

PART 22 MEASUREMENT REPORT

Applicant Name:
Samsung Electronics Co., Ltd.
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Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea


Date of Testing:
9/28/2020 – 12/07/2020
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2009280154-19.A3L

FCC ID:	A3LSMG998B
Applicant Name:	Samsung Electronics Co., Ltd.



Application Type: Certification
Model: SM-G998B/DS
Additional Model(s): SM-G998B
EUT Type: Portable Handset
FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part: 22
Test Procedure(s): ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01, KDB 648474 D03 v01r04

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in §2.947. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.


Randy Ortanez
President





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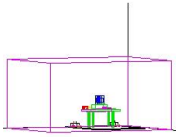
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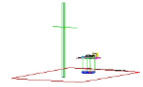
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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
LTE Band 26	15MHz	QPSK	831.5 - 841.5	0.065	18.14	0.107	20.29	13M5G7D
		16QAM	831.5 - 841.5	0.049	16.93	0.081	19.08	13M5W7D
		64QAM	831.5 - 841.5	0.041	16.10	0.067	18.25	13M5W7D
		256QAM	831.5 - 841.5	0.009	9.61	0.015	11.76	13M5W7D
LTE Band 26/5	10 MHz	QPSK	829.0 - 844.0	0.065	18.11	0.106	20.26	9M02G7D
		16QAM	829.0 - 844.0	0.049	16.92	0.081	19.07	9M00W7D
		64QAM	829.0 - 844.0	0.041	16.12	0.067	18.27	9M03W7D
		256QAM	829.0 - 844.0	0.009	9.47	0.015	11.62	9M02W7D
	5 MHz	QPSK	826.5 - 846.5	0.064	18.08	0.105	20.23	4M52G7D
		16QAM	826.5 - 846.5	0.051	17.08	0.084	19.23	4M54W7D
		64QAM	826.5 - 846.5	0.040	15.97	0.065	18.12	4M56W7D
		256QAM	826.5 - 846.5	0.009	9.38	0.014	11.53	4M52W7D
	3 MHz	QPSK	825.5 - 847.5	0.065	18.10	0.106	20.25	2M72G7D
		16QAM	825.5 - 847.5	0.050	16.96	0.081	19.11	2M73W7D
		64QAM	825.5 - 847.5	0.040	16.01	0.065	18.16	2M72W7D
		256QAM	825.5 - 847.5	0.009	9.33	0.014	11.48	2M71W7D
	1.4 MHz	QPSK	824.7 - 848.3	0.062	17.92	0.102	20.07	1M10G7D
		16QAM	824.7 - 848.3	0.049	16.93	0.081	19.08	1M10W7D
		64QAM	824.7 - 848.3	0.040	15.97	0.065	18.12	1M10W7D
		256QAM	824.7 - 848.3	0.009	9.53	0.015	11.68	1M11W7D
NR Band n5	20 MHz	QPSK	834.0 - 839.0	0.027	14.38	0.045	16.53	19M4G7D
		16QAM	834.0 - 839.0	0.021	13.32	0.035	15.47	19M2W7D
		64QAM	834.0 - 839.0	0.015	11.67	0.024	13.82	19M0W7D
		256QAM	834.0 - 839.0	0.009	9.74	0.015	11.89	19M0W7D
	15 MHz	QPSK	831.5 - 841.5	0.027	14.30	0.044	16.45	14M4G7D
		16QAM	831.5 - 841.5	0.021	13.28	0.035	15.43	14M3W7D
		64QAM	831.5 - 841.5	0.016	11.96	0.026	14.11	14M2W7D
		256QAM	831.5 - 841.5	0.009	9.76	0.016	11.91	14M2W7D
	10 MHz	QPSK	829.0 - 844.0	0.025	13.93	0.041	16.08	9M38G7D
		16QAM	829.0 - 844.0	0.019	12.87	0.032	15.02	9M39W7D
		64QAM	829.0 - 844.0	0.013	11.18	0.022	13.33	9M38W7D
		256QAM	829.0 - 844.0	0.015	11.67	0.024	13.82	9M04W7D
	5 MHz	QPSK	826.5 - 846.5	0.025	14.05	0.042	16.20	4M56G7D
		16QAM	826.5 - 846.5	0.019	12.85	0.032	15.00	4M56W7D
		64QAM	826.5 - 846.5	0.014	11.57	0.024	13.72	4M52W7D
		256QAM	826.5 - 846.5	0.010	9.91	0.016	12.06	4M60W7D

Mode	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
			Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
GSM/GPRS	GMSK	824.2 - 848.8	0.413	26.16	0.678	28.31	245KGXW
EDGE	8-PSK	824.2 - 848.8	0.094	19.74	0.155	21.89	247KG7W
WCDMA	Spread Spectrum	826.4 - 846.6	0.066	18.18	0.108	20.33	4M29F9W

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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 22.

Test Device Serial No.: 0204M, 0048M, 0036M, 0211M, 0205M

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 26 (814.7 – 849 MHz) overlaps the entire frequency range of LTE Band 5 (824 – 849 MHz). Therefore, test data provided in this report covers Band 5 and the portion of Band 26 subject to Part 22.

Sub 6GHz NR Band n5 (824 – 849 MHz) operates using 15kHz Subcarrier Spacing with both CP-OFDM and DFTs OFDM waveforms. The band supports QPSK, 16QAM, 64QAM, and 256QAM modulation. The test data provided in this report represents the worst case configuration.



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 half-wave 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:

$$P_d \text{ [dBm]} = P_g \text{ [dBm]} - \text{cable loss [dB]} + \text{antenna gain [dBd/dBi]};$$

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 $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

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:



$$E_{\text{[dB}\mu\text{V/m]}} = \text{Measured amplitude level}_{\text{[dBm]}} + 107 + \text{Cable Loss}_{\text{[dB]}} + \text{Antenna Factor}_{\text{[dB/m]}}$$

And

$$\text{EIRP}_{\text{[dBm]}} = E_{\text{[dB}\mu\text{V/m]}} + 20\log D - 104.8; \text{ where } D \text{ is the measurement distance in meters.}$$

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 (\pm 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	9/16/2020	Annual	9/16/2021	LTx2
-	LTx4	Licensed Transmitter Cable Set	9/16/2020	Annual	9/16/2021	LTx4
-	LTx5	Licensed Transmitter Cable Set	9/16/2020	Annual	9/16/2021	LTx5
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Biennial	8/27/2022	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/14/2019	Biennial	2/14/2021	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	128338
Keysight Technologies	N9020A	MXA Signal Analyzer	8/14/2020	Annual	8/14/2021	US46470561
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	11/5/2020	Annual	11/5/2021	112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/9/2020	Annual	9/9/2021	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/10/2020	Annual	2/10/2021	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102133
Rohde & Schwarz	TS-PR1840	Pre-Amp		N/A		100059
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol Science	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/NR

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Occupied Bandwidth	2.1049	RSS-139(2.3)	N/A	PASS	Section 7.2
	Conducted Band Edge / Spurious Emissions	2.1051, 22.917(a)	RSS-132(5.5)	> 43 + 10log10(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.3, 7.4
	Transmitter Conducted Output Power	2.1046	RSS-132(5.4)	N/A	PASS	See RF Exposure Report
	Frequency Stability	2.1055, 22.355	RSS-132(5.3)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
RADIATED	Effective Radiated Power / Equivalent Isotropic Radiated Power	22.913(a)(5)	RSS-132(5.4)	< 7 Watts max. ERP	PASS	Section 7.6
	Radiated Spurious Emissions	2.1053, 22.917(a)	RSS-132(5.5)	> 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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7.3 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 $\geq 3 \times$ 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.

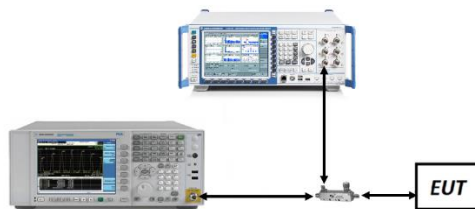




Figure 7-1. Test Instrument & Measurement Setup

Test Notes

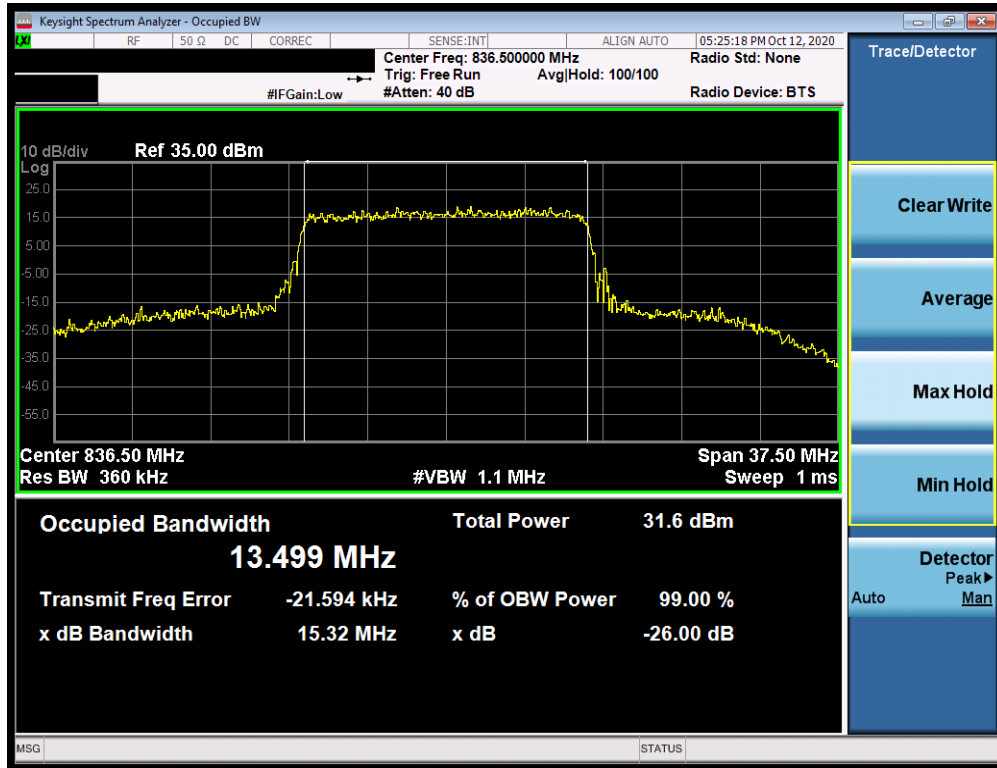
None.

FCC ID: A3LSMG998B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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LTE Band 26/5



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

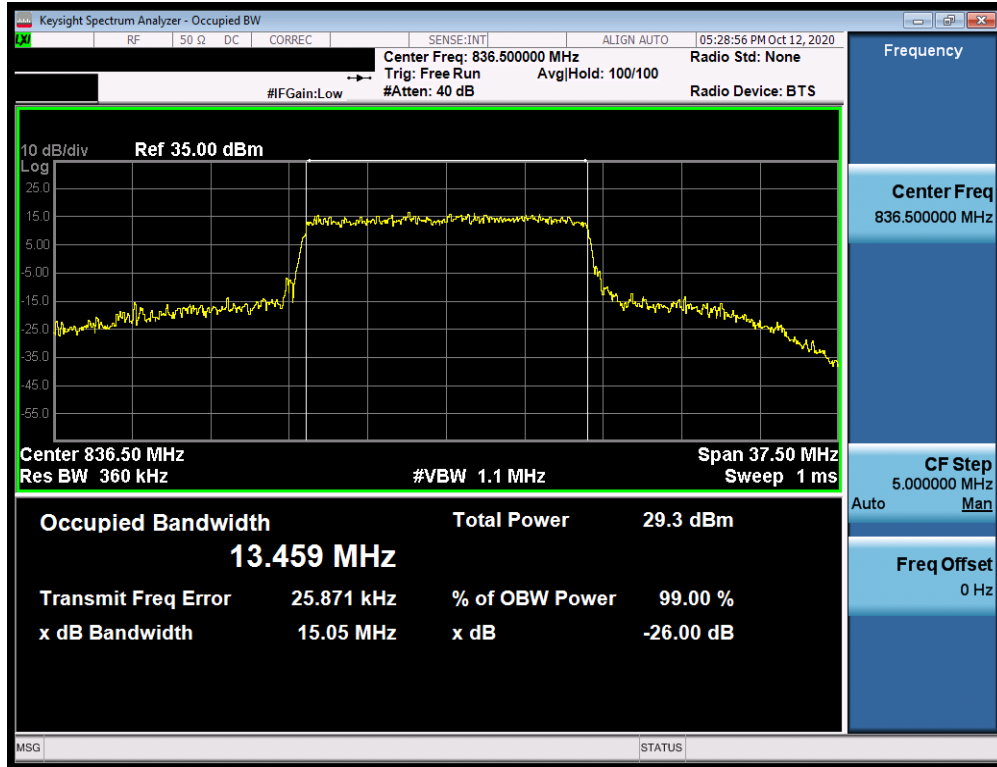


Plot 7-2. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB Configuration)

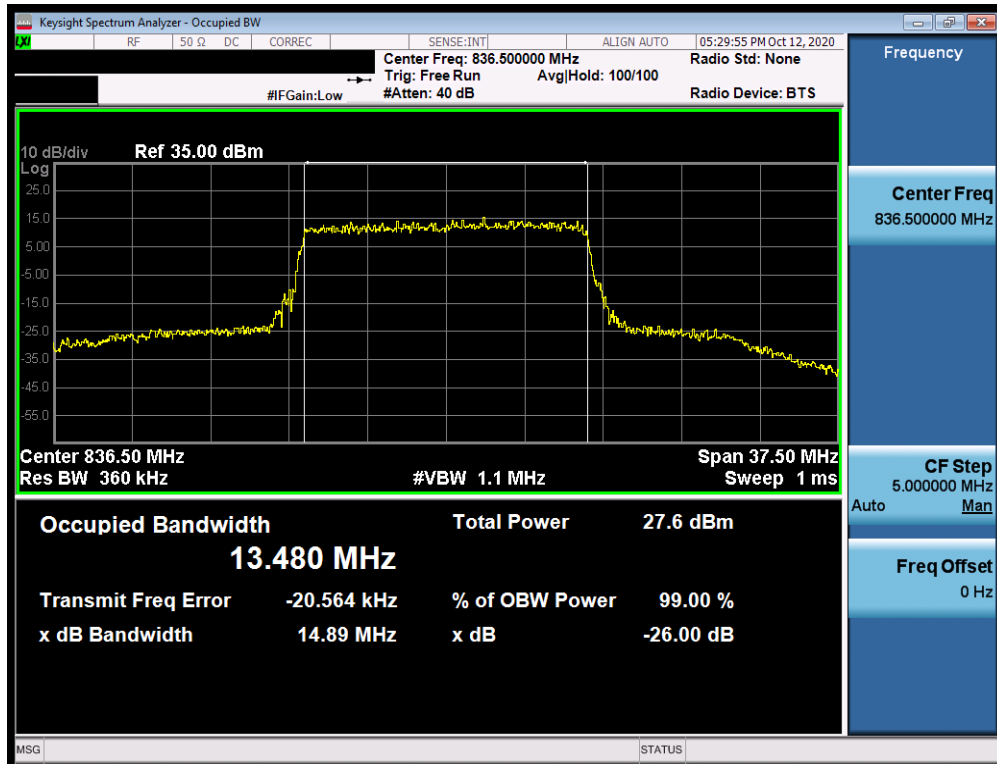
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-3. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 64-QAM - Full RB Configuration)



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

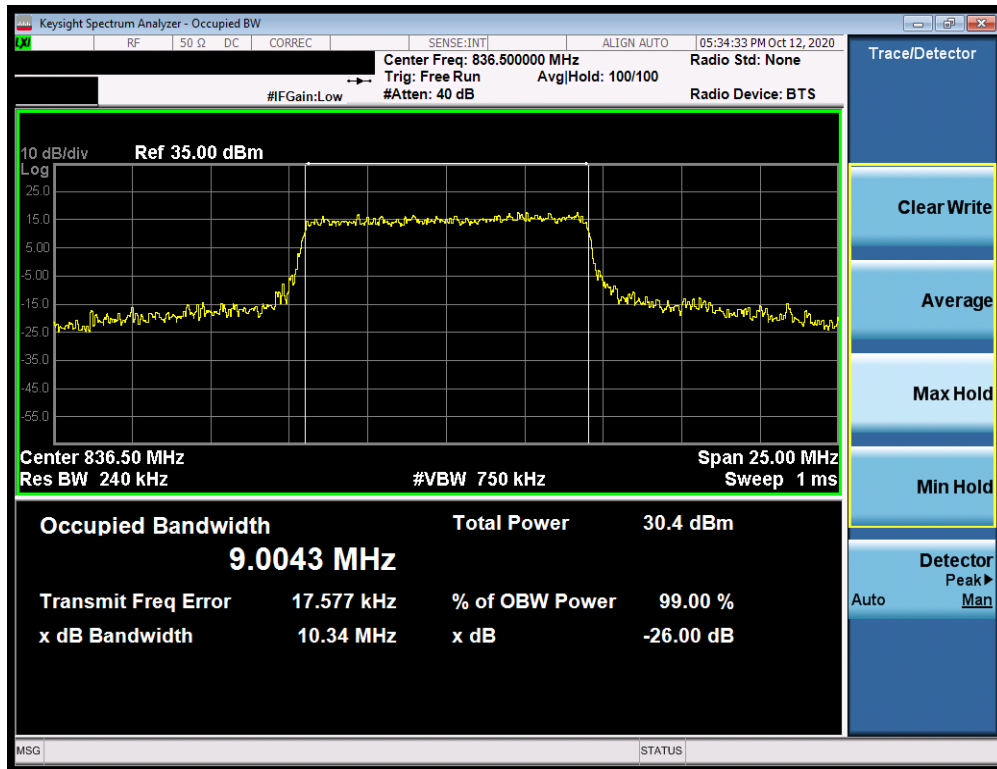
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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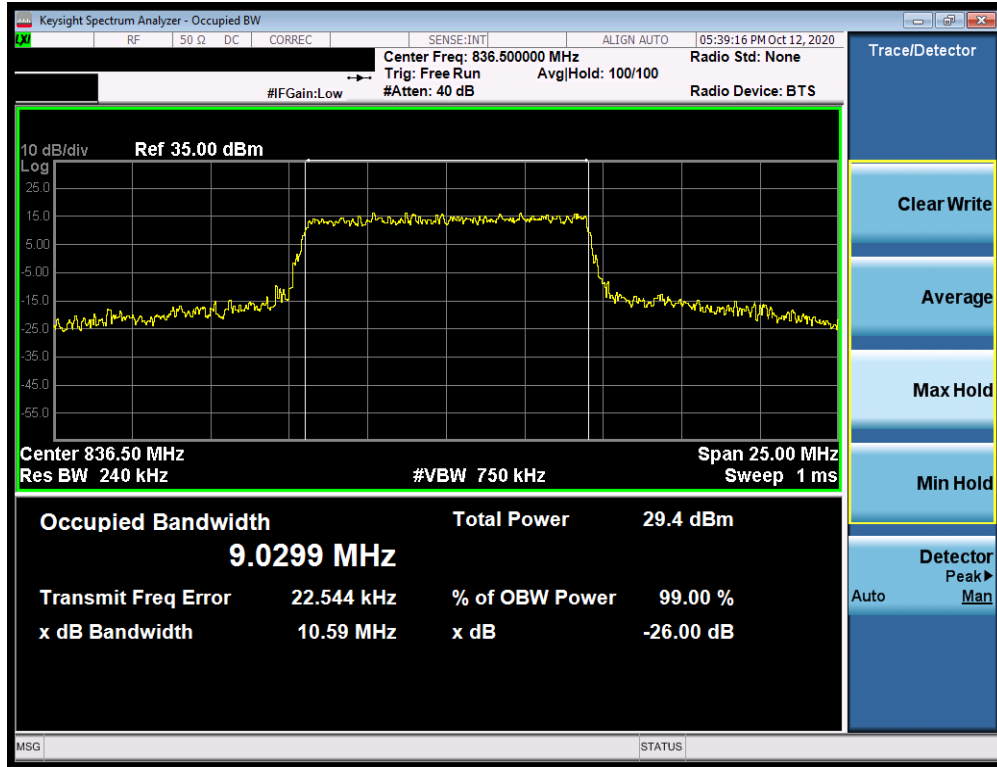


Plot 7-5. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz QPSK - Full RB Configuration)

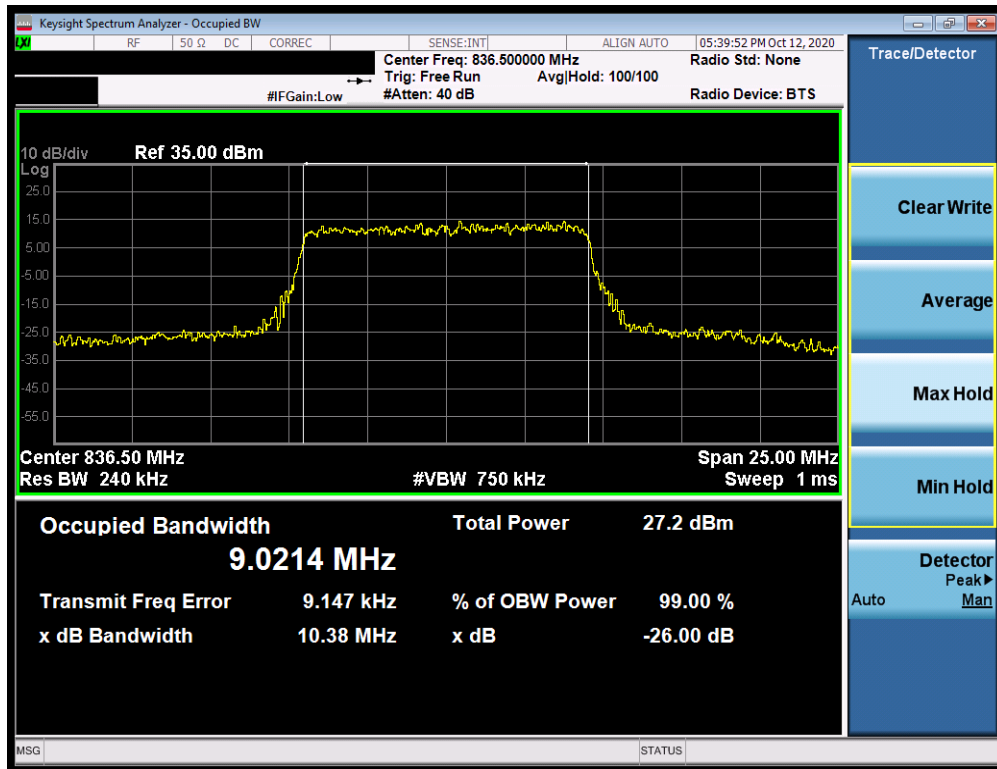


Plot 7-6. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of 	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-7. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 64-QAM - Full RB Configuration)

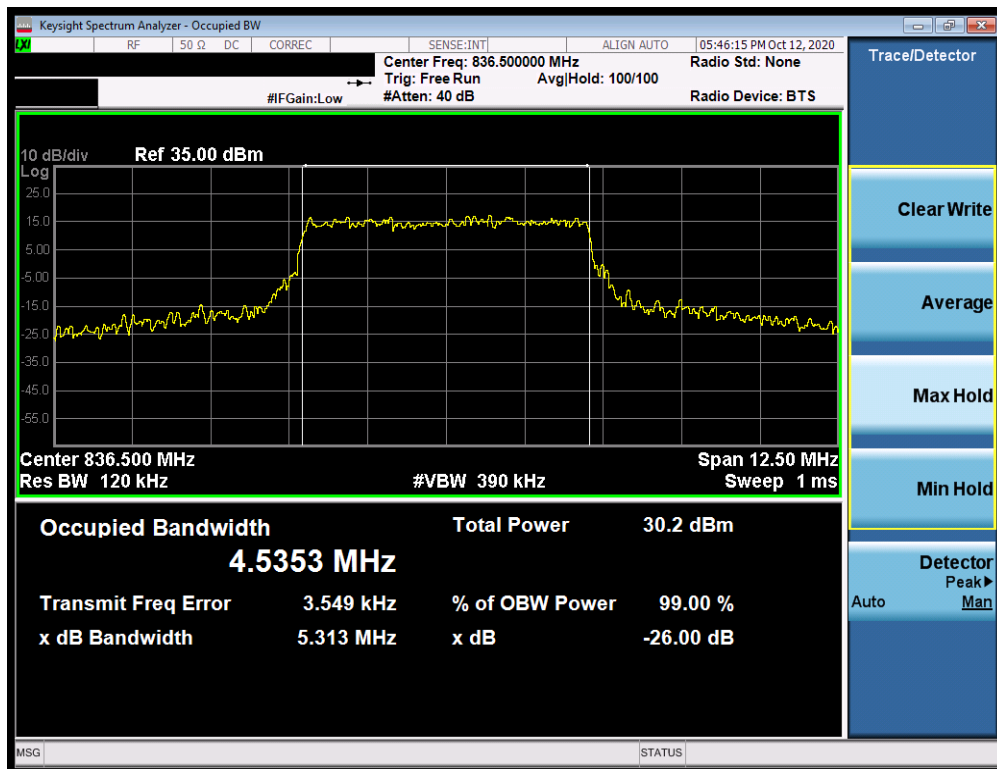


Plot 7-8. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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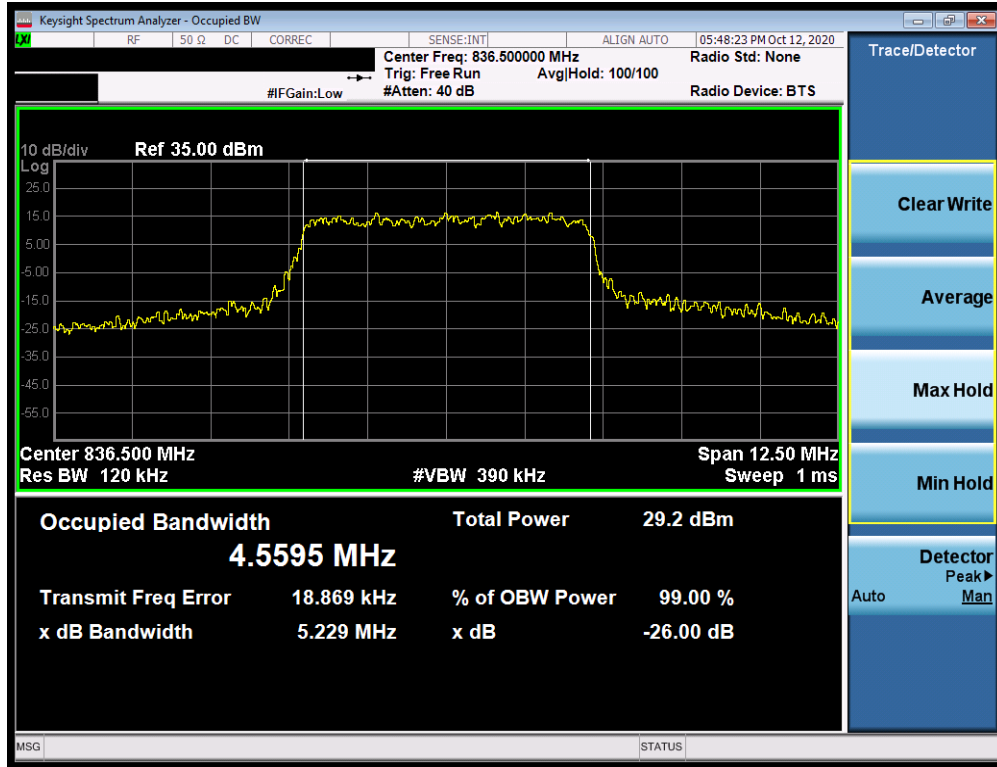


Plot 7-9. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz QPSK - Full RB Configuration)



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

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-11. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 64-QAM - Full RB Configuration)

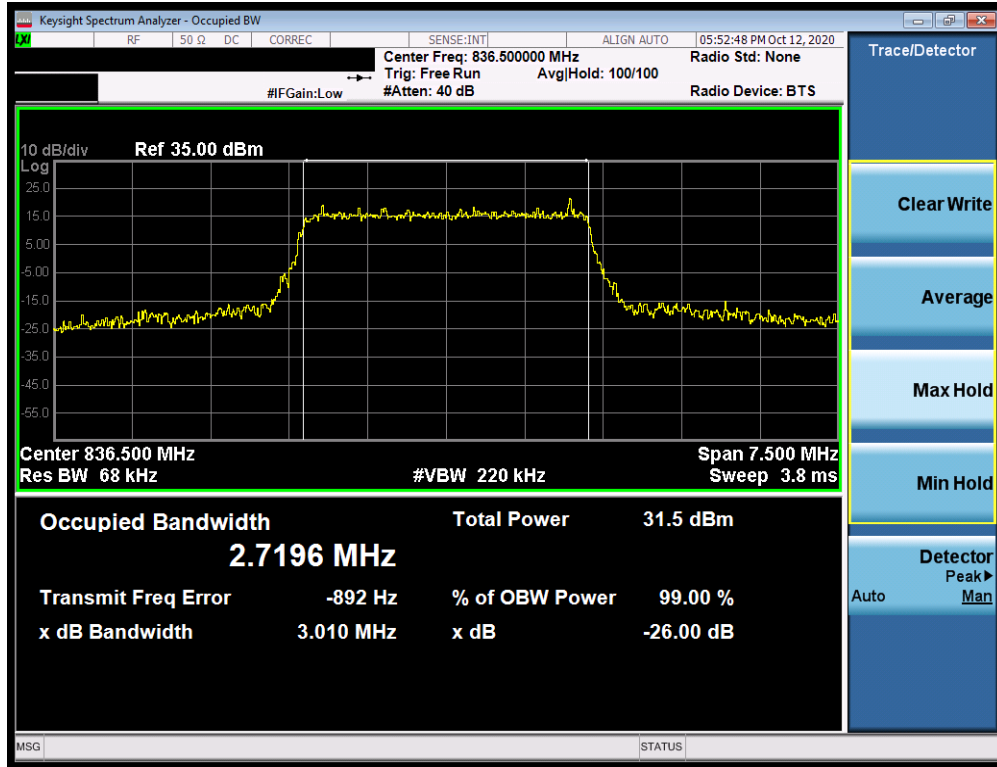


Plot 7-12. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 256-QAM - Full RB Configuration)

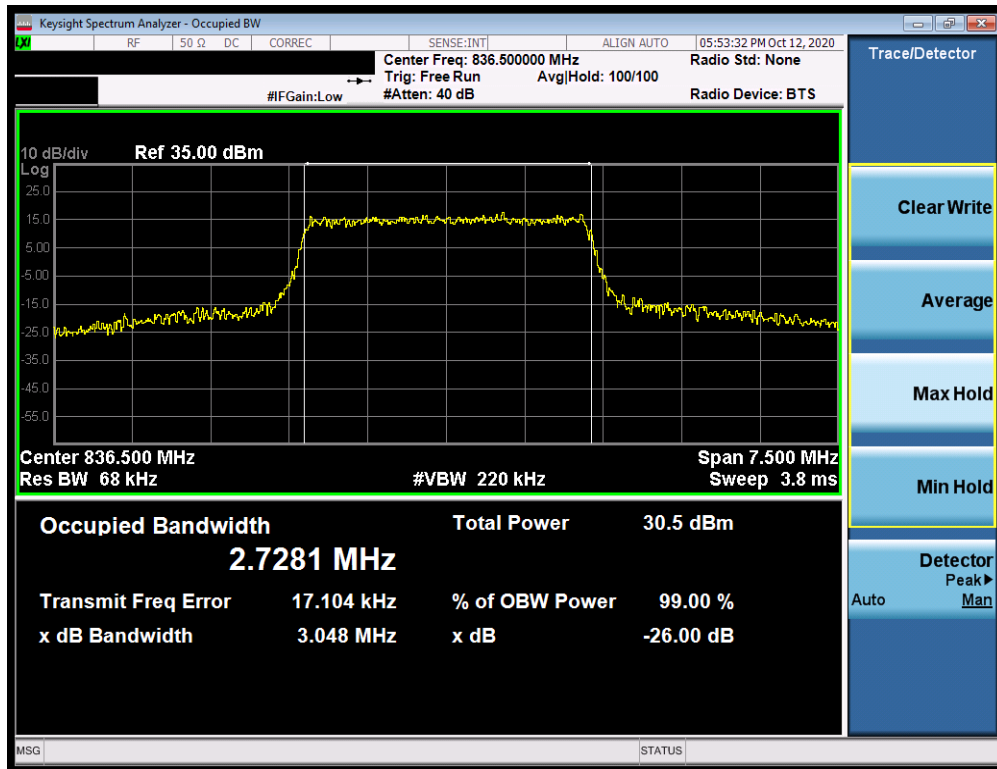
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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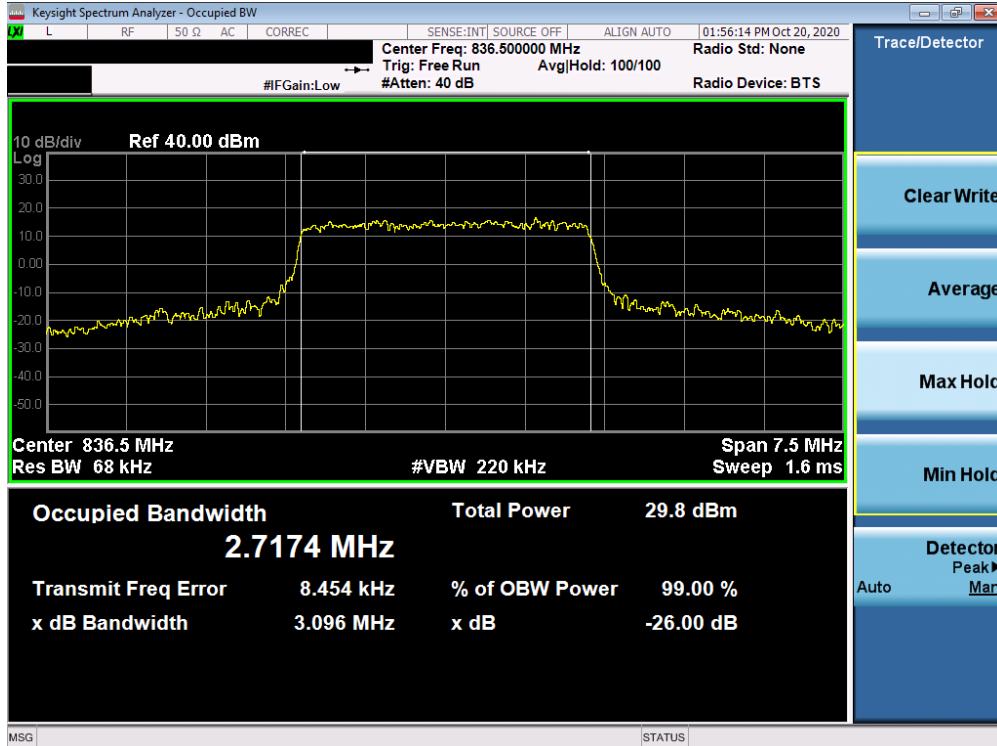


Plot 7-13. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz QPSK - Full RB Configuration)

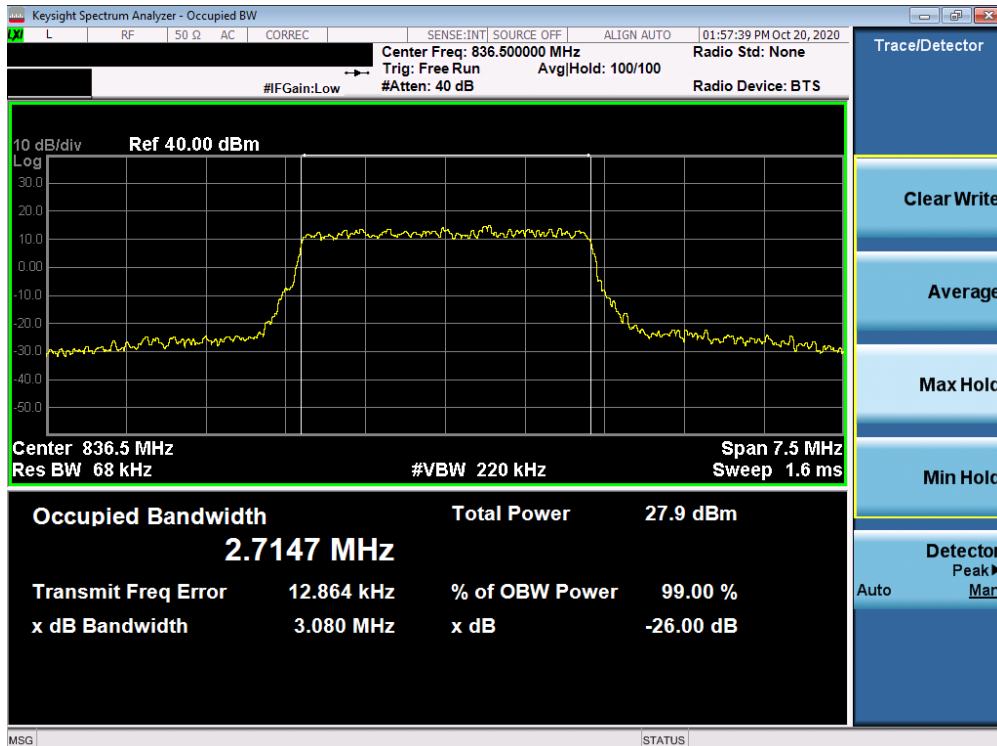


Plot 7-14. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-15. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 64-QAM - Full RB Configuration)

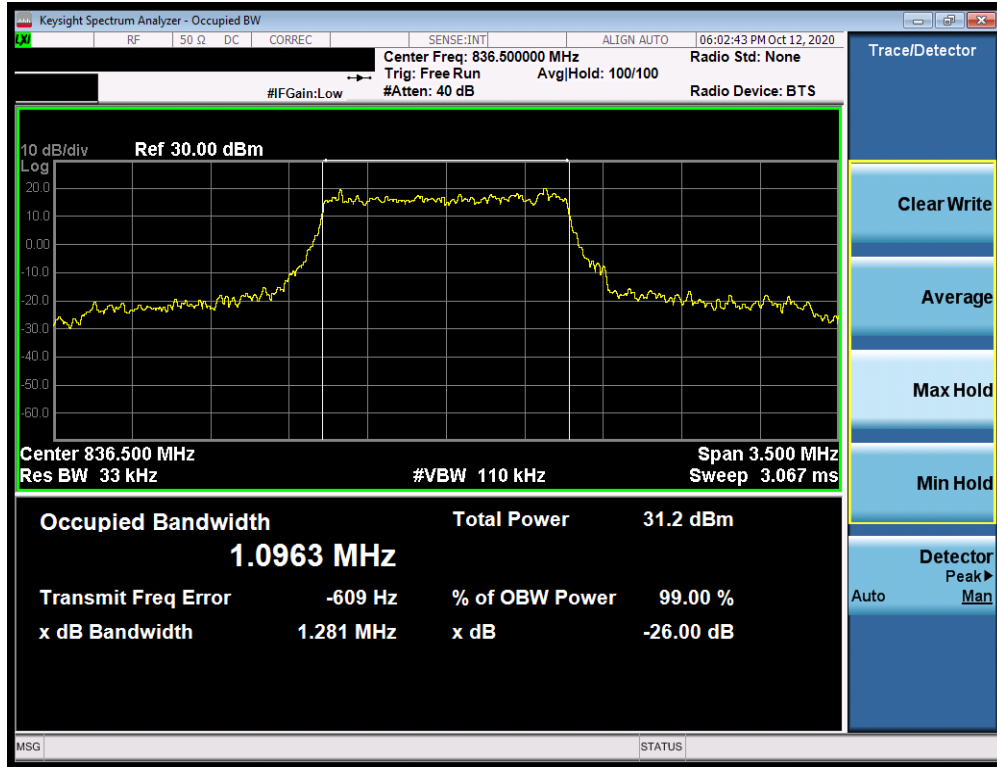


Plot 7-16. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 256-QAM - Full RB Configuration)

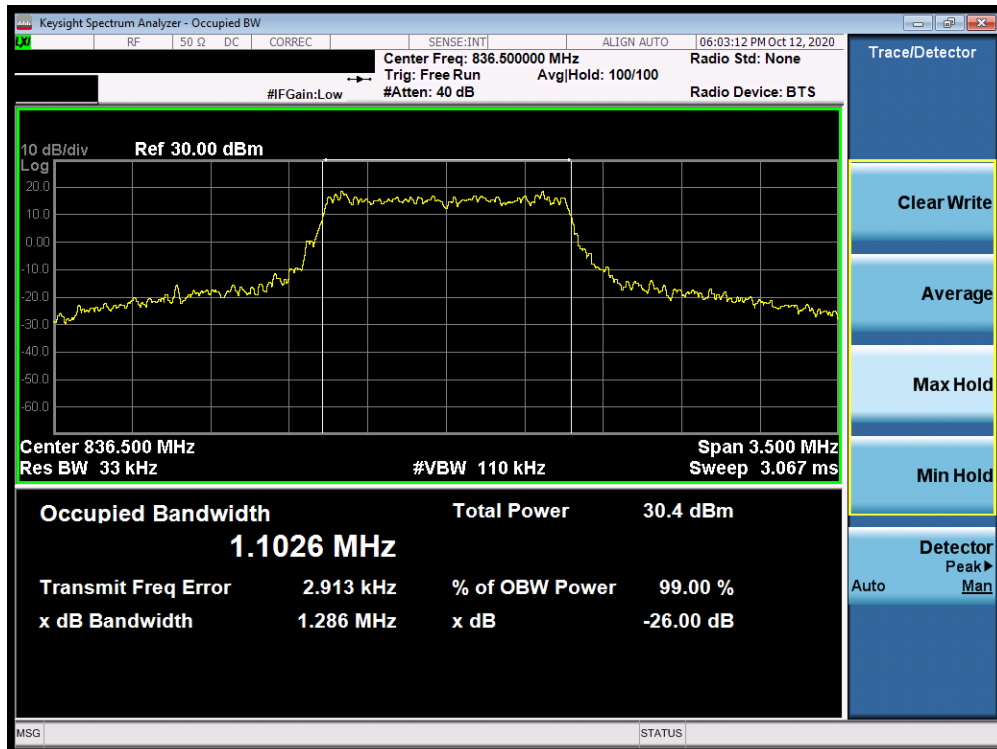
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 20 of 88

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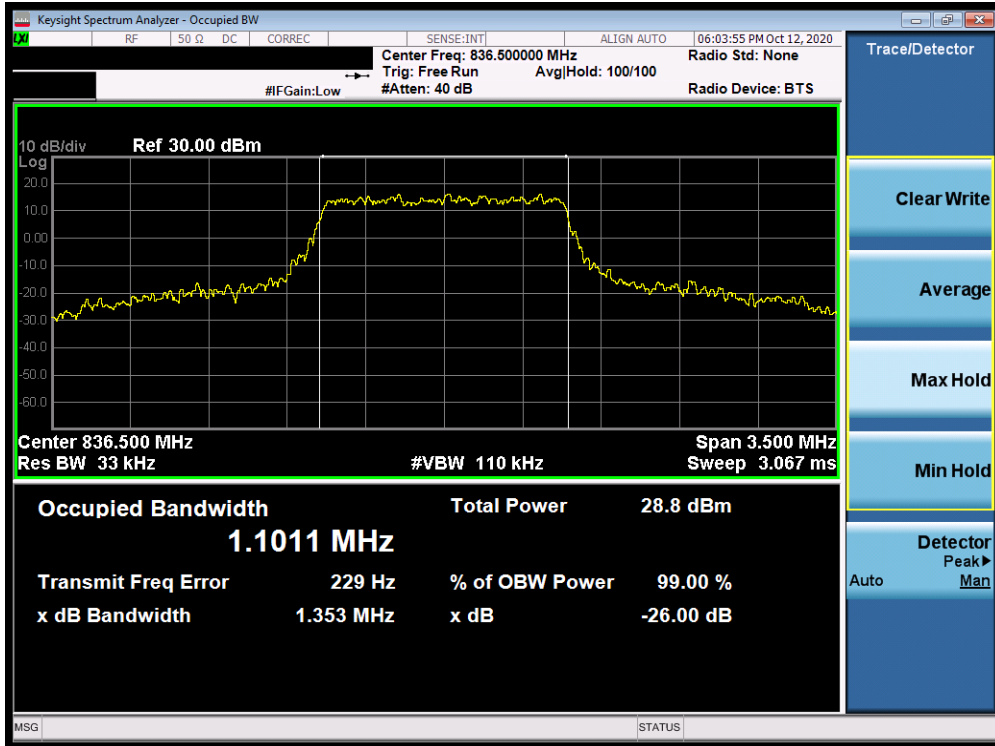


Plot 7-17. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz QPSK - Full RB Configuration)

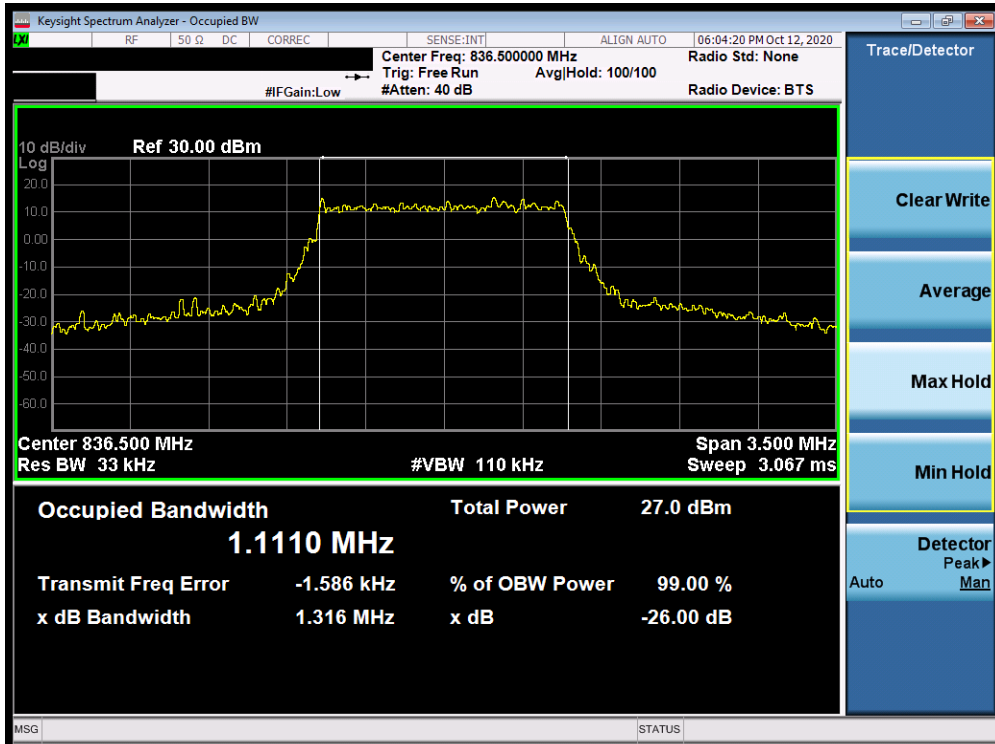


Plot 7-18. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-19. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 64-QAM - Full RB Configuration)



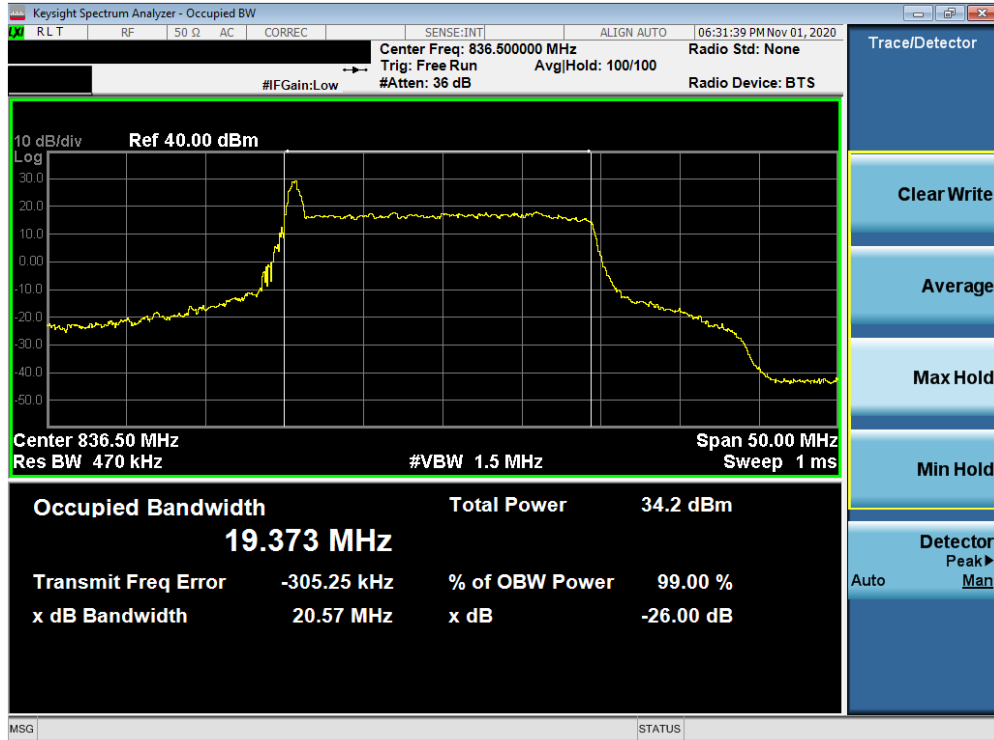
Plot 7-20. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 - 12/07/2020	EUT Type: Portable Handset		Page 22 of 88

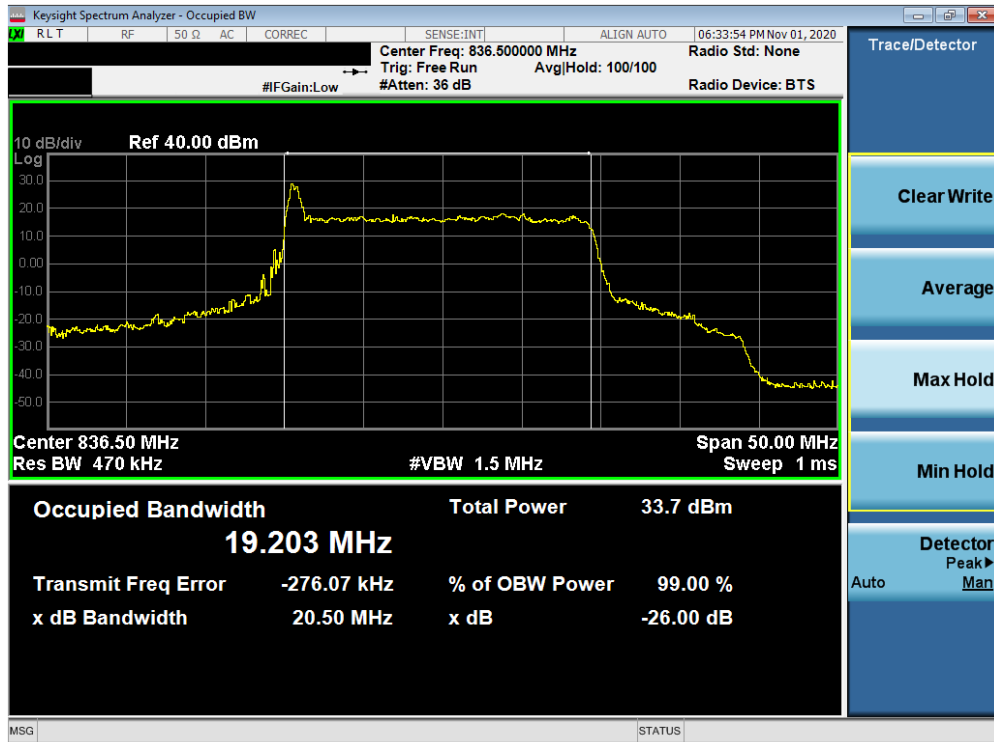
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NR Band n5



Plot 7-21. Occupied Bandwidth Plot (NR Band n5 - 20MHz QPSK - Full RB Configuration)



Plot 7-22. Occupied Bandwidth Plot (NR Band n5 - 20MHz 16-QAM - Full RB Configuration)

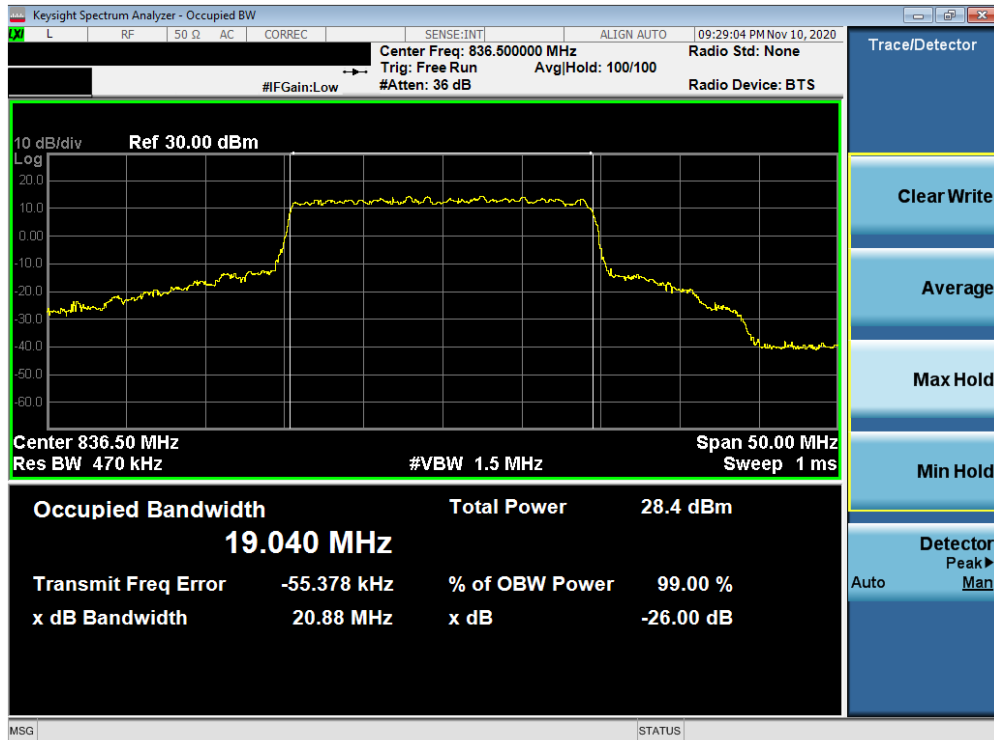
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-23. Occupied Bandwidth Plot (NR Band n5 - 20MHz 64-QAM - Full RB Configuration)

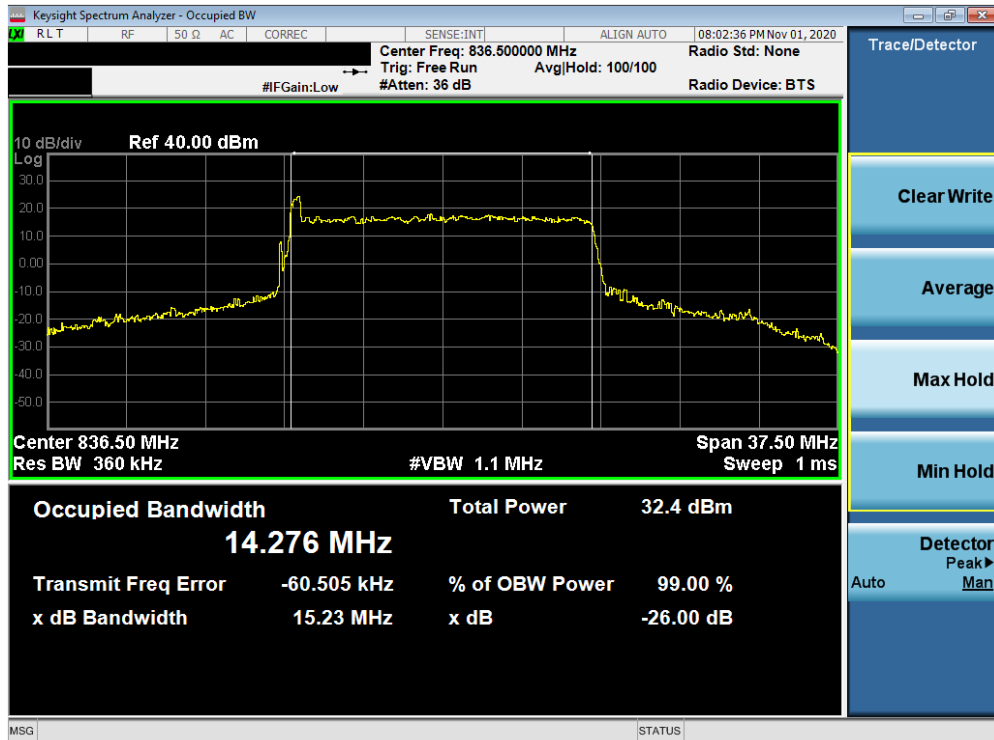


Plot 7-24. Occupied Bandwidth Plot (NR Band n5 - 20MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of 	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-25. Occupied Bandwidth Plot (NR Band n5 - 15MHz QPSK - Full RB Configuration)



Plot 7-26. Occupied Bandwidth Plot (NR Band n5 - 15MHz 16-QAM - Full RB Configuration)

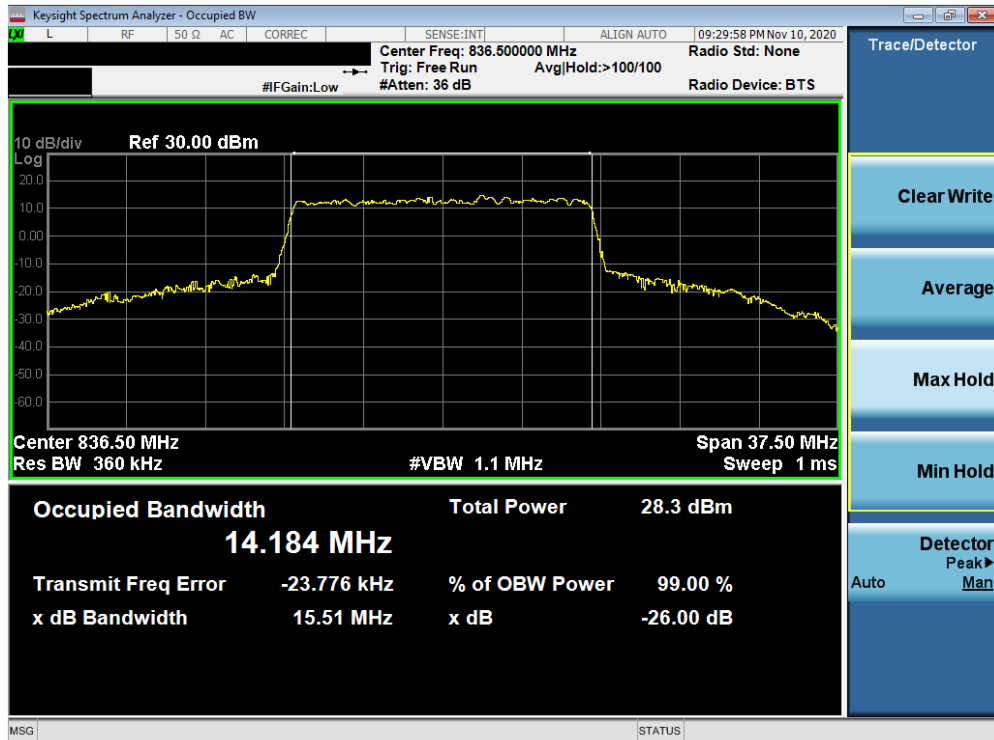
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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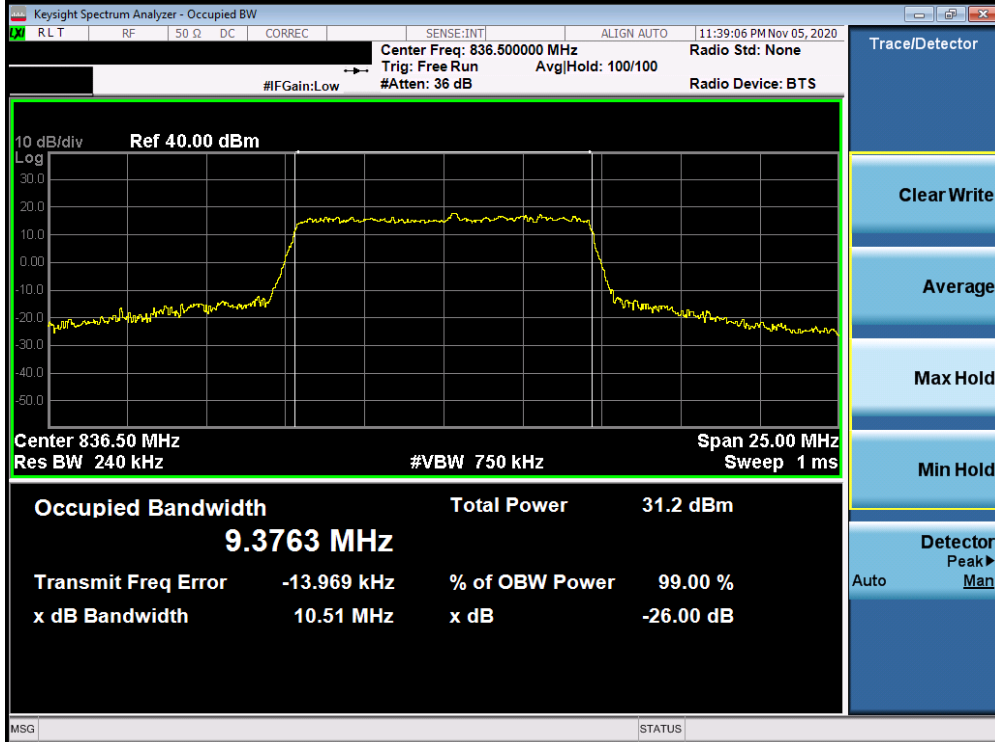


Plot 7-27. Occupied Bandwidth Plot (NR Band n5 - 15MHz 64-QAM - Full RB Configuration)

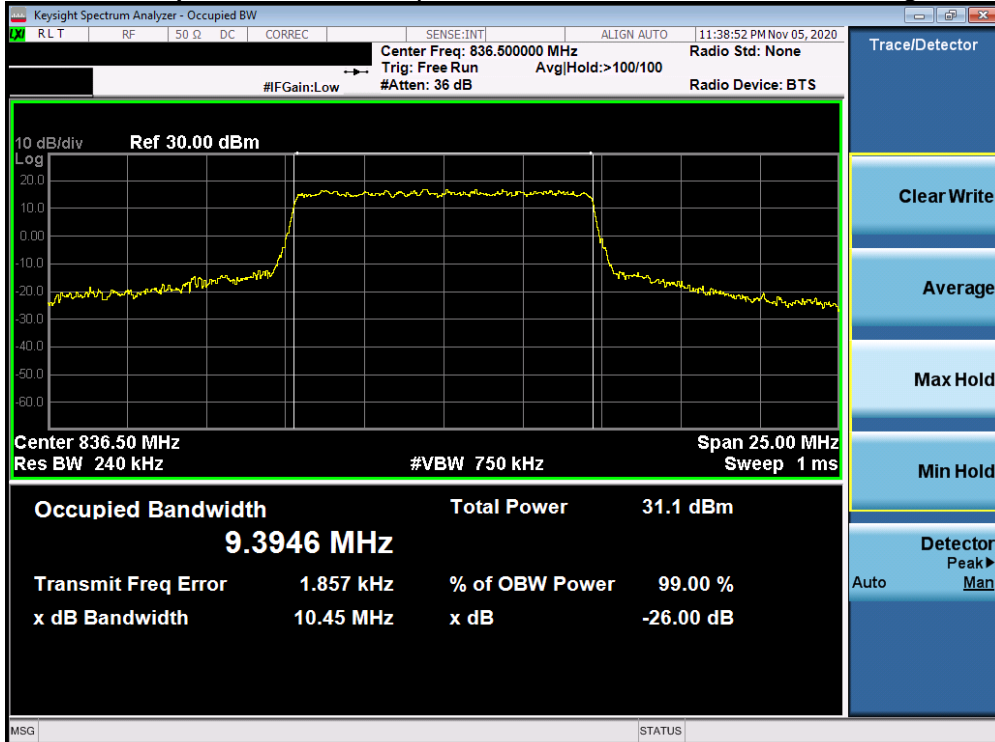


Plot 7-28. Occupied Bandwidth Plot (NR Band n5 - 15MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-29. Occupied Bandwidth Plot (NR Band n5 - 10MHz QPSK - Full RB Configuration)

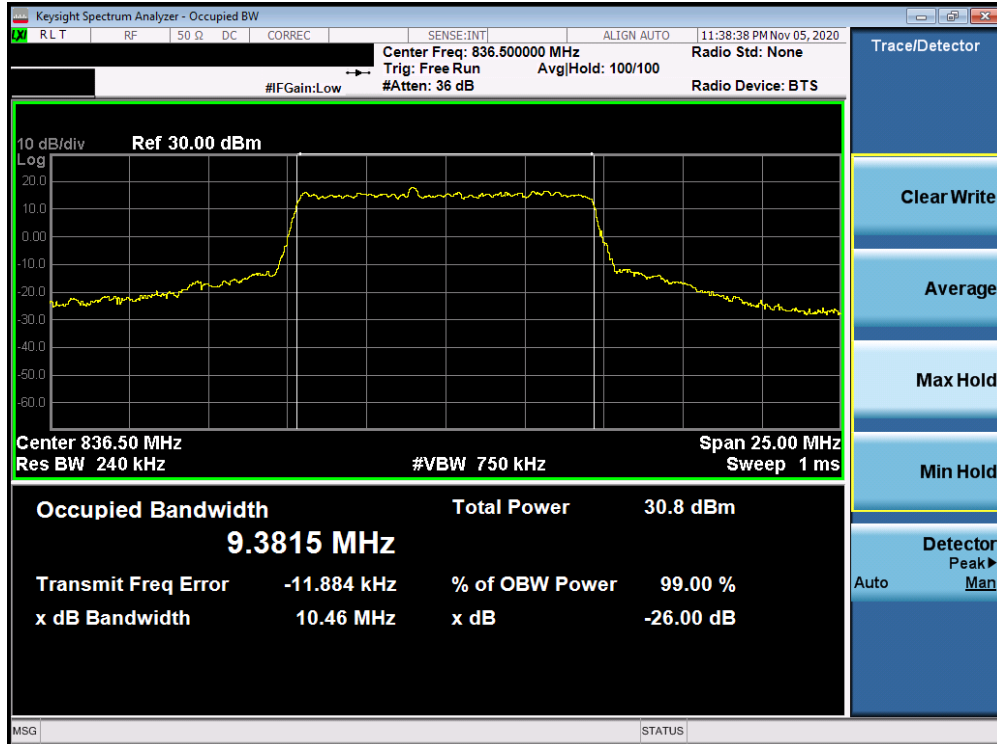


Plot 7-30. Occupied Bandwidth Plot (NR Band n5 - 10MHz 16-QAM - Full RB Configuration)

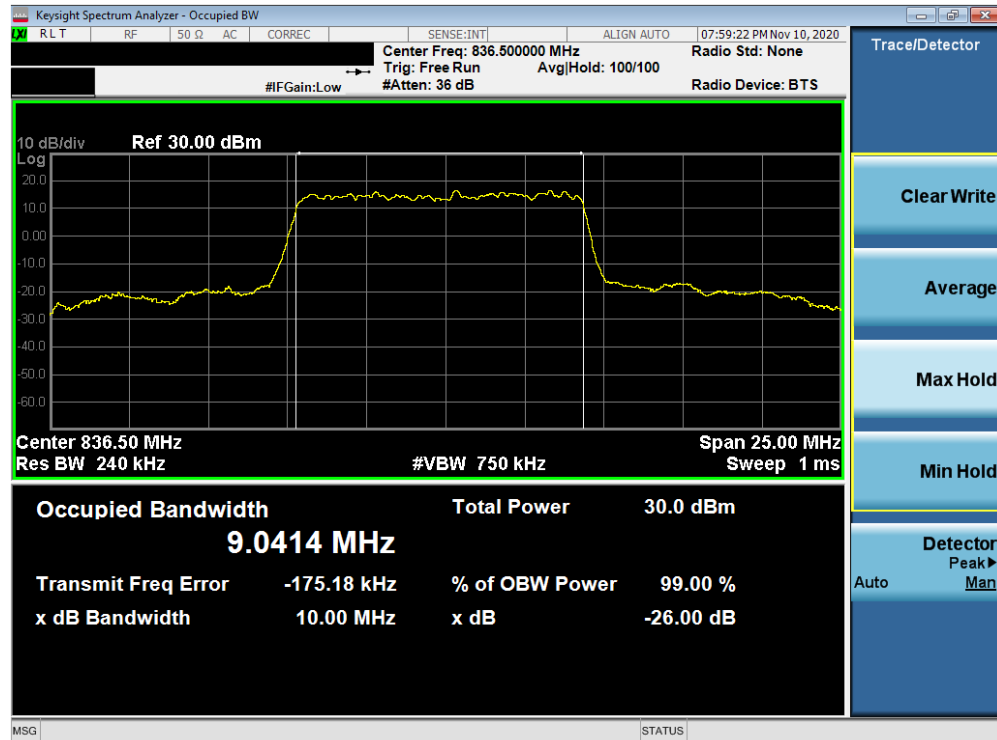
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 - 12/07/2020	EUT Type: Portable Handset		Page 27 of 88

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Plot 7-31. Occupied Bandwidth Plot (NR Band n5 - 10MHz 64-QAM - Full RB Configuration)

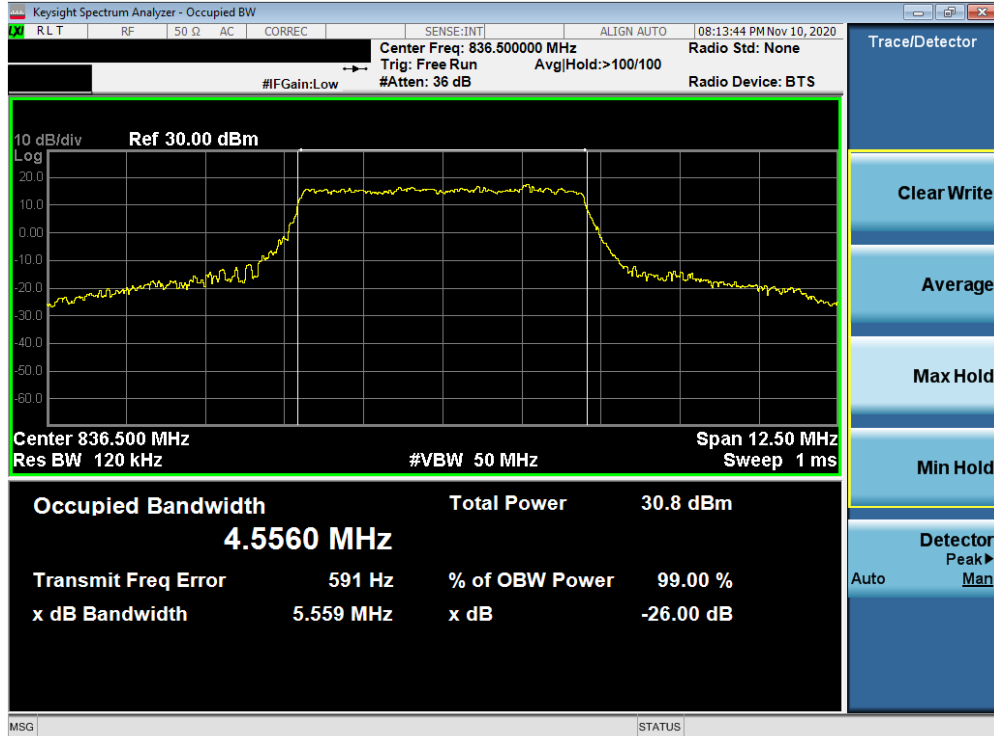


Plot 7-32. Occupied Bandwidth Plot (NR Band n5 - 10MHz 256-QAM - Full RB Configuration)

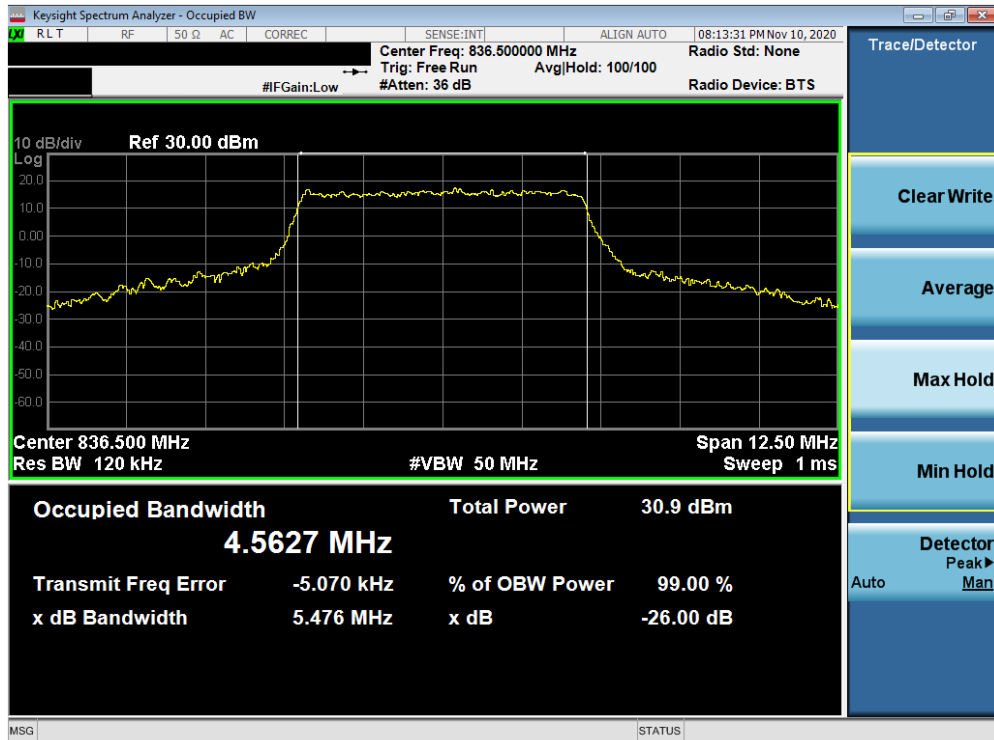
FCC ID: A3LSMG998B	 PCTEST Proud to be part of 	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 28 of 88

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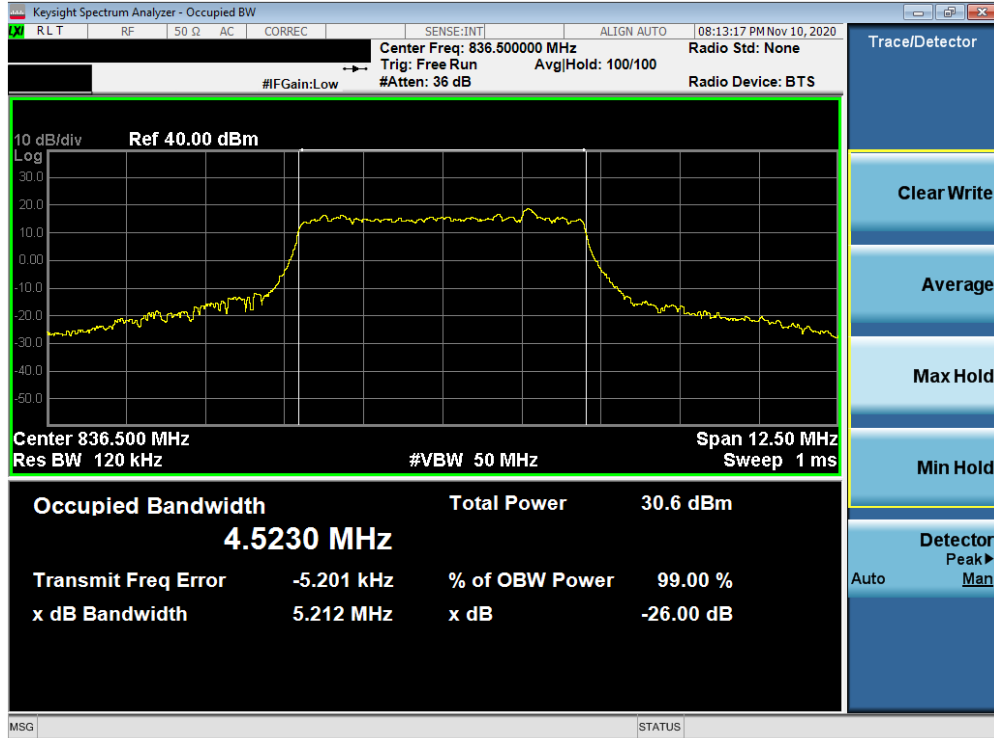


Plot 7-33. Occupied Bandwidth Plot (NR Band n5 - 5MHz QPSK - Full RB Configuration)

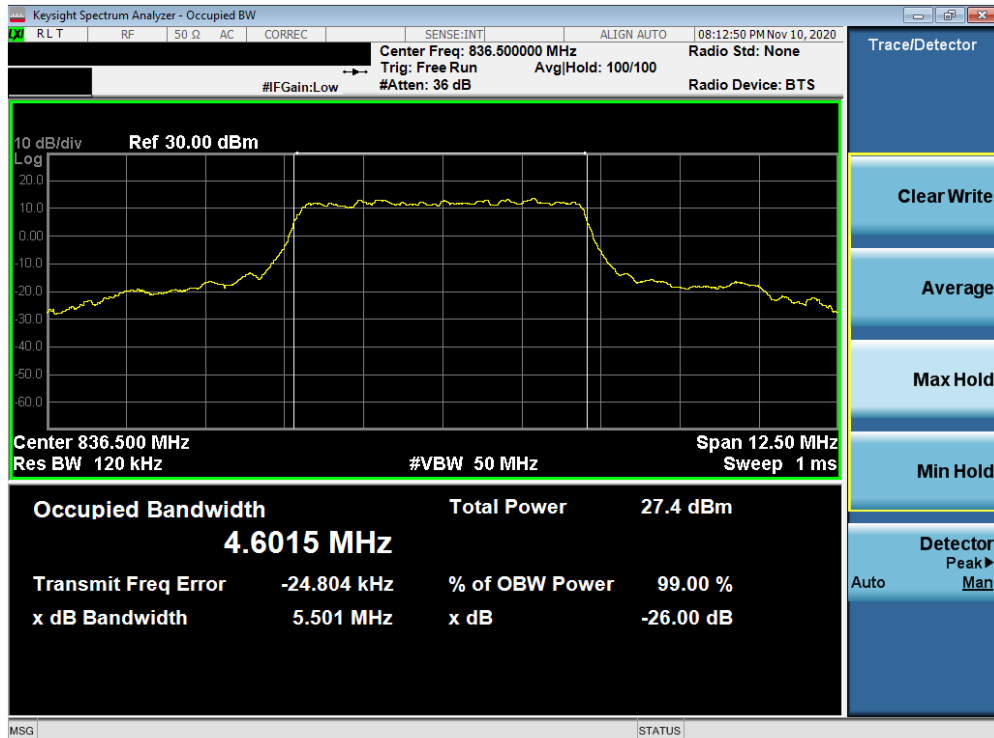


Plot 7-34. Occupied Bandwidth Plot (NR Band n5 - 5MHz 16-QAM - Full RB Configuration)




FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-35. Occupied Bandwidth Plot (NR Band n5 - 5MHz 64-QAM - Full RB Configuration)



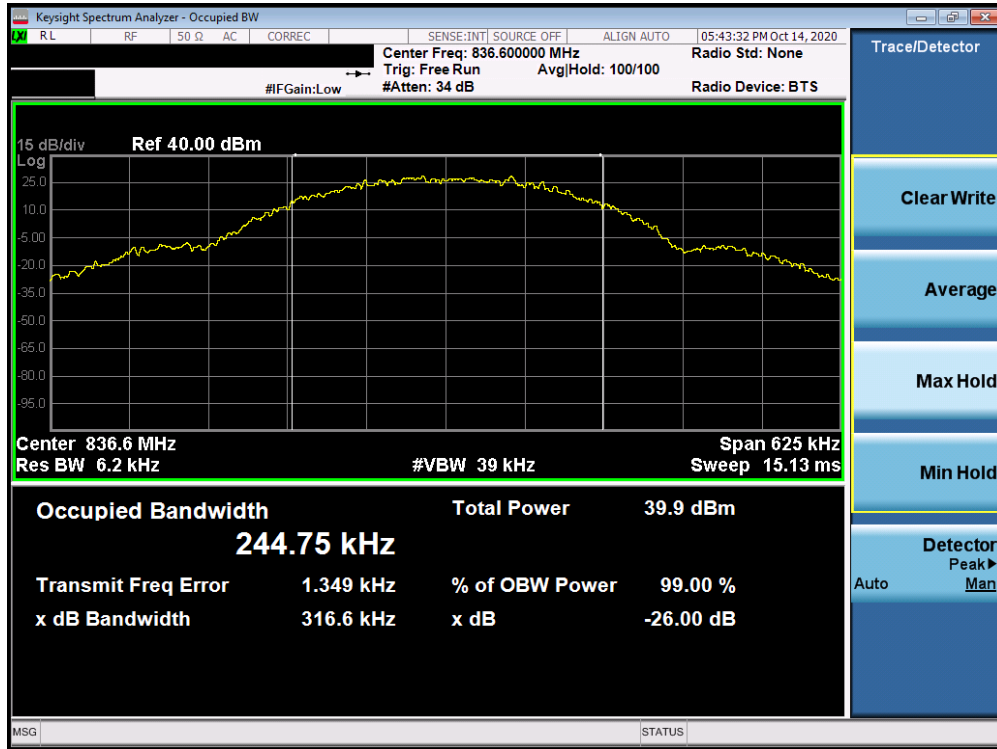
Plot 7-36. Occupied Bandwidth Plot (NR Band n5 - 5MHz 256-QAM - Full RB Configuration)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of 	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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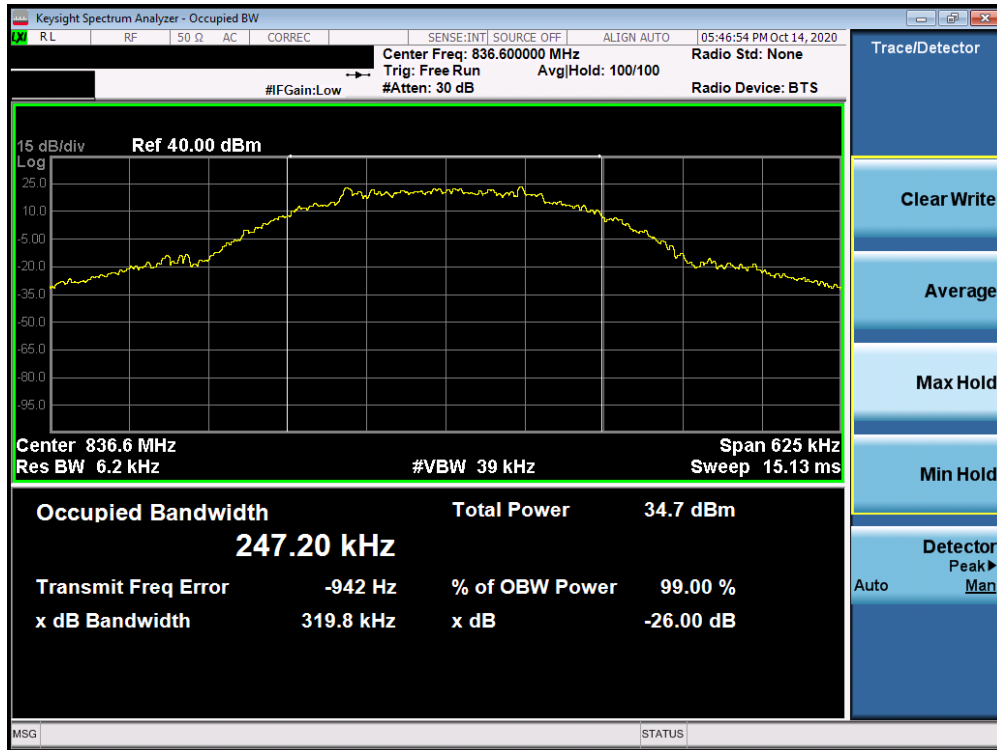
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GPRS Cell



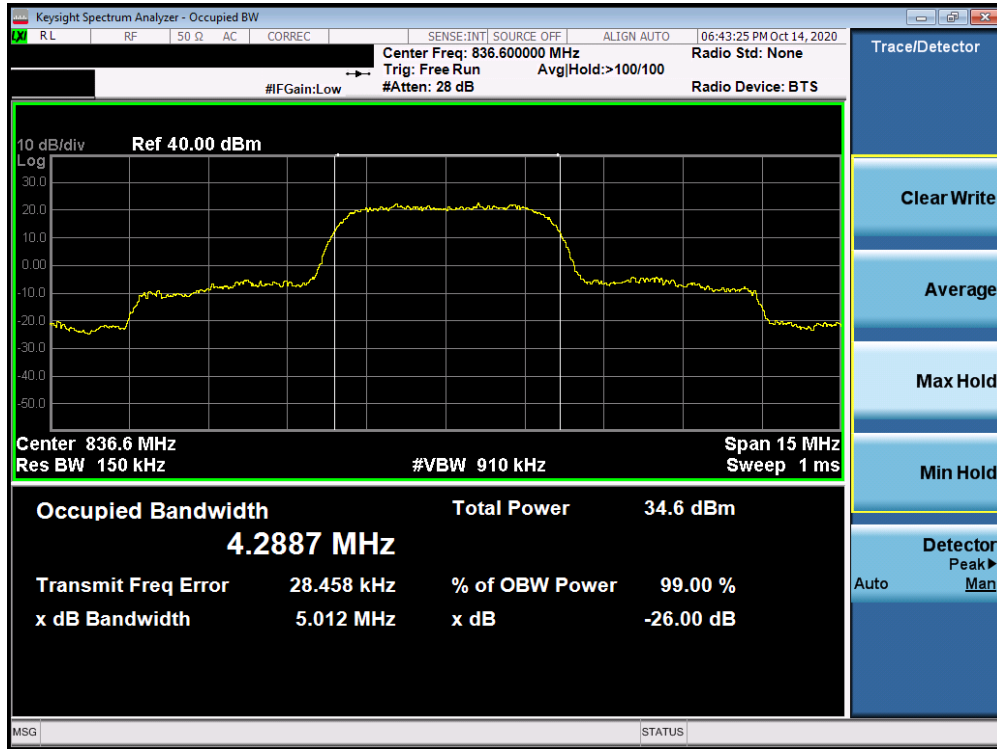
Plot 7-37. Occupied Bandwidth Plot (GPRS, Ch. 190)



Plot 7-38. Occupied Bandwidth Plot (EDGE, Ch. 190)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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WCDMA Cell



Plot 7-39. Occupied Bandwidth Plot (WCDMA, Ch. 4183)

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7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz (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.

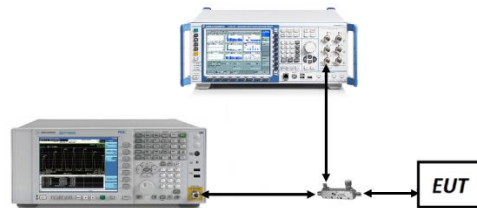




Figure 7-2. Test Instrument & Measurement Setup

Test Notes

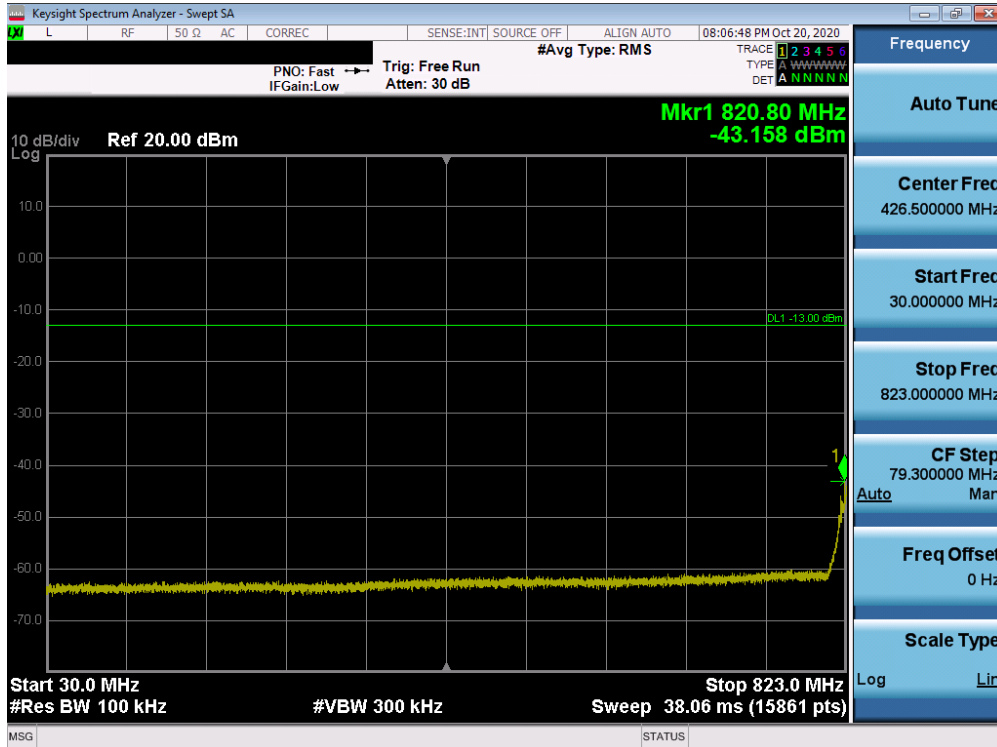
1. Per Part 22 and RSS-132, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth 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.

FCC ID: A3LSMG998B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset	Page 33 of 88	

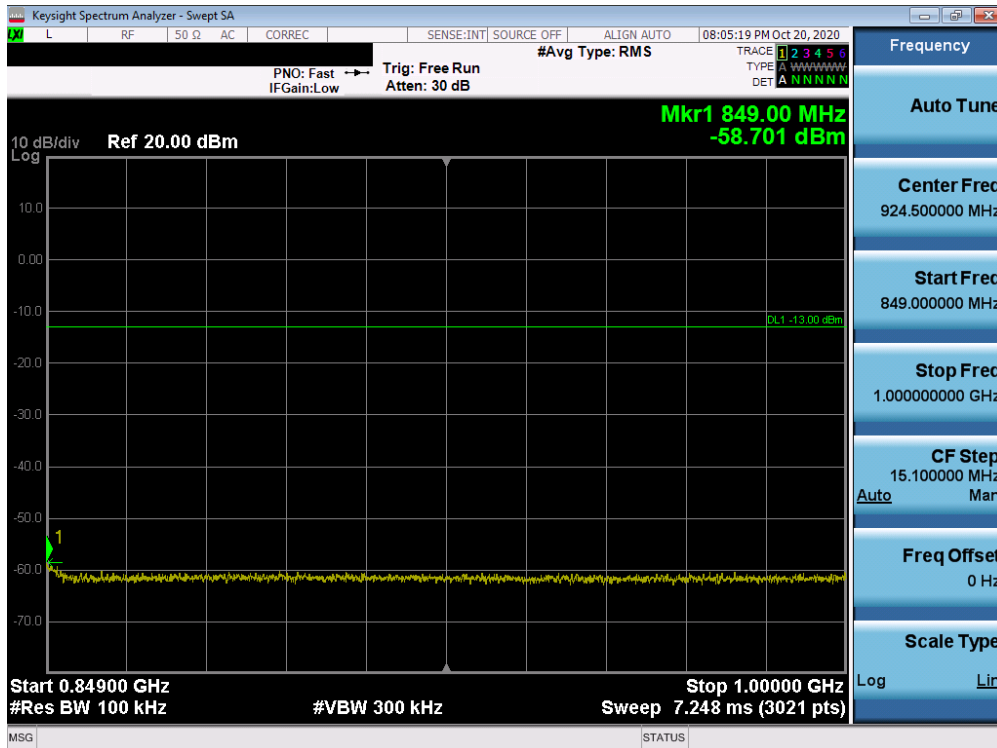
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LTE Band 26/5

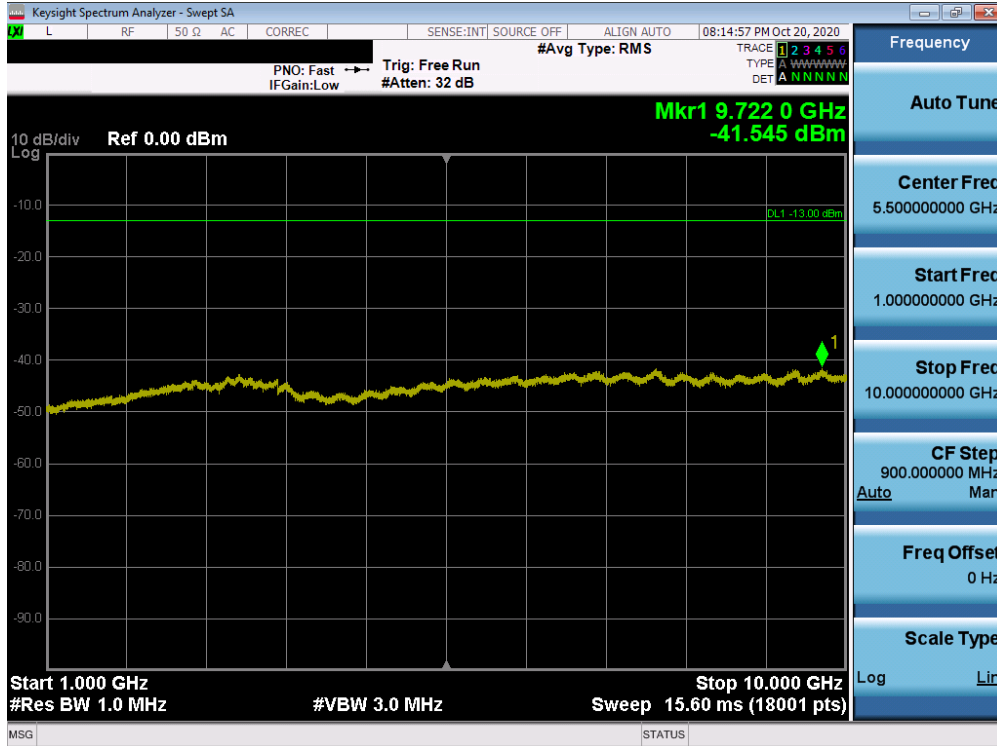


Plot 7-40. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

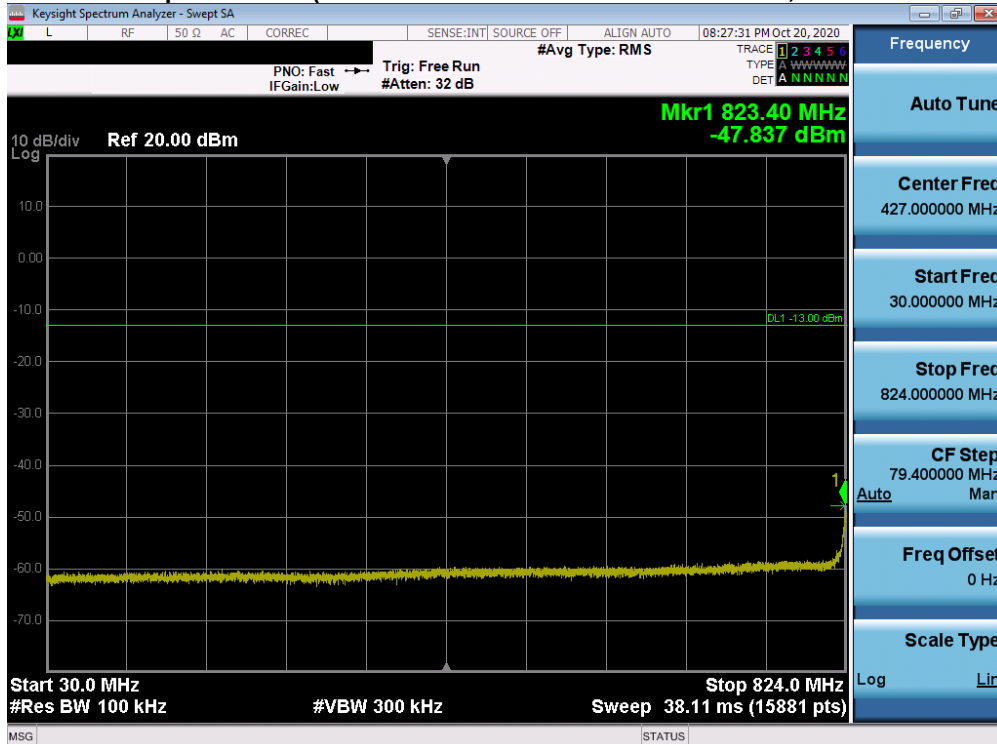


Plot 7-41. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-42. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

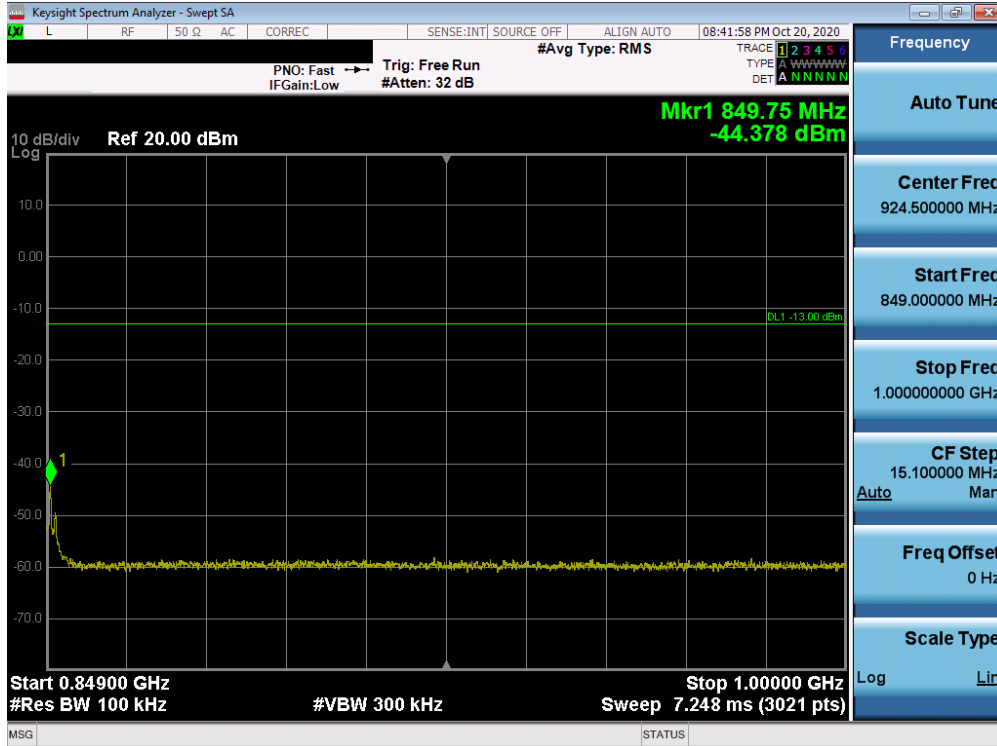


Plot 7-43. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

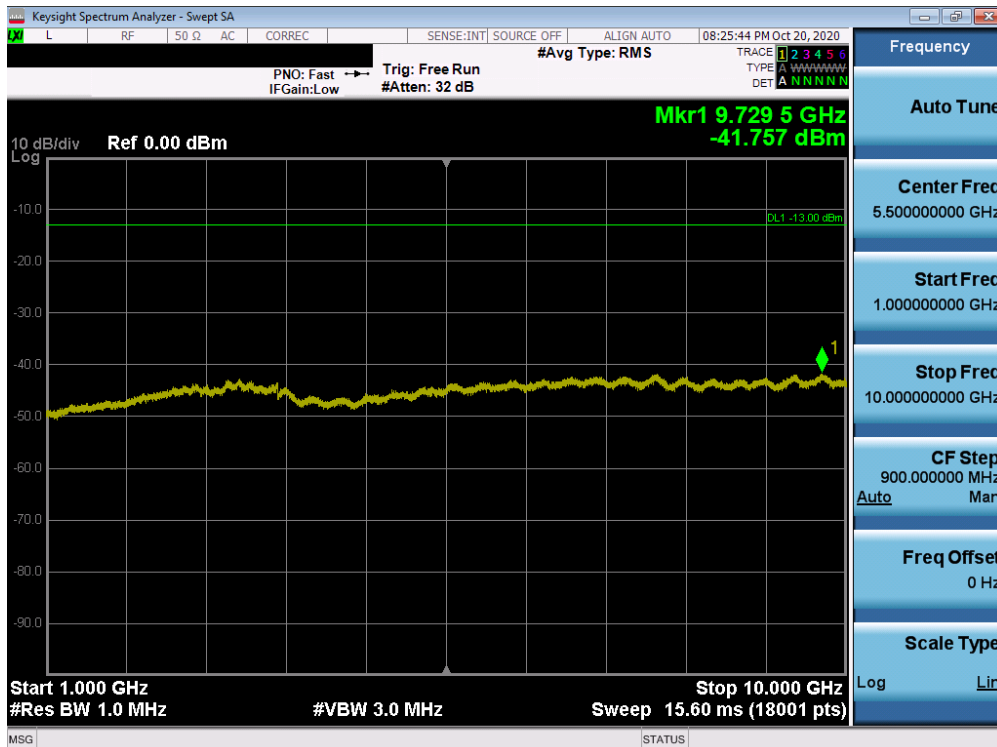
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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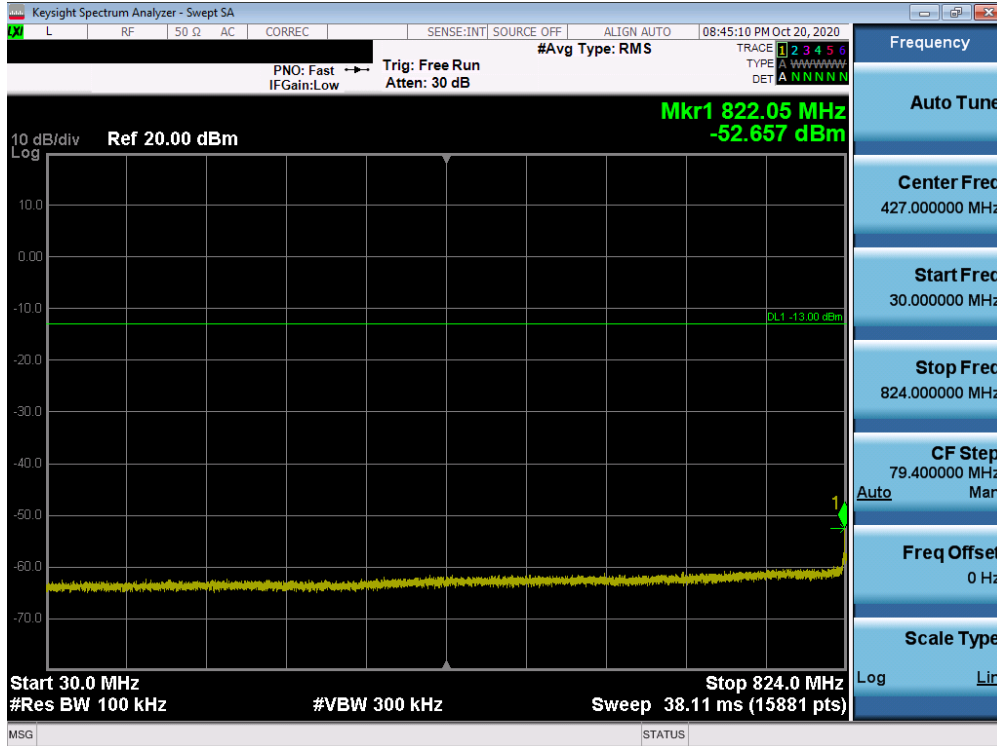


Plot 7-44. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

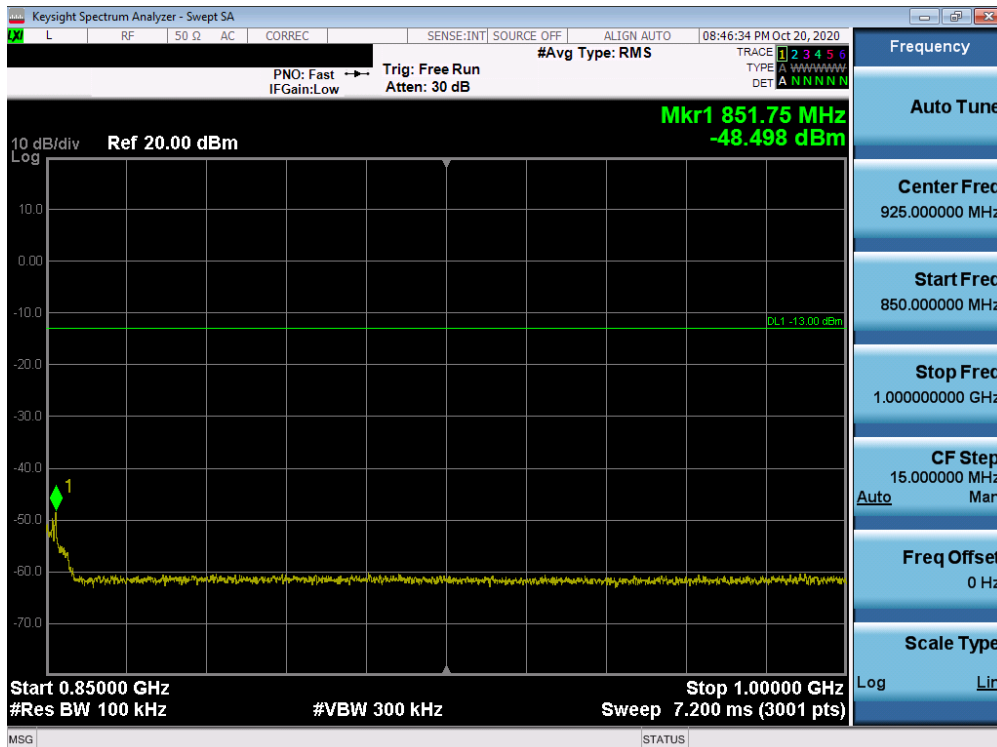


Plot 7-45. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-46. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

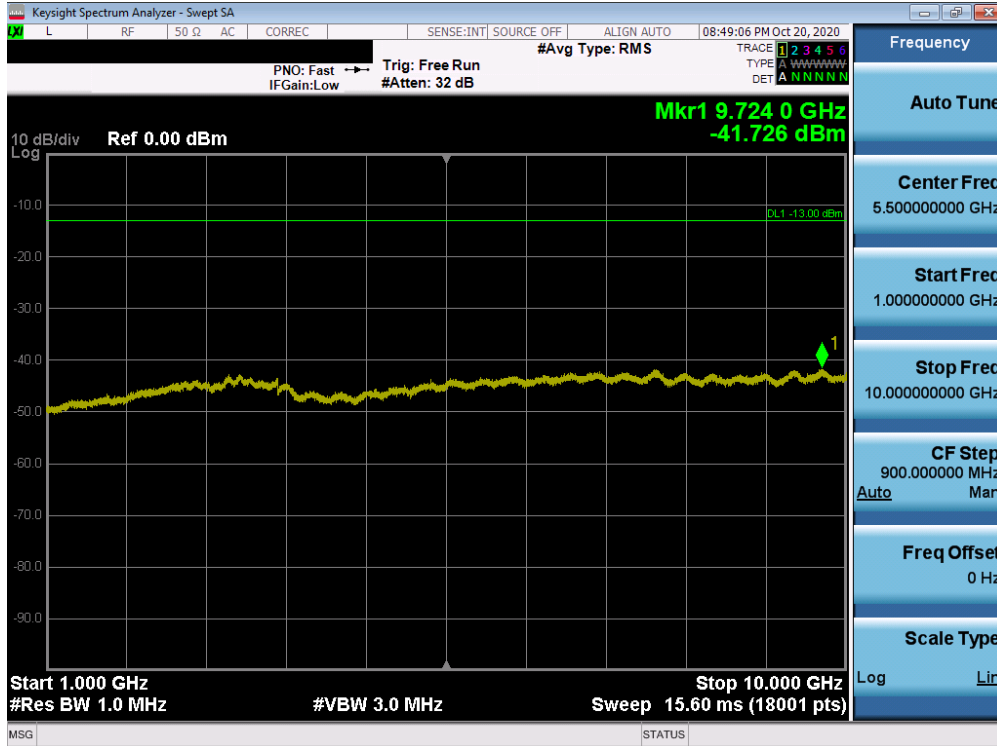


Plot 7-47. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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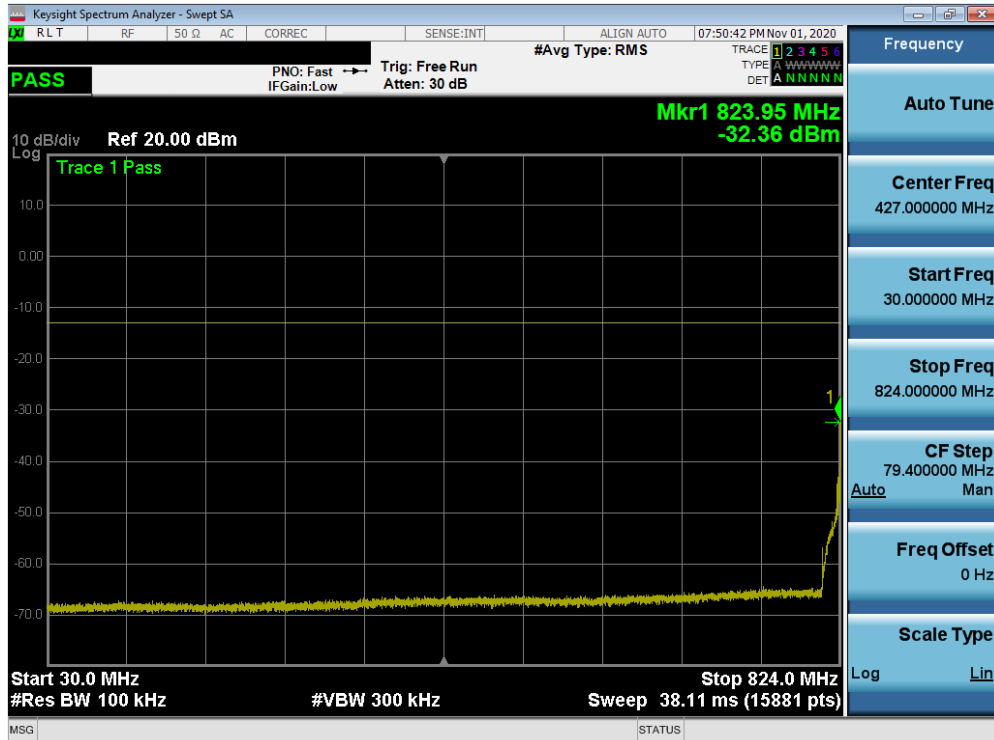
Plot 7-48. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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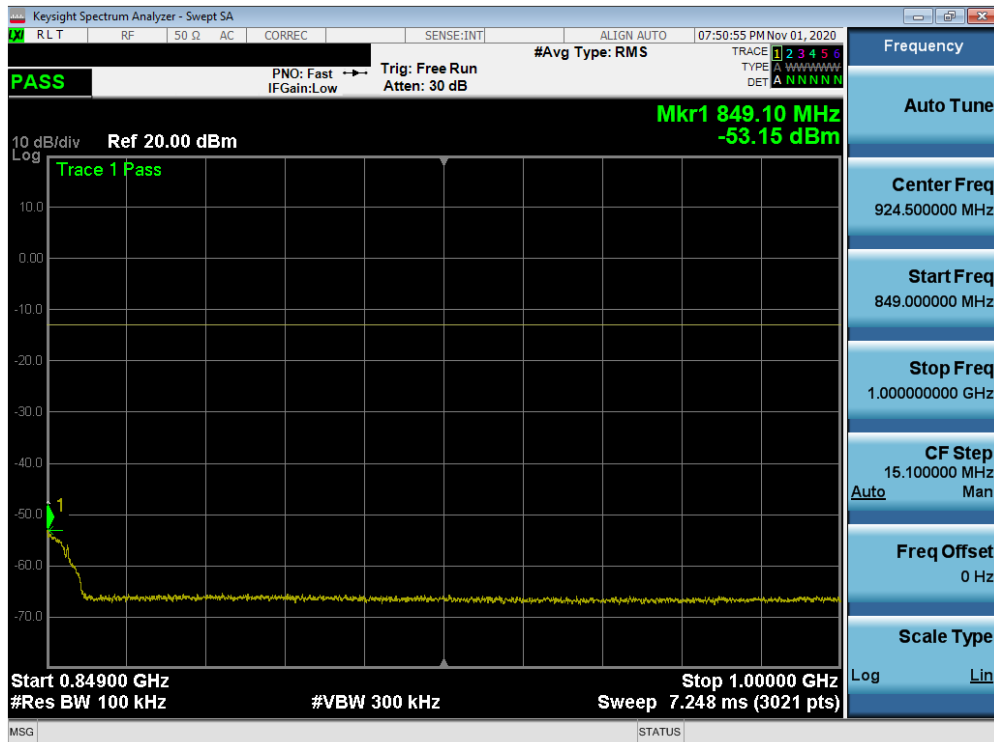
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NR Band n5



Plot 7-49. Conducted Spurious Plot (NR Band n5 - 20.0MHz - RB Size 1, RB Offset 0 - Low Channel)

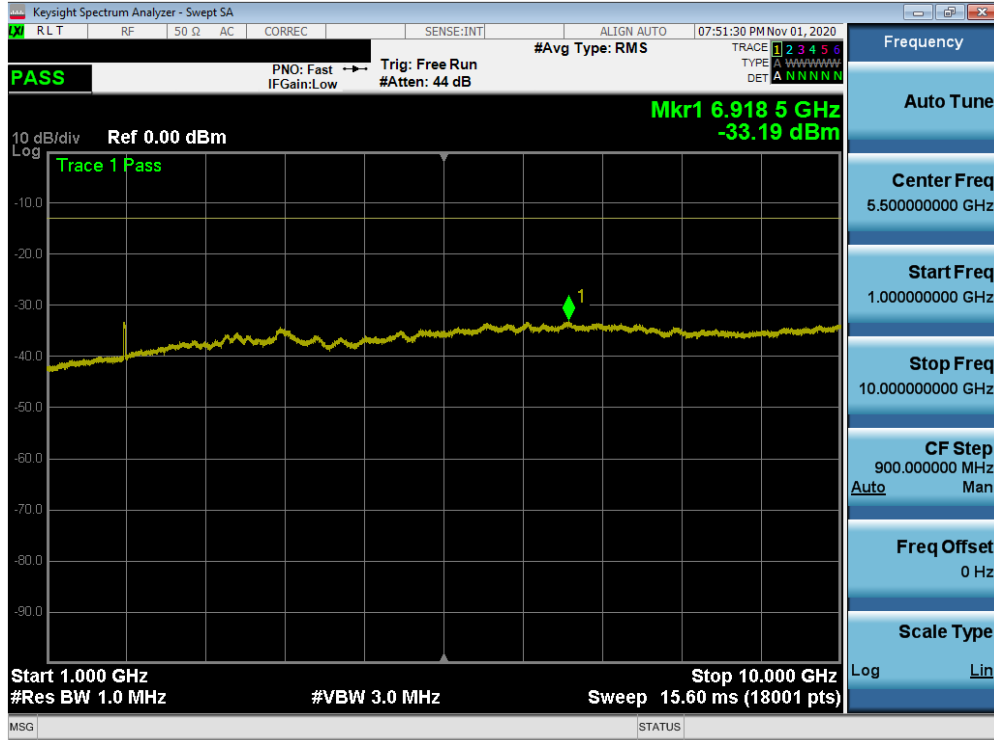


Plot 7-50. Conducted Spurious Plot (NR Band n5 - 20.0MHz DFT-s-OFDM BPSK - RB Size 1, RB Offset 0 - Low Channel)

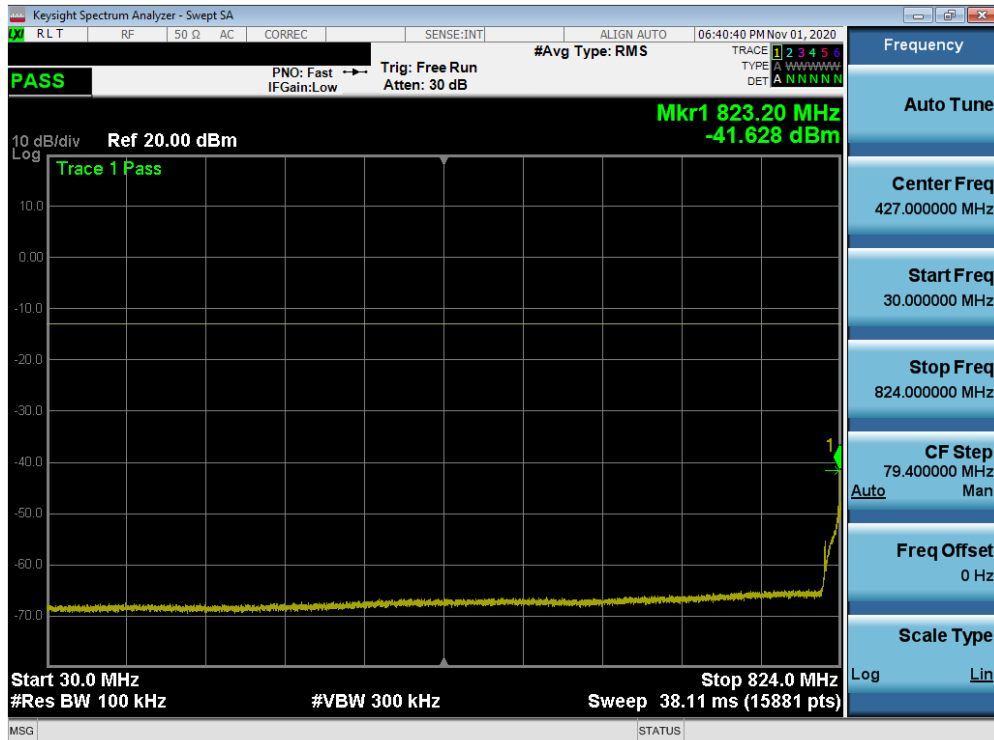
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-51. Conducted Spurious Plot (NR Band n5 - 20.0MHz - RB Size 1, RB Offset 0 - Low Channel)

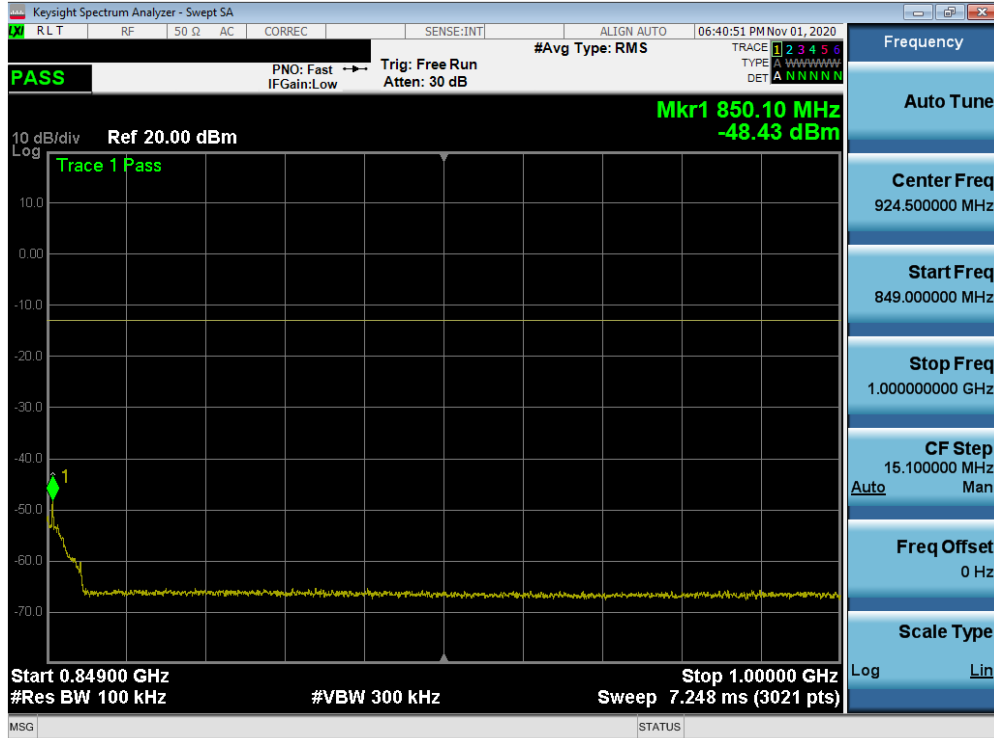


Plot 7-52. Conducted Spurious Plot (NR Band n5 - 20.0MHz - RB Size 1, RB Offset 0 - Mid Channel)

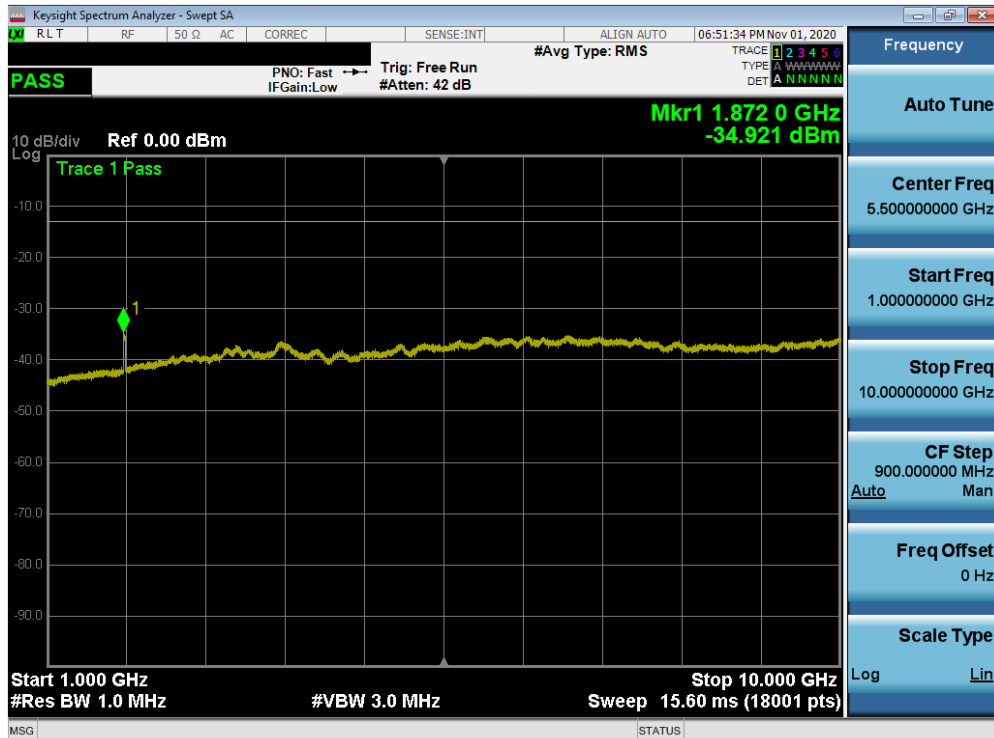
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 40 of 88

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Plot 7-53. Conducted Spurious Plot (NR Band n5 - 20.0MHz - RB Size 1, RB Offset 0 - Mid Channel)

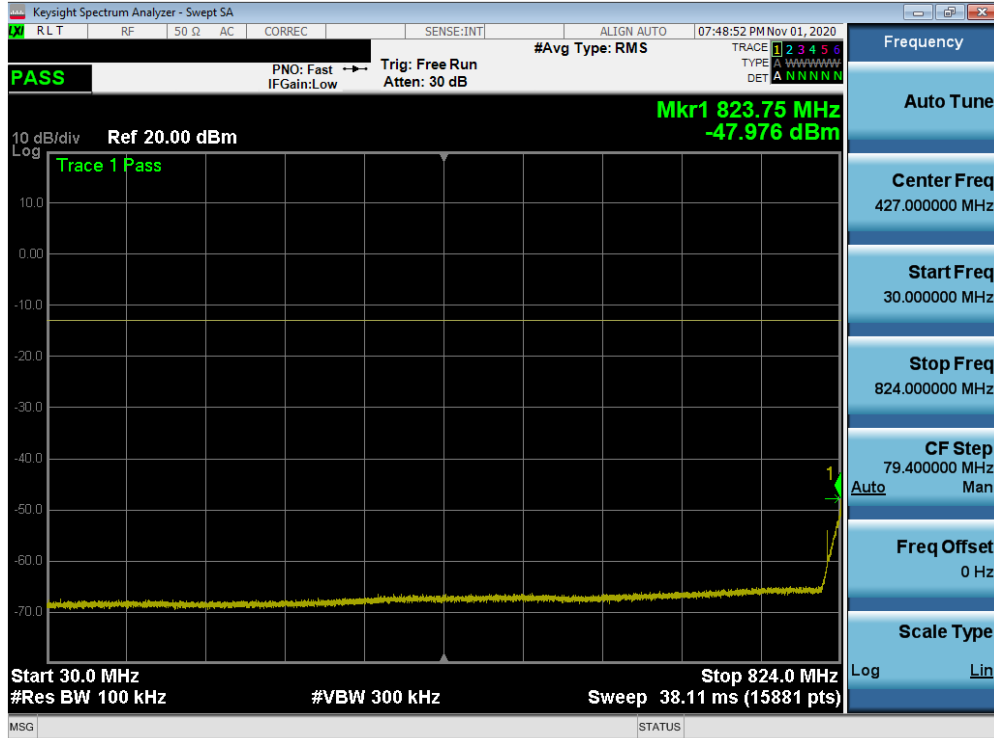


Plot 7-54. Conducted Spurious Plot (NR Band n5 - 20.0MHz - RB Size 1, RB Offset 0 - Mid Channel)

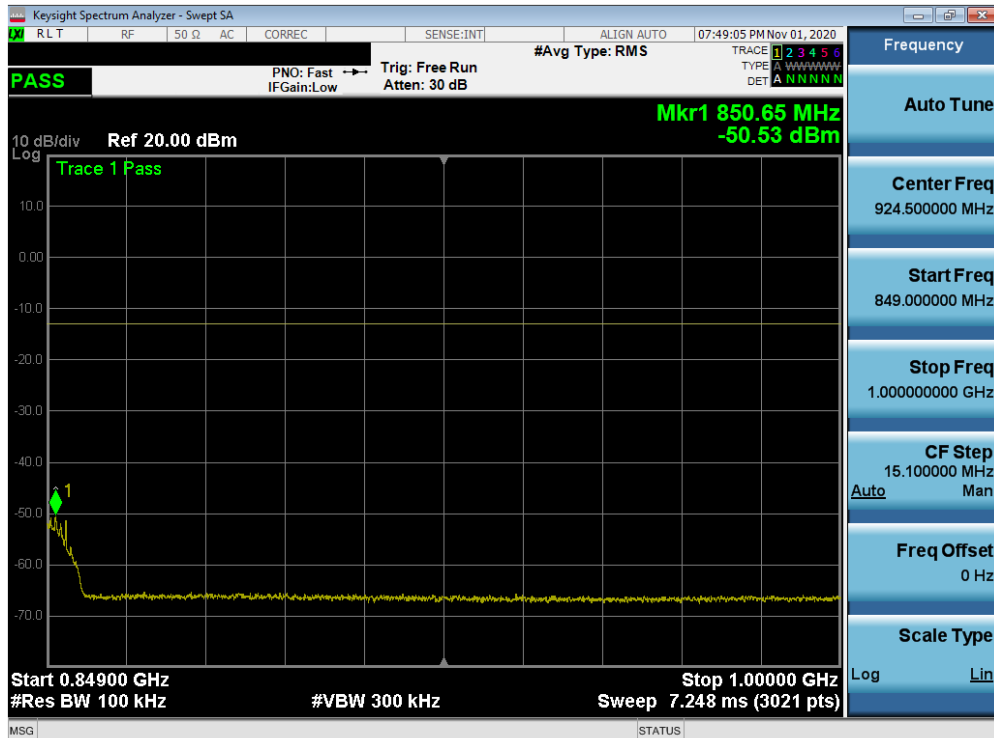
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 41 of 88

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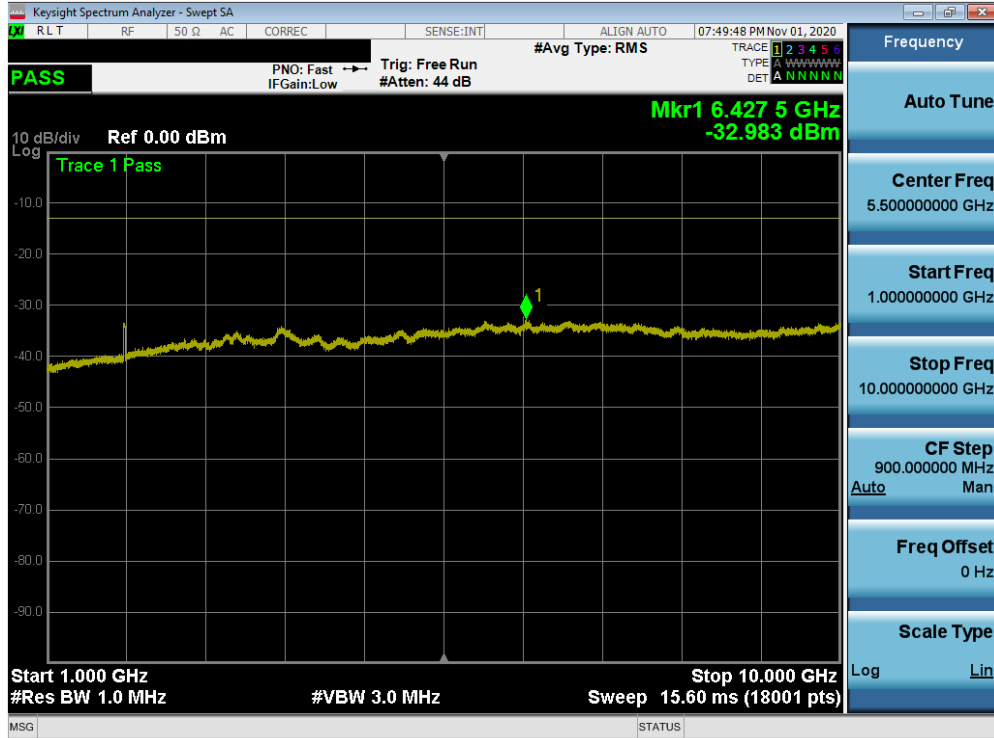


Plot 7-55. Conducted Spurious Plot (NR Band n5 - 20.0MHz - RB Size 1, RB Offset 0 - High Channel)



Plot 7-56. Conducted Spurious Plot (NR Band n5 - 20.0MHz - RB Size 1, RB Offset 0 - High Channel)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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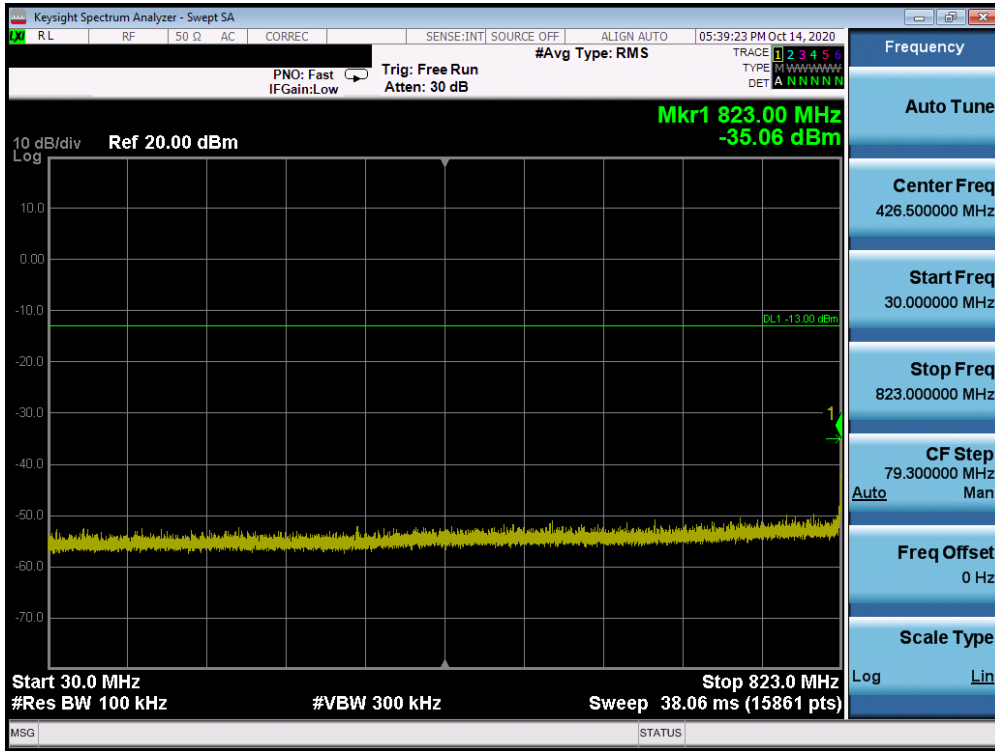
Plot 7-57. Conducted Spurious Plot (NR Band n5 - 20.0MHz - RB Size 1, RB Offset 0 - High Channel)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 43 of 88

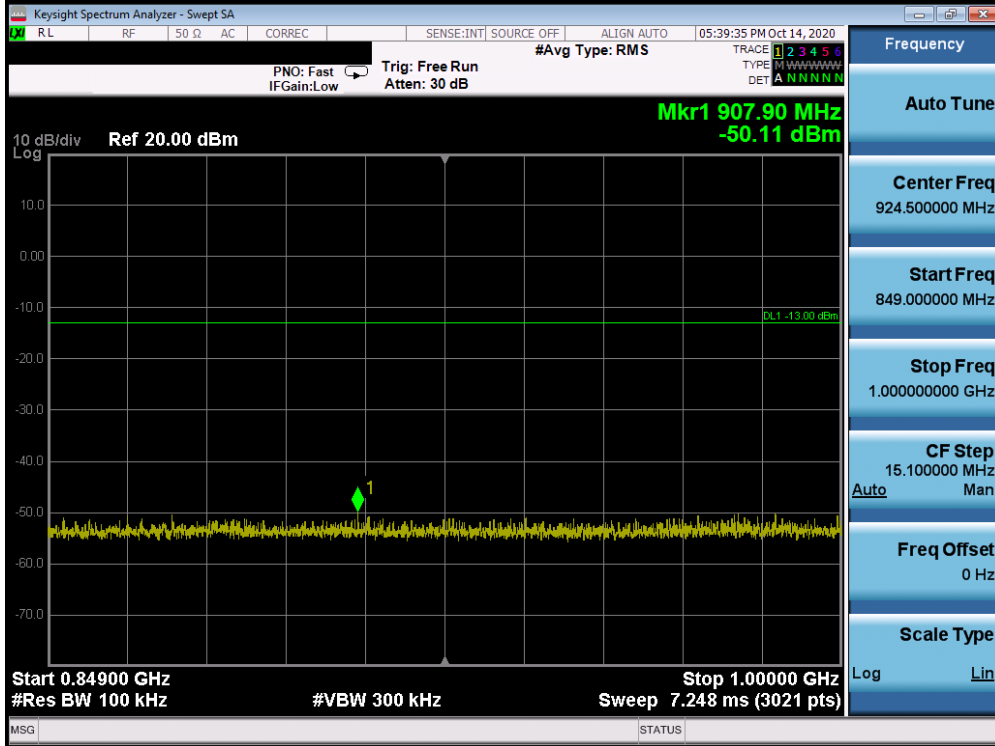
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GSM/GPRS Cell

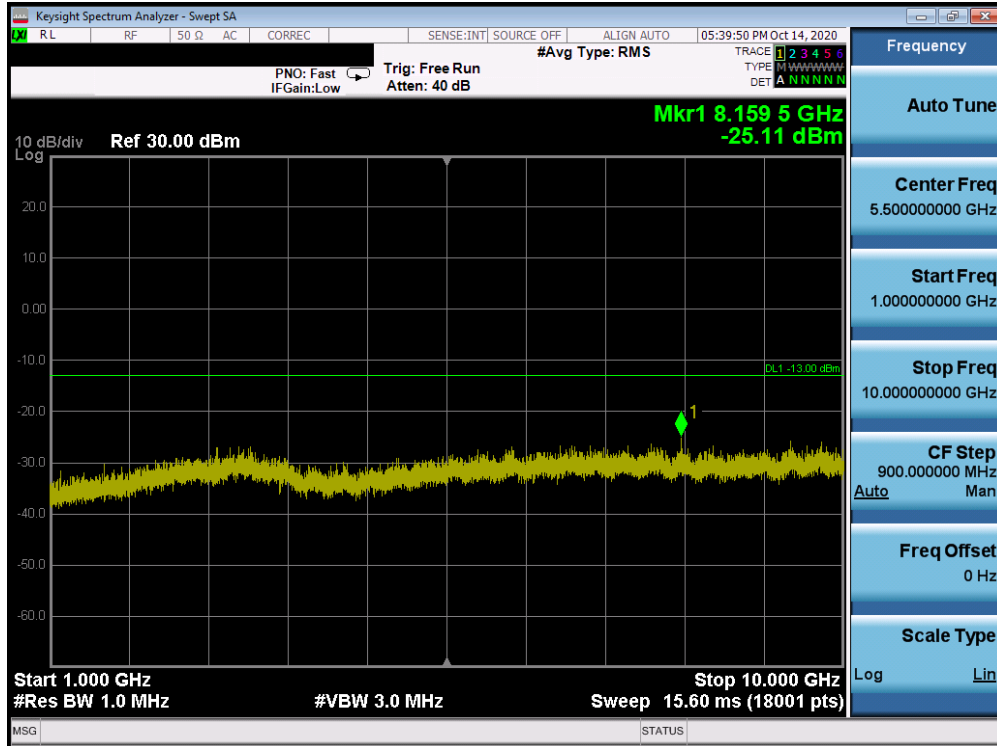


Plot 7-31. Conducted Spurious Plot (GPRS Ch. 128)

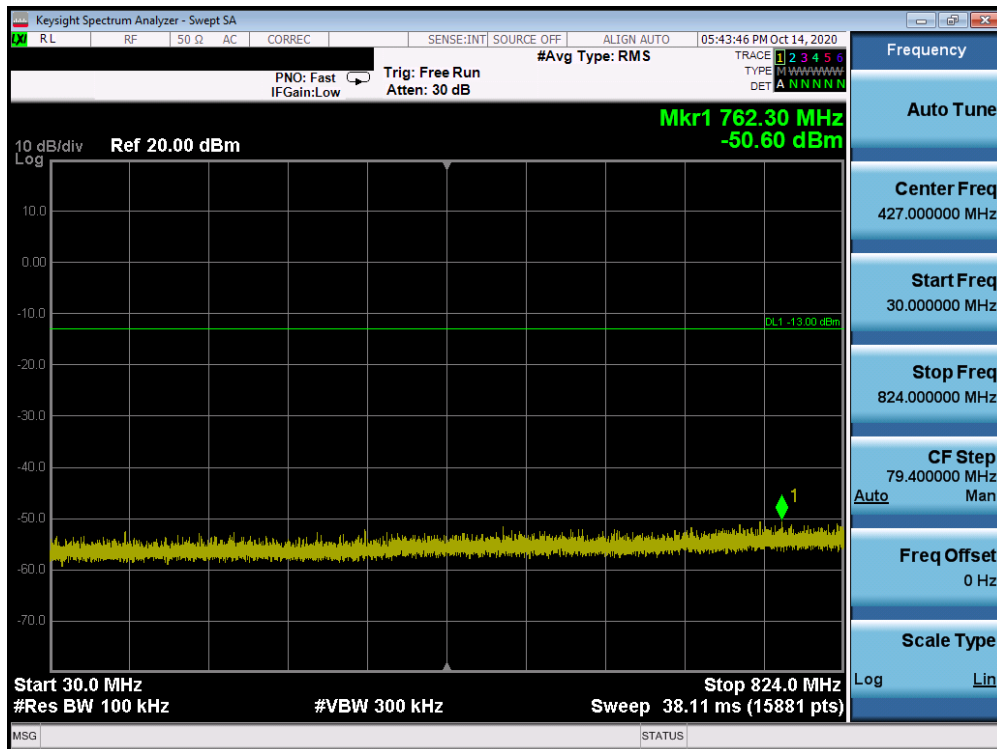


Plot 7-31. Conducted Spurious Plot (GPRS Ch. 128)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-31. Conducted Spurious Plot (GPRS Ch. 128)

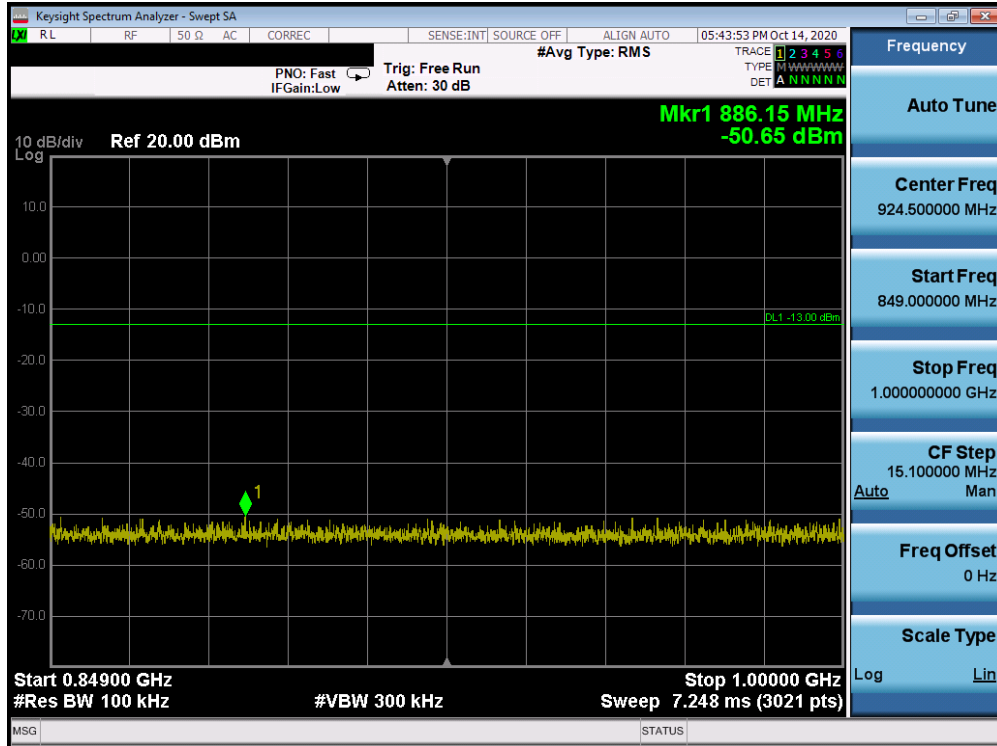


Plot 7-31. Conducted Spurious Plot (GPRS Ch. 190)

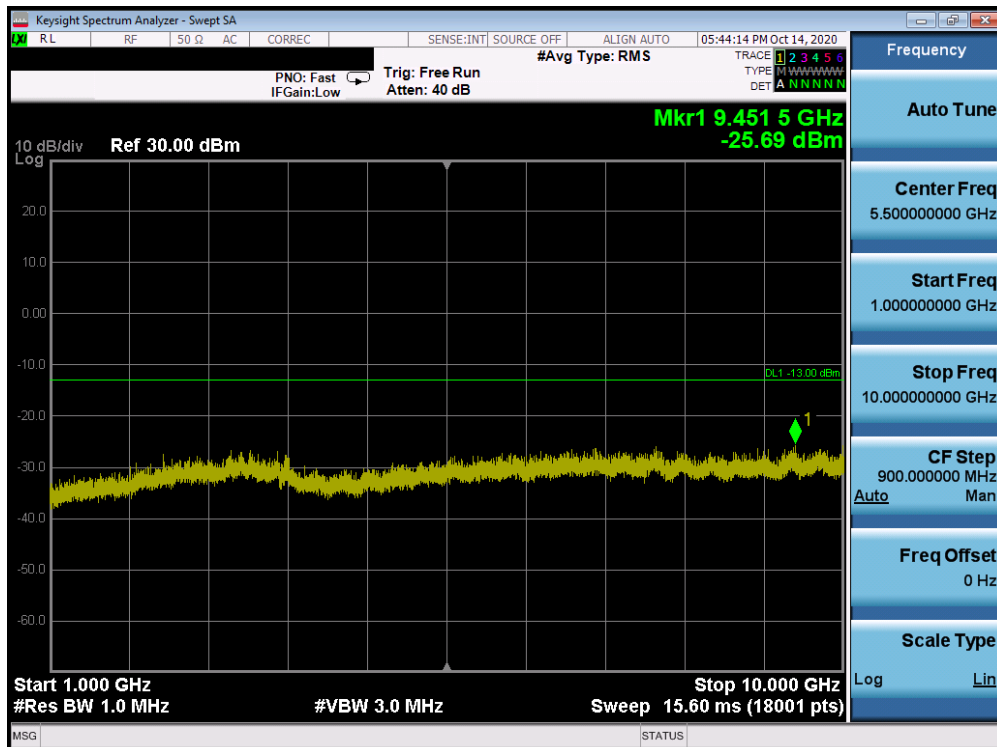
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 45 of 88

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Plot 7-31. Conducted Spurious Plot (GPRS Ch. 190)

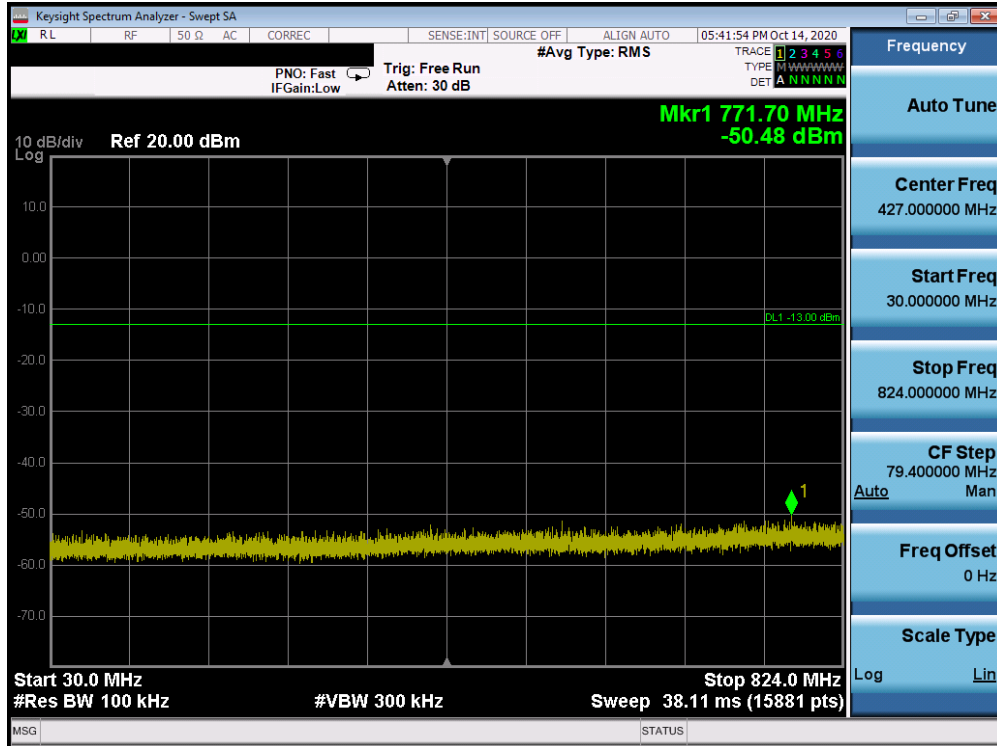


Plot 7-31. Conducted Spurious Plot (GPRS Ch. 190)

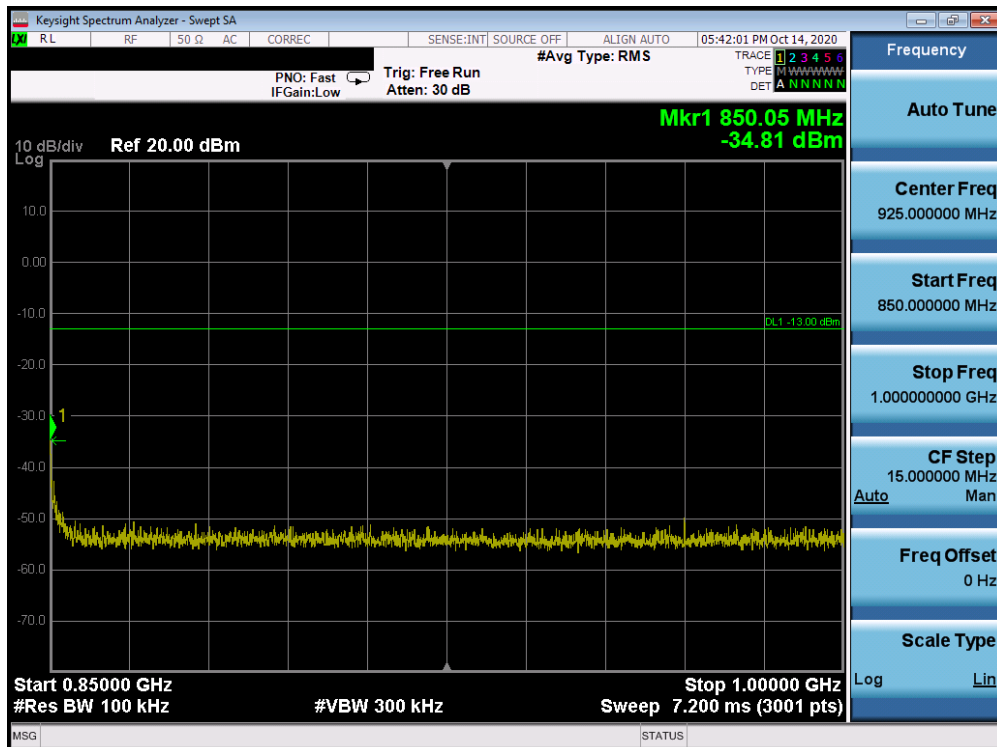
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 46 of 88

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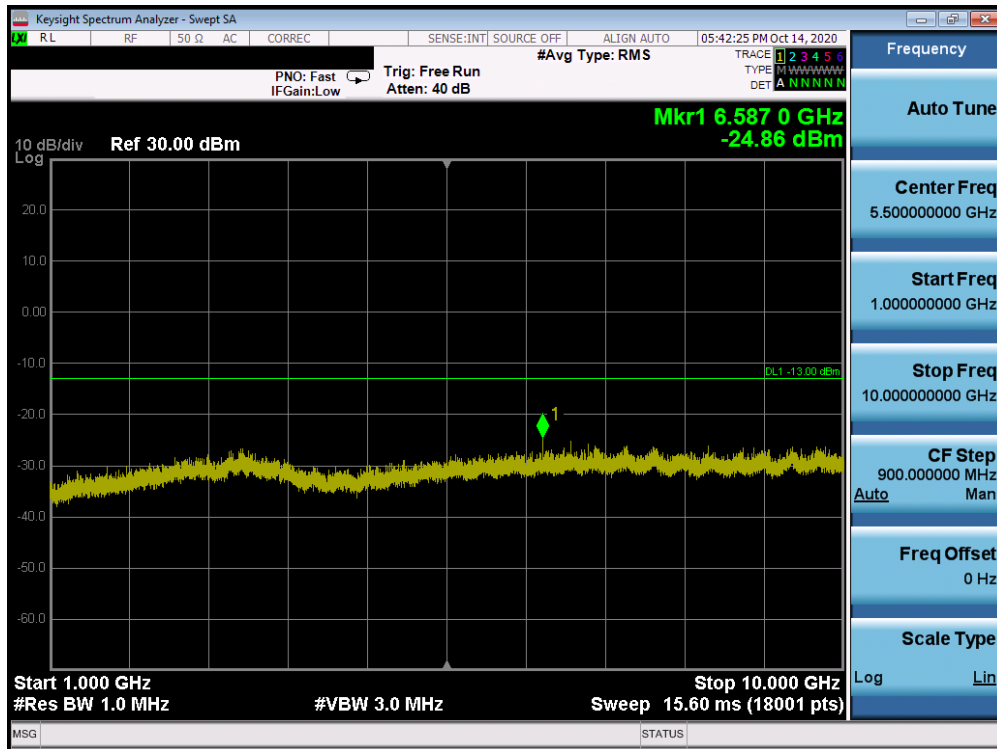


Plot 7-31. Conducted Spurious Plot (GPRS Ch. 251)



Plot 7-31. Conducted Spurious Plot (GPRS Ch. 251)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 47 of 88



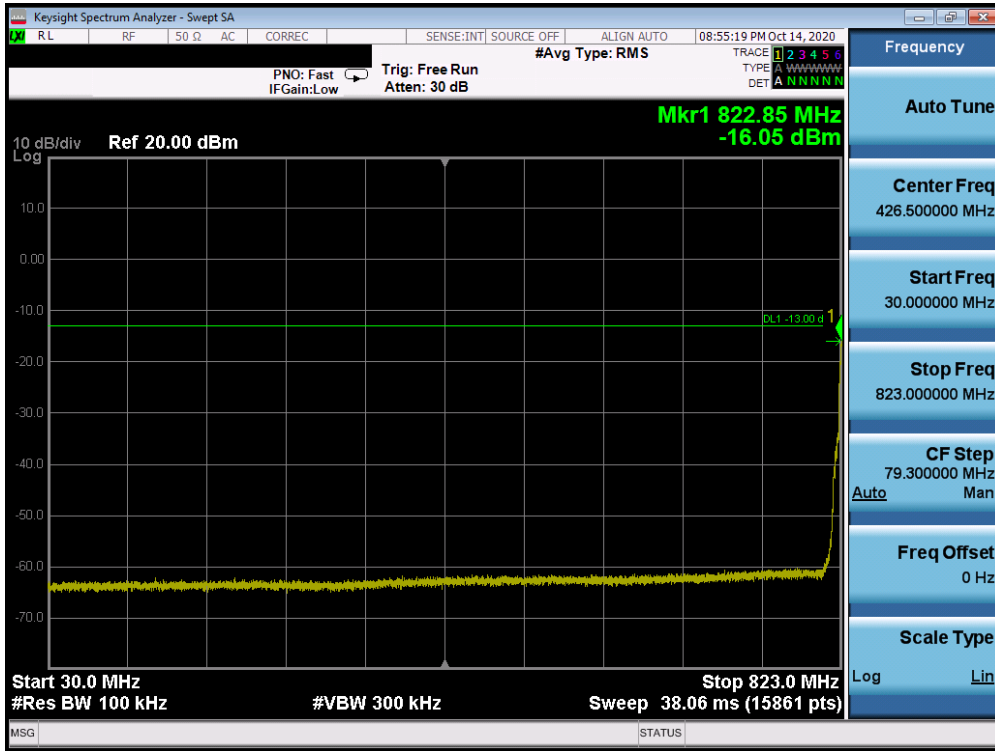
Plot 7-31. Conducted Spurious Plot (GPRS Ch. 251)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 48 of 88

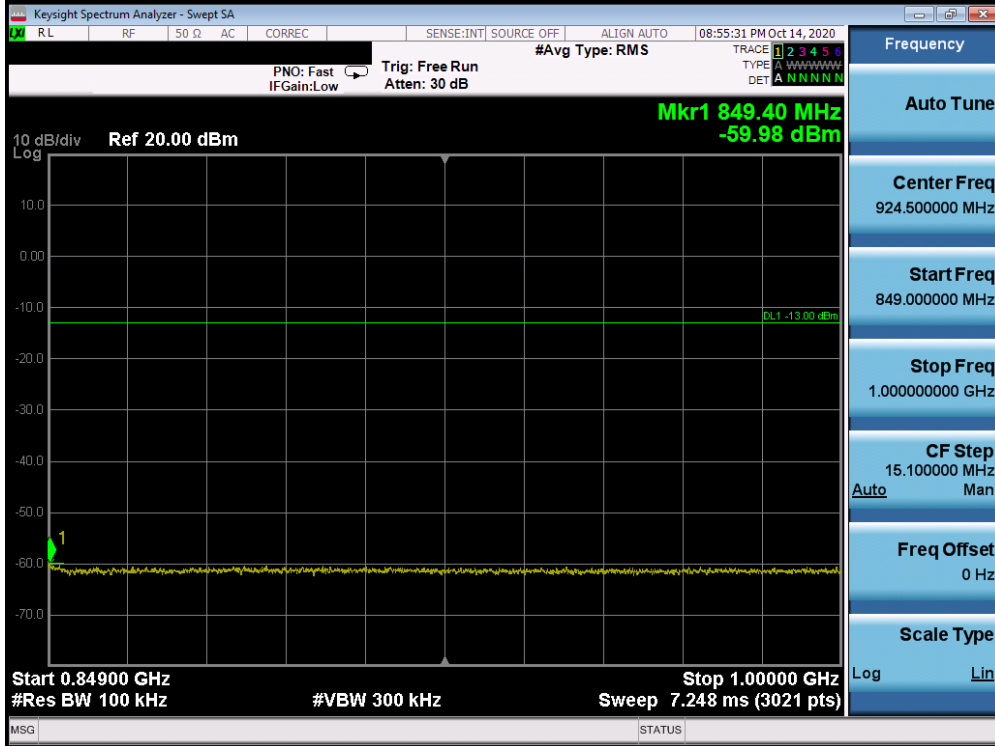
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WCDMA Cell

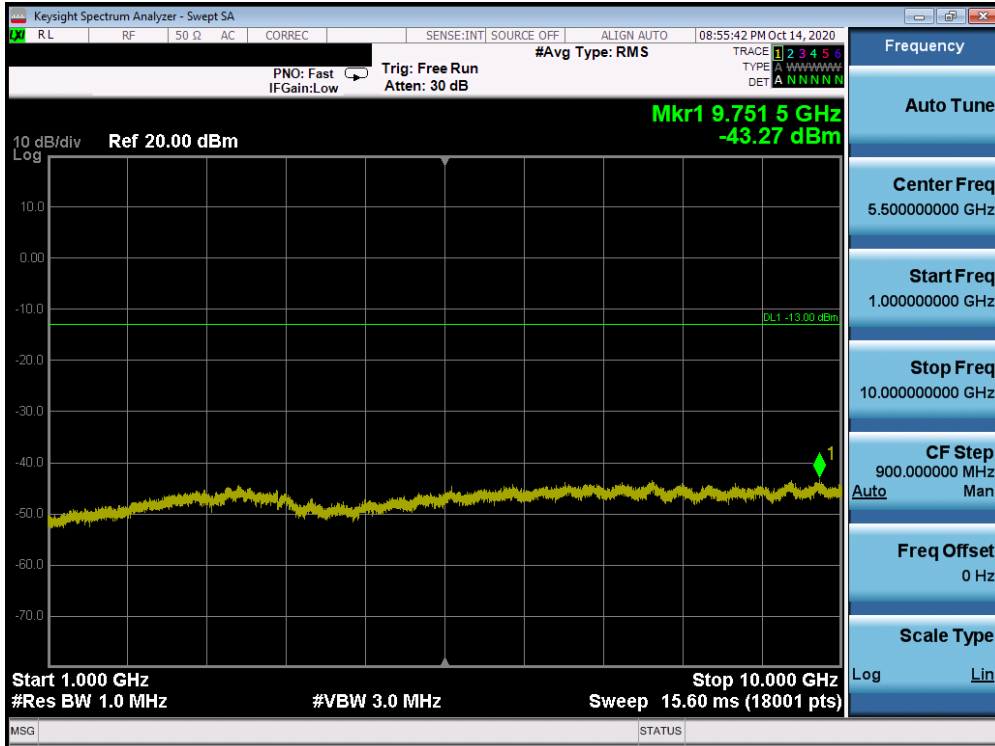


Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4132)

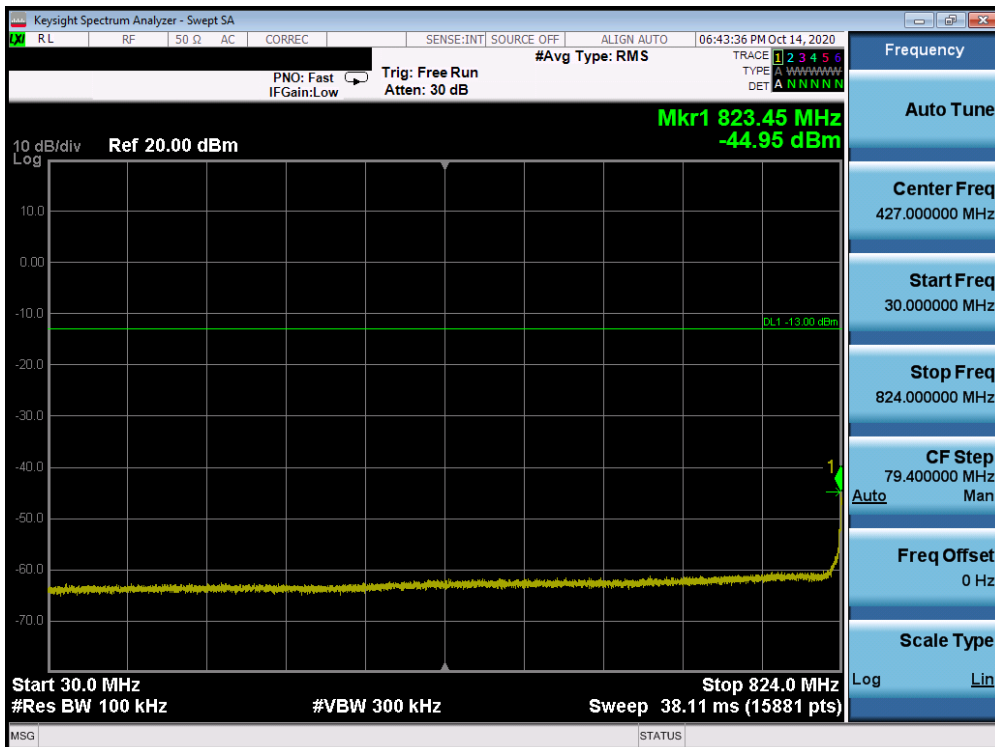


Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4132)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4132)

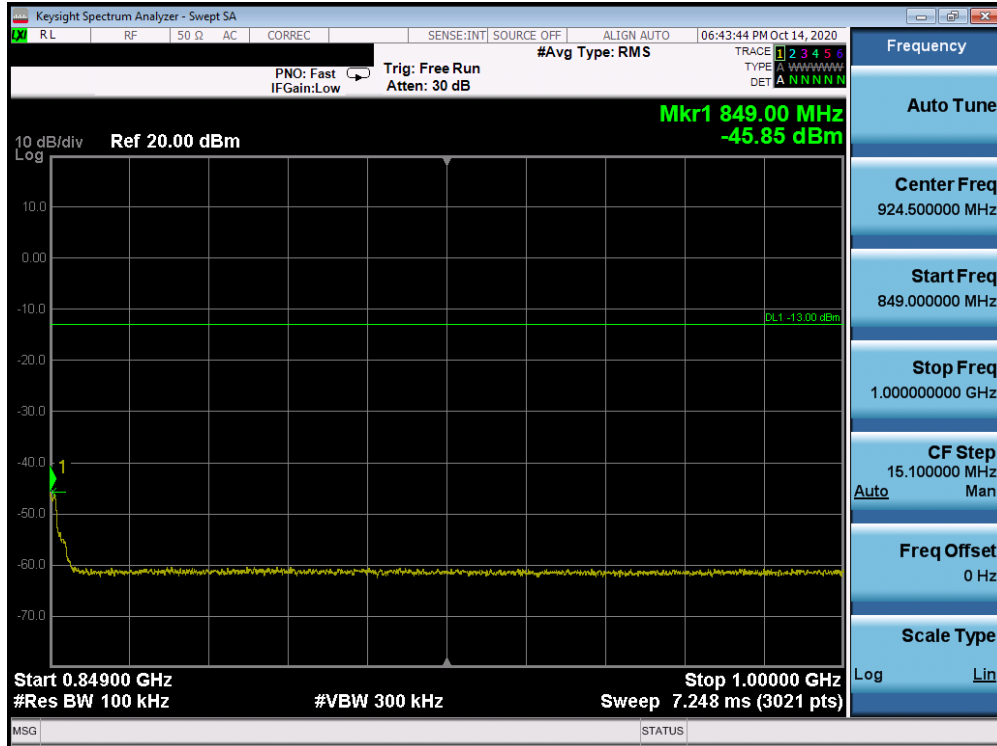


Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4183)

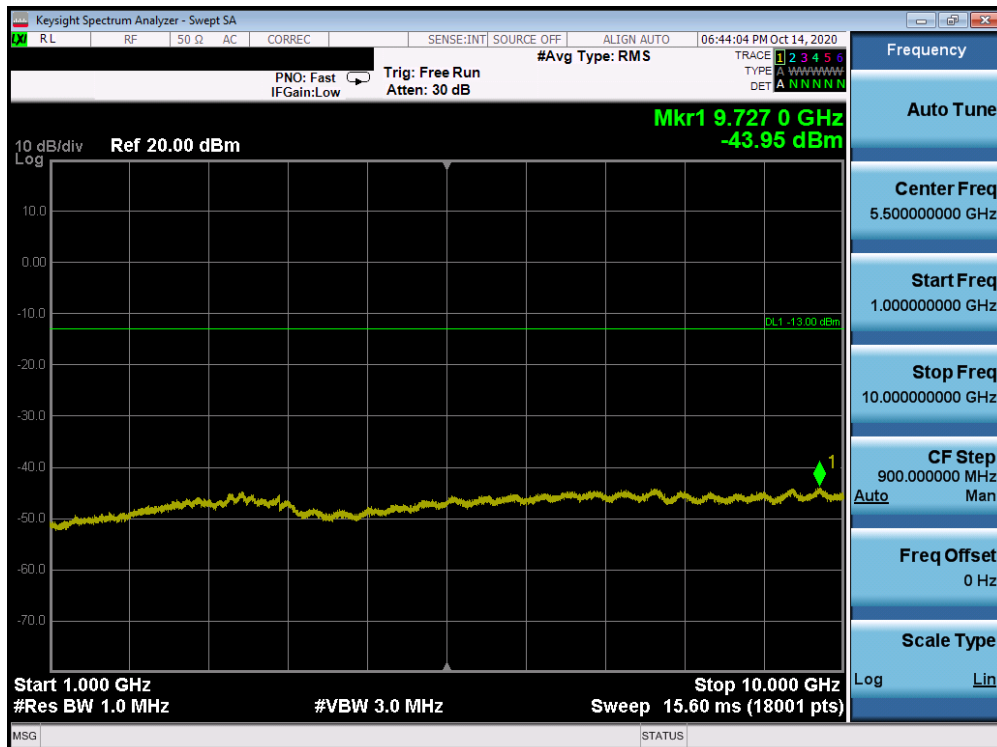
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 50 of 88

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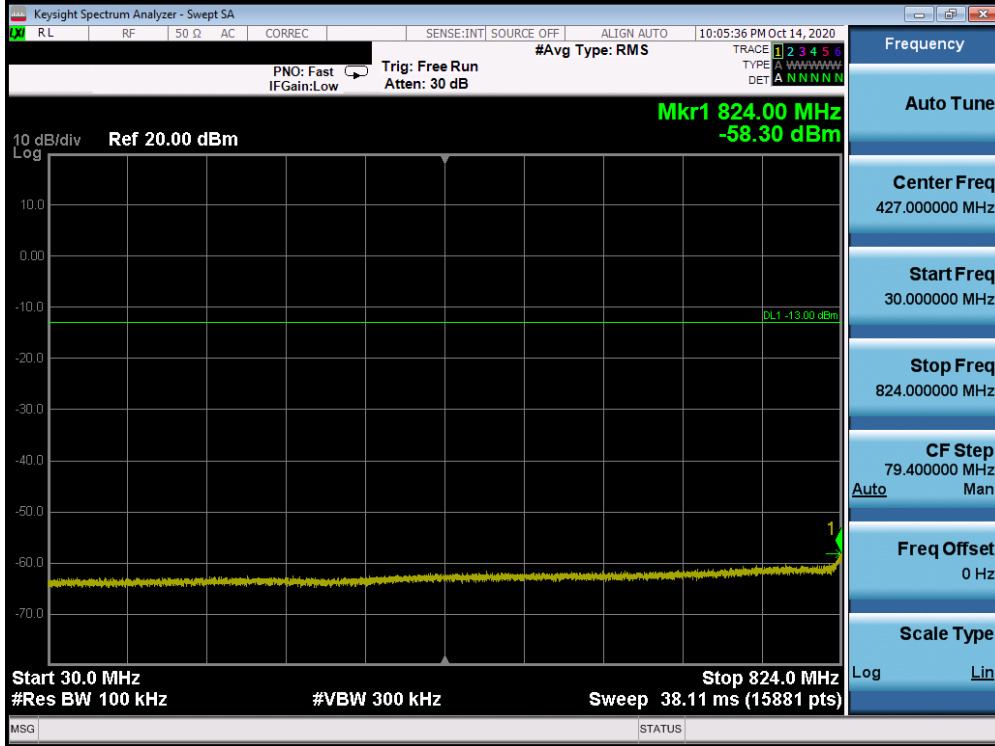


Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4183)

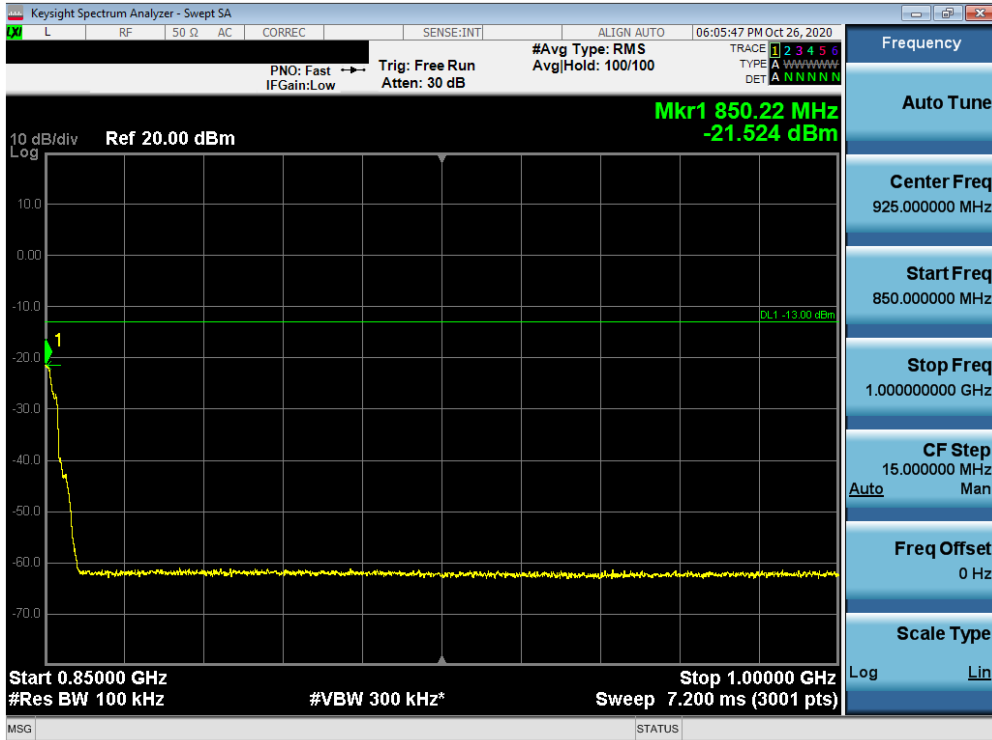


Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4183)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 51 of 88

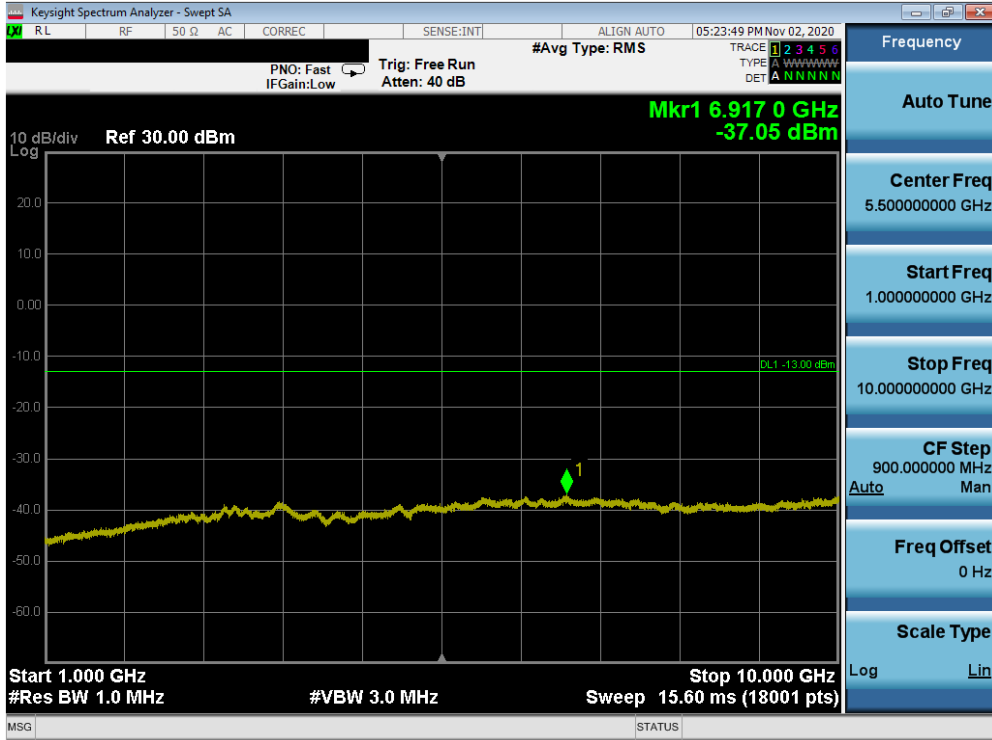


Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4233)



Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4233)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 52 of 88



Plot 7-31. Conducted Spurious Plot (WCDMA Ch. 4233)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 53 of 88

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7.5 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. $VBW \geq 3 \times RBW$
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.

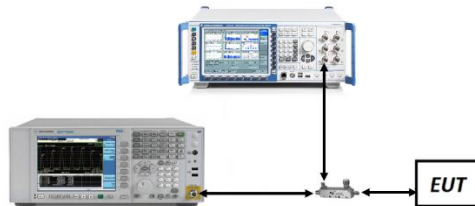





Figure 7-3. Test Instrument & Measurement Setup

FCC ID: A3LSMG998B	 PCTEST Proud to be part of 	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Test Notes

1. Per 22.917(b) and RSS-132(5.5), 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.

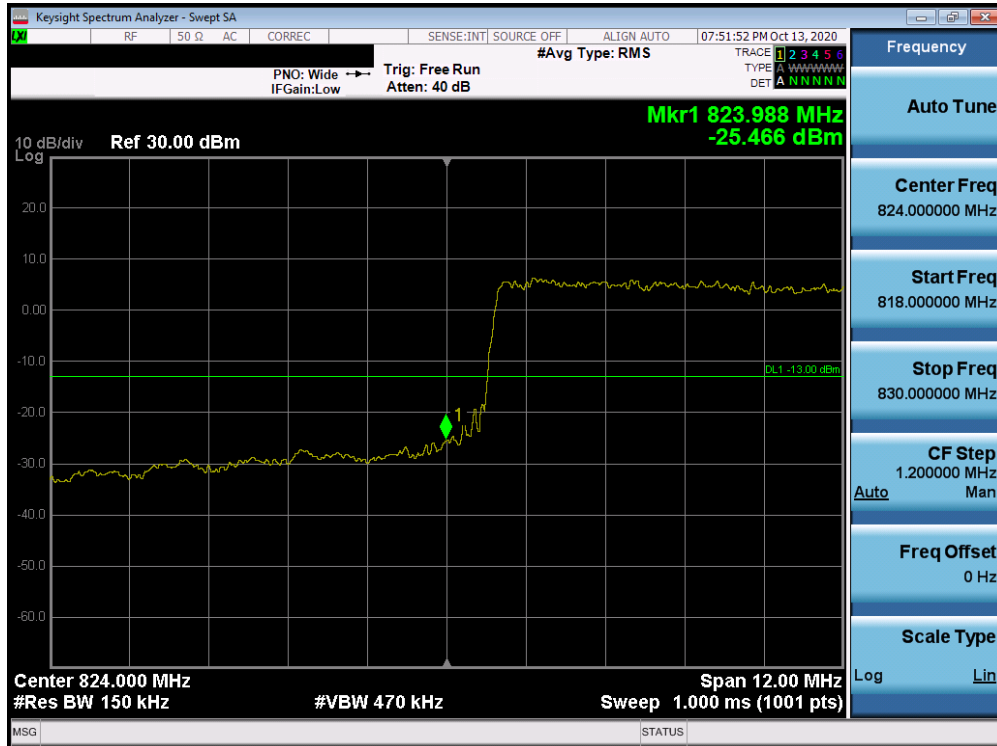
2. For NR operation, all subcarrier spacings (SCS) and transmission schemes (e.g. CP-OFDM and DFT-s-OFDM) were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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LTE Band 26/5



Plot 7-58. Lower Band Edge Plot (LTE Band 26 - 15MHz QPSK – Full RB Configuration)

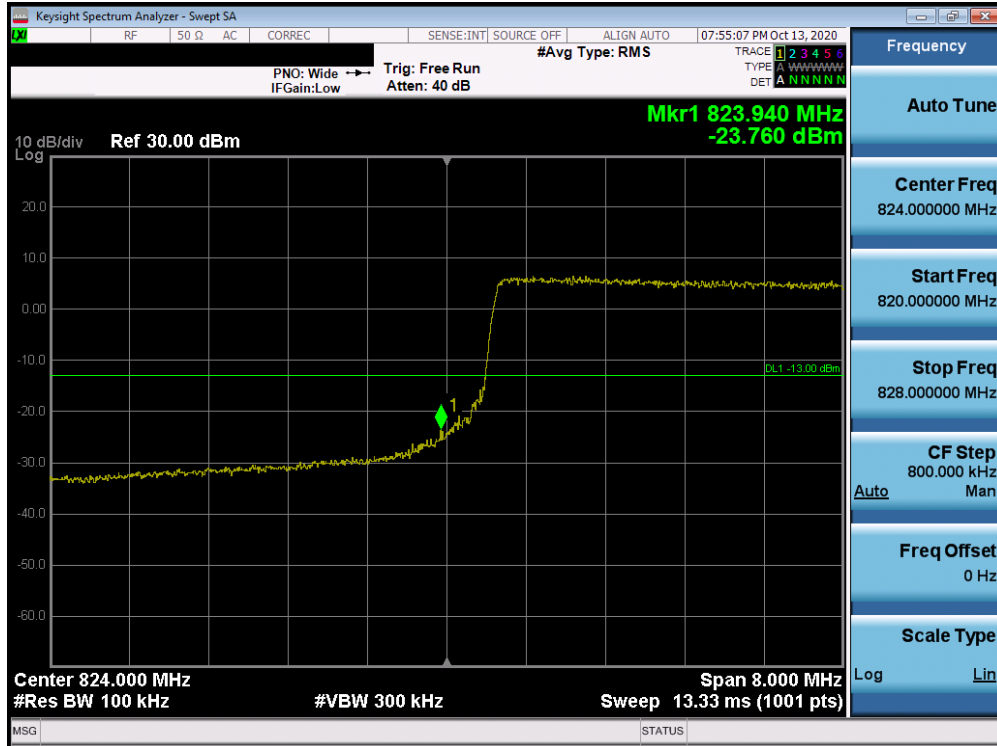


Plot 7-59. Upper Band Edge Plot (LTE Band 26 - 15MHz QPSK – Full RB Configuration)

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Plot 7-60. Lower Band Edge Plot (LTE Band 26/5 - 10MHz QPSK – Full RB Configuration)

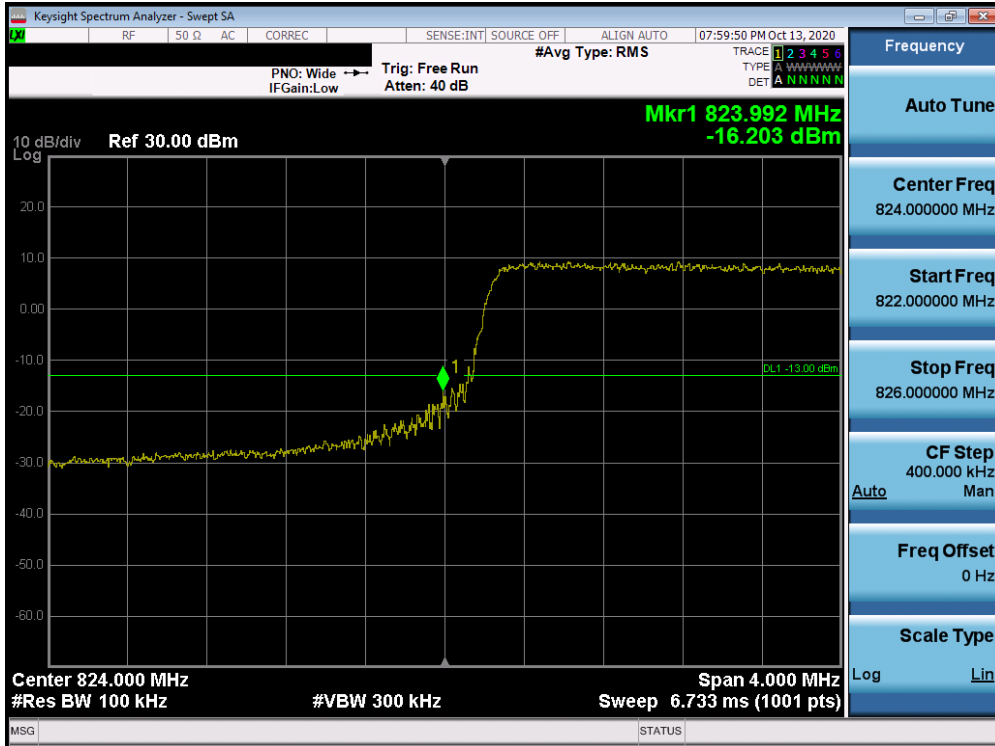


Plot 7-61. Upper Band Edge Plot (LTE Band 26/5 - 10MHz QPSK – Full RB Configuration)

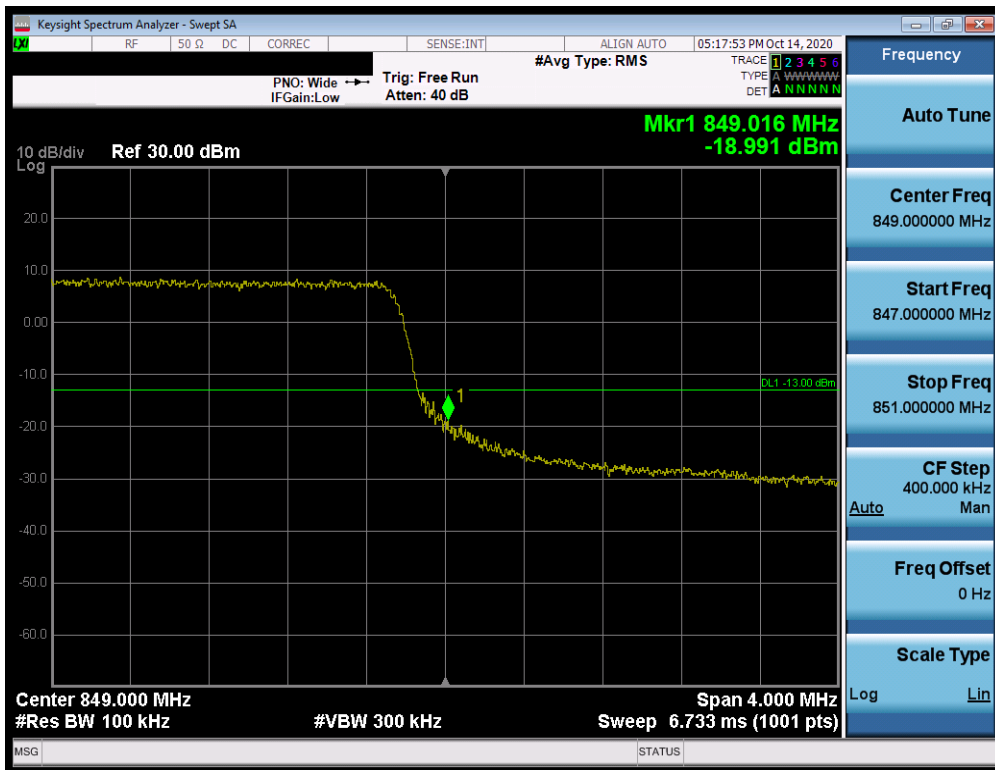
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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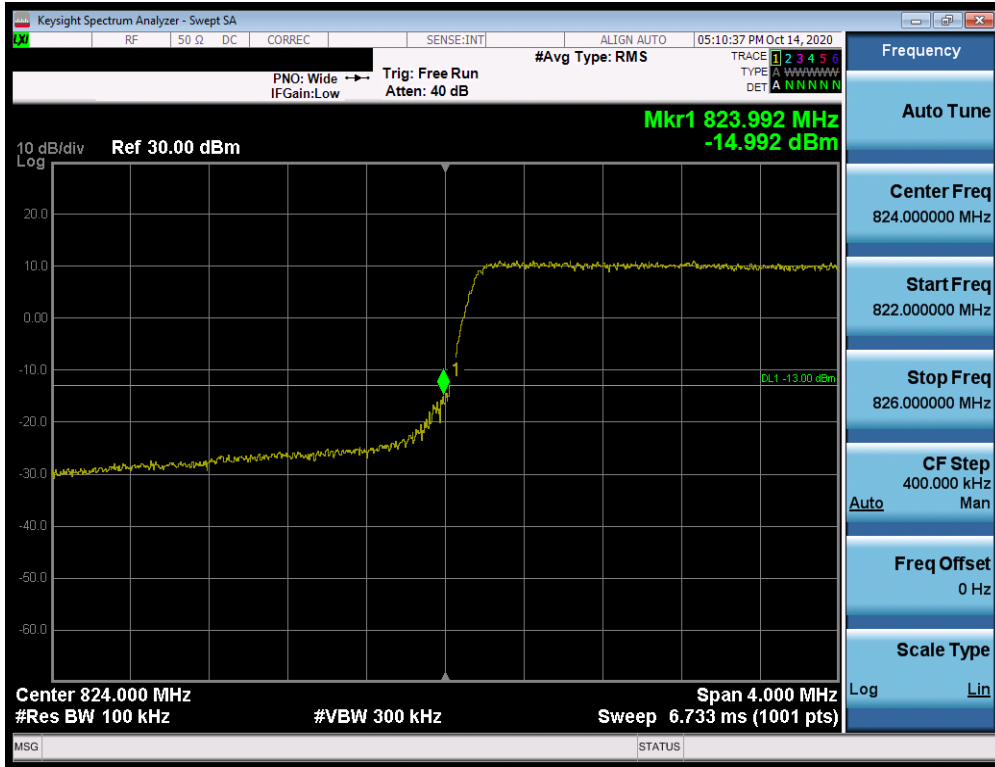


Plot 7-62. Lower Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB Configuration)

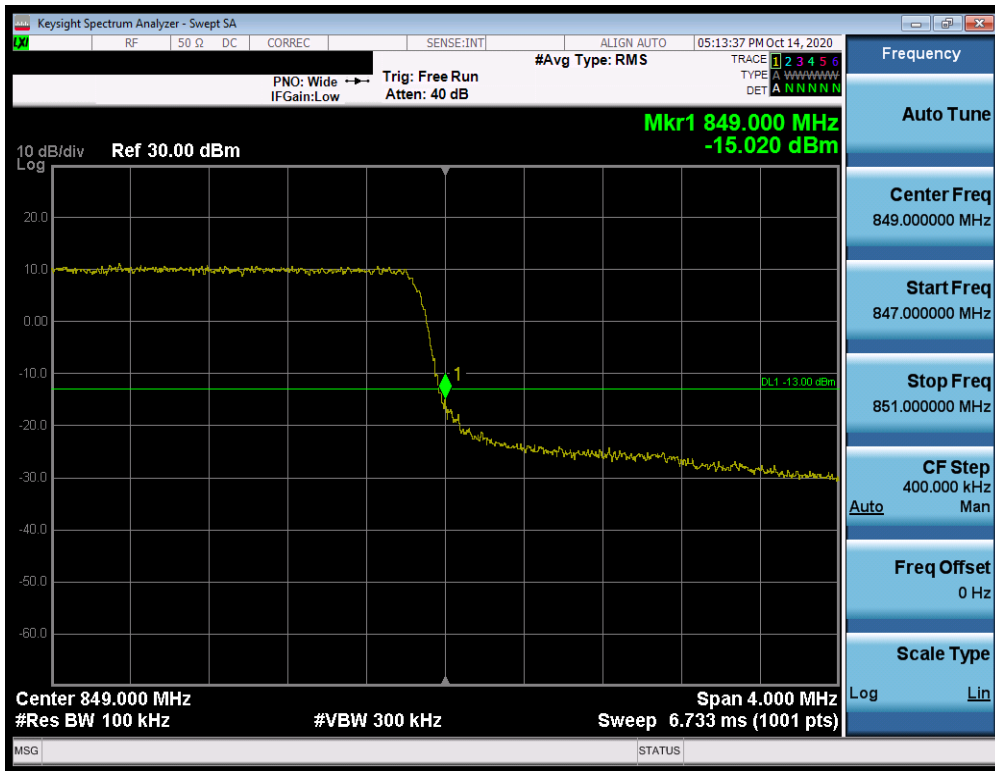


Plot 7-63. Upper Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-64. Lower Band Edge Plot (LTE Band 26/5 - 3MHz QPSK – Full RB Configuration)

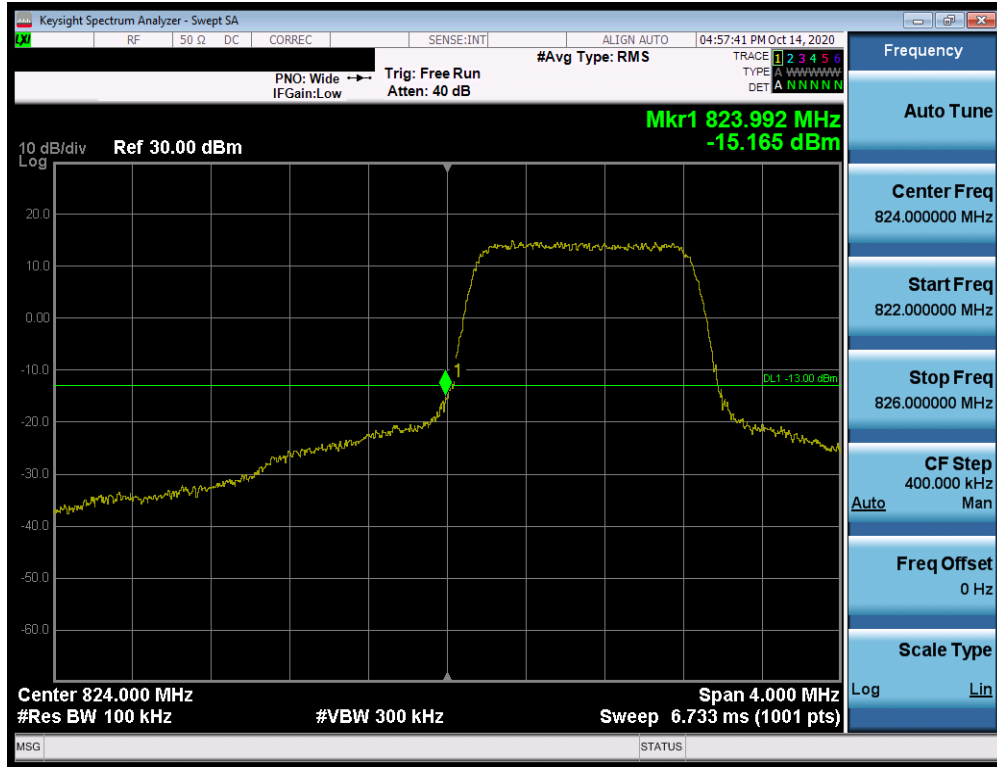


Plot 7-65. Upper Band Edge Plot (LTE Band 26/5 - 3MHz QPSK – Full RB Configuration)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-66. Lower Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB Configuration)

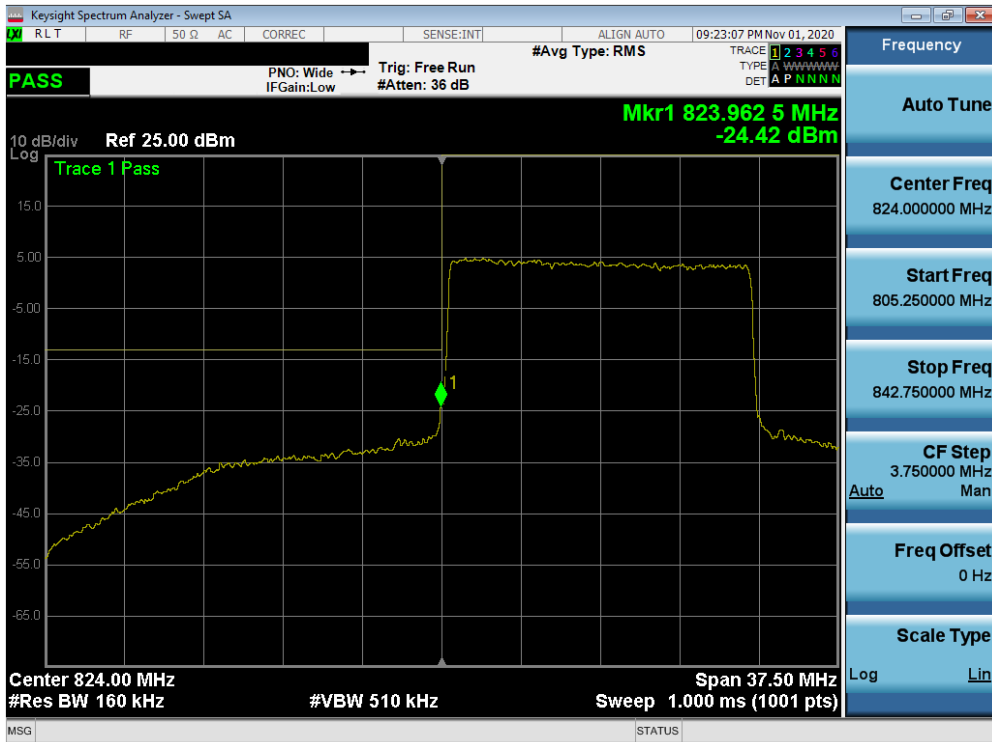


Plot 7-67. Upper Band Edge Plot (LTE Band 26/5 – 1.4MHz QPSK – Full RB Configuration)

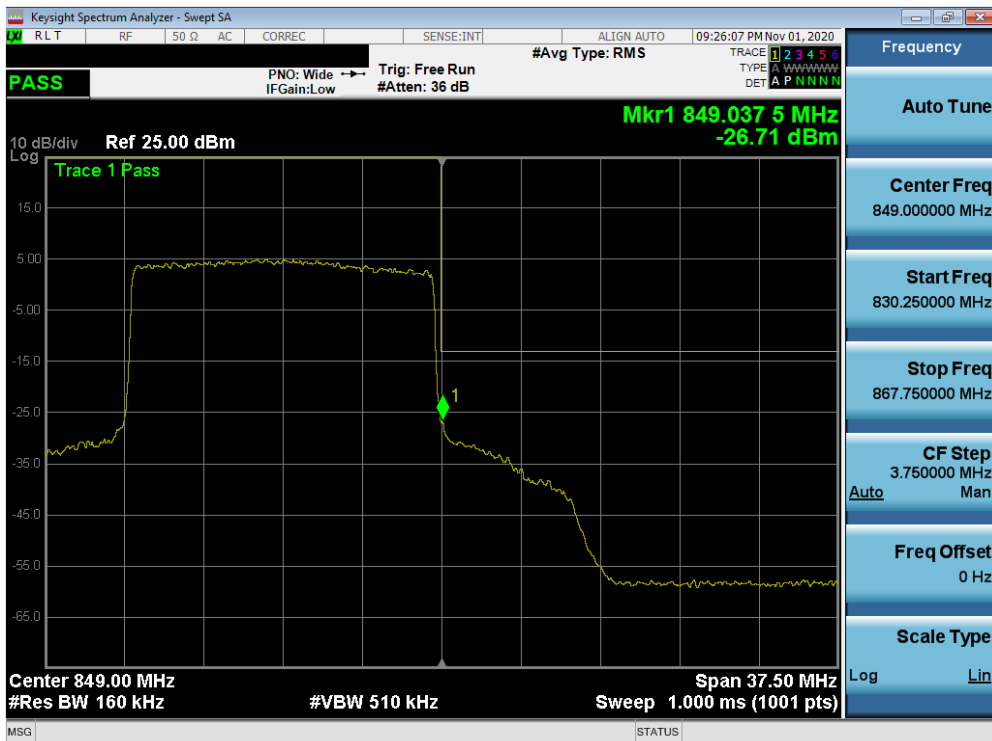
FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-70. Lower Band Edge Plot (NR Band n5 – 15.0MHz - CP QPSK - Full RB)



Plot 7-71. Upper Band Edge Plot (NR Band n5 – 15.0MHz - CP QPSK - Full RB)

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Plot 7-72. Lower Band Edge Plot (NR Band n5 – 10.0MHz - CP QPSK - Full RB)

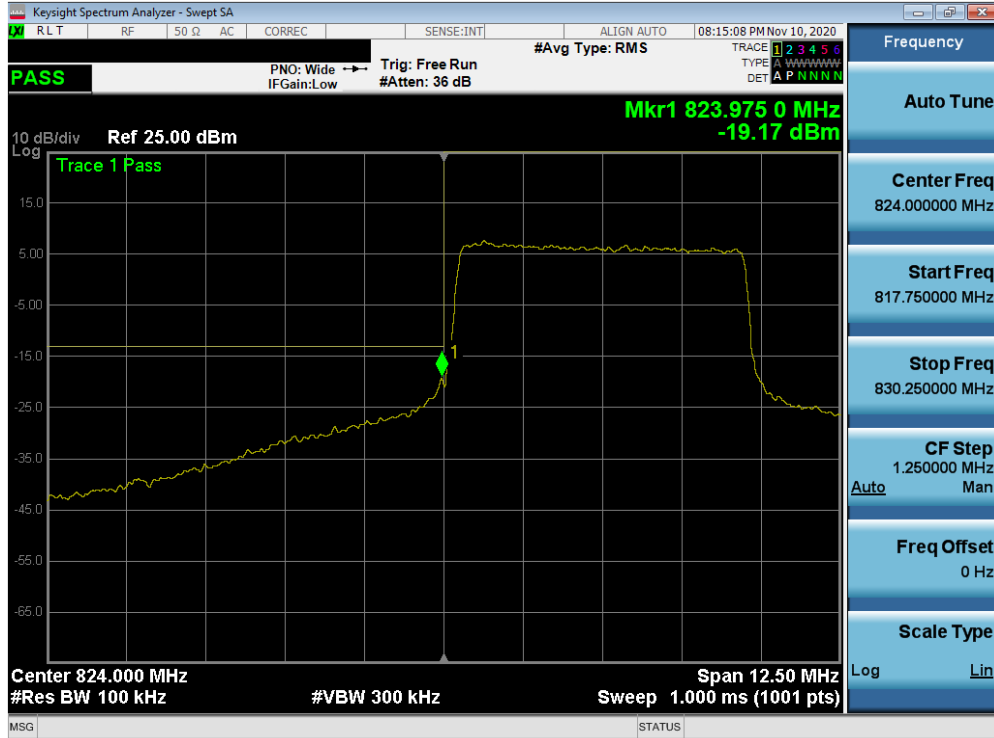


Plot 7-73. Upper Band Edge Plot (NR Band n5 – 10.0MHz – DFT-s QPSK - Full RB)

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Plot 7-74. Lower Band Edge Plot (NR Band n5 – 5.0MHz - CP QPSK - Full RB)



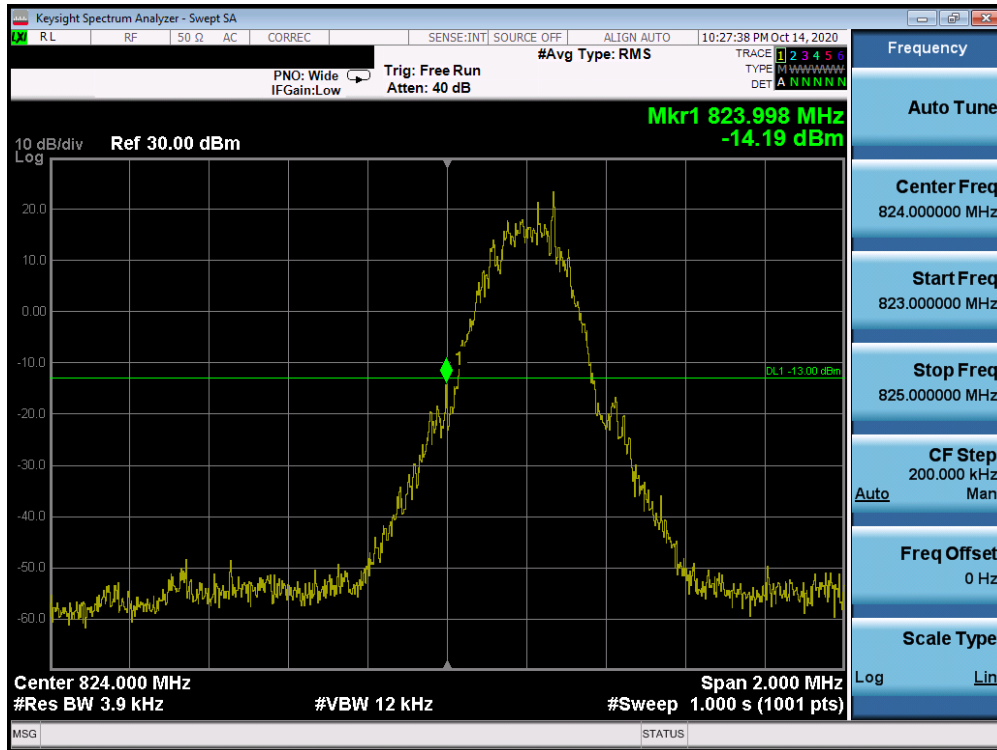
Plot 7-75. Upper Band Edge Plot (NR Band n5 – 5.0MHz – DFT-s QPSK - Full RB)

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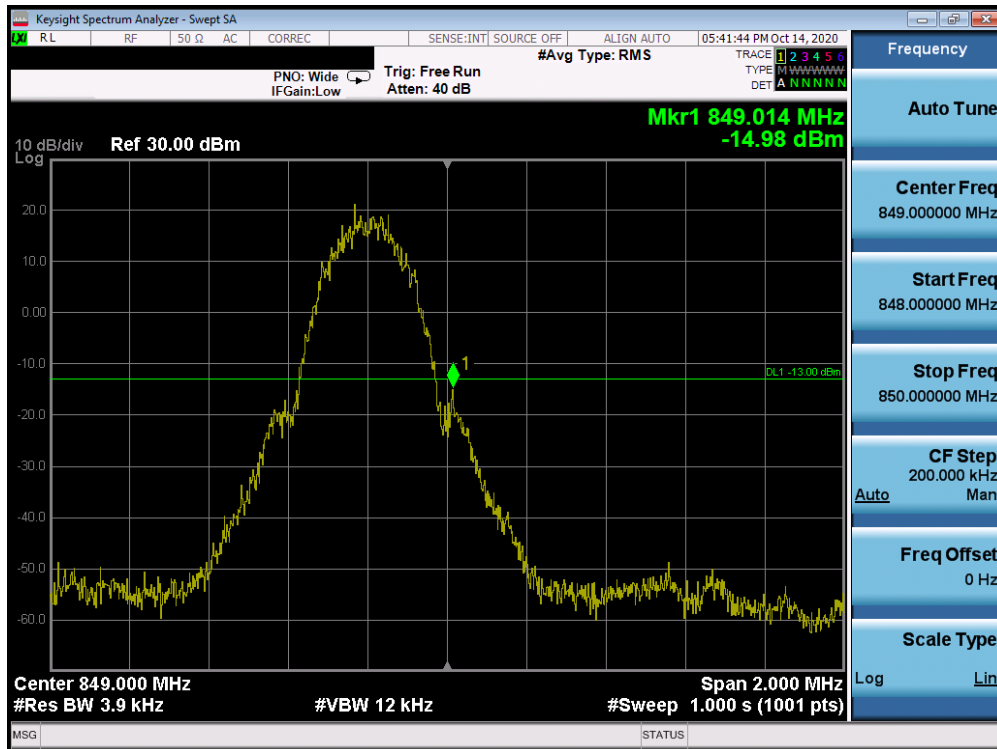
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GSM/GPRS Cell



Plot 7-76. Lower Band Edge Plot (GSM Cell – Ch. 128)



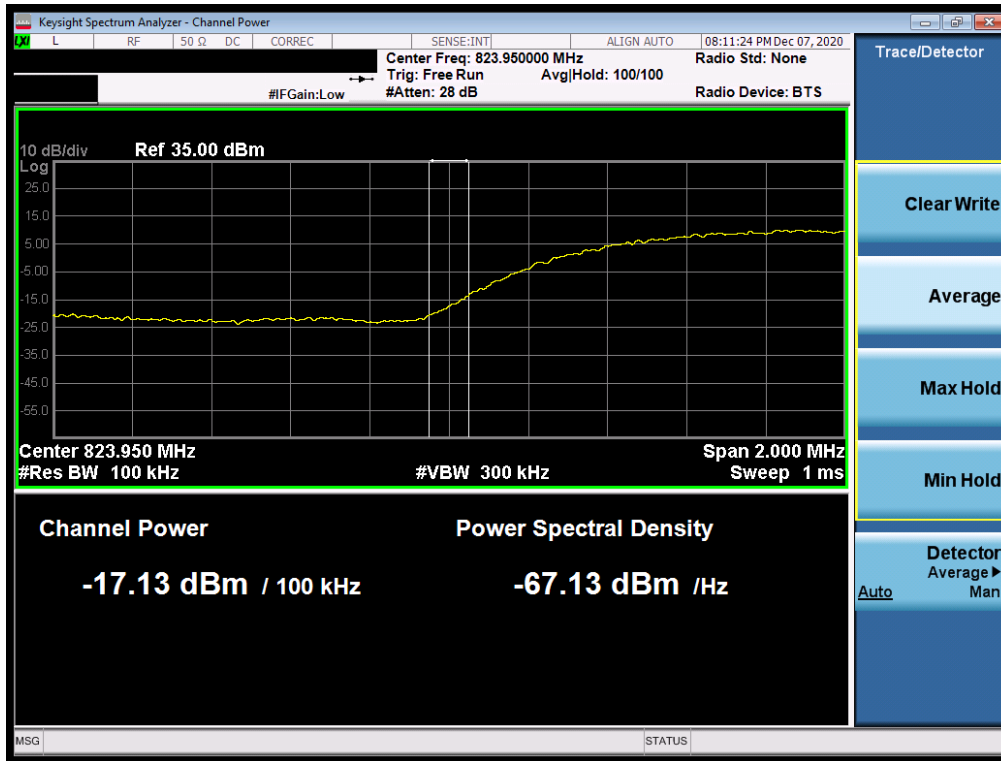
Plot 7-77. Upper Band Edge Plot (GPRS Cell – Ch. 251)

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WCDMA Cell



Plot 7-78. Lower Band Edge Plot (WCDMA Cell – Ch. 4132)



Plot 7-79. Upper Band Edge Plot (WCDMA Cell – Ch. 4233)

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7.6 Radiated Power (ERP)

Test Overview

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



Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer’s “channel power” measurement capability for signals with continuous operation. 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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Test Setup

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

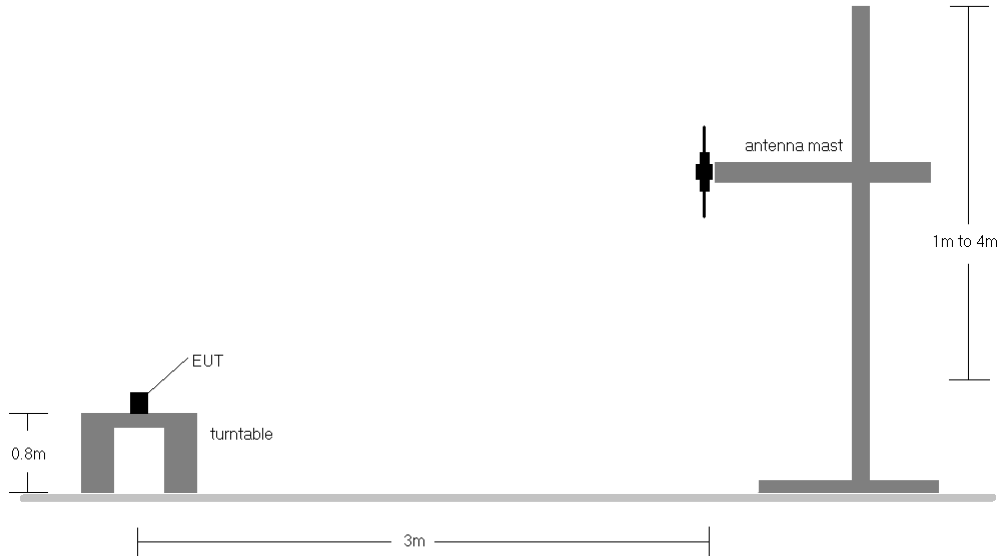


Figure 7-4. Radiated Test Setup <1GHz

Test Notes

- 1) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
- 2) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to “1”.
- 3) 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.
- 4) This unit was tested with its standard battery.
- 5) 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.
- 6) 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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Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
15MHz (Band 26 only)	QPSK	831.5	V	136.0	272.0	6.43	1 / 0	13.72	18.00	0.063	38.45	-20.45	20.15	0.104	40.61	-20.46
		836.5	V	147.0	280.0	6.38	1 / 0	13.91	18.14	0.065	38.45	-20.31	20.29	0.107	40.61	-20.32
		841.5	V	133.0	281.0	6.43	1 / 0	13.85	18.13	0.065	38.45	-20.32	20.28	0.107	40.61	-20.33
	16-QAM	831.5	V	136.0	272.0	6.43	1 / 0	12.65	16.93	0.049	38.45	-21.52	19.08	0.081	40.61	-21.52
		836.5	V	147.0	280.0	6.38	1 / 0	11.87	16.10	0.041	38.45	-22.35	18.25	0.067	40.61	-22.35
256-QAM	836.5	V	147.0	280.0	6.38	1 / 0	5.38	9.61	0.009	38.45	-28.84	11.76	0.015	40.61	-28.84	
10 MHz	QPSK	829.0	V	136.0	272.0	0.00	1/36	19.96	17.81	0.060	38.45	-20.64	19.96	0.099	40.61	-20.65
		836.5	V	147.0	280.0	0.00	1/0	20.12	17.97	0.063	38.45	-20.48	20.12	0.103	40.61	-20.49
		844.0	V	133.0	281.0	0.00	1/0	20.26	18.11	0.065	38.45	-20.34	20.26	0.106	40.61	-20.35
	16-QAM	844.0	V	133.0	281.0	0.00	1/36	19.07	16.92	0.049	38.45	-21.53	19.07	0.081	40.61	-21.54
	256-QAM	836.5	V	147.0	280.0	0.00	1/0	18.27	16.12	0.041	38.45	-22.33	18.27	0.067	40.61	-22.33
5 MHz	836.5	V	147.0	280.0	0.00	1/36	11.62	9.47	0.009	38.45	-28.98	11.62	0.015	40.61	-28.98	
5 MHz	QPSK	826.5	V	136.0	272.0	0.00	1/24	20.01	17.86	0.061	38.45	-20.59	20.01	0.100	40.61	-20.60
		836.5	V	147.0	280.0	0.00	1/24	20.08	17.93	0.062	38.45	-20.52	20.08	0.102	40.61	-20.53
		846.5	V	133.0	281.0	0.00	1/25	20.23	18.08	0.064	38.45	-20.37	20.23	0.105	40.61	-20.38
	16-QAM	846.5	V	133.0	281.0	0.00	1/24	19.23	17.08	0.051	38.45	-21.37	19.23	0.084	40.61	-21.38
	256-QAM	836.5	V	147.0	280.0	0.00	1/0	18.12	15.97	0.040	38.45	-22.48	18.12	0.065	40.61	-22.48
3 MHz	836.5	V	147.0	280.0	0.00	1/0	11.53	9.38	0.009	38.45	-29.07	11.53	0.014	40.61	-29.07	
3 MHz	QPSK	825.5	V	136.0	272.0	0.00	1/0	19.96	17.81	0.060	38.45	-20.64	19.96	0.099	40.61	-20.65
		836.5	V	147.0	280.0	0.00	1/12	20.12	17.97	0.063	38.45	-20.48	20.12	0.103	40.61	-20.49
		847.5	V	133.0	281.0	0.00	1/24	20.25	18.10	0.065	38.45	-20.35	20.25	0.106	40.61	-20.36
	16-QAM	847.5	V	133.0	281.0	0.00	1/12	19.11	16.96	0.050	38.45	-21.49	19.11	0.081	40.61	-21.50
	256-QAM	836.5	V	147.0	280.0	0.00	1/24	18.16	16.01	0.040	38.45	-22.44	18.16	0.065	40.61	-22.44
1.4 MHz	836.5	V	147.0	280.0	0.00	1/0	11.48	9.33	0.009	38.45	-29.12	11.48	0.014	40.61	-29.12	
1.4 MHz	QPSK	824.7	V	136.0	272.0	0.00	1/0	19.87	17.72	0.059	38.45	-20.73	19.87	0.097	40.61	-20.74
		836.5	V	147.0	280.0	0.00	1/7	19.89	17.74	0.059	38.45	-20.71	19.89	0.097	40.61	-20.72
		848.3	V	133.0	281.0	0.00	1/7	20.07	17.92	0.062	38.45	-20.53	20.07	0.102	40.61	-20.54
	16-QAM	824.7	V	136.0	272.0	0.00	1/7	19.08	16.93	0.049	38.45	-21.52	19.08	0.081	40.61	-21.52
	256-QAM	836.5	V	147.0	280.0	0.00	1/14	18.12	15.97	0.040	38.45	-22.48	18.12	0.065	40.61	-22.48
Opposite Pol.	836.5	H	247.0	289.0	6.38	1 / 0	10.75	17.13	0.052	38.45	-21.32	19.28	0.085	40.61	-21.33	
WCP	836.5	H	202.0	302.0	6.38	1 / 0	5.44	11.82	0.015	38.45	-26.63	13.97	0.025	40.61	-26.64	

Table 7-80. ERP Data (LTE Band 26/5)

Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
20 MHz	QPSK	834.0	V	137.0	257.0	6.35	1 / 79	9.70	13.90	0.025	38.45	-24.55	16.05	0.040	40.61	-24.55
		836.5	V	123.0	259.0	6.38	1 / 79	9.78	14.01	0.025	38.45	-24.44	16.16	0.041	40.61	-24.45
		839.0	V	139.0	250.0	6.40	1 / 79	10.13	14.38	0.027	38.45	-24.07	16.53	0.045	40.61	-24.07
	16-QAM	836.5	V	123.0	259.0	6.38	1 / 79	9.09	13.32	0.021	38.45	-25.13	15.47	0.035	40.61	-25.14
	256-QAM	839.0	V	139.0	257.0	6.40	1 / 79	7.42	11.67	0.015	38.45	-26.78	13.82	0.024	40.61	-26.78
15 MHz	839.0	V	139.0	257.0	6.40	1 / 79	5.49	9.74	0.009	38.45	-28.71	11.89	0.015	40.61	-28.71	
15 MHz	QPSK	831.5	V	137.0	257.0	6.43	1 / 73	9.69	13.96	0.025	38.45	-24.49	16.11	0.041	40.61	-24.49
		836.5	V	123.0	259.0	6.38	1 / 37	9.88	14.11	0.026	38.45	-24.34	16.26	0.042	40.61	-24.35
		841.5	V	139.0	250.0	6.43	1 / 37	10.02	14.30	0.027	38.45	-24.15	16.45	0.044	40.61	-24.15
	16-QAM	841.5	V	139.0	250.0	6.43	1 / 37	9.00	13.28	0.021	38.45	-25.17	15.43	0.035	40.61	-25.18
	256-QAM	841.5	V	139.0	250.0	6.43	75 / 0	7.68	11.96	0.016	38.45	-26.49	14.11	0.026	40.61	-26.50
10 MHz	841.5	V	139.0	250.0	6.43	1 / 37	5.48	9.76	0.009	38.45	-28.69	11.91	0.016	40.61	-28.70	
10 MHz	QPSK	829.0	V	137.0	257.0	6.40	1 / 25	9.39	13.64	0.023	38.45	-24.81	15.79	0.038	40.61	-24.82
		836.5	V	123.0	259.0	6.38	1 / 48	9.62	13.85	0.024	38.45	-24.60	16.00	0.040	40.61	-24.61
		844.0	V	139.0	250.0	6.46	1 / 48	9.62	13.93	0.025	38.45	-24.52	16.08	0.041	40.61	-24.53
	16-QAM	844.0	V	139.0	250.0	6.46	1 / 25	8.56	12.87	0.019	38.45	-25.58	15.02	0.032	40.61	-25.59
	256-QAM	836.5	V	123.0	259.0	6.38	50 / 0	7.44	11.67	0.015	38.45	-26.78	13.82	0.024	40.61	-26.79
5 MHz	829.0	V	137.0	257.0	6.37	1 / 12	9.20	13.42	0.022	38.45	-25.03	15.57	0.036	40.61	-25.04	
5 MHz	QPSK	836.5	V	123.0	259.0	6.38	1 / 12	9.82	14.05	0.025	38.45	-24.41	16.20	0.042	40.61	-24.41
		844.0	V	139.0	250.0	6.48	1 / 1	9.60	13.93	0.025	38.45	-24.52	16.08	0.041	40.61	-24.52
		836.5	V	123.0	259.0	6.38	1 / 23	8.62	12.85	0.019	38.45	-25.61	15.00	0.032	40.61	-25.61
	16-QAM	844.0	V	139.0	250.0	6.48	1 / 12	7.24	11.57	0.014	38.45	-26.88	13.72	0.024	40.61	-26.88
	256-QAM	844.0	V	139.0	250.0	6.48	1 / 12	5.58	9.91	0.010	38.45	-28.54	12.06	0.016	40.61	-28.54
QPSK (CP-OFDM)	839.0	V	139.0	250.0	6.40	1 / 79	6.09	12.49	0.018	38.45	-25.96	14.64	0.029	40.61	-25.96	
QPSK (Opposite Pol.)	839.0	H	100.0	298.0	6.70	1 / 79	5.99	12.69	0.019	38.45	-25.76	14.84	0.031	40.61	-25.76	
QPSK (WCP)	839.0	V	139.0	250.0	6.40	1 / 79	0.55	6.95	0.005	38.45	-31.50	9.10	0.008	40.61	-31.50	

Table 7-81. ERP Data (NR Band n5)



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Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
824.20	GPRS850	H	212	310	21.56	6.75	26.16	0.413	38.45	-12.29
836.60	GPRS850	V	225	294	20.72	6.68	25.25	0.335	38.45	-13.20
848.80	GPRS850	V	390	297	19.29	6.71	23.85	0.242	38.45	-14.61
824.20	GPRS850	H	251	266	17.28	6.35	21.48	0.141	38.45	-16.97
824.20	EDGE850	V	274	196	15.14	6.75	19.74	0.094	38.45	-18.71
824.20	GPRS850 (WCP)	V	170	54	13.36	6.75	17.96	0.063	38.45	-20.49

Table 7-82. ERP Data (GPRS Cell)

Frequency [MHz]	Mode	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
826.40	WCDMA850	V	114	253	13.56	6.77	18.18	0.066	38.45	-20.27
836.60	WCDMA850	V	100	262	12.81	6.68	17.34	0.054	38.45	-21.11
846.60	WCDMA850	V	109	268	13.36	6.68	17.89	0.062	38.45	-20.56
826.40	WCDMA850	H	254	295	12.27	6.77	16.89	0.049	38.45	-21.56
826.40	WCDMA850 (WCP)	V	133	309	10.55	6.77	15.17	0.033	38.45	-23.28

Table 7-83. ERP Data (WCDMA Cell)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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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 peak measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ 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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Test Setup

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

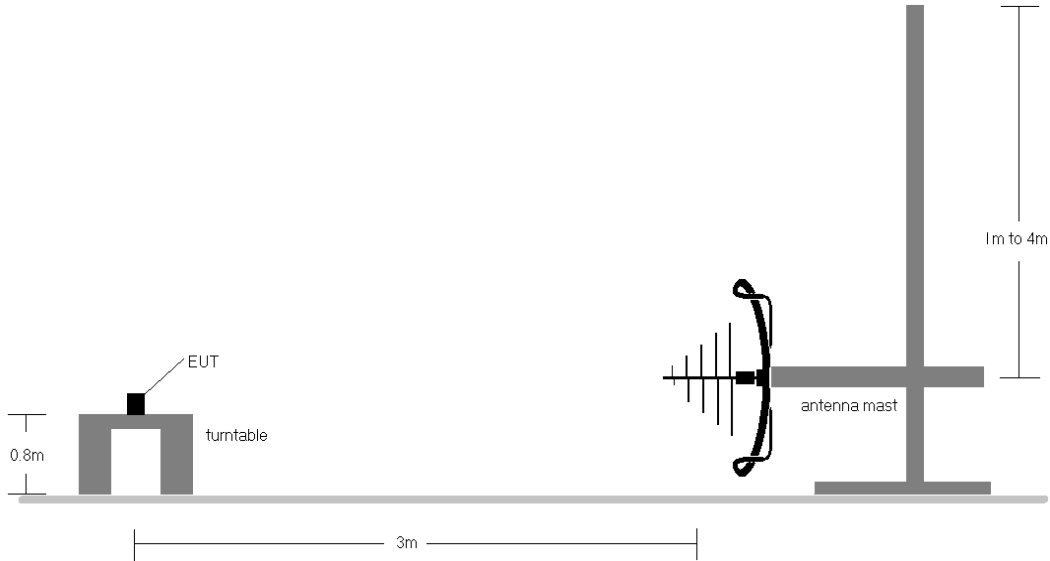


Figure 7-5. Test Instrument & Measurement Setup < 1GHz

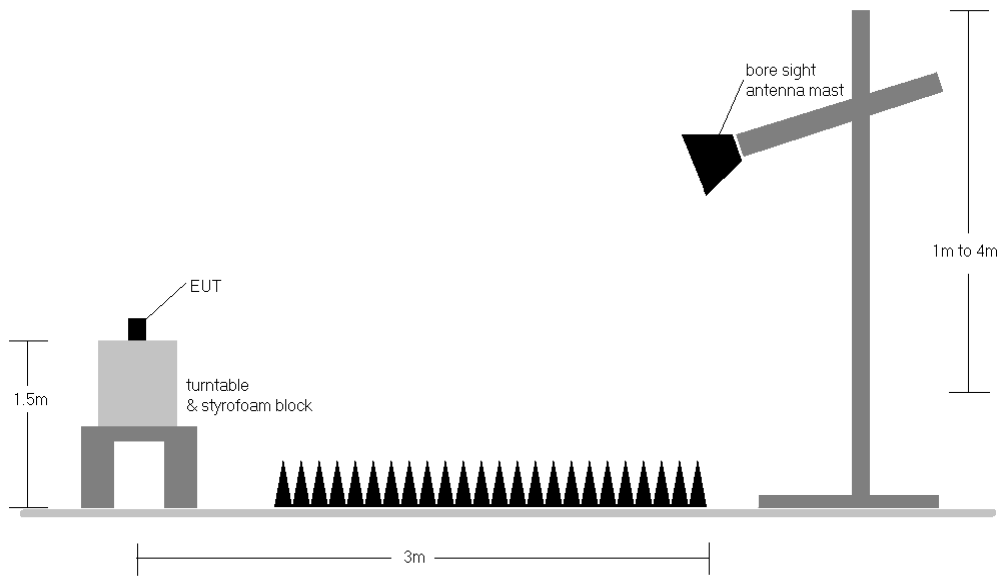




Figure 7-6. Test Instrument & Measurement Setup >1 GHz

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Test Notes

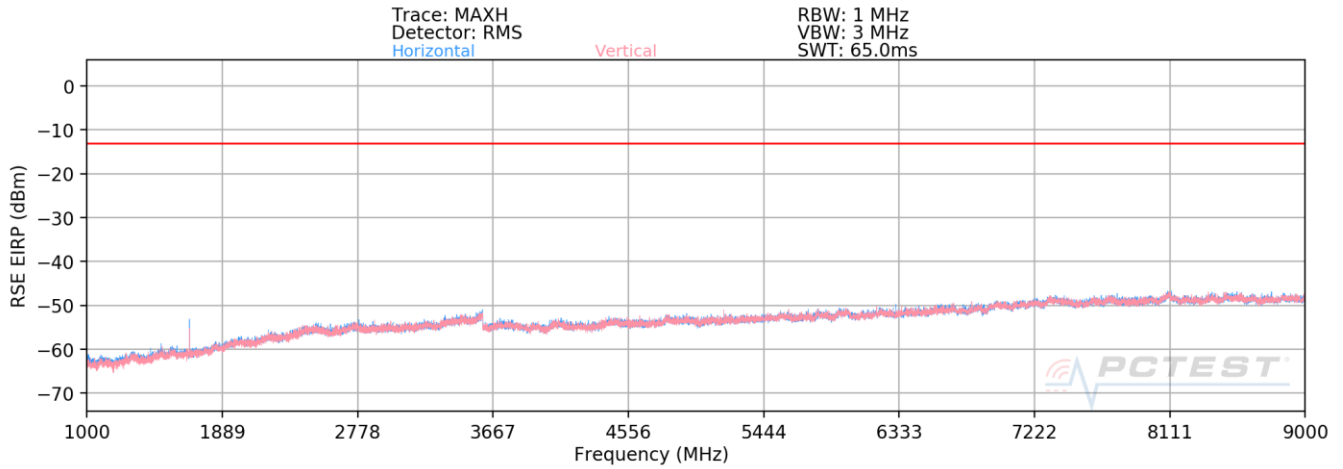
- 1) Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
 - b) $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
 - d) $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$; where D is the measurement distance in meters.
- 2) This device employs GSM, GPRS, and EDGE capabilities. The EUT was tested under all configurations and the highest powers is reported in GPRS mode while transmitting with one slot active.
- 3) This device employs UMTS technology with WCDMA (AMR/RMC) and HSDPA capabilities. The EUT was tested under all configurations and the highest power is reported in WCDMA mode with HSDPA Inactive at 12.2 kbps RMC and TPC bits all set to "1".
- 4) 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.
- 5) This unit was tested with its standard battery.
- 6) 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.
- 7) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 8) 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.
- 9) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 10) 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.
- 11) 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.
- 12) Spurious emissions shown in this section are measured while operating in EN-DC mode with Sub 6GHz NR carrier as well as an LTE carrier (anchor). Spurious emissions from the NR carrier device, is subject to the rules under which the NR carrier operates. Spurious emission caused by the LTE carrier must meet the requirements of the rules under which the LTE carrier operates.

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LTE Band 26/5



Plot 7-84. Radiated Spurious Plot (LTE Band 26/5)

Bandwidth (MHz):	10
Frequency (MHz):	829.0
RB / Offset:	1/25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1658.0	H	101	339	-68.63	0.77	39.14	-56.12	-13.00	-43.12
2487.0	H	329	229	-73.98	5.14	38.16	-57.10	-13.00	-44.10
3316.0	H	101	323	-78.63	6.76	35.13	-60.13	-13.00	-47.13
4145.0	H	-	-	-80.57	8.53	34.96	-60.29	-13.00	-47.29
4974.0	H	-	-	-81.13	10.56	36.43	-58.83	-13.00	-45.83
5803.0	H	-	-	-81.88	12.41	37.53	-57.73	-13.00	-44.73

Table 7-2. Radiated Spurious Data (LTE Band 26/5– Low Channel)

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Bandwidth (MHz):	10
Frequency (MHz):	836.5
RB / Offset:	1/25



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1673.0	H	103	344	-68.97	1.02	39.05	-56.21	-13.00	-43.21
2509.5	H	149	321	-73.38	5.17	38.79	-56.46	-13.00	-43.46
3346.0	H	100	31	-77.10	6.75	36.65	-58.61	-13.00	-45.61
4182.5	H	-	-	-80.79	8.62	34.83	-60.43	-13.00	-47.43
5019.0	H	-	-	-81.37	10.78	36.41	-58.85	-13.00	-45.85
5855.5	H	-	-	-81.74	12.19	37.45	-57.80	-13.00	-44.80

Table 7-3. Radiated Spurious Data (LTE Band 26/5 – Mid Channel)

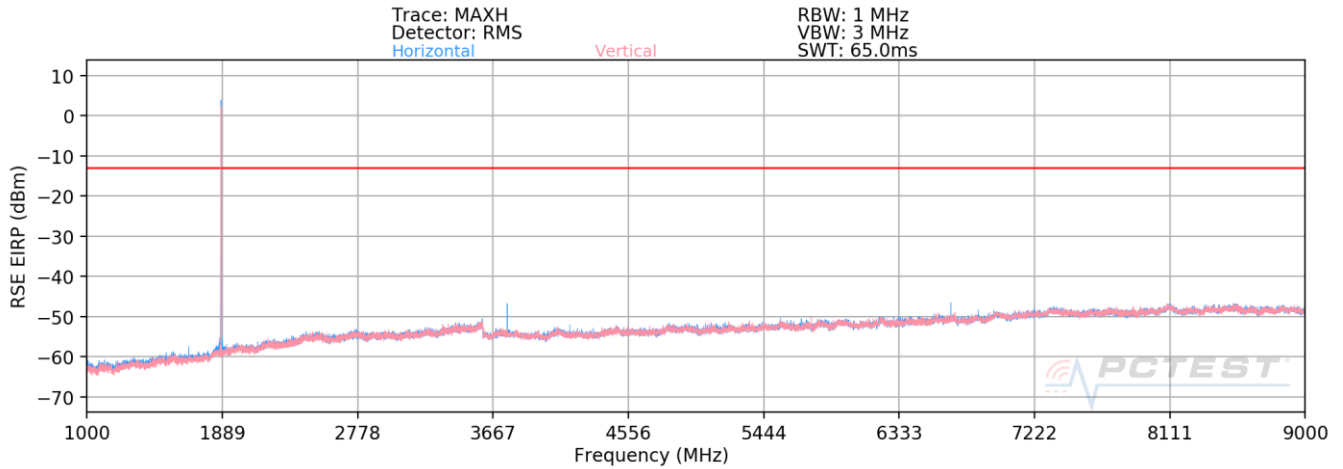
Bandwidth (MHz):	10
Frequency (MHz):	844.0
RB / Offset:	1/25

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	EIRP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
1688.00	H	124	347	-69.90	1.24	38.34	-56.91	-13.00	-43.91
2532.00	H	120	225	-74.09	5.61	38.52	-56.74	-13.00	-43.74
3376.00	H	121	42	-78.39	7.09	35.70	-59.56	-13.00	-46.56
4220.00	H	-	-	-80.38	8.36	34.98	-60.27	-13.00	-47.27
5064.00	H	-	-	-81.13	9.77	35.64	-59.62	-13.00	-46.62
5908.00	H	-	-	-81.91	12.94	38.03	-57.23	-13.00	-44.23

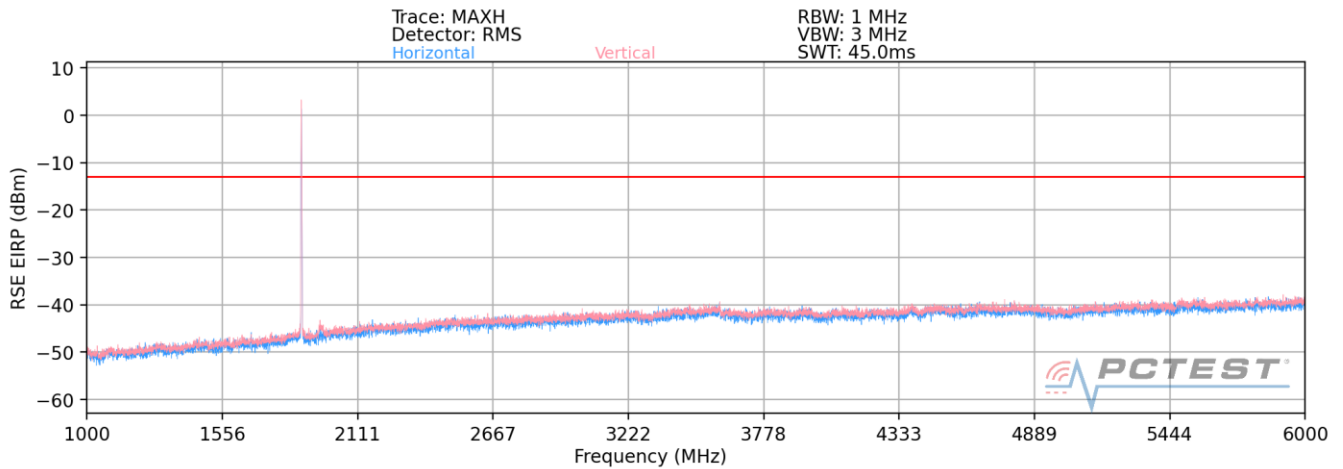
Table 7-4. Radiated Spurious Data (LTE Band 26/5 – High Channel)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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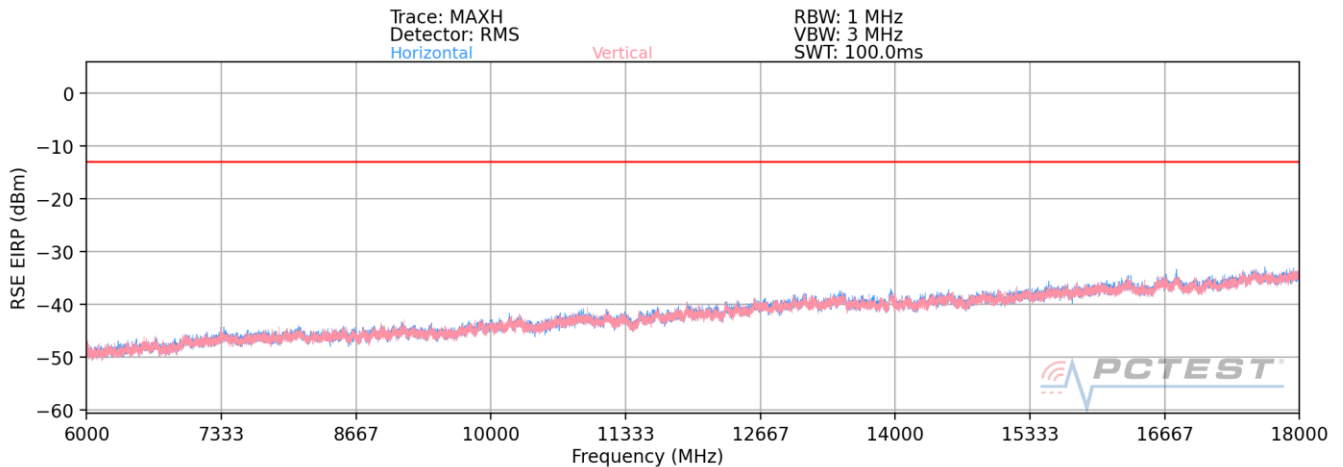
NR Band n5



Plot 7-85. Radiated Spurious Plot (NR Band n5)



Plot 7-86. Radiated Spurious Plot (NR Band n5) EN-DC Anchor B2 1-6GHz



Plot 7-87. Radiated Spurious Plot (NR Band n5) EN-DC Anchor B2 6-18GHz

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Bandwidth (MHz):	20
Frequency (MHz):	834.0
RB / Offset:	1 / 53
Mode:	DFT-s QPSK
Anchor Band:	LTE Band 2



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]
1668.0	H	210	351	-68.76	-1.20	37.04	-58.22	-13.00	-45.22
2502.0	H	-	-	-78.19	3.23	32.04	-63.22	-13.00	-50.22
3336.0	H	118	334	-72.42	4.92	39.50	-55.76	-13.00	-42.76
4170.0	H	354	326	-72.72	5.92	40.20	-55.06	-13.00	-42.06
5004.0	H	161	333	-75.74	7.05	38.31	-56.95	-13.00	-43.95
5838.0	H	-	-	-80.19	9.23	36.04	-59.22	-13.00	-46.22
6672.0	H	316	304	-67.86	10.46	49.60	-45.66	-13.00	-32.66
7506.0	H	-	-	-80.80	11.90	38.10	-57.16	-13.00	-44.16

Table 7-5. Radiated Spurious Data (NR Band n5 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	836.5
RB / Offset:	1 / 53
Mode:	DFT-s QPSK
Anchor Band:	LTE Band 2

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]
1673.0	H	251	24	-67.57	-1.15	38.28	-56.98	-13.00	-43.98
2509.5	H	-	-	-78.07	3.29	32.22	-63.03	-13.00	-50.03
3346.0	H	123	351	-75.38	5.03	36.65	-58.60	-13.00	-45.60
4182.5	H	349	321	-73.47	5.94	39.47	-55.79	-13.00	-42.79
5019.0	H	218	315	-75.11	6.87	38.76	-56.50	-13.00	-43.50
5855.5	H	-	-	-80.34	9.29	35.95	-59.31	-13.00	-46.31
6692.0	H	316	302	-67.16	10.72	50.56	-44.70	-13.00	-31.70
7528.5	H	-	-	-80.69	11.74	38.05	-57.20	-13.00	-44.20



Table 7-6. Radiated Spurious Data (NR Band n5 – Mid Channel)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Bandwidth (MHz):	20
Frequency (MHz):	839.0
RB / Offset:	1 / 50
Mode:	DFT-s QPSK
Anchor Band:	LTE Band 2

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]
1678.0	H	249	350	-71.18	-1.11	34.71	-60.55	-13.00	-47.55
2517.0	H	-	-	-77.67	3.29	32.62	-62.64	-13.00	-49.64
3356.0	H	118	339	-75.99	5.12	36.13	-59.13	-13.00	-46.13
4195.0	H	291	323	-73.45	5.89	39.44	-55.82	-13.00	-42.82
5034.0	H	214	323	-75.29	7.02	38.73	-56.53	-13.00	-43.53
5873.0	H	-	-	-80.45	8.75	35.30	-59.95	-13.00	-46.95
6712.0	H	307	305	-68.01	10.21	49.20	-46.06	-13.00	-33.06
7551.0	H	-	-	-80.52	11.80	38.28	-56.97	-13.00	-43.97

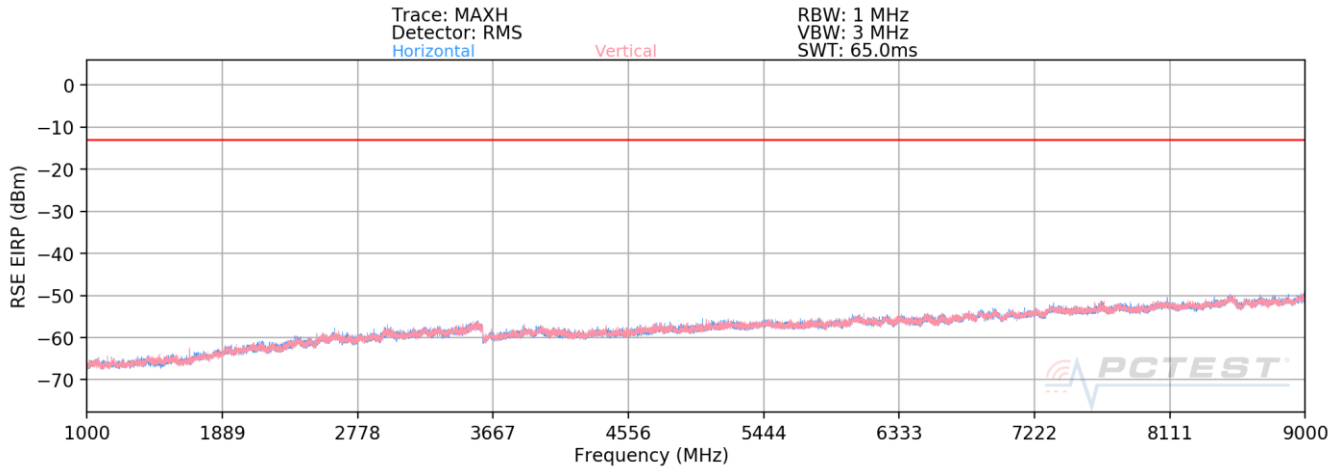
Table 7-7. Radiated Spurious Data (NR Band n5 – High Channel)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 78 of 88

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GSM/GPRS Cell





Plot 7-88. Radiated Spurious Plot (GPRS Cell)

Mode:	GPRS 1 Tx Slot
Channel:	128
Frequency (MHz):	824.2

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]
1648.4	H	210	213	-64.77	-5.22	37.01	-58.25	-13.00	-45.25
2472.6	H	133	44	-60.17	-2.22	44.61	-50.65	-13.00	-37.65
3296.8	H	-	-	-71.43	0.59	36.16	-59.10	-13.00	-46.10
4121.0	H	-	-	-76.43	2.28	32.85	-62.41	-13.00	-49.41
4945.2	H	-	-	-76.47	3.35	33.88	-61.38	-13.00	-48.38

Table 7-8. Radiated Spurious Data (GPRS Cell – Low Channel)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset		Page 79 of 88

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Mode:	GPRS 1 Tx Slot
Channel:	190
Frequency (MHz):	836.6



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]
1673.2	H	146	202	-68.75	-5.23	33.02	-62.23	-13.00	-49.23
2509.8	H	135	42	-65.64	-2.32	39.04	-56.22	-13.00	-43.22
3346.4	H	-	-	-72.59	0.30	34.71	-60.55	-13.00	-47.55
4183.0	H	-	-	-76.37	2.04	32.67	-62.59	-13.00	-49.59
5019.6	H	-	-	-77.44	4.03	33.59	-61.67	-13.00	-48.67

Table 7-9. Radiated Spurious Data (GPRS Cell – Mid Channel)

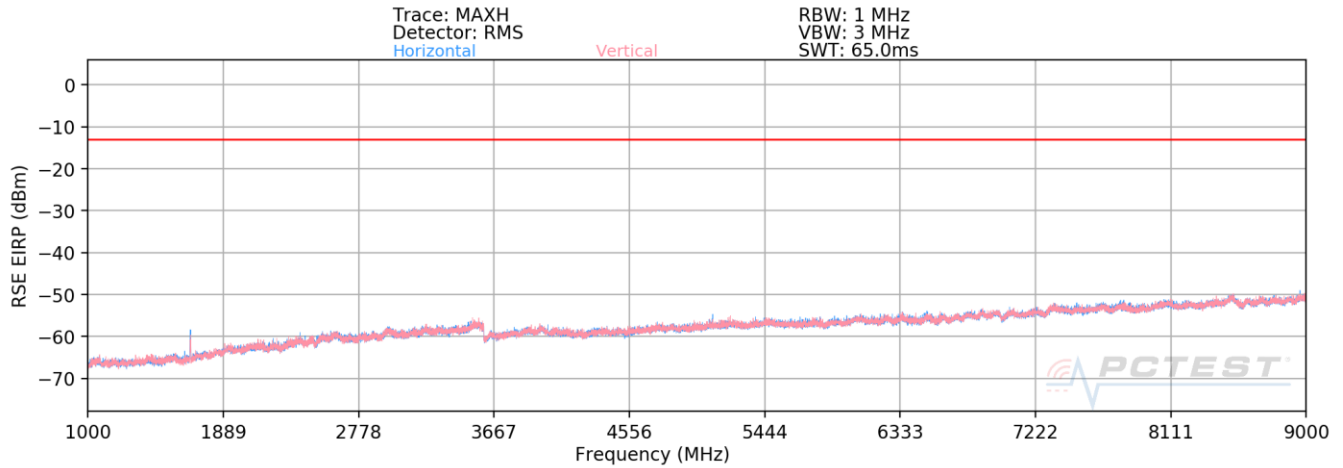
Mode:	GPRS 1 Tx Slot
Channel:	251
Frequency (MHz):	848.8

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]
1697.6	H	146	215	-66.77	-5.13	35.10	-60.16	-13.00	-47.16
2546.4	H	115	47	-63.24	-1.67	42.09	-53.17	-13.00	-40.17
3395.2	H	-	-	-70.23	0.46	37.23	-58.03	-13.00	-45.03
4244.0	H	-	-	-76.45	1.93	32.48	-62.78	-13.00	-49.78
5092.8	H	-	-	-77.16	4.38	34.22	-61.03	-13.00	-48.03

Table 7-10. Radiated Spurious Data (GPRS Cell – High Channel)

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WCDMA Cell





Plot 7-89. Radiated Spurious Plot (WCDMA Cell)

Mode:	WCDMA RMC
Channel:	4132
Frequency (MHz):	826.4

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]
1652.8	H	202	5	-66.57	-5.23	35.20	-60.05	-13.00	-47.05
2479.2	H	-	-	-76.33	-2.46	28.21	-67.05	-13.00	-54.05
3305.6	H	-	-	-75.73	0.61	31.88	-63.38	-13.00	-50.38
4132.0	H	-	-	-77.64	2.08	31.44	-63.82	-13.00	-50.82

Table 7-11. Radiated Spurious Data (WCDMA Cell – Low Channel)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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Mode:	WCDMA RMC
Channel:	4183
Frequency (MHz):	836.6



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]
1673.2	H	131	356	-65.31	-5.23	36.46	-58.79	-13.00	-45.79
2509.8	H	-	-	-76.31	-2.32	28.37	-66.89	-13.00	-53.89
3346.4	H	-	-	-76.36	0.30	30.94	-64.32	-13.00	-51.32
4183.0	H	-	-	-78.33	2.04	30.71	-64.55	-13.00	-51.55

Table 7-12. Radiated Spurious Data (WCDMA Cell – Mid Channel)

Mode:	WCDMA RMC
Channel:	4233
Frequency (MHz):	846.6

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]
1693.2	H	112	14	-62.97	-5.17	38.86	-56.40	-13.00	-43.40
2539.8	H	-	-	-76.77	-1.69	28.54	-66.72	-13.00	-53.72
3386.4	H	-	-	-74.49	0.30	32.81	-62.45	-13.00	-49.45
4233.0	H	-	-	-78.56	2.01	30.45	-64.81	-13.00	-51.81

Table 7-13. Radiated Spurious Data (WCDMA Cell – High Channel)

FCC ID: A3LSMG998B	 PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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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.

For Part 22 and RSS-132, the frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings



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

Test Setup

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

Test Notes

None

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LTE Band 26/5

LTE Band 26/5					
Operating Frequency (Hz):		836,500,000			
Ref. Voltage (VDC):		4.37			
Deviation Limit:		± 0.00025% or 2.5 ppm			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	831,500,188	188	0.0000226
		- 20	831,499,810	-190	-0.0000229
		- 10	831,499,781	-219	-0.0000263
		0	831,500,221	221	0.0000266
		+ 10	831,499,996	-4	-0.0000005
		+ 20 (Ref)	831,499,915	-85	-0.0000102
		+ 30	831,500,087	87	0.0000105
		+ 40	831,500,261	261	0.0000314
Battery Endpoint	3.35	+ 20	831,499,989	-11	-0.0000013

Table 7-9. LTE Band 26/5 Frequency Stability Data

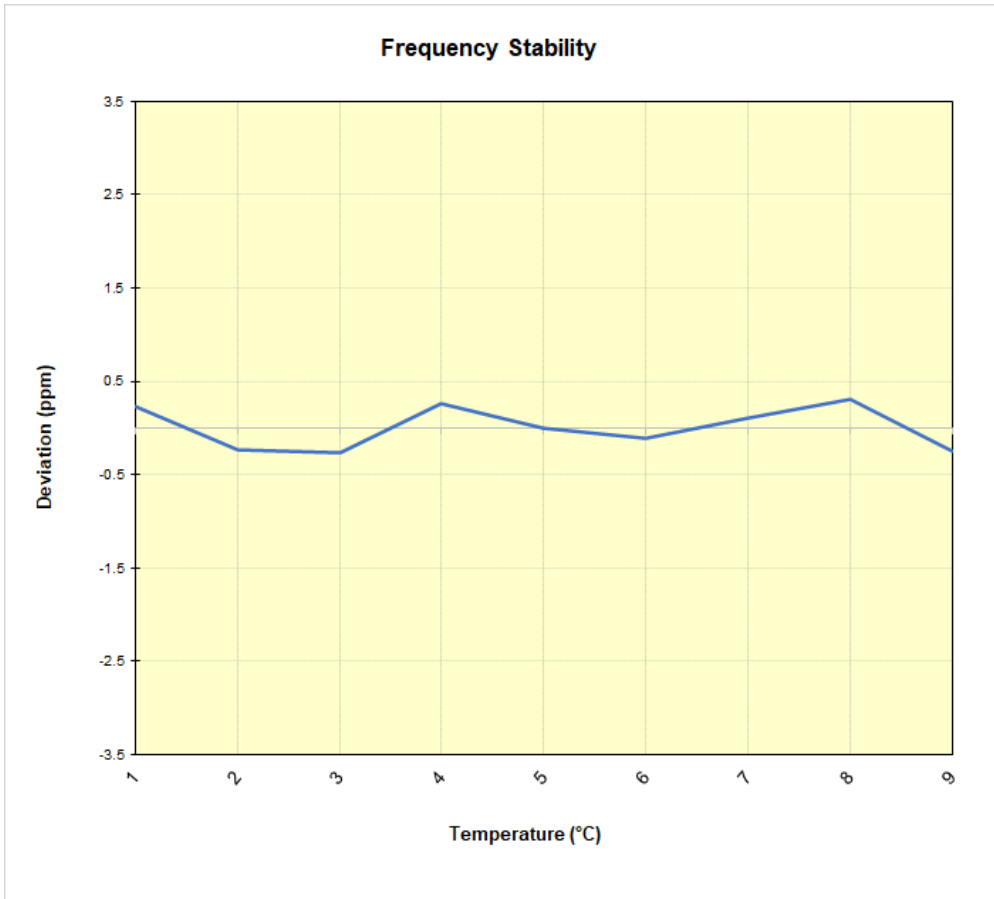


Table 7-9. LTE Band 26/5 Frequency Stability Chart

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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NR Band n5

NR Band n5					
Operating Frequency (Hz):		836,500,000			
Ref. Voltage (VDC):		4.37			
Deviation Limit:		± 0.00025% or 2.5 ppm			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	831,499,723	-277	-0.0000333
		- 20	831,499,831	-169	-0.0000203
		- 10	831,499,990	-10	-0.0000012
		0	831,500,198	198	0.0000238
		+ 10	831,499,852	-148	-0.0000178
		+ 20 (Ref)	831,499,724	-276	-0.0000332
		+ 30	831,499,953	-47	-0.0000057
		+ 40	831,500,075	75	0.0000090
Battery Endpoint	3.35	+ 20	831,500,219	219	0.0000263

Table 7-9. NR Band n5 Frequency Stability Data

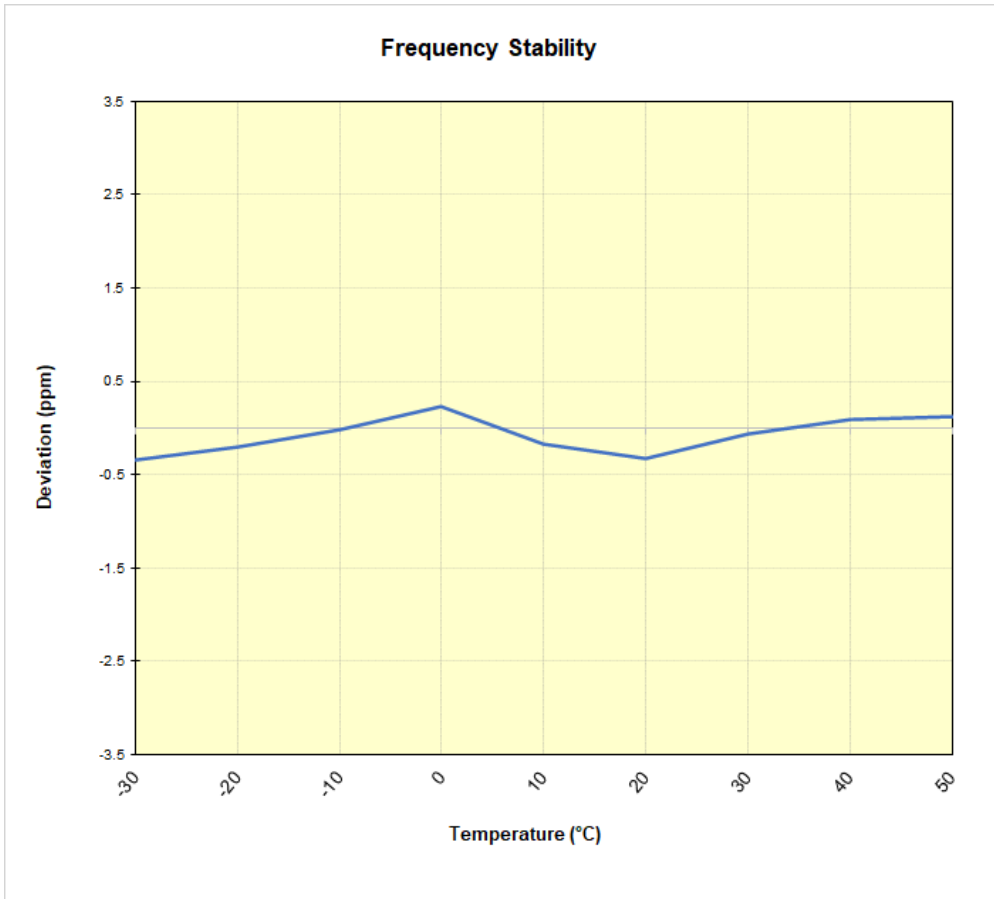


Table 7-9. NR Band n5 Frequency Stability Chart

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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GSM/GPRS Cell

GSM/GPRS Cellular					
Operating Frequency (Hz):		836,600,000			
Ref. Voltage (VDC):		4.37			
Deviation Limit:		± 0.00025% or 2.5 ppm			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	836,600,031	31	0.0000037
		- 20	836,599,864	-136	-0.0000163
		- 10	836,600,051	51	0.0000061
		0	836,600,106	106	0.0000127
		+ 10	836,599,774	-226	-0.0000270
		+ 20 (Ref)	836,600,207	207	0.0000247
		+ 30	836,599,998	-2	-0.0000002
		+ 40	836,599,791	-209	-0.0000250
Battery Endpoint	3.35	+ 20	836,600,107	107	0.0000128

Table 7-9. GSM/GPRS Cell Frequency Stability Data

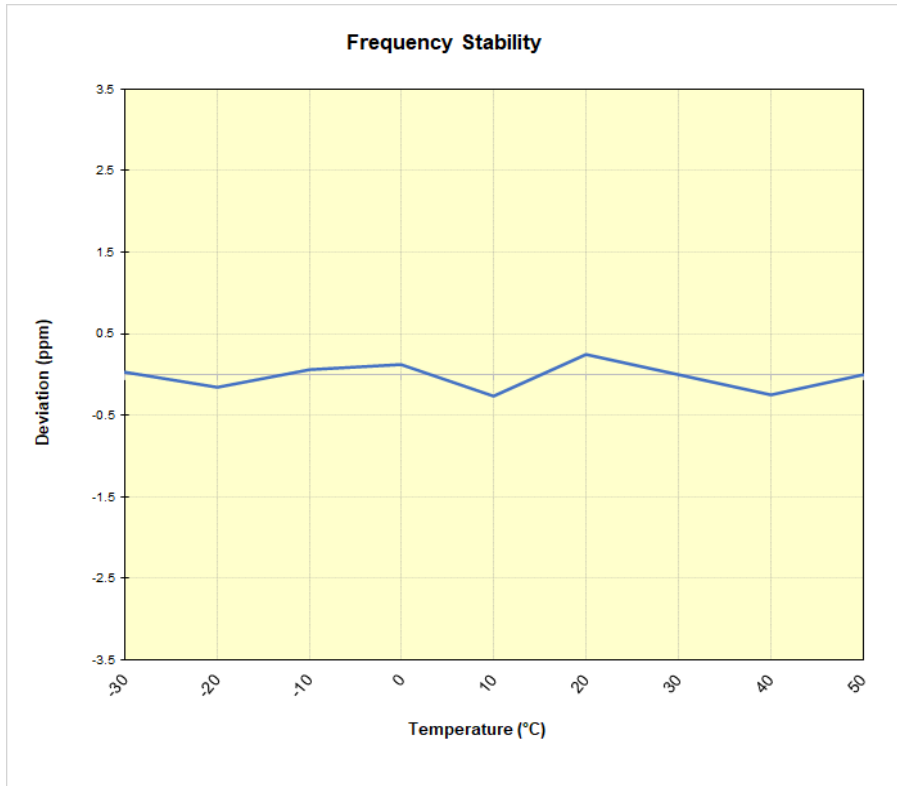


Table 7-9. GSM/GPRS Cell Frequency Stability Chart

FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		Approved by: Technical Manager
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WCDMA Cell

WCDMA Cellular					
		Operating Frequency (Hz):		836,600,000	
		Ref. Voltage (VDC):		4.37	
		Deviation Limit:		± 0.00025% or 2.5 ppm	
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.37	- 30	836,600,034	34	0.0000041
		- 20	836,600,266	266	0.0000318
		- 10	836,599,971	-29	-0.0000035
		0	836,600,008	8	0.0000010
		+ 10	836,599,966	-34	-0.0000041
		+ 20 (Ref)	836,599,993	-7	-0.0000008
		+ 30	836,600,172	172	0.0000206
		+ 40	836,600,069	69	0.0000082
Battery Endpoint	3.35	+ 20	836,600,207	207	0.0000247

Table 7-9. WCDMA Cell Frequency Stability Data

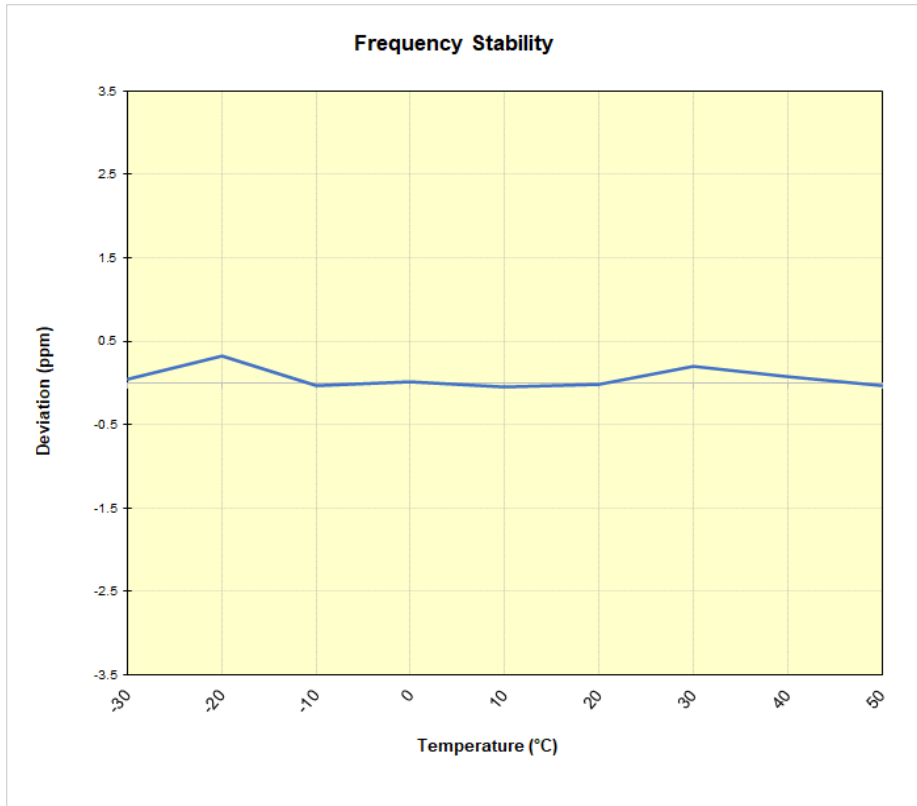


Table 7-9. WCDMA Cell Frequency Stability Chart



FCC ID: A3LSMG998B	PCTEST Proud to be part of element	PART 22 MEASUREMENT REPORT		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: A3LSMG998B** complies with all the requirements of Part 22 of the FCC rules.

FCC ID: A3LSMG998B	 PART 22 MEASUREMENT REPORT 		Approved by: Technical Manager
Test Report S/N: 1M2009280154-19.A3L	Test Dates: 9/28/2020 – 12/07/2020	EUT Type: Portable Handset	Page 88 of 88

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