

PCTEST

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MEASUREMENT REPORT

WCDMA

Applicant Name: Date of Testing: Apple Inc. 06/12/2020-08/20/2020 One Apple Park Way **Test Site/Location:** Cupertino, CA 95014 PCTEST Lab. Morgan Hill, CA, USA United States **Test Report Serial No.:** 1C2004270023-02.BCG FCC ID: **BCG-A2353** IC: 579C-A2353 **APPLICANT:** Apple Inc.

Application Type: Model/HVIN: EUT Type: FCC Classification: FCC Rule Part(s): ISED Specification: Test Procedure(s):

Certification A2353 Watch PCS Licensed Transmitter Worn on Body (PCT) 22, 24, & 27 RSS-132, RSS-133, RSS-139 ANSI C63.26-2015, TIA-603-E-2016, KDB 971168 D01 v03r01

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

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

Randy Ortanez President



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			ERP		EIRP			
Mode	FCC Rule Part	Tx Frequency (MHz)	Max. Power (mW)	Max. Power (dBm)	Max. Power (mW)	Max. Power (dBm)	Emission Designator	
WCDMA850	22H	826.4 - 846.6	0.226	-6.45	0.372	-4.30	4M10F9W	
WCDMA1700	27	1712.4 - 1752.6			21.380	13.30	4M09F9W	
WCDMA1900	24E	1852.4 - 1907.6			25.704	14.10	4M10F9W	

EUT Overview

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1.0 INTRODUCTION

1.1 Scope

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

1.2 PCTEST Test Location

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

1.3 Test Facility / Accreditations Measurements were performed at PCTEST located in Morgan Hill, CA 95037, U.S.A.

- PCTEST is an ISO 17025-2005 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 ISED Standards (RSS).
- PCTEST facility is a registered (22831) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Watch FCC ID: BCG-A2353**. 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.: DVPCR023Q7TM, DVPCR00VQ7TM

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

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.

		Antenna F	СМ
Simultaneous	WLAN	Bluetooth	LTE/WCDMA
Tx Config	802.11 b/g/n	BDR, EDR, HDR4/8, LE	Mid band/ High band
Config 1	×	✓	\checkmark
Config 2	✓	×	\checkmark

Table 2-1. Simultaneous Transmission Configuration

 \checkmark = Support ; * = NOT Support

All the above simultaneous configurations have been tested and the worst case configuration was found to be configuration 1 (BT and LTE). These results can be found in the RF BT and RF LTE FCC reports.

2.3 Antenna Description

Following antennas were used for the testing.

Frequency [MHz]	Antenna	Gain (dBi)
Frequency [whz]	ВСМ	FCM
814-849	-29.3	N/A
1710-1785	N/A	-10.7
1850-1915	N/A	-9.9

Table 2-2. Highest Antenna Gain

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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:	32530F
	w/ Charging Dock	Model:	FAPS73	S/N:	17481001320
	w/ Dock	Model:	X241	S/N:	CVY751400J
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:	DLC9223004YLNWL43
	Wireless Charging Pad (WCP)	Model:	EVT	S/N:	DLC92230061LNWK4V
5	X1456 Test Pathfinder Sinsa Board	Model:	920-06235-01	S/N:	N/A
	SiP Cradle	Model:	P1 X1819S	S/N:	N/A
		_		_	
6	DC Power Supply	Model:	KPS3010D	S/N:	N/A
R	Table 2-3	Test Supp	ort Equipment L	ist	÷

Table 2-3. Test Support Equipment List

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 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.

2.6 Software and Firmware

The test was conducted with firmware version wOS 7.0 installed on the EUT.

2.7 EMI Suppression Device(s)/Modifications

No EMI suppression device(s) were added and no modifications were made during testing.

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

3.2 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 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 dBd (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 C63.26-2015/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:

$$P_{d [dBm]} = P_{g [dBm]} - cable loss_{[dB]} + antenna gain_{[dBd/dBi]}$$

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 $P_{g [dBm]}$ – 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 log₁₀(Power [Watts]).

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.

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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_{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 (±dB)
Conducted Bench Top Measurements	1.30
Radiated Disturbance (<1GHz)	4.15
Radiated Disturbance (>1GHz)	4.59
Radiated Disturbance (>18GHz)	4.96

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5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/4/2020	Annual	3/4/2021	MY49430244
ATM	180-442A-KF	20dB Nominal Gain Horn Antenna	10/29/2019	Annual	10/29/2020	T058701-02
ESPEC	SU-241	Tabletop Temperature Chamber	9/3/2019	Annual	9/3/2020	92009574
ETS-Lindgren	3142E-PA	Pre-Amplifier (30MHz - 6GHz)	9/19/2019	Annual	9/19/2020	213236
ETS-Lindgren	3142E	BiConiLog Antenna (30MHz - 6GHz)	1/6/2020	Annual	1/6/2021	224569
ETS-Lindgren	3117	Double Ridged Guide Antenna (1-18 GHz)	4/21/2020	Annual	4/21/2021	205956
Rohde & Schwarz	FSV40	Signal Analyzer (10Hz-40GHz)	3/2/2020	Annual	3/2/2021	101619
Rohde & Schwarz	ESW26	EMI Test Receiver	6/1/2020	Annual	6/1/2021	101299
Rohde & Schwarz	ESW44	EMI Test Receiver	9/13/2019	Annual	9/13/2020	101570
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	11/16/2019	Annual	11/16/2020	164715
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	4/16/2020	Annual	4/16/2021	166869
Rohde & Schwarz	TS-PR1840	Pre-Amplifier (18GHz - 40GHz)	9/19/2019	Annual	9/19/2020	100051
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Antenna (400MHz-18GHz)	11/14/2019	Annual	11/14/2020	101057
Rohde & Schwarz	HFH2-Z2	Loop Antenna	3/12/2020	Annual	3/12/2021	100546



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

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.

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7.0 TEST RESULTS

7.1 Summary

Company Name:	Apple Inc.
FCC ID:	BCG-A2353
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		N/A	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			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 dB		PASS	Section 7.5
2.1046	RSS-132(5.4) RSS-133(4.1) RSS-139(4.1)	Transmitter Conducted Output Power	Output Power N/A		PASS	Refer to RF Exposure Report
22.913(a)(5)	RSS-132(5.4)	Effective Radiated Power			PASS	Section 7.6
24.232(c)	RSS-133(6.4)	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP		PASS	Section 7.6
27.50(d)(4)	RSS-139(6.5)	Equivalent Isotropic Radiated Power	< 1 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 > 43 + 10 log ₁₀ (P[Watts]) for all out-of-band emissions		RADIATED	PASS	Section 7.7
2.1055 22.355 24.235 27.54	RSS-132(5.3) RSS-133(6.3) RSS-139(6.4)	Frequency Stability	Frequency Stability <pre>< 2.5 ppm (Part 22) Emission must remain in band (Part 24, 27)</pre>		PASS	Section 7.8

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 4.2.

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

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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Mode	Occupied Bandwidth [kHz]
WCDMA850	4096.43
WCDMA1700	4091.40
WCDMA1900	4095.40

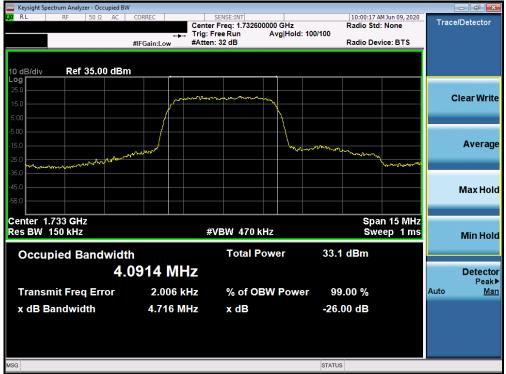
Table 7-2. Occupied Band Width Results



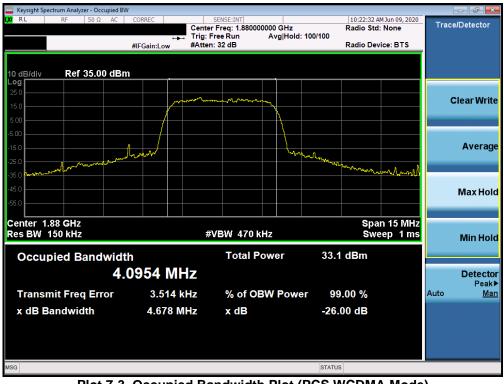
Plot 7-1. Occupied Bandwidth Plot (Cellular WCDMA Mode)

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



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

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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 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.

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to 10GHz 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.

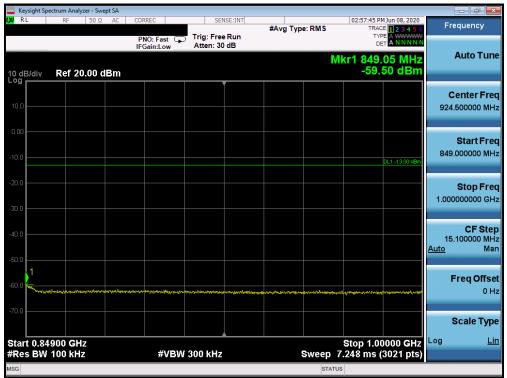
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Cellular WCDMA Mode

Center F 222.70 WHZ 32.88 dBm 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0 30.0000 M 30.000 M		ectrum Analyz	zer - Swep	et SA										
Mkr1 822.70 MHz Auto Tu 0 gB/div Ref 20.00 dBm -32.88 dBm Center F 10 gB/div Image: Start Fill -32.88 dBm Start Fill 10 g Image: Start Fill -30.00000 M -30.00000 M 10 g Image: Start Fill -30.00000 M -30.00000 M 10 g Image: Start Fill -30.00000 M -30.00000 M 10 g Image: Start Fill -30.00000 M -30.00000 M 10 g Image: Start Fill -30.00000 M -30.0000 M -20 g Image: Start Fill -30.00000 M -30.0000 M -20 g Image: Start Fill -30.00000 M -30.0000 M -20 g Image: Start Fill -30.0000 M -30.0000 M -20 g Image: Start Fill -30.0000 M -30.0000 M -20 g Image: Start Fill -30.0000 M -30.0000 M -20 g Image: Start Fill -30.0000 M -30.0000 M -20 g Image: Start Fill -30.0000 M -30.0000 M -20 g Image: Start Fill -30.0000 M -30.0000 M -20 g Image: Start Fill -30.00	XI RL	RF	50 Ω	AC	PNO: F	ast 🖵	Trig: Fre	e Run	#Avg Typ	e: RMS	TRAC	E 1 2 3 4 5 6	Fi	requency
100 Center F 100 Start F 100 Duil -1300000 200 Duil -13000000 200		Ref 20	.00 di	Зm	IFGaint	Low	Attent			M	kr1 822. -32.	70 MHz 88 dBm		Auto Tune
100 DLI -1300 del Start Fill 200 DLI -1300 del Stop Fill														Center Fre 6.500000 MH
30.0 1 1 823,00000 M 40.0 1 1 1 823,00000 M 40.0 1 1 1 1 1 60.0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 <td></td> <td>DL1 -13.00 dBm</td> <td>30</td> <td>Start Fre</td>												DL1 -13.00 dBm	30	Start Fre
4400 79.300000 M 500 4400 500 4400 500 500 600 500 100 100 500 100 500 100 500 100 600 100 500 100 500 100 500 100 500 100 600 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500 100 500												1	823	Stop Fre 3.000000 MH
600 70.0 Start 30.0 MHz Stop 823.0 MHz														CF Ste 9.300000 MH Ma
Start 30.0 MHz Stop 823.0 MHz					an first lynn i de		an a		nife miles Christian I a constant					Freq Offse 0 H
Gtart 30.0 Miliz	-70.0													Scale Typ
#Res BW 100 kHz #VBW 300 kHz Sweep 38.06 ms (15861 pts)			4			#VBW	300 kHz		s	weep 38	Stop 8 .06 ms (1	23.0 MHz 5861 pts)		Lii

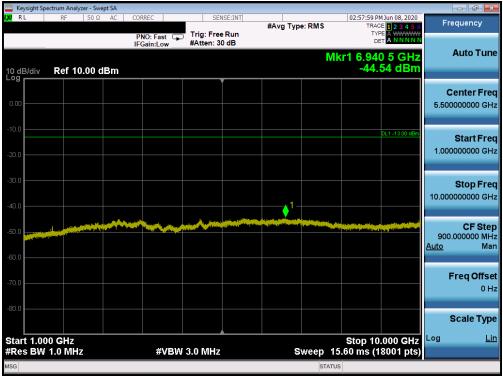
Plot 7-4. Conducted Spurious Plot (Cellular WCDMA Mode - Low Channel)



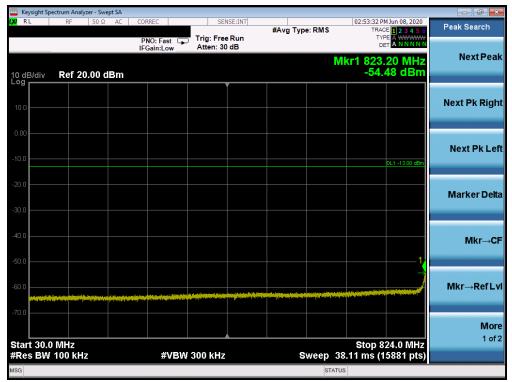
Plot 7-5. Conducted Spurious Plot (Cellular WCDMA Mode - Low Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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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-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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	ectrum Analyzer - Swe									
LXI RL	RF 50 Ω	AC (CORREC	SEN	ISE:INT	#Avg Typ	e PMS		MJun 08, 2020	Peak Search
			PNO: Fast G	Trig: Free Atten: 30	Run dB	#r.vg i yp	e. Ring	TYP	A WWWWW A NNNNN	
10 dB/div Log	Ref 20.00 d	lBm					М	kr1 849. -53.	00 MHz 30 dBm	Next Peak
10.0										Next Pk Right
-10.0									DL1 -13.00 dBm	Next Pk Left
-20.0										Marker Delta
-40.0										Mkr→CF
-60.0	allayayay tagamat jasa ayay katal pasa a	an ya ngangangan ngangan ngang	**************************************	anga anganga ang ang ang	en anti-stationen and and and and and and and and and an	لىمۇرىلار مەربىلىدىچا ئەرچە ^{رى} يوپ		t and a contract of the grade of the f	ana mangapanganganganganganganganganganganganganga	Mkr→RefLvl
Start 0.84								Stop 1.00	0000 GHz	More 1 of 2
#Res BW	100 KHZ		#VBW	300 kHz			Sweep /		3021 pts)	
							STATU			

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



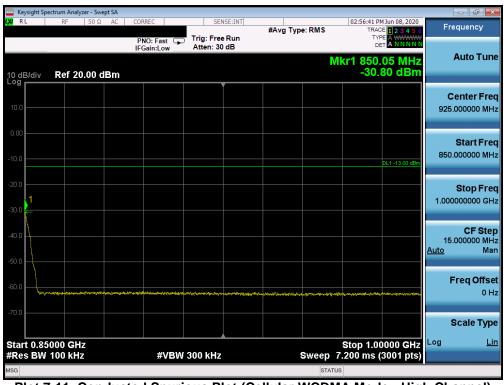
Plot 7-9. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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	Spectrum Analyzer - Sw									(
L <mark>XI</mark> RL	RF 50 Ω	2 AC	CORREC	SEN	SE:INT	#Avg Typ	e: RMS		1 Jun 08, 2020	Fre	equency
10 dB/div	Ref 20.00	dBm	PNO: Fast IFGain:Low	Trig: Free Atten: 30				TYP DE	90 MHz 94 dBm		Auto Tune
10.0											enter Freq 000000 MHz
-10.0									DL1 -13.00 dBm		Start Freq 000000 MHz
-20.0										824.	Stop Freq 000000 MHz
-40.0										79. <u>Auto</u>	CF Step 400000 MHz Man
-60.0	andro Janeiro di Calendro di Angeli								1	F	F req Offset 0 Hz
-70.0 Start 30	0 MHz							Stop 8	24.0 MHz	s Log	Scale Type Lin
	V 100 kHz		#VBW	300 kHz		S	weep 38.	11 ms (1			
MSG							STATUS				

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-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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		trum Analyze:		A									- 6 ×
L <mark>XI</mark> RL		RF	50 Ω AC	C CORR	REC	SE	NSE:INT	#Avg Typ	e. DMS	02:56:57 P	M Jun 08, 2020 CE 1 2 3 4 5 6	Fre	equency
					0: Fast 🕞 ain:Low	Trig: Free #Atten: 3		#AV9 Typ		TY D			Auto Tune
10 dB Log r	//div	Ref 10.	00 dBn	n					M	kr1 5.95 -44.	7 5 GHz 70 dBm		Auto Tune
0.00													enter Freq
0.00 -												5.500	000000 GHz
-10.0											DL1 -13.00 dBm		Start Freq
-20.0												1.000	000000 GHz
20.0													
-30.0													Stop Freq
-40.0							. 1 _					10.000	000000 GHz
-40.0						بالتعم في			and a star of a				
-50.0					~~~		A MARINA AND A MARINE					900	CF Step 000000 MHz
-60.0												<u>Auto</u>	Man
-00.0												_	
-70.0												ŀ	req Offset 0 Hz
-80.0													
-00.0												:	Scale Type
Start	1.000) GHz								Stop 10	.000 GHz	Log	Lin
		1.0 MHz			#VBW	/ 3.0 MHz		s	weep 1	5.60 ms (1	8001 pts)		
MSG									STATU	s			

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

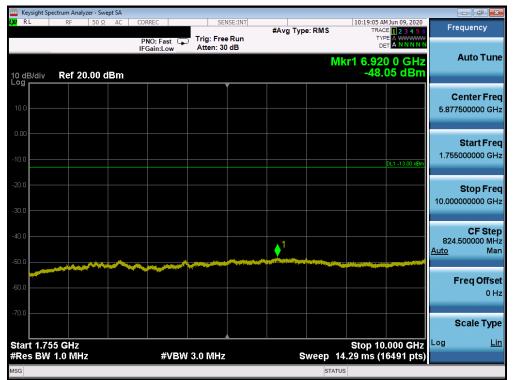
FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 20 of 50
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AWS WCDMA Mode

	rum Analyzer - Swej	pt SA								
LXI RL	RF 50 Ω	AC COR	REC			#Avg Type:	RMS	TYPE	un 09, 2020 1 2 3 4 5 6 A WWWWWW A N N N N N	Frequency
10 dB/div	Ref 20.00 d		am.cow	, tach. oc			Mkr	1 1.705 -38.5	0 GHz 7 dBm	Auto Tu
10.0										Center Fr 867.500000 M
-10.0								DL	.1 -13.00 dBm	Start Fr 30.000000 M
-20.0										Stop Fr 1.705000000 G
-40.0										CF Sto 167.500000 M <u>Auto</u> M
-60.0		and the state of the	San aga di sa Tangan da da jara	ana	,	A-21-4	in of our any second	ye na sadan kasaran kasaran k asaran kasar	www.ene	Freq Offs 0
-70.0										Scale Ty
Start 0.030 #Res BW 1	0 GHz .0 MHz		#VBW	/ 3.0 MHz		Sv	veep 2.2	Stop 1.70 33 ms (33	50 GHz 351 pts)	Log <u>l</u>
MSG							STATUS			

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



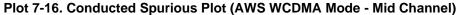
Plot 7-14. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dama 04 at 50
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	pectrum Analyz											
L <mark>XI</mark> RL	RF	50 Ω AC		EC		e Run	#Avg Typ	e: RMS	TRAC	M Jun 09, 2020 DE 1 2 3 4 5 6 PE A WWWWW ET A N N N N N	Frequ	ency
10 dB/div	Ref 10	.00 dBm	IFGa	in:Low	Atten: 20) dB		Mkr	1 18.60	6 0 GHz 51 dBm	Au	ito Tune
0.00											Cen 15.00000	ter Freq 0000 GHz
-10.0										DL1 -13.00 dBm	St 10.000000	art Freq 0000 GHz
-30.0									. 1		St 20.000000	o p Freq 0000 GHz
-50.0				~~~	and the second						1.000000 <u>Auto</u>	CF Step 0000 GHz Man
-70.0											Fre	q Offse l 0 Hz
Start 10.	000 CH7								Stop 20	.000 GHz	Sca Log	ale Type _{Lin}
#Res BW	/ 1.0 MHz			#VBW	3.0 MHz		s		.33 ms (2	20001 pts)		
ISG								STATUS	\$			

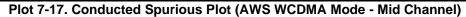




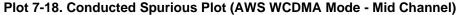
FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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	Spectrum Analyz	zer - Swept	SA										- •
LXI RL	RF	50 Ω	AC C	ORREC		SEN	ISE:INT	#Avg Typ	e: RMS		AM Jun 09, 2020	Fre	quency
				PNO: Fas	st 🖵	Trig: Free Atten: 30				1	TYPE A WWWWW		
				FGain:Lo	w	Atten: 30	ab			lend d 7			Auto Tune
40 -00-00-00-00-00-00-00-00-00-00-00-00-0	Dof 20								IVI	-46	56 0 GHz 6.25 dBm		
10 dB/div	Ref 20	.00 UB											
												C	enter Freq
10.0												5.877	500000 GHz
0.00													Start Freq
40.0													000000 GHz
-10.0											DL1 -13.00 dBm		
-20.0													
20.0													Stop Freq
-30.0												10.0000	000000 GHz
-40.0												824 6	CF Step
												Auto	Man
-50.0	والمحافظة بشبين	PP And			-								
												F	req Offset
-60.0													0 Hz
70.0													
-70.0												S	cale Type
	755 GHz									Stop 1	0.000 0112	Log	Lin
	V 1.0 MHz			#	ABM	3.0 MHz		s			(16491 pts)		
MSG									STATU	JS			







FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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	ght Specti		zer - Swej											
l <mark>xi</mark> RL		RF	50 Ω	AC	CORRE	C	9	ENSE:INT	#Avg Typ	e RMS		M Jun 09, 2020	Fre	quency
10 dB/c	div	Ref 2().00 d	Bm		:Fast ⊂ n:Low	Trig: Fr Atten:				TY C	5 0 GHz 89 dBm		Auto Tune
10.0														e nter Freq 000000 MHz
-10.0												DL1 -13.00 dBm		Start Freq 000000 MHz
-20.0														Stop Freq 000000 GHz
-40.0												1	168.0 <u>Auto</u>	CF Step 000000 MHz Man
-60.0	a, A, and Symphoton		****			المادينية المحيمة الم		,	1994		affa adıptırı birələri dər		F	req Offset 0 Hz
-70.0	0.030										Stop 1	7100 GHz	S Log	cale Type <u>Lin</u>
#Res I						#VBW	/ 3.0 MH	z		Sweep	2.240 ms	(3361 pts)		
MSG										STAT	US			

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-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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	ectrum Analyzer - Swep	ot SA									
l <mark>XI</mark> RL	RF 50 Ω	AC COR	REC	SEN	ISE:INT	#Avg Typ	e. DMS	10:17:39 A	MJun 09, 2020 E 1 2 3 4 5 6	Fre	quency
			IO: Fast 🕞 Gain:Low	Trig: Free Atten: 20		#AV9 19P		TYI Di			Auto Tune
10 dB/div Log	Ref 10.00 di	Bm					Mkı	1 18.26 -48.4	5 0 GHz 12 dBm		
											enter Freq
0.00										15.000	000000 GHz
-10.0									DL1 -13.00 dBm		Start Freq
-20.0											000000 GHz
-20.0											
-30.0											Stop Freq
-40.0											000000 GHz
-40.0								. ♦1			CF Step
-50.0						-					000000 GHz
-60.0										<u>Auto</u>	Man
00.0										_	05
-70.0										F	req Offset 0 Hz
-80.0										s	cale Type
Start 10.	000 GHz							Stop 20	.000 GHz	Log	Lin
#Res BW			#VBW	3.0 MHz		S	weep 2	5.33 ms (2	0001 pts)		
MSG							STATU	s			

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

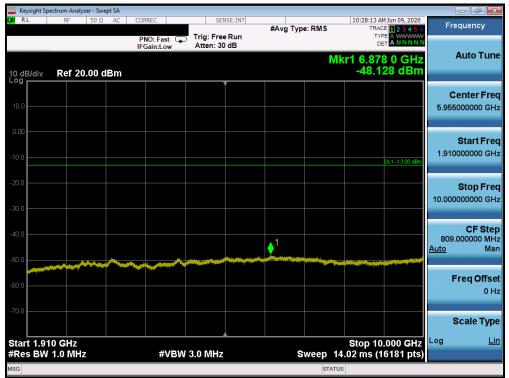
FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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PCS WCDMA Mode

Keysight Spectrum Analyzer - Swept SA				
X RL RF 50Ω AC		#Avg Type: RMS	10:28:03 AM Jun 09, 2020 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast Trig: Free Run IFGain:Low Atten: 30 dB		TYPE A WWWWW DET A NNNNN	Auto Tun
10 dB/div Ref 20.00 dBn	1	N	lkr1 1.845 0 GHz -35.57 dBm	Auto Tun
				Center Fre
10.0				937.500000 MH
0.00				
				Start Fre 30.000000 MH
-10.0			DL1 -13.00 dBm	30.00000 WIN
-20.0				Stop Fre
30.0				1.845000000 GH
40.0				CF Ste 181.500000 MH
-50.0				<u>Auto</u> Ma
an a san an a			****	Freq Offse
-60.0				он
-70.0				Our la Tra
				Scale Typ
Start 0.0300 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz	Sween	Stop 1.8450 GHz 2.420 ms (3631 pts)	Log <u>Li</u>
ISG		STAT		

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-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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-60.0 -60.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 -70.0 <td< th=""><th>Keysight Spectrum Analys</th><th>zer - Swept SA</th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th></th><th>d X</th></td<>	Keysight Spectrum Analys	zer - Swept SA									d X
Income Mikr1 18.300 GHz Auto Tur 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000 000	KI RF			Trig: Free F	Run	#Avg Type	RMS	TRAC	E 1 2 3 4 5 6	Frequen	су
OUND Center Fr 100 011-1300 dem 15.00000000 G 100 011-1300 dem Start Fr 200 011-1300 dem 10.00000000 G 200 011-1100 dem 10.0000000 G 200 011-1100 dem 10.0000000 G 200 011-1100 dem 10.000 dem 200		I	FGain:Low	Atten: 20 d	B		Mkr	1 18.30	0 5 GHz	Auto	Tune
-200											
-40.0 -1 -20.00000000 G -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -60.0 -1 -1 -70.0 -1 -1 -70.0 -1 -1 -70.0 -1 -1 -70.0 -1 -1 -70.0 -1 -1 -70.0 -1 -1 -70.0 -1 -1 -70.0 -1 -1 -70.0 -1 -1 -70.0 -1 -1 -70.0 -1									DL1 -13.00 dBm		
-3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 -3000 <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>											
-7.00	and to many statistical second second									1.0000000	
Start 10.000 GHz Stop 20.000 GHz										Freq	Offse 0 Hi
#Res BW 1.0 MHz #VBW 3.0 MHz Sweep 25.33 ms (20001 pts) Msg Istatus	#Res BW 1.0 MHz		#VBW	3.0 MHz		SI		.33 ms (2		LUg	Lin

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



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

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	ectrum Analyzer - Sw									-	- • ×
LXI RL	RF 50 Ω	AC CC	RREC	SEN	ISE:INT	#Avg Typ	e DMS		I Jun 09, 2020	Fre	quency
10 dB/div	Ref 20.00 c	IF	PNO: Fast 🕞 Gain:Low	Trig: Free Atten: 30		#778 1 JP		TYP		,	Auto Tune
10.0	Kei 20.00 C										e nter Freq 000000 GHz
-10.0									DL1 -13.00 dBm		Start Freq 000000 GHz
-20.0											Stop Freq 000000 GHz
-40.0	an and a second second second					1 1				809.0 <u>Auto</u>	CF Step 000000 MHz Man
-60.0										F	r eq Offset 0 Hz
Start 1.91	10 GHz							Stop <u>10</u> .		S Log	cale Type <u>Lin</u>
#Res BW			#VBW	3.0 MHz		s		.02 ms (1	6181 pts)		
MSG							STATUS				

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-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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	Spectrum Analyzer - S									
LXI RL	RF 50	Ω AC (CORREC	SEN	ISE:INT	#Avg Typ	e: RMS		4 Jun 09, 2020	Frequency
	_		PNO: Fast IFGain:Low	Trig: Free Atten: 30				TYP De		Auto Tune
10 dB/div Log	Ref 20.00	dBm						kr1 1.84 -52.	4 0 GHZ 85 dBm	
10.0										Center Fred 940.000000 MHz
										940.000000 MH2
0.00										Start Fred
-10.0									DL1 -13.00 dBm	30.000000 MH;
-20.0										Stop Fred
-30.0										1.850000000 GH:
-40.0										CF Step
50.0									1,	182.000000 MH <u>Auto</u> Mar
-50.0		and an an and a second second	and manufacture and the		and the second states a	ومحمده ومناوسا والمحر ومحادثه والمحمد و	an a			Freq Offse
-60.0										0 Hz
-70.0										Scale Type
Start 0 (300 GHz							Stop 1 8	3500 GHz	Log <u>Lir</u>
	V 1.0 MHz		#VBW	/ 3.0 MHz			Sweep 2	2.427 ms (3641 pts)	
MSG							STATU	S		

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-A2353	Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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	ectrum Analyzer - Sv										×
L <mark>XI</mark> RL	RF 50 \$	2 AC	CORREC	SEI	SE:INT	#Avg Typ	e RMS		M Jun 09, 2020	Frequency	
10 dB/div	Ref 10.00	dBm	PNO: Fast IFGain:Low	Trig: Free Atten: 20		9.1		TY D	9 5 GHz 36 dBm	Auto Tu	une
0.00										Center F 15.000000000	
-10.0									DL1 -13.00 dBm	Start F 10.000000000 (
-30.0								<u> </u>		Stop F 20.0000000000	
-50.0						the second second				CF S 1.0000000000 Auto	
-70.0										Freq Off (f set 0 Hz
-80.0 Start 10.0								Stop 20	.000 GHz	Scale Ty	ype Lin
#Res BW			#VBW	/ 3.0 MHz		\$	weep 2	5.33 ms (2	20001 pts)		
MSG							STATU	IS			

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

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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 $43 + 10 \log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
- 2. Span was set large enough so as to capture all out of band emissions near the band edge
- 3. RBW \geq 1% of the emission bandwidth
- 4. VBW \geq 3 x RBW
- 5. Detector = RMS
- 6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 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.

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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)

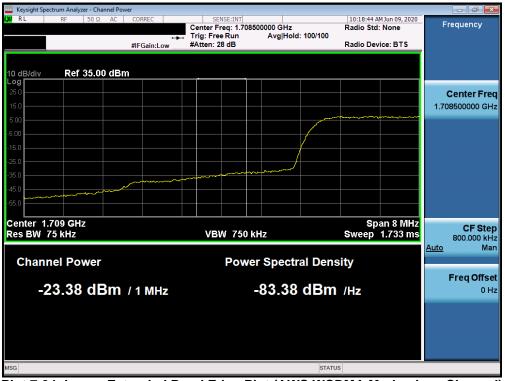
FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 22 of 50
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AWS WCDMA Mode



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



Plot 7-34. Lower Extended Band Edge Plot (AWS WCDMA Mode - Low Channel)

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



Plot 7-36. Upper Extended Band Edge Plot (AWS WCDMA Mode - High Channel)

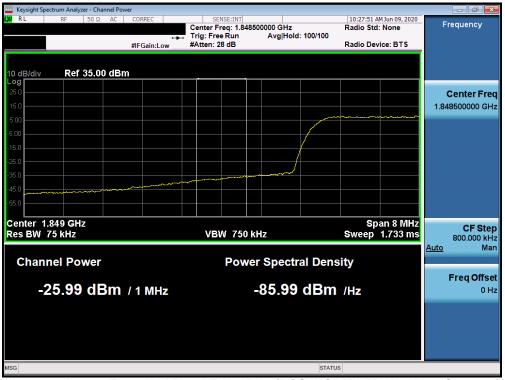
FCC ID: BCG-A2353	Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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PCS WCDMA Mode







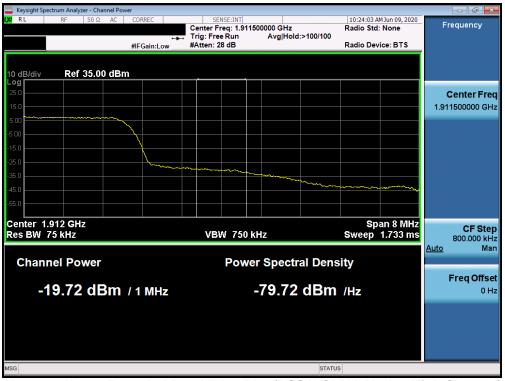
Plot 7-38. Lower Extended Band Edge Plot (PCS WCDMA Mode - Low Channel)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-39. Band Edge Plot (PCS WCDMA Mode - High Channel)



Plot 7-40. Upper Extended Band Edge Plot (PCS WCDMA Mode - High Channel)

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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

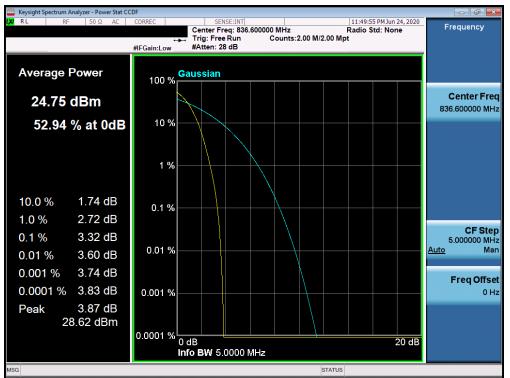
None

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager	
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Mode	Average Power [dBm]	PAR at 0.1% [dB]	Limit [dB]	Margin [dB]
WCDMA850	24.75	3.32	13.0	-9.68
WCDMA1700	23.92	3.27	13.0	-9.73
WCDMA1900	23.70	3.25	13.0	-9.75

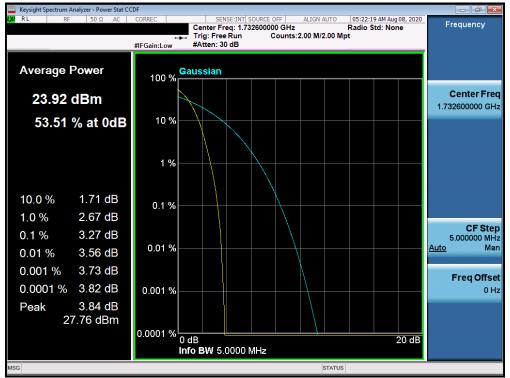
Table 7-3. Peak to Average Ratio Results



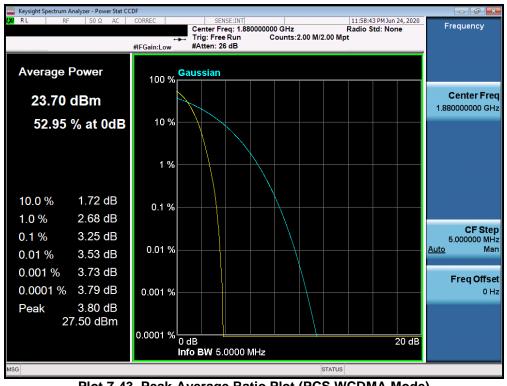
Plot 7-41. Peak-Average Ratio Plot (Cellular WCDMA Mode)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-43. Peak-Average Ratio Plot (PCS WCDMA Mode)

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7.6 Radiated Power (ERP/EIRP)

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:

ERP/EIRP = PMeas - LC + 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

Test Notes

- 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."
- 2) This unit was tested with its standard battery.
- 3) The Ant. Gains (GT) are listed in dBi.

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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	-29.30	-6.45	0.226	38.45	-44.90	-4.30	0.372	40.61	-44.91
836.60	WCDMA850	24.94	-29.30	-6.51	0.223	38.45	-44.96	-4.36	0.366	40.61	-44.97
846.60	WCDMA850	24.97	-29.30	-6.48	0.225	38.45	-44.93	-4.33	0.369	40.61	-44.94

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	24.00	-10.70	13.30	21.380	30.00	-16.70
1732.60	WCDMA1700	23.99	-10.70	13.29	21.330	30.00	-16.71
1752.60	WCDMA1700	23.96	-10.70	13.26	21.184	30.00	-16.74

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	-9.90	14.10	25.704	33.01	-18.91
1880.00	WCDMA1900	23.96	-9.90	14.06	25.468	33.01	-18.95
1907.60	WCDMA1900	23.90	-9.90	14.00	25.119	33.01	-19.01

Table 7-6. EIRP (PCS WCDMA)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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7.7 Radiated Spurious Emissions

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI C63.26-2015/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 C63.26-2015

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 x RBW
- 3. Span = 1.5 times the OBW
- 4. No. of sweep points > 2 x span / RBW
- 5. Detector = RMS
- 6. Trace mode = Average (Max Hold for pulsed emissions)
- 7. The trace was allowed to stabilize

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager	
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Test Setup

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

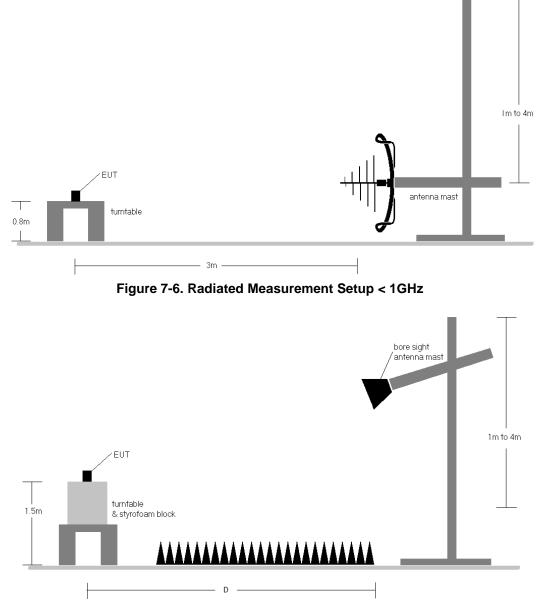


Figure 7-7. Radiated Measurement Setup >1 GHz

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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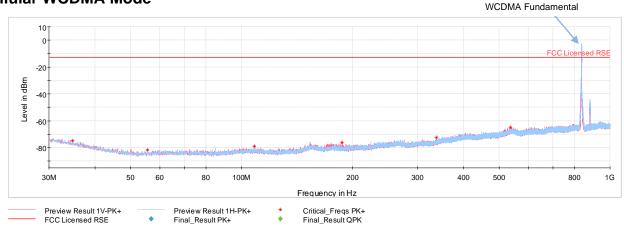
Test Notes

- 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) "D" is 3 meter distance for 1GHz 18GHz measurements and 1 meter distance for above 18GHz 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 and Above 18GHz testing shows no significant emissions.

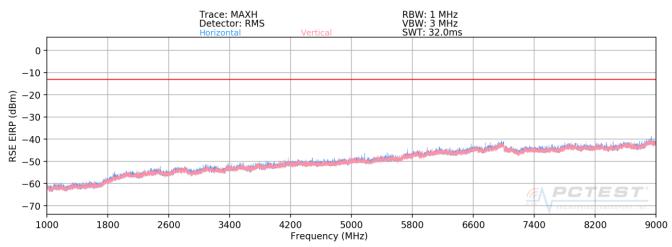
FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Cellular WCDMA Mode







Plot 7-45. Radiated Spurious Emissions above 1GHz (Cellular WCDMA Mode - Ch. 4183)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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OPERATING FREQUENCY:	82	6.40	MHz
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1652.80	V	-	-	-72.29	4.81	-67.48	-54.5
2479.20	V	-	-	-68.12	4.34	-63.78	-50.8
3305.60	V	-	-	-69.28	6.65	-62.63	-49.6
4132.00	V	-	-	-69.22	7.99	-61.24	-48.2

Table 7-7. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4132)

836.60

meters

MHz

OPERATING FREQUENCY:

MODULATION SIGNAL:

DISTANCE:

LIMIT: -13 dBm

WCDMA

3

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1673.20	V	-	-	-72.20	4.71	-67.49	-54.5
2509.80	V	-	-	-67.66	4.38	-63.29	-50.3
3346.40	V	-	-	-69.42	6.70	-62.72	-49.7
4183.00	V	-	-	-69.29	8.07	-61.22	-48.2

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

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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OPERATING FREQUENCY:	84	6.60	MHz
MODULATION SIGNAL:	WCDMA		
DISTANCE:	3	meters	
LIMIT:	-13	_dBm	

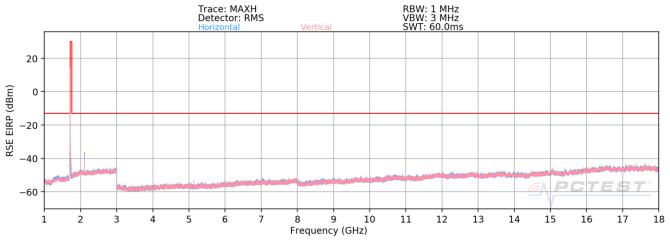
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1693.20	V	-	-	-72.31	4.70	-67.62	-54.6
2539.80	V	-	-	-68.42	4.60	-63.82	-50.8
3386.40	V	-	-	-70.20	6.81	-63.39	-50.4
4233.00	V	-	-	-69.79	8.16	-61.63	-48.6

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

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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AWS WCDMA Mode



Plot 7-46. Radiated Spurious Emissions above 1GHz (AWS WCDMA Mode – Ch. 1312)

OPERATING FREQUENCY:	17	12.40	MHz
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3424.80	V	-	-	-70.56	6.90	-63.66	-50.7
5137.20	V	212	335	-67.85	9.06	-58.79	-45.8
6849.60	V	-	-	-70.19	9.89	-60.29	-47.3
8562.00	V	-	-	-70.21	10.02	-60.18	-47.2

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

FCC ID: BCG-A2353	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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173	32.60	MHz
WCDMA	_	
3	meters	
-13	_dBm	
	WCDMA 3	3 meters

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3465.20	V	-	-	-70.10	6.98	-63.12	-50.1
5197.80	V	104	1	-68.93	9.24	-59.68	-46.7
6930.40	V	-	-	-69.34	9.88	-59.46	-46.5
8663.00	V	-	-	-65.55	10.00	-55.54	-42.5

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

1752.60

meters

dBm

OPERATIN

ERATING FREQUENCY:	
MODULATION SIGNAL:	WCDMA
DISTANCE:	3
LIMIT:	-13

MHz

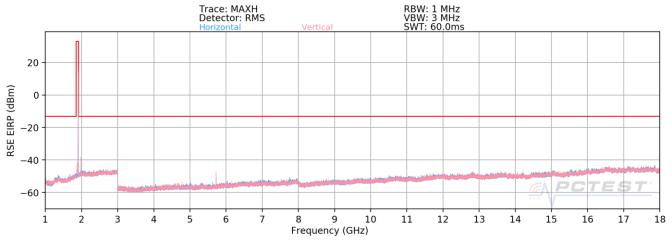
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3505.20	V	-	-	-69.59	7.03	-62.56	-49.6
5257.80	V	121	128	-68.71	9.24	-59.46	-46.5
7010.40	V	-	-	-69.17	9.80	-59.38	-46.4
8763.00	V	-	-	-65.48	10.01	-55.47	-42.5

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

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PCS WCDMA Mode



Plot 7-47. Radiated Spurious Emissions above 1GHz (PCS WCDMA Mode – Ch. 9538)

OPERATING FREQUENCY:	185	52.40	MHz
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3704.80	V	-	-	-70.71	7.35	-63.36	-50.4
5557.20	V	101	211	-66.96	9.33	-57.63	-44.6
7409.60	V	-	-	-69.43	9.48	-59.95	-46.9
9262.00	V	-	-	-69.51	9.64	-59.87	-46.9

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

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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OPERATING FREQUENCY:	188	30.00	MHz
MODULATION SIGNAL:	WCDMA		
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3760.00	V	-	-	-70.73	7.42	-63.30	-50.3
5640.00	V	101	238	-59.35	9.48	-49.88	-36.9
7520.00	V	-	-	-67.75	9.49	-58.26	-45.3
9400.00	V	-	-	-69.06	9.64	-59.42	-46.4

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

meters

dBm

MHz

OPERATING FREQUENCY:

1907.60 WCDMA MODULATION SIGNAL: DISTANCE: 3 LIMIT: -13

Ant. Antenna **Turntable EIRP Level at Substitute Spurious** Frequency Margin Pol. Height Azimuth Sub Ant Port Antenna Gain **Emission Level** [MHz] [dB] [H/V] [cm] [degree] [dBm] [dBi] [dBm] 3815.20 Н --67.93 7.57 -60.35 -47.4 -V 5722.80 105 282 -58.15 9.48 -48.67 -35.7 Н -68.08 9.55 7630.40 -58.53 -45.5 --9538.00 Н -63.98 9.72 -54.26 -41.3 --

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

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015/TIA-603-E-2016. The frequency stability 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, RSS-132, and RSS-133, the frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency. For Part 24, Part 27, and RSS-139, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI C63.26-2015

TIA-603-E-2016

Test Settings

- 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

The EUT was connected via an RF cable to a wideband radio communication tester with the EUT placed inside an environmental chamber.



Figure 7-8. Test Instrument & Measurement Setup

Test Notes

None

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OPERATING FREQUENCY:	836,600,000	Hz
CHANNEL:	4183	_
REFERENCE VOLTAGE:	3.80	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	_

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %		- 30	836,600,001	0.5	0.0000006
100 %		- 20	836,600,000	0.3	0.0000003
100 %		- 10	836,600,000	0.1	0.0000002
100 %		0	836,600,000	0.1	0.00000001
100 %	3.80	+ 10	836,600,000	0.1	0.00000001
100 %		+ 20	836,600,000	0.3	0.0000003
100 %		+ 30	836,600,000	0.4	0.00000004
100 %		+ 40	836,600,001	0.5	0.0000006
100 %		+ 50	836,600,001	0.6	0.0000008
BATT. ENDPOINT	3.40	+ 20	836,600,001	0.9	0.00000010

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

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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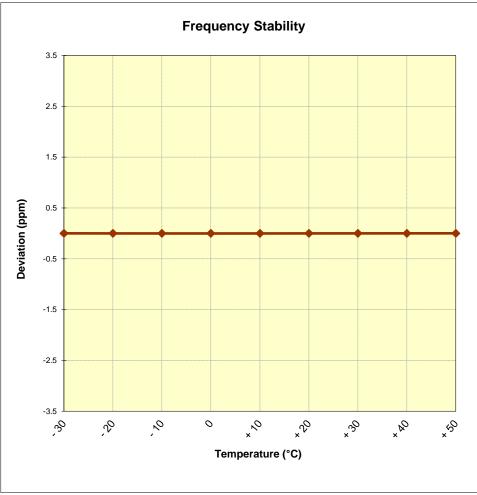


Figure 7-9. Frequency Stability Graph (Cellular WCDMA Mode – Ch. 4183)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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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 %		- 30	1,732,599,999	-1.0	-0.00000006
100 %		- 20	1,732,599,999	-0.6	-0.00000004
100 %		- 10	1,732,600,000	-0.4	-0.0000002
100 %		0	1,732,600,000	-0.3	-0.0000002
100 %	3.80	+ 10	1,732,599,999	-0.7	-0.00000004
100 %		+ 20	1,732,600,000	-0.2	-0.00000001
100 %		+ 30	1,732,600,000	-0.1	-0.00000001
100 %		+ 40	1,732,600,000	-0.4	-0.0000002
100 %		+ 50	1,732,600,001	0.9	0.00000005
BATT. ENDPOINT	3.40	+ 20	1,732,600,001	0.8	0.0000004

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.

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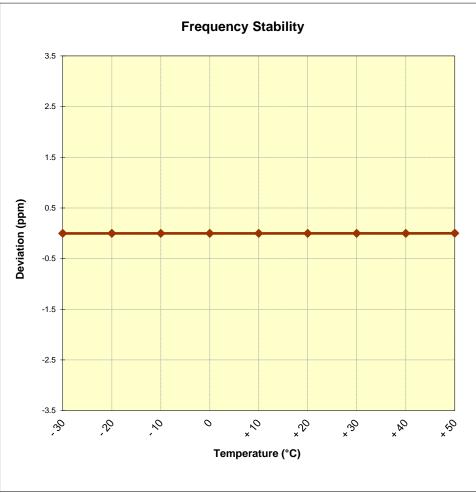


Figure 7-10. Frequency Stability Graph (AWS WCDMA Mode – Ch. 1413)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	9400	_
REFERENCE VOLTAGE:	3.80	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %		- 30	1,880,000,000	0.2	0.000000011
100 %		- 20	1,880,000,000	0.3	0.00000016
100 %		- 10	1,880,000,000	0.1	0.00000007
100 %		0	1,880,000,000	-0.2	-0.00000009
100 %	3.80	+ 10	1,880,000,000	-0.4	-0.00000023
100 %		+ 20	1,880,000,000	0.0	-0.00000002
100 %		+ 30	1,880,000,000	-0.4	-0.00000022
100 %		+ 40	1,880,000,000	0.3	0.00000018
100 %		+ 50	1,880,000,001	0.9	0.00000048
BATT. ENDPOINT	3.40	+ 20	1,880,000,001	0.8	0.00000045

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

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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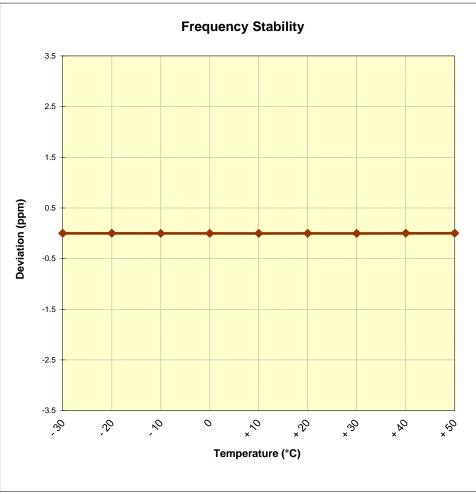


Figure 7-11. Frequency Stability Graph (PCS WCDMA Mode – Ch. 9400)

FCC ID: BCG-A2353	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Apple Watch FCC ID: BCG-A2353** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules and RSS-132, RSS-139 of the Innovation, Science and Economic Development Canada Rules.

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