

PART 96 MEASUREMENT REPORT

Applicant Name:

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

Date of Testing:

4/13/2021 - 6/1/2021

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

1M2107290086-08.A3L

FCC ID:

A3LSMF711U1

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-F711U

Additional Models:

SM-F711U1

EUT Type:

Portable Handset

FCC Classification:

Citizens Band End User Devices (CBE)

FCC Rule Part(s):

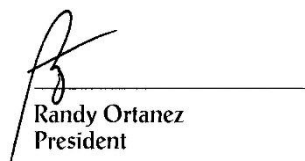
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Test Procedure(s):

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

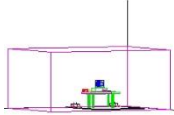


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T A B L E O F C O N T E N T S

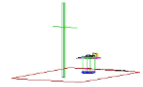
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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 48	40 MHz	QPSK	3570.0 - 3680.0	0.114	20.58	37M7G7D
		16QAM	3570.0 - 3680.0	0.087	19.40	37M6W7D
	35 MHz	QPSK	3567.5 - 3682.5	0.113	20.54	32M9G7D
		16QAM	3567.5 - 3682.5	0.102	20.09	37M8W7D
	30 MHz	QPSK	3565.0 - 3685.0	0.118	20.73	27M8G7D
		16QAM	3565.0 - 3685.0	0.094	19.74	27M8W7D
	25 MHz	QPSK	3562.5 - 3687.5	0.113	20.52	23M0G7D
		16QAM	3562.5 - 3687.5	0.077	18.86	23M0W7D
	20 MHz	QPSK	3560.0 - 3690.0	0.121	20.82	18M0G7D
		16QAM	3560.0 - 3690.0	0.097	19.89	18M0W7D
	15 MHz	QPSK	3557.5 - 3692.5	0.123	20.90	13M6G7D
		16QAM	3557.5 - 3692.5	0.098	19.92	13M6W7D
	10 MHz	QPSK	3555.0 - 3695.0	0.123	20.91	9M01G7D
		16QAM	3555.0 - 3695.0	0.100	20.01	9M01W7D
	5 MHz	QPSK	3552.5 - 3697.5	0.121	20.81	4M51G7D
		16QAM	3552.5 - 3697.5	0.098	19.93	4M50W7D

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 CBRS Alliance (OnGo) Approved Test Lab
- 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: A3LSMF711U1**. 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.: 0859M, 0813M, 0872M, 0151M, 0130M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 CDMA/EvDO Rev0/A, 1x Advanced (BC0, BC1), 850/1900 GSM/GPRS/EDGE, 850/1700/1900 WCDMA/HSPA, Multi-band LTE, 5G NR (n71, n12, n5, n66, n2, n25, n30, n41, n77, n260, n261), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz), Bluetooth (1x, EDR, LE), NFC, 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.

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

2.4 EMI Suppression Device(s)/Modifications

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

2.5 Software and Firmware

The test was conducted with firmware version 711USQU0AUEF installed on the EUT.

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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:

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

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

The calculated P_d levels are then compared to the absolute spurious emission limit of -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
-	ETS-002	EMC Cable and Switch System	3/4/2021	Annual	3/4/2022	ETS-002
-	LTx2	Licensed Transmitter Cable Set	9/16/2020	Annual	9/16/2021	LTx2
Keysight Technologies	N9038A	MXE EMI Receiver	8/11/2020	Annual	8/11/2021	MY51210133
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/17/2020	Annual	8/17/2021	MY52350166
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6200901190
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
Keysight Technologies	N9020A	MXA Signal Analyzer	9/22/2020	Annual	9/22/2021	MY54500644
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/9/2020	Annual	9/9/2021	100348
Emco	3116	Horn Antenna (18-40GHz)	8/7/2018	Triennial	8/7/2021	9203-2178

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: A3LSMF711U1
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
	Uplink Carrier Aggregation	96.41(e)	> 43 + 10log(P[Watts]) at Band Edge and for all out-of-band emissions	PASS	Sections 7.2 - 7.5
	Frequency Stability	2.1055	Fundamental emissions stay within authorized frequency block	PASS	Section 7.8
	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 7.9
RADIATED	Equivalent Isotropic Radiated Power (EIRP)	96.41(b)	23 dBm/10MHz	PASS	Section 7.6
	Radiated Spurious Emissions	2.1053, 96.41(e)	-40 dBm/MHz	PASS	Section 7.7

Table 7-1. Summary of Test Results

Notes:

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

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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

§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.

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.

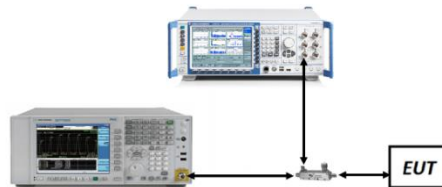


Figure 7-1. Test Instrument & Measurement Setup

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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 Band 48 operation.
3. 256QAM operations do not employ A-MPR.

Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]
20 MHz	QPSK	55340	3560.0	1 / 99	23.90
		55990	3625.0	1 / 99	23.74
		56640	3690.0	1 / 50	23.61
	16-QAM	55340	3560.0	1 / 99	22.96
	64-QAM	55340	3560.0	1 / 99	21.65
	256-QAM	55340	3560.0	1 / 50	18.93
15 MHz	QPSK	55315	3557.5	1 / 74	23.79
		55990	3625.0	1 / 74	23.68
		56665	3692.5	1 / 74	23.69
	16-QAM	55315	3557.5	1 / 74	22.90
	64-QAM	55315	3557.5	1 / 74	21.58
	256-QAM	55315	3557.5	1 / 74	18.93
10 MHz	QPSK	55290	3555.0	1 / 49	23.80
		55990	3625.0	1 / 49	23.69
		56690	3695.0	1 / 25	23.70
	16-QAM	55290	3555.0	1 / 49	23.01
	64-QAM	55290	3555.0	1 / 49	21.57
	256-QAM	55290	3555.0	1 / 25	18.93
5 MHz	QPSK	55265	3552.5	1 / 12	23.78
		55990	3625.0	1 / 12	23.70
		56715	3697.5	1 / 12	23.60
	16-QAM	55265	3552.5	1 / 24	22.95
	64-QAM	55265	3552.5	1 / 12	21.57
	256-QAM	55265	3552.5	1 / 12	18.98

Table 7-2. 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	23.62
		20	3625.0	1 / 99	20	3644.8	1 / 0	23.91
		20	3690.0	1 / 0	20	3670.2	1 / 99	23.77
	16-QAM	20	3625.0	1 / 99	20	3644.8	1 / 0	23.43
	64-QAM	20	3625.0	1 / 99	20	3644.8	1 / 0	21.95
	256-QAM	20	3625.0	1 / 99	20	3644.8	1 / 0	19.02
35 MHz	QPSK	20	3557.5	1 / 99	15	3577.1	1 / 0	23.52
		20	3625.0	1 / 99	15	3642.1	1 / 0	23.92
		20	3692.5	1 / 0	15	3672.9	1 / 74	23.65
	16-QAM	20	3625.0	1 / 99	15	3642.1	1 / 0	24.12
	64-QAM	20	3625.0	1 / 99	15	3642.1	1 / 0	23.00
	256-QAM	20	3625.0	1 / 99	15	3642.1	1 / 0	22.41
30 MHz	QPSK	20	3555.0	1 / 99	10	3574.4	1 / 0	23.56
		20	3625.0	1 / 99	10	3639.4	1 / 0	24.11
		20	3695.0	1 / 0	10	3678.3	1 / 49	23.76
	16-QAM	20	3625.0	1 / 99	10	3639.4	1 / 0	23.77
	64-QAM	20	3625.0	1 / 99	10	3639.4	1 / 0	22.35
	256-QAM	20	3625.0	1 / 99	10	3639.4	1 / 0	19.43
25 MHz	QPSK	20	3552.5	1 / 99	5	3571.7	1 / 0	23.15
		20	3625.0	1 / 99	5	3636.7	1 / 0	23.53
		20	3697.5	1 / 0	5	3678.3	1 / 24	23.71
	16-QAM	20	3697.5	1 / 0	5	3678.3	1 / 24	22.93
	64-QAM	20	3697.5	1 / 0	5	3678.3	1 / 24	21.74
	256-QAM	20	3697.5	1 / 0	5	3678.3	1 / 24	18.87

Table 7-3. Conducted Power Output Data (ULCA LTE Band 48)

Test Case	NS	MCC	MNC	Channel BW [MHz]	PCC			SCC			A-MPR [dB]	Modulation	MPR [dB]	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	1	22.50	13.77
												16-QAM	2	21.50	13.31
												64-QAM	3	20.50	13.47
												256-QAM	5	18.50	13.47
2				20 + 20	3560	1	99	3579.8	1	0	≤ 11	QPSK	0	23.50	19.67
												16-QAM	1	22.50	18.90
												64-QAM	2	21.50	19.63
												256-QAM	5	18.50	19.60
3				20 + 20	3605.1	100	0	3624.9	100	0	≤ 4.5	QPSK	1	22.50	20.26
												16-QAM	2	21.50	20.33
												64-QAM	3	20.50	20.22
												256-QAM	5	18.50	20.24
4				20 + 20	3605.1	1	99	3624.9	1	0	≤ 4.5	QPSK	0	23.50	23.64
												16-QAM	1	22.50	23.57
												64-QAM	2	21.50	23.58
												256-QAM	5	18.50	21.63
5				20 + 20	3689.9	100	0	3670.1	100	0	≤ 11	QPSK	1	22.50	13.44
												16-QAM	2	21.50	13.40
												64-QAM	3	20.50	13.24
												256-QAM	5	18.50	13.27
6				20 + 20	3689.9	1	0	3670.1	1	99	≤ 11	QPSK	0	23.50	21.27
												16-QAM	1	22.50	20.34
												64-QAM	2	21.50	20.70
												256-QAM	5	18.50	20.76

Table 7-4. A-MPR Conducted Power Output Data (ULCA LTE Band 48)

FCC ID: A3LSMF711U1	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset
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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.

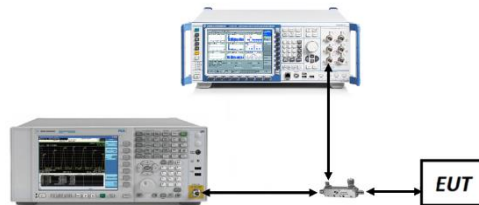
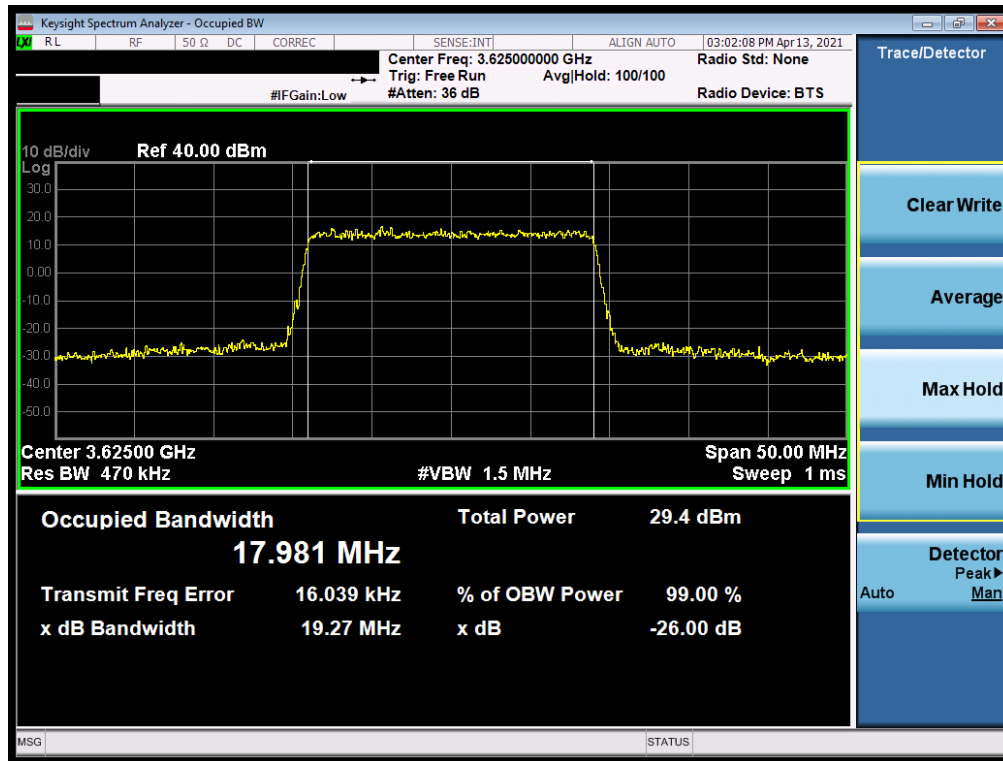


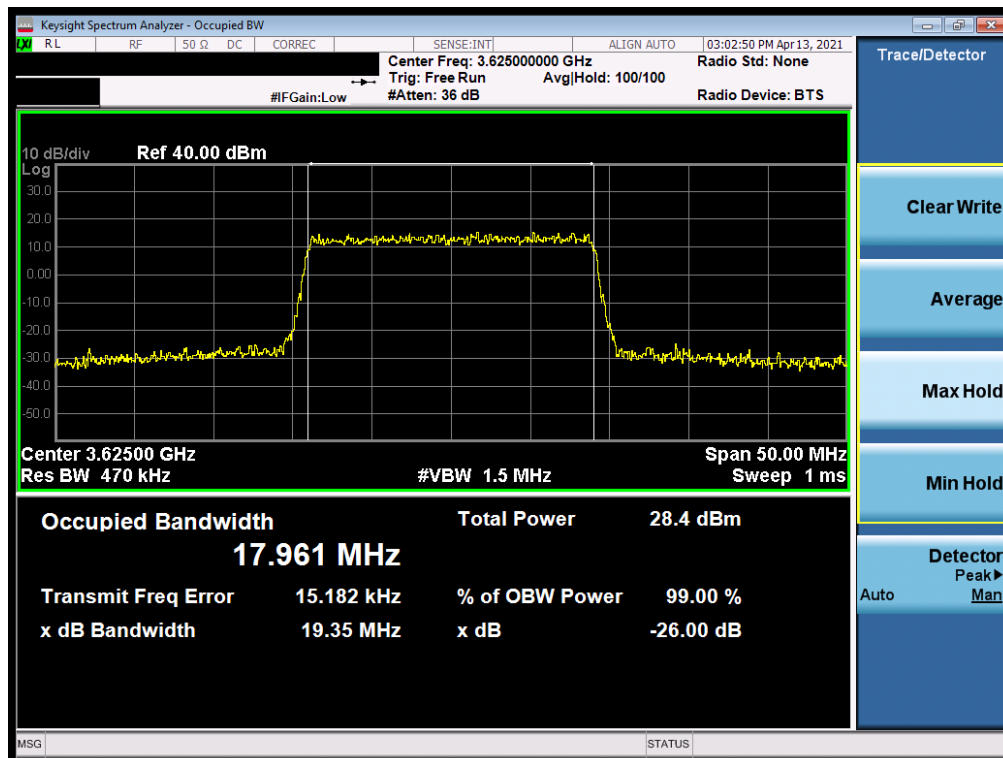
Figure 7-2. Test Instrument & Measurement Setup

FCC ID: A3LSMF711U1	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset
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LTE Band 48

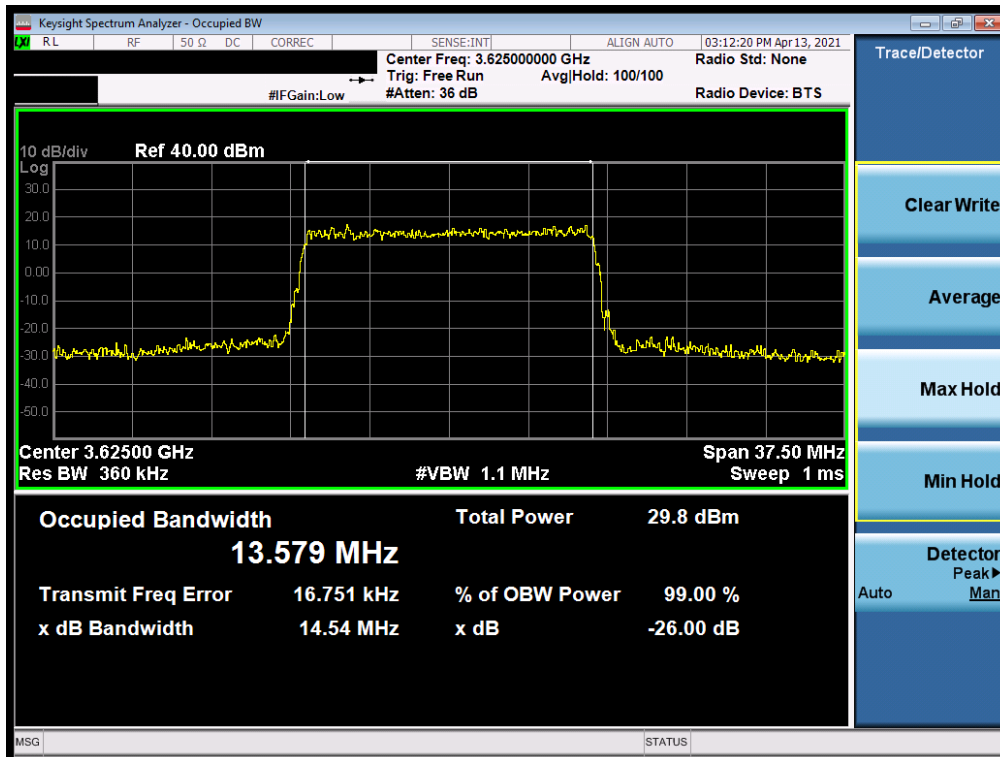


Plot 7-1. Occupied Bandwidth Plot (LTE Band 48 - 20MHz QPSK - Full RB Configuration)

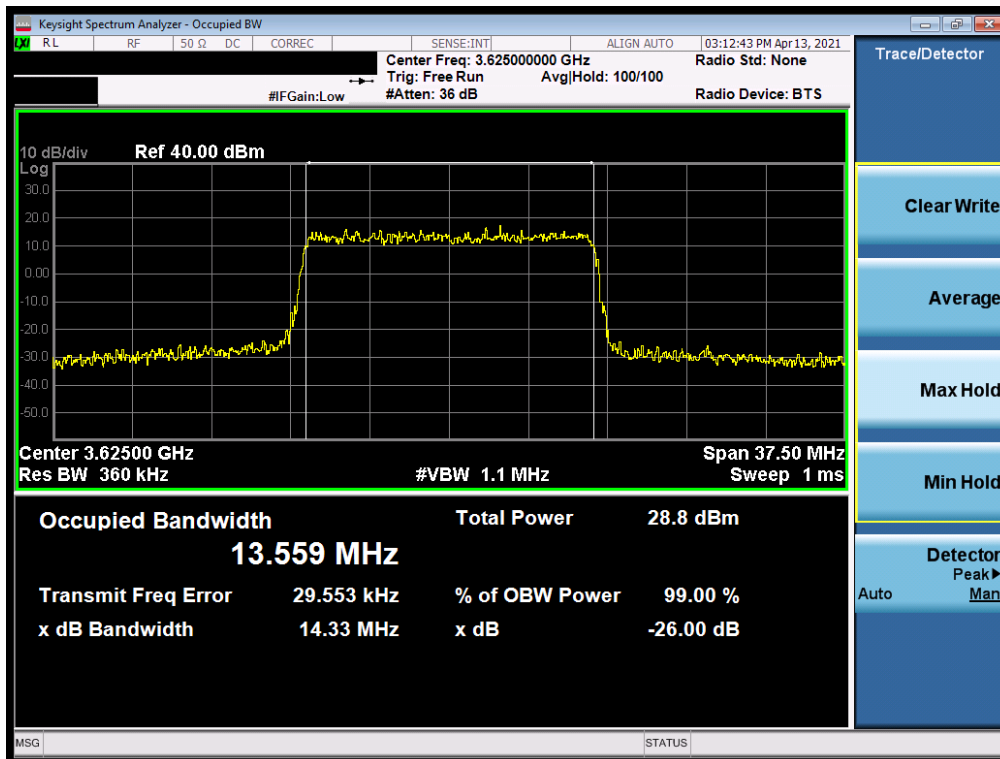


Plot 7-2. Occupied Bandwidth Plot (LTE Band 48 - 20MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 16 of 63

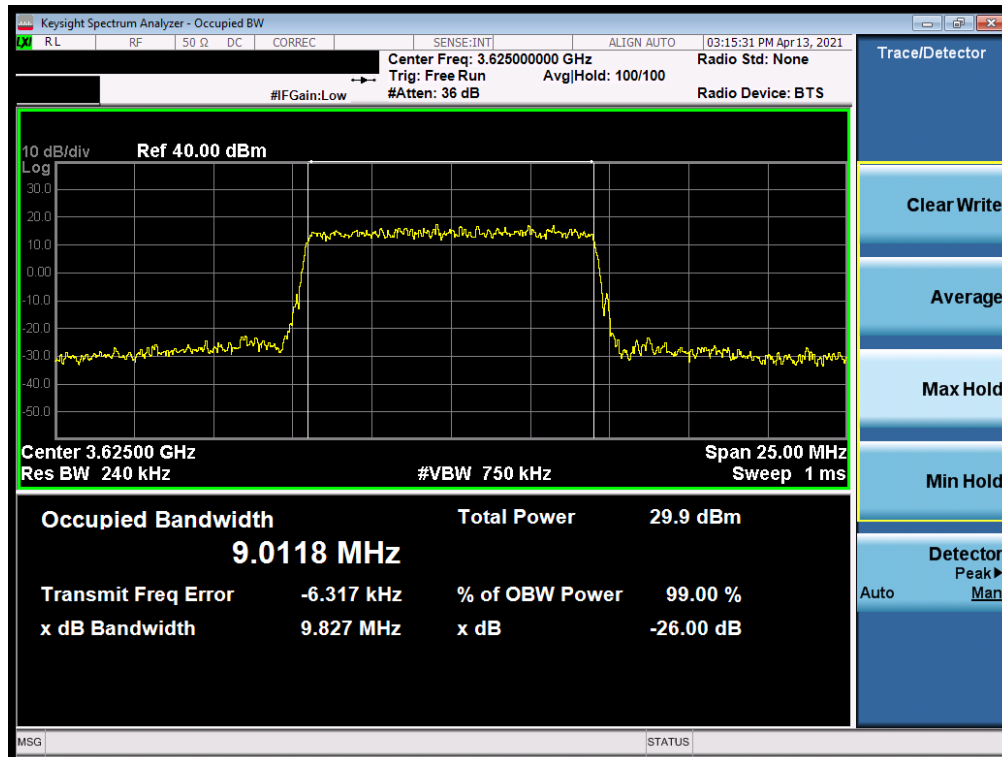


Plot 7-3. Occupied Bandwidth Plot (LTE Band 48 - 15MHz QPSK - Full RB Configuration)

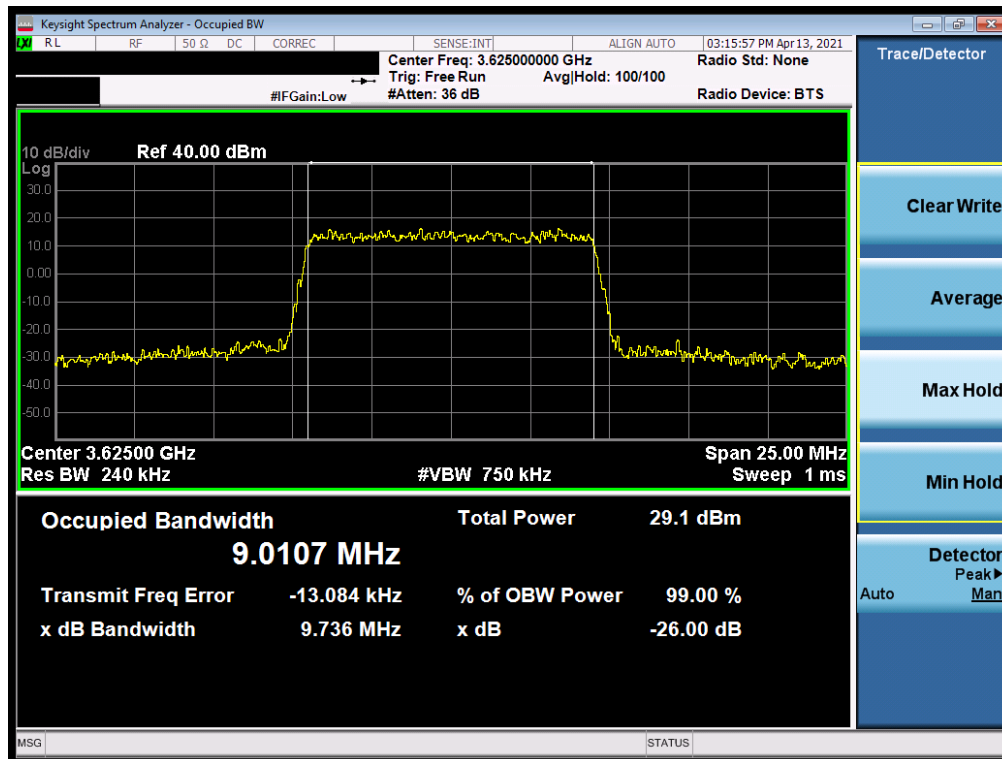


Plot 7-4. Occupied Bandwidth Plot (LTE Band 48 - 15MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 17 of 63

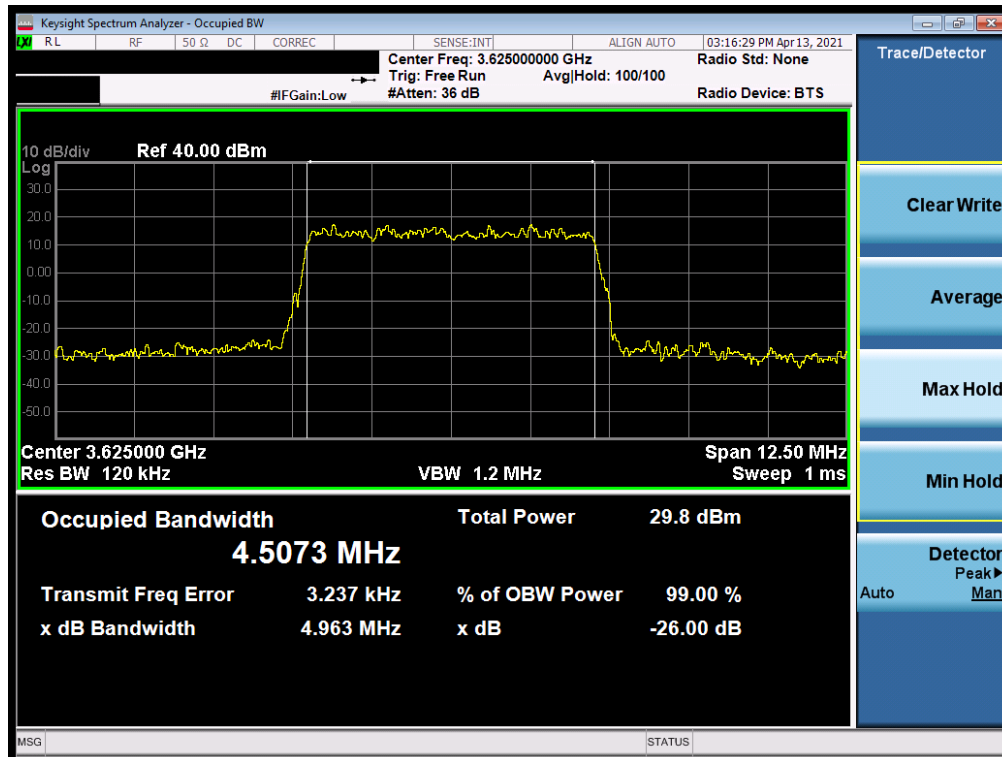


Plot 7-5. Occupied Bandwidth Plot (LTE Band 48 - 10MHz QPSK - Full RB Configuration)

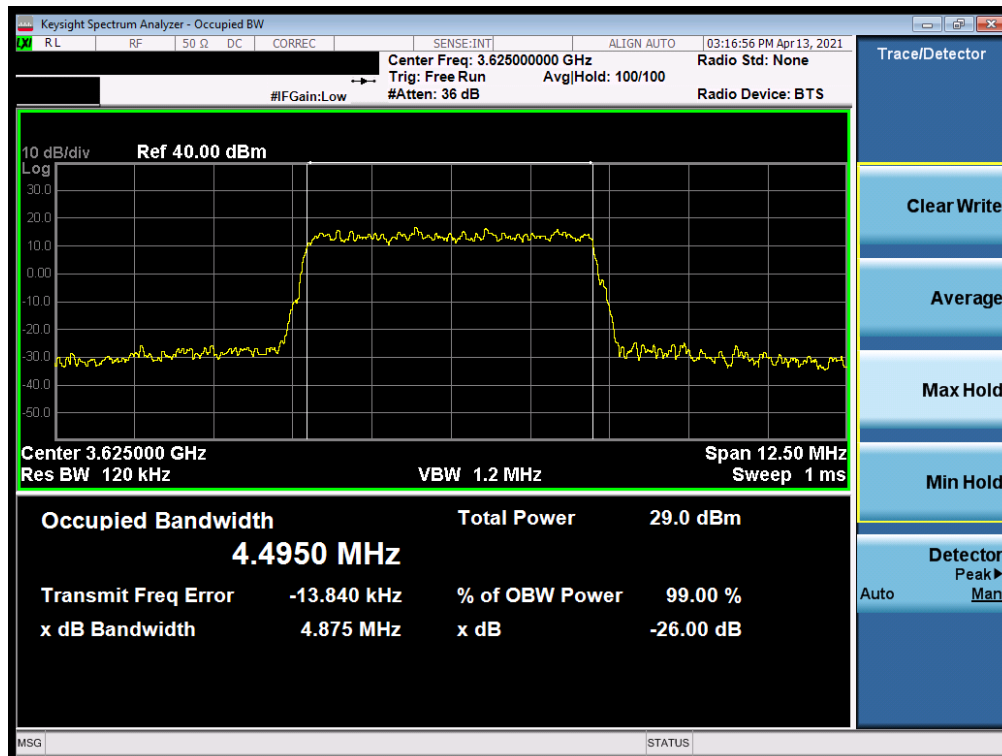


Plot 7-6. Occupied Bandwidth Plot (LTE Band 48 - 10MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 18 of 63



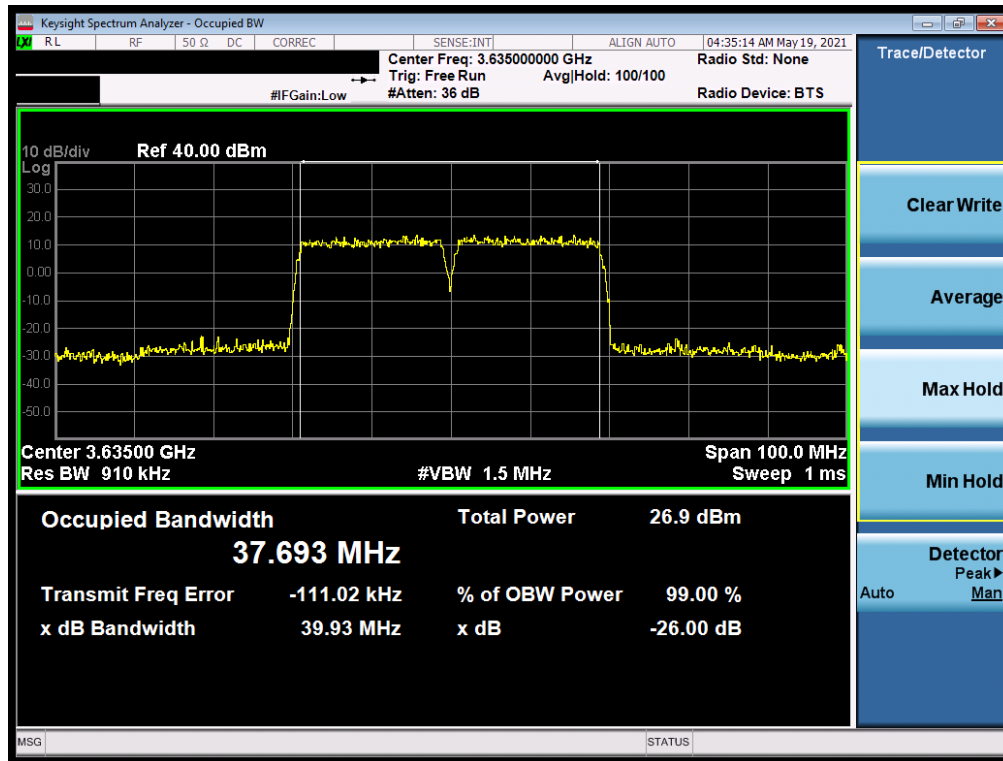
Plot 7-7. Occupied Bandwidth Plot (LTE Band 48 - 5MHz QPSK - Full RB Configuration)



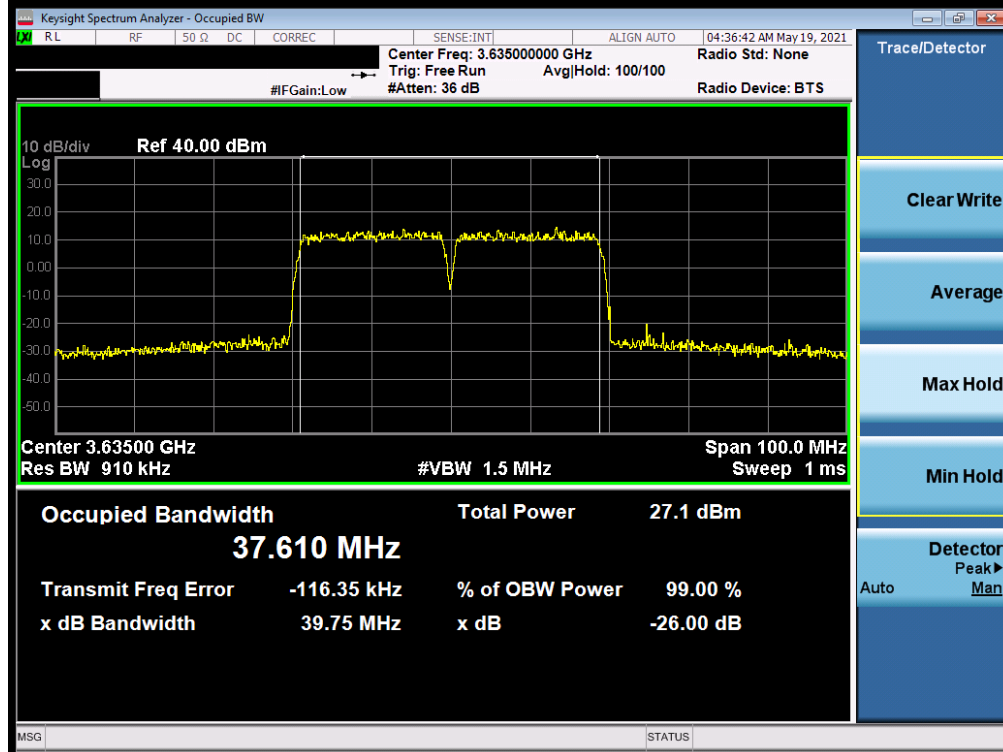
Plot 7-8. Occupied Bandwidth Plot (LTE Band 48 - 5MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 19 of 63

ULCA LTE Band 48

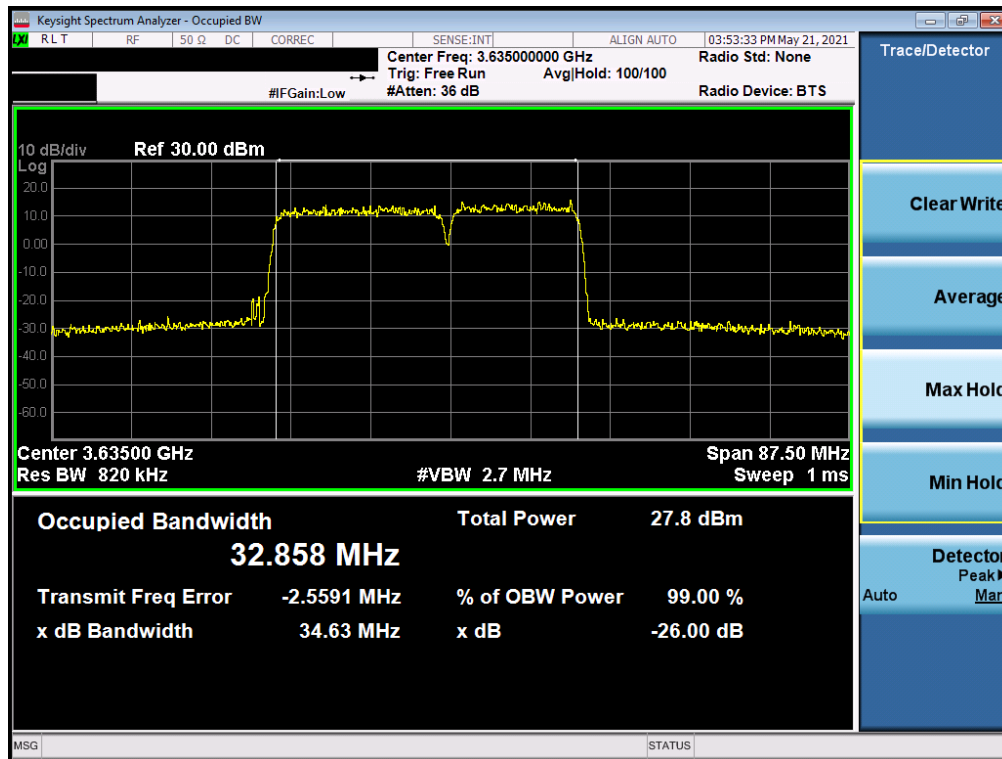


Plot 7-9. Occupied Bandwidth Plot (ULCA LTE Band 48 - 20+20MHz QPSK - Full RB Configuration)

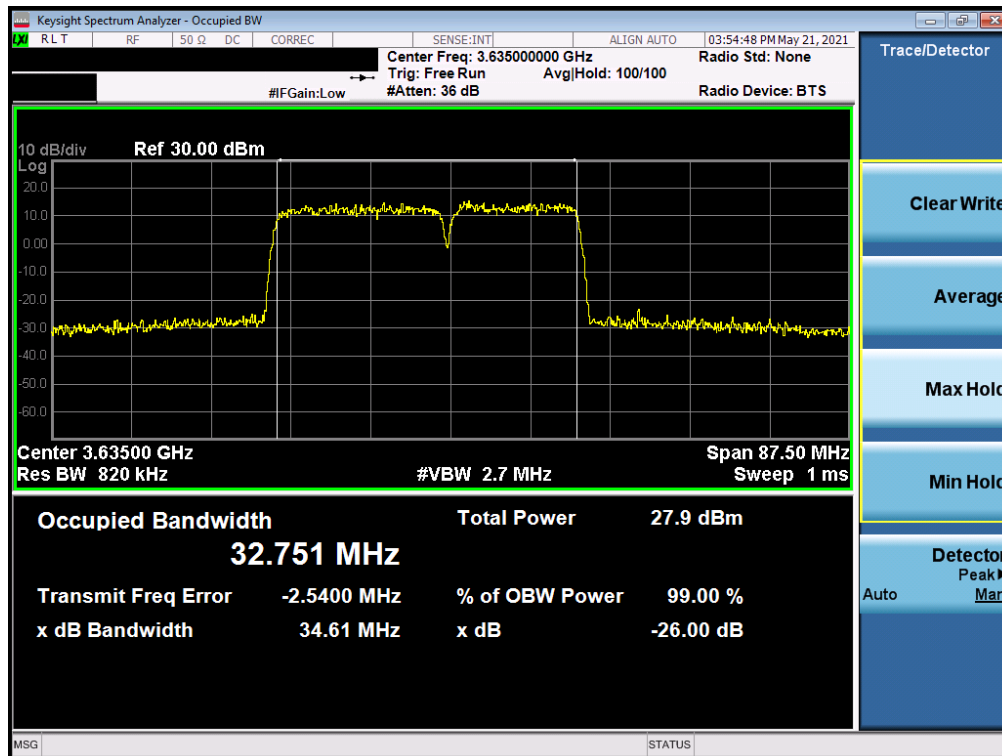


Plot 7-10. Occupied Bandwidth Plot (ULCA LTE Band 48 - 20+20MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 20 of 63

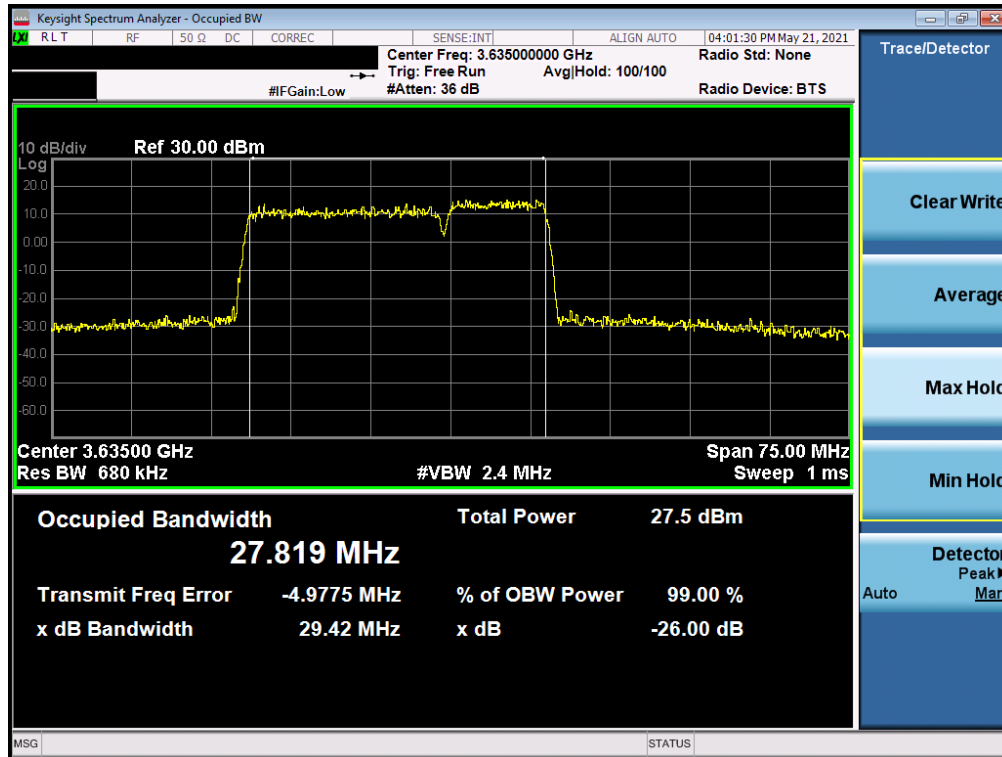


Plot 7-11. Occupied Bandwidth Plot (ULCA LTE Band 48 - 20+15MHz QPSK - Full RB Configuration)

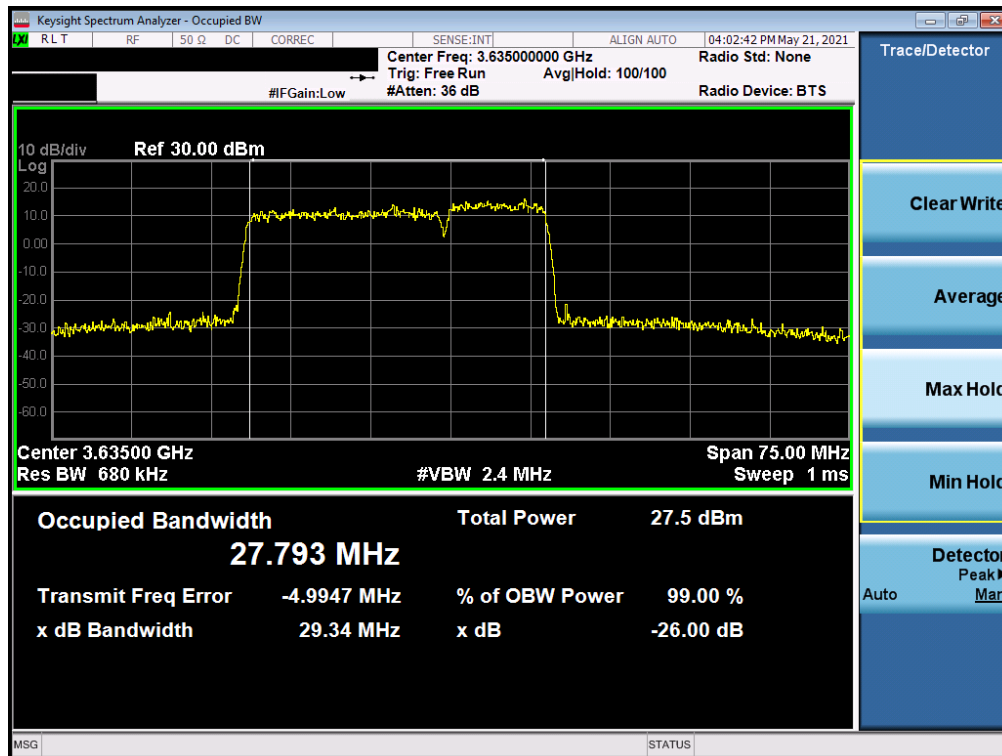


Plot 7-12. Occupied Bandwidth Plot (ULCA LTE Band 48 - 20+15MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 21 of 63

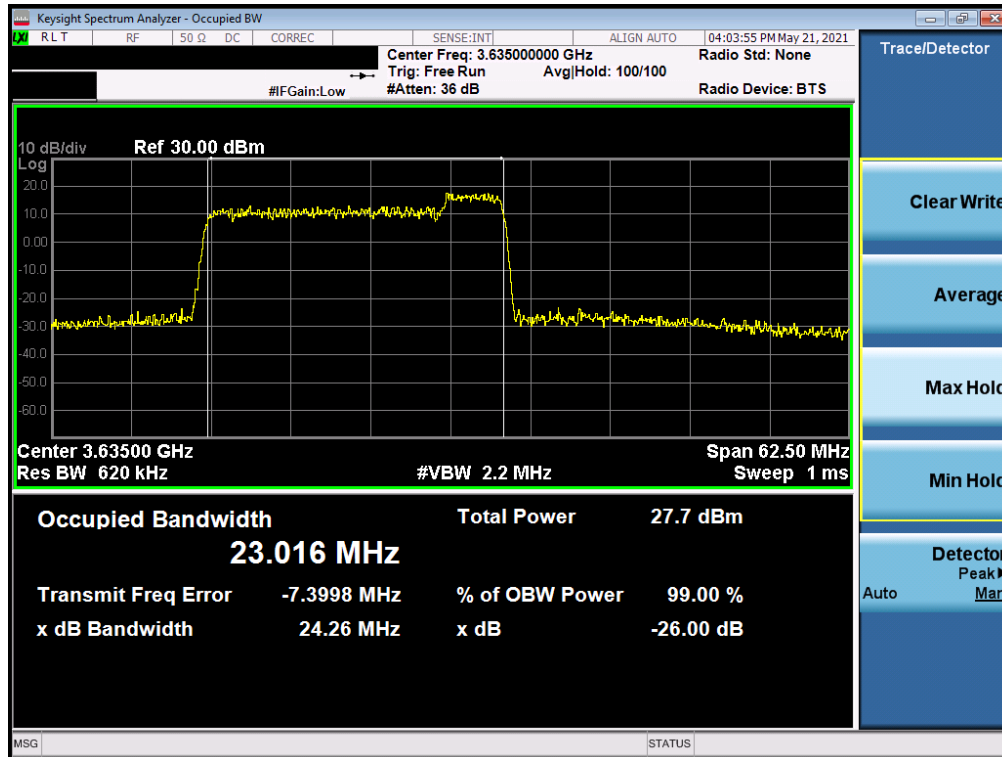


Plot 7-13. Occupied Bandwidth Plot (ULCA LTE Band 48 - 20+10MHz QPSK - Full RB Configuration)

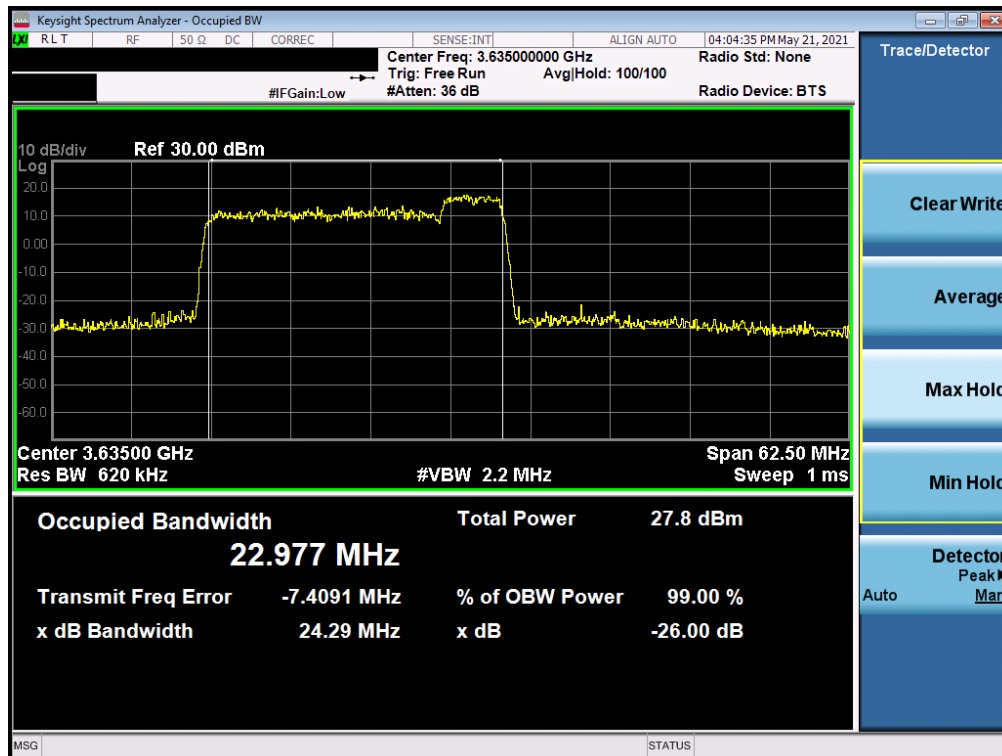


Plot 7-14. Occupied Bandwidth Plot (ULCA LTE Band 48 - 20+10MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF711U1	 PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset	Page 22 of 63



Plot 7-15. Occupied Bandwidth Plot (ULCA LTE Band 48 - 20+5MHz QPSK - Full RB Configuration)



Plot 7-16. Occupied Bandwidth Plot (ULCA LTE Band 48 - 20+5MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 23 of 63

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.

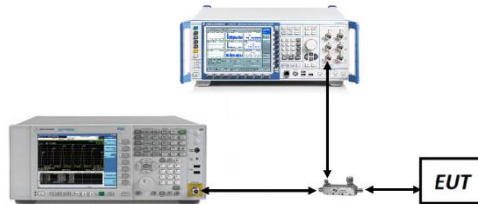


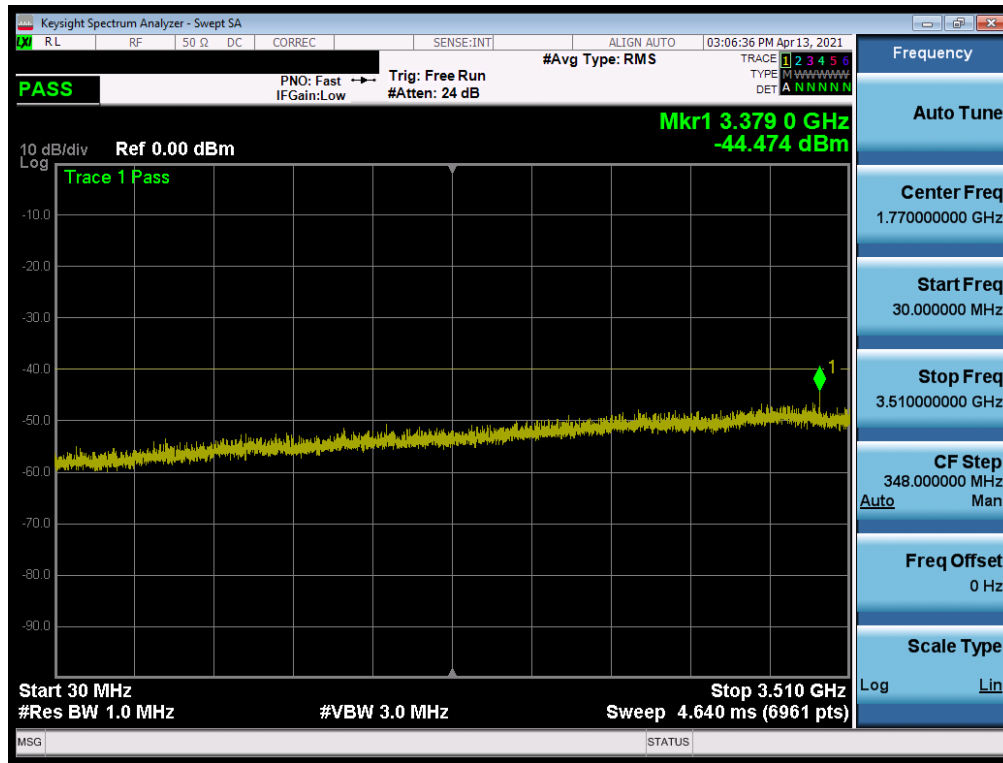
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

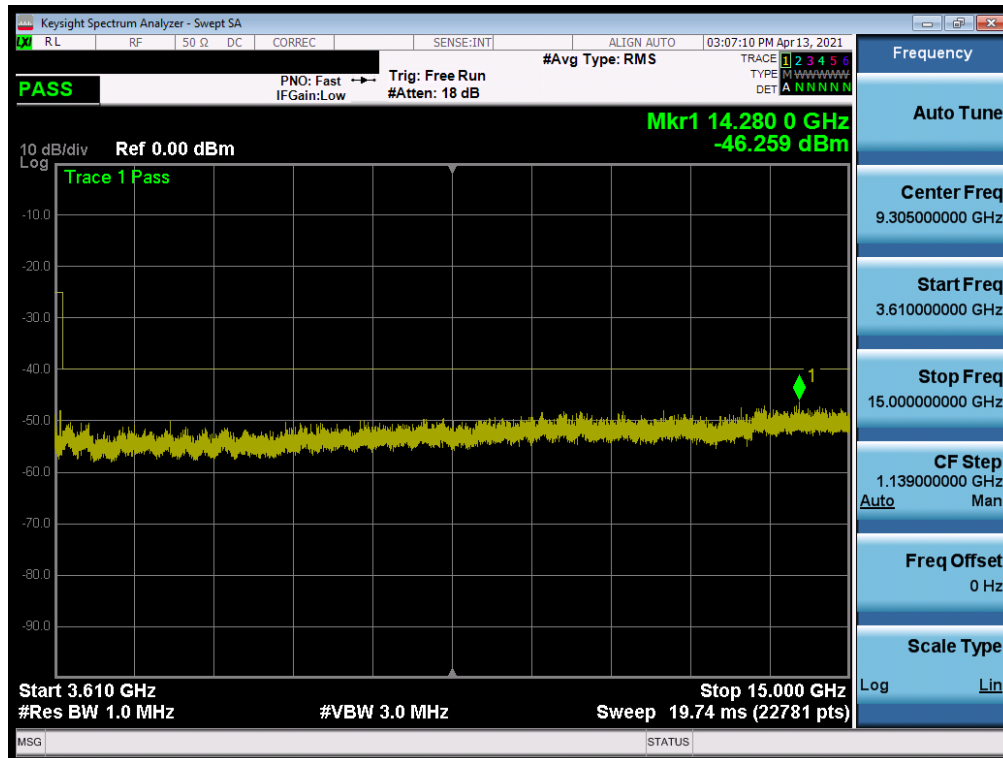
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the 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: A3LSMF711U1	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset
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LTE Band 48

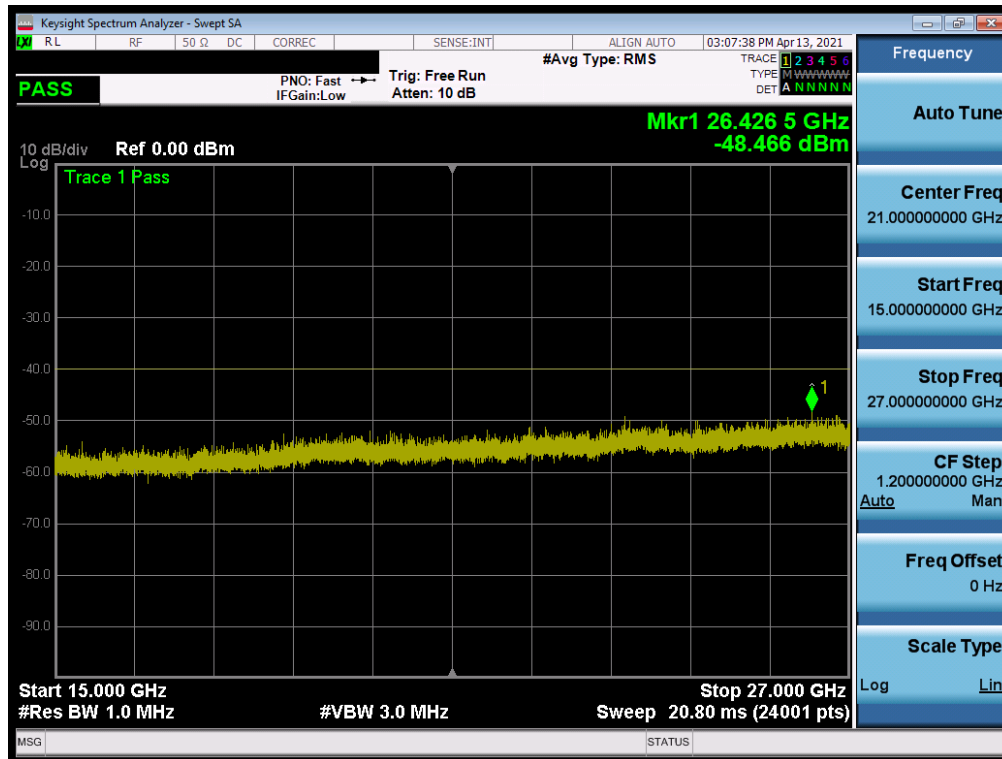


Plot 7-17. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

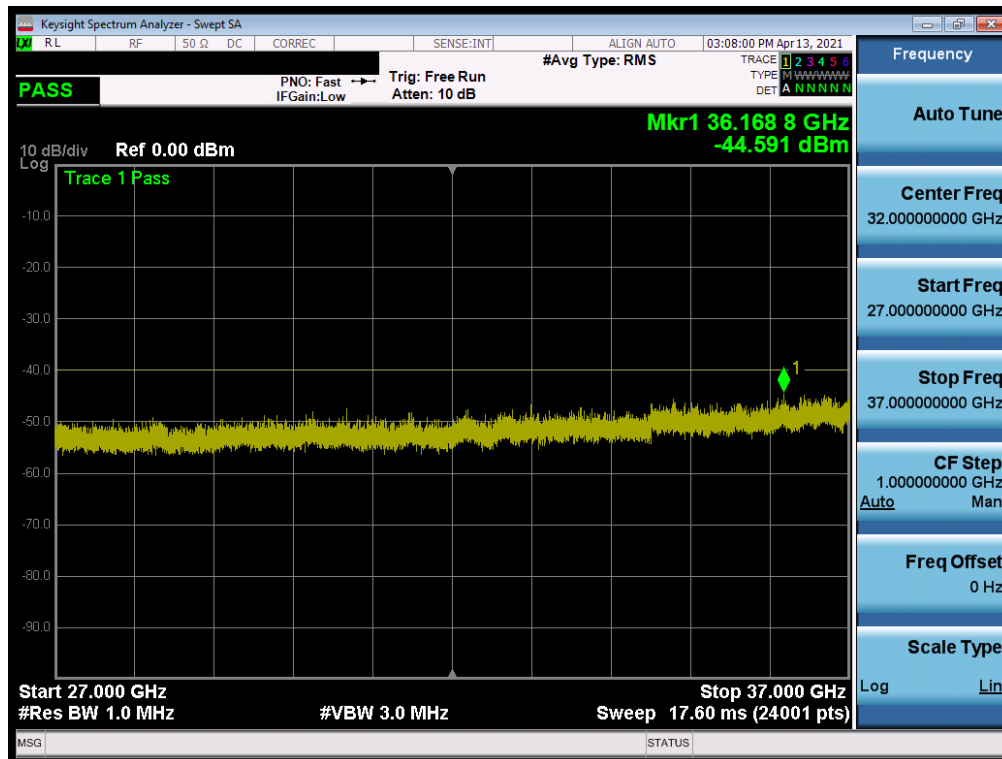


Plot 7-18. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 25 of 63

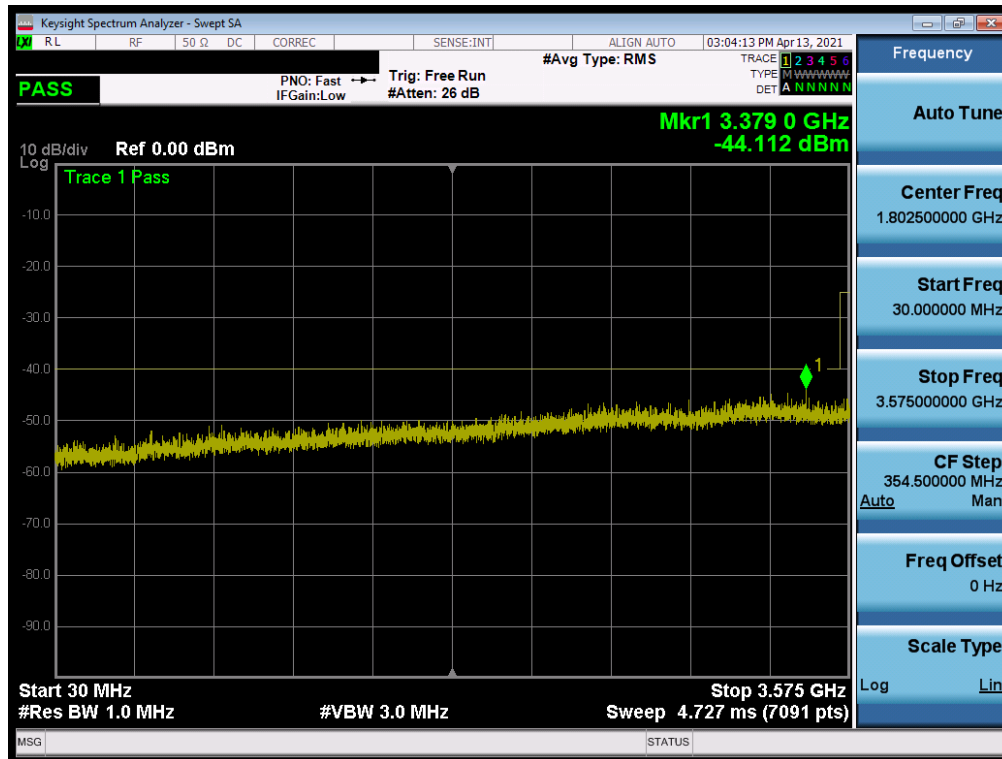


Plot 7-19. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

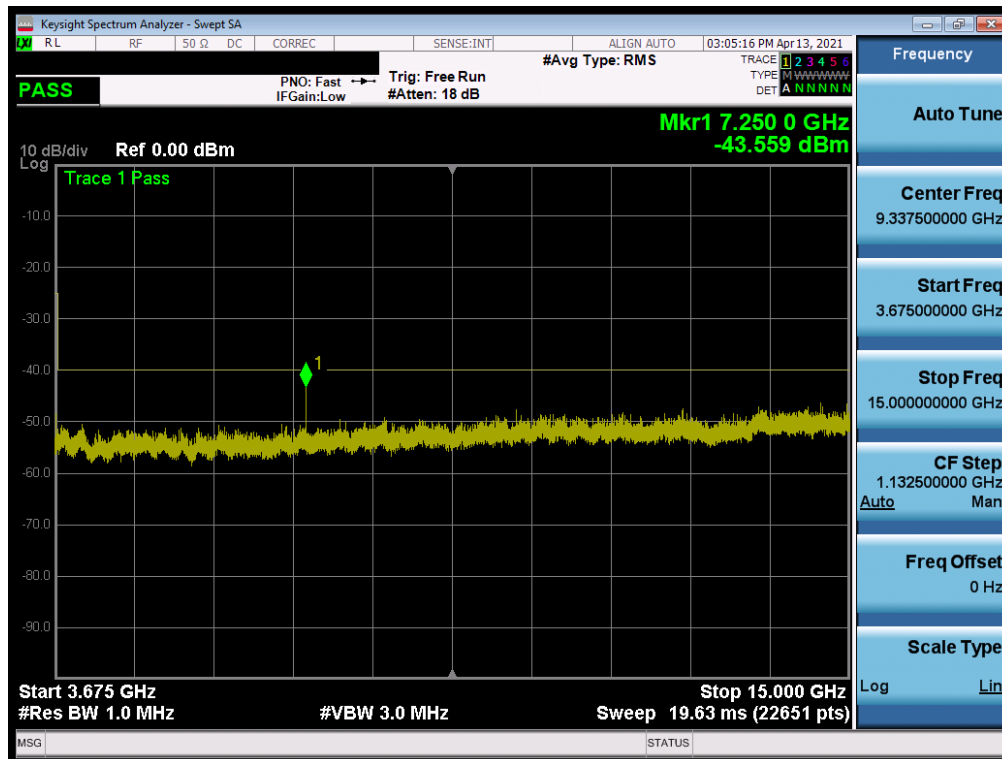


Plot 7-20. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 26 of 63

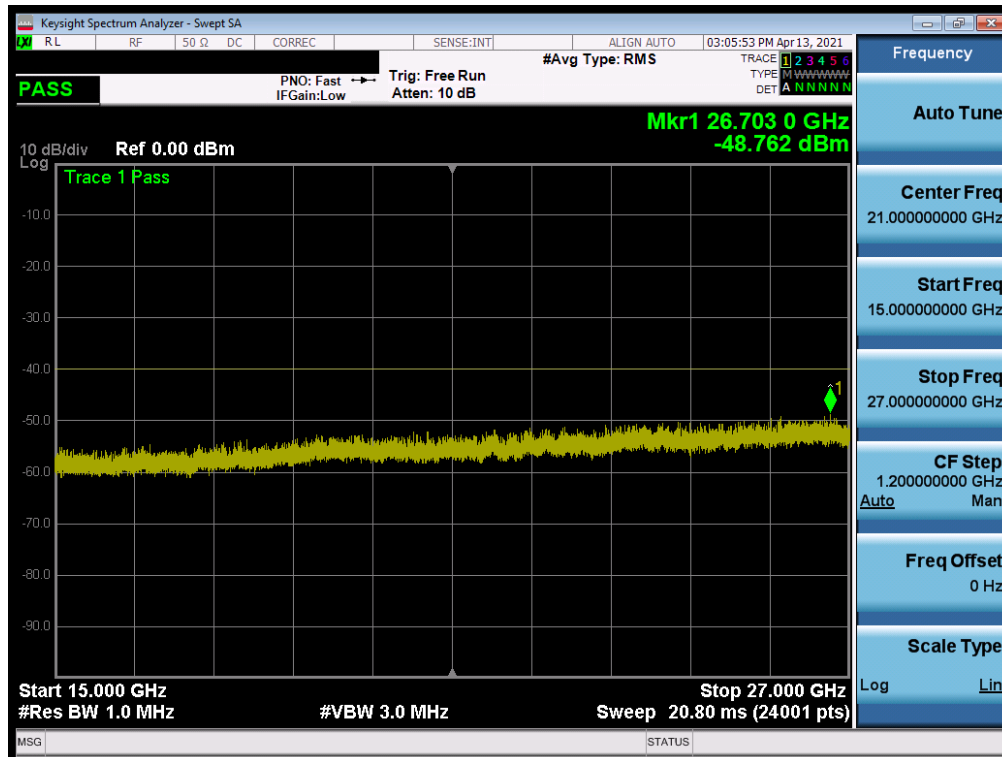


Plot 7-21. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

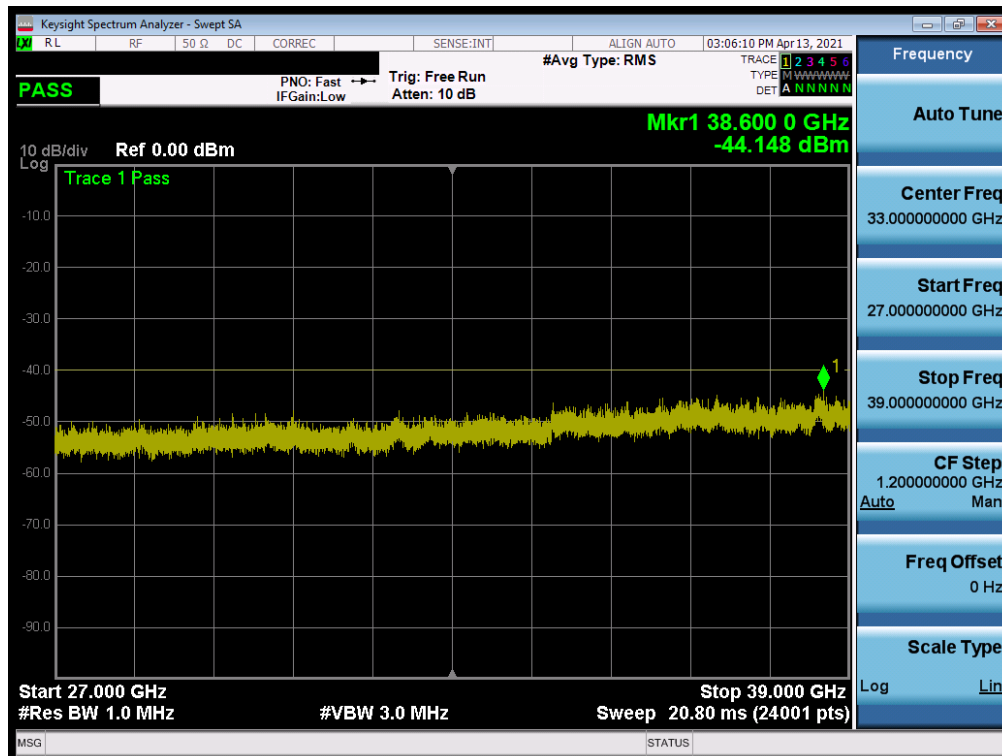


Plot 7-22. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 27 of 63

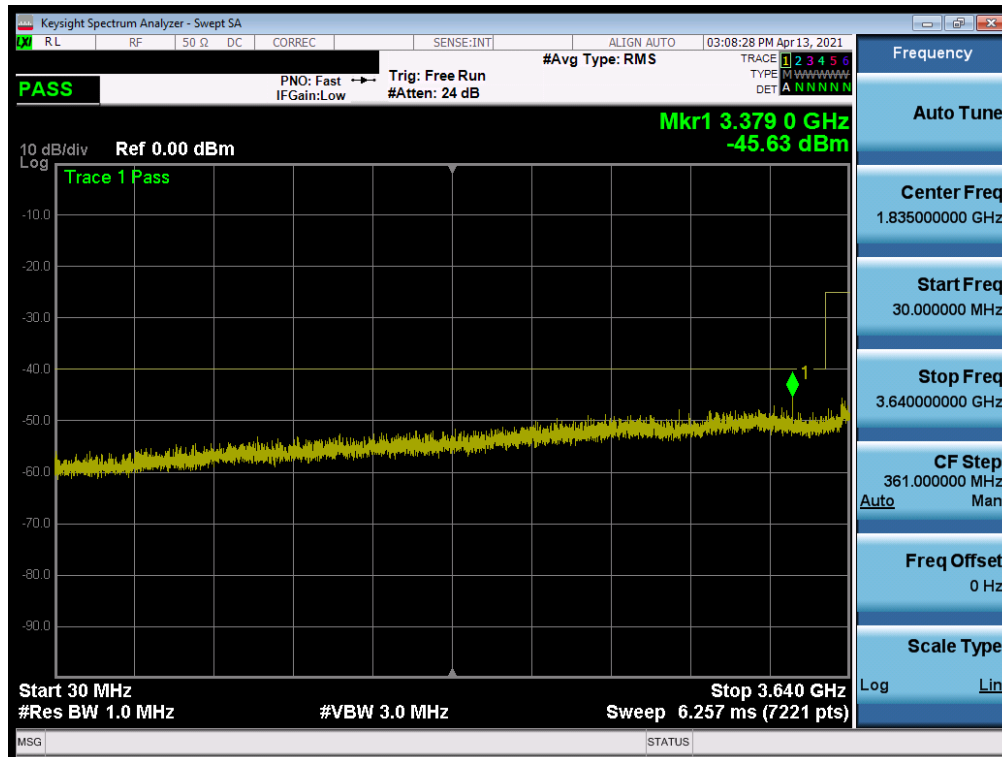


Plot 7-23. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

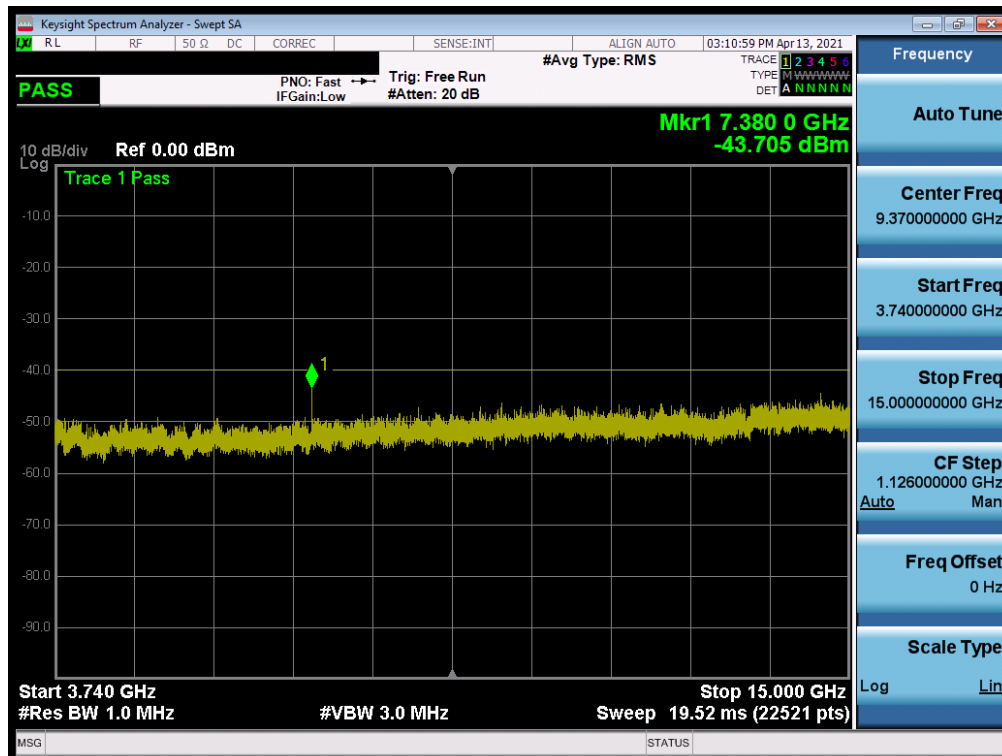


Plot 7-24. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 28 of 63

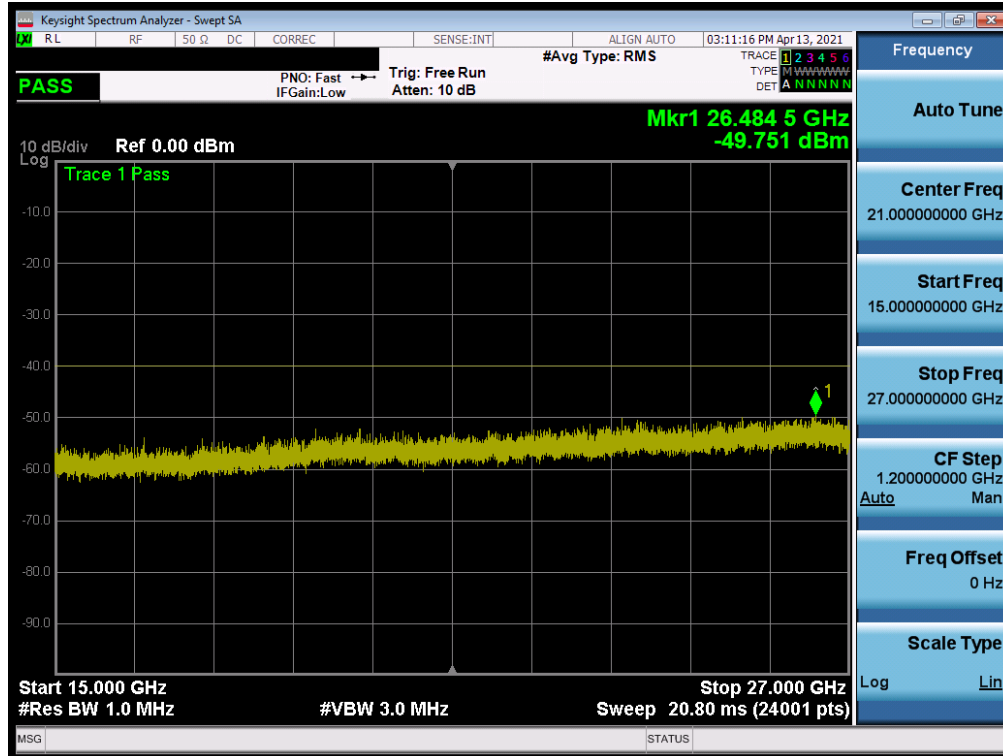


Plot 7-25. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

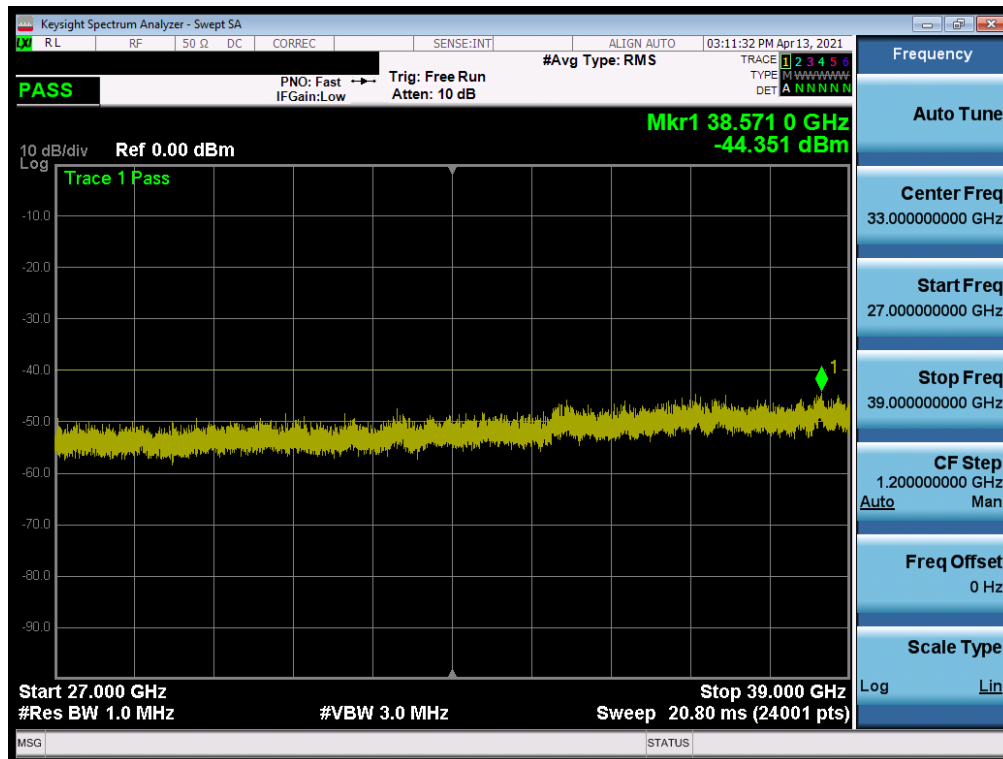


Plot 7-26. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: A3LSMF711U1	 PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset	Page 29 of 63



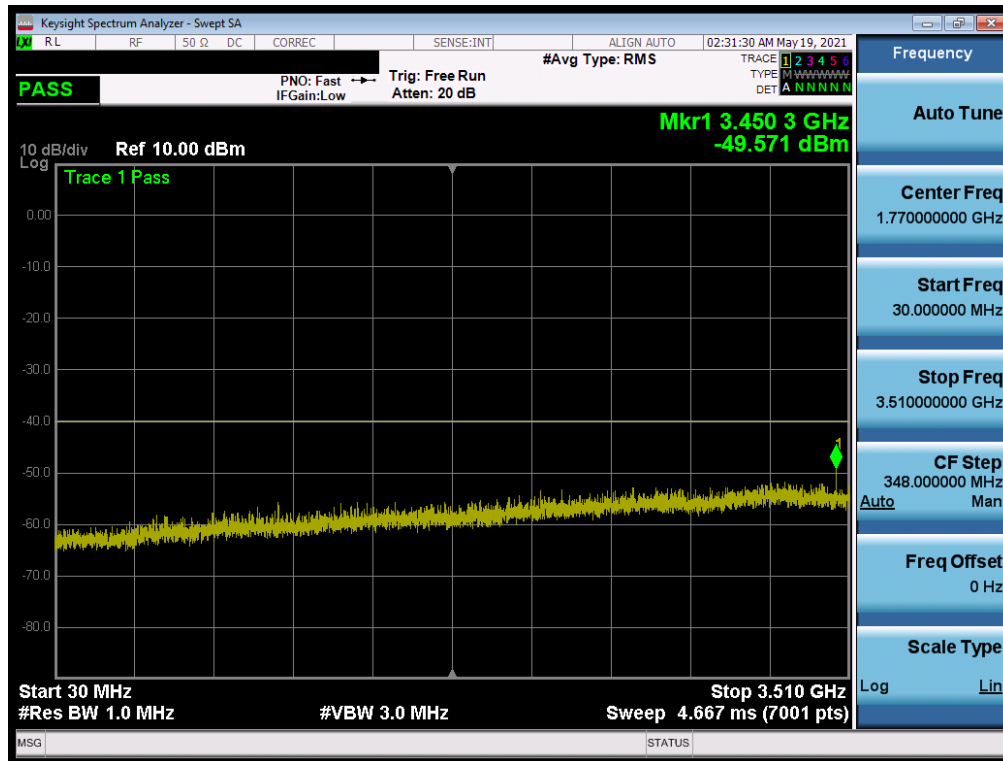
Plot 7-27. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)



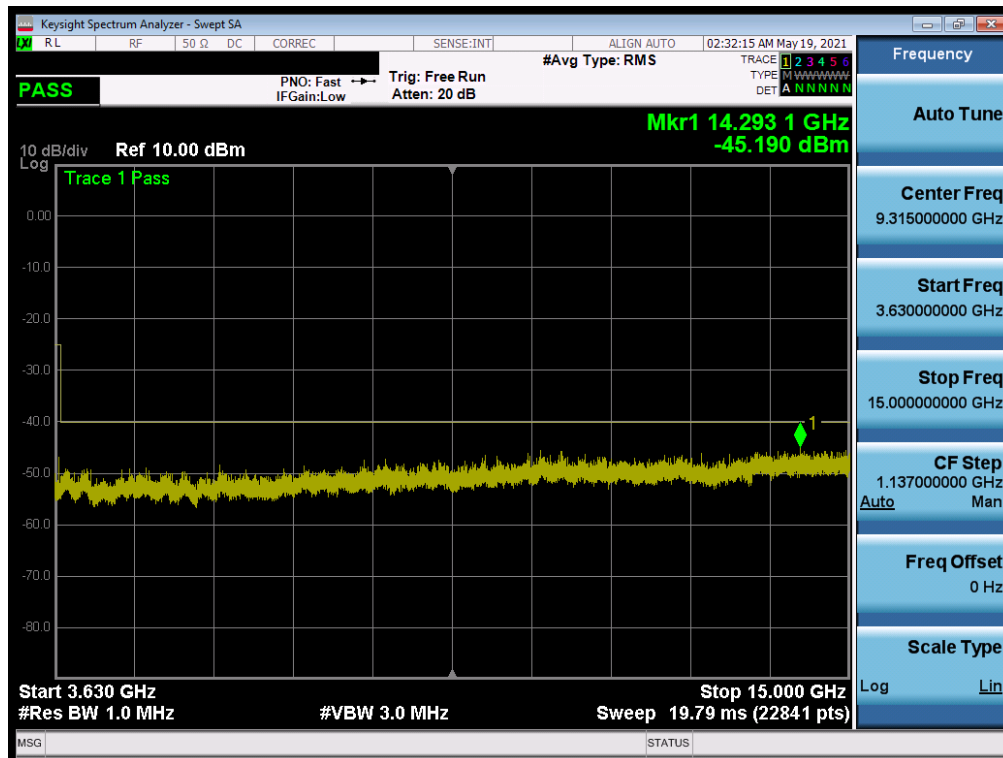
Plot 7-28. Conducted Spurious Plot (LTE Band 48 - 20MHz QPSK - RB Size 1, RB Offset 0 - High Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 30 of 63

ULCA LTE Band 48

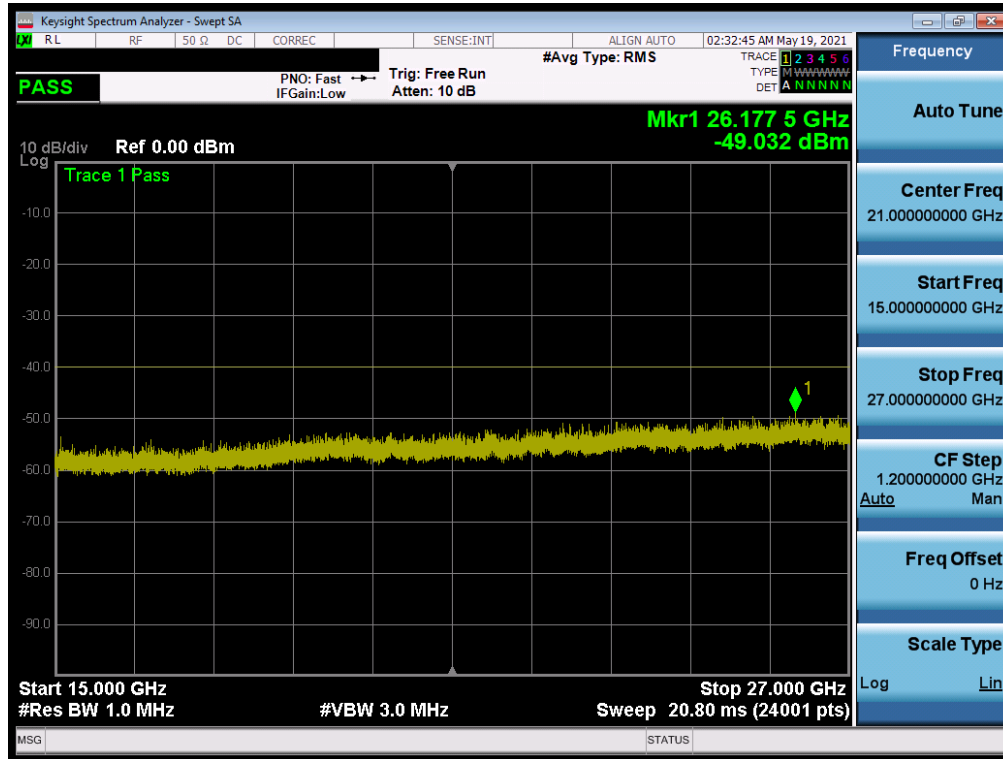


Plot 7-29. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - Low Channel)

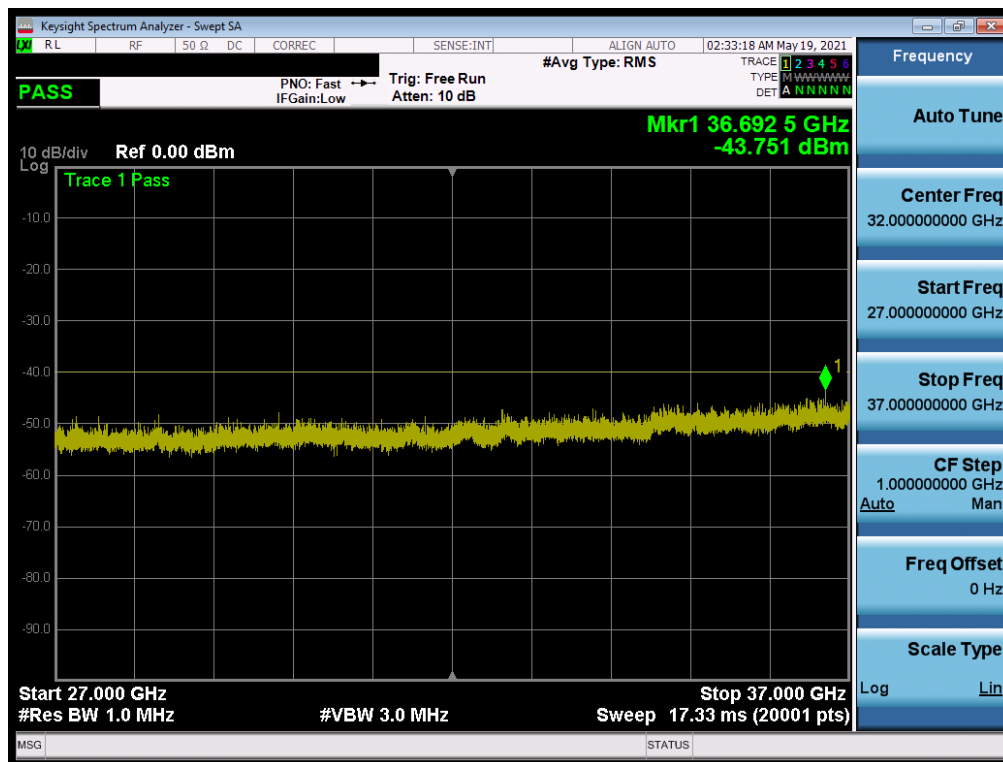


Plot 7-30. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - Low Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 31 of 63

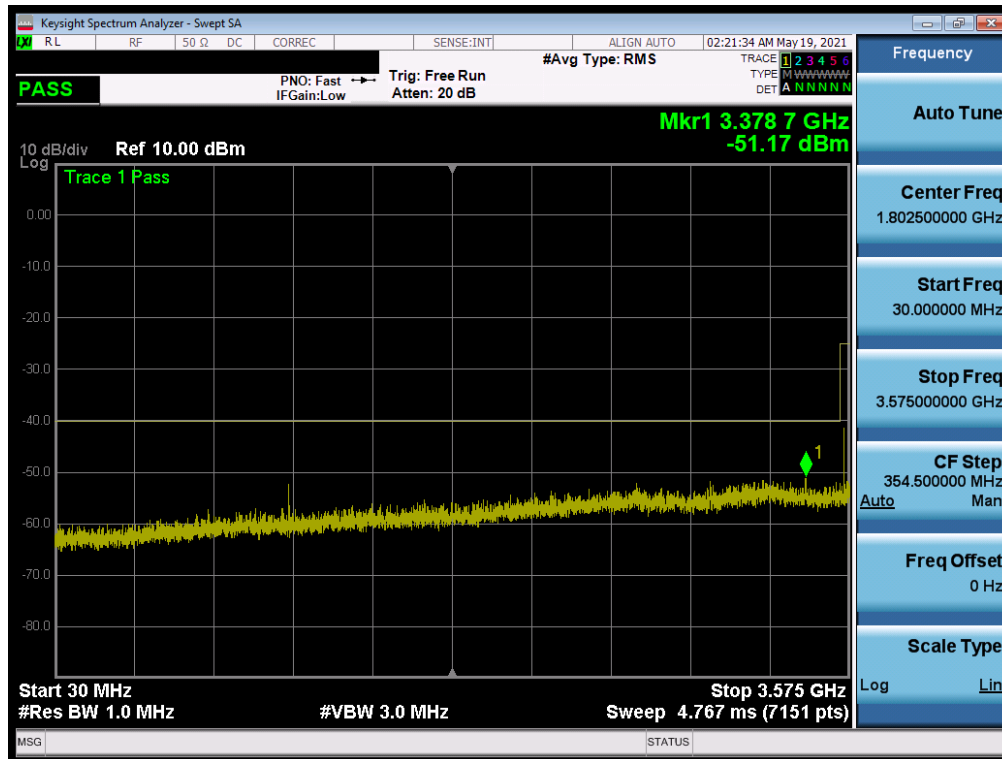


Plot 7-31. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - Low Channel)

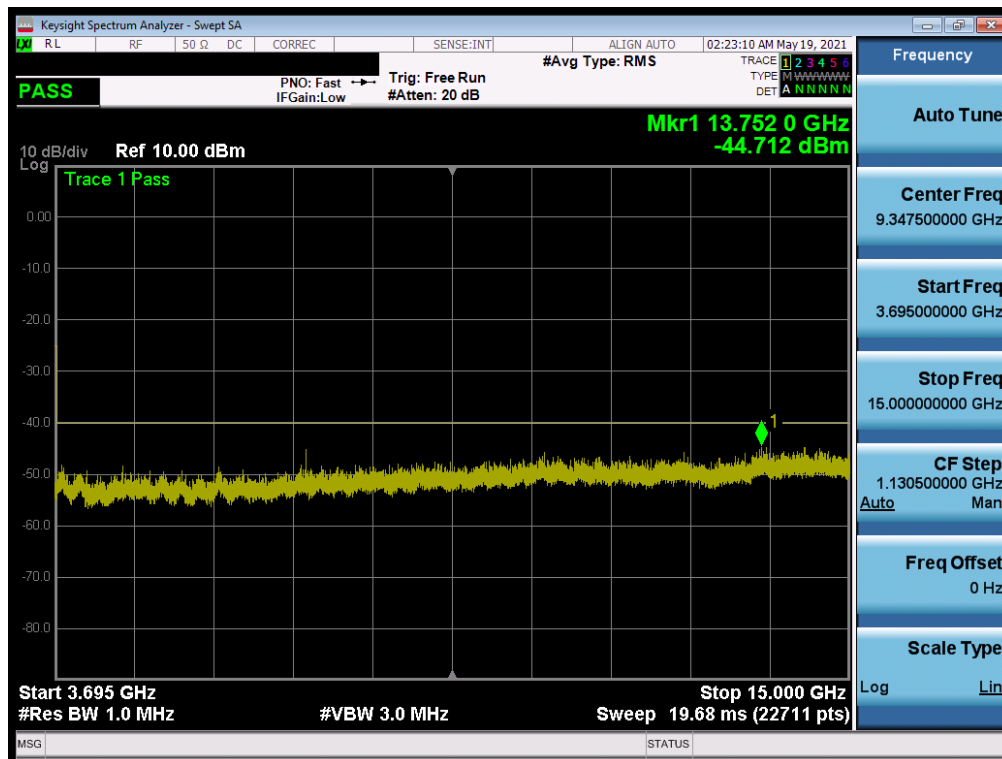


Plot 7-32. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - Low Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 32 of 63

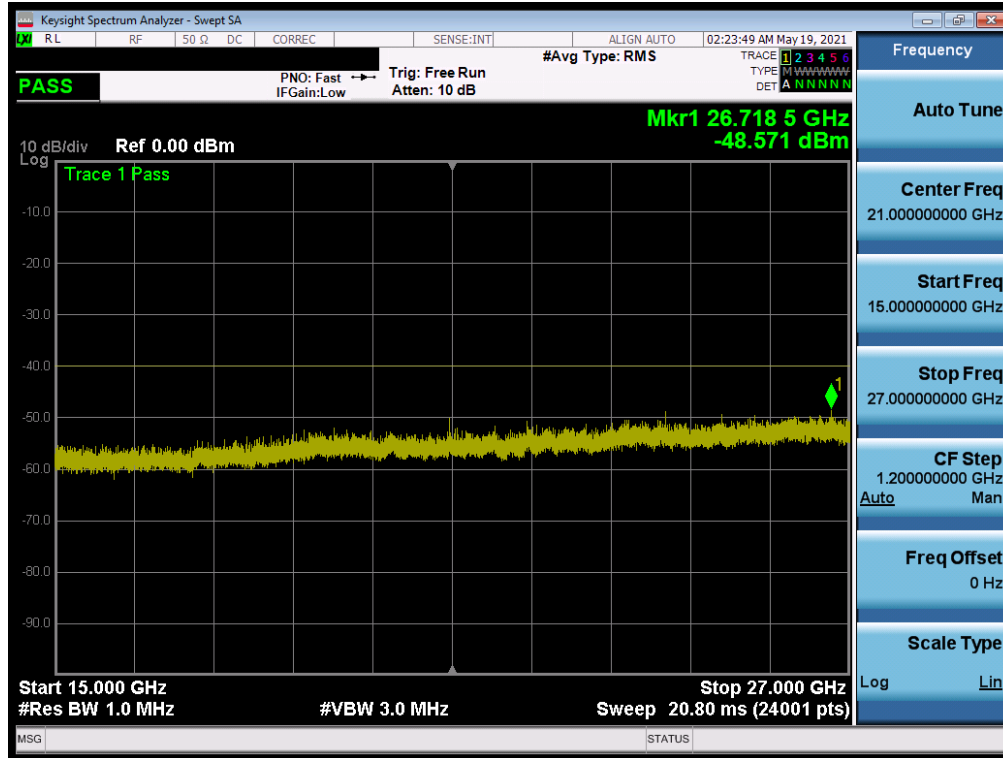


Plot 7-33. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - Mid Channel)

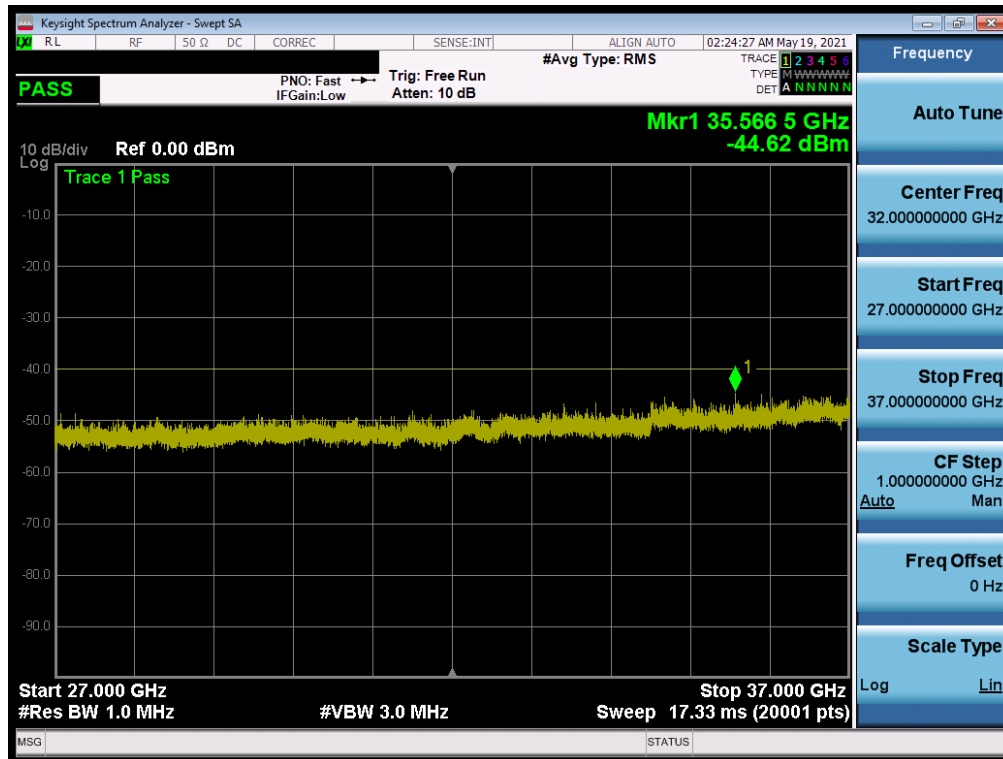


Plot 7-34. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - Mid Channel)

FCC ID: A3LSMF711U1	 PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset	Page 33 of 63

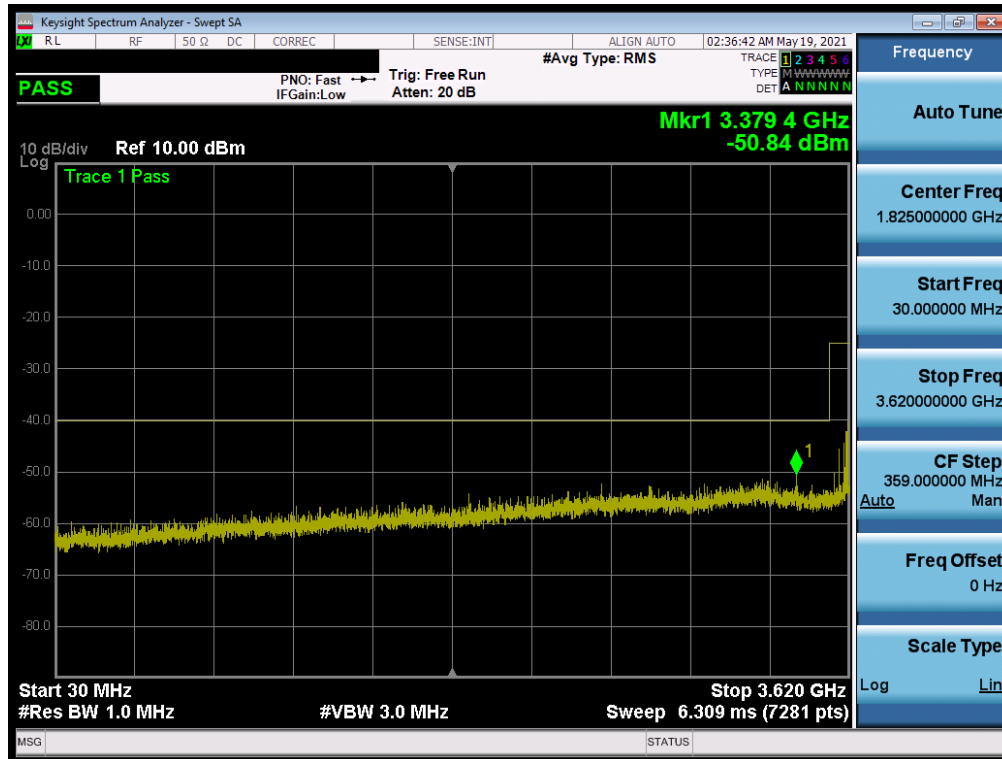


Plot 7-35. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - Mid Channel)

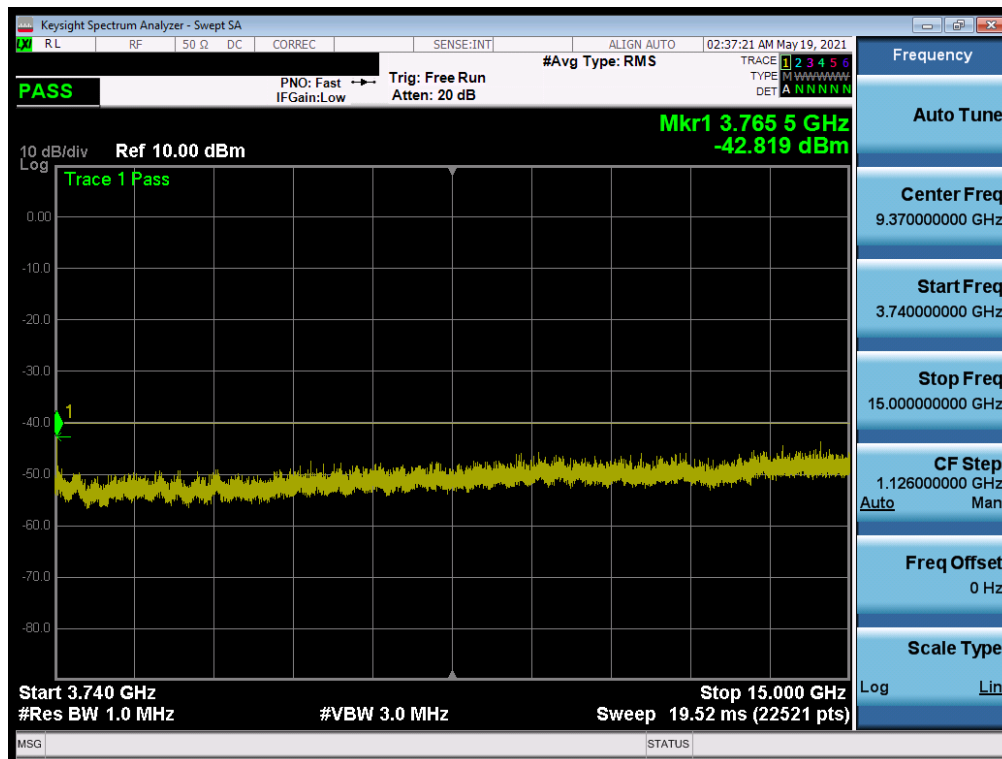


Plot 7-36. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - Mid Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 34 of 63

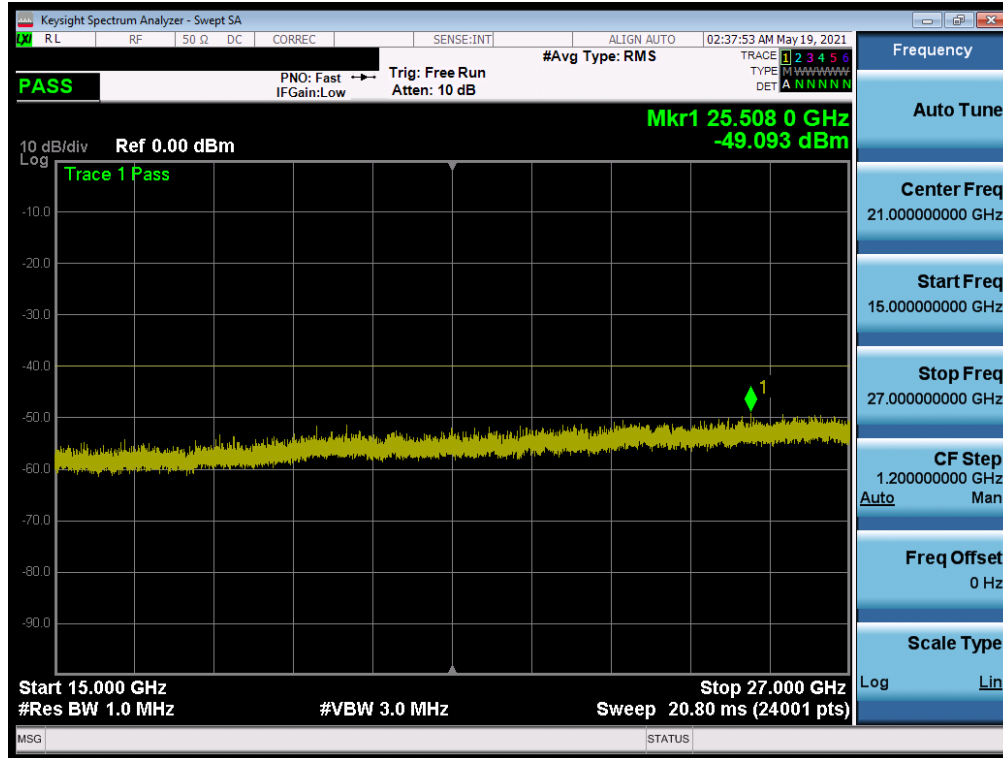


Plot 7-37. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - High Channel)

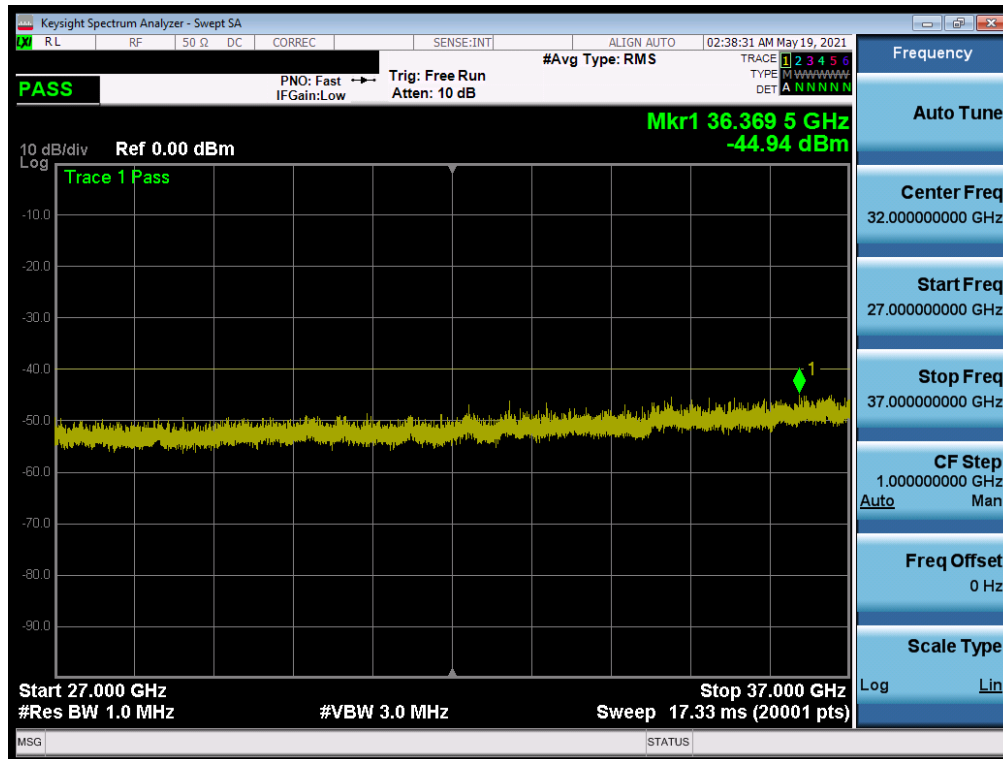


Plot 7-38. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - High Channel)

FCC ID: A3LSMF711U1	 PCTEST Proud to be part of 	PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 35 of 63



Plot 7-39. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - High Channel)



Plot 7-40. Conducted Spurious Plot (ULCA LTE Band 48 - 20+20MHz QPSK - High Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 36 of 63

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.

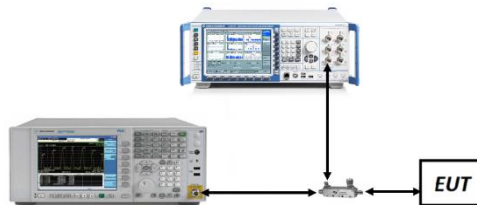


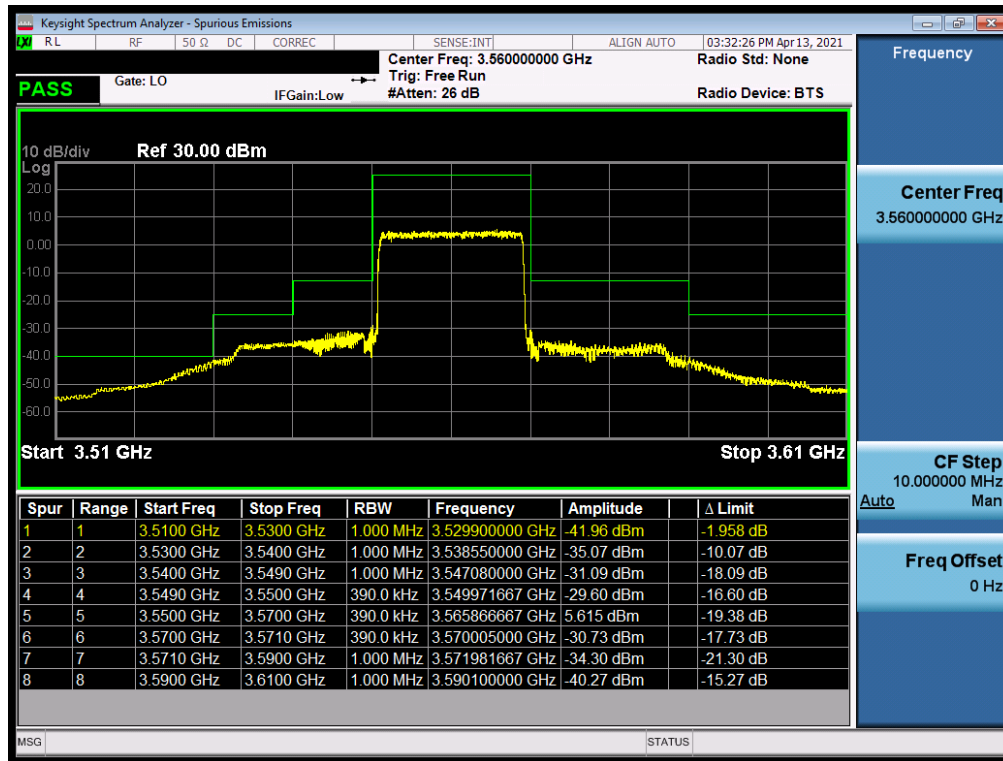
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

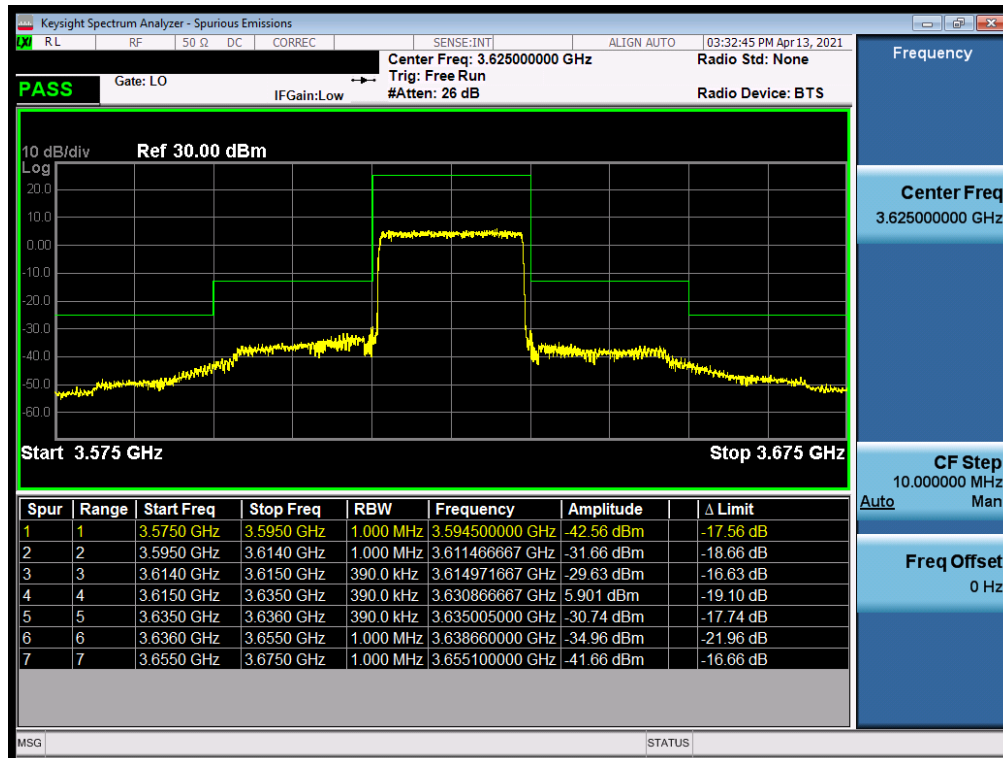
None

FCC ID: A3LSMF711U1	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset
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LTE Band 48

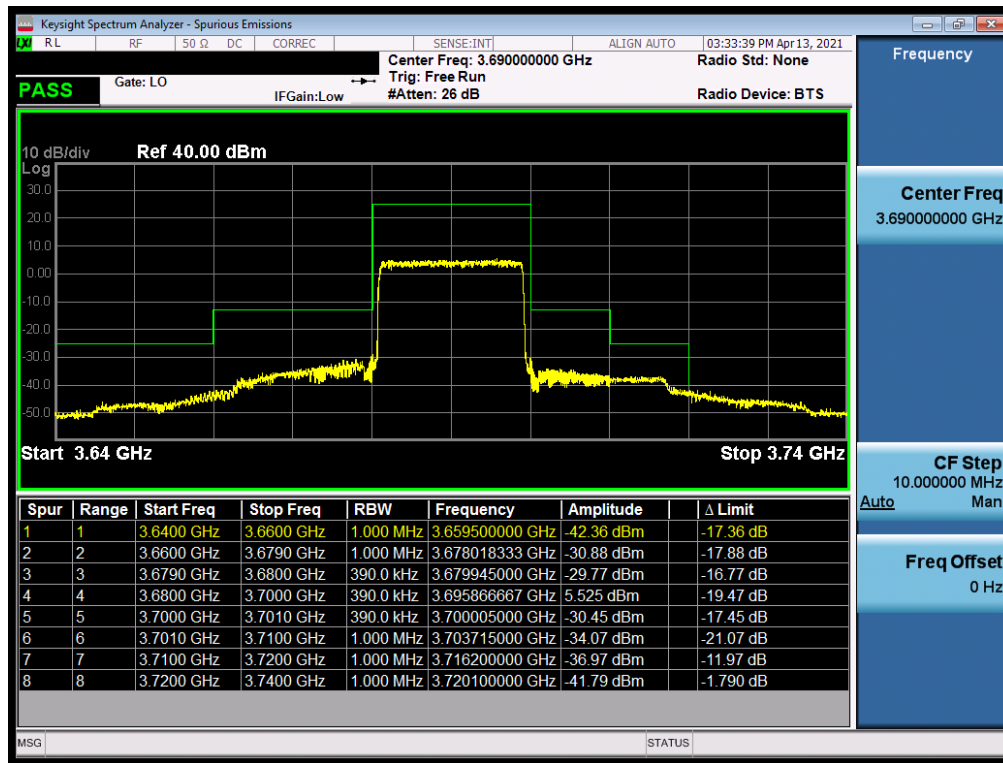


Plot 7-41. Channel Edge Plot (LTE Band 48 - 20MHz QPSK - Low Channel)

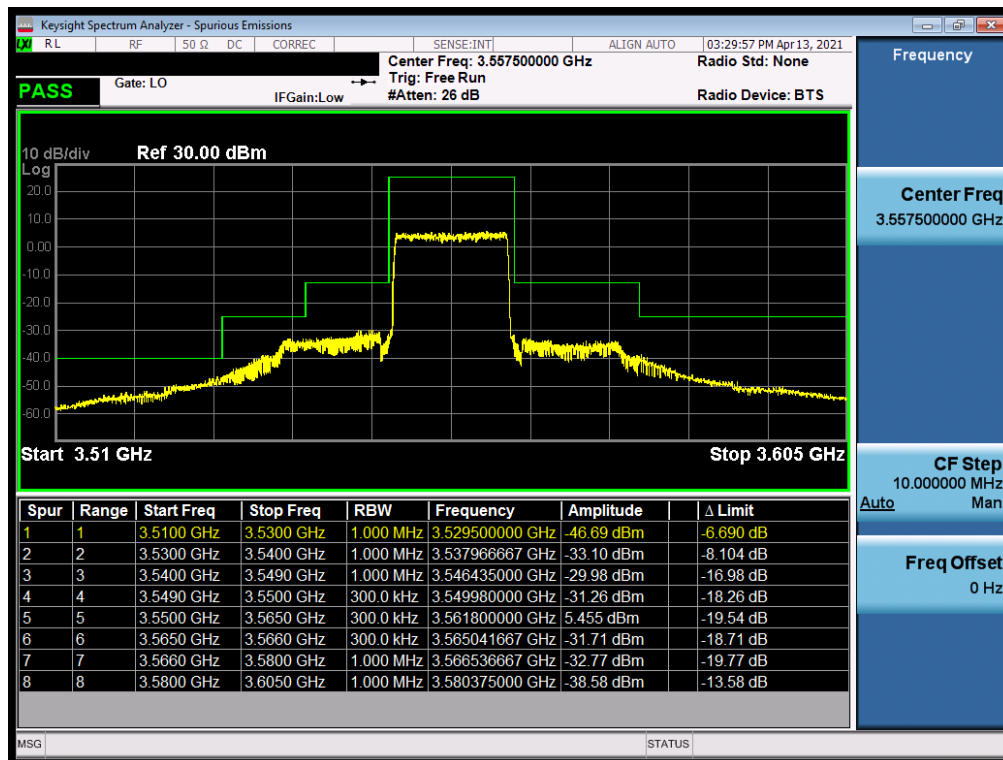


Plot 7-42. Channel Edge Plot (LTE Band 48 - 20MHz QPSK - Mid Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 38 of 63

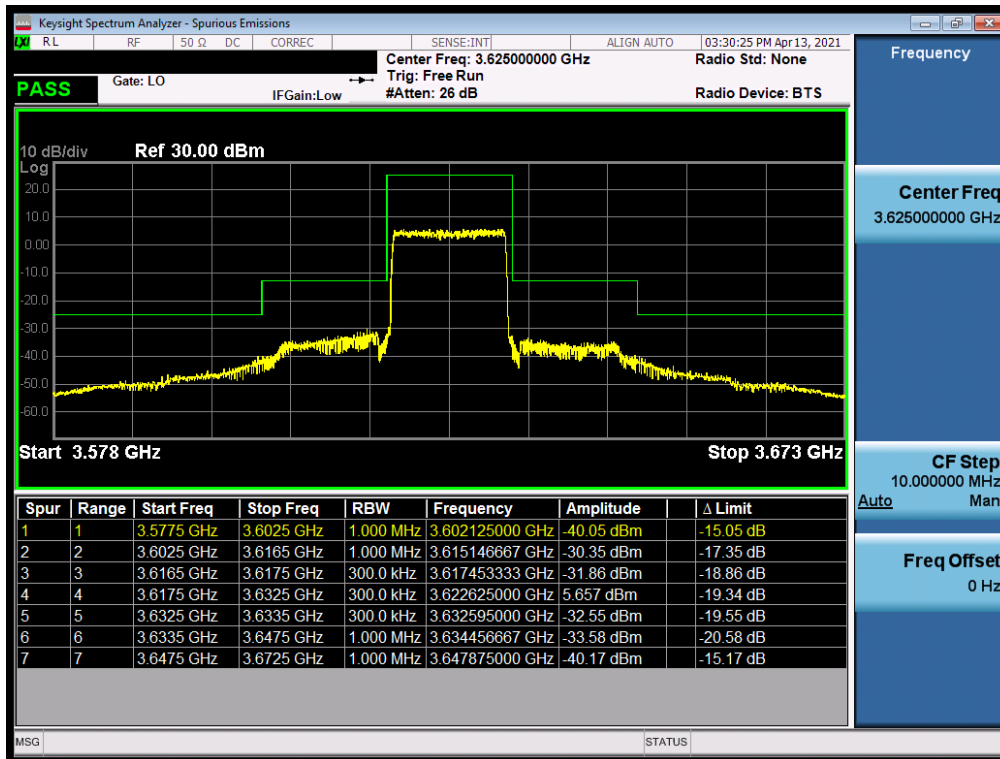


Plot 7-43. Channel Edge Plot (LTE Band 48 - 20MHz QPSK - High Channel)

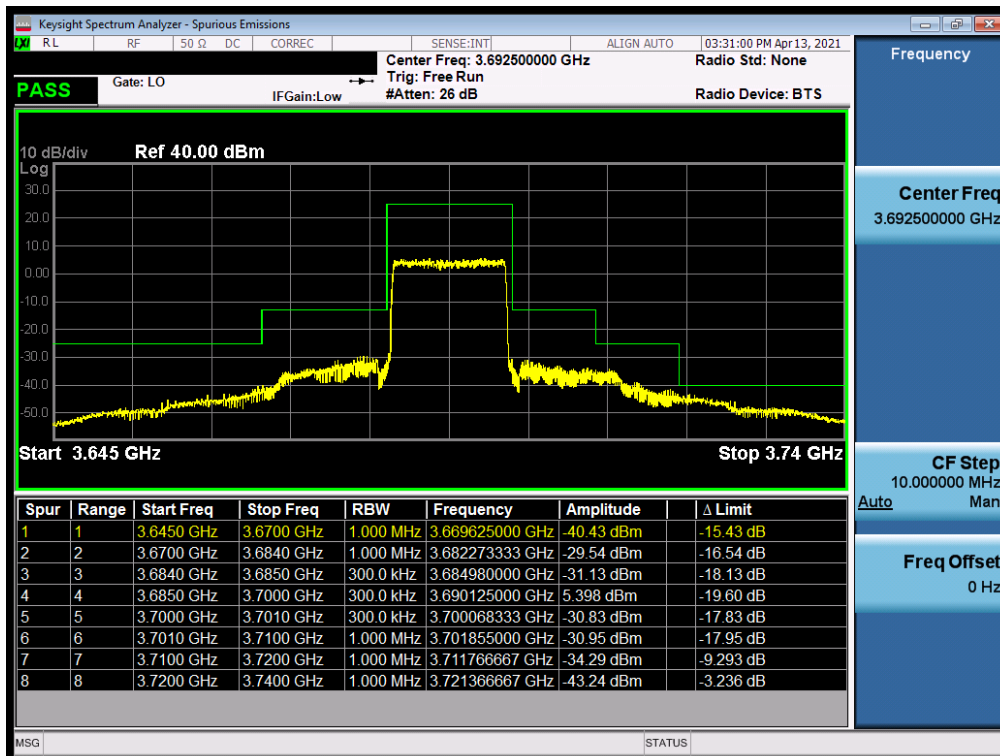


Plot 7-44. Channel Edge Plot (LTE Band 48 - 15MHz QPSK - Low Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 39 of 63

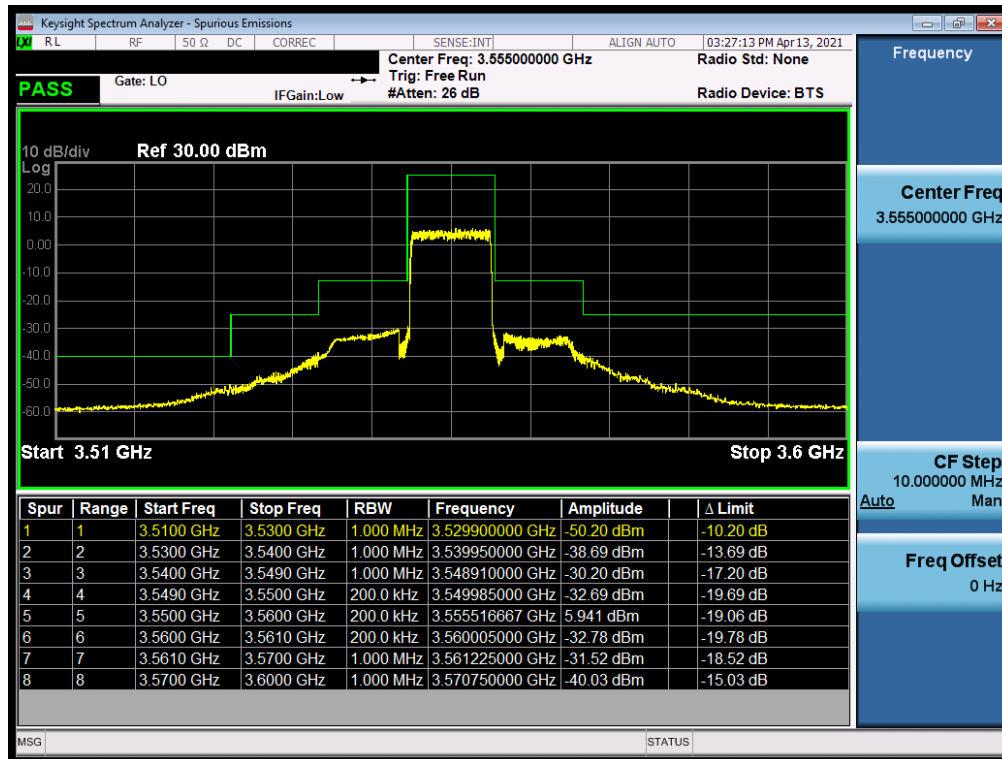


Plot 7-45. Channel Edge Plot (LTE Band 48 - 15MHz QPSK - Mid Channel)

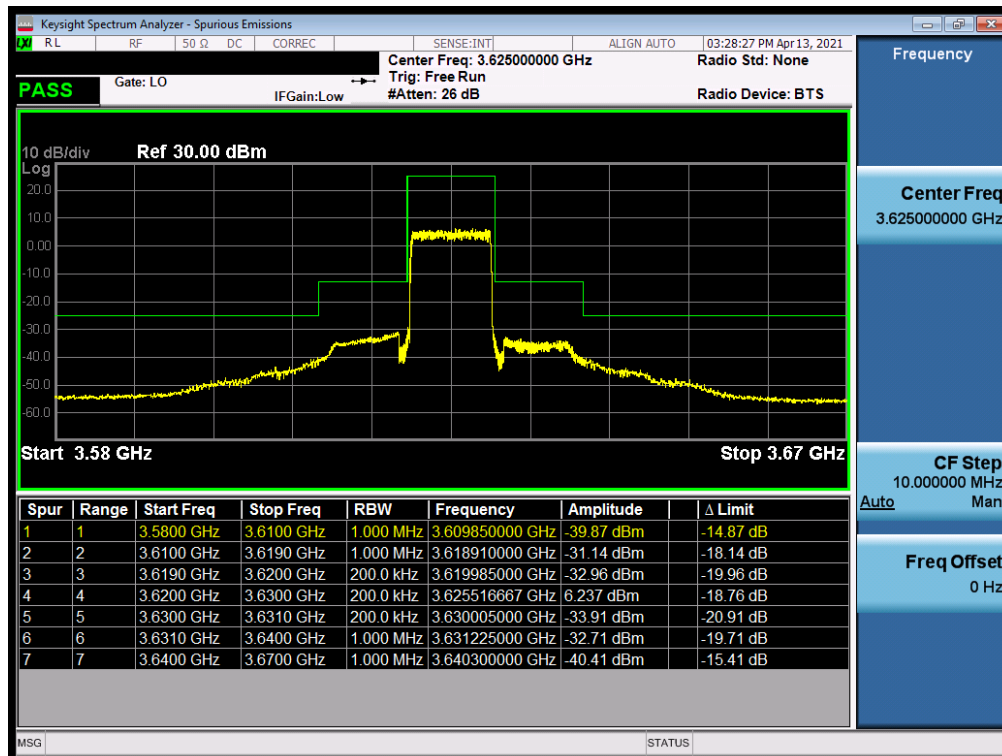


Plot 7-46. Channel Edge Plot (LTE Band 48 - 15MHz QPSK - High Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 40 of 63

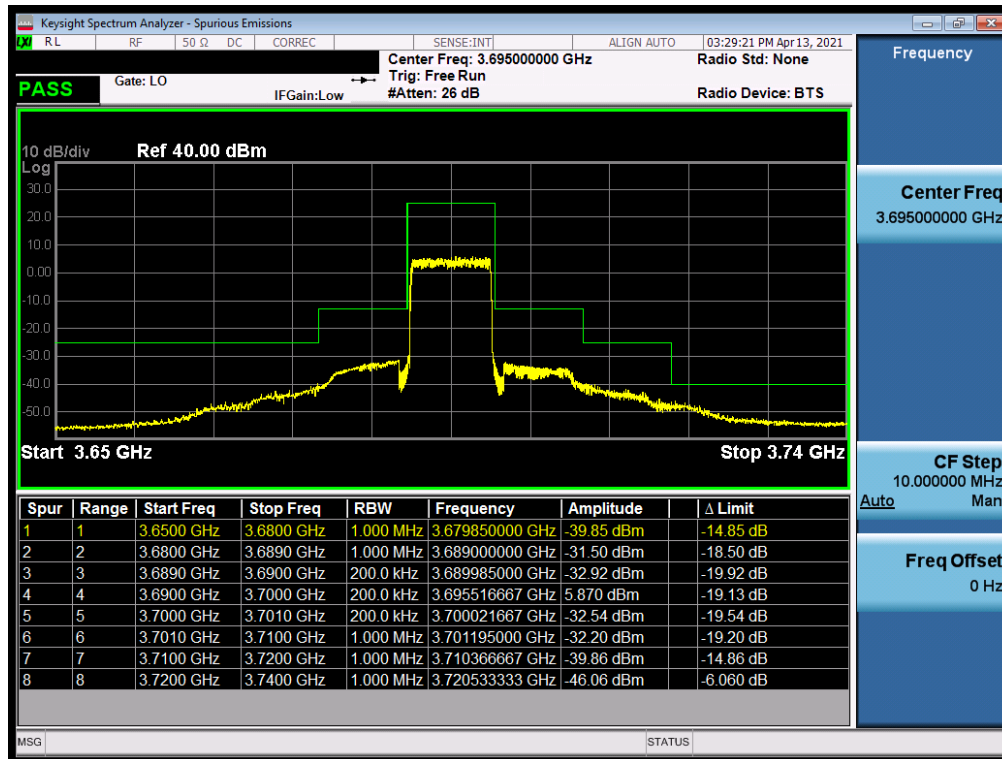


Plot 7-47. Channel Edge Plot (LTE Band 48 - 10MHz QPSK - Low Channel)

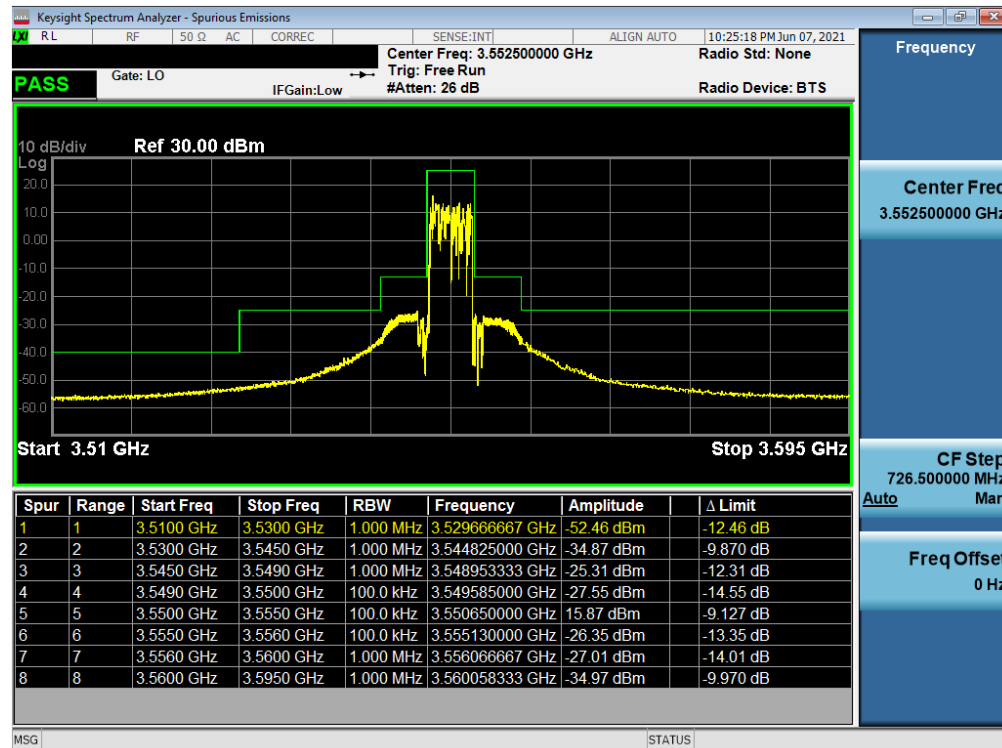


Plot 7-48. Channel Edge Plot (LTE Band 48 - 10MHz QPSK - Mid Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 41 of 63

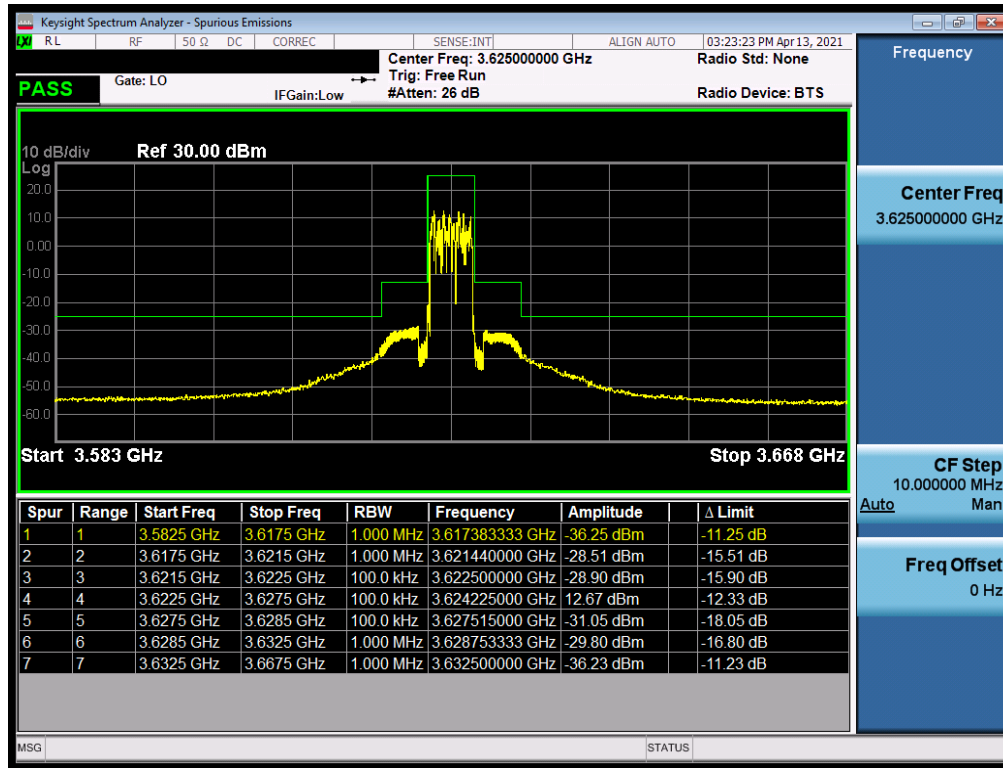


Plot 7-49. Channel Edge Plot (LTE Band 48 - 10MHz QPSK - High Channel)

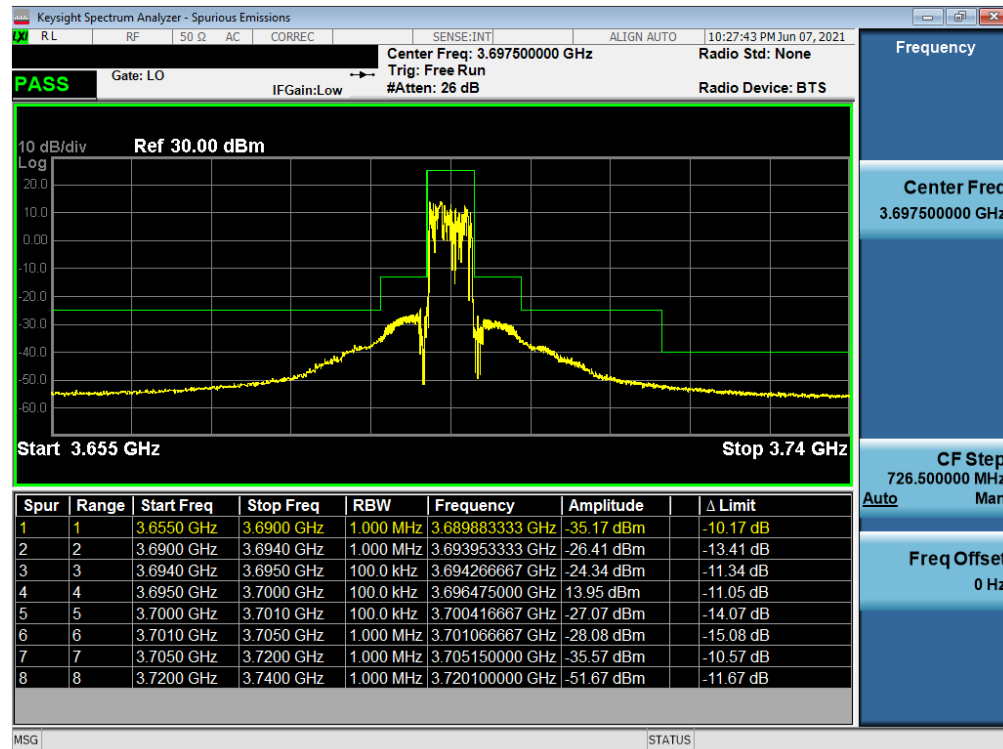


Plot 7-50. Channel Edge Plot (LTE Band 48 - 5MHz QPSK - Low Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 42 of 63



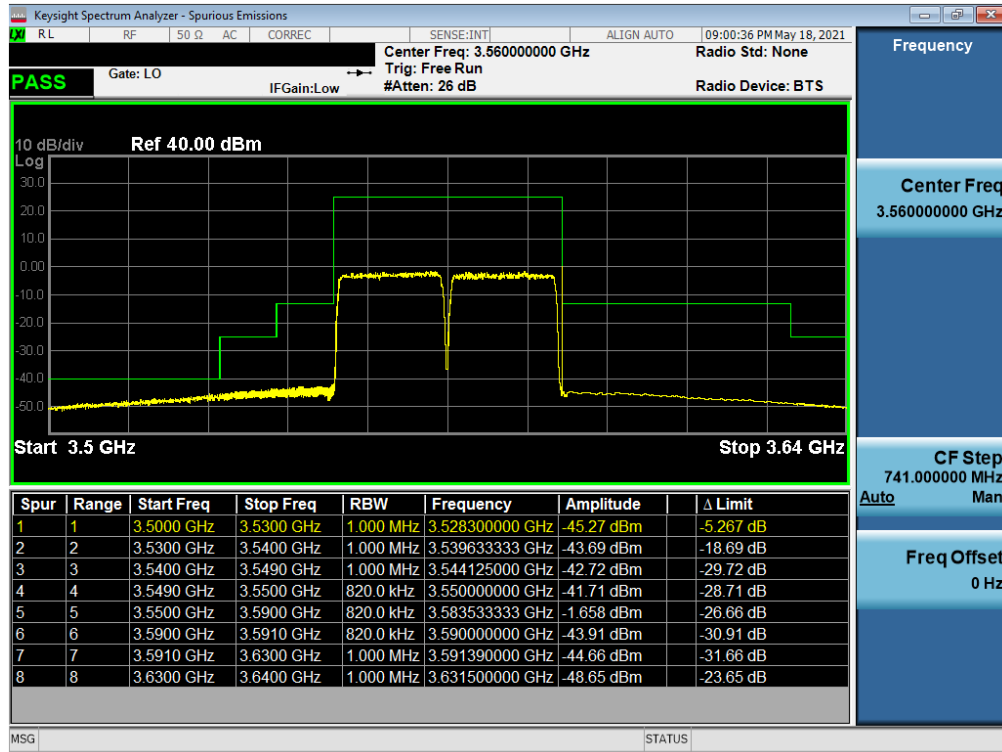
Plot 7-51. Channel Edge Plot (LTE Band 48 - 5MHz QPSK - Mid Channel)



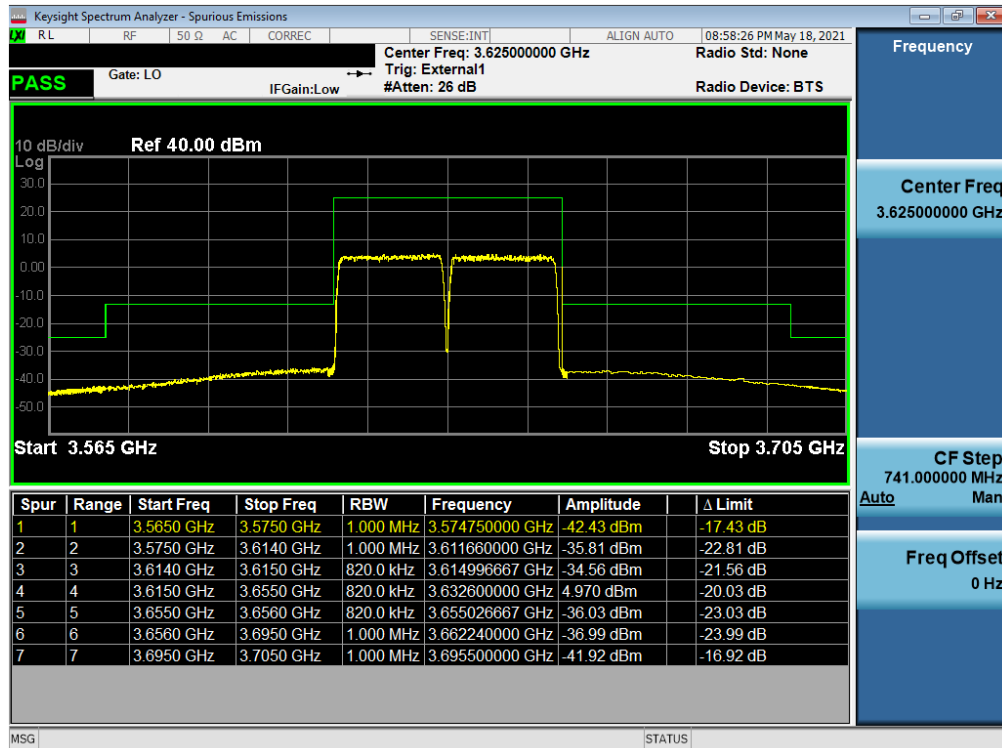
Plot 7-52. Channel Edge Plot (LTE Band 48 - 5MHz QPSK - High Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 43 of 63

ULCA LTE Band 48

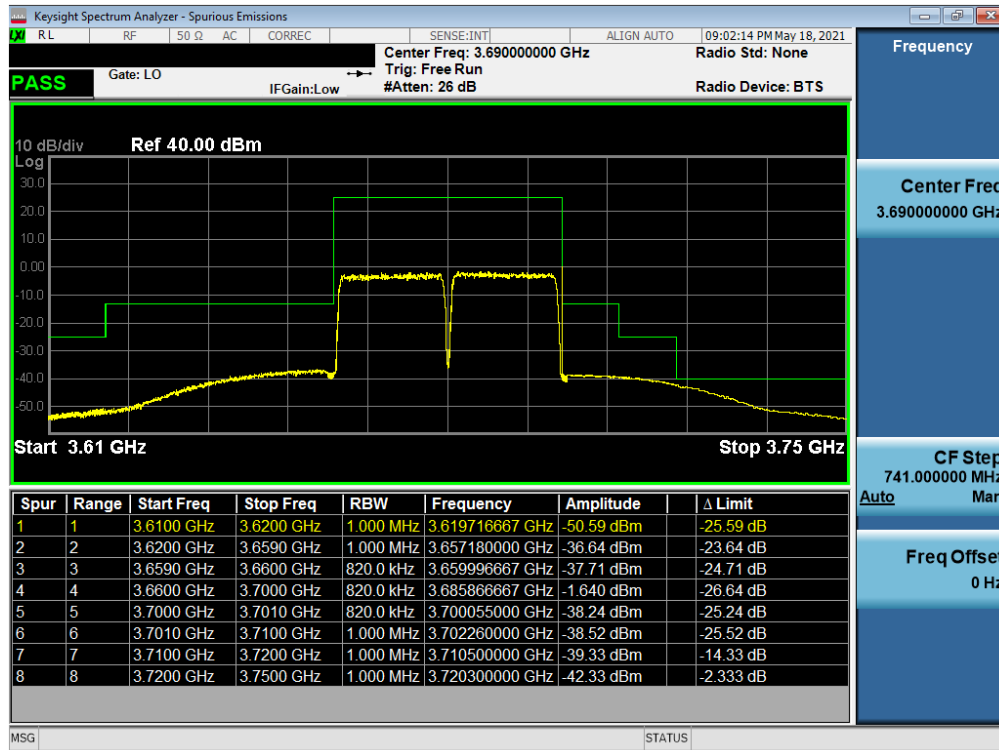


Plot 7-53. Channel Edge Plot (LTE Band 48 – 20+20MHz QPSK - Low Channel)



Plot 7-54. Channel Edge Plot (LTE Band 48 – 20+20MHz QPSK - Mid Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 44 of 63



Plot 7-55. Channel Edge Plot (LTE Band 48 – 20+20MHz QPSK - High Channel)

FCC ID: A3LSMF711U1	PCTEST Proud to be part of element	PART 96 MEASUREMENT REPORT	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset		Page 45 of 63

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: A3LSMF711U1	 PART 96 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2107290086-08.A3L	Test Dates: 4/13/2021- 6/1/2021	EUT Type: Portable Handset	Page 46 of 63

Test Setup

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

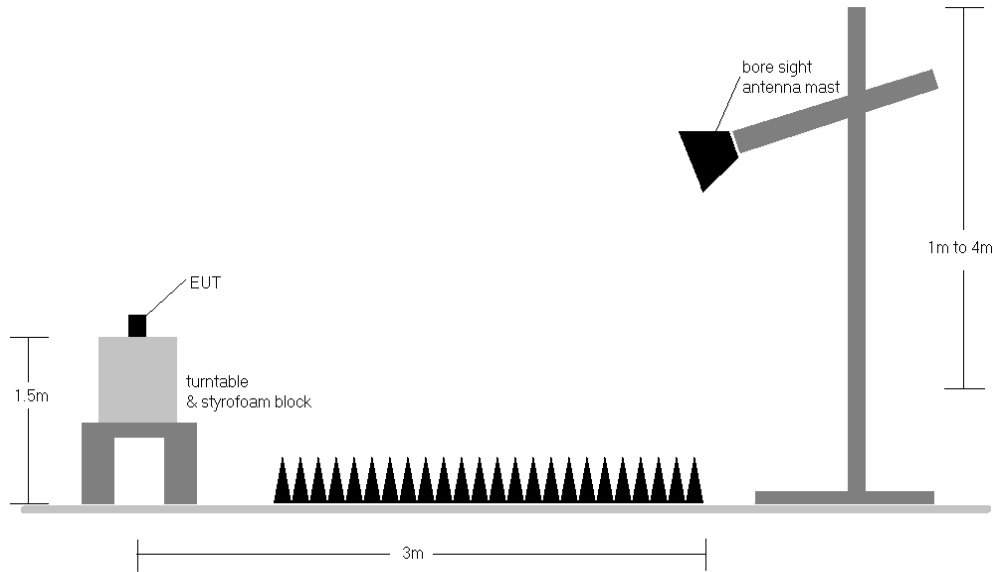


Figure 7-5. Radiated Test Setup >1GHz

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).
- 4) Unless indicated otherwise, all radiated power measurements are made with the EUT in the “screen open” mechanical configuration.

FCC ID: A3LSMF711U1	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
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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	H	111	146	7.16	1 / 99	11.55	18.71	0.074	23.00	-4.29
		3625.0	H	111	142	6.87	1 / 50	13.09	19.96	0.099	23.00	-3.04
		3690.0	H	112	145	6.30	1 / 0	14.52	20.82	0.121	23.00	-2.18
	16-QAM	3690.0	H	112	145	6.30	1 / 0	13.59	19.89	0.097	23.00	-3.11
	QPSK	3557.5	H	111	146	7.17	1 / 74	11.43	18.60	0.072	23.00	-4.40
		3625.0	H	111	142	6.87	1 / 74	13.03	19.90	0.098	23.00	-3.10
		3692.5	H	112	145	6.26	1 / 74	14.63	20.90	0.123	23.00	-2.10
	16-QAM	3692.5	H	112	145	6.26	1 / 74	13.65	19.92	0.098	23.00	-3.08
10 MHz	QPSK	3555.0	H	111	146	7.18	1 / 49	11.43	18.61	0.073	23.00	-4.39
		3625.0	H	111	142	6.87	1 / 49	13.04	19.91	0.098	23.00	-3.09
		3695.0	H	112	145	6.23	1 / 25	14.67	20.91	0.123	23.00	-2.09
	16-QAM	3695.0	H	112	145	6.23	1 / 49	13.77	20.01	0.100	23.00	-2.99
5 MHz	QPSK	3552.5	H	111	146	7.19	1 / 12	11.39	18.59	0.072	23.00	-4.41
		3625.0	H	111	142	6.87	1 / 12	13.05	19.92	0.098	23.00	-3.08
		3697.5	H	112	145	6.20	1 / 12	14.60	20.81	0.120	23.00	-2.19
	16-QAM	3697.5	H	112	145	6.20	1 / 12	13.72	19.93	0.098	23.00	-3.07
10 MHz	QPSK	3695.0	V	111	271	6.50	1 / 0	10.68	17.18	0.052	23.00	-5.82
	QPSK (WCP)	3695.0	H	127	135	6.23	1 / 0	10.23	16.46	0.044	23.00	-6.54
	CLOSED	3695.0	H	101	223	6.23	1 / 0	10.09	16.32	0.043	23.00	-6.68

Table 7-5. 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	H	115	143	7.37	11.73	19.10	0.081	23.00	-3.90
		20	3625.0	1 / 99	20	3644.8	1 / 0	H	109	142	6.77	13.76	20.53	0.113	23.00	-2.47
		20	3690.0	1 / 0	20	3670.2	1 / 99	H	114	147	6.15	14.43	20.58	0.114	23.00	-2.42
	16-QAM	20	3625.0	1 / 99	20	3644.8	1 / 0	H	109	142	6.77	12.63	19.40	0.087	23.00	-3.60
35 MHz	QPSK	20	3557.5	1 / 99	15	3577.1	1 / 0	H	115	143	7.40	11.60	19.00	0.080	23.00	-4.00
		20	3625.0	1 / 99	15	3642.1	1 / 0	H	109	142	6.77	13.77	20.54	0.113	23.00	-2.46
		20	3692.5	1 / 0	15	3672.9	1 / 74	H	114	147	6.12	14.34	20.46	0.111	23.00	-2.54
	16-QAM	20	3625.0	1 / 99	15	3642.1	1 / 0	H	109	142	6.77	13.32	20.09	0.102	23.00	-2.91
30 MHz	QPSK	20	3555.0	1 / 99	10	3574.4	1 / 0	H	115	143	7.43	11.62	19.04	0.080	23.00	-3.96
		20	3625.0	1 / 99	10	3639.4	1 / 0	H	109	142	6.77	13.96	20.73	0.118	23.00	-2.27
		20	3695.0	1 / 0	10	3678.3	1 / 49	H	114	147	6.09	14.47	20.57	0.114	23.00	-2.43
	16-QAM	20	3625.0	1 / 99	10	3639.4	1 / 0	H	109	142	6.77	12.97	19.74	0.094	23.00	-3.26
25 MHz	QPSK	20	3552.5	1 / 99	5	3571.7	1 / 0	H	115	143	7.45	11.18	18.63	0.073	23.00	-4.37
		20	3625.0	1 / 99	5	3636.7	1 / 0	H	109	142	6.77	13.38	20.15	0.103	23.00	-2.85
		20	3697.5	1 / 0	5	3678.3	1 / 24	H	114	147	6.06	14.45	20.52	0.113	23.00	-2.48
	16-QAM	20	3697.5	1 / 0	5	3678.3	1 / 24	H	114	147	6.06	12.79	18.86	0.077	23.00	-4.14
30MHz	QPSK	20	3625.0	1 / 99	10	3639.4	1 / 0	V	115	282	6.60	11.29	17.89	0.062	23.00	-5.11
	QPSK (Closed)	20	3625.0	1 / 99	10	3639.4	1 / 0	H	107	144	6.77	11.16	17.93	0.062	23.00	-5.07

Table 7-6. EIRP Data (ULCA 48)

FCC ID: A3LSMF711U1	 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 field strength conversion method described in KDB 971168 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using horizontally and vertically polarized tuned dipole antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW $\geq 3 \times$ RBW
3. Span = 1.5 times the OBW
4. No. of sweep points $\geq 2 \times$ span / RBW
5. Detector = RMS
6. Trace mode = 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: A3LSMF711U1	 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.

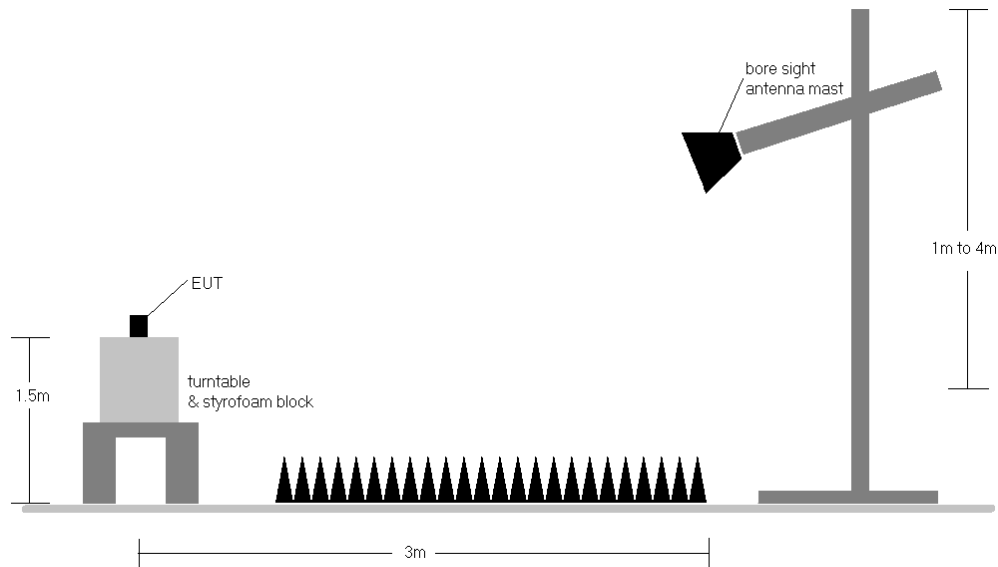


Figure 7-6. Test Instrument & Measurement Setup

Test Notes

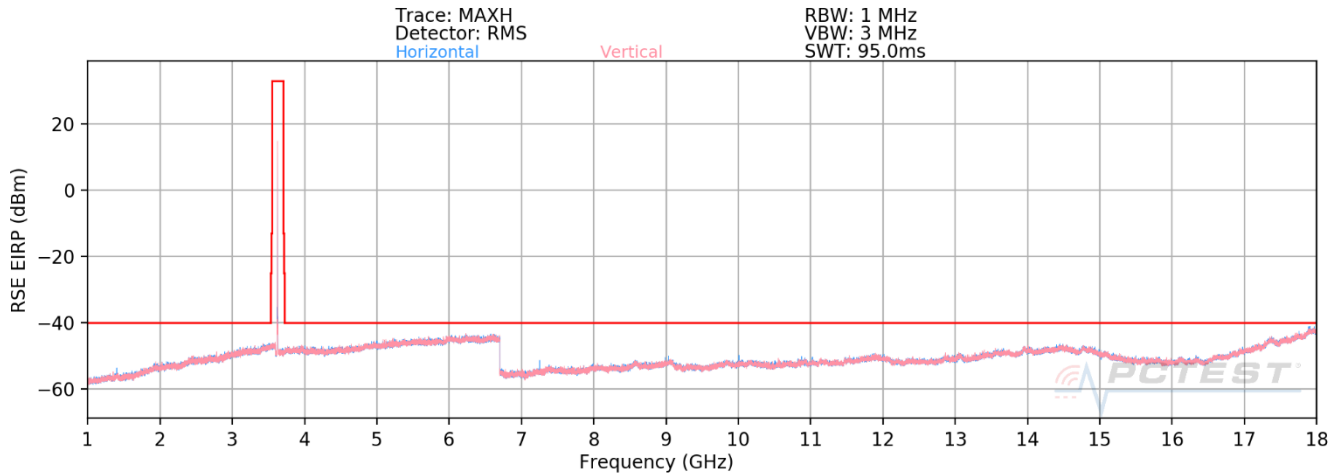
- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested with 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):

a) $E(\text{dB}\mu\text{V/m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$

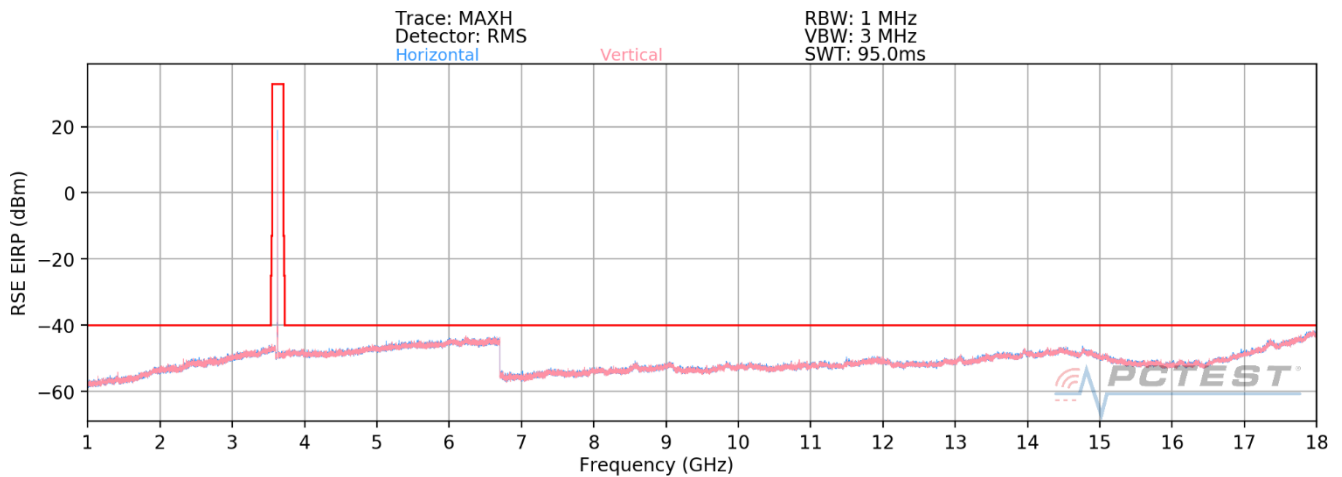
b) $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V/m}) + 20\log D - 104.8$; where D is the measurement distance in meters.

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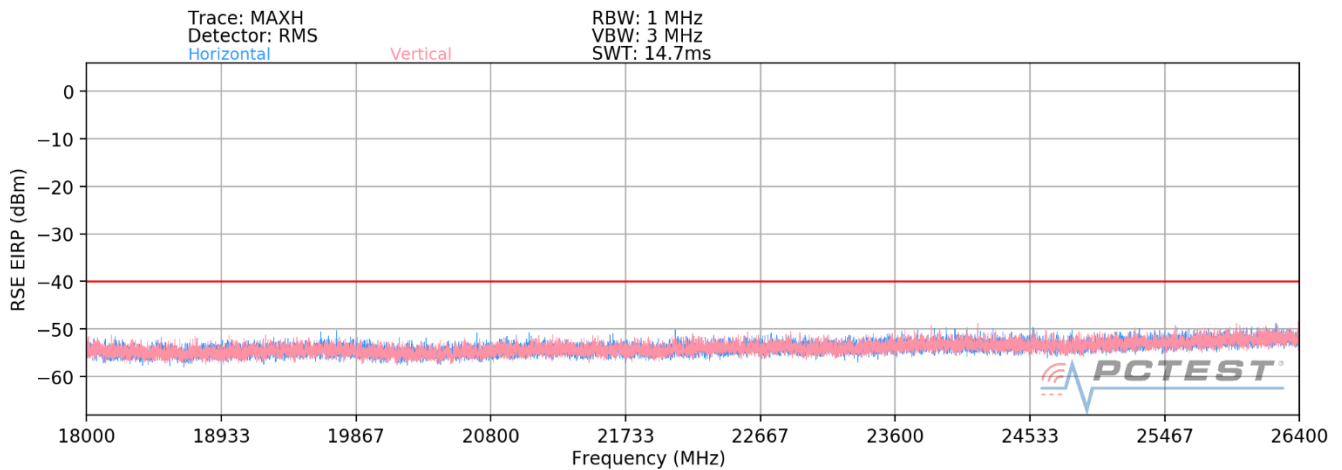
LTE Band 48



Plot 7-56. Radiated Spurious Plot - 1-18 GHz (LTE Band 48) – Open

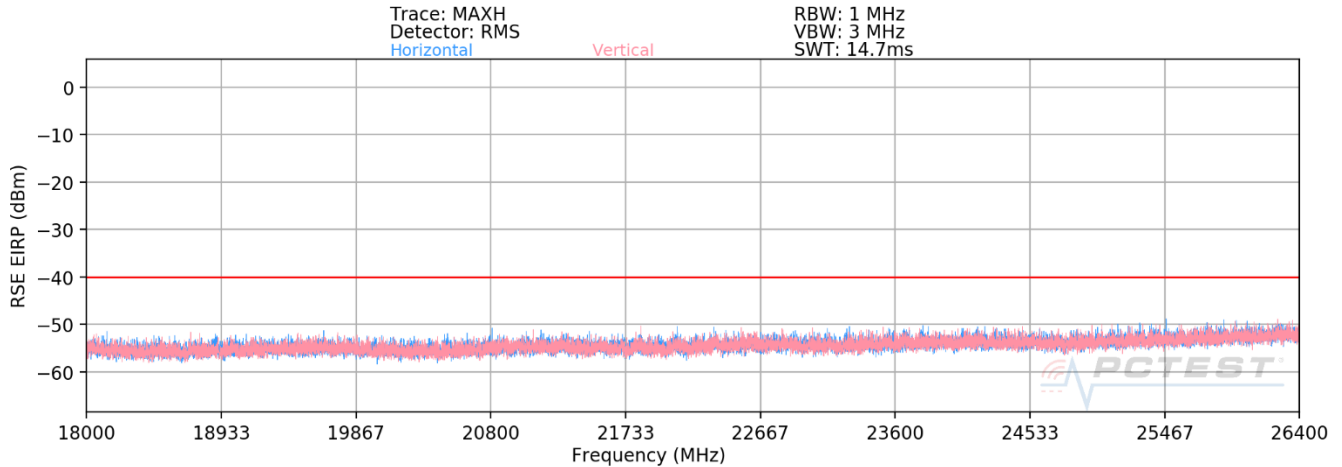


Plot 7-57. Radiated Spurious Plot - 1-18 GHz (LTE Band 48) – Closed

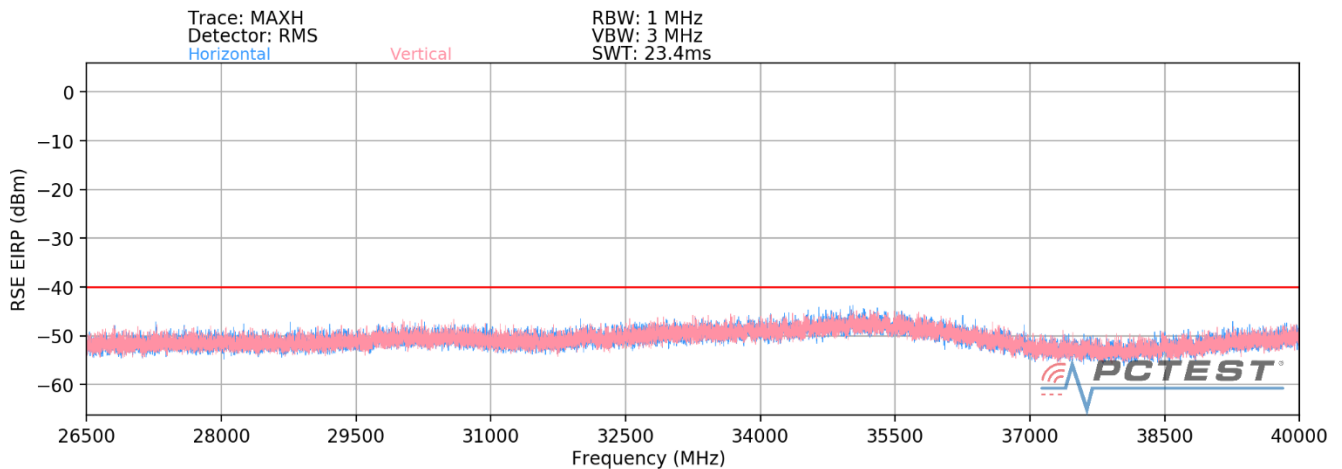


Plot 7-58. Radiated Spurious Plot - 18-26.5 GHz (LTE Band 48) – Open

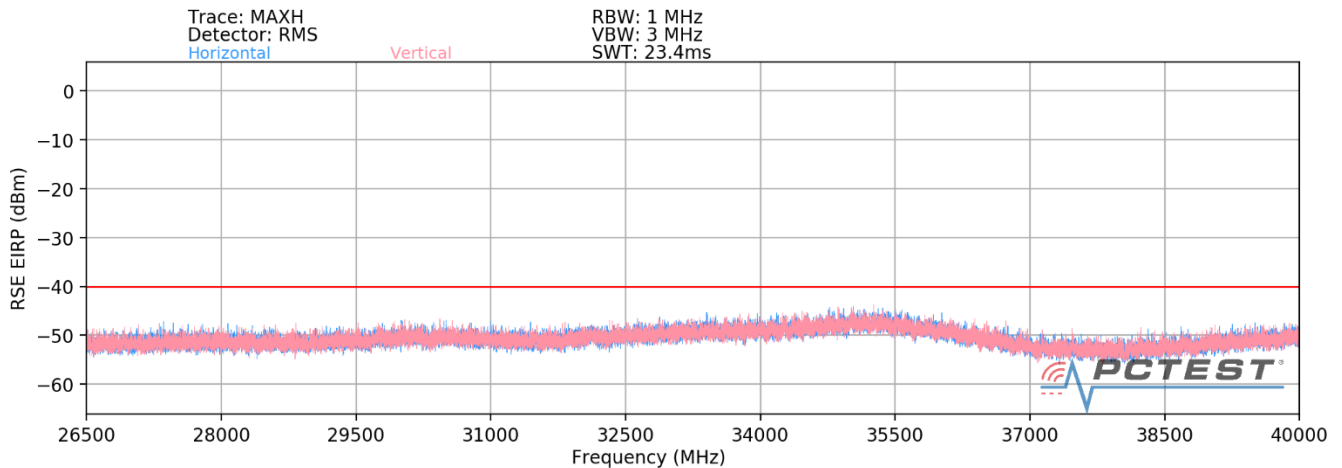
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Plot 7-59. Radiated Spurious Plot - 18-26.5 GHz (LTE Band 48) – Closed



Plot 7-60. Radiated Spurious Plot - 26.5-40 GHz (LTE Band 48) – Open



Plot 7-61. Radiated Spurious Plot - 26.5-40 GHz (LTE Band 48) – Closed

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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]
7120.0	H	121	10	-74.66	8.55	40.89	-54.36	-40.00	-14.36
10680.0	H	204	357	-78.13	13.24	42.11	-53.15	-40.00	-13.15
14240.0	H	-	-	-79.16	17.36	45.20	-50.06	-40.00	-10.06
17800.0	H	-	-	-79.19	21.11	48.92	-46.34	-40.00	-6.34

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

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]
7250.0	H	130	21	-71.54	8.71	44.17	-51.09	-40.00	-11.09
10875.0	H	114	357	-73.75	12.39	45.64	-49.62	-40.00	-9.62
14500.0	H	-	-	-79.23	17.20	44.97	-50.29	-40.00	-10.29

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

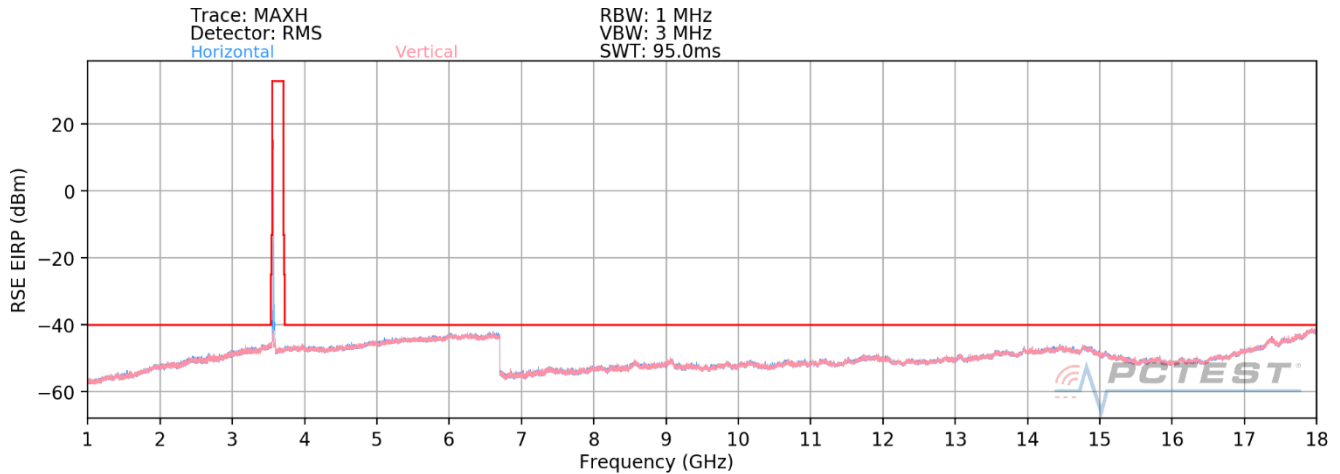
Bandwidth (MHz):	20
Frequency (MHz):	3690.0
Modulation Signal:	QPSK
RB Config (Size / Offset):	1 / 50

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	H	120	15	-72.34	10.30	44.96	-50.30	-40.00	-10.30
11070.00	H	116	358	-74.49	12.85	45.36	-49.90	-40.00	-9.90
14760.00	H	-	-	-79.99	17.79	44.80	-50.46	-40.00	-10.46

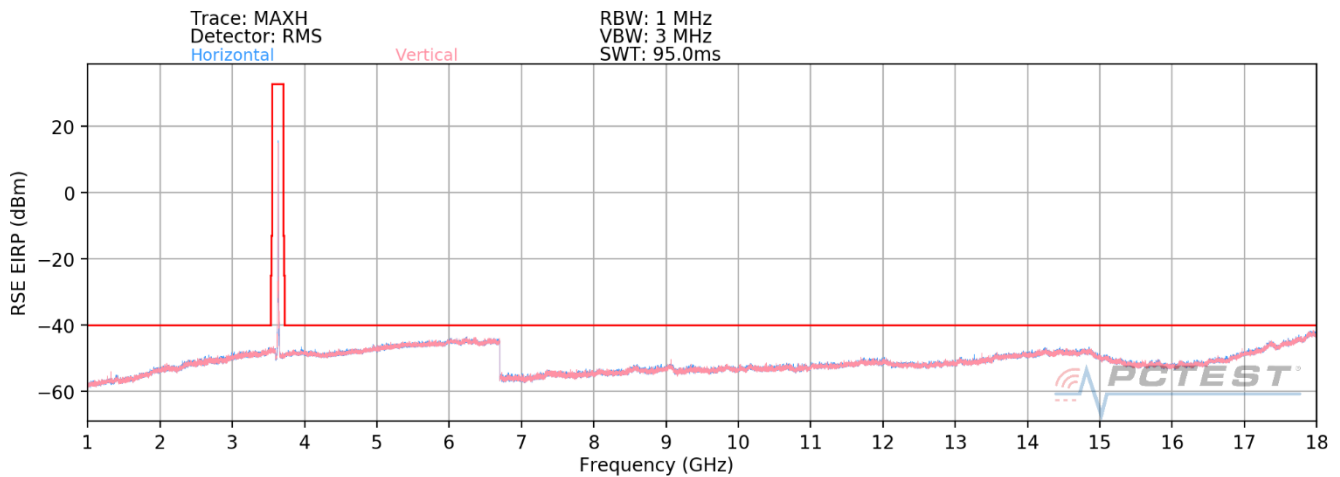
Table 7-9. Radiated Spurious Data (LTE Band 48 – High Channel) – Open

FCC ID: A3LSMF711U1	 PART 96 MEASUREMENT REPORT 	Approved by: Technical Manager
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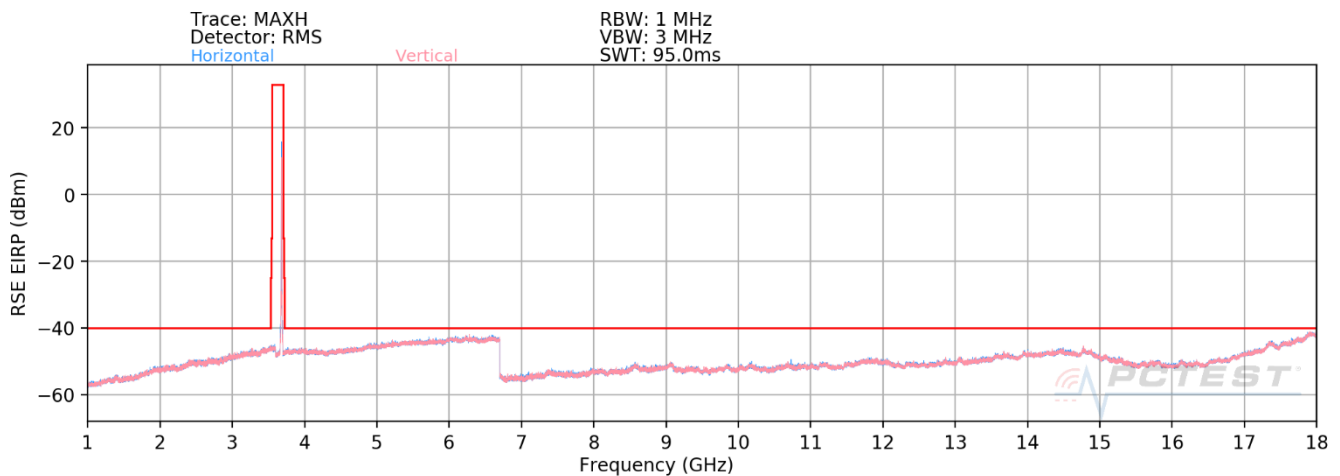
ULCA LTE Band 48



Plot 7-62. Radiated Spurious Plot - 1-18 GHz (ULCA Band 48 – Low Channel – PCC/SCC: 1 RB)



Plot 7-63. Radiated Spurious Plot - 1-18 GHz (ULCA Band 48 – Mid Channel – PCC/SCC: 1 RB)



Plot 7-64. Radiated Spurious Plot - 1-18 GHz (ULCA Band 48 – High Channel – PCC/SCC: 1 RB)

FCC ID: A3LSMF711U1	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]
7120.0	V	307	251	-75.11	8.55	40.44	-54.81	-40.00	-14.81
10680.0	V	-	-	-78.89	13.24	41.35	-53.91	-40.00	-13.91
14240.0	V	-	-	-79.82	17.36	44.54	-50.72	-40.00	-10.72
17800.0	V	-	-	-80.41	21.11	47.70	-47.56	-40.00	-7.56

Table 7-10. Radiated Spurious Data (ULCA LTE Band 48 – 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]
7250.0	V	291	228	-70.73	8.71	44.98	-50.28	-40.00	-10.28
10875.0	V	-	-	-79.30	12.39	40.09	-55.17	-40.00	-15.17
14500.0	V	-	-	-79.27	17.20	44.93	-50.33	-40.00	-10.33

Table 7-11. Radiated Spurious Data (ULCA LTE Band 48 – Mid Channel)

PCC Bandwidth (MHz):	20
PCC Frequency (MHz):	3690.0
PCC RB / Offset:	1 / 0
SCC Bandwidth (MHz):	20
SCC Frequency (MHz):	3670.2
SCC RB / Offset:	1 / 99
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	V	384	248	-75.36	10.30	41.94	-53.32	-40.00	-13.32
11070.00	V	-	-	-79.40	12.85	40.45	-54.81	-40.00	-14.81
14760.00	V	-	-	-80.05	17.79	44.74	-50.52	-40.00	-10.52

Table 7-12. Radiated Spurious Data (ULCA LTE Band 48 – High Channel)

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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

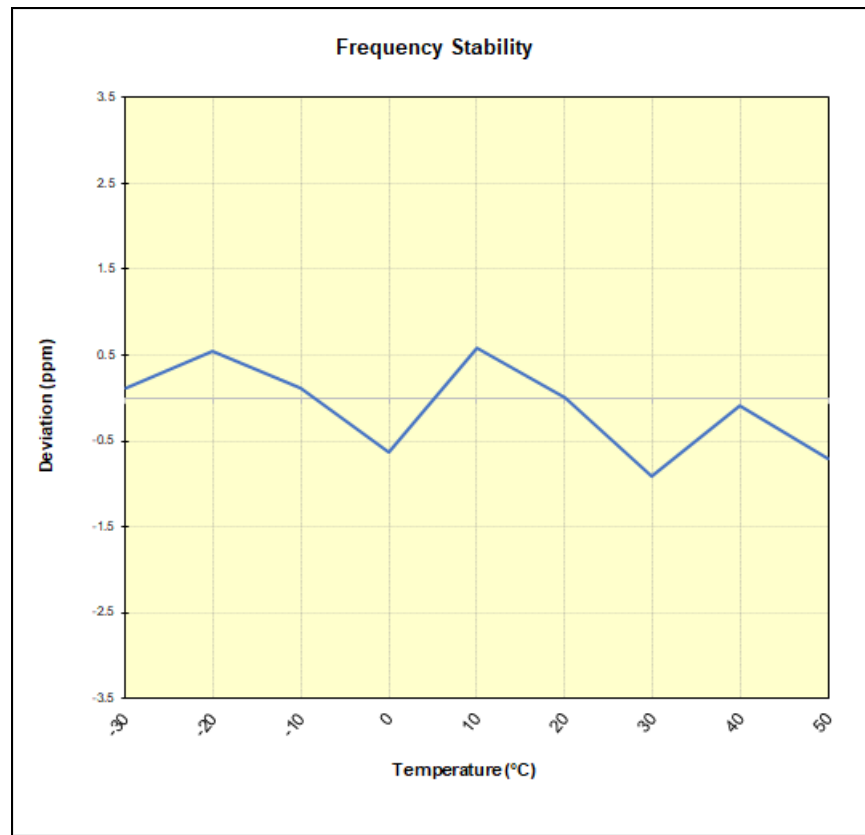
None

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Frequency Stability / Temperature Variation

		Operating Frequency (Hz):		3,625,000,000	
		Ref. Voltage (VDC):		4.43	
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.43	- 30	3,625,000,856	416	0.0000115
		- 20	3,625,002,425	1,986	0.0000548
		- 10	3,625,000,869	429	0.0000118
		0	3,624,998,129	-2,310	-0.0000637
		+ 10	3,625,002,566	2,127	0.0000587
		+ 20 (Ref)	3,625,000,439	0	0.0000000
		+ 30	3,624,997,117	-3,322	-0.0000916
		+ 40	3,625,000,141	-298	-0.0000082
		+ 50	3,624,997,864	-2,575	-0.0000710
Battery Endpoint	3.36	+ 20	3,625,000,832	393	0.0000108

Table 7-13. LTE Band 48 Frequency Stability Data



Plot 7-65. LTE Band 48 Frequency Stability Chart

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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 v03, WINNF-TS-0122 V1.0.2.

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.

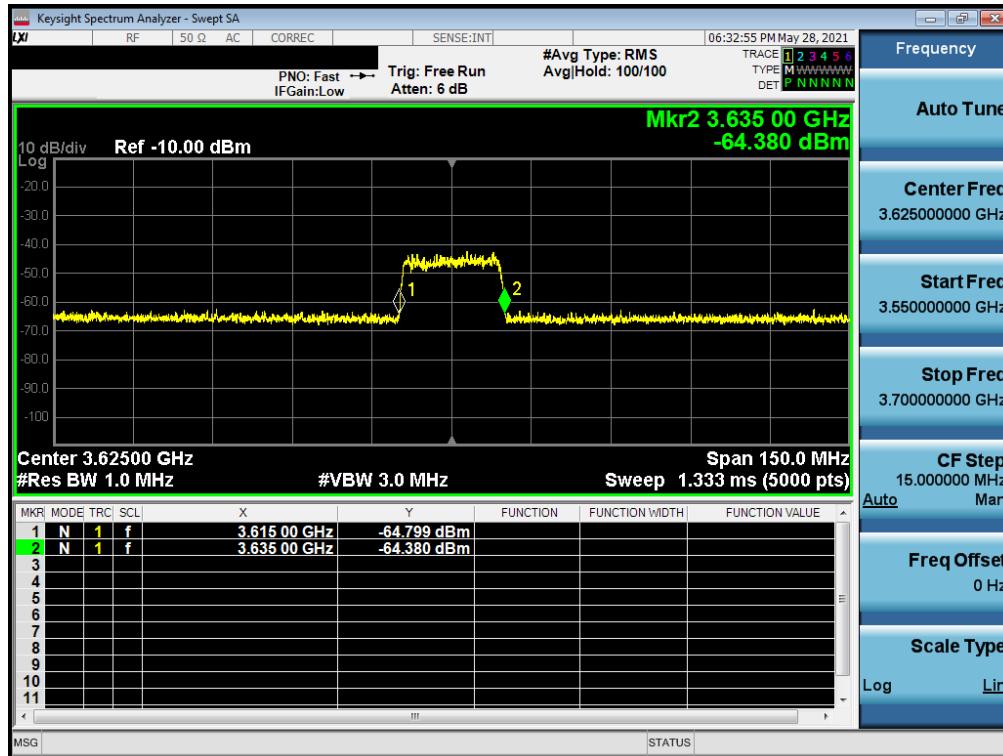
1. Run#1:
 - a. Setup WINNF.PT.C.HBT.1 with 3615MHz – 3635MHz.
 - b. Enable AP service from Ruckus Cloud management.
 - c. Check EUT Tx frequency.
 - d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.
2. Run#2:
 - a. Setup WINNF.PT.C.HBT.1 with 3660MHz – 3680MHz.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

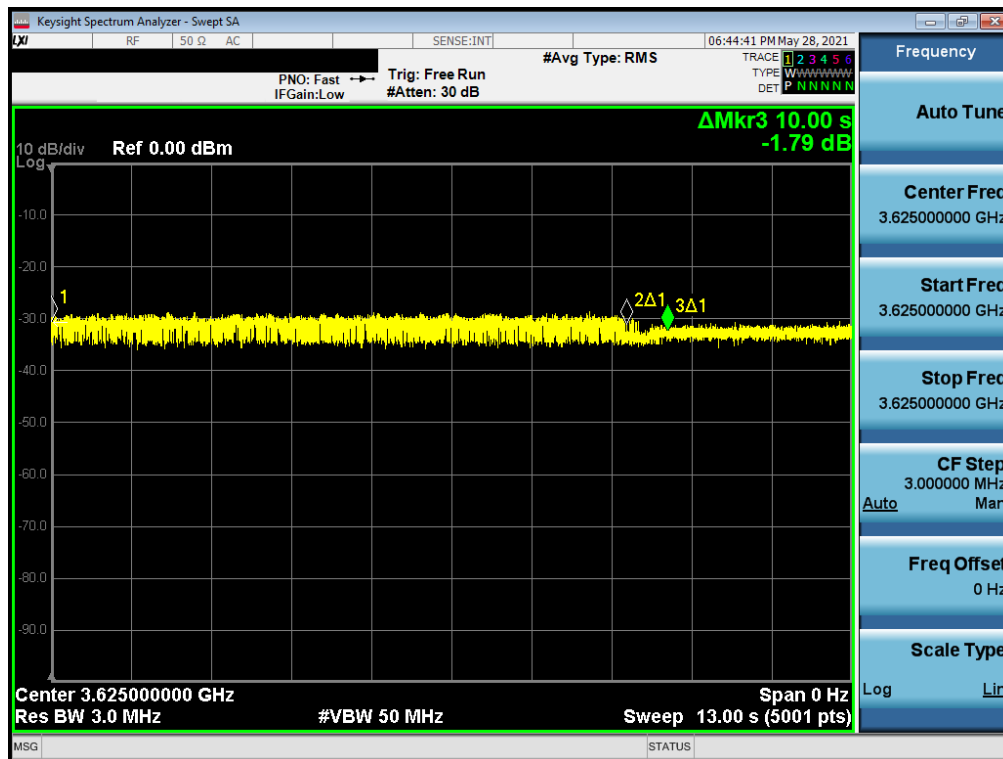
The EUT is an End User Device.

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Run#1:



Plot 7-66. Run#1 End User Device Frequency of Operations



Plot 7-67. Run#1 End User Device Discontinues Operations within 10s

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Note:

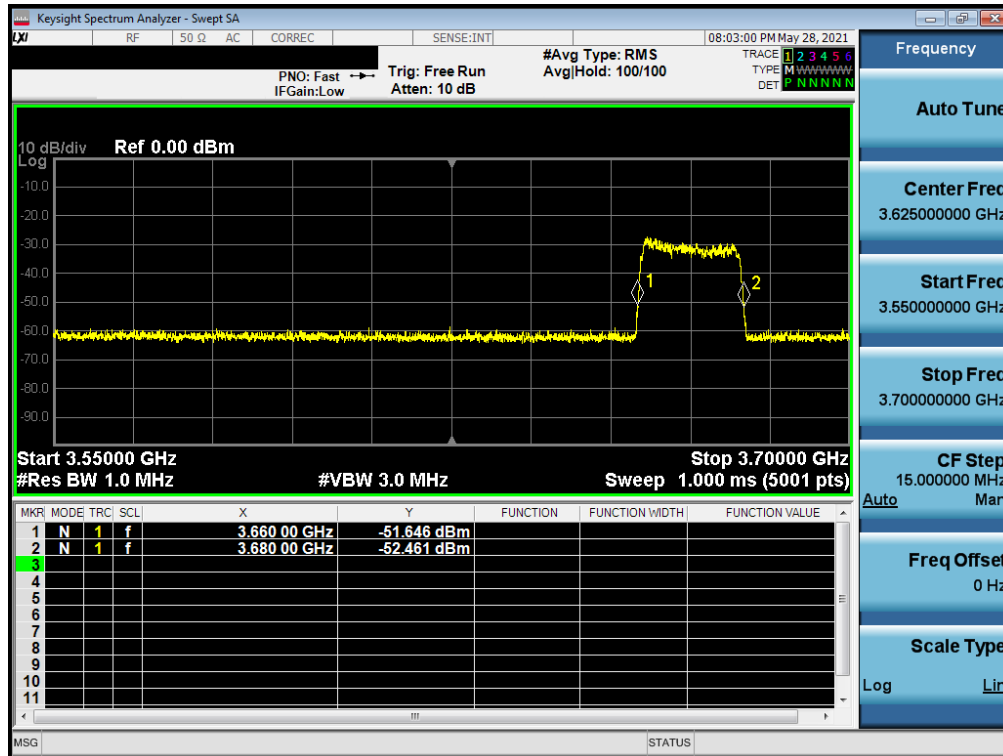
Marker 1: CBSD sends instructions to discontinue LTE operations.

Marker 2: EUT discontinues operation.

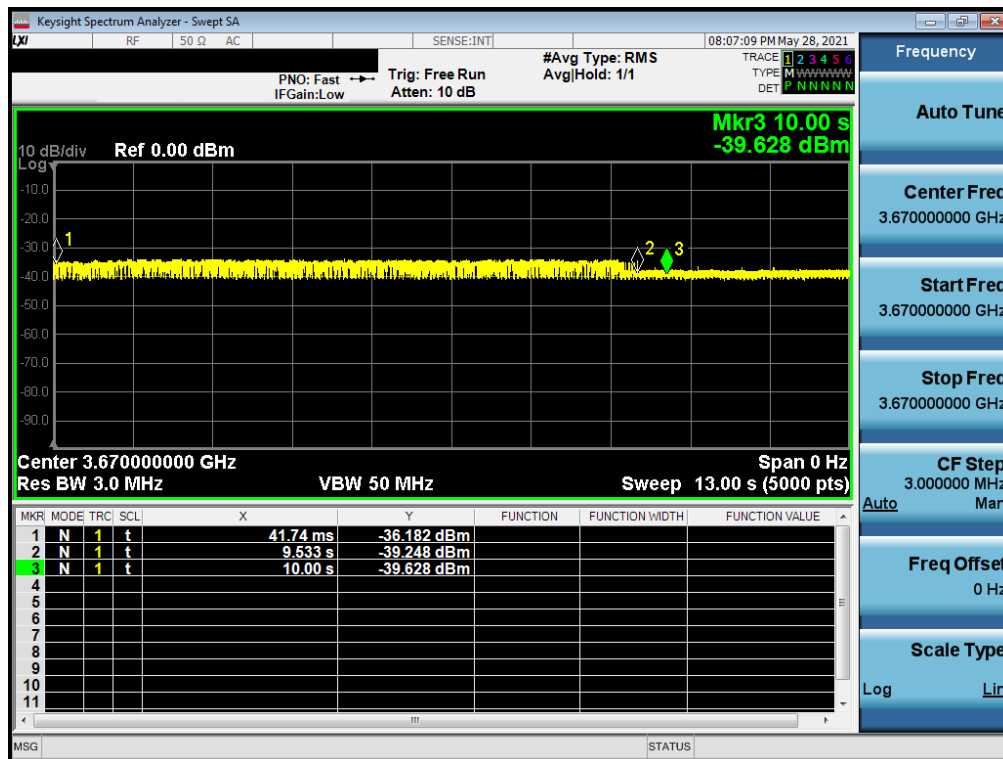
Marker 3: 10 seconds elapsed time from CBSD sending instructions to EUT.

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Run#2:



Plot 7-68. Run#2 End User Device Frequency of Operations



Plot 7-69. 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: A3LSMF711U1** complies with all of the End User Device requirements of Part 96 of the FCC Rules for LTE operation only.

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