

**MEASUREMENT REPORT**  
**LTE/Sub 6GHz NR EN-DC****Applicant Name:**Samsung Electronics Co., Ltd.  
129, Samsung-ro,  
Yeongtong-gu, Suwon-si  
Gyeonggi-do, 16677, Korea**Date of Testing:**

03/09 - 04/17/2020

**Test Site/Location:**

PCTEST Lab. Columbia, MD, USA

**Test Report Serial No.:**

1M2003120045-03.A3L

**FCC ID:****A3LSMG986W****APPLICANT:****Samsung Electronics Co., Ltd.****Application Type:**

Class II Permissive Change

**Model:**

SM-G986W

**EUT Type:**

Portable Handset

**FCC Classification:**

PCS Licensed Transmitter Held to Ear (PCE)

**FCC Rule Part(s):**

22, 24, &amp; 27

**Test Procedure(s):**ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01  
KDB 648474 D03 v01r04**Class II Permissive Change:**


Please see FCC change document



**Original Grant Date:**

02/21/2020

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.

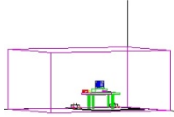
  
Randy Ortanez  
President

<b>FCC ID:</b> A3LSMG986W		<b>MEASUREMENT REPORT</b> <b>(CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 1 of 54	

## TABLE OF CONTENTS

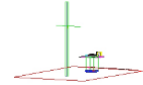
1.0	INTRODUCTION .....	4
1.1	Scope .....	4
1.2	PCTEST Test Location.....	4
1.3	Test Facility / Accreditations.....	4
2.0	PRODUCT INFORMATION.....	5
2.1	Equipment Description .....	5
2.2	Device Capabilities.....	5
2.3	Test Configuration .....	5
2.4	EMI Suppression Device(s)/Modifications .....	5
3.0	DESCRIPTION OF TESTS .....	6
3.1	Measurement Procedure.....	6
3.2	Radiated Power and Radiated Spurious Emissions .....	6
4.0	MEASUREMENT UNCERTAINTY .....	7
5.0	TEST EQUIPMENT CALIBRATION DATA .....	8
6.0	SAMPLE CALCULATIONS .....	9
7.0	TEST RESULTS .....	10
7.1	Summary .....	10
7.2	Occupied Bandwidth .....	12
7.3	Spurious and Harmonic Emissions at Antenna Terminal .....	21
7.4	Band Edge Emissions at Antenna Terminal .....	37
7.5	Peak-Average Ratio .....	43
7.6	Radiated Power (ERP/EIRP).....	46
7.7	Radiated Spurious Emissions Measurements.....	49
8.0	CONCLUSION.....	54

FCC ID: A3LSMG986W	 <b>MEASUREMENT REPORT</b> (CLASS II PERMISSIVE CHANGE)		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 2 of 54





## MEASUREMENT REPORT

### FCC Part 22, 24, & 27



Mode	FCC Rule Part	Tx Frequency (MHz)	ERP		EIRP		Emission Designator	Modulation
			Max. Power (W)	Max. Power (dBm)	Max. Power (W)	Max. Power (dBm)		
n71	27	665.5 - 695.5					4M57G7D	BPSK
n71	27	668 - 693					9M00G7D	BPSK
n71	27	670.5 - 690.5					13M5G7D	BPSK
n71	27	673 - 688	0.033	15.19			18M0G7D	BPSK
n66	27	1712.5 - 1777.5					4M53G7D	BPSK
n66	27	1715 - 1775					8M99G7D	BPSK
n66	27	1717.5 - 1772.5					13M5G7D	BPSK
n66	27	1720 - 1770			0.120	20.81	17M9G7D	BPSK
n41	27	2506.02 - 2679.99					17M9G7D	BPSK
n41	27	2516.01 - 2670.00					35M8G7D	BPSK
n41	27	2521.02 - 2664.99					45M7G7D	BPSK
n41	27	2526.00 - 2659.98					57M9G7D	BPSK
n41	27	2536.00 - 2650.00					77M3G7D	BPSK
n41	27	2541.00 - 2644.98					86M9G7D	BPSK
n41	27	2546.01 - 2640.00			0.118	20.71	96M7G7D	BPSK

#### EUT Overview

FCC ID: A3LSMG986W		<b>MEASUREMENT REPORT</b> (CLASS II PERMISSIVE CHANGE)		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 3 of 54	

## 1.0 INTRODUCTION

### 1.1 Scope

Measurement and determination of electromagnetic emissions (EMC) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission and the Innovation, Science and Economic Development Canada.



### 1.2 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility located at 7185 Oakland Mills Road, Columbia, MD 21046. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

### 1.3 Test Facility / Accreditations

Measurements were performed at PCTEST located in Columbia, MD 21046, U.S.A.

- PCTEST is an ISO 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISED.

FCC ID: A3LSMG986W	 <b>MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>			<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset		Page 4 of 54

## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMG986W**. The test data contained in this report pertains only to the emissions due to the EUT's LTE/Sub 6GHz NR function.

**Test Device Serial No.:** 1011M, 3760M, 0321M

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n71, n66, n41), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (1x, EDR, LE), NFC, ANT+, Wireless Power Transfer

Sub 6GHz NR Band n71 (663 – 698 MHz) operates using 15kHz Subcarrier Spacing with both CP-OFDM and DFT-s OFDM waveforms. The band supports QPSK, BPSK, 16QAM, 64QAM, and 256QAM modulation. The test data provided in this report represents the worst case configuration.

Sub 6GHz NR Band n66 (1710 – 1780 MHz) operates using 15kHz Subcarrier Spacing with both CP-OFDM and DFT-s OFDM waveforms. The band supports QPSK, BPSK, 16QAM, 64QAM, and 256QAM modulation. The test data provided in this report represents the worst case configurations.

Sub 6GHz NR Band n41 (2496 – 2690 MHz) operates using 30kHz Subcarrier Spacing with both CP-OFDM and DFT-s OFDM waveforms. The band supports QPSK, BPSK, 16QAM, 64QAM, and 256QAM modulation. The test data provided in this report represents the worst case configurations.

This device uses a tuner circuit that dynamically updates the antenna impedance parameters to optimize antenna performance for certain bands and modes of operation. The tuner for this device was set to simulate a "free space" condition where the transmit antenna is matched to the medium into which it is transmitting and, thus, the power is at its maximum level.

### 2.3 Test Configuration



The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 7.0 of this test report for a description of the radiated and antenna port conducted emissions tests.

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.

The device was operated using FTM test software to broadcast Sub 6GHz functions as well as LTE during EN-DC operations.

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

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

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 5 of 54	

## 3.0 DESCRIPTION OF TESTS

### 3.1 Measurement Procedure

The measurement procedures described in the document titled “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems” (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. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.



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

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

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

The calculated  $P_d$  levels are then compared to the absolute spurious emission limit of -13dBm which is equivalent to the required minimum attenuation of  $43 + 10 \log_{10}(\text{Power [Watts]})$ . For n41, the calculated  $P_d$  levels are compared to the absolute spurious emission limit of -25dBm which is equivalent to the required minimum attenuation of  $55 + 10 \log_{10}(\text{Power [Watts]})$ .



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.

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 6 of 54	

## 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

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 7 of 54	

## 5.0 TEST EQUIPMENT CALIBRATION DATA



Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurements antennas used during testing were calibrated in accordance to the requirements of ANSI C63.5-2017.

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	LTx1	Licensed Transmitter Cable Set	6/4/2019	Annual	6/4/2020	LTx1
-	LTx2	Licensed Transmitter Cable Set	10/30/2019	Annual	10/30/2020	LTx2
Agilent	N9020A	MXA Signal Analyzer	4/20/2019	Annual	4/20/2020	US46470561
Agilent	N9038A	MXE EMI Receiver	7/17/2019	Annual	7/17/2020	MY51210133
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Com-Power	PAM-103	Pre-Amplifier (1-1000MHz)	5/10/2019	Annual	5/10/2020	441112
Espec	ESX-2CA	Environmental Chamber	6/13/2019	Annual	6/13/2020	17620
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini Circuits	PWR-SEN-4GHS	USB Power Sensor	4/19/2019	Annual	4/19/2020	11401010036
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	6/5/2019	Annual	6/5/2020	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	7/8/2019	Annual	7/8/2020	102133
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Rx	4/30/2018	Biennial	4/30/2020	9105-2404
Schwarzbeck	UHA 9105	Dipole Antenna (400 - 1GHz) Tx	4/30/2018	Biennial	4/30/2020	9105-2403
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	4/19/2018	Biennial	4/19/2020	A051107
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511

**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.

FCC ID: A3LSMG986W	 <b>MEASUREMENT REPORT</b> (CLASS II PERMISSIVE CHANGE)		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 8 of 54



## 6.0 SAMPLE CALCULATIONS

### Emission Designator

#### BPSK Modulation

**Emission Designator = 8M62G7D**

LTE BW = 8.62 MHz

G = Phase Modulation



7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

### Spurious Radiated Emission – LTE Band

#### **Example: Middle Channel LTE Mode 2<sup>nd</sup> Harmonic (1564 MHz)**

The average 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 1564 MHz. So 6.1 dB is added to the signal generator reading of  $-30.9$  dBm yielding  $-24.80$  dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm – (-24.80).

<b>FCC ID:</b> A3LSMG986W		<b>MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 9 of 54	



## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Samsung Electronics Co., Ltd.  
 FCC ID: A3LSMG986W  
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)  
 Mode(s): LTE/Sub 6GHz NR

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	RSS-Gen(4.6.1) RSS-133(2.3) RSS-139(2.3)	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1051 22.917(a) 27.53(g) 27.53(h)	RSS-130(4.6) RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Out of Band Emissions	> 43 + 10 log <sub>10</sub> (P[Watts]) at Band Edge and for all out-of-band emissions			Section 7.3, 7.4
27.53(m)	RSS-199(4.5)	Out of Band Emissions	Undesirable emissions must meet the limits detailed in 27.53(m)			Section 7.3, 7.4
24.232(d) 27.50	RSS-130(4.4) RSS-132(5.4) RSS-133(6.4) RSS-139(6.5)	Peak-Average Ratio	< 13 dB			Section 7.5
2.1046	RSS-130(4.4) RSS-132(5.4) RSS-133(4.1) RSS-139(4.1) RSS-199(4.4)	Transmitter Conducted Output Power	N/A			See RF Exposure Report

**Table 7-1. Summary of Conducted Test Results**



<b>FCC ID:</b> A3LSMG986W		<b>MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 10 of 54	

FCC Part Section(s)	RSS Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
27.50(b)(10) 27.50(c)(10)	RSS-130(4.4)	Effective Radiated Power / Equivalent Isotropic Radiated Power (n71)	< 3 Watts max. ERP	RADIATED	PASS	Section 7.6
24.232(c) 27.50(h)(2)	RSS-133(6.4) RSS-199(4.4)	Equivalent Isotropic Radiated Power (n41)	< 2 Watts max. EIRP			Section 7.6
27.50(d)(4)	RSS-139(6.5)	Equivalent Isotropic Radiated Power (Band n66)	< 1 Watts max. EIRP			Section 7.6
2.1053 22.917(a) 24.238(a) 27.53(h)	RSS-130(4.6) RSS-132(5.5) RSS-133(6.5) RSS-139(6.6)	Undesirable Emissions (n66)	> 43 + 10 log <sub>10</sub> (P[Watts]) for all out-of-band emissions			Section 7.7
27.53(m)	RSS-199(4.5)	Undesirable Emissions (n41)	Undesirable emissions must meet the limits detailed in 27.53(m)			Section 7.7

**Table 7-2. Summary of Radiated 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 (Sections 7.2, 7.3, 7.4, 7.5) were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "LTE Automation," Version 5.3.
- 5) For operation <1GHz, the EIRP limits in the table above are referenced to the specifications written in the relevant Radio Standards Specifications for Innovation, Science, and Economic Development Canada.

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 11 of 54	

## 7.2 Occupied Bandwidth

### Test Overview

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

### Test Procedure Used

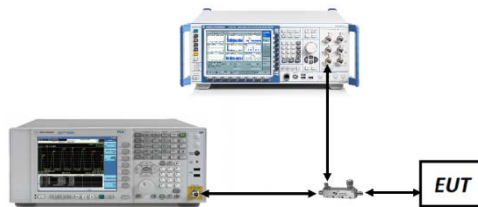
KDB 971168 D01 v03r01 – Section 4.2

### Test Settings

1. The signal analyzer's automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW  $\geq$  3 x RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

### Test Setup



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



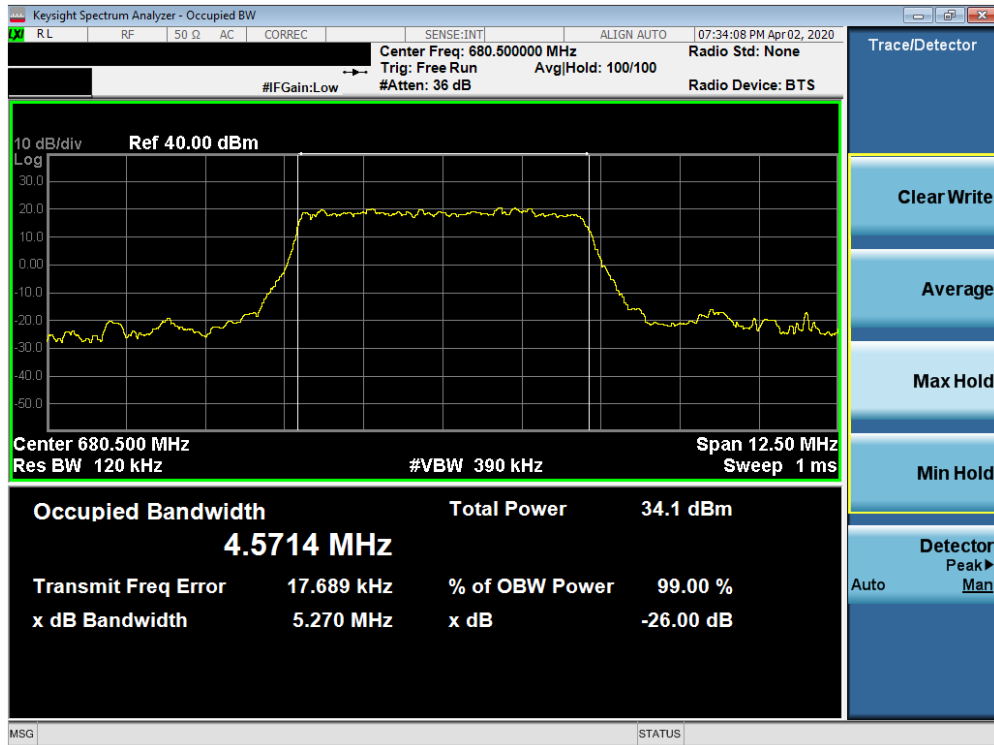
**Figure 7-1. Test Instrument & Measurement Setup**

### Test Notes

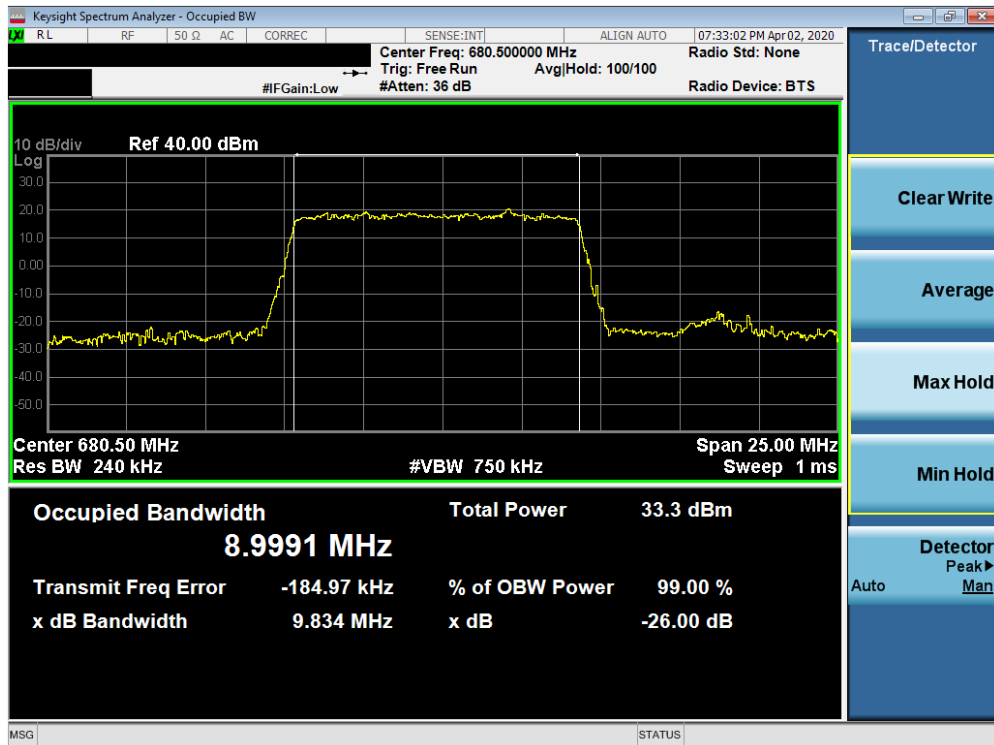
Emissions were tested in all modes and worst case in DFT-s-OFDM BPSK is reported.

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 12 of 54	

## NR Band n71

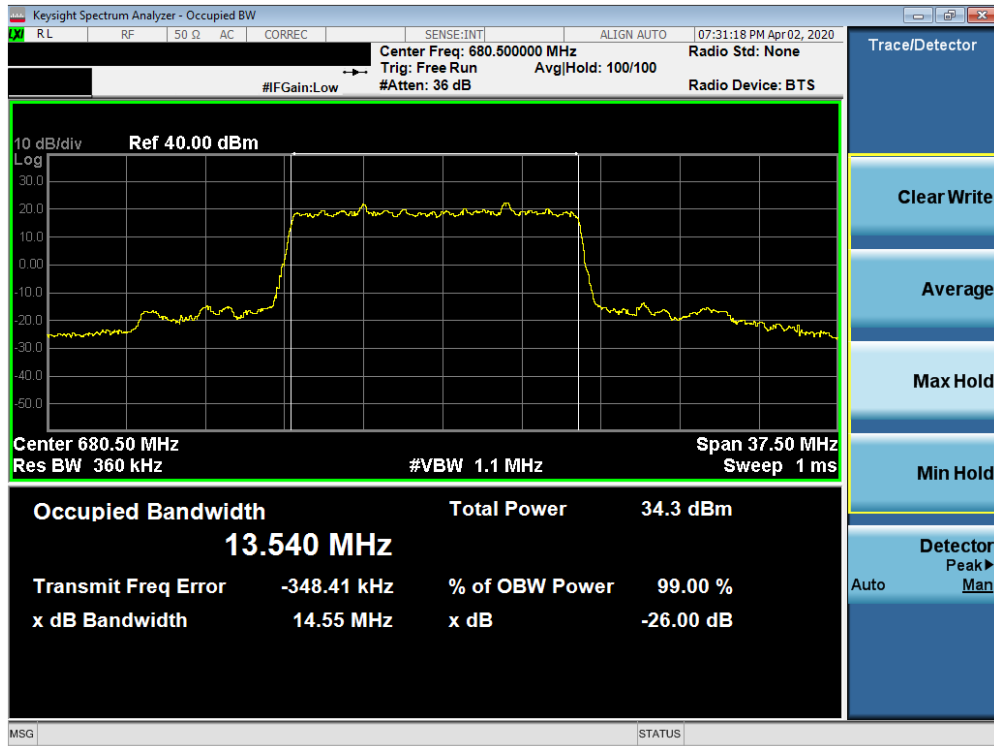


Plot 7-1. Occupied Bandwidth Plot (n71 5MHz DFT-s-OFDM-BPSK Full RB Configuration)

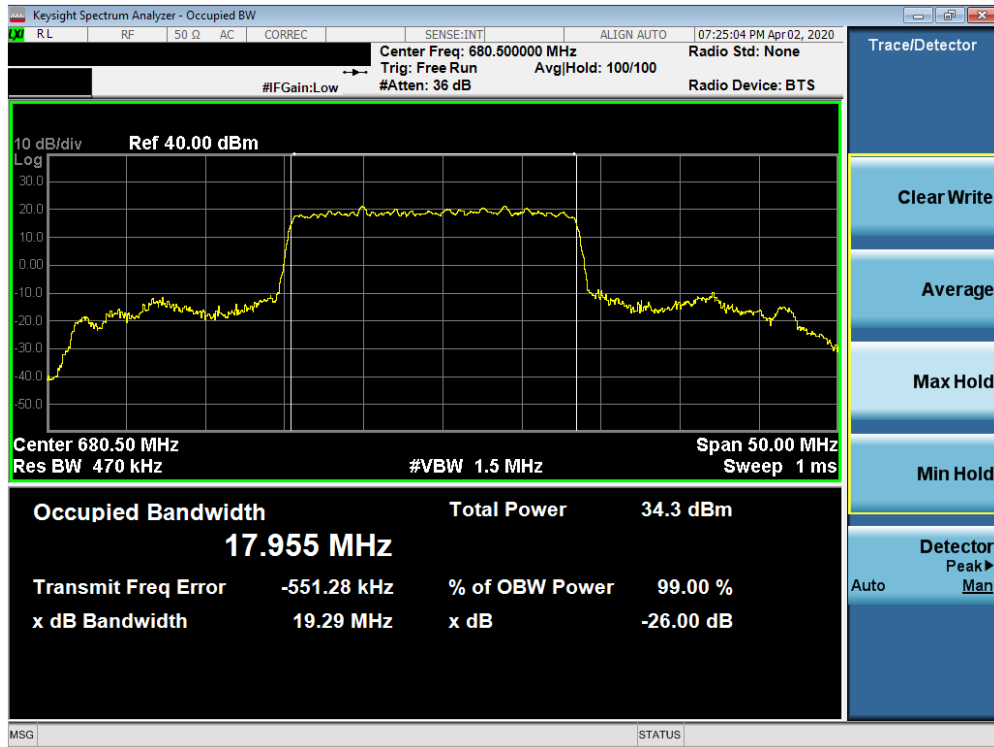


Plot 7-2. Occupied Bandwidth Plot (n71 10MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 13 of 54



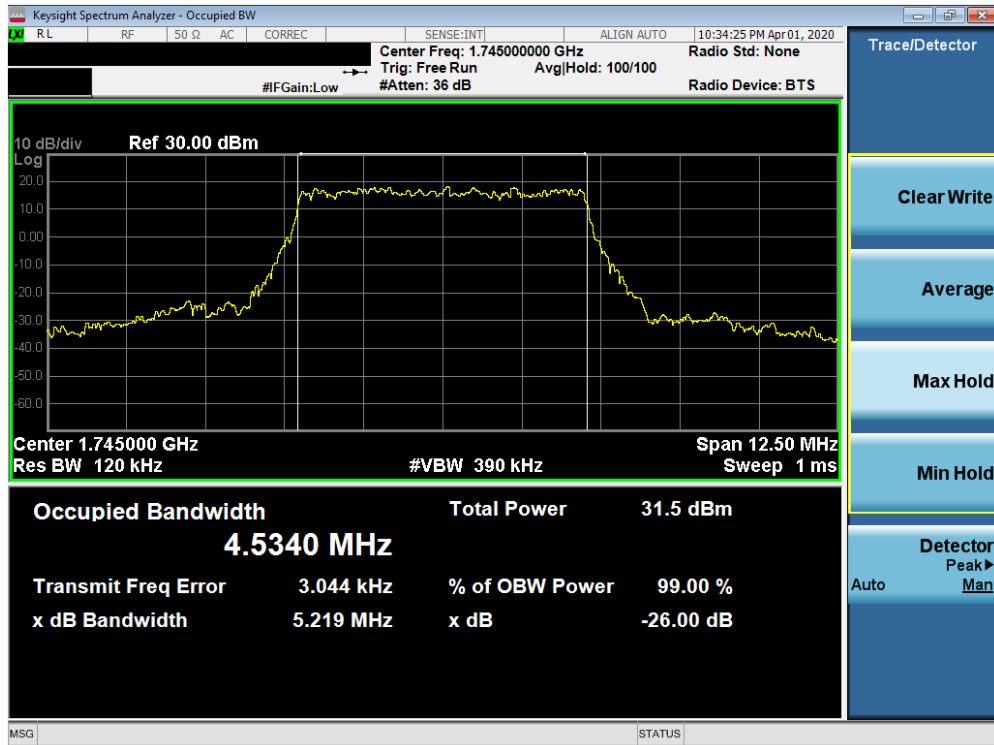
Plot 7-3. Occupied Bandwidth Plot (n71 15MHz DFT-s-OFDM-BPSK - Full RB Configuration)



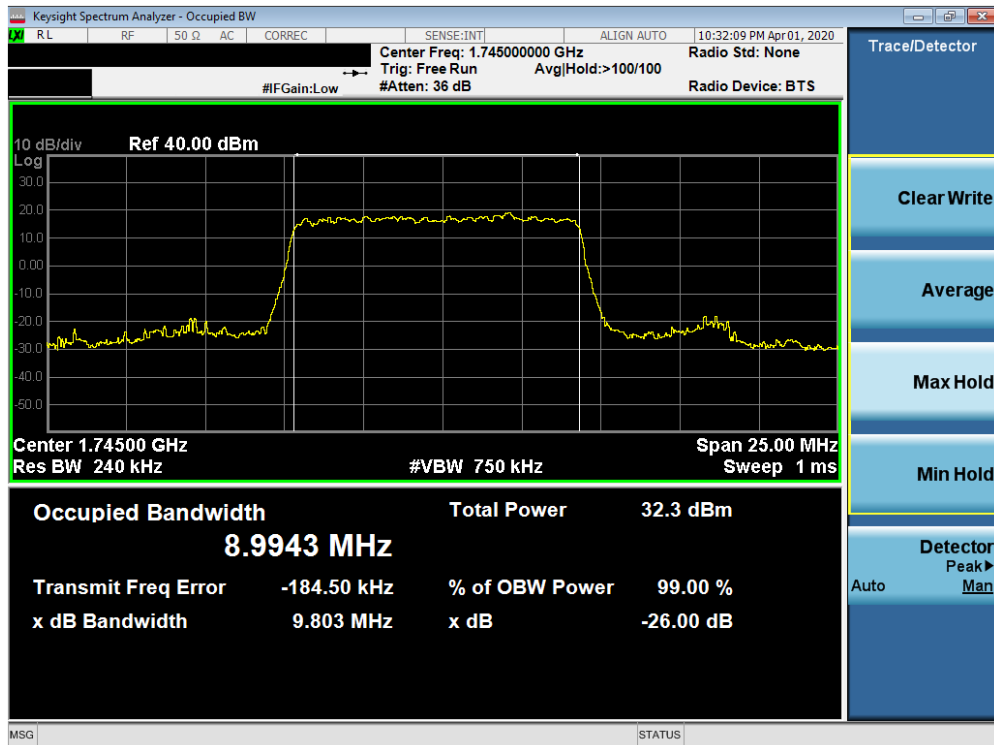
Plot 7-4. Occupied Bandwidth Plot (n71 20MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 14 of 54

## NR Band n66

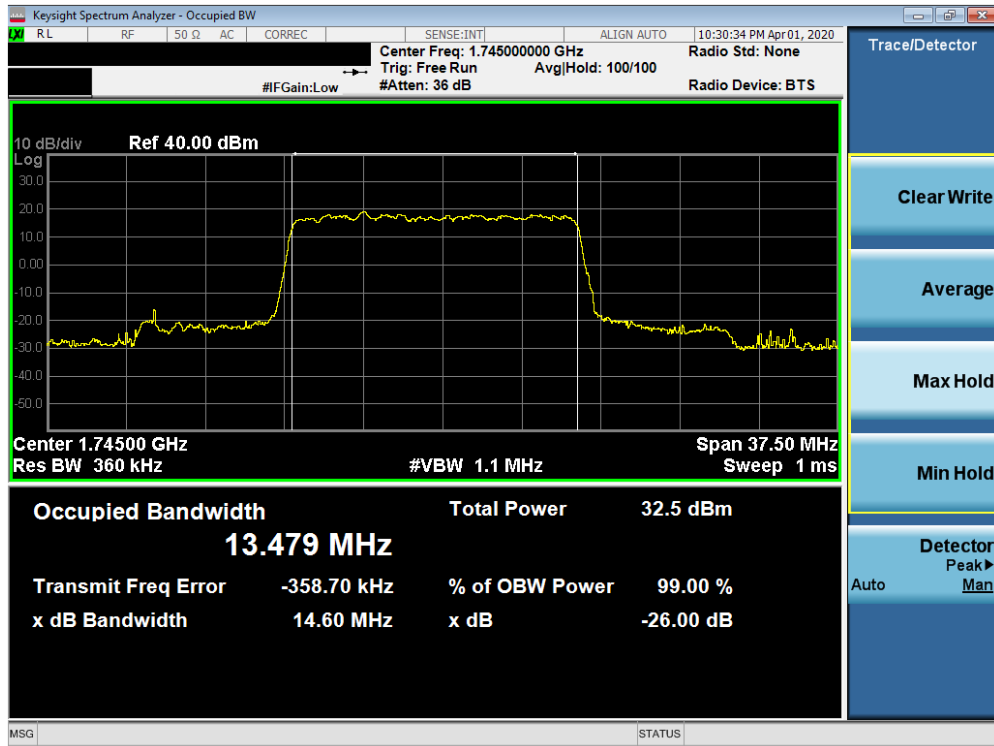


Plot 7-5. Occupied Bandwidth Plot (n66 5MHz DFT-s-OFDM-BPSK Full RB Configuration)

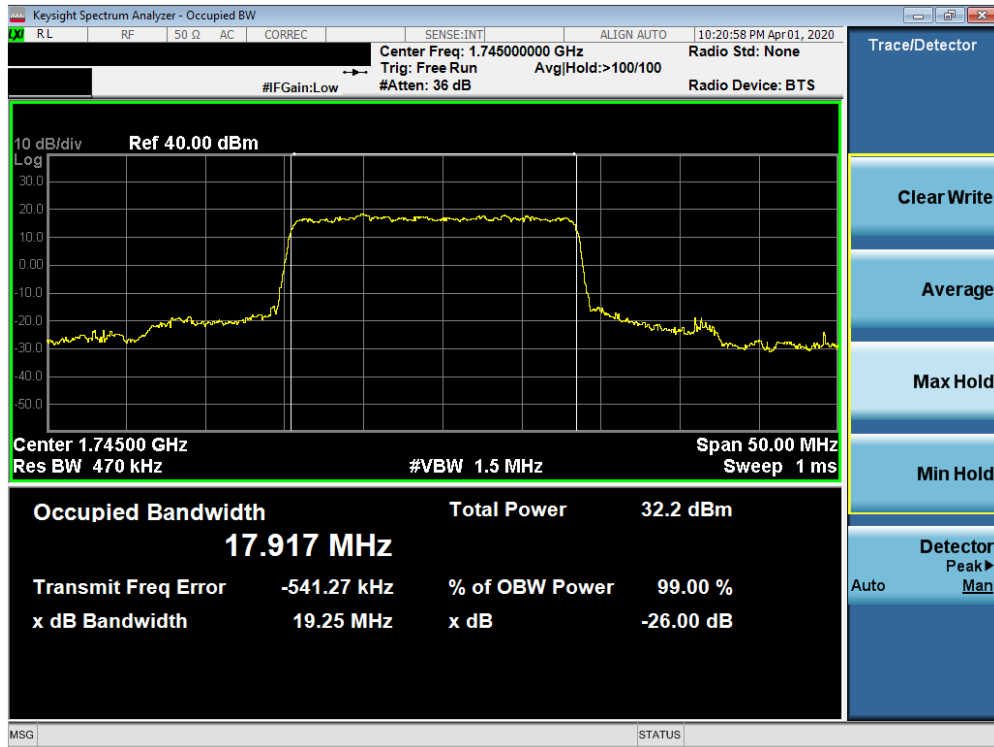


Plot 7-6. Occupied Bandwidth Plot (n66 10MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 15 of 54



Plot 7-7. Occupied Bandwidth Plot (n66 15MHz DFT-s-OFDM-BPSK - Full RB Configuration)

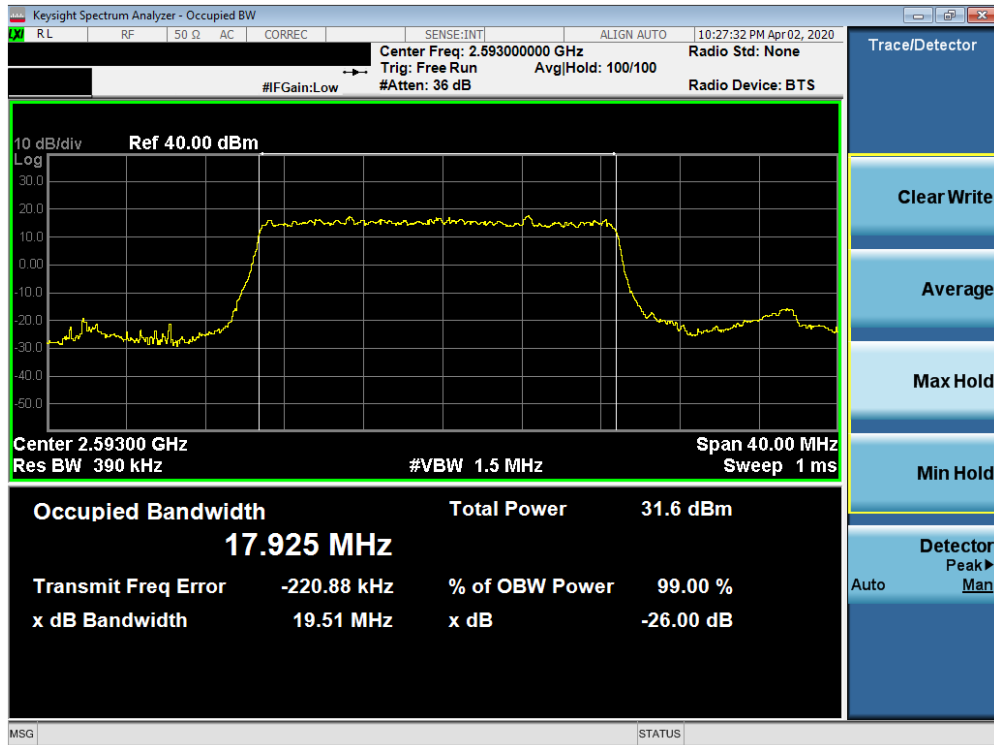


Plot 7-8. Occupied Bandwidth Plot (n66 20MHz DFT-s-OFDM-BPSK - Full RB Configuration)

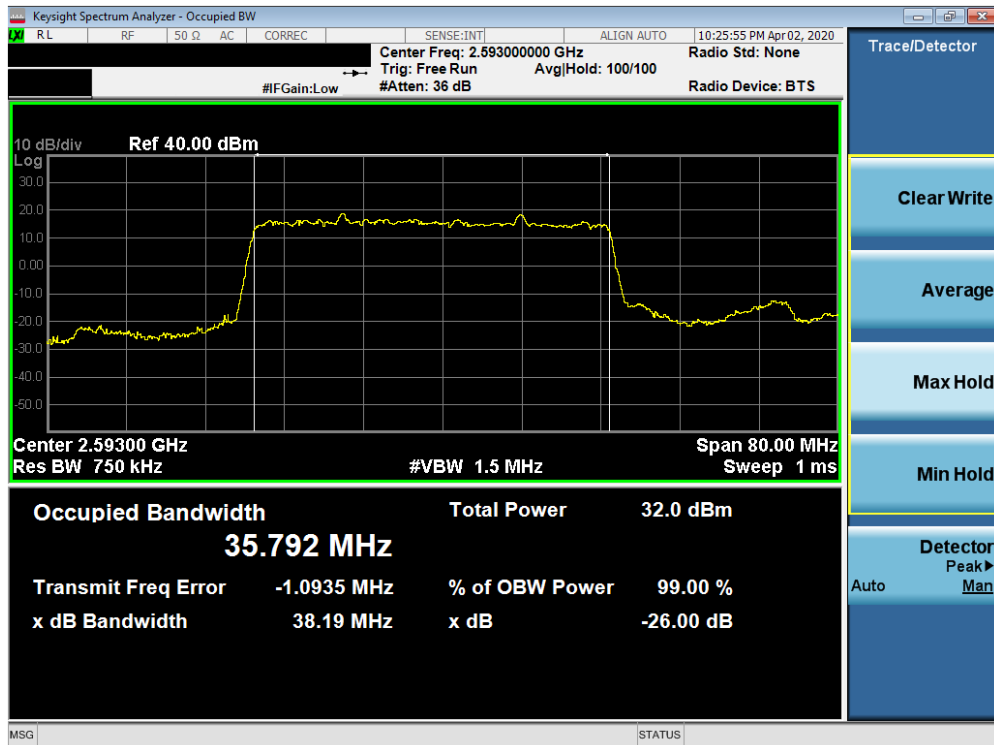
FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 16 of 54



## NR Band n41

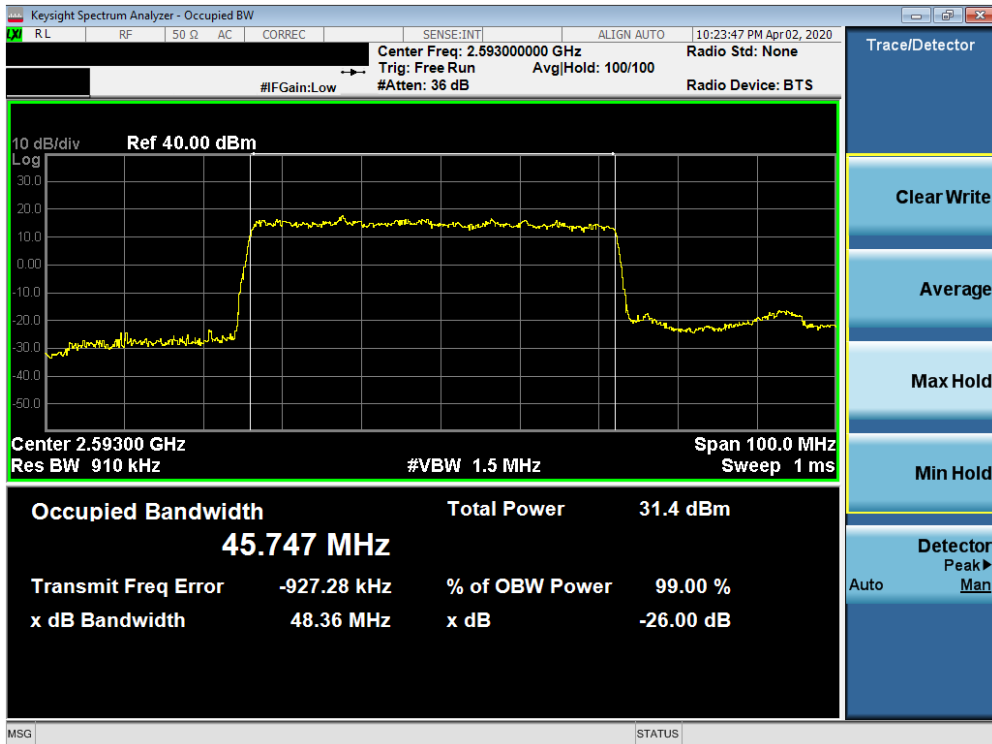


Plot 7-9. Occupied Bandwidth Plot (n41 20MHz DFT-s-OFDM-BPSK Full RB Configuration)

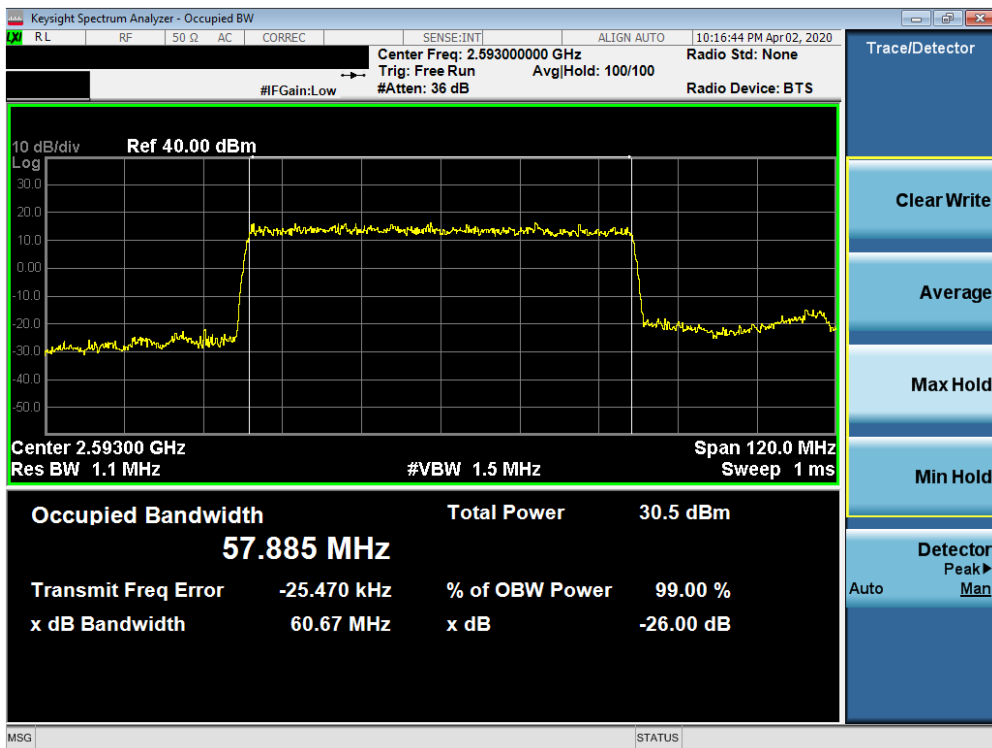


Plot 7-10. Occupied Bandwidth Plot (n41 40MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 17 of 54

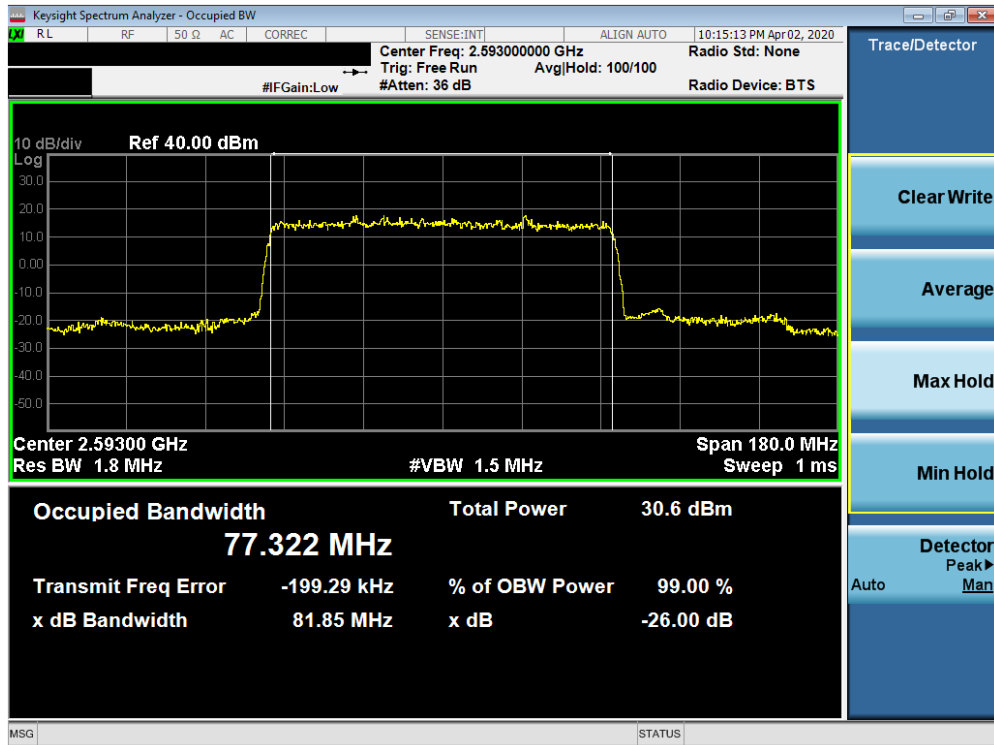


Plot 7-11. Occupied Bandwidth Plot (n41 50MHz DFT-s-OFDM-BPSK - Full RB Configuration)

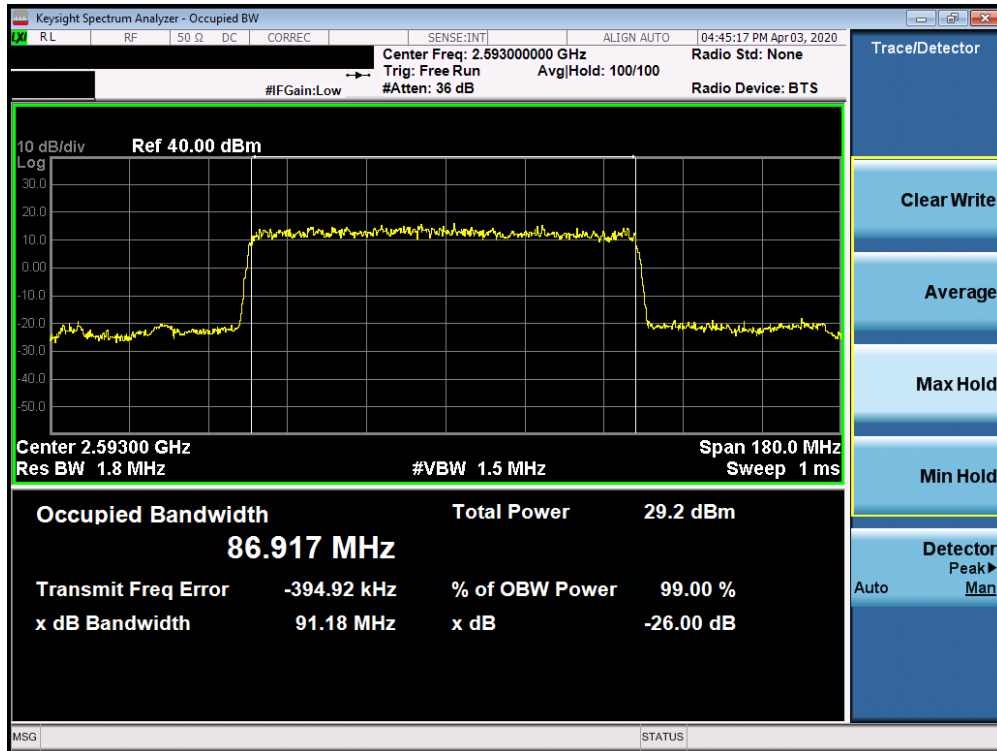


Plot 7-12. Occupied Bandwidth Plot (n41 60MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 18 of 54

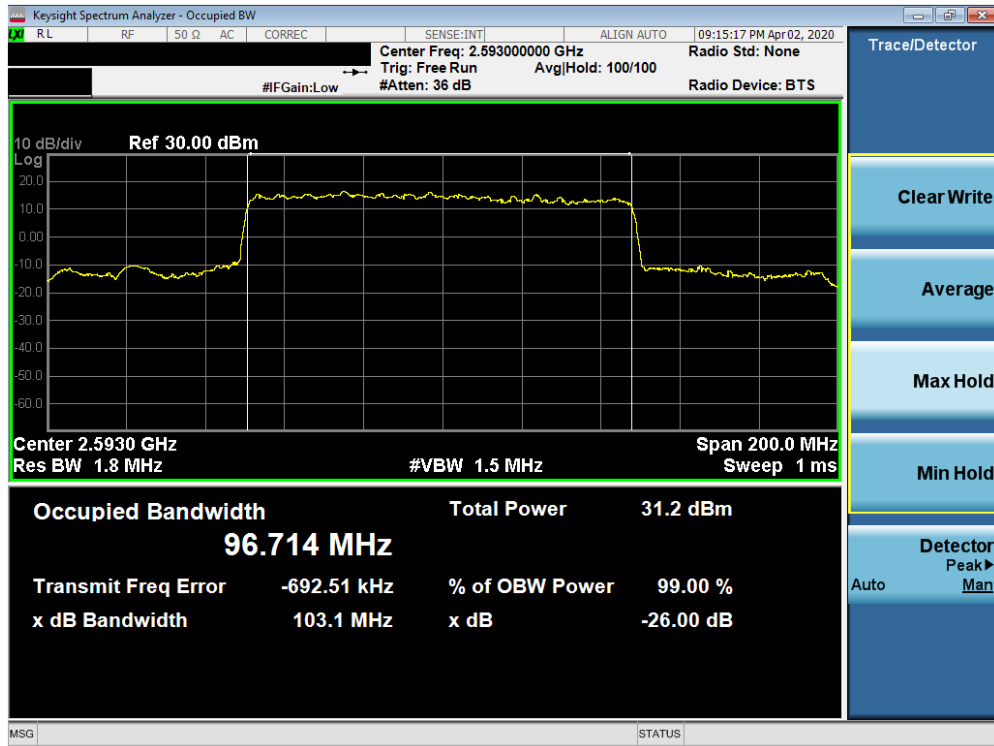


Plot 7-13. Occupied Bandwidth Plot (n41 80MHz DFT-s-OFDM-BPSK Full RB Configuration)



Plot 7-14. Occupied Bandwidth Plot (n41 90MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 19 of 54



Plot 7-15. Occupied Bandwidth Plot (n41 100MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 20 of 54

### 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 its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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

**For n41, the minimum permissible attenuation level of any spurious emission is  $55 + 10 \log_{10}(P_{[Watts]})$ .**

#### Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

#### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to at least 10 \* the fundamental frequency (separated into at least two plots per channel)
2. Detector = RMS
3. Trace mode = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

#### Test Setup

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

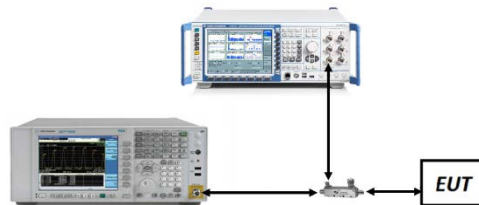




Figure 7-2. Test Instrument & Measurement Setup

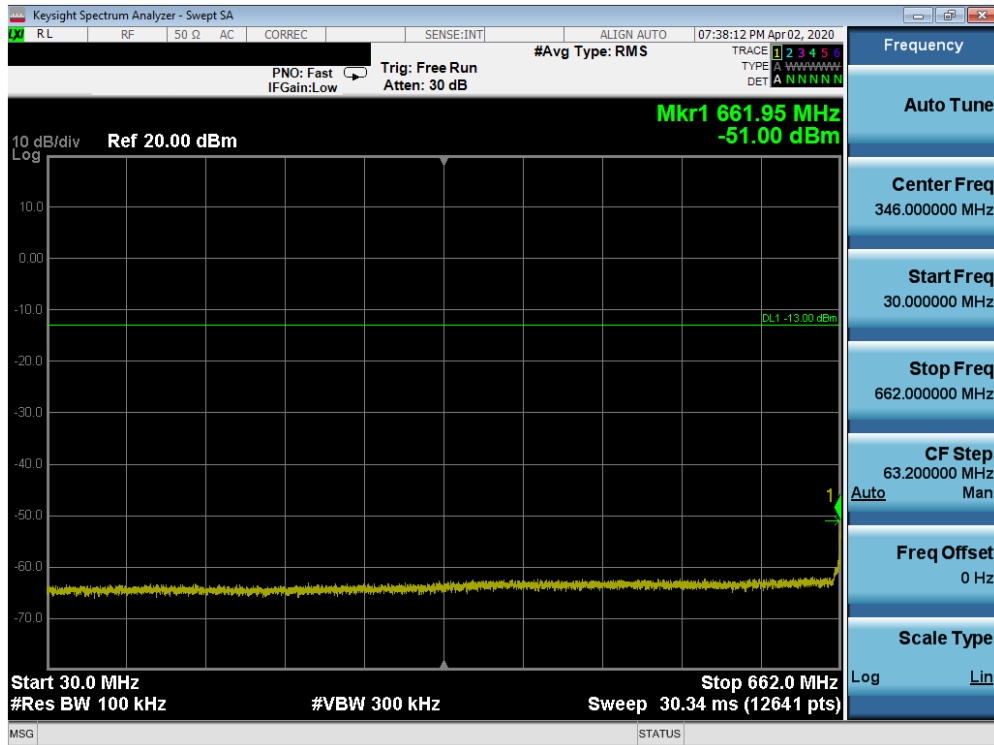
#### Test Notes

Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. 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.

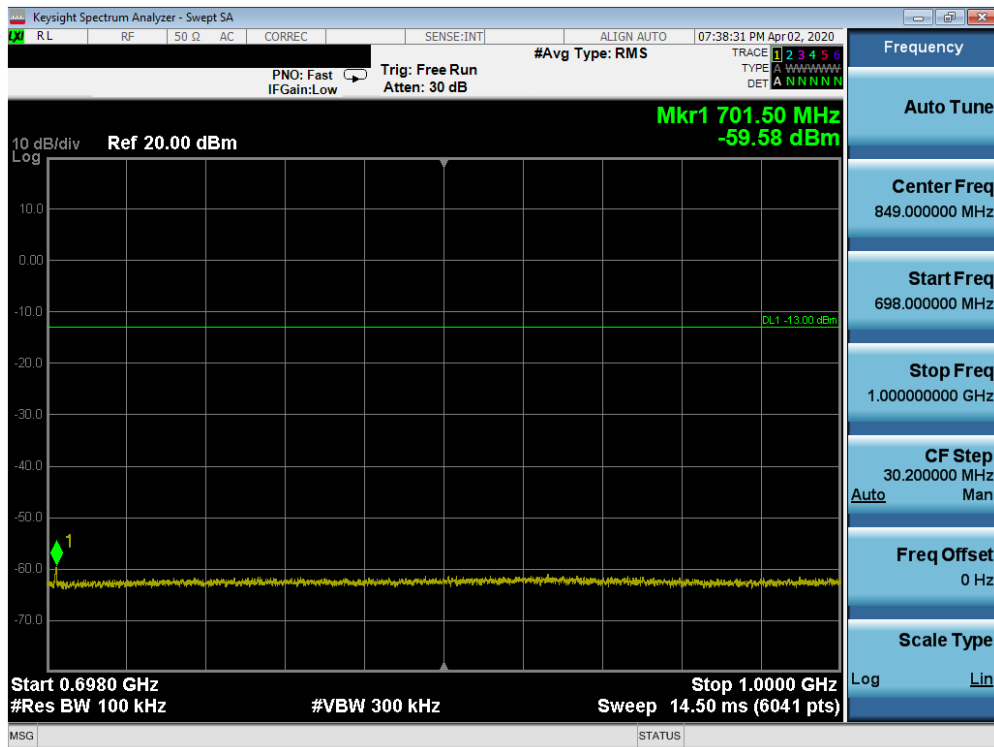
Emissions were tested in all modes and worst case in DFT-s-OFDM BPSK is reported.

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 21 of 54	

### NR Band n71

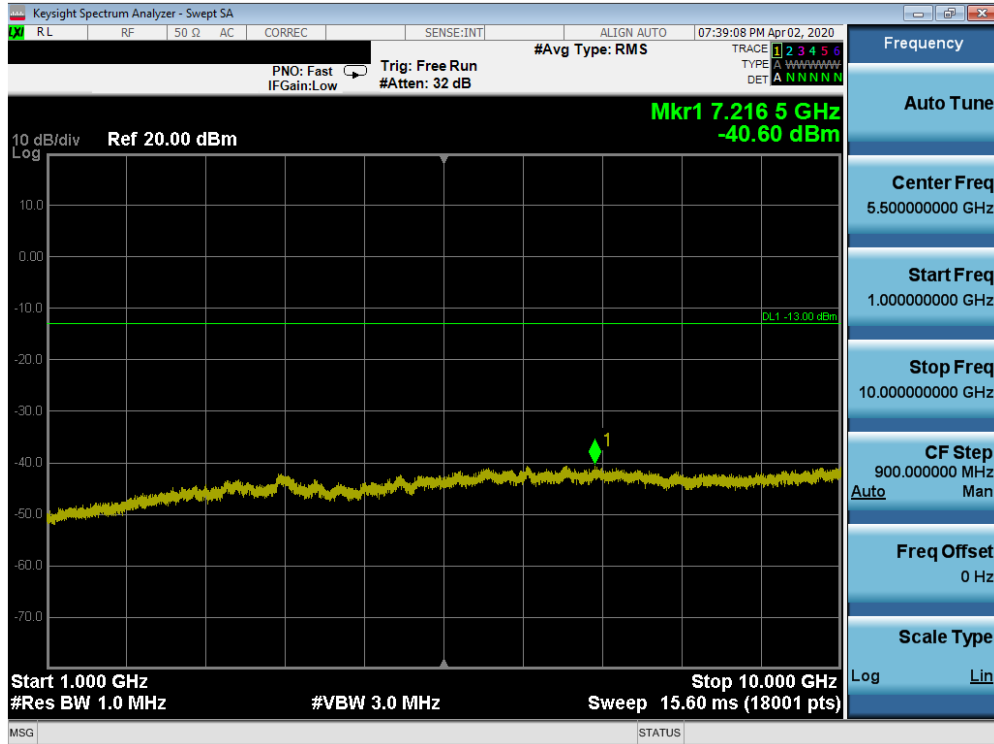


Plot 7-16. Conducted Spurious Plot (n71 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Low Channel)

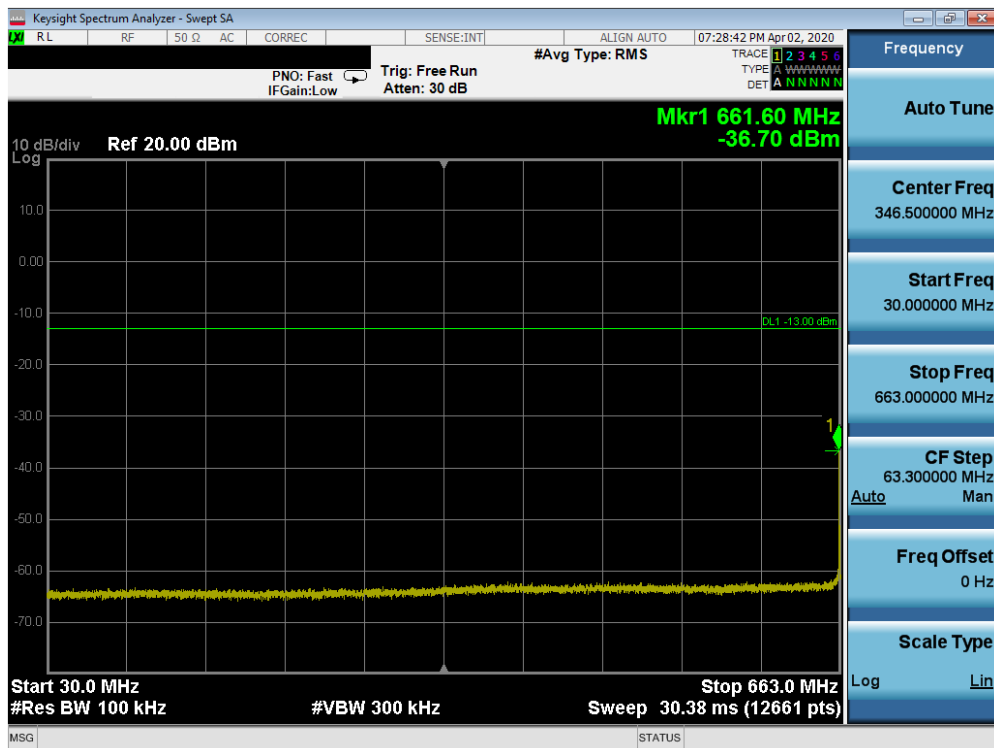


Plot 7-17. Conducted Spurious Plot (n71 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Low Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 22 of 54

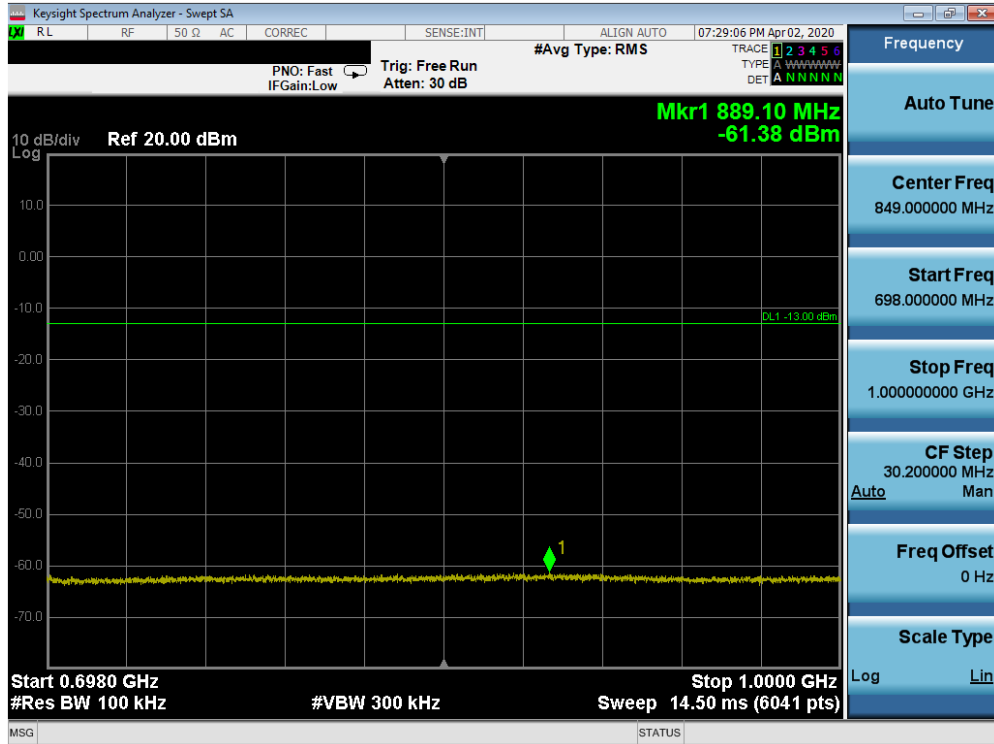


Plot 7-18. Conducted Spurious Plot (n71 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Low Channel)

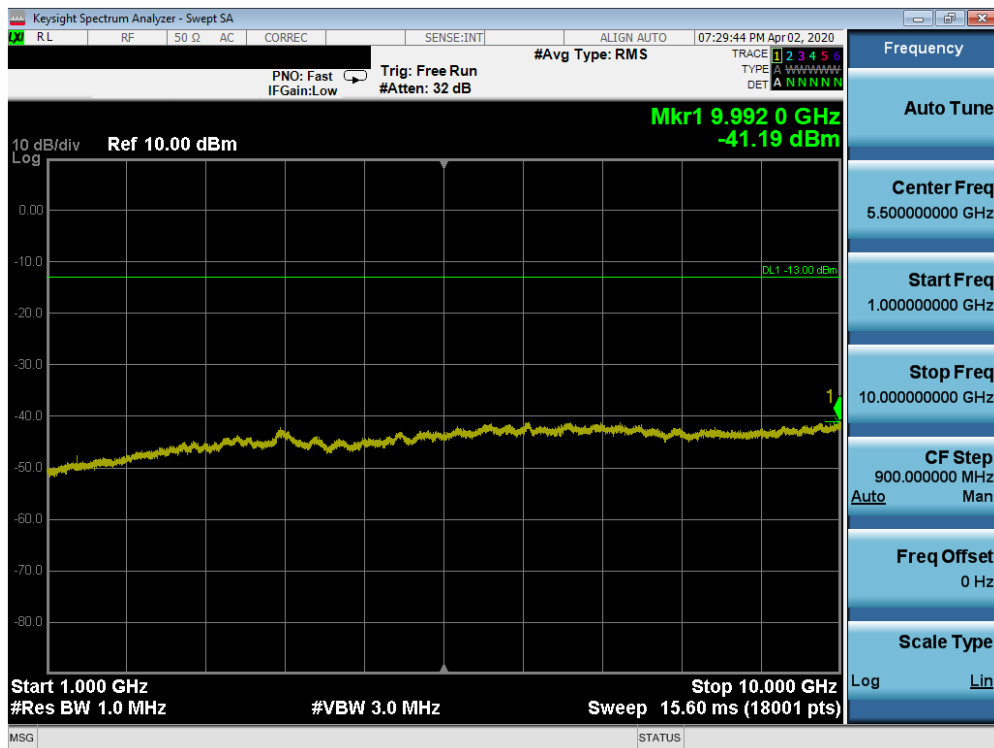


Plot 7-19. Conducted Spurious Plot (n71 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Mid Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 23 of 54



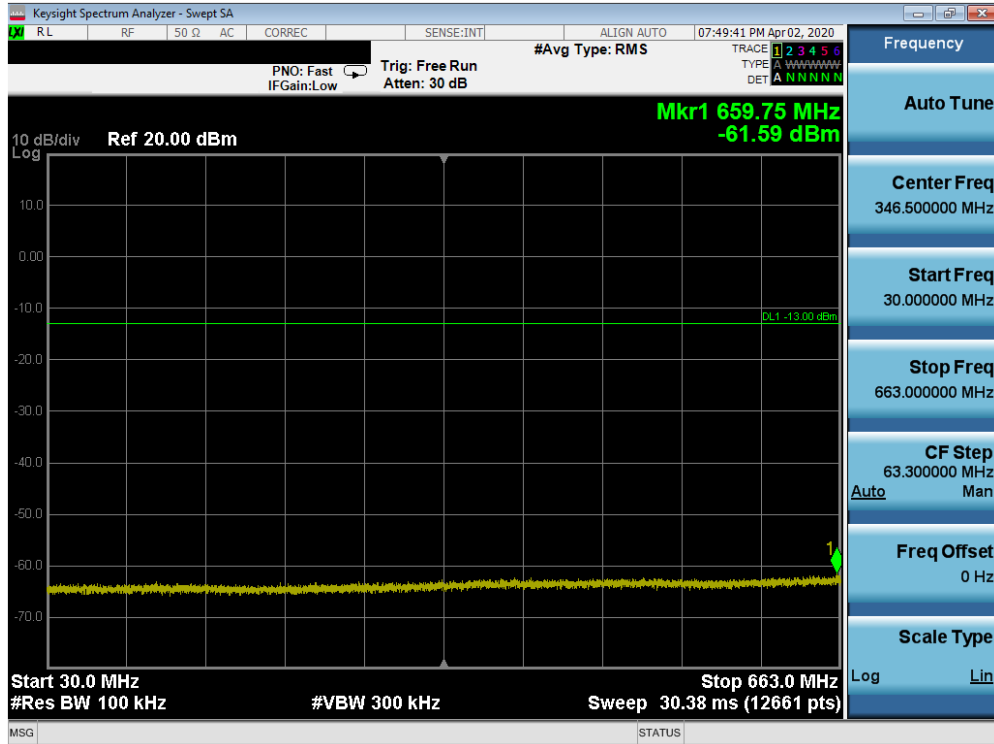
Plot 7-20. Conducted Spurious Plot (n71 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Mid Channel)



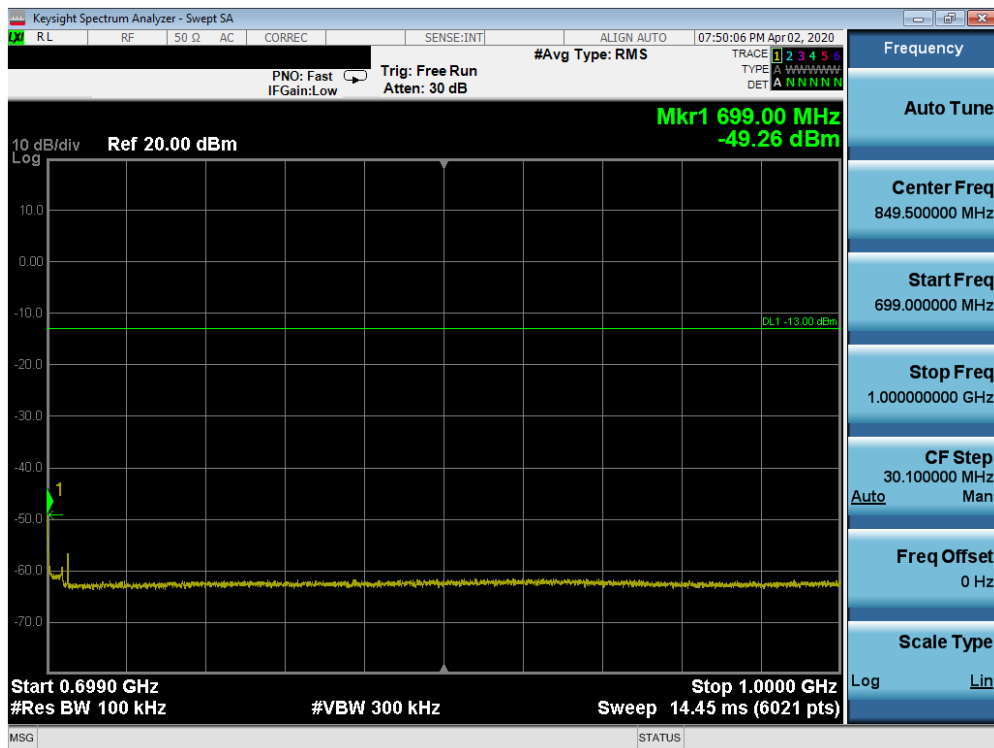
Plot 7-21. Conducted Spurious Plot (n71 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Mid Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 24 of 54



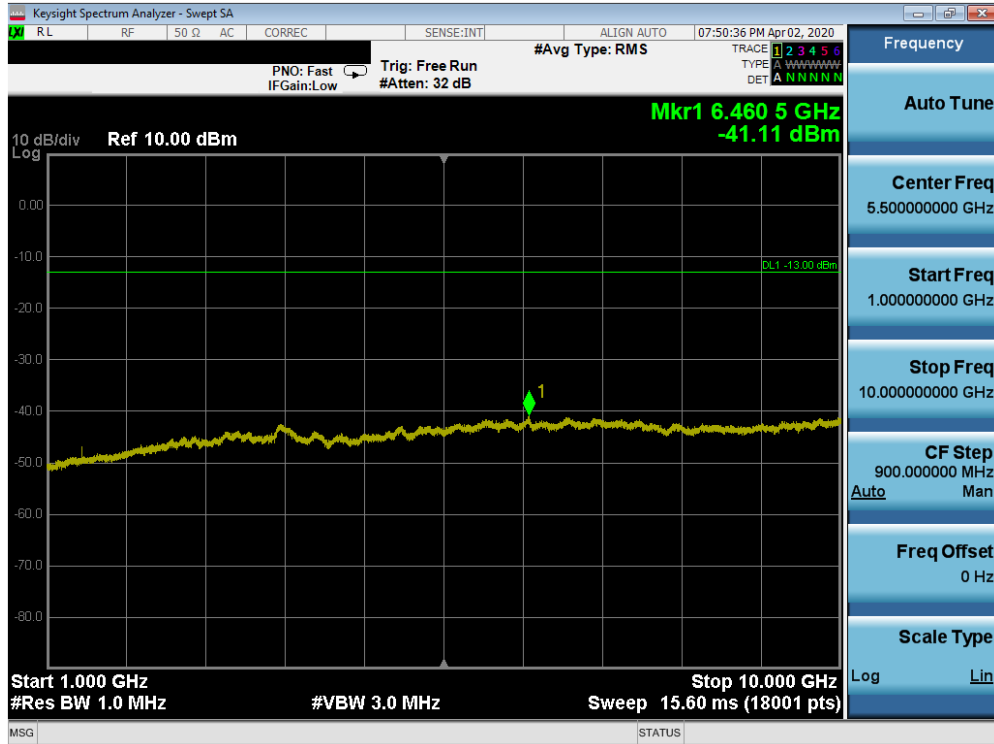


Plot 7-22. Conducted Spurious Plot (n71 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - High Channel)



Plot 7-23. Conducted Spurious Plot (n71 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - High Channel)

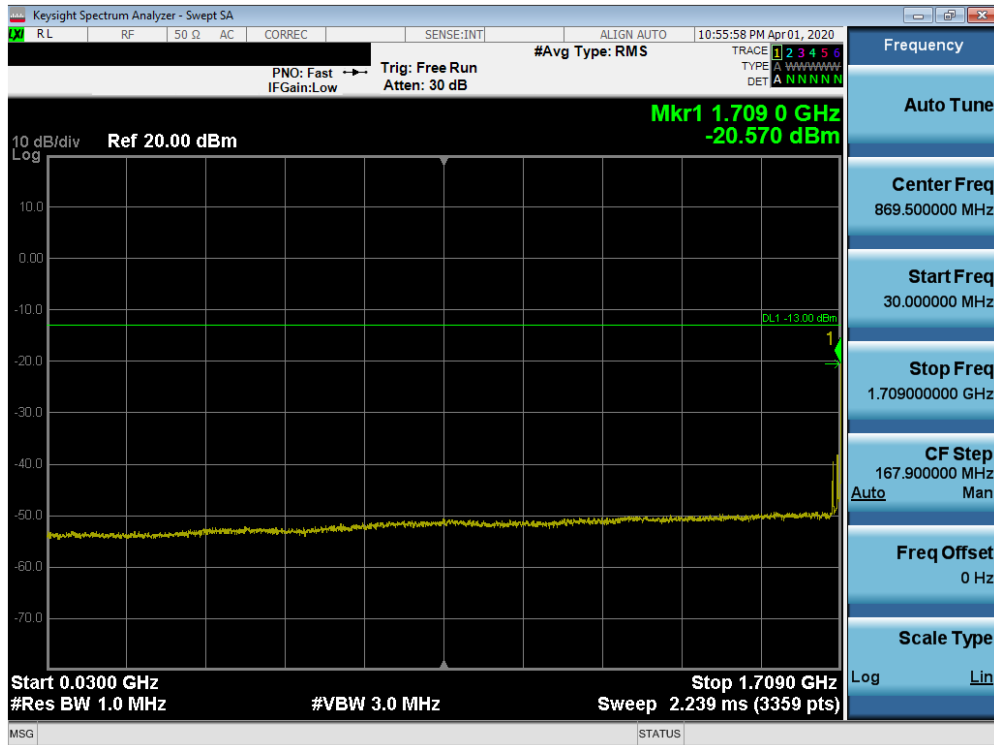
FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 25 of 54



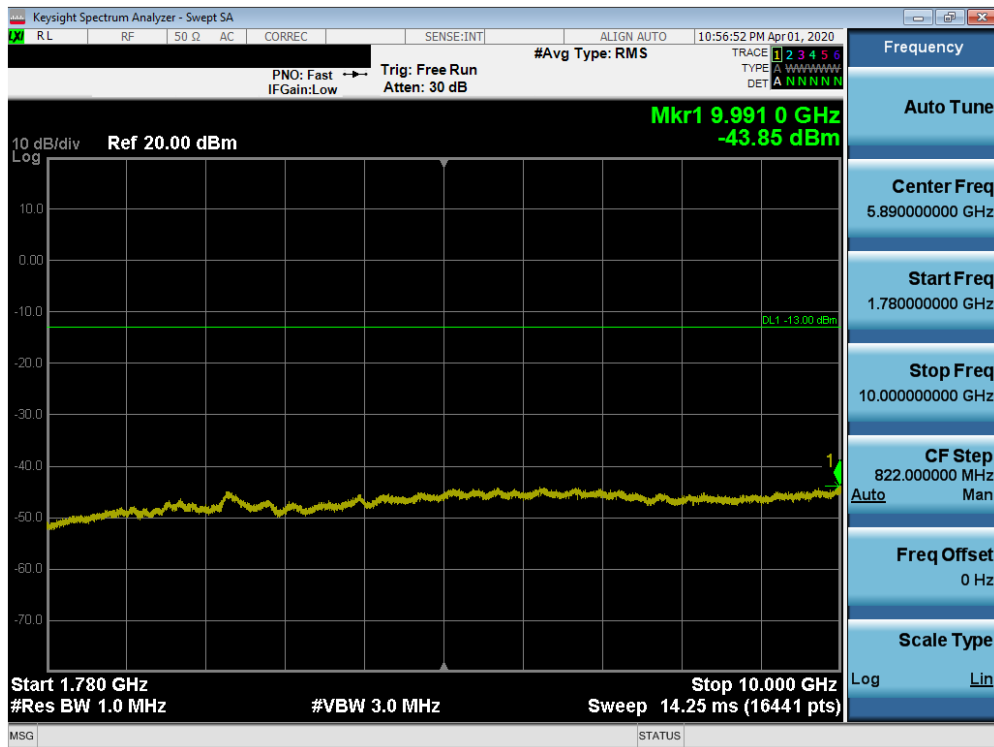
Plot 7-24. Conducted Spurious Plot (n71 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - High Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 26 of 54

### NR Band n66

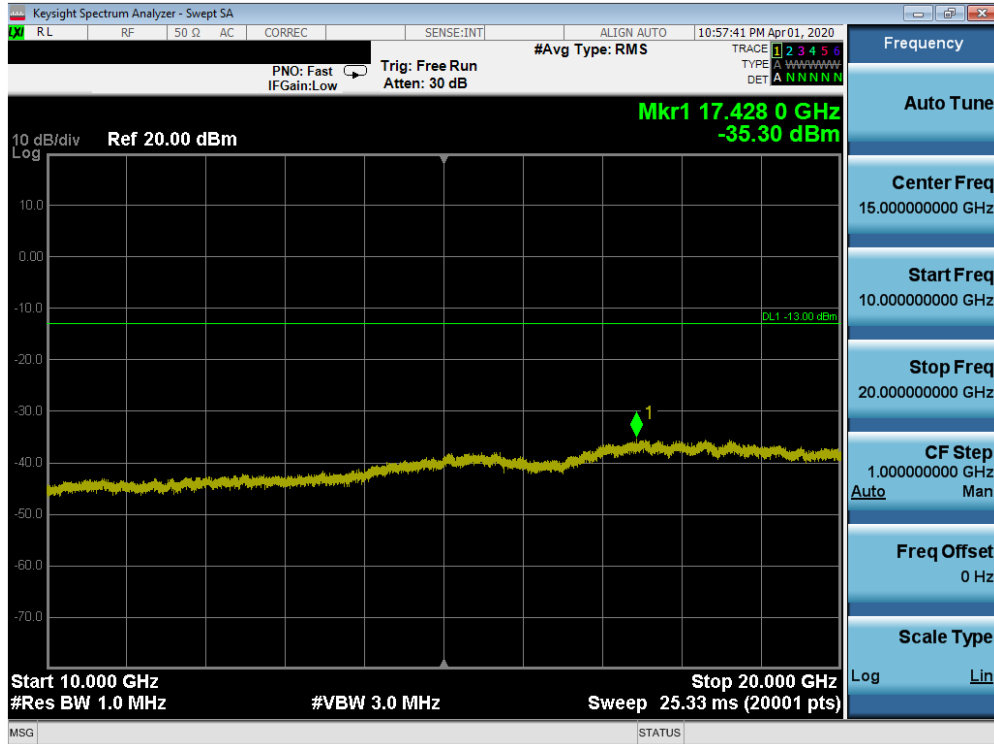


Plot 7-25. Conducted Spurious Plot (n66 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Low Channel)

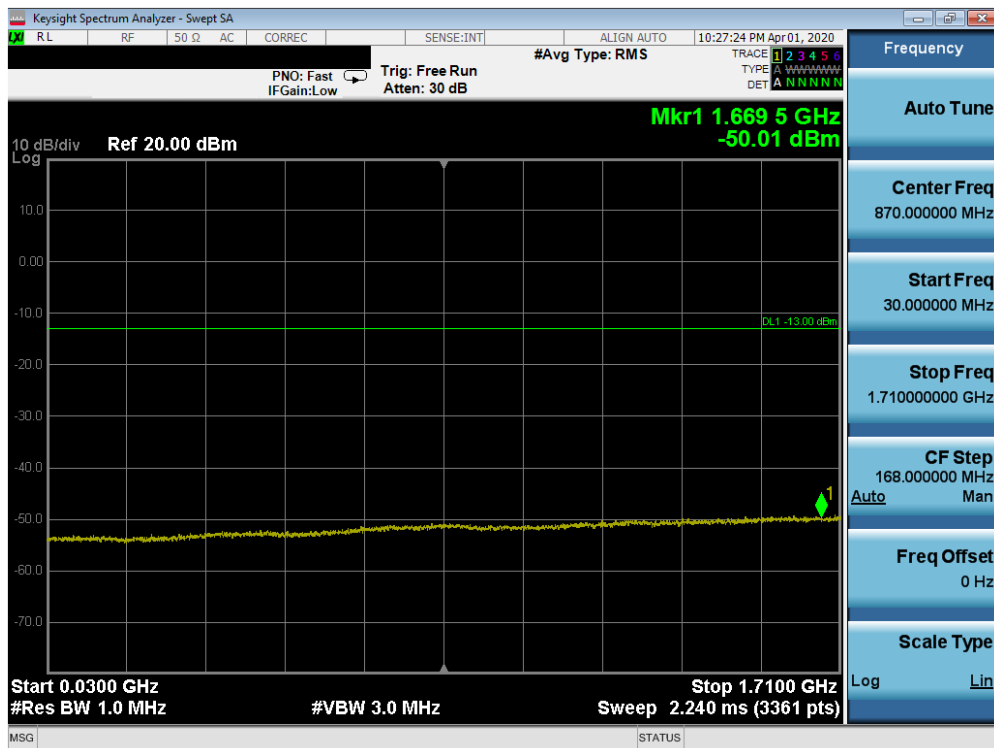


Plot 7-26. Conducted Spurious Plot (n66 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Low Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 27 of 54

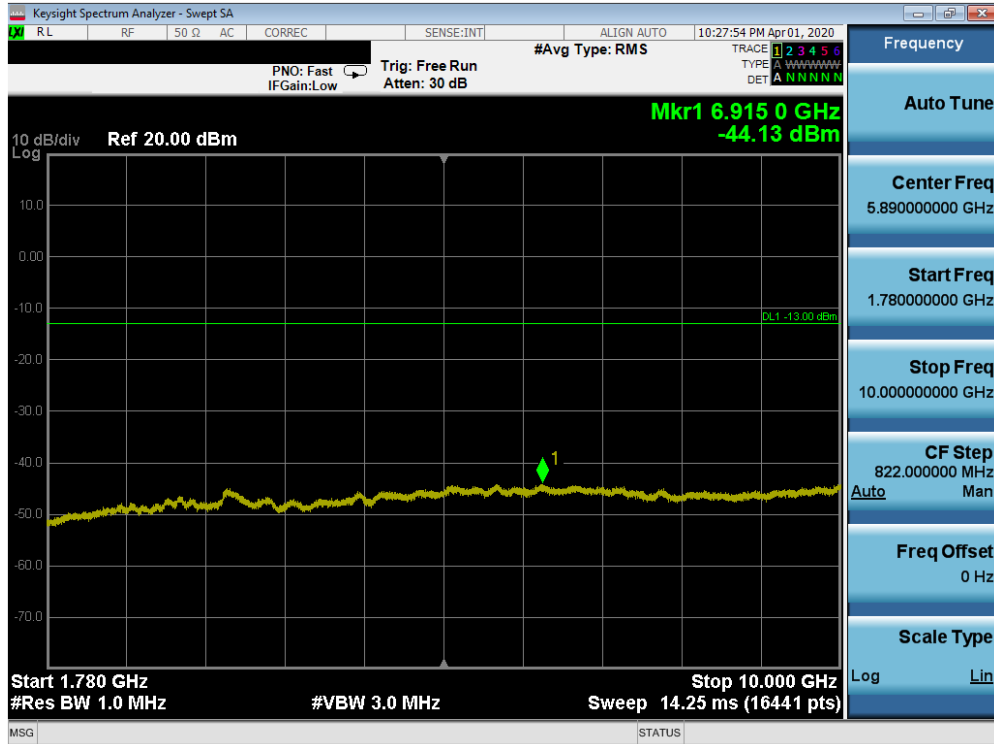


Plot 7-27. Conducted Spurious Plot (n66 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Low Channel)

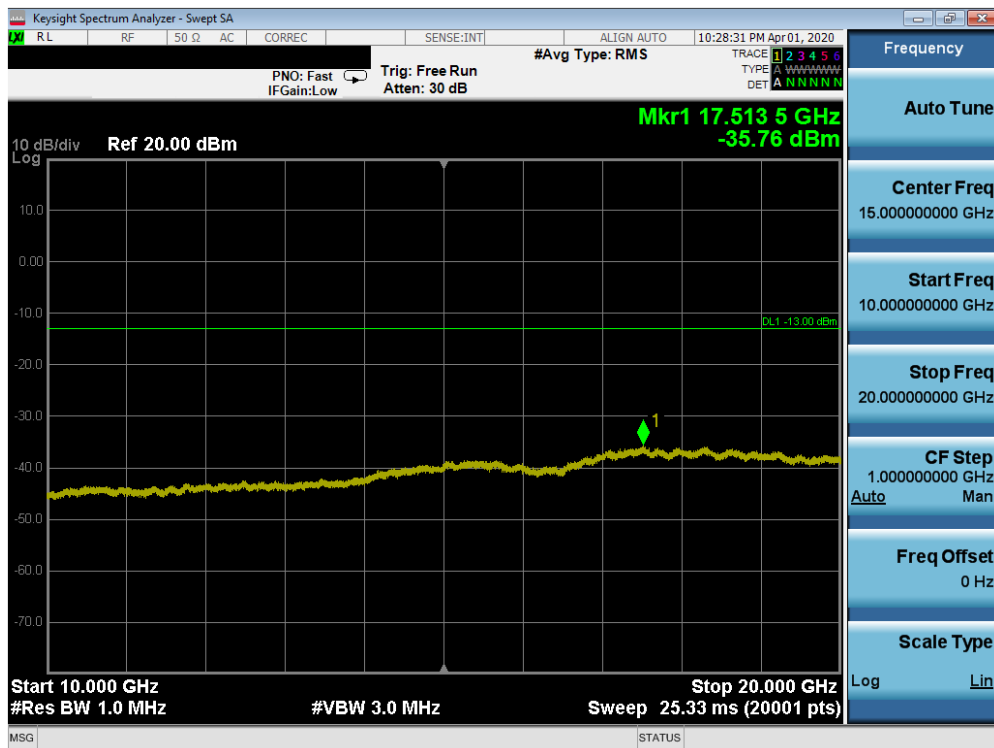


Plot 7-28. Conducted Spurious Plot (n66 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Mid Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 28 of 54

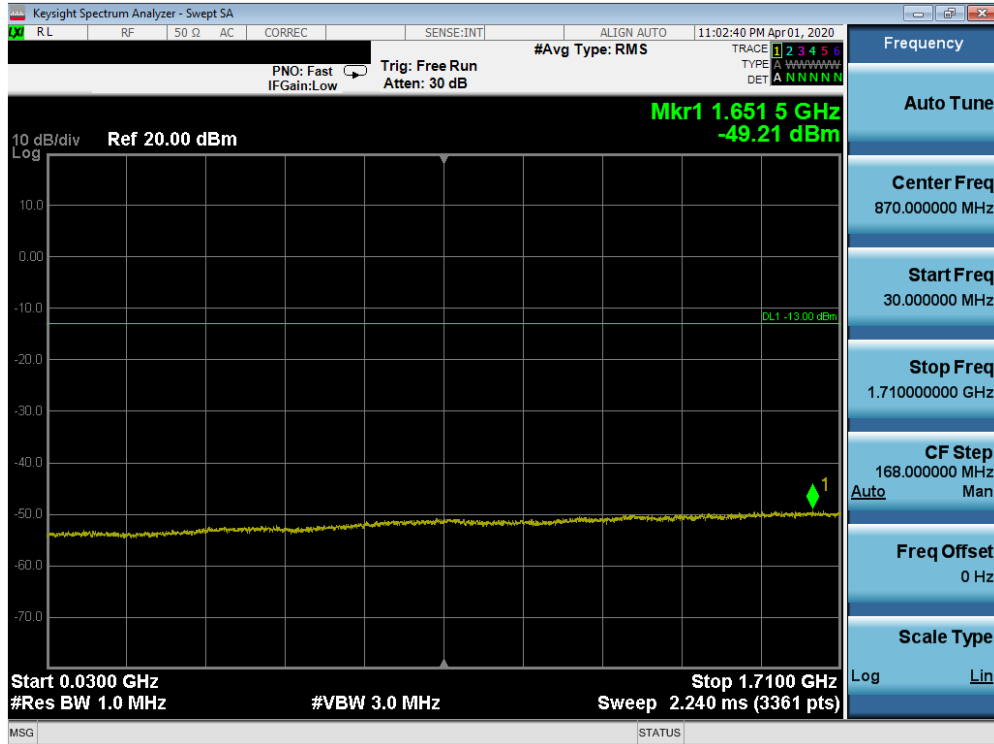


Plot 7-29. Conducted Spurious Plot (n66 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Mid Channel)

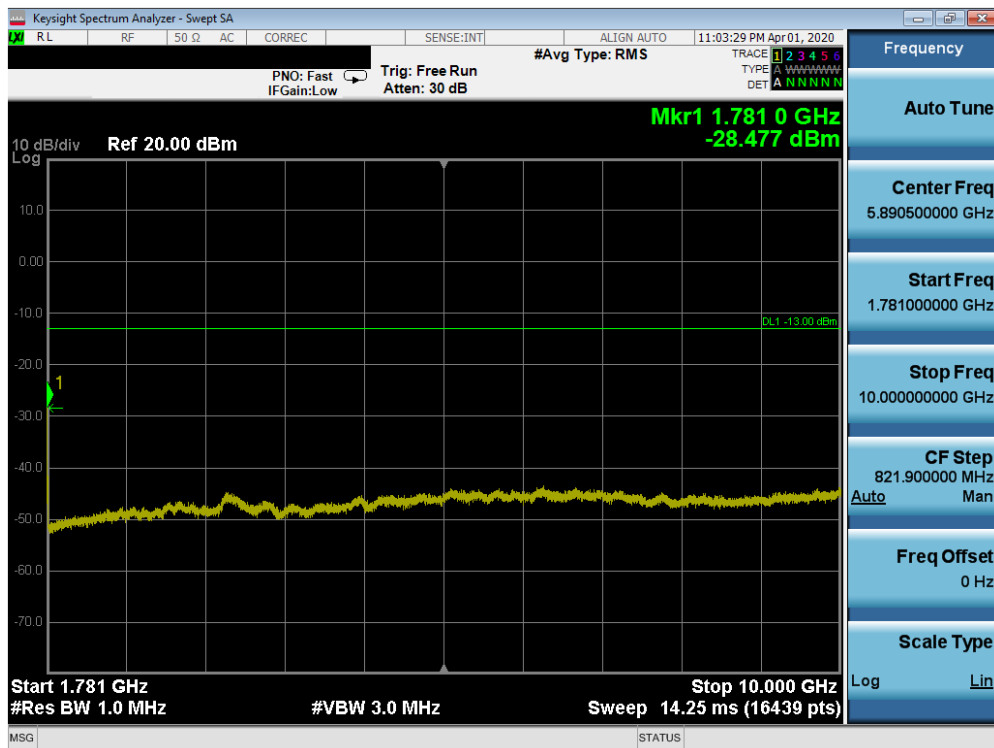


Plot 7-30. Conducted Spurious Plot (n66 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Mid Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 29 of 54

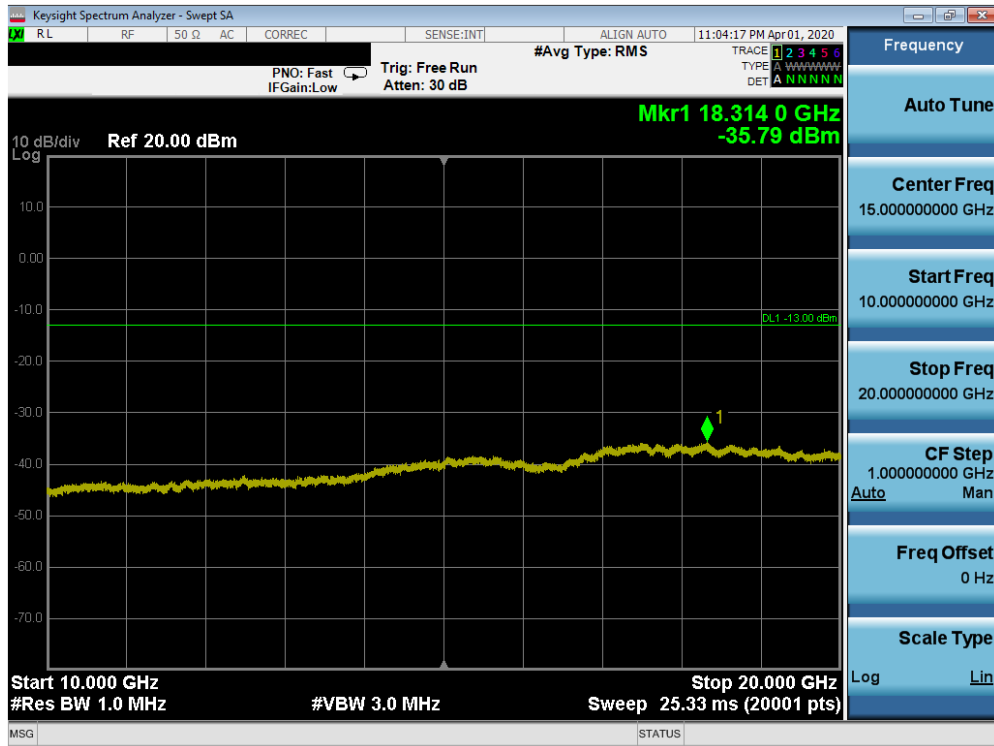


Plot 7-31. Conducted Spurious Plot (n66 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - High Channel)



Plot 7-32. Conducted Spurious Plot (n66 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - High Channel)

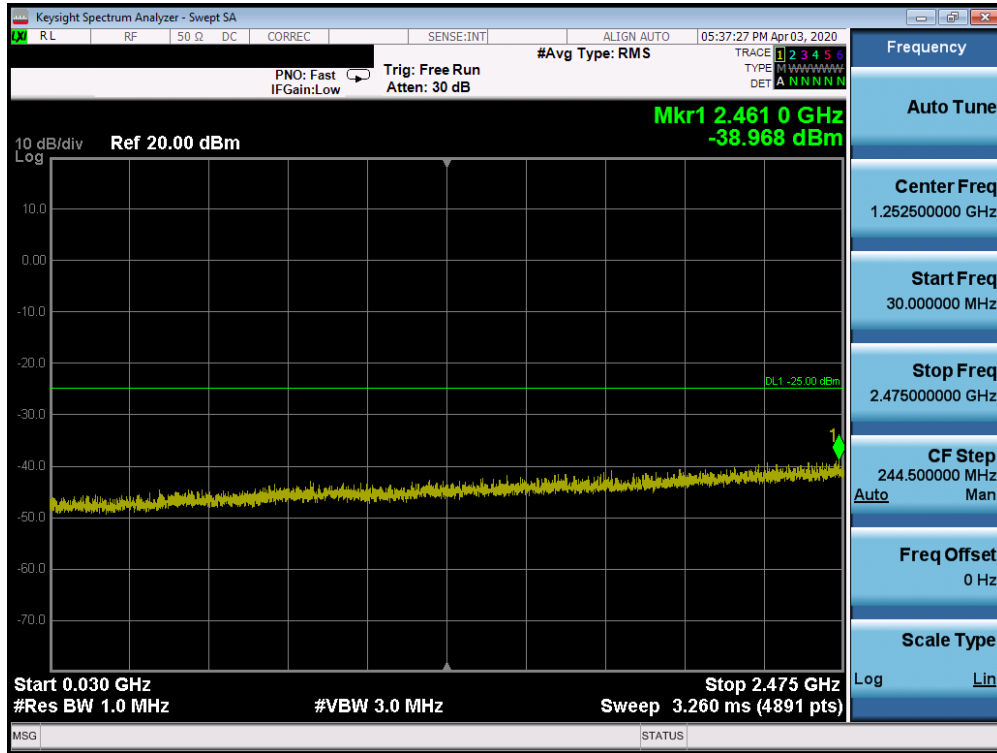
FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 30 of 54



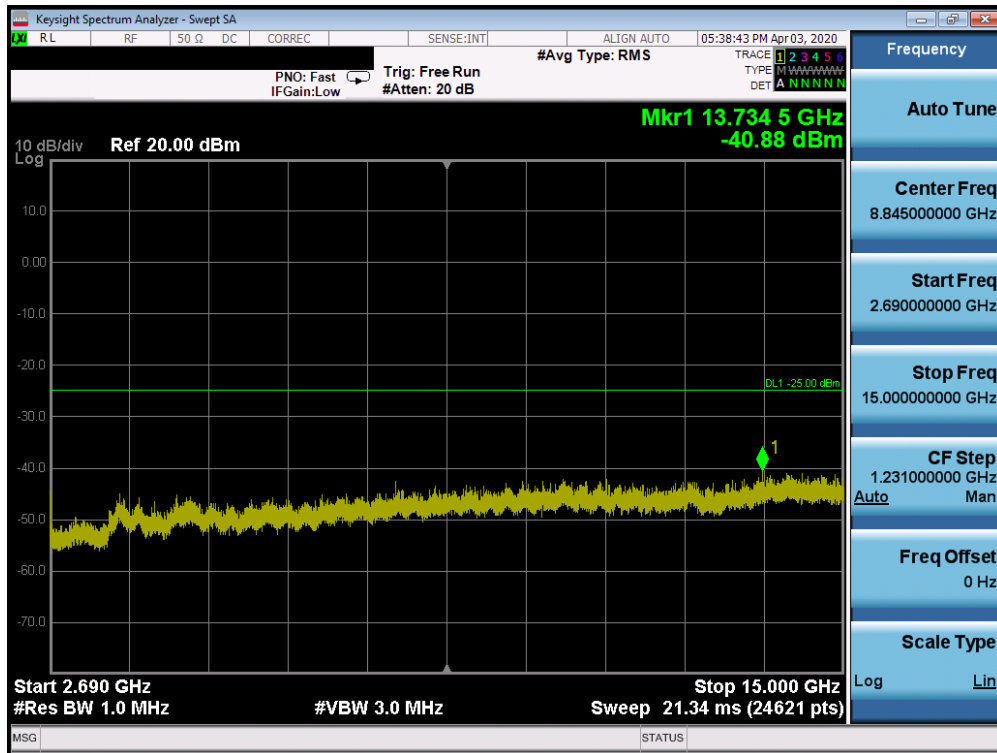
**Plot 7-33. Conducted Spurious Plot (n66 - 20MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - High Channel)**

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 31 of 54

### NR Band n41



Plot 7-34. Conducted Spurious Plot (n41 - 100MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Low Channel)



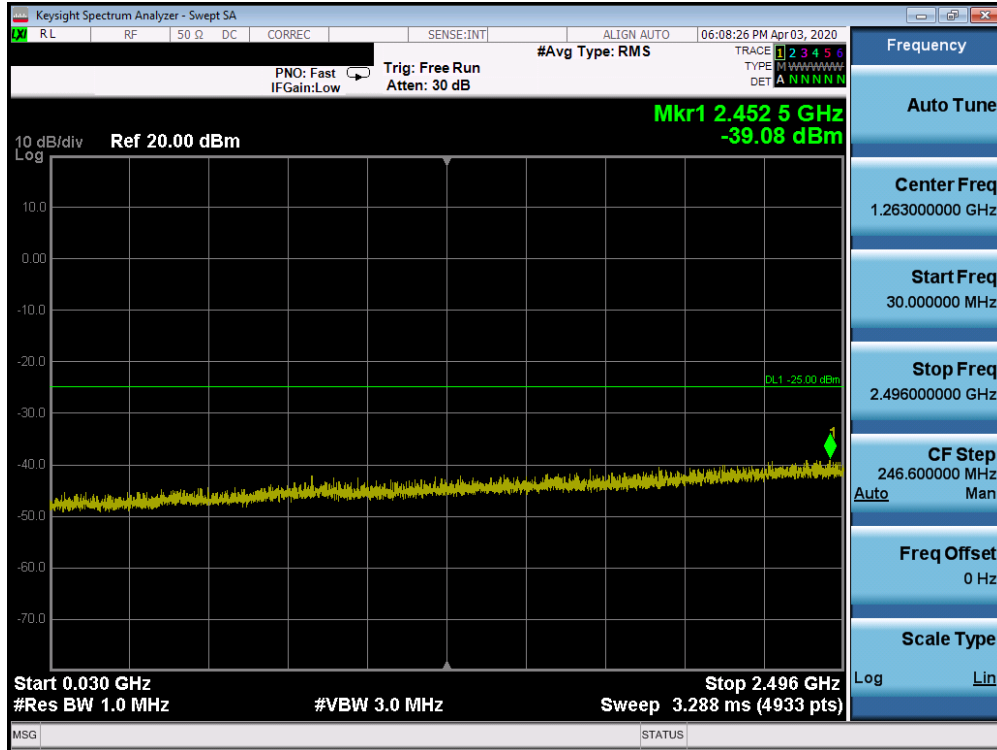
Plot 7-35. Conducted Spurious Plot (n41 - 100MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - Low Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 32 of 54

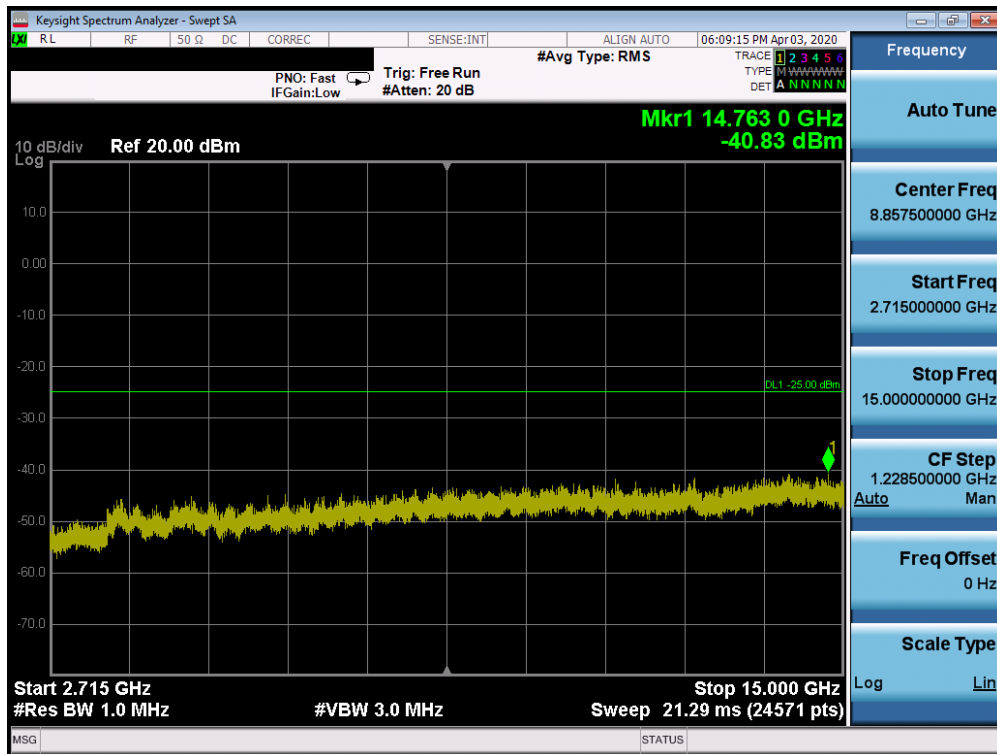






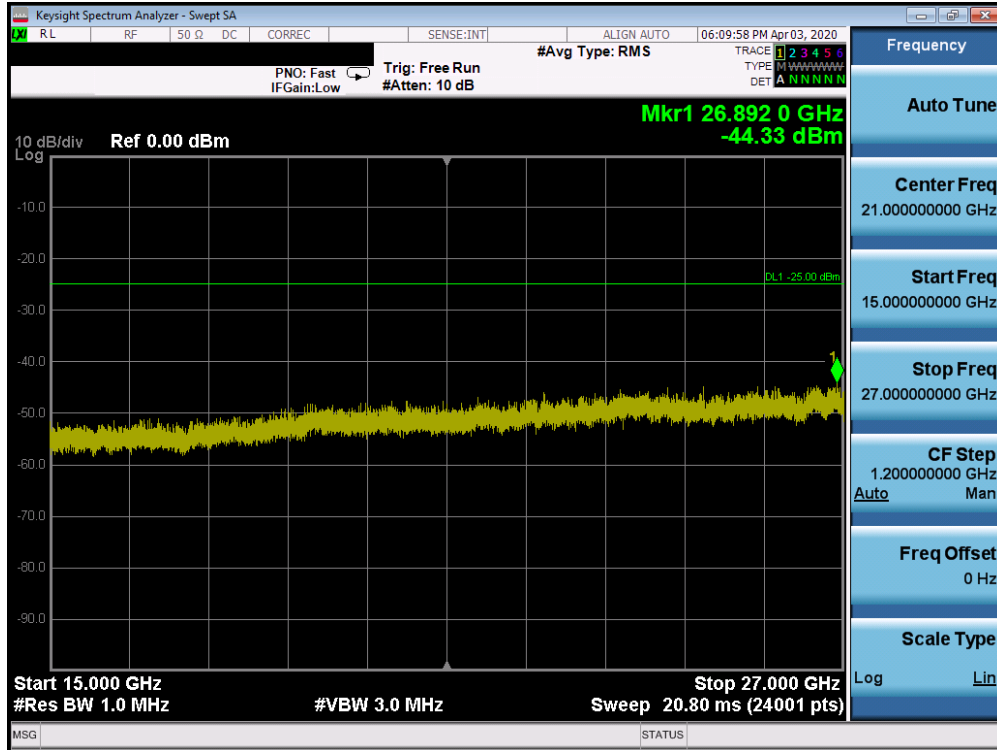


Plot 7-40. Conducted Spurious Plot (n41 - 100MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - High Channel)



Plot 7-41. Conducted Spurious Plot (n41 - 100MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - High Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 35 of 54



Plot 7-42. Conducted Spurious Plot (n41 - 100MHz DFT-s-OFDM-BPSK - RB Size 1, RB Offset 1 - High Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 36 of 54

## 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 its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst case configuration. All modes of operation were investigated and the worst case configuration results are reported in this section.

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

**The minimum permissible attenuation level for n41 is as noted in the Test Notes on the following page.**

### Test Procedure Used

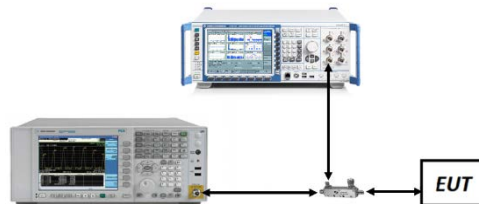
KDB 971168 D01 v03r01 – Section 6.0

### Test Settings



1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW  $\geq$  1% of the emission bandwidth
4. VBW  $\geq$  3 x RBW
5. Detector = RMS
6. Number of sweep points  $\geq$  2 x 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: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 37 of 54

**Test Notes**

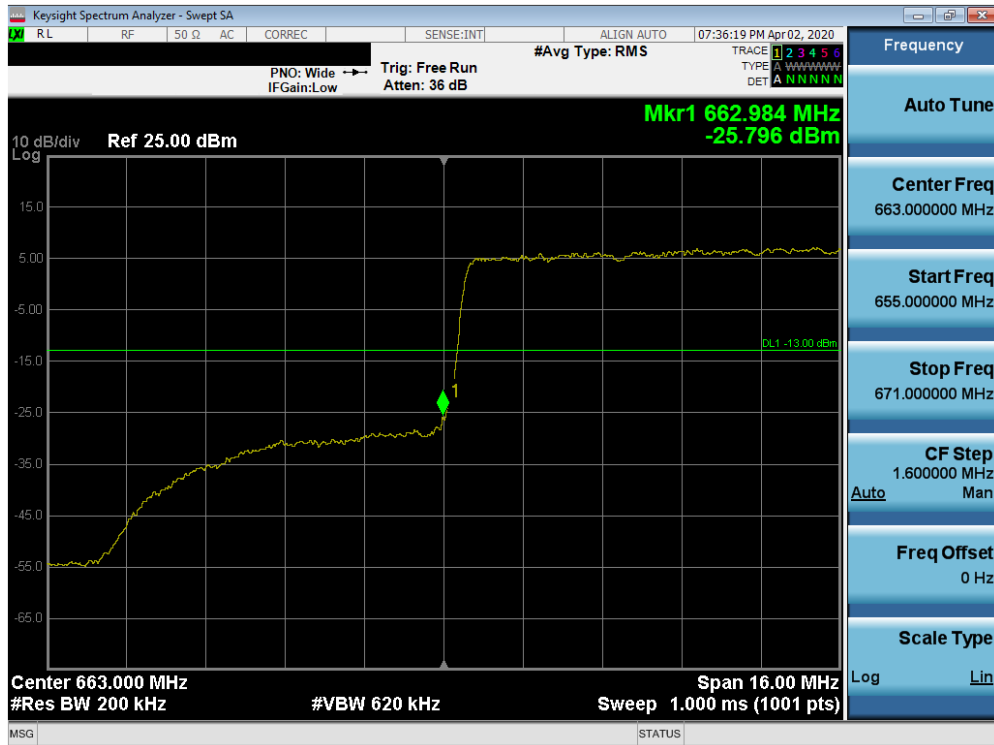
Per 22.917(b) 24.238(a) 27.53(h) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions 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.

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

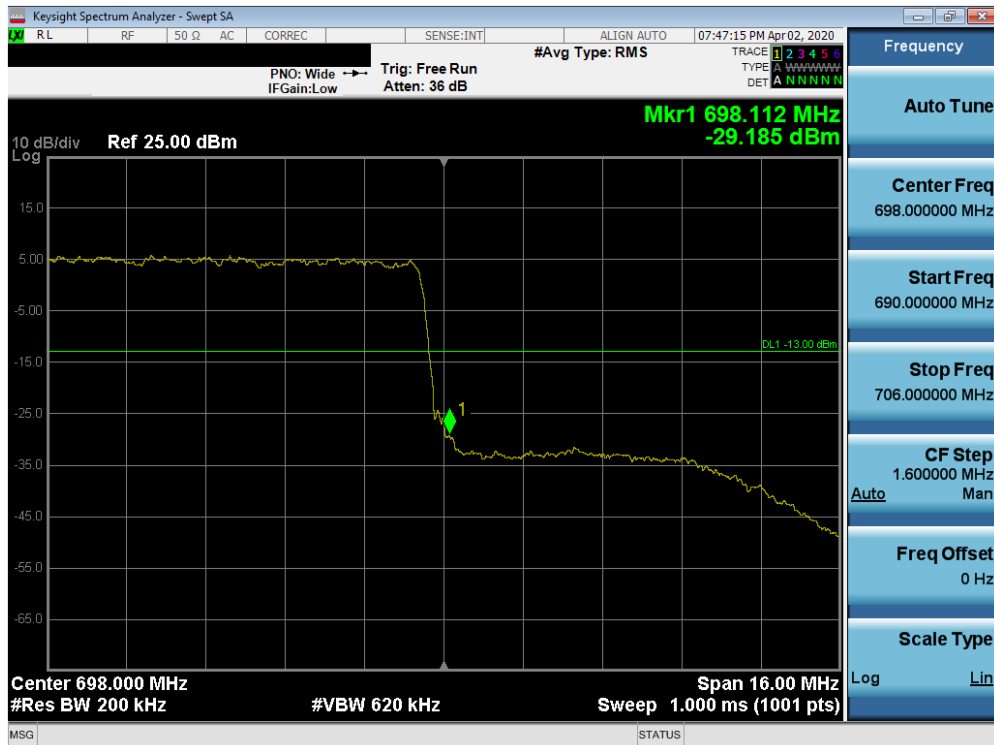
Emissions were tested in all modes and worst case in DFT-s-OFDM BPSK is reported.

<b>FCC ID:</b> A3LSMG986W	 <b>MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 38 of 54

### NR Band n71



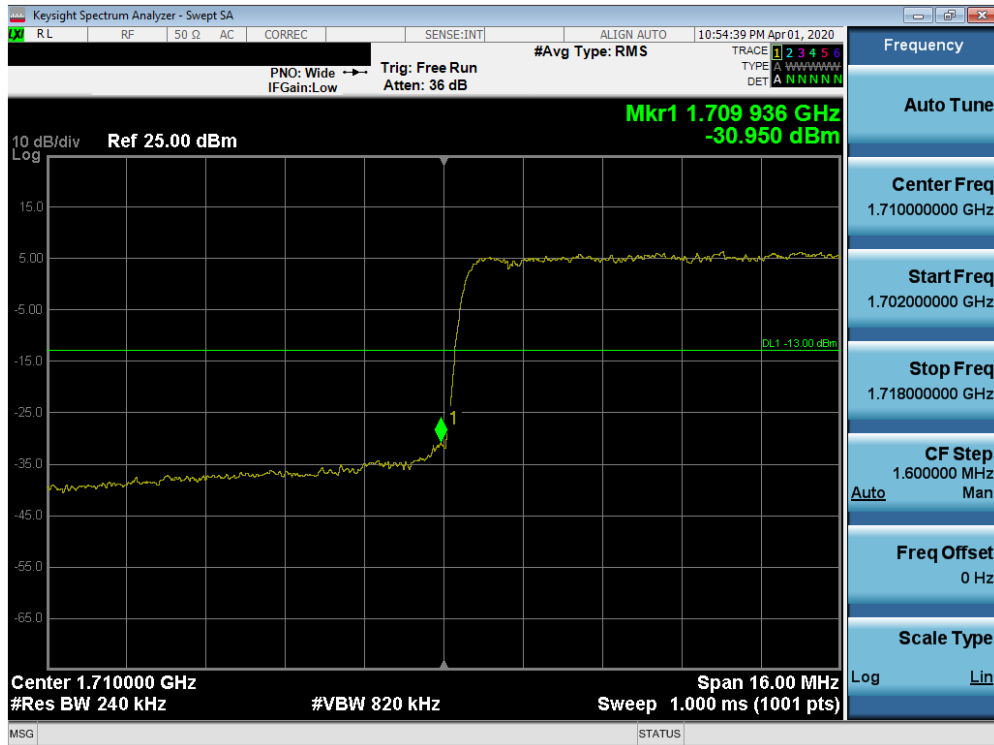
Plot 7-43. Lower Band Edge Plot (n71 - 20MHz DFT-s-OFDM-BPSK - Full RB Configuration)



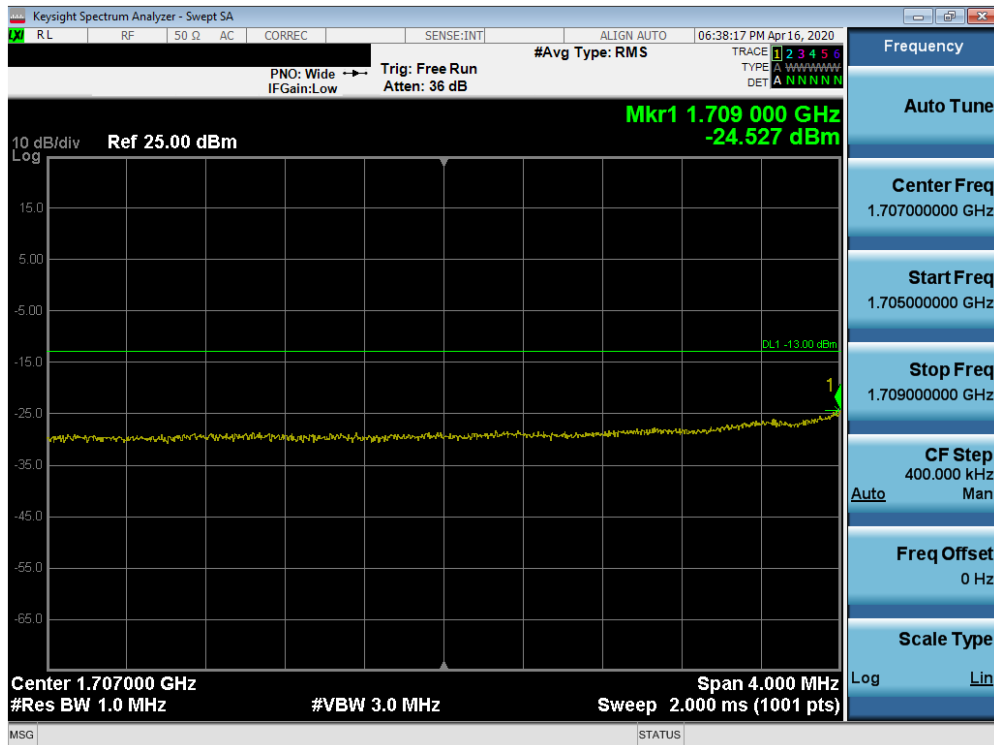
Plot 7-44. Upper Band Edge Plot (n71- 20MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 39 of 54

### NR Band n66



Plot 7-45. Lower Band Edge Plot (n66 - 20MHz DFT-s-OFDM-BPSK - Full RB Configuration)



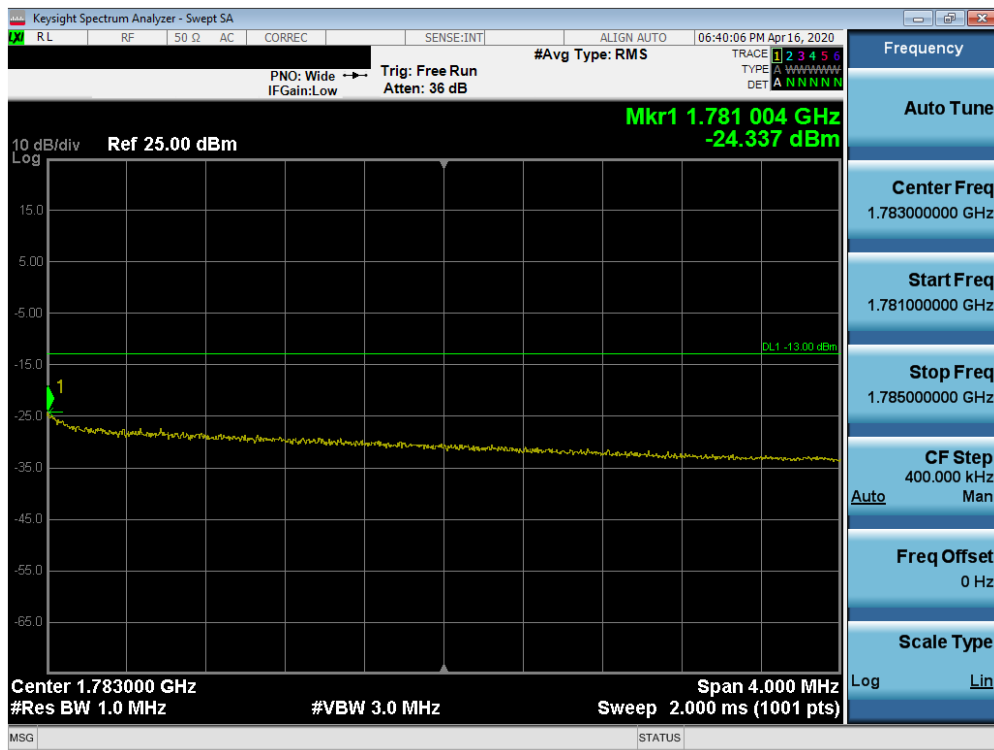
Plot 7-46. Lower Extended Band Edge Plot (n66 - 20MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 40 of 54





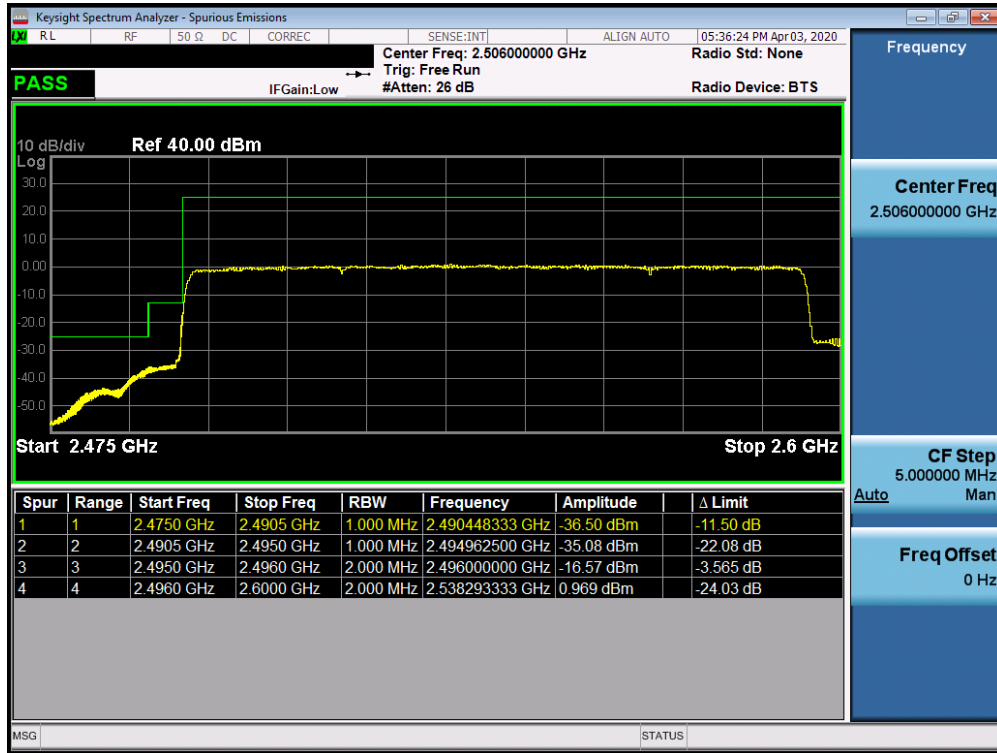
Plot 7-47. Upper Band Edge Plot (n66 - 20MHz DFT-s-OFDM-BPSK - Full RB Configuration)



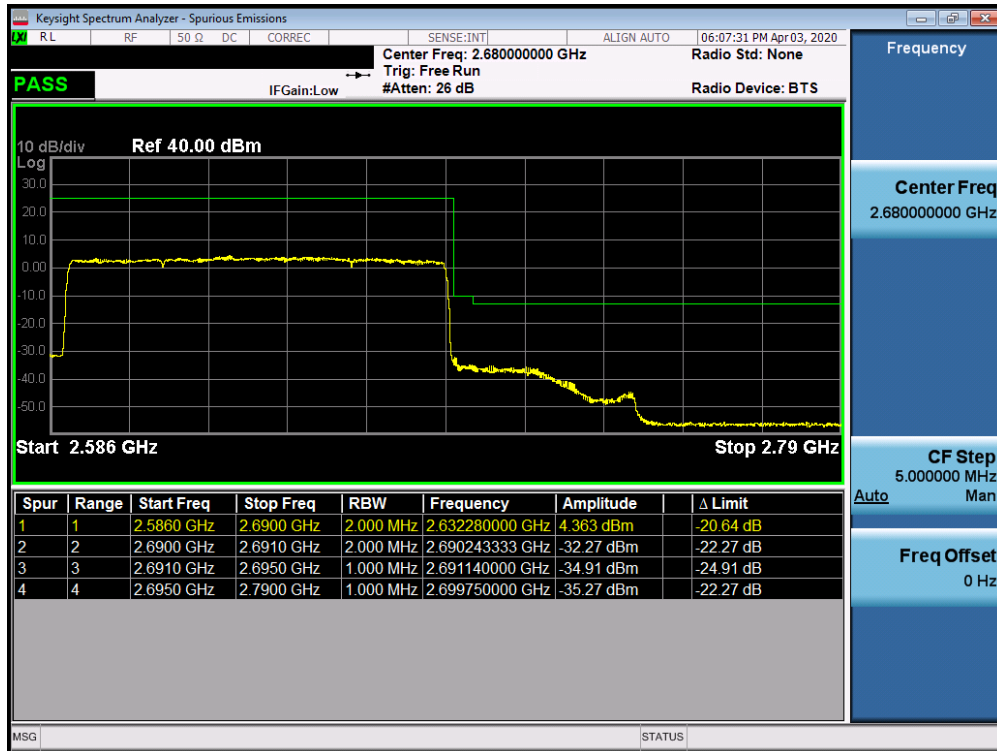
Plot 7-48. Upper Extended Band Edge Plot (n66 - 20MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 41 of 54

### NR Band n41



Plot 7-49. Lower Band Edge Plot (n41 - 100MHz DFT-s-OFDM-BPSK - Full RB Configuration)



Plot 7-50. Lower Band Edge Plot (n41 - 100MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 42 of 54

## 7.5 Peak-Average Ratio

### Test Overview

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

### Test Procedure Used

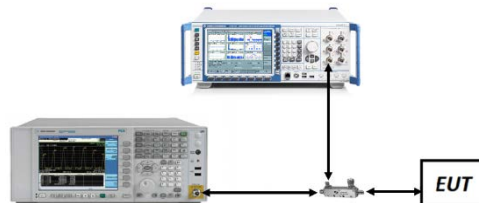
KDB 971168 D01 v03r01 – Section 5.7.1

### Test Settings

1. The signal analyzer's CCDF measurement profile is enabled
2. Frequency = carrier center frequency
3. Measurement BW  $\geq$  OBW or specified reference bandwidth
4. The signal analyzer was set to collect one million samples to generate the CCDF curve
5. The measurement interval was set depending on the type of signal analyzed. For continuous signals (>98% duty cycle), the measurement interval was set to 1ms. For burst transmissions, the spectrum analyzer is set to use an internal "RF Burst" trigger that is synced with an incoming pulse and the measurement interval is set to less than the duration of the "on time" of one burst to ensure that energy is only captured during a time in which the transmitter is operating at maximum power

### Test Setup



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



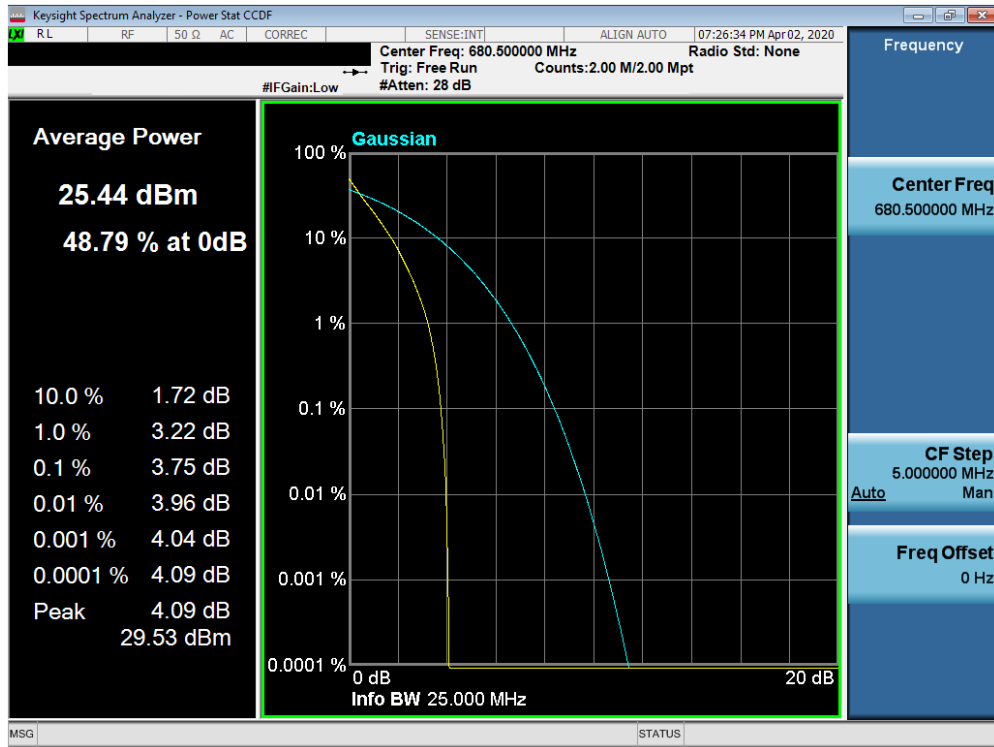
**Figure 7-4. Test Instrument & Measurement Setup**

### Test Notes

Emissions were tested in all modes and worst case in DFT-s-OFDM BPSK is reported.

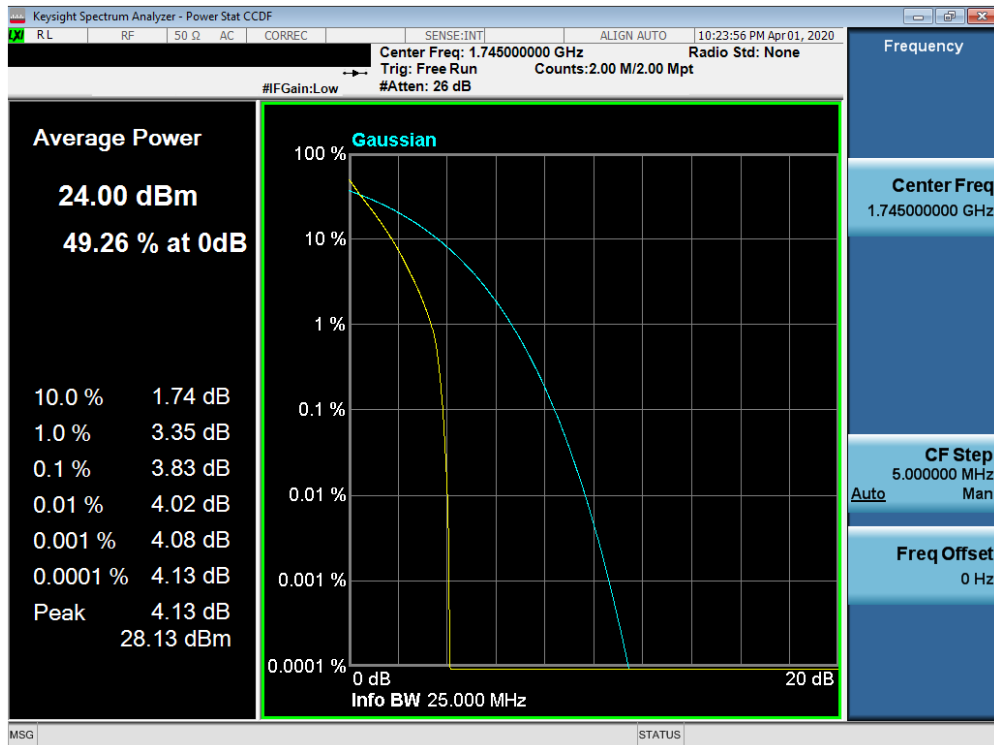
FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 43 of 54	

### NR Band n71



Plot 7-51. PAR Plot (Band n71 - 20.0MHz DFT-s-OFDM-BPSK - Full RB Configuration)

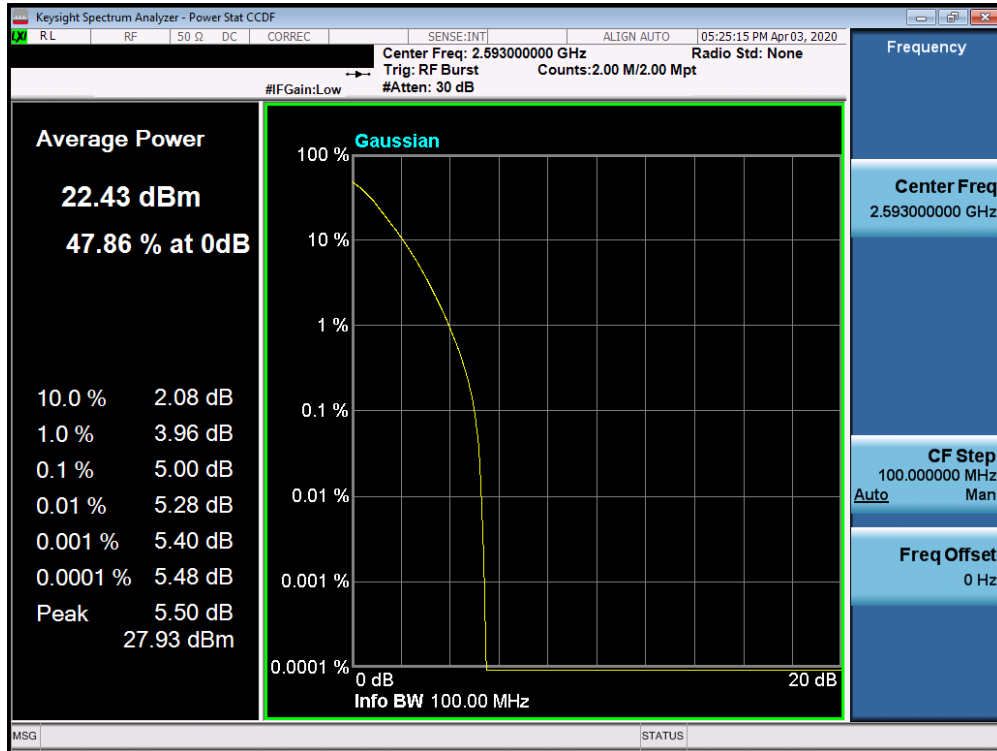
### NR Band n66



Plot 7-52. PAR Plot (Band n66 - 20.0MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 44 of 54

### NR Band n41



Plot 7-53. PAR Plot (Band n41 - 100.0MHz DFT-s-OFDM-BPSK - Full RB Configuration)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 45 of 54

## 7.6 Radiated Power (ERP/EIRP)

### Test Overview

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

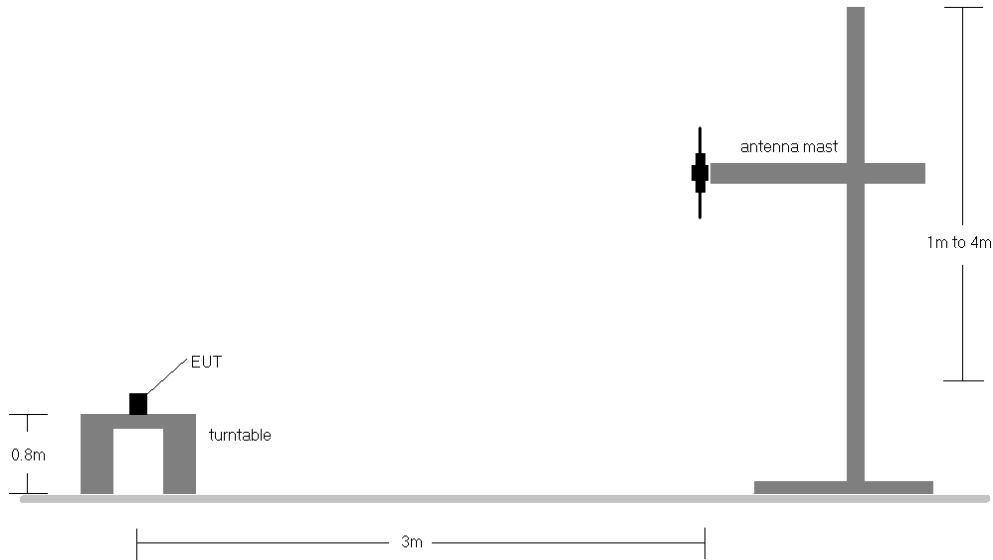
### Test Settings

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

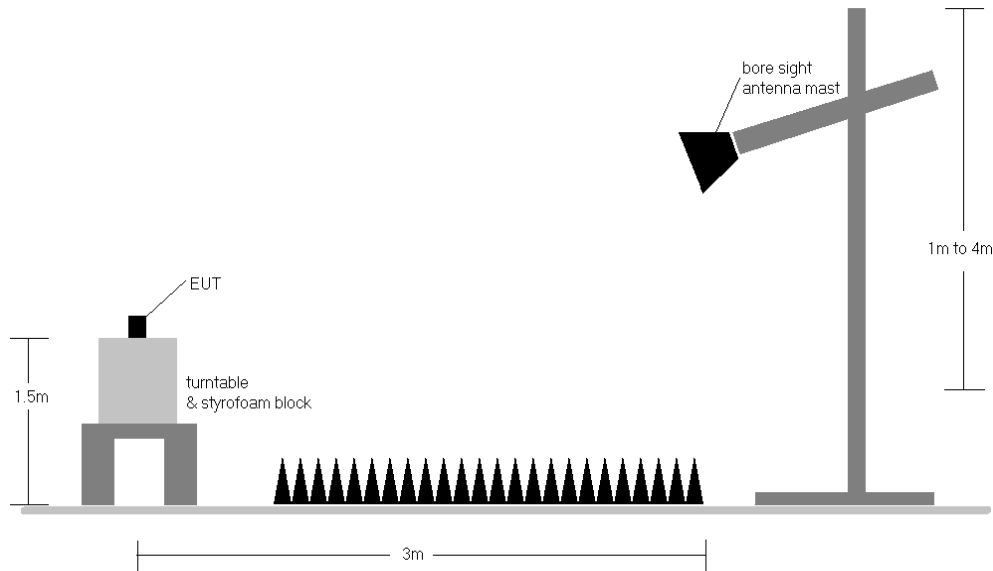
FCC ID: A3LSMG986W		<b>MEASUREMENT REPORT</b> <b>(CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 46 of 54	

**Test Setup**

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





**Figure 7-5. Radiated Test Setup <1GHz**



**Figure 7-6. Radiated Test Setup >1GHz**

**Test Notes**

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) Emissions were tested in all modes and worst case in DFT-s-OFDM BPSK is reported.

<b>FCC ID:</b> A3LSMG986W		<b>MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 47 of 54	

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]
673.00	20	BPSK	V	175	331	50 / 25	13.13	4.09	15.07	0.032	34.77	-19.70
680.50	20	BPSK	V	176	329	50 / 25	13.10	4.24	<b>15.19</b>	0.033	34.77	-19.59
688.00	20	BPSK	V	176	329	50 / 25	12.69	4.48	15.02	0.032	34.77	-19.75
688.00	20	QPSK	H	159	178	1 / 0	10.18	4.48	12.51	0.018	34.77	-22.26
688.00	20 (WCP)	QPSK	V	145	325	1 / 0	9.00	4.48	11.33	0.014	34.77	-23.44



**Table 7-3. ERP Data (n71)**

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
1720.00	20	BPSK	V	212	336	1 / 0	11.46	9.31	20.77	0.119	30.00	-9.23
1745.00	20	BPSK	V	204	339	50 / 25	11.67	9.14	<b>20.81</b>	<b>0.120</b>	30.00	-9.19
1770.00	20	BPSK	V	204	340	1 / 0	11.61	9.17	20.78	0.120	30.00	-9.22
1745.00	20	BPSK	H	371	148	50 / 25	8.16	9.14	17.30	0.054	30.00	-12.70
1745.00	20 (WCP)	BPSK	V	224	6	50 / 25	8.08	9.14	17.22	0.053	30.00	-12.78

**Table 7-4. EIRP Data (n66)**

Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
2546.01	100	BPSK	V	141	296	50 / 25	11.29	9.42	<b>20.71</b>	<b>0.118</b>	33.01	-12.30
2593.00	100	BPSK	V	135	281	50 / 25	10.42	9.59	20.01	0.100	33.01	-13.00
2640.00	100	BPSK	V	145	276	50 / 25	10.54	9.71	20.25	0.106	33.01	-12.76
2546.01	100	BPSK	H	149	289	50 / 25	7.42	9.42	16.84	0.048	33.01	-16.17
2546.01	100 (WCP)	BPSK	V	164	312	50 / 25	6.42	9.42	15.84	0.038	33.01	-17.17

**Table 7-5. EIRP Data (n41)**

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 48 of 54	



## 7.7 Radiated Spurious Emissions Measurements

### Test Overview

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


### Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

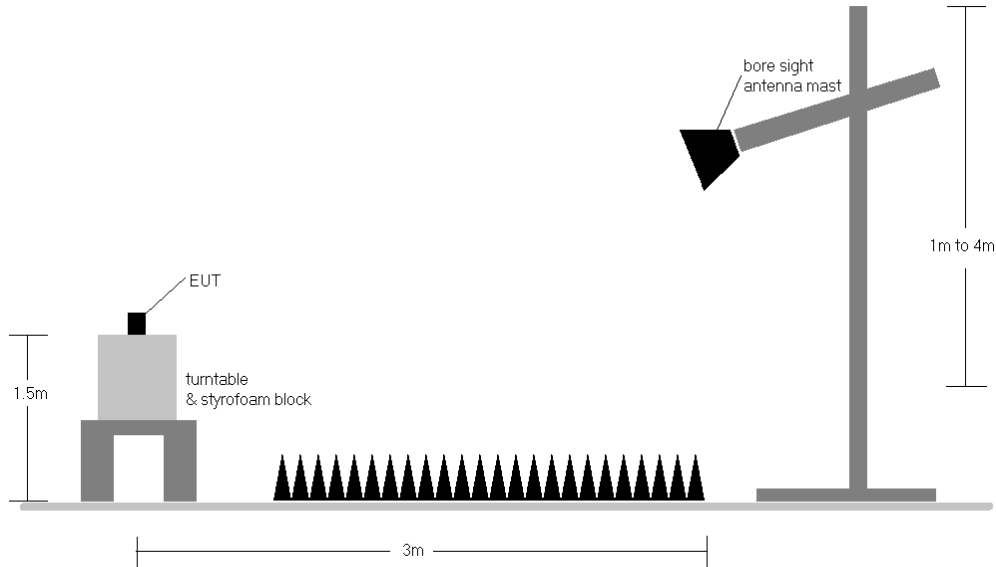
### Test Settings

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

FCC ID: A3LSMG986W	 <b>MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		 <b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 49 of 54

### Test Setup



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



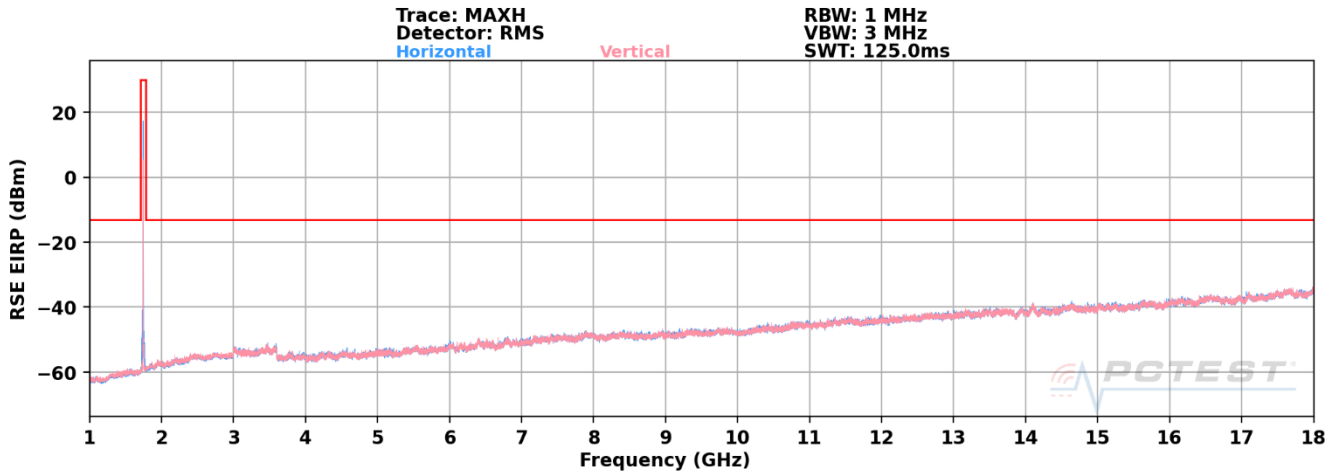
**Figure 7-7. Test Instrument & Measurement Setup**

### Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) 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.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 6) Emissions were tested in all modes standalone and EN-DC. The worst case in DFT-s-OFDM BPSK with EN-DC is reported.

<b>FCC ID:</b> A3LSMG986W		<b>MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 50 of 54	

# NR Band n71



**Plot 7-54. Radiated Spurious Plot above 1GHz (EN-DC n71 + LTE B66)**

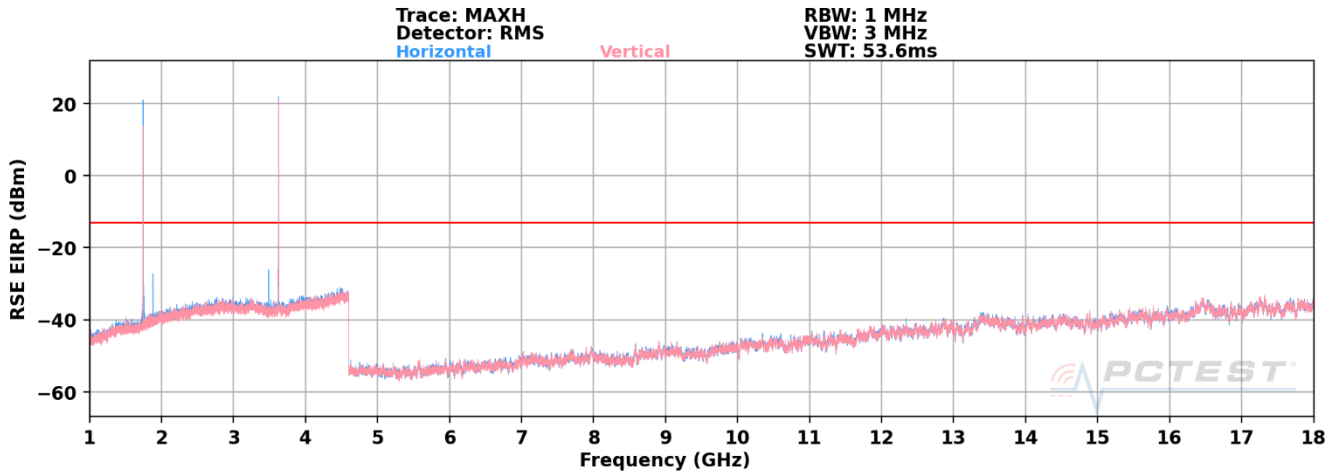
OPERATING FREQUENCY: 680.50 MHz  
 MODULATION SIGNAL: BPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
1361.00	H	267	331	-75.73	8.64	-67.09	-54.1
2041.50	H	-	-	-74.64	10.06	-64.58	-51.6
2722.00	H	-	-	-72.10	9.60	-62.49	-49.5
2809.00	H	328	245	-68.64	9.12	-59.52	-46.5
3402.50	H	279	30	-69.36	7.36	-62.00	-49.0
4083.00	H	107	251	-69.62	7.84	-61.79	-48.8
4763.50	H	-	-	-72.86	9.68	-63.18	-50.2
5444.00	H	-	-	-71.60	11.55	-60.05	-47.1

**Table 7-6. Radiated Spurious Data (EN-DC n71+ LTE B66 – Mid Channel)**

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 51 of 54	

# NR Band n66



Plot 7-55. Radiated Spurious Plot above 1GHz (EN-DC n66+LTE B48)

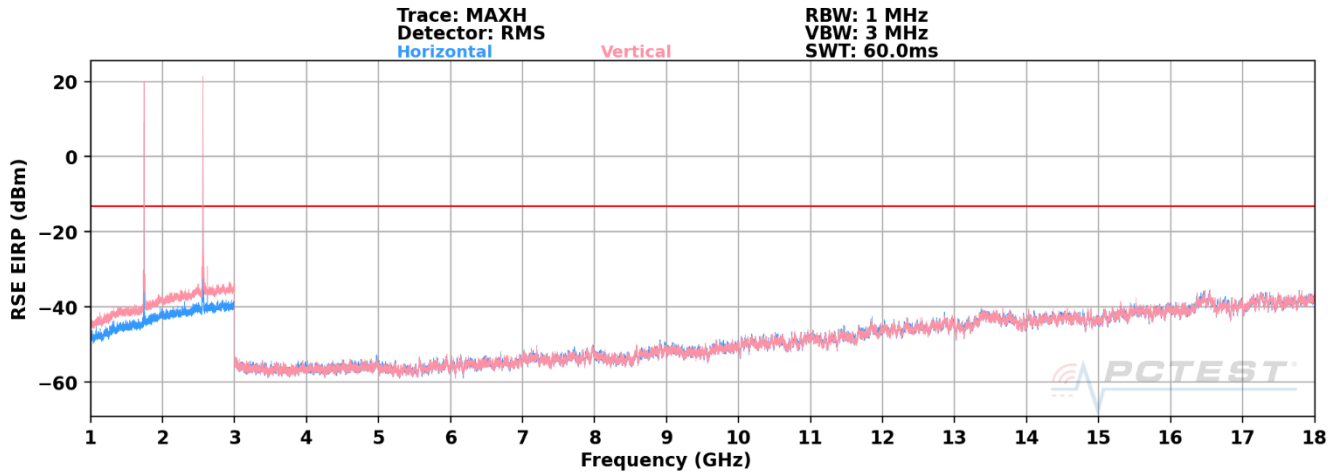
OPERATING FREQUENCY: 1745.00 MHz  
 MODULATION SIGNAL: BPSK  
 BANDWIDTH: 20.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -13 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
3490.00	H	115	165	-63.01	7.53	-55.47	-42.5
5235.00	H	-	-	-73.11	11.28	-61.83	-48.8
5505.00	H	-	-	-73.07	11.81	-61.26	-48.3
6980.00	H	-	-	-70.57	11.88	-58.69	-45.7
7385.00	H	-	-	-71.38	12.44	-58.95	-45.9

Table 7-7. Radiated Spurious Data (EN-DC n66 + LTE B48– Mid Channel)

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)		Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset	Page 52 of 54	

# NR Band n41



**Plot 7-56. Radiated Spurious Plot 1GHz - 18GHz (EN-DC n41+ LTE B66)**

OPERATING FREQUENCY: 2593.00 MHz  
 MODULATION SIGNAL: BPSK  
 BANDWIDTH: 100.0 MHz  
 DISTANCE: 3 meters  
 LIMIT: -13 dBm



Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
5186.00	V	-	-	-72.09	11.16	-60.93	-47.9
7779.00	V	-	-	-71.02	12.35	-58.67	-45.7
10372.00	V	-	-	-65.60	10.37	-55.23	-42.2

**Table 7-8. Radiated Spurious Data (EN-DC n41 + LTE B66 – Mid Channel)**

FCC ID: A3LSMG986W		MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)			Approved by: Quality Manager
Test Report S/N: 1M2003120045-03.A3L	Test Dates: 03/09 - 04/17/2020	EUT Type: Portable Handset		Page 53 of 54	

## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMG986W** complies with all the requirements of Part 22, 24, & 27 of the FCC Rules for LTE/Sub 6GHz NR operation only.

<b>FCC ID:</b> A3LSMG986W	 <b>MEASUREMENT REPORT (CLASS II PERMISSIVE CHANGE)</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2003120045-03.A3L	<b>Test Dates:</b> 03/09 - 04/17/2020	<b>EUT Type:</b> Portable Handset	Page 54 of 54