



PART 27 MEASUREMENT REPORT

Applicant Name:

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

Date of Testing:

6/7/2021 - 7/30/2021

Test Site/Location:

PCTEST Morgan Hill, CA, USA

Test Report Serial No.:

1C2106080051-04-R1.BCG

FCC ID:

BCGA2603

Applicant Name:

Apple Inc.

Application Type:

Certification

Model:

A2603

EUT Type:

Tablet Device

FCC Classification:

PCS Licensed Transmitter (PCB)

FCC Rule Part:

27

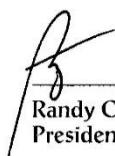
Test Procedure(s):

ANSI C63.26-2015, TIA-603-E-2016, KDB 971168 D01
 v03r01

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.

This revised Test Report (S/N: 1C2106080051-04-R1.BCG Report SNs) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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.



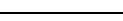
Randy Ortanez
 President

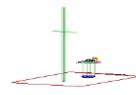
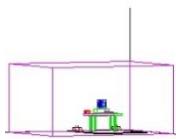


| | | | | |
|--|---|----------------------------|-----------------------------------|---------------------------------|
| FCC ID: BCGA2603 | PCTEST <small>Proud to be part of element</small> | | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 1 of 102 |

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 | Evaluation 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 | 33 |
| 7.4 | Band Edge Emissions at Antenna Terminal | 54 |
| 7.5 | Additional Maximum Power Reduction (A-MPR) | 70 |
| 7.6 | Radiated Power (EIRP) | 72 |
| 7.7 | Radiated Spurious Emissions | 80 |
| 7.8 | Frequency Stability / Temperature Variation | 98 |
| 8.0 | CONCLUSION | 102 |

| | | | |
|--|---|----------------------------|--|
| FCC ID: BCGA2603 |  PCTEST Proud to be part of  | | PART 27 MEASUREMENT REPORT |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Approved by: Quality Manager Page 2 of 102 |



PART 27 MEASUREMENT REPORT

| Mode | Bandwidth | Modulation | Tx Frequency Range [MHz] | OBW [MHz] | EIRP | | Emission Designator |
|-------------------|-------------|------------|--------------------------|-----------|----------------|------------------|---------------------|
| | | | | | Max. Power [W] | Max. Power [dBm] | |
| LTE Band 30 | 5 MHz | QPSK | 2307.5 - 2312.5 | 4.5559 | 0.209 | 23.20 | 4M56G7W |
| | | 16QAM | 2307.5 - 2312.5 | 4.5497 | 0.185 | 22.67 | 4M55D7W |
| | | 64QAM | 2307.5 - 2312.5 | 4.5586 | 0.151 | 21.80 | 4M56D7W |
| | 10MHz | QPSK | 2310.0 | 9.0239 | 0.209 | 23.20 | 9M02G7W |
| | | 16QAM | 2310.0 | 9.0338 | 0.192 | 22.83 | 9M03D7W |
| | | 64QAM | 2310.0 | 9.0016 | 0.148 | 21.69 | 9M00D7W |
| LTE Band 7 | 5 MHz | QPSK | 2502.5 - 2567.5 | 4.5541 | 0.519 | 27.15 | 4M55G7W |
| | | 16QAM | 2502.5 - 2567.5 | 4.5330 | 0.446 | 26.49 | 4M53D7W |
| | | 64QAM | 2502.5 - 2567.5 | 4.5525 | 0.360 | 25.56 | 4M55D7W |
| | 10 MHz | QPSK | 2505.0 - 2565.0 | 9.0575 | 0.504 | 27.02 | 9M06G7W |
| | | 16QAM | 2505.0 - 2565.0 | 9.0203 | 0.446 | 26.49 | 9M02D7W |
| | | 64QAM | 2505.0 - 2565.0 | 9.0525 | 0.341 | 25.33 | 9M05D7W |
| | 15 MHz | QPSK | 2507.5 - 2562.5 | 13.6280 | 0.525 | 27.20 | 13M6G7W |
| | | 16QAM | 2507.5 - 2562.5 | 13.6500 | 0.443 | 26.46 | 13M7D7W |
| | | 64QAM | 2507.5 - 2562.5 | 13.5723 | 0.351 | 25.45 | 13M6D7W |
| | 20 MHz | QPSK | 2510.0 - 2560.0 | 18.0867 | 0.502 | 27.01 | 18M1G7W |
| | | 16QAM | 2510.0 - 2560.0 | 18.0714 | 0.433 | 26.36 | 18M1D7W |
| | | 64QAM | 2510.0 - 2560.0 | 18.0422 | 0.353 | 25.48 | 18M0D7W |
| LTE Band 41 (PC2) | 5 MHz | QPSK | 2498.5 - 2687.5 | 4.5589 | 0.708 | 28.50 | 4M56G7W |
| | | 16QAM | 2498.5 - 2687.5 | 4.5933 | 0.658 | 28.18 | 4M59D7W |
| | | 64QAM | 2498.5 - 2687.5 | 4.6223 | 0.530 | 27.24 | 4M62D7W |
| | 10 MHz | QPSK | 2501.0 - 2685.0 | 9.1830 | 0.738 | 28.68 | 9M18G7W |
| | | 16QAM | 2501.0 - 2685.0 | 9.1836 | 0.661 | 28.20 | 9M18D7W |
| | | 64QAM | 2501.0 - 2685.0 | 9.1481 | 0.543 | 27.35 | 9M15D7W |
| | 15 MHz | QPSK | 2503.5 - 2682.5 | 13.9410 | 0.740 | 28.69 | 13M9G7W |
| | | 16QAM | 2503.5 - 2682.5 | 13.8282 | 0.640 | 28.06 | 13M8D7W |
| | | 64QAM | 2503.5 - 2682.5 | 13.8332 | 0.526 | 27.21 | 13M8D7W |
| | 20 MHz | QPSK | 2506.0 - 2680.0 | 18.3084 | 0.733 | 28.65 | 18M3G7W |
| | | 16QAM | 2506.0 - 2680.0 | 18.2122 | 0.632 | 28.01 | 18M2D7W |
| | | 64QAM | 2506.0 - 2680.0 | 18.2739 | 0.543 | 27.35 | 18M3D7W |
| LTE Band 41(PC3) | 5 MHz | QPSK | 2498.5 - 2687.5 | 4.5589 | 0.493 | 26.93 | 4M56G7W |
| | | 16QAM | 2498.5 - 2687.5 | 4.5933 | 0.414 | 26.17 | 4M59D7W |
| | | 64QAM | 2498.5 - 2687.5 | 4.6223 | 0.356 | 25.51 | 4M62D7W |
| | 10 MHz | QPSK | 2501.0 - 2685.0 | 9.1830 | 0.521 | 27.17 | 9M18G7W |
| | | 16QAM | 2501.0 - 2685.0 | 9.1836 | 0.414 | 26.17 | 9M18D7W |
| | | 64QAM | 2501.0 - 2685.0 | 9.1481 | 0.331 | 25.20 | 9M15D7W |
| | 15 MHz | QPSK | 2503.5 - 2682.5 | 13.9410 | 0.525 | 27.20 | 13M9G7W |
| | | 16QAM | 2503.5 - 2682.5 | 13.8282 | 0.403 | 26.05 | 13M8D7W |
| | | 64QAM | 2503.5 - 2682.5 | 13.8332 | 0.333 | 25.23 | 13M8D7W |
| | 20 MHz | QPSK | 2506.0 - 2680.0 | 18.3084 | 0.525 | 27.20 | 18M3G7W |
| | | 16QAM | 2506.0 - 2680.0 | 18.2122 | 0.423 | 26.26 | 18M2D7W |
| | | 64QAM | 2506.0 - 2680.0 | 18.2739 | 0.337 | 25.28 | 18M3D7W |
| ULCA LTE Band 7 | 20 + 20 MHz | QPSK | 2510.0 - 2560.0 | 37.8190 | 0.468 | 26.70 | 37M8G7W |
| | | 16QAM | 2510.0 - 2560.0 | 37.6360 | 0.234 | 23.70 | 37M6D7W |
| | | 64QAM | 2510.0 - 2560.0 | 37.7380 | 0.229 | 23.60 | 37M7D7W |
| ULCA LTE Band 41 | 20 + 20 MHz | QPSK | 2506.0 - 2680.0 | 38.1010 | 0.468 | 26.70 | 38M1G7W |
| | | 16QAM | 2506.0 - 2680.0 | 37.9450 | 0.306 | 24.86 | 37M9D7W |
| | | 64QAM | 2506.0 - 2680.0 | 37.9070 | 0.301 | 24.79 | 37M9D7W |

Overview Table

| | | | | | |
|--|---------------------------------------|----------------------------|--|----------------------------|---------------------------------|
| FCC ID: BCGA2603 | PCTEST Proud to be part of element | | | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | | |

1.0 INTRODUCTION

1.1 Scope

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

1.2 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 an ISO 17025-2017 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 ISED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISED.

| | | | | |
|--|--|----------------------------|-----------------------------------|---------------------------------|
| FCC ID: BCGA2603 |  PCTEST Proud to be part of  | | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 4 of 102 |

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID:BCGA2603**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 27.

Test Device Serial No.: QCQ16N0YCW, VCXH667WN9, F9F11660HE012891K

2.2 Device Capabilities

This device contains the following capabilities:

WCDMA/HSPA, Multi-Band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, BT (1x, EDR, LE)

LTE Band 41 support NS04 for Antenna C and NS01 for Antenna D.

2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.

| Frequency [MHz] | Antennas | |
|--------------------|-----------|-----------|
| | Antenna C | Antenna D |
| 2300-2320 | 1.4 | 1.7 |
| 2400-2700 | 1.7 | 2.0 |

Table 2-1. Highest Antenna Gain

2.4 Test Support Equipment

| | | | |
|---|--|------------------------------|-------------------------------|
| 1 | Apple MacBook w/AC/DC Adapter | Model: A2141 Model: A2166 | S/N: C02DV7VKMD6T S/N: N/A |
| 2 | Apple Cable | Model: Kanzi | S/N: 32530F |
| 3 | Apple USB-C to Lightning Cable w/ AC/DC Adapter | Model: N/A Model: A2305 | S/N: N/A S/N: N/A |
| 4 | DC Power Supply | Model: KPS3010D | S/N: N/A |

Table 2-2. Test Support Equipment

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 5 of 102 |

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 19A32670z 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: BCGA2603 | PART 27 MEASUREMENT REPORT | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Page 6 of 102 |

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI C63.26 2015, TIA-603-E-2016) and “Measurement Guidance for Certification of Licensed Digital Transmitters” (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

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.

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

$$E_{\text{dB}\mu\text{V/m}} = \text{Measured amplitude level}_{\text{dBm}} + 107 + \text{Cable Loss}_{\text{dB}} + \text{Antenna Factor}_{\text{dB/m}}$$

And

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

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014.

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.

Radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015 and TIA-603-E-2016.

| | | | |
|--|-------------------------------------|----------------------------|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Page 7 of 102 |

4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.23-2012. 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 | 1.65 |
| Radiated Disturbance (<30MHz) | 4.06 |
| Radiated Disturbance (30MHz-1GHz) | 4.30 |
| Radiated Disturbance (1-18GHz) | 4.78 |
| Radiated Disturbance (>18GHz) | 4.79 |

| | | | | |
|--|--|----------------------------|-----------------------------------|---------------------------------|
| FCC ID: BCGA2603 |  PCTEST® <small>Proud to be part of element</small> | | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 8 of 102 |

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 | 3/31/2021 | Annual | 3/31/2022 | MY49430244 |
| ATM | 180-442A-KF | 20dB Nominal Gain Horn Antenna | 12/1/2020 | Annual | 12/1/2021 | T058701-02 |
| ETS-Lindgren | 3142E | BiConiLog Antenna (30MHz - 6GHz) | 9/15/2020 | Annual | 9/15/2021 | 208204 |
| ETS-Lindgren | 3117 | Double Ridged Guide Antenna (1-18 GHz) | 11/4/2020 | Annual | 11/4/2021 | 227597 |
| ESPEC | SU-241 | Tabletop Temperature Chamber | 9/28/2020 | Annual | 9/28/2021 | 92009574 |
| Keysight Technology | N9040B | UXA Signal Analyzer | 12/19/2020 | Annual | 12/19/2021 | MY57212015 |
| Rohde & Schwarz | TS-PR8 | Pre-Amplifier (30MHz - 8GHz) | 12/3/2020 | Annual | 12/3/2021 | 102327 |
| Rohde & Schwarz | TS-PR18 | Pre-Amplifier (1GHz - 18GHz) | 12/3/2020 | Annual | 12/3/2021 | 101648 |
| Rohde & Schwarz | FSV40 | Signal Analyzer (10Hz-40GHz) | 3/16/2021 | Annual | 3/16/2022 | 101619 |
| Rohde & Schwarz | ESW26 | EMI Test Receiver | 6/11/2021 | Annual | 6/11/2022 | 101299 |
| Rohde & Schwarz | ESW44 | EMI Test Receiver | 12/14/2020 | Annual | 12/14/2021 | 101867 |
| Rohde & Schwarz | CMW500 | Wideband Radio Communication Tester | 10/13/2020 | Annual | 10/13/2021 | 161616 |
| Rohde & Schwarz | CMW500 | Wideband Radio Communication Tester | 9/24/2020 | Annual | 9/24/2021 | 151888 |
| Rohde & Schwarz | TS-PR1840 | Pre-Amplifier (18GHz - 40GHz) | 4/29/2021 | Annual | 4/29/2022 | 100051 |
| Rohde & Schwarz | TC-TA18 | ross Polarized Vivaldi Antenna (400MHz-18GHz) | 10/2/2020 | Annual | 10/2/2021 | 101063 |
| Rohde & Schwarz | HFH2-Z2 | Loop Antenna | 4/5/2021 | Annual | 4/5/2022 | 100519 |

Table 5-1. Test Equipment

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: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 9 of 102 |

6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7W

BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

W = Combination of Any

QAM Modulation

Emission Designator = 8M45D7W

BW = 8.45 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

W = Combination of Any

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

The receive spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 3700.40 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.50 dBm so this harmonic was 25.50 dBm $- (-24.80) = 50.3$ dBc.

| | | | | |
|--|---|----------------------------|-----------------------------------|---------------------------------|
| FCC ID: BCGA2603 |  PCTEST <small>Proud to be part of element</small> | | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 10 of 102 |

7.0 TEST RESULTS

7.1 Summary

Company Name: Apple Inc.
 FCC ID: BCGA2603
 FCC Classification: PCS Licensed Transmitter (PCB)
 Mode(s): LTE/ULCA

| Test Condition | Test Description | FCC Part Section(s) | Test Limit | Test Result | Reference |
|----------------|--|---------------------|---|---|------------------------|
| CONDUCTED | Occupied Bandwidth | 2.1049 | N/A | N/A | Section 7.2 |
| | Conducted Band Edge / Spurious Emissions (LTE Band 30) | 2.1051, 27.53(a) | Undesirable emissions must meet the limits detailed in 27.53(a) | PASS | Sections 7.3, 7.4 |
| | Conducted Band Edge / Spurious Emissions (LTE Band 7) | 2.1051, 27.53(m) | Undesirable emissions must meet the limits detailed in 27.53(m) | PASS | Sections 7.3, 7.4 |
| | Conducted Band Edge / Spurious Emissions (LTE Band 41) | | | PASS | Sections 7.3, 7.4 |
| | Transmitter Conducted Output Power | 2.1046 | N/A | N/A | See RF Exposure Report |
| | Additional Maximum Power Reduction (A-MPR) | 2.1046 | N/A | N/A | Section 7.5 |
| | Effective Radiated Power / Equivalent Isotropic Radiated Power (LTE Band 30) | 27.50(a)(3) | < 0.25 Watts max. EIRP | PASS | Section 7.6 |
| | Effective Radiated Power / Equivalent Isotropic Radiated Power (LTE Band 7) | 27.50(h)(2) | < 2 Watts max. EIRP | PASS | Section 7.6 |
| | Effective Radiated Power / Equivalent Isotropic Radiated Power (LTE Band 41) | | | PASS | Section 7.6 |
| | Frequency Stability | 2.1055, 27.54 | Fundamental emissions stay within authorized frequency block over the temperature and voltage range as tested | PASS | Section 7.8 |
| RADIATED | Radiated Spurious Emissions (LTE Band 30) | 2.1053, 27.53(a) | Undesirable emissions must meet the limits detailed in 27.53(a) | PASS | Section 7.7 |
| | Radiated Spurious Emissions (LTE Band 7) | 2.1053, 27.53(m) | Undesirable emissions must meet the limits detailed in 27.53(m) | PASS | Section 7.7 |
| | Radiated Spurious Emissions (LTE Band 41) | | | PASS | Section 7.7 |

Table 7-1. Summary of Test Results

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 11 of 102 |

Notes:

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3. All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4. All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized was PCTEST EMC Software Tool 1.0.

| | | | | |
|--|--|----------------------------|-----------------------------------|---------------------------------|
| FCC ID: BCGA2603 |  PCTEST Proud to be part of  | | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 12 of 102 |

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

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.

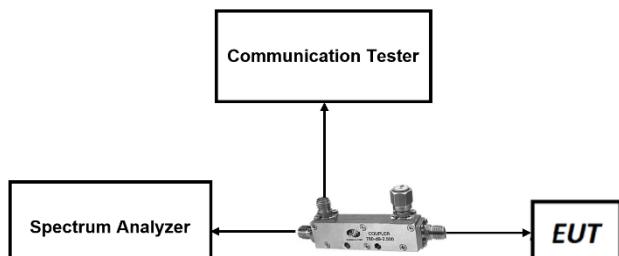


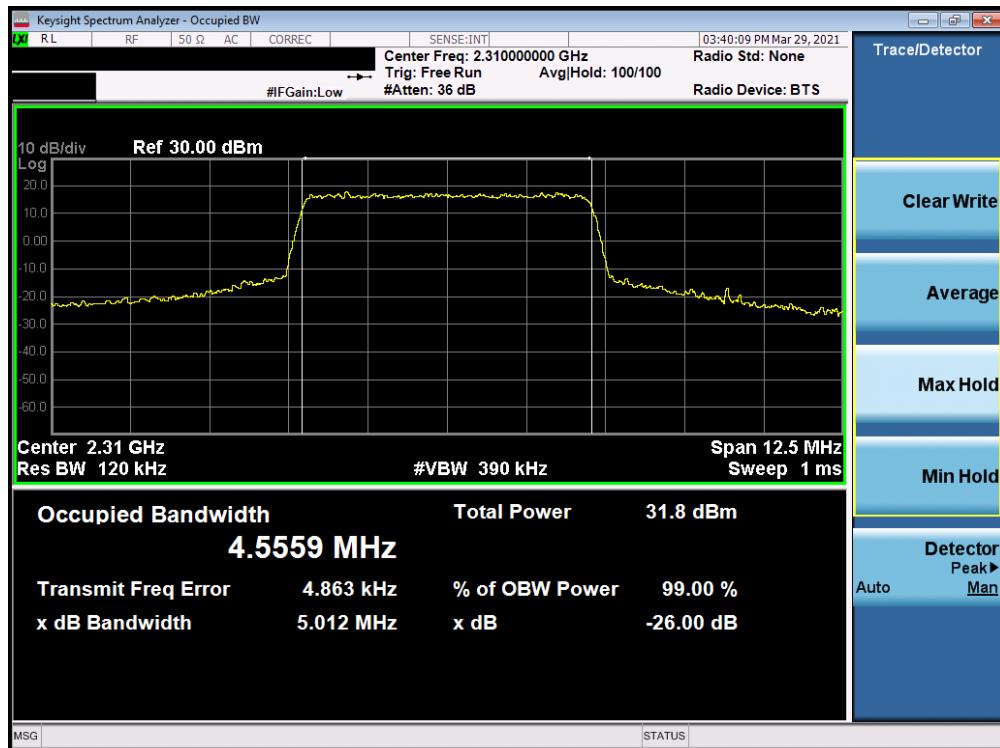
Figure 7-1. Test Instrument & Measurement Setup

Test Notes

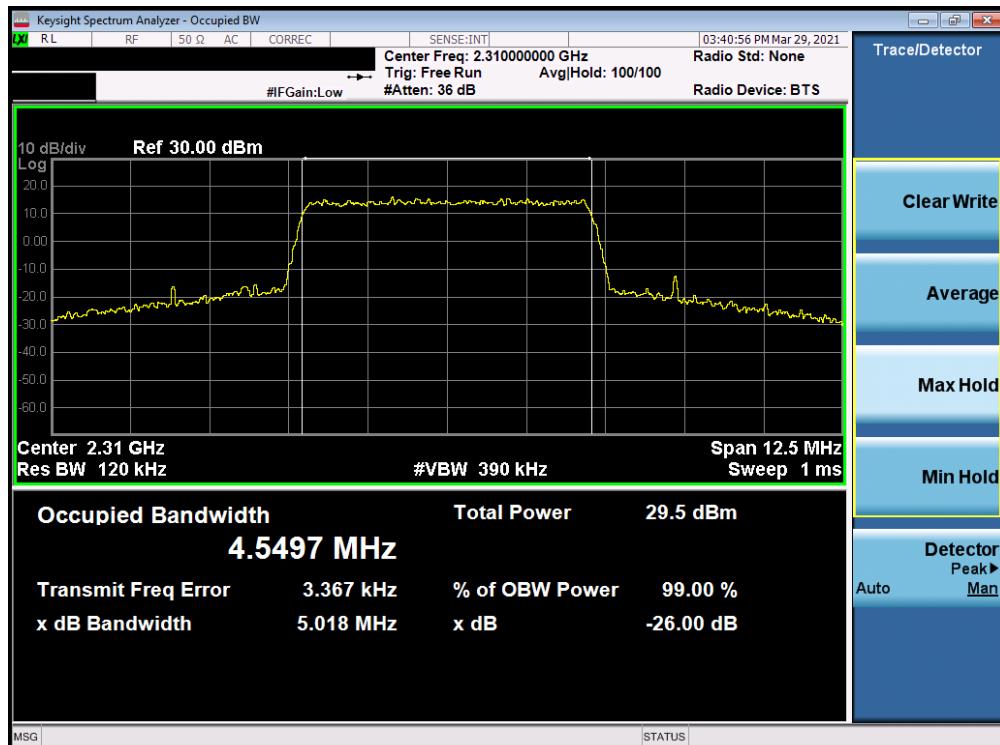
None.

| | | | | |
|--|---|----------------------------|-----------------------------------|---------------------------------|
| FCC ID: BCGA2603 |  PCTEST <small>Proud to be part of element</small> | | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 13 of 102 |

LTE Band 30

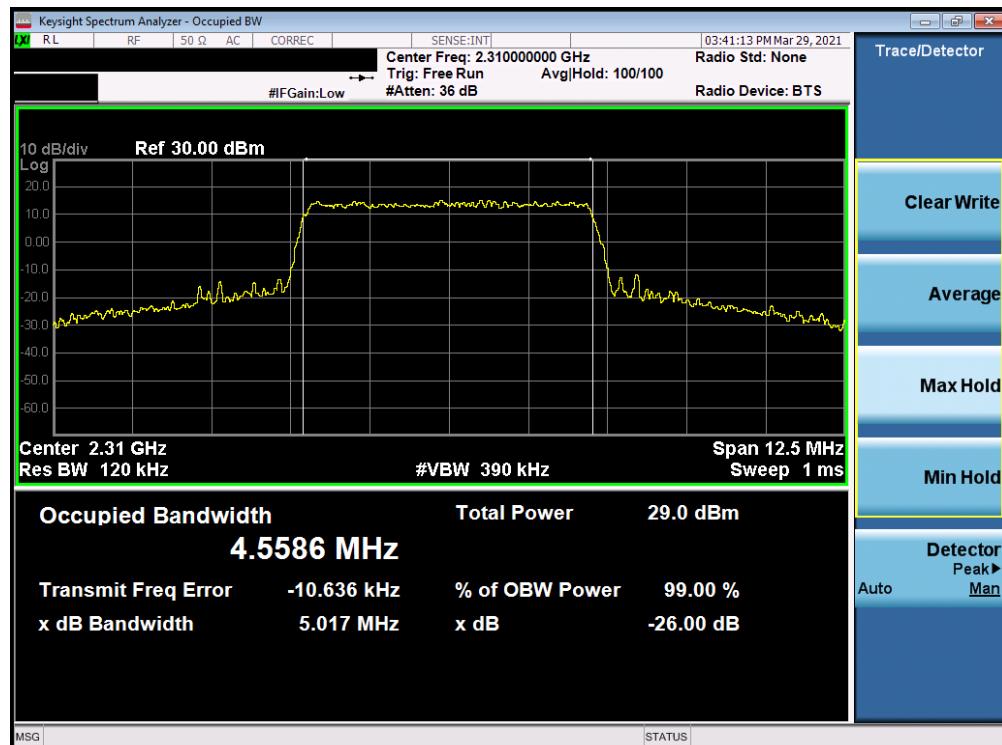


Plot 7-1. Occupied Bandwidth Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

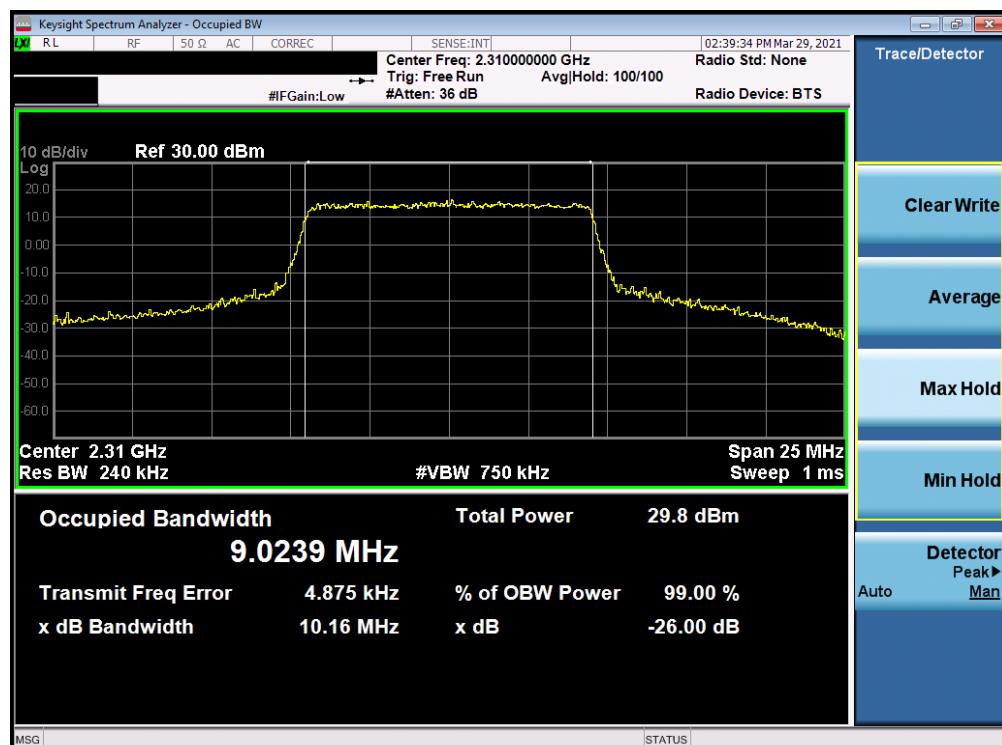


Plot 7-2. Occupied Bandwidth Plot (Band 30 - 5.0MHz 16-QAM - Full RB Configuration)

| FCC ID: BCGA2603 |  | PART 27 MEASUREMENT REPORT | Approved by: |
|--|---|----------------------------|-----------------------------------|
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Quality Manager Page 14 of 102 |

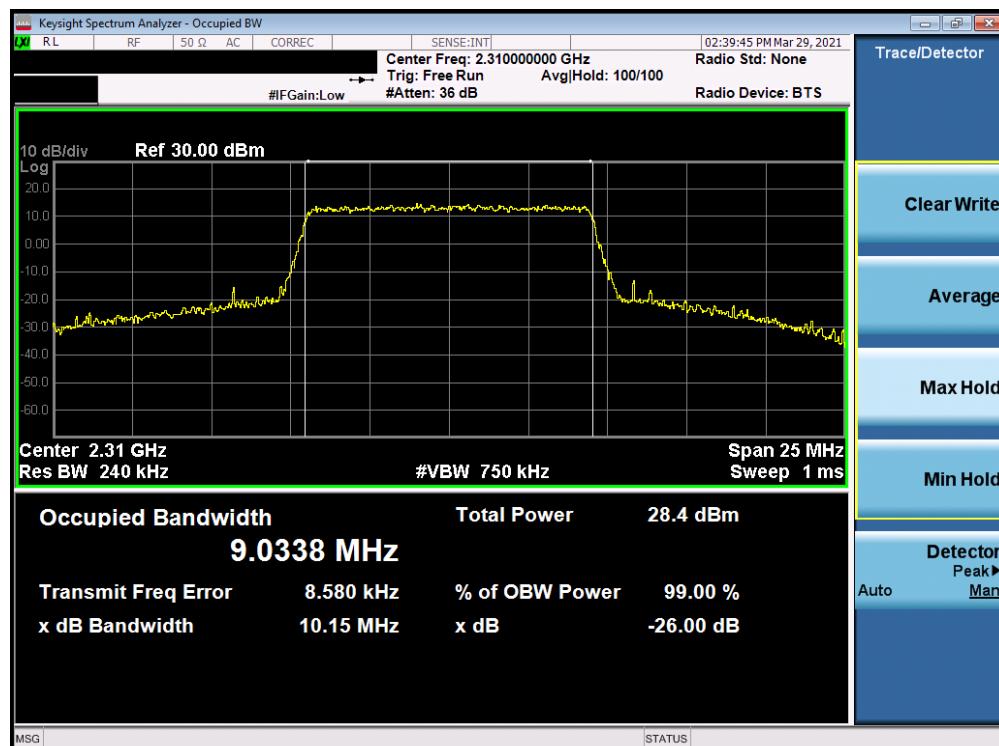


Plot 7-3. Occupied Bandwidth Plot (Band 30 - 5.0MHz 64-QAM - Full RB Configuration)

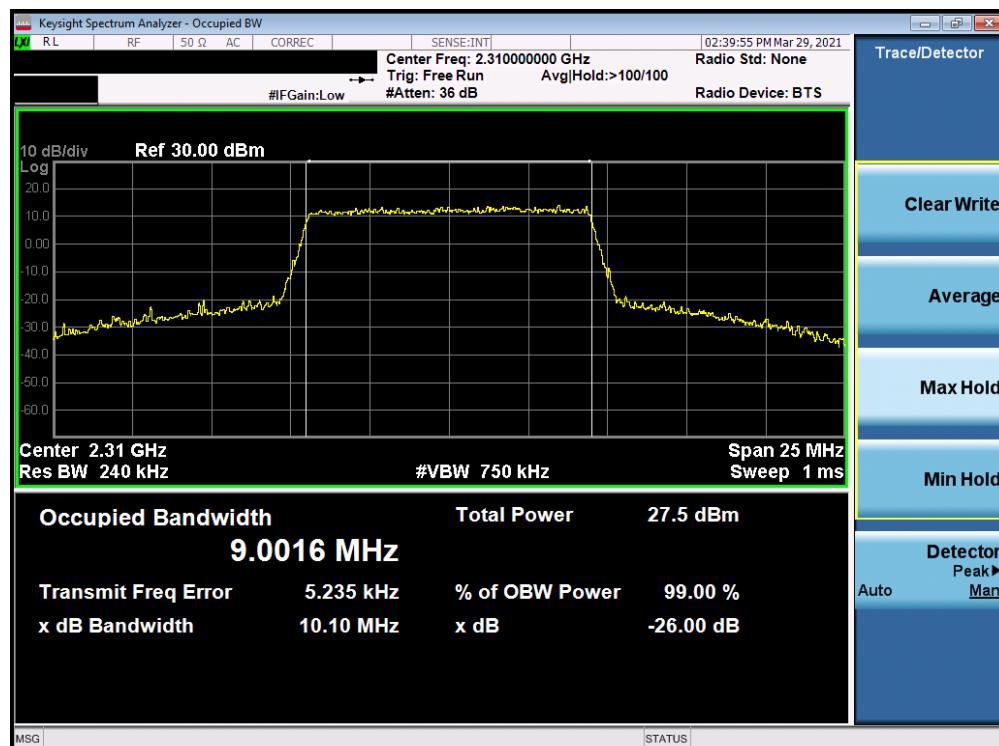


Plot 7-4. Occupied Bandwidth Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)

| | | | | | |
|--|--|----------------------------|--|----------------------------|---------------------------------|
| FCC ID: BCGA2603 | PCTEST Proud to be part of  | | | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | | Page 15 of 102 |



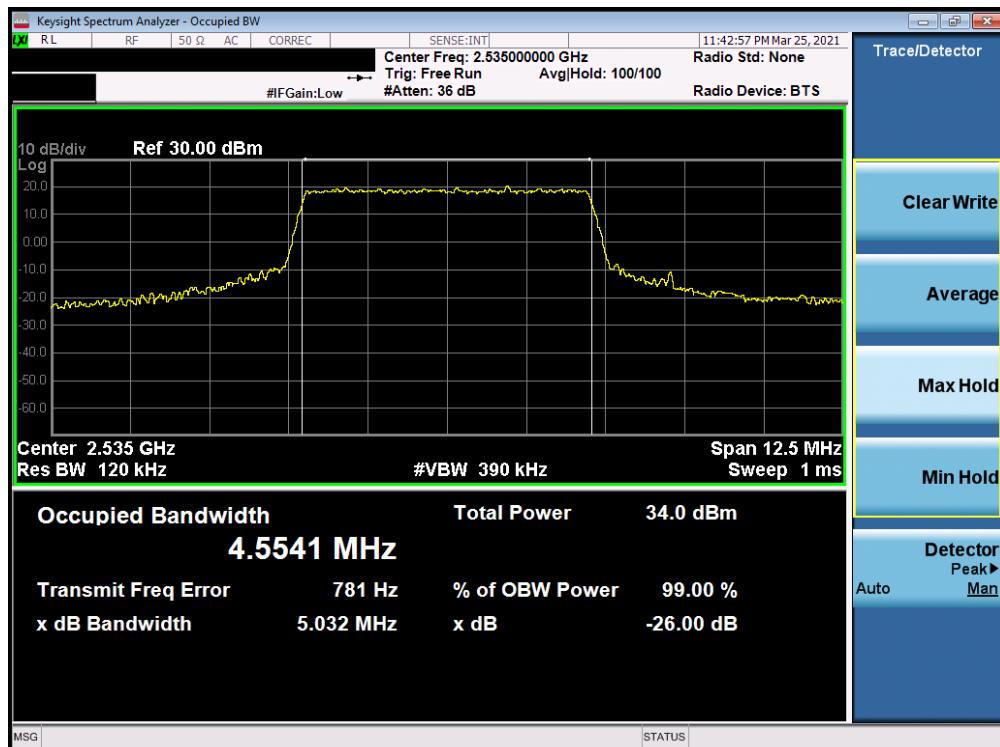
Plot 7-5. Occupied Bandwidth Plot (Band 30 - 10.0MHz 16-QAM - Full RB Configuration)



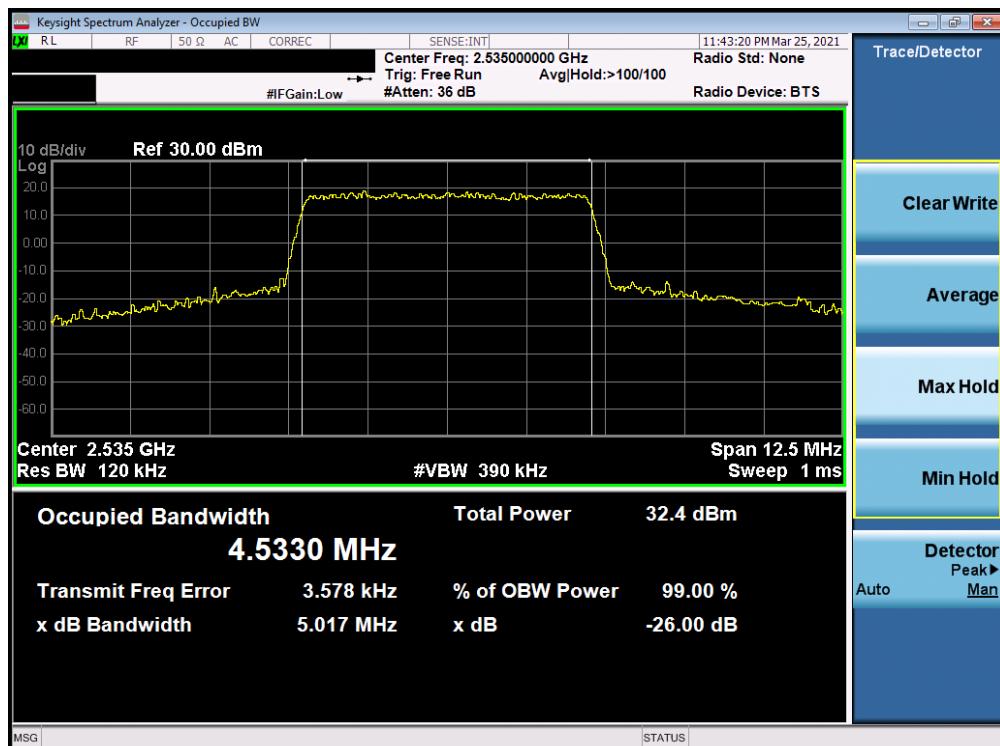
Plot 7-6. Occupied Bandwidth Plot (Band 30 - 10.0MHz 64-QAM - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 16 of 102 |

LTE Band 7

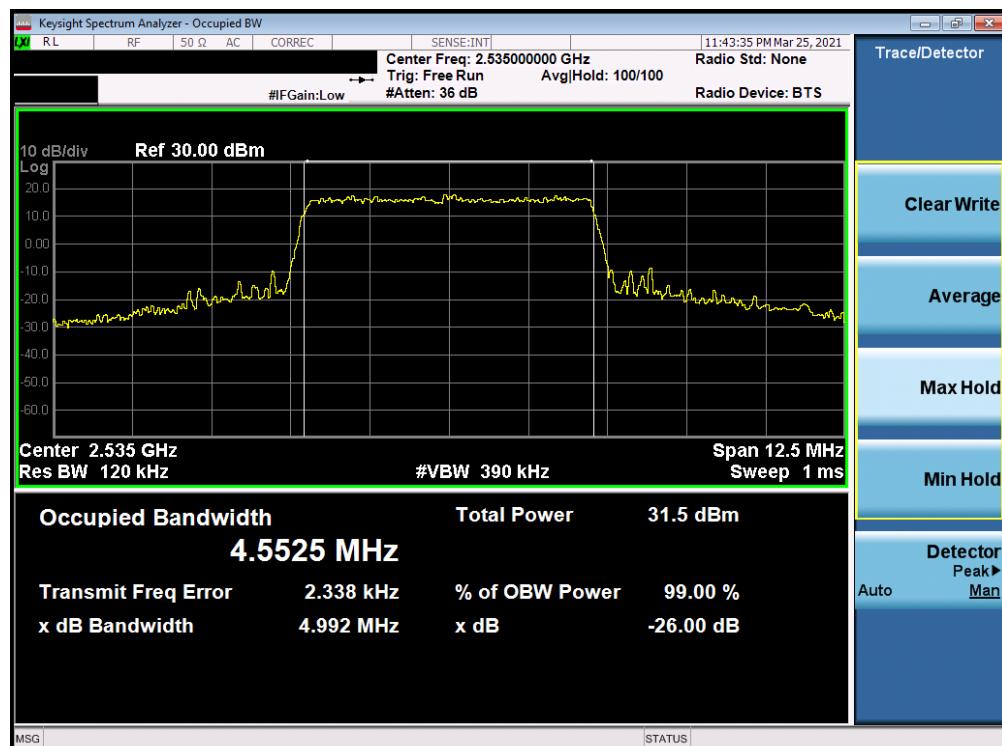


Plot 7-7. Occupied Bandwidth Plot (LTE Band 7 - 5MHz QPSK - Full RB Configuration)



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

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 17 of 102 |



Plot 7-9. Occupied Bandwidth Plot (LTE Band 7 - 5MHz 64-QAM - Full RB Configuration)

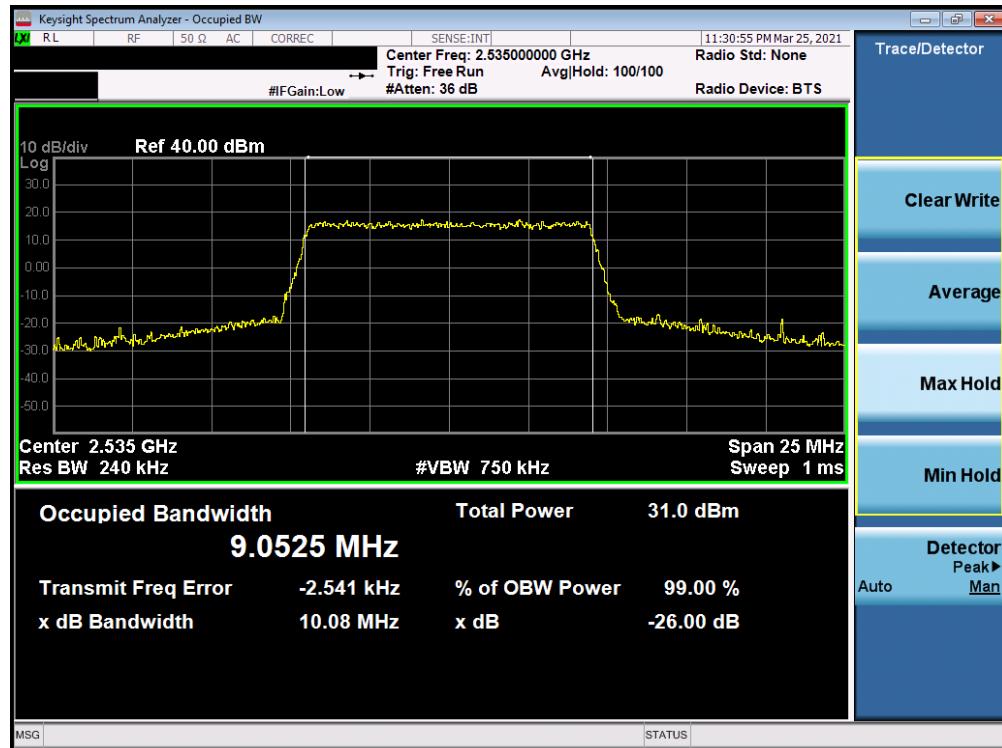


Plot 7-10. Occupied Bandwidth Plot (LTE Band 7 - 10MHz QPSK - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 18 of 102 |

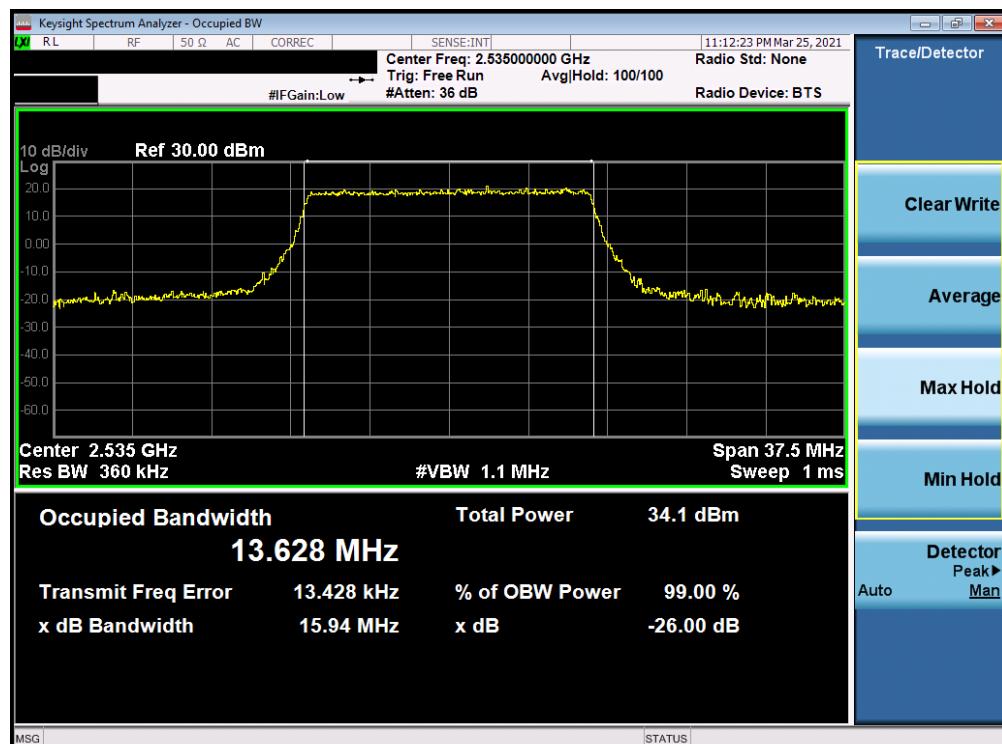


Plot 7-11. Occupied Bandwidth Plot (LTE Band 7 - 10MHz 16-QAM - Full RB Configuration)

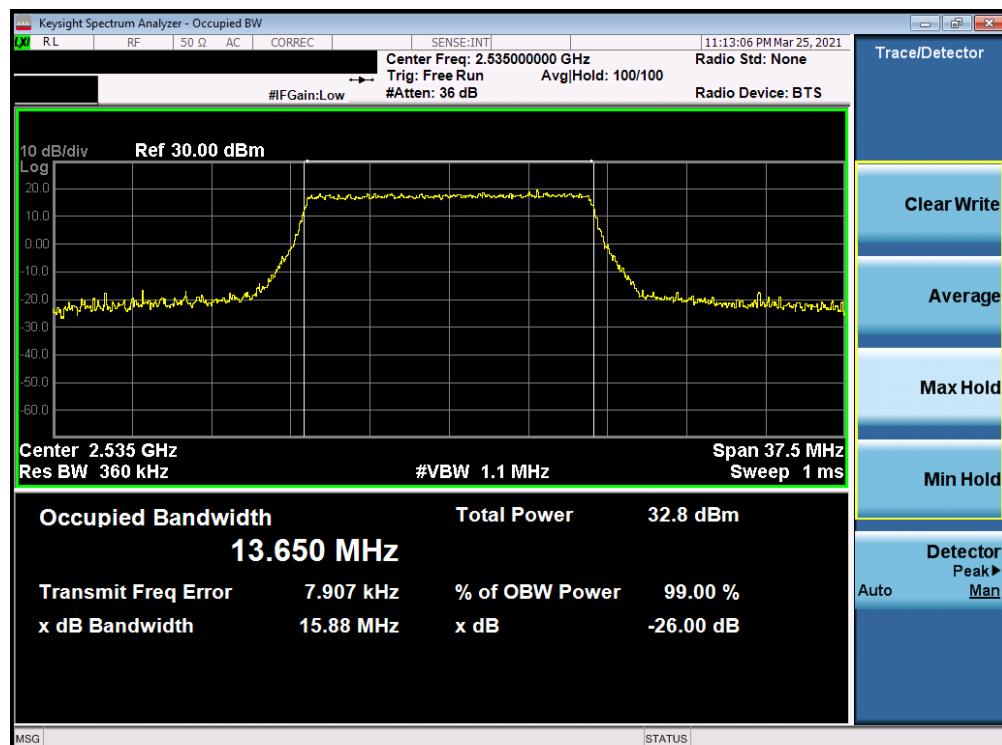


Plot 7-12. Occupied Bandwidth Plot (LTE Band 7 - 10MHz 64-QAM - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 19 of 102 |

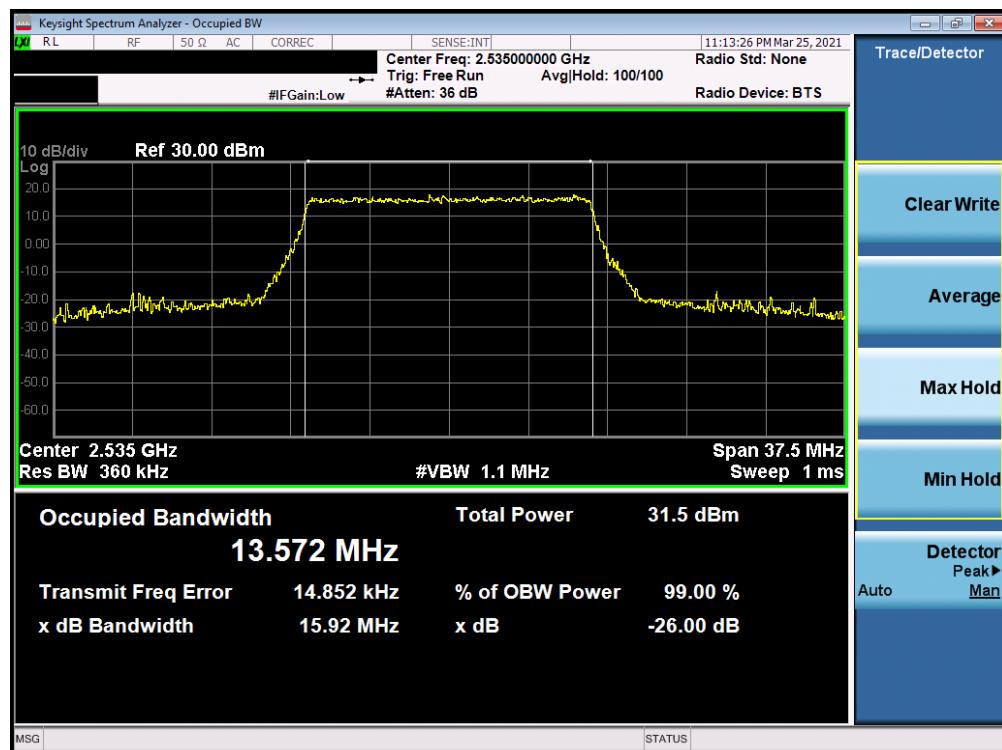


Plot 7-13. Occupied Bandwidth Plot (LTE Band 7 - 15MHz QPSK - Full RB Configuration)



Plot 7-14. Occupied Bandwidth Plot (LTE Band 7 - 15MHz 16-QAM - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 20 of 102 |

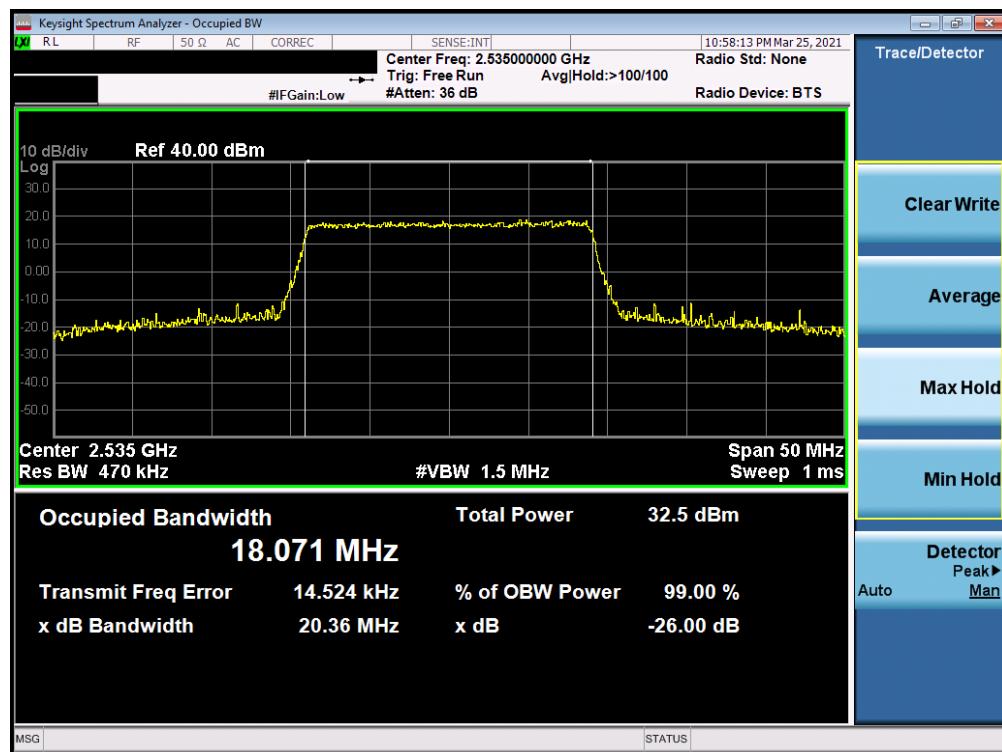


Plot 7-15. Occupied Bandwidth Plot (LTE Band 7 - 15MHz 64-QAM - Full RB Configuration)



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

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 21 of 102 |



Plot 7-17. Occupied Bandwidth Plot (LTE Band 7 - 20MHz 16-QAM - Full RB Configuration)



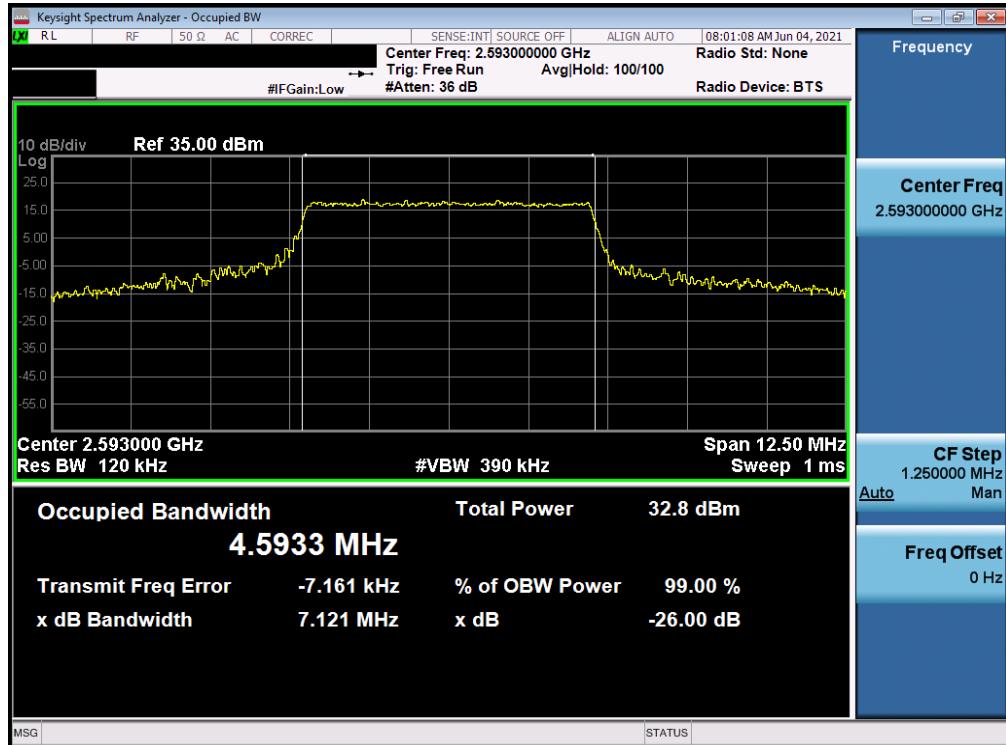
Plot 7-18. Occupied Bandwidth Plot (LTE Band 7 - 20MHz 64-QAM - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 22 of 102 |

LTE Band 41



Plot 7-19. Occupied Bandwidth Plot (LTE Band 41 - 5MHz QPSK - Full RB Configuration)



Plot 7-20. Occupied Bandwidth Plot (LTE Band 41 - 5MHz 16-QAM - Full RB Configuration)

| | | | | |
|--|--|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 |  PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 23 of 102 |



Plot 7-21. Occupied Bandwidth Plot (LTE Band 41 - 5MHz 64-QAM - Full RB Configuration)

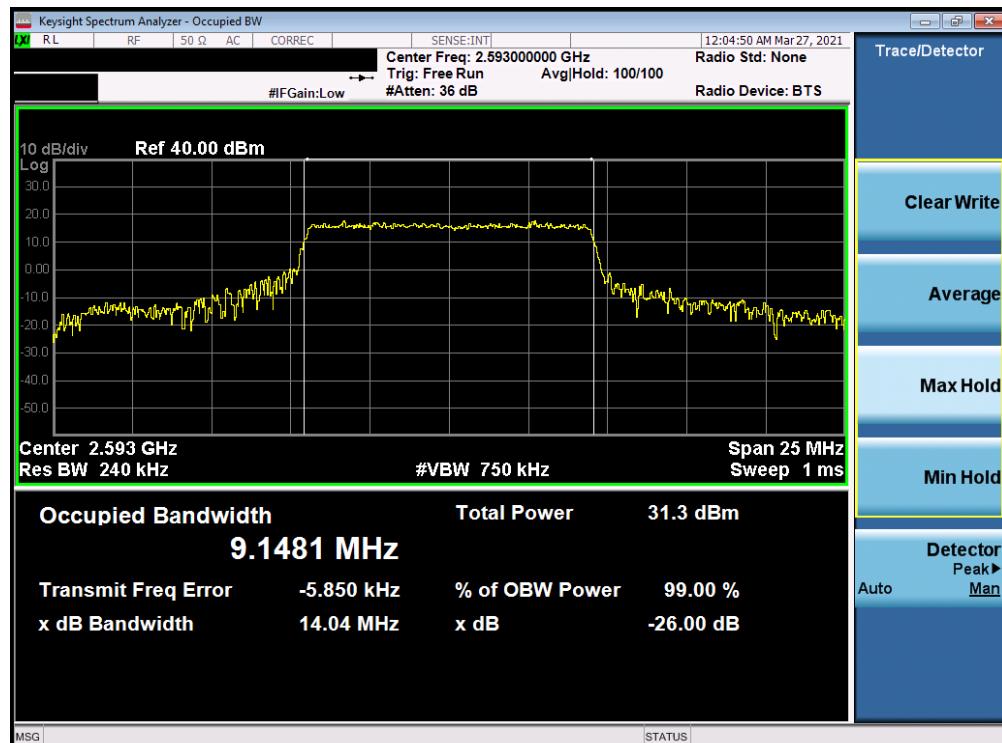


Plot 7-22. Occupied Bandwidth Plot (LTE Band 41 - 10MHz QPSK - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 24 of 102 |

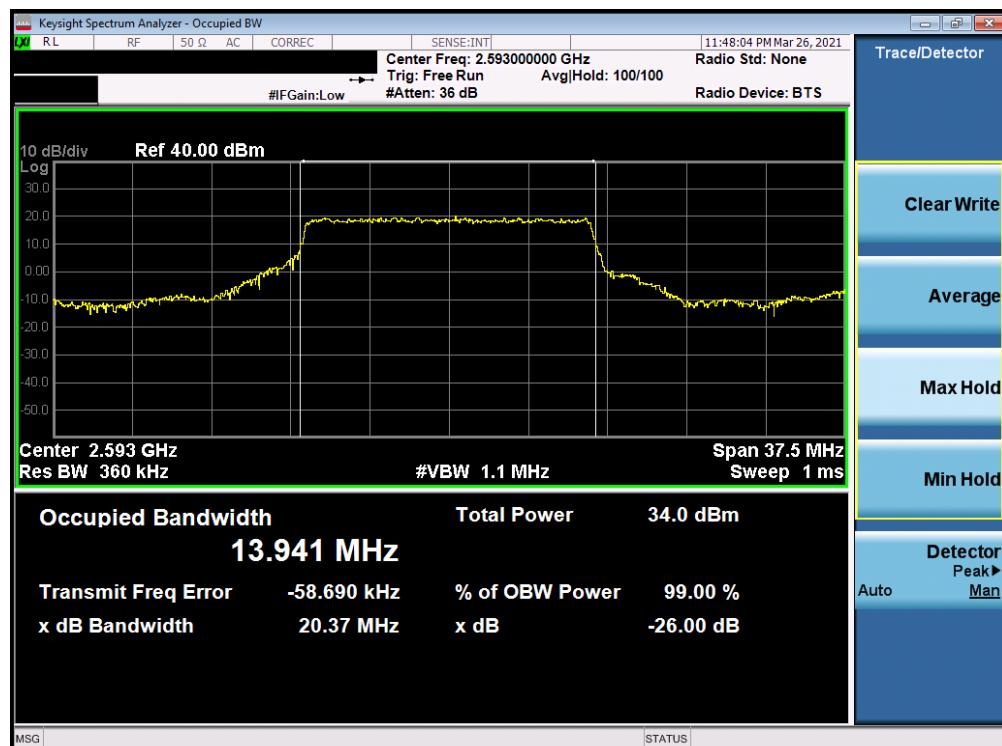


Plot 7-23. Occupied Bandwidth Plot (LTE Band 41 - 10MHz 16-QAM - Full RB Configuration)



Plot 7-24. Occupied Bandwidth Plot (LTE Band 41 - 10MHz 64-QAM - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 25 of 102 |

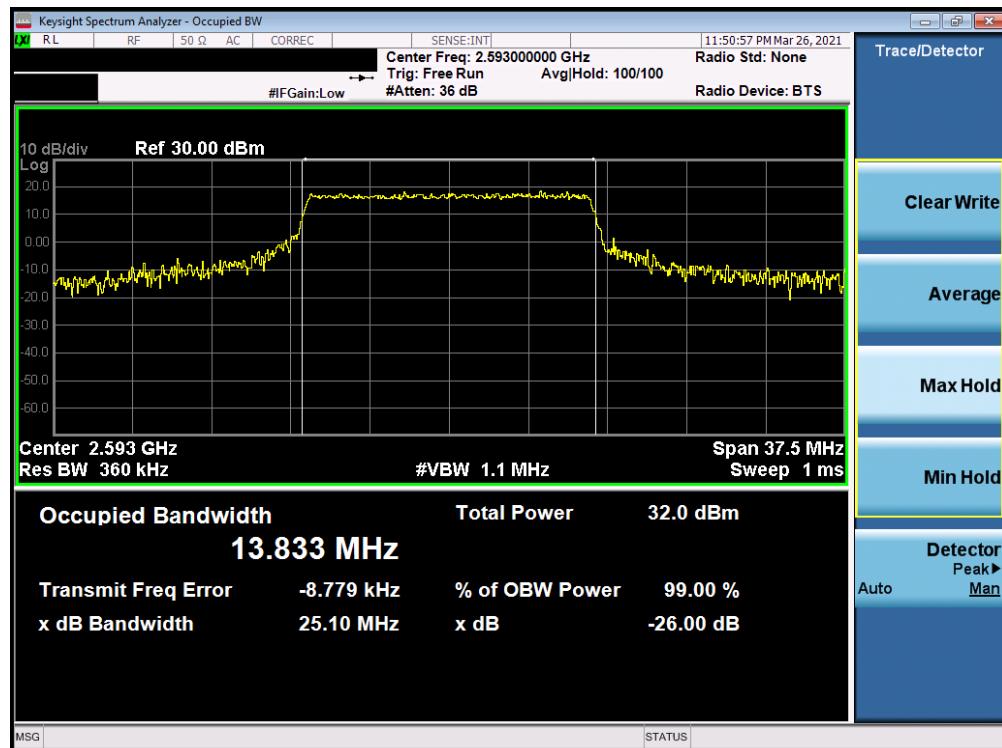


Plot 7-25. Occupied Bandwidth Plot (LTE Band 41 - 15MHz QPSK - Full RB Configuration)

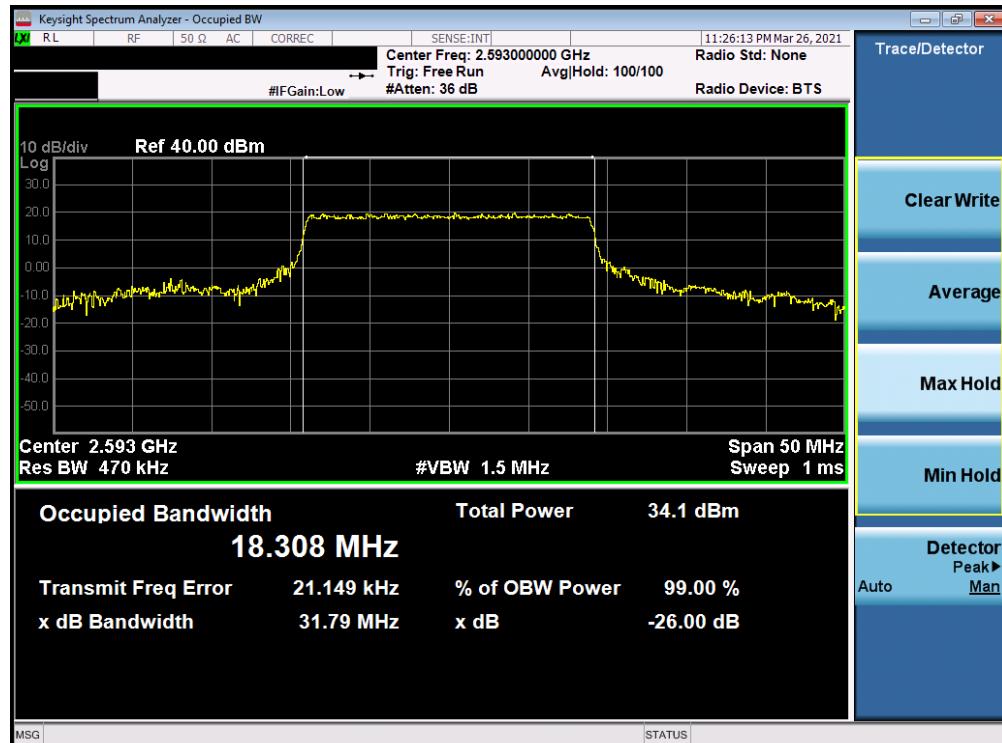


Plot 7-26. Occupied Bandwidth Plot (LTE Band 41 - 15MHz 16-QAM - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 26 of 102 |



Plot 7-27. Occupied Bandwidth Plot (LTE Band 41 - 15MHz 64-QAM - Full RB Configuration)



Plot 7-28. Occupied Bandwidth Plot (LTE Band 41 - 20MHz QPSK - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 27 of 102 |



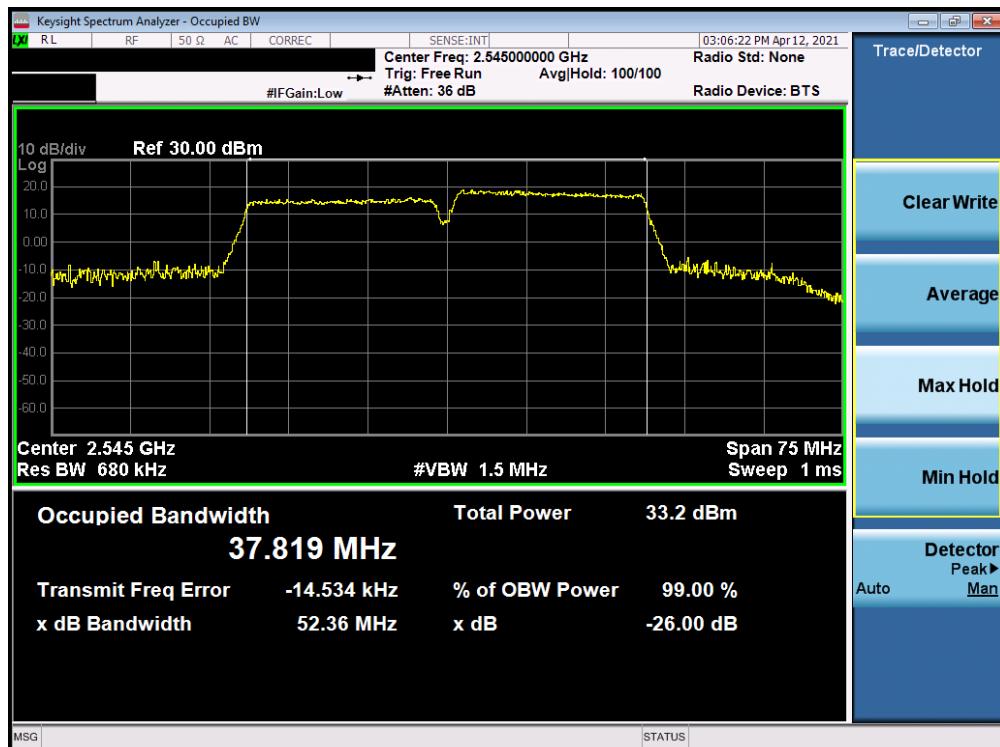
Plot 7-29. Occupied Bandwidth Plot (LTE Band 41 - 20MHz 16-QAM - Full RB Configuration)



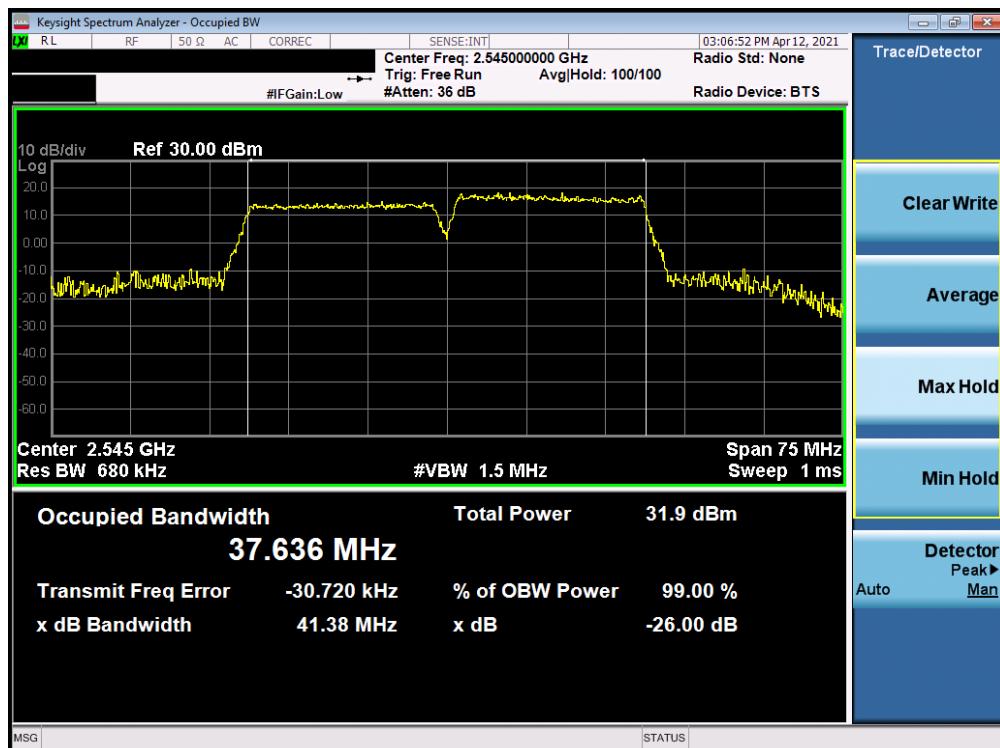
Plot 7-30. Occupied Bandwidth Plot (LTE Band 41 - 20MHz 64-QAM - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 28 of 102 |

ULCA - LTE Band 7

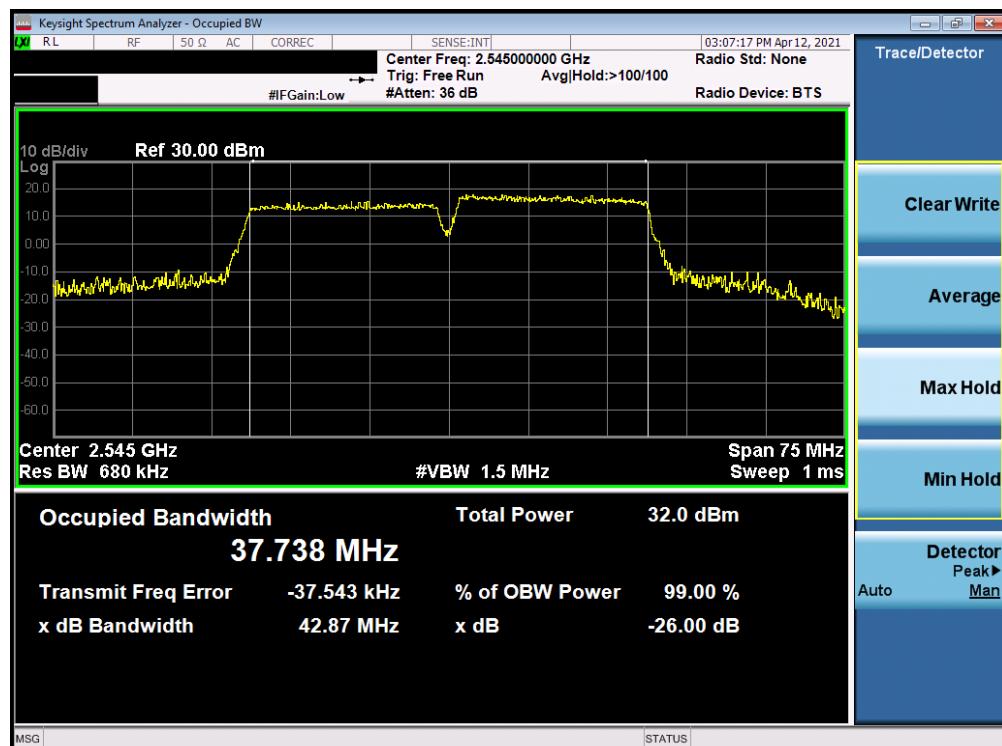


Plot 7-31. Occupied Bandwidth Plot (ULCA - LTE Band 7 - (20 + 20)MHz QPSK - Full RB Configuration)



Plot 7-32. Occupied Bandwidth Plot (ULCA - LTE Band 7 - (20 + 20)MHz 16-QAM - Full RB Configuration)

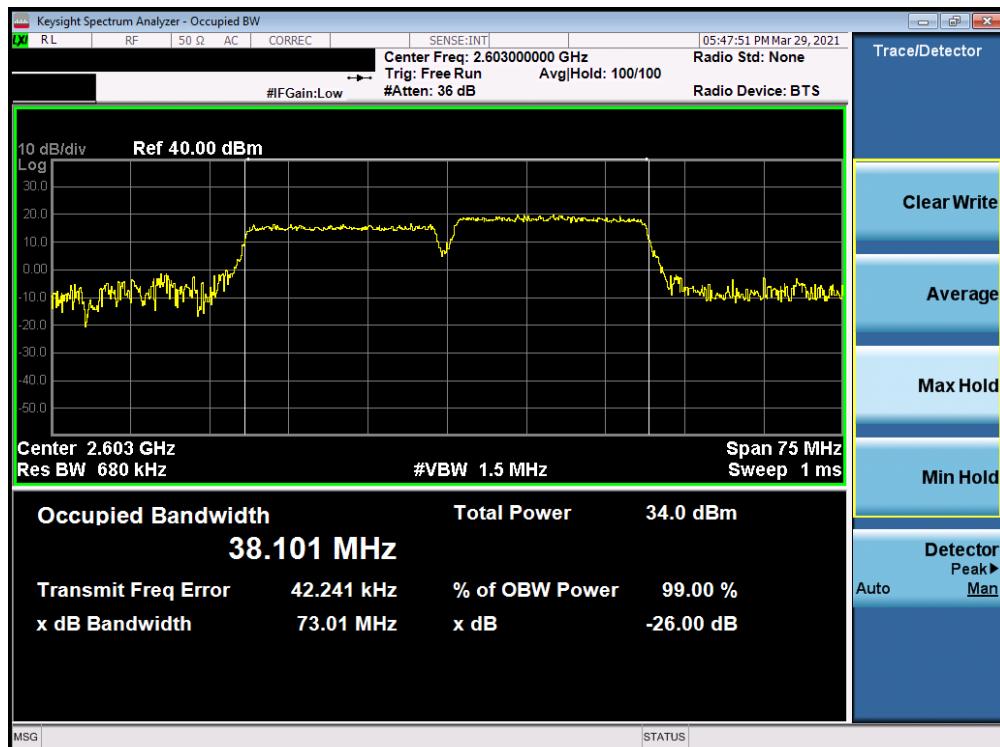
| | | | | |
|--|---|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 |  PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 29 of 102 |



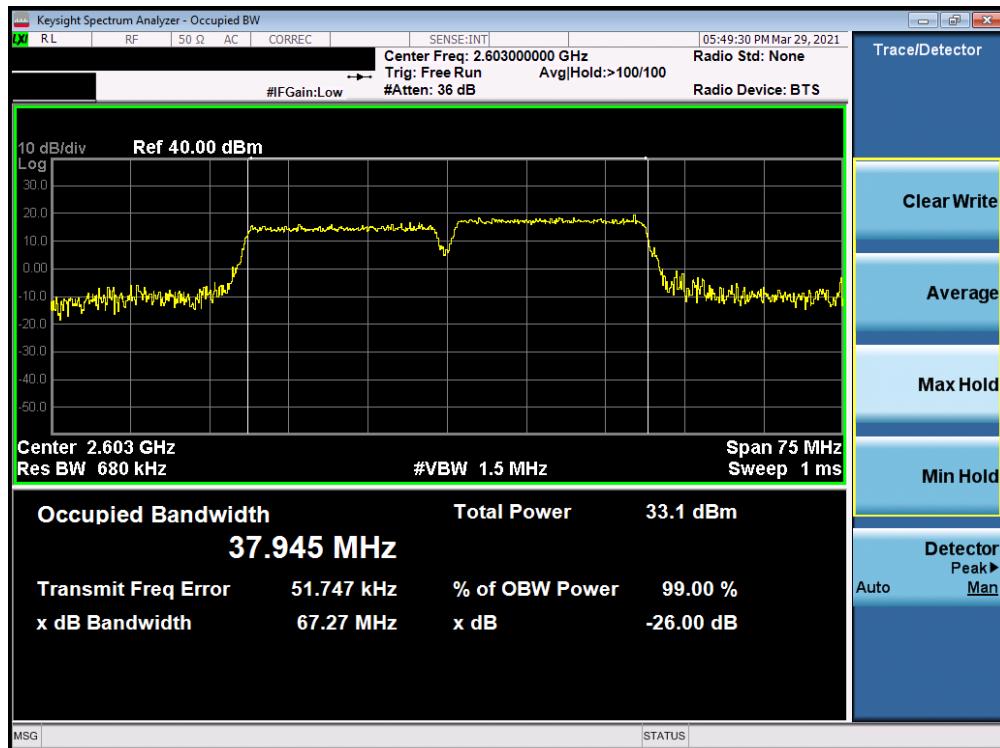
Plot 7-33. Occupied Bandwidth Plot (ULCA - LTE Band 7 - (20 + 20)MHz 64-QAM - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 30 of 102 |

ULCA - LTE Band 41

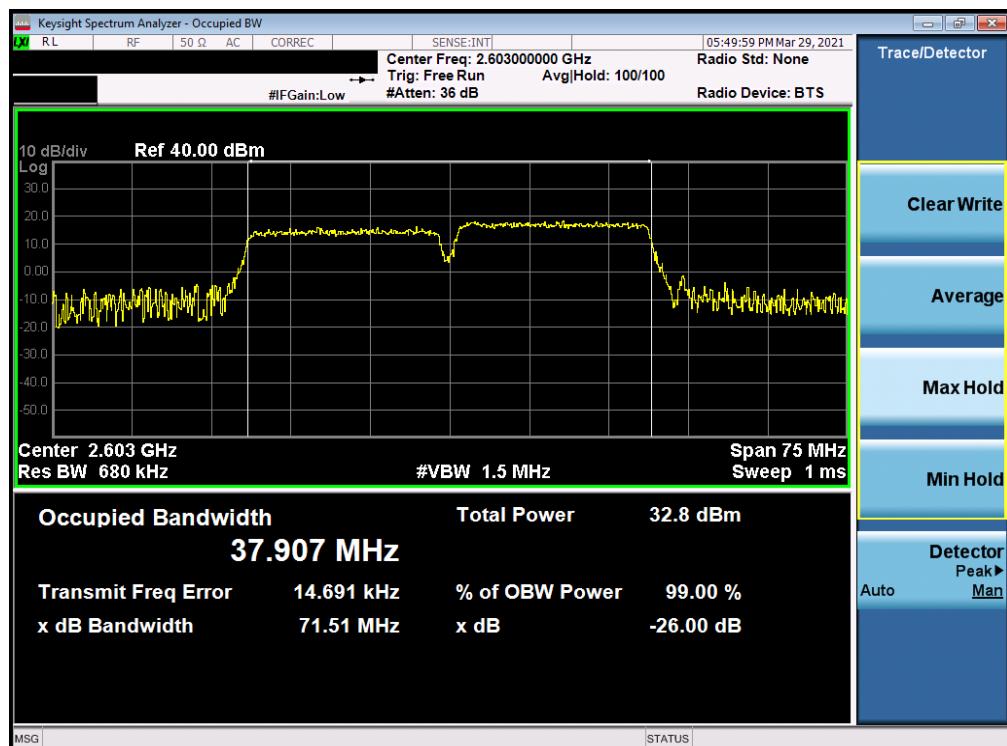


Plot 7-34. Occupied Bandwidth Plot (LTE Band 41 – (20 + 20)MHz QPSK - Full RB Configuration)



Plot 7-35. Occupied Bandwidth Plot (LTE Band 41 - (20 + 20)MHz 16-QAM - Full RB Configuration)

| | | | |
|---|---|-----------------------------------|---------------------------------|
| FCC ID: BCGA2603 |  PCTEST Please be part of the moment | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Page 31 of 102 |



Plot 7-36. Occupied Bandwidth Plot (LTE Band 41 - (20 + 20)MHz 64-QAM - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 32 of 102 |

7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051, §27.53(a), §27.53(m)

Test Overview

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

For Band 30, the minimum permissible attenuation level of any spurious emission <2288MHz and >2365MHz is $70 + 10 \log_{10}(P_{[Watts]})$.

For LTE Bands 7 and 41, the minimum permissible attenuation level of any spurious emission is $55 + 10 \log_{10}(P_{[Watts]})$.

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 10GHz (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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

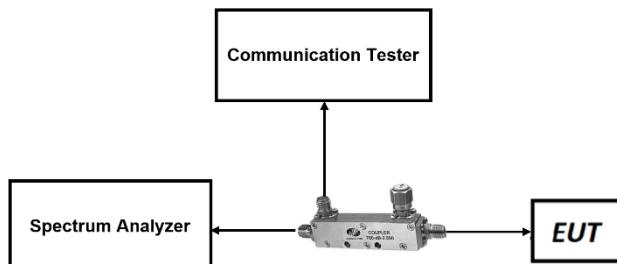


Figure 7-2. Test Instrument & Measurement Setup

| | | | |
|--|-------------------------------------|----------------------------|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Page 33 of 102 |

Test Notes

1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. 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. Uplink carrier aggregation for LTE Band 7 is only supported in this EUT while operating in Power Class 3.
3. Uplink carrier aggregation for LTE Band 41 is supported in this EUT while operating in Power Class 2 and Power Class 3.
4. Uplink carrier aggregation intra-band conducted spurious emissions were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device. The worst case (highest) powers were found while operating with QPSK modulation, as shown in the tables below, with both carriers set to transmit using 1RB.

| | | | |
|--|---|----------------------------|---------------------------------|
| FCC ID: BCGA2603 |  PART 27 MEASUREMENT REPORT | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Page 34 of 102 |

LTE Band 30

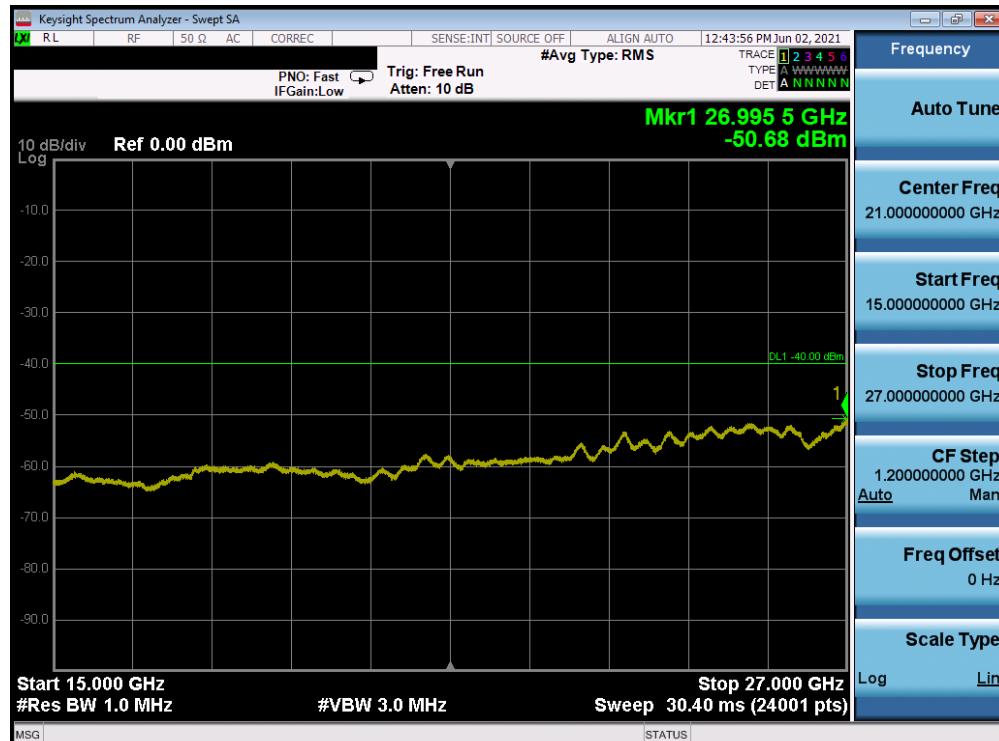


Plot 7-37. CSE (Band 30 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

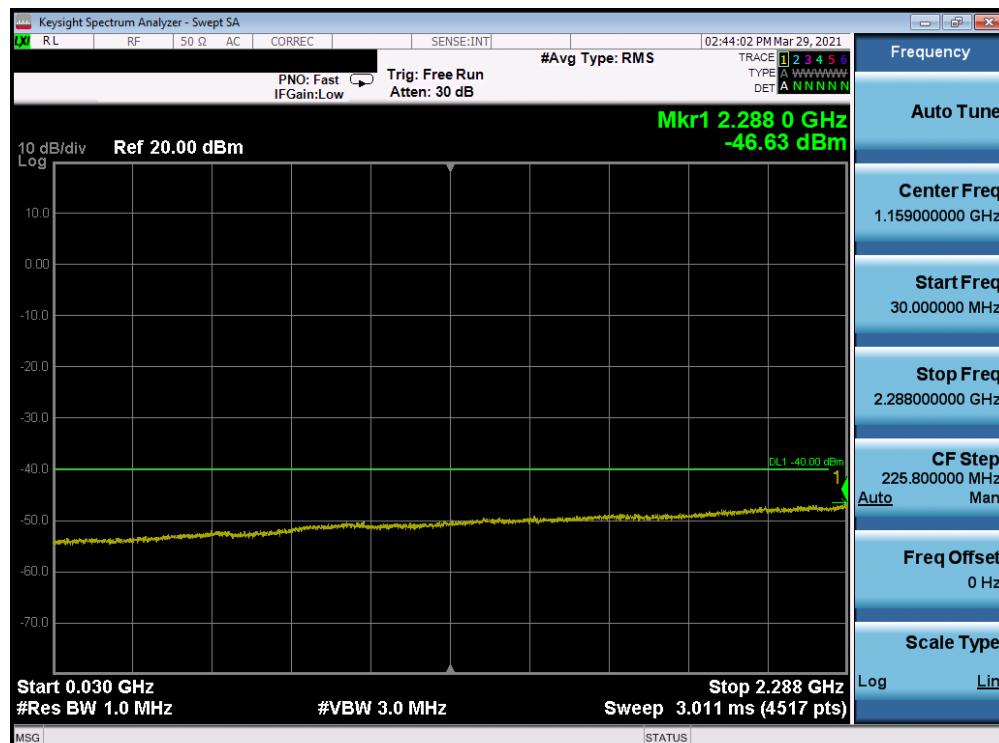


Plot 7-38. CSE (Band 30 - 5.0MHz QPSK - RB Size 1, RB Offset 0 – Low Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 35 of 102 |



Plot 7-39. CSE (Band 30 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-40. CSE (Band 30 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 36 of 102 |

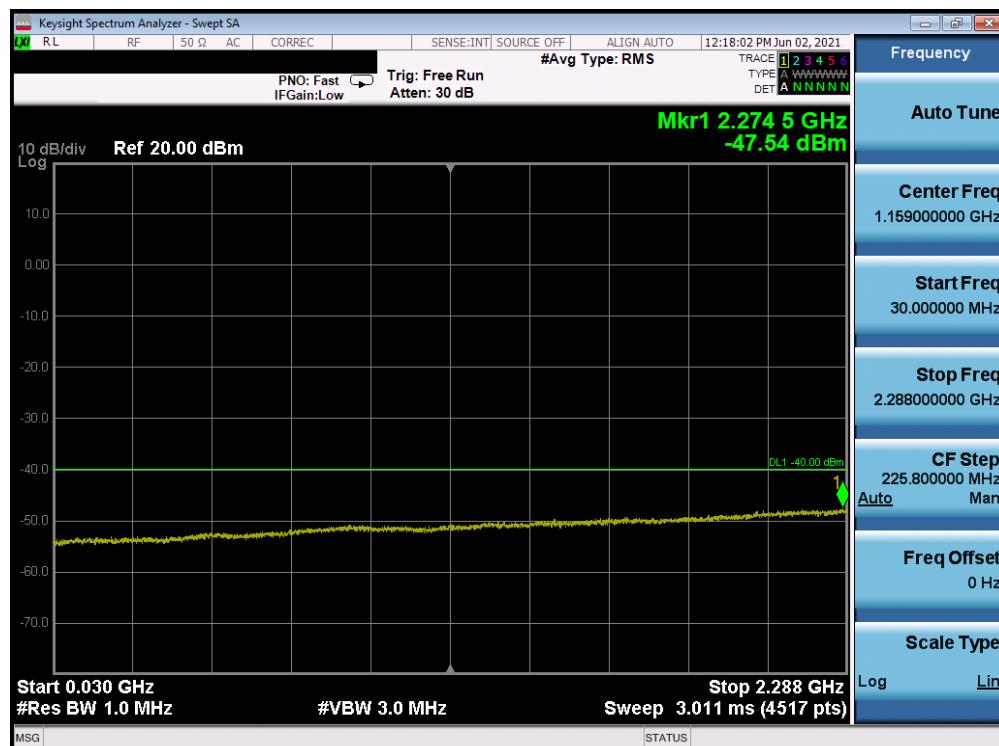


Plot 7-41. CSE (Band 30 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-42. CSE (Band 30 - 10.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 37 of 102 |



Plot 7-43. CSE (Band 30 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-44. CSE (Band 30 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

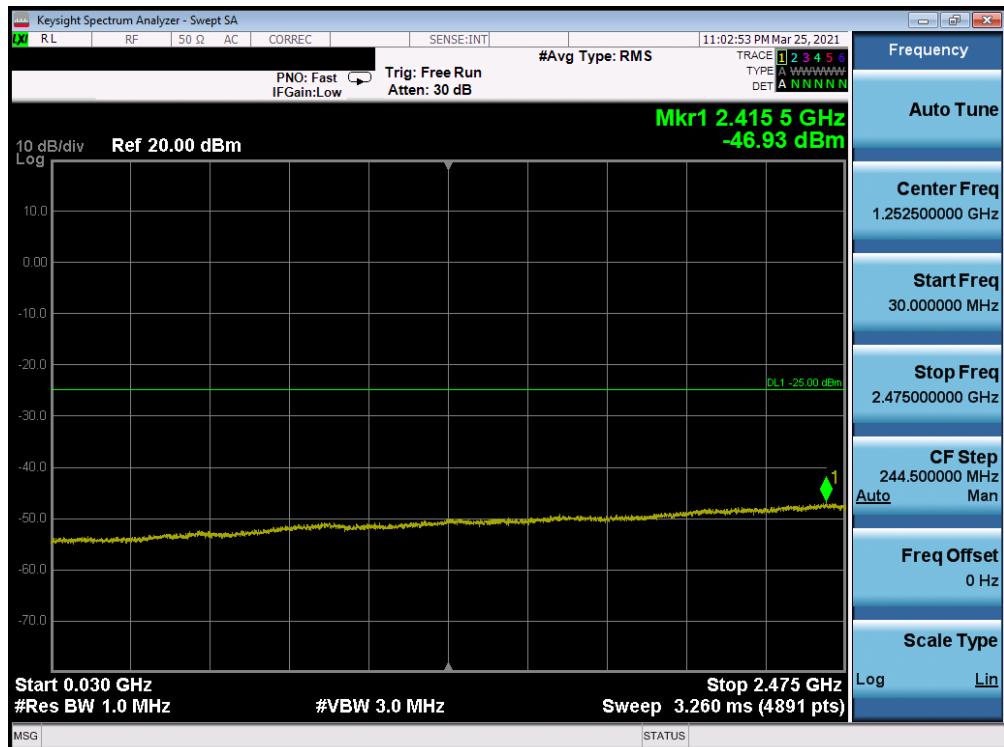
| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 38 of 102 |



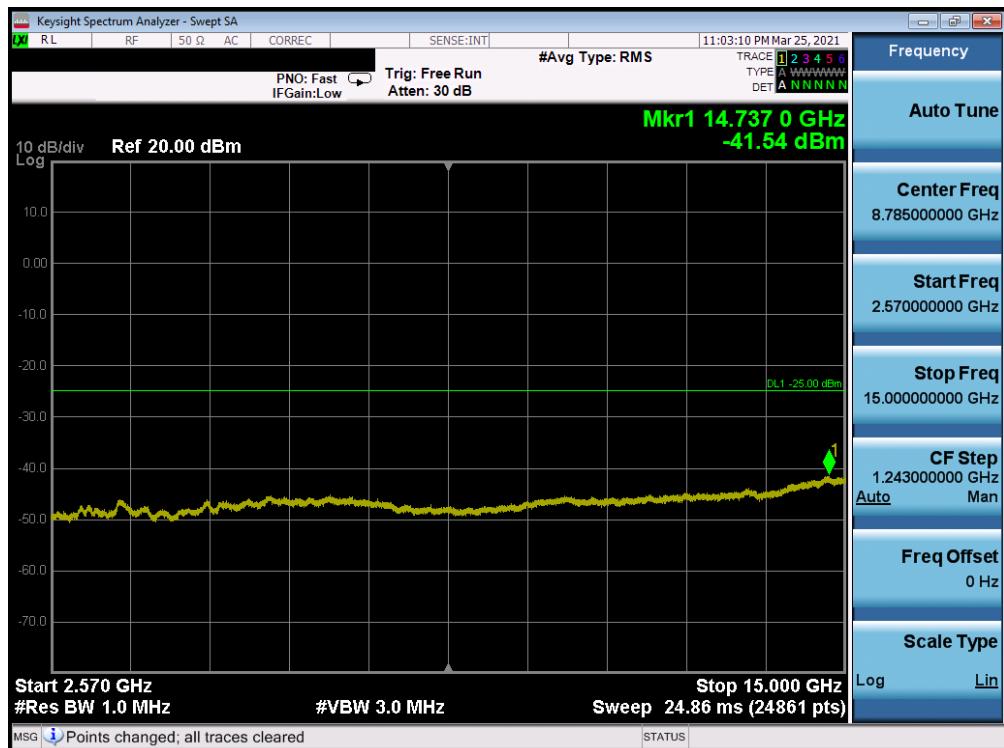
Plot 7-45. CSE (Band 30 - 5.0MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 39 of 102 |

LTE Band 7

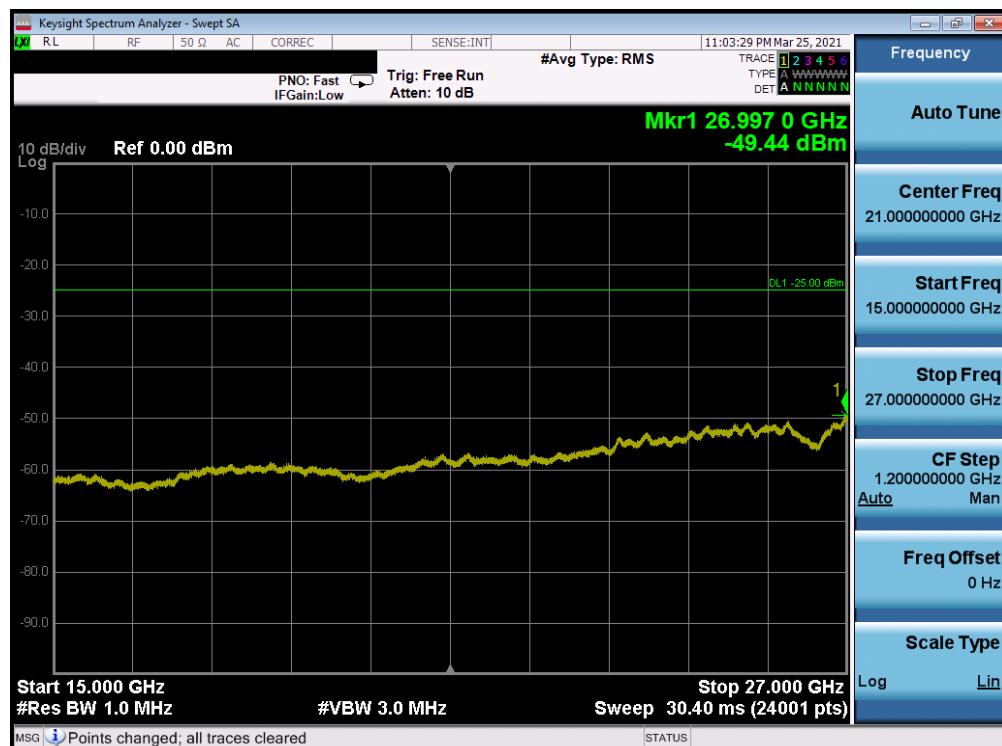


Plot 7-46. CSE (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

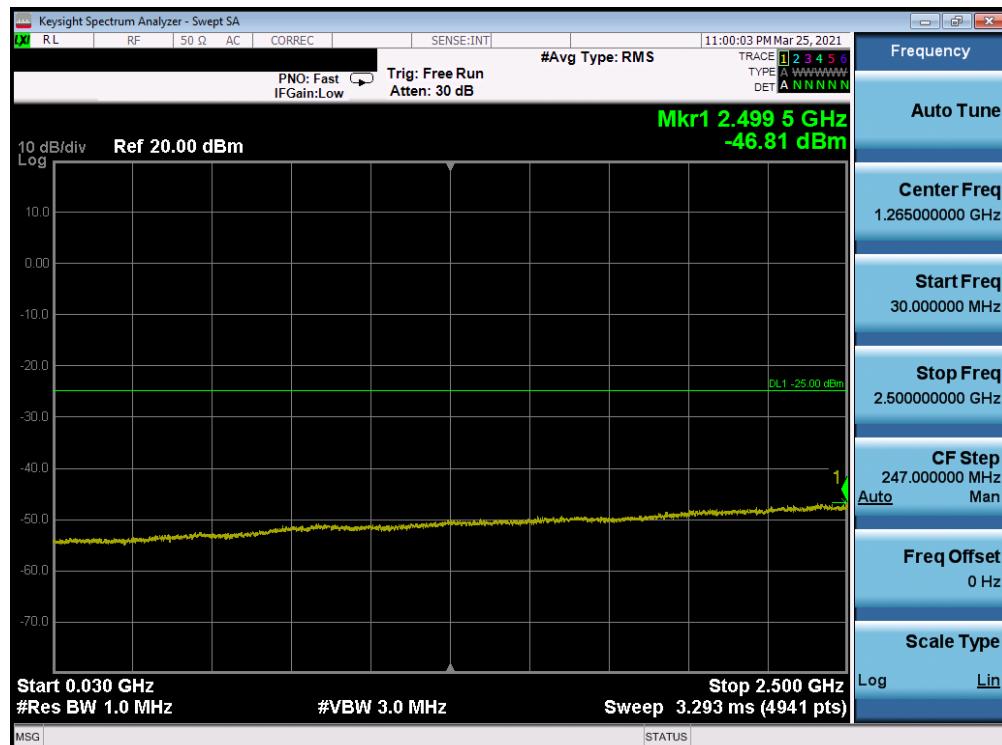


Plot 7-47. CSE (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 40 of 102 |

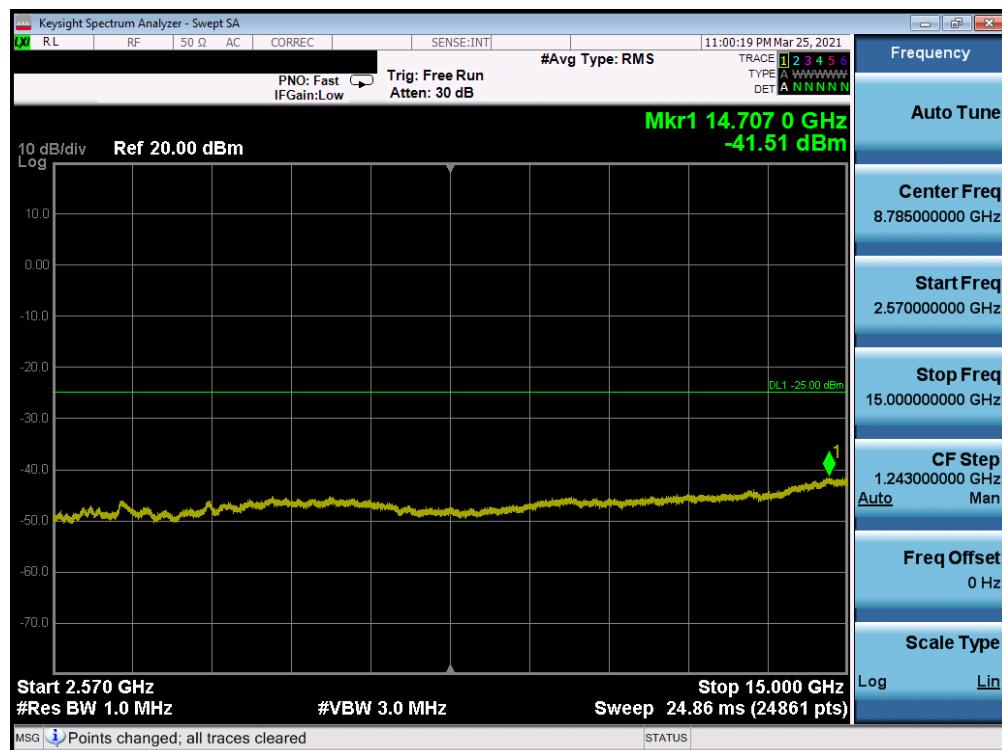


Plot 7-48. CSE (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-49. CSE (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 41 of 102 |

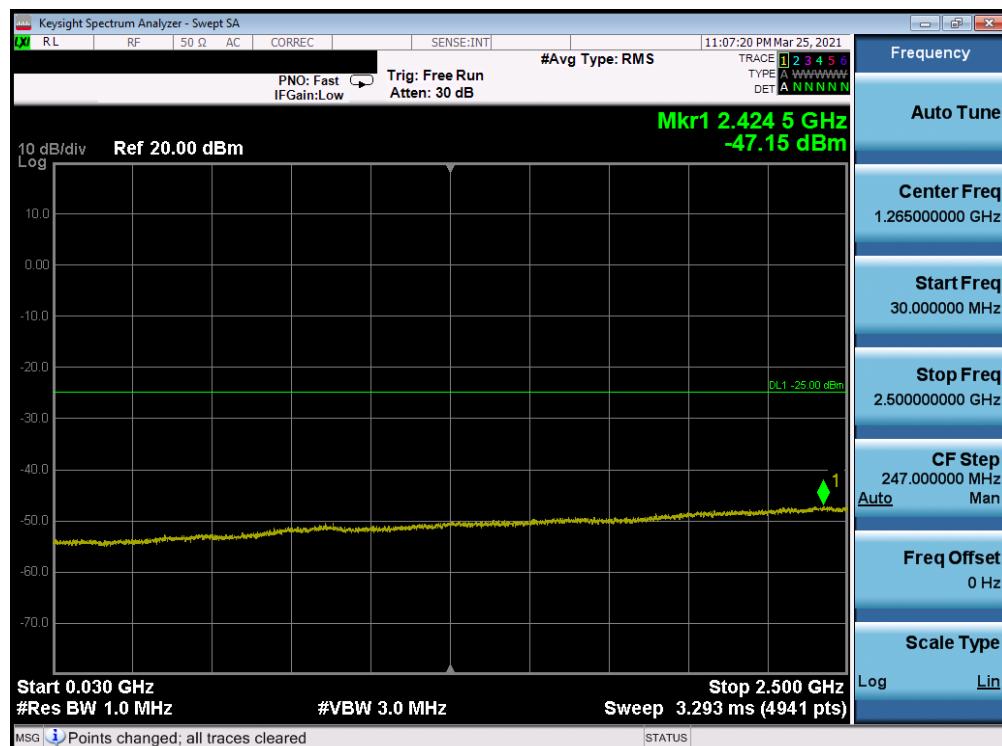


Plot 7-50. CSE (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-51. CSE (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 42 of 102 |

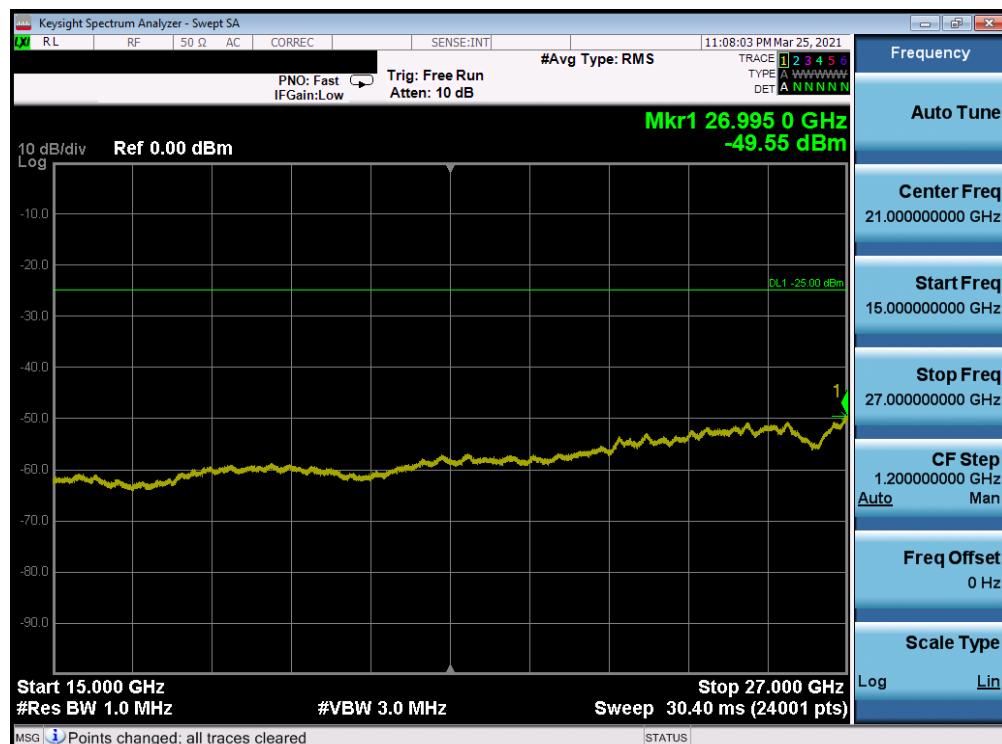


Plot 7-52. CSE (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



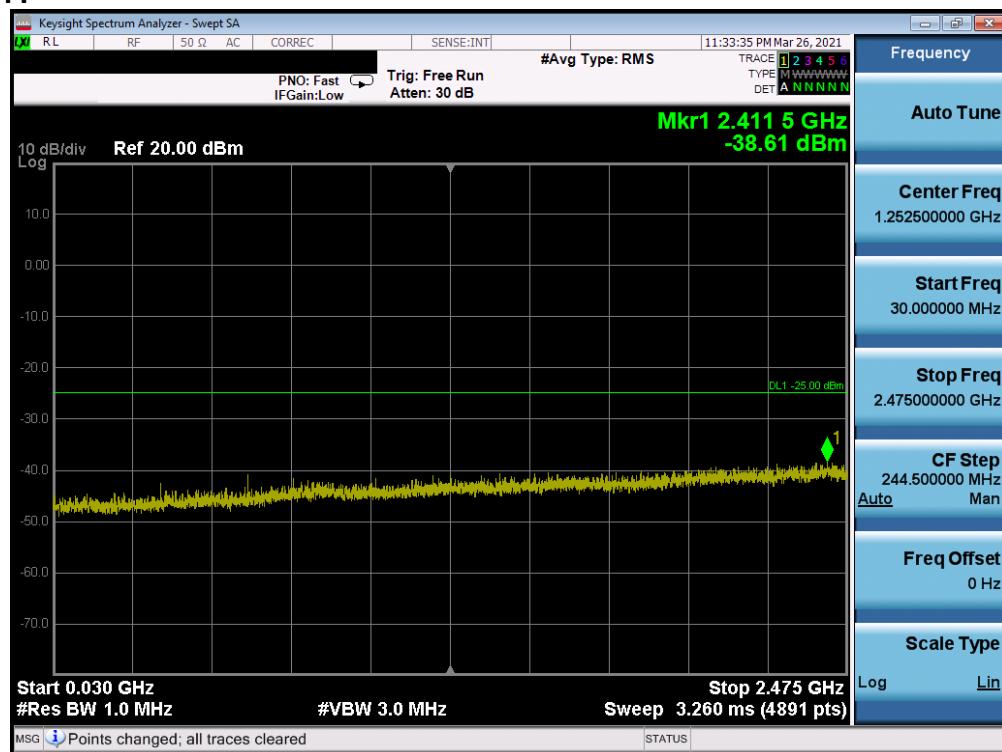
Plot 7-53. CSE (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 43 of 102 |

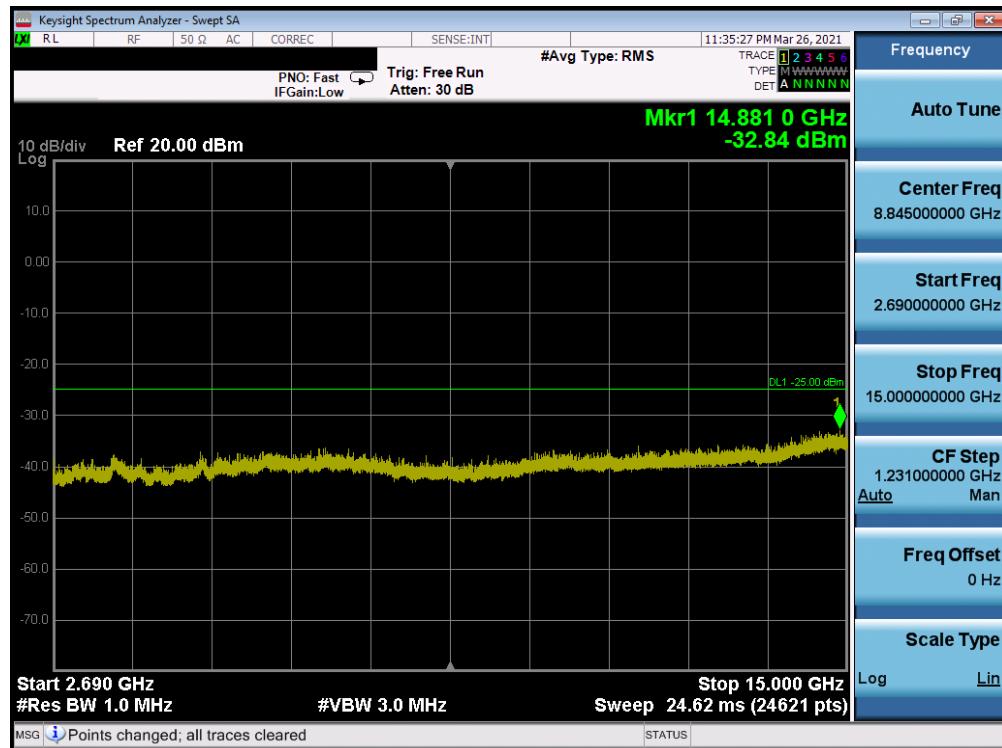


| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 44 of 102 |

LTE Band 41

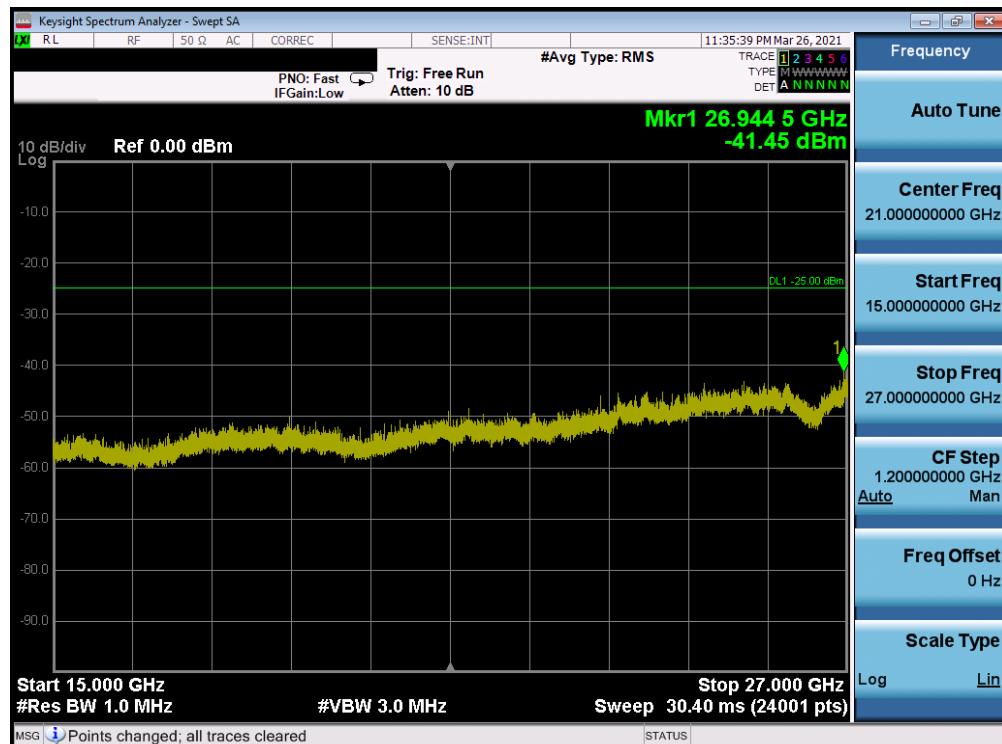


Plot 7-55. CSE (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

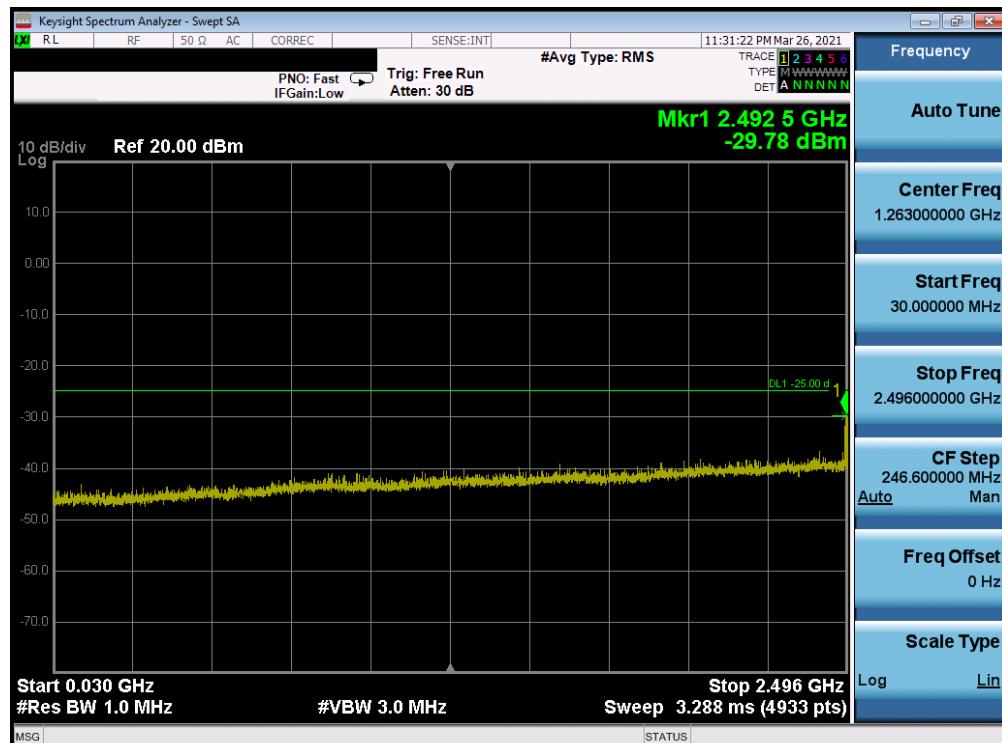


Plot 7-56. CSE (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

| | | | | |
|--|--|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 |  PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 45 of 102 |

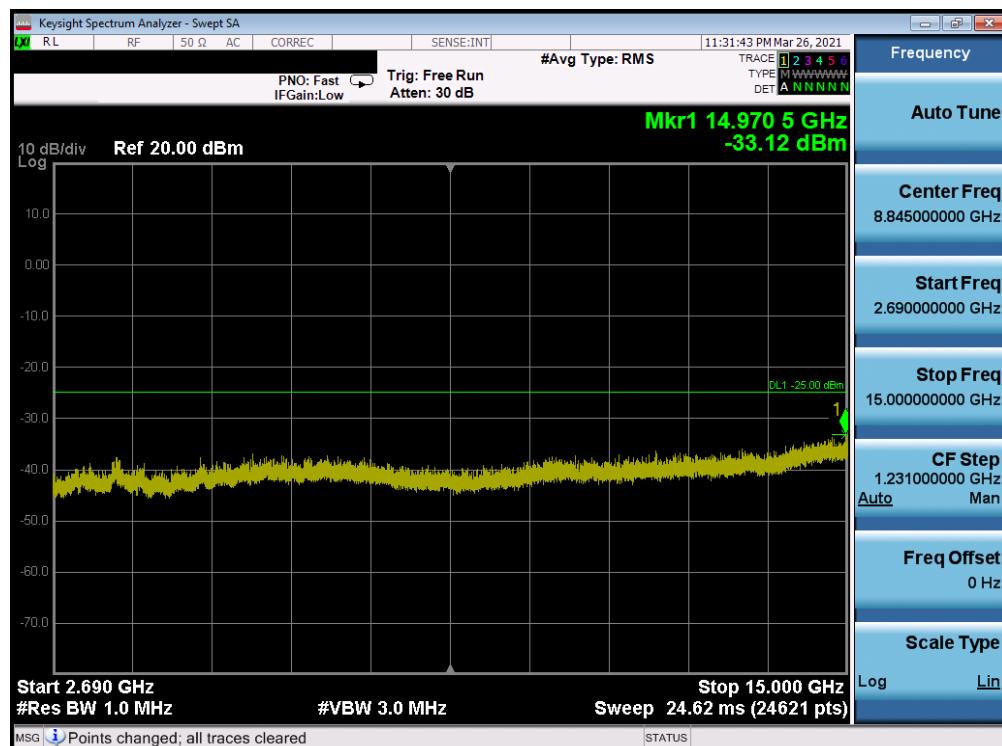


Plot 7-57. CSE (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

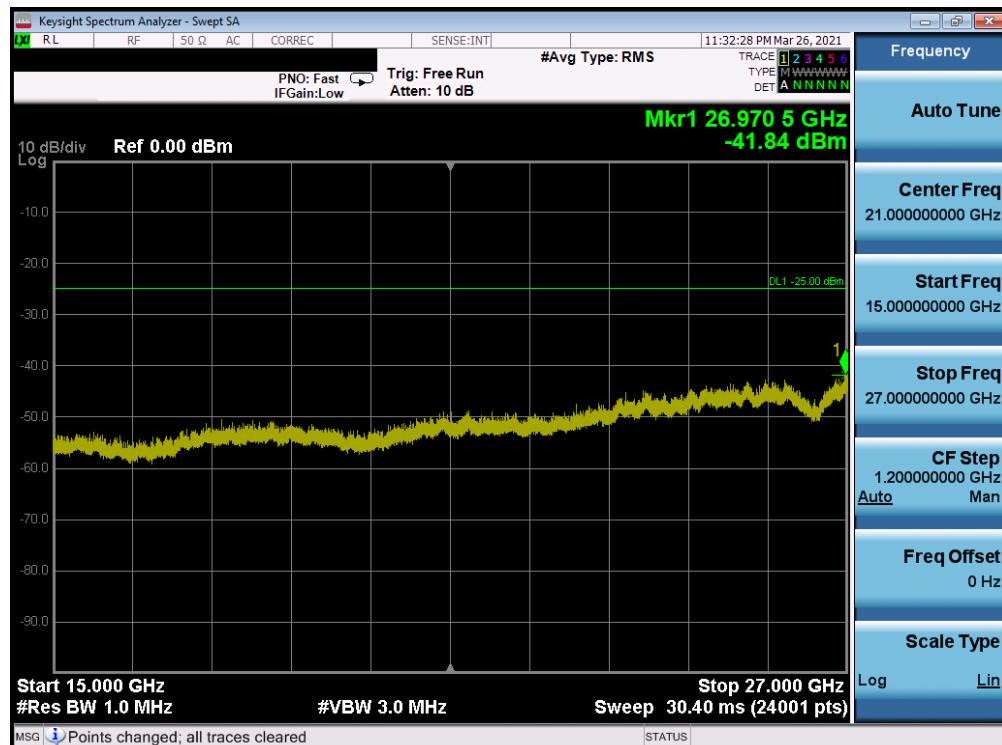


Plot 7-58. CSE (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 46 of 102 |

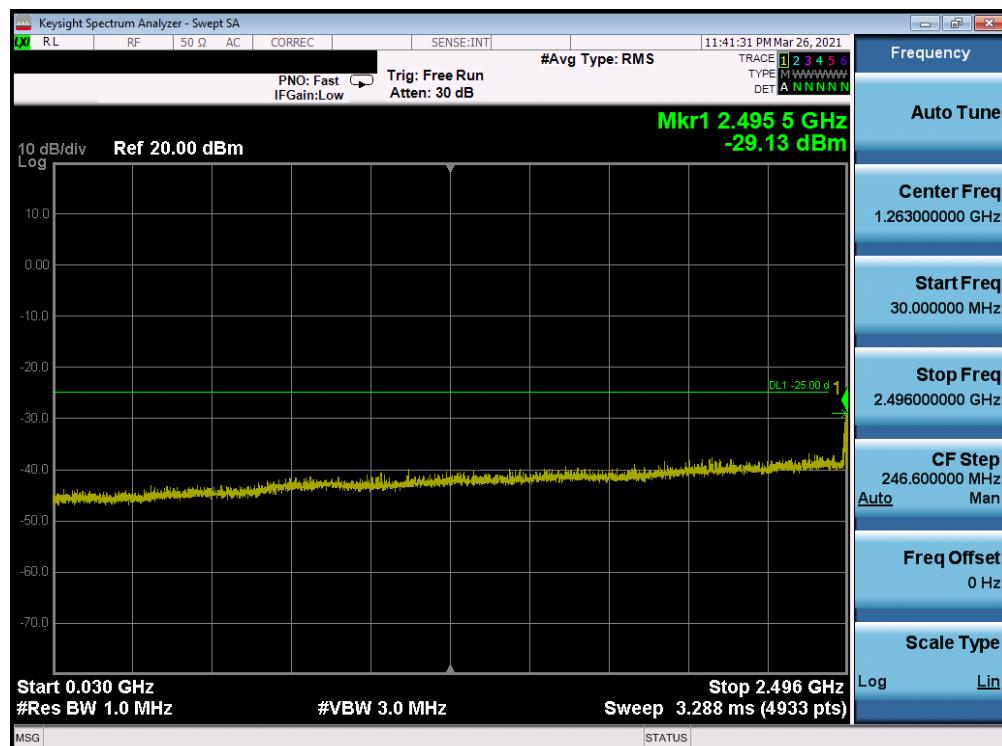


Plot 7-59. CSE (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

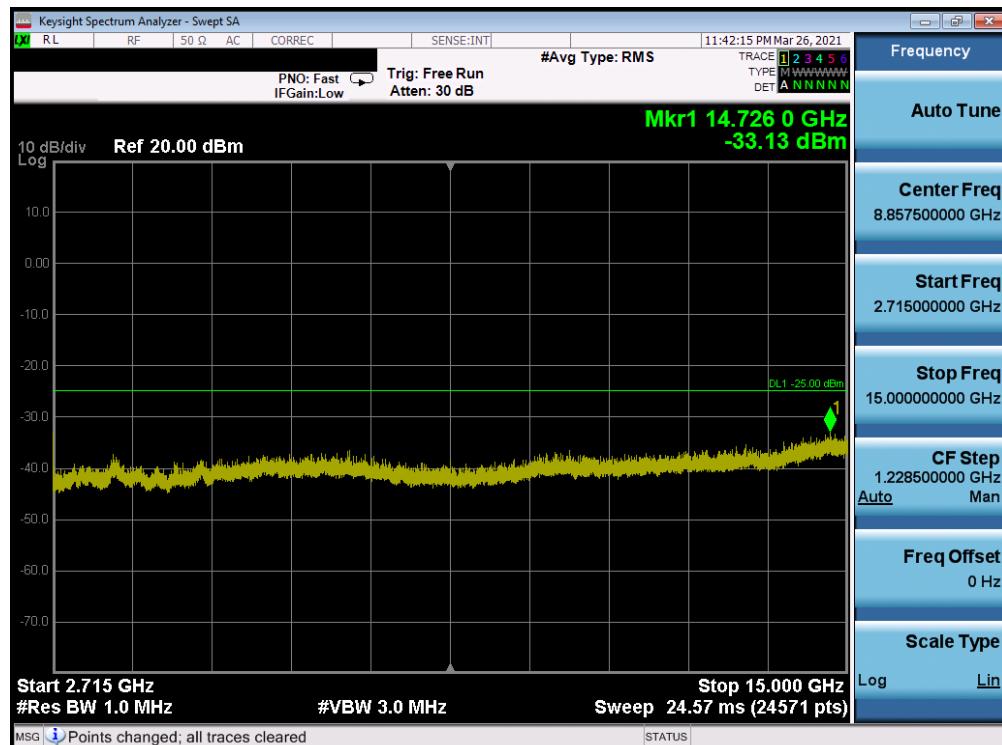


Plot 7-60. CSE (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 47 of 102 |

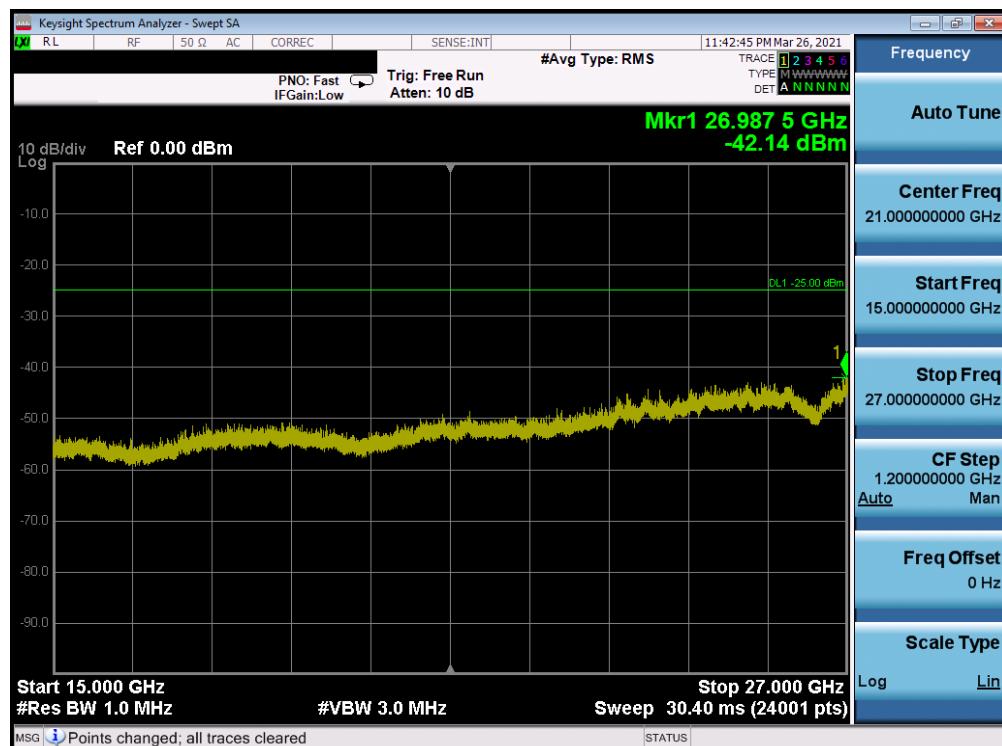


Plot 7-61. CSE (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-62. CSE (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

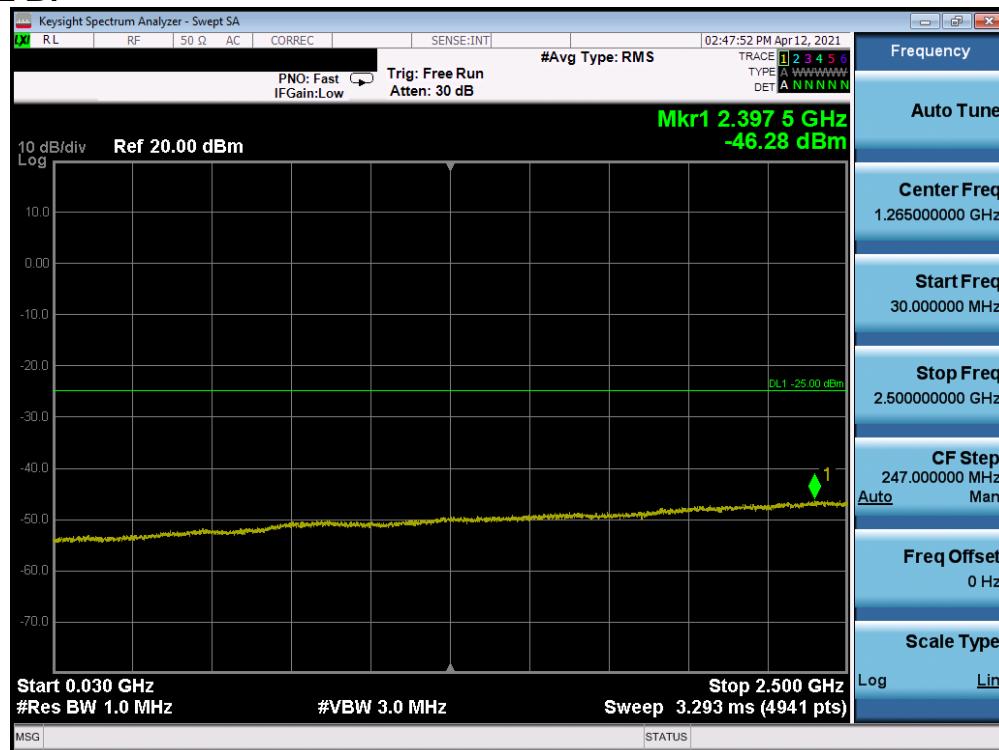
| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 48 of 102 |



Plot 7-63. CSE (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

| | | | |
|--|-------------------------------------|----------------------------|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Page 49 of 102 |

ULCA - LTE B7



Plot 7-64. CSE (ULCA LTE Band 7 - (20 + 20)MHz QPSK - PCC 1/99 SCC 1/0, - Mid Channel)



Plot 7-65. CSE (ULCA LTE Band 7 - (20 + 20)MHz QPSK - PCC 1/99 SCC 1/0, - Mid Channel)

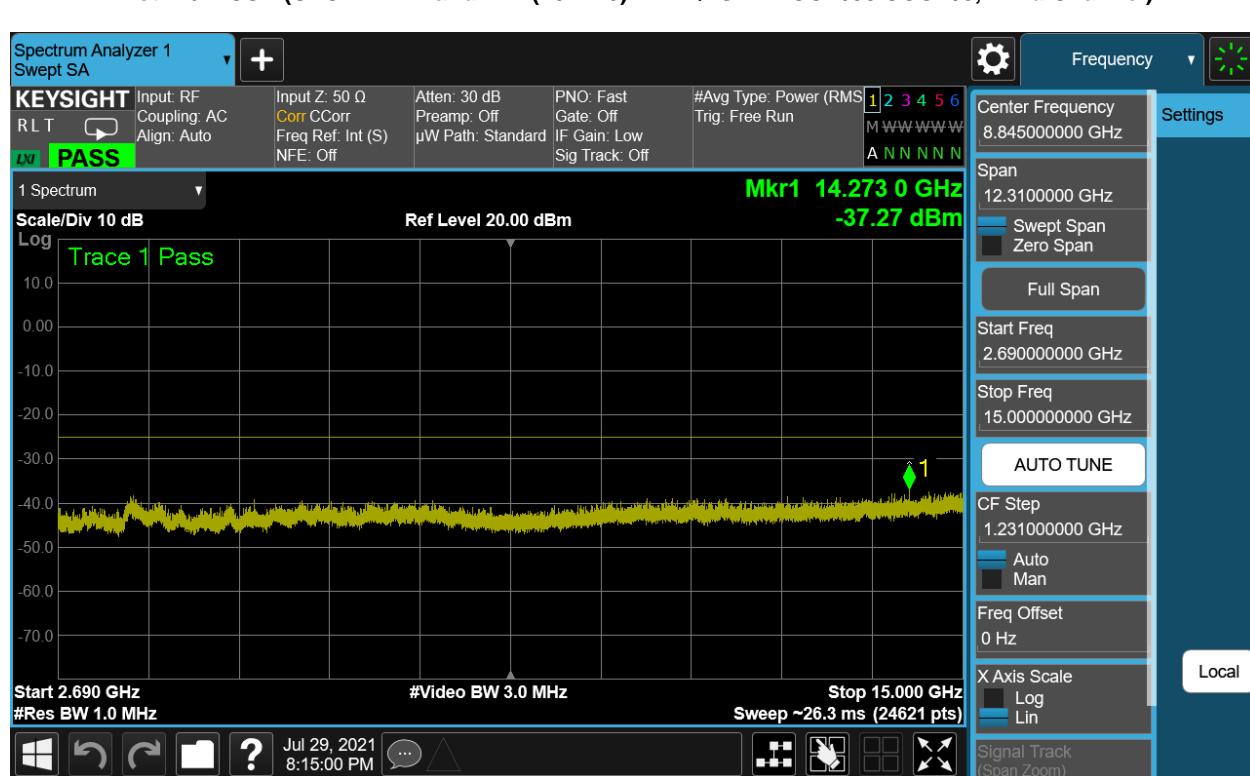
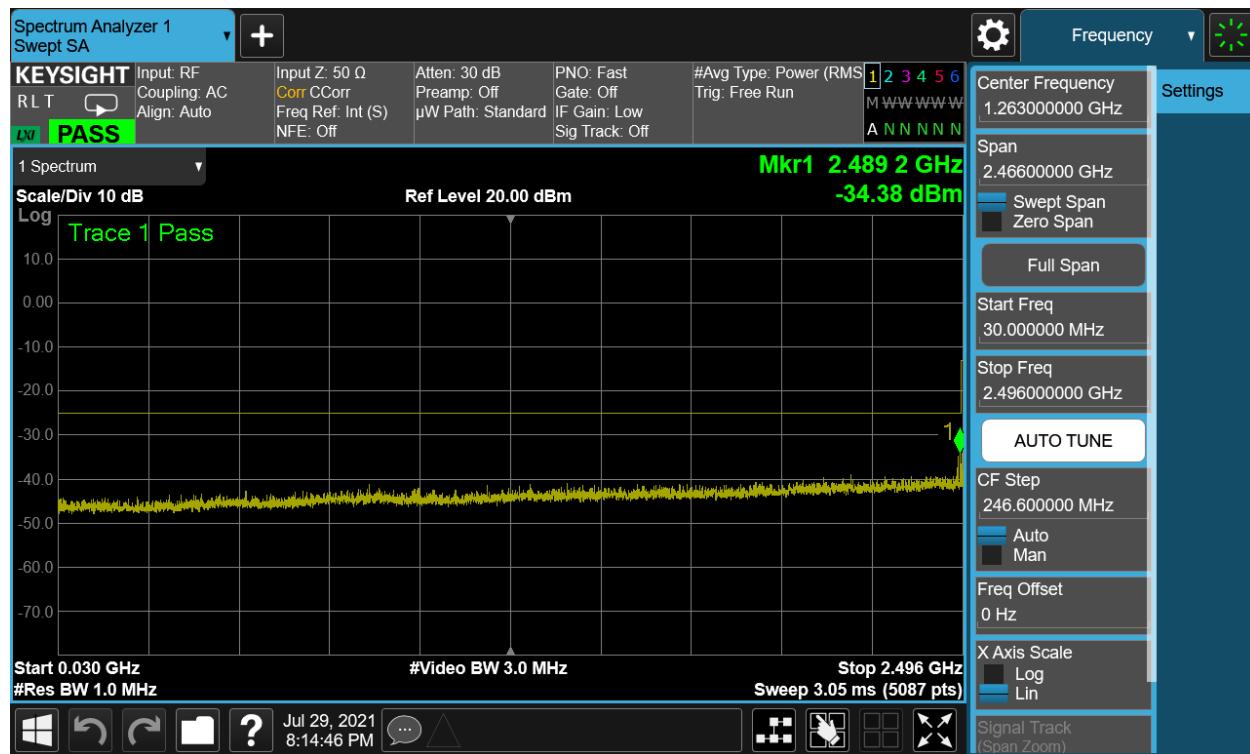
| | | | | |
|--|--|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 |  PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 50 of 102 |



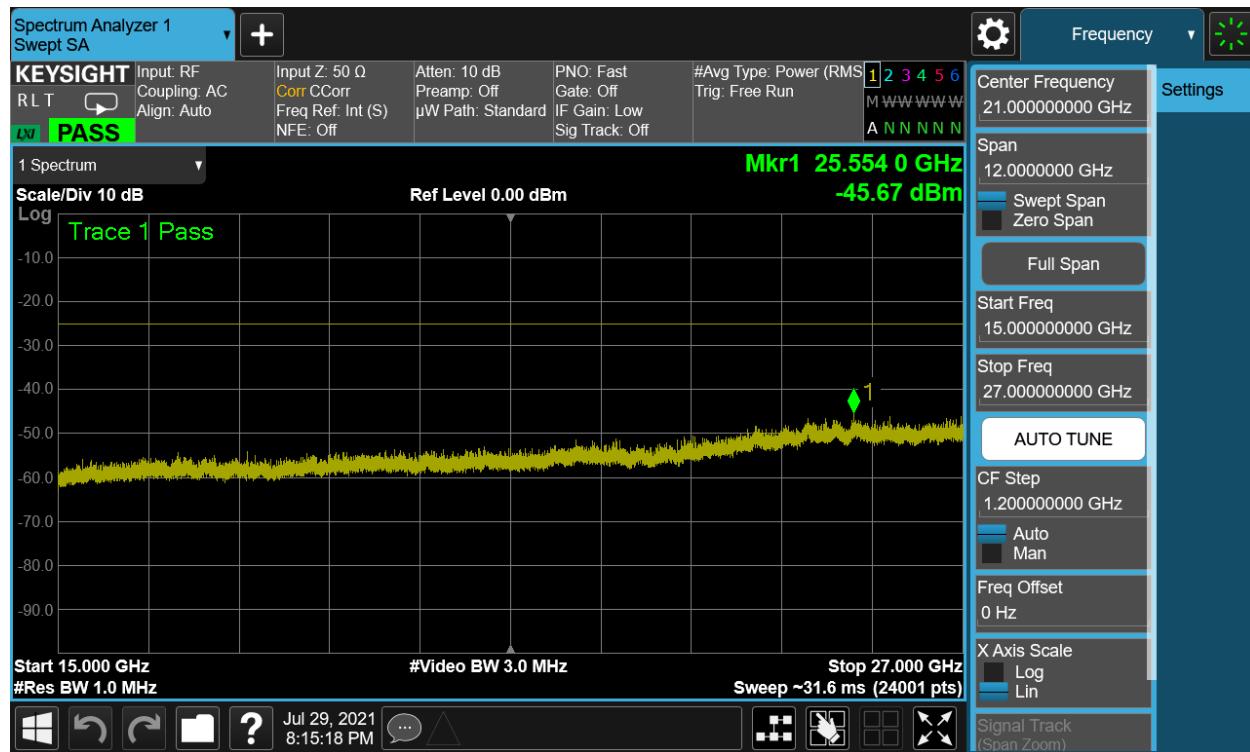
Plot 7-66. CSE (ULCA LTE Band 7 - (20 + 20)MHz QPSK - PCC 1/99 SCC 1/0, - Mid Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 51 of 102 |

ULCA - LTE B41



| | | | |
|--|---|----------------------------|---------------------------------|
| FCC ID: BCGA2603 |  PART 27 MEASUREMENT REPORT | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Page 52 of 102 |



Plot 7-69. CSE (ULCA LTE Band 41 - (20 + 20)MHz QPSK - PCC 1/99 SCC 1/0, - Mid Channel)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 53 of 102 |

7.4 Band Edge Emissions at Antenna Terminal

§2.1051, §27.53(a), §27.53(m)

Test Overview

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

The minimum permissible attenuation level for Band 30 is $> 43 + 10 \log_{10} (P[\text{Watts}])$ at 2300-2305MHz & 2345-2360MHz, $> 55 + 10 \log_{10} (P[\text{Watts}])$ at 2320-2324MHz & 2341-2345MHz, $> 61 + 10 \log_{10} (P[\text{Watts}])$ at 2324-2328MHz & 2337-2341MHz, $> 67 + 10 \log_{10} (P[\text{Watts}])$ at 2288-2292MHz & 2328-2337MHz, and $> 70 + 10 \log_{10} (P[\text{Watts}])$ at frequencies $< 2288\text{MHz}$ & $> 2365\text{MHz}$.

For LTE Bands 7 and 41 the minimum permissible attenuation level is noted in the Test Notes on the following page.

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 $\geq 3 \times \text{RBW}$
5. Detector = RMS
6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

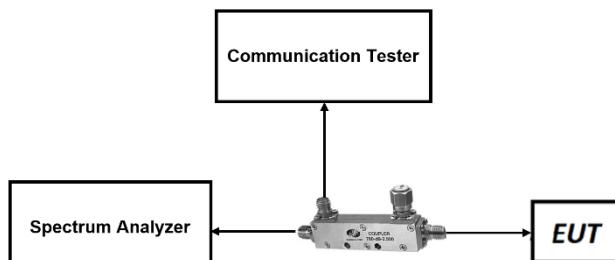


Figure 7-3. Test Instrument & Measurement Setup

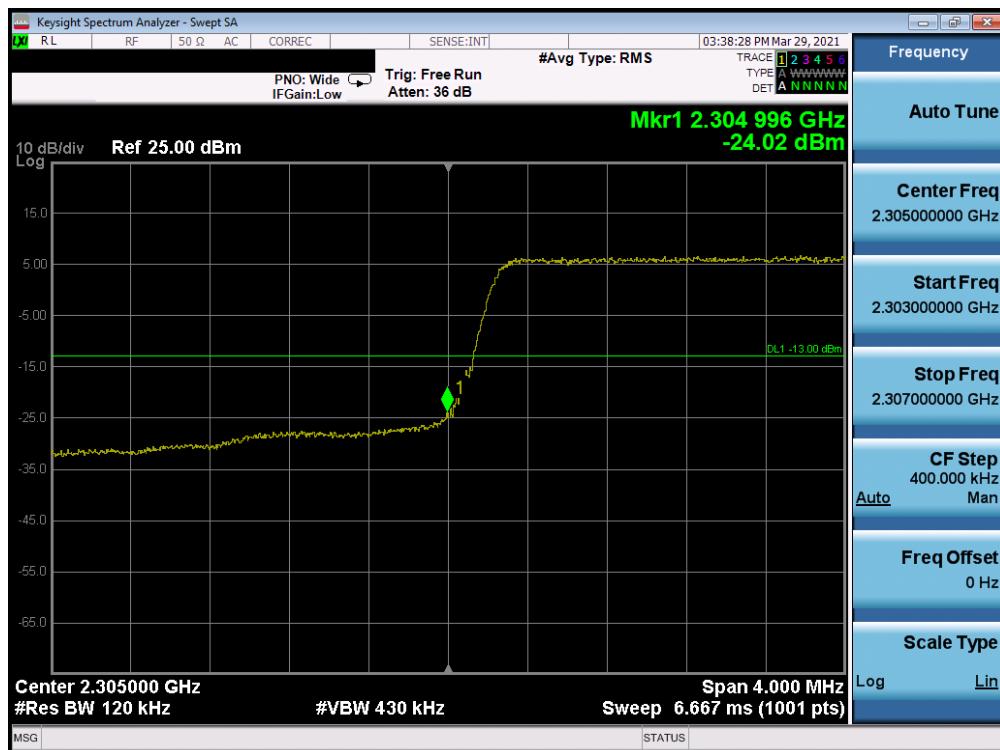
| | | | |
|--|-------------------------------------|----------------------------|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | Page 54 of 102 |

Test Notes

1. Per 27.53(h), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
2. Per 27.53(a)(5) in the 1 MHz bands immediately outside and adjacent to the channel blocks at 2305, 2310, 2315, 2320, 2345, 2350, 2355, and 2360 MHz, a resolution bandwidth of at least 1 percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e., 1 MHz). 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 emissions are attenuated at least 26 dB below the transmitter power.
3. Per 27.53(m) for operations in the BRS/EBS bands, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz.

| | | | | |
|--|---|----------------------------|-----------------------------------|---------------------------------|
| FCC ID: BCGA2603 |  PCTEST <small>Proud to be part of element</small> | | PART 27 MEASUREMENT REPORT | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 55 of 102 |

LTE Band 30



Plot 7-70. Lower Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

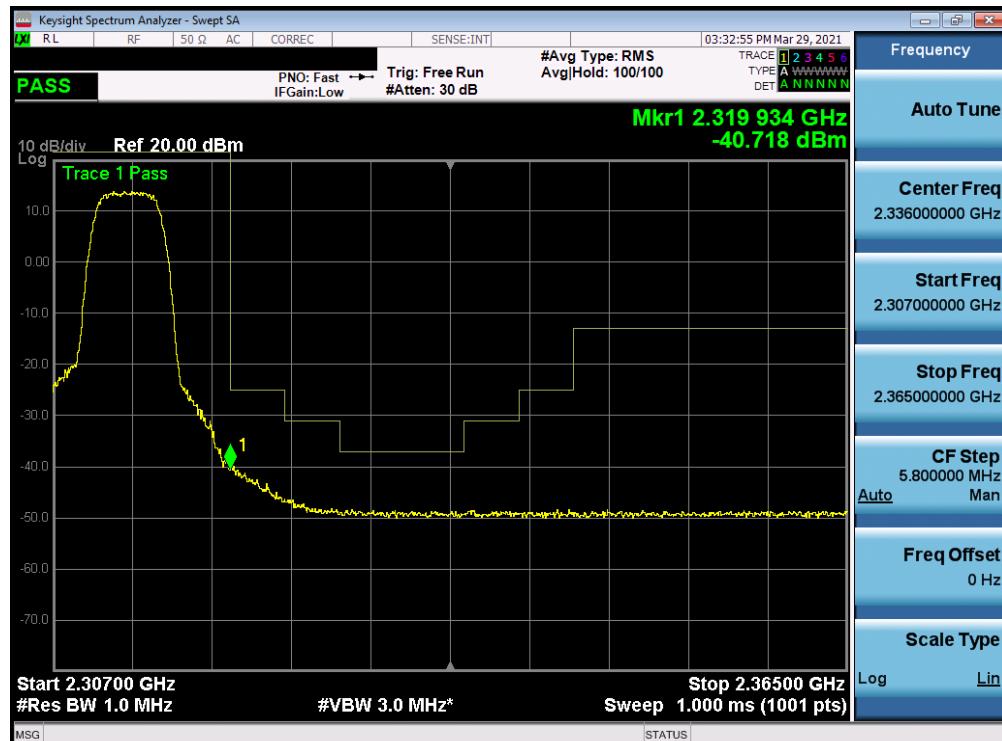


Plot 7-71. Lower Extended Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 56 of 102 |

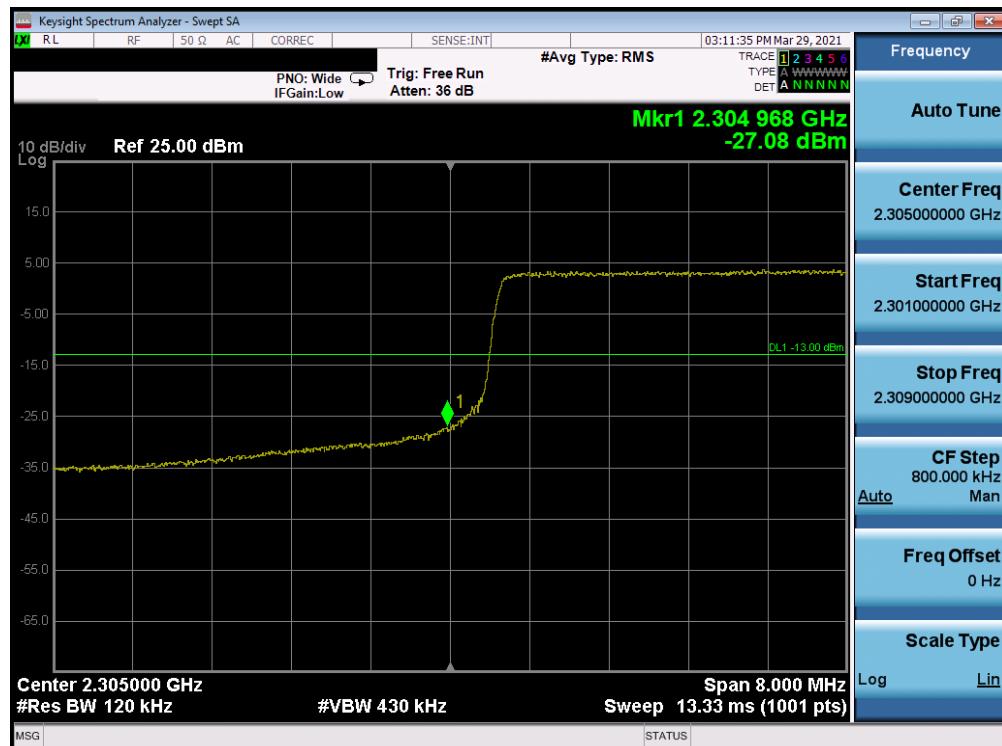


Plot 7-72. Upper Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-73. Upper Extended Band Edge Plot (Band 30 - 5.0MHz QPSK - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 57 of 102 |



Plot 7-74. Lower Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)

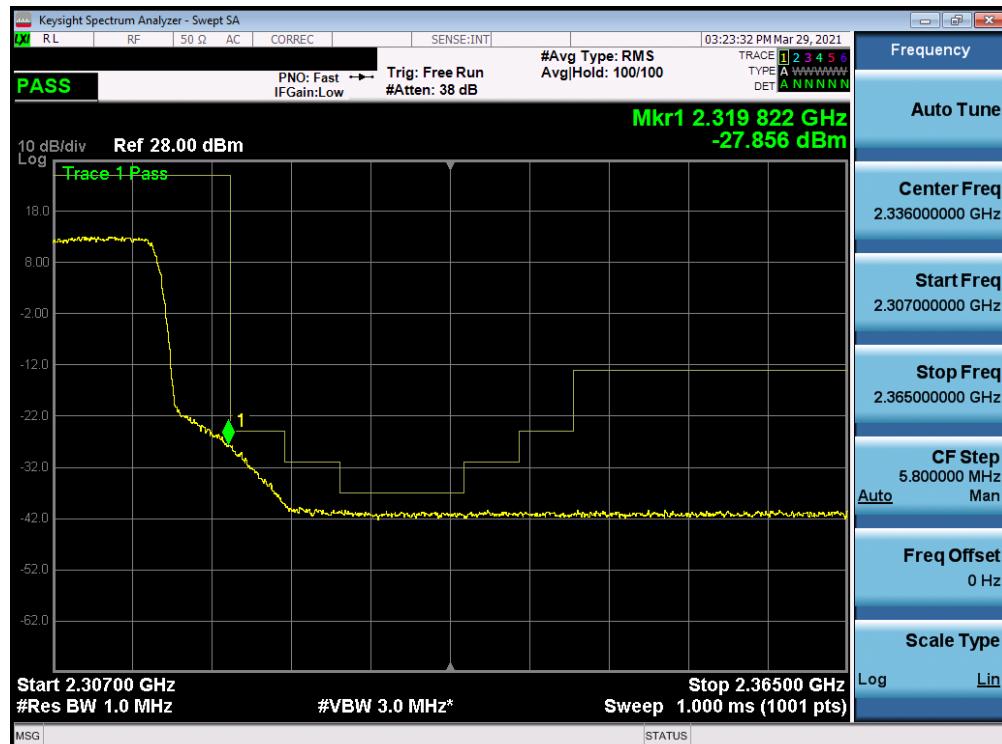


Plot 7-75. Lower Extended Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 58 of 102 |



Plot 7-76. Upper Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)



Plot 7-77. Upper Extended Band Edge Plot (Band 30 - 10.0MHz QPSK - Full RB Configuration)

| | | | | |
|--|-------------------------------------|----------------------------|--|---------------------------------|
| FCC ID: BCGA2603 | PART 27 MEASUREMENT REPORT | | | Approved by: Quality Manager |
| Test Report S/N: 1C2106080051-04-R1.BCG | Test Dates: 6/7/2021 - 7/30/2021 | EUT Type: Tablet Device | | Page 59 of 102 |