



## DATA REFERENCE REPORT PART 22

**Applicant Name:**

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

**Date of Testing:**

4/6/2022 - 8/12/2022

**Test Site/Location:**

Element Washington DC LLC, Morgan Hill, CA, USA

**Test Report Serial No.:**

1C2205090041-01.BCG

**FCC ID:**

BCG-A2775

**Applicant Name:**

Apple Inc.

**Reference Model:**

A2774

**Variant Model:**

A2775 (A2858)

**EUT Type:**

Watch

**FCC Classification:**

PCS Licensed Transmitter Worn on Body (PCT)

**FCC Rule Part:**

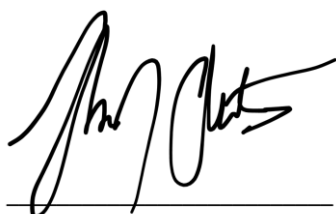
22

**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.



RJ Ortanez  
Executive Vice President



|                                         |                                                                                                                          |                                          |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| FCC ID: BCG-A2775                       |  <b>PART 22 DATA REFERENCE REPORT</b> | <b>Approved by:</b><br>Technical Manager |
| Test Report S/N:<br>1C2205090041-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                      | EUT Type:<br>Watch                       |
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## 1.0 INTRODUCTION

### 1.1 Scope

Per manufacturer declaration, there are two watch 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 and conducted 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              | 1C2205090040-01.BCG | RF Part 22 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 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 ISSED Standards (RSS).
- ELEMENT WASHINGTON DC LLC facility is a registered (22831) test laboratory with the site description on file with ISSED.

|                                         |                                                                                                                          |                                   |
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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 22.

**Test Device Serial No.:** FCGJ4LCV4, WFYT4N230R, M1X9562DDJ

### 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 testing.

| Band          | Antenna Gain [dBi] |
|---------------|--------------------|
|               | Antenna BCM        |
| LTE Band 5/26 | -26.9              |
| WCDMA 850     | -26.9              |

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

### 2.4 Test Support Equipment

|   |                        |        |               |      |                   |
|---|------------------------|--------|---------------|------|-------------------|
| 1 | Apple Macbook          | Model: | A1398         | S/N: | C2QKP008F6F3      |
|   | w/AC/DC Adapter        | Model: | A1435         | S/N: | N/A               |
| 2 | Apple USB-C cable      | Model: | N/A           | S/N: | N/A               |
|   | w/ Charging Dock       | Model: | N/A           | S/N: | DQ812910CU008V22F |
|   | w/ Cradle              | Model: | LA2-BD-LG-P1  | S/N: | N-0017525-02      |
| 3 | Apple Magnetic Charger | Model: | A2515         | S/N: | DLC035200UJMFR0AJ |
|   | Apple Magnetic Charger | Model: | A2515         | S/N: | DLC035202KRMFR0A2 |
| 4 | Pathfinder Falcon      | Model: | 920-098626-01 | S/N: | DLC03770065Q6PM1W |
|   | SiP Socket             | Model: | N/A           | 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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| Test Report S/N:<br>1C2205090041-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                      | EUT Type:<br>Watch                |
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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.

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, Antennas BCM and FCM 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<br>Max BW, 1RB, QPSK                                                  | Low, Mid, High |
| WCDMA, LTE | Conducted Power                     | All Certified Bands:<br>Highest BW only, 1 RB,<br>Modulation<br>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:

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

And

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

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  $U_{\text{CISPR}}$  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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| FCC ID: BCG-A2775                       |  PART 22 DATA REFERENCE REPORT | Approved by:<br>Technical Manager |
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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 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: BCG-A2775  
 FCC Classification: PCS Licensed Transmitter Worn on Body (PCT)  
 Mode(s): WCDMA/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]     | Average [dB] |
| LTE-B5     | Radiated Spurious Emissions | QPSK       | 10MHz / 1/25 RB | L       | 2487.0                      | -57.25            | -58.10            | 0.85         |
| LTE-B5     | Radiated Spurious Emissions | QPSK       | 10MHz / 1/25 RB | M       | 2509.5                      | -58.60            | -59.12            | 0.62         |
| LTE-B5     | Radiated Spurious Emissions | QPSK       | 10MHz / 1/25 RB | H       | 2532.0                      | -57.24            | -57.31            | 0.07         |
| LTE-B5     | Conducted Powers            | QPSK       | 10MHz / 1/25 RB | M       | 836.5                       | 25.20             | 25.24             | 0.04         |
| LTE-B26    | Conducted Powers            | QPSK       | 10MHz / 1/25 RB | M       | 836.5                       | 25.29             | 25.18             | 0.11         |
| WCDMA B5   | Conducted Powers            | QPSK       | 5MHz            | M       | 836.6                       | 24.84             | 24.78             | 0.06         |

**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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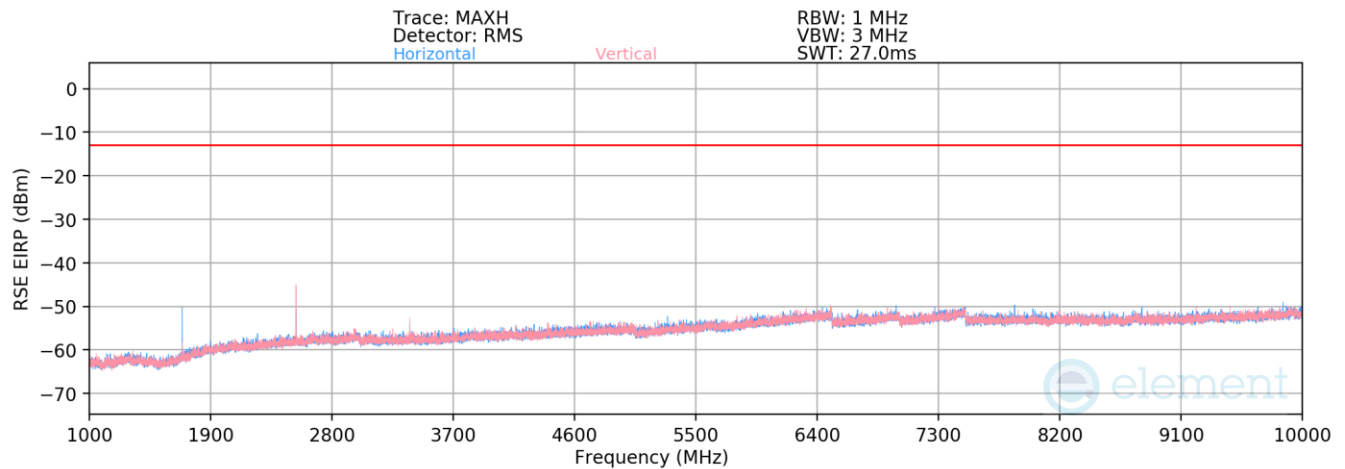
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## 7.2 Radiated Spurious Emissions

§2.1053, 22.917(a)

### LTE



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

|                  |        |
|------------------|--------|
| 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 [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1658.0          | H               | 155                 | 253                        | -68.21               | -2.63       | 36.16                   | -59.10                             | -13.00      | -46.10      |
| 2487.0          | V               | 123                 | 320                        | -71.83               | 1.99        | 37.16                   | -58.10                             | -13.00      | -45.10      |
| 3316.0          | -               | -                   | -                          | -79.81               | 3.39        | 30.58                   | -64.68                             | -13.00      | -51.68      |
| 4145.0          | -               | -                   | -                          | -80.10               | 5.50        | 32.40                   | -62.86                             | -13.00      | -49.86      |
| 4974.0          | -               | -                   | -                          | -80.57               | 6.37        | 32.80                   | -62.45                             | -13.00      | -49.45      |

Table 7-2. Radiated Spurious Data (LTE Cell – 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 [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1673.0          | H               | 174                 | 218                        | -67.61               | -4.15       | 35.24                   | -60.02                             | -13.00      | -47.02      |
| 2509.5          | V               | 333                 | 2                          | -70.62               | -0.24       | 36.14                   | -59.12                             | -13.00      | -46.12      |
| 3346.0          | V               | -                   | -                          | -77.72               | 1.74        | 31.02                   | -64.24                             | -13.00      | -51.24      |
| 4182.5          | V               | -                   | -                          | -78.47               | 2.81        | 31.34                   | -63.92                             | -13.00      | -50.92      |
| 5019.0          | V               | -                   | -                          | -78.88               | 4.32        | 32.44                   | -62.82                             | -13.00      | -49.82      |

Table 7-3. Radiated Spurious Data (LTE Cell – Mid Channel)

|                                         |                                                                                                                   |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| FCC ID: BCG-A2775                       |  PART 22 DATA REFERENCE REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090041-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                               | EUT Type:<br>Watch                |
|                                         |                                                                                                                   | Page 11 of 15                     |

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|                  |        |
|------------------|--------|
| 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 [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1688.00         | V               | 326                 | 224                        | -69.75               | -3.91       | 33.34                   | -61.91                             | -13.00      | -48.91      |
| 2532.00         | V               | 139                 | 2                          | -68.94               | -0.11       | 37.95                   | -57.31                             | -13.00      | -44.31      |
| 3376.00         | V               | -                   | -                          | -78.04               | 1.71        | 30.67                   | -64.59                             | -13.00      | -51.59      |
| 4220.00         | V               | -                   | -                          | -78.45               | 2.82        | 31.37                   | -63.88                             | -13.00      | -50.88      |
| 5064.00         | V               | -                   | -                          | -79.23               | 4.46        | 32.23                   | -63.03                             | -13.00      | -50.03      |

**Table 7-4. Radiated Spurious Data (LTE Cell – High Channel)**

|                                         |                                                                                                                          |                                   |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| FCC ID: BCG-A2775                       |  <b>PART 22 DATA REFERENCE REPORT</b> | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090041-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                      | EUT Type:<br>Watch                |
|                                         |                                                                                                                          | Page 12 of 15                     |

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### 7.3 Antenna BCM – ERP/EIRP

#### LTE-B5

| Bandwidth | Mod. | Frequency [MHz] | Ant. Gain [dBi] | RB Size/Offset | Conducted Power [dBm] | ERP [dBm] | ERP [mW] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP [mW] | EIRP Limit [dBm] | Margin [dB] |
|-----------|------|-----------------|-----------------|----------------|-----------------------|-----------|----------|-----------------|-------------|------------|-----------|------------------|-------------|
| 10 MHz    | QPSK | 836.5           | -26.90          | 1 / 25         | 25.24                 | -3.81     | 0.416    | 38.45           | -42.26      | -1.66      | 0.682     | 40.61            | -42.27      |

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

#### LTE-B26

| Bandwidth | Mod. | Frequency [MHz] | Ant. Gain [dBi] | RB Size/Offset | Conducted Power [dBm] | ERP [dBm] | ERP [mW] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP [mW] | EIRP Limit [dBm] | Margin [dB] |
|-----------|------|-----------------|-----------------|----------------|-----------------------|-----------|----------|-----------------|-------------|------------|-----------|------------------|-------------|
| 10 MHz    | QPSK | 836.5           | -26.90          | 1 / 0          | 25.18                 | -3.87     | 0.410    | 38.45           | -42.32      | -1.72      | 0.673     | 40.61            | -42.33      |

Table 7-6. Antenna BCM ERP/EIRP Data (LTE Band 26)

#### WCDMA B5

| Frequency [MHz] | Mode     | Conducted Power [dBm] | Ant. Gain [dBi] | ERP [dBm] | ERP [mW] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP [mW] | EIRP Limit [dBm] | Margin [dB] |
|-----------------|----------|-----------------------|-----------------|-----------|----------|-----------------|-------------|------------|-----------|------------------|-------------|
| 836.60          | WCDMA850 | 24.78                 | -26.90          | -4.27     | 0.374    | 38.45           | -42.72      | -2.12      | 0.614     | 40.61            | -42.73      |

Table 7-7. Antenna BCM ERP/EIRP Data (WCDMA Band 5)

|                                         |                                                                                                                   |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| FCC ID: BCG-A2775                       |  PART 22 DATA REFERENCE REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090041-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                               | EUT Type:<br>Watch                |
|                                         |                                                                                                                   | Page 13 of 15                     |

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## 8.0 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.

|                                                |                                                                                                    |                                      |                                          |
|------------------------------------------------|----------------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------|
| FCC ID: BCG-A2775                              |  <b>element</b> | <b>PART 22 DATA REFERENCE REPORT</b> | <b>Approved by:</b><br>Technical Manager |
| <b>Test Report S/N:</b><br>1C2205090041-01.BCG | <b>Test Dates:</b><br>4/6/2022 - 8/12/2022                                                         | <b>EUT Type:</b><br>Watch            | Page 14 of 15                            |

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## 9.0 APPENDIX A: REFERENCE MODEL TEST REPORT

Attached is the test report (1C2205090040-01.BCG) from reference model FCC ID: BCG-A2774, which includes referenced data results.

|                                                |                                                                                                                          |                                          |
|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| FCC ID: BCG-A2775                              |  <b>PART 22 DATA REFERENCE REPORT</b> | <b>Approved by:</b><br>Technical Manager |
| <b>Test Report S/N:</b><br>1C2205090041-01.BCG | <b>Test Dates:</b><br>4/6/2022 - 8/12/2022                                                                               | <b>EUT Type:</b><br>Watch                |
|                                                |                                                                                                                          | Page 15 of 15                            |

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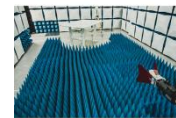


## Element Washington DC LLC

18855 Adams Court, Morgan Hill, CA 95037 USA

Tel. 410.290.6652 / Fax 410.290.6654

<http://www.element.com>



### PART 22 MEASUREMENT REPORT

**Applicant Name:**

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

**Date of Testing:**

4/6/2022 - 8/12/2022

**Test Site/Location:**

Element Washington DC LLC  
Morgan Hill, CA, USA

**Test Report Serial No.:**

1C2205090040-01.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:**

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.

RJ Ortanez

Executive Vice President



|                                         |                                     |                                   |
|-----------------------------------------|-------------------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       | <b>PART 22 MEASUREMENT REPORT</b>   | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022 | EUT Type:<br>Watch                |
|                                         |                                     | Page 1 of 56                      |

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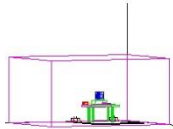
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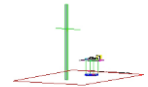
|                                         |                                                                                     |                            |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------|----------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
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## PART 22 MEASUREMENT REPORT



| Mode     | Bandwidth | Modulation      | Tx Frequency Range [MHz] | OBW [MHz] | ERP             |                  | EIRP            |                  | Emission Designator |
|----------|-----------|-----------------|--------------------------|-----------|-----------------|------------------|-----------------|------------------|---------------------|
|          |           |                 |                          |           | Max. Power [mW] | Max. Power [dBm] | Max. Power [mW] | Max. Power [dBm] |                     |
| WCDMA850 | 5 MHz     | Spread Spectrum | 826.4 - 846.6            | 4.0909    | 0.379           | -4.21            | 0.622           | -2.06            | 4M09F9W             |
| Band 5   | 1.4 MHz   | QPSK            | 824.7 - 848.3            | 1.1072    | 0.425           | -3.72            | 0.697           | -1.57            | 1M11G7W             |
|          |           | 16QAM           | 824.7 - 848.3            | 1.1097    | 0.364           | -4.39            | 0.597           | -2.24            | 1M11D7W             |
|          | 3 MHz     | QPSK            | 825.5 - 847.5            | 2.7247    | 0.416           | -3.81            | 0.682           | -1.66            | 2M72G7W             |
|          |           | 16QAM           | 825.5 - 847.5            | 2.7291    | 0.371           | -4.31            | 0.608           | -2.16            | 2M73D7W             |
|          | 5 MHz     | QPSK            | 826.5 - 846.5            | 4.5758    | 0.431           | -3.66            | 0.706           | -1.51            | 4M58G7W             |
|          |           | 16QAM           | 826.5 - 846.5            | 4.5554    | 0.375           | -4.26            | 0.615           | -2.11            | 4M56D7W             |
|          | 10 MHz    | QPSK            | 829.0 - 844.0            | 9.1085    | 0.417           | -3.80            | 0.684           | -1.65            | 9M11G7W             |
|          |           | 16QAM           | 829.0 - 844.0            | 5.5075    | 0.375           | -4.26            | 0.615           | -2.11            | 5M51D7W             |
| Band 26  | 1.4 MHz   | QPSK            | 824.7 - 848.3            | 1.1072    | 0.425           | -3.72            | 0.697           | -1.57            | 1M11G7W             |
|          |           | 16QAM           | 824.7 - 848.3            | 1.1097    | 0.366           | -4.37            | 0.600           | -2.22            | 1M11D7W             |
|          | 3 MHz     | QPSK            | 825.5 - 847.5            | 2.7247    | 0.428           | -3.69            | 0.701           | -1.54            | 2M72G7W             |
|          |           | 16QAM           | 825.5 - 847.5            | 2.7291    | 0.367           | -4.35            | 0.603           | -2.20            | 2M73D7W             |
|          | 5 MHz     | QPSK            | 826.5 - 846.5            | 4.5758    | 0.432           | -3.65            | 0.708           | -1.50            | 4M58G7W             |
|          |           | 16QAM           | 826.5 - 846.5            | 4.5554    | 0.377           | -4.24            | 0.618           | -2.09            | 4M56D7W             |
|          | 10 MHz    | QPSK            | 829.0 - 844.0            | 9.1085    | 0.421           | -3.76            | 0.690           | -1.61            | 9M11G7W             |
|          |           | 16QAM           | 829.0 - 844.0            | 5.5075    | 0.374           | -4.27            | 0.614           | -2.12            | 5M51D7W             |

### EUT Overview

|                                         |                                                                                                                       |                    |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                   | EUT Type:<br>Watch | Page 3 of 56                      |

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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 ISSED Standards (RSS).
- Element facility is a registered (22831) test laboratory with the site description on file with ISSED.

|                                         |                                                                                     |                            |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------|----------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
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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 22.

**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

#### **Note:**

All the above simultaneous transmission configurations have been tested and the worst case configuration was found to be config 10 and reported in RF UNII, RF Bluetooth and RF Part 27b test reports.

|                                         |                                                                                                                       |                    |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                   | EUT Type:<br>Watch | Page 5 of 56                      |

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## 2.3 Antenna Description

Following antenna gains provided by manufacturer were used for testing.

| Band          | Antenna Gain [dBi] |
|---------------|--------------------|
|               | Antenna BCM        |
| LTE Band 5/26 | -26.9              |
| WCDMA 850     | -26.9              |

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

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

## 2.4 Test Support Equipment

|   |                        |        |               |      |                   |
|---|------------------------|--------|---------------|------|-------------------|
| 1 | Apple Macbook          | Model: | A1398         | S/N: | C2QKP008F6F3      |
|   | w/AC/DC Adapter        | Model: | A1435         | S/N: | N/A               |
| 2 | Apple USB-C cable      | Model: | N/A           | S/N: | N/A               |
|   | w/ Charging Dock       | Model: | N/A           | S/N: | DQ812910CU008V22F |
|   | w/ Cradle              | Model: | LA2-BD-LG-P1  | S/N: | N-0017525-02      |
| 3 | Apple Magnetic Charger | Model: | A2515         | S/N: | DLC035200UJMF0AJ  |
|   | Apple Magnetic Charger | Model: | A2515         | S/N: | DLC035202KRMFR0A2 |
| 4 | Pathfinder Falcon      | Model: | 920-098626-01 | S/N: | DLC03770065Q6PM1W |
|   | SiP Socket             | Model: | N/A           | 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 2-3. 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.

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.

## 2.6 Software and Firmware

The test was conducted with firmware 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.

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:

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

And

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

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  | 1.77                             |
| 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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|                                         |                                                                                                                | Page 9 of 56                      |

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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

### WCDMA 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**

LTE BW = 8.62 MHz  
 G = Phase Modulation  
 7 = Quantized/Digital Info  
 W = Combination of Any

### QAM Modulation

#### **Emission Designator = 8M45D7W**

LTE BW = 8.45 MHz  
 D = Amplitude/Angle Modulated  
 7 = Quantized/Digital Info  
 W = Combination of Any

### Spurious Radiated Emission

#### **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): WCDMA/LTE

| Test Condition | Test Description                                               | FCC Part Section(s) | Test Limit                                             | Test Result | Reference              |
|----------------|----------------------------------------------------------------|---------------------|--------------------------------------------------------|-------------|------------------------|
| CONDUCTED      | Occupied Bandwidth                                             | 2.1049              | N/A                                                    | N/A         | Section 7.2            |
|                | Conducted Band Edge / Spurious Emissions                       | 2.1051, 22.917(a)   | -13 dBm at Band Edge and for all out-of-band emissions | PASS        | Sections 7.3, 7.4      |
|                | Transmitter Conducted Output Power                             | 2.1046              | N/A                                                    | N/A         | See RF Exposure Report |
|                | Effective Radiated Power / Equivalent Isotropic Radiated Power | 22.913(a)(5)        | < 7 Watts max. ERP                                     | PASS        | Section 7.5            |
|                | Frequency Stability                                            | 2.1055, 22.355      | ±2.5 ppm                                               | PASS        | Section 7.7            |
| RADIATED       | Radiated Spurious Emissions                                    | 2.1053, 22.917(a)   | -13 dBm for all out-of-band emissions                  | PASS        | 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 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

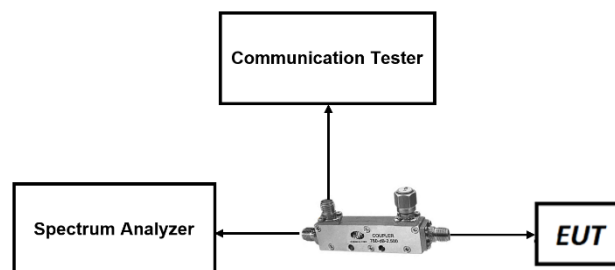
KDB 971168 D01 v03r01 – Section 4.2

### 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  $\geq 3 \times$  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**

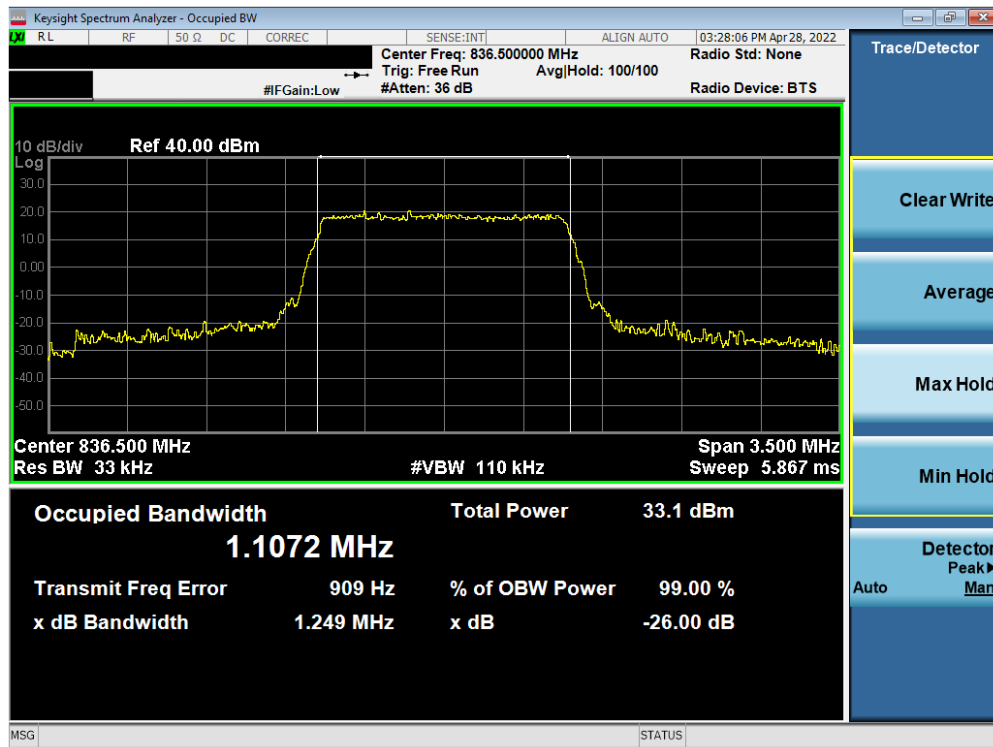
### Test Notes

None.

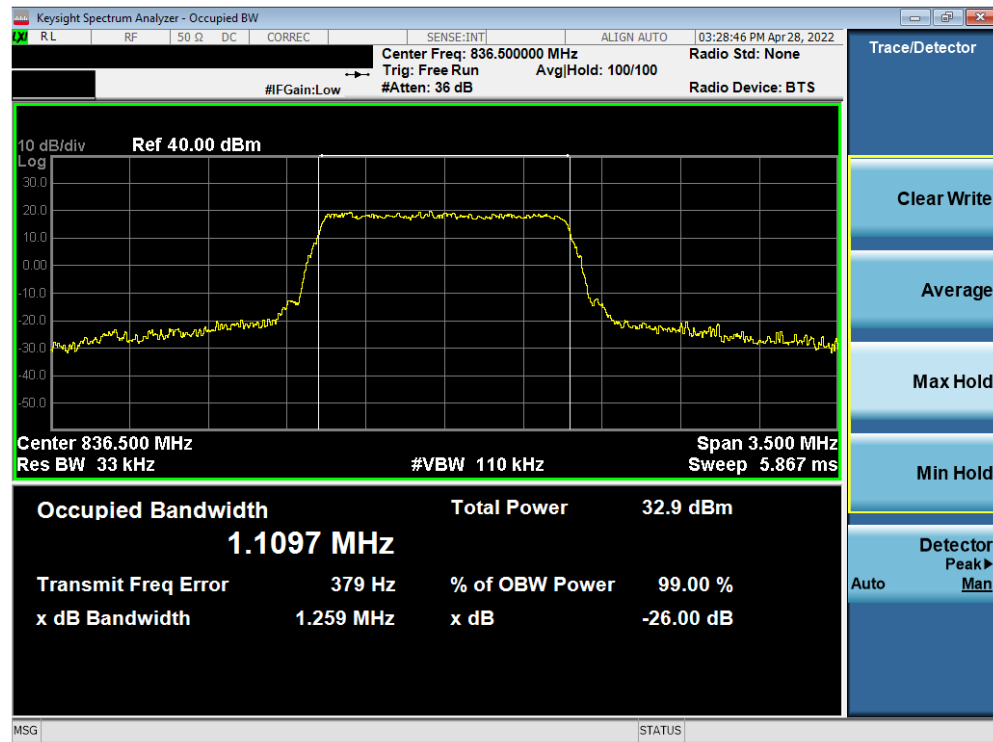
|                                         |                                                                                                                       |                    |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
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## LTE Band 26/5



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

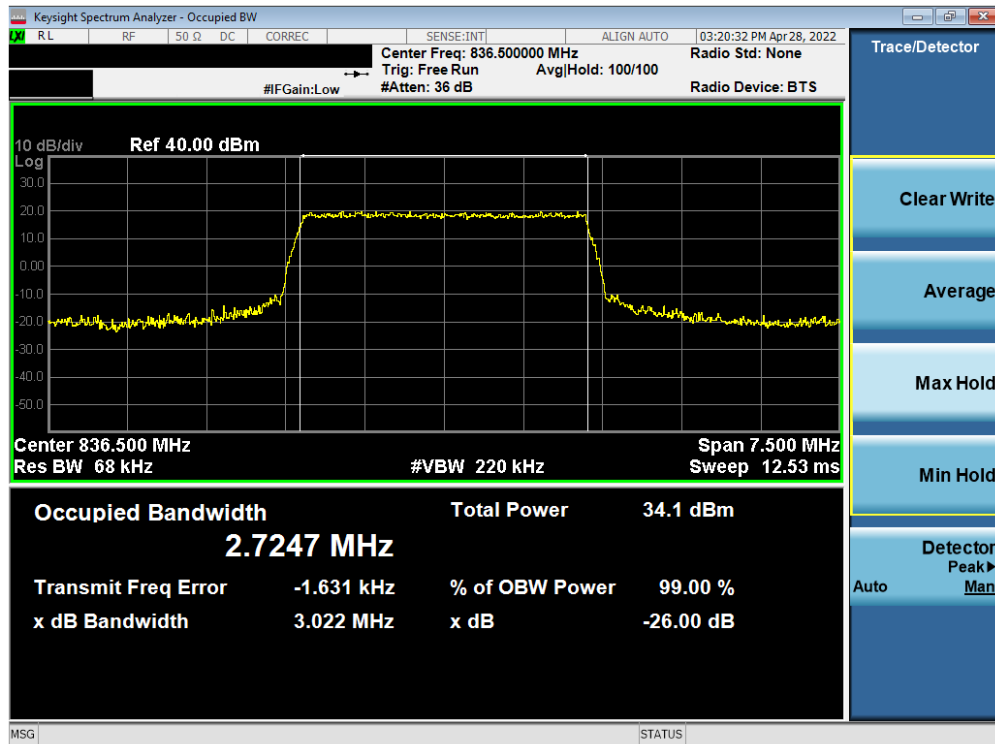


Plot 7-2. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 16-QAM - Full RB Configuration)

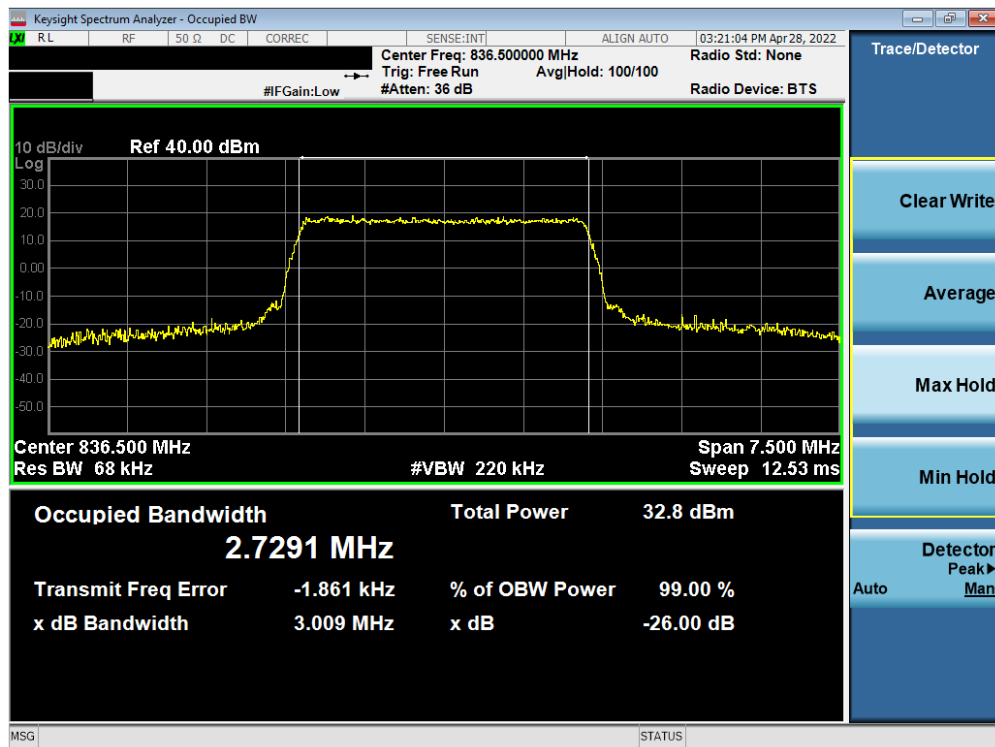
|                                         |                                                                                                                |                    |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------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

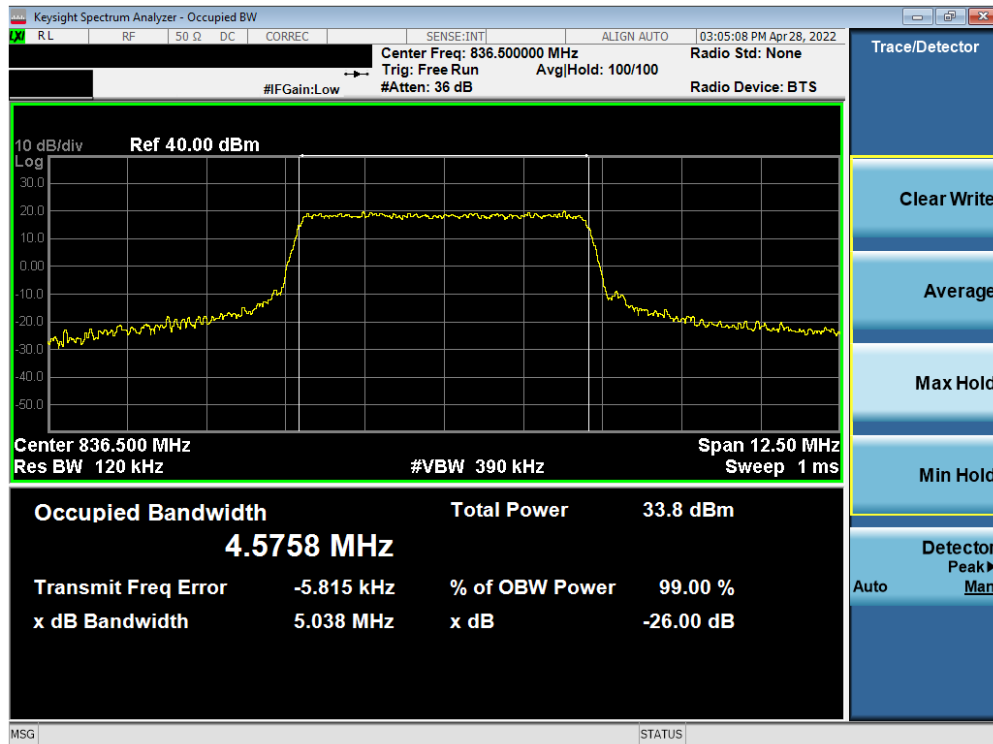


Plot 7-4. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 16-QAM - Full RB Configuration)

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

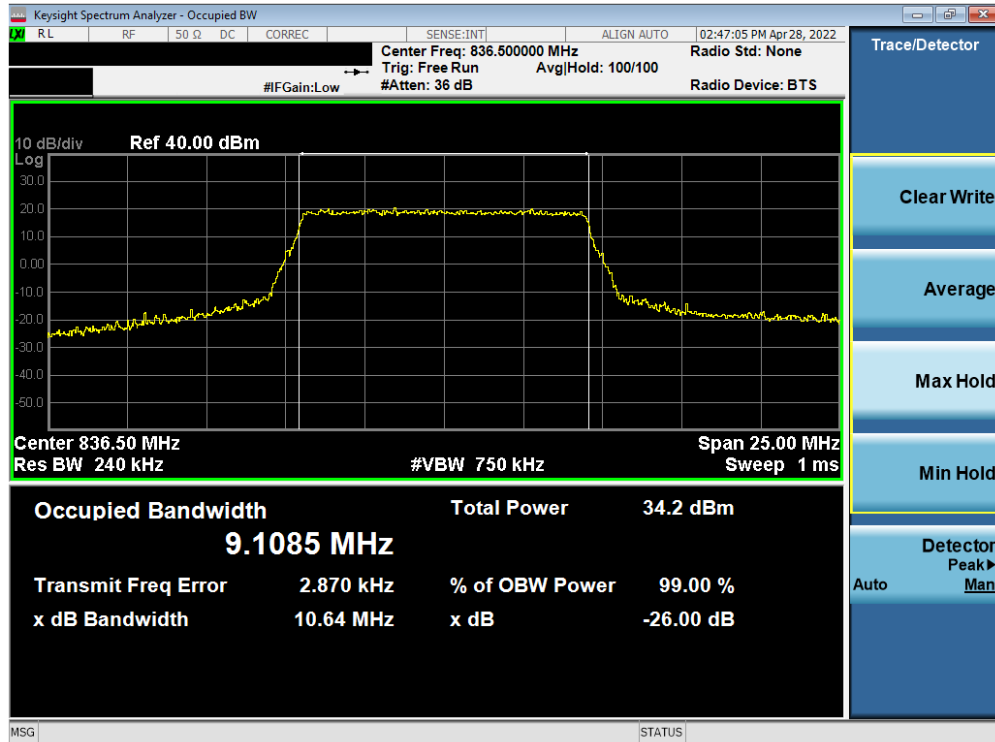


Plot 7-6. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 16-QAM - Full RB Configuration)

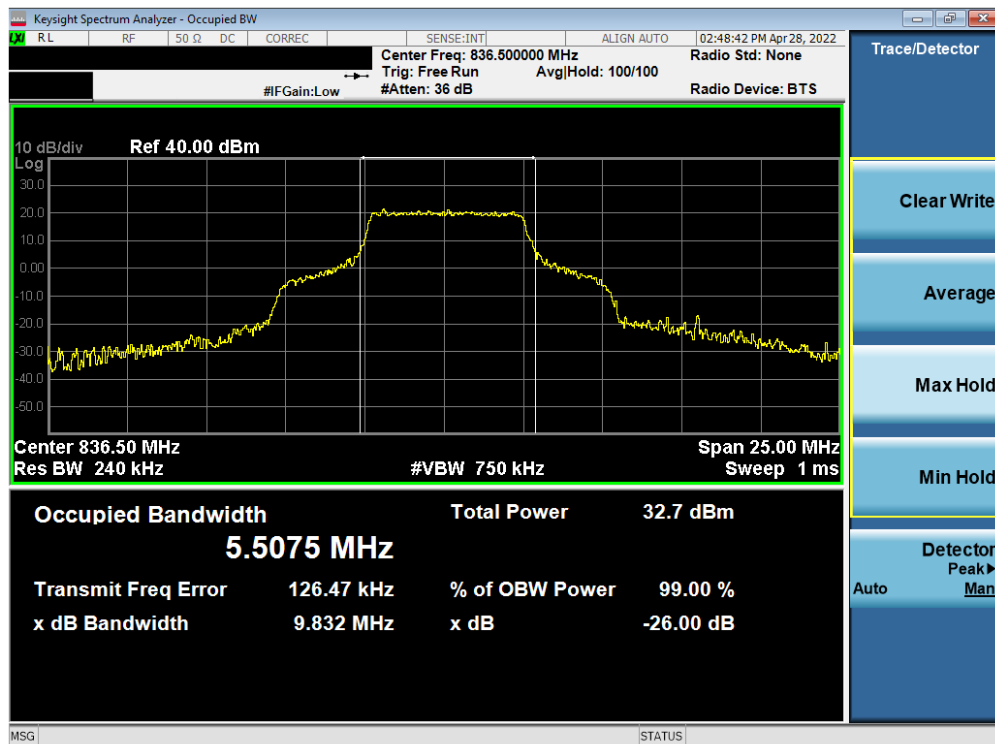
|                                         |                                                                                     |                            |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------|----------------------------|-----------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



Plot 7-8. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 16-QAM - Full RB Configuration)

|                                         |                                                                                                                       |                    |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
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## WCDMA Cell



Plot 7-9. 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  $43 + 10 \log_{10}(P_{\text{Watts}})$ , 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.

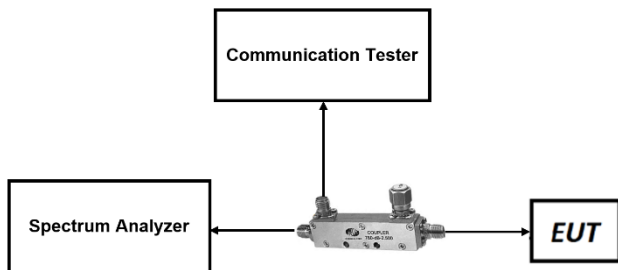


Figure 7-2. Test Instrument & Measurement Setup

|                                         |                                                                                                                |                                   |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|-----------------------------------|
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|                                         |                                                                                                                | Page 19 of 56                     |

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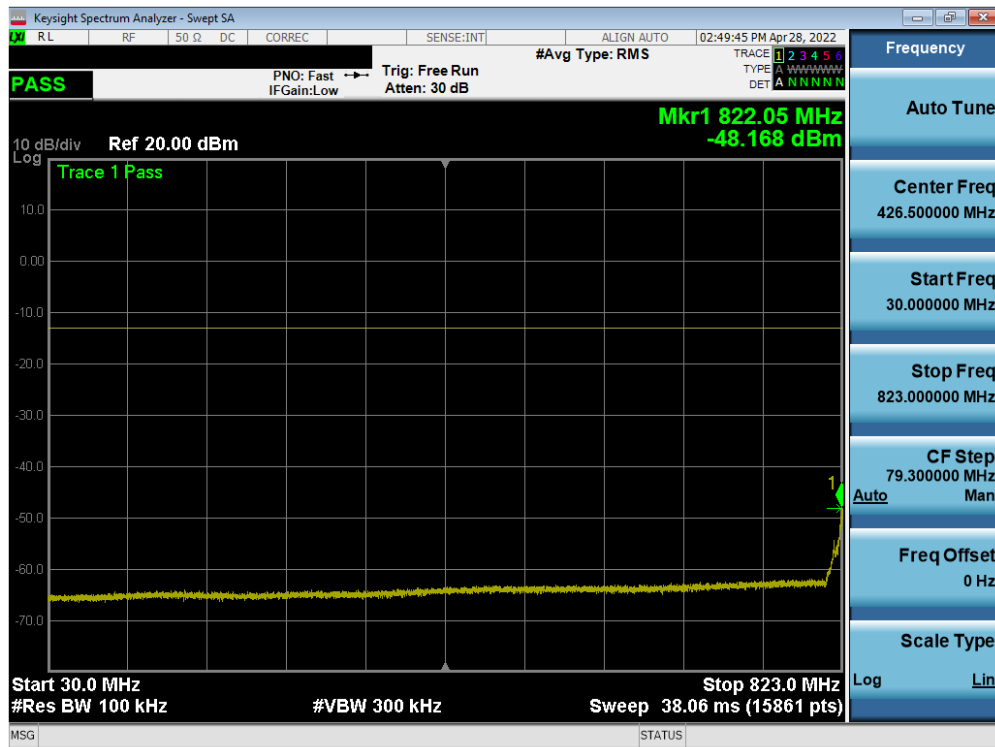
## **Test Notes**

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.

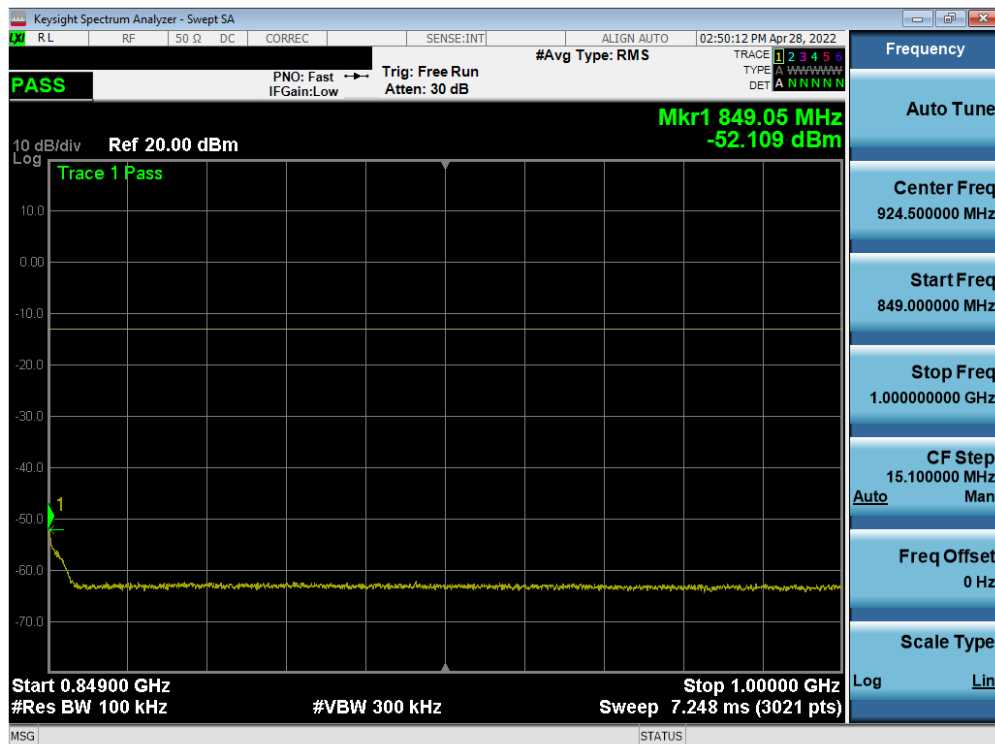
|                                                |                                                                                                                       |                           |                                          |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------|
| <b>FCC ID:</b> BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> |                           | <b>Approved by:</b><br>Technical Manager |
| <b>Test Report S/N:</b><br>1C2205090040-01.BCG | <b>Test Dates:</b><br>4/6/2022 - 8/12/2022                                                                            | <b>EUT Type:</b><br>Watch | Page 20 of 56                            |

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## LTE Band 26/5



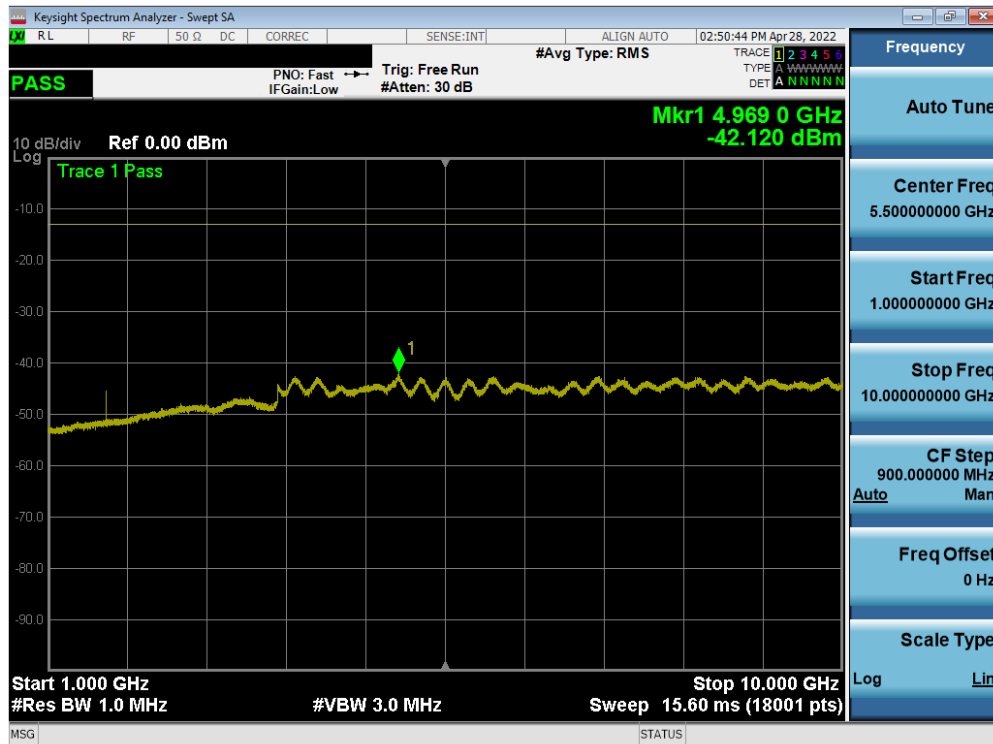
Plot 7-10. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



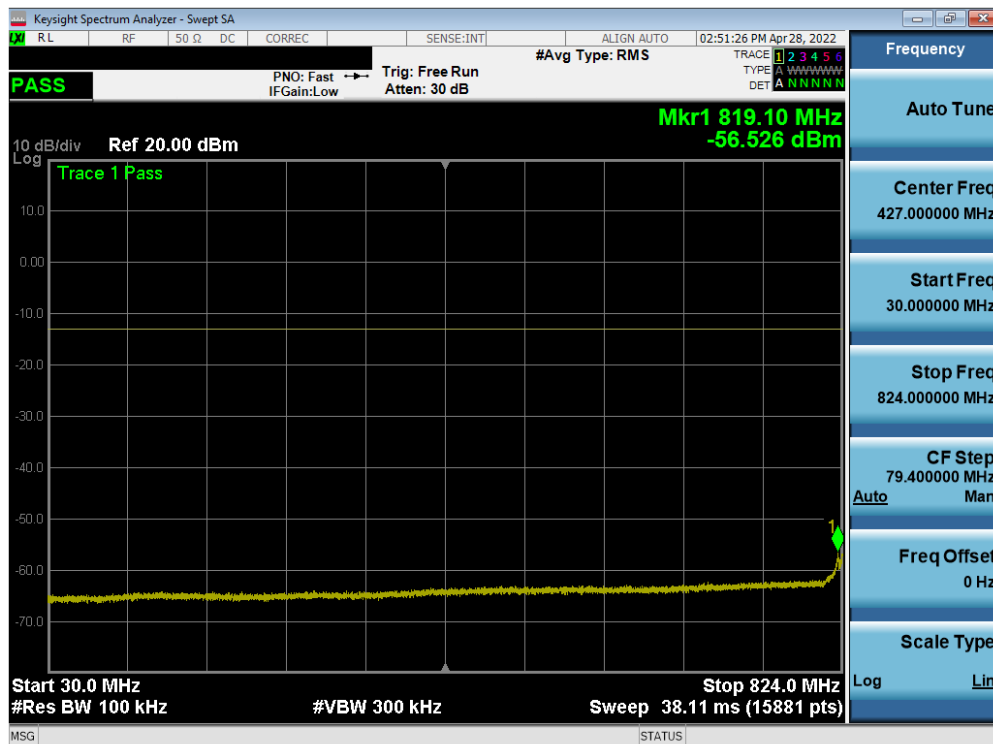
Plot 7-11. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

|                                         |                                                                                                                |                    |                                   |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  PART 22 MEASUREMENT REPORT |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                            | EUT Type:<br>Watch | Page 21 of 56                     |

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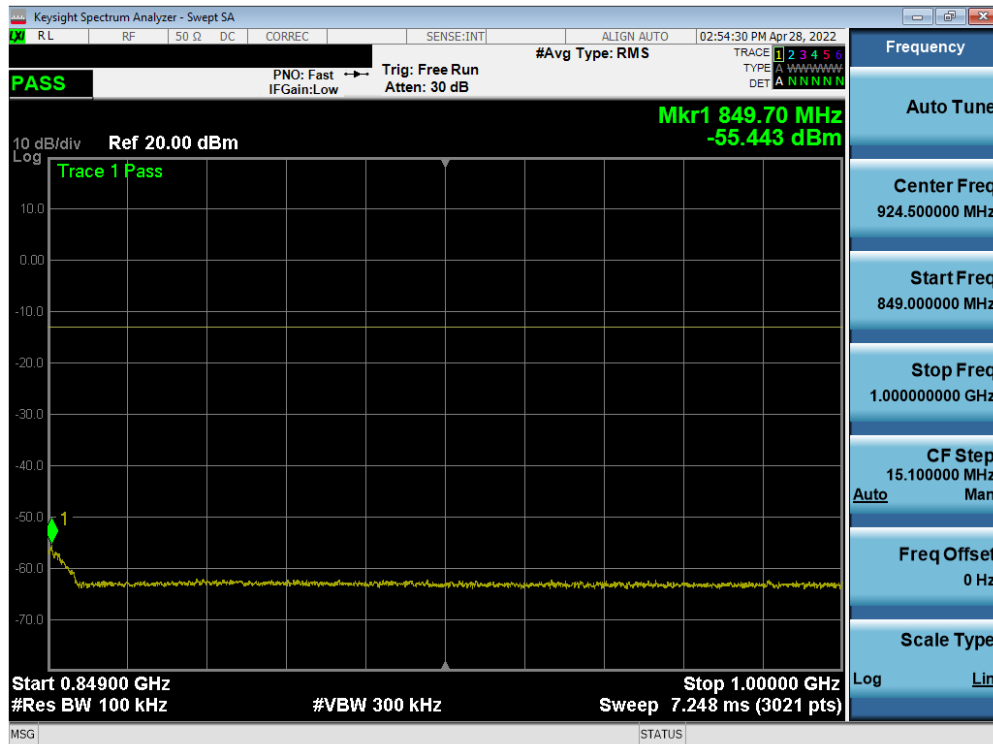


Plot 7-12. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

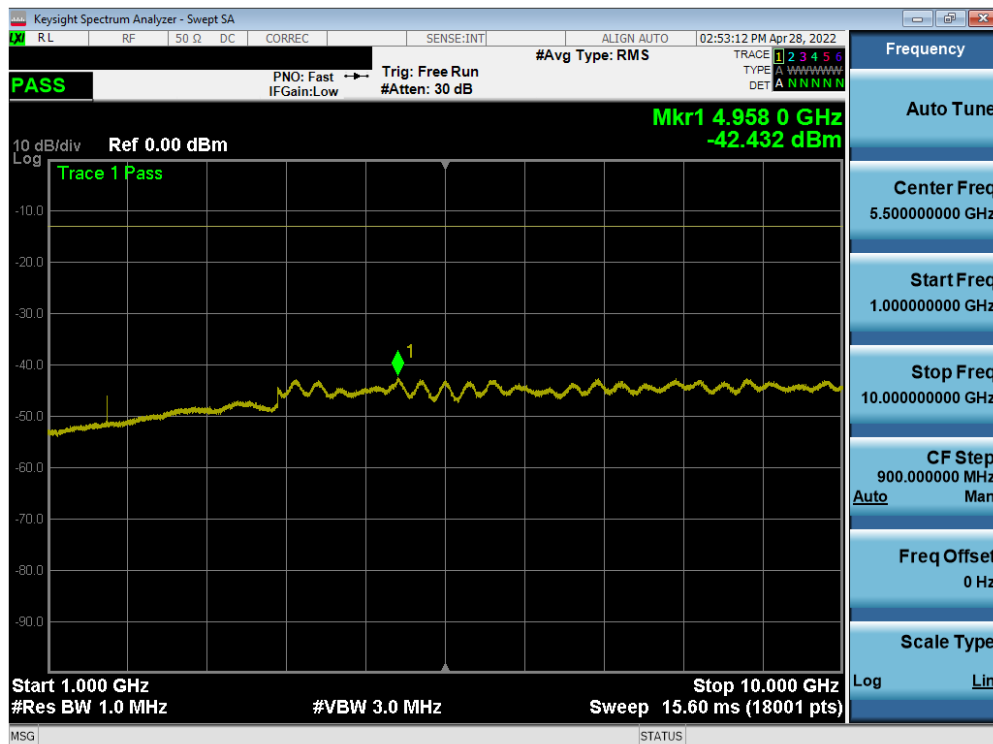


Plot 7-13. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

|                                         |                                     |                            |                                   |
|-----------------------------------------|-------------------------------------|----------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       | element                             | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022 | EUT Type:<br>Watch         | Page 22 of 56                     |

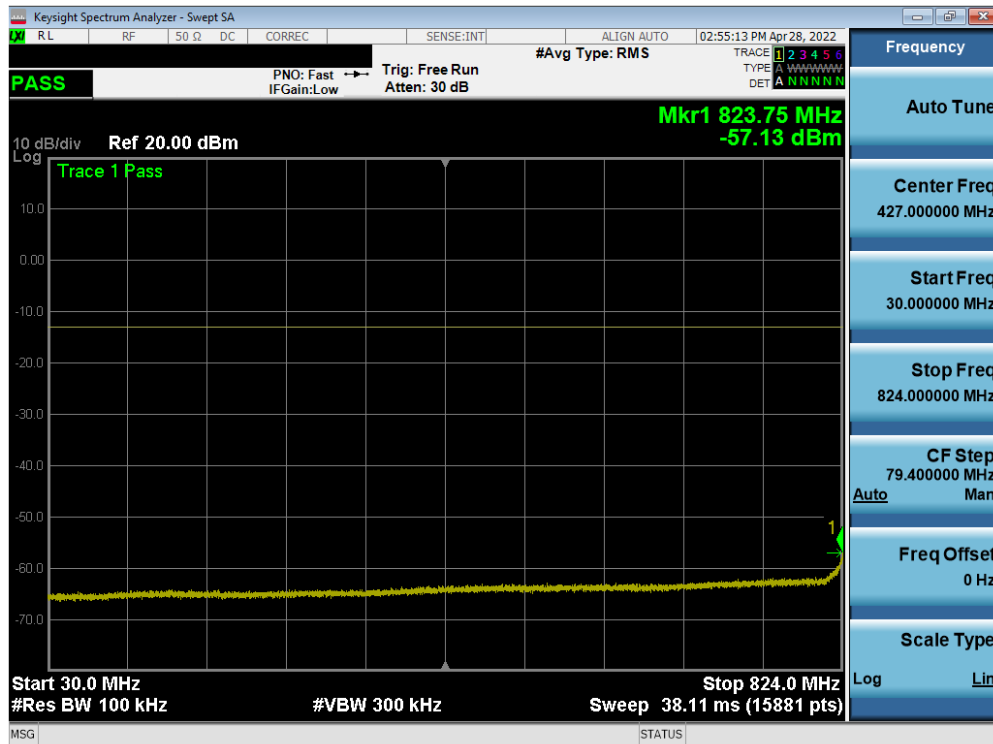


Plot 7-14. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

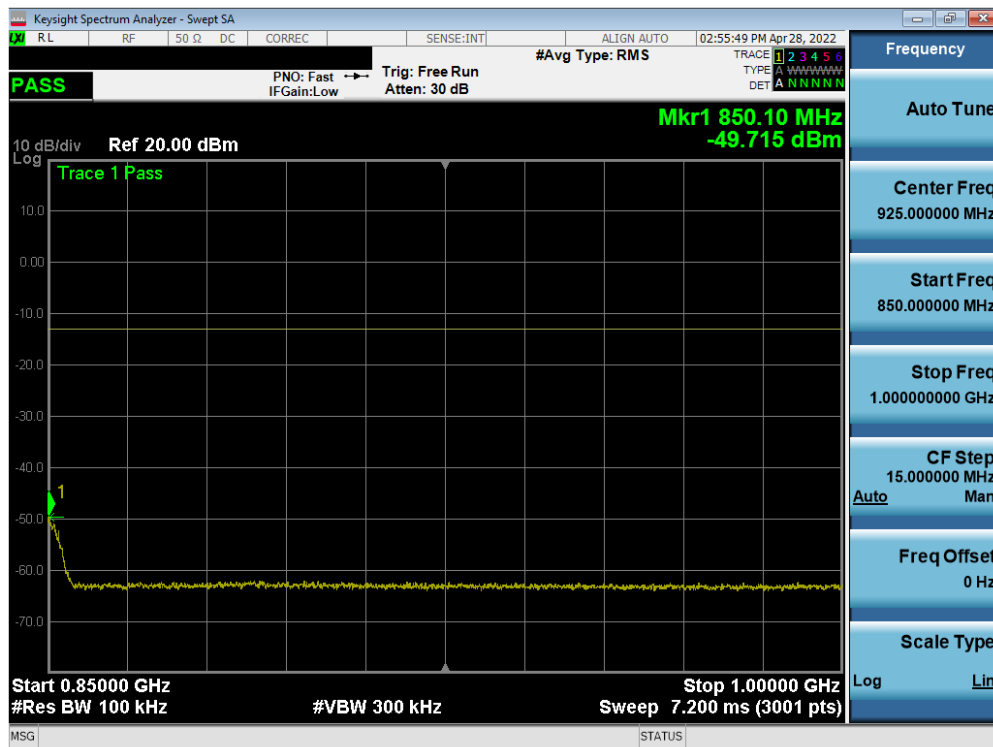


Plot 7-15. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

|                                         |                                     |                    |                                   |
|-----------------------------------------|-------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       | <b>PART 22 MEASUREMENT REPORT</b>   |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022 | EUT Type:<br>Watch | Page 23 of 56                     |



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

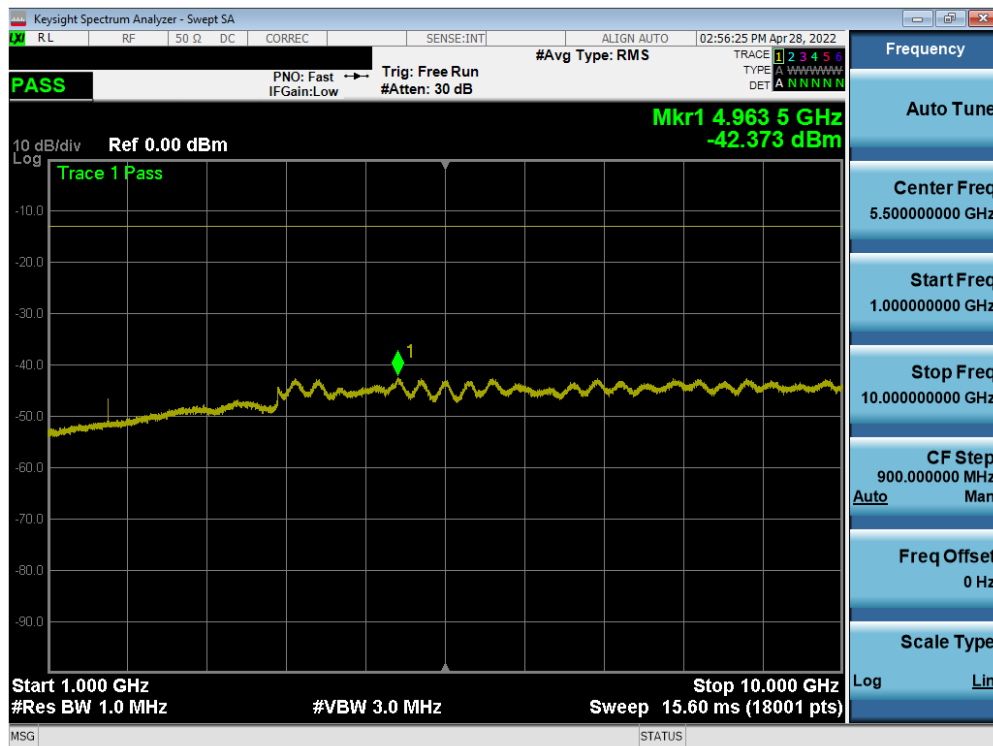


Plot 7-17. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

|                                         |                                                                                                                       |                    |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                   | EUT Type:<br>Watch | Page 24 of 56                     |

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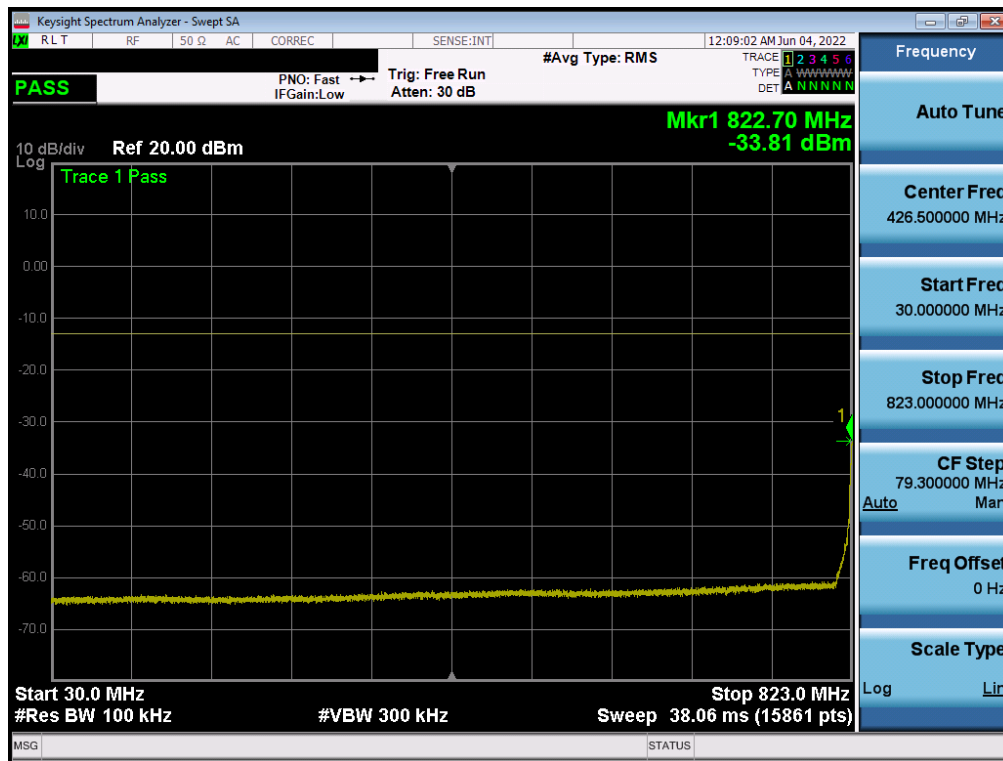
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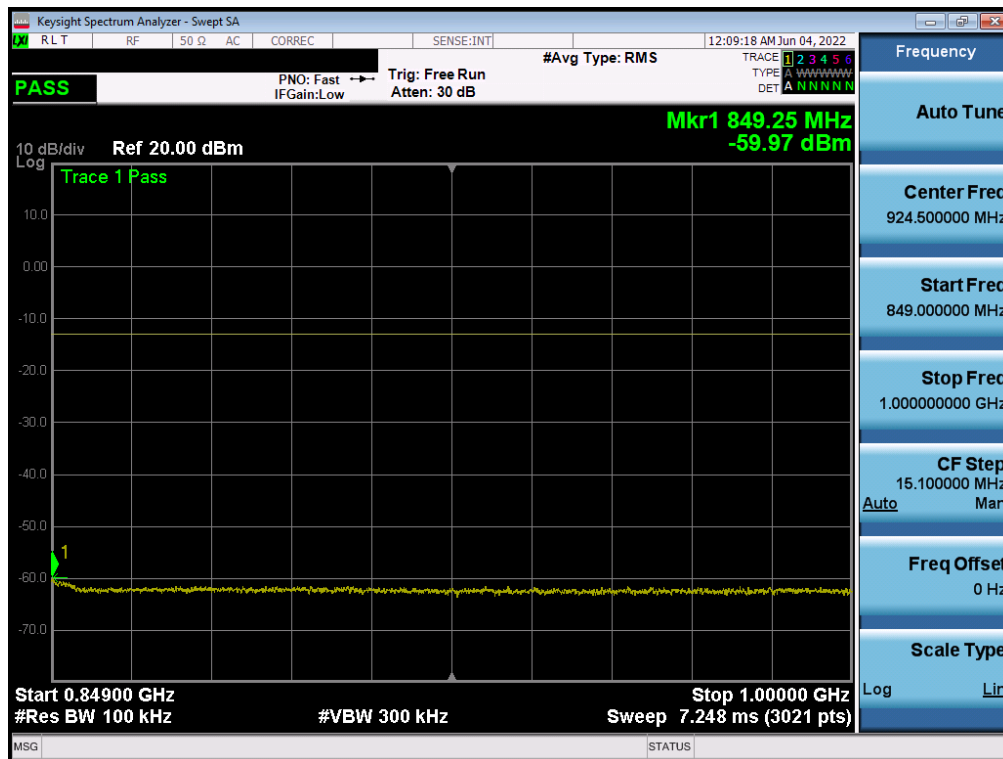
Plot 7-18. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

|                                         |                                                                                             |                            |                                   |
|-----------------------------------------|---------------------------------------------------------------------------------------------|----------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  element | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                         | EUT Type:<br>Watch         | Page 25 of 56                     |

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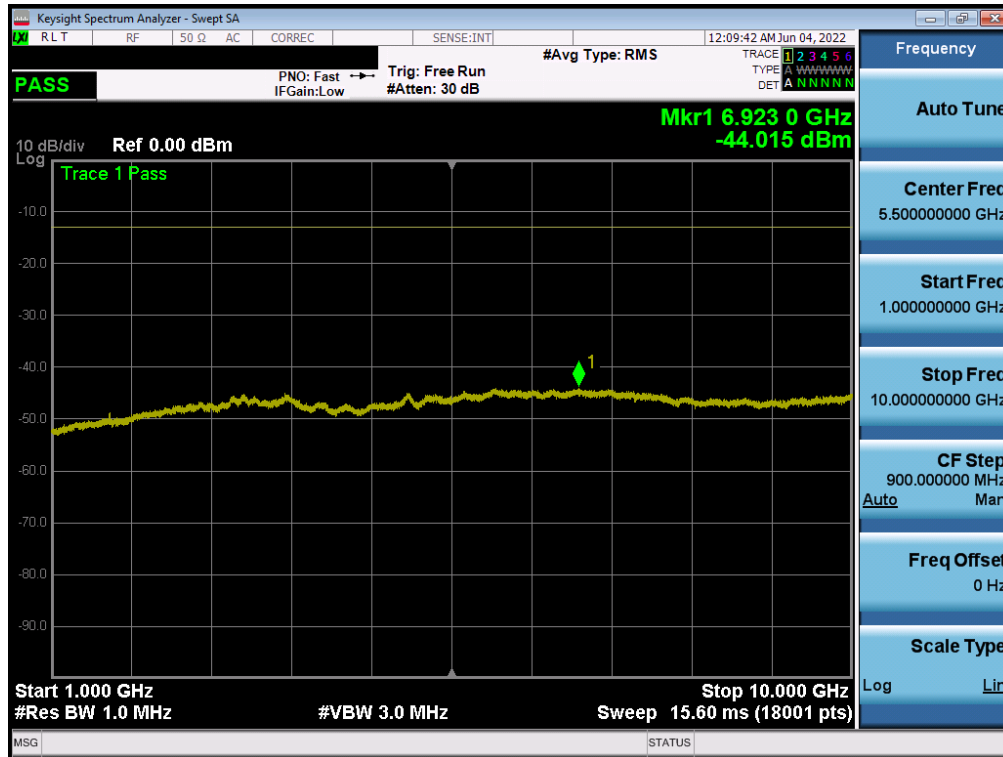


Plot 7-19. Conducted Spurious Plot (WCDMA Ch. 4132)

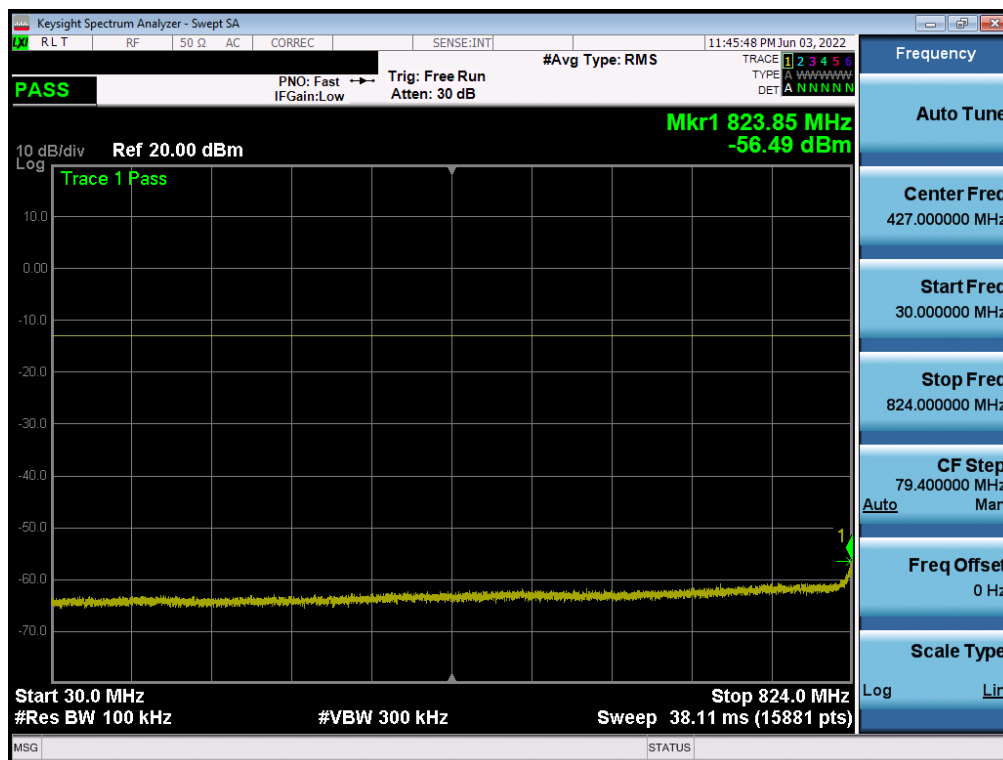


Plot 7-20. Conducted Spurious Plot (WCDMA Ch. 4132)

|                                         |                                                                                                                |                    |                                   |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  PART 22 MEASUREMENT REPORT |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                            | EUT Type:<br>Watch | Page 26 of 56                     |

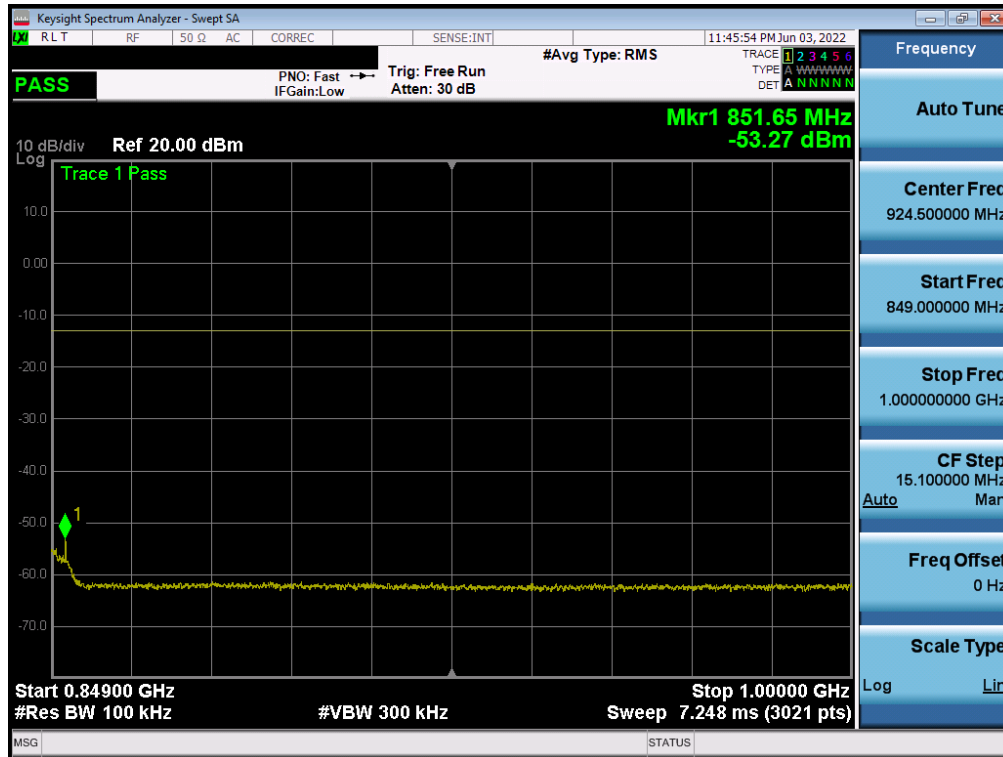


Plot 7-21. Conducted Spurious Plot (WCDMA Ch. 4132)

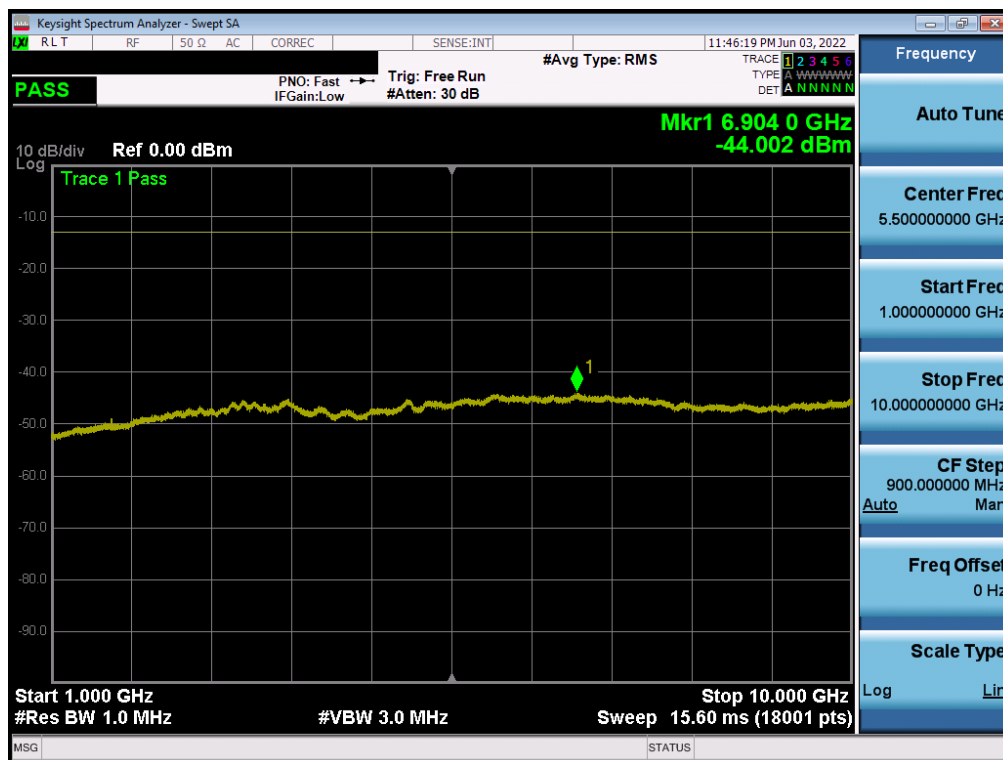


Plot 7-22. Conducted Spurious Plot (WCDMA Ch. 4183)

|                                         |                                                  |                    |                                   |
|-----------------------------------------|--------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       | <p>element</p> <p>PART 22 MEASUREMENT REPORT</p> |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022              | EUT Type:<br>Watch | Page 27 of 56                     |

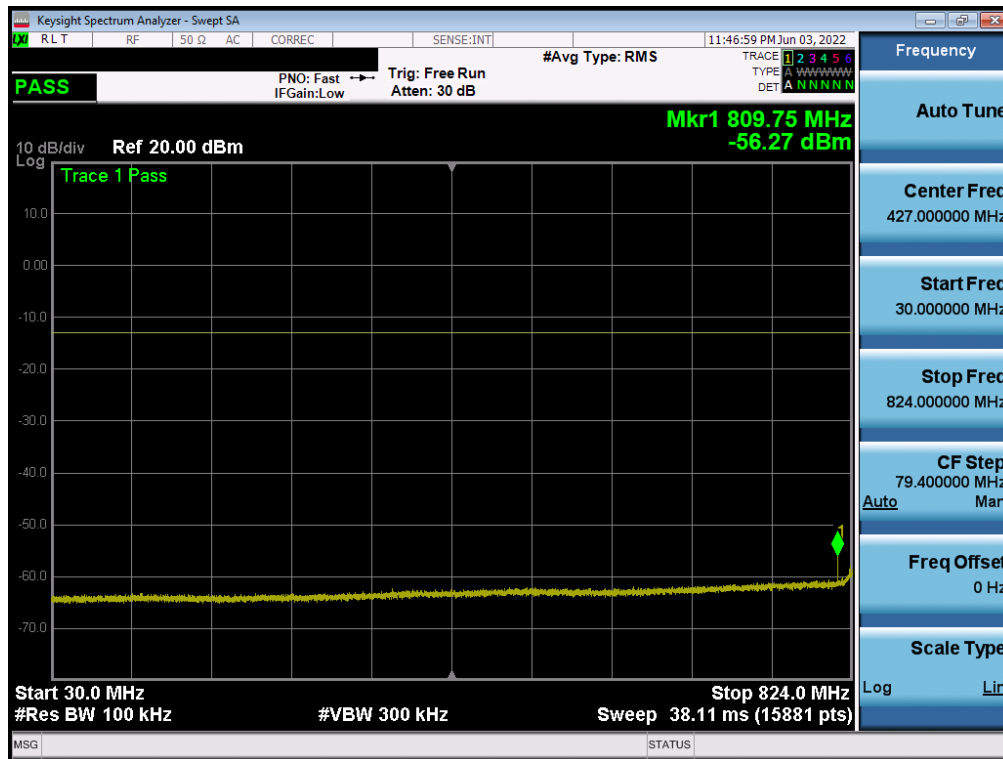


Plot 7-23. Conducted Spurious Plot (WCDMA Ch. 4183)

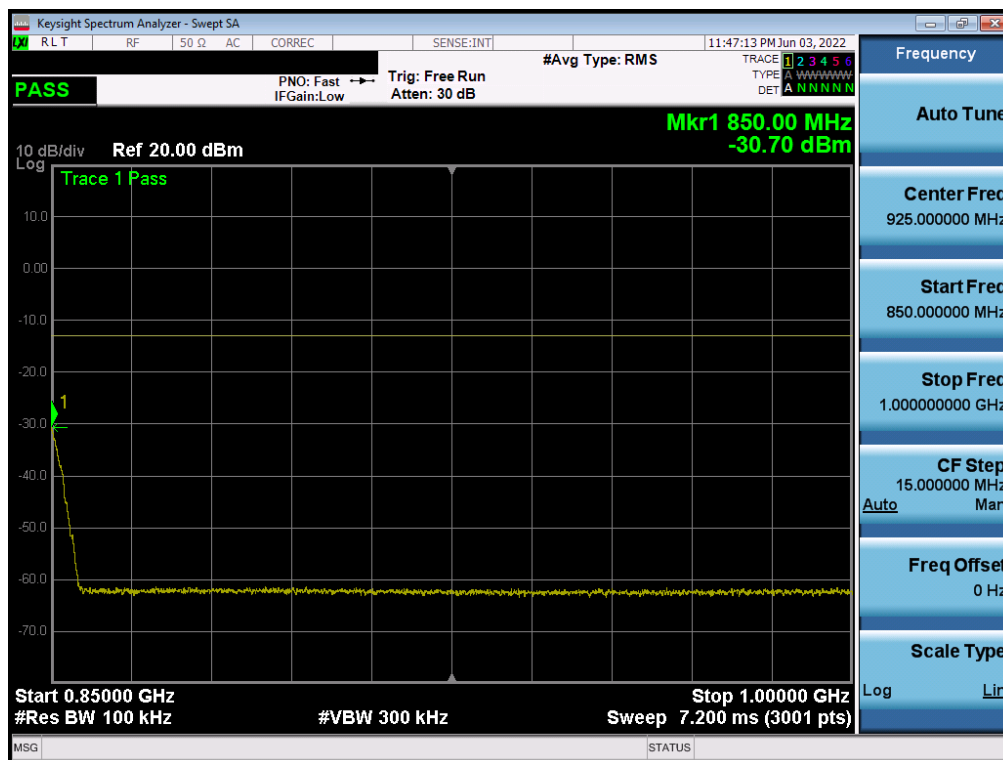


Plot 7-24. Conducted Spurious Plot (WCDMA Ch. 4183)

|                                         |                                                  |                    |                                   |
|-----------------------------------------|--------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       | <p>element</p> <p>PART 22 MEASUREMENT REPORT</p> |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022              | EUT Type:<br>Watch | Page 28 of 56                     |



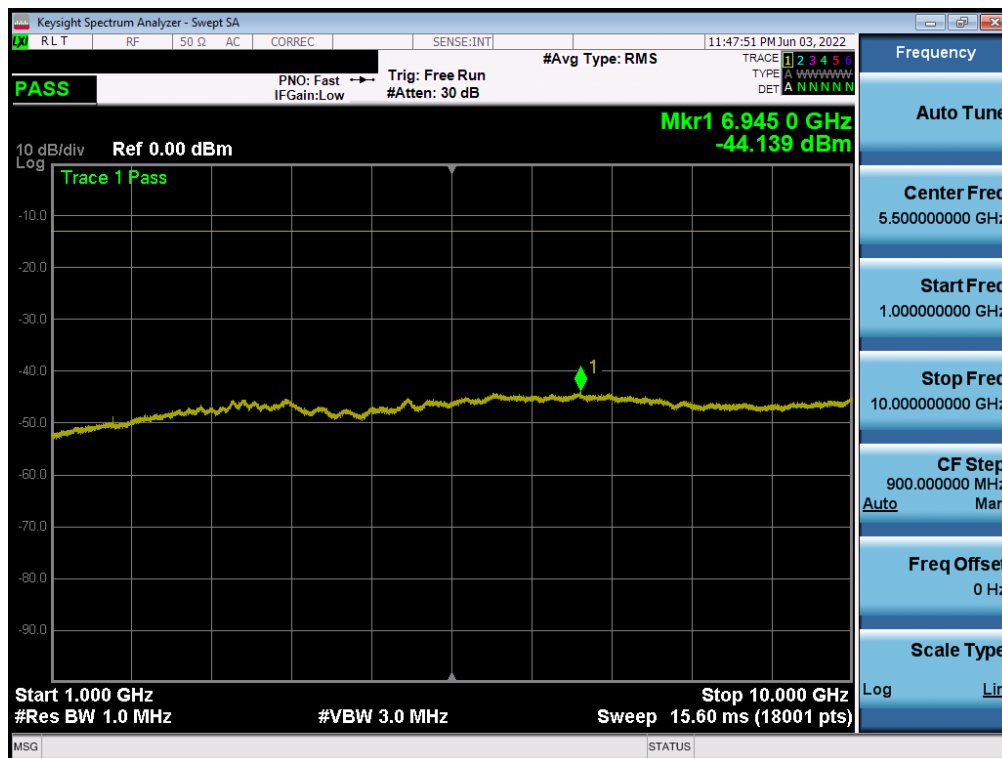
Plot 7-25. Conducted Spurious Plot (WCDMA Ch. 4233)



Plot 7-26. Conducted Spurious Plot (WCDMA Ch. 4233)

|                                         |                                                  |                    |                                   |
|-----------------------------------------|--------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       | <p>element</p> <p>PART 22 MEASUREMENT REPORT</p> |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022              | EUT Type:<br>Watch | Page 29 of 56                     |

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Plot 7-27. Conducted Spurious Plot (WCDMA Ch. 4233)

|                                         |                                                                                                                |                    |                                   |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  PART 22 MEASUREMENT REPORT |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                            | EUT Type:<br>Watch | Page 30 of 56                     |

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## 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

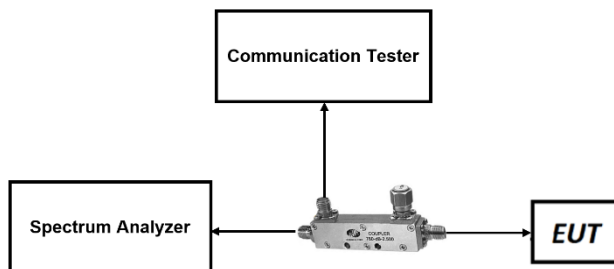
KDB 971168 D01 v03r01 – Section 6.0

### 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.  $\text{RBW} \geq 1\%$  of the emission bandwidth
4.  $\text{VBW} \geq 3 \times \text{RBW}$
5. Detector = RMS
6. Number of sweep points  $\geq 2 \times \text{Span}/\text{RBW}$
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                       |  PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                            | EUT Type:<br>Watch                |
|                                         |                                                                                                                | Page 31 of 56                     |

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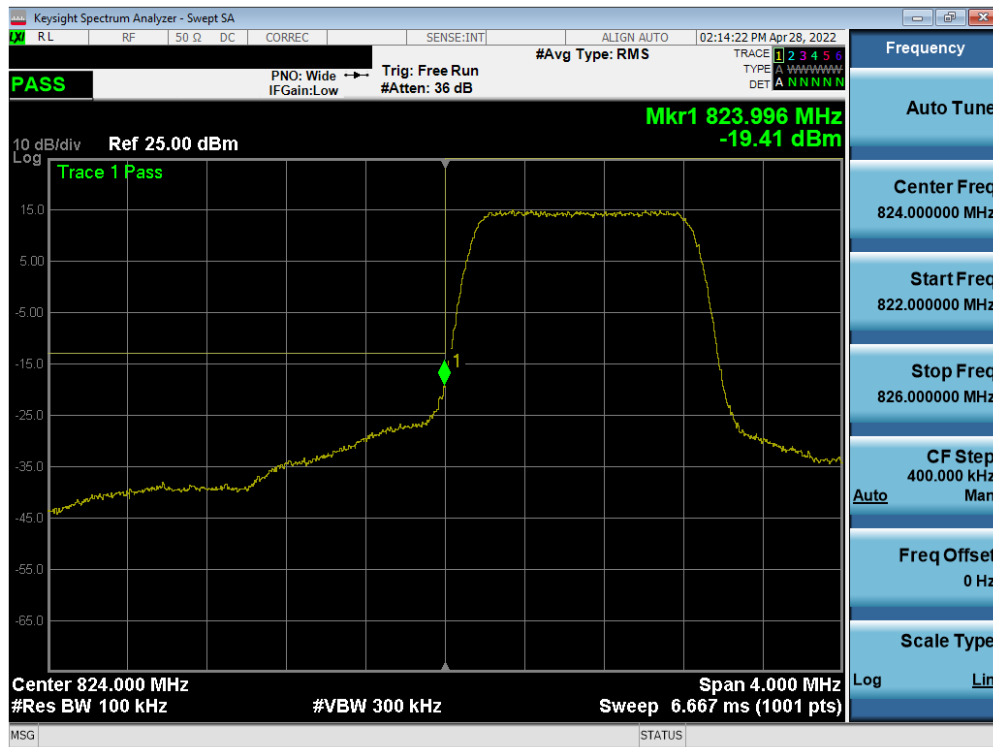
## Test Notes

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.

|                                                |                                                                                                                       |                           |                                          |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------|
| <b>FCC ID:</b> BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> |                           | <b>Approved by:</b><br>Technical Manager |
| <b>Test Report S/N:</b><br>1C2205090040-01.BCG | <b>Test Dates:</b><br>4/6/2022 - 8/12/2022                                                                            | <b>EUT Type:</b><br>Watch | Page 32 of 56                            |

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## LTE Band 5



Plot 7-28. Lower BE Plot (LTE Band 5 – 1.4MHz QPSK – Full RB Configuration)

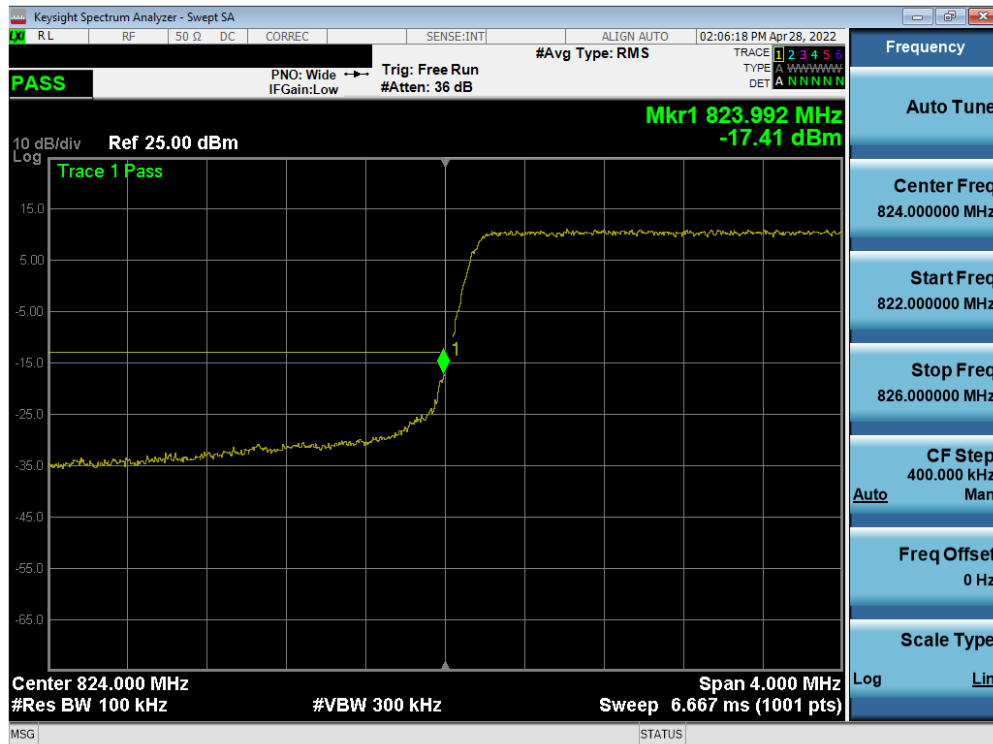


Plot 7-29. Upper BE Plot (LTE Band 5 – 1.4MHz QPSK – Full RB Configuration)

|                                         |                                                                                                                |                    |                                   |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  PART 22 MEASUREMENT REPORT |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                            | EUT Type:<br>Watch | Page 33 of 56                     |

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Plot 7-30. Lower BE Plot (LTE Band 5 - 3MHz QPSK – Full RB Configuration)

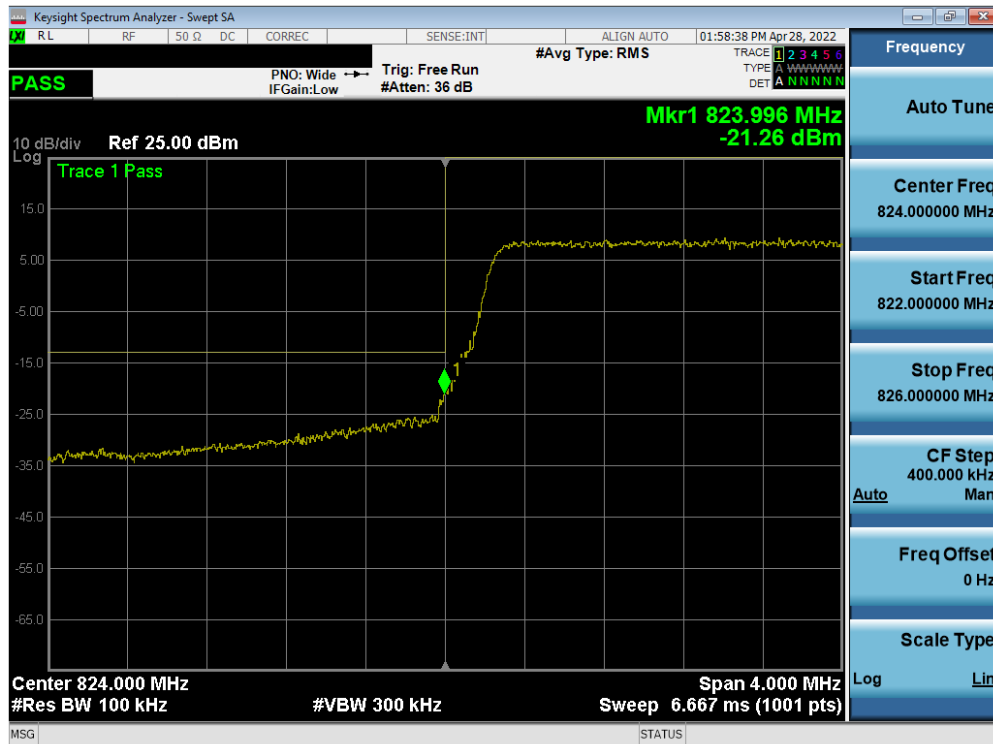


Plot 7-31. Upper BE Plot (LTE Band 5 - 3MHz QPSK – Full RB Configuration)

|                                         |                                                                                                                |                    |                                   |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  PART 22 MEASUREMENT REPORT |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                            | EUT Type:<br>Watch | Page 34 of 56                     |

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Plot 7-32. Lower BE Plot (LTE Band 5 - 5MHz QPSK – Full RB Configuration)

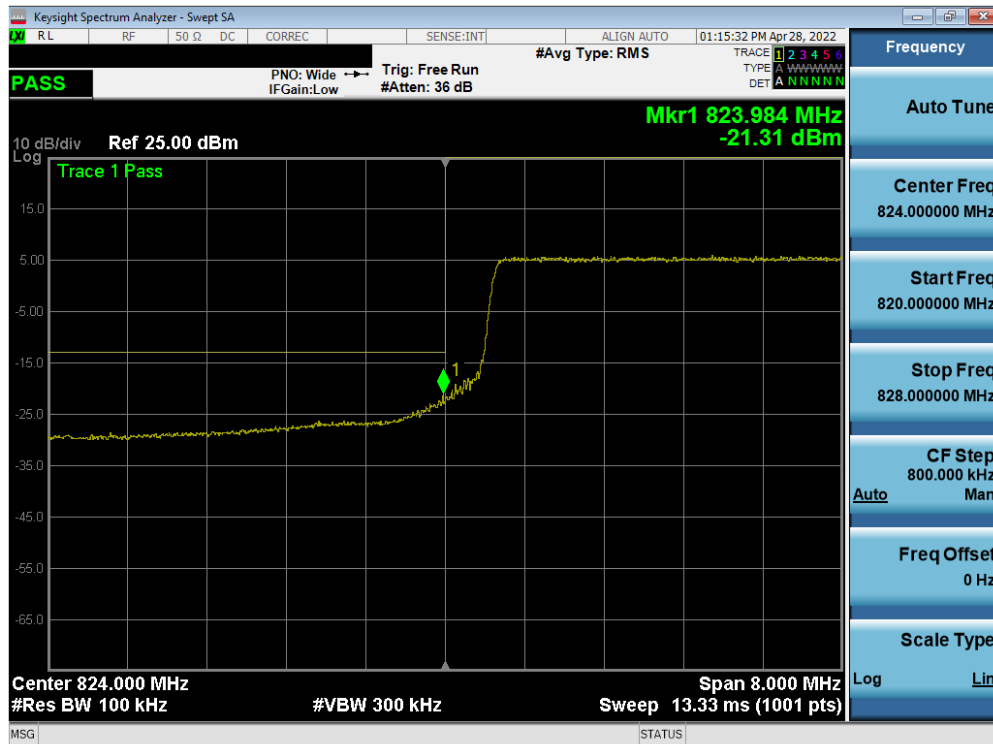


Plot 7-33. Upper BE Plot (LTE Band 5 - 5MHz QPSK – Full RB Configuration)

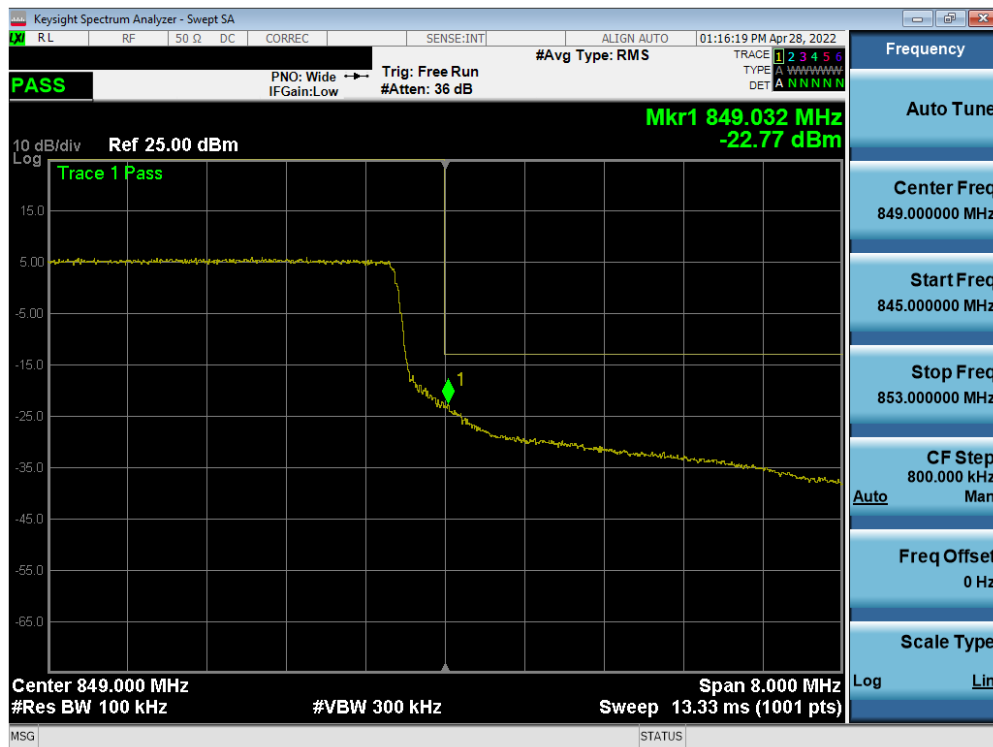
|                                         |                                                                                                                |                    |                                   |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  PART 22 MEASUREMENT REPORT |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                            | EUT Type:<br>Watch | Page 35 of 56                     |

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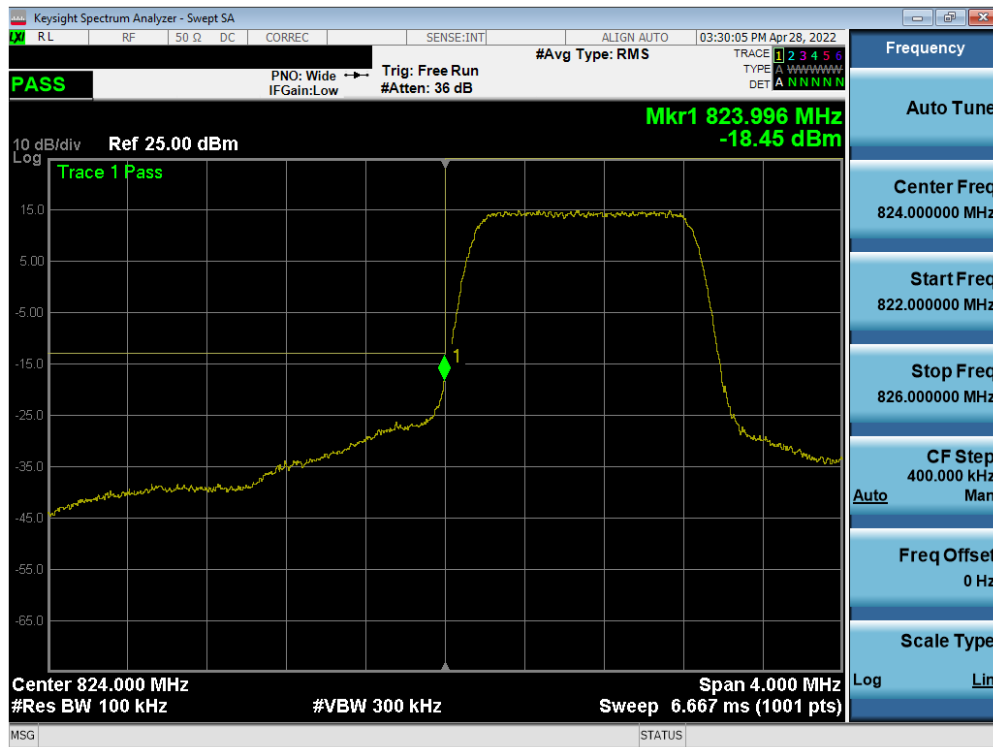
Plot 7-34. Lower BE Plot (LTE Band 5 - 10MHz QPSK – Full RB Configuration)



Plot 7-35. Upper BE Plot (LTE Band 5 - 10MHz QPSK – Full RB Configuration)

|                                         |                                     |                            |                                   |
|-----------------------------------------|-------------------------------------|----------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       | element                             | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022 | EUT Type:<br>Watch         | Page 36 of 56                     |

## LTE Band 26



Plot 7-36. Lower BE Plot (LTE Band 26 – 1.4MHz QPSK – Full RB Configuration)

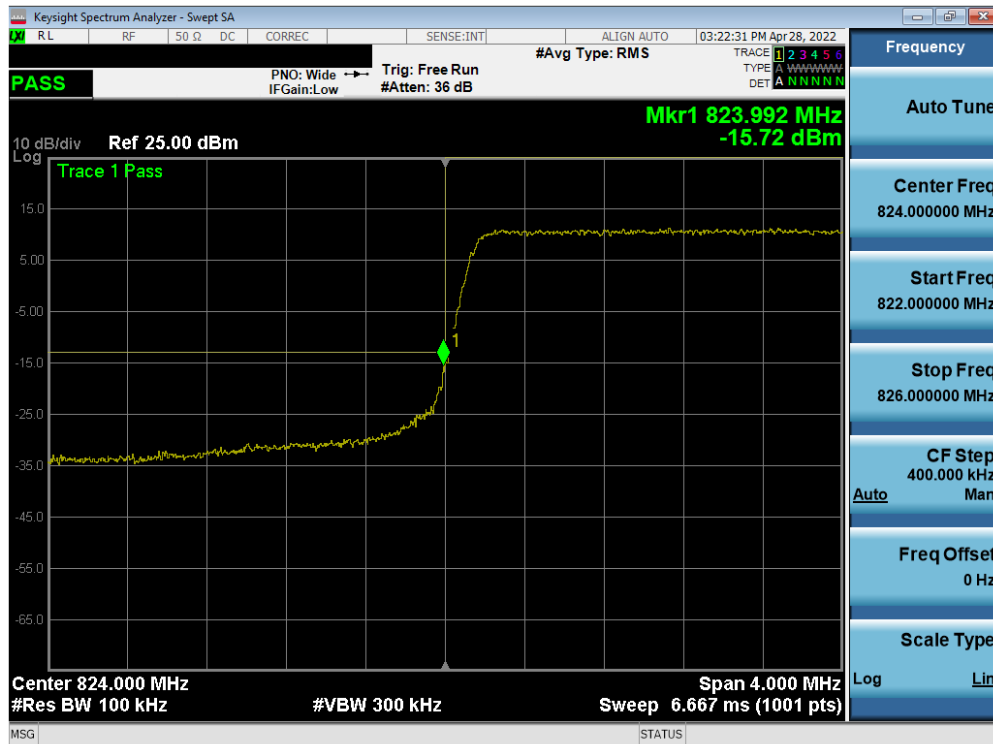


Plot 7-37. Upper BE Plot (LTE Band 26 – 1.4MHz QPSK – Full RB Configuration)

|                                         |                                                                                                                |                    |                                   |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  PART 22 MEASUREMENT REPORT |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                            | EUT Type:<br>Watch | Page 37 of 56                     |

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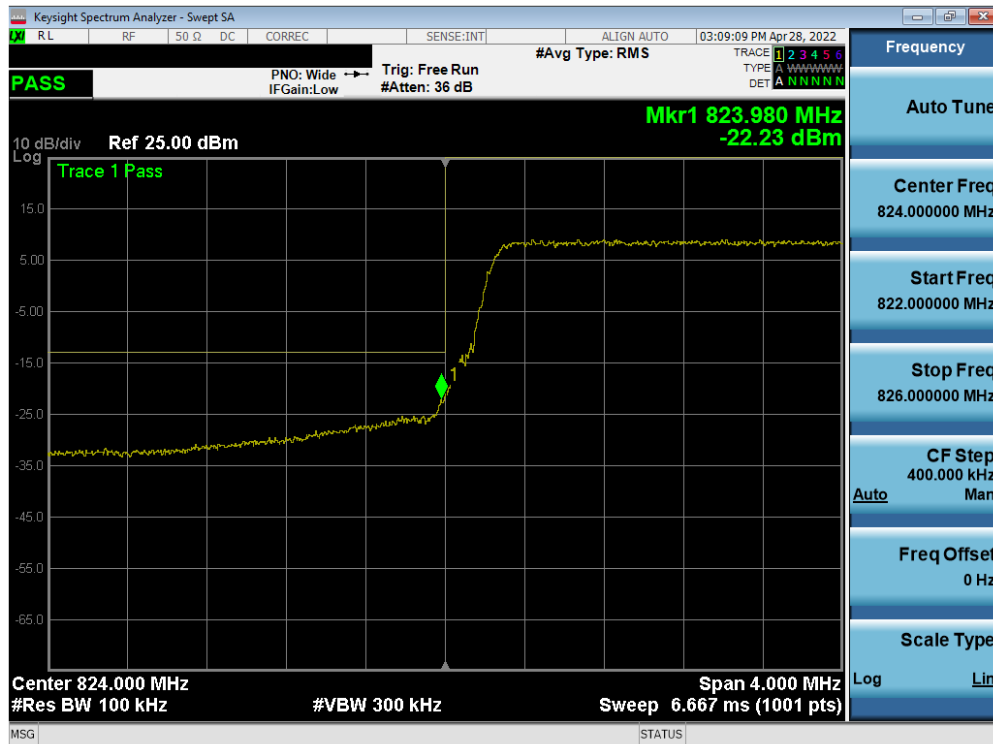


Plot 7-38. Lower BE Plot (LTE Band 26 - 3MHz QPSK – Full RB Configuration)



Plot 7-39. Upper BE Plot (LTE Band 26 - 3MHz QPSK – Full RB Configuration)

|                                         |                                     |                    |                                   |
|-----------------------------------------|-------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       | PART 22 MEASUREMENT REPORT          |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022 | EUT Type:<br>Watch | Page 38 of 56                     |

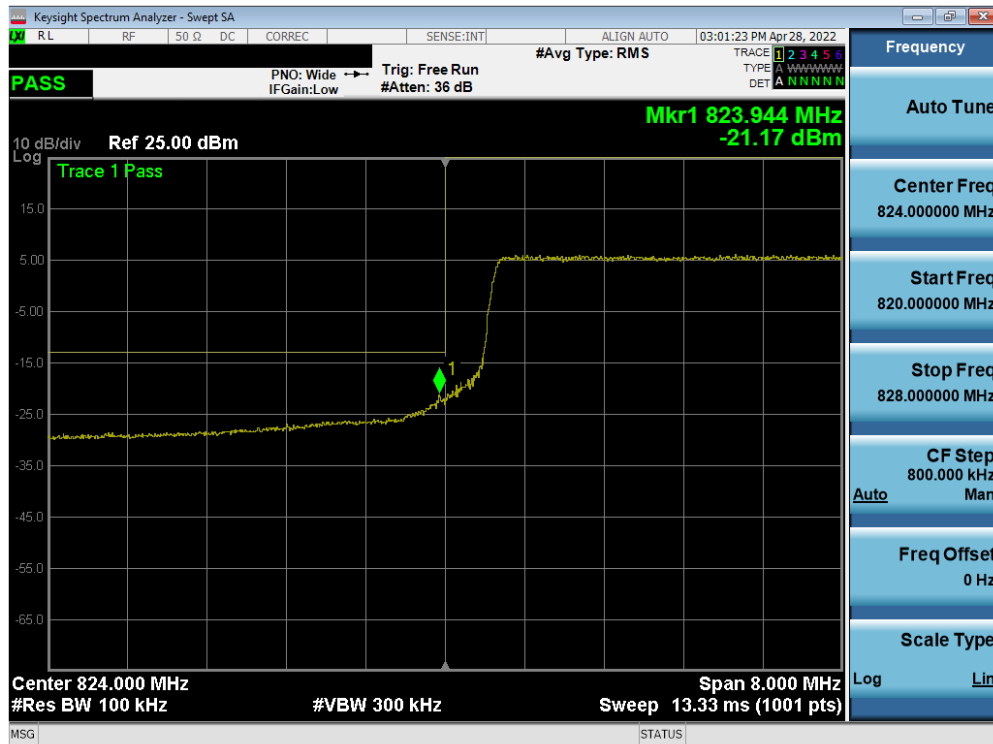


Plot 7-40. Lower BE Plot (LTE Band 26 - 5MHz QPSK – Full RB Configuration)

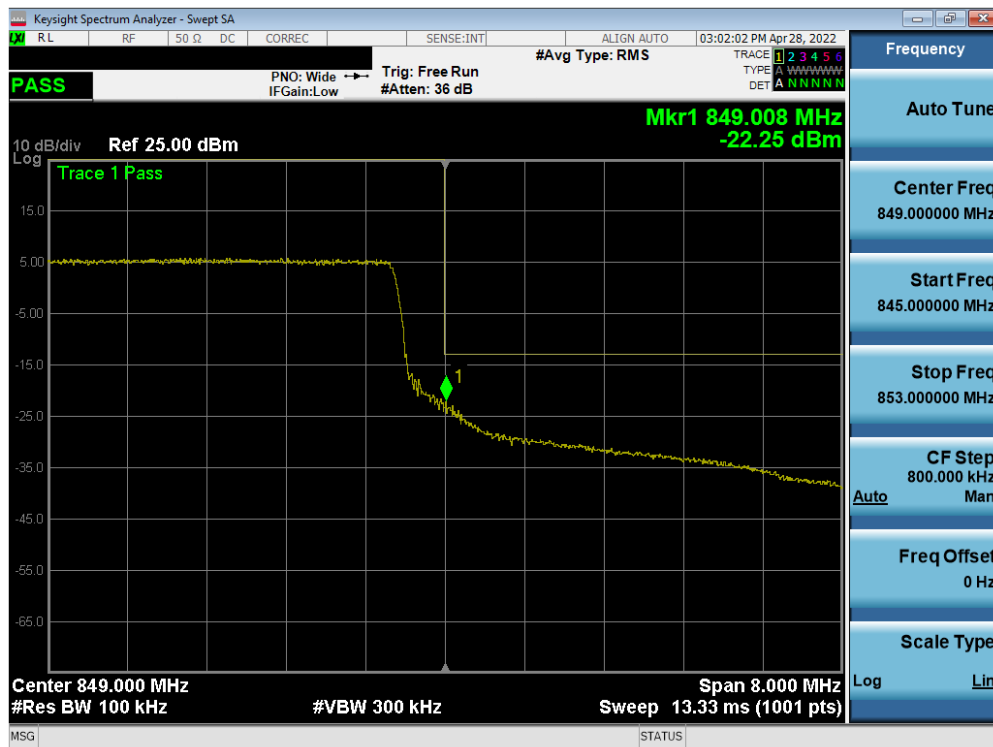


Plot 7-41. Upper BE Plot (LTE Band 26 - 5MHz QPSK – Full RB Configuration)

|                                         |                                                                                                                |                    |                                   |
|-----------------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  PART 22 MEASUREMENT REPORT |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                            | EUT Type:<br>Watch | Page 39 of 56                     |



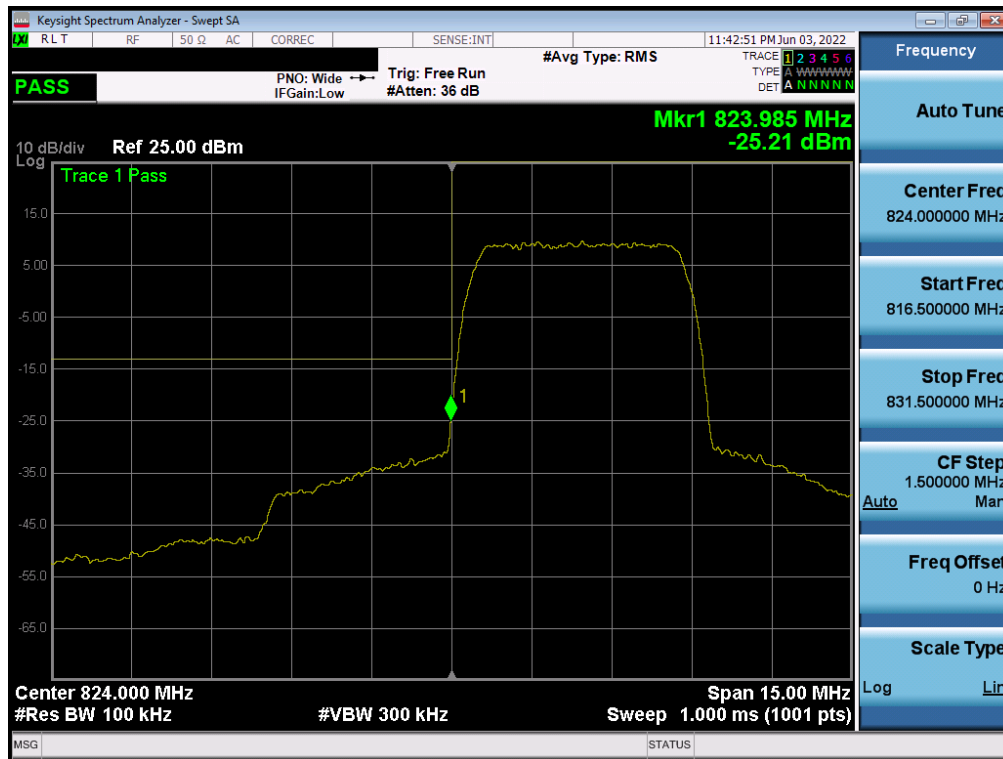
Plot 7-42. Lower BE Plot (LTE Band 26 - 10MHz QPSK – Full RB Configuration)



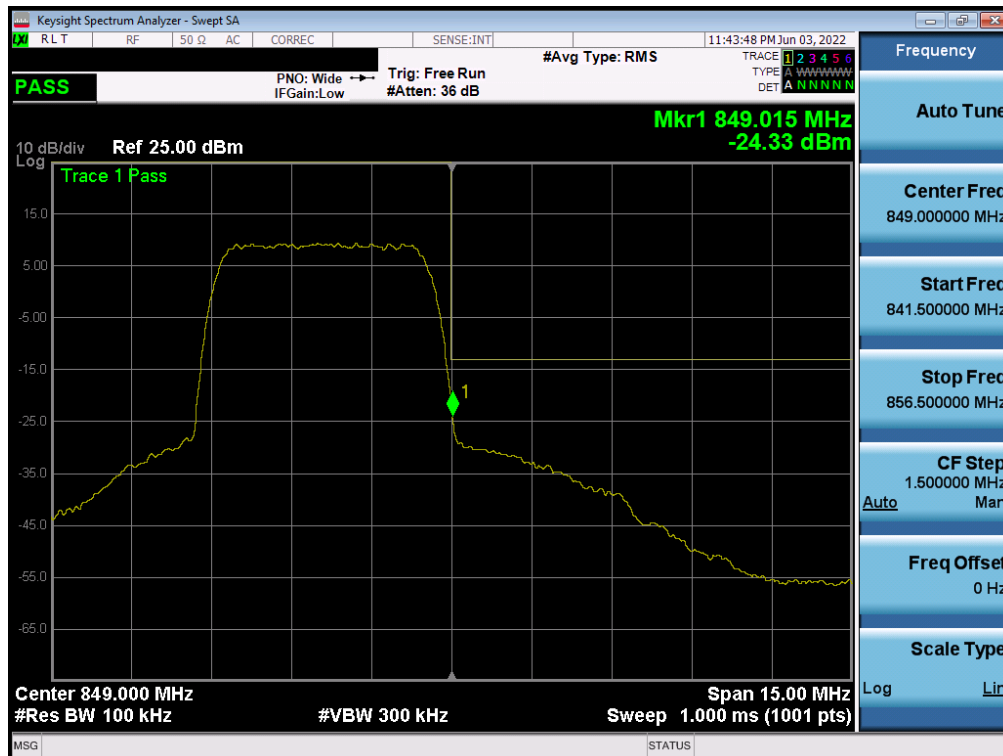
Plot 7-43. Upper BE Plot (LTE Band 26 - 10MHz QPSK – Full RB Configuration)

|                                         |                                     |                            |                                   |
|-----------------------------------------|-------------------------------------|----------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       | element                             | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022 | EUT Type:<br>Watch         | Page 40 of 56                     |

## WCDMA Cell



Plot 7-44. Lower BE Plot (WCDMA Cell – Ch. 4132)



Plot 7-45. Upper BE Plot (WCDMA Cell – Ch. 4233)

|                                         |                                                                                                                       |                    |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                   | EUT Type:<br>Watch | Page 41 of 56                     |

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## 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)

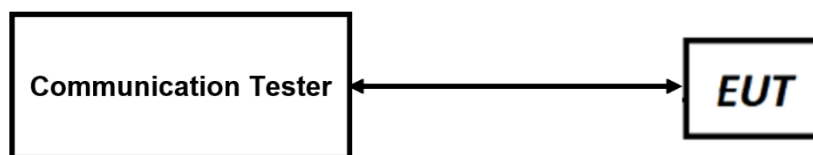
PMeas = measured transmitter output power or PSD, in dBW or dBm

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: BCG-A2774                       |  | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                 | EUT Type:<br>Watch         | Page 42 of 56                     |

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**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.

|                                                |                                                                                                                       |                           |                                          |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|---------------------------|------------------------------------------|
| <b>FCC ID:</b> BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> |                           | <b>Approved by:</b><br>Technical Manager |
| <b>Test Report S/N:</b><br>1C2205090040-01.BCG | <b>Test Dates:</b><br>4/6/2022 - 8/12/2022                                                                            | <b>EUT Type:</b><br>Watch | Page 43 of 56                            |

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## 7.5.1 Antenna BCM - 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 [mW] | EIRP Limit [dBm] | Margin [dB] |
|-----------|------|-----------------|-----------------|----------------|-----------------------|-----------|-------------|-----------------|-------------|------------|-----------|------------------|-------------|
| 1.4 MHz   | QPSK | 824.7           | -26.90          | 1 / 5          | 25.21                 | -3.84     | 0.413       | 38.45           | -42.29      | -1.69      | 0.678     | 40.61            | -42.30      |
|           |      | 836.5           | -26.90          | 1 / 0          | 25.30                 | -3.75     | 0.422       | 38.45           | -42.20      | -1.60      | 0.692     | 40.61            | -42.21      |
|           |      | 848.3           | -26.90          | 1 / 5          | 25.33                 | -3.72     | 0.425       | 38.45           | -42.17      | -1.57      | 0.697     | 40.61            | -42.18      |
| 3 MHz     | QPSK | 836.5           | -26.90          | 1 / 0          | 24.68                 | -4.37     | 0.366       | 38.45           | -42.82      | -2.22      | 0.600     | 40.61            | -42.83      |
|           |      | 825.5           | -26.90          | 1 / 0          | 25.21                 | -3.84     | 0.413       | 38.45           | -42.29      | -1.69      | 0.678     | 40.61            | -42.30      |
|           |      | 836.5           | -26.90          | 1 / 0          | 25.36                 | -3.69     | 0.428       | 38.45           | -42.14      | -1.54      | 0.701     | 40.61            | -42.15      |
| 5 MHz     | QPSK | 847.5           | -26.90          | 1 / 0          | 25.16                 | -3.89     | 0.408       | 38.45           | -42.34      | -1.74      | 0.670     | 40.61            | -42.35      |
|           |      | 836.5           | -26.90          | 1 / 0          | 24.70                 | -4.35     | 0.367       | 38.45           | -42.80      | -2.20      | 0.603     | 40.61            | -42.81      |
|           |      | 826.5           | -26.90          | 1 / 12         | 25.32                 | -3.73     | 0.424       | 38.45           | -42.18      | -1.58      | 0.695     | 40.61            | -42.19      |
| 10 MHz    | QPSK | 836.5           | -26.90          | 1 / 12         | 25.40                 | -3.65     | 0.432       | 38.45           | -42.10      | -1.50      | 0.708     | 40.61            | -42.11      |
|           |      | 846.5           | -26.90          | 1 / 12         | 25.21                 | -3.84     | 0.413       | 38.45           | -42.29      | -1.69      | 0.678     | 40.61            | -42.30      |
|           |      | 836.5           | -26.90          | 1 / 12         | 24.81                 | -4.24     | 0.377       | 38.45           | -42.69      | -2.09      | 0.618     | 40.61            | -42.70      |

Table 7-2. Antenna BCM 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 [mW] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP [mW] | EIRP Limit [dBm] | Margin [dB] |
|-----------|------|-----------------|-----------------|----------------|-----------------------|-----------|----------|-----------------|-------------|------------|-----------|------------------|-------------|
| 1.4 MHz   | QPSK | 829.0           | -26.90          | 1 / 5          | 25.20                 | -3.85     | 0.412    | 38.45           | -42.30      | -1.70      | 0.676     | 40.61            | -42.31      |
|           |      | 836.5           | -26.90          | 1 / 5          | 25.21                 | -3.84     | 0.413    | 38.45           | -42.29      | -1.69      | 0.678     | 40.61            | -42.30      |
|           |      | 844.0           | -26.90          | 1 / 5          | 25.33                 | -3.72     | 0.425    | 38.45           | -42.17      | -1.57      | 0.697     | 40.61            | -42.18      |
| 3 MHz     | QPSK | 836.5           | -26.90          | 1 / 0          | 24.66                 | -4.39     | 0.364    | 38.45           | -42.84      | -2.24      | 0.597     | 40.61            | -42.85      |
|           |      | 829.0           | -26.90          | 1 / 0          | 25.22                 | -3.83     | 0.414    | 38.45           | -42.28      | -1.68      | 0.679     | 40.61            | -42.29      |
|           |      | 836.5           | -26.90          | 1 / 0          | 25.24                 | -3.81     | 0.416    | 38.45           | -42.26      | -1.66      | 0.682     | 40.61            | -42.27      |
| 5 MHz     | QPSK | 844.0           | -26.90          | 1 / 0          | 25.15                 | -3.90     | 0.407    | 38.45           | -42.35      | -1.75      | 0.668     | 40.61            | -42.36      |
|           |      | 836.5           | -26.90          | 1 / 12         | 24.74                 | -4.31     | 0.371    | 38.45           | -42.76      | -2.16      | 0.608     | 40.61            | -42.77      |
|           |      | 829.0           | -26.90          | 1 / 12         | 25.30                 | -3.75     | 0.422    | 38.45           | -42.20      | -1.60      | 0.692     | 40.61            | -42.21      |
| 10 MHz    | QPSK | 836.5           | -26.90          | 1 / 12         | 25.39                 | -3.66     | 0.431    | 38.45           | -42.11      | -1.51      | 0.706     | 40.61            | -42.12      |
|           |      | 844.0           | -26.90          | 1 / 12         | 25.21                 | -3.84     | 0.413    | 38.45           | -42.29      | -1.69      | 0.678     | 40.61            | -42.30      |
|           |      | 836.5           | -26.90          | 1 / 12         | 24.79                 | -4.26     | 0.375    | 38.45           | -42.71      | -2.11      | 0.615     | 40.61            | -42.72      |

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

### WCDMA Cell

| Frequency [MHz] | Mode     | Conducted Power [dBm] | Ant. Gain [dBi] | ERP [dBm] | ERP [mW] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP [mW] | EIRP Limit [dBm] | Margin [dB] |
|-----------------|----------|-----------------------|-----------------|-----------|----------|-----------------|-------------|------------|-----------|------------------|-------------|
| 826.40          | WCDMA850 | 24.81                 | -26.90          | -4.24     | 0.377    | 38.45           | -42.69      | -2.09      | 0.618     | 40.61            | -42.70      |
| 836.60          | WCDMA850 | 24.84                 | -26.90          | -4.21     | 0.379    | 38.45           | -42.66      | -2.06      | 0.622     | 40.61            | -42.67      |
| 846.60          | WCDMA850 | 24.75                 | -26.90          | -4.30     | 0.372    | 38.45           | -42.75      | -2.15      | 0.610     | 40.61            | -42.76      |

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

|                                         |                                                                                                                       |                    |  |  |  |  |  |               |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|--|--|--|--|--|---------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> |                    |  |  |  |  |  |               | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                   | EUT Type:<br>Watch |  |  |  |  |  | Page 44 of 56 |                                   |

## 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

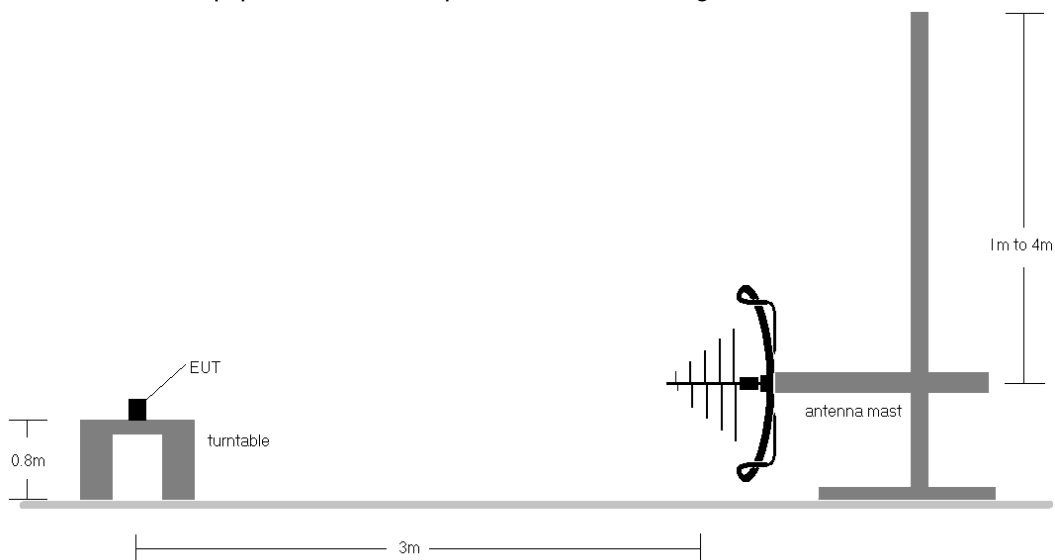
1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW  $\geq 3 \times$  RBW
3. Span = 1.5 times the OBW
4. No. of sweep points  $\geq 2 \times$  span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

|                                         |                                                                                                                       |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                   | EUT Type:<br>Watch                |
|                                         |                                                                                                                       | Page 45 of 56                     |

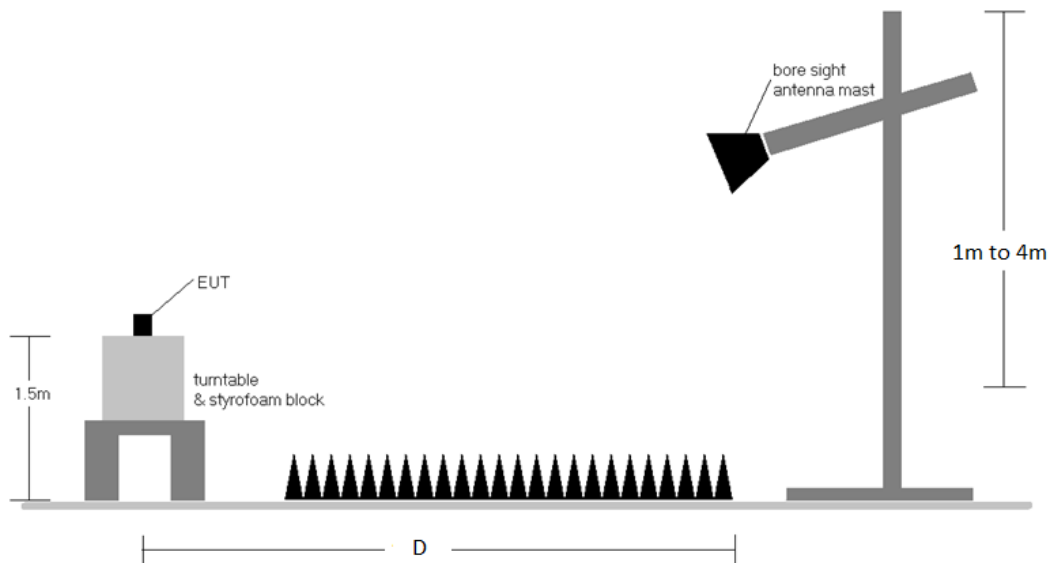
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## Test Setup

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**

|                                         |                                                                                             |                            |  |                                   |
|-----------------------------------------|---------------------------------------------------------------------------------------------|----------------------------|--|-----------------------------------|
| FCC ID: BCG-A2774                       |  element | PART 22 MEASUREMENT REPORT |  | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                         | EUT Type:<br>Watch         |  | Page 46 of 56                     |

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## Test Notes

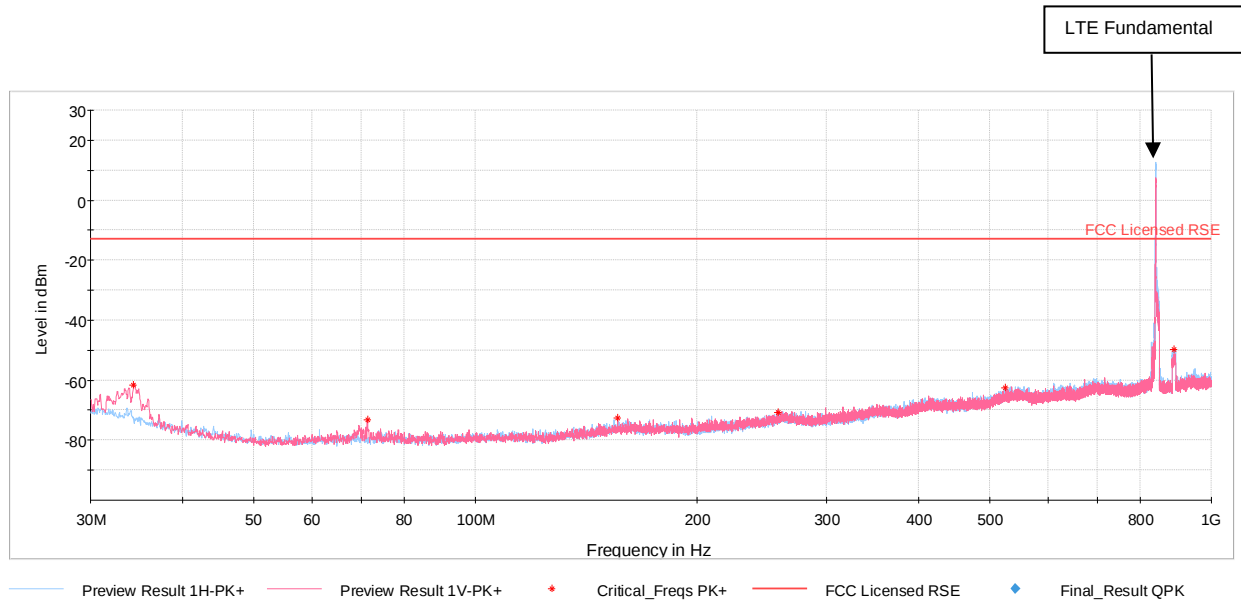
1. Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
  - a.  $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
  - b.  $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$ ; 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: BCG-A2774                       |  <b>PART 22 MEASUREMENT REPORT</b> |                    | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                                                   | EUT Type:<br>Watch | Page 47 of 56                     |

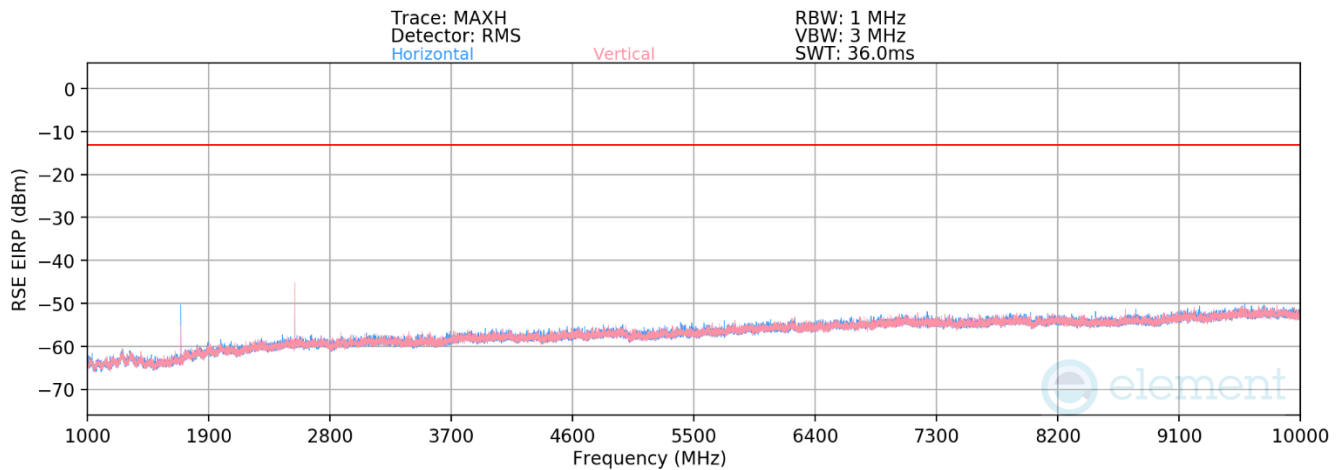
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## 7.6.1 Antenna BCM – Radiated Spurious Emission Measurements

### LTE Band 26/5



**Plot 7-46. Antenna BCM Radiated Spurious Plot below 1GHz (LTE Band 26/5)**



**Plot 7-47. Antenna BCM Radiated Spurious Plot above 1GHz (LTE Band 26/5)**

|                                         |                                                                                     |                            |  |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------|----------------------------|--|-----------------------------------|
| FCC ID: BCG-A2774                       |  | PART 22 MEASUREMENT REPORT |  | Approved by:<br>Technical 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 [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1658.0          | V               | 335                 | 220                        | -74.95               | -0.80       | 31.25                   | -64.00                             | -13.00      | -51.00      |
| 2487.0          | V               | 131                 | 349                        | -73.12               | 4.13        | 38.01                   | -57.25                             | -13.00      | -44.25      |
| 3316.0          | V               | -                   | -                          | -79.78               | 5.18        | 32.40                   | -62.86                             | -13.00      | -49.86      |
| 4145.0          | V               | -                   | -                          | -79.99               | 7.21        | 34.22                   | -61.04                             | -13.00      | -48.04      |
| 4974.0          | V               | -                   | -                          | -80.54               | 8.77        | 35.23                   | -60.02                             | -13.00      | -47.02      |

Table 7-5. Antenna BCM 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 [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1673.0          | V               | 318                 | 250                        | -73.69               | -0.80       | 32.51                   | -62.75                             | -13.00      | -49.75      |
| 2509.5          | V               | 127                 | 326                        | -74.42               | 4.07        | 36.65                   | -58.60                             | -13.00      | -45.60      |
| 3346.0          | V               | -                   | -                          | -79.62               | 4.77        | 32.15                   | -63.11                             | -13.00      | -50.11      |
| 4182.5          | V               | -                   | -                          | -80.62               | 7.43        | 33.81                   | -61.44                             | -13.00      | -48.44      |
| 5019.0          | V               | -                   | -                          | -81.02               | 8.70        | 34.68                   | -60.58                             | -13.00      | -47.58      |

Table 7-6. Antenna BCM Radiated Spurious Data (LTE Band 26/5 – Mid Channel)

|                  |        |
|------------------|--------|
| Bandwidth (MHz): | 10     |
| Frequency (MHz): | 844.0  |
| RB / Offset:     | 1 / 25 |

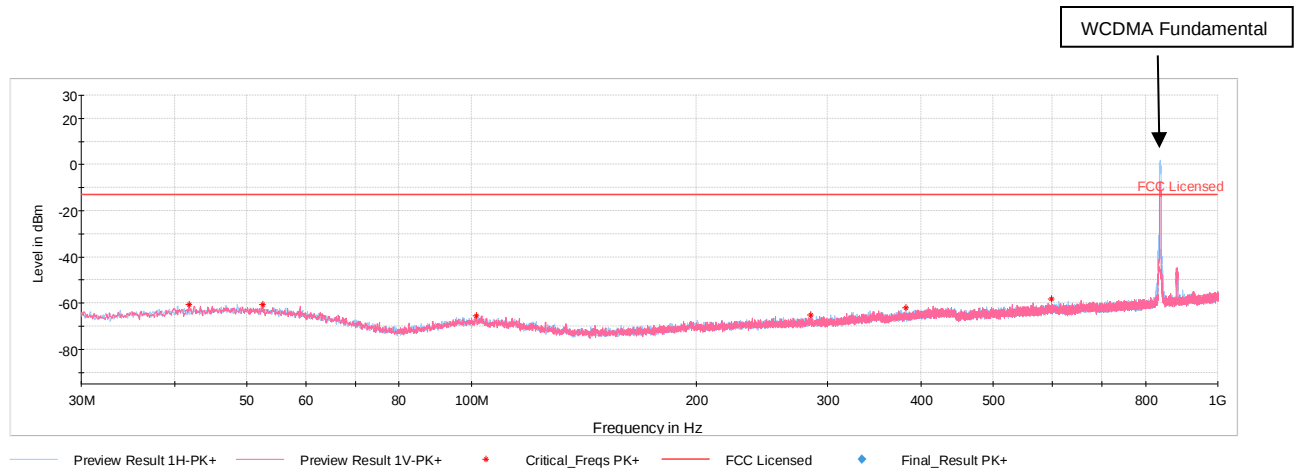
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1688.0          | V               | 209                 | 220                        | -74.54               | -0.71       | 31.75                   | -63.51                             | -13.00      | -50.51      |
| 2532.0          | V               | 180                 | 320                        | -72.62               | 3.64        | 38.02                   | -57.24                             | -13.00      | -44.24      |
| 3376.0          | V               | -                   | -                          | -79.37               | 5.28        | 32.91                   | -62.35                             | -13.00      | -49.35      |
| 4220.0          | V               | -                   | -                          | -80.14               | 7.00        | 33.86                   | -61.40                             | -13.00      | -48.40      |
| 5064.0          | V               | -                   | -                          | -80.89               | 9.25        | 35.36                   | -59.90                             | -13.00      | -46.90      |

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

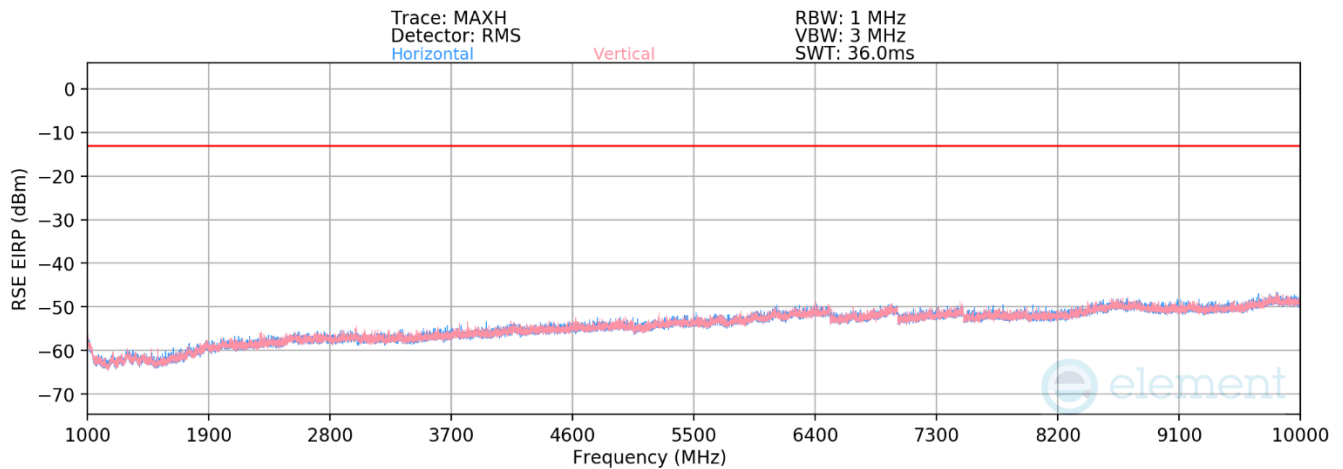
|                                         |                                                                                     |                            |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------|----------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                 | EUT Type:<br>Watch         | Page 49 of 56                     |

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## WCDMA Cell



**Plot 7-48. Antenna BCM Radiated Spurious Plot below 1GHz (WCDMA Cell)**



**Plot 7-49. Antenna BCM Radiated Spurious Plot above 1GHz (WCDMA Cell)**

|                                         |                                                                                     |                            |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------|----------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
| Test Report S/N:<br>1C2205090040-01.BCG | Test Dates:<br>4/6/2022 - 8/12/2022                                                 | EUT Type:<br>Watch         | Page 50 of 56                     |

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|                  |           |
|------------------|-----------|
| 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 [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1652.8          | V               | 399                 | 232                        | -77.32               | -2.38       | 27.30                   | -67.96                             | -13.00      | -54.96      |
| 2479.2          | V               | -                   | -                          | -78.24               | 2.44        | 31.20                   | -64.06                             | -13.00      | -51.06      |
| 3305.6          | V               | -                   | -                          | -78.67               | 3.68        | 32.01                   | -63.25                             | -13.00      | -50.25      |
| 4132.0          | V               | -                   | -                          | -78.96               | 5.21        | 33.25                   | -62.01                             | -13.00      | -49.01      |

Table 7-8. Antenna BCM 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 [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1673.2          | V               | -                   | -                          | -77.90               | -2.46       | 26.64                   | -68.62                             | -13.00      | -55.62      |
| 2509.8          | V               | 271                 | 264                        | -75.89               | 2.88        | 33.99                   | -61.27                             | -13.00      | -48.27      |
| 3346.4          | V               | -                   | -                          | -78.47               | 3.52        | 32.05                   | -63.20                             | -13.00      | -50.20      |
| 4183.0          | V               | -                   | -                          | -79.13               | 5.63        | 33.50                   | -61.76                             | -13.00      | -48.76      |
| 5019.6          | V               | -                   | -                          | -79.35               | 6.21        | 33.86                   | -61.39                             | -13.00      | -48.39      |

Table 7-9. Antenna BCM 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 [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1693.2          | V               | 381                 | 244                        | -75.96               | -2.18       | 28.86                   | -66.39                             | -13.00      | -53.39      |
| 2539.8          | V               | 125                 | 362                        | -76.66               | 2.67        | 33.01                   | -62.25                             | -13.00      | -49.25      |
| 3386.4          | V               | -                   | -                          | -78.57               | 3.08        | 31.51                   | -63.74                             | -13.00      | -50.74      |
| 4233.0          | V               | -                   | -                          | -78.89               | 4.93        | 33.04                   | -62.22                             | -13.00      | -49.22      |
| 5079.6          | V               | -                   | -                          | -79.89               | 7.08        | 34.19                   | -61.07                             | -13.00      | -48.07      |

Table 7-10. Antenna BCM Radiated Spurious Data (WCDMA Cell – High Channel)

|                                         |                                                                                     |                            |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------|----------------------------|-----------------------------------|
| FCC ID: BCG-A2774                       |  | PART 22 MEASUREMENT REPORT | Approved by:<br>Technical Manager |
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## 7.7 Frequency Stability / 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:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

***For Part 22, the Frequency Tolerance of the transmitter shall be maintained within  $\pm 0.00025\%$  ( $\pm 2.5$  ppm) of the center frequency.***

### Test Procedure Used

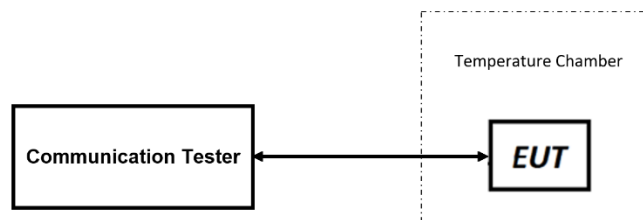
ANSI C63.26-2015

TIA-603-E-2016

### Test Settings

1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
2. The equipment is turned on in a “standby” condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

### Test Setup



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

### Test Notes

None

|                                         |                                                                                     |                            |                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------|----------------------------|-----------------------------------|
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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                      | 836,500,001    | 0.90                  | 0.0000001     |
|                  |             | - 20                      | 836,500,001    | 0.80                  | 0.0000001     |
|                  |             | - 10                      | 836,500,001    | 0.75                  | 0.0000001     |
|                  |             | 0                         | 836,500,000    | 0.40                  | 0.0000000     |
|                  |             | + 10                      | 836,500,001    | 0.70                  | 0.0000001     |
|                  |             | + 20 (Ref)                | 836,500,000    | 0.19                  | 0.0000000     |
|                  |             | + 30                      | 836,499,998    | -1.73                 | -0.0000002    |
|                  |             | + 40                      | 836,500,000    | -0.04                 | 0.0000000     |
|                  |             | + 50                      | 836,500,001    | 1.11                  | 0.0000001     |
| Battery Endpoint | 3.40        | + 20                      | 836,500,000    | -0.21                 | 0.0000000     |

Table 7-11. 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    | -0.54                 | -0.0000001    |
|                  |             | - 20                      | 836,600,000    | -0.47                 | -0.0000001    |
|                  |             | - 10                      | 836,600,000    | -0.19                 | 0.0000000     |
|                  |             | 0                         | 836,600,000    | -0.24                 | 0.0000000     |
|                  |             | + 10                      | 836,600,000    | -0.17                 | 0.0000000     |
|                  |             | + 20 (Ref)                | 836,600,000    | -0.28                 | 0.0000000     |
|                  |             | + 30                      | 836,600,000    | -0.29                 | 0.0000000     |
|                  |             | + 40                      | 836,600,000    | 0.19                  | 0.0000000     |
|                  |             | + 50                      | 836,600,000    | -0.28                 | 0.0000000     |
| Battery Endpoint | 3.40        | + 20                      | 836,600,000    | -0.27                 | 0.0000000     |

Table 7-12. WCDMA Cell Frequency Tolerance 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 22 of the FCC rules.

|                                                |                                                                                                                       |                                          |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|------------------------------------------|
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## 9.0 APPENDIX A

Antenna gains provided by manufacturer:

| Cellular Antenna Gain (BCM), Type: LDS |                 |                  |                |
|----------------------------------------|-----------------|------------------|----------------|
| Band                                   | Frequency (MHz) | Horizontal (dBi) | Vertical (dBi) |
| 12                                     | 700.0           | -34.1            | -31.1          |
| 12                                     | 707.4           | -33.5            | -30.6          |
| 12                                     | 715.0           | -33.1            | -30.4          |
| 13                                     | 778.6           | -32.5            | -27.9          |
| 13                                     | 782.0           | -32.7            | -28.2          |
| 13                                     | 785.4           | -32.4            | -27.7          |
| 26                                     | 815.0           | -33.2            | -28.6          |
| 26                                     | 831.4           | -32.2            | -27.3          |
| 26                                     | 848.0           | -31.9            | -26.9          |
| 40                                     | 2397.4          | -13.0            | -12.8          |

|                                         |                                                                                                                       |                    |                                   |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------|
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