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PART 27 MEASUREMENT REPORT

Applicant Name:

Samsung Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-si Gyeonggi-do, 16677, Korea Date of Testing: 06/10/2021 - 07/16/2021 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M2106100066-05.A3L

FCC ID:

Applicant Name:

A3LSMF711JPN

Samsung Electronics Co., Ltd.

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

Certification SC-54B SCG12 Portable Handset PCS Licensed Transmitter Held to Ear (PCE) 27 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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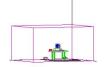


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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Max. Power [W]	Max. Power [dBm]	Emission Designator
	20 MHz	QPSK	2506.0 - 2680.0	0.301	24.79	18M0G7D
		16QAM	2506.0 - 2680.0	0.264	24.22	18M0W7D
		QPSK	2503.5 - 2682.5	0.324	25.10	13M6G7D
TE Band (1/PC2)	15 MHz	16QAM	2503.5 - 2682.5	0.260	24.15	13M5W7D
LTE Band 41(PC3)	10 MHz	QPSK	2501.0 - 2685.0	0.337	25.27	9M04G7D
		16QAM	2501.0 - 2685.0	0.285	24.55	9M00W7D
	5 MHz	QPSK	2498.5 - 2687.5	0.331	25.20	4M51G7D
		16QAM	2498.5 - 2687.5	0.267	24.26	4M51W7D

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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: A3LSMF711JPN**. 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 27.

The Equipment Under Test (EUT) can operate in one of three physical configurations – "Open", "Half open" and "Closed". All emissions are investigated in three modes for compliance, and the worst case radiated emissions data is shown in this report.

Test Device Serial No.: 0879M, 0035M, 0715M, 0716M, 0711M, 0405M, 0080M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz), Bluetooth (1x, EDR, LE), NFC, 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 3.2 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 "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 Power and Radiated Spurious Emissions

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

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

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

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

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

For radiated spurious emissions measurements and calculations, conversion method is used per the formulas in KDB 971168 Section 5.8.4. Field Strength (EIRP) is calculated using the following formulas:

$$\begin{split} E_{[dB\mu V/m]} &= Measured \ amplitude \ level_{[dBm]} + 107 + Cable \ Loss_{[dB]} + Antenna \ Factor_{[dB/m]} \\ And \\ EIRP_{[dBm]} &= E_{[dB\mu V/m]} + 20logD - 104.8; \ where \ D \ is the measurement \ distance \ in \ meters. \end{split}$$

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 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
-	AP2	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	AP2
-	ETS	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	ETS
-	LTx4	Licensed Transmitter Cable Set	3/12/2021	Annual	3/12/2022	LTx4
-	LTx5	LIcensed Transmitter Cable Set	3/3/2021	Annual	3/3/2022	LTx5
Agilent	E5515C	Wireless Communications Test Set		N/A		GB45360985
Agilent	E5515C	Wireless Communications Test Set		N/A		GB46310798
Agilent	N9030A	50GHz PXA Signal Analyzer	1/20/2021	Annual	1/20/2022	US51350301
Anritsu	MT8821C	Radio Communication Analyzer		N/A		6201381794
Anritsu	MT8821C	Radio Communication Analyzer	N/A		6200901190	
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	8/7/2018	Triennial	8/7/2021	9203-2178
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Annual	8/27/2022	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
ETS Lindgren	3816/2NM	LISN	7/9/2020	Biennial	7/9/2022	00114451
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/17/2020	Annual	8/17/2021	MY52350166
Keysight Technologies	N9030A	PXA Signal Analyzer	10/16/2020	Annual	10/16/2021	MY54490576
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	9/17/2020	Annual	9/17/2021	MY57141001
Keysight Technologies	N9038A	MXE EMI Receiver	8/11/2020	Annual	8/11/2021	MY51210133
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A	-	100976
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A		112347	
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/9/2020	Annual	9/9/2021	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	1/21/2021	Annual	1/21/2022	101716
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and Spectrum Analyzer	2/10/2021	Annual	2/10/2022	103187
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/10/2020	Annual	8/10/2021	103200

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

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

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:	A3LSMF711JPN
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	LTE/ULCA

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
0	Occupied Bandwidth	2.1049	RSS-Gen(6.7)	N/A	PASS	Section 7.2
JCTEI	Conducted Band Edge / Spurious Emissions (LTE Band 41)	2.1051, 27.53(m)	RSS-199(4.5)	Undesirable emissions must meet the limits detailed in 27.53(m)	PASS	Sections 7.3, 7.4
CONDUCTED	Transmitter Conducted Output Power	2.1046	RSS-199(4.4)	N/A	PASS	See RF Exposure Report
-	Frequency Stability	2.1055, 27.54	RSS-199(4-3)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
₩	Effective Radiated Power / Equivalent Isotropic Radiated Power (LTE Band 41)	27.50(h)(2)	RSS-199(4.4)	< 2 Watts max. EIRP	PASS	Section 7.6
	Radiated Spurious Emissions (LTE Band 41)	2.1053, 27.53(m)	RSS-199(4.5)	Undesirable emissions must meet the limits detailed in 27.53(m)	PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- All conducted emissions measurements are performed with automated test software to capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST EMC Software Tool v1.0.

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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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Keysight Spectrum Analyzer - Occupied BW					
XURL RF 50Ω DC	Trig	SENSE:INT ter Freq: 2.593000000 GHz : Free Run Avg Holo en: 36 dB	d: 100/100	10:37:44 PM Jun 15, 2021 Radio Std: None Radio Device: BTS	Trace/Detector
10 dB/div Ref 40.00 dBm					
30.0 20.0 10.0		Congress marging and a second s			Clear Wr
0.00 -10.0 -20.0	Jun		manna	warmer for the for the for the for the former of the forme	Avera
40.0					Max Ho
Center 2.59300 GHz Res BW 470 kHz Occupied Bandwidth		#VBW 1.5 MHz	33.8 0	Span 50.00 MHz Sweep 1 ms	Min Ho
	.983 MHz -4.848 kHz	% of OBW Pow		00 %	Detect Pea Auto M
x dB Bandwidth	-4.040 KHZ 19.44 MHz	x dB	-26.00		
SG			STATUS		

Plot 7-1. Occupied Bandwidth Plot (LTE Band 41(PC3) - 20MHz QPSK - Full RB)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 41(PC3) - 20MHz 16-QAM - Full RB)

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🧱 Keysight Spectrum Analyzer - Occupied BW	1						
IXIRL RF 50Ω DC	Trig: I	SENSE:INT Freq: 2.593000000 GHz Free Run Avg Hold n: 36 dB	ALIGN AUTO	11:03:16 PM Radio Std: Radio Devi		Trace	/Detector
10 dB/div Ref 40.00 dBm							
20.0	Jan man mark	Januar Marana				c	lear Write
10.0 0.00 			hannen	un surd mare	مهمته معلوم		Average
-30.0							Max Hold
Center 2.59300 GHz Res BW 360 kHz	#	VBW 1.1 MHz		Swe	7.50 MHz ep 1 ms		Min Hold
	Occupied Bandwidth Total Power 33.7 dBm 13.566 MHz						Detecto Peak
Transmit Freq Error	19.724 kHz	% of OBW Pow	er 99	.00 %		Auto	Mar
x dB Bandwidth	14.73 MHz	x dB	-26.0	00 dB			
MSG			STATUS				





Plot 7-4. Occupied Bandwidth Plot (LTE Band 41(PC3) - 15MHz 16-QAM - Full RB)

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Keysight Spectrum Analyzer - Occupied	BW					_	
LXI RL RF 50Ω DC	CORREC	SENSE:INT er Freg: 2.593000	ALIGN	AUTO 11:14:33 PM Radio Std:	1 Jun 15, 2021	Tracel	Detector
	Trig:	Free Run	Avg Hold: 100/1	100			
,	#IFGain:Low #Atte	en: 36 dB		Radio Devi	ce: BTS		
10 dB/div Ref 40.00 dB	im		i				
Log 30.0							
20.0						C	ear Write
10.0	Law were all a loss	ᢣ᠘ᢞᠾᢖᡨᢤᠬ᠇ᡳᡊ᠇ᠬᠬᡘᡰᢦᠺᡅᠼᡗᢙᡟ	-arrowy				
0.00	1		N.				
-10.0			<u>ار</u>				Average
1 A DO DAD	mon		وسادس الدم	Mundhursonalus	- M		Average
-20.0					a southart		
-30.0							
-40.0							Max Hold
-50.0							
Center 2.59300 GHz				Span 2	5.00 MHz		
Res BW 240 kHz		#VBW 750 kH	lz		ep 1 ms		Min Hold
		T - (- D -		00 5 JB			
Occupied Bandwid		Total Po	ower	33.5 dBm			
9	.0354 MHz						Detector
Tronomit From Freeze	8.935 kHz	% of OD	W Power	99.00 %		Auto	Peak▶ Man
Transmit Freq Error						Auto	<u>Iviari</u>
x dB Bandwidth	9.816 MHz	x dB		-26.00 dB			
MSG				STATUS			

Plot 7-5. Occupied Bandwidth Plot (LTE Band 41(PC3) - 10MHz QPSK - Full RB)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 41(PC3) - 10MHz 16-QAM - Full RB)

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Keysight Spectrum Analyzer - Occupied	BW							
LXIRL RF 50Ω DC		SENSE:INT Center Freg: 2.59300		LIGN AUTO	11:17:28 Pf Radio Std:	1 Jun 15, 2021	Trace	e/Detector
		Trig: Free Run	Avg Hold: 1	100/100				
	#IFGain:Low	#Atten: 36 dB			Radio Dev	ice: BTS		
10 dB/div Ref 40.00 dE	3m							
30.0								
20.0		~^^~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					(Clear Write
10.0		and the second of the second	m					
0.00	1		$\langle \rangle$					
	~ /							Average
-10.0 -20.0			N N	harrow	man M	with a m		/// of ugo
-30.0						0000		
-40.0								
								Max Hold
-50.0							_	
Center 2.593000 GHz					Span 1	2.50 MHz		
Res BW 120 kHz		#VBW 390 k	Hz		Swe	ep 1 ms		Min Hold
		Total P		00 F	dBm			
Occupied Bandwig			ower	33.3	abm			
4	1.5113 MH	Z						Detector
Transmit Freq Error	1.224 kH	- % of O	3W Power	r 00	00 %		Auto	Peak▶ Man
-			JIV I OWEI				/ lato	man
x dB Bandwidth	5.021 MH	z x dB		-26.0	0 dB			
MSG				STATUS				

Plot 7-7. Occupied Bandwidth Plot (LTE Band 41(PC3) - 5MHz QPSK - Full RB)



Plot 7-8. Occupied Bandwidth Plot (LTE Band 41(PC3) - 5MHz 16-QAM - Full RB)

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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.

For Band 41, the minimum permissible attenuation level of any spurious emission is 55 + 10log₁₀(P_[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. Detector = RMS
- 3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
- 4. Sweep time = auto couple
- 5. The trace was allowed to stabilize
- 6. Please see test notes below for RBW and VBW settings

Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

Test Notes

Per Part 27, RSS-195 and RSS-199, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for 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.

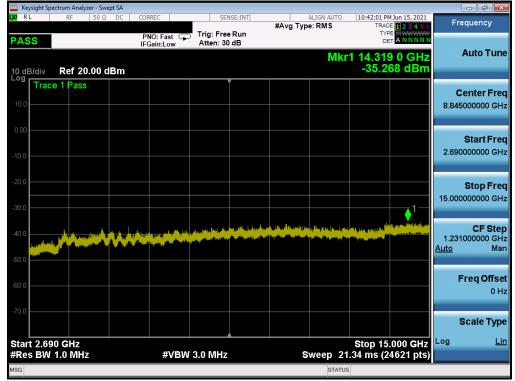
FCC ID: A3LSMF711JPN	PCTEST* Froud to be part of @ element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager	
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LTE Band 41(PC3)

	pectrum Anal												
XU RL	RF	50 Ω	DC	CORREC		SE	NSE:INT		ALIGN AUTO		PM Jun 15, 2021	FI	requency
PASS				PNO: F IFGain:	ast 😱 Low	Trig: Fre Atten: 30		#Avg Typ	e: RIVIS	т	ACE 1 2 3 4 5 6 YPE M WWWWW DET A N N N N N		
I0 dB/div	Ref 2	0.00 d	Bm						N	lkr1 2.38 -41.1	38 0 GHz 198 dBm		Auto Tu
	ce 1 Pas	s					Y						
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0.00											+		
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30.0												2.41	5000000
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70.0													Scole T
													Scale Ty
Start 0.0	30 GHz									Ston	2.475 GHz	Log	
	V 1.0 MH	z			#VBW	3.0 MHz			Sweep	3.260 ms	(4891 pts)		
ISG											· · · · · · · · · · · · · · · · · · ·	-	

Plot 7-9. Conducted Spurious Plot (LTE Band 41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



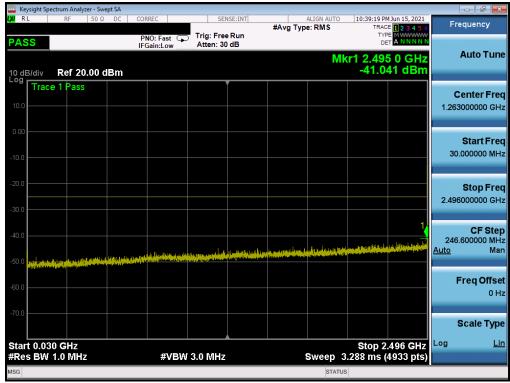
Plot 7-10. Conducted Spurious Plot (LTE Band 41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

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Keysight Spectrur	RF 50 Ω		ORREC	SEN	ISE:INT		ALIGN AUTO	10:42:51 PM	1 Jun 15, 2021	- đ	_
						#Avg Typ		TRAC	E 1 2 3 4 5 6	Frequency	/
PASS			PNO: Fast 🖵 FGain:Low	Trig: Free Atten: 10				DE			
							Mkr	1 26.835	0 GHz	Auto T	ʻur
	ef 0.00 dE	3m						-49.4	16 dBm		
Og Trace 1	Pass			\ \							
										Center F	
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20.0										Start F	En
30.0										15.000000000	
30.0											
40.0											
40.0									1	Stop F	
50.0										27.00000000	G
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90.0											
										Scale T	ÿ
start 15.000	CH-							Stop 27	.000 GHz	Log	L
Res BW 1.0			#VBM	/ 3.0 MHz		s	weep 20	500 27. 1.80 ms (2-	4001 pts)		
SG SG				- 40-			STATUS				_

Plot 7-11. Conducted Spurious Plot (LTE Band 41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-12. Conducted Spurious Plot (LTE Band 41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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RL	RF	- 50 Ω	DC	CORREC	SEI	SE:INT		ALIGN AUTO		1 Jun 15, 2021	-	
					Trig: Free	Pup	#Avg Typ	e:RMS	TRAC		Frequ	ency
PASS				PNO: Fast G IFGain:Low	Atten: 30				DE			
								Mki	1 13.79	0 GHz	Au	to Tur
l0 dB/di	Ref 2	0.00 d	Bm						-35.6	60 dBm		
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												ter Fre
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Res D	W-1.0 IVIH	Z		#VBV	7 J.U MIHZ		8	statu:		aoz i pisj		

Plot 7-13. Conducted Spurious Plot (LTE Band 41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



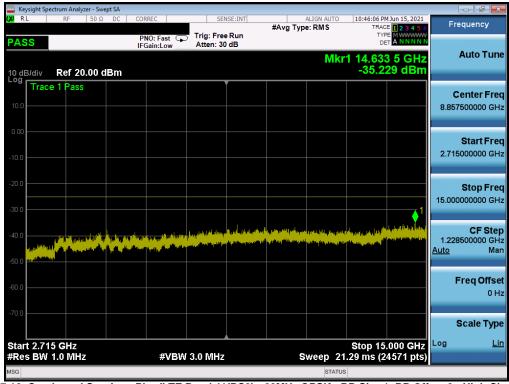
Plot 7-14. Conducted Spurious Plot (LTE Band 41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

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Keysight Spectrum Analyzer - Swept S R RL RF 50 Ω E			I AUTO 10:44:06 PM Jun 15, 2021	
	PNO: Fast 😱 Trig: Fr		AS TRACE 1 2 3 4 5 TYPE MWWWW DET ANNNN	6 Frequency
PASS	IFGain:Low #Atten:	36 dB		
10 dB/div Ref 20.00 dB	m		Mkr1 2.456 0 GH -36.840 dBn	
Og Trace 1 Pass				Center Fr
10.0				1.263000000 G
0.00				Oterst Fr
				Start Fr 30.000000 M
10.0				
20.0				
				Stop Fr 2.496000000 G
30.0				2.49000000 G
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60.0				Freq Offs
				0
70.0				Our la Tu
				Scale Ty
Start 0.030 GHz			Stop 2.496 GH	Log
Res BW 1.0 MHz	#VBW 3.0 MH	z Swe	ep 3.288 ms (4933 pts	

Plot 7-15. Conducted Spurious Plot (LTE Band 41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-16. Conducted Spurious Plot (LTE Band 41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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🔤 Keysight Sp	ectrum Analy	zer - Swep	t SA										- 7 ×
L <mark>XI</mark> RL	RF	50 Ω	DC	CORREC		SE	NSE:INT	#Ava Tu	ALIGN AUT (pe: RMS)		M Jun 15, 2021	Fre	quency
PASS					ast 🖵	Trig: Fre Atten: 10				TY	PE MWWWWW ET A NNNNN		
TAGO				IFGain:	Low	Atten: 10	ab						Auto Tune
	Ref 0.0	00 dB.							IVI	kr1 26.68	37 dBm		
10 dB/div	e 1 Pass		111				•						
Irac	e i Pass											C	enter Fred
-10.0												21.000	000000 GH
-20.0													Start Fred
													000000 GH
-30.0												10.000	
-40.0											<b></b> 1		Stop Free
-50.0											7	27.000	000000 GHz
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-80.0												F	reqOffse 0 Ha
													0 8.
-90.0													
												S	cale Type
Start 15.0	00 GHz						A			Stop 27	.000 GHz	Log	Lir
#Res BW		2			#VBW	3.0 MHz			Sweep	20.80 ms (2	24001 pts)		
MSG										TUS			

Plot 7-17. Conducted Spurious Plot (LTE Band 41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

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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 for Band 41 is as noted in the Test Notes on the following page.

#### 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 for continuous emissions, max hold for pulse emissions
- 8. Sweep time = auto couple
- 9. The trace was allowed to stabilize

#### Test Setup

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



Figure 7-3. Test Instrument & Measurement Setup

#### Test Notes

Per 27.53(m) for operations in the BRS/EBS bands, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth. In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz.

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REYSIG	ght Spectrum F		- <b>3pun</b> 50 Ω		CORRE			SENSE:INT	6000000		ALIGN AUTO	10:49:08 Radio St	PM Jun 15, 2021 td: None	-	uency
PASS	Gat	te: LO			IFGair			Free Run n: 26 dB				Radio D	evice: BTS		
0 dB/	div	Ref 4	0.00	dBm											
30.0 —														Ce	nter Fre
20.0 —														2.5060	00000 GI
10.0								per de la		epinene and		Mar and a state			
0.00 —															
10.0															
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30.0 —				S. Martin	La Barre	a and the second se	pa <mark>lla anna an</mark> na						and a set of the set o		
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50.0															
start	2.471 0	GHz									<u> </u>	Stop	2.521 GHz		
														552.00	CF Ste
Spur	Range	Start F	req	St	op Fre	q	RBW	Frequenc	;y	Ampl	itude	∆ Limit		<u>Auto</u>	M
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2	2	2.4905			950 GI			2.4945800				-8.895 (		Fr	eq Offs
}	3 4	2.4950 2.4960			960 GI 210 GI			2.4959983				-11.29 c			. 0
	4	2.4900	GHZ	Z.J	210 61	12	430.0 KHZ	2.3110000	UU GHZ	1.122		-17.200	JD		

Plot 7-18. Lower ACP Plot (LTE Band 41(PC3) - 20MHz QPSK - Full RB )



Plot 7-19. Upper ACP Plot (LTE Band 41(PC3) - 20MHz QPSK - Full RB )

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		m Analyzer - Spuri										
DAS		RF 50 Ω		ORREC	Trig:	SENSE:INT r Freq: 2.50350 Free Run	0000 (	ALIGN AUT	Radio St		Frec	luency
PAS	5			Gain:Low	, #Atte	n: 26 dB			Radio De	evice: BTS		
10 dE Log	3/div	Ref 40.00	dBm									
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-50.0		11 Margaret Market										
Star	t 2.477	<u>сп</u> 2							Ston	2.515 GHz		
Stai	1 2.477	GUT							Stop	Z.J IJ GHZ		CF Step 00000 MHz
Spu	r   Range	Start Freq	Stop	Freq	RBW	Frequency		Amplitude	∆ Limit		<u>Auto</u>	Man
1	1	2.4773 GHz		5 GHz		2.490124583			-1.345 d			
2	2	2.4905 GHz		0 GHz		2.494910000			-11.14 d		Fr	eq Offset
3	3	2.4950 GHz		0 GHz 8 GHz		2.495955000 2.502843750			-13.55 d			0 Hz
4	4	2.4900 GHZ	2.314	OGHZ	300.0 KHZ	2.302643730	GHZ	5.509 dBm	-10.03 0	D		
MSG							_	STA	TUS		-	
		DI / 7										

Plot 7-20. Lower ACP Plot (LTE Band 41(PC3) - 15MHz QPSK - Full RB )



Plot 7-21. Upper ACP Plot (LTE Band 41(PC3) - 15MHz QPSK - Full RB )

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Key: Key:	sight Spectrum F	n Analyzer - Sj F 50 9		issions CORREC			SENSE:INT Freq: 2.50100	0000 G		ALIGN AUTO			PM Jun 15, 2021 d: None		uency
PAS	S Gat	e: LO		IFGain:	Low		Free Run n: 30 dB				Rad	dio De	vice: BTS		
0 dE	1.1	Ref 40.0	00 dB.	~											
og		Kei 40.													
30.0															nter Fre
20.0 10.0														2.50100	0000 GH
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50.0															
Star	2.484 0	GHz									S	itop 2	2.509 GHz		CF Ste 0000 M⊦
Spur	Range	Start Fre	eq S	top Free	RB	W	Frequency		Ampli	tude	Δ	Limit		<u>Auto</u>	Ma
	1	2.4835 G		4905 GH			2.490476667 (					269 dl			
2	2	2.4905 G		4950 GH			2.495000000					802 d		Fre	q Offs
3 1	3	2.4950 G 2.4960 G		4960 GH			2.495905000 2.503645833					.07 dl 6.79 dl			0H
+	4	2.4900 G	ΠZ [Ζ.	3063 GH	Z  200	U KHZ	2.303043633 (	GHZ JC	0.Z14 (		- 10	).79 u			

Plot 7-22. Lower ACP Plot (LTE Band 41(PC3) - 10MHz QPSK - Full RB )



Plot 7-23. Upper ACP Plot (LTE Band 41(PC3) - 10MHz QPSK - Full RB )

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Plot 7-24. Lower ACP Plot (LTE Band 41(PC3) - 5MHz QPSK - Full RB )



Plot 7-25. Upper ACP Plot (LTE Band 41(PC3) - 5MHz QPSK - Full RB )

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# 7.5 Uplink Carrier Aggregation §27.53(m)

#### **Test Overview**

The EUT is set up to transmit two contiguous LTE channels. The power level of both carriers 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 its maximum duty cycle, 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 Band 41, the minimum permissible attenuation level of any spurious emission is 55 + 10 log₁₀(P_[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 at least 10 * the fundamental frequency (separated into at least two plots per channel)
- 2. Detector = RMS
- 3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
- 4. Sweep time = auto couple
- 5. The trace was allowed to stabilize
- 6. Please see test notes below for RBW and VBW settings

#### Test Setup

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



Figure 7-4. Test Instrument & Measurement Setup

#### Test Notes

- Conducted power and spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device. The worst case (highest) powers were found while operating with QPSK modulation with both carriers set to transmit using 1RB.
- 2. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. 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.

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# Uplink CA Configuration 41C

		Bandwidth	PCC					SCC					ULCA Tx.
		(PCC + SCC)	Modulation	UL Channel	UL Frequency	UL # RB	UL RB Offset	Modulation	UL Channel	UL Frequency	UL # RB	UL RB Offset	Power [dBm]
			QPSK	39750	2506.0	1	99	QPSK	39948	2525.8	1	0	24.06
				40620	2593.0	1	99		40818	2612.8	1	0	24.18
Max	LTE B41 (PC3)	20MHz + 20MHz		41490	2680.0	1	0		41292	2660.2	1	99	24.7
IVICIA	Max LTE B4T (PC3)		QPSK	41490	2680	100	0	QPSK	41292	2660.2	100	0	22.03
		16-QAM	41490	2680	100	0	16-QAM	41292	2660.2	100	0	20.93	
			64-QAM	41490	2680	100	0	64-QAM	41292	2660.2	100	0	20.69

Table 7-2. Conducted Power Data (ULCA LTE B41(PC3))

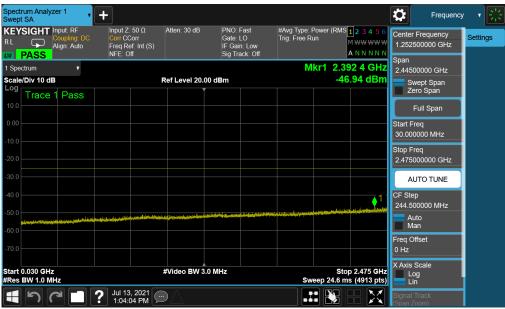
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# ULCA – LTE Band 41 (PC3)

Spectru Swept	um Analy SA	vzer 1	+								Frequency	- * 器
	SIGHT	Input: RF Coupling: DC Align: Auto	Input Ζ: 50 Ω Corr CCorr Freq Ref: Int (S) NFE: Off	Atten: 50 dB	PNO: F Gate: I IF Gair Sig Tra		#Avg Type: F Avg Hold:>10 Trig: Free Ru	10/100 In	123456 MWWWWW ANNNNN		r Frequency 0000000 GHz	Settings
1 Spec		•					Mk		5 80 GHz		00000 MHz	
Scale/	Div 10 d	B		Ref Level 40.	00 dBm			16	.58 dBm		wept Span ero Span	
30.0											Full Span	
20.0		<b>∦</b> 1								Start F 2.496	-req 6000000 GHz	
10.0										Stop F	req	
0.00		] {								2.690	000000 GHz	
-10.0		/ \ <u>.</u>								4	UTO TUNE	
-20.0	Within W		dentala parlanda da antera anter	. IN ANALY CONSTRAINT	nd <i>an tu</i> in did	والبادفار المتعادية	united the state	in itse and itse	l din cindenta	CF St 19.40	ep 10000 MHz	
-30.0											uto Ian	
-40.0										Freq (	Offset	
-50.0										0 Hz X Axis	Scolo	
	.49600 C 3W 1.0 N			#Video BW 3.	.0 MHz*		Swe		2.69000 GHz s (4933 pts)	- L	og in	
	5		<b>?</b> Jul 13, 2021 2:03:01 PM							Signa (Span	<b>Track</b> Zoom)	

Plot 7-26. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



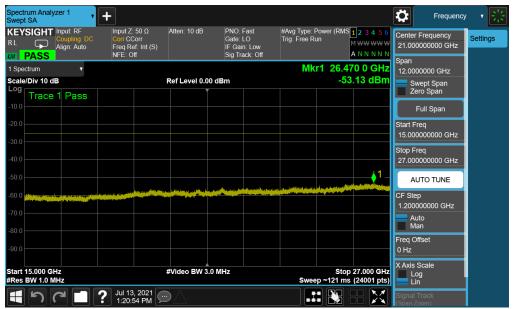
Plot 7-27. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: A3LSMF711JPN	PCTEST* Proud to be part of @ element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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KEYSIGHT  Input: RF    R L  Coupling: DC    Align: Auto  Align: Auto	Input Ζ: 50 Ω Corr CCorr Freq Ref: Int (S) NFE: Off	Atten: 30 dB	PNO: Fast Gate: LO IF Gain: Low Sig Track: Off	#Avg Type: Pow Trig: Free Run	ver (RMS <mark>123456</mark> M <del>WWWWW</del> ANNNNN	Center Frequency 8.845000000 GHz Span	Settings
Spectrum v cale/Div 10 dB		Ref Level 20.00	dBm	Mkr1	14.060 9 GHz -38.95 dBm	12.3100000 GHz Swept Span Zero Span	
10.0 Trace 1 Pass						Full Span	
0.00						Start Freq 2.69000000 GHz	
						Stop Freq 15.000000000 GHz	
30.0					1	AUTO TUNE	
	m					CF Step 1.231000000 GHz	
50.0						Auto Man	
						Freq Offset 0 Hz	
tart 2.690 GHz Res BW 1.0 MHz		#Video BW 3.0	MHz	Sweep 4	Stop 15.000 GHz ~126 ms (24841 pts)		
	<b>?</b> Jul 13, 2021 1:05:36 PM					Signal Track (Span Zoom)	

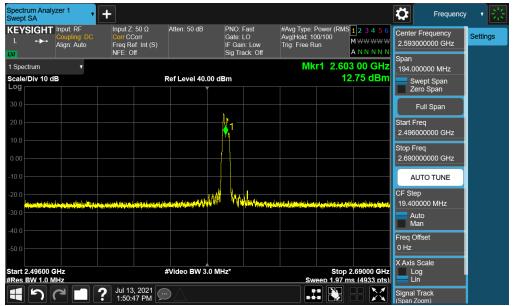
Plot 7-28. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-29. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

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Plot 7-30. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-31. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMF711JPN		PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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KEYSIGHT    Input: RF      RL    Coupling: DC      Align: Auto    Align: Auto	Input Ζ: 50 Ω Corr CCorr Freq Ref: Int (S) NFE: Off	Atten: 30 dB	PNO: Fast Gate: LO IF Gain: Low Sig Track: Off	#Avg Type: Pow Trig: Free Run	er (RMS <mark>1</mark> 2 3 4 5 6 M₩₩₩₩₩ A N N N N N	Center Frequency 8.845000000 GHz	Settings
Spectrum v cale/Div 10 dB		Ref Level 20.00	dBm	Mkr1	14.524 5 GHz -39.17 dBm	Swept Span	L
10.0 Trace 1 Pass						Zero Span Full Span	
10.0						Start Freq 2.690000000 GHz Stop Freq	
20.0						15.00000000 GHz	1
40.0	ىخىلەر بىرغىسىغ يەر يەر	for a second			<u>↓</u> 1	AUTO TUNE CF Step 1.231000000 GHz	
50.0 60.0						Auto Man	1
						Freq Offset 0 Hz X Axis Scale	
Start 2.690 GHz Res BW 1.0 MHz		#Video BW 3.0	MHz	Sweep ~	Stop 15.000 GHz 125 ms (24621 pts)		
	Jul 13, 2021 1:56:28 PM					Signal Track (Span Zoom)	

Plot 7-32. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



Plot 7-33. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMF711JPN		PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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SYSIGHT Input: RF Coupling: DC Align: Auto	Input Z: 50 Ω Atten: 4 Corr CCorr Freq Ref: Int (S) NFE: Off	52 dB PNO: Fast Gate: LO IF Gain: Low Sig Track: Off	#Avg Type: Power (RMS 1 2 3 4 5 Avg Hold: 100/100 Trig: Free Run A N N N N N	2.593000000 GHz
Spectrum v ale/Div 10 dB	Ref Lev	vel 40.47 dBm	Mkr1 2.670 33 GHz 15.38 dBm	194.000000 MHz
- 0.5 				Full Span Start Freq
				2.49600000 GHz
				2.69000000 GHz
9.5 Million stalight to stalight of 199	al year and a state of the state	til he	energentensisten samlere der Mitter	CF Step 19.400000 MHz
				Man Freq Offset 0 Hz
9.5 Int 2.49600 GHz	#Video	BW 3.0 MHz*	Stop 2.69000 GH: Sweep 1.97 ms (4933 pts	X Axis Scale Log

Plot 7-34. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-35. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: A3LSMF711JPN	PCTEST Troud to be part of @ element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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KEYSIGHT    Input: RF      Coupling: DC    Align: Auto      W    PASS	Input Ζ: 50 Ω Corr CCorr Freq Ref: Int (S) NFE: Off	Atten: 30 dB	PNO: Fast Gate: LO IF Gain: Low Sig Track: Off	#Avg Type: Po Trig: Free Run	wer (RMS <mark>1</mark> 23456 M <del>WWWW</del> ANNNN	Center Frequency 8.857500000 GHz Span	Settings
Spectrum v icale/Div 10 dB		Ref Level 20.00	dBm	Mkr	14.619 0 GHz -39.09 dBm	12.2850000 GHz	
Trace 1 Pass		Rei Level 20.00			-55.05 0.511	Swept Span Zero Span	
						Full Span	
0.00						Start Freq 2.715000000 GHz	
						Stop Freq 15.000000000 GHz	
					<b>_</b> 1	AUTO TUNE	
	and the second state	n and an interior of the				CF Step 1.228500000 GHz	
60.0						Auto Man	
						Freq Offset 0 Hz	
tart 2.715 GHz Res BW 1.0 MHz		#Video BW 3.0	MHz	Sureen	Stop 15.000 GHz ~124 ms (24571 pts)		
	Jul 13, 2021 1:43:25 PM			Sweed		Signal Track	

Plot 7-36. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-37. Conducted Spurious Plot (ULCA LTE B41(PC3) - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: A3LSMF711JPN	PCTEST. Proud to be part of @ element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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	Input: RF Coupling: I Align: Auto	OC Corr	Ref: Int (S)	Atten: 26 dB	Gate:	Free Run LO in: Low	Center Freq Radio Std: N		0 GHz	2.50600	requency 0000 GHz	Settings
ll Range Gra	ph 🔻									CF Step 517.200	000 MHz	
ale/Div 10.0	dB		F	Ref Value 40.	00 dBm					Auto		
<b>g</b>										Man	1	
										Freq Offs 0 Hz	et	
					for the second street of the s	1	{ /** <u>}</u> *********	alle and a set of the				
				an average second and	ļ		N		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			
		AND SHOW SHOW SHOW	and the second second second						******			
0.0		1										
rt 2.446 GH	iz							Sto	p 2.546 GHz			
ll Range Tab	le 🔻											
						easure Trac		_	Trace 1			
0	D	01	Ot			асе Туре		Trace Avera	. ,			
Spur 1		Start Freq	Stop Freq	RBW 1.000 MHz	Frequ 2 489165		Amplitude	∆Lim -7.65				
2				1.000 MHz				-16.6				
3				390.0 kHz				-20.6				
4	4	2 4960 GHz	2 5460 GHz	390.0 kHz	2 514750	000 GHz	3.214 dBm	-21.7	9 dB			

Plot 7-38. Lower ACP Plot (ULCA LTE B41(PC3) - 20MHz QPSK - Full RB)



Plot 7-39. Upper ACP Plot (ULCA LTE B41(PC3) - 20MHz QPSK – Full RB)

FCC ID: A3LSMF711JPN	PCTEST* Proud to be part of @ element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager	
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# 7.6 Radiated Power (EIRP)

#### Test Overview

Equivalent Isotropic Radiated Power (EIRP) measurements are performed using the substitution method described in ANSI/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 dipole antennas. Measurements on signals operating above 1GHz 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

- Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation. For signals with burst transmission, the signal analyzer's "time domain power" measurement capability is used
- 2. RBW = 1 5% of the expected OBW, not to exceed 1MHz
- 3. VBW  $\geq$  3 x RBW
- 4. Span = 1.5 times the OBW
- 5. No. of sweep points  $\geq$  2 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". Trigger is set to enable triggering only on full power bursts with the sweep time set less than or equal to the transmission burst duration
- 8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation. For signals with burst transmission, the "gating" function was enabled to ensure that measurements are performed during times in which the transmitter is operating at its maximum power
- 9. Trace mode = trace averaging (RMS) over 100 sweeps
- 10. The trace was allowed to stabilize

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

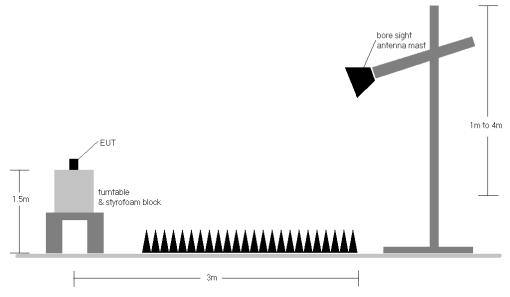


Figure 7-5. Radiated Test Setup >1GHz

### 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.

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Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
N		2506.0	Н	111	196	9.50	1/0	13.24	22.74	0.188	33.01	-10.27
MHz	QPSK	2593.0	Н	100	205	9.49	1 / 50	15.30	24.79	0.301	33.01	-8.22
20 1		2680.0	Н	146	209	9.87	1 / 99	13.68	23.55	0.227	33.01	-9.46
5	16-QAM	2593.0	Н	100	205	9.49	1 / 50	14.73	24.22	0.264	33.01	-8.79
N		2503.5	Н	111	196	9.50	1 / 74	13.21	22.71	0.187	33.01	-10.30
MHz	QPSK	2593.0	Н	100	205	9.49	1 / 37	15.61	25.10	0.324	33.01	-7.91
15 1		2682.5	Н	146	209	9.87	1 / 37	13.98	23.84	0.242	33.01	-9.17
-	16-QAM	2593.0	Н	100	205	9.49	1 / 37	14.66	24.15	0.260	33.01	-8.86
N		2501.0	Н	111	196	9.49	1 / 49	13.17	22.66	0.185	33.01	-10.35
MHz	QPSK	2593.0	Н	100	205	9.49	1 / 25	15.78	25.27	0.337	33.01	-7.74
101		2685.0	Н	146	209	9.86	1 / 25	13.86	23.72	0.236	33.01	-9.29
-	16-QAM	2593.0	Н	100	205	9.49	1 / 25	15.06	24.55	0.285	33.01	-8.46
N		2498.5	Н	111	196	9.49	1 / 24	13.07	22.56	0.180	33.01	-10.45
5 MHz	QPSK	2593.0	Н	100	205	9.49	1 / 24	15.71	25.20	0.331	33.01	-7.81
2		2687.5	Н	146	209	9.86	1 / 12	13.90	23.75	0.237	33.01	-9.26
	16-QAM	2593.0	Н	100	205	9.49	1 / 24	14.77	24.26	0.267	33.01	-8.75
	Opposite Pol.	2593.0	V	326	302	9.46	1 / 99	13.28	22.74	0.188	33.01	-10.27
20 MHz	Opposite Pol. (HALF)	2593.0	Н	137	200	9.49	1 / 50	14.50	23.99	0.251	33.01	-9.02
	WCP	2593.0	Н	100	205	9.49	1 / 50	11.90	21.39	0.138	33.01	-11.62

Table 7-3. EIRP Data (LTE Band 41(PC3) -Open)

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# 7.7 Radiated Spurious Emissions Measurements

## **Test Overview**

Radiated spurious emissions measurements are performed using the field strength conversion method described in KDB 971168 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

#### **Test Settings**

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

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

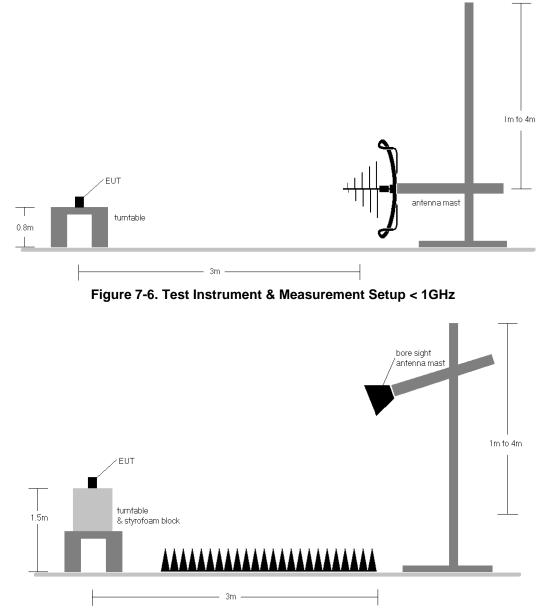


Figure 7-7. Test Instrument & Measurement Setup >1 GHz

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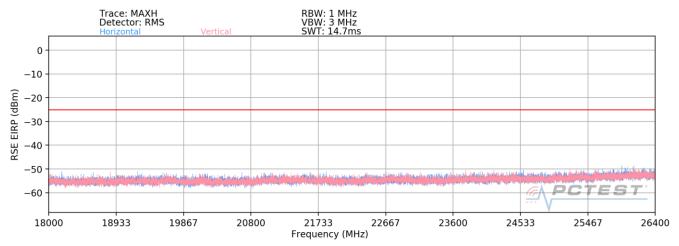
- Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
  a) E(dBµV/m) = Measured amplitude level (dBm) + 107 + Cable Loss (dB) + Antenna Factor (dB/m)
  b) EIRP (dBm) = E(dBµV/m) + 20logD 104.8; where D is the measurement distance in meters.
- 2) This 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.
- 7) ULCA spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device.

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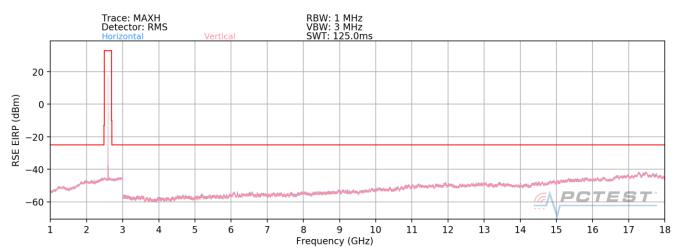


LTE Band 41(PC3) Trace: MAXH Detector: RMS RBW: 1 MHz VBW: 3 MHz SWT: 125.0ms RSE EIRP (dBm) -20 -40 -60 Frequency (GHz)





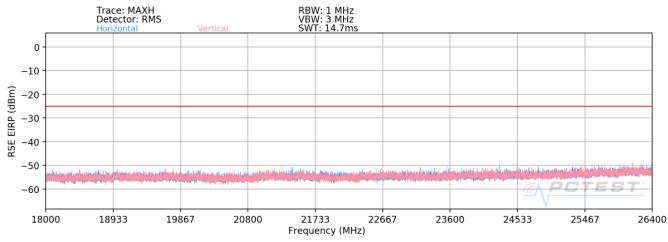
Plot 7-41. Radiated Spurious Plot (LTE Band 41(PC3) -Open)



Plot 7-42. Radiated Spurious Plot (LTE Band 41(PC3) -Half-Open)

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Plot 7-43. Radiated Spurious Plot (LTE Band 41(PC3) -Half-Open)

Bandwidth (MHz): Frequency (MHz):		0 06.0							
RB / Offset:	1/	50							
Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
5012.0	V	113	57	-74.49	5.84	38.35	-56.91	-25.00	-31.91
7518.0	V	-	-	-78.22	7.60	36.38	-58.88	-25.00	-33.88
10024.0	V	-	-	-77.68	11.08	40.40	-54.86	-25.00	-29.86
12530.0	V Tabla 7.4	-	-	-80.01	14.65	41.64	-53.62	-25.00	-28.62

Table 7-4. Radiated Spurious Data (LTE Band 41(PC3) - Low Channel -Open)

Bandwidth (MHz):	20
Frequency (MHz):	2593.0
RB / Offset:	1/50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
5186.0	V	114	34	-72.28	6.27	40.99	-54.27	-25.00	-29.27
7779.0	V	219	360	-77.47	7.64	37.17	-58.09	-25.00	-33.09
10372.0	V	-	-	-79.64	11.99	39.35	-55.91	-25.00	-30.91
12965.0	V	-	-	-79.15	15.05	42.90	-52.35	-25.00	-27.35
15558.0	V	-	-	-79.30	17.37	45.07	-50.18	-25.00	-25.18

Table 7-5. Radiated Spurious Data (LTE Band 41(PC3) – Mid Channel -Open)

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Bandwidth (MHz):	20
Frequency (MHz):	2680.0
RB / Offset:	1 / 50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
5360.0	V	131	354	-74.32	5.43	38.11	-57.14	-25.00	-32.14
8040.0	V	-	-	-78.26	8.73	37.47	-57.79	-25.00	-32.79
10720.0	V	397	309	-78.67	12.75	41.08	-54.17	-25.00	-29.17
13400.0	V	-	-	-79.70	15.04	42.34	-52.92	-25.00	-27.92
16080.0	V	-	-	-79.78	18.10	45.32	-49.93	-25.00	-24.93

Table 7-6. Radiated Spurious Data (LTE Band 41(PC3) – High Channel -Open)

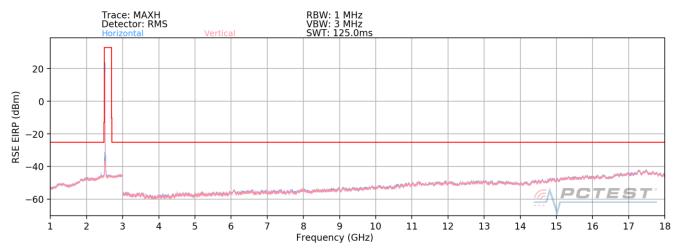
Case:	WCP
Bandwidth (MHz):	20
Frequency (MHz):	2593.0
RB / Offset:	1/50

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBµV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
5186.0	V	116	350	-73.54	6.27	39.73	-55.53	-25.00	-30.53
7779.0	V	-	-	-78.01	7.64	36.63	-58.63	-25.00	-33.63
10372.0	V	-	-	-79.51	11.99	39.48	-55.78	-25.00	-30.78
12965.0	V	-	-	-79.41	15.05	42.64	-52.61	-25.00	-27.61

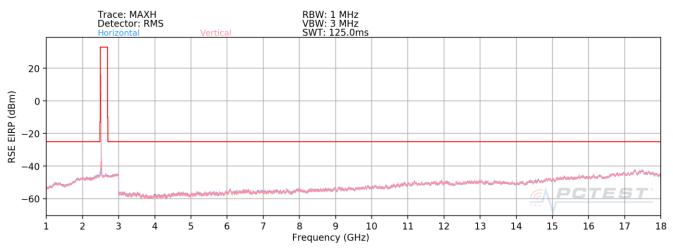
Table 7-7. Radiated Spurious Data (LTE Band 41(PC3) - Mid Channel -WCP-Open)

FCC ID: A3LSMF711JPN		PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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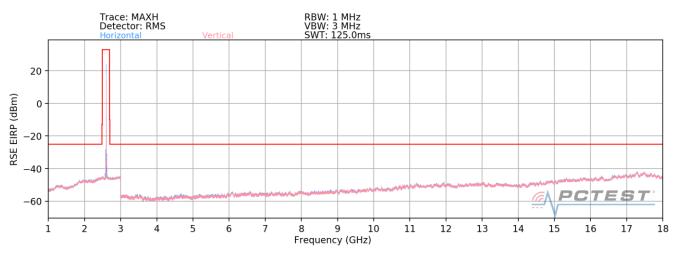








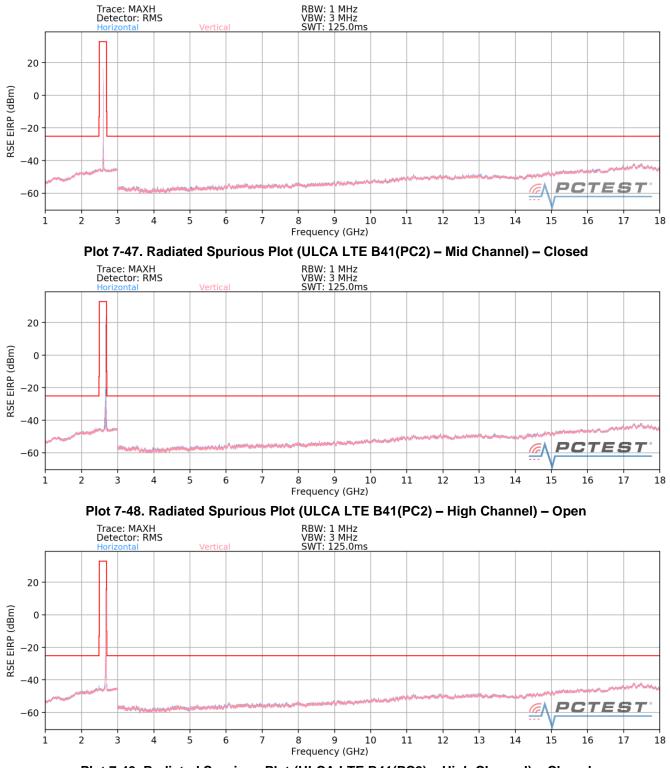
Plot 7-45. Radiated Spurious Plot (ULCA LTE B41(PC2) – Low Channel) – Closed



## Plot 7-46. Radiated Spurious Plot (ULCA LTE B41(PC2) – Mid Channel) – Open

FCC ID: A3LSMF711JPN	PCTEST* Proud to be part of @ element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager	
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Plot 7-49. Radiated Spurious Plot (ULCA LTE B41(PC2) – High Channel) – Closed

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·	
PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	2506.0
PCC RB / Offset:	1/99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	2525.8
SCC RB / Offset:	1/0

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]
5012.0	Н	116	104	-75.63	5.84	37.21	-58.05	-25.00	-33.05
7518.0	Н	-	-	-78.05	7.60	36.55	-58.71	-25.00	-33.71
10024.0	Н	-	-	-78.37	11.08	39.71	-55.55	-25.00	-30.55
12530.0	Н	-	-	-79.92	14.65	41.73	-53.53	-25.00	-28.53

Table 7-8. Radiated Spurious Data (ULCA LTE B41(PC2) – Low Channel) – Open

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	2593.0
PCC RB / Offset:	1/99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	2612.8
SCC RB / Offset:	1/0

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]
5186.0	Н	326	118	-73.99	6.27	39.28	-55.98	-25.00	-30.98
7779.0	Н	-	-	-77.89	7.64	36.75	-58.51	-25.00	-33.51
10372.0	Н	-	-	-79.75	11.99	39.24	-56.02	-25.00	-31.02
12965.0	Н	-	-	-80.07	15.05	41.98	-53.27	-25.00	-28.27

Table 7-9. Radiated Spurious Data (ULCA LTE B41(PC2) – Mid Channel) – Open

20
2680.0
1/0
20
2660.2
1/99

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]
5360.0	Н	348	114	-75.29	5.43	37.14	-58.11	-25.00	-33.11
8040.0	Н	-	-	-78.13	8.73	37.60	-57.66	-25.00	-32.66
10720.0	Н	-	-	-80.10	12.75	39.65	-55.60	-25.00	-30.60
13400.0	Н	-	-	-80.37	15.04	41.67	-53.59	-25.00	-28.59

Table 7-10. Radiated Spurious Data (ULCA LTE B41(PC2) – High Channel) – Open

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# 7.8 Frequency Stability / Temperature Variation

#### **Test Overview and Limit**

Frequency stability testing is performed in accordance with the guidelines of ANSI/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.

#### 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

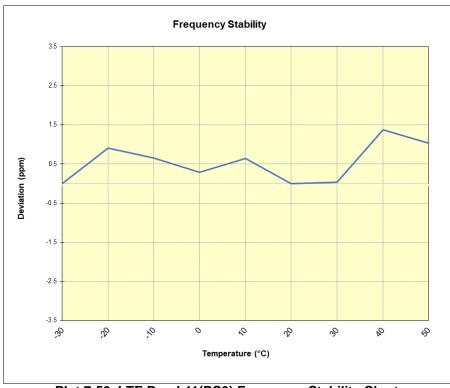
None

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LTE Band 41					
	Operating Frequency (Hz):		2,593,000,000		
	Ref. Voltage (VDC):		4.31		
	· · · · · · · · · · · · · · · · · · ·				
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
		- 30	2,583,995,483	0	0.0000000
		- 20	2,583,997,830	2,347	0.0000908
		- 10	2,583,997,164	1,681	0.0000650
		0	2,583,996,226	743	0.0000288
100 %	4.31	+ 10	2,583,997,137	1,654	0.0000640
		+ 20 (Ref)	2,583,995,483	0	0.0000000
		+ 30	2,583,995,569	86	0.0000033
		+ 40	2,583,999,038	3,555	0.0001376
		+ 50	2,583,998,143	2,660	0.0001029
Battery Endpoint	3.60	+ 20	2,583,995,854	371	0.0000144

Table 7-11. LTE Band 41(PC3) Frequency Stability Data



Plot 7-50. LTE Band 41(PC3) Frequency Stability Chart

FCC ID: A3LSMF711JPN	PCTEST* Proud to be part of @ element	PART 27 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical 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: A3LSMF711JPN** complies with all the requirements of Part 27 of the FCC rules.

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