

Part 96 MEASUREMENT REPORT

Applicant Name:

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

Date of Testing:

09/20 - 11/18/2021

Test Report Issue Date:

11/18/2021

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

1M2109090102-08.A3L

FCC ID:

A3LSMS908U

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-S908U

Additional Models:

SM-S908U1

EUT Type:

Portable Handset

FCC Classification:

Citizens Band End User Devices (CBE)

FCC Rule Part(s):

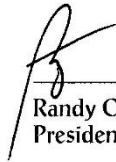
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Test Procedure(s):

ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01,
KDB 940660 D01 v02, WINNF-TS-0122 v1.0.0, 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

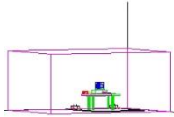


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T A B L E O F C O N T E N T S

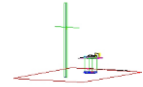
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FCC Part 96



Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 48 (Carrier Aggregation)	40 MHz	QPSK	3570.0 - 3680.0	0.128	21.06	37M8G7D
		16QAM	3570.0 - 3680.0	0.108	20.34	37M6W7D
	35 MHz	QPSK	3567.5 - 3682.5	0.132	21.21	32M9G7D
		16QAM	3567.5 - 3682.5	0.113	20.53	32M8W7D
	30 MHz	QPSK	3565.0 - 3685.0	0.128	21.06	27M9G7D
		16QAM	3565.0 - 3685.0	0.108	20.34	27M9W7D
	25 MHz	QPSK	3562.5 - 3687.5	0.127	21.05	23M1G7D
		16QAM	3562.5 - 3687.5	0.109	20.37	23M1W7D
LTE Band 48	20 MHz	QPSK	3560.0 - 3690.0	0.128	21.07	18M0G7D
		16QAM	3560.0 - 3690.0	0.101	20.03	18M0W7D
	15 MHz	QPSK	3557.5 - 3692.5	0.124	20.92	13M5G7D
		16QAM	3557.5 - 3692.5	0.103	20.12	13M5W7D
	10 MHz	QPSK	3555.0 - 3695.0	0.131	21.18	9M01G7D
		16QAM	3555.0 - 3695.0	0.112	20.48	9M03W7D
	5 MHz	QPSK	3552.5 - 3697.5	0.128	21.07	4M53G7D
		16QAM	3552.5 - 3697.5	0.108	20.33	4M53W7D

EUT Overview

Note: EIRP levels shown in the table above are measured over the full channel bandwidth. These values will appear on the Grant of Authorization.

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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.

1.2 PCTEST Test Location

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

1.3 Test Facility / Accreditations

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

- PCTEST is a OnGo Alliance Approved Test Lab (ATL)
- PCTEST is a WinnForum Approved Test Lab
- PCTEST is an ISO 17025-2017 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for CBRS Alliance Certification Test Plan and WinnForum Conformance and Performance Test Technical Standard.
- 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 ISSED Standards (RSS).
- PCTEST facility is a registered (2451B) test laboratory with the site description on file with ISSED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS908U**. The test data contained in this report pertains only to the emissions due to the EUT's LTE Band 48 operation in the CBRS band. Per FCC Part 96, this device is evaluated under Citizens Band End User Devices (CBE).

Test Device Serial No.: 0351M, 1176M, 0335M, 0959M, 0389M, 0584M, 1283M

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 and FR2), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5 and 6GHz), Bluetooth (1x, EDR, LE), NFC, UWB, Wireless Power Transfer

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

2.3 Test Configuration

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

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

2.4 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Measurement Procedure

The measurement procedures described in the document titled “Land Mobile FM or PM – Communications Equipment – Measurements and Performance Standards” (ANSI/TIA-603-E-2016) and “Procedures for Compliance Measurement of the Fundamental Emission Power of Licensed Wideband (> 1 MHz) Digital Transmission Systems” (KDB 971168 D01 v03r01) were used in the measurement of the EUT.

3.2 Radiated Power and Radiated Spurious Emissions

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

The equipment under test was transmitting while connected to its integral antenna and is placed on a turntable 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

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

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

Where, P_d is the dipole equivalent power, P_g is the generator output into the substitution antenna, and the antenna gain is the gain of the substitute antenna used relative to either a half-wave dipole (dBd) or an isotropic source (dBi). The substitute level is equal to $P_g [\text{dBm}] - \text{cable loss} [\text{dB}]$.

The calculated P_d levels are then compared to the absolute spurious emission limit of -40dBm/MHz for End User Devices.

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.

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4.0 MEASUREMENT UNCERTAINTY

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

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

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5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	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
Keysight Technologies	N9038A	MXE EMI Receiver	12/11/2021	Annual	12/11/2022	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

Notes:

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 (7250 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).

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
FCC ID: A3LSMS908U
FCC Classification: Citizens Band End User Devices (CBE)
Mode(s): LTE

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Conducted Power	2.1046	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions	2.1051, 96.41(e)(ii)	-13 dBm/MHz at frequencies within 0-B MHz of channel edge (where B is the bandwidth of the assigned channel) -25 dBm/MHz at frequencies greater than B MHz above and below channel edge -40 dBm/MHz at frequencies below 3530 MHz and above 3720 MHz	PASS	Sections 7.4, 7.5
	Additional Maximum Power Reduction (A-MPR)	2.1046	N/A	PASS	Section 7.6
	Frequency Stability	2.1055	Fundamental emissions stay within authorized frequency block	PASS	Section 7.10
	End User Device Additional Requirements (CBSD Protocol)	96.47	End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation. An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.	PASS	Section 7.11
	Uplink Carrier Aggregation	96.41(e)	> 43 + 10log(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Section 7.7
RADIATED	Equivalent Isotropic Radiated Power (EIRP)	96.41(b)	23 dBm/10MHz	PASS	Section 7.8
	Radiated Spurious Emissions	2.1053, 96.41(e)	-40 dBm/MHz	PASS	Section 7.9

Table 7-1. Summary of Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.

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- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) 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 v1.0, Chamber Control v1.3.1.

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7.2 Conducted Power Output Data

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.

A-MPR is implemented in this device per the A-MPR specification in 3GPP TS 36.101. The conducted powers are shown herein to cover the different A-MPR levels specified in the standard. Measurement equipment was set up with triggering/gating on the spectrum analyzer such that powers were measured only during the on-time of the signal.

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.

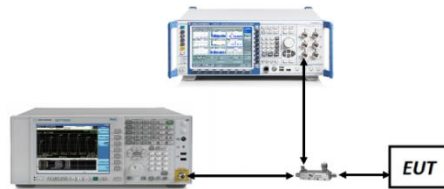


Figure 7-1. Test Instrument & Measurement Setup

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Test Notes

1. A-MPR was only applied for test purposes to the 2CC case since the 1CC case was compliant for all testing at max power.
2. A-MPR was verified to comply with the "CA_NS_10" specification in the 3GPP TS 36.101 standard by setting the MCC to a U.S. code and the MNC to a U.S. carrier supporting LTE B48 operation.
3. 256QAM operations does not employ A-MPR.

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	55340	3560.0	1 / 50	23.66
		55990	3625.0	1 / 50	23.91
		56640	3690.0	1 / 50	23.64
	16-QAM	55340	3560.0	1 / 50	22.34
15 MHz	QPSK	55315	3557.5	1 / 37	23.51
		55990	3625.0	1 / 37	23.87
		56665	3692.5	1 / 37	23.54
	16-QAM	55315	3557.5	1 / 37	22.43
10 MHz	QPSK	55290	3555.0	1 / 49	23.77
		55990	3625.0	1 / 49	23.93
		56690	3695.0	1 / 49	23.82
	16-QAM	55290	3555.0	1 / 49	22.79
5 MHz	QPSK	55265	3552.5	1 / 12	23.65
		55990	3625.0	1 / 12	23.73
		56715	3697.5	1 / 12	23.49
	16-QAM	55265	3552.5	1 / 12	22.64

Table 7-1. Conducted Power Output Data (LTE Band 48)

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Bandwidth	Modulation	PCC			SCC			Conducted Power [dBm]
		Bandwidth [MHz]	Frequency [MHz]	RB / Offset	Bandwidth [MHz]	Frequency [MHz]	RB / Offset	
40 MHz	QPSK	20	3560.0	1 / 99	20	3579.8	1 / 0	22.76
		20	3625.0	1 / 99	20	3644.8	1 / 0	22.45
		20	3690.0	1 / 0	20	3670.2	1 / 99	22.78
	16-QAM	20	3560.0	1 / 99	20	3579.8	1 / 0	21.76
		20	3625.0	1 / 99	20	3644.8	1 / 0	21.48
		20	3690.0	1 / 0	20	3670.2	1 / 99	21.81
35 MHz	QPSK	20	3557.5	1 / 99	15	3577.1	1 / 0	22.72
		20	3625.0	1 / 99	15	3642.1	1 / 0	22.48
		20	3692.5	1 / 0	15	3672.9	1 / 74	22.71
	16-QAM	20	3557.5	1 / 99	15	3577.1	1 / 0	22.68
		20	3625.0	1 / 99	15	3642.1	1 / 0	22.39
		20	3692.5	1 / 0	15	3672.9	1 / 74	22.77
30 MHz	QPSK	20	3555.0	1 / 99	10	3574.4	1 / 0	22.76
		20	3625.0	1 / 99	10	3639.4	1 / 0	22.51
		20	3695.0	1 / 0	10	3678.3	1 / 49	22.67
	16-QAM	20	3555.0	1 / 99	10	3574.4	1 / 0	21.76
		20	3625.0	1 / 99	10	3639.4	1 / 0	21.54
		20	3695.0	1 / 0	10	3678.3	1 / 49	21.76
25 MHz	QPSK	20	3552.5	1 / 99	5	3571.7	1 / 0	22.75
		20	3625.0	1 / 99	5	3636.7	1 / 0	22.51
		20	3697.5	1 / 0	5	3678.3	1 / 24	22.66
	16-QAM	20	3552.5	1 / 99	5	3571.7	1 / 0	21.79
		20	3625.0	1 / 99	5	3636.7	1 / 0	21.50
		20	3697.5	1 / 0	5	3678.3	1 / 24	21.71

Table 7-2. Conducted Power Output Data (ULCA LB48)

Test Case	NS	MCC	MNC	Channel BW [MHz]	PCC			SCC			A-MPR [dB]	Modulation	MPR [dB]	Maximum Target Output Power [dBm]	A-MPR Measured Power [dBm]
					Channel Frequency [MHz]	RB Size	RB Offset	Channel Frequency [MHz]	RB Size	RB Offset					
1	NS_01	310	910	20 + 20	3560	100	0	3579.8	100	0	≤ 11	QPSK	0	23.00	11.91
												16-QAM	1	22.00	11.90
												64-QAM	2	21.00	11.90
												256-QAM	4	19.00	11.67
2				20 + 20	3560	1	99	3579.8	1	0	≤ 11	QPSK	0	23.00	18.29
												16-QAM	1	22.00	18.24
												64-QAM	2	21.00	18.37
												256-QAM	4	19.00	17.79
3				20 + 20	3605.1	100	0	3624.9	100	0	≤ 4.5	QPSK	0	23.00	18.03
												16-QAM	1	22.00	18.02
												64-QAM	2	21.00	18.02
												256-QAM	4	19.00	17.54
4				20 + 20	3605.1	1	99	3624.9	1	0	≤ 4.5	QPSK	0	23.00	21.55
												16-QAM	1	22.00	21.53
												64-QAM	2	21.00	20.71
												256-QAM	4	19.00	17.58
5				20 + 20	3670.1	100	0	3689.9	100	0	≤ 11	QPSK	0	23.00	11.85
												16-QAM	1	22.00	11.87
												64-QAM	2	21.00	11.85
												256-QAM	4	19.00	11.79
6				20 + 20	3670.1	1	99	3689.9	1	0	≤ 11	QPSK	0	23.00	18.31
												16-QAM	1	22.00	18.31
												64-QAM	2	21.00	18.42
												256-QAM	4	19.00	17.90

Table 7-3. A-MPR Conducted Power Output Data (ULCA LB48)

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
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7.3 Occupied Bandwidth

§2.1049

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.

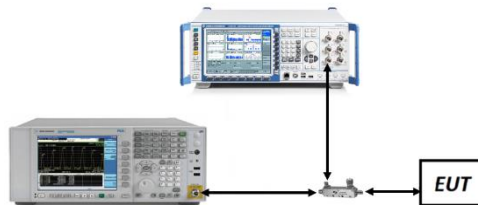
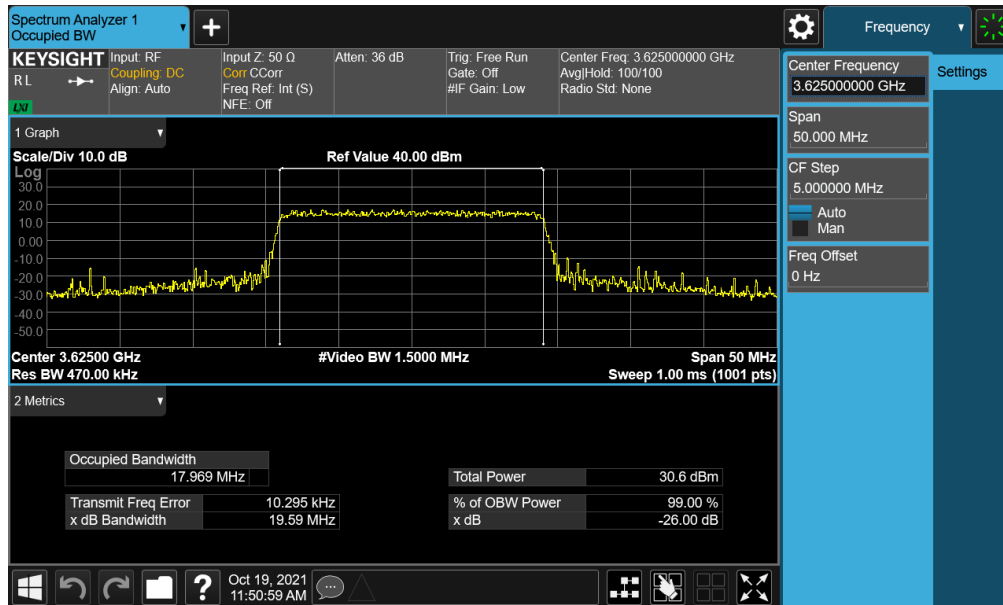


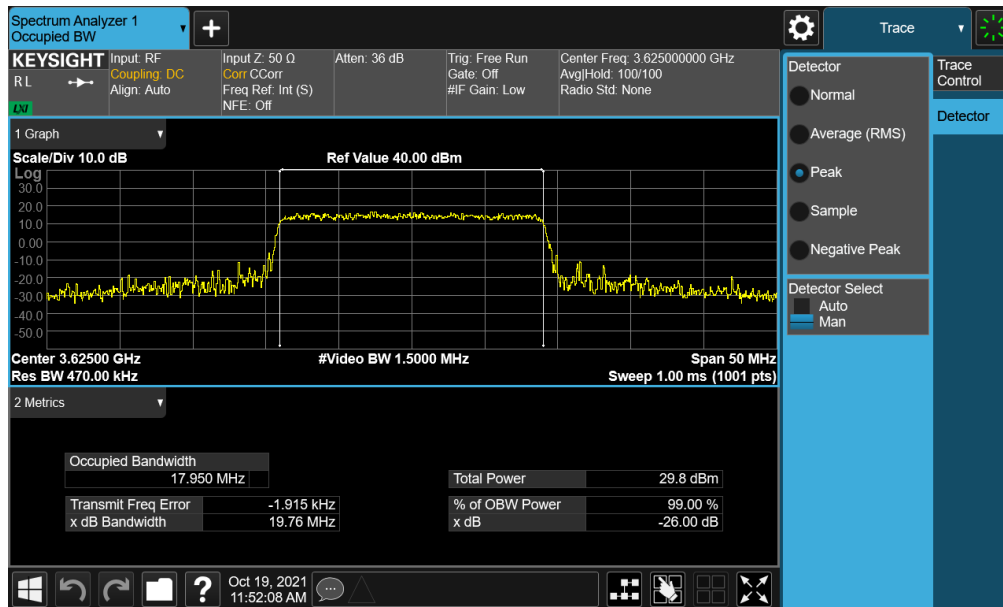
Figure 7-2. Test Instrument & Measurement Setup

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset
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LTE Band 48

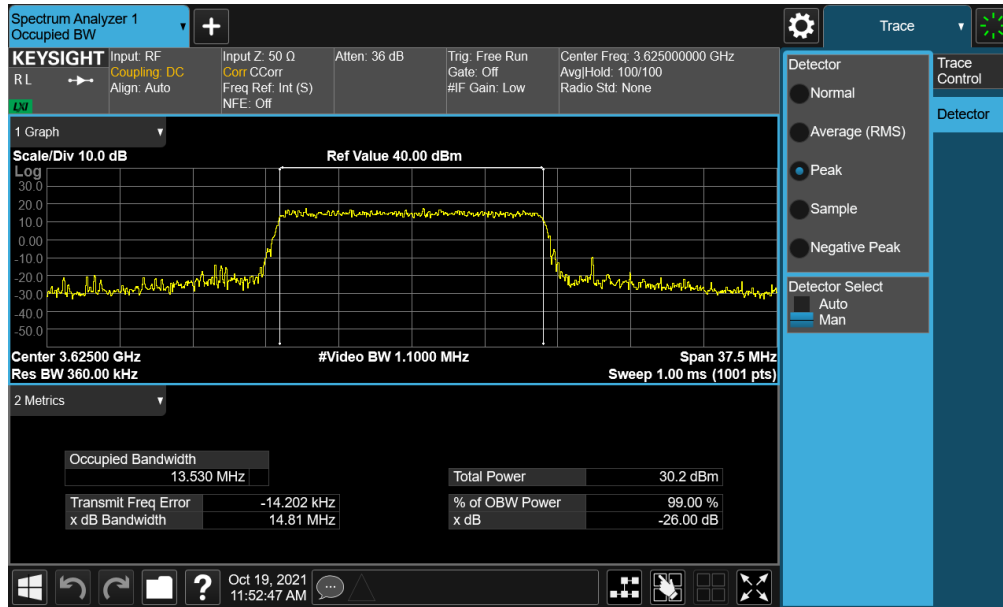


Plot 7-1. Occupied Bandwidth Plot (LTE Band 48 - 20MHz QPSK - Full RB Configuration)

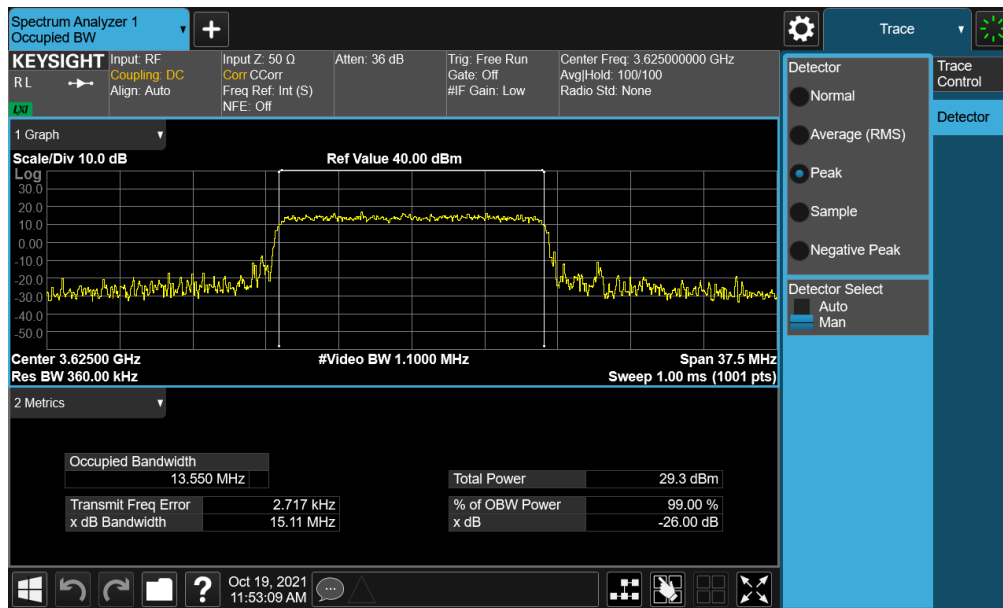


Plot 7-2. Occupied Bandwidth Plot (LTE Band 48 - 20MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS908U	PCTEST Proud to be part of 	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 16 of 61

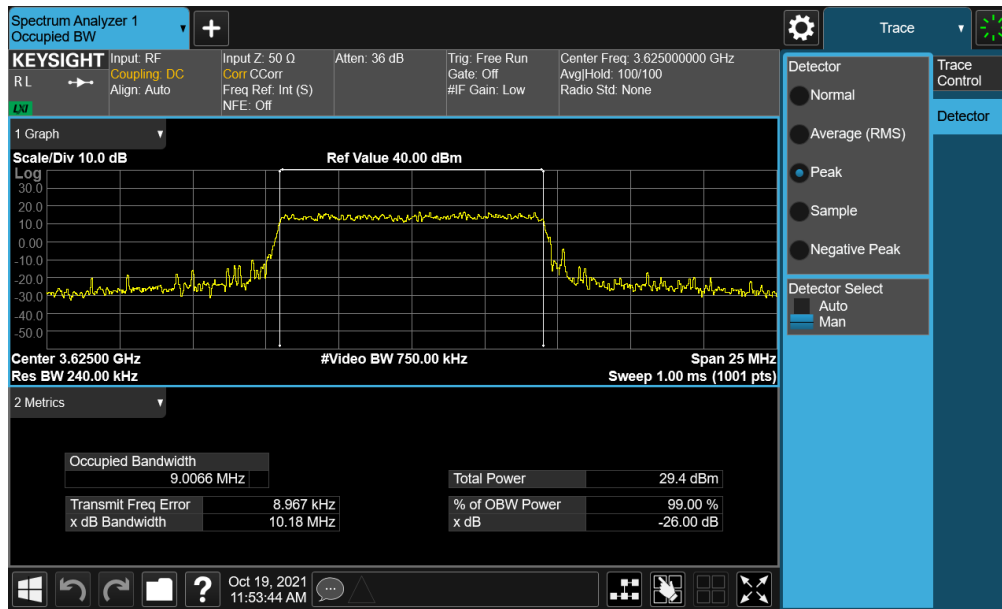


Plot 7-3. Occupied Bandwidth Plot (LTE Band 48 - 15MHz QPSK - Full RB Configuration)

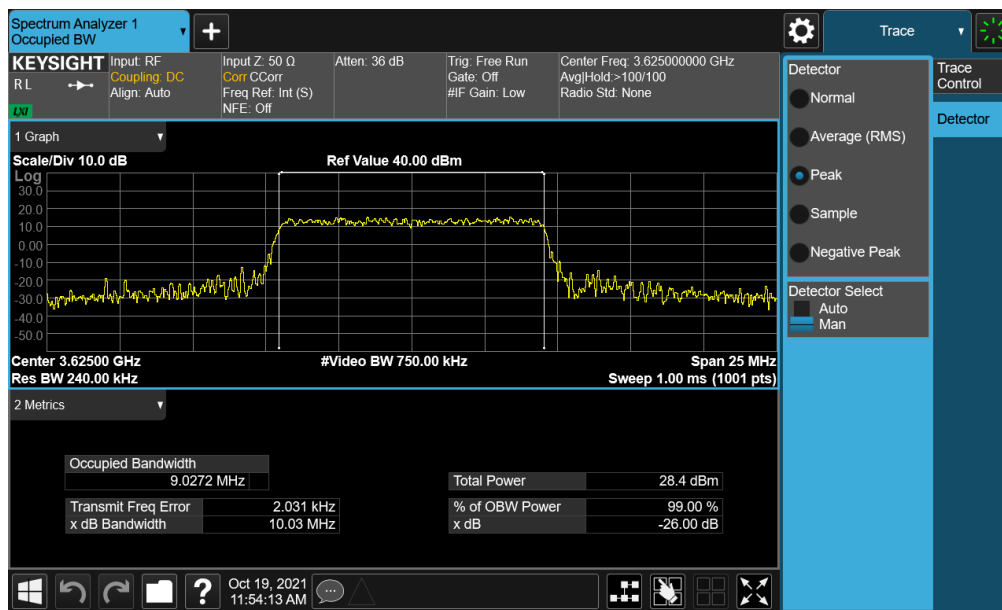


Plot 7-4. Occupied Bandwidth Plot (LTE Band 48 - 15MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 17 of 61

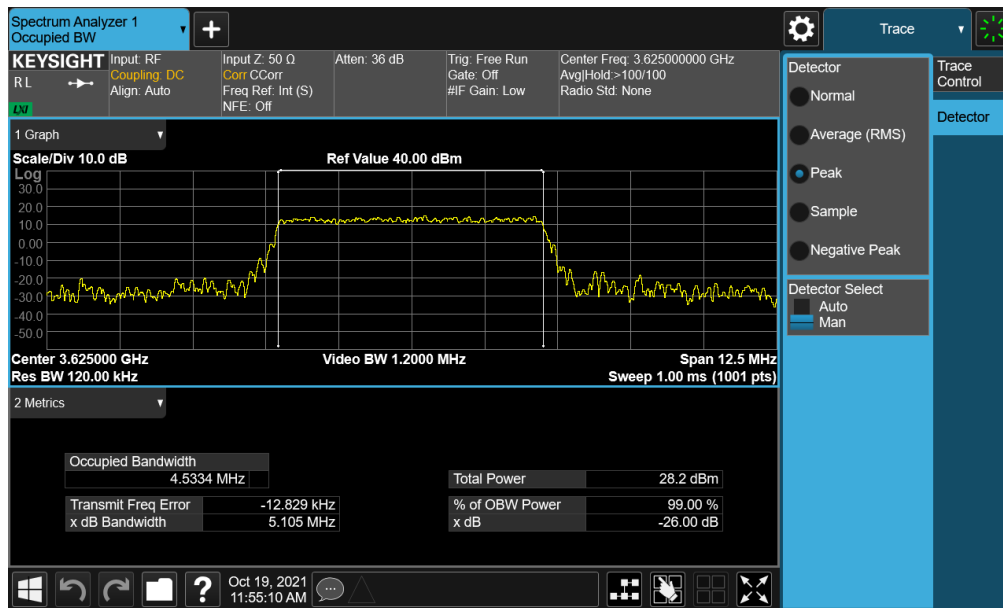
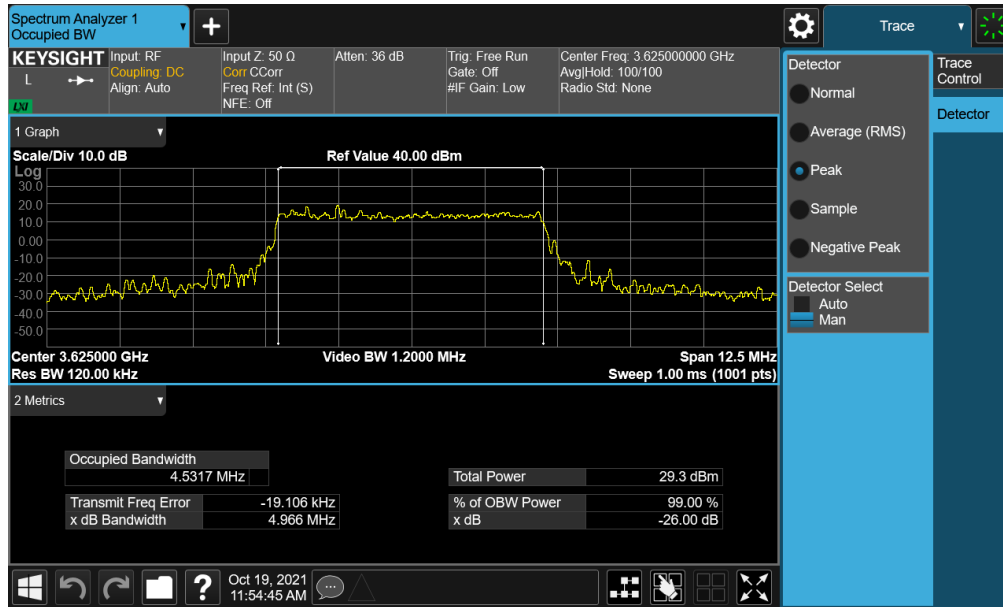


Plot 7-5. Occupied Bandwidth Plot (LTE Band 48 - 10MHz QPSK - Full RB Configuration)



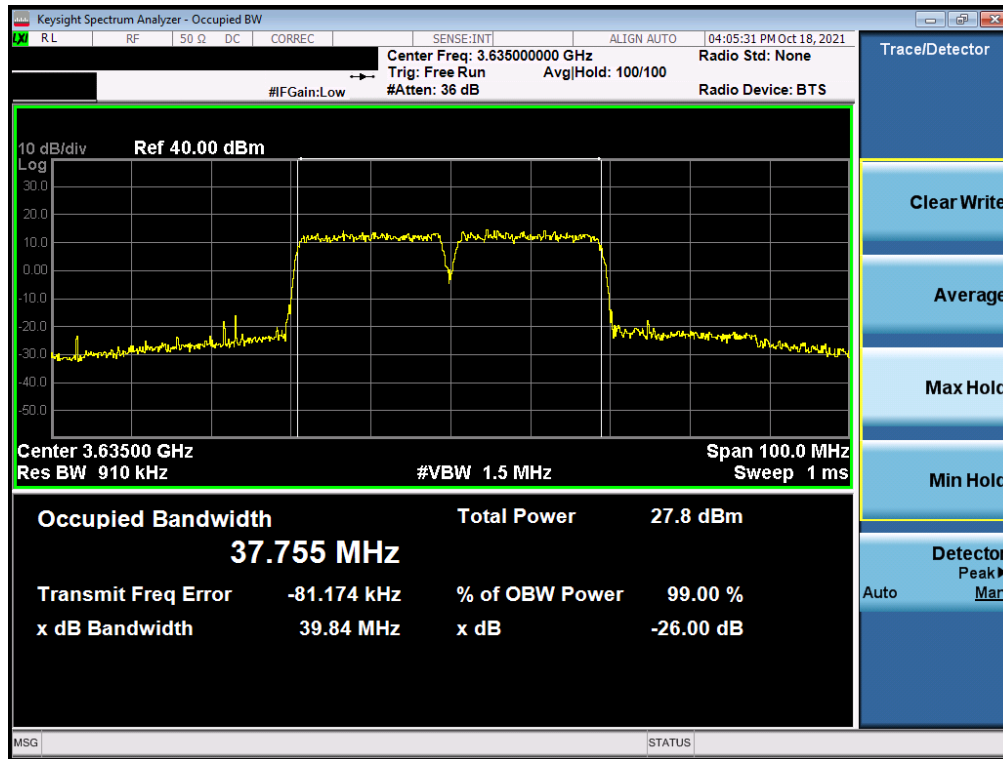
Plot 7-6. Occupied Bandwidth Plot (LTE Band 48 - 10MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 18 of 61

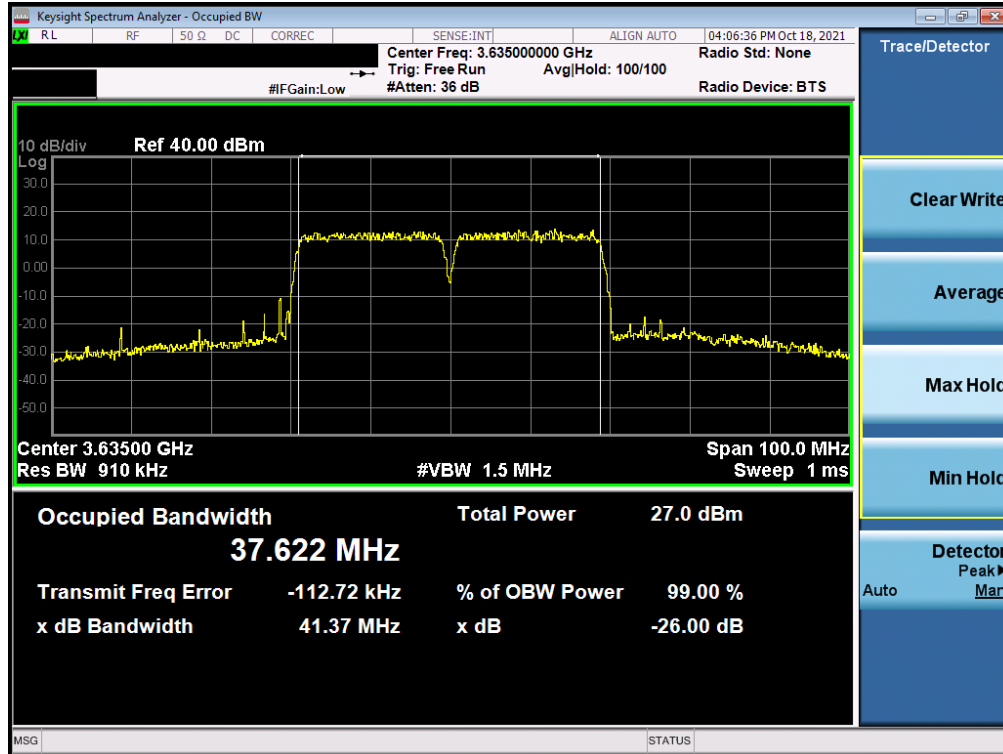


FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 19 of 61

ULCA LTE Band 48

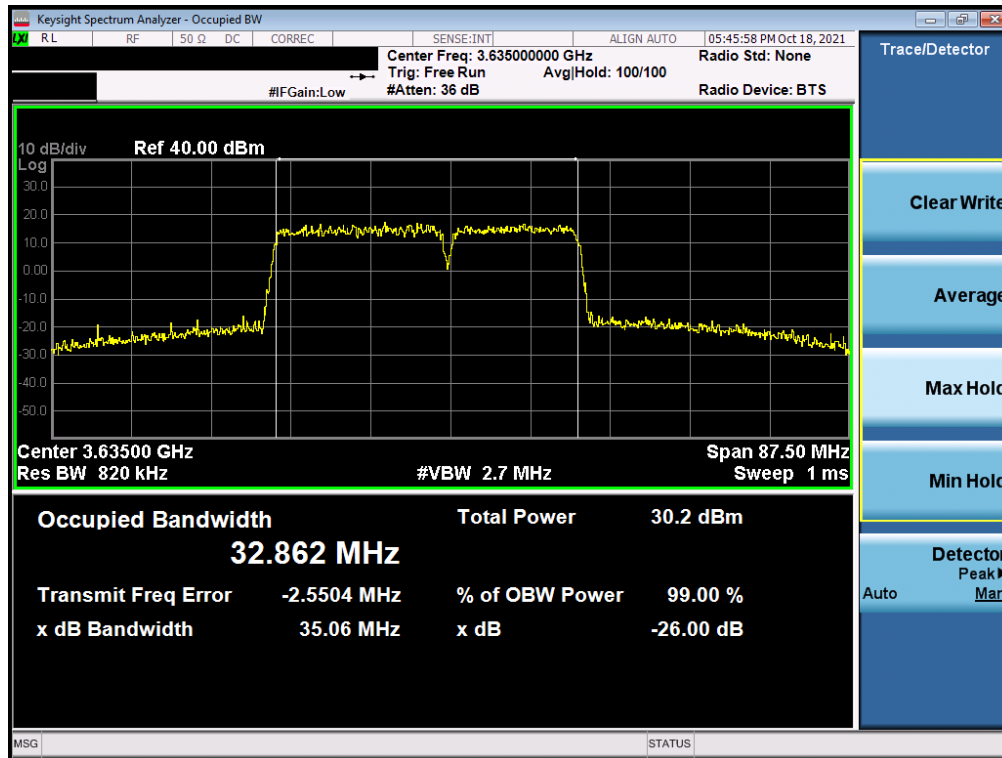


Plot 7-9. Occupied Bandwidth Plot (ULCA LB48 - 20+20MHz QPSK - Full RB Configuration)

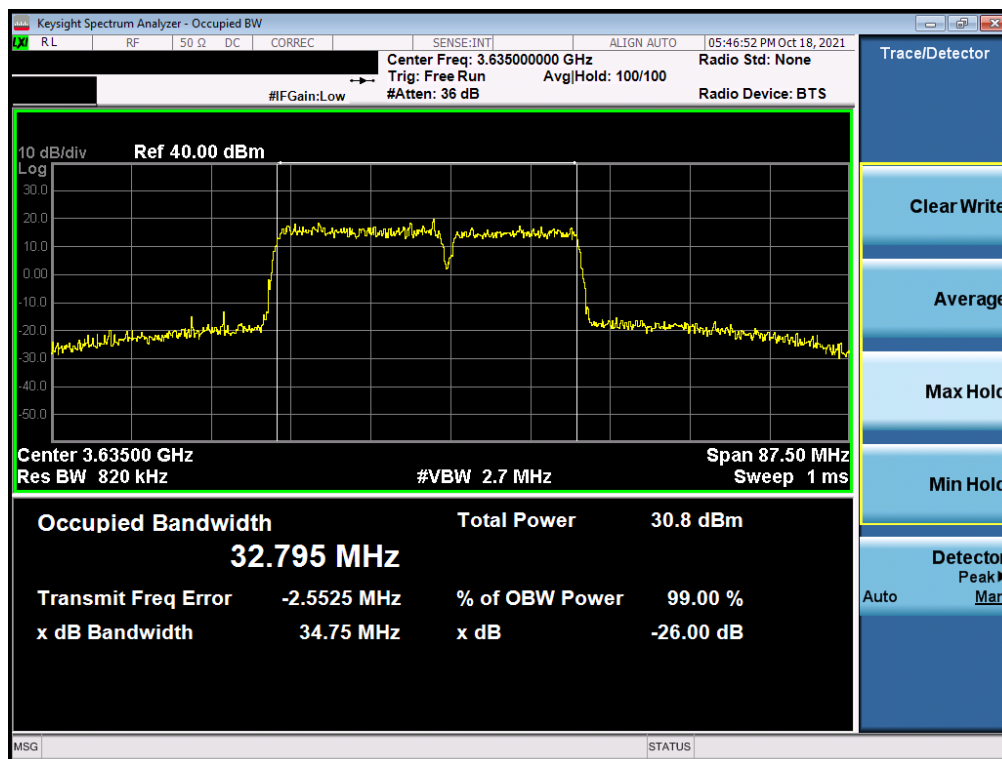


Plot 7-10. Occupied Bandwidth Plot (ULCA LB48 - 20+20MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 20 of 61

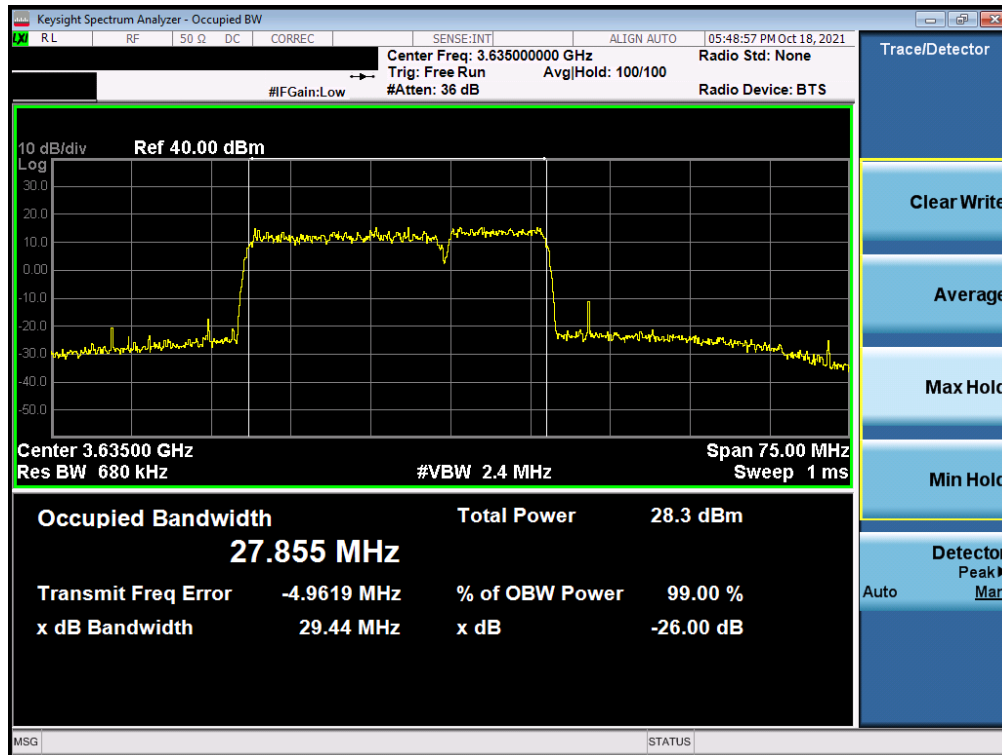


Plot 7-11. Occupied Bandwidth Plot (ULCA LB48 - 20+15MHz QPSK - Full RB Configuration)

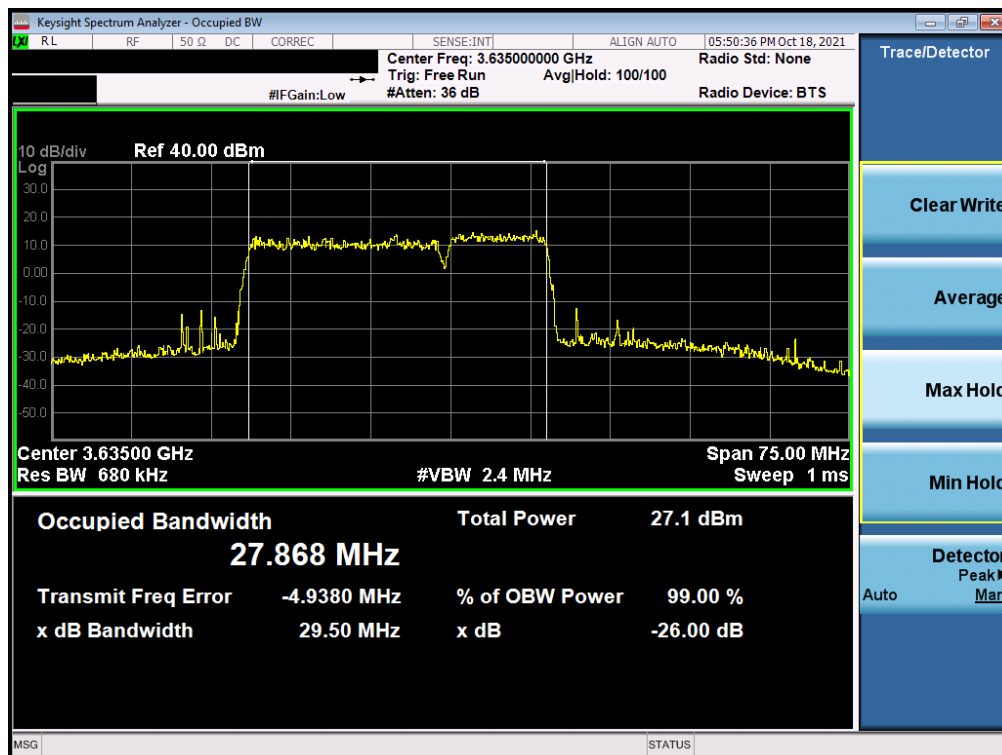


Plot 7-12. Occupied Bandwidth Plot (ULCA LB48 - 20+15MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 21 of 61

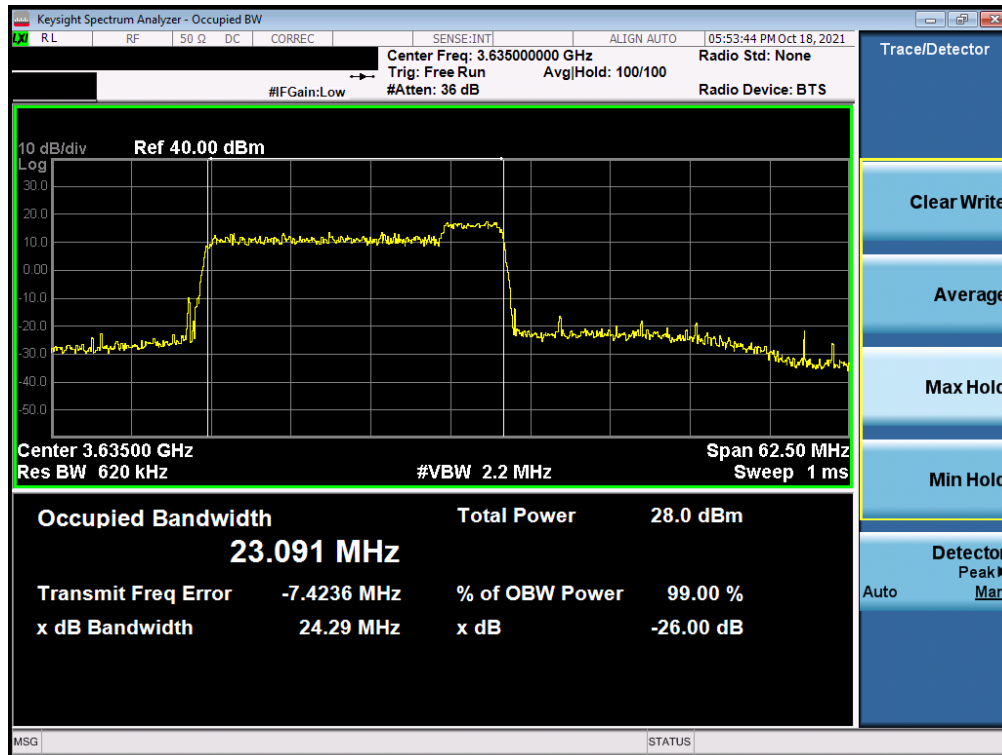


Plot 7-13. Occupied Bandwidth Plot (ULCA LB48 - 20+10MHz QPSK - Full RB Configuration)

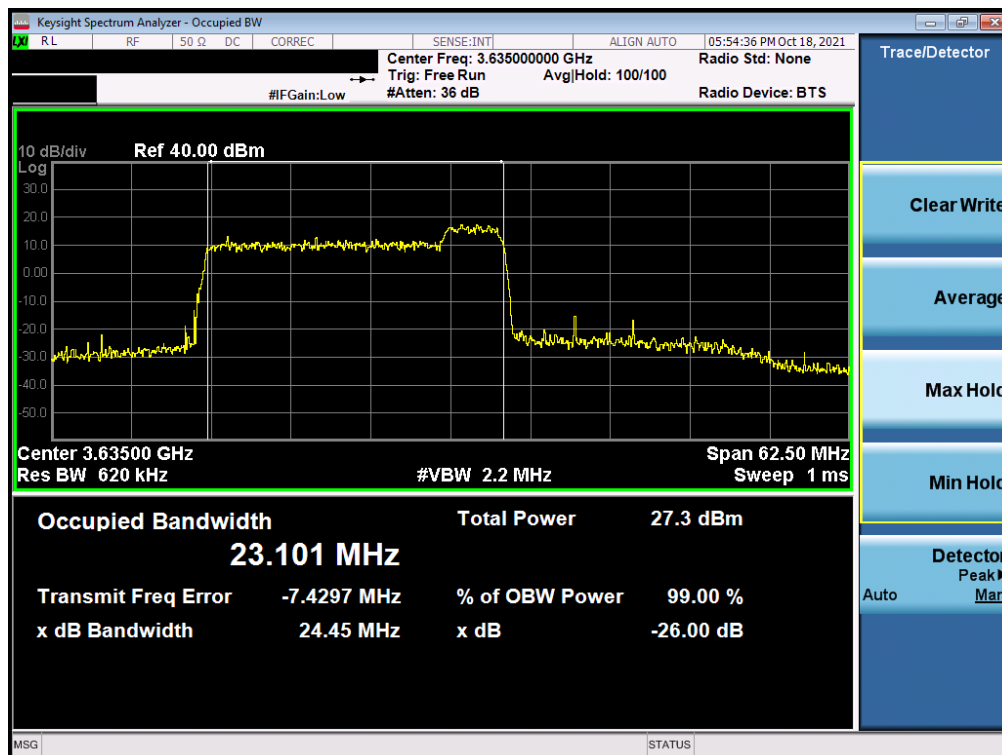


Plot 7-14. Occupied Bandwidth Plot (ULCA LB48 - 20+10MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-15. Occupied Bandwidth Plot (ULCA LB48 - 20+5MHz QPSK - Full RB Configuration)



Plot 7-16. Occupied Bandwidth Plot (ULCA LB48 - 20+5MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset	Page 23 of 61

7.4 Spurious and Harmonic Emissions at Antenna Terminal

§2.1051 §96.41(e)

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 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 conducted power of any emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/Mhz.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

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

Test Setup

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

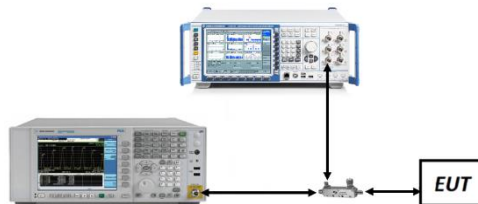


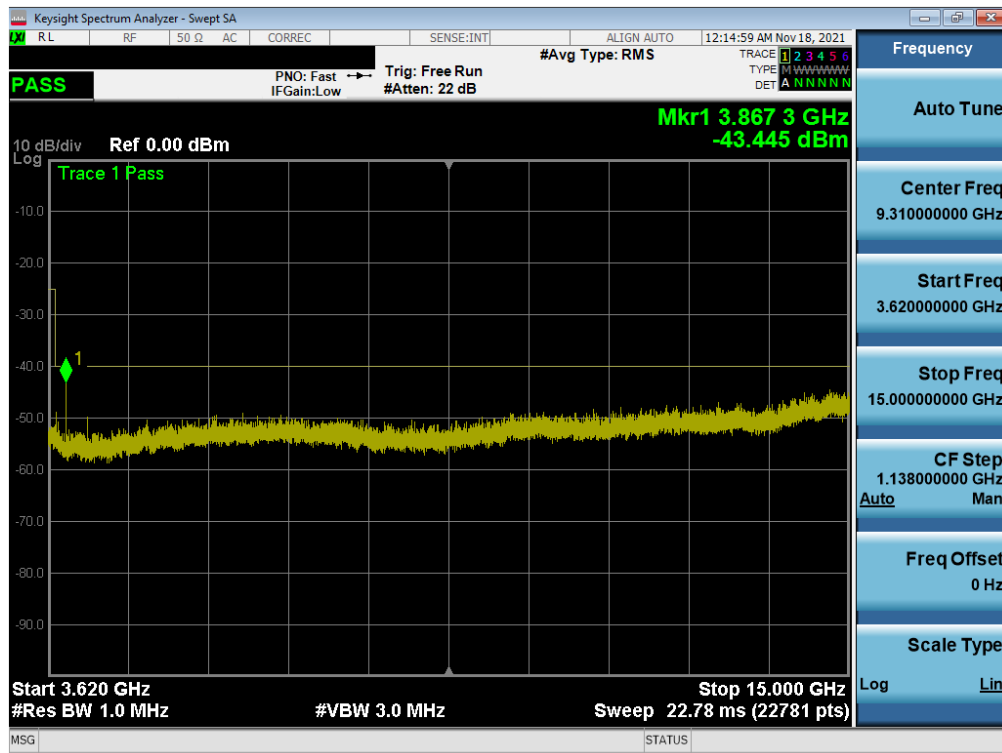
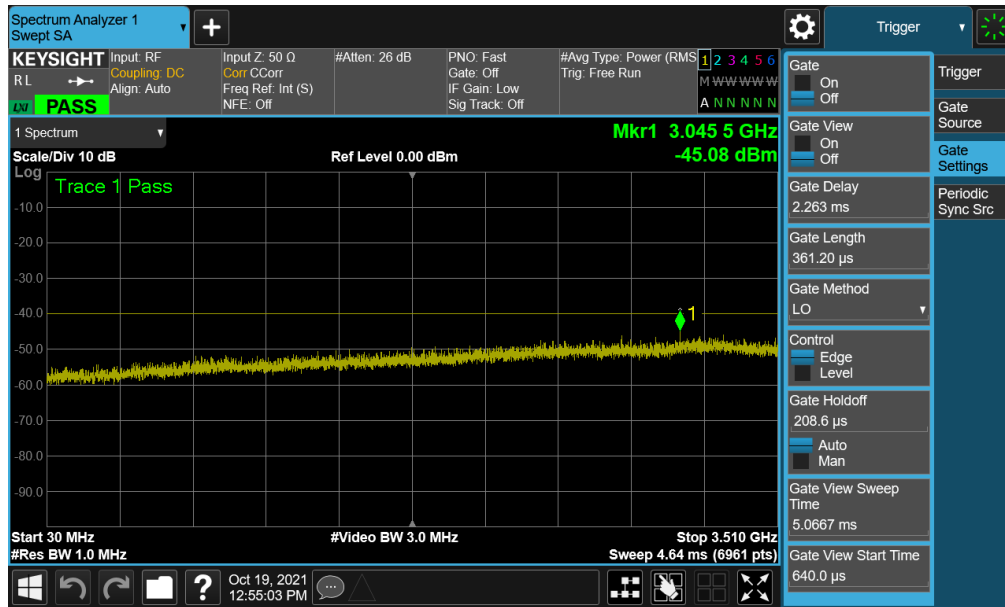
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

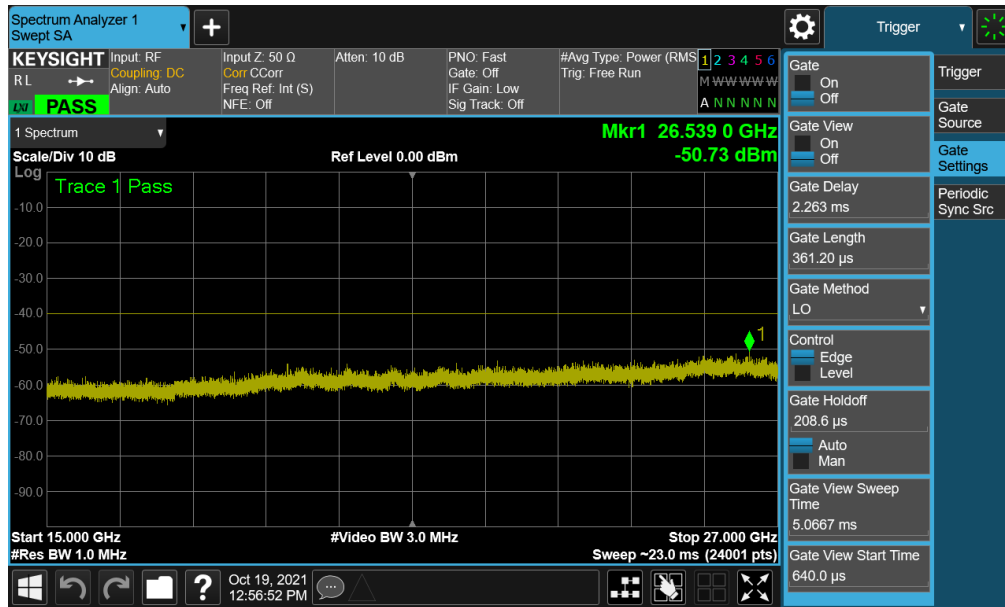
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset
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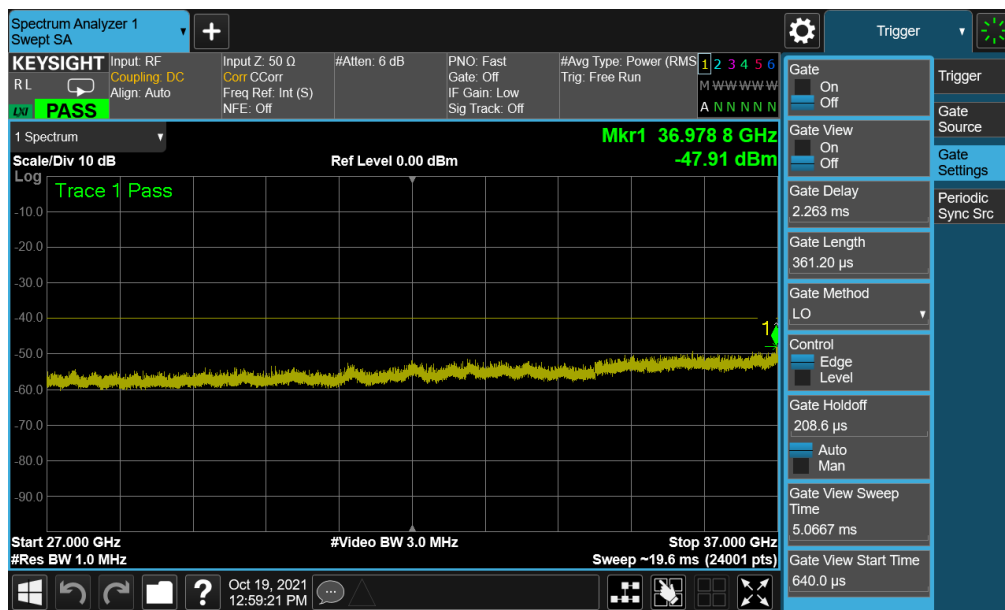
LTE Band 48



FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 25 of 61

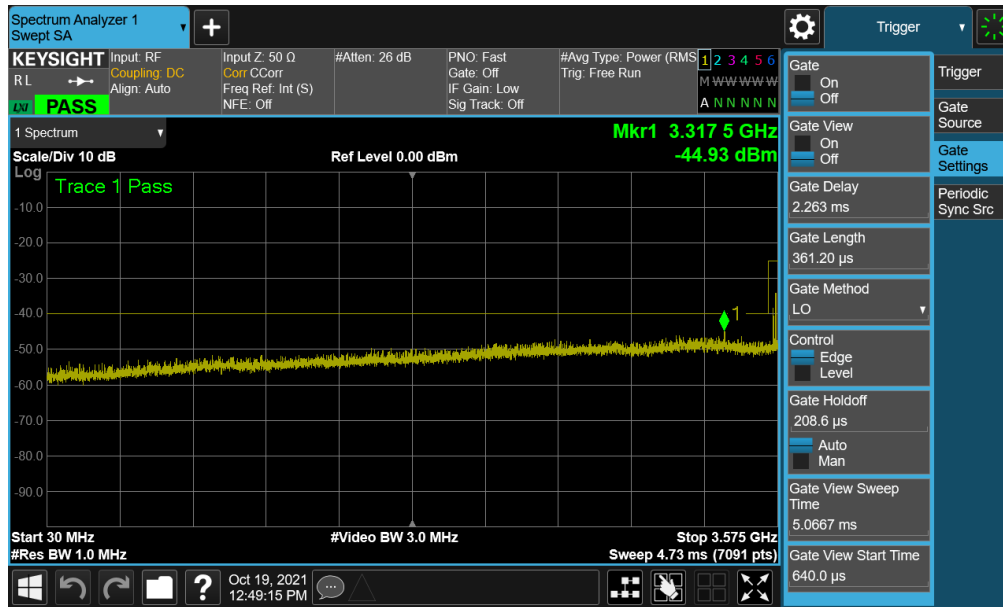


Plot 7-19. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

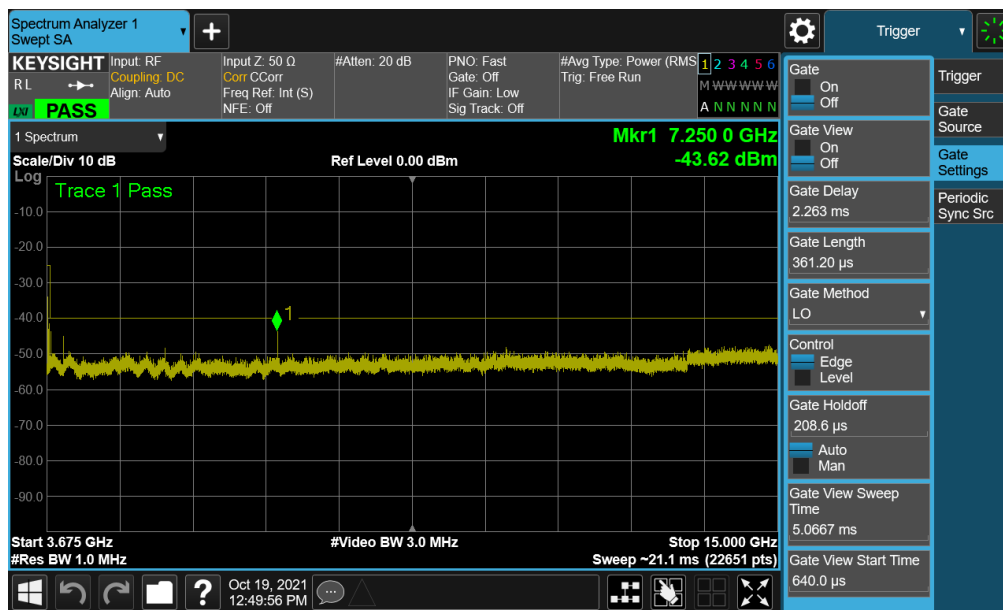


Plot 7-20. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 26 of 61

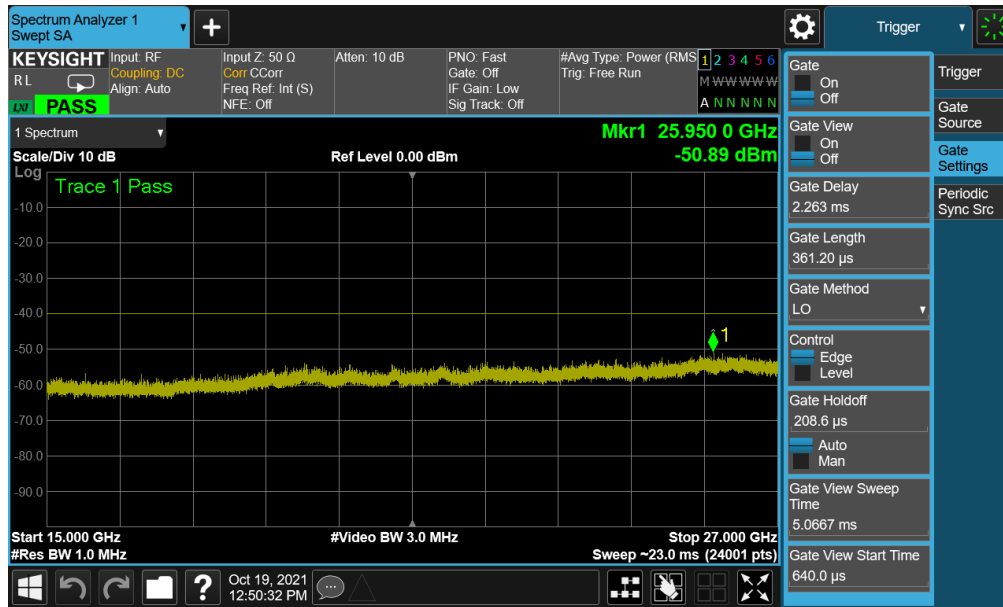


Plot 7-21. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

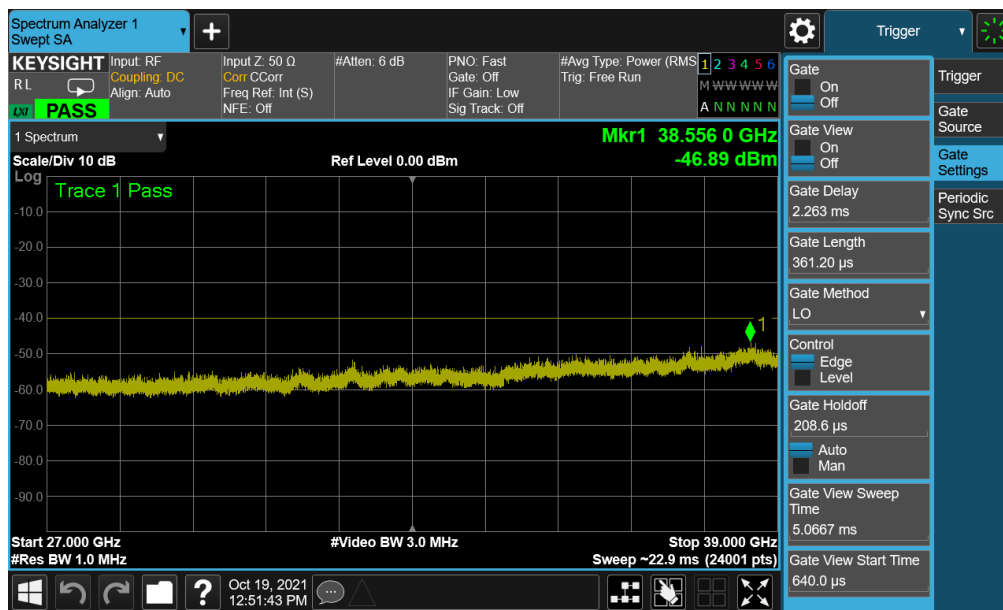


Plot 7-22. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 27 of 61

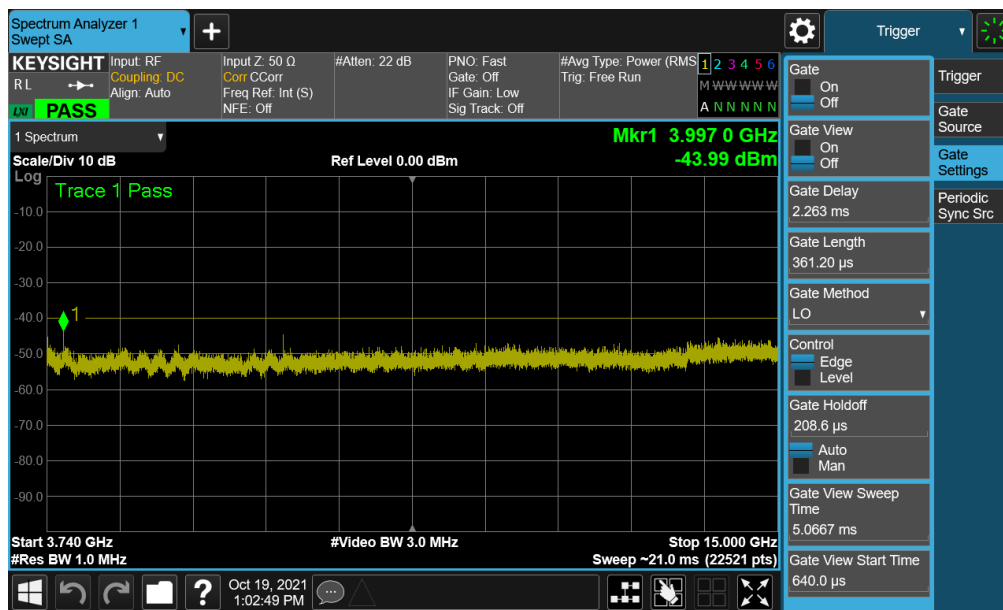
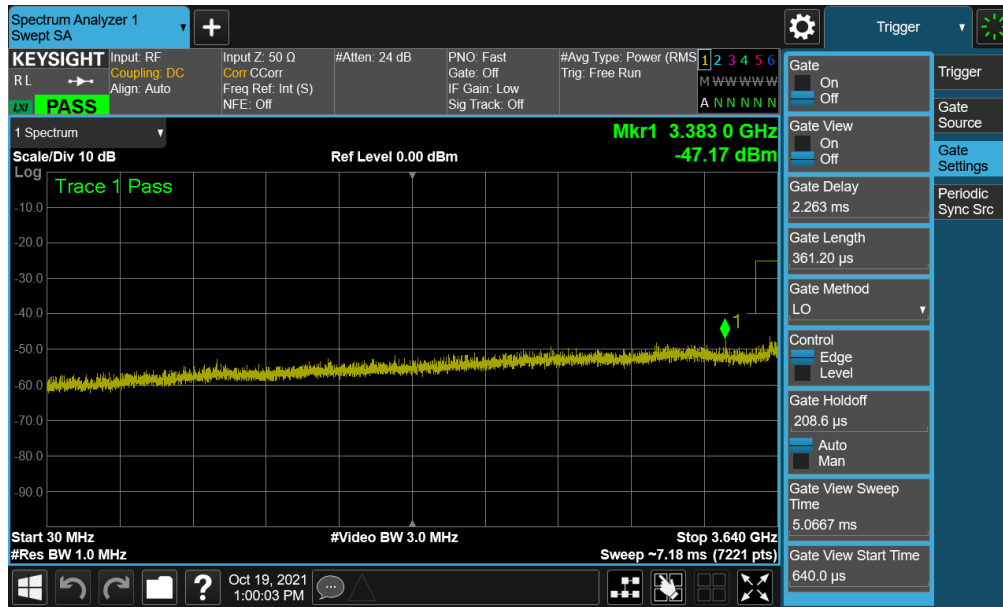


Plot 7-23. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

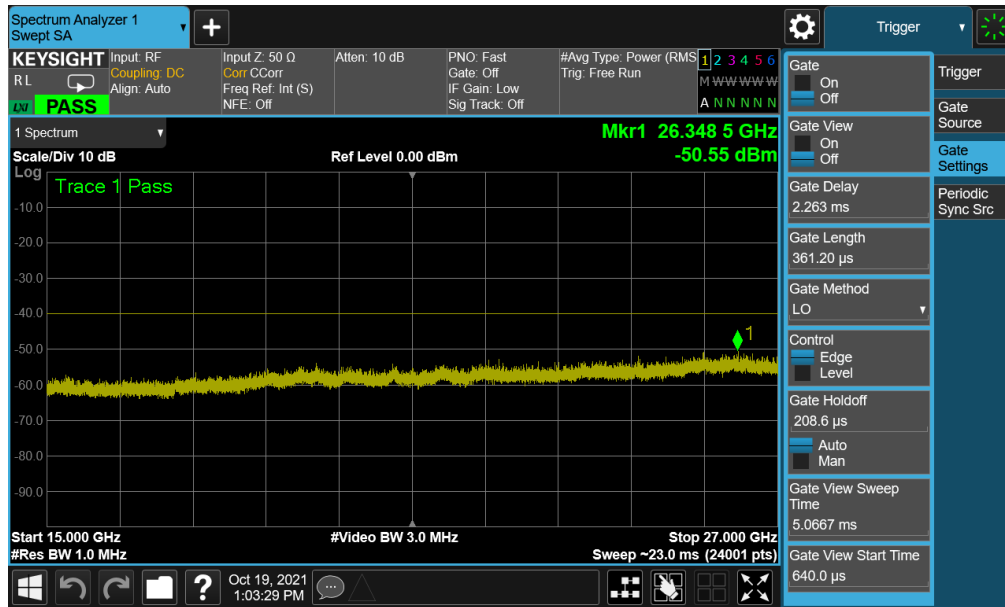


Plot 7-24. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

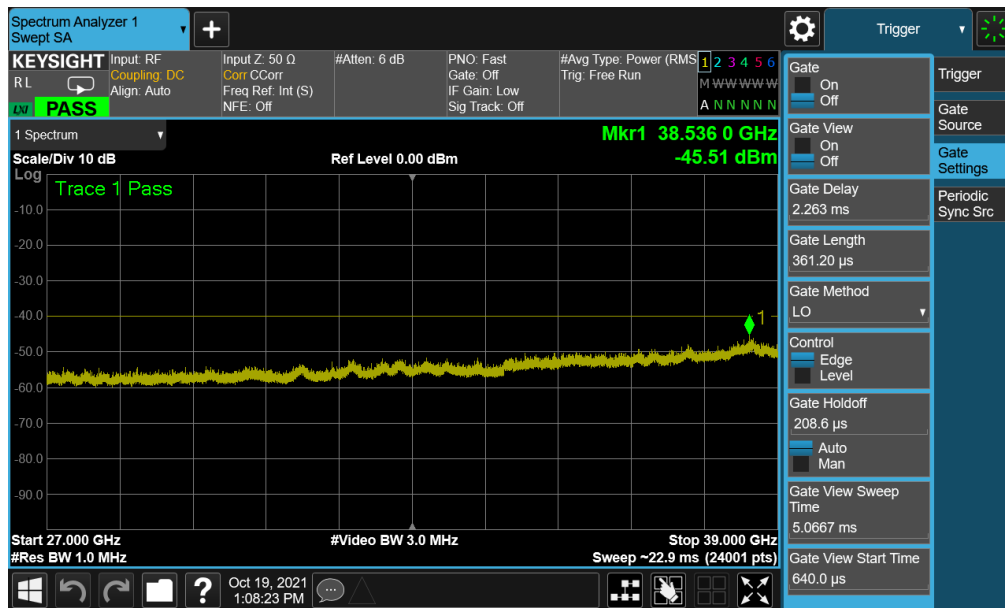
FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 28 of 61



FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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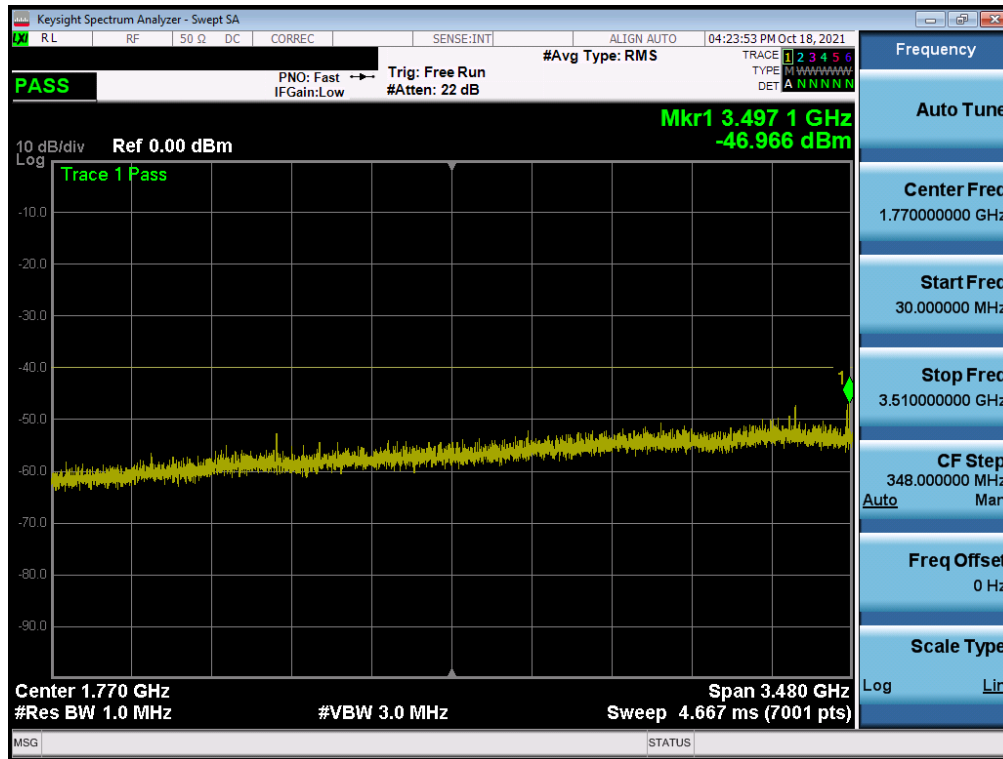
Plot 7-27. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - High Channel)



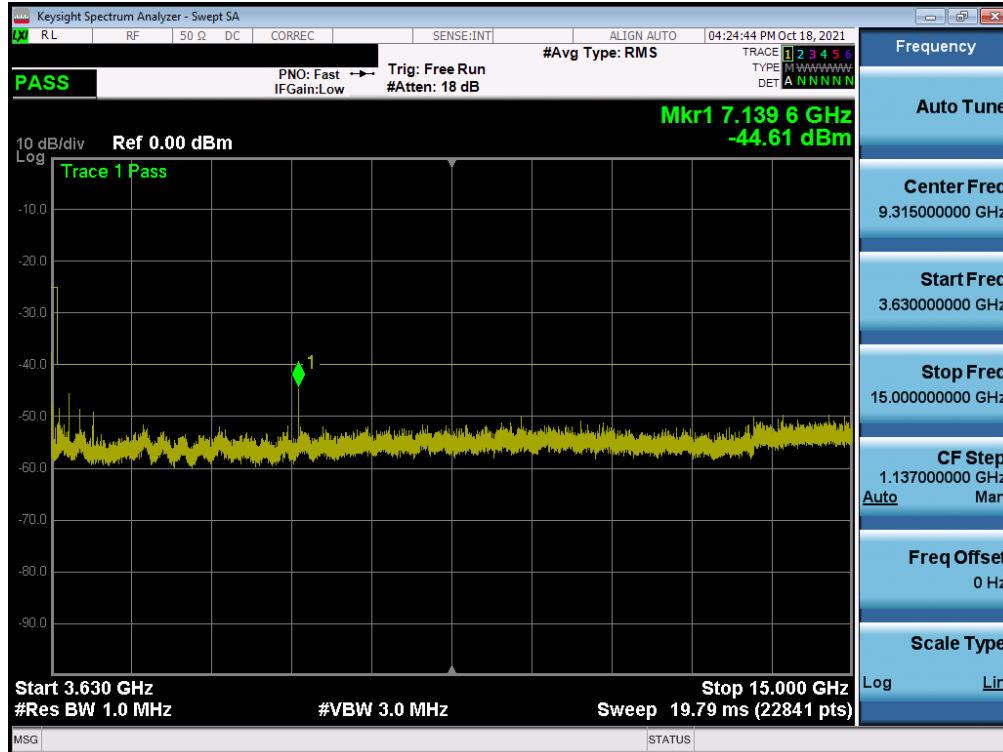
Plot 7-28. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - High Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 30 of 61

ULCA LB48

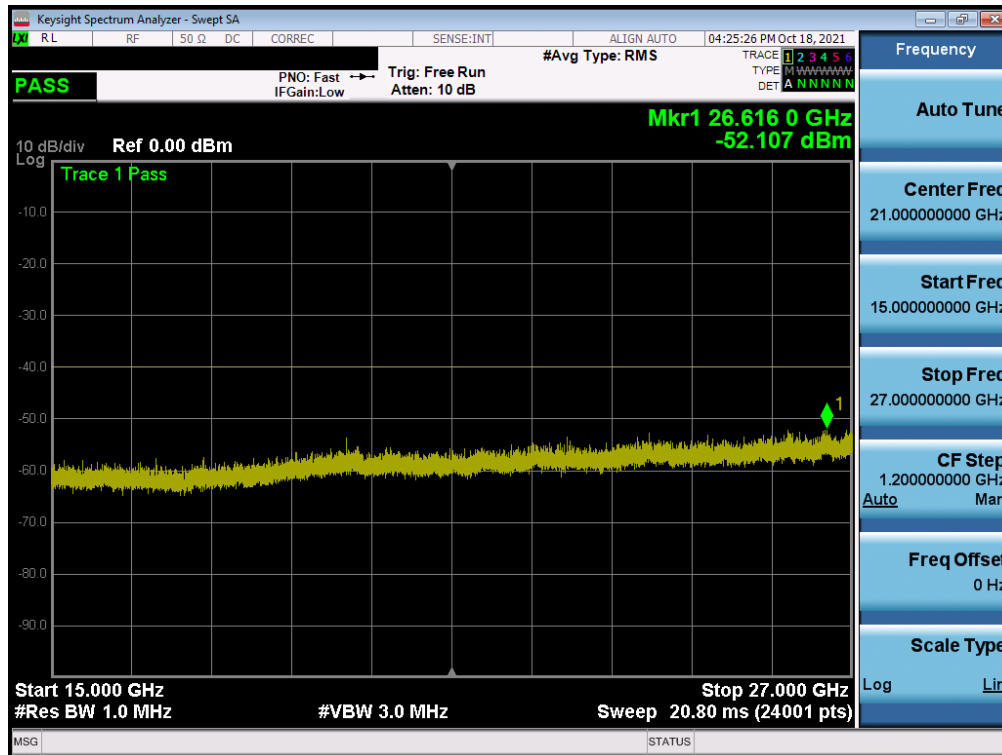


Plot 7-29. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Low Channel)

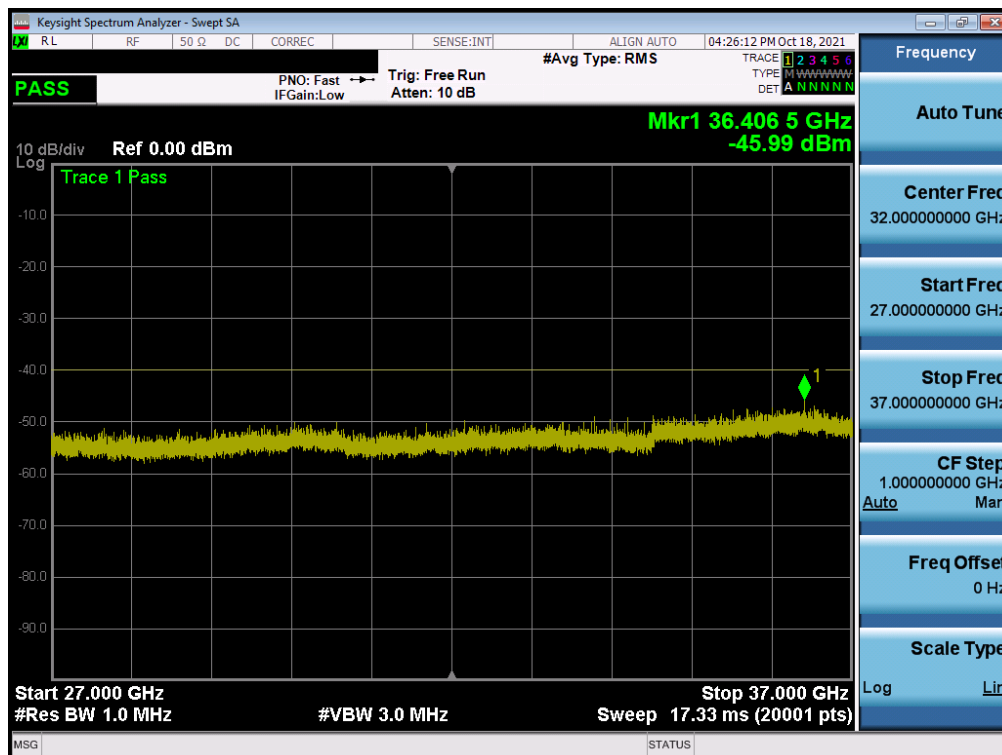


Plot 7-30. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Low Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 31 of 61

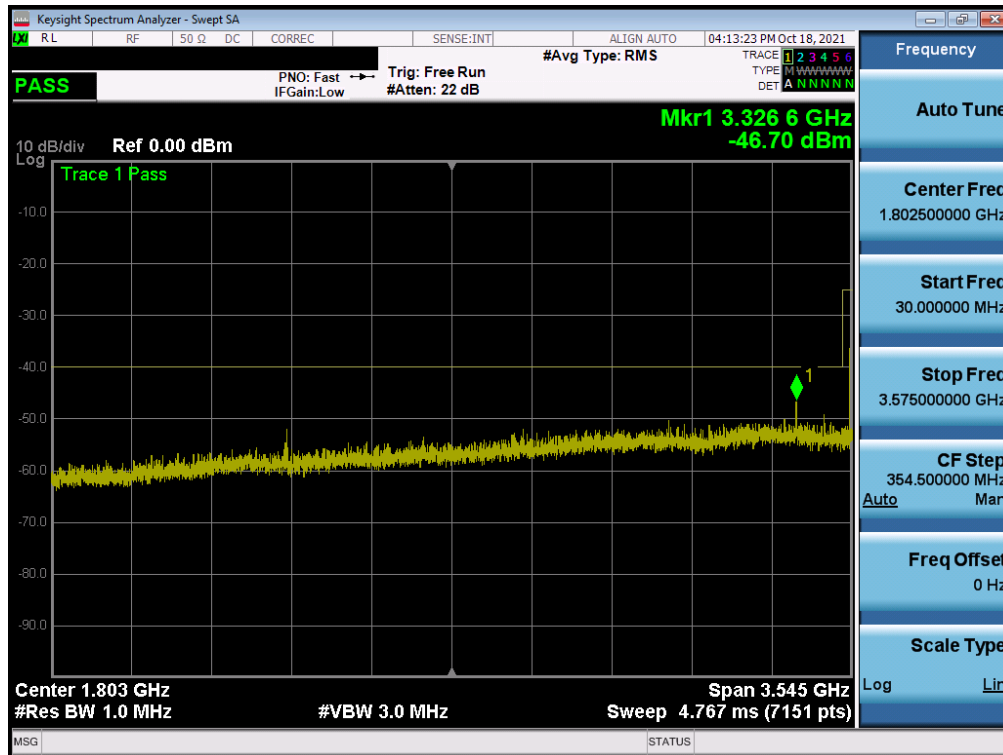


Plot 7-31. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Low Channel)

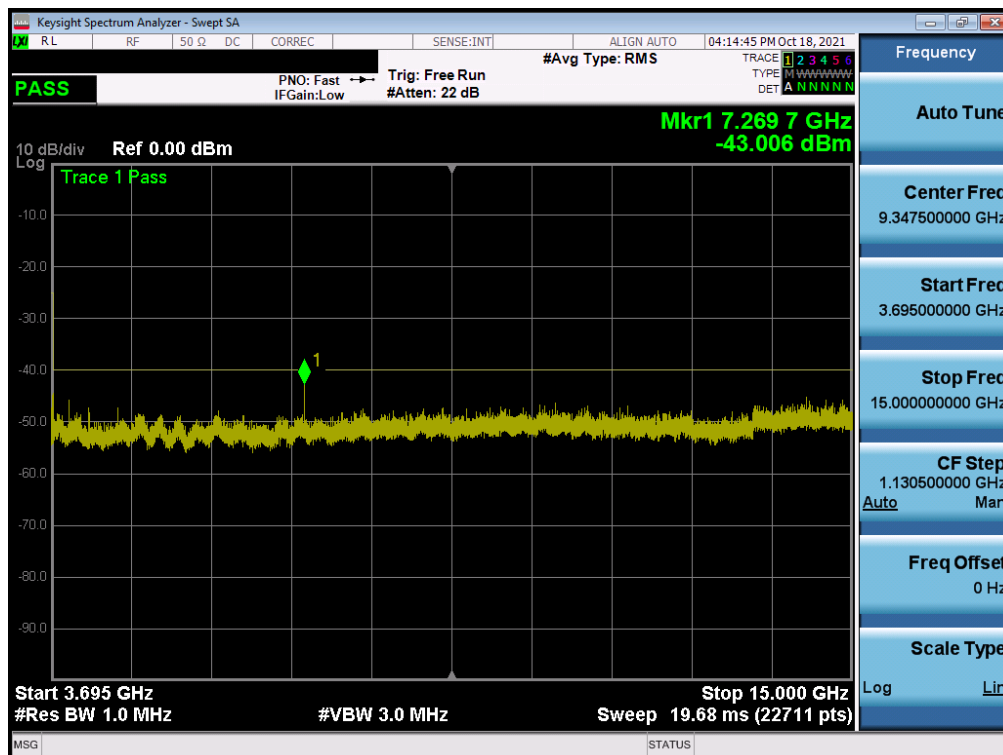


Plot 7-32. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Low Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 32 of 61

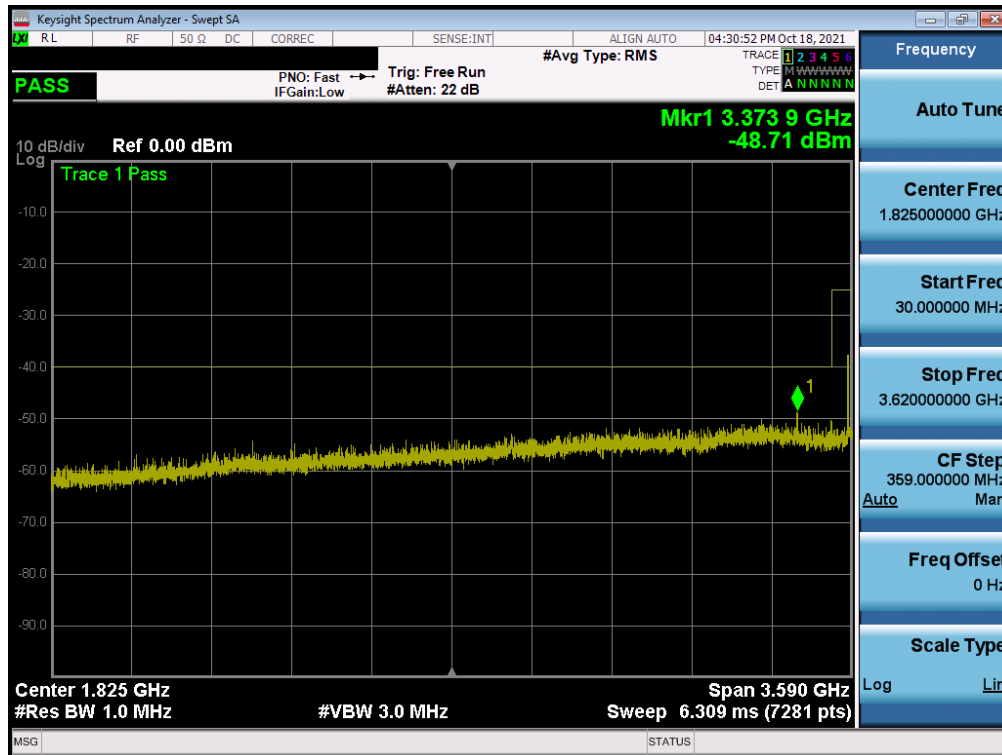


Plot 7-33. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Mid Channel)

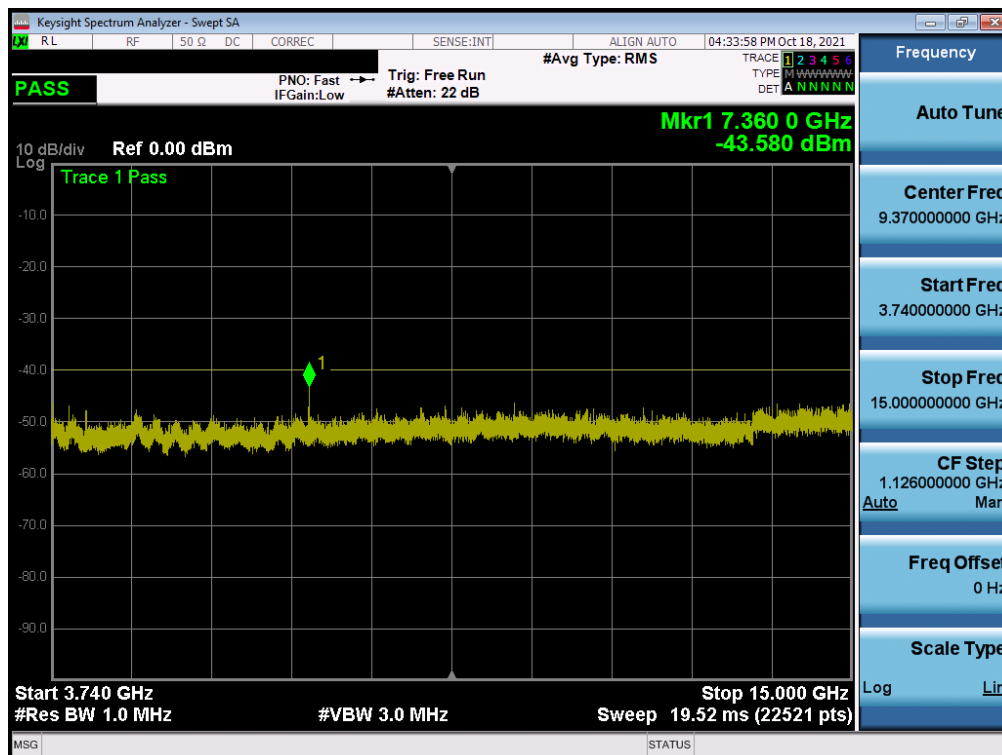


Plot 7-34. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - Mid Channel)

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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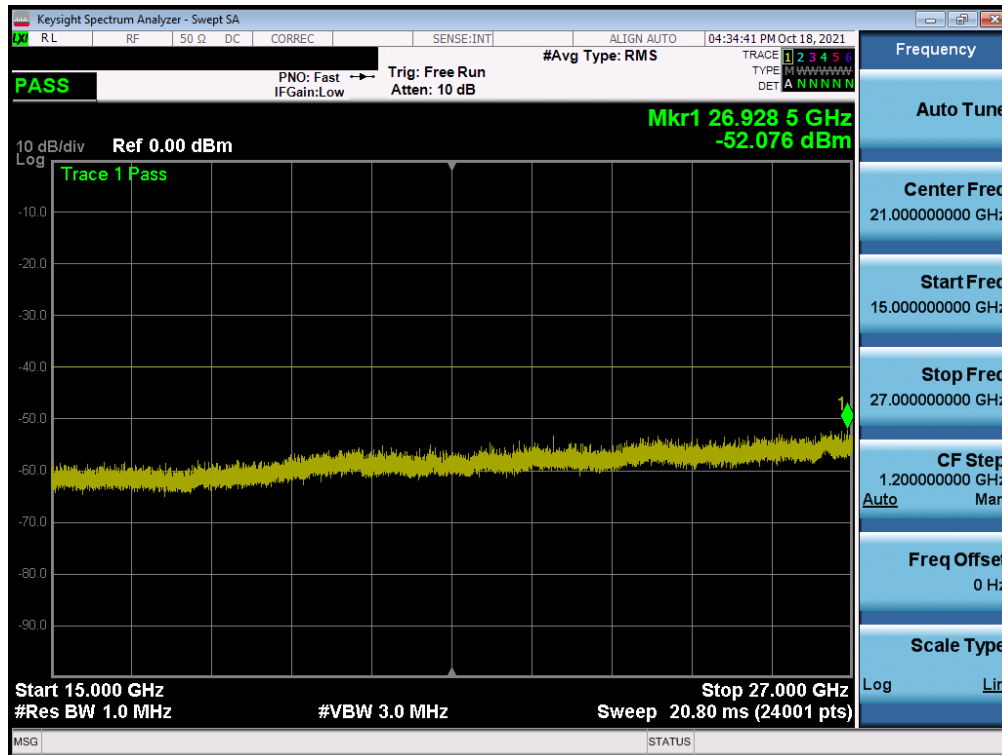


Plot 7-37. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)

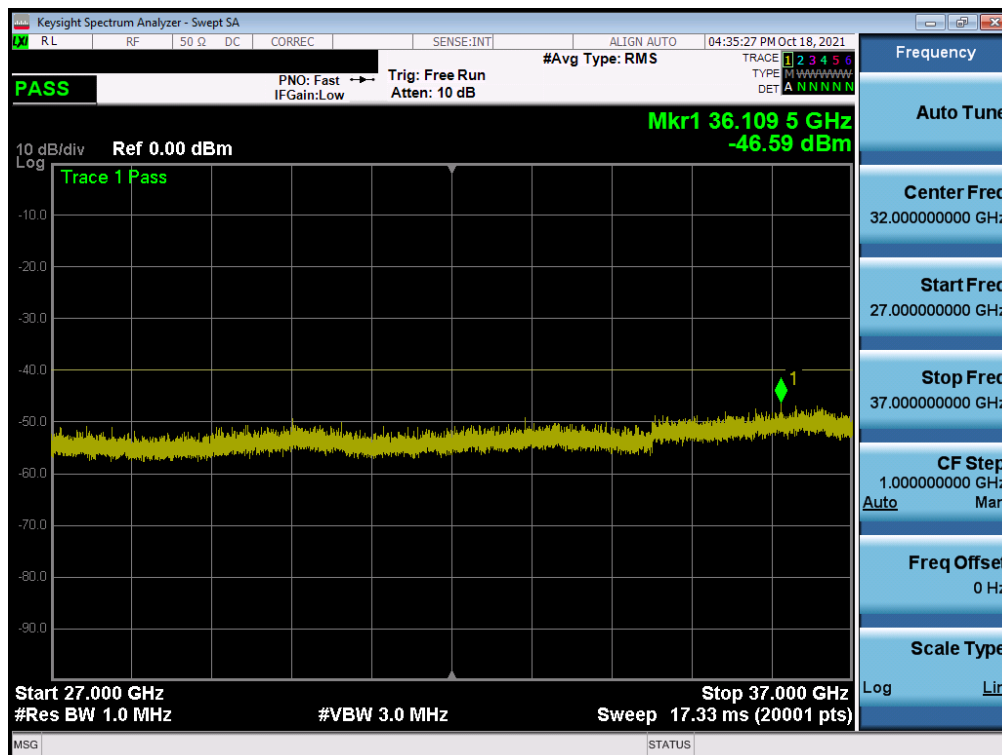


Plot 7-38. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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Plot 7-39. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)



Plot 7-40. Conducted Spurious Plot (ULCA LB48 - 20+20MHz QPSK - High Channel)

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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7.5 Band Edge Emissions at Antenna Terminal

§2.1051 §96.41(e)(ii)

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 conducted power of any emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0 to B MHz (where B is the bandwidth in MHz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0 to B MHz below the lower CBSD-assigned channel edge. At all frequencies greater than B MHz above the upper CBSD assigned channel edge and less than B MHz below the lower CBSD-assigned channel edge, the conducted power of any end user device emission shall not exceed -25 dBm/MHz. The conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

Test Settings

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

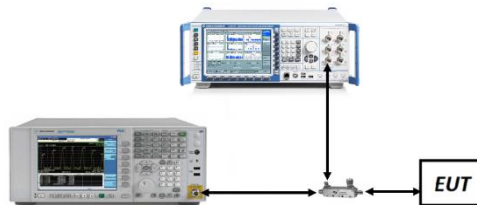
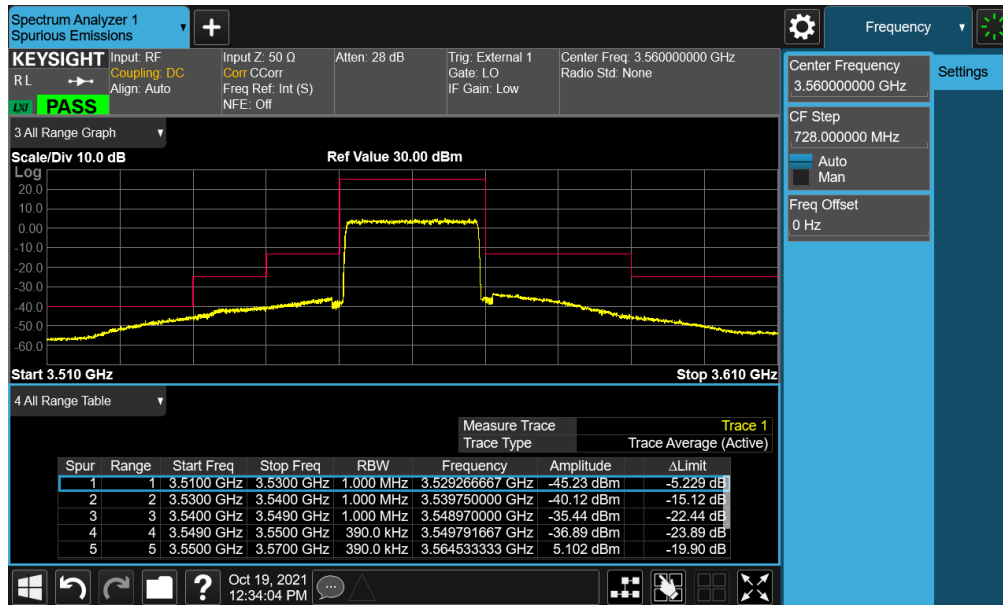


Figure 7-4. Test Instrument & Measurement Setup

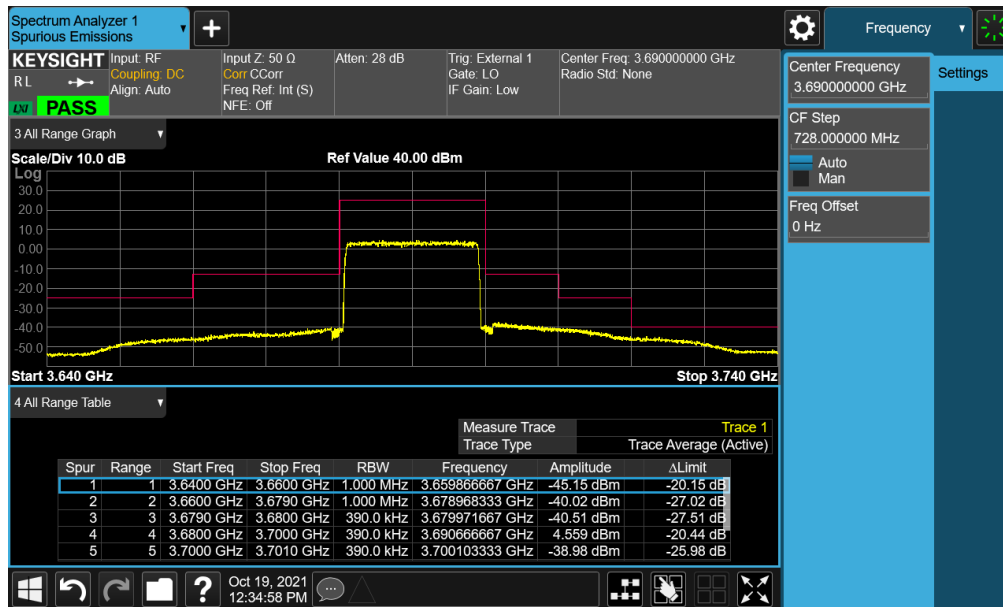
Test Notes

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
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LTE Band 48

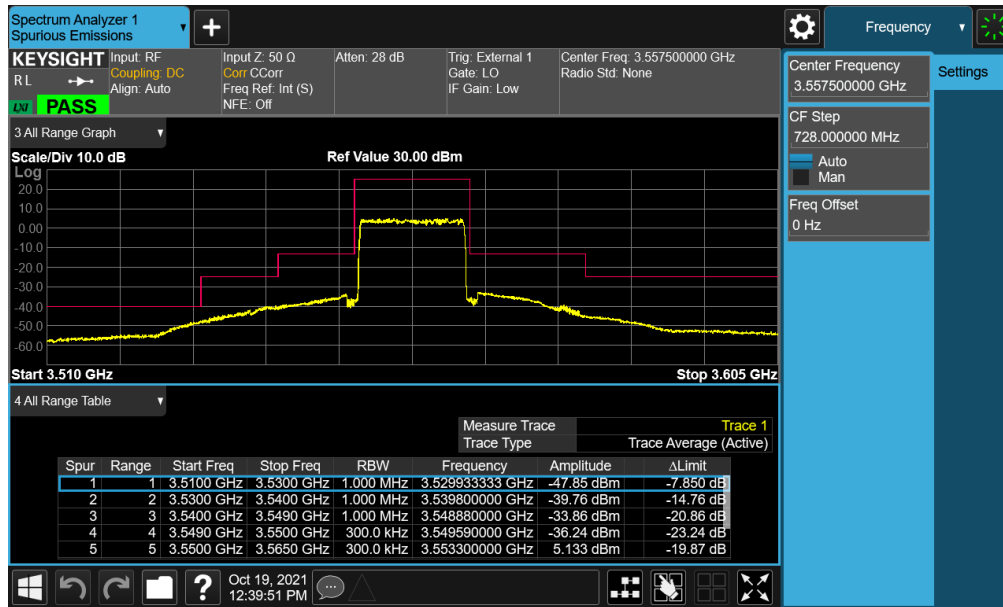


Plot 7-41. Channel Edge Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

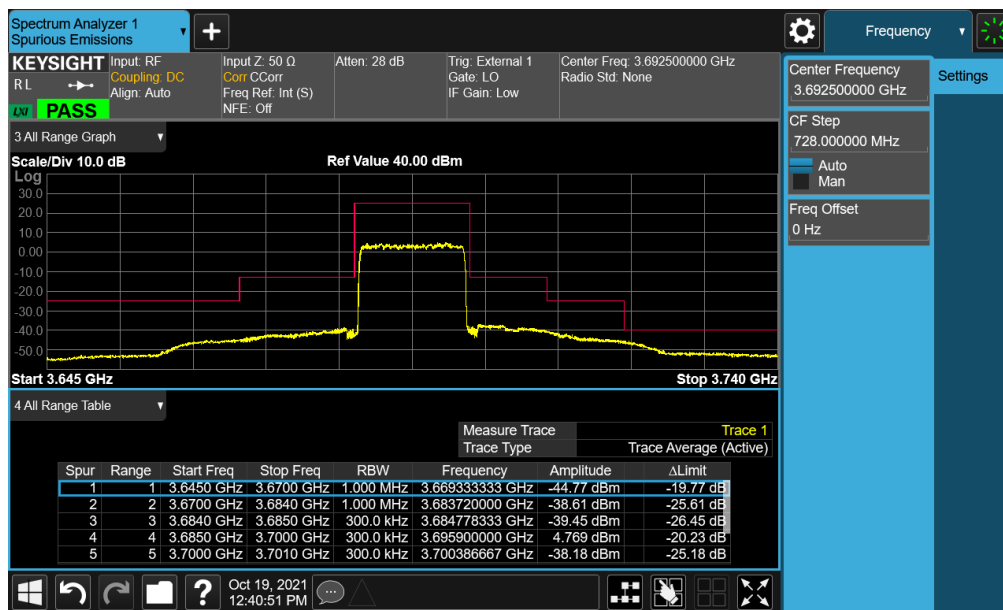


Plot 7-42. Channel Edge Plot (LTE Band 48 - 20MHz QPSK - High Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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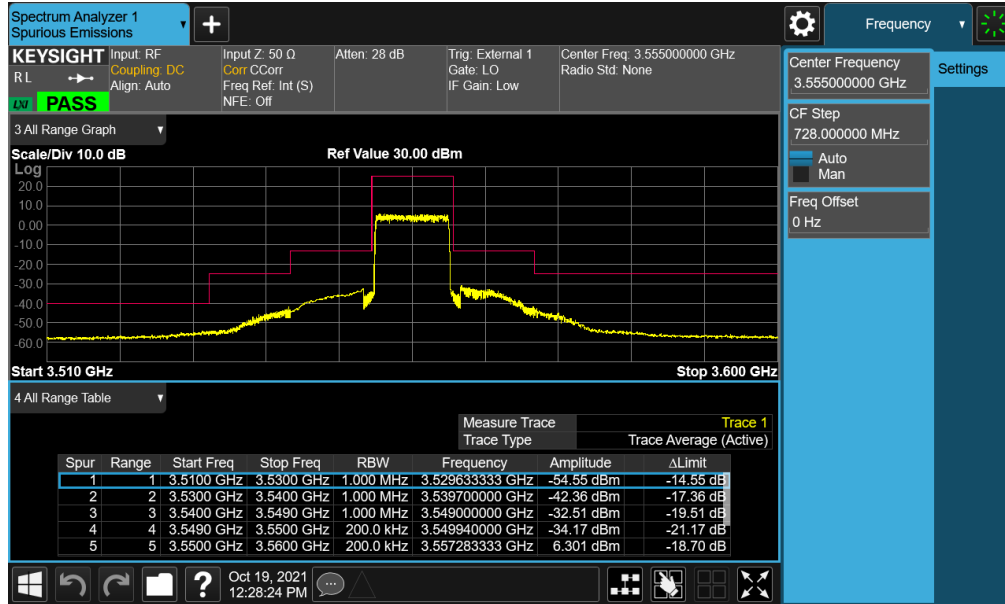


Plot 7-43. Channel Edge Plot (LTE Band 48 - 15MHz QPSK - Low Channel)

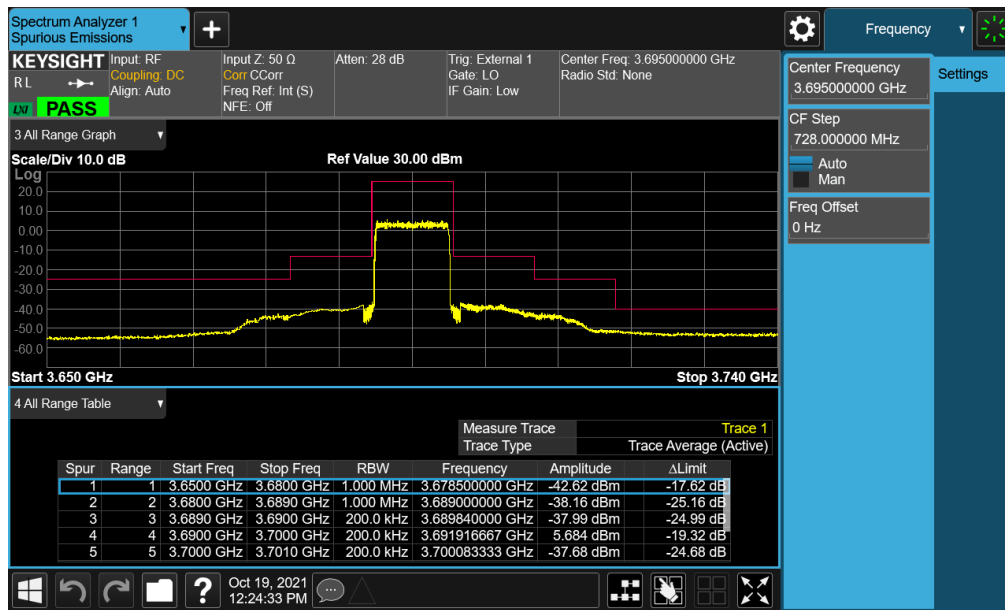


Plot 7-44. Channel Edge Plot (LTE Band 48 - 15MHz QPSK - High Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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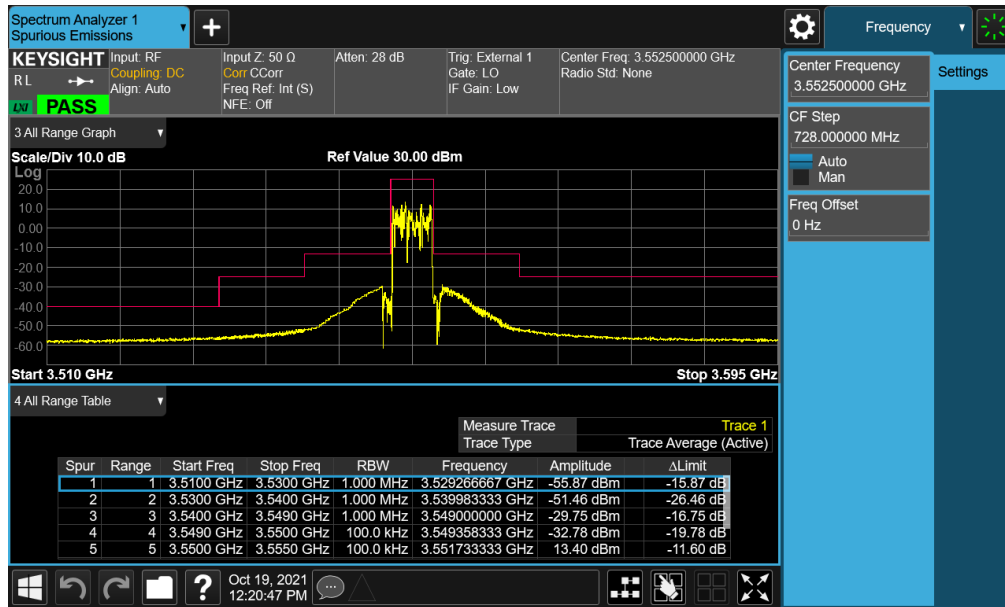


Plot 7-45. Channel Edge Plot (LTE Band 48 - 10MHz QPSK - Low Channel)

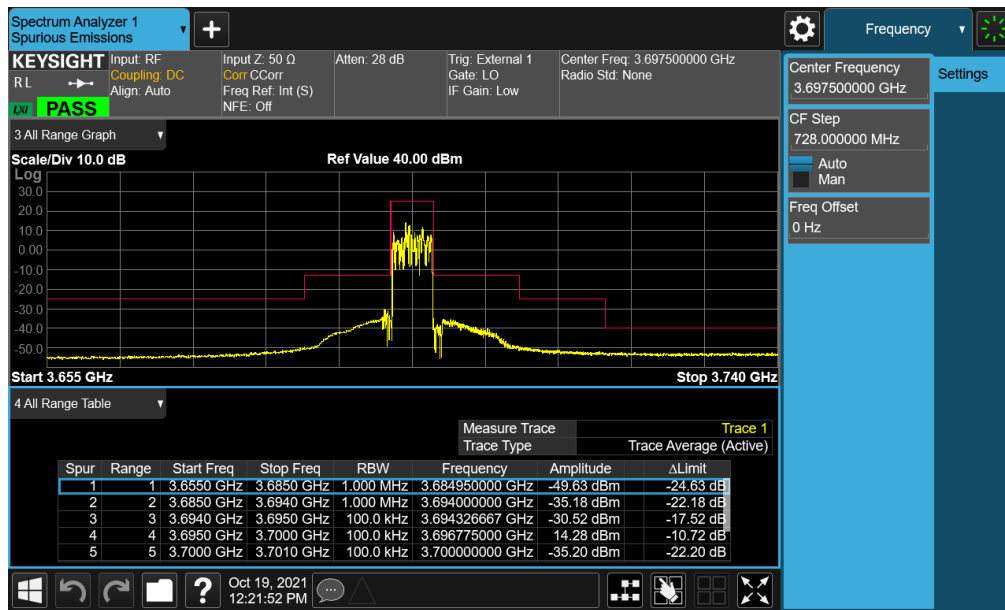


Plot 7-46. Channel Edge Plot (LTE Band 48 - 10MHz QPSK - High Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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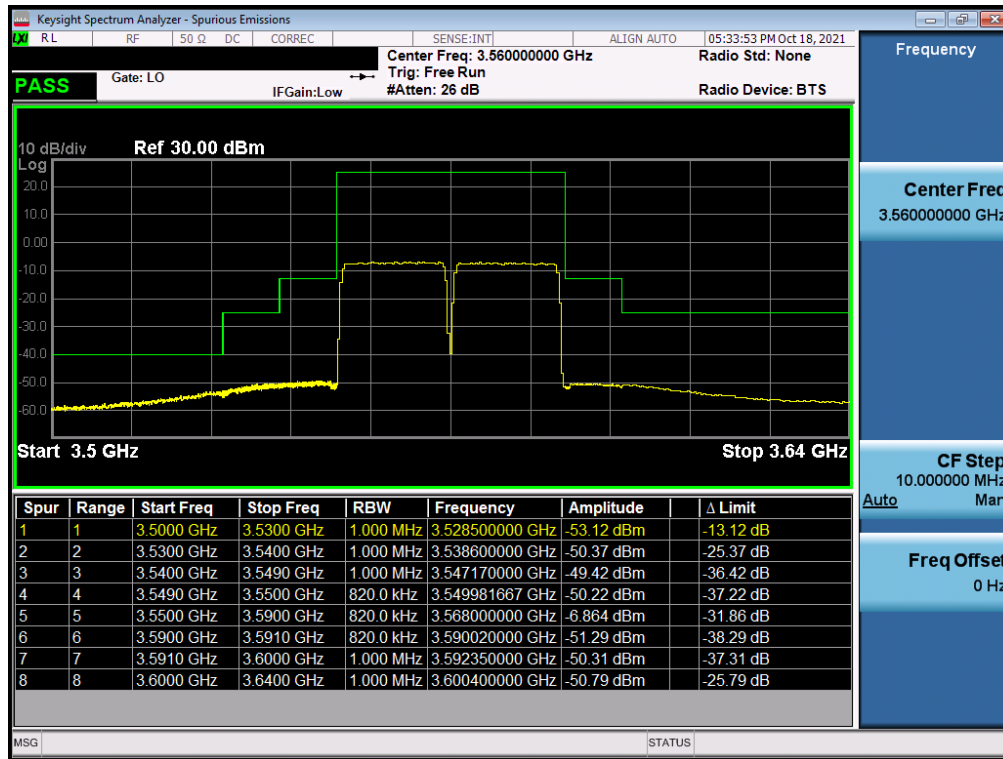
Plot 7-47. Channel Edge Plot (LTE Band 48 - 5MHz QPSK - Low Channel)



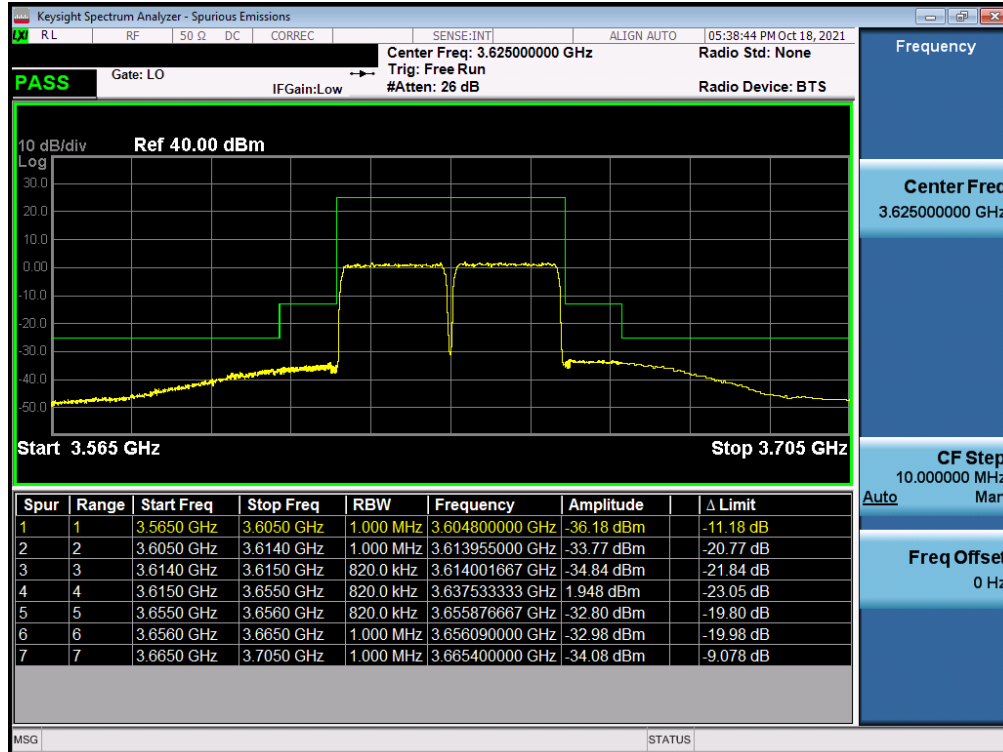
Plot 7-48. Channel Edge Plot (LTE Band 48 - 5MHz QPSK - High Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 41 of 61

ULCA LB48

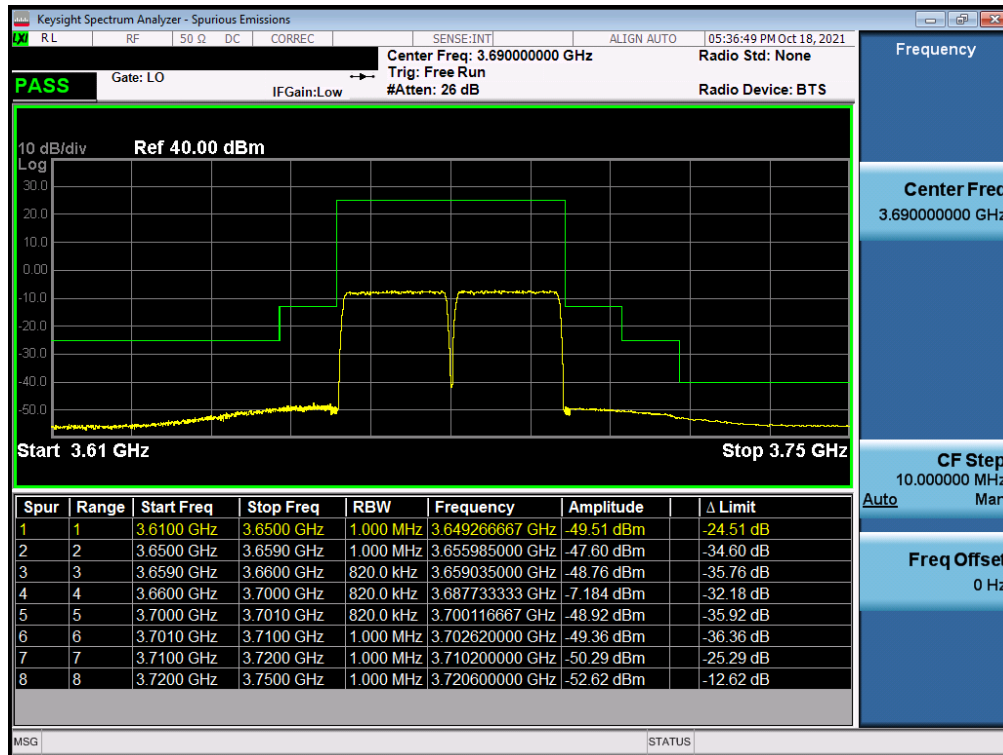


Plot 7-49. Channel Edge Plot (LTE Band 48 – 20+20MHz QPSK - Low Channel)



Plot 7-50. Channel Edge Plot (LTE Band 48 – 20+20MHz QPSK - Mid Channel)

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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Plot 7-51. Channel Edge Plot (LTE Band 48 – 20+20MHz QPSK - High Channel)

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Test Report S/N: 1M2109090102-08.A3L	Test Dates: 09/20 - 11/18/2021	EUT Type: Portable Handset		Page 43 of 61

7.6 Radiated Power (EIRP)

§96.41(b)

Test Overview

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 above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW $\geq 3 \times$ RBW
4. Span = 1.5 times the OBW
5. No. of sweep points $\geq 2 \times$ 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 set equal to 10MHz.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
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Test Setup

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

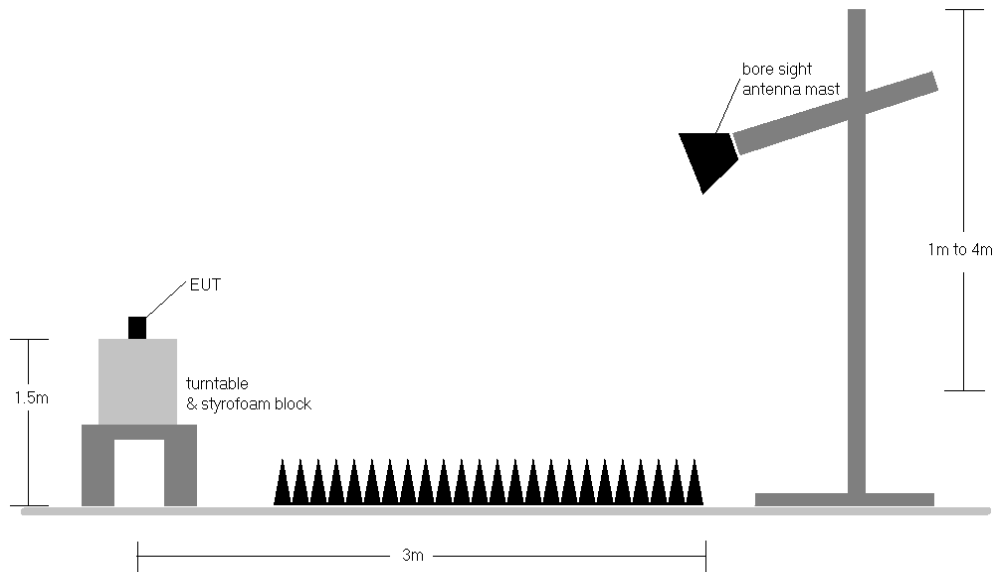


Figure 7-5. Radiated Test Setup >1GHz

Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) The worst case EIRP shown in this section is found with LTE operating only using 1RB. As such, the EIRP/10MHz and full channel EIRP values will be identical since 1RB is fully contained within all available channel bandwidths for LTE Band 48 (i.e. 5, 10, 15, 20MHz).

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Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
20 MHz	QPSK	3560.0	V	112	274	7.15	1 / 0	13.92	21.07	0.128	23.00	-1.93
	QPSK	3625.0	V	128	276	6.91	1 / 0	13.34	20.25	0.106	23.00	-2.75
	QPSK	3690.0	V	100	260	6.60	1 / 0	12.56	19.16	0.082	23.00	-3.84
	16-QAM	3560.0	V	112	274	7.15	1 / 0	12.88	20.03	0.101	23.00	-2.97
15 MHz	QPSK	3557.5	V	112	274	7.15	1 / 37	13.77	20.92	0.124	23.00	-2.08
	QPSK	3625.0	V	128	276	6.91	1 / 37	13.30	20.22	0.105	23.00	-2.78
	QPSK	3692.5	V	100	260	6.60	1 / 37	12.46	19.06	0.081	23.00	-3.94
	16-QAM	3557.5	V	112	274	7.15	1 / 37	12.97	20.12	0.103	23.00	-2.88
10 MHz	QPSK	3555.0	V	112	274	7.15	1 / 49	14.03	21.18	0.131	23.00	-1.82
	QPSK	3625.0	V	128	276	6.91	1 / 49	13.37	20.28	0.107	23.00	-2.72
	QPSK	3695.0	V	100	260	6.59	1 / 49	12.75	19.34	0.086	23.00	-3.66
	16-QAM	3555.0	V	112	274	7.15	1 / 49	13.33	20.48	0.112	23.00	-2.52
5 MHz	QPSK	3552.5	V	112	274	7.16	1 / 12	13.91	21.07	0.128	23.00	-1.93
	QPSK	3625.0	V	128	276	6.91	1 / 12	13.16	20.07	0.102	23.00	-2.93
	QPSK	3697.5	V	100	260	6.59	1 / 12	12.42	19.01	0.080	23.00	-3.99
	16-QAM	3552.5	V	112	274	7.16	1 / 12	13.17	20.33	0.108	23.00	-2.67
20 MHz	QPSK (Opposite Pol.)	3560.0	H	100	144	7.37	1/99	12.86	20.23	0.106	23.00	-2.77
	QPSK (WCP)	3560.0	V	112	274	7.15	1/0	12.73	19.88	0.097	23.00	-3.12

Table 7-4. EIRP Data (LTE Band 48)

Bandwidth	Modulation	PCC			SCC			Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degrees]	Ant. Gain [dBi]	Substitute Level [dBm]	EIRP [dBm/10MHz]	EIRP [Watts/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
		Bandwidth [MHz]	Frequency [MHz]	RB / Offset	Bandwidth [MHz]	Frequency [MHz]	RB / Offset									
40 MHz	QPSK	20	3560.0	1 / 99	20	3579.8	1 / 0	V	109	275	7.15	13.91	21.06	0.128	23.00	-1.94
		20	3625.0	1 / 99	20	3644.8	1 / 0	V	100	281	6.91	13.96	20.87	0.122	23.00	-2.13
		20	3690.0	1 / 0	20	3670.2	1 / 99	V	109	287	6.60	13.74	20.34	0.108	23.00	-2.66
	16-QAM	20	3560.0	1 / 99	20	3579.8	1 / 0	V	109	275	7.15	13.19	20.34	0.108	23.00	-2.66
		20	3625.0	1 / 99	20	3644.8	1 / 0	V	100	281	6.91	13.26	20.17	0.104	23.00	-2.83
		20	3690.0	1 / 0	20	3670.2	1 / 99	V	109	287	6.60	13.12	19.72	0.094	23.00	-3.28
35 MHz	QPSK	20	3557.5	1 / 99	15	3577.1	1 / 0	V	109	275	7.15	14.06	21.21	0.132	23.00	-1.79
		20	3625.0	1 / 99	15	3642.1	1 / 0	V	100	281	6.91	13.99	20.90	0.123	23.00	-2.10
		20	3692.5	1 / 0	15	3672.9	1 / 74	V	109	287	6.60	13.92	20.51	0.113	23.00	-2.49
	16-QAM	20	3557.5	1 / 99	15	3577.1	1 / 0	V	109	275	7.15	13.38	20.53	0.113	23.00	-2.47
		20	3625.0	1 / 99	15	3642.1	1 / 0	V	100	281	6.91	13.49	20.40	0.110	23.00	-2.60
		20	3692.5	1 / 0	15	3672.9	1 / 74	V	109	287	6.60	13.24	19.83	0.096	23.00	-3.17
30 MHz	QPSK	20	3555.0	1 / 99	10	3574.4	1 / 0	V	109	275	7.15	13.91	21.06	0.128	23.00	-1.94
		20	3625.0	1 / 99	10	3639.4	1 / 0	V	100	281	6.91	14.02	20.93	0.124	23.00	-2.07
		20	3695.0	1 / 0	10	3678.3	1 / 49	V	109	287	6.59	13.64	20.23	0.106	23.00	-2.77
	16-QAM	20	3555.0	1 / 99	10	3574.4	1 / 0	V	109	275	7.15	13.19	20.34	0.108	23.00	-2.66
		20	3625.0	1 / 99	10	3639.4	1 / 0	V	100	281	6.91	13.32	20.23	0.105	23.00	-2.77
		20	3695.0	1 / 0	10	3678.3	1 / 49	V	109	287	6.59	13.08	19.67	0.093	23.00	-3.33
25 MHz	QPSK	20	3552.5	1 / 99	5	3571.7	1 / 0	V	109	275	7.16	13.89	21.05	0.127	23.00	-1.95
		20	3625.0	1 / 99	5	3636.7	1 / 0	V	100	281	6.91	14.02	20.93	0.124	23.00	-2.07
		20	3697.5	1 / 0	5	3678.3	1 / 24	V	109	287	6.59	13.64	20.22	0.105	23.00	-2.78
	16-QAM	20	3552.5	1 / 99	5	3571.7	1 / 0	V	109	275	7.16	13.21	20.37	0.109	23.00	-2.63
		20	3625.0	1 / 99	5	3636.7	1 / 0	V	100	281	6.91	13.28	20.19	0.104	23.00	-2.81
		20	3697.5	1 / 0	5	3678.3	1 / 24	V	109	287	6.59	13.04	19.62	0.092	23.00	-3.38

Table 7-5. EIRP Data (ULCA 48C)

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
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7.7 Radiated Spurious Emissions Measurements

§2.1053 §96.41(e)

Test Overview

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

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = Max Hold (In cases where the level is within 2dB of the limit, the final measurement is taken using triggering/gating and trace averaging.)
7. The trace was allowed to stabilize

FCC ID: A3LSMS908U	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
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Test Setup

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

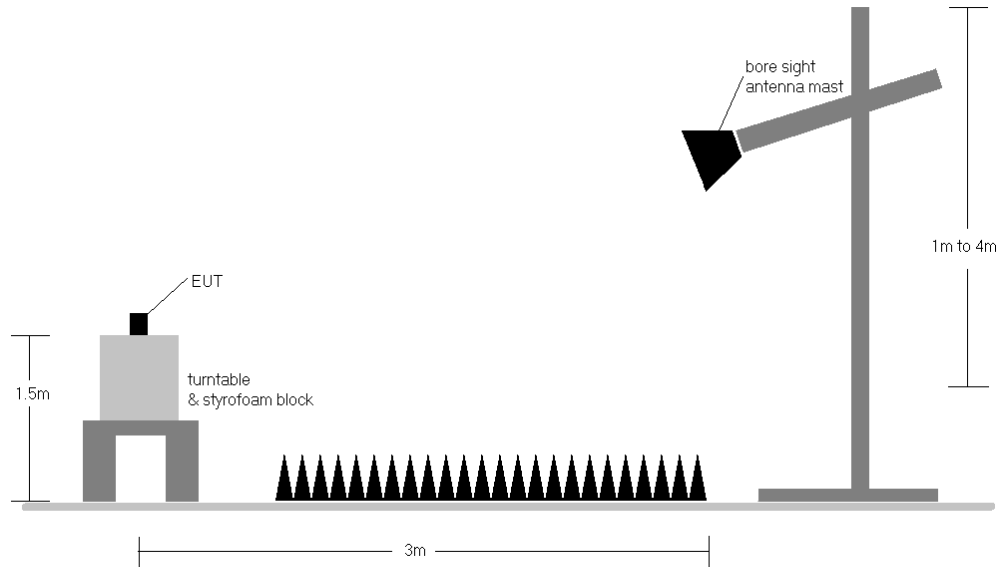


Figure 7-6. Test Instrument & Measurement Setup

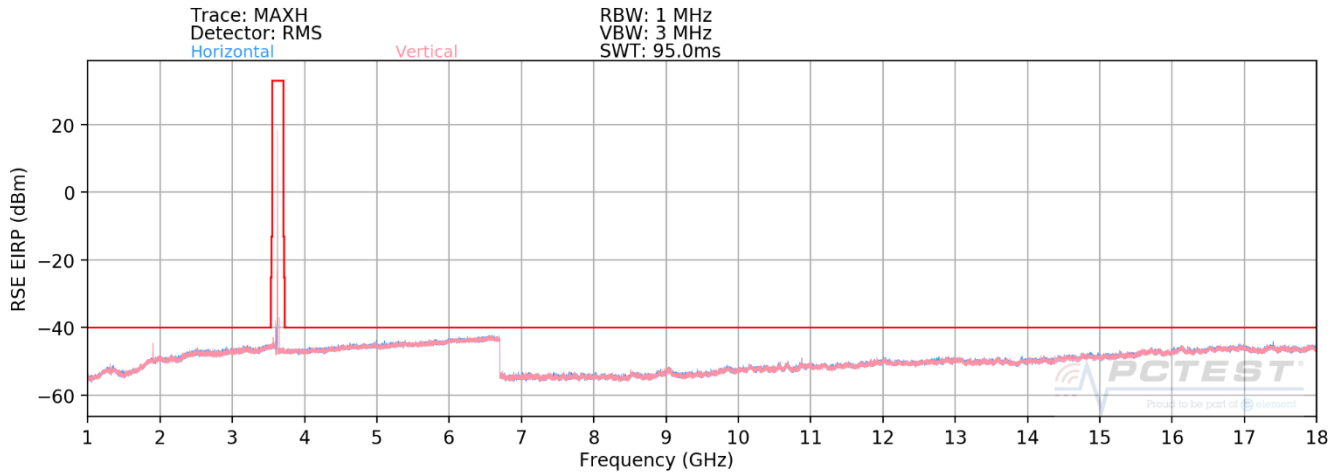
Test Notes

- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with its standard battery.
- 3) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 4) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
- 5) The "-" shown in the following RSE tables are used to denote a noise floor measurement.
- 6) Per KDB 971168, Field Strength Level (dBμV/m) is converted to EIRP Spurious Emission Level (dBm) using the formula in Section 5.8.4 (d):

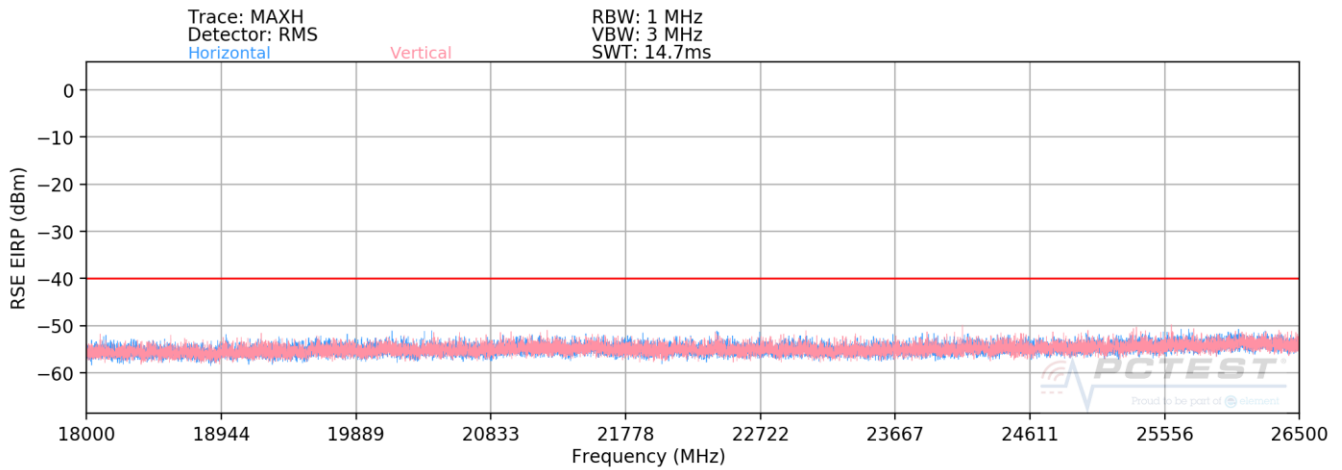
$$\text{EIRP (dBm)} = E \text{ (dB}\mu\text{V/m)} + 20 \log D - 104.8; \text{ where } D \text{ is the measurement distance in meters}$$

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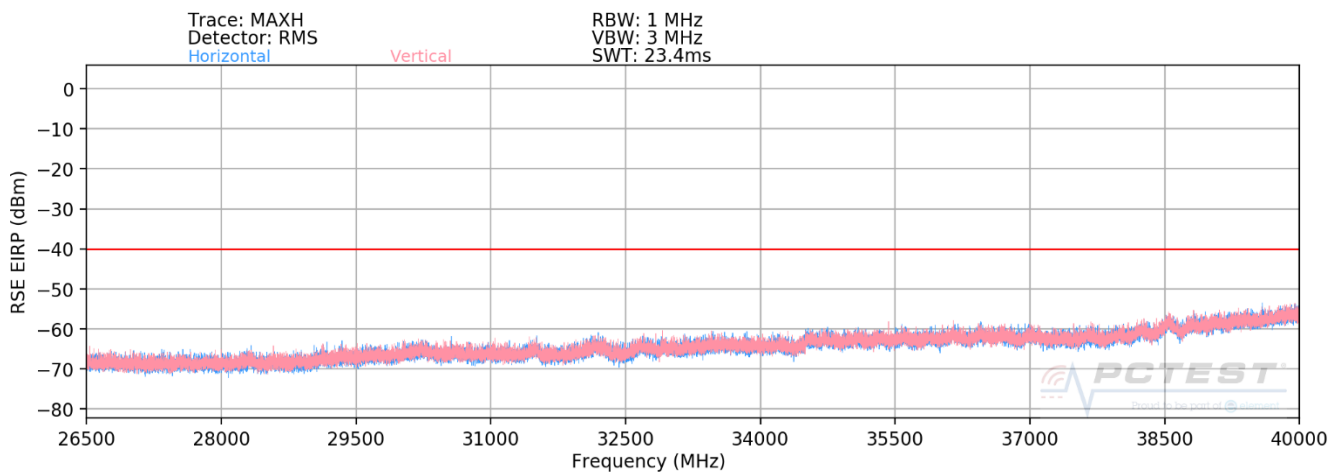
LTE Band 48



Plot 7-52. Radiated Spurious Plot 1-18GHz (LTE Band 48)



Plot 7-53. Radiated Spurious Plot 18-26.5GHz (LTE Band 48)



Plot 7-54. Radiated Spurious Plot 26.5-40GHz (LTE Band 48)

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Bandwidth (MHz):	20
Frequency (MHz):	3560.0
Modulation Signal:	QPSK
RB Config (Size / 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]
7120.00	V	132	354	-74.77	9.24	41.47	-53.79	-40.00	-13.79
10680.00	V	120	16	-74.94	13.42	45.48	-49.77	-40.00	-9.77
14240.00	V	-	-	-79.45	15.28	42.83	-52.43	-40.00	-12.43
17800.00	V	-	-	-79.10	18.07	45.97	-49.29	-40.00	-9.29

Table 7-6. Radiated Spurious Data (LTE Band 48 – Low Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3625.0
Modulation Signal:	QPSK
RB Config (Size / 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]
7250.00	V	285	333	-73.28	8.43	42.15	-53.11	-40.00	-13.11
10875.00	V	342	340	-72.94	12.93	46.99	-48.27	-40.00	-8.27
14500.00	V	-	-	-79.26	14.93	42.67	-52.59	-40.00	-12.59

Table 7-7. Radiated Spurious Data (LTE Band 48 – Mid Channel)

Bandwidth (MHz):	20
Frequency (MHz):	3690.0
Modulation Signal:	QPSK
RB Config (Size / 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]
7380.00	V	213	106	-78.03	9.84	38.81	-56.45	-40.00	-16.45
11070.00	V	400	320	-75.56	12.60	44.04	-51.22	-40.00	-11.22
14760.00	V	-	-	-80.14	16.47	43.33	-51.93	-40.00	-11.93

Table 7-8. Radiated Spurious Data (LTE Band 48 – High Channel)

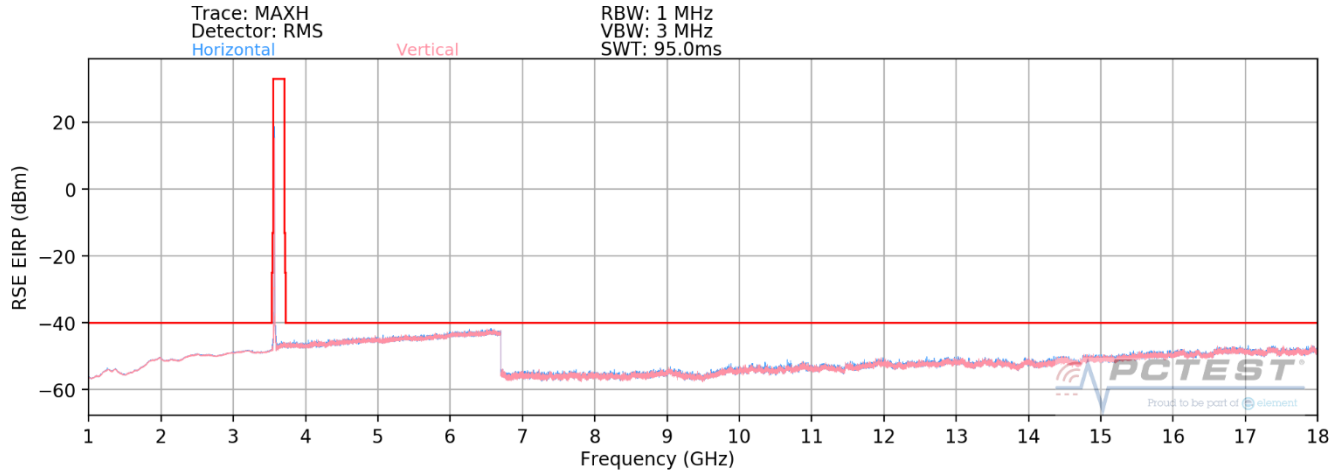
Case:	w/ Wireless Charging Pad
Bandwidth (MHz):	20MHz
Frequency (MHz):	3625.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

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]
7250.00	V	143	154	-72.87	8.43	42.56	-52.70	-40.00	-12.70
10875.00	V	267	150	-71.89	12.93	48.04	-47.22	-40.00	-7.22
14500.00	V	-	-	-79.31	14.93	42.62	-52.64	-40.00	-12.64

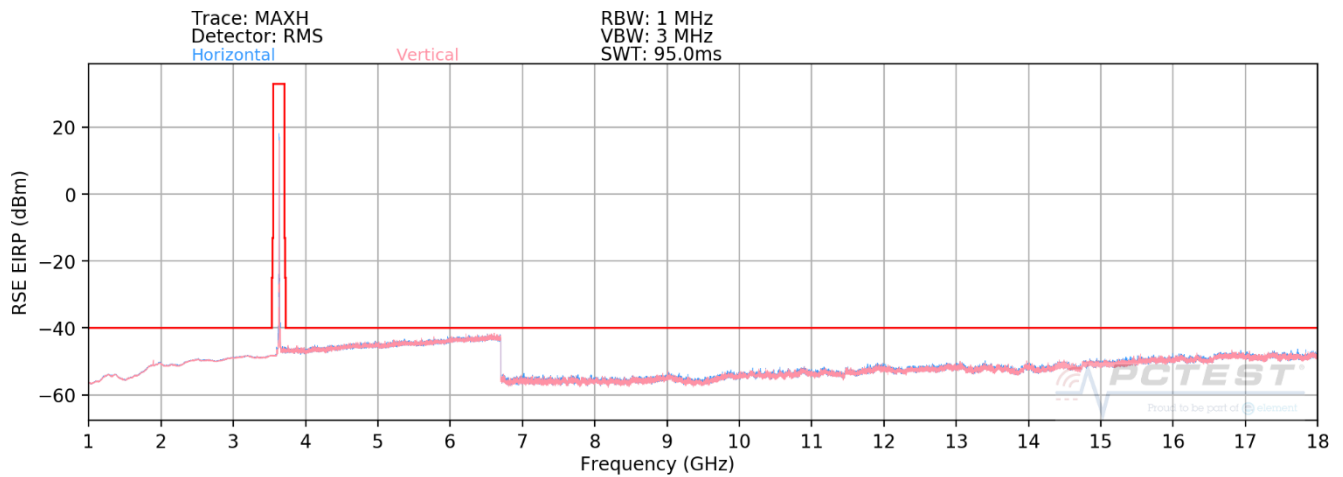
Table 7-9. Radiated Spurious Data with WCP (LTE Band 48)

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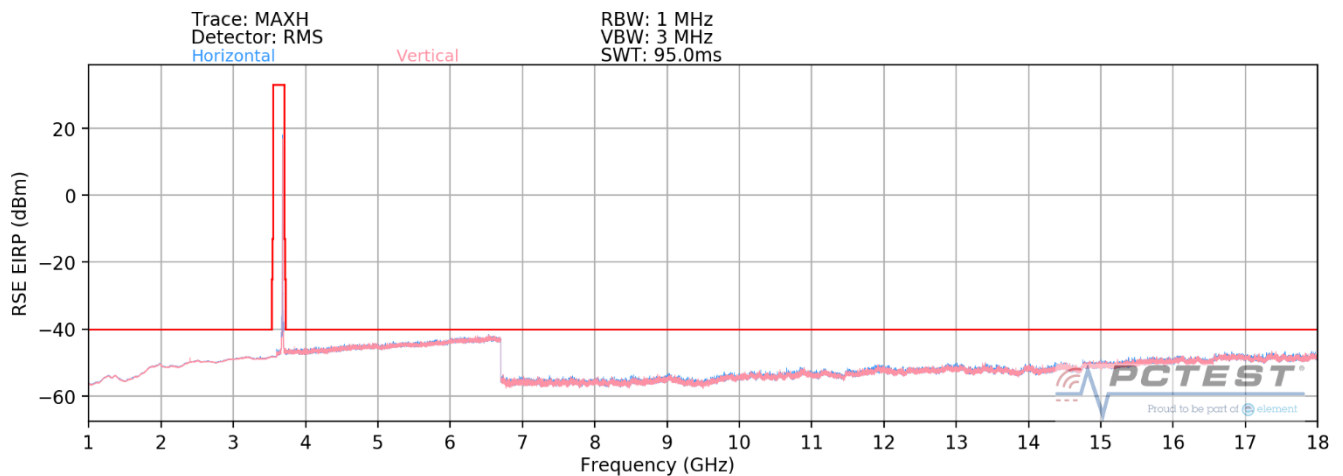
ULCA LB48



Plot 7-55. Radiated Spurious Plot (ULCA LB48) – Low Channel



Plot 7-56. Radiated Spurious Plot (ULCA LB48) – Mid Channel



Plot 7-57. Radiated Spurious Plot (ULCA LB48) – High Channel

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3560.0
PCC RB / Offset:	1 / 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3579.8
SCC RB / Offset:	1 / 0
Modulation Signal:	QPSK

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]
7120.00	H	352	40	-72.73	9.24	43.51	-51.75	-40.00	-11.75
10680.00	H	-	-	-78.36	13.42	42.06	-53.19	-40.00	-13.19
14240.00	H	-	-	-79.03	15.28	43.25	-52.01	-40.00	-12.01
17800.00	H	-	-	-78.87	18.07	46.20	-49.06	-40.00	-9.06

Table 7-10. Radiated Spurious Data (ULCA LB48 – Low Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3625.0
PCC RB / Offset:	1 / 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3644.8
SCC RB / Offset:	1 / 0
Modulation Signal:	QPSK

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]
7250.00	H	307	6	-73.69	8.43	41.74	-53.52	-40.00	-13.52
10875.00	H	-	-	-77.50	12.93	42.43	-52.83	-40.00	-12.83
14500.00	H	-	-	-78.27	14.93	43.66	-51.60	-40.00	-11.60

Table 7-11. Radiated Spurious Data (ULCA LB48 – Mid Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3690.0
PCC RB / Offset:	1 / 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3670.2
SCC RB / Offset:	1 / 0
Modulation Signal:	QPSK

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]
7380.00	H	-	-	-76.77	9.84	40.07	-55.19	-40.00	-15.19
11070.00	H	333	109	-76.43	12.60	43.17	-52.09	-40.00	-12.09
14760.00	H	-	-	-79.10	16.47	44.37	-50.89	-40.00	-10.89

Table 7-12. Radiated Spurious Data (ULCA LB48 – High Channel)

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Case:	w/ Wireless Charging Pad
PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3625.0
PCC RB / Offset:	1 / 99
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3644.8
SCC RB / Offset:	1 / 0
Modulation Signal:	QPSK

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]
7250.00	H	118	356	-75.62	9.24	40.62	-54.64	-40.00	-14.64
10875.00	H	-	-	-78.47	13.42	41.95	-53.30	-40.00	-13.30
14500.00	H	-	-	-78.91	15.28	43.37	-51.89	-40.00	-11.89
18125.00	H	-	-	-78.90	18.07	46.17	-49.09	-40.00	-9.09

Table 7-13. Radiated Spurious Data with WCP (ULCA LB48)

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7.8 Frequency Stability / Temperature Variation

§2.1055

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 96, 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

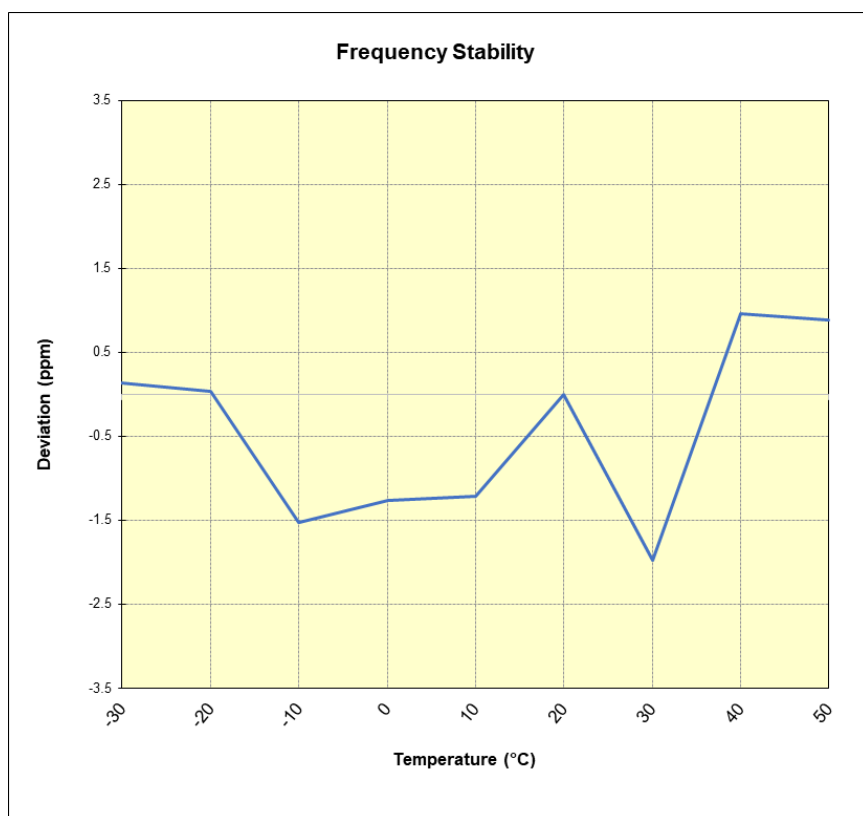
None

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Frequency Stability / Temperature Variation

LTE Band 48					
		Operating Frequency (Hz):		3,625,000,000	
		Ref. Voltage (VDC):		4.38	
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.38	- 30	3,625,025,519	502	0.0000138
		- 20	3,625,025,158	140	0.0000039
		- 10	3,625,019,509	-5,509	-0.0001520
		0	3,625,020,445	-4,573	-0.0001261
		+ 10	3,625,020,644	-4,374	-0.0001207
		+ 20 (Ref)	3,625,025,017	0	0.0000000
		+ 30	3,625,017,863	-7,154	-0.0001974
		+ 40	3,625,028,511	3,494	0.0000964
		+ 50	3,625,028,224	3,206	0.0000885
Battery Endpoint	4.38	+ 20	3,625,023,234	-1,783	-0.0000492

Table 7-14. LTE Band 48 Frequency Stability Data



Plot 7-58. LTE Band 48 Frequency Stability Chart

FCC ID: A3LSMS908U	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
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7.9 End User Device Additional Requirement (CBSD Protocol)

§96.47

Test Overview and Limit

End user device additional requirements (CBSD Protocol) are tested per the test procedures listed below. During testing, the EUT is connected to a certified CBSD (Ruckus FCC ID: S9GQ910US00) as a companion device to show compliance with Part 96.47.

End User Devices may operate only if they can positively receive and decode an authorization signal transmitted by a CBSD, including the frequencies and power limits for their operation.

An End User Device must discontinue operations, change frequencies, or change its operational power level within 10 seconds of receiving instructions from its associated CBSD.

Test Procedure Used

KDB 940660 D01 v02, WINNF-TS-0122 V1.0.0.

Test Setup/Method

The EUT was connected via an RF cable to a certified CBSD and spectrum analyzer. The following procedure is performed by applying WINNF-TS-0122 CBRs CBSD Test Specification.

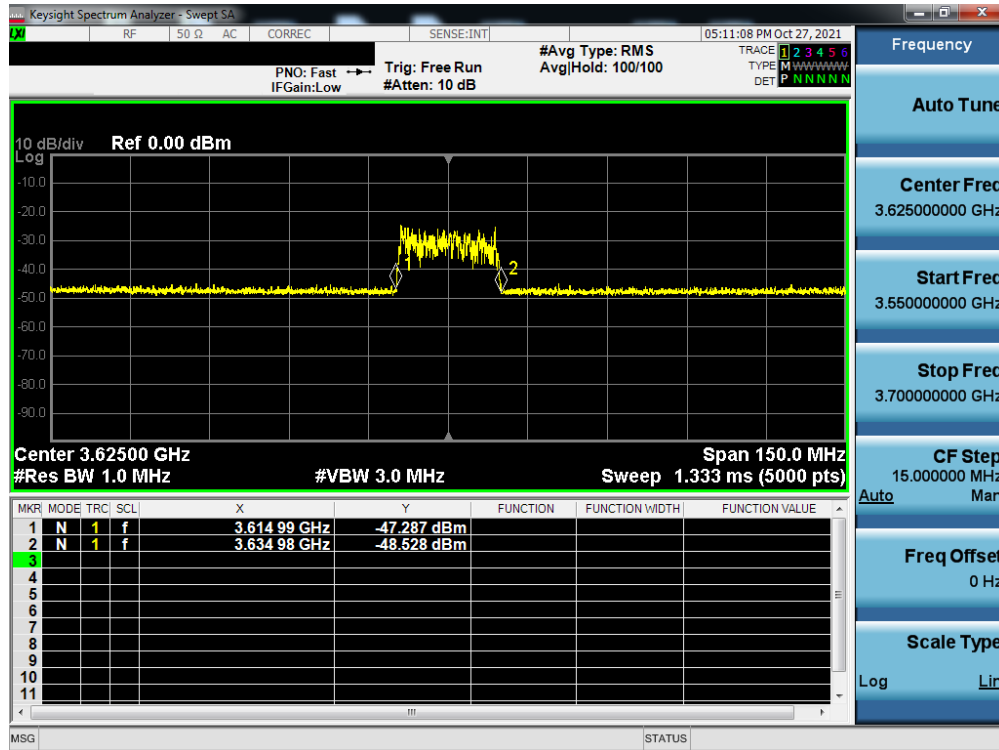
1. Run#1:
 - a. Setup WINNF.PT.C.HBT.1 with 3615MHz – 3635MHz.
 - b. Enable AP service from Ruckus Cloud management.
 - c. Check EUT Tx frequency.
 - d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.
2. Run#2:
 - a. Setup WINNF.PT.C.HBT.1 with 3660MHz – 3680MHz.
 - b. Enable AP service from Ruckus Cloud management.
 - c. Check EUT Tx frequency.
 - d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.

Test Notes

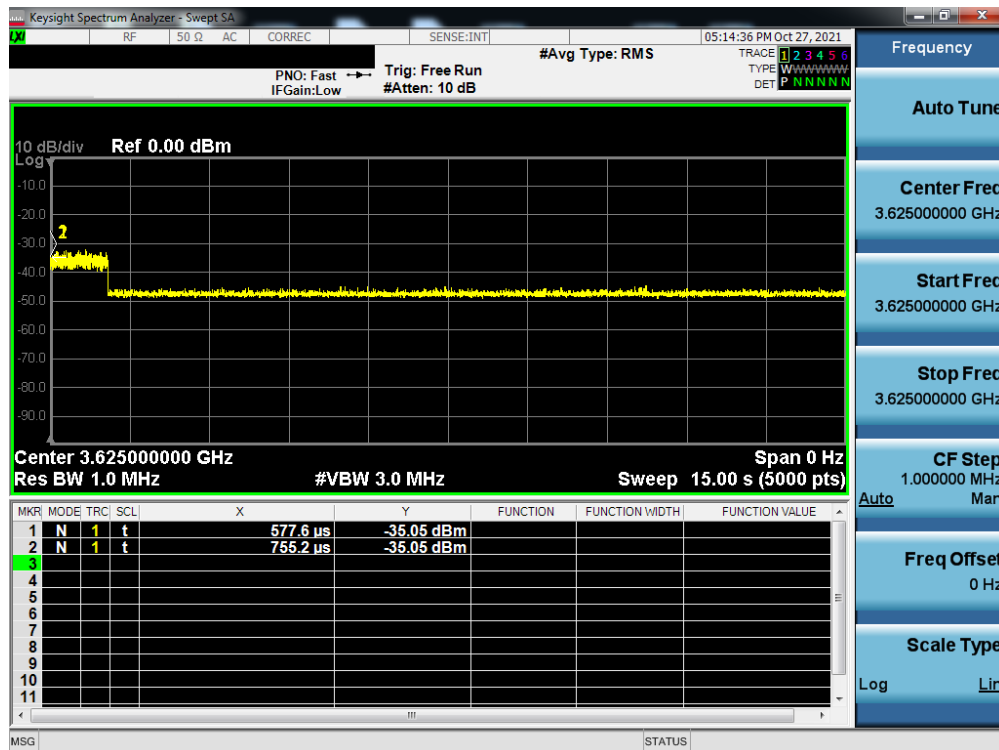
The EUT is an End User Device.

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Run#1:



Plot 7-59. Run#1 End User Device Frequency of Operations



Plot 7-60. Run#1 End User Device Discontinues Operations within 10s

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Note:

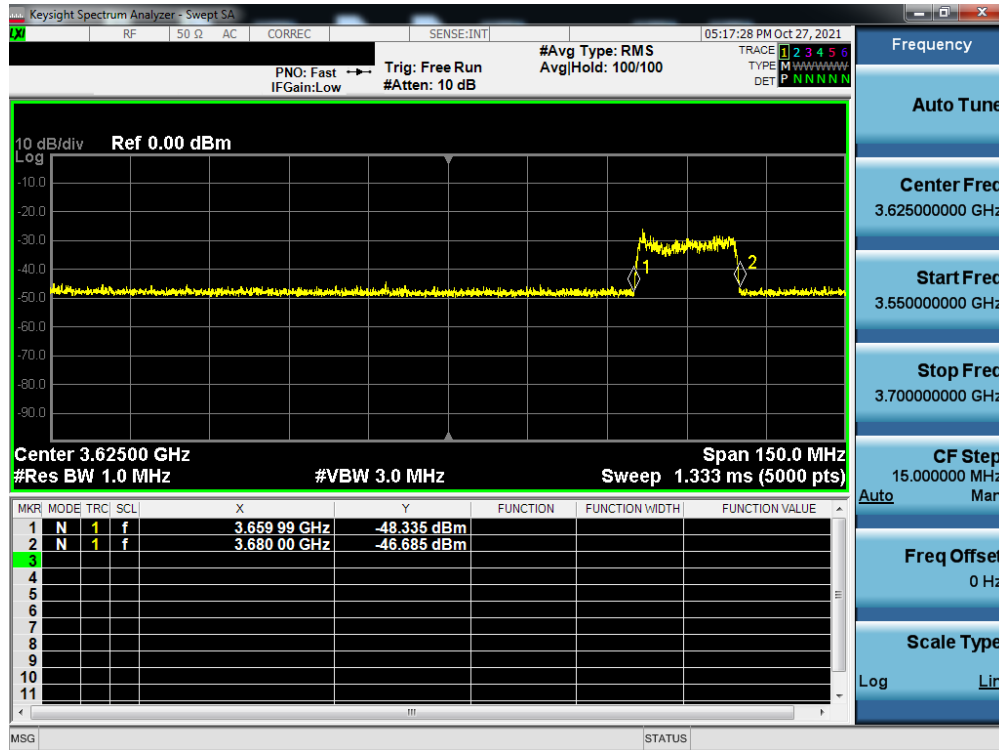
Marker 1: CBSD sends instructions to discontinue LTE operations.

Marker 2: EUT discontinues operation.

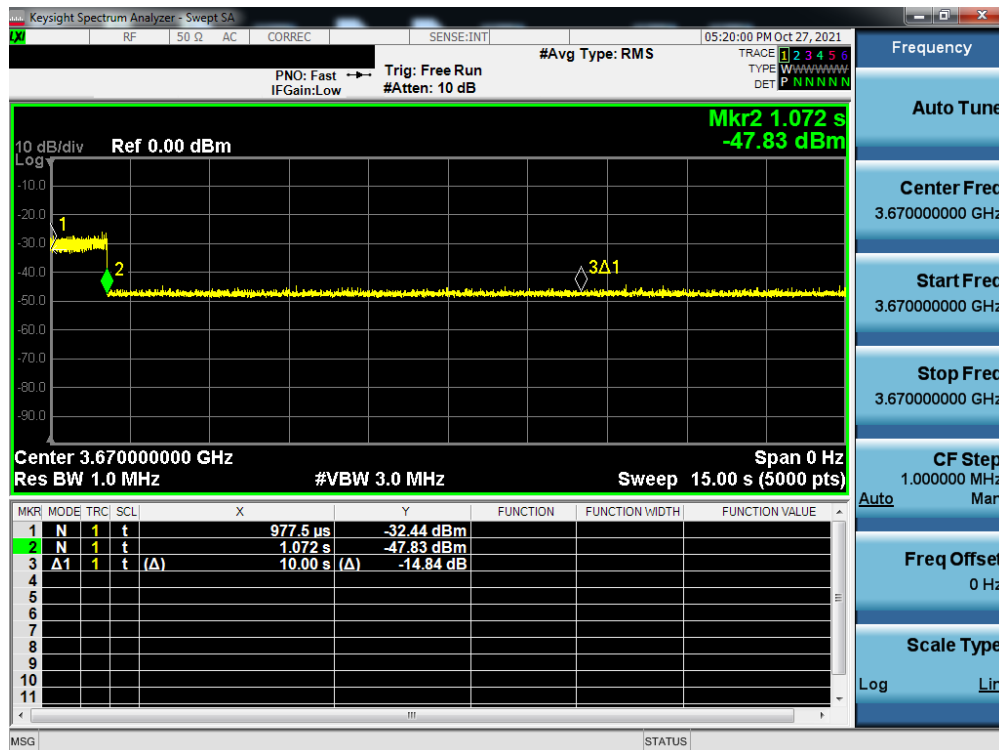
Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

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Run#2:



Plot 7-61. Run#2 End User Device Frequency of Operations



Plot 7-62. Run#2 End User Device Discontinues Operations within 10s

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Note:

Marker 1: CBSD sends instructions to discontinue LTE operations.

Marker 2: EUT discontinues operation.

Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

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8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the Samsung **Portable Handset** **FCC ID: A3LSMS908U** complies with all of the End User Device requirements of Part 96 of the FCC Rules for LTE operation only.

FCC ID: A3LSMS908U	 PCTEST Proud to be part of  element	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
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