

ELEMENT WASHINGTON DC LLC

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PART 24 MEASUREMENT REPORT

Applicant Name:

Samsung Electronics Co., Ltd. 129, Samsung-ro Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea

Date of Testing:

09/08/2023 - 11/2/2023 **Test Report Issue Date:** 11/3/2023 **Test Site/Location:** Element lab., Columbia, MD, USA **Test Report Serial No.:** 1M2309070101-02.A3L

FCC ID:

A3LSMA156M

Applicant Name:

Samsung Electronics Co., Ltd.

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

Certification SM-A156M/DSN SM-A156M/N Portable Handset PCS Licensed Transmitter Held to Ear (PCE) 24 ANSI C63.26-2015

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.

RJ Ortanez Executive Vice President



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Antenna-1						
Mode	Bandwidth	Modulation	Tx Frequency	EIRP Max. Power Max. Power		Emission
mouo	Banamatin	modulation	Range [MHz]	[W]	[dBm]	Designator
GSM/GPRS	N/A	GMSK	1850.2 - 1909.8	0.912	29.60	243KGXW
EDGE	N/A	8-PSK	1850.2 - 1909.8	0.290	24.63	251KG7W
/CDMA	N/A	Spread Spectrum	1852.4 - 1907.6	0.285	24.55	4M16F9W
	20 MHz	QPSK	1860 - 1905	0.299	24.76	18M0G7D
		16QAM	1860 - 1905	0.243	23.85	18M0W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.310	24.91	13M5G7D
		16QAM	1857.5 - 1907.5	0.245	23.89	13M5W7D
	Band 2 5 MHz 0	QPSK	1855 - 1910	0.302	24.80	9M02G7D
LTE Band 2		16QAM	1855 - 1910	0.243	23.86	8M98W7D
LTE Danu Z		QPSK	1852.5 - 1912.5	0.302	24.80	4M51G7D
		16QAM	1852.5 - 1912.5	0.237	23.75	4M51W7D
	3 MHz	QPSK	1851.5 - 1913.5	0.304	24.83	2M70G7D
	3 MHZ	16QAM	1851.5 - 1913.5	0.241	23.82	2M71W7D
	1 4 MH-	QPSK	1850.7 - 1914.3	0.303	24.81	1M10G7D
	1.4 MHz	16QAM	1850.7 - 1914.3	0.239	23.78	1M11W7D

EUT Overview – Antenna 1

Antenna-2						
		Modulation	Tx Frequency Range [MHz]	EIRP		Emission
Mode	Bandwidth			Max. Power [W]	Max. Power [dBm]	Designator
	20 MHz	QPSK	1860 - 1905	0.164	22.14	18M0G7D
		16QAM	1860 - 1905	0.132	21.21	17M9W7D
	15 MHz	QPSK	1857.5 - 1907.5	0.176	22.46	13M4G7D
		16QAM	1857.5 - 1907.5	0.142	21.53	13M5W7D
	10 MHz	QPSK	1855 - 1910	0.175	22.44	8M99G7D
LTE Band 2		16QAM	1855 - 1910	0.147	21.68	9M01W7D
LIE Band 2	5 MHz	QPSK	1852.5 - 1912.5	0.175	22.42	4M50G7D
		16QAM	1852.5 - 1912.5	0.147	21.67	4M49W7D
	0.141	QPSK	1851.5 - 1913.5	0.176	22.46	2M70G7D
	3 MHz	16QAM	1851.5 - 1913.5	0.146	21.65	2M71W7D
		QPSK	1850.7 - 1914.3	0.168	22.25	1M10G7D
	1.4 MHz	16QAM	1850.7 - 1914.3	0.141	21.48	1M10W7D

EUT Overview – Antenna 2

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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 Element Test Location

These measurement tests were conducted at the Element laboratory 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 Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC is an ISO 17025-2017 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.
- Element Washington DC LLC 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).
- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMA156M**. 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 24.

Test Device Serial No.: 0447M, 0456M, 1931M, 1958M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 802.11b/g/n WLAN, 802.11a/n/ac UNII (5GHz), Bluetooth (1x, EDR, LE), NFC

Band	Ant1	Ant2
GSM/GPRS/EDGE PCS	Ant B	N/A
WCDMA PCS	Ant B	N/A
LTE Band 2	Ant B	Ant C

Table 2-1. Antenna Naming Convention

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version A156EDXU0AWI4 installed on the EUT.

2.5 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the "American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services" (ANSI C63.26-2015) 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 C63.26-2015. For emissions below 1GHz, a half-wave dipole is substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

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

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

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. 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 414788 D01 v01r01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

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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
-	AP2-001	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	AP2-001
	AP2-002	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	AP2-002
-	ETS-001	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-001
-	ETS-002	EMC Cable and Switch System	1/11/2023	Annual	1/11/2024	ETS-002
	LTX4	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX4
-	LTX5	Licensed Transmitter Cable Set	1/12/2023	Annual	1/12/2024	LTX5
Anritsu	MT8821C	Radio Communication Analyzer		N/A		620152694
Com-Power	AL-130R	9kHz - 30MHz Loop Antenna	1/18/2022	Biennial	1/19/2024	121085
EMCO	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9704-5182
EMCO	3116	Horn Antenna (18-40GHz)	7/5/2023	Biennial	7/5/2025	9203-2178
Keysight Technologies	N9030A	PXA Signal Analyzer (3Hz-26.5GHz)	8/7/2023	Annual	8/7/2024	MY54490576
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	3/15/2023	Annual	3/15/2024	MY52350166
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		112347
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	9/28/2022	Biennial	9/28/2024	101058
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	9/25/2023	Annual	9/25/2024	100342
Rohde & Schwarz	ESW44	EMI Test Receiver (2Hz-44GHz)	3/1/2023	Annual	3/1/2024	101716
Rohde & Schwarz	VULB9162	Bi-Log Antenna	2/21/2023	Biennial	2/21/2025	00301
Sunol	DRH-118	Horn Antenna (1-18GHz)	2/14/2022	Biennial	2/14/2024	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	8/30/2022	Biennial	8/30/2024	A051107

Table 5-1. Test Equipment

Notes:

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

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6.0 SAMPLE CALCULATIONS

GSM Emission Designator

Emission Designator = 250KGXW GSM BW = 250 kHz G = Phase Modulation

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

EDGE Emission Designator

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

WCDMA Emission Designator

Emission Designator = 4M16F9W WCDMA BW = 4.16 MHz F = Frequency Modulation 9 = Composite Digital Info W = Combination (Audio/Data)

QPSK Modulation

Emission Designator = 8M62G7D

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

QAM Modulation

Emission Designator = 8M45W7D LTE BW = 8.45 MHz W = Amplitude/Angle Modulated 7 = Quantized/Digital Info D = Data transmission, telemetry, telecommand

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Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

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

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7.0 TEST RESULTS

7.1 Summary

Company Name:	Samsung Electronics Co., Ltd.
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FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	GSM/GPRS/EDGE/WCDMA/LTE

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
	Transmitter Conducted Output Power*	2.1046(a), 2.1046(c)	N/A	PASS	See RF Exposure Report
Ĥ	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.2
CONDUCTED	Conducted Band Edge / Spurious Emissions	2.1051, 24.238(a)	> 43 + 10log10(P[Watts]) at Band Edge and for all out- of-band emissions	PASS	Sections 7.3, 7.4
Ö	Peak-to-Average Ratio	24.232(d)	≤ 13 dB	PASS	Section 7.5
	Frequency Stability	2.1055, 24.235	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
RADIATED	Equivalent Isotropic Radiated Power	24.232(c)	< 2 Watts max. EIRP	PASS	Section 7.6
RADI	Radiated Spurious Emissions	2.1053, 24.238(a)	≥ 43 + 10 log (P[Watts]) dB of attenuation below transmitter power	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.
- All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.2.2.

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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

ANSI C63.26-2015 - Section 5.4.4

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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Mode	Bandwidth	Modulation	OBW [MHz]
GSM-PCS	250kHz	GMSK	0.24
GSIVFPCS	250kHz	8-PSK	0.25
WCDMA-PCS	5MHz	Spread Spectrum	4.16
		QPSK	17.98
	20MHz	16QAM	17.96
	15MHz	QPSK	13.51
		16QAM	13.49
	10MHz	QPSK	9.02
LTE-B2		16QAM	8.98
	5MHz	QPSK	4.51
	SIVINZ	16QAM	4.51
	3MHz	QPSK	2.70
		16QAM	2.71
	1.4MHz	QPSK	1.10
	I.4IVI⊓Z	16QAM	1.11

Table 7-2. Summary of Test Results for Occupied Bandwidth – Ant1

Mode	Bandwidth	Modulation	OBW [MHz]
	20MHz	QPSK	17.97
	2010102	16QAM	17.95
	15MHz	QPSK	13.45
		16QAM	13.48
	10MHz	QPSK	8.99
LTE-B2		16QAM	9.01
LIE-DZ	5MHz	QPSK	4.50
		16QAM	4.49
	3MHz	QPSK	2.70
	SIVITZ	16QAM	2.71
	1.4MHz	QPSK	1.10
	I.4IVI⊓Z	16QAM	1.10

Table 7-3. Summary of Test Results for Occupied Bandwidth – Ant2

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LTE Band 2 – Ant1

Keysight Spectrum Analyzer - Occupied BW
RL RF 50 Ω DC - # -12:28:48 PM Sep 27, 2023 SENSE:INT ALIGN AUTO Center Freq: 1.880000000 GHz Trig: Free Run Avg|Hol #Atten: 36 dB Trace/Detector Radio Std: None Avg|Hold: 100/100 Radio Device: BTS #IFGain:Low Ref 40.00 dBm 10 dB/div Log **Clear Write** Average Max Hold Center 1.88000 GHz Res BW 470 kHz Span 50.00 MHz #VBW 1.5 MHz Sweep 1 ms Min Hold Occupied Bandwidth **Total Power** 31.1 dBm 17.978 MHz Detector Peak **Transmit Freq Error** 5.291 kHz % of OBW Power 99.00 % Auto Man x dB Bandwidth 19.47 MHz x dB -26.00 dB STATUS MSG

Plot 7-1. Occupied Bandwidth Plot (LTE Band 2 - 20MHz QPSK - Full RB - Ant1)

Keysight Spectrum Analyzer - Occupied	BW				
LX/RL RF 50Ω DC	CORREC	SENSE:INT		12:28:59 PM Sep 27, 2023 Radio Std: None	Trace/Detector
		Trig: Free Run	Avg Hold: 100/100	Radio Std. None	
	#IFGain:Low	#Atten: 36 dB		Radio Device: BTS	
10 dB/div Ref 40.00 dE	sm				
Log 30.0					
20.0					Clear Write
	hours	Marilan Maria have been and	Martinen		
10.0					
0.00	/		<u>\</u>		
-10.0			1		Average
-20.0	yrlyku, wr		<u>Դիկտորեստո</u>	WENTHUM HUR HAR HAR	
-30.0					
-40.0					Max Hold
-50.0					
Center 1.88000 GHz				Span 50.00 MHz	
Res BW 470 kHz		#VBW 1.5 MH	7	Sweep 1 ms	
					Min Hold
Occupied Bandwic	ith	Total Po	wer 30.1	dBm	
1	7.959 MH	7			Detector
					Peak▶
Transmit Freq Error	-14.201 ki	Iz % of OB	W Power 99	.00 %	Auto <u>Man</u>
x dB Bandwidth	19.47 MF	z x dB	-26.	00 dB	
MSG			STATUS	5	

Plot 7-2. Occupied Bandwidth Plot (LTE Band 2 - 20MHz 16-QAM - Full RB - Ant1)

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Keysight Spectrum Analyzer - Occupi	ied BW				
(X) RL RF 50Ω D	DC CORREC	SENSE:INT	ALIGN AUTO	12:30:28 PM Sep 2 Radio Std: None	
	- -	Trig: Free Run	Avg Hold: 100/100		
	#IFGain:Low	#Atten: 36 dB		Radio Device: B	TS
10 dB/div Ref 40.00 c	dBm				
Log 30.0					
20.0	ر و الکک				Clear Write
	promotion and	han and the states of the stat	man martingen		
10.0					
0.00					
-10.0					Average
-20.0 marine marine and	Mar Marine Contractor		Mar Antonia	warraw and along a start	-A PAAP
-30.0					
-40.0					Max Hold
-50.0					
Center 1.88000 GHz Res BW 360 kHz		#VBW 1.1 M	U -	Span 37.50 Sweep	1
Res DW 300 KH2		#VDW 1.1W	IHZ	Sweep	Min Hold
Occupied Bandw	ridth	Total P	ower 31.2	dBm	
					Detector
	13.507 MH	Z			Detector Peak►
Transmit Freq Error	r 11.553 k⊦	z % of O	BW Power 99	.00 %	Auto <u>Man</u>
x dB Bandwidth	14.77 MF	Hz xdB	-26	00 dB	
	14.77 Wi		-20.		
MSG			STATUS	5	

Plot 7-3. Occupied Bandwidth Plot (LTE Band 2 - 15MHz QPSK - Full RB - Ant1)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 2 - 15MHz 16-QAM - Full RB - Ant1)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	
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Keysight Spectrum Analyzer - Occupied B					
LXX RL RF 50Ω DC	CORREC	SENSE:INT nter Freg: 1.880000000 GHz	ALIGN AUTO	12:31:10 PM Sep 27, 2023 Radio Std: None	Trace/Detector
		g:FreeRun Avg Ho tten:36 dB	old: 100/100	Radio Device: BTS	
	#IFGain:Low #At	tten: 36 db		Radio Device: B13	
10 dB/div Ref 40.00 dB	m				
30.0					
20.0		www			Clear Write
10.0		angeletur angeletur angeletur angeletur angeletur.	\		
0.00			<u> </u>		
-10.0			1		Average
-20.0	want		Jan and the for	www.www.www.www.www.www.www.www.www.ww	
-30.0					
-40.0					Max Hold
-50.0					maxmora
Center 1.88000 GHz Res BW 240 kHz		#VBW 750 kHz		Span 25.00 MHz Sweep 1 ms	
1(C3 DW 240 ((12		#VDVV 750 KHZ		oweep rms	Min Hold
Occupied Bandwid	th	Total Power	31.1	l dBm	
9	.0242 MHz				Detector
					Peak►
Transmit Freq Error	7.785 kHz	% of OBW Po	wer 99	9.00 %	Auto <u>Man</u>
x dB Bandwidth	9.890 MHz	x dB	-26.	00 dB	
MSG			STATU	s	

Plot 7-5. Occupied Bandwidth Plot (LTE Band 2 - 10MHz QPSK - Full RB - Ant1)



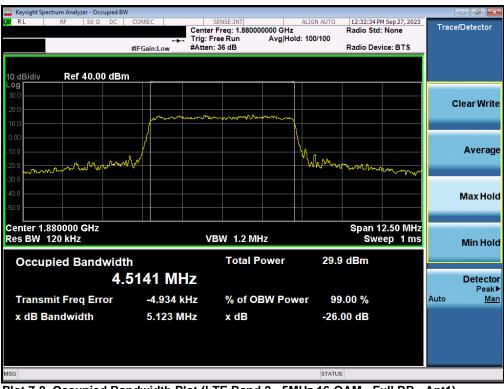
Plot 7-6. Occupied Bandwidth Plot (LTE Band 2 - 10MHz 16-QAM - Full RB - Ant1)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	
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Keysight Spectrum Analyzer - Occupied I						- J J	
XV RL RF 50Ω DC	CORREC	SENSE:INT ter Freg: 1.880000000 GHz	ALIGN AUTO	12:32:23 PM Se Radio Std: No		Trace/Detector	
		:FreeRun Avg Hol en:36 dB	d: 100/100	Radio Device	DTC		
	#IFGain:Low #Att	en: 36 dB		Radio Device	: B13		
10 dB/div Ref 40.00 dB	sm						
30.0							
20.0						Clear Write	
10.0		mmmmm					
0.00	/		<u>\</u>				
-10.0			↓ 			Average	
-20.0 Martin Martin Martin	mand		Lann	an way and	3		
-30.0					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
-40.0						Max Hold	
-50.0						maxinoid	
Center 1.880000 GHz Res BW 120 kHz		VBW 1.2 MHz		Span 12.		Min Hold	
ACS BWY TZO ATZ					Sweep 1 ms Mi		
Occupied Bandwid	lth	Total Power	31.0) dBm			
4	.5092 MHz					Detector	
						Peak▶	
Transmit Freq Error	-3.097 kHz	% of OBW Pow	/er 99	.00 %	A	uto <u>Man</u>	
x dB Bandwidth	4.994 MHz	x dB	-26.	00 dB			
MSG			STATUS	3			

Plot 7-7. Occupied Bandwidth Plot (LTE Band 2 - 5MHz QPSK - Full RB - Ant1)



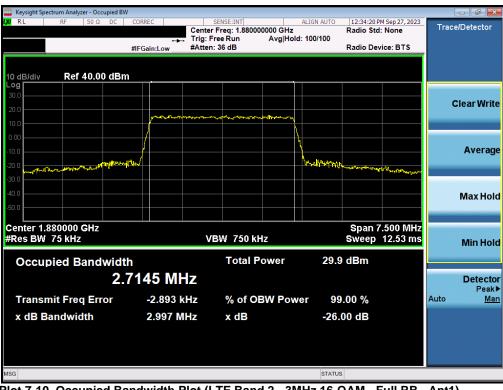
Plot 7-8. Occupied Bandwidth Plot (LTE Band 2 - 5MHz 16-QAM - Full RB - Ant1)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	
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Keysight Spectrum Analyzer - Occu							
LXI RL RF 50 Ω	DC CORREC	SENSE:INT Center Freg: 1.880	ALIGN AUT(2 12:34:04 P Radio Std	M Sep 27, 2023	Trace/I	Detector
		🛶 Trig: Free Run	Avg Hold: 100/100				
	#IFGain:Lo	w #Atten: 36 dB		Radio Dev	vice: BTS		
10 dB/div Ref 40.00	dBm						
30.0							
20.0						CI	ear Write
10.0	مهمر	man and a second and	marchine				
0.00	/						
-10.0	/		N N				Average
	كمريهم المريد		James and a start of the start	-			/// or ugo
-20.0				and the second second	manna		
-30.0							
						1	Max Hold
-50.0							
Center 1.880000 GHz				Span 7	.500 MHz		
#Res BW 75 kHz		VBW 7501	(Hz	Sweep	12.53 ms		Min Hold
		Total	Power 30	.9 dBm			
Occupied Bandy			Fower 30	.9 aBm			
	2.6999	MHz					Detector
Transmit Freq Erro	- <u>-</u> 27	51 kHz % of C	DBW Power	99.00 %		Auto	Peak▶ Man
x dB Bandwidth	2.96	50 MHz x dB	-2	6.00 dB			
MSG			STA	rus			

Plot 7-9. Occupied Bandwidth Plot (LTE Band 2 - 3MHz QPSK - Full RB - Ant1)



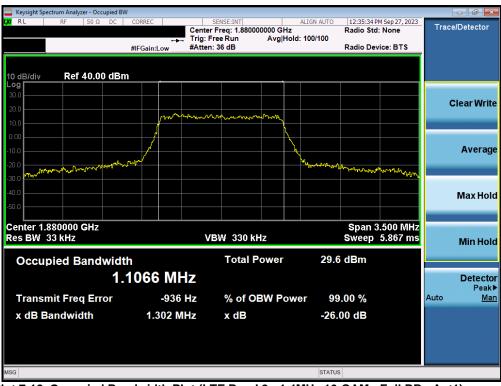
Plot 7-10. Occupied Bandwidth Plot (LTE Band 2 - 3MHz 16-QAM - Full RB - Ant1)

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Plot 7-11. Occupied Bandwidth Plot (LTE Band 2 - 1.4MHz QPSK - Full RB - Ant1)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 2 - 1.4MHz 16-QAM - Full RB - Ant1)

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LTE Band 2 – Ant2

Keysight Spectrum Analyzer - Occupied BW - # -08:00:45 PM Oct 18, 2023 SENSE:INT ALIGN AUTO Center Freq: 1.880000000 GHz Trig: Free Run Avg|Hol #Atten: 36 dB Trace/Detector Radio Std: None Avg|Hold: 100/100 Radio Device: BTS #IFGain:Low Ref 40.00 dBm 10 dB/div Log **Clear Write** Average Montal my have สาน . here later Max Hold Center 1.88000 GHz Res BW 470 kHz Span 50.00 MHz #VBW 1.5 MHz Sweep 1 ms Min Hold Occupied Bandwidth **Total Power** 30.3 dBm 17.971 MHz Detector Peak -10.460 kHz **Transmit Freq Error** % of OBW Power 99.00 % Auto Man x dB Bandwidth 19.45 MHz x dB -26.00 dB STATUS MSG

Plot 7-13. Occupied Bandwidth Plot (LTE Band 2 - 20MHz QPSK - Full RB - Ant2)

🔤 Keysight Spectrum Analyz									_	
LXI RL RF	50 Ω D	C CORRE	C	SENSE:INT Center Freq: 1.880	00000 GHz	ALIGN AUT	ro 08:00:51 F Radio Std	M Oct 18, 2023	Trace	e/Detector
				Trig: Free Run		d: 100/100		. None		
		#IFGa	in:Low	#Atten: 36 dB			Radio Dev	/ice: BTS		
	40.00 d	IBm								
Log 30.0										
										Clear Write
20.0			Alexandrea	whyte Man and an and	900000					
10.0										
0.00		{				{				
-10.0		/				┦───				Average
-20.0	~~\rhvhv [_] hh	ntransfield"				- Joseph Marya	1the manuter willing	والمريد والمراجع		
-30.0								a and an entralitida		
-40.0										Max Hold
-50.0										Maxilola
Center 1.88000 G								50.00 MHz		
Res BW 470 kHz				#VBW 1.5	VIHZ		SW	eep 1 ms		Min Hold
Occupied B	andwi	idth		Total	Power	2	9.5 dBm			
			7 8 41 1							_
		17.94	7 MH	Z						Detector Peak►
Transmit Free		-4	6.787 kH	z % of C	BW Pov	ver	99.00 %		Auto	Peak⊯ Man
	-									
x dB Bandwid	lth	1	9.32 MF	z x dB		-2	26.00 dB			
MSG						ST/	ATUS			

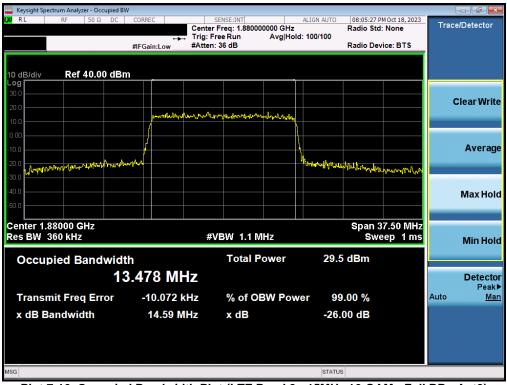
Plot 7-14. Occupied Bandwidth Plot (LTE Band 2 - 20MHz 16-QAM - Full RB - Ant2)

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🔤 Keysight Spectrum Analyzer - Occupi	ied BW						7 X
LXI RL RF 50Ω [SENSE:INT	ALIGN AUTO	08:05:20 PM Oc Radio Std: No		Trace/Dete	ctor
		Trig: Free Run	Avg Hold: 100/100				
	#IFGain:Low	#Atten: 36 dB		Radio Device:	BTS		
10 dB/div Ref 40.00 d	dBm						
Log 30.0							
20.0						Clear	Write
	per man	under marker ward	- all a same for				
10.0							
0.00							
-10.0						AV	erage
- Hughy Why was a for the gar of	un maland		Way low water of	with marty way	white		
-30.0							
-40.0						Мах	(Hold
-50.0							
Contor 4 99000 CHz				- Onen 27.5	A BALL		
Center 1.88000 GHz Res BW 360 kHz		#VBW 1.1 M	Hz.	Span 37.5 Sweep			
NGS BW - OVO MH2				oncop		Min	1 Hold
Occupied Bandw	ridth	Total P	ower 30.3	dBm			
	13.446 MH	7				Det	tector
	13.440 Mill						Peak ►
Transmit Freq Error	r -28.528 kH	Hz % of OE	3W Power 99	.00 %		Auto	Man
x dB Bandwidth	14.54 MH	Hz xdB	-26.	00 dB			
A de Banaman							
MSG			STATUS	5			

Plot 7-15. Occupied Bandwidth Plot (LTE Band 2 - 15MHz QPSK - Full RB - Ant2)



Plot 7-16. Occupied Bandwidth Plot (LTE Band 2 - 15MHz 16-QAM - Full RB - Ant2)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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🤤 Keysight Spectrum Analyzer - Occupie	ed BW				
ιχ RL RF 50 Ω D	а 	SENSE:INT Senter Freq: 1.880000000 GH 'rig: Free Run Avg H Atten: 36 dB	z Radio S old: 100/100	evice: BTS	Trace/Detector
10 dB/div Ref 40.00 d	IBm				
20.0		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			Clear Write
10.0					
0.00 -10.0 -20.0	A		hanne and a ma		Average
-20.0 -20.0			Mar All And all by Tronge	montory	
-00.0					Max Hold
Center 1.88000 GHz Res BW 240 kHz		#VBW 750 kHz		25.00 MHz veep 1 ms	Min Hold
Occupied Bandwi	idth	Total Power	30.0 dBm		
	8.9948 MHz	2			Detector Peak▶
Transmit Freq Error	4.107 kHz	z % of OBW Po	wer 99.00 %		Auto <u>Man</u>
x dB Bandwidth	9.850 MHz	z x dB	-26.00 dB		
MSG			STATUS		

Plot 7-17. Occupied Bandwidth Plot (LTE Band 2 - 10MHz QPSK - Full RB - Ant2)



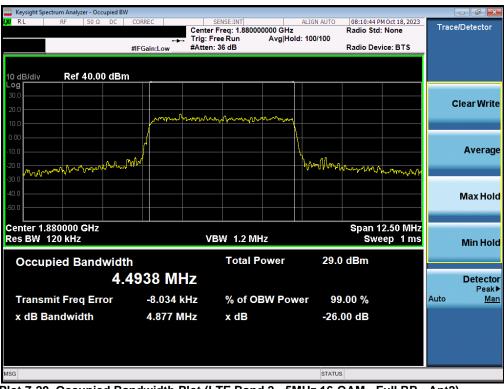
Plot 7-18. Occupied Bandwidth Plot (LTE Band 2 - 10MHz 16-QAM - Full RB - Ant2)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager	
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🔤 Keysight Spectrum Analyzer - Occupie	ed BW					_	
LX/ RL RF 50Ω D	OC CORREC	SENSE:INT Center Freg: 1.88000		N AUTO 08:10:36 PM Radio Std:	10ct 18, 2023 None	Trace	e/Detector
	#IFGain:Low		Avg Hold: 100	/100 Radio Devi	ee: BTS		
,	#IFGam:Low	#Atten: 50 ab		Radio Devi	ce. DTS		
10 dB/div Ref 40.00 d	1Bm						
Log							
30.0						c	lear Write
20.0	hand	manna	wm				
10.0							
-10.0							Average
	Mr. a Mr.) Traff				Average
-20.0				ward war have	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		
-40.0							
-50.0							Max Hold
-30.0							
Center 1.880000 GHz					2.50 MHz		
Res BW 120 kHz		VBW 1.2 MF	Z	Swe	ep 1 ms		Min Hold
Occupied Bandwi	idth	Total P	ower	30.2 dBm			
	4.5011 MH						Detector
	4.3011 1011	12					Delector Peak▶
Transmit Freq Error	-734	Hz % of OE	BW Power	99.00 %		Auto	<u>Man</u>
x dB Bandwidth	4.883 MI	Hz x dB		-26.00 dB			
MSG				STATUS			

Plot 7-19. Occupied Bandwidth Plot (LTE Band 2 - 5MHz QPSK - Full RB - Ant2)



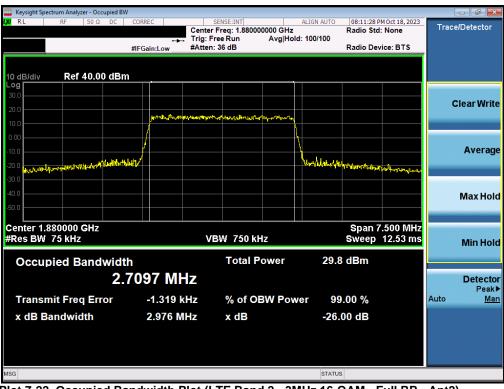
Plot 7-20. Occupied Bandwidth Plot (LTE Band 2 - 5MHz 16-QAM - Full RB - Ant2)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager		
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Keysight Spectru															
L <mark>XI</mark> RL	RF	50 Ω	DC	CORRE	C	Ce		NSE:INT reg: 1.88000	0000 GHz		ALIGN AUTO	08:11:21 P Radio Std	M Oct 18, 2023	Trac	e/Detector
					H	🛶 Tri	g: Free	e Run			100/100				
				#IFGa	in:Low	#A	tten: 3	6 dB		_		Radio Dev	ICE: BIS		
10 dB/div Log	Ref 4	0.00	dBm		1										
30.0															
20.0									a offer the barres						Clear Write
10.0				$ \rightarrow $	- March Mara	ANA Car	What I for the other of the other of the other o	they have be again of the	and the second	_					
0.00										Į					
-10.0										1					Average
-20.0 Mary Martin	aland hat have	a ^{phar} t	malesolum	Ynd							hallet and the	and the second second	nich. Ann del		
-30.0													an aich Dans an		
-40.0															Max Hold
-50.0															Maxilolu
Center 1.88		Ηz					VD	N 750 ki	-				.500 MHz		
#Res BW 7	Э КН2						VD	N 730 KI	12			sweep	12.53 ms		Min Hold
Occupie	ed Ba	nd١	widt	า				Total P	ower		30.7	dBm			
					7 M	47									Detector
			2.0	ופנ		112									Peak
Transmit	t Freq	Erro	or		3.163	kHz		% of O	BW Pov	Ne	er 99	.00 %		Auto	Man
x dB Ban	ndwidt	h			2.962	ИHz		x dB			-26.	00 dB			
MSG											STATUS				
										_					

Plot 7-21. Occupied Bandwidth Plot (LTE Band 2 - 3MHz QPSK - Full RB - Ant2)



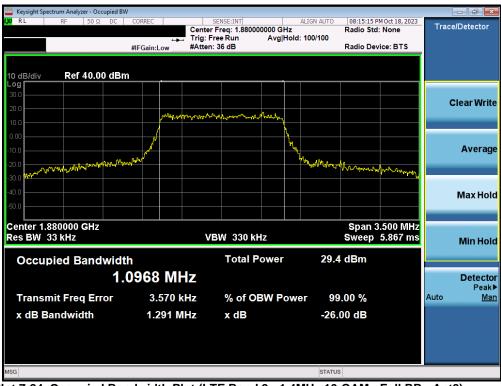
Plot 7-22. Occupied Bandwidth Plot (LTE Band 2 - 3MHz 16-QAM - Full RB - Ant2)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager	
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Plot 7-23. Occupied Bandwidth Plot (LTE Band 2 - 1.4MHz QPSK - Full RB - Ant2)



Plot 7-24. Occupied Bandwidth Plot (LTE Band 2 - 1.4MHz 16-QAM - Full RB - Ant2)

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GSM/GPRS PCS – Ant1



Plot 7-25. Occupied Bandwidth Plot (GPRS, Ch. 661 - Ant1)



Plot 7-26. Occupied Bandwidth Plot (EDGE, Ch. 661 - Ant1)

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WCDMA PCS – Ant1

LXI RL RF	F 50 Ω												
	50 32	DC (CORREC			NSE:INT reg: 1.88000	0000		ALIGN AUTO	01:29:56 P	M Sep 27, 2023	Trac	e/Detector
				+	Trig: Fre	e Run			: 100/100				
		#	IFGain:Lo	w	#Atten: 3	6 dB				Radio Dev	rice: BTS		
	Ref 40.00	dBm		_									
Log 30.0													
20.0													Clear Write
10.0				m	مەلى _{لىرىم} ىيەرلىك	and a grade of the second s	کمب						
0.00			ſ	1									
													Average
-10.0			1					- to					Average
-20.0	mon	ᡧᠬᡎᡕ᠕ᡘ᠕	want					-۲	man	mon			
-30.0	,									`	andrown		
-40.0													Max Hold
-50.0												_	
Center 1.8800	000 GHz									Span 1	5.00 MHz		
Res BW 150	kHz				VB	A 1.5 MI	z				ep 1 ms		Min Hold
0						Total P			22.4	dBm			
Occupied	d Band					Total F	OWE	15	32.1	abm			
		4.1	637	MH	Z								Detector
Transmit I	Erea Erra	or	_8.8	58 k	47	% of O	DW/	Powe	or 00	.00 %		Auto	Peak⊅ Mar
												, lato	Inter
x dB Band	width		4.74	49 M	Hz	x dB			-26.	00 dB			
MSG									STATUS	3			

Plot 7-27. Occupied Bandwidth Plot (WCDMA, Ch. 9400 - Ant1)

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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

ANSI C63.26-2015 – Section 5.7.4

Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to 20GHz (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

- 1. Per Part 24, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz.
- 2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) 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.

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Mode	Bandwidth	Channel	Range [MHz]	Level [dBm]	Limit [dBm]	Margin [dB]
			30.0 - 1845.0	-40.26	-13.00	-27.26
		Low	1910.0 - 10000.0	-27.66	-13.00	-14.66
			10000.0 - 20000.0	-56.10	-13.00	-43.10
			30.0 - 1850.0	-40.08	-13.00	-27.08
GSM-PCS	250 kHz	Mid	1910.0 - 10000.0	-29.28	-13.00	-16.28
			10000.0 - 20000.0	-55.81	-13.00	-42.81
			30.0 - 1850.0	-45.48	-13.00	-32.48
		High	1915.0 - 10000.0	-40.42	-13.00	-27.42
			10000.0 - 20000.0	-56.62	-13.00	-43.62
	5 MHz	Low	30.0 - 1845.0	-33.65	-13.00	-20.65
			1910.0 - 10000.0	-47.36	-13.00	-34.36
			10000.0 - 20000.0	-63.02	-13.00	-50.02
		Mid	30.0 - 1850.0	-53.90	-13.00	-40.90
WCDMA-PCS			1910.0 - 10000.0	-47.28	-13.00	-34.28
			10000.0 - 20000.0	-62.93	-13.00	-49.93
		High	30.0 - 1850.0	-53.81	-13.00	-40.81
			1915.0 - 10000.0	-37.99	-13.00	-24.99
			10000.0 - 20000.0	-62.32	-13.00	-49.32
			30.0 - 1845.0	-28.40	-13.00	-15.40
		Low	1910.0 - 10000.0	-46.47	-13.00	-33.47
			10000.0 - 20000.0	-62.59	-13.00	-49.59
			30.0 - 1850.0	-53.79	-13.00	-40.79
LTE-B2	20 MHz	Mid	1910.0 - 10000.0	-46.88	-13.00	-33.88
			10000.0 - 20000.0	-62.70	-13.00	-49.70
			30.0 - 1850.0	-53.70	-13.00	-40.70
		High	1915.0 - 10000.0	-43.23	-13.00	-30.23
			10000.0 - 20000.0	-62.75	-13.00	-49.75

Table 7-4. Summary of Test Results for Conducted Spurious Emissions – Ant1

Mode	Bandwidth	Channel	Range	Level	Limit	Margin
mode	Danawiath	onanner	[MHz]	[dBm]	[dBm]	[dB]
			30.0 - 1845.0	-43.70	-13.00	-30.70
		Low	1910.0 - 10000.0	-43.09	-13.00	-30.09
			10000.0 - 20000.0	-62.39	-13.00	-49.39
	20 MHz	Mid	30.0 - 1850.0	-53.77	-13.00	-40.77
LTE-B2			1910.0 - 10000.0	-43.72	-13.00	-30.72
			10000.0 - 20000.0	-62.03	-13.00	-49.03
			30.0 - 1850.0	-53.52	-13.00	-40.52
		High	1915.0 - 10000.0	-43.35	-13.00	-30.35
			10000.0 - 20000.0	-62.09	-13.00	-49.09

Table 7-5. Summar	y of Test Results for	Conducted Spi	urious Emissions – Ant2
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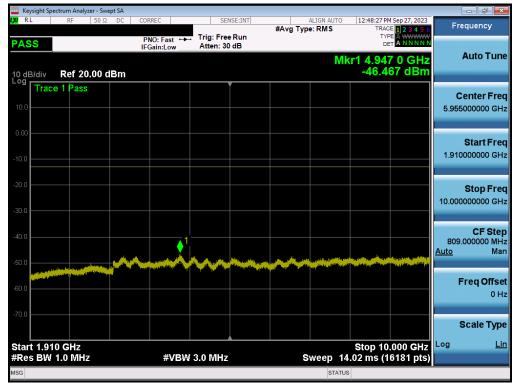
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LTE Band 2 - Ant1

Keysight Spectrum Analyzer - Swept					
<mark>X</mark> RL RF 50 Ω	DC CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	TRACE 1 2 3 4 5 6	Frequency
PASS 10 dB/div Ref 20.00 dB	PNO: Fast ↔ IFGain:Low	Trig: Free Run Atten: 30 dB	M	kr1 1.849 0 GHz -28.400 dBm	Auto Tune
10.0 Trace 1 Pass					Center Fre 939.500000 MH
-10.0					Start Fre 30.000000 MH
-20.0				1	Stop Fre 1.849000000 GH
-40.0					CF Ste 181.90000 M⊢ <u>Auto</u> Ma
-60.0 http://www.analyter	and a second	an a	and and and an an an	nakasan saya ayan generakan san dari	Freq Offse 0 ⊦
-70.0					Scale Typ
Start 0.0300 GHz #Res BW 1.0 MHz	#VBW (3.0 MHz	Sweep	Stop 1.8490 GHz 2.425 ms (3639 pts)	Log <u>Li</u>
MSG			STAT	JS	

Plot 7-28. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - Low Channel - Ant1)



Plot 7-29. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - Low Channel - Ant1)

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🔤 Keysight Sp	ectrum Analyzer - Sw	ept SA									×
LXI RL	RF 50 Ω	DC CO	RREC	SEN	NSE:INT	#Avg Typ	ALIGN AUTO		E 1 2 3 4 5 6	Frequency	
PASS			NO: Fast 🔸	Trig: Free Atten: 10		#rrig i jp		TYP DE			
10 dB/div Log	Ref 0.00 di	Вm					Mkr	1 19.619 -62.59	9 0 GHz 92 dBm	Auto Tu	une
-10.0	ce 1 Pass									Center F 15.000000000 0	
-20.0										Start Fr 10.000000000 0	
-40.0										Stop F i 20.000000000 0	
-60.0		the second state of the second		ا با مرد کار این محمد الدوم می	page for the LEAN part of the	n a fan ser	and the state of the part of the state			CF St 1.000000000 (<u>Auto</u> M	
-80.0		al it to contribute a biblio to contribute a second								Freq Off 0	fset 0 Hz
-90.0										Scale Ty	
Start 10. #Res BW			#VBW	3.0 MHz		s	ween 17	Stop 20. 33 ms (2	000 0112	-	Lin
MSG	1.0 10112			0.0 191112			STATUS		ooor proj		

Plot 7-30. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - Low Channel - Ant1)

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LTE Band 2 – Ant2

Keysight Spectrum Analyzer - Swept SA					
XIRL RF 50Ω DC	CORREC	SENSE:INT	ALIGN #Avg Type: RN	TRACE 2 3	456 Frequency
PASS	IFGain:Low	Atten: 30 dB		Mkr1 1.848 5 G -43.704 d	Auto Tur
10.0 Trace 1 Pass		Ĭ			Center Fre 939.500000 Mi
10.0					Start Fr 30.000000 M
30.0					Stop Fr 1.849000000 G
40.0					1 CF St 181.900000 M Auto M
50.0 and the second	ng gibil sanaa gilaga na tista f	anyahan <mark>hilaring nyapahangapinanga</mark>	مارم المراجع ا المراجع المراجع	h an airinn de an staffagna an airinn faara dhaffar dhaffa	Freq Offs 0
70.0				Stop 1.8490 0	Scale Ty
#Res BW 1.0 MHz	#VBW	3.0 MHz	Swe	ep 2.425 ms (3639	pts)

Plot 7-31. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - Low Channel - Ant2)



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🔤 Keysight Spectrum Anal	yzer - Swept SA						
LXIRL RF	50 Ω DC (CORREC	SENSE:I	TT #Avg Typ	ALIGN AUTO	08:02:55 PM Oct 18, 2023 TRACE 1 2 3 4 5 6	Frequency
PASS		PNO: Fast +++ IFGain:Low	Trig: Free Run Atten: 10 dB			DET A NNNN	
	.00 dBm				Mkr	1 19.390 0 GHz -62.387 dBm	Auto Tune
-10.0 Trace 1 Pas	5						Center Freq 15.00000000 GHz
-20.0							Start Freq 10.000000000 GHz
-40.0							Stop Freq 20.000000000 GHz
-60.0					a del constituti di constitu	1	CF Step 1.00000000 GHz <u>Auto</u> Man
-80.0							Freq Offset 0 Hz
-90.0							Scale Type
Start 10.000 GHz #Res BW 1.0 MH		#VBW	3.0 MHz	s	weep 17	Stop 20.000 GHz .33 ms (20001 pts)	Log <u>Lin</u>
MSG					STATUS		

Plot 7-33. Conducted Spurious Plot (LTE Band 2 - 20MHz QPSK - 1RB - Low Channel - Ant2)

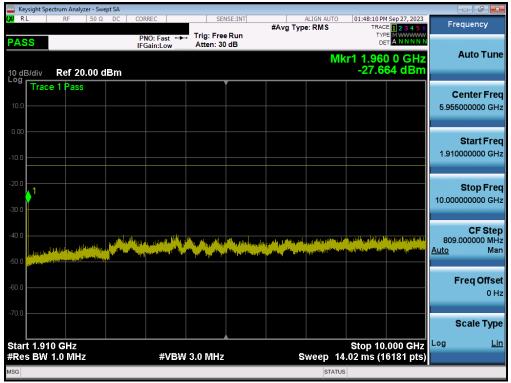
FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT			
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GSM/GPRS PCS – Ant1

Keys Keys		m Analyzer - 1 RF 50	Swept SA	CORREC	SEN	ISE:INT		ALIGN AUTO		1 Sep 27, 2023		uency
PASS	S			PNO: Fast ++	Trig: Free Atten: 30		#Avg Typ	e: RMS	TRAC TYF DE	E 1 2 3 4 5 6 E M WWWWWW T A N N N N N	Field	luency
10 dB/	/div R	ef 20.00) dBm					Mk	r1 1.74 -40.2) 3 GHz 61 dBm	A	uto Tun
- og	Trace 1	Pass										nter Fre 00000 MH
0.00												Start Fre
20.0 - 30.0 -												Stop Fre
40.0 -				un da ato kaladaa	a ta da seconda second	الأساط وتفقيقهم	فلللوا فتعر استلاف وال	hand han she that has	a la la cina di alla di		181.5 <u>Auto</u>	CF Ste 00000 MI Mi
60.0				kiyedi kadin kadin kadin kadin ka	na (y, data with Mood	in an	ing and according to a start of a source				Fr	r eq Offs 0 I
70.0											S	cale Typ
	0.0300 BW 1.0			#VBW	3.0 MHz			Sweep 2	Stop 1.8 .427 ms (450 GHz 3641 pts)	Log	L
SG								STATUS				

Plot 7-34. Conducted Spurious Plot (GPRS Ch. 512 - Ant1)



Plot 7-35. Conducted Spurious Plot (GPRS Ch. 512 - Ant1)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager	
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0.00 dBm	PNO: Fast +++			#Avg Type	ALIGN AUTO e: RMS	TRAC TYP	4 Sep 27, 2023 E 1 2 3 4 5 6 DE MWWWWW	Freque	ency
0.00 dBm				movg typ	e. 10115	TYP	EMWWWW		
						DE	ANNNN		
					Mkr	1 18.97 -56.0	6 0 GHz 97 dBm	Aut	to Tur
SS		,						Cent	ter Fre
			i					15.000000	
								St	art Fre
								St	op Fr
					ĺ		1		
		1.1	en este libre		liati	The state of the state of the	napatri (10) - quadit		CF Ste
n lantinalang philippining diring	tel appresented second	raan agagaan ay a	angener versteren ges mitte Mitte	g gen ann an ann an an an an an an an an an	angen er en	and a state of the local of the	للنه وأعظامها ومن		000 G M
	ati a parte da an								
								Free	q Offs
									01
								Sca	le Ty
z						Stop 20	.000 GHz	Log	L
Hz	#VBW	3.0 MHz		S	weep 17				
	ferre All syling any extension of thing and a syling any extension of thing and a syling any extension of the syling and the syling any extension of the syling and the syling and the syling and the syling any extension of the syling and the sylin	ferende synthese de la construction de la construction de la construction de la construction de la construction la construction de la construction d	fanne kille streft felder och felder socialistikke att på socialistikke so Socialistikke socialistikke socialistikke socialistikke socialistikke socialistikke socialistikke socialistikke s					tere dia productive di la construcción de la constr	

Plot 7-36. Conducted Spurious Plot (GPRS Ch. 512 - Ant1)

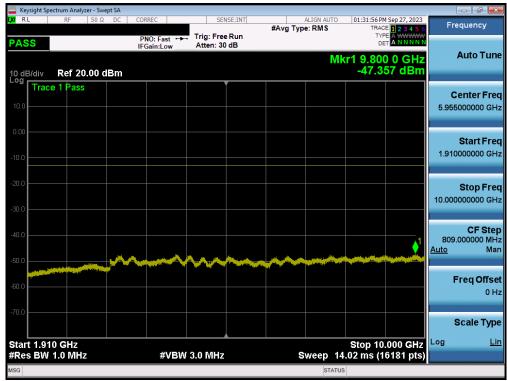
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WCDMA PCS – Ant1

ISG		STATU	s	
Start 0.0300 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 2	Stop 1.8450 GHz 2.427 ms (3641 pts)	Log <u>Li</u>
				Scale Typ
-70.0				0 H
-00.0	and the state of the	ing syntan generating dia na ini anti-ang-ang-aging dia	and an element of the second	FreqOffs
50.0				181.500000 MH <u>Auto</u> Ma
40.0			<u> </u>	CF Ste
30.0			1/	1.845000000 GH
20.0				Stop Fre
10.0				Start Fre 30.000000 MH
0.00				Otert En
10.0				Center Fre 937.500000 MH
0 dB/div Ref 20.00 dBm			-33.647 dBm	
PASS	IFGain:Low Atten: 30 dB	M	_{Det} <u>a nnnn</u> kr1 1.845 0 GHz	Auto Tur
	PNO: Fast ↔ Trig: Free Run	#Avg Type: RMS	TRACE 1 2 3 4 5 6 TYPE A WWWWW	Frequency
Keysight Spectrum Analyzer - Swept SA	CORREC SENSE:INT	ALIGN AUTO	01:31:45 PM Sep 27, 2023	

Plot 7-37. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)



Plot 7-38. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)

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	sight Spect	rum Analyz	er - Swe	pt SA										
LXI RL		RF	50 Ω	DC	CORRE	C	SEI	NSE:INT	#Avg Typ	ALIGN AUTO e: RMS		M Sep 27, 2023	Frequ	lency
PAS	s					:Fast ↔ n:Low	Trig: Free Atten: 10				TYP	PE A WWWWW ET A NNNNN		
					IFGal	n:Low	Atten. It			Mkr	1 19 /8	8 0 GHz	Αι	ito Tune
10 dB	/div	Ref 0.0	10 dB	sm							-63.0	24 dBm		
Log	Trace	1 Pass											Cor	tor From
-10.0														n ter Freq 0000 GHz
ŀ													10.00000	0000 0112
-20.0														
														t art Freq 0000 GHz
-30.0													10.00000	0000 GH2
-40.0														_
40.0														top Freq 0000 GHz
-50.0													20.00000	0000 GH2
												. 1		CF Step
-60.0													1.00000	0000 GHz
-70.0		all and a state	144pmbarr	and the set	Trans		and discontribution			and a second			<u>Auto</u>	Man
-70.0 -			i da alitara	فتقر وخلالته ومراك	ن ال	itten fille								
-80.0													Fre	eq Offset
														0 Hz
-90.0													0.0	ala Trana
													SC	ale Type
	10.00										Stop 20	JUNU OILZ	Log	<u>Lin</u>
	BW 1	.0 MHz				#VBW	3.0 MHz		S			20001 pts)		
MSG										STATU	5			

Plot 7-39. Conducted Spurious Plot (WCDMA Ch. 9262 - Ant1)

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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

ANSI C63.26-2015 - Section 5.7.3

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

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Test Notes

- Per 24.238(b), 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.
- 2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) 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.

Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
0014 000	050111	Low	Band Edge	-18.75	-13.00	-5.75
GSM-PCS	250 kHz	High	Band Edge	-17.27	-13.00	-4.27
			Band Edge	-23.78	-13.00	-10.78
	5 MHz	Low	Extended	-14.97	-13.00	-1.97
WCDMA-PCS	5 IVIHZ	High	Band Edge	-25.13	-13.00	-12.13
		High	Extended	-16.23	-13.00	-3.23
		Law	Band Edge	-32.65	-13.00	-19.65
	20 MHz	Low	Extended	-27.33	-13.00	-14.33
		Lliah	Band Edge	-31.27	-13.00	-18.27
		High	Extended	-25.99	-13.00	-12.99
		Law	Band Edge	-32.55	-13.00	-19.55
	15 MHz	Low	Extended	-26.13	-13.00	-13.13
		High	Band Edge	-31.36	-13.00	-18.36
			Extended	-24.30	-13.00	-11.30
	10 MHz	Low	Band Edge	-31.41	-13.00	-18.41
			Extended	-22.63	-13.00	-9.63
		High	Band Edge	-29.13	-13.00	-16.13
LTE-B2			Extended	-22.03	-13.00	-9.03
LIC-DZ	5 MHz	Low	Band Edge	-30.05	-13.00	-17.05
		LOW	Extended	-22.28	-13.00	-9.28
		Lliab	Band Edge	-28.19	-13.00	-15.19
		High	Extended	-22.25	-13.00	-9.25
		Low	Band Edge	-29.60	-13.00	-16.60
	3 MHz	LOW	Extended	-20.81	-13.00	-7.81
	5 1011 12	High	Band Edge	-29.68	-13.00	-16.68
		nigh	Extended	-21.54	-13.00	-8.54
		Low	Band Edge	-27.96	-13.00	-14.96
	1.4 MHz	LOW	Extended	-25.93	-13.00	-12.93
	1.4 10172	High	Band Edge	-28.75	-13.00	-15.75
		High	Extended	-26.61	-13.00	-13.61

Table 7-6. Summary of Test Results for Conducted Band Edge – Ant1

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Mode	Bandwidth	Channel	Test Case	Level [dBm]	Limit [dBm]	Margin [dB]
			Band Edge	-30.78	-13.00	-17.78
		Low	Extended	-25.46	-13.00	-12.46
	20 MHz	Lline	Band Edge	-28.50	-13.00	-15.50
		High	Extended	-23.31	-13.00	-10.31
		Low	Band Edge	-30.92	-13.00	-17.92
	15 MHz	LOW	Extended	-24.14	-13.00	-11.14
		High	Band Edge	-28.77	-13.00	-15.77
		High	Extended	-22.37	-13.00	-9.37
		Low	Band Edge	-31.02	-13.00	-18.02
	10 MHz	LOW	Extended	-21.72	-13.00	-8.72
		High	Band Edge	-28.92	-13.00	-15.92
LTE-B2			Extended	-20.35	-13.00	-7.35
LIC-DZ	5 MHz	Low	Band Edge	-27.12	-13.00	-14.12
			Extended	-22.14	-13.00	-9.14
		High	Band Edge	-28.39	-13.00	-15.39
			Extended	-19.80	-13.00	-6.80
		Low	Band Edge	-29.35	-13.00	-16.35
	3 MHz	LOW	Extended	-20.88	-13.00	-7.88
		High	Band Edge	-26.87	-13.00	-13.87
		nigh	Extended	-18.41	-13.00	-5.41
		Low	Band Edge	-26.44	-13.00	-13.44
	1.4 MHz	LOW	Extended	-25.19	-13.00	-12.19
		High	Band Edge	-24.96	-13.00	-11.96
		Fight	Extended	-25.15	-13.00	-12.15

Table 7-7. Summary of Test Results for Conducted Band Edge – Ant2

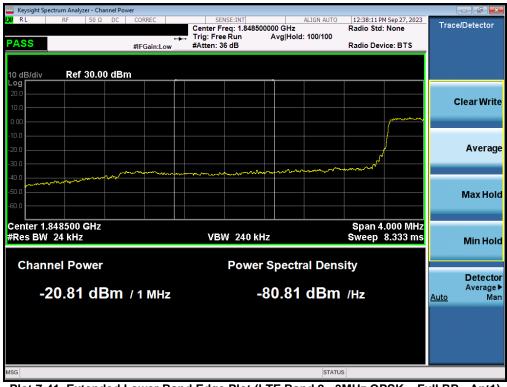
FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dogo 40 of 72	
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LTE Band 2 – Ant1

Keysight Spectrum Analyzer - Swept SA			
🗶 RL RF 50Ω DC	CORREC SENSE:INT	ALIGN AUTO 12:38:00 PM Sep 27, 2023 #Avg Type: RMS TRACE 12 3 4 5 6 TYPE A WWWWW	Frequency
PASS	PNO: Wide ↔ Trig: Free Run IFGain:Low #Atten: 36 dB	Mkr1 1.849 985 0 GHz	Auto Tun
10 dB/div Ref 25.00 dBm		-29.60 dBm	
15.0			Center Fre 1.850000000 G⊦
5.00		and a marked and a second s	Start Fre 1.846250000 GF
25.0			Stop Fre 1.853750000 GH
35.0 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	ner men and a start of the second start of the		CF Ste 750.000 ki <u>Auto</u> Mi
43.0 44			Freq Offs 0 F
65.0			Scale Typ
Center 1.850000 GHz #Res BW 36 kHz	#VBW 120 kHz	Span 7.500 MHz Sweep 12.53 ms (1001 pts)	Log <u>L</u>
ISG		STATUS	

Plot 7-40. Lower Band Edge Plot (LTE Band 2 - 3MHz QPSK - Full RB - Ant1)



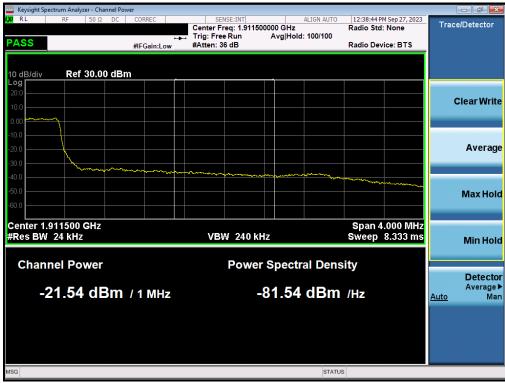
Plot 7-41. Extended Lower Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB - Ant1)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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Plot 7-42. Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK - Full RB - Ant1)



Plot 7-43. Extended Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB - Ant1)

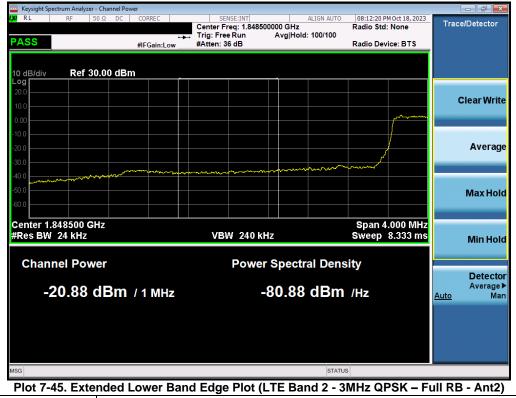
FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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LTE Band 2 – Ant2

Keysight Spectrum Analyzer - Swept SA			
XIRL RF 50Ω DC	CORREC SENSE:INT	ALIGN AUTO 08:12:06 PM Oct 10 #Avg Type: RMS TRACE 12	3 4 5 6 Frequency
PASS 10 dB/div Ref 25.00 dBm	PNO: Wide ↔ Trig: Free Run IFGain:Low #Atten: 36 dB	TYPE & ₩ DET Å N Mkr1 1.849 992 5 0 -29.34 c	GHz Auto Tune
15.0			Center Free 1.850000000 GH
-5.00		a lander and an analysis and a land and a land and a land a la	Start Free 1.846250000 GH
-15.0			Stop Fre 1.853750000 GH
-35.0	nawy of share you and when the share of the		CF Ste 750.000 kH <u>Auto</u> Ma
-55.0			Freq Offse 0 H
-65.0 Center 1.850000 GHz #Res BW 36 kHz	#VBW 120 kHz	Span 7.500 Sweep 12.53 ms (1001	MHz ^{Log <u>Li</u>}
#Res BW 36 kHz	#VBW 120 kHz	Sweep 12.53 ms (1001 STATUS	pts)

Plot 7-44. Lower Band Edge Plot (LTE Band 2 - 3MHz QPSK - Full RB - Ant2)

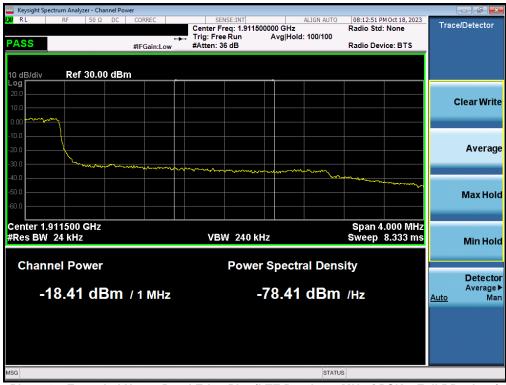


FCC ID: A3LSMA156M	PART 24 MEASUREMENT REPORT		Approved by: Technical Manager	
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	ectrum Analyz												
LXI RL	RF	50 Ω	DC	CORREC		SE	NSE:INT	#Avg Typ	ALIGN AUTO		M Oct 18, 2023	F	requency
PASS				PNO: Wid IFGain:Lo		Trig: Fre #Atten: 3				TY			
10 dB/div Log	Ref 25	.00 dE	3m						Mkr1 1	.910 00 -26.	7 5 GHz 87 dBm		Auto Tune
15.0	e 1 Pass												Center Freq 0000000 GHz
-5.00		anter and and	ᡣᡶᡔᡟᡘᡃᡨᡟᠧᢇᡃᡬ	ر می مراجعه می اور م مراجع می اور م	www.va	4~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						1.90	Start Fred 6250000 GHz
-15.0							1					1.91	Stop Freq 3750000 GHz
-35.0							han provide a pr	han the to be a street for	g After Marken and Marken a	May May	mary Arr	<u>Auto</u>	CF Step 750.000 kHz Man
-55.0													Freq Offse 0 Hz
-65.0													Scale Type
Center 1.9 #Res BW	910000 36 kHz	GHz		#\	/BW	120 kHz	A		Sweep 1	Span 7 2.53 ms (.500 MHz (1001 pts)	Log	Lir
MSG									STATUS				

Plot 7-46. Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK - Full RB - Ant2)

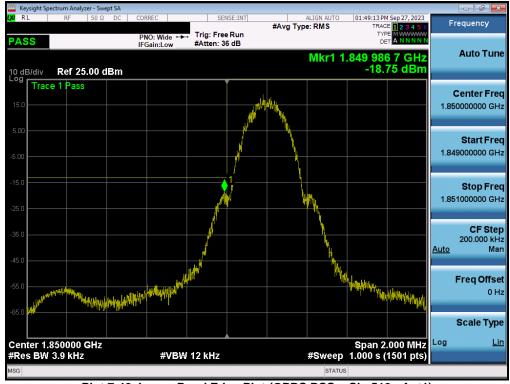


Plot 7-47. Extended Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB - Ant2)

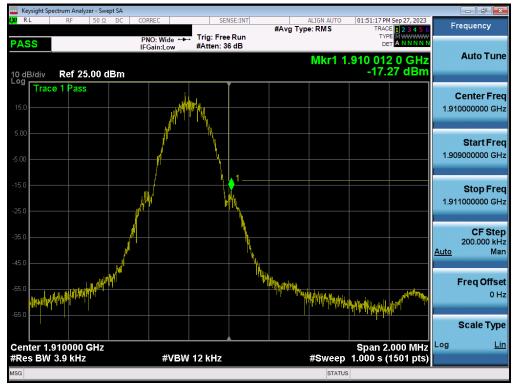
FCC ID: A3LSMA156M		Approved by: Technical Manager	
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GSM/GPRS PCS – Ant1



Plot 7-48. Lower Band Edge Plot (GPRS PCS - Ch. 512 - Ant1)



Plot 7-49. Upper Band Edge Plot (GPRS PCS – Ch. 810 - Ant1)

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WCDMA PCS - Ant1



Plot 7-50. Lower Band Edge Plot (WCDMA PCS - Ch. 9262 - Ant1)

Keysight Spectrum Analyzer - Swept SA				
KIRL RF 50Ω DC	CORREC SENSE:INT	ALIGN AUTO #Avg Type: RMS	01:32:38 PM Sep 27, 2023 TRACE 1 2 3 4 5 6 TYPE A WWWWW	Frequency
PASS	PNO: Wide ↔ Trig: Free Run IFGain:Low #Atten: 36 dB	Mkr1	1.849 000 GHz -14.967 dBm	Auto Tur
o dB/div Ref 25.00 dBm	Ţ.		-14.967 UBII	
15.0				Center Fre 1.847000000 GH
5.00				Start Fre
5.00			1,	1.845000000 GI
15.0				Stop Fre
25.0	way and a second s	an a	and the second	CF Ste
35.0				400.000 k Auto M
45.0				Freq Offs
55.0				. 01
65.0				Scale Typ
Center 1.847000 GHz Res BW 1.0 MHz	#VBW 3.0 MHz	Sweep 6	Span 4.000 MHz 5.667 ms (1001 pts)	Log <u>L</u>
SG		STATU	S	

Plot 7-51. Extended Lower Band Edge Plot (WCDMA PCS - Ch. 9262 - Ant1)

FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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🚾 Keysight Spectrum Analyzer - Swept SA 🚽					
🗶 RL RF 50Ω DC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	01:33:17 PM Sep 27, 2023 TRACE 1 2 3 4 5 6	Frequency
PASS		rig: Free Run Atten: 36 dB	",,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	TYPE A WWWWW DET A NNNN	
10 dB/div Ref 25.00 dBm			Mkr1	1.910 015 GHz -25.13 dBm	Auto Tune
15.0 Trace 1 Pass					Center Free 1.910000000 GH:
5.00	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~			
-5.00					Start Fred 1.902500000 GH
15.0		1			Stop Fre 1.917500000 GH
35.0			m		CF Stej 1.50000 MH <u>Auto</u> Ma
45.0 55.0				m	Freq Offse 0 H
65.0					Scale Typ
Center 1.910000 GHz #Res BW 100 kHz	#VBW 30	0 kHz	Sweep 1	Span 15.00 MHz .000 ms (1001 pts)	Log <u>Li</u> i
MSG			STATUS		

Plot 7-52. Upper Band Edge Plot (WCDMA PCS - Ch. 9538 - Ant1)

Keysight Spectrum Analyzer - Swept SA				ē _
🗶 RL RF 50Ω DC	CORREC SENS	#Avg Type:		6 Frequency
PASS	PNO: Wide +++ Trig: Free F IFGain:Low #Atten: 36		DET A WWWWW	Ν
			Mkr1 1.911 000 GH	z Auto Tun
10 dB/div Ref 25.00 dBm			-16.234 dBn	
Trace 1 Pass				Center Fre
15.0				1.913000000 GH
5.00				
				Start Fre
-5.00				1.911000000 GH
1				
-15.0				Stop Fre
-25.0				1.915000000 GH
		window and the second		CF Ste
35.0				400.000 kł
-45.0				<u>Auto</u> Ma
				Freq Offs
-55.0				0 H
-65.0				
-05.0				Scale Typ
Center 1.913000 GHz			Span 4.000 MH	z Log Li
Res BW 1.0 MHz	#VBW 3.0 MHz	S	weep 6.667 ms (1001 pts	
ISG			STATUS	

Plot 7-53. Extended Upper Band Edge Plot (WCDMA PCS - Ch. 9538 - Ant1)

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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 each bandwidth. The CCDF curve shows how much time the peak waveform spends at, or above, a given average power level. The percentage of time the signal spends at or above the level defines the probability for that power level.

The peak-to-average power ratio (PAPR) of the transmitter output power must not exceed 13 dB.

Test Procedure Used

ANSI C63.26-2015 - Section 5.2.3.4

Test Settings

- 1. The signal analyzer's CCDF measurement profile is enabled
- 2. Frequency = carrier center frequency
- 3. Measurement BW ≥ OBW or specified reference bandwidth
- 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. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

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

For the QAM modulations, 256QAM was found to have the worst-case peak-to-average ratio so it is the only QAM measurement included in this section.

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Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dBm]	Margin [dB]
COMPCO	250kHz	GMSK	27.53	2.67	13.00	-10.33
GSM-PCS	ZOUKHZ	8-PSK	22.55	5.69	13.00	-7.31
WCDMA-PCS	5 MHz	Spread Spectrum	23.66	3.00	13.00	-10.00
		QPSK	22.26	5.33	13.00	-7.67
	20 MHz	256QAM	18.34	7.01	13.00	-5.99
	15 MHz	QPSK	22.25	5.45	13.00	-7.55
		256QAM	18.34	7.00	13.00	-6.00
	10 MHz	QPSK	22.24	5.49	13.00	-7.52
		256QAM	18.32	6.96	13.00	-6.04
LTE-B2		QPSK	22.23	5.51	13.00	-7.49
	5 MHz	256QAM	18.35	6.99	13.00	-6.01
		QPSK	22.20	5.51	13.00	-7.49
	3 MHz	256QAM	18.31	7.00	13.00	-6.00
		QPSK	22.17	5.45	13.00	-7.55
	1.4 MHz	256QAM	18.32	7.16	13.00	-5.84

Table 7-8. Summary of Test Results for Peak-Average Ratio – Ant1

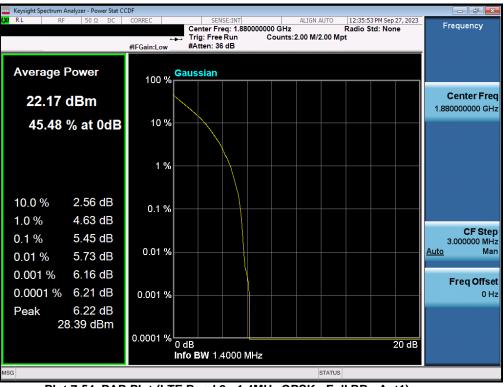
Mode	Bandwidth	Modulation	Average Power [dBm]	PAR at 0.1% [dB]	PAR Limit [dBm]	Margin [dB]
	20 MHz	QPSK	22.82	5.19	13.00	-7.81
		256QAM	18.98	6.97	13.00	-6.03
	15 MHz	QPSK	22.82	5.23	13.00	-7.77
		256QAM	18.97	6.97	13.00	-6.03
	10 MHz	QPSK	22.87	5.28	13.00	-7.72
LTE-B2		256QAM	18.97	6.93	13.00	-6.07
LIC-DZ	5 MHz	QPSK	22.85	5.29	13.00	-7.71
		256QAM	18.99	6.97	13.00	-6.03
	3 MHz	QPSK	22.79	5.29	13.00	-7.71
		256QAM	18.96	6.99	13.00	-6.01
		QPSK	22.91	5.18	13.00	-7.82
	1.4 MHz	256QAM	19.13	7.10	13.00	-5.90

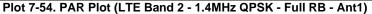
Table 7-9. Summary of Test Results for Peak-Average Ratio – Ant2

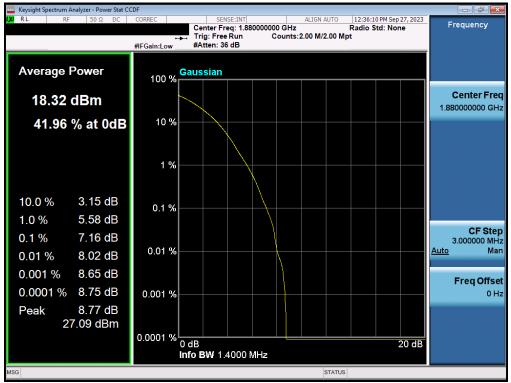
FCC ID: A3LSMA156M		Approved by: Technical Manager	
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LTE Band 2 – Ant1





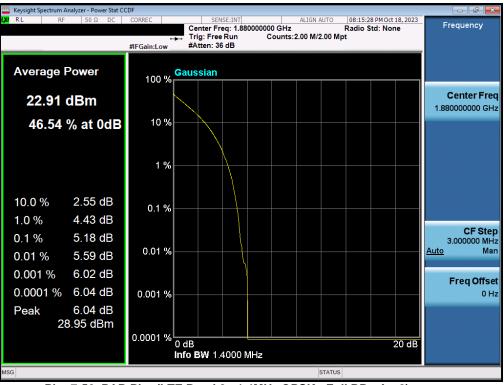


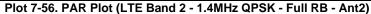
Plot 7-55. PAR Plot (LTE Band 2 - 1.4MHz 256-QAM - Full RB - Ant1)

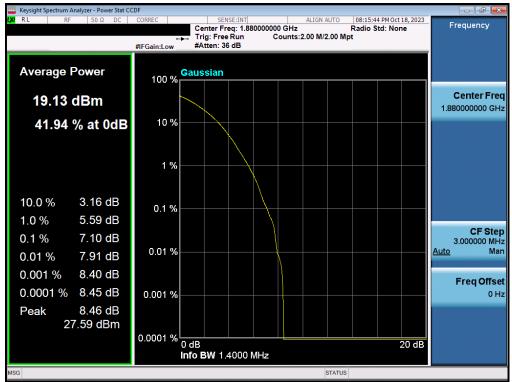
FCC ID: A3LSMA156M		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager	
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LTE Band 2 – Ant2





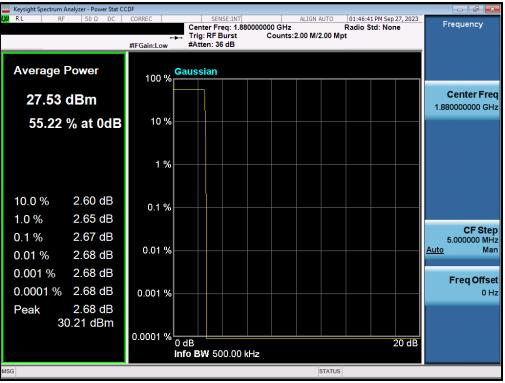


Plot 7-57. PAR Plot (LTE Band 2 - 1.4MHz 256-QAM - Full RB - Ant2)

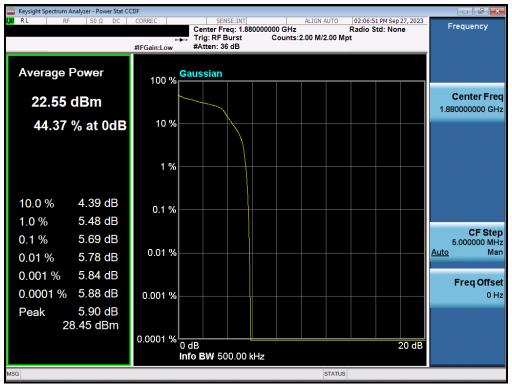
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GSM/GPRS PCS – Ant1





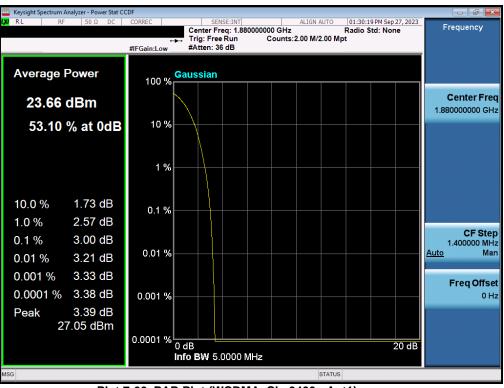


Plot 7-59. PAR Plot (EDGE, Ch. 661 - Ant1)

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WCDMA PCS – Ant1



Plot 7-60. PAR Plot (WCDMA, Ch. 9400 - Ant1)

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7.6 Radiated Power (EIRP)

Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements 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

ANSI C63.26-2015 - Section 5.2.4.4

Test Settings

- Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
- 2. RBW = 1 5% of the expected OBW, not to exceed 1MHz
- 3. VBW \geq 3 x RBW
- 4. Span = 1.5 times the OBW
- 5. No. of sweep points $\geq 2 \times \text{span} / \text{RBW}$
- 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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<u>Test Setup</u>

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

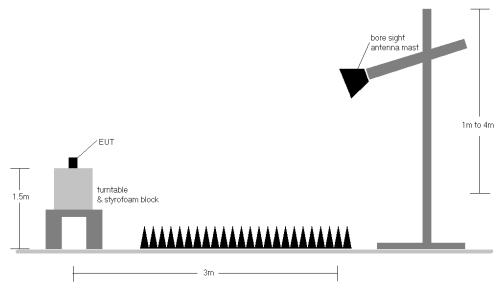


Figure 7-5. Radiated Test Setup >1GHz

Test Notes

- 1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers are 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 powers are 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) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) 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.

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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]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
	QPSK	1860.00	V	108	78	2.53	1/0	22.23	24.76	0.299	33.01	-8.25
	QPSK	1880.00	V	102	63	2.34	1 / 50	21.54	23.88	0.244	33.01	-9.13
20 MHz	QPSK	1900.00	V	116	98	2.15	1/0	21.08	23.23	0.210	33.01	-9.78
20 10112	16-QAM	1860.00	V	108	78	2.53	1/0	21.32	23.85	0.243	33.01	-9.16
	16-QAM	1880.00	V	102	63	2.34	1 / 50	20.56	22.90	0.195	33.01	-10.11
	16-QAM	1900.00	V	116	98	2.15	1/0	20.18	22.33	0.171	33.01	-10.68
	QPSK	1857.50	V	108	78	2.55	1/0	22.35	24.91	0.309	33.01	-8.10
	QPSK	1880.00	V	102	63	2.34	1/37	21.58	23.91	0.246	33.01	-9.10
15 MHz	QPSK	1902.50	V	116	98	2.17	1/37	20.92	23.09	0.204	33.01	-9.92
	16-QAM	1857.50	V	108	78	2.55	1/0	21.34	23.89	0.245	33.01	-9.12
	16-QAM	1880.00	V	102	63	2.34	1/37	20.58	22.92	0.196	33.01	-10.09
	16-QAM	1902.50	V	116	98	2.17	1/37	19.98	22.15	0.164	33.01	-10.86
	QPSK	1855.00	V	108	78	2.58	1 / 49	22.22	24.80	0.302	33.01	-8.21
	QPSK	1880.00	V	102	63	2.34	1/0	21.55	23.89	0.245	33.01	-9.12
10 MHz	QPSK	1905.00	V	116	98	2.19	1/0	20.95	23.14	0.206	33.01	-9.87
	16-QAM	1855.00	V	108	78	2.58	1 / 49	21.28	23.86	0.243	33.01	-9.15
	16-QAM	1880.00	V	102	63	2.34	1/0	20.42	22.76	0.189	33.01	-10.25
	16-QAM	1905.00	V	116	98	2.19	1/0	20.06	22.25	0.168	33.01	-10.77
	QPSK	1852.50	V	108	78	2.60	1 / 12	22.20	24.80	0.302	33.01	-8.21
	QPSK	1880.00	V	102	63	2.34	1 / 24	21.54	23.88	0.244	33.01	-9.13
5 MHz	QPSK	1907.50	V	116	98	2.20	1/0	20.73	22.94	0.197	33.01	-10.08
	16-QAM	1852.50	V	108	78	2.60	1 / 12	21.15	23.75	0.237	33.01	-9.26
	16-QAM	1880.00	V	102	63	2.34	1 / 24	20.49	22.83	0.192	33.01	-10.18
	16-QAM	1907.50	V	116	98	2.20	1/0	19.85	22.06	0.161	33.01	-10.96
	QPSK	1851.50	V	108	78	2.61	1/0	22.22	24.83	0.304	33.01	-8.18
	QPSK	1880.00	V	102	63	2.34	1/7	21.57	23.91	0.246	33.01	-9.10
3 MHz	QPSK	1908.50	V	116	98	2.21	1/0	20.73	22.94	0.197	33.01	-10.07
3 IVIFIZ	16-QAM	1851.50	V	108	78	2.61	1/0	21.21	23.82	0.241	33.01	-9.19
	16-QAM	1880.00	V	102	63	2.34	1/7	20.42	22.76	0.189	33.01	-10.25
	16-QAM	1908.50	V	116	98	2.21	1/0	19.73	21.94	0.156	33.01	-11.07
	QPSK	1850.70	V	108	78	2.62	1/5	22.19	24.81	0.303	33.01	-8.20
	QPSK	1880.00	V	102	63	2.34	1/5	21.52	23.86	0.243	33.01	-9.15
1.4 MHz	QPSK	1909.30	V	116	98	2.22	1/0	20.66	22.88	0.194	33.01	-10.13
1.4 WHZ	16-QAM	1850.70	V	108	78	2.62	1/5	21.16	23.78	0.239	33.01	-9.23
	16-QAM	1880.00	V	102	63	2.34	1/5	20.40	22.74	0.188	33.01	-10.27
	16-QAM	1909.30	V	116	98	2.22	1/0	19.73	21.95	0.157	33.01	-11.06

Table 7-10. EIRP Data (LTE Band 2 – Ant1)

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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]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
	QPSK	1860.00	V	102	276	2.53	1/0	18.54	21.07	0.128	33.01	-11.94
	QPSK	1880.00	V	103	270	2.34	1 / 50	19.80	22.14	0.164	33.01	-10.87
20 MHz	QPSK	1900.00	V	110	275	2.15	1/0	19.53	21.68	0.147	33.01	-11.33
20 MHZ	16-QAM	1860.00	V	102	276	2.53	1/0	17.57	20.10	0.102	33.01	-12.91
	16-QAM	1880.00	V	103	270	2.34	1 / 50	18.87	21.21	0.132	33.01	-11.80
	16-QAM	1900.00	V	110	275	2.15	1/0	18.66	20.81	0.121	33.01	-12.20
	QPSK	1857.50	V	102	276	2.55	1/37	18.97	21.52	0.142	33.01	-11.49
	QPSK	1880.00	V	103	270	2.34	1/37	20.13	22.46	0.176	33.01	-10.55
15 MHz	QPSK	1902.50	V	110	275	2.17	1/0	19.85	22.02	0.159	33.01	-10.99
	16-QAM	1857.50	V	102	276	2.55	1/0	18.05	20.60	0.115	33.01	-12.41
	16-QAM	1880.00	V	103	270	2.34	1 / 74	19.19	21.53	0.142	33.01	-11.48
	16-QAM	1902.50	V	110	275	2.17	1/0	19.16	21.33	0.136	33.01	-11.69
	QPSK	1855.00	V	102	276	2.58	1 / 25	18.94	21.52	0.142	33.01	-11.49
-	QPSK	1880.00	V	103	270	2.34	1 / 49	20.10	22.44	0.175	33.01	-10.57
40.0411-	QPSK	1905.00	V	110	275	2.19	1/0	19.81	22.00	0.158	33.01	-11.01
10 MHz	16-QAM	1855.00	V	102	276	2.58	1/0	17.98	20.56	0.114	33.01	-12.45
	16-QAM	1880.00	V	103	270	2.34	1/0	19.34	21.68	0.147	33.01	-11.33
-	16-QAM	1905.00	V	110	275	2.19	1/0	18.87	21.06	0.128	33.01	-11.95
	QPSK	1852.50	V	102	276	2.60	1 / 12	18.88	21.48	0.141	33.01	-11.53
	QPSK	1880.00	V	103	270	2.34	1 / 12	20.08	22.42	0.175	33.01	-10.59
5 MHz	QPSK	1907.50	V	110	275	2.20	1 / 12	19.70	21.90	0.155	33.01	-11.11
5 MHZ	16-QAM	1852.50	V	102	276	2.60	1 / 24	17.87	20.47	0.111	33.01	-12.54
-	16-QAM	1880.00	V	103	270	2.34	1 / 12	19.33	21.67	0.147	33.01	-11.34
-	16-QAM	1907.50	V	110	275	2.20	1 / 24	18.76	20.96	0.125	33.01	-12.05
	QPSK	1851.50	V	102	276	2.61	1 / 14	18.96	21.57	0.144	33.01	-11.44
-	QPSK	1880.00	V	103	270	2.34	1/0	20.12	22.46	0.176	33.01	-10.55
3 MHz	QPSK	1908.50	V	110	275	2.21	1 / 14	19.50	21.71	0.148	33.01	-11.30
3 WIHZ	16-QAM	1851.50	V	102	276	2.61	1/0	17.76	20.37	0.109	33.01	-12.64
	16-QAM	1880.00	V	103	270	2.34	1/0	19.31	21.65	0.146	33.01	-11.36
	16-QAM	1908.50	V	110	275	2.21	1/7	18.77	20.98	0.125	33.01	-12.03
	QPSK	1850.70	V	102	276	2.62	1/0	18.97	21.59	0.144	33.01	-11.42
	QPSK	1880.00	V	103	270	2.34	1/0	19.91	22.25	0.168	33.01	-10.76
1.4 MHz	QPSK	1909.30	V	110	275	2.22	1/3	19.54	21.75	0.150	33.01	-11.26
1.4 WHZ	16-QAM	1850.70	V	102	276	2.62	1/5	17.71	20.33	0.108	33.01	-12.68
	16-QAM	1880.00	V	103	270	2.34	1/0	19.14	21.48	0.141	33.01	-11.53
	16-QAM	1909.30	V	110	275	2.22	1/0	18.73	20.94	0.124	33.01	-12.07

Table 7-11. EIRP Data (LTE Band 2 – Ant2)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1850.20	GSM1900	V	145	92	26.83	2.62	29.45	0.882	33.01	-3.56
1880.00	GSM1900	V	130	95	27.26	2.34	29.60	0.912	33.01	-3.41
1909.80	GSM1900	V	103	115	26.63	2.22	28.85	0.767	33.01	-4.16
1880.00	EDGE1900	V	130	95	22.29	2.34	24.63	0.290	33.01	-8.38

Table 7-12. EIRP Data (GPRS PCS – Ant1)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1852.40	WCDMA1900	V	106	97	21.95	2.60	24.55	0.285	33.01	-8.46
1880.00	WCDMA1900	V	102	93	21.50	2.34	23.84	0.242	33.01	-9.17
1907.60	WCDMA1900	V	118	96	19.92	2.20	22.12	0.163	33.01	-10.89

Table 7-13. EIRP Data (WCDMA PCS – Ant1)

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7.7 Radiated Spurious Emissions Measurements

Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

ANSI C63.26-2015 - Section 5.5.4

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 \geq 2 x span / RBW
- 5. Detector = RMS
- 6. Trace mode = Average (Max Hold for pulsed emissions)
- 7. The trace was allowed to stabilize

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

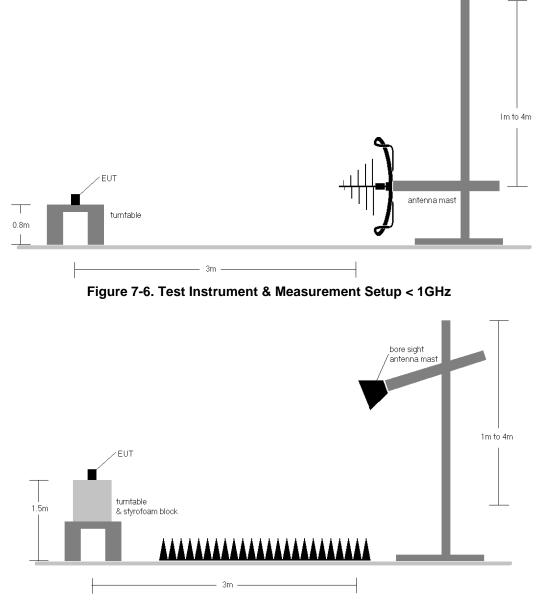


Figure 7-7. Test Instrument & Measurement Setup >1 GHz

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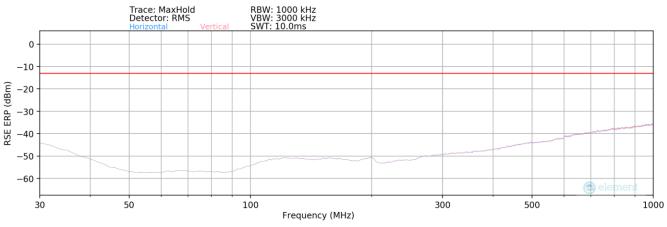
Test Notes

- 1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
 - a) $E(dB\mu V/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m) b) EIRP (dBm) = E(dB\mu V/m) + 20logD 104.8; where D is the measurement distance in meters.$
- 2) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers are 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 powers are 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 spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 7) 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.
- 8) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 9) For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) 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.
- 10) Spurious emission in EN-DC Operating mode with Sub 6GHz NR carrier as well as an LTE carrier (anchor) has been checked and was found to not to be the worst case. Spurious emissions from the NR carrier device are subject to the rules under which the NR carrier operates. Spurious emissions caused by the LTE carrier must meet the requirements of the rules under which the LTE carrier operates.

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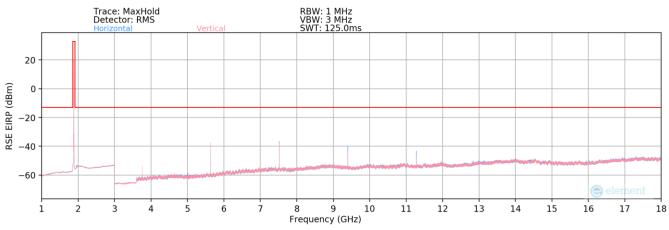
LTE Band 2 – Ant1





Bandwidth (MHz):		20							
Frequency (MHz):	1880								
RB / Offset:		1/50							
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
720.00	Н	-	-	-89.53	28.91	46.38	-51.03	-13.00	-38.03







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Bandwidth (MHz):	20
Frequency (MHz):	1860
RB / Offset:	1/50

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]
3720.00	Н	151	323	-65.25	0.98	42.73	-52.53	-13.00	-39.53
5580.00	н	187	50	-53.08	4.02	57.94	-37.32	-13.00	-24.32
7440.00	Н	161	65	-52.75	8.74	62.99	-32.27	-13.00	-19.27
9300.00	Н	122	19	-63.00	11.02	55.02	-40.23	-13.00	-27.23
11160.00	н	170	37	-67.31	11.93	51.62	-43.64	-13.00	-30.64
13020.00	н	136	27	-77.94	14.54	43.60	-51.66	-13.00	-38.66
14880.00	н	-	-	-82.57	15.17	39.60	-55.66	-13.00	-42.66
16740.00	н	-	-	-82.04	16.62	41.58	-53.68	-13.00	-40.68

Table 7-15. Radiated Spurious Data Above 1GHz (LTE Band 2 – Low Channel - Ant1)

Bandwidth (MHz):	20
Frequency (MHz):	1880
RB / Offset:	1/50

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)
3760.00	Н	125	328	-60.43	0.97	47.54	-47.72	-13.00	-34.72
5640.00	Н	177	52	-54.39	4.29	56.90	-38.36	-13.00	-25.36
7520.00	Н	179	52	-51.78	8.91	64.13	-31.13	-13.00	-18.13
9400.00	Н	137	17	-63.65	11.70	55.05	-40.21	-13.00	-27.21
11280.00	Н	147	34	-69.75	12.11	49.36	-45.89	-13.00	-32.89
13160.00	Н	278	80	-80.52	14.26	40.74	-54.51	-13.00	-41.51
15040.00	Н	-	-	-82.46	14.56	39.10	-56.16	-13.00	-43.16
16920.00	Н	-	-	-81.84	16.89	42.05	-53.21	-13.00	-40.21

Table 7-16. Radiated Spurious Data Above 1GHz (LTE Band 2 – Mid Channel - Ant1)

Bandwidth (MHz):	20
Frequency (MHz):	1900
RB / Offset:	1/50

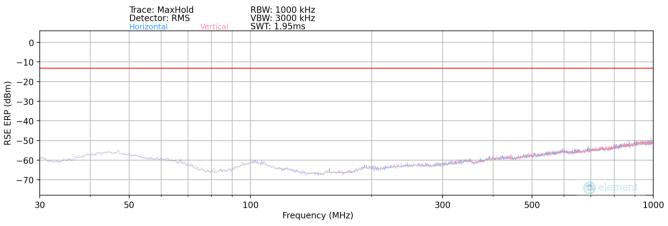
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3800.00	Н	134	327	-57.12	0.94	50.82	-44.43	-13.00	-31.43
5700.00	Н	237	56	-56.64	4.27	54.63	-40.63	-13.00	-27.63
7600.00	Н	168	51	-48.69	9.12	67.43	-27.82	-13.00	-14.82
9500.00	Н	134	35	-60.83	11.30	57.47	-37.79	-13.00	-24.79
11400.00	Н	236	38	-70.55	12.67	49.12	-46.14	-13.00	-33.14
13300.00	Н	150	78	-76.71	14.81	45.10	-50.15	-13.00	-37.15
15200.00	Н	143	34	-80.90	15.10	41.20	-54.06	-13.00	-41.06
17100.00	Н	-	-	-81.68	16.91	42.23	-53.03	-13.00	-40.03

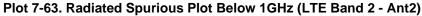
Table 7-17. Radiated Spurious Data Above 1GHz (LTE Band 2 – High Channel - Ant1)

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LTE Band 2 – Ant2

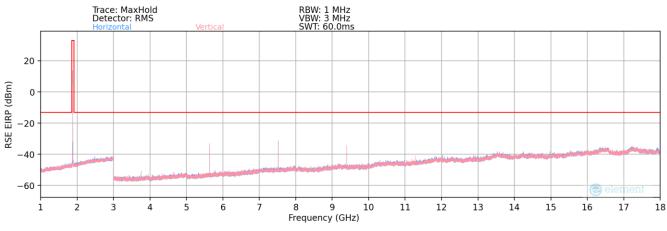




Bandwidth (MHz):	20
Frequency (MHz):	1880
RB / Offset:	1/50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
76.47	Н	-	-	-68.03	14.74	53.71	-43.70	-13.00	-30.70
192.00	Н	-	-	-71.98	18.90	53.92	-43.49	-13.00	-30.49







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Bandwidth (MHz):	20
Frequency (MHz):	1860
RB / Offset:	1/50

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]
3720.00	Н	103	191	-78.33	7.35	36.02	-59.24	-13.00	-46.24
5580.00	н	104	173	-57.50	11.36	60.86	-34.39	-13.00	-21.39
7440.00	н	107	353	-67.45	15.12	54.67	-40.59	-13.00	-27.59
9300.00	Н	102	116	-74.11	17.61	50.50	-44.76	-13.00	-31.76
11160.00	Н	116	327	-80.49	20.63	47.14	-48.12	-13.00	-35.12
13020.00	н	-	-	-84.35	23.53	46.18	-49.08	-13.00	-36.08
14880.00	н	-	-	-84.76	26.36	48.60	-46.66	-13.00	-33.66
16740.00	Н	-	-	-84.70	28.88	51.18	-44.08	-13.00	-31.08

Table 7-19. Radiated Spurious Data Above 1GHz (LTE Band 2 – Low Channel - Ant2)

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]
3760.00	Н	112	336	-73.18	7.58	41.40	-53.86	-13.00	-40.86
5640.00	Н	102	312	-60.33	11.31	57.98	-37.28	-13.00	-24.28
7520.00	Н	108	353	-64.99	15.46	57.47	-37.78	-13.00	-24.78
9400.00	Н	105	114	-74.13	17.69	50.56	-44.69	-13.00	-31.69
11280.00	Н	103	343	-79.98	21.11	48.13	-47.13	-13.00	-34.13
13160.00	Н	-	-	-84.20	23.72	46.52	-48.74	-13.00	-35.74
15040.00	Н	-	-	-85.02	26.28	48.26	-47.00	-13.00	-34.00
16920.00	Н	-	-	-84.96	28.48	50.52	-44.74	-13.00	-31.74

Table 7-20. Radiated Spurious Data Above 1GHz (LTE Band 2 – Mid Channel - Ant2)

Bandwidth (MHz):	20
Frequency (MHz):	1900
RB / Offset:	1/50

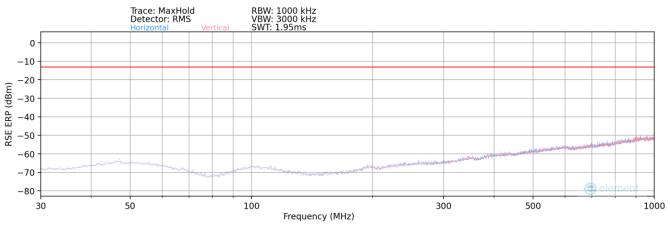
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3800.00	Н	105	136	-72.25	7.92	42.67	-52.58	-13.00	-39.58
5700.00	Н	103	314	-60.74	10.92	57.18	-38.07	-13.00	-25.07
7600.00	н	124	193	-64.67	15.50	57.83	-37.43	-13.00	-24.43
9500.00	Н	112	164	-72.55	17.99	52.44	-42.82	-13.00	-29.82
11400.00	Н	121	340	-79.53	21.14	48.61	-46.65	-13.00	-33.65
13300.00	Н	-	-	-84.06	24.16	47.10	-48.16	-13.00	-35.16
15200.00	Н	-	-	-85.05	26.63	48.58	-46.68	-13.00	-33.68
17100.00	Н	-	-	-84.37	28.52	51.15	-44.11	-13.00	-31.11

Table 7-21. Radiated Spurious Data Above 1GHz (LTE Band 2 – High Channel - Ant2)

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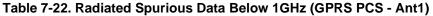
GSM/GPRS PCS - Ant1

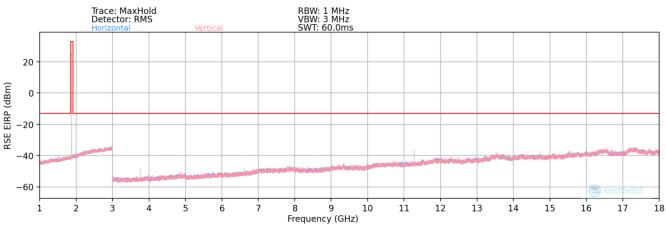


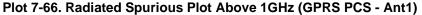


Frequency [MHz]	Ant. Pol.	Antenna	Turntable	A				
Frequency (MHz):	1880							
Channel:	661							
Mode:	GPRS 1 Tx Slot							

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
903.80	н	-	-	-61.95	1.86	46.91	-50.50	-13.00	-37.50
			<u> </u>			(







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Mode:	GPRS 1 Tx Slot
Channel:	512
Frequency (MHz):	1850.2

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]
3700.40	Н	197	42	-61.31	7.39	53.08	-42.18	-13.00	-29.18
5550.60	Н	148	55	-71.74	11.23	46.49	-48.76	-13.00	-35.76
7400.80	Н	-	-	-71.87	14.84	49.97	-45.28	-13.00	-32.28
9251.00	Н	147	3	-73.05	17.31	51.26	-44.00	-13.00	-31.00
11101.20	Н	201	339	-72.25	20.70	55.45	-39.81	-13.00	-26.81
12951.40	Н	-	-	-75.24	23.74	55.50	-39.76	-13.00	-26.76
14801.60	Н	-	-	-75.56	25.81	57.25	-38.01	-13.00	-25.01

Table 7-23. Radiated Spurious Data Above 1GHz (GPRS PCS – Low Channel - Ant1)

Mode:	GPRS 1 Tx Slot
Channel:	661
Frequency (MHz):	1880

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)
3760.00	Н	246	25	-64.82	7.58	49.76	-45.50	-13.00	-32.50
5640.00	Н	-	-	-71.89	11.31	46.42	-48.84	-13.00	-35.84
7520.00	Н	-	-	-72.84	15.46	49.62	-45.63	-13.00	-32.63
9400.00	Н	202	18	-72.46	17.69	52.23	-43.02	-13.00	-30.02
11280.00	Н	104	336	-66.93	21.11	61.18	-34.08	-13.00	-21.08
13160.00	Н	-	-	-75.06	23.72	55.66	-39.60	-13.00	-26.60
15040.00	Н	-	-	-75.59	26.28	57.69	-37.57	-13.00	-24.57

Table 7-24. Radiated Spurious Data Above 1GHz (GPRS PCS – Mid Channel - Ant1)

Mode:	GPRS 1 Tx Slot
Channel:	810
Frequency (MHz):	1909.8

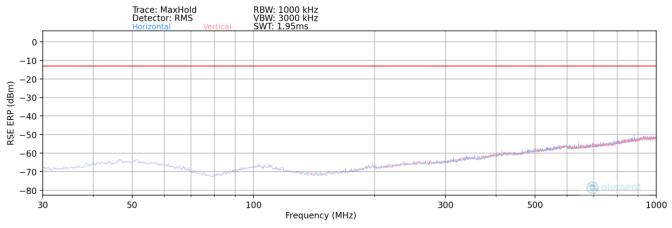
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
3819.60	Н	119	63	-70.31	7.67	44.36	-50.89	-13.00	-37.89
5729.40	Н	-	-	-71.96	11.54	46.58	-48.68	-13.00	-35.68
7639.20	Н	277	72	-73.17	15.65	49.48	-45.78	-13.00	-32.78
9549.00	Н	163	14	-71.67	18.26	53.59	-41.67	-13.00	-28.67
11458.80	Н	114	255	-68.05	20.88	59.83	-35.43	-13.00	-22.43
13368.60	Н	-	-	-75.05	24.23	56.18	-39.08	-13.00	-26.08
15278.40	Н	-	-	-75.71	27.18	58.47	-36.79	-13.00	-23.79

Table 7-25. Radiated Spurious Data Above 1GHz (GPRS PCS – High Channel - Ant1)

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WCDMA PCS - Ant1





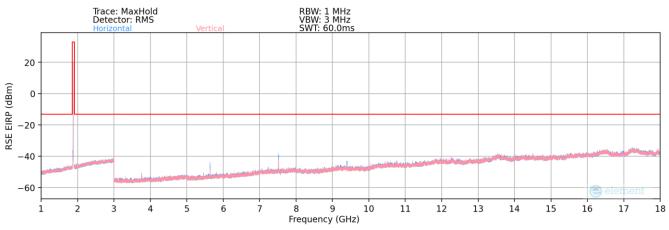
Mode:		WCDMA RMC					
Channel:	9400						
Frequency (MHz):		1880					
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	ERP Spurious Emission Level [dBm]
874.00	Н	-	-	-69.53	1.29	38.76	-58.65

Table 7-26. Radiated Spurious Data Above 1GHz (WCDMA PCS – Low Channel - Ant1)

Limit [dBm] Margin [dB]

-45.65

-13.00





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Mode:	WCDMA RMC
Channel:	9262
Frequency (MHz):	1852.4

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]
3704.80	Н	109	347	-77.26	7.37	37.11	-58.15	-13.00	-45.15
5557.20	Н	187	35	-72.04	11.21	46.17	-49.09	-13.00	-36.09
7409.60	Н	127	20	-73.74	14.93	48.19	-47.07	-13.00	-34.07
9262.00	Н	103	343	-80.35	17.27	43.92	-51.33	-13.00	-38.33
11114.40	Н	-	-	-83.28	20.61	44.33	-50.93	-13.00	-37.93
12966.80	Н	-	-	-84.44	24.10	46.66	-48.60	-13.00	-35.60

Table 7-27. Radiated Spurious Data Above 1GHz (WCDMA PCS – Low Channel - Ant1)

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]
3760.00	Н	189	9	-77.58	7.58	37.00	-58.26	-13.00	-45.26
5640.00	н	161	47	-73.84	11.31	44.47	-50.79	-13.00	-37.79
7520.00	н	343	2	-73.83	15.46	48.63	-46.62	-13.00	-33.62
9400.00	н	170	318	-79.77	17.69	44.92	-50.33	-13.00	-37.33
11280.00	н	-	-	-83.47	21.11	44.64	-50.62	-13.00	-37.62
13160.00	Н		-	-84.18	23.72	46.54	-48.72	-13.00	-35.72

Table 7-28. Radiated Spurious Data Above 1GHz (WCDMA PCS – Mid Channel - Ant1)

Mode:	WCDMA RMC
Channel:	9538
Frequency (MHz):	1907.6

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]
3815.20	Н	202	50	-72.25	7.76	42.51	-52.75	-13.00	-39.75
5722.80	н	165	43	-72.74	11.40	45.66	-49.59	-13.00	-36.59
7630.40	Н	133	338	-72.65	15.67	50.02	-45.23	-13.00	-32.23
9538.00	Н	146	320	-77.77	17.90	47.13	-48.13	-13.00	-35.13
11445.60	н	-	-	-83.34	21.07	44.73	-50.53	-13.00	-37.53
13353.20	Н	-	-	-83.99	24.13	47.14	-48.12	-13.00	-35.12

Table 7-29. Radiated Spurious Data Above 1GHz (WCDMA PCS – High Channel - Ant1)

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7.8 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. 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 24, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI C63.26-2015 – Section 5.6

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

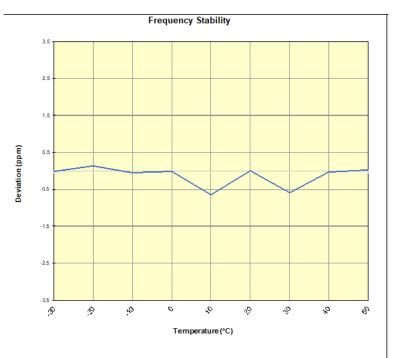
None

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LTE Band 2							
	Operating	Frequency (Hz):	1,880,0	00,000			
	Ref	Voltage (VDC):	4.3	31			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)		
		- 30	1,880,000,543	-13	-0.0000007		
		- 20	1,880,000,810	253	0.0000135		
		- 10	1,880,000,468	-89	-0.0000047		
		0	1,880,000,539	-17	-0.0000009		
100 %	4.331	+ 10	1,879,999,329	-1,227	-0.0000653		
		+ 20 (Ref)	1,880,000,556	0	0.0000000		
		+ 30	1,879,999,454	-1,102	-0.0000586		
		+ 40	1,880,000,487	-70	-0.0000037		
		+ 50	1,880,000,608	52	0.0000028		
Battery Endpoint	3.355	+ 20	1,880,000,239	-317	-0.0000169		

Table 7-30. LTE Band 2 Frequency Stability Data



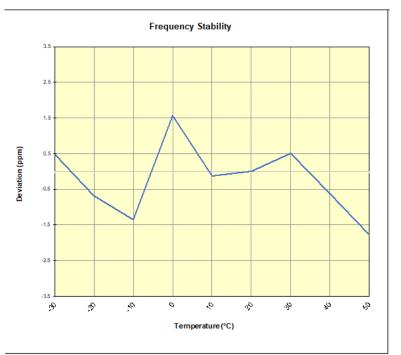
Plot 7-69. LTE Band 2 Frequency Stability Chart

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GSM/GPRS PCS							
	Operating	Frequency (Hz):	1,880,0	00,000			
	Ref	. Voltage (VDC):	4.3	31			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)		
		- 30	1,880,006,018	884	0.0000470		
		- 20	1,880,003,856	-1,278	-0.0000680		
		- 10	1,880,002,596	-2,538	-0.0001350		
		0	1,880,008,082	2,948	0.0001568		
100 %	4.331	+ 10	1,880,004,881	-253	-0.0000135		
		+ 20 (Ref)	1,880,005,134	0	0.0000000		
		+ 30	1,880,006,093	959	0.0000510		
		+ 40	1,880,004,002	-1,132	-0.0000602		
		+ 50	1,880,001,819	-3,315	-0.0001763		
Battery Endpoint	3.355	+ 20	1,880,004,318	-816	-0.0000434		

Table 7-31. GSM/GPRS PCS Frequency Stability Data



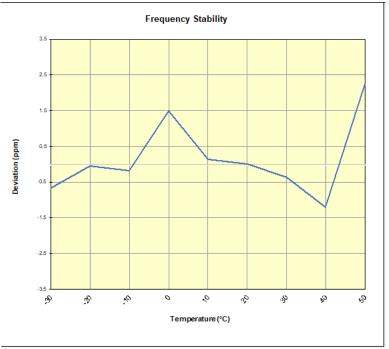
Plot 7-70. GSM/GPRS PCS Frequency Stability Chart

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WCDMA PCS							
	Operating	Frequency (Hz):	1,880,0	00,000]		
	Ref	Voltage (VDC):	4.3	31			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)		
		- 30	1,880,078,824	-1,261	-0.0000671		
		- 20	1,880,080,006	-80	-0.0000043		
		- 10	1,880,079,748	-338	-0.0000180		
		0	1,880,082,902	2,817	0.0001498		
100 %	4.331	+ 10	1,880,080,326	240	0.0000128		
		+ 20 (Ref)	1,880,080,086	0	0.0000000		
		+ 30	1,880,079,408	-677	-0.0000360		
		+ 40	1,880,077,816	-2,270	-0.0001207		
		+ 50	1,880,084,292	4,206	0.0002237		
Battery Endpoint	3.355	+ 20	1,880,080,398	313	0.0000166		

Table 7-32. WCDMA PCS Frequency Stability Data



Plot 7-71. WCDMA PCS Frequency Stability Chart

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMA156M** complies with all the requirements of Part 24 of the FCC rules.

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