



PART 27 MEASUREMENT REPORT

Applicant Name:
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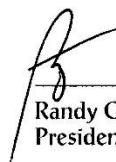
Date of Testing:
11/19/2021 - 12/02/2021
Test Report Issue Date:
12/16/2021
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2109290114-04.A3L

| | |
|-------------------|--------------------------------------|
| FCC ID: | A3LSMS901E |
| APPLICANT: | Samsung Electronics Co., Ltd. |

Application Type: Certification
Model: SM-S901E/DS
Additional Model(s): SM-S901E
EUT Type: Portable Handset
FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part: 27
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







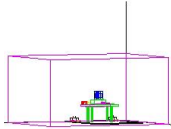
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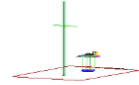
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MEASUREMENT REPORT

FCC Part 27





| Mode | Bandwidth | Modulation | Tx Frequency Range [MHz] | EIRP | | Emission Designator |
|----------------------|-----------|--------------|--------------------------|----------------|------------------|---------------------|
| | | | | Max. Power [W] | Max. Power [dBm] | |
| NR Band n66 ANT A | 20 MHz | $\pi/2$ BPSK | 1720.0 - 1770.0 | 0.205 | 23.12 | 18M0G7D |
| | | QPSK | 1720.0 - 1770.0 | 0.203 | 23.07 | 19M0G7D |
| | | 16QAM | 1720.0 - 1770.0 | 0.170 | 22.30 | 19M0W7D |
| | 15 MHz | $\pi/2$ BPSK | 1717.5 - 1772.5 | 0.206 | 23.15 | 13M5G7D |
| | | QPSK | 1717.5 - 1772.5 | 0.201 | 23.03 | 14M0G7D |
| | | 16QAM | 1717.5 - 1772.5 | 0.156 | 21.93 | 14M0W7D |
| | 10 MHz | $\pi/2$ BPSK | 1715.0 - 1775.0 | 0.193 | 22.86 | 9M04G7D |
| | | QPSK | 1715.0 - 1775.0 | 0.200 | 23.00 | 9M38G7D |
| | | 16QAM | 1715.0 - 1775.0 | 0.156 | 21.94 | 9M40W7D |
| | 5 MHz | $\pi/2$ BPSK | 1712.5 - 1777.5 | 0.201 | 23.03 | 4M54G7D |
| | | QPSK | 1712.5 - 1777.5 | 0.194 | 22.88 | 4M55G7D |
| | | 16QAM | 1712.5 - 1777.5 | 0.160 | 22.04 | 4M53W7D |

Overview Table (NR Band n66 (Ant A))

| Mode | Bandwidth | Modulation | Tx Frequency Range [MHz] | EIRP | | Emission Designator |
|----------------------|-----------|--------------|--------------------------|----------------|------------------|---------------------|
| | | | | Max. Power [W] | Max. Power [dBm] | |
| NR Band n66 ANT F | 20 MHz | $\pi/2$ BPSK | 1720.0 - 1770.0 | 0.106 | 20.25 | 17M9G7D |
| | | QPSK | 1720.0 - 1770.0 | 0.103 | 20.14 | 19M0G7D |
| | | 16QAM | 1720.0 - 1770.0 | 0.081 | 19.11 | 19M0W7D |
| | 15 MHz | $\pi/2$ BPSK | 1717.5 - 1772.5 | 0.126 | 20.99 | 13M5G7D |
| | | QPSK | 1717.5 - 1772.5 | 0.100 | 20.02 | 14M0G7D |
| | | 16QAM | 1717.5 - 1772.5 | 0.091 | 19.59 | 14M0W7D |
| | 10 MHz | $\pi/2$ BPSK | 1715.0 - 1775.0 | 0.135 | 21.29 | 9M03G7D |
| | | QPSK | 1715.0 - 1775.0 | 0.101 | 20.05 | 9M39G7D |
| | | 16QAM | 1715.0 - 1775.0 | 0.077 | 18.89 | 9M36W7D |
| | 5 MHz | $\pi/2$ BPSK | 1712.5 - 1777.5 | 0.137 | 21.36 | 4M56G7D |
| | | QPSK | 1712.5 - 1777.5 | 0.102 | 20.10 | 4M51G7D |
| | | 16QAM | 1712.5 - 1777.5 | 0.082 | 19.14 | 4M52W7D |

Overview Table (NR Band n66 (Ant F))

| | | | | |
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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: A3LSMS901E**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 27.

Test Device Serial No.: 1612M, 1122M, 1603M, 1604M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer

2.3 Test Configuration

The EUT was tested per the guidance of ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01. See Section 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.

2.4 Software and Firmware

The test was conducted with firmware version S901EXXU1AUL2 installed on the EUT.

2.5 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 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 wooden turntable 80cm above the ground plane and 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:

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

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

For fundamental radiated power measurements, the guidance of KDB 971168 D01 v03r01 is used to record the EUT power level that is subsequently matched via the aforementioned substitution method given in ANSI/TIA-603-E-2016.



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 414788 D01 v01r01.

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4.0 MEASUREMENT UNCERTAINTY

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.4-2014. All measurement uncertainty values are shown with a coverage factor of $k = 2$ to indicate a 95% level of confidence. The measurement uncertainty shown below meets or exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

| Contribution | Expanded Uncertainty (\pm dB) |
|----------------------------------|----------------------------------|
| Conducted Bench Top Measurements | 1.13 |
| Radiated Disturbance (<1GHz) | 4.98 |
| Radiated Disturbance (>1GHz) | 5.07 |
| Radiated Disturbance (>18GHz) | 5.09 |

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5.0 TEST EQUIPMENT CALIBRATION DATA



Test Equipment Calibration is traceable to the National Institute of Standards and Technology (NIST). Measurement 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 |
| - | ETS | EMC Cable and Switch System | 3/4/2021 | Annual | 3/4/2022 | ETS |
| - | LTx1 | Licensed Transmitter Cable Set | 3/12/2021 | Annual | 3/12/2022 | LTx1 |
| - | LTx2 | Licensed Transmitter Cable Set | 3/12/2021 | Annual | 3/12/2022 | LTx2 |
| Agilent | N9030A | 50GHz PXA Signal Analyzer | 1/20/2021 | Annual | 1/20/2022 | US51350301 |
| Anritsu | MT8821C | Radio Communication Analyzer | N/A | | | 6201381794 |
| Emco | 3115 | Horn Antenna (1-18GHz) | 6/18/2020 | Biennial | 6/18/2022 | 9704-5182 |
| Espec | ESX-2CA | Environmental Chamber | 8/27/2020 | Annual | 8/27/2022 | 17620 |
| ETS Lindgren | 3117 | 1-18 GHz DRG Horn (Medium) | 4/20/2021 | Biennial | 4/20/2023 | 00125518 |
| ETS Lindgren | 3164-08 | Quad Ridge Horn Antenna | 3/12/2020 | Biennial | 3/12/2022 | 128337 |
| Keysight Technologies | N9020A | MXA Signal Analyzer | 12/22/2020 | Annual | 12/22/2021 | MY54500644 |
| Keysight Technologies | N9030A | PXA Signal Analyzer (44GHz) | 7/21/2021 | Annual | 7/21/2022 | MY49430494 |
| Mini-Circuits | SSG-4000HP | Synthesized Signal Generator | N/A | | | 11208010032 |
| Rohde & Schwarz | CMW500 | Radio Communication Tester | N/A | | | 100976 |
| Rohde & Schwarz | ESU26 | EMI Test Receiver (26.5GHz) | 8/3/2021 | Annual | 8/3/2022 | 100342 |
| Rohde & Schwarz | ESU40 | EMI Test Receiver (40GHz) | 4/30/2021 | Annual | 4/30/2022 | 100348 |
| Rohde & Schwarz | ESW44 | EMI Test Receiver 2Hz to 44 GHz | 1/21/2021 | Annual | 1/21/2022 | 101716 |
| Rohde & Schwarz | FSW26 | 2Hz-26.5GHz Signal and Spectrum Analyzer | 2/10/2021 | Annual | 2/10/2022 | 103187 |
| Sunol | JB6 | LB6 Antenna | 11/13/2020 | Biennial | 11/13/2022 | A082816 |

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

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated



7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd 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 $- (-24.80) = 50.3$ dBc.

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7.0 TEST RESULTS

7.1 Summary



Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMS901E
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): LTE/NR/UL-CA

| Test Condition | Test Description | FCC Part Section(s) | Test Limit | Test Result | Reference |
|----------------|--|---------------------|---|-------------|------------------------|
| CONDUCTED | Transmitter Conducted Output Power | 2.1046 | N/A | PASS | See RF Exposure Report |
| | ULCA Conducted Output Power | 2.1046 | N/A | PASS | Section 7.2 |
| | Occupied Bandwidth | 2.1049(h) | N/A | PASS | Section 7.3 |
| | Conducted Band Edge / Spurious Emissions (NR Band n66) | 2.1051, 27.53(h) | $\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power | PASS | Sections 7.4, 7.5 |
| | Peak-to-Average Ratio (NR Band n66) | 27.50(d)(5) | ≤ 13 dB | PASS | Section 7.6 |
| | Frequency Stability | 2.1055, 27.54 | Fundamental emissions stay within authorized frequency block | PASS | Section 7.9 |
| RADIATED | Equivalent Isotropic Radiated Power (NR Band n66) | 27.50(d)(10) | ≤ 1 Watt max. EIRP | PASS | Section 7.7 |
| | Radiated Spurious Emissions (NR Band n66) | 2.1053, 27.53(h) | $\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power | PASS | Section 7.8 |

Table 7-1. Summary of Test Results (FCC)

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 shown in Section 7.0 were 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 EMC Software Tool v1.1.

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7.2 ULCA Conducted Output Power

§2.1046

Test Overview

The EUT is set up to transmit at maximum power for LTE. All power levels 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.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Span = 2 x OBW to 3 x OBW
2. RBW = 1% to 5% of the OBW
3. Number of measurement points in sweep $\geq 2 \times \text{span} / \text{RBW}$
4. Sweep = auto-couple (less than transmission burst duration)
5. Detector = RMS (power)
6. Trigger was set to enable power measurements only on full power bursts
7. Trace was allowed to stabilize
8. Spectrum analyzer's "Channel Power" function was used to compute the power by integrating the spectrum across the OBW of the signal

Test Setup

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

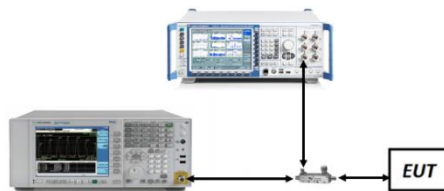


Figure 7-1. Test Instrument & Measurement Setup

Test Note

Conducted power measurements are evaluated for simultaneous transmission of two LTE carriers operating in different bands (inter-band LTE ULCA). The powers were investigated while both bands are operating at their widest supported channel bandwidth.



| | | | | |
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| PCC | | | | | SCC | | | | | PCC Conducted Power [dBm] | SCC Conducted Power [dBm] | Inter-Band ULCA Total Tx. Power (dBm) |
|----------|---------------------|------------------|------|-------------------|----------|---------------------|------------------|-------|-------------------|---------------------------|---------------------------|---------------------------------------|
| PCC Band | PCC Bandwidth [MHz] | PCC (UL) channel | Mod. | PCC UL RB#/Offset | SCC Band | SCC Bandwidth [MHz] | SCC (UL) channel | Mod. | SCC UL RB#/Offset | | | |
| B12 | 10 | Low | QPSK | 50 / 0 | B66 | 20 | Low | QPSK | 100 / 0 | 22.77 | 18.50 | 24.15 |
| | | | QPSK | 1 / 0 | | | | 23.92 | 18.32 | 24.98 | | |
| | | | QPSK | 1 / 25 | | | | 23.87 | 18.56 | 24.99 | | |
| | | | QPSK | 1 / 49 | | | | 23.67 | 18.15 | 24.74 | | |
| | | | 16Q | 1/0 | | | | 23.28 | 18.44 | 24.51 | | |
| | | | QPSK | 50 / 0 | | | | 22.73 | 18.46 | 24.11 | | |
| | | Mid | QPSK | 1 / 0 | | | 23.79 | 18.31 | 24.87 | | | |
| | | | QPSK | 1 / 25 | | | 23.73 | 18.66 | 24.91 | | | |
| | | | QPSK | 1 / 49 | | | 23.74 | 18.27 | 24.82 | | | |
| | | | 16Q | 1/0 | | | 22.99 | 18.54 | 24.32 | | | |
| | | | High | QPSK | | | 50 / 0 | 22.75 | 18.31 | 24.08 | | |
| | | | | QPSK | | | 1 / 0 | 23.77 | 18.37 | 24.87 | | |
| | | QPSK | | 1 / 25 | | | 23.79 | 18.38 | 24.89 | | | |
| | | QPSK | | 1 / 49 | | | 23.74 | 18.55 | 24.89 | | | |
| | | 16Q | | 1/25 | | | 22.96 | 18.42 | 24.27 | | | |
| | | 16Q | | 1/99 | | | 22.96 | 18.42 | 24.27 | | | |

Table 7-2. Conducted Power Output Data (ULCA LTE Band 12 (Ant A) – Band 66 (Ant A))

| PCC | | | | | SCC | | | | | PCC Conducted Power [dBm] | SCC Conducted Power [dBm] | Inter-Band ULCA Total Tx. Power (dBm) |
|----------|---------------------|------------------|------|-------------------|----------|---------------------|------------------|-------|-------------------|---------------------------|---------------------------|---------------------------------------|
| PCC Band | PCC Bandwidth [MHz] | PCC (UL) channel | Mod. | PCC UL RB#/Offset | SCC Band | SCC Bandwidth [MHz] | SCC (UL) channel | Mod. | SCC UL RB#/Offset | | | |
| B4 | 20 | Low | QPSK | 100 / 0 | B2 | 20 | Low | QPSK | 100 / 0 | 20.17 | 20.74 | 23.47 |
| | | | QPSK | 1 / 0 | | | | 20.36 | 21.43 | 23.94 | | |
| | | | QPSK | 1 / 50 | | | | 20.60 | 21.45 | 24.06 | | |
| | | | QPSK | 1 / 99 | | | | 20.23 | 21.30 | 23.81 | | |
| | | | 16Q | 1 / 50 | | | | 19.86 | 20.89 | 23.42 | | |
| | | | QPSK | 100 / 0 | | | | 19.73 | 20.74 | 23.27 | | |
| | | Mid | QPSK | 1 / 0 | | | 20.14 | 21.22 | 23.72 | | | |
| | | | QPSK | 1 / 50 | | | 20.49 | 21.24 | 23.89 | | | |
| | | | QPSK | 1 / 99 | | | 19.80 | 21.33 | 23.64 | | | |
| | | | 16Q | 1 / 50 | | | 20.08 | 20.83 | 23.48 | | | |
| | | | High | QPSK | | | 100 / 0 | 19.70 | 20.71 | 23.24 | | |
| | | | | QPSK | | | 1 / 0 | 20.02 | 21.23 | 23.68 | | |
| | | QPSK | | 1 / 50 | | | 20.07 | 21.31 | 23.74 | | | |
| | | QPSK | | 1 / 99 | | | 19.78 | 21.28 | 23.6 | | | |
| | | 16Q | | 1 / 50 | | | 19.52 | 20.82 | 23.23 | | | |
| | | 16Q | | 1 / 99 | | | 19.52 | 20.82 | 23.23 | | | |

Table 7-3. Conducted Power Output Data (ULCA LTE Band 4 (Ant A) – Band 2 (Ant F))

| | | | | |
|---|---|-------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 12 of 87 | |

7.3 Occupied Bandwidth

Test Overview

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

Test Procedure Used

KDB 971168 D01 v03r01 – Section 4.2

Test Settings

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

Test Setup

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

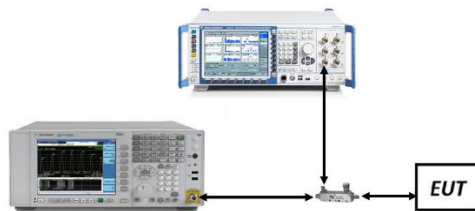


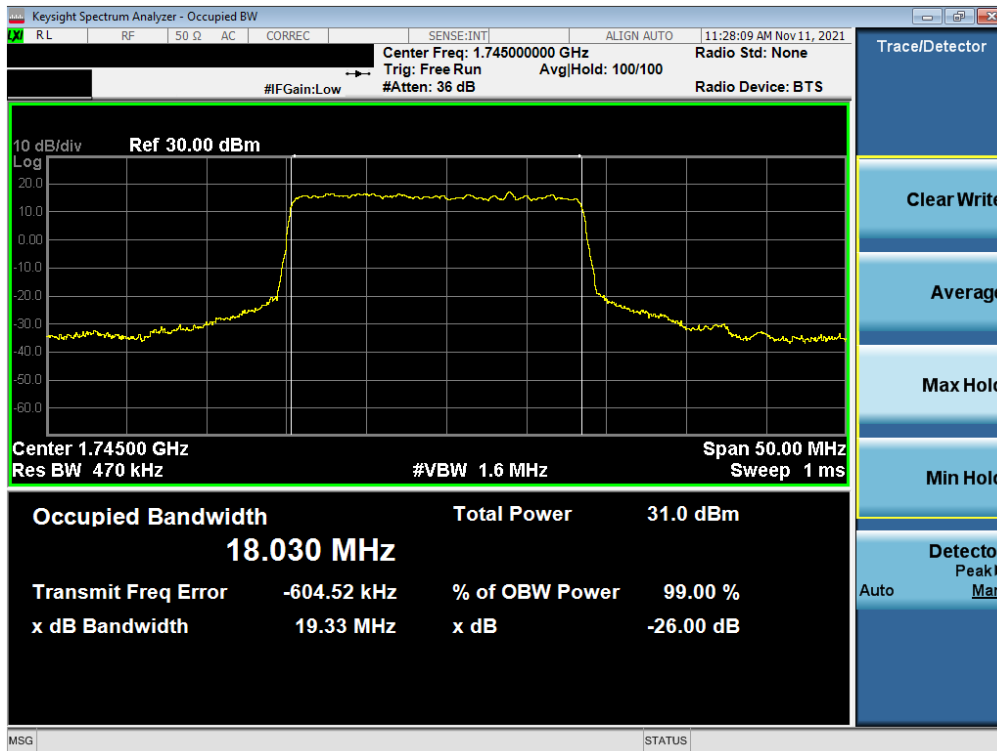
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

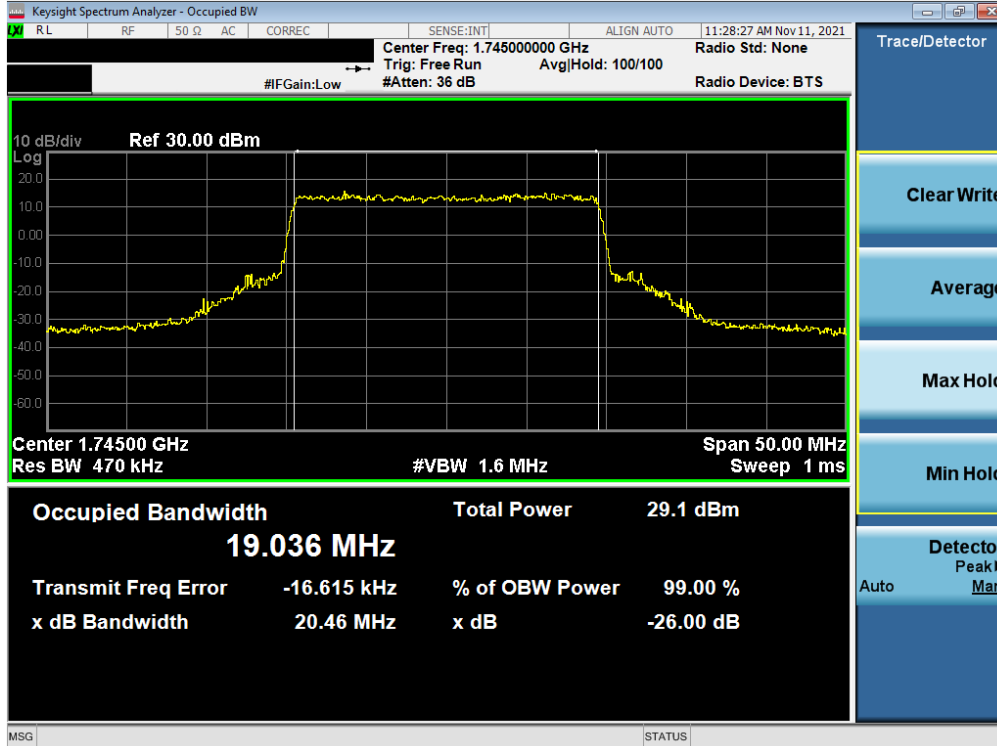
None.

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 13 of 87 |

NR Band n66 – ANT A

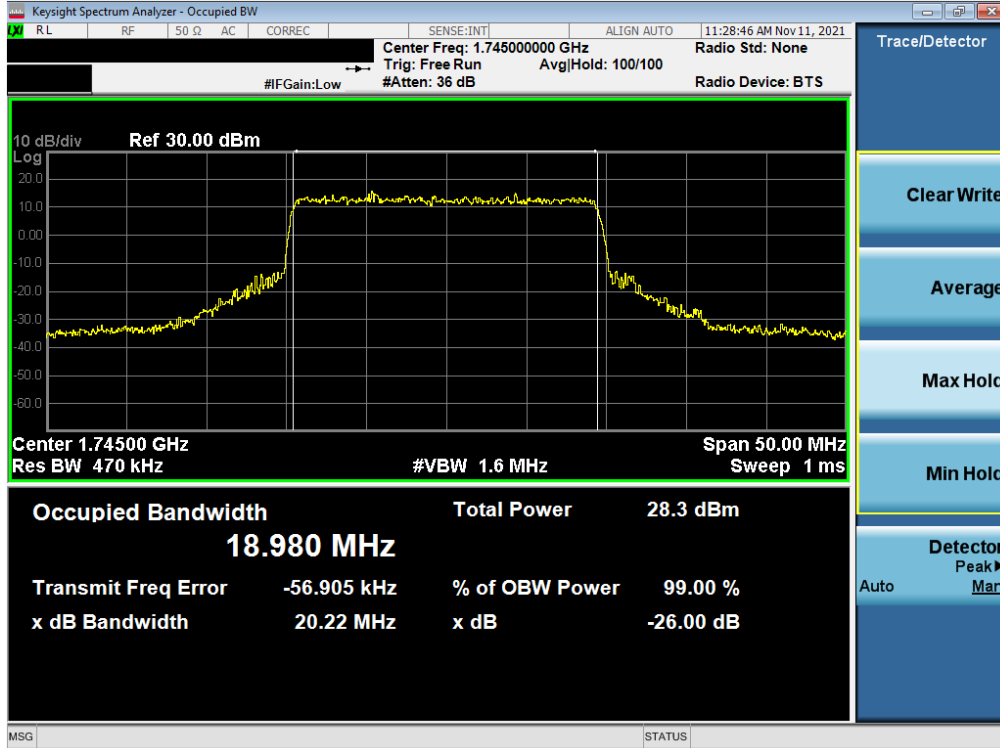


Plot 7-1. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz DFT's-OFDM BPSK - Full RB – ANT A)

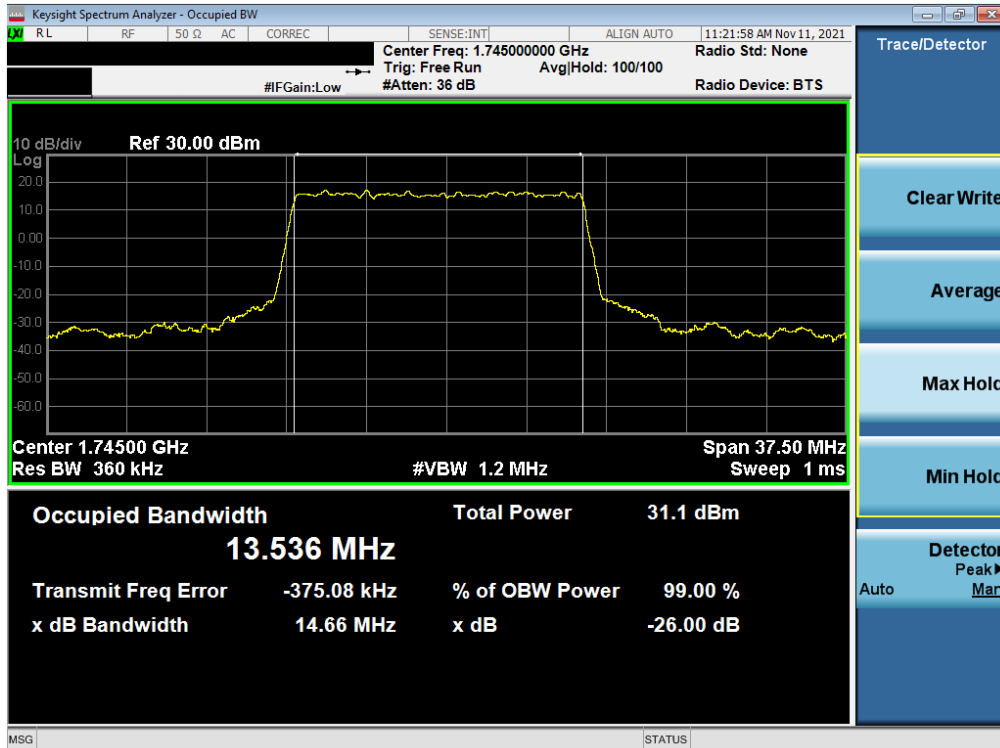


Plot 7-2. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM QPSK - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 14 of 87 |

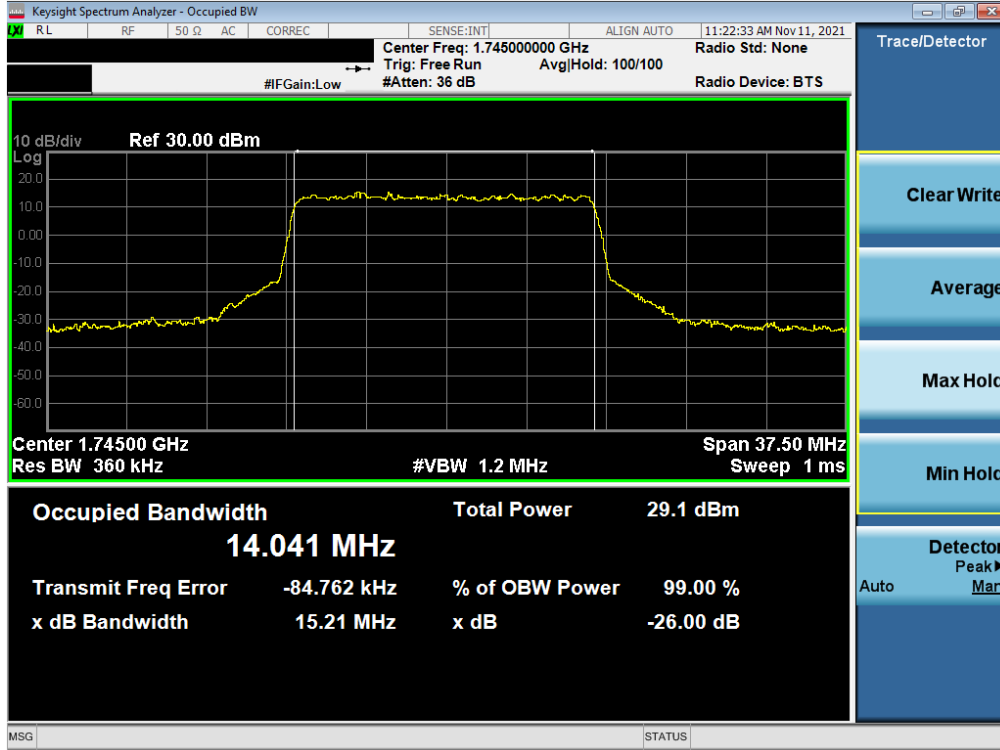


Plot 7-3. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM 16QAM - Full RB – ANT A)

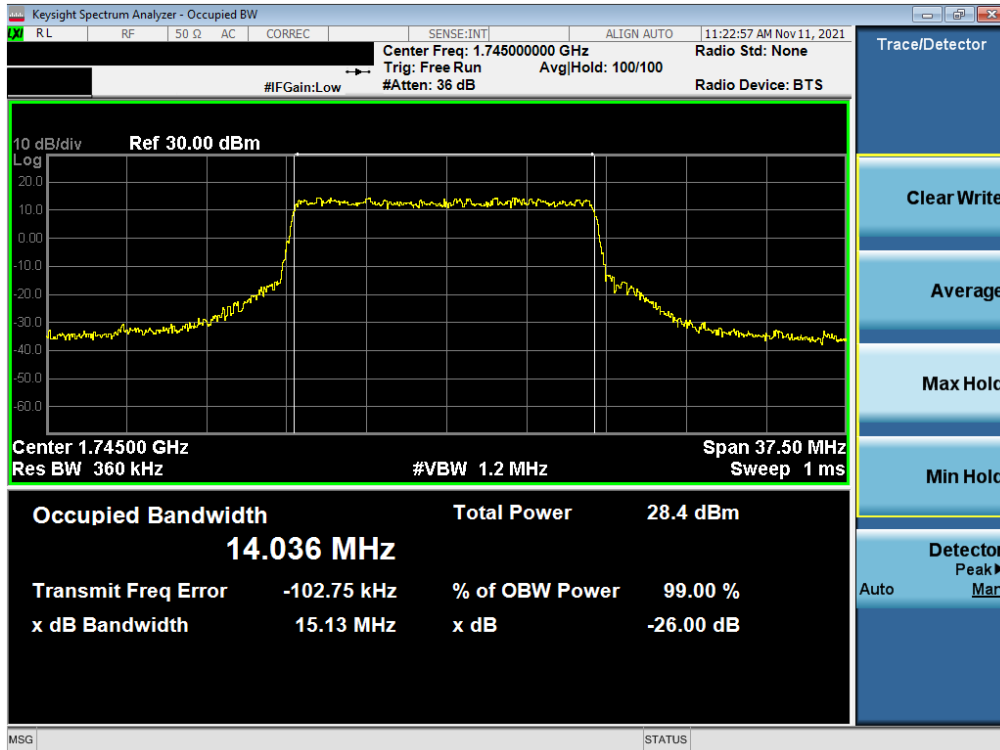


Plot 7-4. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz DFT-s-OFDM BPSK - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 15 of 87 |

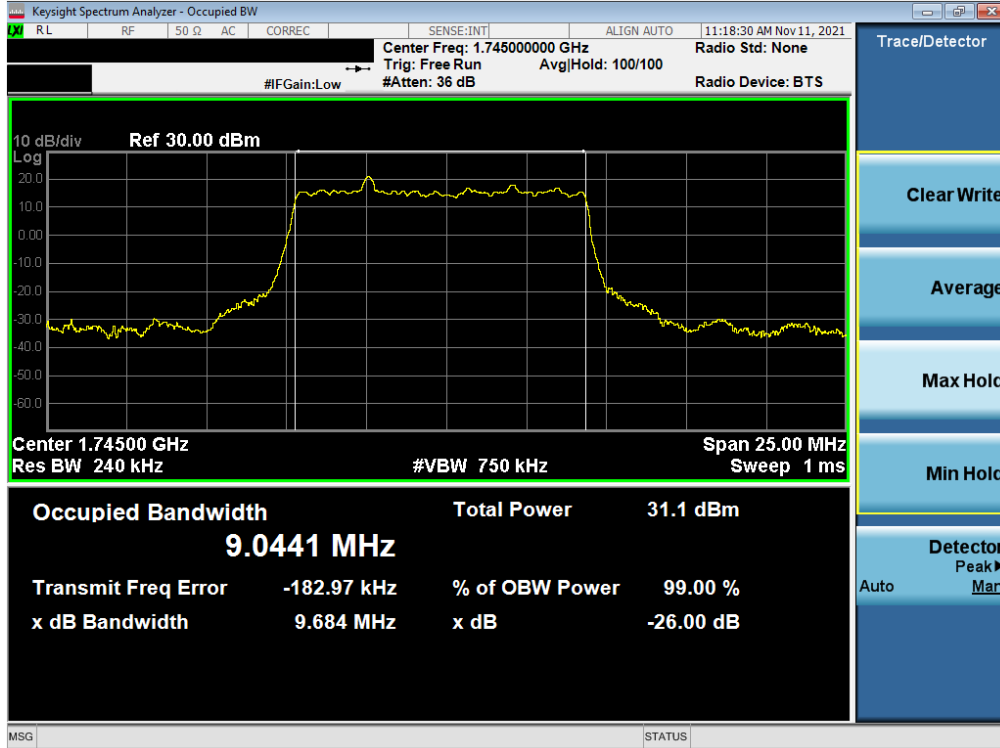


Plot 7-5. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB – ANT A)

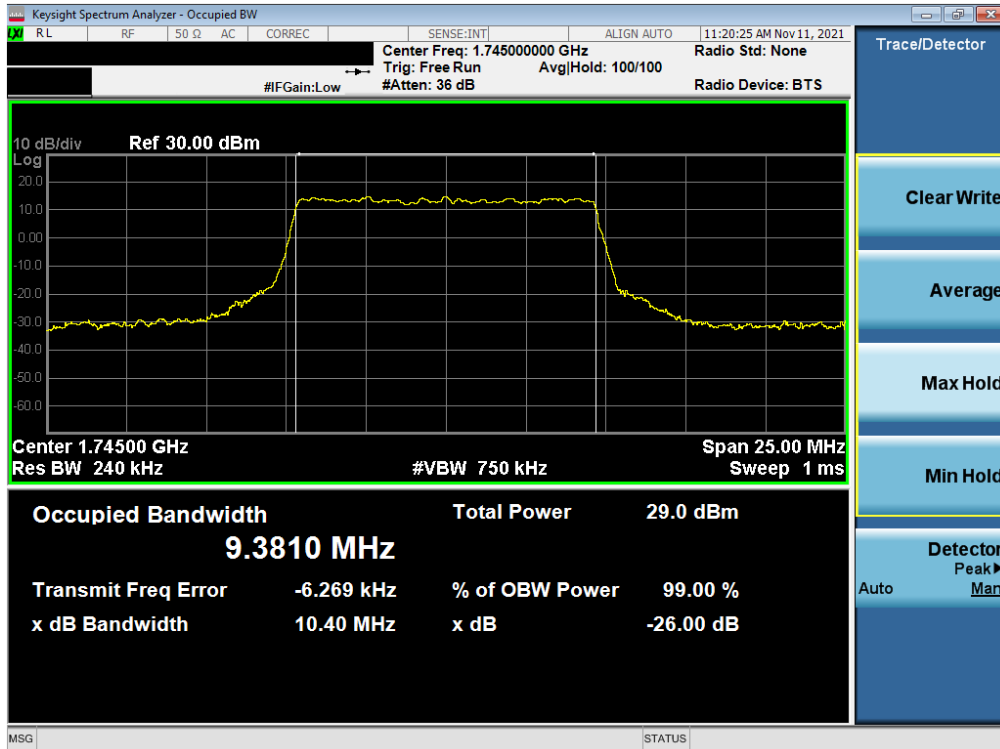


Plot 7-6. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM 16QAM - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 16 of 87 |

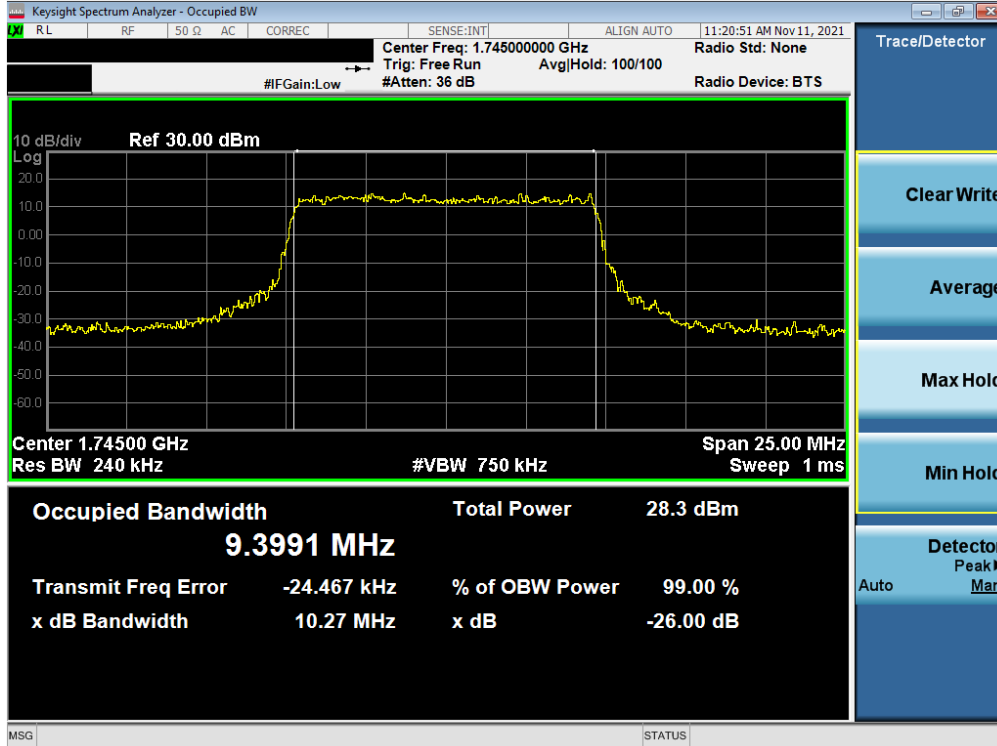


Plot 7-7. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz DFT-s-OFDM BPSK - Full RB - ANT A)

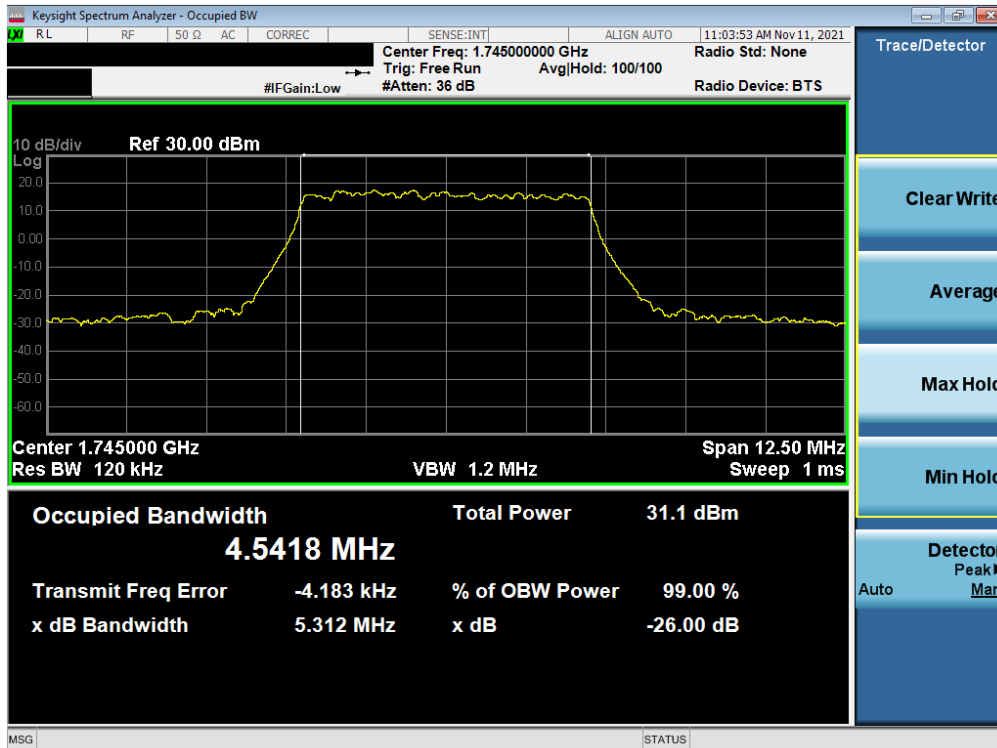


Plot 7-8. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB - ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 17 of 87 |

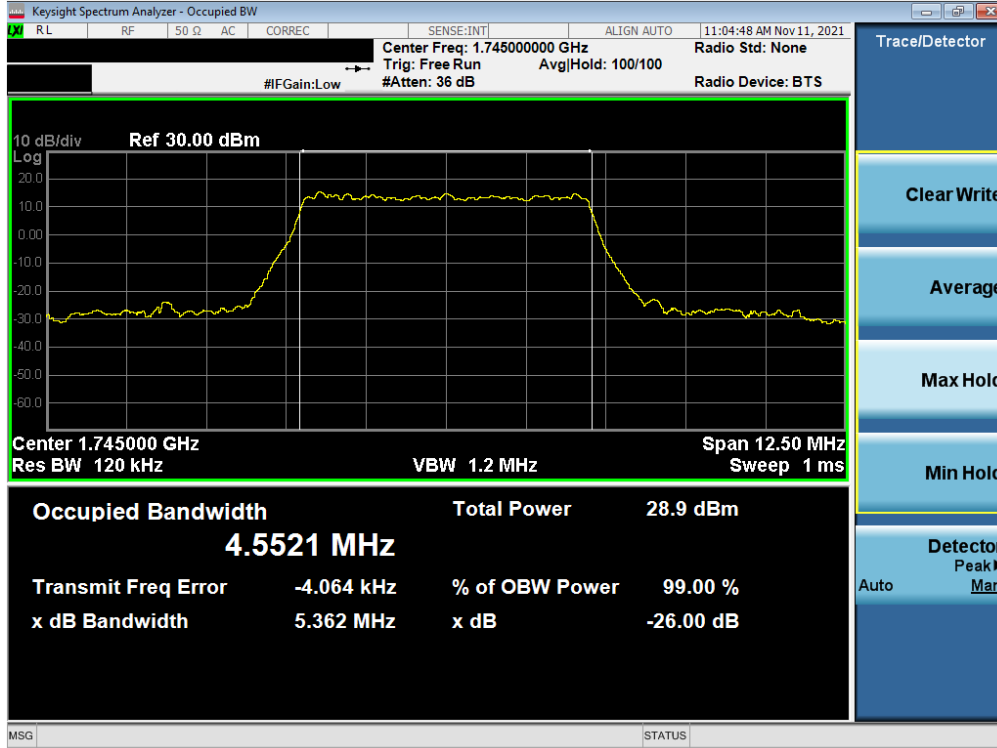


Plot 7-9. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM 16QAM - Full RB – ANT A)

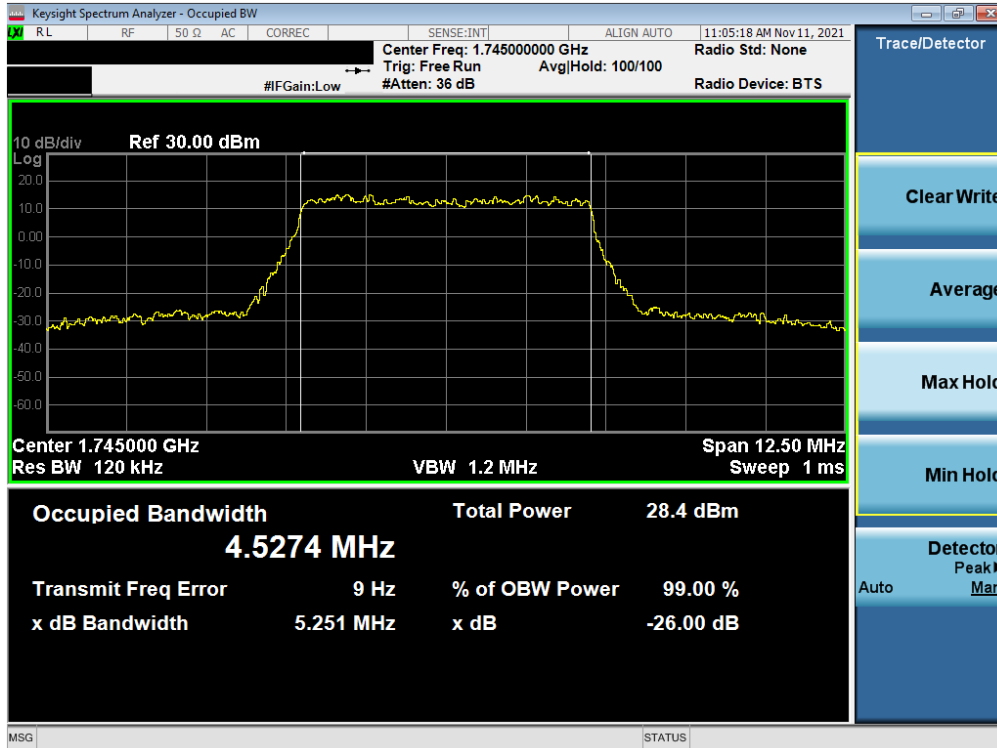


Plot 7-10. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz DFT-s-OFDM BPSK - Full RB – ANT A)

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 18 of 87 |



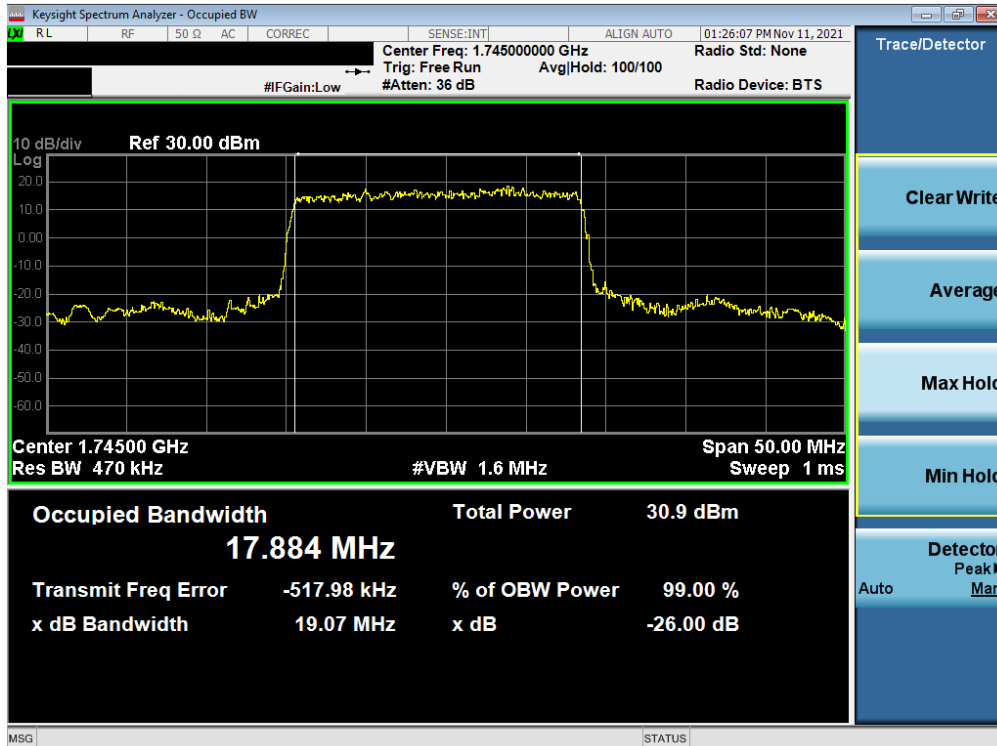
Plot 7-11. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM QPSK - Full RB - ANT A)



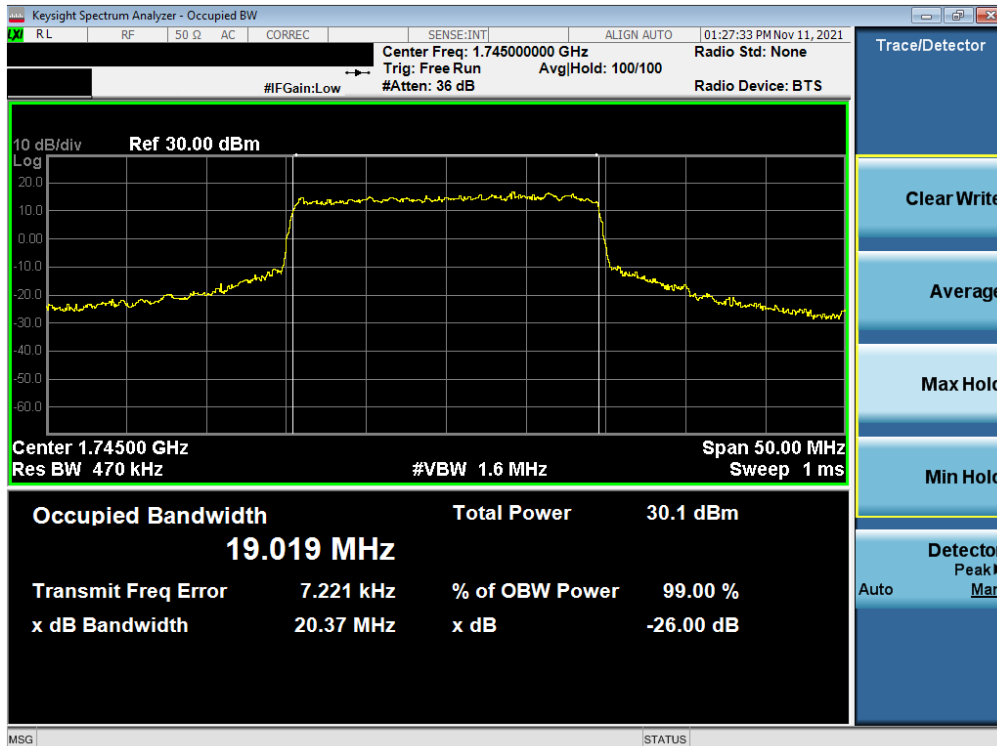
Plot 7-12. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM 16QAM - Full RB - ANT A)

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 19 of 87 |

NR Band n66 – ANT F

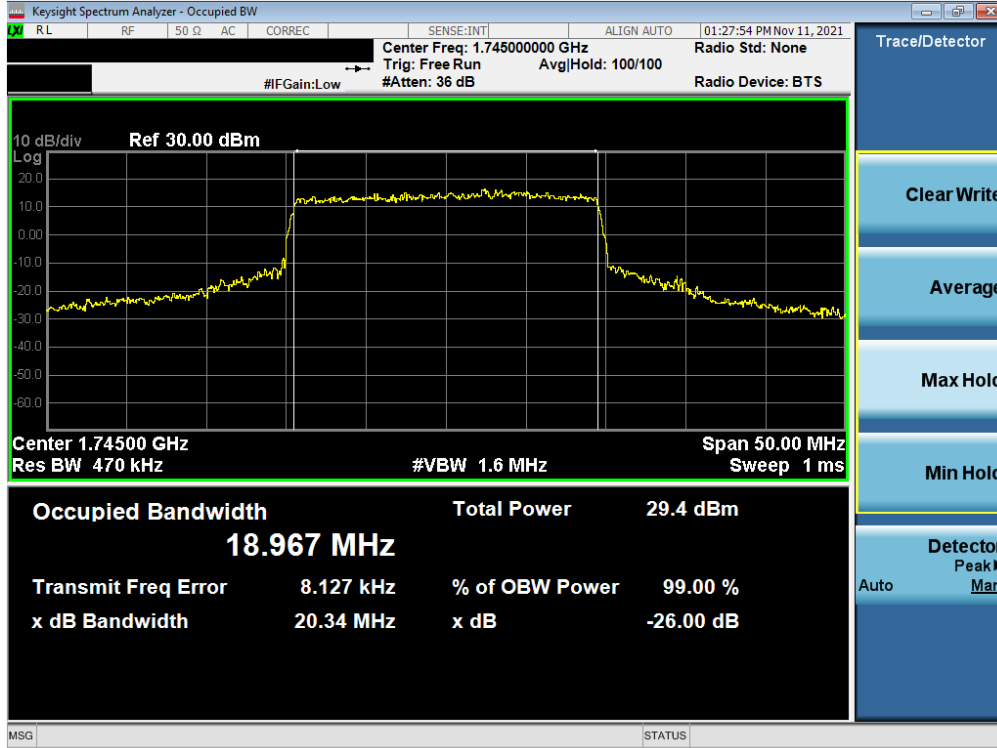


Plot 7-13. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz DFT-s-OFDM BPSK - Full RB – ANT F)

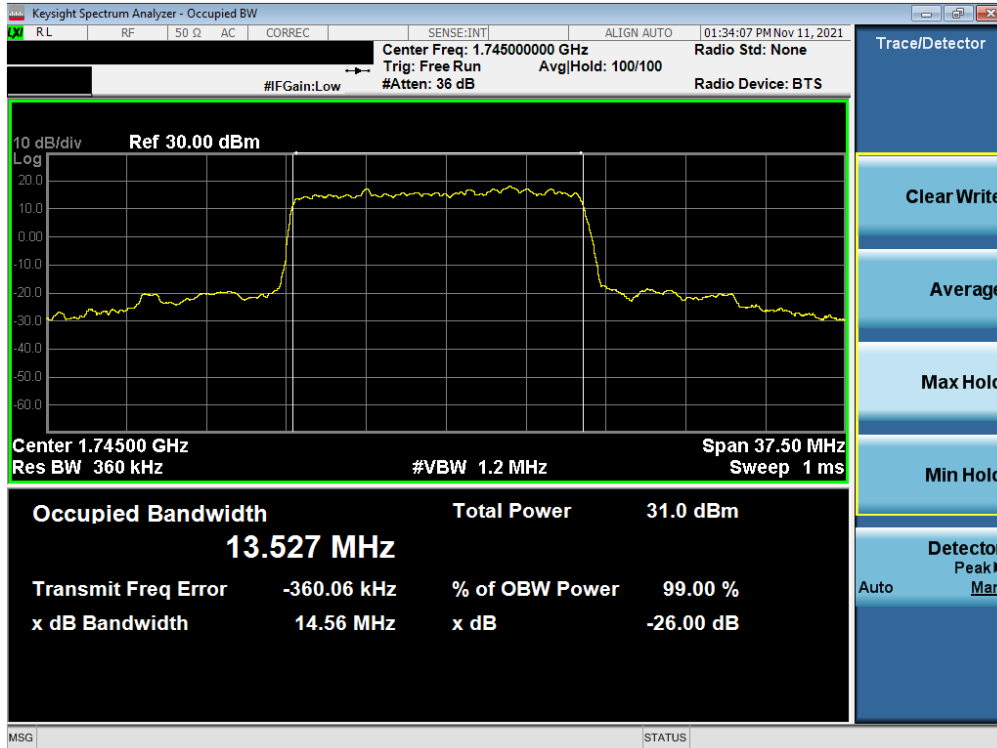


Plot 7-14. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM QPSK - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 20 of 87 |

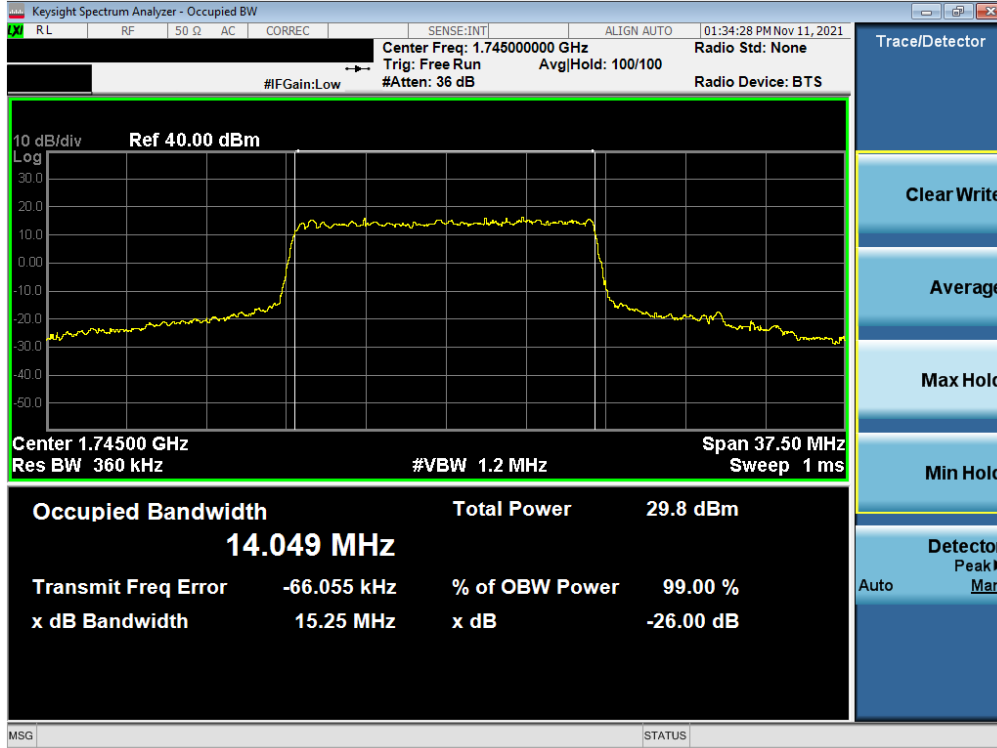


Plot 7-15. Occupied Bandwidth Plot (NR Band n66 - 20.0MHz CP-OFDM 16QAM - Full RB - ANT F)

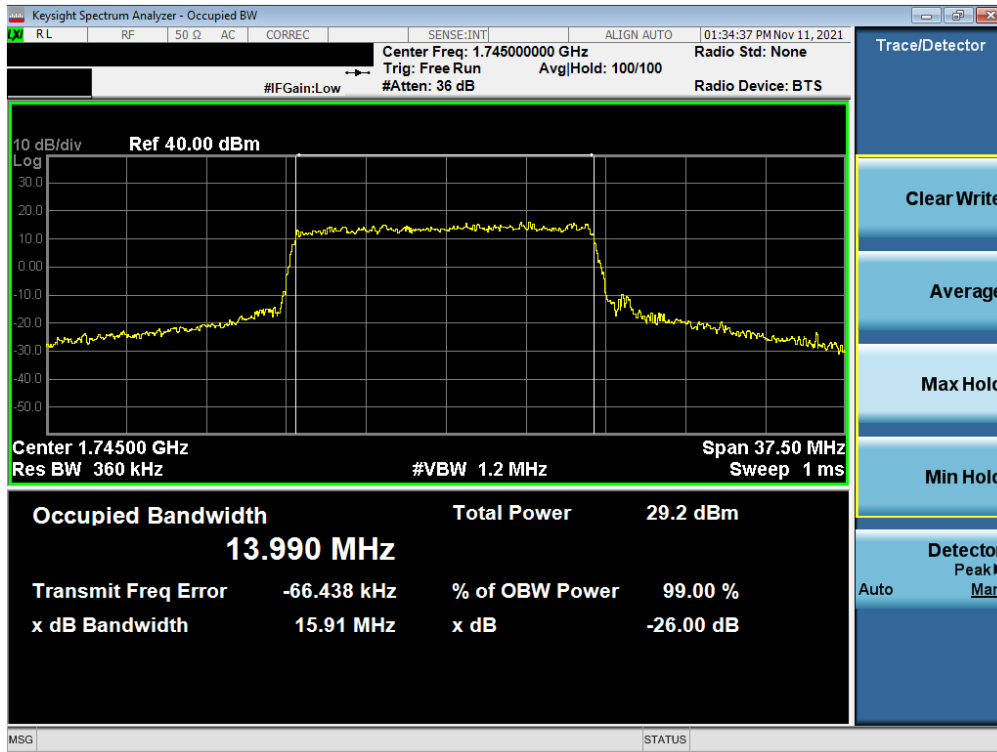


Plot 7-16. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz DFT-s-OFDM BPSK - Full RB - ANT F)

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 21 of 87 |

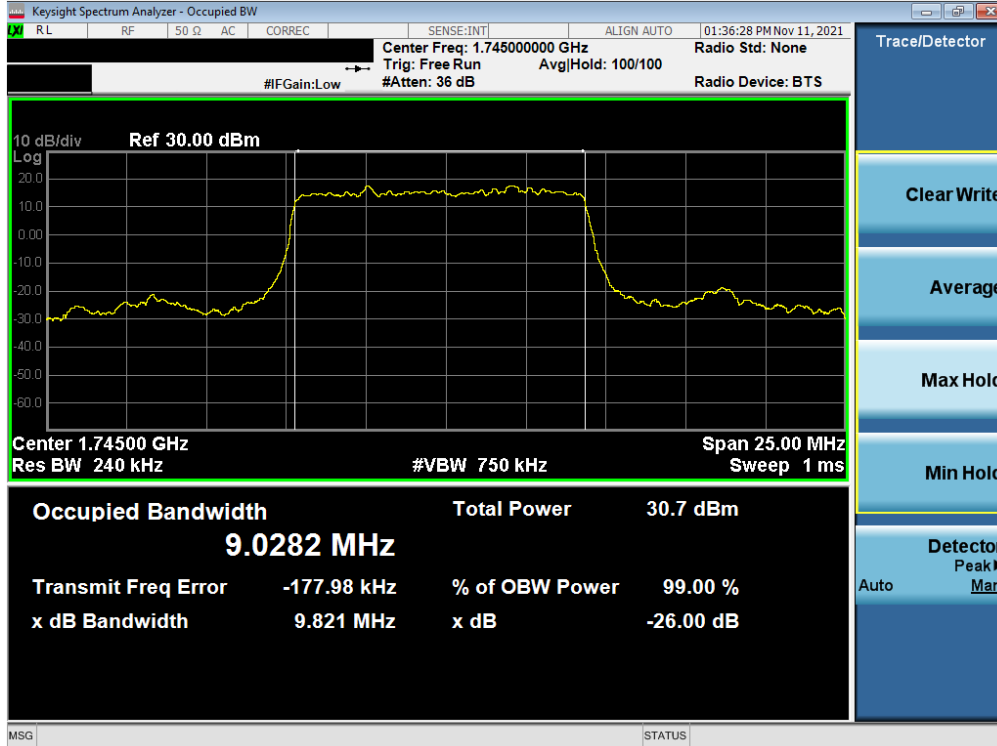


Plot 7-17. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB – ANT F)

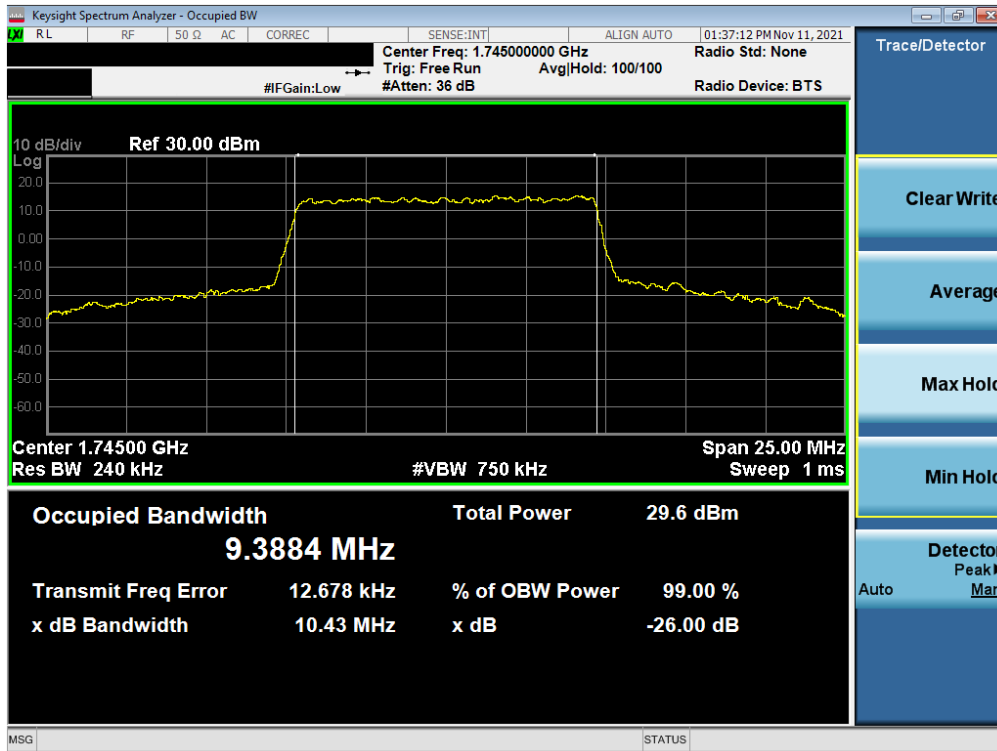


Plot 7-18. Occupied Bandwidth Plot (NR Band n66 - 15.0MHz CP-OFDM 16QAM - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 22 of 87 |

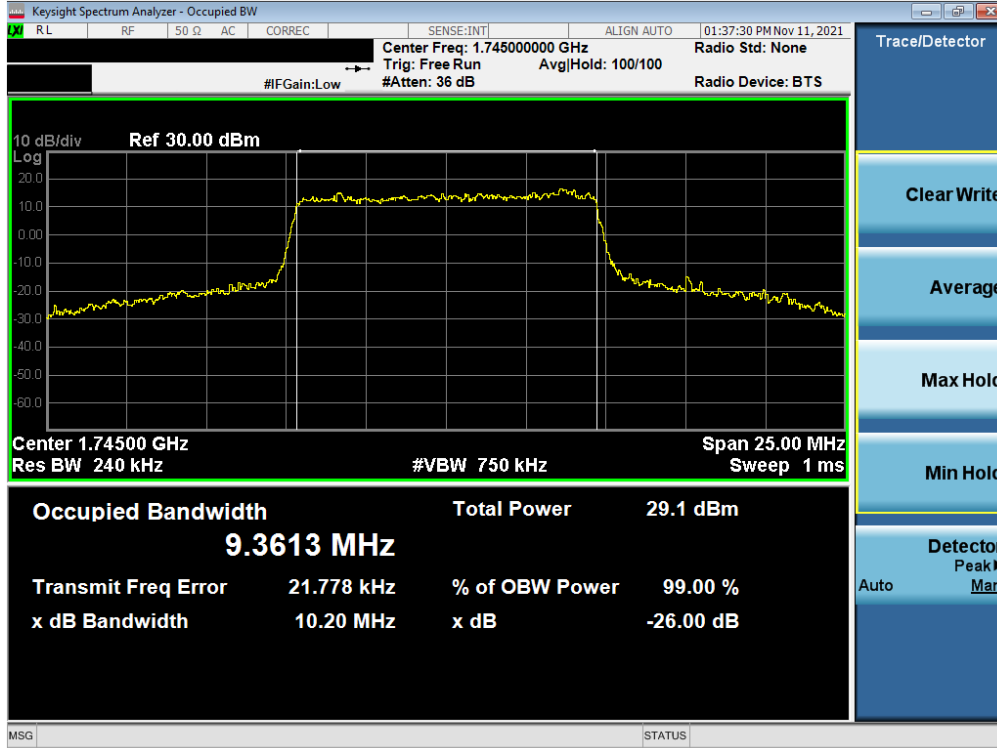


Plot 7-19. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz DFT-s-OFDM BPSK - Full RB – ANT F)

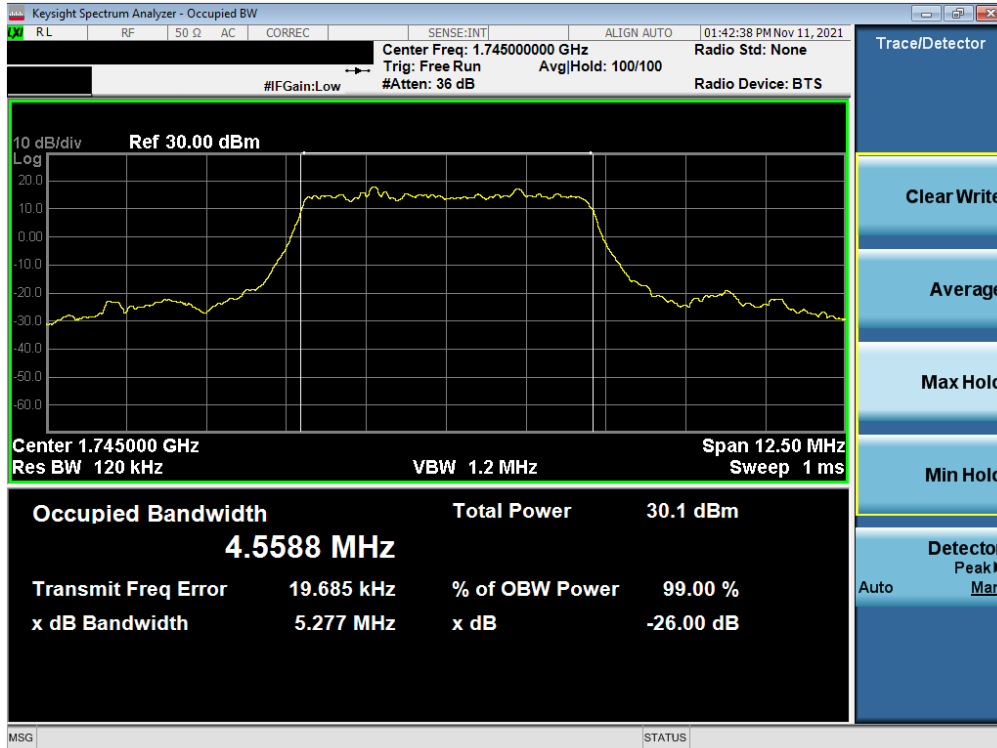


Plot 7-20. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB – ANT F)

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 23 of 87 |

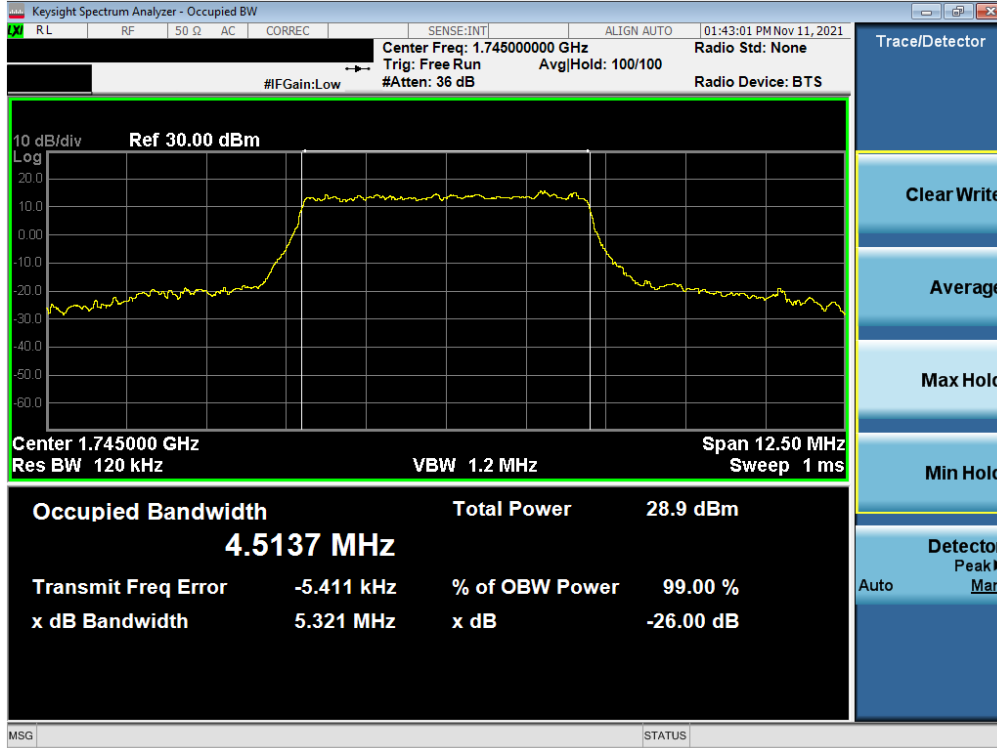


Plot 7-21. Occupied Bandwidth Plot (NR Band n66 - 10.0MHz CP-OFDM 16QAM - Full RB - ANT F)

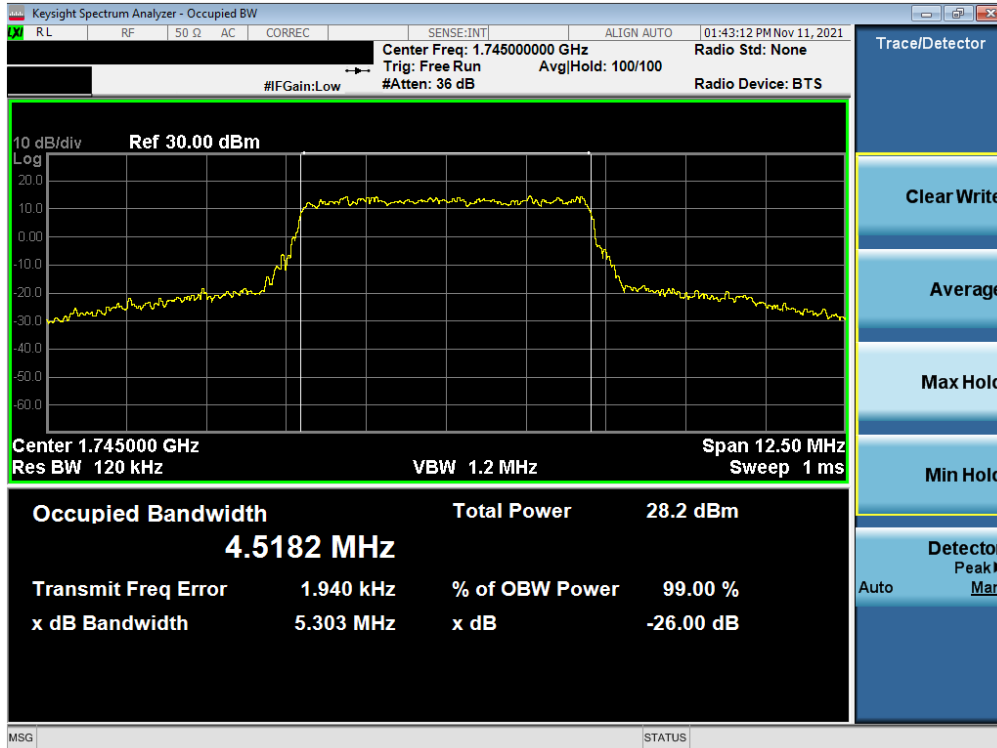


Plot 7-22. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz DFT-s-OFDM BPSK - Full RB - ANT F)

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 24 of 87 |



Plot 7-23. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM QPSK - Full RB - ANT F)



Plot 7-24. Occupied Bandwidth Plot (NR Band n66 - 5.0MHz CP-OFDM 16QAM - Full RB - ANT F)

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 25 of 87 |

7.4 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 18GHz (separated into at least two plots per channel)
2. RBW \geq 100kHz
3. VBW \geq 3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

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

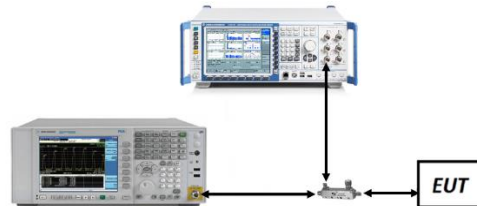




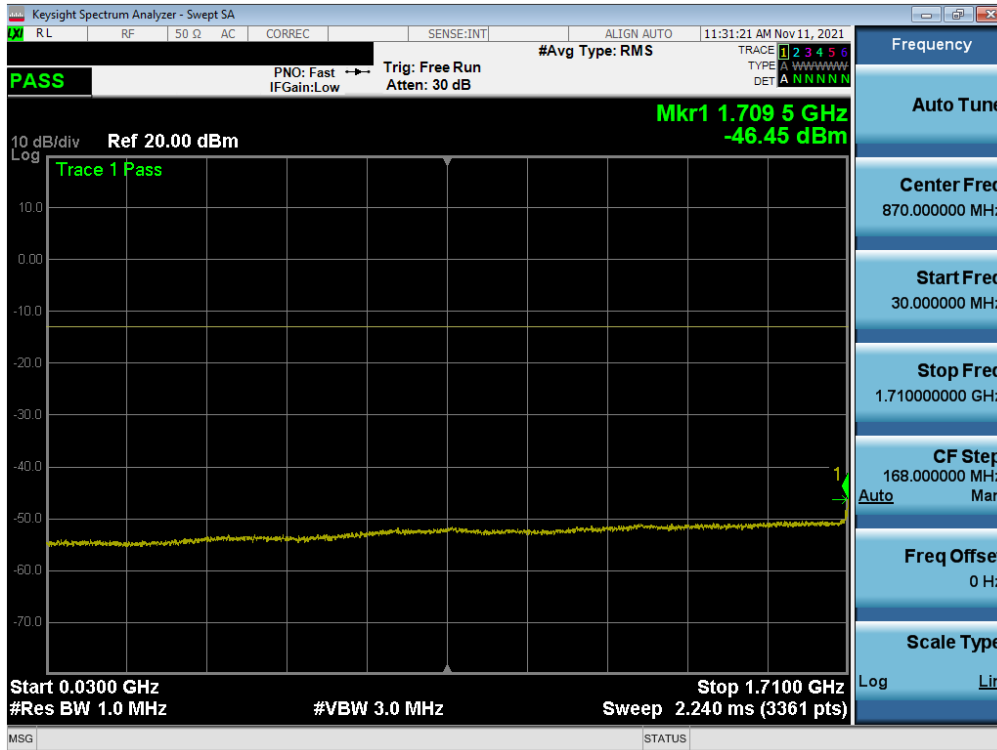
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

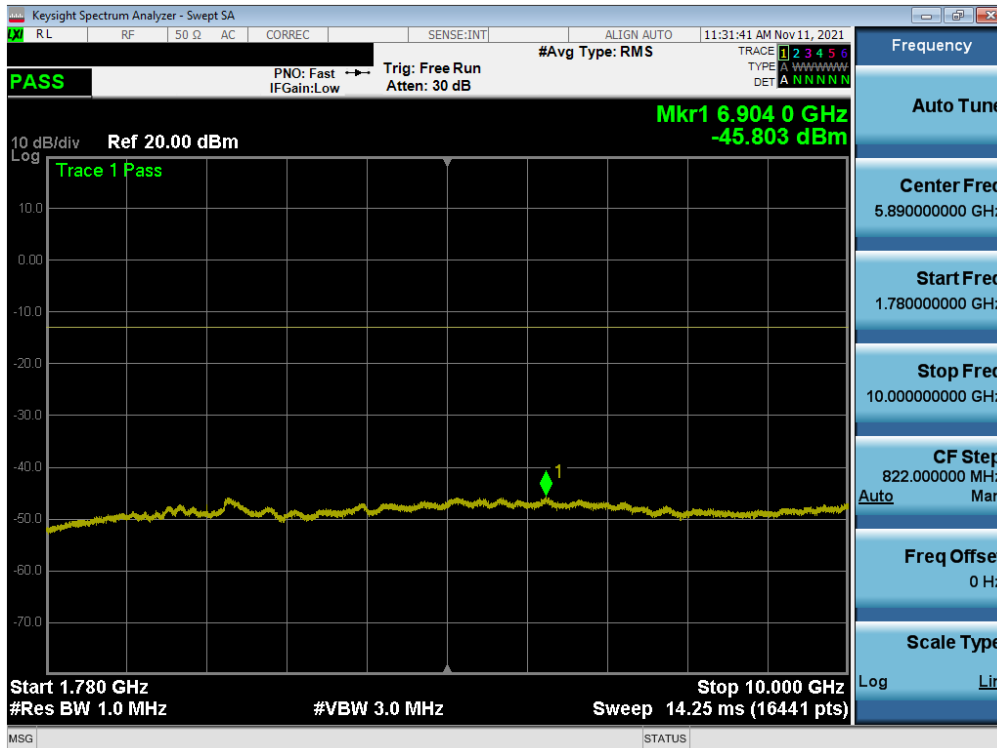
1. Per Part 27 and RSS-139, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz and a resolution bandwidth of 1MHz for measurements above 1GHz.
2. For NR operation, all subcarrier spacings (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.
3. Spurious emissions measurements are included in this section to address compliance of the LTE ULCA capability. The EUT was set to transmit at the widest bandwidth and on the middle channel of each band.

| | | | | |
|---|---|-------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 26 of 87 |

NR Band n66 – ANT A

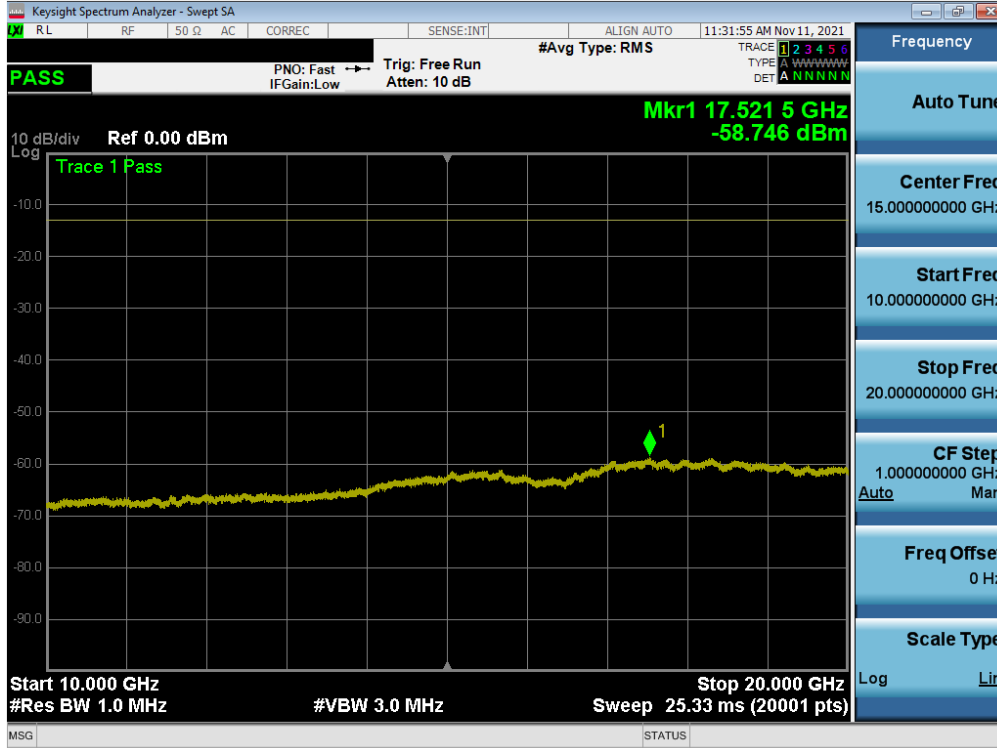


Plot 7-25. Conducted Spurious Plot (NR Band n66 -20MHz - 1 RB - Low Channel – ANT A)

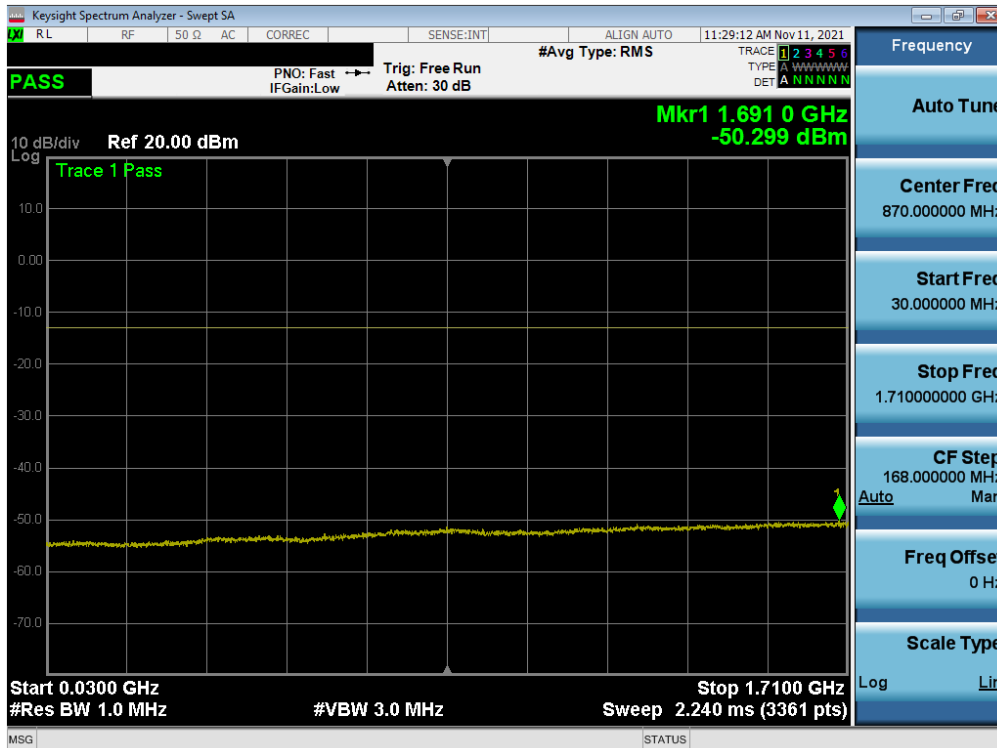


Plot 7-26. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Low Channel – ANT A)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 27 of 87 |

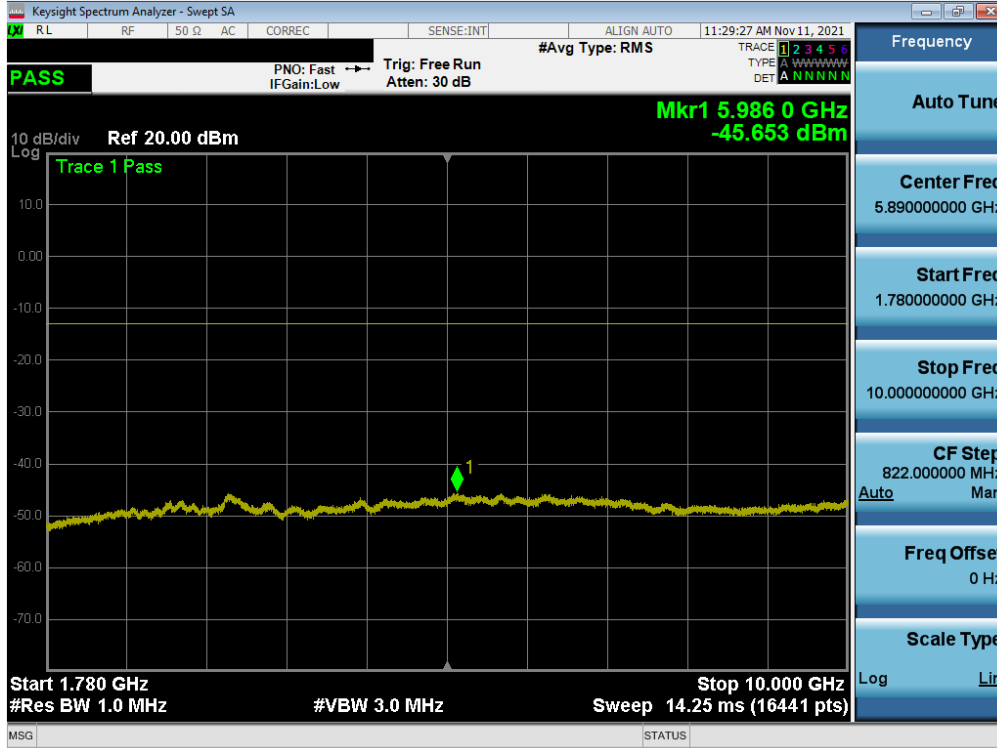


Plot 7-27. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Low Channel – ANT A)

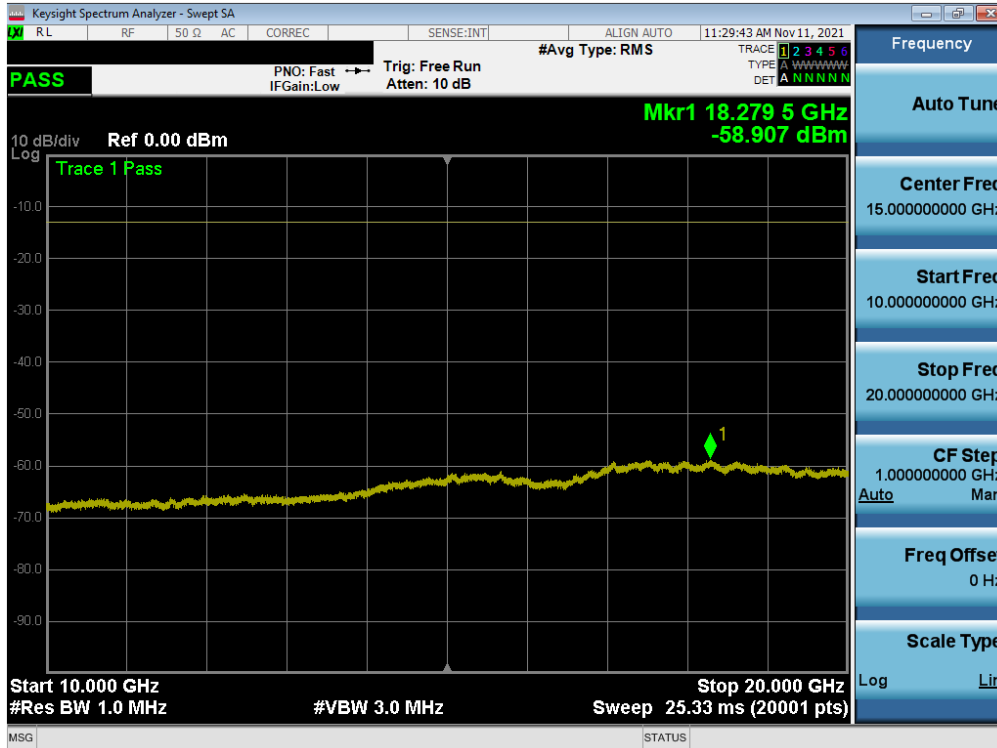


Plot 7-28. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Mid Channel – ANT A)



| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 28 of 87 |

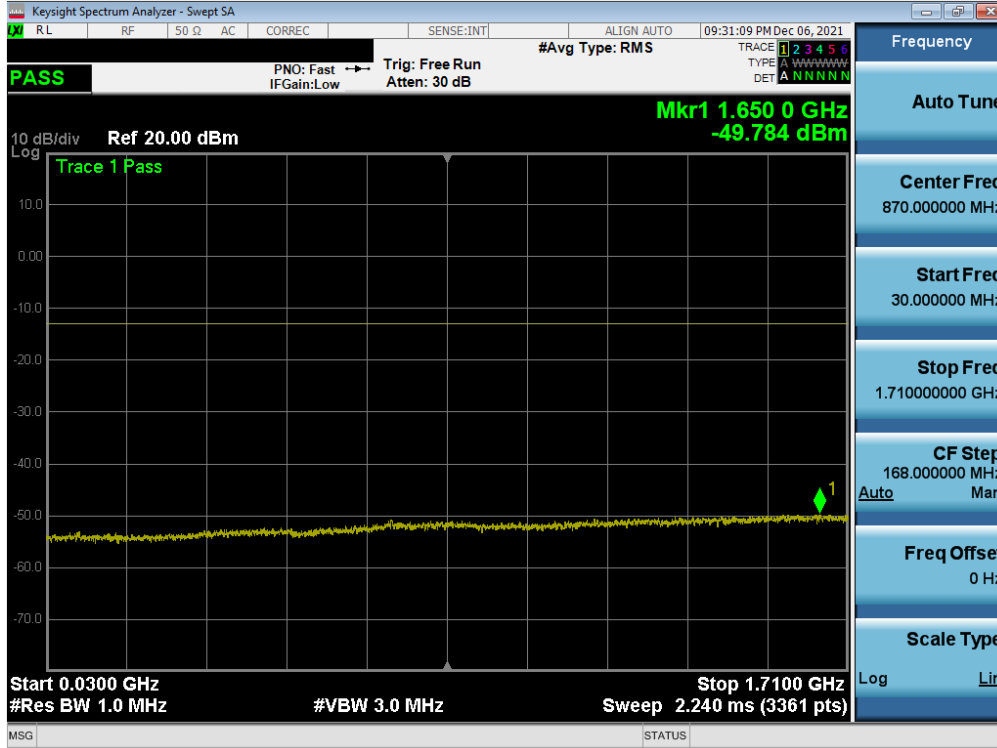


Plot 7-29. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Mid Channel – ANT A)

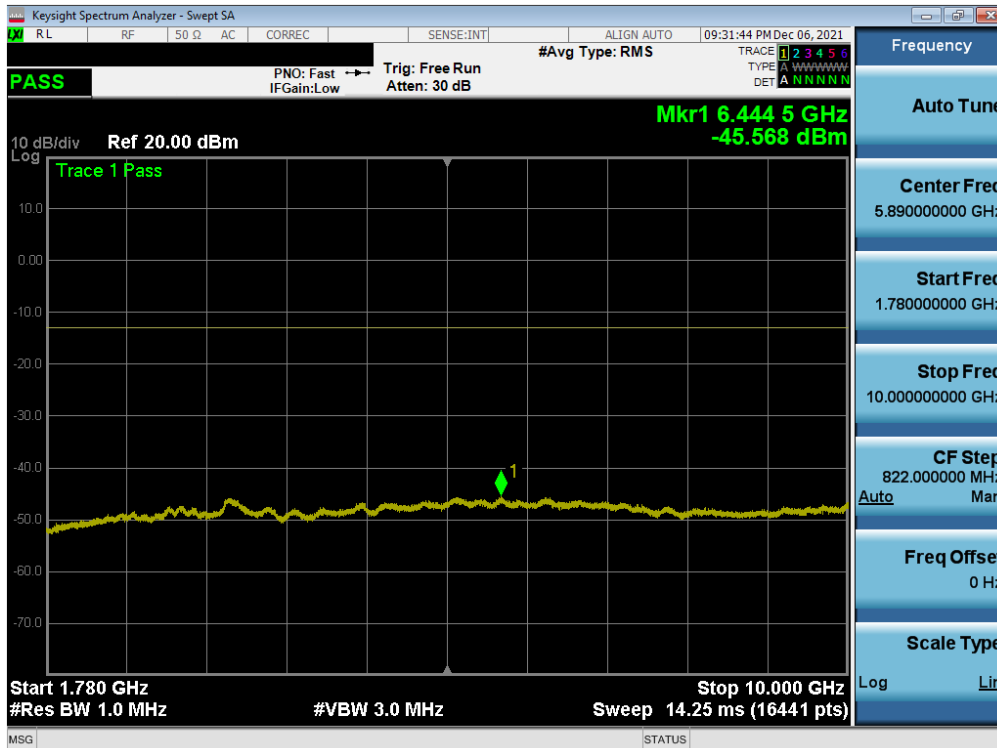


Plot 7-30. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Mid Channel – ANT A)

| | | | | |
|---|---|-------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 29 of 87 |

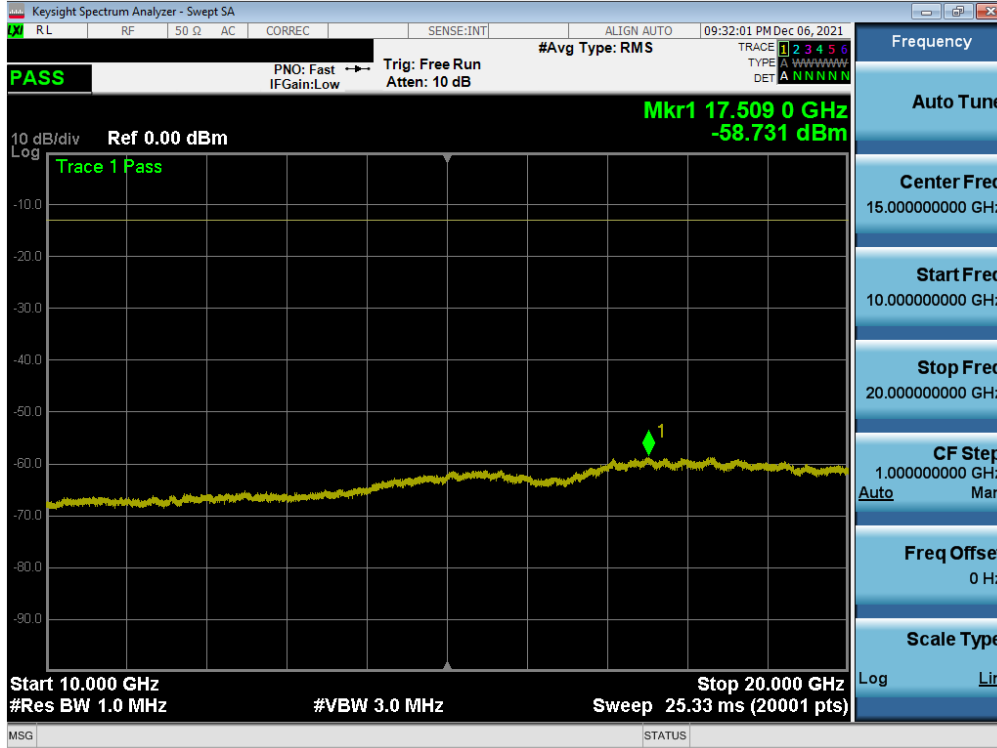


Plot 7-31. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - High Channel – ANT A)






Plot 7-32. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - High Channel – ANT A)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 30 of 87 |



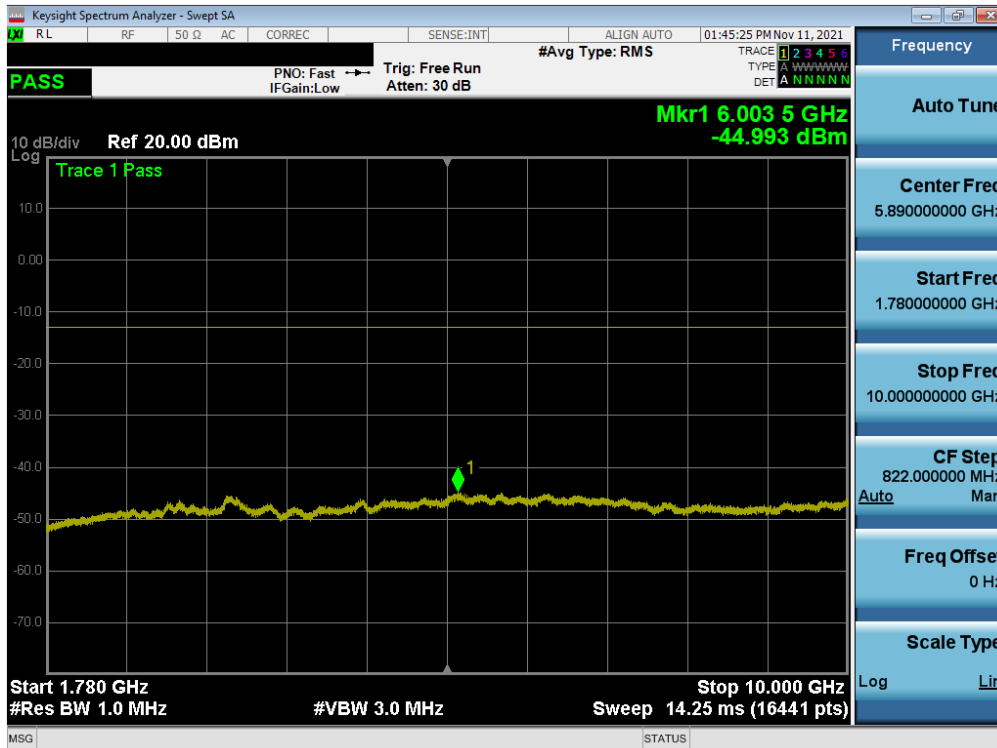
Plot 7-33. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - High Channel – ANT A)

| | | | | |
|---|--|-----------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  PCTEST Proud to be part of  | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 31 of 87 |

NR Band n66 – ANT F

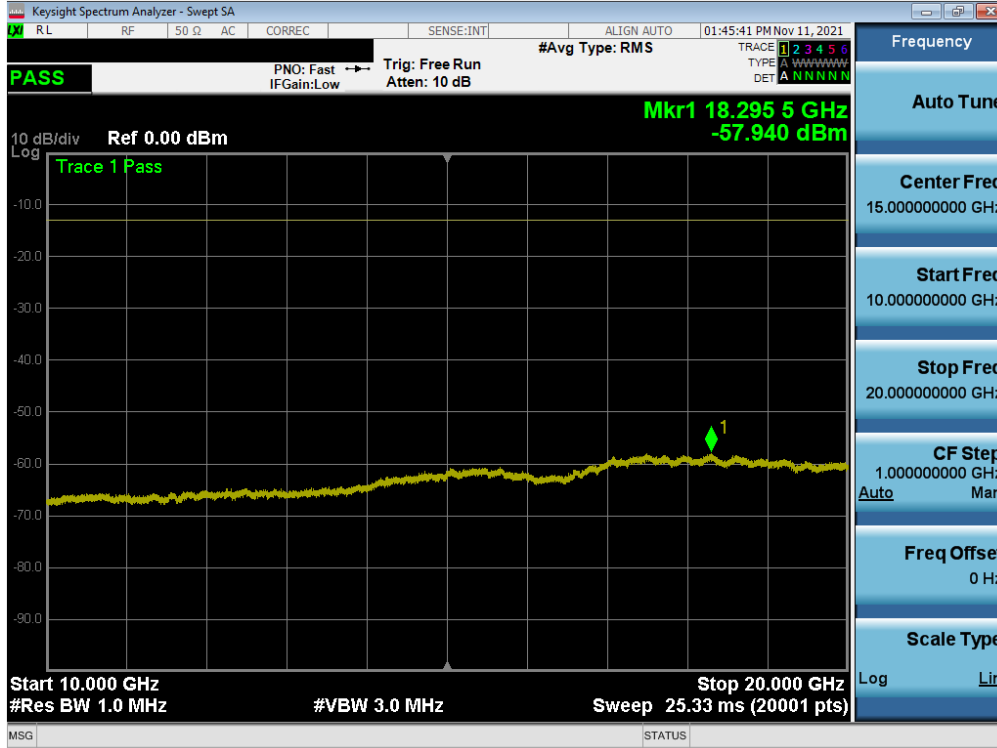


Plot 7-34. Conducted Spurious Plot (NR Band n66 -20MHz - 1 RB - Low Channel – ANT F)



Plot 7-35. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Low Channel – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 32 of 87 |

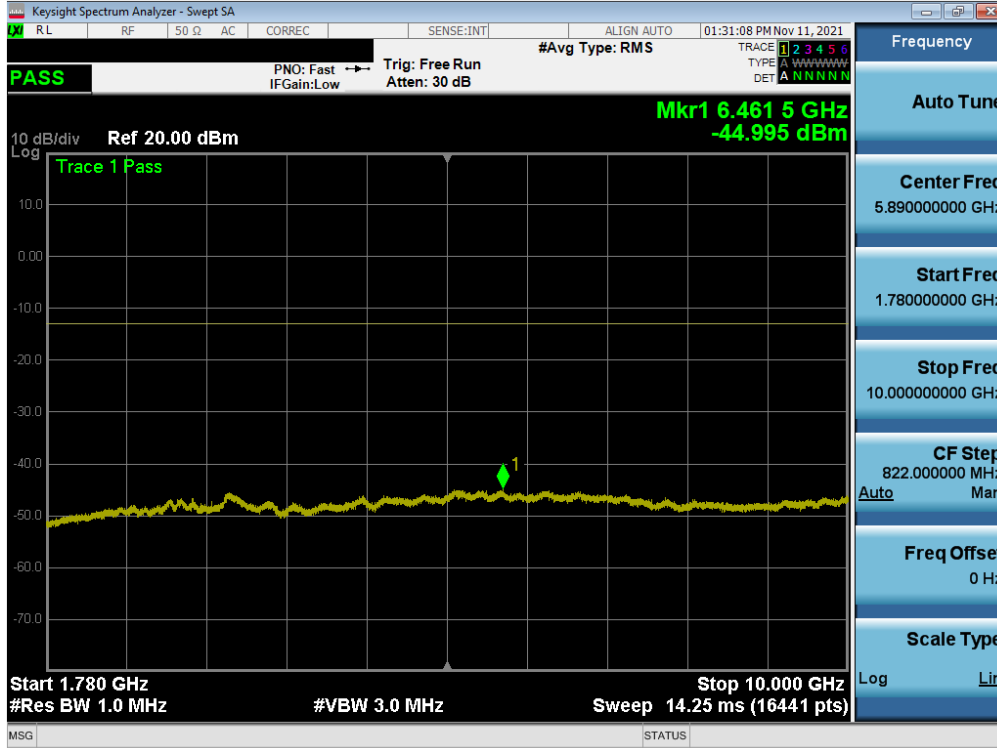


Plot 7-36. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Low Channel – ANT F)

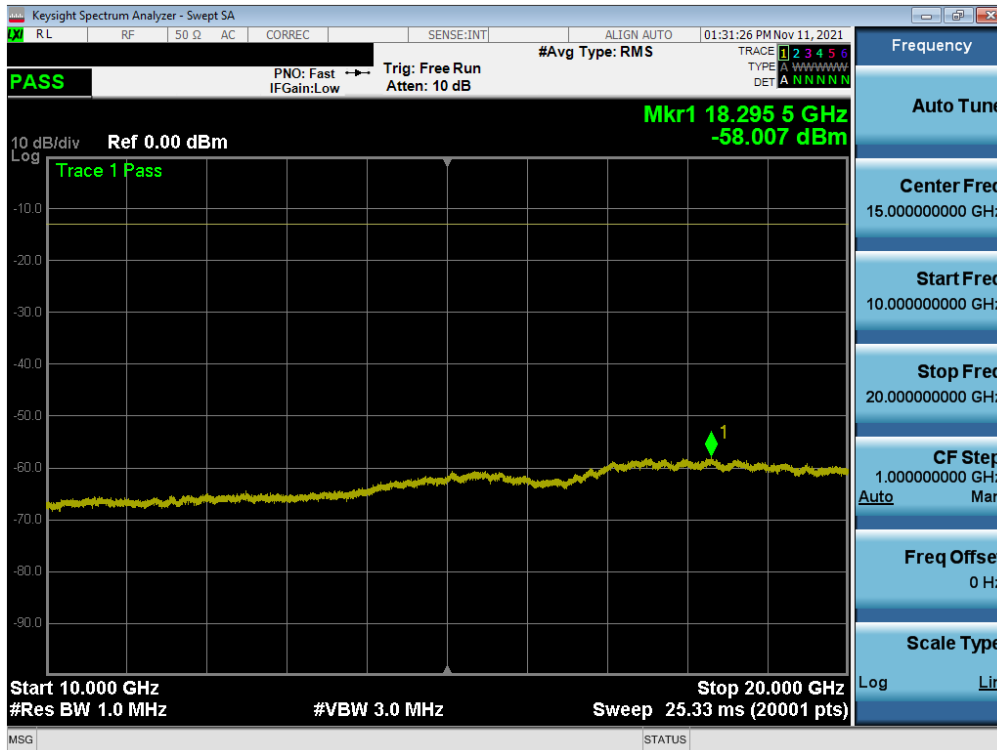


Plot 7-37. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Mid Channel – ANT F)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 33 of 87 |

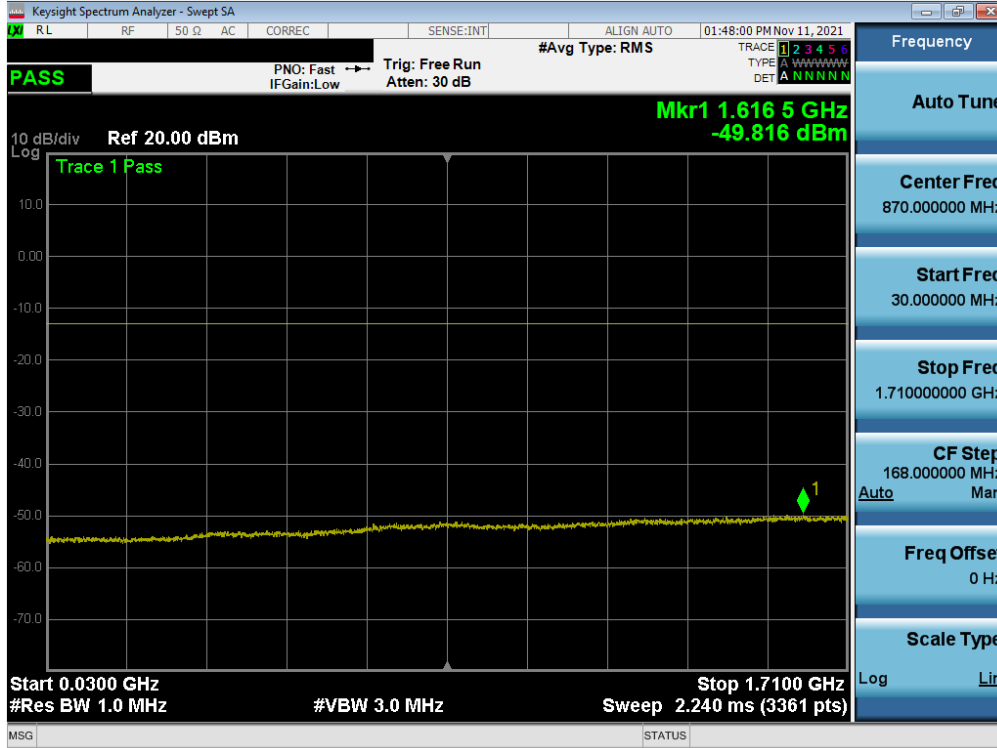


Plot 7-38. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Mid Channel – ANT F)

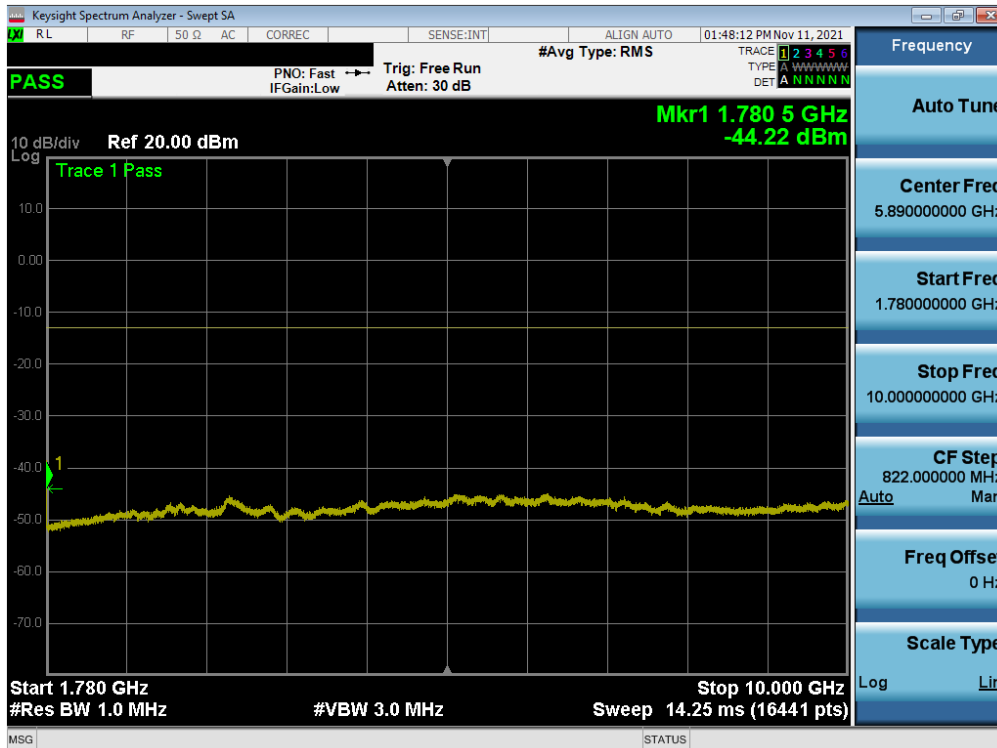


Plot 7-39. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - Mid Channel – ANT F)



| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 34 of 87 |

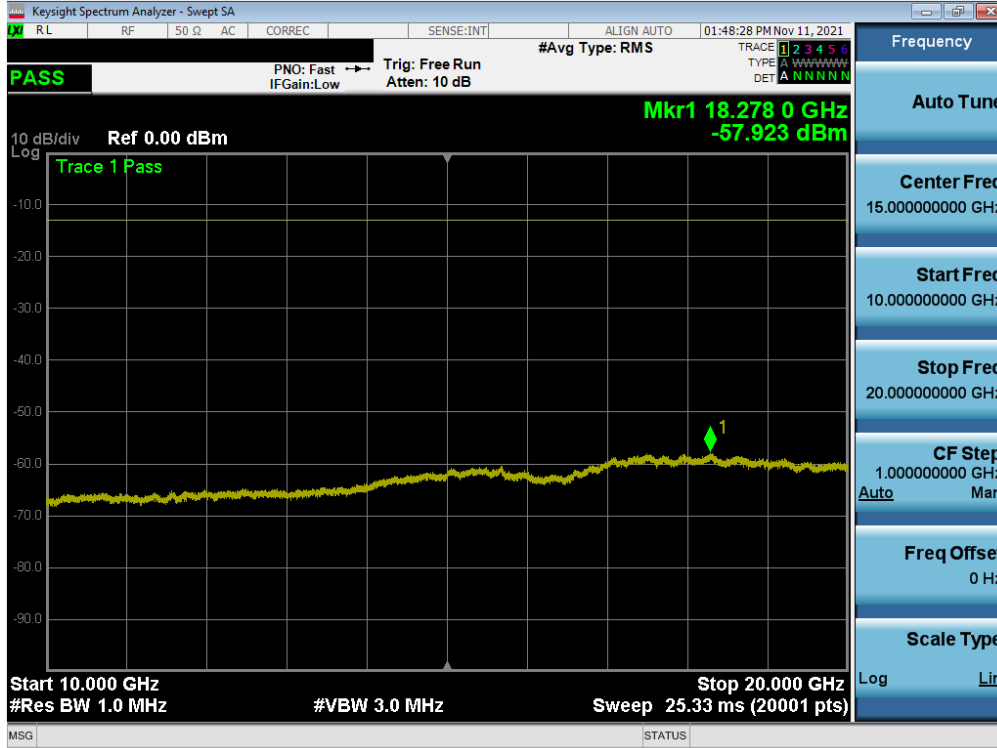


Plot 7-40. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - High Channel – ANT F)






Plot 7-41. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - High Channel – ANT F)

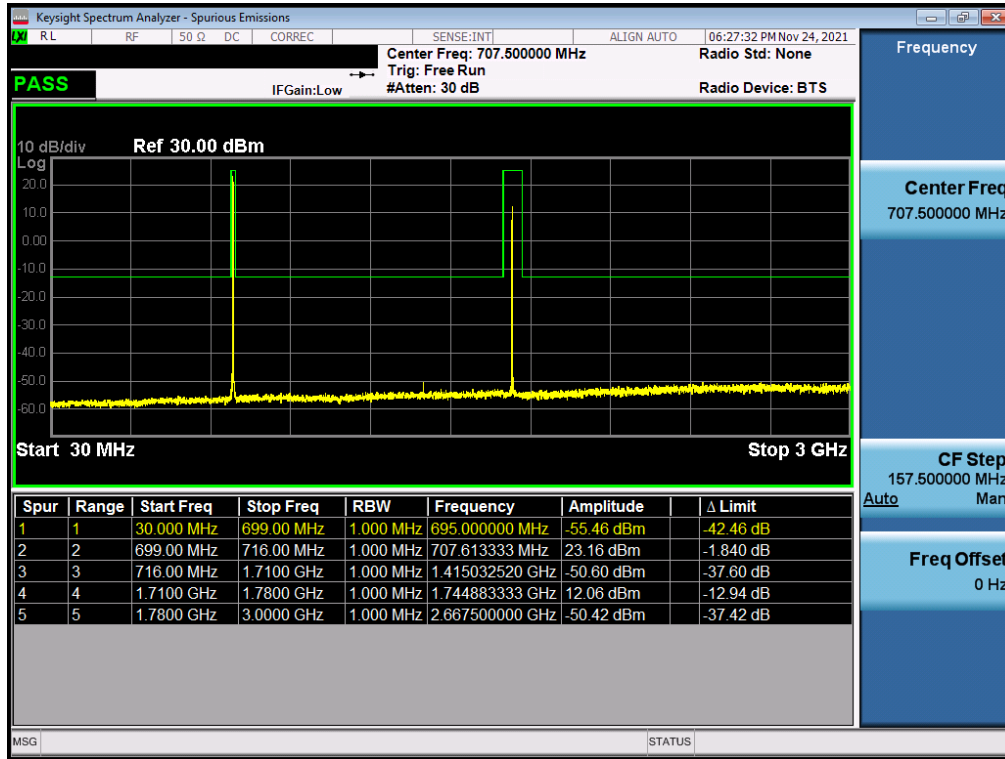
| | | | | |
|---|---|-------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 35 of 87 |



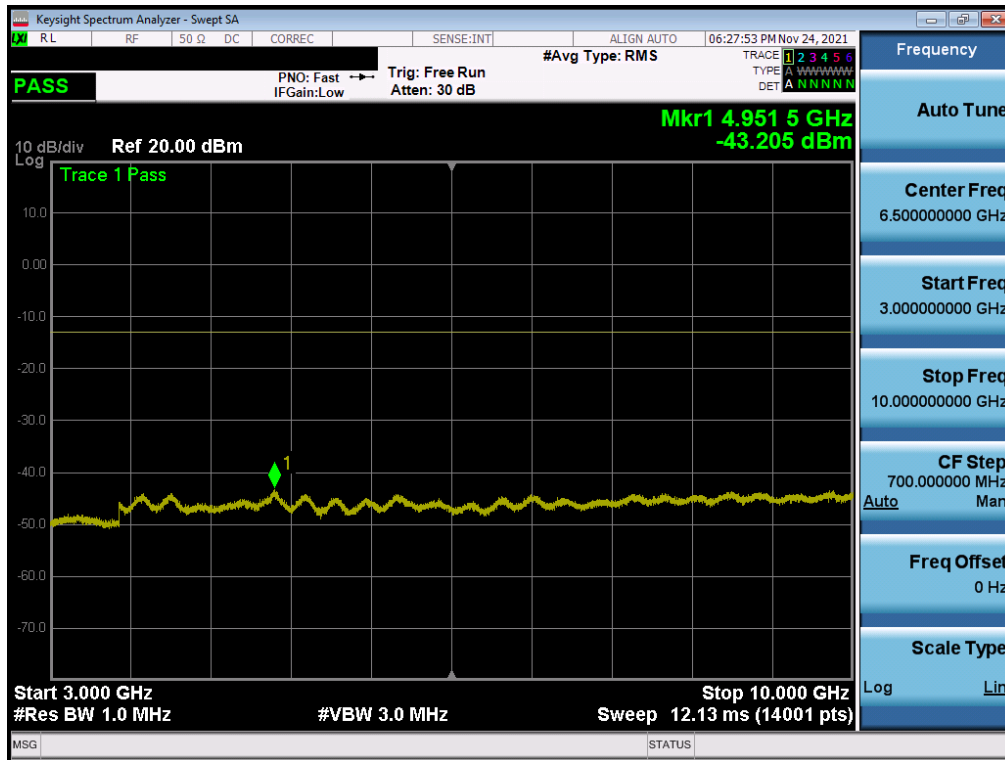
Plot 7-42. Conducted Spurious Plot (NR Band n66 - 20MHz - 1 RB - High Channel – ANT F)

| | | | |
|---|--|-------------------------------|--|
| FCC ID: A3LSMS901E |  Proud to be part of  | PART 27 MEASUREMENT REPORT |  Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 36 of 87 |

ULCA LTE Band 12 – Band 66

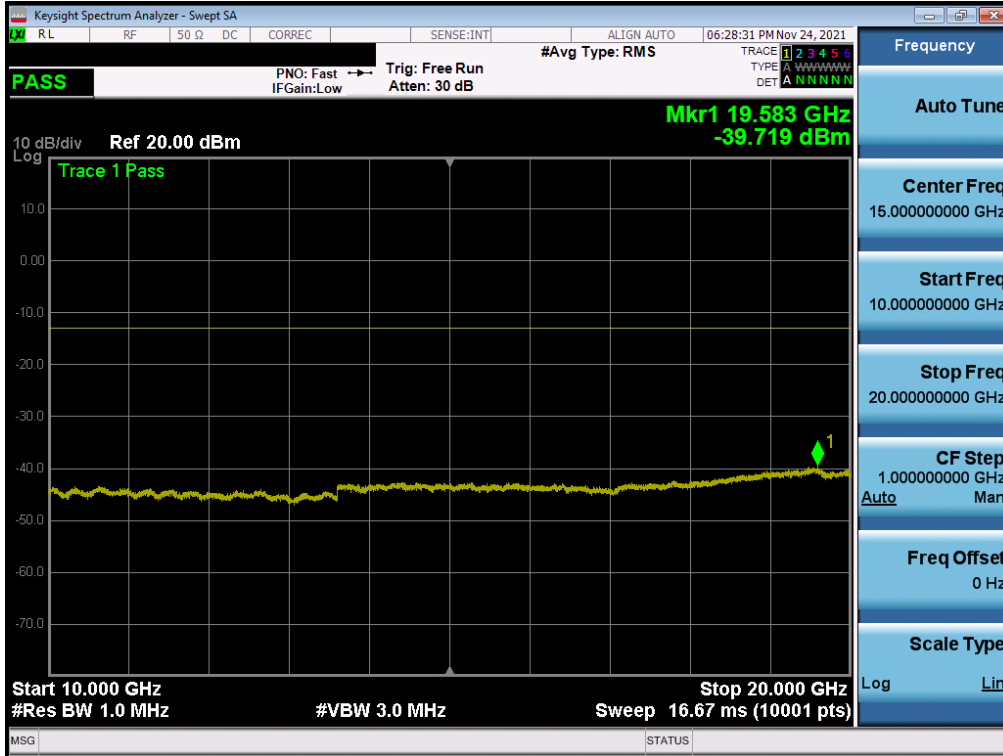


Plot 7-43. Conducted Spurious Plot (ULCA LTE B12 – B66)






Plot 7-44. Conducted Spurious Plot (ULCA LTE B12 – B66)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 37 of 87 |



Plot 7-45. Conducted Spurious Plot (ULCA LTE B12 – B66)

| | | | | |
|---|--|-------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  Proud to be part of  | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 38 of 87 |

7.5 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at 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 $43 + 10 \log_{10}(P_{\text{Watts}})$, where P is the transmitter power in Watts.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW \geq 1% of the emission bandwidth
4. VBW \geq 3 x RBW
5. Detector = RMS
6. Number of sweep points \geq 2 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.

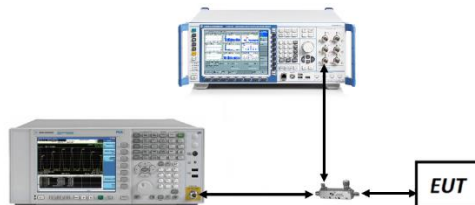


Figure 7-4. Test Instrument & Measurement Setup

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 39 of 87 |



Test Notes

Per 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.

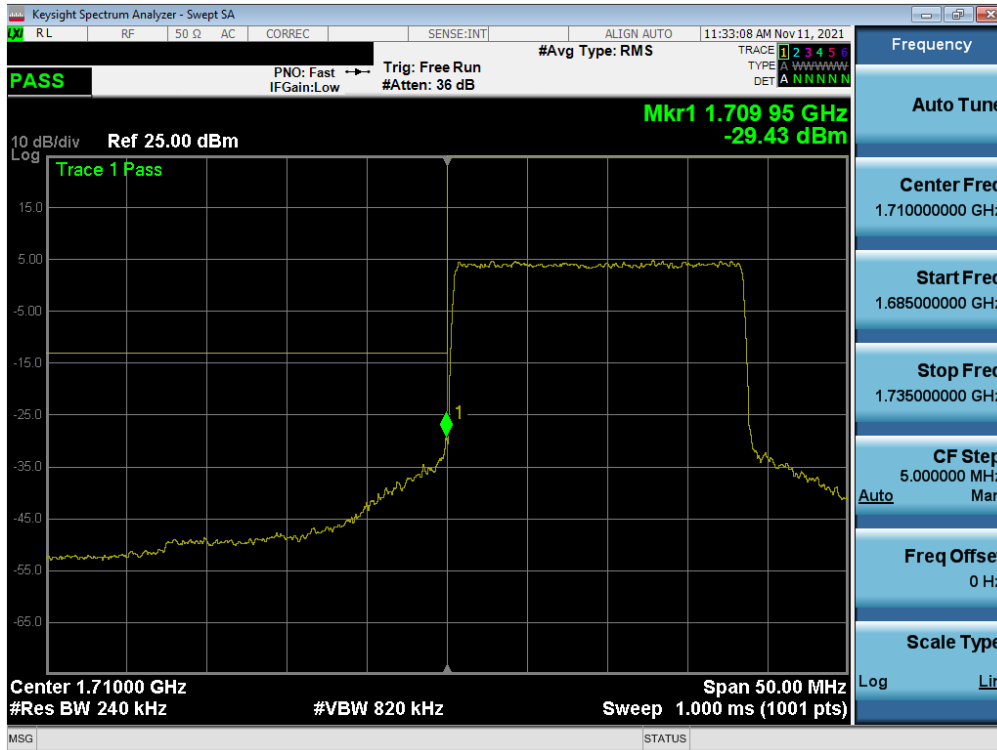
Per 27.53(g) for operations in the 663 - 698 MHz and 698 – 746MHz bands, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

Per 27.53(c)(5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.

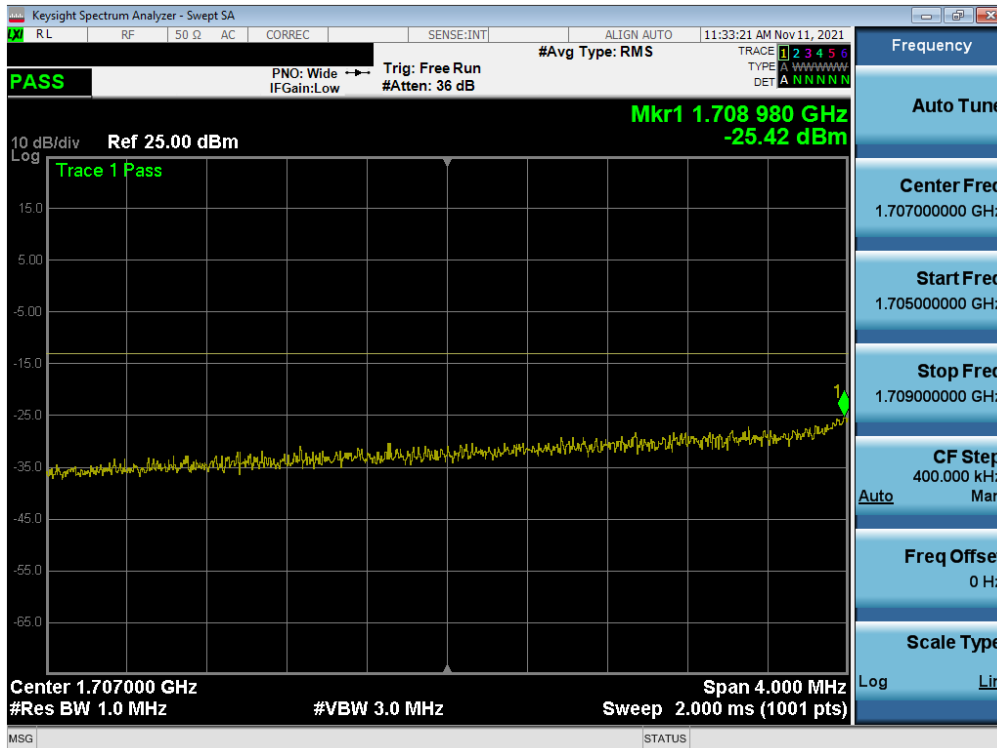
For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c)(4) is $65 + 10 \log_{10}(P) = -35\text{dBm}$ in a 6.25kHz bandwidth.

| | | | |
|---|---|-------------------------------|-----------------------------------|
| FCC ID: A3LSMS901E |  PART 27 MEASUREMENT REPORT  | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 40 of 87 |

NR Band n66 – ANT A

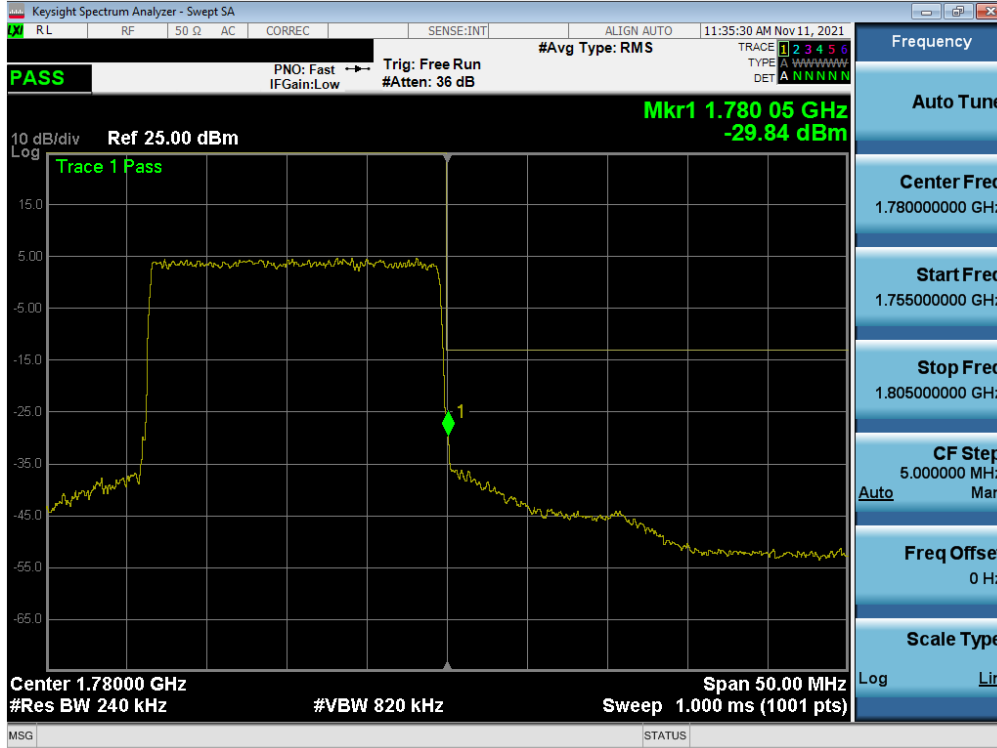


Plot 7-46. Lower Band Edge Plot (NR Band n66 – 20.0MHz - Full RB – ANT A)



Plot 7-47. Lower Extended Band Edge Plot (NR Band n66 – 20.0MHz - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 41 of 87 |

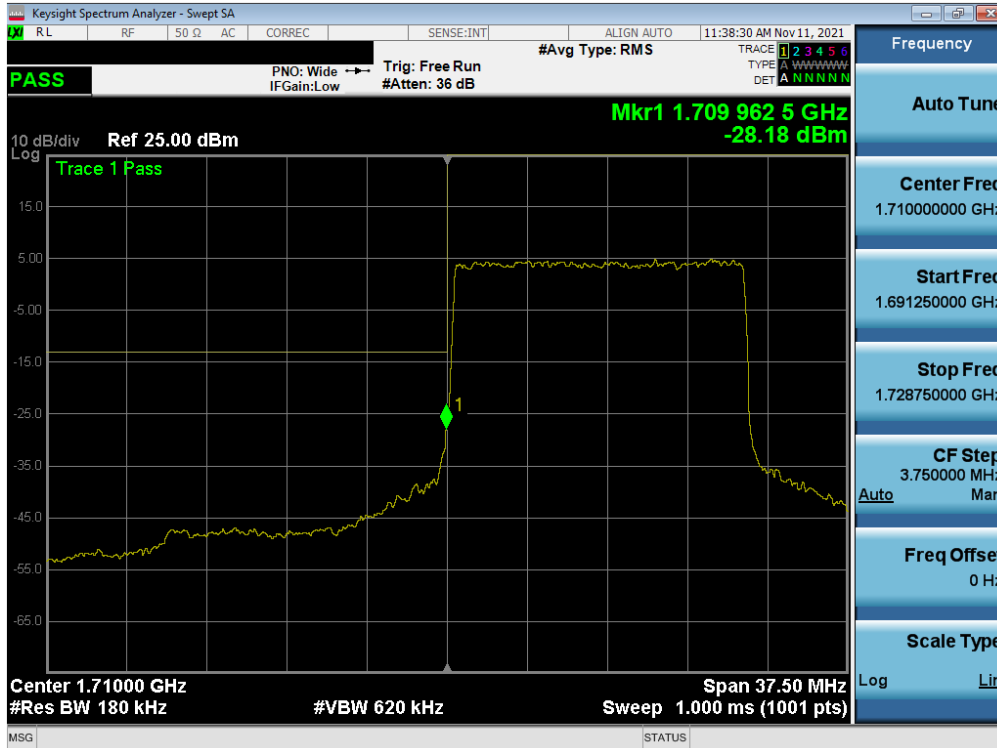


Plot 7-48. Upper Band Edge Plot (NR Band n66 – 20.0MHz - Full RB – ANT A)

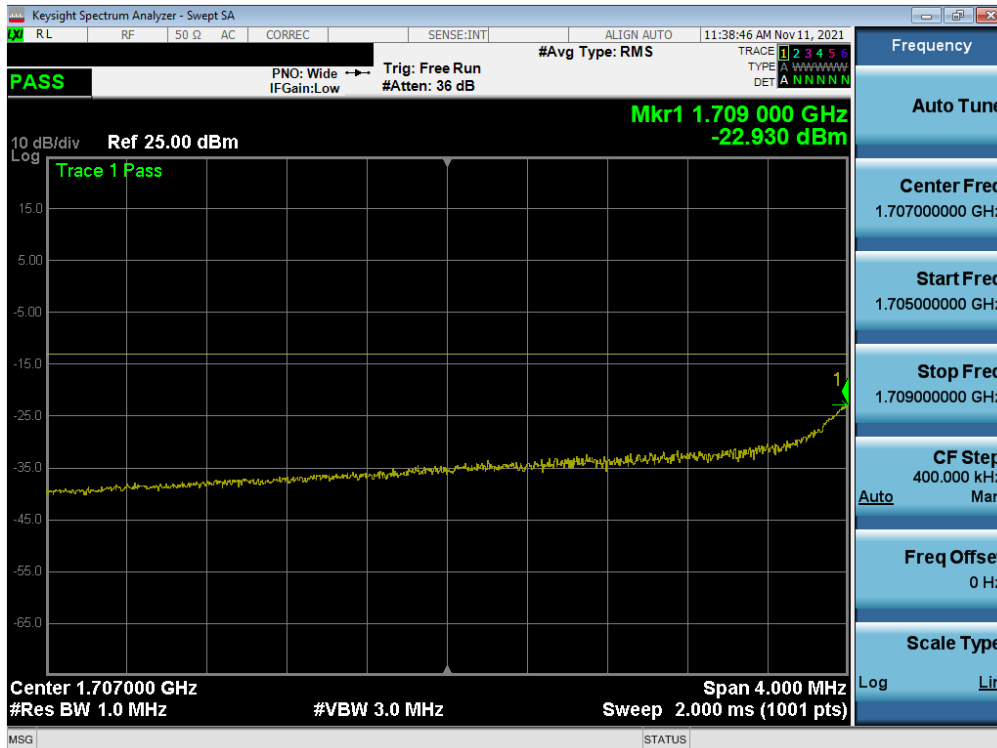


Plot 7-49. Upper Extended Band Edge Plot (NR Band n66 – 20.0MHz - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 42 of 87 |



Plot 7-50. Lower Band Edge Plot (NR Band n66 – 15.0MHz - Full RB – ANT A)

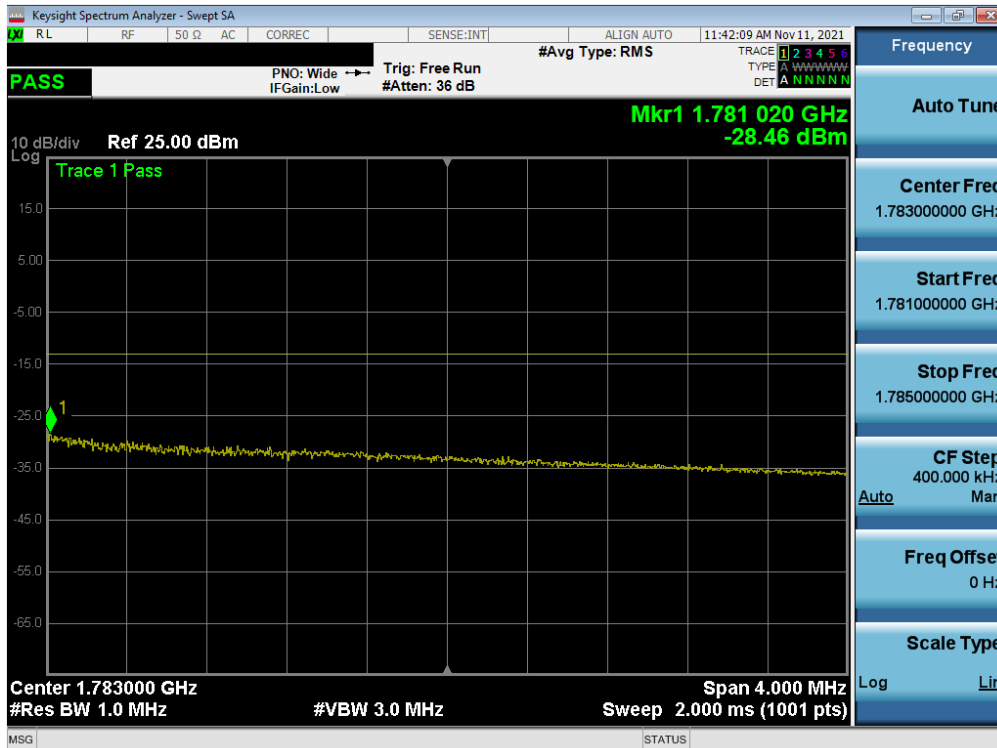


Plot 7-51. Lower Extended Band Edge Plot (NR Band n66 – 15.0MHz - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 43 of 87 |

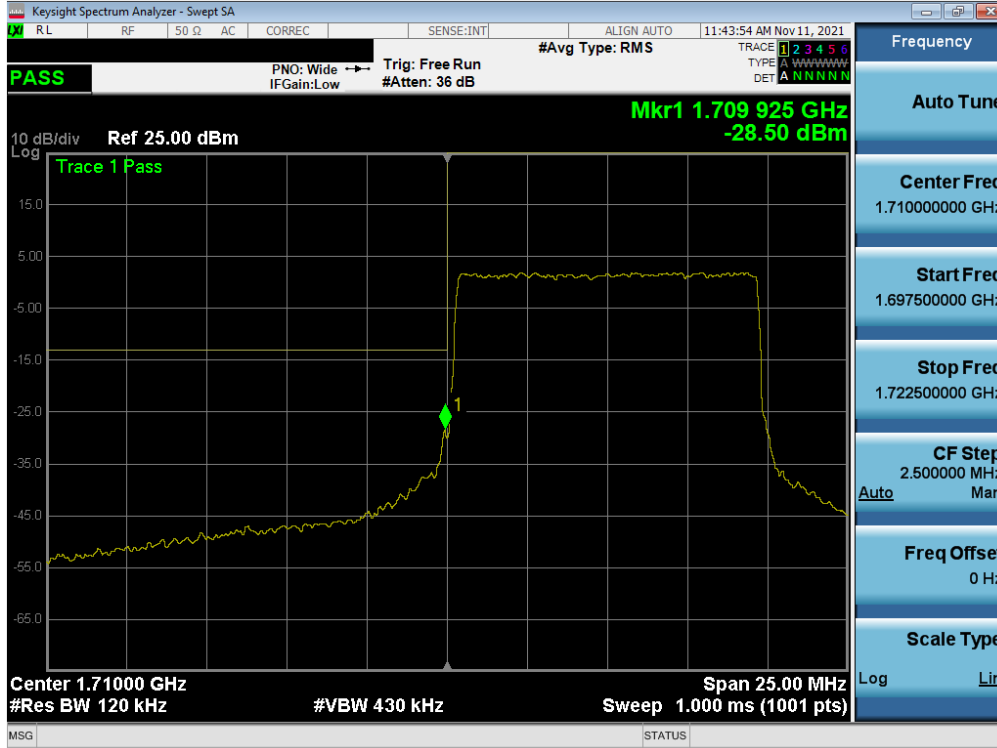


Plot 7-52. Upper Band Edge Plot (NR Band n66 – 15.0MHz - Full RB – ANT A)

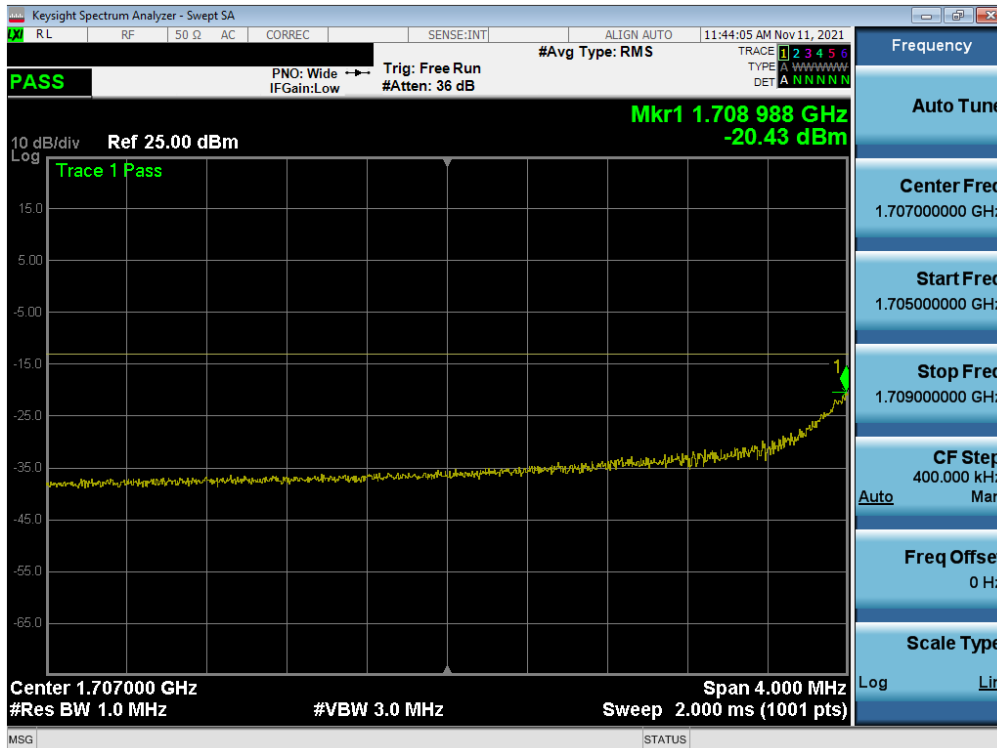


Plot 7-53. Upper Extended Band Edge Plot (NR Band n66 – 15.0MHz - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 44 of 87 |



Plot 7-54. Lower Band Edge Plot (NR Band n66 – 10.0MHz - Full RB – ANT A)

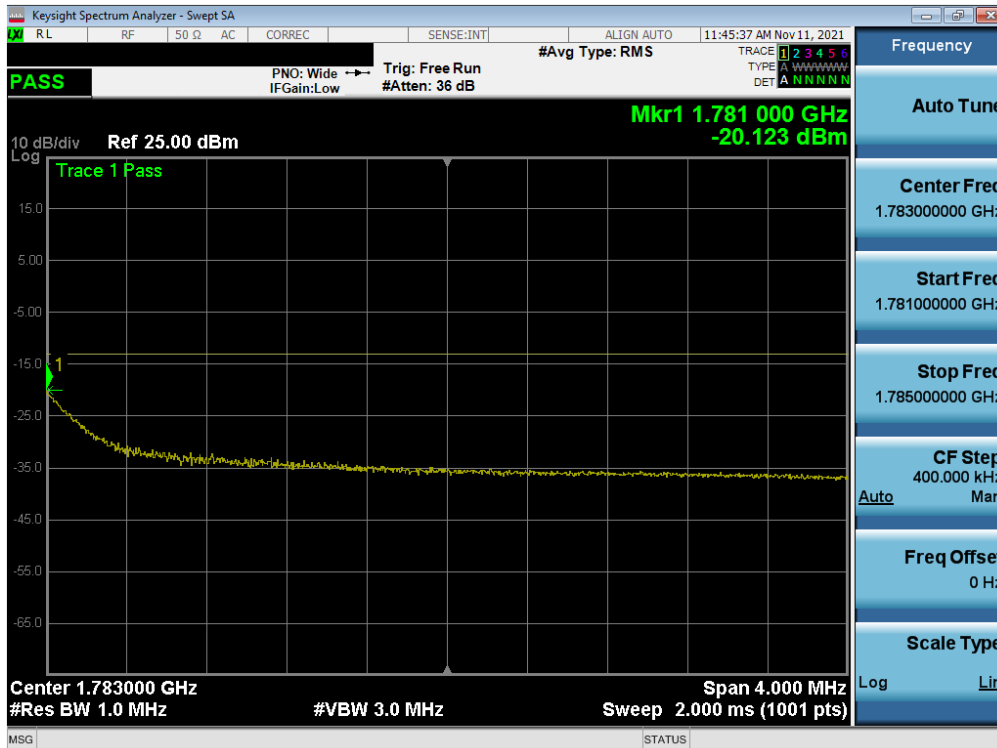


Plot 7-55. Lower Extended Band Edge Plot (NR Band n66 – 10.0MHz - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 45 of 87 |

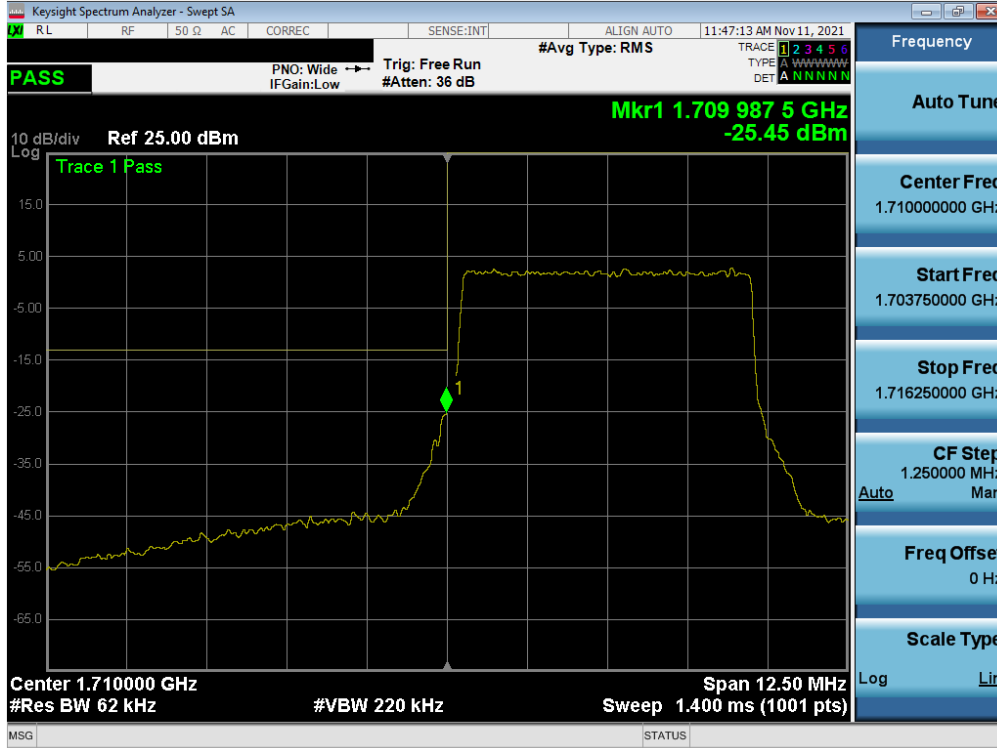


Plot 7-56. Upper Band Edge Plot (NR Band n66 – 10.0MHz - Full RB – ANT A)

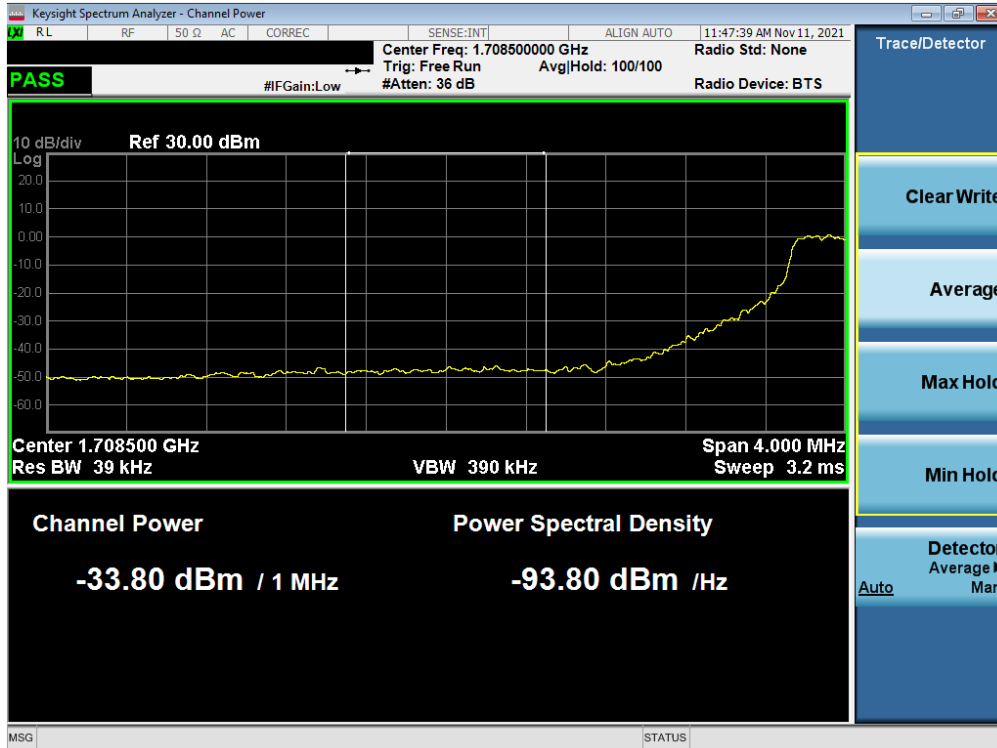


Plot 7-57. Upper Extended Band Edge Plot (NR Band n66 – 10.0MHz - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 46 of 87 |



Plot 7-58. Lower Band Edge Plot (NR Band n66 – 5.0MHz - Full RB – ANT A)

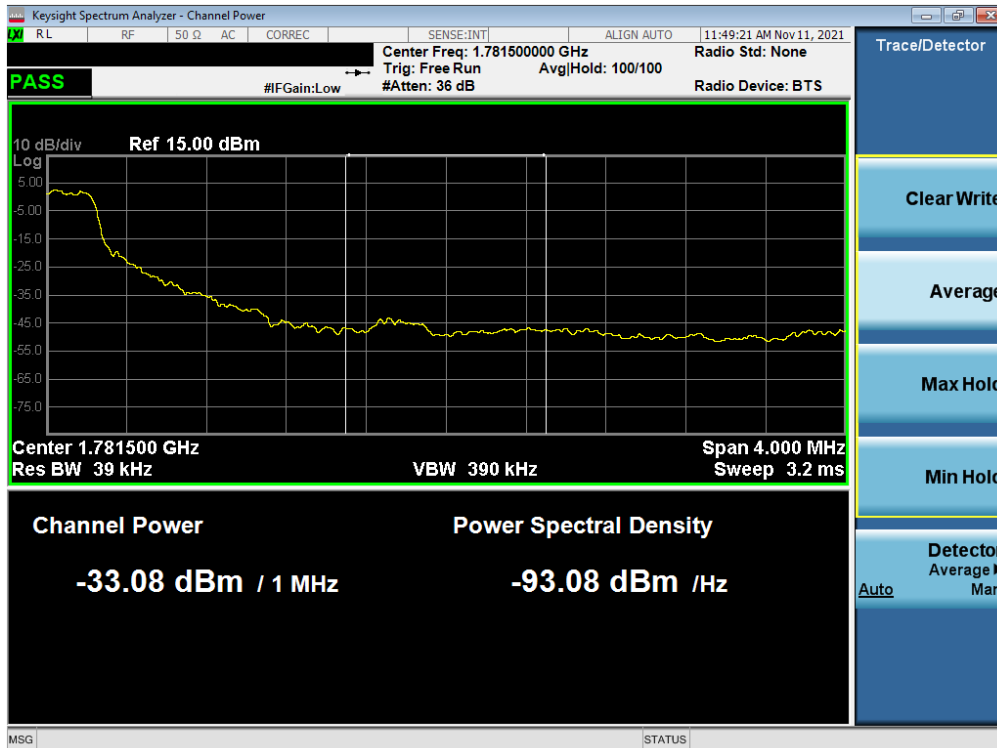


Plot 7-59. Lower Extended Band Edge Plot (NR Band n66 – 5.0MHz - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 47 of 87 |



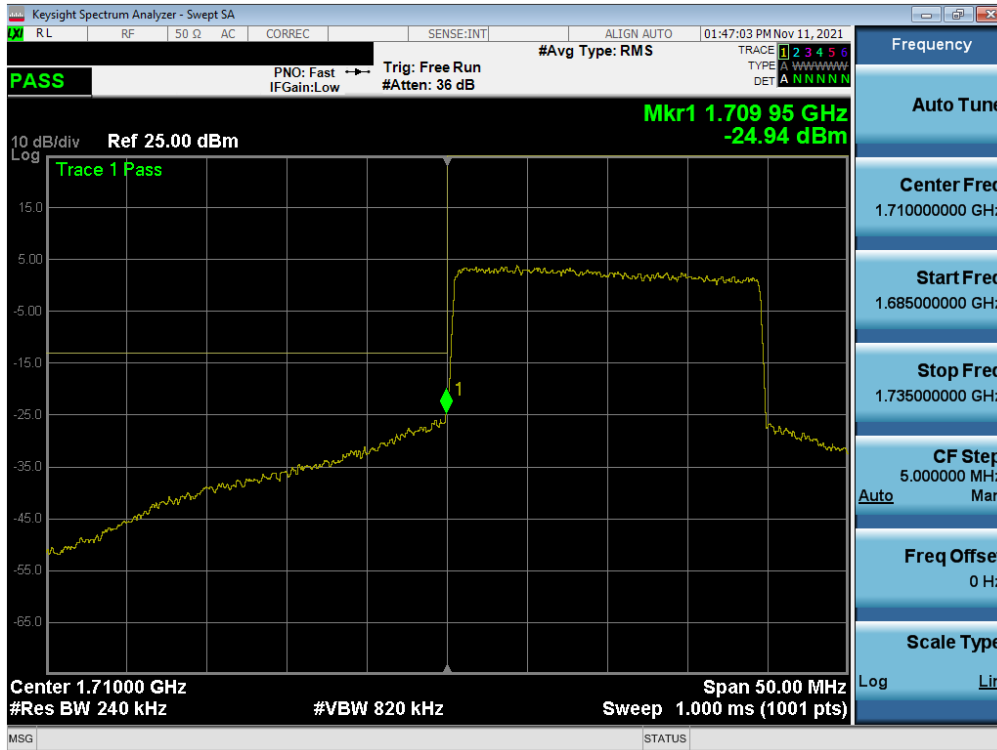
Plot 7-60. Upper Band Edge Plot (NR Band n66 – 5.0MHz - Full RB – ANT A)



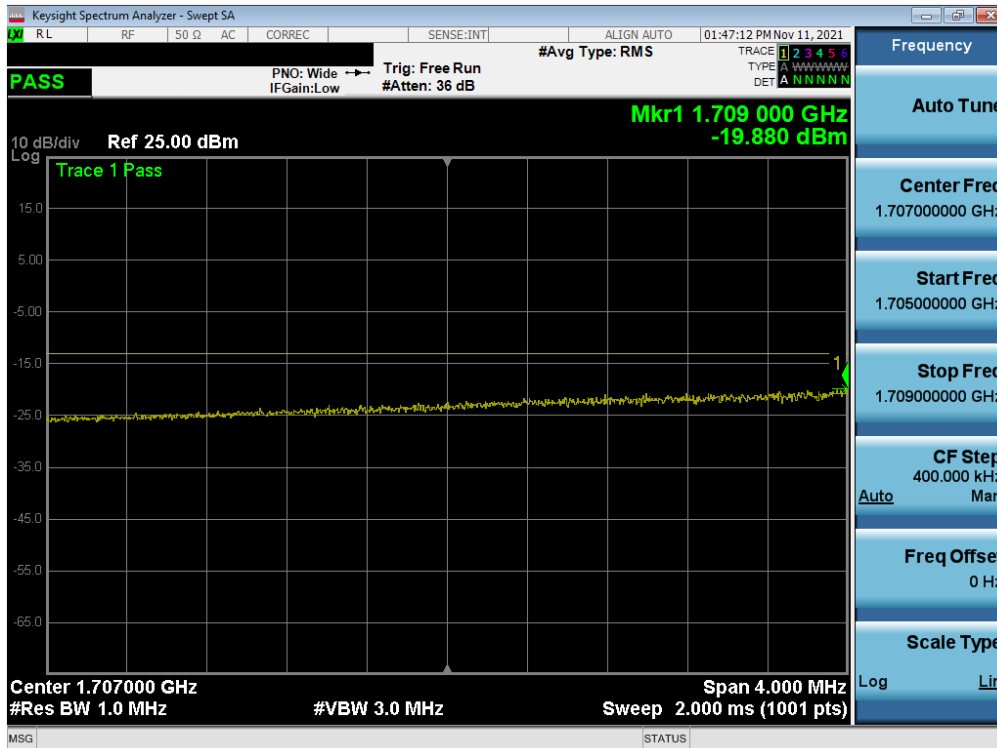
Plot 7-61. Upper Extended Band Edge Plot (NR Band n66 – 5.0MHz - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 48 of 87 |

NR Band n66 – ANT F



Plot 7-62. Lower Band Edge Plot (NR Band n66 – 20.0MHz - Full RB – ANT F)

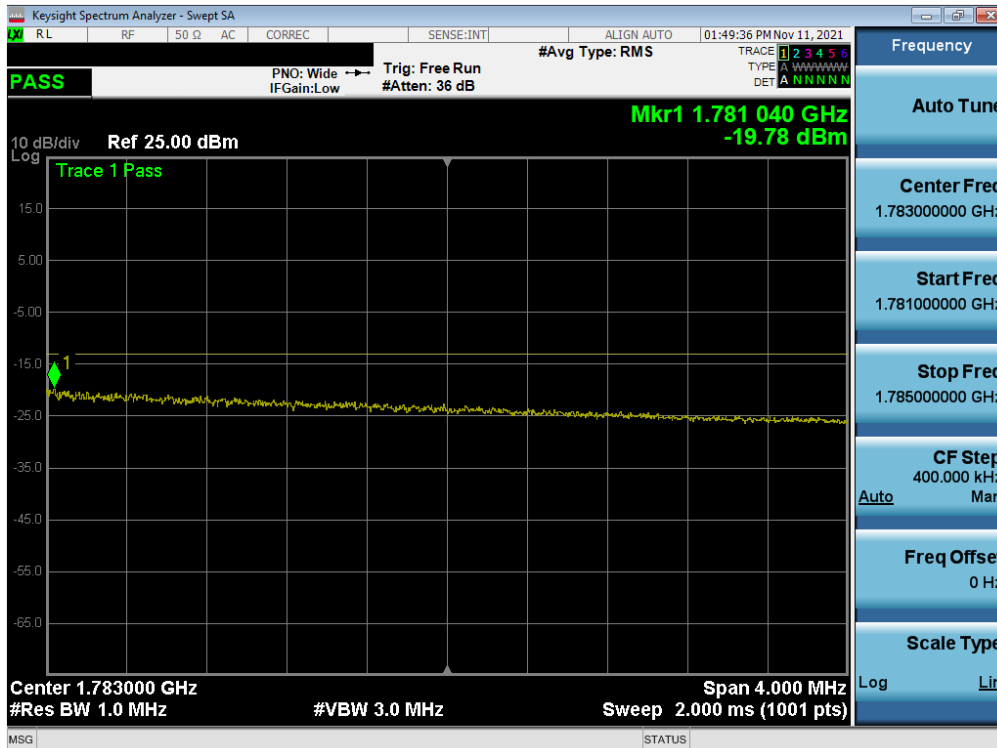


Plot 7-63. Lower Extended Band Edge Plot (NR Band n66 – 20.0MHz - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 49 of 87 |



Plot 7-64. Upper Band Edge Plot (NR Band n66 – 20.0MHz - Full RB – ANT F)

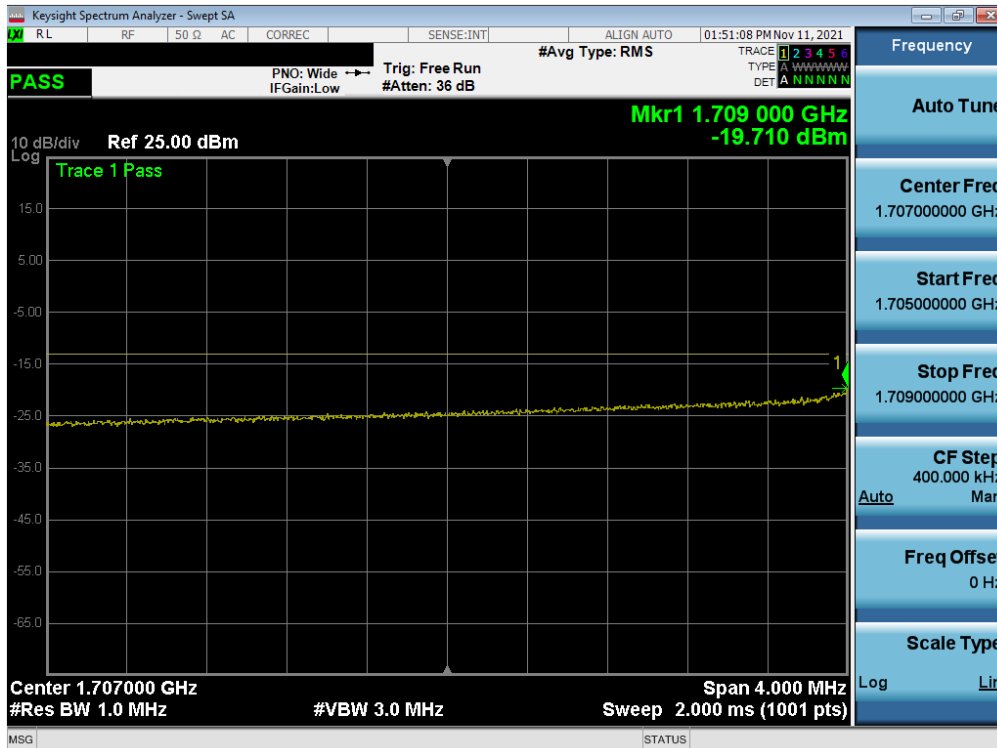


Plot 7-65. Upper Extended Band Edge Plot (NR Band n66 – 20.0MHz - Full RB – ANT F)

| | | | | |
|---|---|-----------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 50 of 87 |



Plot 7-66. Lower Band Edge Plot (NR Band n66 – 15.0MHz - Full RB – ANT F)

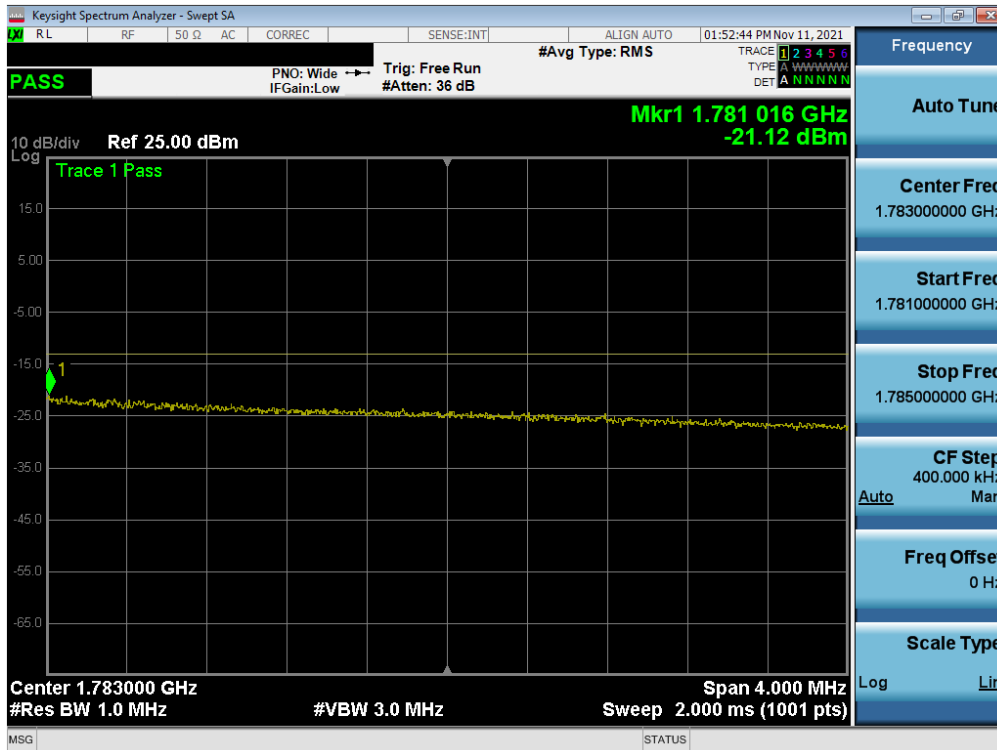


Plot 7-67. Lower Extended Band Edge Plot (NR Band n66 – 15.0MHz - Full RB – ANT F)




| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 51 of 87 |

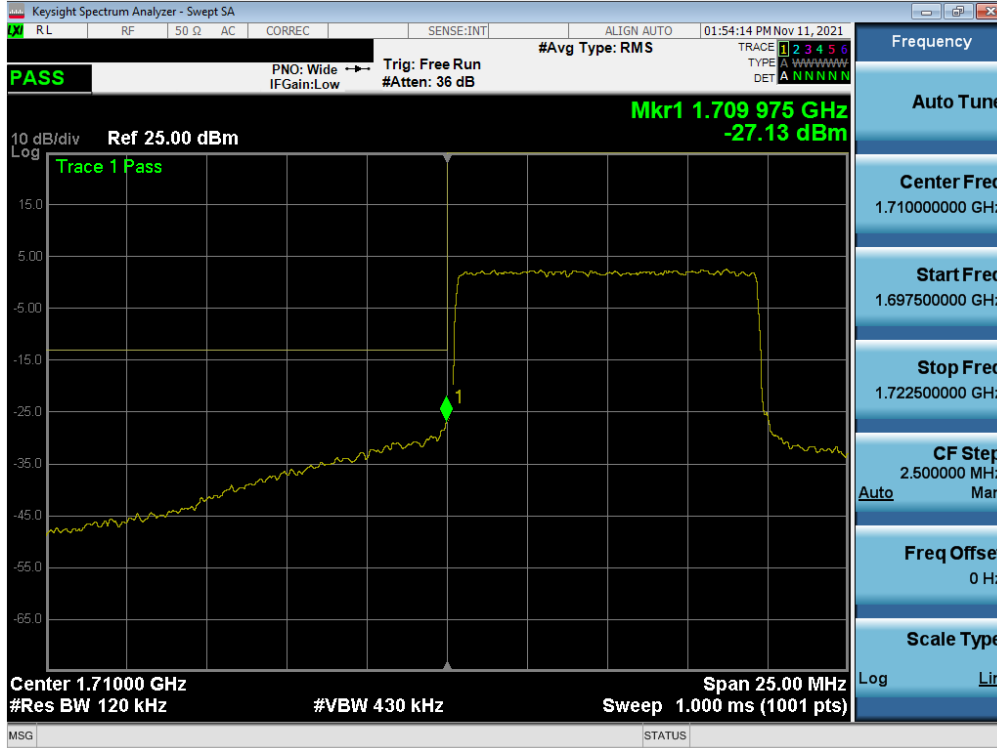


Plot 7-68. Upper Band Edge Plot (NR Band n66 – 15.0MHz - Full RB – ANT F)

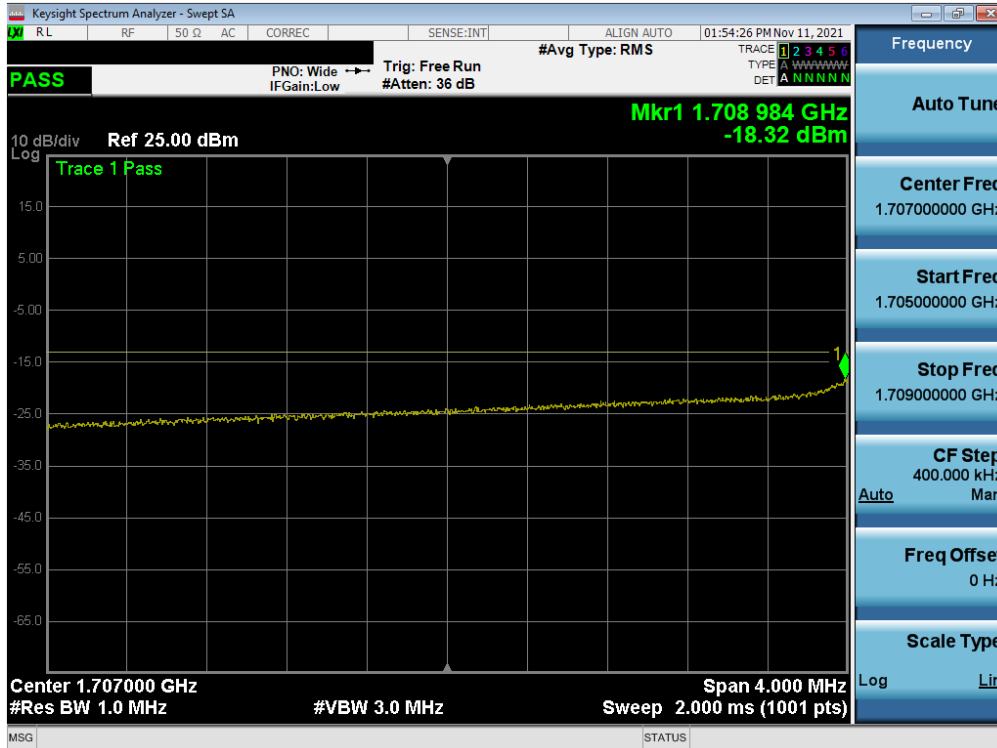


Plot 7-69. Upper Extended Band Edge Plot (NR Band n66 – 15.0MHz - Full RB – ANT F)

| | | | | |
|---|--|-----------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  PCTEST Proud to be part of  | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 52 of 87 |



Plot 7-70. Lower Band Edge Plot (NR Band n66 – 10.0MHz - Full RB – ANT F)

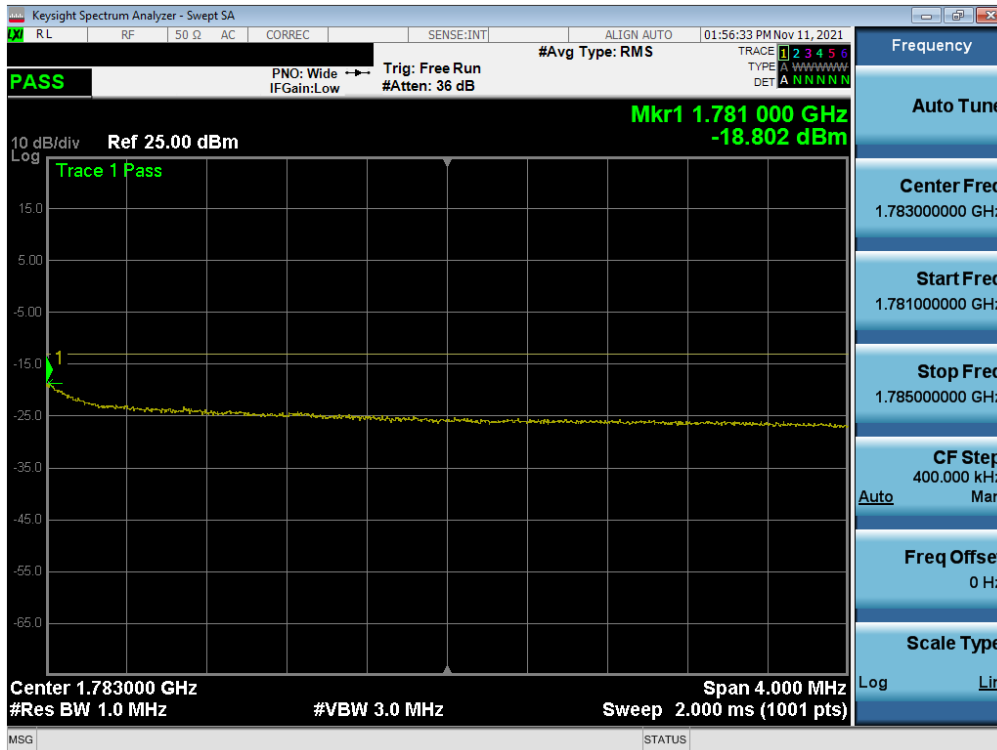


Plot 7-71. Lower Extended Band Edge Plot (NR Band n66 – 10.0MHz - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 53 of 87 |

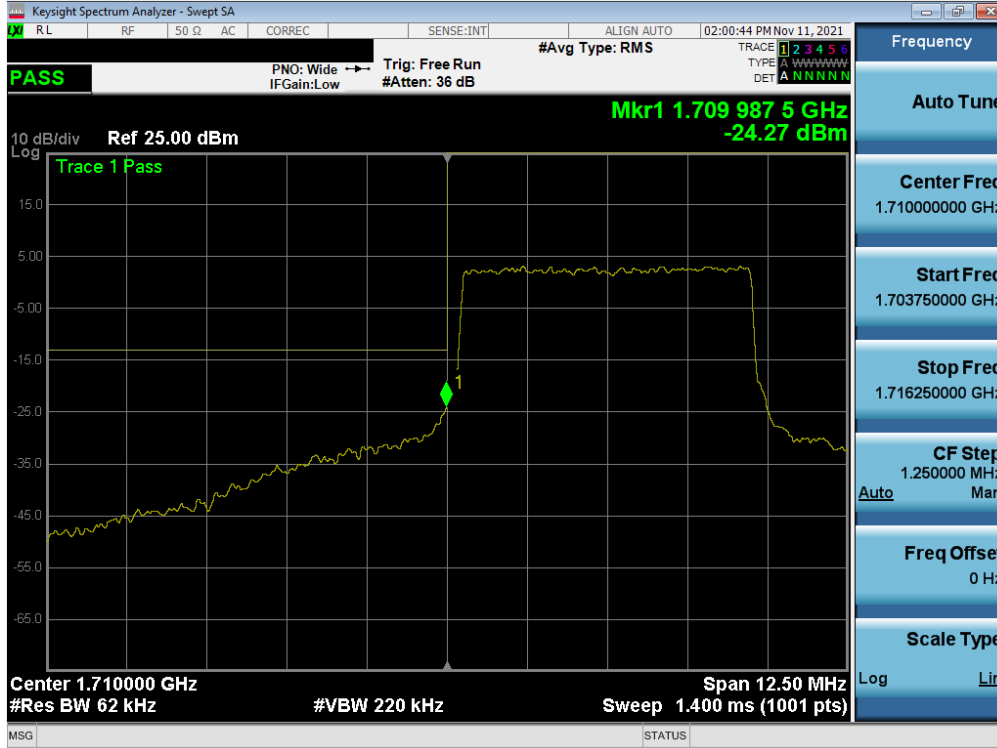


Plot 7-72. Upper Band Edge Plot (NR Band n66 – 10.0MHz - Full RB – ANT F)

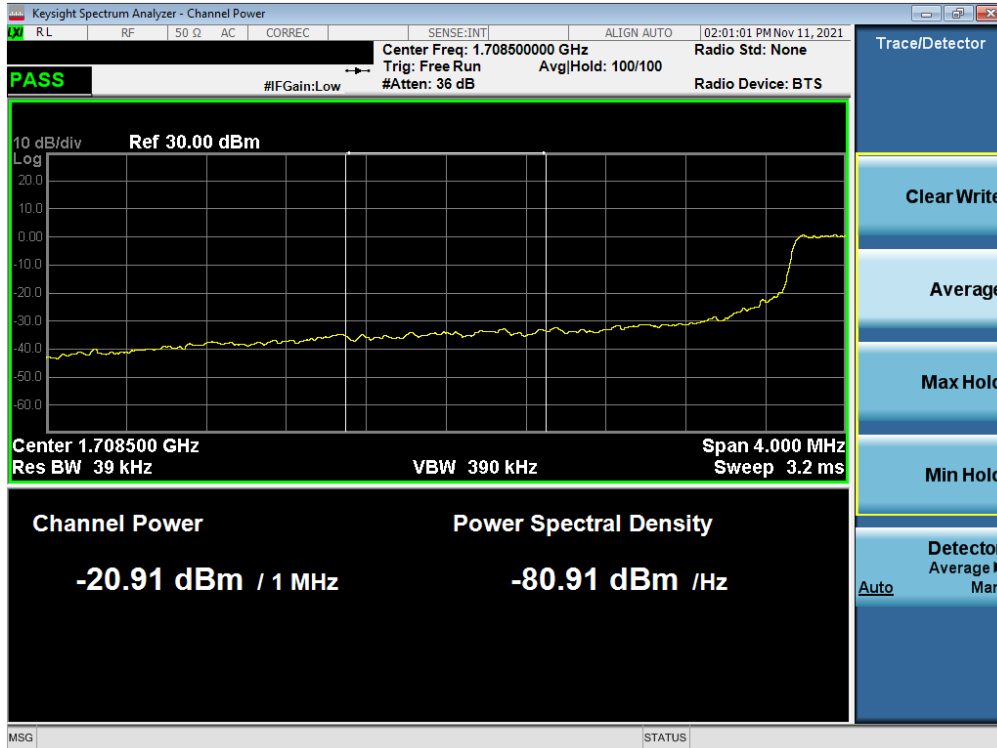


Plot 7-73. Upper Extended Band Edge Plot (NR Band n66 – 10.0MHz - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 54 of 87 |



Plot 7-74. Lower Band Edge Plot (NR Band n66 – 5.0MHz - Full RB – ANT F)

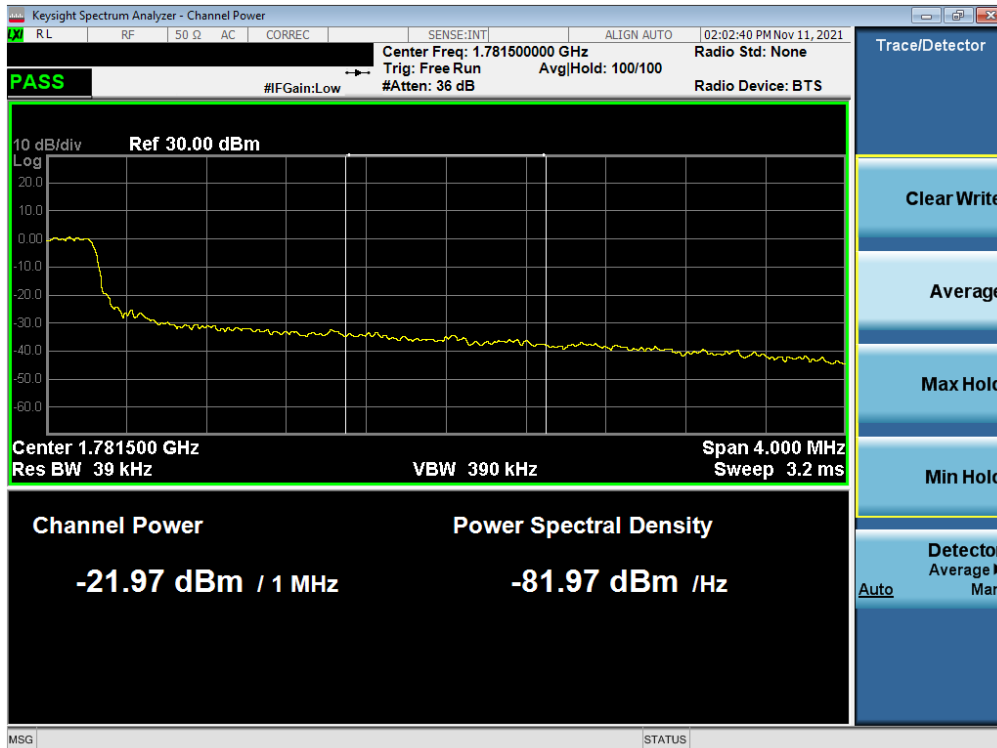


Plot 7-75. Lower Extended Band Edge Plot (NR Band n66 – 5.0MHz - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 55 of 87 |



Plot 7-76. Upper Band Edge Plot (NR Band n66 – 5.0MHz - Full RB – ANT F)



Plot 7-77. Upper Extended Band Edge Plot (NR Band n66 – 5.0MHz - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 56 of 87 |

7.6 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.

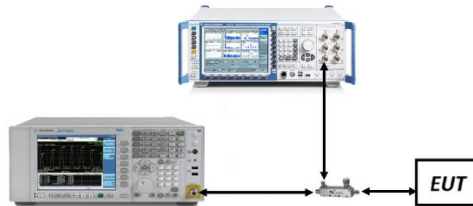


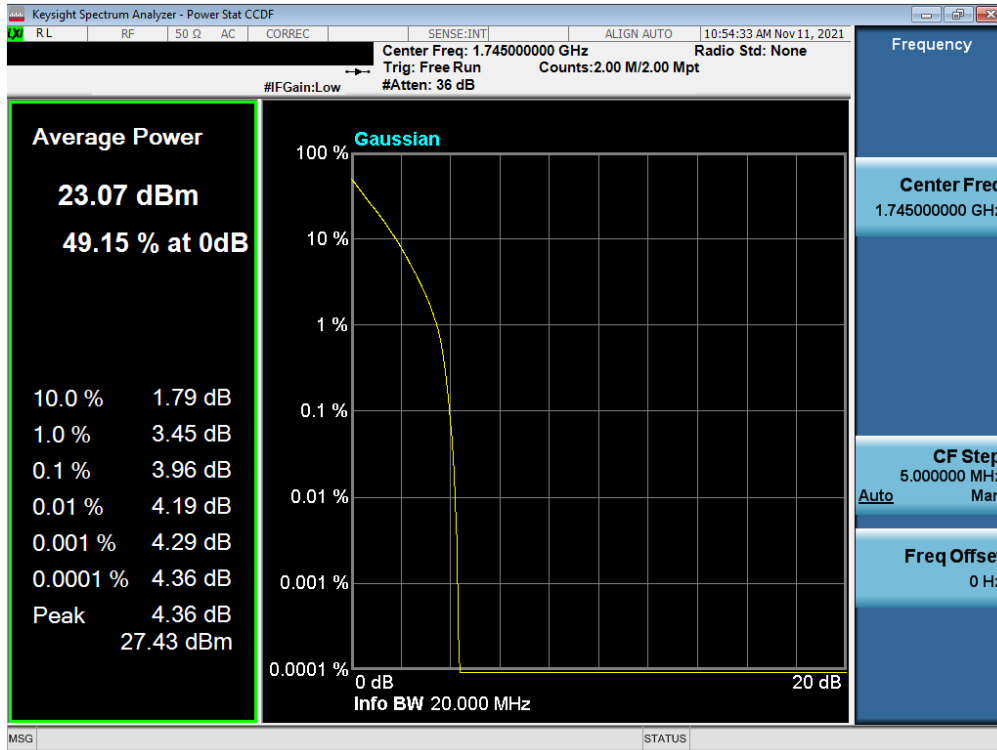
Figure 7-5. Test Instrument & Measurement Setup

Test Notes

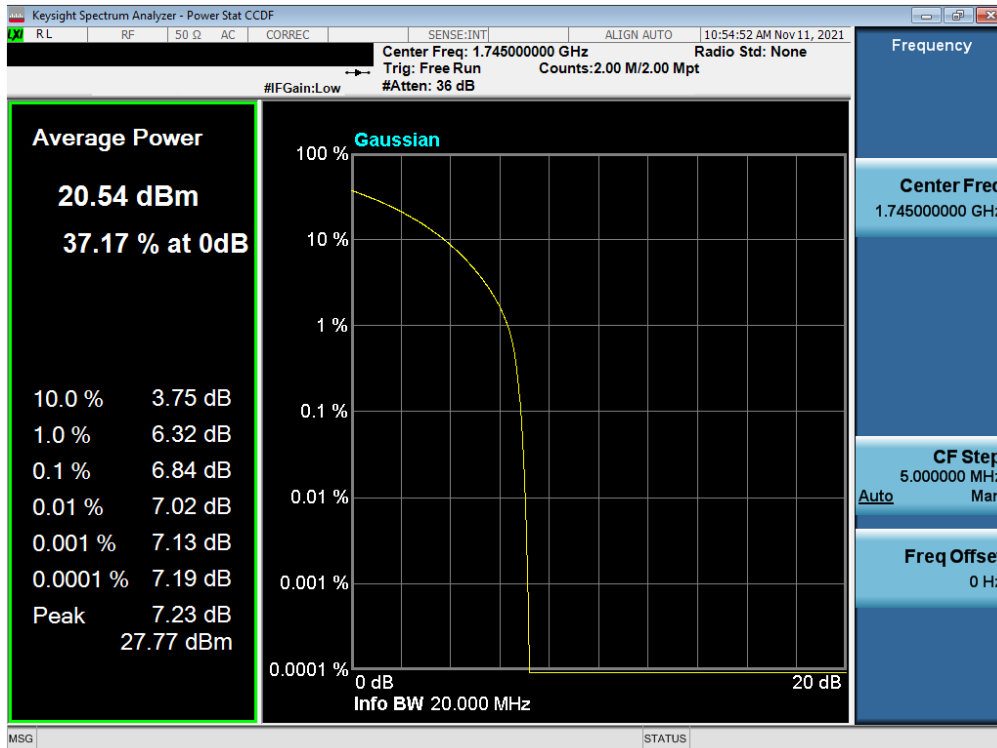
None.

| | | | | |
|--|---|--------------------------------------|---------------|--|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 57 of 87 | |

NR Band n66 – ANT A

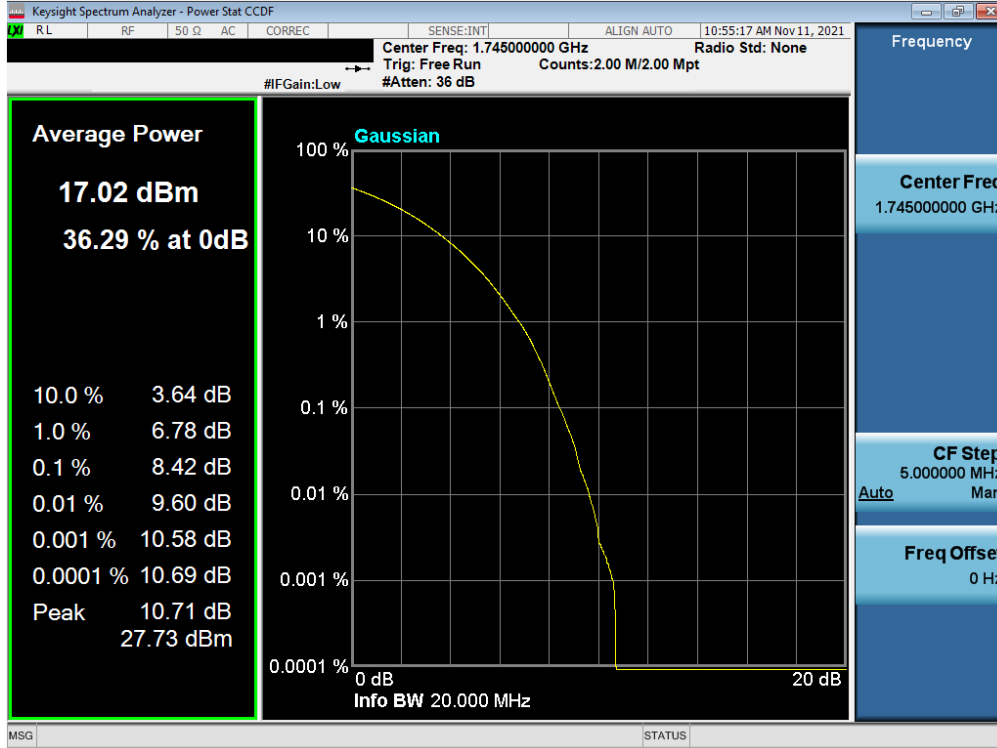


Plot 7-78. PAR Plot (NR Band n66 - 20.0MHz DFT-s-OFDM BPSK - Full RB – ANT A)

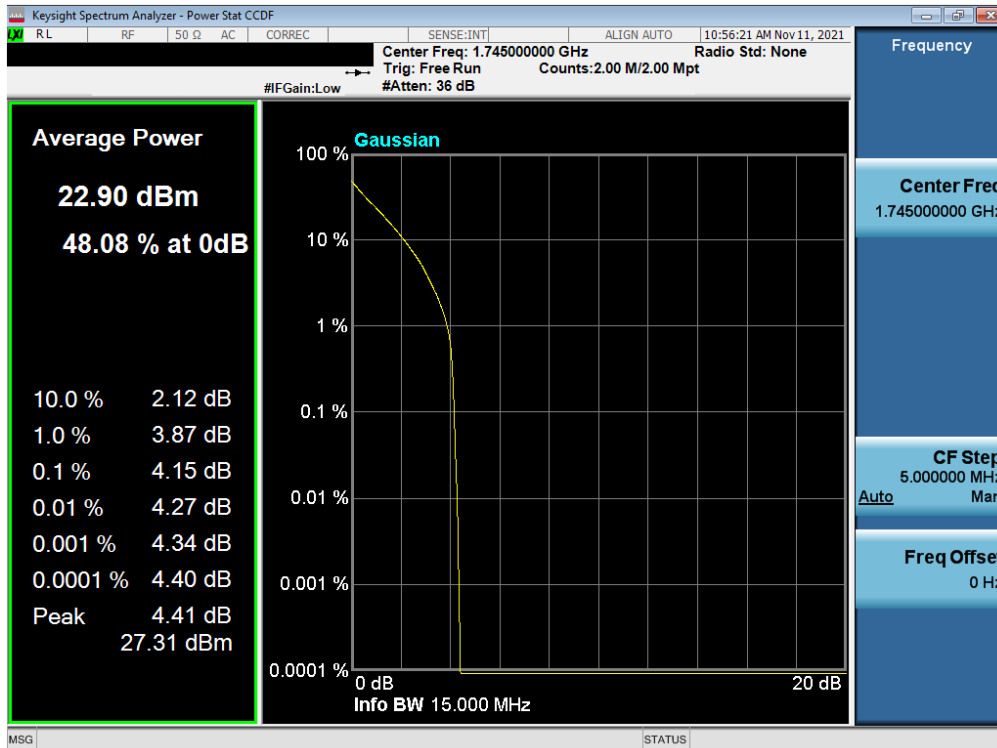


Plot 7-79. PAR Plot (NR Band n66 - 20.0MHz CP-OFDM QPSK - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 58 of 87 |

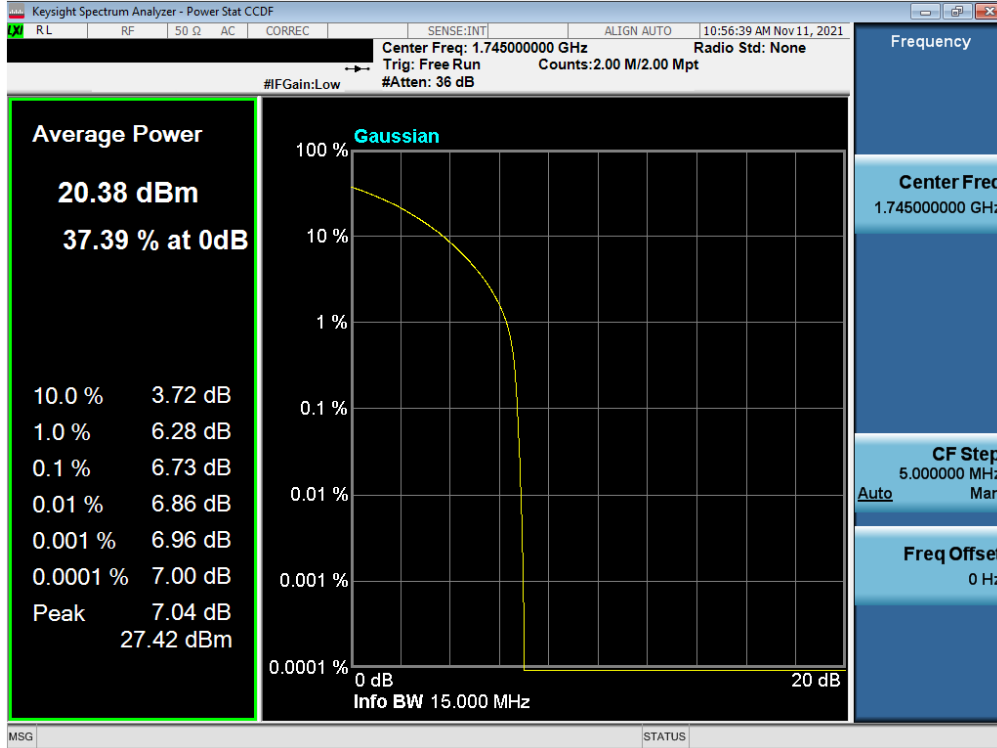


Plot 7-80. PAR Plot (NR Band n66 - 20.0MHz CP-OFDM 256-QAM - Full RB – ANT A)

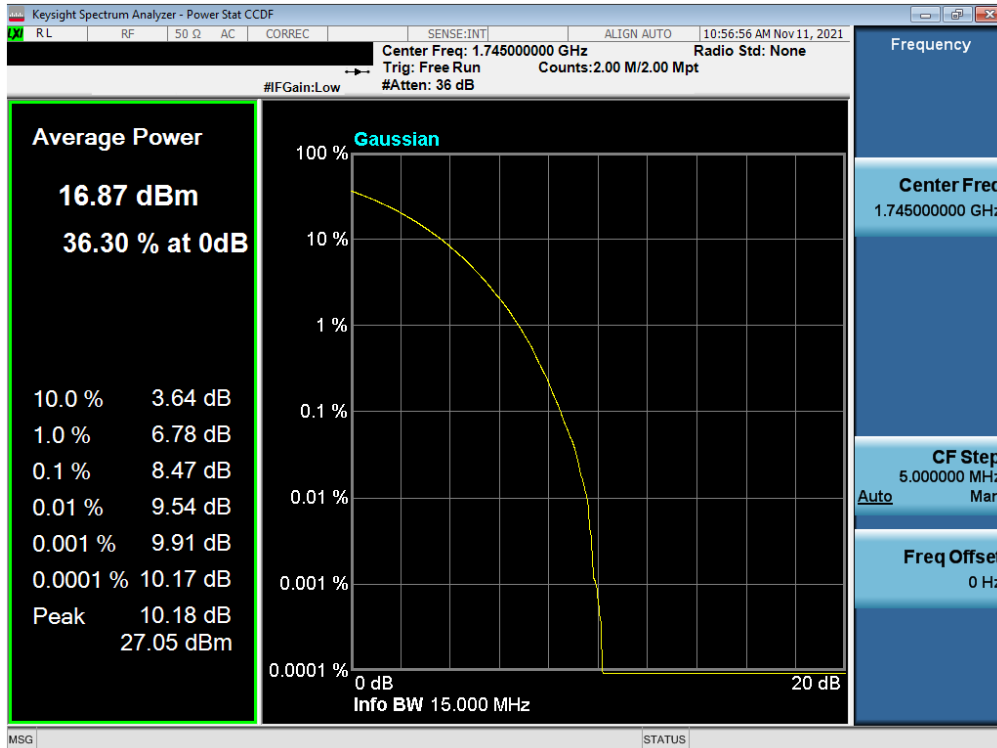


Plot 7-81. PAR Plot (NR Band n66 - 15.0MHz DFT-s-OFDM BPSK - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 59 of 87 |

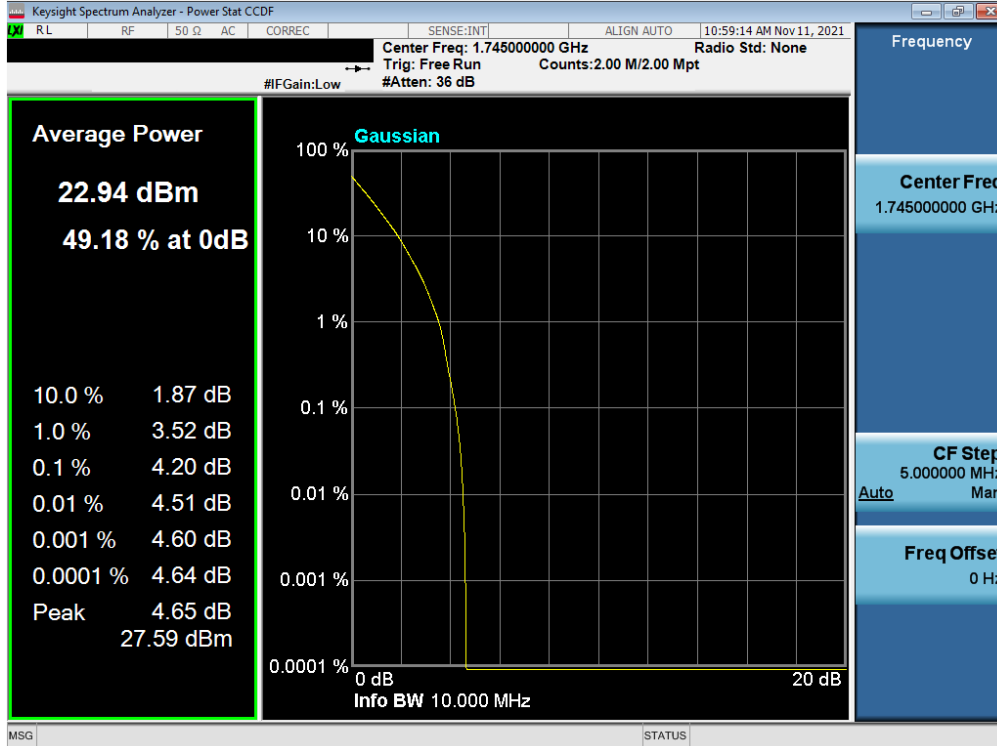


Plot 7-82. PAR Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB - ANT A)

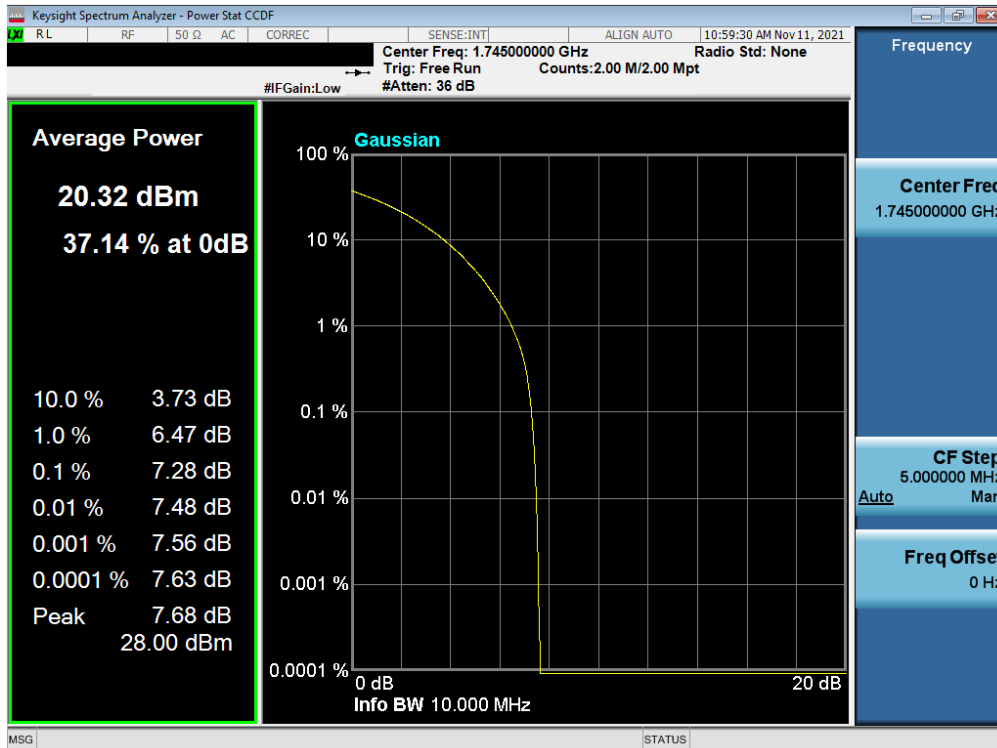


Plot 7-83. PAR Plot (NR Band n66 - 15.0MHz CP-OFDM 256-QAM - Full RB - ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 60 of 87 |

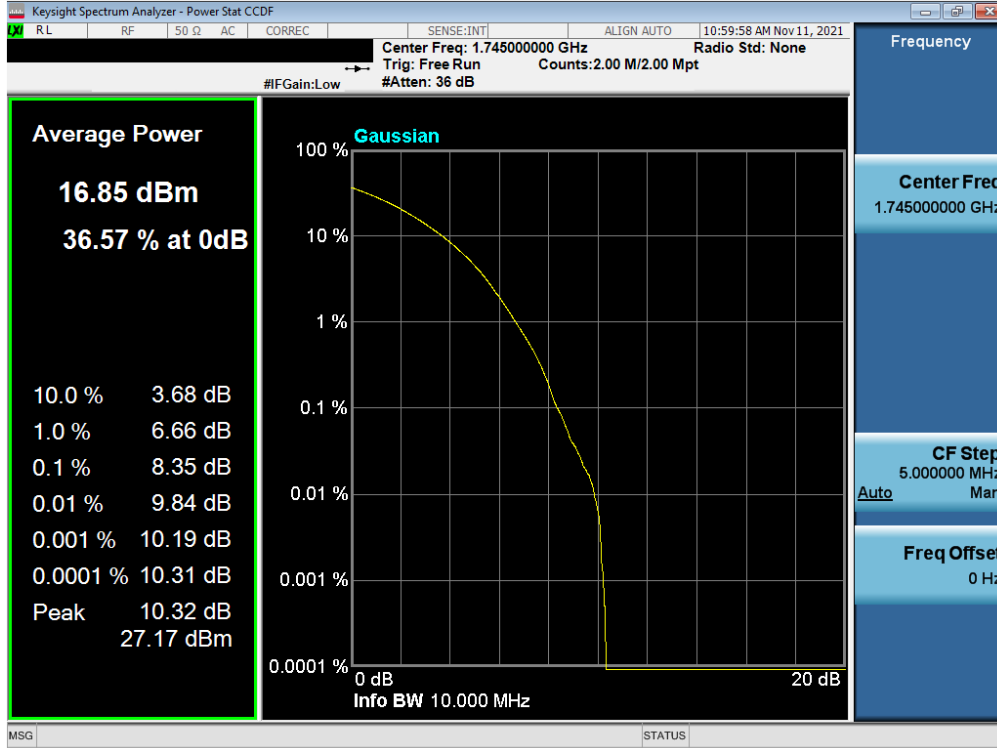


Plot 7-84. PAR Plot (NR Band n66 - 10.0MHz DFT-s-OFDM BPSK - Full RB – ANT A)

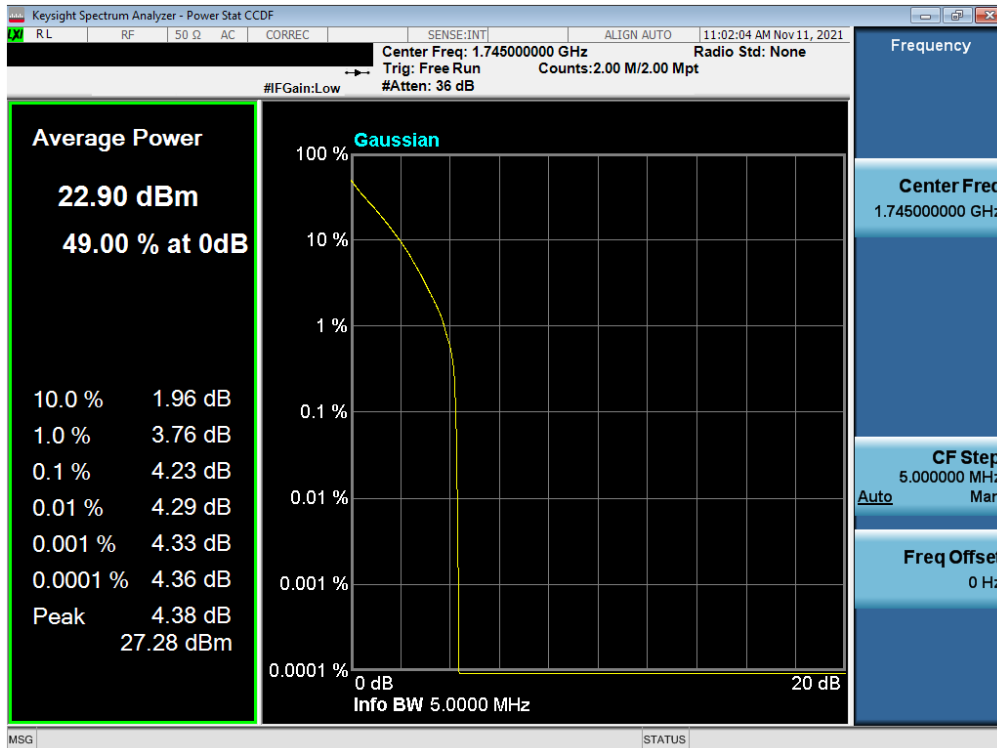


Plot 7-85. PAR Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 61 of 87 |

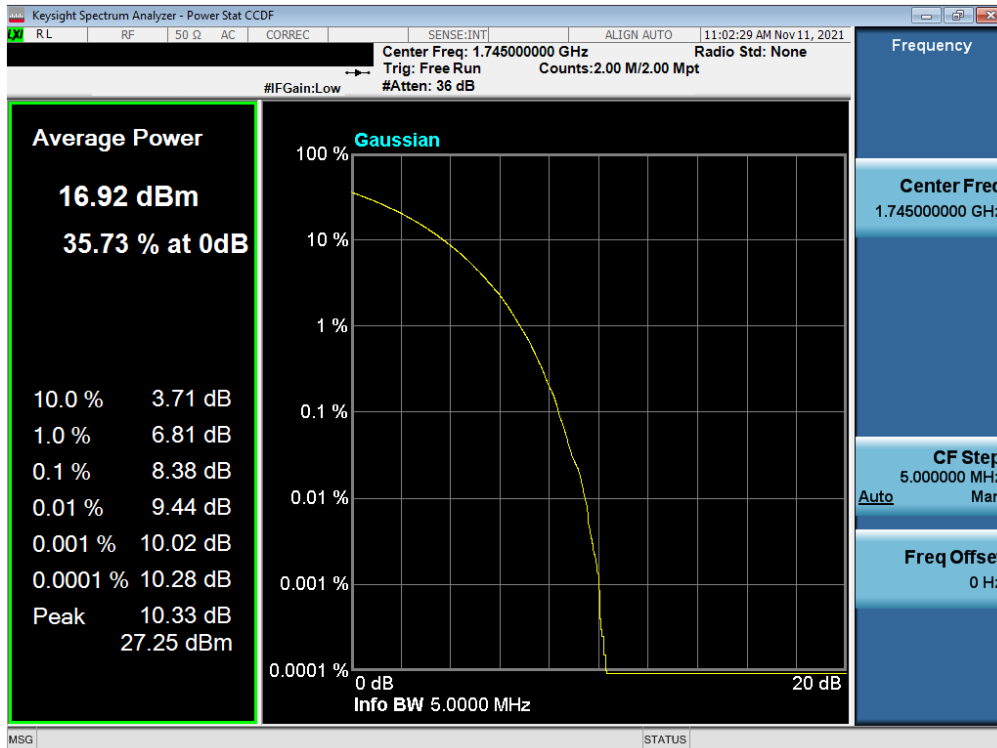
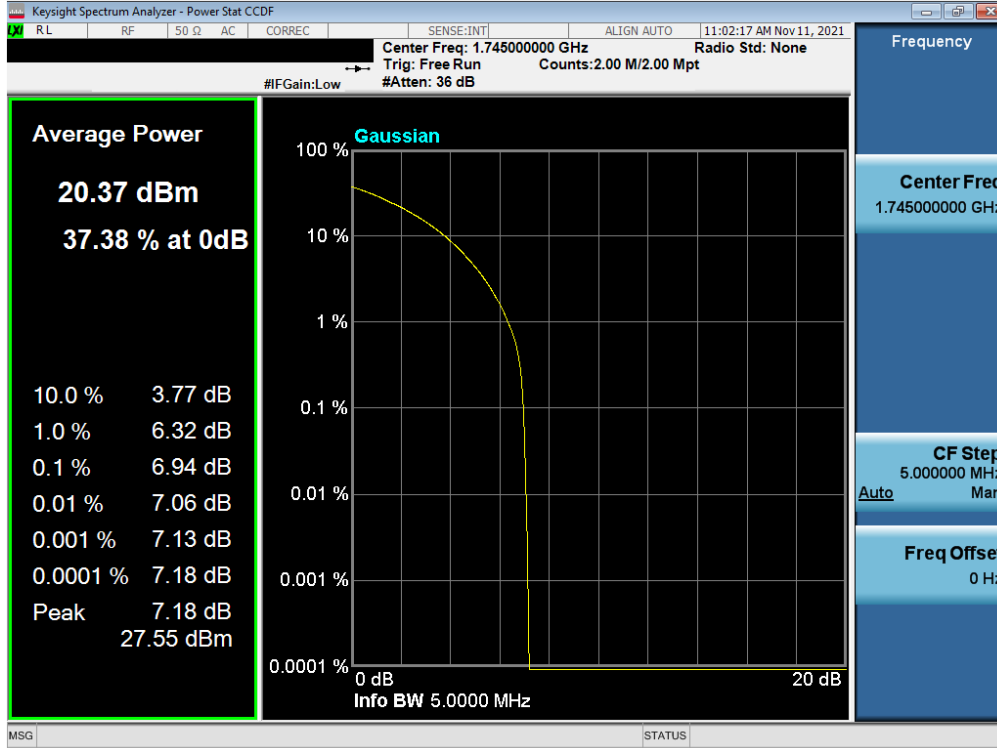


Plot 7-86. PAR Plot (NR Band n66 - 10.0MHz CP-OFDM 256-QAM - Full RB – ANT A)



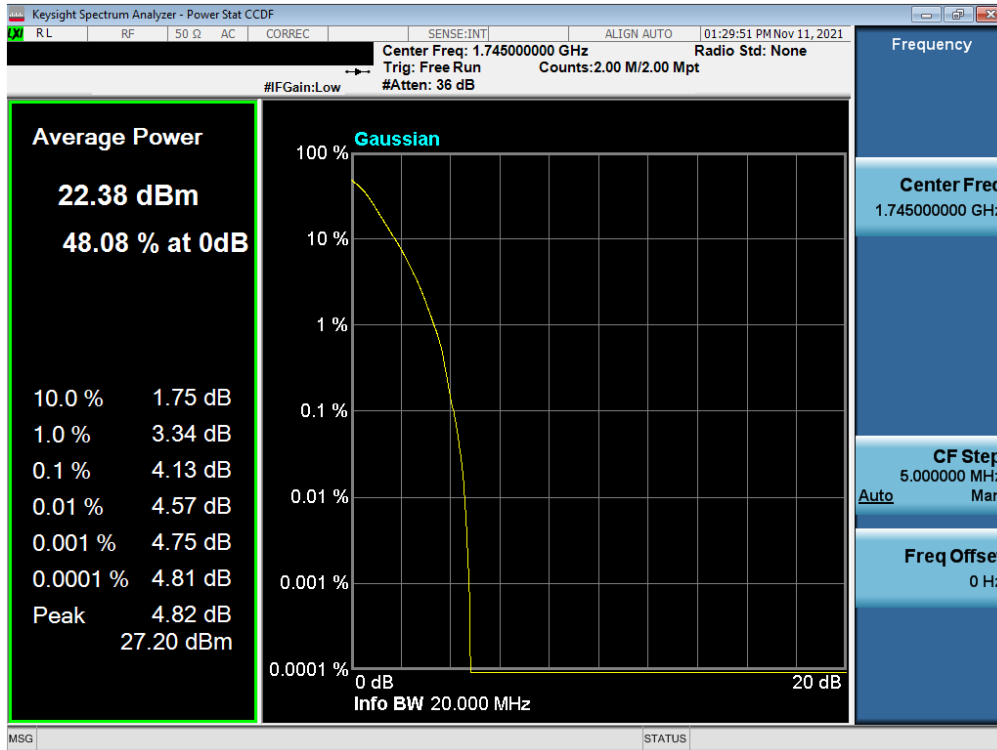
Plot 7-87. PAR Plot (NR Band n66 - 5.0MHz DFT-s-OFDM BPSK - Full RB – ANT A)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 62 of 87 |

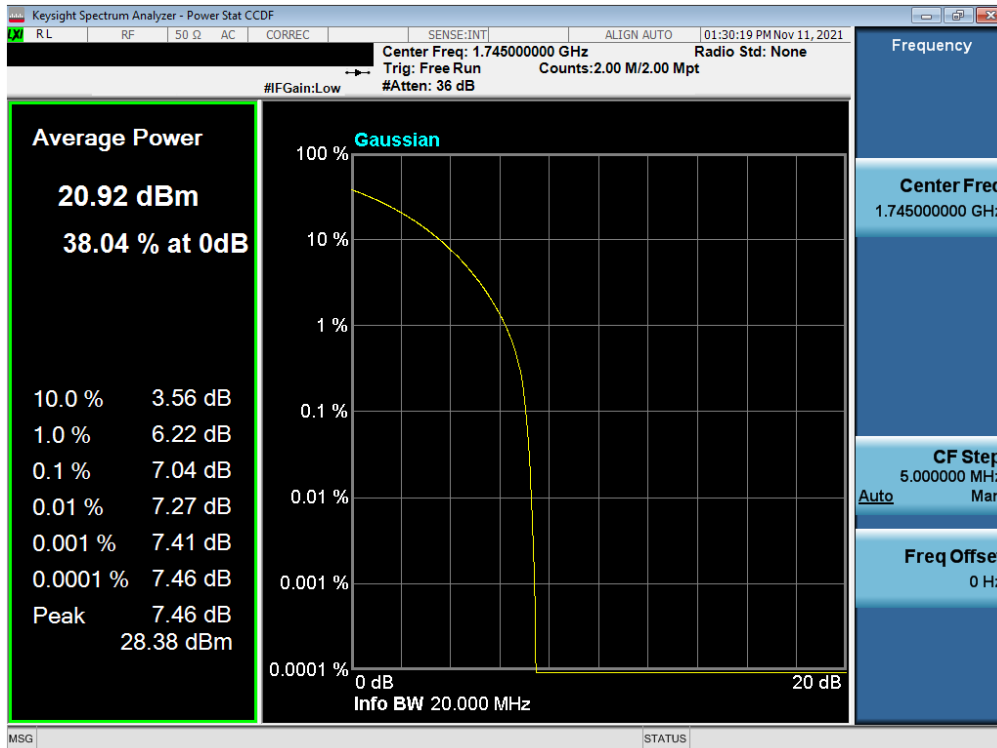


| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 63 of 87 |

NR Band n66 – ANT F

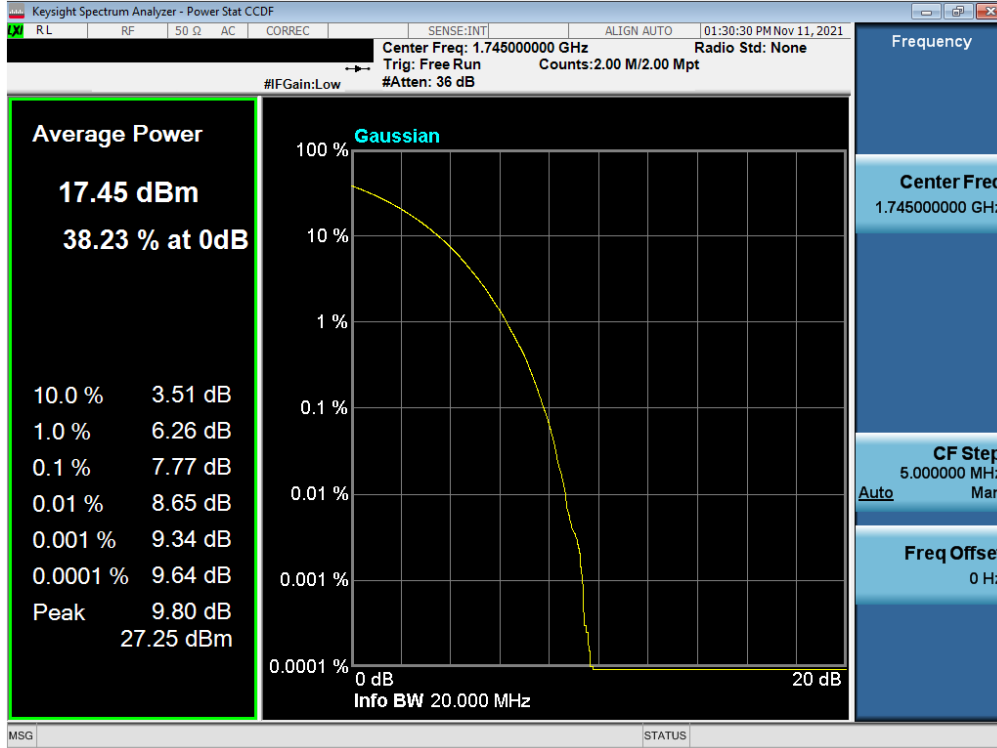


Plot 7-90. PAR Plot (NR Band n66 - 20.0MHz DFT-s-OFDM BPSK - Full RB – ANT F)

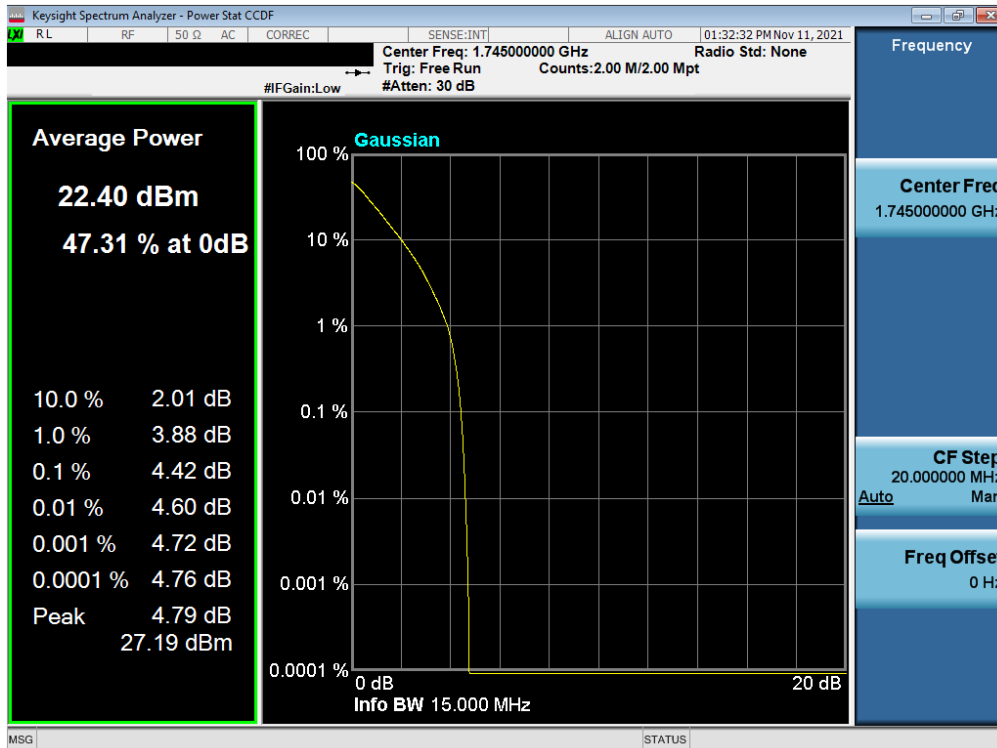


Plot 7-91. PAR Plot (NR Band n66 - 20.0MHz CP-OFDM QPSK - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 64 of 87 |

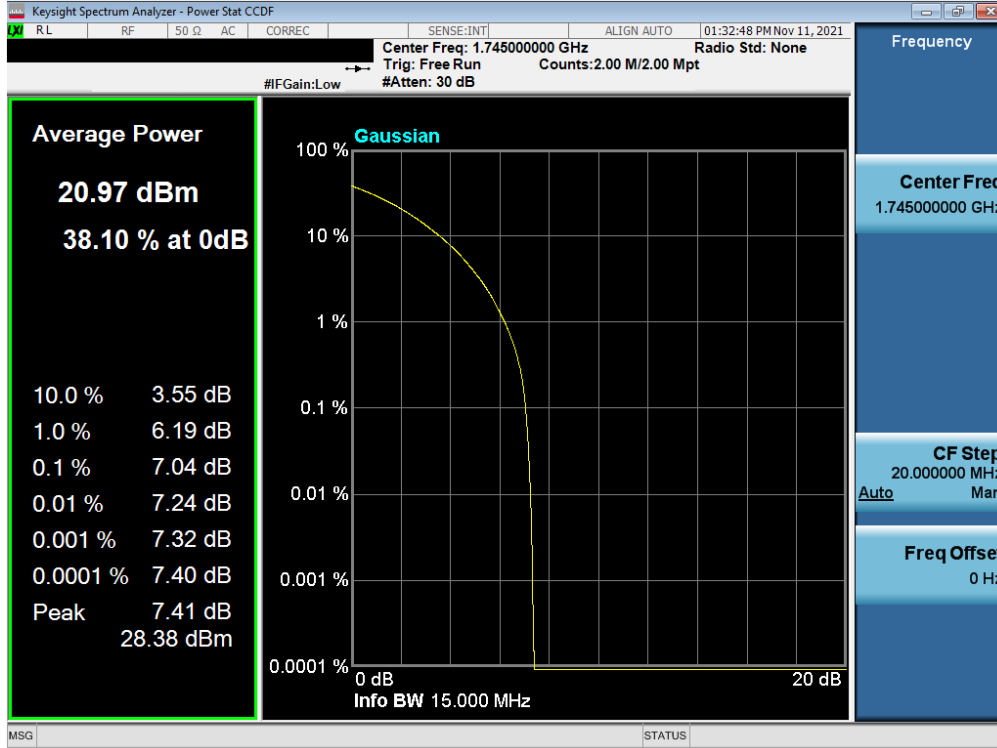


Plot 7-92. PAR Plot (NR Band n66 - 20.0MHz CP-OFDM 256-QAM - Full RB – ANT F)

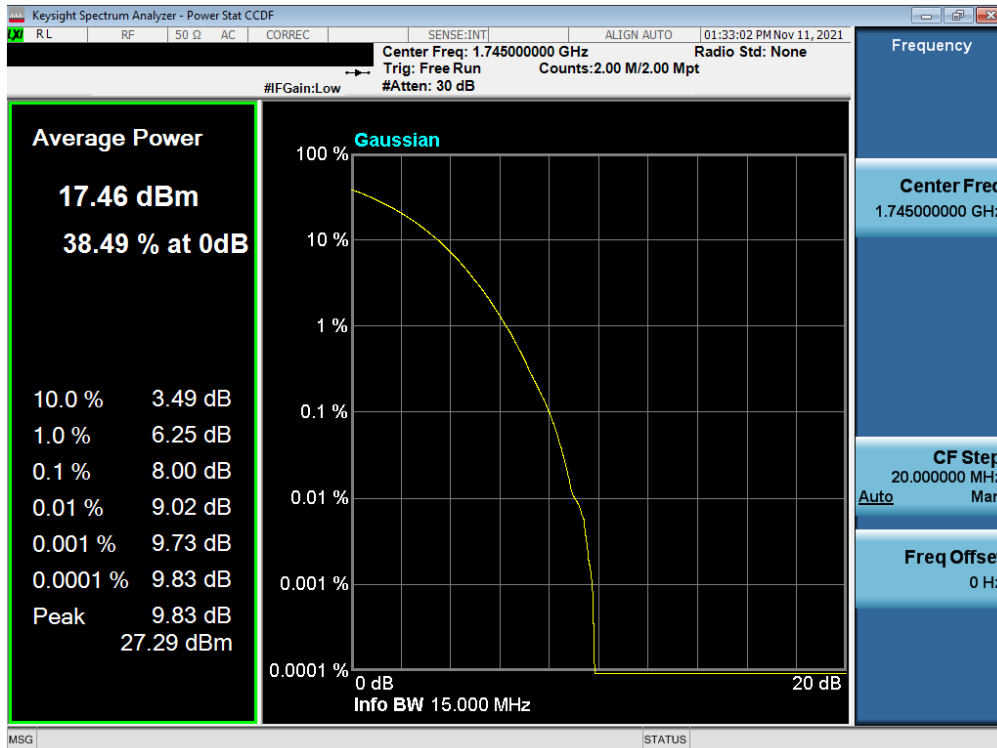


Plot 7-93. PAR Plot (NR Band n66 - 15.0MHz DFT-s-OFDM BPSK - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 65 of 87 |

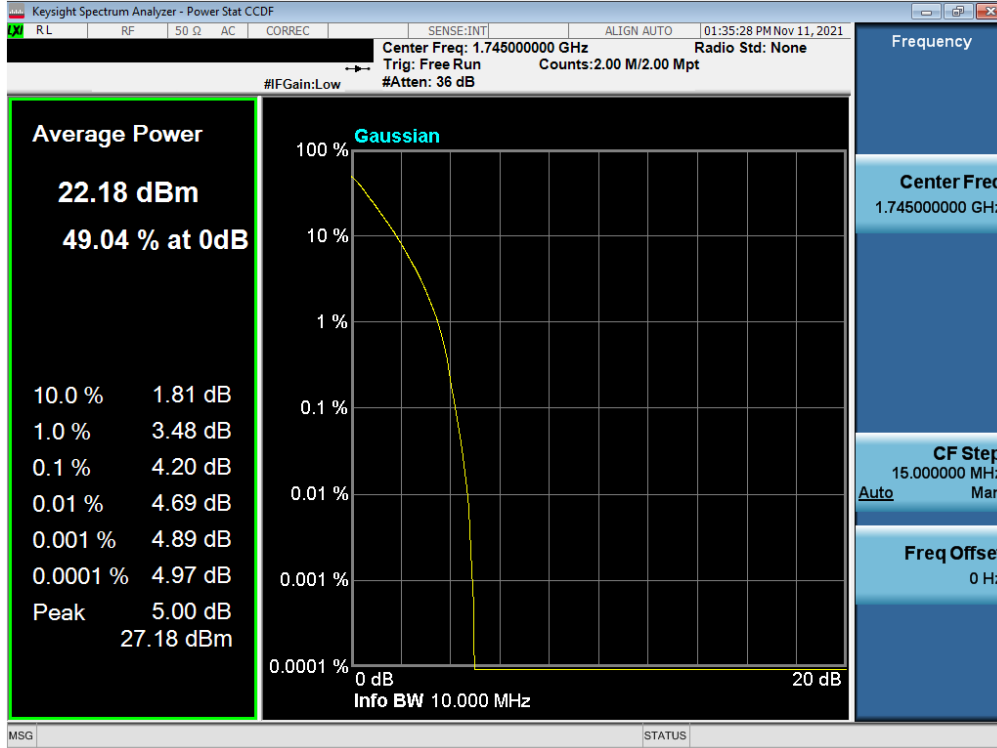


Plot 7-94. PAR Plot (NR Band n66 - 15.0MHz CP-OFDM QPSK - Full RB - ANT F)

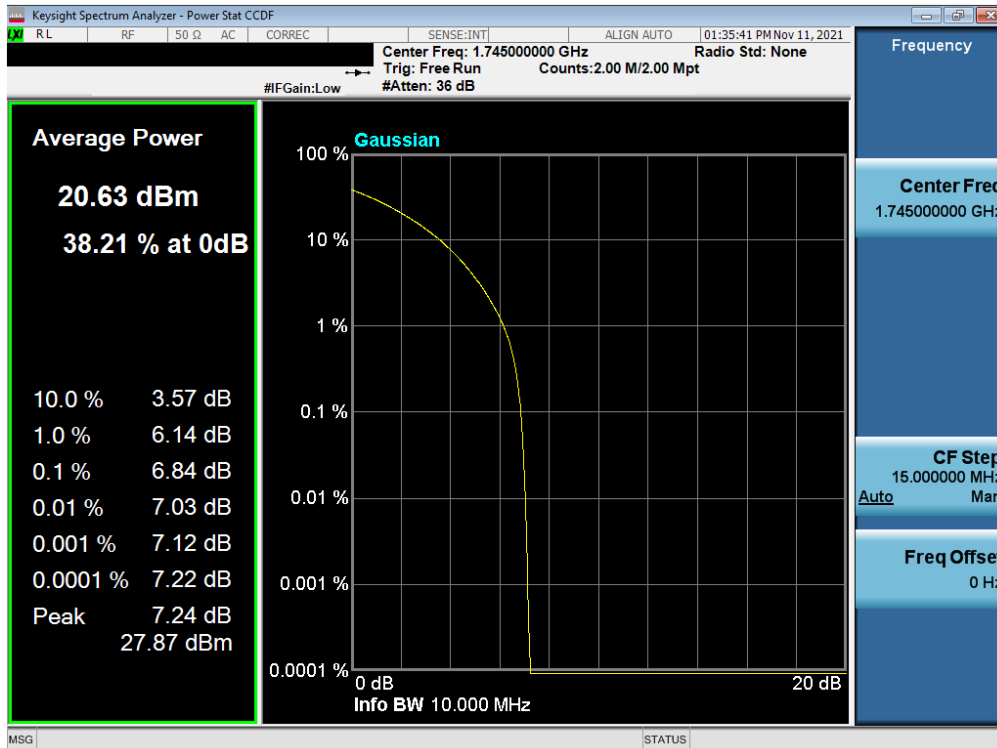


Plot 7-95. PAR Plot (NR Band n66 - 15.0MHz CP-OFDM 256-QAM - Full RB - ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 66 of 87 |

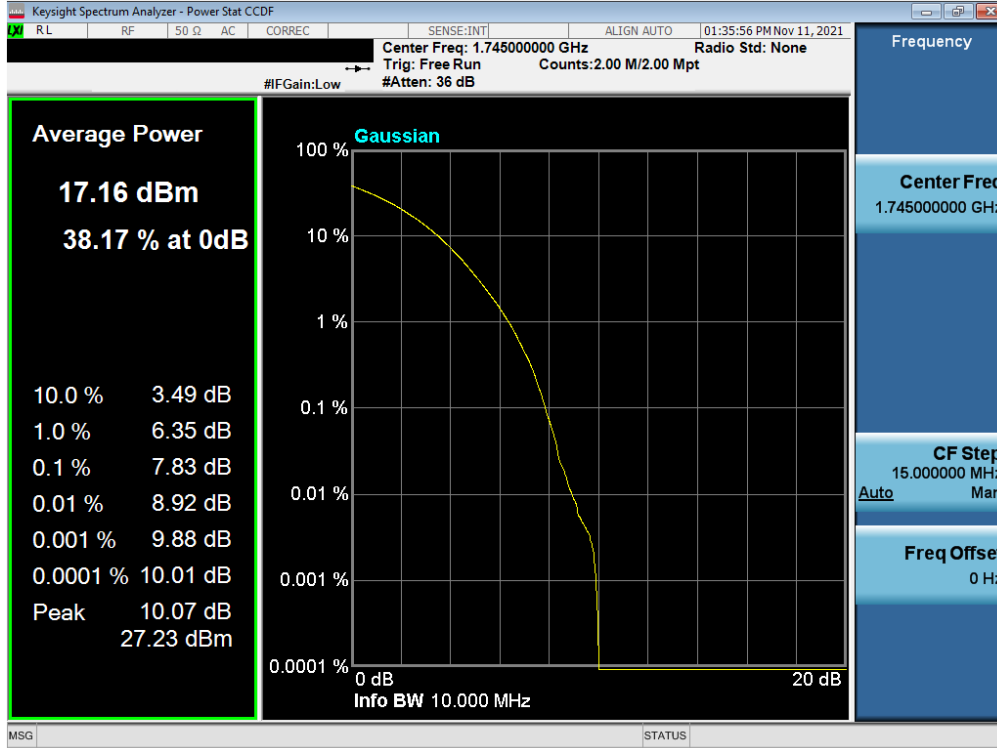


Plot 7-96. PAR Plot (NR Band n66 - 10.0MHz DFT-s-OFDM BPSK - Full RB - ANT F)

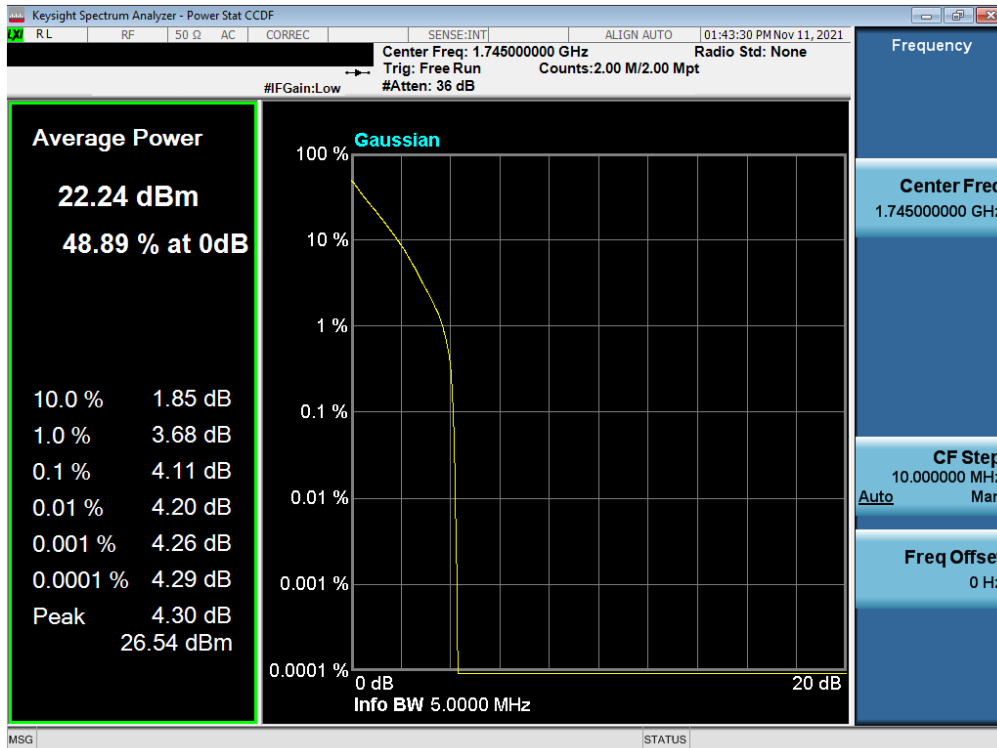


Plot 7-97. PAR Plot (NR Band n66 - 10.0MHz CP-OFDM QPSK - Full RB - ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 67 of 87 |

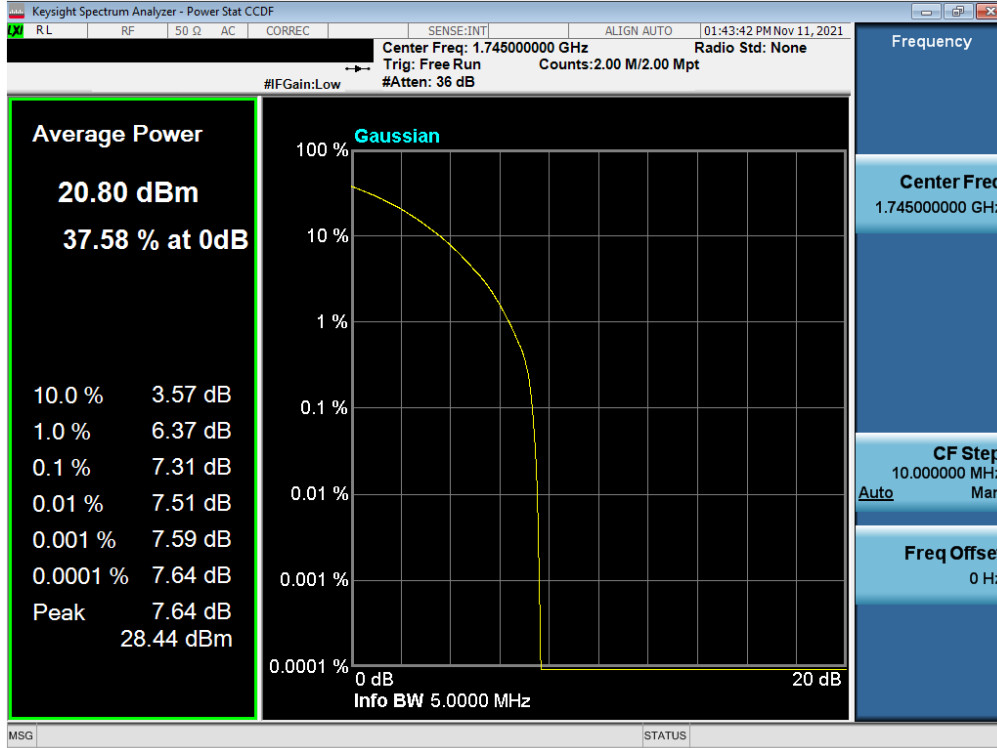


Plot 7-98. PAR Plot (NR Band n66 - 10.0MHz CP-OFDM 256-QAM - Full RB – ANT F)

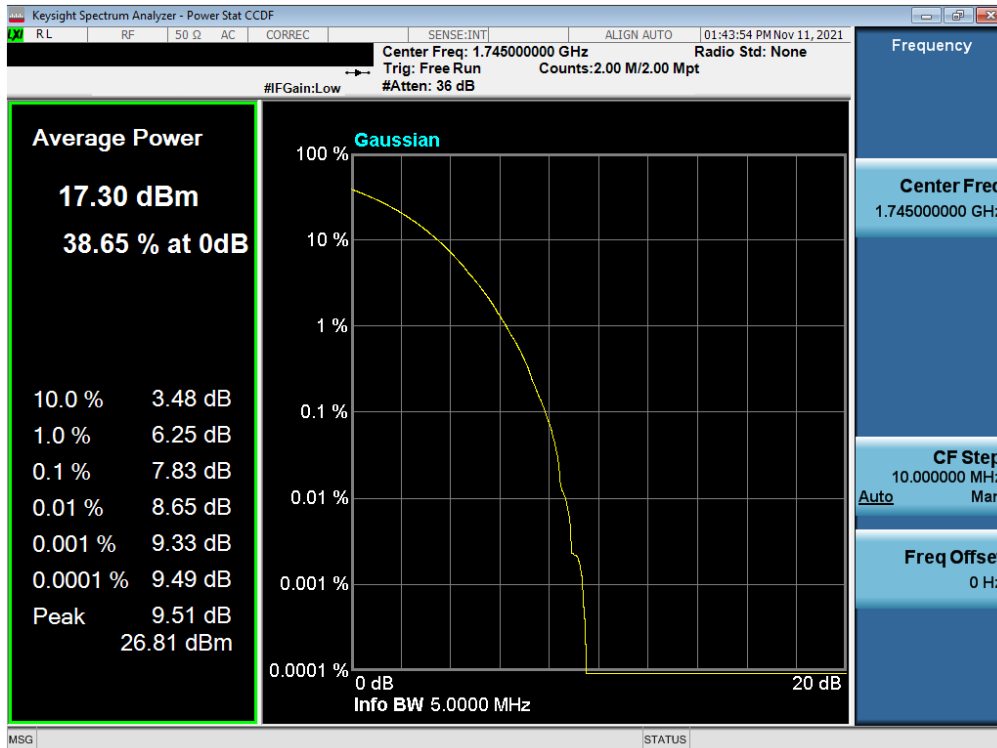


Plot 7-99. PAR Plot (NR Band n66 - 5.0MHz DFT-s-OFDM BPSK - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 68 of 87 |



Plot 7-100. PAR Plot (NR Band n66 - 5.0MHz CP-OFDM QPSK - Full RB – ANT F)



Plot 7-101. PAR Plot (NR Band n66 - 5.0MHz CP-OFDM 256-QAM - Full RB – ANT F)

| | | | | |
|---|--|-------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 69 of 87 |

7.7 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 maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
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".
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

| | | | | |
|---|--|-------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  PCTEST® Proud to be part of element | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 70 of 87 | |

Test Setup

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

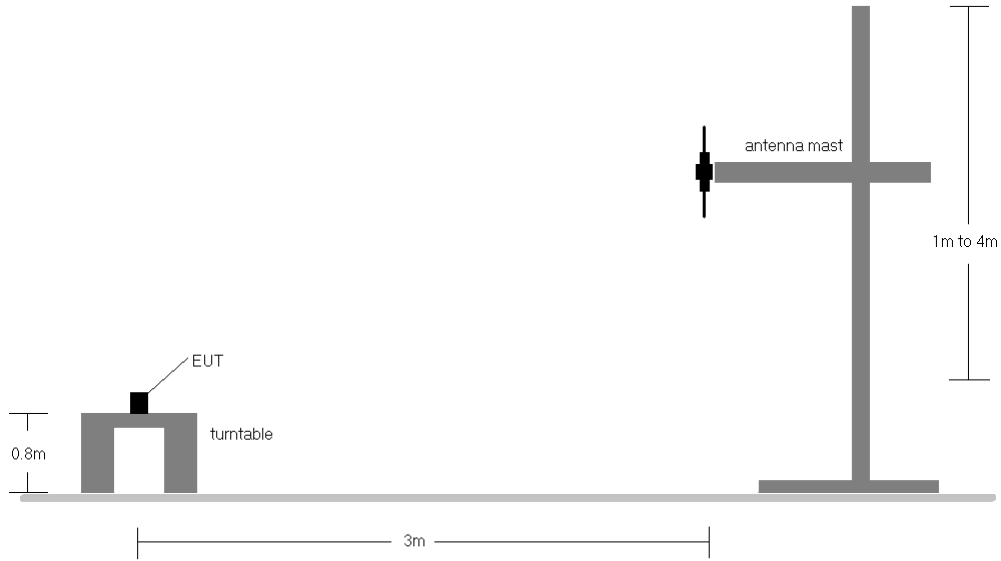


Figure 7-6. Radiated Test Setup <1GHz

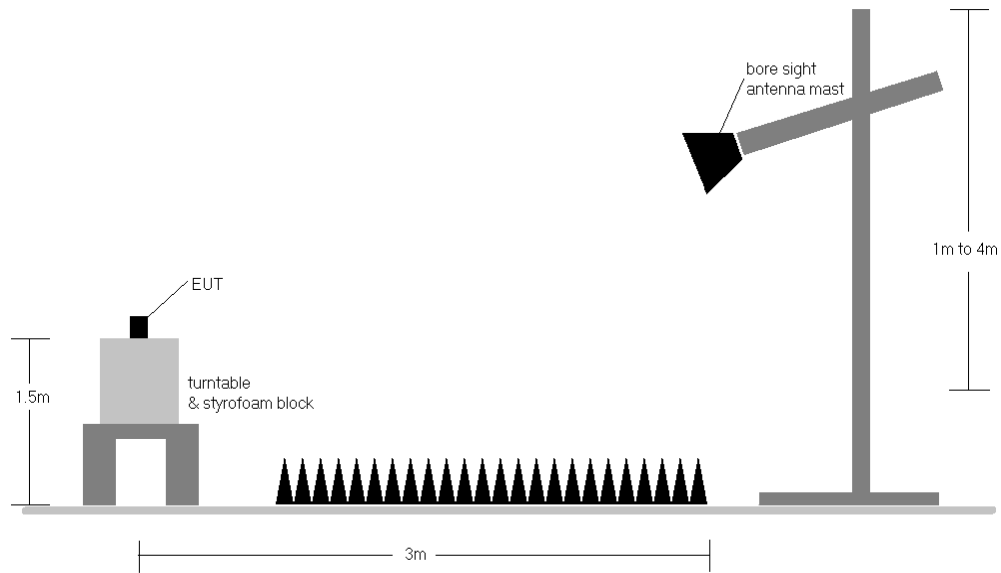




Figure 7-7. Radiated Test Setup >1GHz

| | | | |
|--|---|--|--|
| <p>FCC ID: A3LSMS901E</p> | <p>PCTEST Proud to be part of element</p> | <p>PART 27 MEASUREMENT REPORT</p> | <p>Approved by: Technical Manager</p> |
| <p>Test Report S/N: 1M2109290114-04.A3L</p> | <p>Test Dates: 11/19/2021 - 12/02/2021</p> | <p>EUT Type: Portable Handset</p> | <p>Page 71 of 87</p> |



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) 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: A3LSMS901E |  PART 27 MEASUREMENT REPORT  | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 72 of 87 |



| Bandwidth | Mod. | Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Ant. Gain [dBi] | RB Size/Offset | Substitute Level [dBm] | EIRP [dBm] | EIRP [Watts] | EIRP Limit [dBm] | Margin [dB] |
|-----------|----------------------|-----------------|-----------------|---------------------|----------------------------|-----------------|----------------|------------------------|--------------|--------------|------------------|-------------|
| 20 MHz | $\pi/2$ BPSK | 1720.0 | V | 100 | 310 | 9.33 | 1 / 26 | 13.79 | 23.12 | 0.205 | 30.00 | -6.88 |
| | $\pi/2$ BPSK | 1745.0 | V | 101 | 315 | 9.03 | 1 / 26 | 13.64 | 22.67 | 0.185 | 30.00 | -7.33 |
| | $\pi/2$ BPSK | 1770.0 | V | 104 | 314 | 9.10 | 1 / 26 | 13.81 | 22.91 | 0.195 | 30.00 | -7.09 |
| | QPSK | 1720.0 | V | 100 | 310 | 9.33 | 1 / 26 | 13.74 | 23.07 | 0.203 | 30.00 | -6.93 |
| | QPSK | 1745.0 | V | 101 | 315 | 9.03 | 1 / 26 | 13.62 | 22.65 | 0.184 | 30.00 | -7.35 |
| | QPSK | 1770.0 | V | 104 | 314 | 9.10 | 1 / 26 | 13.80 | 22.90 | 0.195 | 30.00 | -7.10 |
| | 16-QAM | 1720.0 | V | 100 | 310 | 9.33 | 1 / 26 | 12.97 | 22.30 | 0.170 | 30.00 | -7.70 |
| 15 MHz | $\pi/2$ BPSK | 1717.5 | V | 100 | 310 | 9.38 | 1 / 58 | 13.77 | 23.15 | 0.206 | 30.00 | -6.85 |
| | $\pi/2$ BPSK | 1745.0 | V | 101 | 315 | 9.03 | 1 / 58 | 13.71 | 22.75 | 0.188 | 30.00 | -7.25 |
| | $\pi/2$ BPSK | 1772.5 | V | 104 | 314 | 9.11 | 1 / 58 | 13.78 | 22.89 | 0.195 | 30.00 | -7.11 |
| | QPSK | 1717.5 | V | 100 | 310 | 9.38 | 1 / 58 | 13.66 | 23.03 | 0.201 | 30.00 | -6.97 |
| | QPSK | 1745.0 | V | 101 | 315 | 9.03 | 1 / 58 | 13.91 | 22.94 | 0.197 | 30.00 | -7.06 |
| | QPSK | 1772.5 | V | 104 | 314 | 9.11 | 1 / 58 | 13.77 | 22.89 | 0.194 | 30.00 | -7.11 |
| | 16-QAM | 1717.5 | V | 100 | 310 | 9.38 | 1 / 58 | 12.55 | 21.93 | 0.156 | 30.00 | -8.07 |
| 10 MHz | $\pi/2$ BPSK | 1715.0 | V | 100 | 310 | 9.42 | 1 / 13 | 13.44 | 22.86 | 0.193 | 30.00 | -7.14 |
| | $\pi/2$ BPSK | 1745.0 | V | 101 | 315 | 9.03 | 1 / 38 | 13.62 | 22.66 | 0.184 | 30.00 | -7.34 |
| | $\pi/2$ BPSK | 1775.0 | V | 104 | 314 | 9.13 | 1 / 26 | 13.68 | 22.81 | 0.191 | 30.00 | -7.19 |
| | QPSK | 1715.0 | V | 100 | 310 | 9.42 | 1 / 13 | 13.58 | 23.00 | 0.200 | 30.00 | -7.00 |
| | QPSK | 1745.0 | V | 101 | 315 | 9.03 | 1 / 38 | 13.75 | 22.78 | 0.190 | 30.00 | -7.22 |
| | QPSK | 1775.0 | V | 104 | 314 | 9.13 | 1 / 26 | 13.50 | 22.64 | 0.183 | 30.00 | -7.36 |
| | 16-QAM | 1715.0 | V | 100 | 310 | 9.42 | 1 / 13 | 12.52 | 21.94 | 0.156 | 30.00 | -8.06 |
| 5 MHz | $\pi/2$ BPSK | 1712.5 | V | 100 | 310 | 9.47 | 1 / 6 | 13.56 | 23.03 | 0.201 | 30.00 | -6.97 |
| | $\pi/2$ BPSK | 1745.0 | V | 101 | 315 | 9.03 | 1 / 18 | 13.55 | 22.58 | 0.181 | 30.00 | -7.42 |
| | $\pi/2$ BPSK | 1777.5 | V | 104 | 314 | 9.15 | 1 / 6 | 13.60 | 22.75 | 0.188 | 30.00 | -7.25 |
| | QPSK | 1712.5 | V | 100 | 310 | 9.47 | 1 / 6 | 13.41 | 22.88 | 0.194 | 30.00 | -7.12 |
| | QPSK | 1745.0 | V | 101 | 315 | 9.03 | 1 / 18 | 13.79 | 22.82 | 0.192 | 30.00 | -7.18 |
| | QPSK | 1777.5 | V | 104 | 314 | 9.15 | 1 / 6 | 13.62 | 22.77 | 0.189 | 30.00 | -7.23 |
| | 16-QAM | 1712.5 | V | 100 | 310 | 9.47 | 1 / 6 | 12.57 | 22.04 | 0.160 | 30.00 | -7.96 |
| 20 MHz | QPSK (CP-OFDM) | 1720.0 | V | 122 | 323 | 9.10 | 1 / 26 | 12.24 | 21.34 | 0.136 | 30.00 | -8.66 |
| | QPSK (Opposite Pol.) | 1720.0 | H | 282 | 181 | 9.39 | 1 / 26 | 13.55 | 22.94 | 0.197 | 30.00 | -7.06 |
| | QPSK (WCP) | 1720.0 | V | 124 | 281 | 9.10 | 1 / 26 | 11.62 | 20.72 | 0.118 | 30.00 | -9.28 |

Table 7-4. EIRP Data (NR Band n66 – ANT A)

| | | | |
|---|--|---|-----------------------------------|
| FCC ID: A3LSMS901E |  PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 73 of 87 |

| Bandwidth | Mod. | Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Ant. Gain [dBi] | RB Size/Offset | Substitute Level [dBm] | EIRP [dBm] | EIRP [Watts] | EIRP Limit [dBm] | Margin [dB] |
|-----------|----------------------|-----------------|-----------------|---------------------|----------------------------|-----------------|----------------|------------------------|--------------|--------------|------------------|-------------|
| 20 MHz | $\pi/2$ BPSK | 1720.0 | V | 139 | 49 | 9.33 | 1 / 79 | 10.56 | 19.89 | 0.098 | 30.00 | -10.11 |
| | $\pi/2$ BPSK | 1745.0 | V | 135 | 44 | 9.03 | 1 / 79 | 11.22 | 20.25 | 0.106 | 30.00 | -9.75 |
| | $\pi/2$ BPSK | 1770.0 | V | 133 | 35 | 9.10 | 1 / 26 | 9.83 | 18.93 | 0.078 | 30.00 | -11.07 |
| | QPSK | 1720.0 | V | 139 | 49 | 9.33 | 1 / 79 | 10.55 | 19.88 | 0.097 | 30.00 | -10.12 |
| | QPSK | 1745.0 | V | 135 | 44 | 9.03 | 1 / 79 | 11.11 | 20.14 | 0.103 | 30.00 | -9.86 |
| | QPSK | 1770.0 | V | 133 | 35 | 9.10 | 1 / 26 | 9.66 | 18.76 | 0.075 | 30.00 | -11.24 |
| 15 MHz | 16-QAM | 1720.0 | V | 139 | 49 | 9.33 | 1 / 79 | 9.78 | 19.11 | 0.081 | 30.00 | -10.89 |
| | $\pi/2$ BPSK | 1717.5 | V | 139 | 49 | 9.38 | 1 / 58 | 11.56 | 20.93 | 0.124 | 30.00 | -9.07 |
| | $\pi/2$ BPSK | 1745.0 | V | 135 | 44 | 9.03 | 1 / 58 | 11.96 | 20.99 | 0.126 | 30.00 | -9.01 |
| | $\pi/2$ BPSK | 1772.5 | V | 133 | 35 | 9.11 | 1 / 58 | 11.02 | 20.13 | 0.103 | 30.00 | -9.87 |
| | QPSK | 1717.5 | V | 139 | 49 | 9.38 | 1 / 58 | 10.64 | 20.02 | 0.100 | 30.00 | -9.98 |
| | QPSK | 1745.0 | V | 135 | 44 | 9.03 | 1 / 58 | 10.82 | 19.85 | 0.097 | 30.00 | -10.15 |
| 10 MHz | QPSK | 1772.5 | V | 133 | 35 | 9.11 | 1 / 58 | 9.72 | 18.83 | 0.076 | 30.00 | -11.17 |
| | 16-QAM | 1745.0 | V | 135 | 44 | 9.03 | 1 / 58 | 10.56 | 19.59 | 0.091 | 30.00 | -10.41 |
| | $\pi/2$ BPSK | 1715.0 | V | 139 | 49 | 9.42 | 1 / 38 | 11.45 | 20.87 | 0.122 | 30.00 | -9.13 |
| | $\pi/2$ BPSK | 1745.0 | V | 135 | 44 | 9.03 | 1 / 38 | 12.26 | 21.29 | 0.135 | 30.00 | -8.71 |
| | $\pi/2$ BPSK | 1775.0 | V | 133 | 35 | 9.13 | 1 / 26 | 10.90 | 20.03 | 0.101 | 30.00 | -9.97 |
| | QPSK | 1715.0 | V | 139 | 49 | 9.42 | 1 / 38 | 10.57 | 19.99 | 0.100 | 30.00 | -10.01 |
| 5 MHz | QPSK | 1745.0 | V | 135 | 44 | 9.03 | 1 / 38 | 11.01 | 20.05 | 0.101 | 30.00 | -9.95 |
| | QPSK | 1775.0 | V | 133 | 35 | 9.13 | 1 / 26 | 9.44 | 18.57 | 0.072 | 30.00 | -11.43 |
| | 16-QAM | 1745.0 | V | 135 | 44 | 9.03 | 1 / 38 | 9.86 | 18.89 | 0.077 | 30.00 | -11.11 |
| | $\pi/2$ BPSK | 1712.5 | V | 139 | 49 | 9.47 | 1 / 18 | 11.29 | 20.76 | 0.119 | 30.00 | -9.24 |
| | $\pi/2$ BPSK | 1745.0 | V | 135 | 44 | 9.03 | 1 / 18 | 12.33 | 21.36 | 0.137 | 30.00 | -8.64 |
| | $\pi/2$ BPSK | 1777.5 | V | 133 | 35 | 9.15 | 1 / 18 | 11.03 | 20.18 | 0.104 | 30.00 | -9.82 |
| 20 MHz | QPSK | 1712.5 | V | 139 | 49 | 9.47 | 1 / 18 | 10.63 | 20.10 | 0.102 | 30.00 | -9.90 |
| | QPSK | 1745.0 | V | 135 | 44 | 9.03 | 1 / 18 | 11.03 | 20.06 | 0.101 | 30.00 | -9.94 |
| | QPSK | 1777.5 | V | 133 | 35 | 9.15 | 1 / 18 | 9.57 | 18.72 | 0.074 | 30.00 | -11.28 |
| | 16-QAM | 1745.0 | V | 135 | 44 | 9.03 | 1 / 18 | 10.11 | 19.14 | 0.082 | 30.00 | -10.86 |
| 20 MHz | QPSK (CP-OFDM) | 1745.0 | V | 135 | 44 | 9.03 | 1 / 79 | 9.81 | 18.84 | 0.077 | 30.00 | -11.16 |
| | QPSK (Opposite Pol.) | 1745.0 | H | 174 | 33 | 9.48 | 1 / 79 | 9.97 | 19.45 | 0.088 | 30.00 | -10.55 |
| | QPSK (WCP) | 1745.0 | V | 132 | 154 | 9.03 | 1 / 79 | 9.06 | 18.09 | 0.064 | 30.00 | -11.91 |

Table 7-5. EIRP Data (NR Band n66 – ANT F)

| | | | | |
|---|---|-------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 74 of 87 | |

7.8 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 horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.



Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

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: A3LSMS901E |  PART 27 MEASUREMENT REPORT  | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 75 of 87 |

Test Setup

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

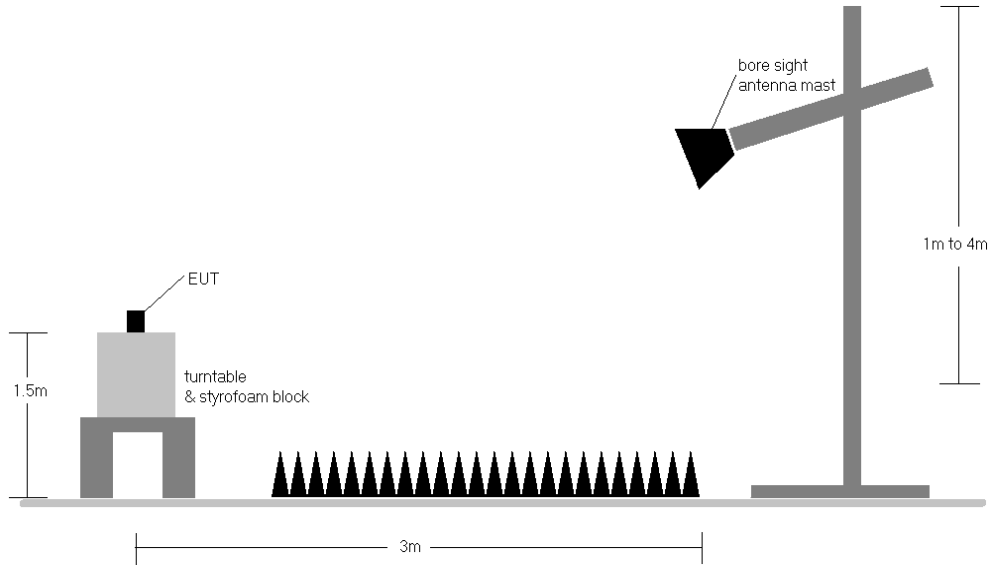


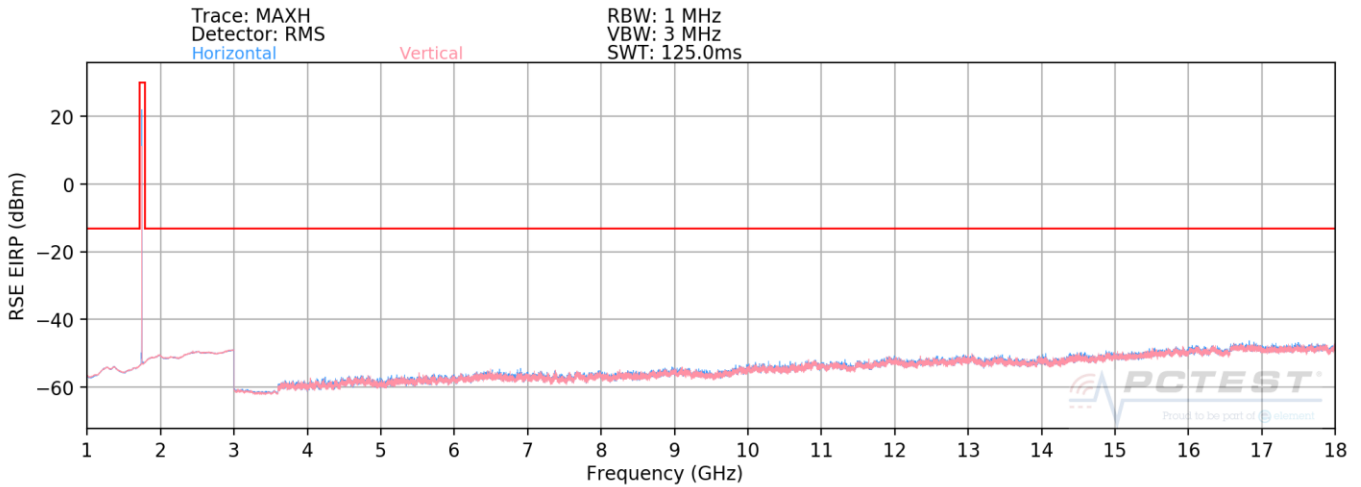
Figure 7-8. Test Instrument & Measurement Setup

Test Notes

- 1) Field strengths are calculated using the Measurement quantity conversions in KDB 971168 Section 5.8.4.
 - a) $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
 - b) $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$; where D is the measurement distance in meters.
- 2) 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.
- 3) This unit was tested with its standard battery.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 6) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 7) 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.
- 8) Spurious emissions shown in this section are measured while operating in EN-DC mode with Sub 6GHz NR carrier as well as an LTE carrier (anchor). Spurious emissions from the NR carrier device, is subject to the rules under which the NR carrier operates. Spurious emission caused by the LTE carrier must meet the requirements of the rules under which the LTE carrier operates.
- 9) Spurious emissions measurements are included in this section to address compliance of the LTE ULCA capability. The EUT was set to transmit at the widest bandwidth and on the middle channel of each band.

| | | | | |
|--|---|--------------------------------------|---------------|--|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 76 of 87 | |

NR Band n66 – ANT A



Plot 7-102. Radiated Spurious Plot (NR Band n66 – ANT A)

| Bandwidth (MHz): | 20 | | | | | | | | |
|------------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| Frequency (MHz): | 1720 | | | | | | | | |
| RB / Offset: | 1 / 53 | | | | | | | | |
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
| 3440.0 | H | - | - | -77.70 | 4.00 | 33.30 | -61.95 | -13.00 | -48.95 |
| 5160.0 | H | - | - | -79.17 | 6.13 | 33.96 | -61.30 | -13.00 | -48.30 |
| 6880.0 | H | - | - | -80.39 | 9.27 | 35.88 | -59.37 | -13.00 | -46.37 |

Table 7-6. Radiated Spurious Data (NR Band n66 – Low Channel – ANT A)

| Bandwidth (MHz): | 20 | | | | | | | | |
|------------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| Frequency (MHz): | 1745 | | | | | | | | |
| RB / Offset: | 1 / 53 | | | | | | | | |
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
| 3490.0 | H | - | - | -78.25 | 3.69 | 32.44 | -62.82 | -13.00 | -49.82 |
| 5235.0 | H | - | - | -79.01 | 6.14 | 34.13 | -61.13 | -13.00 | -48.13 |
| 6980.0 | H | - | - | -79.37 | 8.20 | 35.83 | -59.43 | -13.00 | -46.43 |

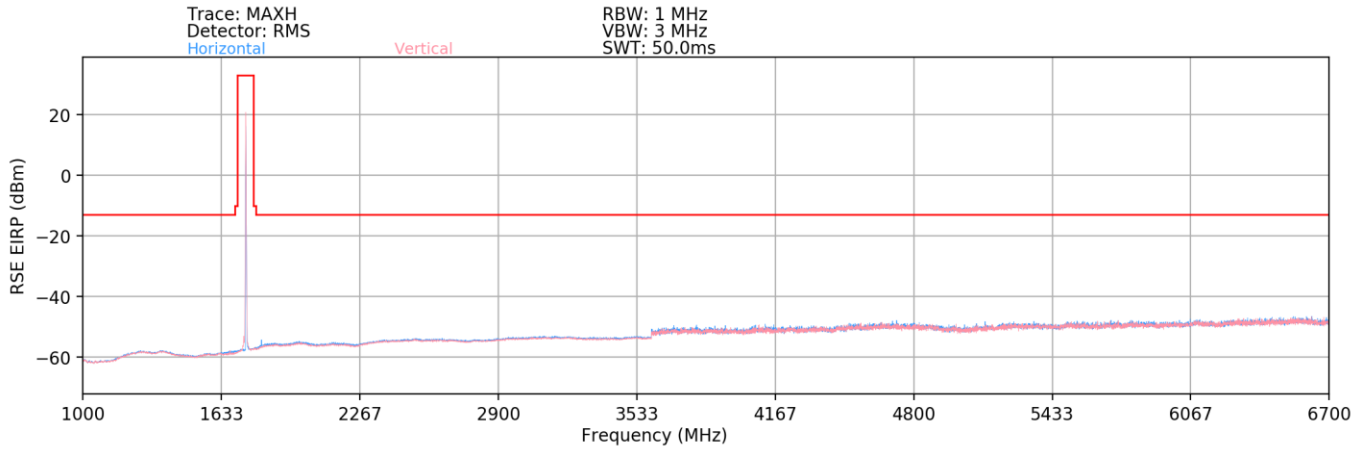
Table 7-7. Radiated Spurious Data (NR Band n66 – Mid Channel – ANT A)

| Bandwidth (MHz): | 20 | | | | | | | | |
|------------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| Frequency (MHz): | 1770 | | | | | | | | |
| RB / Offset: | 1 / 53 | | | | | | | | |
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
| 3540.0 | H | - | - | -78.04 | 3.67 | 32.63 | -62.63 | -13.00 | -49.63 |
| 5310.0 | H | - | - | -79.03 | 6.30 | 34.27 | -60.99 | -13.00 | -47.99 |
| 7080.0 | H | - | - | -79.23 | 8.39 | 36.16 | -59.09 | -13.00 | -46.09 |

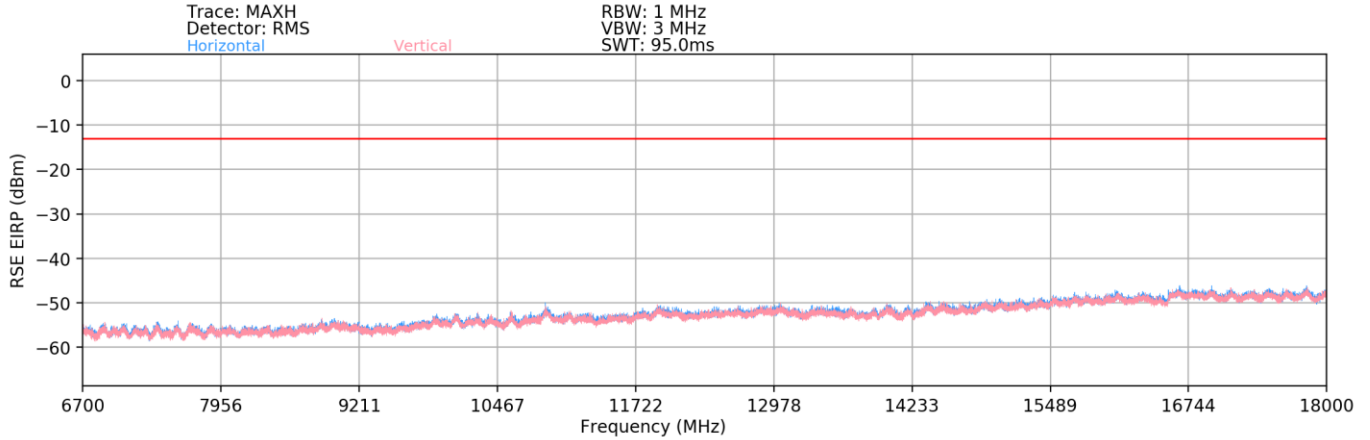
Table 7-8. Radiated Spurious Data (NR Band n66 – High Channel – ANT A)

| | | | | |
|---|--|-------------------------------|--|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 77 of 87 |

EN-DC n66 (ANT A) + LTE Band 5





Plot 7-103. Radiated Spurious Plot (EN-DC n66 (ANT A) + B5)



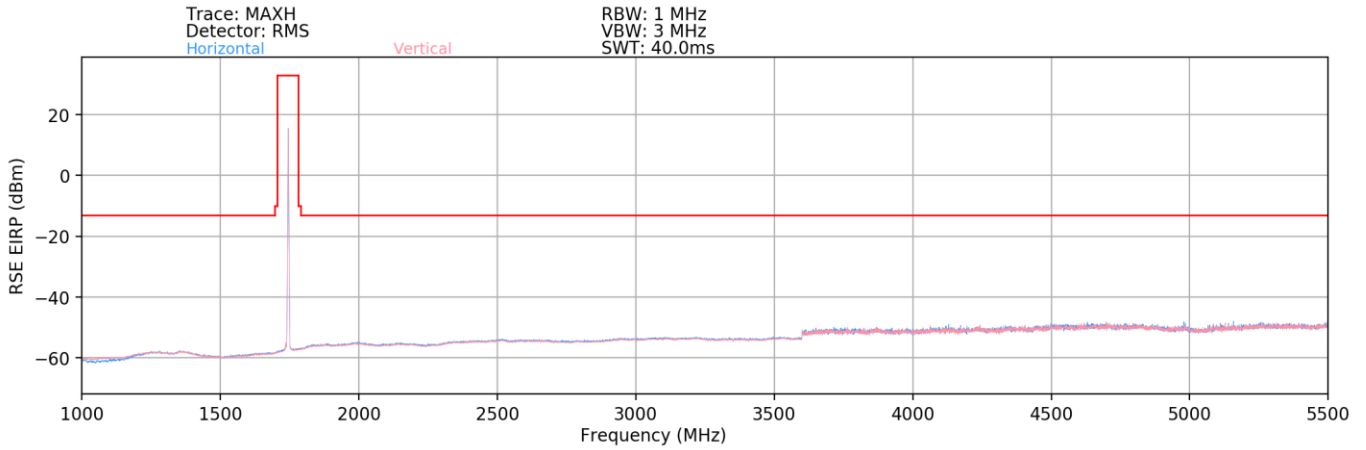
Plot 7-104. Radiated Spurious Plot (EN-DC n66 (ANT A) + B5)

| Bandwidth (MHz): | 20 & 10 | | | | | | | | |
|------------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| Frequency (MHz): | 1745 & 836.5 | | | | | | | | |
| RB / Offset: | 1 / 53 & 1 / 25 | | | | | | | | |
| Mode: | EN-DC | | | | | | | | |
| Anchor Band: | 5 | | | | | | | | |
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
| 2653.5 | V | - | - | -77.52 | 10.63 | 40.11 | -55.15 | -13.00 | -42.15 |
| 3562.0 | V | - | - | -77.00 | 11.82 | 41.82 | -53.43 | -13.00 | -40.43 |
| 4470.5 | V | - | - | -78.77 | 13.23 | 41.46 | -53.80 | -13.00 | -40.80 |

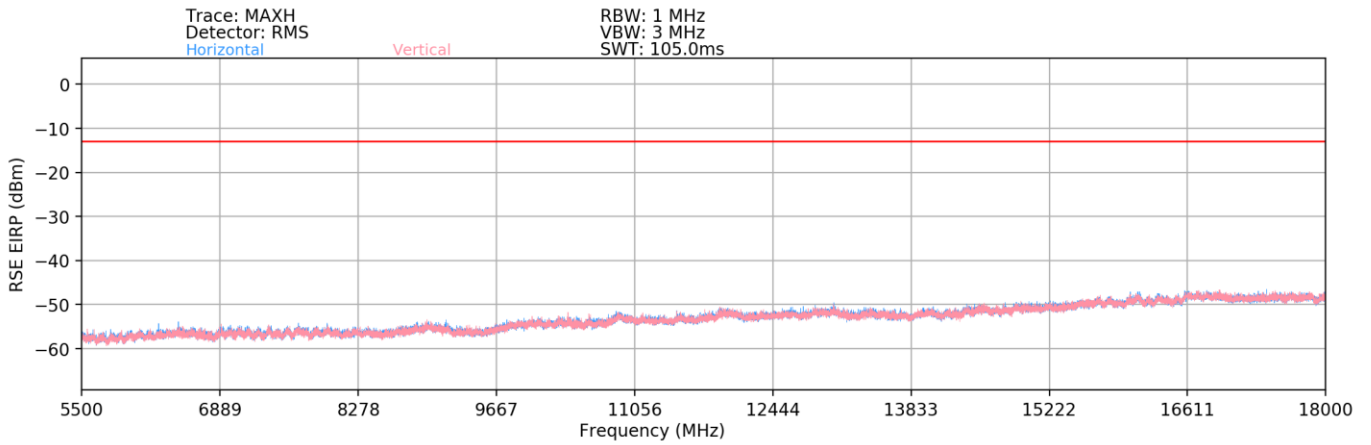
Table 7-9. Radiated Spurious Data (EN-DC n66 (ANT A) + B5)

| | | | | |
|---|---|-------------------------------|---|-----------------------------------|
| FCC ID: A3LSMS901E |  | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 78 of 87 |

EN-DC n66 (ANT A) + LTE Band 12



Plot 7-105. Radiated Spurious Plot (EN-DC n66 (ANT A) + B12)



Plot 7-106. Radiated Spurious Plot (EN-DC n66 (ANT A) + B12)

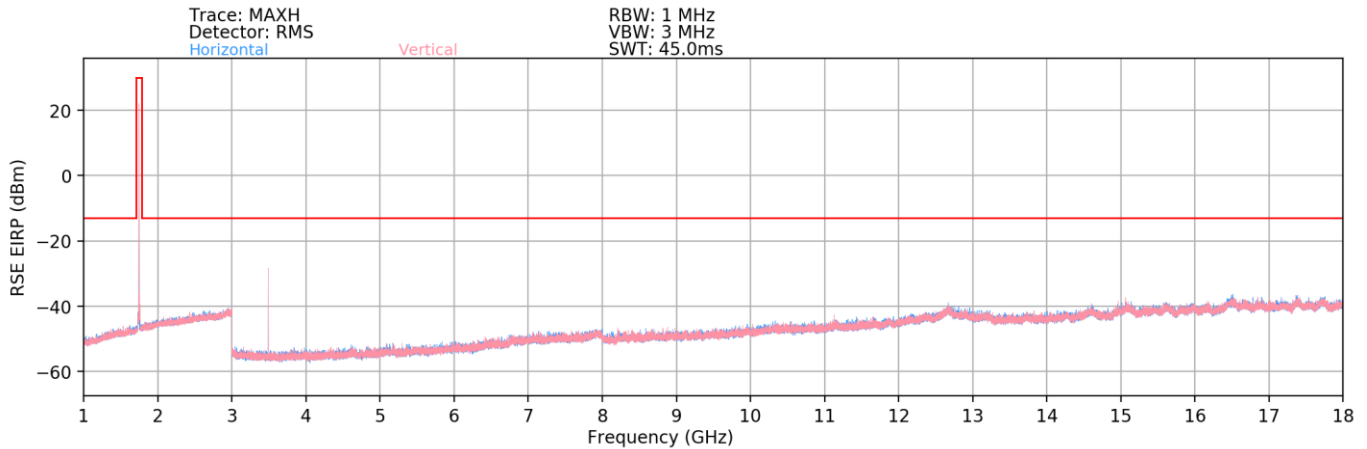
| | |
|-------------------------|-----------------|
| Bandwidth (MHz): | 20 & 10 |
| Frequency (MHz): | 1745 & 707.5 |
| RB / Offset: | 1 / 53 & 1 / 25 |
| Mode: | EN-DC |
| Anchor Band: | 12 |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 2782.5 | V | - | - | -77.78 | 10.47 | 39.69 | -55.57 | -13.00 | -42.57 |
| 3820.0 | V | - | - | -78.69 | 12.36 | 40.67 | -54.59 | -13.00 | -41.59 |
| 4857.5 | V | - | - | -79.04 | 13.92 | 41.88 | -53.38 | -13.00 | -40.38 |

Table 7-10. Radiated Spurious Data (EN-DC n66 (ANT A) + B12)

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 79 of 87 |

NR Band n66 – ANT F



Plot 7-107. Radiated Spurious Plot (NR Band n66 – ANT F)

| Bandwidth (MHz): | 20 | | | | | | | | |
|------------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| Frequency (MHz): | 1720 | | | | | | | | |
| RB / Offset: | 1 / 53 | | | | | | | | |
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
| 3440.0 | H | 195 | 30 | -52.10 | 5.63 | 60.53 | -34.73 | -13.00 | -21.73 |
| 5160.0 | H | - | - | -79.29 | 7.64 | 35.35 | -59.90 | -13.00 | -46.90 |
| 6880.0 | H | - | - | -79.92 | 11.50 | 38.58 | -56.68 | -13.00 | -43.68 |
| 8600.0 | H | - | - | -81.02 | 13.80 | 39.78 | -55.47 | -13.00 | -42.47 |
| 10320.0 | H | - | - | -81.51 | 16.55 | 42.04 | -53.22 | -13.00 | -40.22 |

Table 7-11. Radiated Spurious Data (NR Band n66 – Low Channel – ANT F)



| Bandwidth (MHz): | 20 | | | | | | | | |
|------------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| Frequency (MHz): | 1745 | | | | | | | | |
| RB / Offset: | 1 / 53 | | | | | | | | |
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
| 3490.0 | H | 187 | 21 | -50.31 | 5.49 | 62.18 | -33.07 | -13.00 | -20.07 |
| 5235.0 | H | - | - | -79.04 | 7.43 | 35.39 | -59.86 | -13.00 | -46.86 |
| 6980.0 | H | - | - | -79.74 | 11.36 | 38.62 | -56.64 | -13.00 | -43.64 |
| 8725.0 | H | - | - | -80.73 | 13.50 | 39.77 | -55.49 | -13.00 | -42.49 |
| 10470.0 | H | - | - | -81.85 | 17.16 | 42.31 | -52.94 | -13.00 | -39.94 |

Table 7-12. Radiated Spurious Data (NR Band n66 – Mid Channel – ANT F)

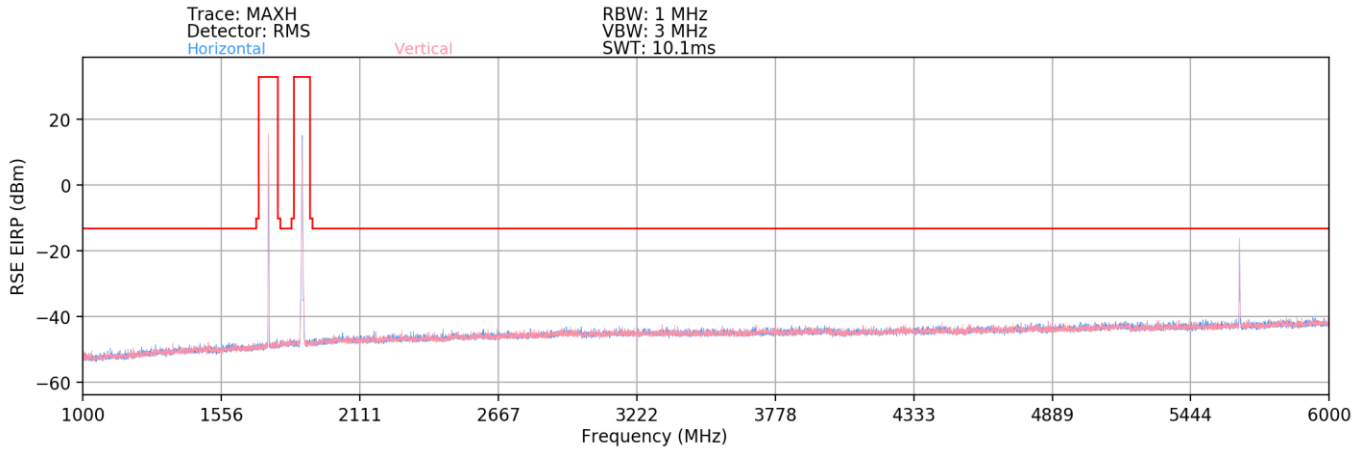
| | | | | | |
|---|--|-------------------------------|-----------------------------------|---------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | | PART 27 MEASUREMENT REPORT | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 80 of 87 | |

| Bandwidth (MHz): | | 20 | | | | | | | |
|------------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| Frequency (MHz): | | 1770 | | | | | | | |
| RB / Offset: | | 1 / 53 | | | | | | | |
| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
| 3540.0 | H | 226 | 38 | -50.49 | 5.45 | 61.96 | -33.30 | -13.00 | -20.30 |
| 5310.0 | H | 288 | 341 | -76.49 | 7.67 | 38.18 | -57.07 | -13.00 | -44.07 |
| 7080.0 | H | - | - | -79.94 | 11.88 | 38.94 | -56.32 | -13.00 | -43.32 |
| 8850.0 | H | - | - | -80.71 | 13.50 | 39.79 | -55.47 | -13.00 | -42.47 |
| 10620.0 | H | - | - | -81.70 | 16.66 | 41.96 | -53.30 | -13.00 | -40.30 |

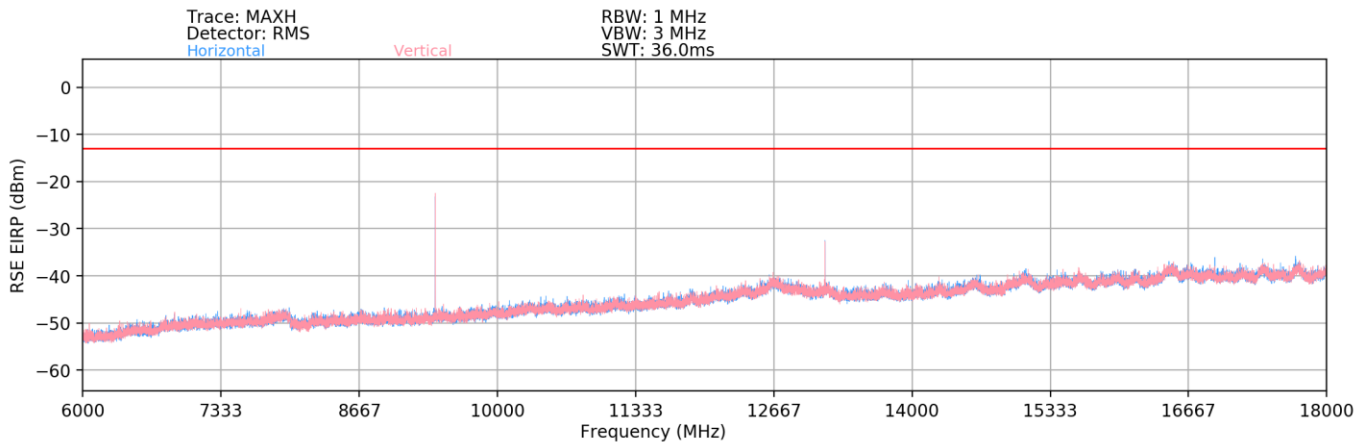
Table 7-13. Radiated Spurious Data (NR Band n66 – High Channel – ANT F)

| | | | |
|---|---|-------------------------------|-----------------------------------|
| FCC ID: A3LSMS901E |  PART 27 MEASUREMENT REPORT  | | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | Page 81 of 87 |

EN-DC n66 (ANT F) + LTE Band 2



Plot 7-108. Radiated Spurious Plot (EN-DC n66 (ANT F) + B2)



Plot 7-109. Radiated Spurious Plot (EN-DC n66 (ANT F) + B2)

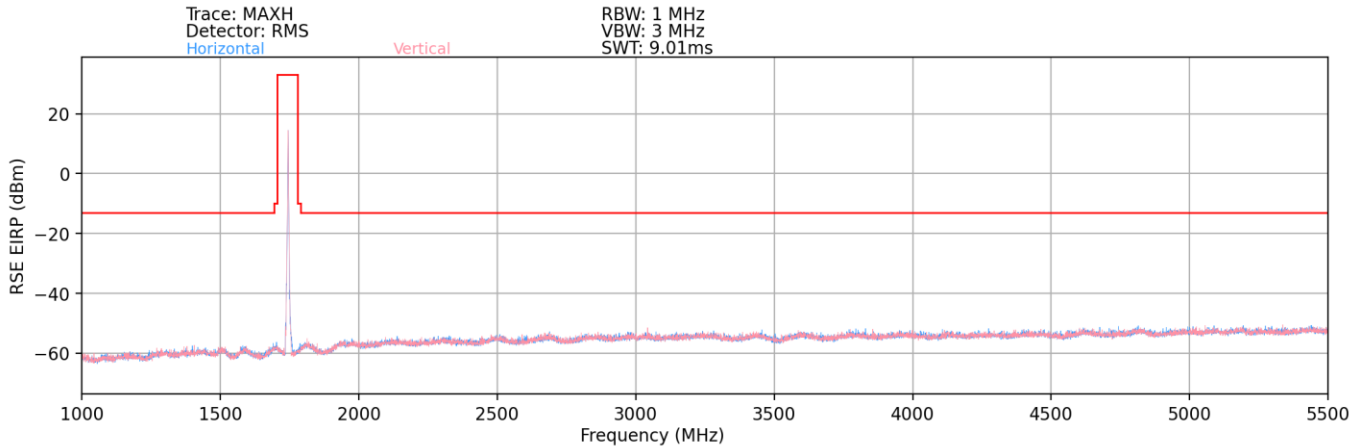
| | |
|-------------------------|-----------------|
| Bandwidth (MHz): | 20 & 20 |
| Frequency (MHz): | 1745 & 1880 |
| RB / Offset: | 1 / 53 & 1 / 50 |
| Mode: | EN-DC |
| Anchor Band: | 2 |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1475.0 | V | - | - | -76.67 | 7.81 | 38.14 | -57.12 | -13.00 | -44.12 |
| 1610.0 | V | - | - | -76.87 | 8.42 | 38.55 | -56.71 | -13.00 | -43.71 |
| 2015.0 | V | - | - | -77.21 | 11.30 | 41.09 | -54.17 | -13.00 | -41.17 |
| 3490.0 | V | 243 | 146 | -73.59 | 13.17 | 46.58 | -48.68 | -13.00 | -35.68 |
| 5640.3 | V | 112 | 21 | -52.79 | 18.37 | 72.58 | -22.68 | -13.00 | -9.68 |
| 9400.0 | V | 114 | 5 | -58.37 | 24.46 | 73.09 | -22.16 | -13.00 | -9.16 |
| 13160.0 | V | 101 | 26 | -72.31 | 29.49 | 64.18 | -31.07 | -13.00 | -18.07 |

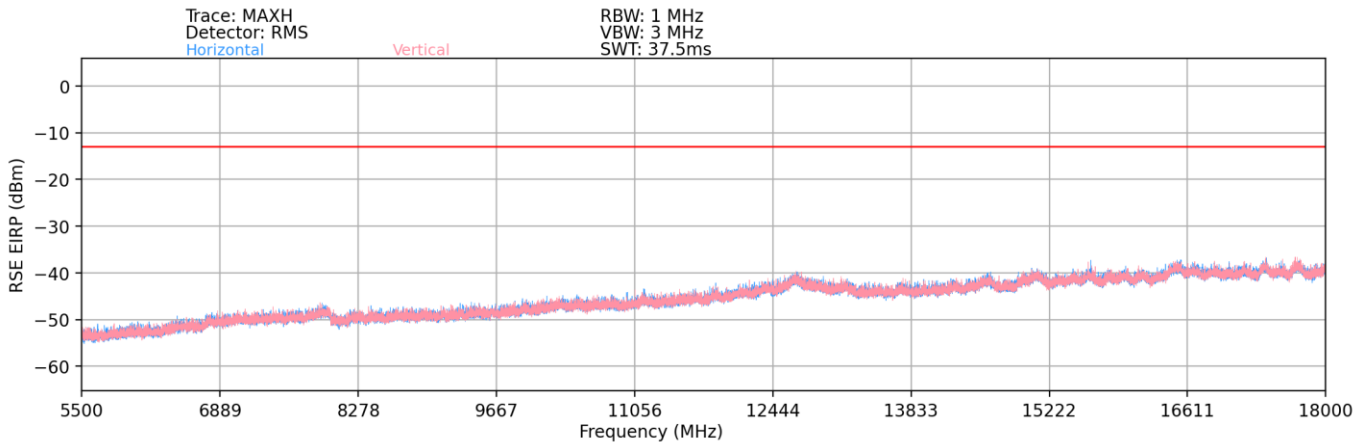
Table 7-14. Radiated Spurious Data (EN-DC n66 (ANT F) + B2)

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 82 of 87 |

LTE ULCA: Band 12 (ANT A) – Band 66 (ANT A)



Plot 7-110. Radiated Spurious Plot (ULCA LTE B12 – B66)



Plot 7-111. Radiated Spurious Plot (ULCA LTE B12 – B66)

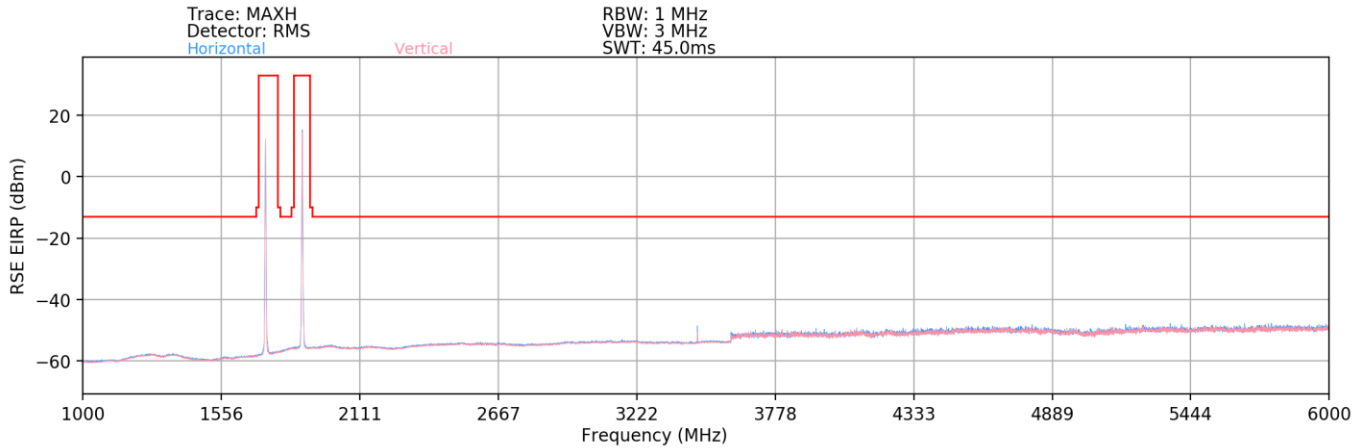
| | |
|----------------------|--------|
| PCC Bandwidth (MHz): | 10 |
| PCC Frequency (MHz): | 707.5 |
| PCC RB / Offset: | 1 / 25 |
| SCC Bandwidth (MHz): | 20 |
| SCC Frequency (MHz): | 1745.0 |
| SCC RB / Offset: | 1 / 50 |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1367.5 | V | - | - | -76.19 | -2.68 | 28.13 | -67.12 | -13.00 | -54.12 |
| 2405.0 | V | - | - | -77.70 | 2.14 | 31.44 | -63.82 | -13.00 | -50.82 |
| 2782.5 | V | - | - | -77.96 | 3.14 | 32.18 | -63.08 | -13.00 | -50.08 |
| 3820.0 | V | - | - | -78.27 | 5.09 | 33.82 | -61.44 | -13.00 | -48.44 |
| 4857.5 | V | - | - | -79.45 | 6.46 | 34.01 | -61.24 | -13.00 | -48.24 |
| 15708.0 | V | - | - | -82.94 | 23.45 | 47.51 | -47.74 | -13.00 | -34.74 |

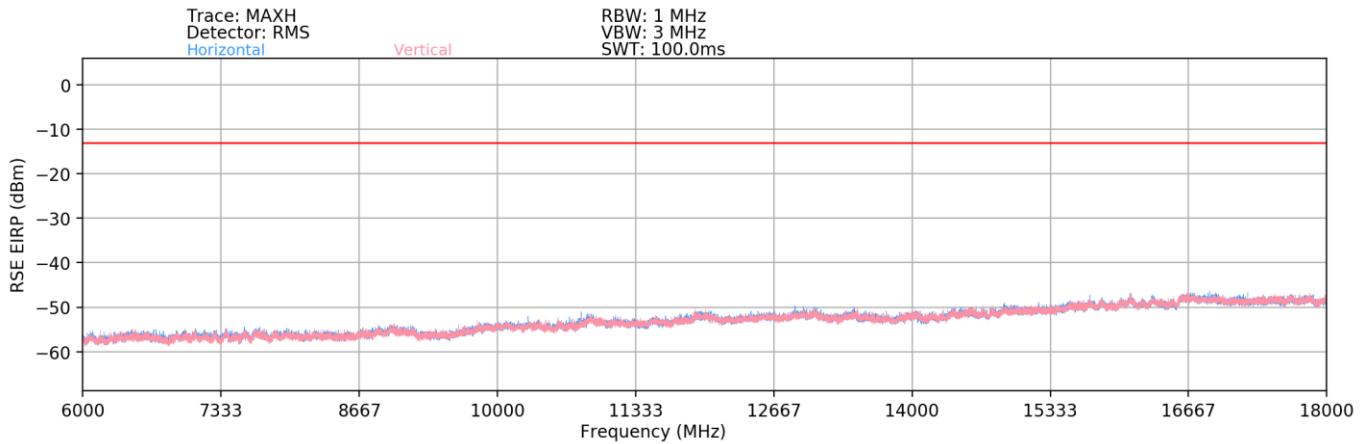
Table 7-15. Radiated Spurious Data (ULCA LTE B12 – B66)

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 83 of 87 |

LTE ULCA: Band 4 (ANT A) – Band 2 (ANT F)



Plot 7-112. Radiated Spurious Plot (ULCA LTE B4 – B2)





Plot 7-113. Radiated Spurious Plot (ULCA LTE B4 – B2)

| | |
|----------------------|--------|
| PCC Bandwidth (MHz): | 20 |
| PCC Frequency (MHz): | 1732.5 |
| PCC RB / Offset: | 1 / 50 |
| SCC Bandwidth (MHz): | 20 |
| SCC Frequency (MHz): | 1880.0 |
| SCC RB / Offset: | 1 / 50 |

| Frequency [MHz] | Ant. Pol. [H/V] | Antenna Height [cm] | Turntable Azimuth [degree] | Analyzer Level [dBm] | AFCL [dB/m] | Field Strength [dBμV/m] | EIRP Spurious Emission Level [dBm] | Limit [dBm] | Margin [dB] |
|-----------------|-----------------|---------------------|----------------------------|----------------------|-------------|-------------------------|------------------------------------|-------------|-------------|
| 1585.0 | H | - | - | -76.49 | 5.44 | 35.95 | -59.31 | -13.00 | -46.31 |
| 2027.5 | H | - | - | -76.78 | 9.28 | 39.50 | -55.75 | -13.00 | -42.75 |
| 2175.0 | H | - | - | -76.72 | 9.27 | 39.55 | -55.70 | -13.00 | -42.70 |
| 3465.0 | H | 229 | 15 | -69.18 | 11.36 | 49.18 | -46.08 | -13.00 | -33.08 |
| 5197.5 | H | - | - | -78.50 | 14.58 | 43.08 | -52.17 | -13.00 | -39.17 |

Table 7-16. Radiated Spurious Data (ULCA LTE B4 – B2)

| | | | |
|---|--|---|-----------------------------------|
| FCC ID: A3LSMS901E |  PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
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7.9 Frequency Stability / Temperature Variation

Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

For Part 27, the frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings



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

Test Setup

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

Test Notes

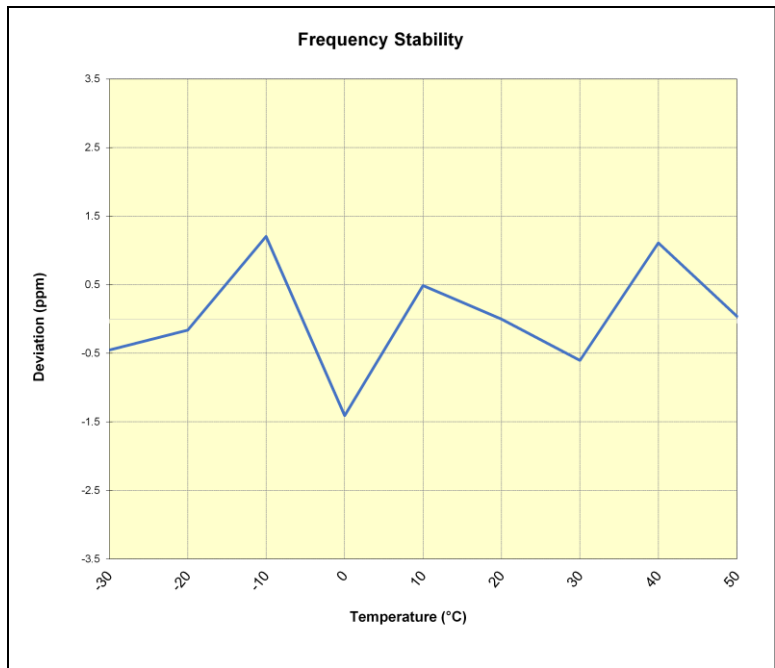
None

| | | | | |
|--|--|--------------------------------------|---|--|
| FCC ID: A3LSMS901E |  PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
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Frequency Stability / Temperature Variation

| NR Band n66 | | | | | |
|---------------------------|-------------|---------------|----------------|-----------------|---------------|
| Operating Frequency (Hz): | | 1,745,000,000 | | | |
| Ref. Voltage (VDC): | | 4.39 | | | |
| Voltage (%) | Power (VDC) | Temp (°C) | Frequency (Hz) | Freq. Dev. (Hz) | Deviation (%) |
| 100 % | 4.39 | - 30 | 1,745,088,234 | -788 | -0.0000452 |
| | | - 20 | 1,745,088,736 | -286 | -0.0000164 |
| | | - 10 | 1,745,091,125 | 2,103 | 0.0001205 |
| | | 0 | 1,745,086,562 | -2,459 | -0.0001409 |
| | | + 10 | 1,745,089,871 | 849 | 0.0000487 |
| | | + 20 (Ref) | 1,745,089,022 | 0 | 0.0000000 |
| | | + 30 | 1,745,087,965 | -1,057 | -0.0000606 |
| | | + 40 | 1,745,090,958 | 1,936 | 0.0001110 |
| | | + 50 | 1,745,089,089 | 67 | 0.0000039 |
| Battery Endpoint | 3.40 | + 20 | 1,745,089,200 | 178 | 0.0000102 |

Table 7-17. NR Band n66 Frequency Stability Data






Plot 7-114. NR Band n66 Frequency Stability Chart

| | | | | |
|---|--|-----------------------------------|----------------|-----------------------------------|
| FCC ID: A3LSMS901E | PCTEST Proud to be part of element | PART 27 MEASUREMENT REPORT | SAMSUNG | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 86 of 87 |

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMS901E** complies with all the requirements of Part 27 of the FCC rules.

| | | | | |
|--|--|--------------------------------------|---|--|
| FCC ID: A3LSMS901E |  PCTEST <small>Proud to be part of </small> | PART 27 MEASUREMENT REPORT |  | Approved by: Technical Manager |
| Test Report S/N: 1M2109290114-04.A3L | Test Dates: 11/19/2021 - 12/02/2021 | EUT Type: Portable Handset | | Page 87 of 87 |