



# PCTEST ENGINEERING LABORATORY, INC.

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

**Applicant Name:**  
Samsung Electronics Co., Ltd.  
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Yeongtong-gu, Suwon-si  
Gyeonggi-do, 16677, Korea

**Date of Testing:**  
10/11 - 12/06/2019  
**Test Site/Location:**  
PCTEST Lab. Columbia, MD, USA  
**Test Report Serial No.:**  
1M1910220166-02.A3L

<b>FCC ID:</b>	<b>A3LSMG986U</b>
<b>APPLICANT:</b>	<b>Samsung Electronics Co., Ltd.</b>

<b>Application Type:</b>	Certification
<b>Model:</b>	SM-G986U
<b>Additional Model (s):</b>	SM-G986U1, SM-G986XU
<b>EUT Type:</b>	Portable Handset
<b>FCC Classification:</b>	PCS Licensed Transmitter Held to Ear (PCE)
<b>FCC Rule Part(s):</b>	22, 24, & 27
<b>Test Procedure(s):</b>	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.

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

Randy Ortanez  
President

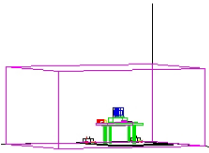


<b>FCC ID:</b> A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset	Page 1 of 109	

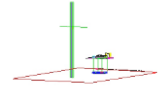
# TABLE OF CONTENTS

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).....	72
7.7	Radiated Spurious Emissions Measurements.....	77
7.8	Frequency Stability / Temperature Variation .....	94
8.0	CONCLUSION.....	109

<b>FCC ID:</b> A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset	Page 2 of 109	



## 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	0.410	26.13	0.673	28.28	245KGXW
EDGE850	22H	824.2 - 848.8	0.152	21.82	0.249	23.97	236KG7W
CDMA850	22H	824.70 - 848.31	0.087	19.40	0.143	21.55	1M28F9W
WCDMA850	22H	826.4 - 846.6	0.068	18.34	0.112	20.49	4M17F9W
WCDMA1700	27	1712.4 - 1752.6			0.278	24.44	4M16F9W
GPRS1900	24E	1850.2 - 1909.8			0.726	28.61	245KGXW
EDGE1900	24E	1850.2 - 1909.8			0.206	23.14	238KG7W
CDMA1900	24E	1851.25 - 1908.75			0.231	23.63	1M28F9W
WCDMA1900	24E	1852.4 - 1907.6			0.264	24.22	4M16F9W

**EUT Overview**

<b>FCC ID:</b> A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset	Page 3 of 109	

# 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.

<b>FCC ID:</b> A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset	Page 4 of 109	

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMG986U**. 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.:** 0470M, 0918H, 0493M

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1, BC10), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n71, n5, n66, n2, n41, n260, n261), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC, ANT+, Wireless Power Transfer

This device uses a tuner circuit that dynamically updates the antenna impedance parameters to optimize antenna performance for certain bands and modes of operation. The tuner for this device was set to simulate a "free space" condition where the transmit antenna is matched to the medium into which it is transmitting and, thus, the power is at its maximum level.

### 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) Model: EP-N5100 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.

<b>FCC ID:</b> A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset	<b>Approved by:</b> Quality Manager
			Page 5 of 109

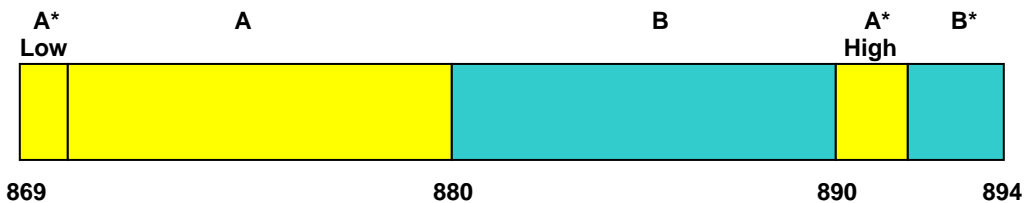
## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

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

Deviation from Measurement Procedure.....None

### 3.2 Cellular - Base Frequency Blocks



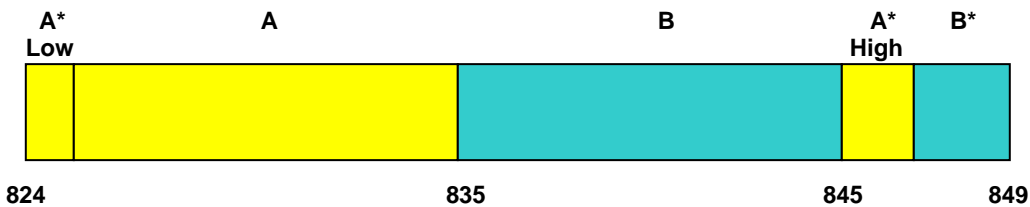
BLOCK 1: 869 – 880 MHz (A\* Low + A)

BLOCK 3: 890 – 891.5 MHz (A\* High)

BLOCK 2: 880 – 890 MHz (B)

BLOCK 4: 891.5 – 894 MHz (B\*)

### 3.3 Cellular - Mobile Frequency Blocks



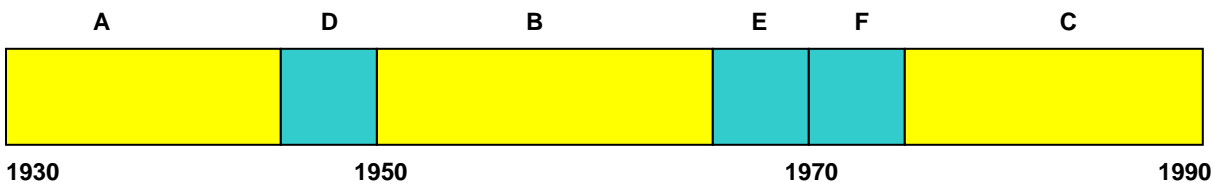
BLOCK 1: 824 – 835 MHz (A\* Low + A)

BLOCK 3: 845 – 846.5 MHz (A\* High)

BLOCK 2: 835 – 845 MHz (B)

BLOCK 4: 846.5 – 849 MHz (B\*)

### 3.4 PCS - Base Frequency Blocks



BLOCK 1: 1930 – 1945 MHz (A)

BLOCK 4: 1965 – 1970 MHz (E)

BLOCK 2: 1945 – 1950 MHz (D)

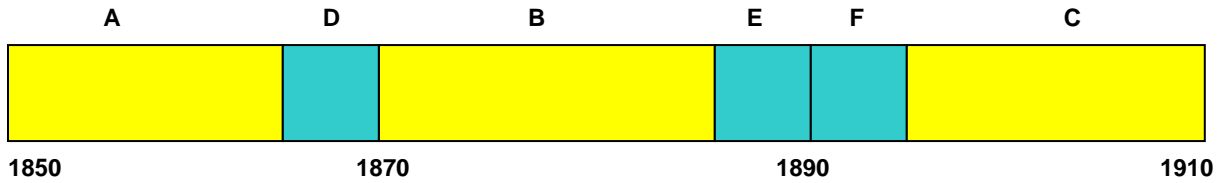
BLOCK 5: 1970 – 1975 MHz (F)

BLOCK 3: 1950 – 1965 MHz (B)

BLOCK 6: 1975 – 1990 MHz (C)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 6 of 109

### 3.5 PCS - Mobile Frequency Blocks



BLOCK 1: 1850 – 1865 MHz (A)

BLOCK 4: 1885 – 1890 MHz (E)

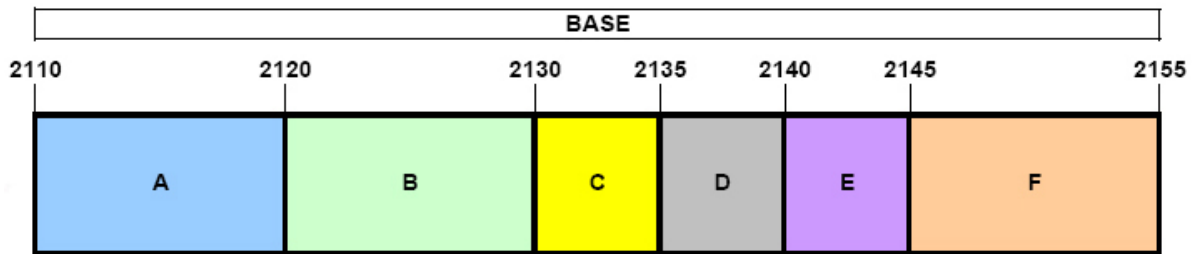
BLOCK 2: 1865 – 1870 MHz (D)

BLOCK 5: 1890 – 1895 MHz (F)

BLOCK 3: 1870 – 1885 MHz (B)

BLOCK 6: 1895 – 1910 MHz (C)

### 3.6 AWS - Base Frequency Blocks



BLOCK 1: 2110 – 2120 MHz (A)

BLOCK 4: 2135 – 2140 MHz (D)

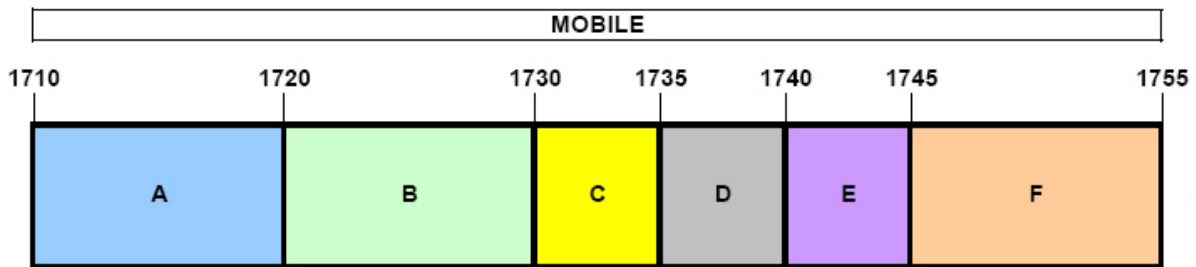
BLOCK 2: 2120 – 2130 MHz (B)

BLOCK 5: 2140 – 2145 MHz (E)

BLOCK 3: 2130 – 2135 MHz (C)

BLOCK 6: 2145 – 2155 MHz (F)

### 3.7 AWS - Mobile Frequency Blocks



BLOCK 1: 1710 – 1720 MHz (A)

BLOCK 4: 1735 – 1740 MHz (D)

BLOCK 2: 1720 – 1730 MHz (B)

BLOCK 5: 1740 – 1745 MHz (E)

BLOCK 3: 1730 – 1735 MHz (C)

BLOCK 6: 1745 – 1755 MHz (F)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset	Page 7 of 109

### 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  $P_g [dBm] - \text{cable loss} [dB]$ .

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.

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	 <b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset	Page 8 of 109



## 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 ( $\pm$ dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset	Page 9 of 109	

## 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
-	LTx1	Licensed Transmitter Cable Set	6/4/2019	Annual	6/4/2020	LTx1
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/29/2019	Annual	4/29/2020	3613A00315
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	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	5/10/2019	Annual	5/10/2020	441112
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/14/2019	Biennial	2/14/2021	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	128338
Mini Circuits	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	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	PWR-SEN-4RMS	USB Power Sensor	4/20/2019	Annual	4/20/2020	11210140001
Rohde & Schwarz	CMW500	Radio Communication Tester	8/26/2019	Annual	8/26/2020	100976
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	6/5/2019	Annual	6/5/2020	100342
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/11/2019	Annual	7/11/2020	102134
Seekonk	NC-100	Torque Wrench (8" lb)	5/10/2018	Biennial	5/10/2020	N/A
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107

**Table 5-1. Test Equipment**

**Notes:**

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

<b>FCC ID:</b> A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset	Page 10 of 109	

## 6.0 SAMPLE CALCULATIONS

### GSM Emission Designator

**Emission Designator = 250KGXW**

GSM 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.

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset	Page 11 of 109	

## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Samsung Electronics Co., Ltd.  
 FCC ID: A3LSMG986U  
 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) RSS-133(2.3) RSS-139(2.3)	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a) 24.238(a) 27.53(h)	RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Conducted Band Edge / Spurious Emissions	> 43 + 10 log <sub>10</sub> (P[Watts]) at Band Edge and for all out-of-band emissions		PASS	Sections 7.3, 7.4
24.232(d) 27.50(d)(5)	RSS-132(5.4) RSS-133(6.4) RSS-139(6.5)	Peak-Average Ratio	< 13 dB		PASS	Section 7.5
2.1046	RSS-132(5.4) RSS-133(4.1) RSS-139(4.1)	Transmitter Conducted Output Power	N/A		PASS	RF Exposure Report
2.1055 22.355 24.235 27.54	RSS-132(5.3) RSS-133(6.3) RSS-139(6.4)	Frequency Stability	< 2.5 ppm (Part 22) Emission must remain in band (Part 24, 27)		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 22.917(a) 24.238(a) 27.53(h)	RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Radiated Spurious Emissions	> 43 + 10 log <sub>10</sub> (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 4.2.

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>			Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 12 of 109	

## 7.2 Occupied Bandwidth

### Test Overview

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

### Test Procedure Used

KDB 971168 D01 v03r01 – Section 4.2

### Test Settings

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

### Test Setup

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

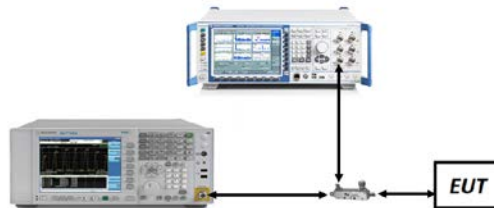
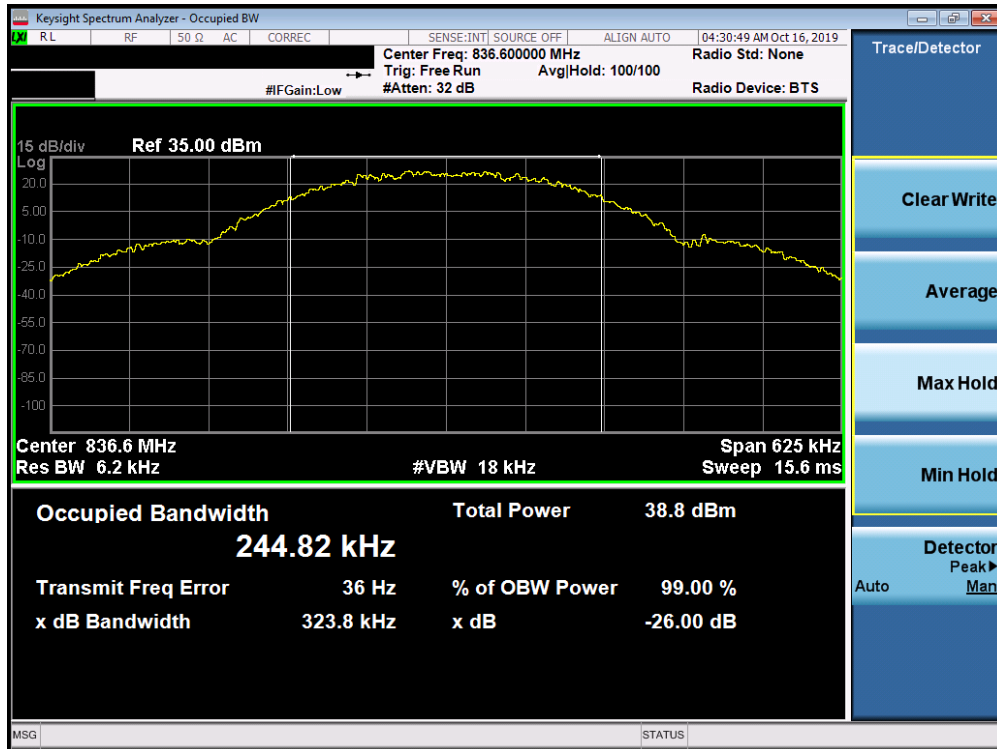


Figure 7-1. Test Instrument & Measurement Setup

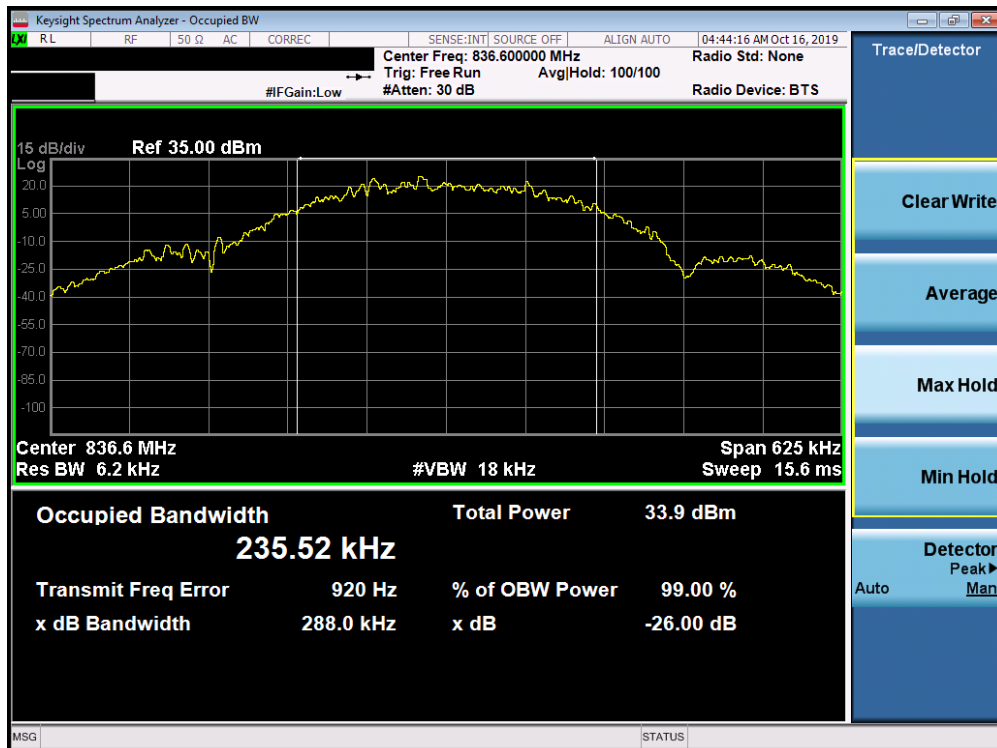
### Test Notes

None.

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset	Page 13 of 109	

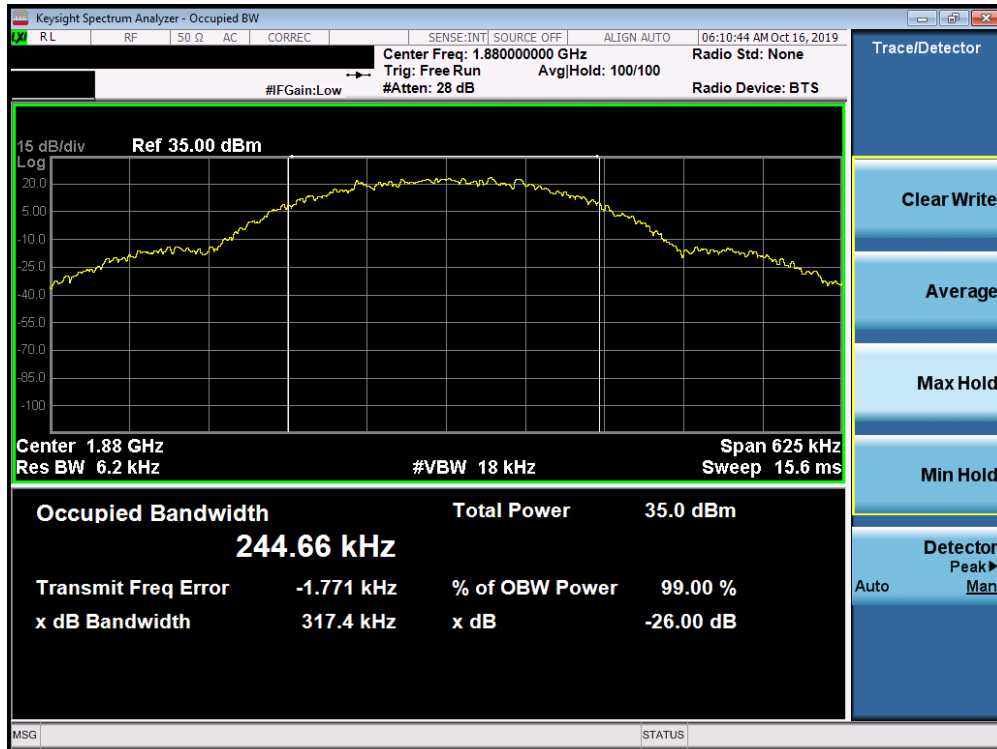


Plot 7-1. Occupied Bandwidth Plot (Cellular GSM Mode)

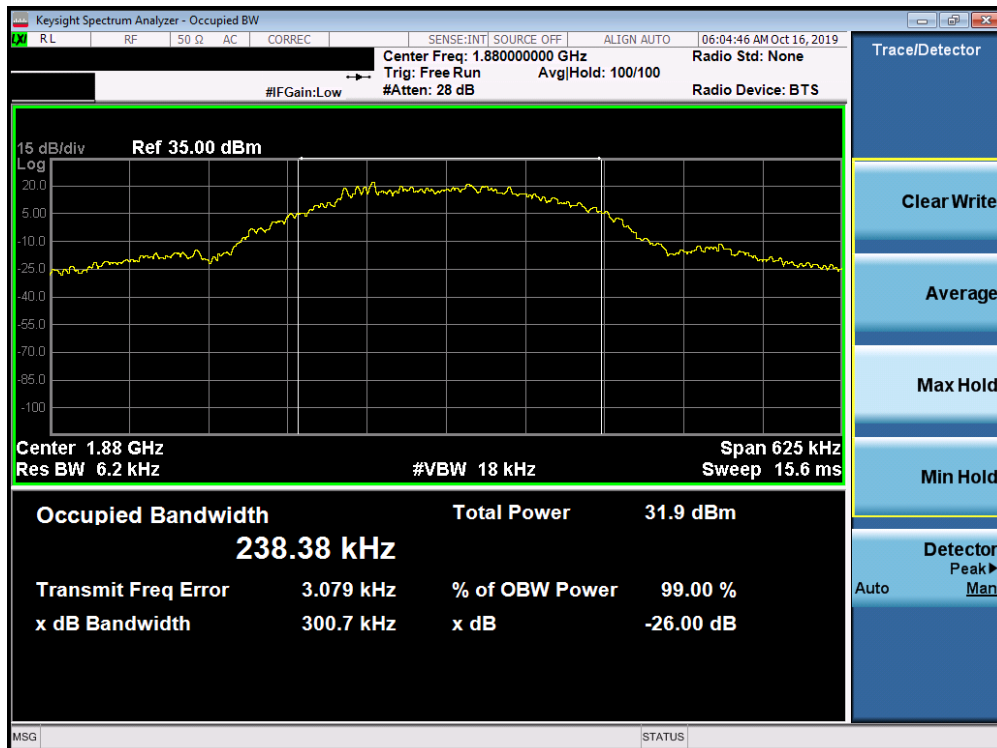


Plot 7-2. Occupied Bandwidth Plot (EDGE850 Mode)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 14 of 109

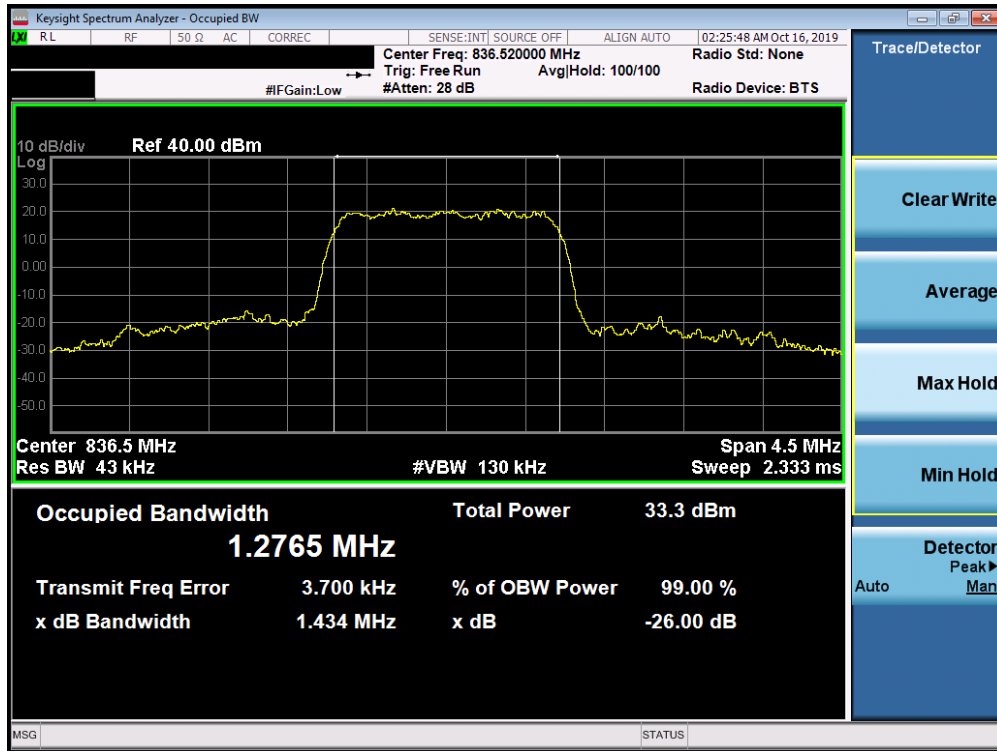


Plot 7-3. Occupied Bandwidth Plot (PCS GSM Mode)

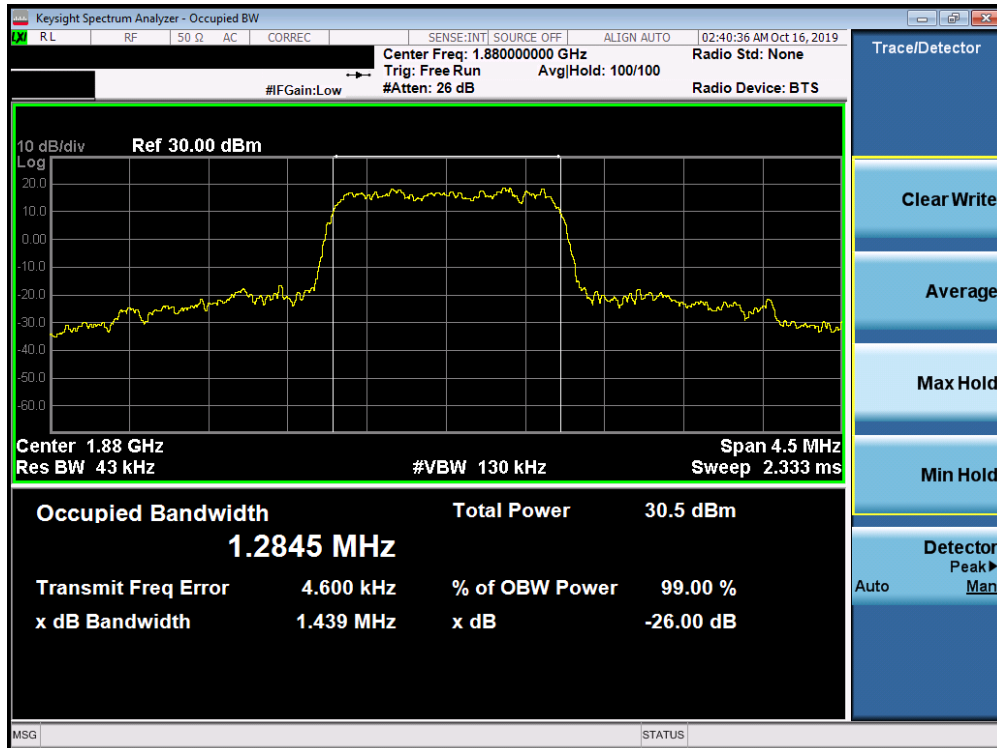


Plot 7-4. Occupied Bandwidth Plot (EDGE1900 Mode)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 15 of 109



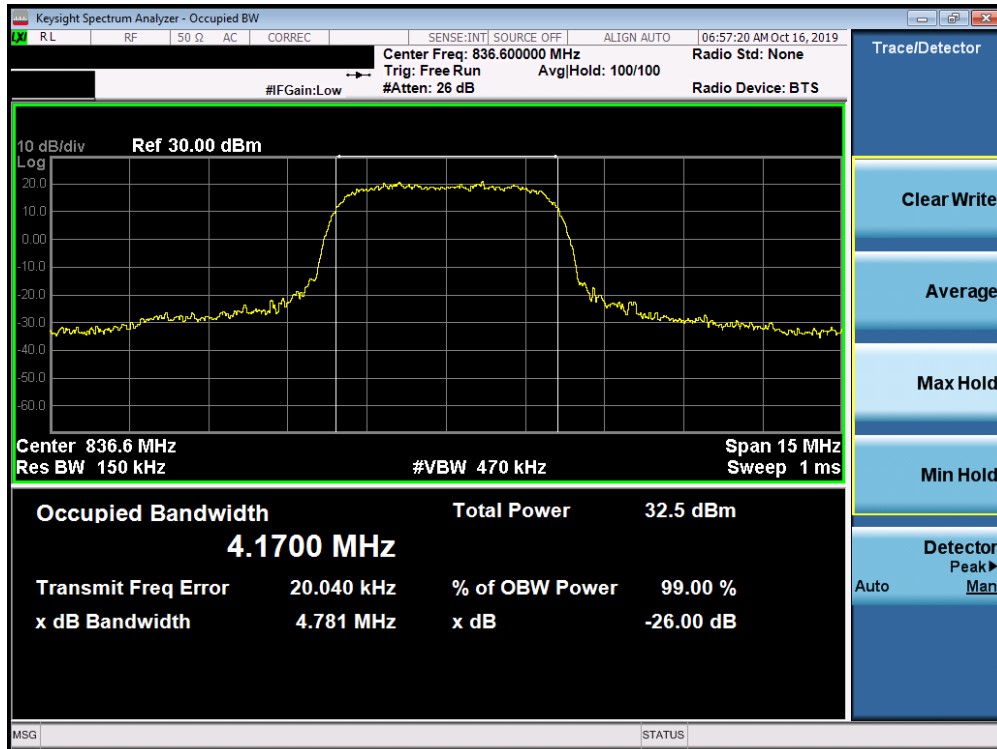
Plot 7-5. Occupied Bandwidth Plot (Cellular CDMA Mode)



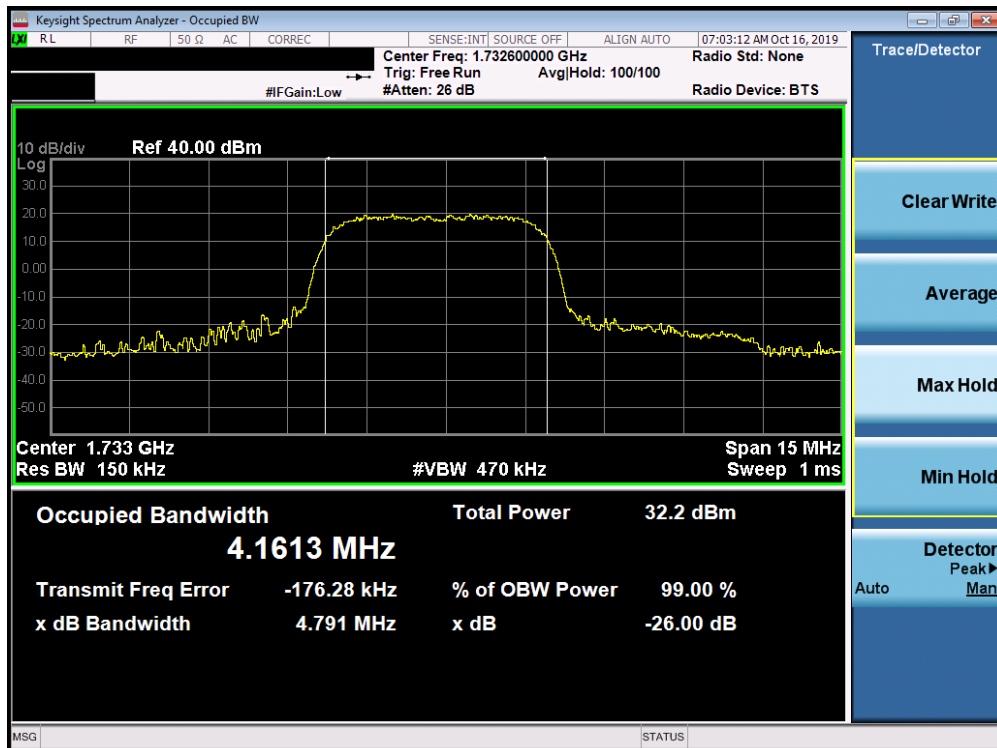
Plot 7-6. Occupied Bandwidth Plot (PCS CDMA Mode)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 16 of 109



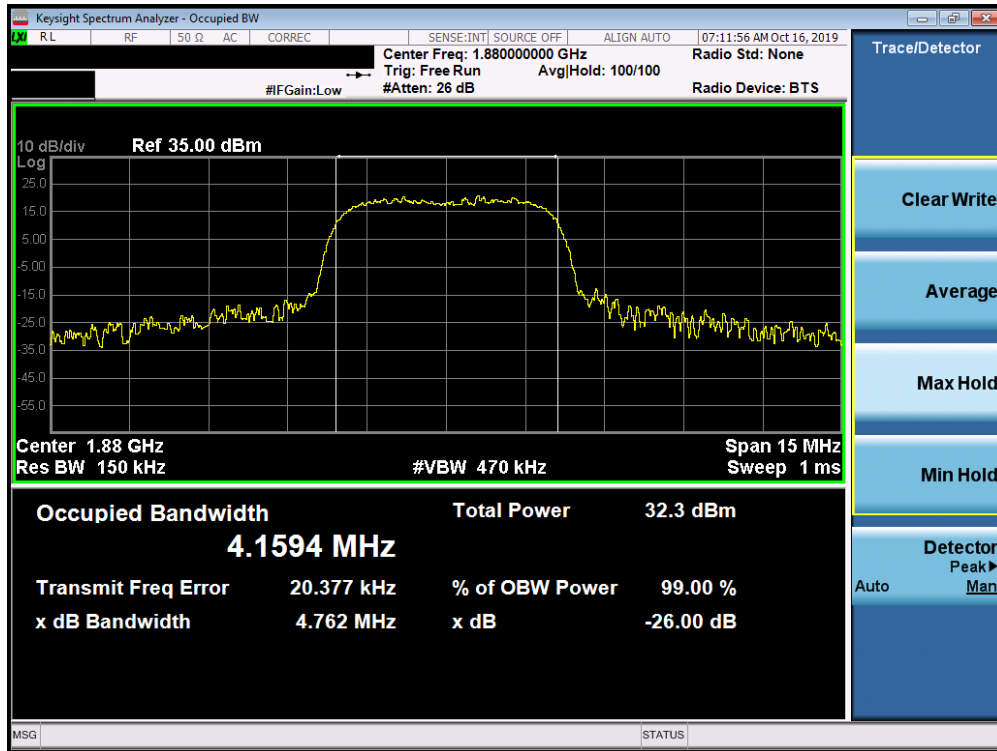


Plot 7-7. Occupied Bandwidth Plot (Cellular WCDMA Mode)



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

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 17 of 109



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

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset		Page 18 of 109

## 7.3 Spurious and Harmonic Emissions at Antenna Terminal

### Test Overview

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

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

### Test Procedure Used

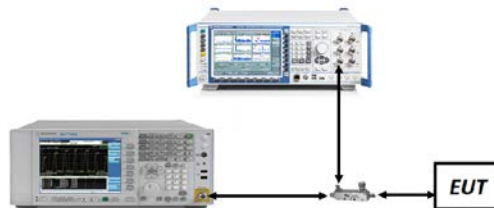
KDB 971168 D01 v03r01 – Section 6.0

### Test Settings

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

### Test Setup

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



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

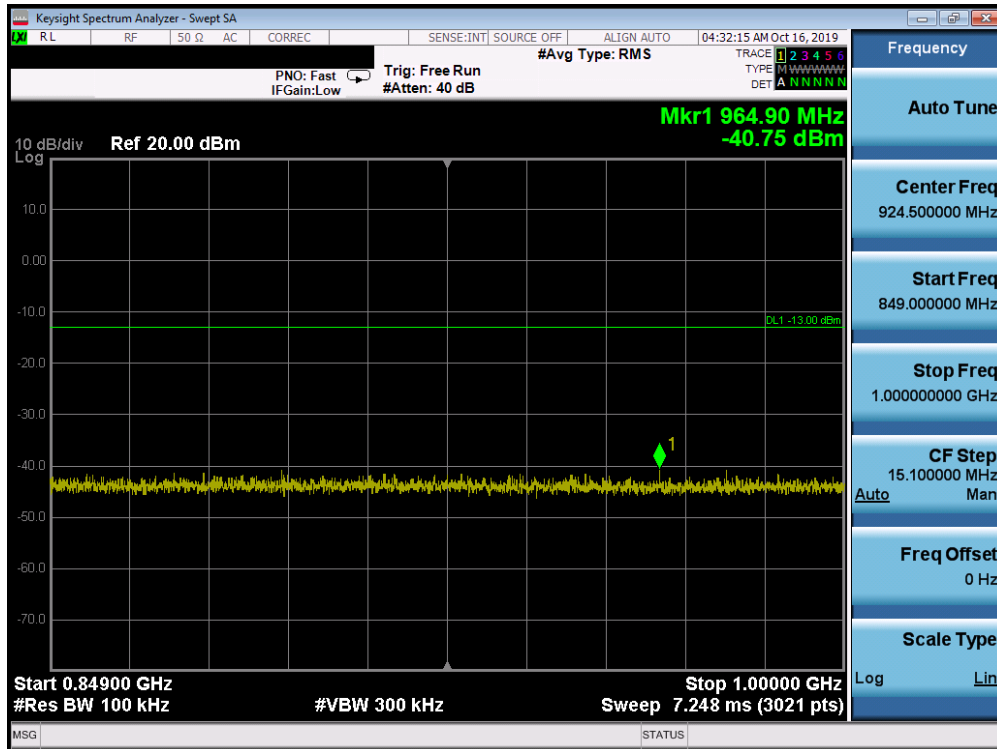
### Test Notes

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

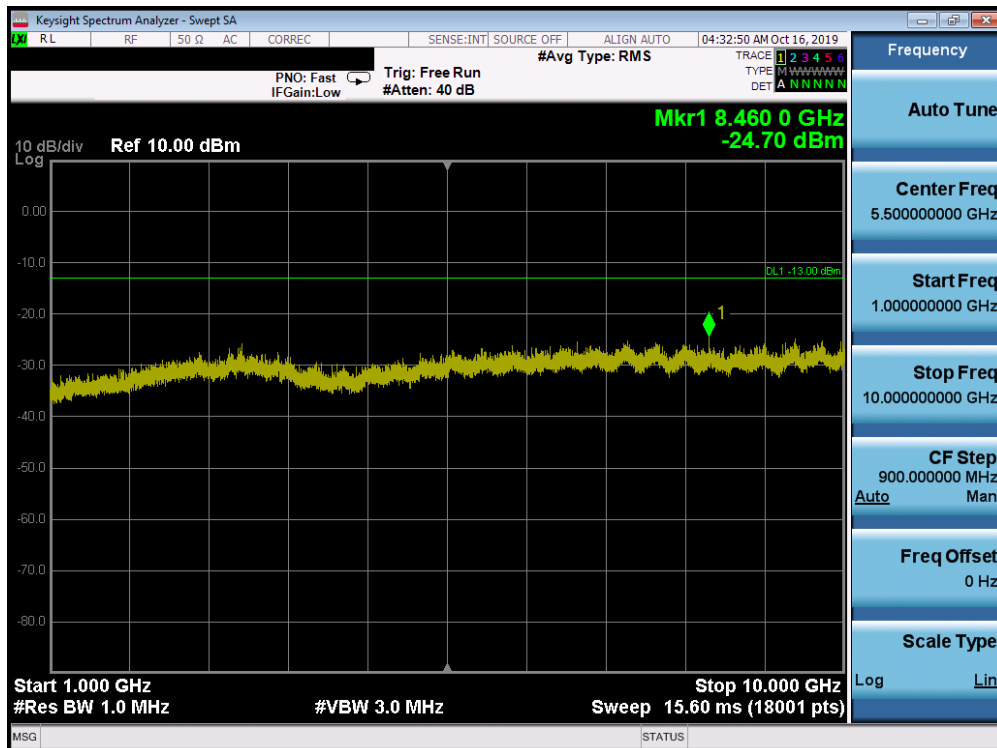
FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 19 of 109





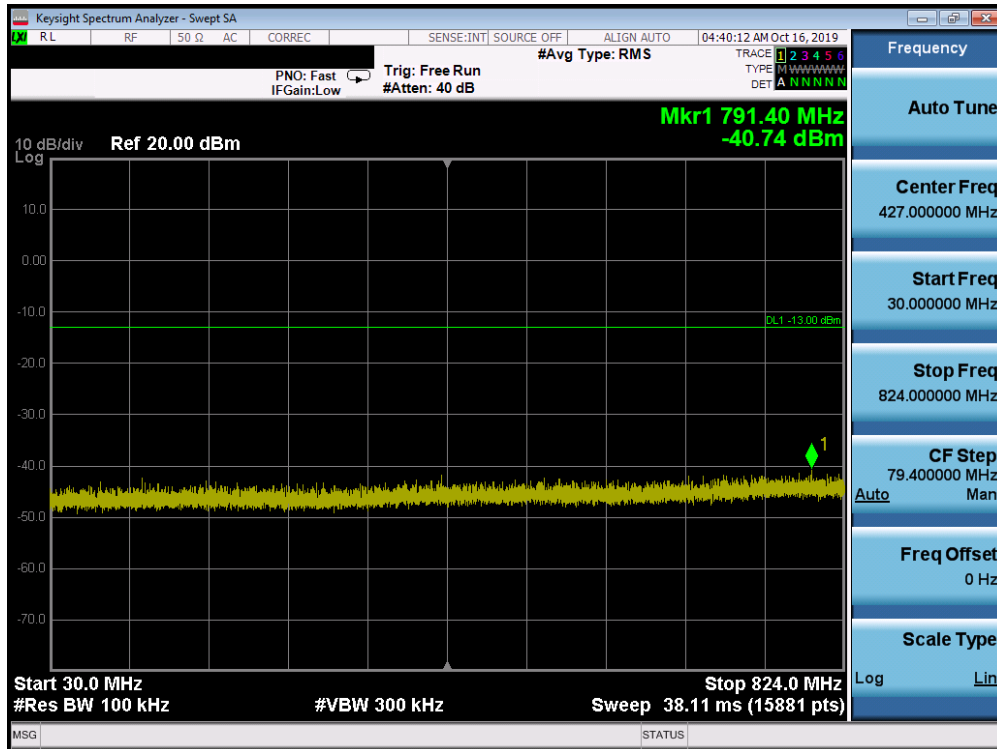


**Plot 7-14. Conducted Spurious Plot (Cellular GSM Mode - Mid Channel)**

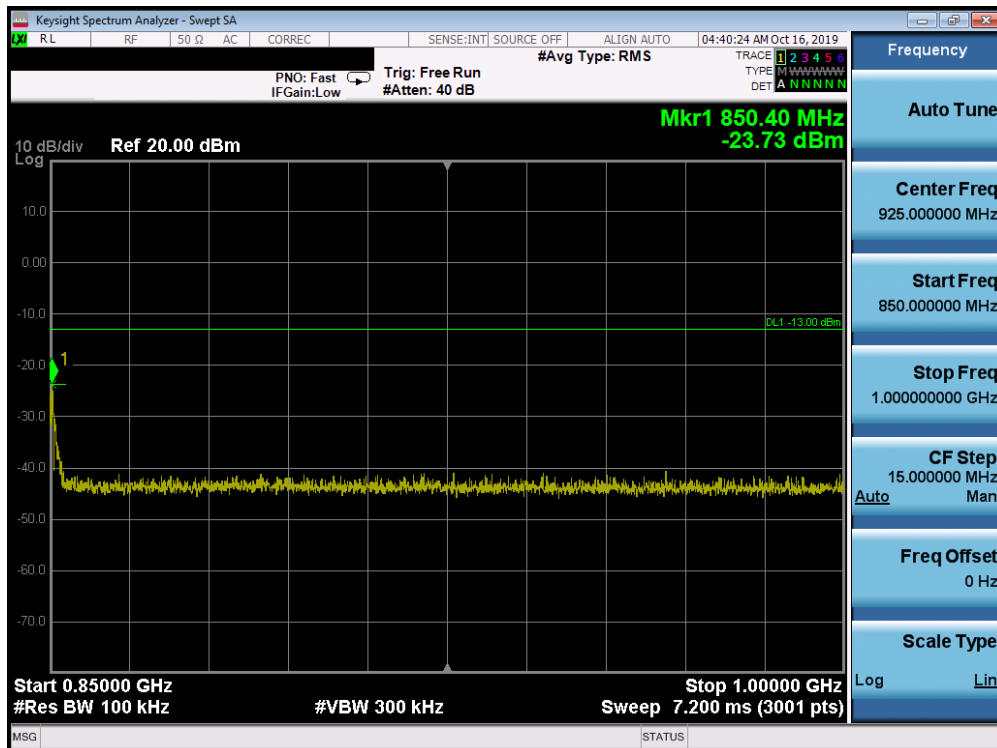


**Plot 7-15. Conducted Spurious Plot (Cellular GSM Mode - Mid Channel)**

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 22 of 109

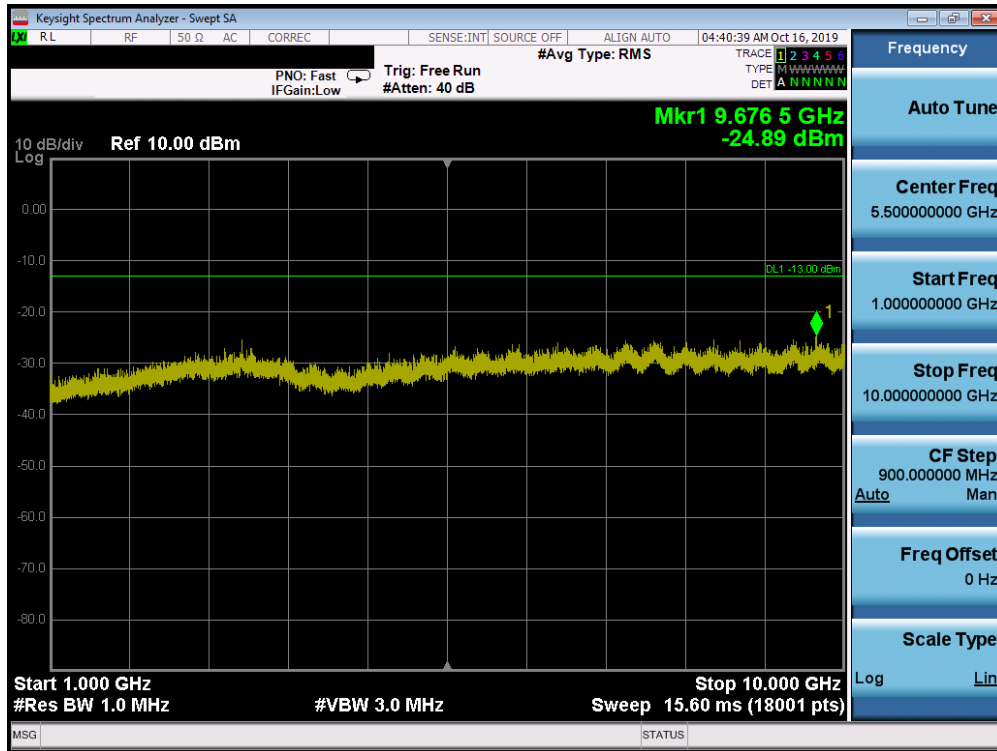


Plot 7-16. Conducted Spurious Plot (Cellular GSM Mode - High Channel)



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

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 23 of 109

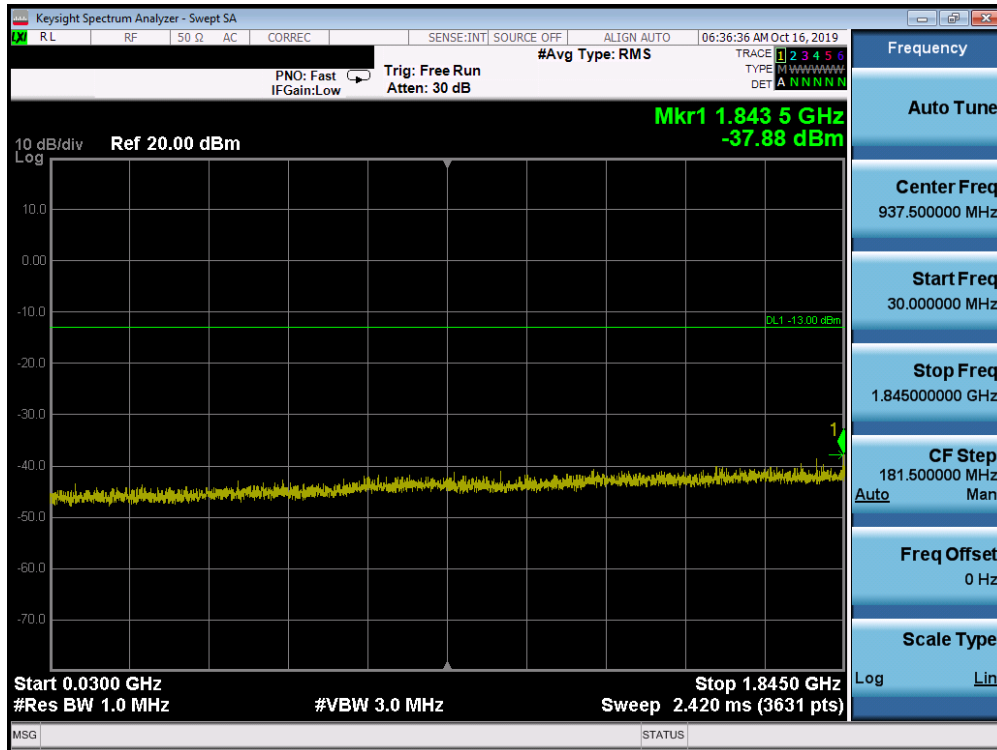


**Plot 7-18. Conducted Spurious Plot (Cellular GSM Mode - High Channel)**

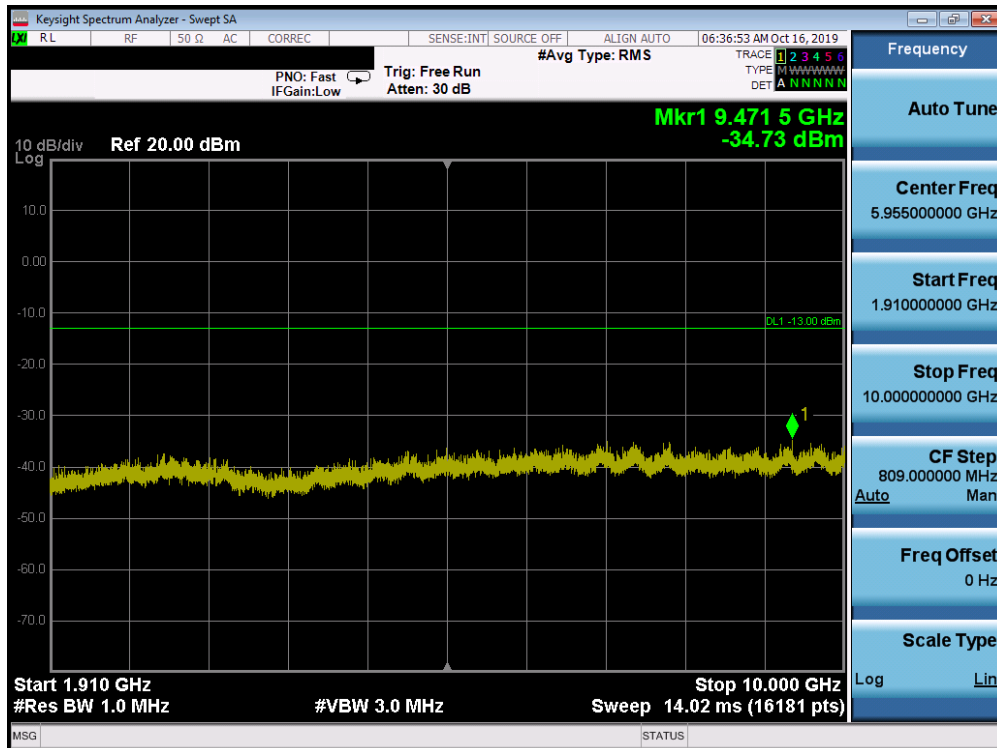
FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset		Page 24 of 109



**PCS GSM Mode**

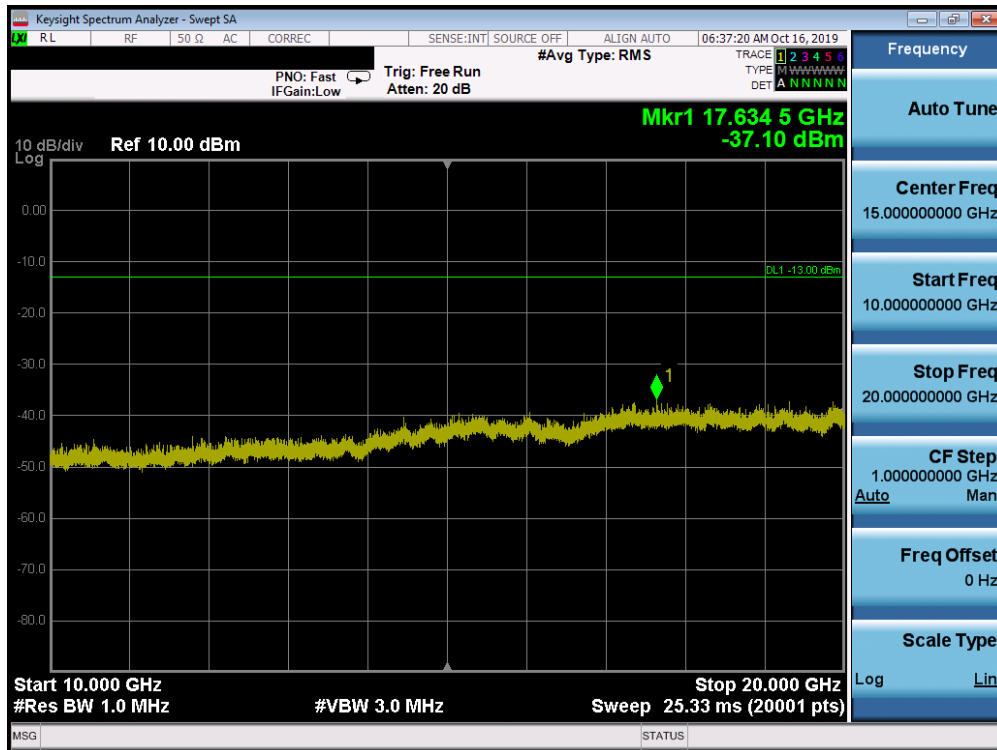


**Plot 7-19. Conducted Spurious Plot (PCS GSM Mode - Low Channel)**

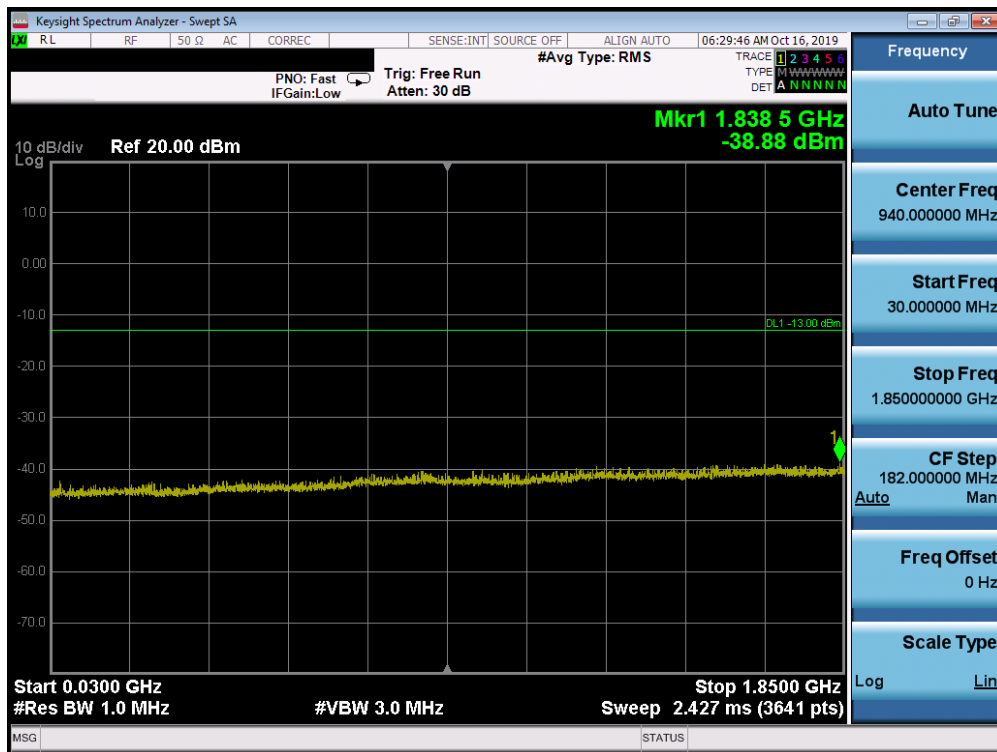


**Plot 7-20. Conducted Spurious Plot (PCS GSM Mode - Low Channel)**

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 25 of 109

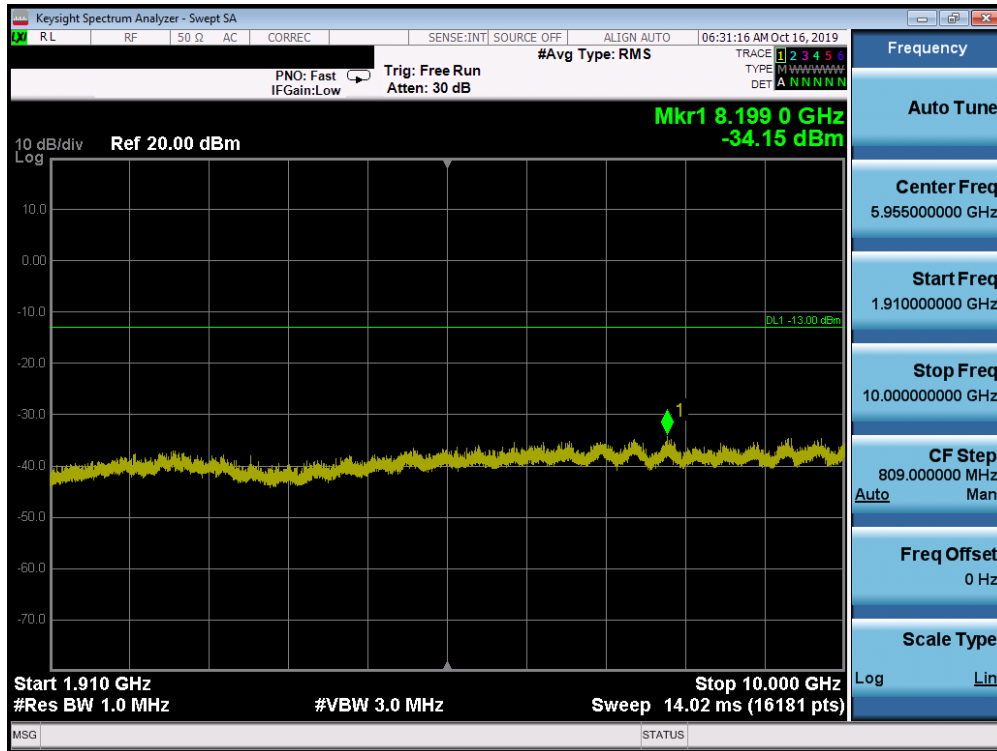


**Plot 7-21. Conducted Spurious Plot (PCS GSM Mode - Low Channel)**

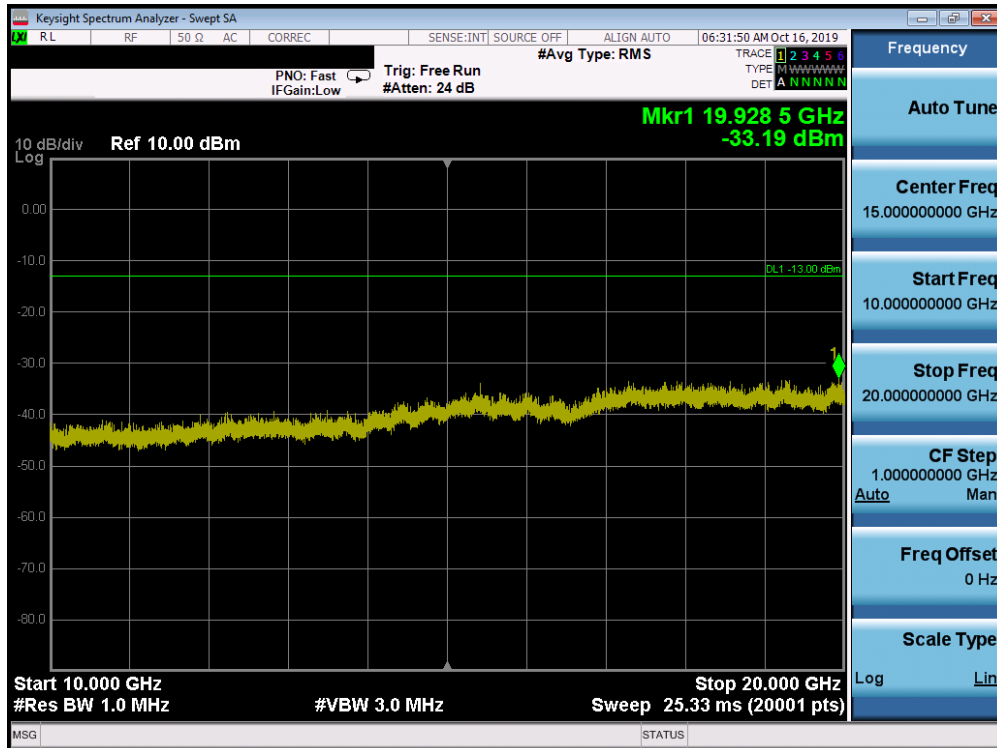


**Plot 7-22. Conducted Spurious Plot (PCS GSM Mode - Mid Channel)**

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>	 <b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset	Page 26 of 109

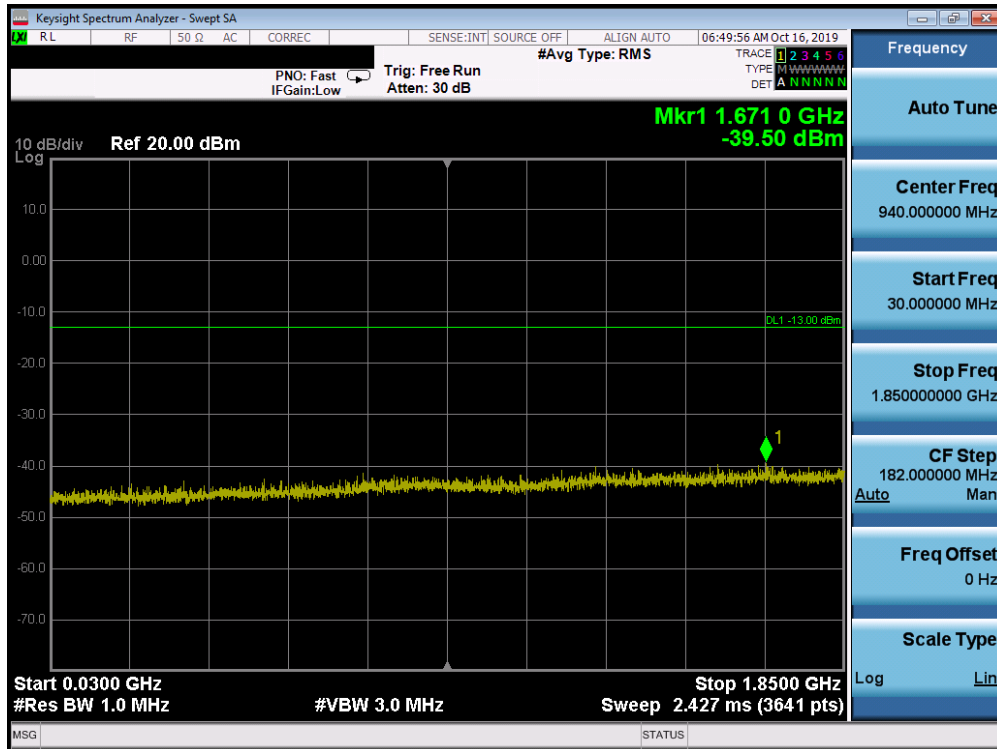


Plot 7-23. Conducted Spurious Plot (PCS GSM Mode - Mid Channel)

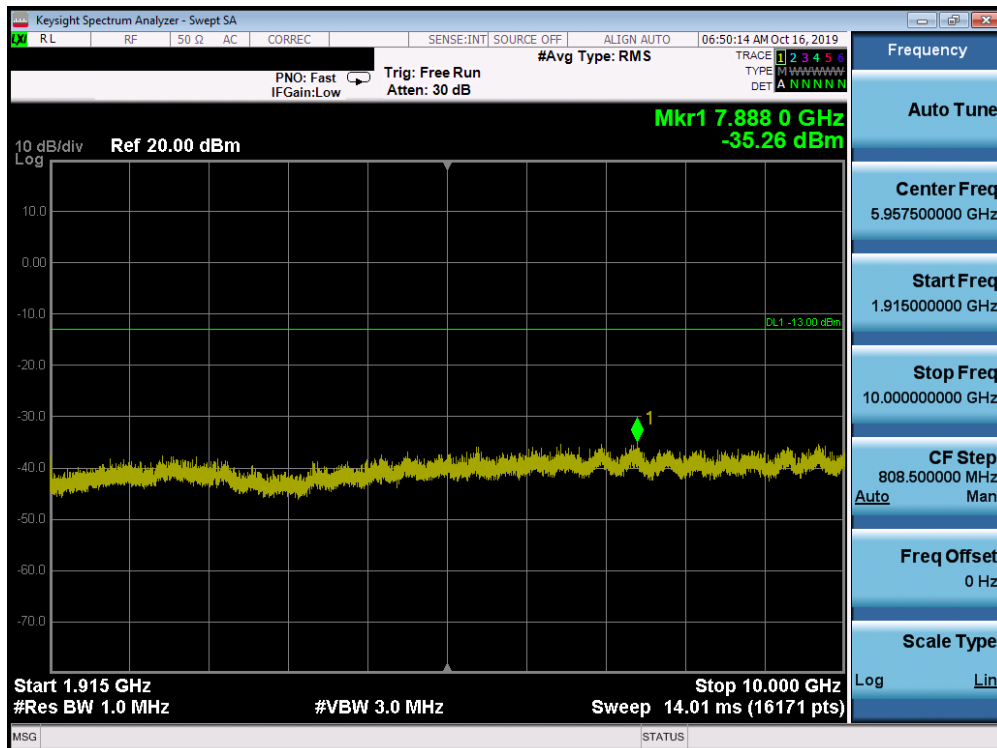


Plot 7-24. Conducted Spurious Plot (PCS GSM Mode - Mid Channel)

FCC ID: A3LSMG986U	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 27 of 109

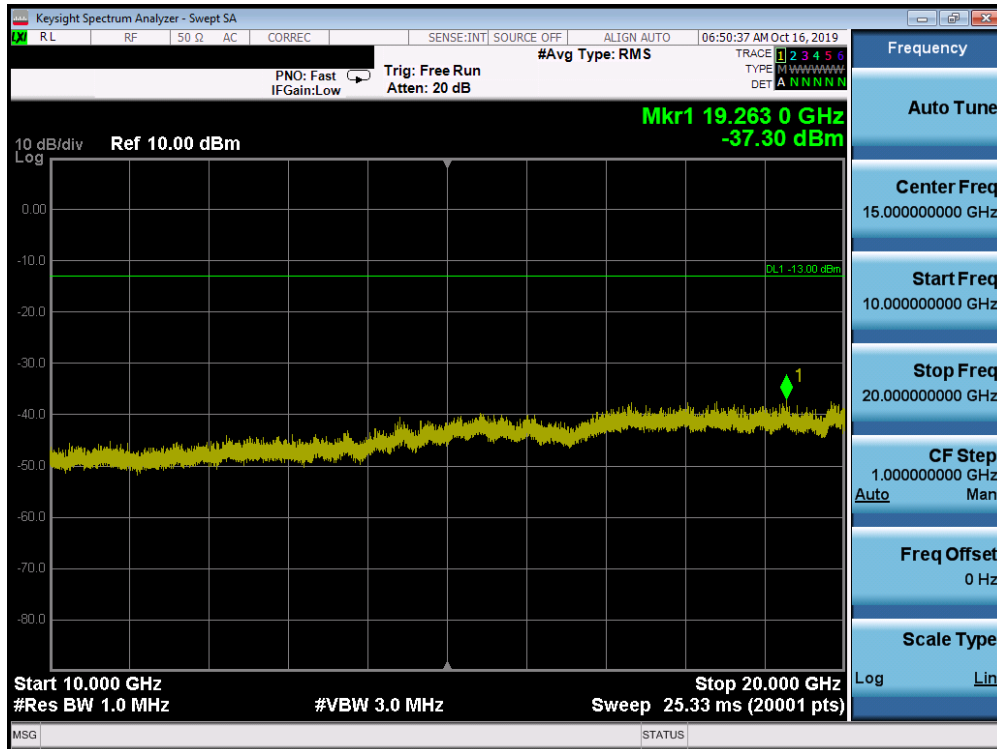


Plot 7-25. Conducted Spurious Plot (PCS GSM Mode - High Channel)



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

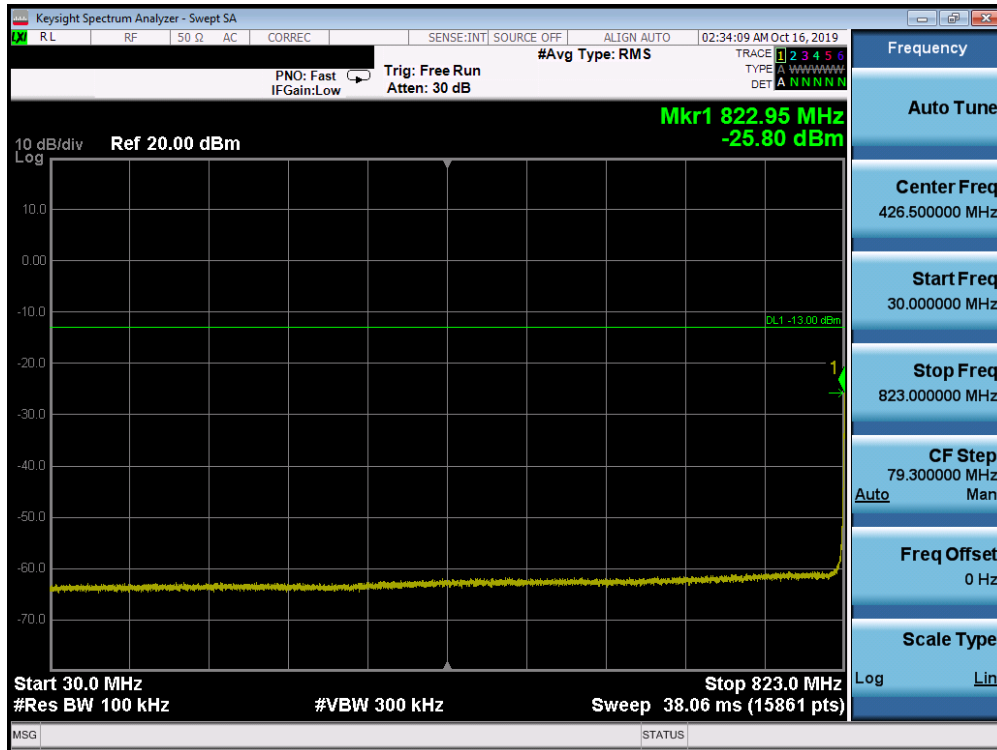
FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 28 of 109



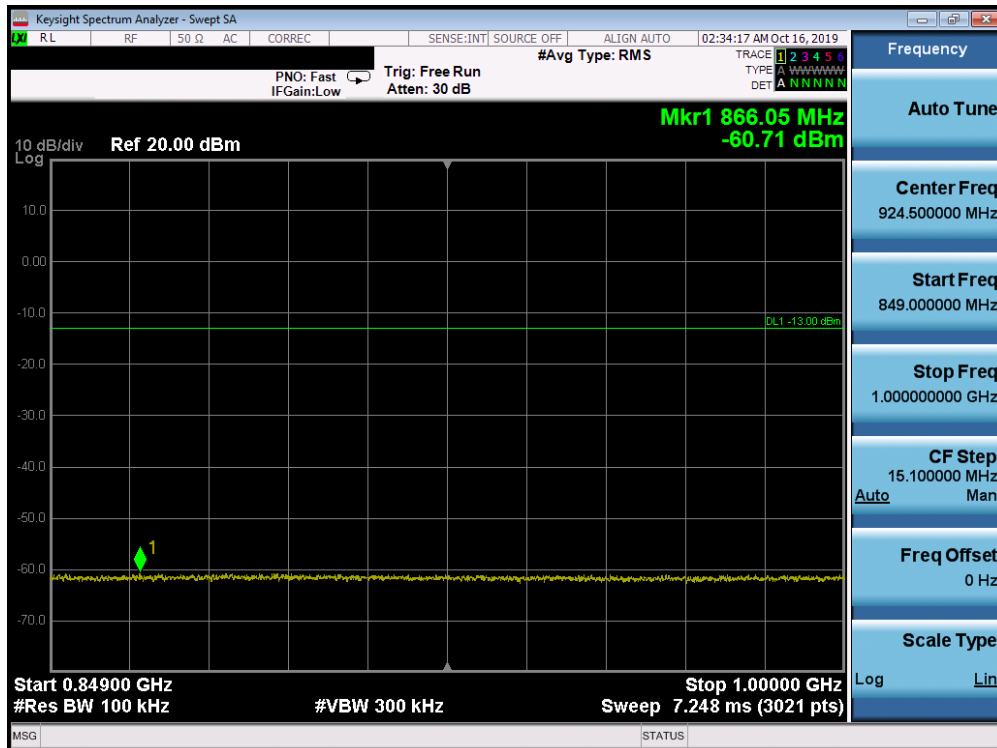
**Plot 7-27. Conducted Spurious Plot (PCS GSM Mode - High Channel)**

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset		Page 29 of 109

## Cellular CDMA Mode

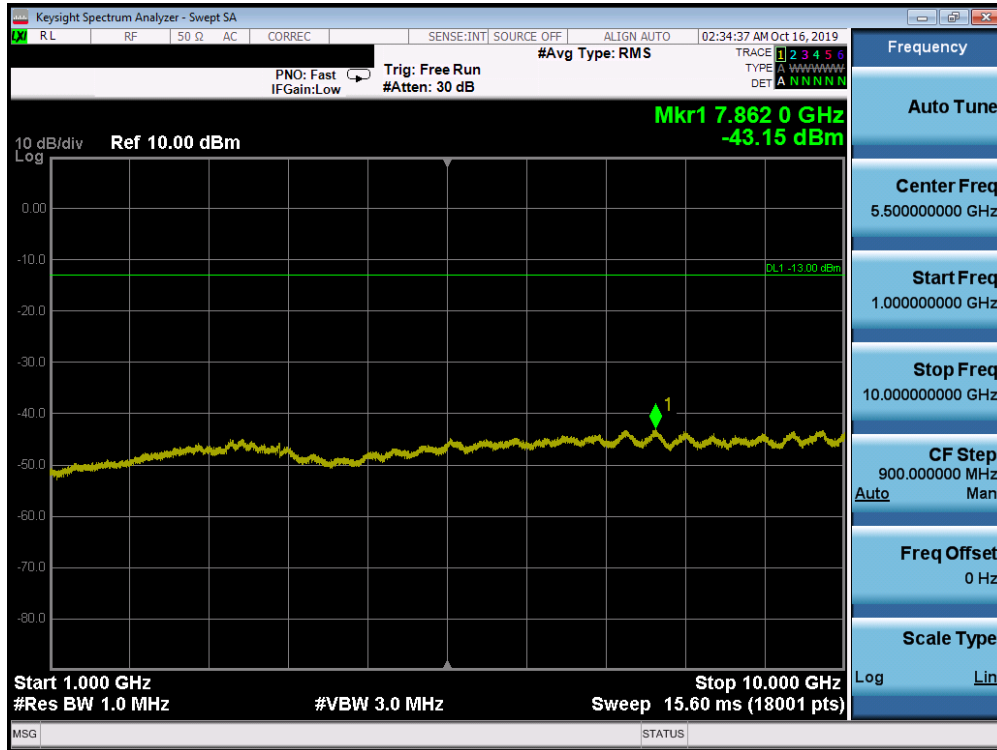


Plot 7-28. Conducted Spurious Plot (Cellular CDMA Mode - Low Channel)

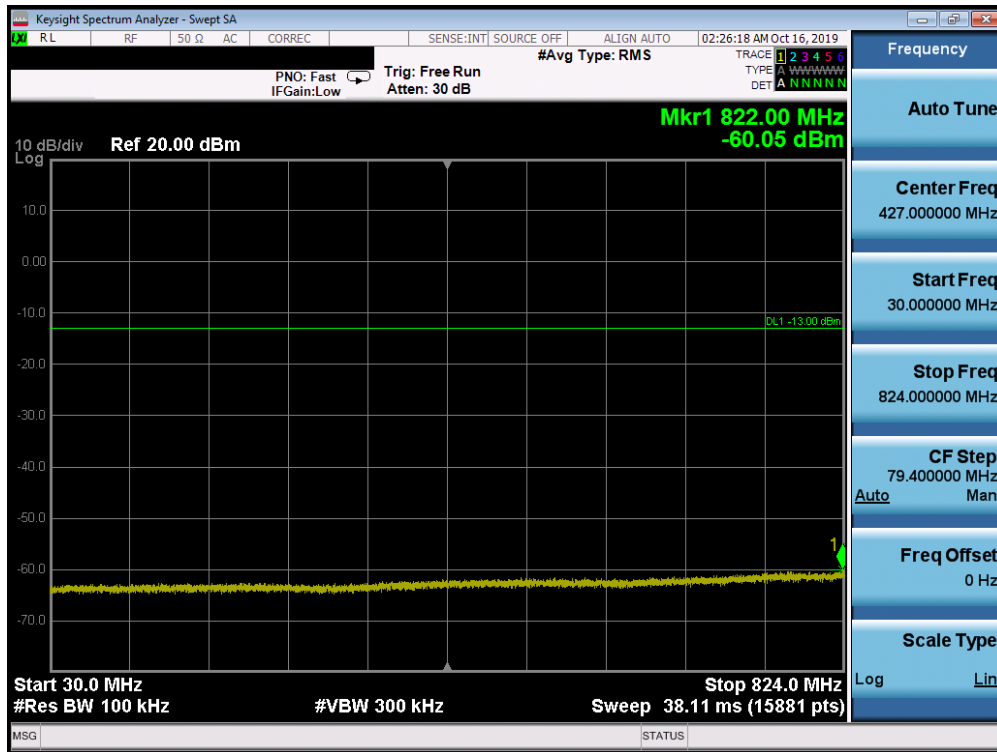


Plot 7-29. Conducted Spurious Plot (Cellular CDMA Mode - Low Channel)

FCC ID: A3LSMG986U	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 30 of 109

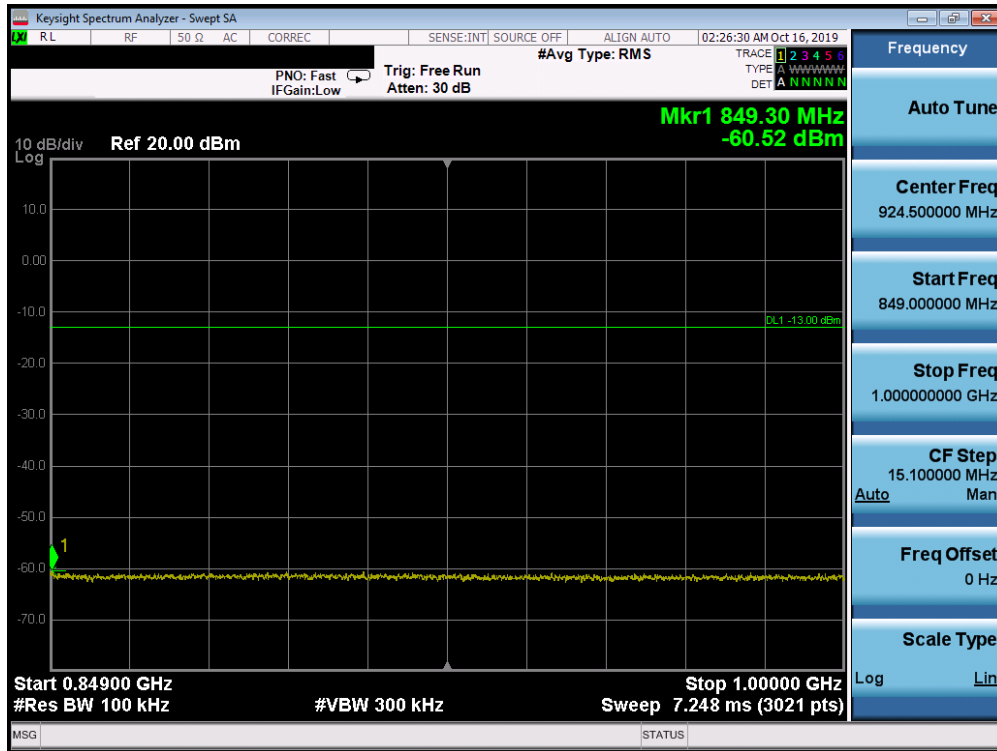


Plot 7-30. Conducted Spurious Plot (Cellular CDMA Mode - Low Channel)

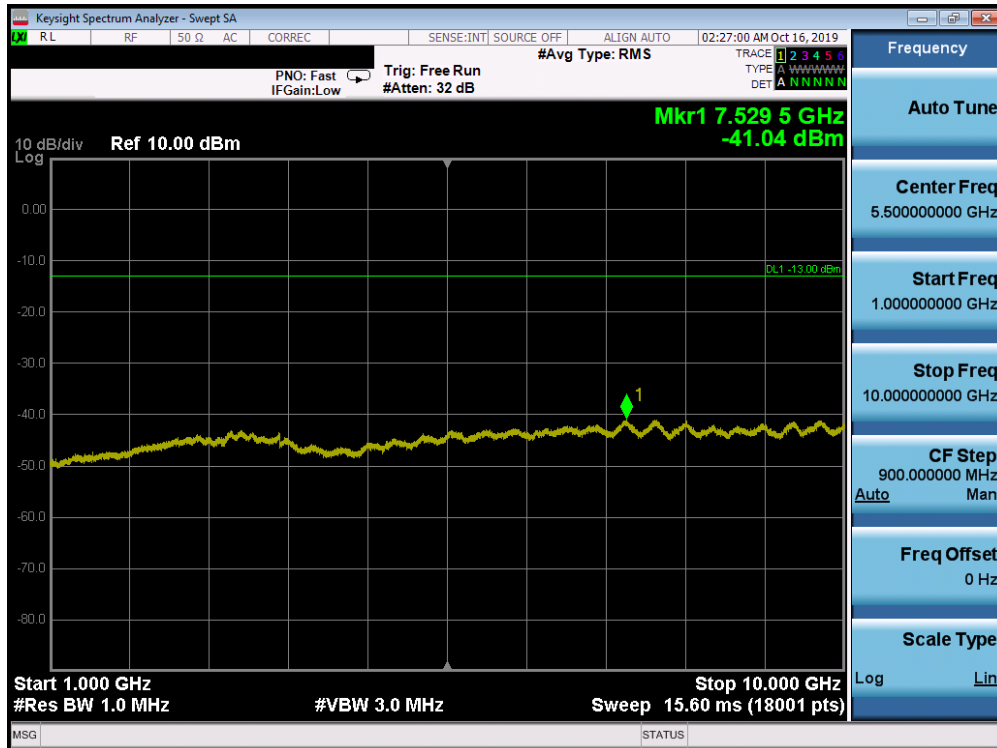


Plot 7-31. Conducted Spurious Plot (Cellular CDMA Mode - Mid Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 31 of 109



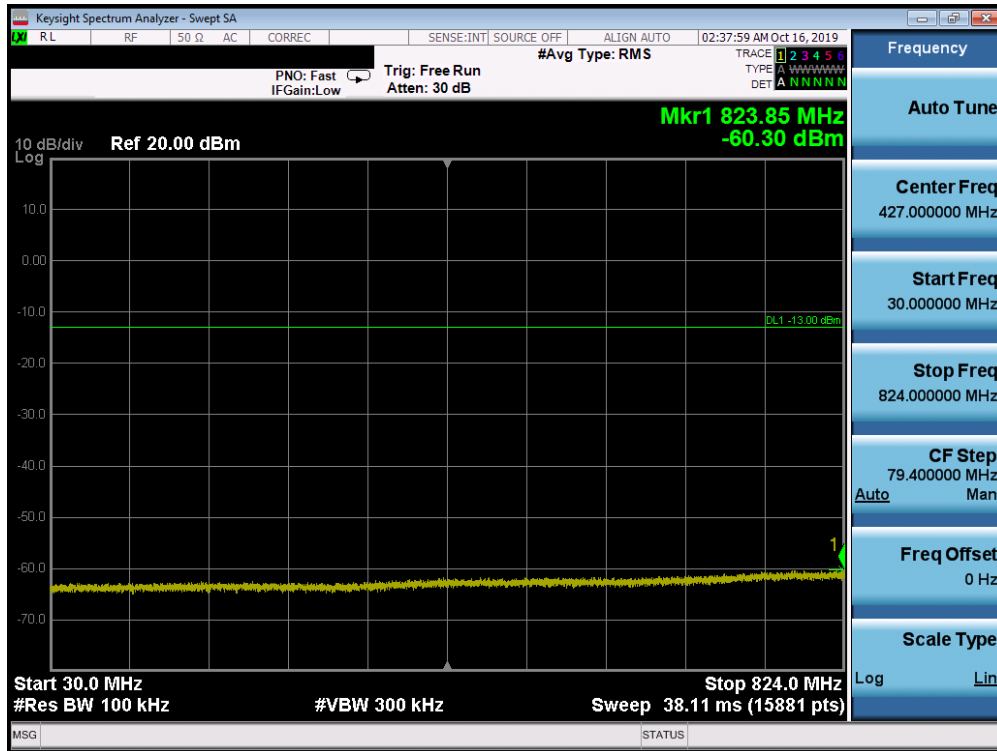
Plot 7-32. Conducted Spurious Plot (Cellular CDMA Mode - Mid Channel)



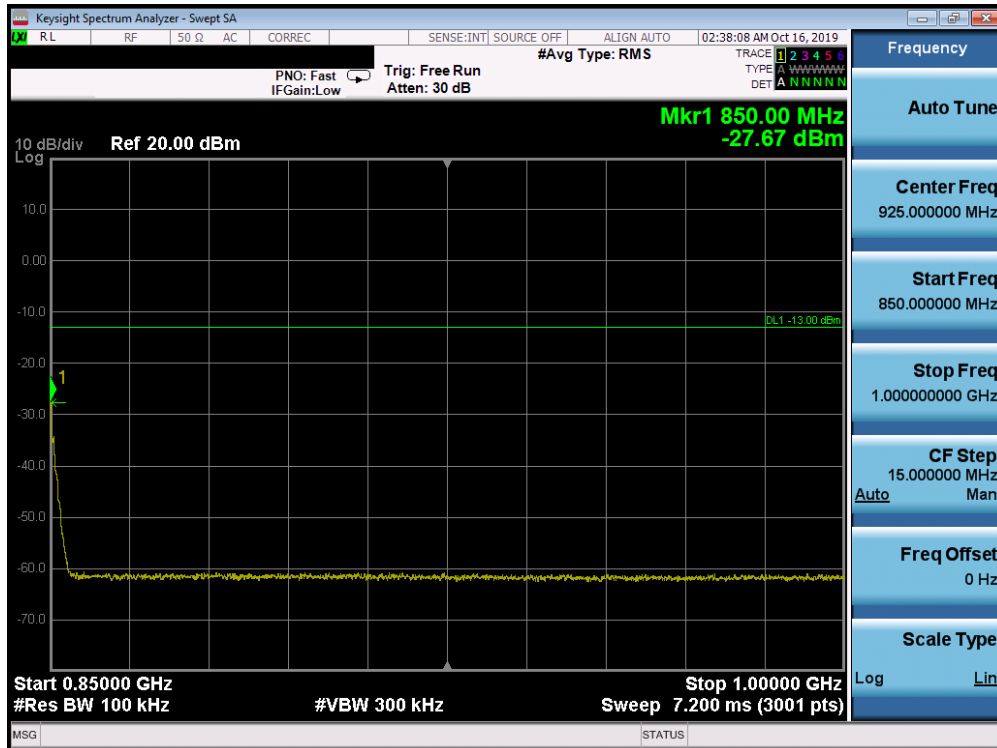
Plot 7-33. Conducted Spurious Plot (Cellular CDMA Mode - Mid Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 32 of 109



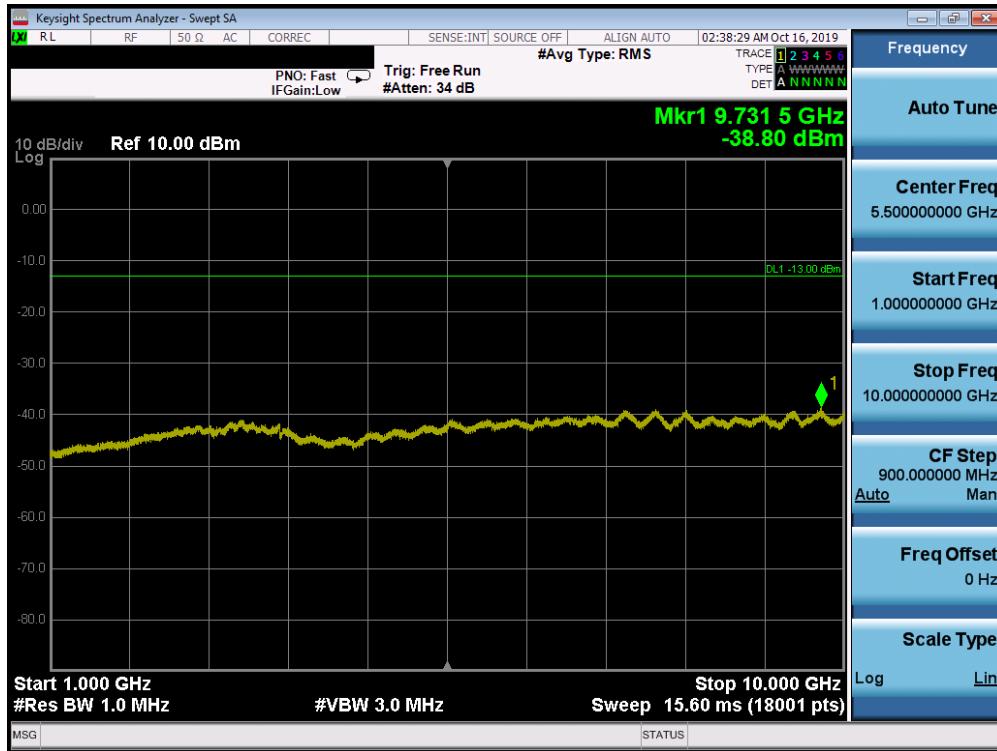


Plot 7-34. Conducted Spurious Plot (Cellular CDMA Mode - High Channel)



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

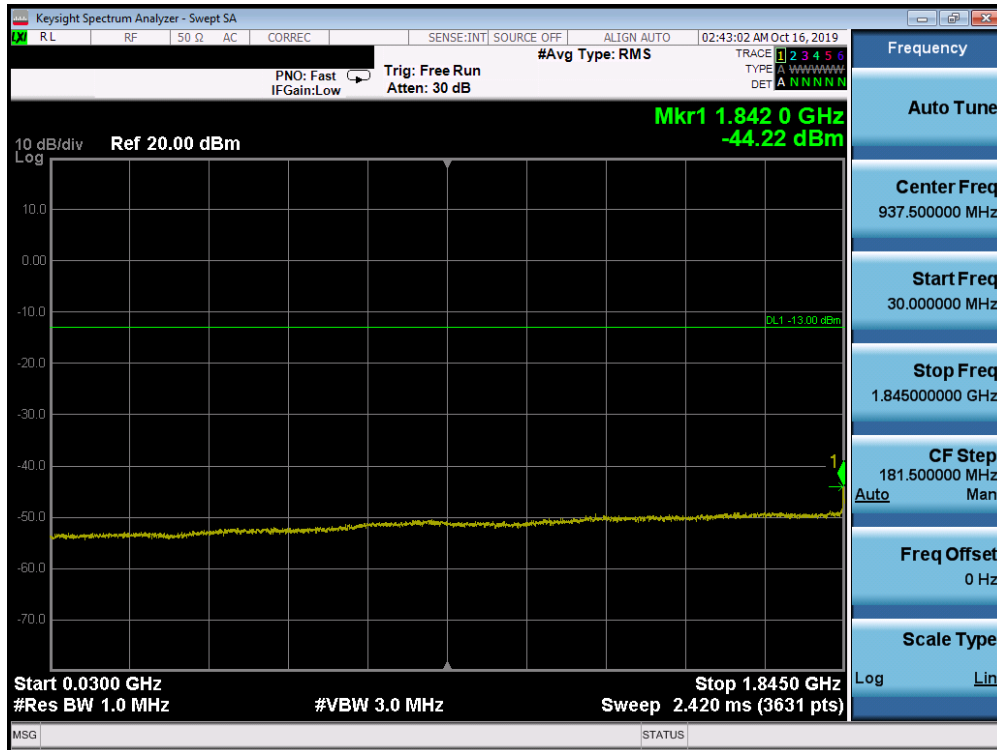
FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 33 of 109



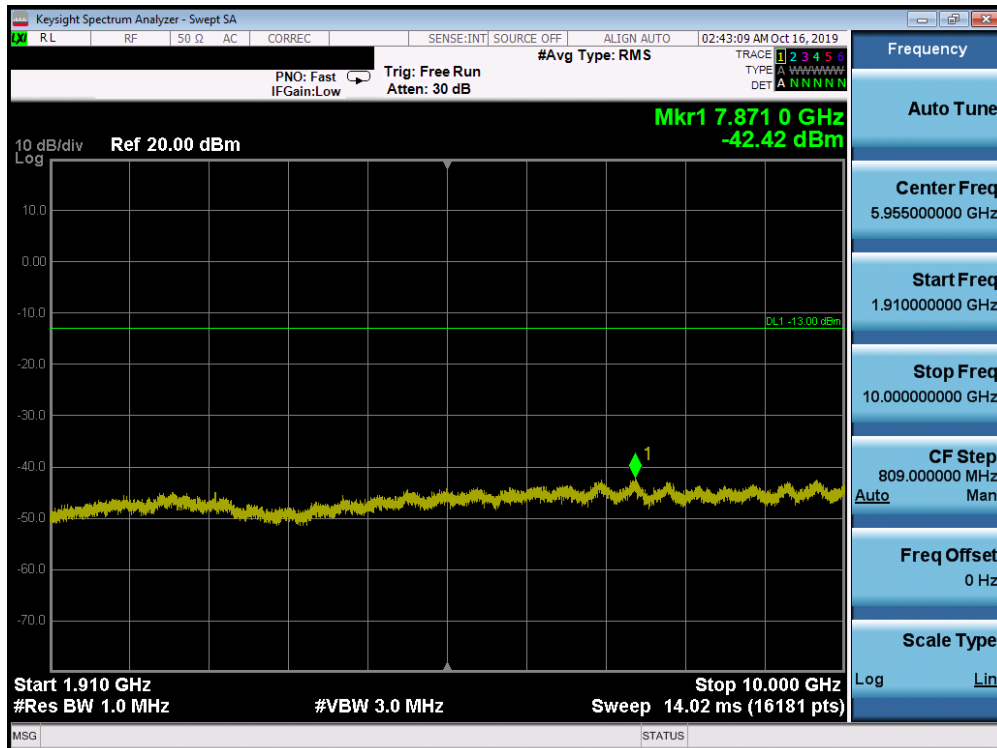
**Plot 7-36. Conducted Spurious Plot (Cellular CDMA Mode - High Channel)**

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset		Page 34 of 109

**PCS CDMA Mode**

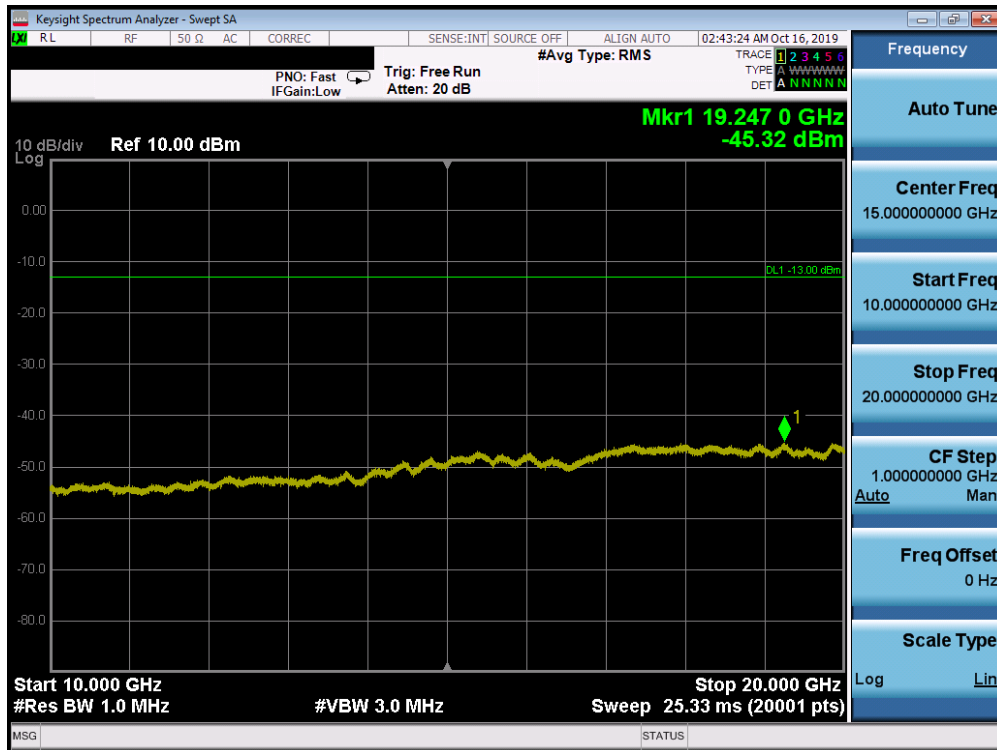


**Plot 7-37. Conducted Spurious Plot (PCS CDMA Mode - Low Channel)**



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

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 35 of 109

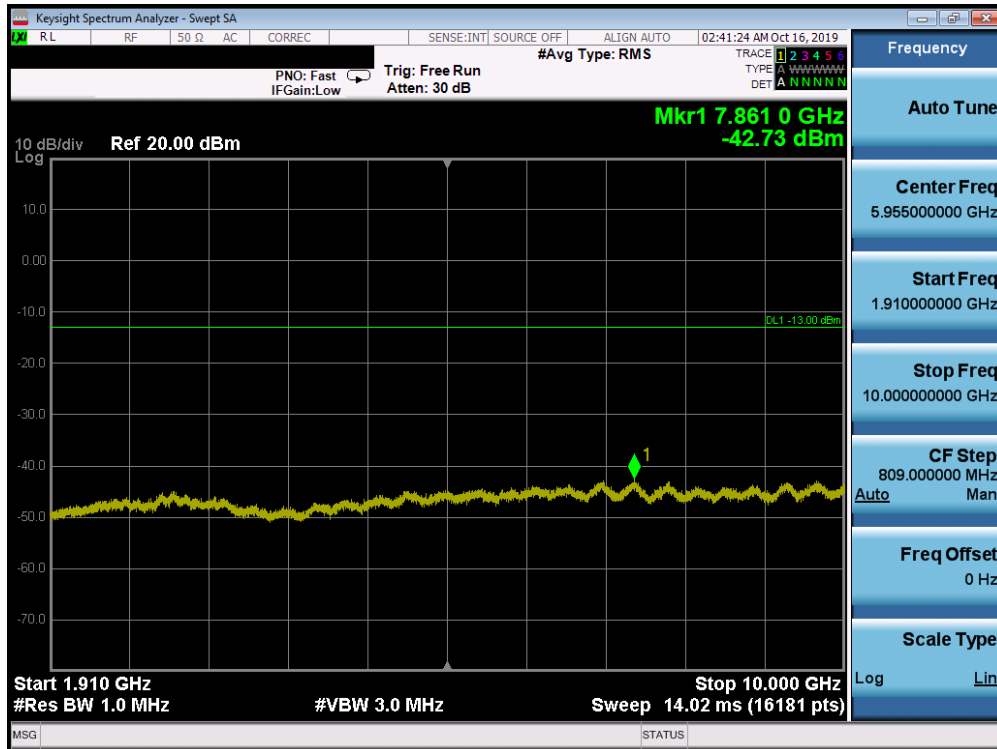


Plot 7-39. Conducted Spurious Plot (PCS CDMA Mode - Low Channel)

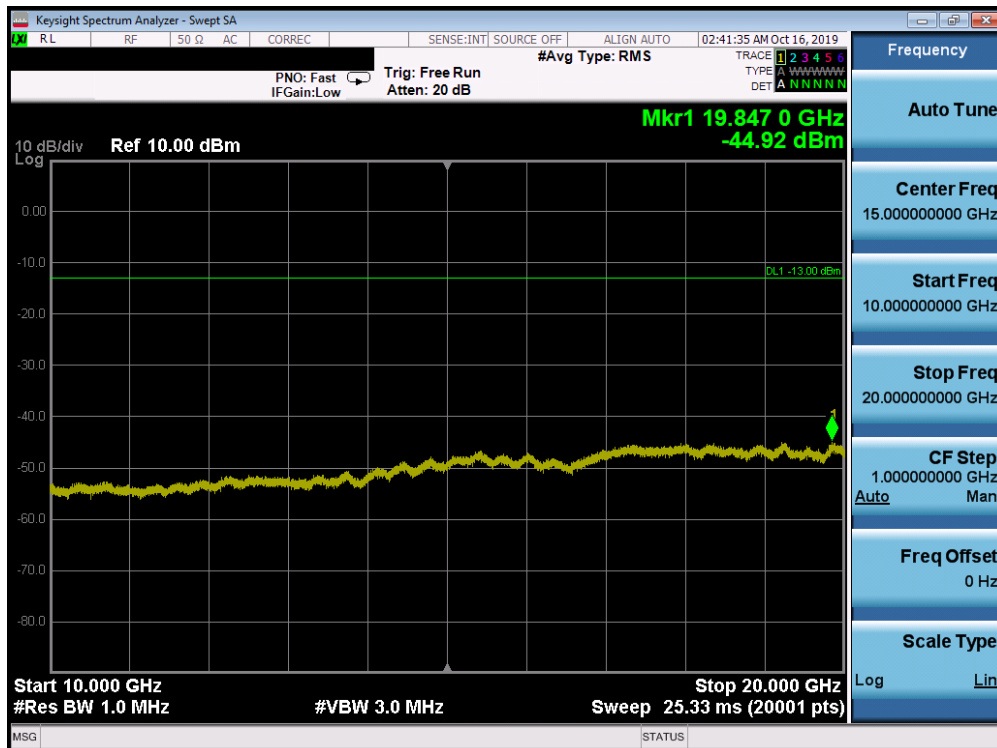


Plot 7-40. Conducted Spurious Plot (PCS CDMA Mode - Mid Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 36 of 109

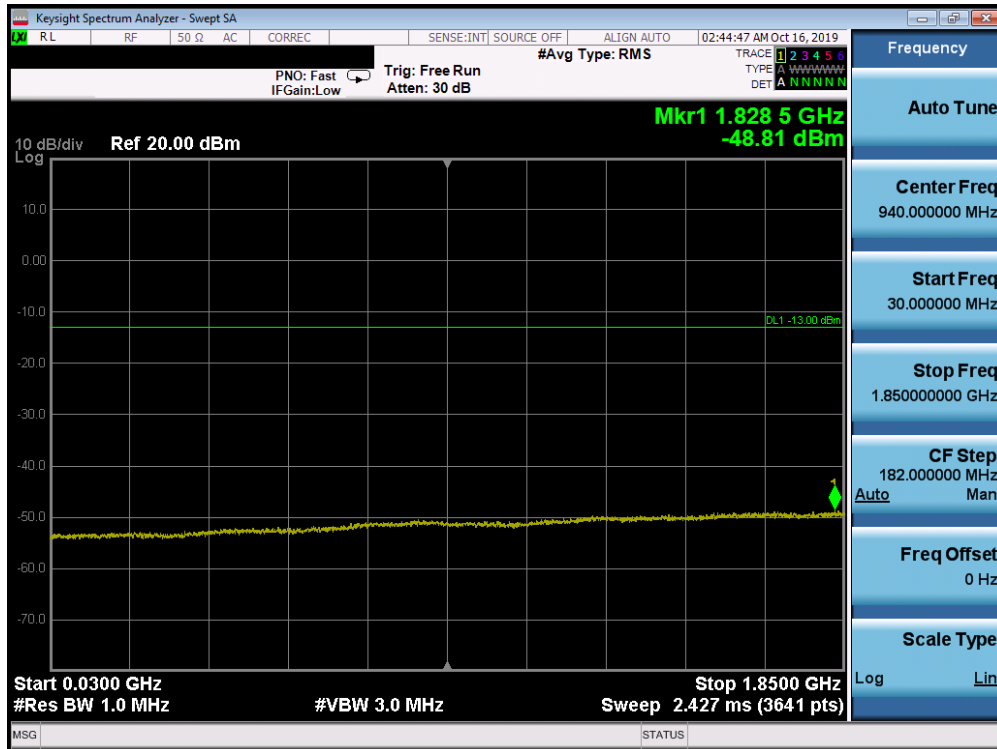


Plot 7-41. Conducted Spurious Plot (PCS CDMA Mode - Mid Channel)

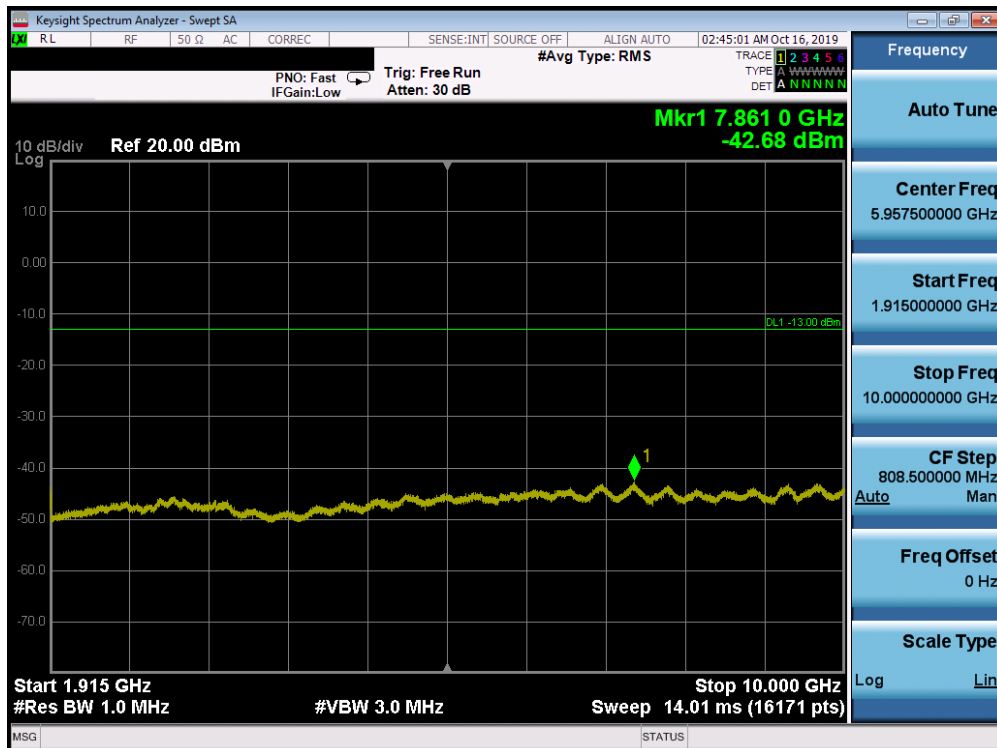


Plot 7-42. Conducted Spurious Plot (PCS CDMA Mode - Mid Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 37 of 109

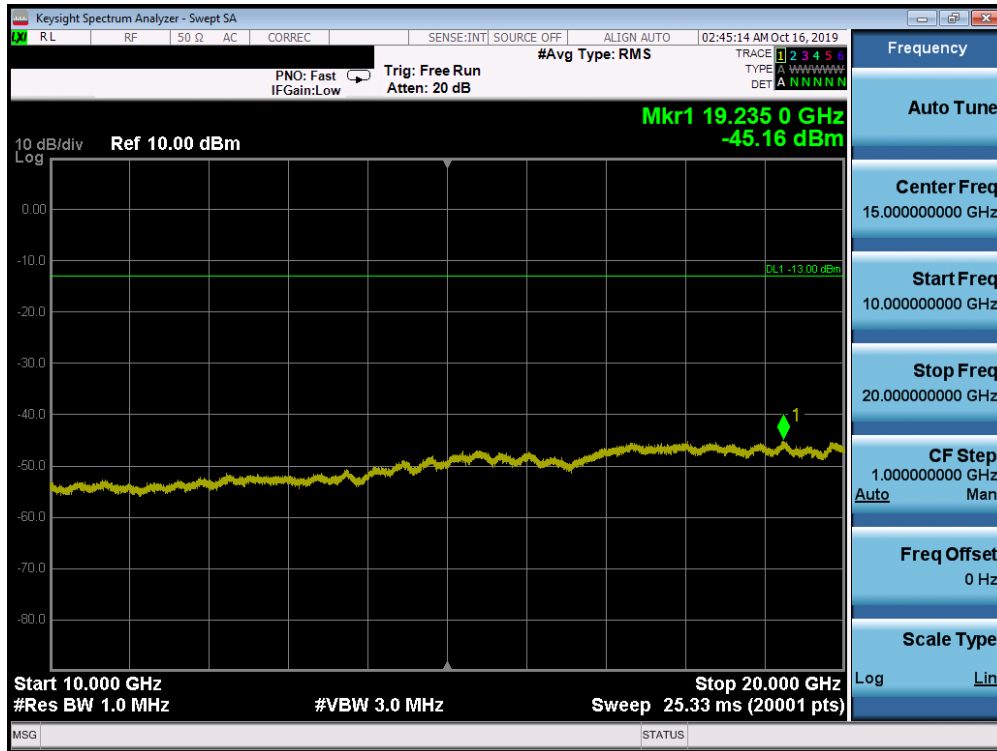


Plot 7-43. Conducted Spurious Plot (PCS CDMA Mode - High Channel)



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

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 38 of 109

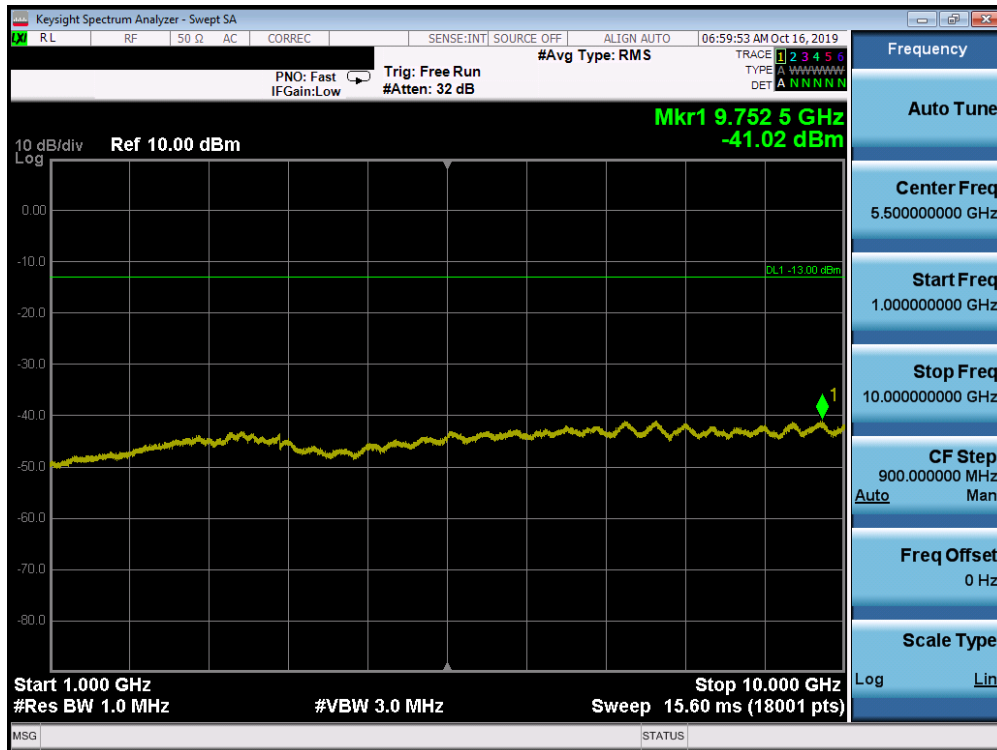


**Plot 7-45. Conducted Spurious Plot (PCS CDMA Mode - High Channel)**

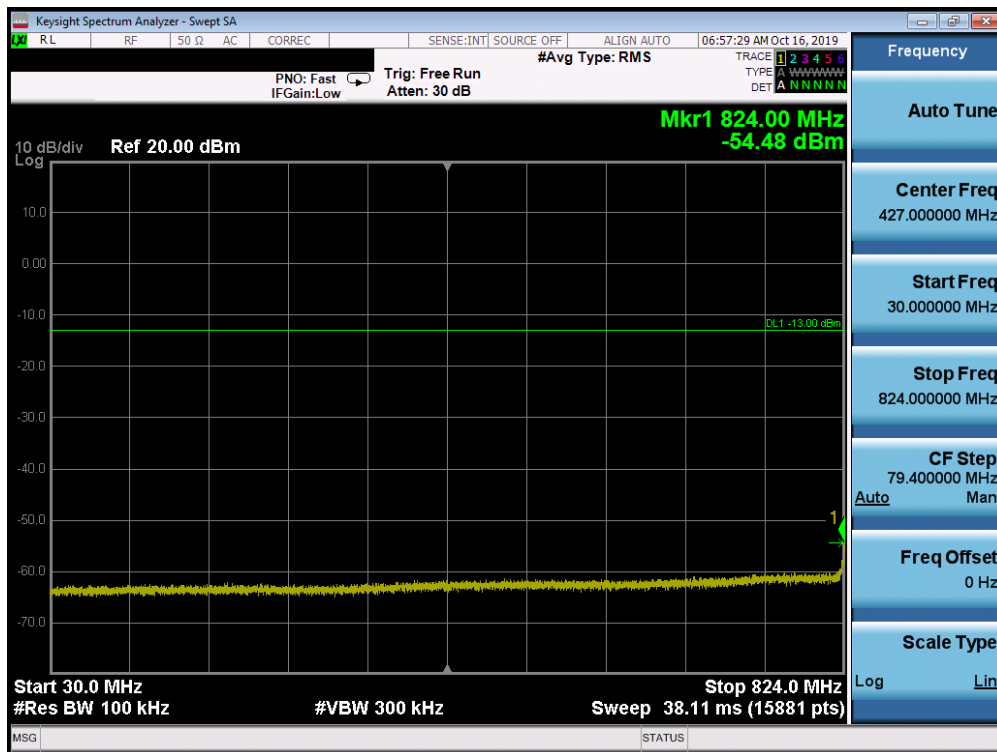
FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset		Page 39 of 109





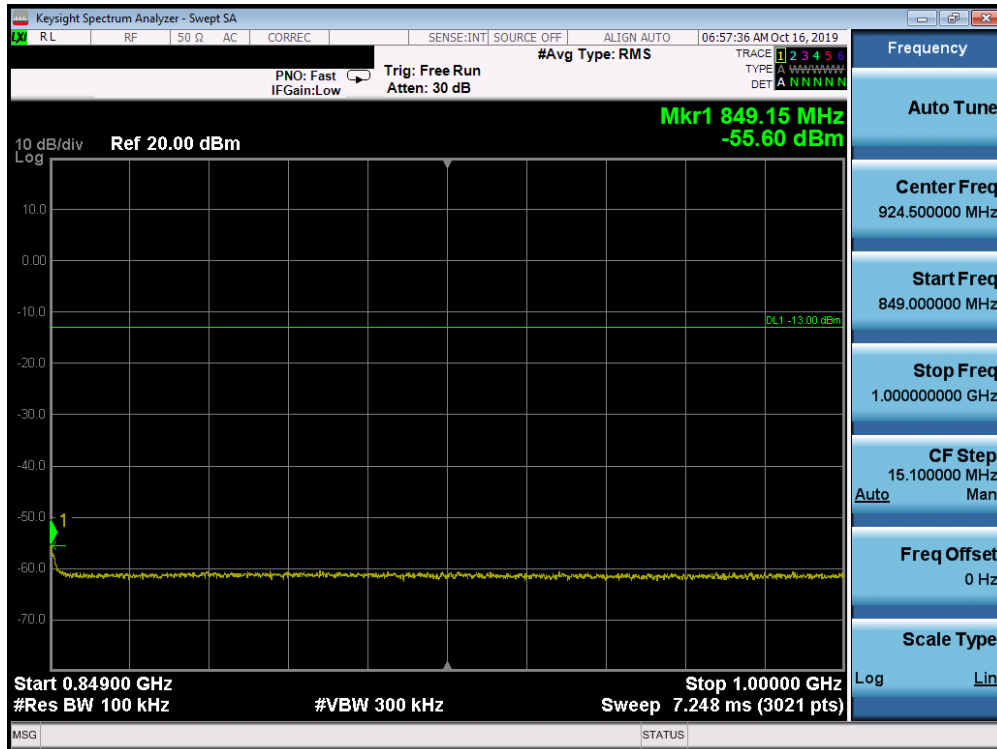


Plot 7-48. Conducted Spurious Plot (Cellular WCDMA Mode - Low Channel)

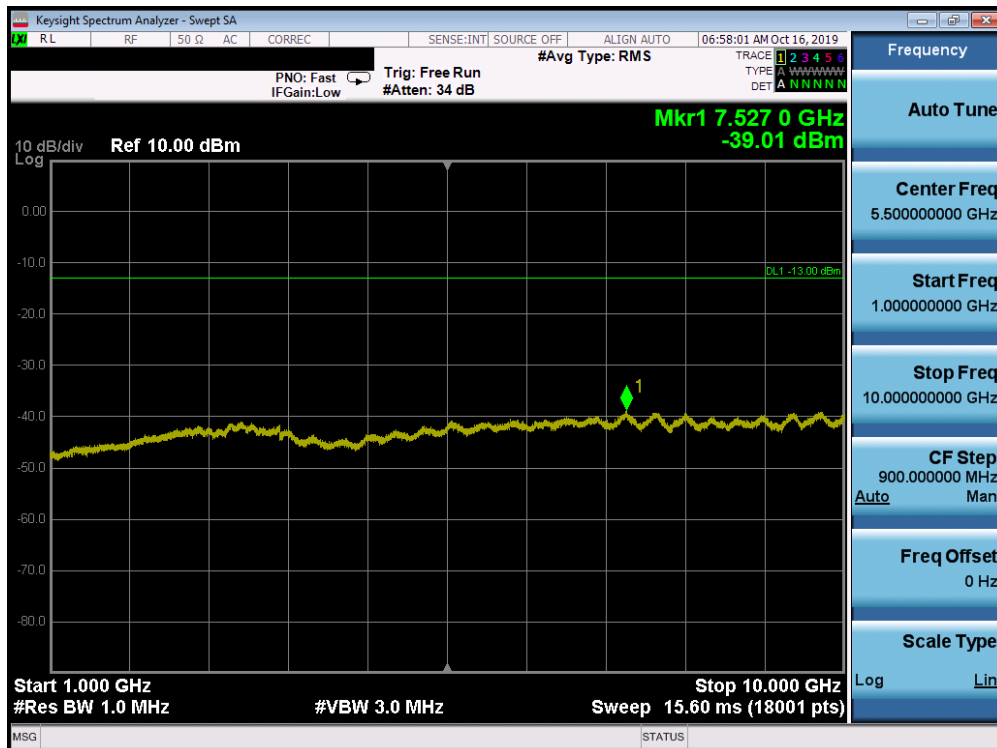


Plot 7-49. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 41 of 109

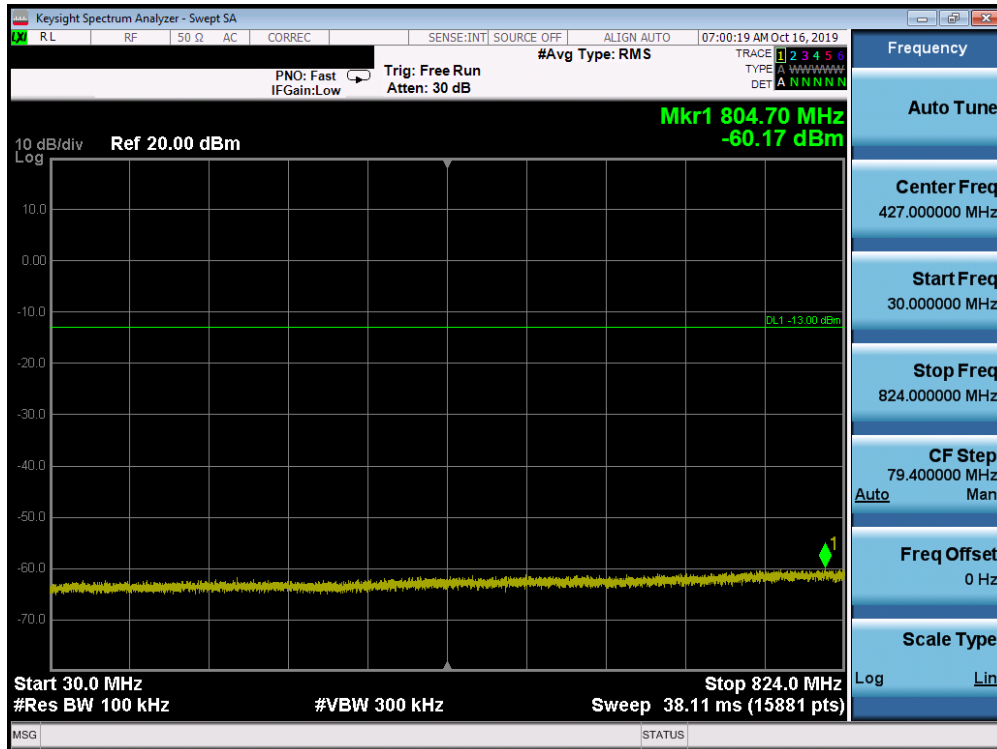


Plot 7-50. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

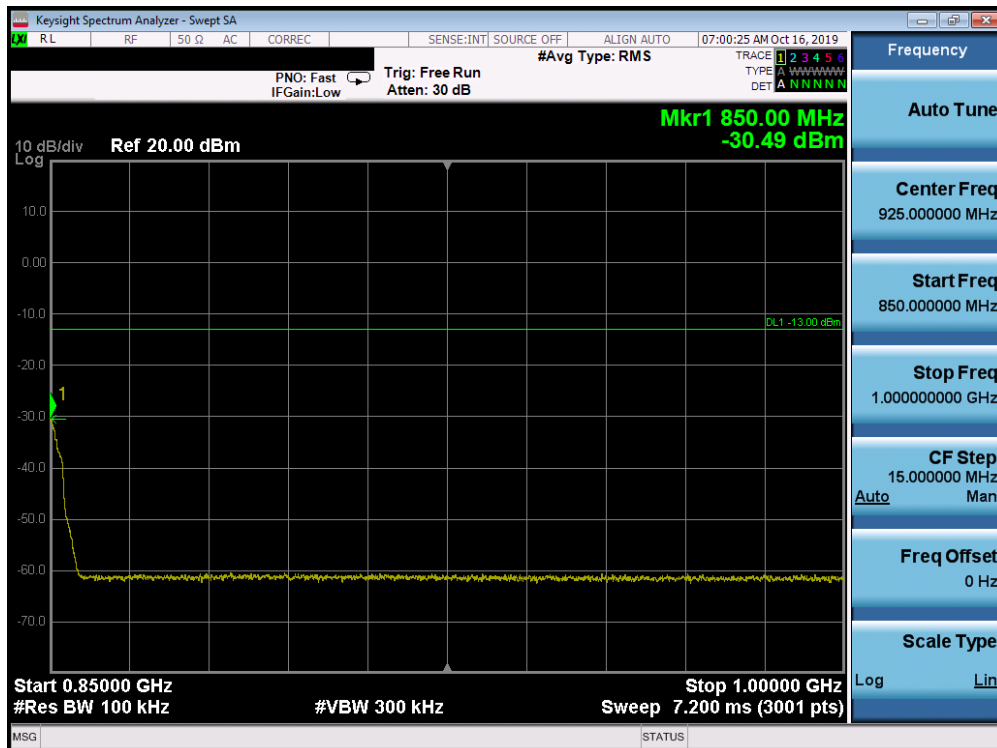


Plot 7-51. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 42 of 109



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



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

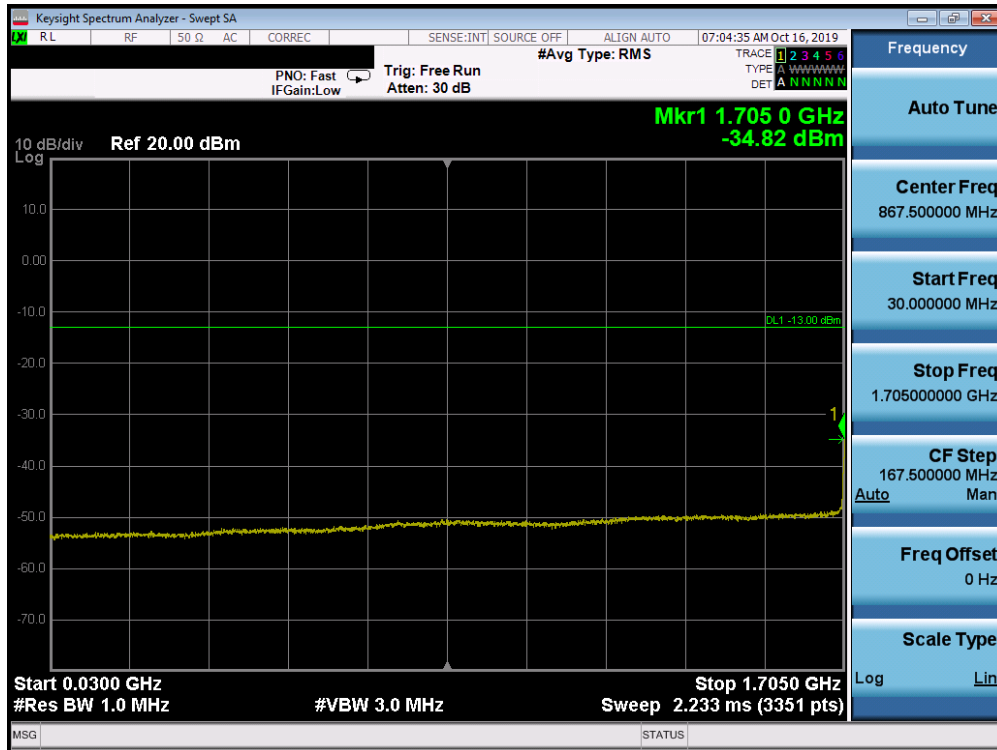
FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 43 of 109



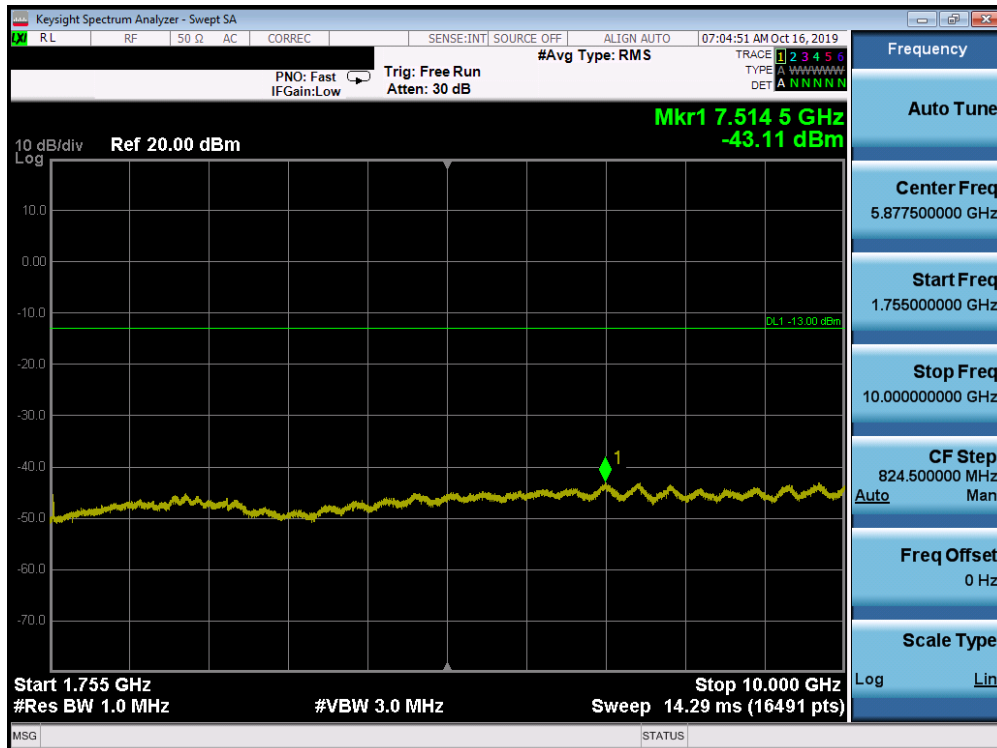
**Plot 7-54. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)**

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 44 of 109

**AWS WCDMA Mode**

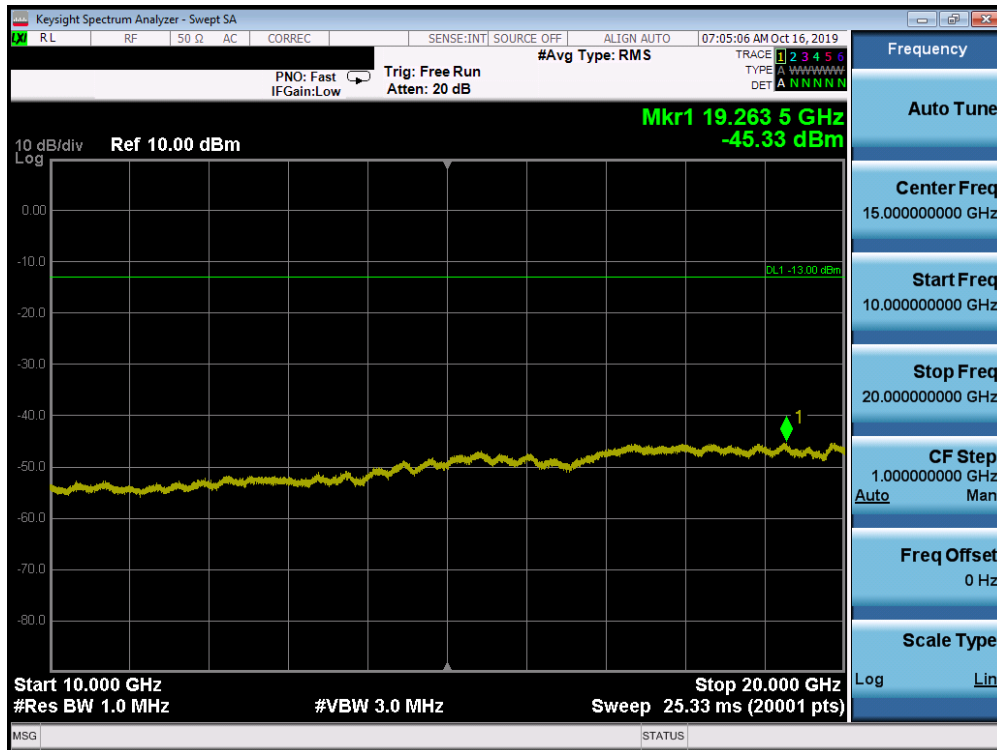


**Plot 7-55. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)**



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

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 45 of 109

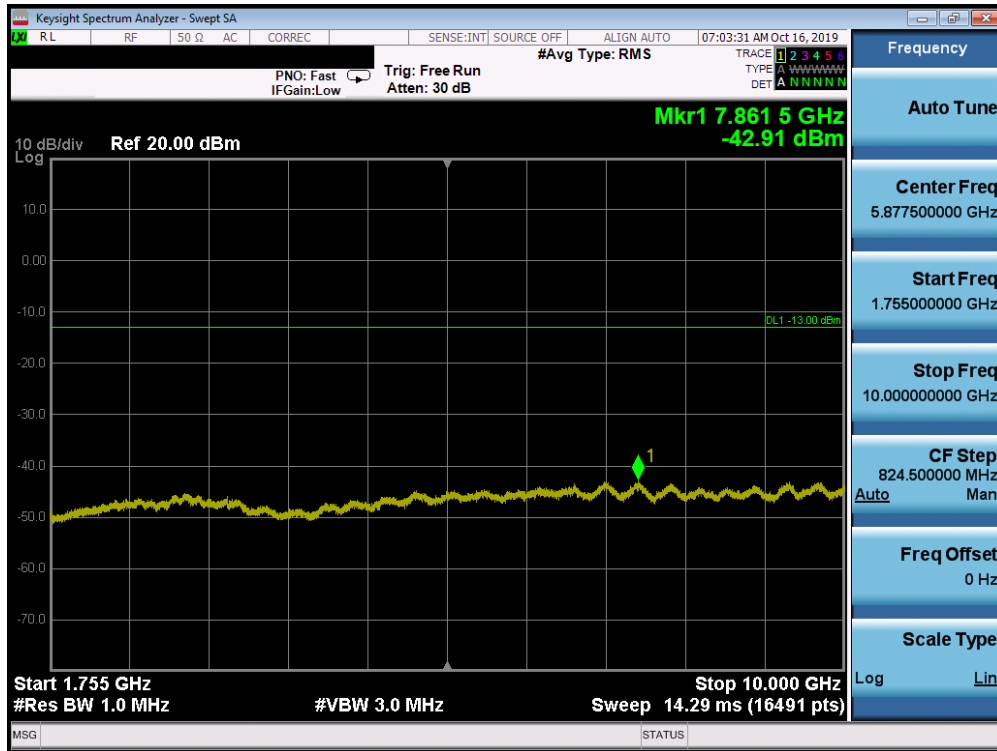


Plot 7-57. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)

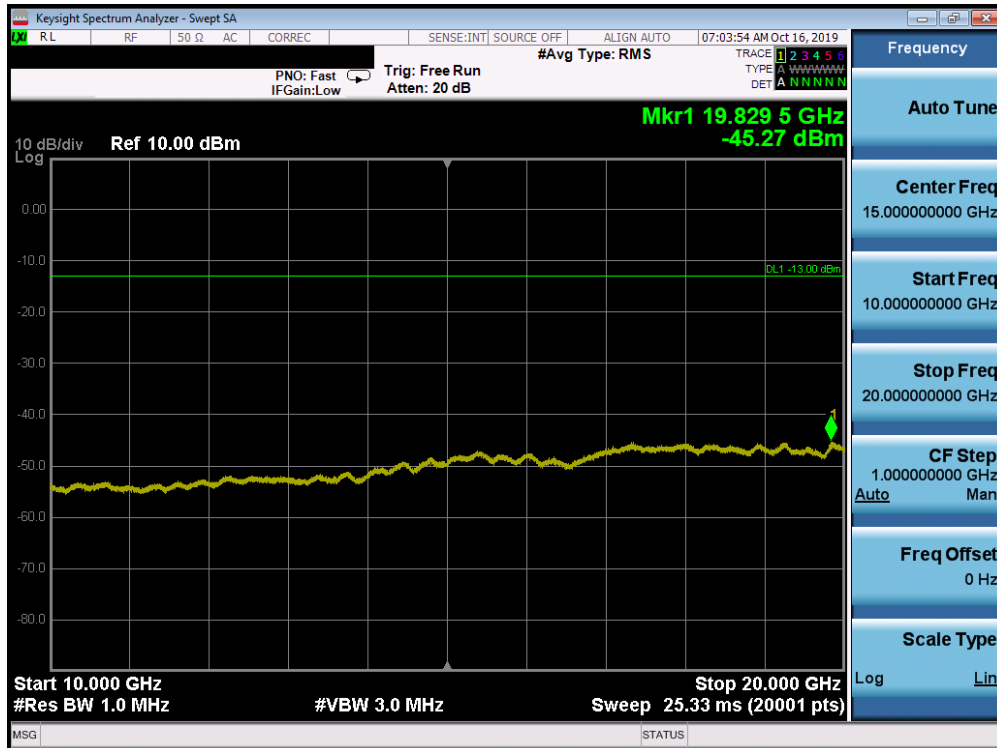


Plot 7-58. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 46 of 109

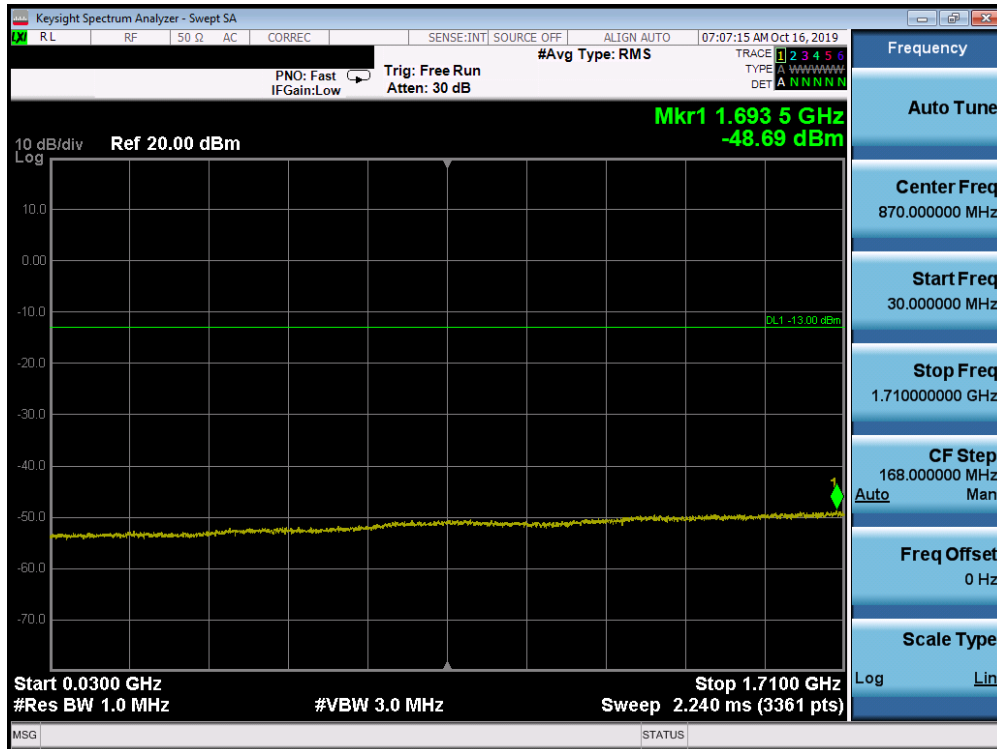


Plot 7-59. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)

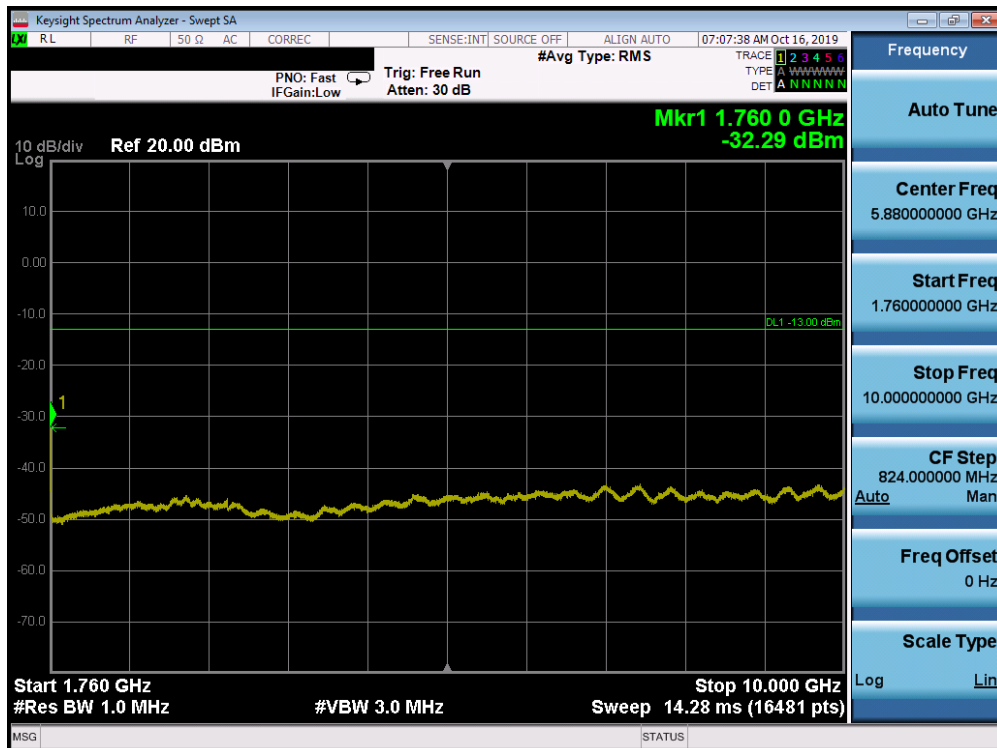


Plot 7-60. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 47 of 109



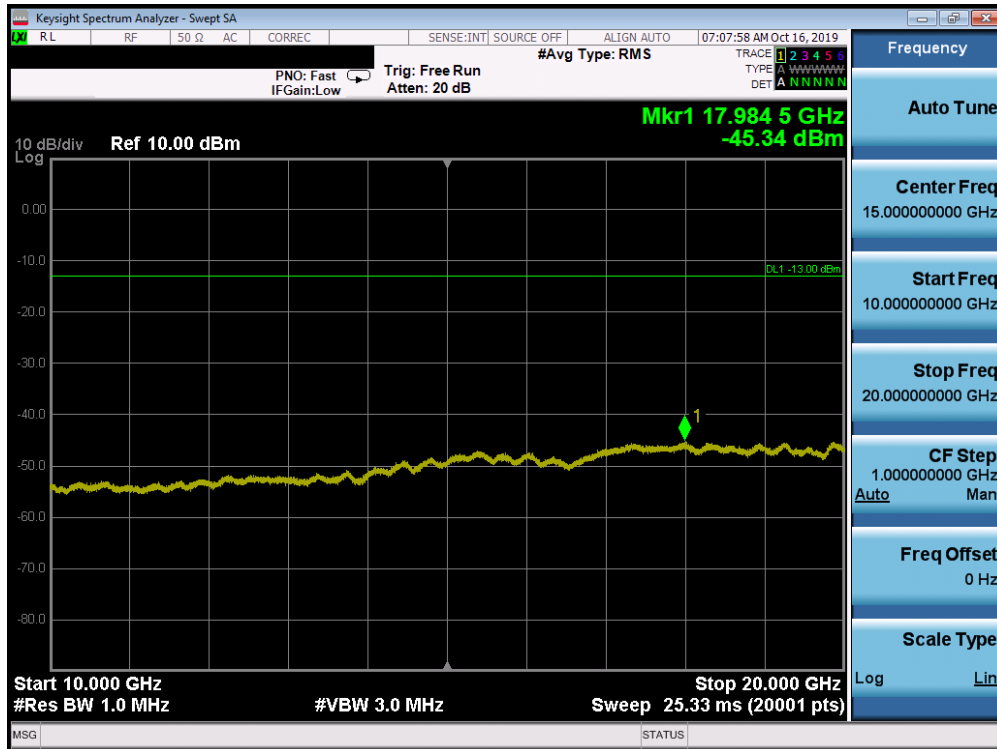
Plot 7-61. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)



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

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 48 of 109

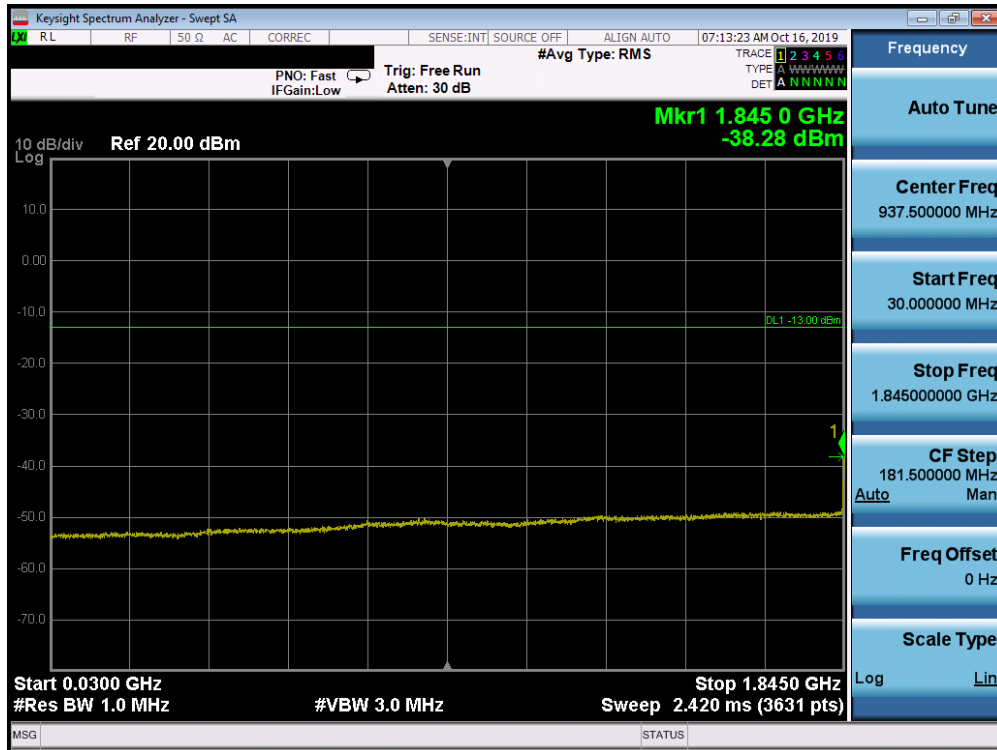




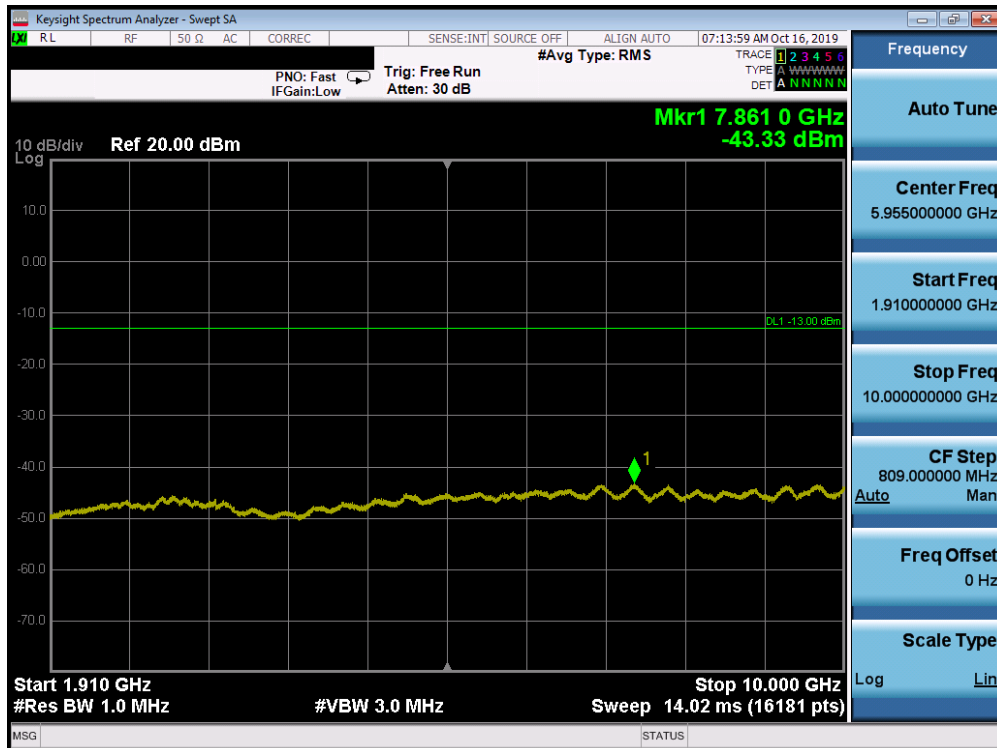
**Plot 7-63. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)**

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M1910220166-02.A3L	<b>Test Dates:</b> 10/11 - 12/06/2019	<b>EUT Type:</b> Portable Handset		Page 49 of 109

**PCS WCDMA Mode**

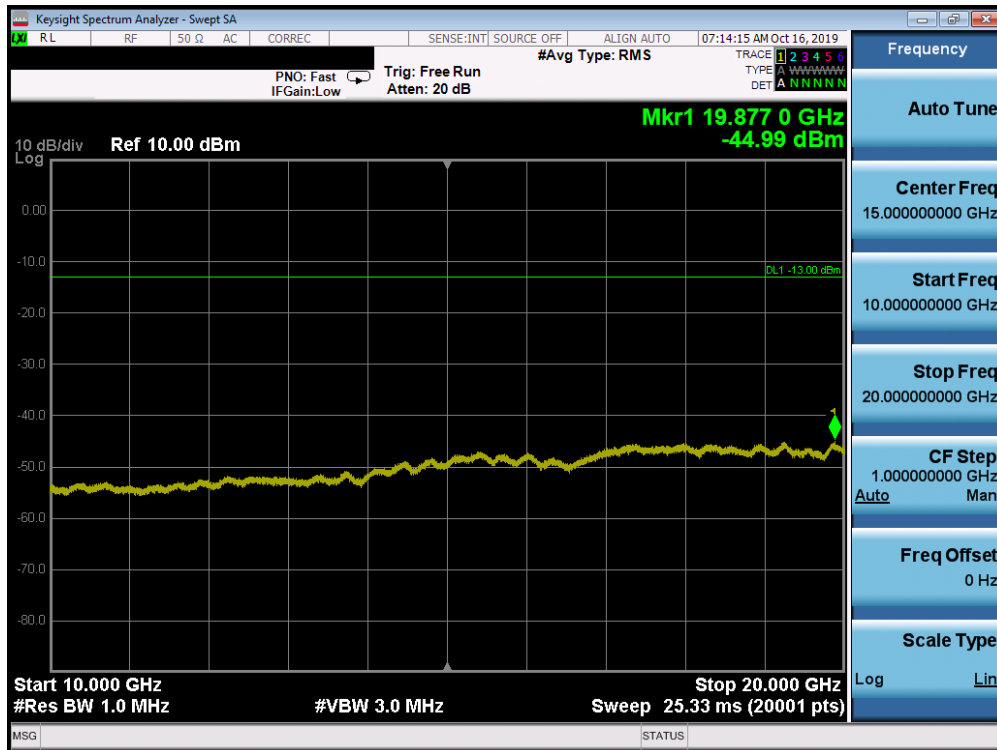


**Plot 7-64. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)**

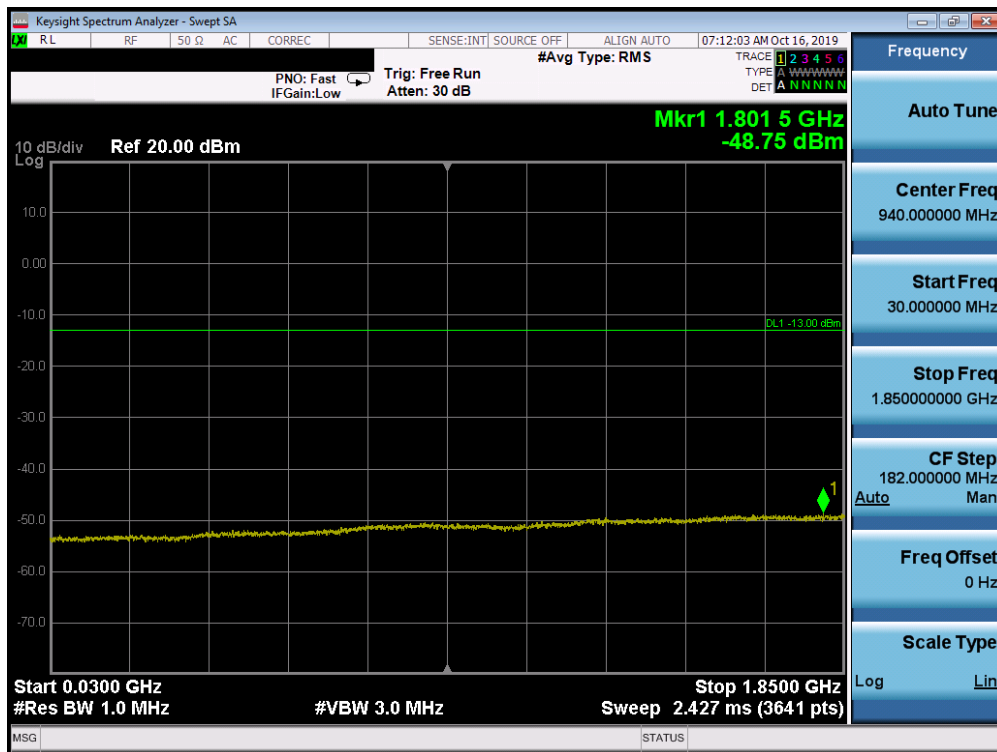


**Plot 7-65. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)**

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 50 of 109

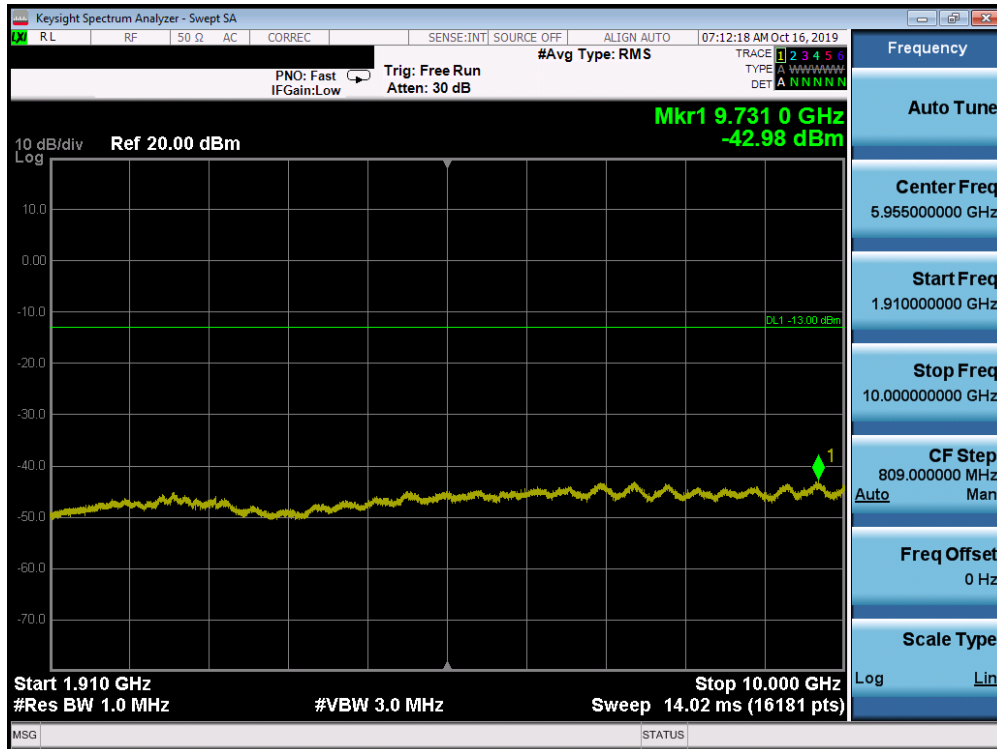


Plot 7-66. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)

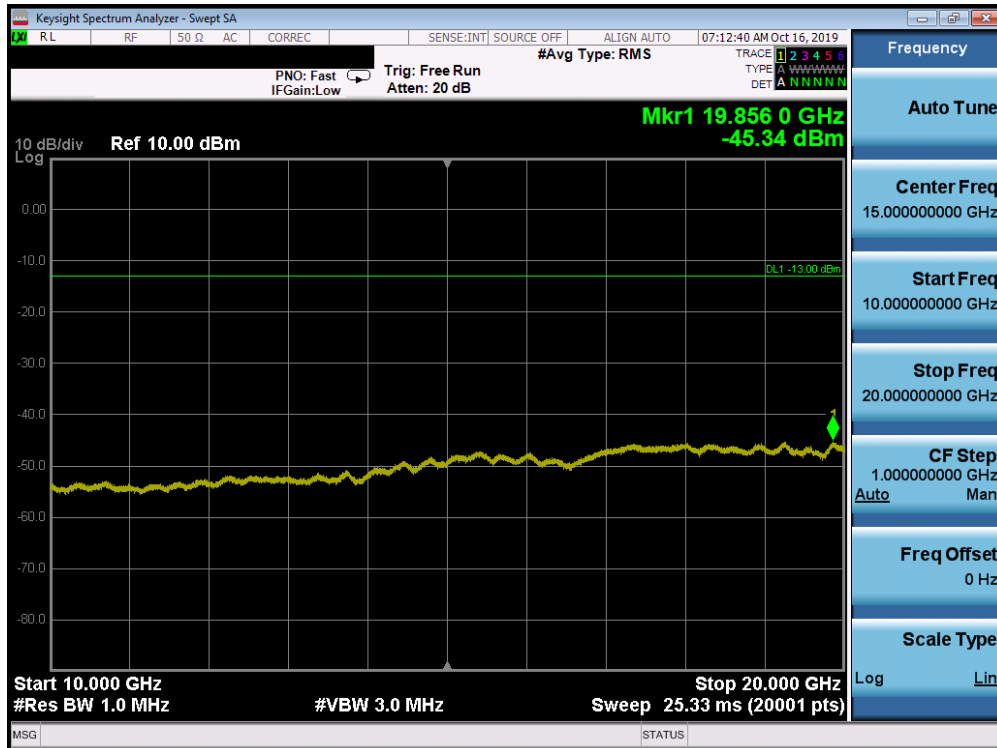


Plot 7-67. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 51 of 109

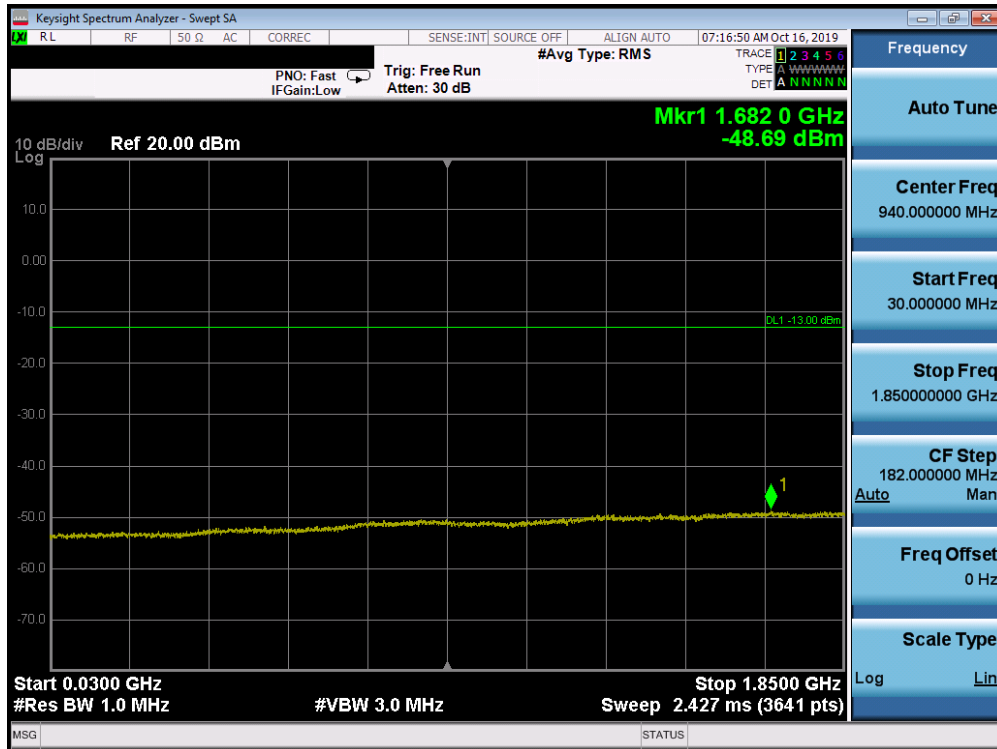


**Plot 7-68. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)**

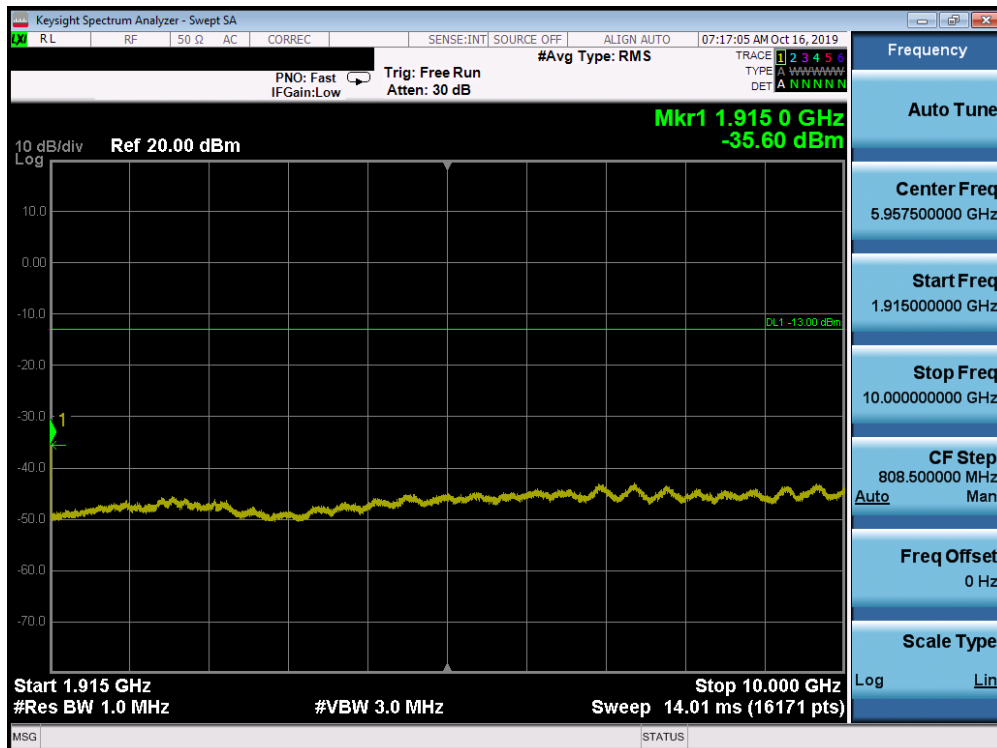


**Plot 7-69. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)**

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 52 of 109

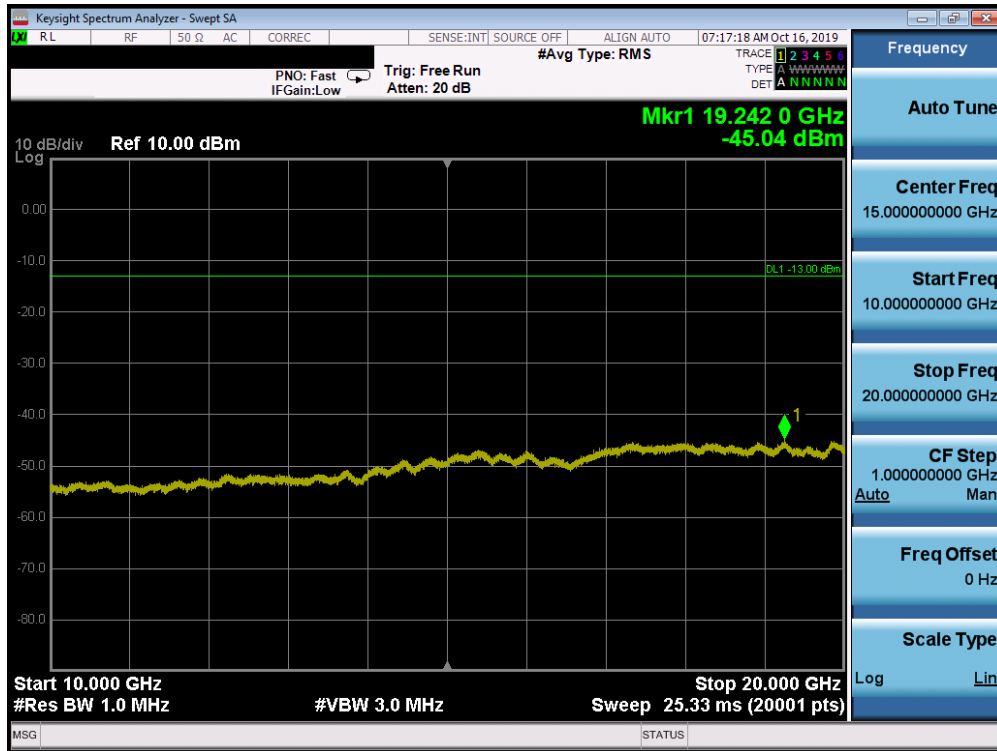


Plot 7-70. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)



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

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 53 of 109



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

FCC ID: A3LSMG986U		<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 54 of 109

## 7.4 Band Edge Emissions at Antenna Terminal

### Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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

### Test Procedure Used

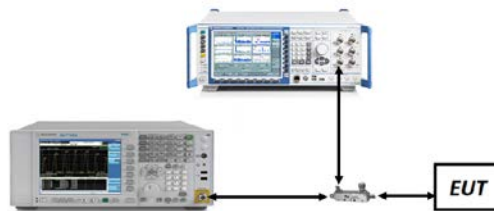
KDB 971168 D01 v03r01 – Section 6.0

### Test Settings

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



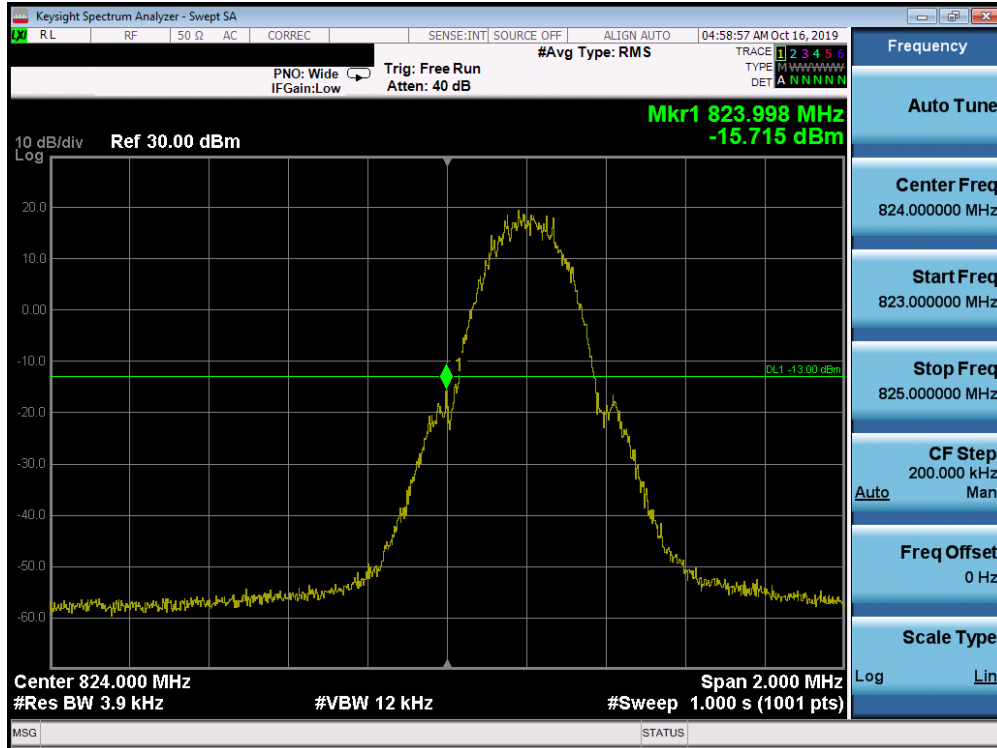
**Figure 7-3. Test Instrument & Measurement Setup**

### Test Notes

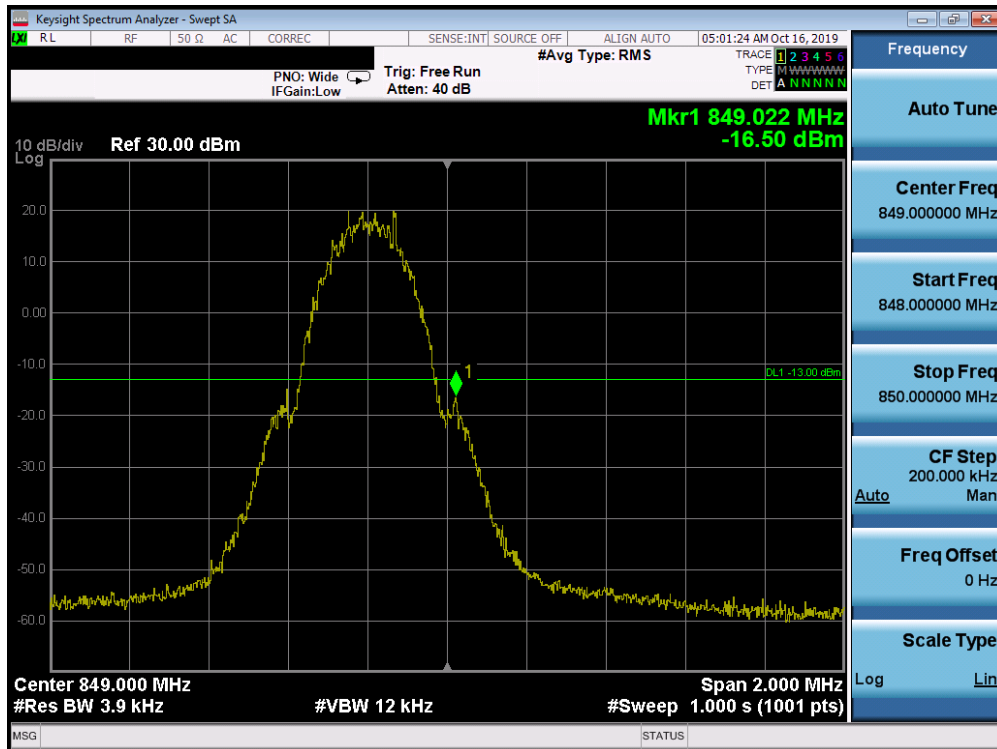
Per 22.917(b), 24.238(b), 27.53(h)(3), and RSS-132(5.5), RSS-133(6.5), RSS-139(6.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate 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.

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 55 of 109

**Cellular GSM Mode**



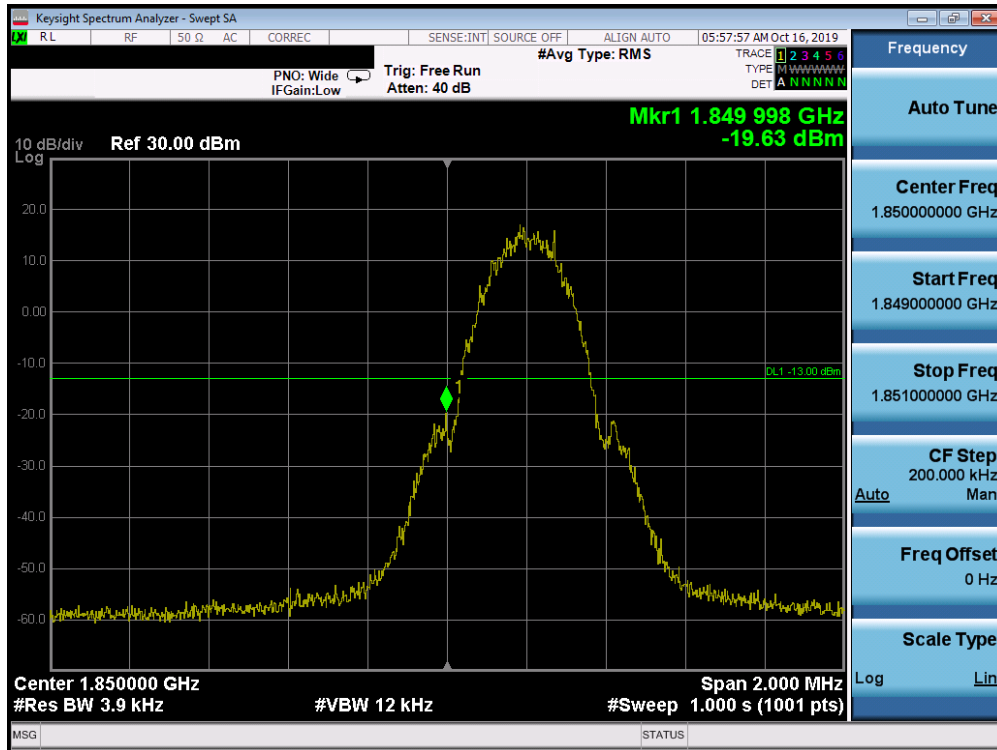
**Plot 7-73. Band Edge Plot (Cellular GSM Mode - Low Channel)**



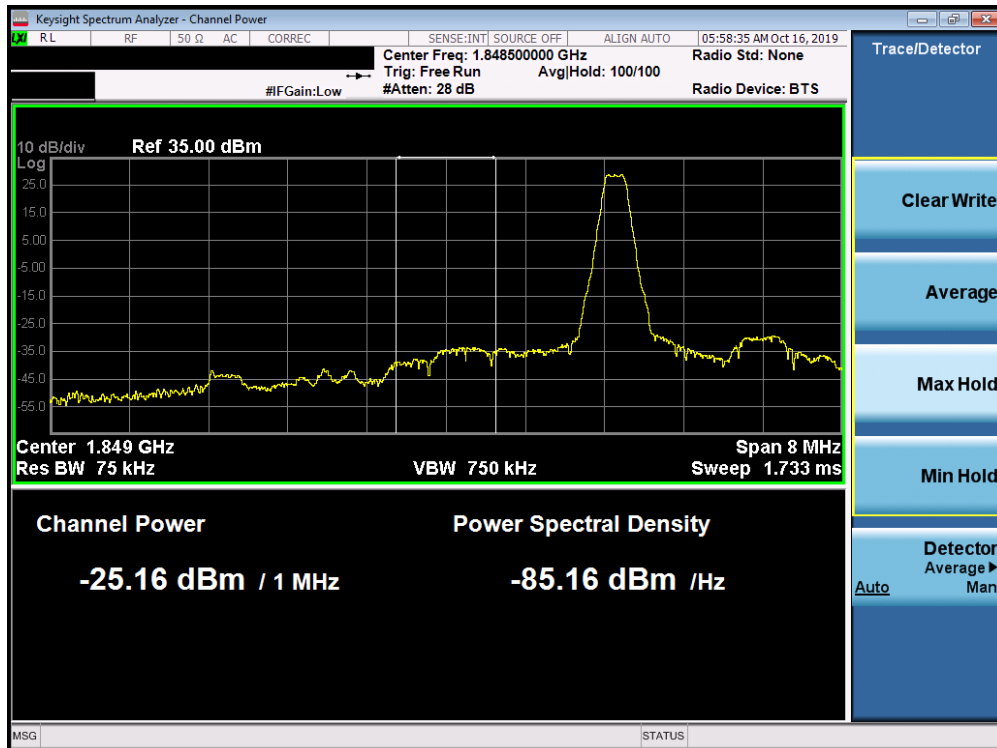
**Plot 7-74. Band Edge Plot (Cellular GSM Mode - High Channel)**

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 56 of 109



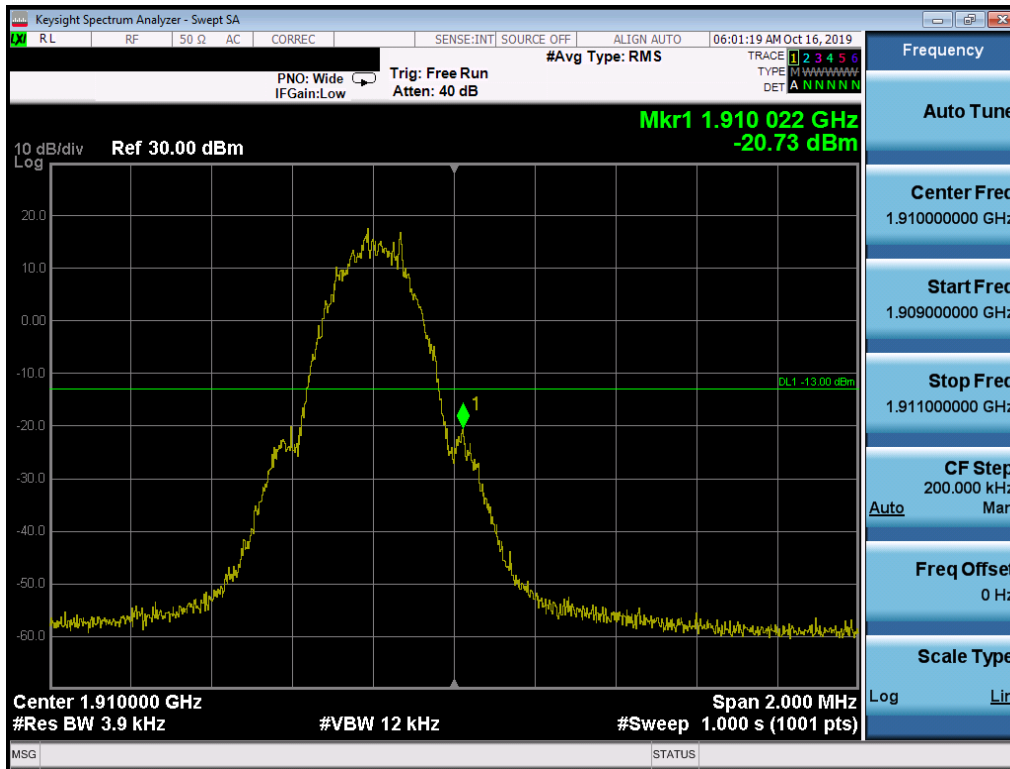


**Plot 7-75. Band Edge Plot (PCS GSM Mode - Low Channel)**

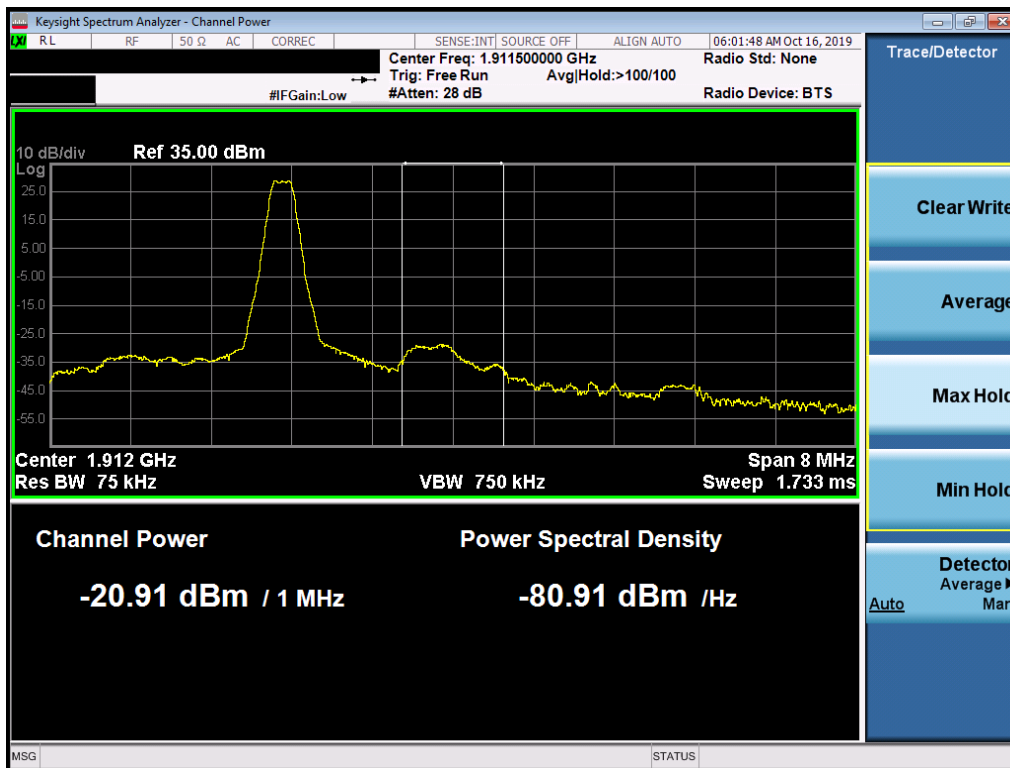


**Plot 7-76. 4MHz Span Plot (PCS GSM Mode - Low Channel)**

FCC ID: A3LSMG986U	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 57 of 109



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



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

FCC ID: A3LSMG986U	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 58 of 109

## Cellular CDMA Mode

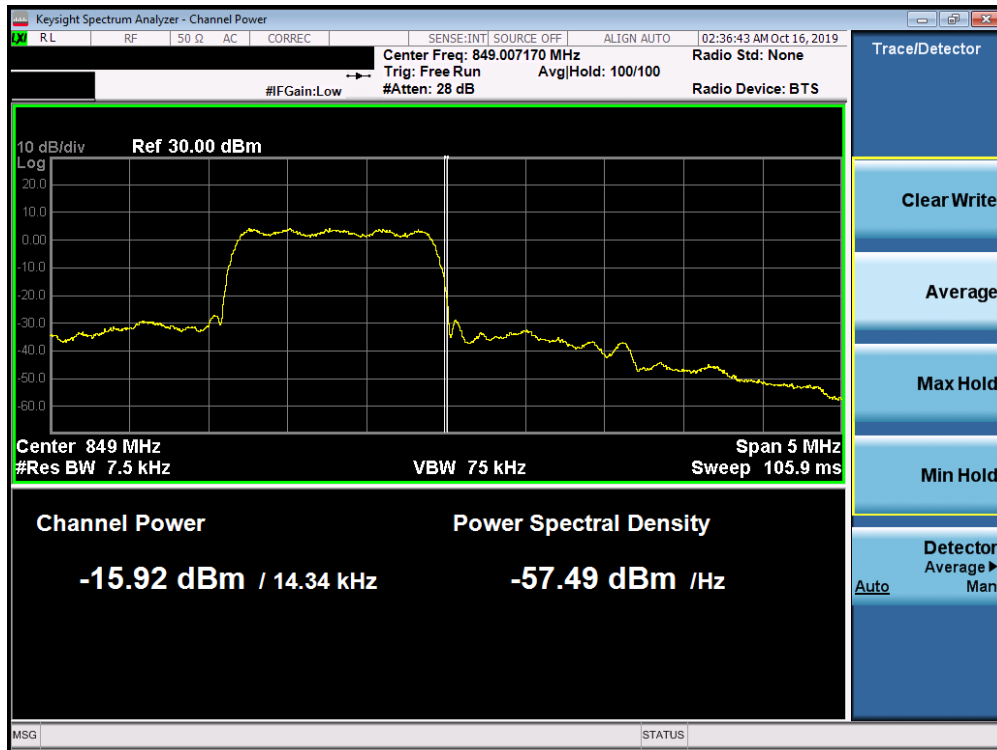


Plot 7-79. Band Edge Plot (Cellular CDMA Mode - Low Channel)



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

FCC ID: A3LSMG986U	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 59 of 109



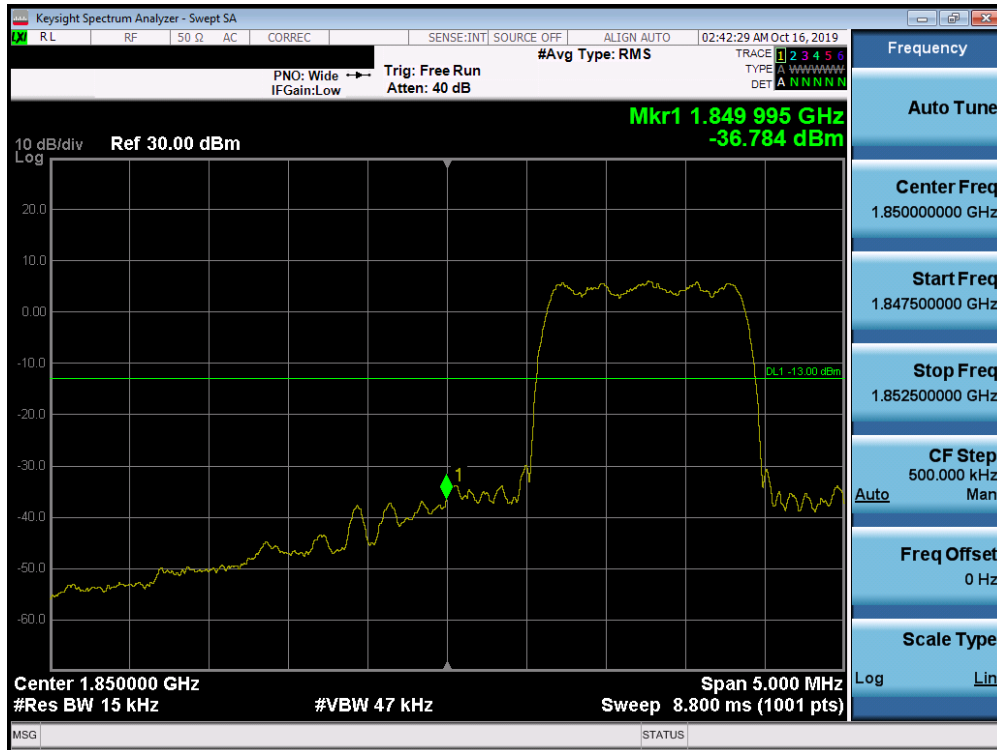
Plot 7-81. Band Edge Plot (Cellular CDMA Mode - High Channel)



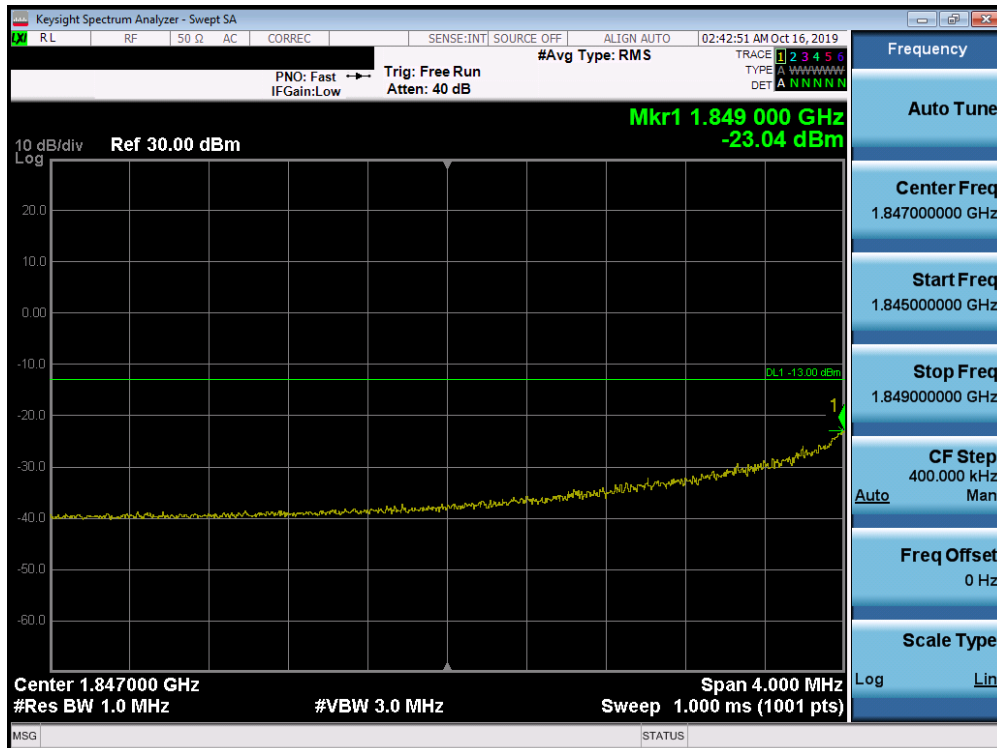
Plot 7-82. 4MHz Span Plot (Cellular CDMA Mode - High Channel)

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 60 of 109

**PCS CDMA Mode**

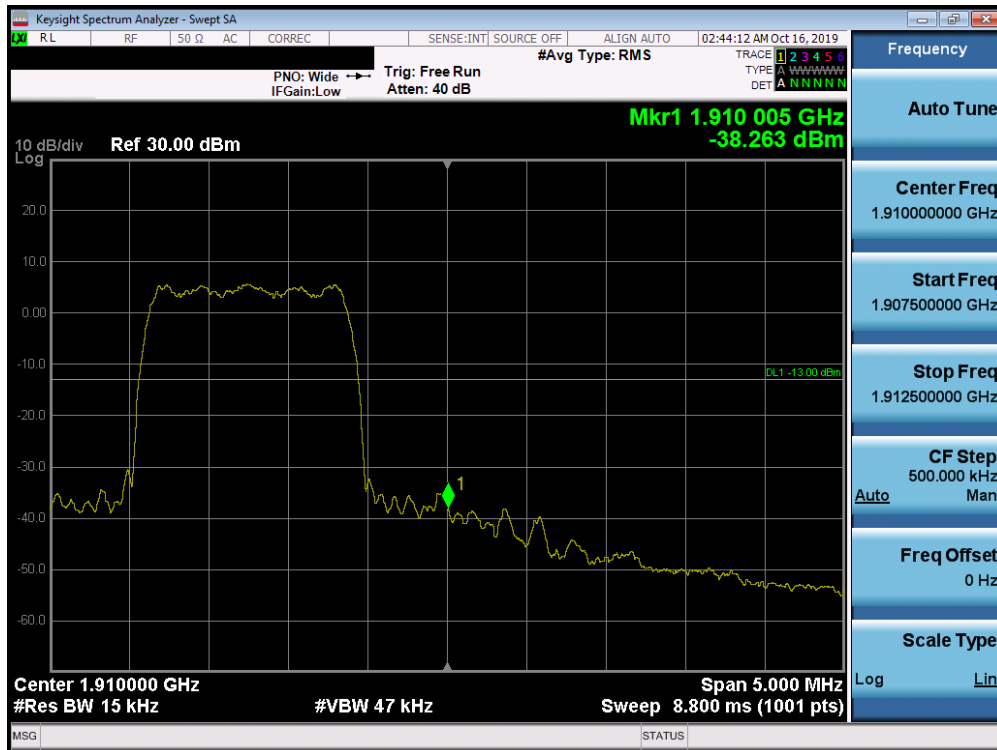


**Plot 7-83. Band Edge Plot (PCS CDMA Mode - Low Channel)**

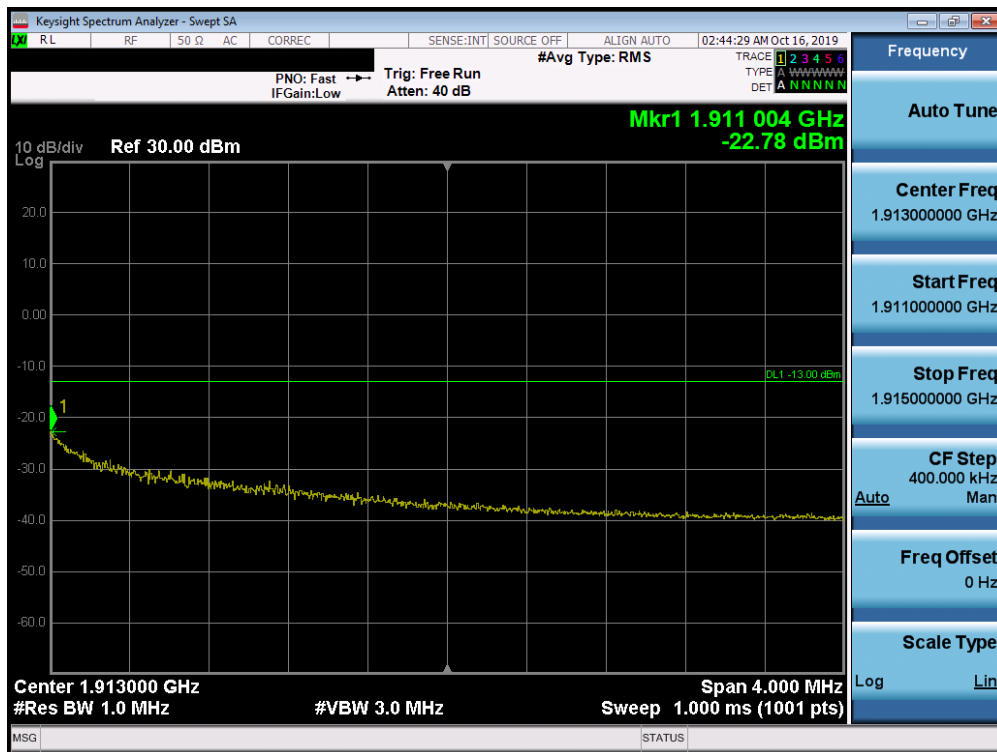


**Plot 7-84. 4MHz Span Plot (PCS CDMA Mode - Low Channel)**

FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 61 of 109



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



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

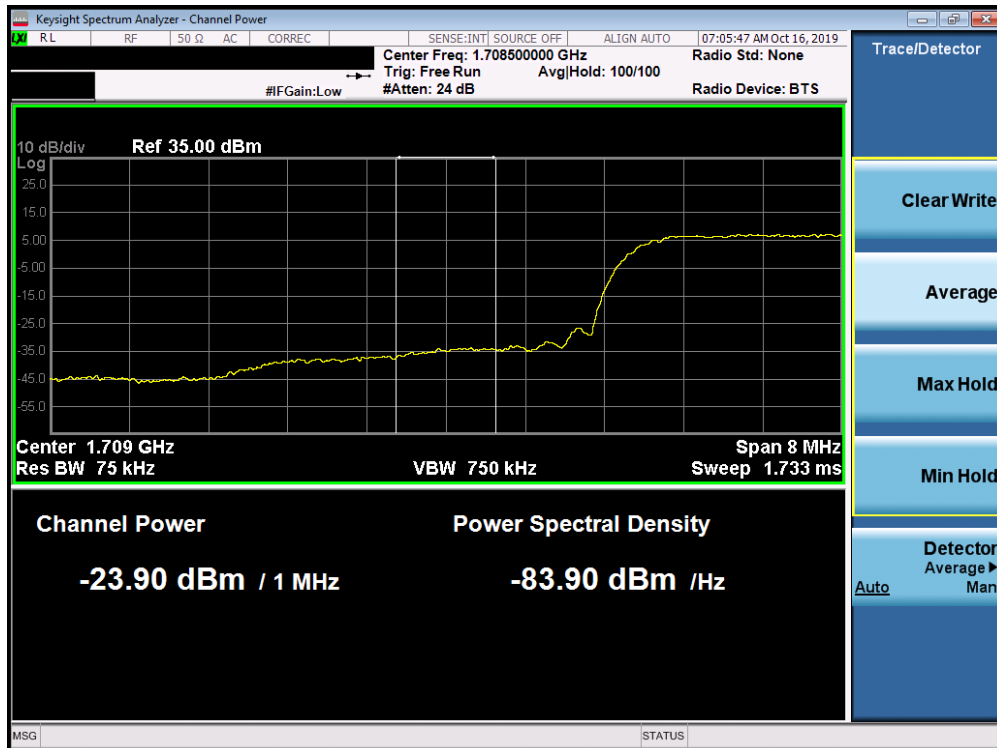
FCC ID: A3LSMG986U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 62 of 109



**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)**

FCC ID: A3LSMG986U	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1910220166-02.A3L	Test Dates: 10/11 - 12/06/2019	EUT Type: Portable Handset		Page 64 of 109