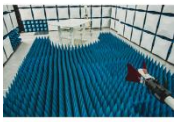
PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. 410.290.6652 / Fax 410.290.6654
http://www.pctest.com



# MEASUREMENT REPORT
## GSM / GPRS / EDGE / CDMA / WCDMA

**Applicant Name:**
LG Electronics USA, Inc.
1000 Sylvan Avenue
Englewood Cliffs, NJ 07632
United States

**Date of Testing:**
7/26 - 8/16/2019
**Test Site/Location:**
PCTEST Lab. Columbia, MD, USA
**Test Report Serial No.:**
1M1907250129-02-R2.ZNF

| | |
|---|---|
| **FCC ID:** | **ZNFG850UM** |
| **APPLICANT:** | **LG Electronics USA, Inc.** |

| | |
|---|---|
| **Application Type:** | Certification |
| **Model:** | LM-G850UM |
| **Additional Model(s):** | LM-G850QM, LM-G850QM6, LM-G850V, LM-G850UM2, LM-G850UM2X, LMG850UM, LMG850QM, LMG850QM6, LMG850V, LMG850UM2, LMG850UM2X, G850UM, G850QM, G850QM6, G850V, G850UM2, G850UM2X |
| **EUT Type:** | Portable Handset |
| **FCC Classification:** | PCS Licensed Transmitter Held to Ear (PCE) |
| **FCC Rule Part(s):** | 22, 24, & 27 |
| **Test Procedure(s):** | ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01, KDB 648474 D03 v01r04 |

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.

Note: This revised Test Report (S/N: 1M1907250129-02-R2.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

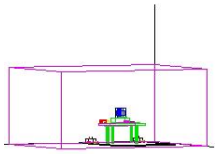
# TABLE OF CONTENTS


1.0 INTRODUCTION ..... 4
1.1 Scope ..... 4
1.2 PCTEST Test Location ..... 4
1.3 Test Facility / Accreditations ..... 4
2.0 PRODUCT INFORMATION ..... 5
2.1 Equipment Description ..... 5
2.2 Device Capabilities ..... 5
2.3 Test Configuration ..... 5
2.4 EMI Suppression Device(s)/Modifications ..... 5
3.0 DESCRIPTION OF TESTS ..... 6
3.1 Evaluation Procedure ..... 6
3.2 Cellular - Base Frequency Blocks ..... 6
3.3 Cellular - Mobile Frequency Blocks ..... 6
3.4 PCS - Base Frequency Blocks ..... 6
3.5 PCS - Mobile Frequency Blocks ..... 7
3.6 AWS - Base Frequency Blocks ..... 7
3.7 AWS - Mobile Frequency Blocks ..... 7
3.8 Radiated Measurements ..... 8
4.0 MEASUREMENT UNCERTAINTY ..... 9
5.0 TEST EQUIPMENT CALIBRATION DATA ..... 10
6.0 SAMPLE CALCULATIONS ..... 11
7.0 TEST RESULTS ..... 12
7.1 Summary ..... 12
7.2 Occupied Bandwidth ..... 13
7.3 Spurious and Harmonic Emissions at Antenna Terminal ..... 19
7.4 Band Edge Emissions at Antenna Terminal ..... 55
7.5 Peak-Average Ratio ..... 68
7.6 Radiated Power (ERP/EIRP) ..... 74
7.7 Radiated Spurious Emissions Measurements ..... 79
7.8 Frequency Stability / Temperature Variation ..... 97
8.0 CONCLUSION ..... 112

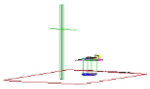




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



# MEASUREMENT REPORT
## GSM / GPRS / EDGE / CDMA / WCDMA



| Mode | FCC Rule Part | Tx Frequency (MHz) | ERP | | EIRP | | Emission Designator |
|---|---|---|---|---|---|---|---|
| | | | Max. Power (W) | Max. Power (dBm) | Max. Power (W) | Max. Power (dBm) | |
| GPRS850 | 22H | 824.2 - 848.8 | 0.526 | 27.21 | 0.863 | 29.36 | 244KGXW |
| EDGE850 | 22H | 824.2 - 848.8 | 0.077 | 18.86 | 0.126 | 21.01 | 244KG7W |
| CDMA850 | 22H | 824.70 - 848.31 | 0.071 | 18.52 | 0.117 | 20.67 | 1M28F9W |
| WCDMA850 | 22H | 826.4 - 846.6 | 0.085 | 19.27 | 0.139 | 21.42 | 4M16F9W |
| WCDMA1700 | 27 | 1712.4 - 1752.6 | | | 0.315 | 24.98 | 4M17F9W |
| GPRS1900 | 24E | 1850.2 - 1909.8 | | | 1.411 | 31.50 | 240KGXW |
| EDGE1900 | 24E | 1850.2 - 1909.8 | | | 0.369 | 25.67 | 245KG7W |
| CDMA1900 | 24E | 1851.25 - 1908.75 | | | 0.313 | 24.95 | 1M28F9W |
| WCDMA1900 | 24E | 1852.4 - 1907.6 | | | 0.379 | 25.78 | 4M17F9W |

**EUT Overview**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

# 1.0 INTRODUCTION

## 1.1 Scope

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

## 1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

## 1.3 Test Facility / Accreditations

**Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.**

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 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 (2451B) test laboratory with the site description on file with ISED.



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

# 2.0 PRODUCT INFORMATION

## 2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFG850UM**. 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.:** 01723, 01731, 02788, 02796

## 2.2 Device Capabilities

This device contains the following capabilities:

800/850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1, BC10), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n/ac WLAN, 802.11a/n/ac UNII, Bluetooth (1x, EDR, LE), NFC

## 2.3 Test Configuration

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

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT lying flat on an authorized wireless charging pad (WCP) FCC ID: A3LEPPN920 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

## 2.4 EMI Suppression Device(s)/Modifications

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




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

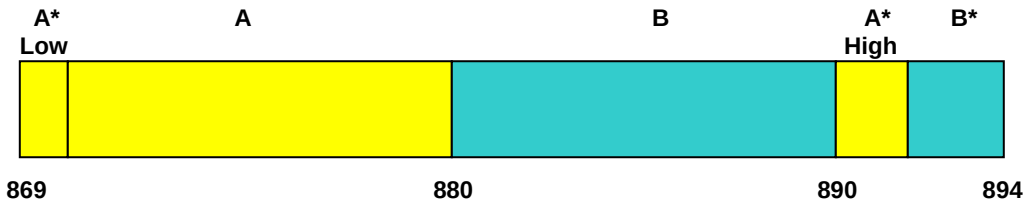
# 3.0 DESCRIPTION OF TESTS

## 3.1 Evaluation Procedure

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

**Deviation from Measurement Procedure……..None**

## 3.2 Cellular - Base Frequency Blocks



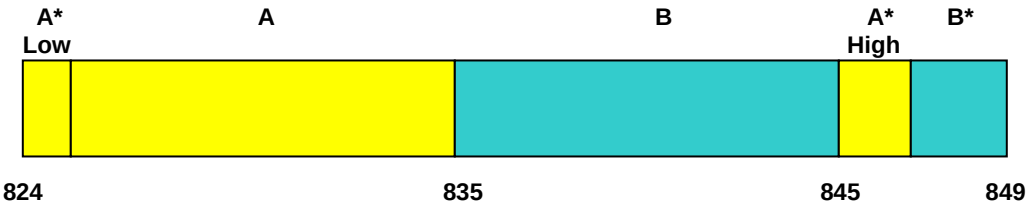

**BLOCK 1: 869 – 880 MHz (A* Low + A)**

**BLOCK 2: 880 – 890 MHz (B)**

**BLOCK 3: 890 – 891.5 MHz (A* High)**

**BLOCK 4: 891.5 – 894 MHz (B*)**

## 3.3 Cellular - Mobile Frequency Blocks



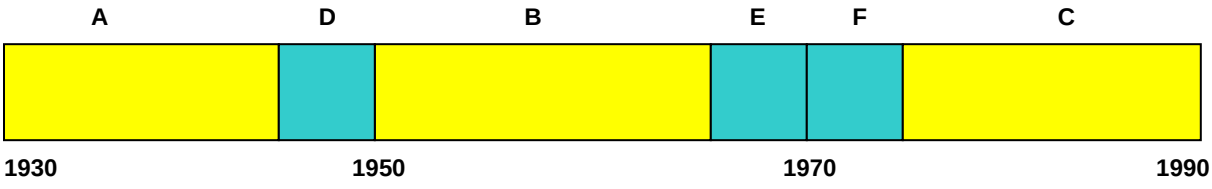

**BLOCK 1: 824 – 835 MHz (A* Low + A)**

**BLOCK 2: 835 – 845 MHz (B)**

**BLOCK 3: 845 – 846.5 MHz (A* High)**

**BLOCK 4: 846.5 – 849 MHz (B*)**

## 3.4 PCS - Base Frequency Blocks




**BLOCK 1: 1930 – 1945 MHz (A)**

**BLOCK 2: 1945 – 1950 MHz (D)**

**BLOCK 3: 1950 – 1965 MHz (B)**

**BLOCK 4: 1965 – 1970 MHz (E)**

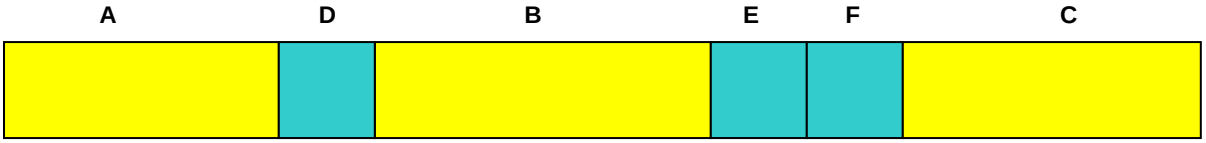
**BLOCK 5: 1970 – 1975 MHz (F)**

**BLOCK 6: 1975 – 1990 MHz (C)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## 3.5 PCS - Mobile Frequency Blocks




**BLOCK 1: 1850 – 1865 MHz (A)**

**BLOCK 2: 1865 – 1870 MHz (D)**

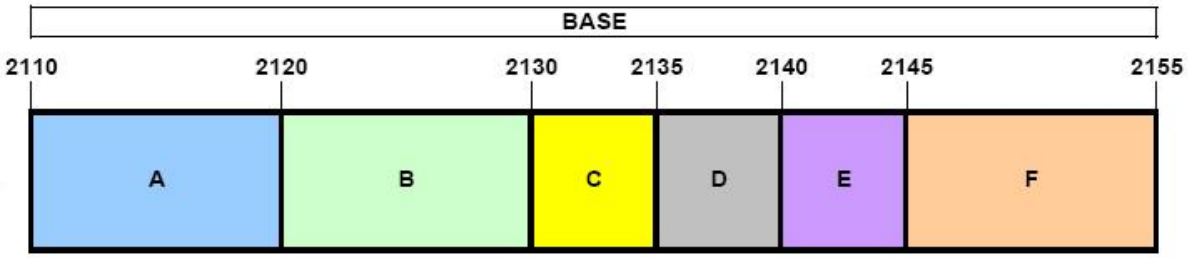
**BLOCK 3: 1870 – 1885 MHz (B)**

**BLOCK 4: 1885 – 1890 MHz (E)**

**BLOCK 5: 1890 – 1895 MHz (F)**

**BLOCK 6: 1895 – 1910 MHz (C)**

## 3.6 AWS - Base Frequency Blocks




**BLOCK 1: 2110 – 2120 MHz (A)**

**BLOCK 2: 2120 – 2130 MHz (B)**

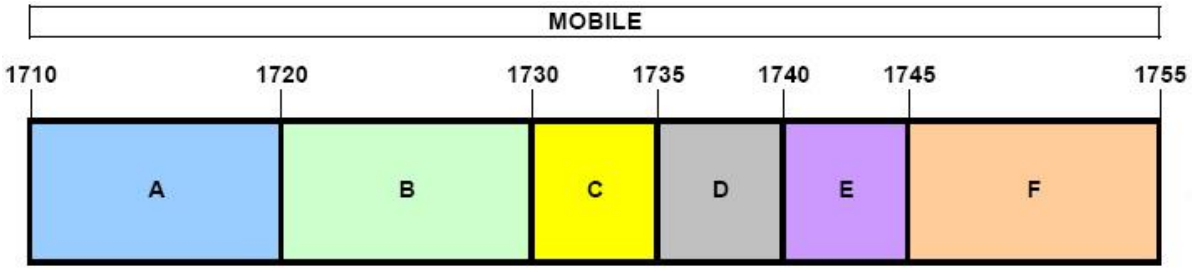
**BLOCK 3: 2130 – 2135 MHz (C)**

**BLOCK 4: 2135 – 2140 MHz (D)**

**BLOCK 5: 2140 – 2145 MHz (E)**

**BLOCK 6: 2145 – 2155 MHz (F)**

## 3.7 AWS - Mobile Frequency Blocks




**BLOCK 1: 1710 – 1720 MHz (A)**

**BLOCK 2: 1720 – 1730 MHz (B)**

**BLOCK 3: 1730 – 1735 MHz (C)**

**BLOCK 4: 1735 – 1740 MHz (D)**

**BLOCK 5: 1740 – 1745 MHz (E)**

**BLOCK 6: 1745 – 1755 MHz (F)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019

All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## 3.8 Radiated Measurements

The radiated test facilities consisted of an indoor 3 meter semi-anechoic chamber used for final measurements and exploratory measurements, when necessary. The measurement area is contained within the semi-anechoic chamber which is shielded from any ambient interference. The test site inside the chamber is a 6m x 5.2m elliptical, obstruction-free area in accordance with Figure 5.7 of Clause 5 in ANSI C63.4-2014. Absorbers are arranged on the floor between the turn table and the antenna mast in such a way so as to maximize the reduction of reflections for measurements above 1GHz. For measurements below 1GHz, the absorbers are removed. A raised turntable is used for radiated measurement. The turn table is a continuously rotatable, remote-controlled, metallic turntable and 2 meters (6.56 ft.) in diameter. The turn table is flush with the raised floor of the chamber in order to maintain its function as a ground plane. An 80cm tall test table made of Styrodur is placed on top of the turn table. A Styrodur pedestal is placed on top of the test table to bring the total table height to 1.5m.

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

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

$$P_{d\ [dBm]} = P_{g\ [dBm]} - \text{cable loss}_{\ [dB]} + \text{antenna gain}_{\ [dBd/dBi]}$$

Where, $P_d$ is the dipole equivalent power, $P_g$ is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_{g\ [dBm]}$ – cable loss $_{[dB]}$.

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 474788 D01.

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



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

# 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 | 1.13 |
| Radiated Disturbance (<1GHz) | 4.98 |
| Radiated Disturbance (>1GHz) | 5.07 |
| Radiated Disturbance (>18GHz) | 5.09 |



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

# 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 |
|---|---|---|---|---|---|---|
| - | LTx2 | Licensed Transmitter Cable Set | 8/23/2018 | Annual | 8/23/2019 | LTx2 |
| - | LTx4 | Licensed Transmitter Cable Set | 6/4/2019 | Annual | 6/4/2020 | LTx4 |
| Agilent | N9020A | MXA Signal Analyzer | 4/20/2019 | Annual | 4/20/2020 | US46470561 |
| Agilent | N9030A | PXA Signal Analyzer (44GHz) | 6/12/2019 | Annual | 6/12/2020 | MY52350166 |
| Com-Power | PAM-103 | Pre-Amplifier (1-1000MHz) | 9/17/2018 | Annual | 9/17/2019 | 441119 |
| Emco | 3115 | Horn Antenna (1-18GHz) | 3/28/2018 | Biennial | 3/28/2020 | 9704-5182 |
| EMCO | 3160-09 | Small Horn (18 - 26.5GHz) | 8/9/2018 | Biennial | 8/9/2020 | 135427 |
| ETS-Lindgren | TVA-11-422 | RF Power Amp | N/A | | | QA1317001 |
| Mini Circuits | PWR-SEN-4GHS | USB Power Sensor | 4/19/2019 | Annual | 4/19/2020 | 11401010036 |
| Mini Circuits | TS-PR26 | 18-26.5 GHz Pre-Amplifier | 9/19/2018 | Annual | 9/19/2019 | 100040 |
| Rohde & Schwarz | ESU26 | EMI Test Receiver (26.5GHz) | 6/5/2019 | Annual | 6/5/2020 | 100342 |
| Rohde & Schwarz | NC-100 | Torque Wrench (8" lb) | 5/10/2018 | Biennial | 5/10/2020 | N/A |
| Rohde & Schwarz | 3816/2NM | Line Impedance Stabilization Network | 6/18/2018 | Biennial | 6/18/2020 | 114451 |
| Rohde & Schwarz | TS-PR26 | 18-26.5 GHz Pre-Amplifier | 9/19/2018 | Annual | 9/19/2019 | 100040 |
| Rohde & Schwarz | ESU26 | EMI Test Receiver (26.5GHz) | 6/5/2019 | Annual | 6/5/2020 | 100342 |
| Rohde & Schwarz | TS-PR40 | 26.5-40 GHz Pre-Amplifier | 9/19/2018 | Annual | 9/19/2019 | 100037 |
| Seekonk | FSW67 | Signal / Spectrum Analyzer | 5/6/2019 | Annual | 5/6/2020 | 103200 |

**Table 5-1. Test Equipment**

**Notes:**

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

2. Equipment with a calibration date of “N/A” shown in this list was not used to make direct calibrated measurements.




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

# 6.0 SAMPLE CALCULATIONS

## GPRS Emission Designator

**Emission Designator = 250KGXW**

GPRS BW = 250 kHz
G = Phase Modulation
X = Cases not otherwise covered
W = Combination (Audio/Data)

## EDGE Emission Designator

**Emission Designator = 250KG7W**

EDGE BW = 250 kHz
G = Phase Modulation
7 = Quantized/Digital Info
W = Combination (Audio/Data)

## CDMA Emission Designator

**Emission Designator = 1M25F9W**

CDMA BW = 1.25 MHz
F = Frequency Modulation
9 = Composite Digital Info
W = Combination (Audio/Data)

## 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.



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

# 7.0 TEST RESULTS

## 7.1 Summary

Company Name: LG Electronics USA, Inc.

FCC ID: ZNFG850UM

FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)

Mode(s): GSM / GPRS / EDGE / CDMA / WCDMA

| FCC Part Section(s) | RSS Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|---|---|---|---|---|---|---|
| 2.1049 | RSS-Gen (4.6.1)<br>RSS-133(2.3)<br>RSS-139(2.3) | Occupied Bandwidth | N/A | CONDUCTED | PASS | Section 7.2 |
| 2.1051<br>22.917(a)<br>24.238(a)<br>27.53(h) | RSS-132(5.5)<br>RSS-133(6.5)<br>RSS-139(6.6) | Conducted Band Edge / Spurious Emissions | > 43 + 10 $\log_{10}$ (P[Watts]) at Band Edge and for all out-of-band emissions | | PASS | Sections 7.3, 7.4 |
| 24.232(d)<br>27.50(d) | RSS-132(5.4)<br>RSS-133(6.4)<br>RSS-139(6.5) | Peak-Average Ratio | < 13 dB | | PASS | Section 7.5 |
| 2.1046 | RSS-132(5.4)<br>RSS-133(4.1)<br>RSS-139(4.1) | Transmitter Conducted Output Power | N/A | | PASS | RF Exposure Report |
| 2.1055 22.355<br>24.235 27.54 | RSS-132(5.3)<br>RSS-133(6.3)<br>RSS-139(6.4) | Frequency Stability | < 2.5 ppm (Part 22)<br>Emission must remain in band (Part 24, 27) | | PASS | Section 7.8 |
| 22.913(a)(5) | RSS-132(5.4) | Effective Radiated Power | < 7 Watts max. ERP | RADIATED | 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<br>22.917(a)<br>24.238(a)<br>27.53(h) | RSS-132(5.5)<br>RSS-133(6.5)<br>RSS-139(6.6) | Radiated Spurious Emissions | > 43 + 10 $\log_{10}$ (P[Watts]) for all out-of-band emissions | | PASS | Section 7.7 |

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

**Notes:**

1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "2G/3G Automation," Version 3.9.



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## 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 ≥ 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.

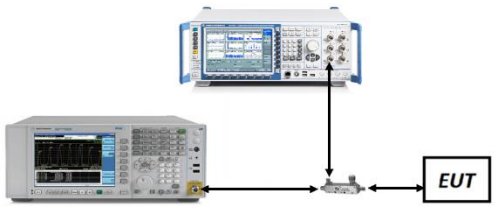



**Figure 7-1. Test Instrument & Measurement Setup**

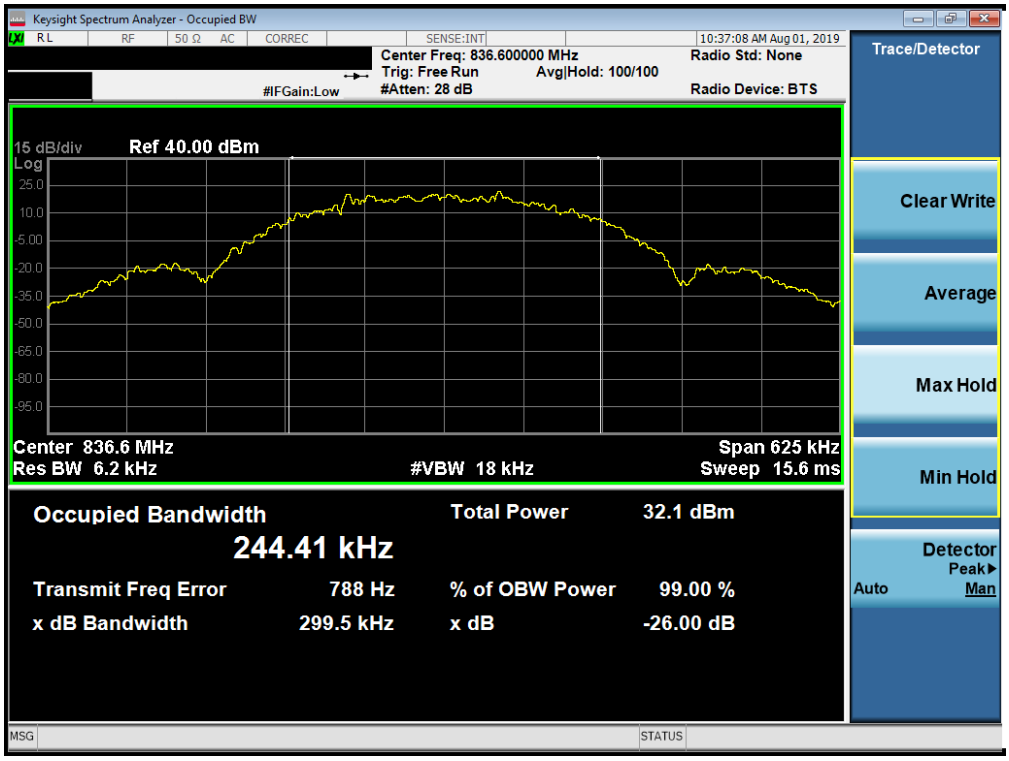
**Test Notes**

None.



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

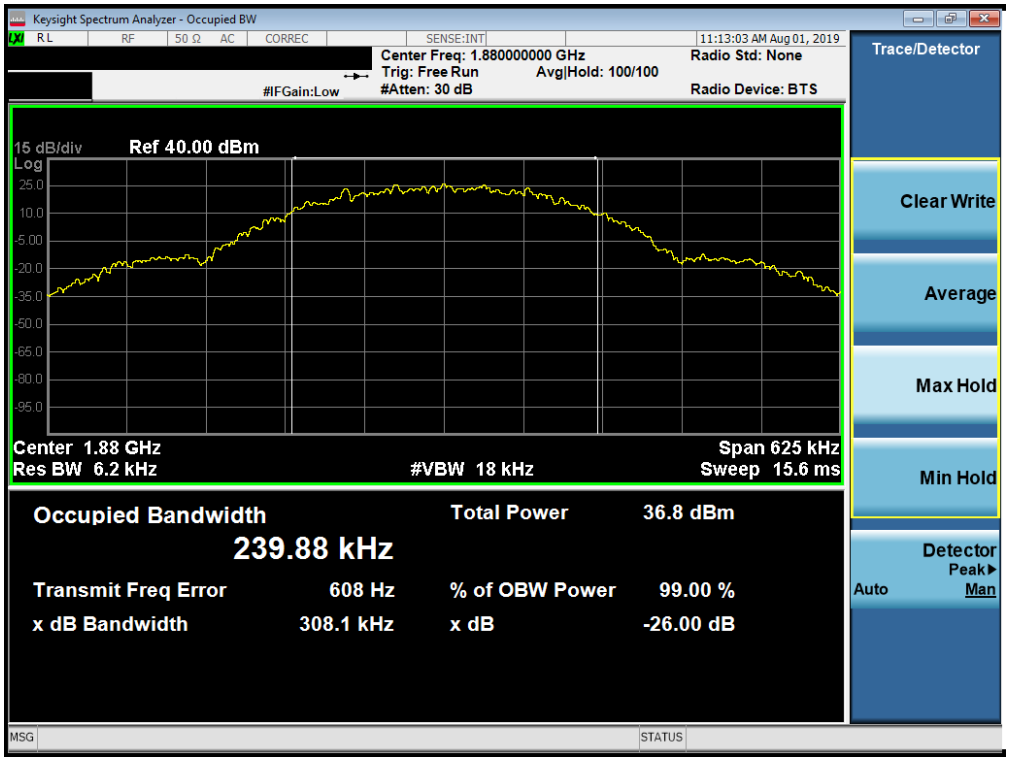
**Plot 7-1. Occupied Bandwidth Plot (Cellular GPRS Mode)**



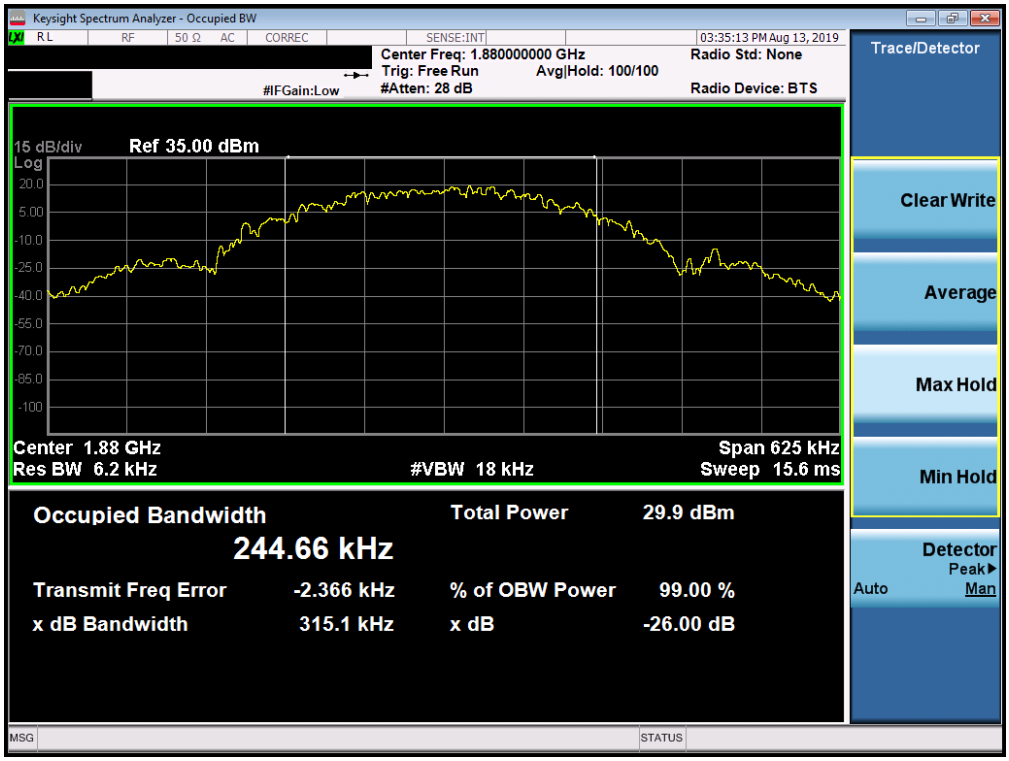

**Plot 7-2. Occupied Bandwidth Plot (EDGE850 Mode)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



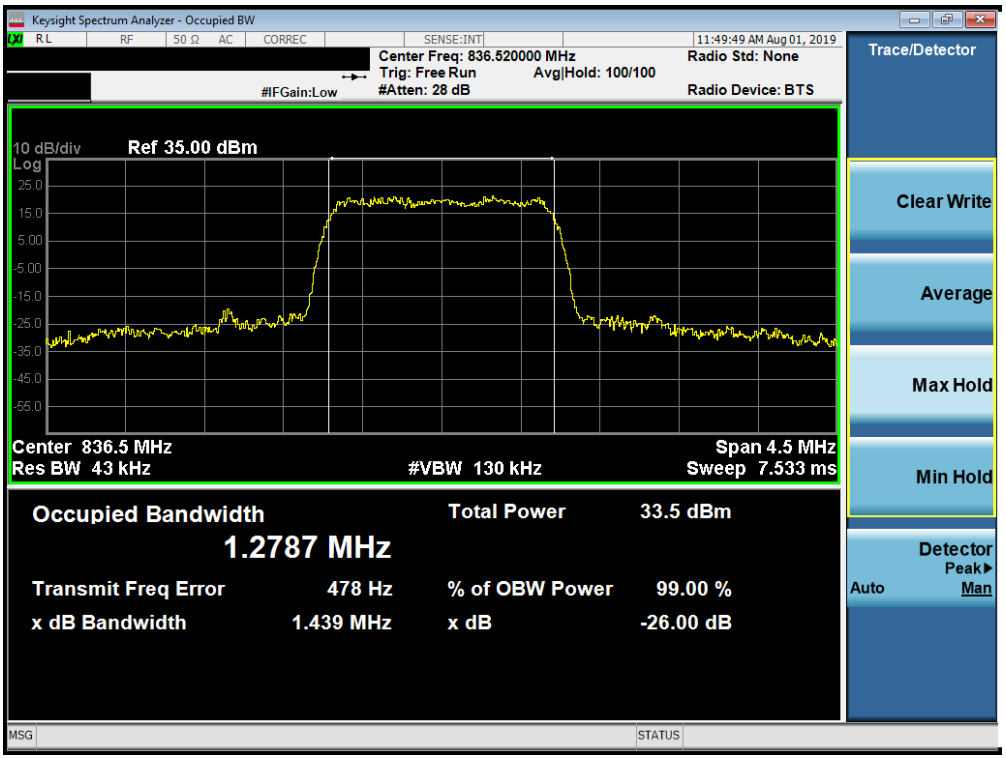

**Plot 7-3. Occupied Bandwidth Plot (PCS GPRS Mode)**



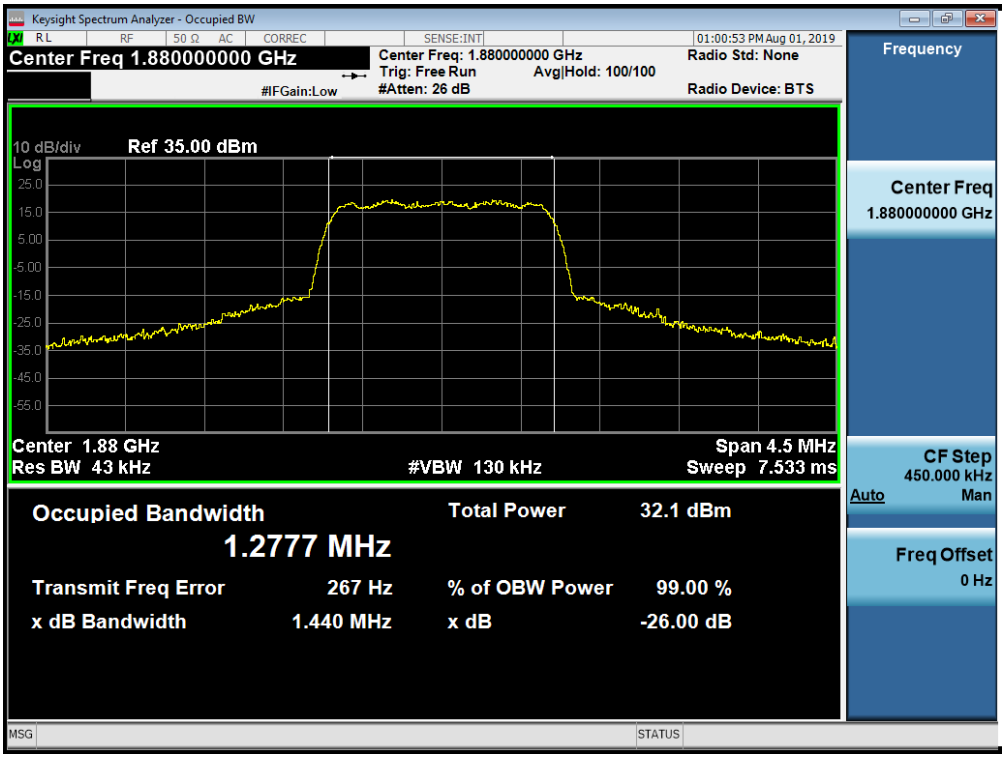

**Plot 7-4. Occupied Bandwidth Plot (EDGE1900 Mode)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



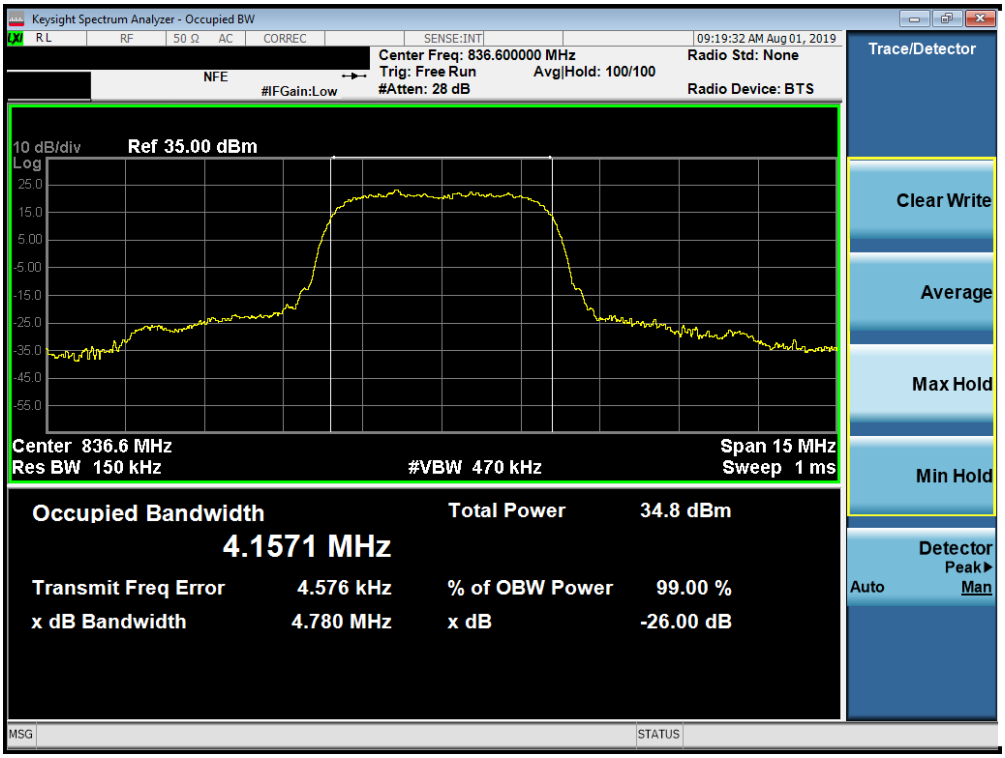

**Plot 7-5. Occupied Bandwidth Plot (Cellular CDMA Mode)**



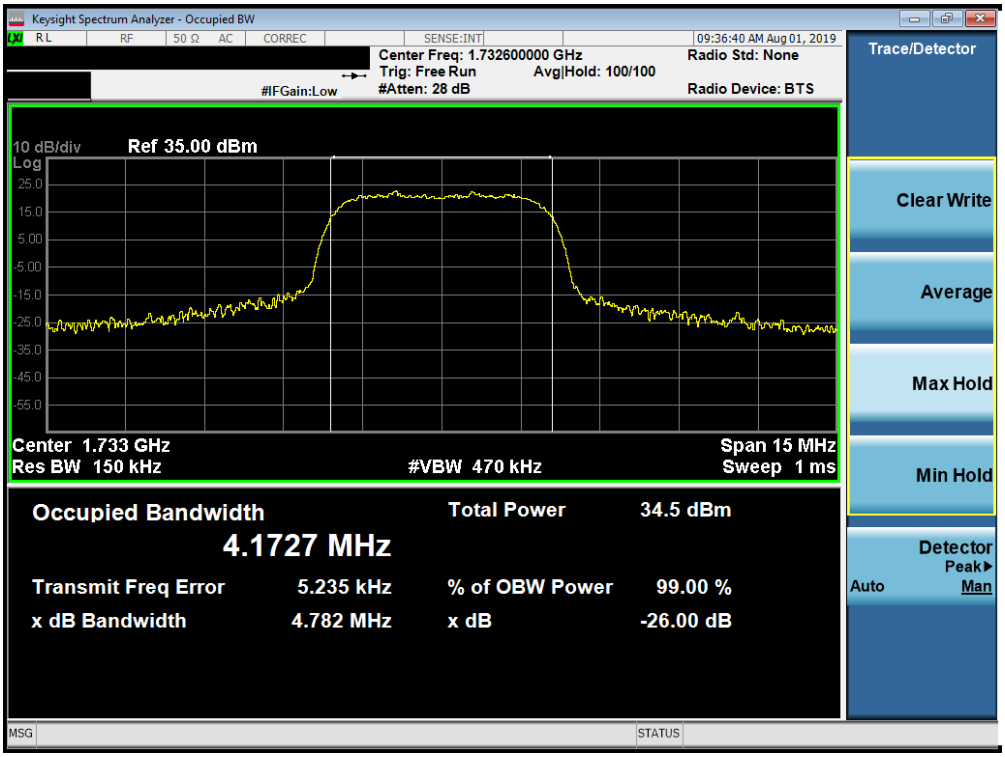

**Plot 7-6. Occupied Bandwidth Plot (PCS CDMA Mode)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



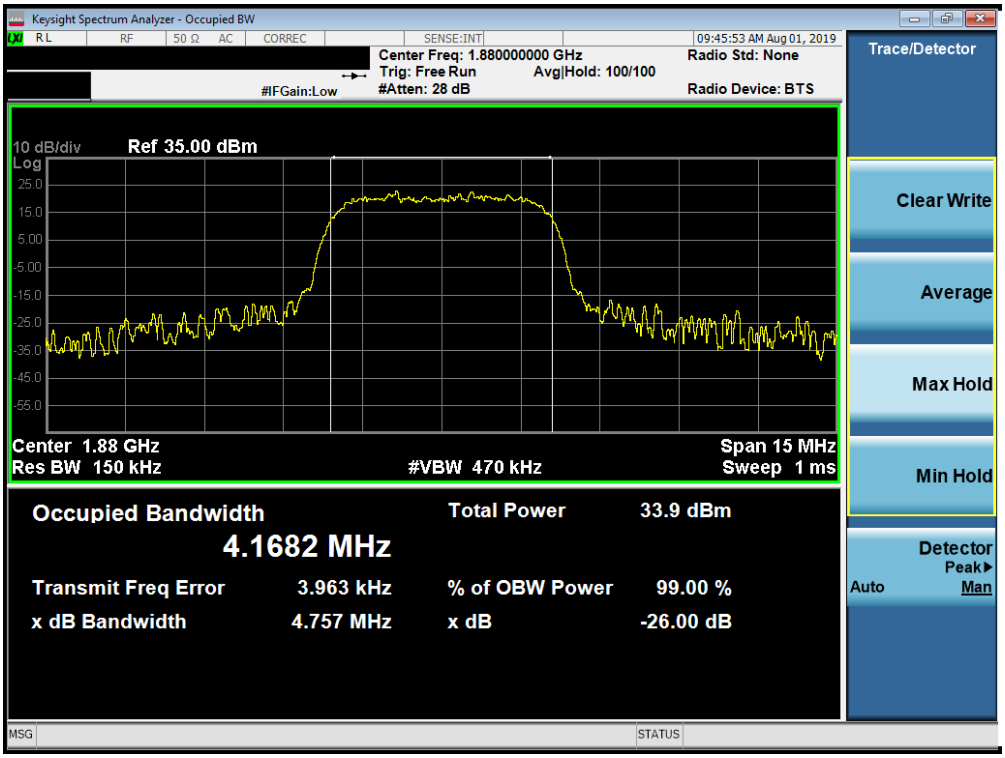

**Plot 7-7. Occupied Bandwidth Plot (Cellular WCDMA Mode)**




**Plot 7-8. Occupied Bandwidth Plot (AWS WCDMA Mode)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.




**Plot 7-9. Occupied Bandwidth Plot (PCS WCDMA Mode)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## 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 + 10log$_{10}$(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.

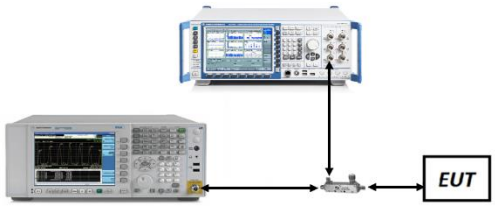



**Figure 7-2. Test Instrument & Measurement Setup**

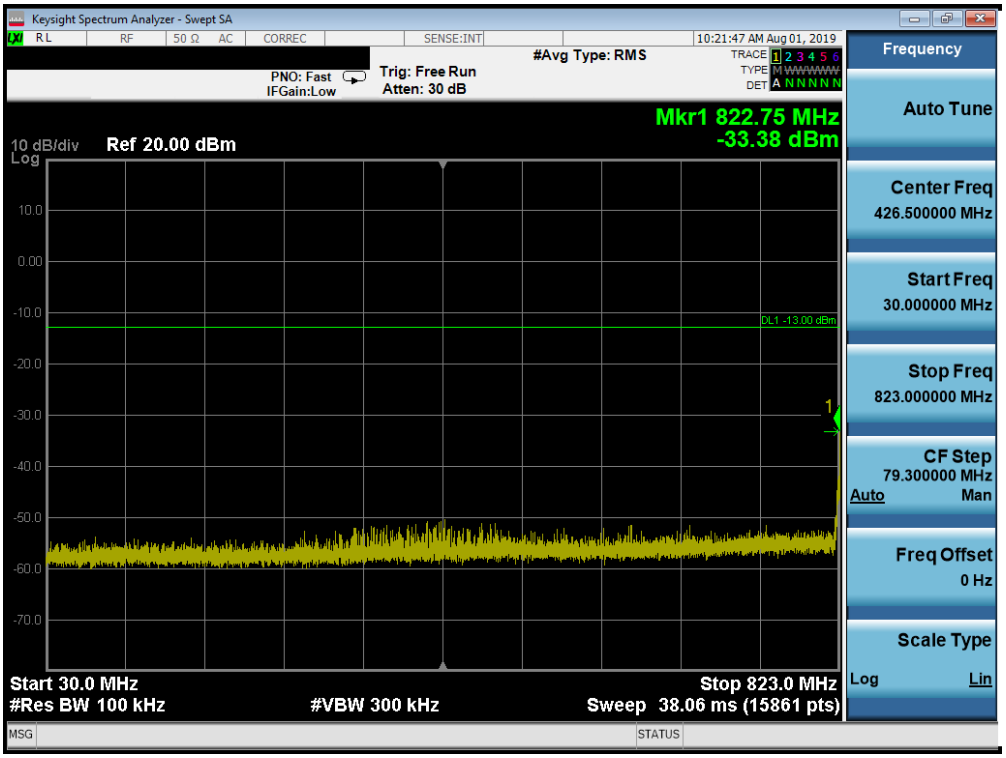
### Test Notes

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.

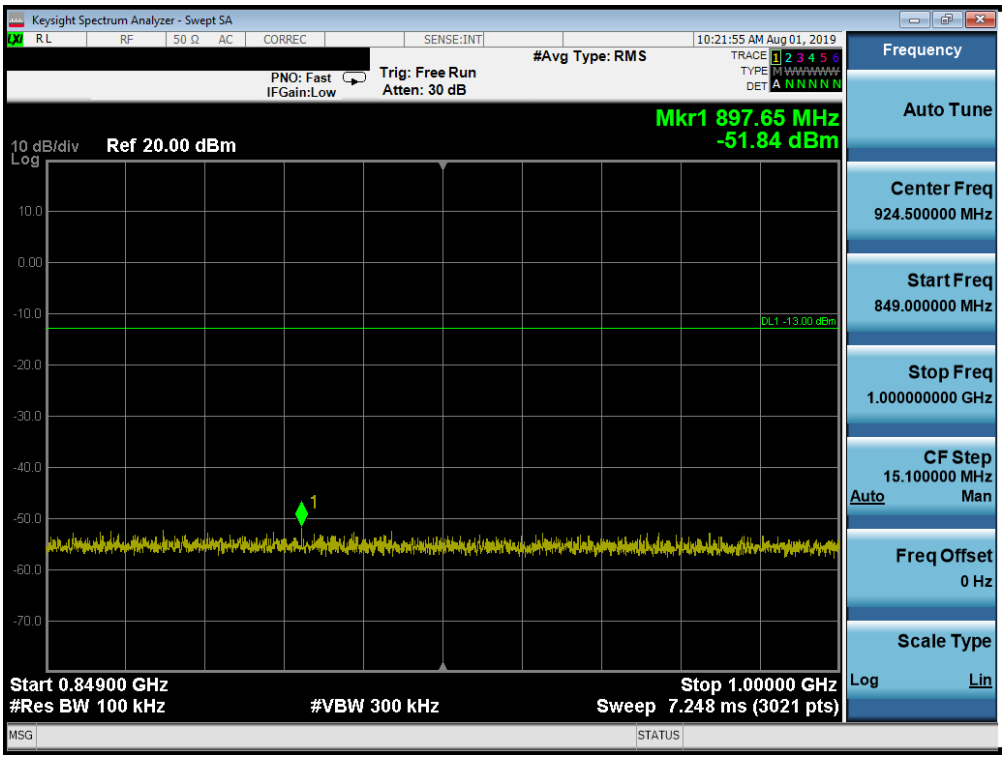


© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Cellular GPRS Mode



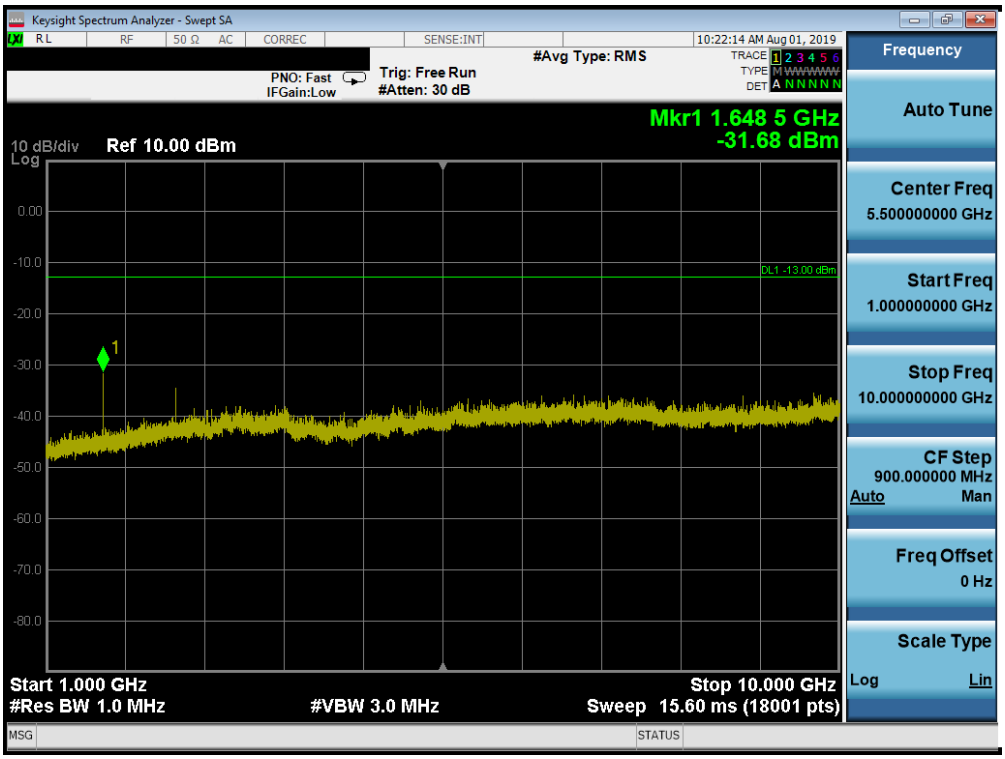

**Plot 7-10. Conducted Spurious Plot (Cellular GPRS Mode - Low Channel)**



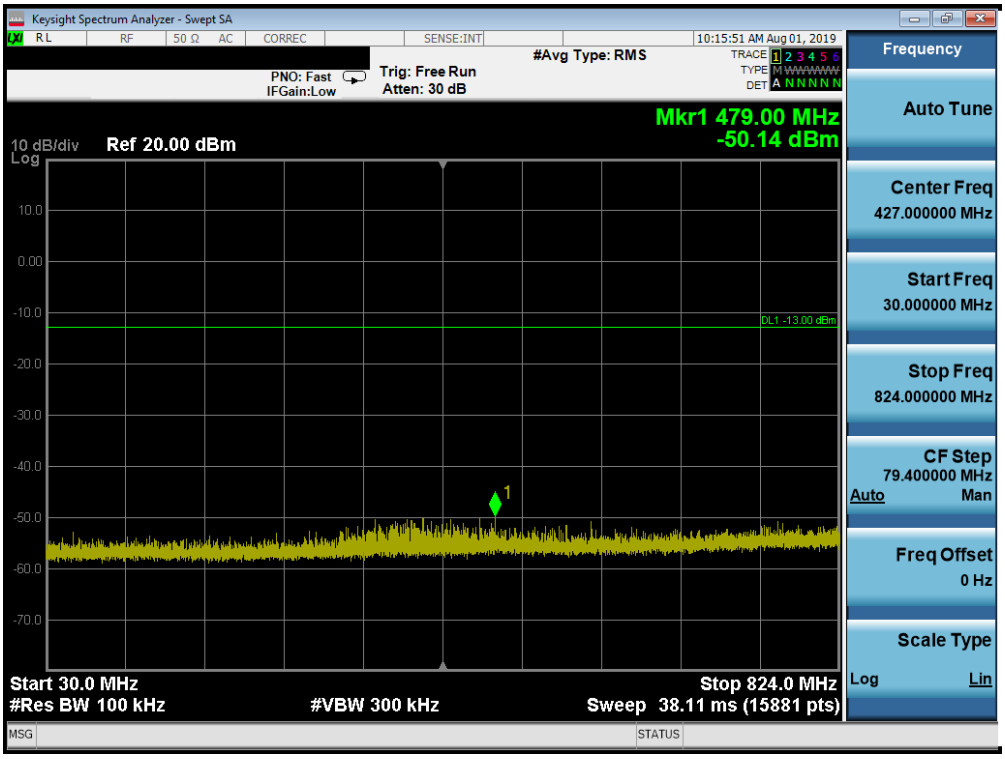

**Plot 7-11. Conducted Spurious Plot (Cellular GPRS Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



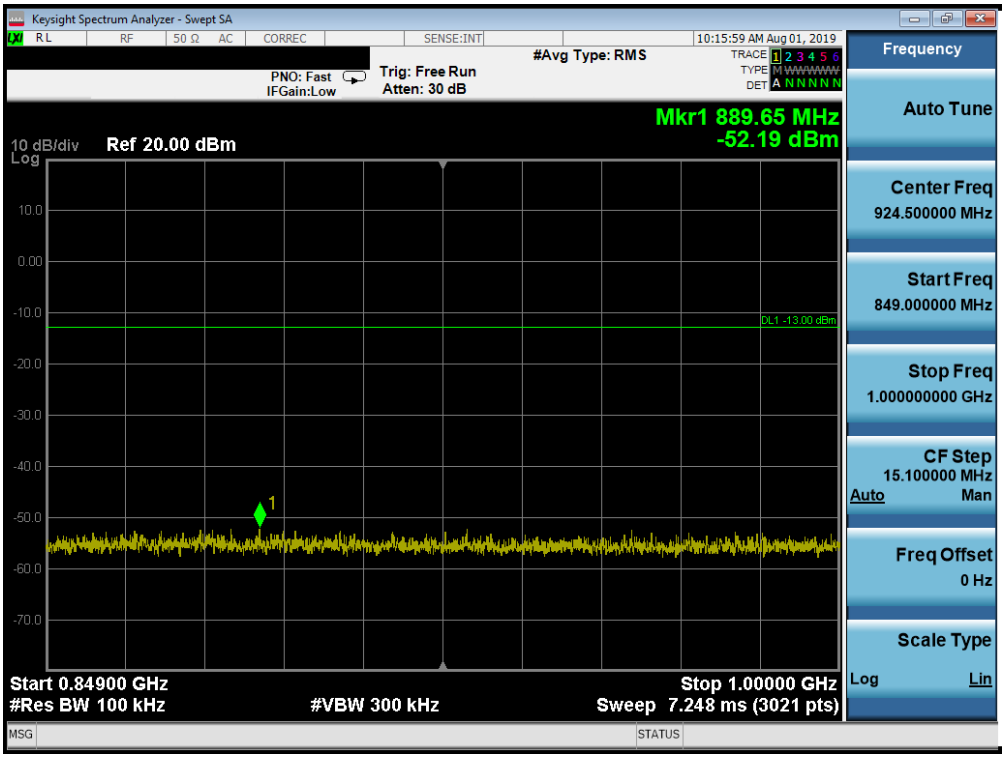

**Plot 7-12. Conducted Spurious Plot (Cellular GPRS Mode - Low Channel)**



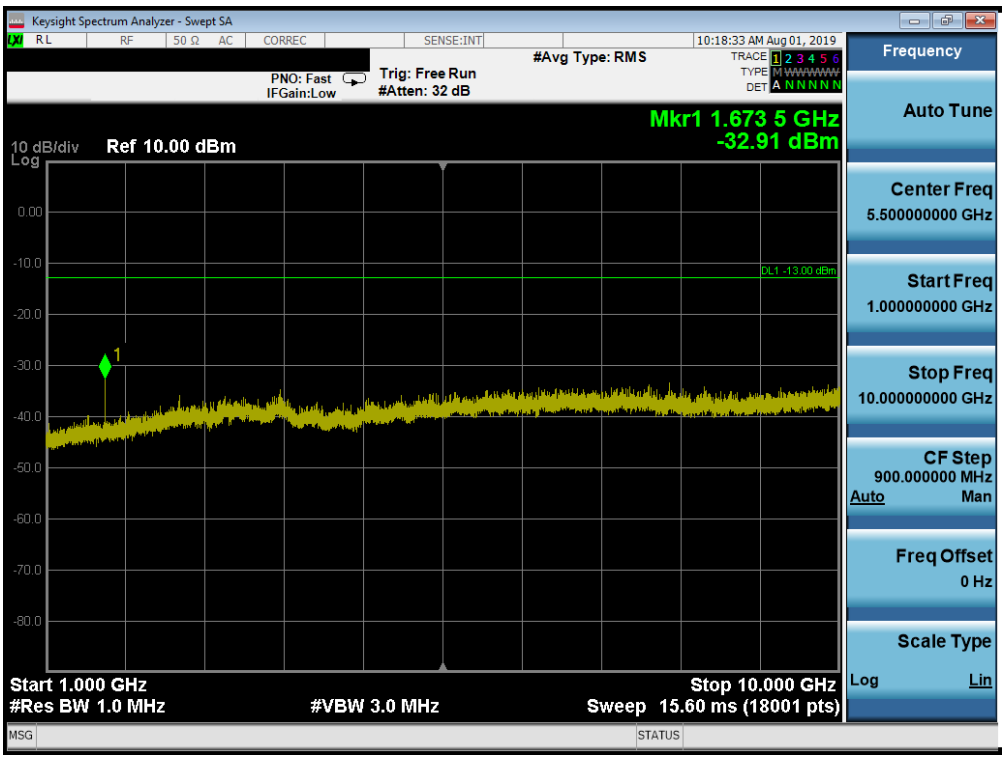

**Plot 7-13. Conducted Spurious Plot (Cellular GPRS Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



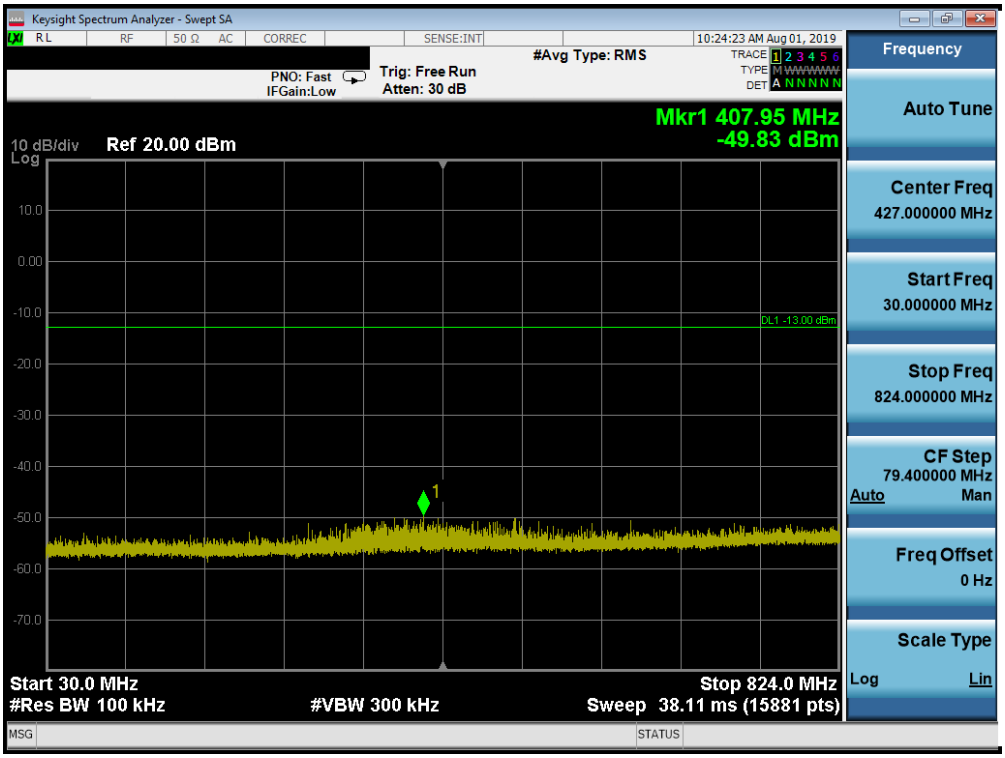

**Plot 7-14. Conducted Spurious Plot (Cellular GPRS Mode - Mid Channel)**



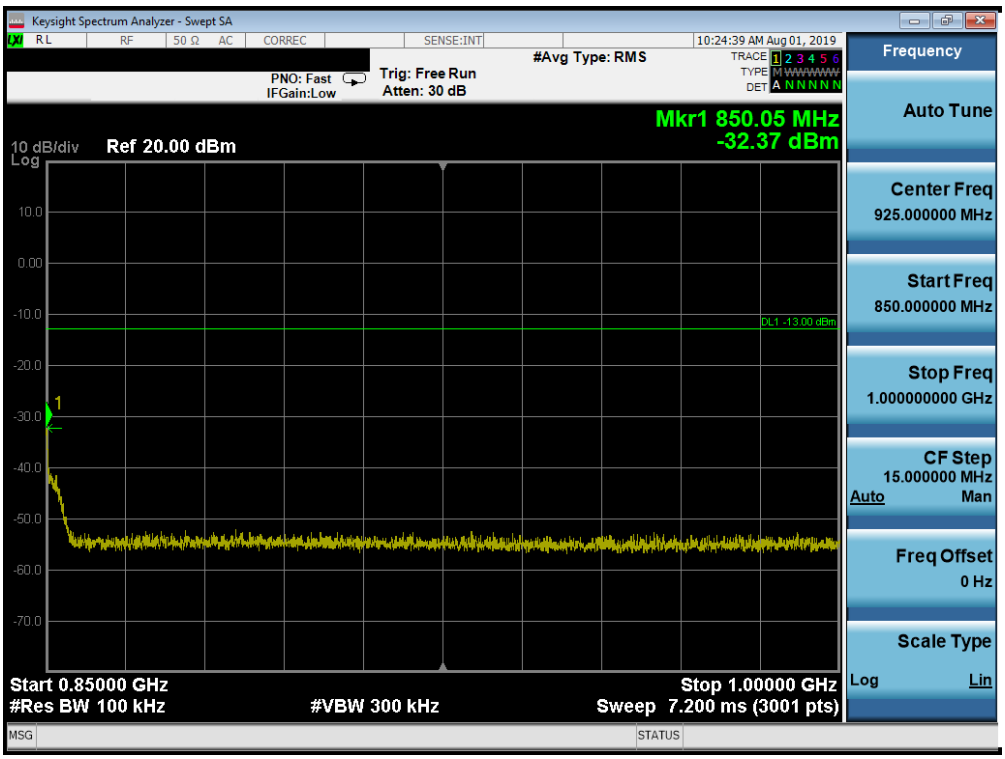

**Plot 7-15. Conducted Spurious Plot (Cellular GPRS Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



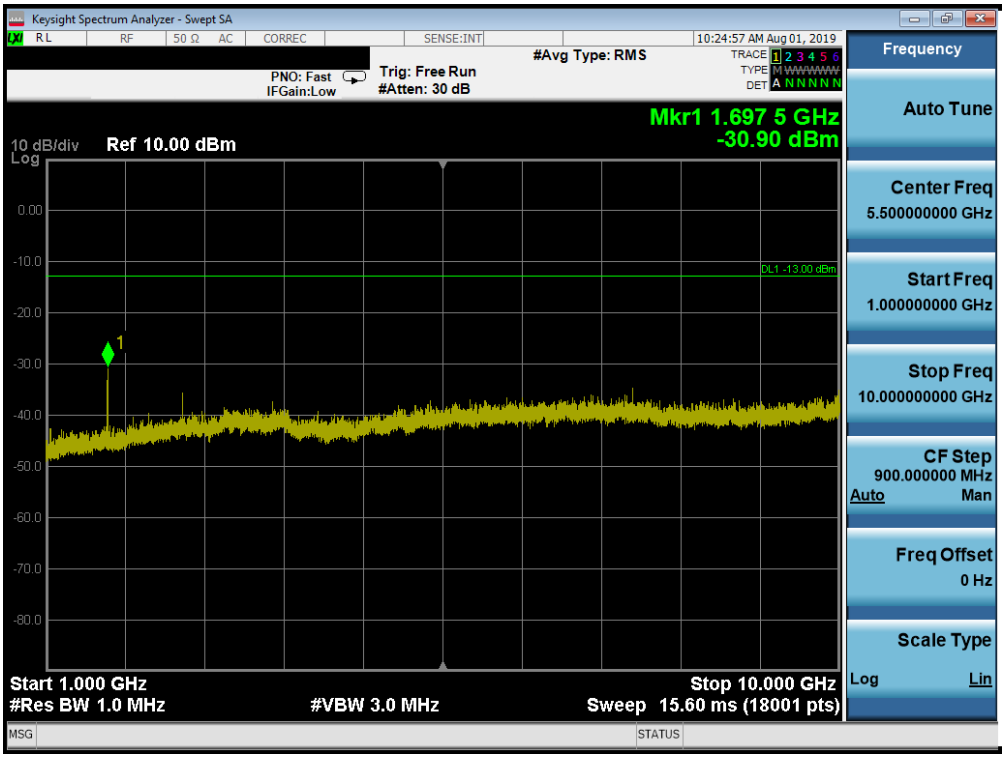

**Plot 7-16. Conducted Spurious Plot (Cellular GPRS Mode - High Channel)**




**Plot 7-17. Conducted Spurious Plot (Cellular GPRS Mode - High Channel)**



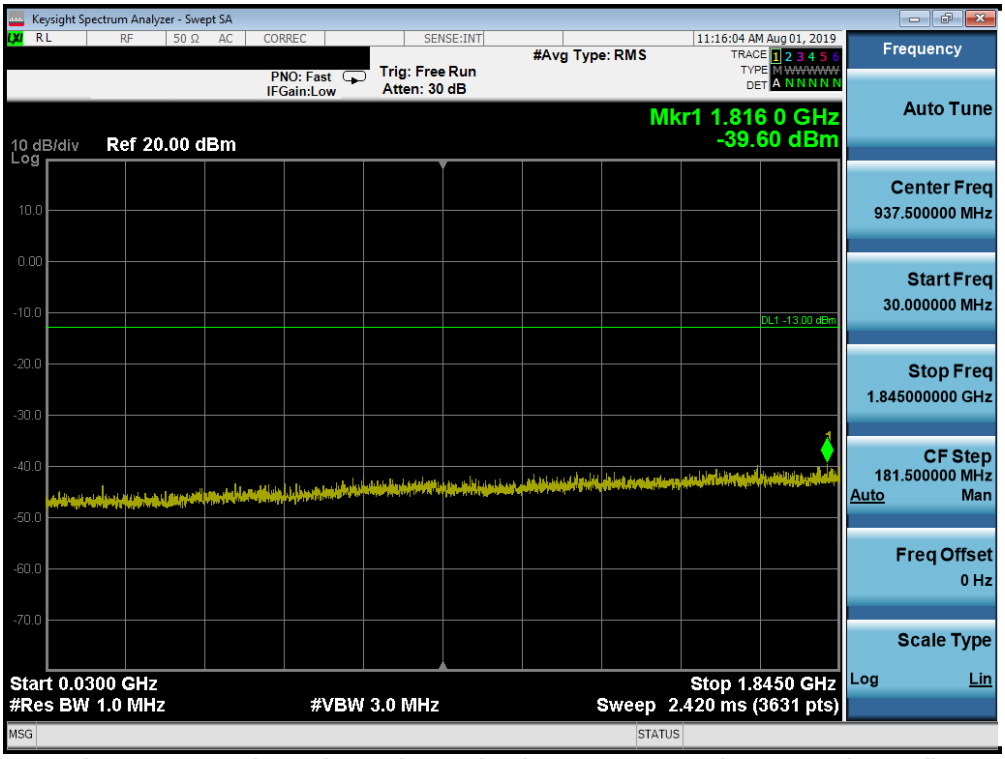

© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



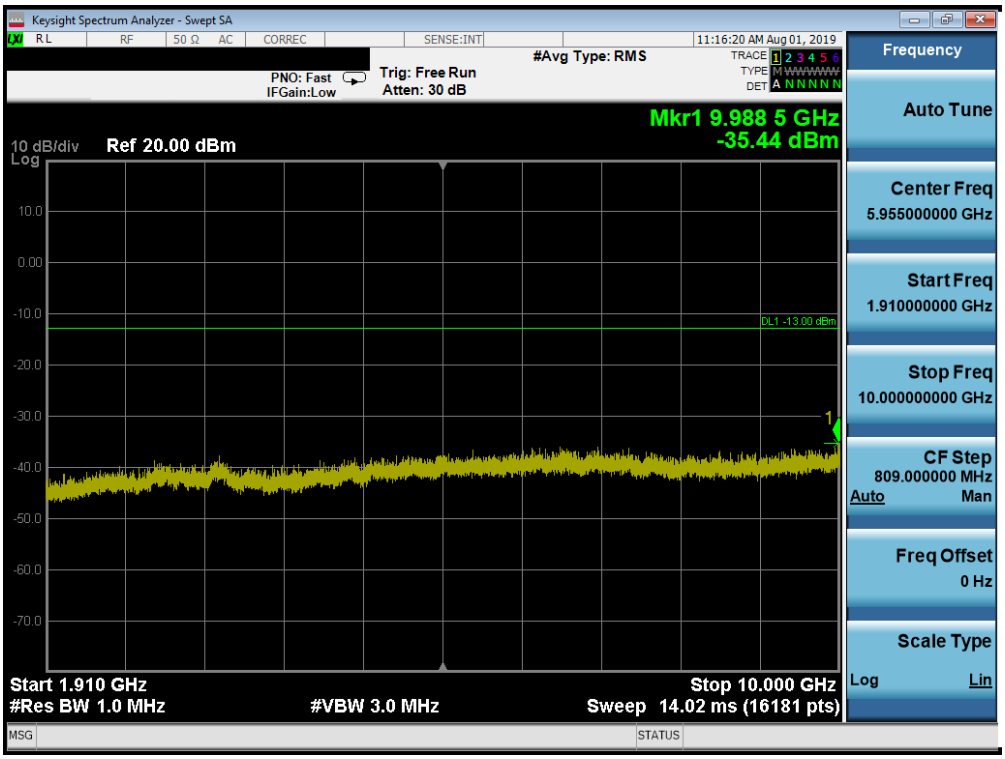

**Plot 7-18. Conducted Spurious Plot (Cellular GPRS Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



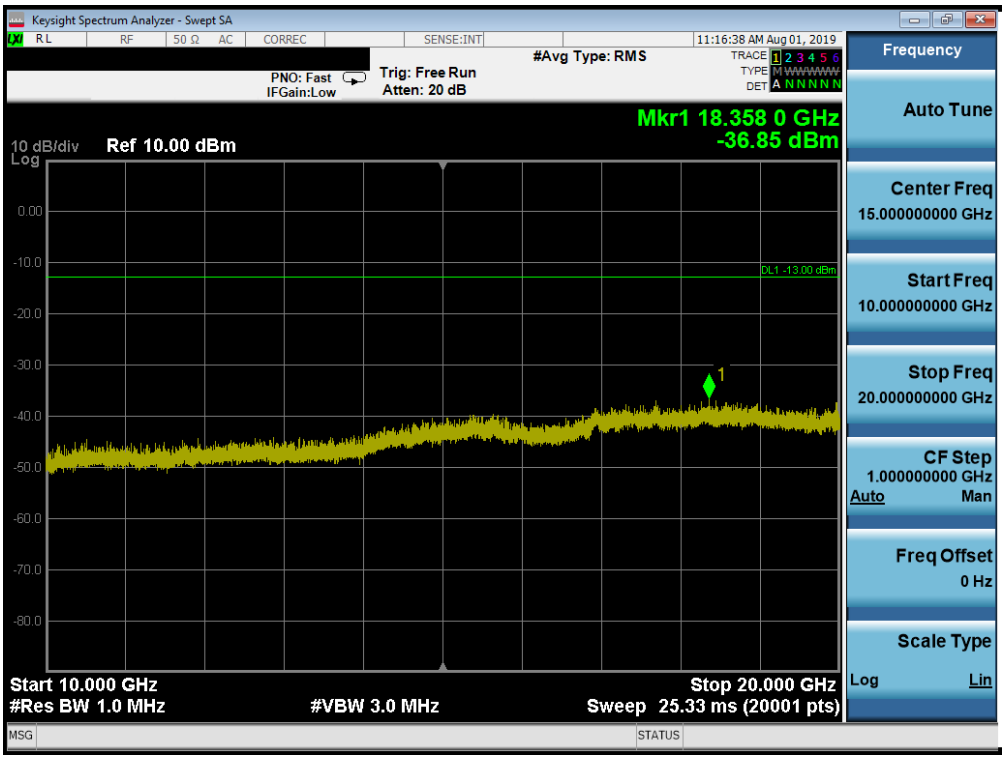

**Plot 7-19. Conducted Spurious Plot (PCS GPRS Mode - Low Channel)**



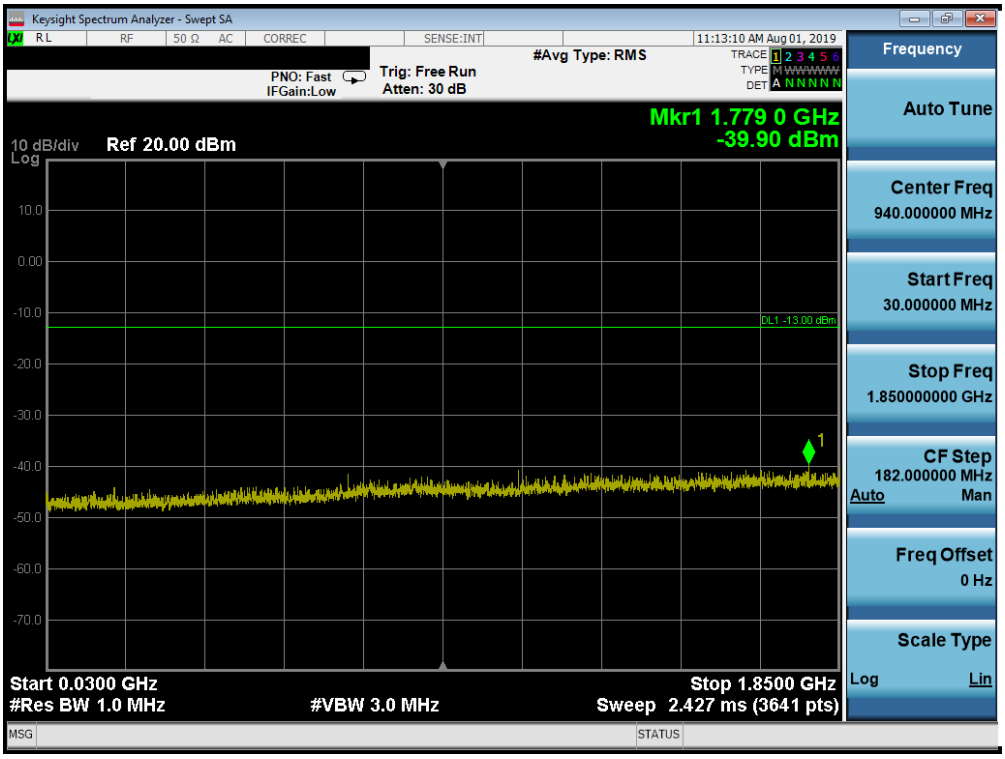

**Plot 7-20. Conducted Spurious Plot (PCS GPRS Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



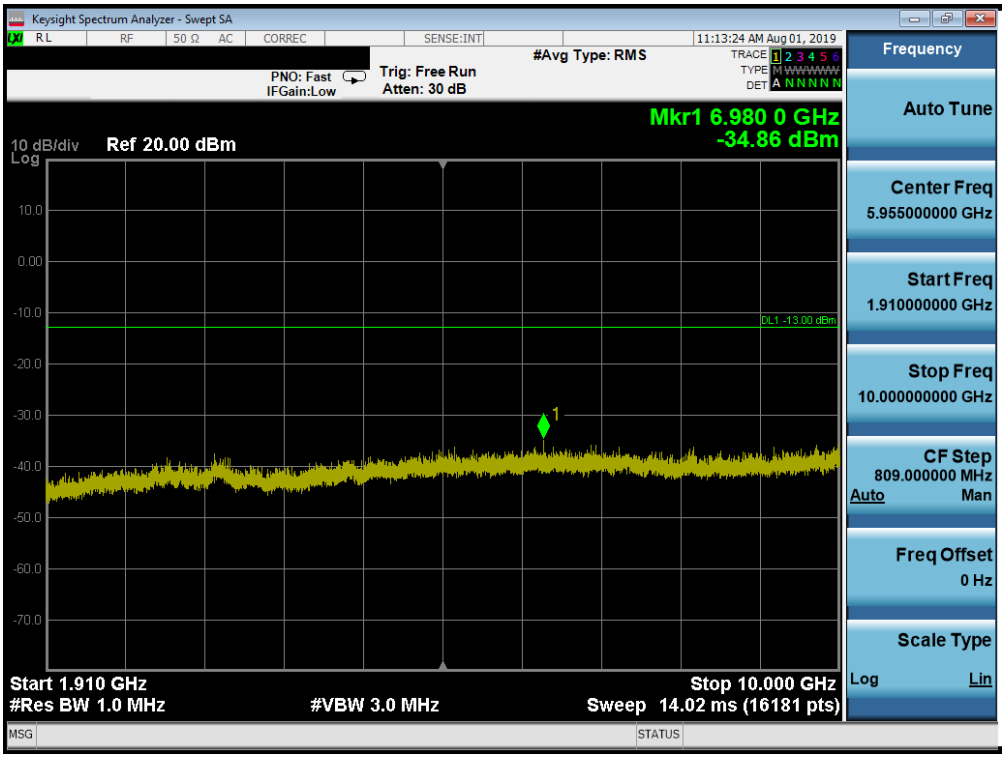

**Plot 7-21. Conducted Spurious Plot (PCS GPRS Mode - Low Channel)**



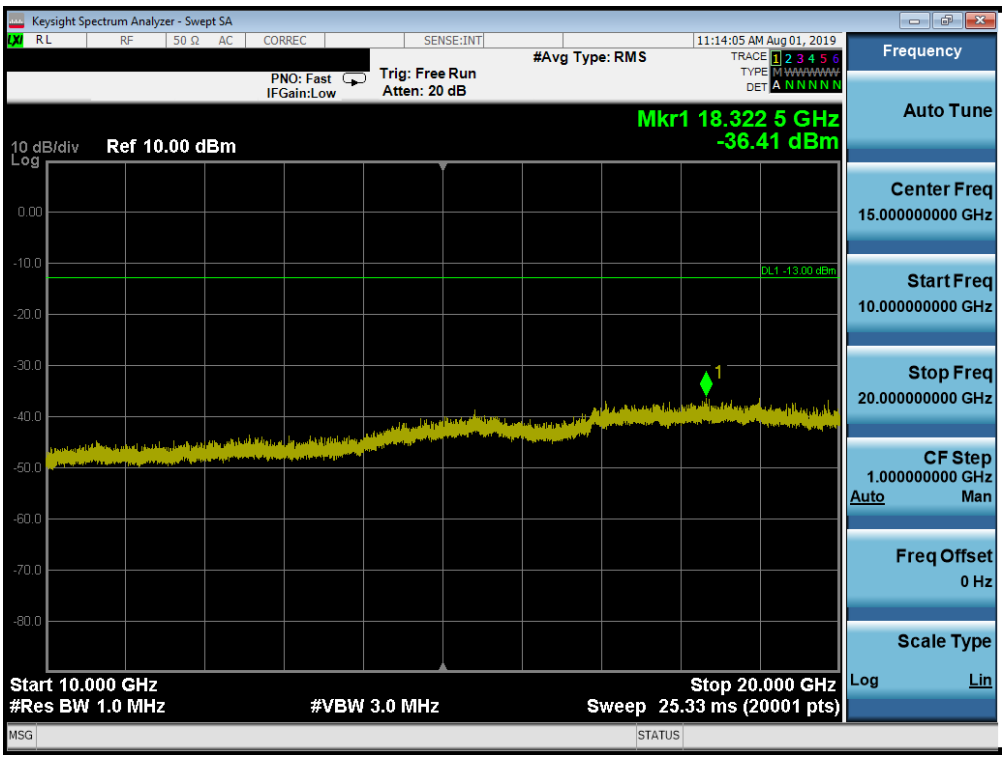

**Plot 7-22. Conducted Spurious Plot (PCS GPRS Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



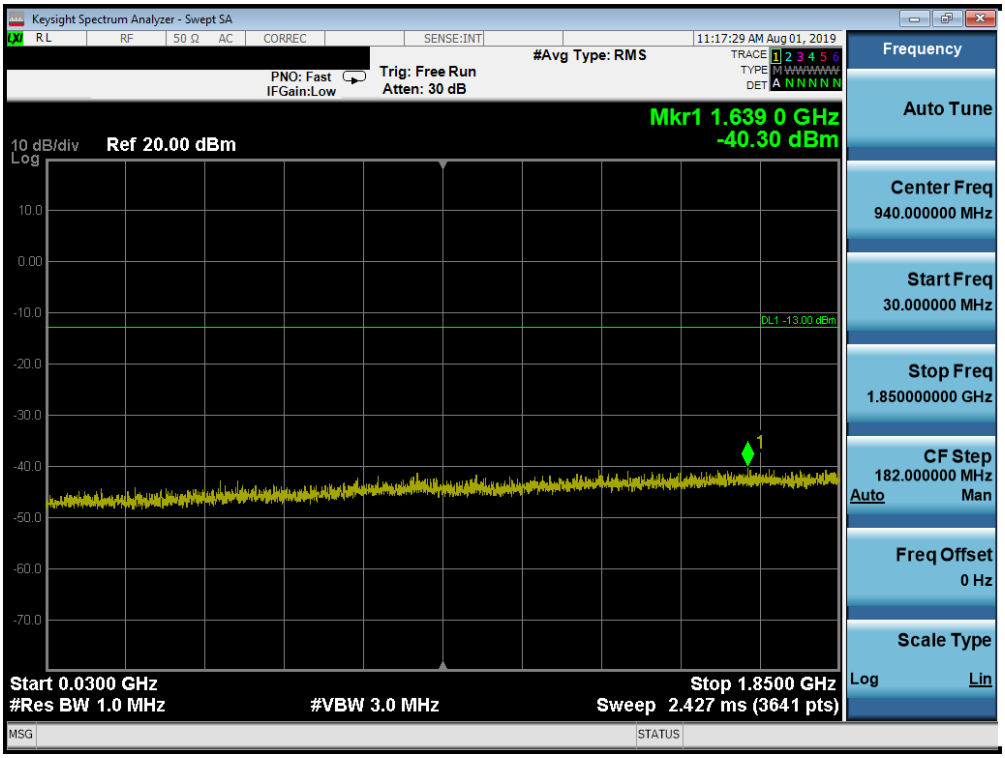

**Plot 7-23. Conducted Spurious Plot (PCS GPRS Mode - Mid Channel)**



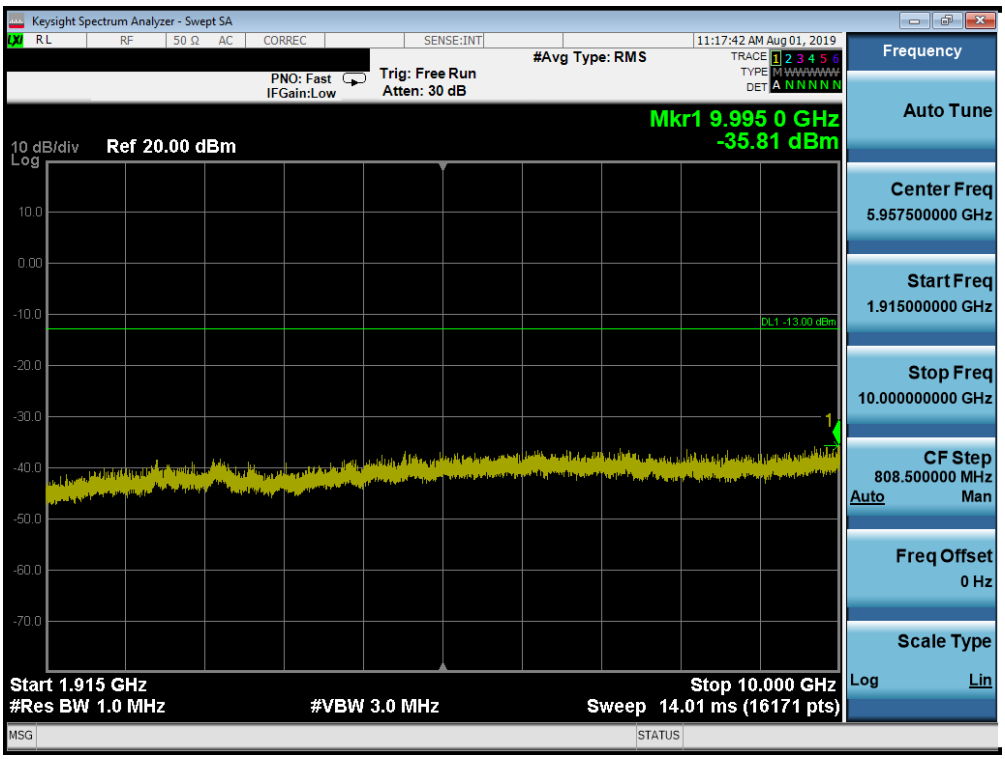

**Plot 7-24. Conducted Spurious Plot (PCS GPRS Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



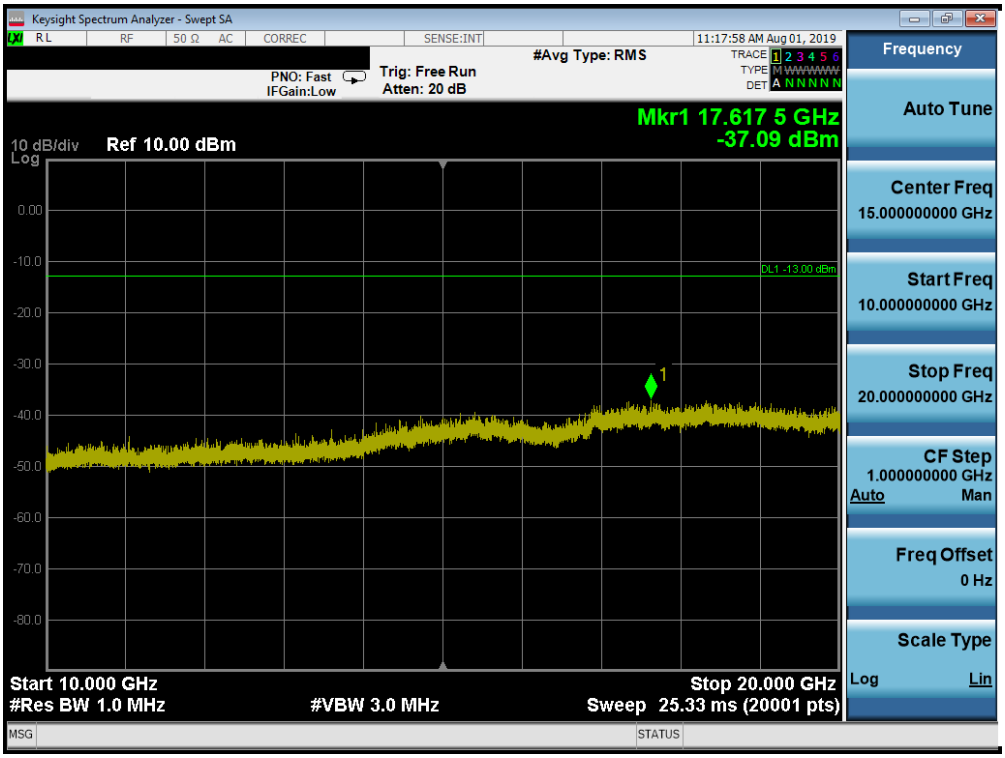

**Plot 7-25. Conducted Spurious Plot (PCS GPRS Mode - High Channel)**




**Plot 7-26. Conducted Spurious Plot (PCS GPRS Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

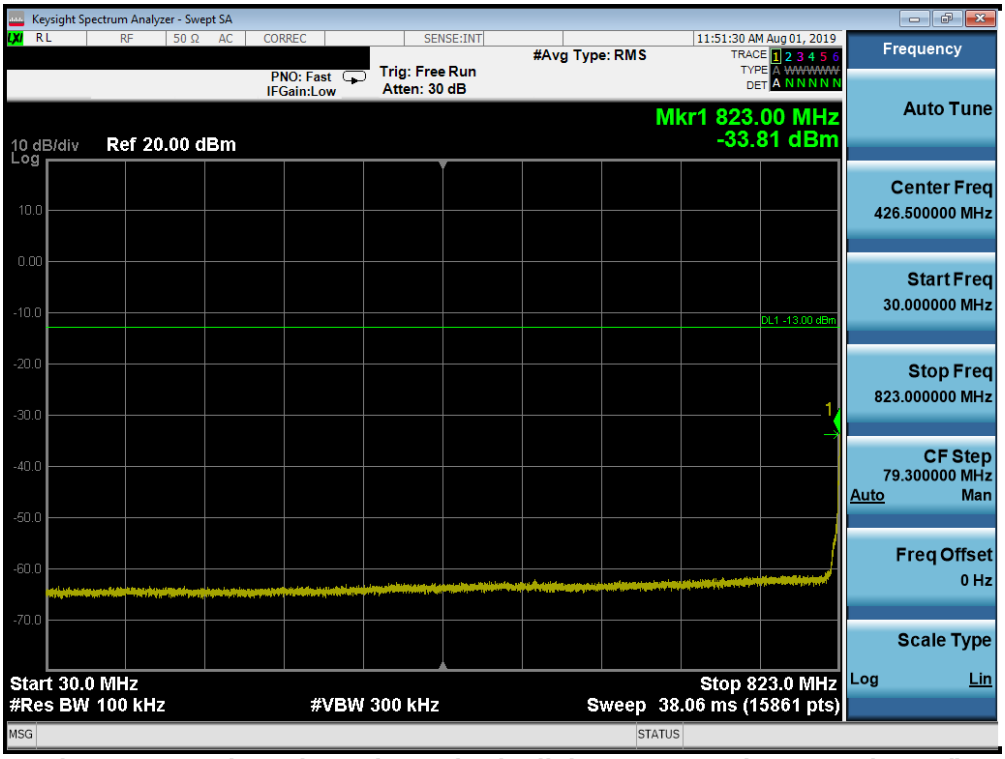



**Plot 7-27. Conducted Spurious Plot (PCS GPRS Mode - High Channel)**

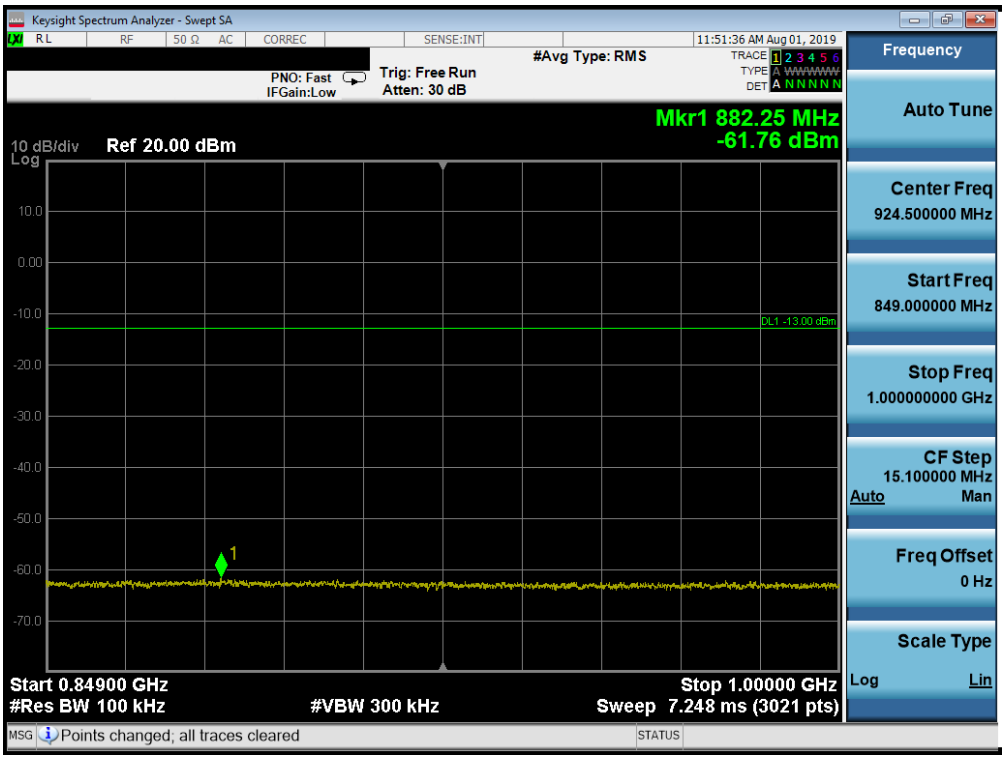



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Cellular CDMA Mode



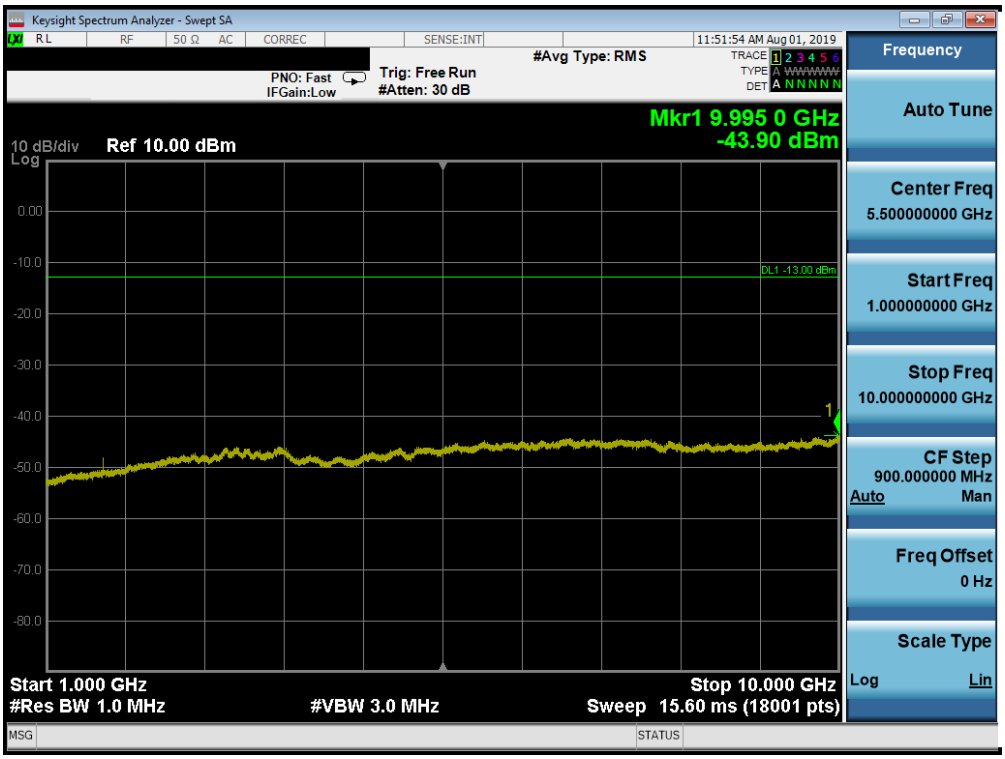

**Plot 7-28. Conducted Spurious Plot (Cellular CDMA Mode - Low Channel)**



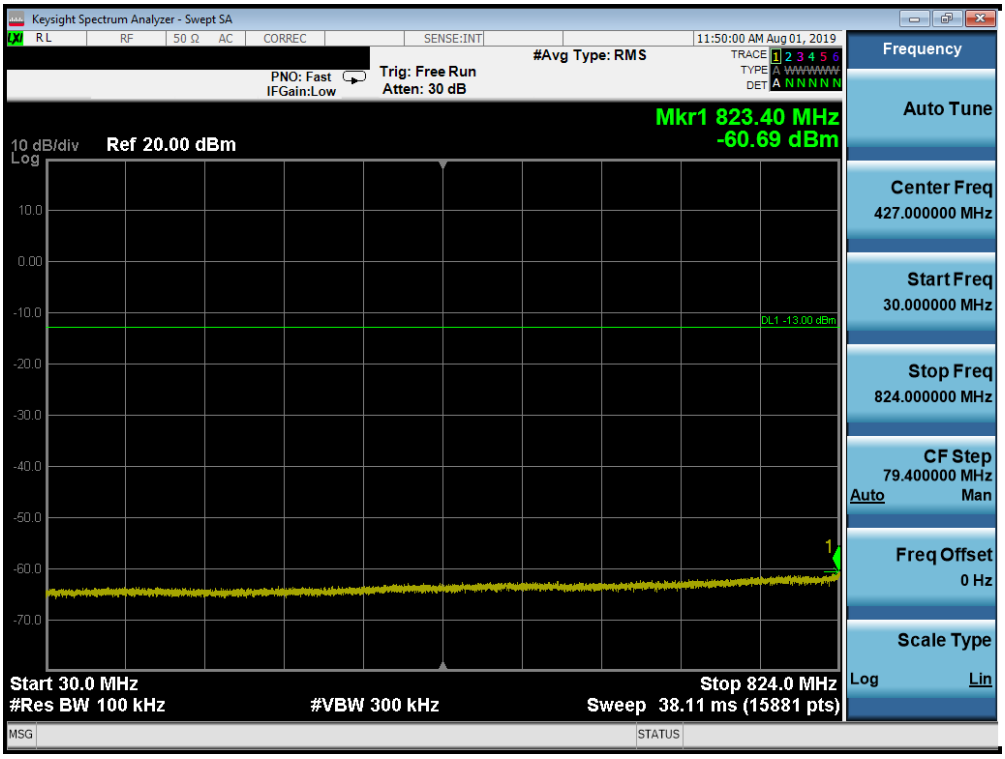

**Plot 7-29. Conducted Spurious Plot (Cellular CDMA Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



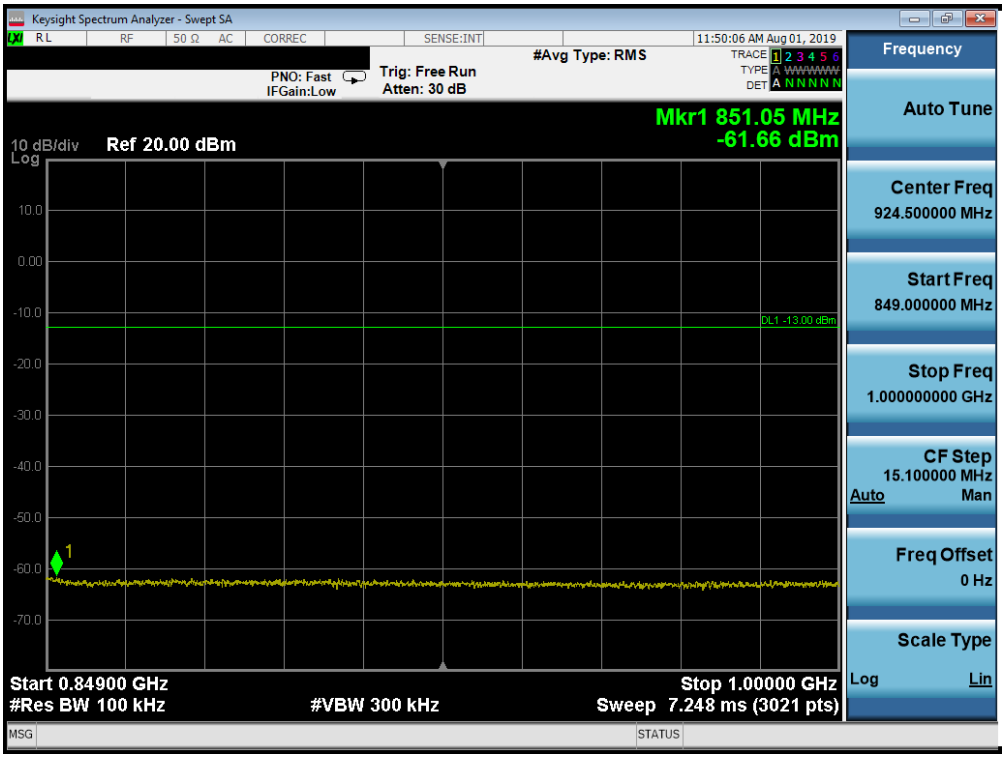

**Plot 7-30. Conducted Spurious Plot (Cellular CDMA Mode - Low Channel)**



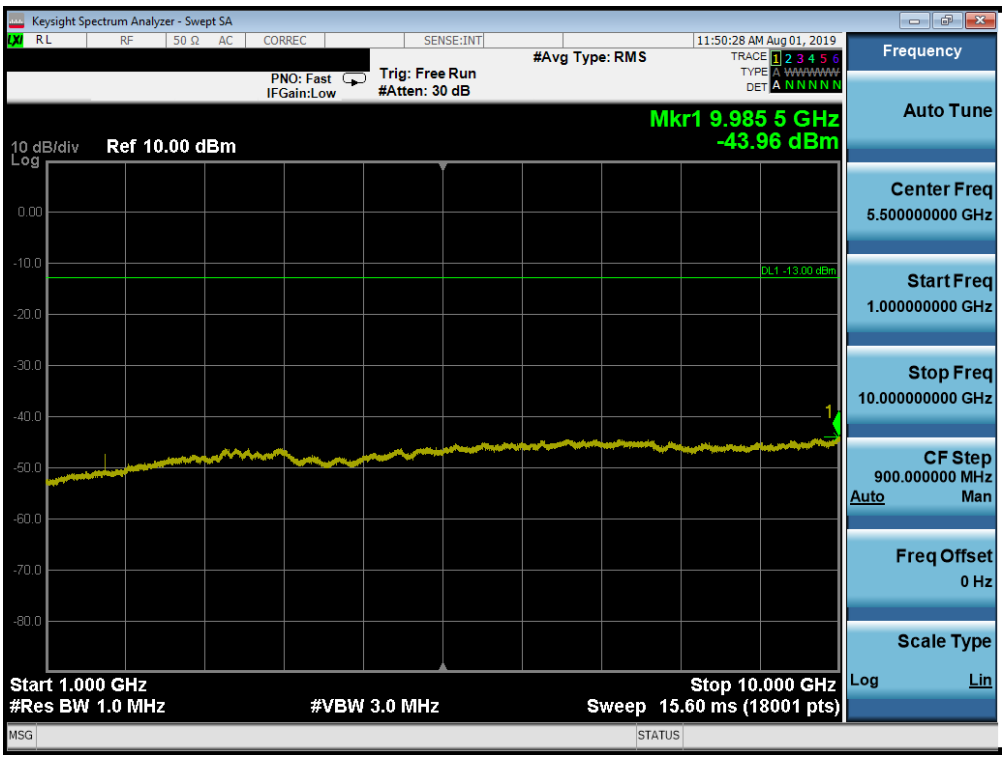

**Plot 7-31. Conducted Spurious Plot (Cellular CDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



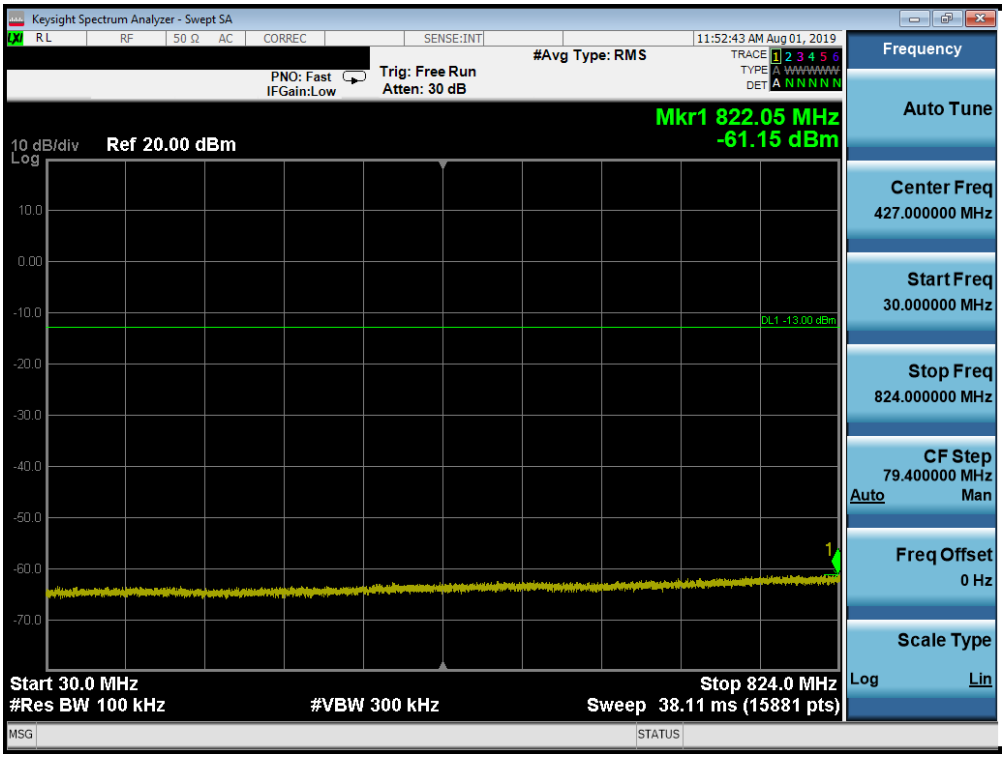

**Plot 7-32. Conducted Spurious Plot (Cellular CDMA Mode - Mid Channel)**



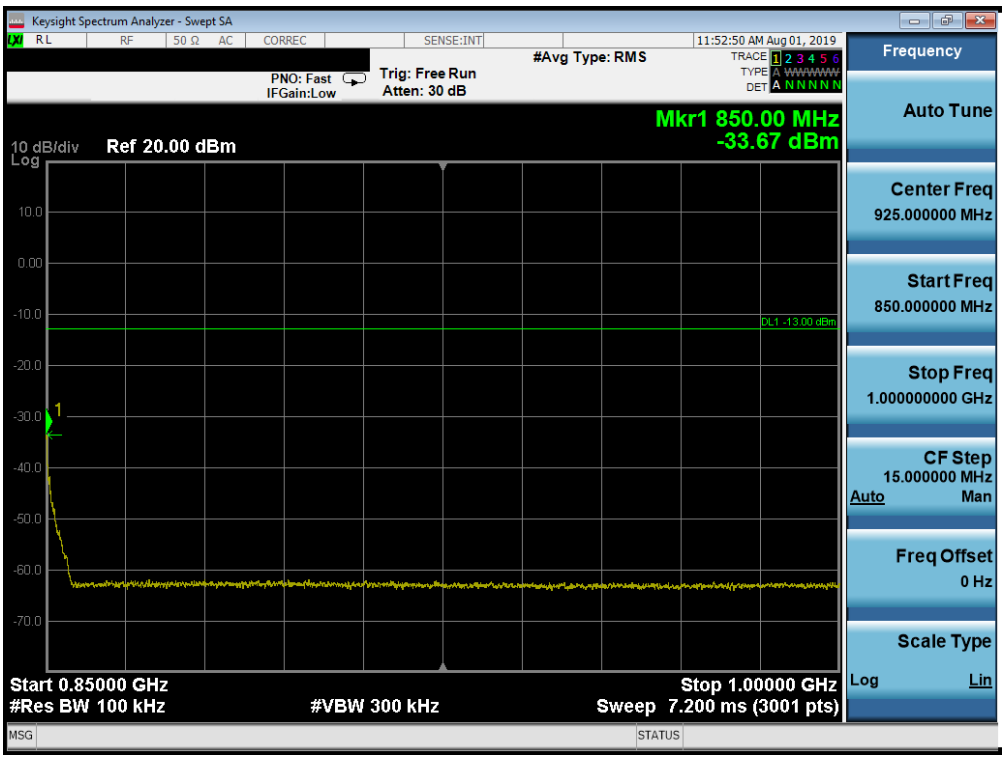

**Plot 7-33. Conducted Spurious Plot (Cellular CDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



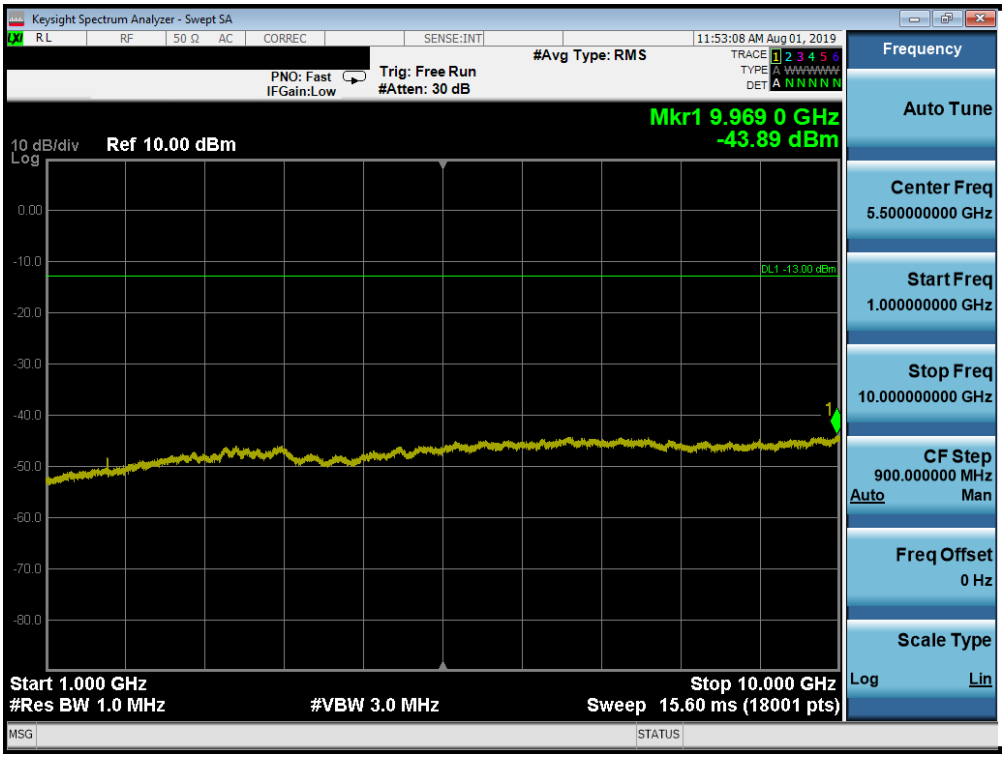

**Plot 7-34. Conducted Spurious Plot (Cellular CDMA Mode - High Channel)**




**Plot 7-35. Conducted Spurious Plot (Cellular CDMA Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

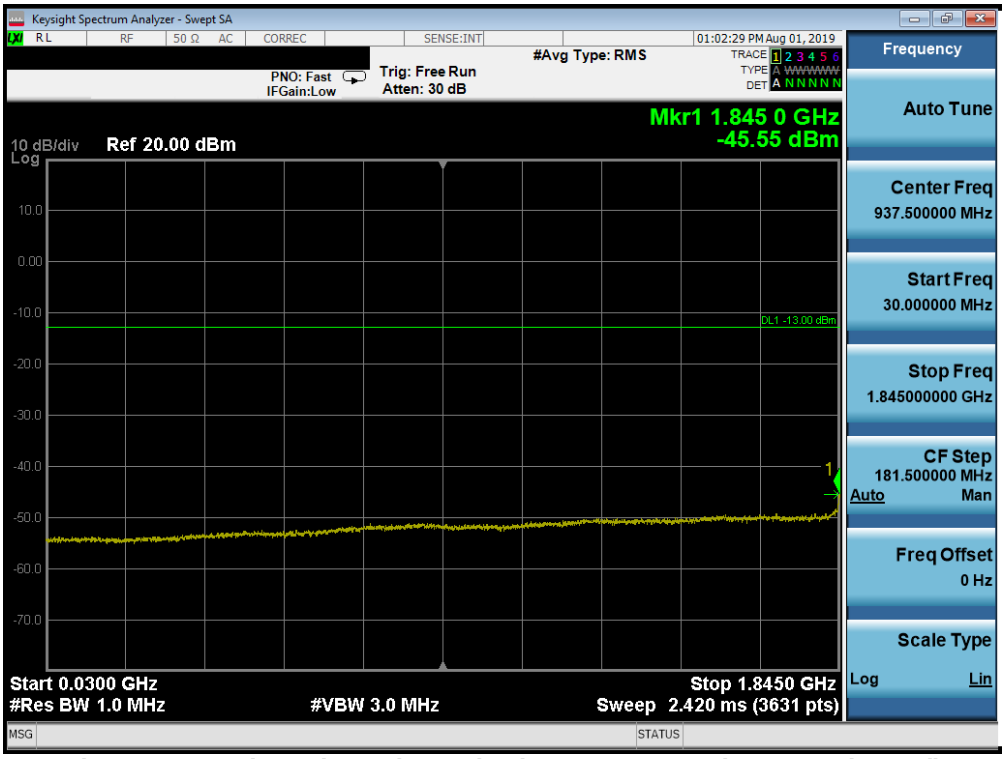



**Plot 7-36. Conducted Spurious Plot (Cellular CDMA Mode - High Channel)**

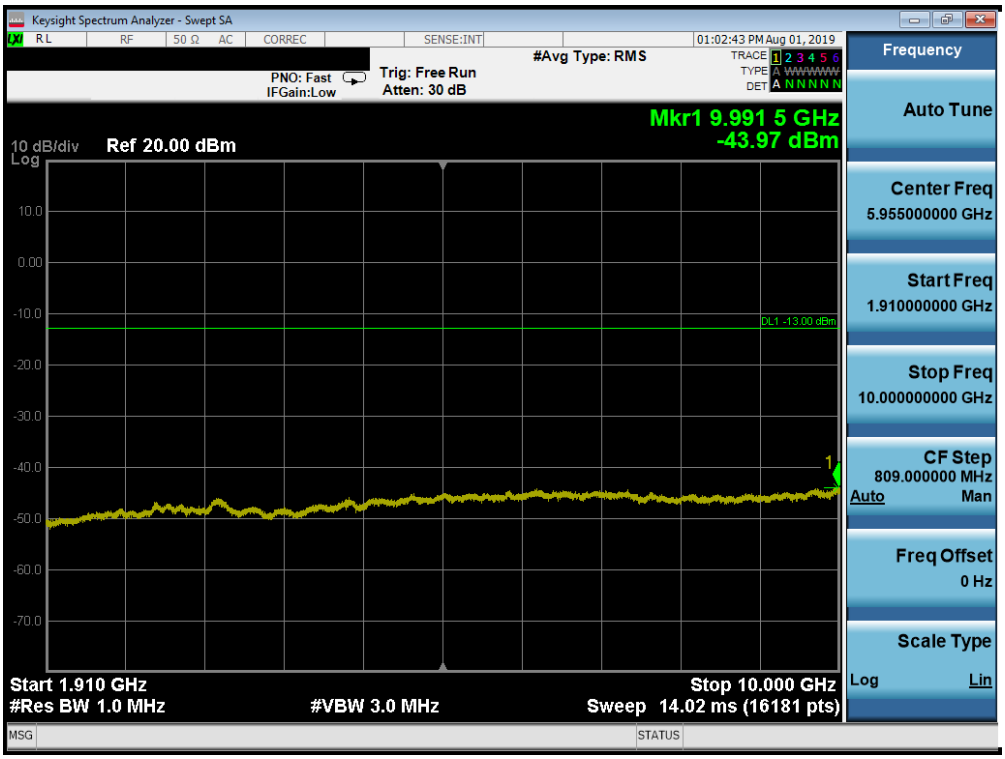



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## PCS CDMA Mode



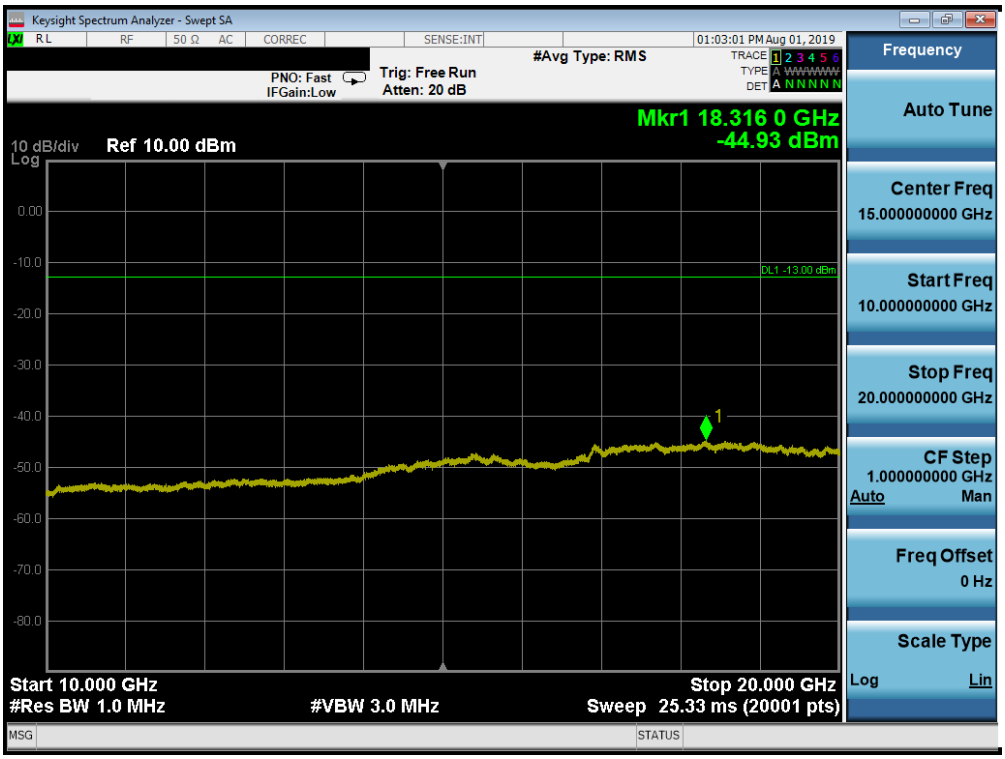

**Plot 7-37. Conducted Spurious Plot (PCS CDMA Mode - Low Channel)**



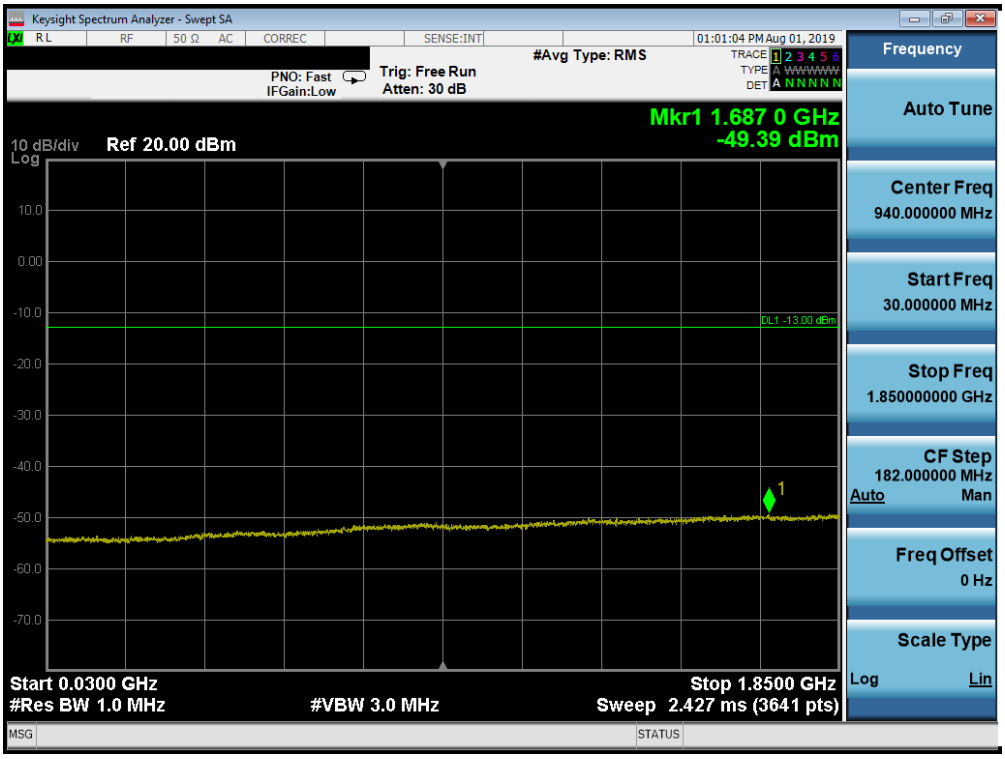

**Plot 7-38. Conducted Spurious Plot (PCS CDMA Mode - Low Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



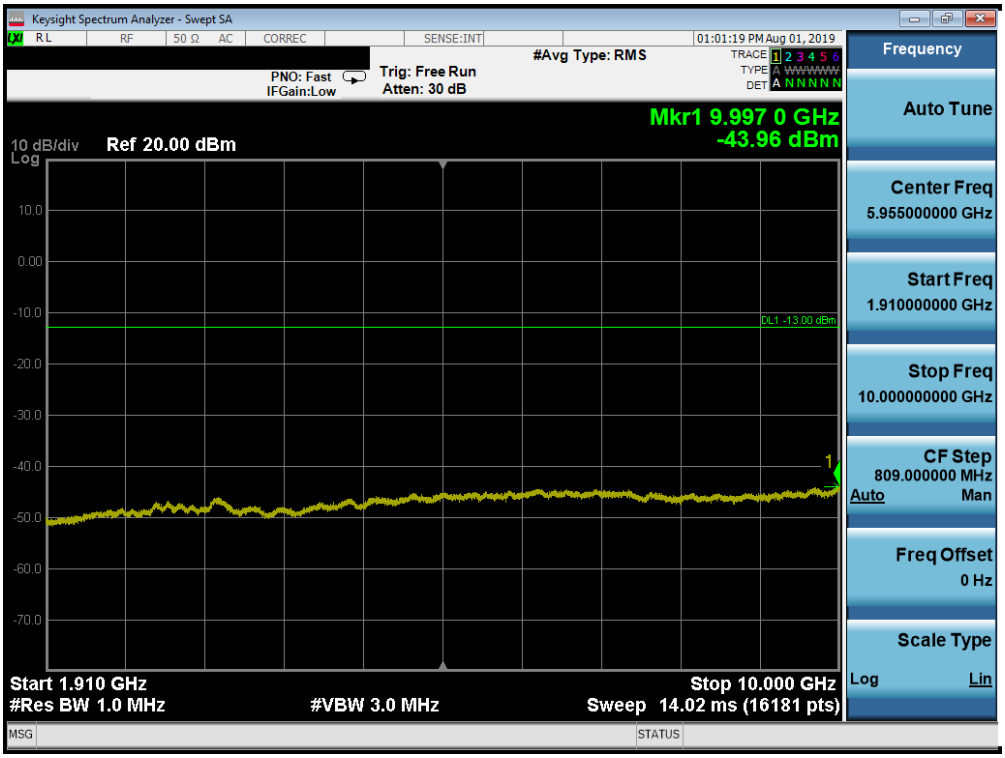

**Plot 7-39. Conducted Spurious Plot (PCS CDMA Mode - Low Channel)**



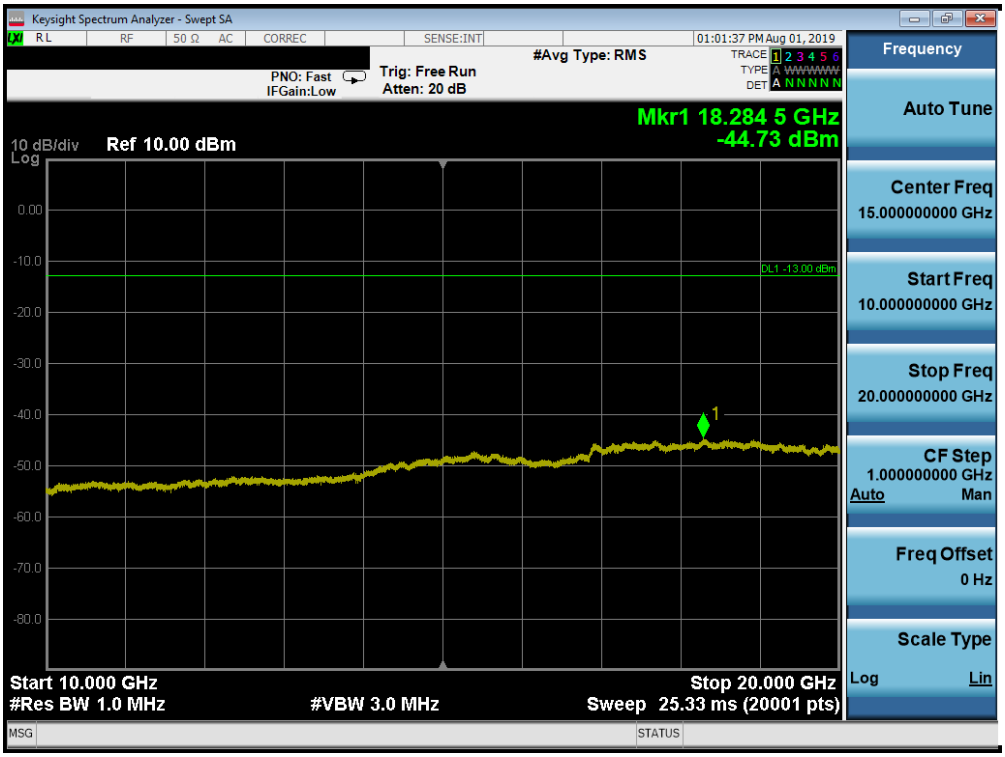

**Plot 7-40. Conducted Spurious Plot (PCS CDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



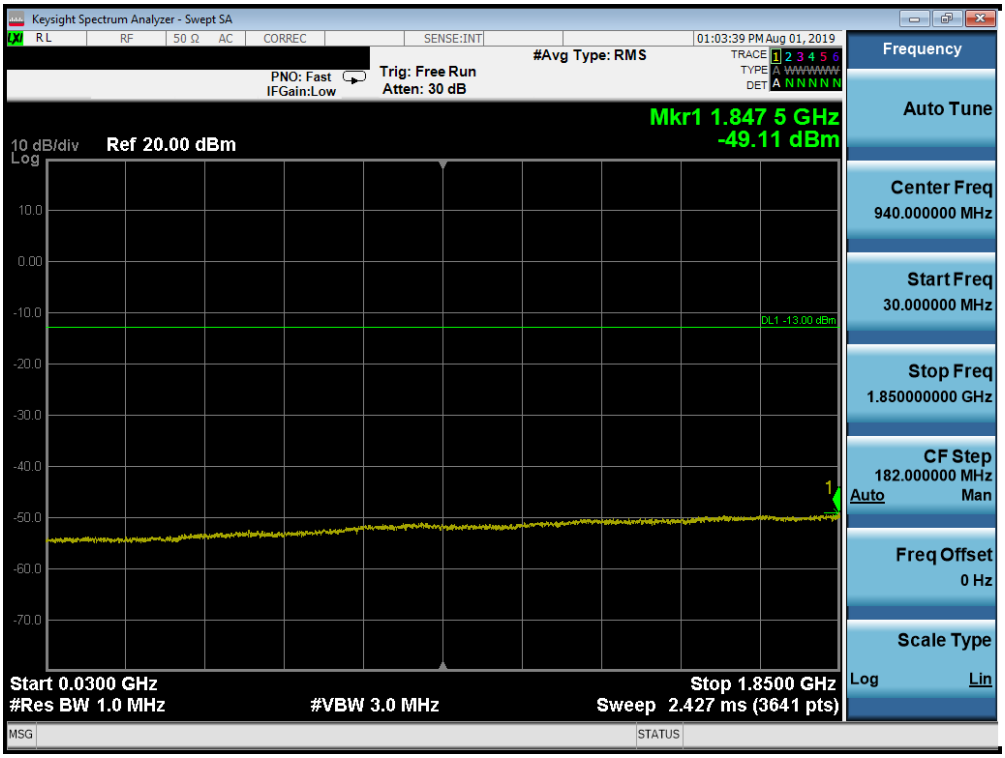

**Plot 7-41. Conducted Spurious Plot (PCS CDMA Mode - Mid Channel)**



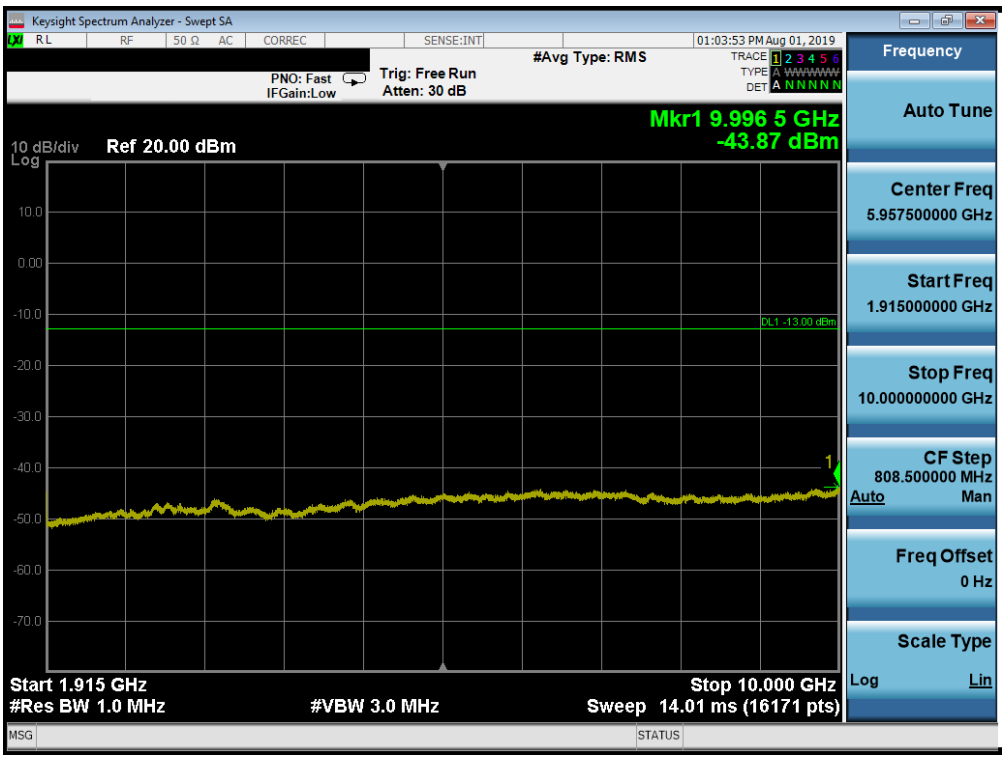

**Plot 7-42. Conducted Spurious Plot (PCS CDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



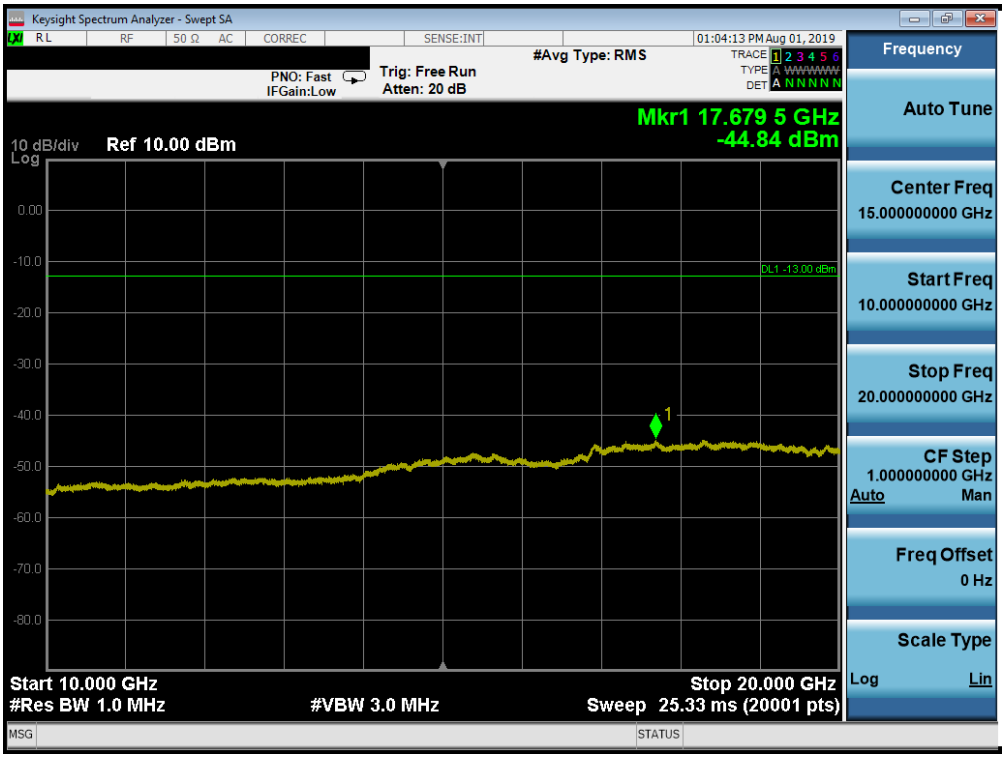

**Plot 7-43. Conducted Spurious Plot (PCS CDMA Mode - High Channel)**




**Plot 7-44. Conducted Spurious Plot (PCS CDMA Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

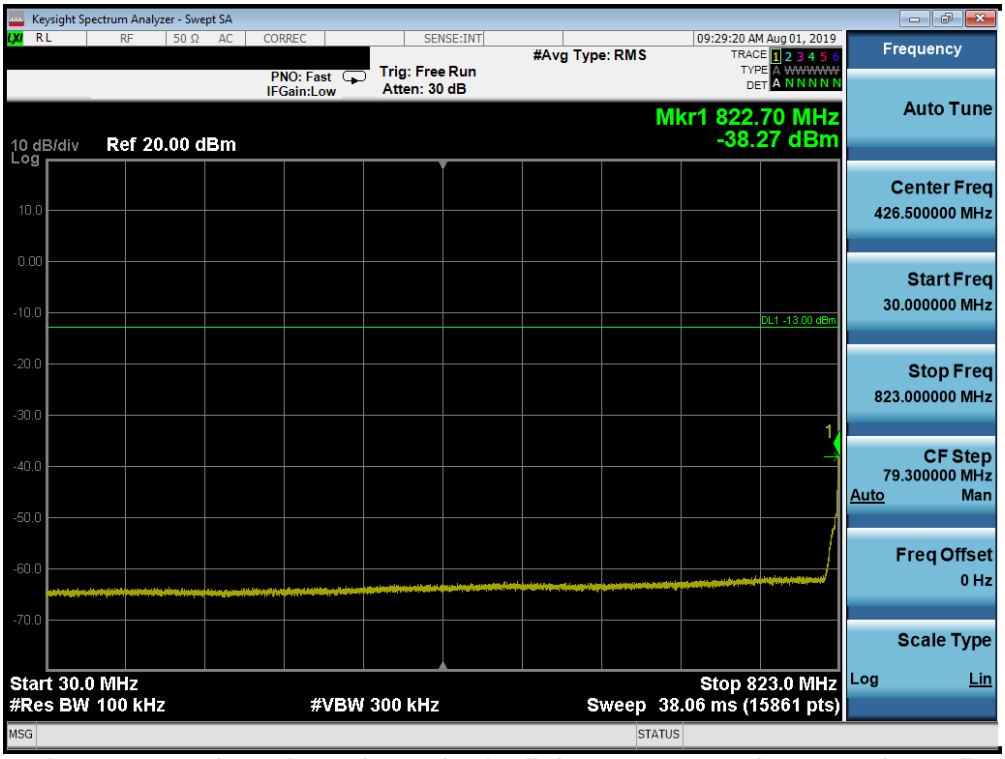



**Plot 7-45. Conducted Spurious Plot (PCS CDMA Mode - High Channel)**

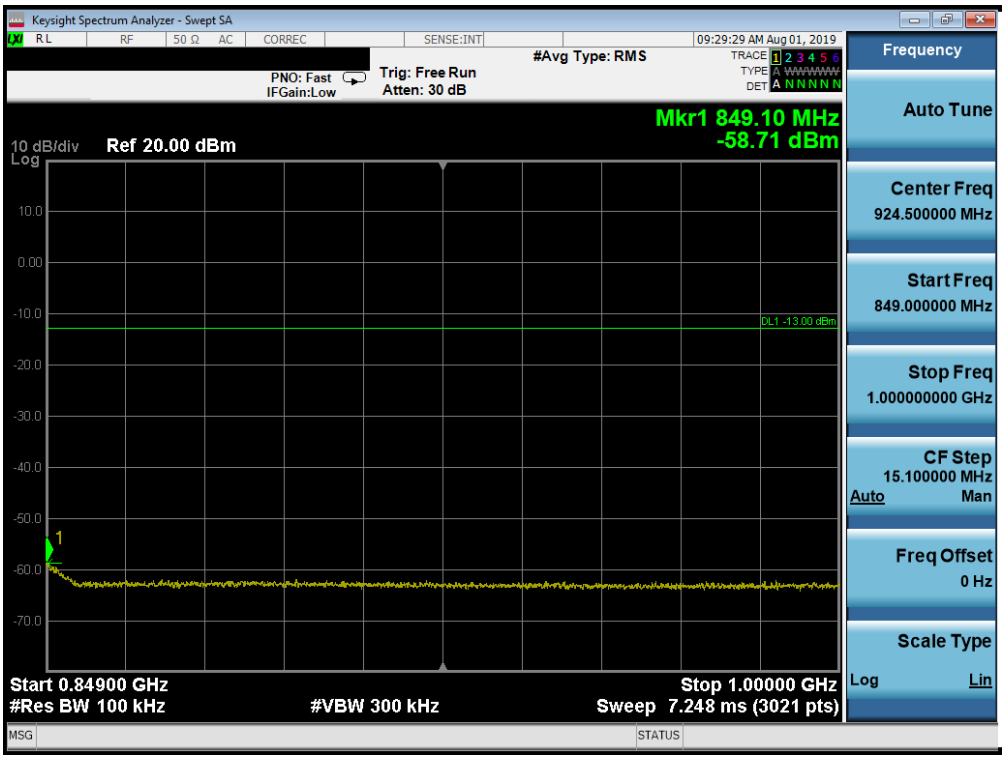



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Cellular WCDMA Mode



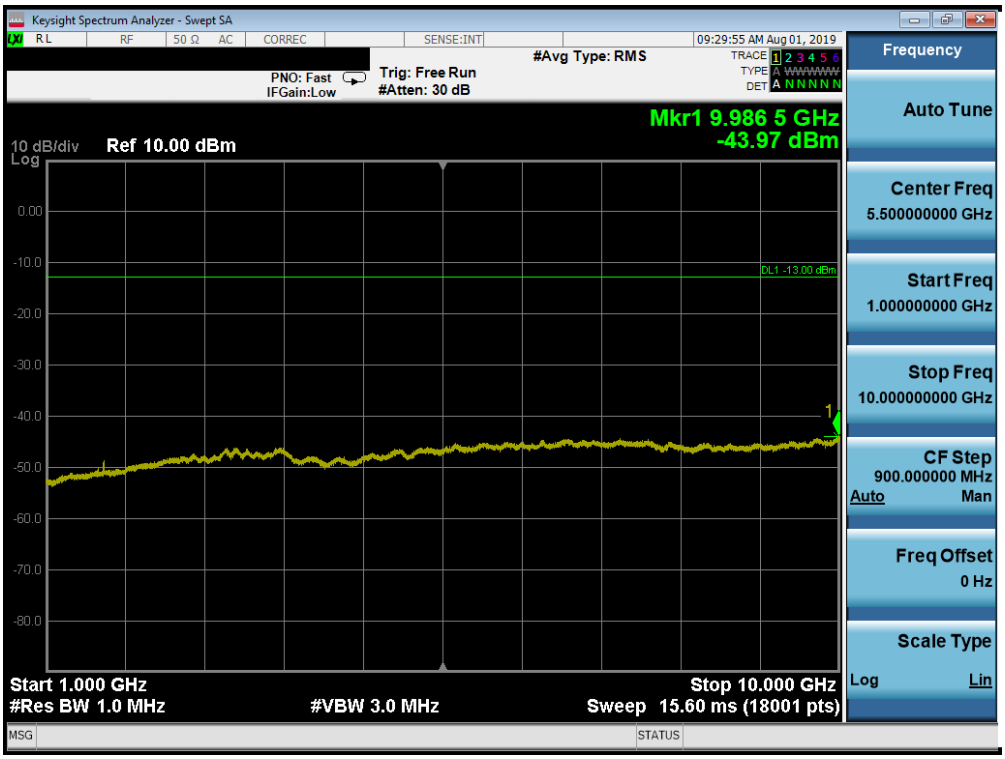

**Plot 7-46. Conducted Spurious Plot (Cellular WCDMA Mode - Low Channel)**



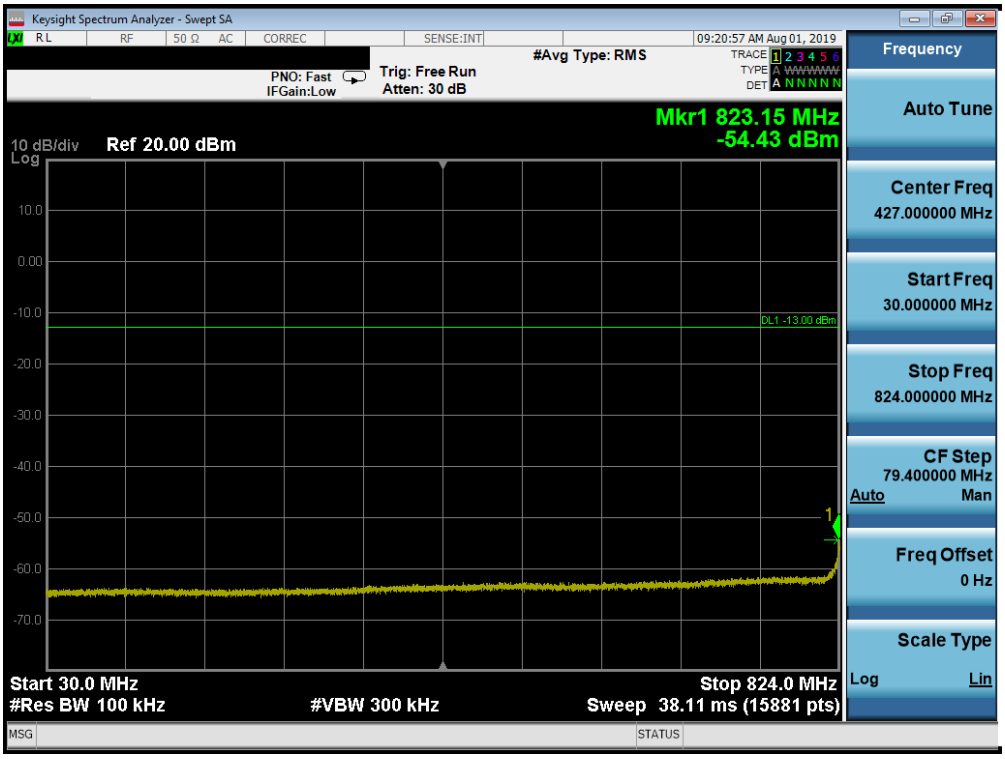

**Plot 7-47. Conducted Spurious Plot (Cellular WCDMA Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



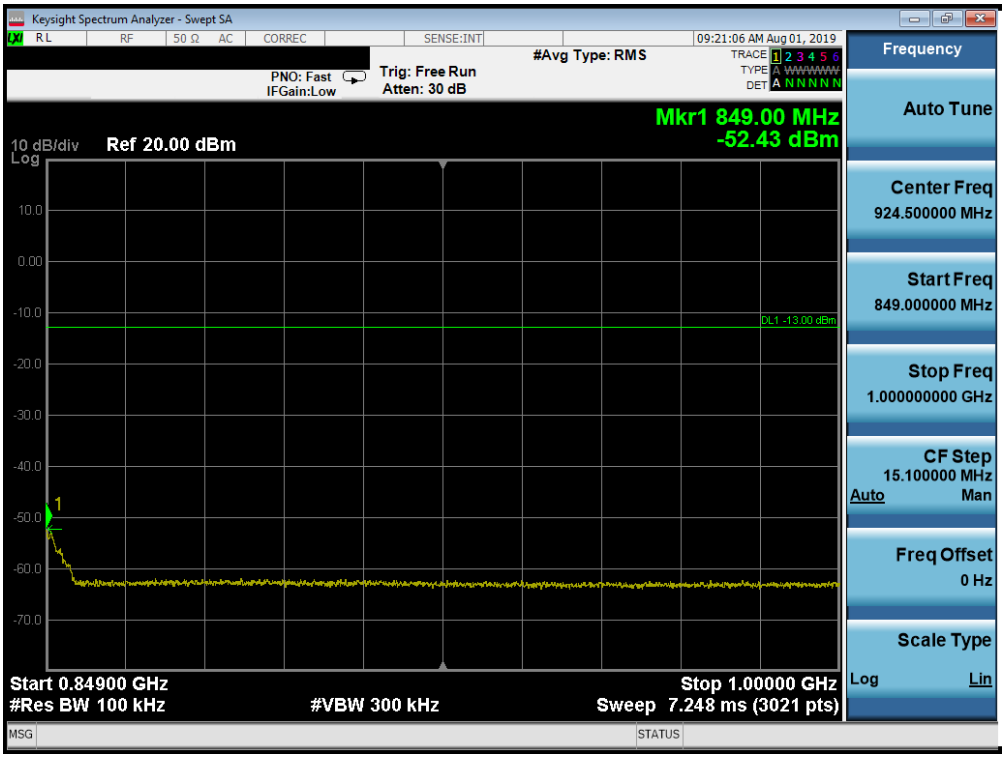

**Plot 7-48. Conducted Spurious Plot (Cellular WCDMA Mode - Low Channel)**



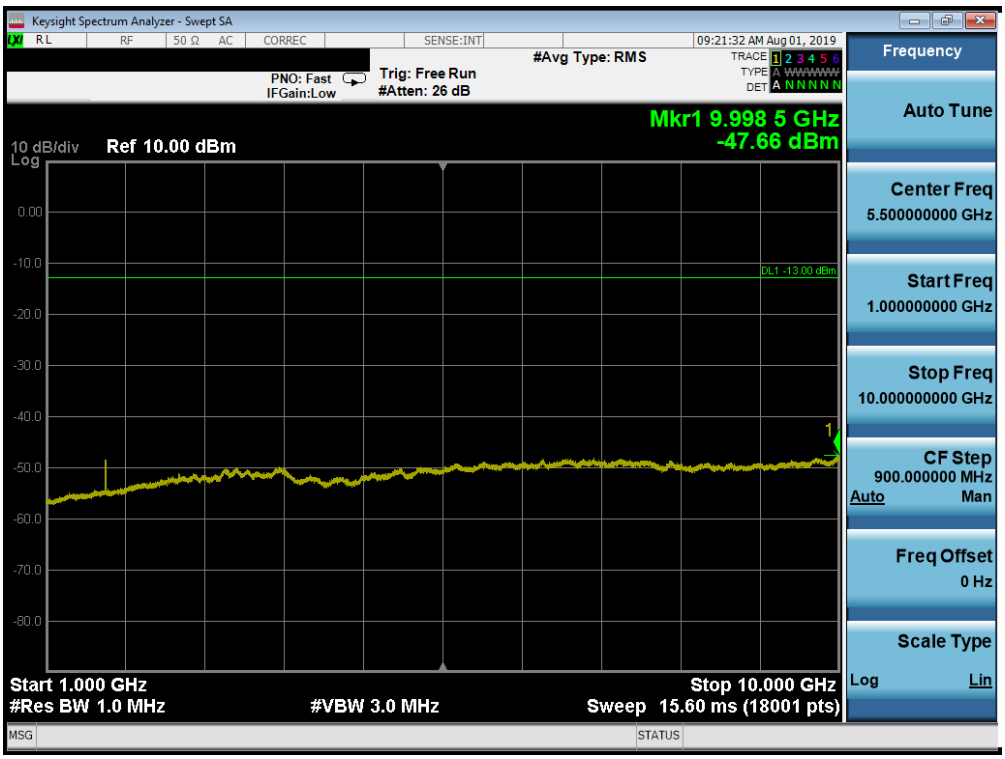

**Plot 7-49. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



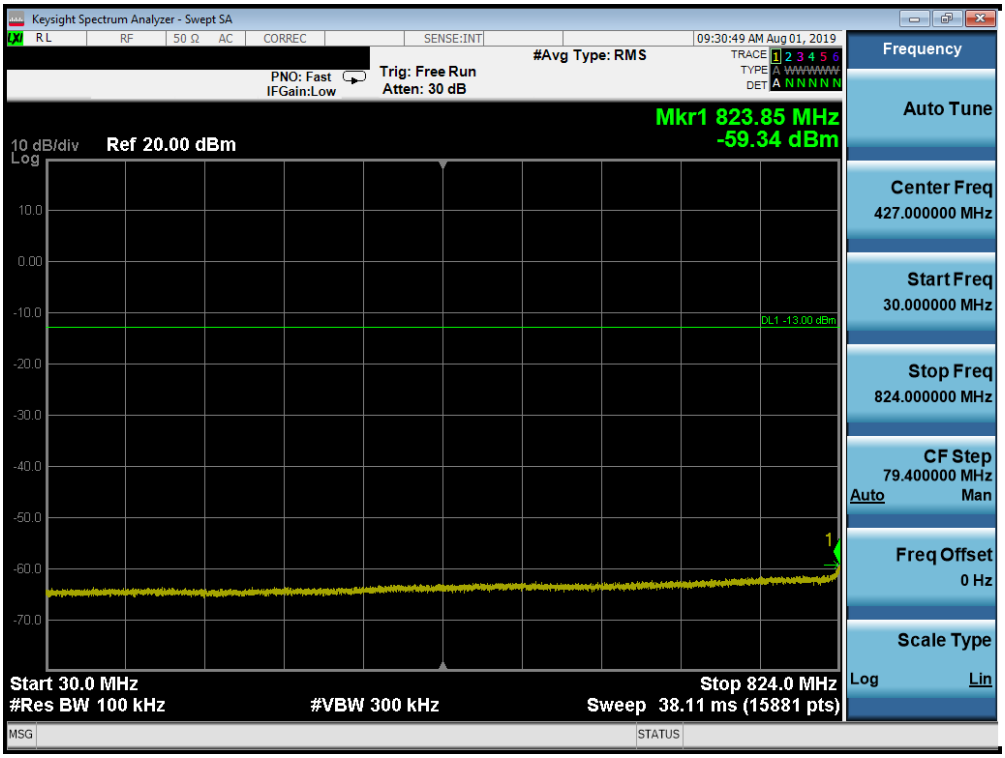

**Plot 7-50. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)**



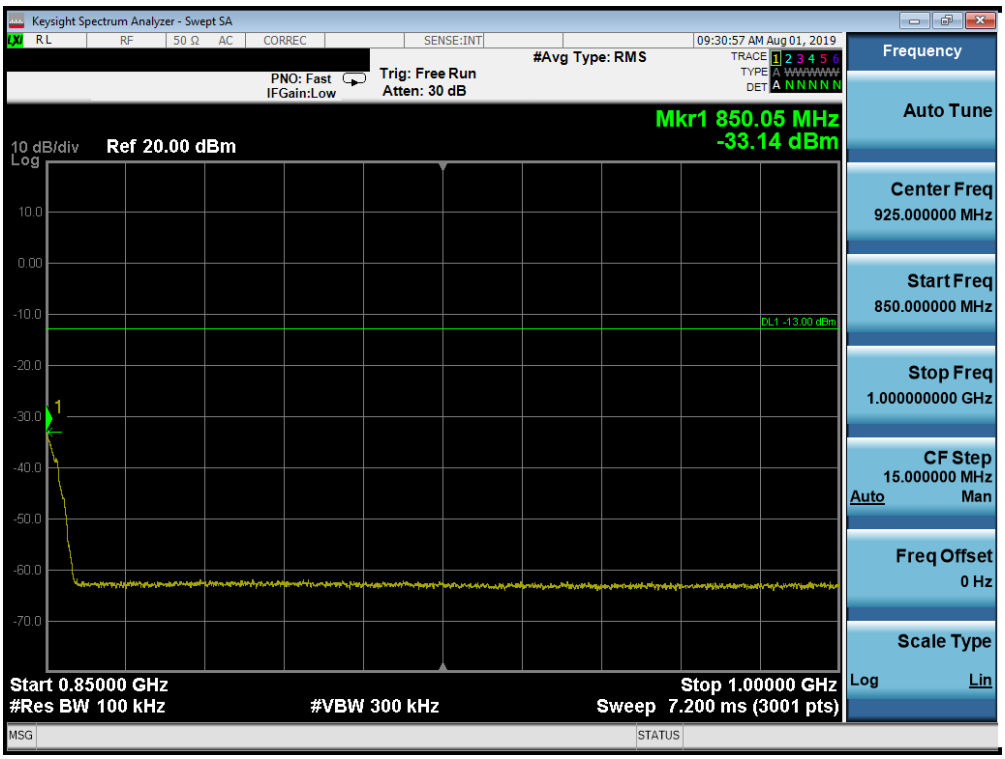

**Plot 7-51. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



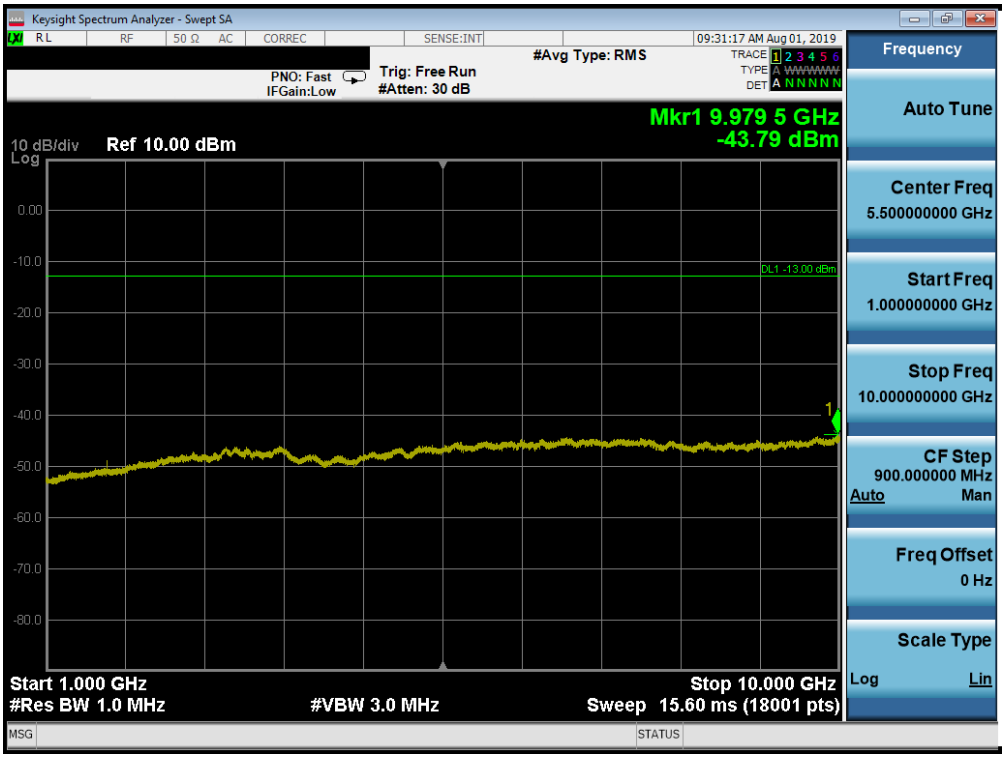

**Plot 7-52. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)**




**Plot 7-53. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

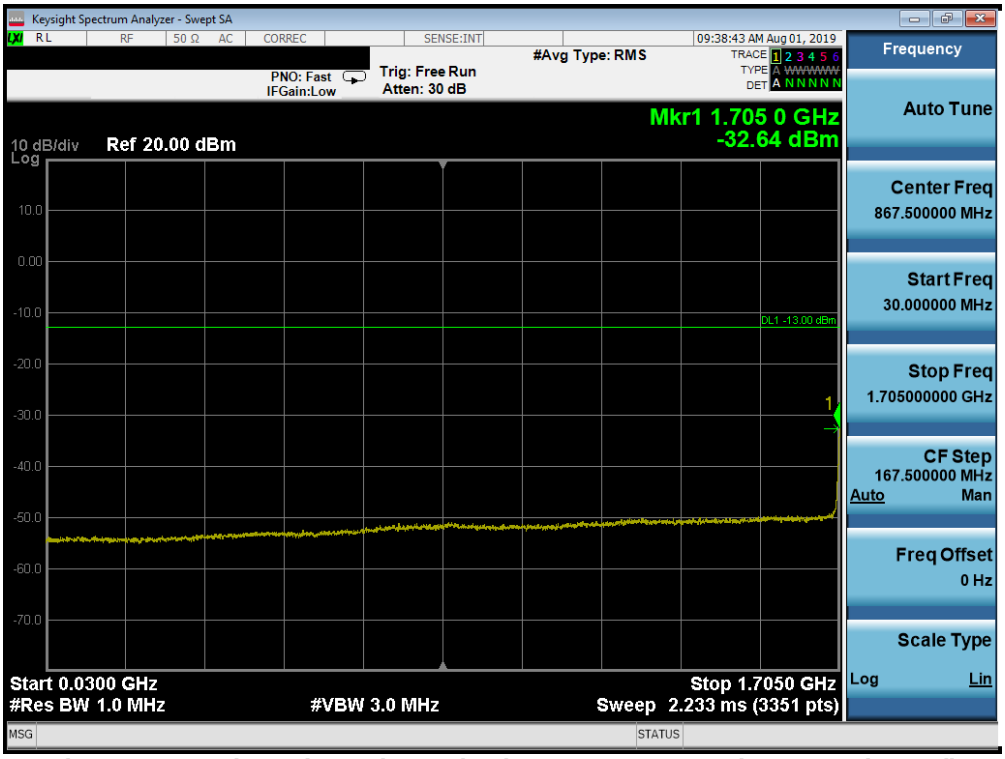



**Plot 7-54. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)**

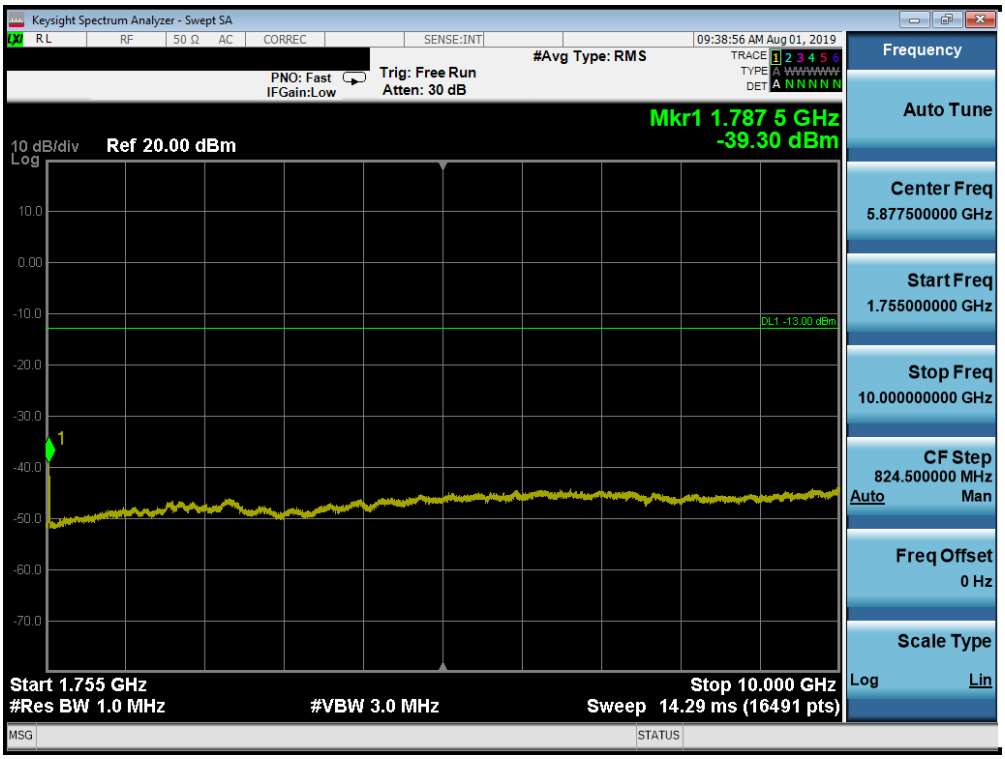



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## AWS WCDMA Mode



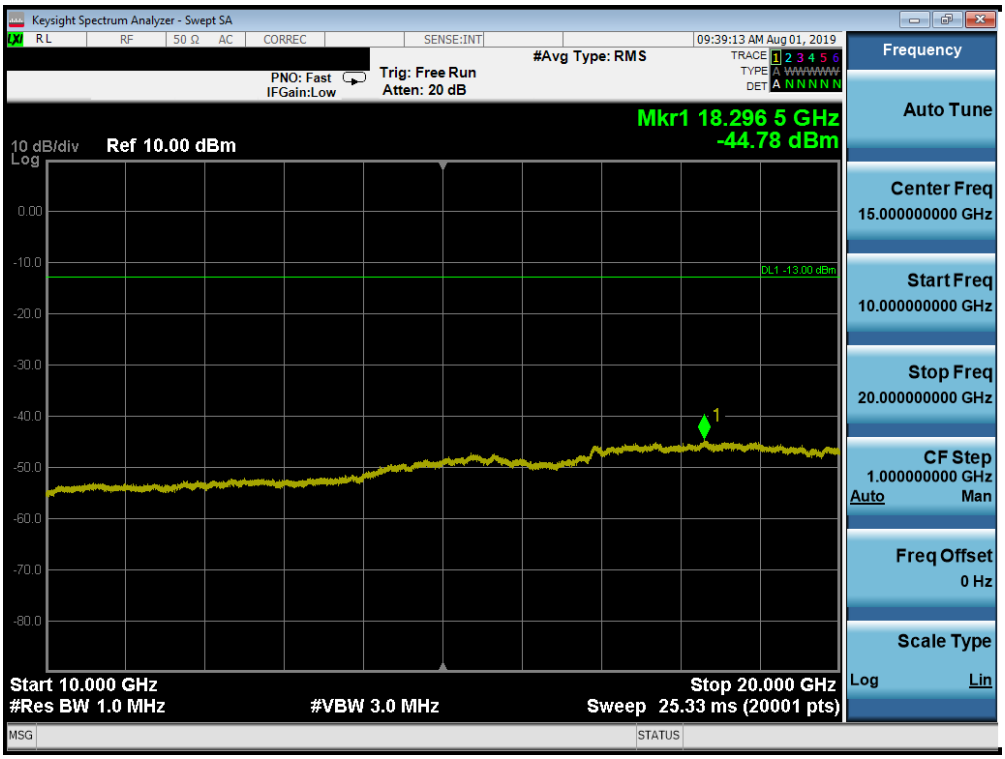

**Plot 7-55. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)**



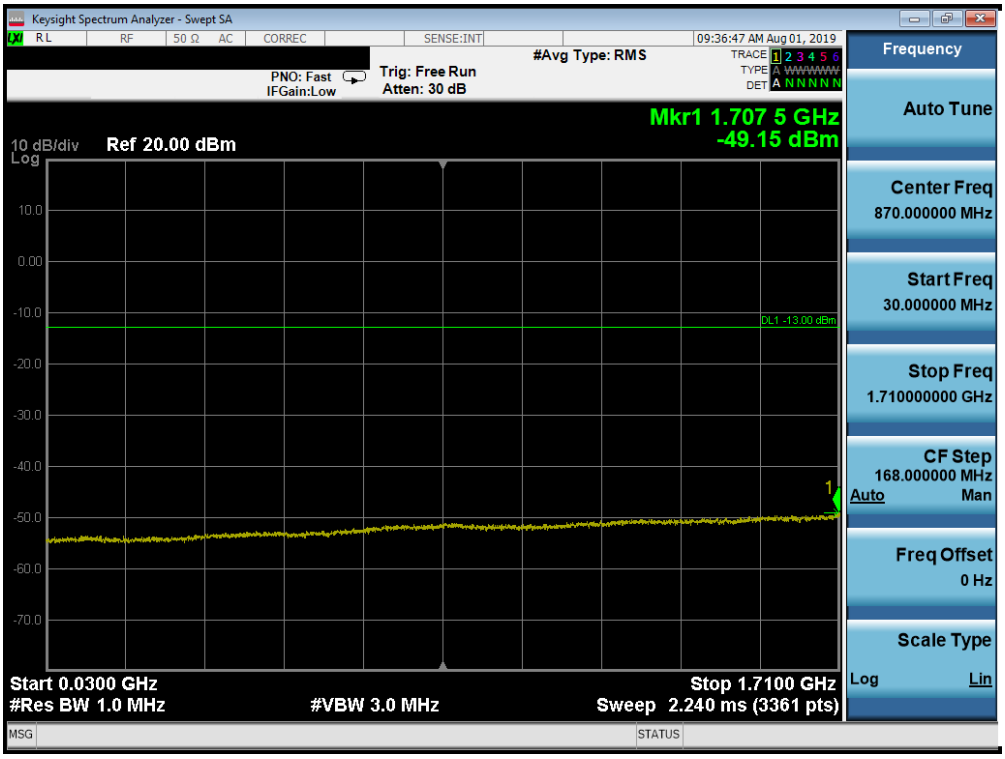

**Plot 7-56. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



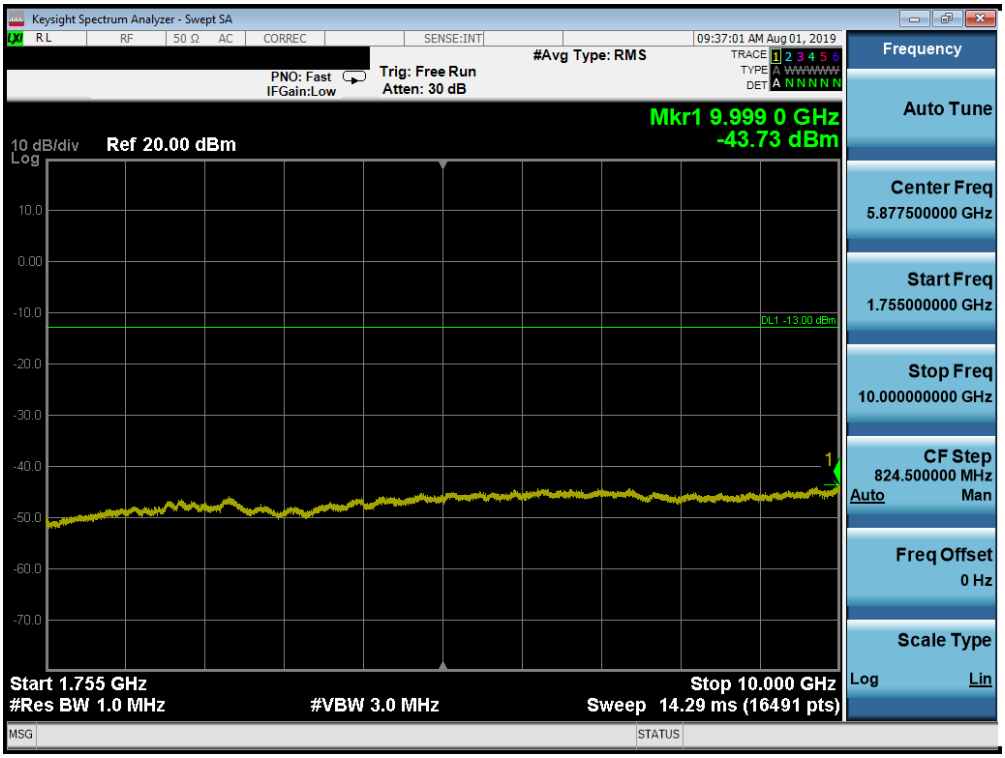

**Plot 7-57. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)**



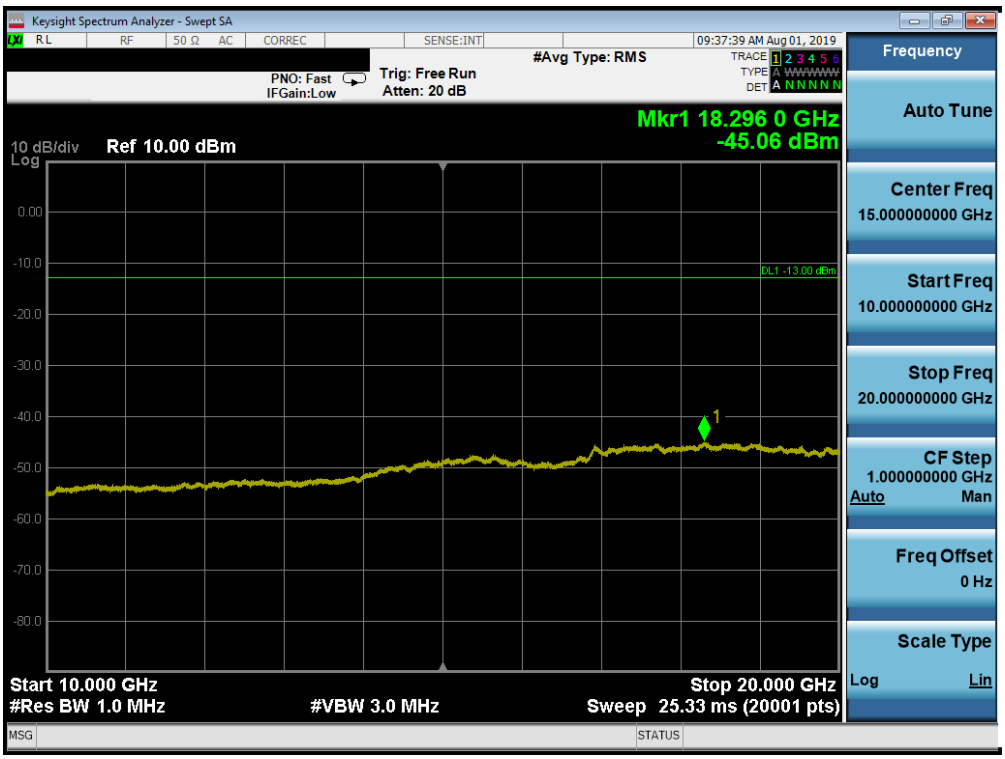

**Plot 7-58. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



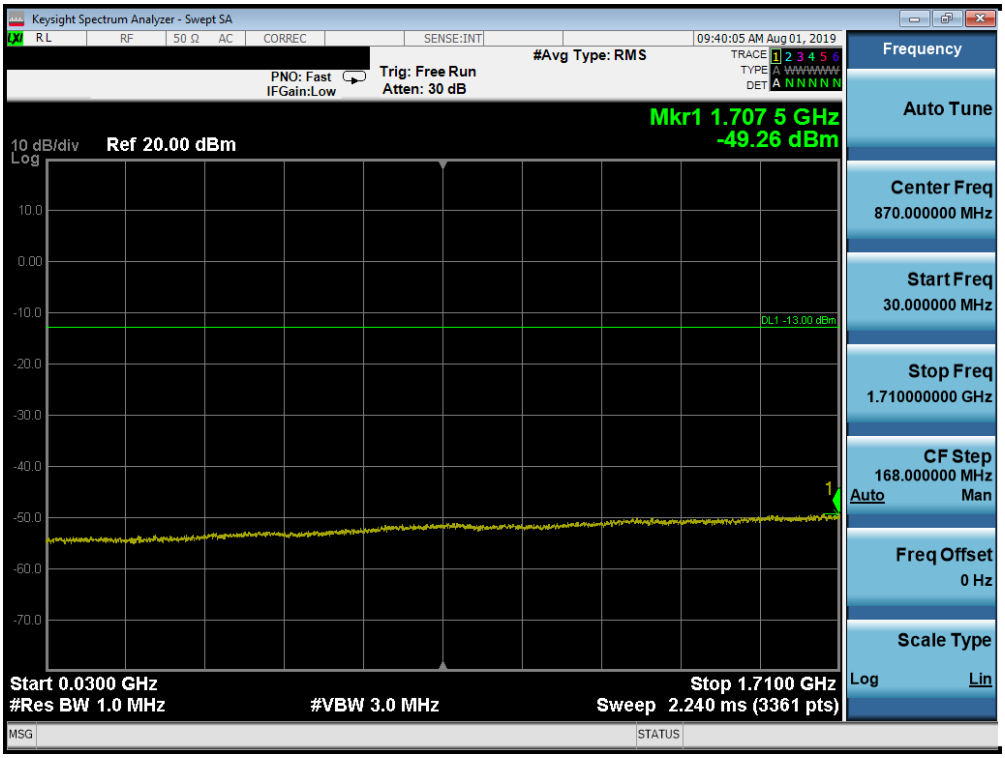

**Plot 7-59. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)**



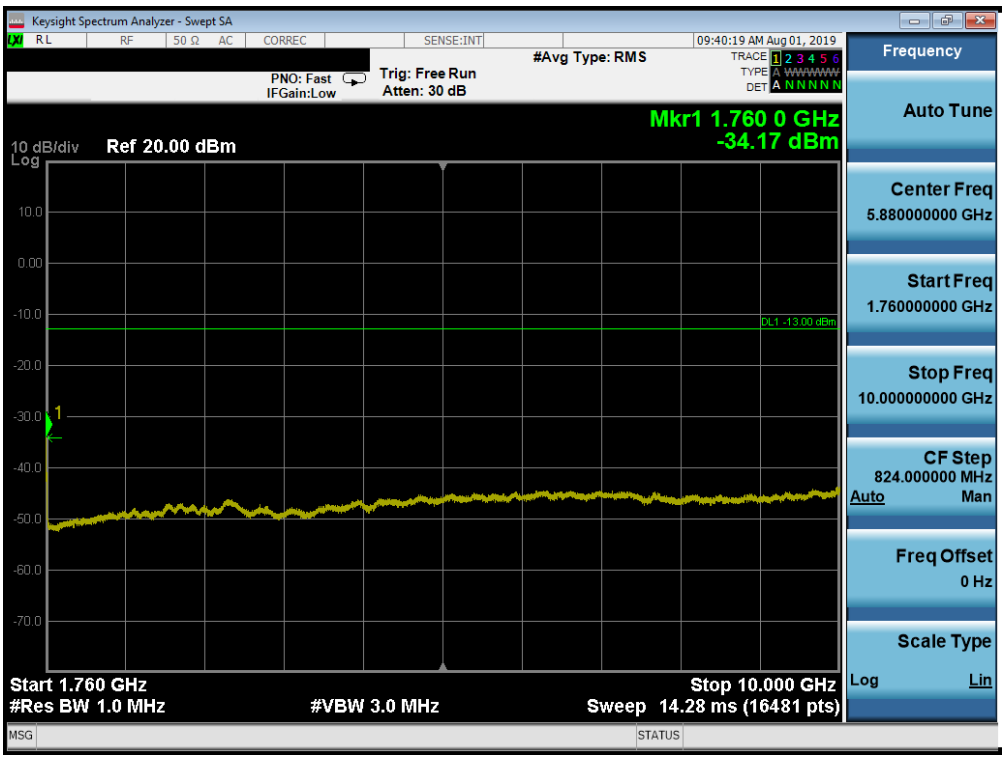

**Plot 7-60. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



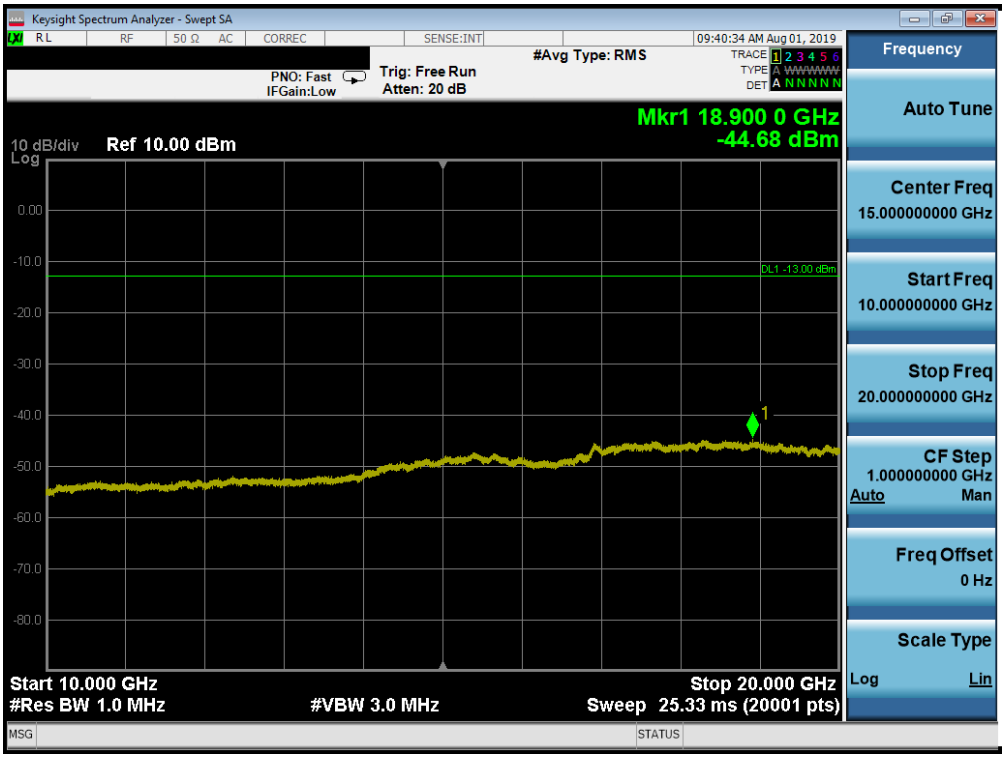

**Plot 7-61. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)**




**Plot 7-62. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)**



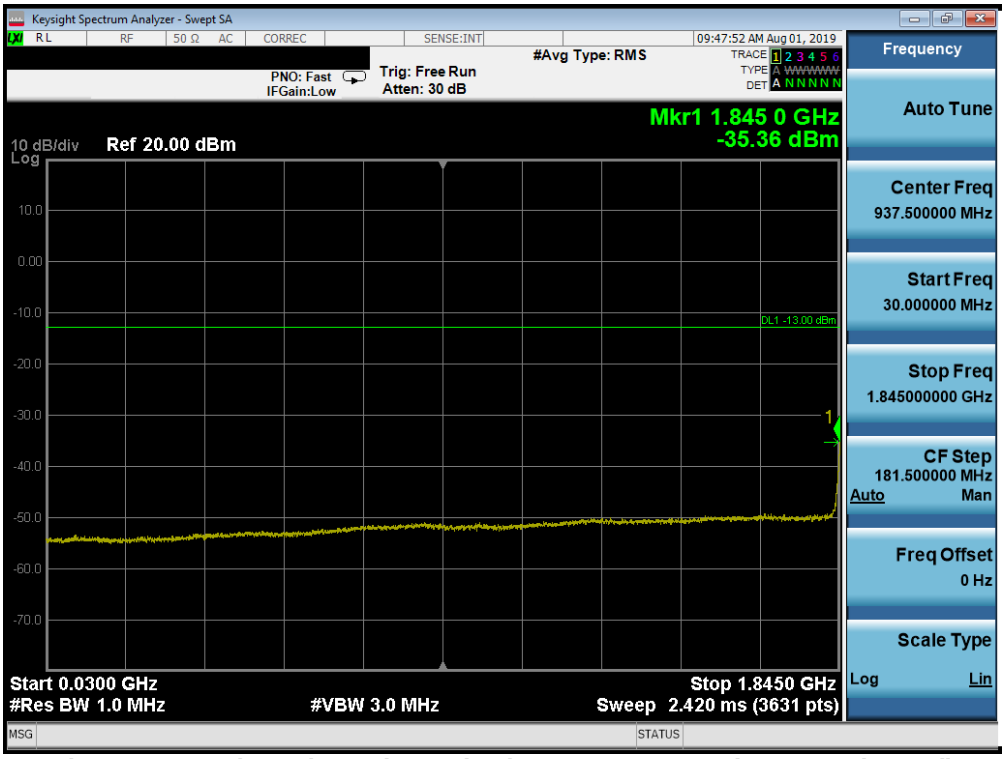

© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



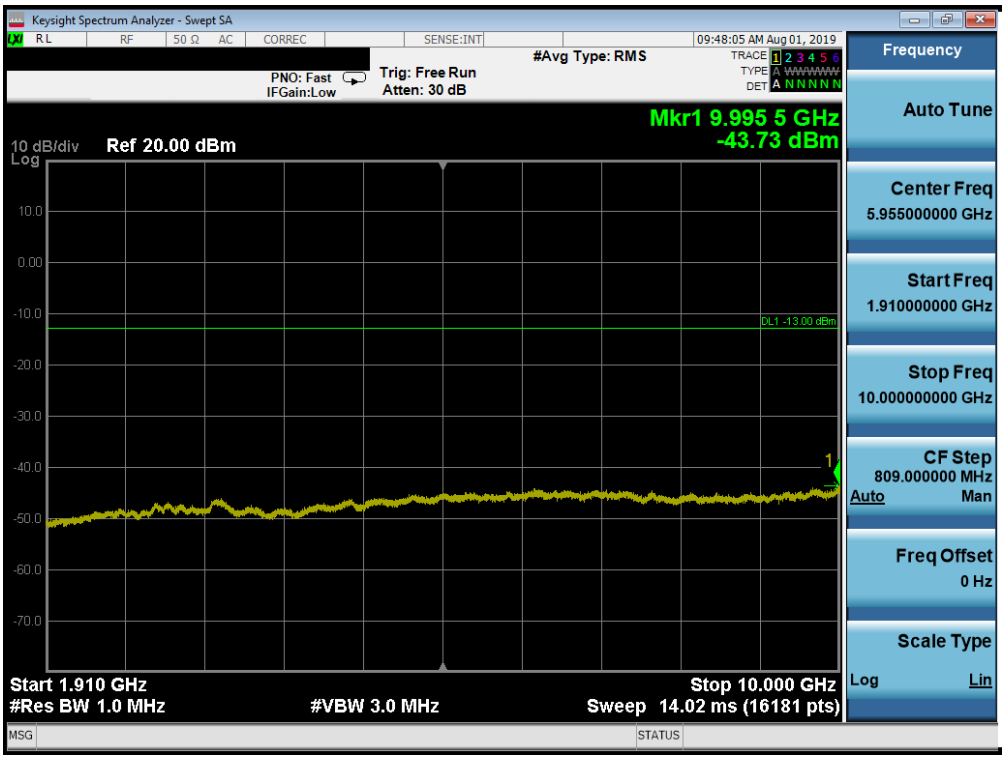

**Plot 7-63. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



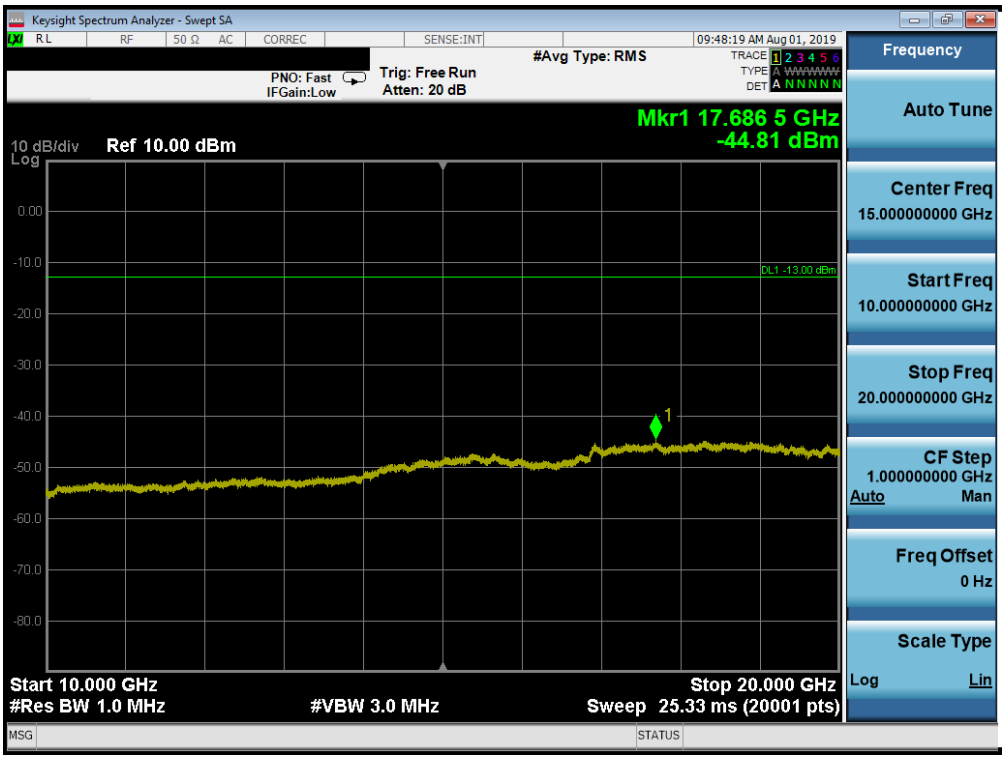

**Plot 7-64. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)**



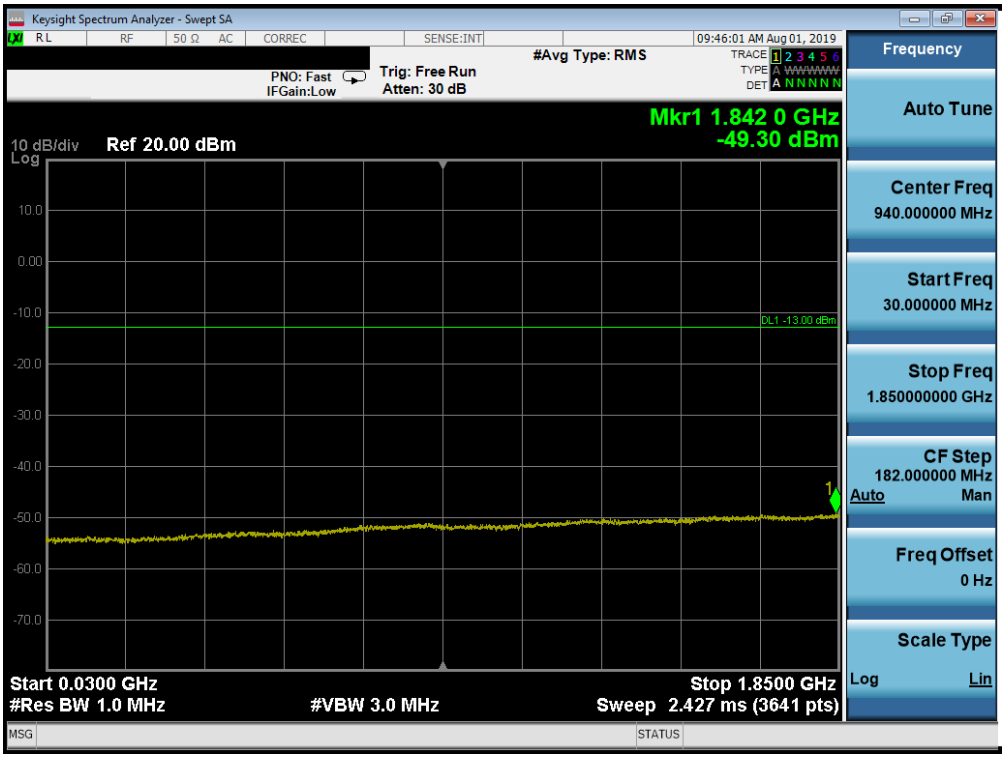

**Plot 7-65. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



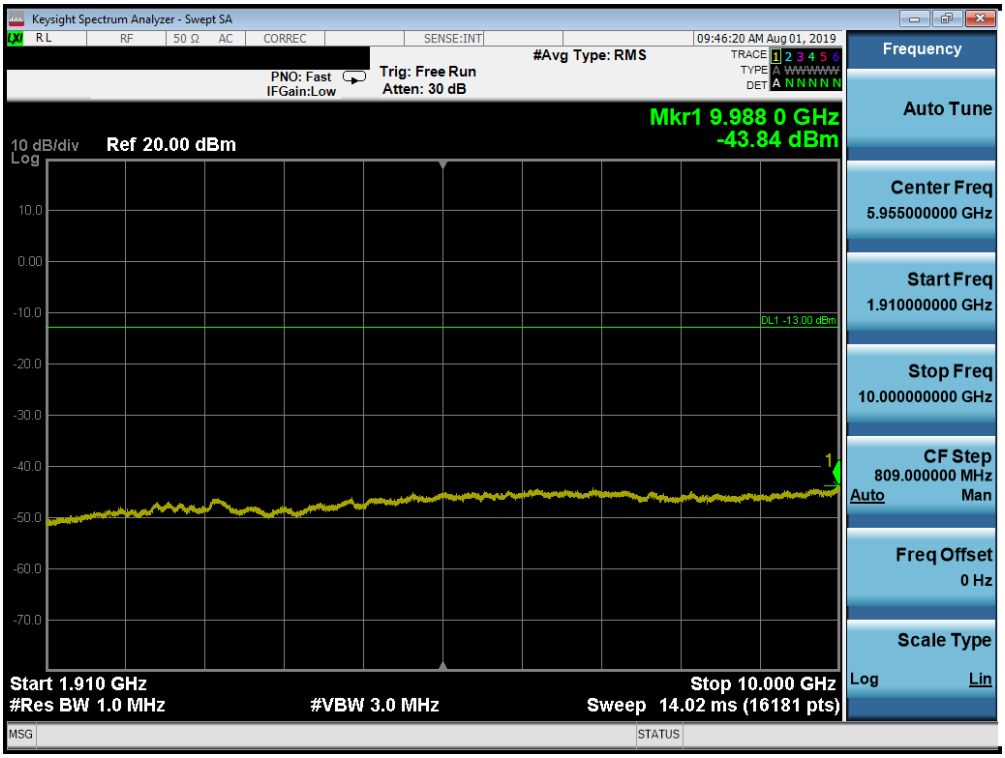

**Plot 7-66. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)**



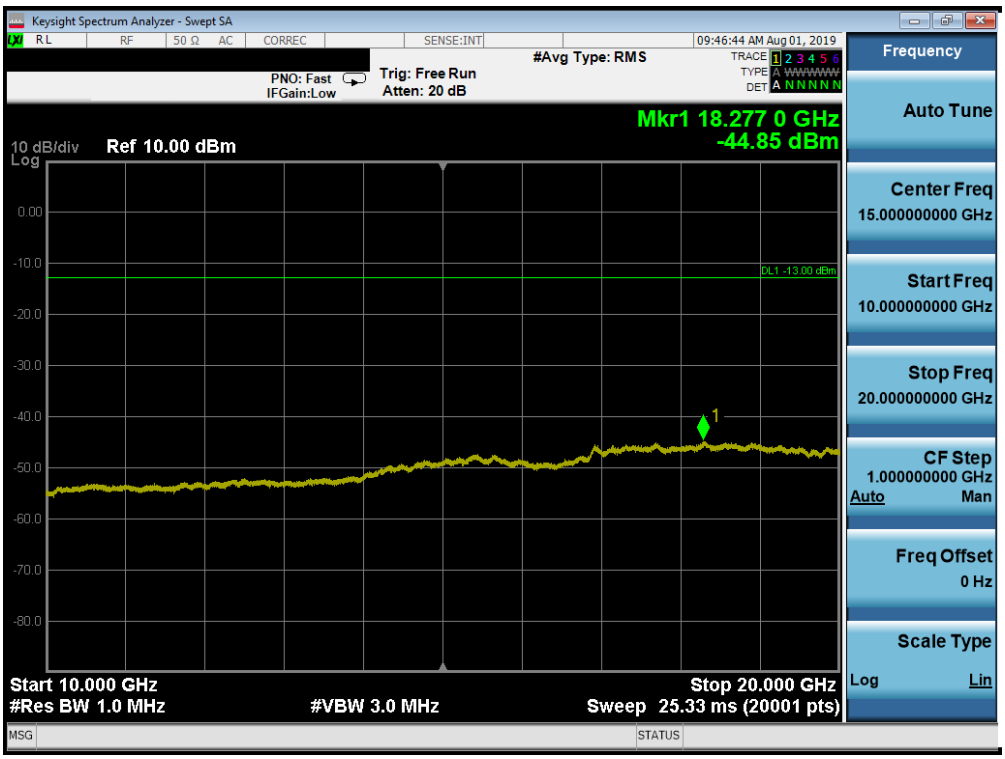

**Plot 7-67. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



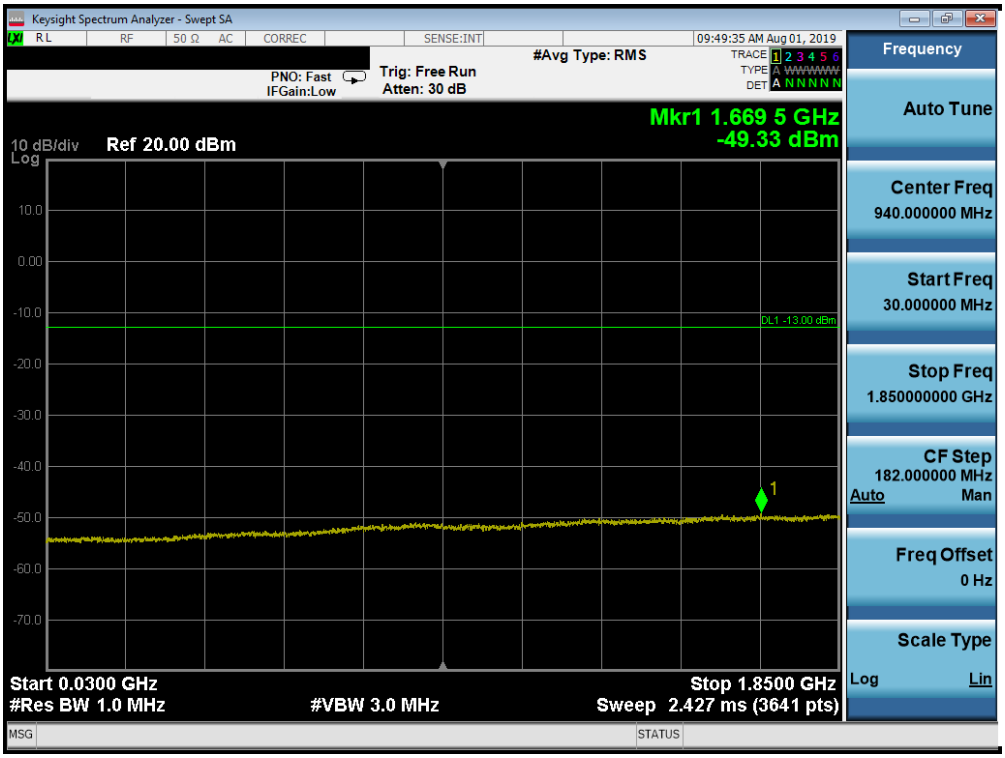

**Plot 7-68. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)**



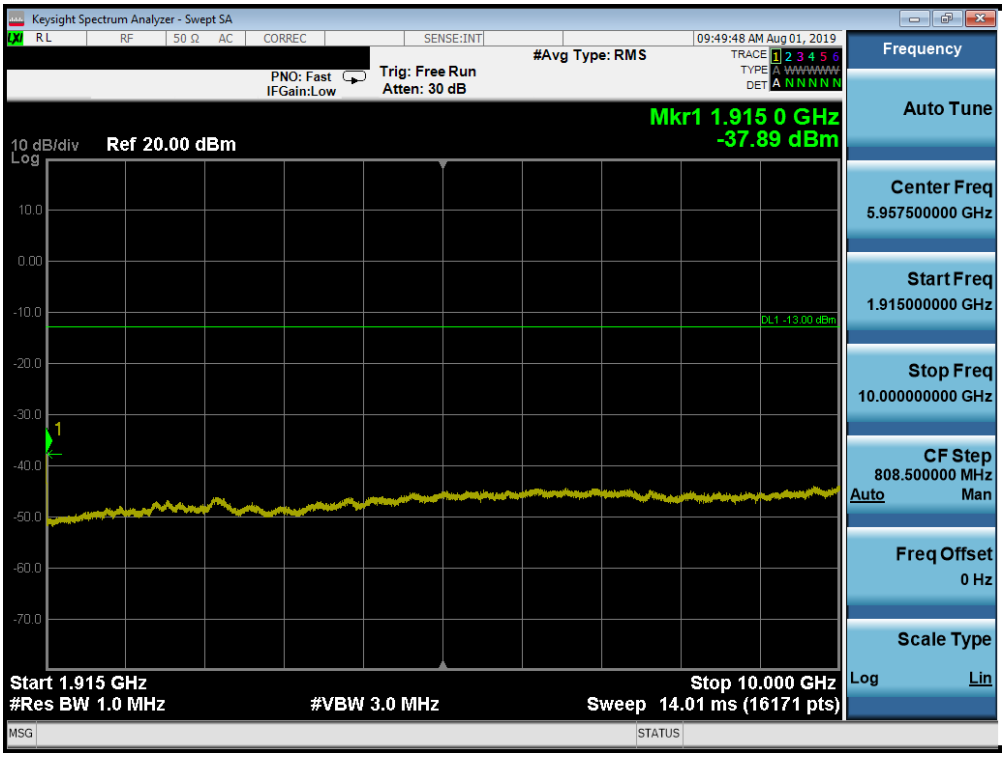

**Plot 7-69. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



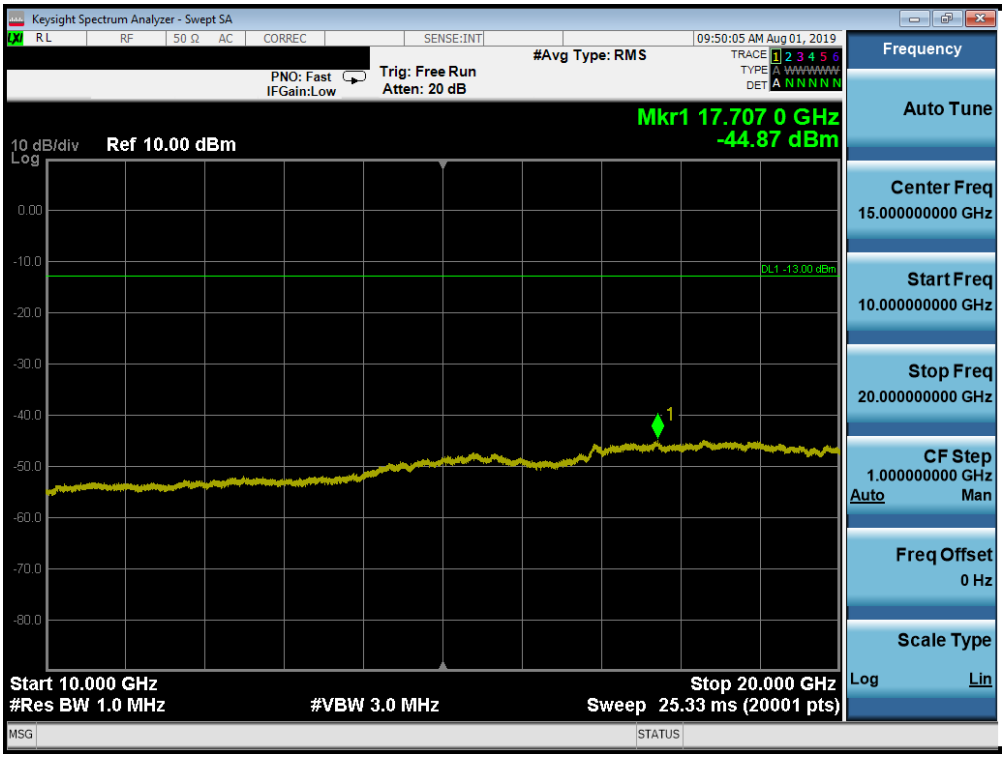

**Plot 7-70. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)**




**Plot 7-71. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.




**Plot 7-72. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## 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 ≥ 1% of the emission bandwidth
4. VBW ≥ 3 x RBW
5. Detector = RMS
6. Number of sweep points ≥ 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

**Test Setup**

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

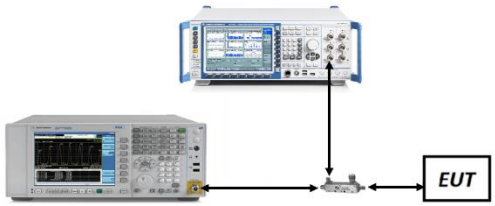



**Figure 7-3. Test Instrument & Measurement Setup**

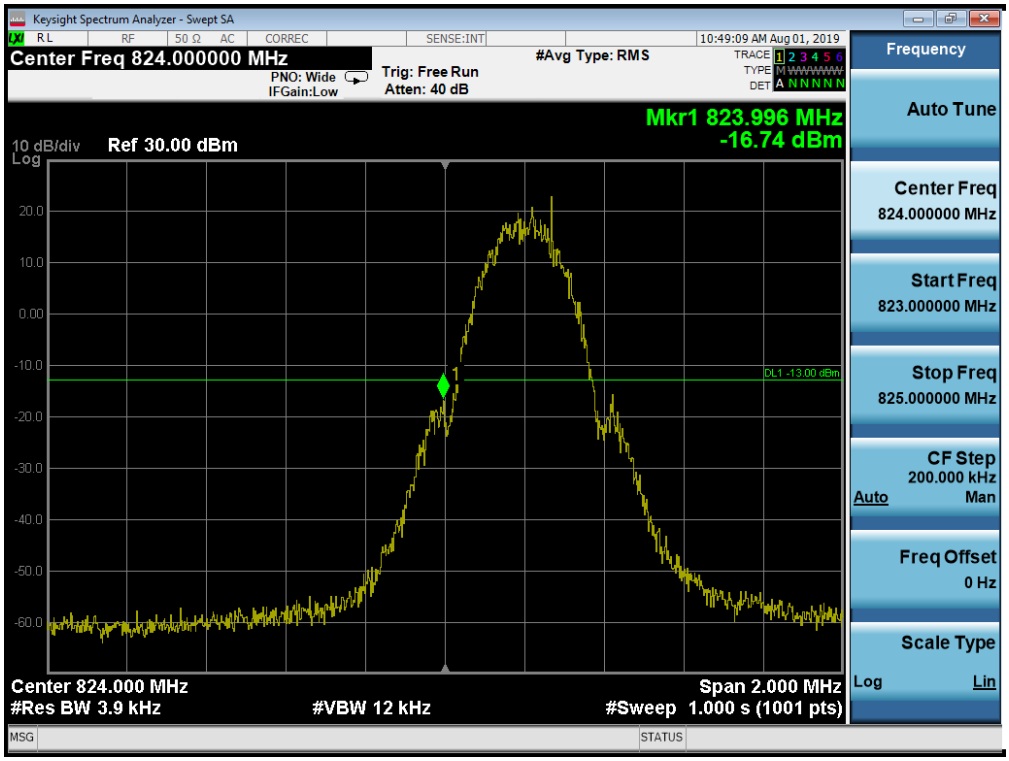
**Test Notes**

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.

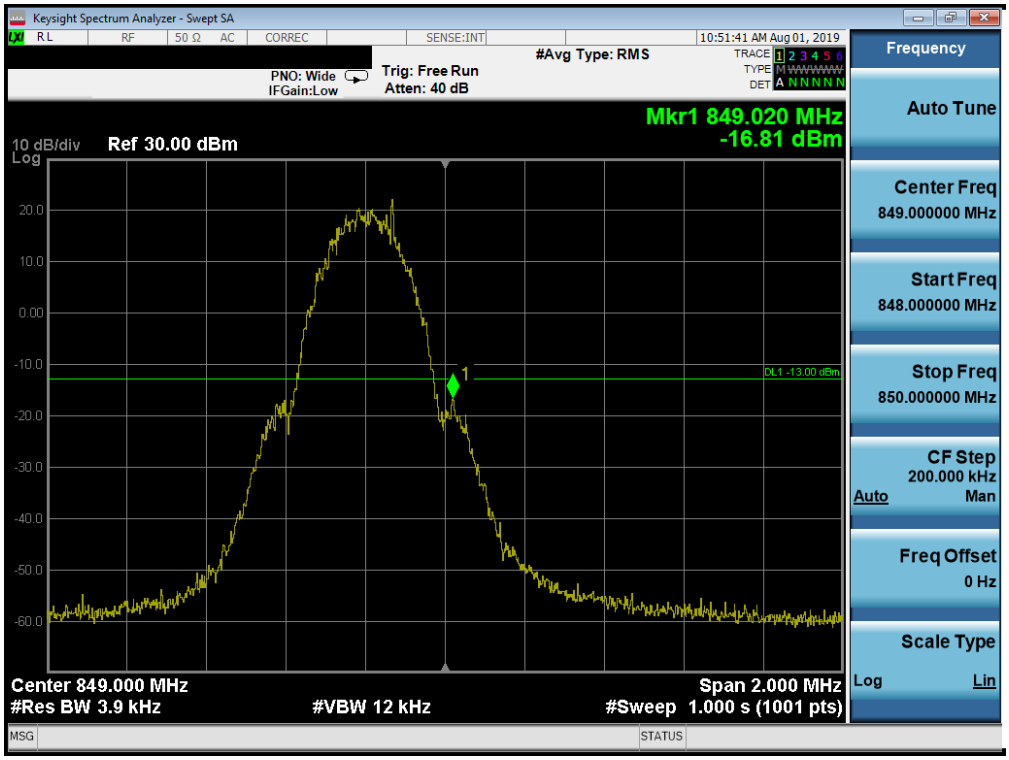


© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Cellular GSM Mode



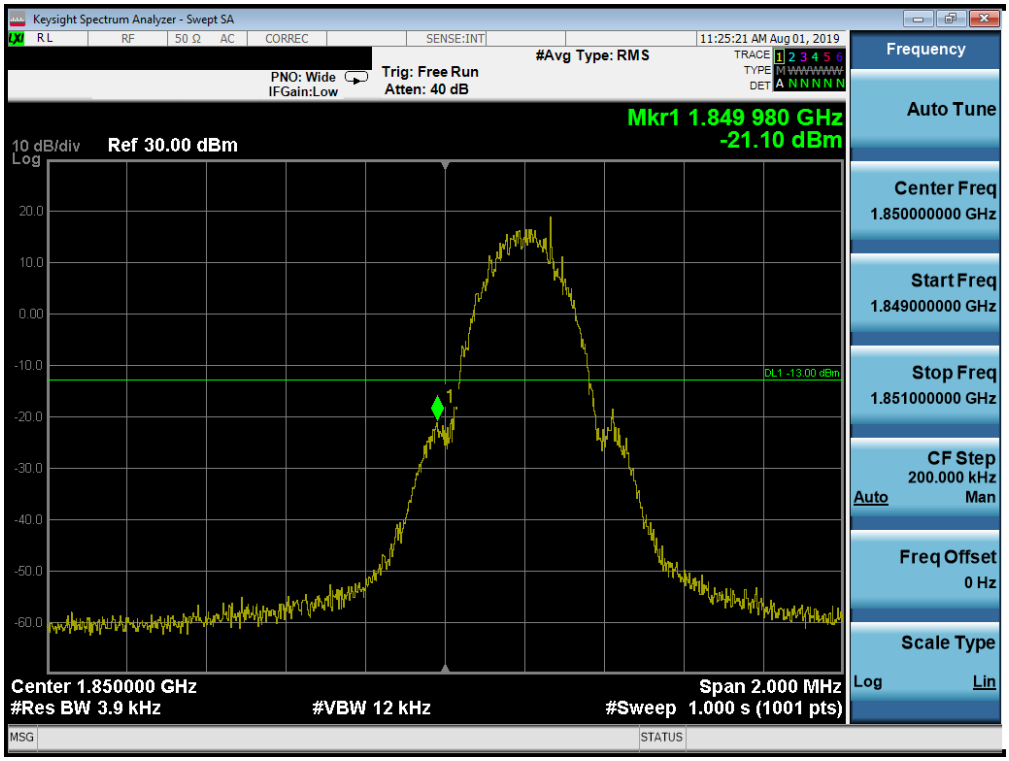

**Plot 7-73. Band Edge Plot (Cellular GSM Mode - Low Channel)**



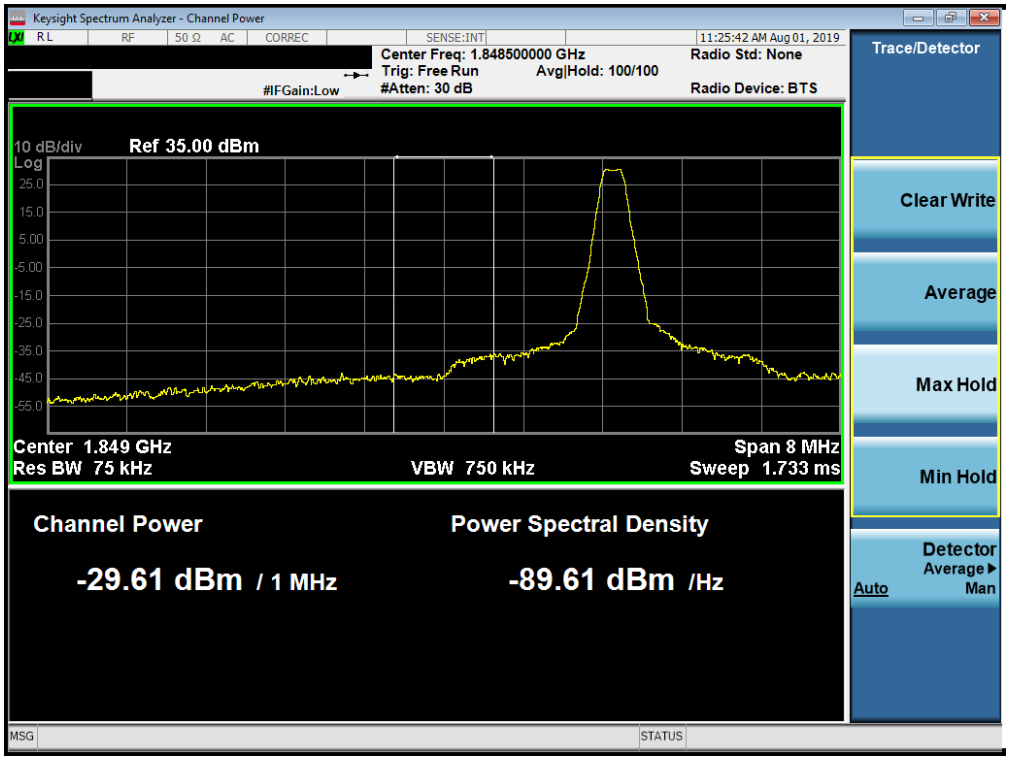

**Plot 7-74. Band Edge Plot (Cellular GSM Mode - High Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



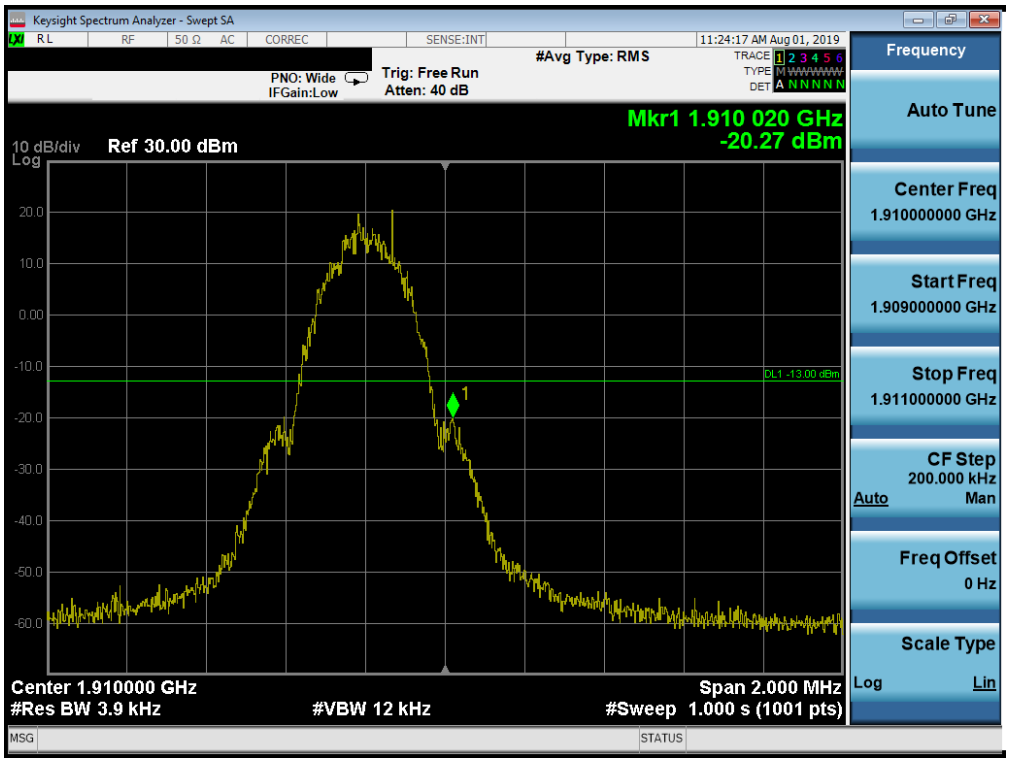

**Plot 7-75. Band Edge Plot (PCS GSM Mode - Low Channel)**



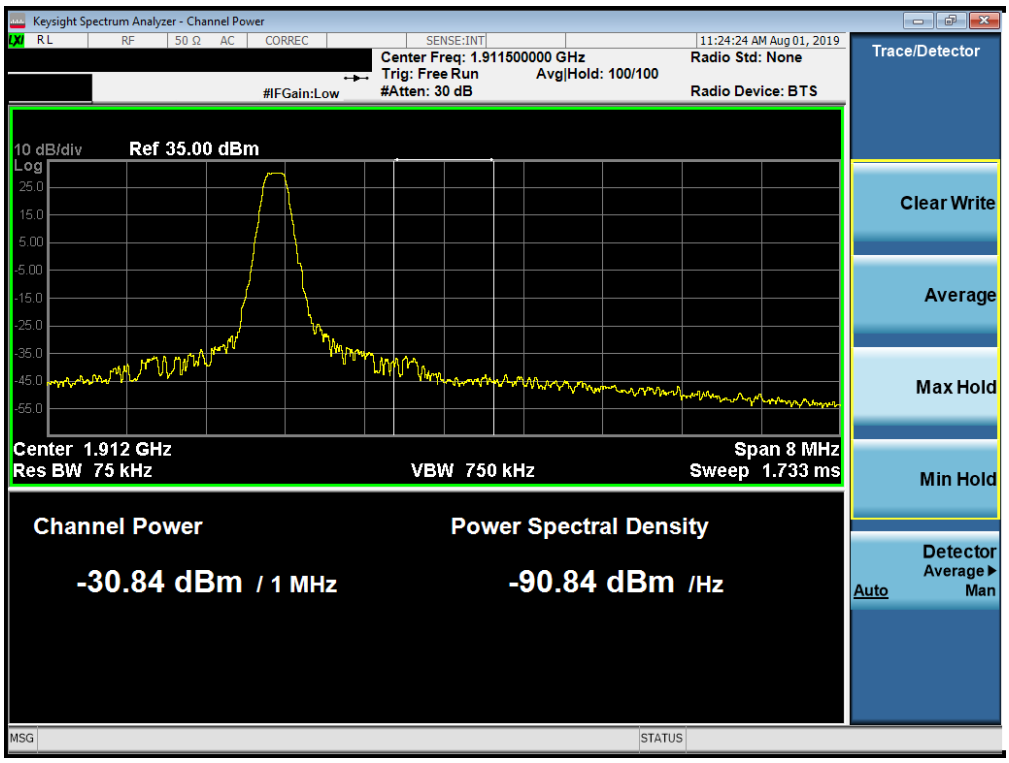

**Plot 7-76. 4MHz Span Plot (PCS GSM Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.




**Plot 7-77. Band Edge Plot (PCS GSM Mode - High Channel)**

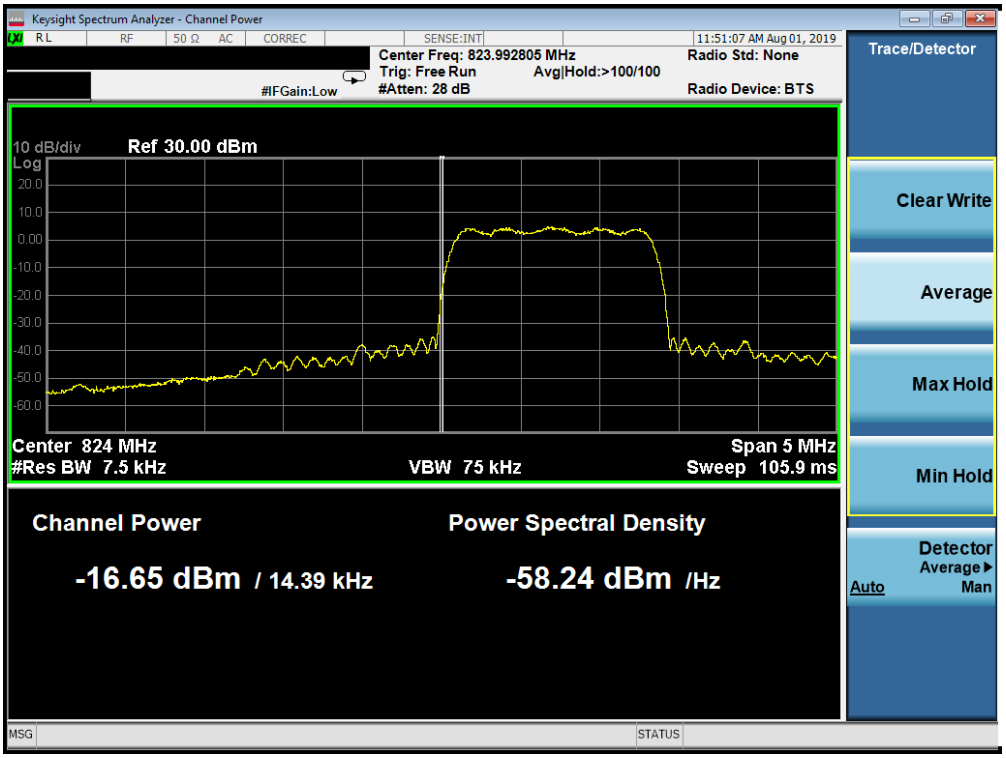



**Plot 7-78. 4MHz Span Plot (PCS GSM Mode - High Channel)**

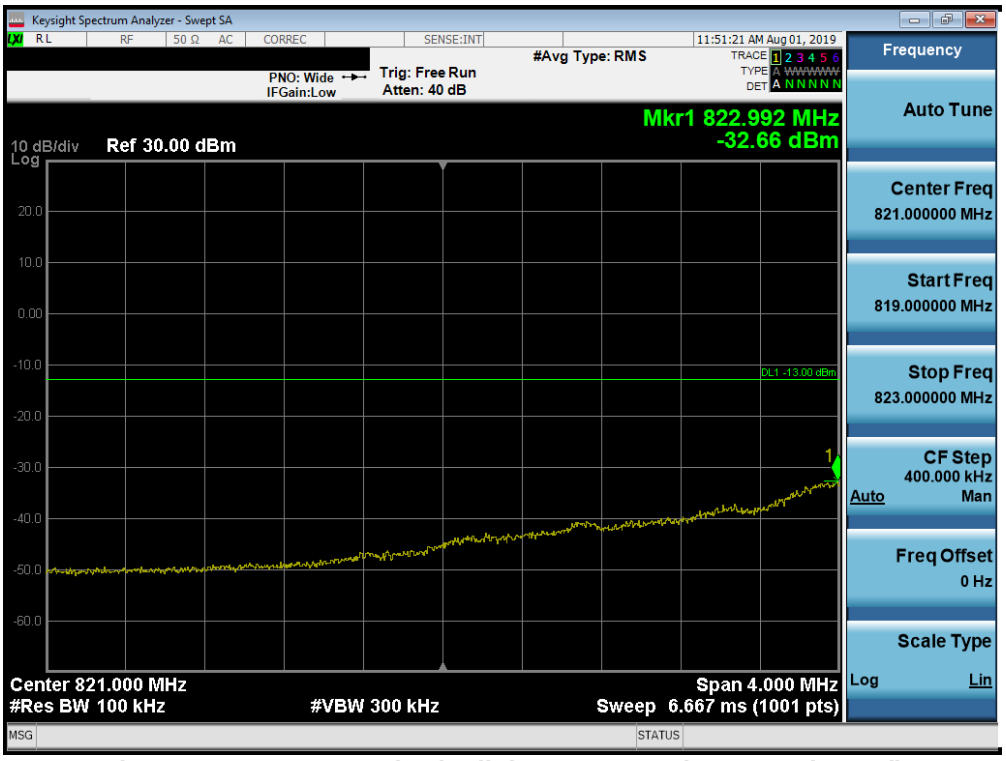



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Cellular CDMA Mode



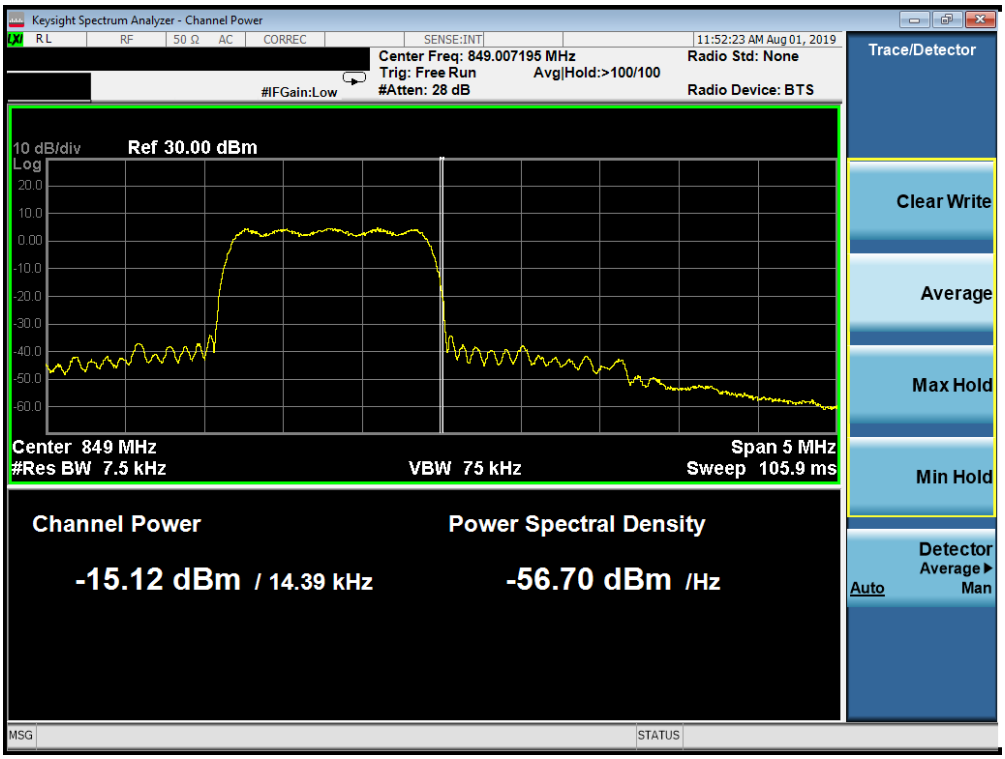

**Plot 7-79. Band Edge Plot (Cellular CDMA Mode - Low Channel)**



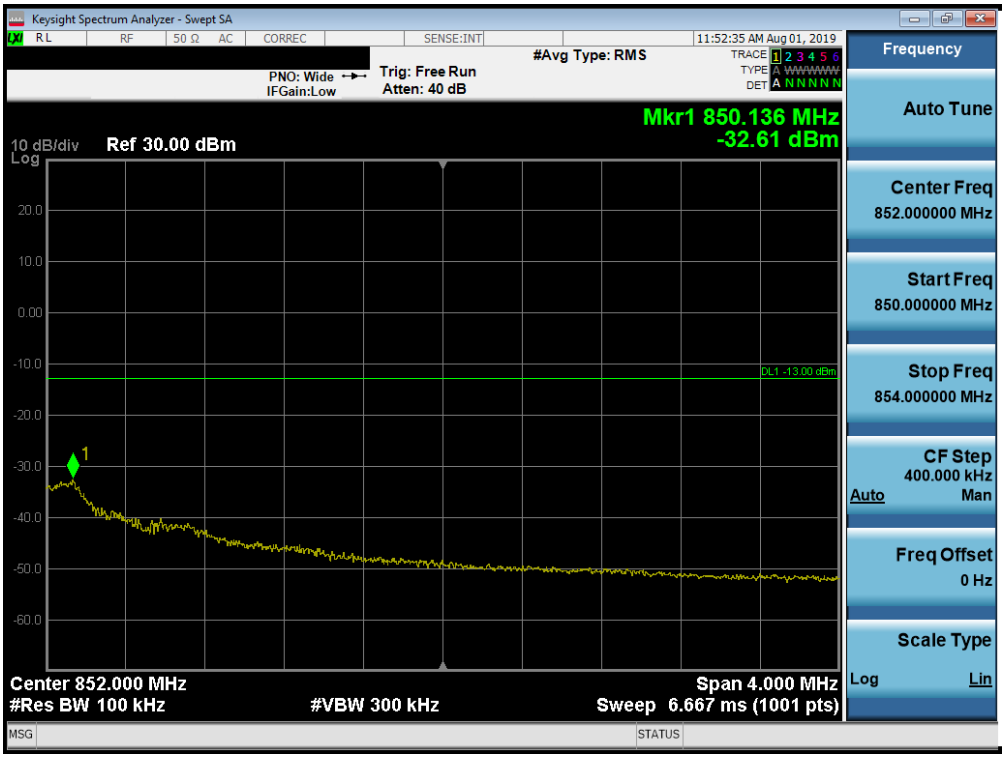

**Plot 7-80. 4MHz Span Plot (Cellular CDMA Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



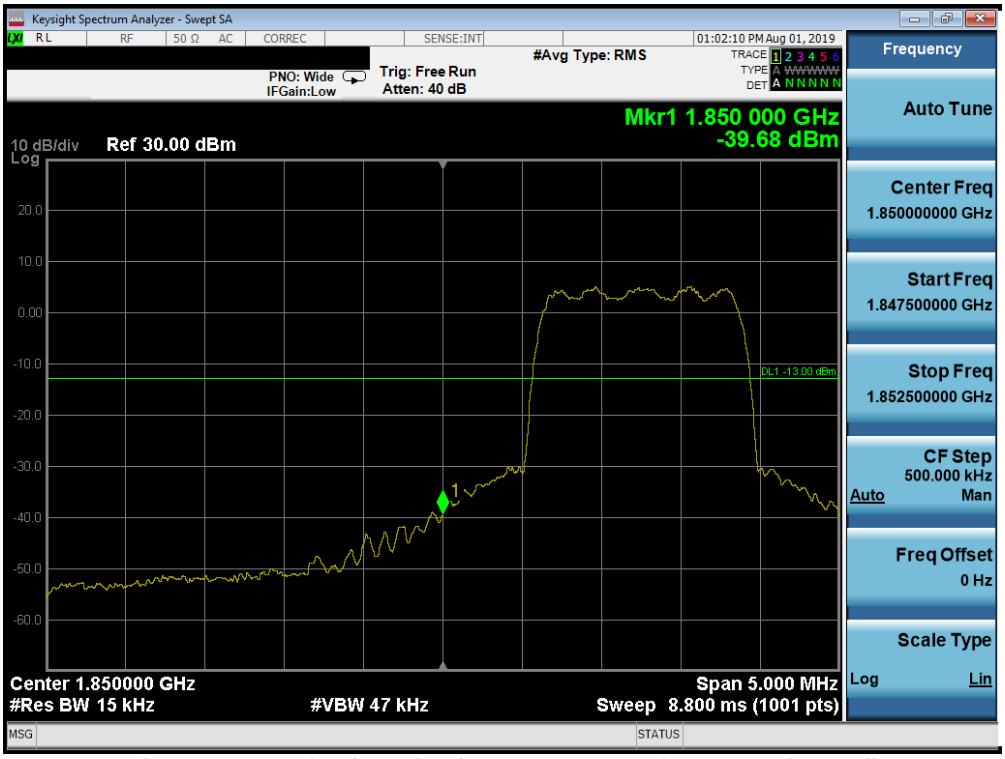

**Plot 7-81. Band Edge Plot (Cellular CDMA Mode - High Channel)**



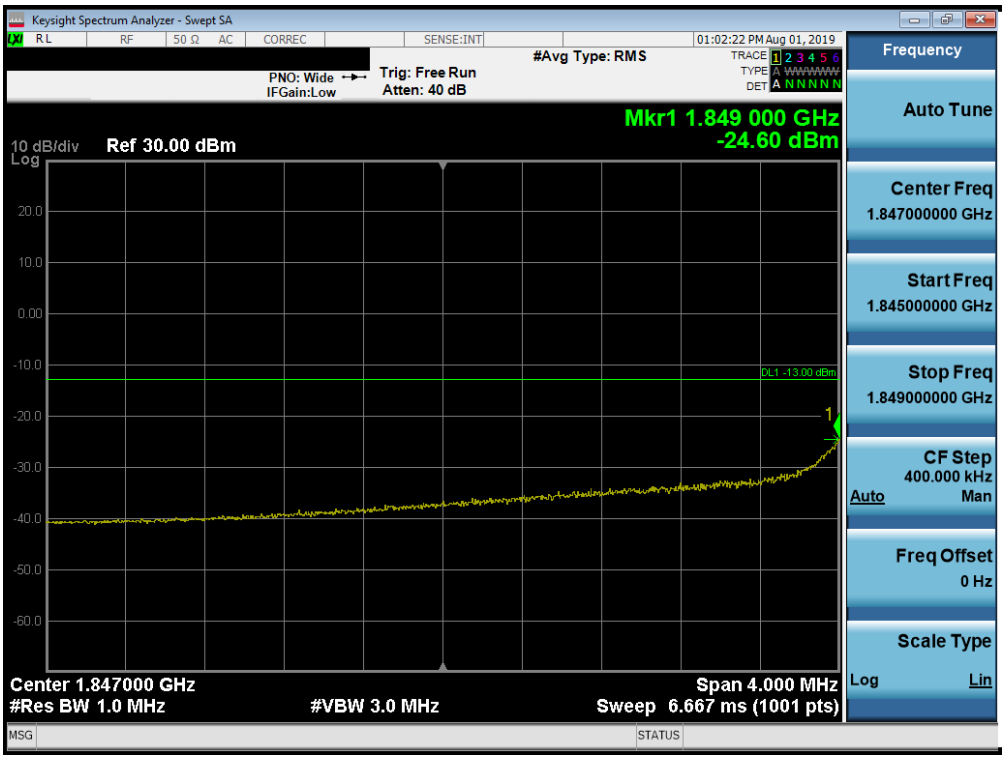

**Plot 7-82. 4MHz Span Plot (Cellular CDMA Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



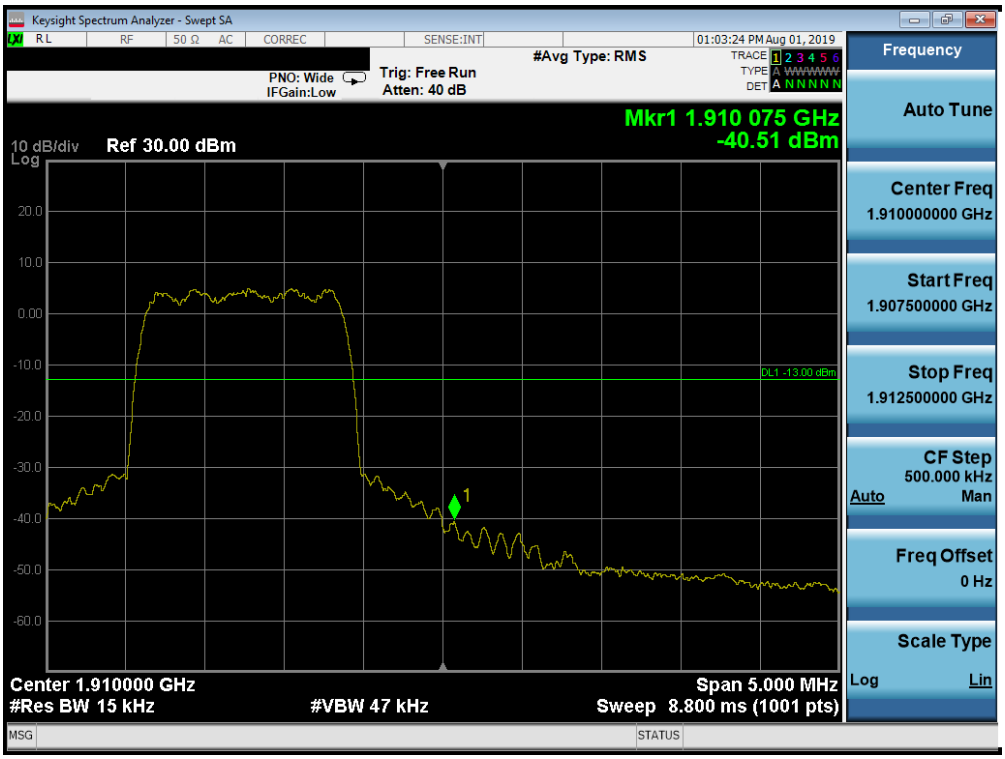

**Plot 7-83. Band Edge Plot (PCS CDMA Mode - Low Channel)**



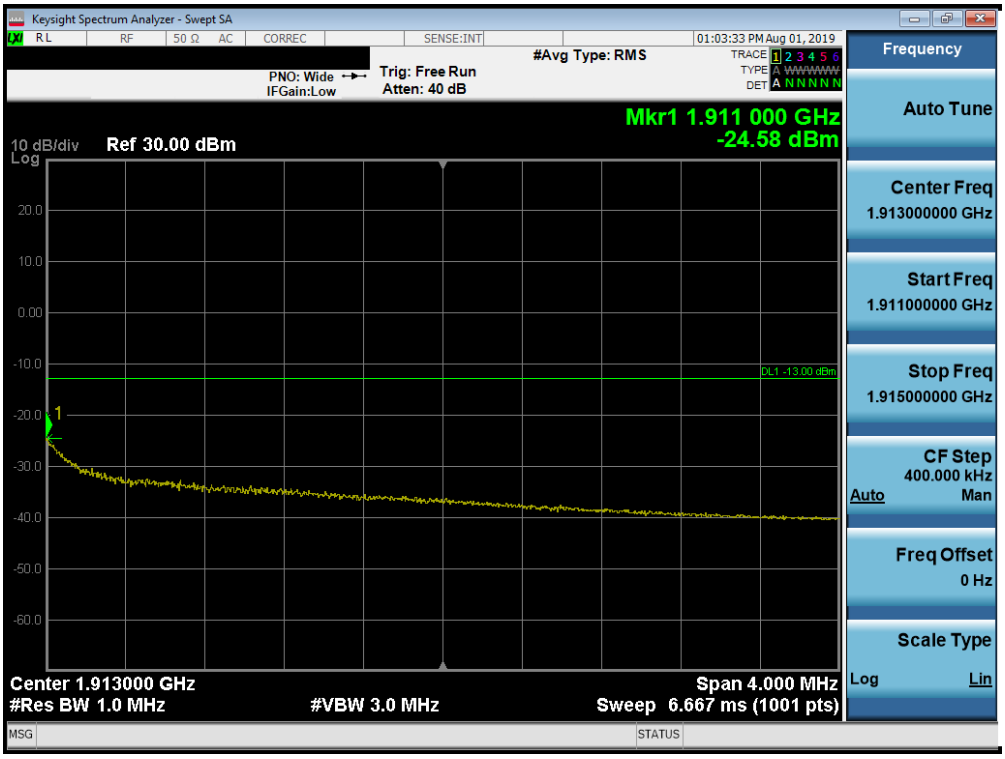

**Plot 7-84. 4MHz Span Plot (PCS CDMA Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.




**Plot 7-85. Band Edge Plot (PCS CDMA Mode - High Channel)**

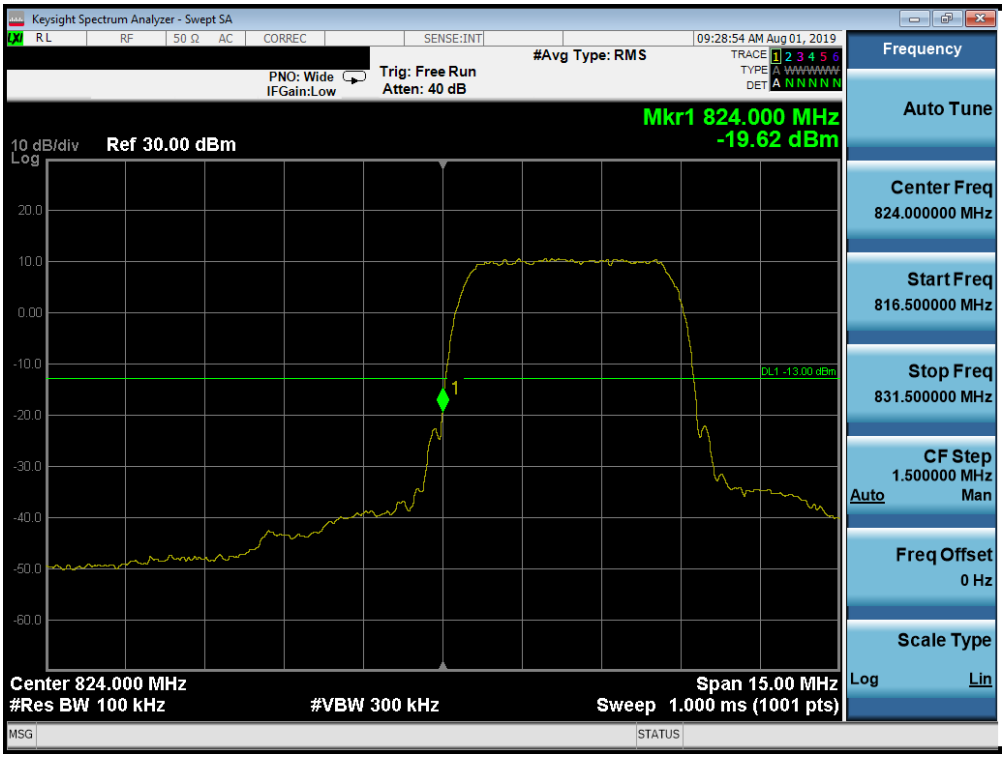



**Plot 7-86. 4MHz Span Plot (PCS CDMA Mode - High Channel)**

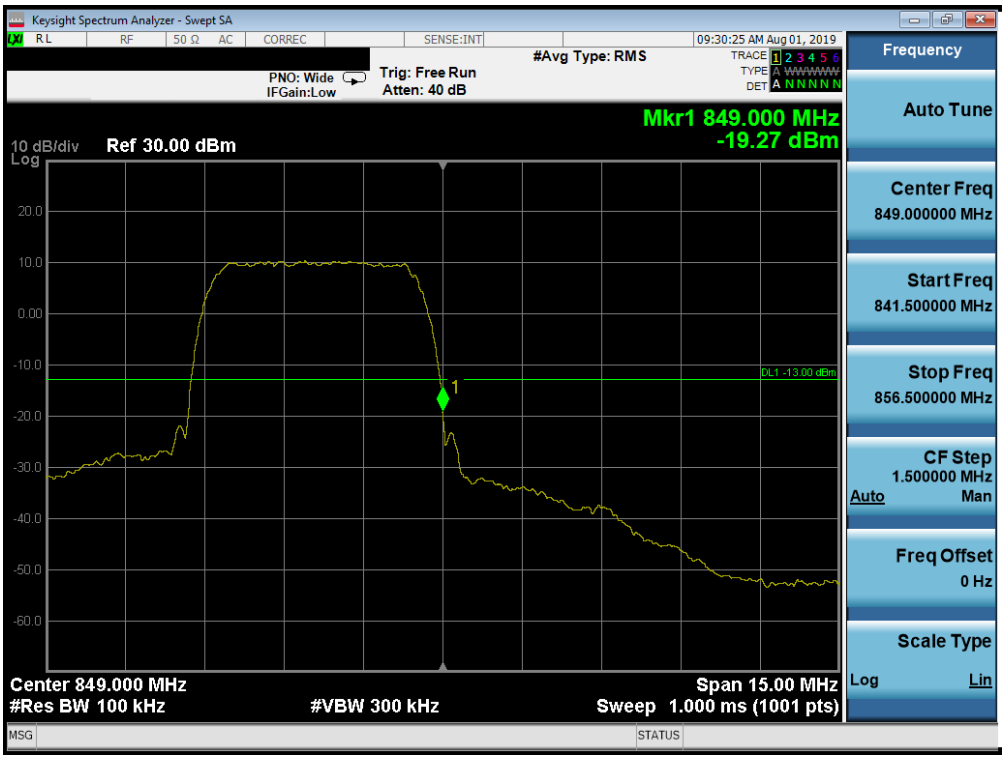



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Cellular WCDMA Mode




**Plot 7-87. Band Edge Plot (Cellular WCDMA Mode - Low Channel)**

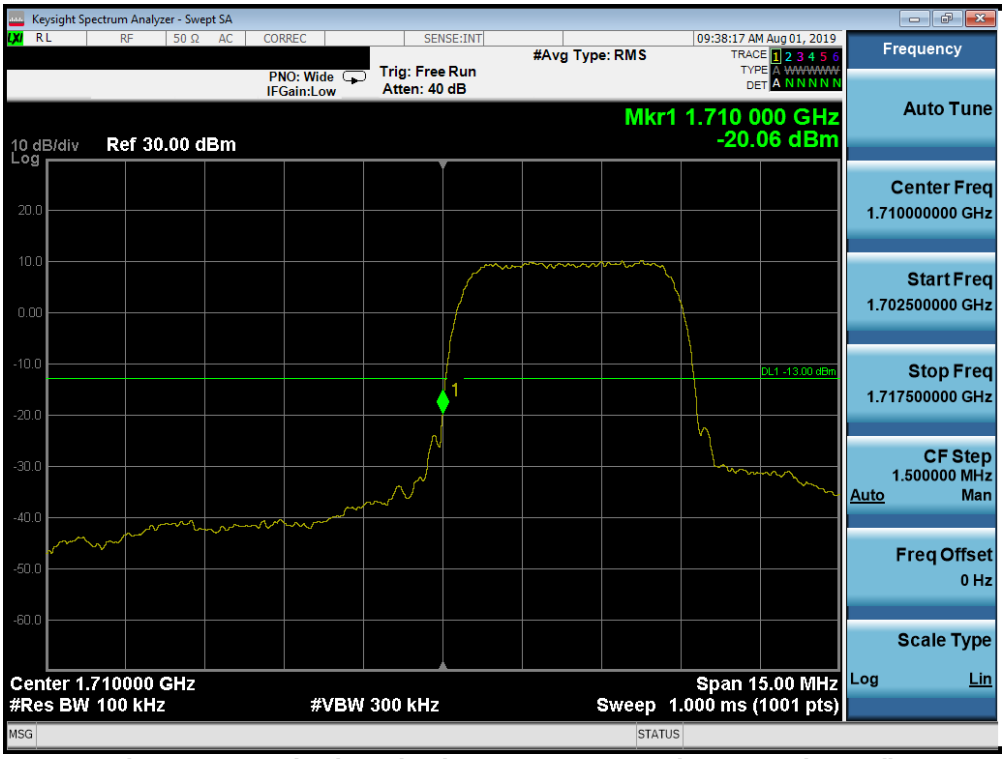



**Plot 7-88. Band Edge Plot (Cellular WCDMA Mode - High Channel)**

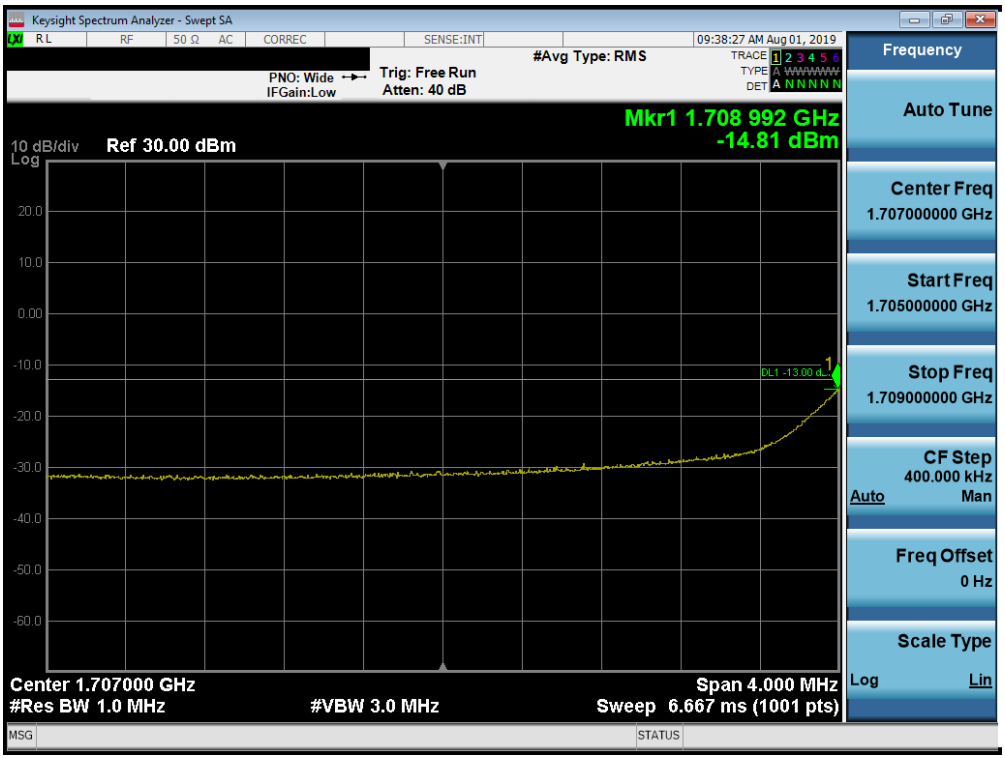


© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## AWS WCDMA Mode



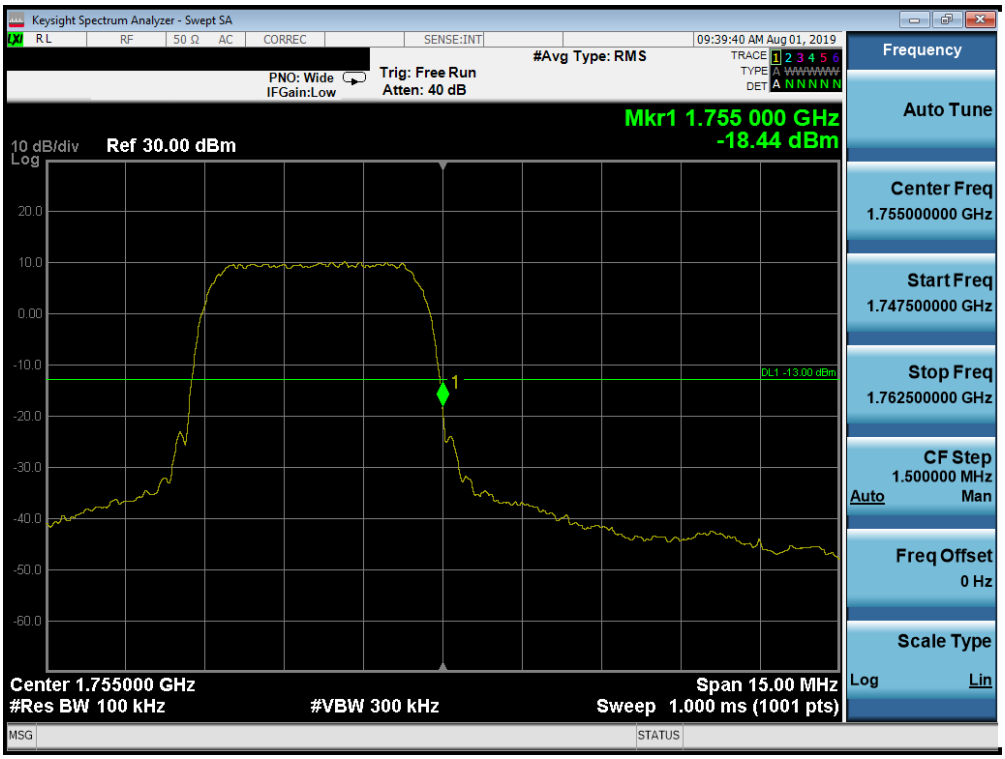

**Plot 7-89. Band Edge Plot (AWS WCDMA Mode - Low Channel)**



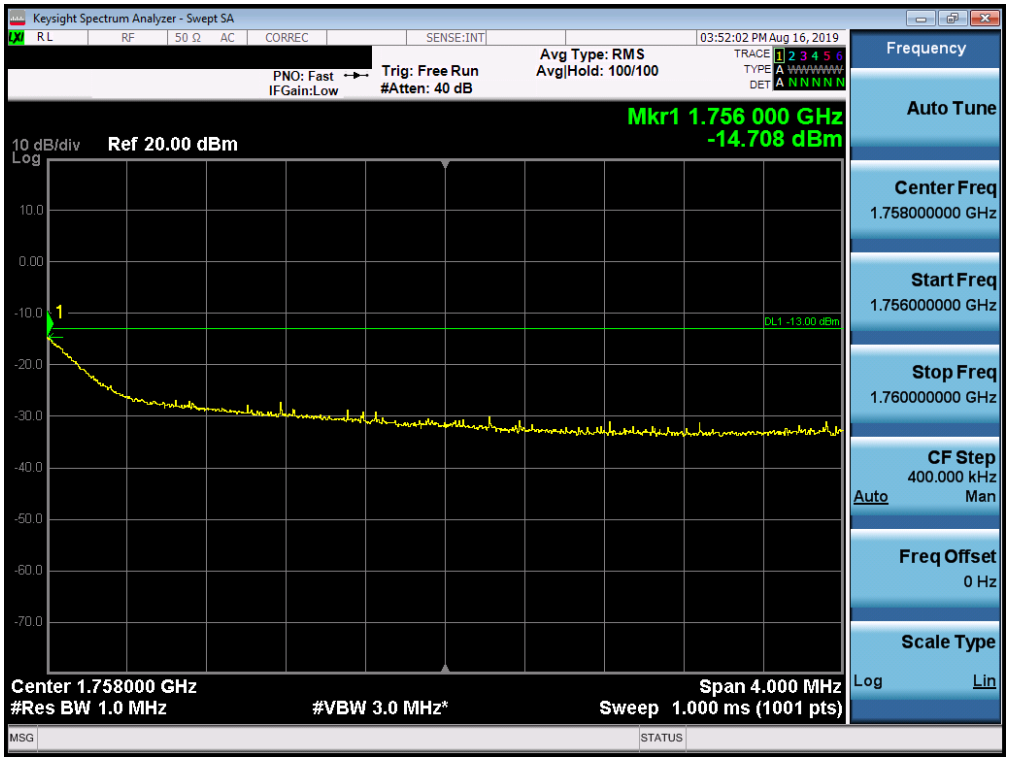

**Plot 7-90. 4MHz Span Plot (AWS WCDMA Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



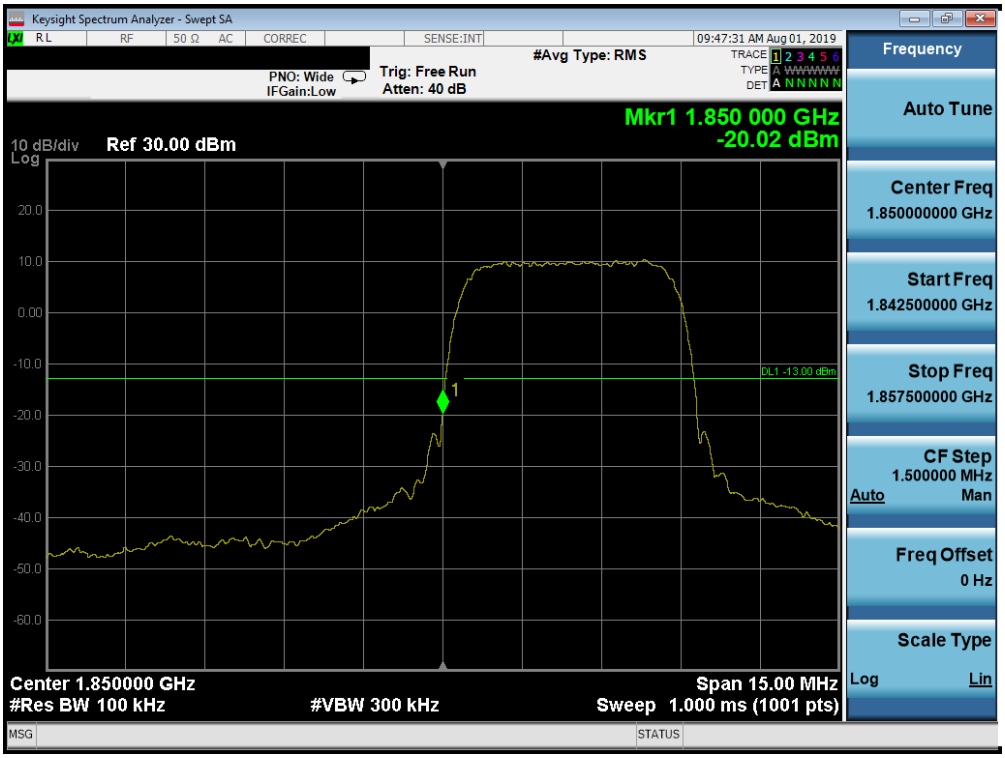

**Plot 7-91. Band Edge Plot (AWS WCDMA Mode - High Channel)**



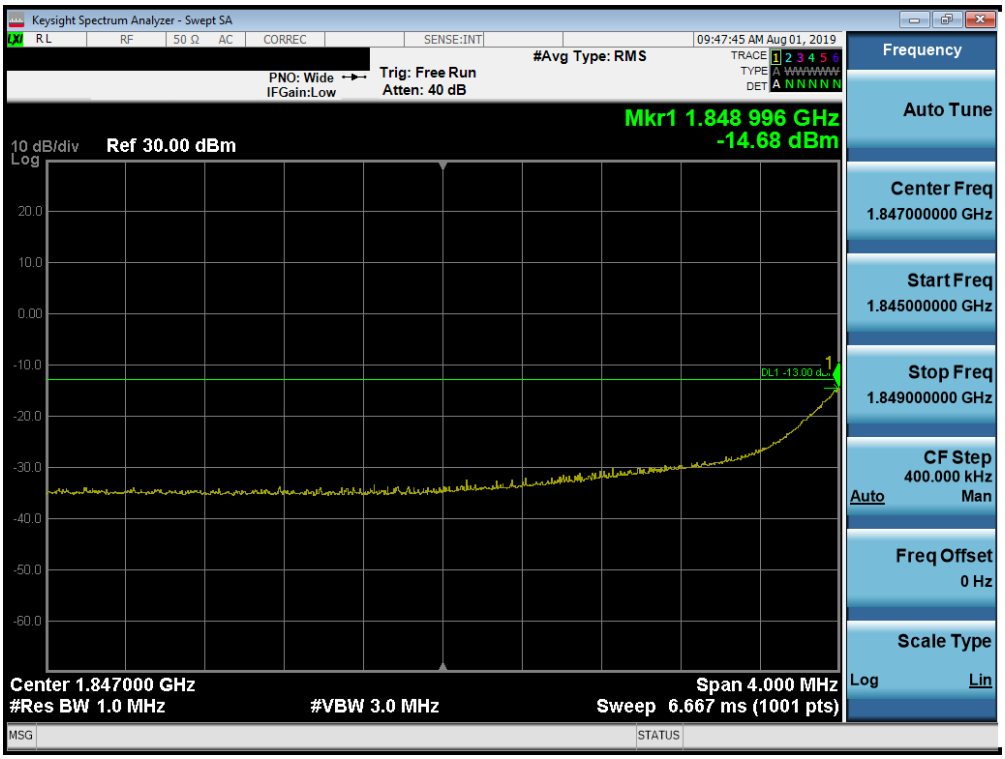

**Plot 7-92. 4MHz Span Plot (AWS WCDMA Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



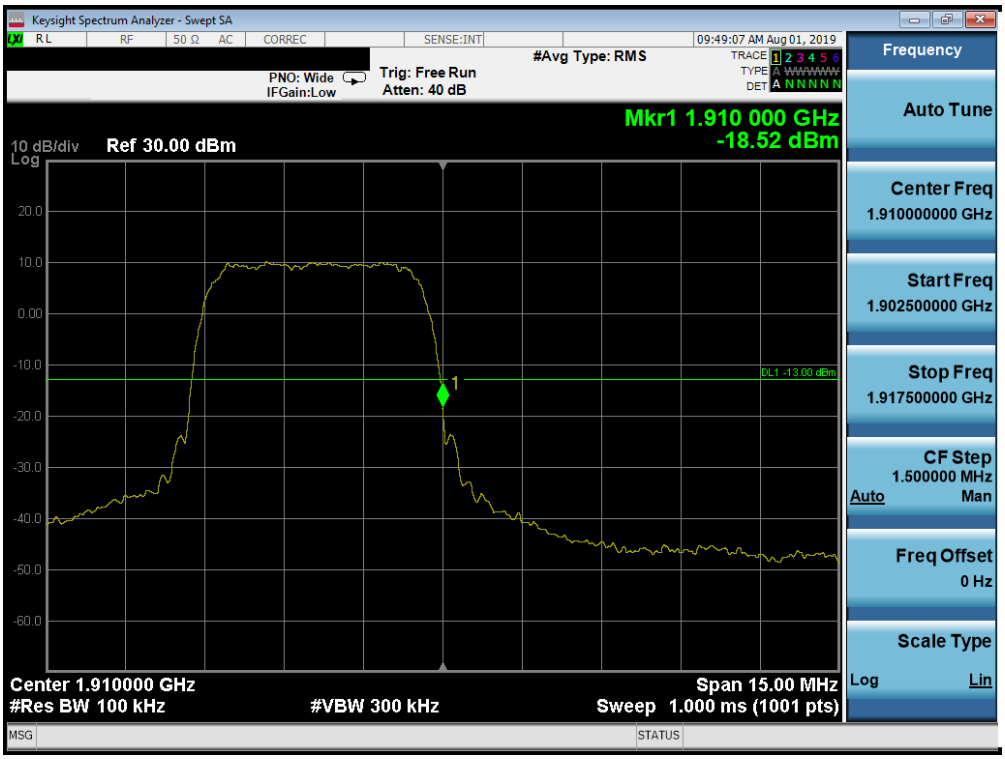

**Plot 7-93. Band Edge Plot (PCS WCDMA Mode - Low Channel)**



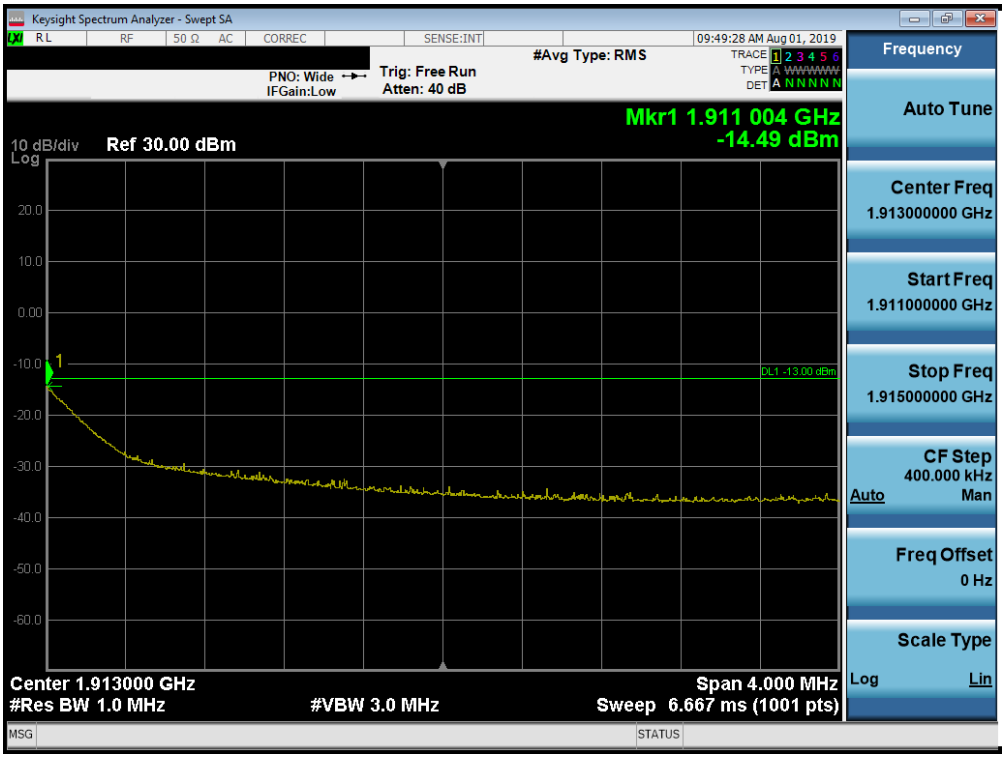

**Plot 7-94. 4MHz Span Plot (PCS WCDMA Mode - Low Channel)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.




**Plot 7-95. Band Edge Plot (PCS WCDMA Mode - High Channel)**




**Plot 7-96. 4MHz Span Plot (PCS WCDMA Mode - High Channel)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## 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.

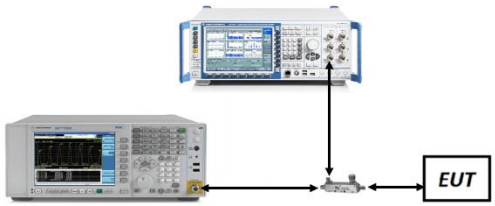


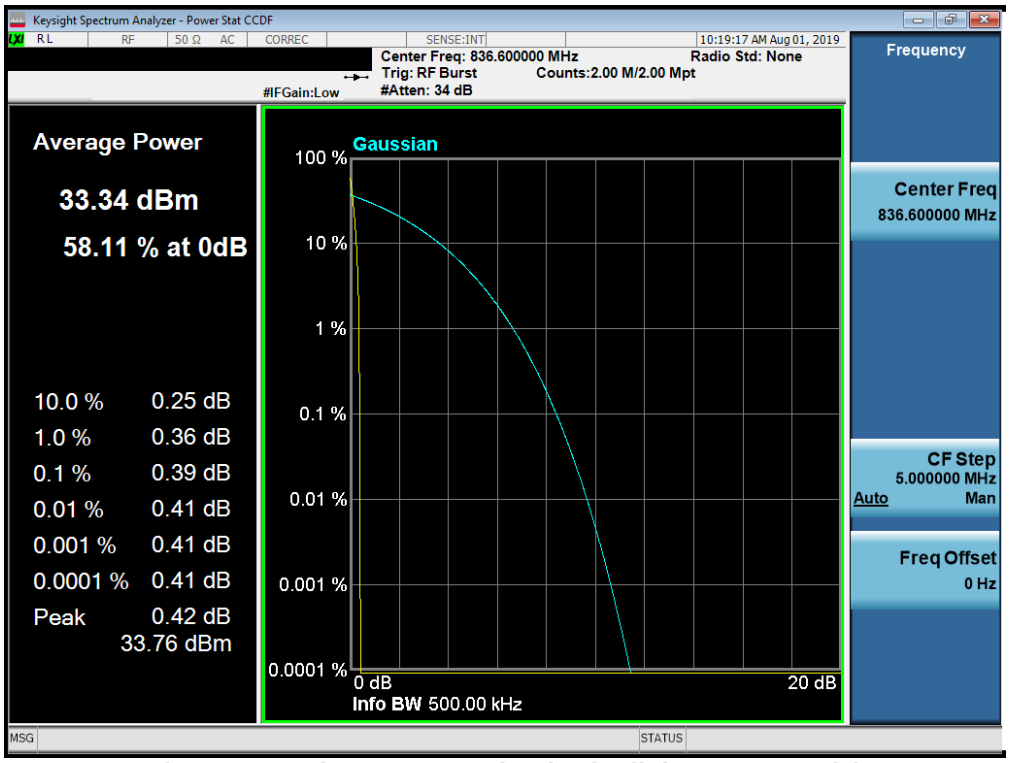

**Figure 7-4. Test Instrument & Measurement Setup**

**Test Notes**

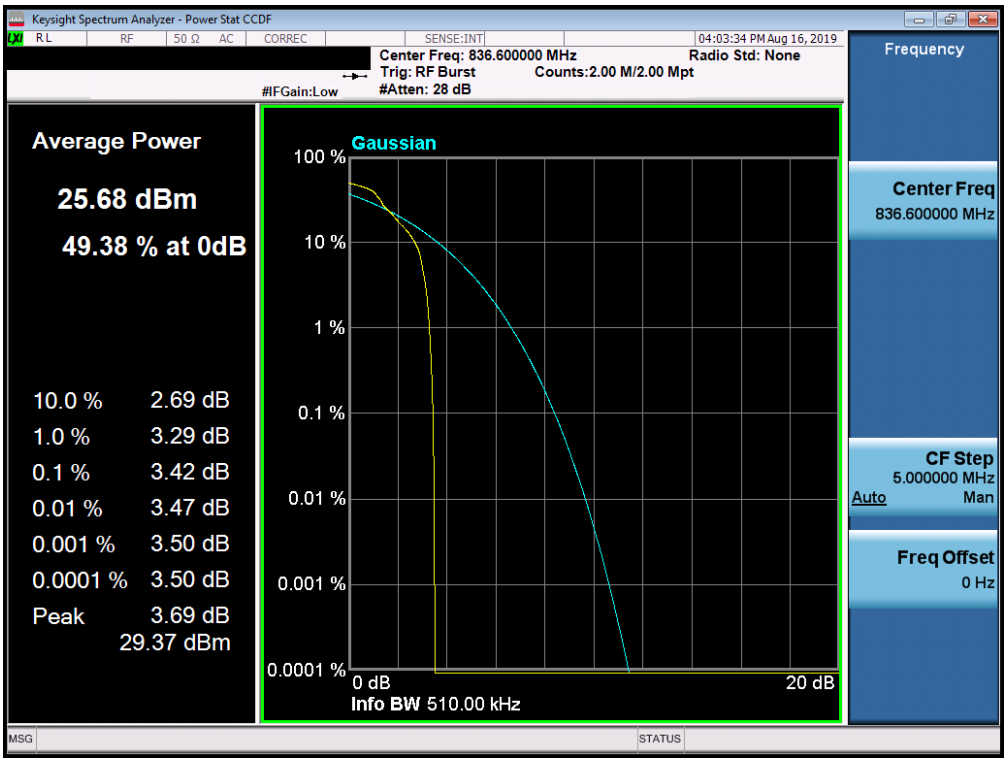
None



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



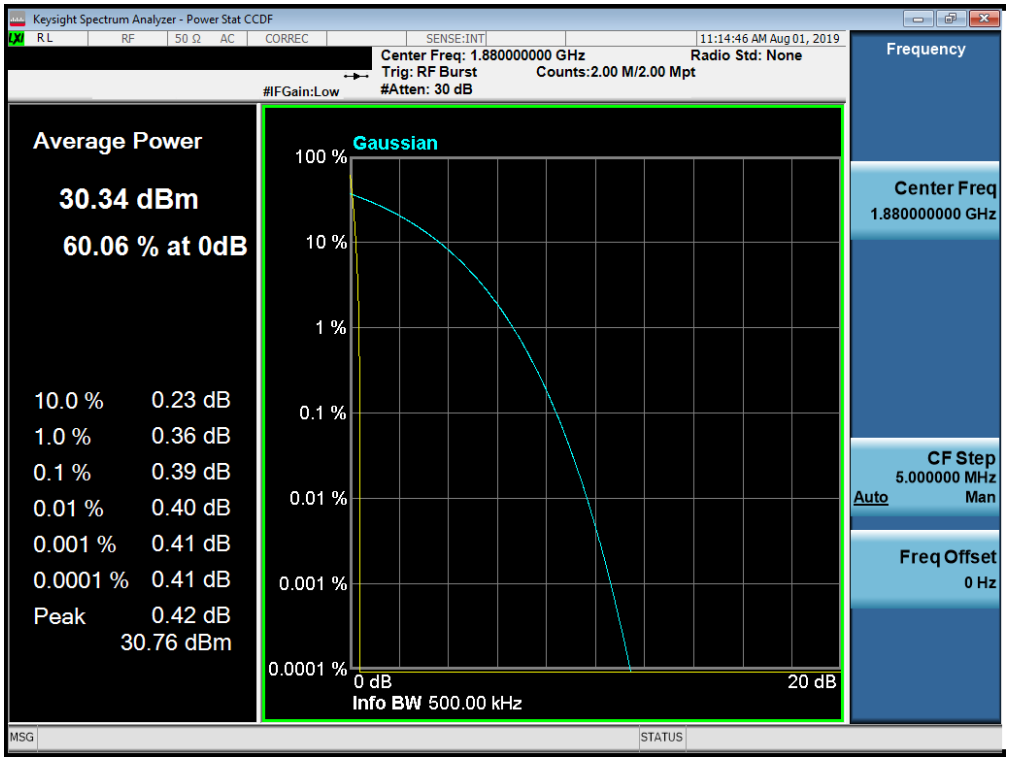

**Plot 7-97. Peak-Average Ratio Plot (Cellular GPRS Mode)**



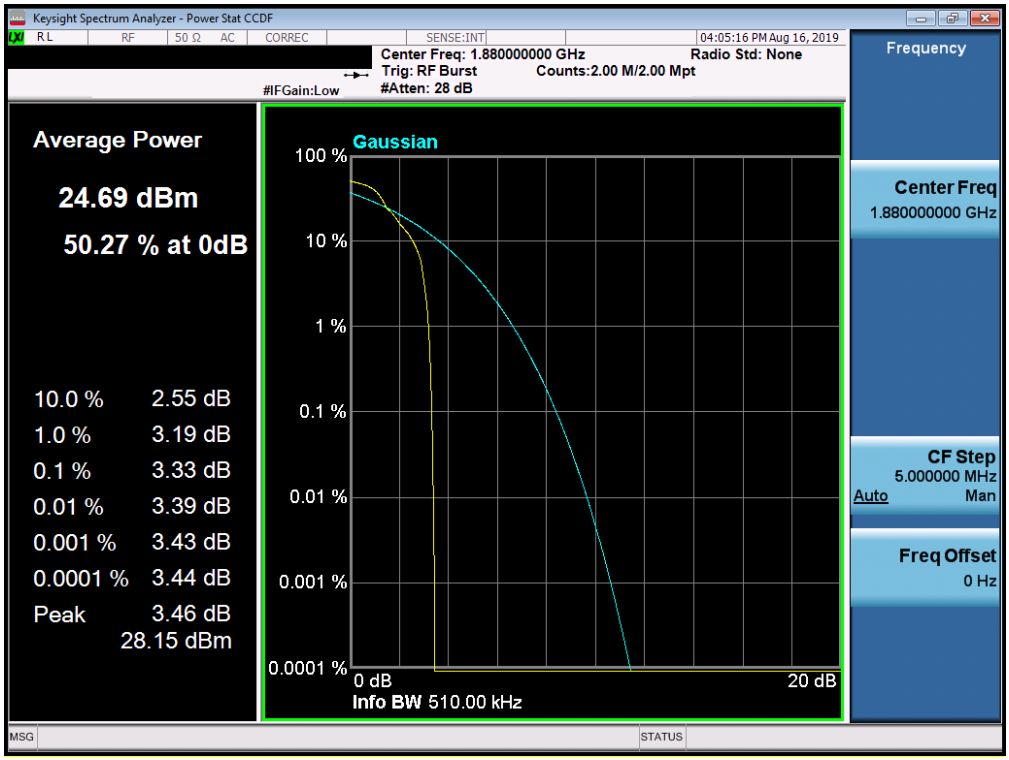

**Plot 7-98. Peak-Average Ratio Plot (Cellular EDGE Mode)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



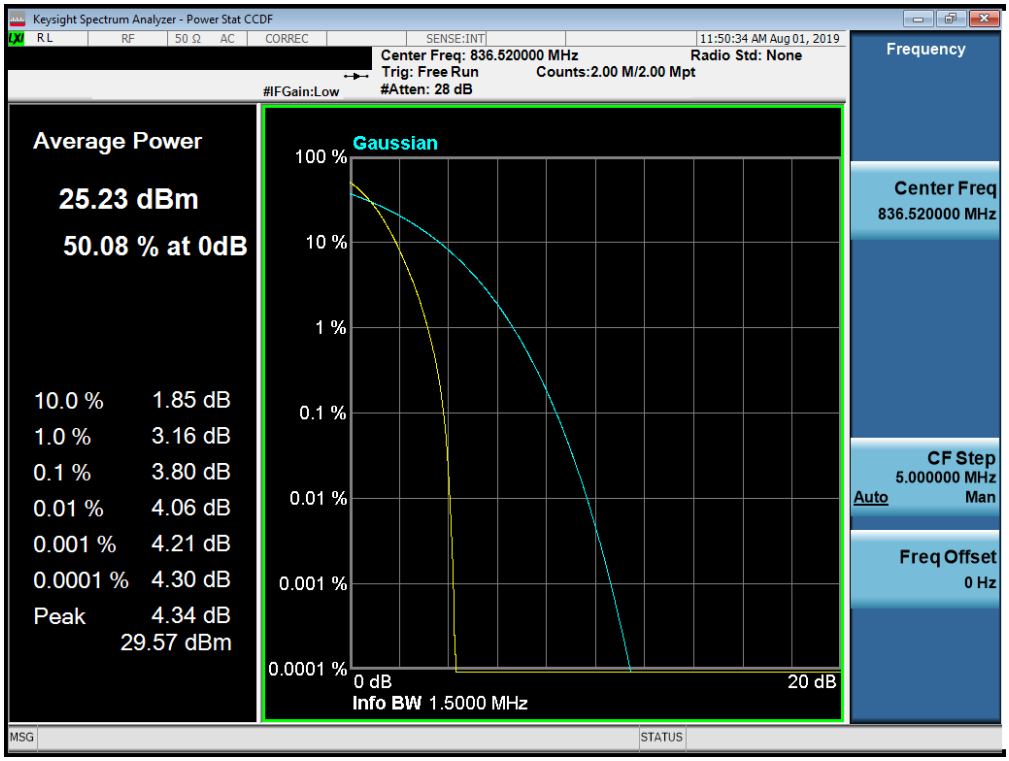

**Plot 7-99. Peak-Average Ratio Plot (PCS GPRS Mode)**



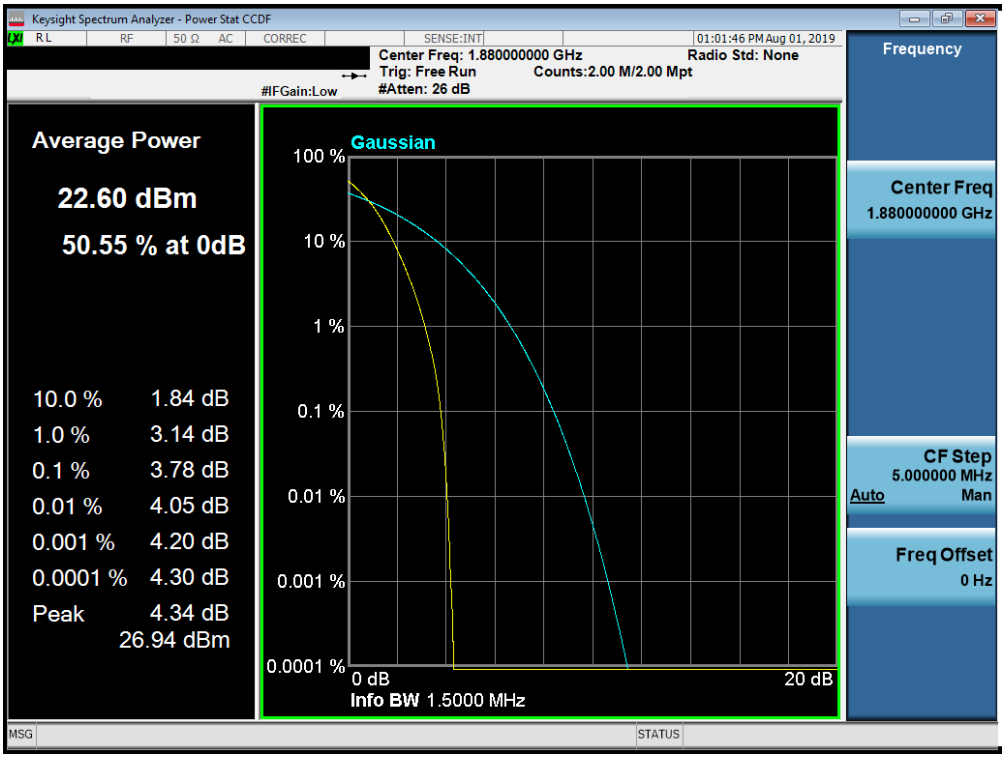

**Plot 7-100. Peak-Average Ratio Plot (PCS EDGE Mode)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



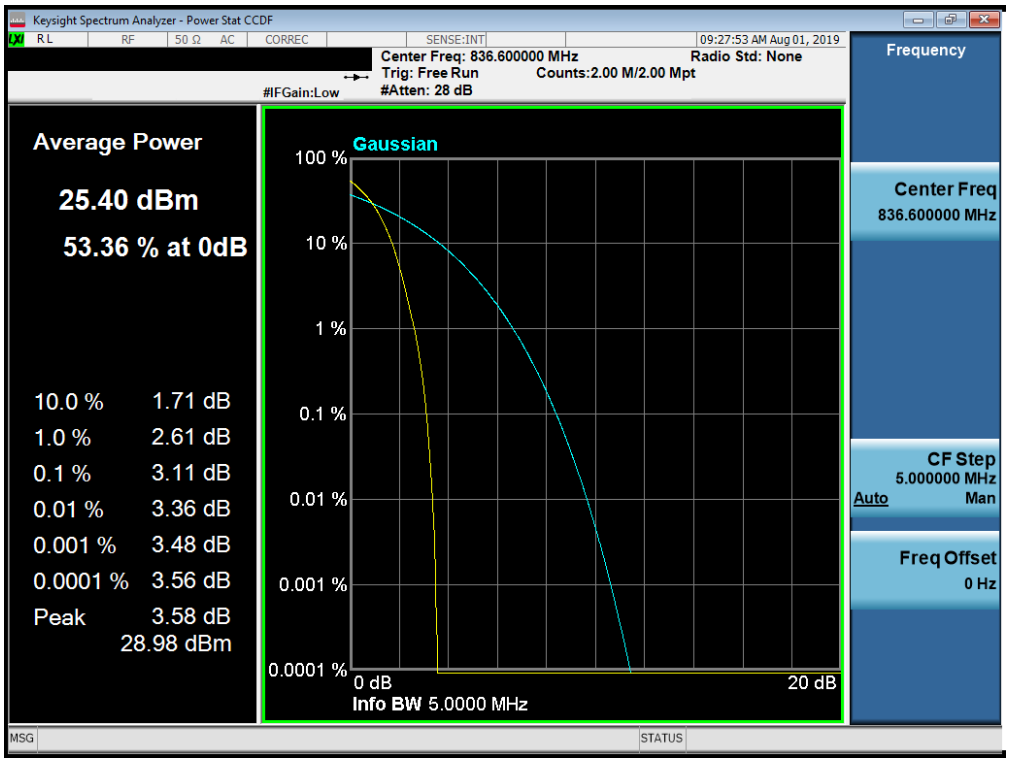

**Plot 7-101. Peak-Average Ratio Plot (Cellular CDMA Mode)**



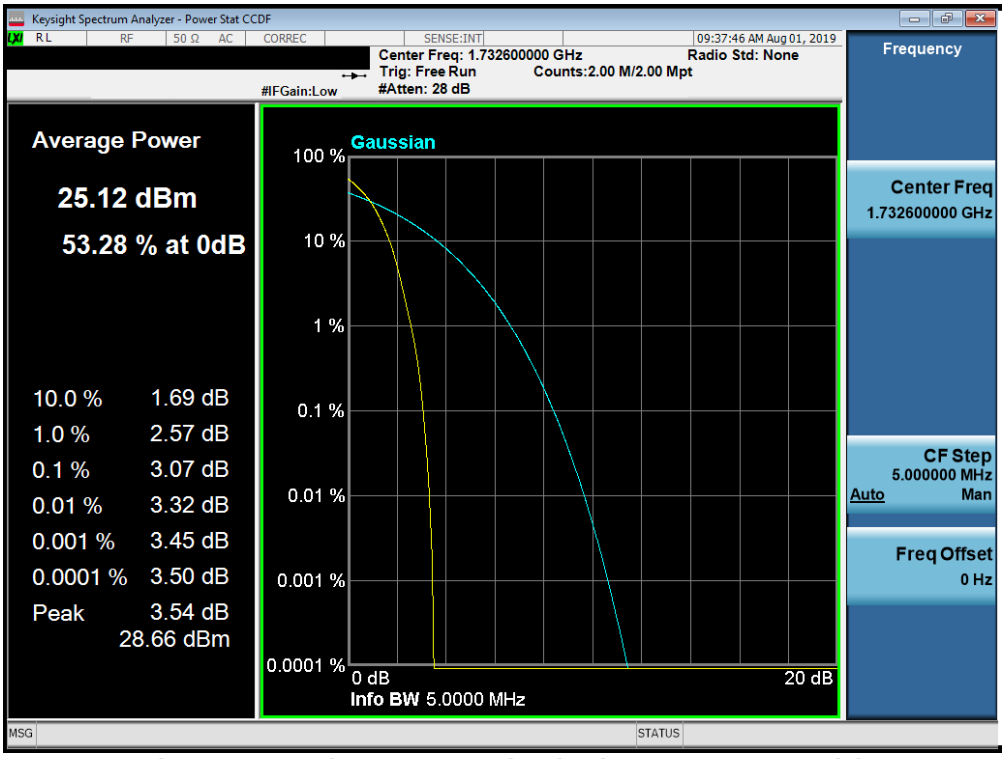

**Plot 7-102. Peak-Average Ratio Plot (PCS CDMA Mode)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.



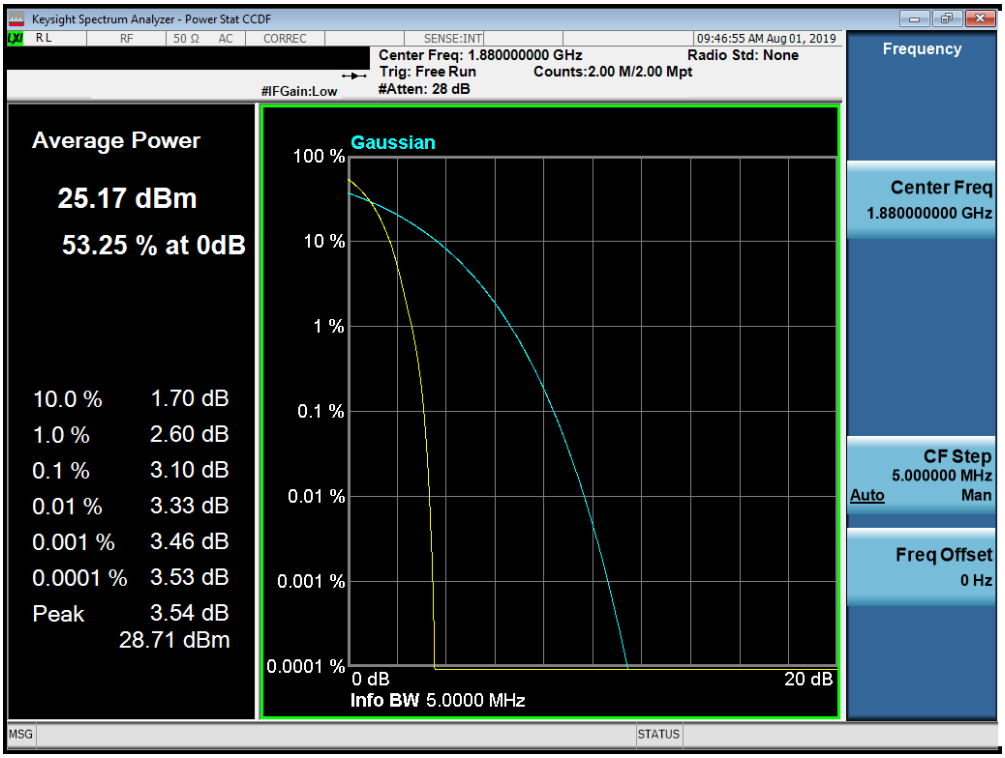

**Plot 7-103. Peak-Average Ratio Plot (Cellular WCDMA Mode)**




**Plot 7-104. Peak-Average Ratio Plot (AWS WCDMA Mode)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.




**Plot 7-105. Peak-Average Ratio Plot (PCS WCDMA Mode)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## 7.6 Radiated Power (ERP/EIRP)

**Test Overview**

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally 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 RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

**Test Procedures Used**

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

**Test Settings**

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW ≥ 3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points ≥ 2 x span / RBW
6. Detector = RMS
7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Test Setup

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

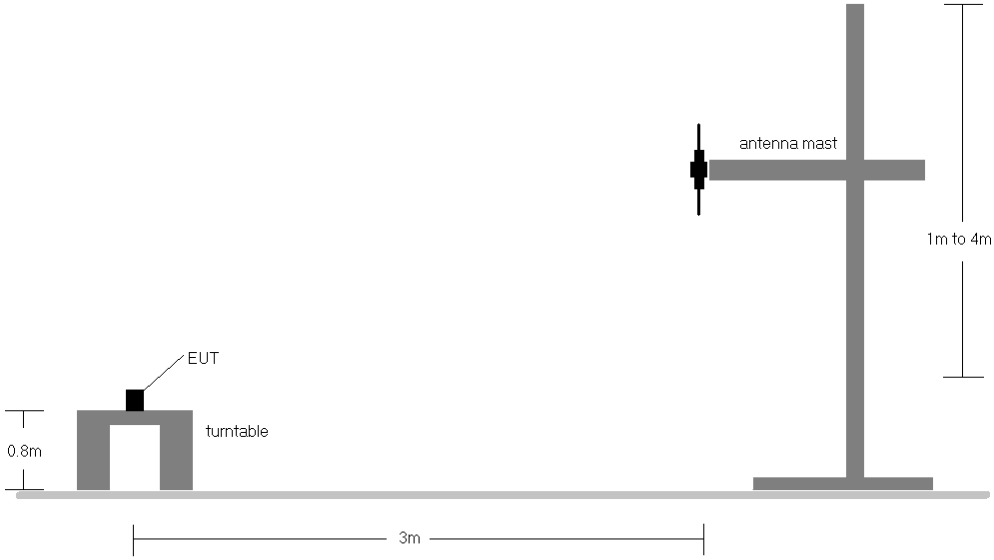



**Figure 7-5. Radiated Test Setup <1GHz**

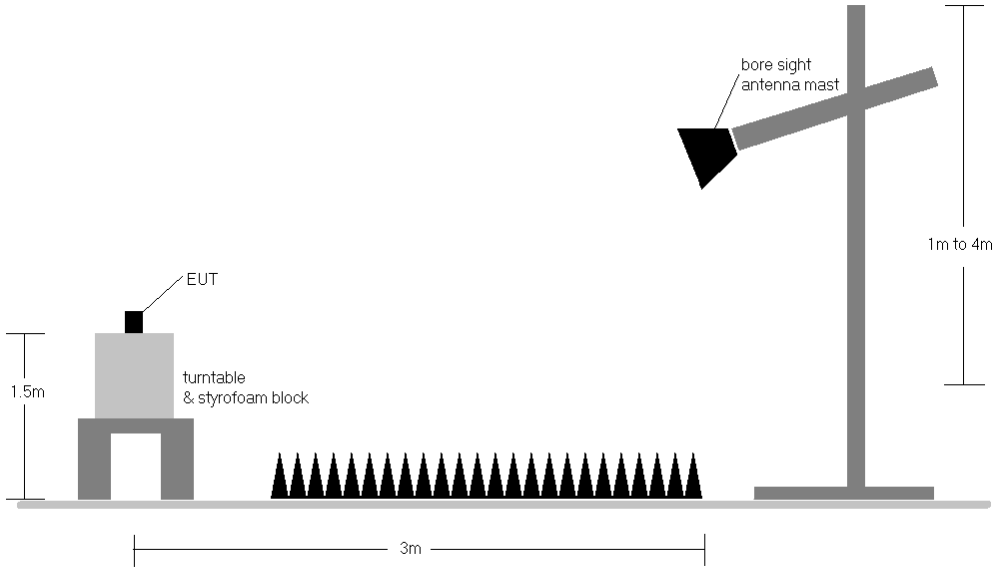



**Figure 7-6. Radiated Test Setup >1GHz**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Test Notes

1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest power is reported in GPRS mode while transmitting with one slot active.

2) 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."

3) This device was tested under all RC and SO combinations and the worst case is reported with RC3/SO55 with "All Up" power control bits.

4) This unit was tested with its standard battery.

5) 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.

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | ERP [dBm] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 824.20 | GPRS850 | H | 186 | 97 | 25.40 | 1.65 | 24.90 | 38.45 | -13.55 | 27.05 | 40.61 | -13.56 |
| 836.60 | GPRS850 | H | 106 | 103 | 27.79 | 1.57 | **27.21** | 38.45 | -11.24 | **29.36** | 40.61 | -11.24 |
| 848.80 | GPRS850 | H | 108 | 110 | 27.75 | 1.50 | 27.10 | 38.45 | -11.35 | 29.25 | 40.61 | -11.36 |
| 836.60 | GPRS850 | V | 102 | 364 | 27.27 | 1.57 | 26.69 | 38.45 | -11.76 | 28.84 | 40.61 | -11.76 |
| 836.60 | EDGE850 | H | 106 | 103 | 19.44 | 1.57 | **18.86** | 38.45 | -19.59 | **21.01** | 40.61 | -19.59 |
| 836.60 | GPRS850 (WCP) | H | 138 | 4 | 18.60 | 6.70 | 23.15 | 38.45 | -15.30 | 25.30 | 40.61 | -15.31 |

**Table 7-2. ERP/EIRP (Cellular GPRS)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | ERP [dBm] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 824.70 | CDMA850 | H | 187 | 98 | 17.10 | 1.65 | 16.60 | 38.45 | -21.86 | 18.75 | 40.61 | -21.86 |
| 836.52 | CDMA850 | H | 103 | 99 | 19.10 | 1.57 | **18.52** | 38.45 | -19.93 | **20.67** | 40.61 | -19.93 |
| 848.31 | CDMA850 | H | 104 | 107 | 18.75 | 1.50 | 18.10 | 38.45 | -20.35 | 20.25 | 40.61 | -20.36 |
| 836.52 | CDMA850 | V | 131 | 100 | 18.96 | 1.57 | 18.38 | 38.45 | -20.07 | 20.53 | 40.61 | -20.07 |
| 836.52 | CDMA850 (WCP) | H | 142 | 24 | 10.62 | 6.70 | 15.17 | 38.45 | -23.28 | 17.32 | 40.61 | -23.29 |

**Table 7-3. ERP/EIRP (Cellular CDMA)**

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | ERP [dBm] | ERP Limit [dBm] | Margin [dB] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 826.40 | WCDMA850 | H | 107 | 103 | 17.64 | 1.63 | 17.12 | 38.45 | -21.33 | 19.27 | 40.61 | -21.33 |
| 836.60 | WCDMA850 | H | 103 | 108 | 19.85 | 1.57 | **19.27** | 38.45 | -19.18 | **21.42** | 40.61 | -19.18 |
| 846.60 | WCDMA850 | H | 105 | 112 | 19.02 | 1.51 | 18.38 | 38.45 | -20.07 | 20.53 | 40.61 | -20.08 |
| 836.60 | WCDMA850 | V | 130 | 94 | 19.71 | 1.57 | 19.13 | 38.45 | -19.32 | 21.28 | 40.61 | -19.32 |
| 836.60 | WCDMA850 (WCP) | H | 357 | 103 | 14.10 | 6.70 | 18.65 | 38.45 | -19.80 | 20.80 | 40.61 | -19.81 |

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

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 1712.40 | WCDMA1700 | H | 102 | 21 | 15.61 | 8.41 | 24.02 | 30.00 | -5.98 |
| 1732.60 | WCDMA1700 | H | 165 | 44 | 16.88 | 8.10 | **24.98** | 30.00 | -5.02 |
| 1752.60 | WCDMA1700 | H | 132 | 4 | 16.86 | 7.86 | 24.72 | 30.00 | -5.28 |
| 1732.60 | WCDMA1700 | V | 103 | 147 | 15.58 | 8.10 | 23.68 | 30.00 | -6.32 |
| 1732.60 | WCDMA1700 (WCP) | H | 149 | 91 | 13.08 | 9.31 | 22.39 | 30.00 | -7.61 |

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




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 1850.20 | GPRS1900 | H | 100 | 179 | 21.99 | 9.48 | 31.47 | 33.01 | -1.54 |
| 1880.00 | GPRS1900 | H | 100 | 230 | 20.94 | 9.90 | 30.84 | 33.01 | -2.17 |
| 1909.80 | GPRS1900 | H | 100 | 184 | 21.24 | 10.26 | **31.50** | 33.01 | -1.51 |
| 1909.80 | GPRS1900 | V | 329 | 239 | 18.82 | 9.90 | 28.72 | 33.01 | -4.29 |
| 1909.80 | EDGE1900 | H | 100 | 179 | 15.77 | 9.90 | **25.67** | 33.01 | -7.34 |
| 1909.80 | GPRS1900 (WCP) | H | 100 | 15 | 19.45 | 9.90 | 29.35 | 33.01 | -3.66 |

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

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 1851.25 | CDMA1900 | H | 158 | 0 | 16.53 | 8.42 | **24.95** | 33.01 | -8.06 |
| 1880.00 | CDMA1900 | H | 194 | 355 | 16.46 | 8.26 | 24.72 | 33.01 | -8.29 |
| 1908.75 | CDMA1900 | H | 111 | 313 | 11.97 | 8.16 | 20.13 | 33.01 | -12.88 |
| 1851.25 | CDMA1900 | V | 103 | 314 | 15.07 | 8.42 | 23.49 | 33.01 | -9.52 |
| 1851.25 | CDMA1900 (WCP) | H | 140 | 10 | 10.71 | 9.90 | 20.61 | 33.01 | -12.40 |

**Table 7-7. EIRP (PCS CDMA)**

| Frequency [MHz] | Mode | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Substitute Level [dBm] | Ant. Gain [dBi] | EIRP [dBm] | EIRP Limit [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|
| 1852.40 | WCDMA1900 | H | 161 | 177 | 17.37 | 8.41 | **25.78** | 33.01 | -7.23 |
| 1880.00 | WCDMA1900 | H | 194 | 356 | 17.22 | 8.26 | 25.48 | 33.01 | -7.53 |
| 1907.60 | WCDMA1900 | H | 113 | 203 | 13.51 | 8.16 | 21.67 | 33.01 | -11.34 |
| 1852.40 | WCDMA1900 | V | 102 | 73 | 15.91 | 8.26 | 24.17 | 33.01 | -8.84 |
| 1852.40 | WCDMA1900 (WCP) | H | 198 | 197 | 11.68 | 9.90 | 21.58 | 33.01 | -11.43 |

**Table 7-8. EIRP (PCS WCDMA)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## 7.7 Radiated Spurious Emissions Measurements

**Test Overview**

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as peak measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

**Test Procedures Used**

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

**Test Settings**

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW ≥ 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



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Test Setup

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

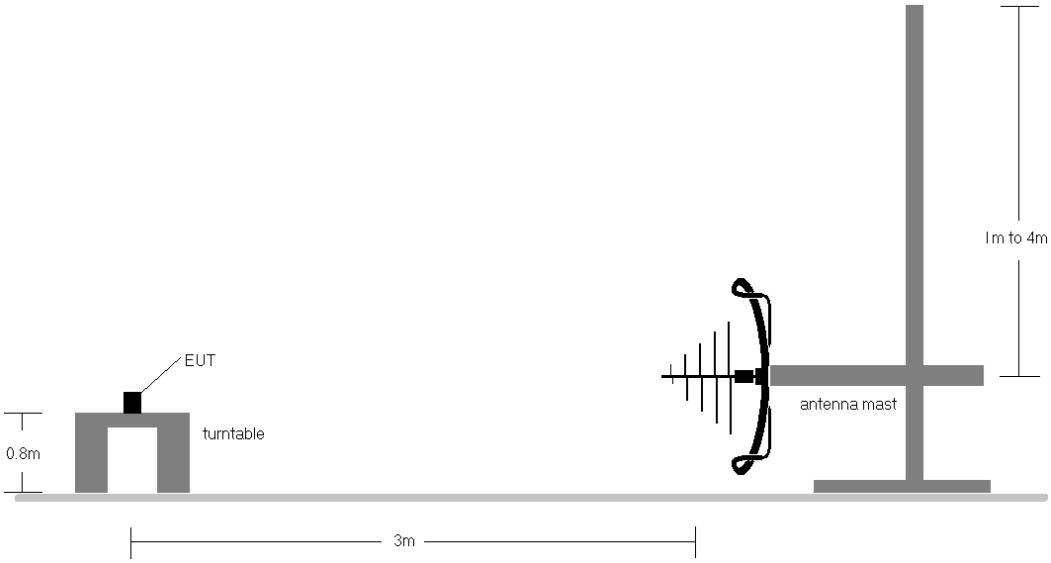



**Figure 7-7. Test Instrument & Measurement Setup < 1GHz**

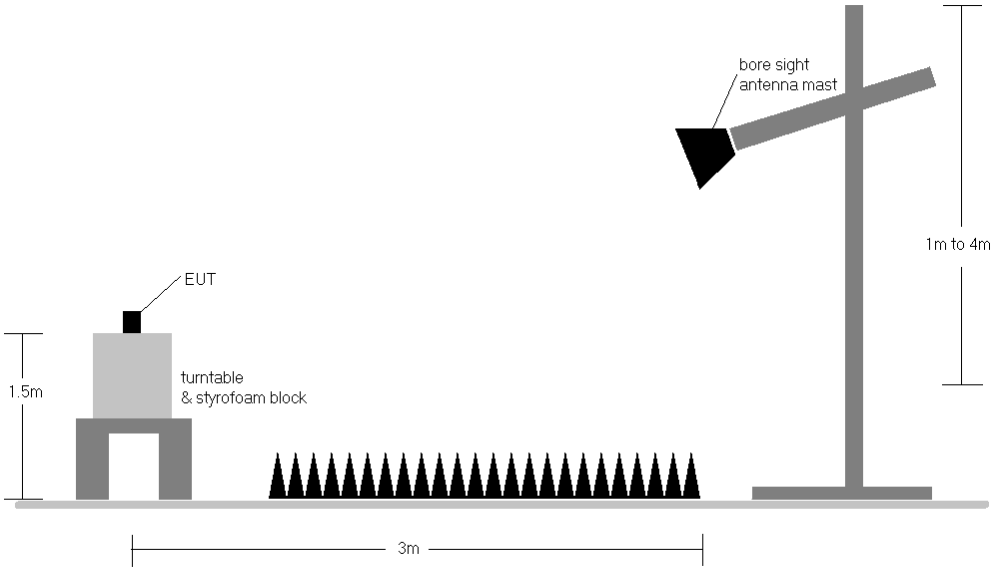



**Figure 7-8. Test Instrument & Measurement Setup >1 GHz**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Test Notes

1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest power is reported in GPRS mode while transmitting with one slot active.

2) 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."

3) This device was tested under all RC and SO combinations and the worst case is reported with RC3/SO55 with "All Up" power control bits.

4) This unit was tested with its standard battery.

5) 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.

6) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.

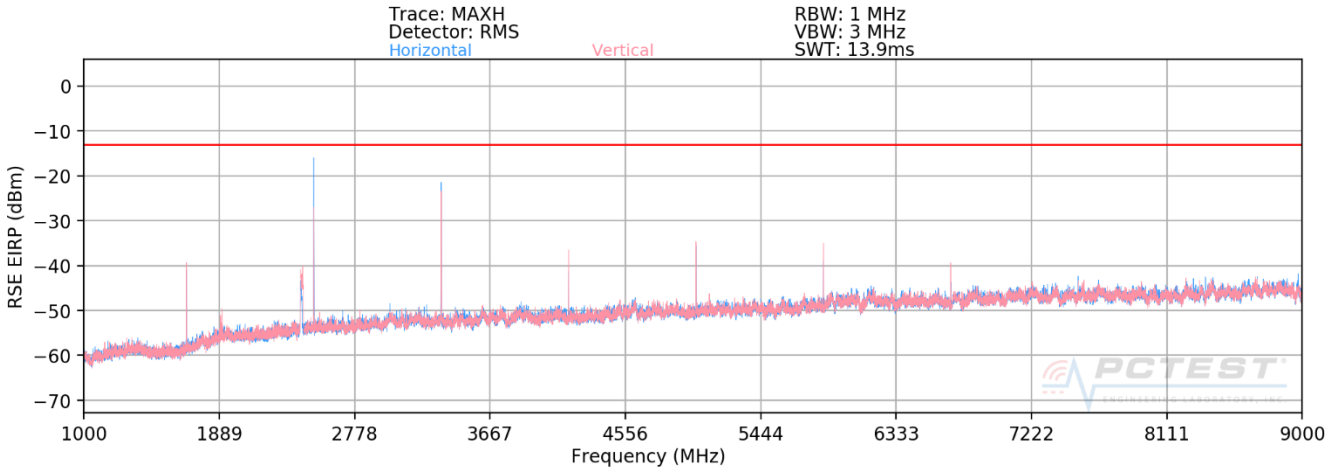
7) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

8) The "-" shown in the following RSE tables are used to denote a noise floor measurement.



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Cellular GPRS Mode




**Plot 7-106. Radiated Spurious Plot above 1GHz (Cellular GPRS Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 824.20 | MHz |
| CHANNEL: | 128 | |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1648.40 | H | 124 | 233 | -59.72 | 9.57 | -50.15 | -37.2 |
| 2472.60 | H | 149 | 198 | -27.72 | 9.47 | -18.25 | -5.3 |
| 3296.80 | H | 102 | 25 | -29.92 | 7.54 | -22.39 | -9.4 |
| 4121.00 | H | 100 | 265 | -63.77 | 7.97 | -55.80 | -42.8 |
| 4945.20 | H | - | - | -66.63 | 10.59 | -56.04 | -43.0 |

**Table 7-9. Radiated Spurious Data (Cellular GPRS Mode – Ch. 128)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836.60 | MHz |
| CHANNEL: | 190 | |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1673.20 | H | 345 | 358 | -48.60 | 9.54 | -39.06 | -26.1 |
| 2509.80 | H | 111 | 183 | -27.72 | 9.42 | -18.30 | -5.3 |
| 3346.40 | H | 269 | 228 | -29.58 | 7.31 | -22.27 | -9.3 |
| 4183.00 | H | 100 | 31 | -49.93 | 8.16 | -41.77 | -28.8 |
| 5019.60 | H | 124 | 357 | -62.11 | 10.80 | -51.32 | -38.3 |
| 5856.20 | H | 356 | 333 | -53.59 | 12.39 | -41.20 | -28.2 |
| 6692.80 | H | - | - | -64.30 | 11.98 | -52.31 | -39.3 |

**Table 7-10. Radiated Spurious Data (Cellular GPRS Mode – Ch. 190)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 848.80 | MHz |
| CHANNEL: | 251 | |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1697.60 | H | 147 | 229 | -46.24 | 9.51 | -36.73 | -23.7 |
| 2546.40 | H | 316 | 167 | -27.10 | 9.38 | -17.71 | -4.7 |
| 3395.20 | H | 113 | 252 | -28.64 | 7.32 | -21.33 | -8.3 |
| 4244.00 | H | 313 | 215 | -52.35 | 8.49 | -43.86 | -30.9 |
| 5092.80 | H | 116 | 32 | -48.25 | 10.93 | -37.32 | -24.3 |
| 5941.60 | H | 117 | 27 | -46.12 | 12.39 | -33.73 | -20.7 |
| 6790.40 | H | 125 | 18 | -51.48 | 11.82 | -39.66 | -26.7 |
| 7639.20 | H | 113 | 1 | -56.43 | 12.38 | -44.05 | -31.0 |
| 8488.00 | H | 113 | 329 | -53.41 | 9.16 | -44.25 | -31.2 |
| 9336.80 | H | 116 | 220 | -58.91 | 9.01 | -49.90 | -36.9 |
| 10185.60 | H | - | - | -60.14 | 12.09 | -53.84 | -40.8 |

**Table 7-11. Radiated Spurious Data (Cellular GPRS Mode – Ch. 251)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 848.80 | MHz |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

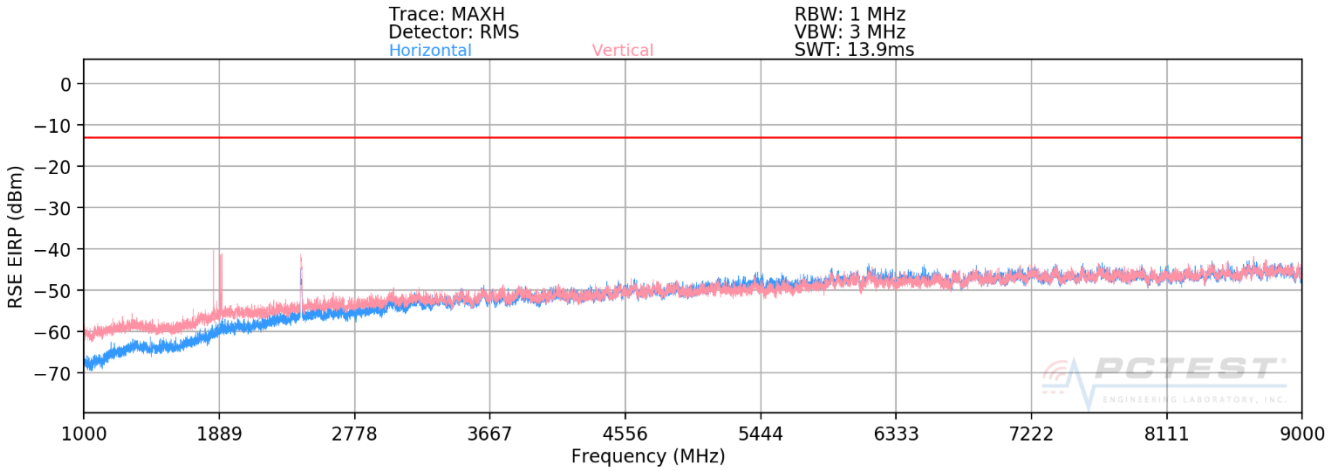
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1697.60 | H | 156 | 101 | -46.59 | 9.51 | -37.08 | -24.1 |
| 2546.40 | H | 174 | 166 | -27.81 | 9.38 | -18.42 | -5.4 |
| 3395.20 | H | 114 | 246 | -27.97 | 7.32 | -20.66 | -7.7 |
| 4244.00 | H | 327 | 208 | -51.11 | 8.49 | -42.62 | -29.6 |
| 5092.80 | H | 151 | 142 | -49.75 | 10.93 | -38.82 | -25.8 |
| 5941.60 | H | 115 | 24 | -48.63 | 12.39 | -36.24 | -23.2 |
| 6790.40 | H | 119 | 347 | -50.68 | 11.82 | -38.86 | -25.9 |
| 7639.20 | H | 134 | 158 | -59.59 | 12.38 | -47.21 | -34.2 |
| 8488.00 | H | 113 | 11 | -51.04 | 9.16 | -41.88 | -28.9 |
| 9336.80 | H | 126 | 340 | -58.95 | 9.01 | -49.94 | -36.94 |
| 10185.60 | H | - | - | -65.29 | 12.09 | -53.20 | -40.20 |

**Table 7-12. Radiated Spurious Data with WCP (Cellular GPRS Mode – Ch. 251)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Cellular CDMA Mode




**Plot 7-107. Radiated Spurious Plot above 1GHz (Cellular CDMA Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 824.70 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1649.40 | V | - | - | -75.42 | 9.56 | -65.85 | -52.9 |
| 2474.10 | V | - | - | -71.86 | 9.47 | -62.39 | -49.4 |

**Table 7-13. Radiated Spurious Data (Cellular CDMA Mode – Ch. 1013)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836.52 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1673.04 | V | - | - | -75.33 | 9.54 | -65.79 | -52.8 |
| 2509.56 | V | 191 | 353 | -69.24 | 9.42 | -59.82 | -46.8 |
| 3346.08 | V | - | - | -69.51 | 7.32 | -62.19 | -49.2 |

**Table 7-14. Radiated Spurious Data (Cellular CDMA Mode – Ch. 384)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 848.31 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1696.62 | V | - | - | -75.50 | 9.51 | -65.98 | -53.0 |
| 2544.93 | V | - | - | -71.50 | 9.38 | -62.12 | -49.1 |
| 3393.24 | V | - | - | -69.50 | 7.32 | -62.19 | -49.2 |

**Table 7-15. Radiated Spurious Data (Cellular CDMA Mode – Ch. 777)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836.52 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

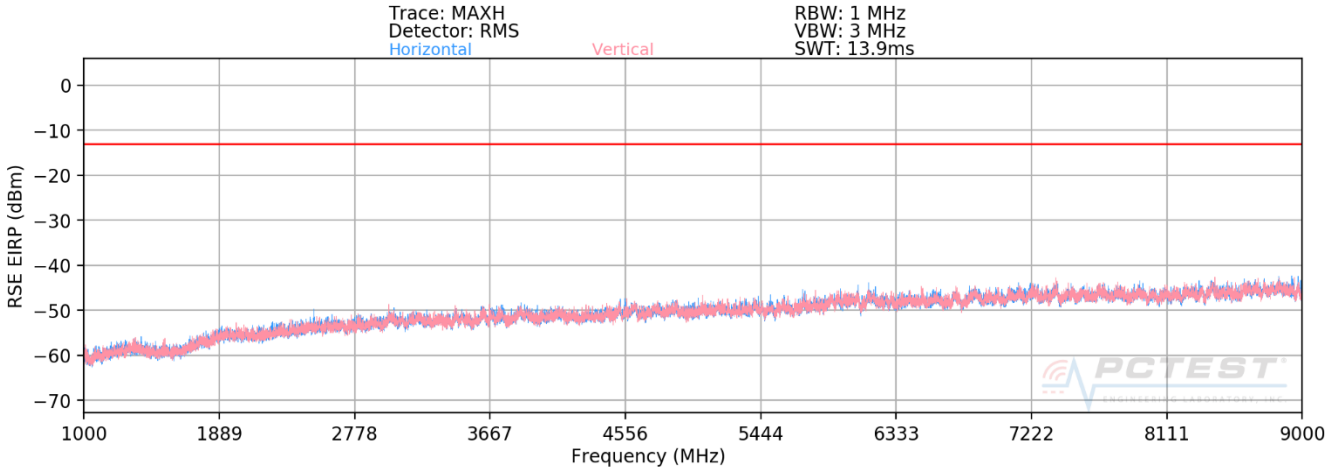
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1673.04 | H | 146 | 320 | -72.24 | 9.54 | -62.71 | -49.7 |
| 2509.56 | H | 113 | 61 | -76.37 | 9.42 | -66.94 | -53.9 |
| 3346.08 | H | - | - | -71.77 | 7.32 | -64.45 | -51.5 |

**Table 7-16. Radiated Spurious Data with WCP (Cellular CDMA Mode – Ch. 384)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Cellular WCDMA Mode




**Plot 7-108. Radiated Spurious Plot above 1GHz (Cellular WCDMA Mode)**

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1652.80 | V | - | - | -72.16 | 6.02 | -66.14 | -53.1 |
| 2479.20 | V | - | - | -68.13 | 5.77 | -62.36 | -49.4 |

**Table 7-17. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4132)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1673.20 | V | - | - | -71.97 | 5.97 | -66.00 | -53.0 |
| 2509.80 | V | - | - | -68.20 | 5.80 | -62.40 | -49.4 |

**Table 7-18. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4183)**

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1693.20 | V | - | - | -71.83 | 5.92 | -65.91 | -52.9 |
| 2539.80 | V | - | - | -68.88 | 5.90 | -62.99 | -50.0 |

**Table 7-19. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4233)**

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

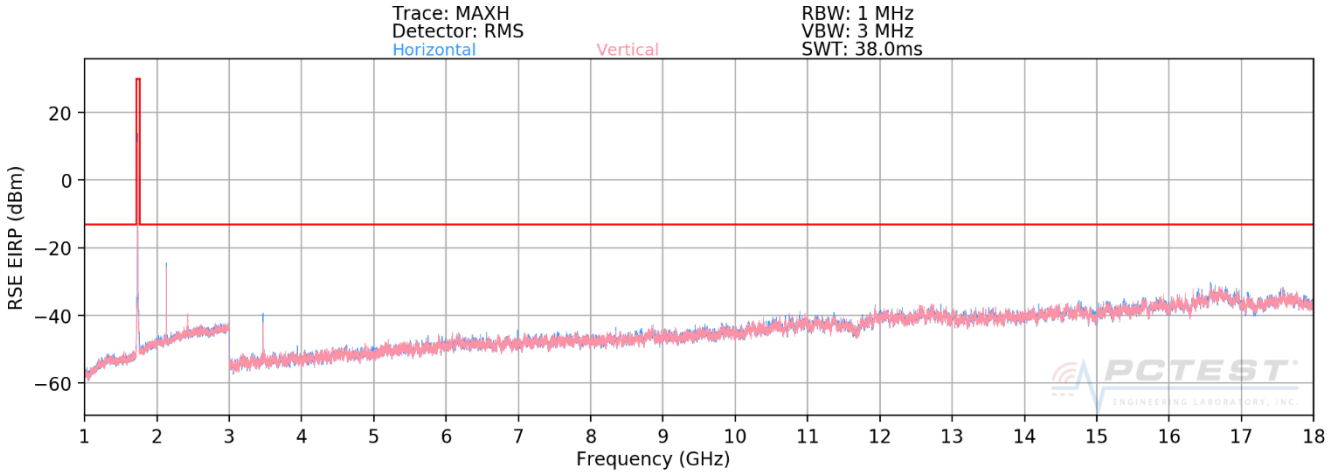
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 1673.20 | V | - | - | -80.63 | 8.95 | -71.68 | -58.7 |
| 2509.80 | V | - | - | -77.86 | 9.74 | -68.12 | -55.1 |

**Table 7-20. Radiated Spurious Data with WCP (Cellular WCDMA Mode – Ch. 4183)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## AWS WCDMA Mode




**Plot 7-109. Radiated Spurious Plot above 1GHz (AWS WCDMA Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1712.40 | MHz |
| MODULATION SIGNAL: | WCDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3424.80 | H | 103 | 227 | -45.81 | 7.44 | -38.38 | -25.4 |
| 5137.20 | H | 100 | 39 | -63.36 | 11.05 | -52.31 | -39.3 |
| 6849.60 | H | - | - | -68.76 | 11.71 | -57.06 | -44.1 |

**Table 7-21. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1312)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3465.20 | H | 114 | 225 | -49.48 | 7.53 | -41.94 | -28.9 |
| 5197.80 | H | 101 | 40 | -66.70 | 11.15 | -55.55 | -42.5 |
| 6930.40 | H | - | - | -69.53 | 11.80 | -57.73 | -44.7 |

**Table 7-22. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1413)**

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3505.20 | H | 104 | 233 | -57.58 | 7.46 | -50.12 | -37.1 |
| 5257.80 | H | - | - | -71.82 | 11.33 | -60.49 | -47.5 |

**Table 7-23. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1513)**

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

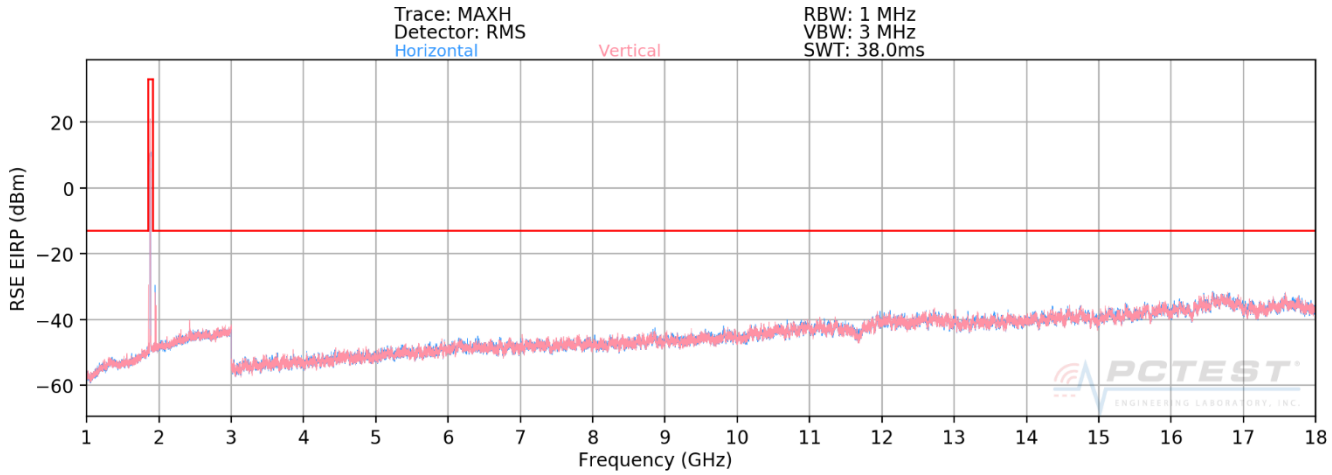
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3465.20 | H | 137 | 131 | -55.91 | 9.88 | -46.03 | -33.0 |
| 5197.80 | H | 123 | 25 | -69.61 | 10.76 | -58.85 | -45.9 |
| 6930.40 | H | - | - | -73.76 | 11.74 | -62.01 | -49.0 |

**Table 7-24. Radiated Spurious Data with WCP (AWS WCDMA Mode – Ch. 1413)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## PCS GPRS Mode




**Plot 7-110. Radiated Spurious Plot above 1GHz (PCS GPRS Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1850.20 | MHz |
| MODULATION SIGNAL: | GPRS (GMSK) | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3700.40 | V | 283 | 183 | -61.64 | 6.14 | -55.50 | -42.5 |
| 5550.60 | V | 324 | 279 | -61.57 | 12.00 | -49.57 | -36.6 |
| 7400.80 | V | - | - | -64.42 | 12.44 | -51.98 | -39.0 |

**Table 7-25. Radiated Spurious Data (PCS GPRS Mode – Ch. 512)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

OPERATING FREQUENCY: 1880.00 MHz
MODULATION SIGNAL: GPRS (GMSK)
DISTANCE: 3 meters
LIMIT: -13 dBm

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3760.00 | V | 146 | 225 | -68.50 | 5.90 | -62.60 | -49.6 |
| 5640.00 | V | - | - | -75.57 | 12.27 | -63.30 | -50.3 |

**Table 7-26. Radiated Spurious Data (PCS GPRS Mode – Ch. 661)**

OPERATING FREQUENCY: 1909.80 MHz
MODULATION SIGNAL: GPRS (GMSK)
DISTANCE: 3 meters
LIMIT: -13 dBm

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3819.60 | V | 378 | 108 | -66.57 | 5.82 | -60.76 | -47.8 |
| 5729.40 | V | 345 | 17 | -71.58 | 12.45 | -59.14 | -46.1 |
| 7639.20 | V | - | - | -76.01 | 12.38 | -63.63 | -50.6 |

**Table 7-27. Radiated Spurious Data (PCS GPRS Mode – Ch. 810)**

OPERATING FREQUENCY: 1850.20 MHz
MODULATION SIGNAL: GPRS (GMSK)
DISTANCE: 3 meters
LIMIT: -13 dBm

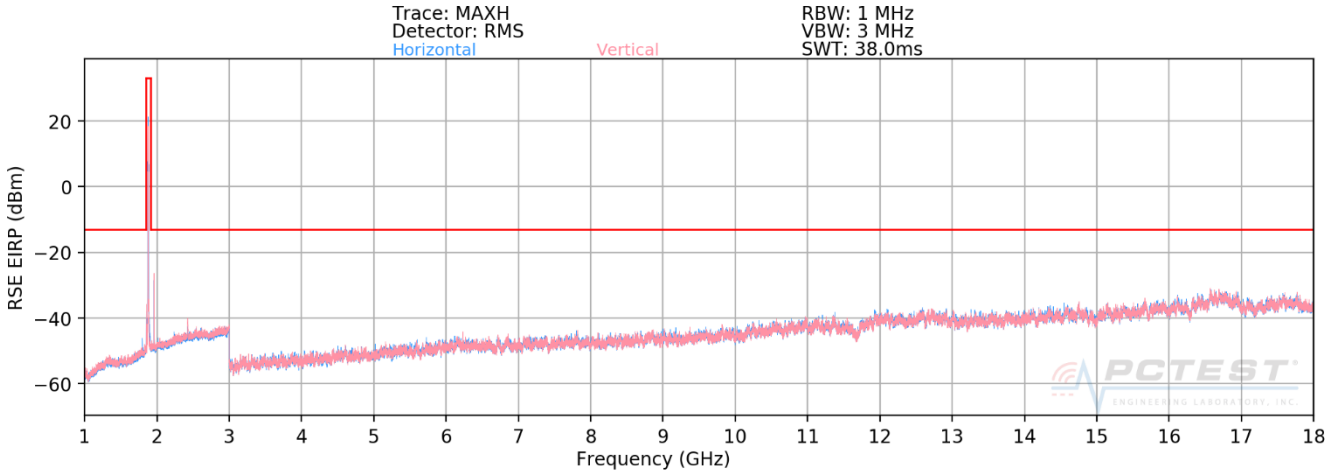
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3700.40 | V | 101 | 15 | -62.10 | 6.14 | -55.96 | -43.0 |
| 5550.60 | V | 144 | 248 | -66.08 | 12.00 | -54.08 | -41.1 |
| 7400.80 | V | - | - | -66.11 | 12.44 | -53.67 | -40.7 |

**Table 7-28. Radiated Spurious Data with WCP (PCS GPRS Mode – Ch. 512)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## PCS CDMA Mode




**Plot 7-111. Radiated Spurious Plot above 1GHz (PCS CDMA Mode)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1851.25 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3702.50 | V | - | - | -67.77 | 6.13 | -61.64 | -48.6 |
| 5553.75 | V | - | - | -71.95 | 12.01 | -59.94 | -46.9 |

**Table 7-29. Radiated Spurious Data (PCS CDMA Mode – Ch. 25)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3760.00 | V | - | - | -67.64 | 5.90 | -61.74 | -48.7 |
| 5640.00 | V | - | - | -71.89 | 12.27 | -59.61 | -46.6 |

**Table 7-30. Radiated Spurious Data (PCS CDMA Mode – Ch. 600)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1908.75 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3817.50 | V | - | - | -67.23 | 5.82 | -61.41 | -48.4 |
| 5726.25 | V | - | - | -72.57 | 12.44 | -60.13 | -47.1 |

**Table 7-31. Radiated Spurious Data (PCS CDMA Mode – Ch. 1175)**

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1851.25 | MHz |
| MODULATION SIGNAL: | CDMA | |
| DISTANCE: | 3 | meters |
| LIMIT: | -13 | dBm |

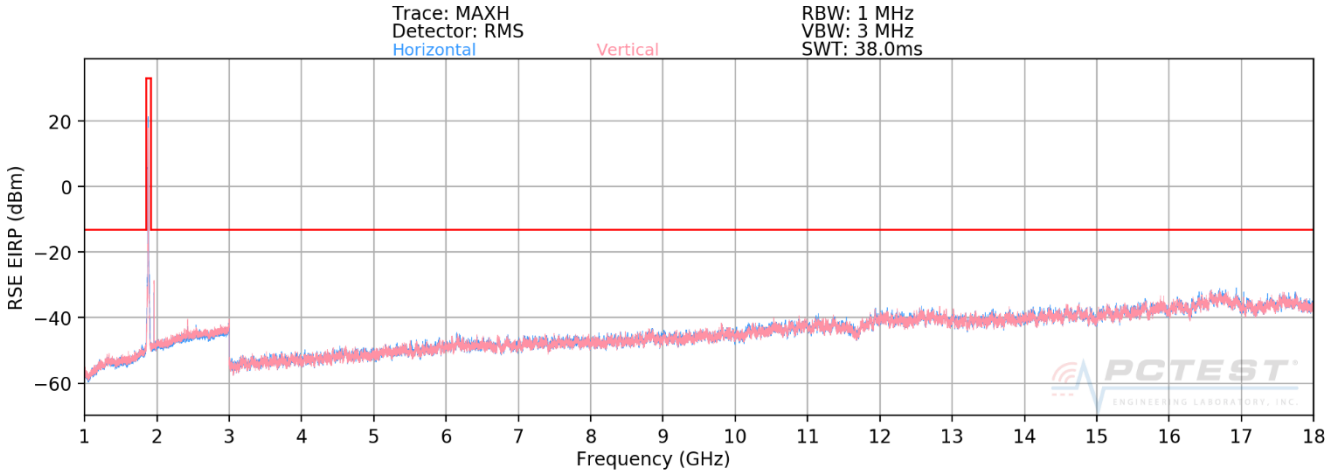
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3702.50 | H | 157 | 152 | -57.04 | 6.13 | -50.91 | -37.9 |
| 5553.75 | H | - | - | -68.64 | 12.01 | -56.63 | -43.6 |

**Table 7-32. Radiated Spurious Data with WCP (PCS CDMA Mode – Ch. 25)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## PCS WCDMA Mode




**Plot 7-112. Radiated Spurious Plot above 1GHz (PCS WCDMA Mode)**

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3704.80 | H | - | - | -65.46 | 6.12 | -59.34 | -46.3 |
| 5557.20 | H | - | - | -68.67 | 12.02 | -56.65 | -43.6 |
| 7409.60 | H | - | - | -65.88 | 12.45 | -53.43 | -40.4 |

**Table 7-33. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9262)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3760.00 | H | - | - | -67.89 | 5.90 | -61.99 | -49.0 |
| 5640.00 | H | - | - | -72.02 | 12.27 | -59.75 | -46.7 |

**Table 7-34. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9400)**

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3815.20 | H | - | - | -64.72 | 5.82 | -58.89 | -45.9 |
| 5722.80 | H | - | - | -69.54 | 12.44 | -57.10 | -44.1 |
| 7630.40 | H | - | - | -65.90 | 12.39 | -53.51 | -40.5 |

**Table 7-35. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9538)**

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

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Level at Antenna Terminals [dBm] | Substitute Antenna Gain [dBi] | Spurious Emission Level [dBm] | Margin [dB] |
|---|---|---|---|---|---|---|---|
| 3704.80 | H | - | - | -75.48 | 9.57 | -65.91 | -52.9 |
| 5557.20 | H | - | - | -74.74 | 10.95 | -63.79 | -50.8 |
| 7409.60 | H | - | - | -71.18 | 10.96 | -60.22 | -47.2 |

**Table 7-36. Radiated Spurious Data with WCP (PCS WCDMA Mode – Ch. 9262)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## 7.8 Frequency Stability / Temperature Variation

**Test Overview and Limit**

Frequency stability testing is performed in accordance with the guidelines of ANSI/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 ±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/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 spectrum analyzer with the EUT placed inside an environmental chamber.

**Test Notes**

None



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836,600,000 | Hz |
| CHANNEL: | 190 | |
| REFERENCE VOLTAGE: | 4.39 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 4.39 | - 30 | 836,600,251 | 251 | 0.0000300 |
| 100 % | | - 20 | 836,600,089 | 89 | 0.0000106 |
| 100 % | | - 10 | 836,600,021 | 21 | 0.0000025 |
| 100 % | | 0 | 836,600,113 | 113 | 0.0000135 |
| 100 % | | + 10 | 836,599,662 | -338 | -0.0000404 |
| 100 % | | + 20 | 836,599,734 | -266 | -0.0000318 |
| 100 % | | + 30 | 836,600,053 | 53 | 0.0000063 |
| 100 % | | + 40 | 836,599,993 | -7 | -0.0000008 |
| 100 % | | + 50 | 836,599,825 | -175 | -0.0000209 |
| BATT. ENDPOINT | 2.20 | + 20 | 836,600,006 | 6 | 0.0000007 |

**Table 7-37. Frequency Stability Data (Cellular GPRS Mode – Ch. 190)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

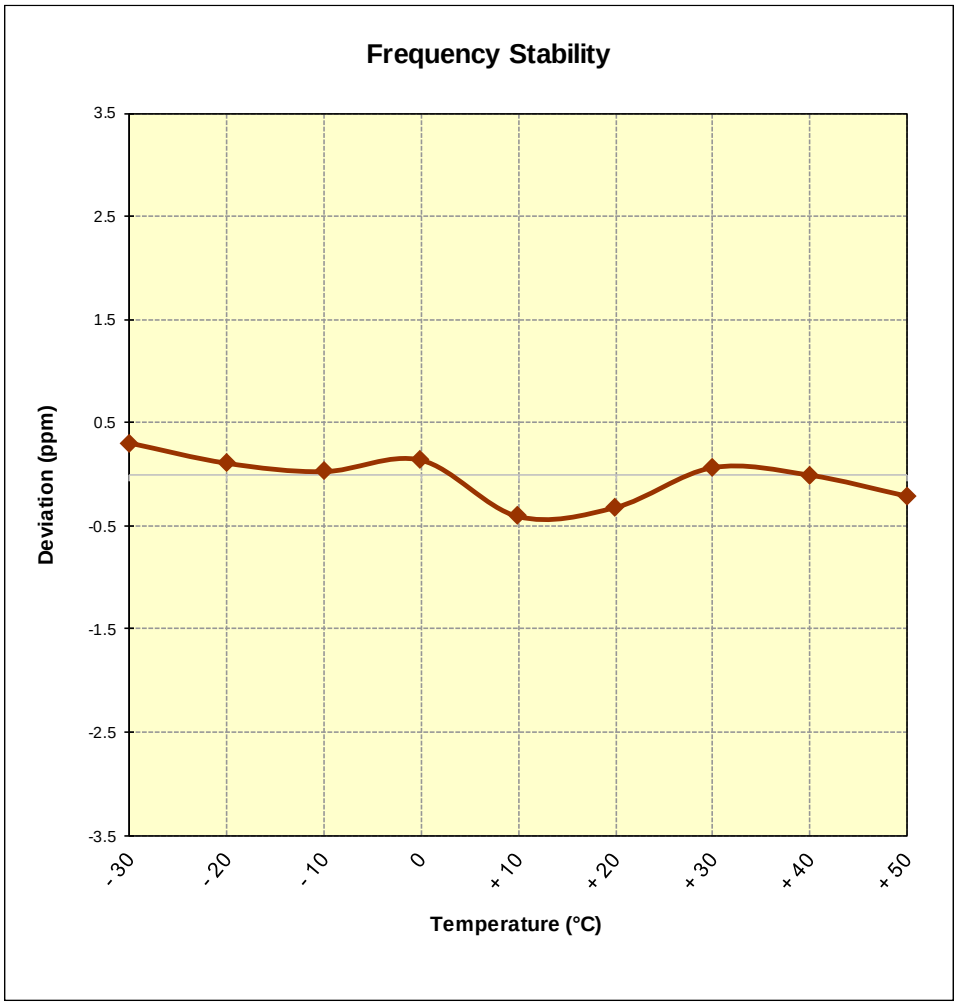



**Figure 7-9. Frequency Stability Graph (Cellular GPRS Mode – Ch. 190)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836,520,000 | Hz |
| CHANNEL: | 384 | |
| REFERENCE VOLTAGE: | 4.39 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 4.39 | - 30 | 836,519,914 | -86 | -0.0000103 |
| 100 % | | - 20 | 836,520,064 | 64 | 0.0000077 |
| 100 % | | - 10 | 836,520,327 | 327 | 0.0000391 |
| 100 % | | 0 | 836,520,174 | 174 | 0.0000208 |
| 100 % | | + 10 | 836,519,744 | -256 | -0.0000306 |
| 100 % | | + 20 | 836,519,883 | -117 | -0.0000140 |
| 100 % | | + 30 | 836,519,729 | -271 | -0.0000324 |
| 100 % | | + 40 | 836,519,972 | -28 | -0.0000033 |
| 100 % | | + 50 | 836,520,276 | 276 | 0.0000330 |
| BATT. ENDPOINT | 2.20 | + 20 | 836,519,909 | -91 | -0.0000109 |

**Table 7-38. Frequency Stability Data (Cellular CDMA Mode – Ch. 384)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

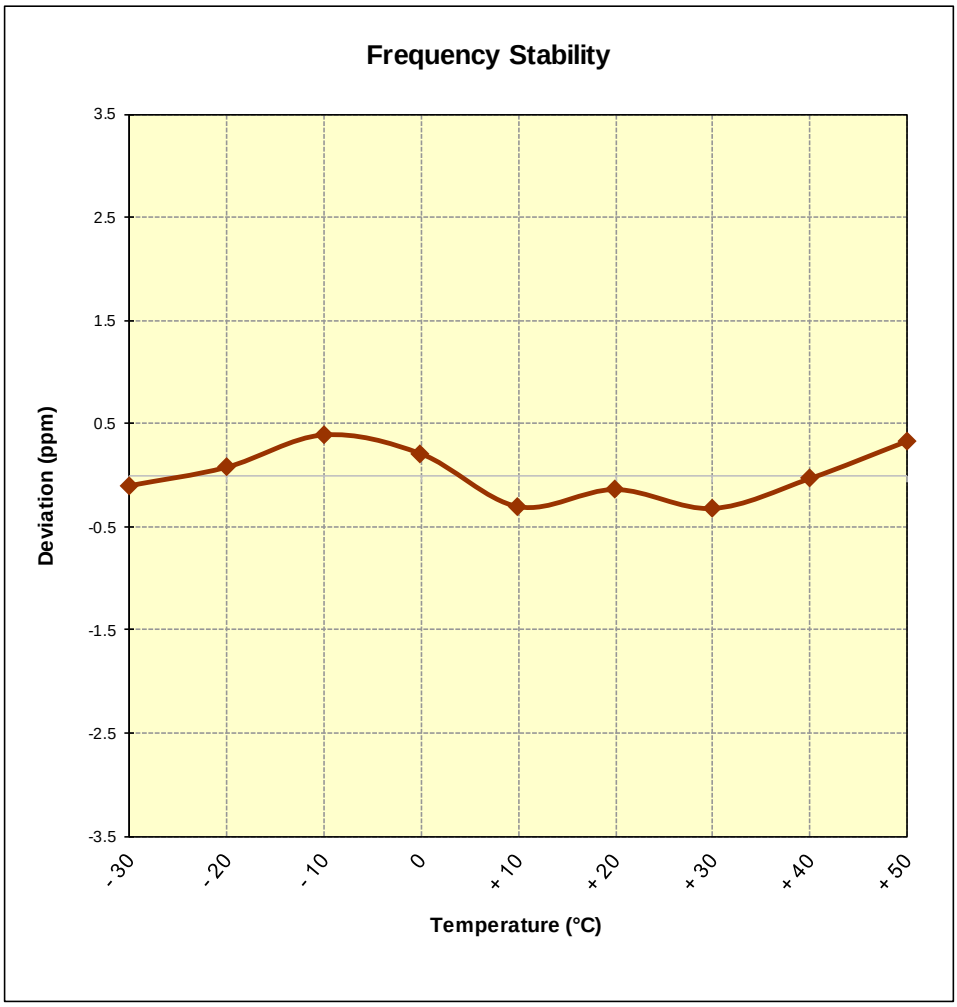



**Figure 7-10. Frequency Stability Graph (Cellular CDMA Mode – Ch. 384)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 836,600,000 | Hz |
| CHANNEL: | 4183 | |
| REFERENCE VOLTAGE: | 4.39 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 4.39 | - 30 | 836,600,179 | 179 | 0.0000214 |
| 100 % | | - 20 | 836,600,268 | 268 | 0.0000320 |
| 100 % | | - 10 | 836,599,979 | -21 | -0.0000025 |
| 100 % | | 0 | 836,600,429 | 429 | 0.0000513 |
| 100 % | | + 10 | 836,600,264 | 264 | 0.0000316 |
| 100 % | | + 20 | 836,600,333 | 333 | 0.0000398 |
| 100 % | | + 30 | 836,600,027 | 27 | 0.0000032 |
| 100 % | | + 40 | 836,599,809 | -191 | -0.0000228 |
| 100 % | | + 50 | 836,599,993 | -7 | -0.0000008 |
| BATT. ENDPOINT | 2.20 | + 20 | 836,599,743 | -257 | -0.0000307 |

**Table 7-39. Frequency Stability Data (Cellular WCDMA Mode – Ch. 4183)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

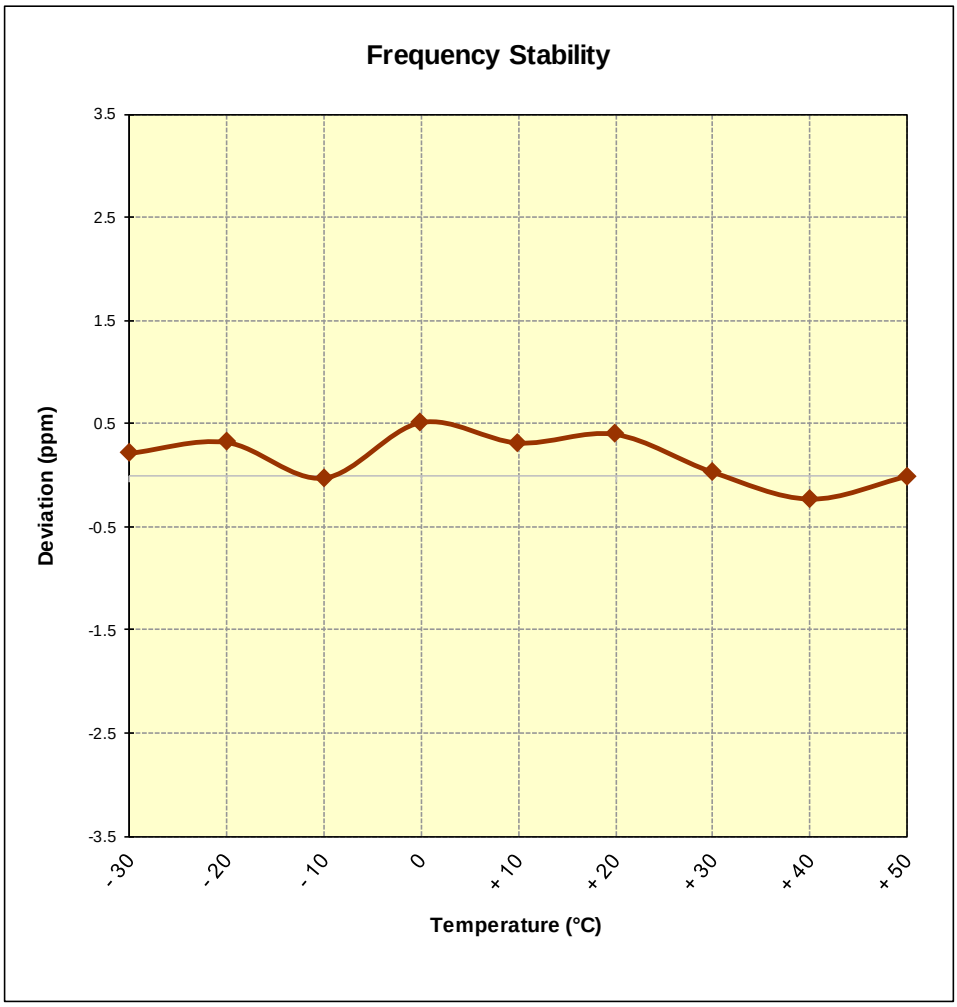



**Figure 7-11. Frequency Stability Graph (Cellular WCDMA Mode – Ch. 4183)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1,732,600,000 | Hz |
| CHANNEL: | 1413 | |
| REFERENCE VOLTAGE: | 4.39 | VDC |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 4.39 | - 30 | 1,732,599,543 | -457 | -0.0000264 |
| 100 % | | - 20 | 1,732,600,045 | 45 | 0.0000026 |
| 100 % | | - 10 | 1,732,599,904 | -96 | -0.0000055 |
| 100 % | | 0 | 1,732,599,900 | -100 | -0.0000058 |
| 100 % | | + 10 | 1,732,600,328 | 328 | 0.0000189 |
| 100 % | | + 20 | 1,732,599,844 | -156 | -0.0000090 |
| 100 % | | + 30 | 1,732,599,794 | -206 | -0.0000119 |
| 100 % | | + 40 | 1,732,600,302 | 302 | 0.0000174 |
| 100 % | | + 50 | 1,732,599,793 | -207 | -0.0000119 |
| BATT. ENDPOINT | 2.20 | + 20 | 1,732,599,990 | -10 | -0.0000006 |

**Table 7-40. 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.




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

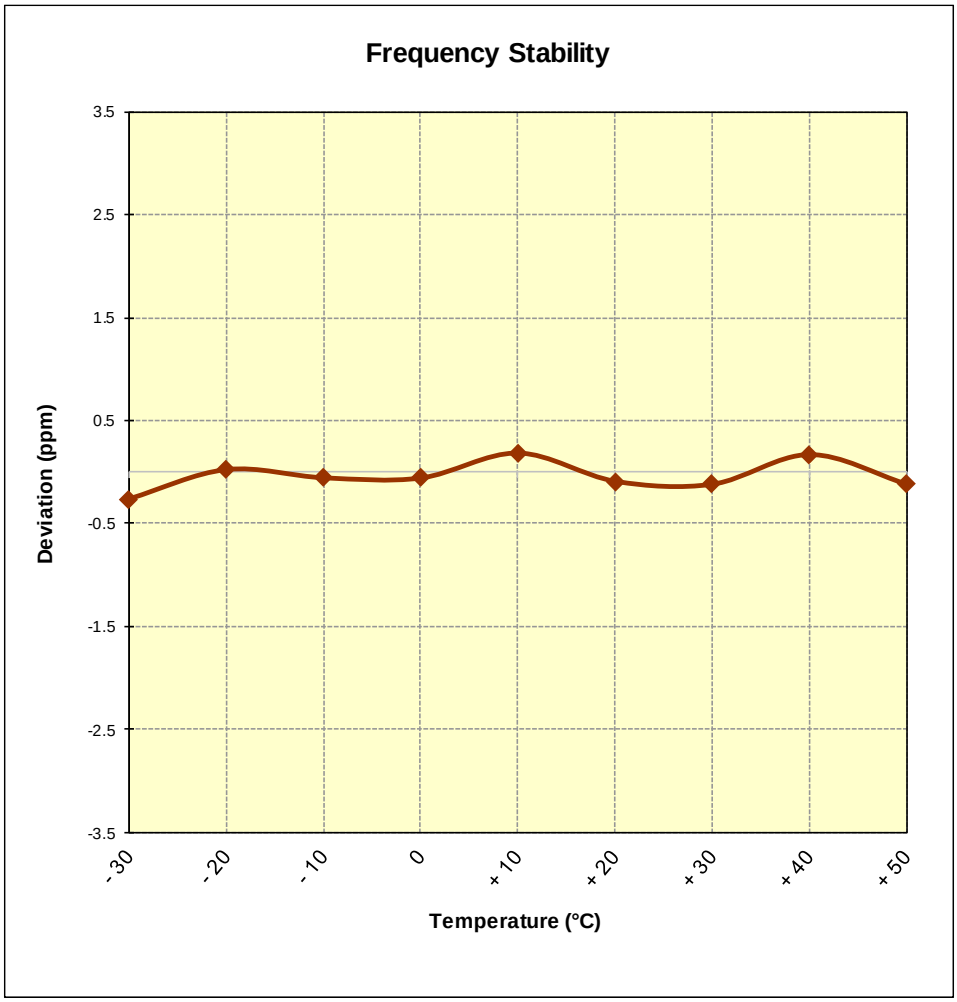



**Figure 7-12. Frequency Stability Graph (AWS WCDMA Mode – Ch. 1413)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1,880,000,000 | Hz |
| CHANNEL: | 661 | |
| REFERENCE VOLTAGE: | 4.39 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 4.39 | - 30 | 1,880,000,017 | 17 | 0.0000009 |
| 100 % | | - 20 | 1,880,000,131 | 131 | 0.0000070 |
| 100 % | | - 10 | 1,880,000,230 | 230 | 0.0000122 |
| 100 % | | 0 | 1,880,000,190 | 190 | 0.0000101 |
| 100 % | | + 10 | 1,880,000,391 | 391 | 0.0000208 |
| 100 % | | + 20 | 1,879,999,970 | -30 | -0.0000016 |
| 100 % | | + 30 | 1,879,999,960 | -40 | -0.0000021 |
| 100 % | | + 40 | 1,880,000,130 | 130 | 0.0000069 |
| 100 % | | + 50 | 1,879,999,801 | -199 | -0.0000106 |
| BATT. ENDPOINT | 2.20 | + 20 | 1,879,999,921 | -79 | -0.0000042 |

**Table 7-41. Frequency Stability Data (PCS GPRS Mode – Ch. 661)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

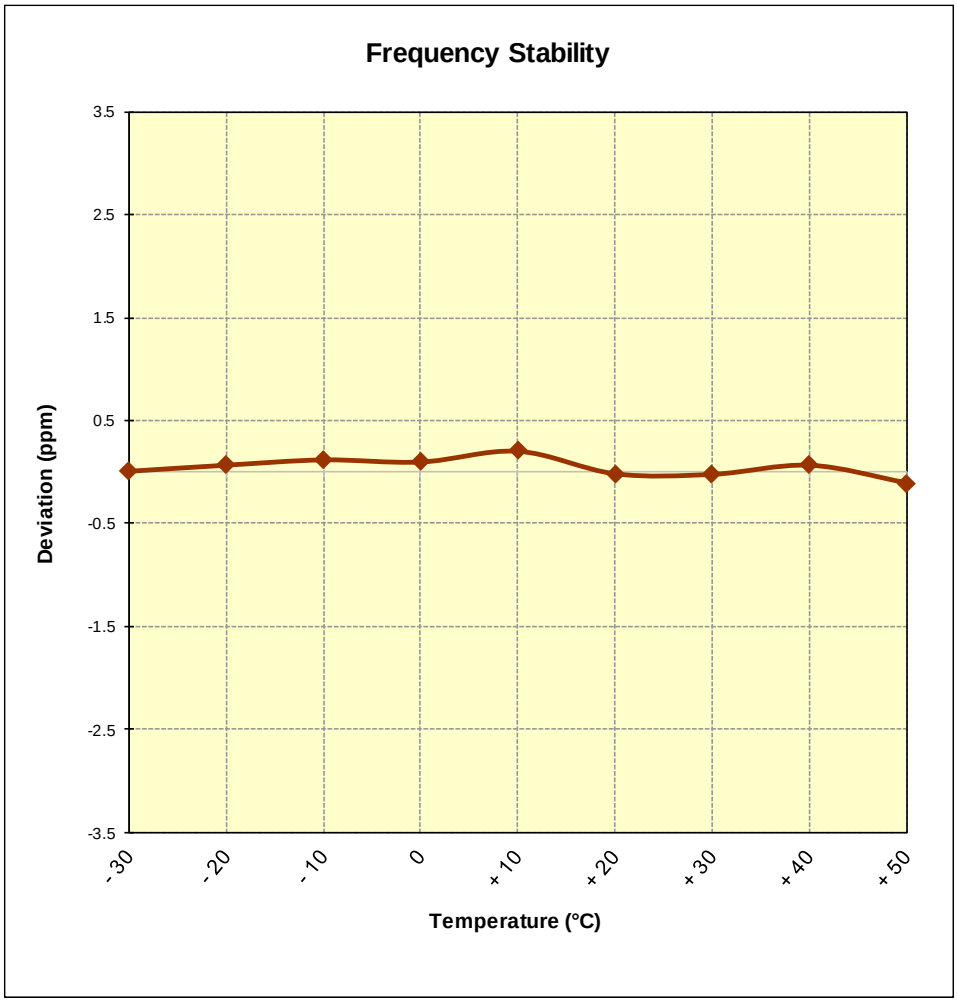



**Figure 7-13. Frequency Stability Graph (PCS GPRS Mode – Ch. 661)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1,880,000,000 | Hz |
| CHANNEL: | 600 | |
| REFERENCE VOLTAGE: | 4.39 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 4.39 | - 30 | 1,879,999,882 | -118 | -0.0000063 |
| 100 % | | - 20 | 1,880,000,185 | 185 | 0.0000098 |
| 100 % | | - 10 | 1,880,000,162 | 162 | 0.0000086 |
| 100 % | | 0 | 1,879,999,924 | -76 | -0.0000040 |
| 100 % | | + 10 | 1,880,000,182 | 182 | 0.0000097 |
| 100 % | | + 20 | 1,879,999,737 | -263 | -0.0000140 |
| 100 % | | + 30 | 1,880,000,215 | 215 | 0.0000114 |
| 100 % | | + 40 | 1,879,999,991 | -9 | -0.0000005 |
| 100 % | | + 50 | 1,879,999,988 | -12 | -0.0000006 |
| BATT. ENDPOINT | 2.20 | + 20 | 1,880,000,017 | 17 | 0.0000009 |

**Table 7-42. Frequency Stability Data (PCS CDMA Mode – Ch. 600)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

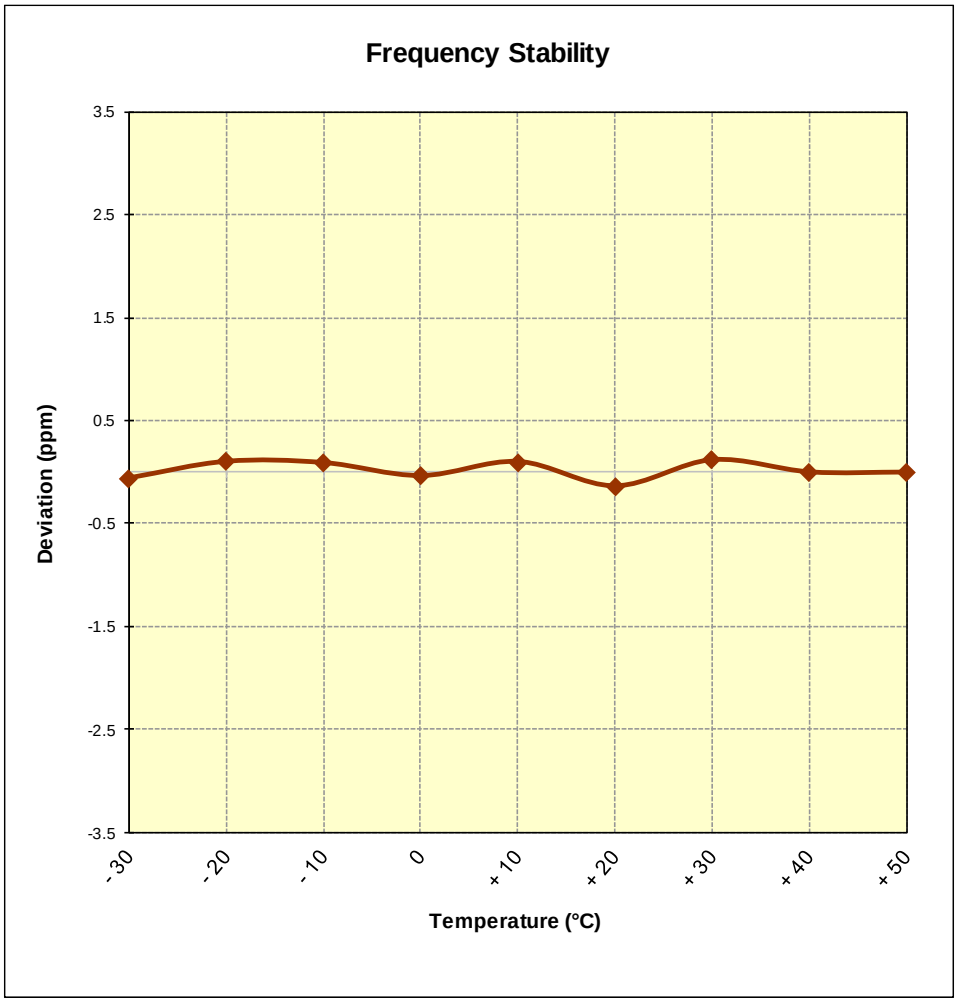



**Figure 7-14. Frequency Stability Graph (PCS CDMA Mode – Ch. 600)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

| | | |
|---|---|---|
| OPERATING FREQUENCY: | 1,880,000,000 | Hz |
| CHANNEL: | 9400 | |
| REFERENCE VOLTAGE: | 4.39 | VDC |
| DEVIATION LIMIT: | ± 0.00025 % or 2.5 ppm | |

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|---|---|---|---|---|---|
| 100 % | 4.39 | - 30 | 1,879,999,956 | -44 | -0.0000023 |
| 100 % | | - 20 | 1,879,999,914 | -86 | -0.0000046 |
| 100 % | | - 10 | 1,879,999,826 | -174 | -0.0000093 |
| 100 % | | 0 | 1,880,000,246 | 246 | 0.0000131 |
| 100 % | | + 10 | 1,880,000,030 | 30 | 0.0000016 |
| 100 % | | + 20 | 1,880,000,054 | 54 | 0.0000029 |
| 100 % | | + 30 | 1,880,000,161 | 161 | 0.0000086 |
| 100 % | | + 40 | 1,880,000,005 | 5 | 0.0000003 |
| 100 % | | + 50 | 1,879,999,916 | -84 | -0.0000045 |
| BATT. ENDPOINT | 2.20 | + 20 | 1,880,000,227 | 227 | 0.0000121 |

**Table 7-43. Frequency Stability Data (PCS WCDMA Mode – Ch. 9400)**



© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

## Frequency Stability / Temperature Variation

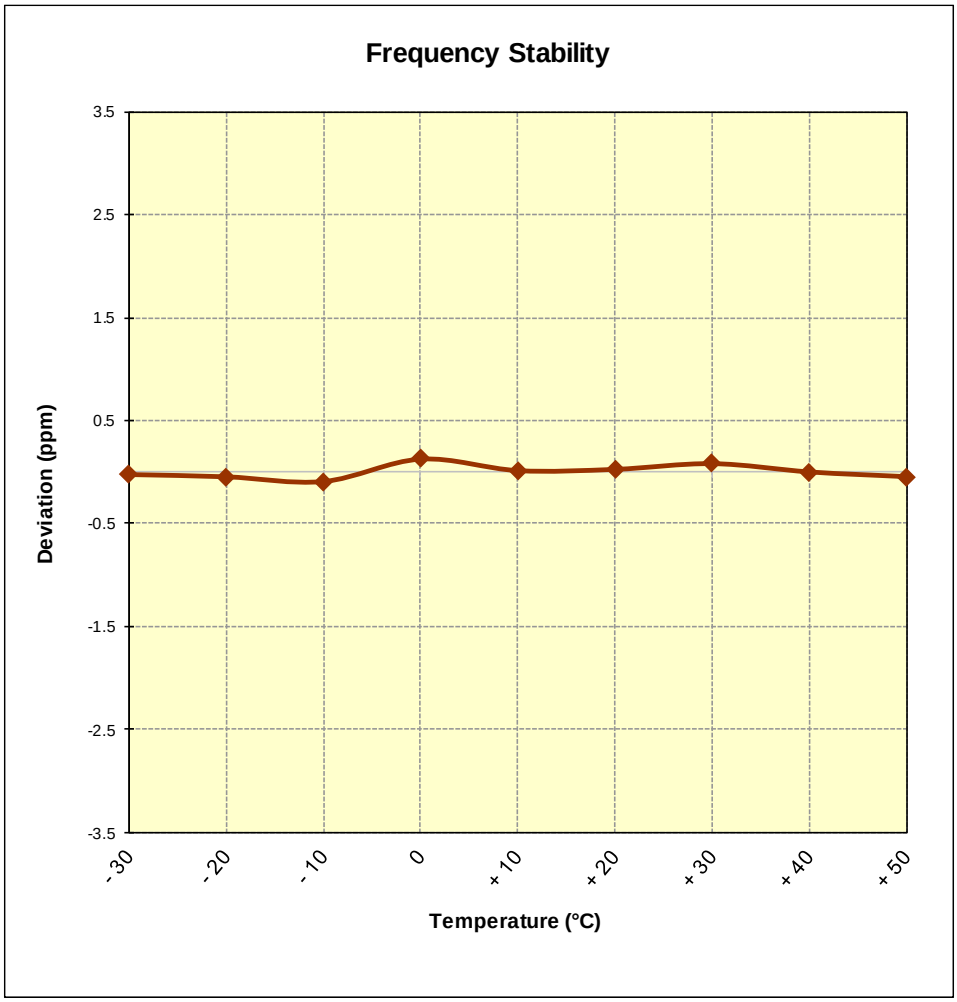



**Figure 7-15. Frequency Stability Graph (PCS WCDMA Mode – Ch. 9400)**




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.

# 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset FCC ID: ZNFG850UM** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules.




© 2019 PCTEST Engineering Laboratory, Inc. V 9.0 02/01/2019
All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST Engineering Laboratory, Inc. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact INFO@PCTEST.COM.