



# Element Washington DC LLC

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## DATA REFERENCE REPORT PART 27

**Applicant Name:**

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

**Date of Testing:**

5/1/2022 - 8/15/2022

**Test Site/Location:**

Element Washington DC LLC, Morgan Hill, CA, USA

**Test Report Serial No.:**

1C2205090041-04.BCG

<b>FCC ID:</b>	<b>BCG-A2775</b>
<b>Applicant Name:</b>	<b>Apple Inc.</b>

**Reference Model:** A2774

**Variant Model:** A2775 (A2858)

**EUT Type:** Watch

**FCC Classification:** PCS Licensed Transmitter Worn on Body (PCT)

**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.

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.

RJ Ortiz  
Executive Vice President



FCC ID: BCG-A2775	PART 27 DATA REFERENCE REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090041-04.BCG	Test Dates: 4/6/2022 - 8/15/2022	EUT Type: Watch	Page 1 of 14

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## 1.0 INTRODUCTION

### 1.1 Scope

Per manufacturer declaration, there are two tablet device models, A2774 and A2775 (A2858), with high degree of similarity, reference model FCC ID: BCG-A2774 and variant model **FCC ID: BCG-A2775**. 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: BCG-A2774, while radiated spot-check verification has been performed on variant model **FCC ID: BCG-A2775**. 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
PCT	BCG-A2774	1C2205090040-04.BCG	RF Part 27b Test Report

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

Reference model FCC ID: BCG-A2774 test report has been included in Appendix A

### 1.2 Element Washington DC LLC Test Location

These measurement tests were conducted at the Element Washington DC LLC. 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

- Element Washington DC LLC 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.
- Element Washington DC LLC 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).
- Element Washington DC LLC 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 Watch FCC ID: BCG-A2775**. 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.:** FCGJ4LCV47, M1X9562DDJ, WFYT4N230R

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n UNII, Bluetooth (1x, EDR, HDR4, HDR8, LE1M, LE2M), NFC, UWB, 60.5GHz Transmitter.

### 2.3 Antenna Description

Following antenna gains provided by manufacturer were used for the testing.

Band	Antenna Gain (dBi)
	Antenna FCM
LTE Band 7	-6.7
LTE Band 41	-6.7

Table 2-1. Highest Antenna Gain

### 2.4 Test Support Equipment

1	Apple Macbook w/AC/DC Adapter	Model: A1398 Model: A1435	S/N: C2QKP008F6F3 S/N: N/A	
2	Apple USB-C cable w/ Charging Dock w/ Cradle	Model: N/A Model: N/A Model: LA2-BD-LG-P1	S/N: N/A S/N: DQ812910CU008V22F S/N: N-0017525-02	
3	Apple Magnetic Charger Apple Magnetic Charger	Model: A2515 Model: A2515	S/N: DLC035200UJMFROAJ S/N: DLC035202KRMFROA2	
4	Pathfinder Falcon SiP Socket	Model: 920-098626-01 Model: N/A	S/N: DLC03770065Q6PM1W S/N: P1 X2539B PF096	
5	DC Power Supply	Model: KPS3010D	S/N: N/A	
6	Store Sample Wristband	Model: N/A	S/N: DLC219400361YDQ2W	

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 6.0 of this test report for a description of the radiated emissions tests.

The worst case configuration was investigated for all combinations of the two materials, aluminum, and stainless steel, and various types of wristbands, metal and non-metal wristbands. The EUT was also investigated with and without wireless charger. The worst case configuration found was used for all testing.

For emissions from 1GHz – 18GHz, low, mid, and high channels were tested with highest power and worst case configuration.

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.

This device only supports 27RBs or less for 16-QAM uplink.

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: BCG-A2775	
		Mode	Channel
WCDMA, LTE	Radiated Spurious Emissions (>1GHz)	LTE Band 5, 2, 7 Max BW, 1RB, QPSK	Low, Mid, High
WCDMA, LTE	Conducted Power	All Certified Bands: Highest BW only, 1 RB, Modulation with the highest power	Mid

**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 watchOS 9.0 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:

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

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

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 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	1.77
Radiated Disturbance (<30MHz)	4.38
Radiated Disturbance (30MHz-1GHz)	4.75
Radiated Disturbance (1-18GHz)	5.20
Radiated Disturbance (>18GHz)	4.72

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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	6/10/2022	Annual	6/10/2023	MY49430244
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	8/13/2021	Annual	8/13/2022	T058701-01
ESPEC	SU-241	Tabletop Temperature Chamber	10/26/2021	Annual	10/26/2022	92009574
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	10/21/2021	Annual	10/21/2022	208204
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	5/11/2022	Annual	5/11/2023	205956
Keysight Technology	N9040B	UXA Signal Analyzer	2/8/2022	Annual	2/8/2023	MY57212015
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	1/6/2022	Annual	1/6/2023	101639
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/4/2022	Annual	3/4/2023	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	5/19/2022	Annual	5/19/2023	101299
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	1/6/2022	Annual	1/6/2023	102327
Rohde & Schwarz	ESW44	EMI Test Receiver	12/2/2021	Annual	12/2/2022	101570
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/11/2021	Annual	10/11/2022	161616
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/4/2021	Annual	11/4/2022	151888
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	4/18/2022	Annual	4/18/2023	100050
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	1/25/2022	Annual	1/25/2023	101063
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/3/2022	Annual	4/3/2023	100546

**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 TEST RESULTS (SPOT-CHECK DATA)

### 6.1 Summary

Company Name: Apple Inc.  
 FCC ID: BCG-A2775  
 FCC Classification: PCS Licensed Transmitter Worn on Body (PCT)  
 Mode(s): LTE

Technology	Test Configurations					Reference Model	Variant Model	Delta
	Test Description	Modulation	BW / RB Config	Channel	Measurement Frequency [MHz]	FCC ID: BCG-A2774	FCC ID: BCG-A2775	
						Average [dBm]	Average [dBm]	
LTE-B7	Radiated Spurious Emissions	QPSK	20MHz / 1/50 RB	L	10040.0	-46.87	-46.50	0.37
LTE-B7	Radiated Spurious Emissions	QPSK	20MHz / 1/50 RB	M	10140.0	-48.62	-49.56	0.94
LTE-B7	Radiated Spurious Emissions	QPSK	20MHz / 1/50 RB	H	5120.0	-59.50	-59.67	0.17
LTE-B7	Conducted Powers	QPSK	20MHz / 1/50 RB	M	2535.0	23.39	23.65	0.26
LTE-B41	Conducted Powers	QPSK	20MHz / 1/0 RB	M	2510.0	23.36	23.92	0.56

**Table 6-1. Worst Case Spot-Check Results**

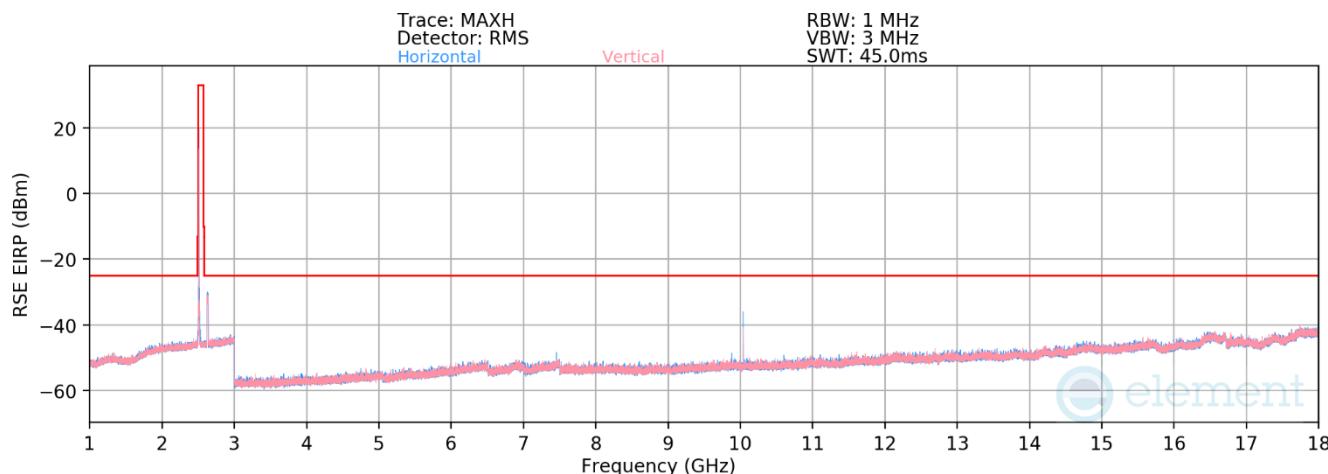
Spot-checks were conducted, all measurements were investigated and found to be within acceptable tolerance in accordance with FCC Approved Data Referencing Test Plan.

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## 6.2 Radiated Spurious Emissions

§2.1053, 22.917(a)

### LTE



**Plot 6-1. Radiated Spurious Emission above 1GHz (LTE-B7)**

Bandwidth (MHz):	20
Frequency (MHz):	2510.0
RB / Offset:	1 / 50

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]
5020.0	-	-	-	-82.37	4.71	29.34	-65.92	-25.00	-40.92
7530.0	-	-	-	-83.49	8.71	32.22	-63.04	-25.00	-38.04
10040.0	H	249	83	-68.21	9.96	48.75	-46.50	-25.00	-21.50
12550.0	-	-	-	-85.95	12.15	33.20	-62.06	-25.00	-37.06
15060.0	-	-	-	-85.43	14.58	36.15	-59.10	-25.00	-34.10
17570.0	-	-	-	-86.16	20.71	41.55	-53.71	-25.00	-28.71

**Table 6-2. Radiated Spurious Data (LTE-B7 – Low Channel)**

Bandwidth (MHz):	20
Frequency (MHz):	2535.0
RB / Offset:	1 / 50

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]
5070.0	V	333	350	-78.79	5.00	33.21	-62.04	-25.00	-37.04
7605.0	-	-	-	-81.24	9.11	34.87	-60.39	-25.00	-35.39
10140.0	H	250	351	-71.16	9.86	45.70	-49.56	-25.00	-24.56
12675.0	-	-	-	-81.23	12.73	38.50	-56.75	-25.00	-31.75
15210.0	-	-	-	-81.44	14.37	39.93	-55.33	-25.00	-30.33
17745.0	-	-	-	-83.76	22.59	45.83	-49.43	-25.00	-24.43

**Table 6-3. Radiated Spurious Data (LTE-B7 – Mid Channel)**

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Bandwidth (MHz):	20
Frequency (MHz):	2560.0
RB / Offset:	1 / 50

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]
5120.00	V	250	328	-76.22	4.81	35.59	-59.67	-25.00	-34.67
7680.00	V	-	-	-82.43	9.11	33.68	-61.57	-25.00	-36.57
10240.00	V	264	322	-78.96	10.34	38.38	-56.88	-25.00	-31.88
12800.00	V	-	-	-81.44	12.97	38.53	-56.72	-25.00	-31.72
15360.00	V	-	-	-82.66	14.92	39.26	-56.00	-25.00	-31.00
17920.00	V	-	-	-85.64	21.95	43.31	-51.95	-25.00	-26.95

**Table 6-4. Radiated Spurious Data (LTE-B7 – High Channel)**

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## 6.3 Antenna FCM – ERP/EIRP

### LTE-B7

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	2535.0	-6.70	1 / 50	23.65	16.95	49.55	33.01	-16.06

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

### LTE-B41

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	2593.0	-6.70	1 / 0	23.92	17.22	52.72	33.01	-15.79

Table 6-6. Antenna FCM ERP/EIRP Data (LTE Band 41)

FCC ID: BCG-A2775	PART 27 DATA REFERENCE REPORT			Approved by: Technical Manager
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## 7.0 CONCLUSION

The spot-check data measured for variant model **FCC ID: BCG-A2775** is in tolerance with reference model FCC ID: BCG-A2774 per FCC Approved Data Referencing Test Plan.

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## 8.0 APPENDIX A: REFERENCE MODEL TEST REPORT

Attached is the test report (1C2205090040-04.BCG) from reference model FCC ID: BCG-A2774, which includes referenced data results.

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Version 2.1 11/9/2021



## PART 27 MEASUREMENT REPORT

**Applicant Name:**

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

**Date of Testing:**

5/1/2022 - 8/15/2022

**Test Site/Location:**

Element Washington DC LLC  
Morgan Hill, CA, USA

**Test Report Serial No.:**

1C2205090040-04-R1.BCG

**FCC ID:**

BCG-A2774

**Applicant Name:**

Apple Inc.

**Application Type:**

Certification

**Model:**

A2774

**EUT Type:**

Watch

**FCC Classification:**

PCS Licensed Transmitter Worn on Body (PCT)

**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: 1C2205090040-04-R1.BCG) supersedes and replaces the previously issued test report (S/N: 1C2205090040-04.BCG) 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.



RJ Ortiz  
Executive Vice President



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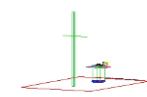
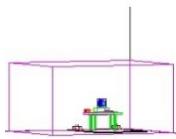
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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	OBW [MHz]	EIRP		Emission Designator
					Max. Power [mW]	Max. Power [dBm]	
LTE Band 7	5 MHz	QPSK	2502.5 - 2567.5	4.5829	51.168	17.09	4M58G7W
		16QAM	2502.5 - 2567.5	4.5445	44.978	16.53	4M54D7W
	10 MHz	QPSK	2505 - 2565	9.1038	52.119	17.17	9M10G7W
		16QAM	2505 - 2565	5.4587	43.251	16.36	5M46D7W
	15 MHz	QPSK	2507.5 - 2562.5	13.6965	50.582	17.04	13M7G7W
		16QAM	2507.5 - 2562.5	6.4642	43.752	16.41	6M46D7W
	20 MHz	QPSK	2510 - 2560	18.2282	52.000	17.16	18M2G7W
		16QAM	2510 - 2560	8.4063	42.855	16.32	8M41D7W
LTE Band 41	5 MHz	QPSK	2498.5 - 2687.5	4.5640	53.211	17.26	4M56G7W
		16QAM	2498.5 - 2687.5	4.5807	40.738	16.10	4M58D7W
	10 MHz	QPSK	2501 - 2685	9.1775	52.481	17.20	9M18G7W
		16QAM	2501 - 2685	5.5127	41.591	16.19	5M51D7W
	15 MHz	QPSK	2503.5 - 2682.5	13.6460	52.360	17.19	13M6G7W
		16QAM	2503.5 - 2682.5	6.5557	42.170	16.25	6M56D7W
	20 MHz	QPSK	2506 - 2680	18.3050	51.523	17.12	18M3G7W
		16QAM	2506 - 2680	7.9261	41.210	16.15	7M93D7W

### 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 Element Washington DC LLC Test Location

These measurement tests were conducted at the Element 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 Element located in Morgan Hill, CA 95037, U.S.A.**

- Element Washington DC LLC 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.
- Element Washington DC LLC 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).
- Element 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 Watch FCC ID:BCG-A2774**. 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.:** CY6RMQ6D0X, PQ92YF5W40, DLC215300C0171C3Q

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n UNII, Bluetooth (1x, EDR, HDR4, HDR8, LE1M, LE2M), NFC, UWB, 60.5GHz Transmitter.

This device supports simultaneous transmission operations, which allows for multiple transmitters to transmit simultaneously on the same antenna. The table below shows all configurations possible.

Simultaneous Tx Config	Antenna FCM				
	WLAN	Bluetooth	LTE/WCDMA	UNII	UWB
	802.11 b/g/n	BDR, EDR, HDR4/8, LE1/2M	Mid band/ High band	802.11 a/n	Ch.5, Ch.9
Config 1	✓	✗	✗	✗	✓
Config 2	✗	✓	✗	✗	✓
Config 3	✗	✗	✓	✗	✓
Config 4	✗	✓	✓	✗	✗
Config 5	✓	✗	✓	✗	✗
Config 6	✗	✗	✓	✓	✗
Config 7	✗	✗	✓	✗	✓
Config 8	✗	✓	✓	✗	✓
Config 9	✓	✗	✓	✗	✓
Config 10	✗	✓	✓	✓	✗

Table 2-1. Simultaneous Transmission Configurations

✓ = Support; ✗ = Not Support

### 2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.

Band	Antenna Gain (dBi)
	Antenna FCM
LTE Band 7	-6.7
LTE Band 41	-6.7

Table 2-2. Highest Antenna Gain

**Note:** Antenna Specifications has been attached to Appendix A

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## 2.4 Test Support Equipment

1	Apple Macbook w/AC/DC Adapter	Model: Model:	A1398 A1435	S/N: S/N:	C2QKP008F6F3 N/A
2	Apple USB-C cable w/ Charging Dock w/ Cradle	Model: Model: Model:	N/A N/A LA2-BD-LG-P1	S/N: S/N: S/N:	N/A DQ812910CU008V22F N-0017525-02
3	Apple Magnetic Charger Apple Magnetic Charger	Model: Model:	A2515 A2515	S/N: S/N:	DLC035200UJMF0AJ DLC035202KRMF0A2
4	Pathfinder Falcon SiP Socket	Model: Model:	920-098626-01 N/A	S/N: S/N:	DLC03770065Q6PM1W P1 X2539B PF096
5	DC Power Supply	Model:	KPS3010D	S/N:	N/A
6	Store Sample Wristband	Model:	N/A	S/N:	DLC219400361YDQ2W

**Table 2-3. Test Support Equipment**

## 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.

The worst case configuration was investigated for all combinations of the two materials, aluminum, and stainless steel, and various types of wristbands, metal and non-metal wristbands. The EUT was also investigated with and without wireless charger. The worst case configuration found was used for all testing.

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.

This device only supports 27RBs or less for 16-QAM uplink.

All possible simultaneous transmission configurations have been investigated and the worst case config has been reported.

Description	Bluetooth	LTE	UNII
Antenna	FCM	FCM	FCM
Channel	78	40620	36
Operating Frequency (MHz)	2480	2593	5180
Mode/Modulation	GFSK ePA	QPSK/1RB/20MHz	11n

**Table 2-4. Worst Case Simultaneous Transmission Configuration**

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## 2.6 Software and Firmware

The test was conducted with firmware version watchOS 9.0 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 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:

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

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

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  $U_{CISPR}$  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	1.77
Radiated Disturbance (<30MHz)	4.38
Radiated Disturbance (30MHz-1GHz)	4.75
Radiated Disturbance (1-18GHz)	5.20
Radiated Disturbance (>18GHz)	4.72

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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	6/10/2022	Annual	6/10/2023	MY49430244
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	8/13/2021	Annual	8/13/2022	T058701-01
ESPEC	SU-241	Tabletop Temperature Chamber	10/26/2021	Annual	10/26/2022	92009574
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	10/21/2021	Annual	10/21/2022	208204
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	5/11/2022	Annual	5/11/2023	205956
Keysight Technology	N9040B	UXA Signal Analyzer	2/8/2022	Annual	2/8/2023	MY57212015
Rohde & Schwarz	TS-PR18	Pre-Amplifier (1GHz - 18GHz)	1/6/2022	Annual	1/6/2023	101639
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/4/2022	Annual	3/4/2023	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	5/19/2022	Annual	5/19/2023	101299
Rohde & Schwarz	TS-PR8	Pre-Amplifier (30MHz - 8GHz)	1/6/2022	Annual	1/6/2023	102327
Rohde & Schwarz	ESW44	EMI Test Receiver	12/2/2021	Annual	12/2/2022	101570
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/11/2021	Annual	10/11/2022	161616
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/4/2021	Annual	11/4/2022	151888
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	4/18/2022	Annual	4/18/2023	100050
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	1/25/2022	Annual	1/25/2023	101063
Rohde & Schwarz	HFH2-Z2	Loop Antenna	4/3/2022	Annual	4/3/2023	100546

**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.

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## 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

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: BCG-A2774  
 FCC Classification: PCS Licensed Transmitter Worn on Body (PCT)  
 Mode(s): LTE

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

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 was Element EMC Software Tool v1.1.

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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

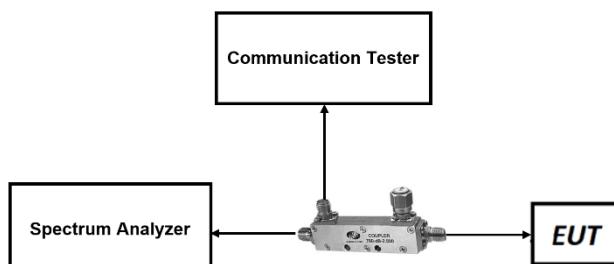
KDB 971168 D01 v03r01 – Section 4.2

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

### Test Setup

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



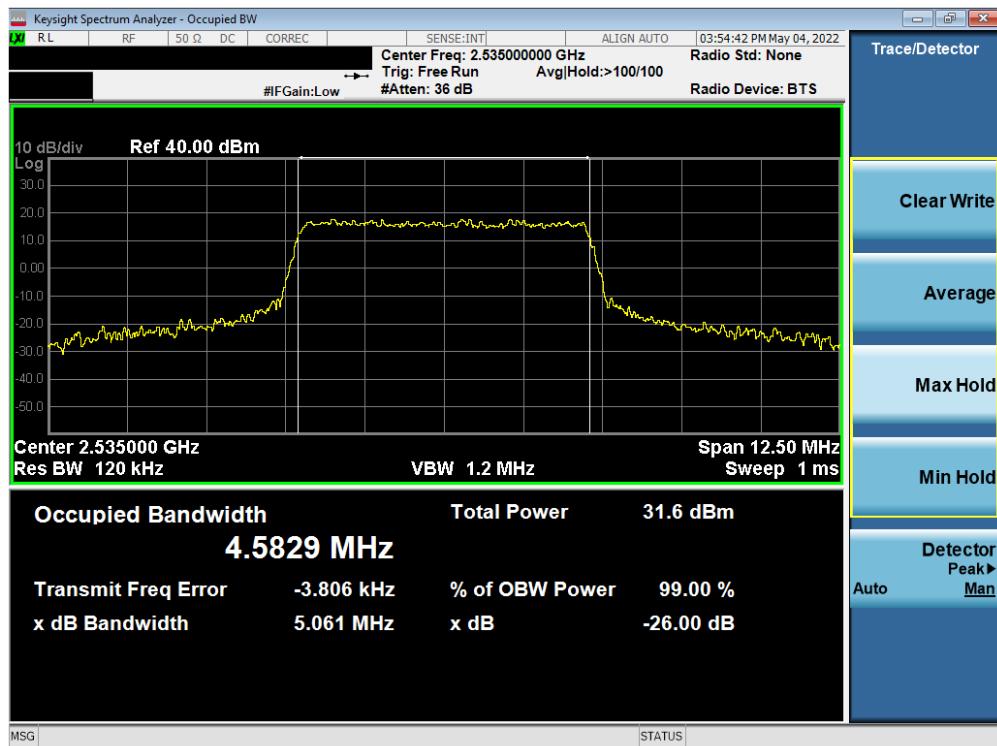
**Figure 7-1. Test Instrument & Measurement Setup**

### Test Notes

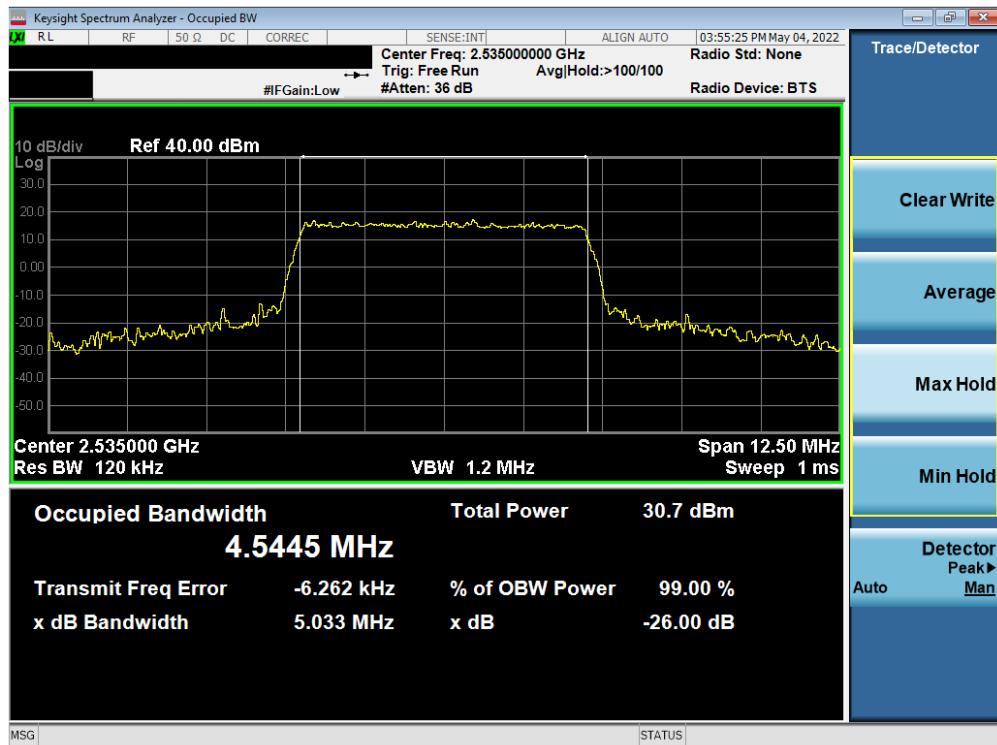
None.

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## LTE Band 7

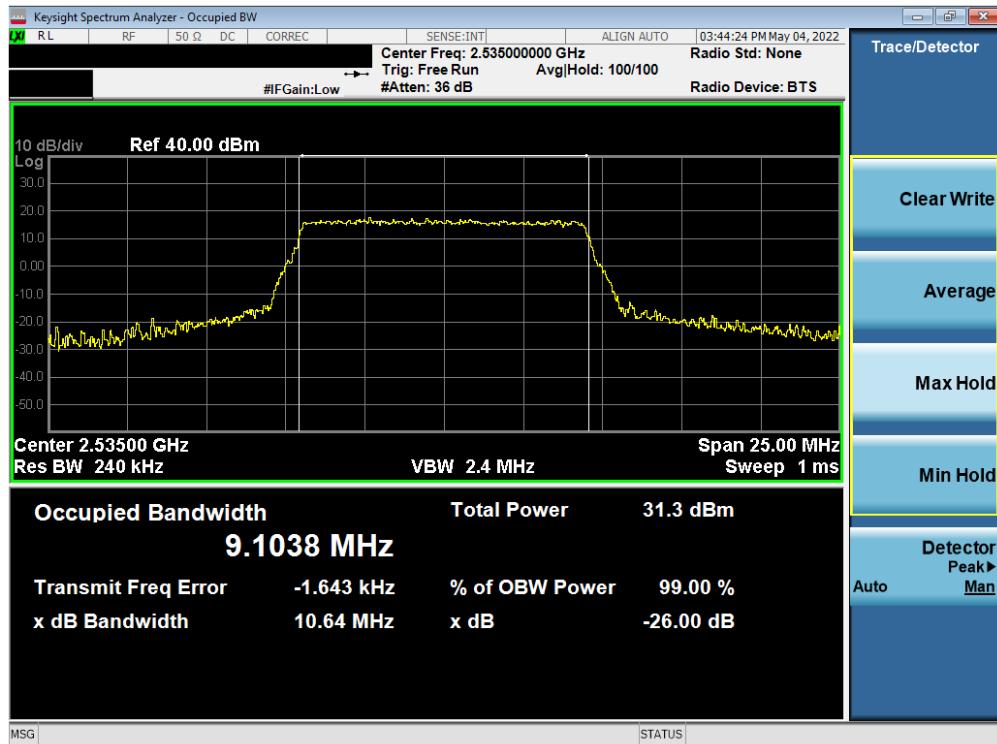


Plot 7-1. Occupied Bandwidth Plot (LTE Band 7 - 5MHz QPSK - Full RB)

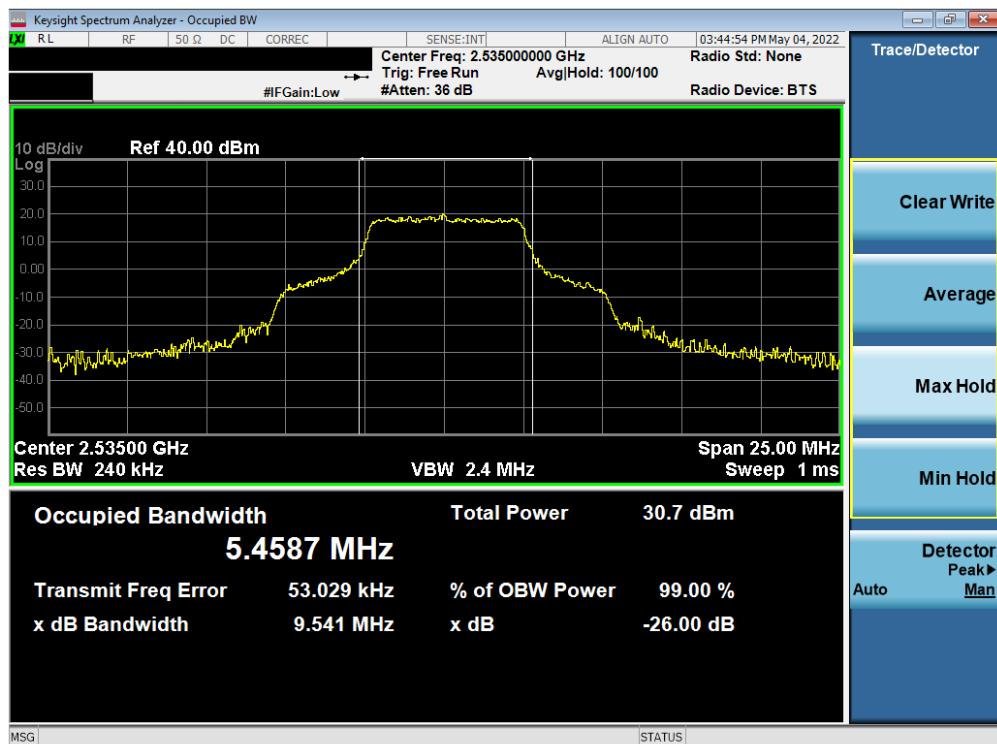


Plot 7-2. Occupied Bandwidth Plot (LTE Band 7 - 5MHz 16-QAM - Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
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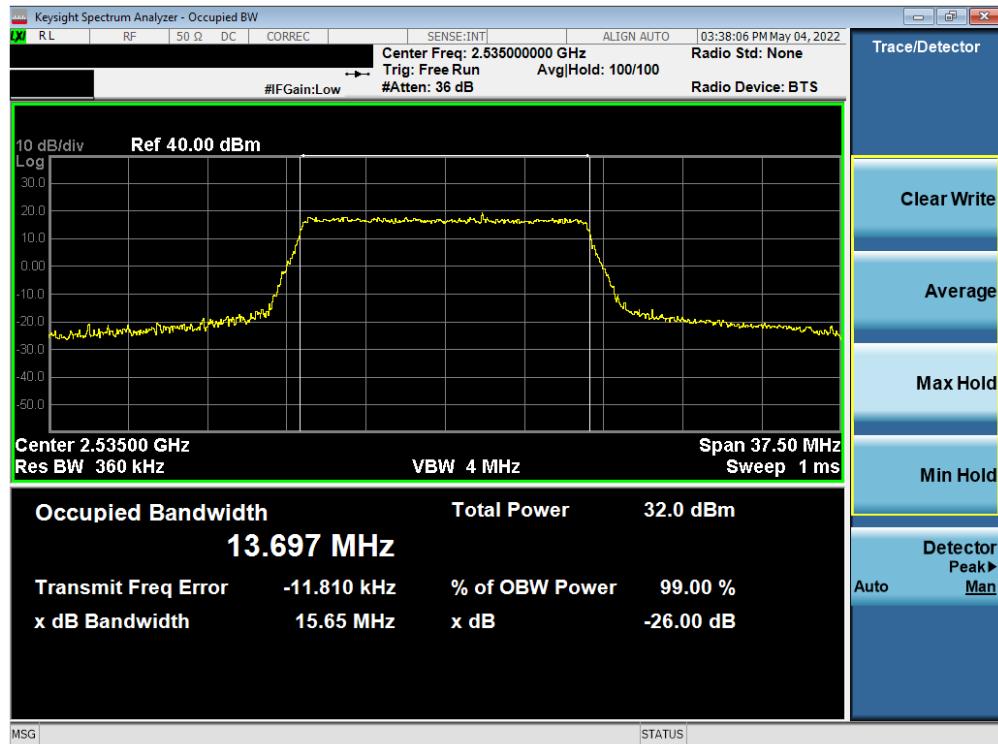


Plot 7-3. Occupied Bandwidth Plot (LTE Band 7 - 10MHz QPSK - Full RB)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 7 - 10MHz 16-QAM - Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 15 of 67	

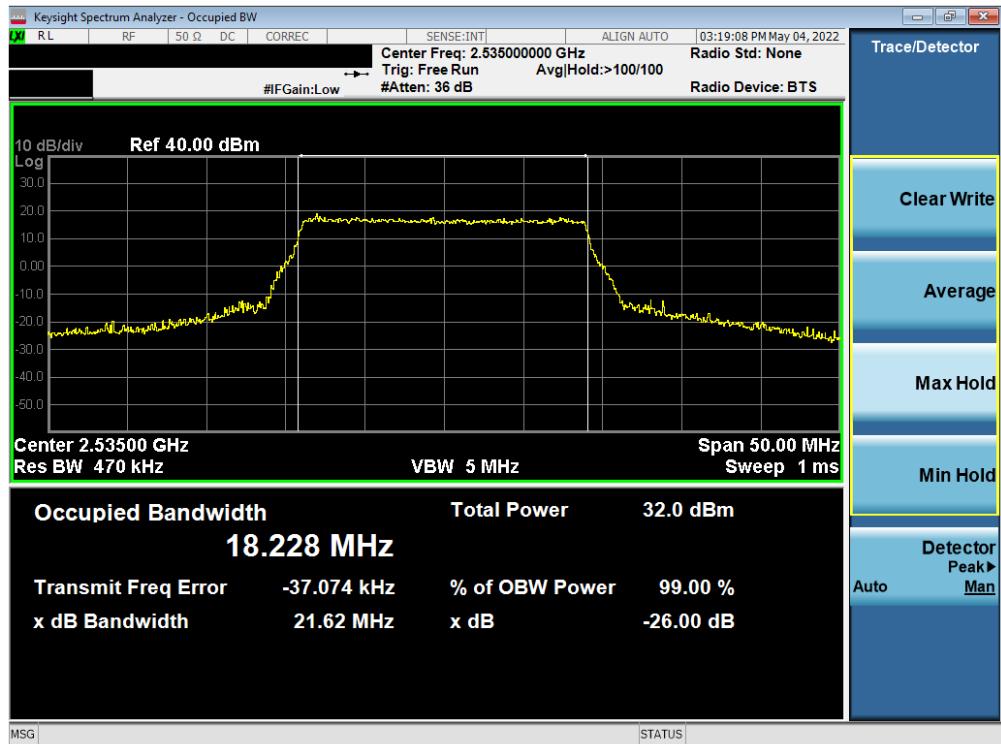


Plot 7-5. Occupied Bandwidth Plot (LTE Band 7 - 15MHz QPSK - Full RB)

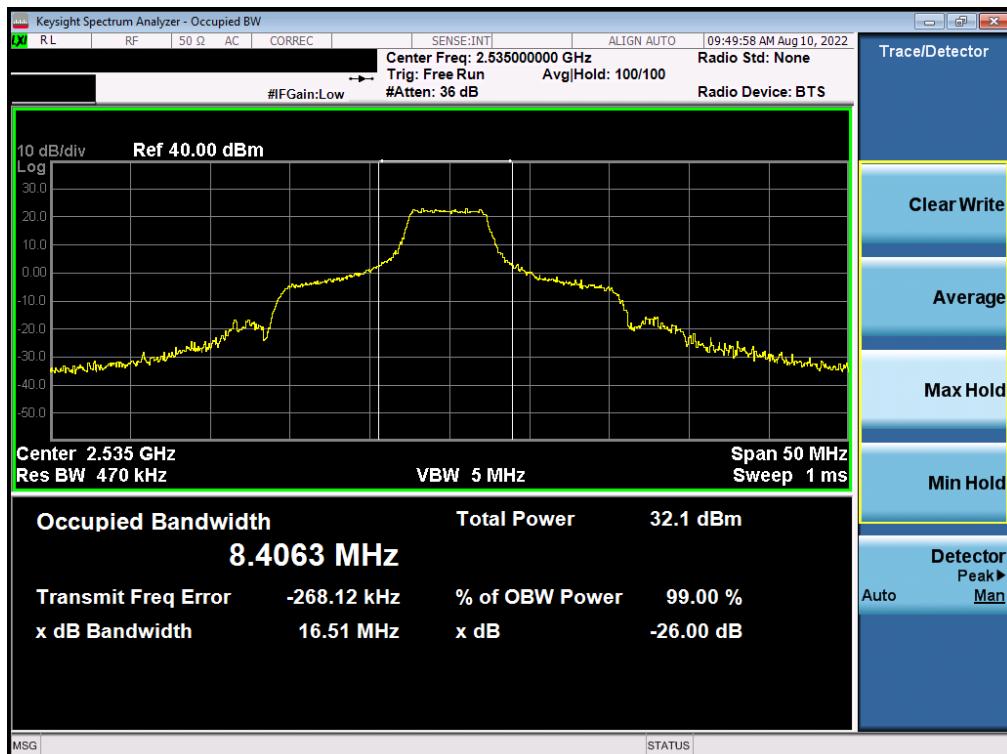


Plot 7-6. Occupied Bandwidth Plot (LTE Band 7 - 15MHz 16-QAM - Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 16 of 67	



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



Plot 7-8. Occupied Bandwidth Plot (LTE Band 7 - 20MHz 16-QAM - Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 17 of 67

## LTE Band 41

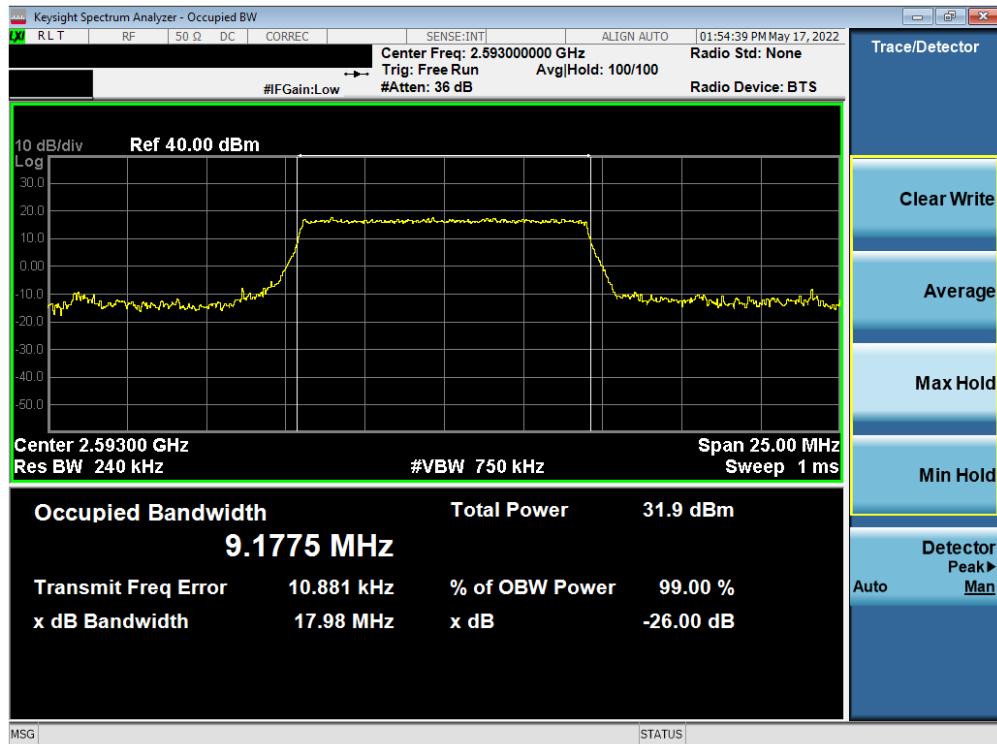


Plot 7-9. Occupied Bandwidth Plot (LTE Band 41 - 5MHz QPSK - Full RB)

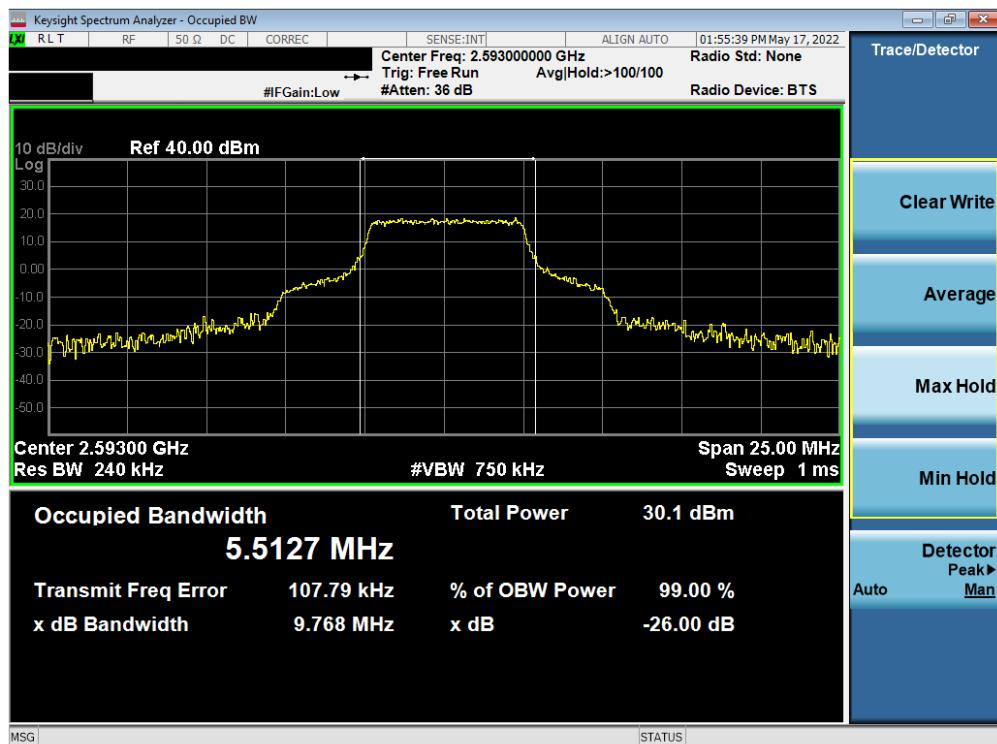


Plot 7-10. Occupied Bandwidth Plot (LTE Band 41 - 5MHz 16-QAM - Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 18 of 67

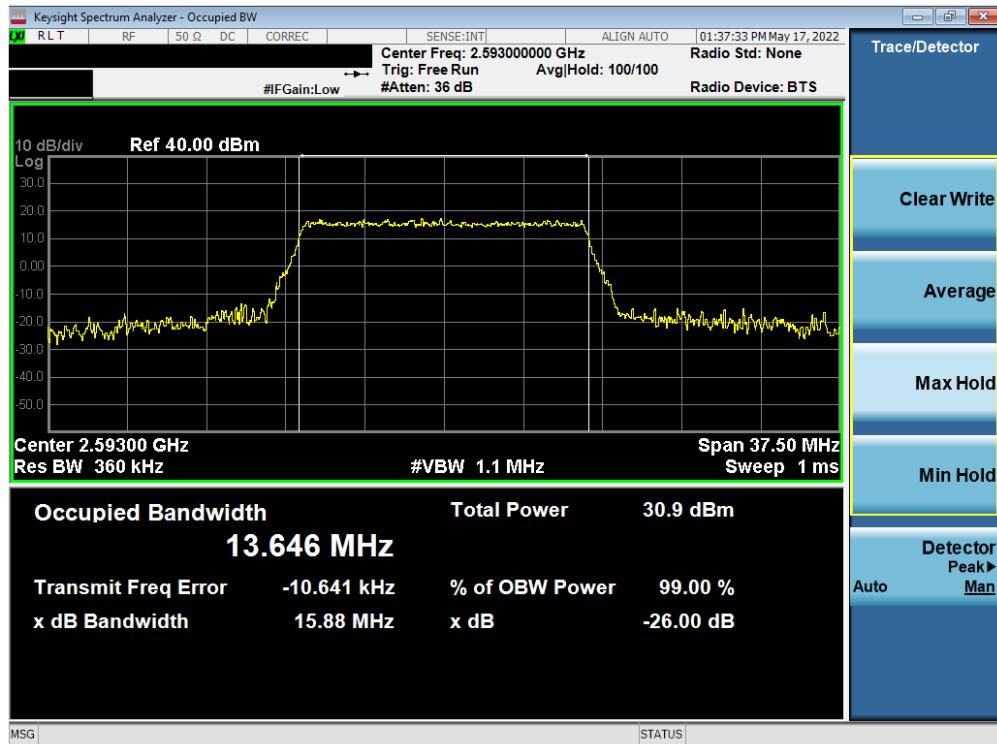


Plot 7-11. Occupied Bandwidth Plot (LTE Band 41 - 10MHz QPSK - Full RB)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 41 - 10MHz 16-QAM - Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 19 of 67	

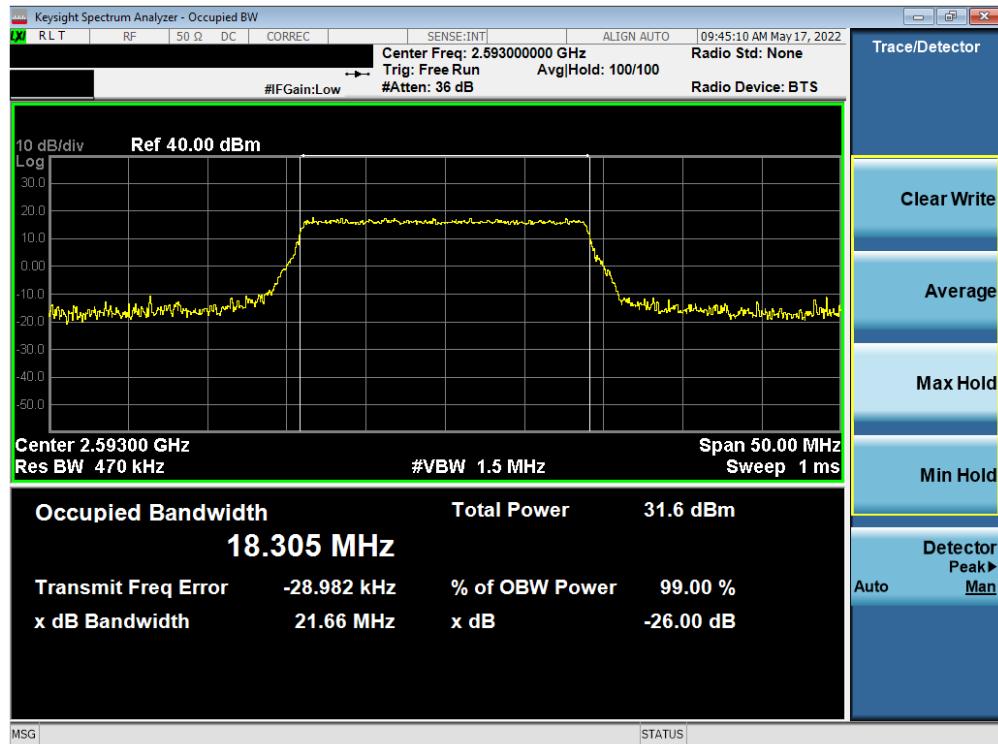


Plot 7-13. Occupied Bandwidth Plot (LTE Band 41 - 15MHz QPSK - Full RB)



Plot 7-14. Occupied Bandwidth Plot (LTE Band 41 - 15MHz 16-QAM - Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 20 of 67	



Plot 7-15. Occupied Bandwidth Plot (LTE Band 41 - 20MHz QPSK - Full RB)



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

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 21 of 67	

## 7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051, §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 10<sup>th</sup> 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 LTE Bands 7 and 41, the minimum permissible attenuation level of any spurious emission is  $55 + 10\log_{10}(P_{\text{Watts}})$ .**

### Test Procedure Used

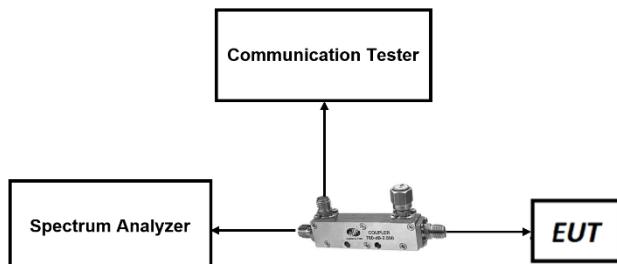
KDB 971168 D01 v03r01 – Section 6.0

### 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**

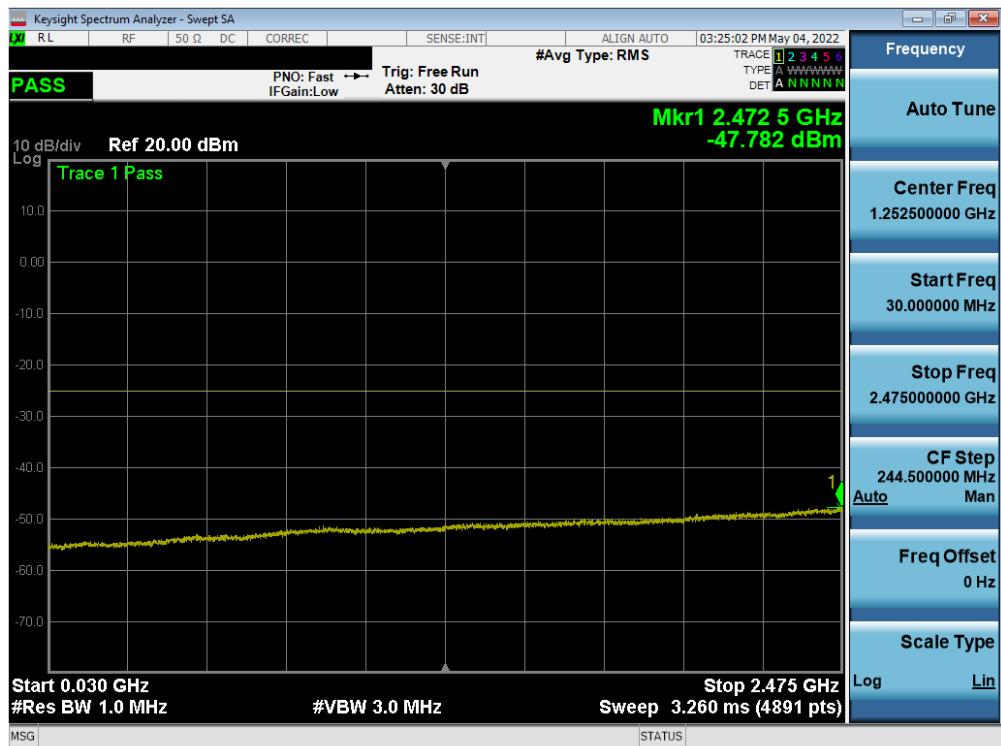
FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 22 of 67

**Test Notes**

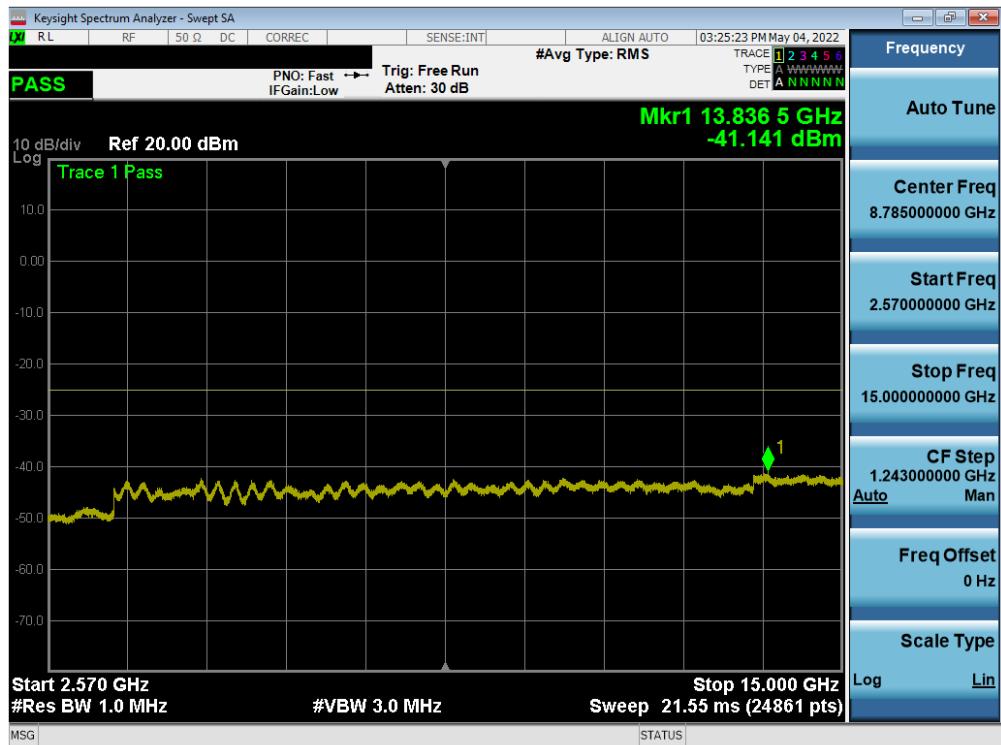
1. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent 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.

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 23 of 67

## LTE Band 7



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



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

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 24 of 67

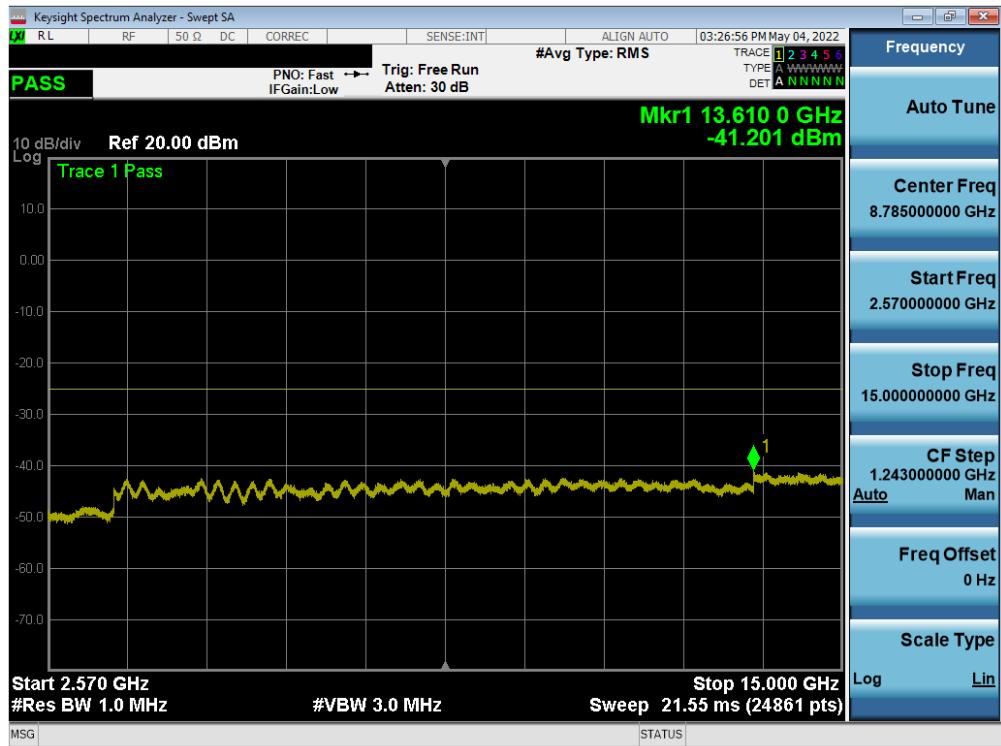


Plot 7-19. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

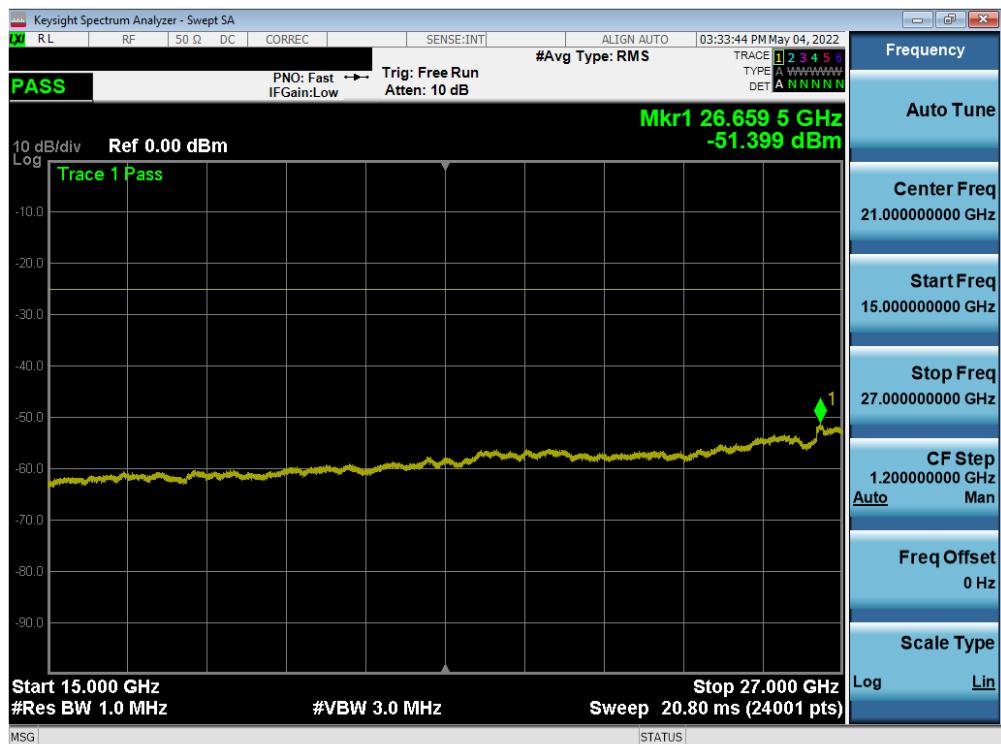


Plot 7-20. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 25 of 67

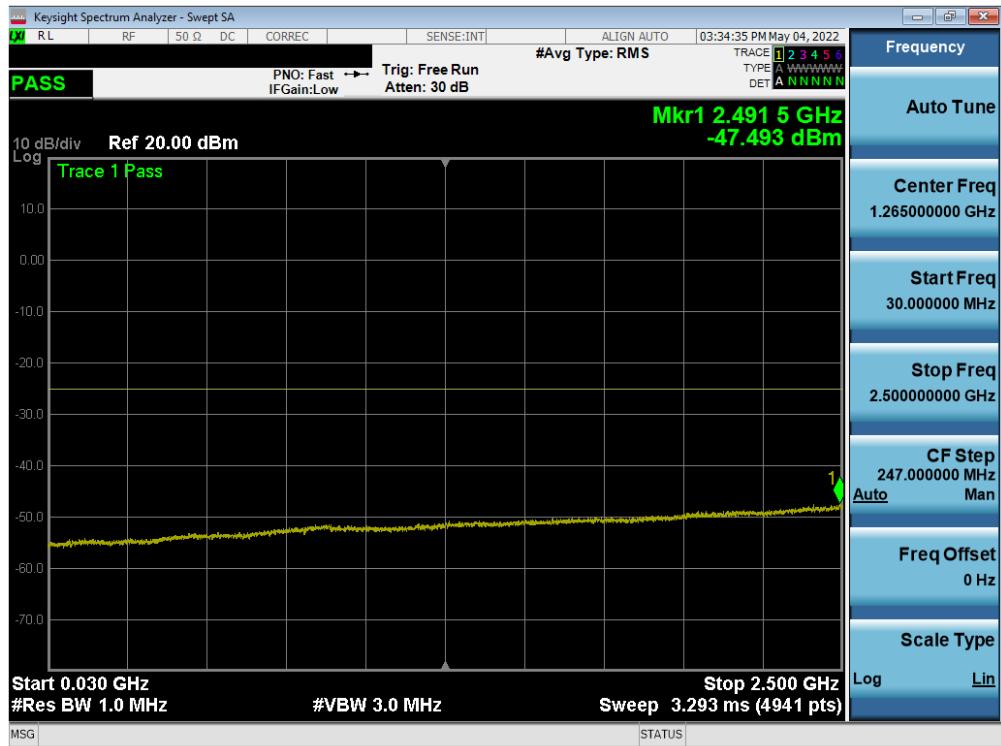


Plot 7-21. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

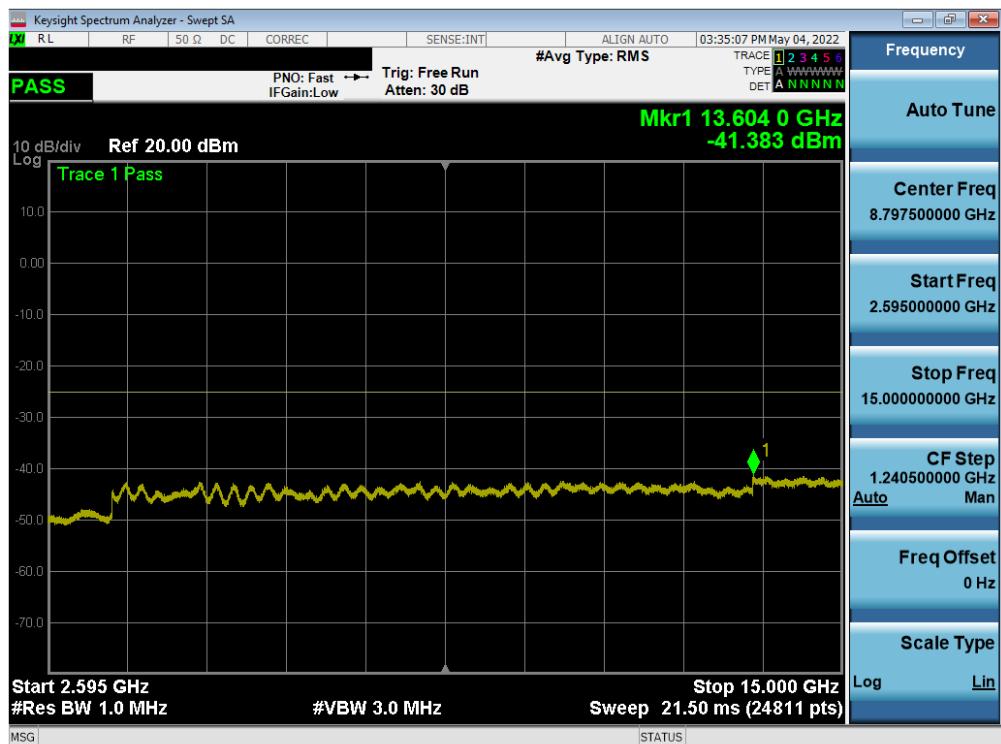


Plot 7-22. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 26 of 67



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



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

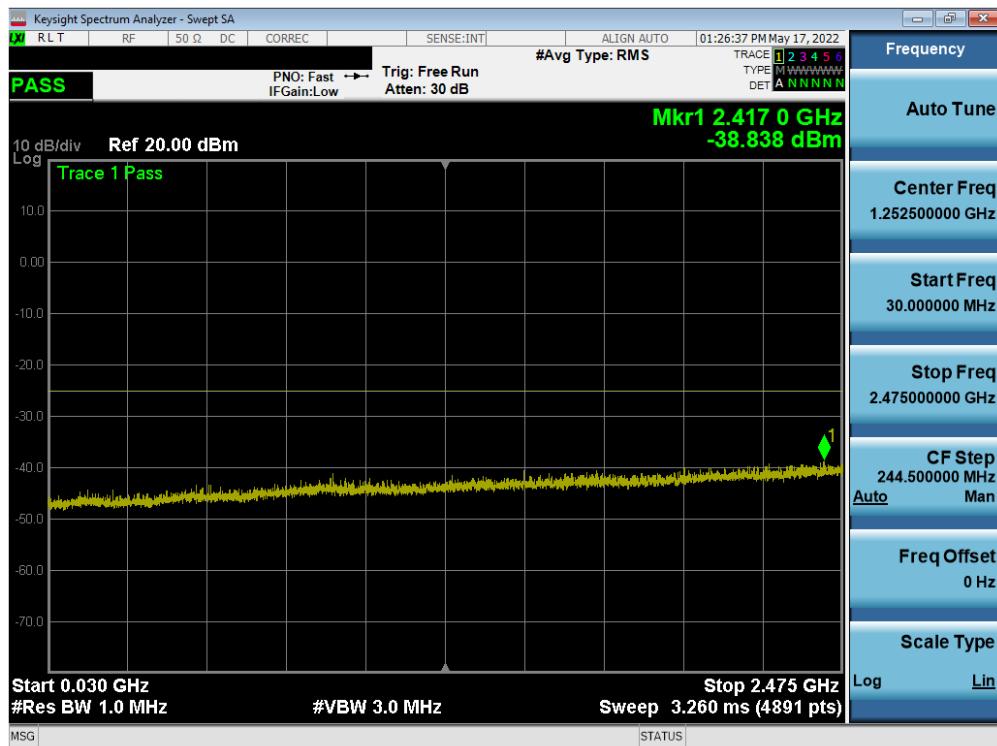
FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 27 of 67



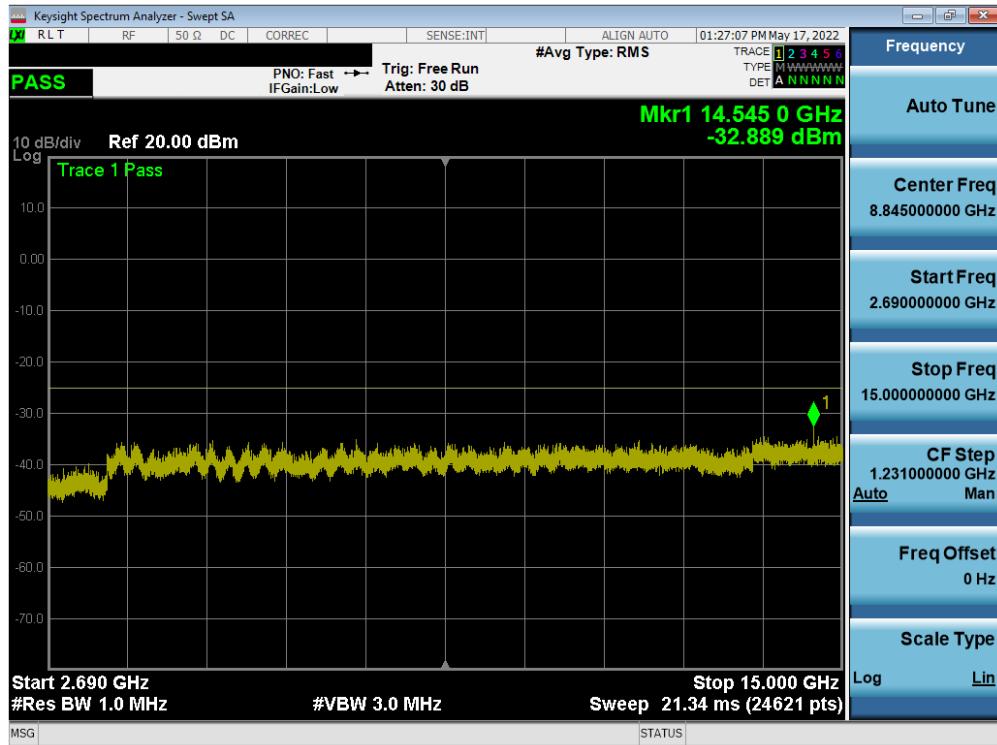
Plot 7-25. Conducted Spurious Plot (LTE Band 7 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2774	PART 27 MEASUREMENT REPORT			Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 28 of 67

## LTE Band 41

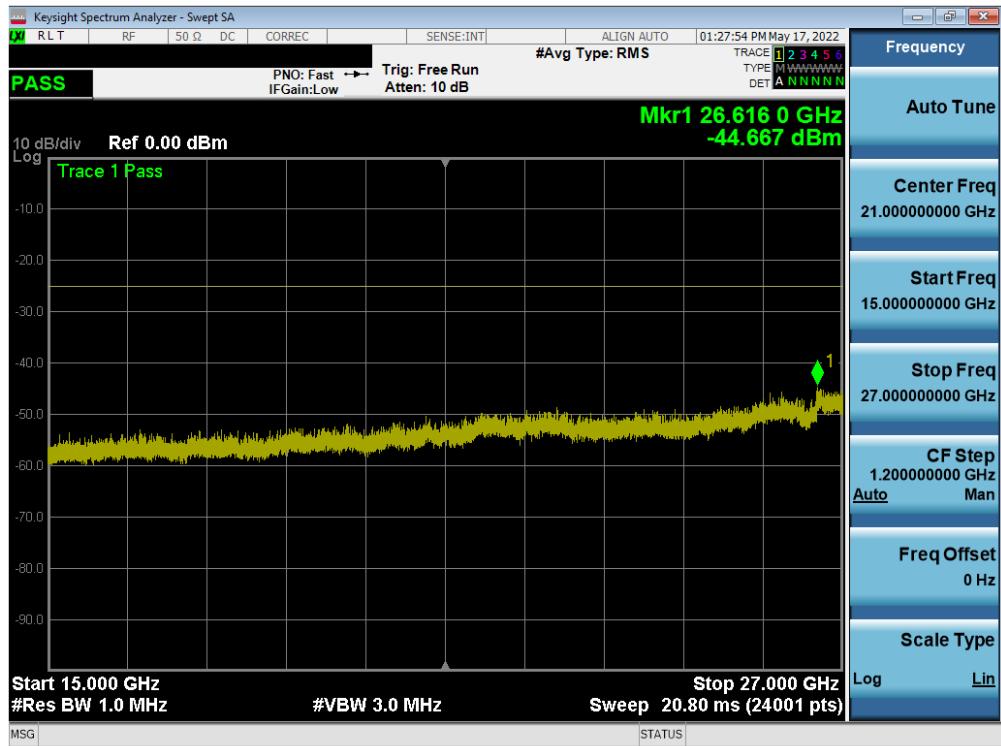


Plot 7-26. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

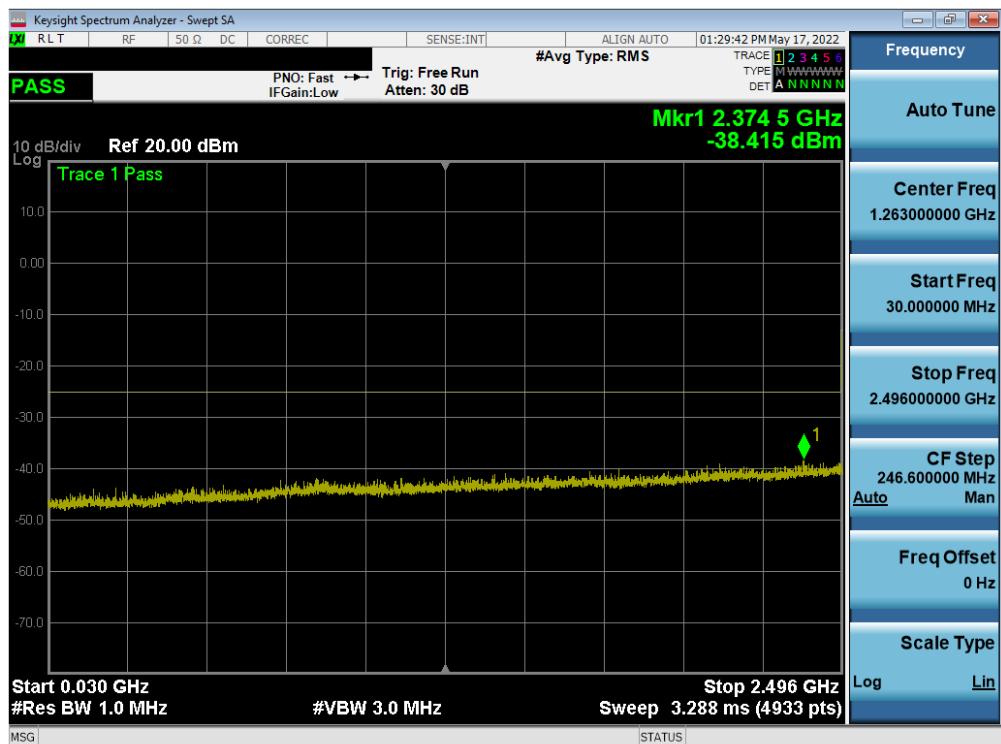


Plot 7-27. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 29 of 67

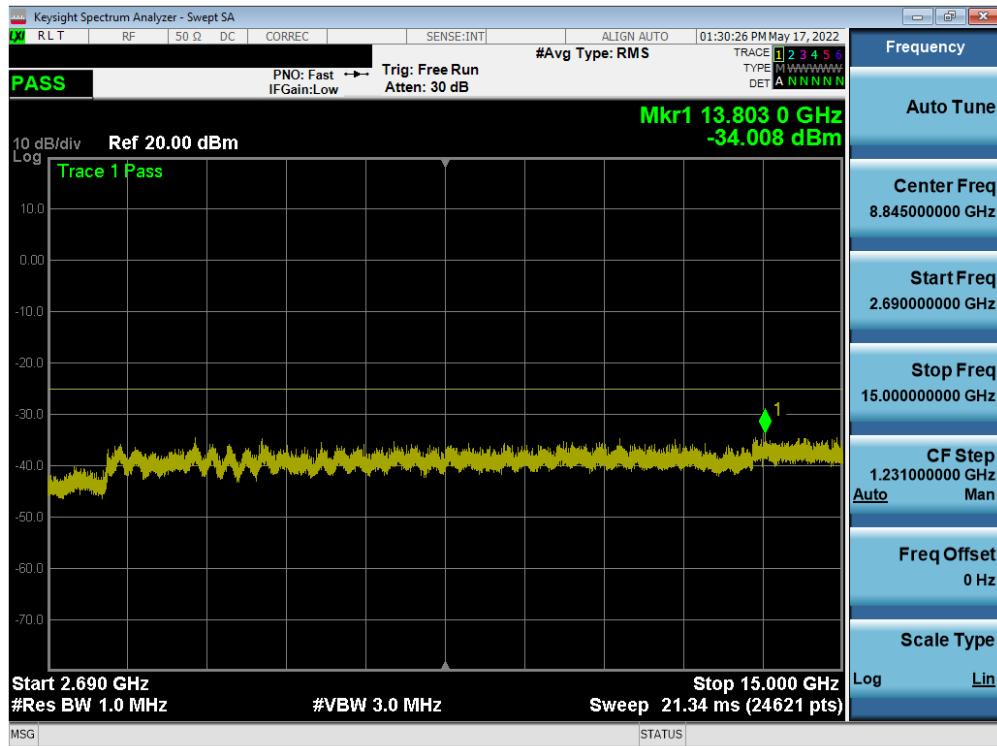


Plot 7-28. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

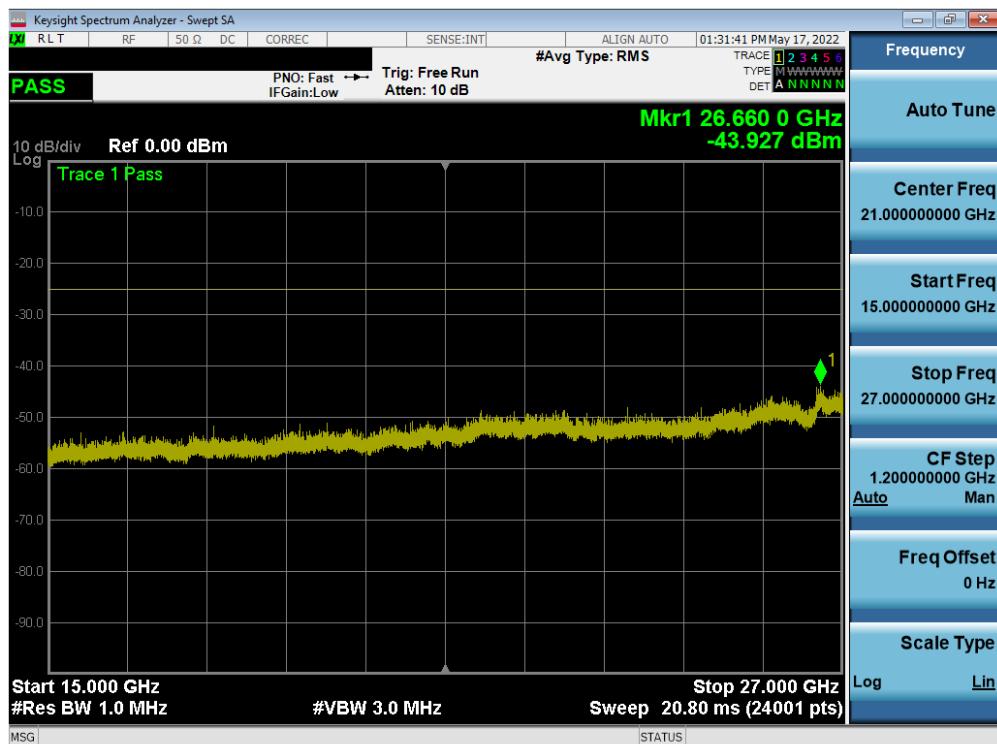


Plot 7-29. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 30 of 67

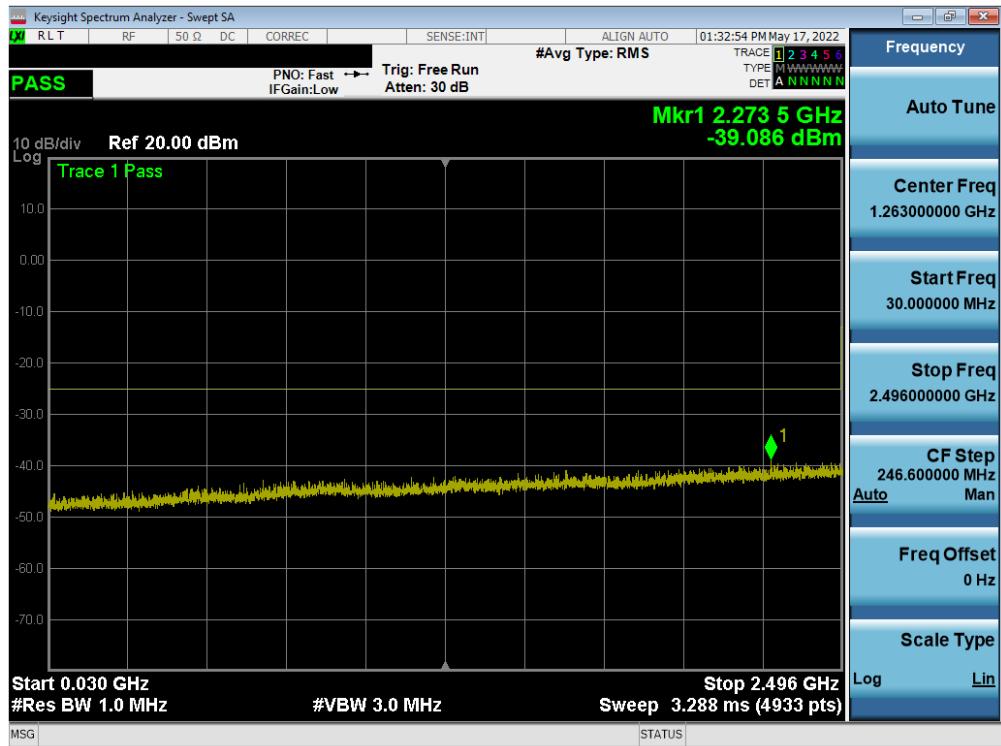


Plot 7-30. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

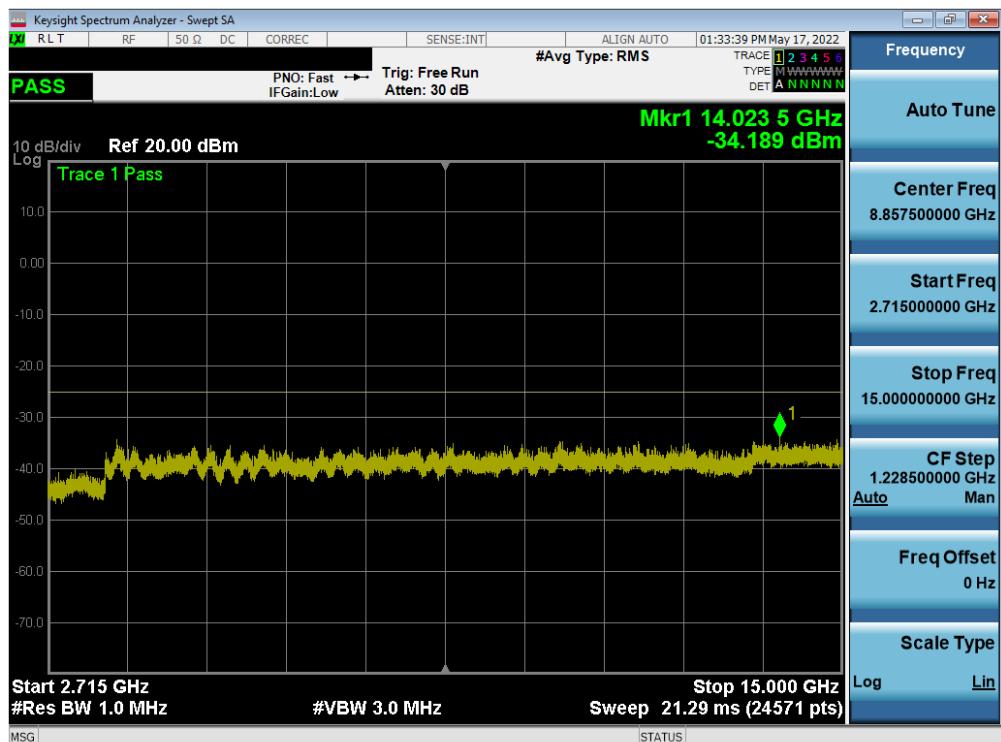


Plot 7-31. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 31 of 67	

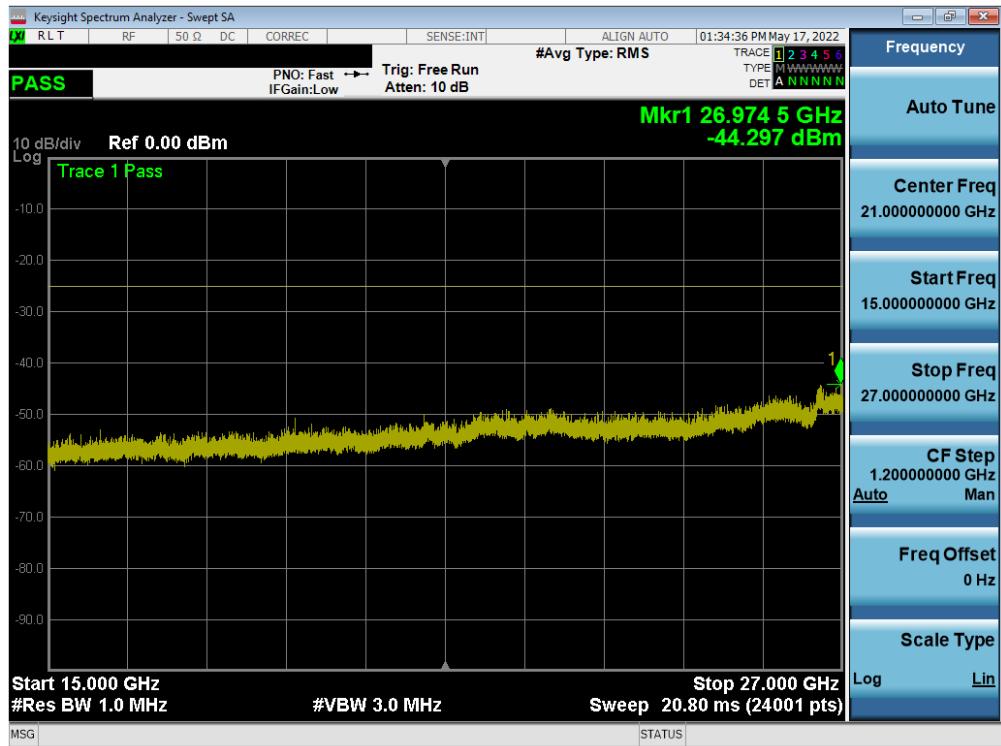


Plot 7-32. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-33. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 32 of 67	



Plot 7-34. Conducted Spurious Plot (LTE Band 41 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: BCG-A2774	PART 27 MEASUREMENT REPORT			Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 33 of 67

## 7.4 Band Edge Emissions at Antenna Terminal

§2.1051, §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.

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

### Test Procedure Used

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### 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.

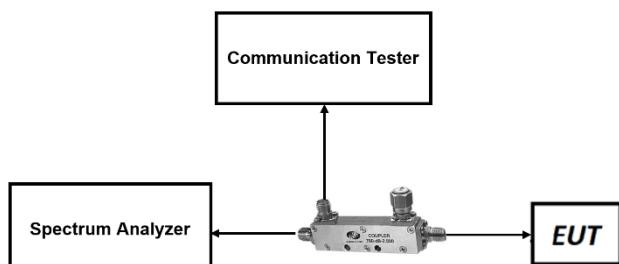


Figure 7-3. Test Instrument & Measurement Setup

FCC ID: BCG-A2774	element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 34 of 67

## 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(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: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 35 of 67

## LTE Band 7

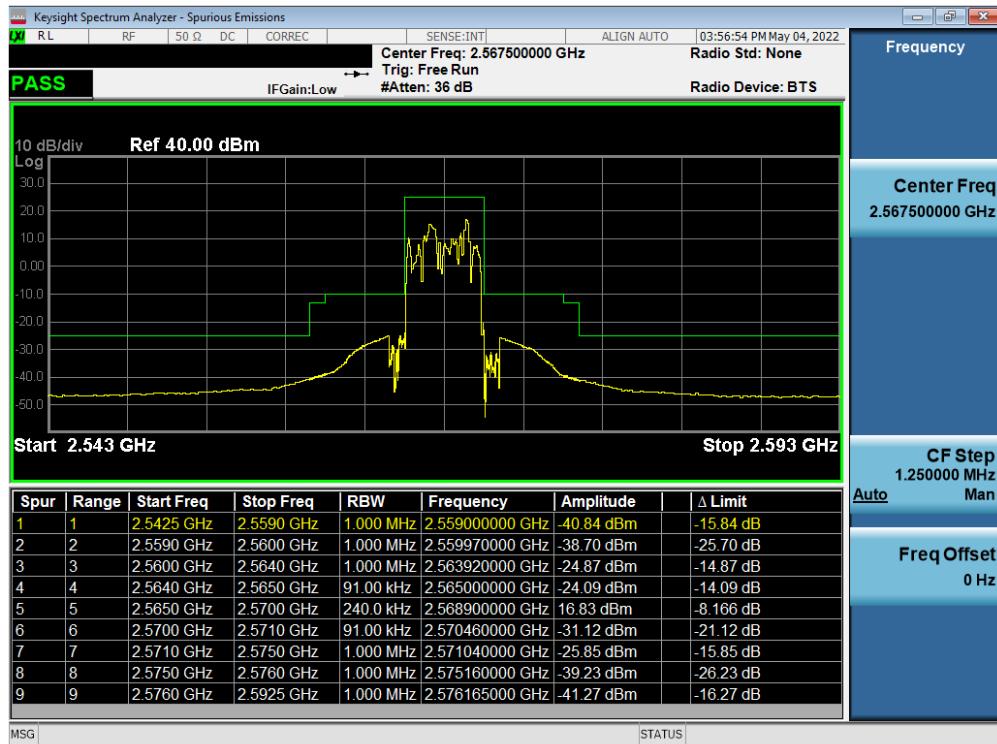


Plot 7-35. Lower ACP Plot (LTE Band 7 - 5MHz QPSK – Full RB)



Plot 7-36. Middle ACP Plot (LTE Band 7 - 5MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 36 of 67



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

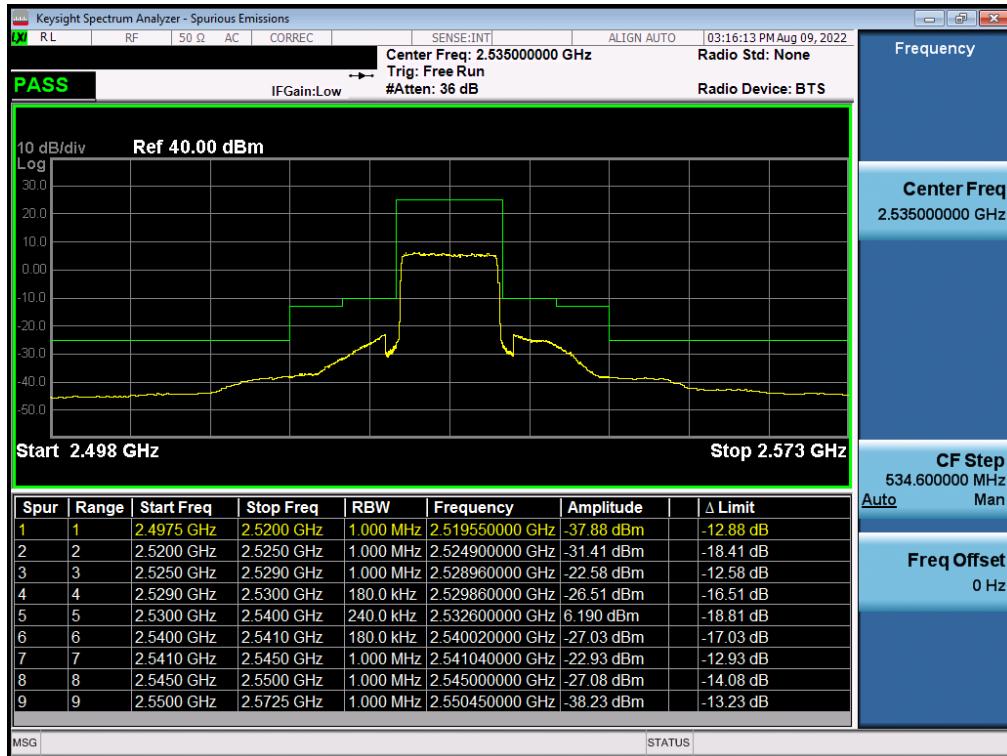


Plot 7-38. Lower ACP Plot (LTE Band 7 - 10MHz QPSK – Full RB)

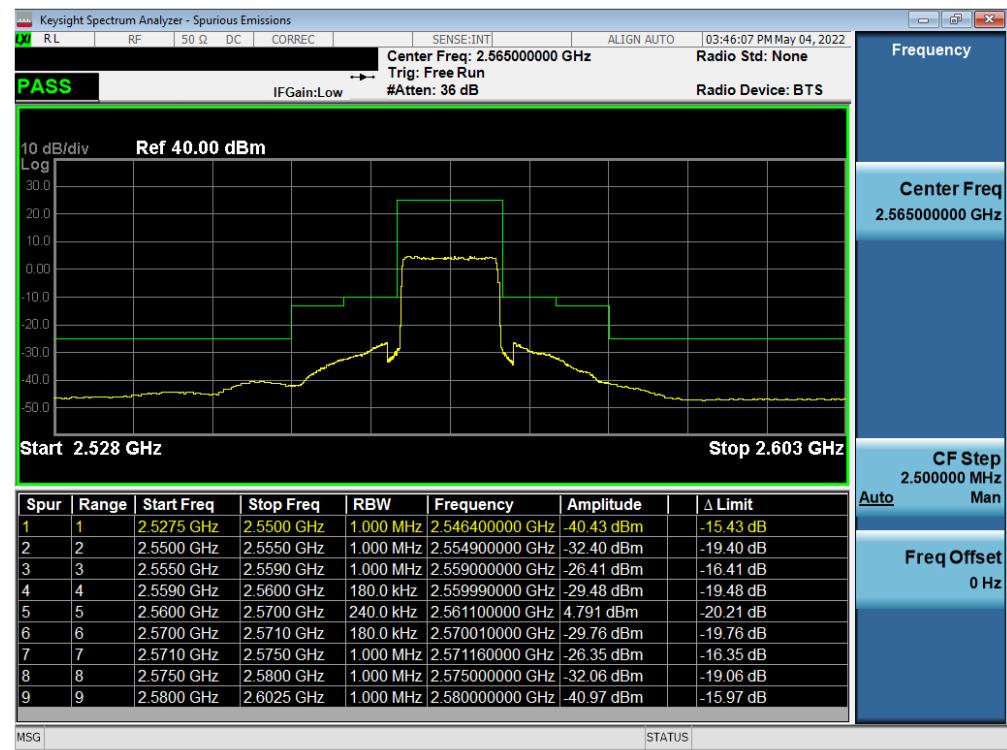
FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT			Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch			

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Plot 7-39. Middle ACP Plot (LTE Band 7 - 10MHz QPSK – Full RB)

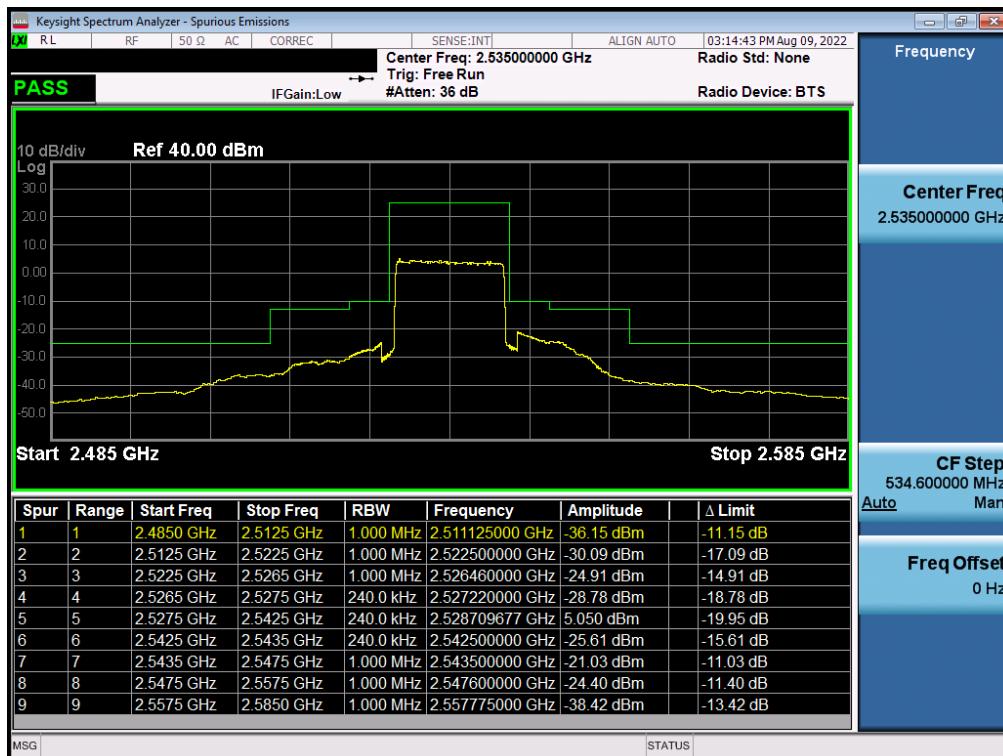


Plot 7-40. Upper ACP Plot (LTE Band 7 - 10MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 38 of 67	



Plot 7-41. Lower ACP Plot (LTE Band 7 - 15MHz QPSK – Full RB)

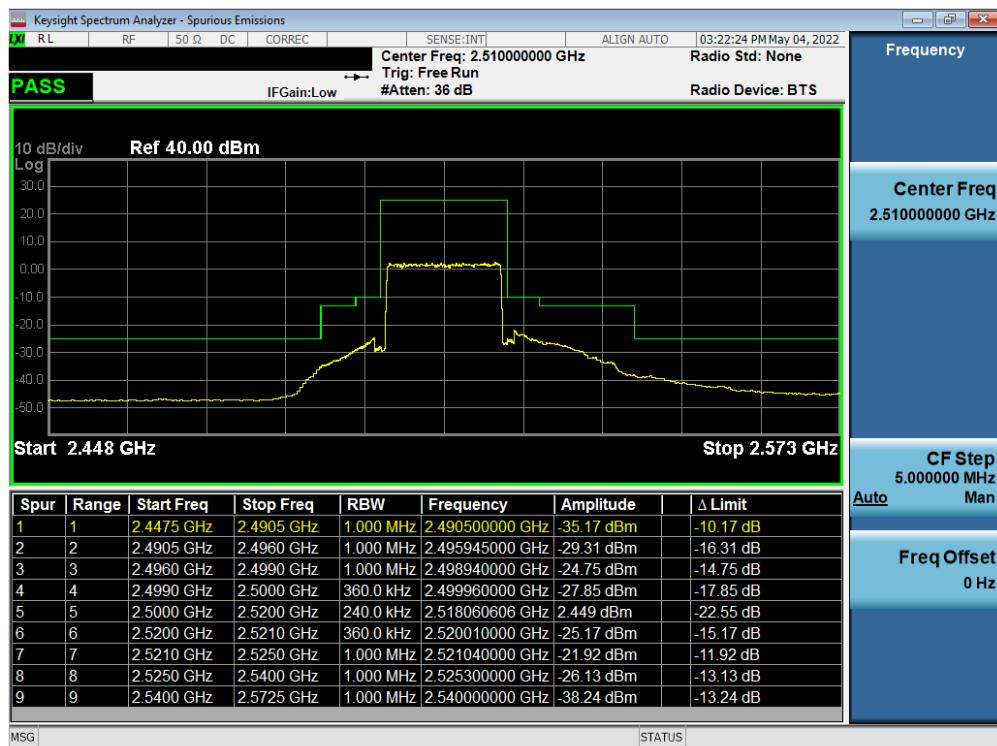


Plot 7-42. Middle ACP Plot (LTE Band 7 - 15MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 39 of 67	

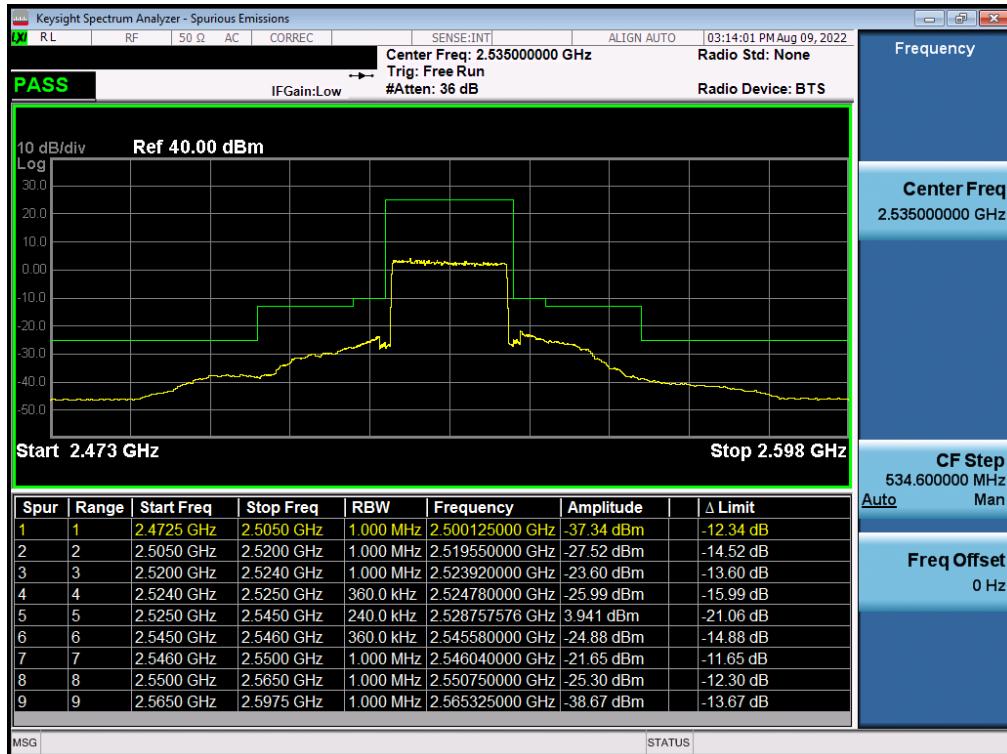


Plot 7-43. Upper ACP Plot (LTE Band 7 - 15MHz QPSK – Full RB)



Plot 7-44. Lower ACP Plot (LTE Band 7 - 20MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 40 of 67



Plot 7-45. Middle ACP Plot (LTE Band 7 - 20MHz QPSK – Full RB)



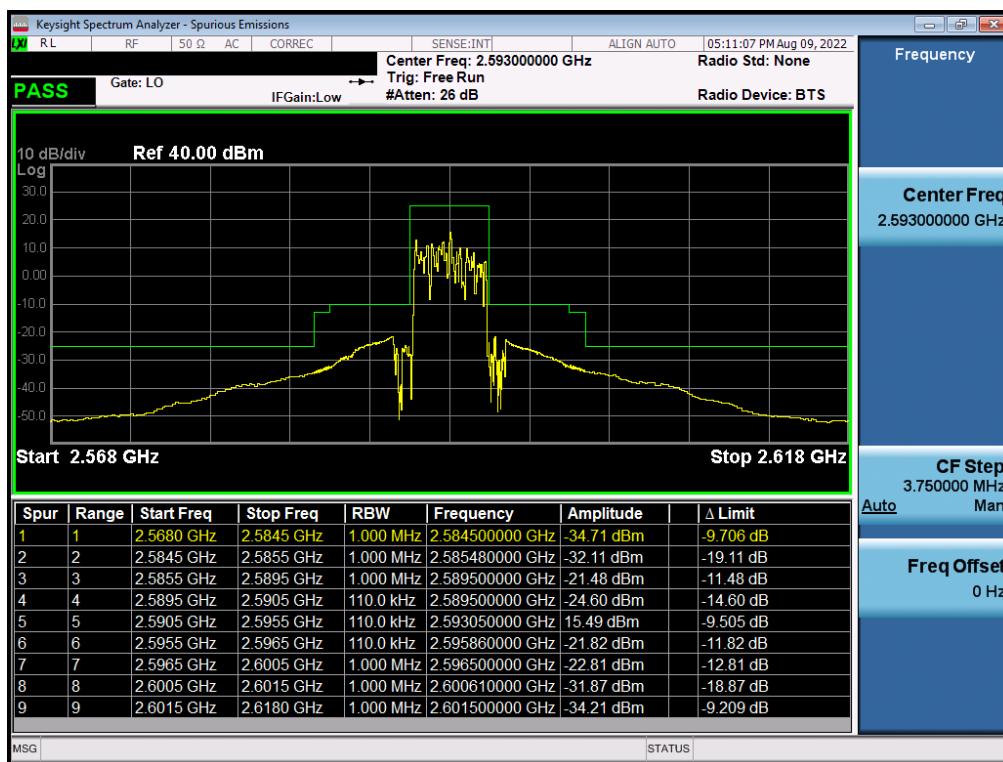
Plot 7-46. Upper ACP Plot (LTE Band 7 - 20MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 41 of 67

## LTE Band 41

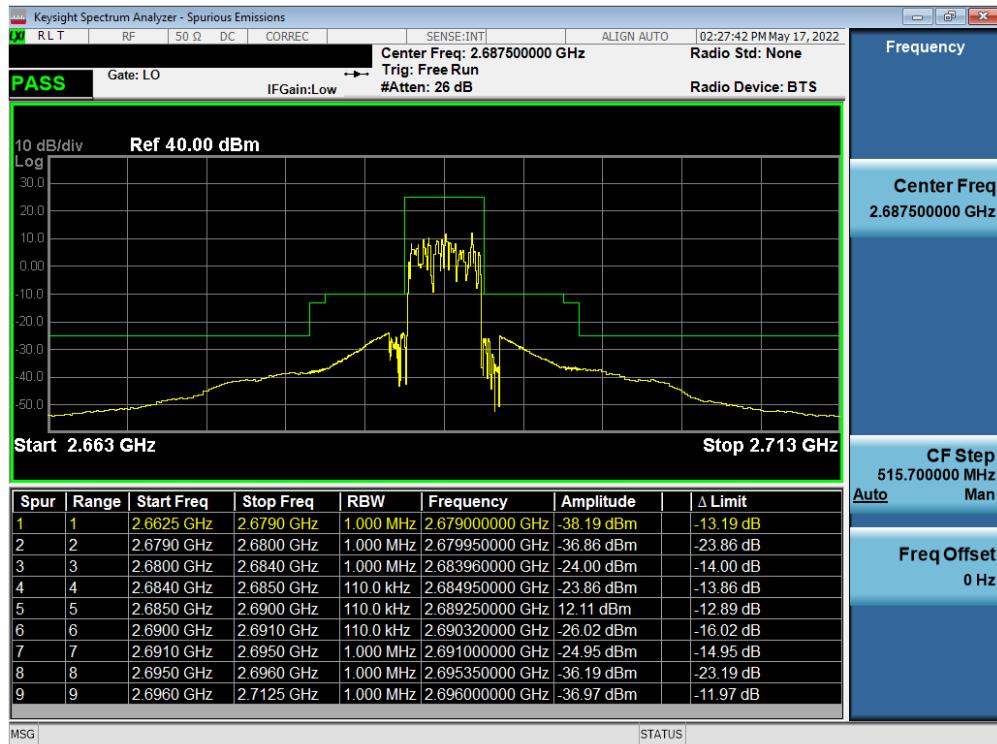


Plot 7-47. Lower ACP Plot (LTE Band 41 - 5MHz QPSK – Full RB)



Plot 7-48. Middle ACP Plot (LTE Band 41 - 5MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 42 of 67

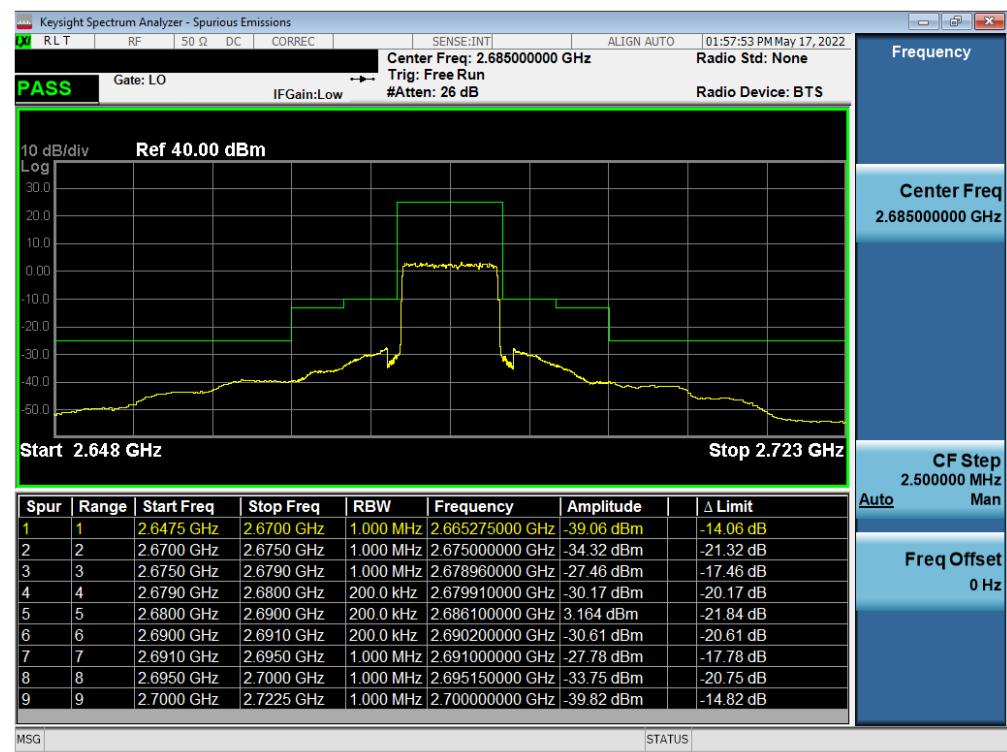
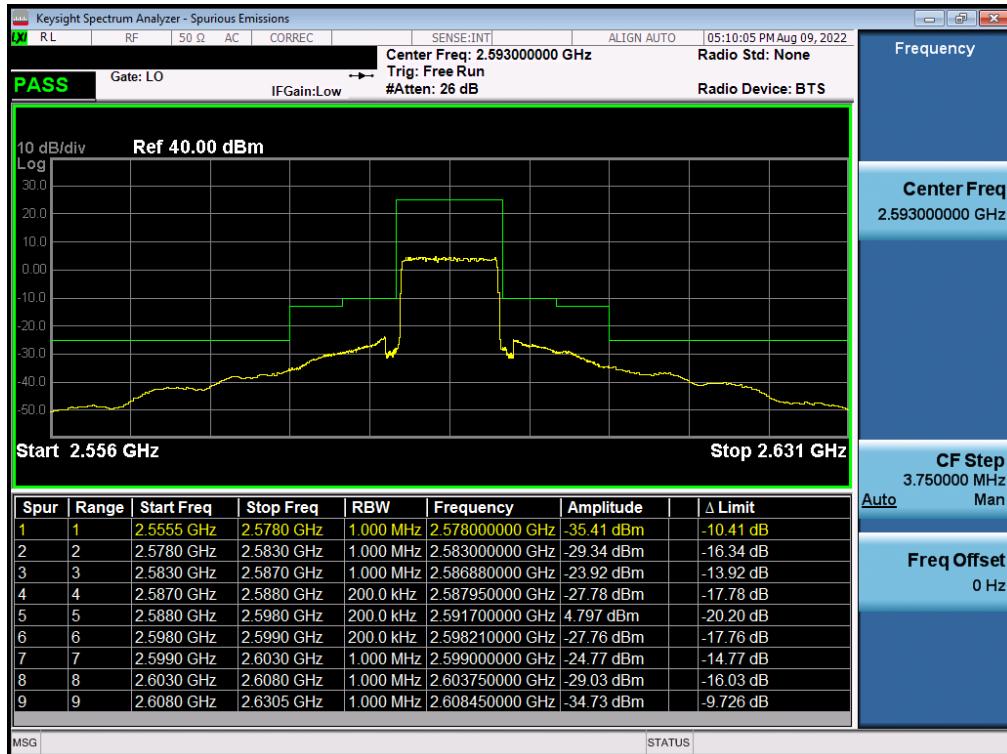


Plot 7-49. Upper ACP Plot (LTE Band 41 - 5MHz QPSK – Full RB)



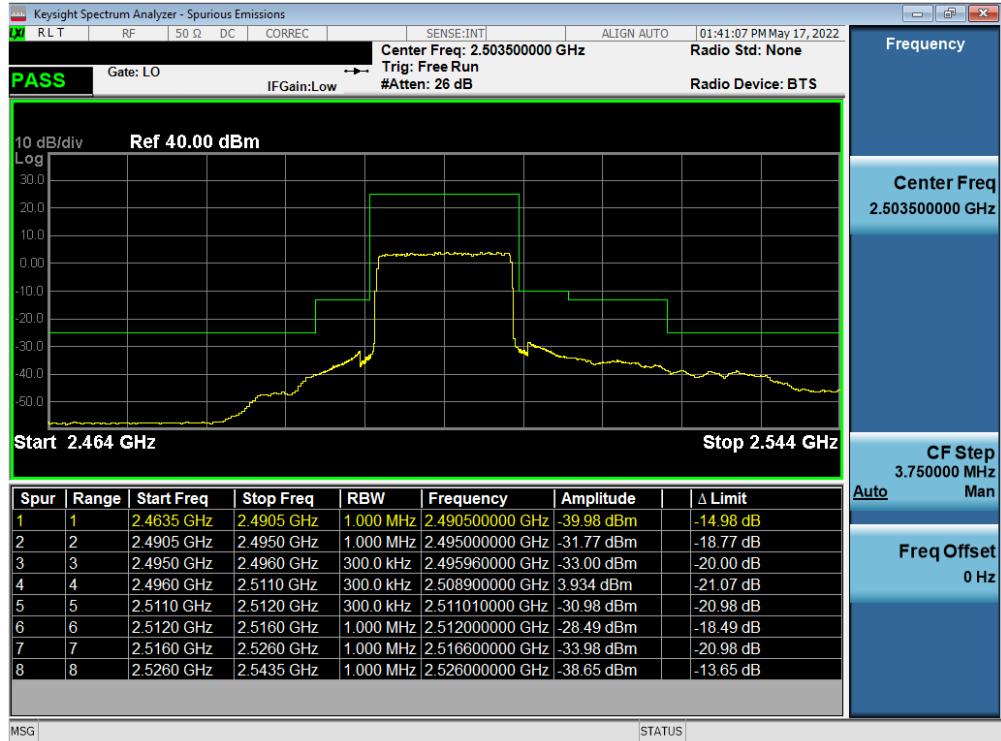
Plot 7-50. Lower ACP Plot (LTE Band 41 - 10MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT			Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch			

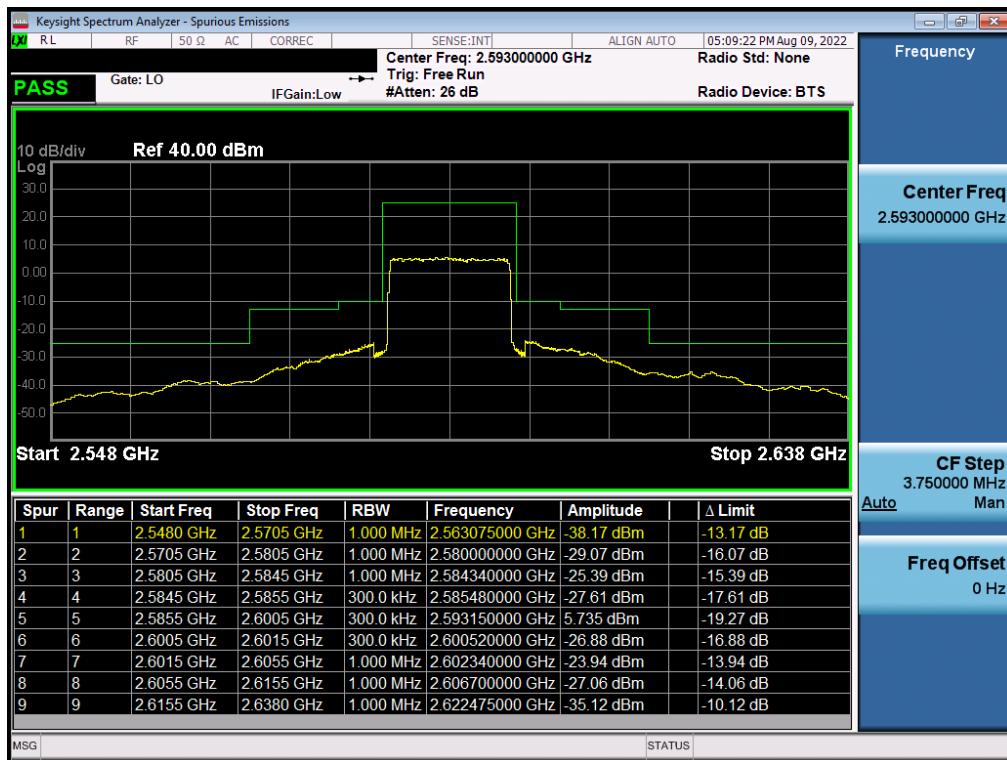


Plot 7-52. Upper ACP Plot (LTE Band 41 - 10MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 44 of 67	



Plot 7-53. Lower ACP Plot (LTE Band 41 - 15MHz QPSK – Full RB)



Plot 7-54. Middle ACP Plot (LTE Band 41 - 15MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 45 of 67

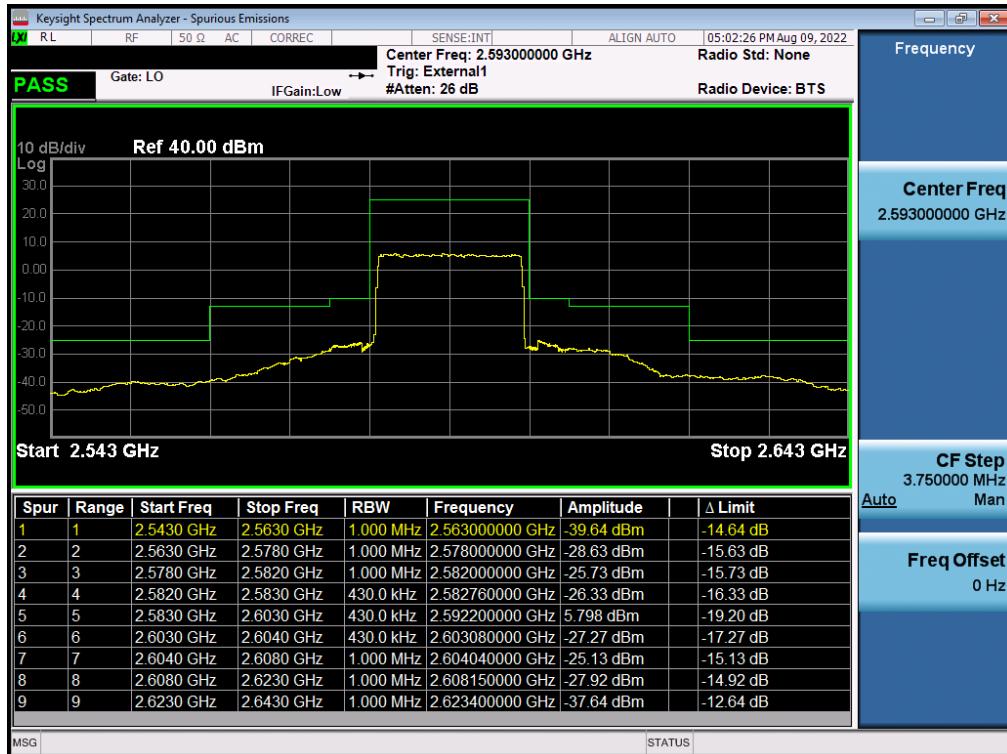


Plot 7-55. Upper ACP Plot (LTE Band 41 - 15MHz QPSK – Full RB)



Plot 7-56. Lower ACP Plot (LTE Band 41 - 20MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 46 of 67



Plot 7-57. Middle ACP Plot (LTE Band 41 - 20MHz QPSK – Full RB)



Plot 7-58. Upper ACP Plot (LTE Band 41 - 20MHz QPSK – Full RB)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 47 of 67

## 7.5 Radiated Power (EIRP)

§27.50(a)(3), §27.50(h)(2)

### Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are calculated by adding highest antenna gain to maximum measured conducted output power. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

### Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI C63.26-2015 – Section 5.2.5.5

### Test Settings

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

$$\text{EIRP} = \text{PMes} - \text{LC} + \text{GT}$$

Where:

EIRP = Equivalent Isotropic Radiated Power (expressed in the same units as PMes, typically dBW or dBm)

PMes = 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 dBi (EIRP)

### Test Setup

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

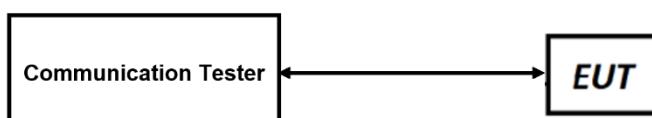


Figure 7-4. EIRP Measurement Setup

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 48 of 67

## 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.

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 49 of 67

## LTE Band 7

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
5 MHz	QPSK	2502.5	-6.70	1 / 0	23.79	<b>17.09</b>	51.168	33.01	-15.92
		2535.0	-6.70	1 / 12	23.11	16.41	43.752	33.01	-16.60
		2567.5	-6.70	1 / 24	23.41	16.71	46.881	33.01	-16.30
	16-QAM	2502.5	-6.70	1 / 0	23.23	<b>16.53</b>	44.978	33.01	-16.48
10 MHz	QPSK	2505.0	-6.70	1 / 25	23.87	<b>17.17</b>	52.119	33.01	-15.84
		2535.0	-6.70	1 / 25	23.21	16.51	44.771	33.01	-16.50
		2565.0	-6.70	1 / 49	23.23	16.53	44.978	33.01	-16.48
	16-QAM	2505.0	-6.70	1 / 25	23.06	16.36	43.251	33.01	-16.65
15 MHz	QPSK	2507.5	-6.70	1 / 37	23.74	<b>17.04</b>	50.582	33.01	-15.97
		2535.0	-6.70	1 / 37	23.24	16.54	45.082	33.01	-16.47
		2562.5	-6.70	1 / 74	23.15	16.45	44.157	33.01	-16.56
	16-QAM	2507.5	-6.70	1 / 37	23.11	16.41	43.752	33.01	-16.60
20 MHz	QPSK	2510.0	-6.70	1 / 50	23.86	<b>17.16</b>	52.000	33.01	-15.85
		2535.0	-6.70	1 / 50	23.39	16.69	46.666	33.01	-16.32
		2560.0	-6.70	1 / 99	23.21	16.51	44.771	33.01	-16.50
	16-QAM	2510.0	-6.70	1 / 50	23.02	16.32	42.855	33.01	-16.69

Table 7-2. Antenna FCM EIRP Data (LTE Band 7)

## LTE Band 41

Bandwidth	Mod.	Frequency [MHz]	Ant. Gain [dBi]	RB Size/Offset	Conducted Power [dBm]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
5 MHz	QPSK	2498.5	-6.70	1 / 0	23.96	<b>17.26</b>	53.211	33.01	-15.75
		2593.0	-6.70	1 / 24	23.37	16.67	46.452	33.01	-16.34
		2687.5	-6.70	1 / 0	23.66	16.96	49.659	33.01	-16.05
	16-QAM	2687.5	-6.70	1 / 24	22.80	<b>16.10</b>	40.738	33.01	-16.91
10 MHz	QPSK	2501.0	-6.70	1 / 0	23.85	17.15	51.880	33.01	-15.86
		2593.0	-6.70	1 / 0	23.32	16.62	45.920	33.01	-16.39
		2685.0	-6.70	1 / 49	23.90	<b>17.20</b>	52.481	33.01	-15.81
	16-QAM	2685.0	-6.70	1 / 49	22.89	16.19	41.591	33.01	-16.82
15 MHz	QPSK	2503.5	-6.70	1 / 0	23.77	17.07	50.933	33.01	-15.94
		2593.0	-6.70	1 / 0	23.33	16.63	46.026	33.01	-16.38
		2682.5	-6.70	1 / 74	23.89	<b>17.19</b>	52.360	33.01	-15.82
	16-QAM	2682.5	-6.70	1 / 37	22.95	16.25	42.170	33.01	-16.76
20 MHz	QPSK	2506.0	-6.70	1 / 0	23.82	<b>17.12</b>	51.523	33.01	-15.89
		2593.0	-6.70	1 / 0	23.36	16.66	46.345	33.01	-16.35
		2680.0	-6.70	1 / 50	23.76	17.06	50.816	33.01	-15.95
	16-QAM	2506.0	-6.70	1 / 0	22.85	16.15	41.210	33.01	-16.86

Table 7-3. Antenna FCM EIRP Data (LTE Band 41)

FCC ID: BCG-A2774	element	PART 27 MEASUREMENT REPORT				Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch				

## 7.6 Radiated Spurious Emissions

§2.1053, 27.53(m)

### 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 broadband hybrid antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed while the EUT is operating at maximum power and at the appropriate frequencies.

### Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

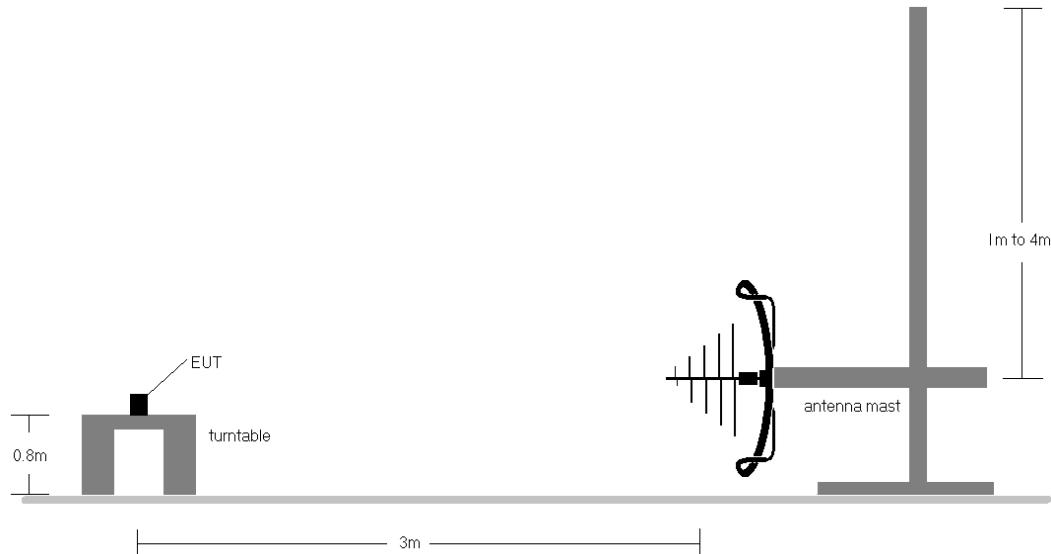
### Test Settings

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

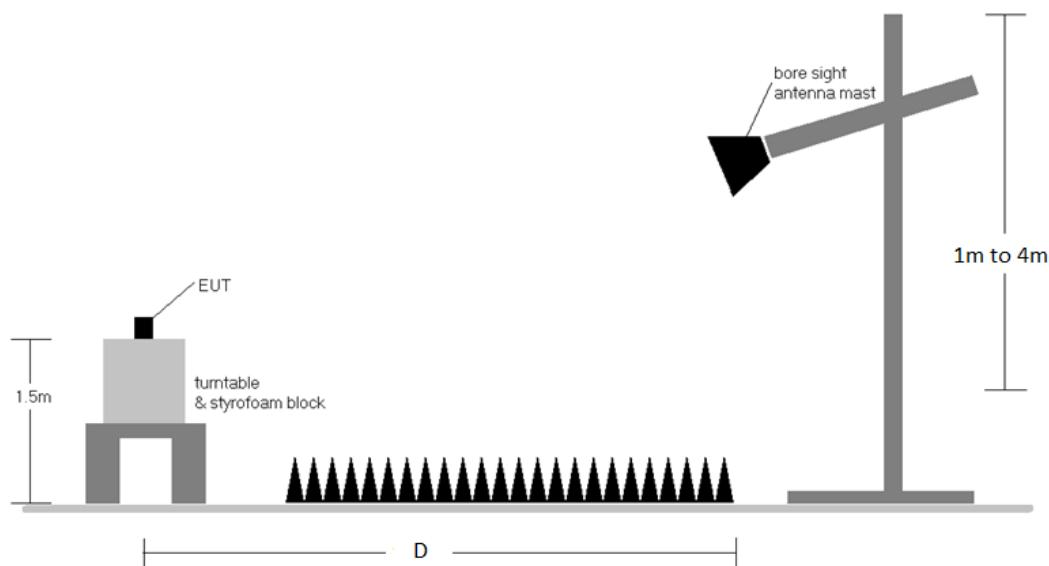
FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 51 of 67

## 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**

FCC ID: BCG-A2774	element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 52 of 67	

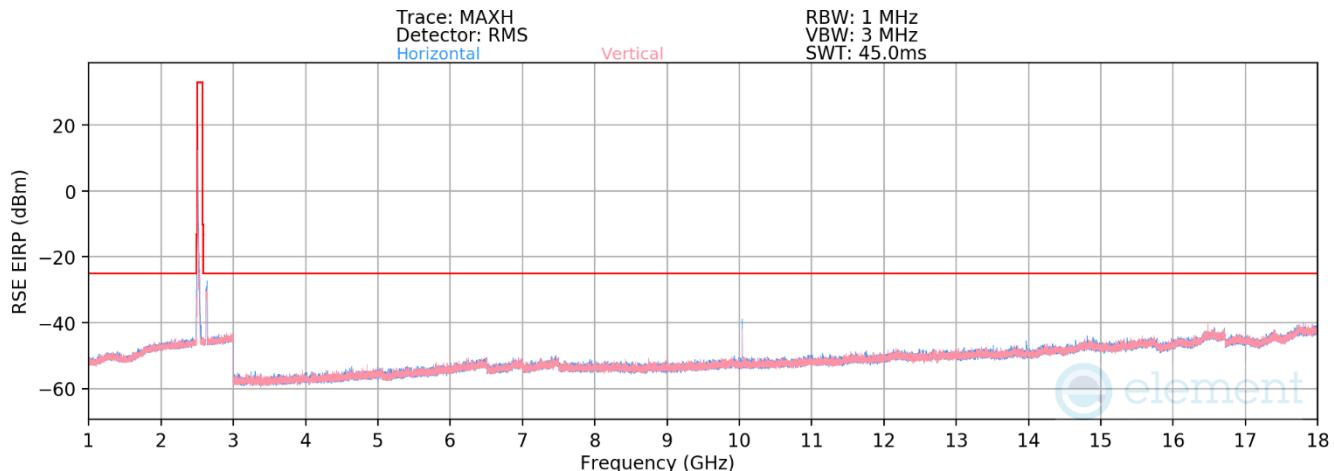
## Test Notes

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. 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.
3. This unit was tested with its standard battery.
4. The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
5. D is the measurement test distance and emissions 1-18GHz were measured at a 3 meters test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

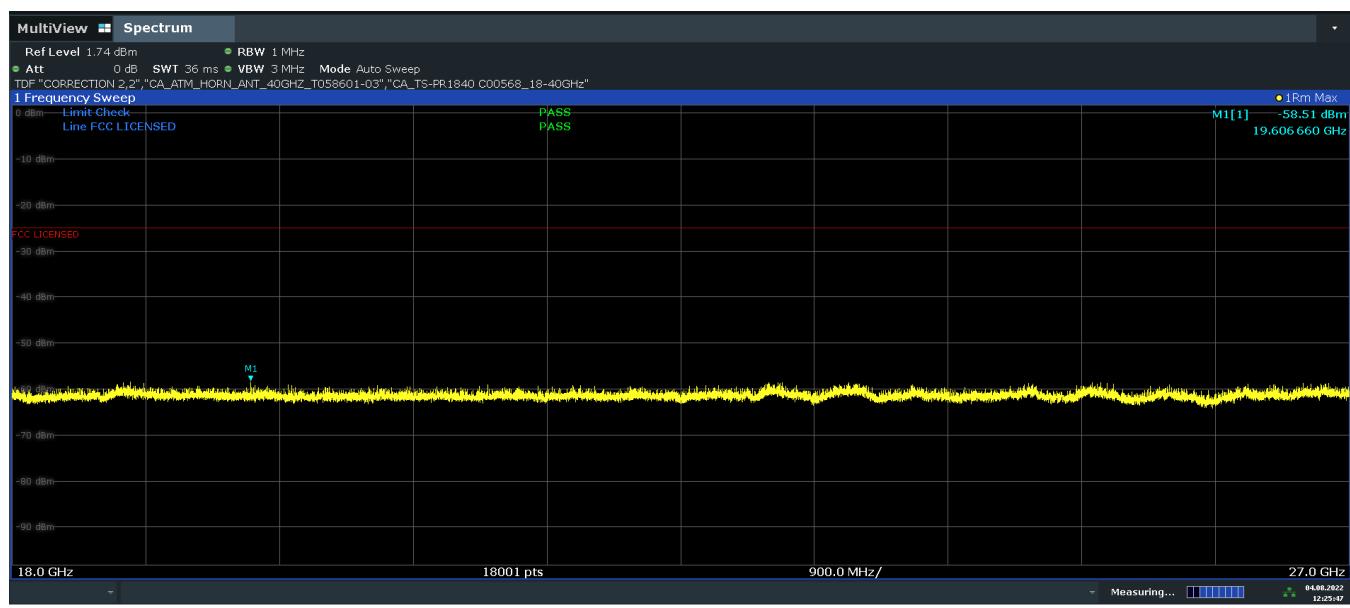
FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 53 of 67

## 7.6.1 Antenna FCM – Radiated Spurious Emission Measurements

### LTE Band 7

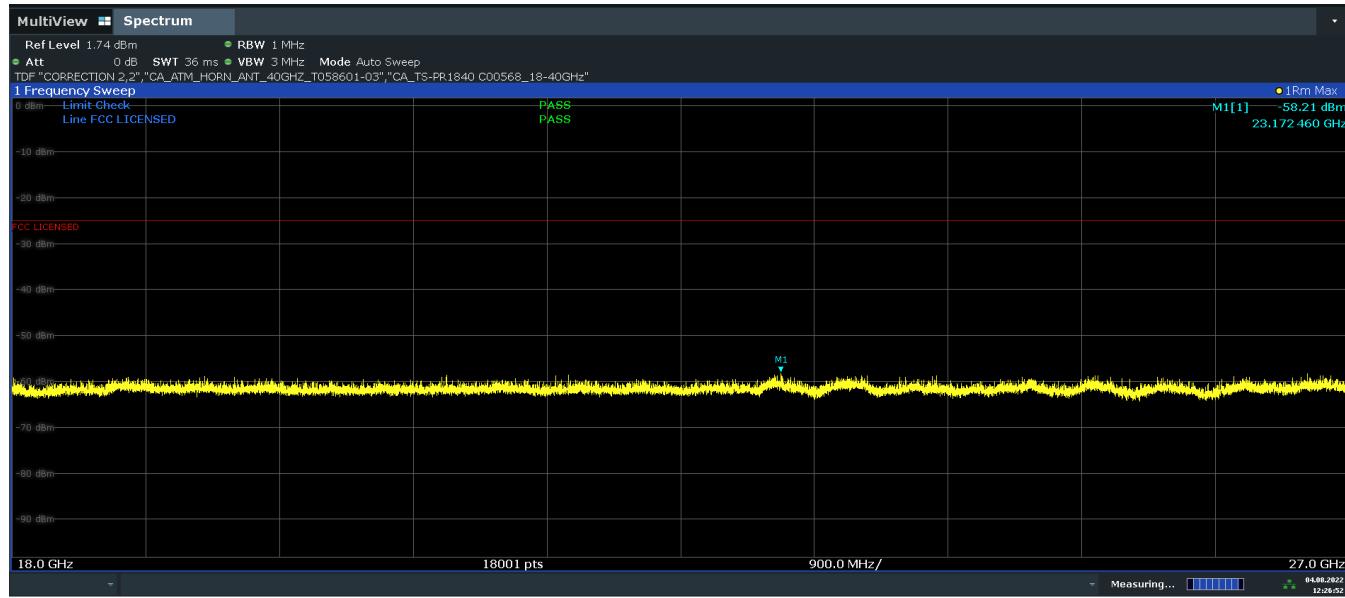


Plot 7-59. Antenna FCM Radiated Spurious Plot 1GHz – 18GHz (LTE Band 7)



Plot 7-60. Antenna FCM Radiated Spurious Emission above 18GHz (LTE Band 7, Pol. H)

FCC ID: BCG-A2774	element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 54 of 67



**Plot 7-61. Antenna FCM Radiated Spurious Emission above 18GHz (LTE Band 7, Pol. V)**

FCC ID: BCG-A2774	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 55 of 67

Bandwidth (MHz):	20								
Frequency (MHz):	2510.0								
RB / Offset:	1 / 50								
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]
5020.0	V	208	96	-79.45	4.71	32.26	-63.00	-25.00	-38.00
7530.0	V	-	-	-82.01	8.71	33.70	-61.56	-25.00	-36.56
10040.0	H	374	43	-68.58	9.96	48.38	-46.87	-25.00	-21.87
12550.0	V	-	-	-82.25	12.15	36.90	-58.36	-25.00	-33.36
15060.0	V	-	-	-83.11	14.58	38.47	-56.78	-25.00	-31.78
17570.0	V	-	-	-85.63	20.71	42.08	-53.18	-25.00	-28.18

**Table 7-4. Antenna FCM Radiated Spurious Data (LTE Band 7 – Low Channel)**

Bandwidth (MHz):	20								
Frequency (MHz):	2535.0								
RB / Offset:	1 / 50								
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]
5070.0	V	277	335	-76.86	6.40	36.54	-58.72	-25.00	-33.72
7605.0	V	-	-	-82.41	10.87	35.46	-59.80	-25.00	-34.80
10140.0	V	250	359	-73.95	13.59	46.64	-48.62	-25.00	-23.62
12675.0	V	-	-	-81.23	16.26	42.03	-53.23	-25.00	-28.23
15210.0	V	-	-	-82.56	17.72	42.16	-53.10	-25.00	-28.10
17745.0	V	-	-	-82.86	20.51	44.65	-50.60	-25.00	-25.60

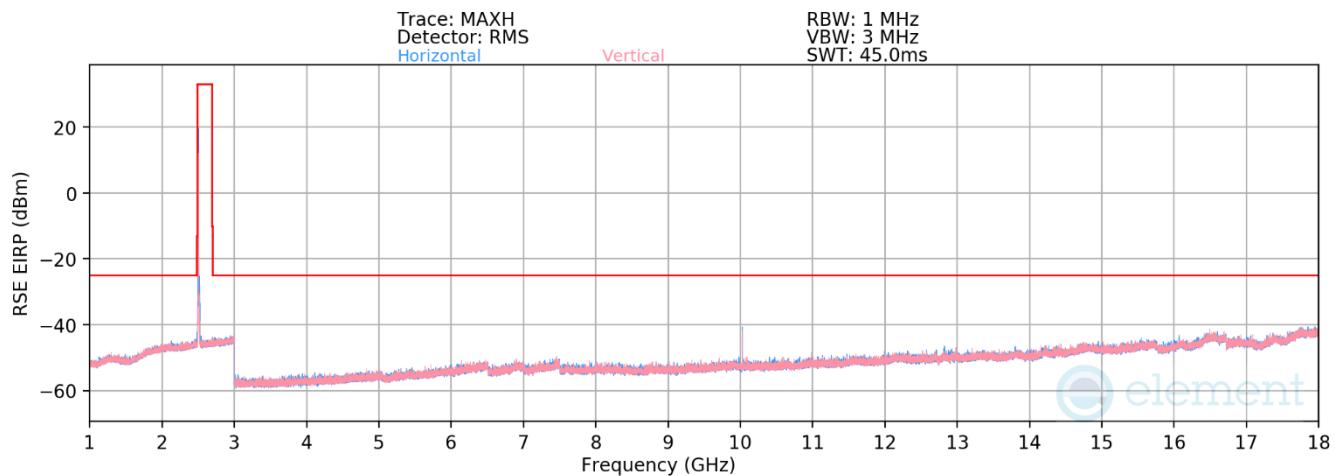
**Table 7-5. Antenna FCM Radiated Spurious Data (LTE Band 7 – Mid Channel)**

Bandwidth (MHz):	20								
Frequency (MHz):	2560.0								
RB / Offset:	1 / 50								
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]
5120.00	V	335	290	-77.54	6.30	35.76	-59.50	-25.00	-34.50
7680.00	V	-	-	-82.70	10.07	34.37	-60.89	-25.00	-35.89
10240.00	V	-	-	-84.21	13.60	36.39	-58.87	-25.00	-33.87
12800.00	V	-	-	-82.72	16.84	41.12	-54.13	-25.00	-29.13

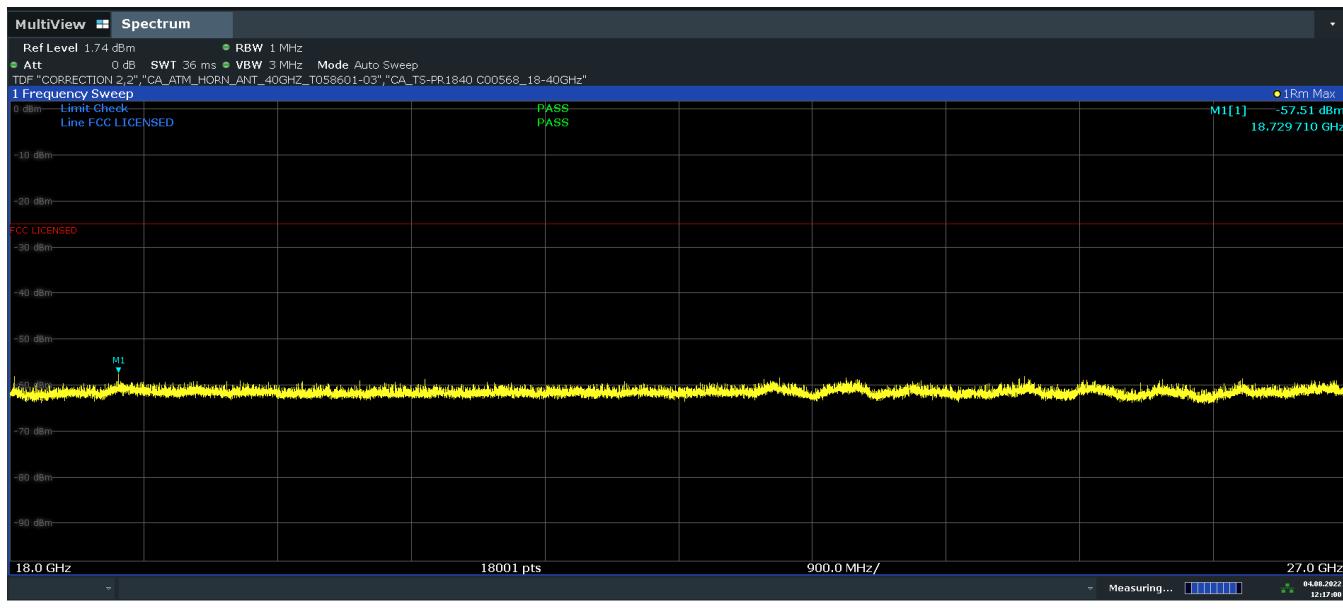
**Table 7-6. Antenna FCM Radiated Spurious Data (LTE Band 7 – High Channel)**

FCC ID: BCG-A2774	PART 27 MEASUREMENT REPORT					Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch				Page 56 of 67

## LTE Band 41

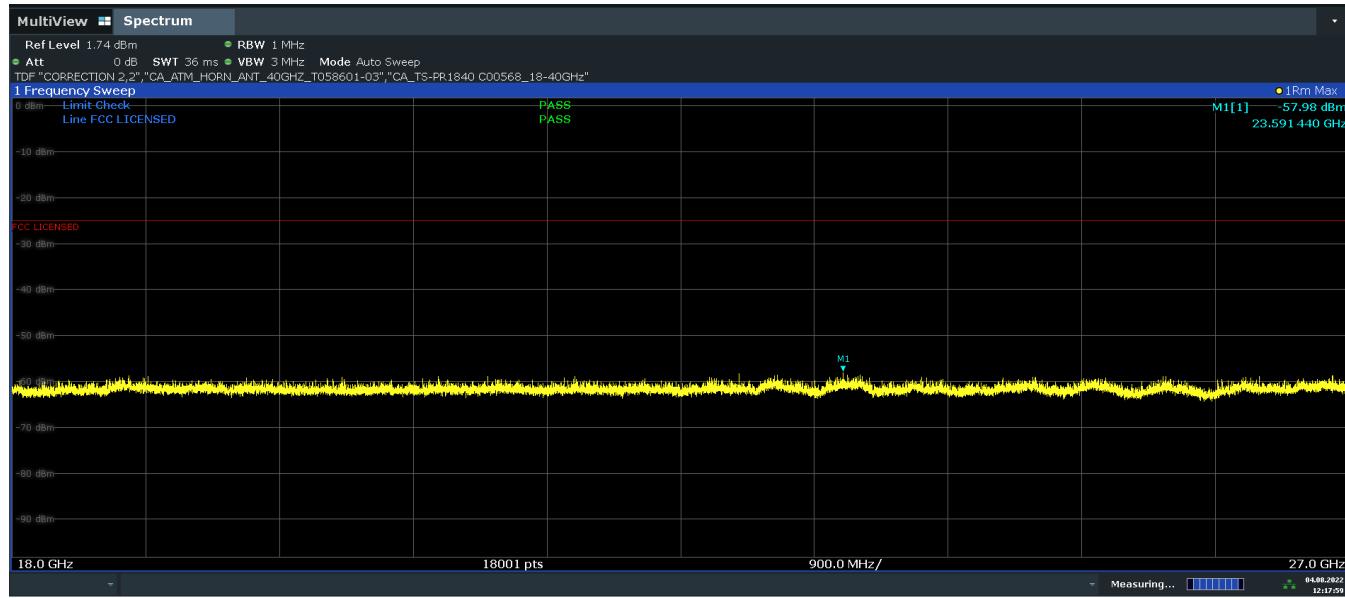


Plot 7-62. Antenna FCM Radiated Spurious Plot 1GHz – 18GHz (LTE Band 41)



Plot 7-63. Antenna FCM Radiated Spurious Emission above 18GHz (LTE Band 41, Pol. H)

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 57 of 67	



**Plot 7-64. Antenna FCM Radiated Spurious Emission above 18GHz (LTE Band 41, Pol. V)**

FCC ID: BCG-A2774	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 58 of 67

Bandwidth (MHz):	20								
Frequency (MHz):	2506.0								
RB / Offset:	1 / 50								
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]
5012.0	V	291	328	-68.08	6.97	45.89	-49.36	-25.00	-24.36
7518.0	V	-	-	-80.52	10.48	36.96	-58.29	-25.00	-33.29
10024.0	V	271	353	-64.93	12.98	55.05	-40.21	-25.00	-15.21
12530.0	H	-	-	-80.94	16.05	42.11	-53.15	-25.00	-28.15
15036.0	H	-	-	-81.53	17.81	43.28	-51.98	-25.00	-26.98

**Table 7-7. Antenna FCM Radiated Spurious Data (LTE Band 41 – Low Channel)**

Bandwidth (MHz):	20								
Frequency (MHz):	2593.0								
RB / Offset:	1 / 50								
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]
5186.0	V	298	322	-75.67	6.59	37.92	-57.34	-25.00	-32.34
7779.0	V	-	-	-80.86	10.35	36.49	-58.77	-25.00	-33.77
10372.0	H	236	359	-66.42	13.53	54.11	-41.15	-25.00	-16.15
12965.0	V	-	-	-82.01	16.42	41.41	-53.85	-25.00	-28.85
15558.0	V	-	-	-81.46	17.97	43.51	-51.75	-25.00	-26.75

**Table 7-8. Antenna FCM Radiated Spurious Data (LTE Band 41 – Mid Channel)**

Bandwidth (MHz):	20								
Frequency (MHz):	2680.0								
RB / Offset:	1 / 50								
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]
5360.0	V	326	329	-77.65	5.33	34.68	-60.58	-25.00	-35.58
8040.0	H	-	-	-81.18	9.40	35.22	-60.04	-25.00	-35.04
10720.0	H	229	346	-72.12	10.26	45.14	-50.11	-25.00	-25.11
13400.0	H	-	-	-81.19	13.09	38.90	-56.36	-25.00	-31.36
16080.0	H	-	-	-81.62	16.46	41.84	-53.42	-25.00	-28.42

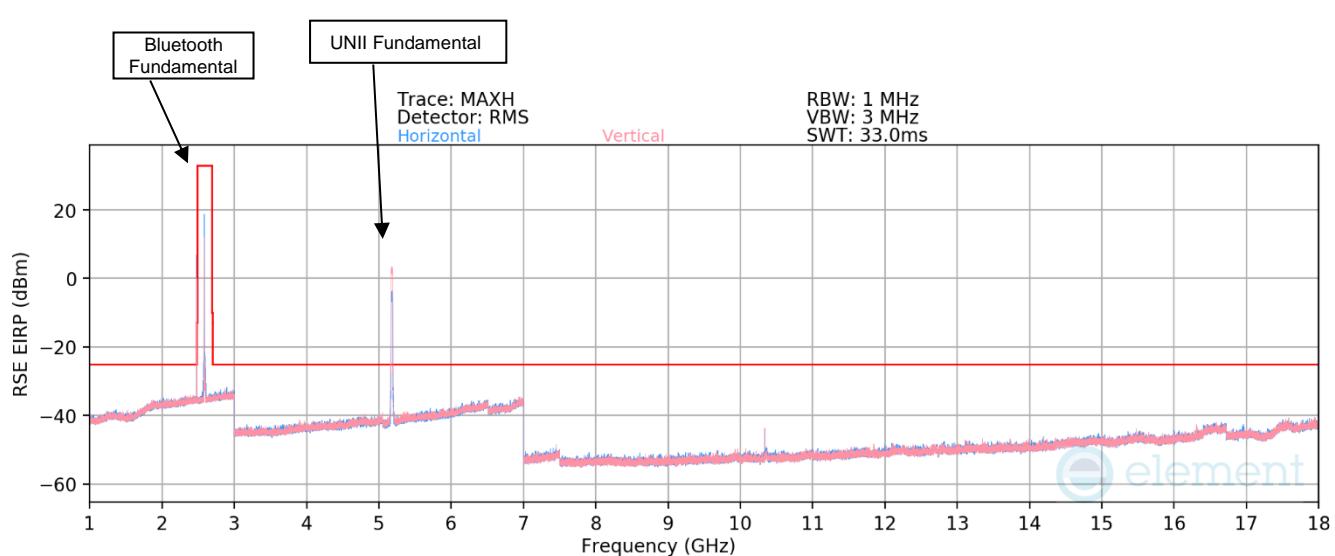
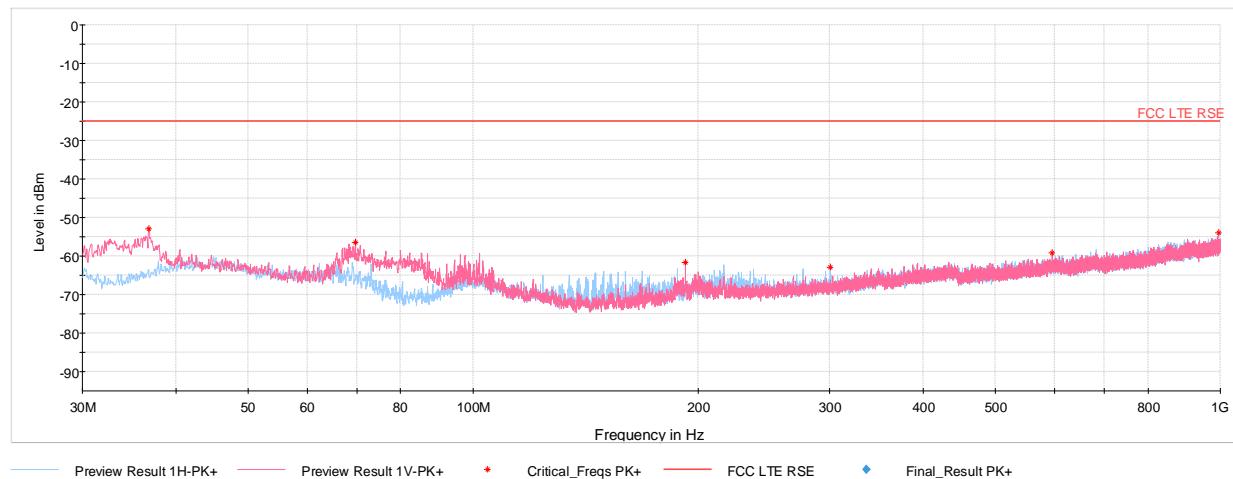
**Table 7-9. Antenna FCM Radiated Spurious Data (LTE Band 41 – High Channel)**

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT					Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch					Page 59 of 67

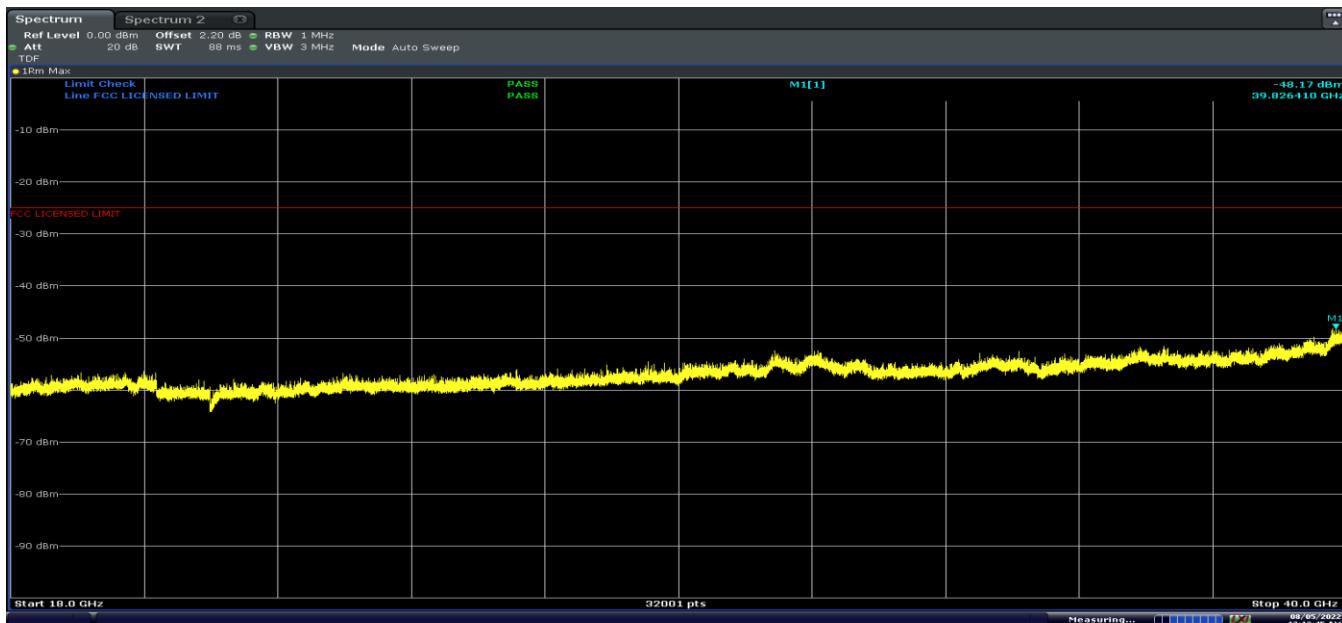
## 7.6.2 Simultaneous Tx Radiated Spurious Emissions Measurements

Description	Bluetooth	LTE	UNII
Antenna	FCM	FCM	FCM
Channel	78	40620	36
Operating Frequency (MHz)	2480	2593	5180
Mode/Modulation	GFSK ePA	QPSK/1RB/20MHz	11n

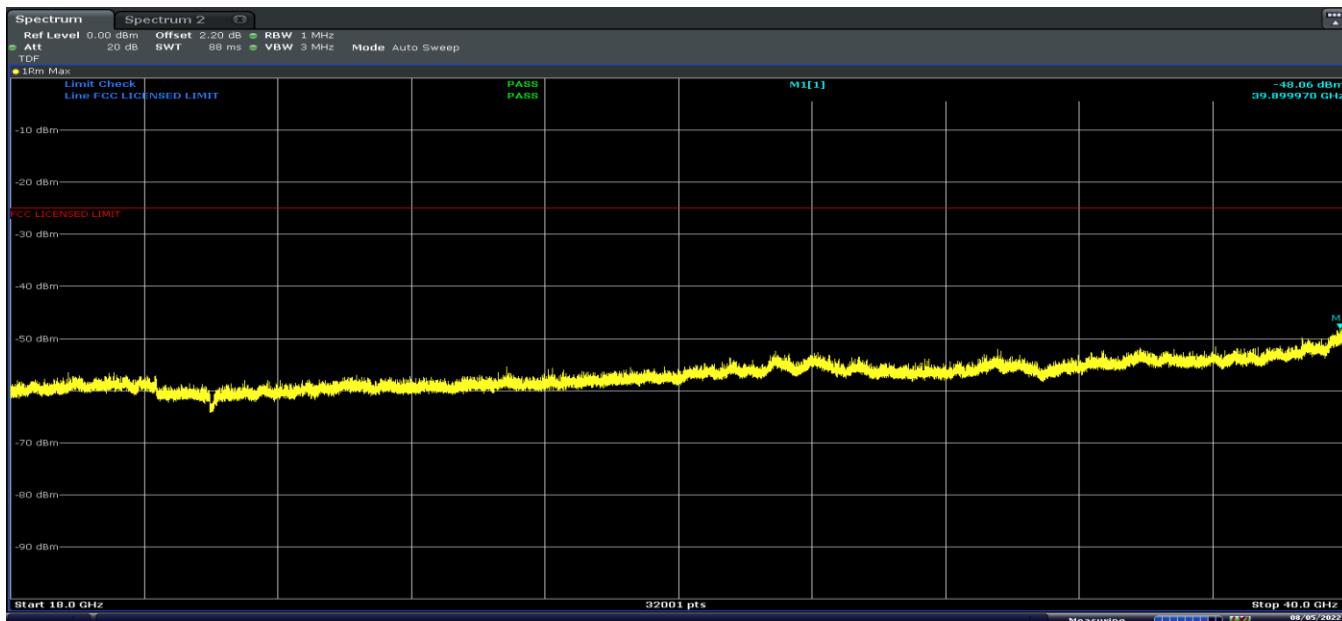
Table 7-10. Worst Case Simultaneous Transmission Configuration



FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch		Page 60 of 67



Plot 7-67. Antenna FCM Radiated Spurious Emissions -Simultaneous Transmission 18GHz-40GHz Pol. H



Plot 7-68. Antenna FCM Radiated Spurious Emissions -Simultaneous Transmission 18GHz-40GHz Pol. V

FCC ID: BCG-A2774	 element	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1C2205090040-04-R1.BCG	Test Dates: 5/1/2022 - 8/15/2022	EUT Type: Watch	Page 61 of 67	

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dB $\mu$ V/m]	Limit [dB $\mu$ V/m]	Margin [dB]
4960.00	Peak	-	-	-	-67.92	16.14	55.22	73.98	-18.76
7440.00	Peak	V	102	145	-68.94	10.08	48.14	73.98	-25.84
12400.00	Peak	V	-	-	-72.64	16.30	50.66	73.98	-23.32
10360.00	Peak	-	-	-	-71.00	13.87	49.87	68.20	-18.33
15540.00	Avg	-	-	-	-82.93	19.14	43.21	53.98	-10.77
15540.00	Peak	-	-	-	-72.24	19.14	53.90	73.98	-20.08

**Table 7-11. Antenna FCM BT and UNII Harmonics Emissions Measurement in Simultaneous Transmission Mode**

Frequency [MHz]	Detector	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	Level at Antenna Terminals [dBm]	Limit [dBm]	Spurious Emission Level [dBm]	Margin [dB]
7752.00	MAXH_RMS	H	222	77	-81.29	-34.35	-25.00	-59.35	-34.4
10336.00	MAXH_RMS	H	291	74	-81.68	-31.39	-25.00	-56.39	-31.4
12920.00	MAXH_RMS	H	-	-	-83.91	-29.72	-25.00	-54.72	-29.7
15504.00	MAXH_RMS	H	-	-	-83.98	-28.09	-25.00	-53.09	-28.1
2376.00	MAXH_RMS	-	-	-	-77.50	-23.22	-25.00	-48.22	-23.2
2688.00	MAXH_RMS	H	272	162	-77.57	-22.58	-25.00	-47.58	-22.6

**Table 7-12. Antenna FCM LTE Harmonics and Intermodulations Emissions Measurement in Simultaneous Transmission Mode**

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## 7.7 Frequency Stability / Temperature Variation

§2.1055, §27.54

### Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015 and TIA-603-E-2016. The frequency stability 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 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.***

### Test Procedure Used

ANSI C63.26 2015

TIA-603-E-2016

### Test Settings

- 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

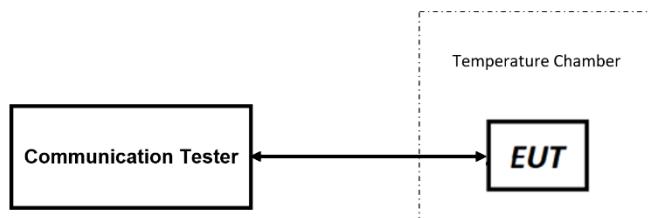


Figure 7-7. Test Instrument & Measurement Setup

### Test Notes

None

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## LTE Band 7

LTE Band 7								
		Low Channel Frequency (Hz):		2,510,000,000				
		High Channel Frequency (Hz):		2,560,000,000				
		Ref. Voltage (VDC):		3.8				
Voltage (%)	Power (VDC)	Temp (°C)	Low Freq. (Hz)	High Freq. (Hz)	Low Freq. Dev. (Hz)	High Freq. Dev. (Hz)	Deviation (%)	
100 %	3.80	- 30	2,510,000,005	2,560,000,004	3.05	2.96	0.00000012	
		- 20	2,510,000,004	2,560,000,004	1.77	2.81	0.00000011	
		- 10	2,510,000,004	2,560,000,003	1.95	1.47	0.00000008	
		0	2,510,000,003	2,560,000,002	0.87	1.12	0.00000004	
		+ 10	2,510,000,003	2,560,000,003	1.45	2.19	0.00000009	
		+ 20 (Ref)	2,510,000,002	2,560,000,001	0.00	0.00	0.00000000	
		+ 30	2,510,000,003	2,560,000,003	0.67	1.42	0.00000006	
		+ 40	2,510,000,003	2,560,000,003	0.89	1.97	0.00000008	
		+ 50	2,510,000,003	2,560,000,003	1.10	1.55	0.00000006	
		Battery Endpoint	3.40	+ 20	2,510,000,002	2,560,000,002	0.41	
0.41								
1.26								
0.00000005								

Table 7-13. LTE Band 7 Frequency Stability Data

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## LTE Band 41

LTE Band 41							
		Low Channel Frequency (Hz):		2,506,000,000			
		High Channel Frequency (Hz):		2,580,000,000			
		Ref. Voltage (VDC):		3.8			
Voltage (%)	Power (VDC)	Temp (°C)	Low Freq. (Hz)	High Freq. (Hz)	Low Freq. Dev. (Hz)	High Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	2,506,000,014	2,580,000,011	7.01	4.83	0.0000003
		- 20	2,506,000,015	2,580,000,011	7.89	5.41	0.0000003
		- 10	2,506,000,013	2,580,000,012	5.92	6.05	0.0000002
		0	2,506,000,014	2,580,000,012	7.22	6.25	0.0000003
		+ 10	2,506,000,016	2,580,000,014	8.85	7.75	0.0000004
		+ 20 (Ref)	2,506,000,007	2,580,000,006	0.00	0.00	0.0000000
		+ 30	2,506,000,013	2,580,000,013	5.78	6.69	0.0000003
		+ 40	2,506,000,012	2,580,000,011	5.48	4.92	0.0000002
		+ 50	2,506,000,012	2,580,000,010	5.15	4.52	0.0000002
		Battery Endpoint	3.40	+ 20	2,506,000,011	2,580,000,011	4.74

Table 7-14. LTE Band 41 Frequency Stability Data

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## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the Apple Watch FCC ID: BCG-A2774 complies with all the requirements of Part 27 of the FCC rules.

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## 9.0 APPENDIX A

Antenna gains provided by manufacturer:

Cellular Antenna Gain (FCM), Type: IFA			
Band	Frequency (MHz)	Horizontal (dBi)	Vertical (dBi)
1	1921.6	-10.6	-10.5
1	1950.0	-10.4	-10.6
1	1978.4	-10.7	-10.5
3	1711.6	-12.5	-9.0
3	1747.5	-12.7	-10.3
3	1783.4	-12.7	-10.8
7	2502.6	-6.8	-6.7
7	2535.0	-8.9	-8.6
7	2567.4	-9.1	-9.0
25	1851.0	-10.8	-10.4
25	1882.4	-10.7	-10.2
25	1914.0	-10.3	-10.2
39	1882.6	-10.8	-10.4
39	1900.0	-10.3	-10.3
39	1917.4	-10.6	-10.4
40	2302.6	-7.3	-7.5
40	2350.0	-7.9	-7.9
41	2498.6	-6.8	-6.7
41	2593.0	-8.8	-9.0
41	2687.4	-8.4	-8.1

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