

## PART 22 MEASUREMENT REPORT

**Applicant Name:**

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

**Date of Testing:**

4/28/2021 – 06/09/2021

**Test Site/Location:**

PCTEST Lab. Columbia, MD, USA

**Test Report Serial No.:**

1M2104190044-02.A3L

**FCC ID:**

**A3LSMF926B**

**Applicant Name:**

**Samsung Electronics Co., Ltd.**

**Application Type:**

Certification

**Model:**

SM-F926B

**Additional Model(s):**

SM-F926B/DS

**EUT Type:**

Portable Handset

**FCC Classification:**

PCS Licensed Transmitter Held to Ear (PCE)

**FCC Rule Part:**

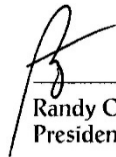
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**Test Procedure(s):**

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

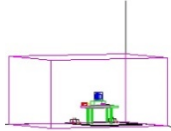


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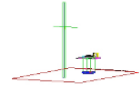
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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
LTE Band 26/5	15MHz (Band 26 only)	QPSK	831.5 - 841.5	0.069	18.40	0.113	20.55	13M5G7D
		16QAM	831.5 - 841.5	0.058	17.63	0.095	19.78	13M5W7D
	10 MHz	QPSK	829.0 - 844.0	0.072	18.56	0.118	20.71	9M01G7D
		16QAM	829.0 - 844.0	0.064	18.06	0.105	20.21	8M99W7D
	5 MHz	QPSK	826.5 - 846.5	0.072	18.58	0.118	20.73	4M53G7D
		16QAM	826.5 - 846.5	0.062	17.92	0.102	20.07	4M52W7D
	3 MHz	QPSK	825.5 - 847.5	0.075	18.74	0.123	20.89	2M71G7D
		16QAM	825.5 - 847.5	0.062	17.92	0.102	20.07	2M72W7D
	1.4 MHz	QPSK	824.7 - 848.3	0.073	18.61	0.119	20.76	1M10G7D
		16QAM	824.7 - 848.3	0.060	17.78	0.098	19.93	1M10W7D
NR Band n5	20 MHz	$\pi/2$ BPSK	834.0 - 839.0	0.091	19.60	0.150	21.75	18M0G7D
		QPSK	834.0 - 839.0	0.093	19.66	0.152	21.81	18M9G7D
		16QAM	834.0 - 839.0	0.069	18.40	0.114	20.55	19M0W7D
	15 MHz	$\pi/2$ BPSK	831.5 - 841.5	0.092	19.62	0.150	21.77	13M5G7D
		QPSK	831.5 - 841.5	0.090	19.54	0.148	21.69	13M5G7D
		16QAM	831.5 - 841.5	0.067	18.24	0.109	20.39	14M2W7D
	10 MHz	$\pi/2$ BPSK	829.0 - 844.0	0.088	19.46	0.145	21.61	9M00G7D
		QPSK	829.0 - 844.0	0.087	19.40	0.143	21.55	9M34G7D
		16QAM	829.0 - 844.0	0.069	18.41	0.114	20.56	9M31W7D
	5 MHz	$\pi/2$ BPSK	826.5 - 846.5	0.089	19.48	0.146	21.63	4M50G7D
		QPSK	826.5 - 846.5	0.089	19.52	0.147	21.67	4M49G7D
		16QAM	826.5 - 846.5	0.066	18.17	0.108	20.32	4M51W7D

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	0.530	27.24	0.869	29.39	247KGXW
EDGE	8-PSK	824.2 - 848.8	0.184	22.65	0.302	24.80	245KG7W
WCDMA	Spread Spectrum	826.4 - 846.6	0.076	18.80	0.125	20.95	4M16F9W

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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: A3LSMF926B**. 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.:** 0450M, 0714M

### 2.2 Device Capabilities

This device contains the following capabilities:

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

### 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.

This device supports two configurations: one is with screen open and one is with screen closed. Both configurations are tested, and the worst case radiated emissions data is shown in this report.

This device supports two additional antenna configurations for LTE/NR Low bands [AFS operation]: one is with two antennas transmitting from one feed, and one is with a singular antenna transmitting. Both configurations are tested, and the worst case radiated emissions data is shown in this report.

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

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

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

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

Deviation from Measurement Procedure.....None

### 3.2 Radiated Power and Radiated Spurious Emissions

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

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

For radiated power measurements, substitution method is used per the guidance of ANSI/TIA-603-E-2016. A 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  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

Contribution	Expanded Uncertainty ( $\pm$ 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
-	AP2	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	AP2
-	AP1	EMC Cable and Switch System	3/9/2021	Annual	3/9/2022	AP1
-	LTx2	Licensed Transmitter Cable Set	3/12/2021	Annual	3/12/2022	LTx2
-	LTx5	Licensed Transmitter Cable Set	3/3/2021	Annual	3/3/2022	LTx5
Agilent	E5515C	Wireless Communications Test Set	N/A			GB46310798
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201525694
Com-Power	AL-130R	Active Loop Antenna	8/22/2019	Biennial	8/22/2021	121085
Emco	3115	Horn Antenna (1-18GHz)	6/18/2020	Biennial	6/18/2022	9704-5182
Emco	3116	Horn Antenna (18 - 40GHz)	8/7/2018	Triennial	8/7/2021	9203-2178
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Annual	8/27/2022	17620
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
ETS Lindgren	3816/2NM	LISN	7/9/2020	Biennial	7/9/2022	00114451
Keysight Technologies	N9020A	MXA Signal Analyzer	9/22/2020	Annual	9/22/2021	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/17/2020	Annual	8/17/2021	MY52350166
Keysight Technologies	N9038A	MXE EMI Receiver	8/11/2020	Annual	8/11/2021	MY51210133
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	7/15/2020	Annual	7/15/2021	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/9/2020	Annual	9/9/2021	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	1/21/2021	Annual	1/21/2022	101716
Rohde & Schwarz	FSW67	Signal / Spectrum Analyzer	8/10/2020	Annual	8/10/2021	103200
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107

**Table 5-1. Test Equipment**

### Notes:

- 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.
- 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

### GSM Emission Designator

#### **Emission Designator = 250KGXW**

GSM 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: A3LSMF926B  
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)  
 Mode(s): LTE

Test Condition	Test Description	FCC Part Section(s)	RSS Section(s)	Test Limit	Test Result	Reference
<b>CONDUCTED</b>	Transmitter Conducted Output Power	2.1046	RSS-132(5.4)	N/A	PASS	See RF Exposure Report
	Occupied Bandwidth	2.1049	RSS-Gen(6.7)	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
	Frequency Stability	2.1055, 22.355	RSS-132(5.3)	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
<b>RADIATED</b>	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 EMC Software Tool Beta 8.

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## 7.2 Occupied Bandwidth

### Test Overview

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

### Test Procedure Used

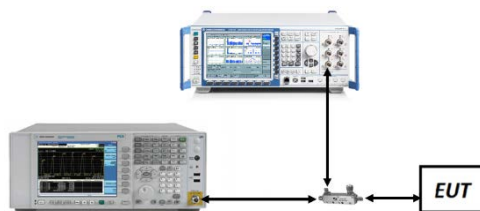
KDB 971168 D01 v03r01 – Section 4.2

### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq 3 \times$  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.



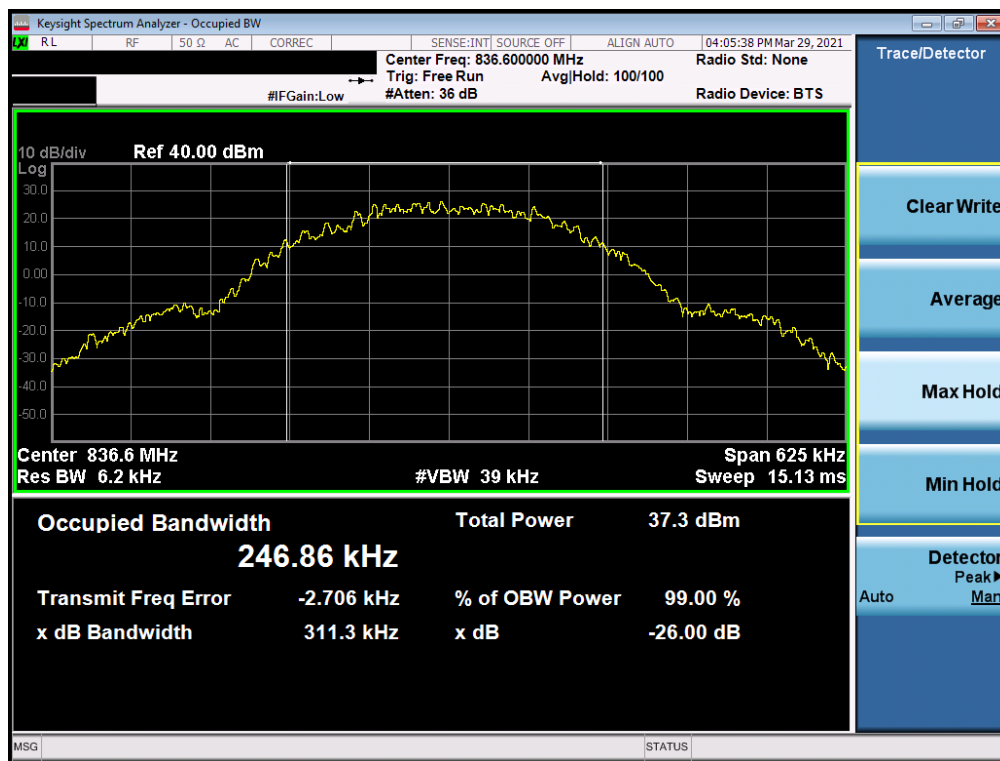
**Figure 7-1. Test Instrument & Measurement Setup**

### Test Notes

None.

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## GPRS Cell



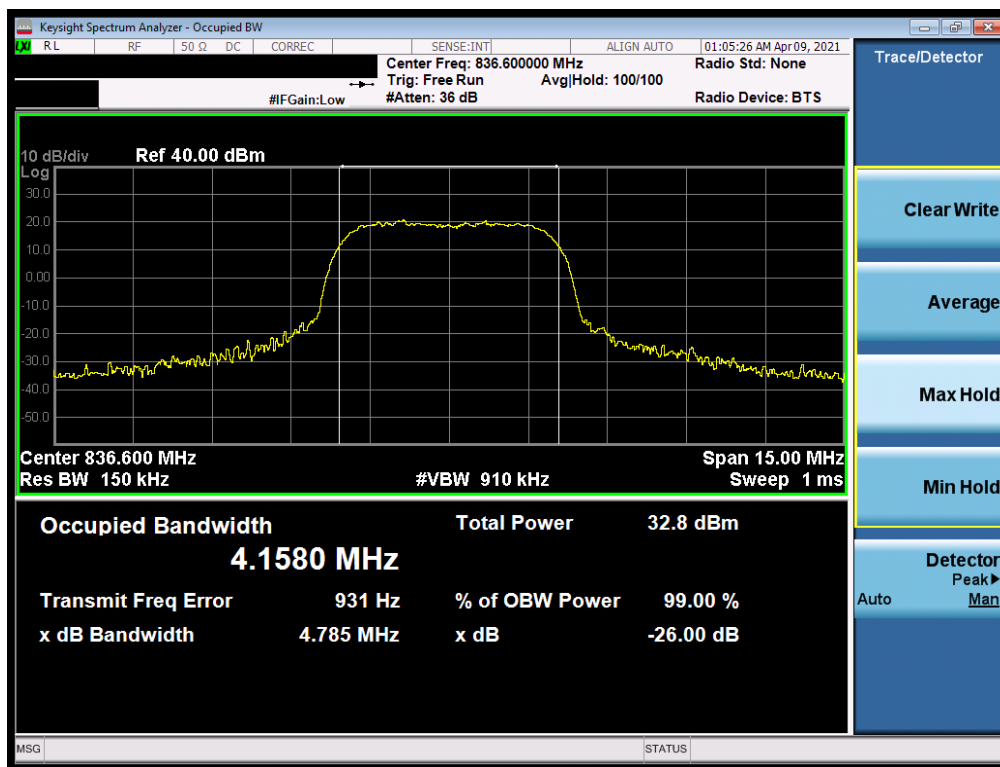
Plot 7-1. Occupied Bandwidth Plot (GPRS, Ch. 190)



Plot 7-2. Occupied Bandwidth Plot (EDGE, Ch. 190)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>Approved by:</b> Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset	Page 13 of 88

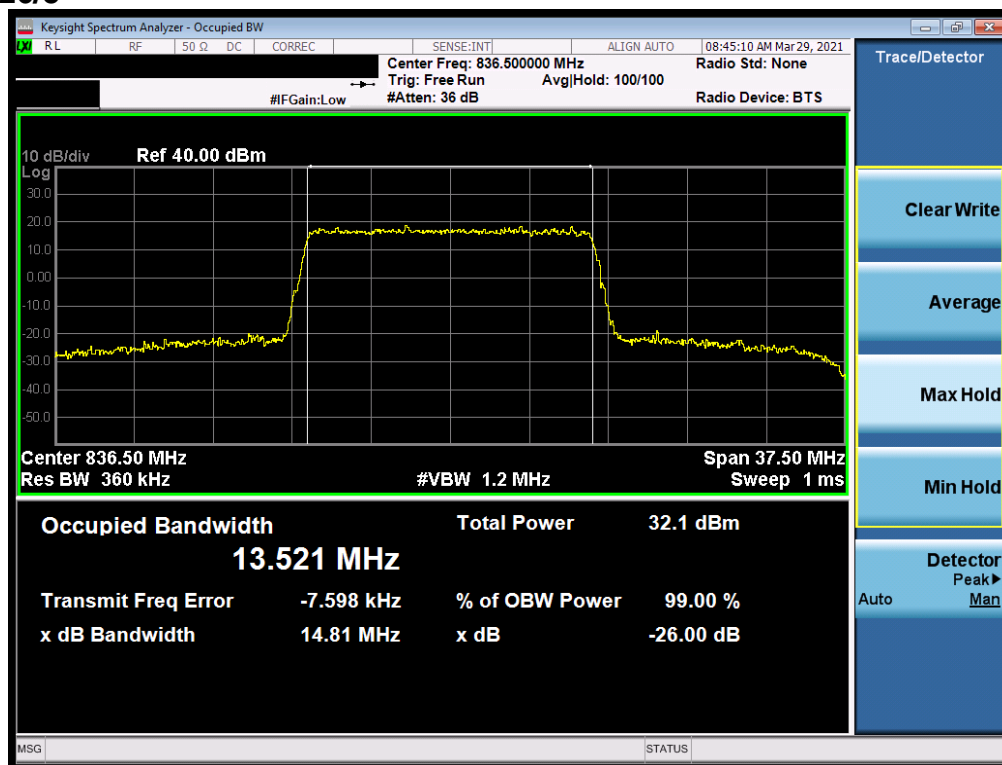
## WCDMA Cell



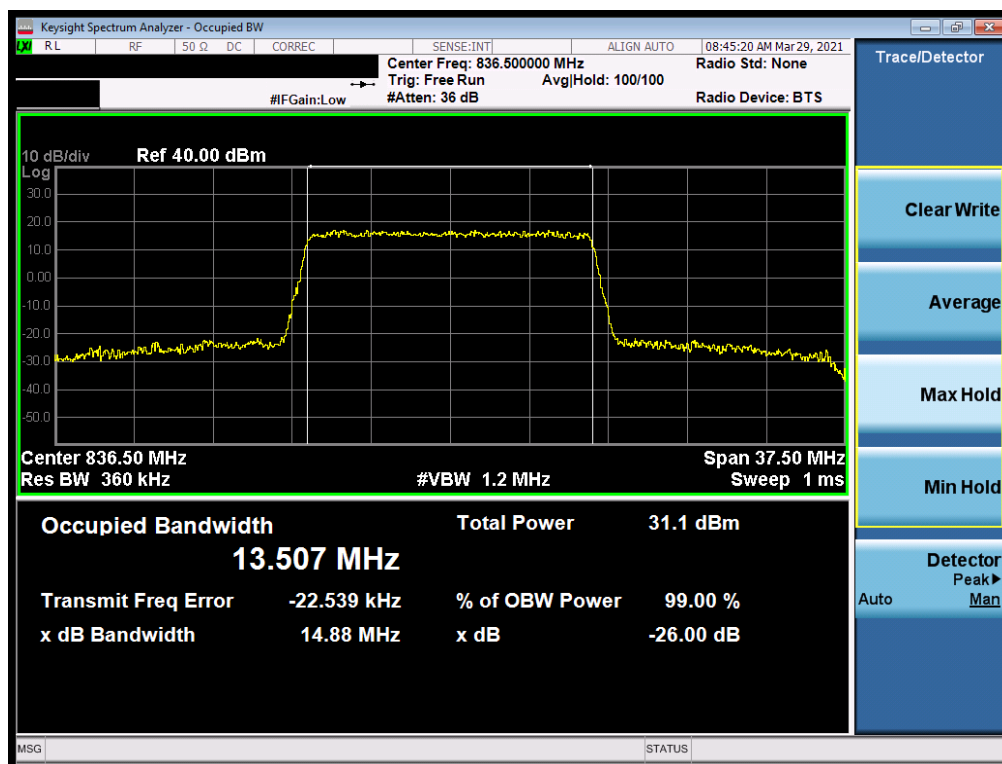
Plot 7-3. Occupied Bandwidth Plot (WCDMA, Ch. 4183)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 14 of 88

## LTE Band 26/5

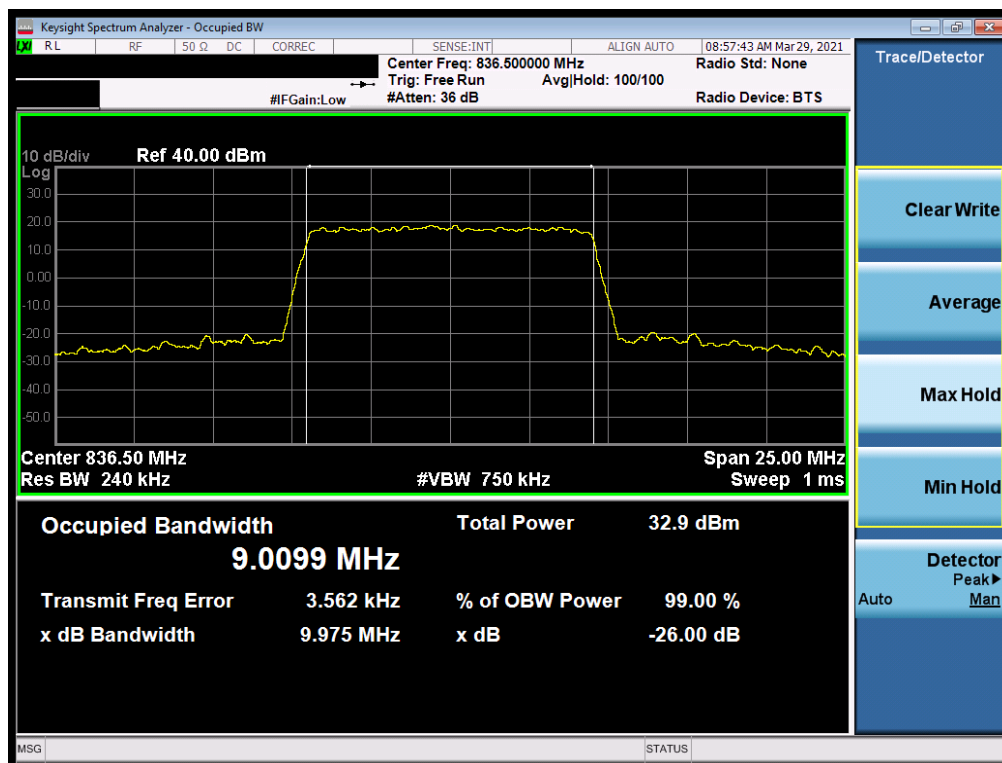


Plot 7-4. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB)

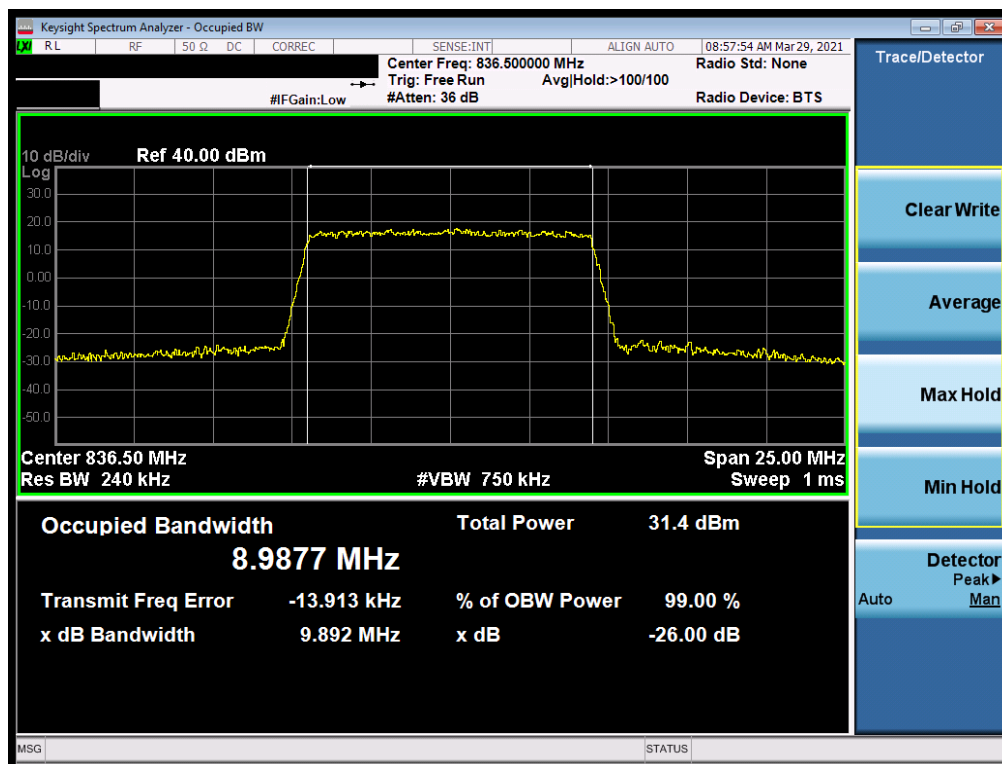


Plot 7-5. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 - 06/09/2021	EUT Type: Portable Handset		Page 15 of 88

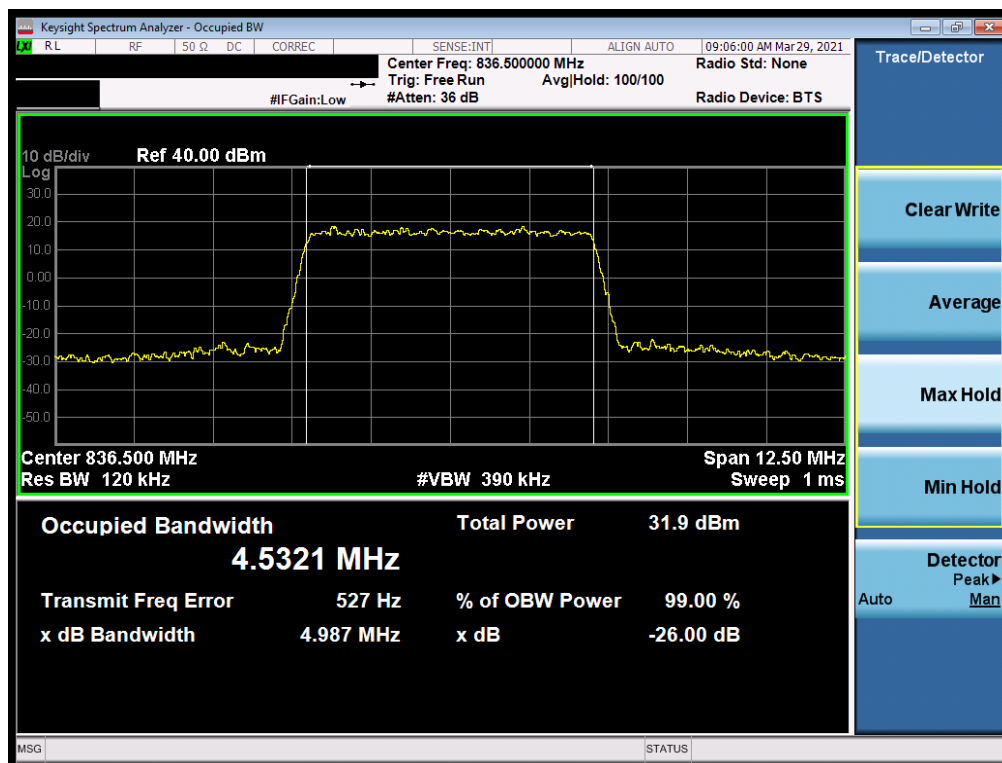


Plot 7-6. Occupied Bandwidth Plot (LTE Band 26/5 - 10MHz QPSK - Full RB)



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

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 16 of 88

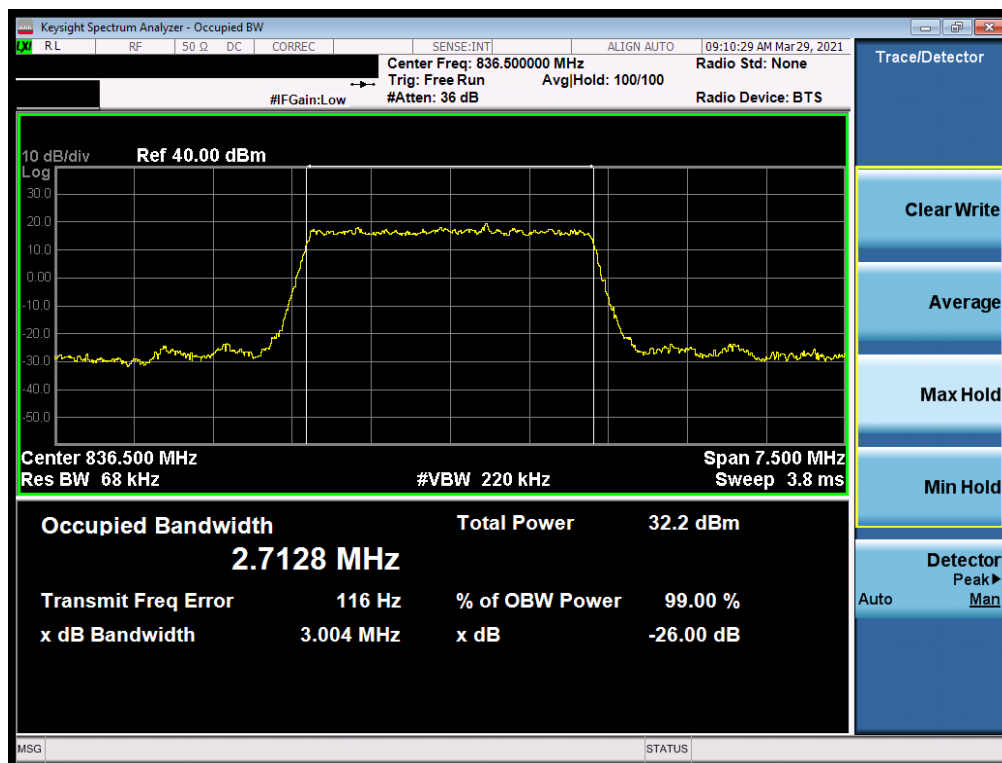


Plot 7-8. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz QPSK - Full RB)

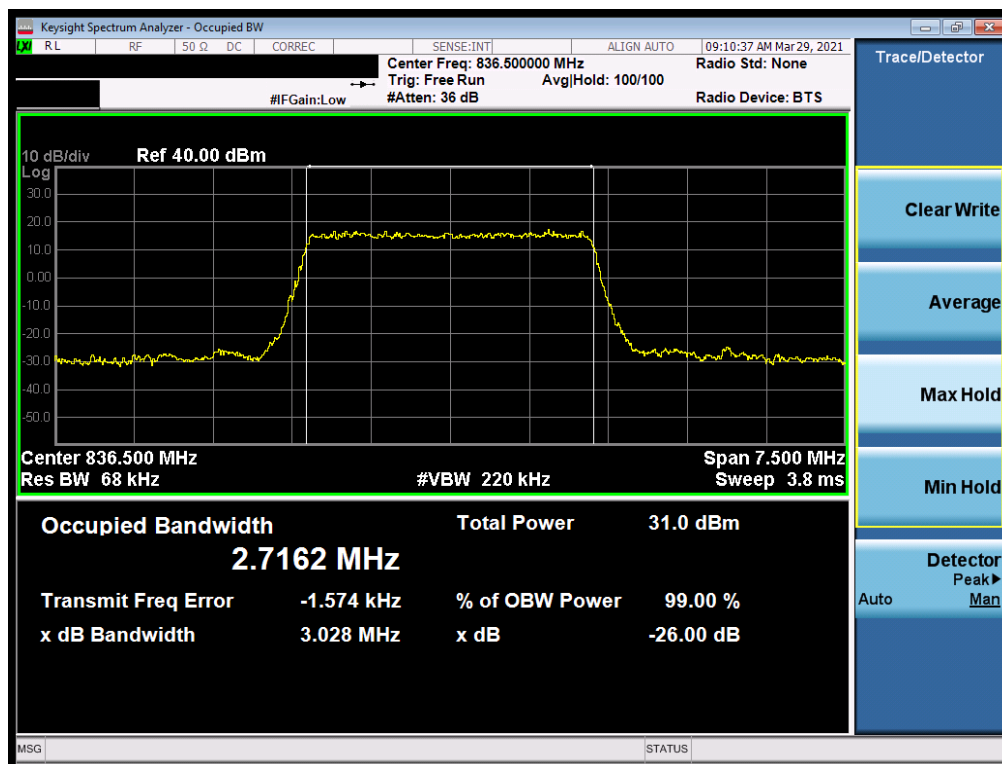


Plot 7-9. Occupied Bandwidth Plot (LTE Band 26/5 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 17 of 88

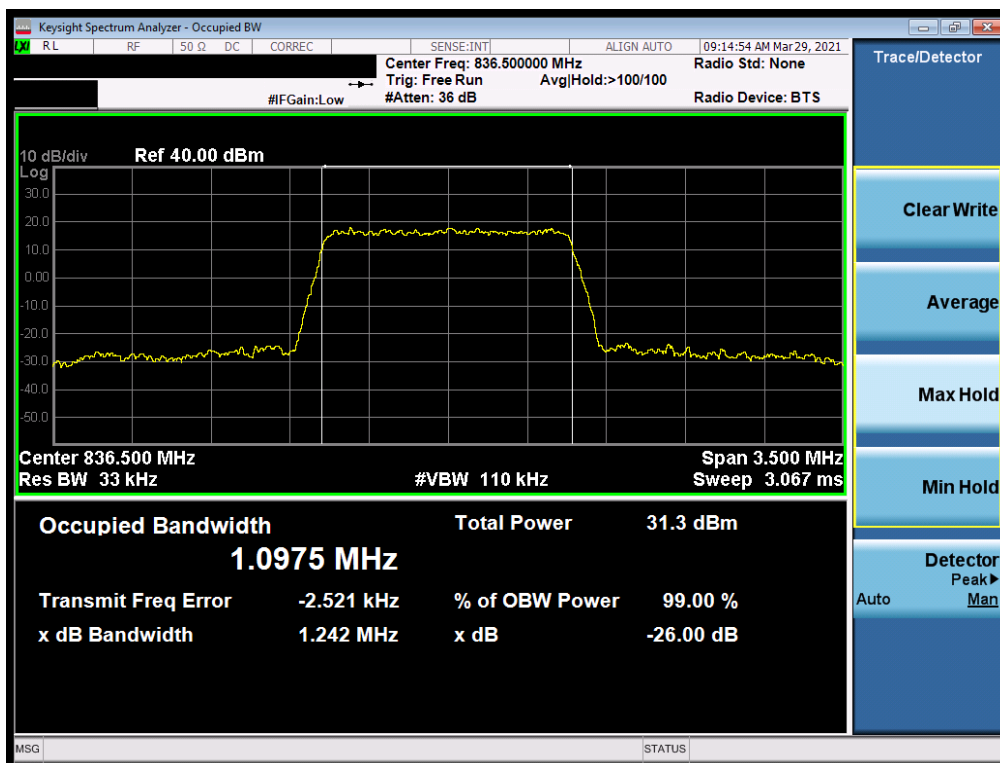


Plot 7-10. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz QPSK - Full RB)

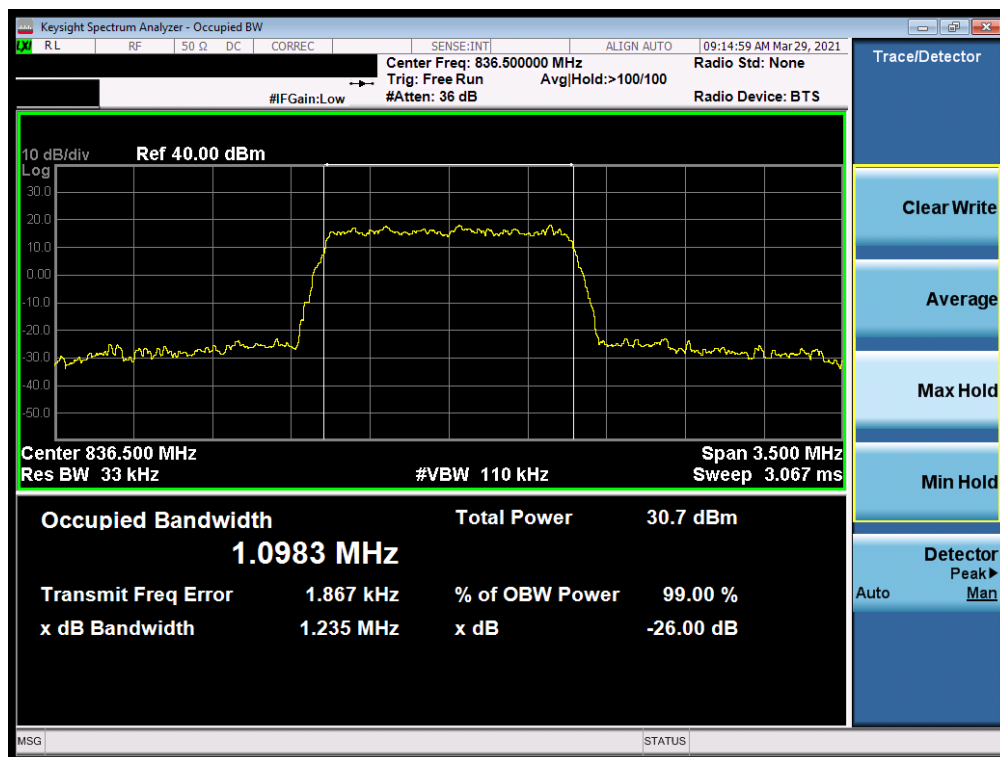


Plot 7-11. Occupied Bandwidth Plot (LTE Band 26/5 - 3MHz 16-QAM - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 18 of 88



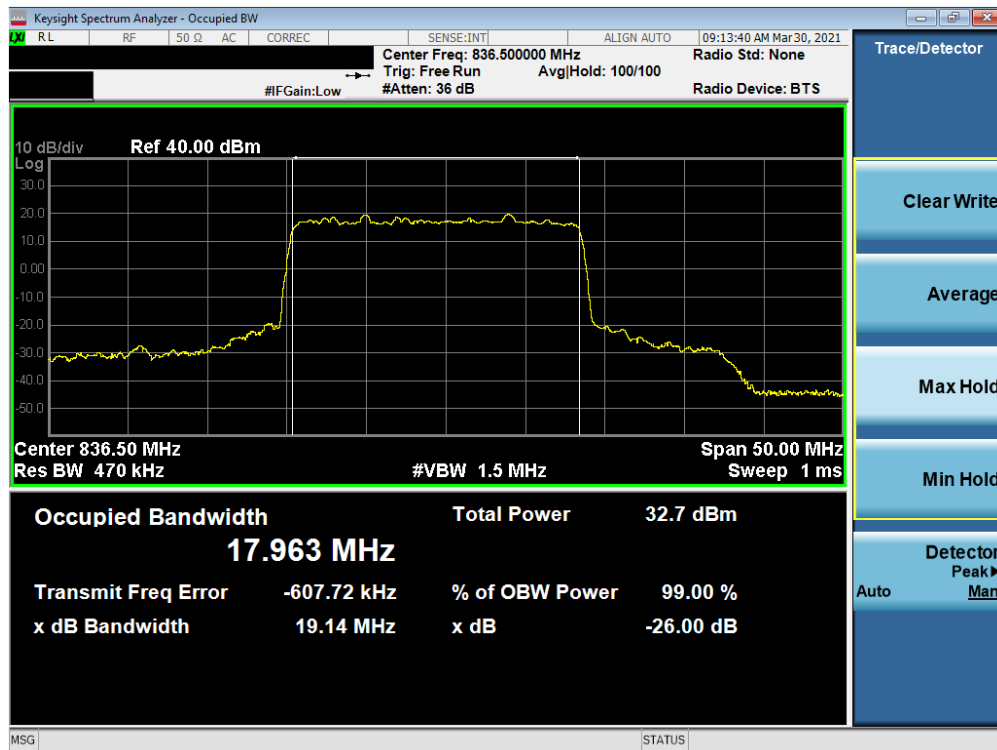
Plot 7-12. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz QPSK - Full RB)



Plot 7-13. Occupied Bandwidth Plot (LTE Band 26/5 - 1.4MHz 16-QAM - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 19 of 88

## NR Band n5

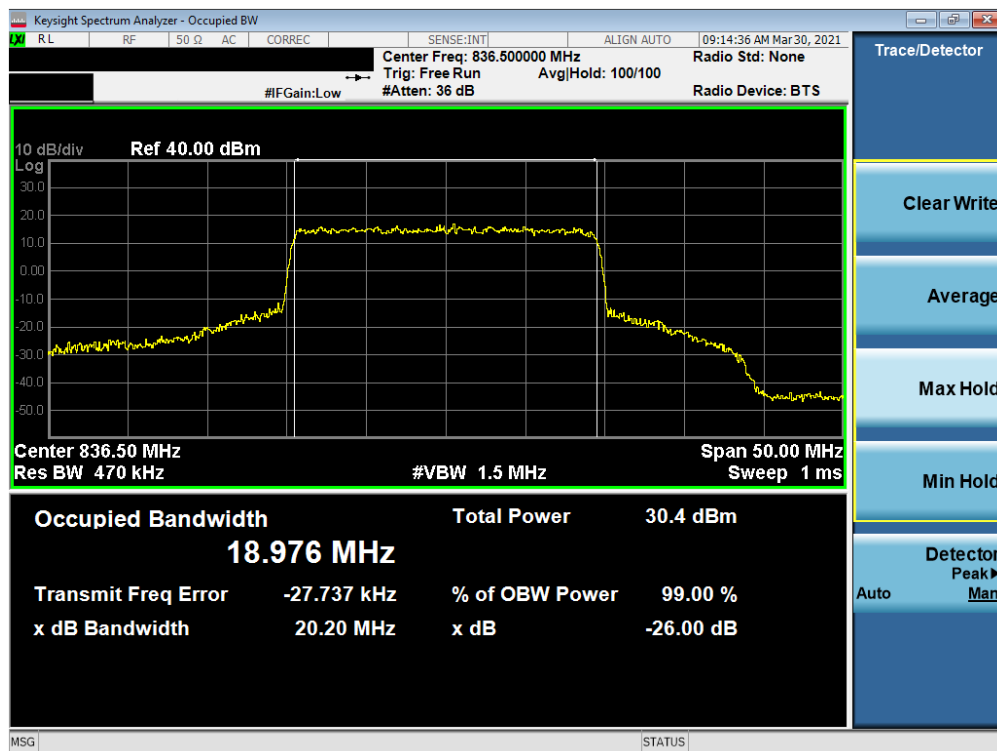


Plot 7-14. Occupied Bandwidth Plot (NR Band n5 - 20MHz  $\pi/2$  BPSK - Full RB)

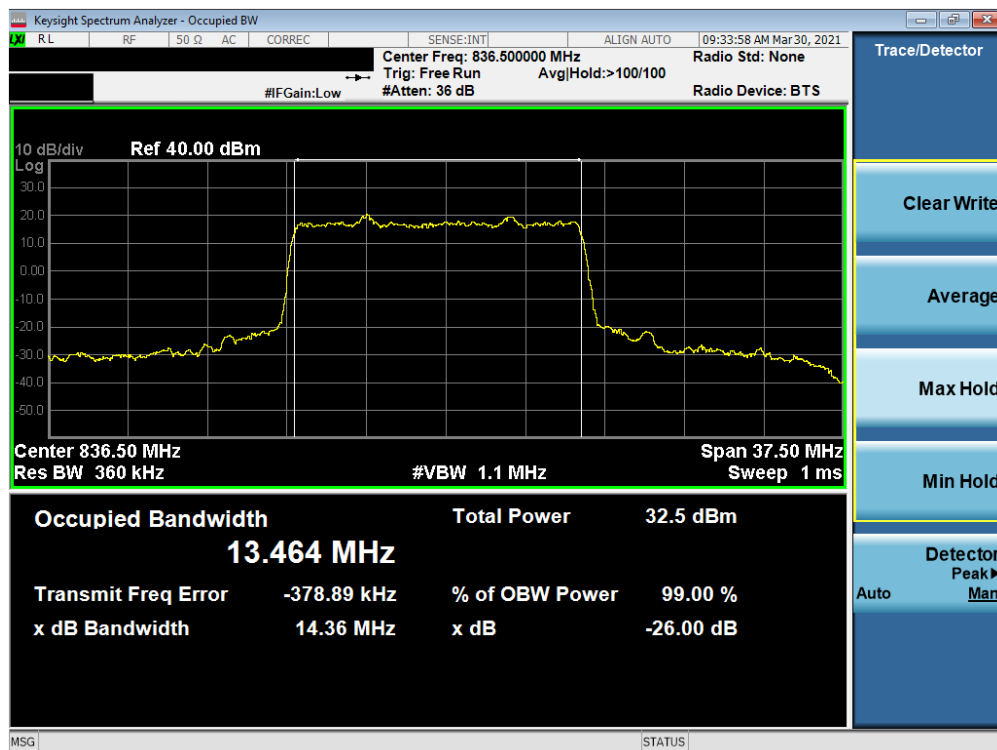


Plot 7-15. Occupied Bandwidth Plot (NR Band n5 - 20MHz QPSK - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 20 of 88

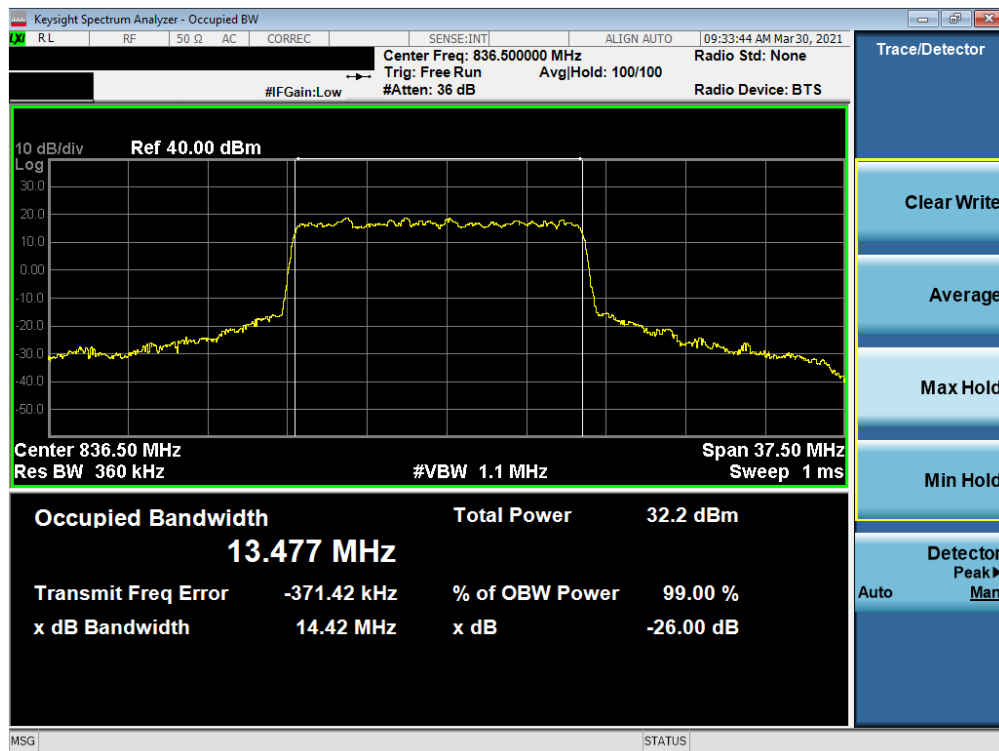


Plot 7-16. Occupied Bandwidth Plot (NR Band n5 - 20MHz 16-QAM - Full RB)

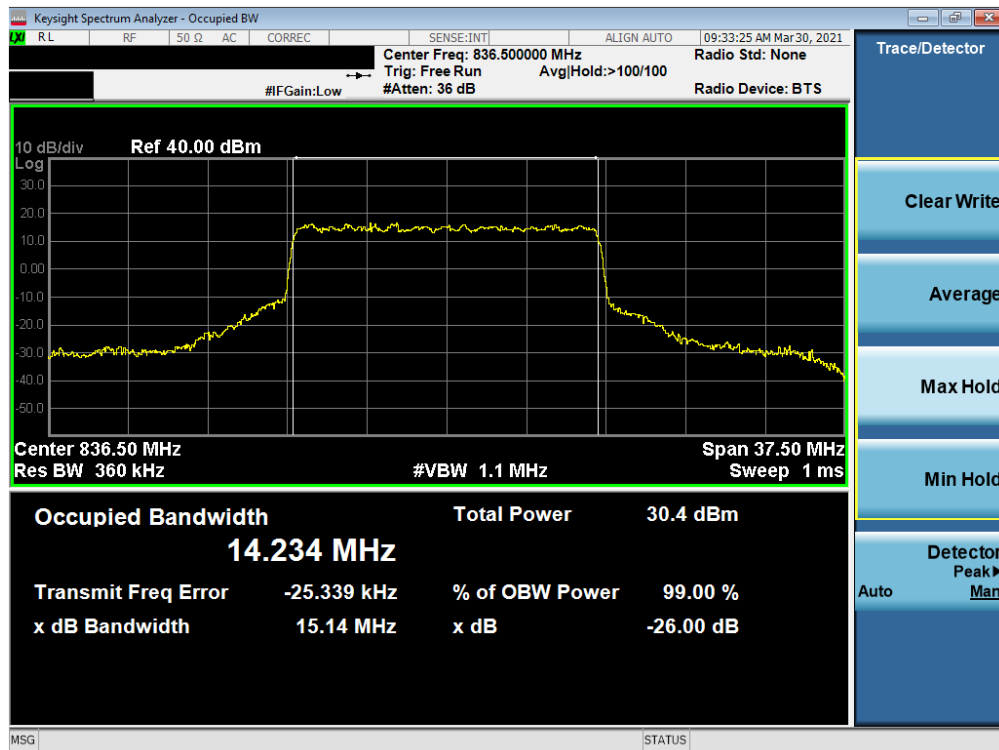


Plot 7-17. Occupied Bandwidth Plot (NR Band n5 - 15MHz  $\pi/2$  BPSK - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 21 of 88

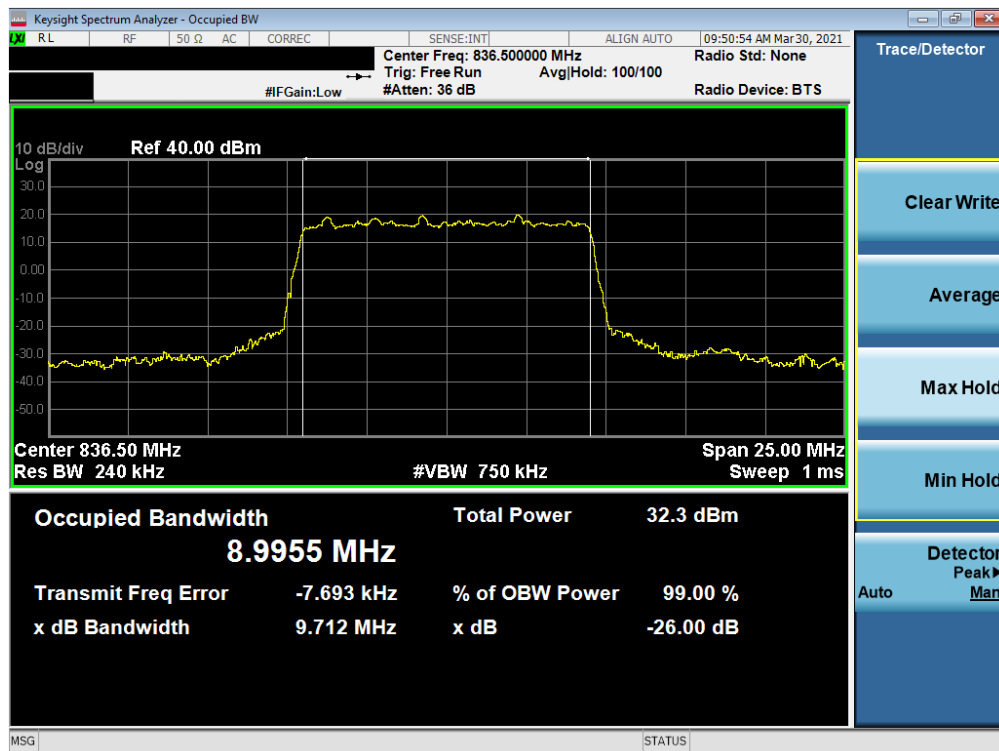


Plot 7-18. Occupied Bandwidth Plot (NR Band n5 - 15MHz QPSK - Full RB)

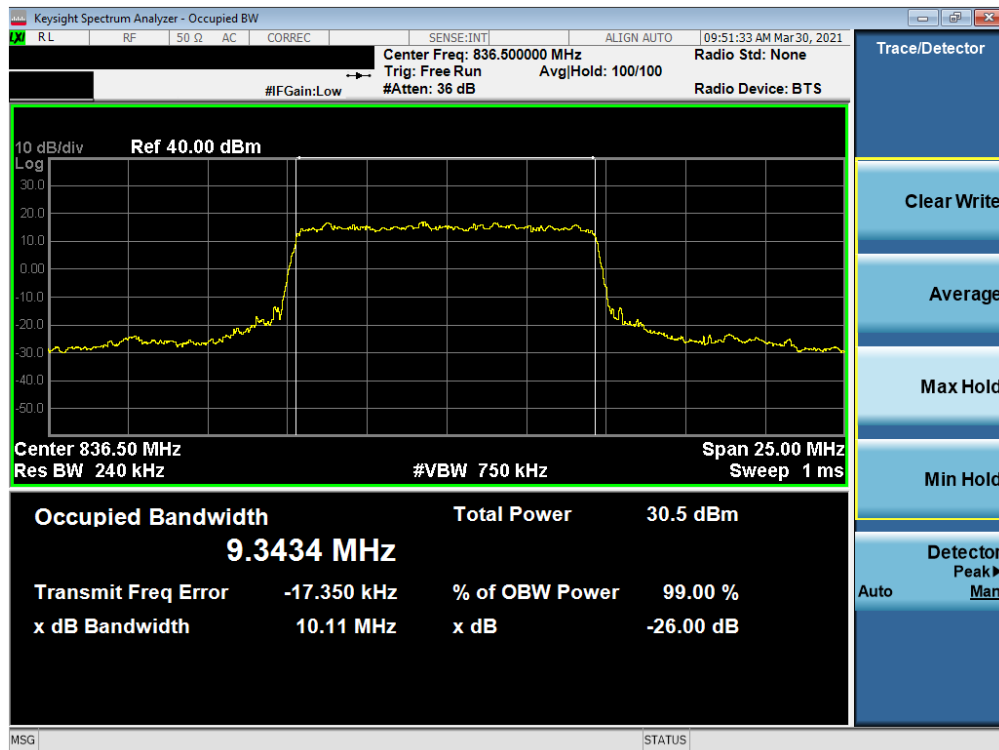


Plot 7-19. Occupied Bandwidth Plot (NR Band n5 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element		<b>PART 22 MEASUREMENT REPORT</b> 	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2104190044-02.A3L	<b>Test Dates:</b> 4/28/2021 – 06/09/2021	<b>EUT Type:</b> Portable Handset	Page 22 of 88	

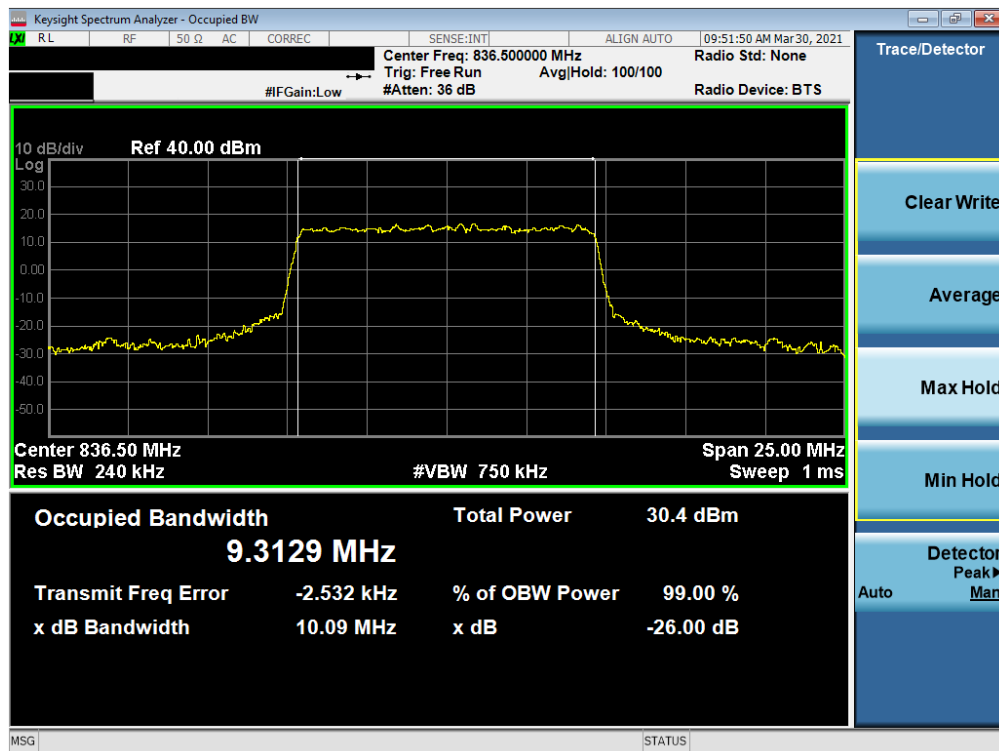


Plot 7-20. Occupied Bandwidth Plot (NR Band n5 - 10MHz  $\pi/2$  BPSK - Full RB)

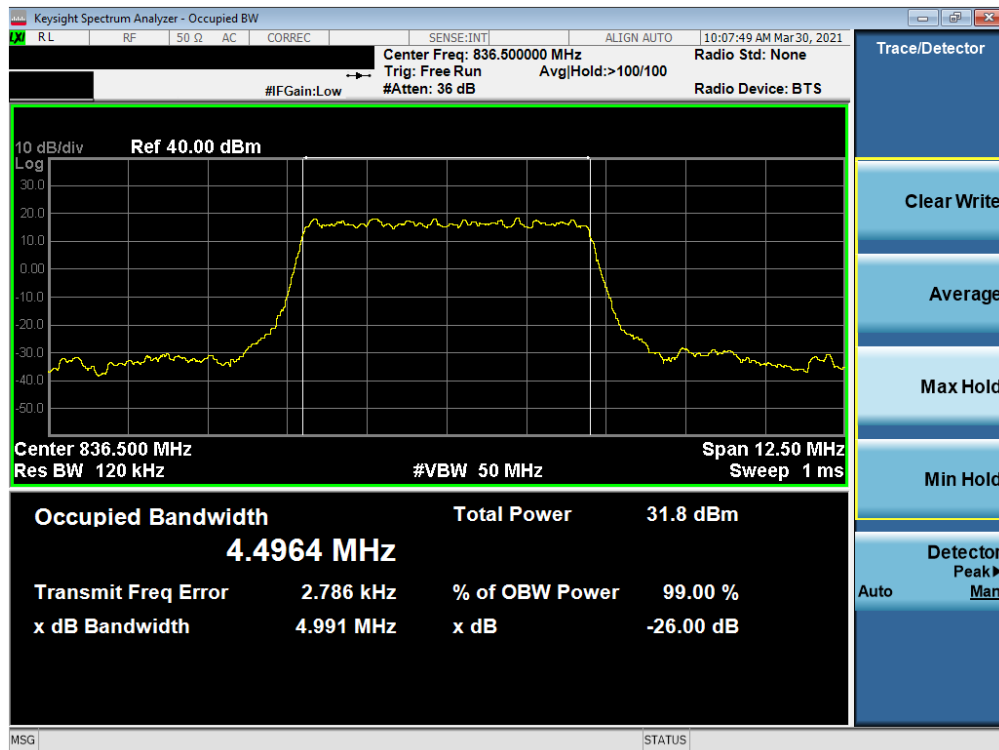


Plot 7-21. Occupied Bandwidth Plot (NR Band n5 - 10MHz QPSK - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 23 of 88

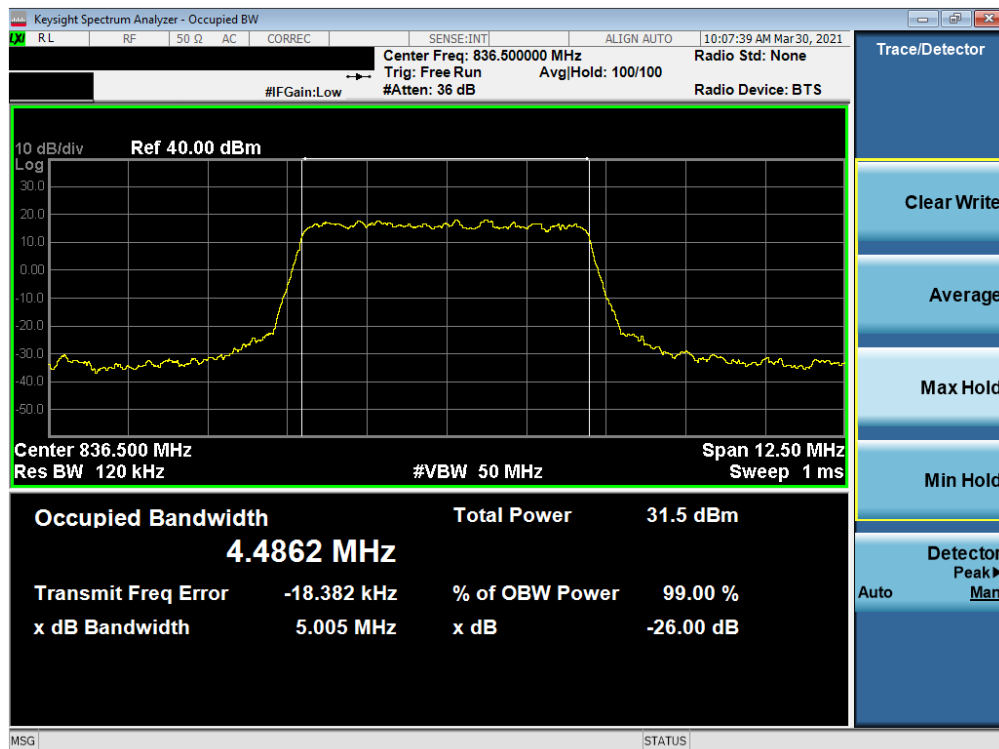


Plot 7-22. Occupied Bandwidth Plot (NR Band n5 - 10MHz 16-QAM - Full RB)

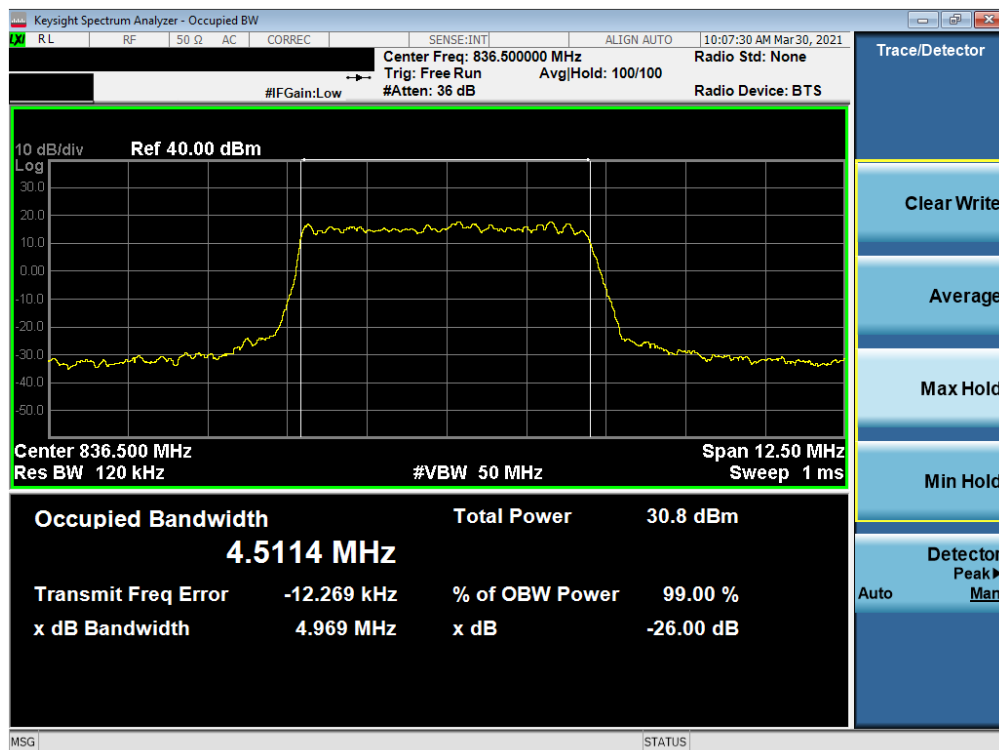


Plot 7-23. Occupied Bandwidth Plot (NR Band n5 - 5MHz  $\pi/2$  BPSK - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 24 of 88



Plot 7-24. Occupied Bandwidth Plot (NR Band n5 - 5MHz QPSK - Full RB)



Plot 7-25. Occupied Bandwidth Plot (NR Band n5 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 25 of 88

## 7.3 Spurious and Harmonic Emissions at Antenna Terminal

### Test Overview

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

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

### Test Procedure Used

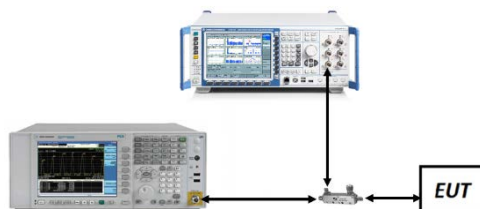
KDB 971168 D01 v03r01 – Section 6.0

### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 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.



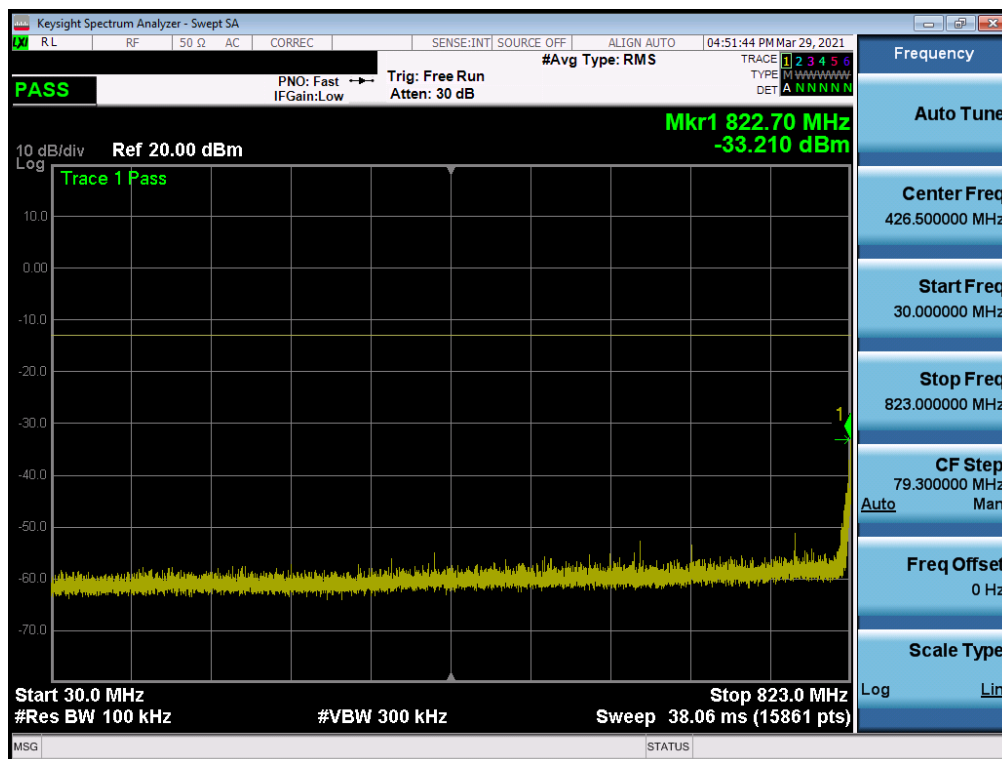
**Figure 7-2. Test Instrument & Measurement Setup**

### Test Notes

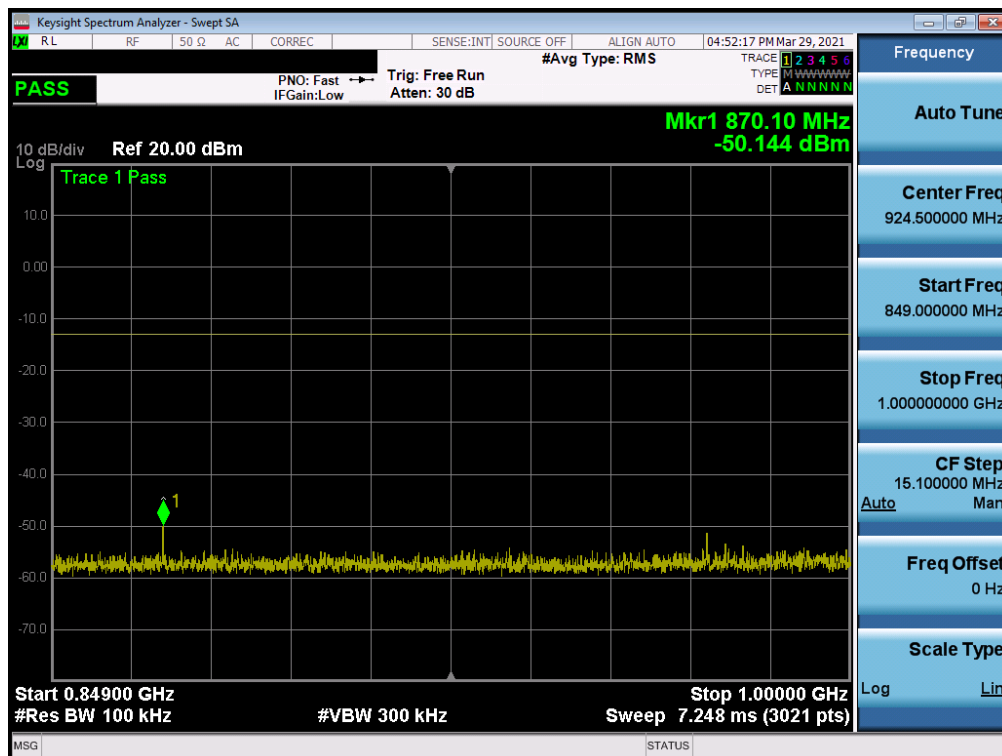
1. Per Part 22 and RSS-132, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth 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: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>Approved by:</b> Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset	Page 26 of 88

## GSM/GPRS Cell

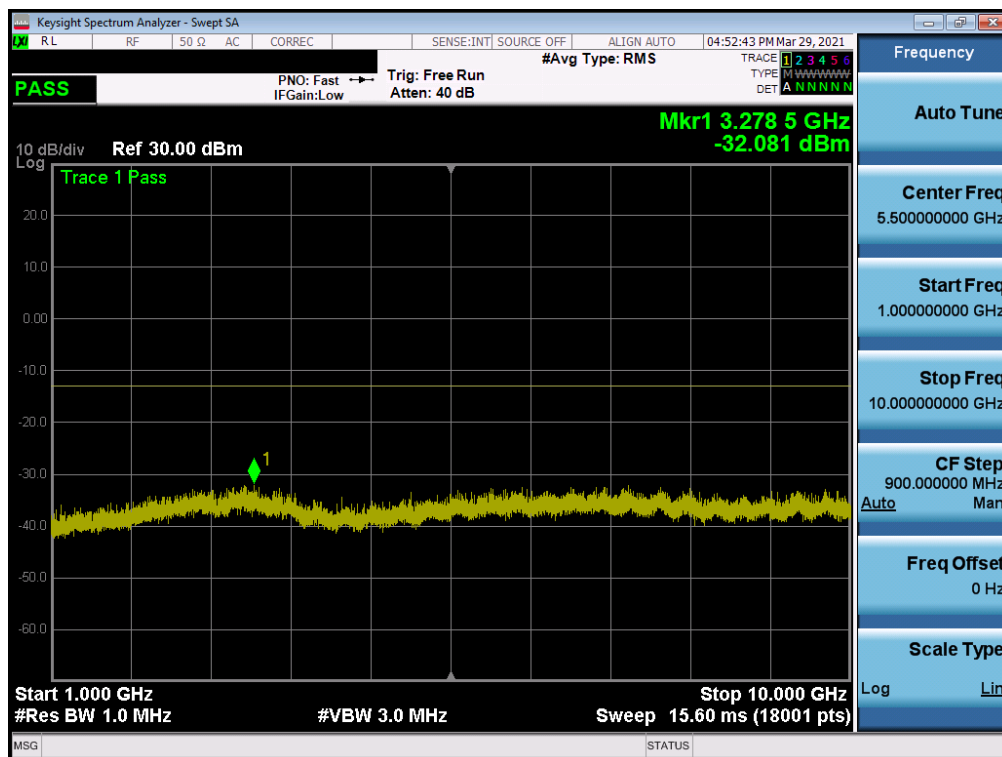


Plot 7-26. Conducted Spurious Plot (GPRS Ch. 128)

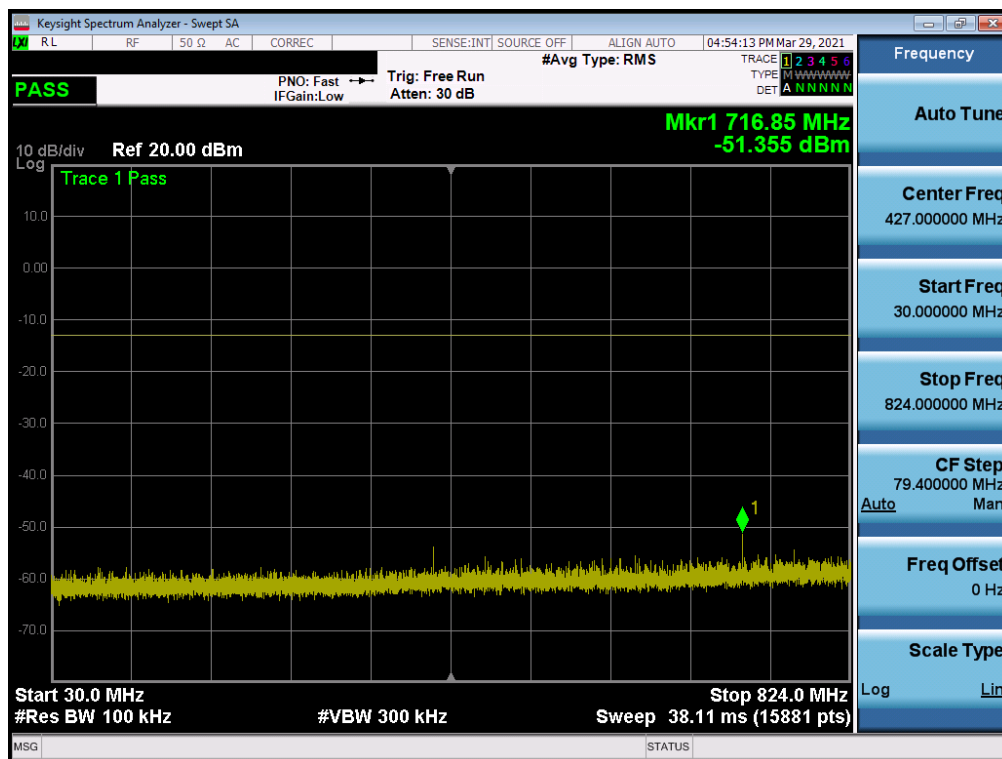


Plot 7-27. Conducted Spurious Plot (GPRS Ch. 128)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 27 of 88

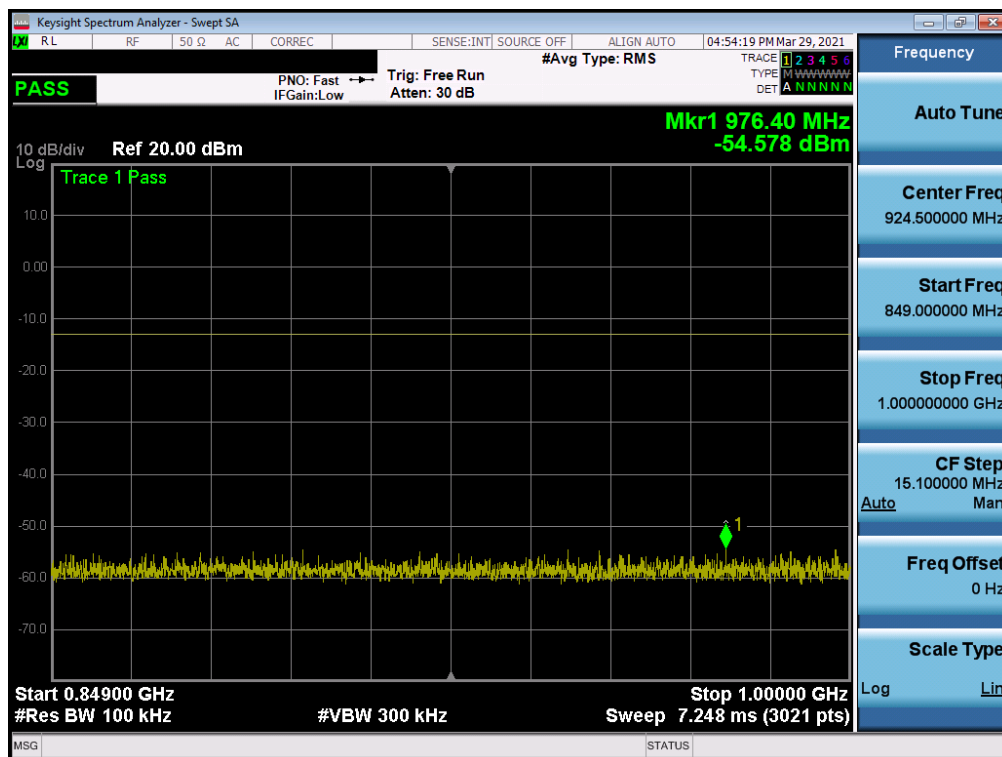


Plot 7-28. Conducted Spurious Plot (GPRS Ch. 128)

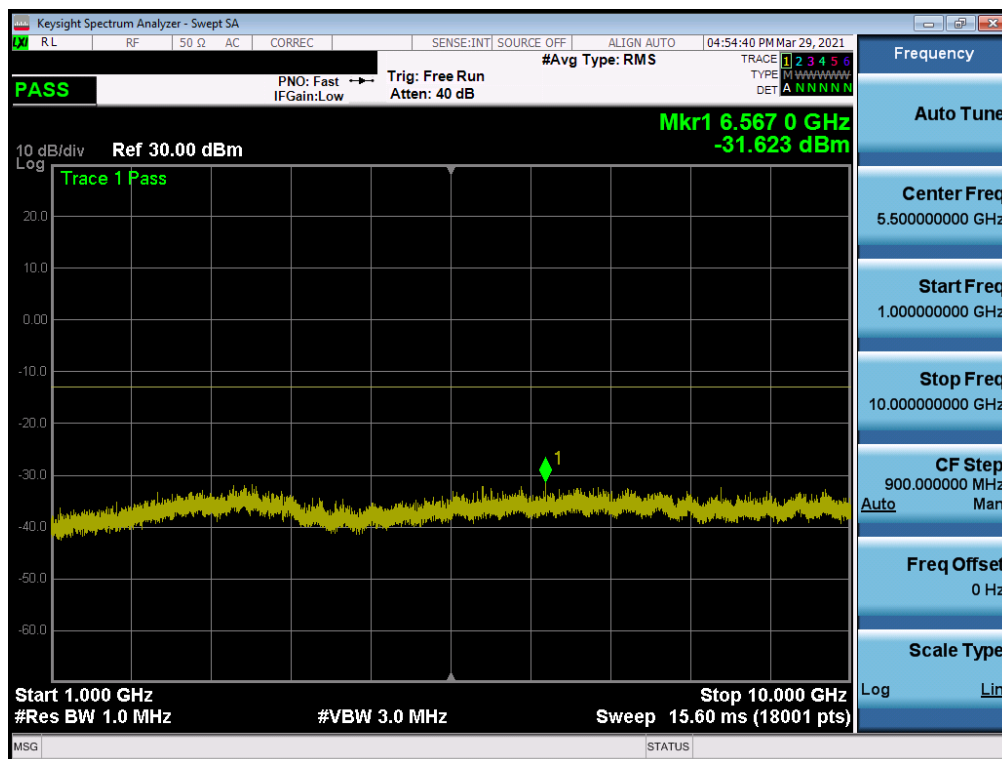


Plot 7-29. Conducted Spurious Plot (GPRS Ch. 190)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 28 of 88

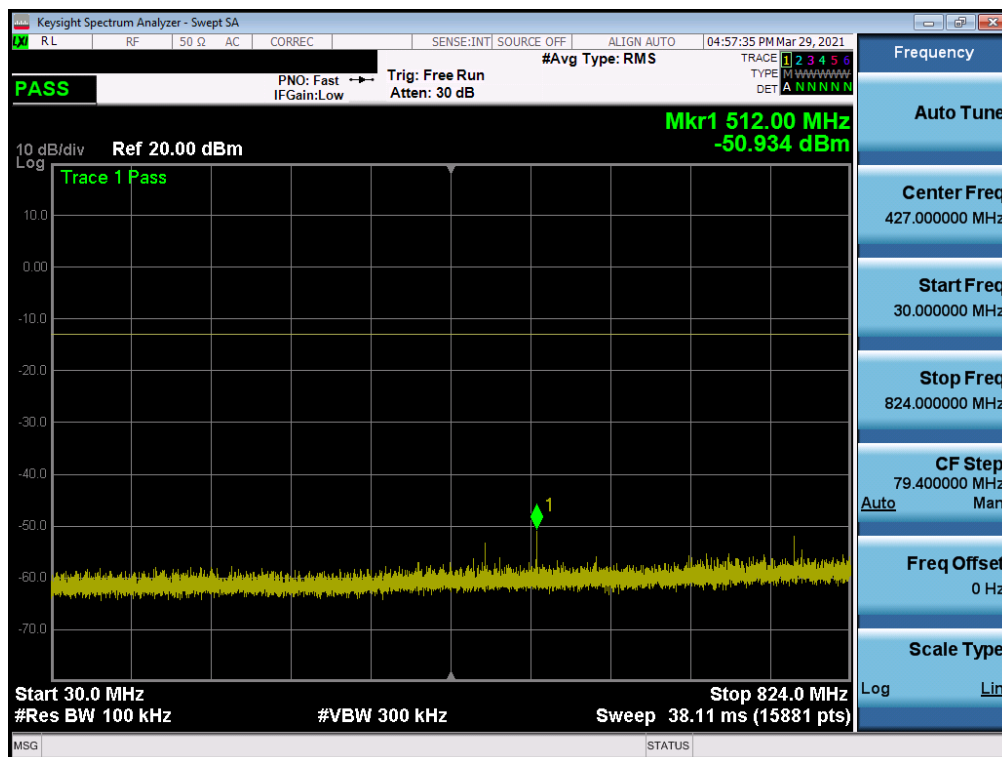


Plot 7-30. Conducted Spurious Plot (GPRS Ch. 190)

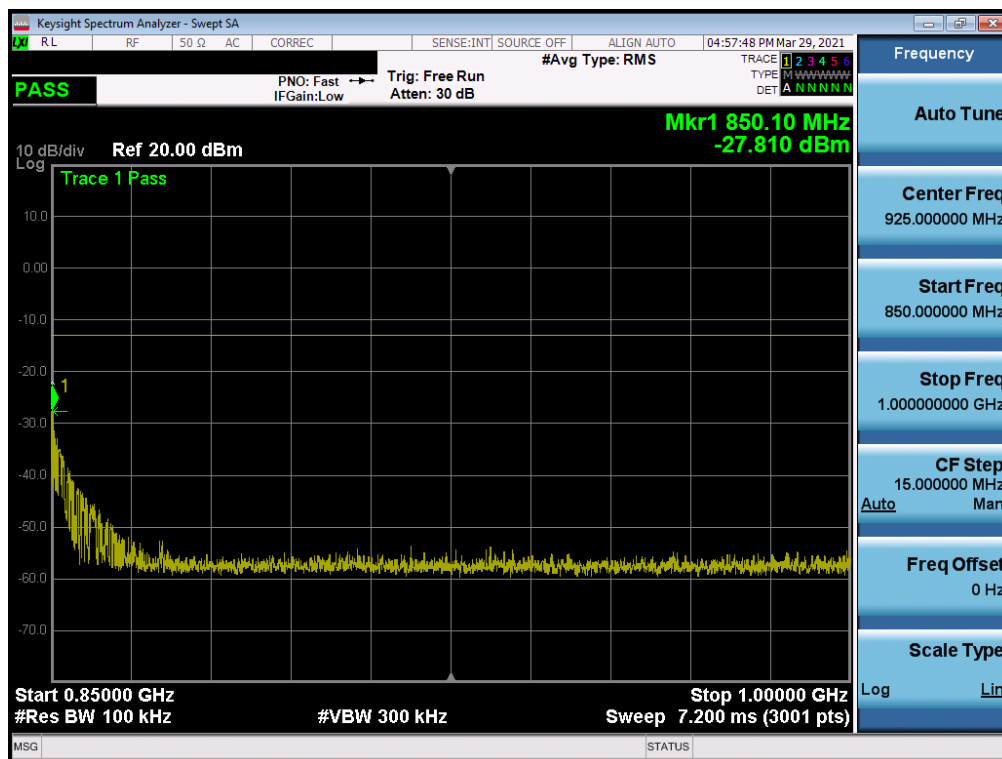


Plot 7-31. Conducted Spurious Plot (GPRS Ch. 190)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 29 of 88

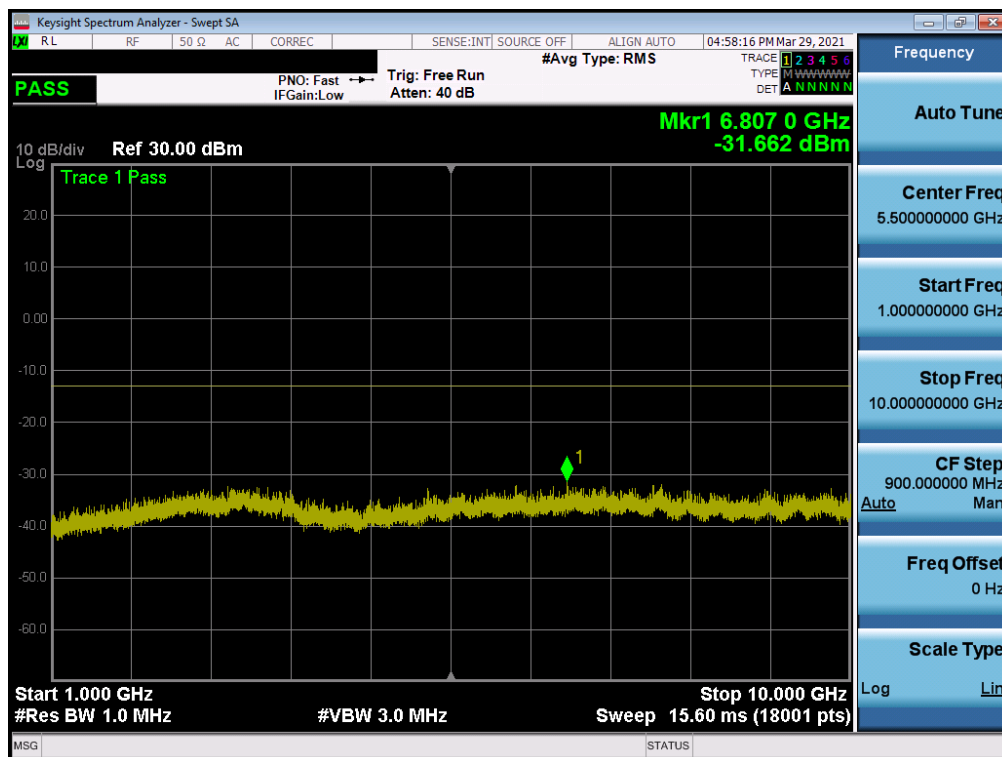


Plot 7-32. Conducted Spurious Plot (GPRS Ch. 251)



Plot 7-33. Conducted Spurious Plot (GPRS Ch. 251)

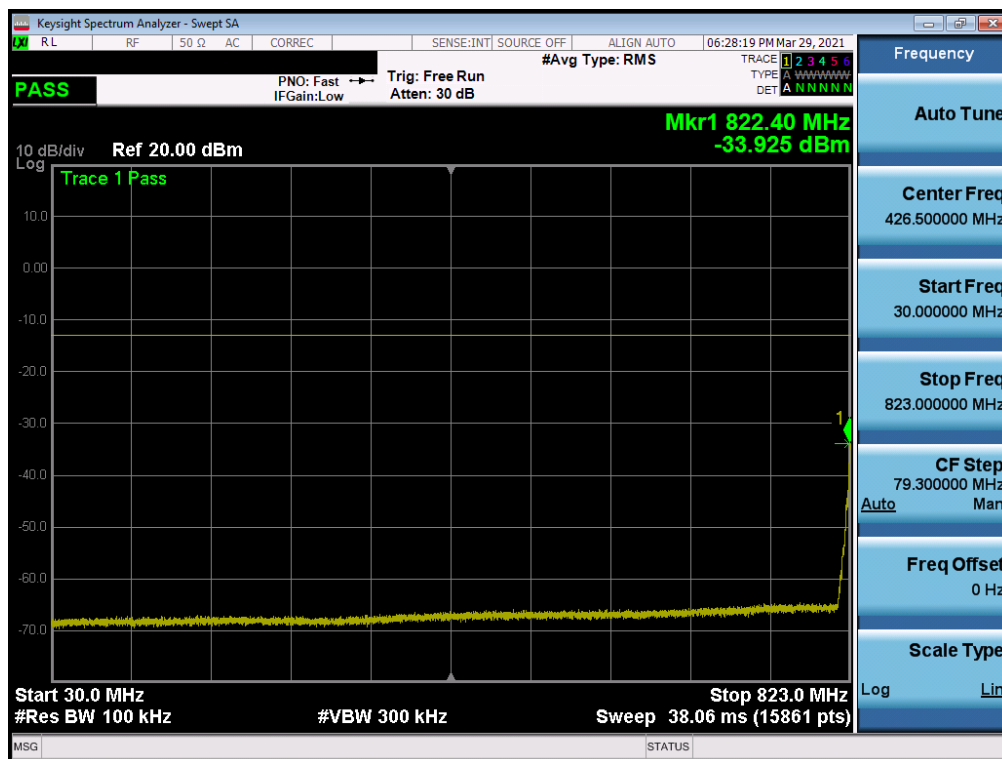
FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 30 of 88



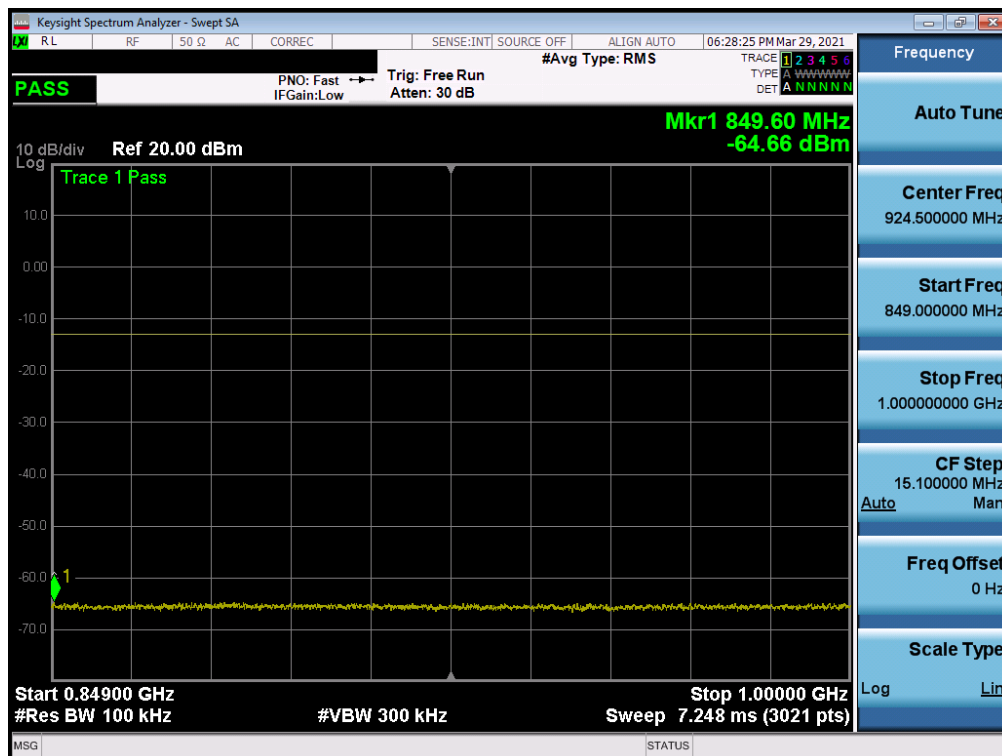
Plot 7-34. Conducted Spurious Plot (GPRS Ch. 251)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 31 of 88

## WCDMA Cell

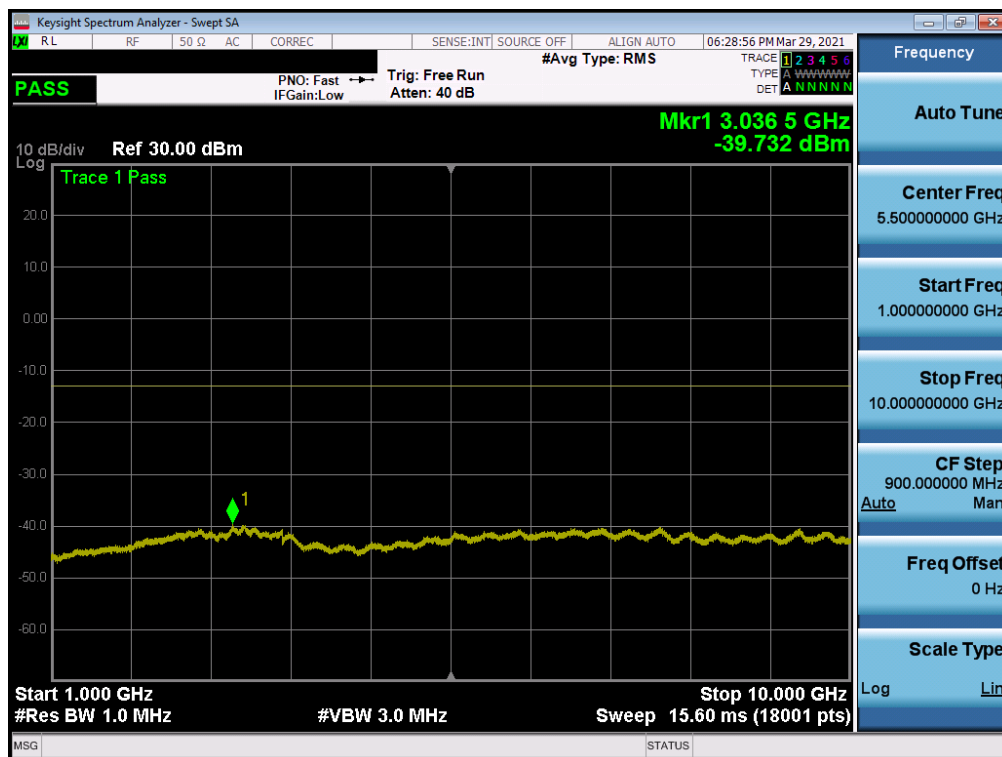


Plot 7-35. Conducted Spurious Plot (WCDMA Ch. 4132)



Plot 7-36. Conducted Spurious Plot (WCDMA Ch. 4132)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 32 of 88

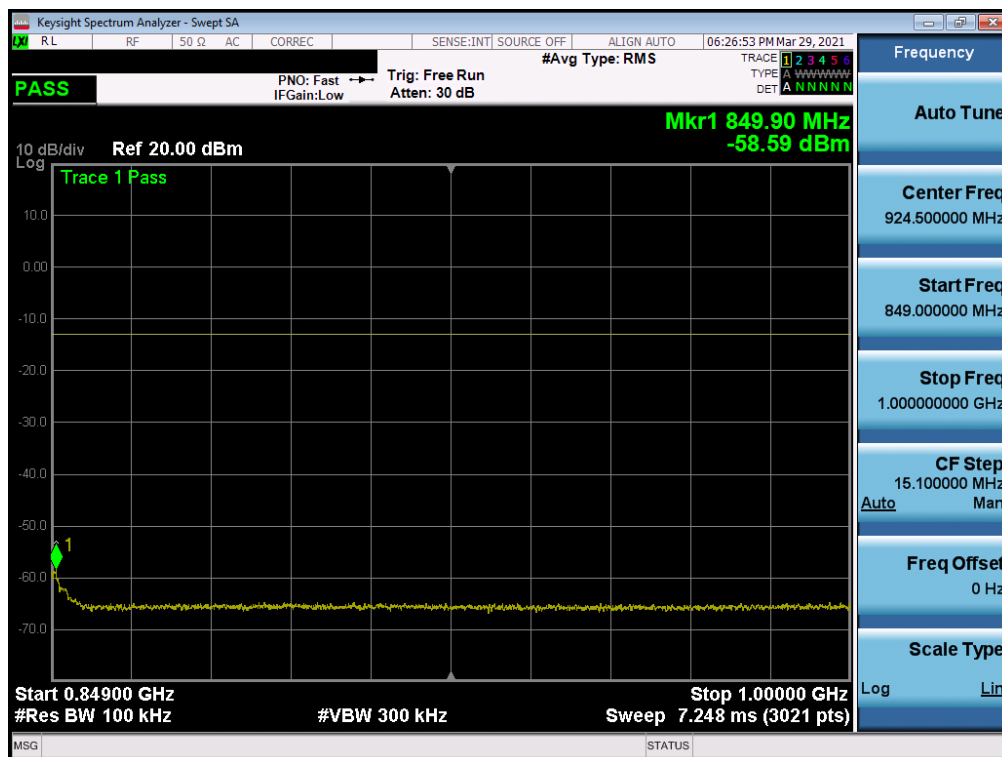


Plot 7-37. Conducted Spurious Plot (WCDMA Ch. 4132)

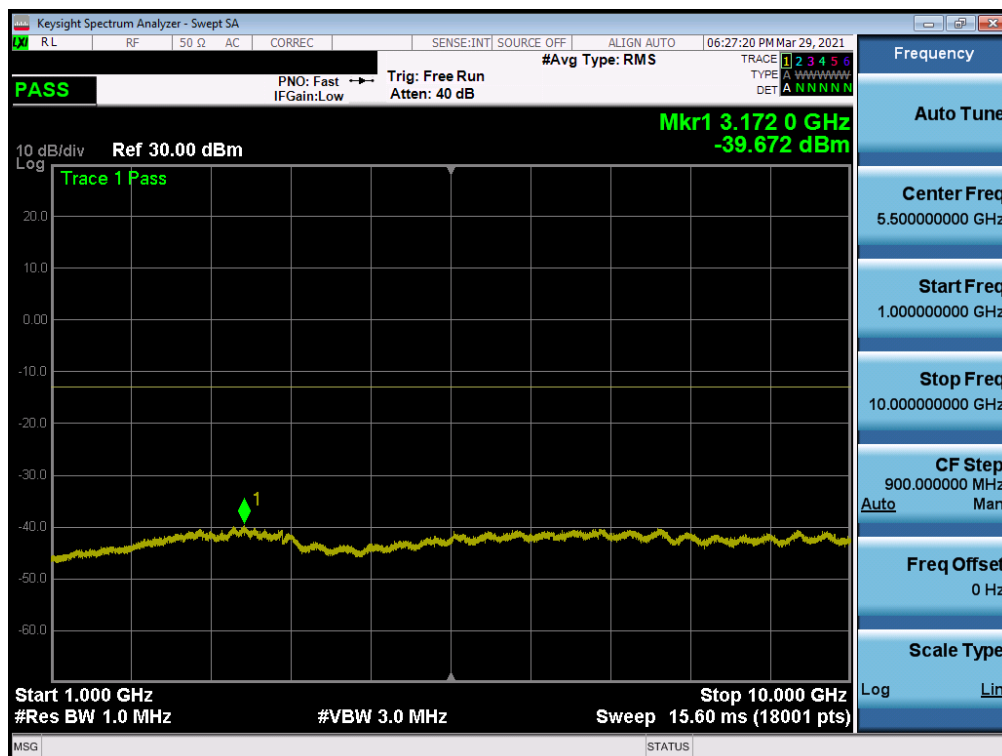


Plot 7-38. Conducted Spurious Plot (WCDMA Ch. 4183)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 33 of 88



Plot 7-39. Conducted Spurious Plot (WCDMA Ch. 4183)

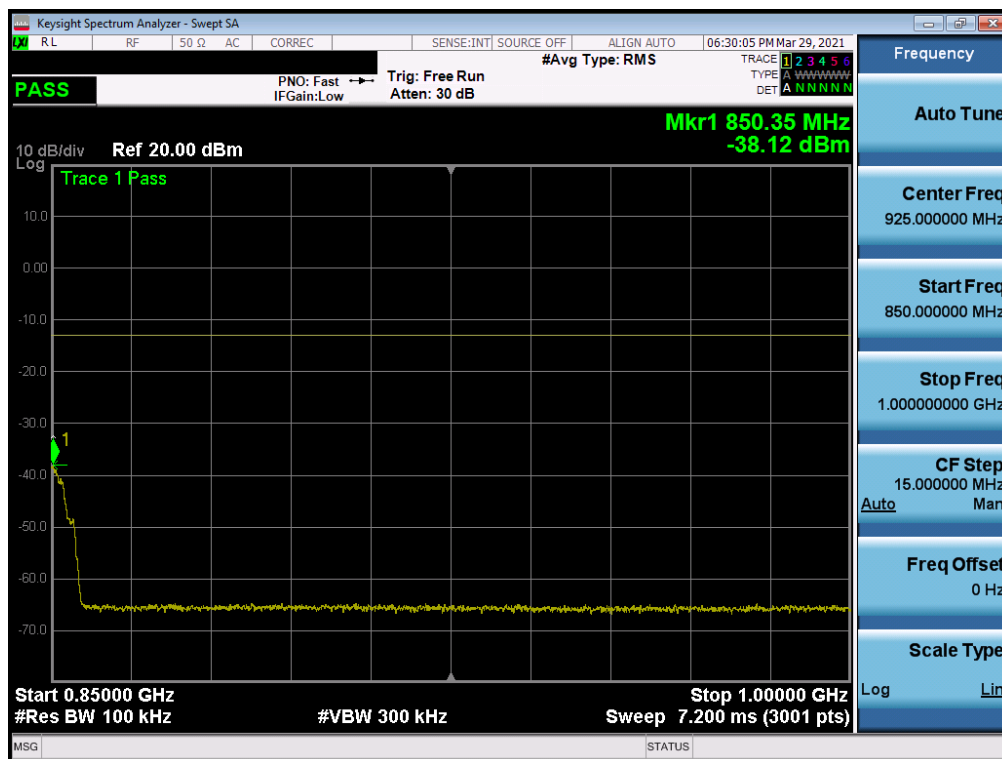


Plot 7-40. Conducted Spurious Plot (WCDMA Ch. 4183)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 - 06/09/2021	EUT Type: Portable Handset		Page 34 of 88

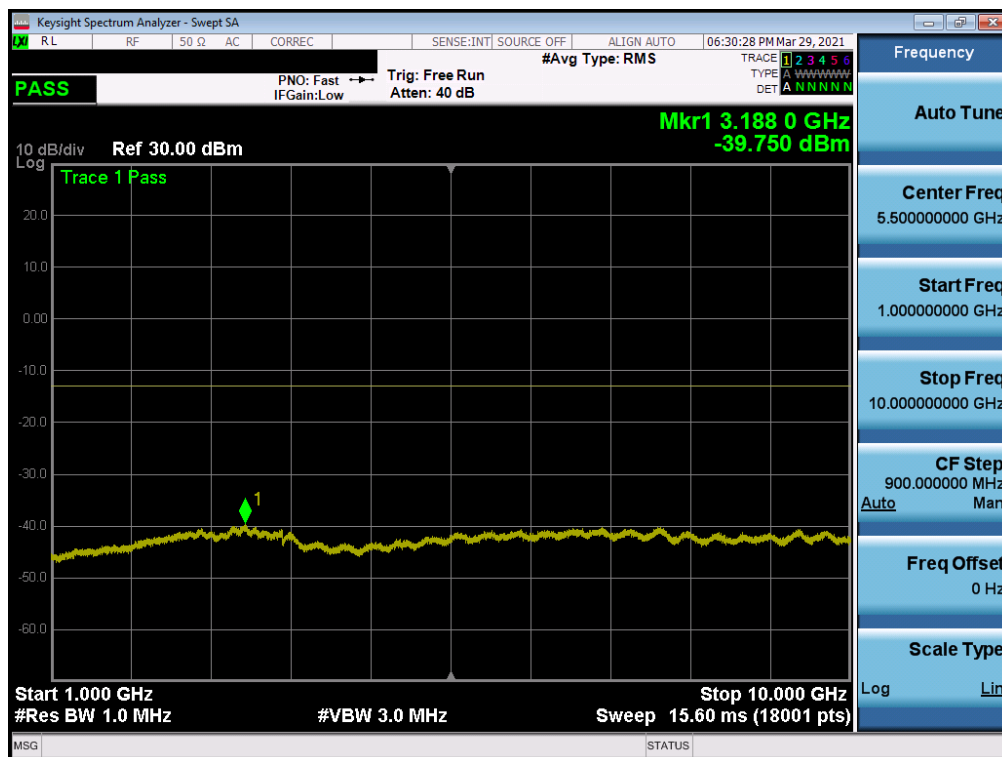


Plot 7-41. Conducted Spurious Plot (WCDMA Ch. 4233)



Plot 7-42. Conducted Spurious Plot (WCDMA Ch. 4233)

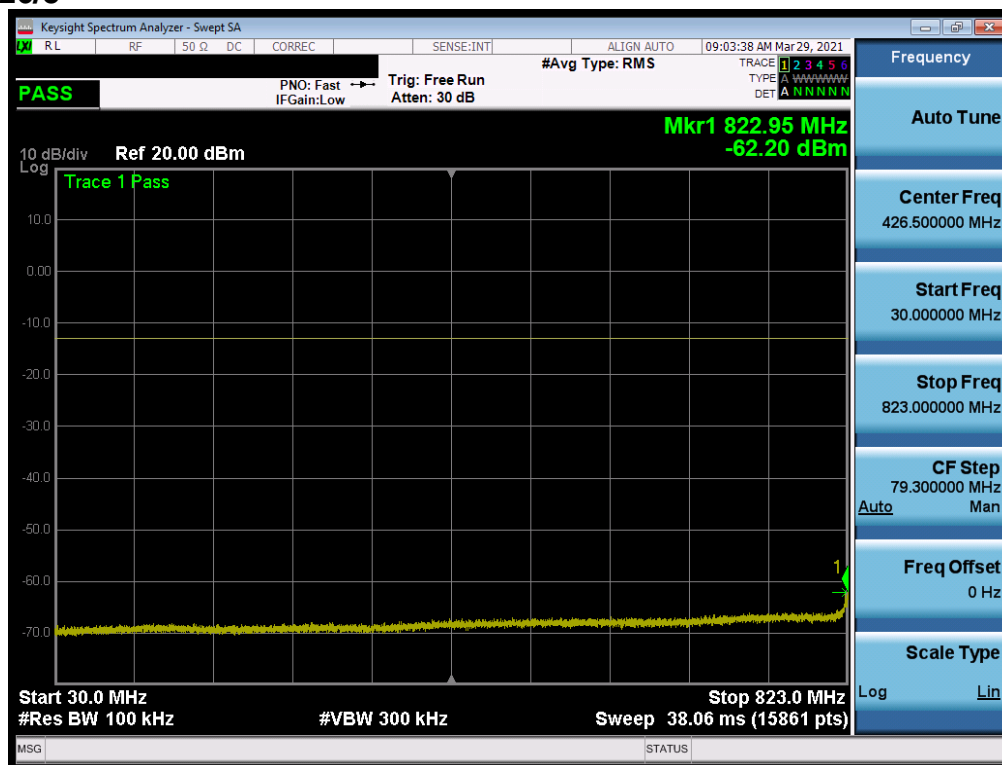
FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 35 of 88



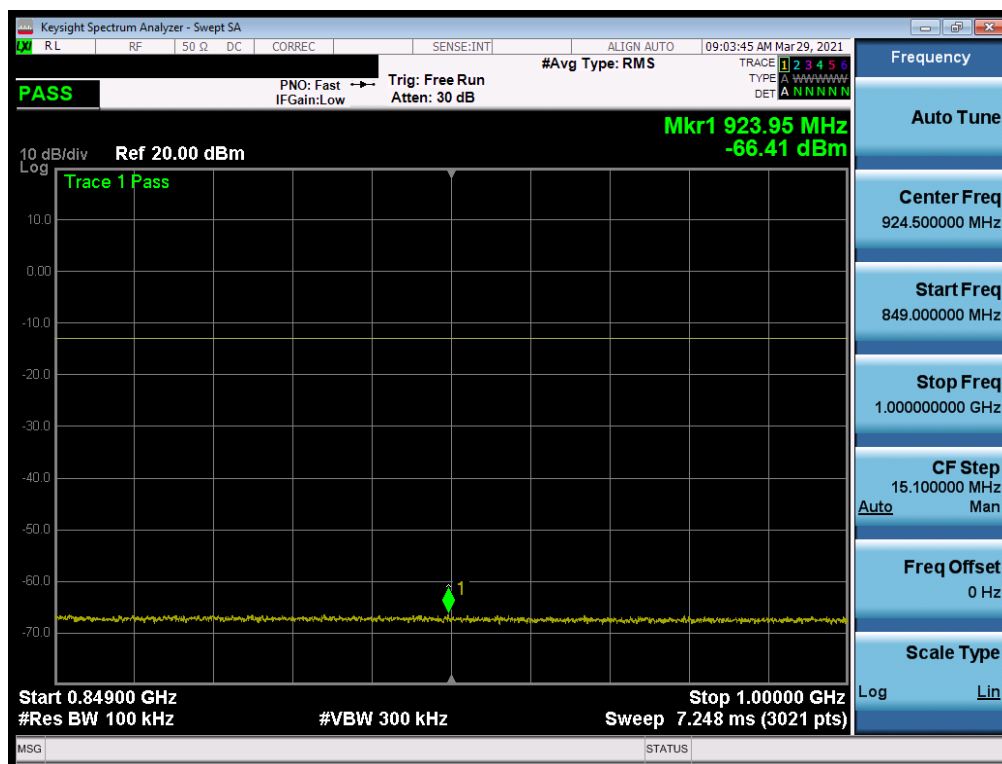
Plot 7-43. Conducted Spurious Plot (WCDMA Ch. 4233)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 36 of 88

## LTE Band 26/5

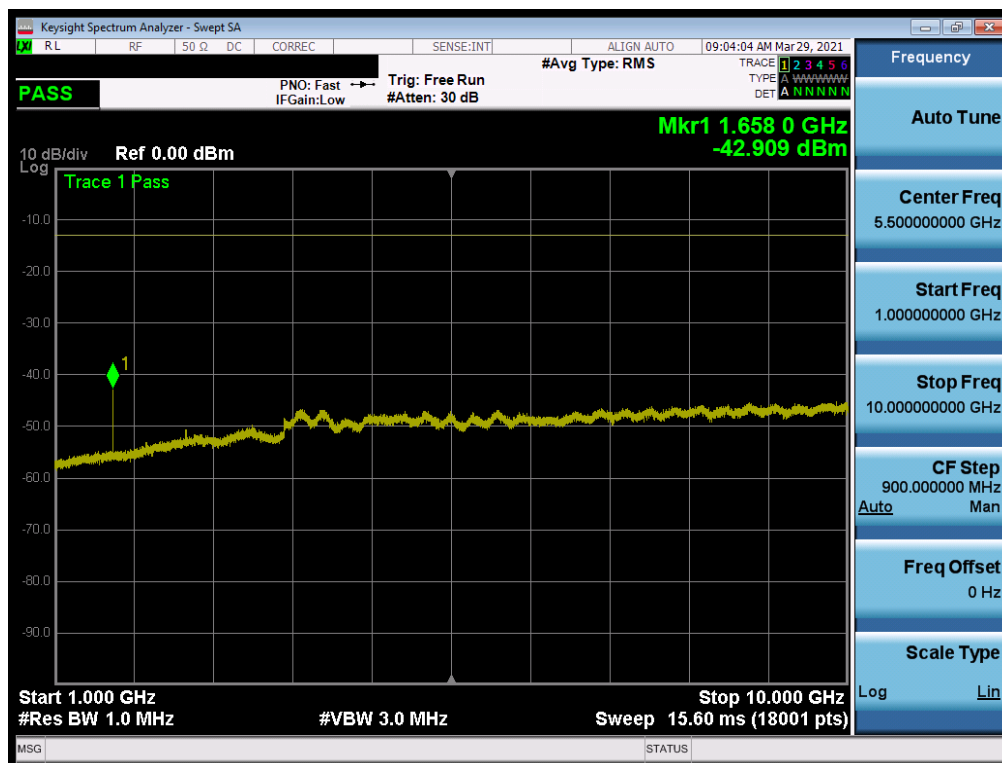


Plot 7-44. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK – 1 RB - Low Channel)

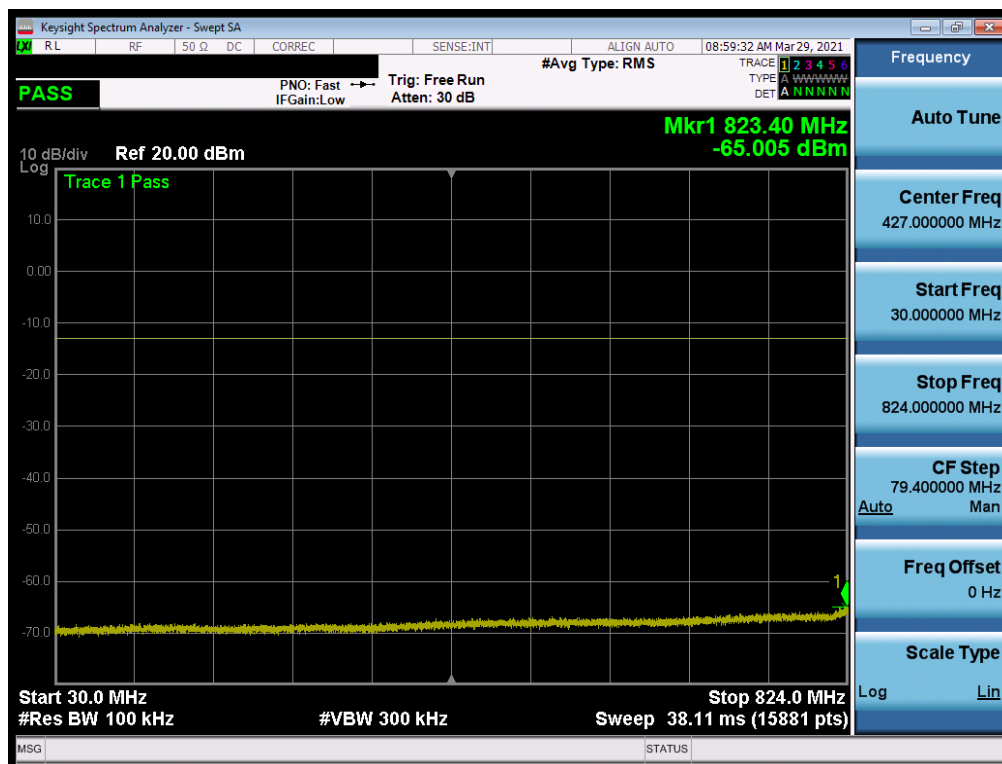


Plot 7-45. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Low Channel)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 37 of 88

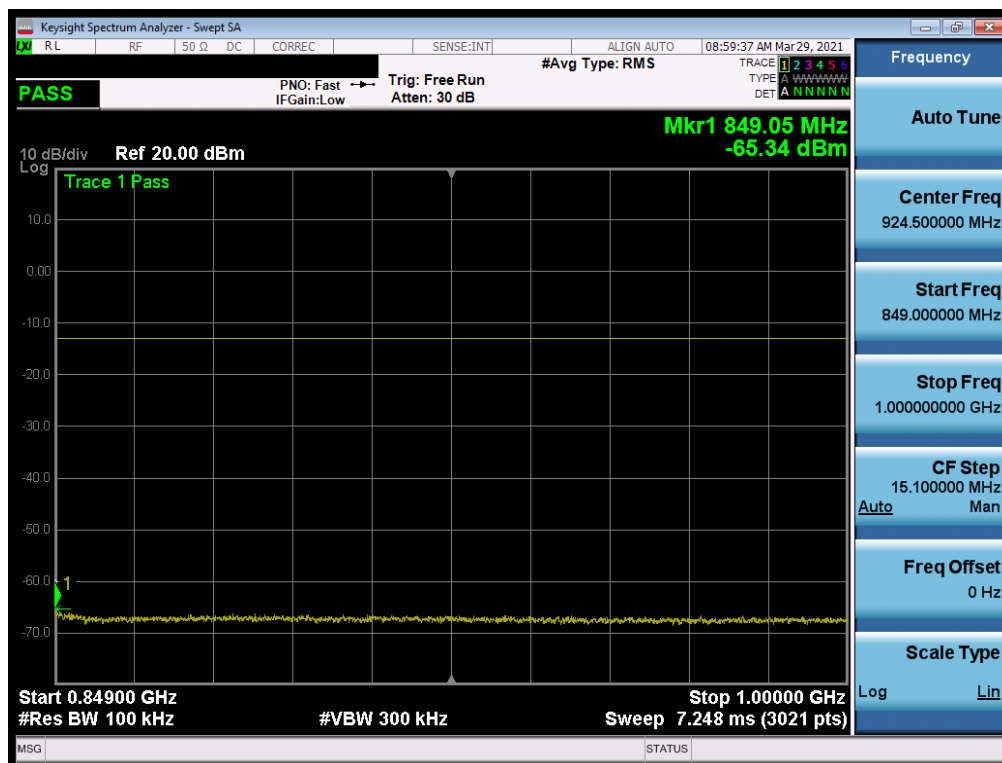


Plot 7-46. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Low Channel)

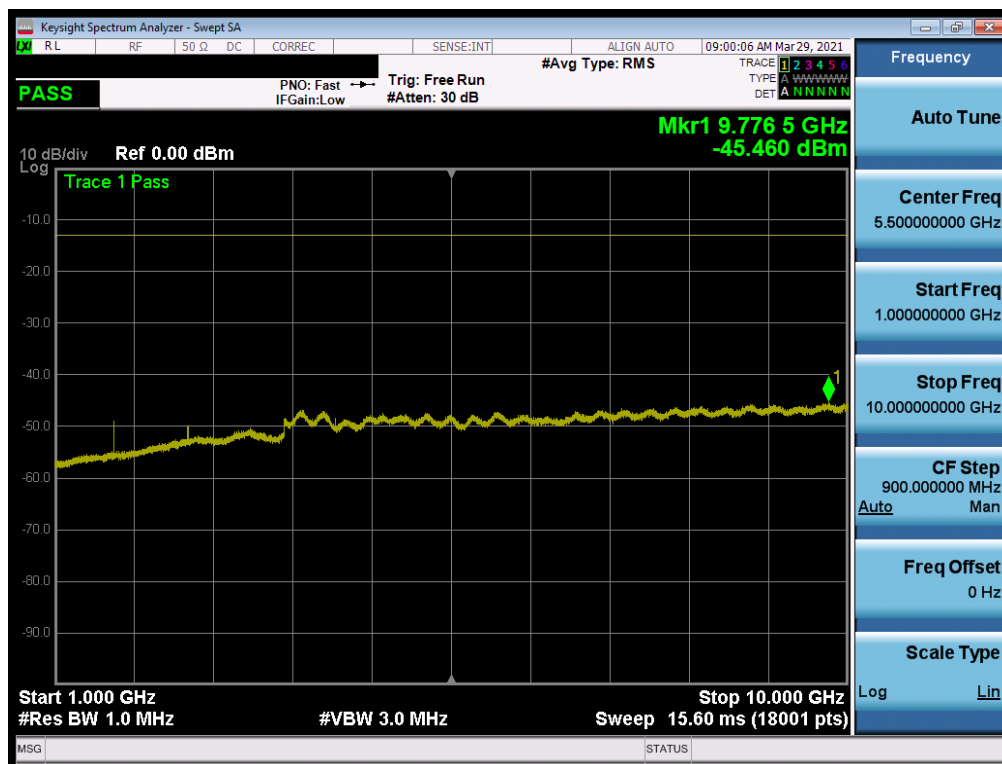


Plot 7-47. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 38 of 88

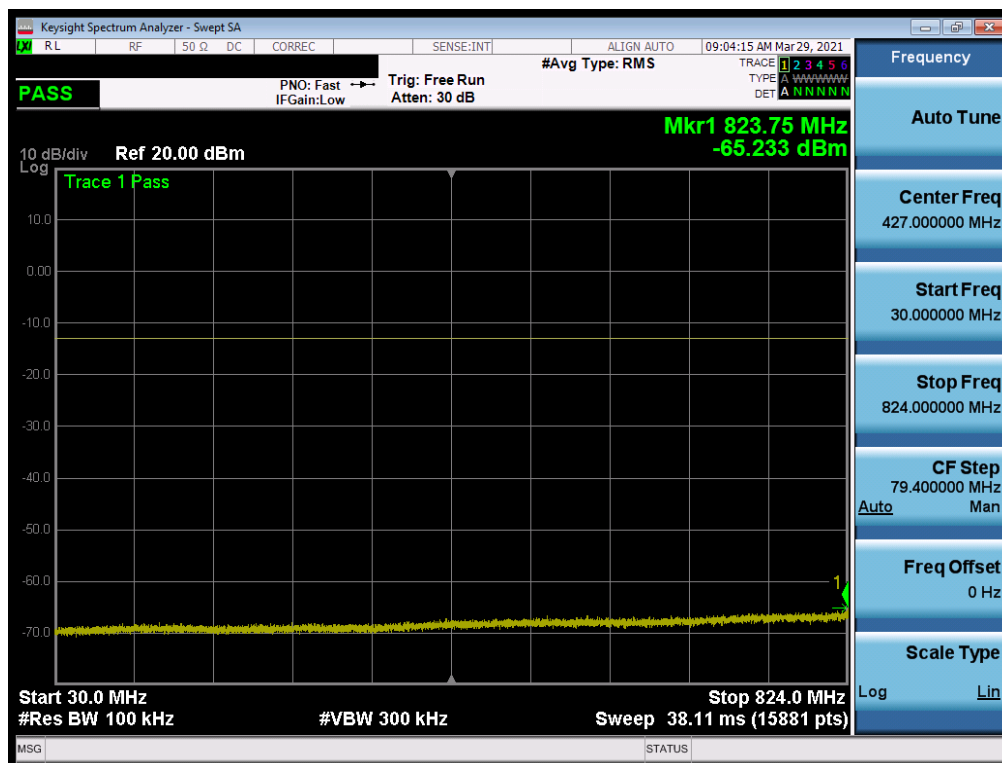


Plot 7-48. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Mid Channel)

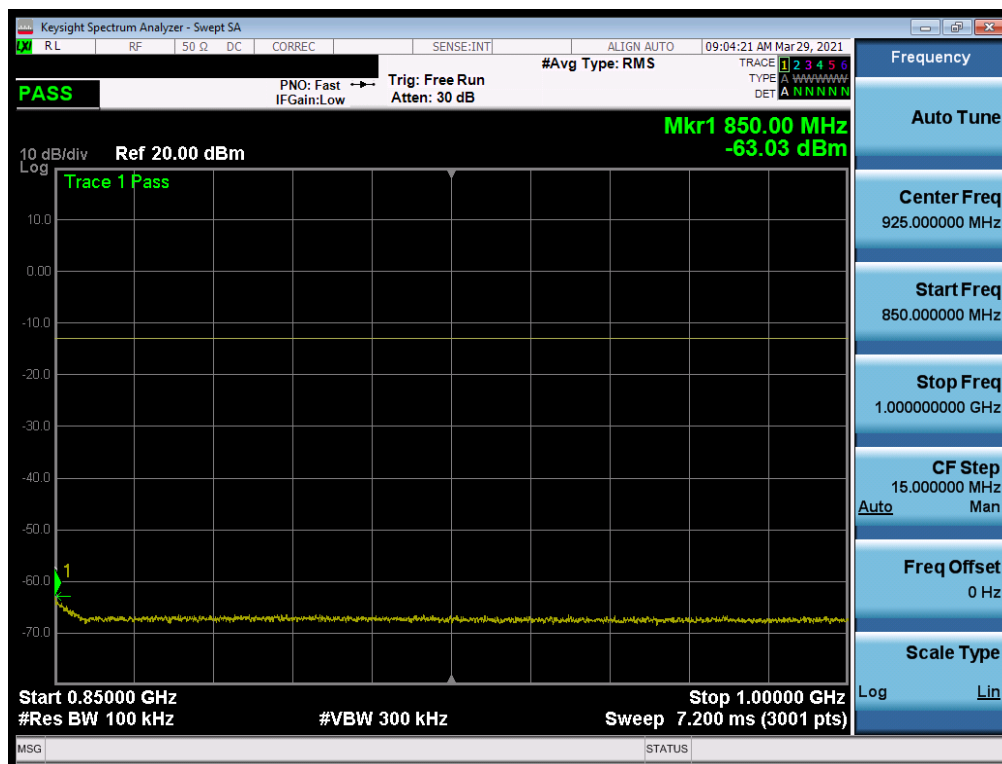


Plot 7-49. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 39 of 88

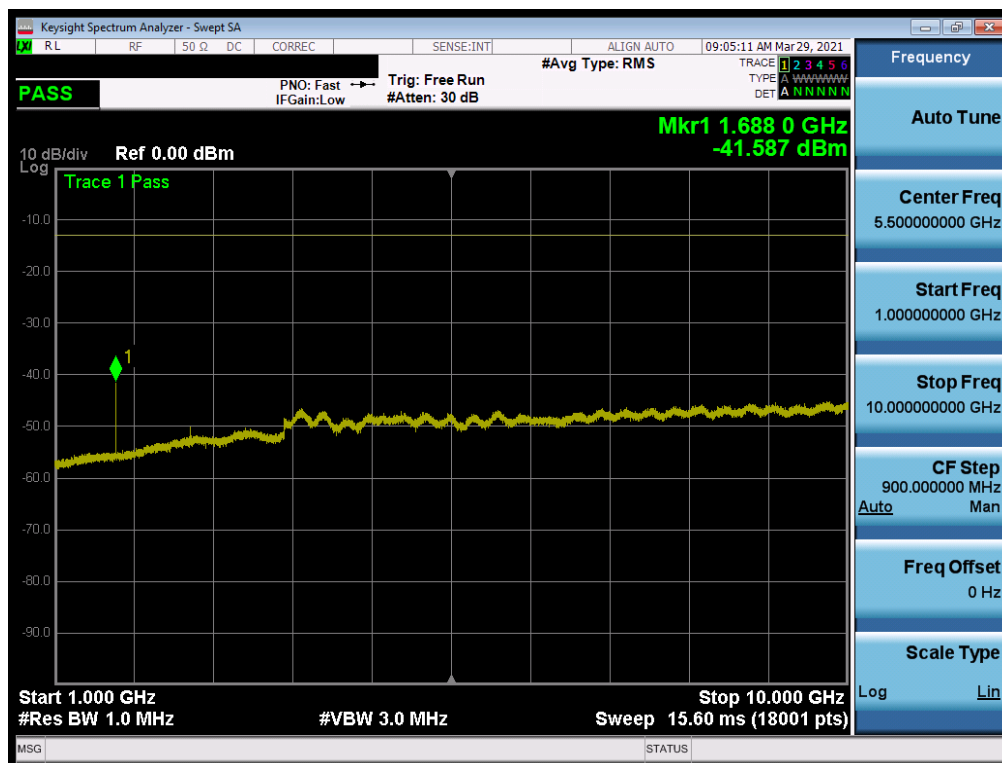


Plot 7-50. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - High Channel)



Plot 7-51. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - High Channel)

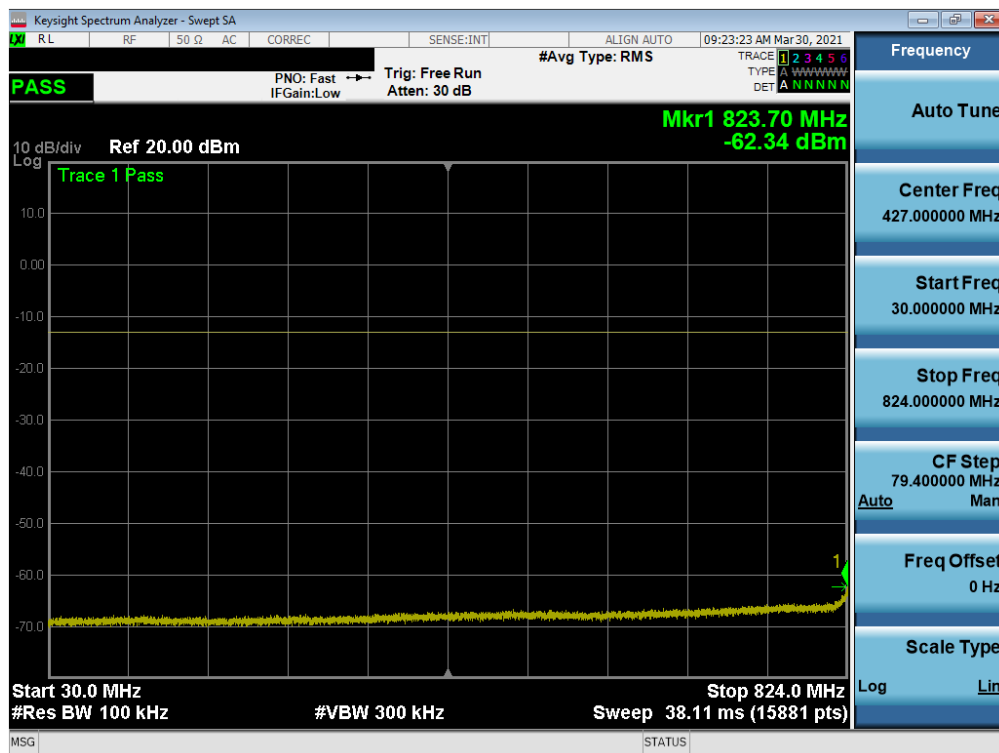
FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 40 of 88



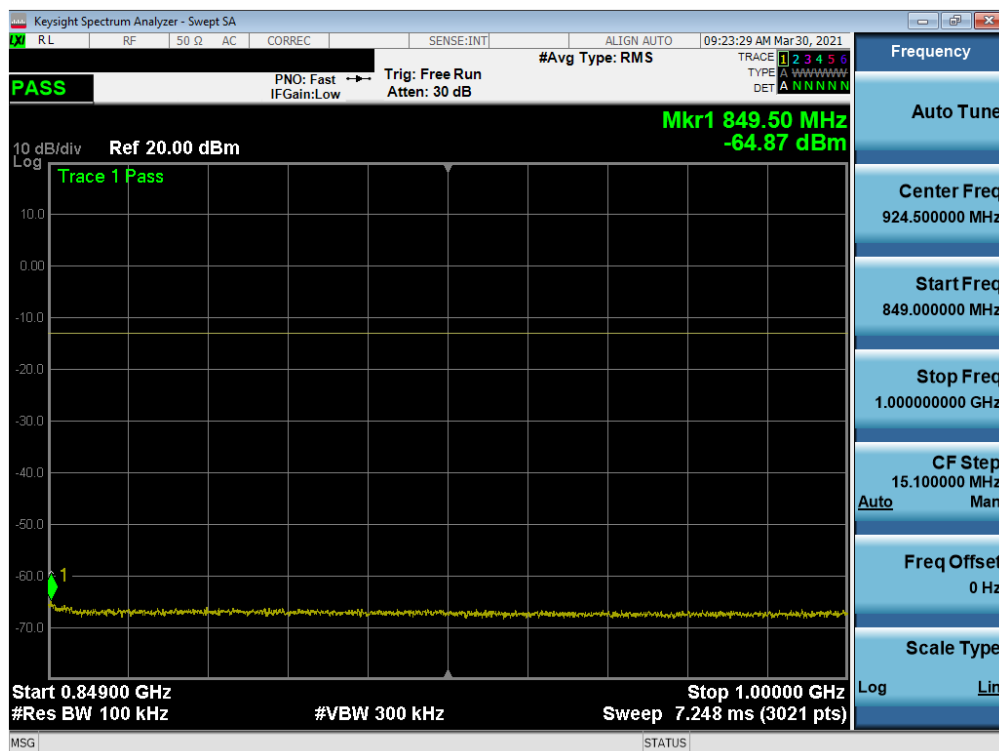
Plot 7-52. Conducted Spurious Plot (LTE Band 26/5 - 10MHz QPSK - 1 RB - High Channel)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 41 of 88

## NR Band n5

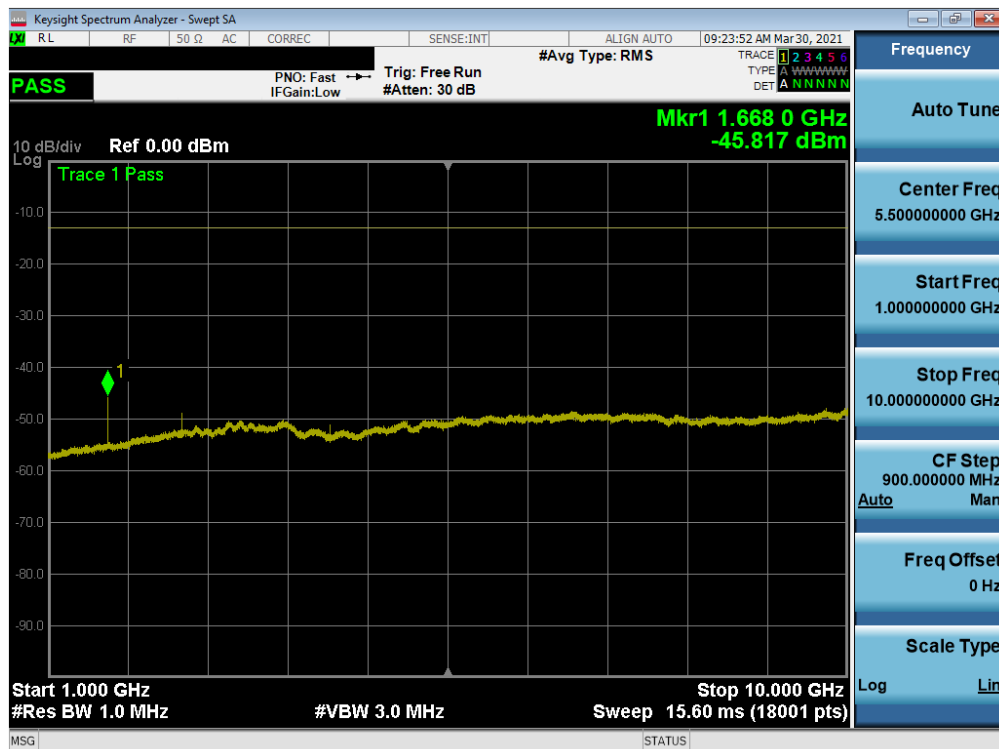


Plot 7-53. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Low Channel)

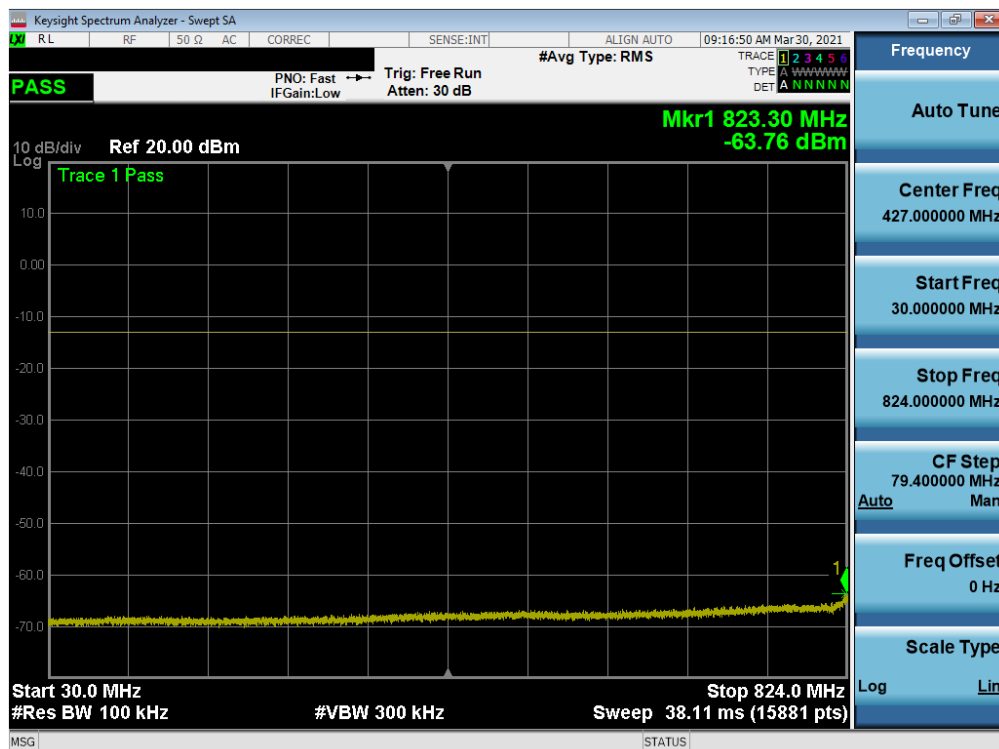


Plot 7-54. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Low Channel)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 42 of 88

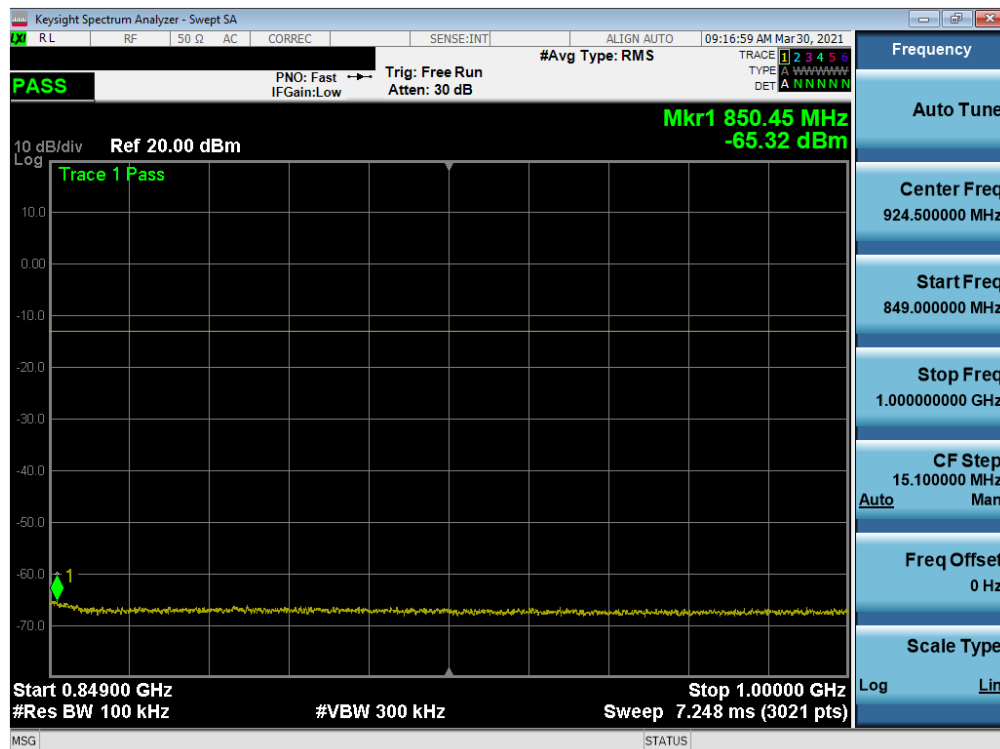


Plot 7-55. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Low Channel)

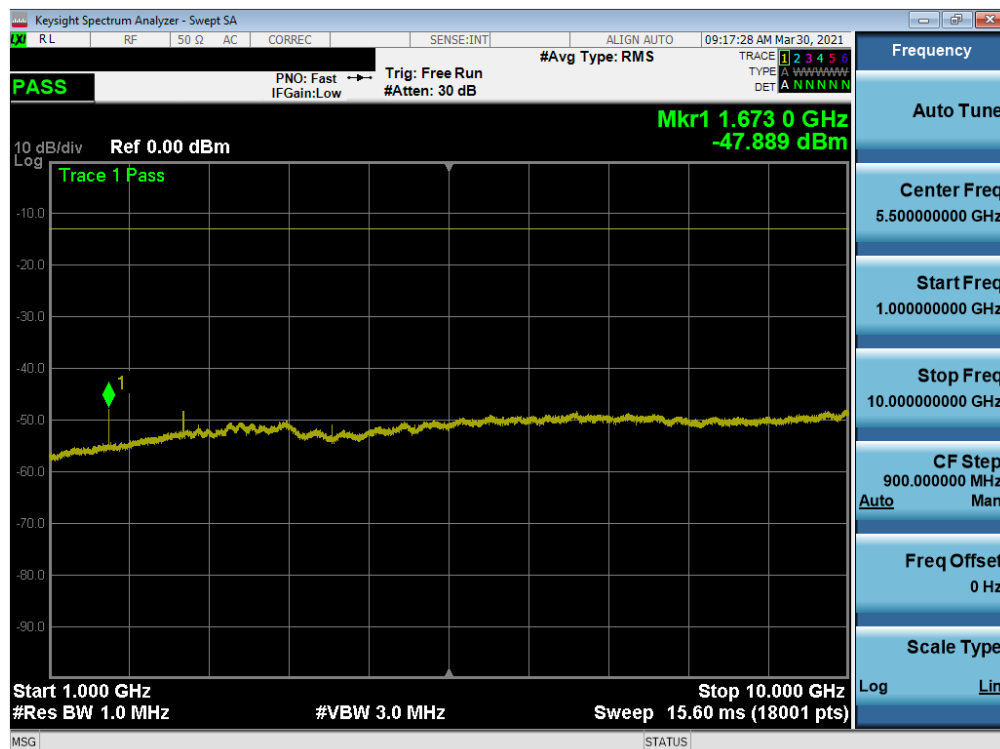


Plot 7-56. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Mid Channel)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>Approved by:</b> Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset	Page 43 of 88

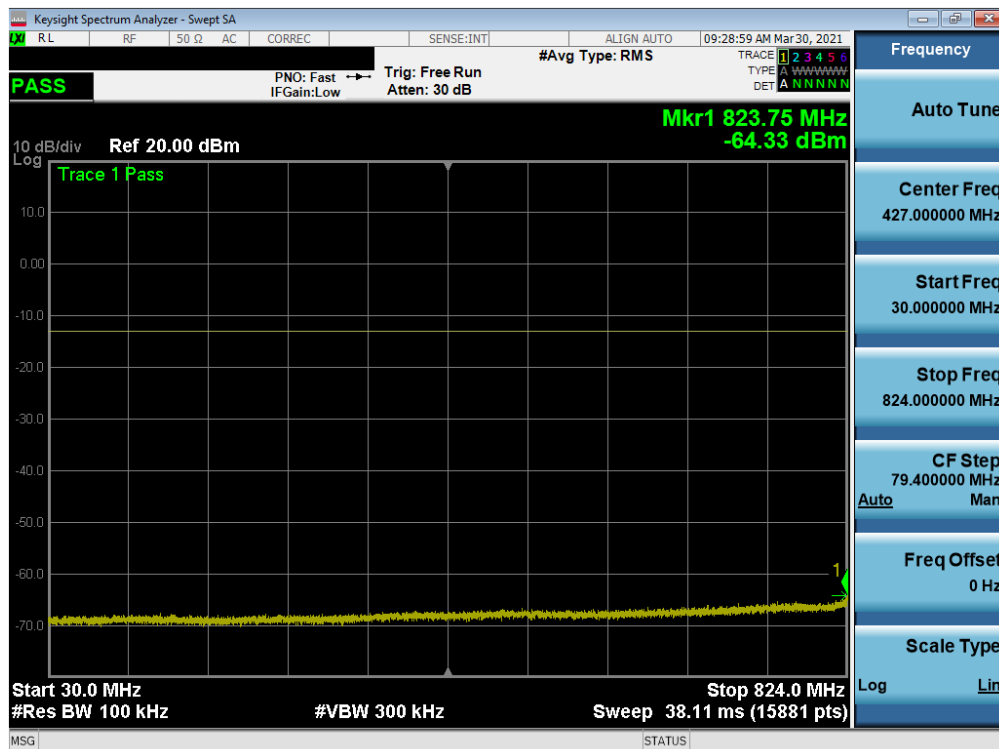


Plot 7-57. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Mid Channel)

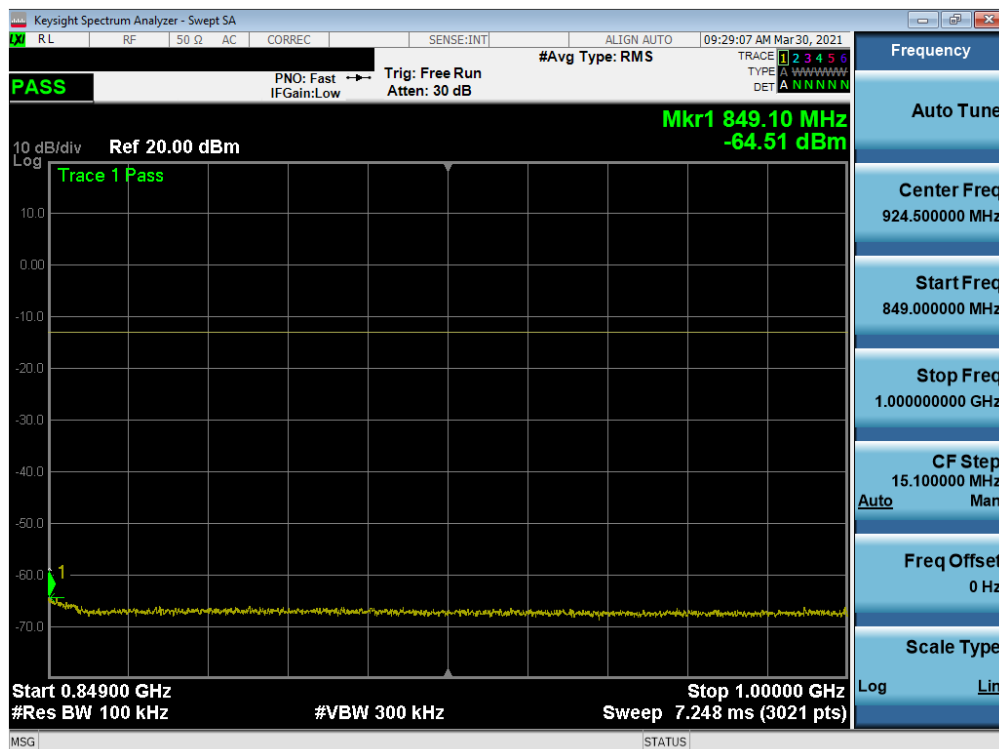


Plot 7-58. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - Mid Channel)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>Approved by:</b> Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset	Page 44 of 88

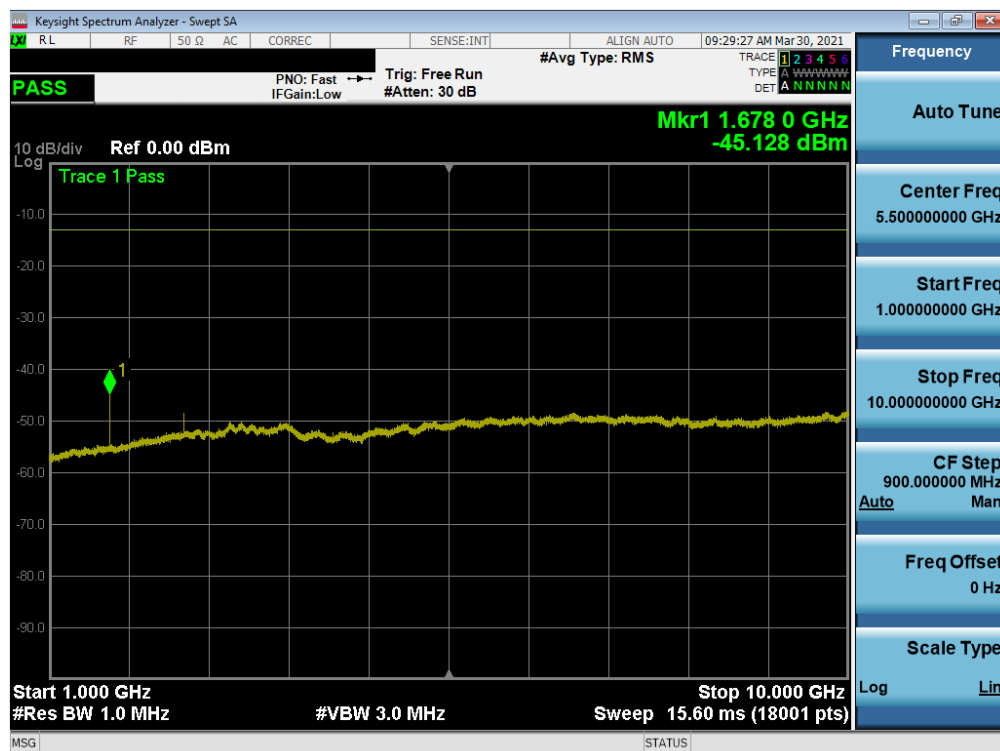


Plot 7-59. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - High Channel)



Plot 7-60. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - High Channel)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>Approved by:</b> Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset	Page 45 of 88



**Plot 7-61. Conducted Spurious Plot (NR Band n5 - 20.0MHz - 1 RB - High Channel)**

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 46 of 88

## 7.4 Band Edge Emissions at Antenna Terminal

### Test Overview

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

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

### Test Procedure Used

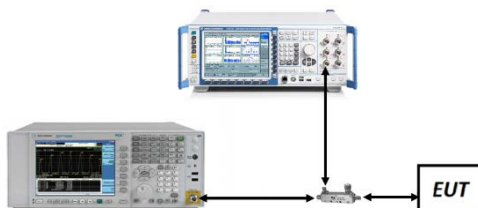
KDB 971168 D01 v03r01 – Section 6.0

### Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3.  $RBW \geq 1\%$  of the emission bandwidth
4.  $VBW \geq 3 \times RBW$
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**

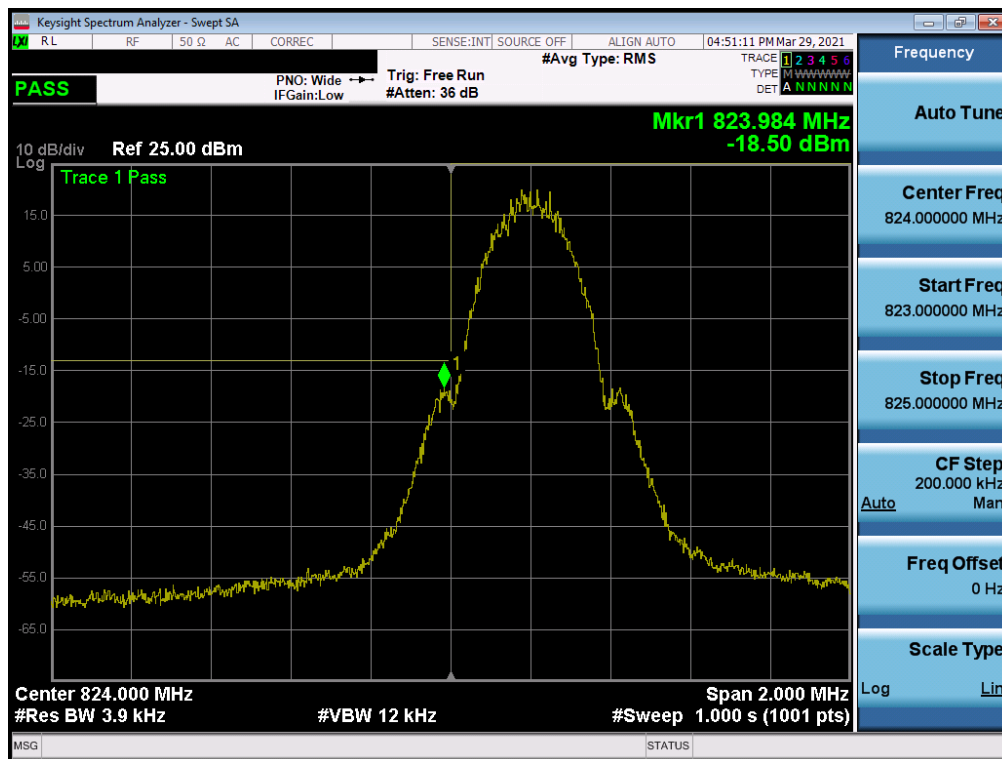
FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	<b>PART 22 MEASUREMENT REPORT</b>	<b>Approved by:</b> Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset	Page 47 of 88

## Test Notes

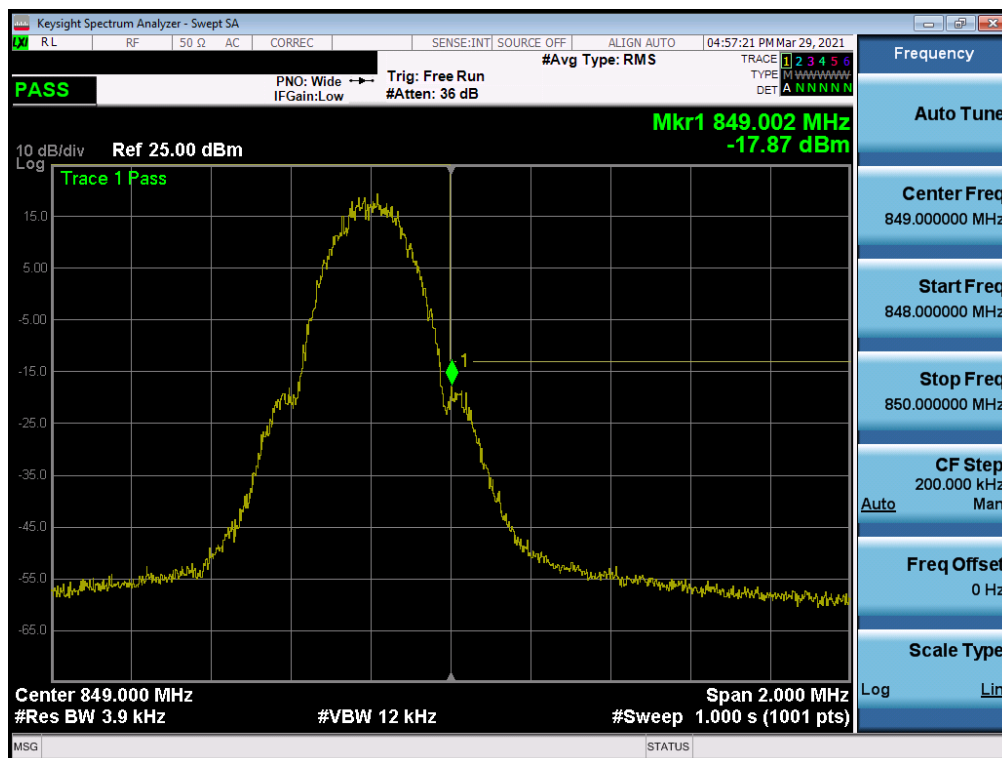
1. Per 22.917(b) and RSS-132(5.5), in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions 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.

FCC ID: A3LSMF926B	 <b>PART 22 MEASUREMENT REPORT</b> 		Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset	Page 48 of 88

## GSM/GPRS Cell



Plot 7-62. Lower Band Edge Plot (GPRS Cell – Ch. 128)



Plot 7-63. Upper Band Edge Plot (GPRS Cell – Ch. 251)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 49 of 88

## WCDMA Cell



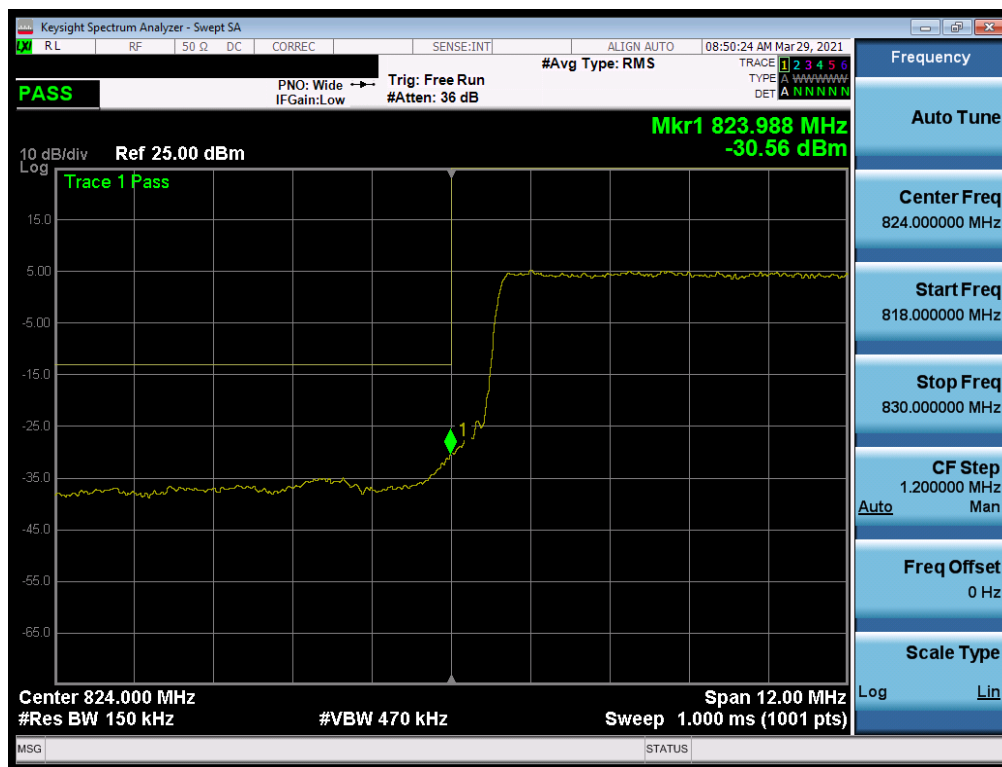
Plot 7-64. Lower Band Edge Plot (WCDMA Cell – Ch. 4132)



Plot 7-65. Upper Band Edge Plot (WCDMA Cell – Ch. 4233)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 50 of 88

## LTE Band 26/5

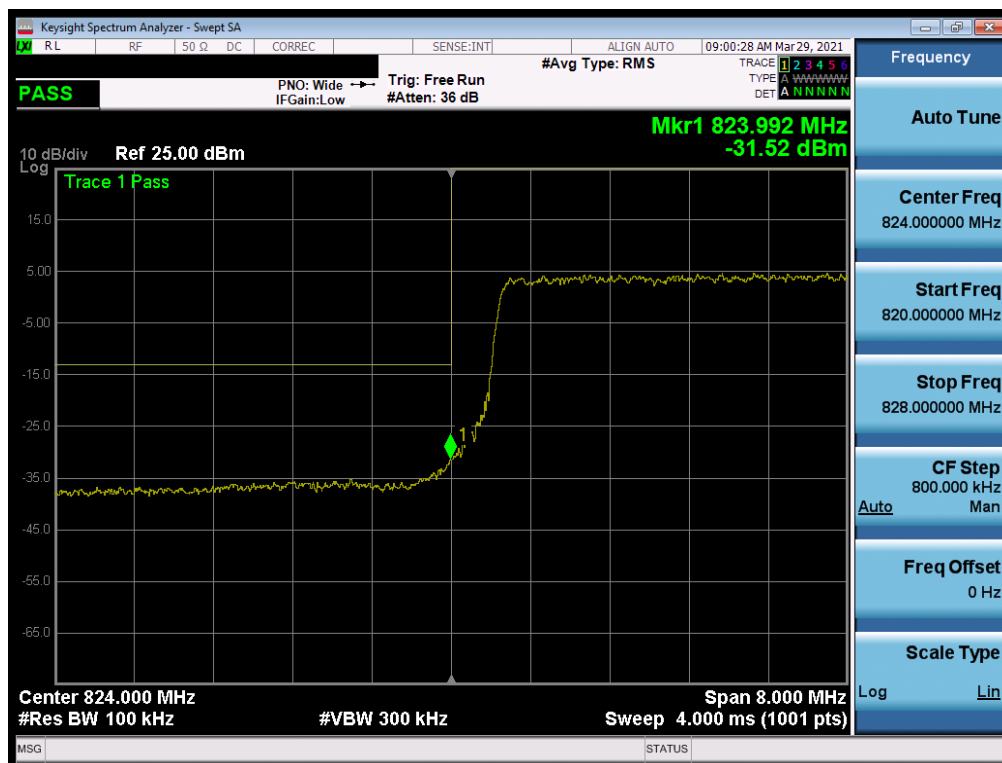


Plot 7-66. Lower Band Edge Plot (LTE Band 26 - 15MHz QPSK – Full RB)



Plot 7-67. Upper Band Edge Plot (LTE Band 26 - 15MHz QPSK – Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 51 of 88

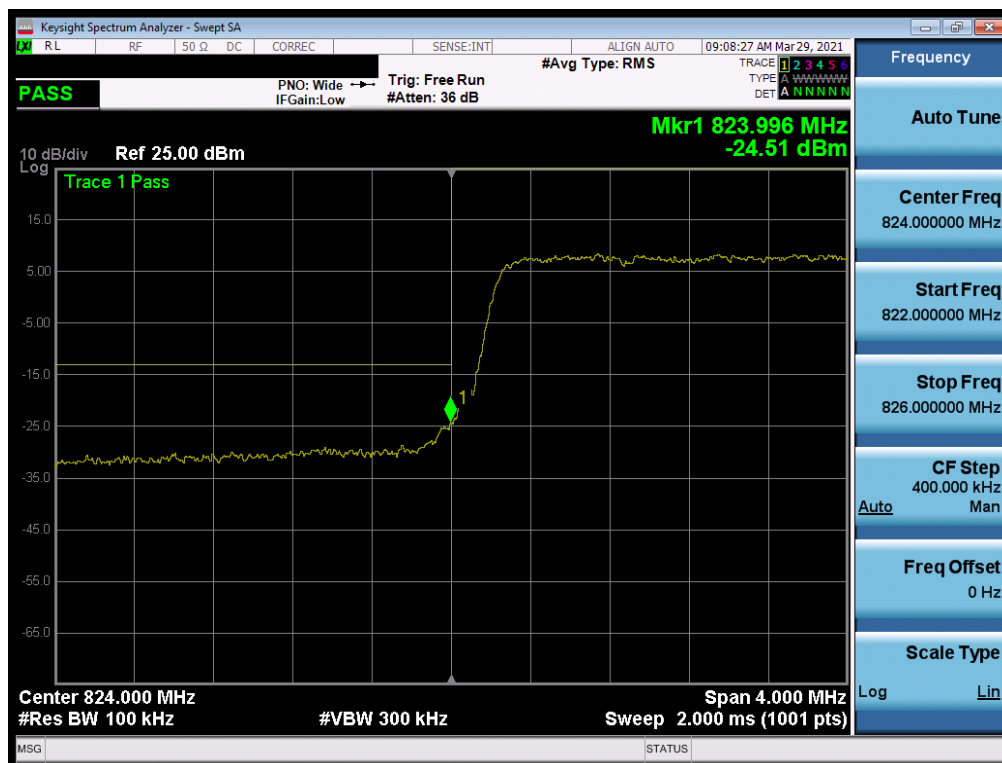


Plot 7-68. Lower Band Edge Plot (LTE Band 26/5 - 10MHz QPSK – Full RB)

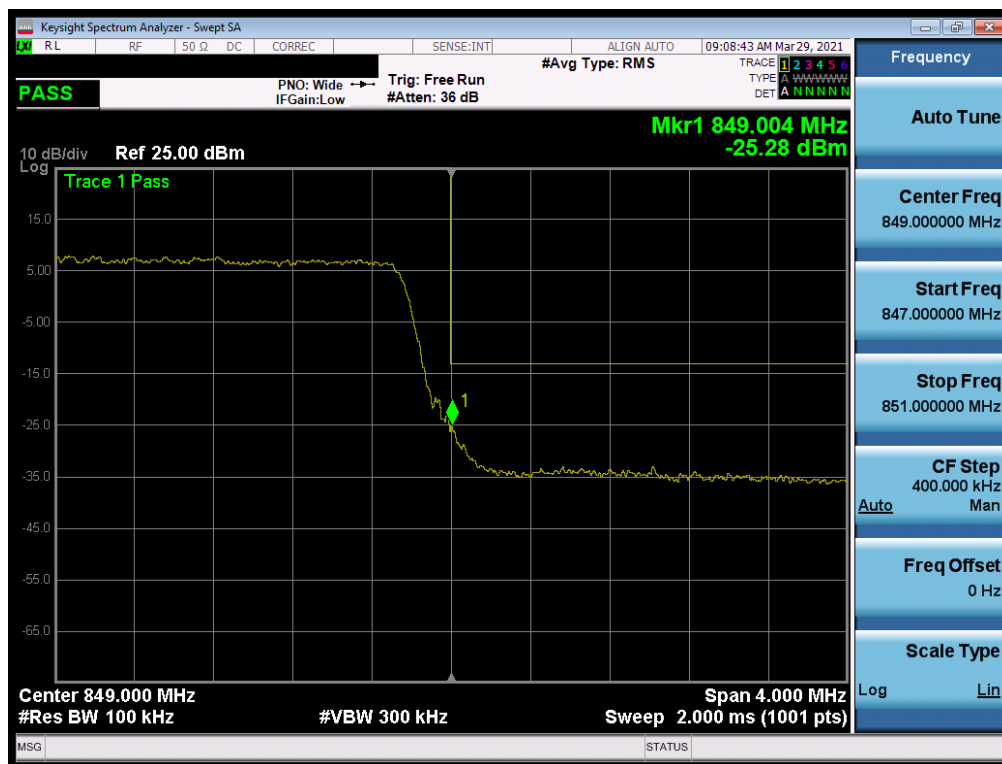


Plot 7-69. Upper Band Edge Plot (LTE Band 26/5 - 10MHz QPSK – Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 52 of 88

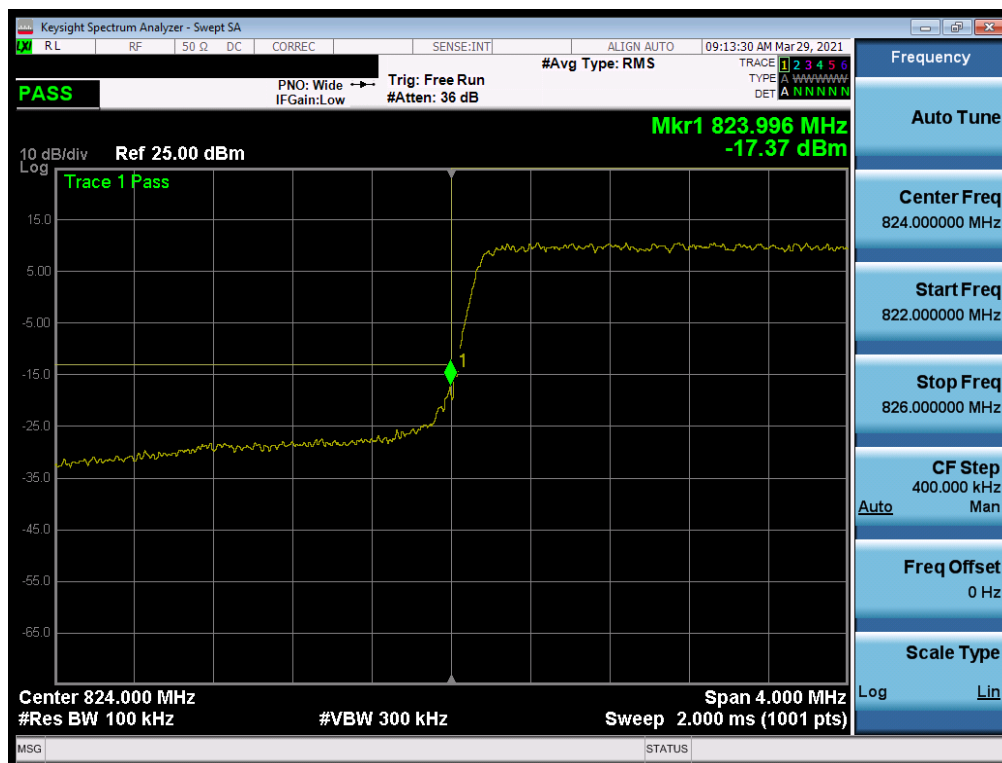


Plot 7-70. Lower Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB)



Plot 7-71. Upper Band Edge Plot (LTE Band 26/5 - 5MHz QPSK – Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 53 of 88



Plot 7-72. Lower Band Edge Plot (LTE Band 26/5 - 3MHz QPSK – Full RB)



Plot 7-73. Upper Band Edge Plot (LTE Band 26/5 - 3MHz QPSK – Full RB)

FCC ID: A3LSMF926B	<b>PCTEST</b> Proud to be part of element	PART 22 MEASUREMENT REPORT	<b>SAMSUNG</b>	Approved by: Technical Manager
Test Report S/N: 1M2104190044-02.A3L	Test Dates: 4/28/2021 – 06/09/2021	EUT Type: Portable Handset		Page 54 of 88