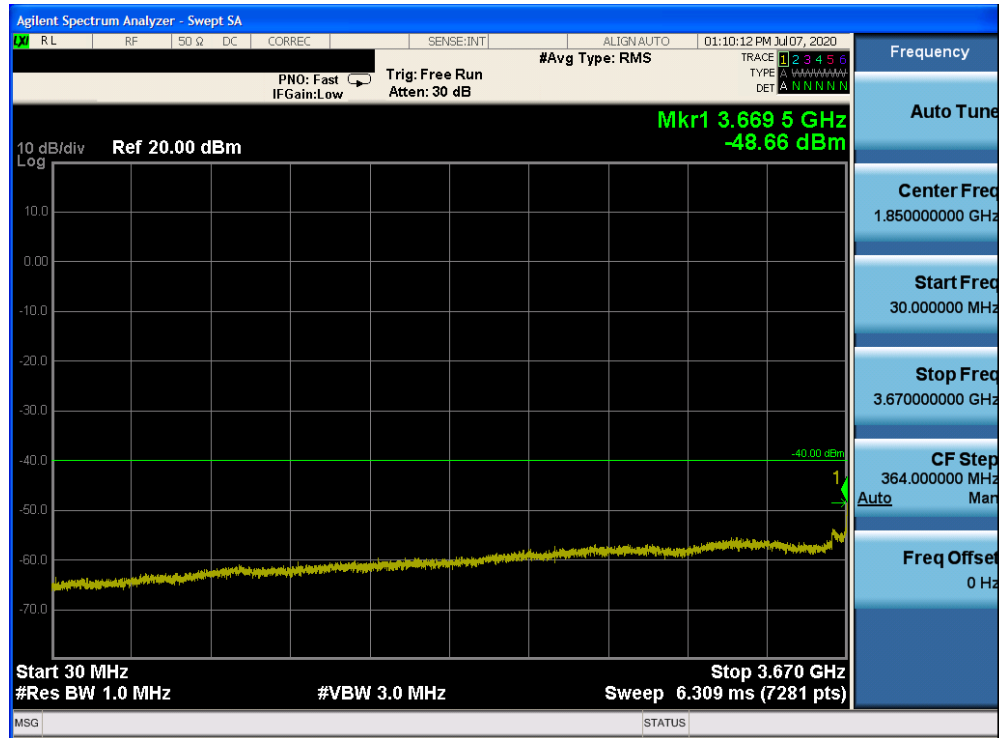


Plot 7-19. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

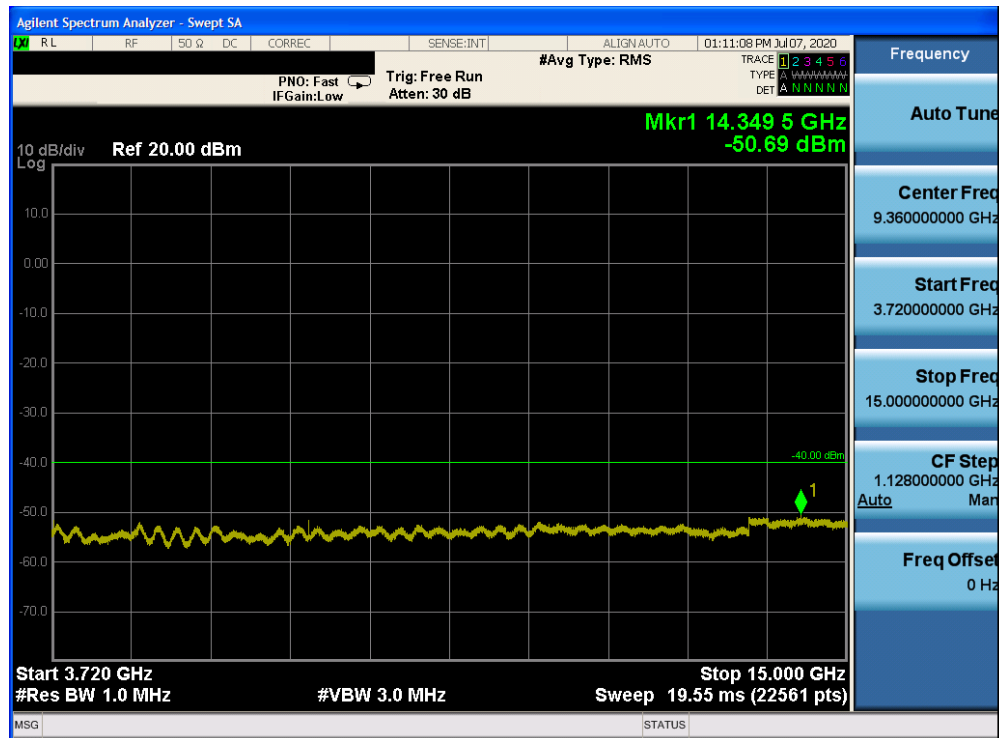


Plot 7-20. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 24 of 51

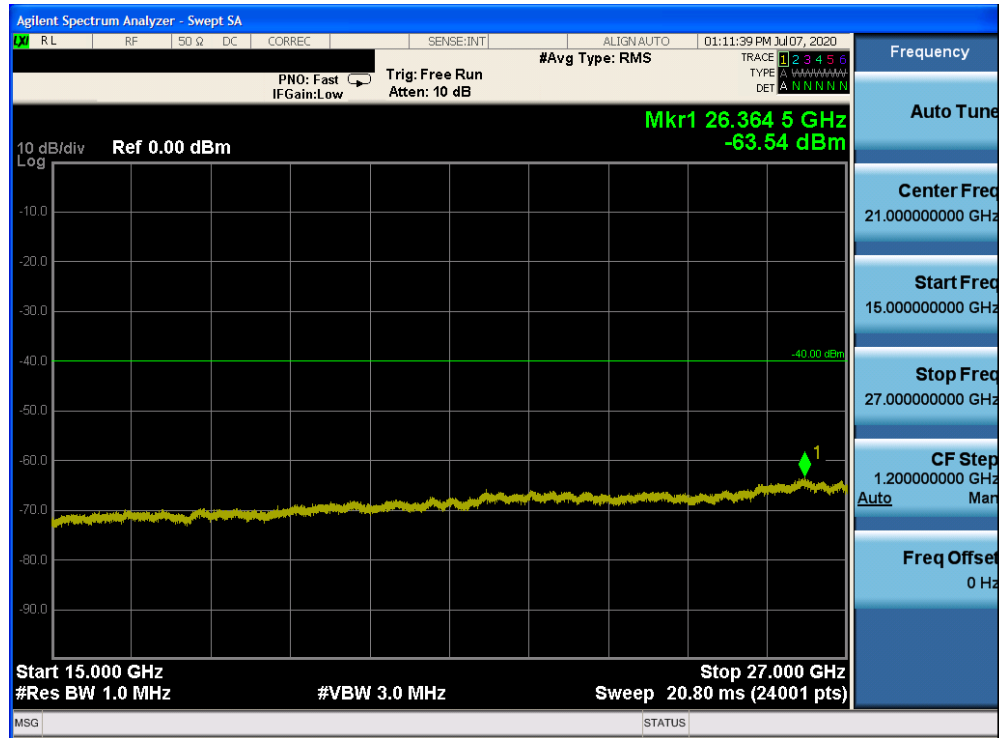


Plot 7-21. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

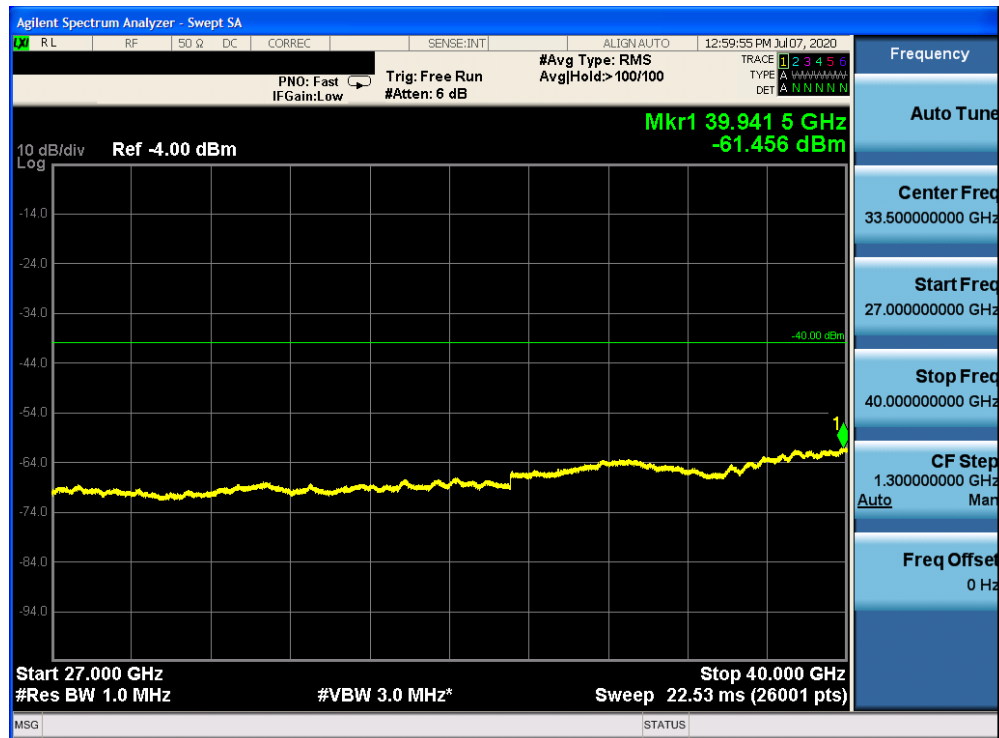


Plot 7-22. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 25 of 51



Plot 7-23. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-24. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 26 of 51

7.4 Band Edge Emissions at Antenna Terminal

~~§2.1051~~ §96.41(e)(iii)

Test Overview

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

The conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0 to B MHz (where B is the bandwidth in MHz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B MHz below the lower CBSD-assigned channel edge. At all frequencies greater than B MHz above the upper CBSD assigned channel edge and less than B MHz below the lower CBSD-assigned channel edge, the conducted power of any end user device emission shall not exceed -25 dBm/MHz. The conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -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 $\geq 1\%$ of the emission bandwidth
4. VBW $\geq 3 \times$ RBW
5. Detector = RMS
6. Number of sweep points $\geq 2 \times$ 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.

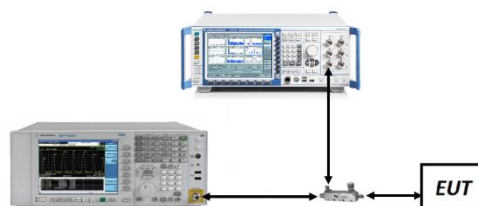


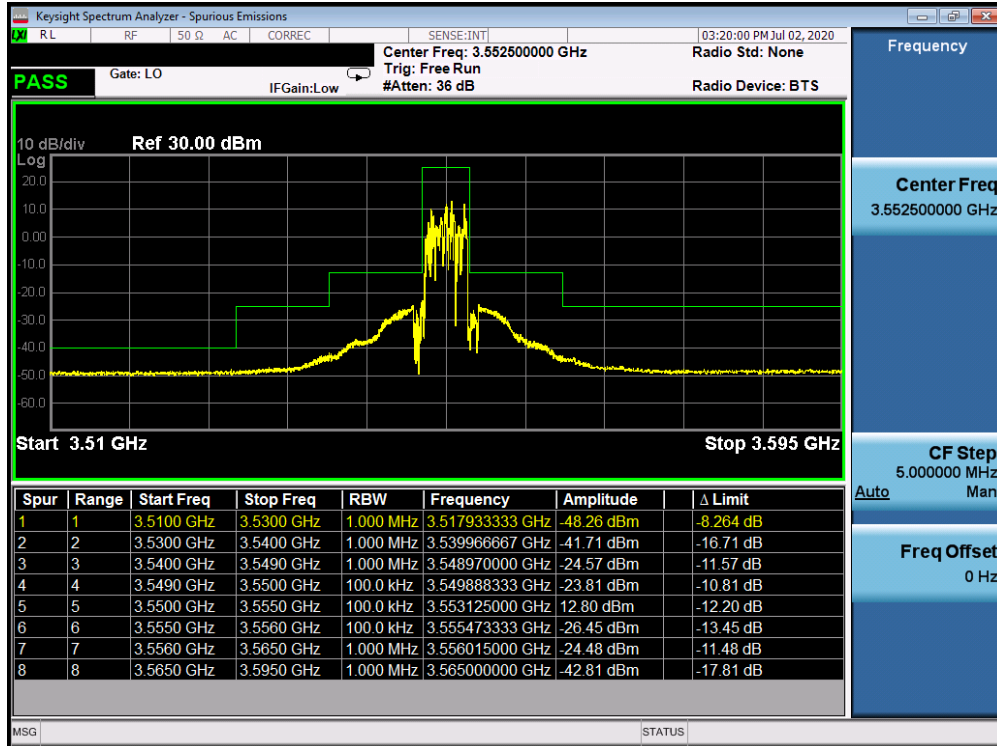
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

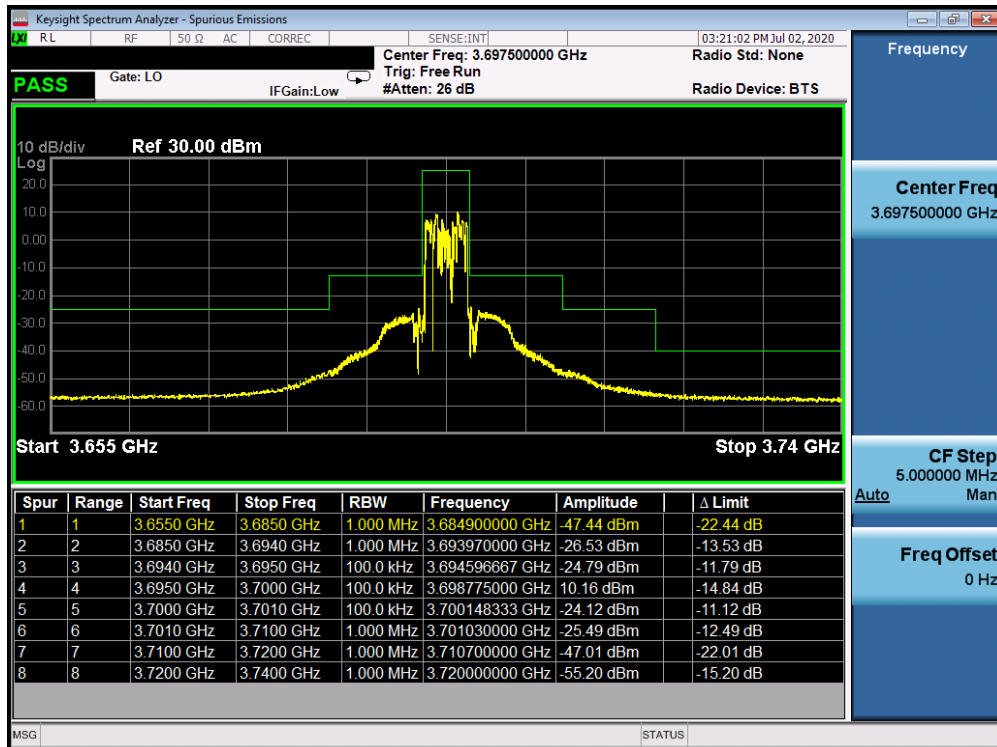
All ports were tested and only the worst case data were reported.

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 27 of 51

LTE Band 48

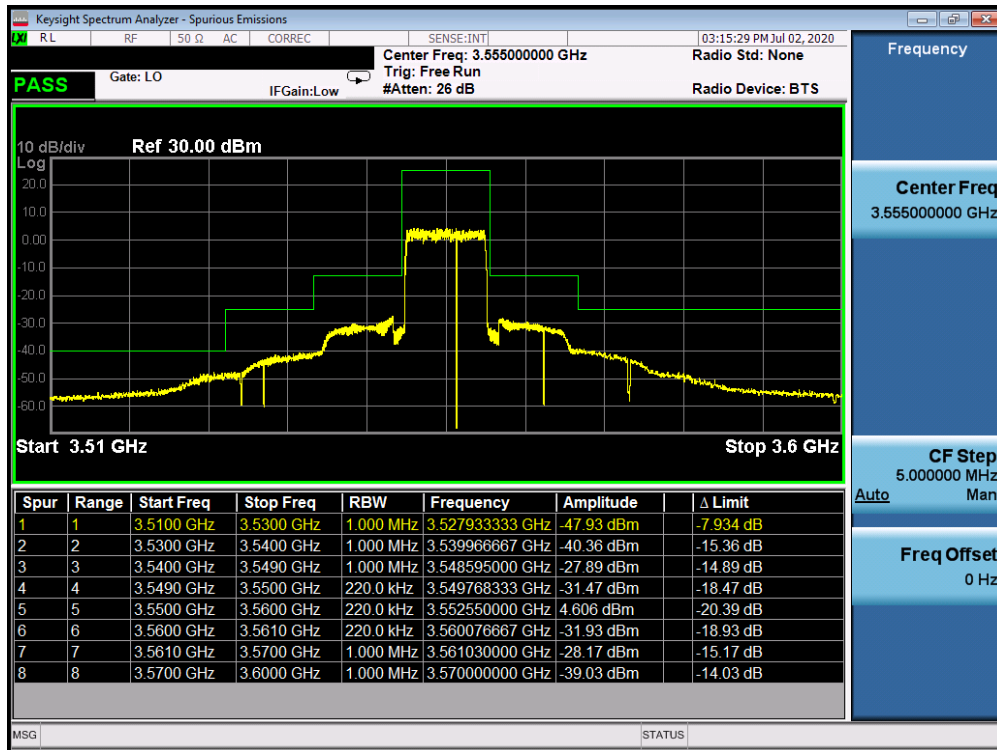


Plot 7-25. Lower ACP Plot (LTE Band 48 - 5MHz QPSK)

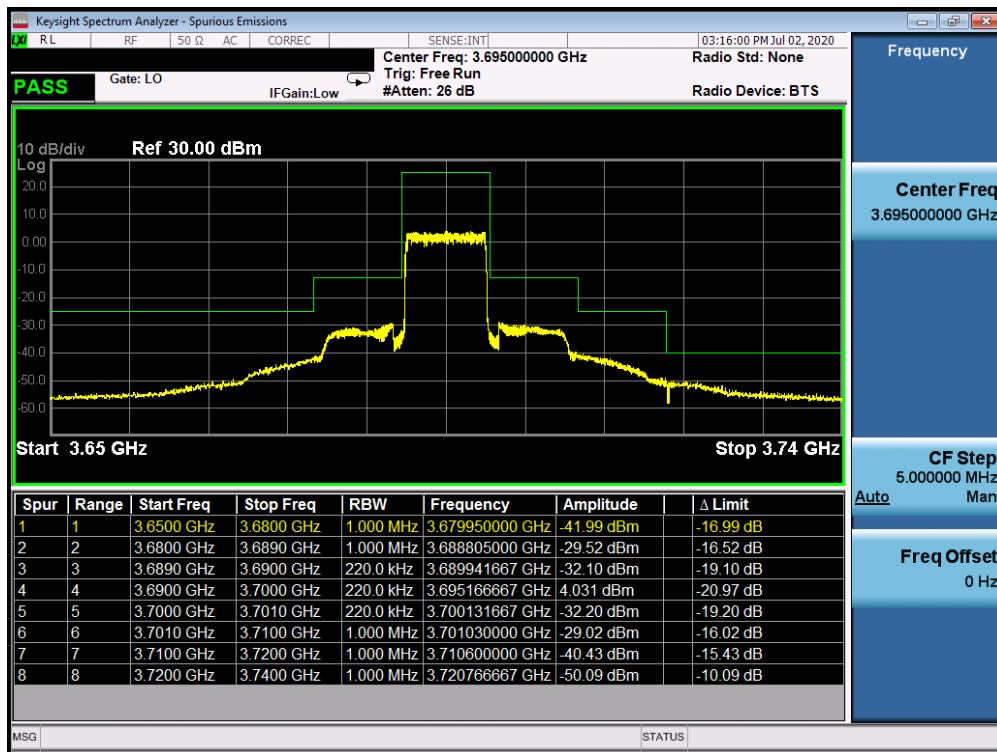


Plot 7-26. Upper ACP Plot (LTE Band 48 - 5MHz QPSK)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 28 of 51

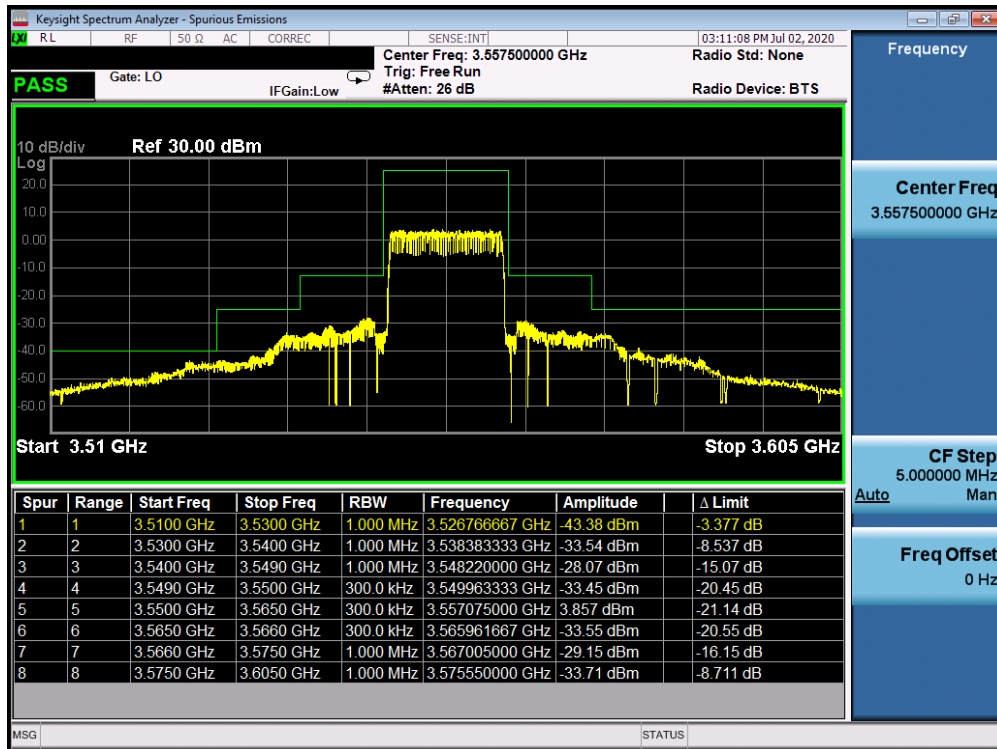


Plot 7-27. Lower ACP Plot (LTE Band 48 - 10MHz QPSK)

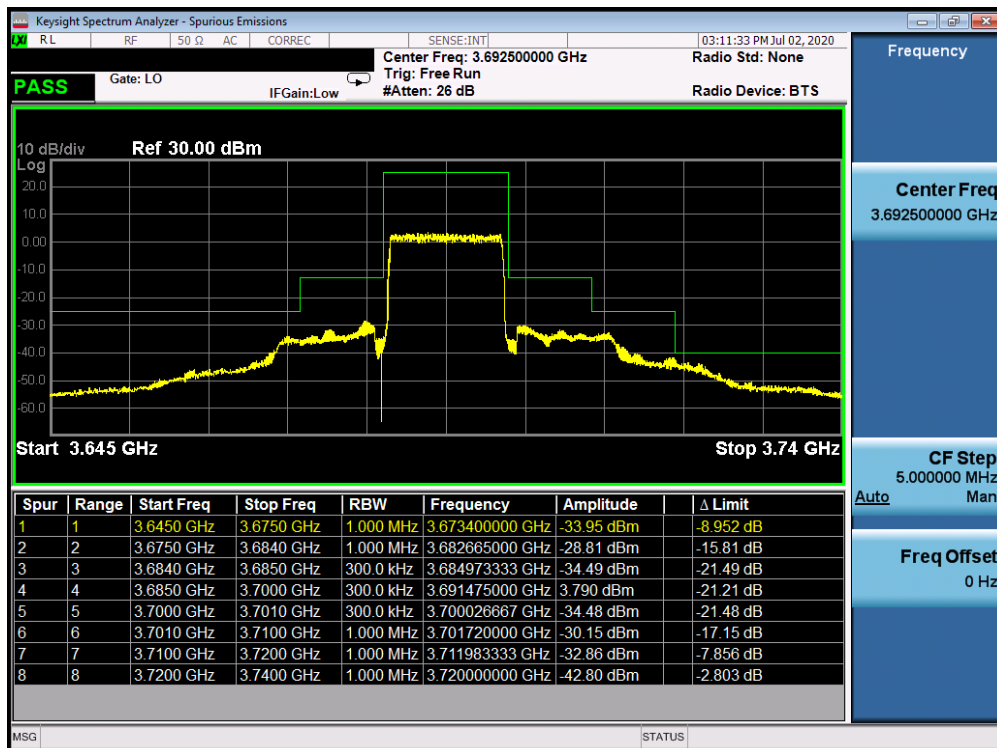


Plot 7-28. Upper ACP Plot (LTE Band 48 - 10MHz QPSK)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 29 of 51

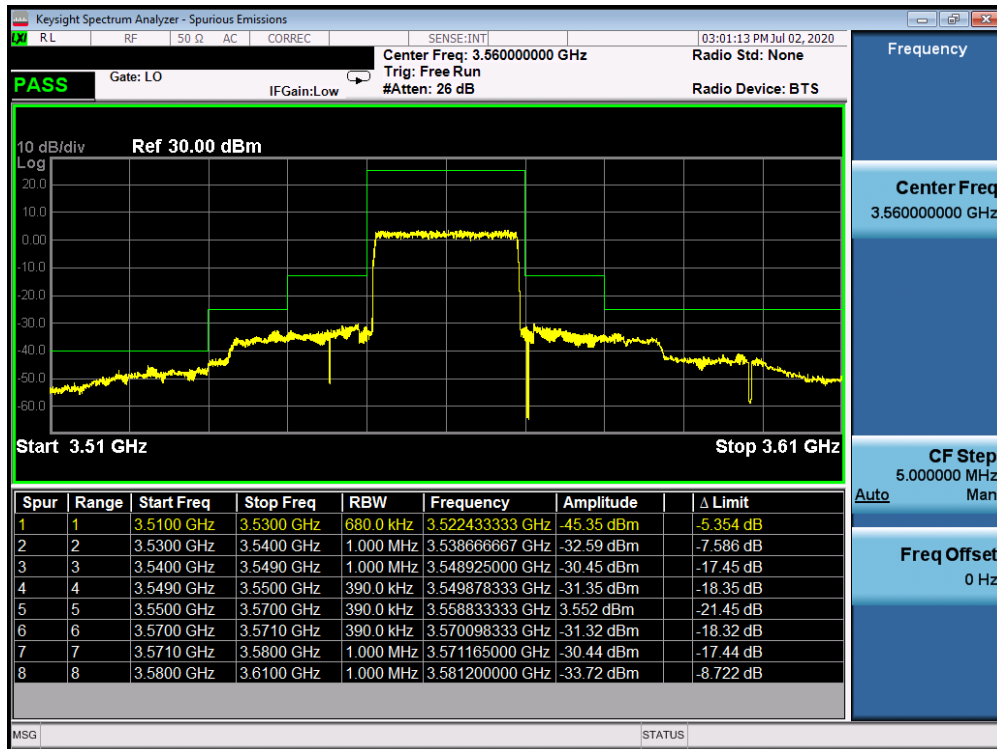


Plot 7-29. Lower ACP Plot (LTE Band 48 - 15MHz QPSK)

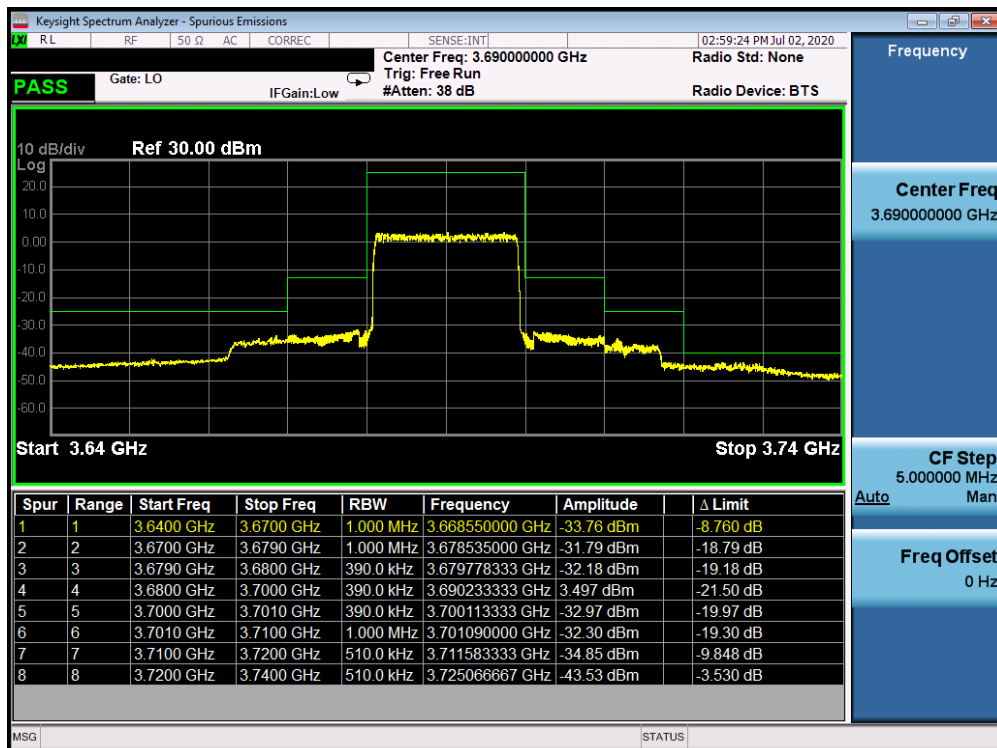


Plot 7-30. Upper ACP Plot (LTE Band 48 - 15MHz QPSK)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 30 of 51



Plot 7-31. Lower ACP Plot (LTE Band 48 - 20MHz QPSK)



Plot 7-32. Upper ACP Plot (LTE Band 48 - 20MHz QPSK)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 31 of 51

7.5 Radiated Power (EIRP)

§96.41(b)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are calculated by adding highest antenna gain to maximum measured conducted output power. 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 C63.26-2015

Test Settings

The relevant equation for determining the ERP or EIRP from the conducted RF output power measured is:

$$\text{ERP/EIRP} = \text{PMeas} - \text{LC} + \text{GT}$$

Where:

ERP/EIRP = effective or equivalent radiated power, respectively (expressed in the same units as PMeas, typically dBW or dBm)

PMeas = measured transmitter output power or PSD, in dBW or dBm

LC = signal attenuation in the connecting cable between the transmitter and antenna in dB

GT = gain of the transmitting antenna, in dBd (ERP) or dBi (EIRP)

Test Setup

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



Figure 7-4. ERP/EIRP Measurement Setup

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 32 of 51

Test Notes

- 1) The worst case emissions are reported with the 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 Level (dBm) readings in the table were taken with a correction table loaded into the base station simulator. The correction table was used to account for the signal attenuation in the connecting cable between the transmitter and antenna.
- 4) The Ant. Gains (GT) are listed in dBi.
- 5) 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).

FCC ID: BCGA2324	 PCTEST Proud to be part of  element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 33 of 51

Antenna 4

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	RB Size/Offset	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
3552.50	5	QPSK	1 / 24	20.41	-4.00	16.41	0.044	23.00	-6.59
3625.00	5	QPSK	1 / 24	25.14	-4.00	21.14	0.130	23.00	-1.86
3697.50	5	QPSK	1 / 24	20.42	-4.00	16.42	0.044	23.00	-6.58
3625.00	5	16-QAM	1 / 24	24.06	-4.00	20.06	0.101	23.00	-2.94
3625.00	5	64-QAM	1 / 24	23.15	-4.00	19.15	0.082	23.00	-3.85
3555.00	10	QPSK	1 / 0	20.50	-4.00	16.50	0.045	23.00	-6.50
3625.00	10	QPSK	1 / 49	25.21	-4.00	21.21	0.132	23.00	-1.79
3695.00	10	QPSK	1 / 49	20.26	-4.00	16.26	0.042	23.00	-6.74
3625.00	10	16-QAM	1 / 0	24.26	-4.00	20.26	0.106	23.00	-2.74
3625.00	10	64-QAM	1 / 49	23.28	-4.00	19.28	0.085	23.00	-3.72
3557.50	15	QPSK	1 / 0	20.36	-4.00	16.36	0.043	23.00	-6.64
3625.00	15	QPSK	1 / 0	25.24	-4.00	21.24	0.133	23.00	-1.76
3692.50	15	QPSK	1 / 74	20.29	-4.00	16.29	0.043	23.00	-6.71
3625.00	15	16-QAM	1 / 74	24.34	-4.00	20.34	0.108	23.00	-2.66
3625.00	15	64-QAM	1 / 0	23.36	-4.00	19.36	0.086	23.00	-3.64
3560.00	20	QPSK	1 / 99	20.50	-4.00	16.50	0.045	23.00	-6.50
3625.00	20	QPSK	1 / 99	25.18	-4.00	21.18	0.131	23.00	-1.82
3690.00	20	QPSK	1 / 99	20.41	-4.00	16.41	0.044	23.00	-6.59
3625.00	20	16-QAM	1 / 99	24.33	-4.00	20.33	0.108	23.00	-2.67
3625.00	20	64-QAM	1 / 99	23.30	-4.00	19.30	0.085	23.00	-3.70

Table 7-2. EIRP Data (Band 48)

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 34 of 51

Antenna 3b

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	RB Size/Offset	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
3552.50	5	QPSK	1 / 0	19.75	-2.30	17.45	0.056	33.01	-15.56
3625.00	5	QPSK	1 / 24	23.75	-2.30	21.45	0.140	33.01	-11.56
3697.50	5	QPSK	1 / 0	19.31	-2.30	17.01	0.050	33.01	-16.00
3625.00	5	16-QAM	1 / 0	22.52	-2.30	20.22	0.105	33.01	-12.79
3625.00	5	64-QAM	1 / 0	21.45	-2.30	19.15	0.082	33.01	-13.86
3555.00	10	QPSK	1 / 0	19.75	-2.30	17.45	0.056	33.01	-15.56
3625.00	10	QPSK	1 / 0	23.69	-2.30	21.39	0.138	33.01	-11.62
3695.00	10	QPSK	1 / 0	19.26	-2.30	16.96	0.050	33.01	-16.05
3625.00	10	16-QAM	1 / 49	22.76	-2.30	20.46	0.111	33.01	-12.55
3625.00	10	64-QAM	1 / 0	21.46	-2.30	19.16	0.082	33.01	-13.85
3557.50	15	QPSK	1 / 0	19.75	-2.30	17.45	0.056	33.01	-15.56
3625.00	15	QPSK	1 / 74	23.70	-2.30	21.40	0.138	33.01	-11.61
3692.50	15	QPSK	1 / 0	19.25	-2.30	16.95	0.050	33.01	-16.06
3625.00	15	16-QAM	1 / 74	22.80	-2.30	20.50	0.112	33.01	-12.51
3625.00	15	64-QAM	1 / 74	21.68	-2.30	19.38	0.087	33.01	-13.63
3560.00	20	QPSK	1 / 0	19.75	-2.30	17.45	0.056	33.01	-15.56
3625.00	20	QPSK	1 / 99	23.73	-2.30	21.43	0.139	33.01	-11.58
3690.00	20	QPSK	1 / 0	19.61	-2.30	17.31	0.054	33.01	-15.70
3625.00	20	16-QAM	1 / 99	22.77	-2.30	20.47	0.111	33.01	-12.54
3625.00	20	64-QAM	1 / 99	21.65	-2.30	19.35	0.086	33.01	-13.66

Table 7-3. EIRP Data (Band 48)

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 35 of 51

7.6 Radiated Spurious Emissions

§2.1053 §96.41(e)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI C63.26-2015, 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 C63.26-2015

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 $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Max Hold (In cases where the level is within 2dB of the limit, the final measurement is taken using triggering/gating and trace averaging.)
7. The trace was allowed to stabilize

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 36 of 51

Test Setup

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

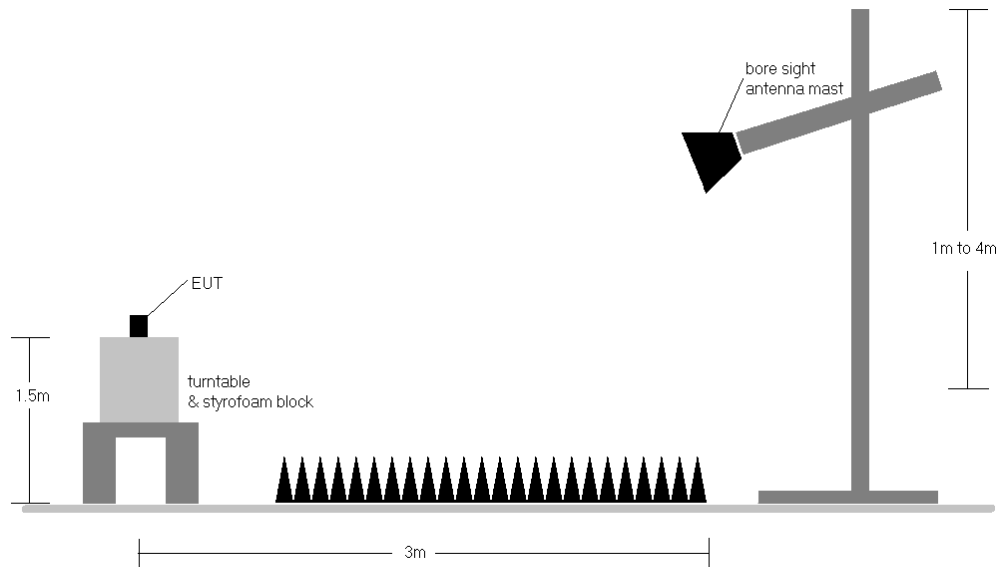


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

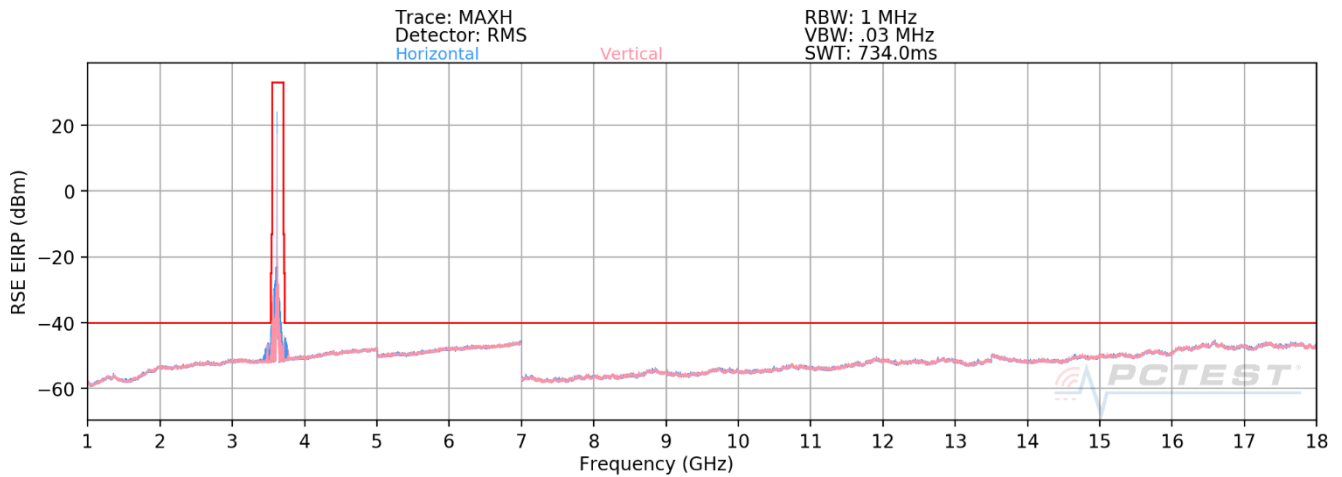
- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below. 1RB config was found and reported as a worst case RB size.
- 2) This unit was tested with its standard battery.
- 3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 6) Per KDB 971168, Field Strength Level (dBμV/m) is converted to EIRP Spurious Emission Level (dBm) using the formula in Section 5.8.4 (d):

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

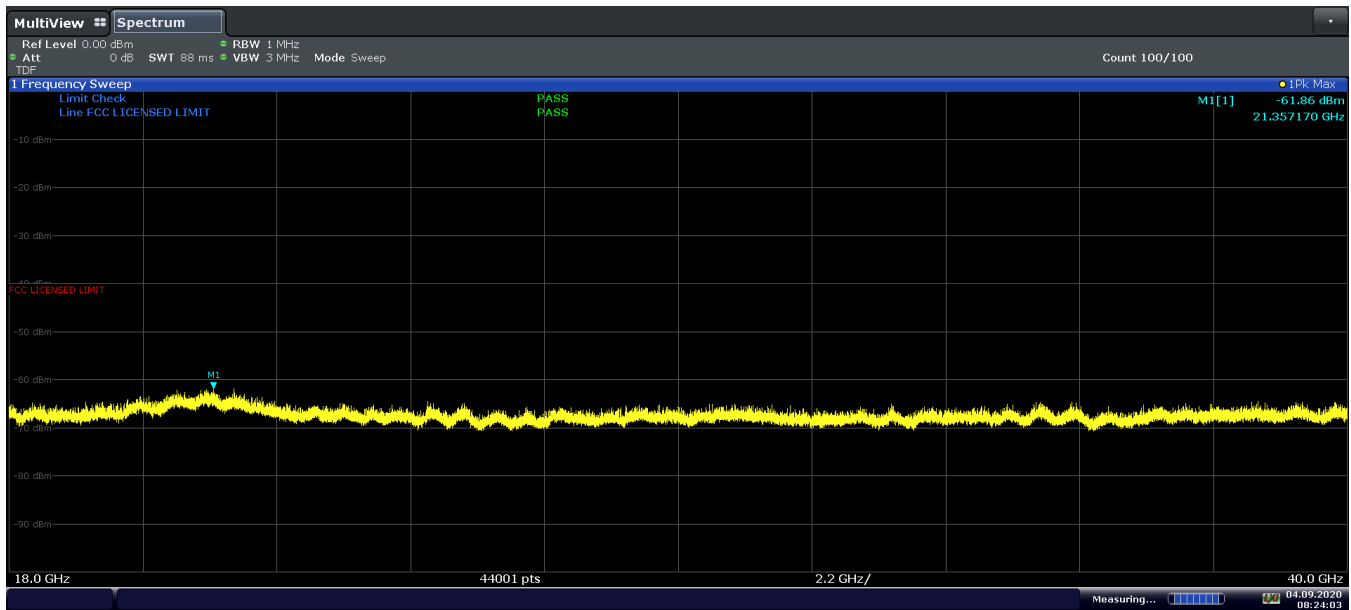
- 7) For LTE Band 48 pre-scans 1-18GHz, the RBW is set to 1MHz and VBW to 30kHz. For final measurements above 1GHz, the RBW is set to 1MHz and VBW to 3MHz when measuring with an RMS detector and max hold trace.

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 37 of 51

7.6.1 Antenna 4 Radiated Spurious Emissions Measurements



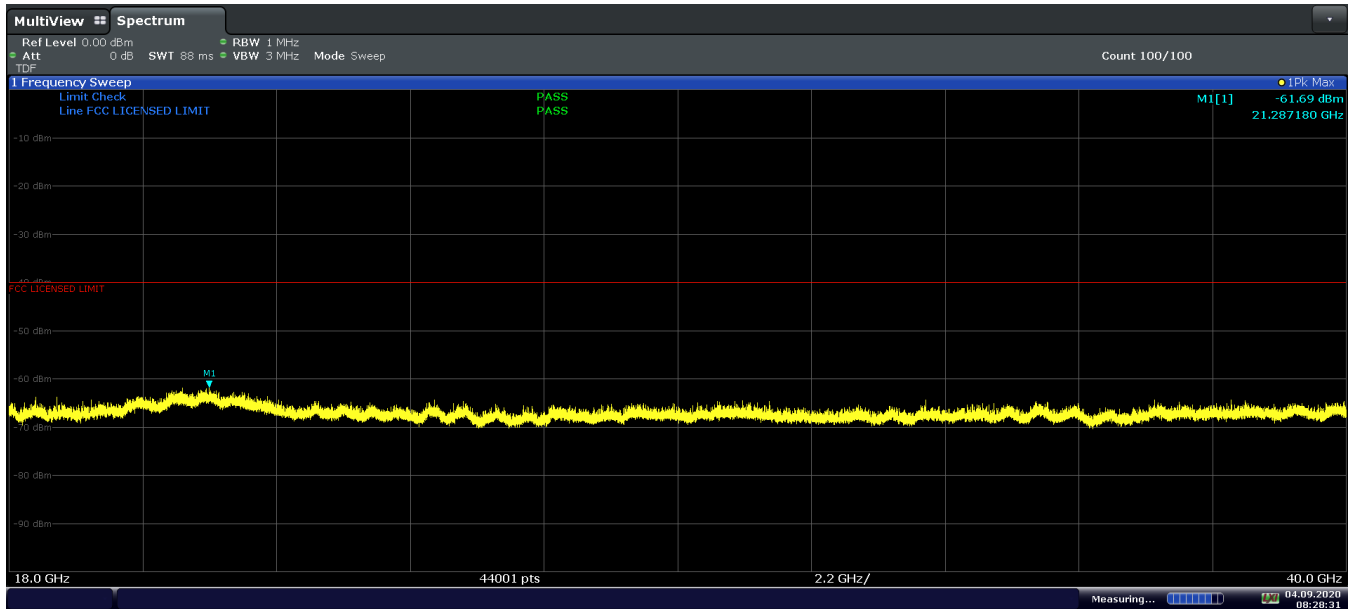
Plot 7-33. Radiated Spurious Plot 1 - 18GHz (Band 48)



08:24:03 04.09.2020

Plot 7-34. Radiated Spurious Plot 18 - 40GHz (Band 48 – Ant. Pol H)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 38 of 51



08:28:32 04.09.2020

Plot 7-35. Radiated Spurious Plot 18 - 40GHz (Band 48 – Ant. Pol V)

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]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7120.00	V	-	-	-58.15	9.45	-48.69	-8.7
10680.00	V	-	-	-56.38	9.47	-46.92	-6.9
14240.00	V	-	-	-53.46	9.17	-44.29	-4.3

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

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device		Page 39 of 51

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]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7250.00	V	-	-	-58.78	9.44	-49.34	-9.3
10875.00	V	-	-	-55.68	9.60	-46.08	-6.1
14500.00	V	-	-	-53.81	9.16	-44.66	-4.7

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]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7380.00	V	-	-	-58.73	9.41	-49.32	-9.3
11070.00	V	-	-	-56.50	9.76	-46.74	-6.7
14760.00	V	-	-	-52.66	9.04	-43.61	-3.6

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

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 40 of 51

7.6.2 Antenna 3b Radiated Spurious Emissions Measurements

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]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7120.00	H	-	-	-58.47	9.45	-49.01	-9.0
10680.00	H	-	-	-55.75	9.47	-46.29	-6.3
14240.00	H	-	-	-52.80	9.17	-43.63	-3.6

Table 7-7. 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]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7250.00	H	184	217	-57.08	9.44	-47.64	-7.6
10875.00	H	-	-	-55.12	9.60	-45.52	-5.5
14500.00	H	-	-	-53.12	9.16	-43.97	-4.0

Table 7-8. Radiated Spurious Data (Band 48 – Mid Channel)

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 41 of 51

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]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7380.00	H	147	138	-57.62	9.41	-48.21	-8.2
11070.00	H	-	-	-56.71	9.76	-46.95	-6.9
14760.00	H	-	-	-52.63	9.04	-43.58	-3.6

Table 7-9. Radiated Spurious Data (Band 48 – High Channel)

FCC ID: BCGA2324	 MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020 EUT Type: Tablet Device	Page 42 of 51

7.7 Frequency Stability / Temperature Variation

§2.1055

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015, 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 C63.26-2015

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



Figure 7-6. Test Instrument & Measurement Setup

Test Notes

All ports were tested and only the worst case data were reported.

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 43 of 51

© 2020 PCTEST

V1.0 12/17/2018

All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

LTE Band 48 Frequency Stability Measurements

OPERATING FREQUENCY:	3,625,000,000	Hz
CHANNEL:	55,990	
REFERENCE VOLTAGE:	3.80	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	3,624,999,970	-30	-0.0000008
100 %		- 20	3,624,999,977	-23	-0.0000006
100 %		- 10	3,624,999,979	-21	-0.0000006
100 %		0	3,624,999,980	-20	-0.0000006
100 %		+ 10	3,624,999,983	-17	-0.0000005
100 %		+ 20	3,624,999,981	-19	-0.0000005
100 %		+ 30	3,624,999,982	-18	-0.0000005
100 %		+ 40	3,624,999,982	-18	-0.0000005
100 %		+ 50	3,624,999,981	-19	-0.0000005
BATT. ENDPOINT	3.40	+ 20	3,624,999,981	-19	-0.0000005

Table 7-10. Frequency Stability Data (LTE Band 48)

Note:

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

FCC ID: BCGA2324		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 44 of 51

LTE Band 48 Frequency Stability Measurements

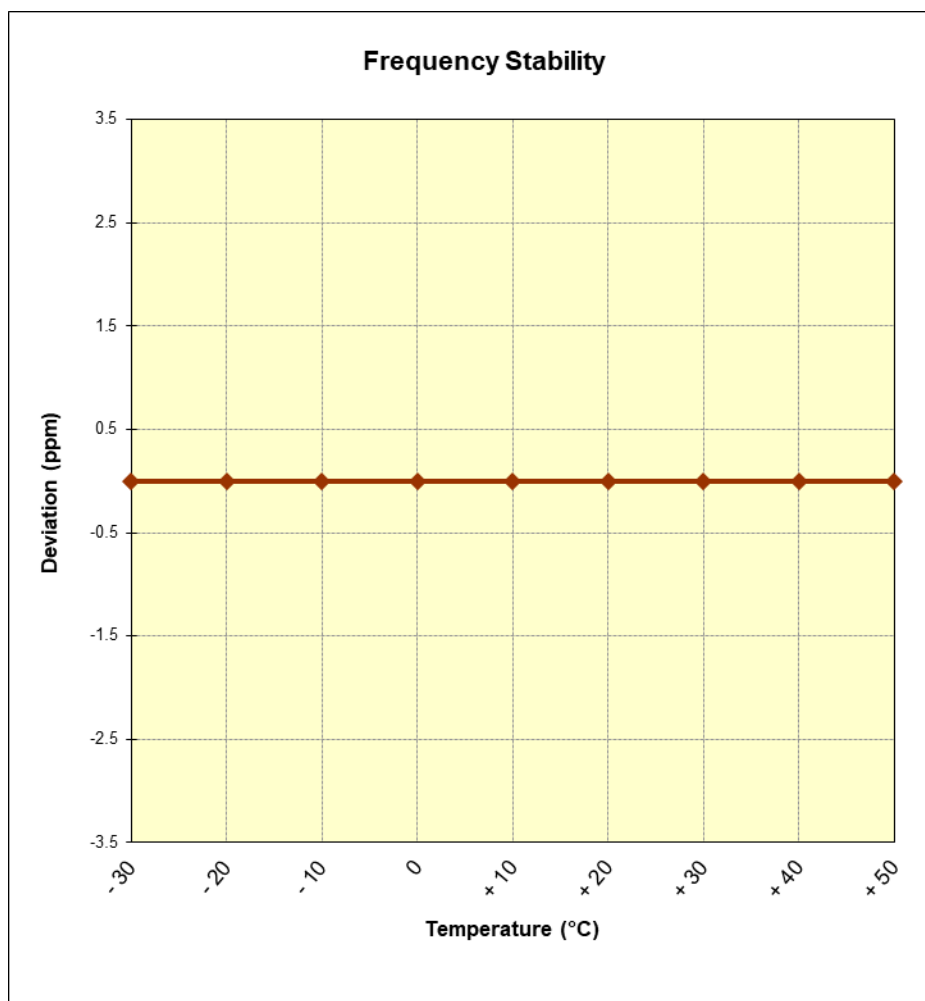


Figure 7-7. Frequency Stability Graph (LTE Band 48)

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 45 of 51

7.8 End User Device Additional Requirement (CBSD Protocol)

§96.47

Test Overview and Limit

End user device additional requirements (CBSD Protocol) are tested per the test procedures listed below. During testing, the EUT is connected to a certified CBSD (Ruckus FCC ID: S9GQ910US00) as a companion device to show compliance with Part 96.47.

End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.

An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.

Test Procedure Used

KDB 940660 D01 v02, WINNF-TS-0122 V1.0.0.

Test Setup/Method

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

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

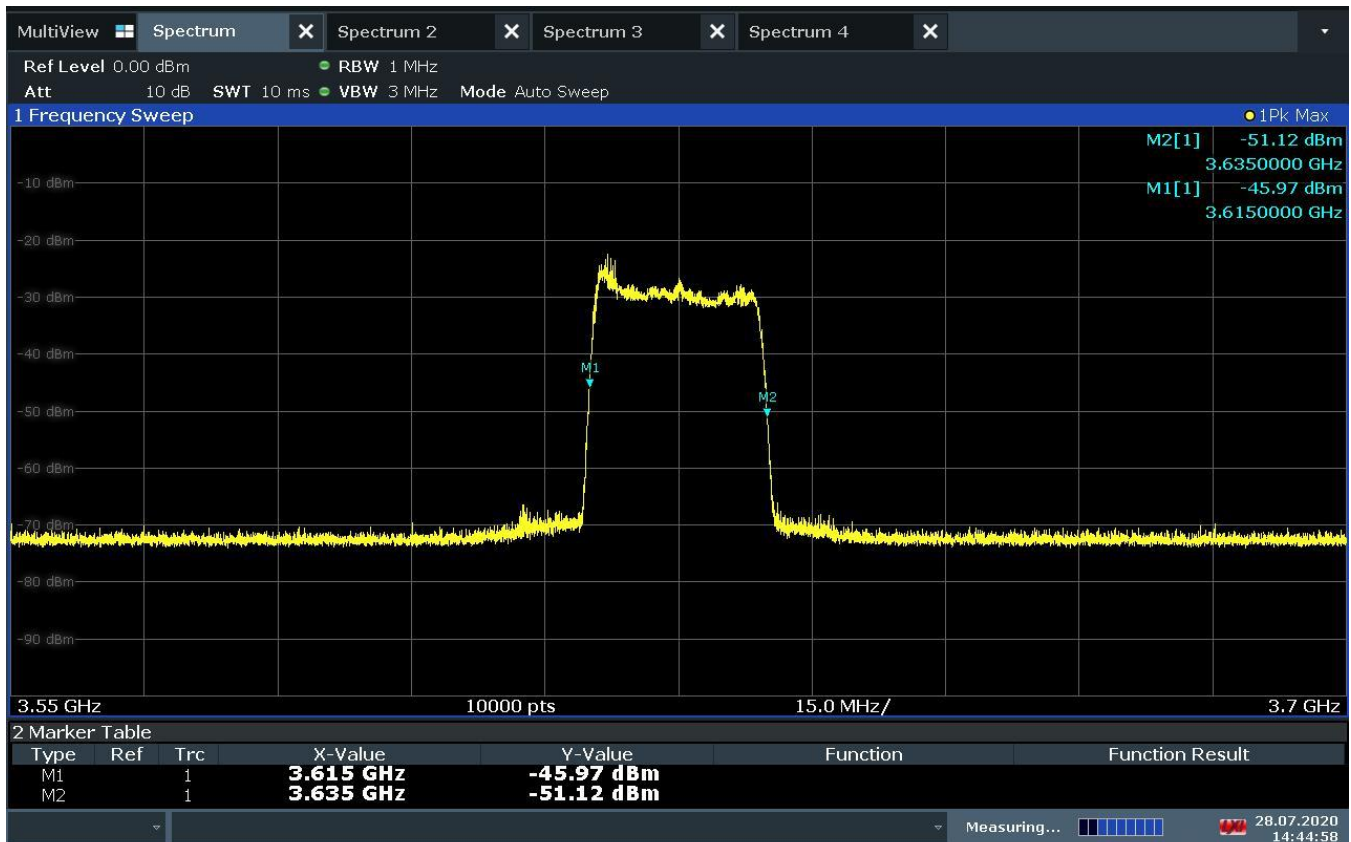
Test Notes

The EUT is an End User Device.

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 46 of 51

Run#1:

- Tx Frequency Set: 3615 – 3635MHz
- MaxEIRP Set: 13dBm/MHz



14:44:58 28.07.2020

Plot 7-36. Run#1 End User Device Frequency of Operations

FCC ID: BCGA2324	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device		Page 47 of 51



14:49:07 28.07.2020

Plot 7-37. Run#1 End User Device Discontinues Operations within 10s

Note:

Marker 1: CBSD sends instructions to discontinue LTE operations.

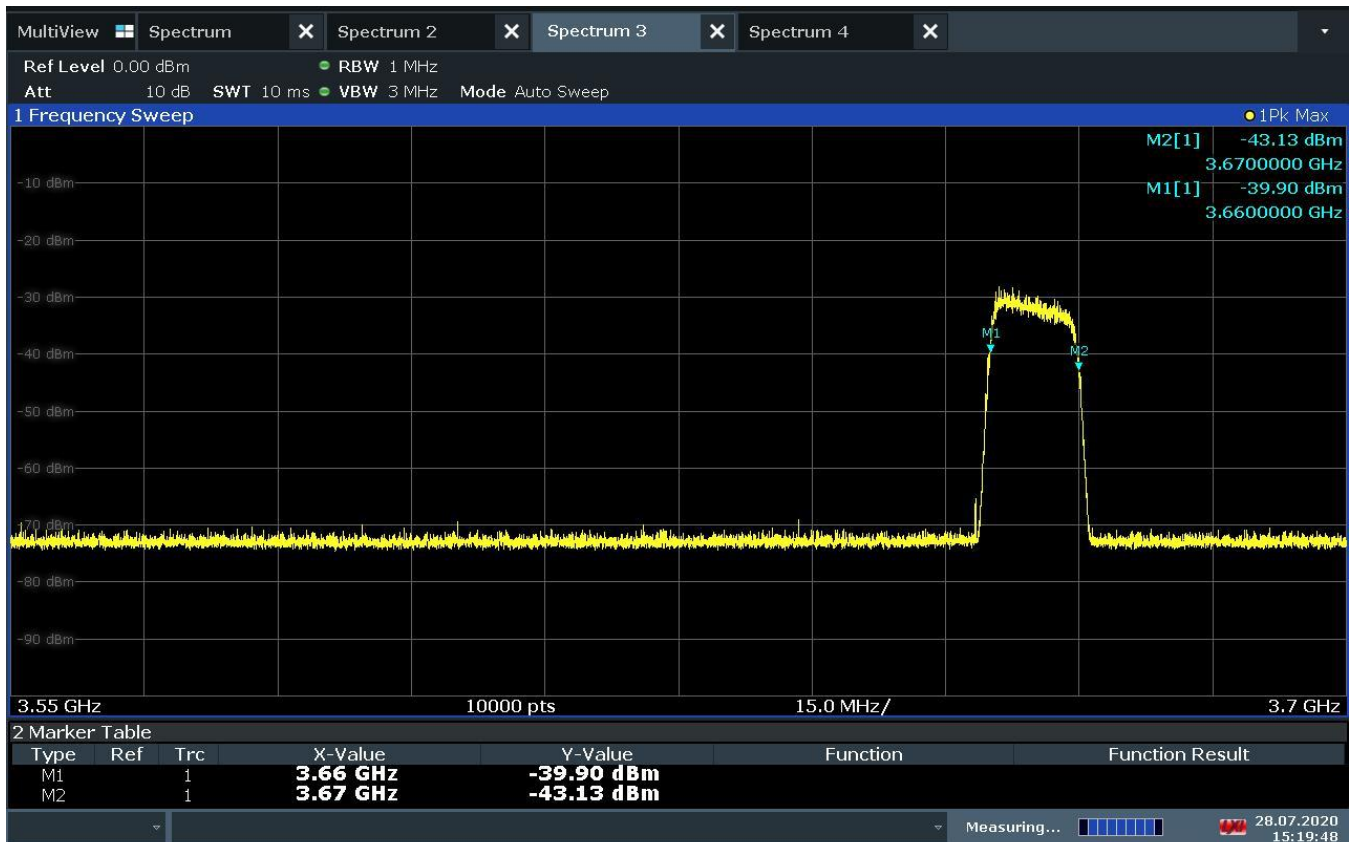
Marker 2: EUT discontinues operation.

Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

FCC ID: BCGA2324	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 48 of 51

Run#2:

- Tx Frequency Set: 3660 – 3670MHz
- MaxEIRP Set: 8dBm/MHz



15:19:48 28.07.2020

Plot 7-38. Run#2 End User Device Frequency of Operations

FCC ID: BCGA2324	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 49 of 51



15:26:41 28.07.2020

Plot 7-39. 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.

FCC ID: BCGA2324	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 50 of 51

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Apple Tablet Device FCC ID: BCGA2324** complies with all of the End User Device requirements of Part 96 of the FCC Rules for LTE operation only.

FCC ID: BCGA2324	 PCTEST Proud to be part of 	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C2004270029-05.BCG	Test Dates: 07/16/2020 - 8/31/2020	EUT Type: Tablet Device	Page 51 of 51