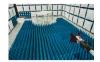


PCTEST ENGINEERING LABORATORY, INC.

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



MEASUREMENT REPORT

FCC Part 22 & 90

Applicant Name:

LG Electronics USA, Inc. 1000 Sylvan Avenue Englewood Cliffs, NJ 07632 United States

Date of Testing: 10/28 - 11/22/2019 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M1910280174-04-R1.ZNF

ZNFL455DL

APPLICANT:

FCC ID:

LG Electronics USA, Inc.

Application Type:	Certification
Model:	LG L455DL
Additional Model(s):	LG-L455DL, LM-K400UM, LM-K400MM, LM-K400QM,
	LM-K400VPP, LM-K400QM5, LM-K400QM6, LGL455DL,
	LMK400UM, LMK400MM, LMK400QM, LMK400QM5, LMK400QM6,
	LMK400VPP, L455DL, K400UM, K400MM, K400QM, K400QM5,
	K400QM6, K400VPP
EUT Type:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	§2.1049, §22(S), §90(S)
Test Procedure(s):	ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

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

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

Note: This revised Test Report (S/N: 1M1910280174-04-R1.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

Randy Ortanez President



FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
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MEASUREMENT REPORT FCC Part 90



Mode	Tx Frequency (MHz)	Measurement	Max. Power (W)	Max. Power (dBm)	Emission Designator	Modulation
CDMA800 (BC10)	817.9 - 823.1	Conducted	0.294	24.68	1M27F9W	CDMA
LTE Band 26	814.7 - 823.3	Conducted	0.330	25.19	1M08G7D	QPSK
LTE Band 26	814.7 - 823.3	Conducted	0.261	24.16	1M09W7D	16-QAM
LTE Band 26	814.7 - 823.3	Conducted	0.208	23.19	1M08W7D	64-QAM
LTE Band 26	815.5 - 822.5	Conducted	0.330	25.19	2M69G7D	QPSK
LTE Band 26	815.5 - 822.5	Conducted	0.263	24.20	2M68W7D	16-QAM
LTE Band 26	815.5 - 822.5	Conducted	0.209	23.20	2M68W7D	64-QAM
LTE Band 26	816.5 - 821.5	Conducted	0.331	25.20	4M47G7D	QPSK
LTE Band 26	816.5 - 821.5	Conducted	0.263	24.20	4M48W7D	16-QAM
LTE Band 26	816.5 - 821.5	Conducted	0.209	23.20	4M50W7D	64-QAM
LTE Band 26	819	Conducted	0.316	25.00	8M97G7D	QPSK
LTE Band 26	819	Conducted	0.258	24.11	8M97W7D	16-QAM
LTE Band 26	819	Conducted	0.207	23.16	8M98W7D	64-QAM
LTE Band 26	821.5	Conducted	0.330	25.18	13M5G7D	QPSK
LTE Band 26	821.5	Conducted	0.263	24.20	13M5W7D	16-QAM
LTE Band 26	821.5	Conducted	0.205	23.11	13M4W7D	64-QAM
LTE Band 26	821.5	ERP	0.071	18.52	13M5G7D	QPSK
LTE Band 26	821.5	ERP	0.060	17.77	13M5W7D	16-QAM
LTE Band 26	821.5	ERP	0.049	16.88	13M4W7D	64-QAM

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: ZNFL455DL**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 90(S).

Test Device Serial No.: 00350, 00368, 00376, 00384

2.2 Device Capabilities

This device contains the following capabilities:

800/850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1, BC10), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII, 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 v03r01. 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 document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

3.2 Radiated Power and Radiated Spurious Emissions

<u>§2.1053, §90.635, §90(S)</u>

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 wooden turntable 80cm above the ground plane and 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. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

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:

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

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

The calculated Pd levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of $43 + 10 \log_{10}(Power [Watts])$ specified in 90(S).

For fundamental radiated power measurements, the guidance of KDB 971168 D01 v03r01 is used to record the EUT power level that is subsequently matched via the aforementioned substitution method given in ANSI/TIA-603-E-2016.

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.

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4.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
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	6/4/2019	Annual	6/4/2020	LTx1
-	LTx3	LIcensed Transmitter Cable Set	6/3/2019	Annual	6/3/2020	LTx3
Agilent	N9020A	MXA Signal Analyzer	4/20/2019	Annual	4/20/2020	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	5/10/2019	Annual	5/10/2020	441112
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
EMCO	3160-09	Small Horn (18 - 26.5GHz)	8/9/2018	Biennial	8/9/2020	135427
ETS Lindgren	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
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		100976
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		112347
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
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/8/2019	Annual	7/8/2020	102133
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:

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

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6.0 SAMPLE CALCULATIONS

Emission Designator

Emission Designator = 1M25F9W

CDMA BW = 1.25 MHz F = Frequency Modulation 9 = Composite Digital Info W = Combination (Audio/Data) (Measured at the 99.75% power bandwidth)

Spurious Radiated Emission – BC10

Example: Channel 476 CDMA BC10 Mode 3rd Harmonic (2453.70MHz)

The average spectrum analzyer 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 analzyer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 2453.70 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm -(-24.80) = 50.3 dBc.

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz G = Phase Modulation 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

16QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz W = Amplitude/Angle Modulated 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average 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 1564 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm - (-24.80).

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7.0 TEST RESULTS

7.1 Summary

Company Name:	LG Electronics USA, Inc.
FCC ID:	ZNFL455DL
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	<u>CDMA / EvDO / LTE</u>
Band:	Band Class 10 / Band 26

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A		PASS	Section 7.2
2.1051 90(S).691(a) 90(R).543(a)	Conducted Band Edge / Spurious Emissions	 > 43 + 10 log₁₀ (P[Watts]) for all out-of-band emissions except > 50 + 10 log₁₀ (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge (Band 26) 	CONDUCTED	PASS	Sections 7.3, 7.4
2.1055 90.213	Frequency Stability	< 2.5 ppm		PASS	Section 7.8
2.1046 90.635	Conducted Power	< 100 Watts		PASS	Section 7.5
22.913(a.2)	Effective Radiated Power (Band 26)	< 7 Watts max. ERP	RADIATED	PASS	Section 7.6
2.1053 90(S).691(a) 90(R).543(e)	Radiated Spurious Emissions	> 43 + 10 log ₁₀ (P[Watts]) for all out-of-band emissions	KADIATED	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 shown in Section 7.0 were 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.
- 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 4.3.

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Test Overview

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 4.2

Test Settings

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

1-5% of the 99% occupied bandwidth observed in Step 7

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

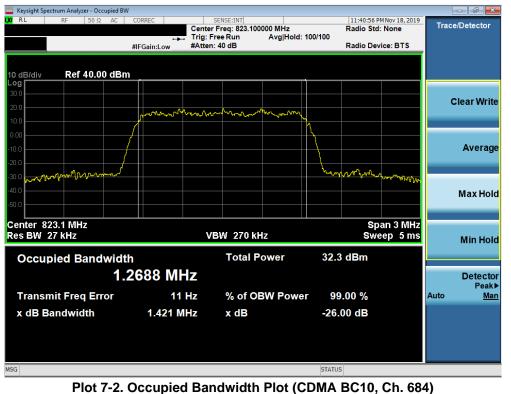
None.

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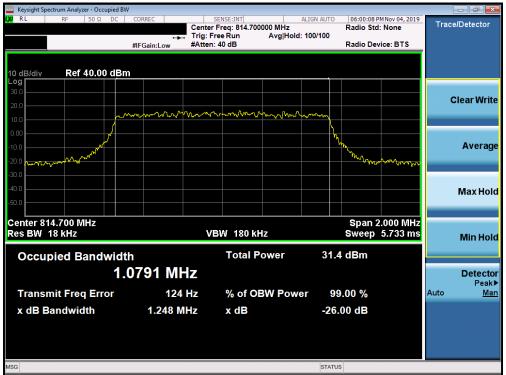




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Plot 7-3. Occupied Bandwidth Plot (LTE Band 26, 1.4MHz QPSK – RB Size 6 – Low Channel)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 26, 1.4MHz 16Q - RB Size 6 - Low Channel)

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Keysight Spectrum Analyzer - Occupied BW					
XIRL RF 50Ω DC		SENSE:INT Freg: 814.700000 MHz	ALIGN AUTO	06:00:31 PM Nov 04, 2019 Radio Std: None	Trace/Detector
	🛶 Trig: F		old: 100/100	Radio Device: BTS	
10 dB/div Ref 40.00 dBm					
20.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	- An Mand	νn Γ		Clear Writ
					Averag
20.0				When we want the set	Averag
0.0					Max Ho
enter 814.700 MHz es BW 18 kHz	v	BW 180 kHz		Span 2.000 MHz Sweep 5.733 ms	Min Ho
Occupied Bandwidt		Total Power	29.4	dBm	
1.0	0821 MHz				Detect Peal
Transmit Freq Error	709 Hz	% of OBW Po	wer 99	.00 %	Auto <u>Ma</u>
x dB Bandwidth	1.262 MHz	x dB	-26.	00 dB	
G			STATUS	3	

Plot 7-5. Occupied Bandwidth Plot (LTE Band 26, 1.4MHz 64Q - RB Size 6 - Low Channel)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 26, 3.0MHz QPSK - RB Size 15 - Low Channel)

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Keysight Spectrum Analyzer - Occupi					
LX RL RF 50Ω [DC CORREC	SENSE:INT Center Freq: 815.500000 MH	ALIGN AUTO	05:56:09 PM Nov 04, 2019 Radio Std: None	Trace/Detector
	#IFGain:Low		Hold: 100/100	Radio Device: BTS	
10 dB/div Ref 30.00 d	dBm				
20.0	mmuh	Marching	man		Clear Write
0.00					
-20.0			\	wound	Average
-40.0					Max Hold
-60.0					Max Hold
Center 815.500 MHz Res BW 47 kHz		VBW 470 kHz		Span 5.000 MHz Sweep 2.533 ms	Min Hole
Occupied Bandw		Total Power	30.4	l dBm	
	2.6783 MH	Z			Detecto Peak
Transmit Freq Erro	r 2.184 kl	Hz % of OBW P	ower 99	.00 %	Auto <u>Ma</u>
x dB Bandwidth	2.869 MI	Hz x dB	-26.	00 dB	
ISG			STATU	6	

Plot 7-7. Occupied Bandwidth Plot (LTE Band 26, 3.0MHz 16Q – RB Size 15 – Low Channel)



Plot 7-8. Occupied Bandwidth Plot (LTE Band 26, 3.0MHz 64Q - RB Size 15 - Low Channel)

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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🔤 Keysight Spectrum Analyzer - Occupie	ed BW					- 0
<mark>(X/</mark> RL RF 50ΩD		SENSE:INT AL	IGN AUTO 05:52:45 I Radio Sto	M Nov 04, 2019	Trace	Detector
		: Free Run Avg Hold: 1		. None		
	#IFGain:Low #Att	en: 40 dB	Radio De	vice: BTS		
10 dB/div Ref 40.00 d	IBm _					
Log 30.0						
					с	lear Write
20.0	AL Appendiate many and appendiate	- phine how and the second	A			
10.0						
0.00	<mark>/ </mark>					
-10.0						Average
-20.0	A ^{ur}		"In the second second second	TTHUR MAN		
-30.0						
-40.0						Max Hold
-50.0						mux noru
Center 816.500 MHz			Span '	0.00 MHz		
Res BW 91 kHz		VBW 910 kHz	SW	eep 5 ms		Min Hold
Occupied Bandwi	idth	Total Power	31.5 dBm			
	4.4714 MHz					Detector Peak►
Transmit Freq Error	2.447 kHz	% of OBW Power	99.00 %		Auto	Man
x dB Bandwidth	4.866 MHz	x dB	-26.00 dB			
			20100 42			
MSG			STATUS			

Plot 7-9. Occupied Bandwidth Plot (LTE Band 26, 5.0MHz QPSK – RB Size 25 – Low Channel)



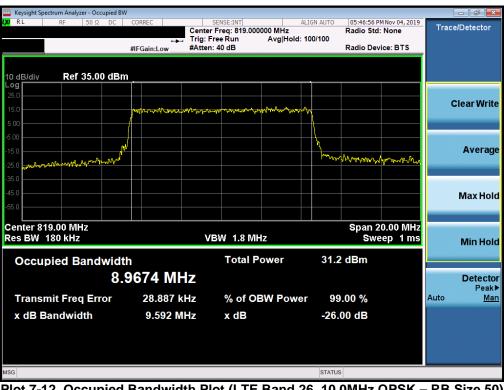
Plot 7-10. Occupied Bandwidth Plot (LTE Band 26, 5.0MHz 16Q - RB Size 25 - Low Channel)

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied B\	N				- d -
LXI RL RF 50Ω DC	CORREC	SENSE:INT r Freq: 816.500000 MHz	ALIGN AUTO 05:53:09 Radio Sto	PM Nov 04, 2019	Trace/Detector
	Trig: I	Free Run Avg Hold:	100/100		
	#IFGain:Low #Atter	n: 40 dB	Radio De	vice: BTS	
10 dB/div Ref 40.00 dBr	n		_		
Log 30.0					
20.0					Clear Write
10.0	por management	Maynor Apple segues Miller	մաչս		
0.00					
-10.0	/				Average
			h.		Average
-20.0			"holybacher rought th	MUMPLE	
2010 MWD dar P. dar La				- And Add	
-40.0					Max Hold
-50.0					
Center 816.500 MHz			Span '	10.00 MHz	
Res BW 91 kHz	v	'BW 910 kHz		eep 5 ms	Min Hold
		Total Power	29.5 dBm		
Occupied Bandwidt		Total Power	29.5 dBm		
4.	4988 MHz				Detector
Transmit Freg Error	-5.059 kHz	% of OBW Powe	er 99.00 %		Peak▶ Auto Man
x dB Bandwidth	4.880 MHz	x dB	-26.00 dB		
MSG			STATUS		

Plot 7-11. Occupied Bandwidth Plot (LTE Band 26, 5.0MHz 64Q - RB Size 25 - Low Channel)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 26, 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	🔁 LG	Approved by: Quality Manager
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🔤 Keysight Spectrum Analyzer - Occupied BV	V				
RL RF 50Ω DC	Trig:	SENSE:INT er Freq: 819.000000 MHz Free Run Avg Hol n: 40 dB	F Id: 100/100	05:47:04 PM Nov 04, 2019 Radio Std: None Radio Device: BTS	Trace/Detector
10 dB/div Ref 35.00 dBn	n				
25.0	MM mart have a for the former former	า _{เป็} น เป็น เป็น เป็น เป็น เป็น เป็น เป็น เป็	- Juny		Clear Write
5.00 -5.00 -15.0 -25.0			h h	1 m. Jahan parana	Averag
-45.0					Max Hol
Center 819.00 MHz Res BW 180 kHz	١	/BW 1.8 MHz		Span 20.00 MHz Sweep 1 ms	Min Hol
Occupied Bandwidt 8.	հ 9660 MHz	Total Power	30.4 c	lBm	Detecto Peak
Transmit Freq Error x dB Bandwidth	7.421 kHz 9.598 MHz	% of OBW Pov x dB	ver 99.0 -26.00		Auto <u>Ma</u> i
ISG			STATUS		

Plot 7-13. Occupied Bandwidth Plot (LTE Band 26, 10.0MHz 16Q – RB Size 50)



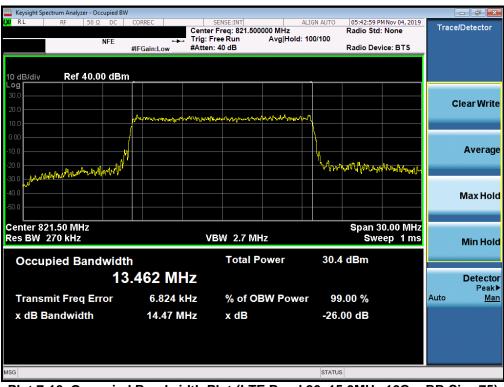
Plot 7-14. Occupied Bandwidth Plot (LTE Band 26, 10.0MHz 64Q - RB Size 50)

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	🕑 LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied B ¹	N						×
LXI RL RF 50Ω DC	CORREC	SENSE:INT ter Freq: 821.500000 MHz	ALIGN AUTO	05:42:49 PM Radio Std:	Nov 04, 2019	Trace/Detec	tor
NFE	Trig:		old: 100/100	Radio Devi			
10 dB/div Ref 40.00 dBr	n _						
30.0						ClearV	Vrite
20.0	mytontheren	wandersellingen and an and an	han				
-10.0						Ave	rage
-20.0 -30.0			hytopu	_{BAR} AL MARCENT	attan and a start of the start		-
-30.0 pp						Max	Hold
-50.0							
Center 821.50 MHz Res BW 270 kHz		VBW 2.7 MHz			0.00 MHz ep 1 ms	Min	Hold
Occupied Bandwid	th	Total Power	31.4	dBm			
1:	3.474 MHz					Dete P	ecto eakl
Transmit Freq Error	7.255 kHz	% of OBW Pov	wer 99	.00 %		Auto	Ma
x dB Bandwidth	14.55 MHz	x dB	-26.	00 dB			
ISG			STATUS	3			

Plot 7-15. Occupied Bandwidth Plot (LTE Band 26, 15.0MHz QPSK – RB Size 75)



Plot 7-16. Occupied Bandwidth Plot (LTE Band 26, 15.0MHz 16Q - RB Size 75)

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Keysight Spectrum Analyzer - Occupied BW	1				
XIRL RF 50Ω DC	CORREC	SENSE:INT er Freg: 821.500000 MHz	ALIGN AUTO	05:43:11 PM Nov 04, 2019 Radio Std: None	Trace/Detector
NFE	🛶 Trig		lold: 100/100	Radio Device: BTS	
10 dB/div Ref 40.00 dBm Log	·				
20.0					Clear Write
10.0	Jand Sur Way Thursday and	ᡰᡏᠬᢇ᠋᠈ᡔᡒᡒᡏᠯᡵ᠋ᢕ᠕ᠯᢛᡝᡅᠺᠰ᠈᠔᠘ᡭᠰᡬᡧᡘᠺ	งดง () () ()		
-10.0					Average
30.0			1771mg	hertol haplo star all appropriate	Max Hold
Center 821.50 MHz Res BW 270 kHz		VBW 2.7 MHz		Span 30.00 MHz Sweep 1 ms	Min Hole
Occupied Bandwidt	h	Total Power	29.4	dBm	
	8.434 MHz				Detecto Peak
Transmit Freq Error	25.254 kHz	% of OBW Po	ower 99	.00 %	Auto <u>Mar</u>
x dB Bandwidth	14.38 MHz	x dB	-26.	00 dB	
SG			STATU	3	

Plot 7-17. Occupied Bandwidth Plot (LTE Band 26, 15.0MHz 64Q – RB Size 75)

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7.3 Spurious and Harmonic Emissions at Antenna Terminal §2.1051 §90(S)

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to 10GHz (separated into at least two plots per channel)
- 2. RBW ≥ 100kHz
- 3. VBW \geq 3 x RBW
- 4. Detector = RMS
- 5. Trace mode = max hold
- 6. Sweep time = auto couple
- 7. The trace was allowed to stabilize

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 100 kHz or greater for Part 22. 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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RL	RF	yzer - Swej 50 Ω	AC	CORREC	_	CE	NSE:INT			11-20-00	PM Nov 18, 2019		7 ×
KL.	N	50.35	AC	PNO: F	ast 🔸	, Trig: Fre	e Run	#Avg Typ	e:RMS	TRA		Frequenc	су
				IFGain:	Low	Atten: 4	0 dB		Mire			Auto '	Tun
0 dB/div	Ref 3	0.00 d	Bm						WIKI	-52	6 8 MHz .68 dBm		
^{og}							Ĭ					Center	r Fre
20.0												422.00000	0 MH
10.0													
												Start 30.00000	
0.00												50.00000	
10.0											DL1 -13.00 dBm	Stop	Fre
20.0												814.00000	
20.0													
30.0												CF 78.400000	Ste
40.0												<u>Auto</u>	Ma
10.0												Freq C	Offer
50.0		danam at b			areasides		-		a and a state of the			FleqC	015
50.0		and all the	تصميليه وراي	The second second		and the second state of th	A STATE OF THE OWNER	and in this paper with the second second					
												Scale	тур
tart 30										Stop 8	314.0 MHz	Log	L
Res BV	V 100 kH	Z			#VBW	/ 300 kHz		s	weep 3	7.33 ms (20001 pts)		

Plot 7-18. Conducted Spurious Plot (CDMA BC10, Ch. 476)

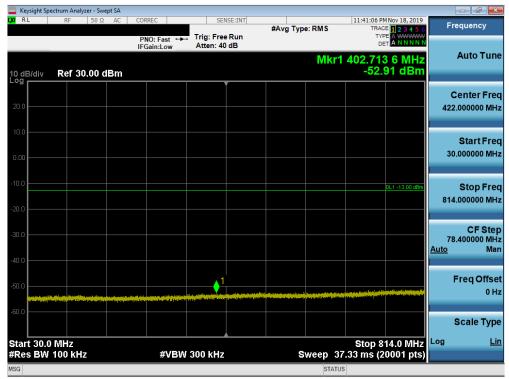


FCC ID: ZNFL455DL	MEASUREMENT REPORT		🕞 LG	Approved by:	
TOO ID: ZINI E433DE	TROINFERING LABORATORY, INC.	(CERTIFICATION)		Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Daga 22 of 47	
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	Spectrum Ana												
<mark>0</mark> RL	RF	50 Ω	AC	CORREC PNO: IFGain	Fast 🔸		#Avg	Type: RMS	11	TRACE	Nov 18, 2019 1 2 3 4 5 6 A WWWWWW A N N N N N	F	requency
0 dB/div	Ref 0	.00 dB	m	II Gail				N	/kr1 9	.738 -41.2	10 GHz 25 dBm		Auto Tun
10.0										C	DL1 -13.00 dBm		Center Fre
30.0											1	1.00	Start Fre
40.0 50.0			, 1 40	~~~								10.00	Stop Fre
60.0												900 <u>Auto</u>	CF Ste 0.000000 Mi Ma
30.0													Freq Offs 0 I
90.0	000 GHz								St	on 10	000 GHz		Scale Typ L
	V 1.0 MH	z			#VBW	3.0 MHz		Sweep	16.00	ms (20	000 GH2 0001 pts)		
SG								S	TATUS				







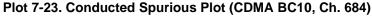
FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 47
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	ight Spectrum	Analyzer - Swe	ept SA									
L <mark>XI</mark> RL	RI	F 50 Ω	AC	CORREC	SEI	NSE:INT	#Avg Typ	e RMS		MNov 18, 2019	Fr	requency
				PNO: Fast +	Trig: Free #Atten: 3				TY			
				IFGain:Low	#Atten: 5	2 00		ML	(r1 824.0			Auto Tune
10 dB/	div Pe	f 0.00 dE	Rm						-28.	17 dBm		
Log Γ		1 0.00 uL			,	ſ						
												Center Freq
-10.0										DL1 -13.00 dBm	912	2.000000 MHz
-20.0												
-20.0	1											Start Freq
-30.0											824	4.000000 MHz
-40.0												Stop Freq
N N	L										1.00	0000000 GHz
-50.0	1											
												CF Step
-60.0	A Married A	an the second	tiyaking she fu	Hard and the grade to	(felagion Saley), ^{gl} asiki, fed	a where a start	an an institution in such a	an a	yaleytayat balliy da	antia di Antonia		7.600000 MHz
-70.0											<u>Auto</u>	Man
-70.0												
-80.0												Freq Offset
												0 Hz
-90.0												
												Scale Type
Start	0.82400	GHz							Stop 1.0	0000 GHz	Log	<u>Lin</u>
	BW 100			#VBV	V 300 kHz			Sweep	8.533 ms (4001 pts)		
MSG								STATU	IS			

Plot 7-22. Conducted Spurious Plot (CDMA BC10, Ch. 684)



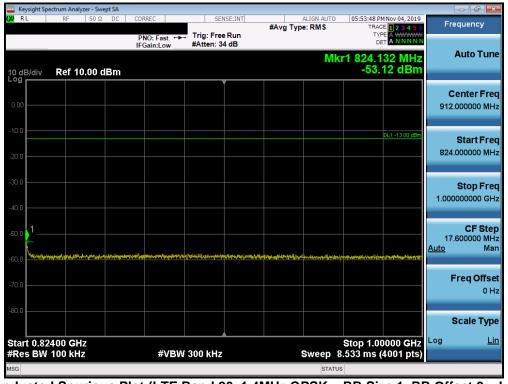


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RL	F	RF	50 Ω	DC	CORRE	C	9	ENSE:INT		ALIGN AUT		M Nov 04, 2019	End	au on ou
						:Fast ↔ in:Low	⊢ Trig: Fr Atten:		#Avg Typ	e:RMS	TRAI TY D	DE 1 2 3 4 5 6 PE A WWWWW ET A NNNNN		equency
0 dB/div	R	ef 30.	00 d	Bm						Mki	r1 814.00 -13.	0 0 MHz 23 dBm		Auto Tur
20.0														enter Fre
10.0													30.	Start Fre
												0L1 -13.00 dBm	814.	Stop Fr .000000 М
0.0													78. <u>Auto</u>	CF Sto 400000 M M
i0.0													F	Freq Offs
50.0													ę	Scale Typ
tart 30 Res Bi						41/D/	V 300 KH	_			Stop 8 37.33 ms (2	14.0 MHz	Log	L

Plot 7-24. Conducted Spurious Plot (LTE Band 26, 1.4MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-25. Conducted Spurious Plot (LTE Band 26, 1.4MHz QPSK – RB Size 1, RB Offset 0 – Low Channel)

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Plot 7-26. Conducted Spurious Plot (LTE Band 26, 1.4MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-27. Conducted Spurious Plot (LTE Band 26, 1.4MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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🔤 Keysight Spectrum Analyzer - Swept	SA				
LXI RL RF 50 Ω	DC CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	05:51:56 PM Nov 04, 2019 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast ↔→ IFGain:Low	Trig: Free Run #Atten: 34 dB		TYPE A WWWW DET A NNNN	Auto Tune
10 dB/div Ref 10.00 dB	im		Mk	r1 827.212 MHz -44.54 dBm	Auto Tune
		Ĭ			Center Freq
0.00					912.000000 MHz
-10.0				DL1 -13.00 dBm	Oto at Essa
-20.0					Start Freq 824.000000 MHz
-30.0					Stop Freq
-40.0					1.000000000 GHz
-50.0					CF Step
	÷valenenenaeratentreterralet	ns Jawa Maren Maren Mara (Indonesia) (Indonesia)	anderste die Beerler, für bis mit der bei die "stratteren sullen, aus sinde	ومعاومة والمعارفة والمراجع والمحاوم والمحاومة والمعاودة والمعاودة والمعاودة والمعاودة والمعاودة	17.600000 MHz <u>Auto</u> Man
-60.0	y day al ya make a dan a dalar ya san. Ha da di ta shina dalar in sa		a filial a an air dhull an bail an air an llean llean a' san air an an air air an air air an air air an air ai	a na an	
-70.0					Freq Offset
					0 Hz
-80.0					Scale Type
Start 0.82400 GHz				Stop 1.00000 GHz	Log Lin
#Res BW 100 kHz	#VBW	300 kHz	Sweep 8	3.533 ms (4001 pts)	
MSG			STATU		

Plot 7-28. Conducted Spurious Plot (LTE Band 26, 1.4MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-29. Conducted Spurious Plot (LTE Band 26, 1.4MHz QPSK – RB Size 1, RB Offset 0 – High Channel)

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager	
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7.4 Band Edge Emissions at Antenna Terminal §2.1051 §90(S)

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.

For LTE B26 operation under Part 90.691, the minimum permissible attenuation level of any spurious emission removed from the EA licensee's frequency block by greater than 37.5 kHz is $43 + 10\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts. The minimum permissible attenuation level of any spurious emission removed from the EA licensee's frequency block by up to and including 37.5 kHz is $50 + 10\log_{10}(P_{[Watts]})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Span was set large enough so as to capture all out of band emissions near the band edge
- 2. RBW = 100 kHz
- 3. VBW = 300 kHz
- 4. Detector = RMS
- 5. Trace mode = trace average
- 6. Sweep time = auto couple
- 7. 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

For channel edge emission, the signal analyzer's "ACP" measurement capability is used.

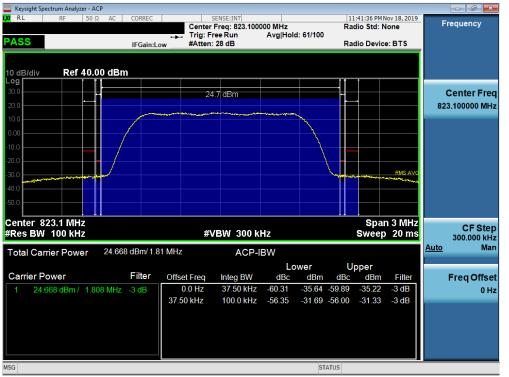
Per 22.917(b) in the 1MHz Bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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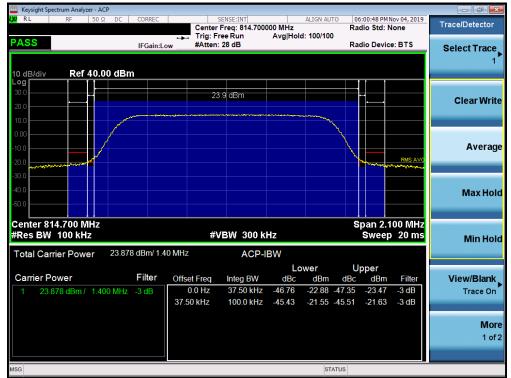
Plot 7-30. Channel Edge Plot (CDMA BC10 - Ch. 476)



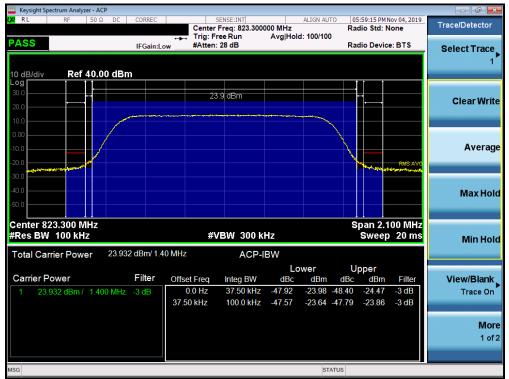
Plot 7-31. Channel Edge Plot (CDMA BC10 - Ch. 684)

		0 1	,	
FCC ID: ZNFL455DL	PCTEST	MEASUREMENT REPORT	🕞 LG	Approved by:
FCC ID. ZINI E435DE	ENGINEERING LANDRATORY, INC.	(CERTIFICATION)		Quality Manager
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Plot 7-32. Channel Edge Plot (LTE Band 26, 1.4MHz QPSK - RB Size 6 - Low Channel)



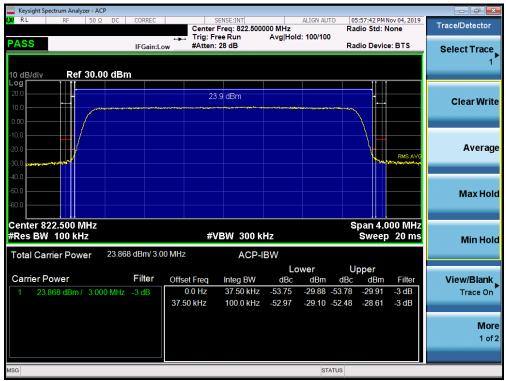
Plot 7-33. Channel Edge Plot (LTE Band 26, 1.4MHz QPSK - RB Size 6 - High Channel)

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Keysight Spectrum Analyzer - ACP				
X RL RF 50 Ω DC CORREC	SENSE:INT Center Freg: 815.50000	ALIGN AUTO	05:56:35 PM Nov 04, 2019 Radio Std: None	Trace/Detector
PASS IFGain:Lc	🛶 Trig: Free Run	Avg Hold: 100/100	Radio Device: BTS	Select Trace
10 dB/div Ref 30.00 dBm				1
- 09 20.0 10.0	23.8 dBm			Clear Writ
			RMS AVG	Averag
40.0 40.0 50.0 60.0				Max Hol
Center 815.500 MHz Res BW 100 kHz	#VBW 300 kH		Span 4.000 MHz Sweep 20 ms	Min Ho
Total Carrier Power 23.831 dBm/ 3.0	0 MHz ACP-IB	W		
Carrier Power Filter		Lower	Upper) (in the District
1 23.831 dBm / 3.000 MHz -3 dB	Offset Freq Integ BW 0.0 Hz 37.50 kHz	dBc dBm dE -52.56 -28.73 -52.5		View/Blank Trace On
	37.50 kHz 100.0 kHz	-50.69 -26.86 -50.2	6 -26.43 -3 dB	
				Мо
				1 of
sg		STATUS		

Plot 7-34. Channel Edge Plot (LTE Band 26, 3.0MHz QPSK - RB Size 15 - Low Channel)



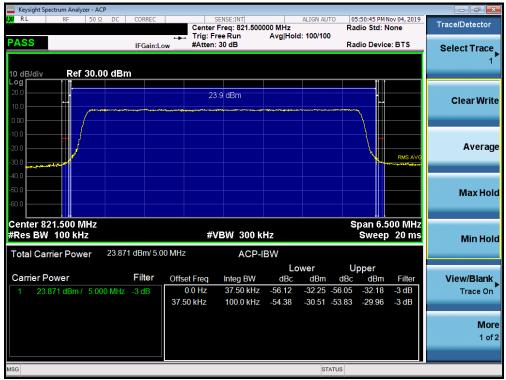
Plot 7-35. Channel Edge Plot (LTE Band 26, 3.0MHz QPSK - RB Size 15 - High Channel)

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Keysight Spectrum Analyzer - ACP				
CRL RF 50 Ω DC CORR	C SENSE:INT	ALIGN AUTO	05:54:43 PM Nov 04, 2019 Radio Std: None	Trace/Detector
PASS	n:Low #Atten: 28 dB	Avg Hold: 100/100	Radio Device: BTS	Select Trace
10 dB/div Ref 40.00 dBm				1
-og 30.0 20.0	23.8 dBm			Clear Writ
				Averag
20.0			RMS AVG	
40.0 50.0				Max Hol
Center 816.500 MHz Res BW 100 kHz	#VBW 300 k	Hz	Span 6.500 MHz Sweep 20 ms	Min Ho
Total Carrier Power 23.817 dBm	5.00 MHz ACP-	IBW		
		Lower	Upper	
Carrier Power Filte	onserried integrati		Bc dBm Filter	View/Blank
1 23.817 dBm / 5.000 MHz -3 dB	0.0 Hz 37.50 kHz 37.50 kHz 100.0 kHz			Trace On
				Mo 1 of
G		STATUS		

Plot 7-36. Channel Edge Plot (LTE Band 26, 5.0MHz QPSK - RB Size 25 - Low Channel)



Plot 7-37. Channel Edge Plot (LTE Band 26, 5.0MHz QPSK - RB Size 25 - High Channel)

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Keysight Spectrum Analyzer - ACP				
XIRL RF 50Ω DC CORREC	SENSE:IN	T ALIGN AL 19.000000 MHz	UTO 05:47:30 PM Nov 04 Radio Std: None	
PASS IFGain:Lc	🛶 Trig: Free Run			
10 dB/div Ref 30.00 dBm				1
Log 20.0 10.0 0.00	23.8 dBm			Clear Write
-10.0			R	MS AVG Averag
40.0				Max Hold
Center 819.000 MHz #Res BW 100 kHz	#VBW:	300 kHz	Span 12.00 Sweep 20	MHz 0 ms Min Hole
Total Carrier Power 23.812 dBm/ 10.	00 MHz	ACP-IBW		
		Lower	Upper	
Carrier Power Filter	Offset Freq Integ 0.0 Hz 37.5			ilter View/Blank
1 23.812 dBm / 10.00 MHz -3 dB			-58.88 -35.07 -3	
				Mo i 1 of
MSG		S	TATUS	

Plot 7-38. Channel Edge Plot (LTE Band 26, 10.0MHz QPSK – RB Size 50)



Plot 7-39. Channel Edge Plot (LTE Band 26, 10.0MHz QPSK – RB Size 75)

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7.5 Conducted Power Output Data §2.1046 §90.635

Frequency [MHz]	BC10 [Channel]	Battery Type	Cond. PWR [dBm]			Margin [dB]
817.90	476	Standard	24.68	0.294	50.00	-25.32
823.10	684	Standard	24.66	0.292	50.00	-25.34

Table 7-2. CDMA BC10 Conducted Power Output Data

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Cond. PWR [dBm]	Cond. PWR [Watts]	Cond. PWR Limit [dBm]	Margin [dB]
814.70	1.4	QPSK	25.04	0.319	50.00	-24.96
823.30	1.4	QPSK	25.19	0.330	50.00	-24.81
823.30	1.4	16-QAM	24.16	0.261	50.00	-25.84
823.30	1.4	64-QAM	23.19	0.208	50.00	-26.81
815.50	3	QPSK	25.17	0.329	50.00	-24.83
822.50	3	QPSK	25.19	0.330	50.00	-24.81
822.50	3	16-QAM	24.20	0.263	50.00	-25.80
822.50	3	64-QAM	23.20	0.209	50.00	-26.80
816.50	5	QPSK	25.00	0.316	50.00	-25.00
821.50	5	QPSK	25.20	0.331	50.00	-24.80
821.50	5	16-QAM	24.20	0.263	50.00	-25.80
821.50	5	64-QAM	23.20	0.209	50.00	-26.80
819.00	10	QPSK	25.00	0.316	50.00	-25.00
819.00	10	16-QAM	24.11	0.258	50.00	-25.89
819.00	10	64-QAM	23.16	0.207	50.00	-26.84
821.50	15	QPSK	25.18	0.330	50.00	-24.82
821.50	15	16-QAM	24.20	0.263	50.00	-25.80
821.50	15	64-QAM	23.11	0.205	50.00	-26.89

Table 7-3. LTE Band 26 Conducted Power Output Data

NOTES:

- 1. For CDMA mode, this device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.
- 2. For LTE mode, the device was tested under all modulations, RB sizes and offsets, and channel bandwidth configurations and the worst case emissions are reported with 1 RB.
- 3. This unit was tested with its standard battery.

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7.6 Radiated Power (ERP) §22.913(a.2) §90.542(a)(7)

Test Overview

Effective Radiated Power (ERP) 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. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 - Section 5.2.1

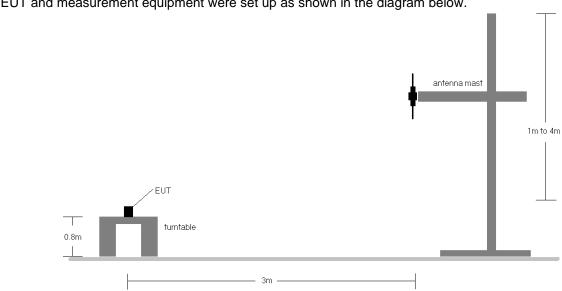
ANSI/TIA-603-E-2016 - Section 2.2.17

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 \geq 3 x RBW
- 4. Span = 1.5 times the OBW
- 5. No. of sweep points \geq 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

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



Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
821.50	15	QPSK	н	214	164	1 / 74	13.97	6.70	18.52	0.071	38.45	-19.93
821.50	15	16-QAM	Н	214	164	1 / 74	13.22	6.70	17.77	0.060	38.45	-20.68
821.50	15	64-QAM	Н	214	164	1 / 74	12.33	6.70	16.88	0.049	38.45	-21.57
821.50	15	QPSK	V	157	189	1 / 74	12.98	6.30	17.13	0.052	38.45	-21.32

Table 7-4. ERP Data (Band 26)

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7.7 Radiated Spurious Emissions Measurements §2.1053 §90(S)

Test Overview

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

Test Procedures Used

KDB 971168 D01 v03r01 - Section 5.8

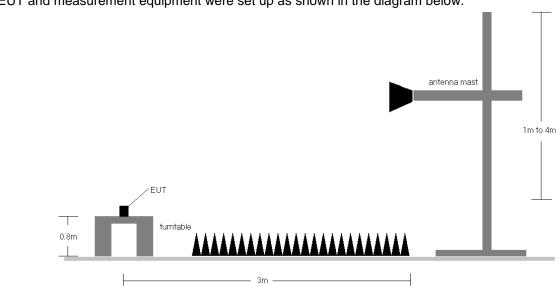
ANSI/TIA-603-E-2016 - Section 2.2.12

Test Settings

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

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

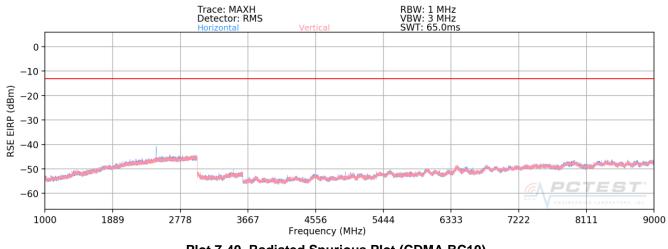
Figure 7-5. Test Instrument & Measurement Setup

Test Notes

- 1. For CDMA mode, this device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.
- 2. For LTE mode, the device was tested under all modulations, RB sizes and offsets, and channel bandwidth configurations and the worst case emissions are reported with 1 RB.
- 3. This unit was tested with its standard battery.
- 4. 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.
- 5. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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Plot 7-40. Radiated Spurious Plot (CDMA BC10)

OPERATING FREQUENCY:		817.90	MHz
MODULATION SIGNAL:	CDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13.00	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]
1635.80	V	387	241	-69.45	3.59	-65.85	-52.9
2453.70	V	-	-	-66.77	4.17	-62.60	-49.6
3271.60	V	-	-	-67.30	5.69	-61.61	-48.6

Table 7-5. CDMA BC10 Radiated Spurious Data (Ch. 476)

823.10

MHz

OPERATING FREQUENCY:

CDMA

MODULATION SIGNAL:

DISTANCE: 3 meters

LIMIT: -13.00 dBm

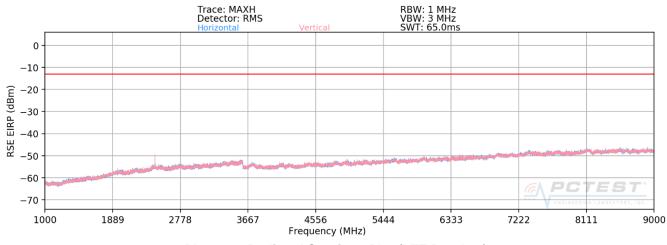
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1646.20	V	139	236	-69.42	3.60	-65.81	-52.8
2469.30	V	-	-	-66.87	4.21	-62.67	-49.7
3292.40	V	-	-	-67.30	5.76	-61.55	-48.5

Table 7-6. CDMA BC10 Radiated Spurious Data (Ch. 684)

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Plot 7-41. Radiated Spurious Plot (LTE Band 26)

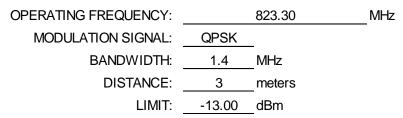
OPERATING FREQUENCY:		814.70	MHz
MODULATION SIGNAL:	QPSK	_	
BANDWIDTH:	1.4	MHz	
DISTANCE:	3	meters	
LIMIT:	-13.00	dBm	

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]
1629.40	V	118	135	-68.01	3.59	-64.42	-51.4
2444.10	V	194	233	-63.51	4.16	-59.35	-46.3
3258.80	V	-	-	-66.99	5.65	-61.34	-48.3
4073.50	V	-	-	-69.03	7.50	-61.53	-48.5

Table 7-7. Radiated Spurious Data (LTE Band 26 – Low Channel)

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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]
1646.60	V	117	130	-67.59	3.60	-63.98	-51.0
2469.90	V	180	227	-61.15	4.21	-56.94	-43.9
3293.20	V	-	-	-67.54	5.76	-61.78	-48.8
4116.50	V	-	-	-68.75	7.58	-61.17	-48.2

Table 7-8. Radiated Spurious Data (LTE Band 26 – High Channel)

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/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.

The frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency.

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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OPERATING FREQUENCY:	817,900,000	Hz
CHANNEL:	476	_
REFERENCE VOLTAGE:	4.25	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.25	- 30	817,900,110	110	0.0000134
100 %		- 20	817,899,966	-34	-0.0000042
100 %		- 10	817,899,978	-22	-0.0000027
100 %		0	817,900,087	87	0.0000106
100 %		+ 10	817,899,584	-416	-0.0000509
100 %		+ 20	817,900,043	43	0.0000053
100 %		+ 30	817,899,633	-367	-0.0000449
100 %		+ 40	817,899,975	-25	-0.0000031
100 %		+ 50	817,900,131	131	0.0000160
BATT. ENDPOINT	2.78	+ 20	817,900,186	186	0.0000227

Table 7-9. CDMA BC10 Frequency Stability Data

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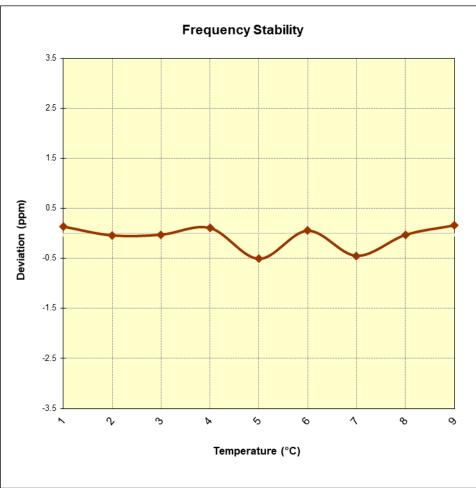


Figure 7-6. CDMA BC10 Frequency Stability Chart

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OPERATING FREQUENCY:	819,000,000	Hz
CHANNEL:	26740	-
REFERENCE VOLTAGE:	4.25	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.25	- 30	819,000,131	131	0.0000160
100 %		- 20	818,999,984	-16	-0.0000020
100 %		- 10	818,999,767	-233	-0.0000284
100 %		0	819,000,129	129	0.0000158
100 %		+ 10	818,999,581	-419	-0.0000512
100 %		+ 20	819,000,222	222	0.0000271
100 %		+ 30	818,999,628	-372	-0.0000454
100 %		+ 40	818,999,952	-48	-0.0000059
100 %		+ 50	819,000,095	95	0.0000116
BATT. ENDPOINT	2.78	+ 20	819,000,011	11	0.0000013

Table 7-10. LTE Band 26 Frequency Stability Data

FCC ID: ZNFL455DL		MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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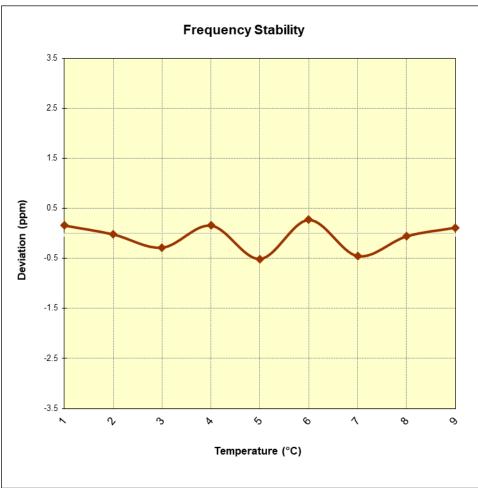


Figure 7-7. LTE Band 26 Frequency Stability Chart

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the LG Portable Handset FCC ID: ZNFL455DL complies with all the requirements of Parts 90 of the FCC rules.

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