

PCTEST ENGINEERING LABORATORY, INC.

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MEASUREMENT REPORT

FCC Part 22 & 90

Applicant Name:

FCC ID:

APPLICANT:

Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea Date of Testing: 01/22 - 05/08/2019 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M1903060032-21.A3L

A3LSMG977T

Samsung Electronics Co., Ltd.

Application Type:	Certification
Model:	SM-G977T
Additional Model:	SM-G977P
ЕИТ Туре:	Portable Handset
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part:	§2.1049, §22(H), §90(S)
Test Procedure(s):	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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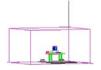


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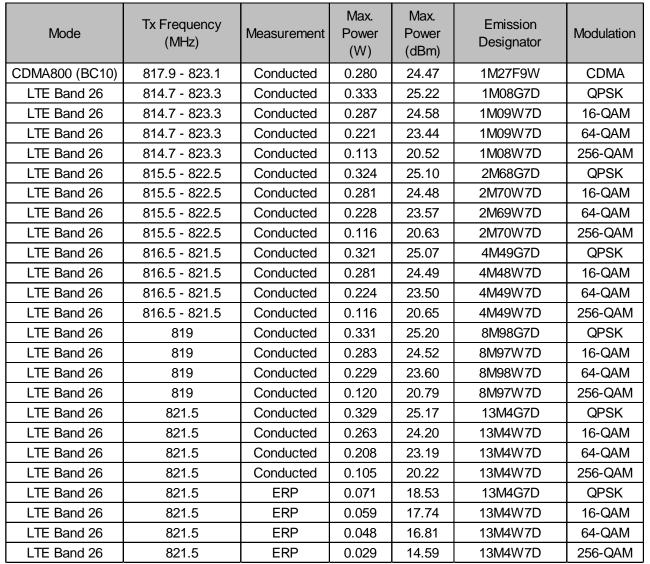
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MEASUREMENT REPORT FCC Part 22(H) & 90



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: A3LSMG977T**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 22(H) and 90(S).

Test Device Serial No.: 2581B, 2531B, 9878B, 1270B, 0263M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1, BC10), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n41, n260, n261, EN-DC), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC, Wireless Phone Transfer

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)

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 P_d levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of 43 + 10 log₁₀(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	Biennial	6/7/2020	9203-2178
Espec	ESX-2CA	Environmental Chamber	4/25/2019	Annual	4/25/2020	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/14/2019	Biennial	2/14/2021	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/28/2018	Biennial	3/28/2020	128337
Huber + Suhner	Sucoflex 102A	40GHz Radiated Cable Set	8/23/2018	Annual	8/23/2019	251425001
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	4/19/2019	Annual	4/19/2020	11401010036
Mini Circuits	TVA-11-422	RF Power Amp		N/A		QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator		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

Emission Designator = 1M25F9W

CDMA BW = 1.25 MHz F = Frequency Modulation 9 = Composite Digital Info W = Combination (Audio/Data) (Measured at the 99.75% power bandwidth)

Spurious Radiated Emission – BC10

Example: Channel 476 CDMA BC10 Mode 3rd Harmonic (2453.70MHz)

The average spectrum analzyer 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 2453.70 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) = 50.3 dBc.

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 analyzer. 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:	A3LSMG977T
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	<u>CDMA / EvDO / LTE</u>
Band:	Band Class 10 / Band 26

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	Conducted Band Edge / 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 (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
2.1053 90.691	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 	RADIATED	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 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

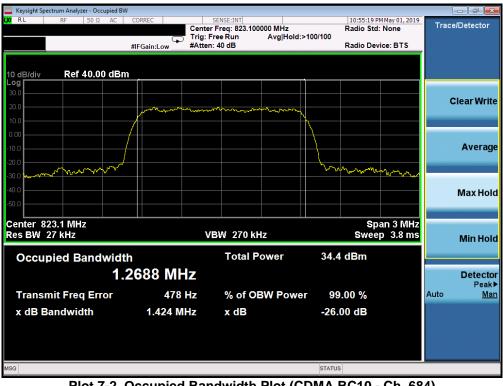
None.

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Keysight Spectrum Analyzer - Occupied B ¹	w				-0	
LXIRL RF 50Ω AC		SENSE:INT Freg: 817.900000 MHz	10:56:00 PN Radio Std:	May 01, 2019	Trace/D	etector
	Trig: F	ree Run Avg Hold:>*	100/100			
	#IFGain:Low #Atten	: 40 dB	Radio Devi	ce: BTS		
10 dB/div Ref 40.00 dBr	m					
Log 30.0						
20.0					Cle	ar Write
	manno					
10.0						
0.00						
-10.0			- Auno		,	Average
-20.0			- marken marken	mar and a second		
-30.0						
-40.0					M	ax Hold
-50.0						
Center 817.9 MHz						
Res BW 27 kHz	v	BW 270 kHz		an 3 MHz 3.8 ms	_	
		BW 2FVKH2	Unce	7 0.0 m3	N	lin Hold
Occupied Bandwidt	th	Total Power	34.3 dBm			
	2727 MHz					Detector
						Peak ►
Transmit Freq Error	1.524 kHz	% of OBW Power	99.00 %		Auto	<u>Man</u>
x dB Bandwidth	1.426 MHz	x dB	-26.00 dB			
MSG			STATUS			

Plot 7-1. Occupied Bandwidth Plot (CDMA BC10 - Ch. 476)



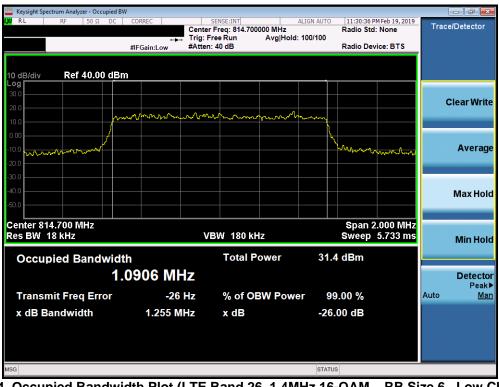
Plot 7-2. Occupied Bandwidth Plot (CDMA BC10 - Ch. 684)

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Keysight Spectrum Analyzer - Occupied BV					- 6 - X
LX/RL RF 50Ω DC	CORREC	SENSE:INT nter Freg: 814.700000 MHz	ALIGN AUTO	11:53:31 PM Feb 19, 2019 Radio Std: None	Trace/Detector
	+++ Tri		old: 100/100	Radio Device: BTS	
10 dB/div Ref 30.00 dBn	ı				
20.0	may and a contraction of the con	- mun man man man man	<u>~</u> /~~~~~~		Clear Write
0.00					
-10.0				humber	Average
-30.0					
-50.0					Max Hold
Center 814.700 MHz				Span 2.000 MHz	
Res BW 18 kHz		VBW 180 kHz		Sweep 5.733 ms	Min Hold
Occupied Bandwidt	^h 0832 MHz	Total Power	31.	7 dBm	Detector
Transmit Freq Error	254 Hz	% of OBW Po	wer 99	9.00 %	Peak▶ Auto <u>Man</u>
x dB Bandwidth	1.216 MHz	x dB	-26.	00 dB	
MSG			STATU	S	

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



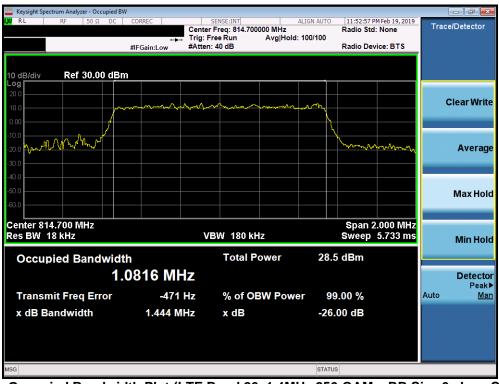
Plot 7-4. Occupied Bandwidth Plot (LTE Band 26, 1.4MHz 16-QAM - RB Size 6- Low Channel)

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Keysight Spectrum Analyz												- 6
R L RF	50 Ω	DC	CORREC		Cent	SENSE:INT er Freg: 814.70	0000 MHz	ALIGN AUT		8 PM Feb 19, 2019 td: None	Trac	e/Detector
					. Trig:	Free Run		d: 100/100				
			#IFGair	:Low	#Atte	en: 40 dB			Radio D	evice: BTS		
)dB/div Ref	40.00	dBn	<u> </u>									
0.0												
D.O											(Clear Wri
0.0		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~	-Armon	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mm	mm	mm				
.00		/							\			
	A								my			Avera
	,									ىلىرائى بى غىرىيەل ياس		
0.0												
0.0												Max Ho
												мах по
enter 814.700 M	Hz					100 L				2.000 MHz		
es BWI 18 kHz						VBW 180 k	HZ		Sweep	o 5.733 ms		Min Ho
Occupied Ba	andv	vidt	h			Total I	Power	30).3 dBm			
				6 M	47							Detect
			000		12							Peal
Transmit Freq	l Erro	r	2	.155	kHz	% of C	BW Pow	er	99.00 %		Auto	<u>M</u>
x dB Bandwid	lth		1	.229 N	٨Hz	x dB		-2	6.00 dB			
								STA				

Plot 7-5. Occupied Bandwidth Plot (LTE Band 26, 1.4MHz 64-QAM - RB Size 6- Low Channel)



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

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager		
Test Report S/N:	Test Dates:	EUT Type:		Dage 14 of 40		
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Keysight Spectrum Analyzer - Occupied BW					- 6 -
XIRL RF 50Ω DC	CORREC	SENSE:INT nter Frea: 815.500000 MHz	ALIGN AUTO	12:10:36 AM Feb 20, 2019 Radio Std: None	Trace/Detector
	Tr		lold:>100/100		
	#IFGain:Low #A	tten: 40 dB		Radio Device: BTS	
10 dB/div Ref 30.00 dBm					
20.0			~		
10.0	montemp	mmmm	mar brann		Clear Write
0.00					
-10.0				<u>ң</u>	
-20.0 mmmmmmmmmmmmmmmm				monoun	Average
-30.0					
-40.0					
-50.0					Max Hole
-60.0					Maxilon
Center 815.500 MHz Res BW 47 kHz		VBW 470 kHz		Span 5.000 MHz Sweep 2.533 ms	
					Min Hold
Occupied Bandwidt	h	Total Power	31.	9 dBm	
2.	6815 MHz				Detecto
					Peakl
Transmit Freq Error	298 Hz	% of OBW Pc	ower 9	9.00 %	Auto <u>Ma</u>
x dB Bandwidth	2.944 MHz	x dB	-26	.00 dB	
ISG			STATU	IS	

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



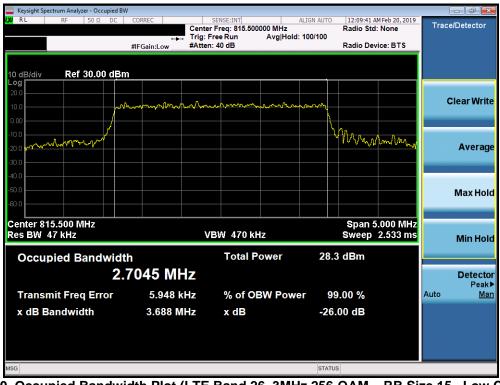
Plot 7-8. Occupied Bandwidth Plot (LTE Band 26, 3MHz 16-QAM – RB Size 15– Low Channel)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 15 of 10
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Keysight Spectrum Analyzer - Occupied B						
RL RF 50 Ω DC		SENSE:INT er Freq: 815.500000 MHz Free Run Avg H	ALIGN AUTO	12:10:49 AM		Trace/Detector
		en: 40 dB		Radio Devic	e: BTS	
0 dB/div Ref 30.00 dBi	m					
20.0						Clear Writ
0.0	mar and a second	mun (m h h	many			Ciedi Wil
0.00						
				1		Avera
				Mr. S. Marine Marine	www	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
0.0						
0.0						Max Ho
50.0						
enter 815.500 MHz				Span 5.0	000 MHz	
es BW 47 kHz		VBW 470 kHz		Sweep 2	.533 ms	Min Ho
Occupied Bandwid	th	Total Power	29.	7 dBm		
	.6945 MHz					Detect
						Peal
Transmit Freq Error	1.184 kHz	% of OBW Po		9.00 %	Au	ito <u>M</u>
x dB Bandwidth	2.962 MHz	x dB	-26	.00 dB		
G			STATU	s		

Plot 7-9. Occupied Bandwidth Plot (LTE Band 26, 3MHz 64-QAM - RB Size 15- Low Channel)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 26, 3MHz 256-QAM - RB Size 15- Low Channel)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dogo 16 of 10
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Plot 7-11. Occupied Bandwidth Plot (LTE Band 26, 5MHz QPSK - RB Size 25- Low Channel)



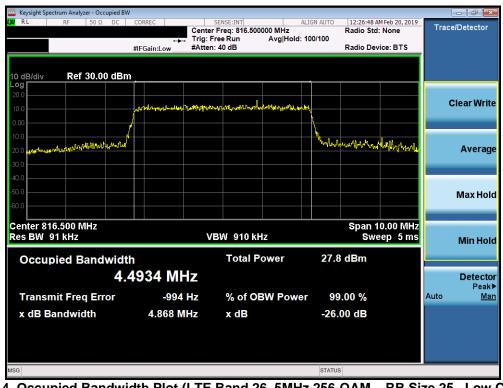
Plot 7-12. Occupied Bandwidth Plot (LTE Band 26, 5MHz 16-QAM – RB Size 25– Low Channel)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 17 of 10
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Plot 7-13. Occupied Bandwidth Plot (LTE Band 26, 5MHz 64-QAM – RB Size 25– Low Channel)



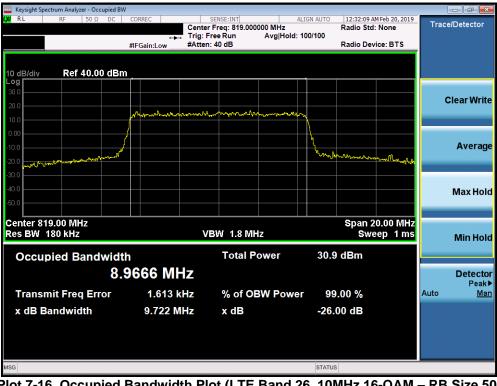
Plot 7-14. Occupied Bandwidth Plot (LTE Band 26, 5MHz 256-QAM – RB Size 25– Low Channel)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 19 of 40
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Keysight Spectrum Analyze													- 6 -
KI RE RF	50 Ω D	C (CORREC			ENSE:INT Freg: 819.00	0000 MHz	ALIO	SN AUTO	12:32:03 Radio St	AM Feb 20, 2019	Trac	e/Detector
				- - - -	Trig: Fr	ee Run	Avg Ho	old: 10	0/100				
		#	IFGain:L	.ow	#Atten:	40 dB				Radio De	evice: BTS		
	40.00 d	IBm _											
.og													
20.0												(Clear Writ
			per	-	ᡆᠬᠬᡗᢇᡪᢛᡢ	- hour and a	warm. hvg-~v	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
10.0		ł											
).00									h				A
0.0	marian								por and	-	mahan		Averag
20.0 mark and Mark													
0.0													
0.0													Max Ho
50.0													
enter 819.00 MH	7									Snan	20.00 MHz		
es BW 180 kHz	2				VE	W 1.8 N	IHz				/eep 1 ms		Min Ho
													IMIT HO
Occupied Ba	andwi	idth				Total	Power		32.1	1 dBm			
		8.9	833	MH	Z								Detect
													Peal
Transmit Freq	Error		16.	414 kl	HZ	% of C	BW Po	wer	99	9.00 %		Auto	M
x dB Bandwid	th		9.8	34 MI	Hz	x dB			-26.	.00 dB			
G									STATU	s			
			_			- (/) T			_		0.001/		0

Plot 7-15. Occupied Bandwidth Plot (LTE Band 26, 10MHz QPSK – RB Size 50)



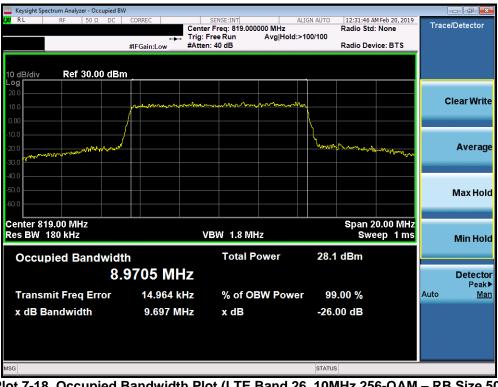
Plot 7-16. Occupied Bandwidth Plot (LTE Band 26, 10MHz 16-QAM – RB Size 50)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 10 of 10
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Plot 7-17. Occupied Bandwidth Plot (LTE Band 26, 10MHz 64-QAM – RB Size 50)



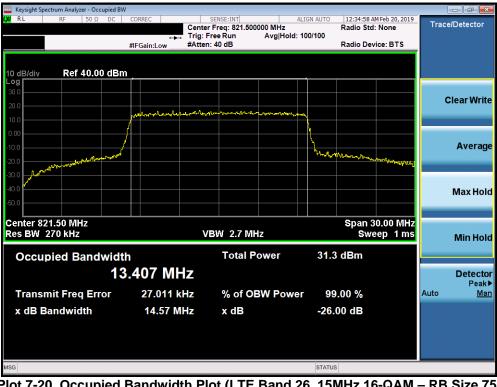
Plot 7-18. Occupied Bandwidth Plot (LTE Band 26, 10MHz 256-QAM – RB Size 50)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Plot 7-19. Occupied Bandwidth Plot (LTE Band 26, 15MHz QPSK - RB Size 75)



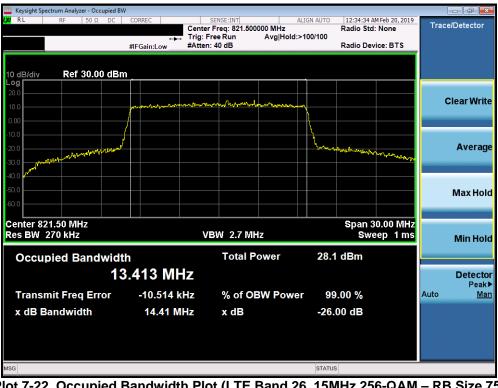
Plot 7-20. Occupied Bandwidth Plot (LTE Band 26, 15MHz 16-QAM – RB Size 75)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 21 of 10
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Plot 7-21. Occupied Bandwidth Plot (LTE Band 26, 15MHz 64-QAM – RB Size 75)



Plot 7-22. Occupied Bandwidth Plot (LTE Band 26, 15MHz 256-QAM – RB Size 75)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager			
Test Report S/N:	Test Dates:	EUT Type:		Dogo 22 of 40			
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7.3 Spurious and Harmonic Emissions at Antenna Terminal §2.1051 §90.691

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

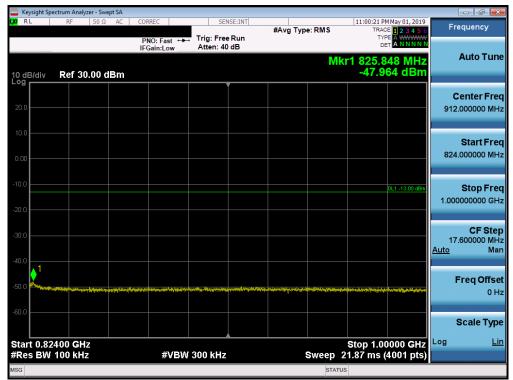
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for Part 22. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission 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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02 RL RF 50 Ω AC 10 dB/div Ref 30.00 dBm 20 0 0 0 10 0 0 0 0 10 0 0 0 0		sense:int	#Avg Type: R	Mkr1 813.8	24 PM Av 01, 2019 TRACE [] 2 3 4 5 6 TYPE A WINNIN DET A NINNIN 843 2 MHz 17.09 dBm	Auto Tune
20.0 10.0 0.00				Mkr1 813.: -4	843 2 MHz 17.09 dBm	Center Free
20.0						
0.00						
-10.0						Start Free 30.000000 MH
-20.0					DL1 -13.00 dBm	Stop Fre 814.000000 MH
30.0						CF Ste 78.400000 MH <u>Auto</u> Ma
50.0				- se, son a star star generating blir s - sen son a star star star star star star star st	1	Freq Offse 0 H
						Scale Typ
Start 30.0 MHz #Res BW 100 kHz //sg	#VBW 300	kHz	Swe	sto ep 97.33 ms	p 814.0 MHz s (20001 pts)	

Plot 7-23. Conducted Spurious Plot (CDMA BC10 - Ch. 476)



Plot 7-24. Conducted Spurious Plot (CDMA BC10 - Ch. 476)

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	ectrum Analyz	er - Swep	ot SA									- # ×
LXI RL	RF	50 Ω	AC	CORREC	ast 🔸		#Avg Typ	e:RMS	TI	5 PM May 01, 2019 RACE 1 2 3 4 5 6 TYPE A WWWWW DET A NNNNN	Fre	equency
				IFGain:		Atten: 40		м		9 35 GHz 873 dBm		Auto Tune
10 dB/div Log	Ref 30	.00 dl	Bm						-33.	873 dBm		
20.0												enter Fred
0.00											1.000	Start Free
-10.0										DL1 -13.00 dBm	10.000	Stop Free 0000000 GH
-30.0						_			1		900. <u>Auto</u>	CF Stej 000000 MH Ma
-50.0											F	F req Offs e 0 H
-60.0												Scale Type
Start 1.00 #Res BW					#VBW	3.0 MHz	s	weep	Stop 16.00 ms	10.000 GHz (20001 pts)	Log	Lii
MSG								STA	TUS			

Plot 7-25. Conducted Spurious Plot (CDMA BC10 - Ch. 476)



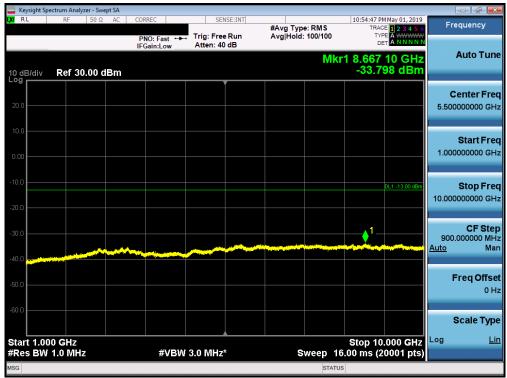
Plot 7-26. Conducted Spurious Plot (CDMA BC10 - Ch. 684)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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Keysight Spectrum Analyzer - Swept S	5A				
X/ RL RF 50ΩA	AC CORREC PNO: Fast ↔ IFGain:Low	SENSE:INT Trig: Free Run Atten: 40 dB	#Avg Type: RMS	10:53:50 PM May 01, 2019 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A N N N N N	Frequency
10 dB/div Ref 30.00 dBi		Atten: 40 db	Mk	r1 824.000 MHz -26.852 dBm	Auto Tun
20.0					Center Fre 912.000000 MH
0.00					Start Fre 824.000000 MH
-20.0				DL1 -13.00 dBm	Stop Fre 1.000000000 GH
30.0 40.0					CF Ste 17.600000 MH <u>Auto</u> Ma
	ang Palan Shaharay ng Palan Shay Yan Aran Aran ay san A	na an ing pangangan na katalan na	an a	the and the tight pair of the product of the science and a state	Freq Offso 0 ⊦
-60.0					Scale Typ
Start 0.82400 GHz Res BW 100 kHz	#VBW	300 kHz	Sweep 2	Stop 1.00000 GHz 21.87 ms (4001 pts)	Log <u>L</u>
SG			STATU	s	

Plot 7-27. Conducted Spurious Plot (CDMA BC10 - Ch. 684)



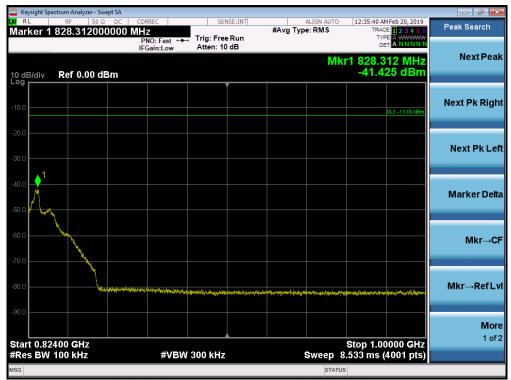
Plot 7-28. Conducted Spurious Plot (CDMA BC10 - Ch. 684)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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	ectrum Analyz												
X/RL	RF	50 Ω	DC	CORREC			NSE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	MFeb 20, 2019	Fr	equency
				PNO: F IFGain:	ast ⊶⊷ Low	Trig: Fre Atten: 40				TYF			
									Mkr1	814.00	0 0 MHz		Auto Tune
10 dB/div Log	Ref 30	.00 d	Bm							-32.	72 dBm		
												(Center Fred
20.0													2.000000 MHz
10.0													Start Free
0.00												30	0.000000 MHz
-10.0											DL1 -13.00 dBm		Stop Freq
-20.0												814	1.000000 MHz
-20.0													
-30.0											1	75	CF Step 3.400000 MH;
												Auto	Mar
-40.0													
-50.0													Freq Offse
and a state of the		المرجوم التع جمار الشمار حماد	har paper and the second	ر المحمد المحمد المحمد المحمد المطاورة محمد المحمد المحم		to be designed and the	المربق المربق المربق المربق						0 Hz
-60.0													
													Scale Type
Start 30.0											14.0 MHz	Log	Lin
#Res BW	100 kHz				#VBW	300 kHz		s			0001 pts)		
MSG									STATUS				

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: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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	pectrum Analyzer -										
LXU RL	RF 50	Ω DC	CORREC PNO: Fast		NSE:INT	#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Feb 20, 2019 CE 1 2 3 4 5 6 PE A WWWWW	Fr	equency
10 dB/div	Ref 0.00	dBm	IFGain:Low	#Atten: 3			Mkr	1 9.749	80 GHz 26 dBm		Auto Tune
-10.0									DL1 -13.00 dBm		e nter Freq 0000000 GHz
-20.0									1	1.000	Start Freq 0000000 GHz
-40.0			- <u></u>							10.000	Stop Freq 0000000 GHz
-60.0										900 <u>Auto</u>	CF Step 000000 MHz Man
-80.0										F	F req Offset 0 Hz
-90.0 Start 1.0	00 GHz							Stop 10	.000 GHz	tog	Scale Type <u>Lin</u>
	1.0 MHz		#VB	W 3.0 MHz		s	weep 16	.00 ms (2	0001 pts)		
MSG							STATUS	6			

Plot 7-31. Conducted Spurious Plot (LTE Band 26, 15MHz QPSK – RB Size 1, RB Offset 0 – Mid Channel)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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7.4 Band Edge Emissions at Antenna Terminal §2.1051 §90.691

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.

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

Test Notes

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.

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 40	
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PACC.		SENSE:INT enter Freq: 817.900 rig: Free Run Atten: 28 dB	000 MHz Avg Hold:>100	Ra /100	1:01:39 PMM dio Std: N dio Device	one	Frequency
10 dB/div Ref 40.00 dBm							
20.0		24.6 dBm					Center Fre 817.900000 MH
0.00							
-20.0						RMS AVG	
-40.0							
Center 817.9 MHz #Res BW 100 kHz		#VBW 300 k	Hz		Span Sweep		CF Ste 300.000 kH
Total Carrier Power 24.618 dB	3m/ 1.81 MHz	ACP-I	BW				<u>Auto</u> Ma
Carrier Power Fi	Iter Offset F		Lower		pper		F O
1 24.618 dBm / 1.808 MHz OF	onseri			m dBc	dBm -29.39	Filter OFF	Freq Offs
1 24.010 dbill/ 1.808 MHZ OF	37.50 k			53 -54.01 52 -49.53		OFF	UP OF

Plot 7-32. Channel Edge Plot (CDMA BC10 - Ch. 476)



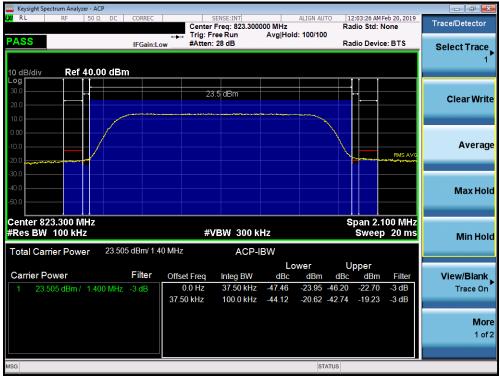
Plot 7-33. Channel Edge Plot (CDMA BC10 - Ch. 684)

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Keysight Spectrum Analyzer - ACP							
RL RF 50 Ω DC CORRE		NSE:INT reg: 814.7000			1:52:31 PM F dio Std: N		Trace/Detector
ASS	Trig: Fre	e Run	Avg Hold: 100/	100	dio Device		
IFGai	n:Low #Atten: 2			Ra		2:015	Select Trace
							1
0 dB/div Ref 40.00 dBm							
0.0	23 0	dBm					
0.0	20.1				·		Clear Wri
0.0				~~			
				X			Avera
				λ		RMS AVG	Avera
						a a construction of the second second	
0.0							
0.0							Max Ho
0.0							
enter 814.700 MHz					non 14	00 MHz	
Res BW 100 kHz	#VI	3W 300 kH	17			20 ms	
					oncep	20110	Min Ho
otal Carrier Power 23.555 dBm/	1.40 MHz	ACP-I					
Carrier Power Filte			Lower		pper		
	onserried	Integ BW	dBc dE		dBm -23 50	Filter -3 dB	View/Blank
1 23.555 dBm / 1.400 MHz -3 dB	0.0 Hz 37.50 kHz	37.50 kHz 100.0 kHz		27 -47.06 76 -43.83		-3 dB -3 dB	Trace Or
	37.30 KHZ		-44.31 -20.	-43.63	-20.28	-3 UD	
							Мо
							1 0
							10
G				STATUS			

Plot 7-34. Channel Edge Plot (LTE Band 26, 1.4MHz QPSK - RB Size 6- Low Channel)



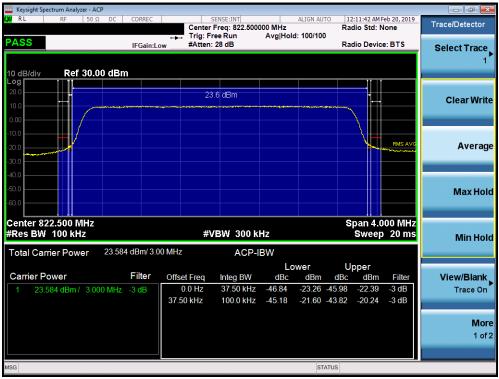
Plot 7-35. Channel Edge Plot (LTE Band 26, 1.4MHz QPSK – RB Size 6 – High Channel)

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Keysight Spectrum Analyzer - ACP RL RF 50 Ω DC CORREC	SENSE:INT	ALIGN AUTO	12:05:49 AM Feb 20, 2019 Radio Std: None	Trace/Detector
ASS IFGain:L	→→ Trig: Free Run w #Atten: 28 dB	Avg Hold: 100/100	Radio Device: BTS	Select Trace
IO dB/div Ref 40.00 dBm				1
	23.6 dBm			Clear Write
			RMS AVG	Averag
				Max Hol
Center 815.500 MHz Res BW 100 kHz Total Carrier Power 23.598 dBm/ 3.0	#VBW 300 ki		Span 4.000 MHz Sweep 20 ms	Min Hol
l otal Carrier Power 23.396 ubill 3.0	ACP-I	Lower	Upper	
Carrier Power Filter	Offset Freq Integ BW	dBc dBm d	IBc dBm Filter	View/Blank
1 23.598 dBm / 3.000 MHz -3 dB	0.0 Hz 37.50 kHz 37.50 kHz 100.0 kHz	-47.24 -23.65 -46. -45.13 -21.53 -44.	72 -23.13 -3 dB 96 -21.37 -3 dB	Trace On
				Moi 1 of
SG		STATUS		

Plot 7-36. Channel Edge Plot (LTE Band 26, 3MHz QPSK - RB Size 15- Low Channel)



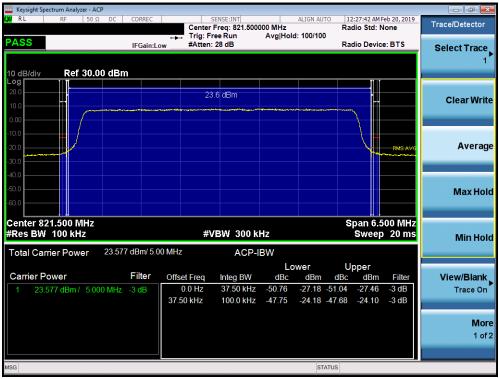
Plot 7-37. Channel Edge Plot (LTE Band 26, 3MHz QPSK - RB Size 15 - High Channel)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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Keysight Spectrum Analyzer - ACP K RL RF 50 Ω DC CORREC	SENSE:INT	ALIGN AUTO	12:24:55 AM Feb 20, 2019	
PASS IFGain:L	Center Freq: 816.500 Trig: Free Run w #Atten: 28 dB	000 MHz Avg Hold: 100/100	Radio Std: None Radio Device: BTS	Trace/Detector
10 dB/div Ref 30.00 dBm				1
	23.6 dBm			Clear Write
20 0 30.0			RMS AVG	Averag
				Max Hol
Center 816.500 MHz #Res BW 100 kHz Total Carrier Power 23.602 dBm/ 5.0	#VBW 300 k		Span 6.500 MHz Sweep 20 ms	Min Hol
Total Carrier Power 23.602 dBm/ 5.0	00 MHz ACP-	Lower	Upper	
Carrier Power Filter	Offset Freq Integ BW	dBc dBm	dBc dBm Filter	View/Blank
1 23.602 dBm / 5.000 MHz -3 dB	0.0 Hz 37.50 kHz 37.50 kHz 100.0 kHz		0.71 -27.11 -3 dB 8.03 -24.43 -3 dB	Trace On
				Mor 1 of
SG		STAT	US	

Plot 7-38. Channel Edge Plot (LTE Band 26, 5MHz QPSK - RB Size 25- Low Channel)



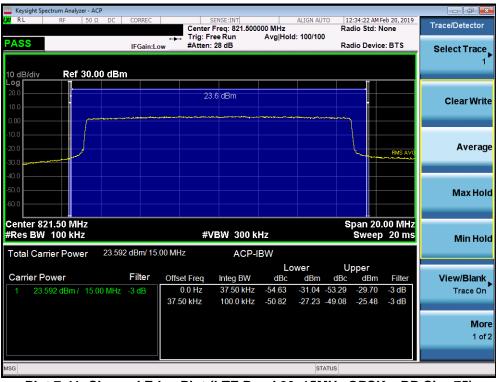
Plot 7-39. Channel Edge Plot (LTE Band 26, 5MHz QPSK - RB Size 25 - High Channel)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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Keysight Spectrum Analyzer - ACP					-		- 7 🛃
RL RF 50 Ω DC CORREC	Center I			ALIGN AUTO	Radio Std: N	one	Trace/Detector
ASS IFGain:Lo	w #Atten:	28 dB			Radio Device	e: BTS	Select Trace
0 dB/div Ref 30.00 dBm							
og 00.0	23	.6 dBm					
						-	Clear Writ
						RMS AVG	Avera
0.0							
							Max Ho
enter 819.000 MHz Res BW 100 kHz	#V	BW 300 k	Hz		Span 12. Sweep	00 MHZ 20 ms	Min Ho
otal Carrier Power 23.564 dBm/ 10.	00 MHz	ACP-I	BW				
				wer	Upper		
Carrier Power Filter	Offset Freq 0.0 Hz	Integ BW 37.50 kHz	dBc -52.51	dBm 0	IBc dBm	Filter -3 dB	View/Blank
1 23.564 dBm / 10.00 MHz -3 dB	0.0 Hz 37.50 kHz	37.50 KHZ 100.0 kHz	-52.51 -48.53		.79 -28.22	-3 dB -3 dB	Trace Or
							Mo 1 o
							10
G				STATUS			

Plot 7-40. Channel Edge Plot (LTE Band 26, 10MHz QPSK – RB Size 50)



Plot 7-41. Channel Edge Plot (LTE Band 26, 15MHz QPSK – RB Size 75)

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7.5 Conducted Power Output Data §2.1046 §90.635

Frequency [MHz]	BC10 [Channel]	Battery Type	Cond. PWR [dBm]	Cond. PWR [Watts]	Cond. PWR Limit [dBm]	Margin [dB]
817.90	476	Standard	24.47	0.280	50.00	-25.53
823.10	684	Standard	24.17	0.261	50.00	-25.83

Table 7-2. CDMA BC10 Conducted Power Output Data

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Cond. PWR [dBm]	Cond. PWR [Watts]	Cond. PWR Limit [dBm]	Margin [dB]
814.70	1.4	QPSK	24.84	0.305	50.00	-25.16
823.30	1.4	QPSK	25.22	0.333	50.00	-24.78
814.70	1.4	16-QAM	23.83	0.242	50.00	-26.17
823.30	1.4	16-QAM	24.58	0.287	50.00	-25.42
814.70	1.4	64-QAM	23.44	0.221	50.00	-26.56
823.30	1.4	64-QAM	23.44	0.221	50.00	-26.56
814.70	1.4	256-QAM	19.89	0.097	50.00	-30.11
823.30	1.4	256-QAM	20.52	0.113	50.00	-29.48
815.50	3	QPSK	24.85	0.305	50.00	-25.15
822.50	3	QPSK	25.10	0.324	50.00	-24.90
815.50	3	16-QAM	24.21	0.264	50.00	-25.79
822.50	3	16-QAM	24.48	0.281	50.00	-25.52
815.50	3	64-QAM	23.27	0.212	50.00	-26.73
822.50	3	64-QAM	23.57	0.228	50.00	-26.43
815.50	3	256-QAM	19.83	0.096	50.00	-30.17
822.50	3	256-QAM	20.63	0.116	50.00	-29.37
816.50	5	QPSK	24.86	0.306	50.00	-25.14
821.50	5	QPSK	25.07	0.321	50.00	-24.93
816.50	5	16-QAM	24.26	0.267	50.00	-25.74
821.50	5	16-QAM	24.49	0.281	50.00	-25.51
816.50	5	64-QAM	23.18	0.208	50.00	-26.82
821.50	5	64-QAM	23.50	0.224	50.00	-26.50
816.50	5	256-QAM	20.37	0.109	50.00	-29.63
821.50	5	256-QAM	20.65	0.116	50.00	-29.35
819.00	10	QPSK	25.20	0.331	50.00	-24.80
819.00	10	16-QAM	24.52	0.283	50.00	-25.48
819.00	10	64-QAM	23.60	0.229	50.00	-26.40
819.00	10	256-QAM	20.79	0.120	50.00	-29.21
821.50	15	QPSK	25.17	0.329	50.00	-24.83
821.50	15	16-QAM	24.20	0.263	50.00	-25.80
821.50	15	64-QAM	23.19	0.208	50.00	-26.81
821.50	15	256-QAM	20.22	0.105	50.00	-29.78

Table 7-3. LTE Band 26 Conducted Power Output Data

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.

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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

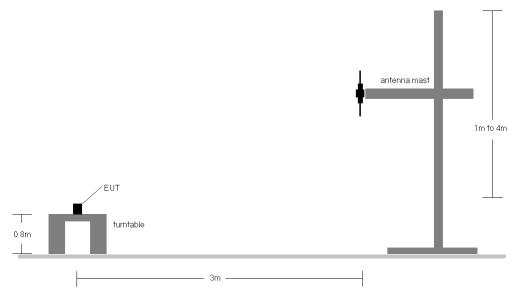
Test Settings

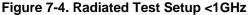
- 1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
- 2. RBW = 1 5% of the expected OBW, not to exceed 1MHz
- 3. VBW \geq 3 x RBW
- 4. Span = 1.5 times the OBW
- 5. No. of sweep points \geq 2 x span /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

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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	163	54	1 / 74	13.62	7.06	18.53	0.071	38.45	-19.92
821.50	15	16-QAM	V	163	54	1 / 74	12.83	7.06	17.74	0.059	38.45	-20.71
821.50	15	64-QAM	V	163	54	1 / 74	11.90	7.06	16.81	0.048	38.45	-21.64
821.50	15	256-QAM	V	163	54	1 / 74	9.68	7.06	14.59	0.029	38.45	-23.86
821.50	15 (WCP)	QPSK	V	155	145	1 / 74	11.78	7.06	16.69	0.047	38.45	-21.76

Table 7-4. ERP Data (Band 26)

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7.7 Radiated Spurious Emissions Measurements §2.1053 §90.691

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

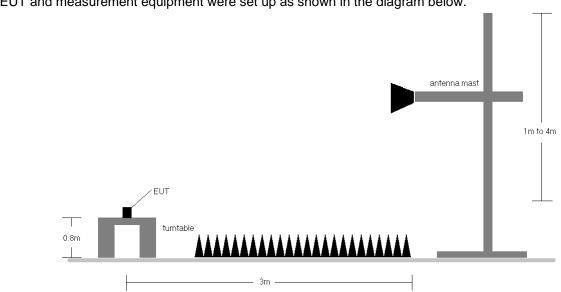
ANSI/TIA-603-E-2016 - Section 2.2.12

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

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

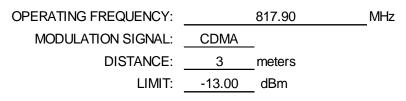
Figure 7-5. Test Instrument & Measurement Setup

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.
- 3. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.
- 4. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

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Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1635.80	Н	-	-	-69.25	3.00	-66.25	-53.2
2453.70	Н	158	15	-65.14	3.73	-61.41	-48.4
3271.60	Н	-	-	-68.42	5.98	-62.44	-49.4
4089.50	Н	-	-	-69.31	7.56	-61.75	-48.7

Table 7-5. CDMA BC10 Radiated Spurious Data (Ch. 476)

meters

OPERATING FREQUENCY:

Y: <u>823.10</u> L: CDMA

___MHz

MODULATION SIGNAL:

DISTANCE: 3

LIMIT: <u>-13.00</u> 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]
1646.20	Н	101	305	-69.26	3.06	-66.20	-53.2
2469.30	Н	191	13	-61.35	3.78	-57.57	-44.6
3292.40	Н	-	-	-68.33	5.99	-62.34	-49.3
4115.50	Н	-	-	-69.57	7.65	-61.92	-48.9

Table 7-6. CDMA BC10 Radiated Spurious Data (Ch. 684)

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	823.10	MHz
CDMA	_	
3	meters	
-13.00	dBm	
		CDMA 3 meters

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]
1646.20	Н	309	132	-68.69	3.06	-65.63	-52.6
2469.30	Н	216	349	-59.70	3.78	-55.92	-42.9
3292.40	Н	-	-	-68.38	5.99	-62.39	-49.4
4115.50	Н	-	-	-69.58	7.65	-61.93	-48.9

Table 7-7. CDMA BC10 Radiated Spurious Data with WCP (Ch. 684)

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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OPERATING FREQUENCY:		814.70	MHz
MODULATION SIGNAL:	QPSK		
BANDWIDTH:	1.4	MHz	
DISTANCE:	3	meters	
LIMIT:	-13.00	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]
1629.40	Н	-	-	-69.20	2.98	-66.22	-53.2
2444.10	Н	-	-	-66.61	3.75	-62.86	-49.9

Table 7-8. Radiated Spurious Data (LTE Band 26 – Low Channel)

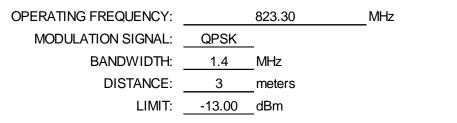
OPERATING FREQUENCY:		823.30	MHz
MODULATION SIGNAL:	QPSK	_	
BANDWIDTH:	1.4	MHz	
DISTANCE:	3	meters	
LIMIT:	-13.00	dBm	

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]
1646.60	Н	-	-	-69.17	3.06	-66.11	-53.1
2469.90	Н	-	-	-66.40	3.78	-62.62	-49.6

Table 7-9. Radiated Spurious Data (LTE Band 26 – High Channel)

FCC ID: A3LSMG977T		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]
1646.60	Н	242	276	-64.45	3.06	-61.39	-48.4
2469.90	Н	-	-	-66.67	3.78	-62.89	-49.9
3293.20	Н	-	-	-69.21	6.00	-63.22	-50.2

Table 7-10. Radiated Spurious Data with WCP (LTE Band 26 - Ch. 26715)

FCC ID: A3LSMG977T		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:	817,900,000	Hz
CHANNEL:	476	
REFERENCE VOLTAGE:	4.31	VDC
DEVIATION LIMIT:	± 0.00025 % or 2.5 ppm	_

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %		- 30	817,900,189	189	0.0000231
100 %		- 20	817,899,895	-105	-0.0000128
100 %		- 10	817,900,460	460	0.0000562
100 %		0	817,899,932	-68	-0.000083
100 %		+ 10	817,899,788	-212	-0.0000259
100 %		+ 20	817,899,786	-214	-0.0000262
100 %		+ 30	817,899,977	-23	-0.000028
100 %		+ 40	817,899,845	-155	-0.0000190
100 %		+ 50	817,899,844	-156	-0.0000191
BATT. ENDPOINT	3.44	+ 20	817,899,945	-55	-0.0000067

Table 7-11. CDMA BC10 Frequency Stability Data

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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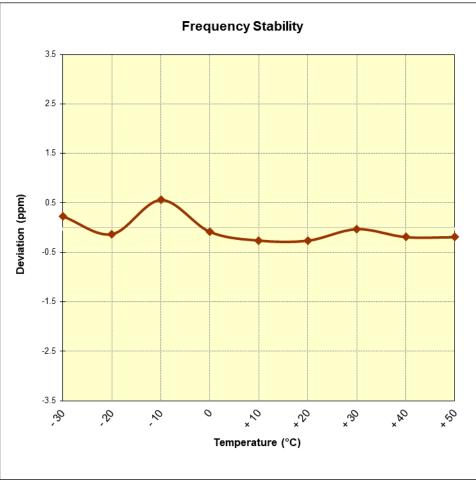


Figure 7-6. CDMA BC10 Frequency Stability Graph

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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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)	ТЕМР (°С)	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 7-12. LTE Band 26 Frequency Stability Data

FCC ID: A3LSMG977T		MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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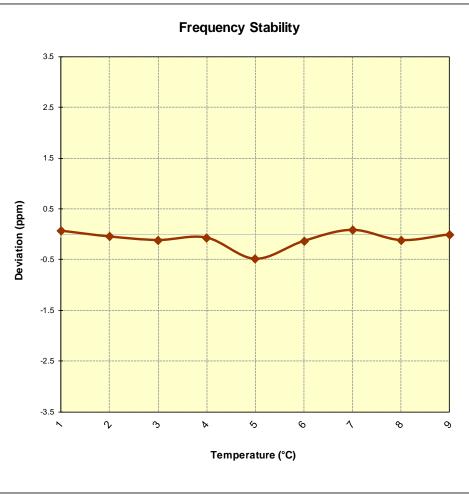


Table 7-13. LTE Band 26 Frequency Stability Data

FCC ID: A3LSMG977T		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: A3LSMG977T** complies with all the requirements of Parts 22(H) and 90 of the FCC rules.

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