

### PCTEST

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## PART 24 MEASUREMENT REPORT

#### **Applicant Name:**

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

#### Date of Testing:

9/28/2020 - 11/20/2020 Test Site/Location: PCTEST Lab. Columbia, MD, USA Test Report Serial No.: 1M2009280154-20.A3L

### FCC ID:

### Applicant Name:

### A3LSMG998B

#### Samsung Electronics Co., Ltd.

Application Type: Model: Additional Model(s): EUT Type: FCC Classification: FCC Rule Part: Test Procedure(s): Certification SM-G998B/DS SM-G998B Portable Handset PCS Licensed Transmitter Held to Ear (PCE) 24 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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			Ty Freemanny	El	RP	Emission
Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Max. Power [W]	Max. Power [dBm]	Emission Designator
		QPSK	1860 - 1905	0.058	17.65	18M1G7D
	20 MHz	16QAM	1860 - 1905	0.041	16.10	18M0W7D
	20 1011 12	64QAM	1860 - 1905	0.035	15.38	18M0W7D
		256QAM	1860 - 1905	0.018	12.55	18M0W7D
		QPSK	1857.5 - 1907.5	0.063	18.01	13M6G7D
	15 MHz	16QAM	1857.5 - 1907.5	0.044	16.44	13M5W7D
		64QAM	1857.5 - 1907.5	0.036	15.61	13M6W7D
		256QAM	1857.5 - 1907.5	0.019	15.75	13M5W7D
	10 MHz	QPSK	1855 - 1910	0.063	18.01	9M06G7D
		16QAM	1855 - 1910	0.043	16.38	9M06W7D
		64QAM	1855 - 1910	0.038	15.75	9M13W7D
LTE Band 25/2		256QAM	1855 - 1910	0.019	12.85	9M03W7D
	5 MHz	QPSK	1852.5 - 1912.5	0.066	18.20	4M53G7D
		16QAM	1852.5 - 1912.5	0.046	16.67	4M51W7D
		64QAM	1852.5 - 1912.5	0.037	15.72	4M55W7D
		256QAM	1852.5 - 1912.5	0.020	12.99	4M54W7D
		QPSK	1851.5 - 1913.5	0.065	18.13	2M72G7D
	2 1411-	16QAM	1851.5 - 1913.5	0.047	16.74	2M71W7D
	3 MHz	64QAM	1851.5 - 1913.5	0.036	15.58	2M72W7D
		256QAM	1851.5 - 1913.5	0.020	12.99	2M71W7D
		QPSK	1850.7 - 1914.3	0.067	18.27	1M09G7D
	1.4 MHz	16QAM	1850.7 - 1914.3	0.046	16.61	1M09W7D
	I.4 IVI⊓Z	64QAM	1850.7 - 1914.3	0.036	15.60	1M09W7D
		256QAM	1850.7 - 1914.3	0.020	13.03	1M10W7D

	Tx Fraguenov E		Ell	RP	Emission
Mode	Modulation	Tx Frequency Range [MHz]	Max. Power [W]	Max. Power [dBm]	Emission Designator
GSM/GPRS	GMSK	1850.2 - 1909.8	0.445	26.48	244KGXW
EDGE	8-PSK	1850.2 - 1909.8	0.192	22.82	249KG7W
WCDMA	Spread Spectrum	1852.4 - 1907.6	0.081	19.08	4M31F9W

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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:A3LSMG998B**. 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 24.

Test Device Serial No.: 0195M, 0036M, 0106M, 0205M, 0048M, 1070H, 0216M

#### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n5, n66), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax(6E) UNII, Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, UWB

LTE Band 25 (1850 - 1915 MHz) overlaps the entire frequency range of LTE Band 2 (1850 - 1910 MHz). Therefore, test data provided in this report covers Band 2 as well as Band 25.

### 2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 0 of this test report for a description of the radiated and antenna port conducted emissions tests.

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

### 2.4 EMI Suppression Device(s)/Modifications

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

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### 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the "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.

### 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  $P_{g \, [dBm]}$  – 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:

$$\begin{split} & \mathsf{E}_{[d\mathsf{B}\mu\mathsf{V}/m]} = \mathsf{Measured} \ \mathsf{amplitude} \ \mathsf{level}_{[d\mathsf{B}m]} + 107 + \mathsf{Cable} \ \mathsf{Loss}_{[d\mathsf{B}]} + \mathsf{Antenna} \ \mathsf{Factor}_{[d\mathsf{B}/m]} \\ & \mathsf{And} \\ & \mathsf{EIRP}_{[d\mathsf{B}m]} = \mathsf{E}_{[d\mathsf{B}\mu\mathsf{V}/m]} + 20\mathsf{log}\mathsf{D} - 104.8; \ \mathsf{where} \ \mathsf{D} \ \mathsf{is} \ \mathsf{the} \ \mathsf{measurement} \ \mathsf{distance} \ \mathsf{in} \ \mathsf{meters}. \end{split}$$

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
-	LTx2	Licensed Transmitter Cable Set	4/9/2020	Annual	4/9/2021	LTx2
-	LTx4	Licensed Transmitter Cable Set	7/9/2020	Annual	7/9/2021	LTx4
-	LTx5	Licensed Transmitter Cable Set	4/9/2020	Annual	4/6/2021	LTx5
Agilent	N9020A	MXA Signal Analyzer	8/4/2020	Annual	8/4/2021	US46470561
Agilent	N9030A	PXA Signal Analyzer (44GHz)	7/17/2020	Annual	7/17/2021	MY52350166
Anritsu	MT8821C	Radio Communication Analyzer		N/A		6201381794
Anritsu	MT8821C	Radio Communication Analyzer N/A		6200901190		
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Emco	3115	Hom Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	128338
Mini Circuits	TVA-11-422	RF Power Amp	N/A		QA1317001	
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		100976
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	SFU NIT-Rx	Shielded Filter Unit	2/10/2020	Annual	2/10/2021	102134
Rohde & Schwarz	SFU NIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102133
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107

Table 5-1. 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

### **GPRS Emission Designator**

#### Emission Designator = 250KGXW

GPRS BW = 250 kHz G = Phase Modulation X = Cases not otherwise covered W = Combination (Audio/Data)

### **EDGE Emission Designator**

#### Emission Designator = 250KG7W EDGE BW = 250 kHz

G = Phase Modulation 7 = Quantized/Digital Info W = Combination (Audio/Data)

#### WCDMA Emission Designator

#### **Emission Designator = 4M16F9W** WCDMA BW = 4.16 MHz F = Frequency Modulation 9 = Composite Digital Info

W = Combination (Audio/Data)

### **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

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### **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:	A3LSMG998B
FCC Classification:	PCS Licensed Transmitter Held to Ear (PCE)
Mode(s):	GSM/GPRS/EDGE/WCDMA/LTE

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
0	Occupied Bandwidth	2.1049	RSS-133(2.3)	N/A	PASS	Section 7.2
JCTED	Conducted Band Edge / Spurious Emissions	2.1051, 24.238(a)	RSS-133(6.5)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of- band emissions	PASS	Sections 7.3, 7.4
CONDUC	Transmitter Conducted Output Power	2.1046	RSS-133(4.1)	N/A	PASS	See RF Exposure Report
o	Frequency Stability	2.1055, 24.235	RSS-133(6.3)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
ATED	Effective Radiated Power / Equivalent Isotropic Radiated Power	24.232(c)	RSS-132(5.4)	< 7 Watts max. ERP	PASS	Section 7.6
RADIA.	Radiated Spurious Emissions	2.1053, 24.238(a)	RSS-133(6.5)	> 43 + 10 log10 (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) 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 2G/3G Automation Version 4.5, LTE Automation Version 5.3.

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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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### LTE Band 25/2

🔤 Keysight Spectrum Analyzer - Occupie	ed BW				
<b>LX</b> RF 50 Ω D	C CORREC	SENSE:INT Center Freg: 1.8825000	ALIGN AUTO	06:56:56 PM Oct 12, 2020 Radio Std: None	Trace/Detector
	- <b>+</b>	Trig: Free Run	Avg Hold: 100/100		
	#IFGain:Low	#Atten: 26 dB		Radio Device: BTS	
10 dB/div Ref 30.00 d	Bm				
20.0					
10.0	por what has had he	wanter the termine the second	etulon		Clear Write
0.00					
-10.0	1		K		
	ANT PRIMA		Unalore from the	www.malangerenter	Average
				and and a lot of the work of a	Average
-30.0					
-40.0					
-50.0					Max Hold
-60.0					
Contor 4 00250 Olla				On on 50 00 Mills	
Center 1.88250 GHz Res BW 470 kHz		#VBW 1.5 MH	7	Span 50.00 MHz Sweep 1 ms	
		#VBW 1.5 MIT	2	owcep rms	Min Hold
Occupied Bandwi	dth	Total Por	wer 31.2	2 dBm	
	18.077 MH	7			Detector
		12			Peak
Transmit Freq Error	-3.109 k	Hz % of OBV	V Power 99	0.00 %	Auto <u>Man</u>
x dB Bandwidth	19.72 M	Hz xdB	-26	00 dB	
	10.12		Ev.		
MSG			STATUS	3	

Plot 7-1. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz QPSK - Full RB Configuration)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 16-QAM - Full RB Configuration)

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Keysight Spectrum Analyzer - Occupied B	W				
<b>LXI</b> RF 50 Ω DC	CORREC	SENSE:INT Center Freg: 1.8825000	ALIGN AUTO	06:55:44 PM Oct 12, 2020 Radio Std: None	Trace/Detector
		Trig: Free Run #Atten: 26 dB	Avg Hold: 100/100	Radio Device: BTS	
	#IFGam.Low			radio Berloci Biro	Ĩ
10 dB/div Ref 30.00 dB	m				
20.0					
10.0	Manna	والمراجع ومعاوية ومعرفة والمعارمين والمعارمين والمعاومة والمعاوية والمعاومة والمعاومة والمعاومة والمعاومة والمع	*******		Clear Write
0.00	/				
-10.0	- ablidd		Window Low Law Law Low Low Low Low Low Low Low Low Low Lo		
-20.0	p.4-0.1.0.1		and a standay	Minika da martinghan	Average
-30.0					
-40.0					
-50.0					Max Hold
Center 1.88250 GHz Res BW 470 kHz		#VBW 1.5 MH	2	Span 50.00 MHz Sweep 1 ms	
Res DW 470 KHZ		#8048 1.3 M	2	Sweep This	Min Hold
Occupied Bandwid	th	Total Po	wer 29.1	dBm	
1	8.015 MH	Z			Detector
Transmit Freq Error	-6.042 kH	z % of OB	W Power 99	.00 %	Peak▶ Auto <u>Man</u>
x dB Bandwidth	20.20 MH			00 dB	
	20.20		20.		
MSG			STATUS		

Plot 7-3. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 64-QAM - Full RB Configuration)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 25/2 - 20MHz 256-QAM - Full RB Configuration)

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🔤 Keysight Spe	ctrum Analyze	er - Occu	pied BW											- • •
L <mark>XI</mark>	RF	50 Ω	DC	CORREC			NSE:INT reg: 1.88250	0000 GHz		LIGN AUTO	07:00:43 P Radio Std	M Oct 12, 2020	Trac	e/Detector
						Trig: Fre	e Run	Avg Hol		100/100				
			#	#IFGain	:Low	#Atten: 2	26 dB				Radio Dev	rice: BTS		
10 dB/div	Ref	35.00	dBm											
25.0														
15.0					nation of the abo	Mahahata ak	monther Alanta	la mar						Clear Write
5.00				1				1						
				ľ					١					
-5.00			4	.N					h	<b>(1)</b>				Average
-15.0	AN MARINE	millet	<sub>₩</sub> ∽₽Ů₽₩₩	* <b>-</b>					T I	. Inder windstrukern	anna an that	mallenal		Average
												H. Stylet		
-35.0														
-45.0				$\rightarrow + +$										Max Hold
-55.0				$\rightarrow +$					$\square$				_	
Center 1.	28250 G	H7									Snan 3	7.50 MHz		
Res BW		112				#VE	3W 1.1 M	Hz				ep 1 ms		Min Hold
														WIIITHOID
Occup	bied Ba	andv	vidth				Total P	ower		31.3	dBm			
			13	59	3 M⊦	7								Detector
														Peak▶
Transn	nit Freq	Erro	or	-28	3.753 k	Hz	% of O	3W Pov	ve	r 99	.00 %		Auto	<u>Man</u>
x dB B	andwid	th		14	4.92 M	Hz	x dB			-26.	00 dB			
MSG										STATUS				

Plot 7-5. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz QPSK - Full RB Configuration)



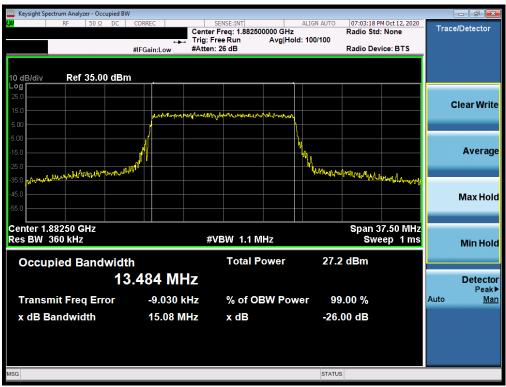
Plot 7-6. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	Proved to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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Keysight Spectrum Analyzer - Occupied BW			
KM RF 50 Ω DC CORRE	EC SENSE:INT Center Freq: 1.882500000 GH	ALIGN AUTO 07:02:56 PM Oct 12, 2020	Trace/Detector
	Trig: Free Run Avg	lold: 100/100	
#IFGa	in:Low #Atten: 26 dB	Radio Device: BTS	-
10 dB/div Ref 35.00 dBm Log	r		
25.0			
15.0			Clear Write
5.00			
-5.00		ս հ <u>վ</u>	
-15.0		Pedathast lines and do	Average
-15.0 -25.0 alt mark how the alpha the alpha and the alpha although the alpha		What yet many draw put was not and	J
-35.0			
-45.0			
-55.0			Max Hold
-55.0			
Center 1.88250 GHz		Span 37.50 MHz	
Res BW 360 kHz	#VBW 1.1 MHz	Sweep 1 ms	Min Hold
Occupied Bandwidth	Total Power	29.0 dBm	
		2010 (18)	
13.56	5 MHz		Detector Peak▶
Transmit Freq Error 1	8.825 kHz % of OBW Po	ower 99.00 %	Auto <u>Man</u>
x dB Bandwidth	15.22 MHz x dB	-26.00 dB	
MSG		STATUS	

Plot 7-7. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 64-QAM - Full RB Configuration)



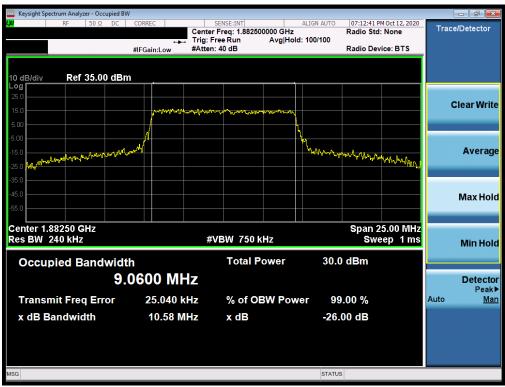
Plot 7-8. Occupied Bandwidth Plot (LTE Band 25/2 - 15MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	Poud to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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u Keysight Spectrum Analyzer - Occupied BW											
<mark>LXI</mark>	RF 50 Ω	DC CORF	REC		NSE:INT reg: 1.88250	0000 CH-	ALIGN AUTO	07:13:26 P Radio Std	M Oct 12, 2020	Trac	e/Detector
							I: 100/100	Radio Sta	: None		
		#IFG	ain:Low	#Atten: 4	l0 dB			Radio Dev	vice: BTS		
10 dB/div	Ref 35.0	0 dBm									
Log											
25.0				a a secolo de ale							Clear Write
15.0			harrow	an a	ware a construction of the second	and and the second					
5.00			/								
-5.00		l /					WV.				
-15.0	. Labora M	manperform					- homer	markallerapeline			Average
-25.0 AMAM	Marally Jong of Marally and the								A A A A A A A A A A A A A A A A A A A		
-35.0											
-45.0											Manullala
-55.0											Max Hold
-55.0											
Center 1.	88250 GHz							Span 2	25.00 MHz		
Res BW	240 kHz			#VE	3W 750 k	Hz		Swe	eep 1 ms		Min Hold
					T-4-LD		24.4	10			
Occu	pied Band				Total P	ower	31.1	dBm			
		9.057	79 MI	-IZ							Detector
_										0	Peak►
Trans	mit Freq Err	or	-8.903	(HZ	% of O	3W Pow	er 99	.00 %		Auto	<u>Man</u>
x dB E	Bandwidth		10.34 N	IHz	x dB		-26.	00 dB			
MSG							STATUS				
mag							STATUS	,			

Plot 7-9. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz QPSK - Full RB Configuration)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 16-QAM - Full RB Configuration)

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Keysight Spectrum Analyzer - Occupied BV	V				
LX/ RF 50 Ω DC	CORREC	SENSE:INT Center Freg: 1.882500000	ALIGN AUTO	07:11:51 PM Oct 12, 2020 Radio Std: None	Trace/Detector
		Trig: Free Run Av	g Hold: 100/100		
	#IFGain:Low #	#Atten: 40 dB		Radio Device: BTS	
10 dB/div Ref 30.00 dBn	n <sub>.</sub>				
20.0					
10.0	MAN TON BY BAR AN	ᡊᠰ᠋ᡖᡘᡒᠬ᠓ᡃᡎᢛᢇᢇᠧᠬᢣᢑᢣ᠇ᢑᢥᢏᡵᠮᢦᠬ	m		Clear Write
	/		۲, I		
0.00	nd		1.		
-10.0 -20.0 mt month martine	lland and a start and a start a		Murrh mann	WMM and a	Average
-20.0 Mary and a company and a company				and on the second se	Average
-30.0					
-40.0					
-50.0					Max Hold
-60.0					
Center 1.88250 GHz				Span 25.00 MHz	
Res BW 240 kHz		#VBW 750 kHz		Sweep 1 ms	Min Hald
				· ·	Min Hold
Occupied Bandwidt	h	Total Powe	er 29.0	dBm	
9	1303 MHz				Detector
0.					Peak►
Transmit Freq Error	25.268 kH	z % of OBW	Power 99.	00 %	Auto <u>Man</u>
x dB Bandwidth	10.53 MH	z xdB	-26.0	0 dB	
			07.0710		
MSG			STATUS		

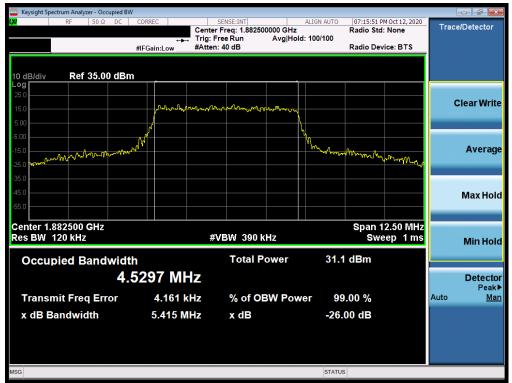
Plot 7-11. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 64-QAM - Full RB Configuration)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 25/2 - 10MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	Pour lo be part of @element	PART 24 MEASUREMENT REPORT	AMSUNG	Approved by: Technical Manager
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Plot 7-13. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz QPSK - Full RB Configuration)



Plot 7-14. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @ element	PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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Plot 7-15. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 64-QAM - Full RB Configuration)



Plot 7-16. Occupied Bandwidth Plot (LTE Band 25/2 - 5MHz 256-QAM - Full RB Configuration)

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Plot 7-17. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz QPSK - Full RB Configuration)



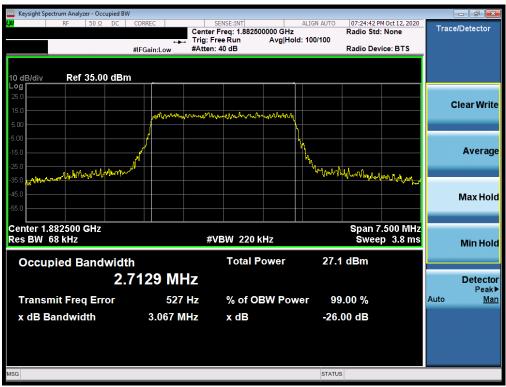
Plot 7-18. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @ element	PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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Plot 7-19. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 64-QAM - Full RB Configuration)



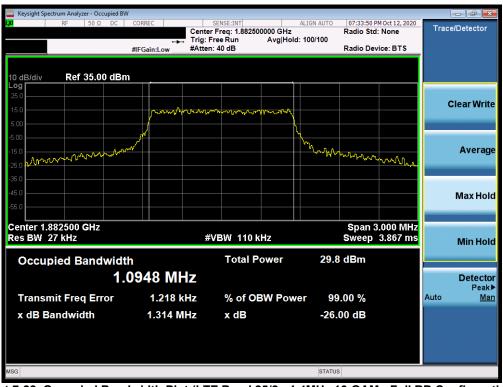
Plot 7-20. Occupied Bandwidth Plot (LTE Band 25/2 - 3MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	Proved to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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Keysight Spectrum Analyzer - Occupied E	3W					
L <mark>X/</mark> RF 50Ω DC	CORREC	SENSE:INT	ALIGN AUTO	07:33:09 PM 00 Radio Std: No		Trace/Detector
	T	Trig: Free Run Av	g Hold: 100/100			
	#IFGain:Low #	Atten: 40 dB		Radio Device	BTS	
10 dB/div Ref 35.00 dB	m					
25.0						
15.0						Clear Write
5.00			4			
-5.00	Mart		N.M			A
-15.0 -25.0 mm www.www.	- by		- Miner	R.M. Www.	ham	Average
				×	- Anneal Contract	
-35.0						
-45.0						Max Hold
-55.0						
Center 1.882500 GHz				Span 3.00		
Res BW 27 kHz		#VBW 110 kHz		Sweep 3.		Mindald
						Min Hold
Occupied Bandwid	th	Total Powe	r 30.8	dBm		
1	.0921 MHz	,				Detector
•						Peak►
Transmit Freq Error	-1.525 kH	z % of OBW	Power 99	.00 %	A	Auto <u>Man</u>
x dB Bandwidth	1.303 MH	z xdB	-26.	00 dB		
MSG			074710			
MSG			STATUS			

Plot 7-21. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz QPSK - Full RB Configuration)



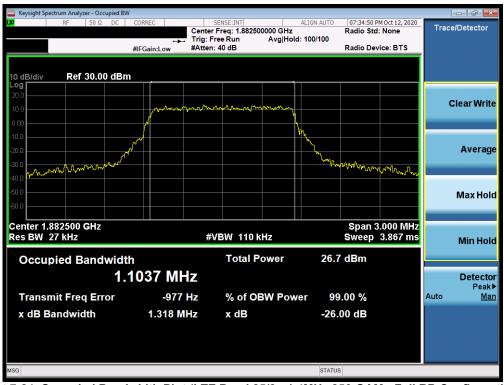
Plot 7-22. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 16-QAM - Full RB Configuration)

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Keysight Spectrum Analyzer - Occupied BW	1				
LX/ RF 50 Ω DC	CORREC	SENSE:INT Center Freg: 1.882500	ALIGN AUTO	07:34:13 PM Oct 12, 2020 Radio Std: None	Trace/Detector
		Trig: Free Run	Avg Hold: 100/100		
	#IFGain:Low	#Atten: 40 dB		Radio Device: BTS	
10 dB/div Ref 35.00 dBm	<u> </u>				
25.0					
15.0					Clear Write
	mon	May mar and marked was	mm		
5.00			<u> </u>		
-5.00			1		
-15.0			Junun	when my and	Average
-25.0				and Curry Value	
-35.0					
-45.0					Max Hold
-55.0					
Center 1.882500 GHz		40 (BW) 440 L	-	Span 3.000 MHz	
Res BW 27 kHz		#VBW 110 ki	HZ	Sweep 3.867 ms	Min Hold
Occupied Bandwidt	h	Total Po	ower 28.5	dBm	
1.	0908 MH	Z			Detector Peak►
Transmit Freg Error	210	Hz % of OB	W Power 99	.00 %	Auto Man
x dB Bandwidth	1.332 MI	Hz xdB	-26.	00 dB	
MSG			STATU	3	

Plot 7-23. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 64-QAM - Full RB Configuration)



Plot 7-24. Occupied Bandwidth Plot (LTE Band 25/2 - 1.4MHz 256-QAM - Full RB Configuration)

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### **GSM/GPRS PCS**







Plot 7-26. Occupied Bandwidth Plot (EDGE, Ch. 661)

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### WCDMA PCS

	rum Analyzer - C	ccupied BV	٧										
LXI RL	RF 50	Ω AC	CORREC			NSE:INT SO			ALIGN AUTO	07:19:39 P Radio Std	M Oct 14, 2020	Trac	e/Detector
					Trig: Fre	e Run			100/100	Raulo Stu	. None		
			#IFGain:L	ow	#Atten: 2	26 dB				Radio Dev	vice: BTS		
10 dB/div	Ref 40.	00 dBn	n	_									
Log 30.0													
20.0							~						<b>Clear Write</b>
				1									
10.0								$\backslash$					
0.00			~~~					1 mm					Aueroa
-10.0										- many			Average
-20.0	~										manne		
-30.0													
-40.0													Max Hold
-50.0													
Center 1.8	8 GHz									Sna	n 15 MHz		
Res BW 15					#VE	VBW 910 kHz				O		Min Hold	
													Millinoic
Occupi	ed Ban	dwidt	h			Total	Powe	r	34.4	4 dBm			
		4.	3099	MH	Z								Detector
-			00.4		-	0/ - 5 6				00.0/		Auto	Peak
	it Freq E			215 kł		% of C	BW F	owe		9.00 %		Auto	Mar
x dB Ba	ndwidth		5.0	61 MI	z	x dB			-26.	00 dB			
ASG									STATU	s			

Plot 7-27. Occupied Bandwidth Plot (WCDMA, Ch. 9400)

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

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

#### **Test Procedure Used**

KDB 971168 D01 v03r01 - Section 6.0

#### Test Settings

- 1. Start frequency was set to 30MHz and stop frequency was set to 20GHz (separated into at least two plots per channel)
- 2. Detector =  $\acute{R}MS$
- 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

- 1. Per Part 24 and RSS-133, 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.
- 2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) 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.

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### LTE Band 25/2

PNO: Fast       Trig: Free Run       Trig: Free Run       Trig: Trig: Free Run       Auto         D dB/div       Ref 20.00 dBm       Center       939.500000         00	🔤 Keysight Sp	pectrum Anal												- 6 <b>-</b> ×
IFGO Fisher       Atten: 30 dB       Der MINNIN         Mkr1 1.849 0 GHz       Center         0 dB/div       Ref 20.00 dBm       Center         0 dB/div       Center       939.50000         1 84900000       Center       939.50000         0 dB/div	XI	RF	50 Ω	DC					#Avg Ty		TRA	CE 1 2 3 4 5 6	Fr	equency
Center 939.50000 00 00 00 00 00 00 00 00 00 00 00 0	10 dB/div Log	Ref 2	0.00 d	Bm						М	، 1.84 kr1	90GHz		Auto Tun
0.0       0.1       0.1       0.1       0.1       0.0       0.1       0.1       0.0       0.1       0	10.0							• •						enter Fre 500000 MH
000       1.84900000         000       1.84900000         000       1.84900000         000       1.84900000         000       1.84900000         000       1.84900000         000       1.84900000         000       1.84900000         000       1.84900000         000       1.84900000         100       1.84900000         100       1.84900000         100       1.84900000         100       1.84900000	10.0											DL1 -13.00 dBm	30	Start Fre
Image: Contract of the second seco	20.0 30.0											1	1.849	<b>Stop Fr</b> 0000000 GI
Freq C	40.0													CF Ste 900000 MI M
tart 0.0300 GHz Stop 1.8490 GHz	60.0	, , , , , , , , , , , , , , , , , , ,		uddyfeir offiel	, and the second se	Referitori, Libite and	14943/499 <i>4-14</i> 979-149	eleg tiyy, species and a state sind	an fallen for fallen fan fallen f				F	F <b>req Offs</b> 0
Page BML 4.0 MHz #3/(BML 2.0 MHz Buyers 2.425 mg (2620 mtg)	70.0	300 GHz									Stop 1.	8490 GHz	Log	Scale Ty
	Res BW	1.0 MH	Z			#VBW	3.0 MHz			Sweep	2.425 ms	(3639 pts)		

Plot 7-28. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-29. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

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🔤 Keysight Spe	ectrum Analy	/zer - Swep	ot SA									(	- 0
L <mark>XI</mark>	RF	50 Ω	DC	CORREC		SE	NSE:INT	#Avg Ty	ALIGN AUTO		PM Oct 14, 2020	Fre	quency
					ast 🔸	Trig: Fre			pe. runo	т			
				IFGain:L	.ow	Atten: 1	0 dB						Auto Tune
									MK	r1 19.5	58 0 GHz 517 dBm		
10 dB/div Log	Ref 0.	00 dB	m					_	_	-55.3			
							Ĭ					С	enter Freg
-10.0											DL1 -13.00 dBm		000000 GHz
											DET-13.00 GBM		
-20.0													
													Start Freq
-30.0												10.000	000000 GHz
-40.0											<u> </u>		Stop Freq
													000000 GHz
-50.0											1		
													CF Step
-60.0	~~~~					a ano da		white countries or tellevise of	and the second			1.000	000000 GHz
												<u>Auto</u>	Man
-70.0													
												F	req Offset
-80.0													0 Hz
-90.0													
-90.0												S	cale Type
Start 10.0										Stop 2	0.000 GHz	Log	<u>Lin</u>
#Res BW	1.0 MH	Z		#	ŧVB₩	3.0 MHz	2		Sweep 1	7.33 ms (	20001 pts)		
MSG									STATU	JS			

Plot 7-30. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



Plot 7-31. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager	
Test Report S/N:	Test Dates:	EUT Type:	Dogo 20 of 09	
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Plot 7-32. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)



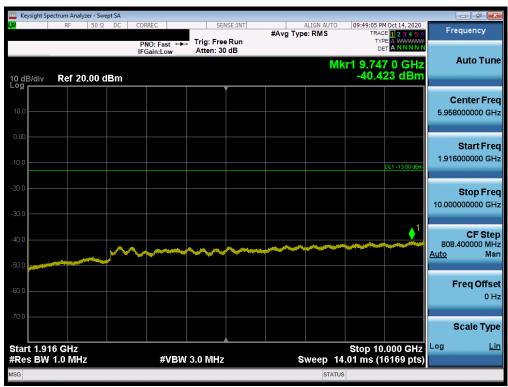
Plot 7-33. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager	
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🔤 Keysight Sp	ectrum Analyze												
<mark>LXI</mark>	RF	50 Ω	DC	CORREC		SE	NSE:INT	#Avg Typ	ALIGN AUTO	TR	PM Oct 14, 2020 ACE 1 2 3 4 5 6		quency
				PNO: F IFGain:I	ast 🔸	Trig: Fre Atten: 3		•		٦			
				IF Galli.	_0w	/titelit e	U U D		М	kr1 1 8	46 0 GHz		Auto Tune
10 dB/div Log	Ref 20.	00 dE	Sm							-49.	207 dBm		
LUg												C	enter Freg
10.0													000000 MHz
0.00													Start Freq
-10.0													000000 MHz
											DL1 -13.00 dBm		
-20.0													Stop Freq
												1.850	000000 GHz
-30.0													
-40.0													CF Step
											1	182. Auto	000000 MHz Man
-50.0						uh kauna tina	al an inc. Ale and	and a state of the		the state of the s	and the second second second		
<del>ايد طبيه ب</del> يدي		and the second secon										F	req Offset
-60.0													0 Hz
-70.0													
												S	Scale Type
Start 0.03	00 GHz						<b>A</b>			Stop 1	.8500 GHz	Log	Lin
#Res BW				3	#VBW	3.0 MHz	2		Sweep 2	2.427 ms	(3641 pts)		
MSG									STATU	IS			

Plot 7-34. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



Plot 7-35. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: A3LSMG998B	Proud to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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🔤 Keysight Spo	ectrum Analyz													
l <b>X</b> I	RF	50Ω D	C COI	RREC		SEN	ISE:INT	#Ava	ALIG	N AUTO		PM Oct 14, 2020 ACE 1 2 3 4 5 6	F	requency
			Р	NO: Fast		Trig: Free			1,990.10		т			
			IF	Gain:Lov	N	Atten: 10	dB							Auto Tune
										Mkr	1 19.58	38 5 GHz 478 dBm		Auto Tune
10 dB/div Log	Ref 0.0	0 dBm									-55.4	+/ o ubiii		
-							Í							Center Freq
-10.0												DL1 -13.00 dBm		00000000 GHz
												DET -13.00 GB/I		
-20.0														
														Start Freq
-30.0													10.00	0000000 GHz
-40.0														Stop Freq
													20.00	00000000 GHz
-50.0												1-		
										t. toorithe				CF Step
-60.0	the second second	-	and the second										1.00	00000000 GHz
													<u>Auto</u>	Man
-70.0														
														Freq Offset
-80.0														0 Hz
-90.0														Scale Type
Start 10.0		_	_	_	_			_	_	_	Stop 2	0.000 GHz	Log	<u>Lin</u>
#Res BW	1.0 MHz			#∖	/BW 3	.0 MHz			Swe	ep 17	.33 ms (	20001 pts)		
MSG										STATUS				

Plot 7-36. Conducted Spurious Plot (LTE Band 25/2 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

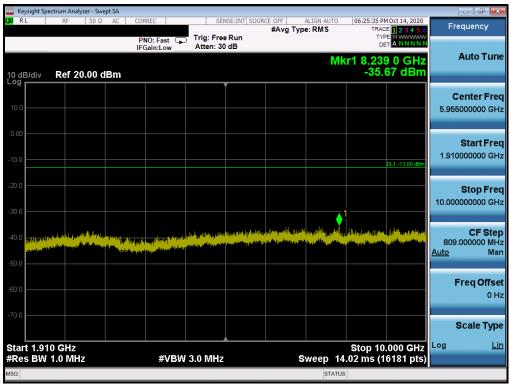
FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:	Page 32 of 98
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### **GSM/GPRS PCS**

	t Spectrum Analyz	er - Swept SA									- 7 💌
L <mark>XI</mark> RL	RF	50 Ω AC	CORREC	SENS	E:INT SOURCE O	F ALIG	IN AUTO		Oct 14, 2020	Fre	equency
			PNO: Fast 🕞 IFGain:Low	Trig: Free A Atten: 30 c	Run			TYP DE			
10 dB/di	v Ref 20	.00 dBm					Mkr	1 1.791 -39.3	5 GHz 36 dBm		Auto Tune
10.0											<b>enter Freq</b> 500000 MHz
-10.0									DL1 -13.00 dBm	30.	Start Freq 000000 MHz
-20.0										1.845	Stop Freq
-40.0	and the construction of the second	e subject of the subj	and the property of the state of the		plantingstabyd fysty		lander start privile st	ing a second the second		181. <u>Auto</u>	CF Step 500000 MHz Man
-60.0										F	F <b>req Offset</b> 0 Hz
-70.0										5	Scale Type
	.0300 GHz		#)(B)A	( 2 0 MH=		<u>Cu</u>	1000 J.	Stop 1.8	430 0112	Log	Lin
#Res B	W 1.0 MHz		#VBV	/ 3.0 MHz		SW	status	zu ms (	3631 pts)		

Plot 7-37. Conducted Spurious Plot (GPRS Ch. 512)



Plot 7-38. Conducted Spurious Plot (GPRS Ch. 512)

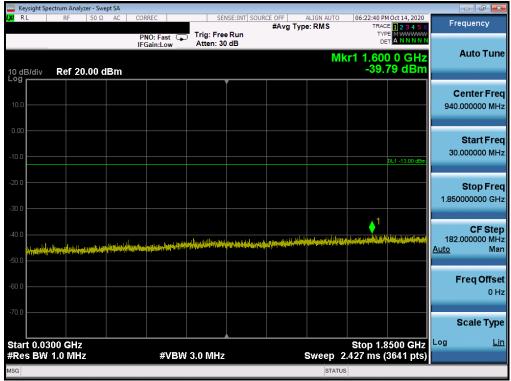
FCC ID: A3LSMG998B	PCTEST Proud to be part of @element	PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 33 of 98
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	ectrum Analyzer	- Swept SA									7 X
L <mark>XI</mark> RL	RF	50Ω AC	CORREC	SEI	SE:INT SOU	RCE OFF #Avg Typ	ALIGN AUTO		M Oct 14, 2020	Frequen	су
	_		PNO: Fast G	Trig: Free Atten: 20		#Avg iyp	e. Kwij	TY			
10 dB/div Log	Ref 10.0	0 dBm					MI	kr1 19.94 -37.	3 0 GHz 92 dBm	Auto	Tune
0.00										Center 15.00000000	
-10.0									DL1 -13.00 dBm	Star 10.00000000	t Fred 00 GH:
-30.0					an and a produce of the	and the part of the second state			n piloitin p <sub>il</sub> iti	Stop 20.00000000	<b>5 Fre</b> 00 GH
-50.0	handelijke <sub>store</sub> jekstreft N <sup>adal</sup> en store versen fil		sert in the ord of partial of the solution		and the states of the states o					CF 1.00000000 <u>Auto</u>	<b>Stej</b> 00 GH Ma
-70.0										Freq	Offse 0 H
-80.0								<b>0</b> 4 00		Scale	<b>Typ</b>
Start 10.0 #Res BW	000 GHZ 1.0 MHZ		#VBV	V 3.0 MHz		s	weep	20 Stop 25.33 ms	.000 GHz 20001 pts)		
MSG							STAT	rus			

Plot 7-39. Conducted Spurious Plot (GPRS Ch. 512)



Plot 7-40. Conducted Spurious Plot (GPRS Ch. 661)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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	ectrum Analyze												
XI <mark>RL</mark>	RF	50 Ω	AC CC	ORREC		SEN	ISE:INT SOU		ALIGN AUTO		M Oct 14, 2020	Freq	uency
			F	PNO: Fast FGain:Low		Trig: Free Atten: 30				TY D			
10 dB/div	Ref 20.	00 dB	m						MI	(r1 9.73 -35.	5 0 GHz 54 dBm	A	uto Tun
10.0													nter Free 00000 GH
10.00											DL1 -13.00 dBm		tart Free
30.0											1		top Free
40.0	uniulii songing <sup>ing</sup> alaisii jampa <sup>ilai</sup>			Personal and a second	ng) - <sub>an</sub> Loon Upotol <sup>decide</sup>	ang baay pila Ng Jesty part	tegy for matry of the association by the	a <mark>ada ana ana ana ana ana ana ana ana ana </mark>	nt <sub>repu</sub> nt <sub>ban</sub> nya Mangan Pa <sub>ba</sub> nya,	, eyl hapepedire, pysyli P <sup>danna</sup> a b <sup>aller</sup> en pa <sup>la</sup> r	a padila para di bajka Andrika padila para	809.00 <u>Auto</u>	CF Ste 00000 MH Ma
60.0												Fr	e <b>q Offse</b> 0 H
70.0												Sc	ale Typ
tart 1.91 Res BW	IO GHz 1.0 MHz			#VI	3W 3.	0 MHz			Sweep 14	Stop 10		Log	Li
SG									STATU	5			

Plot 7-41. Conducted Spurious Plot (GPRS Ch. 661)



Plot 7-42. Conducted Spurious Plot (GPRS Ch. 661)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @ element	PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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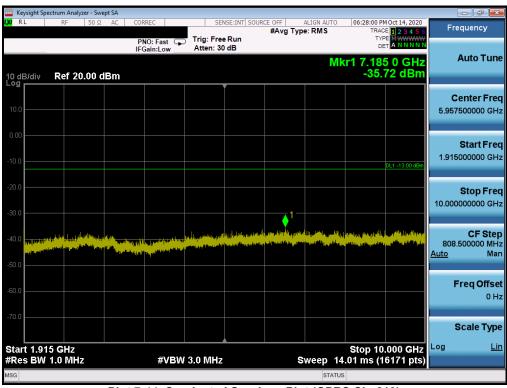
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	Spectrum Analy												ð 🔀
RL	RF	50 Ω	AC	CORREC		SEI	NSE:INT SO		ALIGN AUTO		M Oct 14, 2020	Freque	ncy
				PNO: Fas IFGain:Lo	st 🖵	Trig: Free Atten: 30			,,	TYP			
0 dB/div	Ref 20	).00 di	Зm						M	kr1 1.59 -39.	6 0 GHz 76 dBm	Aut	o Tun
10.0												Cento 940.0000	
10.0											DL1 -13.00 dBm	<b>Sta</b> 30.0000	n <b>t Fre</b> 000 M⊦
20.0												<b>Sto</b> 1.8500000	<b>p Fre</b> 000 GH
40.0	at the state of the			an shink	ntraj kaj manda da	a tuju ji	eletan lengi	han an <mark>hairean an h</mark> airean an h-	uidin sife on sing di bilan	1 Witerweiterten		<b>C</b> 182.0000 <u>Auto</u>	F Ste 000 M⊦ Ma
60.0												Freq	0 <b>ffs</b> 0 H
70.0												Scal	е Тур
	0300 GHz W 1.0 MHz	z		#	VBW	3.0 MHz			Sweep 2	Stop 1.8 2.427 ms (	3500 GHz 3641 pts)	Log	L
SG									STATU	s			

Plot 7-43. Conducted Spurious Plot (GPRS Ch. 810)



Plot 7-44. Conducted Spurious Plot (GPRS Ch. 810)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @ element	PART 24 MEASUREMENT REPORT	MSUNG	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 36 of 98
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	Spectrum Ana												×
X/RL	RF	50 Ω	AC	CORREC		SEN	ISE:INT SOUR	CE OFF	ALIGN AUTO e: RMS		M Oct 14, 2020	Frequency	
	_			PNO: Fas IFGain:Lo		Trig: Free Atten: 20		• •	Mk	r1 17.32		Auto Ti	une
10 dB/div Log	Ref 1	0.00 d	Bm							-38.	.00 dBm		
0.00												Center F 15.000000000	
10.0											DL1 -13.00 dBm	Start F	re
-20.0												10.00000000	GH
-30.0									<b>♦</b> <sup>1</sup>			Stop F	
40.0	umathe the the	ور الارونيني ( وين	n and the second se	and a grand for		n particularity					hi na di sa in putiti Punti sena punti	CF S	to
50.0	وهو رود ماند ه <sup>نگرانه</sup> را ا		مانندر، خ <del>امر</del> <sub>ال</sub>			and the second sec						1.00000000	
50.0												Freq Off	fs
70.0												· · · · · · · · · · · · · · · · · · ·	0  -
80.0												Scale T	ур
	.000 GH: V 1.0 MH			#	VBW	3.0 MHz			weep_2	Stop 20	).000 GHz 20001 pts)	Log	Li
ISG									STAT				-

Plot 7-45. Conducted Spurious Plot (GPRS Ch. 810)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @ element	PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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# WCDMA PCS

	ectrum Analyzer - Sw							
LXU RL	RF 50 Ω	AC	CORREC		SOURCE OFF #Avg Typ	ALIGN AUTO	07:21:20 PM Oct 14, 2020 TRACE 2 3 4 5 6 TYPE A WWWW DET A N N N N	Frequency
10 dB/div Log	Ref 20.00 (	dBm	IFGain:Low	Atten: 30 dB		Mk	r1 1.845 0 GHz -28.31 dBm	Auto Tune
10.0								Center Fred 937.500000 MHz
-10.0							DL1 -13.00 dBm	Start Free 30.000000 MH:
-20.0							1	Stop Fred 1.845000000 GH2
-40.0					-the many of the large state of the	erginen group griptigerheitet	and the second	CF Step 181.500000 MH <u>Auto</u> Mar
-60.0	4994-1994-9994-9994-9994-9994-99 <sup>944</sup>	and the second						<b>Freq Offse</b> 0 H
-70.0								Scale Type
Start 0.03 #Res BW			#VBM	/ 3.0 MHz		Sweep 2	Stop 1.8450 GHz .420 ms (3631 pts)	Log <u>Lir</u>
MSG						STATUS		

Plot 7-46. Conducted Spurious Plot (WCDMA Ch. 9262)



#### Plot 7-47. Conducted Spurious Plot (WCDMA Ch. 9262)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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	ctrum Analyze	r - Swept S	SA									
L <mark>XI</mark> RL	RF	50 Ω /	AC C	ORREC		SE	NSE:INT SO	ALIGN AUT		57 PM Oct 14, 2020 TRACE 1 2 3 4 5 6	Fi	equency
				PNO: Fa IFGain:L		Trig: Fre Atten: 2						
10 dB/div	Ref 10.0	00 dB	m					Μ	lkr1 17. -4	350 5 GHz 15.89 dBm		Auto Tune
Log												<b>Center Freq</b> 0000000 GHz
-10.0										DL1 -13.00 dBm	10.00	Start Freq 0000000 GHz
-30.0								1			20.00	<b>Stop Freq</b> 0000000 GHz
-50.0	**************************************		-			~				~~~~	1.00 <u>Auto</u>	<b>CF Step</b> 0000000 GHz Man
-70.0												Freq Offset 0 Hz
-80.0												Scale Type
Start 10.00 #Res BW				#	VBW	3.0 MHz		Sweep	Stop 25.33 ms	20.000 GHz (20001 pts)	Log	Lin
MSG									ATUS			

Plot 7-48. Conducted Spurious Plot (WCDMA Ch. 9262)



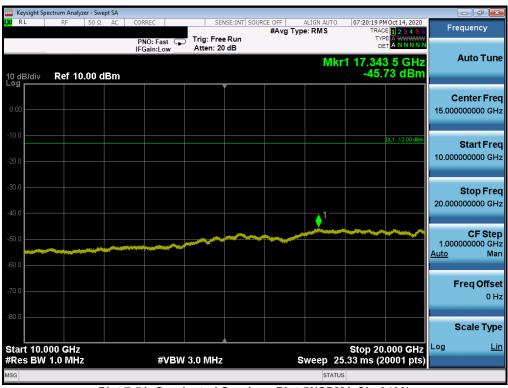
Plot 7-49. Conducted Spurious Plot (WCDMA Ch. 9400)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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	ctrum Analyzer -							
LXI RL	RF 50	Ω AC	CORREC	SENSE:INT SO	URCE OFF ALIGN #Avg Type: RN		Oct 14, 2020	Frequency
			PNO: Fast 🖵 IFGain:Low	Trig: Free Run Atten: 30 dB		TYP DE		Auto Tune
10 dB/div Log	Ref 20.0	) dBm				Mkr1 7.856 -43.7	5 5 GHz 79 dBm	Auto Tune
10.0								Center Freq 5.955000000 GHz
-10.0							DL1 -13.00 dBm	<b>Start Freq</b> 1.910000000 GHz
-20.0								<b>Stop Freq</b> 10.000000000 GHz
-40.0	***	·····				1		CF Step 809.000000 MHz Auto Man
-60.0								Freq Offset 0 Hz
-70.0								Scale Type
Start 1.91 #Res BW			#VBW	3.0 MHz	Swee	Stop 10. p 14.02 ms (1		_og <u>Lin</u>
MSG						STATUS		

Plot 7-50. Conducted Spurious Plot (WCDMA Ch. 9400)



Plot 7-51. Conducted Spurious Plot (WCDMA Ch. 9400)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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	ectrum Analyzer											
X/RL	RF	50Ω AC				NSE:INT SOU		ALIGN AUTO	TRAC	Oct 14, 2020	Frequ	iency
			PN0 IFGa	D: Fast 😱 ain:Low	Atten: 30			M	r1 1.849 -48.4		Au	ito Tune
10 dB/div Log	Ref 20.0	0 dBm	<b>1</b>						-48.4	43 dBm		
10.0												n <b>ter Freq</b> 0000 MHz
-10.0										DL1 -13.00 dBm		t <b>art Frec</b> 0000 MHz
-20.0												top Fred 0000 GHz
-40.0										1	182.00 <u>Auto</u>	CF Step 0000 MH: Mar
-60.0	a i genegen om for skale s		1*9**********				مەربە بەمىرىدىكىسەر يارىي مەربە بەمىرىدىكىسەر يارىي				Fre	e <b>q Offse</b> 0 H:
-70.0											Sc	ale Type
Start 0.03 #Res BW				#VBW	3.0 MHz			Sweep 2	Stop 1.8 2.427 ms (	500 GHz 3641 pts)	Log	Lir
MSG								STATU	5			

Plot 7-52. Conducted Spurious Plot (WCDMA Ch. 9538)



Plot 7-53. Conducted Spurious Plot (WCDMA Ch. 9538)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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	ectrum Analyzer - Sw										X
L <mark>XI</mark> RL	RF 50 Ω	AC	CORREC		NSE:INT SOUR	CE OFF #Avg Typ	ALIGN AUTO e: RMS	TRAC	HOct 14, 2020	Frequency	/
			PNO: Fast G	Trig: Free Atten: 20				DE			
10 dB/div Log	Ref 10.00 (	dBm					Mkr	1 17.36 -45.	6 5 GHz 82 dBm	Auto T	une
LOg										Center F	Freq
0.00										15.000000000	GHz
-10.0									DL1 -13.00 dBm		
-20.0										Start F 10.000000000	
-20.0											
-30.0										Stop F	
-40.0							1			20.000000000	GHz
									<u> </u>	CF S	Sten
-50.0	-		***	mar and a second						1.00000000	
-60.0											Ivian
-70.0										Freq Of	
10.0											0 Hz
-80.0										Scale T	vpe
Stort 10.0								Oton 20		Log	Lin
Start 10.0 #Res BW			#VBV	/ 3.0 MHz		S	weep 25	.33 ms (2	.000 GHz 0001 pts)		
MSG							STATUS				

Plot 7-54. Conducted Spurious Plot (WCDMA Ch. 9538)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical 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 $43 + 10 \log_{10}(P_{[Watts]})$ , where P is the transmitter power in Watts.

#### Test Procedure Used

KDB 971168 D01 v03r01 - Section 6.0

#### Test Settings

- 1. Start 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  $\geq$  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

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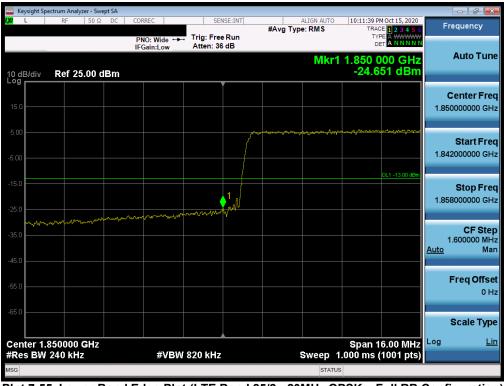
## Test Notes

1. Per 24.238(a) and RSS-133(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.

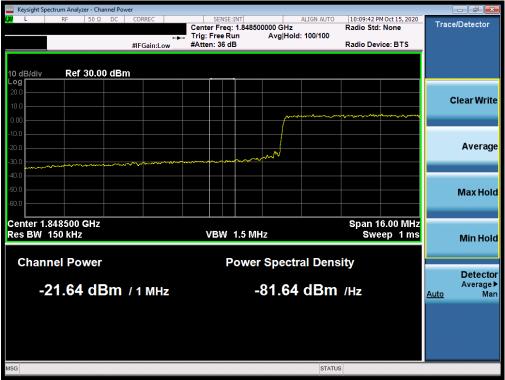
FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	MSUNG	Approved by: Technical Manager
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# LTE Band 25/2



Plot 7-55. Lower Band Edge Plot (LTE Band 25/2 - 20MHz QPSK – Full RB Configuration)



Plot 7-56. Extended Lower Band Edge Plot (LTE Band 25/2 - 20MHz QPSK – Full RB Configuration)

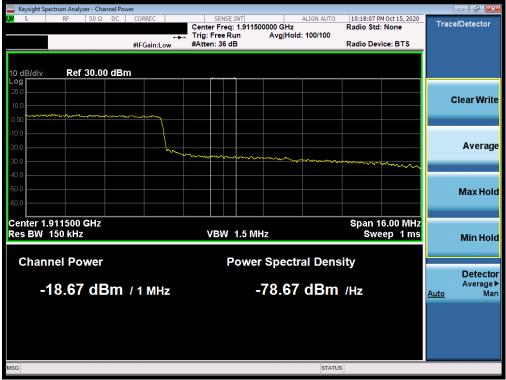
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Keysight Spectrum Analyzer - Swept SA					- F
<mark>α L</mark> RF 50 Ω DC	PNO: Wide	SENSE:INT	#Avg Type: RMS	10:16:35 PM Oct 15, 2020 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A NNNNN	Frequency
0 dB/div Ref 25.00 dBm	IFGain:Low	Atten: 36 dB	Mkr1	1.910 096 GHz -22.670 dBm	Auto Tur
15.0					Center Fre 1.91000000 GH
5.00 Myruna Ayna Anna Anna Anna Anna Anna Anna An	nyker-Munikerinkara korood				Start Fre 1.902000000 GH
25.0		Mul 1	after martine way		<b>Stop Fre</b> 1.918000000 GH
15.0				- Mar Mar	CF Ste 1.600000 Mł <u>Auto</u> Ma
55.0					Freq Offs 0 I
55.0					Scale Typ
enter 1.910000 GHz Res BW 240 kHz	#VBW	820 kHz	Sweep 1	Span 16.00 MHz .000 ms (1001 pts)	Log <u>L</u>
SG			STATUS	\$	

Plot 7-57. Upper Band Edge Plot (LTE Band 2 - 20MHz QPSK – Full RB Configuration)



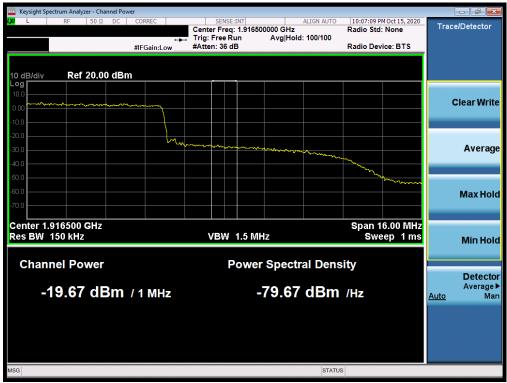
Plot 7-58. Extended Upper Band Edge Plot (LTE Band 2 - 20MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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🔤 Keysight Spe	ectrum Analyzer - S										
LXI L	RF 50	Ω DC	CORREC		ISE:INT	#Avg Typ	ALIGN AUTO	TRAC	4 Oct 15, 2020	F	requency
			PNO: Wide +++ IFGain:Low	Trig: Free Atten: 36							A
10 dB/div Log	Ref 25.00	dBm					Mkr	1.915 0 -24.3	88 GHz 72 dBm		Auto Tune
											Center Freq
15.0										1.91	5000000 GHz
مممى <sub>يەل</sub> مەر	Angen and and	ᡃᠧᠬ᠆ᠰᡗᡃᠬᡪᢂᡔ	superverter	my							Start Freq
-5.00										1.90	7000000 GHz
-15.0									DL1 -13.00 dBm		Stop Freq
-25.0				hum	1					1.92	3000000 GHz
					a danga internetia	www.www.ww	hor man	Man Mart			CF Step
-35.0								~~~~	M. W.	<u>Auto</u>	1.600000 MHz Man
									<u>у</u>		Freq Offset
-55.0											0 Hz
-65.0											Scale Type
Contor 1 (	15000 CH	_						Enon 1	6 00 MH-	Log	Lin
#Res BW	915000 GHz 240 kHz		#VBW	820 kHz			Sweep	span 1 1.000 ms (	0.00 1911 12		
MSG							STATU	s			

Plot 7-59. Upper Band Edge Plot (LTE Band 25 - 20MHz QPSK – Full RB Configuration)

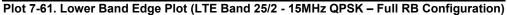


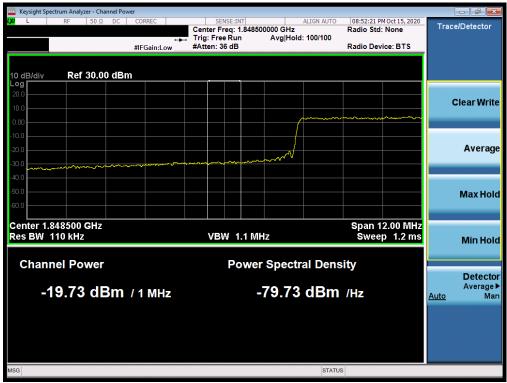
Plot 7-60. Extended Upper Band Edge Plot (LTE Band 25 - 20MHz QPSK – Full RB Configuration)

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					r - Swept SA	t Spectrum Analyzer	Keysight S
Frequency	08:50:55 PM Oct 15, 2020 TRACE 1 2 3 4 5 6	ALIGN AUTO #Avg Type: RMS	SENSE:INT	CORREC	50 Ω DC	RF 5	<b>lxi</b> L
	TYPE A WWWWW DET A N N N N N		Trig: Free Run Atten: 36 dB				
Auto Tune	1.849 820 GHz -24.131 dBm	Mkr1			00 dBm	v Ref 25.0	10 dB/div Log
Center Freq 1.85000000 GHz			Ĭ				15.0
<b>Start Freq</b> 1.844000000 GHz	میں	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~					-5.00
<b>Stop Freq</b> 1.856000000 GHz			1 N	manna			-15.0
CF Step 1.200000 MHz <u>Auto</u> Man					- Andrew	un and a second s	-35.0
Freq Offset 0 Hz							-55.0
Scale Type							-65.0
Log <u>Lin</u>	Span 12.00 MHz 000 ms (1001 pts)	Sweep 1	620 kHz	#VBW 62	Hz	1.850000 GI W 180 kHz	
		STATUS					MSG





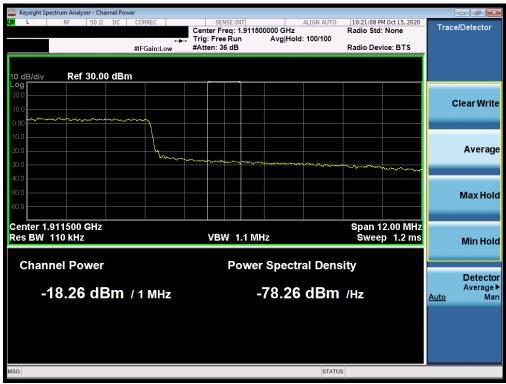
Plot 7-62. Extended Lower Band Edge Plot (LTE Band 25/2 - 15MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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										ight Spectrum /	Keys
Frequency	10:24:37 PM Oct 15, 2020 TRACE 1 2 3 4 5 6	IGN AUTO RMS	#Avg Typ	NSE:INT	SEI		CORREC	DC	50 Ω	RF	L <mark>X/</mark> L
Auto Tune	TYPE A WWWWW DET A NNNNN				Atten: 36	ide ↔ ow	PNO: W IFGain:L				
Auto Tune	1.910 024 GHz -21.953 dBm	Mkr1						Bm	f 25.00 d	/div <b>Re</b> f	10 dB Log r
Center Freq											-
1.910000000 GHz											15.0 -
Start Freq					my		~~~~	ᡊᡔᠬ᠋ᠣᢝᠯᡔ᠇ᠯ	ᢁ᠋ᡧᠧᢧᡎᡐᠧ᠕᠊ᠥᡘ	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	5.00 🖴
1.904000000 GHz											-5.00
Stop Freq	DL1 -13.00 dBm										-15.0
1.916000000 GHz			<u>^</u>	man	huy						-25.0 -
CF Step	mmmmm	ver wor	v w vov								-20.0
1.200000 MHz Auto Man											-35.0
											-45.0
Freq Offset 0 Hz											-55.0
0 H2											-65.0
Scale Type											-00.0
Log <u>Lin</u>										er 1.9100	
	000 ms (1001 pts)	status			620 kHz	¢γΒ₩(	;		KHZ	BW 180	#Res

Plot 7-63. Upper Band Edge Plot (LTE Band 2 - 15MHz QPSK – Full RB Configuration)



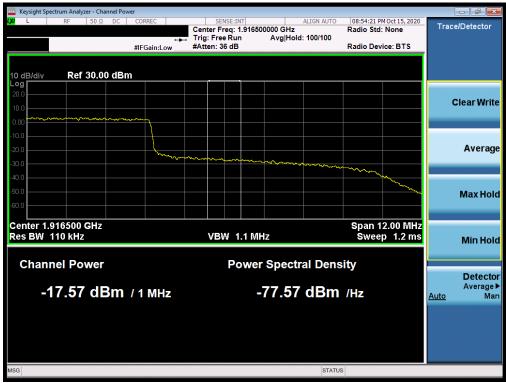
Plot 7-64. Extended Upper Band Edge Plot (LTE Band 2 - 15MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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Keysight Spec			t SA										
<mark>XI</mark> L	RF	50 Ω	DC	CORREC		SE		#Avg Ty	ALIGN AUTO pe: RMS	TRA	M Oct 15, 2020 CE 1 2 3 4 5 6 PE A WARAAAA	F	requency
				PNO: W IFGain:L	ide 🔸	Atten: 3							Auto Tune
10 dB/div Log	Ref 25	.00 dE	3m						WIKE	-21.8	216 GHz 26 dBm		
							Ĭ						Center Freq
15.0												1.91	5000000 GHz
5.00	~~~~~	******	ᠰᢦᡎᢦᠵ	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~							Start Freq
-5.00						$\rightarrow$						1.90	9000000 GHz
-15.0							<u> </u>				DL1 -13.00 dBm		Stop Freq
-25.0						Ly w	vin	mangenage				1.92	21000000 GHz
-35.0									- Marine Mari	m	mm		CF Step
												<u>Auto</u>	1.200000 MHz Man
-45.0													
-55.0													Freq Offset 0 Hz
-65.0													Scale Type
	15000											Log	
Center 1.9 #Res BW 1				\$	¢VB₩	620 kHz			Sweep	Span 1 1.000 ms	2.00 MHz (1001 pts)	LUg	
MSG									STATU	JS			

Plot 7-65. Upper Band Edge Plot (LTE Band 25 - 15MHz QPSK – Full RB Configuration)



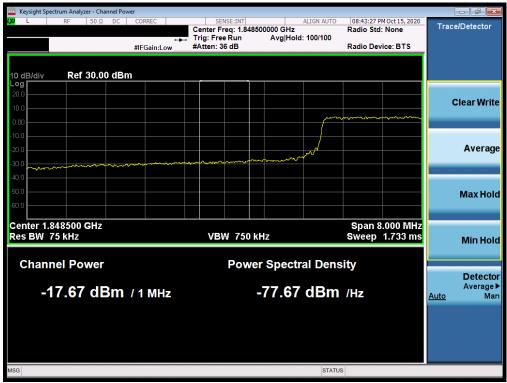
Plot 7-66. Extended Upper Band Edge Plot (LTE Band 25 - 15MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	Pout to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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	PM Oct 15, 2020
#Avg Type: RMS	ACE 1 2 3 4 5 6 Frequency
IFGalliLow Attent to db	
10 dB/div Ref 25.00 dBm -22.	000 GHz 372 dBm
	Center Freq
15.0	1.850000000 GHz
5,00	Start Freq
-5.00	1.846000000 GHz
-15.0	DL1 -13.00 dBm
-25.0	<b>Stop Freq</b> 1.854000000 GHz
-25.0 man way way to be man the man way way the the second s	
-35.0	CF Step 800.000 kHz Auto Man
-45.0	<u>Auto</u> Man
-55.0	Freq Offset
-65.0	0 Hz
	Scale Type
Center 1.850000 GHz Spar	8.000 MHz
#Res BW 120 kHz #VBW 430 kHz Sweep 4.000 ms	(1001 pts)

Plot 7-67. Lower Band Edge Plot (LTE Band 25/2 - 10MHz QPSK – Full RB Configuration)



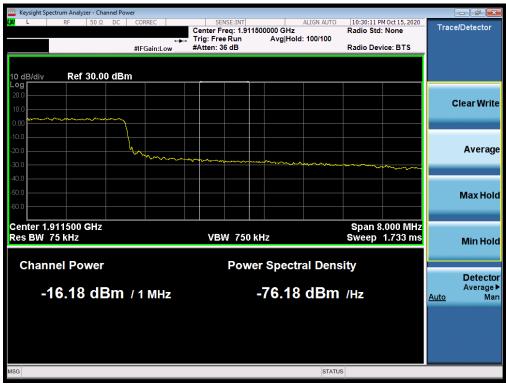
Plot 7-68. Extended Lower Band Edge Plot (LTE Band 25/2 - 10MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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🔤 Keysight Spe	ctrum Analyzer - Swe										
<b>lxi</b> L	RF 50 Ω	DC	CORREC			#Avg Typ	ALIGN AUTO	TRAC	M Oct 15, 2020 E 1 2 3 4 5 6 E A WWWW A N N N N N	F	requency
10 dB/div	Ref 25.00 d	Bm	IFGain:Low	Atten: 36			Mkr1	DE 1.910 0 -20.7			Auto Tune
15.0											<b>Center Freq</b> 10000000 GHz
5.00 -5.00	9.000,000,000,000,000,000,000,000,000,00		297 - ANG 28 - 2020 - 2020 - 2020 - 2020 - 2020 - 2020 - 2020 - 2020 - 2020 - 2020 - 2020 - 2020 - 2020 - 2020						DL1 -13.00 dBm	1.90	Start Freq 06000000 GHz
-15.0				When	1	and the state of the	and and and the second	- Andrew - Salat and	hultmanystyteen	1.9 <sup>,</sup>	<b>Stop Freq</b> 14000000 GHz
-35.0										<u>Auto</u>	CF Step 800.000 kHz Man
-55.0											Freq Offset 0 Hz
-65.0											Scale Type
Center 1.9 #Res BW	910000 GHz 120 kHz		#VBW	430 kHz			Sweep	Span 8 13.33 ms (	.000 MHz 1001 pts)	Log	Lin
MSG							STATU	S			

Plot 7-69. Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB Configuration)



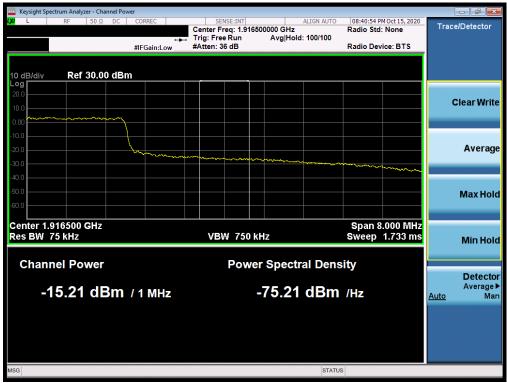
Plot 7-70. Extended Upper Band Edge Plot (LTE Band 2 - 10MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUND	Approved by: Technical Manager
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Keysight Spe		zer - Swept SA										
L <mark>XI</mark> L	RF	50 Ω DC	CORREC		SEN	SE:INT	#Avg T	ALIGN AUTO	TRA	M Oct 15, 2020 CE 1 2 3 4 5 6	F	requency
			PNO: Wie IFGain:Le		tten: 36							Auto Tune
10 dB/div Log	Ref 25	5.00 dBm						MKL	-20.7	088 GHz 23 dBm		
												Center Freq
15.0											1.9	15000000 GHz
5.00 <b>******</b> *	ayanta da	Alter agen alter that a fait of the	᠃ᡔᢦᡧᢛᢛᠺ᠕ᢦᢛᢛᢣᡀᢛ᠇ᠬᢦ	Jan Ballanda an								Start Freq
-5.00											1.9	11000000 GHz
-15.0						1				DL1 -13.00 dBm		Stop Freq
-25.0					Wyy	erne some water	monner	4- your all many of the second	and the second second		1.9	19000000 GHz
									. A P. B.	Variation and the formation of the		CF Step
-35.0											<u>Auto</u>	800.000 kHz Man
-45.0												
-55.0												Freq Offset 0 Hz
-65.0												
												Scale Type
Center 1.9 #Res BW			#	VBW 43	0 kHz			Sweep	Span 8 4.000 ms	8.000 MHz (1001 pts)	Log	<u>Lin</u>
MSG								STATU				

Plot 7-71. Upper Band Edge Plot (LTE Band 25 - 10MHz QPSK – Full RB Configuration)



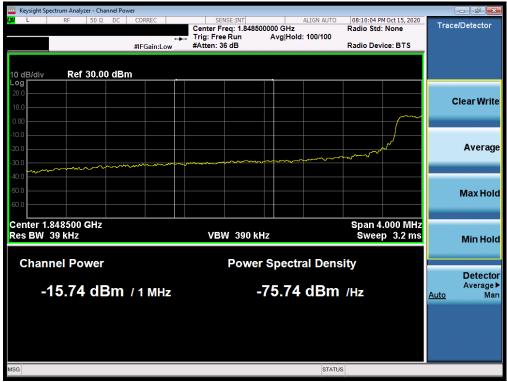
Plot 7-72. Extended Upper Band Edge Plot (LTE Band 25 - 10MHz QPSK – Full RB Configuration)

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Keysight Spo	ectrum Analyzer - Sv										
<b>lxi</b> l	RF 50 Ω	2 DC	CORREC		ISE:INT	#Avg Typ	ALIGN AUTO	TRAC	M Oct 15, 2020	F	requency
			PNO: Wide ↔ IFGain:Low	Trig: Free Atten: 36				TYF DE			Auto Tune
10 dB/div Log	Ref 25.00	dBm					Mkr	1 1.849 9 -20.2	024 GHz 31 dBm		Auto Tune
15.0											<b>Center Freq</b> 50000000 GHz
-5.00									DL1 -13.00 dBm	1.8	Start Freq 48000000 GHz
-15.0	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		1 marcan	1	v				0L1 - 13.00 0Bm	1.8	<b>Stop Freq</b> 52000000 GHz
-35.0										<u>Auto</u>	<b>CF Step</b> 400.000 kHz Man
-55.0											Freq Offset 0 Hz
-65.0											Scale Type
Center 1. #Res BW	350000 GHz 62 kHz		#VBI	№ 220 kHz			Sweep	Span 4 2.000 ms (	.000 MHz 1001 pts)	Log	<u>Lin</u>
MSG							STATU				

Plot 7-73. Lower Band Edge Plot (LTE Band 25/2 - 5MHz QPSK – Full RB Configuration)



Plot 7-74. Extended Lower Band Edge Plot (LTE Band 25/2 - 5MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	Proved to be part of @element	PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager	
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Keysight Spectrum Analyzer - Swept S					- đ ×
X L RF 50 Ω D		SENSE:INT	#Avg Type: RMS	10:36:19 PM Oct 15, 2020 TRACE 1 2 3 4 5 6	Frequency
10 dB/div Ref 25.00 dBr	PNO: Wide IFGain:Low	Atten: 36 dB	Mkr	TYPE A WWWW DET A NNNNN 1 1.910 000 GHz -18.805 dBm	Auto Tune
15.0					Center Fred 1.910000000 GHz
5.00 hadron to the second seco	yayyayaana ahaana karaana karaa			DL1 -13.00 dBm	Start Free 1.908000000 GH:
-25.0		11	un war and a second	and a construction of the second s	<b>Stop Fred</b> 1.912000000 GH:
45.0					<b>CF Ste</b> j 400.000 kH <u>Auto</u> Ma
55.0					Freq Offse 0 ⊢
65.0 Center 1.910000 GHz				opan 4.000 minz	Scale Type
≉Res BW 62 kHz ss	#VBW :	220 kHz	Sweep	6.733 ms (1001 pts)	

Plot 7-75. Upper Band Edge Plot (LTE Band 2 - 5MHz QPSK – Full RB Configuration)



Plot 7-76. Extended Upper Band Edge Plot (LTE Band 2 - 5MHz QPSK – Full RB Configuration)

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🔤 Keysight Spe			t SA										
L) L	RF	50 Ω	DC	CORREC			NSE:INT	#Avg Ty	ALIGN AUTO	TRA	CE 1 2 3 4 5 6	F	requency
				PNO: W IFGain:L	ide ↔ .ow	Trig: Free Atten: 36							
10 dB/div Log	Ref 2	5.00 dE	3m						Mkr	1 1.915 ( -18.1	000 GHz 41 dBm		Auto Tune
15.0													<b>Center Freq</b> 15000000 GHz
-5.00	¥		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		~~~~~						DL1 -13.00 dBm	1.9 <sup>,</sup>	Start Freq 13000000 GHz
-15.0						-	1	m	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	n		1.9*	Stop Freq 17000000 GHz
-35.0												Auto	<b>CF Step</b> 400.000 kHz Man
-55.0													Freq Offset 0 Hz
-65.0													Scale Type
Center 1.9 #Res BW				#	¢VBW :	220 kHz			Sweep	Span 4 2.000 ms	1.000 MHz (1001 pts)	Log	Lin
MSG									STAT				

Plot 7-77. Upper Band Edge Plot (LTE Band 25 - 5MHz QPSK – Full RB Configuration)



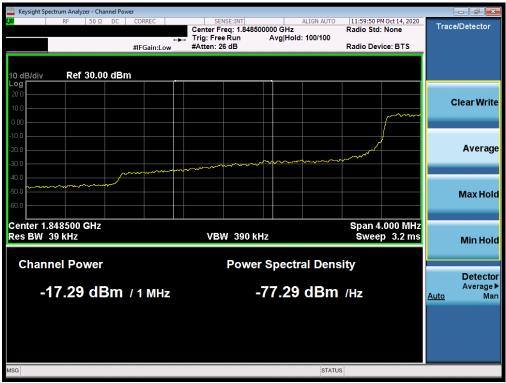
Plot 7-78. Extended Upper Band Edge Plot (LTE Band 25 - 5MHz QPSK – Full RB Configuration)

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🔤 Keysight Sp	oectrum Analyzer -										
l XI	RF 5	0Ω DC	CORREC		SENSE:INT	#Avg Type	ALIGN AUTO E: RMS	11:56:24 PM TRACE	123456	F	requency
10 dB/div	Ref 25.0	0 dBm	PNO: Wide IFGain:Lov		ree Run : 36 dB		Mkr1	1.850 0	0 GHz 1 dBm		Auto Tune
15.0											<b>Center Freq</b> 50000000 GHz
-5.00						~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	- waen		)L1 -13.00 dBm	1.84	Start Freq 18000000 GHz
-15.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	1 1 7				21-1-1-3.00 (dom)	1.8	Stop Freq 52000000 GHz
-35.0		~~~~~								<u>Auto</u>	<b>CF Step</b> 400.000 kHz Man
-55.0											Freq Offset 0 Hz
-65.0 Center 1. #Res BW	.850000 GH	łz		/BW 130 ki			Swoon 1	Span 4. 2.000 ms (1		Log	Scale Type <u>Lin</u>
#Res BW	30 KHZ		#1	BW 130 KI	12	*	sweep 2		oor pts)		

Plot 7-79. Lower Band Edge Plot (LTE Band 25/2 - 3MHz QPSK – Full RB Configuration)



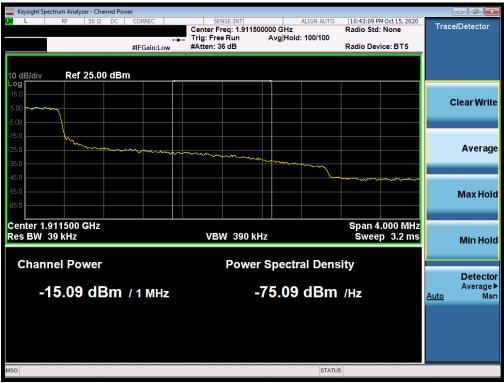
Plot 7-80. Extended Lower Band Edge Plot (LTE Band 25/2 - 3MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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🔤 Keysight Spe	ectrum Analyz										_	
<mark>ixi</mark> L	RF	50 Ω DC		: Wide ↔→		NSE:INT	#Avg Ty	ALIGN AUTO pe: RMS	TRA	M Oct 15, 2020 CE 1 2 3 4 5 6 PE A WWWWW ET A N N N N N	F	requency
10 dB/div	Ref 25.	.00 dBm	IFGair	:Low	Atten: 36			Mkr		008 GHz 076 dBm		Auto Tune
15.0												<b>Center Freq</b> 10000000 GHz
5.00 -5.00				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						DL1 -13.00 dBm	1.90	Start Freq 08000000 GHz
-15.0						1			~~~		1.9 <sup>,</sup>	Stop Freq 12000000 GHz
-35.0										~~~~	<u>Auto</u>	<b>CF Step</b> 400.000 kHz Man
-55.0												Freq Offset 0 Hz
-65.0												Scale Type
Center 1.9 #Res BW		GHz		#VBW	130 kHz			Sweep	Span 4 2.000 ms	l.000 MHz (1001 pts)	Log	<u>Lin</u>
MSG								STAT	JS			

Plot 7-81. Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB Configuration)



Plot 7-82. Extended Upper Band Edge Plot (LTE Band 2 - 3MHz QPSK – Full RB Configuration)

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🔤 Keysight Spo	ectrum Analyz												
LXI	RF	50Ω [	DC	CORREC		SE	NSE:INT	#Avg Ty	ALIGN AUTO	TI	AM Oct 15, 2020 RACE 1 2 3 4 5 6 TYPE A WWWW DET A NNNNN	F	requency
10 dB/div	Ref 25	.00 dB		IFGain:L		Atten: 3			Mkr	1 1.915	008 GHz 9.16 dBm		Auto Tune
15.0													<b>Center Freq</b> 15000000 GHz
-5.00		<del></del>	~~~~	î	~~~~						DL1 -13.00 dBm	1.9 <sup>.</sup>	Start Freq 13000000 GHz
-15.0						t	1	~ <u>~~~</u> ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	Ann	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		1.91	Stop Freq 17000000 GHz
-35.0												<u>Auto</u>	<b>CF Step</b> 400.000 kHz Man
-55.0													Freq Offset 0 Hz
-65.0													Scale Type
Center 1.9 #Res BW		GHz		#	VBW	130 kHz			Sweep	Span 2.000 m	4.000 MHz s (1001 pts)	Log	Lin
MSG									STAT	US			

Plot 7-83. Upper Band Edge Plot (LTE Band 25 - 3MHz QPSK – Full RB Configuration)



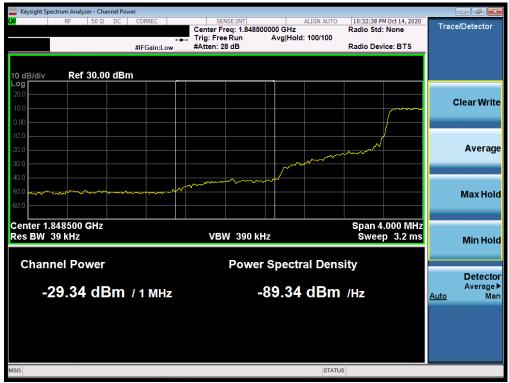
Plot 7-84. Extended Upper Band Edge Plot (LTE Band 25 - 3MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	POTEST Proud to be part of @element	PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
Test Report S/N:	Test Dates:	EUT Type:		Page 59 of 98
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Keysight Spectrum Analyzer - Swept SA					- ē <b>×</b>
<b>LXI</b> RF 50 Ω DC		SENSE:INT	ALIGN AUTO #Avg Type: RMS	10:18:49 PM Oct 14, 2020 TRACE 1 2 3 4 5 6 TYPE A WWWW DET A N N N N N	Frequency
10 dB/div Ref 25.00 dBn	IFGain:Low	Atten: 36 dB	Mkr1	1.849 996 GHz -22.470 dBm	Auto Tune
15.0					Center Freq 1.85000000 GHz
-5.00				DL1 -13.00 dBm	<b>Start Freq</b> 1.848000000 GHz
-15.0	and the second second	1		h mmm m	<b>Stop Freq</b> 1.852000000 GHz
-35.0				~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	CF Step 400.000 kHz <u>Auto</u> Man
-45.0					Freq Offset 0 Hz
-65.0					Scale Type
Center 1.850000 GHz #Res BW 15 kHz	#VBW 5	1 kHz	#Sweep 6.	Span 4.000 MHz 733 ms (1001 pts)	Log <u>Lin</u>
MSG			STATUS		

Plot 7-85. Lower Band Edge Plot (LTE Band 25/2 – 1.4MHz QPSK – Full RB Configuration)

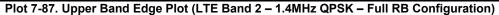


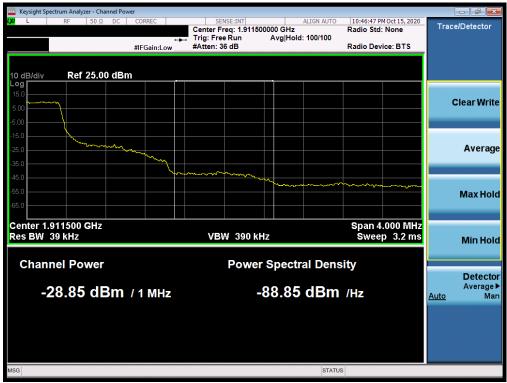
Plot 7-86. Extended Lower Band Edge Plot (LTE Band 25/2 – 1.4MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	Poud to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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Keysight Sp	ectrum Analyzer - S										
L <mark>XI</mark> L	RF 50	ΩDC	CORREC PNO: Wide ↔			#Avg Typ	ALIGN AUTO e: RMS	TRAC	MOct 15, 2020 E 1 2 3 4 5 6 E A WWWW T A N N N N N	F	requency
10 dB/div	Ref 25.00	dBm	IFGain:Low	Atten: 36			Mkr	1 1.910 0 -21.5			Auto Tune
15.0											<b>Center Freq</b> 10000000 GHz
-5.00									DL1 -13.00 dBm	1.90	Start Freq 08000000 GHz
-15.0	warmen				1 Martin	Mone -				1.91	Stop Freq 2000000 GHz
-35.0						- where the second seco	and t			<u>Auto</u>	<b>CF Step</b> 400.000 kHz Man
-40.0									, , , , , , , , , , , , , , , , , , ,		Freq Offset 0 Hz
-65.0	910000 GH							- Chort		Log	Scale Type
#Res BW			#VBW	56 kHz				5.667 ms (			
MSG							STATU	JS			



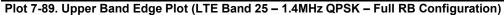


Plot 7-88. Extended Upper Band Edge Plot (LTE Band 2 – 1.4MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	Poud to be part of @ element	PART 24 MEASUREMENT REPORT	Approved by: Technical Manager
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🔤 Keysight Sp	ectrum Analy.											-	
LXI	RF	50 Ω	DC	CORREC	ide ⊶►→		e Run	#Avg Typ	ALIGN AUTO	TR/	PM Oct 14, 2020 ACE 1 2 3 4 5 6 YPE A WWWWW DET A N N N N N	F	requency
10 dB/div	Ref 25	i.00 dl	Bm	IFGain:L	.ow	Atten: 3	6 dB		Mkr	1 1.915	028 GHz .34 dBm		Auto Tune
15.0													<b>Center Freq</b> 15000000 GHz
-5.00			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~						DL1 -13.00 dBm	1.9 <sup>,</sup>	Start Freq 13000000 GHz
-15.0	mm					, L	1 mm	Aura				1.9 <sup>,</sup>	Stop Freq 17000000 GHz
-35.0								- May	n		www.tut-	<u>Auto</u>	<b>CF Step</b> 400.000 kHz Man
-55.0													Freq Offset 0 Hz
-65.0	015000	CH2								Snan	4.000 MHz	Log	Scale Type Lin
#Res BW		enz		;	¢VBW	51 kHz				6.667 ms	4.000 MH2 (1001 pts)		
MSG									STAT	US			



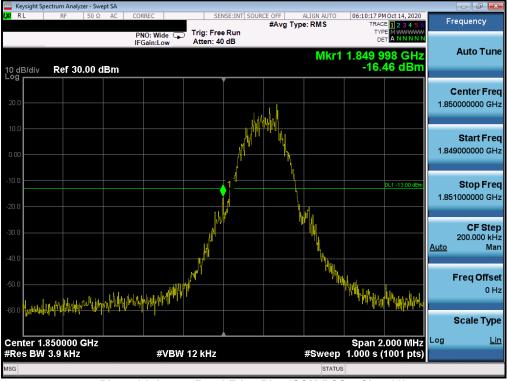


Plot 7-90. Extended Upper Band Edge Plot (LTE Band 25 – 1.4MHz QPSK – Full RB Configuration)

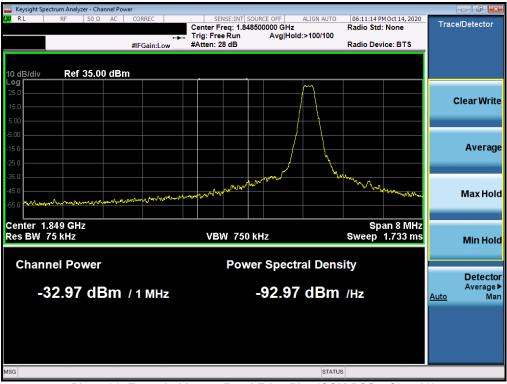
FCC ID: A3LSMG998B	Pout to be part of @element	PART 24 MEASUREMENT REPORT	SAMSONE	Approved by: Technical Manager
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## **GSM/GPRS PCS**



Plot 7-91. Lower Band Edge Plot (GSM PCS - Ch. 512)

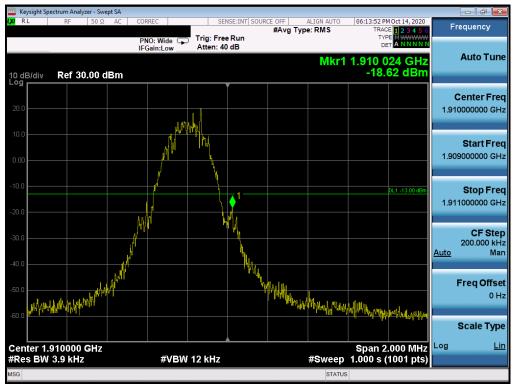


## Plot 7-92. Extended Lower Band Edge Plot (GSM PCS - Ch. 512)

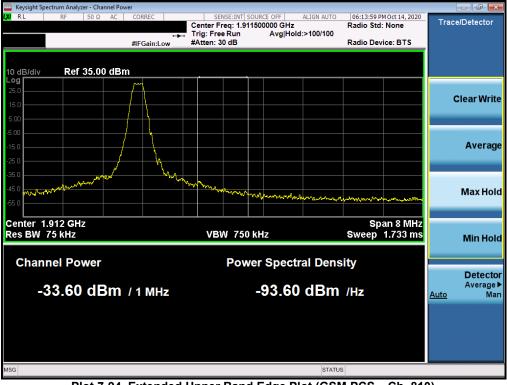
	PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-93. Upper Band Edge Plot (GSM PCS - Ch. 810)



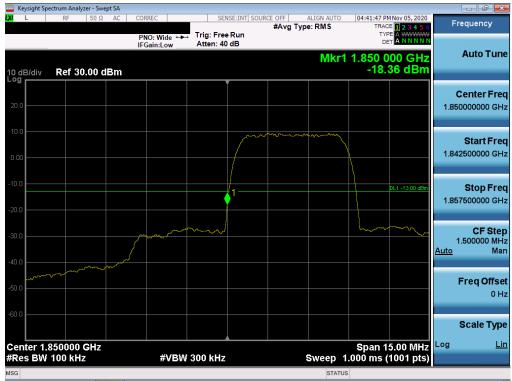
Plot 7-94. Extended Upper Band Edge Plot (GSM PCS - Ch. 810)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager	
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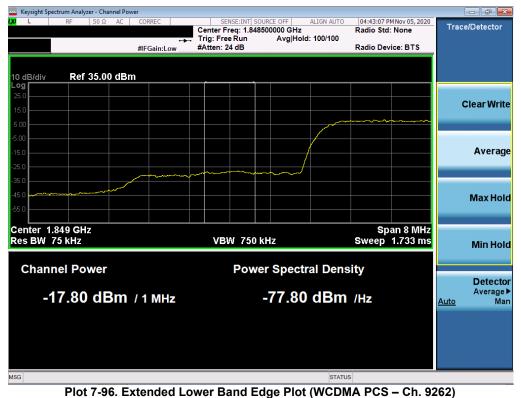
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## WCDMA PCS



Plot 7-95. Lower Band Edge Plot (WCDMA PCS – Ch. 9262)



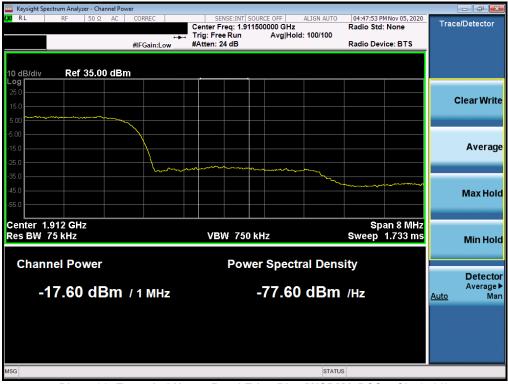
FCC ID: A3LSMG998B	PCTEST Proud to be part of @element	PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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	ectrum Analyzer -										_	
L	RF 50	Ω AC	CORREC	Nide ↔	Trig: Free			ALIGN AUTO ype: RMS	TRA	PM Nov 05, 2020 CE 1 2 3 4 5 6 (PE A WWWW	F	requency
0 dB/div	Ref 30.00	) dBm	IFGain		Atten: 40	) dB		Mkr	1 1.910	000 GHz 288 dBm		Auto Tun
20.0												Center Fre 0000000 G⊢
0.0			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~							1.90	<b>Start Fre</b> 2500000 GF
0.0						1				DL1 -13.00 dBm	1.91	<b>Stop Fre</b> 7500000 GF
0.0							~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~			<u>Auto</u>	<b>CF St</b> e 1.500000 M M
D.0										and the second s		Freq Offs 0
0.0	910000 GH	_							Snon	15.00 MHz	Log	Scale Tyr
	100 kHz	2		#VBW	300 kHz			Sweep	3pan 1.000 ms	(1001 pts)	3	_
SG								STAT				





Plot 7-98. Extended Upper Band Edge Plot (WCDMA PCS - Ch. 9538)

FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager	
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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 ≥ OBW or specified reference bandwidth
- 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. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

#### Test Setup

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



Figure 7-4. Test Instrument & Measurement Setup

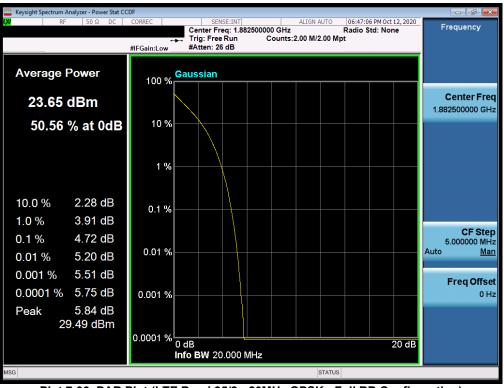
#### Test Notes

None.

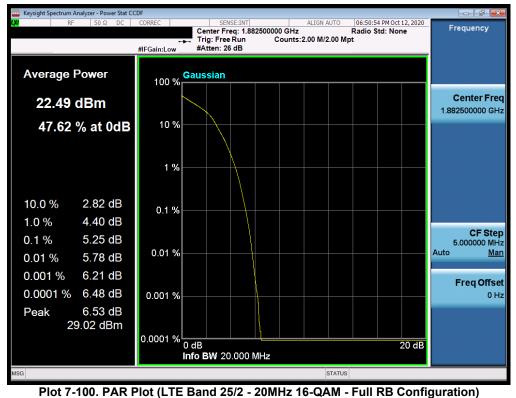
FCC ID: A3LSMG998B		PART 24 MEASUREMENT REPORT	SAMSUNE	Approved by: Technical Manager
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## LTE Band 25/2



Plot 7-99. PAR Plot (LTE Band 25/2 - 20MHz QPSK - Full RB Configuration)



# MG998B

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