

PCTEST

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MEASUREMENT REPORT

WCDMA

Applicant Name:	Date of Testing:
Apple Inc.	04/09/2020-08/11/2020
One Apple Park Way	Test Site/Location:
Cupertino, CA 95014	PCTEST Lab. Morgan Hill, CA, USA
United States	Test Report Serial No.:
	1C2004270018-02.BCG
FCC ID:	BCG-A2375
IC:	579C-A2375
APPLICANT:	Apple Inc.

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

A2375 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



FCC ID: BCG-A2375	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 1 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 1 of 59
© 2020 PCTEST			V 10.1 02/01/2020

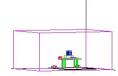


TABLE OF CONTENTS

INTRO	DDUCTION	4
1.1	Scope	4
1.2	PCTEST Test Location	4
1.3	Test Facility / Accreditations	4
PROD	DUCT INFORMATION	5
2.1	Equipment Description	5
2.2	Device Capabilities	5
2.3	Antenna Description	6
2.4	Test Support Equipment	6
2.5	Test Configuration	7
2.6	Software and Firmware	7
2.7	EMI Suppression Device(s)/Modifications	7
DESC	RIPTION OF TESTS	8
3.1	Evaluation Procedure	8
3.2	Radiated Measurements	8
MEAS	SUREMENT UNCERTAINTY	9
TEST	EQUIPMENT CALIBRATION DATA	.10
SAMF	PLE CALCULATIONS	.11
TEST	RESULTS	.12
7.1	Summary	. 12
7.2	Occupied Bandwidth	. 13
7.3	Spurious and Harmonic Emissions at Antenna Terminal	. 16
7.4	Band Edge Emissions at Antenna Terminal	. 32
7.5	Peak-Average Ratio	. 38
7.6	Radiated Power (ERP/EIRP)	. 41
7.7	Radiated Spurious Emissions	. 43
7.8	Frequency Stability / Temperature Variation	. 52
CON	CLUSION	.59
	1.1 1.2 1.3 PROE 2.1 2.2 2.3 2.4 2.5 2.6 2.7 DESC 3.1 3.2 MEAS TEST 7.1 7.2 7.3 7.4 7.5 7.6 7.7 7.8	1.2 PCTEST Test Location 1.3 Test Facility / Accreditations. PRODUCT INFORMATION.

FCC ID: BCG-A2375	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo 2 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 2 of 59
© 2020 PCTEST			V 10 1 02/01/2020





MEASUREMENT REPORT WCDMA



			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	0.248	-6.05	0.407	-3.90	4M11F9W	
WCDMA1700	27	1712.4 - 1752.6			13.868	11.42	4M09F9W	
WCDMA1900	24E	1852.4 - 1907.6			9.795	9.91	4M11F9W	

EUT Overview

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: Test Dates:		EUT Type:	Dage 2 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 3 of 59
© 2020 PCTEST			V 10 1 02/01/2020



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.

FCC ID: BCG-A2375	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: Test Dates:		EUT Type:	Dage 4 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 4 of 59
© 2020 PCTEST			V 10.1 02/01/2020



2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Apple Watch FCC ID: BCG-A2375**. 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.: GY6CN00UQ608, GY6CR001Q60V

2.2 Device Capabilities

This device contains the following capabilities:

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

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

Table 2-1. Simultaneous Transmission Configuration

 \checkmark = Support ; \varkappa = NOT Support

All the above simultaneous configurations have been tested and the worst case configuration was found to be configuration 8 (WLAN, LTE and UWB). These results can be found in the RF WLAN, RF LTE and RF UWB reports.

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element		
Test Report S/N:	Test Dates:	EUT Type:	Dage 5 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 5 of 59
© 2020 PCTEST		·	V 10 1 02/01/2020



2.3 **Antenna Description**

Following antennas were used for the testing.

Frequency	Antenna Gain (dBi)		
[MHz]	BCM	FCM	
814-849	-28.9	N/A	
1710-1785	N/A	-12.5	
1850-1915	N/A	-14.0	

Table 2-2. 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:	32530F		
	w/ Charging Dock	Model:	FAPS73	S/N:	17481001320		
	w/ Dock	Model:	X241	S/N:	CYV7614004		
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	WW19xx Pathfinder Canmore Board	Model:	920-08295-03	S/N:	N/A		
	SiP Cradle	Model:	P2 X1657B	S/N:	N/A		
6	DC Power Supply	Model:	KPS3010D	S/N:	N/A		
	Table 2-3. T	est Supp	ort Equipment Li	st			

Table 2-3. Test Support Equipment List

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga C of EQ
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 6 of 59
© 2020 PCTEST		•	V 10 1 02/01/2020



2.5 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015, TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

The worst case configuration was investigated for all combinations of the three materials, aluminum, stainless steel, and Titanium 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 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.

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: Test Dates:		EUT Type:	Dogo Z of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 7 of 59
@ 2020 DOTEST			V/ 10 1 02/01/2020



3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

Deviation from Measurement Procedure.....None

3.2 Radiated 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:

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.

FCC ID: BCG-A2375	Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: Test Dates:		EUT Type:	Daga 8 of 50
1C2004270018-02.BCG 04/09/2020-08/11/2020		Watch	Page 8 of 59
© 2020 PCTEST		•	V/ 10 1 02/01/2020



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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: Test Dates:		EUT Type:	Dogo 0 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 9 of 59
© 2020 PCTEST	•		V 10.1 02/01/2020



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

Table 5-1. Test Equipment List

Notes:

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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 10 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 10 of 59
© 2020 PCTEST	•	·	V 10.1 02/01/2020



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-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dana 44 at 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 11 of 59
© 2020 PCTEST	-		V 10.1 02/01/2020



7.0 TEST RESULTS

7.1 Summary

Company Name:	Apple Inc.
FCC ID:	BCG-A2375
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-133(2.3) RSS-Gen (6.7)	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	CONDUCTED	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	Refer to RF Exposure Report
22.913(a)(5)	RSS-132(5.4)	Effective Radiated Power	<td>PASS</td> <td>Section 7.6</td>		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			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	urious > 43 + 10 log ₁₀ (P[Watts]) for all out-of-band emissions		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 < 2.5 ppm (Part 22) Emission must remain in band (Part 24, 27) Table 7-1 Summary of Tost Posults		CONDUCTED	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.

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element		
Test Report S/N:	Test Dates:	EUT Type:	Dage 12 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 12 of 59
© 2020 PCTEST			V 10.1 02/01/2020



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.

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo 12 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 13 of 59
© 2020 PCTEST	-	•	V 10.1 02/01/2020



Mode	Occupied Bandwidth [kHz]					
WCDMA850	4105.2					
WCDMA1700	4087.0					
WCDMA1900	4107.5					
able 7.2 Occupied	blo 7-2 Occupied Band Width Becu					

Table 7-2. Occupied Band Width Results

Keysight Spectrum Analyzer - Occupied B				
CIRL RF 50Ω AC	CORREC	SENSE:INT r Freg: 836.600000 MHz	02:25:42 PM Jun 06, 2020 Radio Std: None	Trace/Detector
	Trig: I	Free Run Avg Hold: 100/10 n: 28 dB		
	#IFGain:Low #Atter	n: 28 dB	Radio Device: BTS	
0 dB/div Ref 40.00 dB	m			
°g :0.0				
0.0	Jon man man			Clear Wri
0.0				
.00				
0.0				Avera
		Mary and and		
and			Non marken and marke	
0.0				Max Ho
0.0				
enter 836.6 MHz			Span 15 MHz	
es BW 150 kHz	#	VBW 470 kHz	Sweep 1 ms	Min Ho
Occupied Bandwid	th	Total Power 3	3.6 dBm	
				_
4.	.1052 MHz			Detect
Transmit Freq Error	-192.52 kHz	% of OBW Power	99.00 %	Auto <u>M</u>
x dB Bandwidth	4.709 MHz	x dB -	26.00 dB	
iG		ST	ATUS	

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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 14 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 14 of 59
© 2020 PCTEST	•		V 10.1 02/01/2020





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



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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo 15 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 15 of 59
© 2020 PCTEST		·	V 10.1 02/01/2020



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 for continuous emissions, max hold for pulse emissions
- 4. Sweep time = auto couple
- 5. The trace was allowed to stabilize
- 6. Please see test notes below for RBW and VBW settings

Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

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.

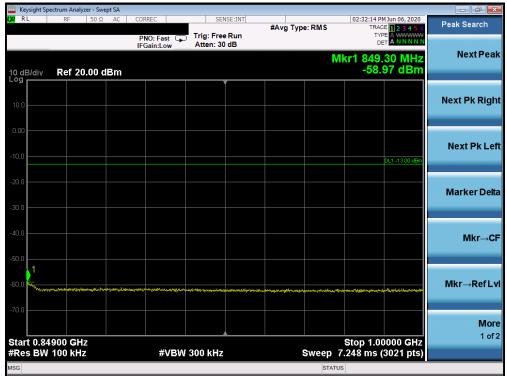
FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 16 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 16 of 59
© 2020 PCTEST			V 10 1 02/01/2020



Cellular WCDMA Mode

Keysight Spectrum Analyzer - Swept SA				- 6 -
	PNO: Fast Trig: Free Run IFGain:Low Atten: 30 dB	#Avg Type: RMS	02:31:58 PM Jun 06, 2020 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A NNNNN	Peak Search
0 dB/div Ref 20.00 dBm		Μ	kr1 822.85 MHz -33.06 dBm	Next Pea
10.0				Next Pk Righ
10.0			DL1 -13.00 dBm	Next Pk Le
20.0			1	Marker Del
0.0				Mkr→C
				Mkr→RefL
100 Hz	#\/B\\(\ 300 kHz	Sweep 20	Stop 823.0 MHz	Mo 1 of
start 30.0 MHz Res BW 100 kHz	#VBW 300 kHz	Sweep 38	3.06 ms (15861 pts)	

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-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 17 of 59
© 2020 PCTEST	•	·	V 10.1 02/01/2020



RF 50	Ω AC	PNO: Fast	Trig: Fre	e Run	#Avg Type	e: RMS	TRA	CE 1 2 3 4 5 6	Peak Search
Ref 10.00	dBm	IFGain:Low	#Atten: 5			M	kr1 6.91	9 0 GHz	Next Peal
									Next Pk Righ
								DL1 -13.00 dBm	Next Pk Lei
					1				Marker Delt
		~~~~							Mkr→C
									Mkr→RefL
0 GHz 1.0 MHz			W 3.0 MHz				Stop 10	).000 GHz	Mor 1 of
	Ref 10.00	Ref 10.00 dBm	RF     50 Ω     AC     CORREC       PNO: Fast (IFGain:Low)	RF     50 Ω     AC     CORREC     SE       PNO: Fast IFGain:Low     Trig: Fre #Atten: 3       Ref 10.00 dBm	RF     50 Ω     AC     CORREC     SENSE:INT       PNO: Fast IFGain:Low     Trig: Free Run #Atten: 30 dB	RF     50 Ω     AC     CORREC     SENSE:INT       PN0: Fast IFGain:Low     Trig: Free Run #Atten: 30 dB     #Avg Typ	RF     50 Ω     AC     CORREC     SENSE:INT     #Avg Type: RMS       PN0: Fast IFGain:Low     Trig: Free Run #Atten: 30 dB     Image: Correct of the sense of the	RF         50 Ω         AC         CORREC         SENSE:INT         #Avg Type: RMS         Transmission           PN0: Fast IFGain:Low         Trig: Free Run #Atten: 30 dB         Trig: Action of the sense interval mitrice         Mikr1 6.91           Ref 10.00 dBm         -45:	RF         50 Ω         AC         CORREC         SENSE.INT         02:32:43 PM Jun 06, 2020           PNO: Fast (FGain:Low         Trig: Free Run #Atten: 30 dB         #Avg Type: RMS         TRACE         23 4 56           Ref         10.00 dBm         Mkr1 6.919 0 GHz -45.30 dBm

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



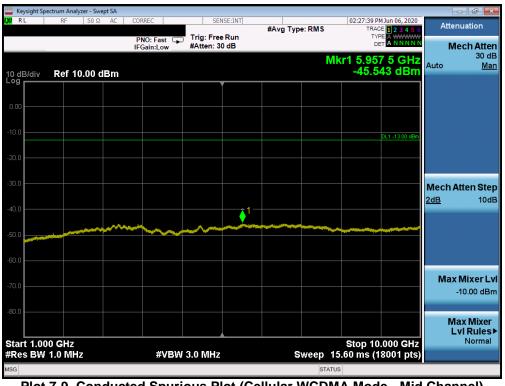
Plot 7-7. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 19 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 18 of 59
© 2020 PCTEST	•		V 10.1 02/01/2020



	ectrum Analyzer -									
LXVI RL	RF 50	Ω AC	CORREC		SENSE:INT	#Avg 1	Type: RMS		M Jun 06, 2020	Peak Search
			PNO: Fast IFGain:Low		ree Run 30 dB					
			il Galileon				Ν	/kr1 849.	75 MHz	Peak Criteria►
10 dB/div Log	Ref 20.00	dBm						-52.	78 dBm	
10.0										Peak Table ►
0.00										Continuous
-10.0										Peak Search
-10.0									DL1 -13.00 dBm	
-20.0										
-30.0										
-40.0										
-40.0										Pk-Pk Search
-50.0										
1										
-60.0		yusisimawastar		and the second	www.www.ww	uper party and a state of the				Min Search
-70.0										
										More
Start 0.84	000 CH-							Stop 1-0		2 of 2
#Res BW			#V	BW 300 kH	Iz		Sweep	7.248 ms (	0000 GHz (3021 pts)	
MSG							STAT			

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



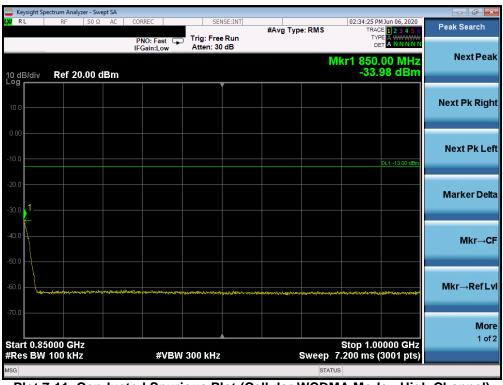
Plot 7-9. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 10 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 19 of 59
© 2020 PCTEST		·	V 10.1 02/01/2020



	ectrum Analyzer - Sv									
X/RL	RF 50 Ω	AC	CORREC	SENS	E:INT	#Avg Type	RMS		1 Jun 06, 2020 E 1 2 3 4 5 6	Peak Search
10 dB/div	Ref 20.00	dBm	PNO: Fast G	Trig: Free Atten: 30				TYP DE	85 MHz 07 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			ay daa siyaa ka si tuu yahaa si tuu	a de la constante de la constitución		har an			1.	Mkr→RefLvl
Start 30.0 #Res BW			#VB\	V 300 kHz		S	weep 3 <u>8.</u>	Stop 8: 11 ms <u>(1</u>	24.0 MHz 5881 pts)	More 1 of 2
ISG							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-A2375	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
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 20 of 59
© 2020 PCTEST	•	•	V 10.1 02/01/2020



	ectrum Analyzer - Swe									
LXI RL	RF 50 Ω	AC CO	RREC	SEN	ISE:INT	#Avg Typ	e RMS		1 Jun 06, 2020 E 1 2 3 4 5 6	Peak Search
		P	NO: Fast 🕞 Gain:Low	Trig: Free #Atten: 3		**** <b>8</b> 1 j P		TYP	E A WWWWWW T A N N N N N	
10 dB/div	Ref 10.00 c	1Bm					M	(r1 6.95) -45.	5 0 GHz 57 dBm	Next Peak
Log										Next Pk Right
-10.0									DL1 -13.00 dBm	Next Pk Left
-30.0						1-				Marker Delta
-50.0	Marine Marine Marine			~~						Mkr→CF
-70.0										Mkr→RefLvi
-80.0								Stop 10	.000 GHz 8001 pts)	More 1 of 2
#Res BW	1.0 MHz		#VBN	/ 3.0 MHz		S			8001 pts)	
MSG							STATUS	5		

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

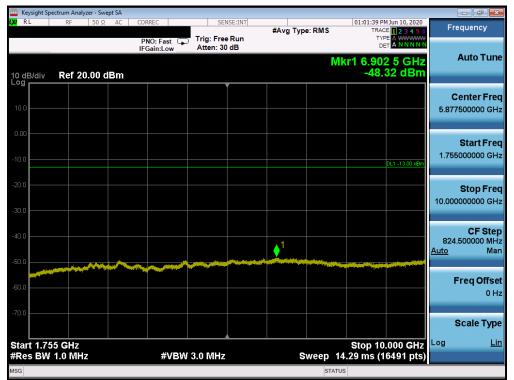
FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Page 21 of 59
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 21 01 59
© 2020 PCTEST	•	•	V 10 1 02/01/2020



# AWS WCDMA Mode

Keysight Spectrum						
I <mark>XI</mark> RL RF	50 Ω AC		SENSE:INT	#Avg Type: RMS	01:01:29 PM Jun 10, 2020 TRACE 1 2 3 4 5 6	Frequency
		PNO: Fast IFGain:Low	Trig: Free Run Atten: 30 dB		TYPE A WWWW DET A NNNN	Auto Tune
10 dB/div Rei	f 20.00 dBm			M	kr1 1.705 0 GHz -33.46 dBm	Auto Tune
209			Ĭ			Center Fred
10.0						867.500000 MHz
0.00						Start Fred
-10.0					DL1 -13.00 dBm	30.000000 MHz
-20.0						
					4	<b>Stop Fred</b> 1.705000000 GHz
-30.0						
-40.0						CF Step 167.500000 MHz
-50.0						<u>Auto</u> Man
-60.0				*****	farlen heren set en	Freq Offset
70.0						0 Hz
-70.0						Scale Type
Start 0.0300 G #Res BW 1.0 I		#\/B\A	/ 3.0 MHz	Sween	Stop 1.7050 GHz 2.233 ms (3351 pts)	Log <u>Lir</u>
MSG	VII 12	<i></i>		statu		

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-A2375	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
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 22 of 59
© 2020 PCTEST			V 10.1 02/01/2020



	ectrum Analyzer - Sv									5 ×
LXI RL	RF 50 \$		DRREC		#Avg Typ	e: RMS	TRAC	M Jun 10, 2020 CE 1 2 3 4 5 6 PE A WWWWW T A N N N N N	Frequen	су
10 dB/div	Ref 10.00	I	FGain:Low	Atten: 20		Mkr	1 18.54	4 5 GHz 35 dBm	Auto	Tune
0.00									Center 15.00000000	
-10.0								DL1 -13.00 dBm	Start 10.00000000	
-30.0							. 1		Stop 20.00000000	<b>Fred</b> 0 GHz
-50.0					in a second and				CF 1.00000000 <u>Auto</u>	<b>Step</b> 0 GH: Mar
-70.0									Freq C	Offse 0 H
									Scale	
Start 10.0 #Res BW			#VBW	/ 3.0 MHz	s		.33 ms (2	.000 GHz 20001 pts)	Log	Lin
MSG						STATUS				



Plot 7-16. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)

FCC ID: BCG-A2375	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
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 23 of 59
© 2020 PCTEST	•		V 10 1 02/01/2020



	ectrum Analyzer -	Swept SA									×
LXI RL	RF 50	Ω AC	CORREC	SEN	ISE:INT	#Avg Typ	e: RMS		MJun 10, 2020	Frequency	
			PNO: Fast G	Trig: Free Atten: 30				TY			
10 dB/div Log	Ref 20.00	) dBm					Mk	(r1 1.75 -48.	5 0 GHz 23 dBm	Auto Tu	ine
10.0										<b>Center Fr</b> 5.877500000 G	
-10.0									DL1 -13.00 dBm	Start Fr 1.755000000 G	
-20.0										Stop Fr 10.000000000 G	
-40.0								Last an interest of an interest of		CF St 824.500000 M <u>Auto</u> M	t <b>ep</b> /Hz //an
-60.0										Freq Offs 0	set Hz
-70.0										Scale Ty	/pe Lin
Start 1.75 #Res BW			#VBW	3.0 MHz		S	weep 14	Stop 10 .29 ms (1	.000 GHz 6491 pts)		<u>= 11</u>
MSG							STATUS	;			

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-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 24 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 24 of 59
© 2020 PCTEST		·	V 10.1 02/01/2020



	ectrum Analyzer - Swe									
I,XI RL	RF 50 Ω	AC CO	RREC	SEN	ISE:INT	#Avg Typ	e: RMS		MJun 10, 2020	Frequency
10 dB/div	Ref 20.00 d	IF	PNO: Fast 🕞	Trig: Free Atten: 30				TYP		Auto Tune
10.0										Center Free 870.000000 MH
-10.0									DL1 -13.00 dBm	Start Free 30.000000 MH
-20.0										Stop Free 1.710000000 GH
-40.0									1	CF Step 168.000000 MH <u>Auto</u> Mar
-60.0	nelecture and an end of the second of the			ng ng nang nang ng n	arren andere and a second state of the second s		20 - 20 - 20 - 20 - 20 - 20 - 20 - 20 -	24244-24549-2474-2474		Freq Offse 0 H
Start 0.03								Stop 1.7	7100 GHz	Scale Type
#Res BW			#VBW	3.0 MHz			Sweep 2	2.240 ms (	3361 pts)	
MSG							STATU	s		

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-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:	Page 25 of 59	
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch		
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		nalyzer - Swe	pt SA									×
L <mark>XI</mark> RL	RF	50 Ω	AC (	CORREC	SE	NSE:INT	#Avg Typ	e: RMS		M Jun 10, 2020	Frequency	/
10 dB/div	Ref	10.00 d		PNO: Fast IFGain:Low	Trig: Fre Atten: 2				DI 1 18.53	7 0 GHz 18 dBm	Auto T	une
Log											Center F 15.000000000	
-10.0										DL1 -13.00 dBm	Start F 10.000000000	
-30.0									. 1		Stop F 20.000000000	
-50.0											CF S 1.000000000 <u>Auto</u>	
-70.0											Freq Of	f <b>fset</b> 0 Hz
-80.0	.000 G	Hz							Stop 20	.000 GHz	Scale T	「ype Lin
#Res B				#VE	W 3.0 MH	z	s	weep 25	.33 ms (2	0001 pts)		
MSG								STATUS	5			

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

FCC ID: BCG-A2375	Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 26 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 26 of 59
@ 2020 DCTEST			V/ 10 1 02/01/2020



# PCS WCDMA Mode

- 6 -							t SA	Analyzer - Swe		
Frequency	TRACE 1 2 3 4 5 6	e: RMS	#Avg Typ	NSE:INT		REC	AC CC	= 50 Ω	- R	<mark>X/</mark> RL
Auto Turo	TYPE A WWWWW DET A NNNNN			e Run 0 dB	Trig: Fre Atten: 30	lO:Fast ⊂ ain:Low	i Ii			
Auto Tun	1.845 0 GHz -31.05 dBm	Mkr					Зm	f 20.00 d	3/div <b>Re</b>	10 dE Log r
Center Free										
937.500000 MH										10.0
										0.00
Start Free 30.000000 MH										
30.00000 Mil 1	DL1 -13.00 dBm									-10.0
Stop Free										-20.0
1.845000000 GH	1									-30.0
0 <b>5</b> 0to										30.0
CF Ster 181.500000 MH										-40.0
<u>Auto</u> Mai										-50.0
Freq Offse		inneg frank frank frank frank		ripgninghedasinger		والمعاجب والمعالية و	*****	weigen generation		
он										-60.0
Occile Tran										-70.0
Scale Type										
Log <u>Li</u> i	op 1.8450 GHz ) ms (3631 pts)	Sweep 2.4		,	/ 3.0 MHz	#VBW			t 0.0300 ( s BW 1.0	
	(0001-003)	STATUS								MSG

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



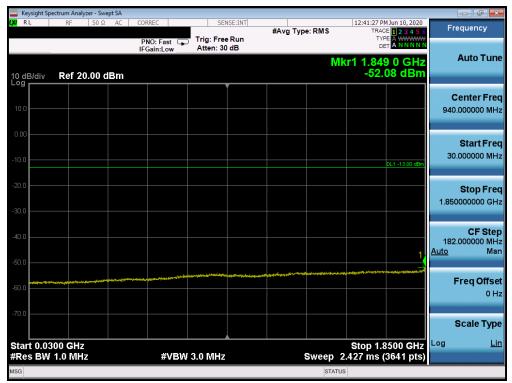
Plot 7-23. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 07 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 27 of 59
© 2020 PCTEST			V 10.1 02/01/2020



🤤 Keysight Spectrum Analyzer - Swept SA 🛛				
<b>LXI RL</b> RF 50 Ω AC	CORREC SENSE:INT PNO: Fast Trig: Free Run	#Avg Type: RMS	12:50:37 PM Jun 10, 2020 TRACE 1 2 3 4 5 6 TYPE A WWWWW DET A N N N N N	Frequency
10 dB/div Ref 10.00 dBm	IFGain:Low Atten: 20 dB	Mk	r1 18.311 5 GHz -48.44 dBm	Auto Tune
0.00	Ť			Center Freq 15.00000000 GHz
-10.0			DL1 -13.00 dBm	Start Fred 10.000000000 GHz
-30.0				Stop Frec 20.000000000 GHz
-50.0				CF Step 1.00000000 GH: <u>Auto</u> Mar
-70.0				Freq Offse 0 Ha
				Scale Type
Start 10.000 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 2	5.33 ms (20001 pts)	Log <u>Lin</u>

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



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

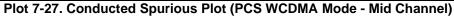
FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dama 28 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 28 of 59
© 2020 PCTEST	-	·	V 10.1 02/01/2020



	ectrum Analyzer - Sw										
LXI RL	RF 50 Ω	AC C	ORREC	SEN	ISE:INT	#Avg Typ	e RMS		MJun 10, 2020	Frequ	Jency
10 dB/div	Ref 20.00 d		PNO: Fast 🕞 FGain:Low	Trig: Free Atten: 30				TYP	9 0 GHz 50 dBm	Aı	uto Tune
10.0											n <b>ter Freq</b> 10000 GHz
-10.0									DL1 -13.00 dBm		<b>tart Freq</b> 10000 GHz
-20.0											<b>top Freq</b> 10000 GHz
-40.0		~~~			-	<b>↓</b> ¹					<b>CF Step</b> 0000 MHz Man
-60.0										Fre	e <b>q Offset</b> 0 Hz
-70.0 Start 1.91	0 GHz							Stop 10		Sc Log	ale 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)





FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 29 of 59
© 2020 PCTEST	•		V 10.1 02/01/2020



	ectrum Analyzer - Swe										
IXI RL	RF 50 Ω	AC CO	RREC	SEN	ISE:INT	#Avg Typ	e: RMS		1 Jun 10, 2020	Fre	quency
10 dB/div	Ref 20.00 d	IF	NO: Fast 🖵 Gain:Low	Trig: Free Atten: 30				TYP DE			Auto Tune
10.0											enter Freq D00000 MHz
-10.0									DL1 -13.00 dBm		<b>Start Freq</b> 000000 MHz
-20.0											<b>Stop Freq</b> 000000 GHz
-40.0									1	182.0 <u>Auto</u>	CF Step 000000 MHz Man
-60.0	anderson and the foreign of the fore	ang		a, and any and a second se	*******************************	and the second			ануландан алар (1999) 	F	req Offset 0 Hz
Start 0.03	000 GHz			,				Stop 1.8	500 GHz	S Log	cale Type <u>Lin</u>
#Res BW	1.0 MHz		#VBW	3.0 MHz			Sweep 2	2.427 ms (	3641 pts)		

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-A2375	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dogo 20 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 30 of 59
© 2020 PCTEST		•	V 10.1 02/01/2020



	ectrum Analyzer - Swept SA					
L <mark>XI</mark> RL	RF 50 Ω AC	CORREC	SENSE:INT	#Avg Type: RMS	12:54:35 PM Jun 10, 2020 TRACE 1 2 3 4 5 6	Frequency
		PNO: Fast 🖵 IFGain:Low	Trig: Free Run Atten: 20 dB		TYPE A MININA DET A NNNN Ikr1 18.337 0 GHz -48.32 dBm	Auto Tune
10 dB/div Log	Ref 10.00 dBm	1			-48.32 dBm	
0.00						Center Freq 15.00000000 GHz
-10.0					DL1 -13.00 dBm	<b>Start Freq</b> 10.000000000 GHz
-30.0						<b>Stop Freq</b> 20.000000000 GHz
-50.0						<b>CF Step</b> 1.00000000 GHz <u>Auto</u> Man
-60.0						<b>Freq Offset</b> 0 Hz
-80.0						Scale Type
Start 10.0 #Res BW		#VBW	3.0 MHz	Sweep	Stop 20.000 GHz 25.33 ms (20001 pts)	Log <u>Lin</u>
MSG					ATUS	

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

FCC ID: BCG-A2375	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 21 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 31 of 59
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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 for continuous emissions, max hold for pulse emissions
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

#### Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

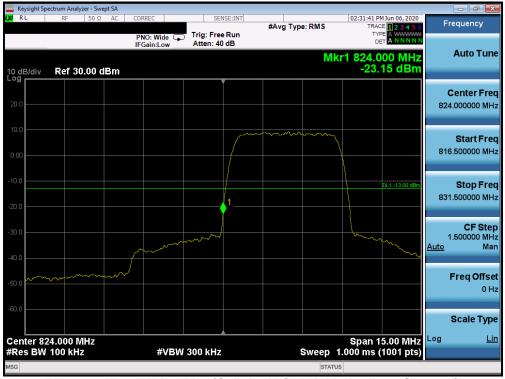
#### Test Notes

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-A2375	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
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 32 of 59
© 2020 PCTEST	•	•	V 10 1 02/01/2020



# 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-A2375	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
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 33 of 59
© 2020 PCTEST			V 10.1 02/01/2020



# 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)

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 24 of 50	
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 34 of 59	
© 2020 PCTEST		·	V 10.1 02/01/2020	



	ectrum Analyzer -										d ×
0 RL	RF 50	Ω AC	CORREC PNO: Wide IFGain:Low	Trig: Fre		#Avg Typ	be: RMS	TRAC	M Jun 10, 2020 DE <b>1 2 3 4 5 6</b> DE A WWWWW A N N N N N	Frequer	ncy
0 dB/div	Ref 30.00	) dBm					Mkr1	1.755 ( -20.	000 GHz 30 dBm	Auto	o Tun
20.0										Cente 1.7550000	
0.00			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m						<b>Stai</b> 1.7475000	rt Fre 00 GH
20.0					1				DL1 -13.00 dBm	<b>Sto</b> 1.7625000	<b>р Fre</b> 00 GH
30.0 ^^ 40.0	~~~~~				h		un la			CI 1.5000 <u>Auto</u>	F Ste 00 M⊢ Ma
50.0									~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Freq	Offse 0⊢
50.0										Scale	
enter 1. Res BW	755000 GH 100 kHz	Z	#V	BW 300 kHz	4		Sweep	Span 1 1.000 ms (	5.00 MHz (1001 pts)	Log	Li
SG							STATU	IS			

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

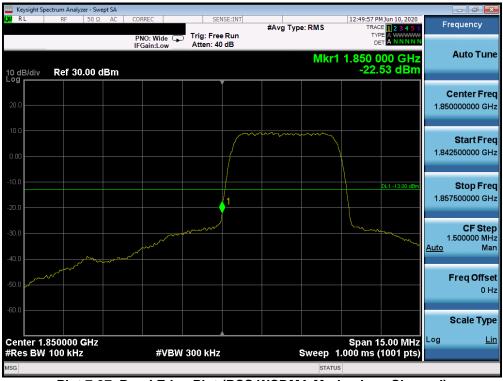


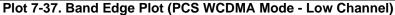
Plot 7-36. Upper Extended Band Edge Plot (AWS WCDMA Mode - High Channel)

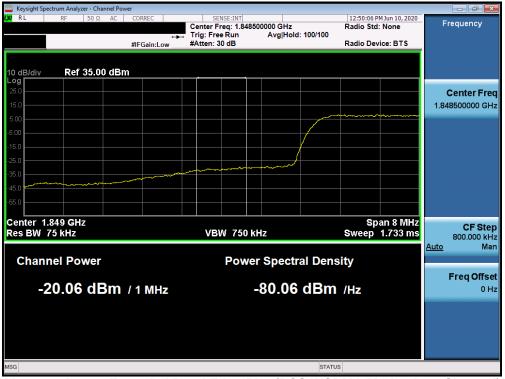
FCC ID: BCG-A2375	Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 25 of 50	
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 35 of 59	
© 2020 PCTEST		•	V 10.1 02/01/2020	



# PCS WCDMA Mode







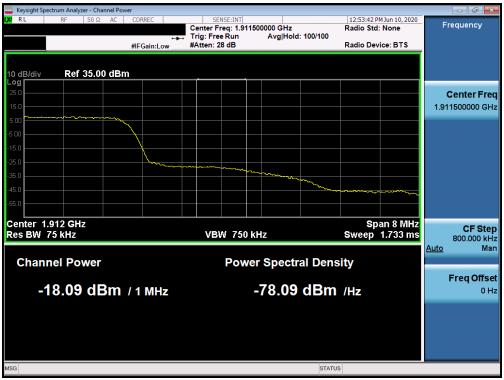
Plot 7-38. Lower Extended Band Edge Plot (PCS WCDMA Mode - Low Channel)

FCC ID: BCG-A2375	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 26 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 36 of 59
© 2020 PCTEST		-	V 10 1 02/01/2020





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



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

FCC ID: BCG-A2375	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga 27 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 37 of 59
© 2020 PCTEST	*	·	V 10.1 02/01/2020



## 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. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

### 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

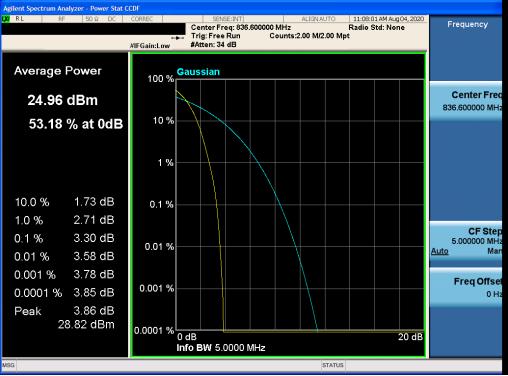
None

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dega 20 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 38 of 59
© 2020 PCTEST			V 10 1 02/01/2020



Mode	Average Power [dBm]	PAR at 0.1% [dB]	Limit [dB]	Margin [dB]
WCDMA850	24.96	3.30	13.0	-9.70
WCDMA1700	23.79	3.12	13.0	-9.88
WCDMA1900	23.96	3.20	13.0	-9.80

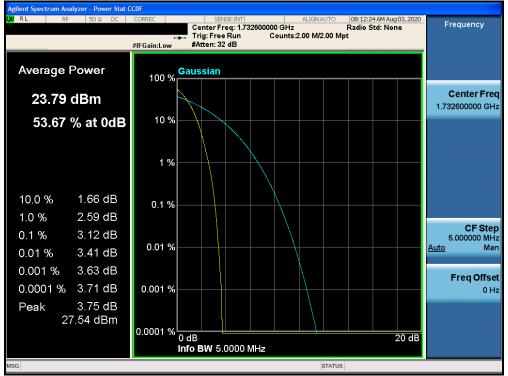
Table 7-3. Peak to Average Ratio Results



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

FCC ID: BCG-A2375	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
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 39 of 59
© 2020 PCTEST	•		V 10.1 02/01/2020









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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 40 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 40 of 59
© 2020 PCTEST		·	V 10.1 02/01/2020



## 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 equivalen 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), 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.
- 4) This device only supports 27RBs or less for 16-QAM uplink.

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dogo 41 of 50	
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 41 of 59	
© 2020 PCTEST			V 10 1 02/01/2020	



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	-28.90	-6.05	0.248	38.45	-44.50	-3.90	0.407	40.61	-44.51
836.60	WCDMA850	25.00	-28.90	-6.05	0.248	38.45	-44.50	-3.90	0.407	40.61	-44.51
846.60	WCDMA850	24.82	-28.90	-6.23	0.238	38.45	-44.68	-4.08	0.391	40.61	-44.69

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	23.83	-12.50	11.33	13.583	30.00	-18.67
1732.60	WCDMA1700	23.92	-12.50	11.42	13.868	30.00	-18.58
1752.60	WCDMA1700	23.80	-12.50	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	23.87	-14.00	9.87	9.705	33.01	-23.14
1880.00	WCDMA1900	23.85	-14.00	9.85	9.661	33.01	-23.16
1907.60	WCDMA1900	23.91	-14.00	9.91	9.795	33.01	-23.10

Table 7-6. EIRP (PCS WCDMA)

FCC ID: BCG-A2375	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dago 42 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 42 of 59
© 2020 PCTEST		-	V 10 1 02/01/2020



## 7.7 Radiated Spurious Emissions

### **Test Overview**

Radiated spurious emissions measurements are performed using the substitution method described in ANSI C63.26-2015 and 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  $\geq 2 \times \text{span} / \text{RBW}$
- 5. Detector = RMS
- 6. Trace mode = Average (Max Hold for pulsed emissions)
- 7. The trace was allowed to stabilize

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 42 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 43 of 59
© 2020 PCTEST	•	•	V 10 1 02/01/2020



### Test Setup

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

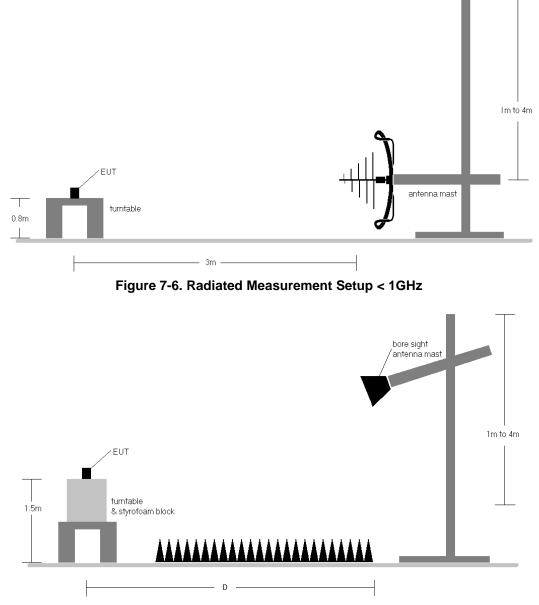


Figure 7-7. Radiated Measurement Setup > 1GHz

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dage 44 of 50	
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 44 of 59	
© 2020 PCTEST	•		V 10.1 02/01/2020	



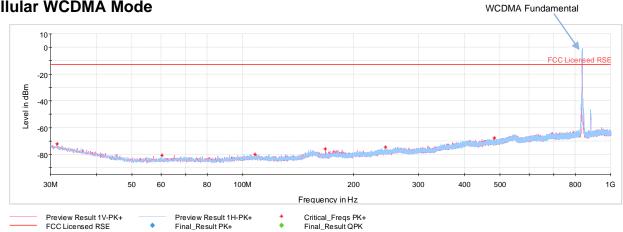
### Test Notes

- 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.

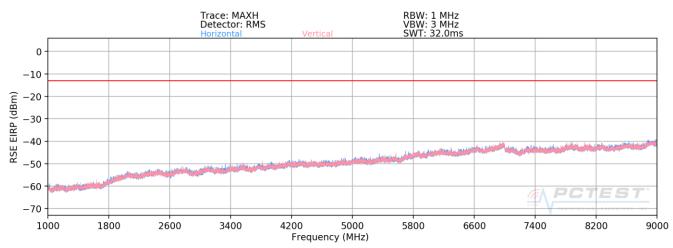
FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 45 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 45 of 59
© 2020 PCTEST		•	V/ 10 1 02/01/2020



### **Cellular WCDMA Mode**









OPERATING FREQUENCY:	82	6.40	MHz
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1652.80	Н	-	-	-72.90	3.89	-69.01	-56.0
2479.20	Н	-	-	-67.46	4.34	-63.12	-50.1
3305.60	Н	-	-	-69.57	6.50	-63.07	-50.1

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

FCC ID: BCG-A2375	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 46 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 46 of 59
© 2020 PCTEST			V 10.1 02/01/2020



OPERATING FREQUENCY:	83	6.60	MHz
MODULATION SIGNAL:	WCDMA		
DISTANCE:	3	meters	
LIMIT:	-13	_dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1673.20	Н	-	-	-72.63	3.69	-68.94	-55.9
2509.80	Н	-	-	-67.58	4.20	-63.38	-50.4
3346.40	Н	-	-	-69.25	6.55	-62.70	-49.7

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

OPERATING FREQUENCY:

MODULATION SIGNAL: DISTANCE:

ENCY: 846.60 GNAL: WCDMA ANCE: 3 meters LIMIT: -13 dBm MHz

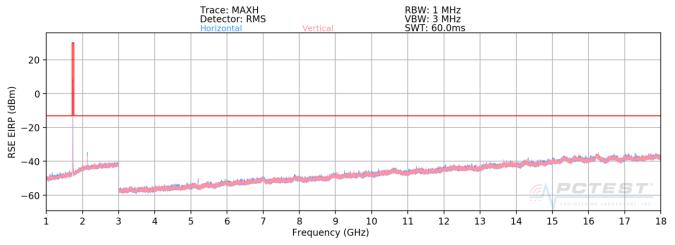
Frequency [MHz]	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1693.20	Н	-	-	-72.54	3.74	-68.80	-55.8
2539.80	Н	-	-	-68.25	4.41	-63.84	-50.8
3386.40	Н	-	-	-69.00	6.61	-62.39	-49.4

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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 47 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 47 of 59
© 2020 PCTEST		-	V 10 1 02/01/2020



# **AWS WCDMA Mode**



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

MHz

OPERATING		`
OPERATING	FREQUEINC	1

ERATING FREQUENCY:	171	2.40
MODULATION SIGNAL:	WCDMA	_
DISTANCE:	3	meters
LIMIT:	-13	dBm

Frequency [MHz]	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3424.80	V	-	-	-69.47	6.67	-62.81	-49.8
5137.20	V	224	19	-68.13	9.04	-59.09	-46.1
6849.60	V	-	-	-66.56	9.59	-56.97	-44.0
8562.00	V	-	-	-64.97	9.65	-55.32	-42.3
10274.40	V	-	-	-61.82	9.57	-52.24	-39.2

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

FCC ID: BCG-A2375	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 49 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 48 of 59
© 2020 PCTEST		-	V 10 1 02/01/2020



173	32.60	MHz
WCDMA	_	
3	meters	
-13	dBm	
	WCDMA 3	3 meters

Frequency [MHz]	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3465.20	V	-	-	-69.51	6.73	-62.78	-49.8
5197.80	V	29	343	-67.72	9.15	-58.57	-45.6
6930.40	V	-	-	-65.90	9.51	-56.40	-43.4
8663.00	V	-	-	-65.09	9.63	-55.46	-42.5
10395.60	V	-	-	-61.66	9.52	-52.14	-39.1

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

OPERATING FREQUENCY:

MODULATION SIGNAL: DISTANCE:

 ENCY:
 1752.60

 IGNAL:
 WCDMA

 ANCE:
 3

 LIMIT:
 -13

MHz

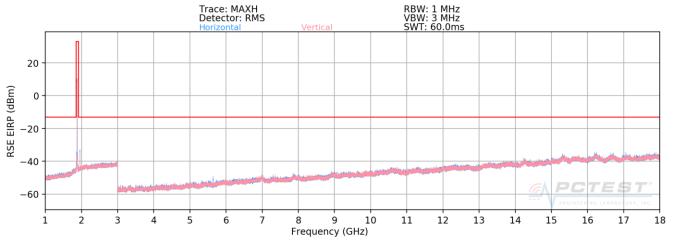
Frequency [MHz]	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3505.20	V	-	-	-68.36	6.81	-61.55	-48.5
5257.80	V	367	82	-61.55	9.15	-52.40	-39.4
7010.40	V	-	-	-65.38	9.48	-55.91	-42.9
8763.00	V	-	-	-64.74	9.63	-55.11	-42.1
10515.60	V	-	-	-60.52	9.40	-51.12	-38.1

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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dege 40 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 49 of 59
© 2020 PCTEST			V 10 1 02/01/2020



# **PCS WCDMA Mode**



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

MHz

OPERATING FREQUENCY:	
----------------------	--

ERATING FREQUENCY:	1852.40		
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
	4.0		

LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3704.80	Н	-	-	-68.95	7.29	-61.66	-48.7
5557.20	Н	-	-	-67.90	9.33	-58.56	-45.6
7409.60	Н	-	-	-65.42	9.43	-55.99	-43.0

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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga 50 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 50 of 59
© 2020 PCTEST			V 10 1 02/01/2020



OPERATING FREQUENCY:	188	80.00	MHz
MODULATION SIGNAL:	WCDMA		
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3760.00	Н	-	-	-68.51	7.30	-61.21	-48.2
5640.00	Н	-	-	-68.57	9.37	-59.20	-46.2
7520.00	Н	-	-	-65.72	9.44	-56.28	-43.3

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

**OPERATING FREQUENCY:** 

MODULATION SIGNAL:

1907.60 WCDMA DISTANCE: 3 meters LIMIT: -13 dBm

MHz

Frequency [MHz]	Ant. Pol. [H/V]	Positioner Azimuth [degree]	Turntable Azimuth [degree]	EIRP Level at Sub Ant Port [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3815.20	Н	-	-	-69.07	7.39	-61.67	-48.7
5722.80	Н	-	-	-68.32	9.40	-58.92	-45.9
7630.40	Н	-	-	-65.76	9.39	-56.37	-43.4

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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 51 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 51 of 59
© 2020 PCTEST			V 10 1 02/01/2020



### **Test Overview and Limit**

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015 and TIA-603-E-2016. The frequency stability of the transmitter is measured by:

- 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  $\pm 0.00025\%$  ( $\pm 2.5$  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

TIA-603-E-2016

ANSI C63.26-2015

#### **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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 52 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 52 of 59
© 2020 PCTEST	<u>.</u>		V 10.1 02/01/2020



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	1.1	0.00000013
100 %		- 20	836,600,001	1.1	0.00000014
100 %		- 10	836,600,001	1.0	0.00000012
100 %		0	836,600,001	0.9	0.00000010
100 %	3.80	+ 10	836,600,001	0.7	0.0000009
100 %		+ 20	836,600,001	0.8	0.0000009
100 %		+ 30	836,600,001	1.1	0.00000013
100 %		+ 40	836,600,001	1.1	0.00000014
100 %		+ 50	836,600,002	1.5	0.00000018
BATT. ENDPOINT	3.40	+ 20	836,600,001	1.0	0.00000012

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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dege 52 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 53 of 59
© 2020 PCTEST	•		V 10.1 02/01/2020



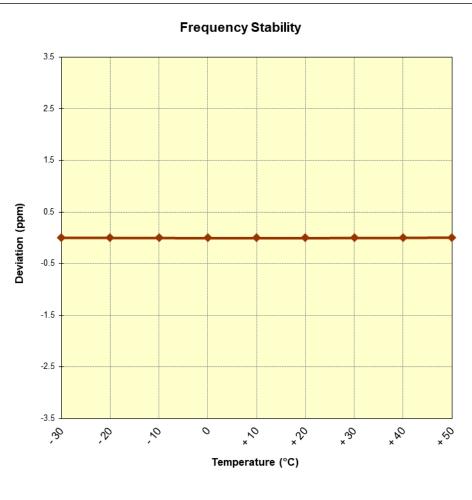


Figure 7-9. Frequency Stability Graph (Cellular WCDMA Mode – Ch. 4183)

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 54 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 54 of 59
© 2020 PCTEST	•		V 10.1 02/01/2020



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	1,732,600,001	0.6	0.0000004
100 %		- 20	1,732,600,000	0.4	0.0000002
100 %		- 10	1,732,599,999	-1.2	-0.00000007
100 %		0	1,732,599,999	-1.0	-0.00000006
100 %	3.80	+ 10	1,732,600,001	0.9	0.00000005
100 %		+ 20	1,732,600,000	-0.4	-0.0000003
100 %		+ 30	1,732,599,999	-0.5	-0.0000003
100 %		+ 40	1,732,599,999	-0.6	-0.00000004
100 %		+ 50	1,732,599,999	-1.2	-0.0000007
BATT. ENDPOINT	3.40	+ 20	1,732,599,999	-1.2	-0.0000007

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-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dago 55 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 55 of 59
© 2020 PCTEST			V 10 1 02/01/2020



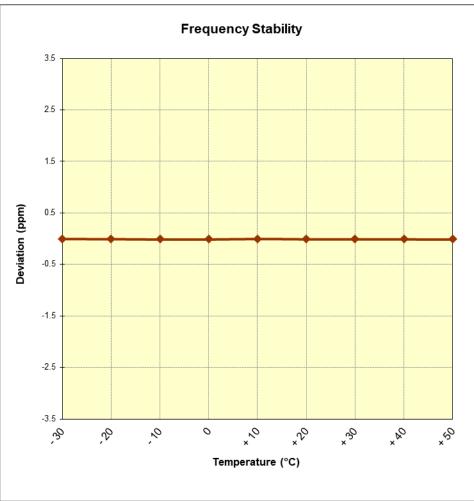


Figure 7-10. Frequency Stability Graph (AWS WCDMA Mode – Ch. 1413)

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga EC of EQ
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 56 of 59
© 2020 PCTEST	•		V 10.1 02/01/2020



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	1,880,000,001	1.3	0.0000007
100 %		- 20	1,880,000,001	1.1	0.00000006
100 %		- 10	1,880,000,000	0.4	0.0000002
100 %		0	1,880,000,002	1.6	0.0000009
100 %	3.80	+ 10	1,880,000,002	1.8	0.0000009
100 %		+ 20	1,880,000,001	0.8	0.00000004
100 %		+ 30	1,879,999,999	-1.4	-0.00000008
100 %		+ 40	1,879,999,999	-0.5	-0.00000003
100 %		+ 50	1,880,000,001	1.3	0.0000007
BATT. ENDPOINT	3.40	+ 20	1,880,000,001	1.0	0.00000005

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

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: Test Dates:		EUT Type:	Dege 57 of 50
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 57 of 59
© 2020 PCTEST			V 10 1 02/01/2020



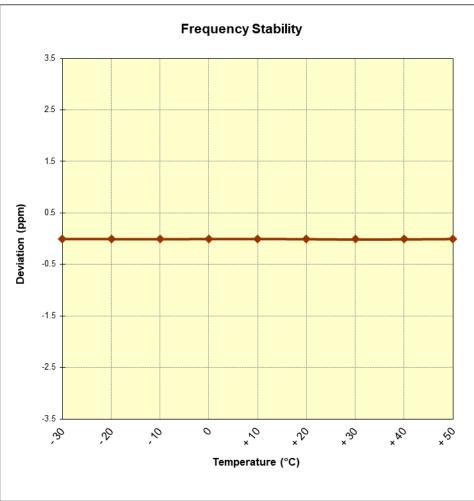


Figure 7-11. Frequency Stability Graph (PCS WCDMA Mode – Ch. 9400)

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Daga EQ of EQ
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	Page 58 of 59
© 2020 PCTEST	•		V 10.1 02/01/2020



# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Apple Watch FCC ID: BCG-A2375** 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.

FCC ID: BCG-A2375	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Page 59 of 59
1C2004270018-02.BCG	04/09/2020-08/11/2020	Watch	
© 2020 PCTEST			V 10.1 02/01/2020