



PCTEST ENGINEERING LABORATORY, INC.

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MEASUREMENT REPORT CDMA

Applicant Name:
LG Electronics MobileComm U.S.A
1000 Sylvan Avenue
Englewood Cliffs, NJ 07632
United States

Date of Testing:
1/3-1/19/2018
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M1712280340-02.ZNF

FCC ID:	ZNFX210ULM
APPLICANT:	LG Electronics MobileComm U.S.A

Application Type: Certification
Model: LM-X210ULM
Additional Models: LMX210ULM, X210ULM
EUT Type: Portable Handset
FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part(s): 22 & 24
Test Procedure(s): ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03

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

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

Randy Ortanez
President

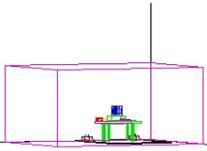


FCC ID: ZNFX210ULM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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MEASUREMENT REPORT CDMA



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP		EIRP		Emission Designator
			Max. Power (W)	Max. Power (dBm)	Max. Power (W)	Max. Power (dBm)	
CDMA850	22H	824.70 - 848.31	0.136	21.34	0.223	23.49	1M27F9W
CDMA1900	24E	1851.25 - 1908.75			0.445	26.49	1M28F9W

EUT Overview

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1.0 INTRODUCTION

1.1 Scope

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

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST 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.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **LG Portable Handset FCC ID: ZNFX210ULM**. 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.: 05271, RF3

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA (BC0, BC1), Multi-band LTE, 802.11b/g/n WLAN, Bluetooth (1x, EDR, LE)

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

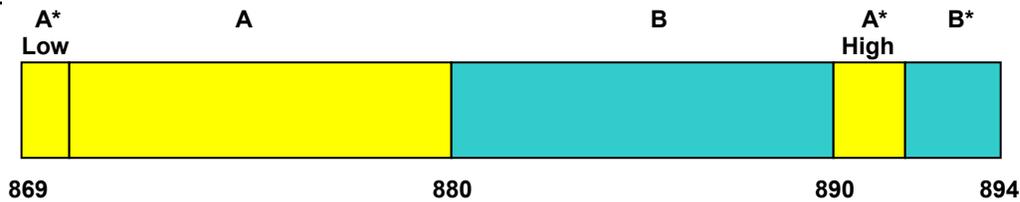
3.1 Evaluation Procedure

The measurement procedures described in the “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Measurement Guidance for Certification of Licensed Digital Transmitters” (KDB 971168 D01 v03) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

3.2 Cellular - Base Frequency Blocks

§22.905



BLOCK 1: 869 – 880 MHz (A* Low + A)

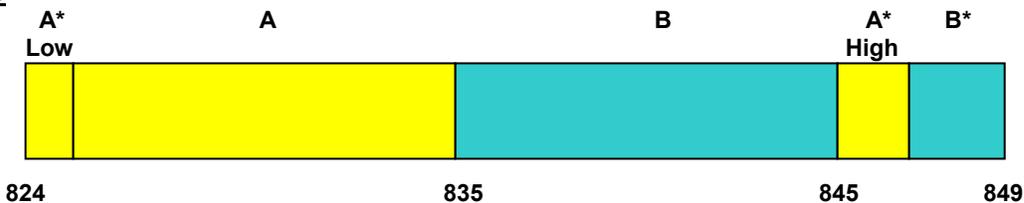
BLOCK 3: 890 – 891.5 MHz (A* High)

BLOCK 2: 880 – 890 MHz (B)

BLOCK 4: 891.5 – 894 MHz (B*)

3.3 Cellular - Mobile Frequency Blocks

§22.905



BLOCK 1: 824 – 835 MHz (A* Low + A)

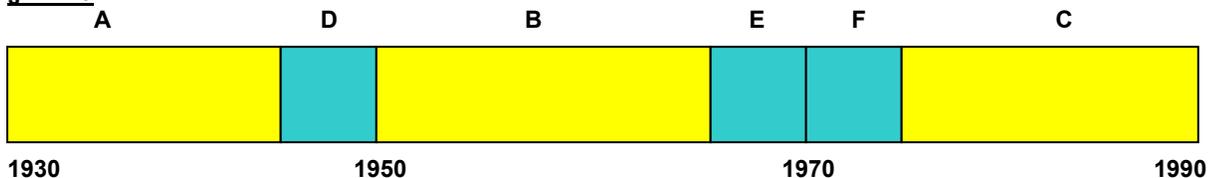
BLOCK 3: 845 – 846.5 MHz (A* High)

BLOCK 2: 835 – 845 MHz (B)

BLOCK 4: 846.5 – 849 MHz (B*)

3.4 PCS - Base Frequency Blocks

§24.229



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)

3.5 PCS - Mobile Frequency Blocks

§24.229



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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

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5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx1	Licensed Transmitter Cable Set	1/6/2017	Annual	1/6/2018	LTx1
Agilent	E5515C	Wireless Communications Test Set	1/29/2016	Biennial	1/29/2018	GB46310798
Agilent	N9030A	PXA Signal Analyzer (44GHz)	3/27/2017	Annual	3/27/2018	MY52350166
Emco	6502	Active Loop Antenna (10k - 30 MHz)	8/9/2016	Biennial	8/9/2018	2936
EMCO	3160-09	Small Horn (18 - 26.5GHz)	8/23/2016	Biennial	8/23/2018	135427
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	5/11/2017	Annual	5/11/2018	100040
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	7/31/2017	Annual	7/31/2018	100348
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/11/2017	Annual	8/11/2018	103200
Rohde & Schwarz	TC-TA18	Cross-Pol Antenna 400MHz-18GHz	10/30/2017	Annual	10/30/2018	101058
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/3/2017	Annual	7/3/2018	102135
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/3/2017	Annual	7/3/2018	102134
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	3/14/2016	Biennial	3/14/2018	A051107
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/11/2017	Biennial	8/11/2019	A042511

Table 5-1. Test Equipment

Notes:

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

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6.0 SAMPLE CALCULATIONS

CDMA Emission Designator

Emission Designator = 1M25F9W

CDMA BW = 1.25 MHz

F = Frequency Modulation

9 = Composite Digital Info

W = Combination (Audio/Data)

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

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

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7.0 TEST RESULTS

7.1 Summary

Company Name: LG Electronics MobileComm U.S.A
 FCC ID: ZNFX210ULM
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): CDMA

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)	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a) 24.238(a)	RSS-132(5.5) RSS-133(6.5)	Conducted Band Edge / Spurious Emissions	> 43 + log ₁₀ (P[Watts]) at Band Edge and for all out-of-band emissions		PASS	Sections 7.3, 7.4
24.232(d)	RSS-132(5.4) RSS-133(6.4)	Peak-Average Ratio	< 13 dB		PASS	Section 7.5
2.1046	RSS-132(5.4) RSS-133(4.1)	Transmitter Conducted Output Power	N/A		PASS	RF Exposure Report
2.1055 22.355 24.235	RSS-132(5.3) RSS-133(6.3)	Frequency Stability	< 2.5 ppm (Part 22) Emission must remain in band (Part 24)		PASS	Section 7.8
22.913(a)(2)	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
2.1053 22.917(a) 24.238(a)	RSS-132(5.5) RSS-133(6.5)	Radiated Spurious Emissions	> 43 + 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.

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7.2 Occupied Bandwidth

§2.1049 RSS-Gen (4.6.1) RSS-133(2.3)

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 v03 – Section 4.2

Test Settings

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

Test Setup

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

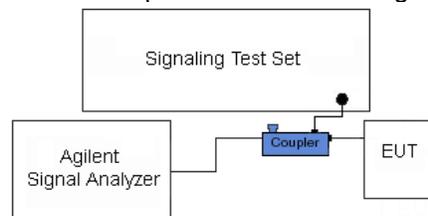
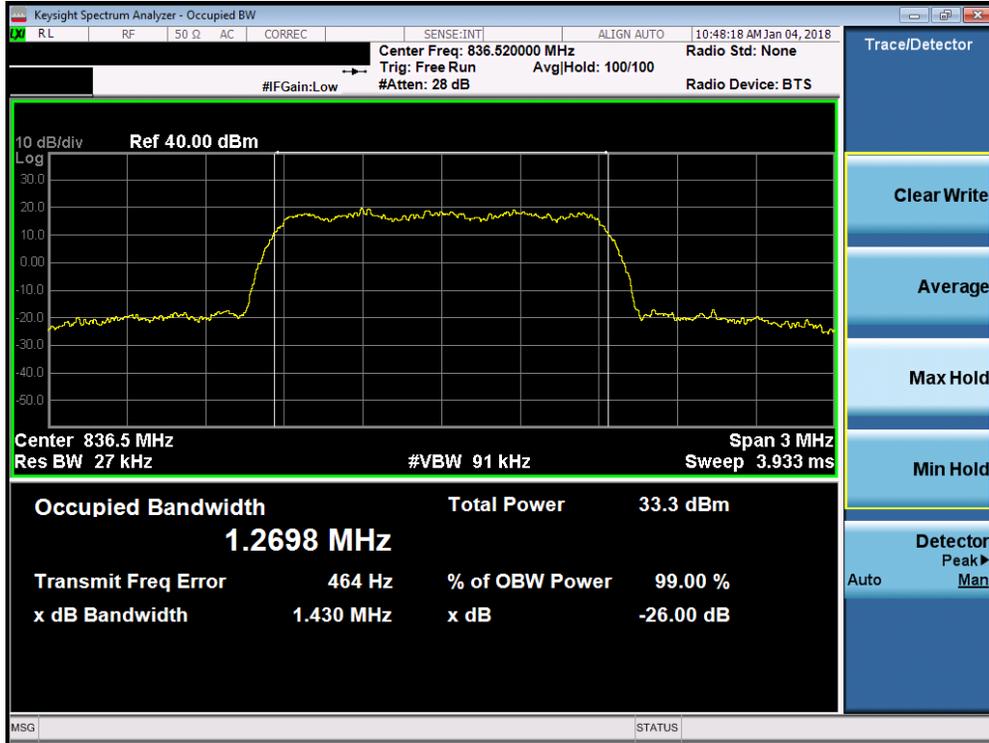


Figure 7-1. Test Instrument & Measurement Setup

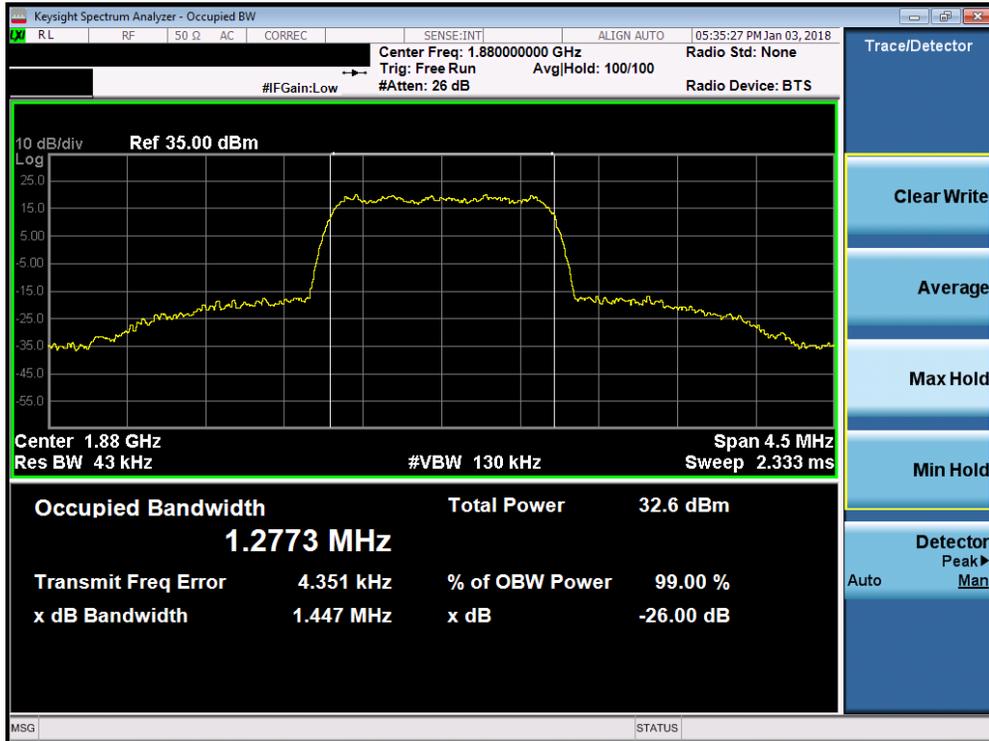
Test Notes

None.

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



Plot 7-2. Occupied Bandwidth Plot (PCS CDMA Mode)

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7.3 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §22.917(a) §24.238(a) RSS-132(5.5) RSS-133(6.5)

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

Test Procedure Used

KDB 971168 D01 v03 – Section 6.0

Test Settings

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

Test Setup

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

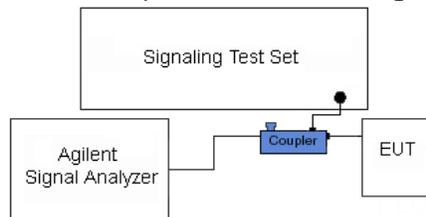


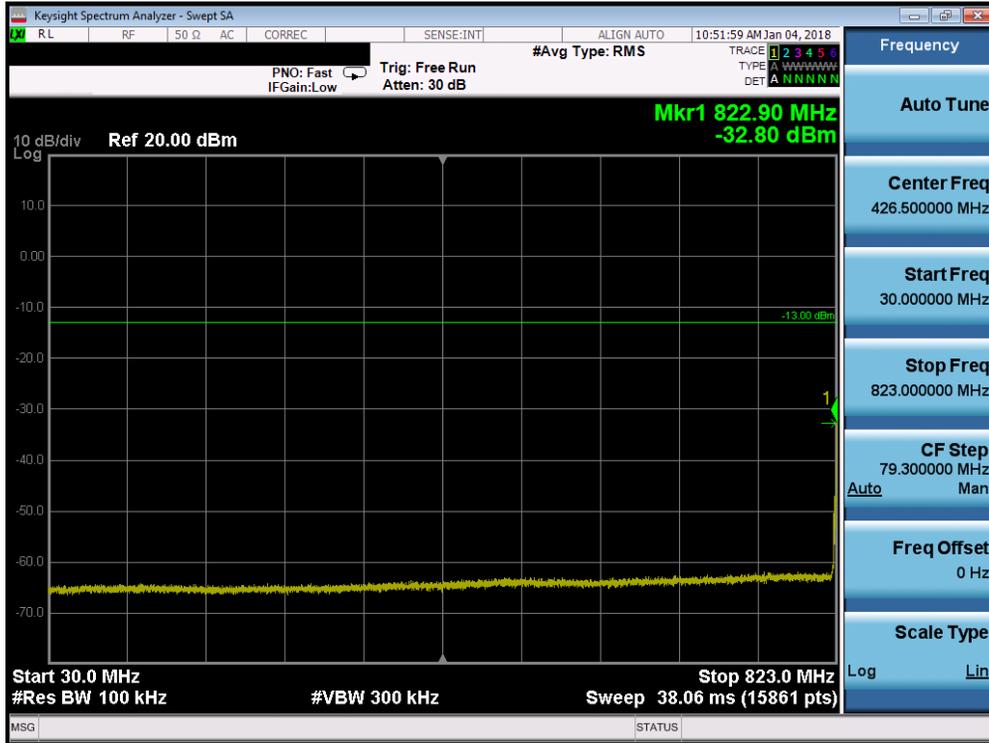
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

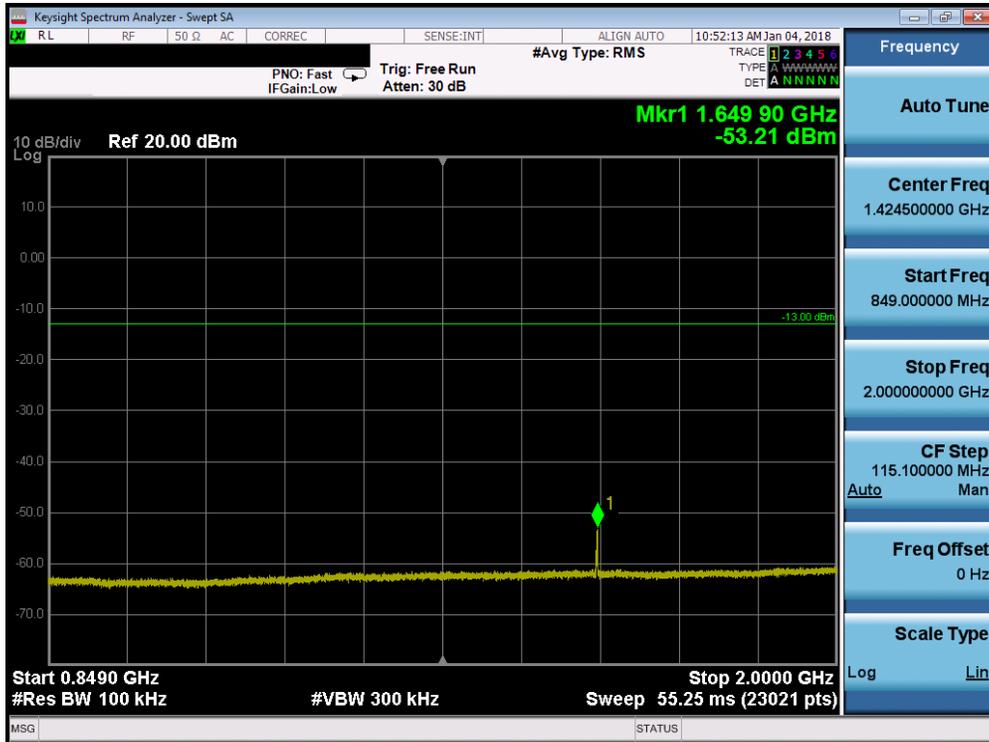
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1MHz, and 100 kHz or greater for Part 22 and RSS-132 measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth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

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Cellular CDMA Mode

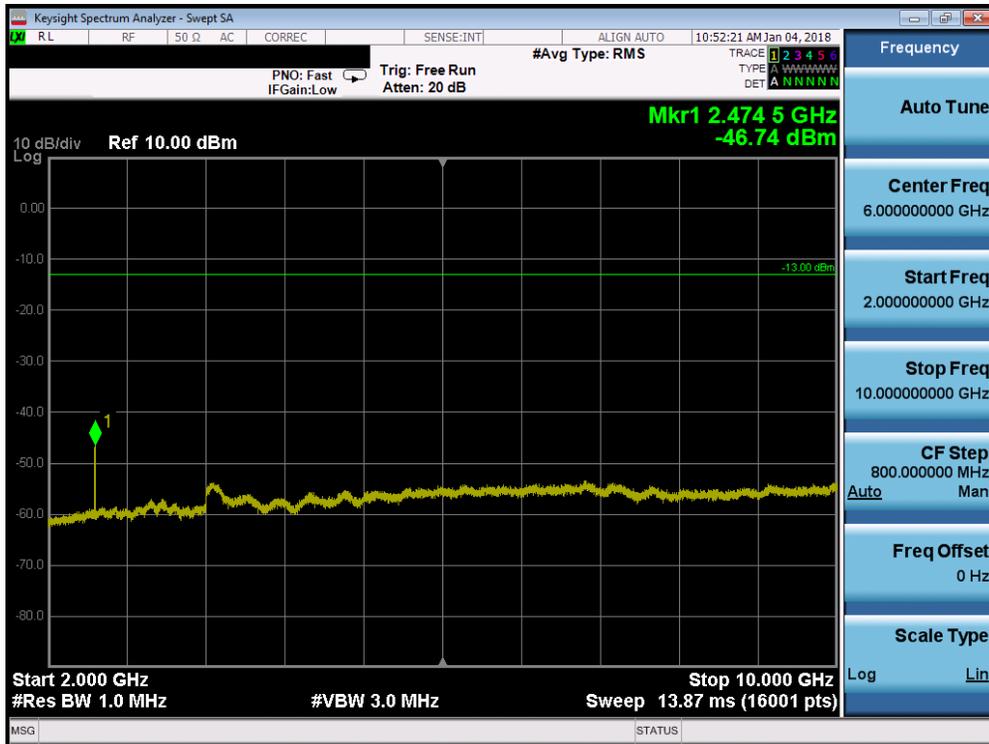


Plot 7-3. Conducted Spurious Plot (Cellular CDMA Mode - Low Channel)

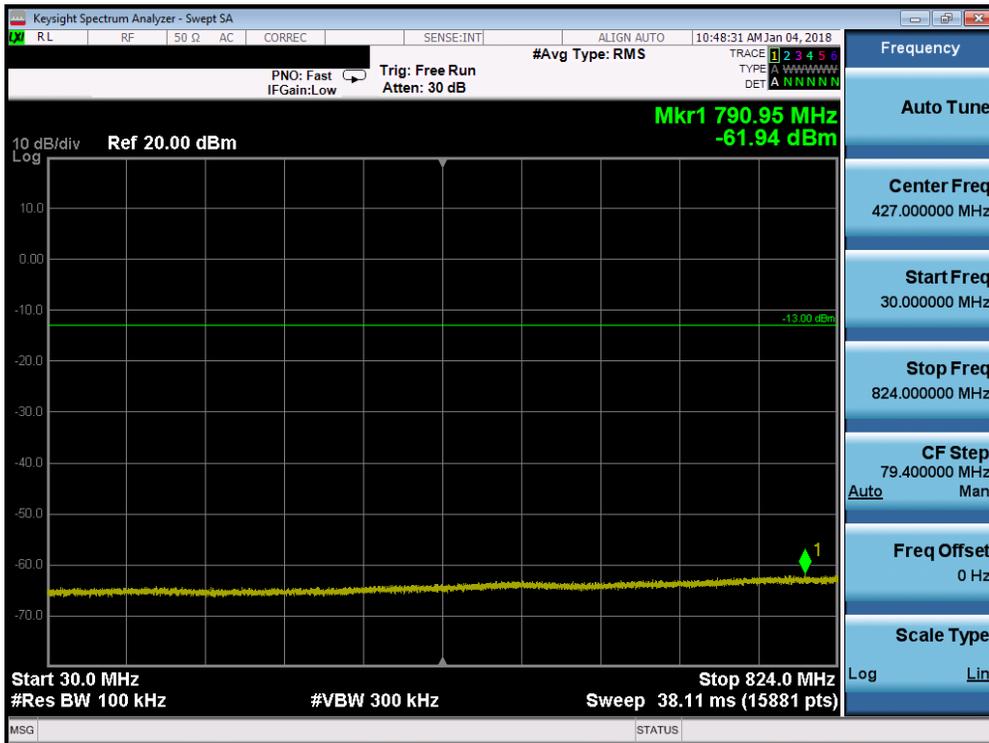


Plot 7-4. Conducted Spurious Plot (Cellular CDMA Mode - Low Channel)

FCC ID: ZNFX210ULM	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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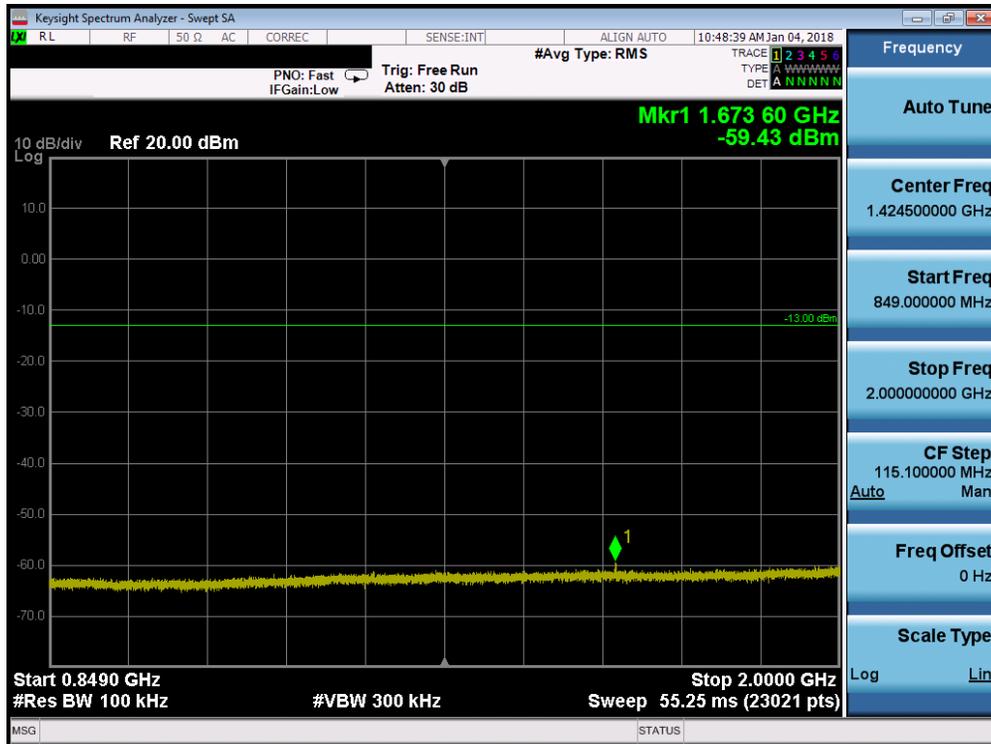


Plot 7-5. Conducted Spurious Plot (Cellular CDMA Mode - Low Channel)

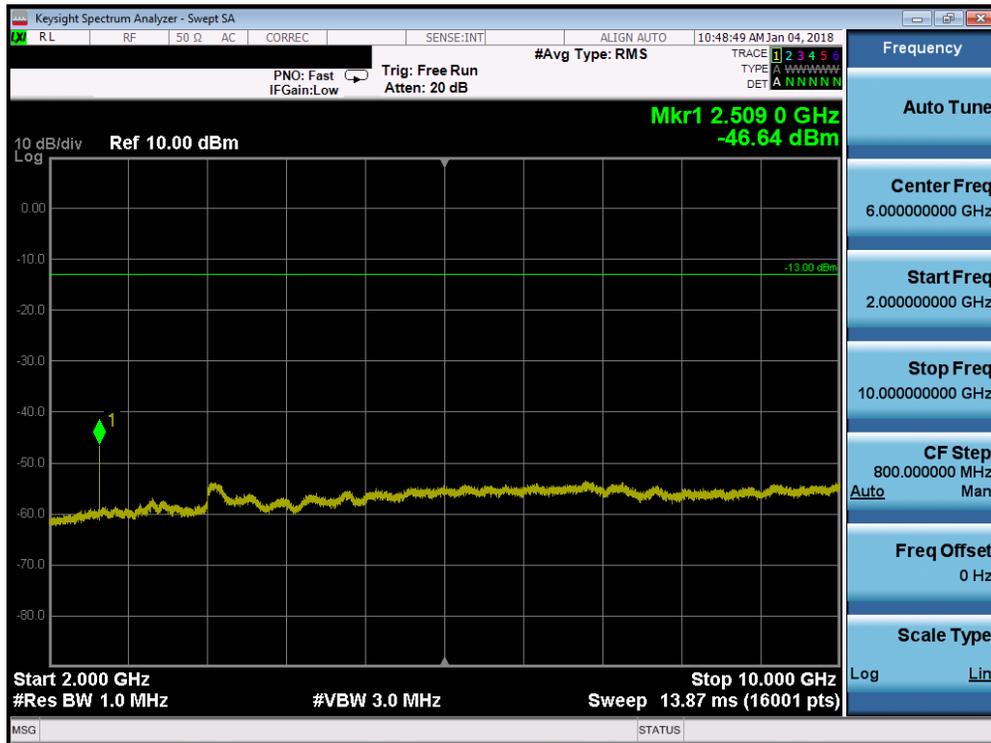


Plot 7-6. Conducted Spurious Plot (Cellular CDMA Mode - Mid Channel)

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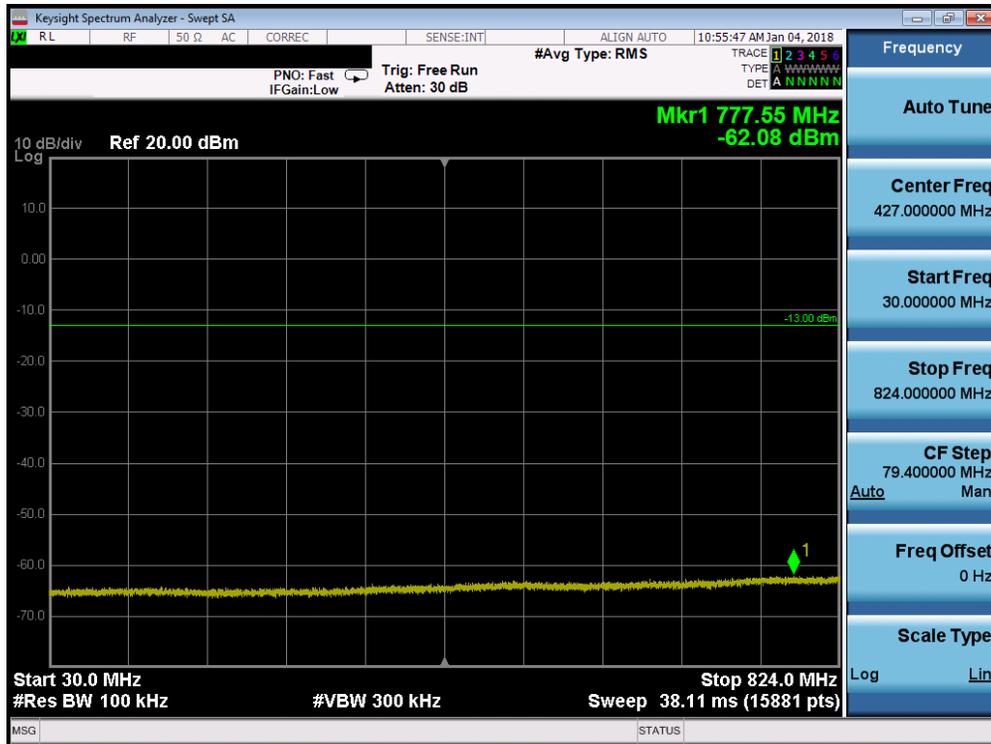


Plot 7-7. Conducted Spurious Plot (Cellular CDMA Mode - Mid Channel)

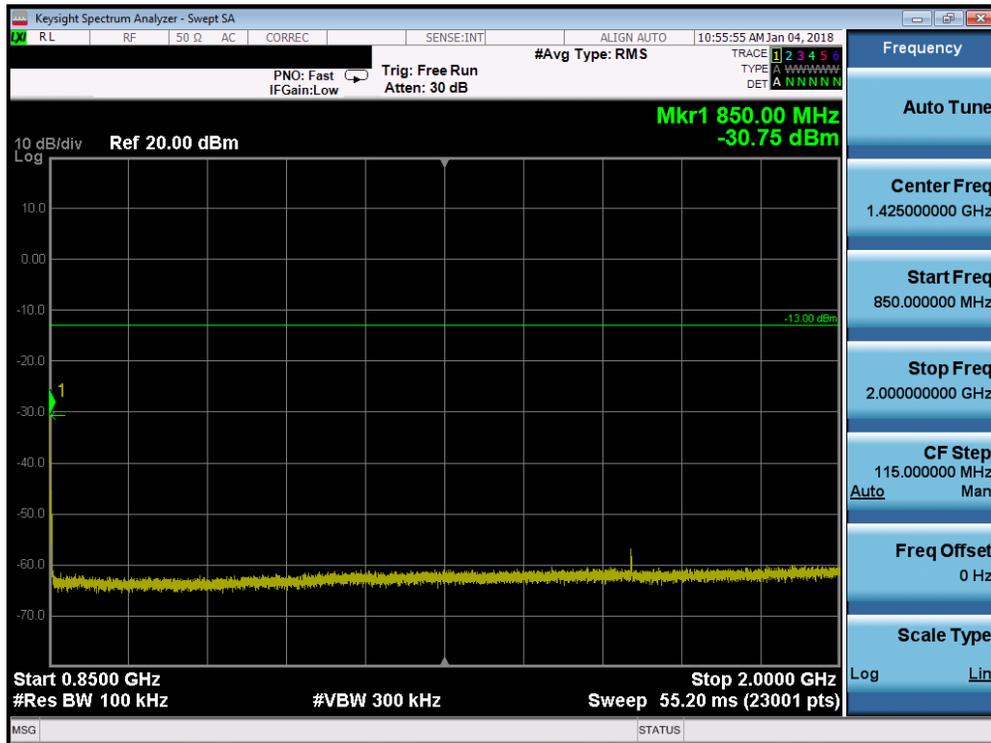


Plot 7-8. Conducted Spurious Plot (Cellular CDMA Mode - Mid Channel)

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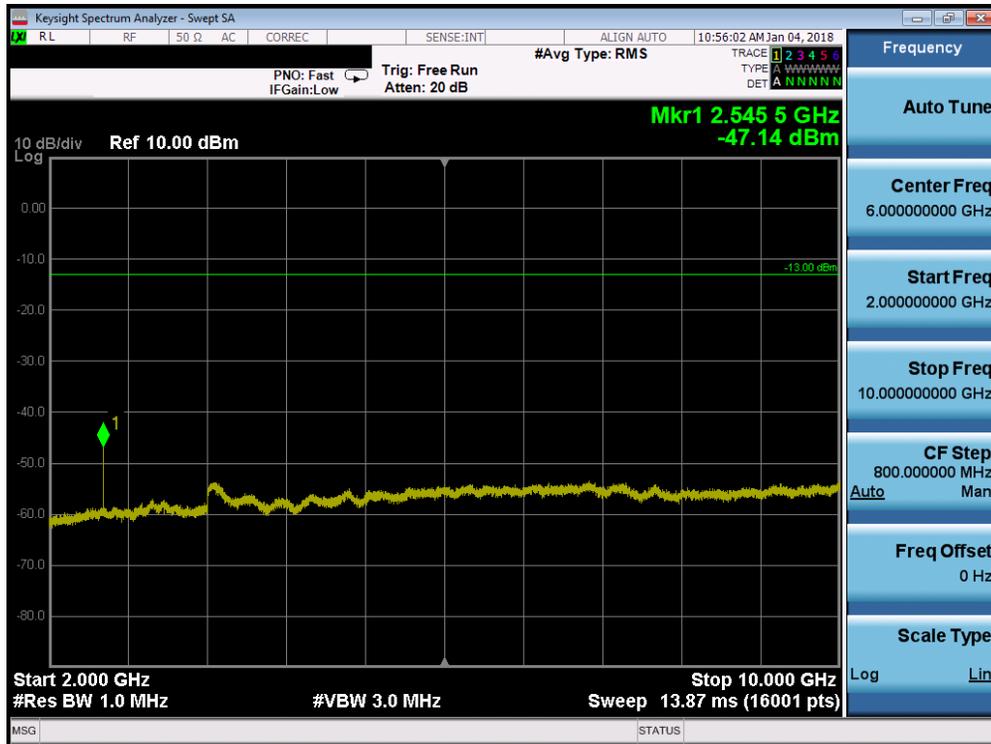


Plot 7-9. Conducted Spurious Plot (Cellular CDMA Mode - High Channel)



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

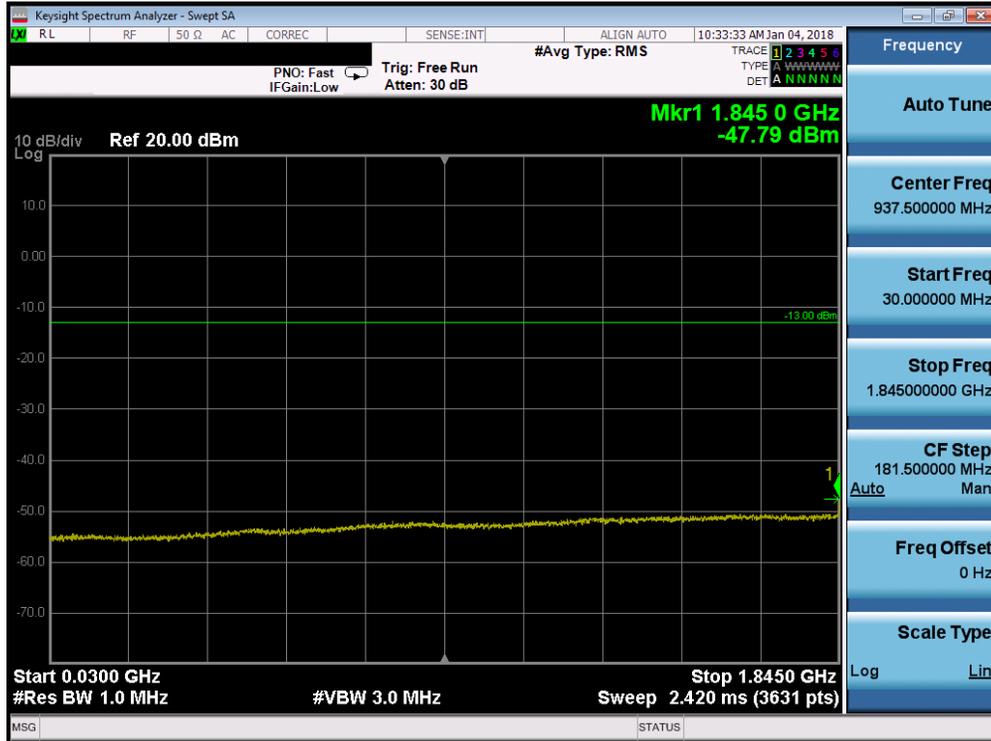
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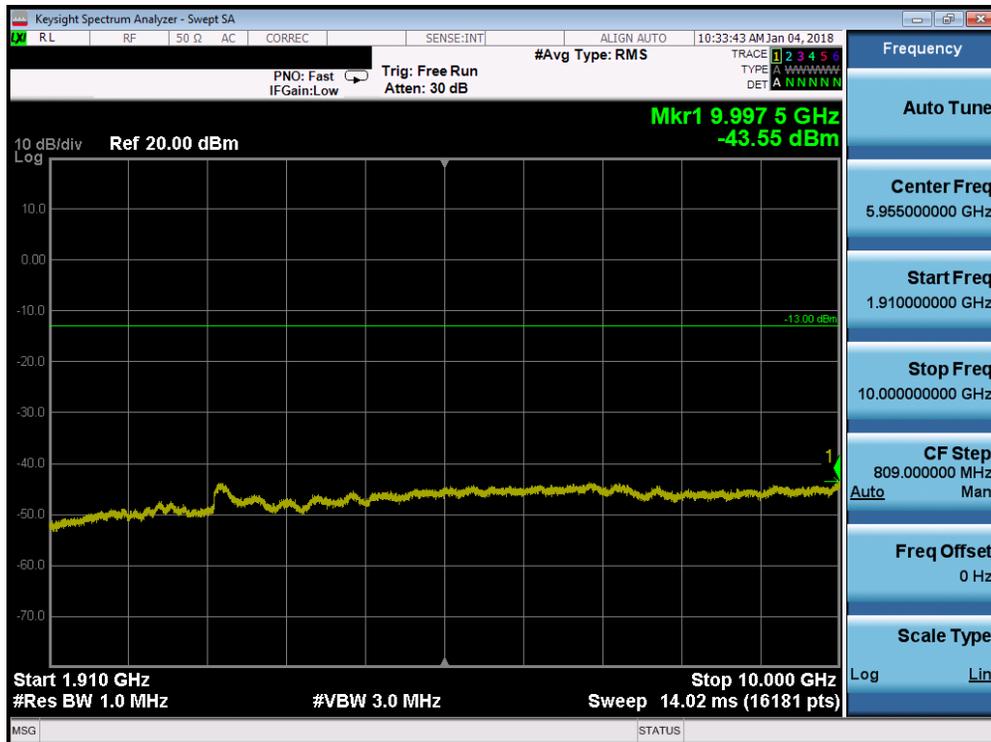
Plot 7-11. Conducted Spurious Plot (Cellular CDMA Mode - High Channel)

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PCS CDMA Mode

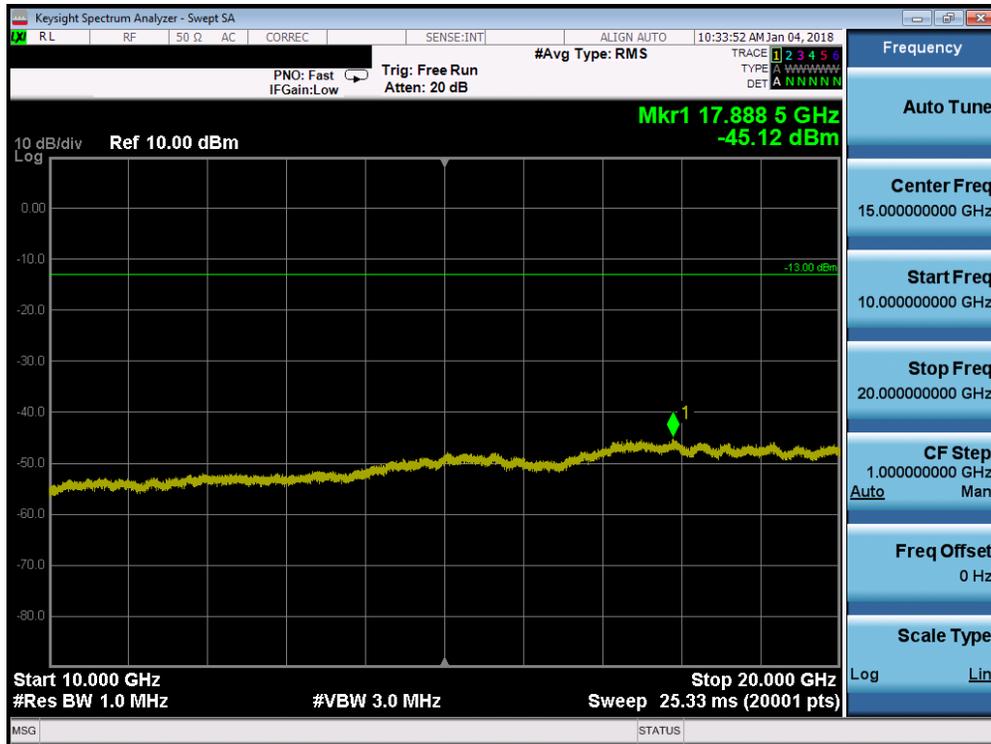


Plot 7-12. Conducted Spurious Plot (PCS CDMA Mode - Low Channel)

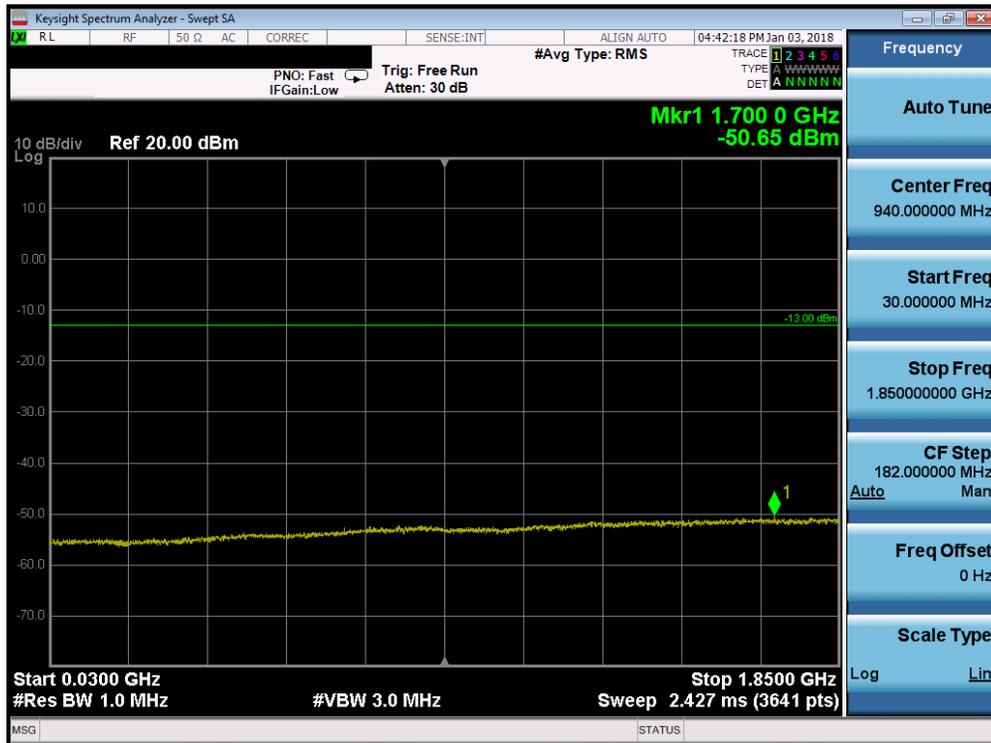


Plot 7-13. Conducted Spurious Plot (PCS CDMA Mode - Low Channel)

FCC ID: ZNFX210ULM	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset		Page 20 of 46

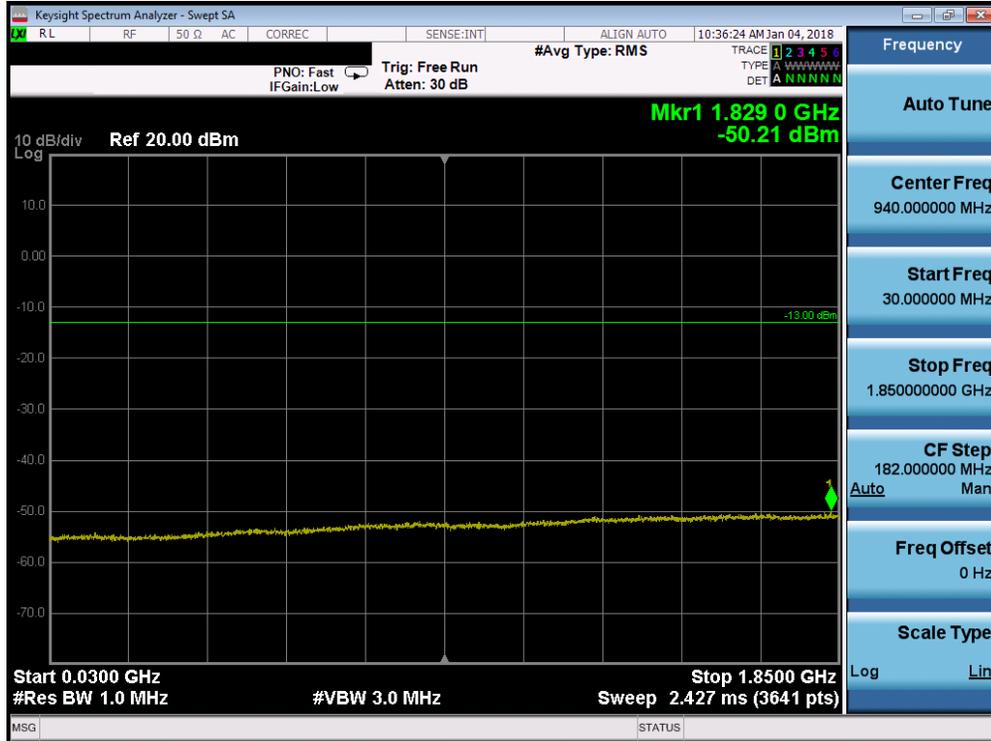


Plot 7-14. Conducted Spurious Plot (PCS CDMA Mode - Low Channel)

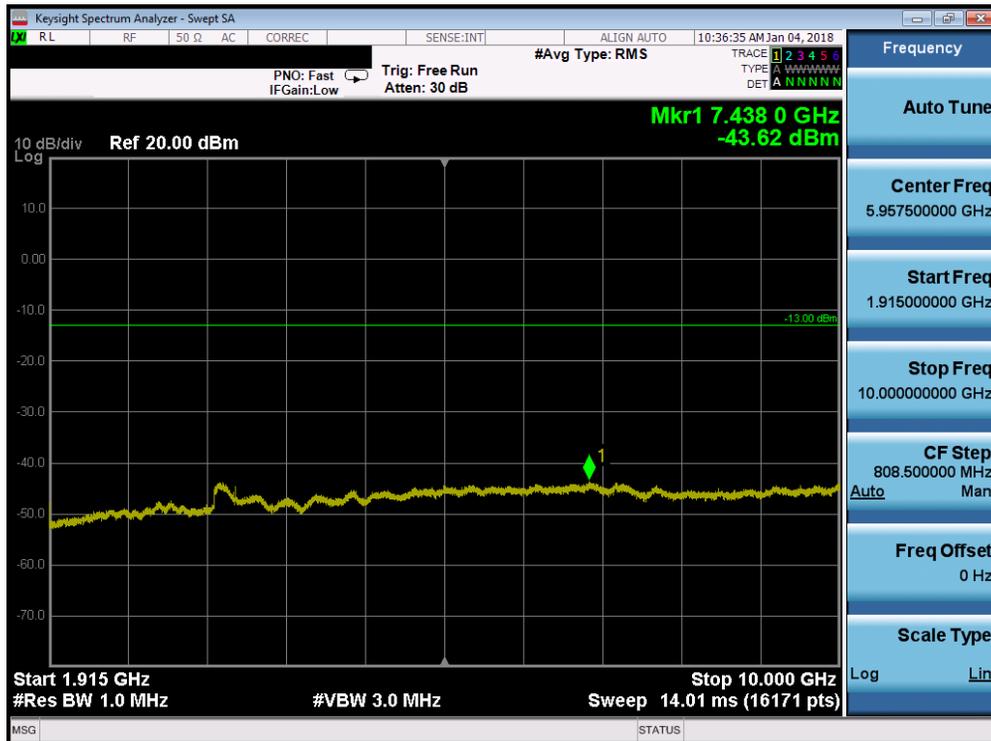


Plot 7-15. Conducted Spurious Plot (PCS CDMA Mode - Mid Channel)

FCC ID: ZNFX210ULM	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset		Page 21 of 46



Plot 7-18. Conducted Spurious Plot (PCS CDMA Mode - High Channel)



Plot 7-19. Conducted Spurious Plot (PCS CDMA Mode - High Channel)

FCC ID: ZNFX210ULM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset		Page 23 of 46

7.4 Band Edge Emissions at Antenna Terminal

§2.1051 §22.917(a) §24.238(a) RSS-132(5.5) RSS-133(6.5)

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

Test Procedure Used

KDB 971168 D01 v03 – 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. $VBW \geq 3 \times RBW$
5. Detector = RMS
6. Number of sweep points $\geq 2 \times \text{Span}/RBW$
7. Trace mode = trace average
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

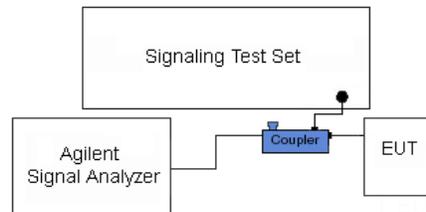


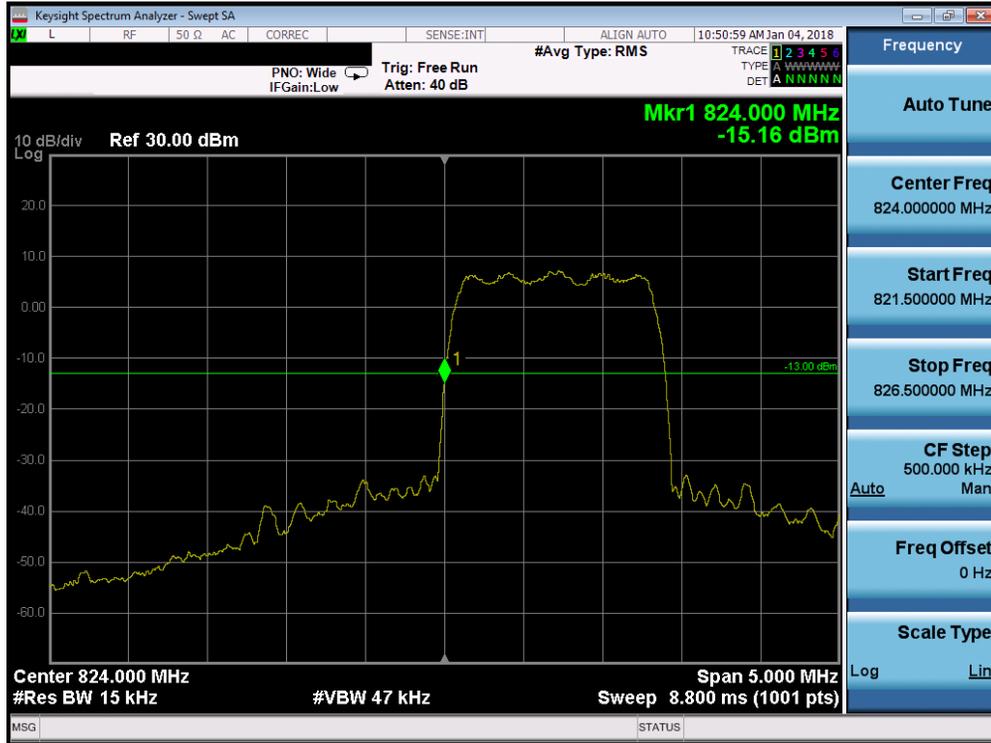
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

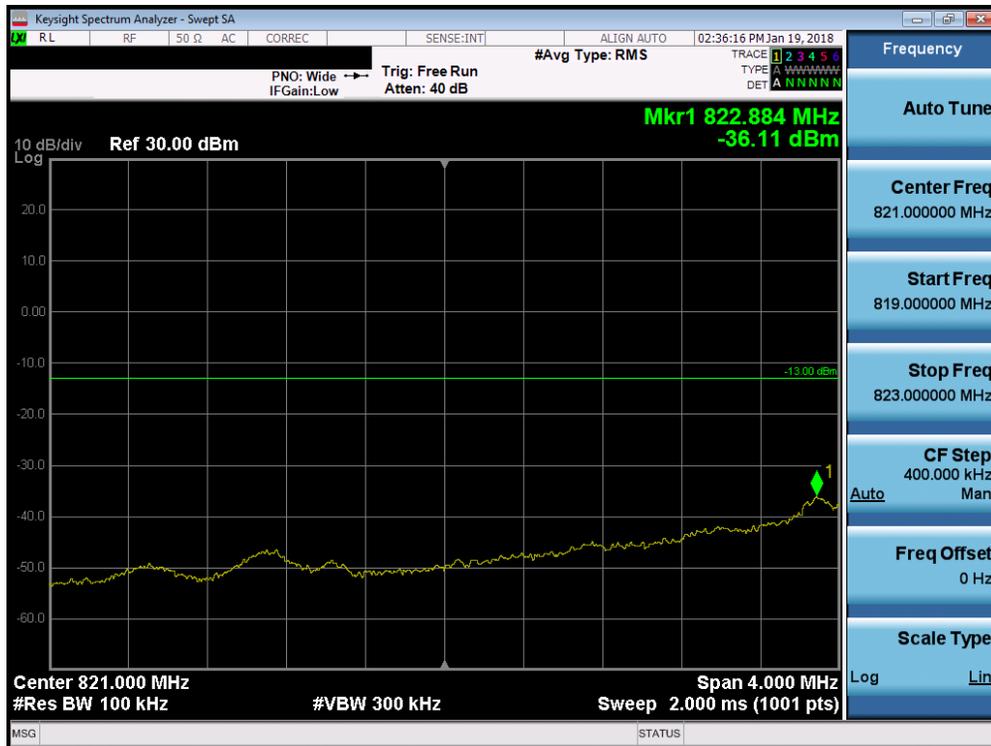
Per 22.917(b), 24.238(b) and RSS-132(5.5), RSS-133(6.5) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the 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: ZNFX210ULM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Cellular CDMA Mode

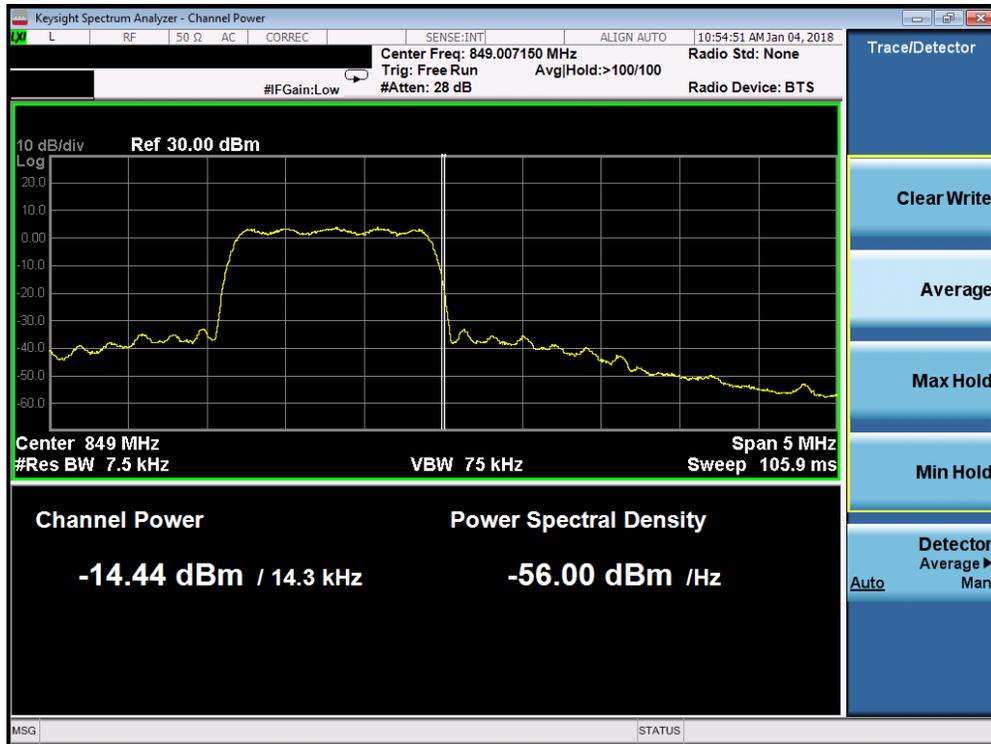


Plot 7-21. Band Edge Plot (Cellular CDMA Mode - Low Channel)



Plot 7-22. 4MHz Span Plot (Cellular CDMA Mode - Low Channel)

FCC ID: ZNFX210ULM	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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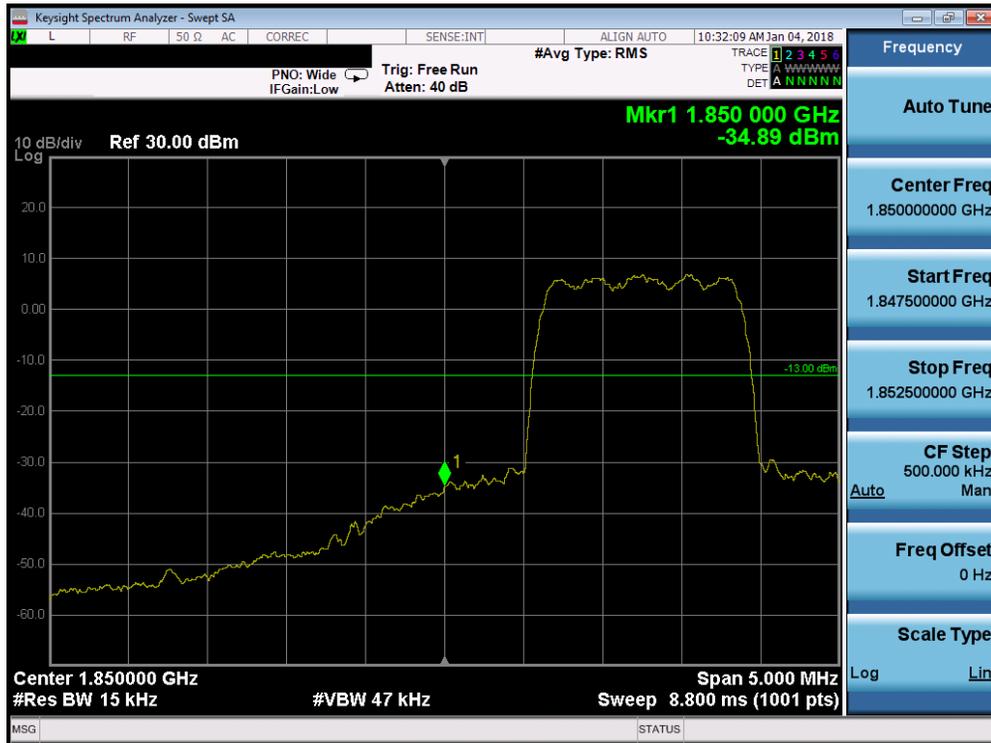
Plot 7-23. Band Edge Plot (Cellular CDMA Mode - High Channel)



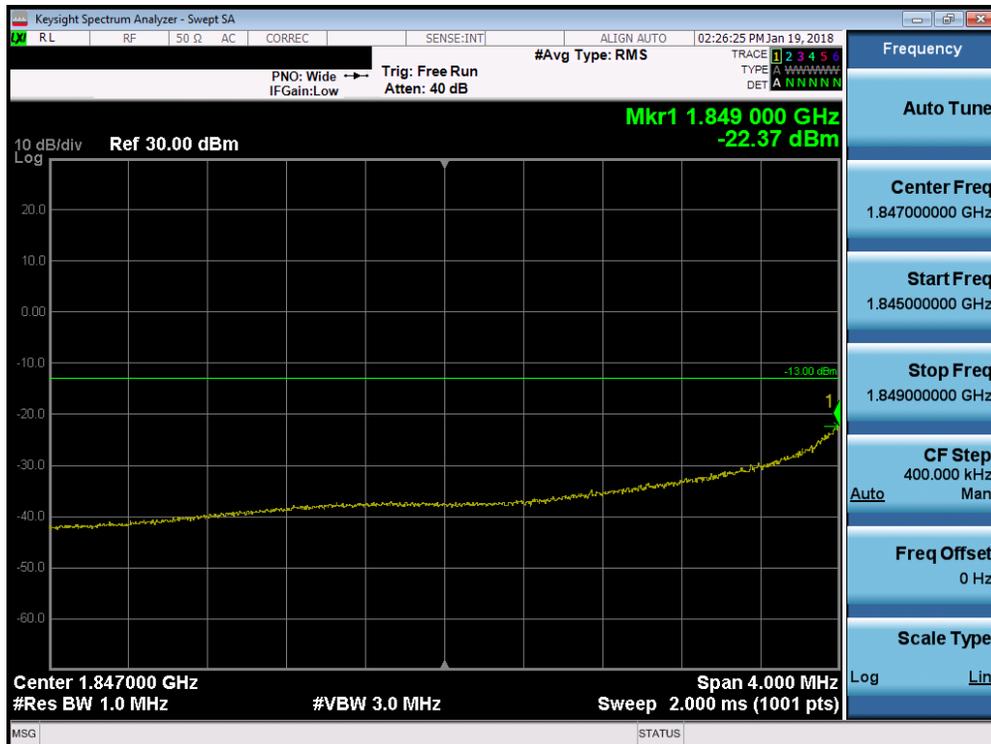
Plot 7-24. 4MHz Span Plot (Cellular CDMA Mode - High Channel)

FCC ID: ZNFX210ULM	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1712280340-02-ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset		Page 27 of 46

PCS CDMA Mode

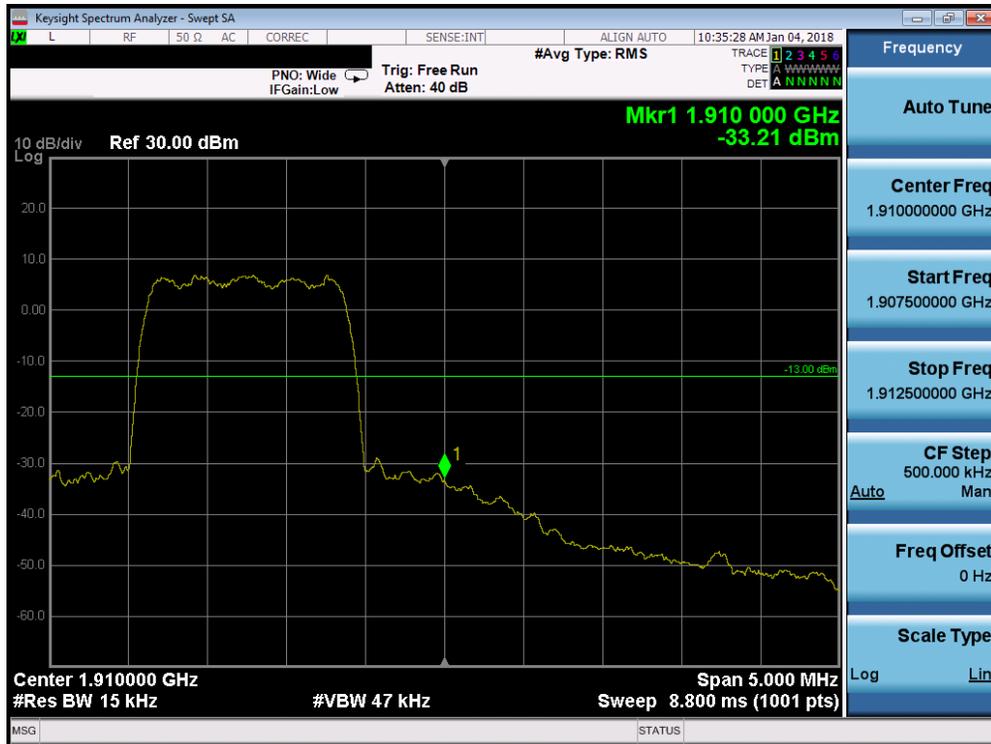


Plot 7-25. Band Edge Plot (PCS CDMA Mode - Low Channel)

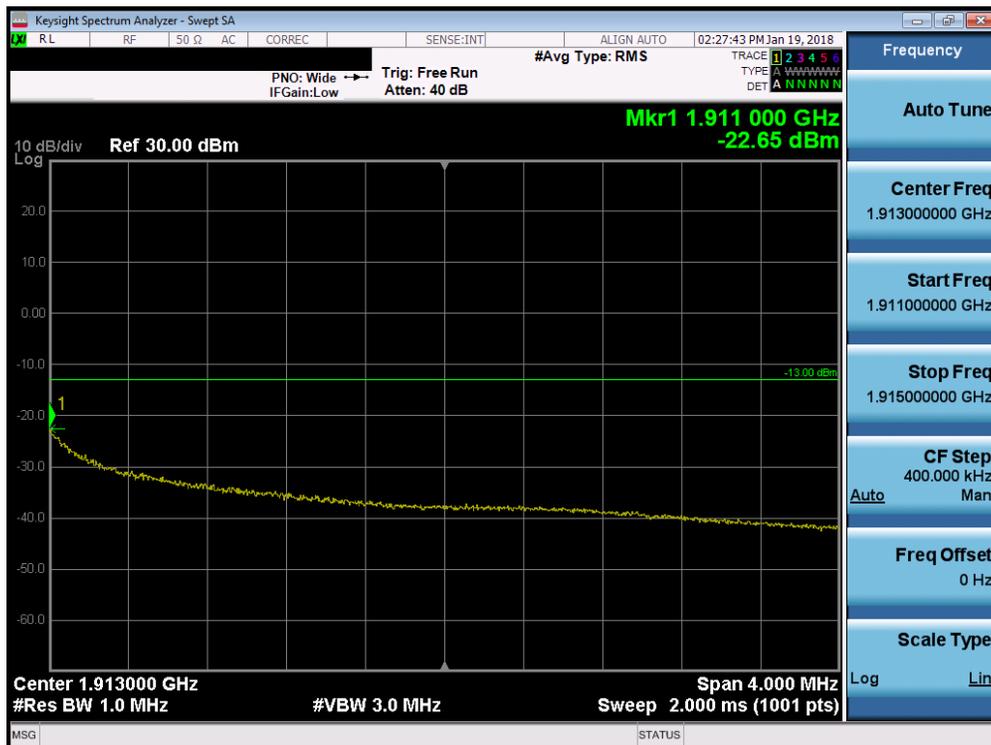


Plot 7-26. Band Edge Plot (PCS CDMA Mode - Low Channel)

FCC ID: ZNFX210ULM	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset		Page 28 of 46



Plot 7-27. Band Edge Plot (PCS CDMA Mode - High Channel)



Plot 7-28. Band Edge Plot (PCS CDMA Mode - Low Channel)

FCC ID: ZNFX210ULM	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset		Page 29 of 46

7.5 Peak-Average Ratio

§24.232(d) RSS-132(5.4) RSS-133(6.4)

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 v03 – Section 5.7.1

Test Settings

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

Test Setup

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

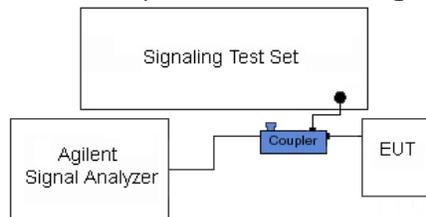
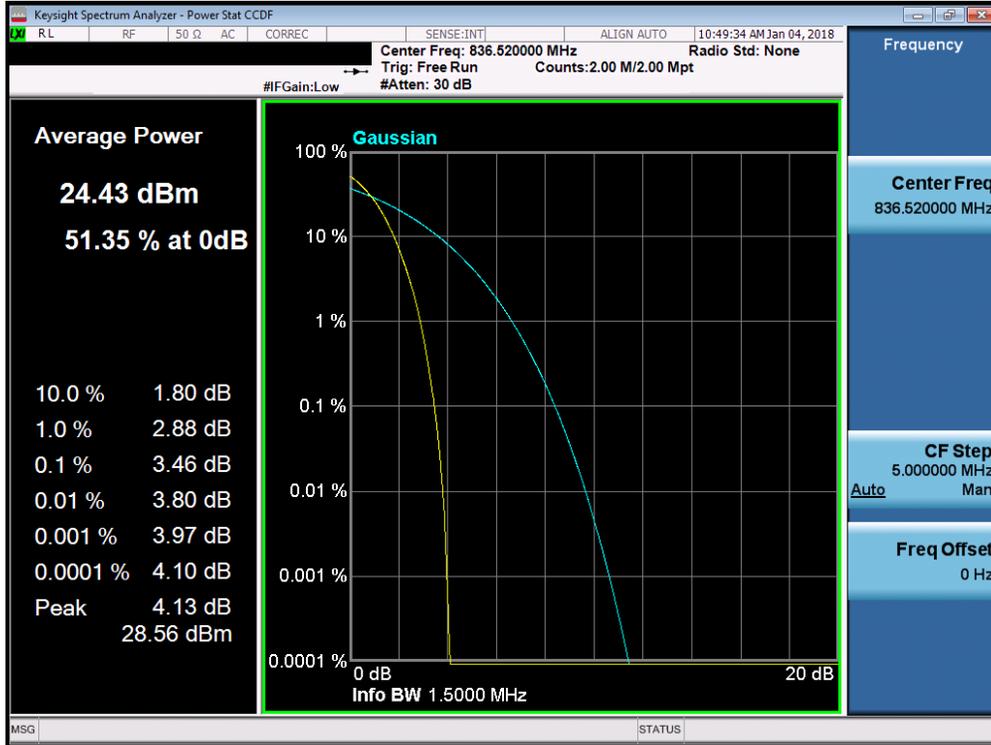


Figure 7-4. Test Instrument & Measurement Setup

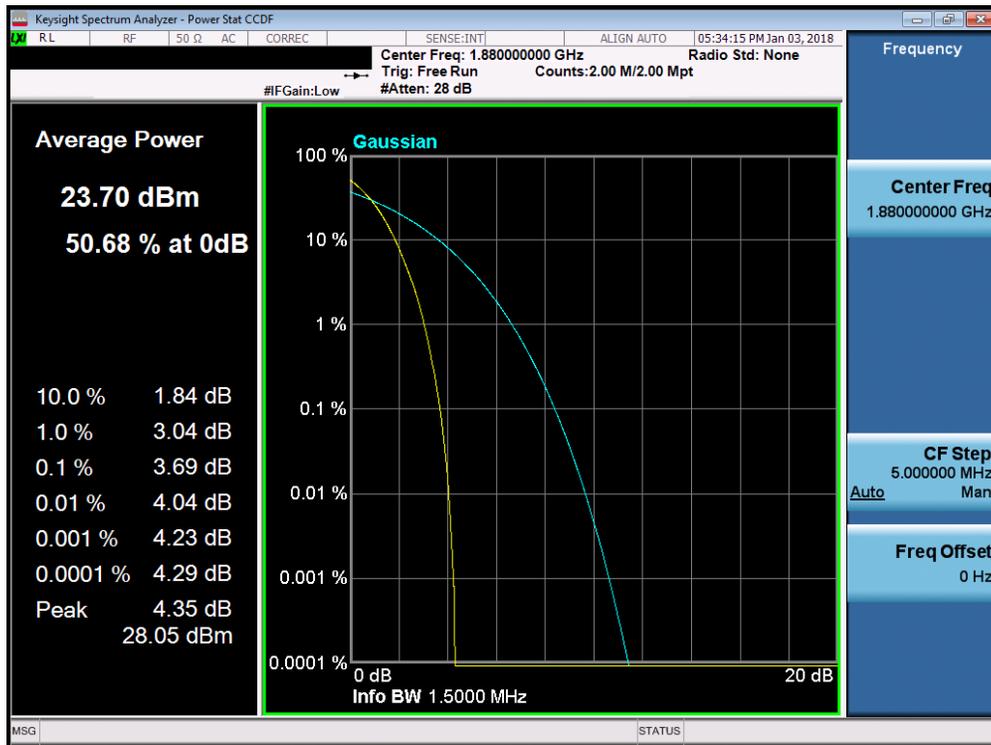
Test Notes

None

FCC ID: ZNFX210ULM		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Plot 7-29. Peak-Average Ratio Plot (Cell CDMA Mode)



Plot 7-30. Peak-Average Ratio Plot (PCS CDMA Mode)

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7.6 Radiated Power (ERP/EIRP)
§22.913(a)(2) 24.232(c) RSS-132(5.4) RSS-133(6.4)

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 v03 – 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.
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”.
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

FCC ID: ZNFX210ULM	 MEASUREMENT REPORT (CERTIFICATION) 		Approved by: Quality Manager
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Test Setup

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

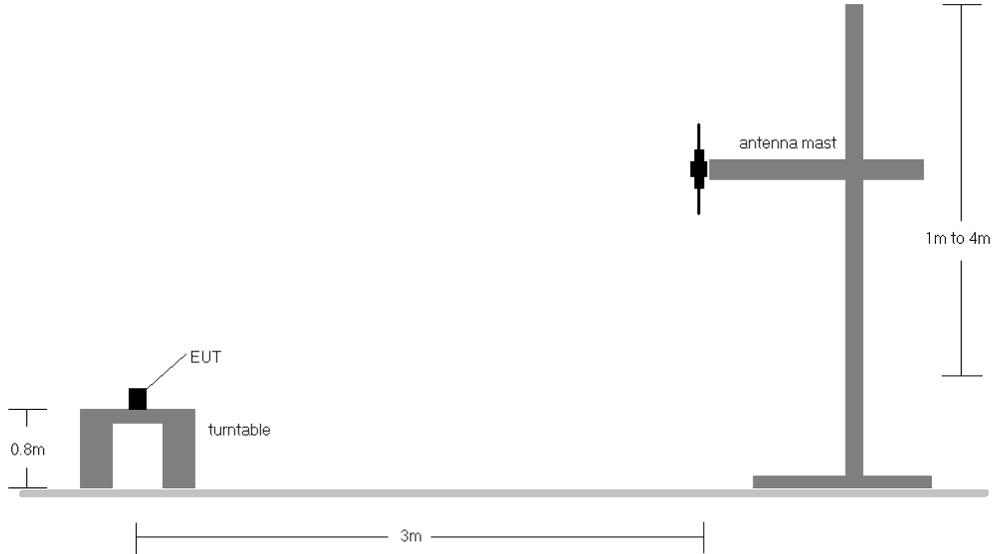


Figure 7-5. Radiated Test Setup <1GHz

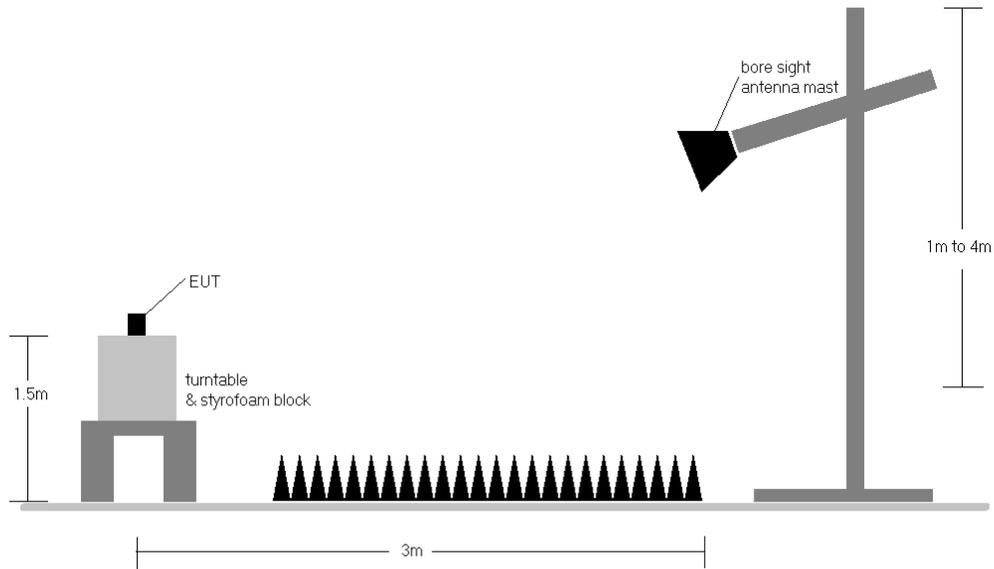


Figure 7-6. Radiated Test Setup >1GHz

FCC ID: ZNFX210ULM		MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Quality Manager
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Test Notes

- 1) 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.
- 2) This unit was tested with its standard battery.
- 3) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.70	CDMA850	H	150	8	21.99	1.50	21.34	0.136	38.45	-17.11	23.49	0.223	40.61	-17.12
836.52	CDMA850	H	150	283	21.66	1.50	21.01	0.126	38.45	-17.44	23.16	0.207	40.61	-17.45
848.31	CDMA850	H	150	174	21.92	1.50	21.27	0.134	38.45	-17.18	23.42	0.220	40.61	-17.19
824.70	CDMA850	V	150	317	18.46	1.50	17.81	0.060	38.45	-20.64	19.96	0.099	40.61	-20.65

Table 7-2. ERP/EIRP (Cellular CDMA)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1851.25	CDMA1900	V	150	80	21.70	4.79	26.49	0.445	33.01	-6.52
1880.00	CDMA1900	V	150	158	20.80	4.84	25.64	0.367	33.01	-7.37
1908.75	CDMA1900	V	150	321	20.30	4.86	25.16	0.328	33.01	-7.85
1851.25	CDMA1900	H	150	282	20.91	4.82	25.73	0.374	33.01	-7.28

Table 7-3. EIRP (PCS CDMA)

FCC ID: ZNFX210ULM	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
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7.7 Radiated Spurious Emissions Measurements

§2.1053 §22.917(a) 24.238(a) RSS-132(5.5) RSS-133(5.5)

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 v03 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

Test Settings

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

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Test Setup

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

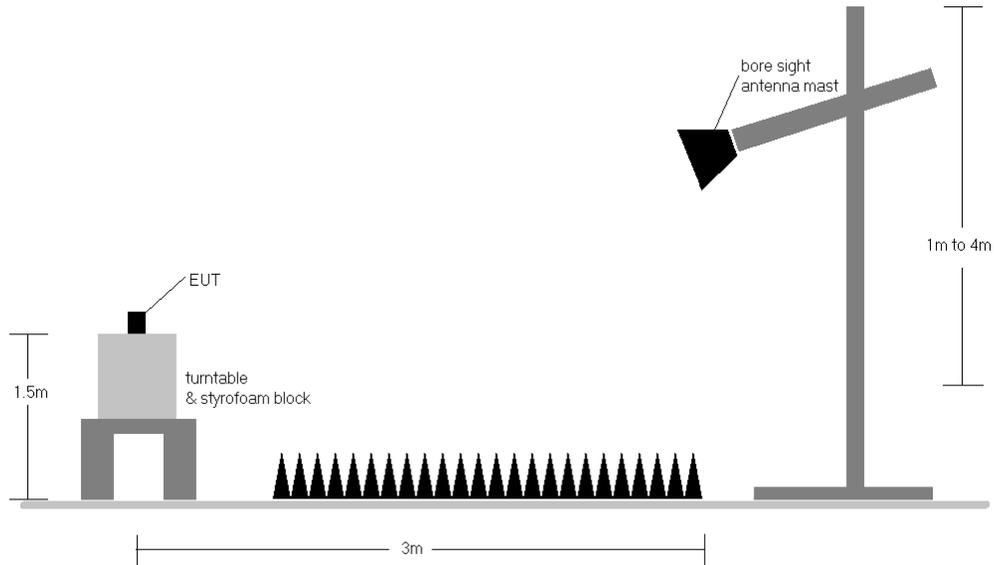


Figure 7-7. Test Instrument & Measurement Setup

Test Notes

- 1) 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.
- 2) This unit was tested with its standard battery.
- 3) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 6) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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Cellular CDMA Mode

OPERATING FREQUENCY: 824.70 MHz
 CHANNEL: 1013
 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	H	150	6	-55.64	4.81	-50.82	-37.8
2474.10	H	-	-	-56.47	4.99	-51.48	-38.5

Table 7-4. Radiated Spurious Data (Cellular CDMA Mode – Ch. 1013)

OPERATING FREQUENCY: 836.52 MHz
 CHANNEL: 384
 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	150	17	-53.49	4.86	-48.63	-35.6
2509.56	H	-	-	-56.92	5.10	-51.82	-38.8

Table 7-5. Radiated Spurious Data (Cellular CDMA Mode – Ch. 384)

OPERATING FREQUENCY: 848.31 MHz
 CHANNEL: 777
 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	H	150	2	-55.55	4.91	-50.64	-37.6
2544.93	H	-	-	-55.57	5.27	-50.30	-37.3

FCC ID: ZNFX210ULM		MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
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Table 7-6. Radiated Spurious Data (Cellular CDMA Mode – Ch. 777)

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PCS CDMA Mode

OPERATING FREQUENCY: 1851.25 MHz
 CHANNEL: 25
 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	-	-	-55.37	6.76	-48.61	-35.6
5553.75	H	-	-	-54.81	8.44	-46.37	-33.4

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

OPERATING FREQUENCY: 1880.00 MHz
 CHANNEL: 600
 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	H	-	-	-54.59	6.84	-47.75	-34.8
5640.00	H	-	-	-56.06	8.52	-47.55	-34.5

Table 7-8. Radiated Spurious Data (PCS CDMA Mode – Ch. 600)

OPERATING FREQUENCY: 1908.75 MHz
 CHANNEL: 1175
 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	H	-	-	-54.44	6.99	-47.45	-34.4
5726.25	H	-	-	-53.59	8.58	-45.02	-32.0

FCC ID: ZNFX210ULM	 PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
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Table 7-9. Radiated Spurious Data (PCS CDMA Mode – Ch. 1175)

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.

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For Part 22, and RSS-132, and RSS-133, the frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency. For Part 24, 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

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Frequency Stability / Temperature Variation

OPERATING FREQUENCY:	836,520,000	Hz
CHANNEL:	384	
REFERENCE VOLTAGE:	3.85	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	836,519,904	-96	-0.0000115
100 %		- 30	836,519,942	-58	-0.0000069
100 %		- 20	836,520,019	19	0.0000023
100 %		- 10	836,519,864	-136	-0.0000163
100 %		0	836,520,126	126	0.0000151
100 %		+ 10	836,519,948	-52	-0.0000062
100 %		+ 20	836,519,934	-66	-0.0000079
100 %		+ 30	836,519,909	-91	-0.0000109
100 %		+ 40	836,519,950	-50	-0.0000060
100 %		+ 50	836,519,993	-7	-0.0000008
BATT. ENDPOINT	3.45	+ 20	836,519,950	-50	-0.0000060

Table 7-10. Frequency Stability Data (Cellular CDMA Mode – Ch. 384)

FCC ID: ZNFX210ULM		MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset			Page 42 of 46

Frequency Stability / Temperature Variation

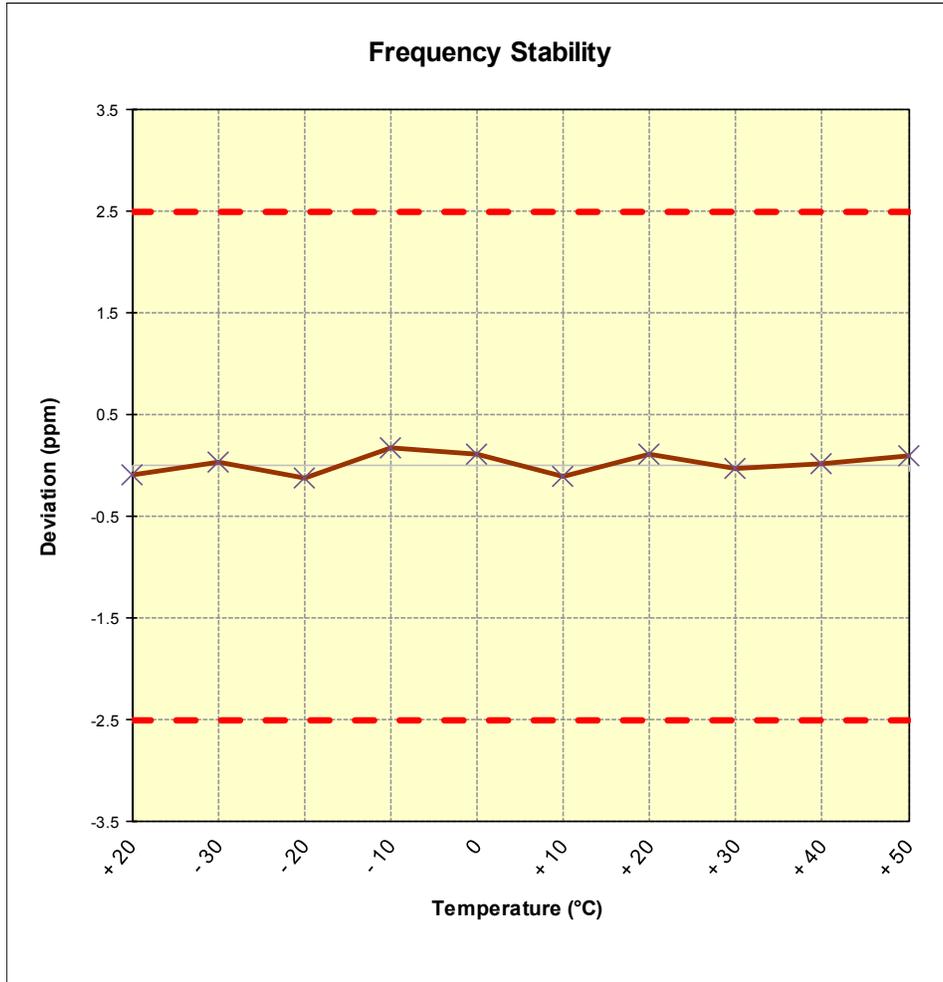


Figure 7-8. Frequency Stability Graph (Cellular CDMA Mode – Ch. 384)

FCC ID: ZNFX210ULM	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)		LG	Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset		Page 43 of 46	

Frequency Stability / Temperature Variation

OPERATING FREQUENCY: 1,880,000,000 Hz
 CHANNEL: 600
 REFERENCE VOLTAGE: 3.85 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,880,000,102	102	0.0000054
100 %		- 30	1,880,000,016	16	0.0000009
100 %		- 20	1,879,999,951	-49	-0.0000026
100 %		- 10	1,879,999,978	-22	-0.0000012
100 %		0	1,879,999,921	-79	-0.0000042
100 %		+ 10	1,880,000,045	45	0.0000024
100 %		+ 20	1,880,000,026	26	0.0000014
100 %		+ 30	1,880,000,028	28	0.0000015
100 %		+ 40	1,880,000,063	63	0.0000034
100 %		+ 50	1,879,999,964	-36	-0.0000019
BATT. ENDPOINT	3.45	+ 20	1,880,000,019	19	0.0000010

Table 7-11. Frequency Stability Data (PCS CDMA Mode – Ch. 600)

FCC ID: ZNFX210ULM	 MEASUREMENT REPORT (CERTIFICATION)			Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset	Page 44 of 46	

Frequency Stability / Temperature Variation

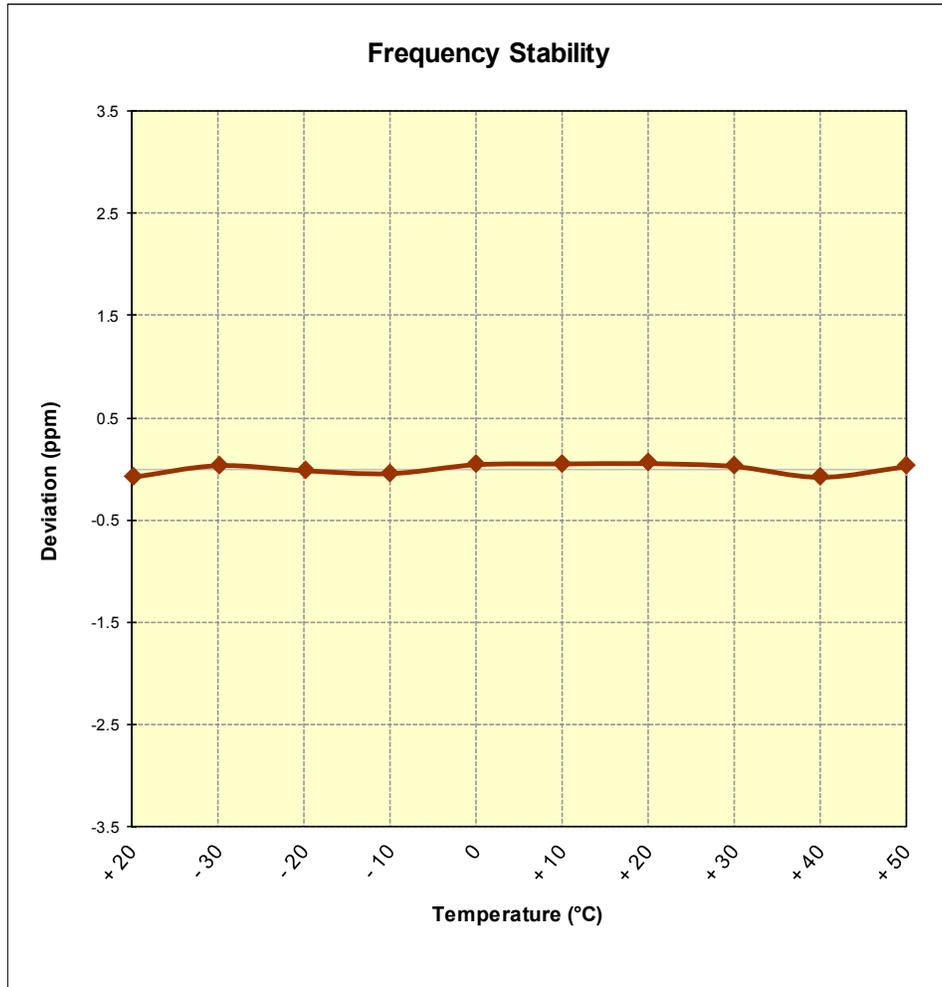


Figure 7-9. Frequency Stability Graph (PCS CDMA Mode – Ch. 600)

FCC ID: ZNFX210ULM	PCTEST ENGINEERING LABORATORY, INC.	MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset	Page 45 of 46	

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **LG Portable Handset** **FCC ID: ZNFX210ULM** complies with all the requirements of Part 22 & 24 of the FCC Rules.

FCC ID: ZNFX210ULM	 MEASUREMENT REPORT (CERTIFICATION)		 Approved by: Quality Manager
Test Report S/N: 1M1712280340-02.ZNF	Test Dates: 1/3-1/19/2018	EUT Type: Portable Handset	Page 46 of 46