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MEASUREMENT REPORT WCDMA

WCDI

Applicant Name:

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

Date of Testing: 4/26 - 07/29/2020 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M2004230075-02-R1.A3L

FCC ID:

A3LSMT978U

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type: Model: EUT Type: FCC Classification: FCC Rule Part(s): Test Procedure(s): Certification SM-T978U Portable Tablet PCS Licensed Transmitter (PCB) 22, 24 & 27 ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

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.

This revised Test Report (S/N: 1M200430075-02-R1.A3L) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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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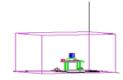


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			ERP		EI	RP	
Mode	FCC Rule Part	Tx Frequency (MHz)	Max. Power (W)	Max. Power (dBm)	Max. Power (W)	Max. Power (dBm)	Emission Designator
WCDMA850	22H	826.4 - 846.6	0.087	19.38	0.142	21.53	4M17F9W
VV CDIVIA030	220	020.4 - 040.0	0.007	19.30	0.142	21.00	411177911
WCDMA1700	27	1712.4 - 1752.6			0.269	24.30	4M16F9W
WCDMA1900	24E	1852.4 - 1907.6			0.290	24.62	4M15F9W
		FUT	Overview	,			

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 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 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 Tablet FCC ID: A3LSMT978U**. The test data contained in this report pertains only to the emissions due to the EUT's 2G/3G licensed transmitters.

Test Device Serial No.: 04097, 03743

2.2 Device Capabilities

This device contains the following capabilities:

850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n71, n5, n66, n25, n2, n41), 802.11b/g/n/ac/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE)

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.

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 "Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards" (ANSI/TIA-603-E-2016) and "Measurement Guidance for Certification of Licensed Digital Transmitters" (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

3.2 Radiated Measurements

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

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer.

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].

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.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI/TIA-603-E-2016.

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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
-	LTx1	Licensed Transmitter Cable Set	5/1/2020	Biannual	11/1/2020	LTx1
-	LTx2	Licensed Transmitter Cable Set	4/9/2020	Annual	10/9/2020	LTx2
Agilent	N9038A	MXE EMI Receiver	7/17/2019	Annual	7/17/2020	MY51210133
EMCO	3160-09	Small Horn (18 - 26.5GHz)	8/9/2018	Biennial	8/9/2020	135427
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	11/1/2019	Annual	11/1/2020	100040
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102135
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2020	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/19/2018	Biennial	7/19/2020	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

WCDMA Emission Designator

Emission Designator = 4M16F9W

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

Spurious Radiated Emission

Example: Spurious emission at 3700.40 MHz

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

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7.0 TEST RESULTS

7.1 Summary

Company Name:	Samsung Electronics Co., Ltd.
FCC ID:	<u>A3LSMT978U</u>
FCC Classification:	PCS Licensed Transmitter (PCB)
Mode(s):	<u>WCDMA</u>

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	RSS-Gen (4.6.1) RSS-133(2.3) RSS-139(2.3)	Occupied Bandwidth	N/A		PASS	Section 7.2
2.1051 22.917(a) 24.238(a) 27.53(h)	RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Conducted Band Edge / Spurious Emissions	> 43 + 10 log ₁₀ (P[Watts]) at Band Edge and for all out-of- band emissions		PASS	Sections 7.3, 7.4
24.232(d)	RSS-132(5.4) RSS-133(6.4) RSS-139(6.5)	Peak-Average Ratio	< 13 dB	CONDUCTED	PASS	Section 7.5
2.1046	RSS-132(5.4) RSS-133(4.1) RSS-139(4.1)	Transmitter Conducted Output Power	N/A		PASS	RF Exposure Report
2.1055 22.355 24.235 27.54	RSS-132(5.3) RSS-133(6.3) RSS-139(6.4)	Frequency Stability	< 2.5 ppm (Part 22) Emission must remain in band (Part 24, 27)		PASS	Section 7.8
22.913(a)(5)	RSS-132(5.4)	Effective Radiated Power	< 7 Watts max. ERP		PASS	Section 7.6
24.232(c)	RSS-133(6.4)	Equivalent Isotropic Radiated Power	< 2 Watts max. EIRP		PASS	Section 7.6
27.50(d)(4)	RSS-139(6.5)	Equivalent Isotropic Radiated Power	< 1 Watts max. EIRP	RADIATED	PASS	Section 7.6
2.1053 22.917(a) 24.238(a) 27.53(h)	RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Radiated Spurious Emissions	> 43 + 10 log ₁₀ (P[Watts]) for all out-of-band emissions		PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 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.

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7.2 Occupied Bandwidth

Test Overview

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

Test Procedure Used

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.



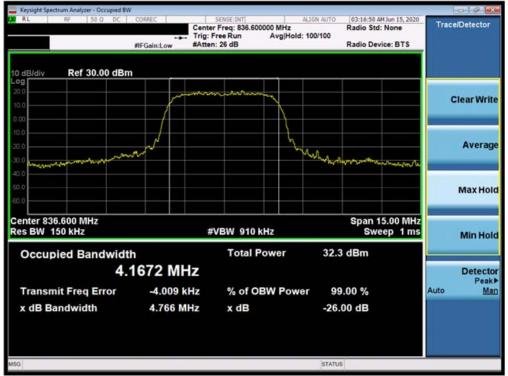
Figure 7-1. Test Instrument & Measurement Setup

Test Notes

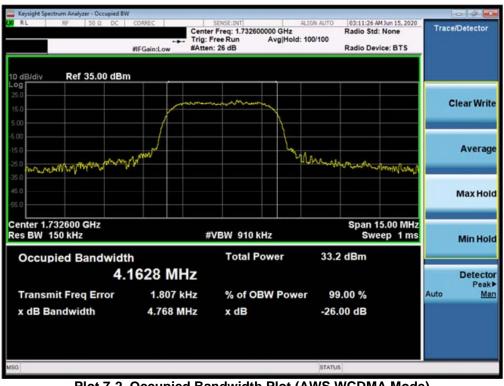
None.

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Plot 7-1. Occupied Bandwidth Plot (Cellular WCDMA Mode)



Plot 7-2. Occupied Bandwidth Plot (AWS WCDMA Mode)

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Plot 7-3. Occupied Bandwidth Plot (PCS WCDMA Mode)

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7.3 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to 10GHz for Cell, 20GHz for AWS, 20GHz for PCS (separated into at least two plots per channel)
- 2. Detector = RMS
- 3. Trace mode = trace average
- 4. Sweep time = auto couple
- 5. The trace was allowed to stabilize
- 6. Please see test notes below for RBW and VBW settings

Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

Test Notes

Per 24.238(b), 27.53(h)(3), and RSS-133(6.5), RSS-139(6.5), compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1MHz, and 100 kHz or greater for Part 22 and RSS-132 measurements below 1GHz. 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.

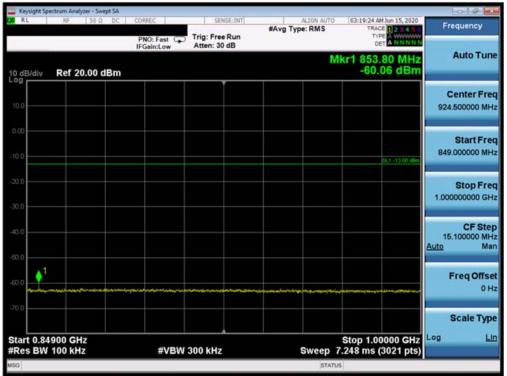
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Cellular WCDMA Mode

RL RF 50 Q		I manual scale	1		0.9
RL RF 50 Q	DC CORREC PNO: Fast	Trig: Free Run Atten: 30 dB	#Avg Type: RMS	03:19:08 AM Jun 15, 2020 TRACE 2 3 4 5 TYPE A WWWWW DET A NNNNN	Frequency
0 dB/div Ref 20.00 dB	m		М	kr1 822.95 MHz -37.87 dBm	Auto Tur
10.0					Center Fre 426.500000 MH
0.00				0c.1 -13.00 albee	Start Fre 30.000000 MH
0.0					Stop Fro 823.000000 Mi
0.0					CF Sto 79.300000 Mi <u>Auto</u> M
0.0	ident to the state of the state of the			an a	Freq Offs 01
70.0					Scale Typ
tart 30.0 MHz Res BW 100 kHz	#VBW	300 kHz	Sweep 38	Stop 823.0 MHz 3.06 ms (15861 pts)	Log L
90			STATU	5	

Plot 7-4. Conducted Spurious Plot (Cellular WCDMA Mode - Low Channel)

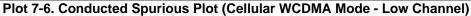


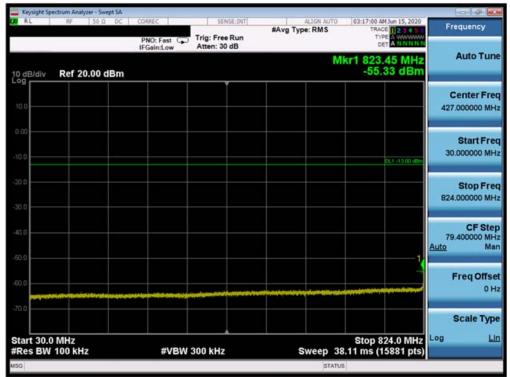
Plot 7-5. Conducted Spurious Plot (Cellular WCDMA Mode - Low Channel)

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0.0	03:19:48 AM Jun 15, 2020	ALIGN AUTO	SENSE:INT	CORREC	ectrum Analyzer - Swept SA RF 50 Ω DC	RL RL
Frequency	TRACE 2 3 4 5 1 TYPE A WANNER DET A NNNNN	#Avg Type: RMS	Trig: Free Run Atten: 30 dB	PNO: Fast 😱 IFGain:Low		
Auto Tun	r1 9.718 5 GHz -41.31 dBm	Mk			Ref 20.00 dBm	0 dB/div
Center Fre 5.50000000 GH						10.0
Start Fre 1.00000000 GH	06.1 -13.00 džin					0.0
Stop Fre 10.00000000 GF						0.0
CF Ste 900.000000 MH Auto Ma						0.0
Freq Offs 0 F						0.0
Scale Typ	Stop 10.000 GHz .60 ms (18001 pts)	Sween 15	3.0 MHz	#VBW 3	0 GHz 1.0 MHz	tart 1.00





Plot 7-7. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

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RL	RF 50 Ω	DC	CORREC	SENSE:INT	ALIGN AUTO	03:17:09 AM Jun 15, 2020	-
			PNO: Fast	Trig: Free Run Atten: 30 dB	#Avg Type: RMS	TRACE 2 3 4 5 C TYPE A WWWWW DET A NNNNN	Frequency
0 dB/div	Ref 20.00 d	Bm			м	kr1 849.00 MHz -56.57 dBm	Auto Tun
10.0							Center Fre 924.500000 MH
10.0						DL1 -13 00 oBm	Start Fre 849.000000 MH
x0.0 30.0							Stop Fre 1.000000000 GH
0.0							CF Ste 15.100000 MH Auto Ma
0.0	nalling and an analysis and and	مدومتناو	•••••••••	يود الإرامة المحافظة	****		Freq Offse 0 H
tart 0.84			#\/B\#	300 kHz	Sween 2	Stop 1.00000 GHz 248 ms (3021 pts)	Scale Typ
IG DW	TOO KH2		#VBVV	500 KH2	SWEED		

Plot 7-8. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)



Plot 7-9. Conducted Spurious Plot (Cellular WCDMA Mode - Mid Channel)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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0.9	03:20:40 AM Jun 15, 2020	ALIGN AUTO	SENSE:INT	CORREC	50 Q DC	Keysight Spectru R L
Frequency	TRACE 2 3 4 5 6 TYPE A WWWWW DET A NNNNN	#Avg Type: RMS	Trig: Free Run Atten: 30 dB	PNO: Fast 😱		
Auto Tur	kr1 806.40 MHz -61.37 dBm	м			20.00 dBm	dB/div R
Center Fre 427.000000 MF						0.0
Start Fre 30.000000 MH	0.1 -13 00 iBm					0.0
Stop Fre 824.000000 MH						0.0
CF Ste 79.400000 Mi Auto Ma						0.0
Freq Offs 0 F		ineration and produce and the	and the state of the	auto d'Arias i ar as ar		0.0
Scale Typ	Stop 824.0 MHz					tart 30.0 M
	.11 ms (15881 pts)	Sweep 38	300 kHz	#VBW 3	Hz	Res BW 10
		STATUS				0

Plot 7-10. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)



Plot 7-11. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dogo 19 of 59	
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0 9 10	03:21:15 AM Jun 15, 2020	ALIGN AUTO	SENSE:INT	CORREC	50 Q DC	RL RL
Frequency	TRACE 2 3 4 5 1 TYPE A WWWWW DET A NNNNN	#Avg Type: RMS	Trig: Free Run Atten: 30 dB	PNO: Fast		
Auto Tune	41.35 dBm	Mk	Auen. wub	IFGain:Low	20.00 dBm	dB/div R
Center Free 5.500000000 GH						10
Start Free 1.000000000 GH	CC1 -13 00 (Bm					1.0
Stop Fre 10.00000000 GH						.0
CF Stej 900.000000 MH Auto Ma						10
Freq Offse 0 H						.0
Scale Type).0
Log <u>Lir</u>	Stop 10.000 GHz 60 ms (18001 pts)	Sweep 15	3.0 MHz	#VBW :		art 1.000 C tes BW 1.0

Plot 7-12. Conducted Spurious Plot (Cellular WCDMA Mode - High Channel)

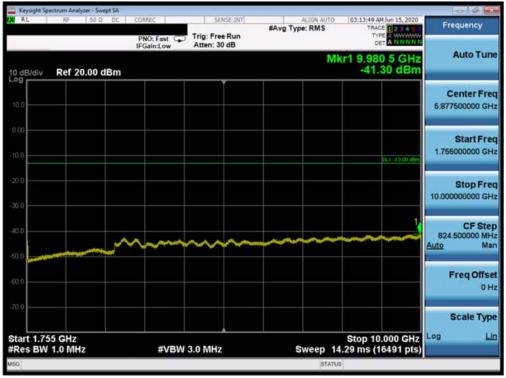
FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dage 10 of 59	
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AWS WCDMA Mode

Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO	03:13:28 AM Jun 15, 2020	Frequency
	PNO: Fast G	Trig: Free Run Atten: 30 dB	#Avg Type: RMS	TRACE 2 2 4 5 1 TYPE A WWWWWW DET ANNNNN	
0 dB/div Ref 20.00 dBm			Mk	r1 1.705 0 GHz -34.59 dBm	Auto Tur
10.0					Center Fre 867.500000 MH
0.0				DL1 -13 00 oBes	Start Fre 30.000000 Mi
0.0				1	Stop Fre 1.705000000 G
0.0					CF Ste 167.500000 Mi Auto Mi
0.0		nga jaran katalar kata			Freq Offs 01
0.0					Scale Typ
tart 0.0300 GHz Res BW 1.0 MHz	#VBW :	3.0 MHz	Sweep 2	Stop 1.7050 GHz .233 ms (3351 pts)	Log L
G			STATUS		

Plot 7-13. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)

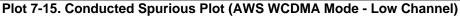


Plot 7-14. Conducted Spurious Plot (AWS WCDMA Mode - Low Channel)

FCC ID: A3LSMT978U	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 59	
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Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO	03:14:20 AM Jun 15, 2020	0 4 43
	PNO: Fast C	Trig: Free Run Atten: 20 dB	#Avg Type: RMS	TRACE 2 3 4 5 6 TYPE A WWWWW DET A NNNNN	Frequency
dB/div Ref 10.00 dBm			Mkr	1 19.562 0 GHz -46.37 dBm	Auto Tun
					Center Fre 15.000000000 GH
0.0				CL1-13.00 dBm	Start Fre 10.000000000 GH
10 10					Stop Fre 20.000000000 GH
					CF Ste 1.000000000 GH Auto Ma
2.0					Freq Offs 0 F
art 10.000 GHz Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 17	Stop 20.000 GHz .33 ms (20001 pts)	Scale Typ Log L

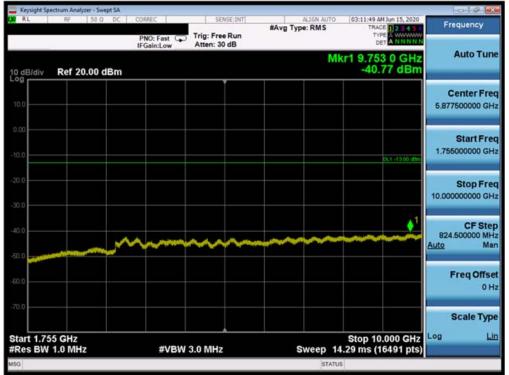


Keysight Spectrum Analyzer - Swept SA RL RF 50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO	03:11:36 AM Jun 15, 2020	
	PNO: Fast	Trig: Free Run Atten: 30 dB	#Avg Type: RMS	TRACE 2 3 4 5 P TYPE A WWWWWW DET A NNNNN	Frequency
IO dB/div Ref 20.00 dBm			MI	r1 1.710 0 GHz -49.31 dBm	Auto Tun
10.0					Center Fre 870.000000 MH
0.00				DL1 -13 00 dBm	Start Fre 30.000000 MH
20.0					Stop Fre 1.710000000 GP
50.0				1	CF Ste 168.000000 Mi <u>Auto</u> Mi
50.0			and a second		Freq Offs 01
70.0					Scale Typ
Start 0.0300 GHz Res BW 1.0 MHz	#VBW :	3.0 MHz	Sweep 2	Stop 1.7100 GHz .240 ms (3361 pts)	Log
sg			STATUS		

Plot 7-16. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
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Plot 7-17. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)



Plot 7-18. Conducted Spurious Plot (AWS WCDMA Mode - Mid Channel)

FCC ID: A3LSMT978U	Potest Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 22 of 59
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	03:15:12 AM Jun 15, 2020	ALIGN AUTO	SENSE:INT	CORREC	2 DC	RF 50 0	RL
ANNNN	TYPE A WANNER DET A NNNNN	#Avg Type: RMS	Trig: Free Run Atten: 30 dB	PNO: Fast			
5 GHz Auto Tu 0 dBm	r1 1.579 5 GHz -50.10 dBm	M			dBm	Ref 20.00	0 dB/div
Center F 870.000000 M							10.0
Start F 30.000000 M	04,1 -13 00 dBm						10.00
Stop F 1.710000000							30.0
CF S 168.000000 M Auto	↓ ¹						0.0
Freq Off			an 1949 an an Angel an Anna an Angel an	*****	****	an bill darma fra y angan galaman biyangan	0.0
00 GHz Log	Stop 1.7100 GHz						70.0 Start 0.03
361 pts)	.240 ms (3361 pts)	Sweep 2	3.0 IVIHZ	#VBW 3		1.0 MHz	Res BW

Plot 7-19. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)



Plot 7-20. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)

FCC ID: A3LSMT978U	Post to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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RL	RF 50	Ω DC	CORREC		SENSE:INT	AL	IGN AUTO	03:16:05 A	4 Jun 15, 2020	1.000	ang palantang ang
			PNO: Fast		ree Run 20 dB	#Avg Type:	RMS	TRAC TVI DI	E 2 3 4 5 1 E A WWWWW A NNNNN		quency
0 dB/div	Ref 10.00	dBm					Mkr	1 19.57 -46.	2 0 GHz 45 dBm		Auto Tune
100											enter Fred
0.0									0L1 -13.00 dBm	10.000	Start Fre
0.0									1	20.000	Stop Fre
0.0	~~~	~~~					P10-710-770			1.000 <u>Auto</u>	CF Ste 000000 GH Ma
0.0										F	F req Offs e 0 H
30.0											Scale Typ
tart 10.000 Res BW 1.			#\	/BW 3.0 MH	Iz	Sw	eep 17	Stop 20 .33 ms (2	.000 GHz 0001 pts)	Log	Li

Plot 7-21. Conducted Spurious Plot (AWS WCDMA Mode - High Channel)

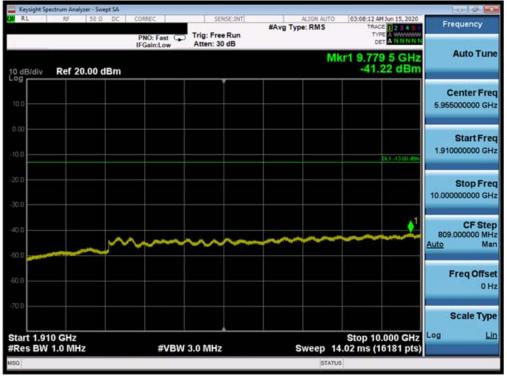
FCC ID: A3LSMT978U	PCTEST Houd to be part of Comment	MEASUREMENT REPORT (CERTIFICATION)	MSUNG	Approved by: Quality Manager
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PCS WCDMA Mode

Keysight Spectrum Analyzer - Swept SA		I design and			0 6
RL RF 50 Ω DC	PNO: Fast	Trig: Free Run Atten: 30 dB	#Avg Type: RMS	03:07:51 AM Jun 15, 2020 TRACE 2 3 4 5 TYPE A WWWWW DET A NNNN N	Frequency
IQ dB/div Ref 20.00 dBm		Atten. 30 GB	M	r1 1.845 0 GHz -35.16 dBm	Auto Tun
10.0					Center Fre 937.500000 MH
0.00				DL1 -13 00 dBe	Start Fre 30.000000 MH
30.0				1	Stop Fre 1.845000000 GF
40.0					CF Ste 181.500000 MH Auto Ma
50.0		ang bin contributing games and data	and a second	a da da para para da p	Freq Offs 0 F
70.0					Scale Typ
Start 0.0300 GHz Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 2	Stop 1.8450 GHz .420 ms (3631 pts)	Log L
ISG			STATUS		

Plot 7-22. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)



Plot 7-23. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Swept S RL RF 50 Ω D		SENSE:INT	ALIGN AUTO	03:08:44 AM Jun 15, 2020	0.0
RL Nr 30.0 0	PNO: Fast	Trig: Free Run Atten: 20 dB	#Avg Type: RMS	TRACE 2 2 4 5 TYPE A WWWWW DET A NNNNN	Frequency
0 dB/div Ref 10.00 dBr	n		Mkr	1 19.557 0 GHz -46.23 dBm	Auto Tun
0,00					Center Fre 15.00000000 GH
20.0				0L1-13.00 dBm	Start Fre 10.000000000 GH
10.0					Stop Fre 20.00000000 GH
					CF Ste 1.00000000 GH Auto Ma
0.0					Freq Offs 0 F
30.0					Scale Typ
tart 10.000 GHz Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 17	Stop 20.000 GHz .33 ms (20001 pts)	Log <u>L</u>
90			STATUS		

Plot 7-24. Conducted Spurious Plot (PCS WCDMA Mode - Low Channel)

Mikr1 Rf S0 Ω DC CORREC SENSE:INT ALLON AUTO 03:36513 AM Jan 15, 2020 PNO: Fast Trig: Free Run Trig: Free Run Trig: Trace 12.34 Man 15, 2020 IPNO: Fast Trig: Free Run Atten: 30 dB Trig: AN Jan 15, 2020 Mikr1 1.8550 0 GHz -49.68 dBm 10 dE/div Ref 20.00 dBm -49.68 dBm 000 000 -20.0 0.0	Auto Tune Center Free 940.000000 MH
10 dB/div Ref 20.00 dBm -49.68 dBm	Center Fre
-10 0	
	Start Fre 30.000000 MH
30.0	Stop Fre 1.85000000 GF
	CF Ste 182.000000 MH <u>ito</u> Ma
	Freq Offs 0 H
	Scale Typ
Start 0.0300 GHz Stop 1.8500 GHz #Res BW 1.0 MHz #VBW 3.0 MHz Sweep 2.427 ms (3641 pts)	

Plot 7-25. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Swept SA					
RL RF S0Ω DC	PNO: Fast	SENSE:INT	#Avg Type: RMS	03:05:36 AM Jun 15, 2020 TRACE 2 3 4 5 0 TYPE A WINN N	Frequency
10 dB/div Ref 20.00 dBm	IFGain:Low	Atten: 30 dB	M	r1 9.757 0 GHz -41.13 dBm	Auto Tune
10.0					Center Free 5.955000000 GH
0.00				0c.1 -13 00 attes	Start Free 1.910000000 GH
20.0					Stop Free 10.000000000 GH
	~~~~			¹	CF Step 809.000000 MH <u>Auto</u> Ma
60.0					Freq Offse 0 H
70.0					Scale Type
Start 1.910 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 14	Stop 10.000 GHz .02 ms (16181 pts)	Log <u>Lir</u>

Plot 7-26. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)



Plot 7-27. Conducted Spurious Plot (PCS WCDMA Mode - Mid Channel)

FCC ID: A3LSMT978U	Post to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager	
Test Report S/N:	Test Dates:	EUT Type:		Dega 07 of 59	
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RL RF 50 Q DC	CORREC	SENSE:INT	ALIGN AUTO	03:09:38 AM Jun 15, 2020	Frequency
	PNO: Fast 😱	Trig: Free Run Atten: 30 dB	#Avg Type: RMS	TYPE A WWWWW DET A NNNNN	Frequency
dB/div Ref 20.00 dBm			M	r1 1.839 0 GHz -49.94 dBm	Auto Tune
0.0					Center Fred 940.000000 MHz
0.0				DL1 -13 00 dBm	Start Free 30.000000 MH
					Stop Fre 1.850000000 GH
				1	CF Ste 182.000000 MH Auto Ma
0.0					Freq Offse 0 H
					Scale Type
tart 0.0300 GHz Res BW 1.0 MHz	#VBW	3.0 MHz	Sweep 2	Stop 1.8500 GHz .427 ms (3641 pts)	Log <u>Li</u>

Plot 7-28. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)



Plot 7-29. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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RL	RF 50 Ω	DC	CORREC		SENSE:INT	A	LIGN AUTO	03:10:30 A	M Jun 15, 2020	11.000	10000000
			PNO: Fast IFGain:Low		ree Run 20 dB	#Avg Type	RMS	TRAC TVI DI	E 2 3 4 5 6 A WWWWW A NNNN		quency
0 dB/div	Ref 10.00 c	lBm					Mkr	1 19.59 -46.	4 5 GHz 42 dBm		Auto Tuni
3.00											enter Fre
0.0									0L1 -13.00 dBn		Start Fre
0.0											Stop Fre
	~~~~			angada pengatuka	********		picologica		anatary Produce	1.0000 Auto	CF Ste 000000 GH Ma
0.0										F	req Offso 0 H
30.0											cale Typ
tart 10.000 Res BW 1.			#V	BW 3.0 MH	lz	Sv	veep 17	Stop 20 .33 ms (2	.000 GHz 0001 pts)	Log	Li

Plot 7-30. Conducted Spurious Plot (PCS WCDMA Mode - High Channel)

FCC ID: A3LSMT978U	PCTEST Houd to be part of Comment	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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7.4 Band Edge Emissions at Antenna Terminal

Test Overview

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

The minimum permissible attenuation level of any spurious emission is 43 + 10 log₁₀(P_[Watts]), where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

Test Settings

- 1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
- 2. Span was set large enough so as to capture all out of band emissions near the band edge
- 3. RBW \geq 1% of the emission bandwidth
- 4. VBW ≥ 3 x RBW
- 5. Detector = RMS
- 6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
- 7. Trace mode = trace average
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

Test Notes

Per 22.917(b), 24.238(b), 27.53(h)(3), and RSS-132(5.5), RSS-133(6.5), RSS-139(6.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

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Cellular WCDMA Mode



Plot 7-31. Band Edge Plot (Cellular WCDMA Mode - Low Channel)



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AWS WCDMA Mode



Plot 7-33. Band Edge Plot (AWS WCDMA Mode - Low Channel)

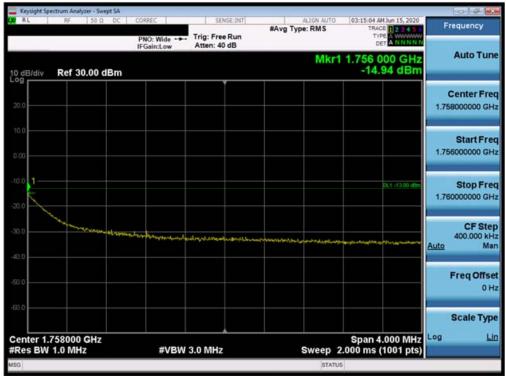


FCC ID: A3LSMT978U	PCTEST Proud to be part of @ elemented	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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RL RL	ctrum Analyzer - Swept SA RF 50 Ω DC	CORREC	SENSE:INT	ALIGN AUTO	03:14:51 AM Jun 15, 2020	0 9 4
RL.	NP 30.52 UC	PNO: Wide	Trig: Free Run Atten: 40 dB	#Avg Type: RMS	TRACE 2 2 4 5 TYPE A WWWWW DET A NNNNN	Frequency
0 dB/div	Ref 30.00 dBm			Mkr1	1.755 000 GHz -19.12 dBm	Auto Tun
20.0						Center Fre 1.755000000 GH
10.0	(~~~~~	\sim			Start Fre 1.747500000 GH
0.0			1		0L1 -13 00 aBn	Stop Fre 1.762500000 GH
0.0			h	M		CF Ste 1.500000 MH Auto Ma
50.0				· ·····		Freq Offse 0 H
center 1.7	'55000 GHz 100 kHz	#VBW	300 kHz	Sweep 1	Span 15.00 MHz .000 ms (1001 pts)	Scale Typ Log <u>Li</u>
50				STATU		

Plot 7-35. Band Edge Plot (AWS WCDMA Mode - High Channel)



Plot 7-36. 4MHz Span Plot (AWS WCDMA Mode - High Channel)

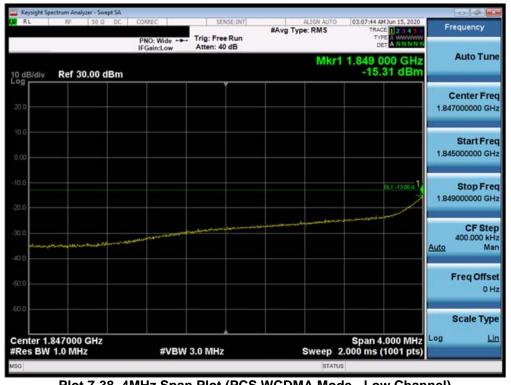
FCC ID: A3LSMT978U	PCTEST Proud to be part of @ elemented	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Daga 22 of 59
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PCS WCDMA Mode



Plot 7-37. Band Edge Plot (PCS WCDMA Mode - Low Channel)



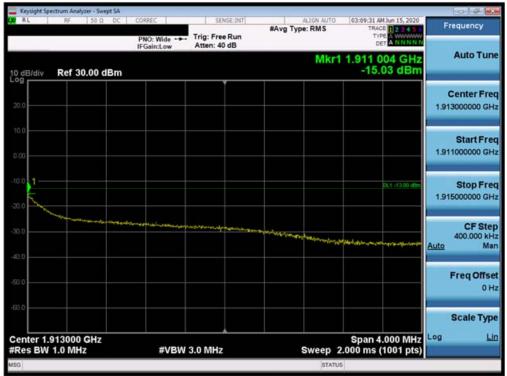
Plot 7-38. 4MHz Span Plot (PCS WCDMA Mode - Low Channel)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Keysight Spectrum Analyzer - Swept SA	1				0 9 0
RL RF 50.0 DC	PNO: Wide	Trig: Free Run Atten: 40 dB	#Avg Type: RMS	03:09:20 AM Jun 15, 2020 TRACE 2 2 3 4 5 TYPE A WANN N N	Frequency
0 dB/div Ref 30.00 dBm		Alleli 40 0D	Mkr1	1.910 000 GHz -19.79 dBm	Auto Tun
20.0					Center Free 1.910000000 GH
0.00		~			Start Fre 1.902500000 GH
0.0		1		01.1 -13 00 dBn	Stop Fre 1.917500000 GH
		h			CF Ste 1.500000 MH Auto Ma
50.0			<u></u>		Freq Offse 0 H
© 0 Center 1.910000 GHz Res BW 100 kHz	#VBW	300 kHz	Sweep 7	Span 15.00 MHz 1.000 ms (1001 pts)	Scale Typ
96			STATU	s	

Plot 7-39. Band Edge Plot (PCS WCDMA Mode - High Channel)



Plot 7-40. 4MHz Span Plot (PCS WCDMA Mode - High Channel)

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7.5 Peak-Average Ratio

Test Overview

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

Test Procedure Used

KDB 971168 D01 v03r01 - Section 5.7.1

Test Settings

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

Test Setup

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



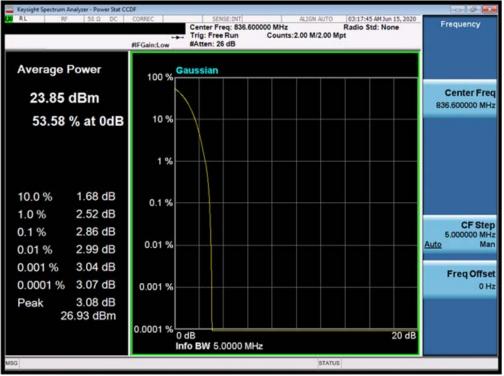
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

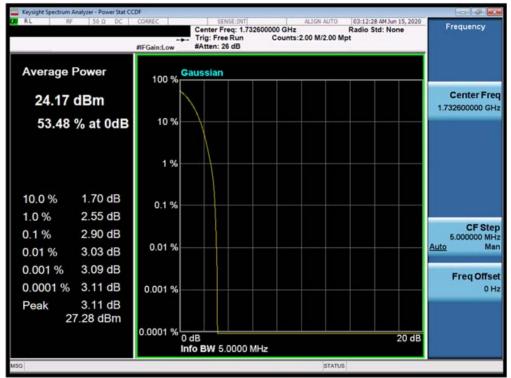
None

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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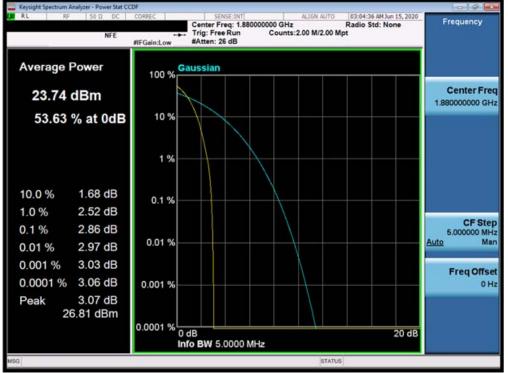
Plot 7-41. Peak-Average Ratio Plot (Cellular WCDMA Mode)



Plot 7-42. Peak-Average Ratio Plot (AWS WCDMA Mode)

FCC ID: A3LSMT978U	POLICEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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Plot 7-43. Peak-Average Ratio Plot (PCS WCDMA Mode)

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7.6 Radiated Power (ERP/EIRP)

Test Overview

Effective Radiated Power (ERP) and Equivalent Isotropic Radiated Power (EIRP) 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. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized tuned broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

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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Test Setup

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

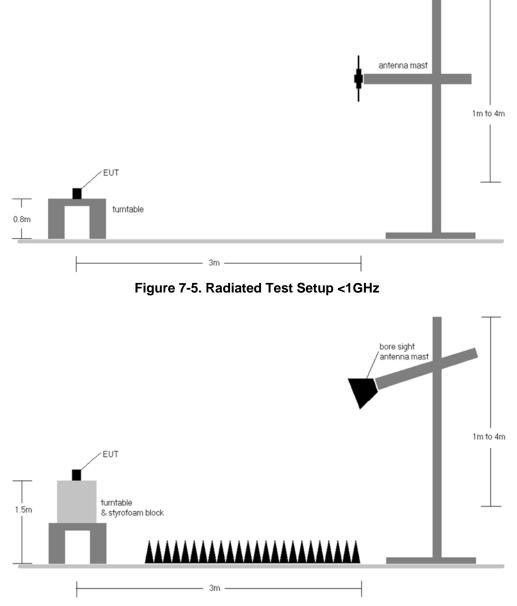


Figure 7-6. Radiated Test Setup >1GHz

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Test Notes

- This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, and HSUPA capabilities. For WCDMA and HSUPA transmission, all configurations were investigated and the worst case UMTS emissions were found in RMC WCDMA mode at 12.2kbps with HSDPA inactive and TPC bits all set to "1."
- 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.

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
826.40	WCDMA850	v	139	138	15.16	6.37	19.38	38.45	-19.07	21.53	40.61	-19.07
836.60	WCDMA850	v	155	130	14.97	6.38	19.20	38.45	-19.25	21.35	40.61	-19.26
846.60	WCDMA850	v	147	52	14.23	6.48	18.56	38.45	-19.89	20.71	40.61	-19.89
826.40	WCDMA850	н	199	348	14.14	6.77	18.76	38.45	-19.69	20.91	40.61	-19.70

Table 7-2. ERP/EIRP (Cellular WCDMA)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1712.40	WCDMA1700	v	157	118	14.39	9.37	23.76	30.00	-6.24
1732.60	WCDMA1700	V	199	125	15.08	9.22	24.30	30.00	-5.70
1752.60	WCDMA1700	V	184	106	14.43	9.11	23.54	30.00	-6.46
1732.60	WCDMA1700	н	123	348	14.79	9.34	24.13	30.00	-5.87

Table 7-3. EIRP (AWS WCDMA)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP Limit [dBm]	Margin [dB]
1852.40	WCDMA1900	v	207	107	14.33	9.92	24.25	33.01	-8.76
1880.00	WCDMA1900	V	159	91	14.49	10.13	24.62	33.01	-8.39
1907.60	WCDMA1900	V	338	87	13.60	10.33	23.93	33.01	-9.08
1880.00	WCDMA1900	н	101	21	14.31	9.93	24.24	33.01	-8.77

Table 7-4. EIRP (PCS WCDMA)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ elemented	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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7.7 Radiated Spurious Emissions Measurements

Test Overview

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

Test Procedures Used

KDB 971168 D01 v03r01 - Section 5.8

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

Test Settings

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

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ elemented	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.

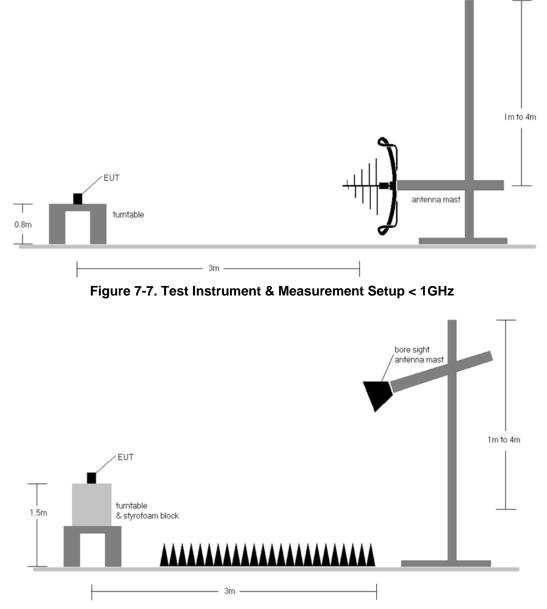


Figure 7-8. Test Instrument & Measurement Setup >1 GHz

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ elemented	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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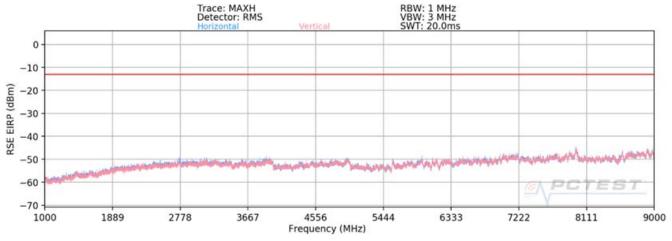
Test Notes

- This device employs UMTS technology with WCDMA (AMR/RMC), HSDPA, and HSUPA capabilities. For WCDMA and HSUPA transmission, all configurations were investigated and the worst case UMTS emissions were found in RMC WCDMA mode at 12.2kbps with HSDPA inactive and TPC bits all set to "1."
- 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 spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 6) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	NG	Approved by: Quality Manager
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Cellular WCDMA Mode



Plot 7-44. Radiated Spurious Plot above 1GHz (Cellular WCDMA Mode)

OPERATING FREQUENCY:	82	6.40	MHz
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1652.80	Н	-	-	-68.82	3.09	-65.72	-52.7
2479.20	Н	-	-	-66.49	3.91	-62.59	-49.6
3305.60	Н	-	-	-68.53	6.00	-62.53	-49.5

Table 7-5. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4132)

FCC ID: A3LSMT978U	PCTEST*	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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OPERATING FREQUENCY:	83	6.60	MHz
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1673.20	Н	-	-	-68.65	3.10	-65.55	-52.5
2509.80	Н	-	-	-66.17	4.02	-62.15	-49.1
3346.40	Н	-	-	-67.97	6.03	-61.94	-48.9

Table 7-6. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4183)

OPERATING FREQUENCY:	84	6.60 MHz
MODULATION SIGNAL:	WCDMA	
DISTANCE:	3	meters
LIMIT:	-13	_dBm

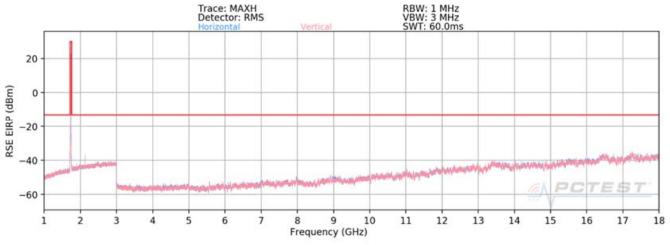
Frequenc [MHz]	y Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1693.20	Н	-	-	-69.08	3.17	-65.91	-52.9
2539.80	н	-	-	-66.43	4.13	-62.30	-49.3
3386.40	Н	-	-	-67.96	6.20	-61.76	-48.8

Table 7-7. Radiated Spurious Data (Cellular WCDMA Mode – Ch. 4233)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ ehimmed	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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AWS WCDMA Mode



Plot 7-45. Radiated Spurious Plot above 1GHz (AWS WCDMA Mode)

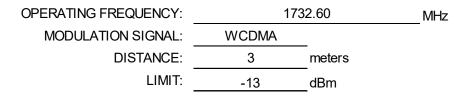
OPERATING FREQUENCY:	171	12.40	MHz
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3424.80	Н	-	-	-68.26	6.27	-61.99	-49.0
5137.20	Н	-	-	-69.80	8.94	-60.86	-47.9
6849.60	Н	-	-	-69.62	9.44	-60.17	-47.2

Table 7-8. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1312)

FCC ID: A3LSMT978U	Pound to be part of @ element	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]
3465.20	Н	-	-	-69.32	6.35	-62.96	-50.0
5197.80	Н	-	-	-70.87	9.05	-61.82	-48.8
6930.40	Н	-	-	-70.22	9.38	-60.84	-47.8

Table 7-9. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1413)

175	52.60	MHz
WCDMA	_	
3	meters	
-13	_dBm	
	WCDMA 3	<u>3</u> meters

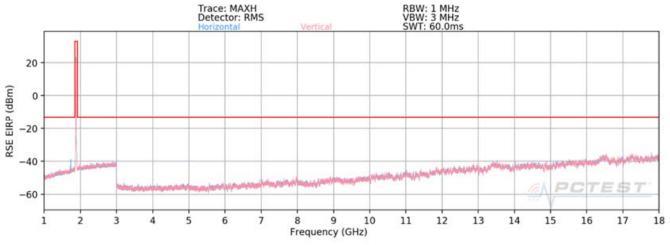
F	requency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
	3505.20	Н	-	-	-68.48	6.50	-61.98	-49.0
	5257.80	Н	-	-	-71.08	8.96	-62.12	-49.1
	7010.40	Н	-	-	-68.40	9.14	-59.25	-46.3

Table 7-10. Radiated Spurious Data (AWS WCDMA Mode – Ch. 1513)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	NG	Approved by: Quality Manager
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PCS WCDMA Mode



Plot 7-46. Radiated Spurious Plot above 1GHz (PCS WCDMA Mode)

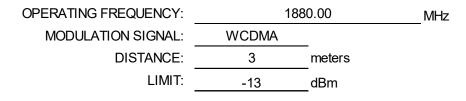
RATING FREQUENCY:	185	52.40	MHz
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13	dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3704.80	Н	-	-	-68.26	6.89	-61.37	-48.4
5557.20	Н	-	-	-70.15	9.03	-61.12	-48.1
7409.60	Н	-	-	-68.62	9.23	-59.39	-46.4

Table 7-11. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9262)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	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]
3760.00	Н	-	-	-69.20	6.93	-62.27	-49.3
5640.00	Н	-	-	-70.83	9.15	-61.68	-48.7
7520.00	Н	-	-	-69.32	9.31	-60.01	-47.0

Table 7-12. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9400)

OPERATING FREQUENCY:	190	07.60	MHz
MODULATION SIGNAL:	WCDMA	_	
DISTANCE:	3	meters	
LIMIT:	-13	_dBm	

Frequency [MHz]	Ant. Pol. [H/V]	Pol. Height Azim		Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3815.20	Н	-	-	-69.05	7.09	-61.96	-49.0
5722.80	Н	-	-	-70.06	9.04	-61.03	-48.0
7630.40	Н	-	-	-67.73	9.28	-58.45	-45.4

Table 7-13. Radiated Spurious Data (PCS WCDMA Mode – Ch. 9538)

FCC ID: A3LSMT978U	PCTEST	MEASUREMENT REPORT (CERTIFICATION)	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.

For Part 22, RSS-132, and RSS-133, the frequency stability of the transmitter shall be maintained within $\pm 0.00025\%$ (± 2.5 ppm) of the center frequency. For Part 24, Part 27, and RSS-139, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

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

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
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OPERATING FREQUENCY:	836,600,000	Hz
CHANNEL:	4183	
REFERENCE VOLTAGE:	4.33	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	836,599,893	-107	-0.0000128
100 %		- 20	836,599,825	-175	-0.0000209
100 %		- 10	836,600,180	180	0.0000215
100 %		0	836,600,117	117	0.0000140
100 %		+ 10	836,600,000	0	0.0000000
100 %		+ 20	836,599,983	-17	-0.0000020
100 %		+ 30	836,599,736	-264	-0.0000316
100 %		+ 40	836,599,868	-132	-0.0000158
100 %		+ 50	836,599,955	-45	-0.0000054
BATT. ENDPOINT	3.38	+ 20	836,600,132	132	0.0000158

Table 7-14. Frequency Stability Data (Cellular WCDMA Mode – Ch. 4183)

FCC ID: A3LSMT978U	PCTEST houd to be part of entirement	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004230075-02-R1.A3L	Test Dates: 4/26 - 07/29/2020	EUT Type: Portable Tablet		Page 52 of 58
1M2004230075-02-R1.A3L	4/20 - 07/29/2020			V 0 0 02/01/2010



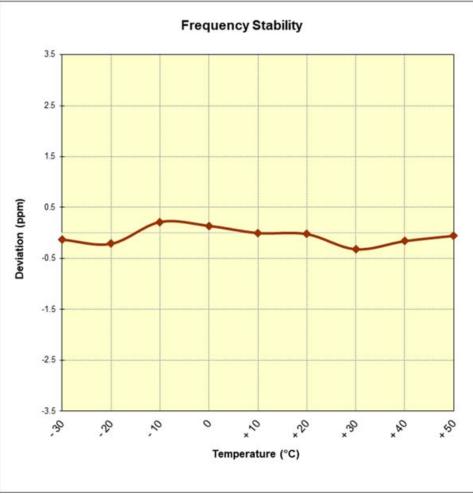


Figure 7-9. Frequency Stability Graph (Cellular WCDMA Mode – Ch. 4183)

FCC ID: A3LSMT978U	Poud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 52 of 59
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Frequency Stability / Temperature Variation

	VOLTAGE		TEMP	FREQUENCY	Freq. Dev.	Deviation
	REFERENCE VOLTAGE:		4.33		VDC	
	С	HANNEL:		1413	_	
OPERATING FREQUENCY:		1,732,600,000		Hz		

(%)	(VDC)	(°C)	(Hz)	(Hz)	(%)
100 %	4.33	- 30	1,732,599,940	-60	-0.0000035
100 %		- 20	1,732,599,937	-63	-0.0000036
100 %		- 10	1,732,600,128	128	0.0000074
100 %		0	1,732,600,296	296	0.0000171
100 %		+ 10	1,732,599,897	-103	-0.0000059
100 %		+ 20	1,732,600,002	2	0.0000001
100 %		+ 30	1,732,599,801	-199	-0.0000115
100 %		+ 40	1,732,599,738	-262	-0.0000151
100 %		+ 50	1,732,600,001	1	0.0000001
BATT. ENDPOINT	3.38	+ 20	1,732,599,836	-164	-0.0000095
		_		_	

 Table 7-15. Frequency Stability Data (AWS WCDMA Mode – Ch. 1413)

Note:

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

FCC ID: A3LSMT978U	PCTEST Froud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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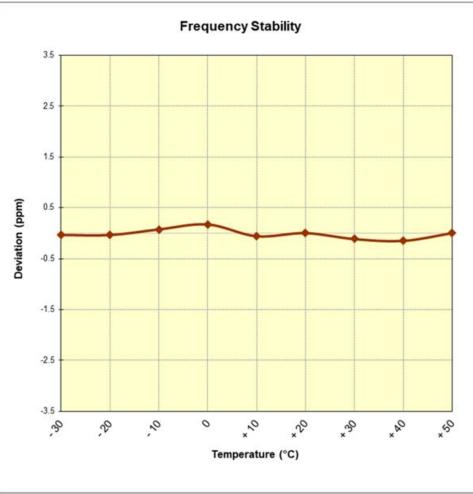


Figure 7-10. Frequency Stability Graph (AWS WCDMA Mode – Ch. 1413)

FCC ID: A3LSMT978U	PCTEST Proud to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Dage 55 of 59
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OPERATING FREQUENCY:	1,880,000,000	Hz
CHANNEL:	9400	
REFERENCE VOLTAGE:	4.33	VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.33	- 30	1,880,000,010	10	0.0000005
100 %		- 20	1,880,000,024	24	0.0000013
100 %		- 10	1,880,000,166	166	0.0000088
100 %		0	1,880,000,062	62	0.0000033
100 %		+ 10	1,879,999,724	-276	-0.0000147
100 %		+ 20	1,880,000,223	223	0.0000119
100 %		+ 30	1,879,999,758	-242	-0.0000129
100 %		+ 40	1,879,999,651	-349	-0.0000186
100 %		+ 50	1,879,999,900	-100	-0.0000053
BATT. ENDPOINT	3.38	+ 20	1,879,999,866	-134	-0.0000071

Table 7-16. Frequency Stability Data (PCS WCDMA Mode – Ch. 9400)

FCC ID: A3LSMT978U	PCTEST Product to be part of @ element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 56 of 58
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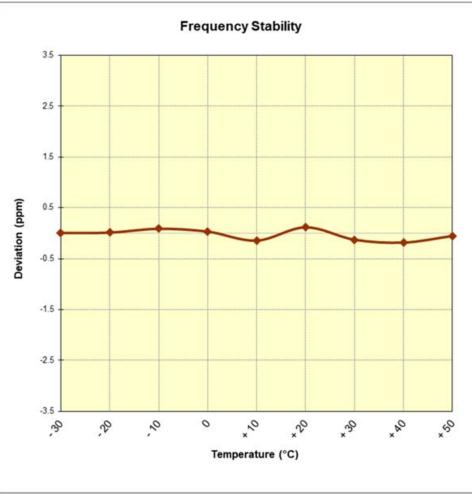


Figure 7-11. Frequency Stability Graph (PCS WCDMA Mode – Ch. 9400)

FCC ID: A3LSMT978U	PCTEST Houd to be part of Generation	MEASUREMENT REPORT (CERTIFICATION)	SUNG	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:		Dage 57 of 59
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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Tablet FCC ID: A3LSMT978U** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules.

FCC ID: A3LSMT978U	PCTEST*	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N:	Test Dates:	EUT Type:	Page 58 of 58
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