

# PCTEST

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# MEASUREMENT REPORT FCC Part 22 & 90

#### **Applicant Name:**

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

### Date of Testing:

09/15 – 12/01/2020 **Test Site/Location:** PCTEST Lab. Columbia, MD, USA **Test Report Serial No.:** 1M2009140143-04.A3L

## FCC ID:

# A3LSMG996U

## **APPLICANT:**

# Samsung Electronics Co., Ltd.

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

Certification SM-G996U SM-G996U1 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.

Randy Ortanez President



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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Measurement	Max. Power [W]	Max. Power [dBm]	Emission Designator
		QPSK	821.5	ERP	0.087	19.38	13M5G7D
1	15 MHz	16QAM	821.5	ERP	0.072	18.59	13M4W7D
		64QAM	821.5	ERP	0.058	17.67	13M4W7D
		256QAM	821.5	ERP	0.028	14.51	13M4W7D
		QPSK	821.5	Conducted	0.313	24.96	13M5G7D
		16QAM	821.5	Conducted	0.252	24.01	13M4W7D
	15 MHz	64QAM	821.5	Conducted	0.202	23.06	13M4W7D
		256QAM	821.5	Conducted	0.097	19.89	13M4W7D
		QPSK	819.0	Conducted	0.308	24.89	8M96G7D
		16QAM	819.0	Conducted	0.247	23.92	8M95W7D
	10 MHz	64QAM	819.0	Conducted	0.203	23.08	8M93W7D
LTE Band 26		256QAM	819.0	Conducted	0.100	19.98	8M95W7D
LTE Band 20		QPSK	816.5 - 821.5	Conducted	0.308	24.89	4M48G7D
	5 MHz	16QAM	816.5 - 821.5	Conducted	0.264	24.22	4M47W7D
	3 IVINZ	64QAM	816.5 - 821.5	Conducted	0.219	23.41	4M49W7D
		256QAM	816.5 - 821.5	Conducted	0.102	20.08	4M48W7D
		QPSK	815.5 - 822.5	Conducted	0.315	24.98	2M70G7D
	2 MU-	16QAM	815.5 - 822.5	Conducted	0.255	24.07	2M69W7D
	3 MHz	64QAM	815.5 - 822.5	Conducted	0.209	23.20	2M69W7D
		256QAM	815.5 - 822.5	Conducted	0.103	20.11	2M70W7D
		QPSK	814.7 - 823.3	Conducted	0.315	24.98	1M08G7D
	1.4 MHz	16QAM	814.7 - 823.3	Conducted	0.270	24.32	1M08W7D
	1.4 IVI⊓∠	64QAM	814.7 - 823.3	Conducted	0.213	23.29	1M08W7D
		256QAM	814.7 - 823.3	Conducted	0.103	20.13	1M08W7D
		QPSK	793.0	ERP	0.102	20.08	9M02G7D
	10 MHz	16QAM	793.0	ERP	0.092	19.64	8M98W7D
		64QAM	793.0	ERP	0.067	18.27	9M00W7D
LTE Band 14		256QAM	793.0	ERP	0.033	15.12	8M99W7D
		QPSK	790.5 - 795.5	ERP	0.108	20.33	4M51G7D
	5 MHz	16QAM	790.5 - 795.5	ERP	0.097	19.88	4M51W7D
		64QAM	790.5 - 795.5	ERP	0.082	19.15	4M52W7D
		256QAM	790.5 - 795.5	ERP	0.033	15.17	4M51W7D
CDMA BC10	N/A	CDMA	817.9 - 823.1	Conducted	0.30	24.84	1M27F9W

**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 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- 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: A3LSMG996U**. 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.

#### Test Device Serial No.: N/A

### 2.2 Device Capabilities

This device contains the following capabilities:

800/850/1900 CDMA/EVDO Rev. 0/A (BC0, BC1, BC10), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (FR1/FR2), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC, UWB, Wireless Power Transfer

## 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 lying flat 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

#### <u>§2.1053</u>

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].

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  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

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# 5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx2	Licensed Transmitter Cable Set	4/9/2020	Annual	4/9/2021	LTx2
-	LTx4	Licensed Transmitter Cable Set	7/9/2020	Annual	7/9/2021	LTx4
-	LTx5	LIcensed Transmitter Cable Set	4/9/2020	Annual	4/6/2021	LTx5
Agilent	N9020A	MXA Signal Analyzer	8/4/2020	Annual	8/4/2021	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	7/17/2020	Annual	7/17/2021	MY52350166
Agilent	E5515C	Wireless Communications Test Set		N/A		GB45360985
Anritsu	MT8820C	Radio Communication Analyzer		N/A		6201300731
Anritsu	MT8821C	Radio Communication Analyzer		N/A	6201381794	
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
Mini Circuits	TVA-11-422	RF Power Amp	N/A		QA1317001	
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator		N/A		11208010032
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		836371/0079
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		100976
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/10/2020	Annual	2/10/2021	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102133
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107

Table 5-1. Summary of Test Results

#### 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.

### **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 2<sup>nd</sup> 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:	A3LSMG996U
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	<u>CDMA / LTE</u>
Band:	Band Class 10 / Band 26 / Band 14

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
	Occupied Bandw idth	2.1049	NA	PASS	Section 7.2
CTED	Conducted Band Edge / Spurious Emissions (LTE Band 14)	2.1051, 90.691(a)	On all frequencies betw een 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. On any frequency betw een 775-788 MHz, above 805 MHz, and below 758 MHz, attenuation by at least 43 + 10 log(P) dB	PASS	Sections 7.3, 7.4
CONDUCTED	Conducted Band Edge / Spurious Emissions (LTE Band 26)	2.1051, 90.543(a)	> 43 + 10 log10 (P[Watts]) for all out-of-band emissions except	PASS	Sections 7.3, 7.4
	Conducted Band Edge / Spurious Emissions (CDMA BC10)		> 50 + 10 log10 (P[Watts]) at Band Edge and for all out- of-band emissions w ithin 37.5kHz of Block Edge	PASS	Sections 7.3, 7.4
	Frequency Stability	2.1055, 90.213	< 2.5 ppm	PASS	Section 7.8
	Conducted Pow er	ted Pow er 2.1046, 90.635 < 100 Watts		PASS	Section 7.5
	Effective Radiated Pow er (LTE Band 14)	90.542(a)(7)	< 3 Watts max. ERP	PASS	Section 7.6
	Effective Radiated Pow er (LTE Band 26)	22.913(a.2)	< 7 Watts max. ERP	PASS	Section 7.6
RADIATED	Radiated Spurious Emissions (LTE Band 14) 2.1053, 90.543(e)		> 43 + 10 log10 (P[Watts]) for all out-of-band emissions except emissions in the 1559 - 1610MHz band are subject to a limit of -40dBm/MHz for wideband signals	PASS	Section 7.7
	Radiated Spurious Emissions (LTE Band 26)	2.1053, 90.543(e)	> 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 w ithin 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 4.2.
- 5) For LTE B14 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 "LTE Automation," Version.5.3.

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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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# LTE Band 26



Plot 7-1. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB Configuration)



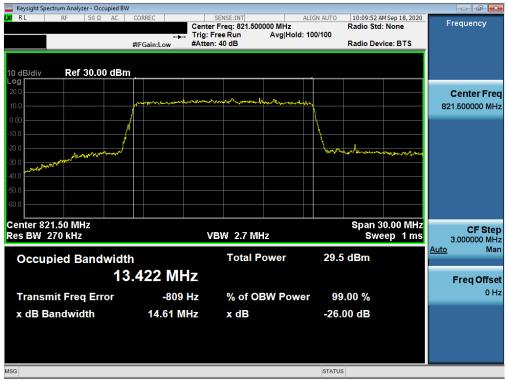
Plot 7-2. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Occupied BV							
XIRL RF 50Ω AC	CORREC	SENSE:INT er Freg: 821.500000 MHz	ALIGN AUTO	09:47:45 AN Radio Std:	Sep 18, 2020 None	Tracel	Detector
		Free Run Avg Hol en: 40 dB	d:>100/100	Radio Devi	ce: BTS		
	#IFGain:Low #Atte	an. 40 dB		Radio Devi	ce. DTS		
10 dB/div Ref 30.00 dBn							
10 dB/div Ref 30.00 dBn							
20.0	at the set the set of		~~~			C	ear Write
10.0							
0.00	(						
-10.0							
-20.0			Vienes	www.w.sha	- alamanakarak		Average
-30.0 Journal 1						_	
-40.0							
-50.0							Max Hold
-60.0							
Center 821.50 MHz				Span 30	0.00 MHz		
Res BW 270 kHz		VBW 2.7 MHz			ep 1 ms		Min Hold
		Total Power	22.4	l dBm			
Occupied Bandwidt		Total Power	JZ.	иыш			
13	.445 MHz						Detector Peak
Transmit Freq Error	8.597 kHz	% of OBW Pow	ver <u>99</u>	9.00 %		Auto	Peak Mar
x dB Bandwidth	14.58 MHz	x dB		00 dB			
	14.50 MIHZ	Xub	-20.				
MSG			STATU	9			
			51/103				

Plot 7-3. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 64-QAM - Full RB Configuration)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 14 of 61
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		pied BW										
RF	50 Ω	AC	CORRE	C	Cente		0000 MHz	ALIGN AUTO			Trac	e/Detector
			#IFGai		📑 Trig:	Free Run		d: 100/100				
Ref	40.00	dBm	۱ <u> </u>									
												Clear Wri
			~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	marthan	Mart Mart Mart	a and the second second	~~~~~				
								<u> </u>				
								+				Avera
alan a share of	Mmm	(h~l)								- how they		
												Max Ho
0.00 MIL									- Cnon (			
180 kHz					١	/BW 1.8 M	Hz					Min Ho
pied B	and	vidt	h			Total F	Power	33.	6 dBm			
		8.	963	0 M	Hz							Detect
nit Freq	q Erro	or	1	2.041	kHz	% of O	BW Pow	ver 9	9.00 %		Auto	Pea <u>M</u>
andwid	lth		g	.813	ИHz	x dB		-26	.00 dB			
								CTAT	10			
	9.00 MH 180 KHz Died B	Ref 40.00 9.00 MHz 180 kHz Died Bandy	Ref 40.00 dBm Ref 40.00 dBm 9.00 MHz 180 kHz Died Bandwidt 8.1 nit Freq Error	#FGat Ref 40.00 dBm	Ref 40.00 dBm	Ref 40.00 dBm	Center Freq: 819.00 #/FGain:Low #Atten: 40 dB Ref 40.00 dBm 9.00 MHz 180 kHz VBW 1.8 M bied Bandwidth Total F 8.9630 MHz nit Freq Error 12.041 kHz % of O	Center Freq: 819.00000 MHz Trig: Free Run Avg Hol #Atten: 40 dB Ref 40.00 dBm 9.00 MHz 180 kHz VBW 1.8 MHz bied Bandwidth Total Power 8.9630 MHz nit Freq Error 12.041 kHz % of OBW Pow	Center Freq: 819.00000 MHz Trig: Free Run Avg Hold: 100/100 #Atten: 40 dB Ref 40.00 dBm 	Center Freq: 819.000000 MHz Trig: Free Run Avg Hold: 100/100 Radio Der Ref 40.00 dBm 9.00 MHz 180 kHz VBW 1.8 MHz Span 2 Span 2 Symptotic State	Center Freq: 819.000000 MHz Trig: Free Run       Radio Std: None Radio Device: BTS         Ref 40.00 dBm       Image: Ref 40.00 dBm         9.00 MHz       Span 20.00 MHz         9.00 MHz       Span 20.00 MHz         9.00 MHz       VBW 1.8 MHz         Span 20.00 MHz         Span 20.00 MHz         9.00 MHz         100 MHz         110 MHz         120 MHz <td>Center Freq: 819.000000 MHz Trig: Free Run Avg Hold: 100/100 Radio Device: BTS Ref 40.00 dBm 9.00 MHz 180 kHz VBW 1.8 MHz Span 20.00 MHz System 12.041 kHz % of OBW Power 99.00 % andwidth 9.813 MHz x dB -26.00 dB</td>	Center Freq: 819.000000 MHz Trig: Free Run Avg Hold: 100/100 Radio Device: BTS Ref 40.00 dBm 9.00 MHz 180 kHz VBW 1.8 MHz Span 20.00 MHz System 12.041 kHz % of OBW Power 99.00 % andwidth 9.813 MHz x dB -26.00 dB

Plot 7-5. Occupied Bandwidth Plot (LTE Band 26 - 10MHz QPSK - Full RB Configuration)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Plot 7-7. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 64-QAM - Full RB Configuration)



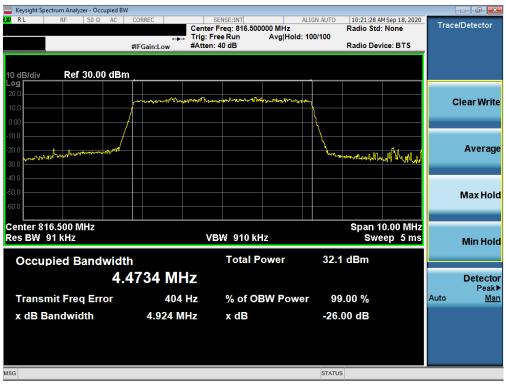
Plot 7-8. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 16 of 61
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Plot 7-9. Occupied Bandwidth Plot (LTE Band 26 - 5MHz QPSK - Full RB Configuration)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 26 - 5MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST Proud to be part of (e) element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 17 of 61
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Plot 7-11. Occupied Bandwidth Plot (LTE Band 26 - 5MHz 64-QAM - Full RB Configuration)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 26 - 5MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST Proud to be part of (e) element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 19 of 61
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Keysight Spectrum Analyzer - Occu										
<mark>X/</mark> RL RF 50 Ω	AC CO	RREC		ENSE:INT Freg: 815.50		ALIGN AUT		8 AM Sep 18, 2020 td: None	Trac	e/Detector
			Trig: Fr #Atten:	ee Run	Avg Hold	: 100/100	Dedie D	evice: BTS		
	#IF	Gain:Low	#Atten:	40 aB			Radio D	evice: DTS		
	-18									
10 dB/div Ref 30.00	dBm									
20.0					~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					
10.0							<u> </u>		(	Clear Write
0.00	/						<u>\</u>			
-10.0	<u> </u>						<u> </u>			
-20.0							have			Average
-30.0										
-40.0										
-50.0										Max Hold
-60.0										
Center 815.500 MHz							0	5 000 MU		
Res BW 47 kHz			VE	SW 470 k	Hz			5.000 MHz 2.533 ms		Min Hold
										Min Hold
Occupied Bandy	vidth			Total I	Power	33	3.7 dBm			
	2.69	97 M	Hz							Detector
									0	Peak
Transmit Freq Erro	or	5.652	KHZ	% of C	BW Pow	er	99.00 %		Auto	Mar
x dB Bandwidth		2.987	MHz	x dB		-2	6.00 dB			
ISG						STA	TUS			

Plot 7-13. Occupied Bandwidth Plot (LTE Band 26 - 3MHz QPSK - Full RB Configuration)



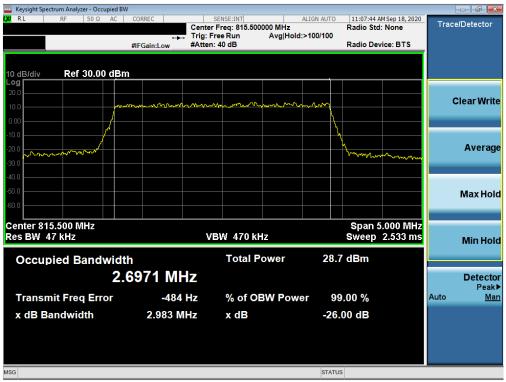
Plot 7-14. Occupied Bandwidth Plot (LTE Band 26 - 3MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 10 of 61
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Keysight Spectrum Analy															
KL RF	50 Ω	AC	CORR	EC			Freg: 81	5.5000	00 MHz	ALIGN AU	то	11:07:31 / Radio Std	M Sep 18, 2020	Trac	ce/Detector
					<b></b>		ree Run		Avg Hold	: 100/100	)	Radio Dev	dee: BTC		
			#IFGa	in:Low		#Atten:	40 dB				_	Radio Dev	/ice: B15		
	~~ ~~														
10 dB/div Ref	30.00	dBn	1												
20.0															<b>O</b> I
10.0			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~	አካሌታላ	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~	~~~~	╞				Clear Write
0.00		$\square$									ł				
-10.0	لم	<u> </u>									X	<u></u>			
-20.0	كمسميني											<b>h</b>			Average
-30.0												www	mmm		
-40.0															
-50.0															Max Hold
-60.0															maxmore
Center 815.500 N Res BW 47 kHz	/IHZ					V	3W 47	) kH	7				5.000 MHz 2.533 ms		
							148548	v IXIII	-			Oncep	2.000 1113		Min Hold
Occupied B	andv	vidt	h				Tota	il Po	ower	3	1.2	2 dBm			
		2.	689	3	ΛН	7									Detector
	_														Peak▶
Transmit Free	q Erro	r		4.35	0 kl	Z	% oʻ	OB	W Pow	er	99	0.00 %		Auto	Mar
x dB Bandwid	dth			2.973	3 MI	Ιz	x dE	3		-7	26.	00 dB			
MSG										ST	ATUS	5			

Plot 7-15. Occupied Bandwidth Plot (LTE Band 26 - 3MHz 64-QAM - Full RB Configuration)



Plot 7-16. Occupied Bandwidth Plot (LTE Band 26 - 3MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST Proud to be part of (e) element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 61
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Keysight Spectrum Analyzer - Occupi					
KI RF 50Ω /	AC CORREC	SENSE:INT Center Freg: 814.700000 N	ALIGN AUTO	01:17:40 PM Sep 18, 202 Radio Std: None	Trace/Detector
		Trig: Free Run Av	g Hold: 100/100		
	#IFGain:Low	#Atten: 40 dB		Radio Device: BTS	_
10 dB/div Ref 30.00 d	dBm				
- <b>og</b> 20.0					
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	mmm	m		Clear Writ
10.0					
0.00			)	4	
10.0					
20.0				hannam	Averag
30.0					
40.0					
50.0					Max Hol
60.0					
Center 814.700 MHz Res BW 18 kHz		VBW 180 kHz		Span 2.000 MH Sweep 5.733 m	
				Sweep 5.755 III	s Min Hol
Occupied Bandw	idth	Total Powe	r 33.	3 dBm	
	1.0812 MH	-			Detecto
		Z			Peak
Transmit Freq Erro	r -222 I	Hz % of OBW	Power 99	9.00 %	Auto <u>Ma</u>
x dB Bandwidth	1.214 M	Hz xdB	-26	.00 dB	
	1.2 14 101		-20		
SG			STATU	JS	

Plot 7-17. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz QPSK - Full RB Configuration)



Plot 7-18. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST: Proud to be part of @element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Keysight Spe														
RL	RF	<u>50 Ω</u>	AC	CORRE	C	Cont	SENSE:INT er Freq: 814.7	00000 MH-	ALIGN AUT		1:18:32 P dio Std	M Sep 18, 2020	Trac	e/Detector
				#IFGai		Trig:	Free Run en: 40 dB		d: 100/100	)		vice: BTS		
0 dB/div	Ref	30.00	dBn	n				1						
0.0			~~~	n	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						Clear Writ
0.00		/	/											
0.0 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	v., min	m									$\sim$	^^		Averag
0.0 0.0														
0.0														Max Ho
enter 81 es BW		/IHz					VBW 180	kHz				2.000 MHz 5.733 ms		Min Ho
Occup	oied B	andv	vidt	h			Total	Power	3	0.7 dE	Bm			
			1.	079	8 M	Hz								Detecto Peak
Transr	nit Fre	q Erro	or		1.214	kHz	% of (	OBW Pow	er	99.00	) %		Auto	<u>Ma</u>
x dB B	andwid	dth		1	.220	MHz	x dB		-2	26.00	dB			

Plot 7-19. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 64-QAM - Full RB Configuration)



Plot 7-20. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 61
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# LTE Band 14



Plot 7-21. Occupied Bandwidth Plot (LTE Band 14 - 10MHz QPSK - Full RB Configuration)



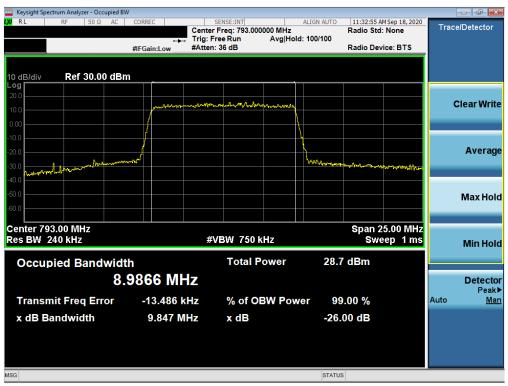
Plot 7-22. Occupied Bandwidth Plot (LTE Band 14 - 10MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dama 02 of 01
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Keysight Spectrum Analyze														
RL RF	50 Ω	AC	CORRE	C	Ce		NSE:INT eq: 793.000	000 MHz		ALIGN AUTO	11:32:31 A Radio Std	M Sep 18, 2020 : None	Trac	e/Detector
				4	📑 Tr	ig: Fre	Run		ld:	>100/100				
			#IFGa	in:Low	#A	tten: 3	6 dB				Radio Dev	vice: BTS		
	30.00	dBm		_										
.og														
				manan		t. Alerach	yyong rathylinessay	monsmuter						Clear Writ
10.0			1						l.					
).00			-1						ţ					
0.0			-+						H					
0.0	Jun Alash		کی کھی											Avera
0.0 mbanantan	Jww. Marine									manymen	arren are flother	munt later	_	
0.0														
50.0														Max Ho
50.0														Max no
														_
enter 793.00 MH	z											5.00 MHz		
Res BW 240 kHz						#VE	SW 750 H	(Hz			Swe	eep 1 ms		Min Ho
	a na alta						Total P	owor		20.5	dBm			
Occupied Ba	angv						TULATE	Ower		50.5	UBIII			
		9.0	003	6 M	Ηz									Detect
Transmit Frag	Erro		4	4.306	니ㅋ		% of O			- 00	.00 %		Auto	Peak Ma
Transmit Freq		Л	-1	4.300	KITZ		% 0I U		NE	99	.00 %		Auto	1416
x dB Bandwid	th		ę	9.861	MHz		x dB			-26.	00 dB			
G									_	STATUS				
SG										STATUS	8			

Plot 7-23. Occupied Bandwidth Plot (LTE Band 14 - 10MHz 64-QAM - Full RB Configuration)



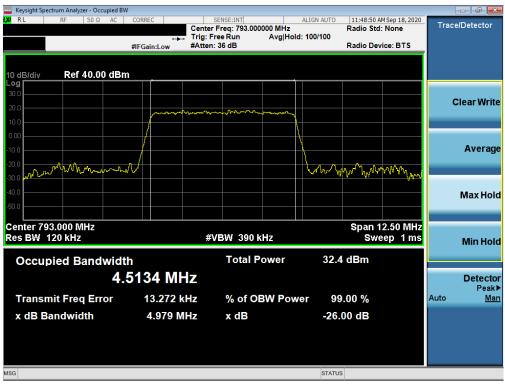
Plot 7-24. Occupied Bandwidth Plot (LTE Band 14 - 10MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 24 of 61
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Keysight Spectrum Analyzer - Occupied B\					
LXI RL RF 50Ω AC	CORREC	SENSE:INT r Freg: 793.000000 MHz	ALIGN AUTO 11:48:31 A Radio Std	M Sep 18, 2020	Trace/Detector
	🛶 Trig: F	Free Run Avg Hol	d: 100/100		
	#IFGain:Low #Atter	n: 36 dB	Radio Dev	/ice: BTS	
10 dB/div Ref 40.00 dBr	n				
Log					
30.0					Clear Write
20.0					01001 01110
10.0					
0.00					
-10.0					Average
-20.0			handhan		
-30.0 -30.0	-V U		harrow	1 W Were	
-40.0					Mawliald
-50.0					Max Hold
-30.0					
Center 793.000 MHz			Span 1	2.50 MHz	
Res BW 120 kHz	#	VBW 390 kHz	Sw	eep 1 ms	Min Hold
		<b>T</b> ( 1 <b>D</b>	00.4.15		
Occupied Bandwidt		Total Power	33.4 dBm		
4.	5112 MHz				Detector
					Peak▶
Transmit Freq Error	18.051 kHz	% of OBW Pow	ver 99.00 %		Auto <u>Man</u>
x dB Bandwidth	5.024 MHz	x dB	-26.00 dB		
MSG			STATUS		
mod			51/105		

Plot 7-25. Occupied Bandwidth Plot (LTE Band 14 - 5MHz QPSK - Full RB Configuration)



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

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 25 of 61
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Keysight Spectrum Analyzer - Occupie					
RL RF 50Ω A		SENSE:INT er Freg: 793.000000 MHz	ALIGN AUTO	11:49:03 AM Sep 18, 2020 Radio Std: None	Trace/Detector
	Trig:	Free Run Avg Ho	ld: 100/100	Radio Sta. None	
	#IFGain:Low #Atte	en: 36 dB		Radio Device: BTS	
0 dB/div Ref 40.00 d	Bm				
og					
30.0					Clear Wri
20.0	- man have	mon			cica mi
10.0					
.00	/		<u> </u>		
0.0	/				Avera
20.0			An a ba		
0.0			ግግ የአለም ነ	mann	
10.0					Max Ho
in n					IVIAX FIO
enter 793.000 MHz				Span 12.50 MHz	
tes BW 120 kHz		#VBW 390 kHz		Sweep 1 ms	Min Ho
Occurried Dendus		Total Power	24.2	dBm	
Occupied Bandwi			51.5	ubiii	
	4.5199 MHz				Detect
Transmit Freq Error	11.924 kHz	% of OBW Pov	Nor 00	.00 %	Peak Auto Ma
					<u></u>
x dB Bandwidth	4.967 MHz	x dB	-26.	00 dB	

Plot 7-27. Occupied Bandwidth Plot (LTE Band 14 - 5MHz 64-QAM - Full RB Configuration)



Plot 7-28. Occupied Bandwidth Plot (LTE Band 14 - 5MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG996U	PCTEST Proud to be part of (e) element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 26 of 61
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## CDMA BC10







#### Plot 7-30. Occupied Bandwidth Plot (CDMA, Ch. 684)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 07 of 61
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# 7.3 Spurious and Harmonic Emissions at Antenna Terminal §2.1051 §90.691(a) §90.543(e)

#### 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 10<sup>th</sup> 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  $\ge$  3 x RBW
- 4. Detector = RMS
- 5. Trace mode = max hold
- 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

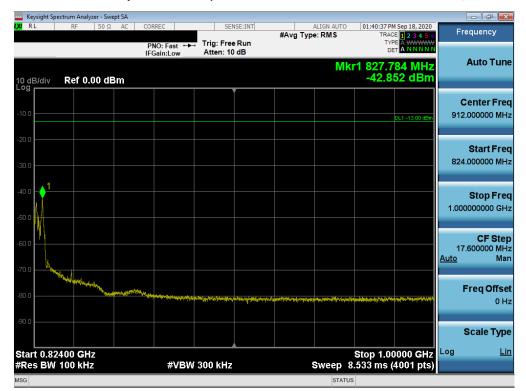
FCC ID: A3LSMG996U	Proved to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 29 of 61
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# LTE Band 26

	ectrum Analyzer - S										7 ×
X/RL	RF 50	Ω AC	CORREC	SEI	NSE:INT	#Avg Typ	ALIGN AUTO e: RMS		M Sep 18, 2020	Frequen	су
			PNO: Fast ↔ IFGain:Low	Trig: Free Atten: 40				TY			
10 dB/div Log	Ref 30.00	dBm					Mkr1	415.72 -52.	8 0 MHz 27 dBm	Auto	Tune
20.0										Center 422.00000	
0.00										Star 30.00000	t Frec 10 MHz
-10.0									DL1 -13.00 dBm	Stop 814.00000	o Frec 10 MHz
30.0										CF 78.40000 <u>Auto</u>	Step MH: Mar
50.0			ta na star na di sa na ana ang sa		1	gente antenne for (en preside)			adalas dalapitan astro mayar di sasala dala	Freq	Offse 0 Ha
-60.0										Scale	
Start 30.0 #Res BW			#VBW	/ 300 kHz		s	weep 37	Stop 8 33 ms (2	14.0 MHz 20001 pts)	Log	Lin
//SG							STATUS	3			

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



Plot 7-32. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

FCC ID: A3LSMG996U	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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	ectrum Analyzer - Swe								- 6 론
XI	RF 50 Ω	P	RREC NO:Fast ↔ Gain:Low		#Avg Typ	ALIGN AUTO e: RMS	TRAC	MNov 23, 2020 E <b>1 2 3 4 5 6</b> PE A WWWWW A N N N N N	Frequency
10 dB/div	Ref 30.00 c		Juin.20			Mk	r1 9.735 -37.9	40 GHz 84 dBm	Auto Tune
20.0									Center Fred 5.500000000 GH:
0.00									Start Free 1.000000000 GH:
20.0								DL1 -13.00 dBm	Stop Free 10.000000000 GH:
30.0		. Alfanad							CF Step 900.000000 MH <u>Auto</u> Mar
50.0									Freq Offse 0 H:
60.0	0 GHz						Stop 10	.000 GHz	Scale Type
Res BW			#VBW	3.0 MHz	s	weep 1	6.00 ms (2	0001 pts)	
ISG						STAT	us		

Plot 7-33. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

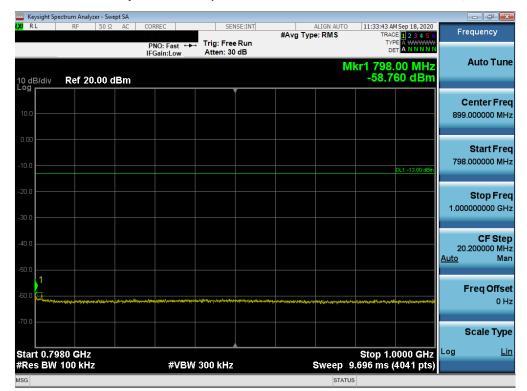
FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 20 of 61
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# LTE Band 14

	ectrum Analy		t SA											
X/RL	RF	50 Ω	AC	CORREC			NSE:INT	#Avg Typ	ALIGN AU e: RMS	TO 11	TRAC	Sep 18, 2020	Fr	equency
				PNO: F IFGain:I	ast ⊶⊷ .ow	Trig: Fre Atten: 30					TYP	E A WWWWW T A N N N N N		
										Mkr1	788.	00 MHz		Auto Tune
10 dB/div Log	Ref 20	).00 dE	Зm				-				27.1	36 dBm		
							Ĭ							Center Freq
10.0													409	.000000 MHz
0.00														
0.00														Start Freq
-10.0												DL1 -13.00 dBm	30	.000000 MHz
-20.0												1		Stop Free
-30.0												<u> </u>	788	8.000000 MHz
-40.0													75	CF Step 8.800000 MH
													<u>Auto</u>	Mar
-50.0														
-60.0														Freq Offse
									la parte de caracter d					0 H:
-70.0														
														Scale Type
Start 30.0										s	top 7	38.0 MHz	Log	Lin
#Res BW	100 KHz	2			#VBW	300 kHz		s			ms (1	5161 pts)		
ISG									ST	ATUS				

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



Plot 7-35. Conducted Spurious Plot (LTE Band 14 - 10MHz QPSK - RB Size 1, RB Offset 0)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 21 of 61
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	ectrum Analyzer - Sw									
XI	RF 50 Ω	Р	RREC NO:Fast ↔ Gain:Low		#Avg Typ	ALIGN AUTO e: RMS	TRAC	M Nov 23, 2020 CE <b>1 2 3 4 5 6</b> PE A WWWW T A N N N N N	Fre	equency
10 dB/div Log	Ref 30.00		Sumeon			Mk	(r1 9.41) -38.0	2 0 GHz 24 dBm		Auto Tune
20.0										enter Freq
0.00									1.000	Start Freq
-10.0								DL1 -13.00 dBm	10.000	Stop Freq
-30.0									900. <u>Auto</u>	CF Step 000000 MHz Mar
-50.0									F	F <b>req Offsel</b> 0 Hz
-60.0	00 GHz						Stop 10	.000 GHz	tog	Scale Type Lin
#Res BW			#VBW	3.0 MHz	s	weep 15	60 ms (1	8001 pts)		
/ISG						STATUS	3			

Plot 7-36. Conducted Spurious Plot (LTE Band 14 - 10MHz QPSK - RB Size 1, RB Offset 0)

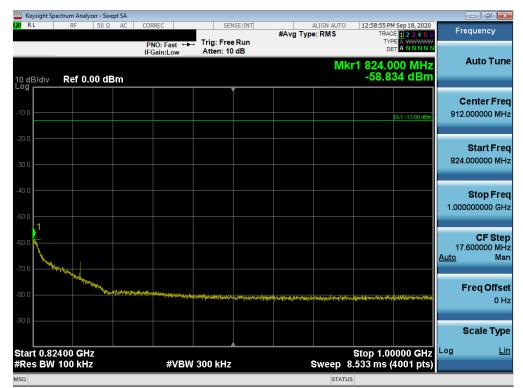
FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 22 of 61
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# CDMA BC10

RL	ectrum Analy RF	2er - Swep 50 Ω		CORREC	_	CEI	SE:INT		ALIGN AUTO	12-59-49 0	M Sep 18, 2020		
KL.	N	50.32	AC		ast ↔→ _ow	Trig: Free Atten: 40	Run	#Avg Typ		TRAC	ET A NNNNN		quency
dB/div	Ref 30	).00 dl	Bm						Mkr1	405.96 -52.	7 2 MHz 23 dBm	4	Auto Tui
).0													enter Fr DOOOOO M
													Start Fr 000000 M
1.0 <u> </u>											DL1 -13.00 dBm	814.	<b>Stop Fr</b> 000000 М
.0												78. <u>Auto</u>	CF St 400000 M M
					di na si			tina kaominina dia mampika dia mampika dia mampika dia kaominina dia mampika dia kaominina dia kaominina dia ka	a ha kan san dikana dikana Mangana kan san dikana		a ang anang kang kang kang kang	F	req Offs 0
1.0													cale Ty
art 30.0 les BW	MHz 100 kHz	z			#VBW	300 kHz		s	weep 37	Stop 8 2.33 ms (2	14.0 MHz 0001 pts)	Log	ļ
3									STATU				

Plot 7-37. Conducted Spurious Plot (CDMA Ch. 476- Low Channel)



#### Plot 7-38. Conducted Spurious Plot (CDMA Ch. 476- Low Channel)

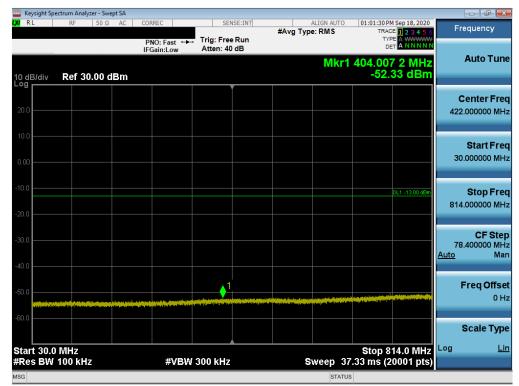
FCC ID: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dega 22 of 61
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Keysight S R L	RE	50 Ω	AC	CORREC		SEN	SE:INT		ALIGN AUT	12:59:0	4 PM Sep 18, 2020		P <b>-</b>
	i u	00 32	AC	PNO: Fa	ast 🛶	Trig: Free	Run	#Avg Typ		т	RACE 1 2 3 4 5 6 TYPE A WWWW DET A NNNNN	Frequency	У
				IFGain:L	.ow	Atten: 10	dB		M	kr1 2.45	4 40 GHz	Auto T	Tun
odB/div	Ref 0.	00 dE	3m							-23	.895 dBm		
- 3							1					Center	Fre
0.0											DL1 -13.00 dBm	5.50000000	) GH
0.0		1										01	-
0.0		Ĭ										Start   1.000000000	
5.0													
0.0												Stop	
0.0												10.00000000	) GI
												CF	Ste
							-					900.000000 Auto	
0.0													
0.0												Freq O	
													01
0.0												Scale 1	Ту
tart 1.0	00 GHz									Stop	10.000 GHz	Log	L
	1.0 MH	,		+	AVD1A	3.0 MHz			woon	16.00 mg	(20001 pts)		





#### Plot 7-40. Conducted Spurious Plot (CDMA Ch. 684- High Channel)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Keysight Spectrum Analyz						
RL RF	50 Ω AC	CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	01:01:58 PM Sep 18, 2020 TRACE 1 2 3 4 5 6	Frequency
		PNO: Fast ↔→→ IFGain:Low	Trig: Free Run #Atten: 24 dB			
<b></b>	·			Mk	r1 824.000 MHz -26.380 dBm	Auto Tun
0 dB/div Ref 0.0	U aBM		•		-20.000 uBm	
						Center Fre
10.0					DL1 -13.00 dBm	912.000000 MH
20.0						
2						Start Fre
30.0						824.000000 MH
40.0						Stop Fre
50.0						1.000000000 GH
50.0 <b></b>						CF Ste 17.600000 MH
manonadurer	**************************************	and the second second second second second	adar Maharan Angara da Maharan ang mangang mangang mangang mangang mangang mangang mangang mangang mangang man	winterstations from contract on and raised by some	an a	<u>Auto</u> Ma
70.0						
80.0						Freq Offs
						01
0.0						
						Scale Typ
tart 0.82400 GHz						Log <u>L</u>
Res BW 100 kHz		#VBW	300 kHz	Sweep 8	8.533 ms (4001 pts)	
G				STATU	5	

Plot 7-41. Conducted Spurious Plot (CDMA Ch. 684- High Channel)





FCC ID: A3LSMG996U	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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# 7.4 Band Edge Emissions at Antenna Terminal §2.1051 §90.691(a) §90.543(e)

#### 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

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### 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.

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.

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# LTE Band 26



Plot 7-43. Channel Edge Plot (LTE Band 26 - 15MHz QPSK - Mid Channel)



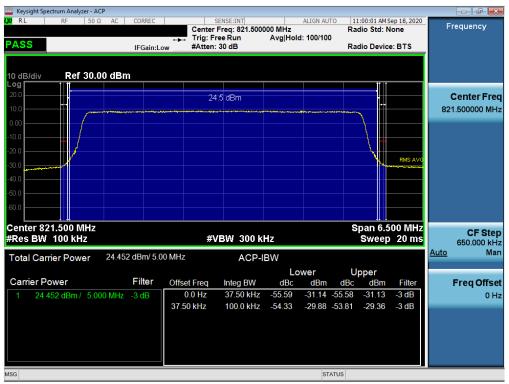
Plot 7-44. Channel Edge Plot (LTE Band 26 - 10MHz QPSK - Mid Channel)

FCC ID: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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💢 RL RF 50 Ω AC CORREC	SENSE:	INT ALIGN 816.500000 MHz	AUTO 10:59:23 AM Se Radio Std: No	
	Trig: Free Ru			She
PASS IFGain:L	ow #Atten: 30 dl	В	Radio Device	BTS
10 dB/div Ref 30.00 dBm				
Log			ii i	
20.0	24.4 dE	3m 👘 👘		Center Freq
10.0				816.500000 MHz
0.00				
-10.0				
-20.0			\_ <b></b>	
-30.0				RMS AVG
-40.0				and the second se
-50.0				
-60.0				
Center 816.500 MHz			Span 6.50	
#Res BW 100 kHz	#VBW	300 kHz	Sweep	
Total Carrier Power 24.425 dBm/ 5.0		ACP-IBW		Auto Man
Carrier Power Filter	Offset Freq Inte	Lower ea BW dBc dB	Upper Im dBc dBm	Filter Freq Offset
1 24.425 dBm / 5.000 MHz -3 dB		5		-3 dB 0 Hz
1 24.425 dBm7 5.000 MHZ -3 dB				-3 dB
	57.50 KHZ 10	0.0 KHZ -01.00 -21	+1 -55.21 -20.15	
MSG			STATUS	

Plot 7-45. Channel Edge Plot (LTE Band 26 - 5MHz QPSK - Low Channel)



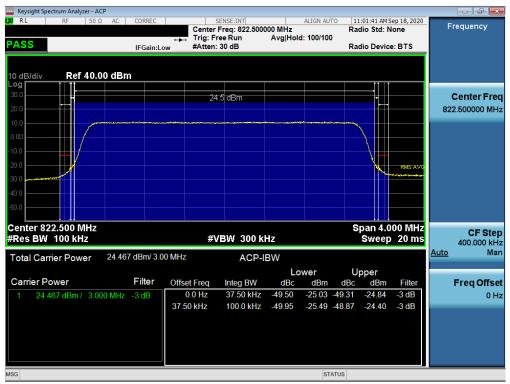


FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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Keysight Spectrum Analyzer - ACP						
XIRL RF 50Ω AC CO		NSE:INT reg: 815.500000 M	ALIGN AUTO	2 11:02:27 AMS Radio Std: N		Frequency
PASS	Gain:Low #Atten: 3	eRun Avg	Hold: 68/100	Radio Devic		
10 dB/div Ref 40.00 dBm						
Log 30.0	241	5 dBm				Center Freq
20.0	24.			Ĩ⊷		815.500000 MHz
10.0						
0.00						
10.0				\		
20.0					RMS AVG	
30.0						
40.0						
-50.0						
Center 815.500 MHz				Enon 4 (		
#Res BW 100 kHz	#V	BW 300 kHz		Span 4.0 Sweep	) 20 ms	CF Step 400.000 kHz
Total Carrier Power 24.460 dB	m/ 3.00 MHz	ACP-IBW				<u>Auto</u> Man
			Lower	Upper		
	ter Offset Freq	2	IBc dBm	dBc dBm	Filter	Freq Offset
1 24.460 dBm / 3.000 MHz -3 c		37.50 kHz -48			-3 dB	0 Hz
	37.50 kHz	100.0 kHz -46	50 -22.04 -4	49.25 -24.79	-3 dB	

Plot 7-47. Channel Edge Plot (LTE Band 26 - 3MHz QPSK - Low Channel)





FCC ID: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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🔤 Keysight Spectrum Analyzer - ACP										
LXX RL RF 50Ω AC 0	CORREC		NSE:INT eq: 814.7000	00 1411-	ALIGN AUTO		:21:22 PM S lio Std: N	Sep 18, 2020	Fr	equency
		Trig: Free		Avg Hold	1: 100/100	Rad	110 Sta: N	ione		,,
PASS	IFGain:Low	#Atten: 3				Rad	lio Devic	e: BTS		
10 dB/div Ref 40.00 dBm										
Log										
30.0		22.1	dBm				+		0	Center Freq
20.0									814	.700000 MHz
10.0		The state of the s	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	V						
0.00					×	<b>N</b>				
						$\mathbf{X}$				
-10.0						$\sim$				
-20.0						-		RMS AVG		
-30.0								Ward (Togical day		
-40.0										
-50.0										
Center 814.700 MHz						S	pan 2.1	00 MHz		CF Step
#Res BW 100 kHz		#VE	SW 300 ki	lz			Sweep	) 20 ms		210.000 kHz
Total Carrier Power 22.099 c	dBm/ 1.40 MHz		ACP-II	зw					<u>Auto</u>	Man
				Lo	wer	Ur	oper			
Carrier Power	Filter Offset	t Freq	Integ BW	dBc	dBm	dBc	dBm	Filter		Freq Offset
1 22.099 dBm / 1.400 MHz -	3 dB 0	.0 Hz	37.50 kHz	-49.49	-27.39 -	51.95	-29.85	-3 dB		0 Hz
	37.50	) kHz	100.0 kHz	-46.40	-24.30 -	49.17	-27.08	-3 dB		
MSG					STAT	rus				

Plot 7-49. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - Low Channel)



Plot 7-50. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - High Channel)

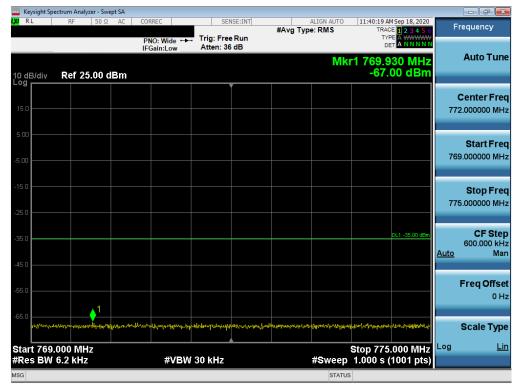
FCC ID: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		D	
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# LTE Band 14

🔤 Keysight Spectrum Analyzer - S					
<b>LXI RE 50</b>	Ω AC CORREC	SENSE:INT	ALIGN AUTO #Avg Type: RMS	11:40:01 AM Sep 18, 2020 TRACE 1 2 3 4 5 6	Frequency
	PNO: Wide IFGain:Low	Trig: Free Run Atten: 36 dB			
10 dB/div Ref 25.00	dBm		Mk	r1 787.984 MHz -30.93 dBm	Auto Tune
15.0					Center Freq 788.000000 MHz
5.00				ر الار من ماند مرد بر معد الار من ماند.	
-5.00			and and a second produced and		Start Freq 784.000000 MHz
				DL1 -13.00 dBm	
-15.0					<b>Stop Freq</b> 792.000000 MHz
-25.0		17			CF Step
-35.0 -45.0	and a second				800.000 kHz <u>Auto</u> Man
-55.0					FreqOffset
					0 Hz
-65.0					Scale Type
Center 788.000 MHz #Res BW 100 kHz	#VI	300 kHz	Sweep 4	Span 8.000 MHz .000 ms (1001 pts)	Log <u>Lin</u>
MSG			STATU		

Plot 7-51. Lower Band Edge Plot (LTE Band 14, 10MHz QPSK - RB Size 50)



Plot 7-52. Lower Emission Mask Plot (LTE Band 14, 10MHz QPSK - RB Size 50)

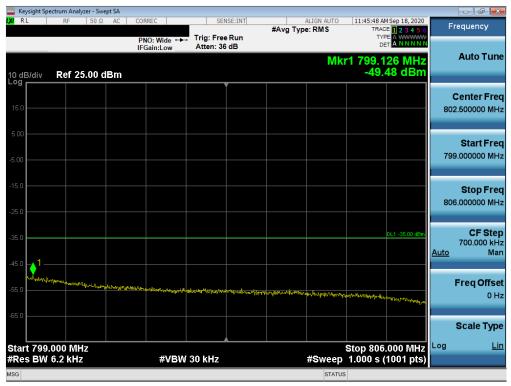
FCC ID: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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	ctrum Analyzer - Swept										
LXI RL	RF 50 Ω	AC COI	RREC	SEN	ISE:INT	#Avg Typ	ALIGN AUTO e: RMS		4 Sep 18, 2020	Fr	equency
			NO:Wide ↔ Gain:Low	Trig: Free Atten: 36			Mk	DE	16 MHz		Auto Tune
10 dB/div Log	Ref 25.00 dE	3m						-31.	93 dBm		_
											Center Freq
15.0										798	.000000 MHz
5.00		and the state of the second	<del>4 مى</del> لەتىلەتىمەنلەر مەر 4	- All and a second s							Start Freq
-5.00										794	.000000 MHz
-15.0									DL1 -13.00 dBm		
-25.0				1 1 1						802	Stop Freq
				"My	1						CF Step
-35.0					an and the second second	man man bre	wwwwwww	monterio	on Morrow	<u>Auto</u>	800.000 kHz Man
-40.0											
-55.0											F <b>req Offset</b> 0 Hz
-65.0											
											Scale Type
	8.000 MHz							Span 8	.000 MHz	Log	<u>Lin</u>
#Res BW	100 kHz		#VBV	V 300 kHz					1001 pts)		
MSG							STATUS				

Plot 7-53. Upper Band Edge Plot (LTE Band 14, 10MHz QPSK - RB Size 50)



Plot 7-54. Upper Emission Mask Plot (LTE Band 14, 10MHz QPSK - RB Size 50)

FCC ID: A3LSMG996U	Proved to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 42 of 61
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	ectrum Analyzer - S										
XIRL	RF 50	Ω AC	CORREC	SEN	ISE:INT	#Avg Typ	ALIGN AUTO		I Sep 18, 2020	F	requency
			PNO: Wide ↔ IFGain:Low	Trig: Free Atten: 36		#/19 Jyp		TYF DE			A
10 dB/div Log	Ref 25.00	dBm					Mk	r1 787.9 -29.:	92 MHz 21 dBm		Auto Tune
				, 						(	Center Freq
15.0										788	3.000000 MHz
5.00						mmm	e hourse		Jun way		
-5.00										786	Start Freq 5.000000 MHz
-3.00									DL1 -13.00 dBm		
-15.0											Stop Freq
-25.0					1					790	0.000000 MHz
-35.0					Ν.						CF Step
-30.0	www.www.www.www.ww	un marine a	www.	يعمر مريد						<u>Auto</u>	400.000 kHz Man
-45.0											_
-55.0											Freq Offset 0 Hz
-65.0											0112
-03.0											Scale Type
	8.000 MHz							Span 4		Log	Lin
#Res BW	100 kHz		#VBW	300 kHz				.000 ms (	1001 pts)		
MSG							STATUS	8			

Plot 7-55. Lower Band Edge Plot (LTE Band 14, 5MHz QPSK - RB Size 25)



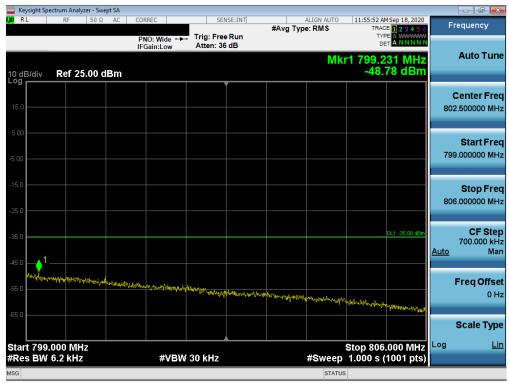
Plot 7-56. Lower Emission Mask Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 14 of 61
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	ectrum Analyzer - Swept SA						
LXI RL	RF 50 Ω AC	CORREC	SENSE:IN	#Avg Typ	ALIGN AUTO	11:55:39 AM Sep 18, 2020 TRACE 1 2 3 4 5 6	Frequency
		PNO: Wide ↔ IFGain:Low	Trig: Free Run Atten: 36 dB	1			
10 dB/div Log	Ref 25.00 dBm				Mkı	1 798.000 MHz -30.870 dBm	Auto Tune
15.0							Center Freq 798.000000 MHz
5.00		an a					Start Freq 796.000000 MHz
-15.0						DL1 -13.00 dBm	Stop Freq 800.000000 MHz
-35.0				un and a second and a	- Marina Marina	Morrison Carrow Carrow	CF Step 400.000 kHz <u>Auto</u> Man
-45.0							<b>Freq Offset</b> 0 Hz
-65.0							Scale Type
Center 79 #Res BW	8.000 MHz 100 kHz	#VBW	300 kHz		Sweep 2	Span 4.000 MHz .000 ms (1001 pts)	Log <u>Lin</u>
MSG					STATUS		

Plot 7-57. Upper Band Edge Plot (LTE Band 14, 5MHz QPSK - RB Size 25)



Plot 7-58. Upper Emission Mask Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

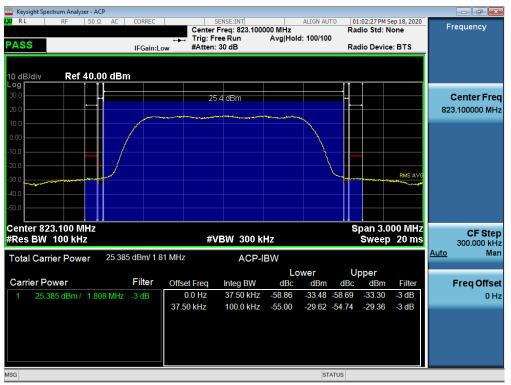
FCC ID: A3LSMG996U	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 45 of 61	
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# CDMA BC10







## Plot 7-60. Channel Edge Plot (CDMA BC10 – Ch. 684)

FCC ID: A3LSMG996U	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 46 of 61	
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# 7.5 Conducted Power Output Data §2.1046 §2.1046 §90.635

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]	Conducted Power [Watts]	Conducted Power Limit [dBm]	Margin [dB]
	QPSK	26765	821.5	1/0	24.96	0.313	50.00	-25.04
15 MHz	16-QAM	26765	821.5	1/36	24.01	0.252	50.00	-25.99
	64-QAM	26765	821.5	1/74	23.06	0.202	50.00	-26.94
	256-QAM	26765	821.5	1/36	19.89	0.097	50.00	-30.11
	QPSK	26740	819.0	1/0	24.89	0.308	50.00	-25.11
10 MHz	16-QAM	26740	819.0	1/0	23.92	0.247	50.00	-26.08
	64-QAM	26740	819.0	1/25	23.08	0.203	50.00	-26.92
	256-QAM	26740	819.0	1/0	19.98	0.100	50.00	-30.02
	QPSK	26715	816.5	1/0	24.89	0.308	50.00	-25.11
		26765	821.5	1/12	24.86	0.306	50.00	-25.14
5 MHz	16-QAM	26715	816.5	1/12	24.22	0.264	50.00	-25.78
	64-QAM	26715	816.5	1/12	23.41	0.219	50.00	-26.59
	256-QAM	26765	821.5	1/12	20.08	0.102	50.00	-29.92
	QPSK	26705	815.5	1/14	24.98	0.315	50.00	-25.02
	QFOR	26775	822.5	1/14	24.88	0.308	50.00	-25.12
3 MHz	16-QAM	26705	815.5	1/14	24.07	0.255	50.00	-25.93
	64-QAM	26775	822.5	1/14	23.20	0.209	50.00	-26.80
	256-QAM	26705	815.5	8/4	20.11	0.103	50.00	-29.89
	QPSK	26697	814.7	1/0	24.98	0.315	50.00	-25.02
	QFOR	26783	823.3	1/5	24.93	0.311	50.00	-25.07
1.4 MHz	16-QAM	26697	814.7	1/2	24.32	0.270	50.00	-25.68
	64-QAM	26783	823.3	1/2	23.29	0.213	50.00	-26.71
	256-QAM	26783	823.3	1/2	20.13	0.103	50.00	-29.87

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

Frequency [MHz]	Channel	Battery Type	Conducted Power [dBm]	Conducted Power [Watts]	Conducted Power Limit [dBm]	Margin [dB]
817.90	476	Standard	24.84	0.305	50.00	-25.16
823.10	684	Standard	24.78	0.301	50.00	-25.22

Table 7-3. Conducted Power Output Data (CDMA BC10)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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## NOTES:

- 1. For CDMA mode, this device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.
- 2. 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.
- 3. This unit was tested with its standard battery.

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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#### 7.6 Radiated Power (ERP) §90.542(a)(7), §22.913(a)(2)

## 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

FCC ID: A3LSMG996U	PCTEST° Proud to be part of @element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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## Test Setup

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



Figure 7-4. Radiated Test Setup <1GHz

## Test Notes

- 1) 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.

FCC ID: A3LSMG996U	Proved to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 50 of 61	
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Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
	QPSK	821.5	V	143.0	261.0	6.32	1 / 74	15.21	19.38	0.087	38.45	-19.07
15 MHz	16-QAM	821.5	V	143.0	261.0	6.32	1 / 74	14.42	18.59	0.072	38.45	-19.86
	64-QAM	821.5	V	143.0	261.0	6.32	1 / 74	13.50	17.67	0.058	38.45	-20.78
	256-QAM	821.5	V	143.0	261.0	6.32	1 / 74	10.34	14.51	0.028	38.45	-23.94
	QPSK	819.0	V	143.0	261.0	6.29	1/0	15.17	19.31	0.085	38.45	-19.14
10 MHz	16-QAM	819.0	V	143.0	261.0	6.29	1/0	14.36	18.50	0.071	38.45	-19.95
	64-QAM	819.0	V	143.0	261.0	6.29	1/25	13.55	17.69	0.059	38.45	-20.76
	256-QAM	819.0	V	143.0	261.0	6.29	1/0	10.46	14.60	0.029	38.45	-23.85
	QPSK	816.5	V	143.0	261.0	6.27	1/0	15.19	19.31	0.085	38.45	-19.14
	QFOR	821.5	V	143.0	261.0	6.32	1/12	15.11	19.28	0.085	38.45	-19.17
5 MHz	16-QAM	816.5	V	143.0	261.0	6.27	1/12	14.68	18.80	0.076	38.45	-19.65
	64-QAM	816.5	V	143.0	261.0	6.27	1/12	13.90	18.02	0.063	38.45	-20.43
	256-QAM	821.5	V	143.0	261.0	6.32	1/12	10.53	14.70	0.030	38.45	-23.75
	QPSK	815.5	V	143.0	261.0	6.26	1/14	15.29	19.40	0.087	38.45	-19.05
	QPSK	822.5	V	143.0	261.0	6.33	1/14	15.12	19.30	0.085	38.45	-19.15
3 MHz	16-QAM	815.5	V	143.0	261.0	6.26	1/14	14.54	18.65	0.073	38.45	-19.80
	64-QAM	822.5	V	143.0	261.0	6.33	1/14	13.63	17.81	0.060	38.45	-20.64
	256-QAM	815.5	V	143.0	261.0	6.26	8/4	10.62	14.73	0.030	38.45	-23.72
	QPSK	814.7	V	143.0	261.0	6.25	1/0	15.30	19.40	0.087	38.45	-19.05
	QFSK	823.3	V	143.0	261.0	6.34	1/5	15.16	19.35	0.086	38.45	-19.10
1.4 MHz	16-QAM	814.7	V	143.0	261.0	6.25	1/2	14.80	18.90	0.078	38.45	-19.55
	64-QAM	823.3	V	143.0	261.0	6.34	1/2	13.71	17.90	0.062	38.45	-20.55
	256-QAM	823.3	V	143.0	261.0	6.34	1/2	10.56	14.75	0.030	38.45	-23.70
15 MHz	QPSK	816.5	Н	178.0	186.0	6.72	1 / 74	5.58	10.15	0.010	38.45	-28.30
13 10112	QPSK (WCP)	821.5	V	138.0	300.0	6.32	1 / 74	10.59	14.76	0.030	38.45	-23.69

# Table 7-61. ERP Data (LTE Band 26)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
	QPSK	793.0	V	147.0	287.0	5.91	1 / 49	16.32	20.08	0.102	34.77	-14.69
10 MHz	16-QAM	793.0	V	147.0	287.0	5.91	1 / 49	15.88	19.64	0.092	34.77	-15.13
	64-QAM	793.0	V	147.0	287.0	5.91	1 / 49	14.51	18.27	0.067	34.77	-16.50
	256-QAM	793.0	V	147.0	287.0	5.91	1 / 49	11.36	15.12	0.033	34.77	-19.65
		790.5	V	147.0	287.0	5.89	1/12	16.39	20.13	0.103	34.77	-14.64
	QPSK	793.0	V	147.0	287.0	5.91	1/12	16.42	20.18	0.104	34.77	-14.59
5 MHz		795.5	V	147.0	287.0	5.94	1/12	16.54	20.33	0.108	34.77	-14.44
5 MILIZ	16-QAM	795.5	V	147.0	287.0	5.94	1/12	16.09	19.88	0.097	34.77	-14.89
	64-QAM	793.0	V	147.0	287.0	5.91	1/12	15.39	19.15	0.082	34.77	-15.62
	256-QAM	793.0	V	147.0	287.0	5.91	1/12	11.41	15.17	0.033	34.77	-19.60
10 MHz	QPSK	795.5	Н	204.00	345.00	6.11	1 / 49	6.81	10.77	0.012	34.77	-24.00
	QPSK (WCP)	790.5	V	146.00	256.00	5.91	1 / 49	11.49	15.25	0.033	34.77	-19.52

Table 7-62. ERP Data (LTE Band 14)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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# 7.7 Radiated Spurious Emissions Measurements §2.1053

## **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 RMS 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

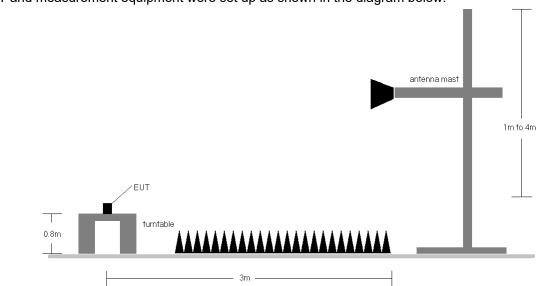
## **Test Settings**

- 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: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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## Test Setup



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

Figure 7-5. Test Instrument & Measurement Setup

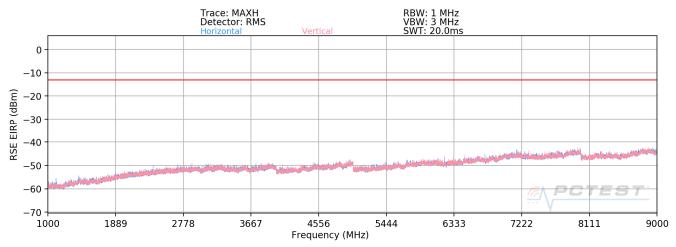
## Test Notes

- 1. For CDMA mode, this device was tested under all R.C.s and S.O.s and the worst case is reported with RC3/SO55 with "All Up" power control bits.
- 2. 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.
- 3. This unit was tested with its standard battery.
- 4. 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.
- 5. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 6. 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.

FCC ID: A3LSMG996U	Proved to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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# LTE Band 26





Bandwidth (MHz):	10
Frequency (MHz):	819.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 25

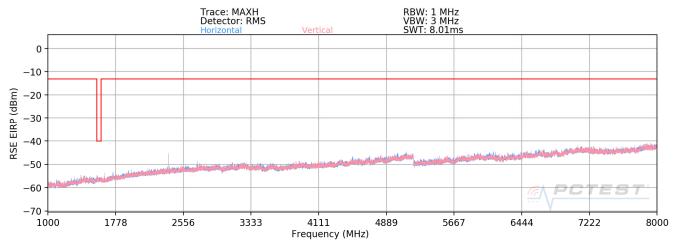
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1638.0	Н	-	-	-77.20	0.52	30.32	-64.94	-13.00	-51.94
2457.0	Н	-	-	-77.12	4.84	34.72	-60.53	-13.00	-47.53
3276.0	Н	-	-	-79.74	6.85	34.11	-61.15	-13.00	-48.15

Table 7-4. Radiated Spurious Data (LTE Band 26 – Mid Channel)

FCC ID: A3LSMG996U	PCTEST. Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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# LTE Band 14





Bandwidth (MHz):	5
Frequency (MHz):	790.5
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 12

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1581.0	V	-	-	-78.07	0.75	29.68	-65.58	-40.00	-25.58
2371.5	V	101	25	-64.35	4.64	47.29	-47.97	-13.00	-34.97
3162.0	V	-	-	-79.29	5.94	33.65	-61.60	-13.00	-48.60
3952.5	V	-	-	-81.35	7.81	33.46	-61.80	-13.00	-48.80
4743.0	V	-	-	-81.80	8.42	33.62	-61.64	-13.00	-48.64

Table 7-5. Radiated Spurious Data (LTE Band 14 – Low Channel)

Bandwidth (MHz):	5
Frequency (MHz):	795.5
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 12

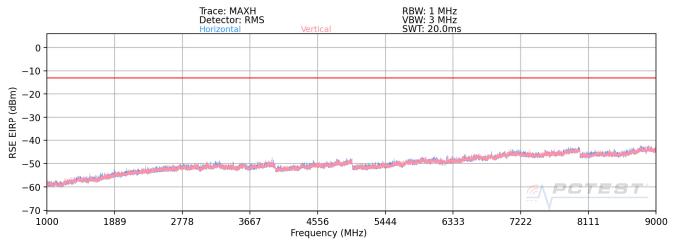
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1591.0	V	-	-	-77.98	0.78	29.80	-65.46	-40.00	-25.46
2386.5	V	103	63	-68.57	4.74	43.17	-52.09	-13.00	-39.09
3182.0	V	-	-	-79.32	6.08	33.76	-61.50	-13.00	-48.50
3977.5	V	-	-	-81.30	7.27	32.97	-62.29	-13.00	-49.29
4773.0	V	-	-	-81.83	9.07	34.24	-61.02	-13.00	-48.02

Table 7-6. Radiated Spurious Data (LTE Band 14 – High Channel)

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# CDMA BC10



Plot 7-65. Radiated Spurious Plot (CDMA BC10)

Frequency (MHz):	817.9								
Modulation:	CDMA BC10								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1635.8	V	-	-	-68.91	0.52	38.61	-56.64	-13.00	-43.64
2453.7	V	-	-	-70.21	4.86	41.65	-53.61	-13.00	-40.61
3271.6	V	-	-	-70.50	6.89	43.39	-51.87	-13.00	-38.87

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

Frequency (MHz):	823.1								
Modulation:	CDMA BC10								
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1646.2	V	-	-	-68.72	0.50	38.78	-56.48	-13.00	-43.48
2469.3	V	-	-	-70.25	4.99	41.74	-53.52	-13.00	-40.52
3292.4	V	-	-	-70.46	6.75	43.29	-51.97	-13.00	-38.97
							<b>AA (</b> )		

Table 7-8. Radiated Spurious Data (CDMA BC10 - Ch. 684)

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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# 7.8 Frequency Stability / Temperature Variation §2.1055 §90.213

### 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 $\pm 0.00025\%$ ( $\pm 2.5$ ppm) of the center frequency.

### Test Procedure Used

ANSI/TIA-603-E-2016

#### Test Settings

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

### Test Setup

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

### Test Notes

None

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# Frequency Stability / Temperature Variation

LTE Band 26							
	Operating F	Frequency (Hz):	819,00	00,000			
	Ref.	Voltage (VDC):	4.	41			
		Deviation Limit:	± 0.00025%	o or 2.5 ppm			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)		
		- 30	819,000,114	-69	-0.000084		
		- 20	818,999,834	211	0.0000258		
		- 10	818,999,874	171	0.0000209		
		0	818,999,884	161	0.0000197		
100 %	4.41	+ 10	818,999,921	124	0.0000151		
		+ 20 (Ref)	819,000,045	0	0.0000000		
		+ 30	819,000,102	-57	-0.0000070		
		+ 40	818,999,975	70	0.000085		
		+ 50	819,000,213	-168	-0.0000205		
Battery Endpoint	3.37	+ 20	818,999,747	298	0.0000364		

Table 7-9. LTE Band 26 Frequency Stability Data

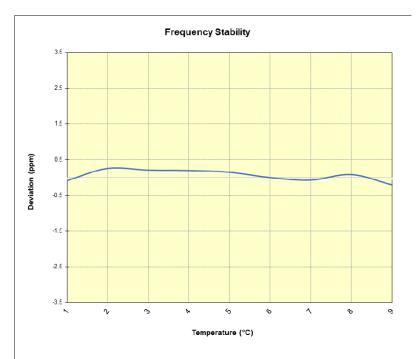


Table 7-9. LTE Band 26 Frequency Stability Chart

FCC ID: A3LSMG996U	Prove to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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# Frequency Stability / Temperature Variation

LTE Band 14							
	Operating F	requency (Hz):	793,00	00,000	T I		
	Ref. Voltage (VDC):		4.4	41			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)		
		- 30	793,000,315	-432	-0.0000545		
		- 20	792,999,989	-106	-0.0000134		
		- 10	792,999,687	196	0.0000247		
		0	792,999,640	243	0.0000306		
100 %	4.41	+ 10	792,999,856	27	0.000034		
		+ 20 (Ref)	792,999,883	0	0.0000000		
		+ 30	792,999,999	-116	-0.0000146		
		+ 40	792,999,858	25	0.000032		
		+ 50	793,000,012	-129	-0.0000163		
Battery Endpoint	3.37	+ 20	792,999,973	-90	-0.0000113		

Table 7-9. LTE Band 14 Frequency Stability Data

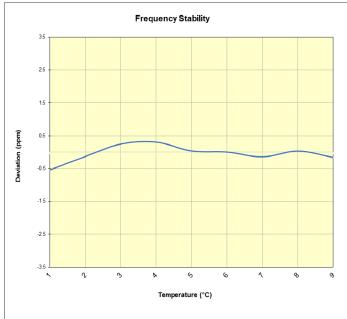


 Table 7-9. LTE Band 14 Frequency Stability Chart

FCC ID: A3LSMG996U	PCTEST: Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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# Frequency Stability / Temperature Variation

CDMA BC10							
	Operating F	requency (Hz):	817,90	00,000	T I		
	Ref.	Voltage (VDC):	4.	41			
		Deviation Limit:	± 0.00025%	or 2.5 ppm			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)		
		- 30	817,900,280	-212	-0.0000259		
		- 20	817,899,862	206	0.0000252		
		- 10	817,900,207	-139	-0.0000170		
		0	817,900,065	3	0.0000004		
100 %	4.41	+ 10	817,899,717	351	0.0000429		
		+ 20 (Ref)	817,900,068	0	0.0000000		
		+ 30	817,899,724	344	0.0000421		
		+ 40	817,899,887	181	0.0000221		
		+ 50	817,899,806	262	0.0000320		
Battery Endpoint	3.37	+ 20	817,900,031	37	0.0000045		

Table 7-9. CDMA BC10 Frequency Stability Data

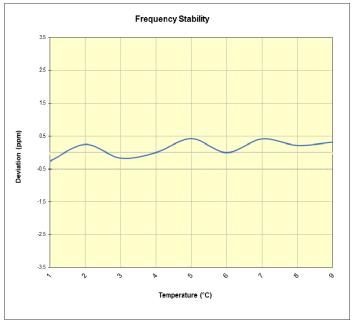


Table 7-9. CDMA BC10 Frequency Stability Chart

FCC ID: A3LSMG996U	Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	<b>Approved by:</b> 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: A3LSMG996U** complies with all the requirements of Parts 22(H) and 90 of the FCC rules.

FCC ID: A3LSMG996U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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