

**MEASUREMENT REPORT  
WCDMA****Applicant Name:**

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

**Date of Testing:**

05/01/2019 - 08/09/2019

**Test Site/Location:**

PCTEST Lab. Morgan Hill, CA, USA

**Test Report Serial No.:**

1C1905130011-02.BCG

**FCC ID:**

**BCG-A2157**

**IC:**

**579C-A2157**

**APPLICANT:**

**Apple Inc.**

**Application Type:**

Certification

**Model/HVIN:**

A2157

**EUT Type:**

Watch

**FCC Classification:**

PCS Licensed Transmitter Worn on Body (PCT)

**FCC Rule Part(s):**

22, 24, 27

**ISED Specification:**


RSS-132, RSS-133, RSS-139

**Test Procedure(s):**

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

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

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

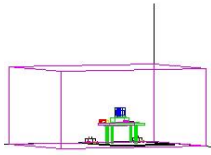
  
Randy Ortanez  
President

<b>FCC ID:</b> BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 1 of 62

# TABLE OF CONTENTS

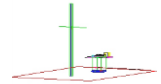
1.0	INTRODUCTION .....	4
1.1	Scope .....	4
1.2	PCTEST Test Location.....	4
1.3	Test Facility / Accreditations.....	4
2.0	PRODUCT INFORMATION.....	5
2.1	Equipment Description .....	5
2.2	Device Capabilities.....	5
2.3	Antenna Description .....	5
2.4	Test Support Equipment.....	5
2.5	Test Configuration .....	6
2.6	Software and Firmware .....	6
2.7	EMI Suppression Device(s)/Modifications .....	6
3.0	DESCRIPTION OF TESTS .....	7
3.1	Evaluation Procedure .....	7
3.2	Cellular - Base Frequency Blocks .....	7
3.3	Cellular - Mobile Frequency Blocks .....	7
3.4	PCS - Base Frequency Blocks .....	7
3.5	PCS - Mobile Frequency Blocks.....	8
3.6	AWS - Base Frequency Blocks .....	8
3.7	AWS - Mobile Frequency Blocks.....	8
3.8	Radiated Measurements .....	9
4.0	MEASUREMENT UNCERTAINTY .....	10
5.0	TEST EQUIPMENT CALIBRATION DATA .....	11
6.0	SAMPLE CALCULATIONS .....	12
7.0	TEST RESULTS.....	13
7.1	Summary.....	13
7.2	Occupied Bandwidth .....	14
7.3	Spurious and Harmonic Emissions at Antenna Terminal .....	17
7.4	Band Edge Emissions at Antenna Terminal .....	33
7.5	Peak-Average Ratio .....	39
7.6	Radiated Power (ERP/EIRP).....	42
7.7	Radiated Spurious Emissions Measurements.....	45
7.8	Frequency Stability / Temperature Variation .....	55
8.0	CONCLUSION.....	62

<b>FCC ID:</b> BCG-A2157		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 2 of 62



## MEASUREMENT REPORT

### WCDMA



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP		EIRP		Emission Designator
			Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	
WCDMA850	22H	826.4 - 846.6	0.473	-3.25	0.776	-1.10	4M10F9W
WCDMA1700	27	1712.4 - 1752.6			13.804	11.40	4M08F9W
WCDMA1900	24E	1852.4 - 1907.6			12.303	10.90	4M09F9W

#### EUT Overview

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 3 of 62

## 1.0 INTRODUCTION

### 1.1 Scope

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

### 1.2 PCTEST Test Location

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

### 1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Morgan Hill, CA 95037, U.S.A.

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.02 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISSED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISSED.

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 4 of 62

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Watch FCC ID: BCG-A2157**. The test data contained in this report pertains only to the emissions due to the EUT's 2G/3G licensed transmitters.

**Test Device Serial No.:** D92YD00QM8CJ, FN6911410EMKTRT5K

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, Bluetooth (1x, EDR, HDR4, HDR8, LE), NFC

### 2.3 Antenna Description

Following antenna was used for the testing.

Frequency [MHz]	Antenna Gain (dBi)	
	BCM	FCM
814-849	-26.10	N/A
1710-1785	N/A	-12.60
1850-1915	N/A	-13.10

**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 Cable	Model: Kanzi	S/N: 311C81
	w/ Charging Dock	Model: FAPS73	S/N: 17481001022
	w/ Dock	Model: X241	S/N: GW17F01ST22
3	USB Lightning Cable	Model: N/A	S/N: N/A
	w/ AC Adapter	Model: A1385	S/N: N/A
4	Wireless Charging Pad (WCP)	Model: EVT	S/N: DLC915600ECLNWL3K
	Wireless Charging Pad (WCP)	Model: EVT	S/N: DLC9156006TLNWK3V
5	Test Pathfinder Sinsa Board	Model: X1456	S/N: 920-062535-01
	w/ SiP Cradle	Model: P1 X1454S	S/N: 920-06373-02
6	DC Power Supply	Model: KPS3010D	S/N: N/A
7	Mobile Comm DC Source	Model: 66321D	S/N: MY52000555

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

<b>FCC ID:</b> BCG-A2157		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 5 of 62

## 2.5 Test Configuration

The EUT was tested per the guidance of ANSI/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 four materials, aluminum, stainless steel, ceramic, and aluminum/ceramic mix, and various types of wristbands, metal and non-metal wristbands. The store display sample was investigated and determined as not the worst case. 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 channel and the 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.

## 2.6 Software and Firmware

The test was conducted with firmware version wOS 6.0 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.

<b>FCC ID:</b> BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 6 of 62

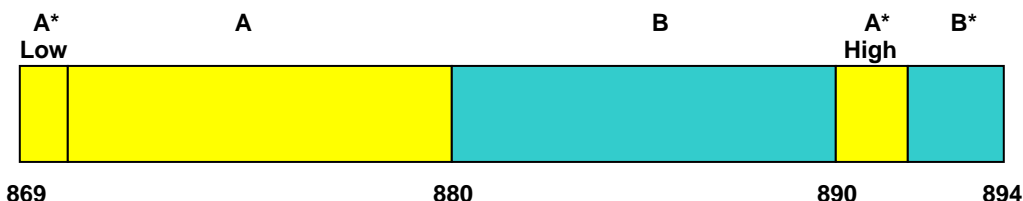
## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

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

Deviation from Measurement Procedure.....None

### 3.2 Cellular - Base Frequency Blocks



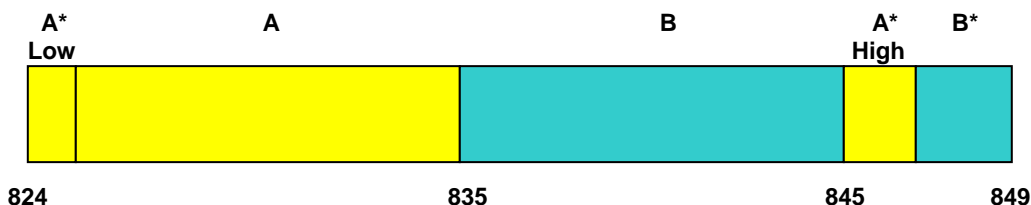
BLOCK 1: 869 – 880 MHz (A\* Low + A)

BLOCK 3: 890 – 891.5 MHz (A\* High)

BLOCK 2: 880 – 890 MHz (B)

BLOCK 4: 891.5 – 894 MHz (B\*)

### 3.3 Cellular - Mobile Frequency Blocks



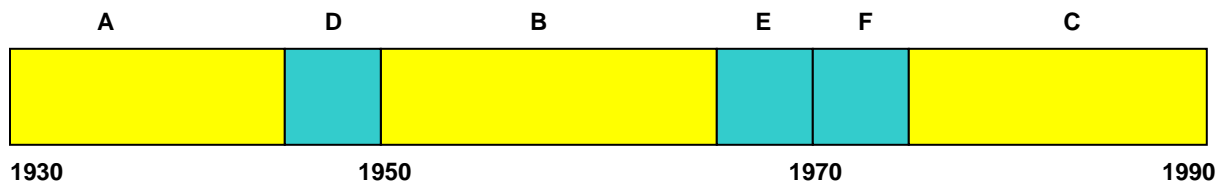
BLOCK 1: 824 – 835 MHz (A\* Low + A)

BLOCK 3: 845 – 846.5 MHz (A\* High)

BLOCK 2: 835 – 845 MHz (B)

BLOCK 4: 846.5 – 849 MHz (B\*)

### 3.4 PCS - Base Frequency Blocks



BLOCK 1: 1930 – 1945 MHz (A)

BLOCK 4: 1965 – 1970 MHz (E)

BLOCK 2: 1945 – 1950 MHz (D)

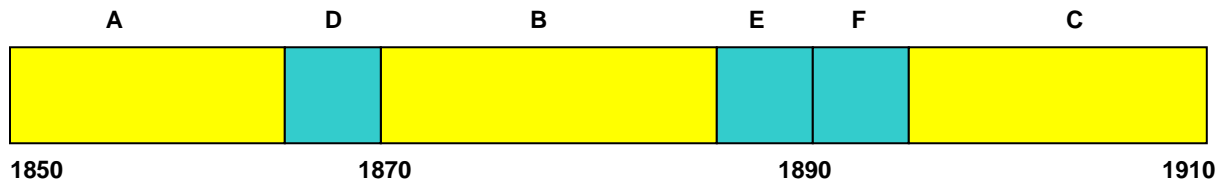
BLOCK 5: 1970 – 1975 MHz (F)

BLOCK 3: 1950 – 1965 MHz (B)

BLOCK 6: 1975 – 1990 MHz (C)

FCC ID: BCG-A2157		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 7 of 62

### 3.5 PCS - Mobile Frequency Blocks



BLOCK 1: 1850 – 1865 MHz (A)

BLOCK 4: 1885 – 1890 MHz (E)

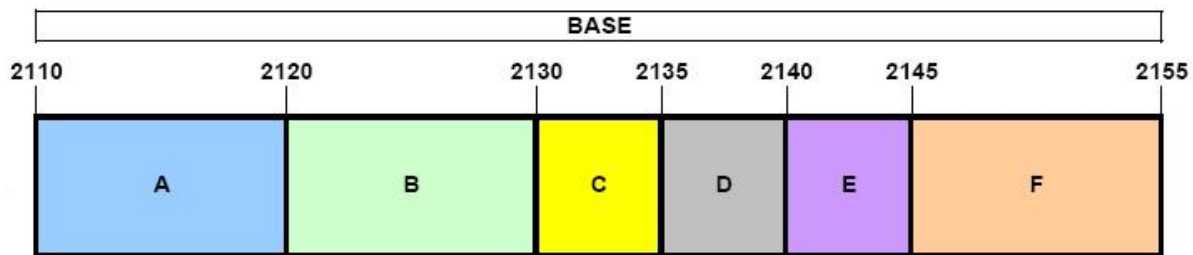
BLOCK 2: 1865 – 1870 MHz (D)

BLOCK 5: 1890 – 1895 MHz (F)

BLOCK 3: 1870 – 1885 MHz (B)

BLOCK 6: 1895 – 1910 MHz (C)

### 3.6 AWS - Base Frequency Blocks



BLOCK 1: 2110 – 2120 MHz (A)

BLOCK 4: 2135 – 2140 MHz (D)

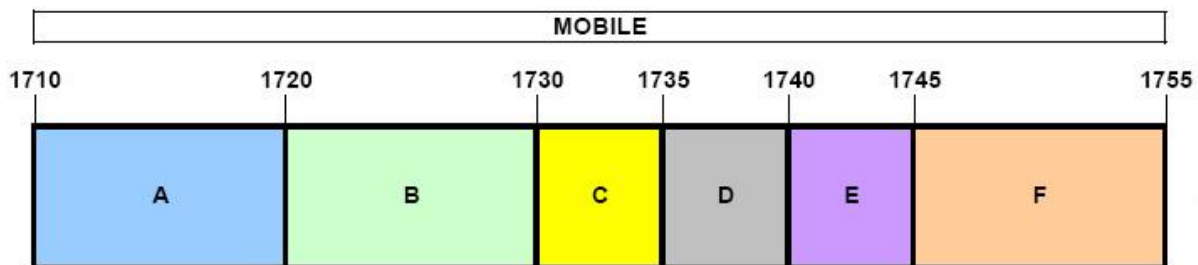
BLOCK 2: 2120 – 2130 MHz (B)

BLOCK 5: 2140 – 2145 MHz (E)

BLOCK 3: 2130 – 2135 MHz (C)

BLOCK 6: 2145 – 2155 MHz (F)

### 3.7 AWS - Mobile Frequency Blocks



BLOCK 1: 1710 – 1720 MHz (A)

BLOCK 4: 1735 – 1740 MHz (D)

BLOCK 2: 1720 – 1730 MHz (B)

BLOCK 5: 1740 – 1745 MHz (E)

BLOCK 3: 1730 – 1735 MHz (C)

BLOCK 6: 1745 – 1755 MHz (F)

FCC ID: BCG-A2157		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 8 of 62



### 3.8 Radiated Measurements

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. Per the guidelines of KDB 412172 D01 v01r01, radiated power levels are measured using the following formula:

$$ERP \text{ or } EIRP = P_T + G_T - L_C$$

Where  $P_T$  is the transmitter output power, expressed in dBm,  $G_T$  is the gain of the transmitting antenna, in dBi (ERP) or dBi (EIRP), and  $L_C$  signal attenuation in the connecting cable between the transmitter and antenna in dB.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

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

Where,  $P_d$  is the dipole equivalent power,  $P_g$  is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to  $P_g \text{ [dBm]} - \text{cable loss [dB]}$ . The calculated  $P_d$  levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of  $43 + 10 \log_{10}(\text{Power [Watts]})$ .

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

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 9 of 62

## 4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of  $k = 2$  to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the  $U_{\text{CISPR}}$  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	1.29
Radiated Disturbance (<1GHz)	4.15
Radiated Disturbance (>1GHz)	4.70
Radiated Disturbance (>18GHz)	5.01
Temperature	0.01

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 10 of 62

## 5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/13/2019	Annual	3/13/2020	MY49430244
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	9/10/2018	Annual	9/10/2019	T058701-03
ESPEC	SU-241	Tabletop Temperature Chamber	8/10/2018	Annual	8/10/2019	92009574
ETS-Lindgren	118490	Pre-Amplifier (30MHz - 6GHz)	8/31/2018	Annual	8/31/2019	213236
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	12/11/2018	Annual	12/11/2019	224569
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	2/27/2019	Annual	2/27/2020	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	5/21/2019	Annual	5/21/2020	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	11/20/2018	Annual	11/20/2019	101570
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	8/10/2018	Annual	8/10/2019	161616
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/16/2018	Annual	11/16/2019	164715
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	1/8/2019	Annual	1/8/2020	166869
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	9/5/2018	Annual	9/5/2019	100050
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	11/21/2018	Annual	11/21/2019	101057
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	12/7/2018	Annual	12/7/2019	101063
Rohde & Schwarz	HFH2-Z2	Loop Antenna	3/21/2019	Annual	3/21/2020	100519

**Table 5-1. Test Equipment**

### Notes:

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

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 11 of 62

## 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)

### Spurious Radiated Emission

**Example: Spurious emission at 3700.40 MHz**

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

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 12 of 62

## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Apple Inc.  
 FCC ID: BCG-A2157  
 FCC Classification: PCS Licensed Transmitter Worn on Body (PCT)  
 Mode(s): WCDMA

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	RSS-Gen (6.7) RSS-133(2.3)	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a) 24.238(a) 27.53(h)	RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Conducted Band Edge / Spurious Emissions	$> 43 + 10 \log_{10}(P[\text{Watts}])$ at Band Edge and for all out-of-band emissions		PASS	Sections 7.3, 7.4
24.232(d) 27.50(d)(5)	RSS-132(5.4) RSS-133(6.4) RSS-139(6.5)	Peak-Average Ratio	$< 13 \text{ dB}$		PASS	Section 7.5
2.1046	RSS-132(5.4) RSS-133(4.1) RSS-139(4.1)	Transmitter Conducted Output Power	N/A		PASS	Section 7.67.5
2.1055 22.355 24.235 27.54	RSS-132(5.3) RSS-133(6.3) RSS-139(6.4)	Frequency Stability	$< 2.5 \text{ ppm}$ (Part 22) Emission must remain in band (Part 24, 27)		PASS	Section 7.8
22.913(a)(5)	RSS-132(5.4)	Effective Radiated Power	$< 7 \text{ Watts max. ERP}$	RADIATED	PASS	Section 7.6
24.232(c)	RSS-133(6.4)	Equivalent Isotropic Radiated Power	$< 2 \text{ Watts max. EIRP}$		PASS	Section 7.6
27.50(d)(4)	RSS-139(6.5)	Equivalent Isotropic Radiated Power	$< 1 \text{ Watts max. EIRP}$		PASS	Section 7.6
2.1053 22.917(a) 24.238(a) 27.53(h)	RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Radiated Spurious Emissions	$> 43 + 10 \log_{10}(P[\text{Watts}])$ for all out-of-band emissions		PASS	Section 7.7

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

#### Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "2G/3G Automation," Version 3.11.

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 13 of 62

## 7.2 Occupied Bandwidth

### Test Overview

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

### Test Procedure Used

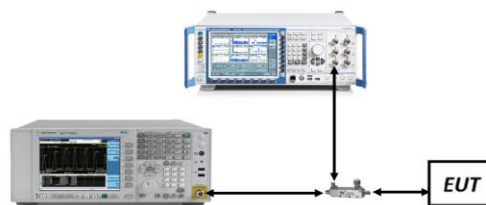
KDB 971168 D01 v03r01 – Section 4.2

### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq 3 \times$  RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

### Test Setup

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



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

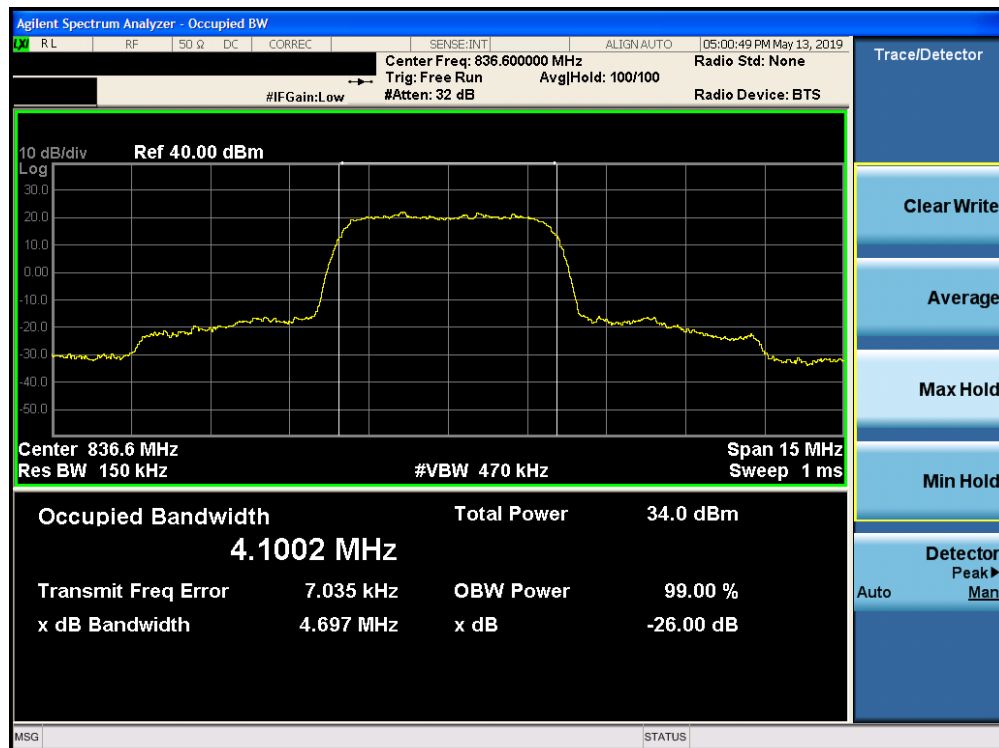
### Test Notes

None.

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 14 of 62

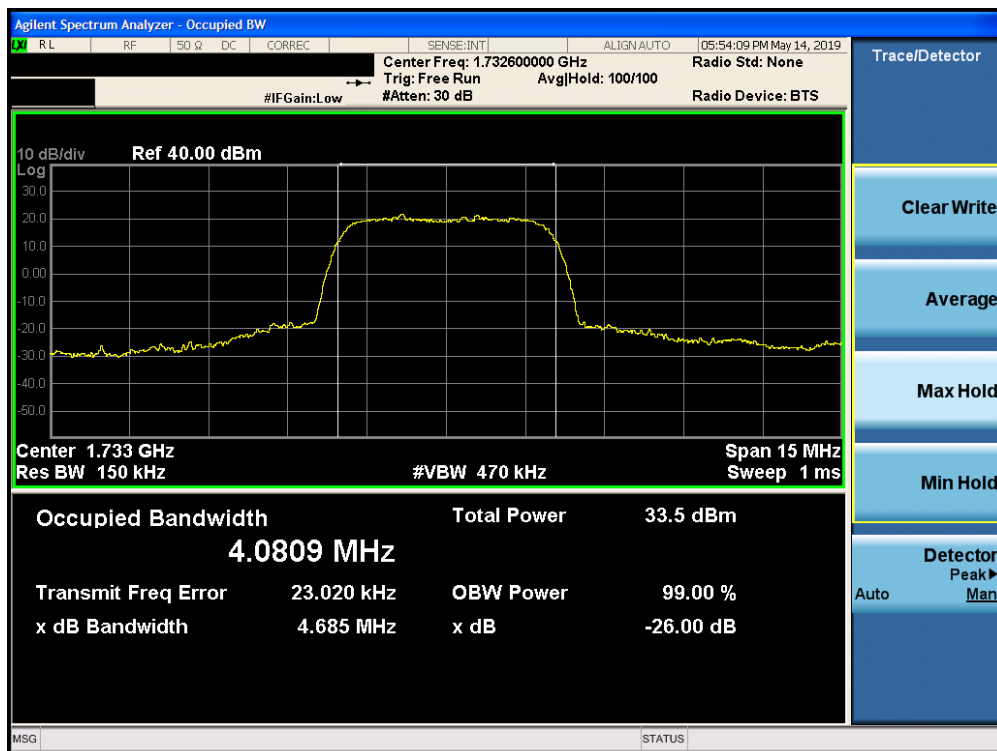
Mode	Occupied Bandwidth [kHz]
WCDMA850	4100.2
WCDMA1700	4080.9
WCDMA1900	4087.6

**Table 7-2. Occupied Band Width Results**

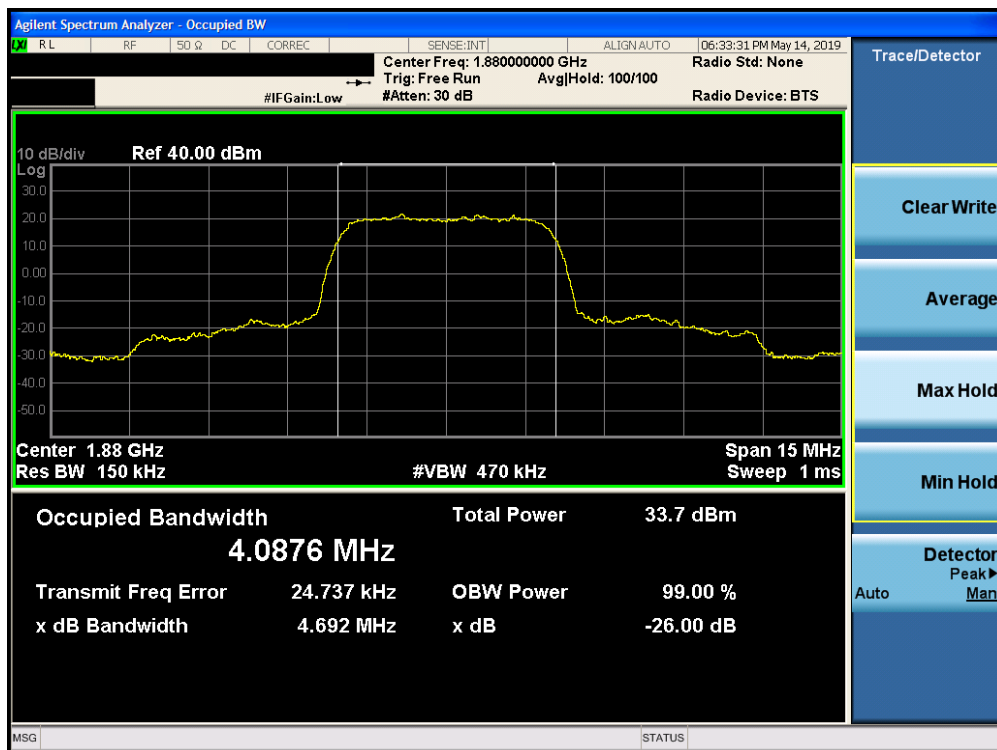


**Plot 7-1. Occupied Bandwidth Plot (Cellular WCDMA Mode)**

FCC ID: BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 15 of 62



Plot 7-2. Occupied Bandwidth Plot (AWS WCDMA Mode)



Plot 7-3. Occupied Bandwidth Plot (PCS WCDMA Mode)

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 16 of 62



## 7.3 Spurious and Harmonic Emissions at Antenna Terminal

### Test Overview

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

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

### Test Procedure Used

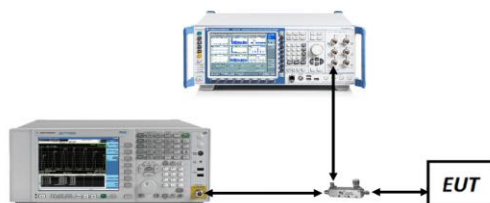
KDB 971168 D01 v03r01 – Section 6.0

### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz for Cell, 20GHz for AWS, 20GHz for PCS (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

### Test Setup

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



**Figure 7-2. Test Instrument & Measurement Setup**

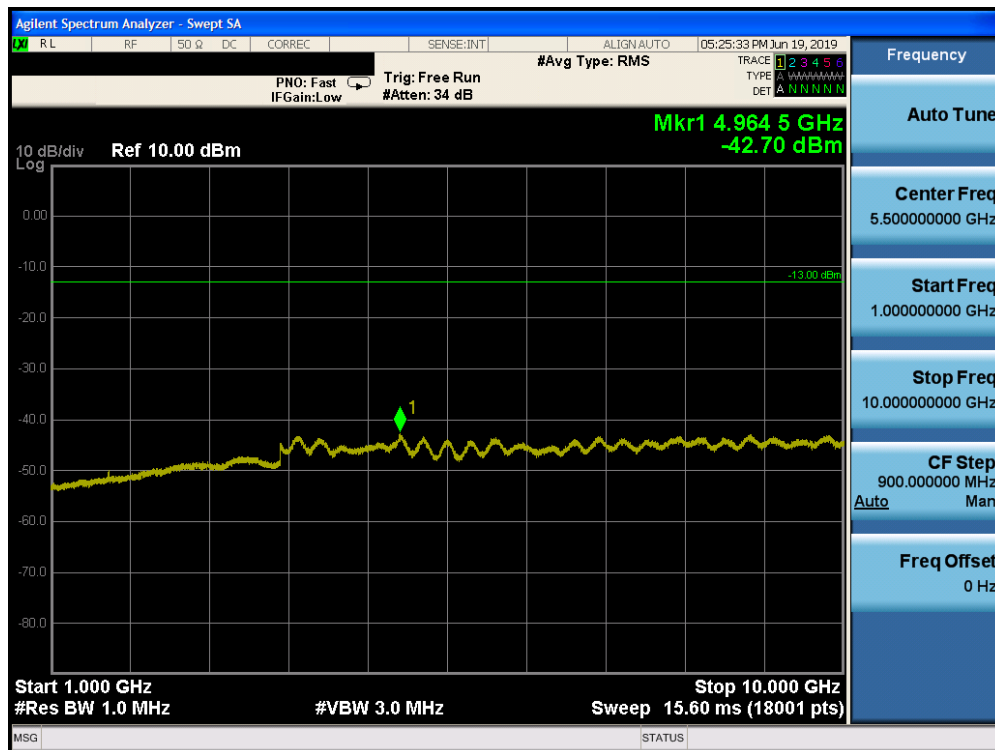
### Test Notes

Per 24.238(b), 27.53(h)(3), and RSS-133(6.5), RSS-139(6.5), compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1MHz, and 100 kHz or greater for Part 22 and RSS-132 measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

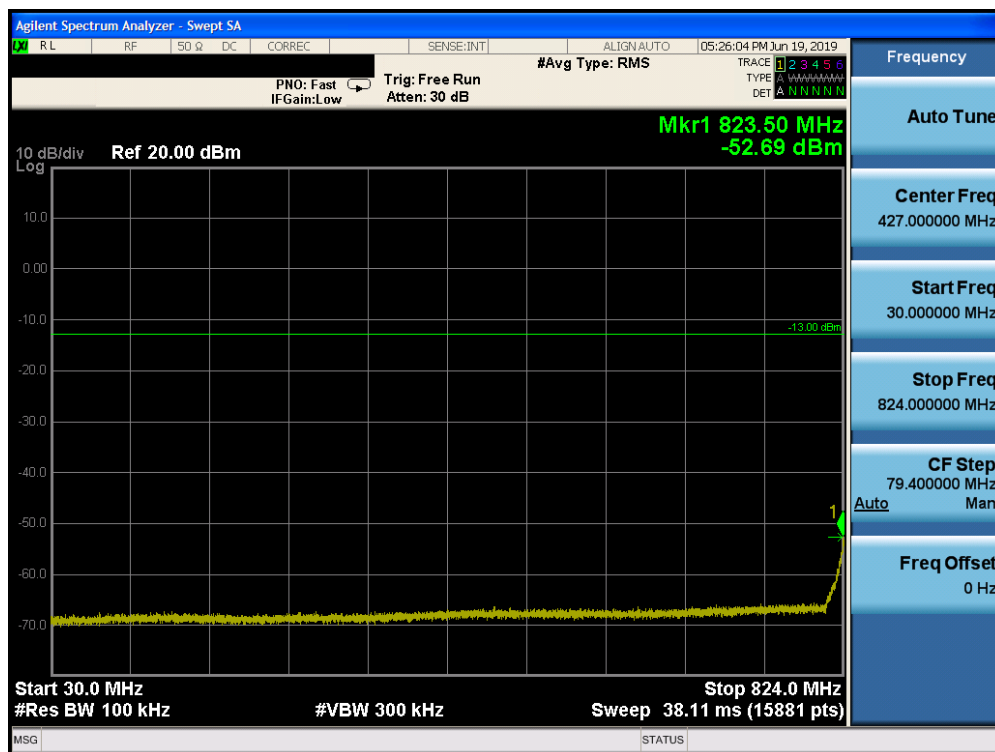
FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 17 of 62



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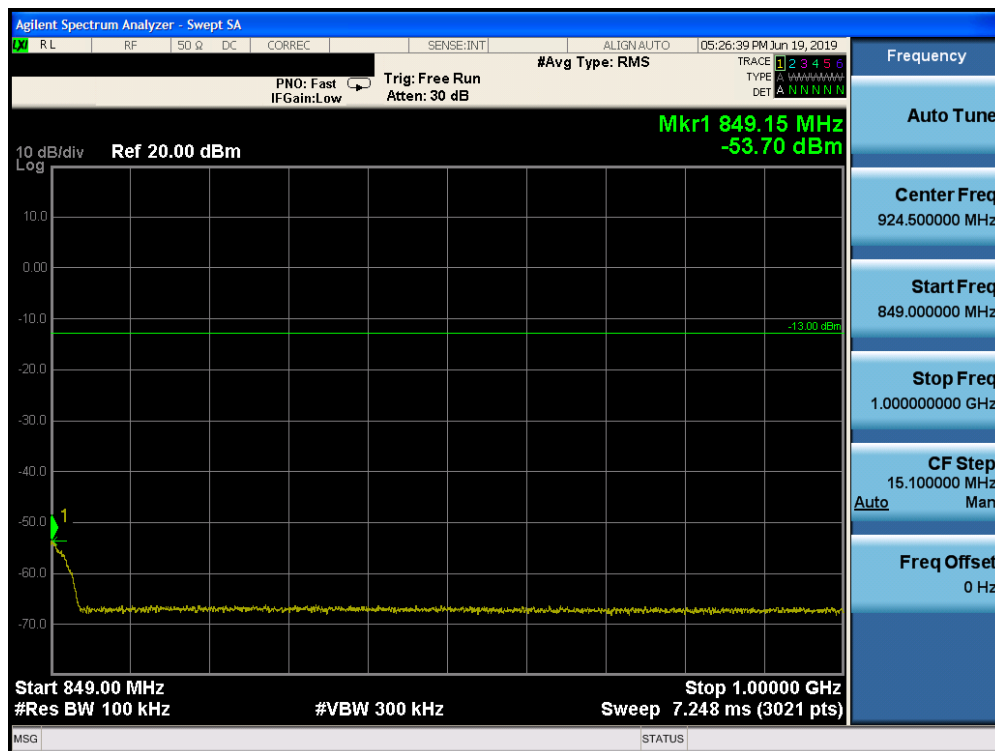


Plot 7-6. Conducted Spurious Plot (Cellular WCDMA Mode - Low Channel)

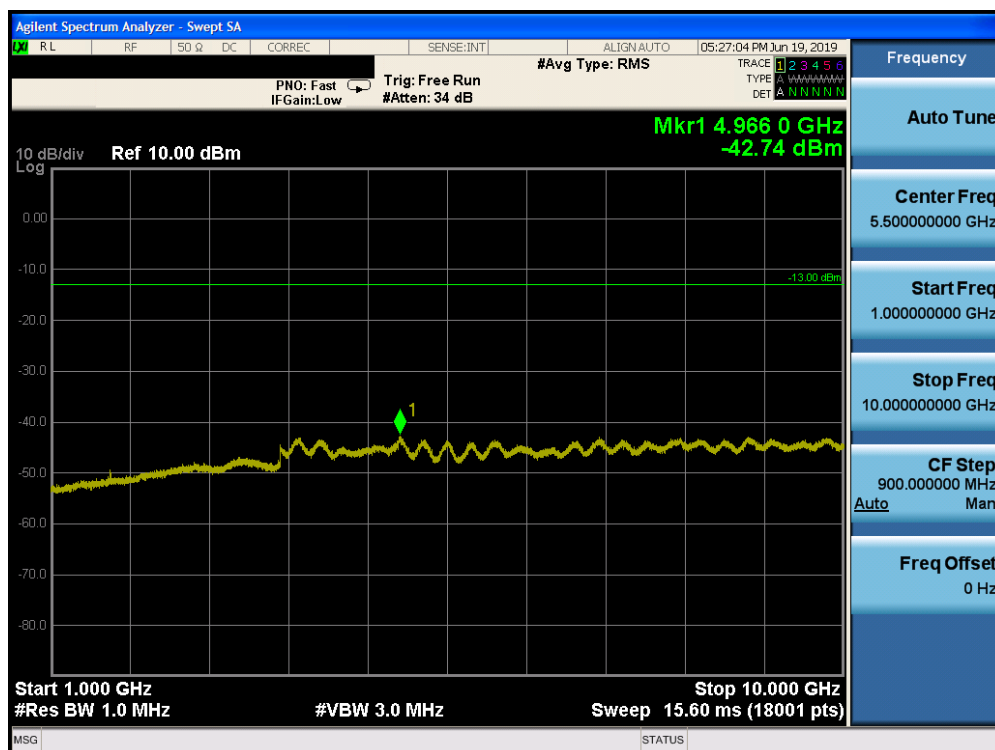


Plot 7-7. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

FCC ID: BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 19 of 62

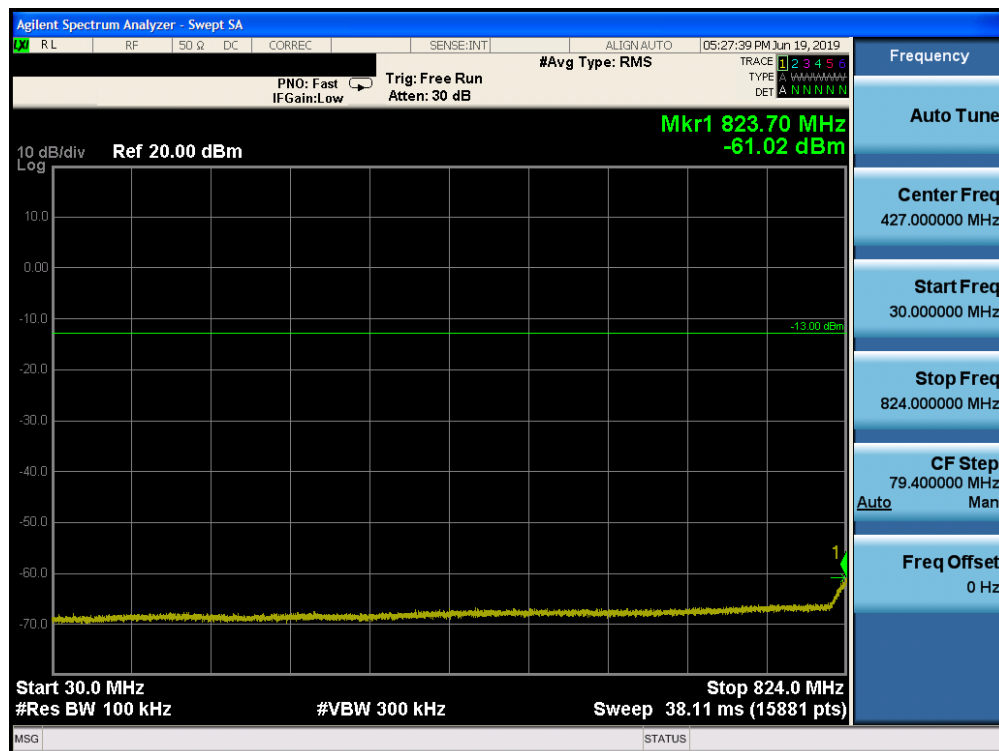


### Plot 7-8. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

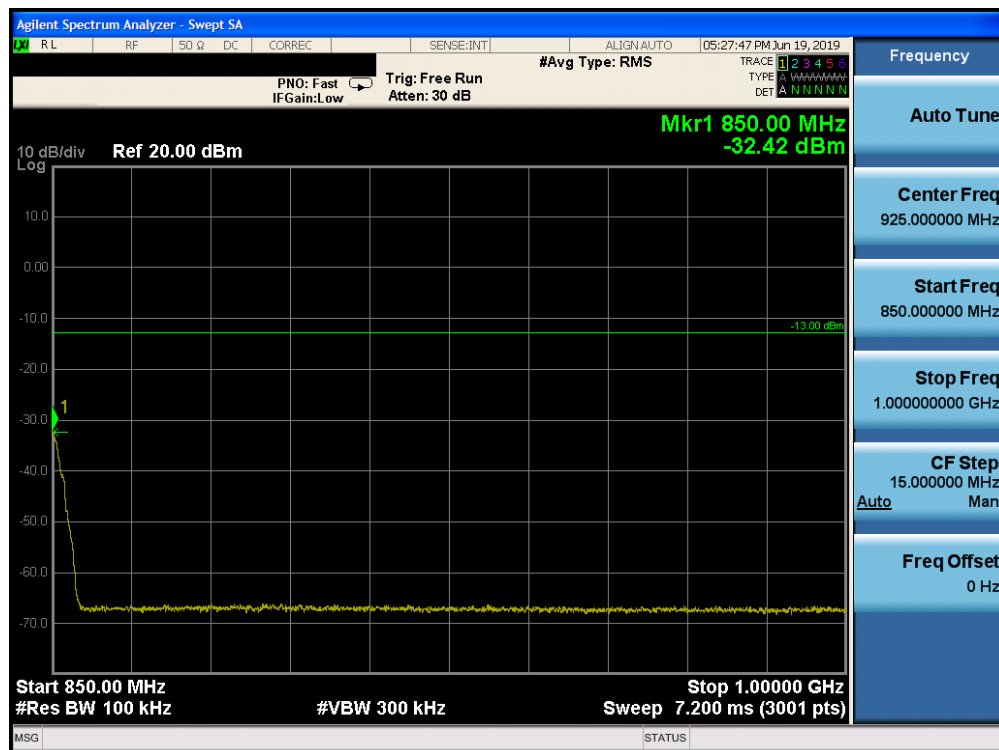


### Plot 7-9. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 20 of 62

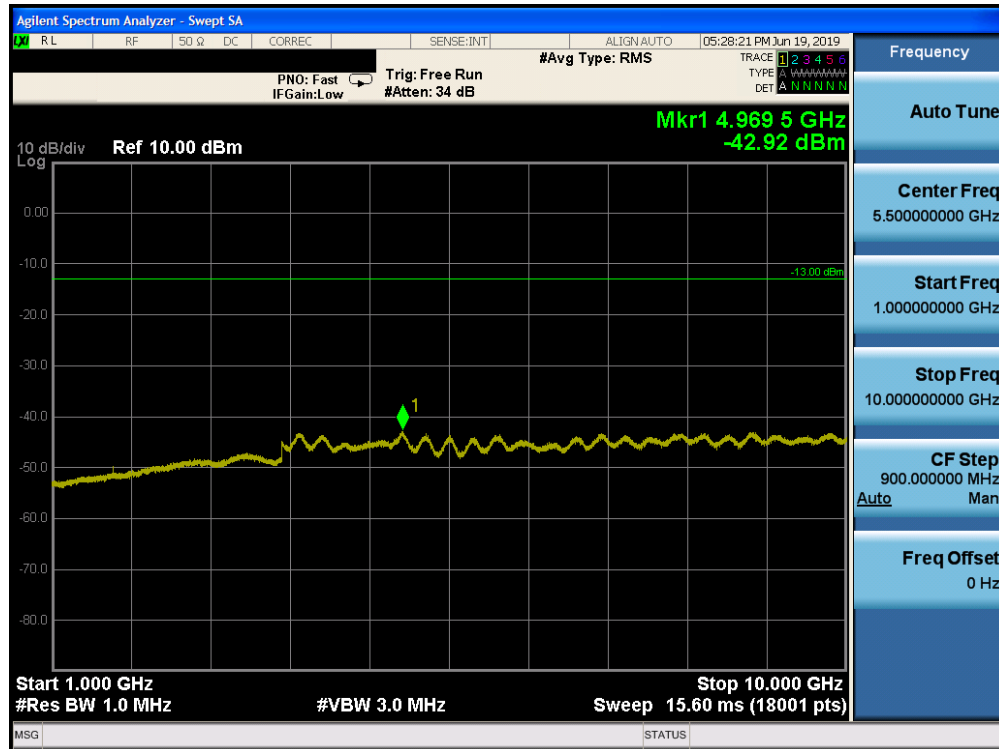


Plot 7-10. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)



Plot 7-11. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)

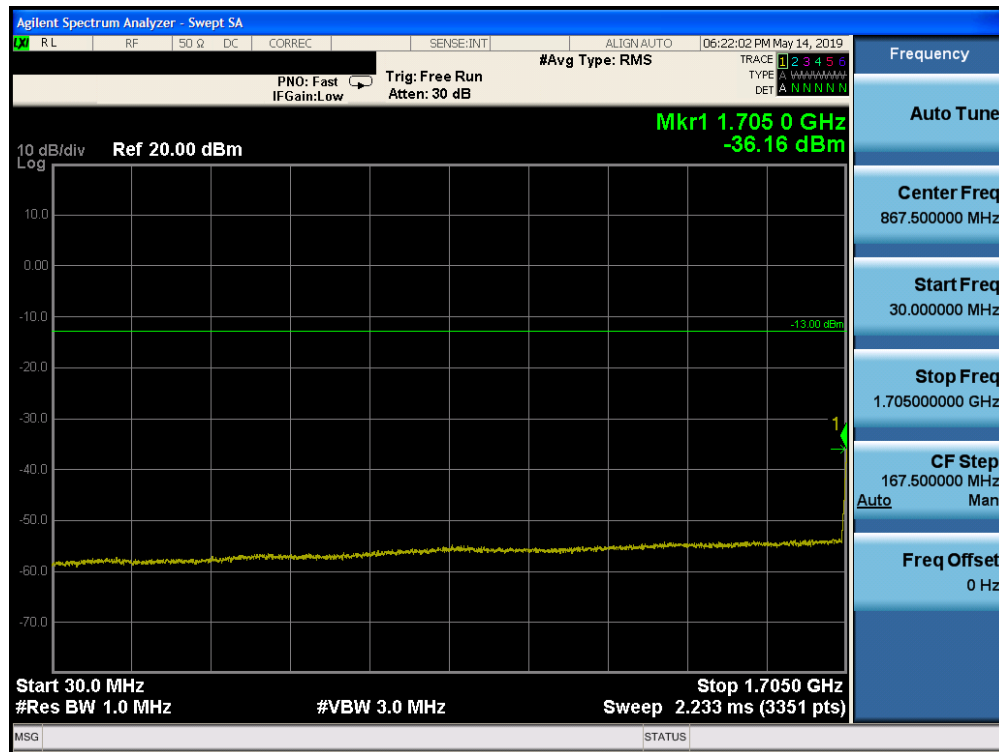
FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 21 of 62



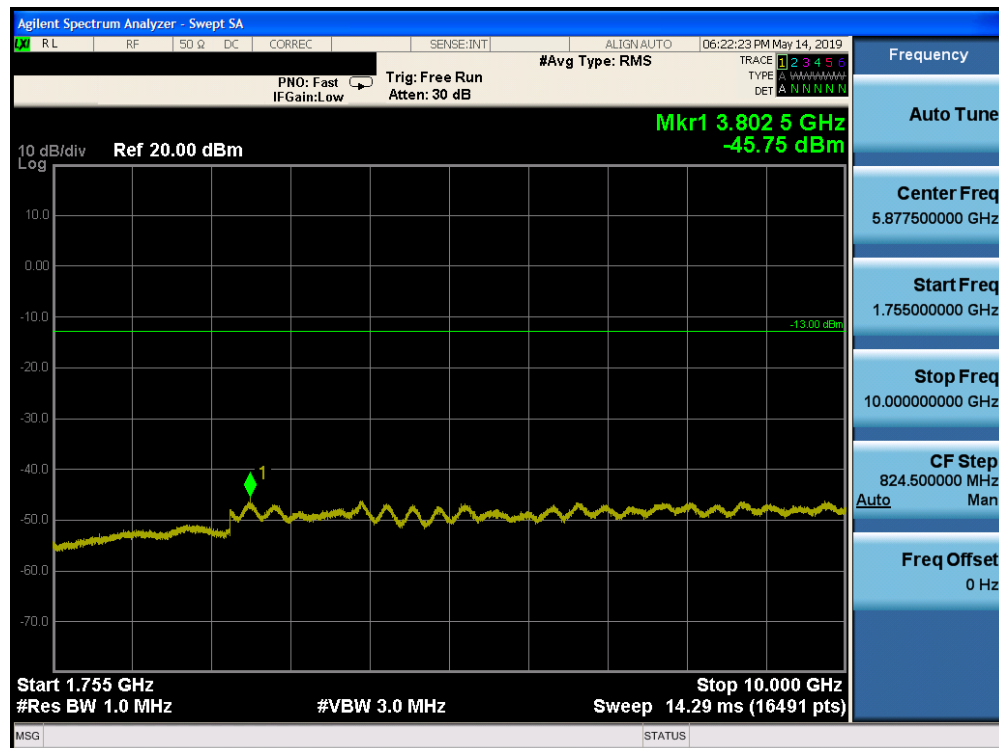
Plot 7-12. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 22 of 62

## AWS WCDMA Mode

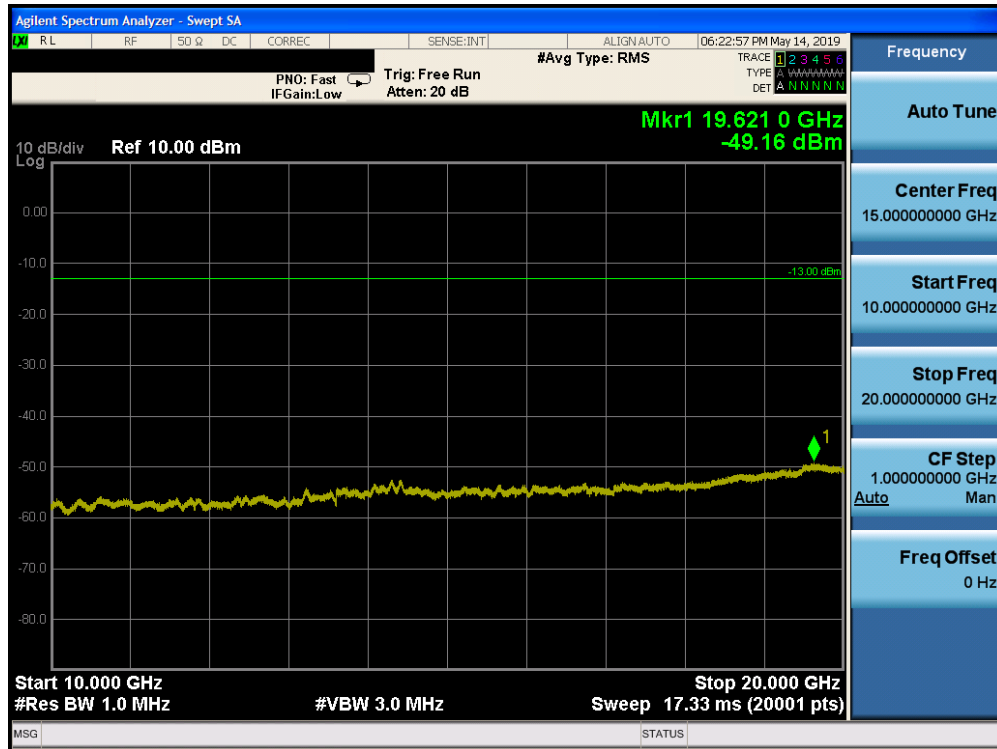


Plot 7-13. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)

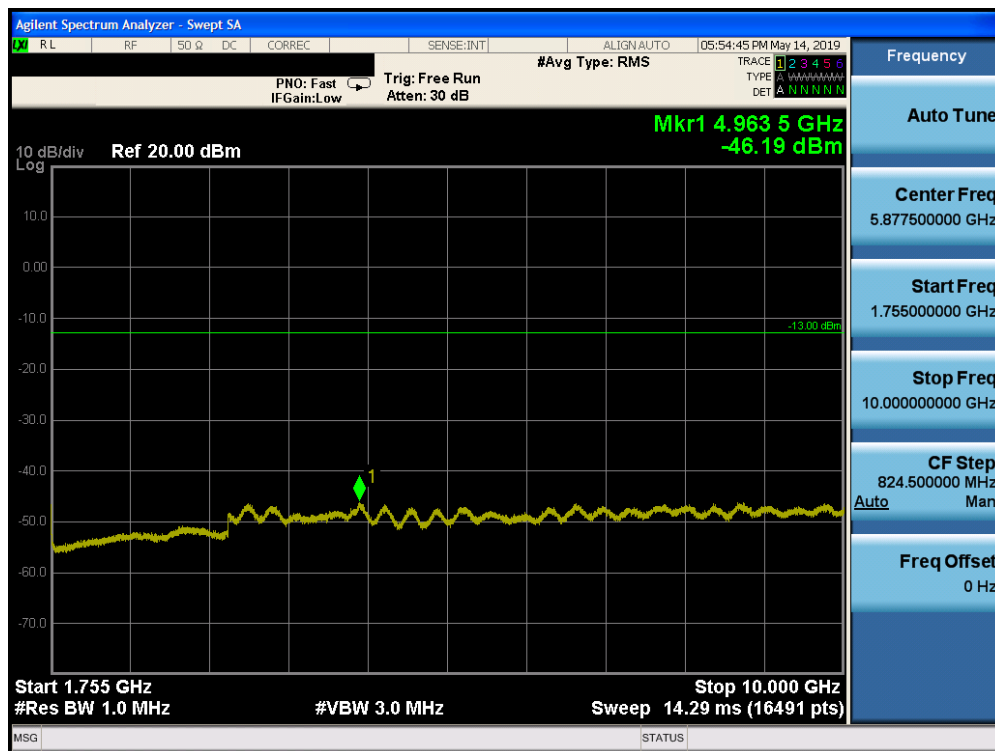


Plot 7-14. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)

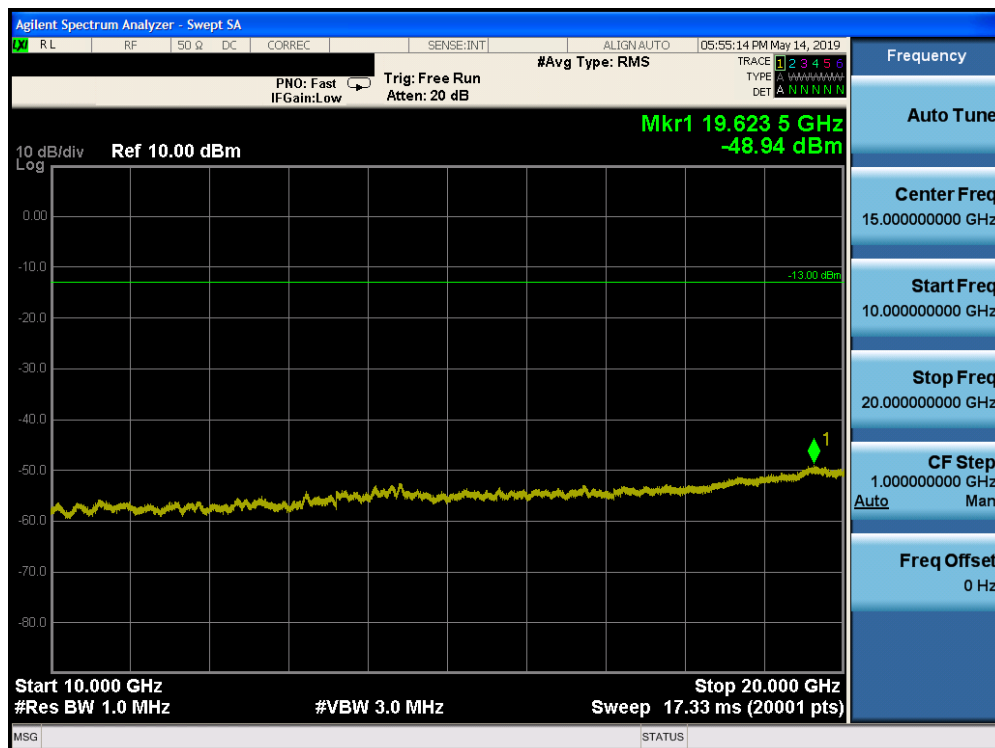
FCC ID: BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 23 of 62





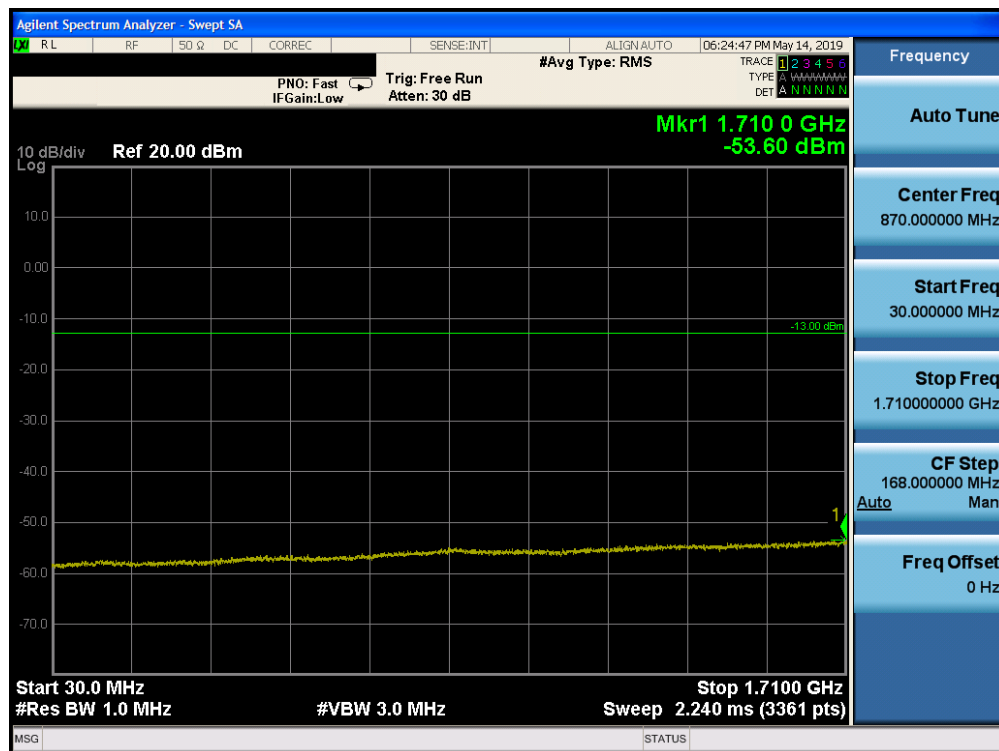


Plot 7-17. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)

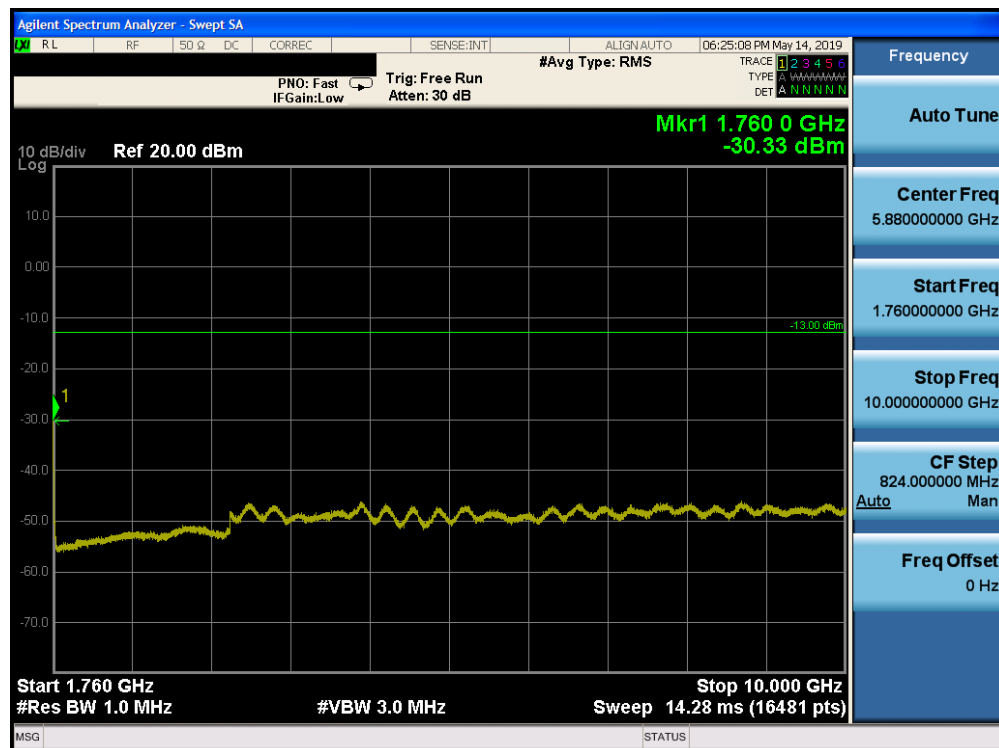


Plot 7-18. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 25 of 62

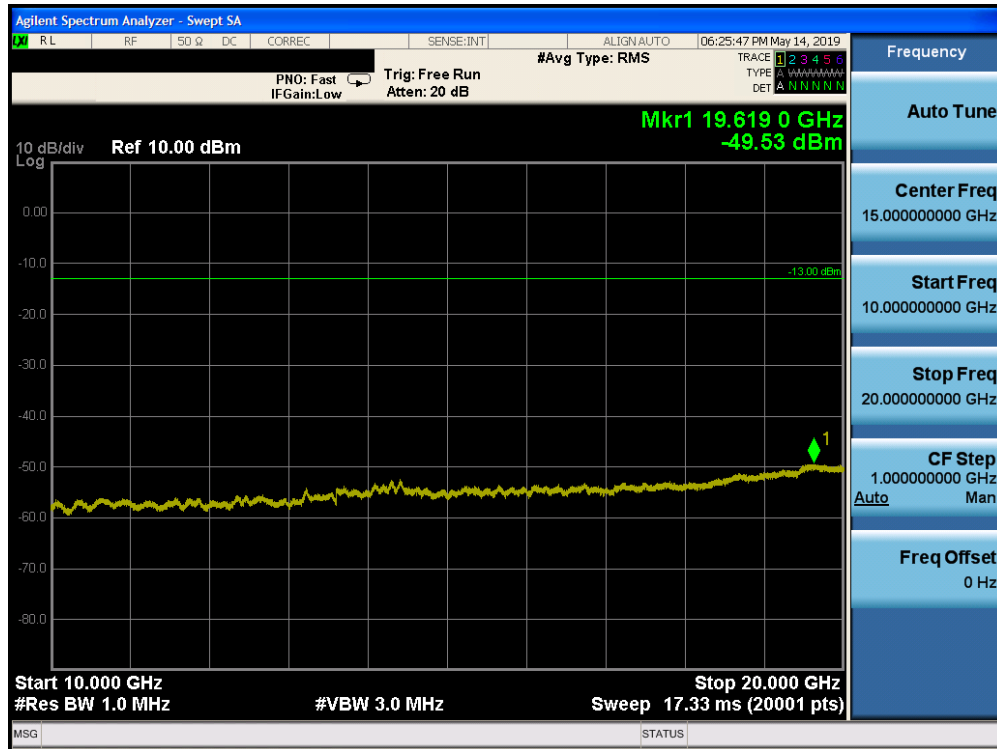


Plot 7-19. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)



Plot 7-20. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)

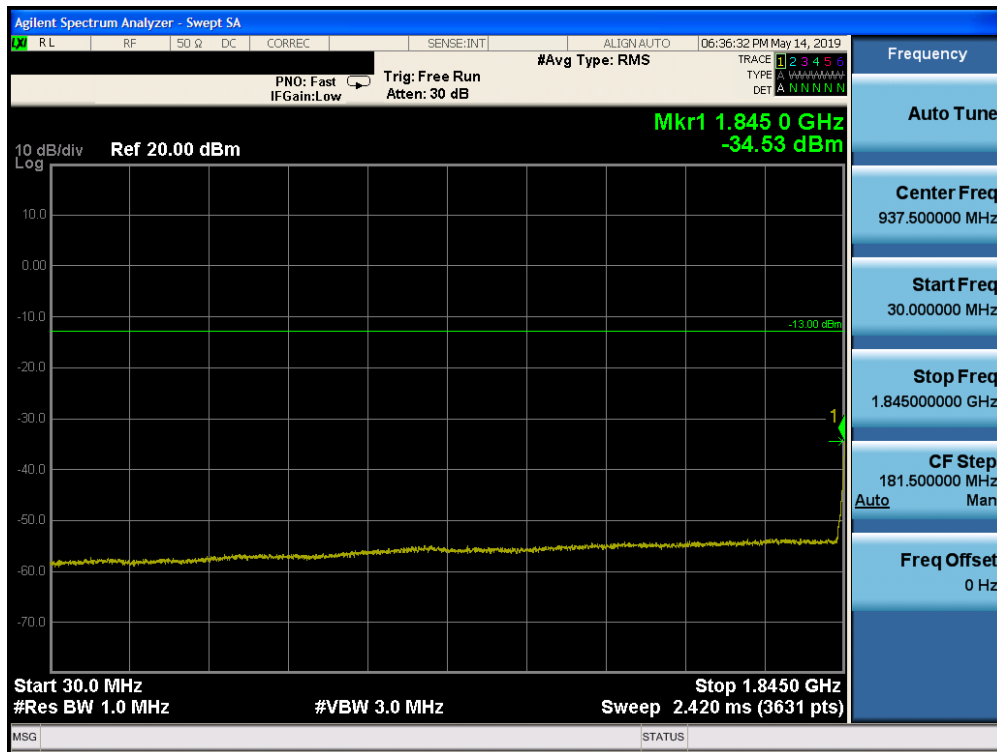
FCC ID: BCG-A2157	<b>MEASUREMENT REPORT</b> (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 26 of 62



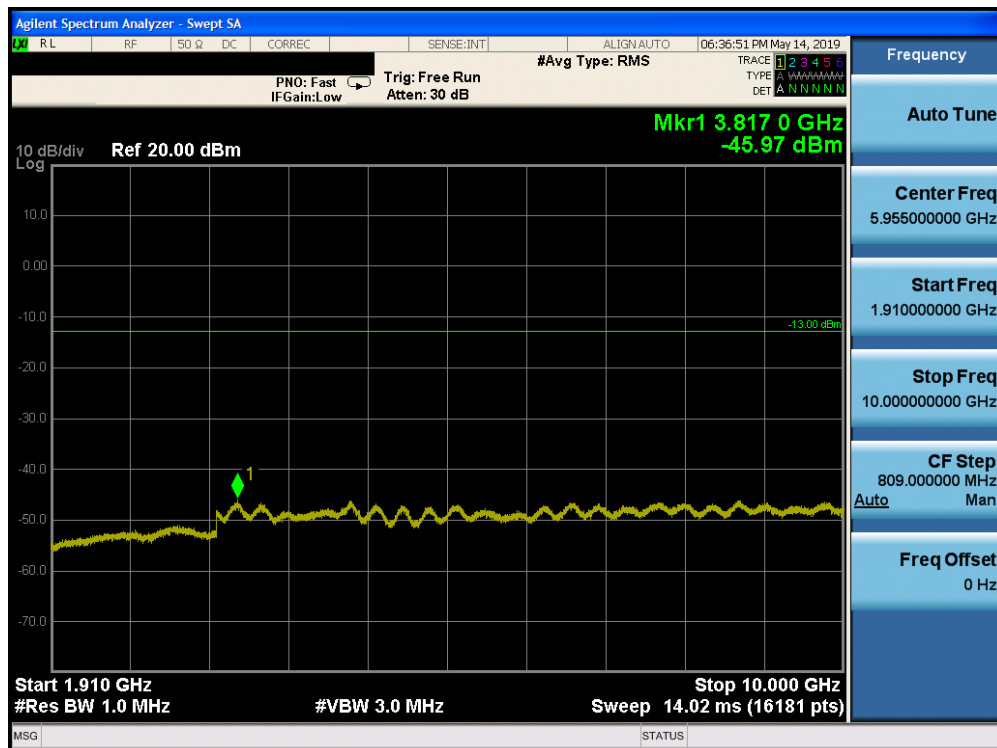
**Plot 7-21. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)**

<b>FCC ID:</b> BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 27 of 62

## PCS WCDMA Mode

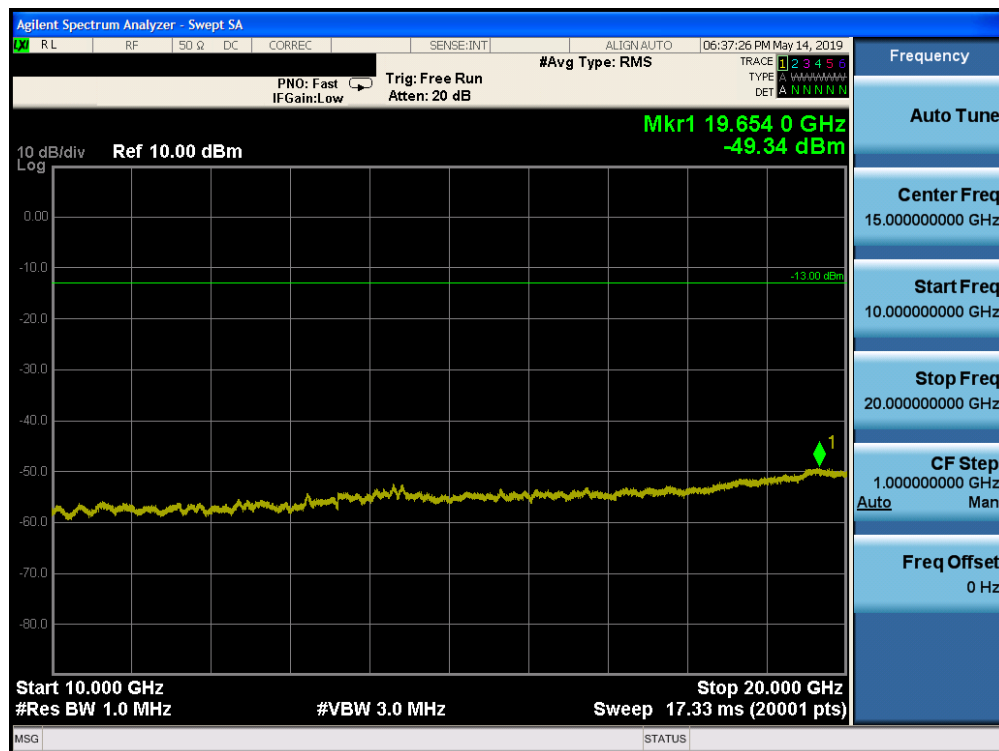


Plot 7-22. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)

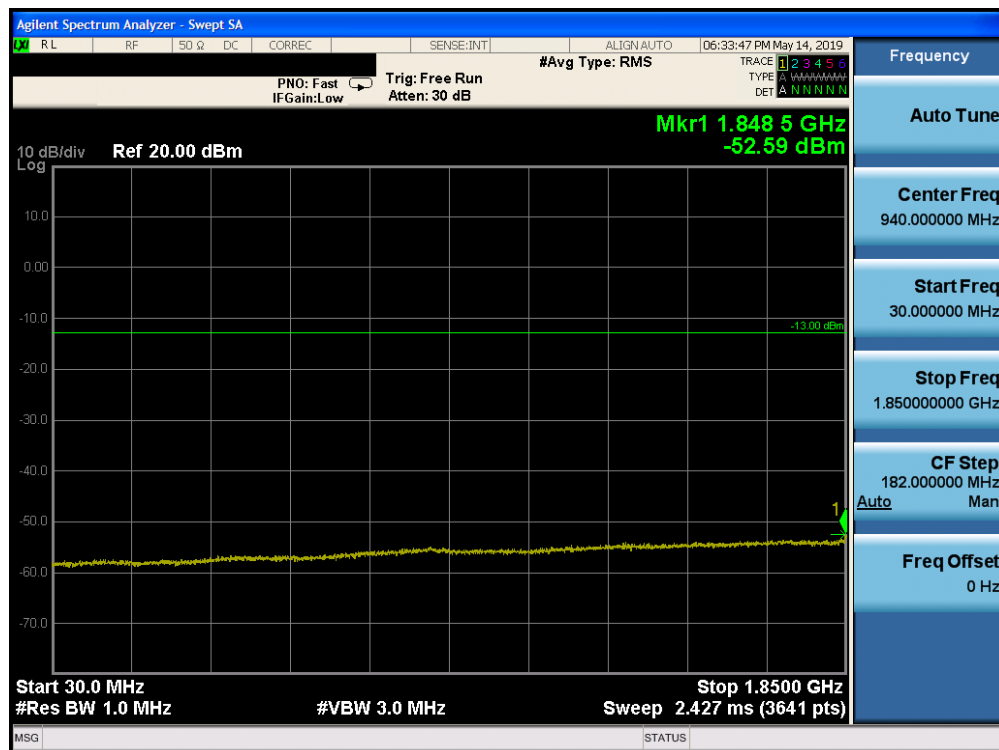


Plot 7-23. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)

FCC ID: BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 28 of 62

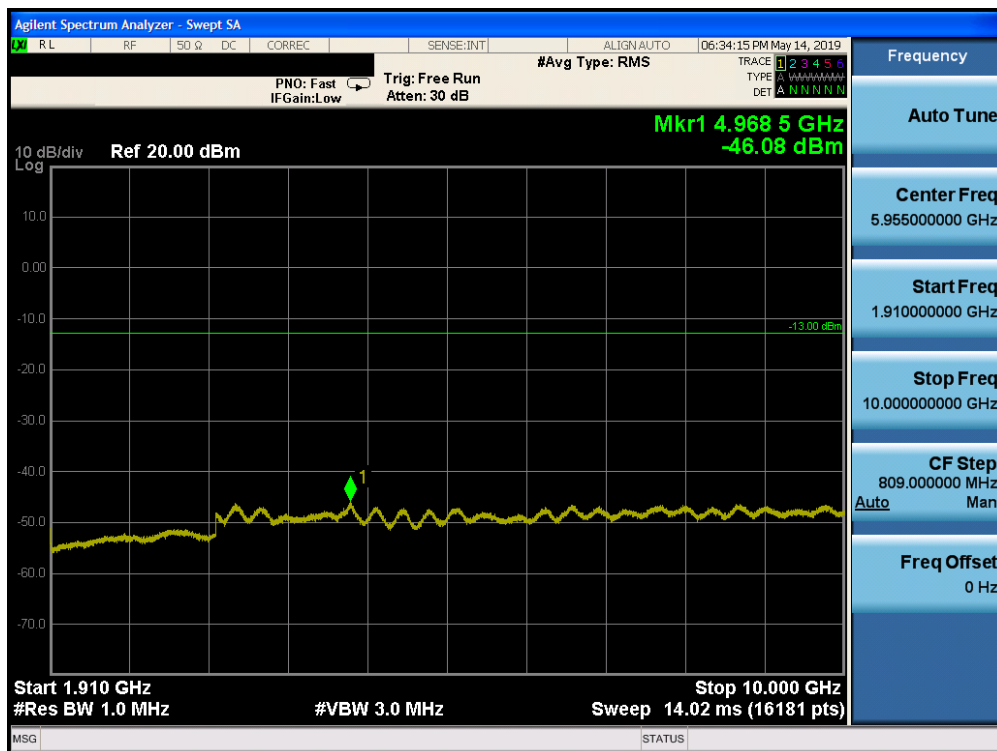


Plot 7-24. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)

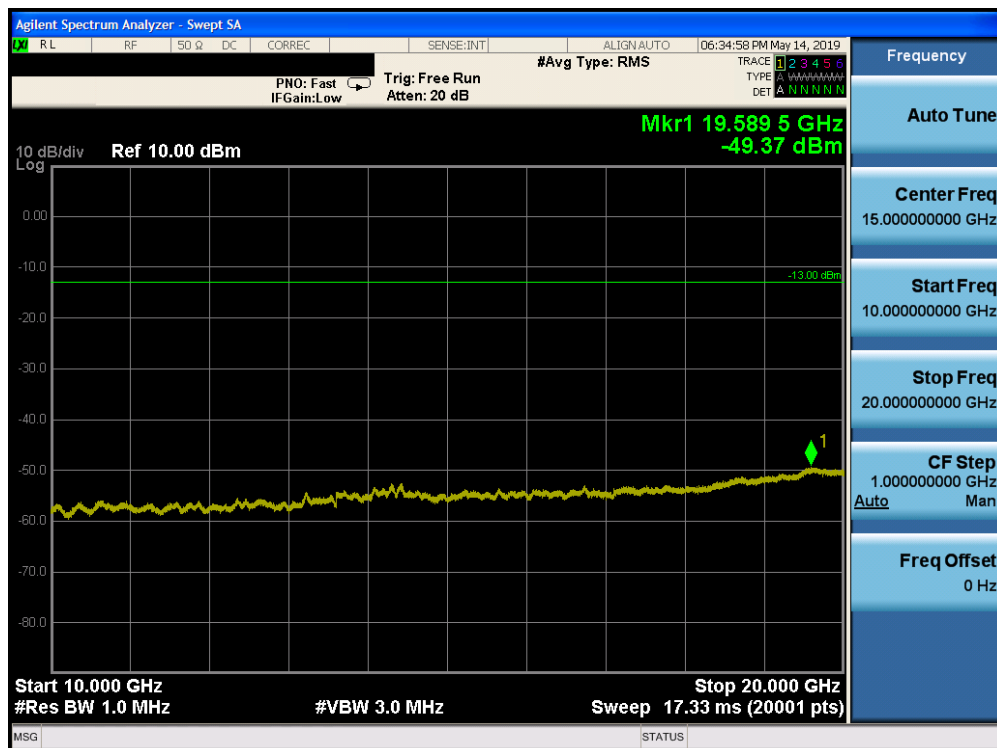


Plot 7-25. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 29 of 62

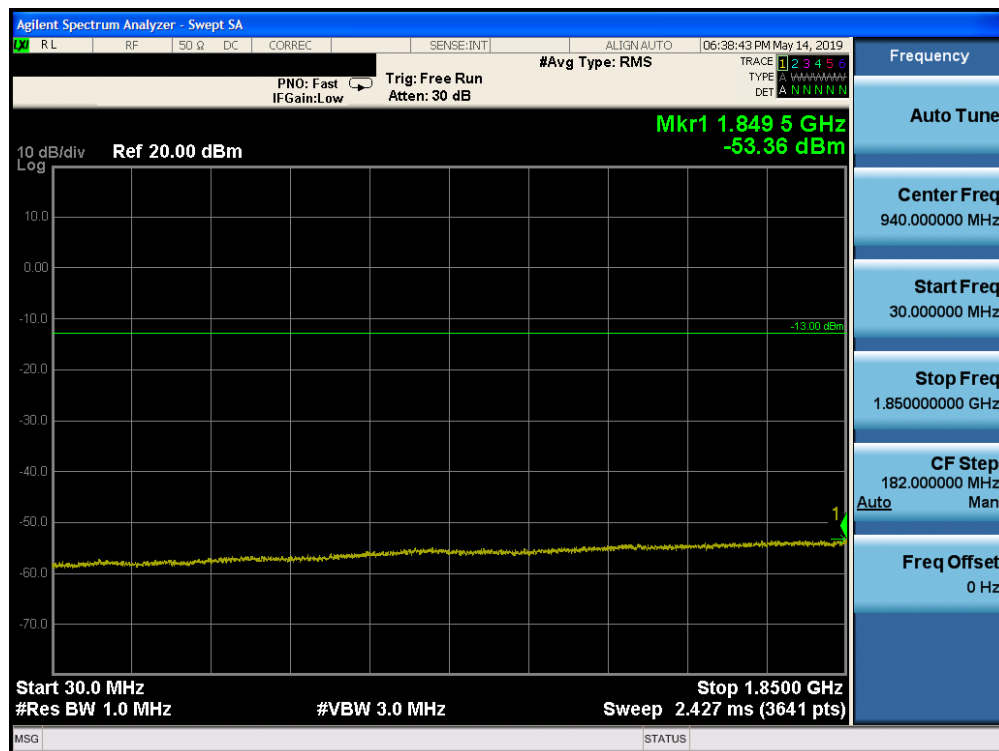


Plot 7-26. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)

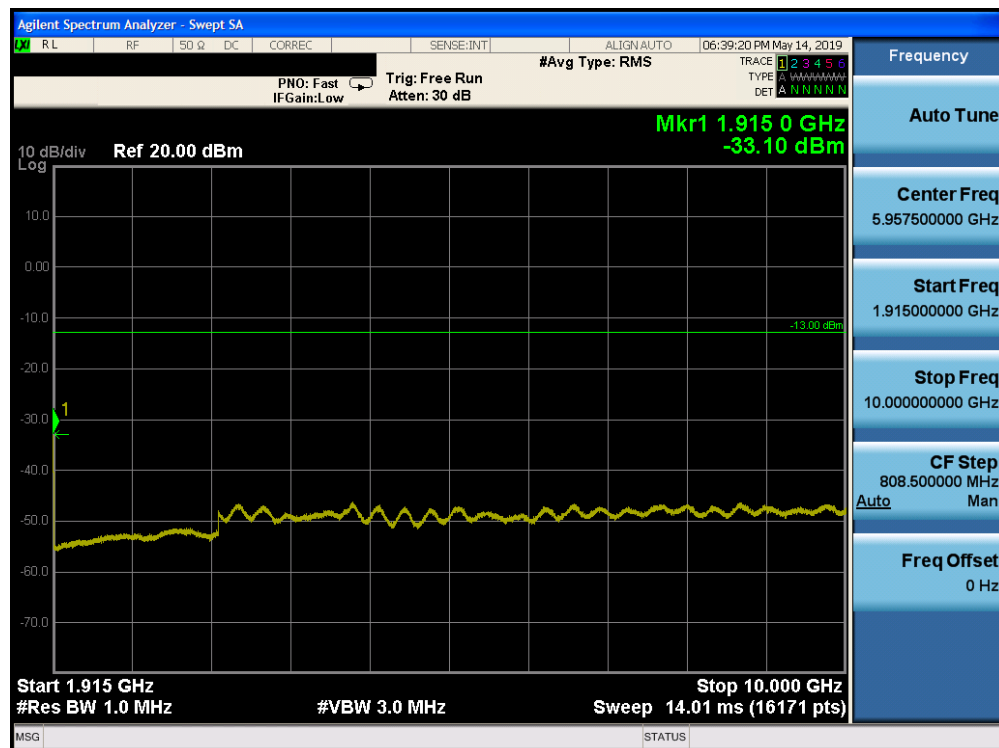


Plot 7-27. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 30 of 62

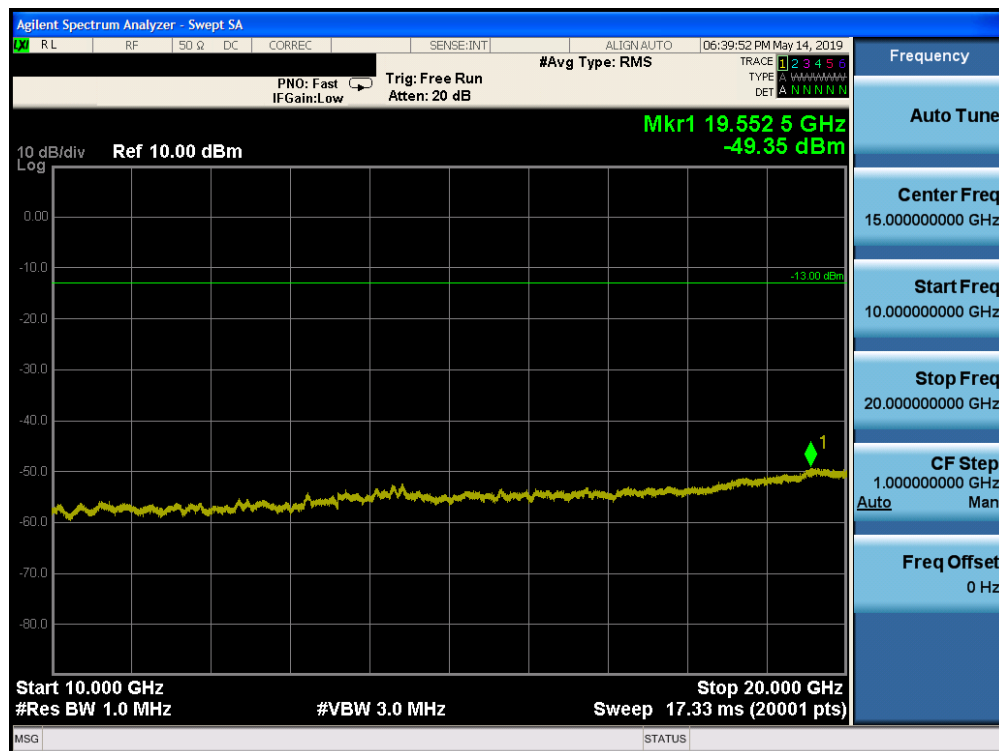


Plot 7-28. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)



Plot 7-29. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 31 of 62



Plot 7-30. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 32 of 62



## 7.4 Band Edge Emissions at Antenna Terminal

### 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.

***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

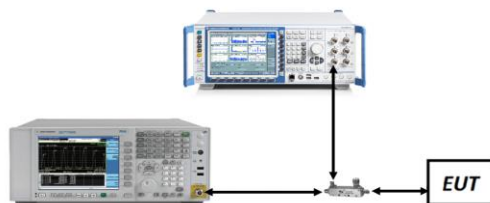
KDB 971168 D01 v03r01 – Section 6.0

### 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
8. Sweep time = auto couple
9. The trace was allowed to stabilize

### Test Setup


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



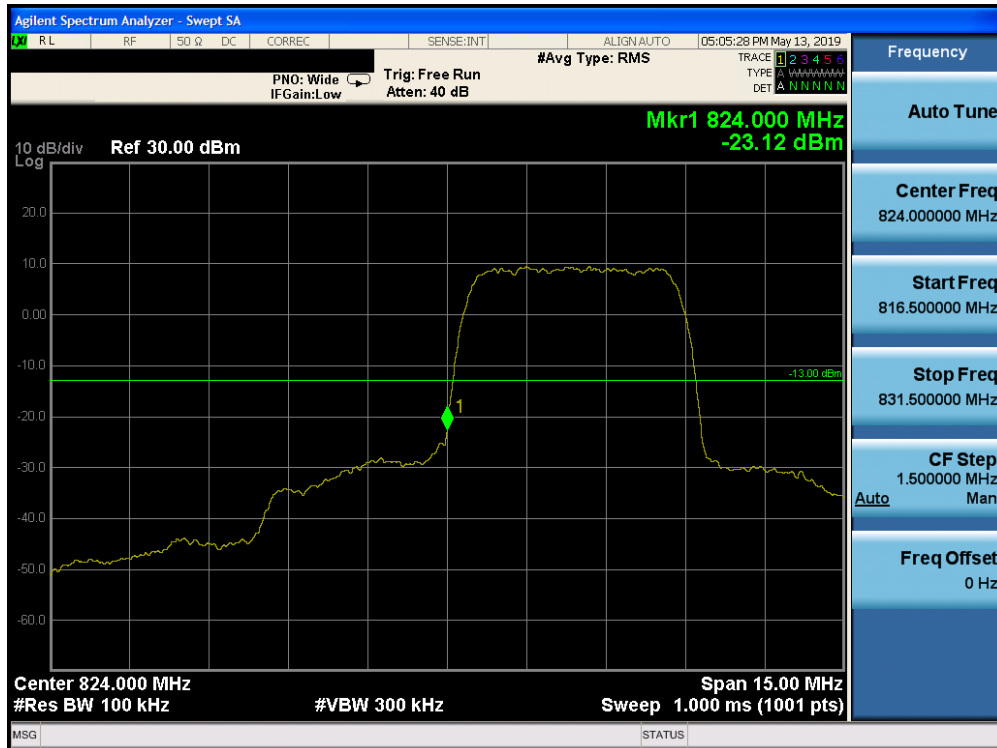
**Figure 7-3. Test Instrument & Measurement Setup**

### Test Notes

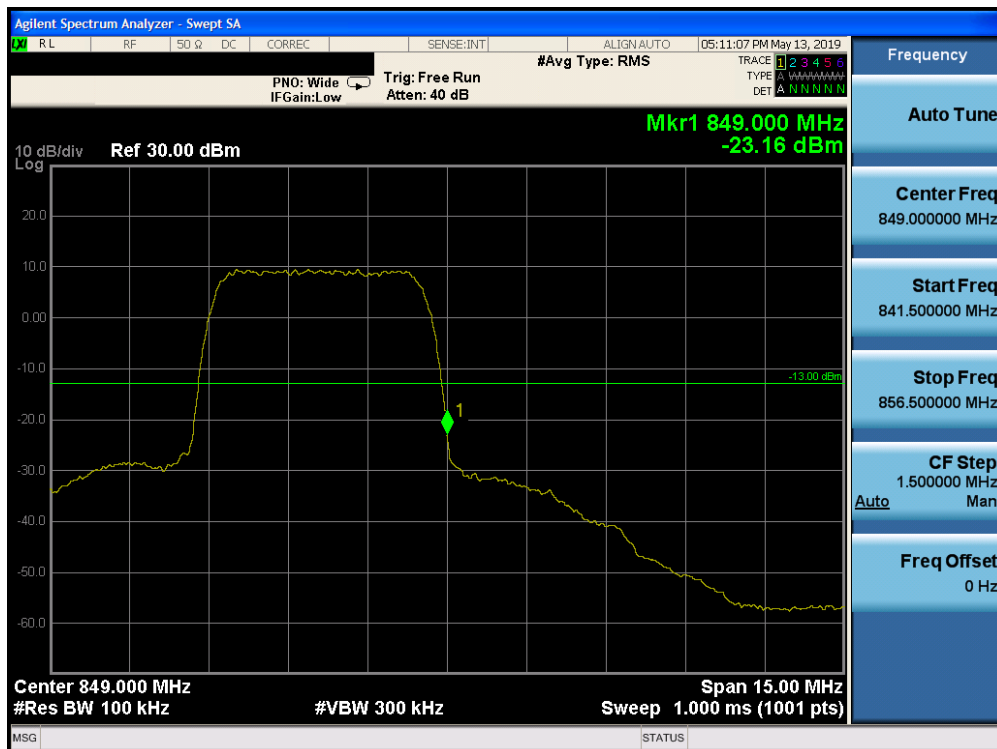
Per 22.917(b), 24.238(b), 27.53(h)(3), and RSS-132(5.5), RSS-133(6.5), RSS-139(6.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 33 of 62

## Cellular WCDMA Mode



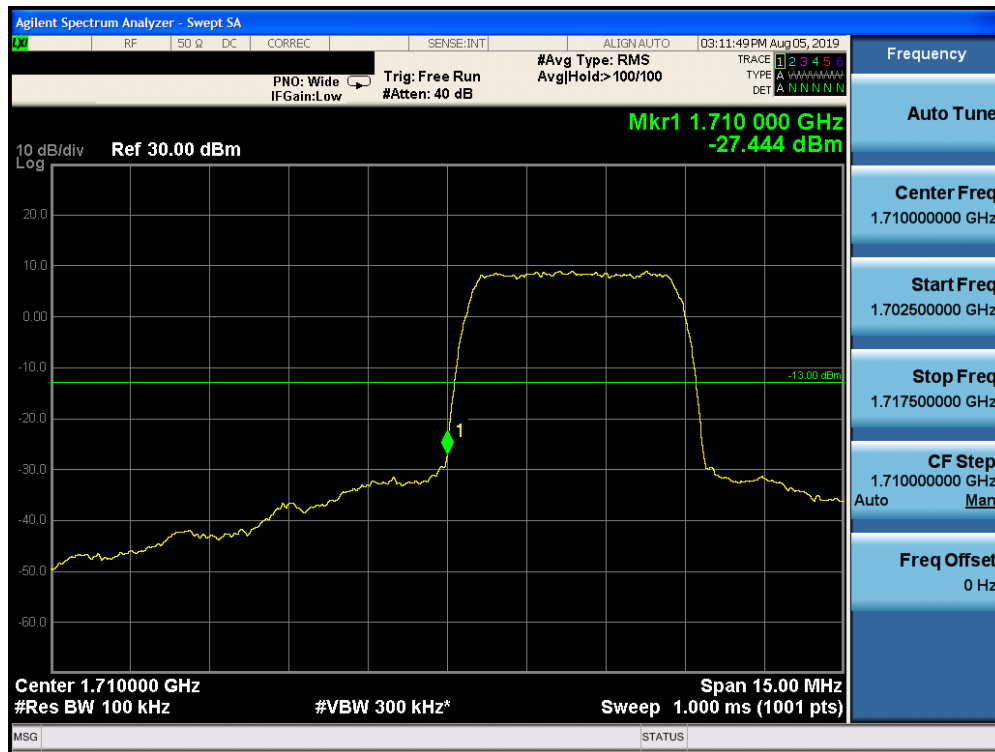
Plot 7-31. Band Edge Plot (Cellular WCDMA Mode - Low Channel)



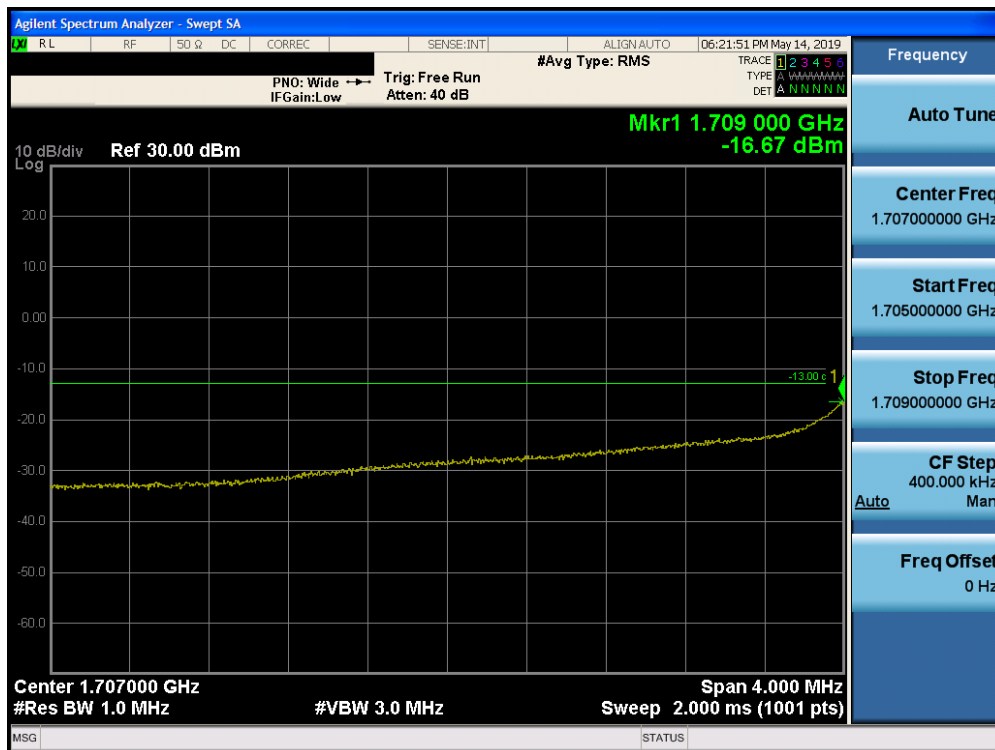
Plot 7-32. Band Edge Plot (Cellular WCDMA Mode - High Channel)

FCC ID: BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 34 of 62

## AWS WCDMA Mode

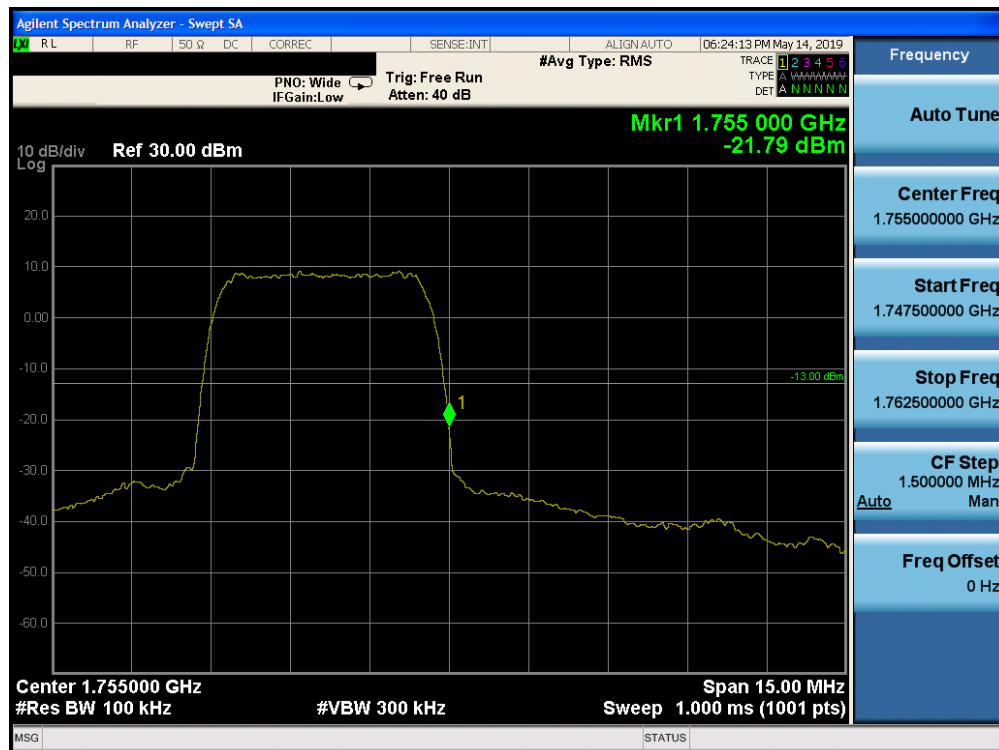


Plot 7-33. Band Edge Plot (AWS WCDMA Mode - Low Channel)



Plot 7-34. 4MHz Span Plot (AWS WCDMA Mode - Low Channel)

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 35 of 62



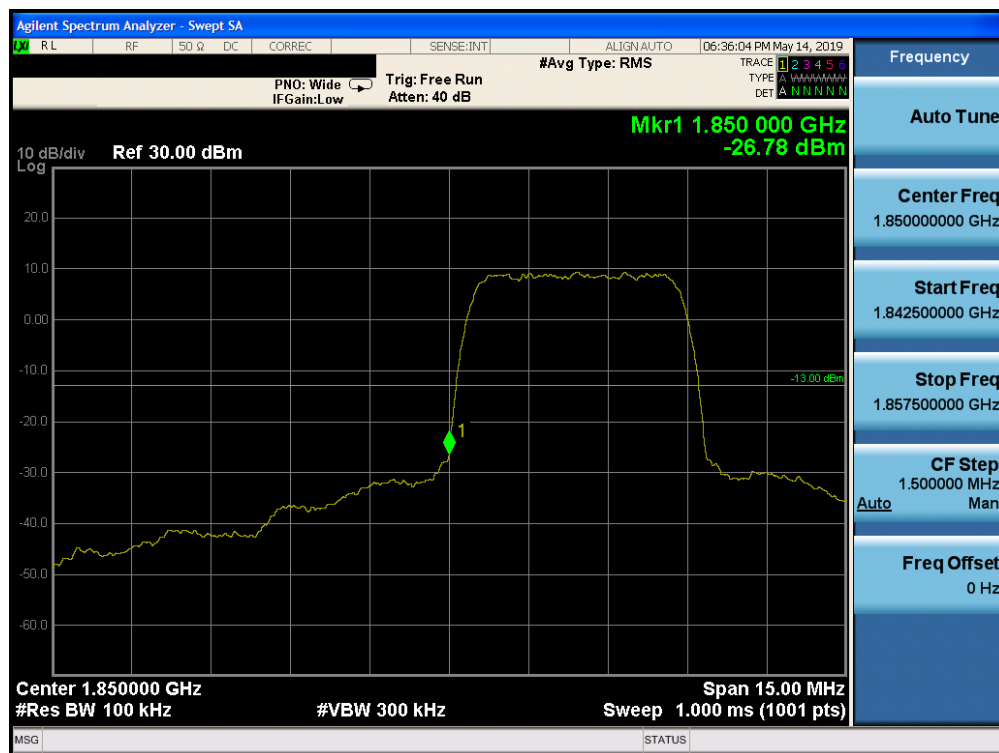
Plot 7-35. Band Edge Plot (AWS WCDMA Mode - High Channel)



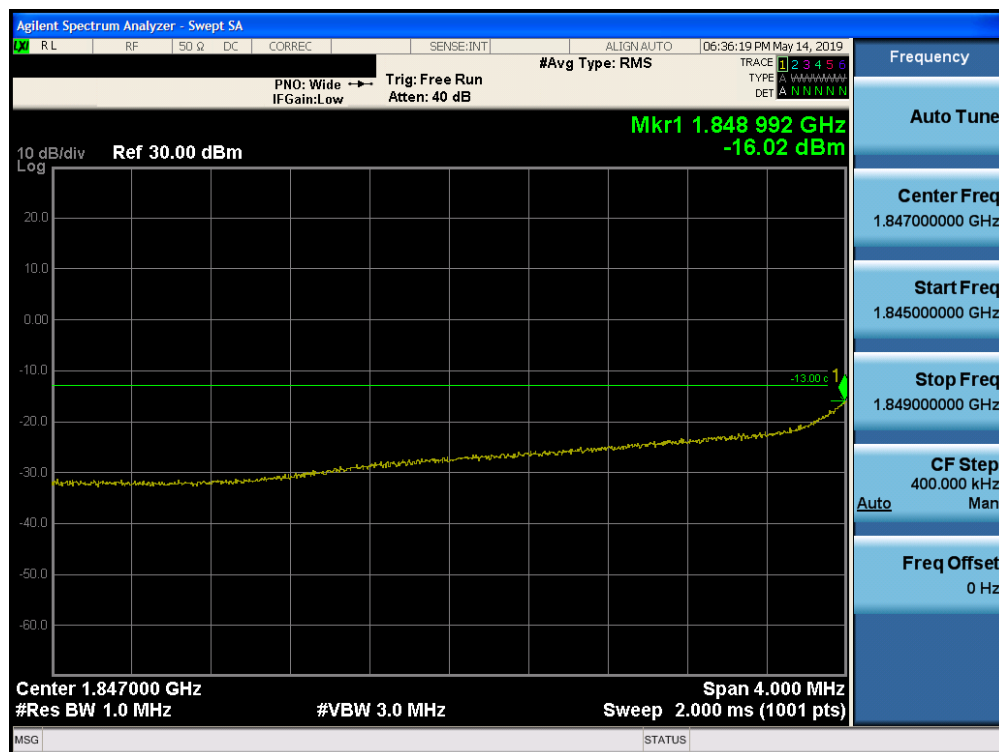
Plot 7-36. 4MHz Span Plot (AWS WCDMA Mode - High Channel)

FCC ID: BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 36 of 62

## PCS WCDMA Mode



Plot 7-37. Band Edge Plot (PCS WCDMA Mode - Low Channel)



Plot 7-38. 4MHz Span Plot (PCS WCDMA Mode - Low Channel)

FCC ID: BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 37 of 62



Plot 7-39. Band Edge Plot (PCS WCDMA Mode - High Channel)



Plot 7-40. 4MHz Span Plot (PCS WCDMA Mode - High Channel)

FCC ID: BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 38 of 62

## 7.5 Peak-Average Ratio

### Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

### Test Procedure Used

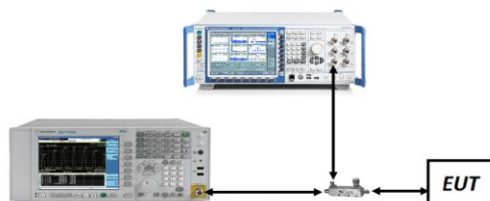
KDB 971168 D01 v03r01 – Section 5.7.1

### Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW > Emission bandwidth of signal
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms.

### Test Setup

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



**Figure 7-4. Test Instrument & Measurement Setup**

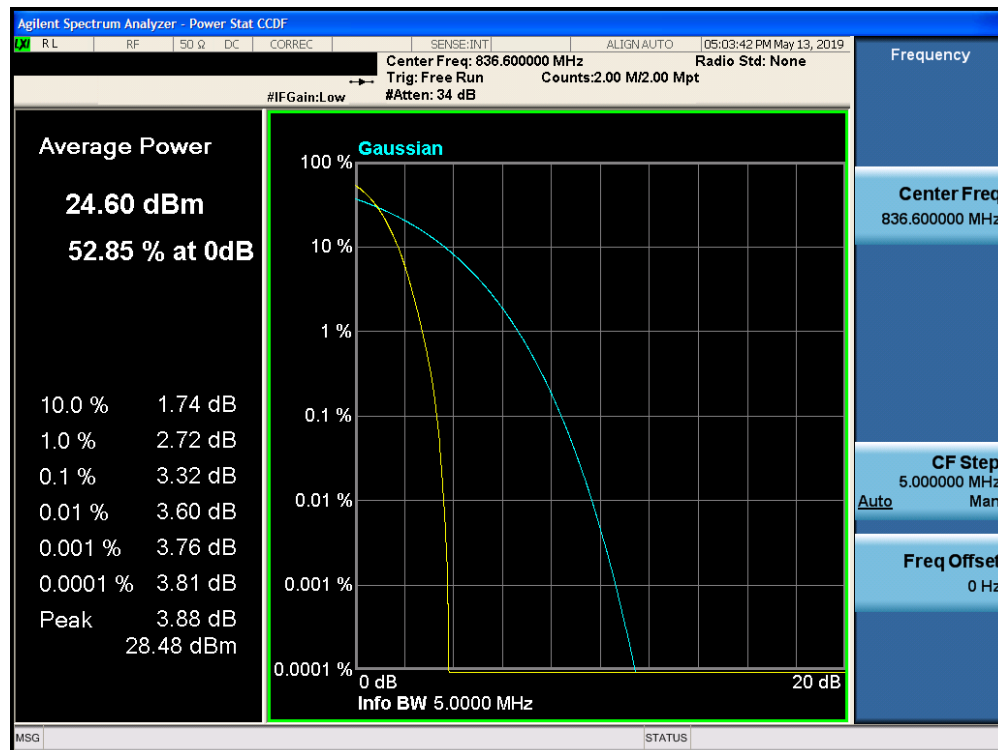
### Test Notes

None

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 39 of 62

Mode	Average Power [dBm]	PAR at 0.1% [dB]	Limit [dB]	Margin [dB]
WCDMA850	24.60	3.32	13.0	-9.68
WCDMA1700	24.00	3.32	13.0	-9.68
WCDMA1900	23.94	3.38	13.0	-9.62

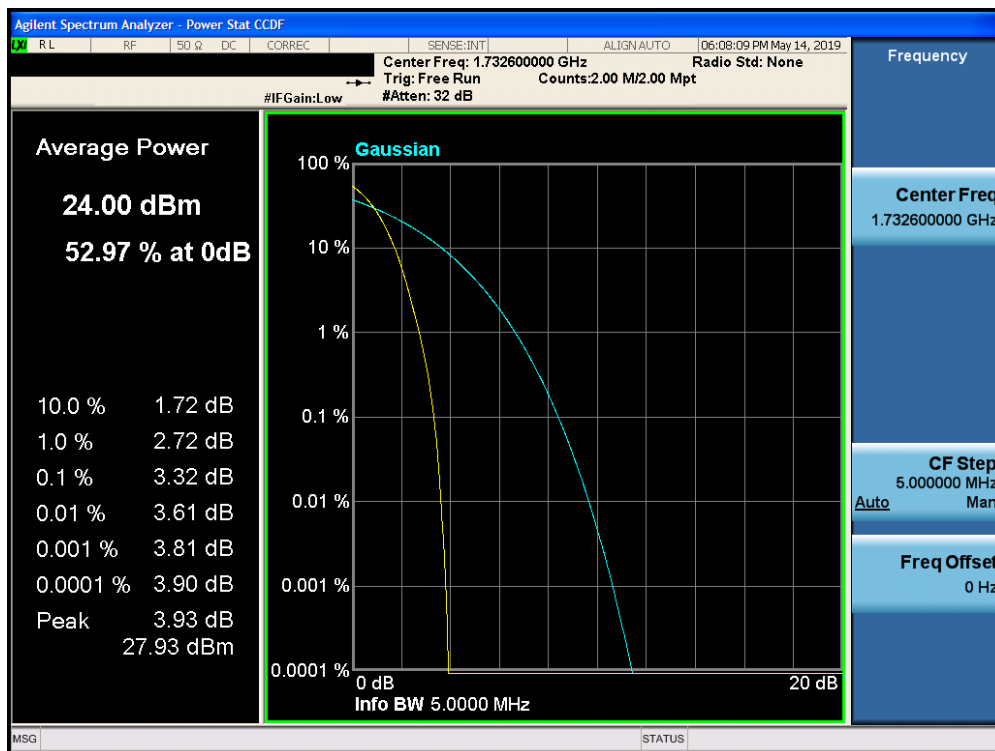
**Table 7-3. Peak to Average Ratio Results**



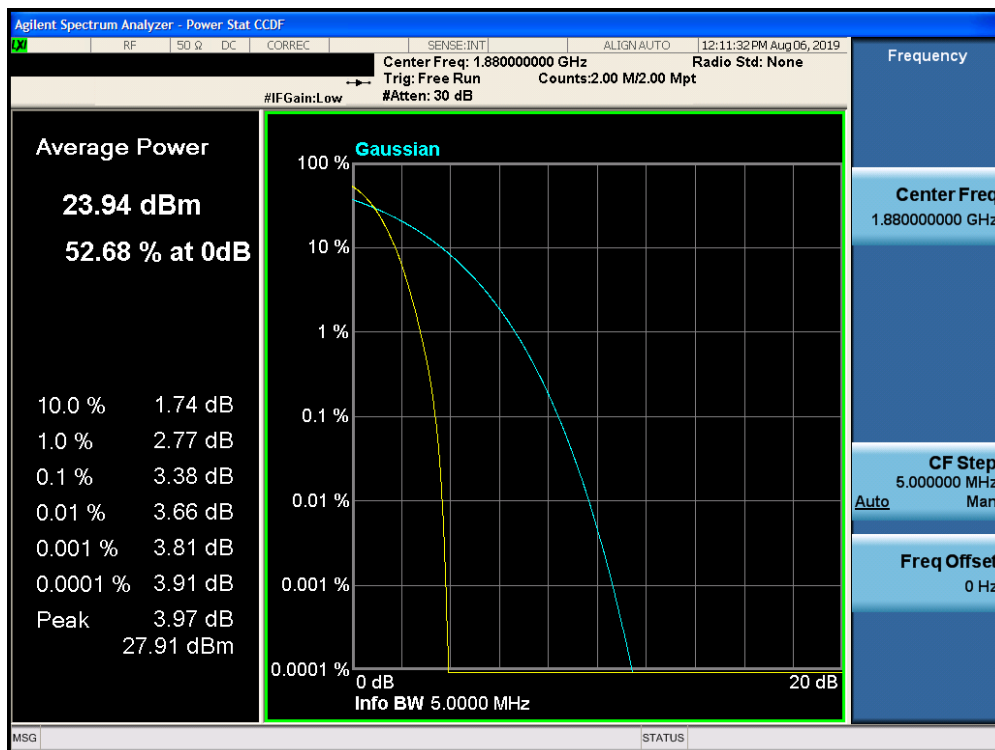
**Plot 7-41. Peak-Average Ratio Plot (Cellular WCDMA Mode)**

FCC ID: BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 40 of 62





Plot 7-42. Peak-Average Ratio Plot (AWS WCDMA Mode)



Plot 7-43. Peak-Average Ratio Plot (PCS WCDMA Mode)

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 41 of 62

## 7.6 Radiated Power (ERP/EIRP)

### Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are determined from the equation below.

### Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

### Test Settings

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

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

Where:

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

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

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

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

### Test Setup

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



**Figure 7-5. ERP/EIRP Measurement Setup**

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 42 of 62

## Test Notes

- 1) This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, and HSUPA capabilities. For WCDMA and HSUPA transmission, all configurations were investigated and the worst case UMTS emissions were found in RMC WCDMA mode at 12.2kbps with HSDPA inactive and TPC bits all set to "1."
- 2) This unit was tested with its standard battery.
- 3) The Ant. Gains (GT) are listed in dBi.

<b>FCC ID:</b> BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 43 of 62

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	25.00	-26.10	<b>-3.25</b>	<b>0.473</b>	38.45	-41.70	<b>-1.10</b>	<b>0.776</b>	40.61	-41.71
836.60	WCDMA850	24.98	-26.10	-3.27	0.471	38.45	-41.72	-1.12	0.773	40.61	-41.73
846.60	WCDMA850	25.00	-26.10	<b>-3.25</b>	<b>0.473</b>	38.45	-41.70	<b>-1.10</b>	<b>0.776</b>	40.61	-41.71

**Table 7-4. ERP/EIRP (Cellular WCDMA)**

Frequency [MHz]	Mode	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
1712.40	WCDMA1700	23.92	-12.60	11.32	13.552	30.00	-18.68
1732.60	WCDMA1700	24.00	-12.60	<b>11.40</b>	<b>13.804</b>	30.00	-18.60
1752.60	WCDMA1700	23.90	-12.60	11.30	13.490	30.00	-18.70

**Table 7-5. EIRP (AWS WCDMA)**

Frequency [MHz]	Mode	Conducted Power [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [mW]	EIRP Limit [dBm]	Margin [dB]
1852.40	WCDMA1900	24.00	-13.10	<b>10.90</b>	<b>12.303</b>	33.01	-22.11
1880.00	WCDMA1900	23.97	-13.10	10.87	12.218	33.01	-22.14
1907.60	WCDMA1900	23.93	-13.10	10.83	12.106	33.01	-22.18

**Table 7-6. EIRP (PCS WCDMA)**

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 44 of 62

## 7.7 Radiated Spurious Emissions Measurements

### Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 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

ANSI/TIA-603-E-2016 – Section 2.2.12

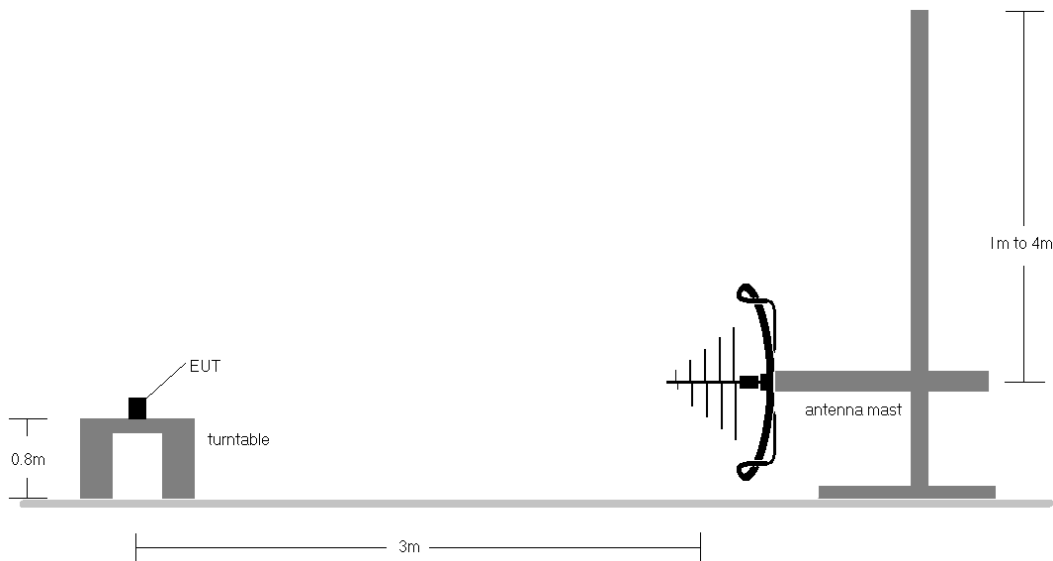
### Test Settings

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

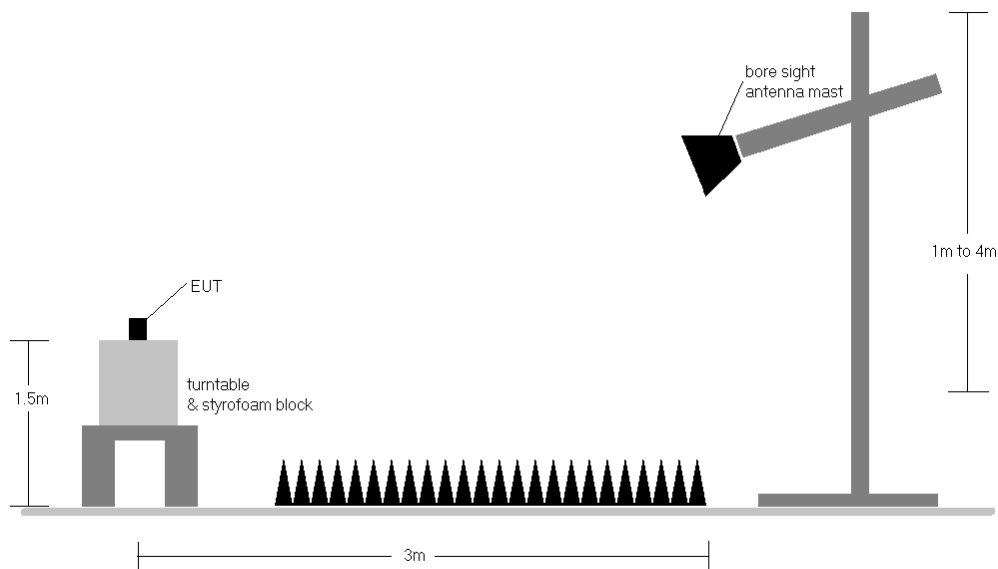
FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 45 of 62

## Test Setup

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



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



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

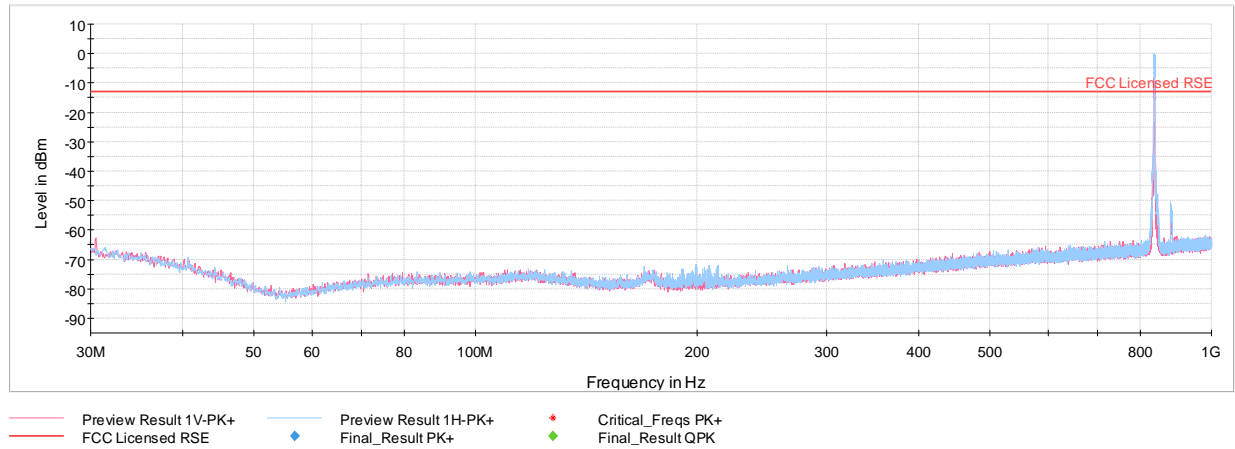
<b>FCC ID:</b> BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 46 of 62

## Test Notes

- 1) This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, and HSUPA capabilities. For WCDMA and HSUPA transmission, all configurations were investigated and the worst case UMTS emissions were found in RMC WCDMA mode at 12.2kbps with HSDPA inactive and TPC bits all set to "1."
- 2) This unit was tested with its standard battery.
- 3) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 6) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 7) Below 1GHz Pre-scan plot shows no significant emissions.

<b>FCC ID:</b> BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 47 of 62

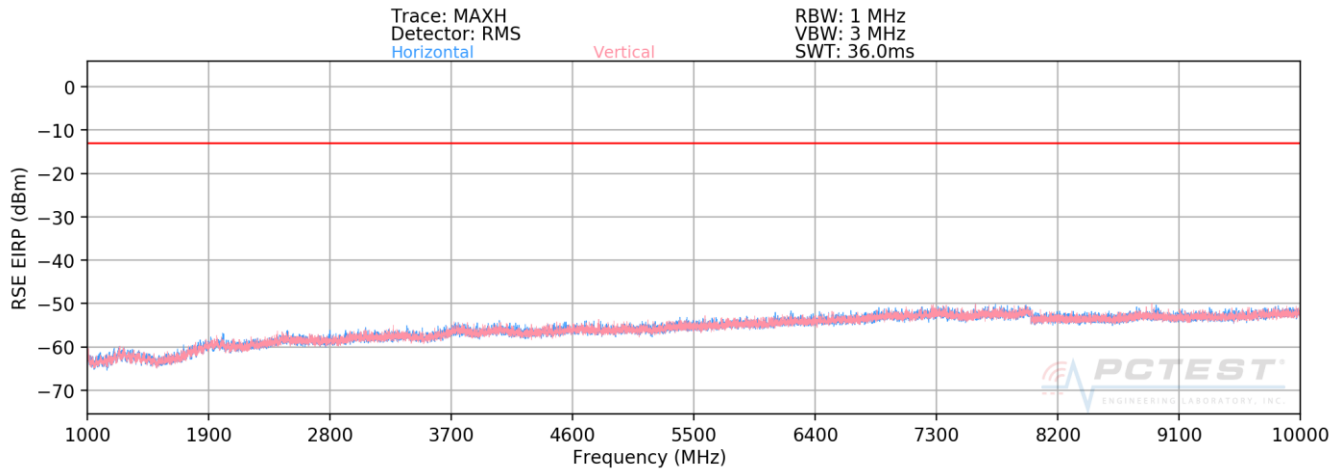
## Cellular WCDMA Mode



**Plot 7-44. Radiated Spurious Plot below 1GHz (Cellular WCDMA Mode)**

<b>FCC ID:</b> BCG-A2157	<b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>MEASUREMENT REPORT (CERTIFICATION)</b>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 48 of 62





**Plot 7-45. Radiated Spurious Plot above 1GHz (Cellular WCDMA Mode)**

OPERATING FREQUENCY: 826.40 MHz  
MODULATION SIGNAL: WCDMA  
DISTANCE: 3 meters  
LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1652.80	H	-	-	-72.76	5.43	-67.33	-54.3
2479.20	H	-	-	-70.00	5.93	-64.07	-51.1
3305.60	H	-	-	-71.08	7.84	-63.24	-50.2
4132.00	H	-	-	-71.28	8.99	-62.28	-49.3
4958.40	H	-	-	-71.62	10.04	-61.58	-48.6

**Table 7-7. Radiated Spurious Data Above 1GHz (Cellular WCDMA Mode – Ch. 4132)**

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 49 of 62

OPERATING FREQUENCY: 836.60 MHz  
 MODULATION SIGNAL: WCDMA  
 DISTANCE: 3 meters  
 LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1673.20	H	-	-	-73.93	5.60	-68.32	-55.3
2509.80	H	-	-	-70.50	5.90	-64.60	-51.6
3346.40	H	-	-	-71.77	7.95	-63.82	-50.8
4183.00	H	-	-	-71.73	9.13	-62.60	-49.6
5019.60	H	-	-	-71.76	10.00	-61.75	-48.8

Table 7-8. Radiated Spurious Data Above 1GHz (Cellular WCDMA Mode – Ch. 4183)

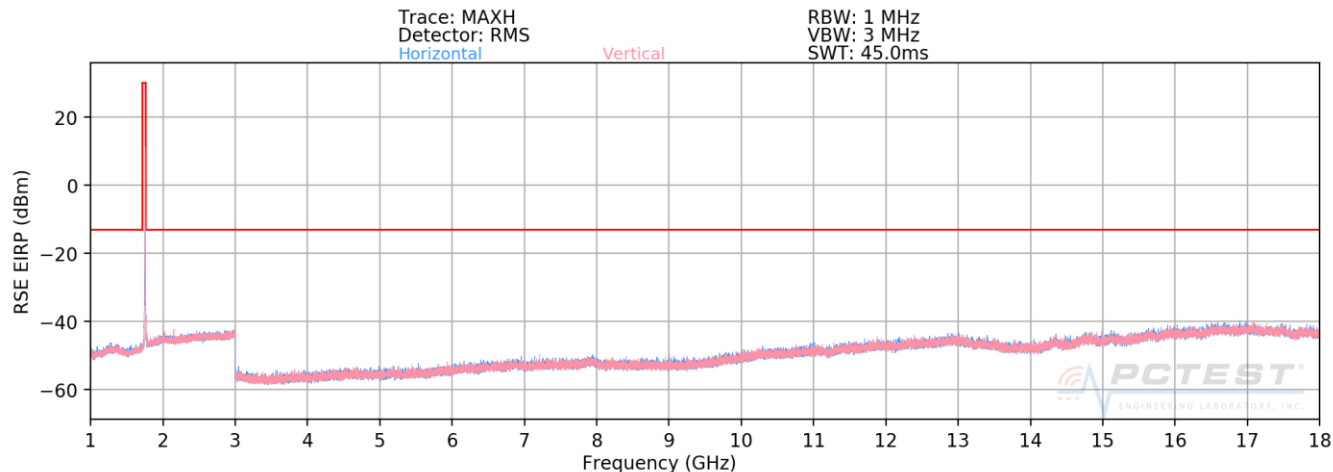
OPERATING FREQUENCY: 846.60 MHz  
 MODULATION SIGNAL: WCDMA  
 DISTANCE: 3 meters  
 LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1693.20	H	-	-	-72.65	5.64	-67.01	-54.0
2539.80	H	-	-	-70.03	5.98	-64.05	-51.1
3386.40	H	-	-	-71.50	8.07	-63.43	-50.4
4233.00	H	-	-	-71.40	9.20	-62.20	-49.2
5079.60	H	-	-	-71.76	10.07	-61.69	-48.7

Table 7-9. Radiated Spurious Data Above 1GHz (Cellular WCDMA Mode – Ch. 4233)

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 50 of 62

## AWS WCDMA Mode



**Plot 7-46. Radiated Spurious Plot above 1GHz (AWS WCDMA Mode)**

OPERATING FREQUENCY: 1712.40 MHz

MODULATION SIGNAL: WCDMA

DISTANCE: 3 meters

LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3424.80	H	-	-	-71.03	8.12	-62.91	-49.9
5137.20	H	-	-	-71.63	10.11	-61.52	-48.5
6849.60	H	-	-	-70.95	11.37	-59.58	-46.6
8562.00	H	-	-	-73.53	13.00	-60.53	-47.5
10274.40	H	-	-	-71.24	13.10	-58.14	-45.1

**Table 7-10. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1312)**

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 51 of 62

OPERATING FREQUENCY: 1732.60 MHz  
 MODULATION SIGNAL: WCDMA  
 DISTANCE: 3 meters  
 LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3465.20	H	-	-	-71.50	8.11	-63.39	-50.4
5197.80	H	-	-	-71.76	10.23	-61.53	-48.5
6930.40	H	-	-	-71.81	11.41	-60.40	-47.4
8663.00	H	-	-	-73.47	13.15	-60.31	-47.3
10395.60	H	-	-	-70.99	13.03	-57.96	-45.0

Table 7-11. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1413)

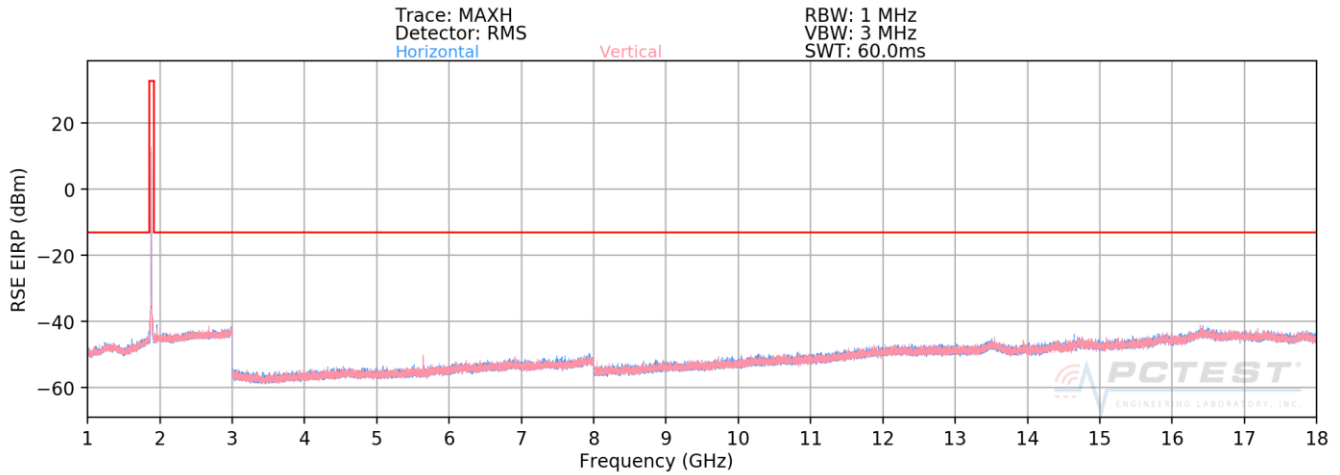
OPERATING FREQUENCY: 1752.60 MHz  
 MODULATION SIGNAL: WCDMA  
 DISTANCE: 3 meters  
 LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3505.20	H	-	-	-71.02	8.07	-62.96	-50.0
5257.80	H	-	-	-70.95	10.27	-60.67	-47.7
7010.40	H	-	-	-71.75	11.51	-60.24	-47.2
8763.00	H	-	-	-73.29	13.18	-60.11	-47.1
10515.60	H	-	-	-71.06	13.08	-57.98	-45.0

Table 7-12. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1513)

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 52 of 62

## PCS WCDMA Mode



**Plot 7-47. Radiated Spurious Plot above 1GHz (PCS WCDMA Mode)**

OPERATING FREQUENCY: 1852.40 MHz  
MODULATION SIGNAL: WCDMA  
DISTANCE: 3 meters  
LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3704.80	V	-	-	-70.71	8.41	-62.30	-49.3
5557.20	V	-	-	-70.88	10.72	-60.16	-47.2
7409.60	V	-	-	-71.36	11.89	-59.47	-46.5
9262.00	V	-	-	-73.08	13.30	-59.78	-46.8
11114.40	V	-	-	-69.78	13.23	-56.56	-43.6

**Table 7-13. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9262)**

FCC ID: BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 53 of 62

OPERATING FREQUENCY: 1880.00 MHz  
 MODULATION SIGNAL: WCDMA  
 DISTANCE: 3 meters  
 LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3760.00	V	-	-	-70.13	8.47	-61.66	-48.7
5640.00	V	348	138	-68.21	10.69	-57.52	-44.5
7520.00	V	-	-	-71.42	11.99	-59.43	-46.4
9400.00	V	-	-	-72.07	13.36	-58.70	-45.7
11280.00	V	-	-	-69.22	13.22	-55.99	-43.0

Table 7-14. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9400)

OPERATING FREQUENCY: 1907.60 MHz  
 MODULATION SIGNAL: WCDMA  
 DISTANCE: 3 meters  
 LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3815.20	V	-	-	-71.10	8.62	-62.48	-49.5
5722.80	V	-	-	-70.20	10.66	-59.53	-46.5
7630.40	V	-	-	-71.95	12.16	-59.79	-46.8
9538.00	V	-	-	-72.56	13.21	-59.35	-46.4
11445.60	V	-	-	-69.49	13.28	-56.21	-43.2

Table 7-15. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9538)

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 54 of 62



## Frequency Stability / Temperature Variation

OPERATING FREQUENCY: 836,600,000 Hz

CHANNEL: 4183

REFERENCE VOLTAGE: 3.80 VDC

DEVIATION LIMIT:  $\pm 0.00025$  % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	836,600,047	47	0.0000056
100 %		- 20	836,600,042	42	0.0000050
100 %		- 10	836,600,034	34	0.0000040
100 %		0	836,600,034	34	0.0000041
100 %		+ 10	836,600,039	39	0.0000047
100 %		+ 20	836,600,041	41	0.0000049
100 %		+ 30	836,600,005	5	0.0000006
100 %		+ 40	836,600,006	6	0.0000007
100 %		+ 50	836,600,005	5	0.0000006
BATT. ENDPOINT	3.40	+ 20	836,600,005	5	0.0000005

**Table 7-16. Frequency Stability Data (Cellular WCDMA Mode – Ch. 4183)**

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 56 of 62



## Frequency Stability / Temperature Variation

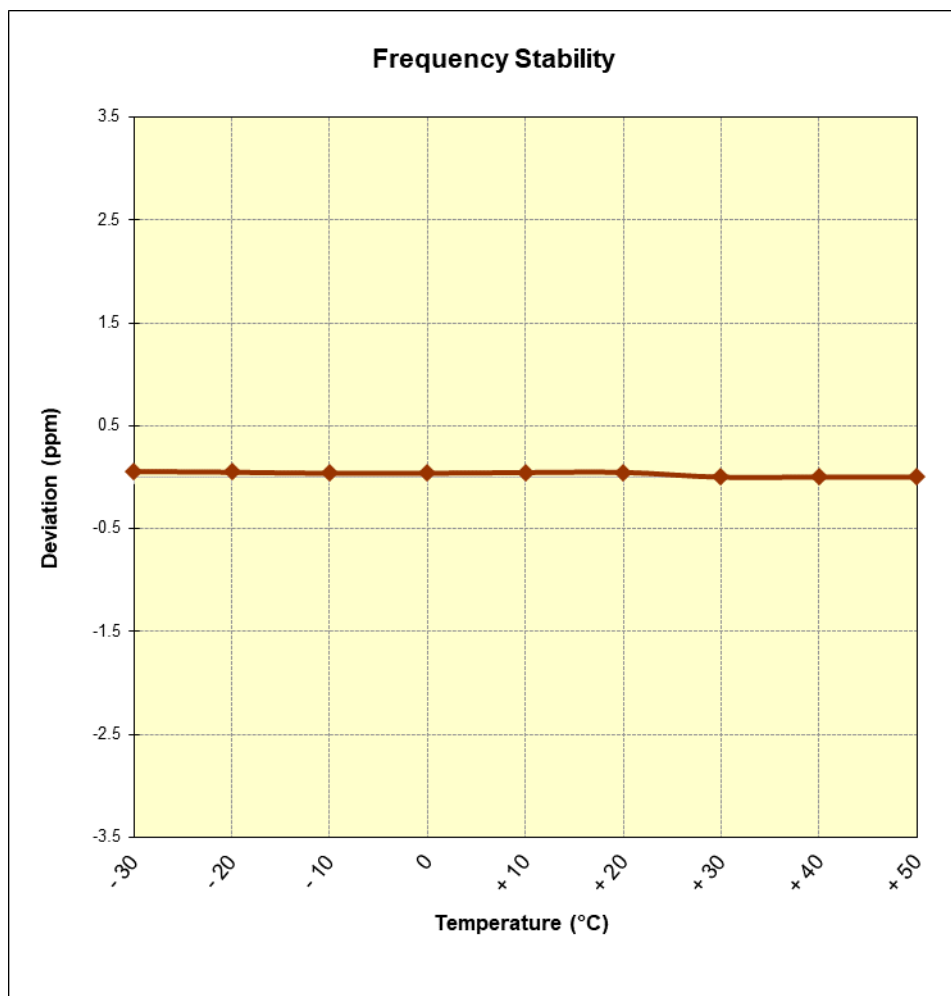


Figure 7-9. Frequency Stability Graph (Cellular WCDMA Mode – Ch. 4183)

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 57 of 62

## Frequency Stability / Temperature Variation

OPERATING FREQUENCY: 1,732,600,000 Hz  
 CHANNEL: 1413  
 REFERENCE VOLTAGE: 3.80 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	1,732,600,039	39	0.0000023
100 %		- 20	1,732,600,032	32	0.0000019
100 %		- 10	1,732,600,034	34	0.0000020
100 %		0	1,732,600,038	38	0.0000022
100 %		+ 10	1,732,600,036	36	0.0000021
100 %		+ 20	1,732,600,038	38	0.0000022
100 %		+ 30	1,732,600,010	10	0.0000006
100 %		+ 40	1,732,600,009	9	0.0000005
100 %		+ 50	1,732,600,010	10	0.0000006
BATT. ENDPOINT	3.40	+ 20	1,732,600,008	8	0.0000005

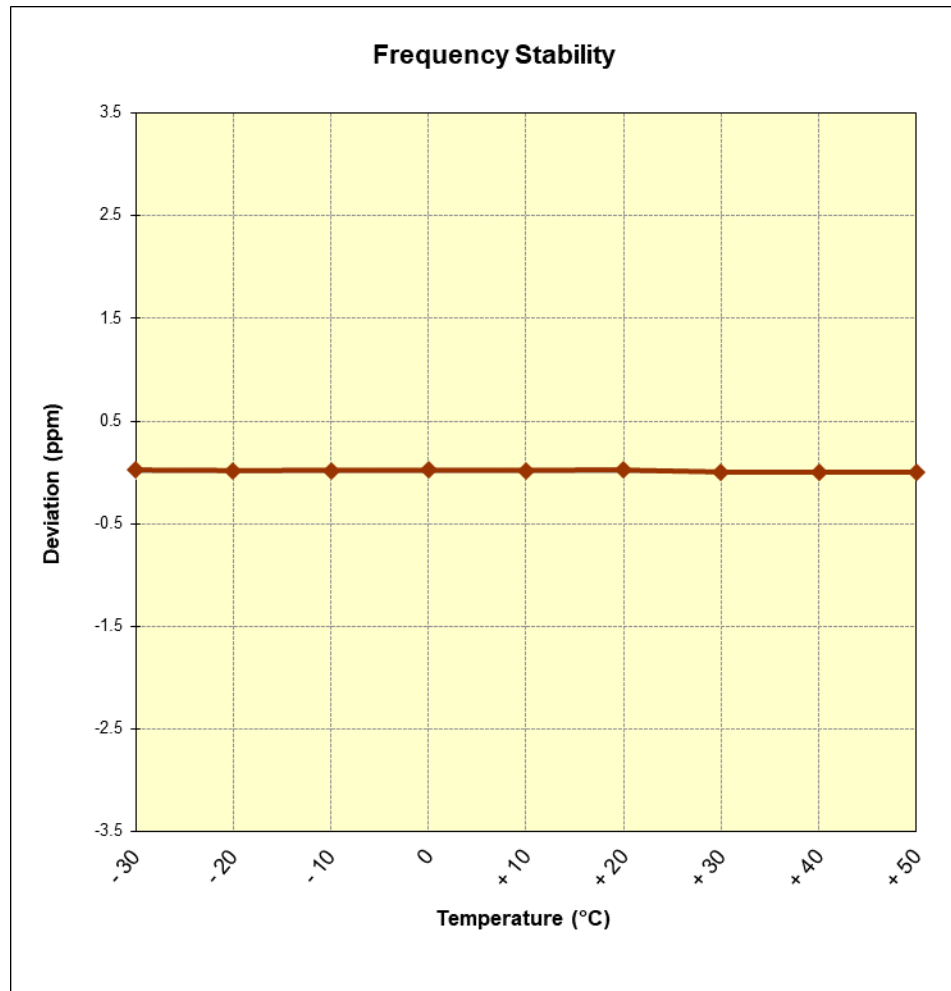
**Table 7-17. Frequency Stability Data (AWS WCDMA Mode – Ch. 1413)**

### Note:

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

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 58 of 62

## Frequency Stability / Temperature Variation



**Figure 7-10. Frequency Stability Graph (AWS WCDMA Mode – Ch. 1413)**

<b>FCC ID:</b> BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 59 of 62

## Frequency Stability / Temperature Variation

OPERATING FREQUENCY: 1,880,000,000 Hz

CHANNEL: 9400

REFERENCE VOLTAGE: 3.80 VDC

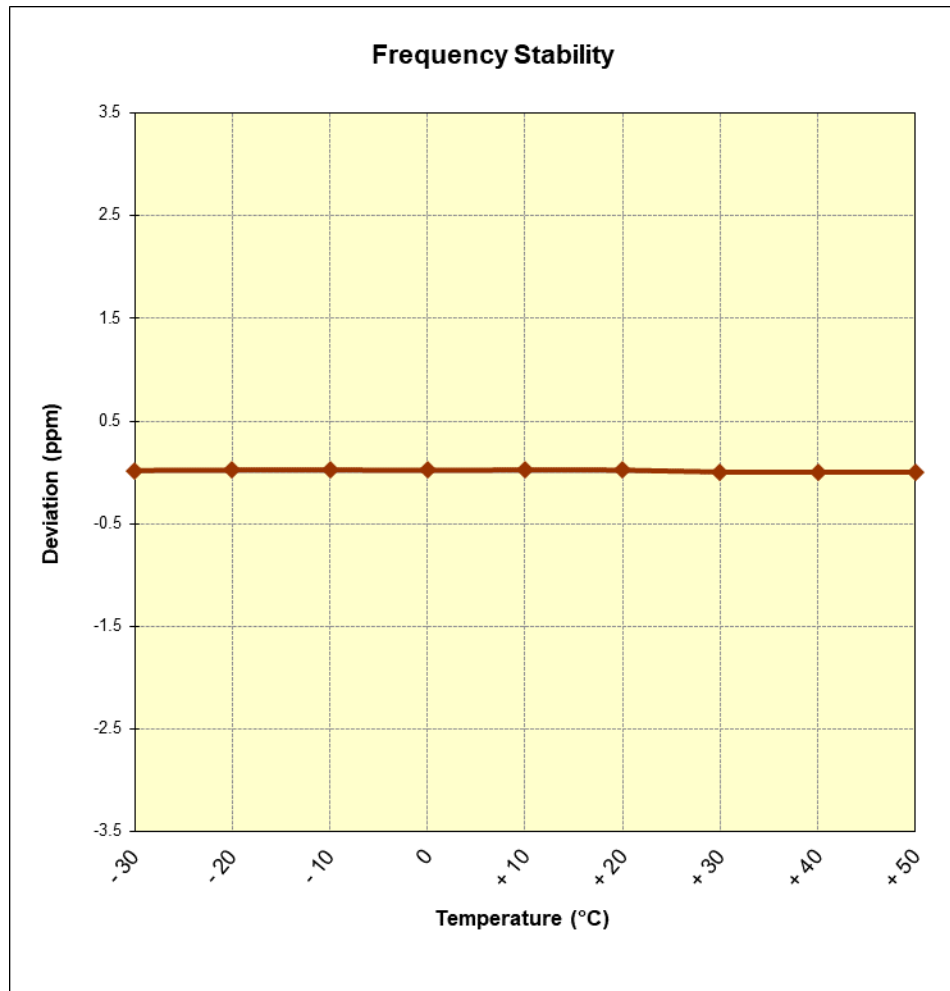
DEVIATION LIMIT:  $\pm 0.00025$  % or 2.5 ppm

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.80	- 30	1,880,000,039	39	0.0000021
100 %		- 20	1,880,000,047	47	0.0000025
100 %		- 10	1,880,000,049	49	0.0000026
100 %		0	1,880,000,044	44	0.0000024
100 %		+ 10	1,880,000,048	48	0.0000026
100 %		+ 20	1,880,000,046	46	0.0000024
100 %		+ 30	1,880,000,010	10	0.0000005
100 %		+ 40	1,880,000,011	11	0.0000006
100 %		+ 50	1,880,000,010	10	0.0000005
BATT. ENDPOINT	3.40	+ 20	1,880,000,007	7	0.0000004

**Table 7-18. Frequency Stability Data (PCS WCDMA Mode – Ch. 9400)**

FCC ID: BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1C1905130011-02.BCG	Test Dates: 05/01/2019 - 08/09/2019	EUT Type: Watch	Page 60 of 62

## Frequency Stability / Temperature Variation



**Figure 7-11. Frequency Stability Graph (PCS WCDMA Mode – Ch. 9400)**

<b>FCC ID:</b> BCG-A2157	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 61 of 62

## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Apple Watch FCC ID: BCG-A2157** complies with all the requirements of Part 27 of the FCC Rules and RSS-139 of the Innovation, Science and Economic Development Canada Rules.

<b>FCC ID:</b> BCG-A2157	 <b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1C1905130011-02.BCG	<b>Test Dates:</b> 05/01/2019 - 08/09/2019	<b>EUT Type:</b> Watch	Page 62 of 62