



## DATA REFERENCE REPORT PART 22

**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 Lab. Morgan Hill, CA, USA

**Test Report Serial No.:**

1C2106080052-01.BCG

<b>FCC ID:</b>	<b>BCGA2604</b>
<b>Applicant Name:</b>	<b>Apple Inc.</b>

**Reference Model:** A2603

**Variant Model:** A2604(A2605)

**EUT Type:** Tablet Device

**FCC Classification:** PCS Licensed Transmitter (PCB)

**FCC Rule Part:** 22

**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.

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: BCGA2604	PART 22 DATA REFERENCE REPORT		Approved by: Quality Manager
Test Report S/N: 1C2106080052-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 1 of 13

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## 1.0 INTRODUCTION

### 1.1 Scope

Per manufacturer declaration, there are two tablet device models, A2603 and A2604(A2605), with high degree of similarity, reference model FCC ID: BCGA2603 and variant model **FCC ID: BCGA2604**. The reference model supports LTE Band 71, while the variant model replaces LTE Band 71 with LTE Band 28 components. Both models share the same material, form factor, circuit design, and components, including antennas and their locations. The reference and variant models use the same power tables and have same tune-up tolerances.

Per FCC approved Data Referencing Test Plan, testing was done fully on the reference model FCC ID: BCGA2603, while radiated spot-check verification has been performed on variant model **FCC ID: BCGA2604**. Spot-check measurements were conducted, all measurements were investigated and found to be within acceptable tolerance.

Equipment Class	Reference Model FCC ID	Reference Report	Report Title
PCB	BCGA2603	1C2106080051-01.BCG	RF Part 22 Test Report

**Table 1-1. Reference Model Details**

Reference model FCC ID: BCGA2603 test report has been included in Appendix A

### 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

- 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.

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Tablet Device FCC ID:BCGA2604**. 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 22.

**Test Device Serial No.:** W2162DHGJW, PRFPL4023V

### 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, Bluetooth (1x, EDR, LE)

### 2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.

Frequency [MHz]	Antennas	
	Antenna C	Antenna D
820-960	-0.8	-0.6

Table 2-1. Highest Antenna Gain

### 2.4 Test Support Equipment

1	Apple MacBook w/AC/DC Adapter	Model: A2141	S/N:	C02DV7VKMD6T
		Model: A2166	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	S/N:	N/A
		Model: A2305	S/N:	N/A
4	DC Power Supply	Model: KPS3010D	S/N:	N/A

Table 2-2. Test Support Equipment

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## 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 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.

Per FCC Approved Data Referencing Test Plan, Antenna C spot-check measurements have been conducted and reported. Spot-check Test Plan can be referred to below Table 2-3.

Technology	Test Case	FCC ID: BCGA2604	
		Mode	Channel
WCDMA, LTE	Radiated Spurious Emissions	Antenna C LTE Band 5, 2, 7 Max BW, 1RB, QPSK	M

**Table 2-3. FCC Approved Spot-Check Test Plan**

Output powers were measured and confirmed to be consistent between Reference and Variant models prior to testing.

## 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.

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Measurement Procedure

The measurement procedures described in the document titled “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI 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.

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:

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

And

$$\text{EIRP}_{[\text{dBm}]} = E_{[\text{dB}\mu\text{V}/\text{m}]} + 20\log D - 104.8;$$

Where D 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.

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## 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)
Radiated Disturbance (<30MHz)	4.06
Radiated Disturbance (30MHz-1GHz)	4.30
Radiated Disturbance (1-18GHz)	4.78
Radiated Disturbance (>18GHz)	4.79

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## 5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/31/2021	Annual	3/31/2022	MY49430244
Keysight Technology	N9040B	UXA Signal Analyzer	12/19/2020	Annual	12/19/2021	MY57212015
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	12/1/2020	Annual	12/1/2021	T058701-02
ESPEC	SU-241	Tabletop Temperature Chamber	9/28/2020	Annual	9/28/2021	92009574
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
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	Cross 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:**

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.

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## 6.0 SAMPLE CALCULATIONS

### 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.

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## 7.0 TEST RESULTS (SPOT-CHECK DATA)

### 7.1 Summary

Company Name: Apple Inc.  
 FCC ID: BCGA2604  
 FCC Classification: PCS Licensed Transmitter (PCB)  
 Mode(s): WCDMA/LTE

Technology	Test Configurations					Reference Model	Variant Model	Delta
	Test Description	Modulation	BW	Channel	Measurement Frequency [MHz]	FCC ID: BCGA2603	FCC ID: BCGA2604	
						Average [dBm]	Average [dBm]	
WCDMA	Radiated Spurious Emissions	QPSK	5MHz	M	2509.8	-58.03	-58.37	0.34

**Table 7-1. Worst Case Spot-Check Results**

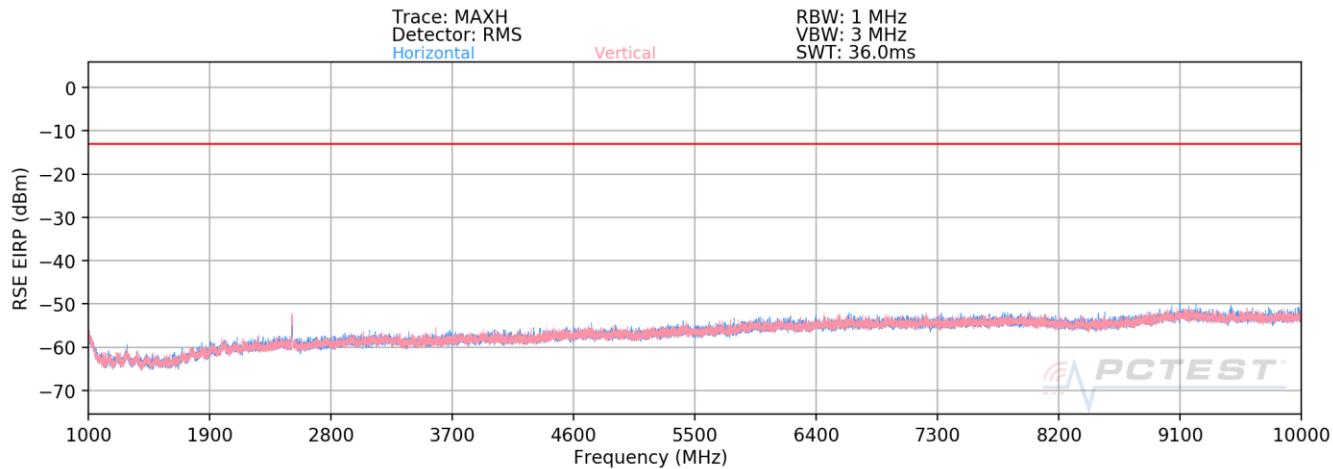
Spot-checks were conducted, all measurements were investigated and found to be within acceptable tolerance in accordance with FCC Approved Data Referencing Test Plan.

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## 7.2 Radiated Spurious Emissions

§2.1053, 22.917(a)

### WCDMA



**Plot 7-1. Radiated Spurious Emission above 1GHz (WCDMA Cell)**

Mode:	WCDMA RMC
Channel:	4183
Frequency (MHz):	836.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.2	V	-	-	-76.93	-2.75	27.32	-67.94	-13.00	-54.94
2509.8	V	244.0	94	-71.64	1.53	36.89	-58.37	-13.00	-45.37
3346.4	V	-	-	-78.62	2.80	31.18	-64.07	-13.00	-51.07
4183.0	V	-	-	-78.93	4.22	32.29	-62.97	-13.00	-49.97
5019.6	V	-	-	-79.55	5.38	32.83	-62.43	-13.00	-49.43

**Table 7-2. Radiated Spurious Data (WCDMA Cell – Mid Channel)**

FCC ID: BCGA2604	 <b>PART 22 DATA REFERENCE REPORT</b>			Approved by: Quality Manager
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## 8.0 CONCLUSION

The spot-check data measured for variant model **FCC ID: BCGA2604** is in tolerance with reference model FCC ID: BCGA2603 per FCC Approved Data Referencing Test Plan.

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## 9.0 APPENDIX A: REFERENCE MODEL TEST REPORT

Attached is the test report (1C2106080051-01.BCG) from reference model FCC ID: BCGA2603, which includes referenced data results.

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## PART 22 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.:**

1C2106080051-01.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:**

22

**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.

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

  
 Randy Ortanez  
 President

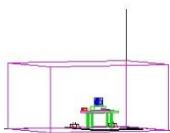

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## T A B L E   O F   C O N T E N T S

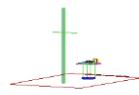
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## PART 22 MEASUREMENT REPORT



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	OBW [MHz]	ERP		EIRP		Emission Designator
					Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
WCDMA850	5 MHz	Spread Spectrum	826.4 - 846.6	4.0937	0.180	22.55	0.295	24.70	4M09F9W
Band 5	1.4 MHz	QPSK	824.7 - 848.3	1.1094	0.177	22.48	0.290	24.63	1M11G7W
		16QAM	824.7 - 848.3	1.1071	0.156	21.94	0.256	24.09	1M11D7W
		64QAM	824.7 - 848.3	1.1098	0.125	20.96	0.205	23.11	1M11D7W
	3 MHz	QPSK	825.5 - 847.5	2.7294	0.172	22.35	0.282	24.50	2M73G7W
		16QAM	825.5 - 847.5	2.7255	0.156	21.94	0.256	24.09	2M73D7W
		64QAM	825.5 - 847.5	2.7257	0.122	20.85	0.200	23.00	2M73D7W
	5 MHz	QPSK	826.5 - 846.5	4.5582	0.178	22.50	0.292	24.65	4M56G7W
		16QAM	826.5 - 846.5	4.5373	0.157	21.97	0.258	24.12	4M54D7W
		64QAM	826.5 - 846.5	4.5303	0.124	20.94	0.204	23.09	4M53D7W
	10 MHz	QPSK	829.0 - 844.0	9.0354	0.173	22.38	0.284	24.53	9M04G7W
		16QAM	829.0 - 844.0	9.0335	0.156	21.94	0.256	24.09	9M03D7W
		64QAM	829.0 - 844.0	9.0371	0.124	20.93	0.203	23.08	9M04D7W
Band 26	1.4 MHz	QPSK	824.7 - 848.3	1.1094	0.180	22.55	0.295	24.70	1M11G7W
		16QAM	824.7 - 848.3	1.1071	0.152	21.82	0.249	23.97	1M11D7W
		64QAM	824.7 - 848.3	1.1098	0.123	20.89	0.201	23.04	1M11D7W
	3 MHz	QPSK	825.5 - 847.5	2.7294	0.180	22.55	0.295	24.70	2M73G7W
		16QAM	825.5 - 847.5	2.7255	0.152	21.81	0.249	23.96	2M73D7W
		64QAM	825.5 - 847.5	2.7257	0.122	20.88	0.201	23.03	2M73D7W
	5 MHz	QPSK	826.5 - 846.5	4.5582	0.180	22.55	0.295	24.70	4M56G7W
		16QAM	826.5 - 846.5	4.5373	0.150	21.76	0.246	23.91	4M54D7W
		64QAM	826.5 - 846.5	4.5303	0.124	20.92	0.203	23.07	4M53D7W
	10 MHz	QPSK	829.0 - 844.0	9.0354	0.180	22.55	0.295	24.70	9M04G7W
		16QAM	829.0 - 844.0	9.0335	0.155	21.91	0.255	24.06	9M03D7W
		64QAM	829.0 - 844.0	9.0371	0.122	20.86	0.200	23.01	9M04D7W

### EUT Overview

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## 1.0 INTRODUCTION

### 1.1 Scope

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

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## 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 22.

**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, Bluetooth (1x, EDR, LE)

### 2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.

Frequency [MHz]	Antennas	
	Antenna C	Antenna D
820-960	-0.8	-0.6

**Table 2-1. Highest Antenna Gain**

### 2.4 Test Support Equipment

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

**Table 2-2. Test Support Equipment**

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## 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 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.

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Measurement Procedure

The measurement procedures described in the document titled “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI 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.

**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.

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## 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  $U_{\text{CISPR}}$  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

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## 5.0 TEST EQUIPMENT CALIBRATION DATA

Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurement's 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
Keysight Technology	N9040B	UXA Signal Analyzer	12/19/2020	Annual	12/19/2021	MY57212015
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	12/1/2020	Annual	12/1/2021	T058701-02
ESPEC	SU-241	Tabletop Temperature Chamber	9/28/2020	Annual	9/28/2021	92009574
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
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	Cross 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:**

1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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## 6.0 SAMPLE CALCULATIONS

### Emission Designator

#### **Emission Designator = 4M16F9W**

WCDMA BW = 4.16 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

### 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

D = 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.

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## 7.0 TEST RESULTS

### 7.1 Summary

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

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Occupied Bandwidth	2.1049	N/A	<span style="background-color: #e0f2ff; border: 1px solid #0070C0; padding: 2px 5px; border-radius: 5px;">N/A</span>	Section 7.2
	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	-13 dBm at Band Edge and for all out-of-band emissions	<span style="background-color: #e0f2ff; border: 1px solid #0070C0; padding: 2px 5px; border-radius: 5px;">PASS</span>	Sections 7.3, 7.4
	Transmitter Conducted Output Power	2.1046	N/A	<span style="background-color: #e0f2ff; border: 1px solid #0070C0; padding: 2px 5px; border-radius: 5px;">N/A</span>	See RF Exposure Report
	Effective Radiated Power / Equivalent Isotropic Radiated Power	22.913(a)(5)	< 7 Watts max. ERP	<span style="background-color: #e0f2ff; border: 1px solid #0070C0; padding: 2px 5px; border-radius: 5px;">PASS</span>	Section 7.5
	Frequency Tolerance	2.1055, 22.355	±2.5 ppm	<span style="background-color: #e0f2ff; border: 1px solid #0070C0; padding: 2px 5px; border-radius: 5px;">PASS</span>	Section 7.7
RADIATED	Radiated Spurious Emissions	2.1053, 22.917(a)	-13 dBm for all out-of-band emissions	<span style="background-color: #e0f2ff; border: 1px solid #0070C0; padding: 2px 5px; border-radius: 5px;">PASS</span>	Section 7.6

**Table 7-1. Summary of Test Results**

**Notes:**

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

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## 7.2 Occupied Bandwidth

§2.1049

### Test Overview

The occupied bandwidth, that is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission shall be measured. All modes of operation were investigated and the worst case configuration results are reported in this section. All ports were tested and only the worst case data were reported.

### Test Procedure Used

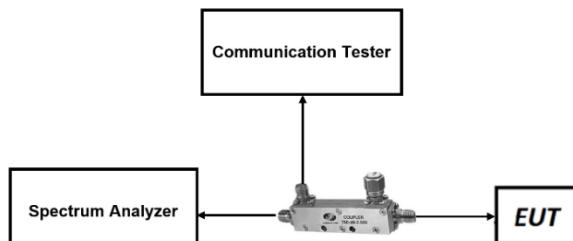
KDB 971168 D01 v03r01 – Section 4.2

### 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.

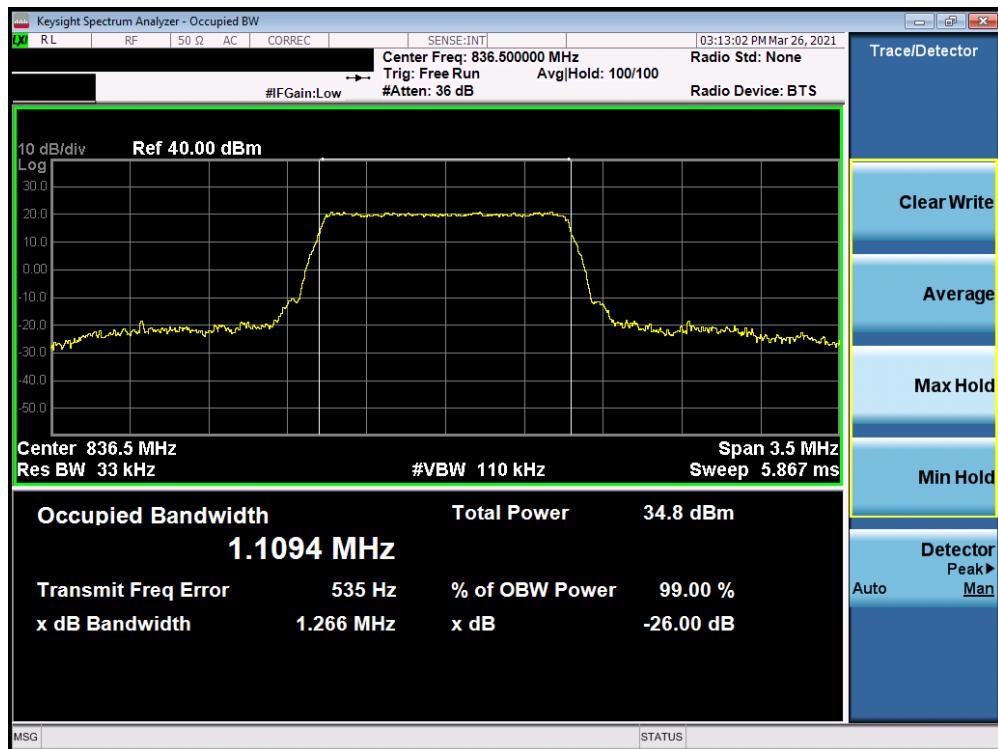
FCC ID: BCGA2603	 <b>PCTEST</b> <small>Proud to be part of element</small>		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
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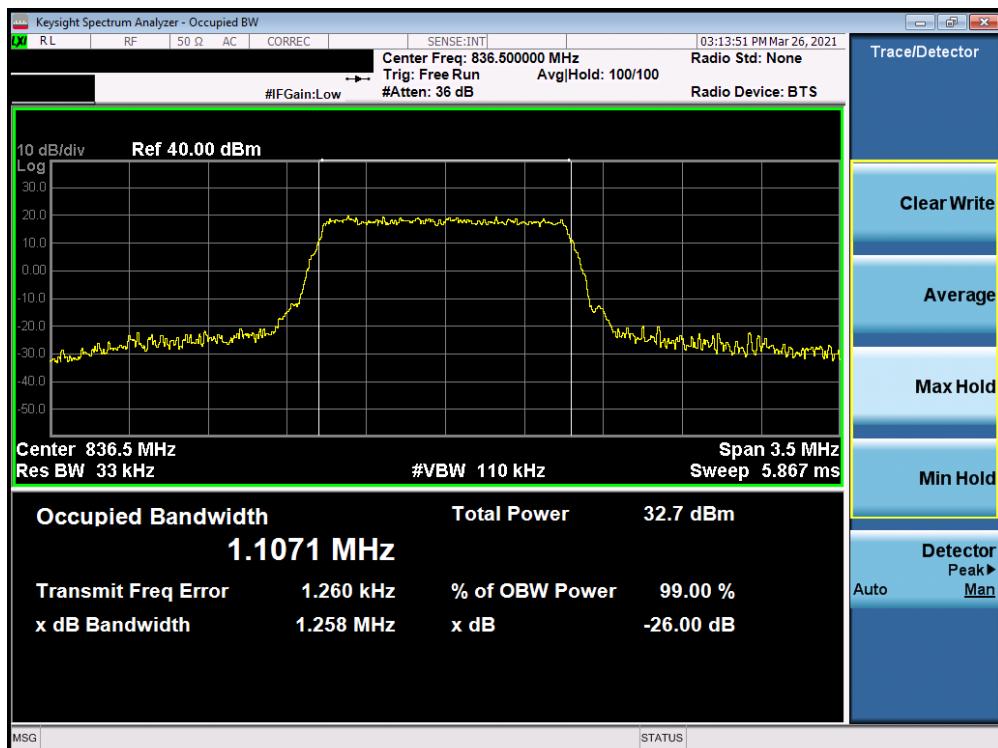
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## LTE Band 26/5



Plot 7-1. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz QPSK - Full RB Configuration)

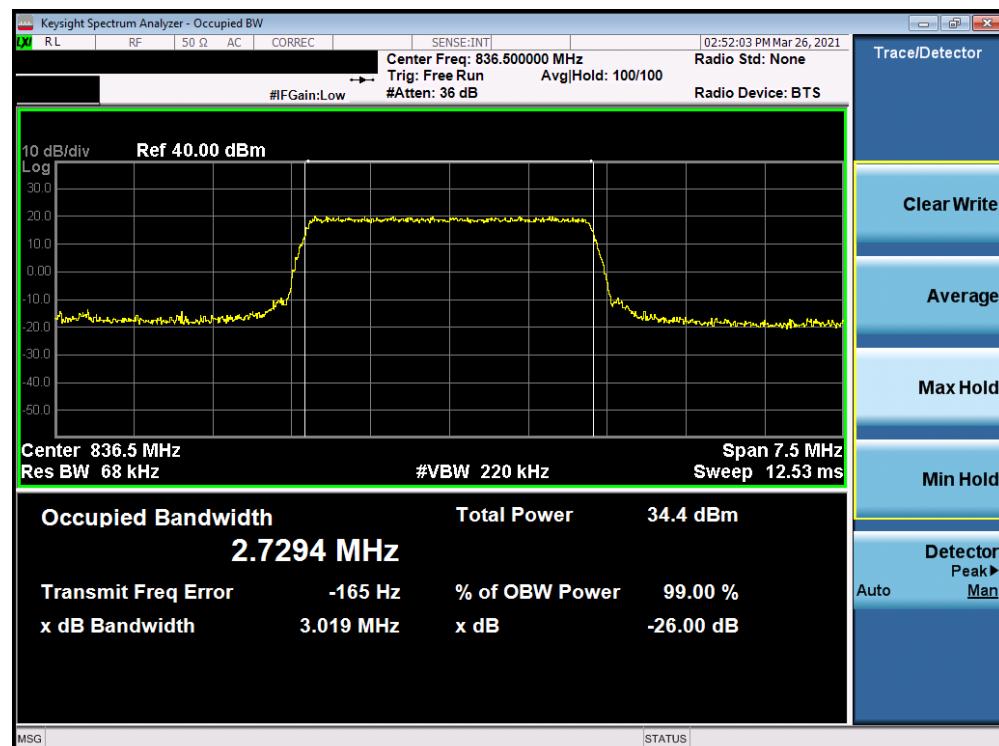


Plot 7-2. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2603	 <b>PCTEST</b> Proud to be part of 	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
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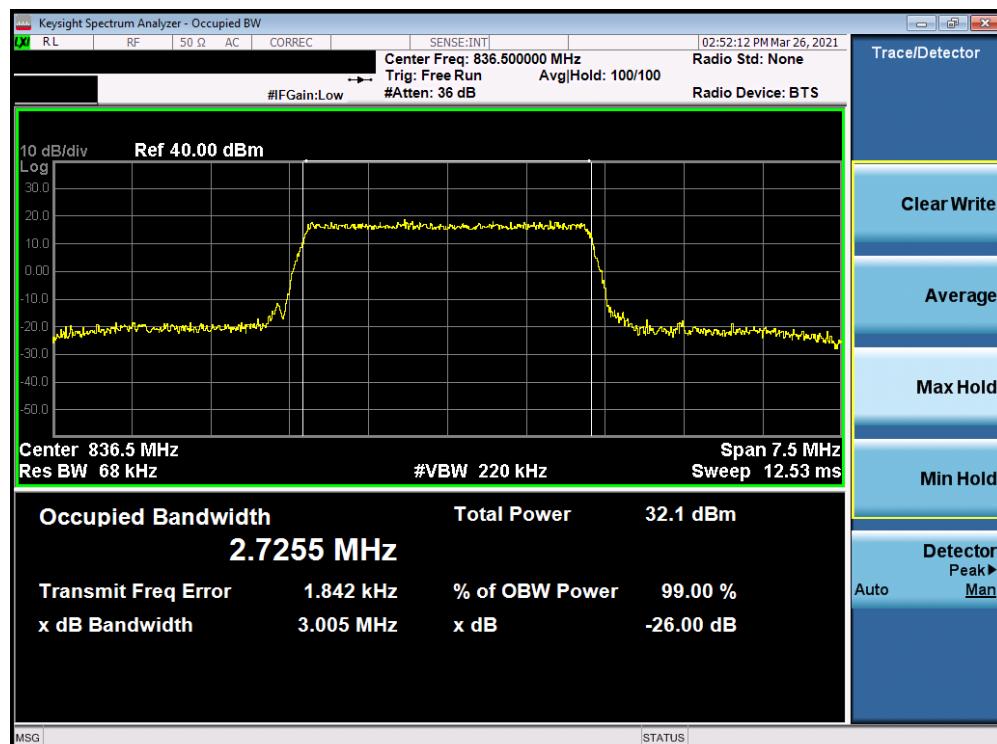


Plot 7-3. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 64-QAM - Full RB Configuration)

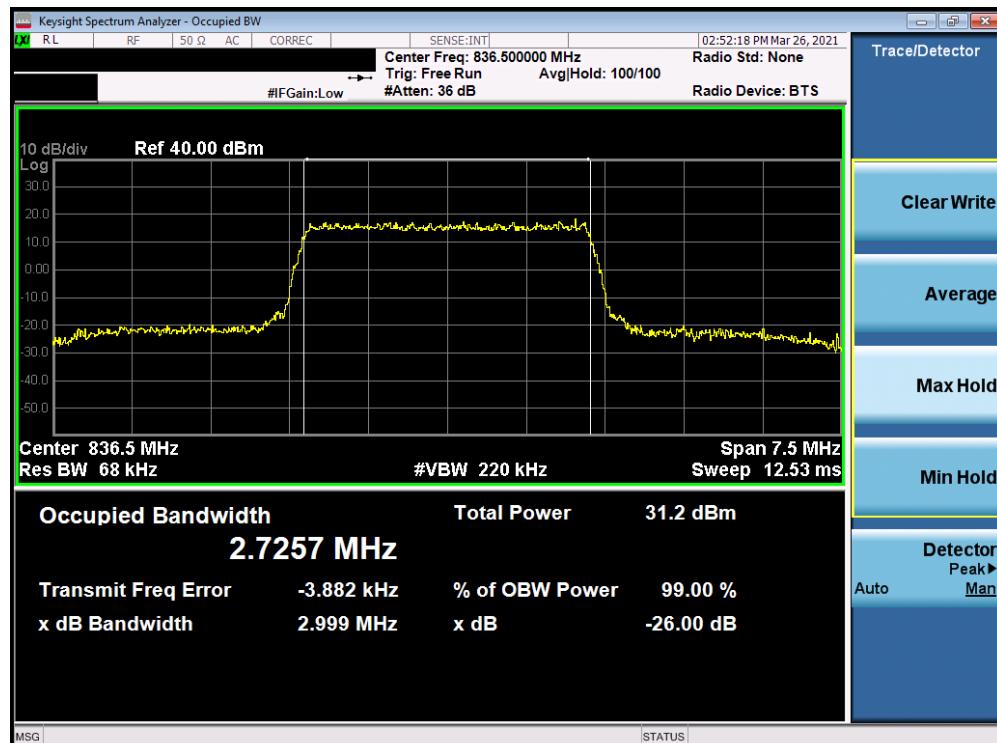


Plot 7-4. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz QPSK - Full RB Configuration)

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
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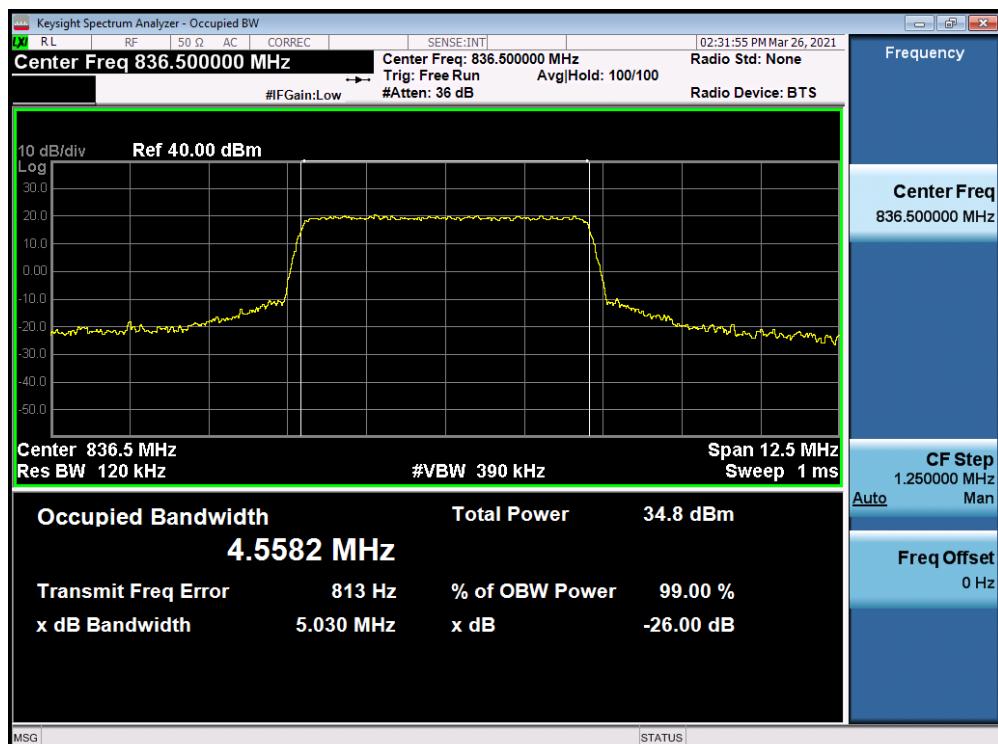


Plot 7-5. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 16-QAM - Full RB Configuration)

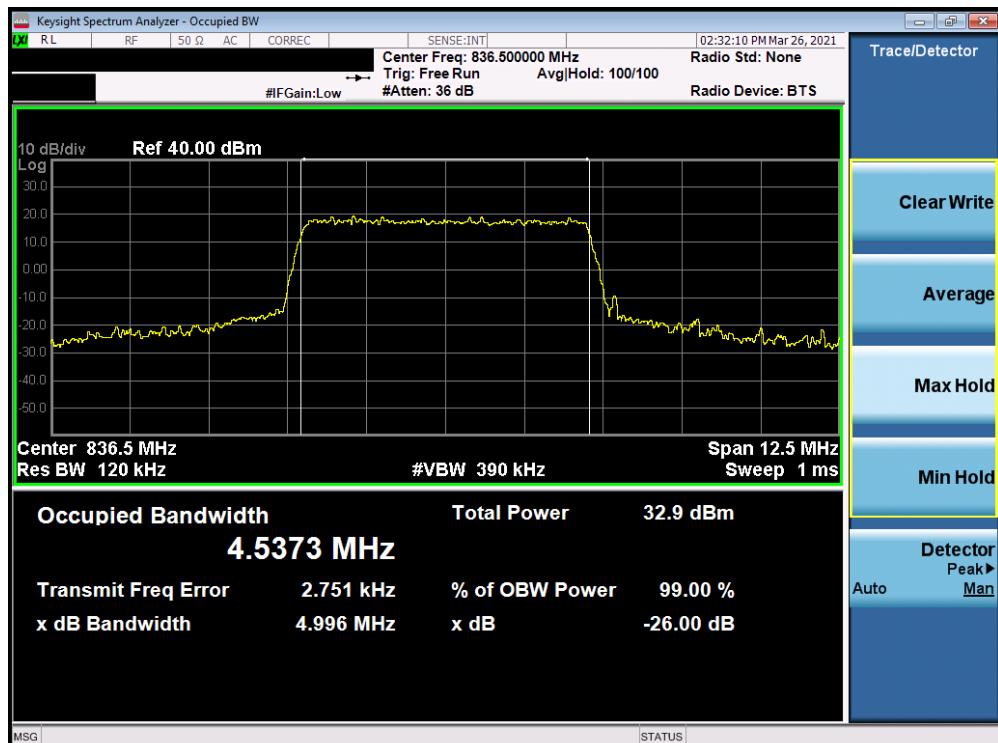


Plot 7-6. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
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Plot 7-7. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz QPSK - Full RB Configuration)

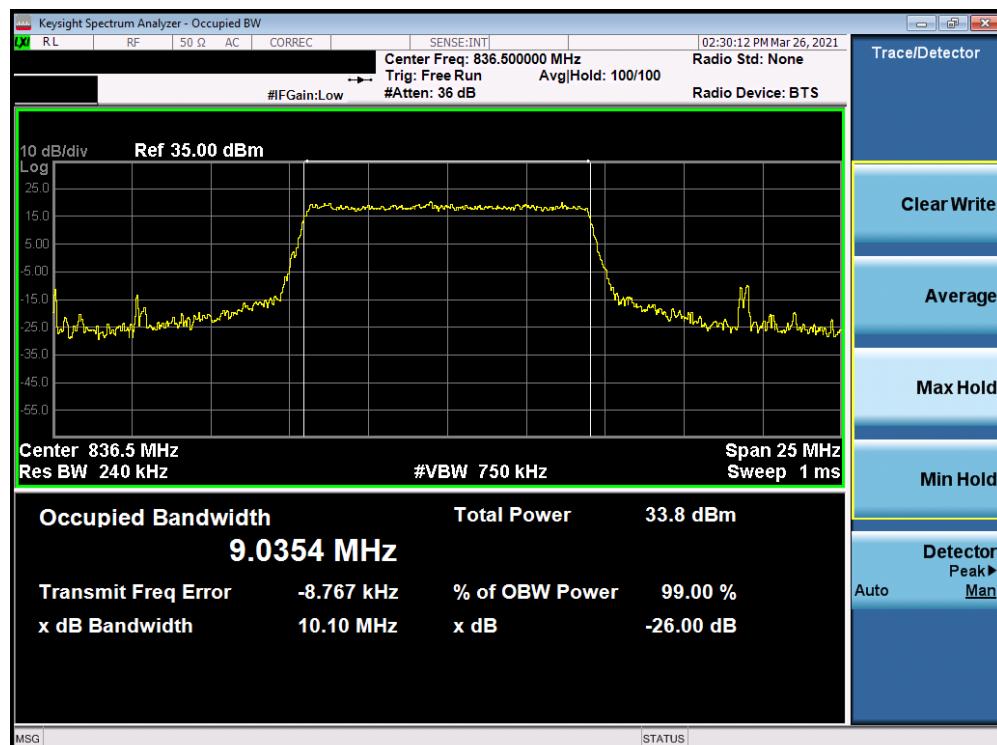


Plot 7-8. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 16-QAM - Full RB Configuration)

FCC ID: BCGA2603	 <b>PCTEST</b> Proud to be part of 		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
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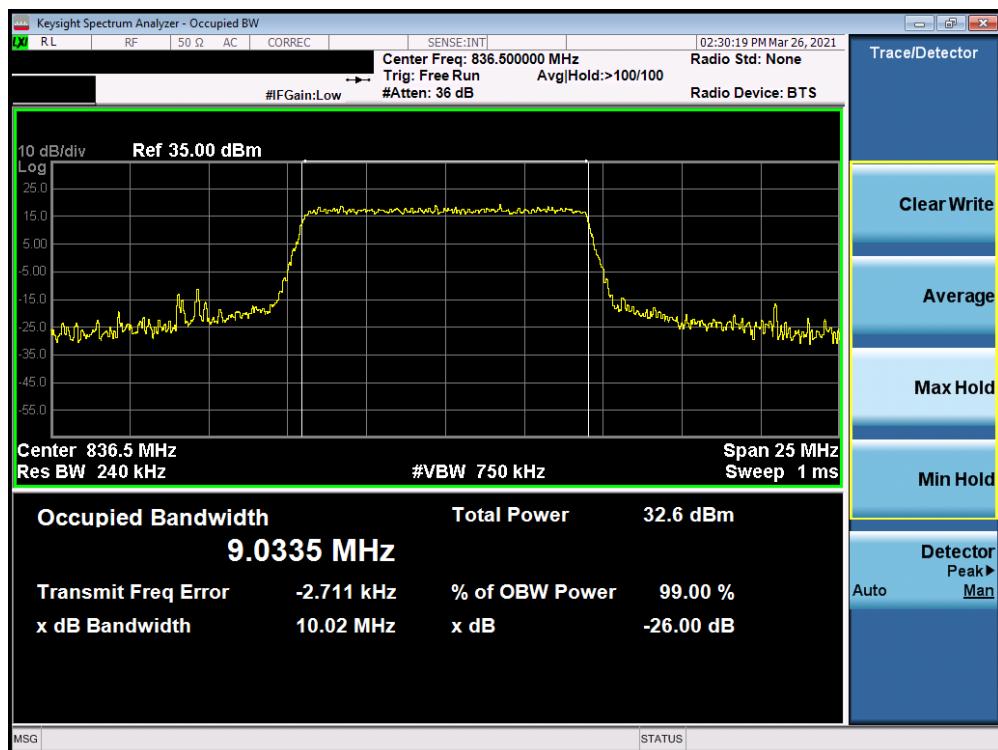


Plot 7-9. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 64-QAM - Full RB Configuration)

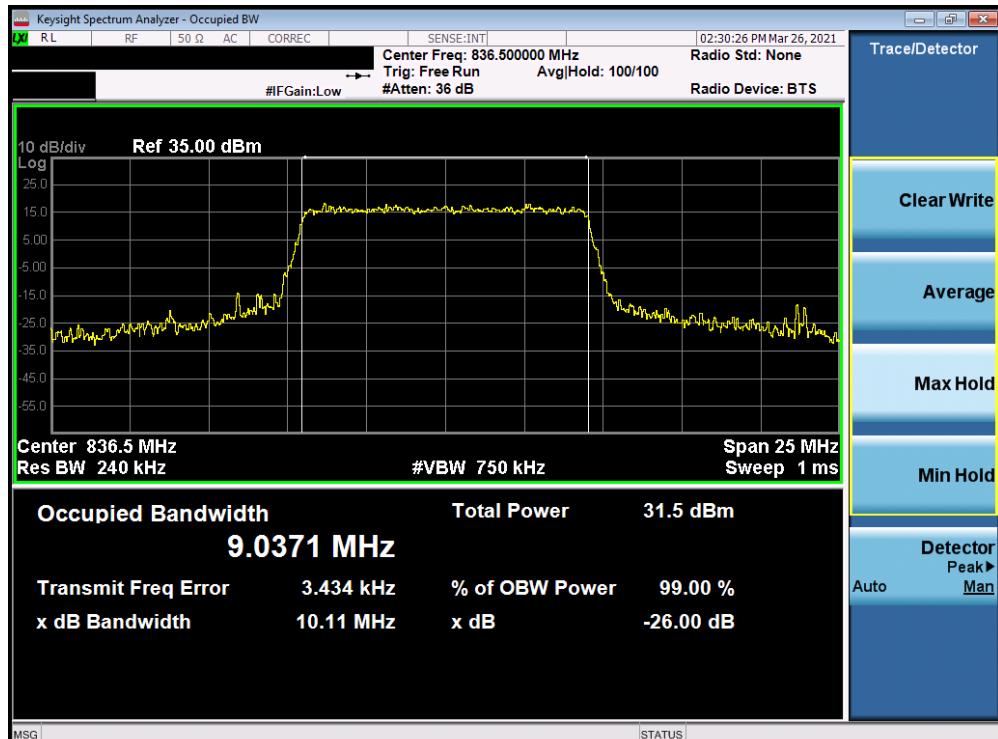


Plot 7-10. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz QPSK - Full RB Configuration)

FCC ID: BCGA2603	<b>PCTEST</b> Proud to be part of Element	PART 22 MEASUREMENT REPORT		Approved by: Quality Manager
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Plot 7-11. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 16-QAM - Full RB Configuration)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 64-QAM - Full RB Configuration)

FCC ID: BCGA2603	<b>PCTEST</b> Proud to be part of Element	PART 22 MEASUREMENT REPORT		Approved by: Quality Manager
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## WCDMA Cell



Plot 7-13. Occupied Bandwidth Plot (WCDMA, Ch. 4183)

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## 7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051, 22.917(a)

### 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.

***The minimum permissible attenuation level of any spurious emission is  $43 + 10 \log_{10}(P_{[Watts]})$ , where P is the transmitter power in Watts.***

### Test Procedure Used

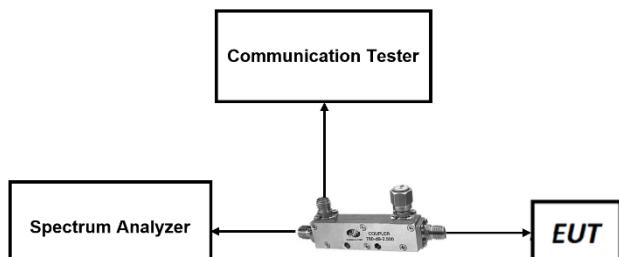
KDB 971168 D01 v03r01 – Section 6.0

### 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**

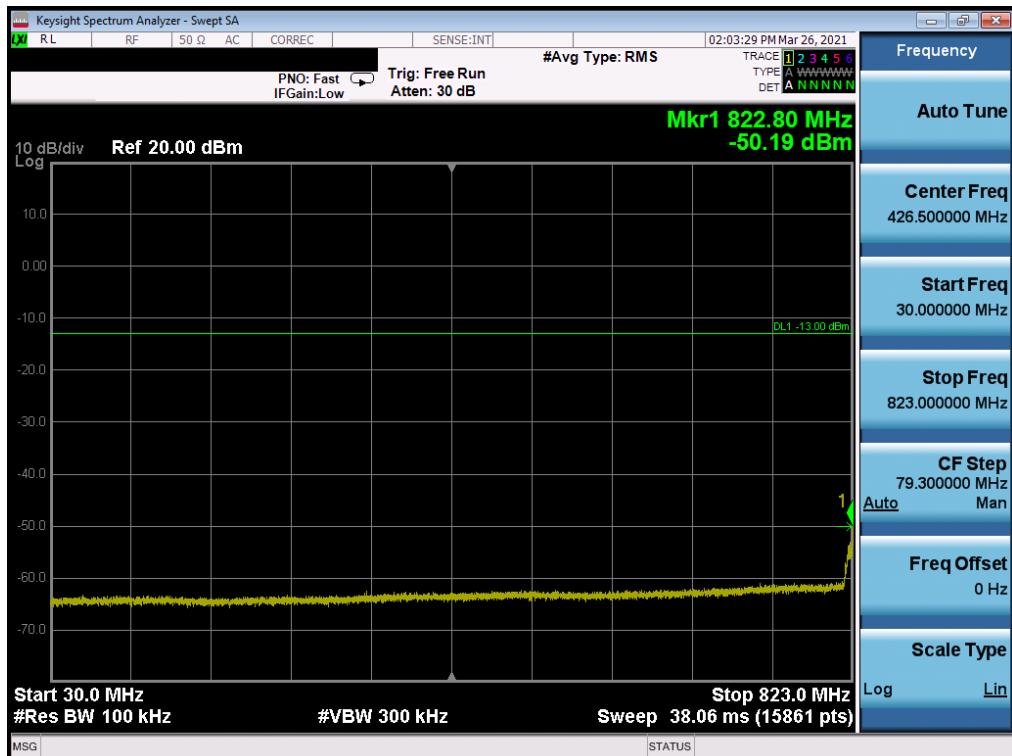
FCC ID: BCGA2603	 <b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 20 of 59

## Test Notes

1. Per Part 22, 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.

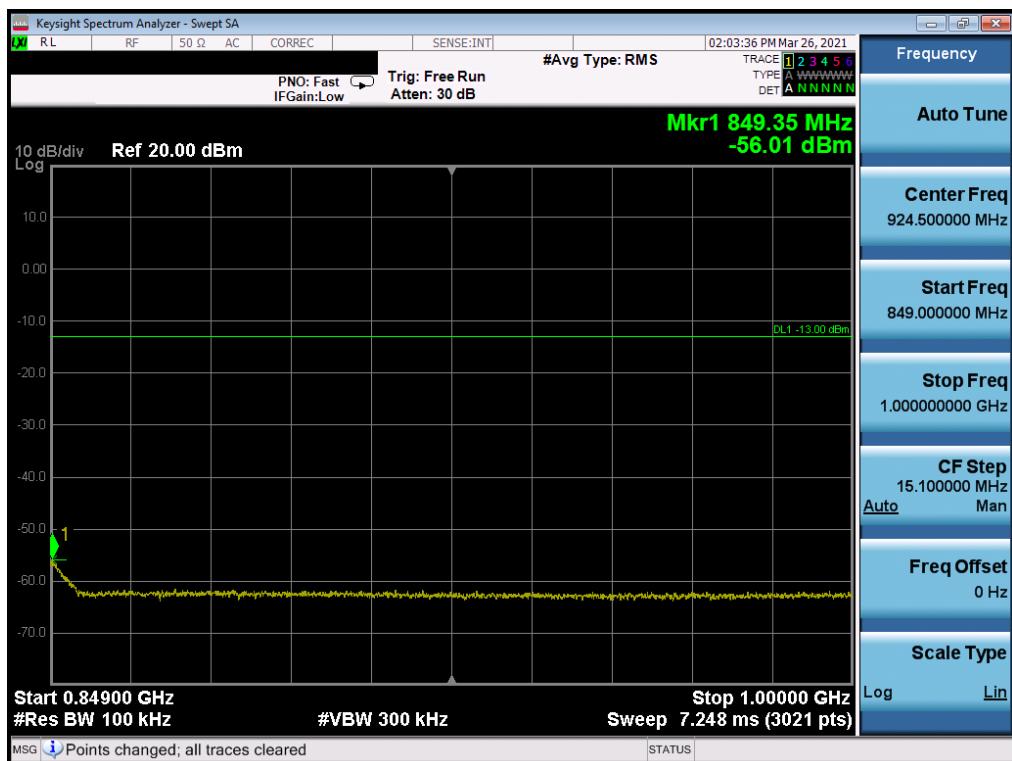
FCC ID: BCGA2603	 <b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 21 of 59

## LTE Band 26/5

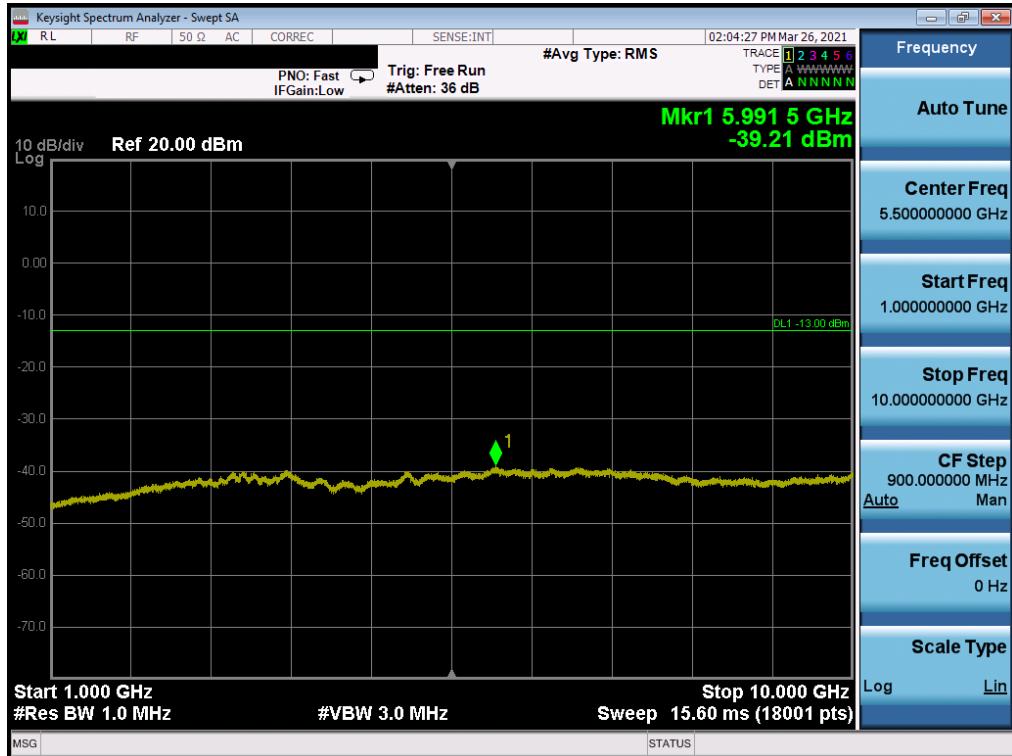


Plot 7-14. CSE (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCGA2603	 <b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 22 of 59

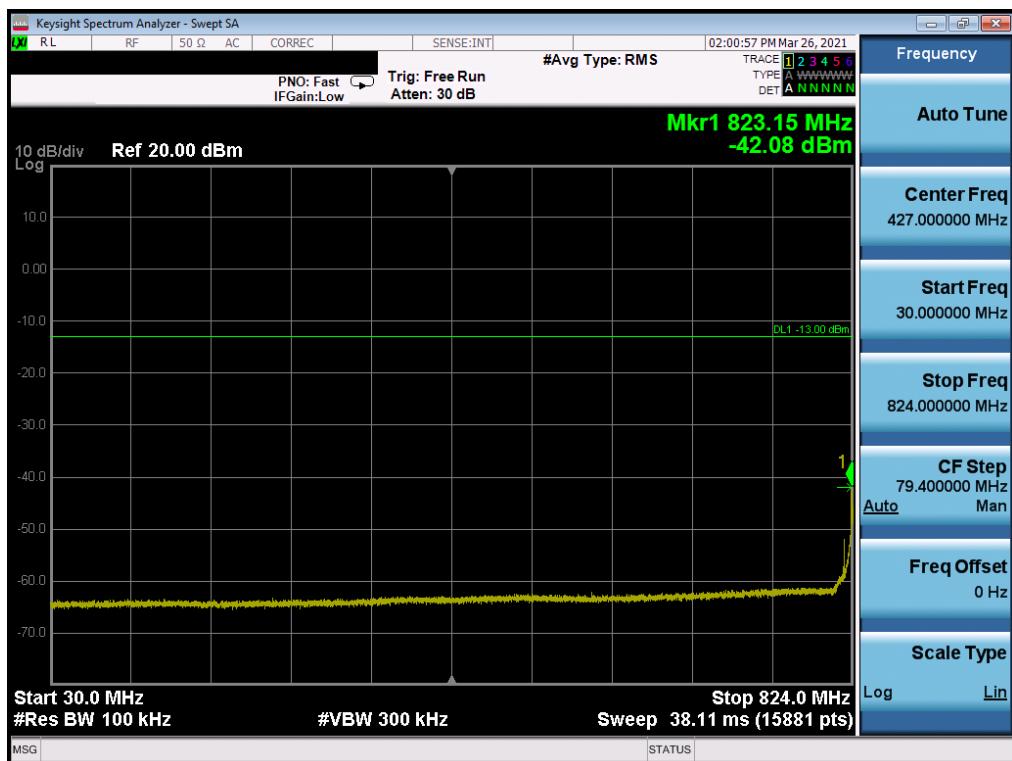


Plot 7-15. CSE (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

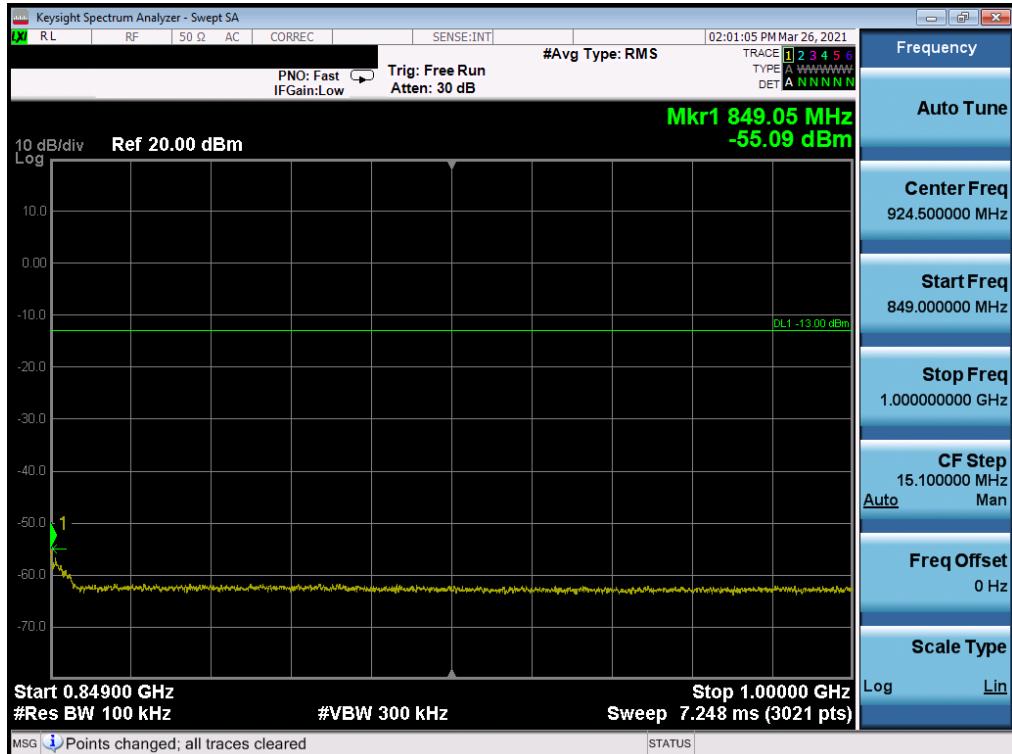


Plot 7-16. CSE (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 23 of 59

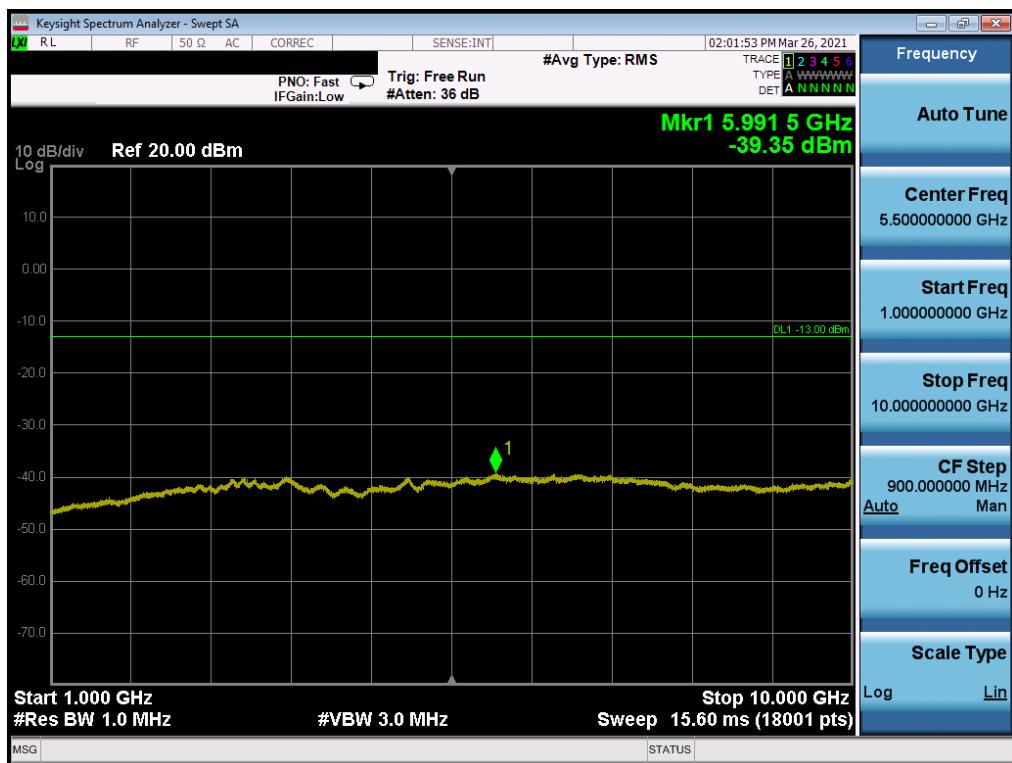


Plot 7-17. CSE (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

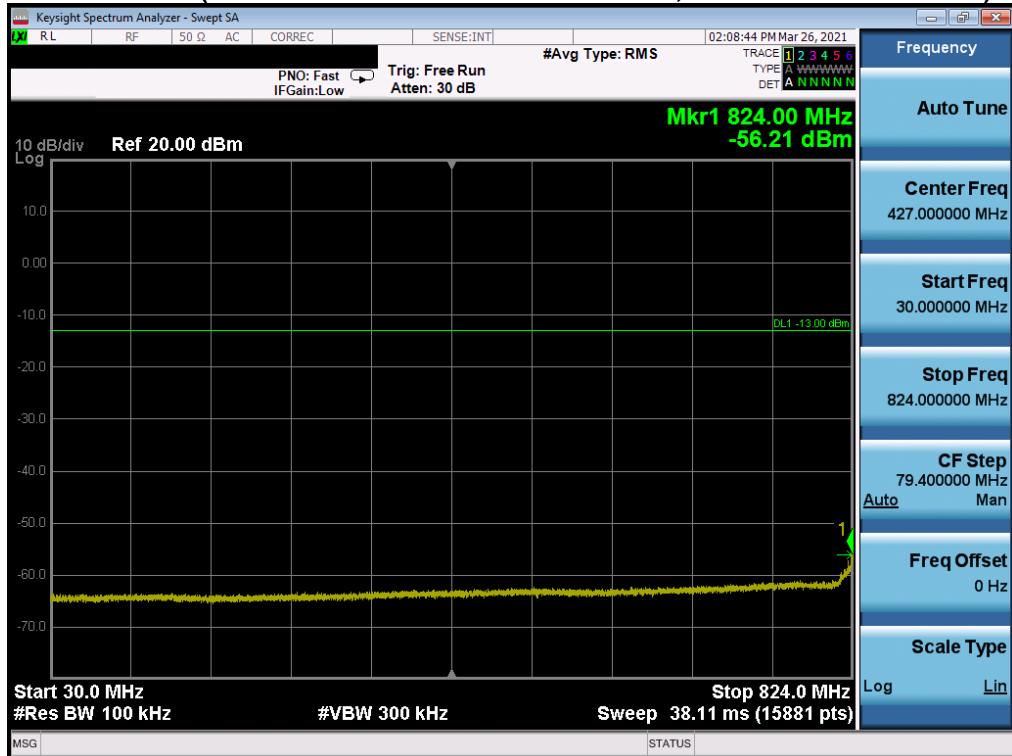


Plot 7-18. CSE (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCGA2603	PART 22 MEASUREMENT REPORT		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 24 of 59

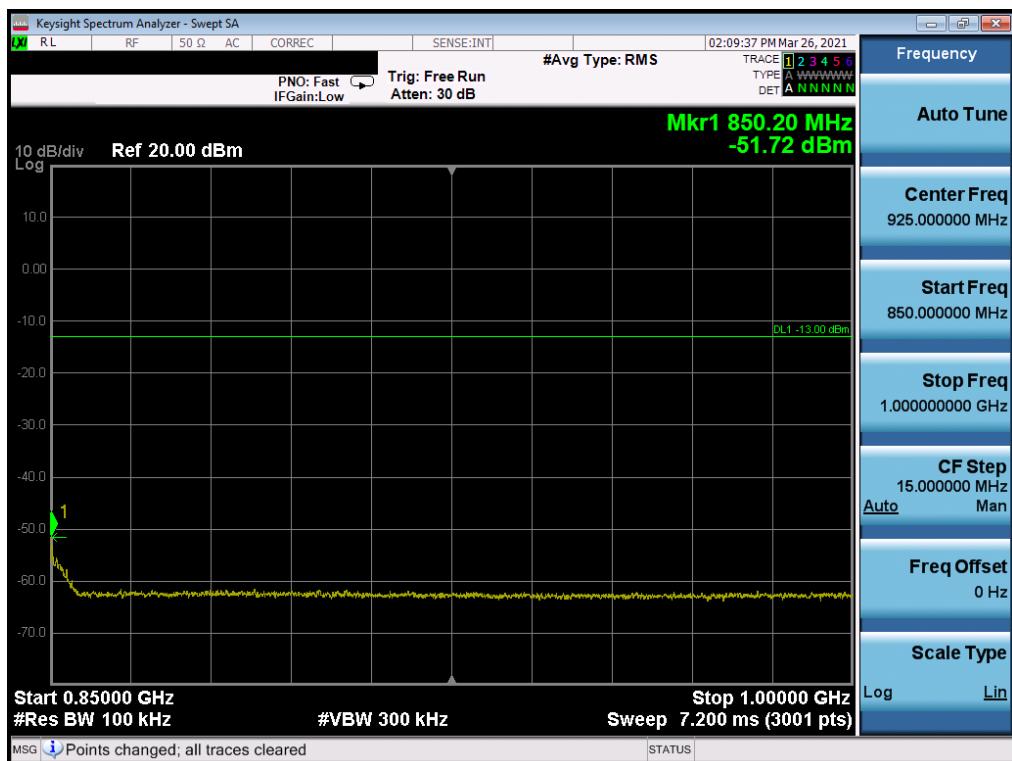


Plot 7-19. CSE (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

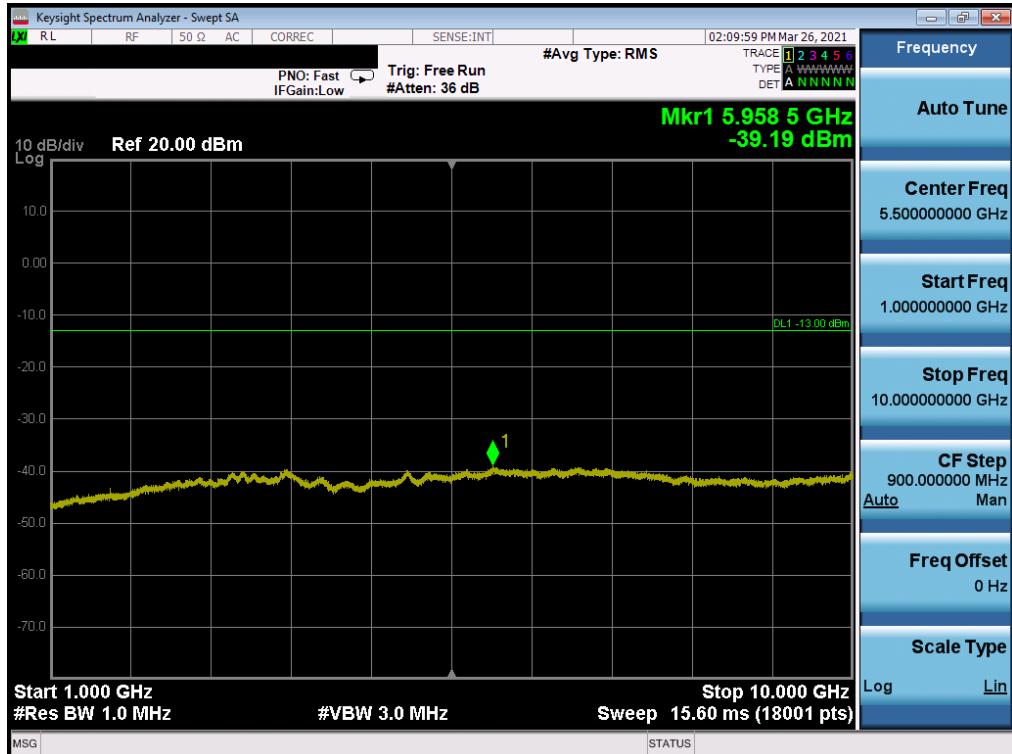


Plot 7-20. CSE (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCGA2603	<b>PCTEST</b> Proud to be part of Element		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 25 of 59	



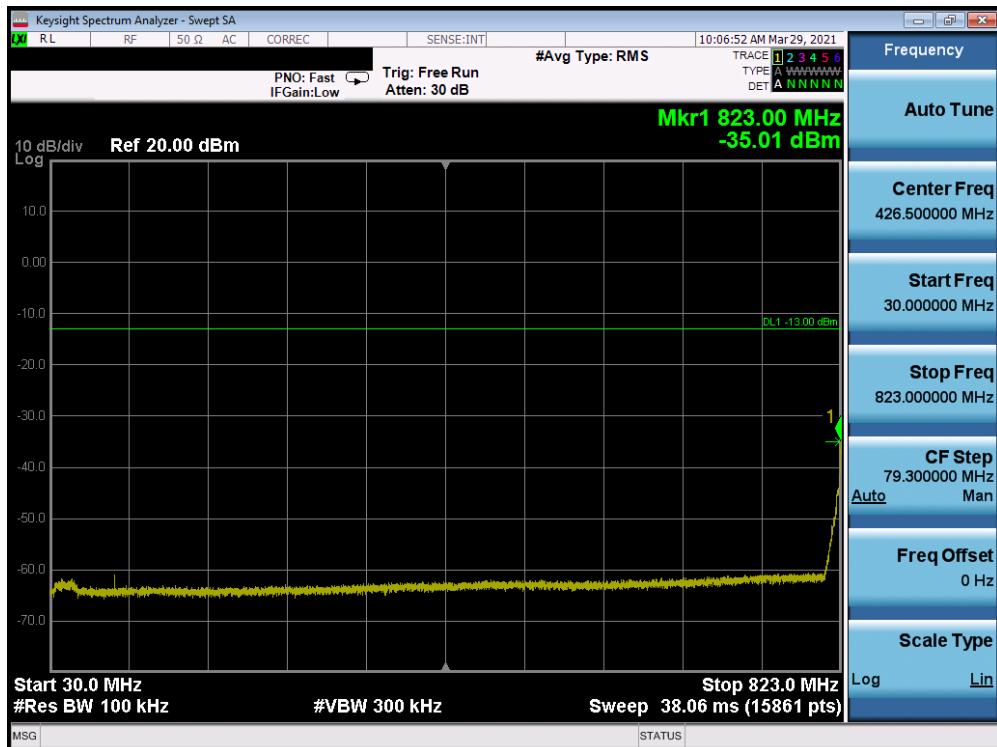
Plot 7-21. CSE (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



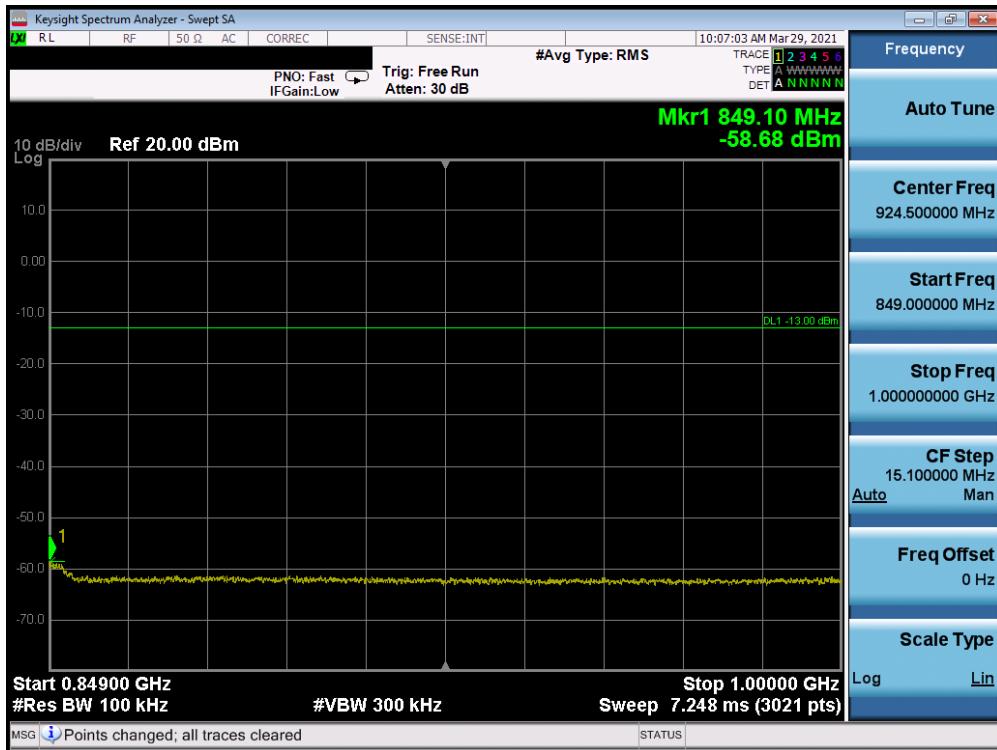
Plot 7-22. CSE (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCGA2603	<b>PCTEST</b> Proud to be part of 		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device		Page 26 of 59

## WCDMA Cell

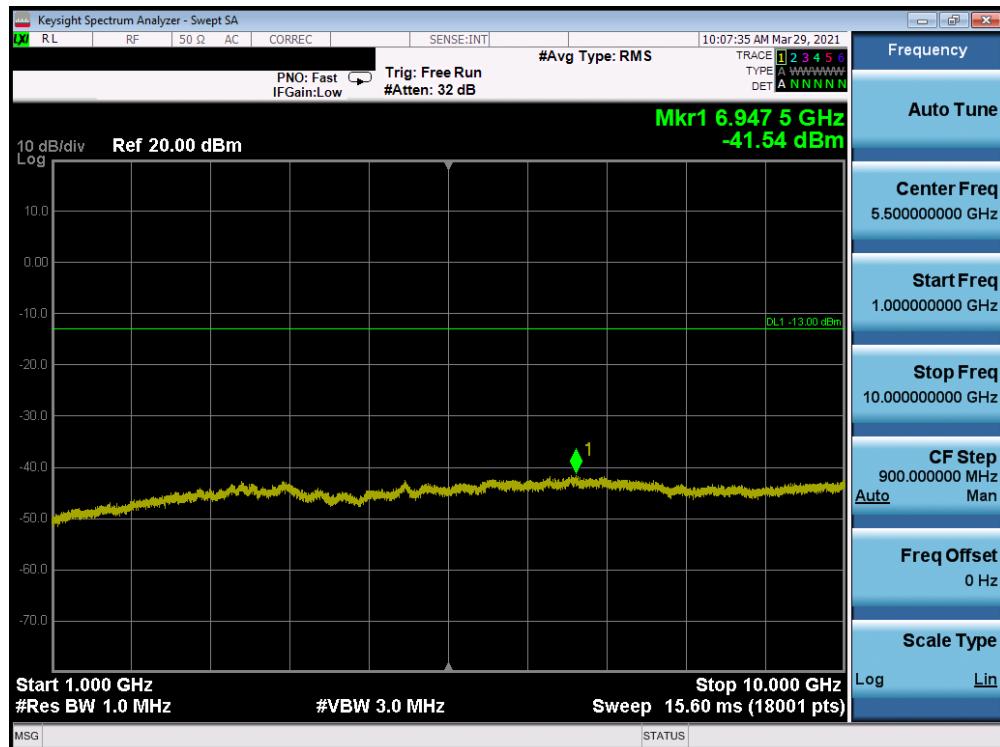


Plot 7-23. CSE (WCDMA Ch. 4132)

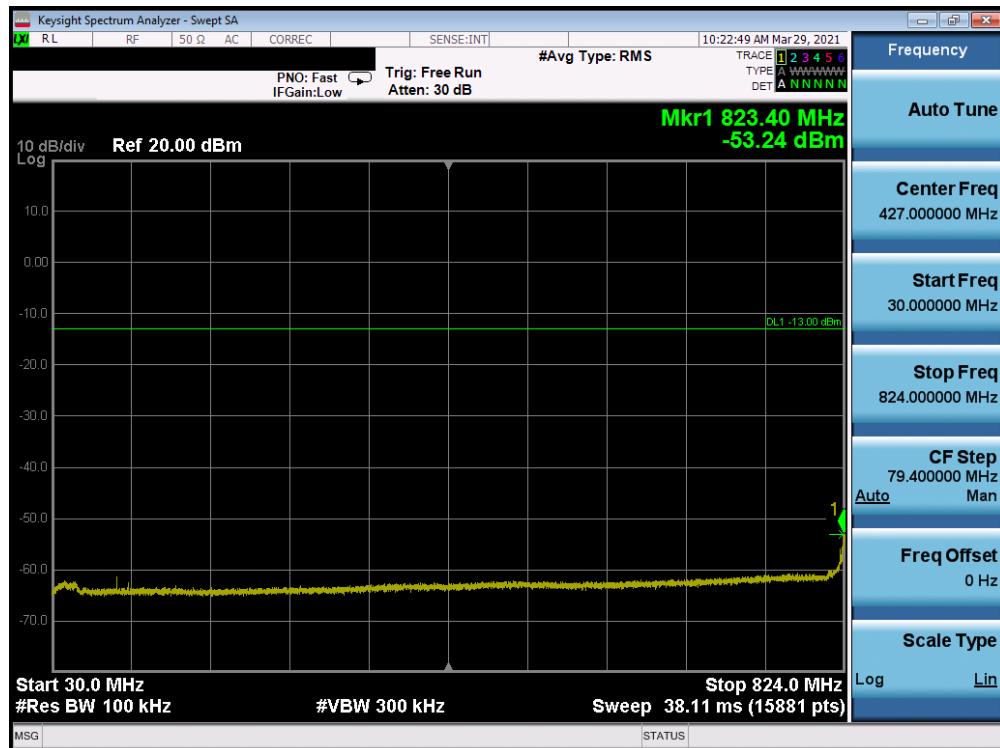


Plot 7-24. CSE (WCDMA Ch. 4132)

FCC ID: BCGA2603	<b>PCTEST®</b> <small>Proud to be part of Element</small>		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device		Page 27 of 59

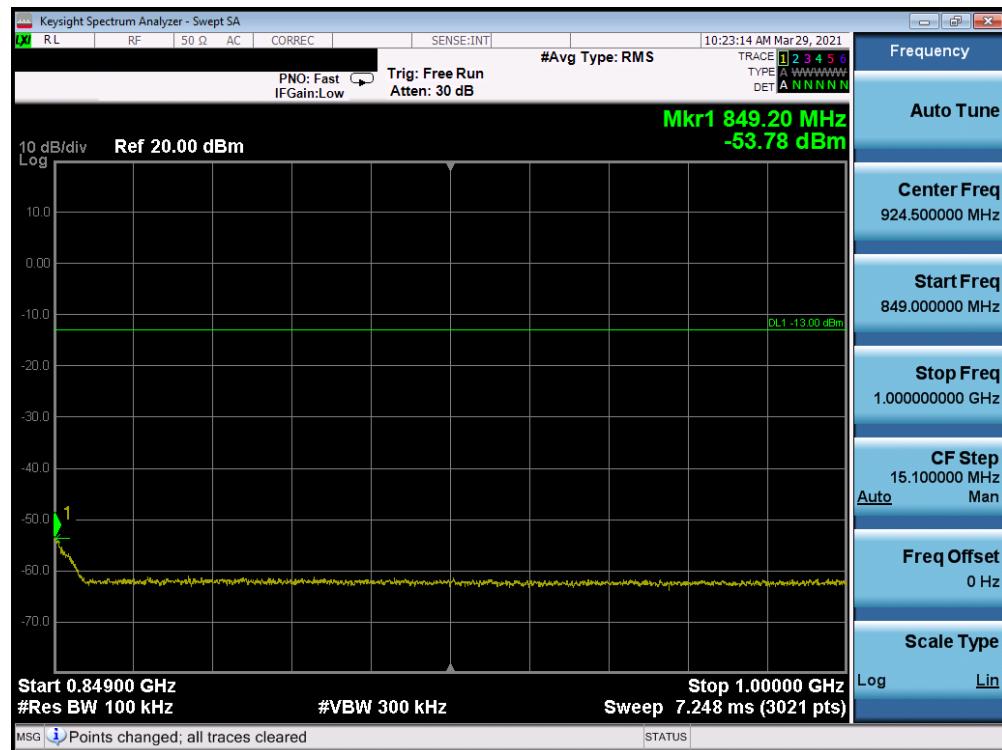


Plot 7-25. CSE (WCDMA Ch. 4132)

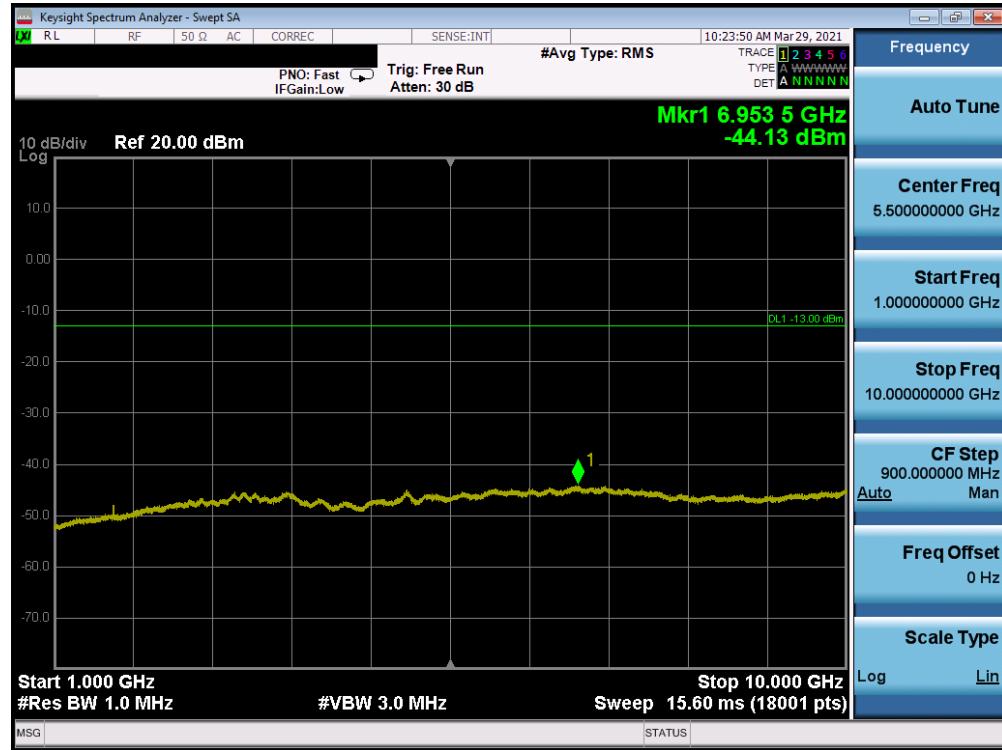


Plot 7-26. CSE (WCDMA Ch. 4183)

FCC ID: BCGA2603	<b>PCTEST</b> Proud to be part of 		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device		Page 28 of 59

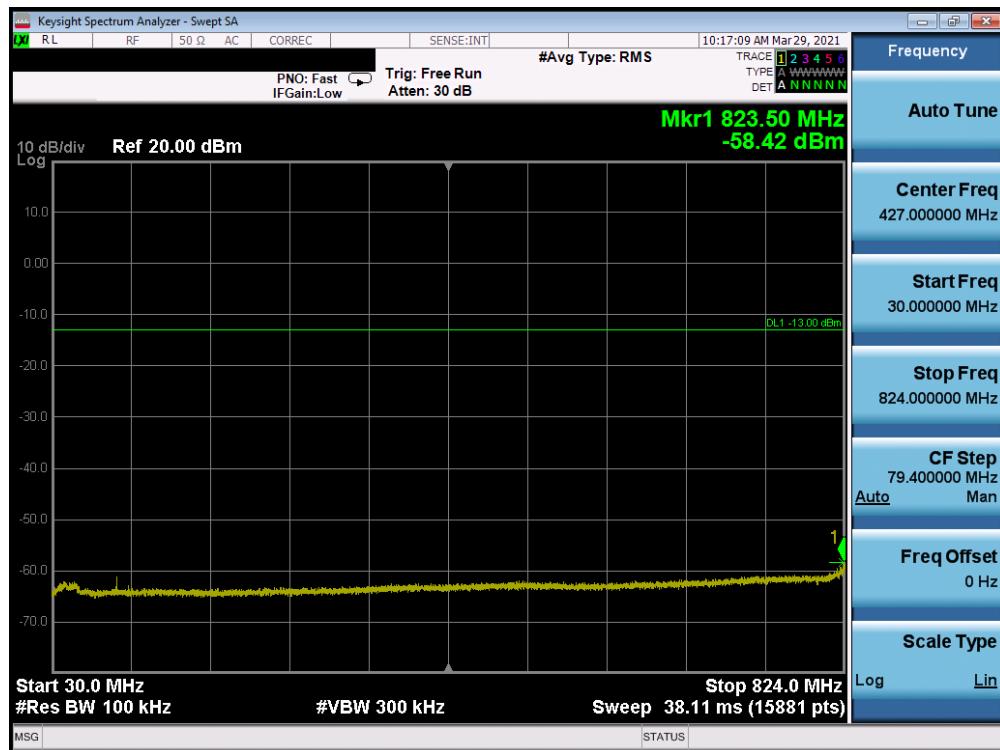


Plot 7-27. CSE (WCDMA Ch. 4183)

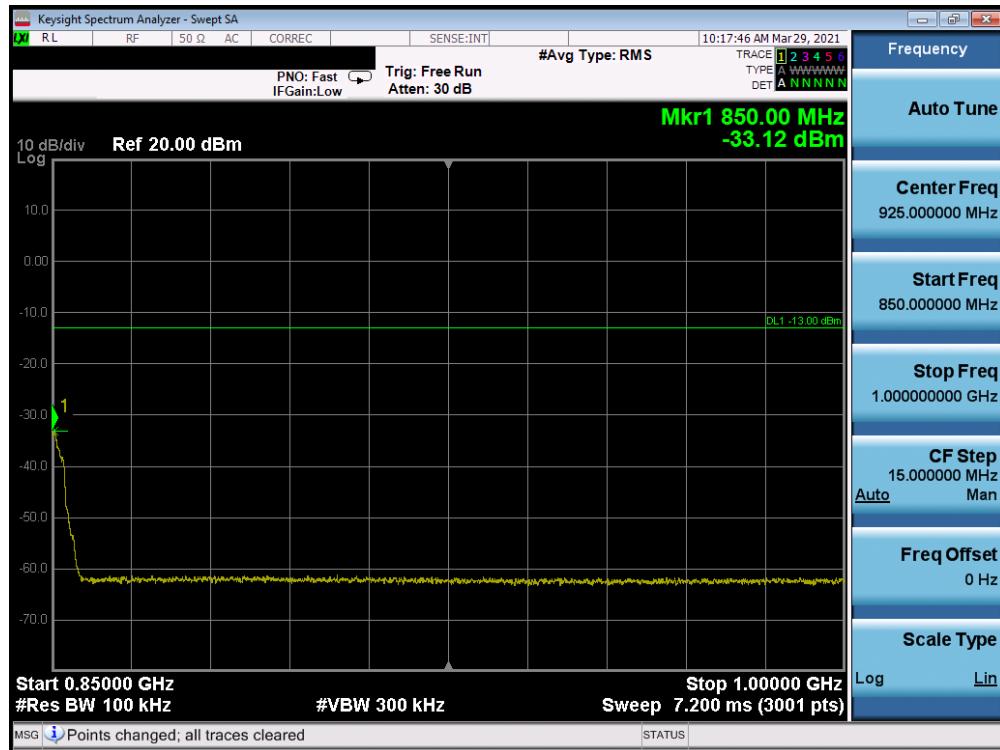


Plot 7-28. CSE (WCDMA Ch. 4183)

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 29 of 59

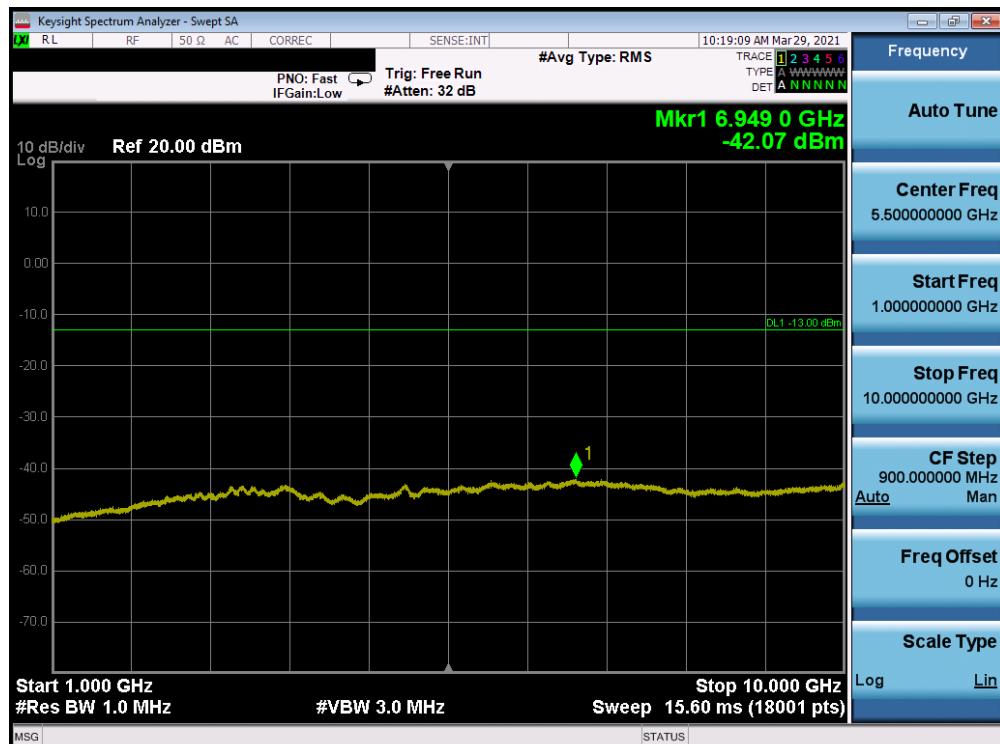


Plot 7-29. CSE (WCDMA Ch. 4233)



Plot 7-30. CSE (WCDMA Ch. 4233)

FCC ID: BCGA2603	 <b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 30 of 59



Plot 7-31. CSE (WCDMA Ch. 4233)

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 31 of 59

## 7.4 Band Edge Emissions at Antenna Terminal

§2.1051, 22.917(a)

### 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 of any spurious emission is  $43 + 10 \log_{10}(P_{\text{Watts}})$ , where P is the transmitter power in Watts.***

### Test Procedure Used

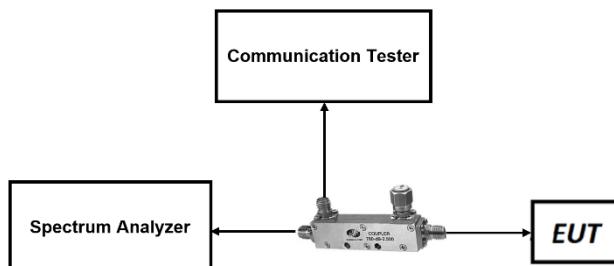
KDB 971168 D01 v03r01 – Section 6.0

### 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 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq$  2 x 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**

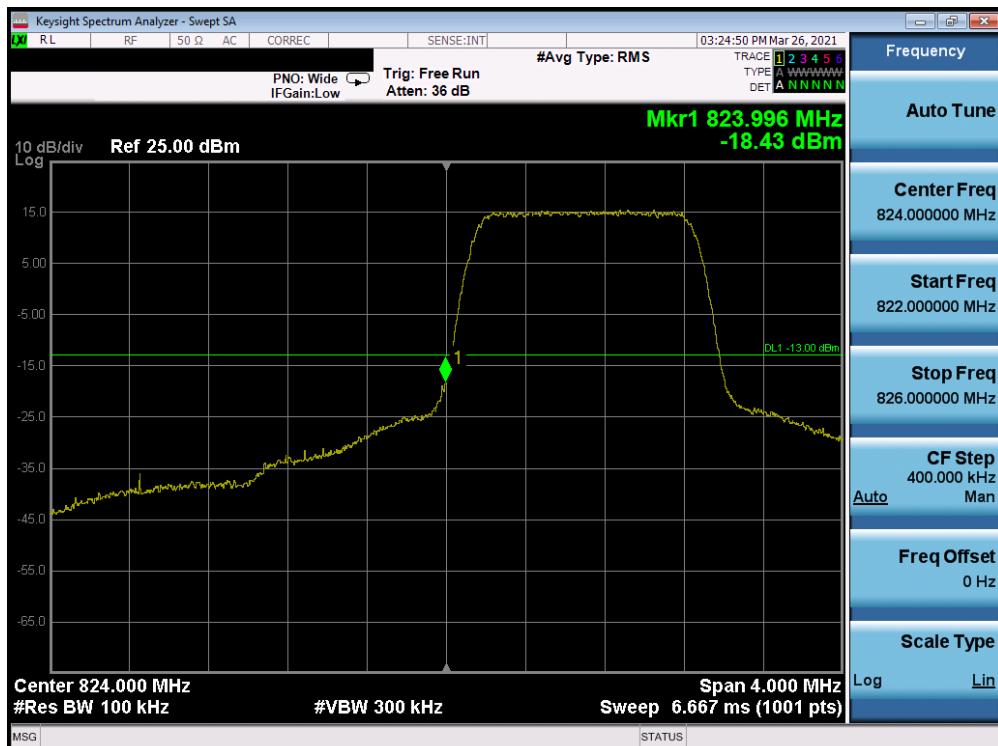
FCC ID: BCGA2603	 <b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 32 of 59

## Test Notes

1. Per 22.917(b), 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.

FCC ID: BCGA2603	 <b>PCTEST</b> Proud to be part of  element		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device		Page 33 of 59

## LTE Band 26

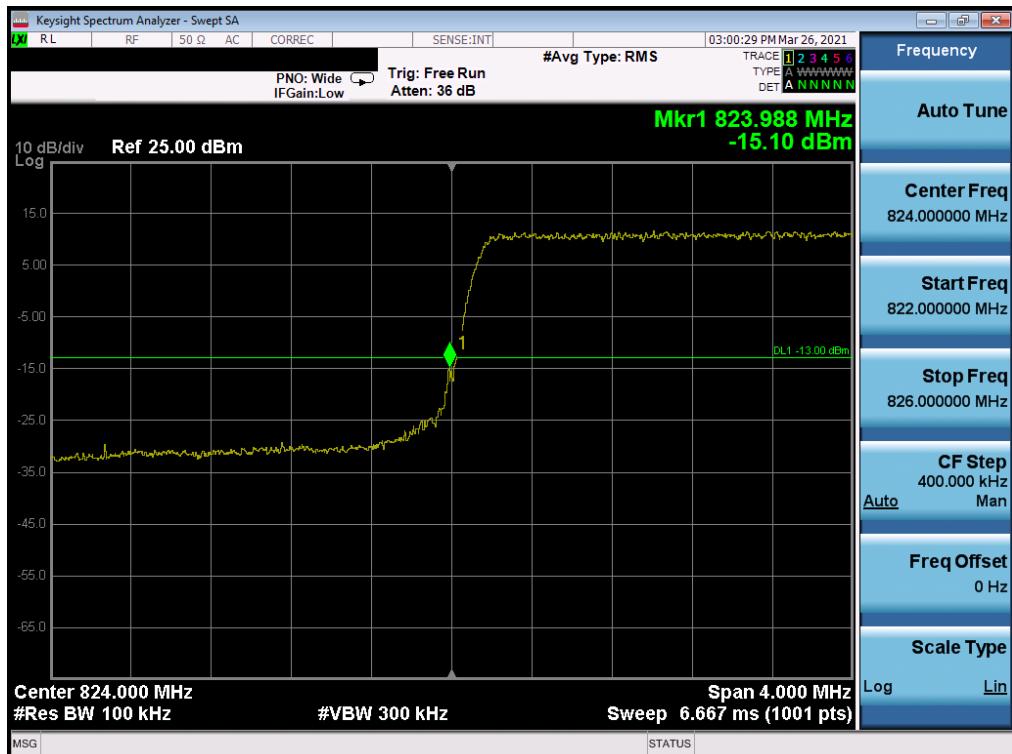


Plot 7-32. Lower Band Edge Plot (LTE Band 26 – 1.4MHz QPSK – Full RB Configuration)

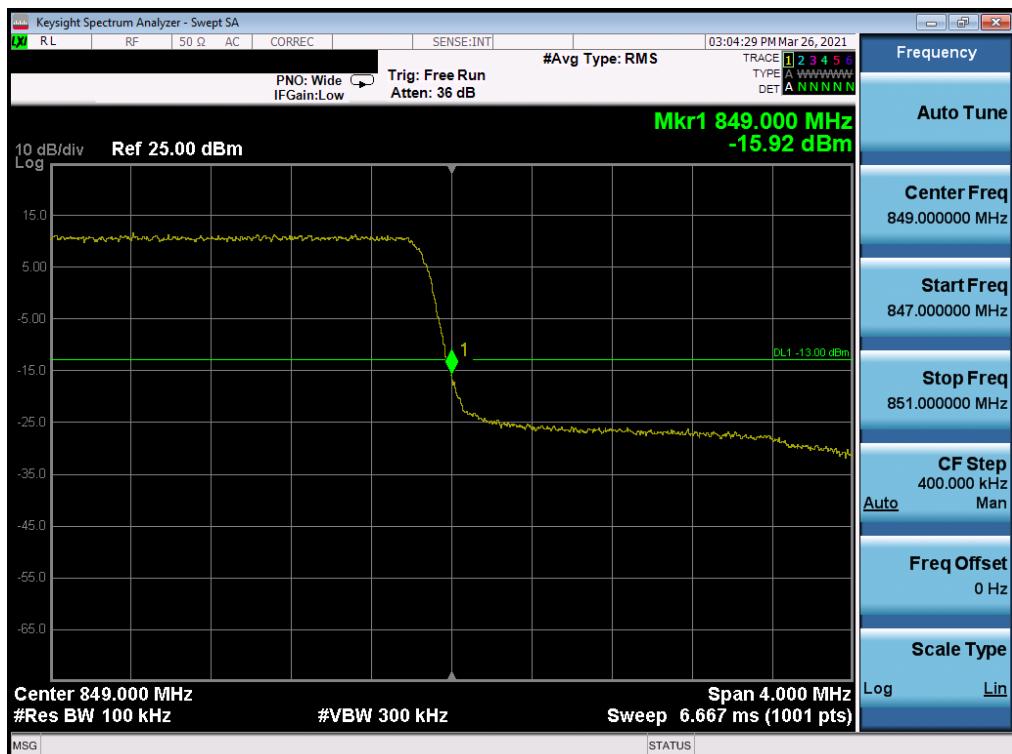


Plot 7-33. Upper Band Edge Plot (LTE Band 26 – 1.4MHz QPSK – Full RB Configuration)

FCC ID: BCGA2603	PART 22 MEASUREMENT REPORT		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 34 of 59

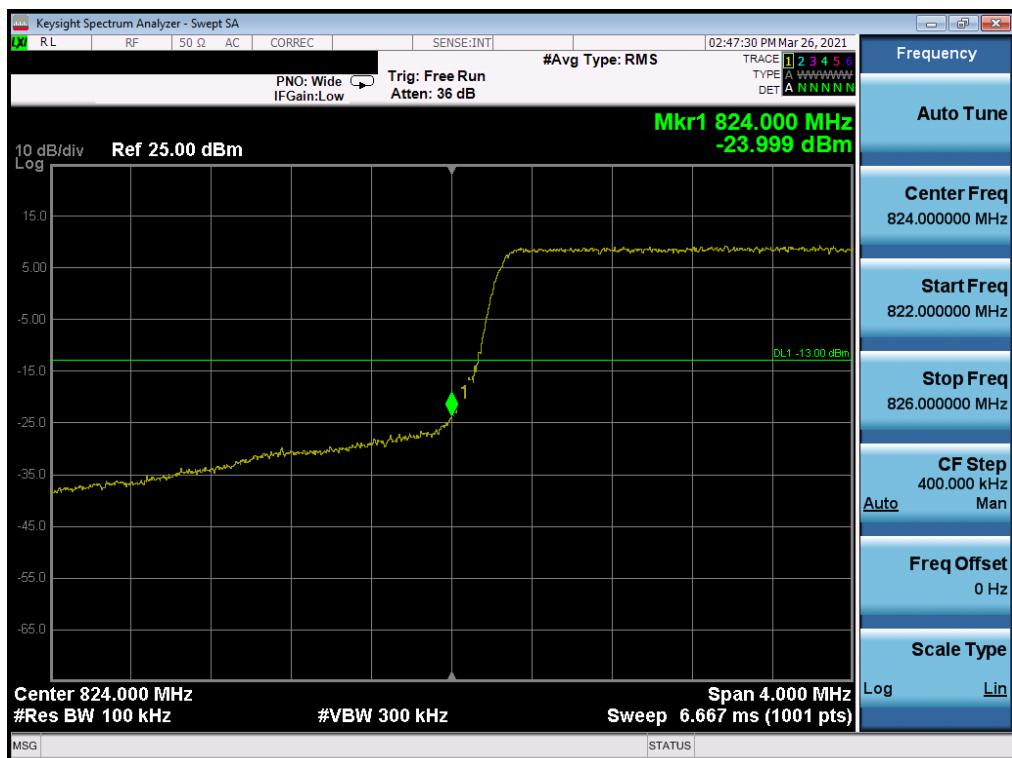


Plot 7-34. Lower Band Edge Plot (LTE Band 26 - 3MHz QPSK – Full RB Configuration)



Plot 7-35. Upper Band Edge Plot (LTE Band 26 - 3MHz QPSK – Full RB Configuration)

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 35 of 59

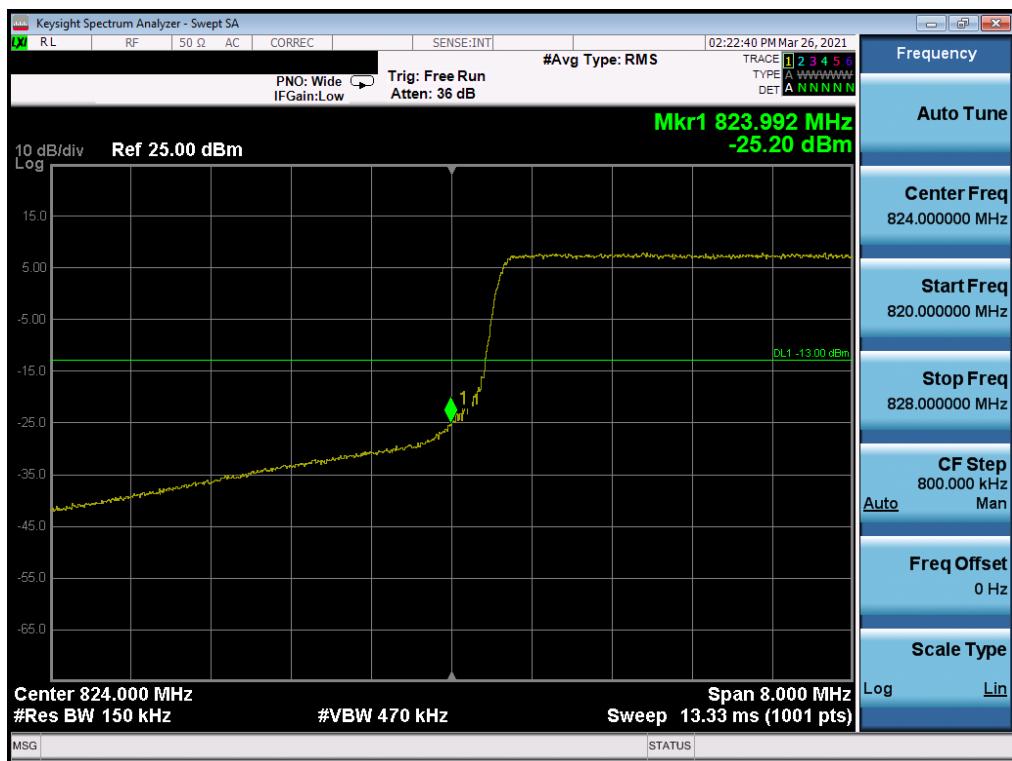


Plot 7-36. Lower Band Edge Plot (LTE Band 26 - 5MHz QPSK – Full RB Configuration)



Plot 7-37. Upper Band Edge Plot (LTE Band 26 - 5MHz QPSK – Full RB Configuration)

FCC ID: BCGA2603	<b>PCTEST</b> Proud to be part of 		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device		Page 36 of 59



Plot 7-38. Lower Band Edge Plot (LTE Band 26 - 10MHz QPSK – Full RB Configuration)



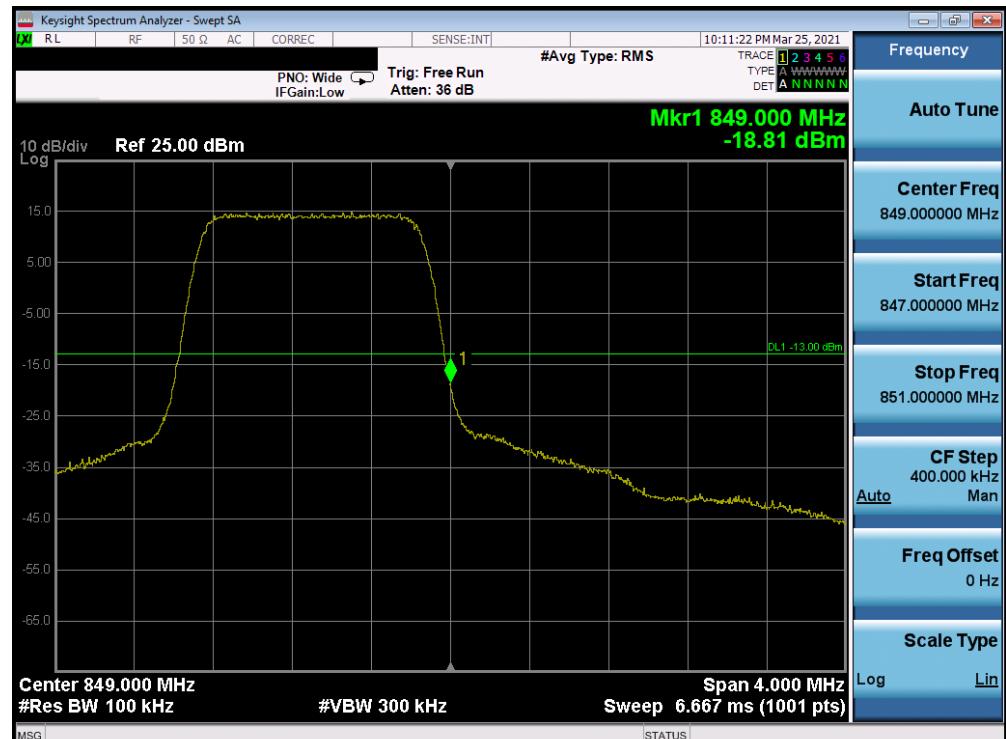
Plot 7-39. Upper Band Edge Plot (LTE Band 26 - 10MHz QPSK – Full RB Configuration)

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 37 of 59

## LTE Band 5

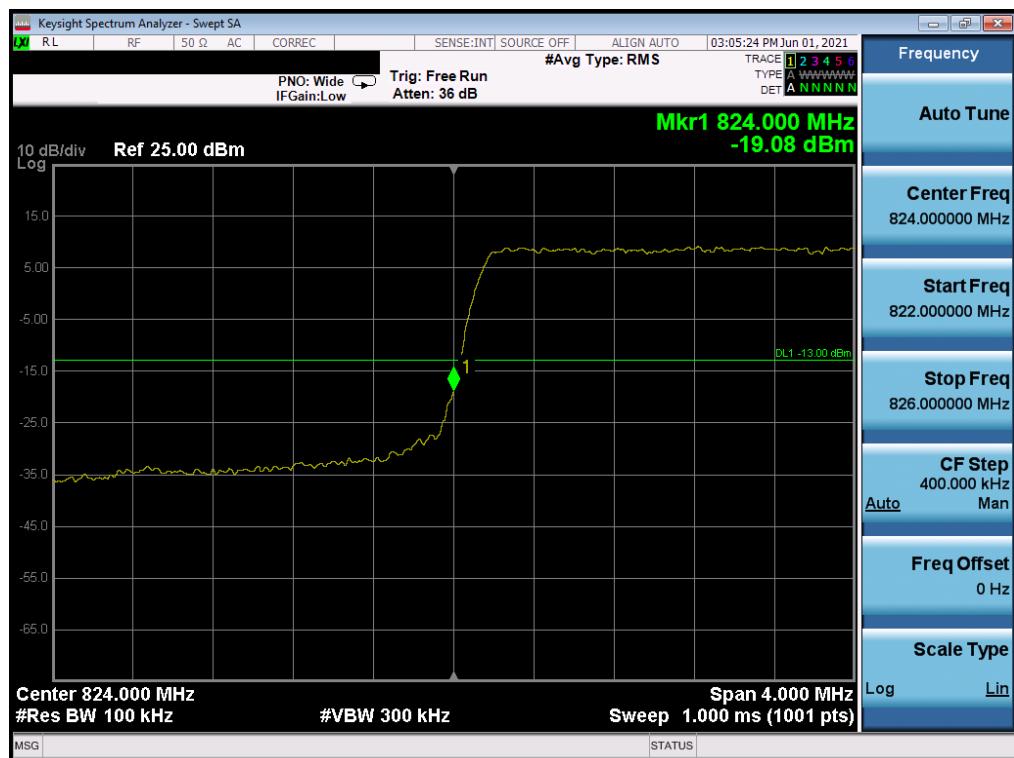


Plot 7-40. Lower Band Edge Plot (LTE Band 5 – 1.4MHz QPSK – Full RB Configuration)

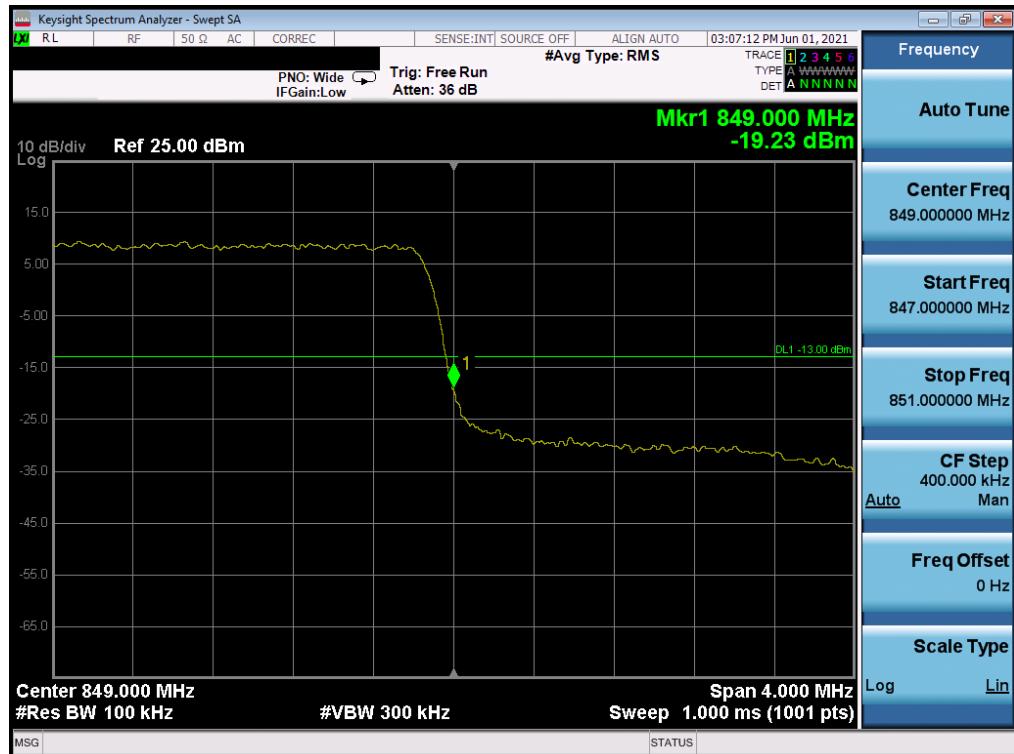


Plot 7-41. Upper Band Edge Plot (LTE Band 5 – 1.4MHz QPSK – Full RB Configuration)

FCC ID: BCGA2603	<b>PCTEST</b> Proud to be part of Element	PART 22 MEASUREMENT REPORT		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device		Page 38 of 59

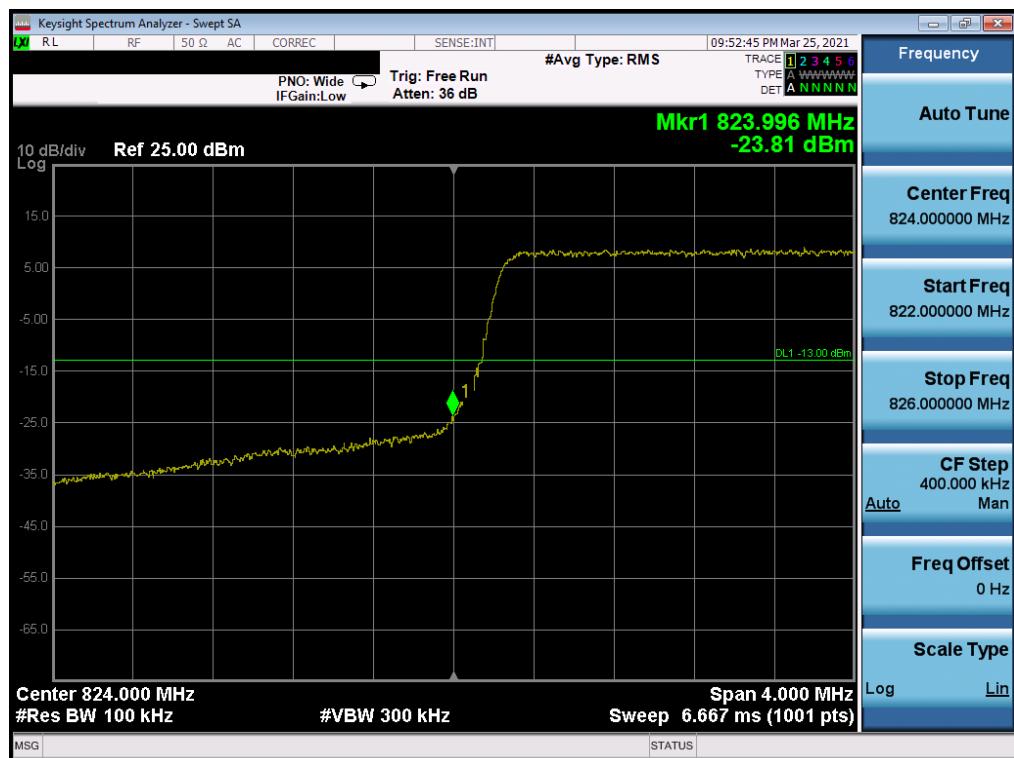


Plot 7-42. Lower Band Edge Plot (LTE Band 5 - 3MHz QPSK – Full RB Configuration)

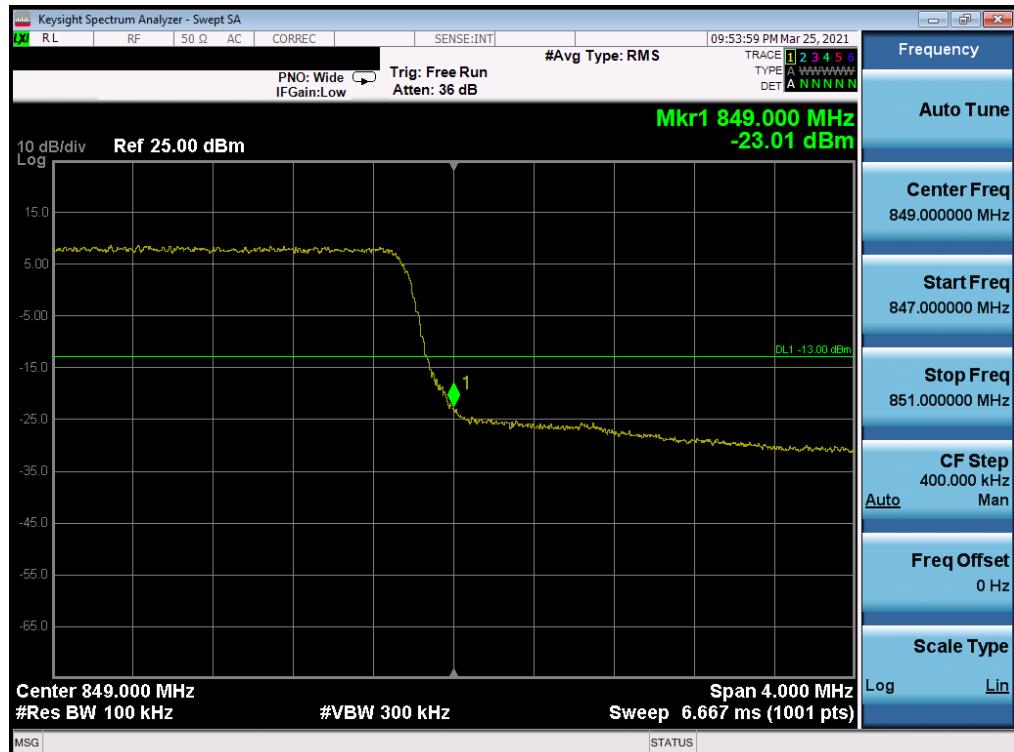


Plot 7-43. Upper Band Edge Plot (LTE Band 5 - 3MHz QPSK – Full RB Configuration)

FCC ID: BCGA2603	PART 22 MEASUREMENT REPORT		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 39 of 59

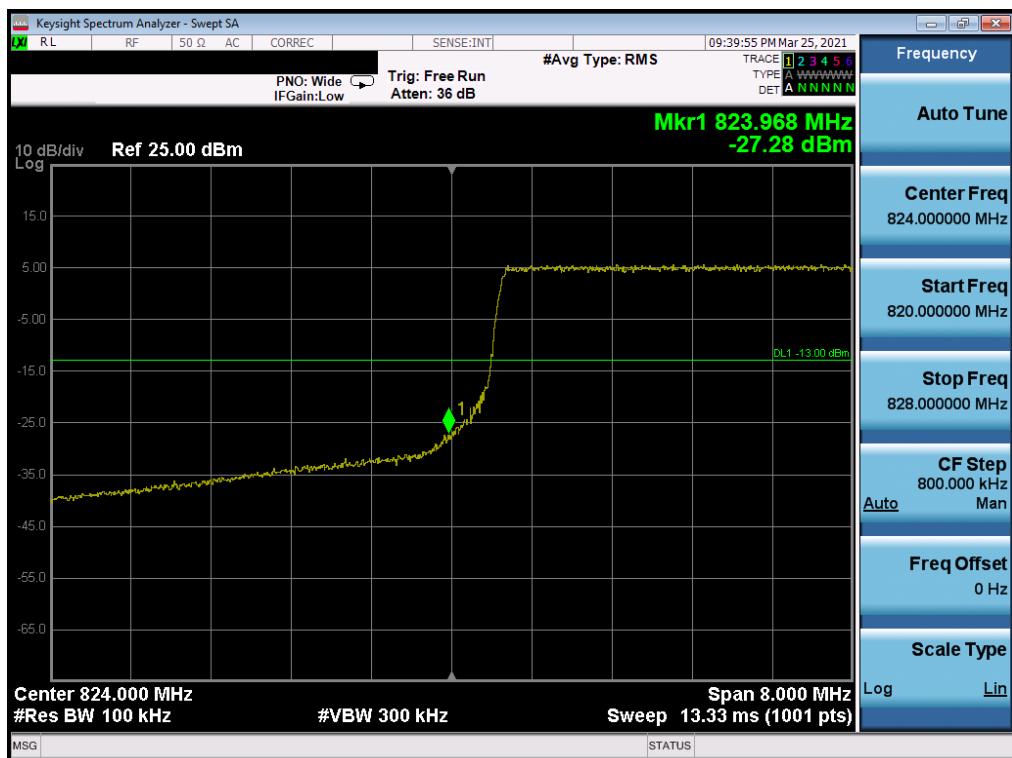


Plot 7-44. Lower Band Edge Plot (LTE Band 5 - 5MHz QPSK – Full RB Configuration)

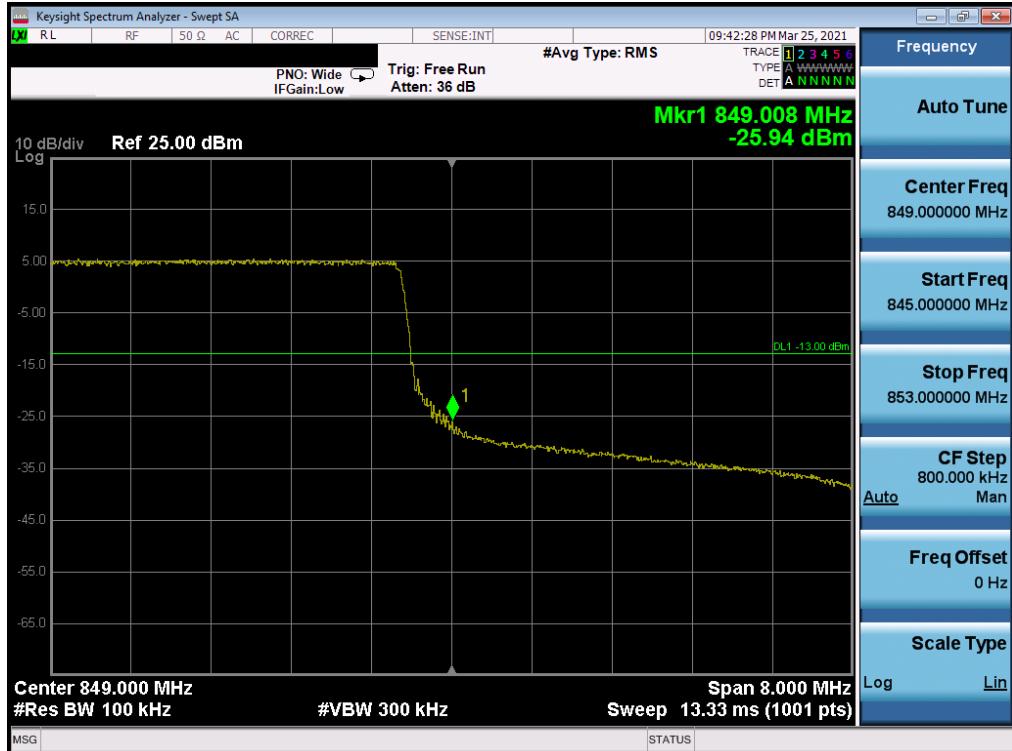


Plot 7-45. Upper Band Edge Plot (LTE Band 5 - 5MHz QPSK – Full RB Configuration)

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 40 of 59



Plot 7-46. Lower Band Edge Plot (LTE Band 5 - 10MHz QPSK – Full RB Configuration)



Plot 7-47. Upper Band Edge Plot (LTE Band 5 - 10MHz QPSK – Full RB Configuration)

FCC ID: BCGA2603	<b>PCTEST</b> Proud to be part of Element		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device		Page 41 of 59

## WCDMA Cell



Plot 7-48. Lower Band Edge Plot (WCDMA Cell – Ch. 4132)



Plot 7-49. Upper Band Edge Plot (WCDMA Cell – Ch. 4233)

FCC ID: BCGA2603	 <b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 42 of 59

## 7.5 Radiated Power (ERP/EIRP)

§22.913(a)(5)

### Test Overview

Effective Radiated Power (ERP) and 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 – Section 5.2.5.5

### 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 Isotropic Radiated Power, respectively (expressed in the same units as PMeas, typically dBW or dBm)

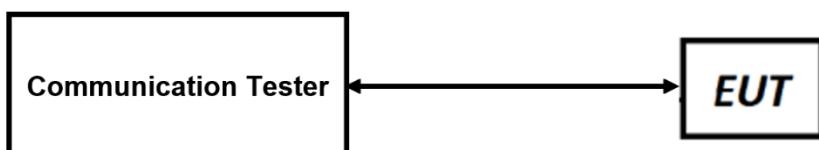
PMeas = measured transmitter output power or PSD, in dBW or dBm

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: BCGA2603	 <b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 43 of 59

**Test Notes:**

1. The EUT was tested in all possible test configurations. The worst case emissions are reported with the EUT 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.

FCC ID: BCGA2603	 <b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 44 of 59

## 7.5.1 Antenna C – ERP/EIRP

### LTE Band 26

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	824.7	-0.80	1 / 0	25.47	22.52	0.179	38.45	-15.93	24.67	0.293	40.61	-15.94
		836.5	-0.80	1 / 0	25.50	22.55	0.180	38.45	-15.90	24.70	0.295	40.61	-15.91
		848.3	-0.80	1 / 12	25.50	22.55	0.180	38.45	-15.90	24.70	0.295	40.61	-15.91
	16-QAM	836.5	-0.80	1 / 24	24.77	21.82	0.152	38.45	-16.63	23.97	0.249	40.61	-16.64
		836.5	-0.80	1 / 0	23.84	20.89	0.123	38.45	-17.56	23.04	0.201	40.61	-17.57
	3 MHz	825.5	-0.80	1 / 0	25.48	22.53	0.179	38.45	-15.92	24.68	0.294	40.61	-15.93
		836.5	-0.80	1 / 0	25.49	22.54	0.179	38.45	-15.91	24.69	0.294	40.61	-15.92
		847.5	-0.80	1 / 24	25.50	22.55	0.180	38.45	-15.90	24.70	0.295	40.61	-15.91
		825.5	-0.80	1 / 12	24.76	21.81	0.152	38.45	-16.64	23.96	0.249	40.61	-16.65
	5 MHz	825.5	-0.80	1 / 12	23.83	20.88	0.122	38.45	-17.57	23.03	0.201	40.61	-17.58
		826.5	-0.80	1 / 0	25.45	22.50	0.178	38.45	-15.95	24.65	0.292	40.61	-15.96
		836.5	-0.80	1 / 24	25.50	22.55	0.180	38.45	-15.90	24.70	0.295	40.61	-15.91
	10 MHz	846.5	-0.80	1 / 24	25.50	22.55	0.180	38.45	-15.90	24.70	0.295	40.61	-15.91
		846.5	-0.80	1 / 12	24.71	21.76	0.150	38.45	-16.69	23.91	0.246	40.61	-16.70
		846.5	-0.80	1 / 24	23.87	20.92	0.124	38.45	-17.53	23.07	0.203	40.61	-17.54
	10 MHz	829.0	-0.80	1 / 24	25.48	22.53	0.179	38.45	-15.92	24.68	0.294	40.61	-15.93
		836.5	-0.80	1 / 24	25.46	22.51	0.178	38.45	-15.94	24.66	0.292	40.61	-15.95
		844.0	-0.80	1 / 24	25.50	22.55	0.180	38.45	-15.90	24.70	0.295	40.61	-15.91
		836.5	-0.80	1 / 24	24.86	21.91	0.155	38.45	-16.54	24.06	0.255	40.61	-16.55
		829.0	-0.80	1 / 12	23.81	20.86	0.122	38.45	-17.59	23.01	0.200	40.61	-17.60

Table 7-2. Antenna C ERP/EIRP Data (LTE Band 26)

### LTE Band 5

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	824.7	-0.80	1 / 3	25.37	22.42	0.175	38.45	-16.03	24.57	0.286	40.61	-16.04
		836.5	-0.80	1 / 5	25.30	22.35	0.172	38.45	-16.10	24.50	0.282	40.61	-16.11
		848.3	-0.80	1 / 5	25.43	22.48	0.177	38.45	-15.97	24.63	0.290	40.61	-15.98
	16-QAM	836.5	-0.80	1 / 0	24.89	21.94	0.156	38.45	-16.51	24.09	0.256	40.61	-16.52
		836.5	-0.80	1 / 3	23.91	20.96	0.125	38.45	-17.49	23.11	0.205	40.61	-17.50
	3 MHz	825.5	-0.80	1 / 0	25.30	22.35	0.172	38.45	-16.10	24.50	0.282	40.61	-16.11
		836.5	-0.80	1 / 0	25.28	22.33	0.171	38.45	-16.12	24.48	0.281	40.61	-16.13
		847.5	-0.80	1 / 0	25.19	22.24	0.167	38.45	-16.21	24.39	0.275	40.61	-16.22
		836.5	-0.80	1 / 14	24.89	21.94	0.156	38.45	-16.51	24.09	0.256	40.61	-16.52
	5 MHz	825.5	-0.80	1 / 7	23.80	20.85	0.122	38.45	-17.60	23.00	0.200	40.61	-17.61
		826.5	-0.80	1 / 12	25.39	22.44	0.175	38.45	-16.01	24.59	0.288	40.61	-16.02
		836.5	-0.80	1 / 24	25.45	22.50	0.178	38.45	-15.95	24.65	0.292	40.61	-15.96
	10 MHz	846.5	-0.80	1 / 24	25.26	22.31	0.170	38.45	-16.14	24.46	0.279	40.61	-16.15
		836.5	-0.80	1 / 24	24.92	21.97	0.157	38.45	-16.48	24.12	0.258	40.61	-16.49
		836.5	-0.80	1 / 12	23.89	20.94	0.124	38.45	-17.51	23.09	0.204	40.61	-17.52
	10 MHz	829.0	-0.80	1 / 25	25.33	22.38	0.173	38.45	-16.07	24.53	0.284	40.61	-16.08
		836.5	-0.80	1 / 49	25.32	22.37	0.173	38.45	-16.08	24.52	0.283	40.61	-16.09
		844.0	-0.80	1 / 25	25.28	22.33	0.171	38.45	-16.12	24.48	0.281	40.61	-16.13
		844.0	-0.80	1 / 25	24.89	21.94	0.156	38.45	-16.51	24.09	0.256	40.61	-16.52
		844.0	-0.80	1 / 49	23.88	20.93	0.124	38.45	-17.52	23.08	0.203	40.61	-17.53

Table 7-3. Antenna C ERP/EIRP Data (LTE Band 5)

### WCDMA Cell

Frequency [MHz]	Mode	Conducted Power [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
826.40	WCDMA850	25.50	-0.80	22.55	0.180	38.45	-15.90	24.70	0.295	40.61	-15.91
836.60	WCDMA850	25.50	-0.80	22.55	0.180	38.45	-15.90	24.70	0.295	40.61	-15.91
846.60	WCDMA850	25.50	-0.80	22.55	0.180	38.45	-15.90	24.70	0.295	40.61	-15.91

Table 7-4. Antenna C ERP/EIRP Data (WCDMA Cell)

FCC ID: BCGA2603	PART 22 MEASUREMENT REPORT							Approved by: Quality Manager
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## 7.5.2 Antenna D – ERP/EIRP

### LTE Band 26

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	824.7	-0.60	1 / 12	24.48	21.73	0.149	38.45	-16.72	23.88	0.244	40.61	-16.73
		836.5	-0.60	1 / 24	24.44	21.69	0.148	38.45	-16.76	23.84	0.242	40.61	-16.77
		848.3	-0.60	1 / 24	24.50	21.75	0.150	38.45	-16.70	23.90	0.245	40.61	-16.71
	16-QAM	836.5	-0.60	1 / 12	23.91	21.16	0.131	38.45	-17.29	23.31	0.214	40.61	-17.30
		836.5	-0.60	1 / 24	22.92	20.17	0.104	38.45	-18.28	22.32	0.171	40.61	-18.29
		825.5	-0.60	1 / 0	24.46	21.71	0.148	38.45	-16.74	23.86	0.243	40.61	-16.75
3 MHz	QPSK	836.5	-0.60	1 / 0	24.42	21.67	0.147	38.45	-16.78	23.82	0.241	40.61	-16.79
		847.5	-0.60	1 / 0	24.39	21.64	0.146	38.45	-16.81	23.79	0.239	40.61	-16.82
		836.5	-0.60	1 / 24	24.00	21.25	0.133	38.45	-17.20	23.40	0.219	40.61	-17.21
	16-QAM	825.5	-0.60	1 / 12	22.81	20.06	0.101	38.45	-18.39	22.21	0.166	40.61	-18.40
		826.5	-0.60	1 / 12	24.47	21.72	0.149	38.45	-16.73	23.87	0.244	40.61	-16.74
		836.5	-0.60	1 / 24	24.50	21.75	0.150	38.45	-16.70	23.90	0.245	40.61	-16.71
5 MHz	QPSK	846.5	-0.60	1 / 24	24.43	21.68	0.147	38.45	-16.77	23.83	0.242	40.61	-16.78
		826.5	-0.60	1 / 24	23.91	21.16	0.131	38.45	-17.29	23.31	0.214	40.61	-17.30
		846.5	-0.60	1 / 24	22.88	20.13	0.103	38.45	-18.32	22.28	0.169	40.61	-18.33
	16-QAM	829.0	-0.60	1 / 12	24.50	21.75	0.150	38.45	-16.70	23.90	0.245	40.61	-16.71
		836.5	-0.60	1 / 24	24.48	21.73	0.149	38.45	-16.72	23.88	0.244	40.61	-16.73
		844.0	-0.60	1 / 12	24.48	21.73	0.149	38.45	-16.72	23.88	0.244	40.61	-16.73
10 MHz	QPSK	836.5	-0.60	1 / 24	23.97	21.22	0.132	38.45	-17.23	23.37	0.217	40.61	-17.24
		836.5	-0.60	1 / 24	22.96	20.21	0.105	38.45	-18.24	22.36	0.172	40.61	-18.25
		836.5	-0.60	1 / 24	22.96	20.21	0.105	38.45	-18.24	22.36	0.172	40.61	-18.25

Table 7-5. Antenna D ERP/EIRP Data (LTE Band 26)

### LTE Band 5

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1.4 MHz	QPSK	824.7	-0.60	1 / 5	24.50	21.75	0.150	38.45	-16.70	23.90	0.245	40.61	-16.71
		836.5	-0.60	1 / 5	24.45	21.70	0.148	38.45	-16.75	23.85	0.243	40.61	-16.76
		848.3	-0.60	1 / 5	24.50	21.75	0.150	38.45	-16.70	23.90	0.245	40.61	-16.71
	16-QAM	824.7	-0.60	1 / 5	23.94	21.19	0.132	38.45	-17.26	23.34	0.216	40.61	-17.27
		848.3	-0.60	1 / 5	22.89	20.14	0.103	38.45	-18.31	22.29	0.169	40.61	-18.32
		825.5	-0.60	1 / 0	24.50	21.75	0.150	38.45	-16.70	23.90	0.245	40.61	-16.71
3 MHz	QPSK	836.5	-0.60	1 / 0	24.44	21.69	0.148	38.45	-16.76	23.84	0.242	40.61	-16.77
		847.5	-0.60	1 / 0	24.46	21.71	0.148	38.45	-16.74	23.86	0.243	40.61	-16.75
		825.5	-0.60	1 / 0	23.91	21.16	0.131	38.45	-17.29	23.31	0.214	40.61	-17.30
	16-QAM	825.5	-0.60	1 / 0	22.84	20.09	0.102	38.45	-18.36	22.24	0.167	40.61	-18.37
		826.5	-0.60	1 / 0	24.49	21.74	0.149	38.45	-16.71	23.89	0.245	40.61	-16.72
		836.5	-0.60	1 / 12	24.49	21.74	0.149	38.45	-16.71	23.89	0.245	40.61	-16.72
5 MHz	QPSK	846.5	-0.60	1 / 12	24.50	21.75	0.150	38.45	-16.70	23.90	0.245	40.61	-16.71
		826.5	-0.60	1 / 0	23.93	21.18	0.131	38.45	-17.27	23.33	0.215	40.61	-17.28
		826.5	-0.60	1 / 12	22.86	20.11	0.103	38.45	-18.34	22.26	0.168	40.61	-18.35
	16-QAM	829.0	-0.60	1 / 25	24.50	21.75	0.150	38.45	-16.70	23.90	0.245	40.61	-16.71
		836.5	-0.60	1 / 49	24.49	21.74	0.149	38.45	-16.71	23.89	0.245	40.61	-16.72
		844.0	-0.60	1 / 49	24.49	21.74	0.149	38.45	-16.71	23.89	0.245	40.61	-16.72
10 MHz	QPSK	829.0	-0.60	1 / 25	23.97	21.22	0.132	38.45	-17.23	23.37	0.217	40.61	-17.24
		836.5	-0.60	1 / 49	22.76	20.01	0.100	38.45	-18.44	22.16	0.164	40.61	-18.45
		836.5	-0.60	1 / 49	22.76	20.01	0.100	38.45	-18.44	22.16	0.164	40.61	-18.45

Table 7-6. Antenna D ERP/EIRP Data (LTE Band 5)

### WCDMA Cell

Frequency [MHz]	Mode	Conducted Power [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
826.40	WCDMA850	24.49	-0.60	21.74	0.149	38.45	-16.71	23.89	0.245	40.61	-16.72
836.60	WCDMA850	24.50	-0.60	21.75	0.150	38.45	-16.70	23.90	0.245	40.61	-16.71
846.60	WCDMA850	24.44	-0.60	21.69	0.148	38.45	-16.76	23.84	0.242	40.61	-16.77

Table 7-7. Antenna D ERP/EIRP Data (WCDMA Cell)

FCC ID: BCGA2603	PART 22 MEASUREMENT REPORT						Approved by: Quality Manager
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## 7.6 Radiated Spurious Emissions

§2.1053, 22.917(a)

### Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

### Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

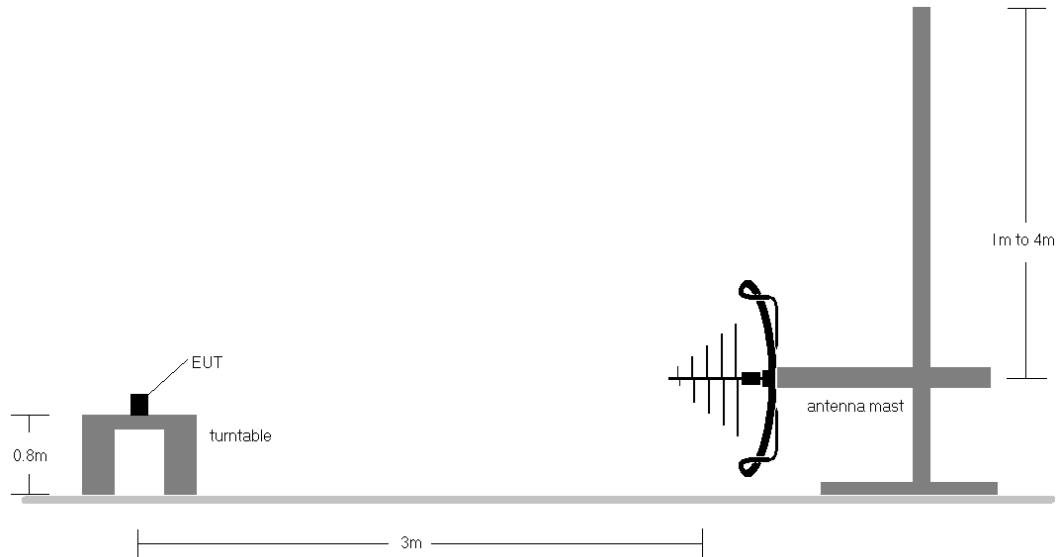
### Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq$  3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $\geq$  2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

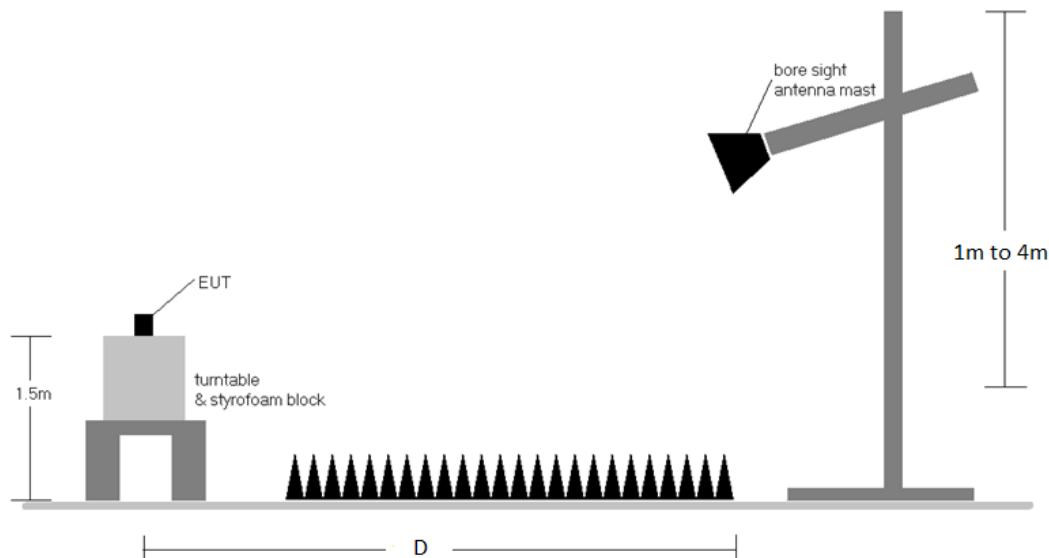
FCC ID: BCGA2603	 <b>PCTEST</b> Proud to be part of 		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
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## Test Setup

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



**Figure 7-5. Test Instrument & Measurement Setup < 1GHz**



**Figure 7-6. Test Instrument & Measurement Setup > 1 GHz**

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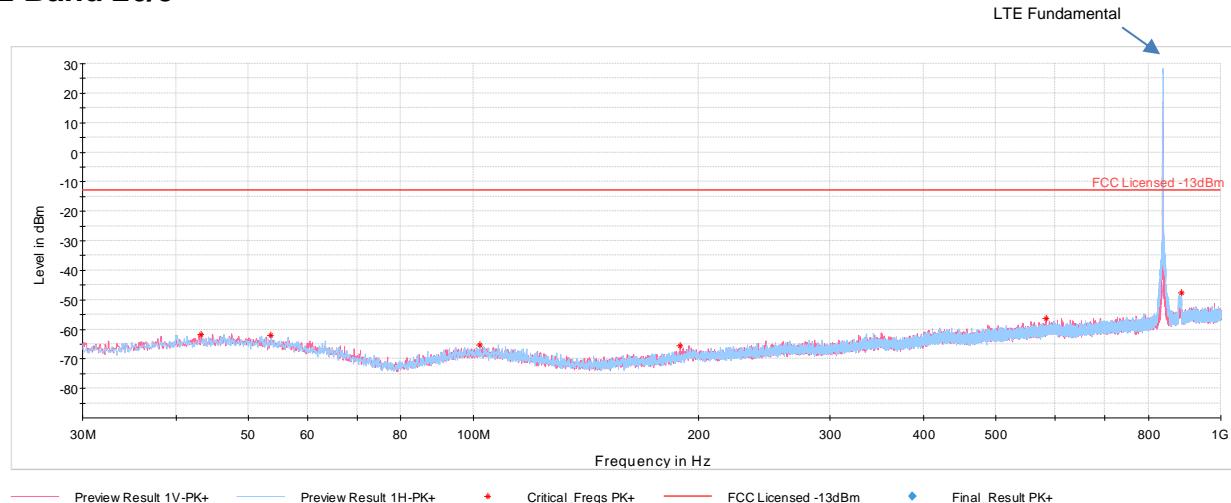
## Test Notes

1. Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
  - a.  $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
  - b.  $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$ ; where D is the measurement distance in meters.
2. This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".
3. 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.
4. This unit was tested with its standard battery.
5. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
6. D is the measurement test distance and emissions 1-18GHz were measured at a 3 meters test distance.
7. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

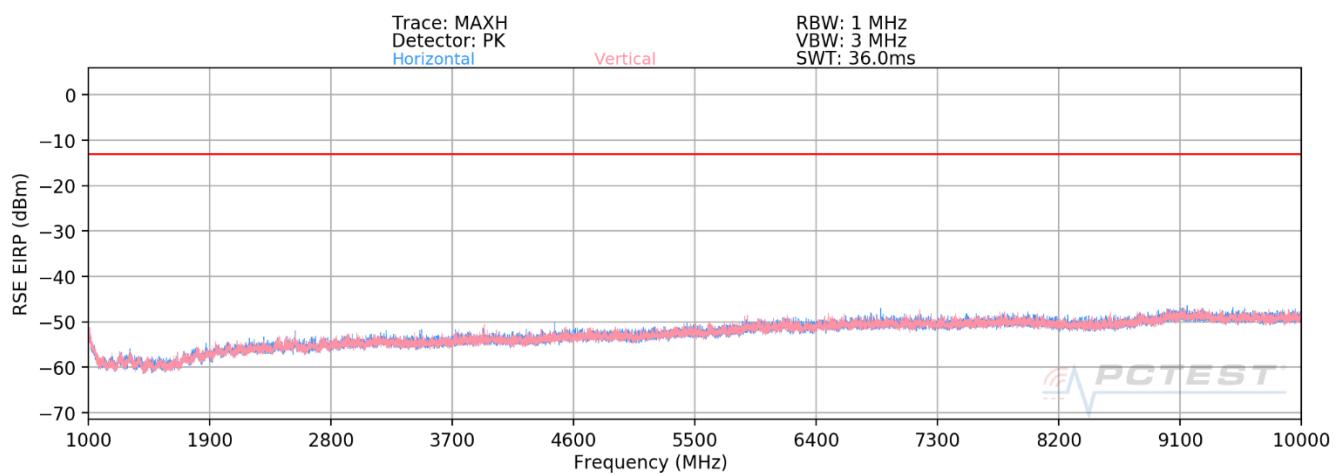
FCC ID: BCGA2603	 <b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 49 of 59

## 7.6.1 Antenna C – Radiated Spurious Emission Measurements

### LTE Band 26/5



Plot 7-50. Antenna C Radiated Spurious Plot below 1GHz (LTE Band 26/5)



Plot 7-51. Antenna C Radiated Spurious Plot above 1GHz (LTE Band 26/5)

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
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Bandwidth (MHz):	10								
Frequency (MHz):	829.0								
RB / Offset:	1 / 25								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1658.0	H	-	-	-77.99	-2.17	26.84	-68.41	-13.00	-55.41
2487.0	H	-	-	-79.08	3.03	30.95	-64.31	-13.00	-51.31
3316.0	H	-	-	-80.20	4.53	31.33	-63.93	-13.00	-50.93

**Table 7-8. Antenna C Radiated Spurious Data (LTE Band 26/5 – Low Channel)**

Bandwidth (MHz):	10								
Frequency (MHz):	836.5								
RB / Offset:	1 / 25								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.0	H	-	-	-78.28	-2.13	26.59	-68.67	-13.00	-55.67
2509.5	H	-	-	-79.37	2.95	30.58	-64.68	-13.00	-51.68
3346.0	H	-	-	-80.28	4.36	31.08	-64.18	-13.00	-51.18

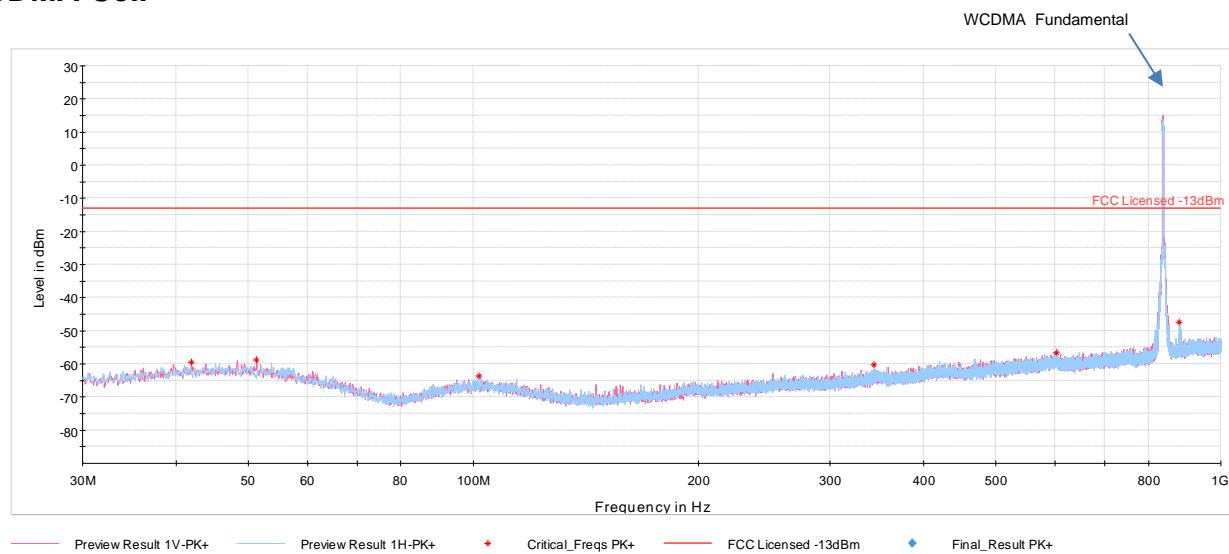
**Table 7-9. Antenna C Radiated Spurious Data (LTE Band 26/5 – Mid Channel)**

Bandwidth (MHz):	10								
Frequency (MHz):	844.0								
RB / Offset:	1 / 25								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1688.0	V	-	-	-76.96	-2.34	27.70	-67.56	-13.00	-54.56
2532.0	V	224	82	-65.15	1.53	43.38	-51.88	-13.00	-38.88
3376.0	V	-	-	-78.38	3.15	31.77	-63.48	-13.00	-50.48
4220.0	V	-	-	-78.78	4.45	32.67	-62.59	-13.00	-49.59
5064.0	V	-	-	-79.64	5.43	32.79	-62.47	-13.00	-49.47

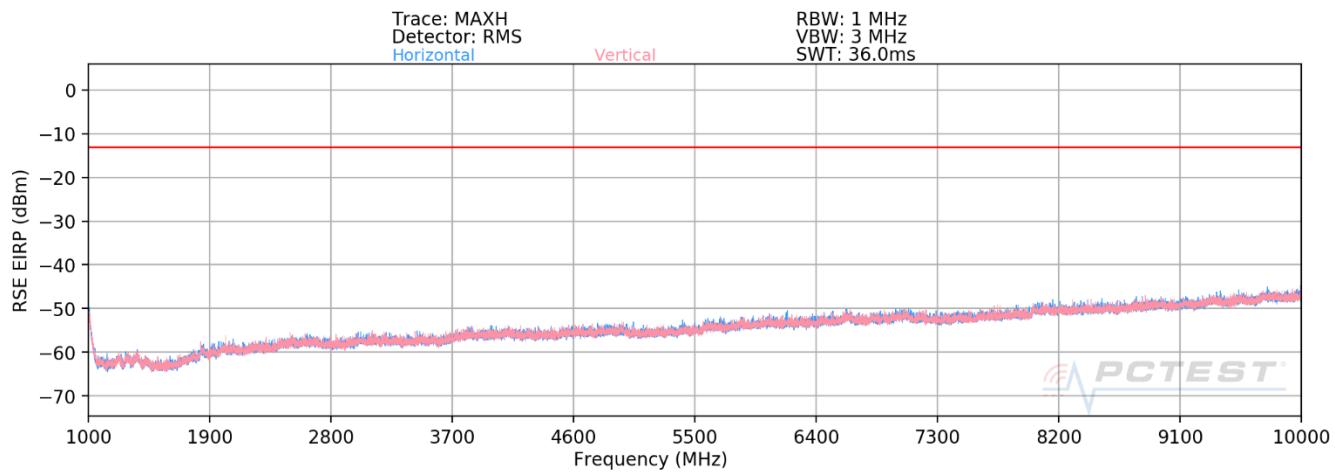
**Table 7-10. Antenna C Radiated Spurious Data (LTE Band 26/5 – High Channel)**

FCC ID: BCGA2603	 <b>PCTEST®</b> <small>Proud to be part of element</small>	<b>PART 22 MEASUREMENT REPORT</b>				Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device				

## WCDMA Cell



**Plot 7-52. Antenna C Radiated Spurious Plot below 1GHz (WCDMA Cell)**



**Plot 7-53. Antenna C Radiated Spurious Plot above 1GHz (WCDMA Cell)**

FCC ID: BCGA2603	<b>PART 22 MEASUREMENT REPORT</b>		Approved by: Quality Manager
Test Report S/N: 1C2106080051-01.BCG	Test Dates: 6/7/2021 - 7/30/2021	EUT Type: Tablet Device	Page 52 of 59

Mode:	WCDMA RMC								
Channel:	4132								
Frequency (MHz):	826.4								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1652.8	V	-	-	-79.77	-2.05	25.18	-70.07	-13.00	-57.07
2479.2	V	-	-	-79.77	2.98	30.21	-65.04	-13.00	-52.04
3305.6	V	-	-	-79.72	4.57	31.85	-63.41	-13.00	-50.41

**Table 7-11. Antenna C Radiated Spurious Data (WCDMA Cell – Low Channel)**

Mode:	WCDMA RMC								
Channel:	4183								
Frequency (MHz):	836.6								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.2	V	-	-	-78.43	-2.13	26.44	-68.82	-13.00	-55.82
2509.8	V	245	85	-72.72	2.95	37.23	-58.03	-13.00	-45.03
3346.4	V	-	-	-80.00	4.35	31.35	-63.90	-13.00	-50.90
4183.0	V	-	-	-80.73	5.38	31.65	-63.61	-13.00	-50.61
5019.6	V	-	-	-81.11	7.67	33.56	-61.70	-13.00	-48.70

**Table 7-12. Antenna C Radiated Spurious Data (WCDMA Cell – Mid Channel)**

Mode:	WCDMA RMC								
Channel:	4233								
Frequency (MHz):	846.6								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1693.2	V	-	-	-78.17	-1.66	27.17	-68.09	-13.00	-55.09
2539.8	V	265	76	-79.72	2.77	30.05	-65.20	-13.00	-52.20
3386.4	V	-	-	-82.03	4.55	29.52	-65.74	-13.00	-52.74
4233.0	V	-	-	-81.74	5.58	30.84	-64.41	-13.00	-51.41
5079.6	V	-	-	-82.98	7.65	31.67	-63.59	-13.00	-50.59

**Table 7-13. Antenna C Radiated Spurious Data (WCDMA Cell – High Channel)**

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## 7.6.2 Antenna D – Radiated Spurious Emission Measurements

### LTE Band 26/5

Bandwidth (MHz):	10								
Frequency (MHz):	829.0								
RB / Offset:	1 / 25								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1658.0	V	41	399	-77.32	-2.17	27.51	-67.74	-13.00	-54.74
2487.0	V	-	-	-79.33	3.03	30.70	-64.56	-13.00	-51.56
3316.0	V	-	-	-80.21	4.53	31.32	-63.94	-13.00	-50.94
4145.0	V	-	-	-79.25	5.40	33.15	-62.11	-13.00	-49.11

Table 7-14. Antenna D Radiated Spurious Data (LTE Band 26/5 – Low Channel)

Bandwidth (MHz):	10								
Frequency (MHz):	836.5								
RB / Offset:	1 / 25								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.0	H	316	72	-76.98	-2.13	27.89	-67.37	-13.00	-54.37
2509.5	H	-	-	-79.04	2.95	30.91	-64.35	-13.00	-51.35
3346.0	H	-	-	-80.22	4.36	31.14	-64.12	-13.00	-51.12
4182.5	H	-	-	-79.17	5.37	33.20	-62.06	-13.00	-49.06

Table 7-15. Antenna D Radiated Spurious Data (LTE Band 26/5 – Mid Channel)

Bandwidth (MHz):	10								
Frequency (MHz):	844.0								
RB / Offset:	1 / 25								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1688.0	V	252	34	-75.74	-1.79	29.47	-65.79	-13.00	-52.79
2532.0	V	-	-	-79.10	2.82	30.72	-64.53	-13.00	-51.53
3376.0	V	-	-	-80.24	4.45	31.21	-64.05	-13.00	-51.05
4220.0	V	-	-	-79.45	5.46	33.01	-62.24	-13.00	-49.24

Table 7-16. Antenna D Radiated Spurious Data (LTE Band 26/5 – High Channel)

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## WCDMA Cell

Mode:	WCDMA RMC								
Channel:	4132								
Frequency (MHz):	826.4								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1652.8	H	-	-	-78.30	-2.05	26.65	-68.60	-13.00	-55.60
2479.2	H	-	-	-78.88	2.98	31.10	-64.15	-13.00	-51.15
3305.6	H	-	-	-79.79	4.57	31.78	-63.48	-13.00	-50.48

**Table 7-17. Antenna D Radiated Spurious Data (WCDMA Cell – Low Channel)**

Mode:	WCDMA RMC								
Channel:	4183								
Frequency (MHz):	836.6								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.2	H	-	-	-78.24	-2.13	26.63	-68.63	-13.00	-55.63
2509.8	H	-	-	-79.14	2.95	30.81	-64.45	-13.00	-51.45
3346.4	H	-	-	-80.13	4.35	31.22	-64.03	-13.00	-51.03

**Table 7-18. Antenna D Radiated Spurious Data (WCDMA Cell – Mid Channel)**

Mode:	WCDMA RMC								
Channel:	4233								
Frequency (MHz):	846.6								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1693.2	H	-	-	-78.01	-1.66	27.33	-67.93	-13.00	-54.93
2539.8	H	-	-	-78.95	2.77	30.82	-64.43	-13.00	-51.43
3386.4	H	-	-	-79.97	4.55	31.58	-63.68	-13.00	-50.68

**Table 7-19. Antenna D Radiated Spurious Data (WCDMA Cell – High Channel)**

FCC ID: BCGA2603	 <b>PCTEST</b> <small>Proud to be part of Element</small>	PART 22 MEASUREMENT REPORT				Approved by: Quality Manager
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## 7.7 Frequency Tolerance / Temperature Variation

§2.1055, 22.355

### Test Overview and Limit

Frequency Tolerance testing is performed in accordance with the guidelines of ANSI C63.26-2015 and TIA-603-E-2016. All port were tested and only the worst case data were reported. The Frequency Tolerance of the transmitter is measured by:

- Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- 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 22, the Frequency Tolerance of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5 \text{ ppm}$ ) of the center frequency.**

### Test Procedure Used

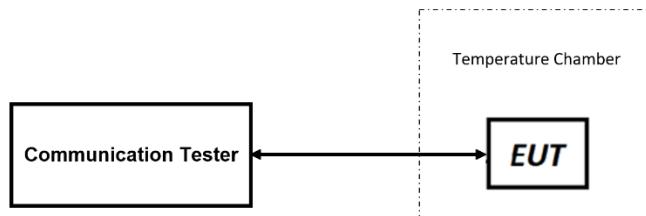
ANSI C63.26-2015

TIA-603-E-2016

### Test Settings

- The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
- 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.
- 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 7-7. Test Instrument & Measurement Setup**

### Test Notes

- All port were tested and only the worst case data were reported.

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## Frequency Tolerance / Temperature Variation

### LTE Band 26/5

Operating Frequency (Hz):	836,500,000
Ref. Voltage (VDC):	3.80
Deviation Limit:	± 0.00025% or ± 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	836,500,004	4	0.000000516
		- 20	836,500,004	4	0.000000481
		- 10	836,500,003	3	0.000000398
		0	836,500,003	3	0.000000380
		+ 10	836,500,002	2	0.000000194
		+ 20 (Ref)	836,500,004	4	0.000000424
		+ 30	836,500,004	4	0.000000527
		+ 40	836,500,004	4	0.000000479
		+ 50	836,500,004	4	0.000000494
Battery Endpoint	3.23	+ 20	836,500,003	3	0.000000411

Table 7-20. LTE Band 26/5 Frequency Tolerance Data

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## Frequency Tolerance / Temperature Variation

### WCDMA Cellular

Operating Frequency (Hz):	836,600,000
Ref. Voltage (VDC):	3.80
Deviation Limit:	± 0.00025% or ± 2.5 ppm

Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	836,599,999	-1	-0.000000092
		- 20	836,600,000	0	0.000000045
		- 10	836,600,001	1	0.000000071
		0	836,600,000	0	0.000000050
		+ 10	836,600,001	1	0.000000080
		+ 20 (Ref)	836,599,999	-1	-0.000000084
		+ 30	836,599,999	-1	-0.000000078
		+ 40	836,599,999	-1	-0.000000077
		+ 50	836,599,999	-1	-0.000000063
Battery Endpoint	3.23	+ 20	836,599,999	-1	-0.000000086

Table 7-21. WCDMA Cell Frequency Tolerance Data

FCC ID: BCGA2603	 <b>PCTEST</b> <small>Proud to be part of element</small>		<b>PART 22 MEASUREMENT REPORT</b>	Approved by: Quality Manager
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## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the Apple **Tablet Device** **FCC ID: BCGA2603** complies with all the requirements of Part 22 of the FCC rules.

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