

PCTEST

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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:

8/26 - 9/25/2020 **Test Site/Location:** PCTEST Lab. Columbia, MD, USA **Test Report Serial No.:** 1M2009170151-08.ZNF

FCC ID:

Applicant Name:

ZNFK200TM

LG Electronics USA, Inc.

Application Type: Model: Additional Model(s): EUT Type: FCC Classification: FCC Rule Part: Test Procedure(s):

Certification LM-K200TM LMK200TM, K200TM Portable Handset PCS Licensed Transmitter Held to Ear (PCE) 22 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.

Randy Ortanez President



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			T., F.,	E	RP	Ell	RP	Emission
Mode Bandwid	Bandwidth		Tx Frequency Range [MHz]	Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	Designator
GSM/GPRS	N/A	GMSK	824.2 - 848.8	0.392	25.93	0.643	28.08	242KGXW
EDGE	N/A	8-PSK	824.2 - 848.8	0.124	20.92	0.203	23.07	238KG7W
WCDMA	N/A	Spread Spectrum	826.4 - 846.6	0.070	18.42	0.114	20.57	4M13F9W
		QPSK	831.5 - 841.5	0.099	19.96	0.162	22.11	13M5G7D
	15MHz (Band 26 only)	16QAM	831.5 - 841.5	0.089	19.52	0.147	21.67	13M5W7D
		64QAM	831.5 - 841.5	0.059	17.68	0.096	19.83	13M5W7D
		QPSK	829.0 - 844.0	0.100	20.00	0.164	22.15	9M01G7D
	10 MHz	16QAM	829.0 - 844.0	0.093	19.70	0.153	21.85	9M01W7D
		64QAM	829.0 - 844.0	0.069	18.38	0.113	20.53	9M01W7D
		QPSK	826.5 - 846.5	0.100	20.00	0.164	22.15	4M57G7D
LTE Band 26/5	5 MHz	16QAM	826.5 - 846.5	0.104	20.16	0.170	22.31	4M57W7D
		64QAM	826.5 - 846.5	0.067	18.27	0.110	20.42	4M57W7D
		QPSK	825.5 - 847.5	0.106	20.26	0.174	22.41	2M71G7D
	3 MHz	16QAM	825.5 - 847.5	0.097	19.89	0.160	22.04	2M71W7D
		64QAM	825.5 - 847.5	0.062	17.94	0.102	20.09	2M72W7D
		QPSK	824.7 - 848.3	0.101	20.05	0.166	22.20	1M11G7D
	1.4 MHz	16QAM	824.7 - 848.3	0.095	19.78	0.156	21.93	1M11W7D
		64QAM	824.7 - 848.3	0.062	17.91	0.101	20.06	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:ZNFK200TM**. 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.: 18852, 19322, 18860

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, Bluetooth (1x, EDR, LE)

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 3.2 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 EWEMI 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 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 $P_{g \text{ [dBm]}}$ – 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:

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

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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5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx2	Licensed Transmitter Cable Set	4/9/2020	Annual	4/9/2021	LTx2
-	LTx3	Licensed Transmitter Cable Set	10/30/2019	Annual	10/30/2020	LTx3
Anritsu	MT8821C	Radio Communication Analyzer	3/10/2020	Annual	3/10/2021	6200901190
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/14/2019	Biennial	2/14/2021	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
ETS-Lindgren	3115	Double Ridged Guide Horn 750MHz - 18GHz	3/12/2020	Biennial	3/12/2022	150693
Hewlett-Packard	8648D	(9kHz-4GHz) Signal Generator	6/23/2020	Annual	6/23/2021	3613A00315
Keysight Technologies	N9020A	MXA Signal Analyzer	8/14/2020	Annual	8/14/2021	US46470561
Keysight Technologies	N9038A	MXE EMI Receiver	8/11/2020	Annual	8/11/2021	MY51210133
Mini Circuits	TVA-11-422	RF Power Amp	N/A		QA1317001	
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A		11208010032	
Rohde & Schwarz	CMU200	Base Station Simulator	N/A		107826	
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		836536/0005
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	11/1/2019	Annual	11/1/2020	100040
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	TC-TA18	Cross-Pol Antenna 400MHz-18GHz	7/8/2020	Biennial	7/8/2022	101058
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/10/2020	Annual	2/10/2021	102134
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511
Sunol Science	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	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

7 = Quantized/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

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

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

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7.0 TEST RESULTS

7.1 Summary

Company Name:	LG Electronics USA, Inc.
FCC ID:	ZNFK200TM
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	GSM/GPRS/EDGE/WCDMA/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
JCTED	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
CONDU	Transmitter Conducted Output Power	2.1046	RSS-132(5.4)	N/A	PASS	See RF Exposure Report
o	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
RADIA	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:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) All conducted emissions measurements are performed with automated test software to capture the 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

12:42:00 AM Sep 09, 2020 Radio Std: None ALIGN AUTO Trace/Detector Center Freq: 836.500000 MHz Avg|Hold: 100/100 Trig: Free Run #Atten: 36 dB Radio Device: BTS #IFGain:Low Ref 40.00 dBm 10 dB/div Log **Clear Write** Average Max Hold Center 836.50 MHz Span 37.50 MHz #Res BW 360 kHz #VBW 1.1 MHz Sweep 1 ms **Min Hold Occupied Bandwidth** Total Power 31.9 dBm 13.475 MHz Detector Peak▶ Transmit Freq Error -9.327 kHz % of OBW Power 99.00 % Auto Man x dB Bandwidth 14.77 MHz x dB -26.00 dB STATUS Plot 7-1. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB Configuration) Keysight Spectrum Analyzer - Occupied BV r X 12:42:16 AM Sep 09, 2020 SENSE:IN ALIGN AUTO Center Freq: 836.500000 MHz Trig: Free Run Avg|He Trace/Detector Radio Std: None Avg|Hold: 100/100 Radio Device: BTS #IFGain:Low #Atten: 36 dB l0 dB/div Ref 40.00 dBm .og **Clear Write** Average "JJU Max Hold Center 836.50 MHz #Res BW 360 kHz Span 37.50 MHz #VBW 1.1 MHz Sweep 1 ms Min Hold 32.0 dBm **Total Power Occupied Bandwidth** 13.473 MHz Detector Peak▶ **Transmit Freq Error** -9.217 kHz Auto % of OBW Power 99.00 % Man -26.00 dB x dB Bandwidth 14.77 MHz x dB STATUS

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

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🔤 Keysight Sp	oectrum Analyzer - Occu										
l XI	RF 50 Ω	DC COR	REC		NSE:INT reg: 836.500	000 MHz	ALIGN AUTO	12:42:31 A	M Sep 09, 2020	Trac	e/Detector
				Trig: Fre	e Run		d: 100/100				
		#IFG	ain:Low	#Atten: 3	6 dB			Radio Dev	ice: BTS		
10 dB/div	Ref 40.00	dBm									
Log 30.0											
20.0										(Clear Write
			month	and the state of t	ware want	mon					
10.0			1								
0.00											
-10.0	1. control alphalpharter Labor	whenman					with the with the	why why when the			Average
	way a thin when when a start							A THE PARTY OF	Man Land		
-30.0									www.wul		
-40.0											Max Hold
-50.0											
Centor 9								Onon 2	2-60-04U-		
	36.50 MHz / 360 kHz			#\/F	3W 1.1 M	Hz			7.50 MHz ep 1 ms		
WINC - 11	500 KHZ					1112			op rino		Min Hold
Occu	pied Bandv	vidth			Total P	ower	32.3	3 dBm			
			87 MI								Detector
		13.4									Peak ►
Trans	mit Freq Erro	or	-4.518	kHz	% of O	3W Pow	ver 99	9.00 %		Auto	<u>Man</u>
x dB F	Bandwidth		14.86 N	/Hz	x dB		-26	00 dB			
	Junawiatin										
MSG							STATU	S			

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					
ΙΧ΄ RF 50 Ω DC	÷		ALIGN AUTO 0000 MHz Avg Hold: 100/100	12:36:47 AM Sep 09, 2020 Radio Std: None	Trace/Detector
	#IFGain:Low	#Atten: 36 dB		Radio Device: BTS	7
10 dB/div Ref 40.00 dE	3m				
Log 30.0					
20.0		Land and a strange second			Clear Write
10.0					
0.00			μ		A
-10.0					Average
-30.0 Manshman	www		howers	hander of the second	
-40.0					Max Hold
-50.0					maxinora
Center 836.50 MHz				Span 25.00 MHz	
#Res BW 240 kHz		#VBW 750 k	(Hz	Sweep 1 ms	
Occupied Bandwig	dth	Total P	ower 31.	9 dBm	
	.0060 MI	17			Detector
				0.00 %	Peak▶ Auto Man
Transmit Freq Error	1.073			9.00 %	Auto <u>Man</u>
x dB Bandwidth	10.03 N	IHz x dB	-26	.00 dB	
MSG			STATU	JS	

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 Sp	pectrum Analyz	zer - Occi	upied BW	v									
L <mark>XI</mark>	RF			CORREC			NSE:INT		ALIGN AUTO	12:31:34 A Radio Std	AM Sep 09, 2020	Tra	ce/Detector
							req: 836.500 e Run		ld: 100/100	Radio Stu	: None		
				#IFGain:		#Atten: 3				Radio Dev	vice: BTS		
10 dB/div	Pof	40.00	dBn										
Log		40.00											
30.0													
20.0													Clear Write
					marine	~~~~	mm	many					
10.0													
0.00													
-10.0													Average
-20.0													
	mont	m	www						A	mp m m			
-30.0													
-40.0				417									Max Hold
-50.0													
	36.500 M										12.50 MHz		
#Res BW	V 120 kH:	z				#VF	BW 390 k	kHz		Swe	eep 1 ms		Min Hold
Occu	ipied Ba	and	widt	h			Total P	ower	31.	.8 dBm			
					4 MH								Detector
				912-		12							Detector Peak▶
Trans	smit Fred	a Erre	or	-20).257 kl	Hz	% of O	BW Pow	ver 9	9.00 %		Auto	Man
x dB E	Bandwid	lth		5.	.076 MI	Hz	x dB		-26	i.00 dB			
MSG									STATU	JS			

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



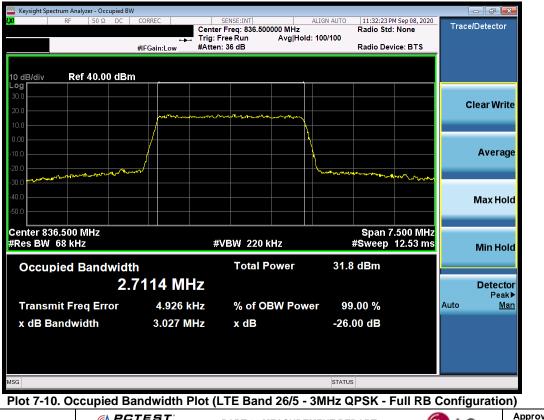
Plot 7-8. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 16-QAM - Full RB Configuration)

FCC ID: ZNFK200TM	POLICE ST*	PART 22 MEASUREMENT REPORT	Approved by: Quality Manager	
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🔤 Keysight Spectrum Analyzer	r - Occupied BW									- 6 -
L <mark>XI</mark> RF	50 Ω DC CC	ORREC		NSE:INT rea: 836.500		ALIGN AUTO	12:32:38 Al Radio Std:	M Sep 09, 2020	Trace	e/Detector
		- -	. Trig: Free	e Run		d:>100/100				
	#IF	FGain:Low	#Atten: 3	6 dB			Radio Dev	ice: BTS		
	10.00 dBm									
Log 30.0		<u>ا معم ا</u> ا								
20.0		<u>کی ا</u> ا							C	Clear Write
			~~~~~~~~	mm	mm					
10.0						1				
0.00										
-10.0	A C C C C C					mandan	Mur Vanna			Average
-10.0 -20.0	YAUNY SW	<u>کی ا</u> ر						mon - man		
-30.0										
-40.0		<u>ک ک</u>								Max Hold
-50.0										
Center 836.500 MH							- Cnon 1	2-60-MU-7		
#Res BW 120 kHz			#VE	3W 390 k	Hz			2.50 MHz ep 1 ms		Mire Linded
										Min Hold
Occupied Ba	ndwidth			Total P	ower	32.1	dBm			
		734 MF	7							Detector
			12							Peak►
Transmit Freq	Error	-18.437 k	kHz	% of O	<b>SW Pow</b>	/er 99	.00 %		Auto	<u>Man</u>
x dB Bandwidt	th	5.076 M	Hz	x dB		-26.	00 dB			
MSG						STATUS				
MSG						STATUS				

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



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🔤 Keysight Spectrum Analyzer - O	ccupied BW							
LXI RF 50 9	Ω DC CORI		SENSE:INT	ALIGN AUTO	11:32:47 P Radio Std	M Sep 08, 2020	Trace	/Detector
			Freq: 836.500000 I Free Run Av	vg Hold: 100/100	Radio Sto	: None		
	#IFG	ain:Low #Atten	: 36 dB		Radio Dev	vice: BTS		
	00 dBm							
Log 30.0								
							С	lear Write
20.0		mmmm	man	mm				
10.0								
0.00	/	4						
-10.0	/			— <u> </u>				Average
-20.0	un hund			monne	-			
-30.0						and the second		
-40.0								Max Hold
-50.0								Maxilola
Center 836.500 MHz						.500 MHz		
#Res BW 68 kHz		#	VBW 220 kHz		#Sweep	12.53 ms		Min Hold
Occupied Ban	dwidth		Total Pow	er 31.8	3 dBm			
			i otari otro					
	2.71	20 MHz						Detector Peak▶
Transmit Freq E	rror	4.503 kHz	% of OBW	Power 99	9.00 %		Auto	Man
x dB Bandwidth		3.030 MHz	x dB	-26.	00 dB			
100								
MSG				STATU	5			

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



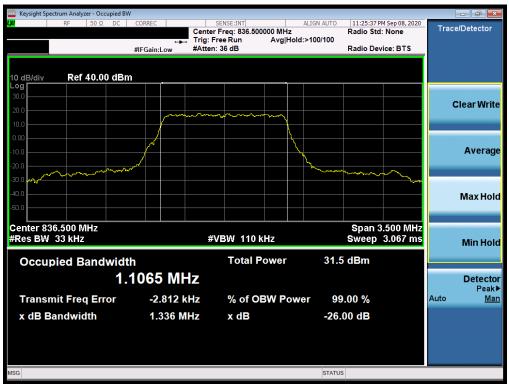
Plot 7-12. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 64-QAM - Full RB Configuration)

FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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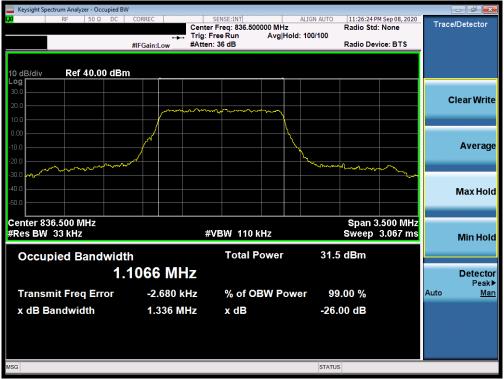
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Plot 7-13. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz QPSK - Full RB Configuration)



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

FCC ID: ZNFK200TM	POTEST* Proud to be part of @ element	PART 22 MEASUREMENT REPORT	🔁 LG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BW		SENSE:INT		46 PM 6 00, 2020	- đ	×
X RF 50 Ω DC		enter Freq: 836.500000 MHz		:46 PM Sep 08, 2020 Std: None	Trace/Detecto	or
	#IFGain:Low #/	Atten: 36 dB	Radio	Device: BTS		
10 dB/div Ref 40.00 dBm						
Log						
20.0					Clear W	rit
10.0	mm	m				
0.00						
10.0					Avera	aç
20.0	<u> </u>		mannon	wwwwww		
30.0						
40.0					Max H	ю
50.0						
Center 836.500 MHz #Res BW 33 kHz		#VBW 110 kHz		n 3.500 MHz ep   3.067 ms		
				· · · · · · · · · · · · · · · · · · ·	Min H	0
Occupied Bandwidt		Total Power	32.1 dBm			
1.'	1042 MHz				Detec	
Transmit Freq Error	-2.015 kHz	% of OBW Pow	er 99.00 %	, D		M
x dB Bandwidth	1.321 MHz	x dB	-26.00 dE	3		
			074710			
SG			STATUS			

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

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MSG

### 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

🚾 Keysight Spectrum Analyzer - Occupied BW				
KI RE 50Ω DC	Trig:	SENSE:INT AL er Freq: 836.600000 MHz Free Run Avg Hold: 1 en: 28 dB	LIGN AUTO 08:32:33 AM Sep Radio Std: Nor 100/100 Radio Device:	ne Trace/Detector
10 dB/div Ref 35.00 dBm				
25.0 15.0 5.00		mmm		Clear Write
-5.00				Averag
45.0				Max Hol
Center 836.600 MHz Res BW 150 kHz		#VBW 910 kHz	Span 15.0 Sweep	
	338 MHz	Total Power	33.9 dBm	Detecto Peak
Transmit Freq Error x dB Bandwidth	2.526 kHz 4.785 MHz	% of OBW Power x dB	r 99.00 % -26.00 dB	Auto <u>Ma</u>
ISG			STATUS	

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

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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.

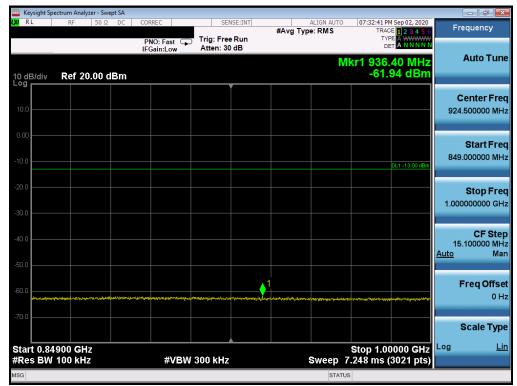
FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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### LTE Band 26/5

RL RL	ectrum Analyz RF	50 Ω		CORREC	1	CEN	SE:INT		ALIGN AUTO	07:22:22	M Sep 02, 2020	_	
NE	N.	20.35	DC	PNO: Fa	st 🖵	Trig: Free Atten: 30	Run	#Avg Ty	pe: RMS	TRA	CE 1 2 3 4 5 6 (PE A WAMMANN N DET A NNNNN	F	requency
10 dB/div	Ref 20	.00 d	Bm	IFGain:L	ow	Atten: 30	αB		ľ	<u>/kr1 820</u>	.20 MHz .01 dBm		Auto Tui
10.0													<b>Center Fr</b> 6.500000 Mi
10.00											DL1 -13.00 dBm	3	<b>Start Fr</b> 0.000000 M
20.0 30.0												82	<b>Stop Fr</b> 3.000000 M
40.0											1 1	7 <u>Auto</u>	CF St 9.300000 N N
60.0				And the state of t			a se a friende a se a						Freq Offs 0
70.0												Log	Scale Ty
Start 30.0 #Res BW	0 MHz 100 kHz			#	VBW :	300 kHz			Sweep (	\$ Stop ) 88.06 ms	323.0 MHz 15861 pts)	Log	1
ISG									STAT				

Plot 7-19. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



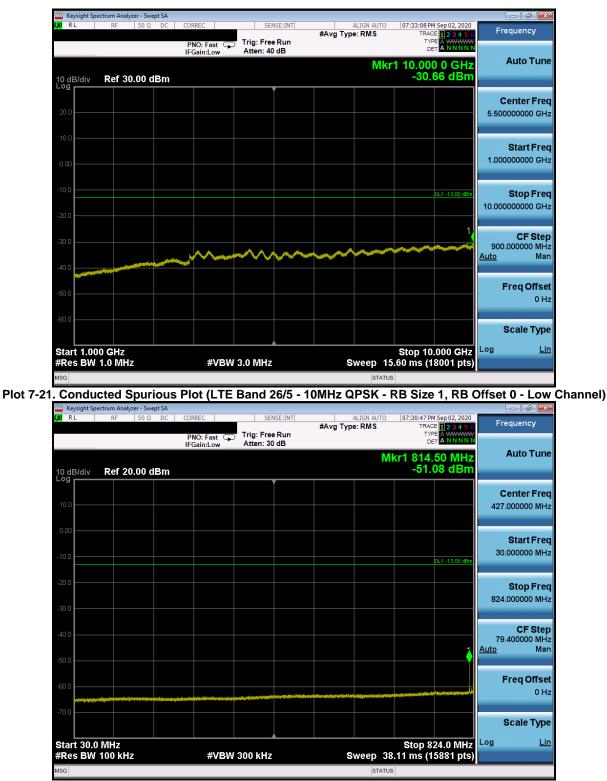
Plot 7-20. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

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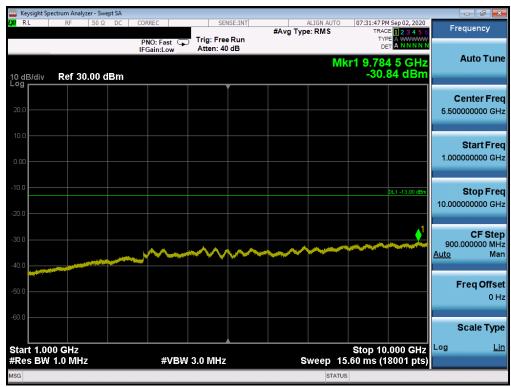
Plot 7-22. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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	ectrum Analyzer									[	
LXU RL	RF 5	0Ω DC	CORREC	SEN	ISE:INT	#Avg Typ	ALIGN AUTO		4 Sep 02, 2020	Fre	quency
			PNO: Fast IFGain:Low	Trig: Free Atten: 30				TYP			
10 dB/div Log	Ref 20.0	0 dBm					M	kr1 849. -45.	75 MHz 96 dBm		Auto Tune
											enter Freq
10.0										924.	500000 MHz
0.00											Start Freq
-10.0									DL1 -13.00 dBm	849.	000000 MHz
-20.0											Stop Freq
-30.0											000000 GHz
											CF Step
-40.0										15. <u>Auto</u>	100000 MHz Man
-50.0											
-60.0	the start of the s	روانلون المراجعة مطاور مراجع	مريد المراجع ا	and when a start and the start s		-	and an instrument	Welmachier survey of	-telenno-employ	F	req Offset 0 Hz
-70.0											
											Scale Type
Start 0.84 #Res BW			#VBW	300 kHz			Sweep 7	Stop 1.00 7.248 m <u>s (</u>	0000 GHz 3021 pts)	Log	<u>Lin</u>
MSG							STATU				

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



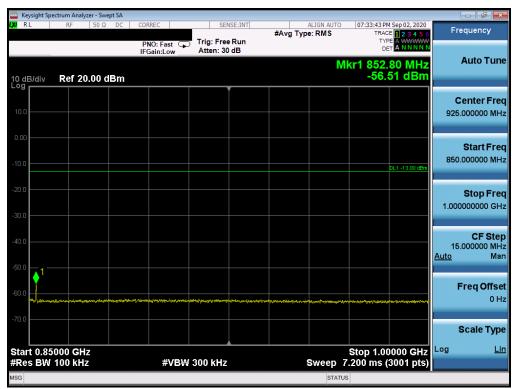
Plot 7-24. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: ZNFK200TM	PCTEST* Pred to be part of @ element	PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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	ectrum Analyze										×
LXI RL	RF	50 Ω DC	CORREC	SEN	SE:INT	#Avg Typ	ALIGN AUTO e: RMS		1 Sep 02, 2020 E 1 2 3 4 5 6	Frequency	
			PNO: Fast 🕞 IFGain:Low	Trig: Free Atten: 30		-		TYP			
10 dB/div	Ref 20.0	00 dBm					Μ	kr1 821. -51.	95 MHz 44 dBm	Auto Tu	une
10.0										Center F 427.000000 N	
-10.0									DL1 -13.00 dBm	Start F 30.000000 N	
-20.0										Stop Fi 824.000000 N	
-40.0									1	CF Si 79.400000 M <u>Auto</u>	
-60.0										Freq Off C	f <b>set</b> DHz
-70.0										Scale Ty	
Start 30.0 #Res BW			#VBV	V 300 kHz		s	weep 38	8 Stop 3.11 ms (1	24.0 MHz 5881 pts)		Lin
MSG							STATU				

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



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

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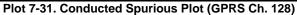
Plot 7-27. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

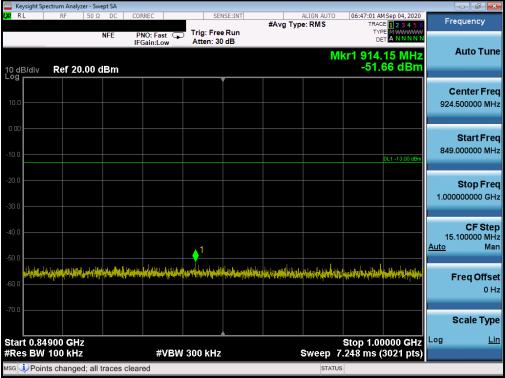
FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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## **GSM/GPRS Cell**

K RL RF	NFE P		sense:INT	Al #Avg Type	LIGN AUTO : RMS	06:46:50 AM Sep 04, 2020 TRACE 1 2 3 4 5 6	Frequency
	IF	Gain:Low					
10 dB/div Ref 2	20.00 dBm		illen. 30 dB		Mk	r1 822.85 MHz -28.94 dBm	Auto Tune
10.0							Center Freq 426.500000 MHz
-10.0						DL1 -13.00 dBm	Start Free 30.000000 MHz
-20.0						1	Stop Free 823.000000 MH:
-40.0							CF Step 79.300000 MH Auto Mar
	aterilla () <mark>All</mark> hamiterationalis Allhalise and an and a statisticalism	a se fyte of a feature particular a synthesis and a second a second	ing and an	n for fall (na fall on fall of	tyn Joerlyn staat f	py Career Career Career Career Career al Again provident and Career Career Career Career Career al Again provident and Career Career Career Career Care	Freq Offse 0 Hz
-70.0 Start 30.0 MHz						Stop 823.0 MHz	
#Res BW 100 kH	lz	#VBW 30	0 kHz	Sv	veep 38.0	)6 ms (15861 pts)	





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

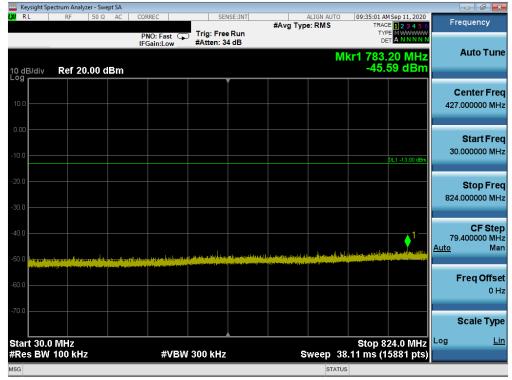
FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	💽 LG	Approved by: Quality Manager	
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	pectrum Analyzer										7 ×
XI RL	RF	50 Ω DC	CORREC	Trig: Free		#Avg Typ	ALIGN AUTO	TRAI TY	M Sep 04, 2020 CE 1 2 3 4 5 6 PE MWWWWW	Frequen	су
10 dB/div Log	Ref 10.0		IFGain:Low	#Atten: 34	4 dB		N	/kr1 4.96	3 0 GHz 62 dBm	Auto	Tune
0.00										Center 5.50000000	
-10.0									DL1 -13.00 dBm	<b>Stari</b> 1.00000000	
-30.0	Iberd see kill and the balling	hywyara nag (pri interna	A STATE AND A S		an a	la pagalana Territori	i <mark>na se di para s</mark> i Li sulta di sulta si	n a han a ga an	laring a fair	<b>Stop</b> 10.00000000	
50.0	ngang dia panjaran di kang di k									CF 900.00000 <u>Auto</u>	Ste 0 M⊢ Ma
70.0										Freq C	Offso 0⊦
								040m-44		Scale	<b>Тур</b> Li
Start 1.00 #Res BW	UU GHZ 1.0 MHz		#VBW	3.0 MHz		S	weep	Stop 10 15.60 ms (1	.000 GHZ	9	
ISG							STA	TUS			

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



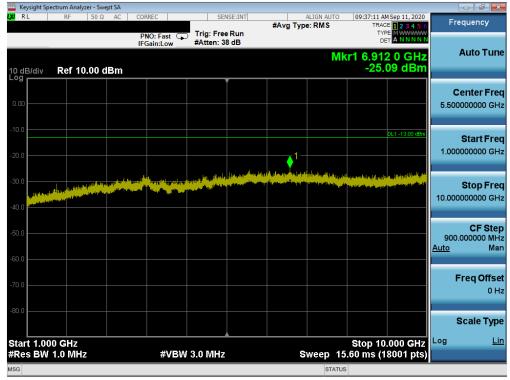
Plot 7-31. Conducted Spurious Plot (GPRS Ch. 190)

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🔤 Keysight Spectrum Analyzer - Swept S/	A				
<b>LX/</b> R.L RF 50 Ω A(	C CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	09:36:29 AM Sep 11, 2020 TRACE 1 2 3 4 5 6	Frequency
	PNO: Fast 😱 IFGain:Low	Trig: Free Run #Atten: 34 dB	- //	TYPE WWWWW DET A N N N N N kr1 981.80 MHz	Auto Tune
10 dB/div Ref 20.00 dBn	n			-47.03 dBm	
10.0					Center Freq 924.500000 MHz
-10.0				DL1 -13.00 dBm	Start Freq 849.000000 MHz
-20.0					<b>Stop Freq</b> 1.000000000 GHz
-40.0	ستاليهم معتجمهم ومطلقان دام والمعر	alt searched, stated to ottatte, relations	al de Sant San or de graf het an de Sant Sant Sant Sant Sant Sant Sant Sant	1	CF Step 15.100000 MHz <u>Auto</u> Man
-60.0			ne fin den berind i stel y zamen en stel den den stel den		Freq Offset 0 Hz
-70.0					Scale Type
Start 0.84900 GHz #Res BW 100 kHz	#VBW	300 kHz	Sweep 7	Stop 1.00000 GHz .248 ms (3021 pts)	
мsg 🧼 Points changed; all trac	es cleared		STATU		

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



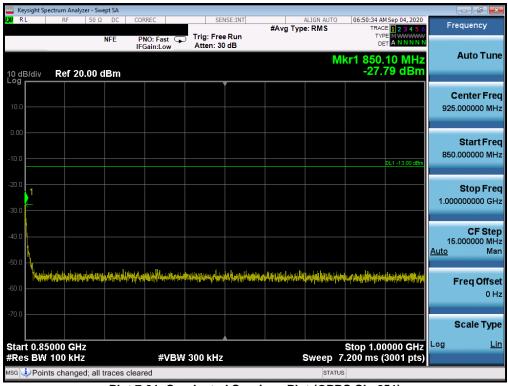
Plot 7-31. Conducted Spurious Plot (GPRS Ch. 190)

FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 20 of 62
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🔤 Keysight Sp	pectrum Analyzer - S	wept SA									
LXI RL	RF 50	Ω DC	CORREC	SEN	ISE:INT	#Avg Typ	ALIGN AUTO		M Sep 04, 2020	Fr	equency
		NFE	PNO: Fast IFGain:Low	Trig: Free Atten: 30		#rrvg Typ	e. 11115	TYF			
10 dB/div Log	Ref 20.00	dBm					MI	kr1 134. -50.	10 MHz 25 dBm		Auto Tune
10.0											Center Freq 000000 MHz
-10.0									DL1 -13.00 dBm	30	Start Freq .000000 MHz
-20.0										824	Stop Freq .000000 MHz
-40.0	<b>↓</b> 1									79 <u>Auto</u>	CF Step 400000 MHz Man
-60.0 <mark>Alderan</mark>		Waldstand, i	the astrony of the second s	in din terretari din Anti anti anti anti anti	tinggang ang pang pang pang pang pang pang	Angen and a station	ta petropo ta po Petro o pu di spontacione di stato	an a	l <mark>yakulatan ang mga Pit</mark> Penangagian kulakula da	<b>_</b>	F <b>req Offset</b> 0 Hz
-70.0											Scale Type
Start 30.								Stop 8	24.0 191112	Log	<u>Lin</u>
	100 kHz		#VBW	300 kHz		S			5881 pts)		
MSG							STATUS				

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



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

FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 24 of 62
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CI RL											e 🛃
	RF 50	ΩDC	CORREC		ISE:INT	#Avg Typ	ALIGN AUTO	TRAC	MSep 04, 2020	Freque	ncy
0 dB/div	Ref 10.00		PNO: Fast IFGain:Low	Trig: Free #Atten: 3			М	kr1 9.71	9 5 GHz 56 dBm	Aut	o Tur
										Cent 5.500000	
0.0									DL1 -13.00 dBm	Sta 1.0000000	n <b>rt Fr</b> DOO G
0.0 0.0 <mark>vyte¹d¹11</mark>	ar ha an	Uniperativa m	an a		A _{ng} alang Stangt L _{an} g Stangt	r s _{aa} nyr saft Ala <u>an alaa</u> d	i yn nawy i'r rede Cyfrifyydd yn farf		an kan Pangapatèn Pangapatèn	Sto 10.0000000	<b>op Fr</b> 000 G
	uspel, jublichter in the second	10.4.01								<b>C</b> 900.0000 <u>Auto</u>	F St 000 M N
).0										Freq	l <b>Off</b> s 0
0.0										Scal	-
tart 1.00	0 GHz 1.0 MHz		40 (5)	V 3.0 MHz		_		Stop 10 5.60 ms (1	.000 GHZ	Log	l

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

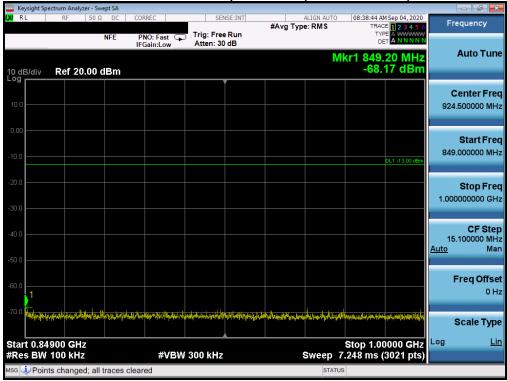
FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	🕑 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 32 of 62
1M2009170151-08.ZNF	8/26 - 9/25/2020	Portable Handset		Fage 32 01 02



# WCDMA Cell

Keysight Spectrum Analyzer - Swep	t SA				
XU RL RF 50Ω Ν	FE PNO: Fast FGain:Low	SENSE:INT Trig: Free Run Atten: 30 dB	ALIGN AUTO #Avg Type: RMS	08:38:38 AM Sep 04, 2020 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A NNNNN	Frequency
10 dB/div Ref 20.00 dE			М	kr1 822.85 MHz -33.88 dBm	Auto Tune
10.0					Center Free 426.500000 MH
-10.0				DL1 -13.00 dBm	Start Free 30.000000 MH
30.0				1	Stop Fre 823.000000 MH
-40.0					<b>CF Ste</b> 79.30000 MH <u>Auto</u> Ma
60.0					Freq Offse 0 H
-70.0 Ale to filling and block had to a second	la for for a liver part of the	ana na ang ang ang ang ang ang ang ang a	an an Anna Long a Ruis An Anna Anna Anna Anna Anna Anna Anna	Stop 823.0 MHz	Scale Type
#Res BW 100 kHz	#VBW	300 kHz	Sweep 38	3.06 ms (15861 pts)	

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



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

FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	🕒 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 33 of 62
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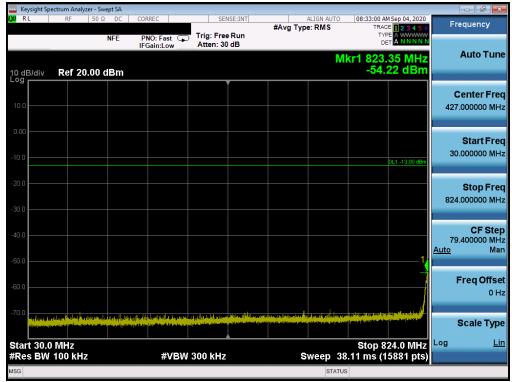
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	ectrum Analyzer - S	wept SA								_	
LXI RL	RF 50 9	Ω DC CO	RREC	SEN	SE:INT	#Avg Typ	ALIGN AUTO		M Sep 04, 2020	Freq	uency
		NFE P IF	NO: Fast 🖵 Gain:Low	Trig: Free #Atten: 3		" <b>ə</b> . ) p		TYI Di			
10 dB/div Log	Ref 10.00	dBm					Mł	(r1 9.18 -45.	1 0 GHz 96 dBm	A	uto Tune
0.00											<b>nter Freq</b> 00000 GHz
-10.0									DL1 -13.00 dBm		<b>Start Freq</b> 00000 GHz
-30.0									1		Stop Freq
-50.0	a Pale Pale Parente a Pale Parente			Ŵ	VVV	J.V				900.00 <u>Auto</u>	CF Step 00000 MHz Man
-70.0	y ch ingé di linitatione									Fr	<b>eq Offsel</b> 0 Hz
-80.0											ale Type
Start 1.00 #Res BW			#\/D\M	3.0 MHz		_	woon 46	Stop 10	.000 GHz 8001 pts)	Log	Lin
#Res BW			#4044	-3.0 MHZ		5	status		sour pis)		

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



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

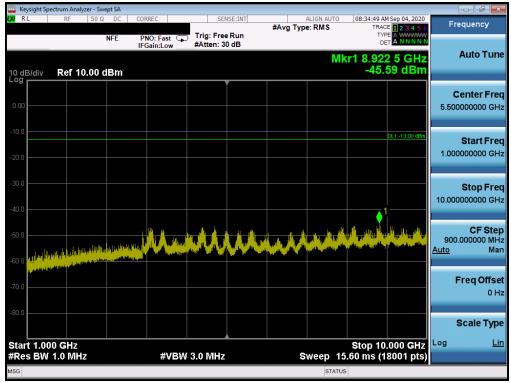
FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	🕑 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 24 of 62
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🔤 Keysight Spo	ectrum Analyzer - Swe	pt SA									
LXU RL	RF 50 Ω	NFE P	RREC NO: Fast Gain:Low			#Avg Typ	ALIGN AUTO e: RMS	TRAC TYP	I Sep 04, 2020 E 1 2 3 4 5 6 E A WWWWW T A N N N N N	Frequ	lency
10 dB/div Log	Ref 20.00 d		Gam.Low				Μ	kr1 849. -56.	65 MHz 61 dBm	Αι	ito Tune
10.0											n <b>ter Freq</b> 0000 MHz
-10.0									DL1 -13.00 dBm		t <b>art Frec</b> 0000 MH:
-20.0											top Fred 0000 GH:
-40.0											<b>CF Stej</b> 0000 MH Mai
-60.0										Fre	e <b>q Offse</b> 0 H
-70.0		and an and a second	epillon (Longenisello)	hand a second	ada ta di kariyo shkolo	lanayaktisinahi	للومي الجويري ومعروم	Stop 1.00		Sc Log	ale Type <u>Lir</u>
#Res BW	100 kHz			300 kHz				7.248 ms (	3021 pts)	_	
usg 🤑 Poin	ts changed; all t	races clear	red				STATU	S			

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



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

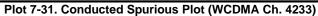
FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	💽 LG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 35 of 62
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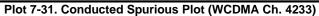
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	ectrum Analyzer - Sw								
X RL	RF 50 Ω	NFE PI	REC NO:Fast 🖵 Gain:Low		#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Sep 04, 2020 DE 1 2 3 4 5 6 DE A WWWWW T A N N N N N	Frequency
10 dB/div	Ref 20.00 c		Sam:Low_	Atten: or		N	/lkr1 823. -62.	.60 MHz 47 dBm	Auto Tun
10.0									Center Fre 427.000000 MH
.10.0								DL1 -13.00 dBm	Start Fre 30.000000 MH
-20.0									Stop Fre 824.000000 MH
40.0									CF Ste 79.400000 M⊢ <u>Auto</u> Ma
60.0								1	Freq Offso 0 ⊦
-70.0 <b>14004</b> Start 30.0	MHz		a of the second states of the	are and site and an other	gynt fernen gwyn gwyn gwyn gwyn gwyn gwyn ar de oferfar y ferne trenefne. Mae'n y		Stop 8	24.0 MHz	Scale Typ
Res BW	100 kHz		#VBW	300 kHz	S	weep 3	8.11 ms (1	5881 pts)	

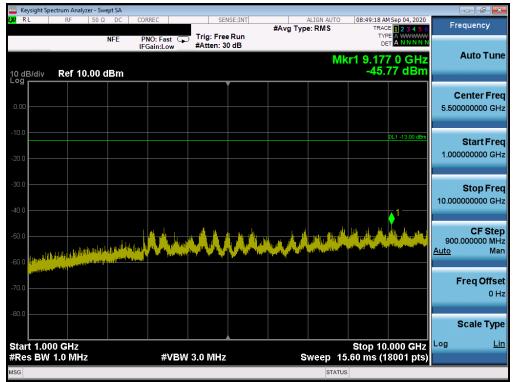


0.00    Center Freq      0.00    Start Freq <td< th=""><th></th><th>ectrum Analyzer - Swept SA</th><th></th><th></th><th></th><th></th><th></th></td<>		ectrum Analyzer - Swept SA							
NFE    PNO: Fast IFGain:Low    Trig: Free Run Atten: 30 dB    Trig: Free Run Atten: 30 dB    Auto Tune      0 dB/div    Ref 20.00 dBm    .31.29 dBm	LXI RL	RF 50 Ω DC	CORREC	SENSE:INT			Frequency		
Mkr1 850.10 MHz    Auto Tune      0 dB/div    Ref 20.00 dBm    -31.29 dBm      0 dD		NFE				TYPE A WWWWW			
0 dB/div    Ref 20.00 dBm    -31.29 dBm      0 dB/div    -31.29 dBm    -31.29 dBm									
100    Image: Center Freq 925.00000 MHz      000    Image: Center Freq 925.00000 MHz      100    Image: Center Freq 925.00000 MHz      11    Image: Center Freq 1.00000000 GHz      11    Image: Center Freq 1.0000000 MHz      11    Image: Center Freq 1.00000000 GHz      11    Image: Center Freq 1.0000000 MHz      11    Image: Center Freq 1.000000 GHz      11    Image: Center Freq 1.000000 GHz </td <td>10 dB/div</td> <td colspan="7">10 dB/div Ref 20.00 dBm -31.29 dBm</td>	10 dB/div	10 dB/div Ref 20.00 dBm -31.29 dBm							
100 100 100 100 100 100 100 100				Ĭ			Contor From		
0.000    Image: start in the start in th	10.0								
100    DL1-13.0045m    Start Freq      200    DL1-13.0045m    Stop Freq      200									
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200 200 1 200 1 200 1 200 1 200 1 200 1 200 1 200 1 200 1 200 1 200 1 200 1 200 1 200 200	10.0								
1    Stop Freq      300    1.00000000 GHz      40.0    CF Step      50.0    CF Step      50.0    Man      60.0    Freq Offset      70.0    Stop 1.00000 GHz      Stop 1.00000 GHz    Stop 1.00000 GHz      Ceg Lin    Stop 1.00000 GHz      Res BW 100 kHz    #VBW 300 kHz    Sweep 7.200 ms (3001 pts)	-10.0					DL1 -13.00 dBm			
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-20.0						Stop Fred		
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Comparison    Comparison <td>-50.0</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	-50.0								
Comparison    Comparison <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Freq Offset</td>							Freq Offset		
Start 0.85000 GHz Stop 1.00000 GHz Log Lin Res BW 100 kHz #VBW 300 kHz Sweep 7.200 ms (3001 pts)	-60.0								
Start 0.85000 GHz Stop 1.00000 GHz Log Lin Res BW 100 kHz #VBW 300 kHz Sweep 7.200 ms (3001 pts)	-70.0								
Res BW 100 kHz      #VBW 300 kHz      Sweep 7.200 ms (3001 pts)	PUN	h dha in an	and the second	ik biya miya jina sunya dina dina dina dina dina dina dina din	alan kiku na ini kada na ini kada an	arakti ani handarakti di ki angari kani kani kani kani kani kani kani kan	Scale Type		
Res BW 100 kHz      #VBW 300 kHz      Sweep 7.200 ms (3001 pts)	Start 0.85	Start 0.85000 GHz Stop 1.00000 GHz							
sa Depints changed; all traces cleared status			#VBW	300 kHz	Swee	o 7.200 ms (3001 pts)			
	мsg 🔱 Point	ISG Depints changed; all traces cleared STATUS							



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

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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

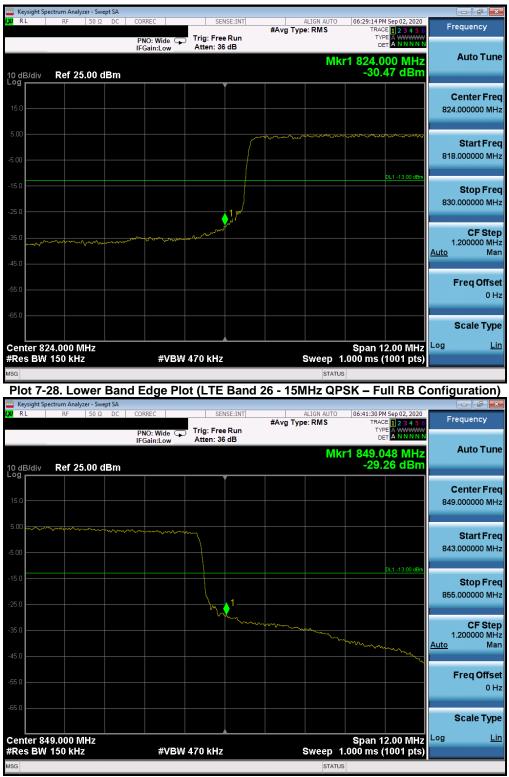
## Test Notes

 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



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

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	ectrum Analyzer - Swept SA					
RL	RF 50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	06:45:49 PM Sep 02, 2020 TRACE 1 2 3 4 5 6	Frequency
		PNO: Wide 😱 IFGain:Low	Trig: Free Run Atten: 36 dB	Mk	TYPE A WWWW DET A NNNNN r1 823.976 MHz	Auto Tun
0 dB/div	Ref 25.00 dBm	า			-29.30 dBm	
15.0						Center Fre 824.000000 M⊦
5.00				rgi, gerijniganasigehile (Adde Made Aysan-Ausopea	and and an an and an an and an	Start Fre 820.000000 MF
25.0					DL1 -13.00 dBm	<b>Stop Fre</b> 828.000000 MH
	and an history there	and a start of the				CF Ste 800.000 kł <u>Auto</u> Ma
55.0						Freq Offs 0 ł
65.0						Scale Typ
enter 82 Res BW	4.000 MHz 100 kHz	#VBW	300 kHz	Sweep 1	Span 8.000 MHz 3.33 ms (1001 pts)	Log <u>L</u>
ISG				STATUS	5	

Plot 7-30. Lower Band Edge Plot (LTE Band 26/5 - 10MHz QPSK – Full RB Configuration)



Plot 7-31. Upper Band Edge Plot (LTE Band 26/5 - 10MHz QPSK – Full RB Configuration)

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Keysight Spectrum An	alyzer - Swept SA					
XI RL RF	50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	06:48:39 PM Sep 02, 2020 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A NNNNN	Frequency
10 dB/div Ref 2	25.00 dBm	IFGain:Low	Atten: 36 dB	Mk	r1 823.988 MHz -23.50 dBm	Auto Tun
15.0						Center Fre 824.000000 MH
5.00						Start Fre 822.000000 M⊦
25.0			1,		DL1 -13.00 dBm	Stop Fre 826.000000 M⊦
35.0 <b></b>	ge-y-elled medical second	and and the second s				CF Ste 400.000 kH <u>Auto</u> Ma
55.0						Freq Offs 0 F
65.0	Dall-					Scale Typ
Center 824.000 #Res BW 100 kl		#VBW	300 kHz	Sweep 6	Span 4.000 MHz i.667 ms (1001 pts)	
ISG				STATU	5	

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



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

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	ectrum Analyzer	Swept SA					
🗶 RL	RF 5	0Ω DC	CORREC	SENSE:INT	ALIGN A #Avg Type: RMS		Frequency
			PNO: Wide G	Trig: Free Run Atten: 36 dB	- //		
10 dB/div	Ref 25.0	0 dBm				Mkr1 823.996 MHz -20.10 dBm	Auto Tune
15.0					protection and the desired of the second	end plantations of the second	Center Fre 824.000000 MH
5.00							Start Fre 822.000000 MH
-15.0				1		DL1 -13.00 dBm	Stop Fre 826.000000 MH
میروسیروں 45.0	M. M	, and a strategy and	nerti ang Marilang ang Ang	And Marine and a second			CF Ste 400.000 k⊦ <u>Auto</u> Ma
55.0							Freq Offs 0 H
-65.0							Scale Typ
	24.000 MH 100 kHz	z	#VBW	/ 300 kHz	Swee	Span 4.000 MHz p 6.667 ms (1001 pts)	Log <u>L</u> i
ISG						TATUS	

Plot 7-34. Lower Band Edge Plot (LTE Band 26/5 - 3MHz QPSK - Full RB Configuration)



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

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Keysight Spectrum											
art RF	50 Ω	DC COF	REC		ISE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	4 Sep 02, 2020	F	requency
		PN IFC	IO: Wide 🖵 Gain:Low	Trig: Free Atten: 36							A
0 dB/div Re	f 25.00 dE	3m					Mki	1 824.0 -16.5	00 MHz 60 dBm		Auto Tur
og											Center Fre
15.0						Jar	per management				4.000000 MH
5.00					/			$\mathbf{i}$			
0.000								l ]			Start Fre
5.00					/					82	2.000000 MH
15.0					1			<u> </u>	DL1 -13.00 dBm		Oton Fre
				Å				h the		82	Stop Fre 6.000000 Mi
25.0		ريتحيهر	Vromentower	phylan an a					with an way when		
35.0	Marine Marine Con	man									CF Ste 400.000 ki
Thread										<u>Auto</u>	400.000 Ki
45.0											
55.0											Freq Offs
											01
65.0											Scale Typ
enter 824.00	0 MHz							Snan 4	.000 MHz	Log	L
Res BW 100			#VBW	300 kHz			Sweep 6	.667 ms (	1001 pts)		
SG							STATUS				





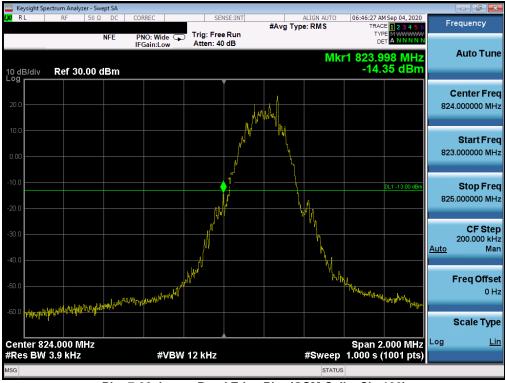
Plot 7-37. Upper Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB Configuration)

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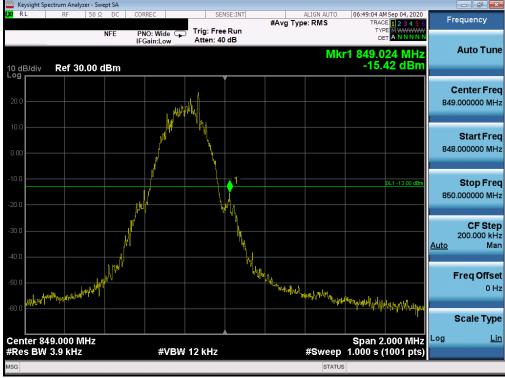
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# **GSM/GPRS Cell**



Plot 7-38. Lower Band Edge Plot (GSM Cell – Ch. 128)



Plot 7-39. Upper Band Edge Plot (GSM Cell - Ch. 251)

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# WCDMA Cell



Plot 7-40. Lower Band Edge Plot (WCDMA Cell - Ch. 4132)



Plot 7-41. Upper Band Edge Plot (WCDMA Cell – Ch. 4233)

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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

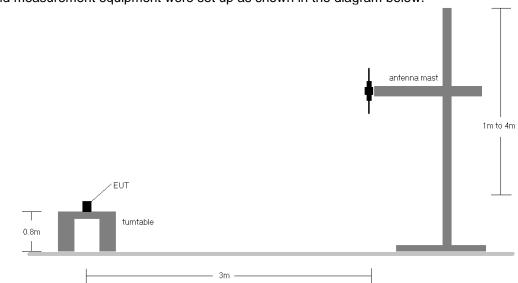
## Test Settings

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

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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]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
		831.5	Н	219.0	310.0	6.73	1/0	15.38	19.96	0.099	38.45	-18.49	22.11	0.162	40.61	-18.50
15MHz	QPSK	836.5	Н	204.0	301.0	6.68	1/0	14.83	19.36	0.086	38.45	-19.09	21.51	0.142	40.61	-19.10
(Band 26		841.5	Н	205.0	315.0	6.63	1/0	14.91	19.39	0.087	38.45	-19.06	21.54	0.143	40.61	-19.07
only)	16-QAM	831.5	Н	219.0	310.0	6.73	1/0	14.94	19.52	0.089	38.45	-18.93	21.67	0.147	40.61	-18.94
	64-QAM	841.5	Н	205.0	315.0	6.63	1/0	13.20	17.68	0.059	38.45	-20.77	19.83	0.096	40.61	-20.78
		829.0	Н	219.0	310.0	6.80	1/25	15.35	20.00	0.100	38.45	-18.45	22.15	0.164	40.61	-18.46
	QPSK	836.5	Н	204.0	301.0	6.68	1/25	14.94	19.47	0.088	38.45	-18.98	21.62	0.145	40.61	-18.99
10 MHz		844.0	Н	205.0	315.0	6.66	1/25	14.82	19.33	0.086	38.45	-19.12	21.48	0.141	40.61	-19.13
	16-QAM	829.0	Н	219.0	310.0	6.80	1/0	15.05	19.70	0.093	38.45	-18.75	21.85	0.153	40.61	-18.76
	64-QAM	844.0	Н	205.0	315.0	6.66	1/25	13.87	18.38	0.069	38.45	-20.07	20.53	0.113	40.61	-20.08
		826.5	Н	219.0	310.0	6.77	1/0	15.36	19.99	0.100	38.45	-18.46	22.14	0.164	40.61	-18.47
	QPSK	836.5	н	204.0	301.0	6.68	1/12	15.47	20.00	0.100	38.45	-18.45	22.15	0.164	40.61	-18.46
5 MHz		846.5	Н	205.0	315.0	6.68	1/12	14.52	19.05	0.080	38.45	-19.40	21.20	0.132	40.61	-19.41
	16-QAM	826.5	Н	219.0	310.0	6.77	1/12	15.53	20.16	0.104	38.45	-18.29	22.31	0.170	40.61	-18.30
	64-QAM	836.5	Н	204.0	301.0	6.68	1/12	13.74	18.27	0.067	38.45	-20.18	20.42	0.110	40.61	-20.19
		825.5	Н	219.0	310.0	6.76	1/7	15.64	20.26	0.106	38.45	-18.19	22.41	0.174	40.61	-18.20
	QPSK	836.5	н	204.0	301.0	6.68	1/7	15.02	19.55	0.090	38.45	-18.90	21.70	0.148	40.61	-18.91
3 MHz		847.5	н	205.0	315.0	6.69	1/7	14.83	19.37	0.087	38.45	-19.08	21.52	0.142	40.61	-19.09
	16-QAM	825.5	Н	219.0	310.0	6.76	1/7	15.27	19.89	0.097	38.45	-18.56	22.04	0.160	40.61	-18.57
	64-QAM	825.5	Н	219.0	310.0	6.76	1/7	13.32	17.94	0.062	38.45	-20.51	20.09	0.102	40.61	-20.52
		824.7	Н	219.0	310.0	6.76	1/2	15.44	20.05	0.101	38.45	-18.40	22.20	0.166	40.61	-18.41
	QPSK	836.5	Н	204.0	301.0	6.68	1/2	14.66	19.19	0.083	38.45	-19.26	21.34	0.136	40.61	-19.27
1.4 MHz		848.3	н	205.0	315.0	6.70	1/0	14.78	19.33	0.086	38.45	-19.12	21.48	0.141	40.61	-19.13
	16-QAM	824.7	Н	219.0	310.0	6.76	1/5	15.17	19.78	0.095	38.45	-18.67	21.93	0.156	40.61	-18.68
	64-QAM	824.7	Н	219.0	310.0	6.76	1/0	13.30	17.91	0.062	38.45	-20.54	20.06	0.101	40.61	-20.55
	Opposite Pol.	831.5	V	231.0	324.0	6.43	1/0	9.21	15.64	0.037	38.45	-22.81	17.79	0.060	40.61	-22.82

Table 7-42. 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]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
824.20	GPRS850	н	100	345	21.33	6.75	25.93	0.392	38.45	-12.52	28.08	0.643	40.61	-12.53
836.60	GPRS850	н	188	169	21.36	6.68	25.89	0.388	38.45	-12.56	28.04	0.637	40.61	-12.57
848.80	GPRS850	н	191	166	20.86	6.71	25.42	0.348	38.45	-13.04	27.57	0.571	40.61	-13.04
824.20	GPRS850	V	139	174	21.63	6.38	25.86	0.385	38.45	-12.59	28.01	0.632	40.61	-12.60
824.20	EDGE850	н	100	345	16.32	6.75	20.92	0.124	38.45	-17.53	23.07	0.203	40.61	-17.54

Table 7-43. ERP Data (GPRS Cell)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	[dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
826.40	WCDMA850	н	202	72	13.80	6.77	18.42	0.070	38.45	-20.03	20.57	0.114	40.61	-20.03
836.60	WCDMA850	н	204	306	13.47	6.68	18.00	0.063	38.45	-20.45	20.15	0.104	40.61	-20.46
846.60	WCDMA850	н	204	75	12.24	6.68	16.77	0.048	38.45	-21.68	18.92	0.078	40.61	-21.68
826.40	WCDMA850	V	147	174	12.58	6.77	17.20	0.053	38.45	-21.25	19.35	0.086	40.61	-21.25

Table 7-44. ERP Data (WCDMA 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.

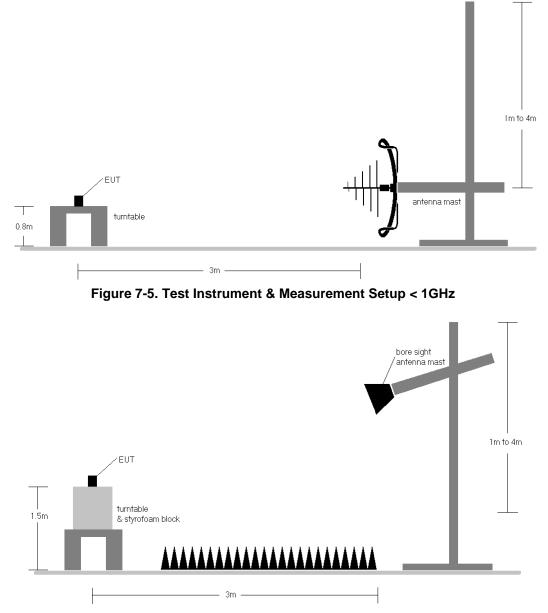


Figure 7-6. Test Instrument & Measurement Setup >1 GHz

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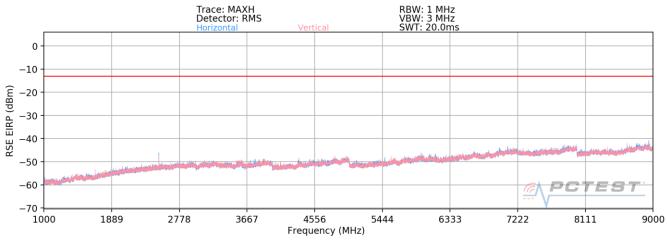
## Test Notes

- 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) 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.
- 7) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 8) 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.
- 9) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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# LTE Band 26/5



Plot 7-45. Radiated Spurious Plot (LTE Band 26/5)

15
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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]
V	100	324	-72.26	0.48	35.22	-60.03	-13.00	-47.03
V	111	164	-70.88	4.93	41.05	-54.21	-13.00	-41.21
V	-	-	-79.46	6.29	33.83	-61.42	-13.00	-48.42
V	-	-	-80.51	7.95	34.44	-60.82	-13.00	-47.82
V	-	-	-81.18	10.03	35.85	-59.40	-13.00	-46.40
	[H/V] V V V V V V	Ant. Pol.      Height        [H/V]      'I00        V      100        V      111        V      -        V      -        V      -        V      -	Ant. Pol. [H/V]      Height [cm]      Azimuth [degree]        V      100      324        V      111      164        V      -      -        V      -      -        V      -      -        V      -      -        V      -      -	Ant. Pol. [H/V]      Height [cm]      Azimuth [degree]      Level [dBm]        V      100      324      -72.26        V      111      164      -70.88        V      -      -      -79.46        V      -      -      -80.51        V      -      -      -81.18	Ant. Pol. [H/V]      Height [cm]      Azimuth [degree]      Level [dBm]      AFCL [dB/m]        V      100      324      -72.26      0.48        V      111      164      -70.88      4.93        V      -      -      -79.46      6.29        V      -      -      -80.51      7.95        V      -      -      -81.18      10.03	Ant. Pol. [H/V]      Height [cm]      Azimuth [degree]      Level [dBm]      AFCL [dBm]      Strength [dBμV/m]        V      100      324      -72.26      0.48      35.22        V      111      164      -70.88      4.93      41.05        V      -      -      -79.46      6.29      33.83        V      -      -      -80.51      7.95      34.44        V      -      -      -81.18      10.03      35.85	Ant. Pol. [H/V]      Height [cm]      Azimuth [degree]      Level [dBm]      AFCL [dB/m]      Strength [dBµV/m]      Emission Level [dBm]        V      100      324      -72.26      0.48      35.22      -60.03        V      111      164      -70.88      4.93      41.05      -54.21        V      -      -      -79.46      6.29      33.83      -61.42        V      -      -      -80.51      7.95      34.44      -60.82        V      -      -      -81.18      10.03      35.85      -59.40	Ant. Pol. [H/V]      Height [cm]      Azimuth [degree]      Level [dBm]      AFCL [dB/m]      Strength [dBµV/m]      Emission Level [dBm]      Limit [dBm]        V      100      324      -72.26      0.48      35.22      -60.03      -13.00        V      111      164      -70.88      4.93      41.05      -54.21      -13.00        V      -      -      -79.46      6.29      33.83      -61.42      -13.00        V      -      -      -80.51      7.95      34.44      -60.82      -13.00        V      -      -      -81.18      10.03      35.85      -59.40      -13.00

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

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

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	V	137	136	-71.65	0.67	36.02	-59.24	-13.00	-46.24
2509.5	V	165	162	-65.79	5.01	46.22	-49.04	-13.00	-36.04
3346.0	V	-	-	-79.61	6.53	33.92	-61.33	-13.00	-48.33
4182.5	V	-	-	-80.46	8.35	34.89	-60.36	-13.00	-47.36
5019.0	V	-	-	-81.13	9.95	35.82	-59.44	-13.00	-46.44

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

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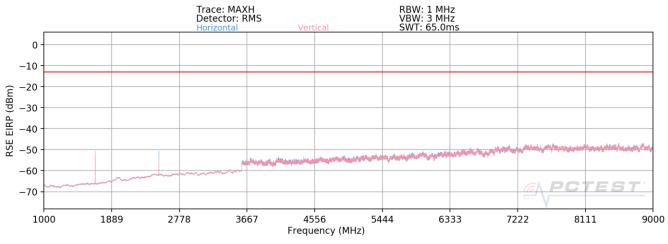
Bandwidth (MHz): Frequency (MHz): RB / Offset:	84	5 1.5 37							
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1683.00	V	103	149	-72.87	0.90	35.03	-60.23	-13.00	-47.23
2524.50	V	109	160	-69.09	5.35	43.26	-52.00	-13.00	-39.00
3366.00	V	-	-	-80.02	6.78	33.76	-61.50	-13.00	-48.50
4207.50	V	-	-	-80.50	8.12	34.62	-60.64	-13.00	-47.64
5049.00	V	-	-	-81.18	9.59	35.41	-59.85	-13.00	-46.85

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

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# **GSM/GPRS** Cell



Plot 7-46. Radiated Spurious Plot (GPRS Cell)

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	252	359	-59.14	-1.22	46.64	-48.62	-13.00	-35.62
2472.6	Н	112	353	-56.49	3.00	53.51	-41.75	-13.00	-28.75
3296.8	Н	-	-	-74.56	4.13	36.57	-58.69	-13.00	-45.69
4121.0	Н	270	152	-72.65	6.34	40.69	-54.57	-13.00	-41.57
4945.2	Н	-	-	-75.74	7.51	38.77	-56.49	-13.00	-43.49
5769.4	Н	-	-	-76.42	8.54	39.12	-56.14	-13.00	-43.14
6593.6	Н	-	-	-76.85	10.19	40.34	-54.92	-13.00	-41.92

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	166	354	-59.40	-1.15	46.45	-48.81	-13.00	-35.81
2509.8	Н	147	362	-53.59	3.30	56.71	-38.55	-13.00	-25.55
3346.4	Н	-	-	-74.47	5.04	37.57	-57.69	-13.00	-44.69
4183.0	Н	160	33	-68.58	5.93	44.35	-50.90	-13.00	-37.90
5019.6	Н	-	-	-75.34	6.86	38.52	-56.74	-13.00	-43.74
5856.2	Н	-	-	-76.17	9.27	40.10	-55.16	-13.00	-42.16
6692.8	Н	-	-	-75.85	10.73	41.88	-53.38	-13.00	-40.38

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

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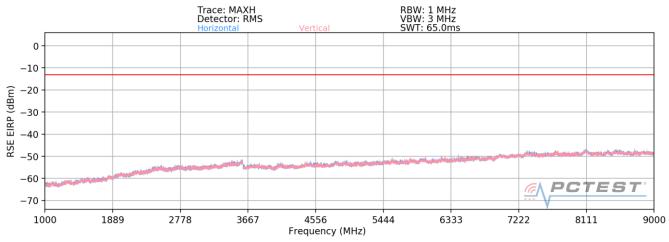
Mode: Channel:		I Tx Slot 51							
Frequency (MHz):	84	8.8							
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1697.6	Н	253	179	-61.39	-1.15	44.46	-50.80	-13.00	-37.80
2546.4	Н	215	12	-53.66	3.01	56.35	-38.91	-13.00	-25.91
3395.2	Н	-	-	-75.05	4.85	36.80	-58.46	-13.00	-45.46
4244.0	Н	237	159	-69.37	5.87	43.50	-51.75	-13.00	-38.75
5092.8	Н	-	-	-76.32	7.64	38.32	-56.94	-13.00	-43.94
5941.6	Н	-	-	-76.94	9.91	39.97	-55.29	-13.00	-42.29
6790.4	Н	-	-	-76.60	10.01	40.41	-54.85	-13.00	-41.85

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

FCC ID: ZNFK200TM		PART 22 MEASUREMENT REPORT	Approved by: Quality Manager
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# WCDMA Cell



Plot 7-47. Radiated Spurious Plot (WCDMA Cell)

Mode:	WCDM	IA RMC							
Channel:	41	32							
Frequency (MHz):	82	6.4							
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	V	117	351	-73.37	-5.23	28.40	-66.85	-13.00	-53.85
2479.2	V	117	29	-74.69	-2.46	29.85	-65.41	-13.00	-52.41
3305.6	V	-	-	-77.20	0.61	30.41	-64.85	-13.00	-51.85
4132.0	V	-	-	-78.04	2.08	31.04	-64.22	-13.00	-51.22
4958.4	V	-	-	-78.70	3.30	31.60	-63.65	-13.00	-50.65

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

Mode:	WCDMA RMC
Channel:	4183
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	V	207	290	-72.22	-5.23	29.55	-65.70	-13.00	-52.70
2509.8	V	120	158	-74.82	-2.32	29.86	-65.40	-13.00	-52.40
3346.4	V	-	-	-78.22	0.30	29.08	-66.18	-13.00	-53.18
4183.0	V	-	-	-78.48	2.04	30.56	-64.70	-13.00	-51.70
5019.6	V	-	-	-78.88	4.03	32.15	-63.11	-13.00	-50.11

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

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3386.4

4233.0

5079.6

V

V

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Mode:	WCDN	IA RMC							
Channel:	42	233							
Frequency (MHz):	84	6.6							
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	V	116	41	-75.86	-5.17	25.97	-69.29	-13.00	-56.29
1093.2	v	110	41	-75.00	-5.17	20.01	00.20	10.00	00.25

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

0.30

2.01

4.34

30.16

30.62

32.12

-65.10

-64.64

-63.13

-13.00

-13.00

-13.00

-52.10

-51.64

-50.13

-77.14

-78.39

-79.22

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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  $\pm 0.00025\%$  ( $\pm 2.5$  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

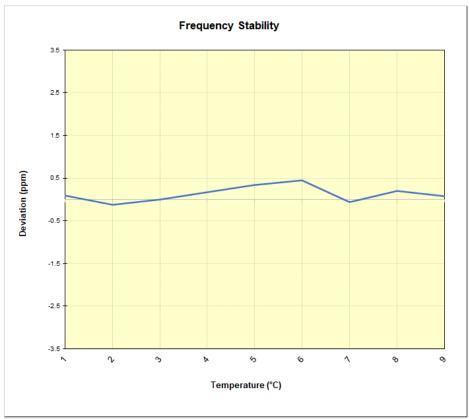
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# LTE Band 26/5

LTE Band 26/5								
	Operating F	requency (Hz):	836,50	00,000				
	Ref.	Voltage (VDC):	3.	79				
		Deviation Limit:	± 0.00025%	or 2.5 ppm				
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)			
		- 30	831,500,080	80	0.0000096			
		- 20	831,499,902	-98	-0.0000118			
		- 10	831,500,004	4	0.000005			
		0	831,500,144	144	0.0000173			
100 %	3.79	+ 10	831,500,279	279	0.0000336			
		+ 20 (Ref)	831,500,375	375	0.0000451			
		+ 30	831,499,945	-55	-0.0000066			
		+ 40	831,500,172	172	0.0000207			
		+ 50	831,500,064	64	0.0000077			
Battery Endpoint	3.04	+ 20	831,500,368	368	0.0000443			

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





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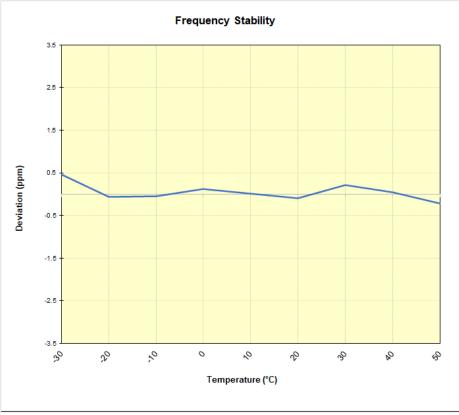
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# **GSM/GPRS** Cell

GSM/GPRS Cellular									
	Operating F	requency (Hz):	836,60	00,000	]				
	Ref.	Voltage (VDC):	3.	79					
		Deviation Limit:	± 0.00025%	or 2.5 ppm					
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)				
		- 30	836,600,390	390	0.0000466				
		- 20	836,599,952	-48	-0.0000057				
		- 10	836,599,965	-35	-0.0000042				
		0	836,600,098	98	0.0000117				
100 %	3.79	+ 10	836,600,010	10	0.0000012				
		+ 20 (Ref)	836,599,919	-81	-0.0000097				
		+ 30	836,600,178	178	0.0000213				
		+ 40	836,600,037	37	0.0000044				
		+ 50	836,599,821	-179	-0.0000214				
Battery Endpoint	3.04	+ 20	836,600,075	75	0.000090				

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



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

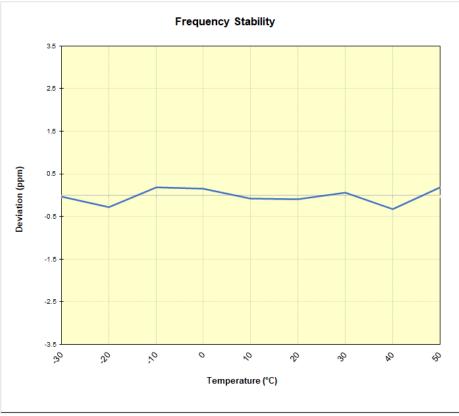
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# WCDMA Cell

WCDMA Cellular									
	Operating F	requency (Hz):	836,60	00,000	]				
	Ref.	Voltage (VDC):	3.	79					
		Deviation Limit:	± 0.00025%	or 2.5 ppm					
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)				
		- 30	836,599,971	-29	-0.000035				
		- 20	836,599,764	-236	-0.0000282				
		- 10	836,600,155	155	0.0000185				
		0	836,600,129	129	0.0000154				
100 %	3.79	+ 10	836,599,939	-61	-0.0000073				
		+ 20 (Ref)	836,599,920	-80	-0.000096				
		+ 30	836,600,050	50	0.0000060				
		+ 40	836,599,734	-266	-0.0000318				
		+ 50	836,600,161	161	0.0000192				
Battery Endpoint	3.04	+ 20	836,600,425	425	0.0000508				

Table 7-9. WCDMA Cell Frequency Stability Data





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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: ZNFK200TM** complies with all the requirements of Part 22 of the FCC rules.

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