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PART 22 MEASUREMENT REPORT

Applicant Name:

LG Electronics USA, Inc. 111 Sylvan Avenue, North Building Englewood Cliffs, NJ 07632 United States

Date of Testing:

4/26 - 5/19/2020 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M2004220073-02-R1.ZNF

FCC ID:

Applicant Name:

ZNFL355DL LG Electronics USA, Inc.

Application Type: Model: Additional Model(s):

EUT Type: FCC Classification: FCC Rule Part: Test Procedure(s): Certification LM-K300QM LG-L355DL, LMK300QM, LGL355DL, K300QM, L355DL, LG L355DL Portable Handset PCS Licensed Transmitter Held to Ear (PCE) 22 ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01, KDB 648474 D03 v01r04

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

This revised test report (S/N: 1M2004220073-02-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.

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



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			EF	RP	EIRP		Emission	
Mode	Bandwidth	Modulation	Range [MHz]	Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	Designator
GSM/GPRS	NI/A	GMSK	824.2 - 848.8	0.468	26.70	0.767	28.85	245KGXW
EDGE	N/A	8-PSK	824.2 - 848.8	0.136	21.32	0.222	23.47	247KG7W
WCDMA	N/A	Spread Spectrum	826.4 - 846.6	0.053	17.23	0.087	19.38	4M18F9W
CDMA	N/A	Spread Spectrum	824.70 - 848.31	0.149	21.72	0.244	23.87	1M28F9W
	15MHz (Dand	QPSK	831.5 - 841.5	0.048	16.86	0.080	19.01	13M5G7D
		16QAM	831.5 - 841.5	0.040	16.05	0.066	18.20	13M5W7D
	20 011iy)	64QAM	831.5 - 841.5	0.032	15.04	0.052	17.19	13M5W7D
		QPSK	829.0 - 844.0	0.048	16.80	0.078	18.95	9M02G7D
	10 MHz	16QAM	829.0 - 844.0	0.040	15.98	0.065	18.13	9M05W7D
		64QAM	829.0 - 844.0	0.031	14.89	0.051	17.04	9M04W7D
		QPSK	826.5 - 846.5	0.048	16.83	0.079	18.98	4M56G7D
LTE Band 26/5	5 MHz	16QAM	826.5 - 846.5	0.040	16.04	0.066	18.19	4M53W7D
		64QAM	826.5 - 846.5	0.031	14.95	0.051	17.10	4M52W7D
		QPSK	825.5 - 847.5	0.047	16.72	0.077	18.87	2M70G7D
	3 MHz	16QAM	825.5 - 847.5	0.039	15.95	0.065	18.10	2M70W7D
		64QAM	825.5 - 847.5	0.031	14.85	0.050	17.00	2M71W7D
		QPSK	824.7 - 848.3	0.047	16.76	0.078	18.91	1M10G7D
	1.4 MHz	16QAM	824.7 - 848.3	0.040	16.04	0.066	18.19	1M10W7D
		64QAM	824.7 - 848.3	0.030	14.76	0.049	16.91	1M10W7D

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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:ZNFL355DL**. 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 22.

Test Device Serial No.: 09870, 02440, 09979

2.2 Device Capabilities

This device contains the following capabilities:

CDMA, GSM/GPRS/EDGE, WCDMA/HSPA, LTE, 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 v03r01. See Section 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 v03r01) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

3.2 Cellular - Base Frequency Blocks



BLOCK 1: 869 - 880 MHz (A* Low + A) BLOCK 2: 880 - 890 MHz (B)

BLOCK 3:	890 – 891.5 MHz	(A* High)
BLOCK 4:	891.5 – 894 MHz	(B*)

3.3 Cellular - Mobile Frequency Blocks



BLOCK 1: 824 – 835 MHz (A* Low + A) BLOCK 2: 835 – 845 MHz (B)



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3.4 Radiated Power and Radiated Spurious Emissions

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

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

For radiated power measurements, substitution method is used per the guidance of ANSI/TIA-603-E-2016. A halfwave dipole is 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].

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

 $E_{[dB\mu V/m]} =$ Measured amplitude level_[dBm] + 107 + Cable Loss_[dB] + Antenna Factor_[dB/m] And EIRP_[dBm] = E_[dB\mu V/m] + 20logD - 104.8; where D is the measurement distance in meters.

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

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

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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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TEST EQUIPMENT CALIBRATION DATA 5.0

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx2	Licensed Transmitter Cable Set	4/9/2020	Annual	4/9/2021	LTx2
Agilent	E5515C	Wireless Communications Test Set		N/A		GB45360985
Agilent	N9038A	MXE EMI Receiver	7/17/2019	Annual	7/17/2020	MY51210133
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Espec	ESX-2CA	Environmental Chamber	6/13/2019	Annual	6/13/2020	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	2/22/2019 Biennial 2/22/2021		128338
Mini Circuits	TVA-11-422	RF Power Amp		N/A	QA1317001	
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator		N/A		11403100002
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		836371/0079
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	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
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
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Annual	10/3/2020	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	5/19/2018	Biennial	5/19/2020	A051107

Table 5-1. Test Equipment

Notes:

- 1. For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
- 2. Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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6.0 SAMPLE CALCULATIONS

GSM Emission Designator

Emission Designator = 250KGXW GSM BW = 250 kHz

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

EDGE Emission Designator

Emission Designator = 250KG7W EDGE BW = 250 kHz G = Phase Modulation 7 = Quantized/Digital Info W = Combination (Audio/Data)

CDMA Emission Designator

Emission Designator = 1M25F9W

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

WCDMA Emission Designator

Emission Designator = 4M16F9W

WCDMA BW = 4.16 MHz F = Frequency Modulation 9 = Composite Digital Info W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 8M62G7D LTE BW = 8.62 MHz G = Phase Modulation 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

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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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TEST RESULTS 7.0

7.1 Summary

Company Name:	LG Electronics USA, Inc.
FCC ID:	ZNFL355DL
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	GSM/GPRS/WCDMA/CDMA/LTE

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
0	Occupied Bandwidth	2.1049	RSS-139(2.3)	N/A	PASS	Section 7.2
JCTE	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	RSS-132(5.5)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of- band emissions	PASS	Sections 7.3, 7.4
IDNO	Transmitter Conducted Output Power	2.1046	RSS-132(5.4)	N/A	PASS	See RF Exposure Report
U	Frequency Stability	2.1055, 22.355	RSS-132(5.3)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
ATED	Effective Radiated Power / Equivalent Isotropic Radiated Power	22.913(a)(5)	RSS-132(5.4)	< 7 Watts max. ERP	PASS	Section 7.6
RADI	Radiated Spurious Emissions	2.1053, 22.917(a)	RSS-132(5.5)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions	PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

- All modes of operation and data rates were investigated. The test results shown in the following sections 1) 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.
- All conducted emissions measurements are performed with automated test software to capture the 4) corresponding plots necessary to show compliance. The measurement software utilized is PCTEST 2G/3G Automation Version 4.5, LTE Automation Version 5.3.

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7.2 Occupied Bandwidth

Test Overview

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 4.2

Test Settings

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

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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LTE Band 26/5

Keysight Spectrum Analyzer - O	ccupied BW								
LXI RL RF 50 S	Ω DC CORF	REC	SENSE:INT	6 500000 MHz	ALIGN AU	TO 02:21:47 P Radio Std	M May 22, 2020	Trace	/Detector
	NFE		Trig: Free Run	Avg H	old:>100/10	0			
,	#IFG	ain:Low	#Atten: 36 dB			Radio Dev	vice: BTS		
10 dB/div Ref 40.0	00 dBm				•				
20.0									
30.0								C	lear Write
20.0		mandow	manser and a for the	and the service of the	٦,				
10.0					1				
0.00	1				ų				
-10.0					thours	manner			Average
-20.0 papaper and a portion and						and the state	alan .		
-30.0							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
-40.0									Max Hold
-50.0									
Center 836.50 MHZ			#\/B\// 1	1 1/147		Span 3	07.50 IVIHZ		
Res DW JOURNZ				. 1 191612		300	sep mis		Min Hold
Occupied Band	dwidth		Tot	al Power	3	2.8 dBm			
	12 5		-						Detector
	15.5		2						Delector Peak▶
Transmit Freq Er	rror	-775 H	lz % o	f OBW Po	wer	99.00 %		Auto	Man
x dB Bandwidth		14.74 MH	z xdl	3	-7	26.00 dB			
MSG					STA	ATUS			

Plot 7-1. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB Configuration)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB Configuration)

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🔤 Keysight Spectrum Analyzer - Oc	cupied BW								
<mark>ιχι</mark> RL RF 50 Ω	DC CORRE	EC Ce	SENSE:INT	000 MHz	ALIGN AUTO	02:22:22 PI	May 22, 2020	Trace	/Detector
	NFE	Tri	g: Free Run	Avg Hold:	: 100/100	Ruulo Stu.	None		
	#IFGa	in:Low #A	tten: 36 dB			Radio Dev	ice: BTS		
10 dB/div Ref 40.0	0 dBm								
Log									
50.0								c	lear Write
20.0		mounder	enthe manual and the						
10.0									
0.00									_
-10.0					and at				Average
-20.0	Have Miren - Jan				ALL COLUMN	Relation	March 1		
-30.0							-W-Mahahat		
-40.0							`		Max Hold
-50.0									
Center 836.50 MHz			#\/B\M 4 4 M			Span 3	7.50 MHz		
Res DW JOURH2				INZ		SWE	eprins		Min Hold
Occupied Band	width		Total P	ower	30.7	dBm			
	12 50								Detector
	13.30								Detector Peak
Transmit Freq Er	ror	2.694 kHz	% of O	BW Powe	er 99	.00 %		Auto	Man
x dB Bandwidth	,	14.62 MHz	x dB		-26.0)0 dB			
100					074710				
MSG					STATUS				

Plot 7-3. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 64-QAM - Full RB Configuration)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz QPSK - Full RB Configuration)

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Keysight Spectrum Analyzer - Occupied	1 BW				
🗱 RL RF 50Ω DC	CORREC	SENSE:INT	ALIGN AUTO 01:39:09 P	M May 22, 2020	Trace/Detector
NEF	Trig:	Free Run Avg Hold:	: 100/100	. None	
	#IFGain:Low #Atte	n: 36 dB	Radio Dev	rice: BTS	
10 dB/div Ref 40.00 dB	Bm				
Log					
30.0					Clear Write
20.0	monum	mall man man man			
10.0					
0.00	/				
-10.0			La .		Average
-20.0	Hr ward		" www. wew play of the work of	John Marson	
-30.0				The second s	
-40.0					Max Hald
50.0					wax Hold
-30.0					
Center 836.50 MHz			Span 2	5.00 MHz	
Res BW 240 kHz	\$	#VBW 750 kHz	Swe	eep 1 ms	Min Hold
	-141-	Total Power	24.0 dDm		
Occupied Bandwid	ath	Total Fower	31.0 UBIII		
9	9.0469 MHz				Detector
	E 405 kHz				Peak► Auto Man
Transmit Freq Error	5.165 KHZ	% OF OBW POWE	er 99.00 %		Auto <u>Man</u>
x dB Bandwidth	9.845 MHz	x dB	-26.00 dB		
MSG			STATUS		

Plot 7-5. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 16-QAM - Full RB Configuration)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 64-QAM - Full RB Configuration)

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Keysight Spectrum Analyzer - Occupied	BW				
IXI RL RF 50 Ω DC	CORREC ←→→ Cente #IFGain:Low #Atte	sense:INT ar Freq: 836.500000 MHz Free Run Avg Hold m: 36 dB	ALIGN AUTO 01:35:09 Radio Sto : 100/100 Radio De	PM May 22, 2020 d: None vice: BTS	Trace/Detector
10 dB/div Ref 40.00 dt	Bm				
20.0		and and a second and a second			Clear Write
10.0 0.00 -10.0 -20.0			how when the second second	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Average
-40.0					MaxHold
Center 836.500 MHz Res BW 120 kHz	#	≇VBW 390 kHz	Span Sw	12.50 MHz eep 1 ms	Min Hold
Occupied Bandwig	dth 4.5638 MHz	Total Power	33.0 dBm		Detector Peak▶
Transmit Freq Error x dB Bandwidth	-14.887 kHz 5.071 MHz	% of OBW Powe x dB	er 99.00 % -26.00 dB		Auto <u>Man</u>
MSG			STATUS		

Plot 7-7. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz QPSK - Full RB Configuration)



Plot 7-8. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 16-QAM - Full RB Configuration)

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🔤 Keysight Spectrum Analyzer - Occupier	BW				
ιχ RL RF 50 Ω DC	CORREC Cent	SENSE:INT ter Freq: 836.500000 MHz	ALIGN AUTO 01:35:45 P Radio Std	M May 22, 2020 : None	Frequency
NFE	#IEGain:Low #Atte	:FreeRun Avg Hold en:36 dB	:>100/100 Radio Dev	vice: BTS	
	#I Gall.Low ta				
10 dB/div Ref 40.00 d	Bm				
200					Contor From
20.0					836 500000 MHz
10.0	man	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			000.000000 11112
0.00	/				
-10.0					
-20.0	~~~~		W. Vmm Many way	mon	
-30.0					
-40.0					
-50.0					
Center 836.500 MHz			Span 1	2.50 MHz	CE Oton
Res BW 120 kHz		#VBW 390 kHz	Swe	eep 1 ms	1.250000 MHz
Occupied Bandwi	dth	Total Power	30.8 dBm		<u>Auto</u> Man
Cocupied Ballan	1 52/1 MHz				
					Freq Offset
Transmit Freq Error	4.688 kHz	% of OBW Powe	er 99.00 %		0 HZ
x dB Bandwidth	5.011 MHz	x dB	-26.00 dB		
MSG			STATUS		

Plot 7-9. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 64-QAM - Full RB Configuration)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz QPSK - Full RB Configuration)

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🔤 Keysight Spectrum Analyzer - Oc	cupied BW									
LXI RL RF 50Ω	DC CORR	EC	SEN	NSE:INT		ALIGN AUT	01:31:01 Pl	May 22, 2020	Trac	e/Detector
	NFE		Trig: Free	eq. 000.000 eRun	Avg Hol	d: 100/100	Raulo Stu.	None		
	#IFGa	ain:Low	#Atten: 3	6 dB			Radio Dev	ice: BTS		
10 dB/div Ref 40.0	0 dBm									
200 J										
20.0									(Clear Write
20.0		markelinner	Mr. Marand	mon	many					
10.0										
0.00						{				Average
-10.0	a a man					Uning	weather an a			Average
-20.0 Min Martin and and and and and and and and and an								M.M. Balling		
-30.0										
-40.0										Max Hold
-50.0										
Center 936 500 MHz							Snan 7	500 MHz		
Res BW 68 kHz			#VE	W 220 k	Hz		Swee	500 Minz		Min Llold
										Min Hold
Occupied Band	lwidth			Total P	ower	3	1.5 dBm			
	2 702	21 MH	7							Detector
	2.1 02									Peak▶
Transmit Freq Er	ror	-923	Hz	% of OE	BW Pow	er	99.00 %		Auto	<u>Man</u>
x dB Bandwidth		2.947 MI	Hz	x dB		-2	26.00 dB			
MSG						PT				
MOG						517	103			

Plot 7-11. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 16-QAM - Full RB Configuration)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 64-QAM - Full RB Configuration)

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Keysight Spectrum Analyzer - Occupied	IBW						
<mark>(X)</mark> RL RF 50Ω DC	CORREC	SENSE:INT		01:26:31 P	M May 22, 2020	Trace	e/Detector
NFE	- -	Trig: Free Run	Avg Hold: 100/100	Raulo Stu	None		
	#IFGain:Low	#Atten: 36 dB		Radio Dev	ice: BTS		
10 dB/div Ref 30.00 df	3m						
20.0							
10.0	h	mon have a	m			C	lear Write
0.00	/		N				
10.0							
-10.0	الممر			man			Avorago
-20.0					WAAN A-I		Average
-30.0							
-40.0							
-50.0							Max Hold
-60.0							
Center 836 500 MHz				Snan 3	000 MHz		
Res BW 27 kHz		#VBW 91 kH	z	Sweep	3.933 ms		Min Hold
				-			Milling
Occupied Bandwi	dth	Total P	ower 32.8	3 dBm			
	1.0960 MH	Z					Detector
		_					Peak▶
Transmit Freq Error	-2.072 ki	Iz % of OE	SW Power 99	0.00 %		Auto	Man
x dB Bandwidth	1.309 MH	lz xdB	-26.	00 dB			
MSG			STATU	5			

Plot 7-13. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-14. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 16-QAM - Full RB Configuration)

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Keysight Spectrum Analyzer - Occupied BW					- ē 🔀
KL RF 50Ω DC	CORREC	SENSE:INT	ALIGN AUTO 01:27:	4 PM May 22, 2020	Trace/Detector
	Cent	ter Freq: 836.500000 MHz : Free Run AvalHa	Radio : ld: 100/100	std: None	indecid eteeter
NFE	#IFGain:Low #Att	en: 36 dB	Radio I	Device: BTS	
10 JD/JU Pof 20 00 dBm					
Log					
20.0					
10.0	m	man man market and the second	<u></u>		Clear Write
0.00	/		λ.		
0.00	کم		<u>\</u>		
-10.0					
-20.0 - Concord and and and and and and and and and an			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m	Average
-30.0					
-40.0					
70.0					
-50.0					Max Hold
-60.0					
Contor 936 500 MHz			Snar	2 000 MHz	
Res BM 27 kHz		#\/B\\(01 kHz	Swee	n 3.033 ms	
		WIDH STRIE	0000	5 0.000 mo	Min Hold
Occupied Bandwidt	n	Total Power	30.8 dBm		
Build Build Wild					
1.0	J986 MHZ				Detector
Transmit Frog Error	704 니~	% of OBW/ Boy	Nor 00.00 %		Peak▶ Auto Man
Fransmit Freq Error	/91 HZ	% OF OBW POV	vei 99.00 %		Man Man
x dB Bandwidth	1.311 MHz	x dB	-26.00 dB		
· · · · · · · · · · · · · · · · · · ·					
MSG			STATUS		

Plot 7-15. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 64-QAM - Full RB Configuration)

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GPRS Cell



Plot 7-16. Occupied Bandwidth Plot (GPRS, Ch. 190)



Plot 7-17. Occupied Bandwidth Plot (EDGE, Ch. 190)

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WCDMA Cell



Plot 7-18. Occupied Bandwidth Plot (WCDMA, Ch. 4183)

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CDMA Cell



Plot 7-19. Occupied Bandwidth Plot (CDMA, Ch. 384)

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7.3 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

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

Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

Test Notes

 Per Part 22 and RSS-132, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for 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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LTE Band 26/5

🔤 Ke	ysight Spe	ctrum A	nalyzer - Sw	ept SA									_	
l,XI R	L	RF	50 Ω	DC	CORREC		SE	NSE:INT	#Avg Ty	ALIGN AUTO	01:43:03 PI TRAC	M May 22, 2020	F	requency
				NFE	PNO: Fa IFGain:Lo	st 🖵 ow	Trig: Fre Atten: 2	e Run 0 dB		M	kr1 822.	30 MHz		Auto Tune
10 de	3/div	Ref	10.00	dBm							-42.	46 dBm		
0.00								.					42	Center Freq 6.500000 MHz
-10.0												DI 4, 40.00 JD-		
-20.0													3	Start Freq 0.000000 MHz
30.0												1,	82	Stop Freq 3.000000 MHz
-40.0														
-50.0													7 <u>Auto</u>	CF Step 9.300000 MHz Man
-60.0														Freq Offset
-/U.U														0 Hz
-80.0	N HANN	, l _{pere}	n Doord	li _{ng} (parti p		hri al	AND Distances	DAL MAN	n fulkat dan	, Lake Hill Character	ly a to the			Scale Type
Star	t 30.0	MHz	ير بالاأم يقديون	n in a cond	المعادية بمرجانا	فليعرب أدعدنا	r a cont à chu lie aite de saite	Carling Stationers and		an i fan den ear an fier	Stop 8	23.0 MHz	Log	Lin
#Re	s BW	100 k	Hz		#	VBW	300 kHz			Sweep 38	.06 ms (1	5861 pts)		
MSG										STATUS				

Plot 7-20. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-21. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

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Plot 7-22. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-23. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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🔤 Key	/sight Spe	ctrum Ar	nalyzer - Sv	vept SA									
l,XI RI	_	RF	50 \$	2 DC	CORREC	SEI	NSE:INT	#Avg Typ	ALIGN AUTO e: RMS	01:41:06 PM TRAC	May 22, 2020	Fr	equency
10 dE	3/div	Ref	10.00	NFE dBm	PNO: Fast IFGain:Low	Atten: 20) dB		N	/lkr1 849. -57.	40 MHz 59 dBm		Auto Tune
0.00												C 924	enter Freq .500000 MHz
-10.0 -20.0											DL1 -13.00 dBm	849	Start Freq .000000 MHz
-30.0 -40.0												1.000	Stop Freq 0000000 GHz
-50.0 -60.0	1											15 <u>Auto</u>	CF Step .100000 MHz Man
-70.0				u.								i	F req Offset 0 Hz
00.3	Verdla	und mai	uter and a start of the	AP 15 holy 19	hoffillelister plan	An Anthony	hadowlogh	holdhalandhulhuadh	alander wie aller	of the second second	pulliturally	:	Scale Type
Star #Res	t 0.849 BW	900 G 100 k	Hz Hz		#VBW	300 kHz			Sweep	Stop 1.00 7.248 ms (1000 GHz 3021 pts)	Log	Lin
MSG 🤇	Point	s char	iged; all	traces c	leared				STAT	US			

Plot 7-24. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-25. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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Keysight Spectrum Analyzer - Swept	SA				
LX/ RL RF 50 Ω	DC CORREC SE	#Avg Typ	ALIGN AUTO 01:44:52 P e: RMS TRAC	M May 22, 2020	Frequency
10 dB/div Ref 10.00 dB	E PNO: Fast Free IFGain:Low Atten: 2	ee Run 20 dB	Mkr1 823 -51.	.70 MHz 36 dBm	Auto Tune
0.00					Center Freq 427.000000 MHz
-20.0				DL1 -13.00 dBm	Start Freq 30.000000 MHz
-30.0					Stop Freq 824.000000 MHz
-60.0					CF Step 79.400000 MHz <u>uto</u> Man
-70.0					Freq Offset 0 Hz
			Million Interport of the post of the Interport		Scale Type
#Res BW 100 kHz	#VBW 3 <u>00 kH</u> z	z S	weep 38.11 ms (1	5881 pts)	
MSG			STATUS		

Plot 7-26. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-27. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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Plot 7-28. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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GSM/GPRS Cell

- Key	/sight Spe	ctrum	Analyzer - :	Swept SA										_	
l XI R	L	RF	50	Ω DC	COR	REC	SEN	ISE:INT	#Avg Typ	e: RMS	09	:34:46 AM TRACE	May 07, 2020	F	requency
				NFE	PN	IO:Fast 🕞	Trig: Free Atten: 30	e Run dB				TYPE DET			
											Mkr1	822.	75 MHz		Auto Tune
10 dE	3/div	Rei	f 20.00) dBm								-43.5	51 dBm		
LOG) Y								Contor From
10.0														42	6.500000 MHz
0.00															Start Fred
40.0														3	0.000000 MHz
-10.0													0L1 -13.00 dBm		
-20.0															Stop Fred
														82	3.000000 MHz
-30.0															
40.0													1,		CF Step
-40.0													-	7 Auto	9.300000 MHz Man
-50.0														Auto	Mari
	met a ten	الهاره	dia adapta	and Philippe	del asart	Area a dal ber	ter Apple of Manual	- Destroying the Pro-	and stand all south	adhaqab	الدير المركونية (population	nan felder fan de skaar Meester wat de skaar		Freg Offset
-60.0		<u></u>	<u>ے پر دیوامر اسم</u>	A state and some a		الدور يعامر والإستاذ والإلاية	م <mark>ار الله عالمان ال</mark> ي لون رعما به محمد . ا	Anna A Mada (Mala) (And	المتليبية فعارك أنتكث والملاط	ann an Intern	and a state of the second s	ind an inclusion			0 Hz
70.0															
-70.0															Scale Type
C.t.	4 20 0	Dala										4an 95	2.0.04	Log	Lin
star #Re	s BW	100	z kHz			#VBW	300 kHz		s	weep	38.06	ms (1	5861 pts)	109	<u></u>
MSG										ST	ATUS				

Plot 7-31. Conducted Spurious Plot (GPRS Ch. 128)



Plot 7-31. Conducted Spurious Plot (GPRS Ch. 128)

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🧧 Keysight Spectrum Analyzer - Swept SA	
(X RL RF 50 Ω DC CORREC SENSE:INT 09:35:24 AM May 07, 2020 #Avg Type: RMS TRACE	Frequency
NFE PNO: Fast Trig: Free Run Type Hwwww IFGain:Low Atten: 26 dB DET ANNNN	
Mkr1 2.472 5 GHz 10 dB/div Ref 15.00 dBm -33.20 dBm	Auto Tune
5.00	Center Freq 5.500000000 GHz
-5.00	Start Freq 1.000000000 GHz
-25.0 -35.0	Stop Freq 10.000000000 GHz
	CF Step 900.000000 MHz <u>Auto</u> Man
-66.0	Freq Offset 0 Hz
-75.0	Scale Type
Start 1.000 GHz Stop 10.000 GHz #VBW 3.0 MHz Sween 15.60 ms (18001 nts)	Log <u>Lin</u>

Plot 7-31. Conducted Spurious Plot (GPRS Ch. 128)



Plot 7-31. Conducted Spurious Plot (GPRS Ch. 190)

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🔤 Key	rsight Spec	trum Ana	ilyzer - Sw	ept SA										
l,XI RI	-	RF	50 Ω	DC	CORR	EC	SEN	ISE:INT	#Avg Typ	e: RMS	09:32:23 / TRA	M May 07, 2020 CE 1 2 3 4 5 6	F	requency
10 dE	3/div	Ref 2	20.00	NFE	PN0 IFGa	D: Fast G	Atten: 30	dB			Mkr1 903 -52	.95 MHz .25 dBm		Auto Tune
10.0													92	Center Freq 4.500000 MHz
0.00 -10.0												DL1 -13.00 dBm	84	Start Freq 9.000000 MHz
-20.0 -30.0													1.00	Stop Freq 00000000 GHz
-40.0 -50.0						1							1: <u>Auto</u>	CF Step 5.100000 MHz Man
-60.0	<u>ti fitore de la p</u>	haday relativity of	ngangid ki yina	ul singruhte	dana di persona di manana di m Na manana di	dal digen Upperter	in the second	ليناوين الملام	nyi yi in ilmayairiyi	gjilleyddynei lith	nelly and all all and a second	in daman yunayi		Freq Offset 0 Hz
-70.0											04 4.0		Log	Scale Type
star #Res	0.849 BW	00 GI 100 ki	lz			#VBW	/ 300 kHz			Sweep	5top 1.0 7.248 ms	(3021 pts)	Log	<u></u>
MSG 🤇	Point	s chang	jed; all	traces	cleare	d				STAT	TUS			

Plot 7-31. Conducted Spurious Plot (GPRS Ch. 190)



Plot 7-31. Conducted Spurious Plot (GPRS Ch. 190)

FCC ID: ZNFL355DL	PCTEST Peace to be part of @ rietner	PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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🔤 Keysight Spectrum Analyzer - S	wept SA									
LXI RL RF 50	ΩDC	CORREC	SEN	ISE:INT	#Avg Typ	e: RMS	09:36:45 A	M May 07, 2020	Fi	requency
	NFE	PNO: Fast IFGain:Low	Atten: 30	dB			DE	ANNNN		
10 dB/div Ref 20.00	dBm					N	Mkr1 773. -52.	35 MHz 13 dBm		Auto Tune
10.0									(427	Center Freq 7.000000 MHz
-10.0								DL1 -13.00 dBm	30	Start Freq 0.000000 MHz
-20.0									824	Stop Freq 4.000000 MHz
-40.0								<u></u> 1	79 <u>Auto</u>	CF Step 9.400000 MHz Man
-60.0 -60.0 <mark>naturation (hall habitation) (hiteration) (h</mark>	hi ji û sasayî kwî di ku	n all a statistic and a statist	e <mark>jejine benevne ben</mark>	PHONE DATA	n dilani ka Dapatelah dapate	and appropriate for the for	plitt hay payor the difference in and a second process of the second	an has an all the star a data dan da filinan		Freq Offset 0 Hz
-70.0										Scale Type
Start 30.0 MHz #Res BW 100 kHz		#VBW	300 kHz		s	weep (Stop 8 38.11 ms (1	24.0 MHz 5881 pts)	Log	Lin
MSG						STAT	rus			

Plot 7-31. Conducted Spurious Plot (GPRS Ch. 251)



Plot 7-31. Conducted Spurious Plot (GPRS Ch. 251)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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🔤 Key	/sight Spec	trum Analyze	r - Swept SA									
lxi r	L	RF	50 Ω DC	CORREC	SE Tria: Fre	NSE:INT	#Avg Typ	e: RMS	09:37:19	AM May 07, 2020	Fi	requency
10 dE	3/div	Ref 15.0	NFE 00 dBm	PNO: Fast G	Atten: 20	dB			Mkr1 1.6 -32	97 5 GHz 2.55 dBm		Auto Tune
5.00											(5.50	Center Freq 0000000 GHz
-5.00 -15.0										DL1 -13.00 dBm	1.00	Start Freq 0000000 GHz
-25.0 -35.0		↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓									10.00	Stop Freq 0000000 GHz
-45.0	and the second		the state of the s					i an an Africa an Aire	pagan Pangu Ang Ding Nanan Pa Ng Ang Ng	dav Nastyan Anglada Saadin ya Kiraani Mare	900 <u>Auto</u>	CF Step 0.000000 MHz Man
-65.U -65.0												Freq Offset 0 Hz
-75.0												Scale Type
Star #Re	t 1.000 s BW	GHz .0 MHz		#VBI	W 3.0 MHz		s	weep	Stop 1 15.60 ms	0.000 GHz (18001 pts)	Log	Lin
MSG								ST	ATUS			

Plot 7-31. Conducted Spurious Plot (GPRS Ch. 251)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	🕒 LG	Approved by: Quality Manager
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WCDMA Cell

- Ke	ysight Spe	trum Ar	alyzer - Sw	ept SA										
lxi R	L	RF	50 Ω	DC	CORRE	C	SEI	NSE:INT	#Ava Tvp	e: RMS	09:53:51 A	M May 07, 2020	F	requency
				NFE	PNO IFGai	:Fast 🕞 in:Low	Trig: Free Atten: 30	e Run) dB			TYI DI			Auto Tupo
10 di	3/div	Ref	20.00 (dBm							Mkr1 822. -32.	.00 MHz 24 dBm		Autorune
L09								Í						Center Freq
10.0													42	6.500000 MHz
0.00														Start Freq
-10.0												DL1 -13.00 dBm	3	0.000000 MHz
20.0														
-20.0												4	82	Stop Freq 3 000000 MHz
-30.0														
-40.0													7	CF Step
50.0													<u>Auto</u>	Man
-30.0														Fred Offset
-60.0								a set i an un contrata de de	مد. وي داديان المحمد الدرام و	Telle el de la g				0 Hz
-70.0										r lie, ha salakari araa				
														Scale Type
Star	t 30.0	MHz									Stop 8	23.0 MHz	Log	Lin
#Re	sBW	100 k	Hz			#VBW	/ 300 kHz		s	weep	38.06 ms (1	5861 pts)		
MSG										STA	TUS			

Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4132)



Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4132)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	🕞 LG	Approved by: Quality Manager
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🔤 Keysight Spectrum Analyzer - Sw	vept SA			
LX/ RL RF 50Ω	2 DC CORREC S	ENSE:INT #Ava Type	09:54:19 AM	May 07, 2020 Frequency
	NFE PNO: Fast Trig: Fr IFGain:Low Atten:	ee Run 20 dB	TYPI DE	
10 dB/div Ref 10.00 d	dBm		Mkr1 1.651 -48.2	5 GHz Auto Tune 21 dBm
0.00				Center Freq 5.500000000 GHz
-20.0				0L1-13.00 dem Start Freq 1.000000000 GHz
-30.0				Stop Freq 10.000000000 GHz
-50.0				CF Step 900.000000 MHz <u>Auto</u> Man
-70.0				Freq Offset 0 Hz
-80.0				Scale Type
Start 1.000 GHz #Res BW 1.0 MHz	#VBW 3.0 MH	z Si	Stop 10. weep 15.60 ms (1	8001 pts)
мsg 🗼 Points changed; all	traces cleared		STATUS	

Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4132)



Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4183)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	🕒 LG	Approved by: Quality Manager	
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🔤 Key	/sight Spe	ctrum /	Analyzer - S	wept SA										
lxi Ri	L	RF	50	Ω DC	CORR	EC	SEN	ISE:INT	#Avg Ty	pe: RMS	09:52:20 A	M May 07, 2020	F	requency
10 dE	3/div	Rei	20.00	NFE dBm	PN IFGa	0: Fast ⊆ ain:Low	Atten: 30	dB		ľ	Mkr1 849 -57.	.00 MHz 12 dBm		Auto Tune
Log 10.0													92	Center Freq 4.500000 MHz
0.00 -10.0												DL1 -13.00 dBm	84	Start Freq 9.000000 MHz
-20.0 -30.0													1.00	Stop Freq 00000000 GHz
-40.0 -50.0	1												1: <u>Auto</u>	CF Step 5.100000 MHz Man
-60.0	Marana and	nyahadar dag	lang ang dipinakang kana	agaillenna againfean a	*4*f6.0,0017-017.0	qdraifedi.orxAqdaadaa	and and a start of the start of	ካፈንሙቶ ችላታቁ	anon Noral angeland bering	e,ee,d-shatferfragerydd	1,22.0° 5 10 ⁷⁵ 2017 1, 161 1, 101 1	94. jonnalastistatura		Freq Offset 0 Hz
Star	t 0.84	900	GHz			<i>"</i> , " –					Stop 1.0	0000 GHz	Log	Scale Type Lin
#Re	SBW	100	KHZ	1.4	-	#VBW	300 kHz			Sweep	7.248 ms	(3021 pts)		
MSG Q	Point	s cha	nged; al	i traces	cieare	a				STAT	US			

Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4183)



Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4183)

FCC ID: ZNFL355DL		PCTEST PART 22 MEASUREMENT REPORT		Approved by: Quality Manager
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📥 Ke	ysight Spe	trum Ana:	lyzer - Swe	ept SA											
l,XI R	L	RF	50 Ω	DC	CORREC		SEN	Bun	#Avg T	ype: RMS	(09:55:12 A TRAC	M May 07, 2020	F	requency
10 dl	B/div	Ref 2	0.00 c	IBm	PNO: Fas IFGain:Lo	w A	Atten: 30	dB			Mkr	1 819 -61.	75 MHz 79 dBm		Auto Tune
10.0														42	Center Freq 7.000000 MHz
0.00 -10.0													DL1 -13.00 dBm	3	Start Freq 0.000000 MHz
-20.0 -30.0														82	Stop Freq 4.000000 MHz
-40.0 -50.0														7 <u>Auto</u>	CF Step 9.400000 MHz Man
-60.0 -70.0				a da sera di ana ang sera di s			epter til let tedel til						1		Freq Offset 0 Hz
10.0															Scale Type
Star #Re	t 30.0 s BW	MHz 100 kH	z		#\	/BW 30	0 kHz			Sweep	38.11	Stop 8 1 ms (1	24.0 MHz 5881 pts)	Log	Lin
MSG										ST	TATUS				

Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4233)



Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4233)

FCC ID: ZNFL355DL	PCTEST Peace to be part of @ rietner	PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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🔤 Keysight Sp	pectrum Analyzer - S	wept SA									
L <mark>XI</mark> RL	RF 50	ΩDC	CORREC	SEN	Run	#Avg Typ	e: RMS	09:55:40 A TRAC	M May 07, 2020	Fr	equency
10 dB/div	Ref 10.00	dBm	IFGain:Low	Atten: 20	dB		N	/kr1 1.69 -47.	1 5 GHz 20 dBm		Auto Tune
0.00										(5.50	Center Freq 0000000 GHz
-10.0									DL1 -13.00 dBm	1.00	Start Freq 0000000 GHz
-30.0										10.00	Stop Freq 0000000 GHz
-50.0				~~~	\sim	~~~			~~~	900 <u>Auto</u>	CF Step 0.000000 MHz Man
-70.0											Freq Offset 0 Hz
-00.0											Scale Type
Start 1.0 #Res BW	00 GHz 1.0 MHz		#VBW	3.0 MHz		s	weep	Stop 10 15.60 ms (1	.000 GHz 8001 pts)	Log	Lin
мsg 🗼 Poir	nts changed; a	ll traces c	eared				STA	TUS			

Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4233)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	🕒 LG	Approved by: Quality Manager
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A MANA POTENT				



CDMA Cell

🔤 Ke	ysight Spe	trum A	nalyzer - Swe	ept SA									
l,XI R	L	RF	50 Ω	DC	CORREC	SE	NSE:INT	#Ava Tvp	ALIGN AUTO	11:45:31 A	M May 22, 2020	F	requency
				NFE	PNO: Fast	Trig: Fre	e Run d B			TYI Di	PE A WWWWW A NNNN		
					IFGain:Low	Atten: 0	U GD		M	cr1 823	00 MHz		Auto Tune
10 di	3/div	Ref	20.00 c	IBm						-30.	22 dBm		
Log							T						
40.0													Center Freq
10.0												42	6.500000 MHz
0.00													
													Start Freq
-10.0											DL1 -13.00 dBm	3	0.000000 MHz
-20.0													Stop Freq
20.0												82	3.000000 MHz
-30.0													
-40.0												7	CF Step
												Auto	Man
-50.0	<u> </u>												
													Freq Offset
-60.0													0 Hz
-70.0													
	اليوني ا			اليال م	ور المارون الم	. J. II marks to takk and	لا لا الديدار ال	فالملاقية وتقرير والمرار		A CHARLES AND COM	P. Northall		Scale Type
Otor	PRATICIPAL OF		an generation and an a faire an	Control Markinson	a to faile and a state of a state	United Street Street	Callman Webs mi	فحمالة وأوراد فعاوي خلام رباد	in constant of stars from stars in a	educeration of		Log	Lin
star #Re	s BW 1	100 k	Hz		#VB	W 300 kHz		s	weep 38	5.00 8 .06 ms (1	5861 pts)	9	
MSG									STATUS	;			

Plot 7-31. Conducted Spurious Plot (CDMA Ch. 1013)



Plot 7-31. Conducted Spurious Plot (CDMA Ch. 1013)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	🕒 LG	Approved by: Quality Manager
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XX RL RF 50Ω DC CO	RREC SEN	SE:INT #Avg Type	ALIGN AUTO 11:46:01 A	M May 22, 2020	Frequency
NFE P IF	NO: Fast Trig: Free Gain:Low Atten: 20	eRun IdB	TY		
10 dB/div Ref 10.00 dBm			Mkr1 1.64 -46.	9 0 GHz 76 dBm	Auto Tune
0.00					Center Freq 5.50000000 GHz
-10.0				DL1 -13.00 dBm	Start Freq 1.00000000 GHz
-30.0					Stop Freq 10.00000000 GHz
-60.0		ان بالله بوران	. t. <u>u</u>		CF Step 900.000000 MHz Auto Man
-70.0 m lh/11 ft for ll ¹¹ hr an ll ¹ hr an	A A A A A A A A A A A A A A A A A A A	AN AN			Freq Offset 0 Hz
-80.0					Scale Type
Start 1.000 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz	s	Stop 10 weep 15.60 ms (1	.000 GHz	Log <u>Lin</u>
MSG Doints changed; all traces clear	red		STATUS		

Plot 7-31. Conducted Spurious Plot (CDMA Ch. 1013)



Plot 7-31. Conducted Spurious Plot (CDMA Ch. 384)

FCC ID: ZNFL355DL		BT PART 22 MEASUREMENT REPORT		Approved by: Quality Manager	
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🔤 Key	/sight Spec	trum An	alyzer - Sw	ept SA									
lxi r	L	RF	50 Ω	DC	CORREC	SE	NSE:INT	#Avg Typ	ALIGN AUTO	11:43:23 Al	May 22, 2020	Fre	equency
10 dE	3/div	Ref	10.00 c	NFE dBm	PNO: Fast IFGain:Low	Atten: 20) dB		N	/lkr1 881. -66.	55 MHz 60 dBm		Auto Tune
Log 0.00												C 924.	enter Freq 500000 MHz
-10.0 -20.0											DL1 -13.00 dBm	849.	Start Freq .000000 MHz
-30.0 -40.0												1.000	Stop Freq 0000000 GHz
-50.0 -60.0												15. <u>Auto</u>	CF Step 100000 MHz Man
-70.0				, '								F	F req Offset 0 Hz
Oto:		Mahal	www.	yal hayaday	etter and the second second	بوداد بالجللة وإمالو	albertere beingt	helmashelahahahahah	y m allinna ha	where the second second		Log	Scale Type
#Re	s BW 1	00 G	HZ HZ		#VBV	/ 300 kHz			Sweep	7.248 ms (3021 pt <u>s)</u>		
MSG									STAT	US			

Plot 7-31. Conducted Spurious Plot (CDMA Ch. 384)



Plot 7-31. Conducted Spurious Plot (CDMA Ch. 384)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	🕒 LG	Approved by: Quality Manager
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🔤 Key	sight Spectr	um Analy	/zer - Swep	ot SA								_	-
lxi RL	-	RF	50 Ω	DC	CORREC	SE Taiau Eas	NSE:INT	#Avg Typ	ALIGN AUT e: RMS	TO 11:51:33 A TRAC	M May 22, 2020	Fred	luency
10 dE	3/div	Ref 0.	• .00 dB	IFE M	PNO: Fast G IFGain:Low	Atten: 10) dB			Mkr1 823. -77.	60 MHz 95 dBm	A	uto Tune
-10.0											DL1 -13.00 dBm	Ce 427.0	nter Freq 00000 MHz
-20.0 + -30.0 +												S 30.0	Start Freq 00000 MHz
-40.0 -50.0												824.0	Stop Freq 00000 MHz
-60.0 -70.0												79.4 <u>Auto</u>	CF Step 00000 MHz Man
-80.0 -								ns. It it.i.init			1. 	Fr	e q Offset 0 Hz
-50.0	And Absorb	an a	har bereiten Lander ber	en an	eran in an	a na an	<mark>e singapapan internet.</mark> Daha sa sa shi shi sa	t det rycepter perfector	a na salatan da Tanggaran	a proprio de la procesión de la		S	cale Type
Star #Res	1 30.0 N 5 BW 10	IHz)0 kH	z		#VBV	V 300 kHz		s	weep	Stop 8 38.11 ms (1	24.0 MHz 5881 pts)	Log	Lin
MSG									STA	ATUS			

Plot 7-31. Conducted Spurious Plot (CDMA Ch. 777)



Plot 7-31. Conducted Spurious Plot (CDMA Ch. 777)

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Plot 7-31. Conducted Spurious Plot (CDMA Ch. 777)

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7.4 Band Edge Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
- 2. Span was set large enough so as to capture all out of band emissions near the band edge
- 3. RBW \geq 1% of the emission bandwidth
- 4. VBW \geq 3 x RBW
- 5. Detector = RMS
- 6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

Test Notes

 Per 22.917(b) and RSS-132(5.5), 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.

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LTE Band 26/5

🔤 Keysight Spectrum Analyzer - S	wept SA									
💢 R.L RF 50	ΩDC	CORREC	SEN	ISE:INT	#Avg Typ	ALIGN AUTO e: RMS	02:23:48 PI TRAC	1 May 22, 2020 E 1 2 3 4 5 6	F	requency
	NFE	PNO: Wide IFGain:Low	Atten: 36	dB			DE			
10 dB/div Ref 25.00	dBm					Mk	r1 821.9 -28.	36 MHz 95 dBm		Auto I une
15.0									824	Center Freq 4.000000 MHz
-5.00					*********		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Munner.	818	Start Freq 3.000000 MHz
-15.0		1						DL1 -13.00 dBm	830	Stop Freq 0.000000 MHz
-35.0	~~~~	~~~~	~~~~	and a second sec					<u>Auto</u>	CF Step 1.200000 MHz Man
-45.0										Freq Offset 0 Hz
-65.0										Scale Type
Center 824.000 MHz #Res BW 150 kHz		#VBW	470 kHz			Sweep 1	Span 1 .000 ms (2.00 MHz 1001 pts)	Log	Lin
MSG						STATUS	3			

Plot 7-29. Lower Band Edge Plot (LTE Band 26 - 15MHz QPSK – Full RB Configuration)



Plot 7-30. Upper Band Edge Plot (LTE Band 26 - 15MHz QPSK – Full RB Configuration)

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Keysight Spe	ectrum Analyzer - Sv	vept SA									
LXI RL	RF 50 \$	2 DC	CORREC	SE	NSE:INT	#Avg Tvp	ALIGN AUTO e: RMS	01:44:06 PM TRAC	May 22, 2020	F	requency
		NFE	PNO: Wide	Trig: Fre	e Run S dB	• • •		TYF			
			IFGain:Low	Atten: 0	UD .		Mk	r1 823 9	44 MHz		Auto Tune
10 dB/div	Ref 25.00	dBm					WIK	-30.1	25 dBm		
Log					Ť						
											Center Freq
15.0										82	4.000000 MHz
5.00											
5.00						A CONTRACTOR OF A CONTRACTOR OF A CONTRACTOR OF A CONTRACTOR OF A CONTRACTOR A CONT	ana a bAnnalor a	n in a suide de la suide de	and the second second		Start Freq
-5.00										82	0.000000 MHz
									DI1_13.00 dBm		
-15.0											Stop Freg
					5					82	B.000000 MHz
-25.0					1						
all and a second		energy when	and whe that whe	marymoura	Jul -						CF Step
-35.0 200000											800.000 kHz
-45.0										Auto	Man
-45.0											
-55.0											Freq Offset
											0 Hz
-65.0											
											Scale Type
Center 82	4.000 MHz							Span 8	.000 MHz	Log	Lin
#Res BW	100 kHz		#VB	W 300 kHz			Sweep 4	.000 ms (1001 pts)		
MSG							STATUS	5			





Plot 7-32. Upper Band Edge Plot (LTE Band 26/5 - 10MHz QPSK – Full RB Configuration)

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🔤 Keysight Spo	ectrum Analyzer - Sv	wept SA									
LXI RL	RF 50 9	Ω DC	CORREC	SEI	NSE:INT	#Avg Typ	ALIGN AUTO	01:37:19 P TRAC	M May 22, 2020	F	requency
10 dB/div	Ref 25.00	dBm	PNO: Wide ⊂⊾ IFGain:Low	Atten: 36	dB		М	kr1 824.0 -26.	00 MHz 89 dBm		Auto Tune
15.0						man	where we have the second secon			82	Center Freq 4.000000 MHz
-5.00									014_12.00 dBm	82	Start Freq 2.000000 MHz
-15.0					1					82	Stop Freq 6.000000 MHz
-35.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	v~~~	man	Mar William						<u>Auto</u>	CF Step 400.000 kHz Man
-55.0											Freq Offset 0 Hz
-05.0											Scale Type
Center 82 #Res BW	4.000 MHz 100 kHz		#VBW	300 kHz			Sweep	Span 4 2.000 ms (.000 MHz 1001 pts)	Log	Lin
MSG							STAT	rus			



Plot 7-33. Lower Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB Configuration)

Plot 7-34. Upper Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB Configuration)

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🔤 Key	ysight Spect	rum An	alyzer - Sw	ept SA										_	
lxi R	L	RF	50 Ω	DC	CORREC		SEI	NSE:INT	#Avg	ALIGN Type: RN	AUTO AS	01:33:20 P	M May 22, 2020 DE 1 2 3 4 5 6	F	requency
10 dE	3/div	Ref 2	25.00 (NFE dBm	PNO: Wi IFGain:L	ide 😱 ow	Atten: 36	e Run 6 dB			Mki	1 824.0 -22.	000 MHz 48 dBm		Auto Tune
15.0								www	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~;	normen -n-a	umun	82	Center Freq 4.000000 MHz
5.00 -5.00														82	Start Freq 2.000000 MHz
-15.0 -25.0								1					DL1 -13.00 dBm	82	Stop Freq 6.000000 MHz
-35.0 -45.0	Mar Mark	www	wingnah	ann l	un and and and and and and and and and an	han	Marghreen							<u>Auto</u>	CF Step 400.000 kHz Man
-55.0															Freq Offset 0 Hz
-65.U															Scale Type
Cen #Res	ter 824 s BW <u>1</u>	.000 00 kl	MHz Hz		#	VBW	300 kHz			Swe	ep <u>2</u>	Span 4 .000 m <u>s</u>	.000 MHz (1001 pt <u>s)</u>	Log	Lin
MSG											STATUS				



Plot 7-35. Lower Band Edge Plot (LTE Band 26/5 - 3MHz QPSK – Full RB Configuration)

Plot 7-36. Upper Band Edge Plot (LTE Band 26/5 - 3MHz QPSK – Full RB Configuration)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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Plot 7-37. Lower Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB Configuration)

Plot 7-38. Upper Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB Configuration)

FCC ID: ZNFL355DL		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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GSM/GPRS Cell



Plot 7-39. Lower Band Edge Plot (GPRS Cell - Ch. 128)



Plot 7-40. Upper Band Edge Plot (GPRS Cell – Ch. 251)

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WCDMA Cell



Plot 7-41. Lower Band Edge Plot (WCDMA Cell – Ch. 4132)



Plot 7-42. Upper Band Edge Plot (WCDMA Cell – Ch. 4233)

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CDMA Cell



Plot 7-43. Lower Band Edge Plot (CDMA Cell – Ch. 1013)



Plot 7-44. Upper Band Edge Plot (CDMA Cell – Ch. 777)

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7.5 Radiated Power (ERP)

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. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 - Section 5.2.1

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

Test Settings

- Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
- 2. RBW = 1 5% of the expected OBW, not to exceed 1MHz
- 3. VBW \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". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
- 8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
- 9. Trace mode = trace averaging (RMS) over 100 sweeps
- 10. The trace was allowed to stabilize

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Test Setup



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

Figure 7-4. Radiated Test Setup <1GHz

Test Notes

- 1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
- 2) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".
- 3) This device was tested under all RC and SO combinations and the worst case is reported with RC3/SO55 with "All Up" power control bits.
- 4) 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.
- 5) This unit was tested with its standard battery.
- 6) 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.

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Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
		831.5	Н	209.0	104.0	6.73	1 / 37	12.28	16.86	0.048	38.45	-21.59
15MHz	QPSK	836.5	Н	209.0	107.0	6.68	1/0	11.80	16.33	0.043	38.45	-22.12
(Band 26		841.5	Н	338.0	103.0	6.63	1 / 37	11.56	16.04	0.040	38.45	-22.41
only)	16-QAM	831.5	Н	209.0	104.0	6.73	1 / 37	11.47	16.05	0.040	38.45	-22.40
	64-QAM	831.5	Н	209.0	104.0	6.73	1 / 37	10.46	15.04	0.032	38.45	-23.41
		829.0	Н	209.0	104.0	6.80	1 / 25	12.15	16.80	0.048	38.45	-21.65
	QPSK	836.5	Н	209.0	107.0	6.68	1 / 25	11.85	16.38	0.043	38.45	-22.07
10 MHz		844.0	Н	338.0	103.0	6.66	1 / 25	11.63	16.14	0.041	38.45	-22.31
	16-QAM	829.0	Н	209.0	104.0	6.80	1 / 25	11.33	15.98	0.040	38.45	-22.47
	64-QAM	829.0	Н	209.0	104.0	6.80	1 / 25	10.24	14.89	0.031	38.45	-23.56
		826.5	Н	209.0	104.0	6.77	1 / 12	12.20	16.83	0.048	38.45	-21.62
	QPSK	836.5	Н	209.0	107.0	6.68	1 / 12	11.78	16.31	0.043	38.45	-22.14
5 MHz		846.5	Н	338.0	103.0	6.68	1 / 12	11.59	16.12	0.041	38.45	-22.33
5 MHz	16-QAM	826.5	Н	209.0	104.0	6.77	1 / 12	11.41	16.04	0.040	38.45	-22.41
	64-QAM	826.5	Н	209.0	104.0	6.77	1 / 12	10.32	14.95	0.031	38.45	-23.50
		825.5	Н	209.0	104.0	6.76	1/7	12.10	16.72	0.047	38.45	-21.73
	QPSK	836.5	Н	209.0	107.0	6.68	1/7	11.83	16.36	0.043	38.45	-22.09
3 MHz		847.5	Н	338.0	103.0	6.69	1/7	11.49	16.03	0.040	38.45	-22.42
	16-QAM	825.5	Н	209.0	104.0	6.76	1/7	11.33	15.95	0.039	38.45	-22.50
	64-QAM	825.5	Н	209.0	104.0	6.76	1/7	10.23	14.85	0.031	38.45	-23.60
		824.7	Н	209.0	104.0	6.76	1/0	12.15	16.76	0.047	38.45	-21.69
	QPSK	836.5	Н	209.0	107.0	6.68	1/3	11.75	16.28	0.042	38.45	-22.17
1.4 MHz		848.3	Н	338.0	103.0	6.70	1/3	11.44	15.99	0.040	38.45	-22.46
	16-QAM	824.7	H	209.0	104.0	6.76	1/0	11.43	16.04	0.040	38.45	-22.41
	64-QAM	824.7	H	209.0	104.0	6.76	1/0	10.15	14.76	0.030	38.45	-23.69
	QPSK (Opp. Pol.)	831.5	V	325.0	321.0	6.73	1/37	8.34	12.92	0.020	38.45	-25.53

Table 7-45. ERP Data (LTE Band 26/5)

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]
824.20	GSM850	Н	348	51	22.10	6.75	26.70	0.468	38.45	-11.75
836.60	GSM850	Н	362	31	22.05	6.68	26.58	0.455	38.45	-11.87
848.80	GSM850	Н	304	64	20.83	6.71	25.39	0.346	38.45	-13.07
824.20	GSM850	V	369	269	18.81	6.75	23.41	0.219	38.45	-15.04
824.20	EDGE850	Н	348	51	16.72	6.75	21.32	0.136	38.45	-17.13
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Table 7-46. ERP Data (GPRS Cell)

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]
826.40	WCDMA850	V	174	205	13.01	6.37	17.23	0.053	38.45	-21.22
836.60	WCDMA850	V	142	177	12.44	6.38	16.67	0.046	38.45	-21.78
846.60	WCDMA850	V	254	225	12.58	6.48	16.91	0.049	38.45	-21.54
826.40	WCDMA850	Н	139	190	12.55	6.38	16.78	0.048	38.45	-21.67

Table 7-47. ERP Data (WCDMA Cell)

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]
824.70	CDMA850	V	216	219	16.64	6.76	21.25	0.133	38.45	-17.21
836.52	CDMA850	V	141	211	17.19	6.68	21.72	0.149	38.45	-16.73
848.31	CDMA850	V	205	205	16.79	6.70	21.34	0.136	38.45	-17.11
836.52	CDMA850	Н	229	322	15.41	6 .68	19.94	0.099	38.45	-18.51

Table 7-48. ERP Data (CDMA Cell)

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7.6 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 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

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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Test Setup

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



Figure 7-6. Test Instrument & Measurement Setup >1 GHz

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Test Notes

- Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
 b) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
 d) EIRP (dBm) = E(dBµV/m) + 20logD 104.8; where D is the measurement distance in meters.
- 2) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
- 3) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".
- 4) For CDMA, 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.
- 5) 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.
- 6) This unit was tested with its standard battery.
- 7) 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.
- 8) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 9) 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.
- 10) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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LTE Band 26/5





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Bandwidth (MHz):	15
Frequency (MHz):	831.5
RB / Offset:	1 / 37

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1663.0	Н	112	120	-67.15	-6.25	33.60	-61.65	-13.00	-48.65
2494.5	Н	139	205	-60.58	-3.07	43.35	-51.91	-13.00	-38.91
3326.0	Н	-	-	-73.72	0.55	33.83	-61.43	-13.00	-48.43
4157.5	Н	-	-	-76.87	2.37	32.50	-62.76	-13.00	-49.76

Table 7-2. Radiated Spurious Data (LTE Band 26/5 – Low Channel)

Bandwidth (MHz):	15
Frequency (MHz):	836.5
RB / Offset:	1/37

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.0	Н	113	26	-71.81	-6.21	28.98	-66.27	-13.00	-53.27
2509.5	Н	112	216	-72.32	-2.57	32.11	-63.14	-13.00	-50.14
3346.0	Н	-	-	-73.89	0.79	33.90	-61.36	-13.00	-48.36
4182.5	Н	-	-	-76.84	2.47	32.63	-62.63	-13.00	-49.63

Table 7-3. Radiated Spurious Data (LTE Band 26/5 – Mid Channel)

Bandwidth (MHz): Frequency (MHz): RB / Offset:	1 84 1 /	5 1.5 37							
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1683.00	Н	159	110	-69.12	-6.20	31.68	-63.58	-13.00	-50.58
2524.50	Н	136	209	-59.02	-2.05	45.93	-49.33	-13.00	-36.33
3366.00	Н	-	-	-73.69	0.74	34.05	-61.21	-13.00	-48.21
4207.50	Н	-	-	-77.29	2.35	32.06	-63.20	-13.00	-50.20

Table 7-4. Radiated Spurious Data (LTE Band 26/5 – High Channel)

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GSM/GPRS Cell



Plot 7-50. Radiated Spurious Plot (GPRS Cell)

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Mode:	GPRS 1 Tx Slot
Channel:	128
Frequency (MHz):	824.2

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1648.4	Н	121	36	-53.73	-6.38	46.89	-48.36	-13.00	-35.36
2472.6	Н	-	-	-62.79	-2.95	41.26	-54.00	-13.00	-41.00
3296.8	Н	-	-	-65.11	1.00	42.89	-52.37	-13.00	-39.37

Table 7-5. Radiated Spurious Data (GPRS Cell – Low Channel)

Mode:	GPRS 1 Tx Slot
Channel:	190
Frequency (MHz):	836.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.2	Н	156	131	-54.51	-6.21	46.28	-48.97	-13.00	-35.97
2509.8	Н	-	-	-59.42	-2.55	45.03	-50.23	-13.00	-37.23
3346.4	Н	-	-	-65.33	0.79	42.46	-52.79	-13.00	-39.79
4183.0	Н	-	-	-68.98	2.47	40.49	-54.77	-13.00	-41.77

Table 7-6. Radiated Spurious Data (GPRS Cell – Mid Channel)

Mode:	GPRS 1	1 Tx Slot							
Channel:	2	51							
Frequency (MHz):	84	8.8							
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1697.6	Н	113	130	-56.30	- <mark>5.6</mark> 5	45.05	-50.21	-13.00	-37.21
2546.4	Н	395	192	-62.73	-1.83	42.44	-52.82	-13.00	-39.82
3395.2	Н	-	-	-65.20	0.34	42.14	-53.11	-13.00	-40.11

Table 7-7. Radiated Spurious Data (GPRS Cell – High Channel)

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WCDMA Cell



Plot 7-51. Radiated Spurious Plot (WCDMA Cell)

Mode:	WCDMA RMC
Channel:	4132
Frequency (MHz):	826.4

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1652.8	Н	-	-	-69.41	-6.34	31.25	-64.01	-13.00	-51.01
2479.2	Н	116	222	-63.94	-3.12	39.94	-55.32	-13.00	-42.32
3305.6	Н	-	-	-69.13	0.71	38.58	-56.68	-13.00	-43.68
4132.0	Н	-	-	-70.56	2.30	38.74	-56.52	-13.00	-43.52

Table 7-8. Radiated Spurious Data (WCDMA Cell – Low Channel)

WCDMA RMC
4183
836.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.2	Н	-	-	-69.49	-6.21	31.30	-63.95	-13.00	-50.95
2509.8	Н	-	-	-68.76	-2.55	35.69	-59.57	-13.00	-46.57

Table 7-9. Radiated Spurious Data (WCDMA Cell – Mid Channel)

Mode:	WCDMA RMC
Channel:	4233
Frequency (MHz):	846.6

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1693.2	Н	-	-	-69.66	-5.84	31.50	-63.76	-13.00	-50.76
2539.8	Н	-	-	-69.42	-1.84	35.74	-59.52	-13.00	-46.52
3386.4	Н	-	-	-69.55	0.37	37.82	-57.43	-13.00	-44.43
4233.0	Н	-	-	-70.84	2.28	38.44	-56.81	-13.00	-43.81

Table 7-10. Radiated Spurious Data (WCDMA Cell – High Channel)

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CDMA Cell



Plot 7-52. Radiated Spurious Plot (CDMA Cell)

Mode:	CDMA
Channel:	1013
Frequency (MHz):	824.7

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1649.40	Н	365	9	-70.29	0.49	37.20	-58.05	-13.00	-45.05
2474.10	Н	-	-	-70.86	5.01	41.15	-54.10	-13.00	-41.10
3298.80	Н	-	-	-71.60	5.74	41.14	-54.12	-13.00	-41.12
4123.50	Н	-	-	-71.86	7.64	42.78	-52.48	-13.00	-39.48
4948.20	Н	-	-	-72.31	8.99	43.68	-51.58	-13.00	-38.58

Table 7-11. Radiated Spurious Data (CDMA Cell – Low Channel)

Mode:	CDMA
Channel:	384
Frequency (MHz):	836.52

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.04	Н	269	124	-63.28	0.81	44.53	-50.72	-13.00	-37.72
2509.56	Н	-	-	-70.19	5.03	41.84	-53.41	-13.00	-40.41
3346.08	Н	-	-	-71.47	6.09	41.62	-53.64	-13.00	-40.64
4182.60	Н	-	-	-72.48	7.74	42.26	-53.00	-13.00	-40.00
5019.12	Н	-	-	-72.43	9.11	43.68	-51.58	-13.00	-38.58

Table 7-12. Radiated Spurious Data (CDMA Cell – Mid Channel)

Mode:	CD	MA							
Channel:	7	77							
Frequency (MHz):	848	3.31							
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1696.62	H	204	7	-70.43	1.01	37.58	-57.68	-13.00	-44.68
2544.93	H	-	-	-72.46	4.99	39.53	-55.72	-13.00	-42.72
3393.24	Н	-	-	-73.43	6.83	40.40	-54.86	-13.00	-41.86
4241.55	Н	-	-	-73.11	6.46	40.35	-54.91	-13.00	-41.91
5089.86	Н	-	-	-72.36	8.99	43.63	-51.63	-13.00	-38.63
5938. <mark>1</mark> 7	Н	-	-	-74.56	12.59	45.03	-50.22	-13.00	-37.22

Table 7-13. Radiated Spurious Data (CDMA Cell – High Channel)

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7.7 Frequency Stability / Temperature Variation

Test Overview and Limit

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

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 22 and RSS-132, 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).
- 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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LTE Band 26/5

LTE Band 26/5									
	Operating F	requency (Hz):	836,50	00,000					
	Ref.	Voltage (VDC):	3.	85					
		Deviation Limit:	± 0.00025%	or 2.5 ppm					
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)				
		- 30	836,499,902	256	0.0000306				
		- 20	836,499,804	158	0.0000189				
		- 10	836,499,649	3	0.0000004				
		0	836,499,950	304	0.0000363				
100 %	3.85	+ 10	836,500,387	741	0.0000886				
		+ 20 (Ref)	836,499,646	0	0.0000000				
		+ 30	836,499,512	-134	-0.0000160				
		+ 40	836,500,178	532	0.0000636				
		+ 50	836,500,013	367	0.0000439				
Battery Endpoint	2.80	+ 20	836,499,690	44	0.0000053				

Table 7-9. LTE Band 26/5 Frequency Stability Data



Table 7-9. LTE Band 26/5 Frequency Stability Chart

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GSM/GPRS Cell

GSM/GPRS Cellular									
	Operating F	requency (Hz):	836,60	00,000]				
	Ref.	Voltage (VDC):	3.	85]				
		Deviation Limit:	± 0.00025%	or 2.5 ppm					
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)				
		- 30	836,599,863	223	0.0000267				
		- 20	836,599,745	105	0.0000126				
		- 10	836,599,509	-131	-0.0000157				
		0	836,600,184	544	0.0000650				
100 %	3.85	+ 10	836,599,773	133	0.0000159				
		+ 20 (Ref)	836,599,640	0	0.0000000				
		+ 30	836,599,906	266	0.0000318				
		+ 40	836,600,459	819	0.0000979				
		+ 50	836,600,441	801	0.0000957				
Battery Endpoint	2.80	+ 20	836,600,046	406	0.0000485				

Table 7-9. GSM/GPRS Cell Frequency Stability Data



Table 7-9. GSM/GPRS Cell Frequency Stability Chart

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WCDMA Cell

WCDMA Cellular									
	Operating F	requency (Hz):	836,60	00,000					
	Ref.	Voltage (VDC):	3.	85					
		Deviation Limit:	± 0.00025%	or 2.5 ppm					
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)				
		- 30	836,600,170	625	0.0000747				
		- 20	836,600,178	633	0.0000757				
		- 10	836,599,940	395	0.0000472				
		0	836,600,015	470	0.0000562				
100 %	3.85	+ 10	836,599,787	242	0.0000289				
		+ 20 (Ref)	836,599,545	0	0.0000000				
		+ 30	836,599,665	120	0.0000143				
		+ 40	836,600,267	722	0.0000863				
		+ 50	836,599,529	-16	-0.0000019				
Battery Endpoint	2.80	+ 20	836,600,244	699	0.0000836				

Table 7-9. WCDMA Cell Frequency Stability Data



Table 7-9. WCDMA Cell Frequency Stability Chart

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CDMA Cell

CDMA Cellular									
	Operating F	requency (Hz):	836,520,000						
	Ref. Voltage (VDC):		3.85						
	Deviation Limit:		± 0.00025% or 2.5 ppm						
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)				
100 %	3.85	- 30	836,519,595	-191	-0.0000228				
		- 20	836,520,354	568	0.0000679				
		- 10	836,519,783	-3	-0.0000004				
		0	836,519,920	134	0.0000160				
		+ 10	836,520,219	433	0.0000518				
		+ 20 (Ref)	836,519,786	0	0.0000000				
		+ 30	836,520,260	474	0.0000567				
		+ 40	836,520,085	299	0.0000357				
		+ 50	836,520,255	469	0.0000561				
Battery Endpoint	2.80	+ 20	836,519,635	-151	-0.0000181				

Table 7-9. CDMA Cell Frequency Stability Data



Table 7-9. CDMA Cell 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: ZNFL355DL** complies with all the requirements of Part 22 of the FCC rules.

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