

7.4 Band Edge Emissions at Antenna Terminal §2.1051 §22.917(a) §24.238(a) §27.53(c) §27.53(h)

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 its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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

Test Procedure Used

KDB 971168 D01 v02r02 - 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 > 1% of the emission bandwidth
- 4. VBW <u>></u> 3 x RBW
- 5. Detector = RMS
- 6. Number of sweep points \geq 2 x Span/RBW
- 7. Trace mode = trace average
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

<u>Test Setup</u>

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



Figure 7-3. Test Instrument & Measurement Setup

Test Notes

Per 22.917(b) 24.238(a) 27.53(h) 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.

Per 27.53(c.5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

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For all plots showing emissions in the 763 - 775MHz and 793 - 805MHz band, the FCC limit per 27.53(c.4) is $65 + 10\log_{10}(P) = -35dBm$ in a 6.25kHz bandwidth.



Plot 7-67. Lower Band Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)

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🔤 Key	sight Spectru	m Analyzer - Sw	ept SA		_				_			
L <mark>XI</mark> RL		RF 50 Ω	AC CO	RREC	SEN	NSE:INT	#Avg Tvp	ALIGN AUTO	05:41:16 PI	M Dec 01, 2016	Fi	equency
			P IF	NO: Wide ↔ Gain:Low	Trig: Free Atten: 36	e Run i dB			TYF DE			
10 dE	3/div R	ef 25.00 d	dBm					Mk	r1 773.8 -61.	36 MHz 24 dBm		Auto Tune
15.0											(769	Center Freq 9.000000 MHz
5.00 -5.00											763	Start Freq 3.000000 MHz
-15.0 -25.0											77	Stop Freq 5.000000 MHz
-35.0 -45.0										DL1 -35.00 dBm	Auto	CF Step 1.200000 MHz Man
-55.0	marketer	ald Introduce Laterals of	na kantan Ukrasia	n which says station	llotal A. American	Maintaine a bla	Namilan Av ^a s Atu ⁶ a s	k htmm: 104/104/1	، المحمولية المحمولية ا	1 International		Freq Offset 0 Hz
-65.0												Scale Type
Star	t 763.00	0 MHz						•	Stop 775	.000 MHz	Log	<u>Lin</u>
#Res	s BW 6.2	kHz		#VBW	30 kHz			#Sweep	1.000 s (1001 pts)		
MSG								STATUS	5			

Plot 7-68. Lower Emission Mask Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



Plot 7-69. Upper Band Edge Plot (Band 13 - 5.0MHz QPSK - RB Size 25)

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🔤 Kej	ysight Sp	ectrum	Analyzer - S	wept SA									
lxi Ri	L	R	F 50	Ω AC	CORREC	SEN	NSE:INT	#Ava Tvp	ALIGN AUTO	05:49:59 PI TRAC	M Dec 01, 2016	F	requency
					PNO: Wide ↔ IFGain:Low	Trig: Free Atten: 36	e Run 6 dB			TYF			
10 dE	3/div	Re	f 25.00	dBm					Mk	r1 800.9 -62.	32 MHz 44 dBm		Auto Tune
15.0												79	Center Freq 9.000000 MHz
5.00 -5.00												79	Start Freq 3.000000 MHz
-15.0 -25.0												80	Stop Freq 5.000000 MHz
-35.0 -45.0											DL1 -35.00 dBm	<u>Auto</u>	CF Step 1.200000 MHz Man
-55.0								↓ ¹					Freq Offset 0 Hz
-65.0	hteren and a	or-Alasy	nkalynyff	les t lesses hij	in fan ferste ferste ferste ferste sterere	and and an	alladaa, fiindaa	vVietadel yelandru	₦₺₼₼₺ ₺ ₽₽₽ ₽ ₽₩₽	How Apply Ap	gemently hered		Scale Type
Star	t 793	.000	MHz		#1/D14	00 kU-			# O	Stop 805	.000 MHz	Log	Lin
#RC	5 DW	0.2	MIZ		#VDVV	JUKHZ			#Sweep	1.000 S (roor pis)		
Mag									STATUS	,			

Plot 7-70. Upper Emission Mask Edge Plot (Band 13 – 5.0MHz QPSK – RB Size 25)



Plot 7-71. Lower Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

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E Keysight	Spectrum Analyz	er - Swept SA									
LXI RL	RF	50 Ω AC	CORREC	SEI	NSE:INT	#Ava Tvp		05:57:52 PI	MDec 01, 2016	Fr	equency
			PNO: Wide ↔ IFGain:Low	, Trig: Free Atten: 36	eRun ∂dB	#//g//jp		TYF DE			
10 dB/div	Ref 25	.00 dBm					Mk	r1 774.9 -58.	64 MHz 73 dBm		Auto I une
15.0										(769	Center Freq 9.000000 MHz
-5.00										763	Start Freq 3.000000 MHz
-15.0										775	Stop Freq 5.000000 MHz
-35.0									DL1 -35.00 dBm	Auto ¹	CF Step I.200000 MHz Man
-55.0									1		Freq Offset 0 Hz
-65.0 http://md	and tool at web of t	yr yr hanne y ffredau yr hynn yn hynn y Yn hynn yn hynn	ekilika jira kika kika ka	daarahka kepertuku	in station of the state			1 March 1			Scale Type
Start 76	3.000 MH	z	#\/D\/	1 20 kH-			#Ouroon	Stop 775	.000 MHz	Log	Lin
#Res EV	V 0.2 KHZ		#VDV	V SU KHZ			#sweep	1.000 S (roor pis)		
MSG							STATUS				

Plot 7-72. Lower Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)



Plot 7-73. Upper Band Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)

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🔤 Key	/sight Spe	ctrum /	Analyzer - S	Swept SA										
l xi Ri		RF	50	Ω AC	CORREC		SE	NSE:INT	#Avg Tvp	ALIGN AUTO	06:03:00 P	MDec 01, 2016	F	requency
					PNO: IFGain	Wide ↔ i:Low	Trig: Fre Atten: 36	e Run 6 dB			TYI Di			
10 dE	3/div	Rei	525.00) dBm						Mk	r1 799.0 -61.	00 MHz 93 dBm		Auto Tune
15.0													79	Center Freq 9.000000 MHz
5.00 -5.00													79	Start Freq 3.000000 MHz
-15.0 -25.0													80	Stop Freq 5.000000 MHz
-35.0 -45.0												DL1 -35.00 dBm	<u>Auto</u>	CF Step 1.200000 MHz Man
-55.0	wanda	h. h. aka	In Marine Marine	4. January 1. offy	ndendeling	Olynor	A Partine Many Inc.	1	المعادية وبمحارك والمطالب	الوسرواديام مزارواره	4117442104491-11-12-14-1	onlyn yndrae y De		Freq Offset 0 Hz
-65.0														Scale Type
Star	t 793.	000	MHz								Stop 805	.000 MHz	Log	Lin
#Res	s BW	6.2 I	HZ			#VBW	30 kHz			#Sweep	1.000 s (1001 pts)		
MSG										STATUS	5			

Plot 7-74. Upper Emission Mask Edge Plot (Band 13 – 10.0MHz QPSK – RB Size 50)



Plot 7-75. Lower Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

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Keysight Spectrum	m Analyzer - Swept SA									
L XI RL	RF 50 Ω AC	CORREC	SEN	SE:INT	#Avg Typ	ALIGN AUTO e: RMS	05:10:06 PI TRAC	MDec 01, 2016	F	requency
		PNO: Wide ↔↔ IFGain:Low	Trig: Free Atten: 36	Run dB			TYF De			Auto Tuno
10 dB/div R	ef 25.00 dBm					Mk	r1 822.9 -30.	76 MHz 07 dBm		Auto I une
15.0									82	Center Freq 1.000000 MHz
-5.00									81	Start Freq 9.000000 MHz
-15.0								<u>DL1 -13.00 dBm</u>	82:	Stop Freq 3.000000 MHz
-35.0				~~	~~~~~	m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mund	<u>Auto</u>	CF Step 400.000 kHz Man
-55,0		M	~~~~~							Freq Offset 0 Hz
-65.0							On on A		Log	Scale Type
#Res BW 10	0 kHz	#VBW	300 kHz			Sweep_1	span 4 1.000 m <u>s (</u>	1001 pt <u>s)</u>		
MSG						STATU	s			

Plot 7-76. Lower Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)



Plot 7-77. Upper Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)

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Keysight Spectrum Analyzer - Swept SA					
XX RL RF 50Ω AC	CORREC S	ENSE:INT		05:12:51 PM Dec 01, 2016	Frequency
	PNO: Wide ↔ Trig: Fr IFGain:Low Atten: 5	ee Run 36 dB	tig type. this	TYPE A WWWW DET A NNNNN	
10 dB/div Ref 25.00 dBm			Mki	1 850.000 MHz -32.73 dBm	Auto Tune
15.0					Center Freq 852.000000 MHz
-5.00					Start Freq 850.000000 MHz
-15.0				DL1 -13.00 dBm	Stop Freq 854.000000 MHz
-35.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				CF Step 400.000 kHz <u>Auto</u> Man
-55.0			······	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Freq Offset 0 Hz
-65.0					Scale Type
Center 852.000 MHz #Res BW 100 kHz	#VBW 300 kH	7	Sween 1	Span 4.000 MHz .000 ms (1001 pts)	
MSG			STATUS		

Plot 7-78. Upper Extended Band Edge Plot (Band 5 – 1.4MHz QPSK – RB Size 6)



Plot 7-79. Lower Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

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Keysight Spectrum Analyzer - Swept SA					
LXU RL RF 50 Ω AC	CORREC SEI	NSE:INT #Ava Tvo	ALIGN AUTO 05:18: e: RMS	12 PM Dec 01, 2016	Frequency
	PNO: Wide ↔ Trig: Free IFGain:Low Atten: 36	e Run 6 dB			
10 dB/div Ref 25.00 dBm			Mkr1 82: -2	2.896 MHz 28.16 dBm	Auto Tune
15.0					Center Freq 821.000000 MHz
-5.00					Start Freq 819.000000 MHz
-15.0				DL1 -13.00 dBm	Stop Freq 823.000000 MHz
-35.0			······································	m	CF Step 400.000 kHz <u>Auto</u> Man
-55.0					Freq Offset 0 Hz
-65.0					Scale Type
Center 821.000 MHz #Res BW 100 kHz	#VBW 300 kHz		Spa Sweep 1.000 m	n 4.000 MHz	Log <u>Lin</u>
MSG			STATUS	(1001-003)	

Plot 7-80. Lower Extended Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)



Plot 7-81. Upper Band Edge Plot (Band 5 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager		
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🔤 Keysight Sp	ectrum Analyzer - Swept	SA			_	_				
LXI RL	RF 50 Ω	AC CORREC	SEN	SE:INT	#Ava Type	ALIGN AUTO	05:19:34 PI	MDec 01, 2016	Fr	equency
		PNO: Wide ↔ IFGain:Low	Trig: Free Atten: 36	Run dB			TYF DE			A
10 dB/div	Ref 25.00 dB	m				M	kr1 850.1 -24.	20 MHz 02 dBm		Auto Tune
15.0									(852	Center Freq 2.000000 MHz
-5.00									850	Start Freq 0.000000 MHz
-15.0								DL1 -13.00 dBm	854	Stop Freq .000000 MHz
-35.0		·····		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	······	<u>Auto</u>	CF Step 400.000 kHz Man
-55.0									1	F req Offset 0 Hz
-65.0										Scale Type
Center 85	52.000 MHz						Span 4	.000 MHz	Log	Lin
#Res BW	100 kHz	#VBW	300 KHZ			sweep	1.000 ms (1001 pts)		
MSG						STAT	US			

Plot 7-82. Upper Extended Band Edge Plot (Band 5 – Band 5 – 3.0MHz QPSK – RB Size 15)



Plot 7-83. Lower Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

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🔤 Keysight Sp	pectrum Analyzer - Swep	ot SA								
(XI RL	RF 50 Ω	AC CORREC	SENS	E:INT	A Ava Type	ERMS	05:25:00 PI TRAC	Dec 01, 2016	F	requency
		PNO: Wide ↔ IFGain:Low	Trig: Free F Atten: 36 d	Run IB	• ,1		TYF De	E A WWWWW T A N N N N N		
10 dB/div	Ref 25.00 dl	Bm				Mł	(r1 822.9 -30.1	64 MHz 06 dBm		Auto Tune
15.0									82 ⁻	Center Freq 1.000000 MHz
-5.00									819	Start Freq 9.000000 MHz
-15.0								<u>DL1 -13.00 dBm</u>	823	Stop Freq 3.000000 MHz
-35.0	~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	~~~~~	~~~~~	·····	~~~~~	<u>Auto</u>	CF Step 400.000 kHz Man
-55.0										Freq Offset 0 Hz
-65.0										Scale Type
Center 8	21.000 MHz	#)/D14	200 64-			Swoon	Span 4	000 MHz	Log	Lin
#Res BW	TOU KHZ	#VBW	300 KHZ			sweep	1.000 MS (root pis)		
MSG						STATU				

Plot 7-84. Lower Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



Plot 7-85. Upper Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)

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Keysight Spectrur	m Analyzer - Swept SA									
LXI RL	RF 50 Ω AC	CORREC	SENS	SE:INT	#Ava Type	BMS	05:26:24 PI	M Dec 01, 2016	F	requency
		PNO: Wide ↔ IFGain:Low	Trig: Free Atten: 36	Run dB			TYF DE			Auto Tuno
10 dB/div R	ef 25.00 dBm					M	kr1 850.0 -26.	28 MHz 85 dBm		Auto Tune
15.0									852	Center Freq 2.000000 MHz
5.00									850	Start Freq 0.000000 MHz
-15.0								DL1 -13.00 dBm	854	Stop Freq 4.000000 MHz
-35.0			~~~~		~~~~~			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	<u>Auto</u>	CF Step 400.000 kHz Man
-45.0										Freq Offset 0 Hz
-65.0										Scale Type
Center 852.0 #Res BW 10	00 MHz	#\/B\//	300 kHz			Sween	Span 4	.000 MHz 1001 pts)	Log	Lin
MSG			5-6-7 NH12			STAT	us	1001 pt3)		

Plot 7-86. Upper Extended Band Edge Plot (Band 5 – 5.0MHz QPSK – RB Size 25)



Plot 7-87. Lower Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

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Keysight Specific Keysight	ectrum Analyzer - Swe	ept SA								
LXI RL	RF 50 Ω	AC CORRE	C SI	ENSE:INT	#Ava Type	ALIGN AUTO	05:31:09 PI TRAC	Dec 01, 2016	Fr	equency
		PNO: IFGai	Wide ↔ Trig: Freen:Low Atten: 3	ee Run 86 dB			TYF DE			
10 dB/div	Ref 25.00 d	IBm				Mk	(r1 822.8 -33.	04 MHz 56 dBm		Auto I une
15.0									(821	Center Freq .000000 MHz
-5.00									819	Start Freq 0.000000 MHz
-15.0								DL1 -13.00 dBm	823	Stop Freq 8.000000 MHz
-35.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	· · · · · · · · · · · · · · · · · · ·	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		- /~- ^	1	<u>Auto</u>	CF Step 400.000 kHz Man
-45.0										Freq Offset 0 Hz
-65.0										Scale Type
Center 82 #Res BW	1.000 MHz		#VBW 300.kH	,		Sween	Span 4	.000 MHz 1001 nts)	Log	Lin
MSG			// BN 300 KH			STATU	is	roo r pts)		
							-			

Plot 7-88. Lower Extended Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)



Plot 7-89. Upper Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)

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Keysight Spectrum	Analyzer - Swept SA									
LXIRL R	F 50 Ω AC	CORREC	SEN	ISE:INT	#Avg Typ	ALIGN AUTO e: RMS	05:32:36 P	MDec 01, 2016	F	requency
		PNO: Wide ↔ IFGain:Low	Trig: Free Atten: 36	Run dB			TYI Di			
10 dB/div Re	ef 25.00 dBm					MI	kr1 850.0 -29.	60 MHz 44 dBm		Auto Tune
15.0									85:	Center Freq 2.000000 MHz
-5.00									85	Start Freq 0.000000 MHz
-15.0								DL1 -13.00 dBm	854	Stop Freq 4.000000 MHz
-36.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	<u>~~~</u>	<u>~~~</u> ~~~		<u>Auto</u>	CF Step 400.000 kHz Man
-55.0										Freq Offset 0 Hz
-65.0										Scale Type
Center 852.00	00 MHz	#\/B\/	300 kHz			Sween	Span 4	.000 MHz	Log	Lin
MSG		#VBV	000 1112			STAT	us	roor pts)		

Plot 7-90. Upper Extended Band Edge Plot (Band 5 – 10.0MHz QPSK – RB Size 50)



Plot 7-91. Lower Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

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Plot 7-92. Lower Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-93. Upper Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)

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Plot 7-94. Upper Extended Band Edge Plot (Band 4 – 1.4MHz QPSK – RB Size 6)



Plot 7-95. Lower Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

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Plot 7-96. Lower Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



Plot 7-97. Upper Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)

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Plot 7-98. Upper Extended Band Edge Plot (Band 4 – 3.0MHz QPSK – RB Size 15)



Plot 7-99. Lower Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

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Plot 7-100. Lower Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 7-101. Upper Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-102. Upper Extended Band Edge Plot (Band 4 – 5.0MHz QPSK – RB Size 25)



Plot 7-103. Lower Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

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Plot 7-104. Lower Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 7-105. Upper Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)

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Plot 7-106. Upper Extended Band Edge Plot (Band 4 – 10.0MHz QPSK – RB Size 50)



Plot 7-107. Lower Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

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Plot 7-108. Lower Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



Plot 7-109. Upper Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-110. Upper Extended Band Edge Plot (Band 4 – 15.0MHz QPSK – RB Size 75)



Plot 7-111. Lower Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕕 LG	Approved by: Quality Manager
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Plot 7-112. Lower Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-113. Upper Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕕 LG	Approved by: Quality Manager
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Plot 7-114. Upper Extended Band Edge Plot (Band 4 – 20.0MHz QPSK – RB Size 100)



Plot 7-115. Lower Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-116. Lower Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



Plot 7-117. Upper Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-118. Upper Extended Band Edge Plot (Band 2 – 1.4MHz QPSK – RB Size 6)



Plot 7-119. Lower Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-120. Lower Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



Plot 7-121. Upper Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)

FCC ID: ZNFVS501	PCTEST	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-122. Upper Extended Band Edge Plot (Band 2 – 3.0MHz QPSK – RB Size 15)



Plot 7-123. Lower Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕕 LG	Approved by: Quality Manager
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Plot 7-124. Lower Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



Plot 7-125. Upper Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-126. Upper Extended Band Edge Plot (Band 2 – 5.0MHz QPSK – RB Size 25)



Plot 7-127. Lower Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕕 LG	Approved by: Quality Manager
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Plot 7-128. Lower Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



Plot 7-129. Upper Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-130. Upper Extended Band Edge Plot (Band 2 – 10.0MHz QPSK – RB Size 50)



Plot 7-131. Lower Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-132. Lower Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



Plot 7-133. Upper Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-134. Upper Extended Band Edge Plot (Band 2 – 15.0MHz QPSK – RB Size 75)



Plot 7-135. Lower Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

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Plot 7-136. Lower Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)



Plot 7-137. Upper Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Plot 7-138. Upper Extended Band Edge Plot (Band 2 – 20.0MHz QPSK – RB Size 100)

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7.5 Peak-Average Ratio

Test Overview

A peak to average ratio measurement is performed at the conducted port of the EUT. The spectrum analyzers Complementary Cumulative Distribution Function (CCDF) measurement profile is used to determine the largest deviation between the average and the peak power of the EUT in a given bandwidth. The CCDF curve shows how much time the peak waveform spends at or above a given average power level. The percent of time the signal spends at or above the level defines the probability for that particular power level.

Test Procedure Used

KDB 971168 D01 v02r02 - Section 5.7.1

Test Settings

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

Test Setup

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



Figure 7-4. Test Instrument & Measurement Setup

Test Notes

None.

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Plot 7-140. PAR Plot (Band 2 – 1.4MHz 16-QAM – RB Size 6)

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Plot 7-142. PAR Plot (Band 2 - 3.0MHz 16-QAM - RB Size 15)

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Plot 7-144. PAR Plot (Band 2 - 5.0MHz 16-QAM - RB Size 25)

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Plot 7-146. PAR Plot (Band 2 - 10.0MHz 16-QAM - RB Size 50)

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Plot 7-148. PAR Plot (Band 2 - 15.0MHz 16-QAM - RB Size 75)

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Plot 7-150. PAR Plot (Band 2 - 20.0MHz 16-QAM - RB Size 100)

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7.6 Radiated Power (ERP/EIRP) §22.913(a.2) §24.232(c.2) §27.50(b.10) §27.50(d.4)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 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 its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 - Section 5.2.1

ANSI/TIA-603-D-2010 - Section 2.2.17

Test Settings

- 1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
- 2. RBW = 1 5% of the expected OBW, not to exceed 1MHz
- 3. VBW \geq 3 x RBW
- 4. Span = 1.5 times the OBW
- 5. No. of sweep points > 2 x span / RBW
- 6. Detector = RMS
- 7. Trigger is set to "free run" for signals with continuous operation with the sweep times set to "auto".
- 8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
- 9. Trace mode = trace averaging (RMS) over 100 sweeps
- 10. The trace was allowed to stabilize

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Test Setup

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



Figure 7-6. Radiated Test Setup >1GHz

Test Notes

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

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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
779.50	5	QPSK	н	231	348	1 / 24	16.64	2.47	19.11	34.77	-15.66
782.00	5	QPSK	н	239	186	1 / 0	16.74	2.54	19.28	34.77	-15.49
784.50	5	QPSK	н	217	182	1 / 24	17.14	2.63	19.77	34.77	-15.00
779.50	5	16QAM	н	231	348	1 / 24	15.66	2.47	18.13	34.77	-16.64
782.00	5	16QAM	н	239	186	1 / 0	15.79	2.54	18.33	34.77	-16.44
784.50	5	16QAM	н	217	182	1 / 24	16.08	2.63	18.71	34.77	-16.06
782.00	10	QPSK	н	235	350	1 / 49	17.31	2.54	19.85	34.77	-14.92
782.00	10	16QAM	н	235	350	1 / 49	16.30	2.54	18.84	34.77	-15.93
782.00	10	QPSK	V	100	159	1 / 74	14.55	3.92	18.47	34.77	-16.30

Table 7-2. ERP Data (Band 13)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBd]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]
824.70	1.4	QPSK	н	400	342	1 / 5	16.04	5.51	21.55	38.45	-16.90
836.50	1.4	QPSK	н	400	205	1 / 0	16.13	5.14	21.27	38.45	-17.18
848.30	1.4	QPSK	н	400	355	1 / 0	15.64	4.68	20.32	38.45	-18.13
824.70	1.4	16-QAM	н	400	342	1 / 5	15.06	5.51	20.57	38.45	-17.88
836.50	1.4	16-QAM	н	400	205	1 / 0	15.26	5.14	20.40	38.45	-18.05
848.30	1.4	16-QAM	н	400	355	1 / 0	14.70	4.68	19.38	38.45	-19.07
825.50	3	QPSK	н	395	220	1 / 0	15.90	5.52	21.42	38.45	-17.03
836.50	3	QPSK	н	400	211	1 / 14	16.18	5.14	21.32	38.45	-17.13
847.50	3	QPSK	н	400	219	1 / 0	15.69	4.67	20.36	38.45	-18.09
825.50	3	16-QAM	н	395	220	1 / 0	14.71	5.52	20.23	38.45	-18.22
836.50	3	16-QAM	н	400	211	1 / 14	15.00	5.14	20.14	38.45	-18.31
847.50	3	16-QAM	н	400	219	1 / 0	14.45	4.67	19.12	38.45	-19.33
826.50	5	QPSK	н	400	197	1 / 24	16.46	5.51	21.97	38.45	-16.48
836.50	5	QPSK	н	397	214	1 / 0	16.15	5.14	21.29	38.45	-17.16
846.50	5	QPSK	н	400	209	1 / 0	14.96	4.66	19.62	38.45	-18.83
826.50	5	16-QAM	н	400	197	1 / 24	15.29	5.51	20.80	38.45	-17.65
836.50	5	16-QAM	н	397	214	1 / 0	15.08	5.14	20.22	38.45	-18.23
846.50	5	16-QAM	н	400	209	1 / 0	14.02	4.66	18.68	38.45	-19.77
829.00	10	QPSK	н	390	187	1 / 49	16.38	5.49	21.87	38.45	-16.58
836.50	10	QPSK	н	400	210	1 / 0	16.10	5.14	21.24	38.45	-17.21
844.00	10	QPSK	н	393	202	1 / 0	16.12	4.70	20.82	38.45	-17.63
829.00	10	16-QAM	н	390	187	1 / 49	15.27	5.49	20.76	38.45	-17.69
836.50	10	16-QAM	н	400	210	1/0	15.05	5.14	20.19	38.45	-18.26
844.00	10	16-QAM	н	393	202	1/0	15.07	4.70	19.77	38.45	-18.68
826.50	5	QPSK	V	124	266	1 / 0	14.12	5.34	19.46	38.45	-18.99

Table 7-3. ERP Data (Band 5)

FCC ID: ZNFVS501	PCTEST	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	LG	Approved by: Quality Manager		
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1710.70	1.4	QPSK	н	100	267	1 / 5	11.73	9.62	21.35	30.00	-8.65
1732.50	1.4	QPSK	Н	100	270	1 / 5	12.04	9.50	21.54	30.00	-8.46
1754.30	1.4	QPSK	н	100	262	1 / 5	12.14	9.38	21.52	30.00	-8.48
1710.70	1.4	16-QAM	Н	100	267	1/5	10.87	9.62	20.49	30.00	-9.51
1732.50	1.4	16-QAM	н	100	270	1 / 5	11.20	9.50	20.70	30.00	-9.30
1754.30	1.4	16-QAM	н	100	262	1 / 5	11.23	9.38	20.61	30.00	-9.39
1711.50	3	QPSK	н	100	249	1 / 14	13.13	9.62	22.75	30.00	-7.25
1732.50	3	QPSK	н	100	274	1 / 0	12.78	9.50	22.28	30.00	-7.72
1753.50	3	QPSK	н	100	268	1 / 14	13.39	9.39	22.78	30.00	-7.22
1711.50	3	16-QAM	н	100	249	1 / 14	11.57	9.62	21.19	30.00	-8.81
1732.50	3	16-QAM	н	100	274	1 / 0	11.19	9.50	20.69	30.00	-9.31
1753.50	3	16-QAM	Н	100	268	1 / 14	11.95	9.39	21.34	30.00	-8.66
1712.50	5	QPSK	н	120	259	1 / 24	13.23	9.61	22.84	30.00	-7.16
1732.50	5	QPSK	Η	116	274	1 / 24	13.33	9.50	22.83	30.00	-7.17
1752.50	5	QPSK	н	116	265	1 / 24	13.39	9.39	22.78	30.00	-7.22
1712.50	5	16-QAM	н	120	259	1 / 24	12.09	9.61	21.70	30.00	-8.30
1732.50	5	16-QAM	н	116	274	1 / 24	12.17	9.50	21.67	30.00	-8.33
1752.50	5	16-QAM	Η	116	265	1 / 24	12.33	9.39	21.72	30.00	-8.28
1715.00	10	QPSK	н	115	272	1 / 0	12.68	9.60	22.28	30.00	-7.72
1732.50	10	QPSK	Н	117	276	1 / 49	12.71	9.50	22.21	30.00	-7.79
1750.00	10	QPSK	Н	115	272	1 / 49	12.67	9.41	22.08	30.00	-7.92
1715.00	10	16-QAM	Н	115	272	1 / 0	11.46	9.60	21.06	30.00	-8.94
1732.50	10	16-QAM	н	117	276	1 / 49	11.53	9.50	21.03	30.00	-8.97
1750.00	10	16-QAM	Н	115	272	1 / 49	11.58	9.41	20.99	30.00	-9.01
1717.50	15	QPSK	Η	100	266	1 / 74	12.49	9.58	22.07	30.00	-7.93
1732.50	15	QPSK	Н	100	271	1 / 74	12.90	9.50	22.40	30.00	-7.60
1747.50	15	QPSK	Н	100	270	1 / 74	12.31	9.42	21.73	30.00	-8.27
1717.50	15	16-QAM	Н	100	266	1 / 74	11.16	9.58	20.74	30.00	-9.26
1732.50	15	16-QAM	Η	100	271	1 / 74	11.59	9.50	21.09	30.00	-8.91
1747.50	15	16-QAM	н	100	270	1 / 74	10.94	9.42	20.36	30.00	-9.64
1720.00	20	QPSK	Н	100	264	1/0	12.46	9.57	22.03	30.00	-7.97
1732.50	20	QPSK	Н	100	279	1 / 99	11.96	9.50	21.46	30.00	-8.54
1745.00	20	QPSK	н	113	282	1 / 99	12.71	9.43	22.14	30.00	-7.86
1720.00	20	16-QAM	н	100	264	1/0	11.61	9.57	21.18	30.00	-8.82
1732.50	20	16-QAM	Н	100	279	1 / 99	11.18	9.50	20.68	30.00	-9.32
1745.00	20	16-QAM	Н	113	282	1 / 99	11.89	9.43	21.32	30.00	-8.68
1712.50	5	QPSK	۷	139	180	1 / 99	12.00	9.43	21.43	30.00	-8.57

Table 7-4. EIRP Data (Band 4)

FCC ID: ZNFVS501	PCTEST	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1850.70	1.4	QPSK	н	100	293	1 / 5	16.68	9.12	25.80	33.01	-7.21
1880.00	1.4	QPSK	Н	100	283	3 / 2	17.21	9.10	26.31	33.01	-6.70
1909.30	1.4	QPSK	Н	100	299	1 / 5	17.34	9.16	26.50	33.01	-6.51
1850.70	1.4	16-QAM	Н	100	293	1 / 5	15.71	9.12	24.83	33.01	-8.18
1880.00	1.4	16-QAM	Н	100	283	3/2	16.35	9.10	25.45	33.01	-7.56
1909.30	1.4	16-QAM	н	100	299	1 / 5	16.39	9.16	25.55	33.01	-7.46
1851.50	3	QPSK	н	100	281	1 / 0	16.85	9.12	25.97	33.01	-7.04
1880.00	3	QPSK	Н	100	281	1 / 0	17.24	9.10	26.34	33.01	-6.67
1908.50	3	QPSK	Н	100	269	1 / 0	17.11	9.15	26.26	33.01	-6.75
1851.50	3	16-QAM	Н	100	281	1 / 0	16.02	9.12	25.14	33.01	-7.87
1880.00	3	16-QAM	н	100	281	1 / 0	16.41	9.10	25.51	33.01	-7.50
1908.50	3	16-QAM	н	100	269	1 / 0	16.24	9.15	25.39	33.01	-7.62
1852.50	5	QPSK	н	100	286	1 / 0	16.80	9.12	25.92	33.01	-7.09
1880.00	5	QPSK	н	100	280	1 / 0	16.99	9.10	26.09	33.01	-6.92
1907.50	5	QPSK	н	100	277	1 / 24	16.96	9.15	26.11	33.01	-6.90
1852.50	5	16-QAM	н	100	286	1 / 0	15.65	9.12	24.77	33.01	-8.24
1880.00	5	16-QAM	н	100	280	1 / 0	15.71	9.10	24.81	33.01	-8.20
1907.50	5	16-QAM	н	100	277	1 / 24	15.84	9.15	24.99	33.01	-8.02
1855.00	10	QPSK	н	100	281	1 / 49	17.02	9.12	26.14	33.01	-6.87
1880.00	10	QPSK	Н	100	278	1 / 49	16.81	9.10	25.91	33.01	-7.10
1905.00	10	QPSK	Н	100	278	1 / 49	17.08	9.13	26.21	33.01	-6.80
1855.00	10	16-QAM	н	100	281	1 / 49	15.85	9.12	24.97	33.01	-8.04
1880.00	10	16-QAM	н	100	278	1 / 49	15.45	9.10	24.55	33.01	-8.46
1905.00	10	16-QAM	Н	100	278	1 / 49	15.88	9.13	25.01	33.01	-8.00
1857.50	15	QPSK	Н	100	290	1 / 74	16.93	9.11	26.04	33.01	-6.97
1880.00	15	QPSK	Н	100	285	1 / 74	16.68	9.10	25.78	33.01	-7.23
1902.50	15	QPSK	н	100	281	1 / 0	17.19	9.11	26.30	33.01	-6.71
1857.50	15	16-QAM	Н	100	290	1 / 74	15.69	9.11	24.80	33.01	-8.21
1880.00	15	16-QAM	Н	100	285	1 / 74	15.82	9.10	24.92	33.01	-8.09
1902.50	15	16-QAM	Н	100	281	1 / 0	15.95	9.11	25.06	33.01	-7.95
1860.00	20	QPSK	Н	100	282	1 / 99	16.98	9.11	26.09	33.01	-6.92
1880.00	20	QPSK	Н	100	282	1/0	16.68	9.10	25.78	33.01	-7.23
1900.00	20	QPSK	Н	100	276	1/0	16.56	9.09	25.65	33.01	-7.36
1860.00	20	16-QAM	н	100	282	1 / 99	15.65	9.11	24.76	33.01	-8.25
1880.00	20	16-QAM	н	100	282	1/0	15.50	9.10	24.60	33.01	-8.41
1900.00	20	16-QAM	н	100	276	1/0	15.37	9.09	24.46	33.01	-8.55
1909.30	1.4	QPSK	V	100	167	1/0	16.12	8.98	25.10	33.01	-7.91

Table 7-5. EIRP Data (Band 2)

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7.7 Radiated Spurious Emissions Measurements §2.1053 §22.917(a) §24.238(a) §27.53(c) §27.53(f) §27.53(h)

Test Overview

Radiated spurious emissions measurements are performed using the substitution method described in ANSI/TIA-603-D-2010 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 tuned dipole antennas. Measurements on signals operating above 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 peak measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v02r02 - Section 5.8

ANSI/TIA-603-D-2010 - Section 2.2.12

Test Settings

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

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Figure 7-7. Test Instrument & Measurement Setup

Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) 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.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
2346.00	н	100	159	-68.07	7.00	-61.07	80.9
3128.00	Н	-	-	-69.86	7.21	-62.64	82.5
3910.00	Н	-	-	-67.47	7.15	-60.32	80.2
4692.00	Н	-	-	-69.26	9.31	-59.95	79.8

Table 7-6. Radiated Spurious Data (Band 13 – Mid Channel)

	QPSK	MODULATION SIGNAL:
MHz	10.00	BANDWIDTH:
meters	3	DISTANCE:
dBm	-50	NARROWBAND EMISSION LIMIT:
dBm/MHz	-40	WIDEBAND EMISSION LIMIT:
—		

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	Margin [dB]
1564.00	Н	127	241	-74.25	6.41	-67.85	-27.8

Table 7-7. Radiated Spurious Data (Band 13 – 1559-1610MHz Band)

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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1653.00	Н	141	126	-69.56	6.28	-63.27	85.2
2479.50	Н	138	180	-67.17	6.84	-60.32	82.3
3306.00	Н	-	-	-68.66	7.14	-61.52	83.5
4132.50	Н	-	-	-68.29	7.74	-60.55	82.5

Table 7-8. Radiated Spurious Data (Band 5 – Low Channel)



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1673.00	Н	121	245	-70.27	6.21	-64.06	85.4
2509.50	Н	100	156	-67.97	6.86	-61.11	82.4
3346.00	Н	-	-	-68.90	7.26	-61.63	82.9
4182.50	Н	-	-	-68.01	8.07	-59.94	81.2

Table 7-9. Radiated Spurious Data (Band 5 – Mid Channel)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBd]	Spurious Emission Level [dBm]	[dBc]
1693.00	Н	137	260	-70.10	6.14	-63.96	83.6
2539.50	Н	111	171	-68.96	6.95	-62.02	81.6
3386.00	Н	-	-	-69.39	7.38	-62.01	81.6
4232.50	Н	-	-	-70.13	8.34	-61.79	81.4

Table 7-10. Radiated Spurious Data (Band 5 – High Channel)

OPERATING FREQUENCY: 1712.50 MHz CHANNEL: 19975 MEASURED OUTPUT POWER: 22.84 dBm 0.192 W = MODULATION SIGNAL: **QPSK** BANDWIDTH: 5.0 MHz DISTANCE: 3 meters LIMIT: 43 + 10 log₁₀ (W) = 35.84 dBc

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3425.00	Н	110	57	-62.19	9.65	-52.54	75.4
5137.50	Н	-	-	-66.30	10.91	-55.39	78.2
6850.00	Н	-	-	-61.95	10.78	-51.17	74.0

Table 7-11. Radiated Spurious Data (Band 4 – Low Channel)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager	
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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3465.00	н	100	35	-64.98	9.77	-55.20	78.0
5197.50	Н	-	-	-65.88	10.81	-55.07	77.9
6930.00	Н	-	-	-61.26	10.89	-50.37	73.2

Table 7-12. Radiated Spurious Data (Band 4 – Mid Channel)



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3505.00	Н	100	64	-63.92	9.89	-54.04	76.8
5257.50	Н	-	-	-66.50	10.92	-55.58	78.4
7010.00	Н	-	-	-62.46	11.06	-51.40	74.2

Table 7-13. Radiated Spurious Data (Band 4 – High Channel)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3701.40	н	100	295	-53.88	10.03	-43.85	69.6
5552.10	Н	100	76	-57.64	11.18	-46.46	72.3
7402.80	Н	-	-	-61.92	10.86	-51.06	76.9
9253.50	Н	-	-	-60.25	12.37	-47.88	73.7

Table 7-14. Radiated Spurious Data (Band 2 – Low Channel)



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3760.00	Н	100	318	-56.49	9.79	-46.71	73.0
5640.00	Н	100	57	-58.89	11.35	-47.54	73.9
7520.00	Н	-	-	-62.38	11.22	-51.16	77.5
9400.00	Н	-	-	-60.77	12.30	-48.47	74.8

Table 7-15. Radiated Spurious Data (Band 2 – Mid Channel)

FCC ID: ZNFVS501	PCTEST	FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	[dBc]
3818.60	Н	100	295	-54.44	9.56	-44.88	71.4
5727.90	Н	100	76	-59.34	11.43	-47.91	74.4
7637.20	Н	-	-	-63.01	11.50	-51.51	78.0
9546.50	Н	-	-	-61.12	12.39	-48.74	75.2

Table 7-16. Radiated Spurious Data (Band 2 – High Channel)

FCC ID: ZNFVS501		FCC Pt. 22, 24, & 27 LTE MEASUREMENT REPORT (CERTIFICATION)	🕒 LG	Approved by: Quality Manager
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7.8 Frequency Stability / Temperature Variation §2.1055 §22.355 §24.235 §27.54

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-D-2010. 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, the frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency. For Part 24 and Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-D-2010

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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Band 13 Frequency Stability Measurements §2.1055 §27.54

OPERATING FREQUENCY:	782,000,000	Hz
CHANNEL:	23230	_
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	781,999,968	-32	-0.0000041
100 %		- 30	781,999,724	-276	-0.0000353
100 %		- 20	782,000,361	361	0.0000462
100 %		- 10	781,999,901	-99	-0.0000127
100 %		0	781,999,854	-146	-0.0000187
100 %		+ 10	781,999,877	-123	-0.0000157
100 %		+ 20	781,999,718	-282	-0.0000361
100 %		+ 30	781,999,807	-193	-0.0000247
100 %		+ 40	781,999,569	-431	-0.0000551
100 %		+ 50	782,000,001	1	0.0000001
BATT. ENDPOINT	3.45	+ 20	781,999,750	-250	-0.0000320

Table 7-17. Frequency Stability Data (Band 13)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain inband when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Band 13 Frequency Stability Measurements §2.1055 §27.54



Figure 7-8. Frequency Stability Graph (Band 13)

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Band 5 Frequency Stability Measurements §2.1055 §22.355

OPERATING FREQUENCY:	836,500,000	Hz
CHANNEL:	20525	_
REFERENCE VOLTAGE:	3.85	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	836,499,734	-266	-0.0000318
100 %		- 30	836,499,624	-376	-0.0000449
100 %		- 20	836,499,963	-37	-0.0000044
100 %		- 10	836,499,822	-178	-0.0000213
100 %		0	836,500,215	215	0.0000257
100 %		+ 10	836,499,855	-145	-0.0000173
100 %		+ 20	836,500,396	396	0.0000473
100 %		+ 30	836,500,033	33	0.0000039
100 %		+ 40	836,499,931	-69	-0.0000082
100 %		+ 50	836,500,294	294	0.0000351
BATT. ENDPOINT	3.45	+ 20	836,499,997	-3	-0.0000004

Table 7-18. Frequency Stability Data (Band 5)

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Band 5 Frequency Stability Measurements §2.1055 §22.355



Figure 7-9. Frequency Stability Graph (Band 5)

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Band 4 Frequency Stability Measurements §2.1055 §§27.54

OPERATING FREQUENCY:	1,732,500,000	Hz
CHANNEL:	20175	_
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,732,499,857	-143	-0.000083
100 %		- 30	1,732,500,066	66	0.000038
100 %		- 20	1,732,499,827	-173	-0.0000100
100 %		- 10	1,732,500,405	405	0.0000234
100 %		0	1,732,499,885	-115	-0.0000066
100 %		+ 10	1,732,499,803	-197	-0.0000114
100 %		+ 20	1,732,500,157	157	0.0000091
100 %		+ 30	1,732,499,975	-25	-0.0000014
100 %		+ 40	1,732,500,098	98	0.0000057
100 %		+ 50	1,732,499,982	-18	-0.0000010
BATT. ENDPOINT	3.45	+ 20	1,732,500,191	191	0.0000110

Table 7-19. Frequency Stability Data (Band 4)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain inband when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Band 4 Frequency Stability Measurements §2.1055 §§27.54



Figure 7-10. Frequency Stability Graph (Band 4)

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Band 2 Frequency Stability Measurements §2.1055 §24.235

OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	18900	
REFERENCE VOLTAGE:	3.85	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	3.85	+ 20 (Ref)	1,880,000,099	99	0.0000053
100 %		- 30	1,880,000,208	208	0.0000111
100 %		- 20	1,880,000,214	214	0.0000114
100 %		- 10	1,879,999,765	-235	-0.0000125
100 %		0	1,880,000,024	24	0.0000013
100 %		+ 10	1,879,999,860	-140	-0.0000074
100 %		+ 20	1,880,000,151	151	0.0000080
100 %		+ 30	1,879,999,780	-220	-0.0000117
100 %		+ 40	1,879,999,999	-1	-0.0000001
100 %		+ 50	1,880,000,059	59	0.0000031
BATT. ENDPOINT	3.45	+ 20	1,880,000,130	130	0.0000069

Table 7-20. Frequency Stability Data (Band 2)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain inband when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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Band 2 Frequency Stability Measurements §2.1055 §24.235



Figure 7-11. Frequency Stability Graph (Band 2)

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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: ZNFVS501** complies with all the requirements of Parts 22, 24, & 27 of the FCC rules for LTE operation only.

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