

PCTEST ENGINEERING LABORATORY, INC.

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MEASUREMENT REPORT

FCC Part 22 & 90

Applicant Name:

FCC ID:

Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea Date of Testing: 01/22/2019 - 03/25/2019 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M1901100003-04.A3L

A3LSMG977U

APPLICANT: Sa

Samsung Electronics Co., Ltd.

Application Type: Model: EUT Type: FCC Classification: FCC Rule Part: Test Procedure(s): Certification SM-G977U Portable Handset PCS Licensed Transmitter Held to Ear (PCE) §2.1049, §22(H), §90(S), §90(R) ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01, KDB 648474 D03 v01r04

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

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.





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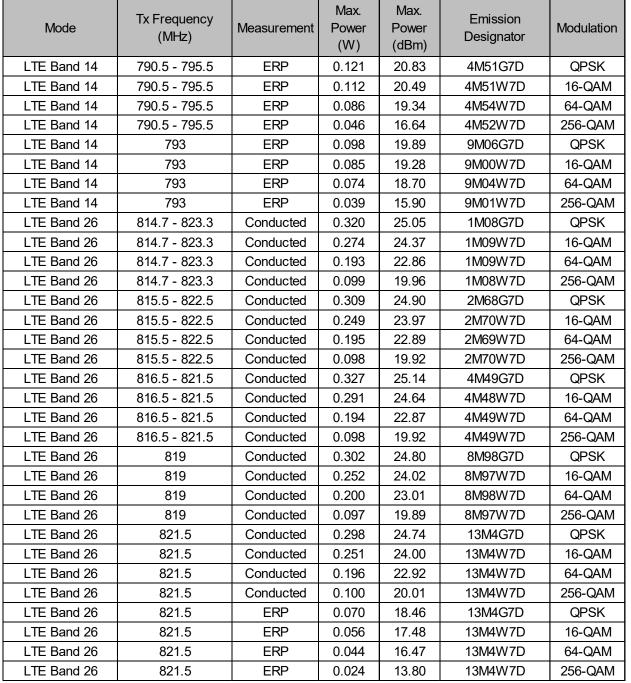
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MEASUREMENT REPORT FCC Part 22(H) & 90



EUT Overview

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1.0 INTRODUCTION

1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.

1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST Engineering Lab located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMG977U**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 90(R), 22(H) and 90(S).

Test Device Serial No.: 2581B, 2531B, 9878B, 1270B

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1), 850/1900 GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC, ANT+, Wireless Power Transfer, n261 5G NR

This device uses a tuner circuit that dynamically updates the antenna impedance parameters to optimize antenna performance for certain bands and modes of operation. The tuner for this device was set to simulate a "free space" condition where the transmit antenna is matched to the medium into which it is transmitting and, thus, the power is at its maximum level.

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

This device supports wireless charging capability and, thus, is subject to the test requirements of KDB 648474 D03 v01r04. Additional radiated spurious emission measurements were performed with the EUT placed on an authorized wireless charging pad (WCP) Model: EP-N5100 while operating under normal conditions in a simulated call or data transmission configuration. The worst case radiated emissions data is shown in this report.

2.4 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the document titled "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

3.2 Radiated Power and Radiated Spurious Emissions

§2.1053, §90.635, §90(S), §90(R)

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

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer "Channel Power" function with the integration band set to the emissions' occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

Per the guidance of ANSI/TIA-603-E-2016, a half-wave dipole is then substituted in place of the EUT. For emissions above 1GHz, a horn antenna is substituted in place of the EUT. The substitute antenna is driven by a signal generator with the level of the signal generator being adjusted to obtain the same receive spectrum analyzer level previously recorded from the spurious emission from the EUT. The power of the emission is calculated using the following formula:

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

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

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

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

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

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4.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (±dB)
Conducted Bench Top Measurements	1.13
Radiated Disturbance (<1GHz)	4.98
Radiated Disturbance (>1GHz)	5.07
Radiated Disturbance (>18GHz)	5.09

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5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx2	Licensed Transmitter Cable Set	8/23/2018	Annual	8/23/2019	LTx2
Agilent	N9030A	PXA Signal Analyzer (44GHz)	5/25/2018	Annual	5/25/2019	MY52350166
Anritsu	MT8821C	Radio Communication Analyzer	7/24/2018	Annual	7/24/2019	6201664756
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2017	Biennial	10/10/2019	121034
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	9/17/2018	Annual	9/17/2019	441119
Emco	3115	Horn Antenna (1-18GHz)	3/28/2018	Biennial	3/28/2020	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	6/7/2018	Triennial	6/7/2021	9203-2178
Espec	ESX-2CA	Environmental Chamber	3/28/2018	Annual	3/28/2019	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/28/2018	Biennial	3/28/2020	128337
Huber + Suhner	Sucoflex 102A	40GHz Radiated Cable Set	8/23/2018	Annual	8/23/2019	251425001
Keysight Technologies	N9030A	3Hz-44GHz PXA Signal Analyzer	3/20/2018	Annual	3/20/2019	MY49430494
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	3/30/2018	Annual	3/30/2019	11401010036
Mini Circuits	TVA-11-422	RF Power Amp	N/A		N/A	QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A		N/A	11208010032
Rohde & Schwarz	CMW500	Radio Communication Tester	9/25/2018	Annual	9/25/2019	102060
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	5/21/2018	Annual	5/21/2019	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	8/9/2018	Annual	8/9/2019	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	6/18/2018	Annual	6/18/2019	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	6/25/2018	Annual	6/25/2019	102133
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	7/16/2018	Biennial	7/16/2020	101073
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	9/19/2018	Annual	9/19/2019	100040
Seekonk	NC-100	Torque Wrench	5/9/2018	Biennial	5/9/2020	22217
Sunol	DRH-118	Horn Antenna (1-18GHz)	8/11/2017	Biennial	8/11/2019	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107

Table 5-1. Test Equipment

Notes:

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

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6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz G = Phase Modulation 7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

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

Spurious Radiated Emission – LTE Band

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

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the spectrum analzyer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

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7.0 TEST RESULTS

7.1 Summary

Company Name:	Samsung Electronics Co., Ltd.
FCC ID:	A3LSMG977U
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	LTE
Band:	Band 26 / Band 14

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A		PASS	Section 7.2
2.1051 90.691 90.543	Conducted Band Edge / Spurious Emissions	On all frequencies between 769- 775 MHz and 799-805 MHz, attenuation by a factor not less than 65 + 10 log(P) dB in a 6.25 kHz band segment, for mobile and portable stations. (LTE B14) On any frequency between 775- 788 MHz, above 805 MHz, and below 758 MHz, attenuation by at least 43 + 10 log(P) dB. (LTE B14) > 43 + 10 log ₁₀ (P[Watts]) for all out-of-band emissions except > 50 + 10 log ₁₀ (P[Watts]) at Band Edge and for all out-of- band emissions within 37.5kHz of Block Edge (LTE B26)	CONDUCTED	PASS	Sections 7.3, 7.4
2.1055 90.213	Frequency Stability	< 2.5 ppm		PASS	Section 7.8
2.1046 90.635	Conducted Power	< 100 Watts		PASS	Section 7.5
22.913(a.2)	Effective Radiated Power (LTE Band 26)	< 7 Watts max. ERP		PASS	Section 7.6
90.542(a)(7)	Effective Radiated Power (LTE Band 14)	< 3 Watts max. ERP	RADIATED	PASS	Section 7.6
2.1053 90.691 90.543	Radiated Spurious Emissions	 > 43 + 10 log₁₀ (P[Watts]) for all out-of-band emissions except > 50 + 10 log₁₀ (P[Watts]) at Band Edge and for all out-of- band emissions within 37.5kHz of Block Edge 		PASS	Section 7.7

Table 7-1. Summary of Test Results

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Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "2G/3G Automation," Version 3.11.

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7.2 Occupied Bandwidth §2.1049

Test Overview

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 4.2

Test Settings

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

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

Test Setup

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



Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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🧫 Keysight Spectrum	Analyzer - Occu	upied BW									- # ×
LXI RL R	F 50 Ω	DC CC	ORREC		ENSE:INT Freg: 814.700		ALIGN AUT	0 11:53:31 Radio Sto	PM Feb 19, 2019	Trac	e/Detector
				🖌 Trig: Fr	ee Run	Avg Hold	: 100/100				
		#1	Gain:Low	#Atten:	40 dB			Radio De	vice: BTS		
	Ref 30.00) d <u>Bm</u>									
20.0											
10.0		m	man	mm-m	mm.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	m			(Clear Write
0.00		1									
	٢	/						N.			
-10.0 -20.0 <mark>A/ml/acade/w</mark>								how	hand		Average
											Average
-30.0											
-40.0											
-50.0											Max Hold
-60.0										_	
Center 814.7	00 MHz							Snan '	2.000 MHz		
Res BW 18 k				VE	W 180 kH	łz			5.733 ms		Min Hold
											WIIITHUIU
Occupie	d Bandv	width			Total P	ower	31	I.7 dBm			
		1 08	332 M	IH7							Detector
											Peak▶
Transmit	Freq Erro	or	25	4 Hz	% of O	BW Powe	er	99.00 %		Auto	<u>Man</u>
x dB Band	dwidth		1.216	MHz	x dB		-2	6.00 dB			
MSG							STA	TUS			

Plot 7-1. Occupied Bandwidth Plot (LTE Band 26, 1.4MHz QPSK – RB Size 6– Low Channel)



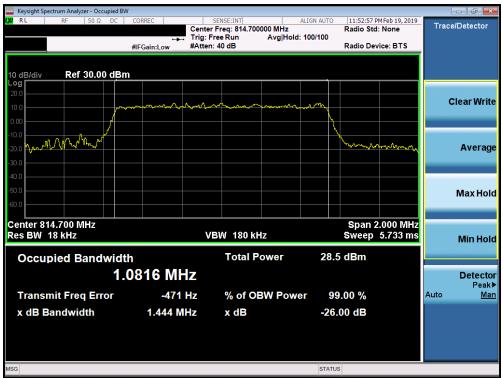
Plot 7-2. Occupied Bandwidth Plot (LTE Band 26, 1.4MHz 16-QAM - RB Size 6- Low Channel)

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Plot 7-3. Occupied Bandwidth Plot (LTE Band 26, 1.4MHz 64-QAM – RB Size 6– Low Channel)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 26, 1.4MHz 256-QAM – RB Size 6– Low Channel)

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Keysight Spectrum Analyzer - Occupied B					
RL RF 50Ω DC	+++ Trig:	sense:INT er Freq: 815.500000 MHz Free Run Avg Hold n: 40 dB	I:>100/100	12:10:36 AM Feb 20, 2019 Radio Std: None Radio Device: BTS	Trace/Detector
10 dB/div Ref 30.00 dBr	n				
20.0	her and the for the former of	m. m	Marin		Clear Wri
10.0 20.0 20.0 20.0 20.0 20.0 20.0 20.0				M W man mar of A	Avera
40.0					Max Ho
Center 815.500 MHz Res BW 47 kHz		/BW 470 kHz	<u> </u>	Span 5.000 MHz Sweep 2.533 ms	Min Ho
Occupied Bandwidt 2 .	^h 6815 MHz	Total Power	31.9 c	iBm	Detect
Transmit Freq Error x dB Bandwidth	298 Hz 2.944 MHz	% of OBW Pow x dB	er 99.0 -26.00		Auto <u>M</u> i
SG			STATUS		

Plot 7-5. Occupied Bandwidth Plot (LTE Band 26, 3MHz QPSK - RB Size 15- Low Channel)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 26, 3MHz 16-QAM – RB Size 15– Low Channel)

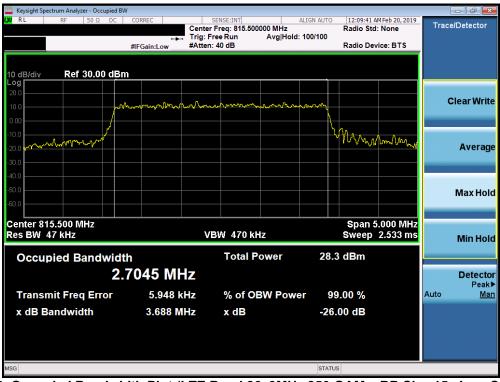
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Keysight Spectrum Analyzer - Occupied BW				-		
X RL RF 50Ω DC	Trig: I	SENSE:INT r Freq: 815.500000 MHz Free Run Avg Hol n: 40 dB	ALIGN AUTO d: 100/100	12:10:49 AM Fel Radio Std: No Radio Device:	one Tra	ce/Detector
10 dB/div Ref 30.00 dBm						
10.0 0.00 10.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mahalan	h h			Clear Writ
20.0				mannow	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Averag
				0		Max Hol
enter 815.500 MHz es BW 47 kHz Occupied Bandwidth		/BW 470 kHz Total Power	29.7	Span 5.00 Sweep 2.5 dBm		Min Ho
	945 MHz					Detect
Transmit Freq Error x dB Bandwidth	1.184 kHz 2.962 MHz	% of OBW Pow x dB		0.00 % 00 dB	Auto	Peak <u>Ma</u>
G			STATUS	6		

Plot 7-7. Occupied Bandwidth Plot (LTE Band 26, 3MHz 64-QAM – RB Size 15– Low Channel)



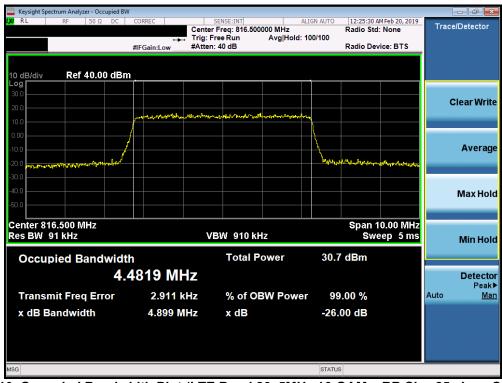
Plot 7-8. Occupied Bandwidth Plot (LTE Band 26, 3MHz 256-QAM - RB Size 15- Low Channel)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BW					- F	2
RL RF 50Ω DC	Trig	SENSE:INT nter Freq: 816.500000 MHz g: Free Run Avg Ho ten: 40 dB	ALIGN AUTO	12:25:23 AM Feb 20, 2019 Radio Std: None Radio Device: BTS	Trace/Detect	tor
0 dB/div Ref 40.00 dBm						
	order promotion of the second second second second	an an the part of the state of the second	-many		Clear W	vrn
0.00 0.00 mpg-tong-marketingtong-marketingtong-marketingtong-marketingtong-marketingtong-marketingtong-marketingtong				Montheasterappingertangert	Aver	raç
0.0					MaxH	Но
enter 816.500 MHz es BW 91 kHz		VBW 910 kHz		Span 10.00 MHz Sweep 5 ms		Но
Occupied Bandwidt		Total Power	31.9	dBm		
4.4	4928 MHz				Dete	ect
Transmit Freq Error	2.130 kHz	% of OBW Pov	ver 99	.00 %	Auto	Ma
x dB Bandwidth	5.000 MHz	x dB	-26.	00 dB		
G			STATUS			-

Plot 7-9. Occupied Bandwidth Plot (LTE Band 26, 5MHz QPSK - RB Size 25- Low Channel)



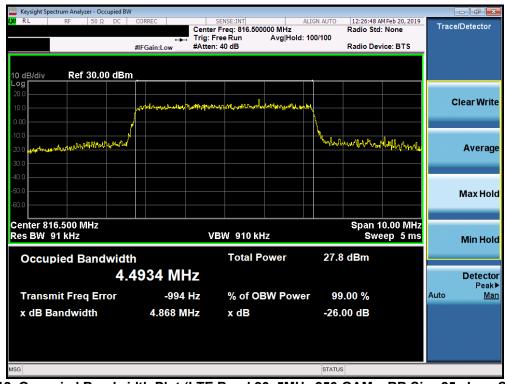
Plot 7-10. Occupied Bandwidth Plot (LTE Band 26, 5MHz 16-QAM - RB Size 25- Low Channel)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	AMSUNG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied	BW				- ē 🔀
LX/ RL RF 50Ω DC	Cente	er Freq: 816.500000 MHz	Radio Ste	AM Feb 20, 2019 d: None	Trace/Detector
		Free Run Avg Hold: 1 n: 40 dB		vice: BTS	
10 dB/div Ref 40.00 dE	3m				
Log 30.0					
20.0					Clear Write
10.0	mathing and the second	what a frank and a star for the second of the second second second second second second second second second se			
0.00			<u> </u>		
-10.0	/		- \ <u>_</u>		Average
-20.0			his way and the way	m VWV los www.mur	
-30.0					
-40.0					Max Hold
-50.0					
Center 816.500 MHz				10.00 MHz	
Res BW 91 kHz		/BW 910 kHz	Sw	eep 5 ms	Min Hold
Occupied Bandwic	dth	Total Power	29.8 dBm		
	.4937 MHz				Detector
					Peak▶
Transmit Freq Error	-1.046 kHz	% of OBW Power			Auto <u>Man</u>
x dB Bandwidth	4.901 MHz	x dB	-26.00 dB		
MSG			STATUS		
mod			STATUS		

Plot 7-11. Occupied Bandwidth Plot (LTE Band 26, 5MHz 64-QAM – RB Size 25– Low Channel)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 26, 5MHz 256-QAM - RB Size 25- Low Channel)

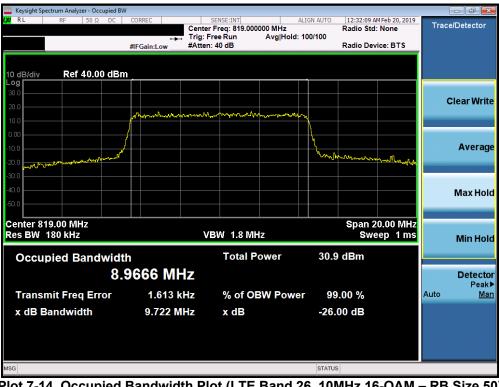
FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BW					
RL RF 50Ω DC	Trig:	SENSE:INT r Freq: 819.000000 MH: Free Run Avg F n: 40 dB	ALIGN AUTO z łold: 100/100	12:32:03 AM Feb 20, 2019 Radio Std: None Radio Device: BTS	Trace/Detector
0 dB/div Ref 40.00 dBm	Jungen Marken Mark	unperformation and the second se	*****		Clear Writ
0.00 0.00 0.00 0.00				Margan Maral Maran	Averag
0.0					Max Hol
enter 819.00 MHz es BW 180 kHz		/BW 1.8 MHz		Span 20.00 MHz Sweep 1 ms	Min Ho
Transmit Freq Error	9833 MHz 16.414 kHz	Total Power % of OBW Po	ower 99	dBm .00 %	Detecto Peak Auto <u>Ma</u>
x dB Bandwidth	9.834 MHz	x dB		00 dB	
ISG			STATUS	5	

Plot 7-13. Occupied Bandwidth Plot (LTE Band 26, 10MHz QPSK - RB Size 50)



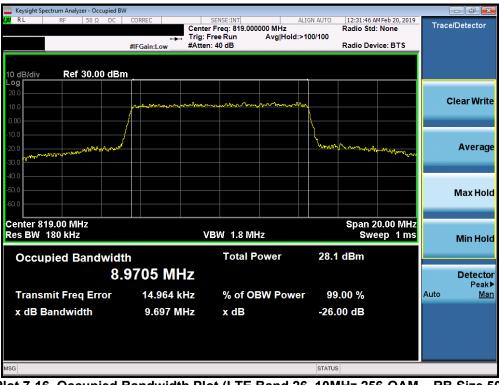
Plot 7-14. Occupied Bandwidth Plot (LTE Band 26, 10MHz 16-QAM – RB Size 50)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Plot 7-15. Occupied Bandwidth Plot (LTE Band 26, 10MHz 64-QAM - RB Size 50)



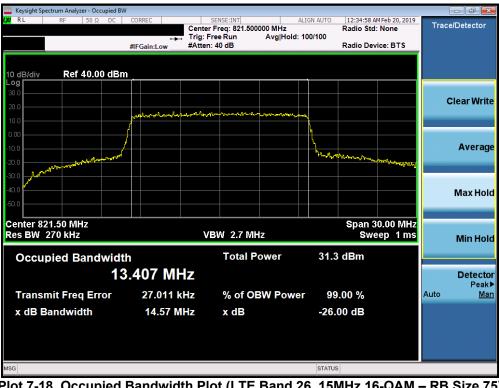
Plot 7-16. Occupied Bandwidth Plot (LTE Band 26, 10MHz 256-QAM – RB Size 50)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	NG	Approved by: Quality Manager
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Plot 7-17. Occupied Bandwidth Plot (LTE Band 26, 15MHz QPSK - RB Size 75)



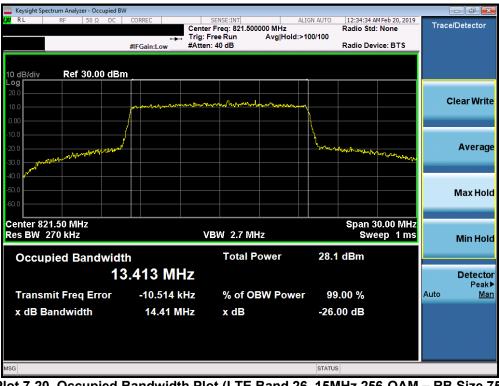
Plot 7-18. Occupied Bandwidth Plot (LTE Band 26, 15MHz 16-QAM – RB Size 75)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Plot 7-19. Occupied Bandwidth Plot (LTE Band 26, 15MHz 64-QAM – RB Size 75)



Plot 7-20. Occupied Bandwidth Plot (LTE Band 26, 15MHz 256-QAM – RB Size 75)

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Keysight Spectrum Analyzer - Occupied BV 11:17:05 PM Feb 01, 2019 RI ALIGN AUTO ENSEITN Trace/Detector Center Freq: 793.000000 MHz Trig: Free Run Avg|Ho #Atten: 36 dB Radio Std: None Avg|Hold: 100/100 #IFGain:Low Radio Device: BTS Ref 40.00 dBm l0 dB/div Log **Clear Write** Average Max Hold Center 793.000 MHz Res BW 120 kHz Span 12.50 MHz #VBW 390 kHz Sweep 1 ms Min Hold 32.9 dBm Total Power **Occupied Bandwidth** 4.5149 MHz Detector Peak▶ -1.653 kHz 99.00 % Auto **Transmit Freq Error** % of OBW Power <u>Man</u> x dB Bandwidth 5.039 MHz x dB -26.00 dB STATUS





Plot 7-22. Occupied Bandwidth Plot (LTE Band 14, 5MHz 16-QAM – RB Size 25)

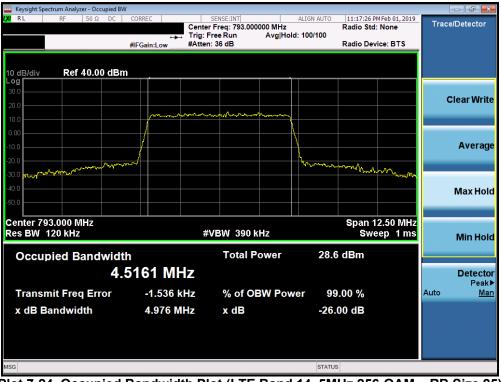
FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 22 of 50
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Plot 7-23. Occupied Bandwidth Plot (LTE Band 14, 5MHz 64-QAM – RB Size 25)



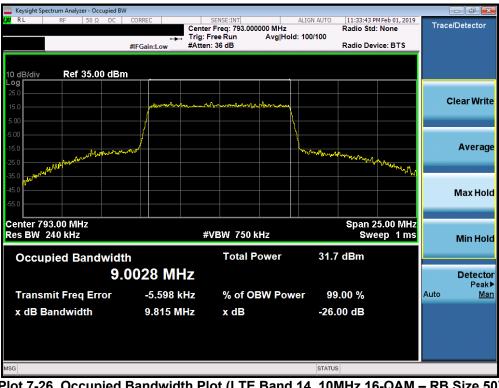
Plot 7-24. Occupied Bandwidth Plot (LTE Band 14, 5MHz 256-QAM – RB Size 25)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Plot 7-25. Occupied Bandwidth Plot (LTE Band 14, 10MHz QPSK - RB Size 50)



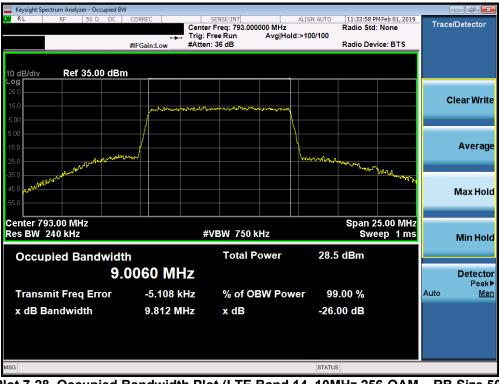
Plot 7-26. Occupied Bandwidth Plot (LTE Band 14, 10MHz 16-QAM – RB Size 50)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BW					
XIRL RF 50Ω DC	the Tr	SENSE:INT enter Freq: 793.000000 MHz ig: Free Run Avg H stten: 36 dB	ALIGN AUTO	11:33:51 PM Feb 01, 2019 Radio Std: None Radio Device: BTS	Trace/Detector
10 dB/div Ref 35.00 dBm	an Gameon				_
25.0 15.0		non-think of the second se	~		Clear Writ
25.00 26.00 26.0 26.0			huhannya	Anton March Barran	Averag
45.0					Max Hol
Center 793.00 MHz Res BW 240 kHz		#VBW 750 kHz		Span 25.00 MHz Sweep 1 ms	
Occupied Bandwidth 9.0) 388 MHz	Total Power	30.5	ō dBm	Detecto Peak
Transmit Freq Error x dB Bandwidth	-1.948 kHz 9.963 MHz			9.00 % 00 dB	Auto <u>Ma</u>
SG			STATUS	S	

Plot 7-27. Occupied Bandwidth Plot (LTE Band 14, 10MHz 64-QAM - RB Size 50)



Plot 7-28. Occupied Bandwidth Plot (LTE Band 14, 10MHz 256-QAM – RB Size 50)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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7.3 Spurious and Harmonic Emissions at Antenna Terminal §2.1051 §90.691 §90.543

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

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

Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

Test Notes

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for Part 22. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 Db below the transmitter power.

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Cen Cen 2B/div Ref 30.00 dBm -32.72 dBm 2 -32.72 dBm -32.72 dBm 3 -32.72 dBm -32.72 dBm 422.000 -32.72 dBm -32.72 dBm 3 -32.72 dBm -32.72 dBm 422.000 -32.72 dBm -32.72 dBm 422.000 -32.72 dBm -32.72 dBm 5 -32.72 dBm -32.72 dBm 6 -32.72 dBm -32.72 dBm	- F
PNO: Fast Trig: Free Run Mikr1 814.000 0 MHz Au dB/div Ref 30.00 dBm -32.72 dBm -32.72 dBm 422.000 0	iency
B/div Ref 30.00 dBm -32.72 dBm -3	
0	ito Tur
0	iter Fre
Image: State of the state	0000 MI
C CLI-13.00 dBm C CLI-13.00 dB	tart Fre
C C C C C C C C C C C C C C C C C C C	0000 MI
	top Fr
	0000 M
	CF Ste
	M
	q Offs
	0
Sca	ale Ty
art 30.0 MHz Stop 814.0 MHz	L
es BW 100 kHz #VBW 300 kHz Sweep 37.33 ms (20001 pts)	

Plot 7-29. Conducted Spurious Plot (LTE Band 26, 15MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-30. Conducted Spurious Plot (LTE Band 26, 15MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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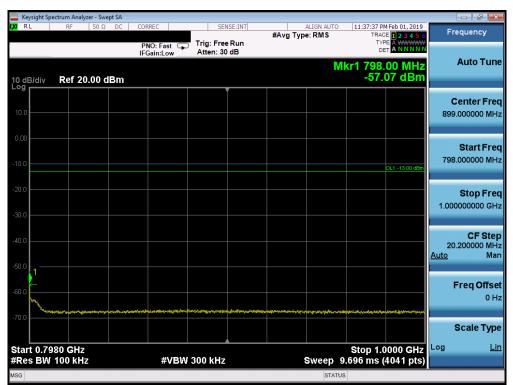
Plot 7-31. Conducted Spurious Plot (LTE Band 26, 15MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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		Analyzer - Sv	vept SA									- 6 -
XI RL	RF	50 \$	2 DC	CORREC PNO: I	Fast 😱		#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Feb 01, 2019 E 1 2 3 4 5 6 E A WWWWW A N N N N N	Fre	quency
I0 dB/div	Rei	f 20.00	dBm					M	kr1 788. -28.	00 MHz 52 dBm		Auto Tun
10.0												enter Fre 000000 МН
10.00										DL1 -13.00 dBm		Start Fre 000000 M⊦
20.0										1		Stop Fre
40.0											75. <u>Auto</u>	CF Ste 800000 MH Ma
60.0 		an shi ki sa da da da	d along the state of a	assas ng	ور برد کار کار کار	a propose state and a state of states of	n filosof a sugar a filosofia filosofia 19 dia da filosofia filosofia da sugar filosofia da sugar filosofia da sugar filosofia da sugar filosofia da su				F	r eq Offs 0 H
-70.0	1. (1. (1. (1. (1. (1. (1. (1. (1. (1. (andre and a state of the state	ىلىغ زۇرىيە <u>ئەرەر قىرىمۇر قىرىمۇر قىرىمى</u> مەرەبىيە تەرەبىيە تەرە	in an in the second	andrei andre a	anta pina di tanggan pina di ta						Scale Typ
	0.0 MH: W 100				#VBW	300 kHz	s	weep 36	Stop 7 .38 ms (1	88.0 MHz 5161 pts)	Log	L
SG								STATUS				

Plot 7-32. Conducted Spurious Plot (LTE Band 14, 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



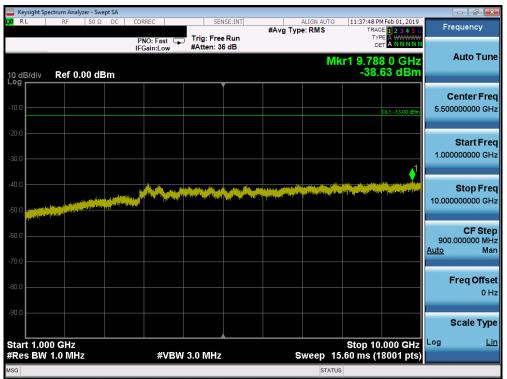
Plot 7-33. Conducted Spurious Plot (LTE Band 14, 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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Plot 7-34. Conducted Spurious Plot (LTE Band 14, 10MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

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7.4 Band Edge Emissions at Antenna Terminal §2.1051 §90.691 §90.543

Test Overview

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

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

For LTE Band 14 operation under Part 90.543, the power of any emission must be reduced below the mean output power (P) by at least 43 + 10log (P) dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

Additionally, for LTE Band 14 operation, on all frequencies between 769-775 MHz and 799-805 MHz, the power of any emission shall be attenuated by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations.

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

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

Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

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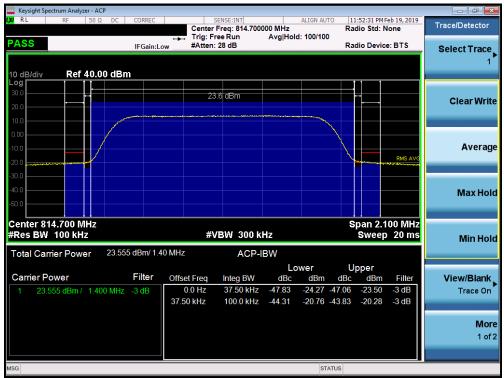


For channel edge emission, the signal analyzer's "ACP" measurement capability is used.

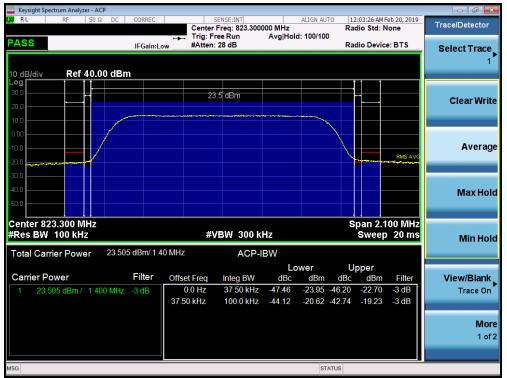
Per 22.917(b) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission 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.

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Plot 7-35. Channel Edge Plot (LTE Band 26, 1.4MHz QPSK – RB Size 6– Low Channel)



Plot 7-36. Channel Edge Plot (LTE Band 26, 1.4MHz QPSK - RB Size 6 - High Channel)

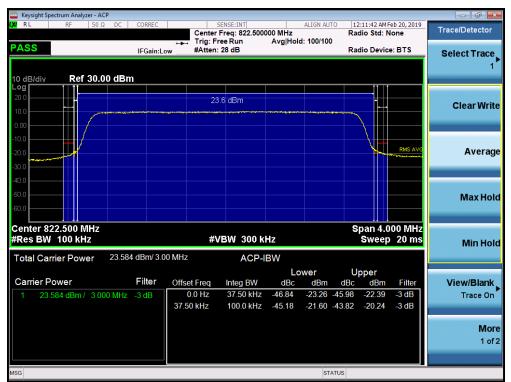
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Keysight Spectrum Analyzer - ACP					- ē -	
XX RL RF 50 Ω DC CORRE	Center Fre	SE:INT eq: 815.500000 MHz	Rac	:05:49 AM Feb 20, 2019 dio Std: None	Trace/Detector	
PASS IFGai	n:Low #Atten: 28		d: 100/100 Rac	lio Device: BTS	Select Trace	
10 dB/div Ref 40.00 dBm					1	
30.0	23.6	dBm			Clear Write	
20.0					Clear write	
0.00						
-10.0				RMS AVG	Average	
-20.0				RMS AVG		
-40.0					Max Hold	
-50.0						
Center 815.500 MHz #Res BW 100 kHz	#VB	W 300 kHz		pan 4.000 MHz Sweep 20 ms	Min Hold	
Total Carrier Power 23.598 dBm/	WIIIT HOIG					
	Lower Upper					
Carrier Power Filter	onoorriod	nteg BW dBc	dBm dBc	dBm Filter	View/Blank ⊾	
1 23.598 dBm / 3.000 MHz -3 dB		37.50 kHz -47.24			Trace On	
	37.50 kHz	100.0 kHz -45.13	-21.53 -44.96	-21.37 -3 dB		
					More	
					1 of 2	
MSG STATUS						

Plot 7-37. Channel Edge Plot (LTE Band 26, 3MHz QPSK – RB Size 15– Low Channel)



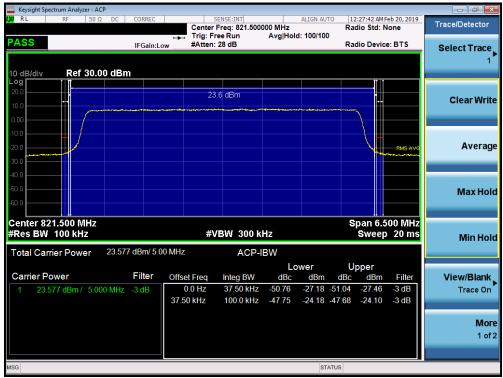
Plot 7-38. Channel Edge Plot (LTE Band 26, 3MHz QPSK - RB Size 15 - High Channel)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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RL RF 50 Ω DC	CORREC	Center	SENSE:INT Freq: 816.5000 ree Run		ALIGN AUTO	12:24:55 AM Radio Std:	Feb 20, 2019 None	Trace/Detector
ASS	IFGain:Lo	-		Avginoid.	100/100	Radio Devi	e: BTS	Select Trace
0 dB/div Ref 30.00 dBr	n							
		23	3.6 dBm					Clear Writ
							RMS AVG	Averaç
								Max Ho
enter 816.500 MHz Res BW 100 kHz		#\	/BW 300 k	Hz			500 MHz p 20 ms	Min Ho
otal Carrier Power 23.60	2 dBm/ 5.0	0 MHz	ACP-I	BW				
arrier Power	Filter	04 15		Low		Upper		
23.602 dBm / 5.000 MHz		Offset Freq 0.0 Hz 37.50 kHz	Integ BW 37.50 kHz 100.0 kHz		-27.59 -50	dBc dBm 0.71 -27.11 3.03 -24.43	Filter -3 dB -3 dB	View/Blank Trace Or
								Мо 1 о

Plot 7-39. Channel Edge Plot (LTE Band 26, 5MHz QPSK - RB Size 25- Low Channel)



Plot 7-40. Channel Edge Plot (LTE Band 26, 5MHz QPSK – RB Size 25 – High Channel)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Daga 26 of 50	
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🔤 Keysight Spectrum Analyzer - ACP							
LXX RL RF 50Ω DC CORR		NSE:INT reg: 819.0000			2:31:34 AM Feb dio Std: No		Trace/Detector
24.00	Trig: Fre	e Run	Avg Hold: 10	0/100			
PASS IFGa	in:Low #Atten: 2	28 dB		Ra	dio Device:	BTS	Select Trace
							1
10 dB/div Ref 30.00 dBm							
Log							
20.0	23.6	6 dBm					Clear Write
10.0							
0.00							
-10.0							
-20.0						RMS AVG	Average
-30.0							
-40.0							
-50.0							
							Max Hold
-60.0							
Center 819.000 MHz				s	pan 12.0	0 MHz	
#Res BW 100 kHz	#VI	BW 300 kl	lz		Sweep	20 ms	Min Hold
Total Carrier Power 23.564 dBm	/ 10.00 MHz	ACP-II	3W				
			Lower	U	pper		
Carrier Power Filte	er Offset Freq	Integ BW		Bm dBc	dBm	Filter	View/Blank
1 23.564 dBm / 10.00 MHz -3 dB	3 0.0 Hz	37.50 kHz	-52.51 -28	.95 -51.79	-28.22	-3 dB	Trace On
	37.50 kHz	100.0 kHz	-48.53 -24	.96 -47.70	-24.14	-3 dB	
							More
							1 of 2
MSG				STATUS			
				0			

Plot 7-41. Channel Edge Plot (LTE Band 26, 10MHz QPSK – RB Size 50)



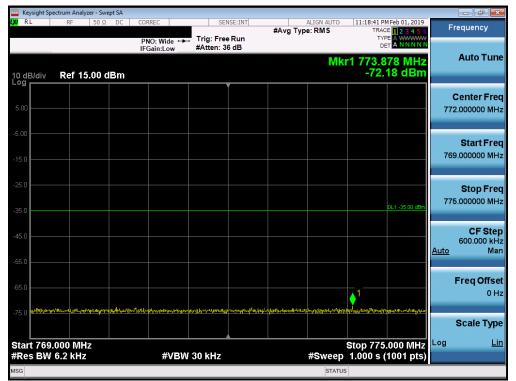
Plot 7-42. Channel Edge Plot (LTE Band 26, 15MHz QPSK – RB Size 75)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 27 of 50	
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RL	RF 50 Ω DC	CORREC	SENSE:INT	#Avg Type: RMS	11:18:26 PM Feb 01, 2019 TRACE 1 2 3 4 5 6	Frequency
		PNO: Wide 🕞	Trig: Free Run Atten: 36 dB			
0 dB/div R	tef 25.00 dBm			Mk	r1 788.000 MHz -21.93 dBm	Auto Tur
15.0				, and the second se		Center Fre 788.000000 MH
.00						Start Fre 786.000000 Mi
5.0		m	1		DL1 -13.00 dBm	Stop Fre 790.000000 Mi
5.0						CF Ste 400.000 kl Auto Ma
5.0						Freq Offs 0
5.0						Scale Typ
enter 788.(Res BW 10		#VBW	300 kHz	Sweep 2	Span 4.000 MHz 2.000 ms (1001 pts)	Log <u>L</u>

Plot 7-43. Lower Band Edge Plot (LTE Band 14, 5MHz QPSK – RB Size 25)



Plot 7-44. Lower Emission Mask Plot (LTE Band 14, 5MHz QPSK – RB Size 25)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dama 28 of 50	
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🔤 Keysight Spectrum Analyzer - Swept SA	1				
LX RL RF 50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	11:19:00 PM Feb 01, 2019 TRACE 1 2 3 4 5 6	Frequency
		j: Free Run en: 36 dB	• //	DET A WWWWW	• -
10 dB/div Ref 25.00 dBn	1		Mki	1 798.000 MHz -22.21 dBm	Auto Tune
15.0					Center Free 798.000000 MH:
5.00	war providence and the second				Start Free 796.000000 MH
-15.0				DL1 -13.00 dBm	Stop Free 800.000000 MH
35.0			- And Maran	mark Marin	CF Ste 400.000 kH Auto Ma
.45.0					Freq Offse
65.0					Scale Typ
Center 798.000 MHz #Res BW 100 kHz	#VBW 300	kHz	Sweep 2	Span 4.000 MHz .000 ms (1001 pts)	Log <u>Li</u>
MSG			STATUS		

Plot 7-45. Upper Band Edge Plot (LTE Band 14, 5MHz QPSK – RB Size 25)



Plot 7-46. Upper Emission Mask Plot (LTE Band 14, 5MHz QPSK – RB Size 25)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dama 20 of 50	
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									/sight Spectrum	
Frequency	11:38:06 PM Feb 01, 2019 TRACE 1 2 3 4 5 6	ALIGN AUTO	:INT	SENS		CORREC	DC	F 50 Ω	L R	KI RI
Auto Tune				Trig: Free F Atten: 36 c	/ide ♀ _ow	PNO: W IFGain:L				
	r1 788.000 MHz -27.443 dBm	IVIK					Bm	f 25.00 d	3/div Re	10 dE Log
Center Freq				ľ						
788.000000 MHz										15.0
Start Freq	and the second	all and a short of the	pm							5.00
784.000000 MHz			_							-5.00
Stop Freq	DL1 -13.00 dBm									-15.0
792.000000 MHz			and the second second							05.0
CF Step			*	manuformal	to the second	Maryan	when	MANNAMIN		-25.0
800.000 kHz Auto Man									when the second	-35.0
										-45.0
Freq Offset 0 Hz										-55.0
										-65.0
Scale Type										
Log <u>Lin</u>	Span 8.000 MHz .000 ms (1001 pts)	Sweep_4		300 kHz	#VBW				ter 788.00 s BW 100	
		STATUS								MSG

Plot 7-47. Lower Band Edge Plot (LTE Band 14, 10MHz QPSK – RB Size 50)



Plot 7-48. Lower Emission Mask Plot (LTE Band 14, 10MHz QPSK – RB Size 50)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 40 of 50
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	ectrum Analyz										
L <mark>XI</mark> RL	RF	50 Ω DC	CORREC	SEN	ISE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	4 Feb 01, 2019 E 1 2 3 4 5 6	Fr	equency
			PNO: Wide 🕞 IFGain:Low	Trig: Free Atten: 36		0 ,1		TYF DE			
10 dB/div Log	Ref 25	.00 dBm					Mk	r1 798.0 -27.	08 MHz 70 dBm		Auto Tune
15.0											Center Freq .000000 MHz
5.00	thequest of the starts	transformer and a second	an a	nne					DL1 -13.00 dBm	794	Start Freq .000000 MHz
-15.0				la Marina	1					802	Stop Fred .000000 MH2
-35.0					Harrison	in han marad	Kalpungland g	Antibage - Contraction of the second	N ^{ll} hitting	<u>Auto</u>	CF Step 800.000 kH Mar
-45.0										i	F req Offse 0 Ha
-65.0											Scale Type
Center 79 #Res BW			#VBW	300 kHz			Sweep 4	Span 8 .000 ms (.000 MHz 1001 pts)	Log	Lin
MSG							STATUS	3			





FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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7.5 Conducted Power Output Data <u>§2.1046 §90.635</u>

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Cond. PWR [dBm]	Cond. PWR [Watts]	Cond. PWR Limit [dBm]	Margin [dB]
814.70	1.4	QPSK	25.05	0.320	50.00	-24.95
823.30	1.4	QPSK	24.65	0.292	50.00	-25.35
814.70	1.4	16-QAM	24.37	0.274	50.00	-25.63
823.30	1.4	16-QAM	23.86	0.243	50.00	-26.14
814.70	1.4	64-QAM	22.86	0.193	50.00	-27.14
823.30	1.4	64-QAM	22.78	0.190	50.00	-27.22
814.70	1.4	256-QAM	19.96	0.099	50.00	-30.04
823.30	1.4	256-QAM	19.71	0.094	50.00	-30.29
815.50	3	QPSK	24.90	0.309	50.00	-25.10
822.50	3	QPSK	24.63	0.290	50.00	-25.37
815.50	3	16-QAM	23.97	0.249	50.00	-26.03
822.50	3	16-QAM	23.88	0.244	50.00	-26.12
815.50	3	64-QAM	22.89	0.195	50.00	-27.11
822.50	3	64-QAM	22.78	0.190	50.00	-27.22
815.50	3	256-QAM	19.92	0.098	50.00	-30.08
822.50	3	256-QAM	19.68	0.093	50.00	-30.32
816.50	5	QPSK	25.14	0.327	50.00	-24.86
821.50	5	QPSK	24.66	0.292	50.00	-25.34
816.50	5	16-QAM	24.64	0.291	50.00	-25.36
821.50	5	16-QAM	23.91	0.246	50.00	-26.09
816.50	5	64-QAM	22.77	0.189	50.00	-27.23
821.50	5	64-QAM	22.87	0.194	50.00	-27.13
816.50	5	256-QAM	19.92	0.098	50.00	-30.08
821.50	5	256-QAM	19.78	0.095	50.00	-30.22
819.00	10	QPSK	24.8	0.302	50.00	-25.20
819.00	10	16-QAM	24.02	0.252	50.00	-25.98
819.00	10	64-QAM	23.01	0.200	50.00	-26.99
819.00	10	256-QAM	19.89	0.097	50.00	-30.11
821.50	15	QPSK	24.74	0.298	50.00	-25.26
821.50	15	16-QAM	24.00	0.251	50.00	-26.00
821.50	15	64-QAM	22.92	0.196	50.00	-27.08
821.50	15	256-QAM	20.01	0.100	50.00	-29.99

Table 7-2. LTE Band 26 Conducted Power Output Data

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 42 of 50
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- 1. For LTE mode, the device was tested under all modulations, RB sizes and offsets, and channel bandwidth configurations and the worst case emissions are reported with 1 RB.
- 2. This unit was tested with its standard battery.

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 42 of 50	
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7.6 Radiated Power (ERP) §22.913(a.2) §90.542(a)(7)

Test Overview

Effective Radiated Power (ERP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 - Section 5.2.1

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

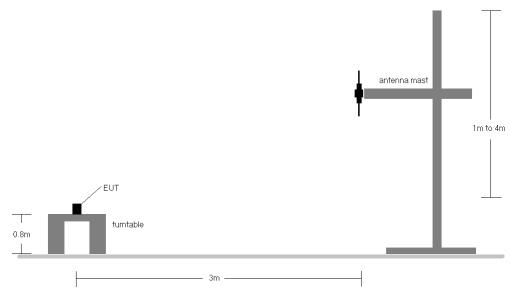
Test Settings

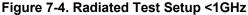
- 1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
- 2. RBW = 1 5% of the expected OBW, not to exceed 1MHz
- 3. VBW \ge 3 x RBW
- 4. Span = 1.5 times the OBW
- 5. No. of sweep points \geq 2 x span /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

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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The EUT and measurement equipment were set up as shown in the diagram below.





Test Notes

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

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
821.50	15	QPSK	V	260	223	1 / 74	13.86	6.75	18.46	0.070	38.45	-20.00
821.50	15	16-QAM	V	260	223	1 / 74	12.88	6.75	17.48	0.056	38.45	-20.98
821.50	15	64-QAM	V	260	223	1 / 74	11.87	6.75	16.47	0.044	38.45	-21.99
821.50	15	256-QAM	V	260	223	1 / 74	9.20	6.75	13.80	0.024	38.45	-24.66
821.50	15 (WCP)	QPSK	V	140	321	1/0	10.83	6.75	15.43	0.035	38.45	-23.03

Table 7-3. ERP Data (Band 26)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 45 of 50	
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Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
790.50	5	QPSK	Н	174	269	1 / 24	16.24	6.46	20.55	0.113	34.77	-14.22
793.00	5	QPSK	Н	174	269	1 / 24	16.46	6.52	20.83	0.121	34.77	-13.94
795.50	5	QPSK	Н	159	258	1 / 0	16.35	6.59	20.79	0.120	34.77	-13.99
793.00	5	16-QAM	Н	174	269	1 / 24	16.12	6.52	20.49	0.112	34.77	-14.28
793.00	5	64-QAM	Н	174	269	1 / 24	14.97	6.52	19.34	0.086	34.77	-15.43
793.00	5	256-QAM	Н	174	269	1 / 24	12.27	6.52	16.64	0.046	34.77	-18.13
793.00	10	QPSK	Н	146	270	1 / 49	15.52	6.52	19.89	0.098	34.77	-14.88
793.00	10	16-QAM	Н	146	270	1 / 0	14.91	6.52	19.28	0.085	34.77	-15.49
793.00	10	64-QAM	Н	146	270	1 / 49	14.33	6.52	18.70	0.074	34.77	-16.07
793.00	10	256-QAM	Н	146	270	1 / 49	11.53	6.52	15.90	0.039	34.77	-18.87
793.00	5	QPSK	V	135	279	1 / 24	16.39	6.52	20.76	0.119	34.77	-14.01
793.00	5 (WCP)	QPSK	Н	176	253	1 / 24	13.76	6.52	18.13	0.065	34.77	-16.64

Table 7-4. ERP Data (Band 14)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 46 of 50	
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7.7 Radiated Spurious Emissions Measurements §2.1053 §90.691 §90.543

Test Overview

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

Test Procedures Used

KDB 971168 D01 v03r01 - Section 5.8

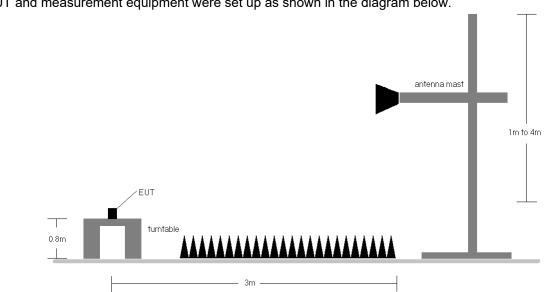
ANSI/TIA-603-E-2016 - Section 2.2.12

Test Settings

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

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager			
Test Report S/N:	Test Dates:	EUT Type:		Dage 47 of 50			
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The EUT and measurement equipment were set up as shown in the diagram below.

Figure 7-5. Test Instrument & Measurement Setup

Test Notes

- 1. For LTE mode, the device was tested under all modulations, RB sizes and offsets, and channel bandwidth configurations and the worst case emissions are reported with 1 RB.
- 2. This unit was tested with its standard battery.
- The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. 3. The worst case setup is reported in the tables below.
- 4. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 5. Per 90.543(f), emissions in the 1559 1610MHz band are subject to a limit of -40dBm/MHz for wideband signals. These emission measurements are shown in this section below.

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Test Report S/N:	Test Dates:	EUT Type:		Dogo 49 of 50	
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OPERATING FREQUENCY:816.50MHzCHANNEL:26715MODULATION SIGNAL:QPSKBANDWIDTH:5.0MHzDISTANCE:3metersLIMIT:-13.00dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1633.00	Н	203	219	-65.34	2.99	-62.35	-49.4
2449.50	Н	-	-	-66.96	3.72	-63.24	-50.2
3266.00	Н	-	-	-68.79	5.98	-62.81	-49.8

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

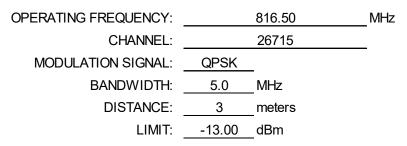
OPERATING FREQUENCY:821.50MHzCHANNEL:26765MODULATION SIGNAL:QPSKBANDWIDTH:5.0MHzDISTANCE:3metersLIMIT:-13.00dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1643.00	Н	144	177	-66.79	3.04	-63.75	-50.7
2464.50	Н	-	-	-67.16	3.76	-63.40	-50.4
3286.00	Н	-	-	-68.44	5.99	-62.45	-49.5

Table 7-6. Radiated Spurious Data (LTE Band 26 – High Channel)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1633.00	Н	101	338	-65.98	2.99	-62.99	-50.0
2449.50	Н	-	-	-66.92	3.72	-63.20	-50.2
3266.00	Н	-	-	-68.68	5.98	-62.70	-49.7

Table 7-7. Radiated Spurious Data with WCP (LTE Band 26 - Ch. 26715)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo E0 of E0
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OPERATING FREQUENCY:	790	0.50 MH	lz
CHANNEL:	23	305	
MODULATION SIGNAL:	QPSK	_	
BANDWIDTH:	5.0	MHz	
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2371.50	Н	-	-	-71.10	7.90	-63.20	-50.2
3162.00	Н	-	-	-70.08	7.00	-63.08	-50.1

Table 7-8. Radiated Spurious Data (LTE Band 14 – Low Channel)

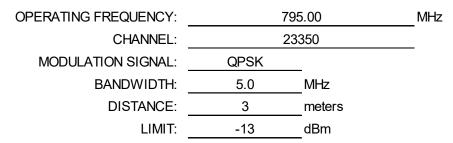
MHz	93.00	79		OPERATING FREQUENCY:
_	23330			CHANNEL:
	_	<	QPSK	MODULATION SIGNAL:
	MHz		5.0	BANDWIDTH:
	meters		3	DISTANCE:
	dBm		-13	LIMIT:

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2379.00	Н	106	218	-70.62	7.90	-62.72	-49.7
3172.00	Н	-	-	-69.77	7.00	-62.77	-49.8
3965.00	Н	-	-	-67.45	5.19	-62.27	-49.3

Table 7-9. Radiated Spurious Data (LTE Band 14 – Mid Channel)

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2385.00	Н	-	-	-71.41	7.90	-63.51	-50.5
3180.00	Н	-	-	-69.54	7.00	-62.54	-49.5

Table 7-10. Radiated Spurious Data (LTE Band 14 – High Channel)

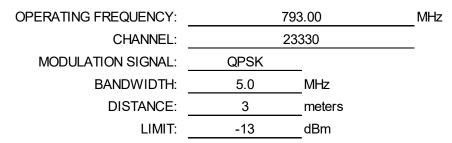
MODULATION SIGNAL:	QPSK	_
BANDWIDTH:	5.00	MHz
DISTANCE:	3	meters
NARROWBAND EMISSION LIMIT:	-50	dBm
WIDEBAND EMISSION LIMIT:	-40	dBm/MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1581.00	Н	-	-	-74.01	8.00	-66.01	-26.0
1586.00	Н	-	-	-73.92	8.01	-65.91	-25.9
1590.00	Н	-	-	-73.99	8.01	-65.98	-26.0

Table 7-11. Radiated Spurious Data (LTE Band 14 – Part 90.543(f))

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
2379.00	Н	-	-	-71.29	7.90	-63.39	-50.4
3172.00	Н	-	-	-69.82	7.00	-62.82	-49.8

Table 7-12. Radiated Spurious Data with WCP (LTE Band 14 - Ch. 23330)

MODULATION SIGNAL:	QPSK	_
BANDWIDTH:	5.00	MHz
DISTANCE:	3	meters
NARROWBAND EMISSION LIMIT:	-50	dBm
WIDEBAND EMISSION LIMIT:	-40	dBm/MHz

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1586.00	Н	-	-	-74.11	8.01	-66.10	-26.1

Table 7-13. Radiated Spurious Data with WCP (LTE Band 14 - Ch. 23330 - Part 90.543(f))

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Test Overview and Limit

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

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

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

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

- 1. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
- 2. The equipment is turned on in a "standby" condition for fifteen minutes before applying power to the transmitter. Measurement of the carrier frequency of the transmitter is made within one minute after applying power to the transmitter.
- 3. Frequency measurements are made at 10°C intervals ranging from -30°C to +50°C. A period of at least one half-hour is provided to allow stabilization of the equipment at each temperature level.

Test Setup

The EUT was connected via an RF cable to a spectrum analyzer with the EUT placed inside an environmental chamber.

Test Notes

None

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OPERATING FREQUENCY:	819,000,000	Hz
CHANNEL:	26740	_
REFERENCE VOLTAGE:	4.33	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	_

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	819,000,053	53	0.0000065
100 %		- 20	818,999,960	-40	-0.0000049
100 %		- 10	818,999,903	-97	-0.0000118
100 %		0	818,999,942	-58	-0.0000071
100 %		+ 10	818,999,602	-398	-0.0000486
100 %		+ 20	818,999,887	-113	-0.0000138
100 %		+ 30	819,000,066	66	0.0000081
100 %		+ 40	818,999,902	-98	-0.0000120
100 %		+ 50	818,999,993	-7	-0.000009
BATT. ENDPOINT	3.46	+ 20	818,999,944	-56	-0.000068

Table 7-14. LTE Band 26 Frequency Stability Data

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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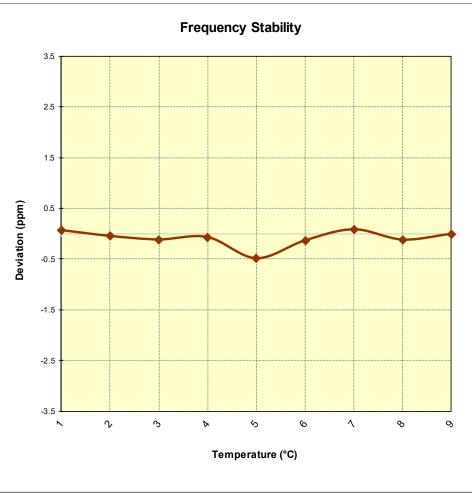


Table 7-15. LTE Band 26 Frequency Stability Data

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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OPERATING FREQUENCY:	793,000,000	Hz
CHANNEL:	23330	_
REFERENCE VOLTAGE:	4.33	VDC

VOLTAGE (%)	POWER (VDC)	ТЕМР ([°] С)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	793,000,004	4	0.0000005
100 %		- 20	793,000,016	16	0.0000020
100 %		- 10	793,000,200	200	0.0000252
100 %		0	793,000,137	137	0.0000173
100 %		+ 10	793,000,027	27	0.0000034
100 %		+ 20	793,000,141	141	0.0000178
100 %		+ 30	793,000,153	153	0.0000193
100 %		+ 40	793,000,351	351	0.0000443
100 %		+ 50	793,000,124	124	0.0000156
BATT. ENDPOINT	3.46	+ 20	792,999,964	-36	-0.0000045

Table 7-16. LTE Band 14 Frequency Stability Data

Note:

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

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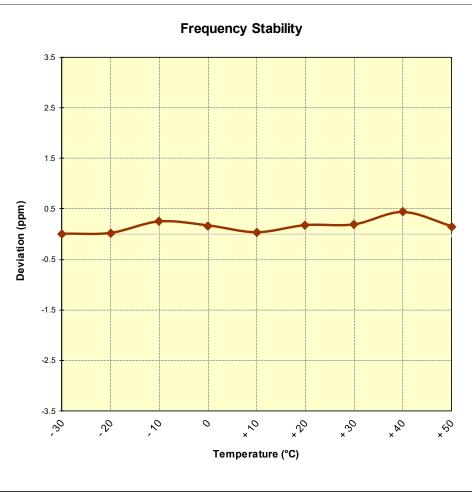


Table 7-17. LTE Band 14 Frequency Stability Data

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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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: A3LSMG977U** complies with all the requirements of Parts 22(H) and 90 of the FCC rules.

FCC ID: A3LSMG977U		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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