

MEASUREMENT REPORT Part 96 LTE

Applicant Name:

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

Date of Testing:

4/29 - 8/12/2020

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

1M2004140062-04.A3L

FCC ID:

A3LSMH204V

APPLICANT:

Samsung Electronics Co., Ltd.

Application Type:

Certification

Model:

SM-H204V

EUT Type:

Indoor Customer Premises Equipment (CPE)

FCC Classification:

Citizens Band End User Devices (CBE)

FCC Rule Part(s):

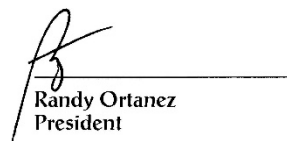
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Test Procedure(s):

ANSI C63.26-2015, ANSI/TIA-603-E-2016, ANSI C63.26-2015,
KDB 971168 D01 v03r01, KDB 940660 D01 v02, WINNF-TS-0122 V1.0.0

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

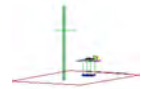
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Mode	CCs Active	FCC Rule Part	Tx Frequency (MHz)	EIRP		Emission Designator	Modulation
				Max. Power (W)	Max. Power (dBm)		
LTE Band 48	1	96	3552.5 - 3697.5	0.142	21.53	4M52G7D	QPSK
LTE Band 48	1	96	3552.5 - 3697.5	0.113	20.54	4M52W7D	16QAM
LTE Band 48	1	96	3552.5 - 3697.5	0.096	19.84	4M51W7D	64QAM
LTE Band 48	1	96	3555 - 3695	0.148	21.69	8M99G7D	QPSK
LTE Band 48	1	96	3555 - 3695	0.122	20.87	9M00W7D	16QAM
LTE Band 48	1	96	3555 - 3695	0.089	19.51	9M06W7D	64QAM
LTE Band 48	1	96	3557.5 - 3692.5	0.143	21.56	13M5G7D	QPSK
LTE Band 48	1	96	3557.5 - 3692.5	0.126	21.01	13M5W7D	16QAM
LTE Band 48	1	96	3557.5 - 3692.5	0.093	19.67	13M6W7D	64QAM
LTE Band 48	1	96	3560 - 3690	0.125	20.96	18M0G7D	QPSK
LTE Band 48	1	96	3560 - 3690	0.113	20.51	18M0W7D	16QAM
LTE Band 48	1	96	3560 - 3690	0.093	19.67	18M0W7D	64QAM
LTE Band 48	2	96	3562.5-3687.5	0.125	20.96	23M0G7D	QPSK
LTE Band 48	2	96	3562.5-3687.5	0.110	20.39	23M0W7D	16QAM
LTE Band 48	2	96	3562.5-3687.5	0.089	19.47	23M0W7D	64QAM
LTE Band 48	2	96	3565-3685	0.152	21.80	27M8G7D	QPSK
LTE Band 48	2	96	3565-3685	0.145	21.62	27M8W7D	16QAM
LTE Band 48	2	96	3565-3685	0.090	19.57	27M9W7D	64QAM
LTE Band 48	2	96	3567.5-3682.5	0.149	21.73	33M0G7D	QPSK
LTE Band 48	2	96	3567.5-3682.5	0.146	21.63	33M2W7D	16QAM
LTE Band 48	2	96	3567.5-3682.5	0.108	20.34	33M3W7D	64QAM
LTE Band 48	2	96	3570-3680	0.155	21.89	37M8G7D	QPSK
LTE Band 48	2	96	3570-3680	0.136	21.32	37M8W7D	16QAM
LTE Band 48	2	96	3570-3680	0.121	20.83	37M7W7D	64QAM

EUT Overview (LTE B48)

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 17025-2005 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 17025-2005 accredited test facility under the American Association for Laboratory Accreditation (A2LA) with Certificate number 2041.01 for Specific Absorption Rate (SAR), Hearing Aid Compatibility (HAC) testing, where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and 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 Indoor Customer Premises Equipment (CPE) FCC ID: A3LSMH204V**. 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.: 14510, 43712, 04955, 43712, 06243

2.2 Device Capabilities

This device contains the following capabilities:

Multi-band LTE, 5G NR (n5, n66, n2, n261, n260), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII, Bluetooth (LE)

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.

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:

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

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.

Per the guidance of ANSI C63.26-2015, field strength method may be performed for both Radiated power and Radiated Spurious Emissions. The field strength is converted direct from radiated emission measurement.

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
-	LTx2	Licensed Transmitter Cable Set	4/9/2020	Annual	4/9/2021	LTx2
-	LTx3	Licensed Transmitter Cable Set	10/30/2019	Annual	10/30/2020	LTx3
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	10/10/2019	Biennial	10/10/2021	121034
Espec	ESX-2CA	Environmental Chamber	8/13/2019	Annual	8/13/2020	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	2/14/2019	Biennial	2/14/2021	125518
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	3/12/2020	Biennial	3/12/2022	128337
ETS Lindgren	3164-08	Quad Ridge Horn Antenna	2/22/2019	Biennial	2/22/2021	128338
Mini Circuits	TVA-11-422	RF Power Amp	N/A			QA1317001
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11208010032
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator	N/A			11403100002
Rohde & Schwarz	CMW500	Radio Communication Tester	8/26/2019	Annual	8/26/2020	100976
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	9/23/2019	Annual	9/23/2020	100348
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/10/2020	Annual	2/10/2021	102134
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2/21/2020	Annual	2/21/2021	102133
Rohde & Schwarz	TS-PR26	18-26.5 GHz Pre-Amplifier	11/1/2019	Annual	11/1/2020	100040
Sunol	DRH-118	Horn Antenna (1-18GHz)	10/3/2019	Biennial	10/3/2021	A050307
Sunol	DRH-118	Horn Antenna (1-18 GHz)	8/27/2019	Biennial	8/27/2021	A042511

Table 5-1. Test Equipment

Notes:

- For equipment listed above that has a calibration date or calibration due date that falls within the test date range, care was taken to ensure that this equipment was used after the calibration date and before the calibration due date.
- Equipment with a calibration date of "N/A" shown in this list was not used to make direct calibrated measurements.

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6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (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: A3LSMH204V
 FCC Classification: Citizens Band End User Devices (CBE)
 Mode(s): LTE

FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
2.1049	Occupied Bandwidth	N/A	CONDUCTED	PASS	Section 7.2
2.1046	Transmitter Conducted Output Power	N/A		PASS	Section 7.3
2.1051 96.41(e)(ii)	Out of Band Emissions	-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	Section 7.4, 7.5
2.1046	Additional Maximum Power Reduction (AMPR)	N/A		PASS	Section 7.6
96.41(e)	Uplink Carrier Aggregation	$>43 + 10\log(P[\text{Watts}])$ at Band Edge and for all out-of-band emissions		PASS	Section 7.7
2.1055	Frequency Stability	Fundamental emissions stay within authorized frequency block		PASS	Section 7.11
96.47	End User Device Additional Requirements (CBSD Protocol)	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 7.12

Table 7-1. Summary of Conducted Test Results

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FCC Part Section(s)	Test Description	Test Limit	Test Condition	Test Result	Reference
96.41(b)	Equivalent Isotropic Radiated Power (EIRP)	23 dBm/10MHz	RADIATED	PASS	Section 7.8
2.1053 96.41(e)	Undesirable Emissions	-40 dBm/MHz		PASS	Section 7.9
96.41(e)	Uplink Carrier Aggregation	Undesirable emissions must meet the limits detailed in 27.53(m)		PASS	Section 7.10

Table 7-2. Summary of Radiated Test Results

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST "LTE Automation," Version 5.3.

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7.2 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.



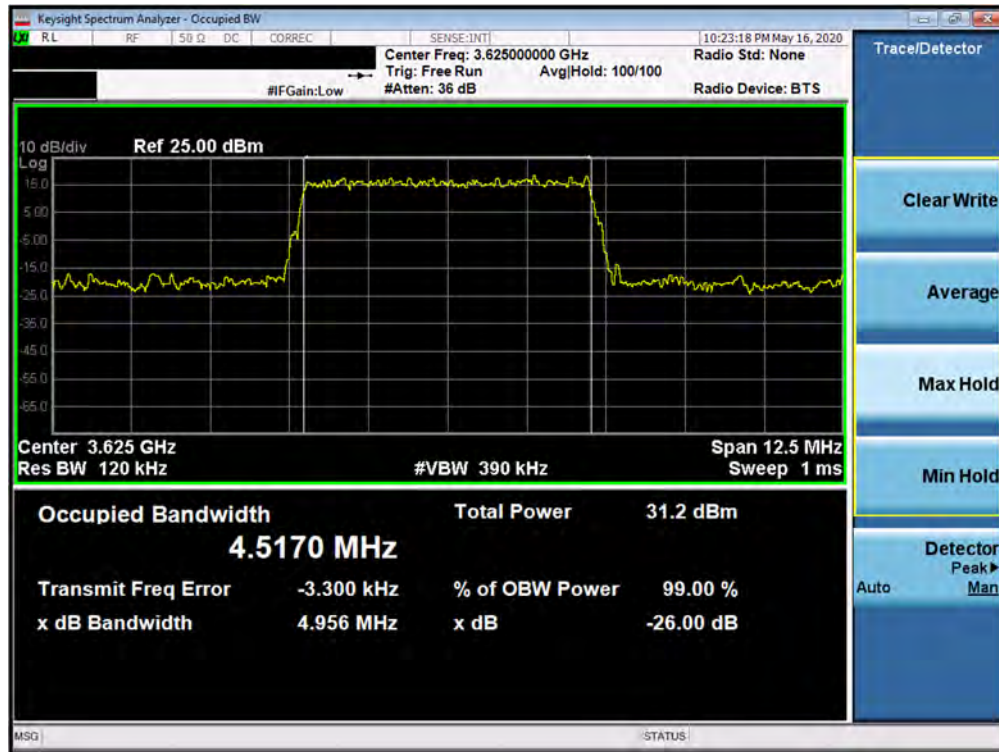
Figure 7-1. Test Instrument & Measurement Setup

Test Notes

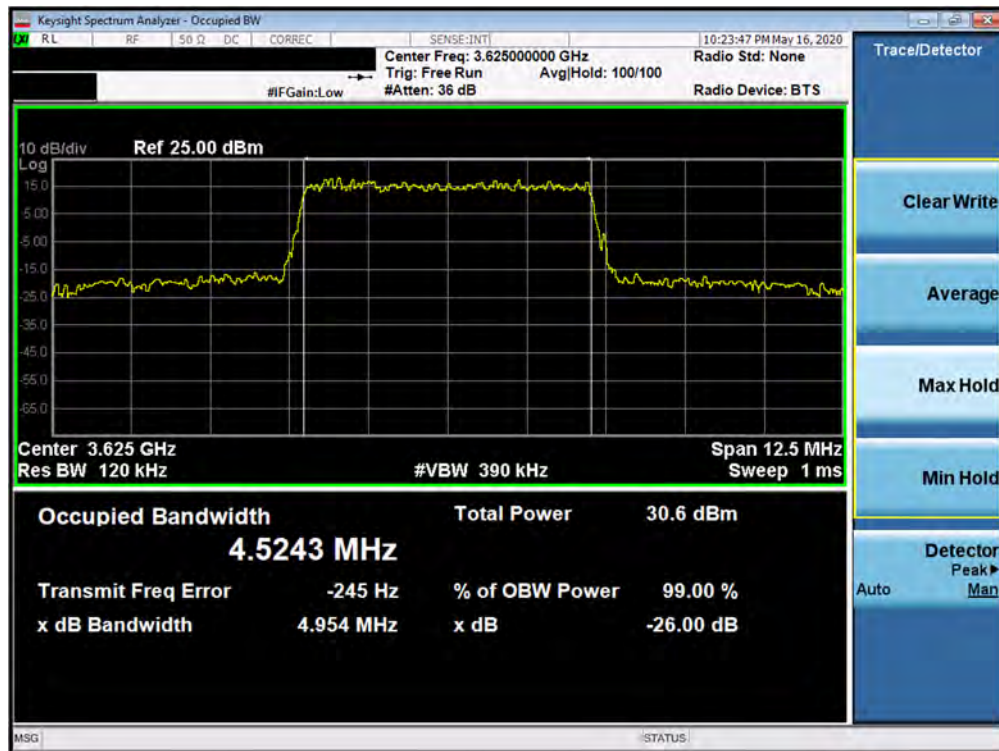
None

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LTE Band 48



Plot 7-1. Occupied Bandwidth Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)



Plot 7-2. Occupied Bandwidth Plot (Band 48 - 5.0MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
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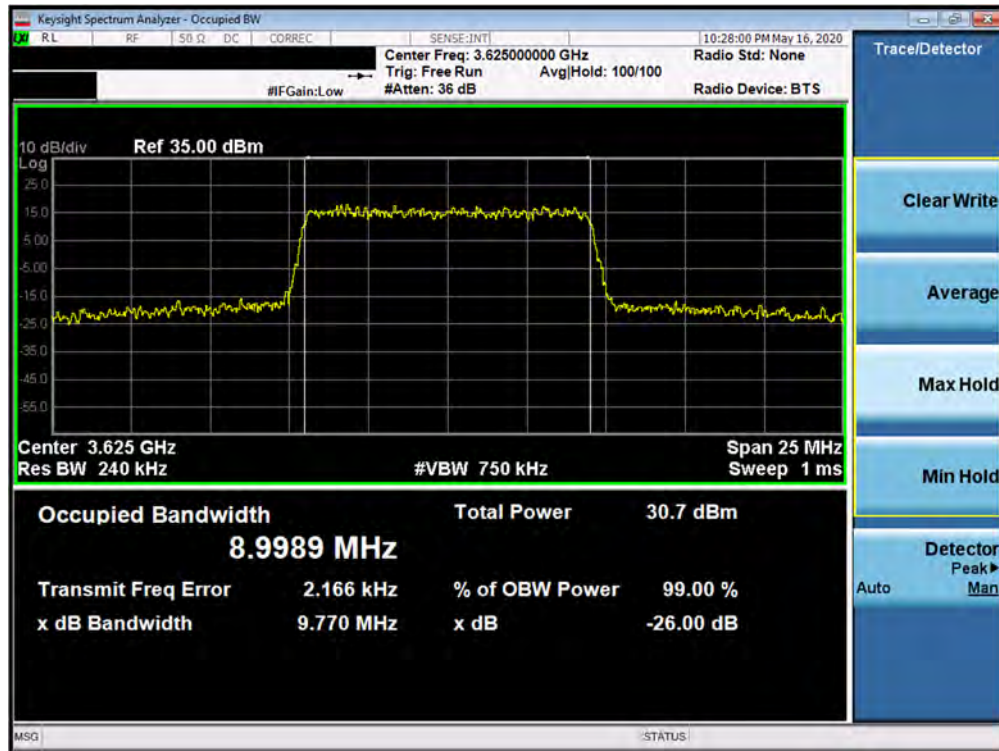


Plot 7-3. Occupied Bandwidth Plot (Band 48 - 5.0MHz 64-QAM - Full RB Configuration)

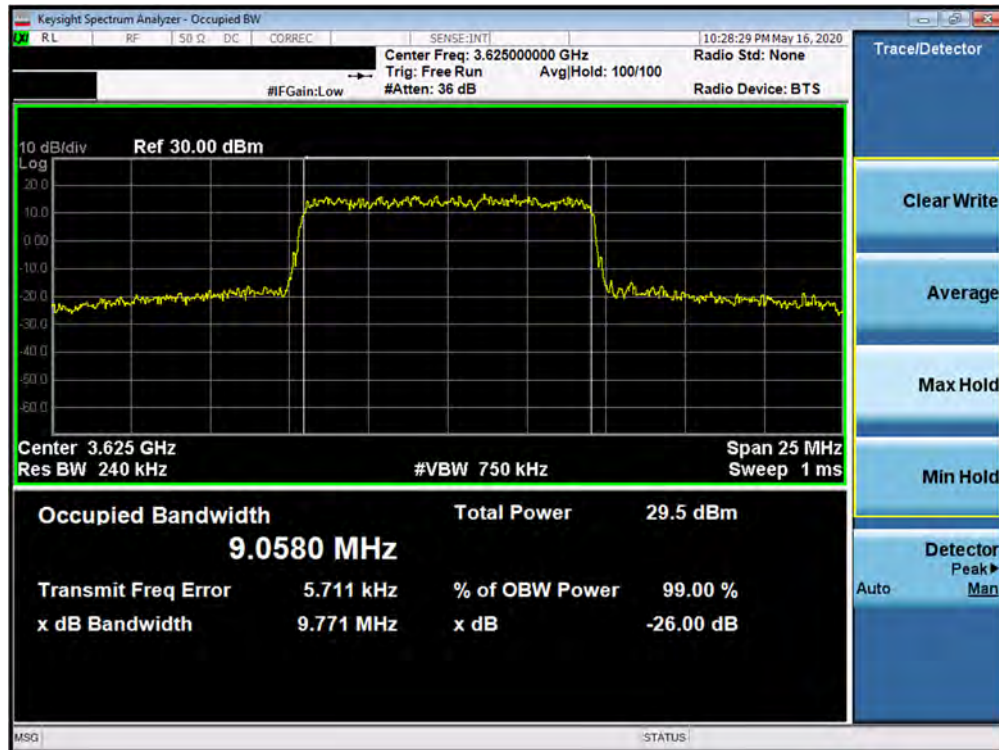


Plot 7-4. Occupied Bandwidth Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

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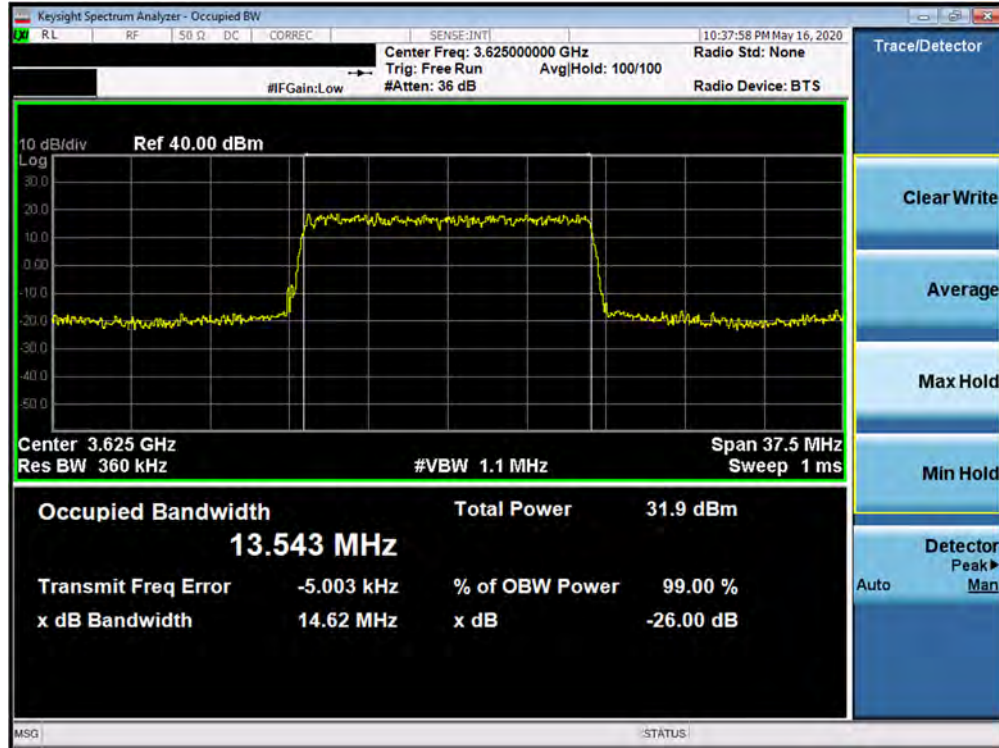


Plot 7-5. Occupied Bandwidth Plot (Band 48 - 10.0MHz 16-QAM - Full RB Configuration)

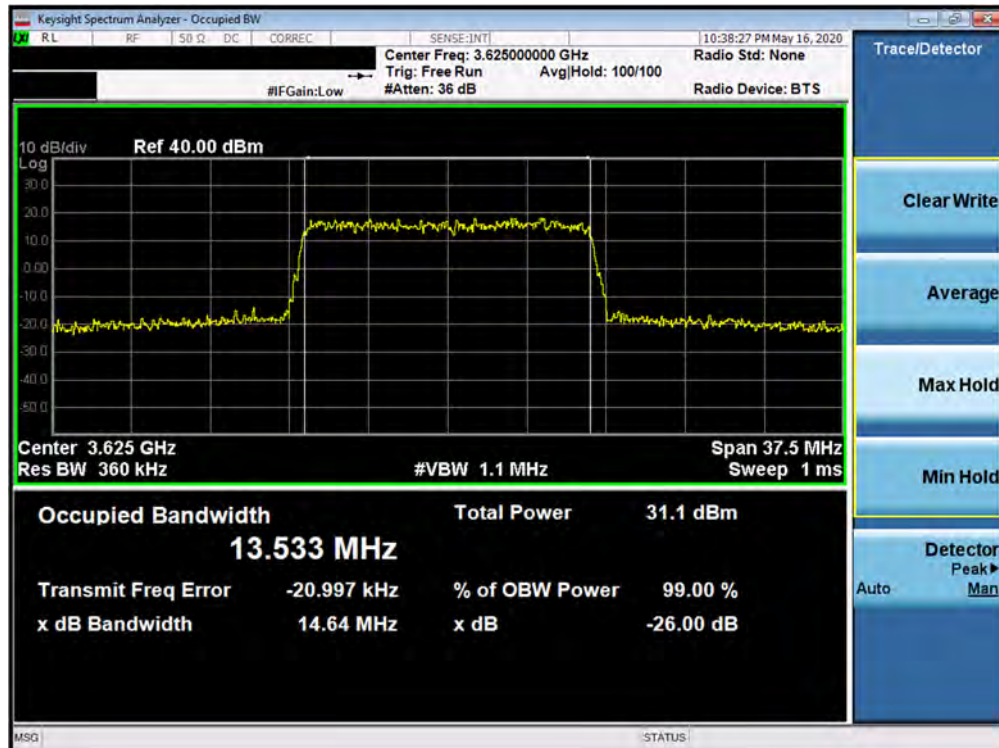


Plot 7-6. Occupied Bandwidth Plot (Band 48 - 10.0MHz 64-QAM - Full RB Configuration)

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Plot 7-7. Occupied Bandwidth Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

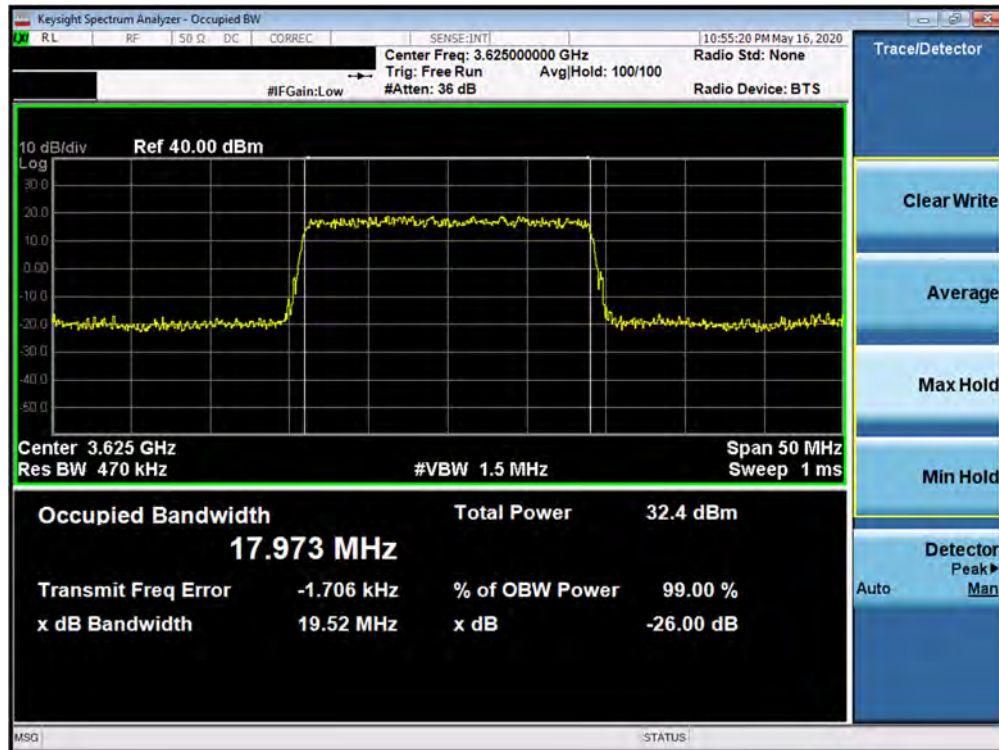


Plot 7-8. Occupied Bandwidth Plot (Band 48 - 15.0MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 16 of 76

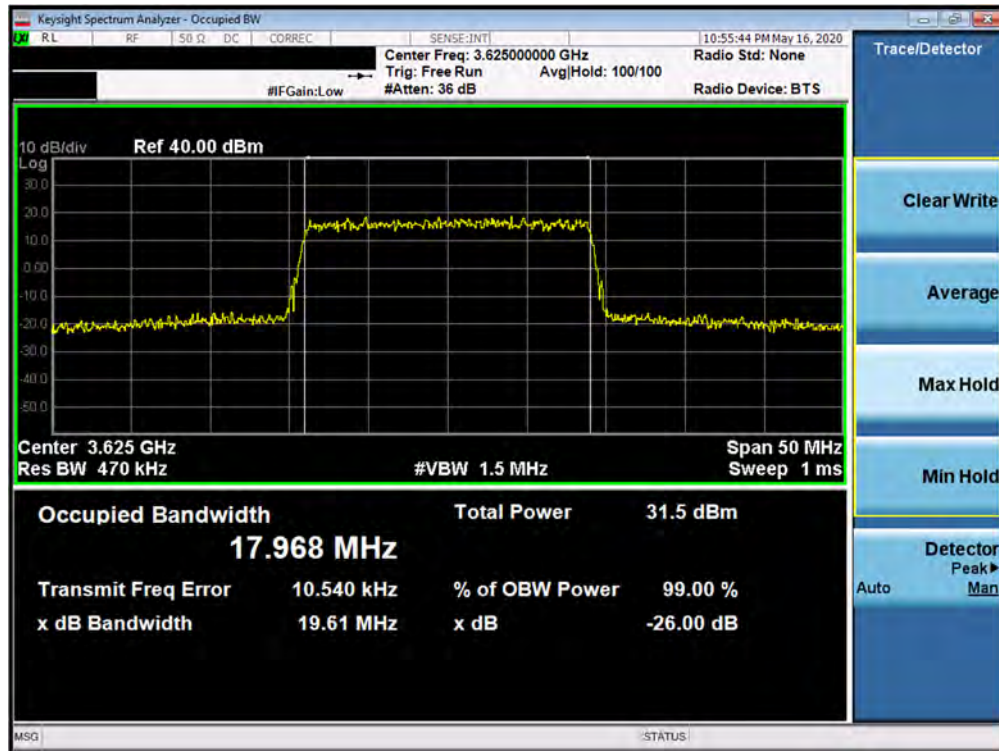


Plot 7-9. Occupied Bandwidth Plot (Band 48 - 15.0MHz 64-QAM - Full RB Configuration)

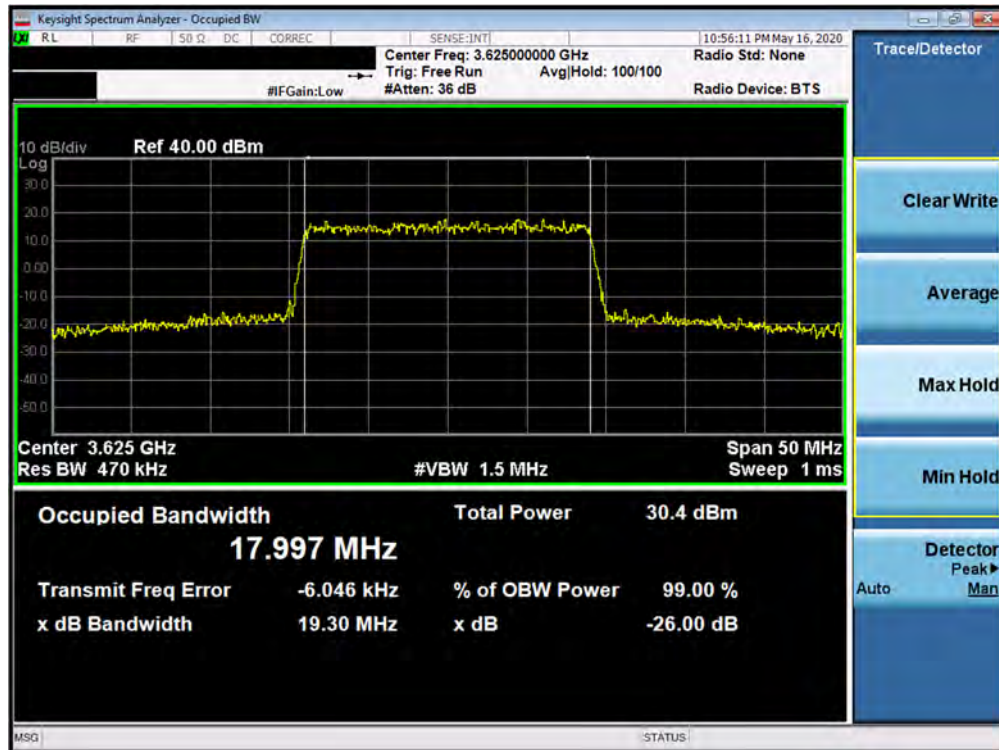


Plot 7-10. Occupied Bandwidth Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 17 of 76

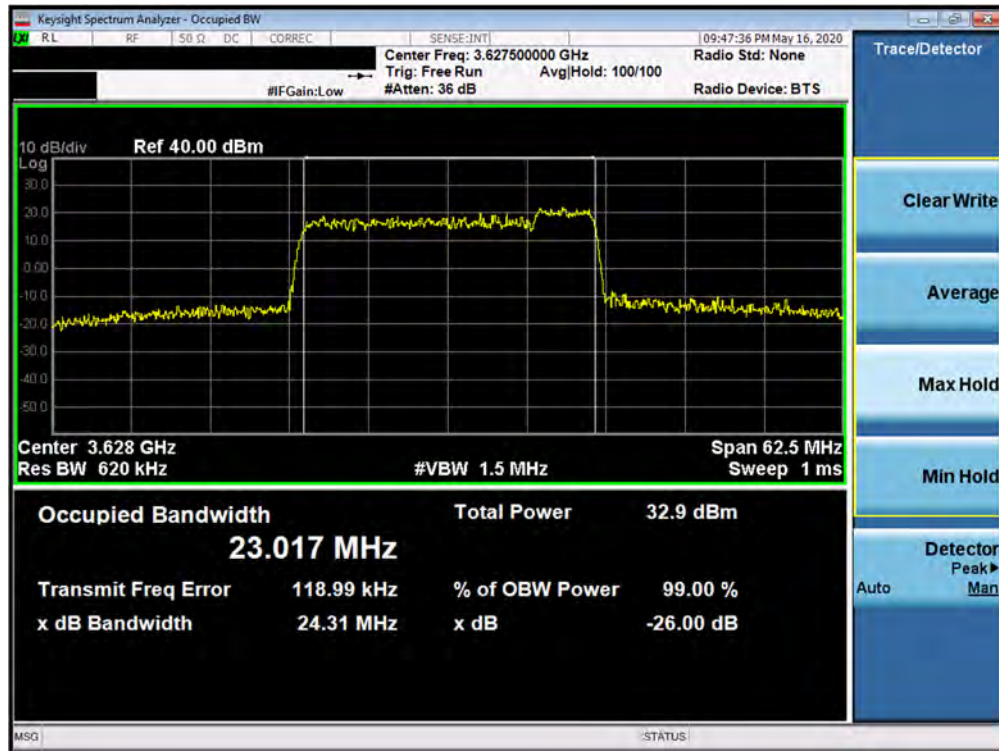


Plot 7-11. Occupied Bandwidth Plot (Band 48 - 20.0MHz 16-QAM - Full RB Configuration)

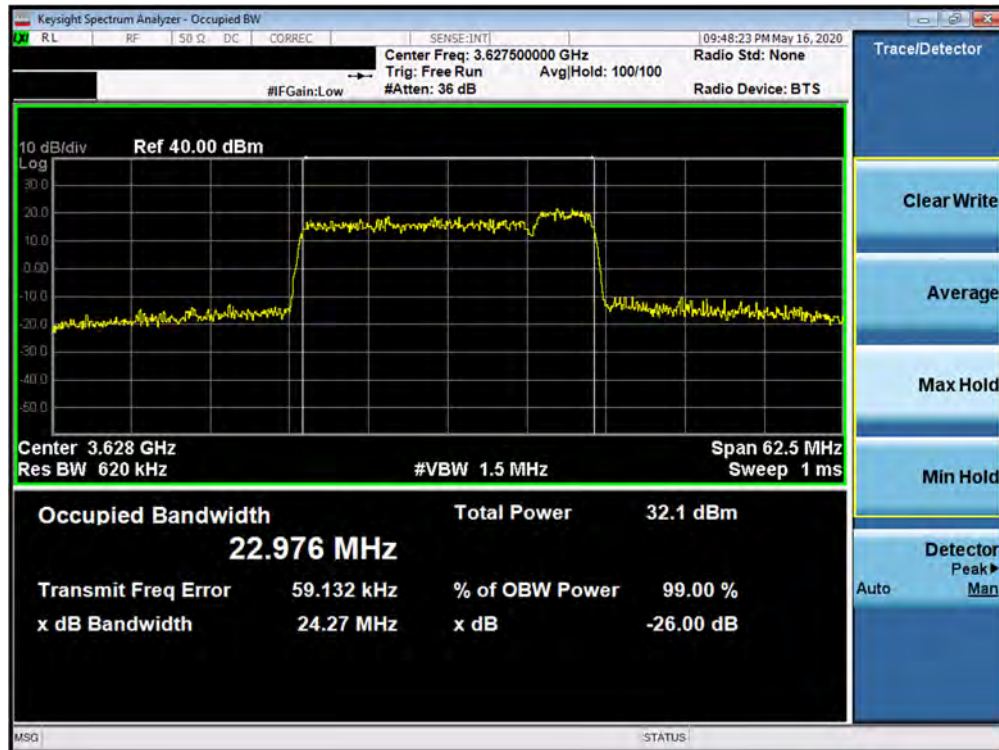


Plot 7-12. Occupied Bandwidth Plot (Band 48 - 20.0MHz 64-QAM - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 18 of 76

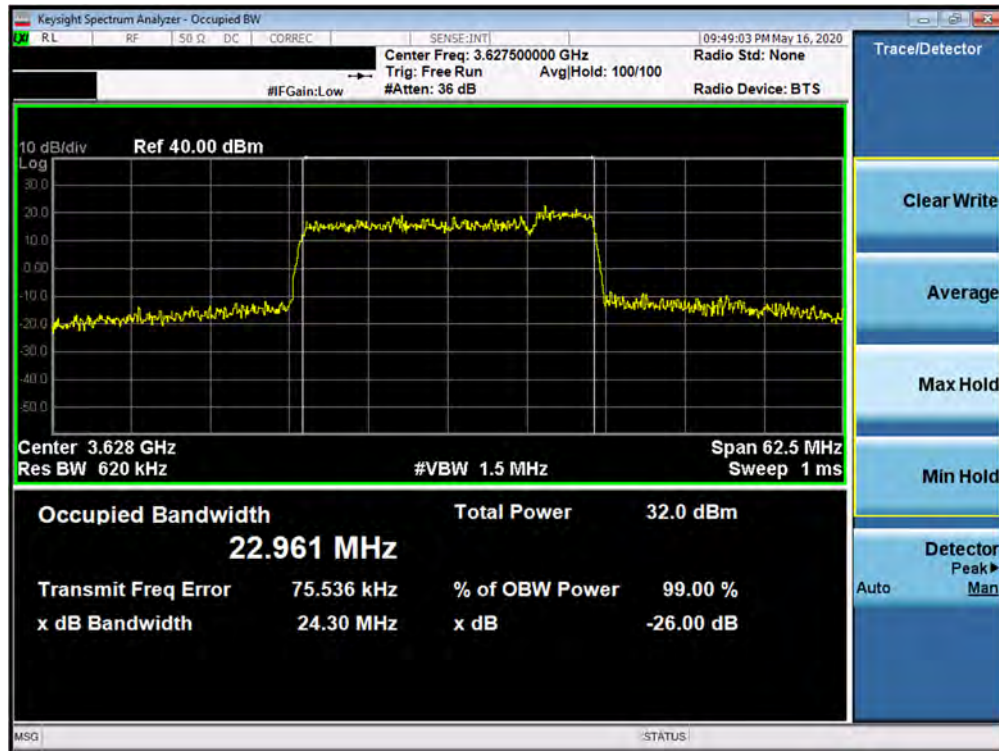


Plot 7-13. Occupied Bandwidth Plot (LTE Band 48 ULCA - 25.0MHz QPSK - Full RB Configuration)

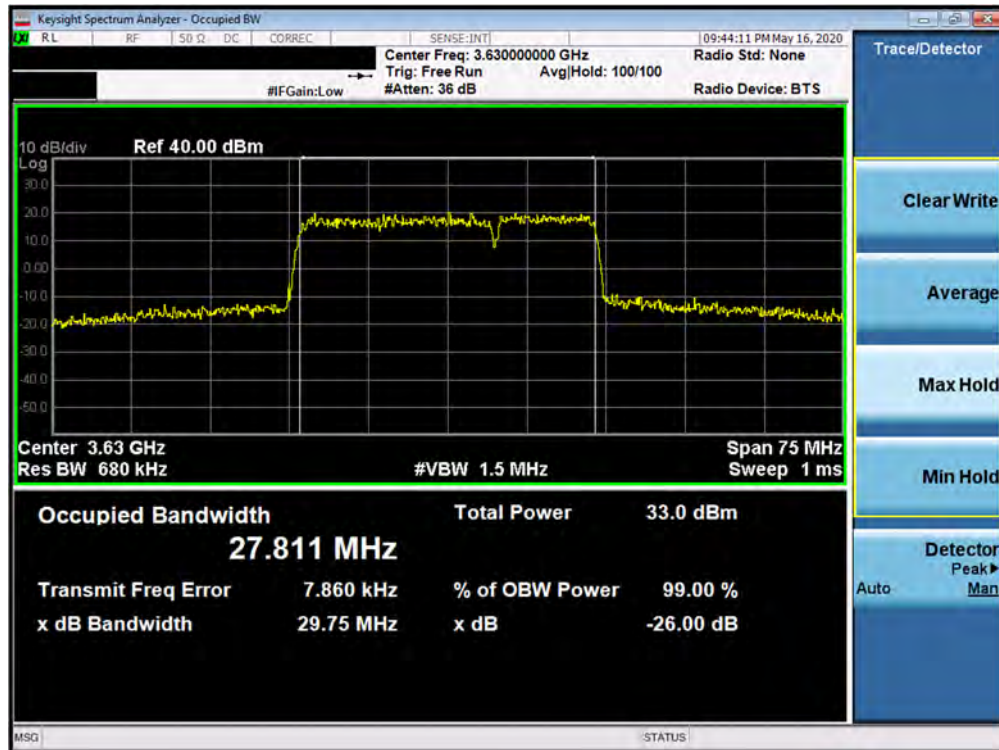


Plot 7-14. Occupied Bandwidth Plot (LTE Band 48 ULCA - 25.0MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 19 of 76

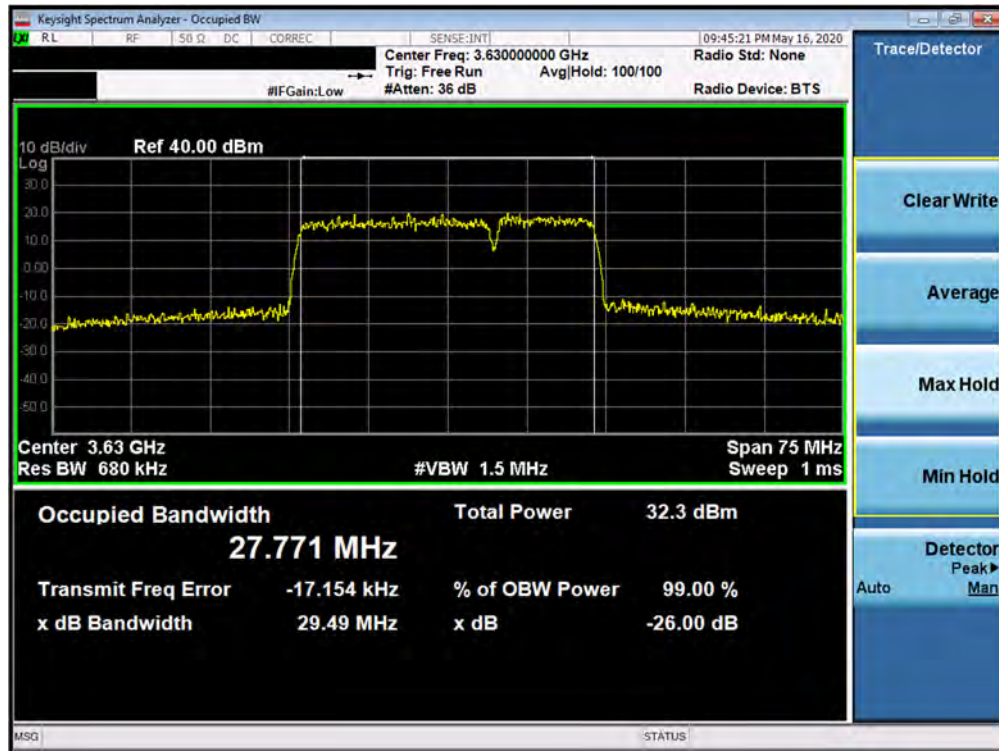


Plot 7-15. Occupied Bandwidth Plot (LTE Band 48 ULCA - 25.0MHz 64-QAM - Full RB Configuration)

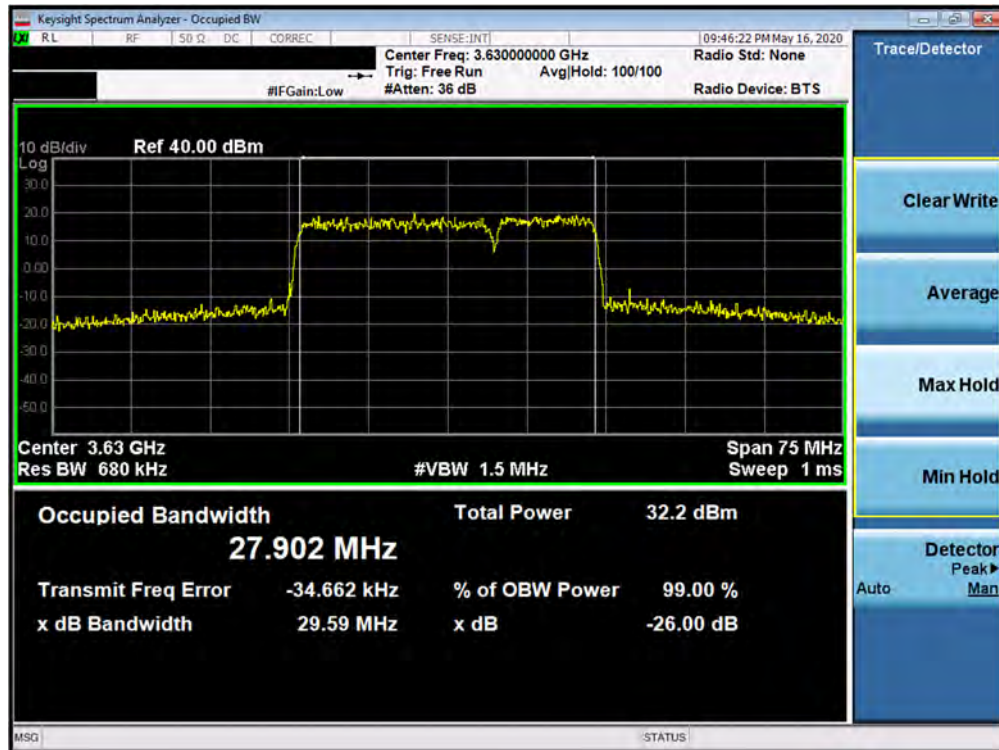


Plot 7-16. Occupied Bandwidth Plot (LTE Band 48 ULCA - 30.0MHz QPSK - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 20 of 76

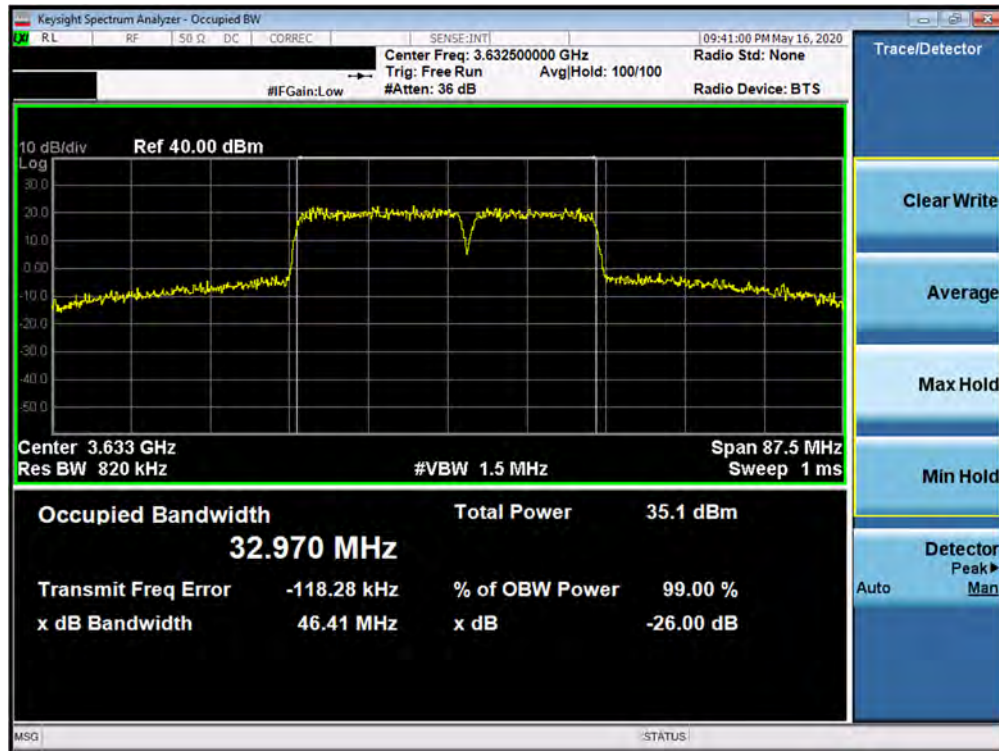


Plot 7-17. Occupied Bandwidth Plot (LTE Band 48 ULCA - 30.0MHz 16-QAM - Full RB Configuration)

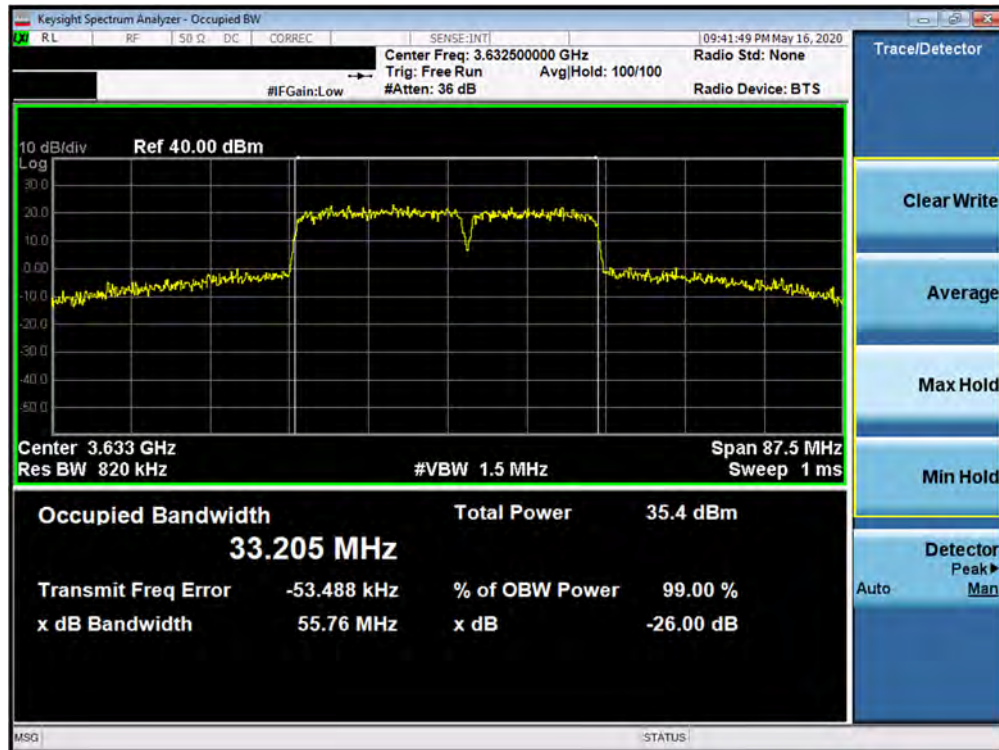


Plot 7-18. Occupied Bandwidth Plot (LTE Band 48 ULCA - 30.0MHz 64-QAM - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 21 of 76

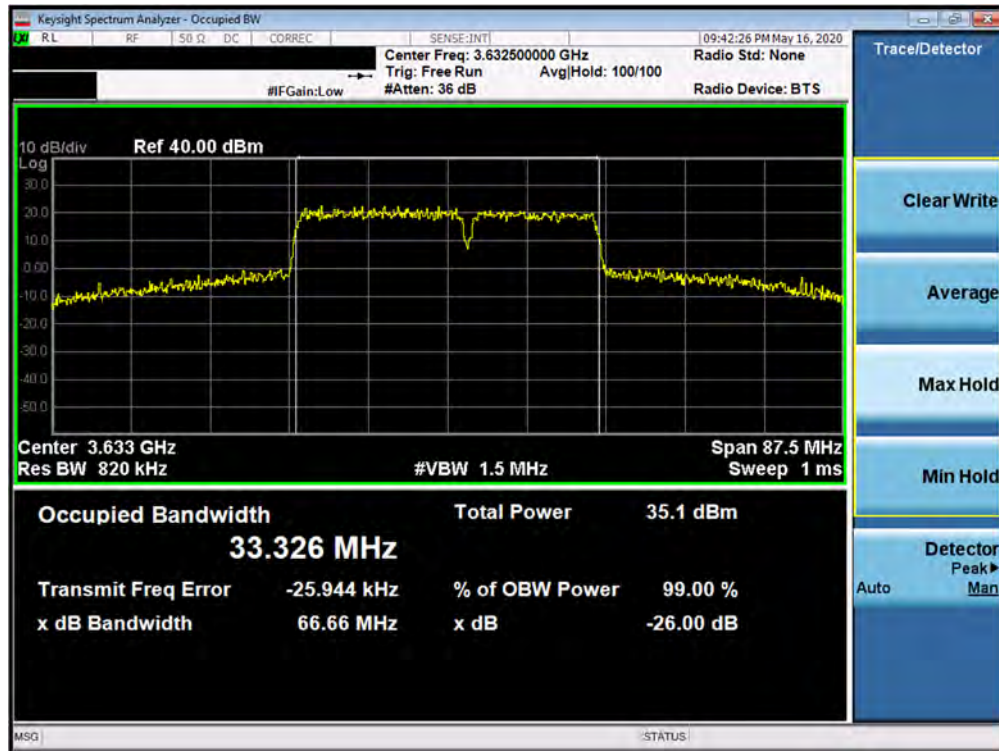


Plot 7-19. Occupied Bandwidth Plot (LTE Band 48 ULCA - 35.0MHz QPSK - Full RB Configuration)

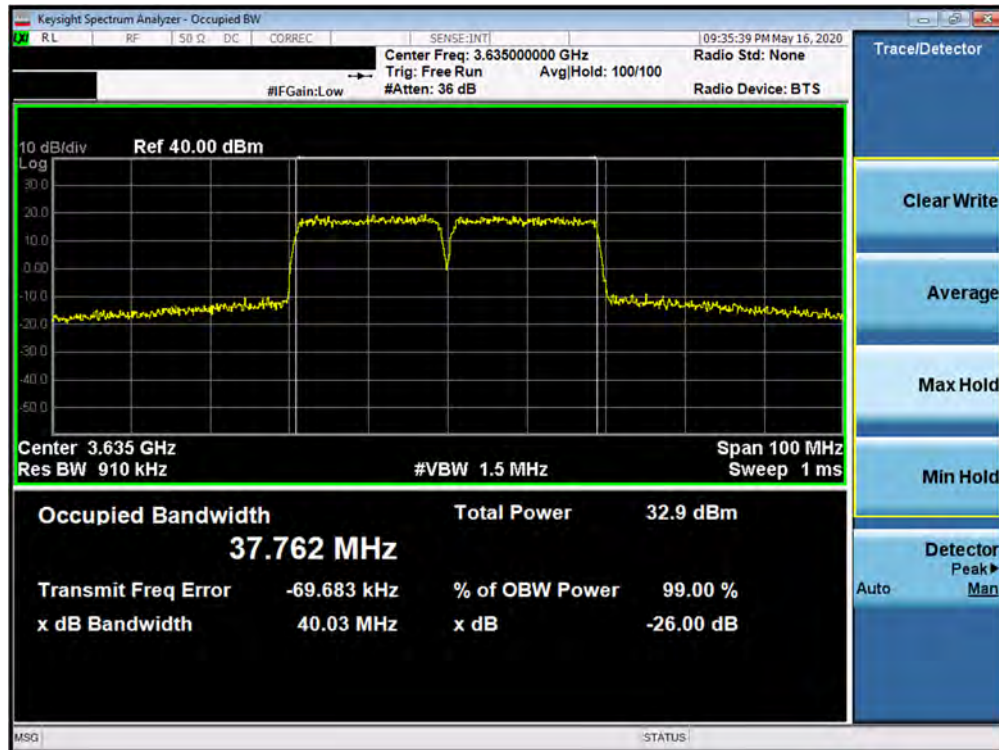


Plot 7-20. Occupied Bandwidth Plot (LTE Band 48 ULCA - 35.0MHz 16-QAM - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 22 of 76

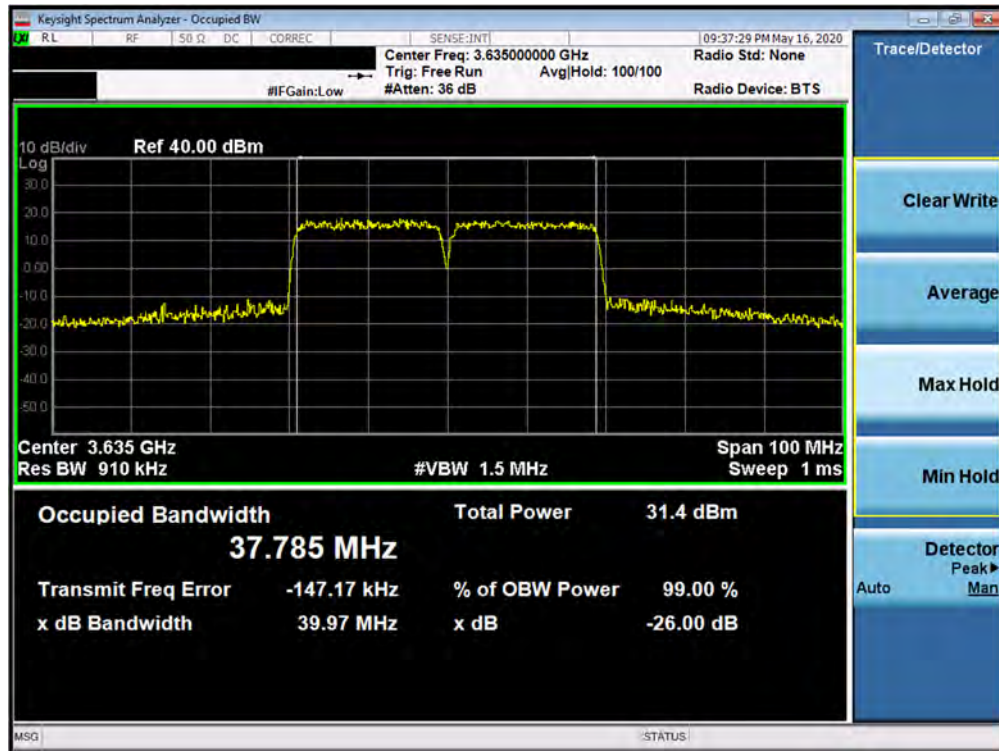


Plot 7-21. Occupied Bandwidth Plot (LTE Band 48 ULCA - 35.0MHz 64-QAM - Full RB Configuration)

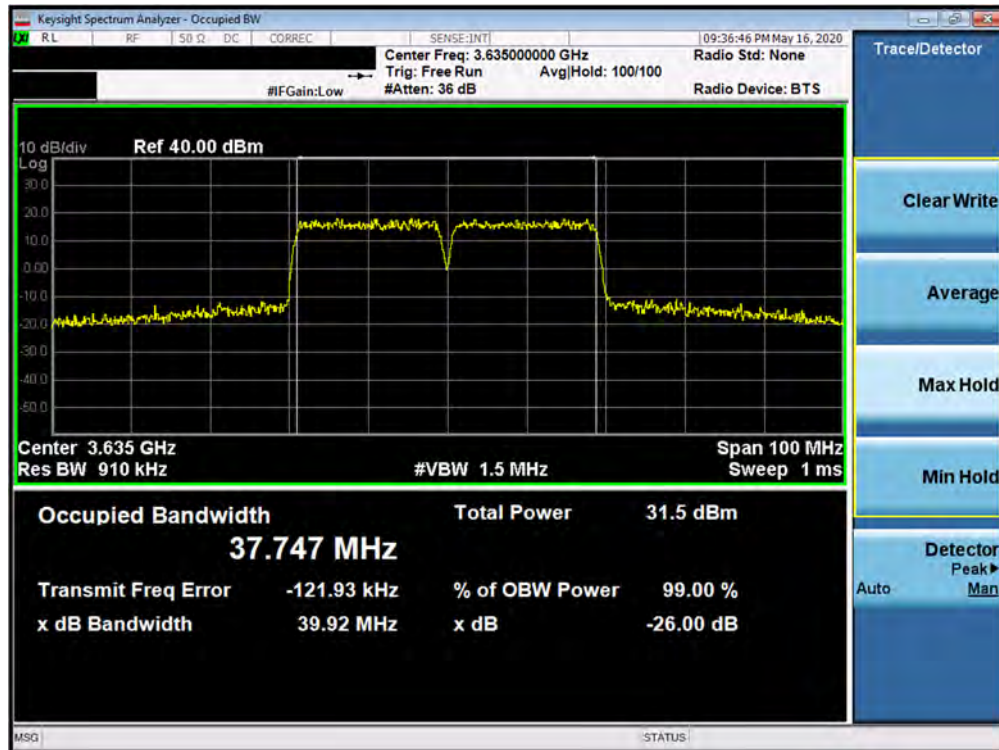


Plot 7-22. Occupied Bandwidth Plot (LTE Band 48 ULCA - 40.0MHz QPSK - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 23 of 76



Plot 7-23. Occupied Bandwidth Plot (LTE Band 48 ULCA - 40.0MHz 16-QAM - Full RB Configuration)



Plot 7-24. Occupied Bandwidth Plot (LTE Band 48 ULCA - 40.0MHz 64-QAM - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 24 of 76

7.3 Transmitter Conducted Output Power

Test Overview and Limit

A transmitter port of EUT is connected to the input of a signal analyzer. 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 Procedure Used

KDB 971168 D01 v03r01 – Section 5.2.2

ANSI/TIA-603-E-2016 – Section 2.2.17

KDB 662911 D01 v02r01 – Section E)1) In-Band Power Measurements

Test Settings

1. Conducted 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 = 2 times the OBW
5. No. of sweep points $> 2 \times$ span / RBW
6. Detector = RMS
7. Trace mode = Trace-Averaging (RMS) set to average over 100 sweeps
8. The trace was allowed to stabilize

Test Setup

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



Figure 7-2. Test Instrument & Measurement Setup

Test Notes

None

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 25 of 76

LTE Band 48 5 MHz Bandwidth					
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel
			55265 (3552.5 MHz)	55990 (3625.0 MHz)	56715 (3697.5 MHz)
			Conducted Power [dBm]		
QPSK	1	0	22.73	22.79	22.46
	1	12	22.83	22.92	22.50
	1	24	22.85	22.85	22.54
	25	0	21.84	21.86	21.54
16QAM	1	0	21.78	21.52	21.52
	1	12	21.87	21.65	21.56
	1	24	21.92	21.55	21.59
	25	0	20.91	20.89	20.63
64QAM	1	0	20.35	20.77	20.12
	1	12	20.50	21.01	20.22
	1	24	20.46	20.82	20.23
	25	0	19.95	19.86	19.64

Table 7-3. Conducted Powers (B48 5MHz)

LTE Band 48 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel
			55290 (3555.0 MHz)	55990 (3625.0 MHz)	56690 (3695.0 MHz)
			Conducted Power [dBm]		
QPSK	1	0	22.56	22.64	22.25
	1	25	22.94	23.05	22.58
	1	49	22.73	22.79	22.37
	50	0	21.79	21.85	21.56
16QAM	1	0	21.42	21.55	21.13
	1	25	21.83	21.96	21.44
	1	49	21.62	21.70	21.22
	50	0	20.81	20.89	20.56
64QAM	1	0	20.20	20.23	19.84
	1	25	20.59	20.66	20.20
	1	49	20.31	20.37	19.92
	50	0	19.83	19.88	19.50

Table 7-4. Conducted Powers (B48 10MHz)

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 26 of 76

LTE Band 48 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel
			55315 (3557.5 MHz)	55990 (3625.0 MHz)	56665 (3692.5 MHz)
			Conducted Power [dBm]		
QPSK	1	0	22.53	22.80	22.25
	1	36	22.85	22.92	22.43
	1	74	22.78	22.84	22.20
	75	0	21.69	21.96	21.52
16QAM	1	0	21.74	22.04	21.50
	1	36	21.79	22.08	21.57
	1	74	21.60	22.05	21.61
	75	0	20.75	21.06	20.63
64QAM	1	0	20.06	20.59	20.25
	1	36	20.32	20.80	20.31
	1	74	20.03	20.65	20.17
	75	0	19.67	20.10	19.65

Table 7-5. Conducted Powers (B48 15MHz)

LTE Band 48 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel
			55340 (3560.0 MHz)	55990 (3625.0 MHz)	56640 (3690.0 MHz)
			Conducted Power [dBm]		
QPSK	1	0	22.33	22.25	22.12
	1	50	22.66	22.63	22.42
	1	99	22.41	22.44	22.03
	100	0	21.66	21.64	21.55
16QAM	1	0	21.53	21.13	21.49
	1	50	21.90	21.47	21.74
	1	99	21.60	21.19	21.34
	100	0	20.71	20.73	20.48
64QAM	1	0	20.28	20.26	20.03
	1	50	20.57	20.68	20.32
	1	99	20.21	20.41	19.91
	100	0	19.82	19.70	19.54

Table 7-6. Conducted Powers (B48 20MHz)

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 27 of 76

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.



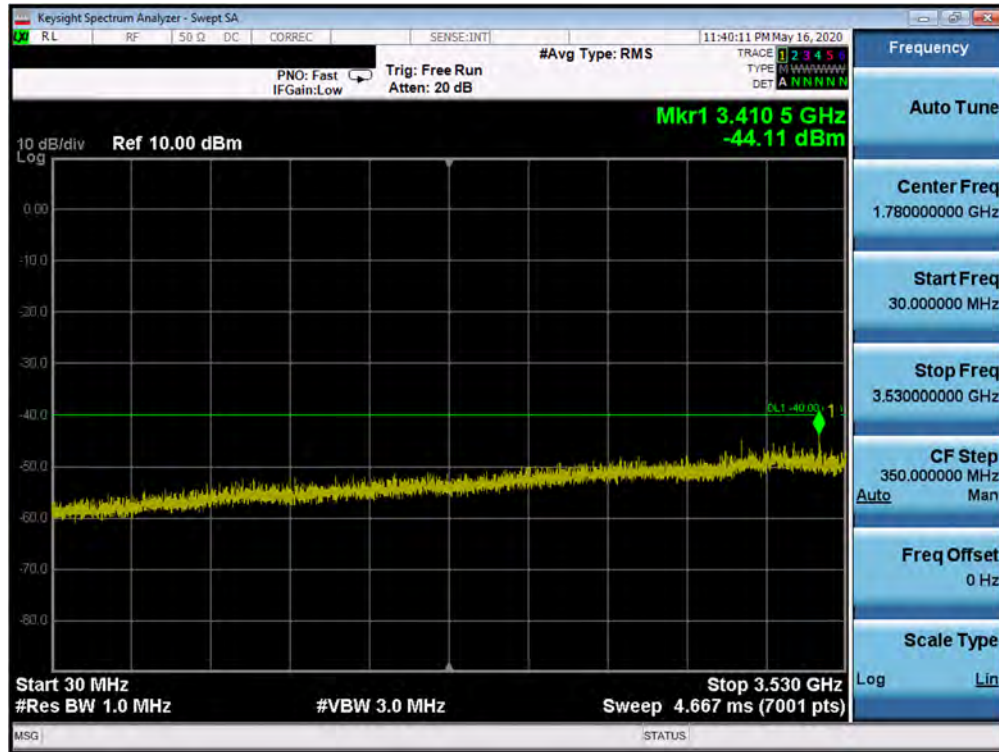
Figure 7-3. Test Instrument & Measurement Setup

Test Notes

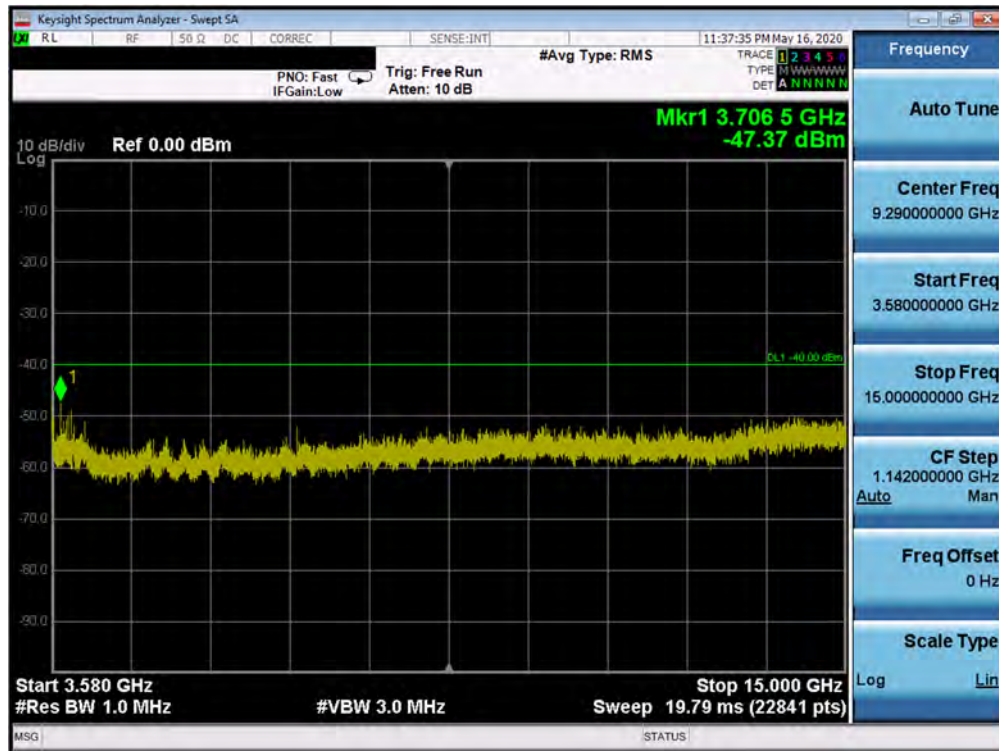
Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater for frequencies less than 1 GHz and 1 MHz or greater for frequencies greater than 1 GHz. However, in the 1 MHz bands immediately outside and adjacent to the 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: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 28 of 76

LTE Band 48

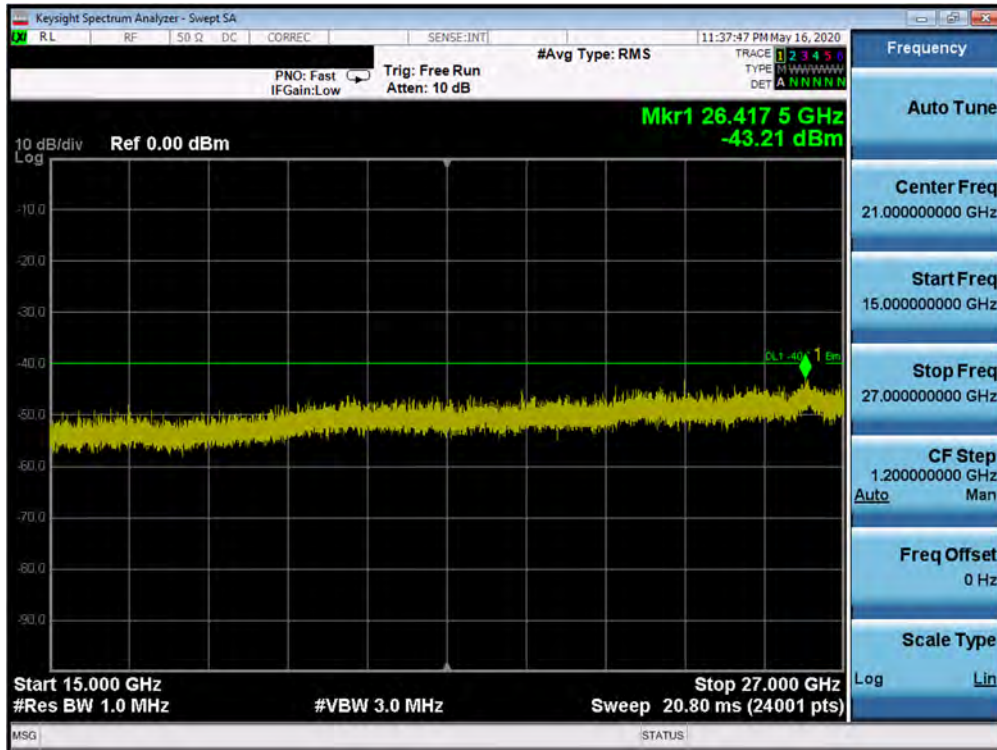


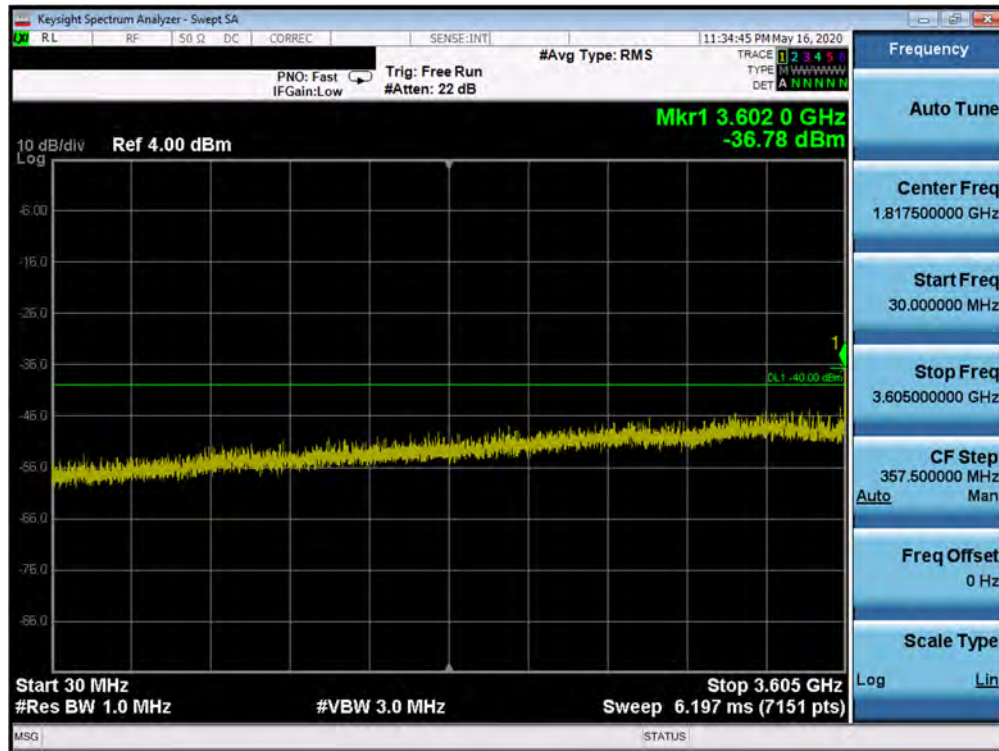
Plot 7-25. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)



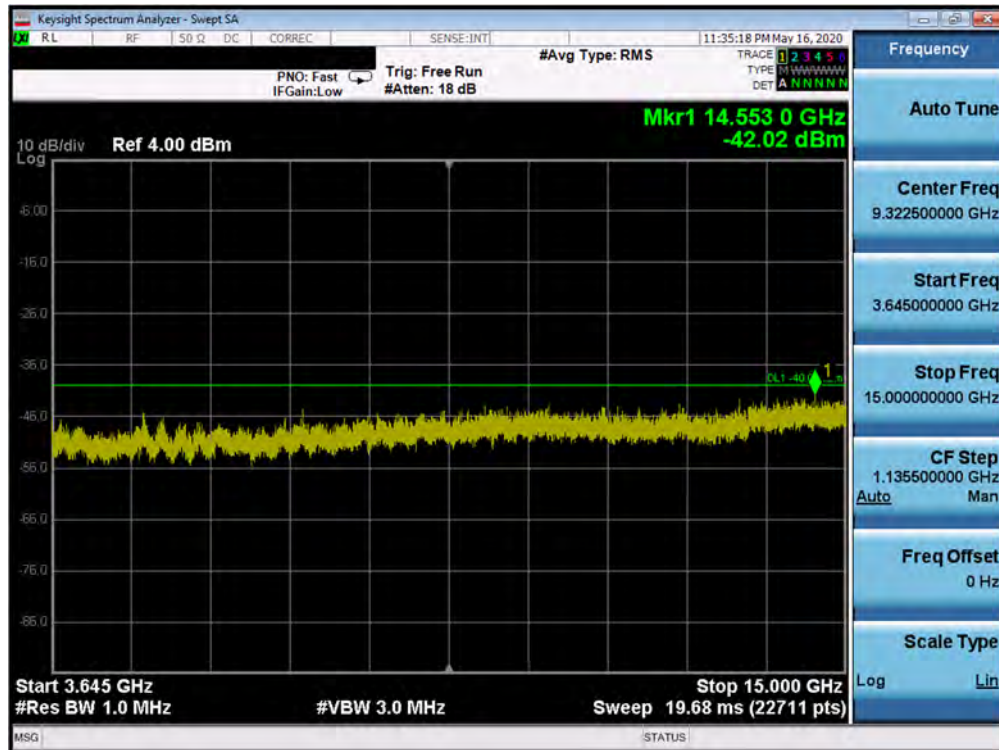
Plot 7-26. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Low Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 29 of 76



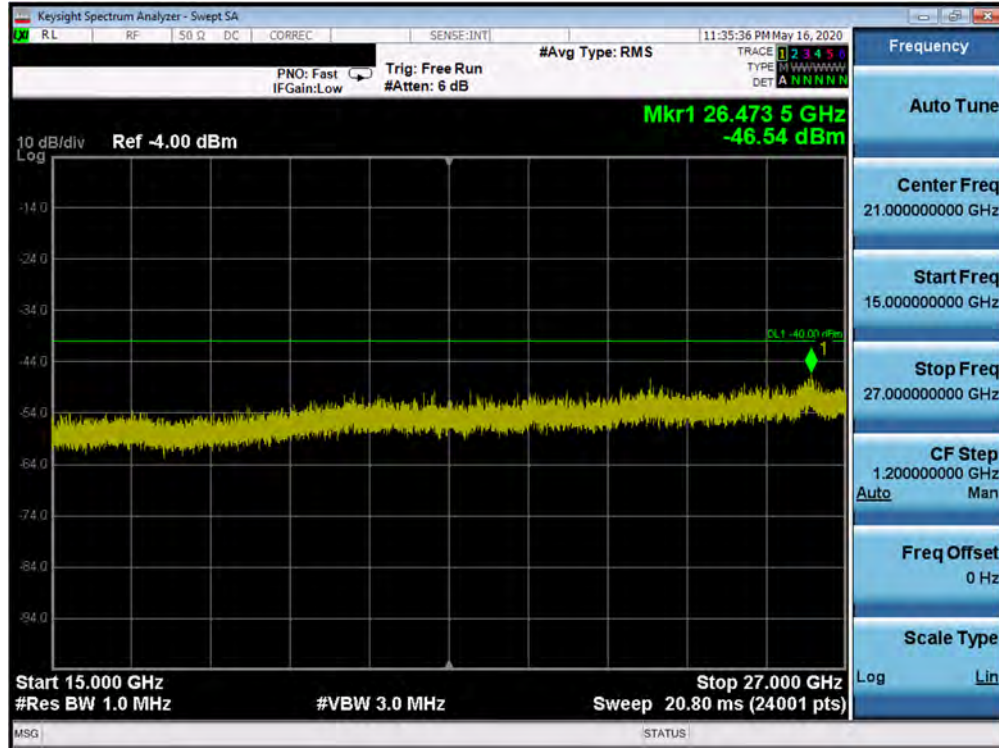


Plot 7-29. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

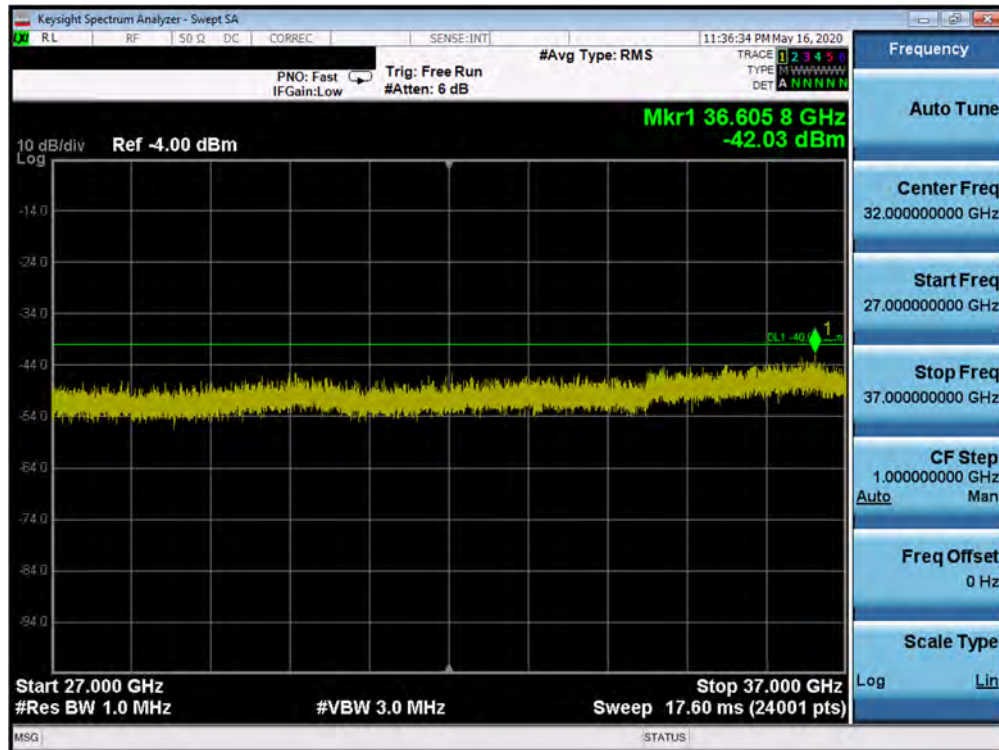


Plot 7-30. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 31 of 76

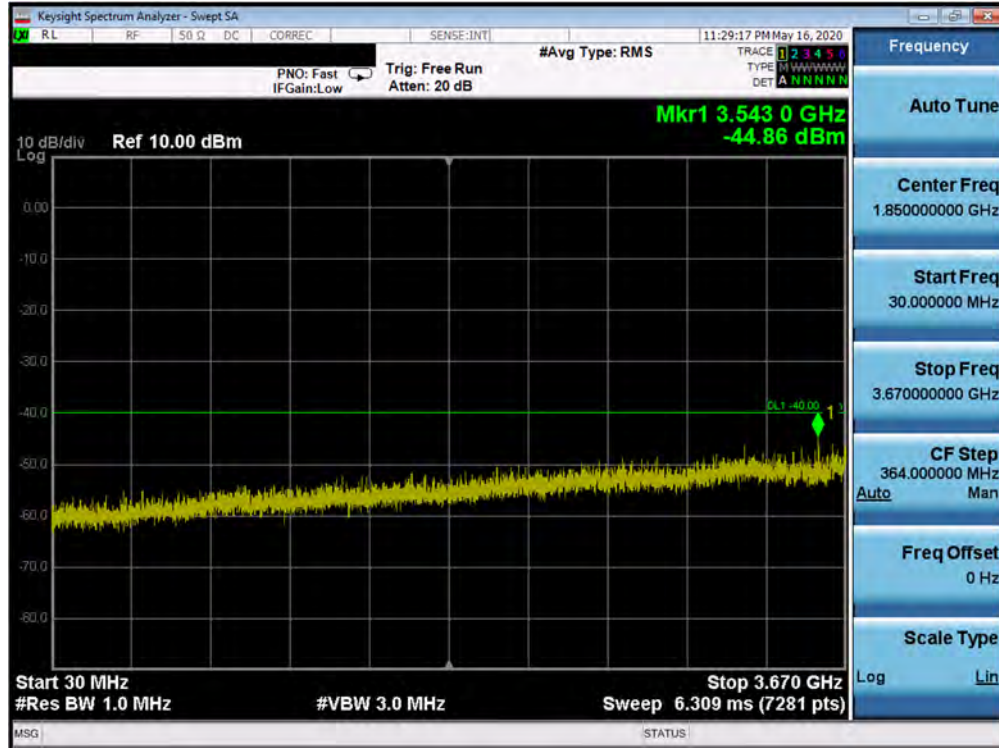


Plot 7-31. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

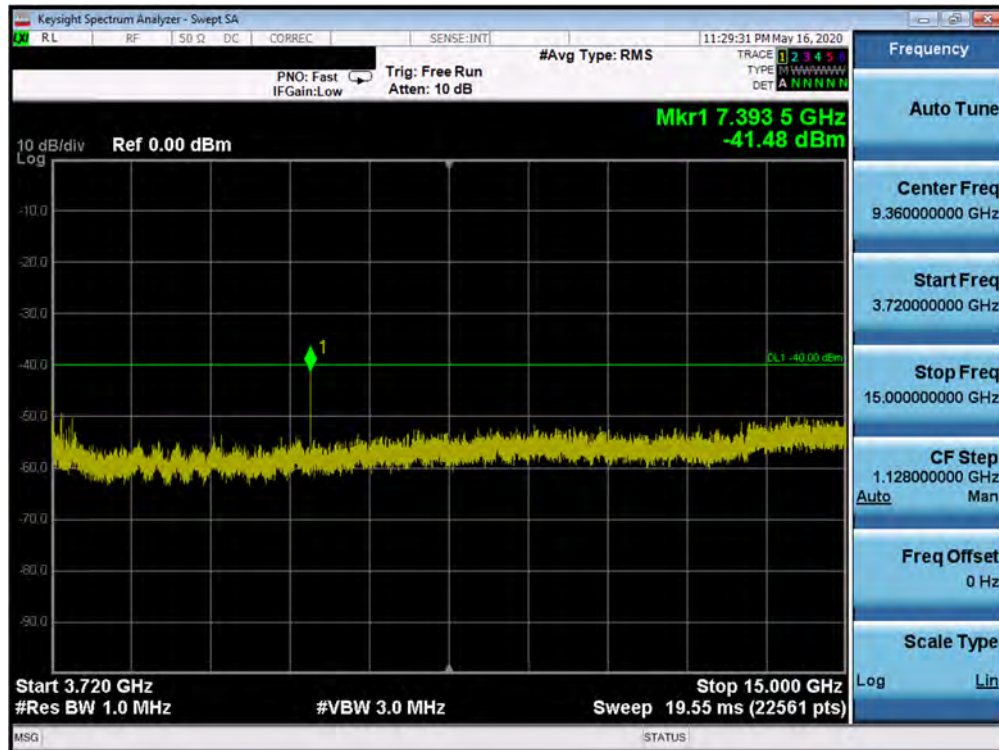


Plot 7-32. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 0 - Mid Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 32 of 76

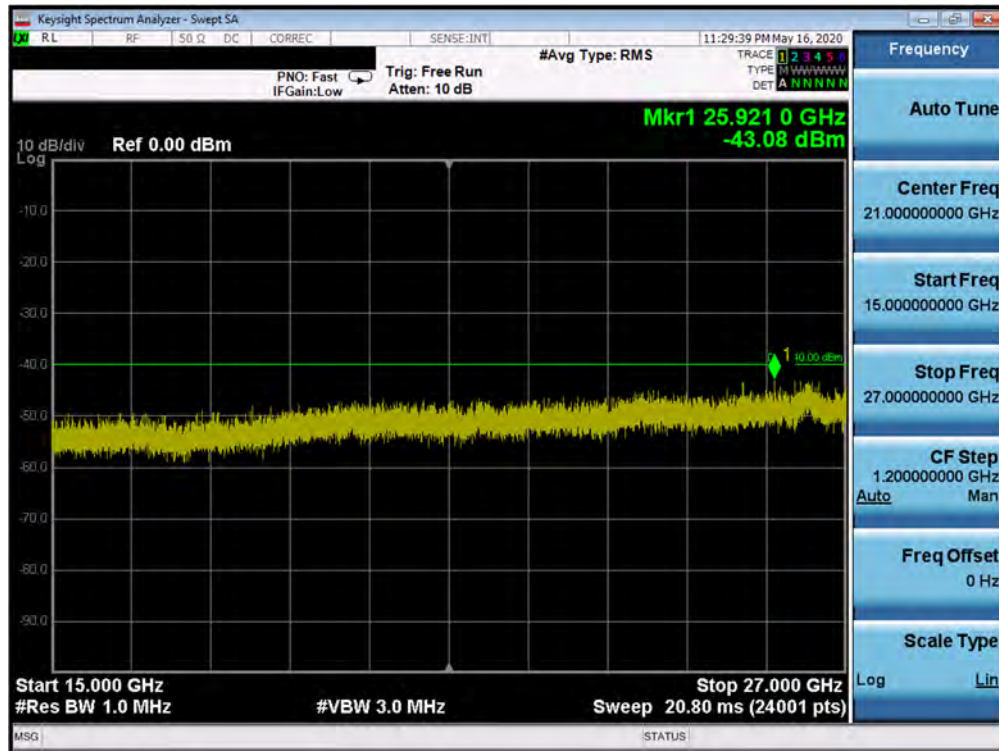


Plot 7-33. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

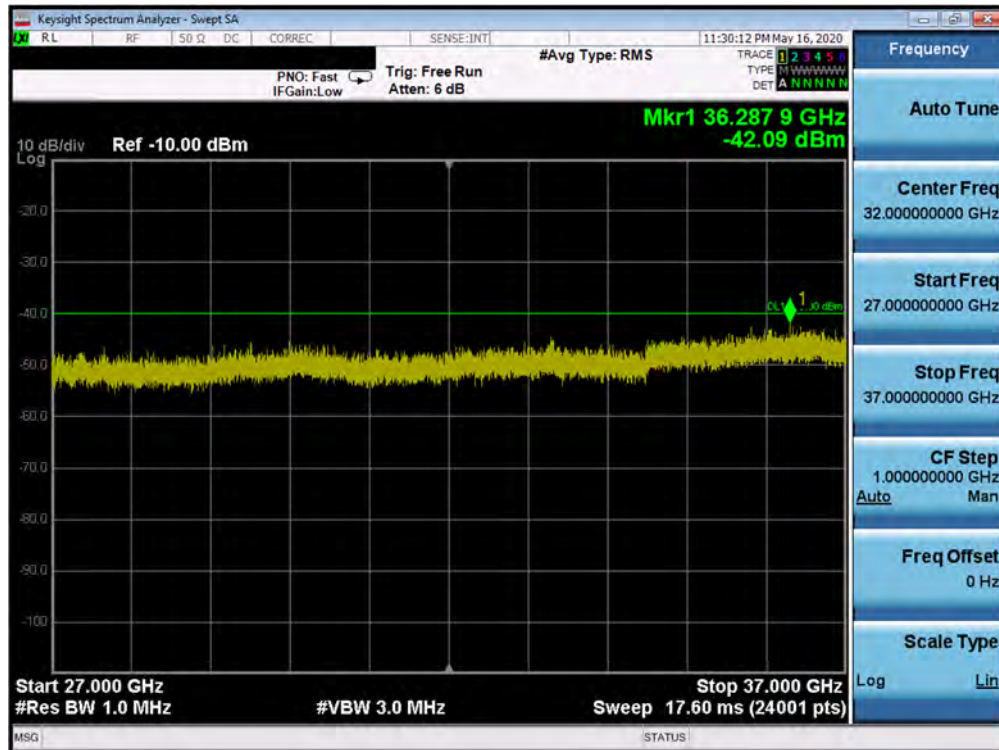


Plot 7-34. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 – High Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 33 of 76



Plot 7-35. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)



Plot 7-36. Conducted Spurious Plot (Band 48 - 20.0MHz QPSK - RB Size 1, RB Offset 99 - High Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 34 of 76

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 -40dBm/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 x RBW
5. Detector = RMS
6. Number of sweep points $\geq$ 2 x 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.



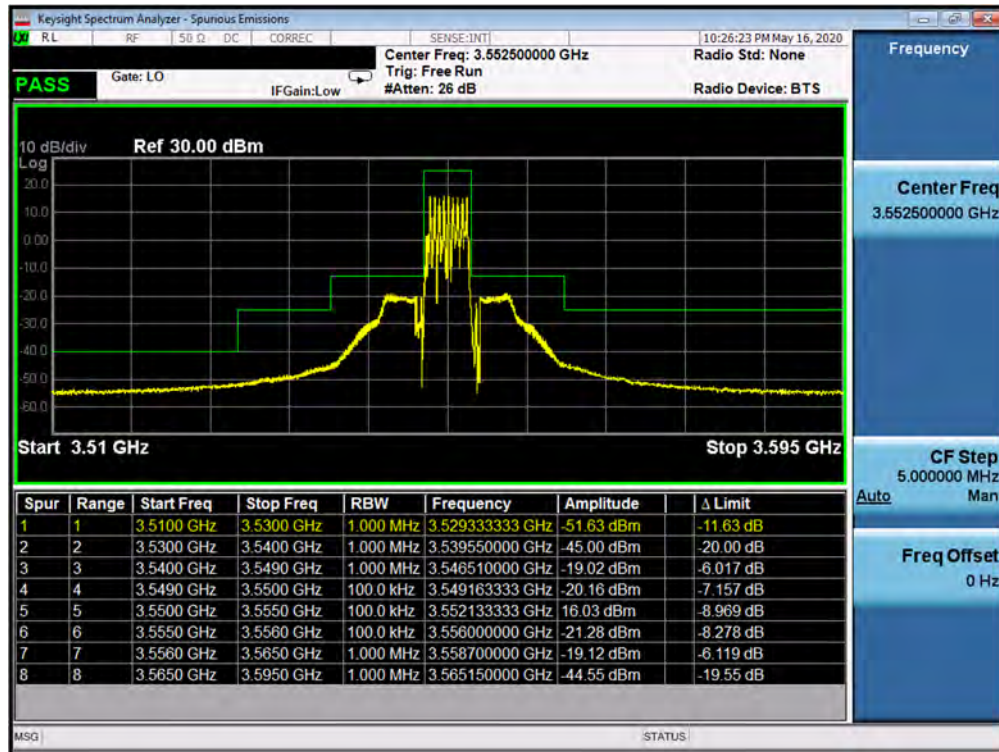
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

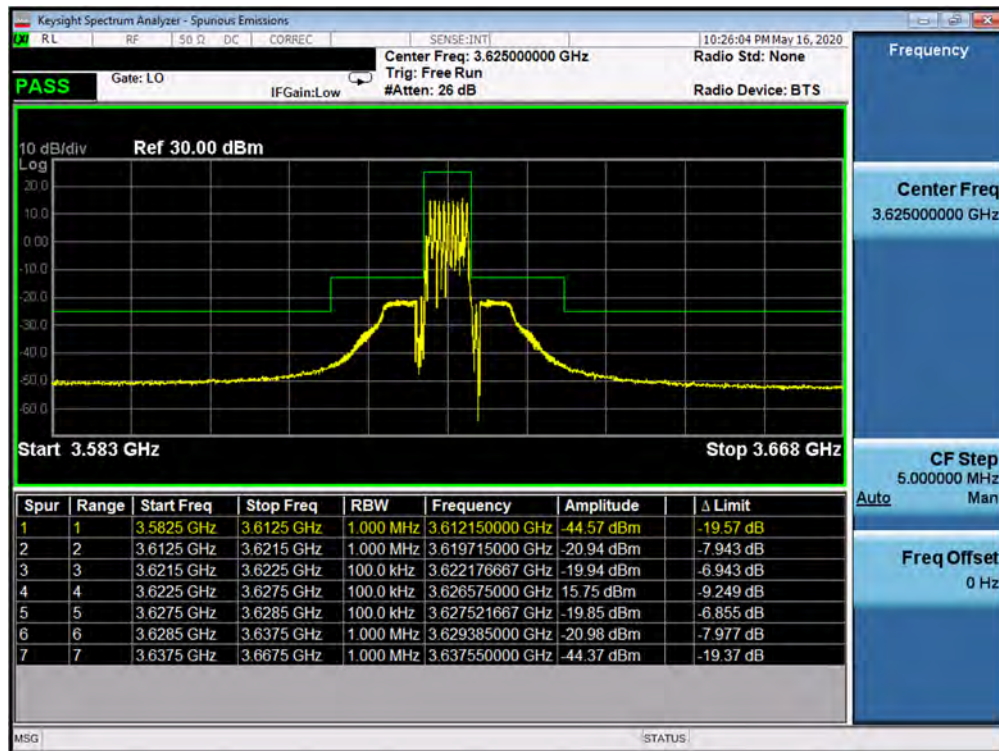
None

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 35 of 76

LTE Band 48

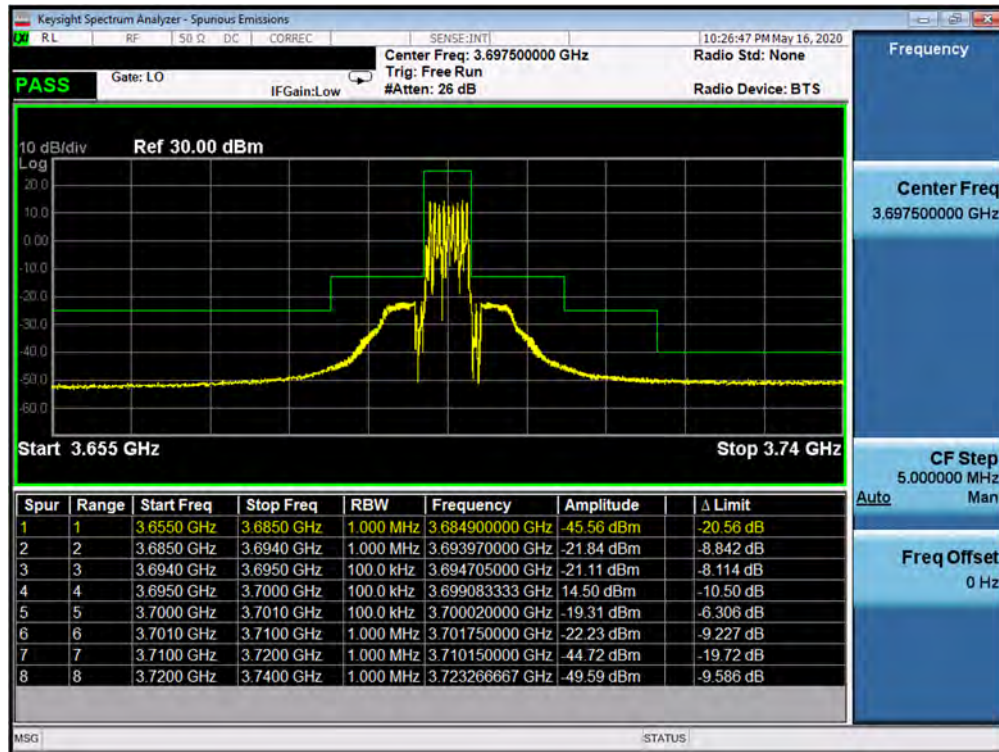


Plot 7-37. Lower Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

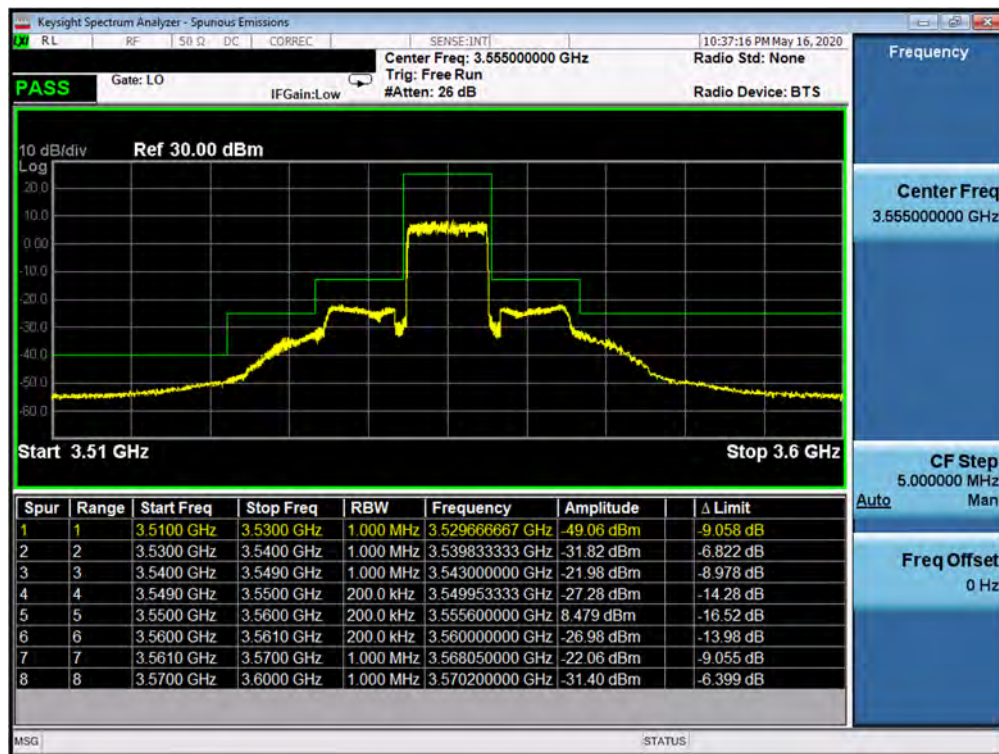


Plot 7-38. Mid Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 36 of 76

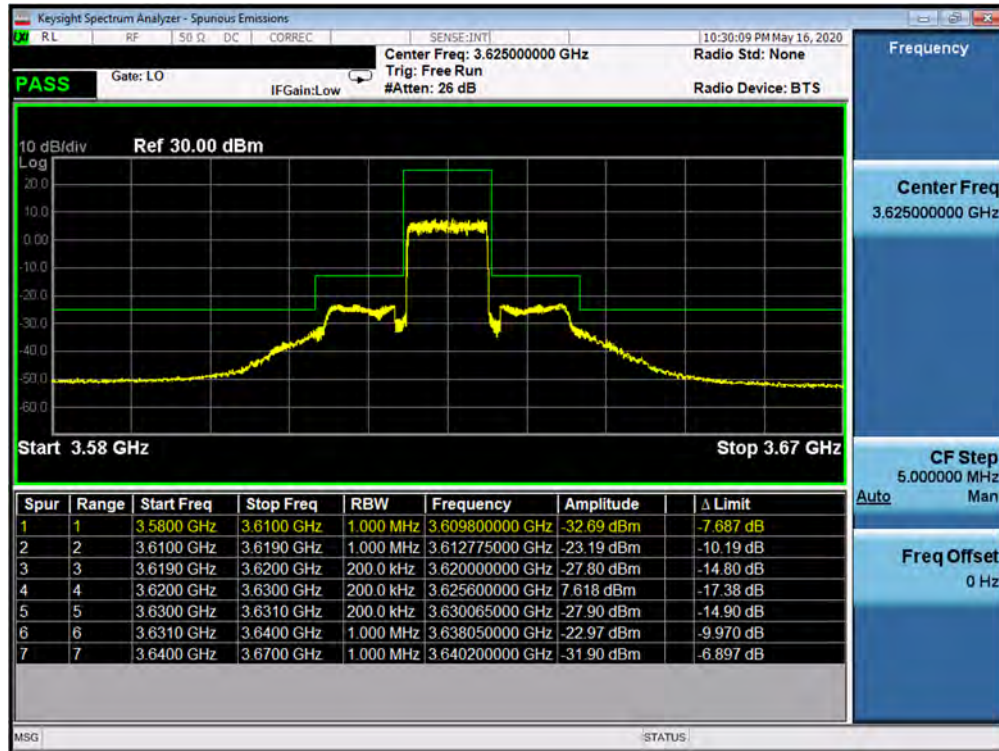


Plot 7-39. Upper Channel Edge Plot (Band 48 - 5.0MHz QPSK - Full RB Configuration)

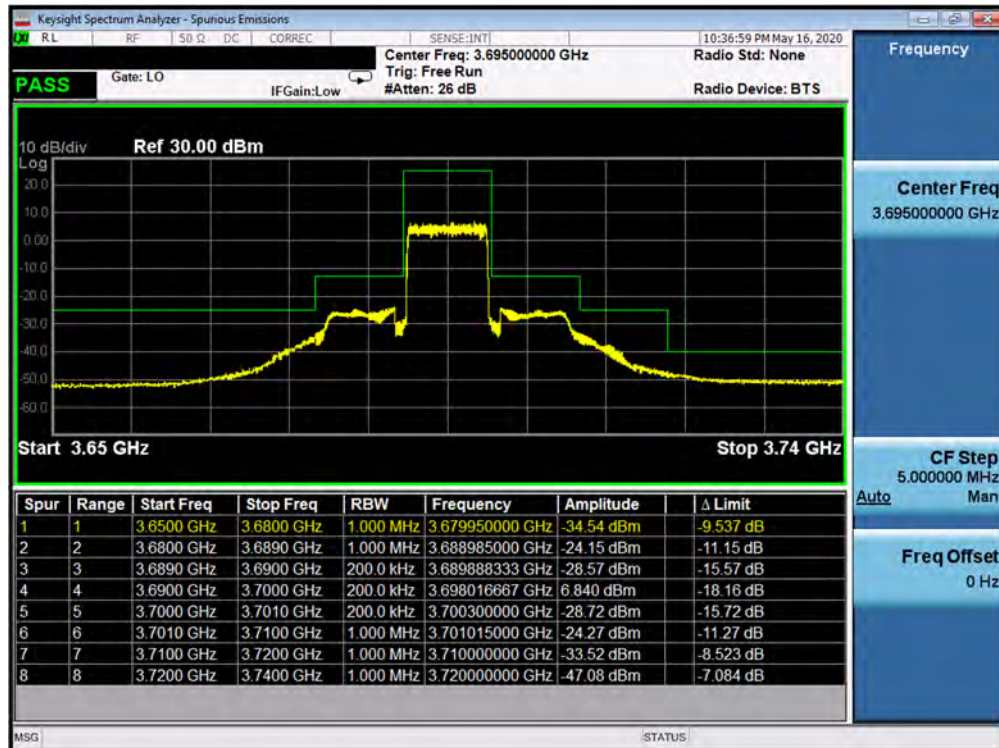


Plot 7-40. Lower Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 37 of 76

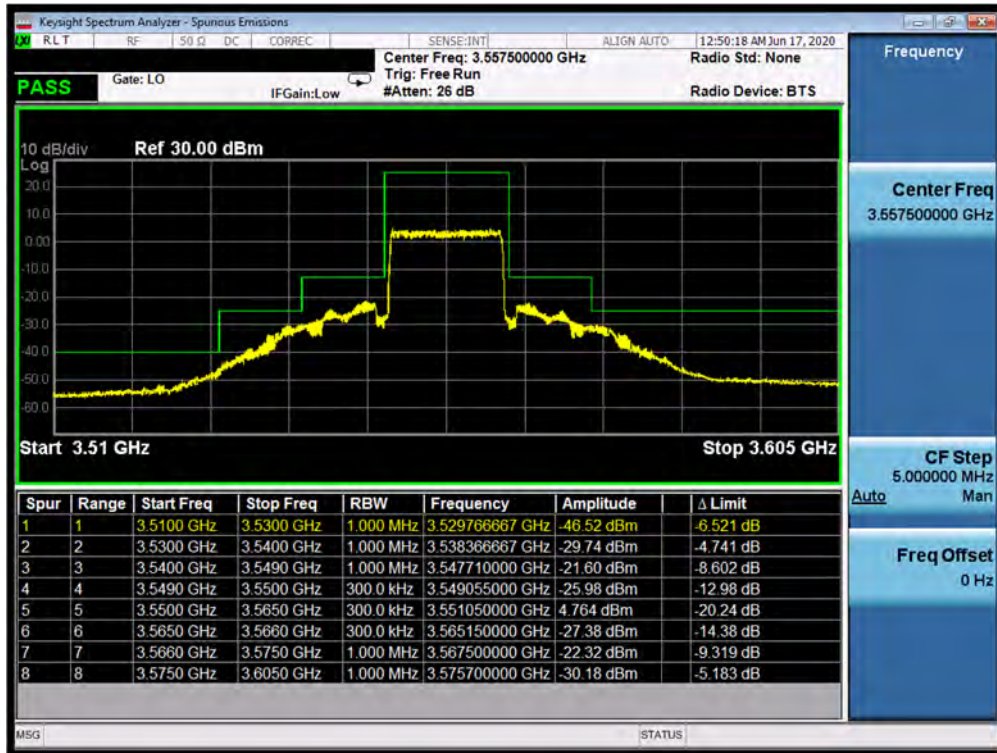


Plot 7-41. Mid Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

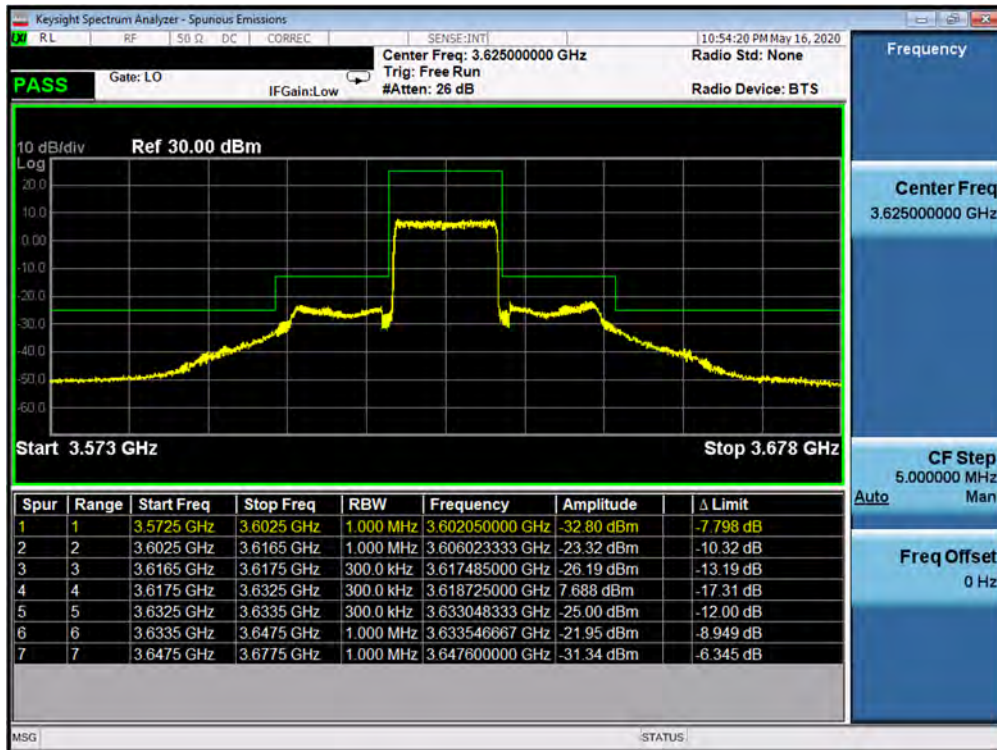


Plot 7-42. Upper Channel Edge Plot (Band 48 - 10.0MHz QPSK - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 38 of 76

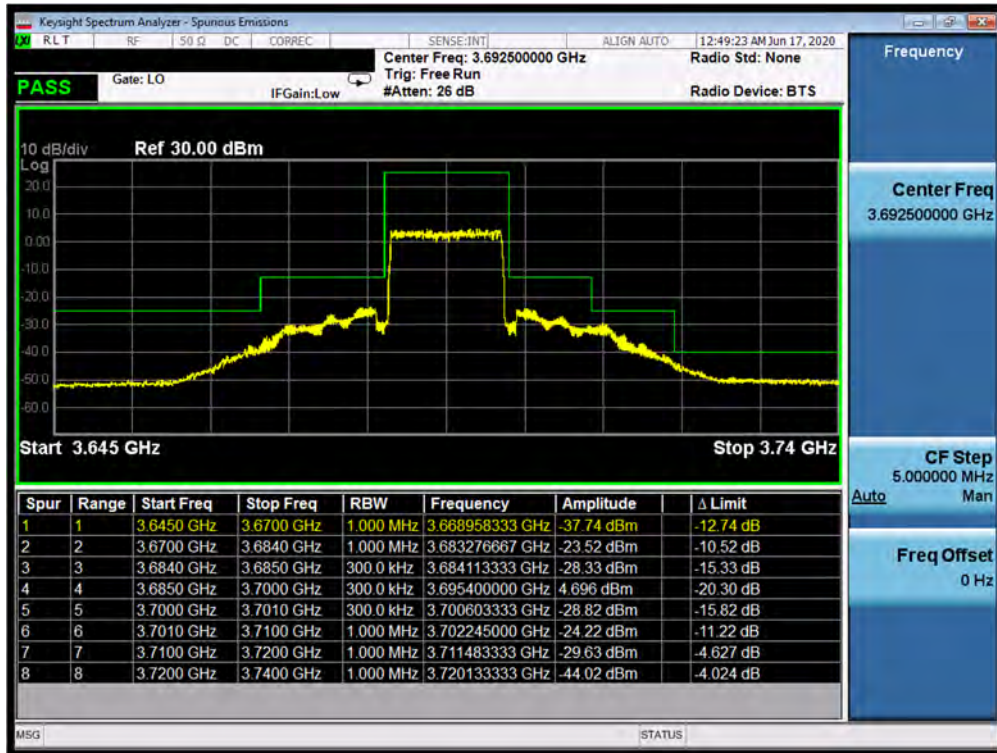


Plot 7-43. Lower Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

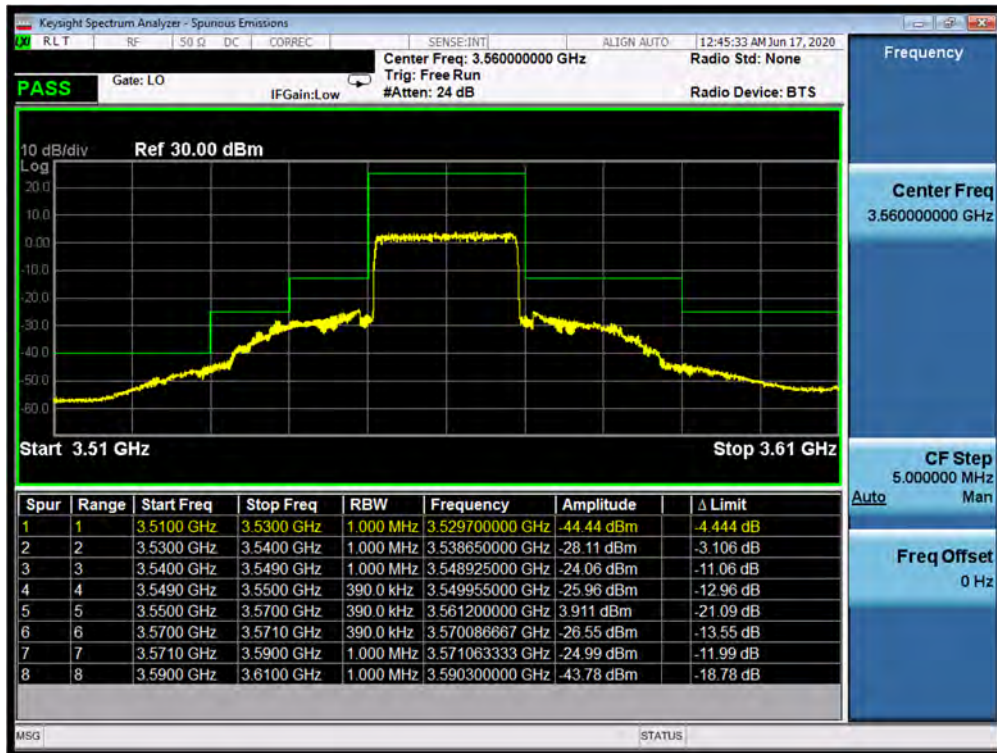


Plot 7-44. Mid Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 39 of 76

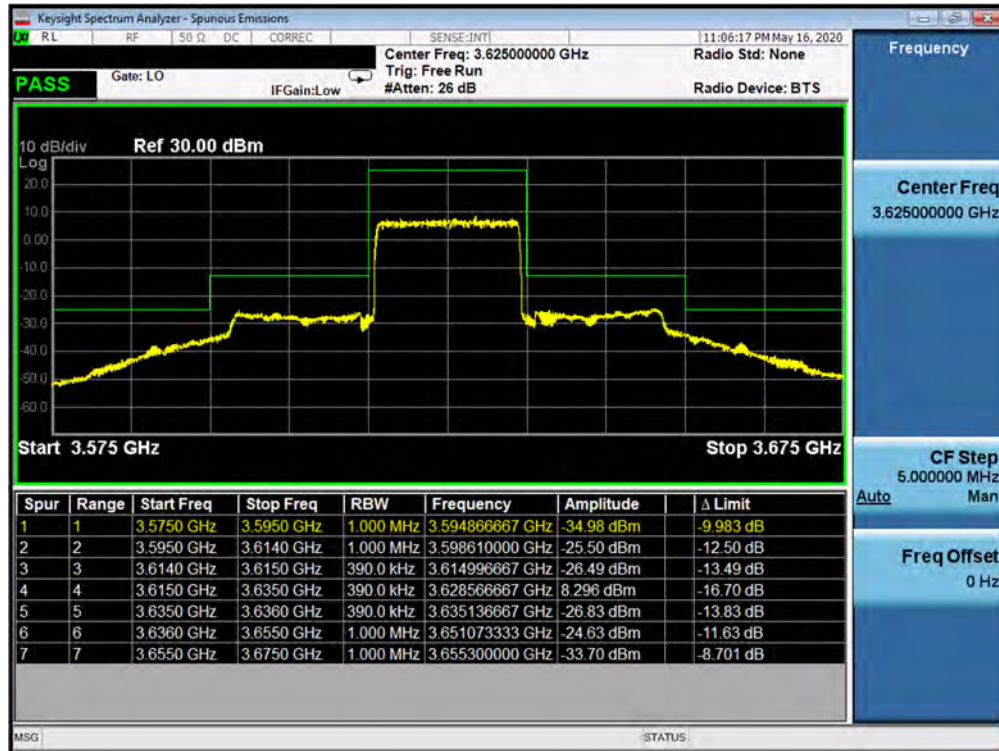


Plot 7-45. Upper Channel Edge Plot (Band 48 - 15.0MHz QPSK - Full RB Configuration)

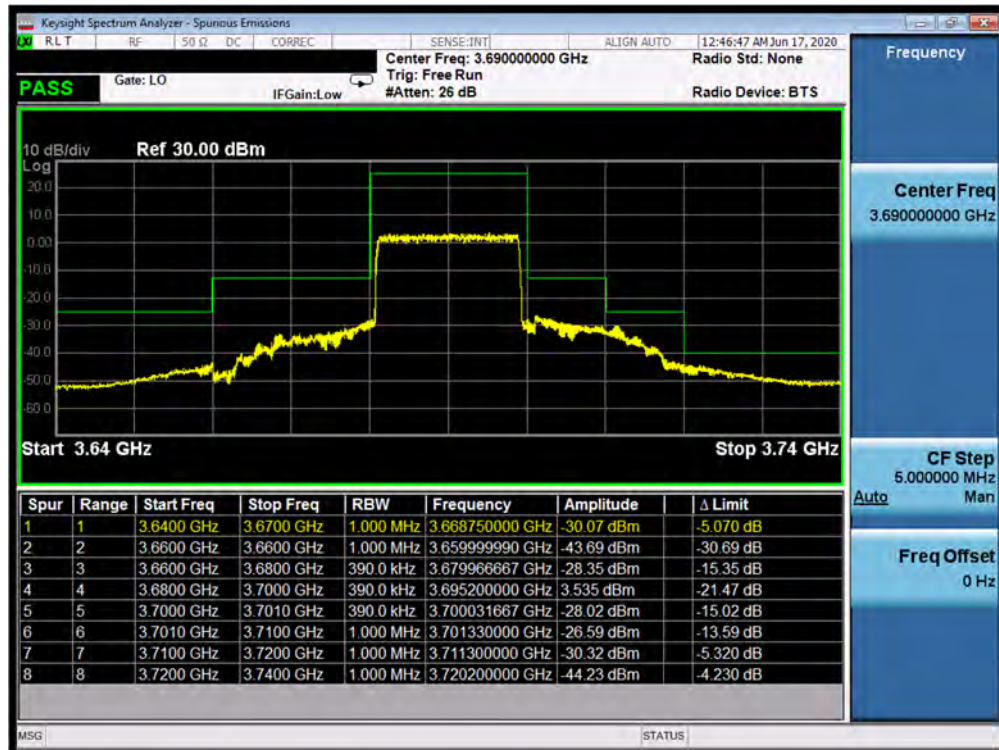


Plot 7-46. Lower Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 40 of 76



Plot 7-47. Mid Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)



Plot 7-48. Upper Channel Edge Plot (Band 48 - 20.0MHz QPSK - Full RB Configuration)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 41 of 76

7.6 Additional Maximum Power Reduction (A-MPR)

§2.1046

Test Overview

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 5.2.2

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 7-5. Test Instrument & Measurement Setup

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.

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 42 of 76

Test Case	NS	MCC	MNC	Channel BW [MHz]	PCC Channel Number	PCC Channel Frequency [MHz]	SCC Channel Frequency [MHz]	Modulation	PCC RB Size	PCC RB Offset	SCC RB Size	SCC RB Offset	A-MPR [dB]	MPR [dB]	A-MPR [dB]	A-MPR Measured Power [dBm]
1	NS_01	310	910	20 + 20	55340	3560	3579.8	QPSK	100	0	100	0	≤ 11	0	≤ 11	13.34
								16-QAM	100	0	100	0		1		13.40
								64-QAM	100	0	100	0		2		13.46
2				20 + 20	55340	3560	3579.8	QPSK	1	99	1	0	≤ 11	0	≤ 11	20.56
								16-QAM	1	99	1	0		1		21.09
								64-QAM	1	99	1	0		2		20.73
4				20 + 20	55791	3605.1	3624.9	QPSK	100	0	100	0	≤ 4.5	0	≤ 4.5	19.63
								16-QAM	100	0	100	0		1		19.79
								64-QAM	100	0	100	0		2		19.72
5				20 + 20	55791	3605.1	3624.9	QPSK	1	99	1	0	≤ 4.5	0	≤ 4.5	22.52
								16-QAM	1	99	1	0		1		22.84
								64-QAM	1	99	1	0		2		22.37
7				20 + 20	56442	3690	3670.2	QPSK	100	0	100	0	≤ 11	0	≤ 11	13.53
								16-QAM	100	0	100	0		1		13.48
								64-QAM	100	0	100	0		2		13.37
8				20 + 20	56442	3690	3670.2	QPSK	1	0	1	99	≤ 11	0	≤ 11	13.42
								16-QAM	1	0	1	99		1		13.34
								64-QAM	1	0	1	99		2		13.39

Table 7-7. A-MPR Conducted Power Measurements

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 43 of 76

7.7 Uplink Carrier Aggregation

§96.41(e)

Test Overview

The EUT is set up to transmit two contiguous LTE channels. The power level of both carriers 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 emission outside the fundamental emission (whether in or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-B megahertz (where B is the bandwidth in megahertz of the assigned channel or multiple contiguous channels of the End User Device) above the upper CBSD-assigned channel edge and within 0-B megahertz below the lower CBSD-assigned channel edge. At all frequencies greater than B megahertz above the upper CBSD assigned channel edge and less than B MHz below the lower CBSD assigned channel edge, the conducted power of any emission shall not exceed -25 dBm/MHz.

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 = trace average for continuous emissions, max hold for pulse emissions
4. Sweep time = auto couple
5. The trace was allowed to stabilize
6. Please see test notes below for RBW and VBW settings

Test Setup

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



Figure 7-6. Test Instrument & Measurement Setup

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 44 of 76

Test Notes

1. Conducted power and spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. Channel bandwidth data is shown in the tables below based only on the channel bandwidths that were supported in this device. The worst case (highest) powers were found while operating with QPSK modulation, as shown in Table 7-4 and 7-5 below, with both carriers set to transmit using 1RB.
2. Compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 megahertz bands immediately outside and adjacent to the licensee's authorized frequency channel, a resolution bandwidth of no less than one percent of the fundamental emission bandwidth may be employed.

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 45 of 76

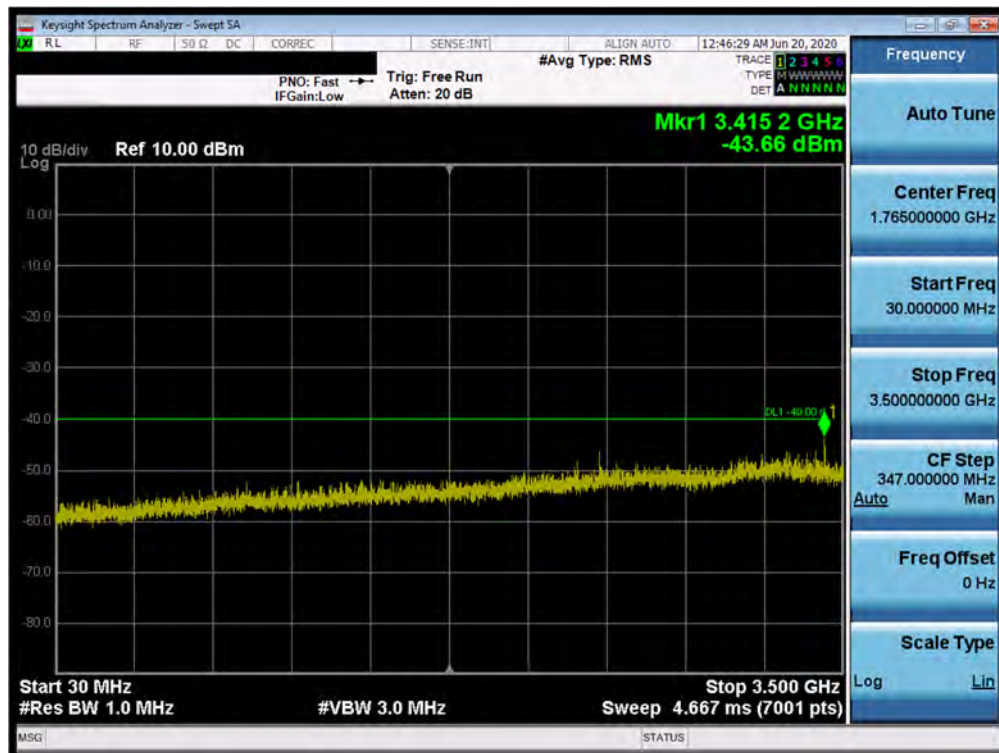
Uplink CA Configuration 48C

PCC						SCC						ULCA Tx.Power (dBm)
Channel	Frequency [MHz]	BW [MHz]	Mod.	RB Size	RB Offset	Channel	Frequency [MHz]	BW [MHz]	Mod.	RB Size	RB Offset	
56640	3690.0	20	QPSK	100	0	56442	3670.2	20	QPSK	100	0	22.60
56640	3690.0	20	16-QAM	100	0	56442	3670.2	20	16-QAM	100	0	21.86
56640	3690.0	20	64-QAM	100	0	56442	3670.2	20	64-QAM	100	0	21.52

Table 7-8. Conducted Powers (B48 with 20MHz BW for all modulations)

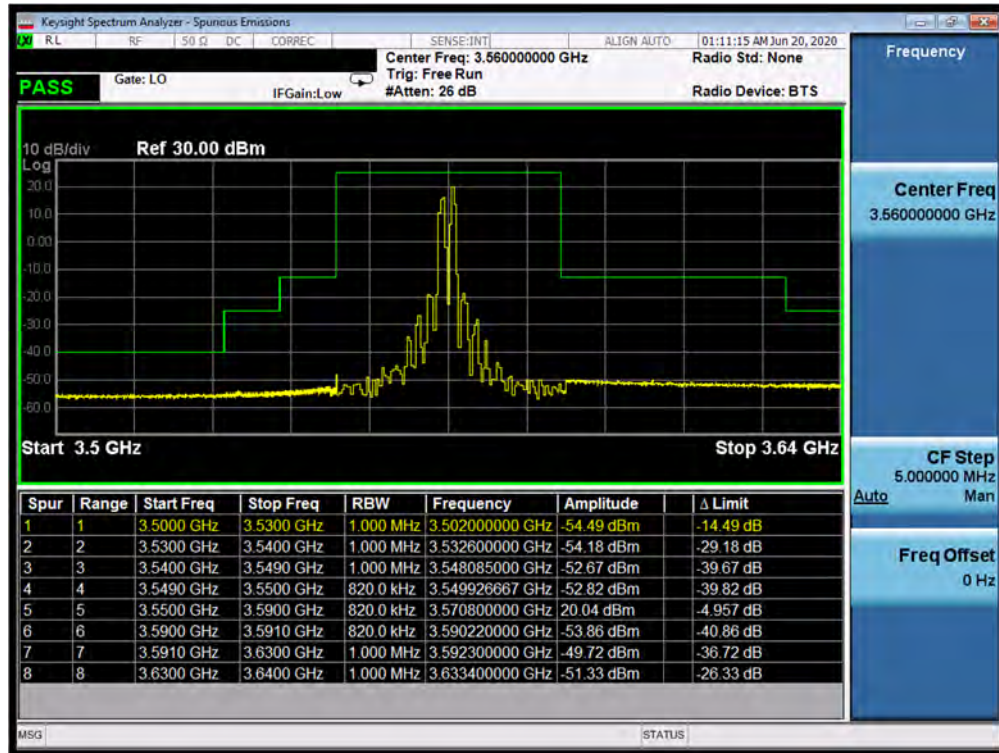
PCC						SCC						ULCA Tx.Power (dBm)
Channel	Frequency [MHz]	BW [MHz]	Mod.	RB Size	RB Offset	Channel	Frequency [MHz]	BW [MHz]	Mod.	RB Size	RB Offset	
55340	3560.0	20	QPSK	1	99	55538	3669.8	20	QPSK	1	0	23.06
55891	3615.1	20	QPSK	1	99	56089	3634.9	20	QPSK	1	0	23.96
56640	3690.0	20	QPSK	1	0	56442	3670.2	20	QPSK	1	99	23.29

Table 7-9. Conducted Powers (B48 – PCC/SCC: RB Size 1)

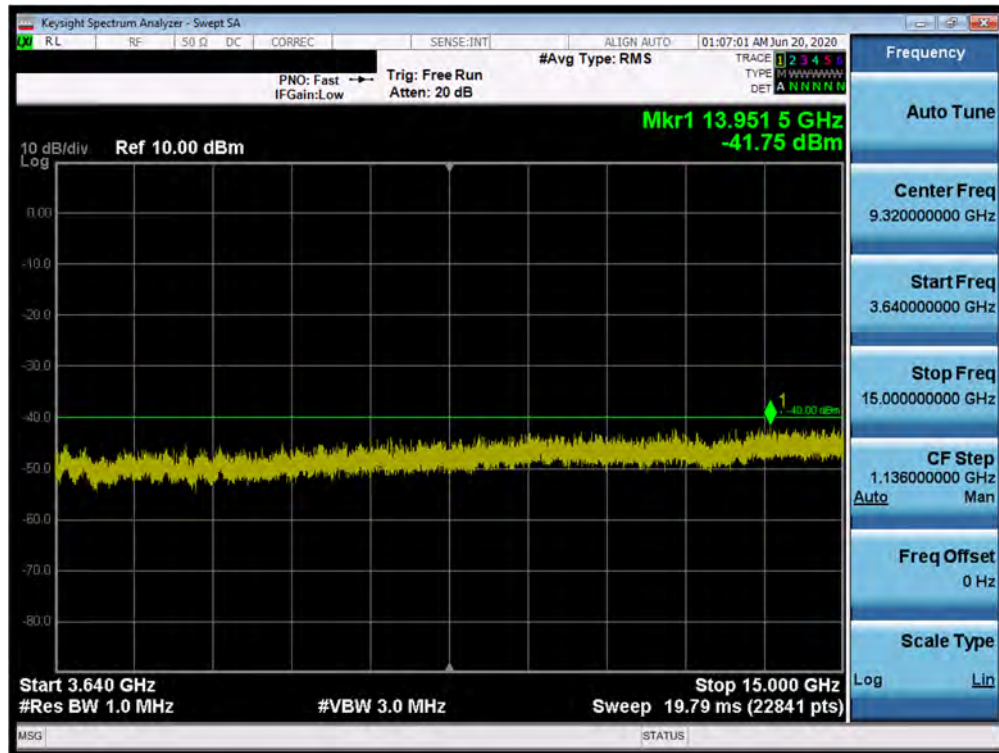


Plot 7-49. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Low Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 46 of 76

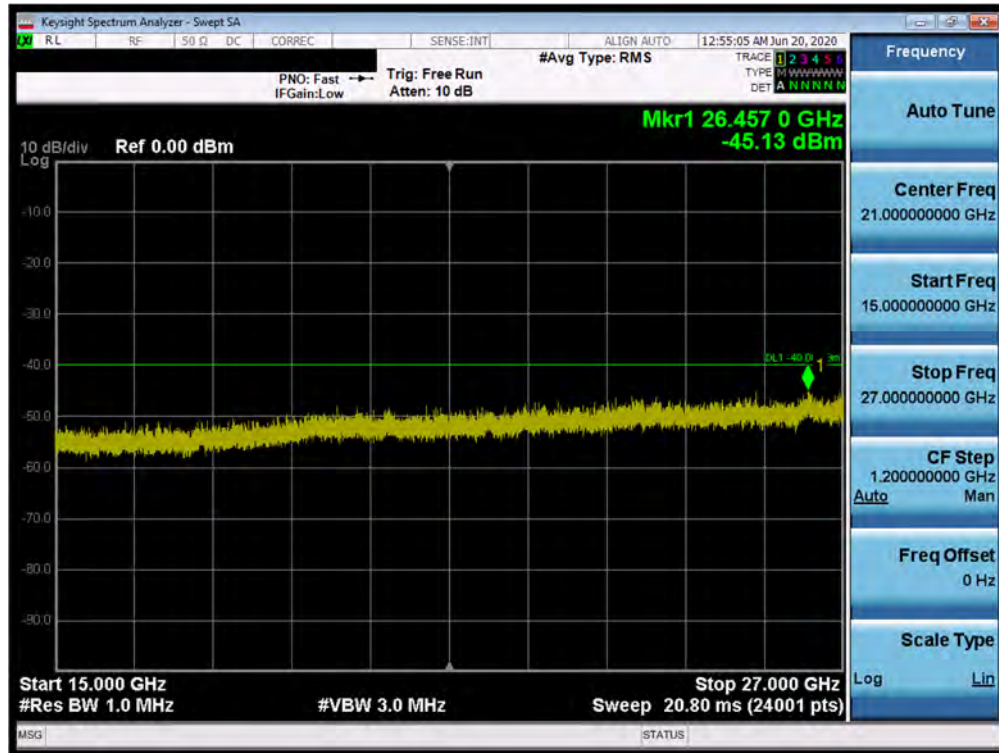


Plot 7-50. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Low Channel)

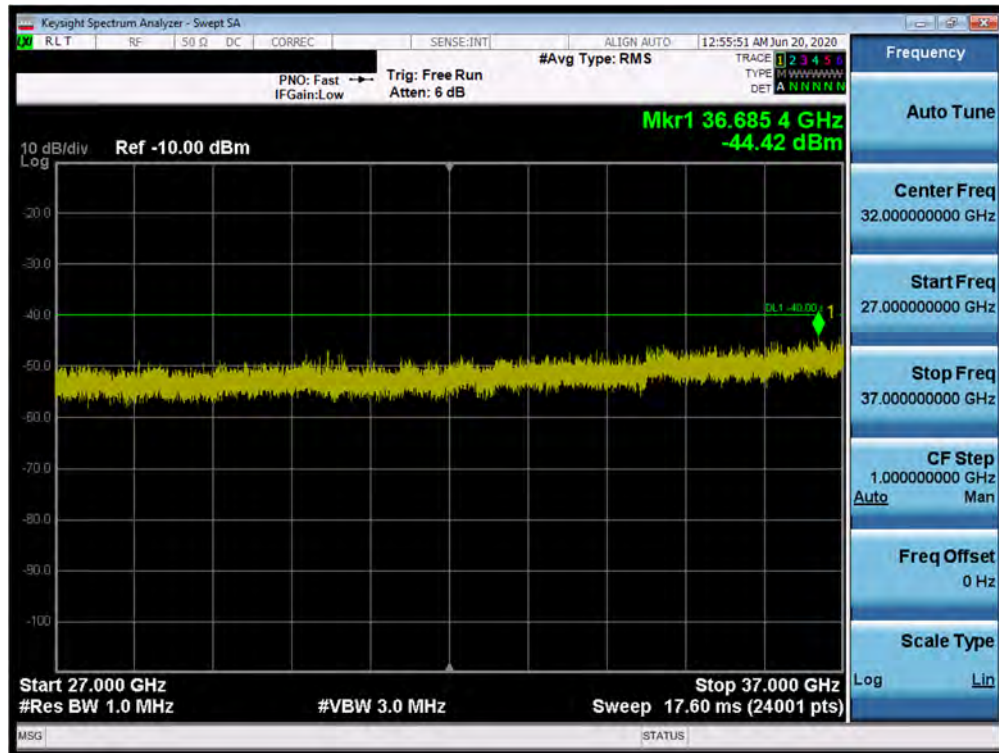


Plot 7-51. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Low Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 47 of 76

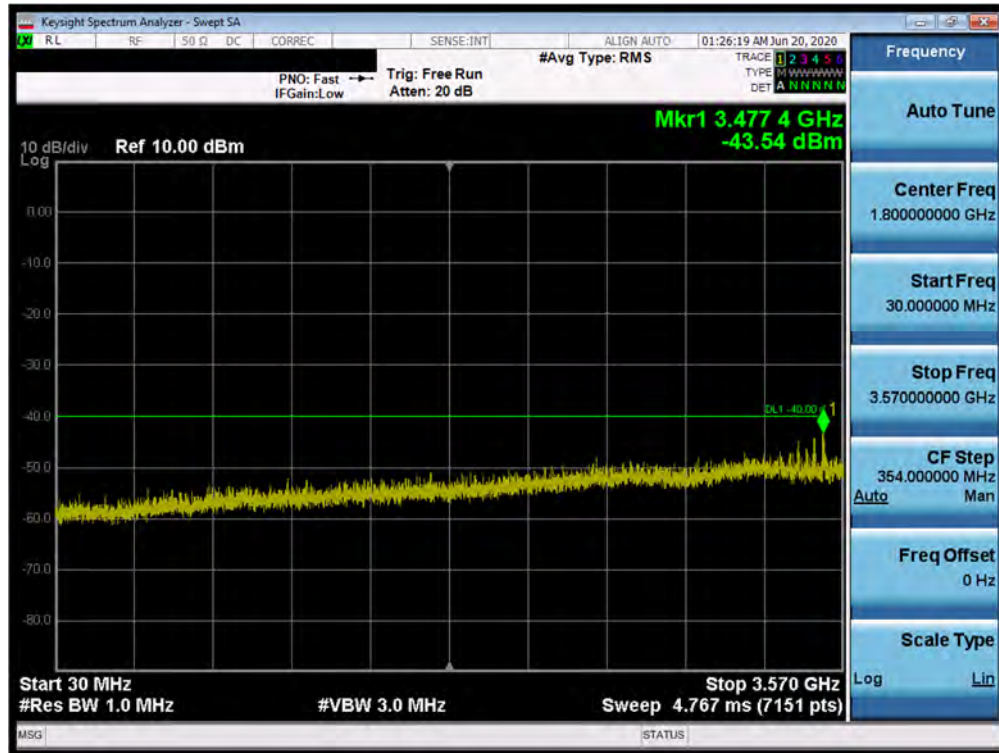


Plot 7-52. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Low Channel)

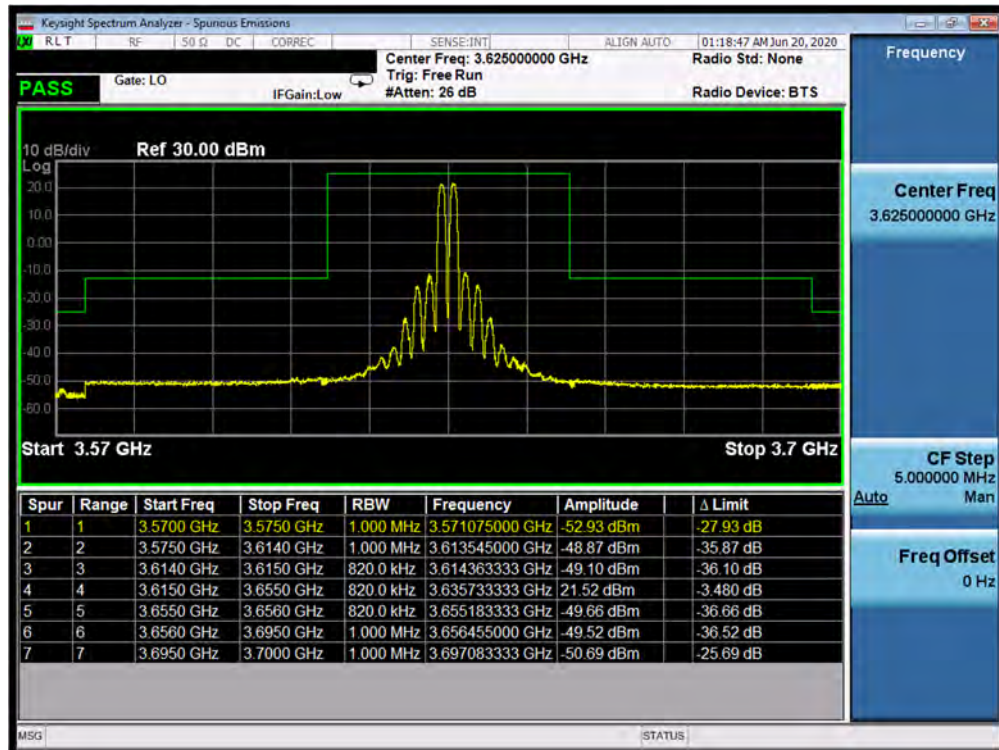


Plot 7-53. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Low Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 48 of 76

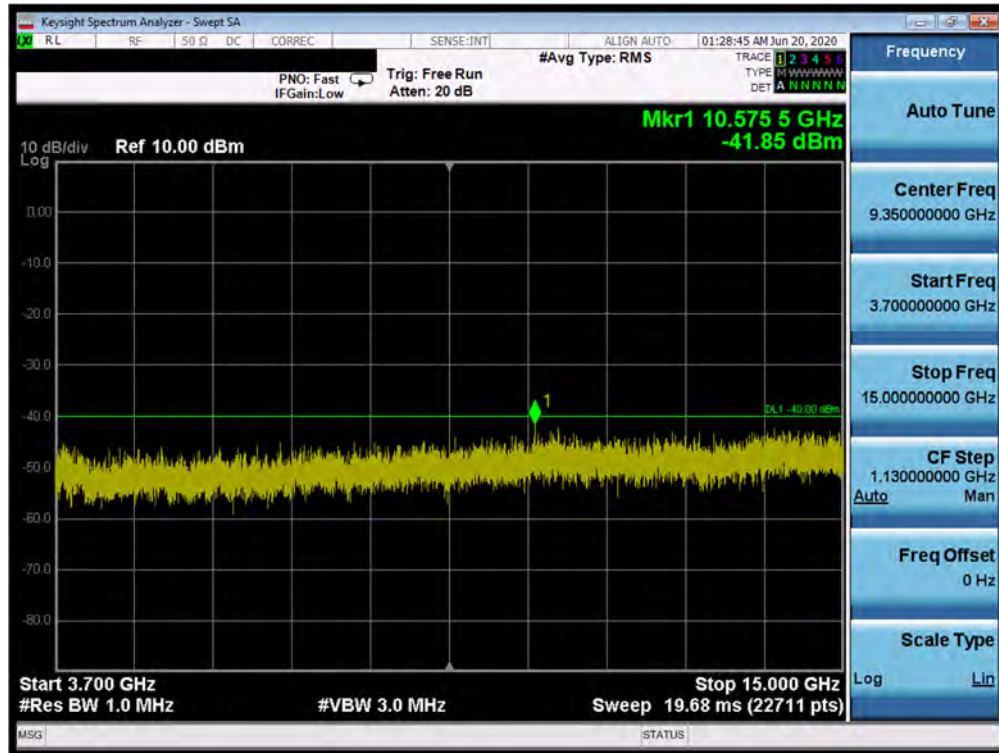


Plot 7-54. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Mid Channel)

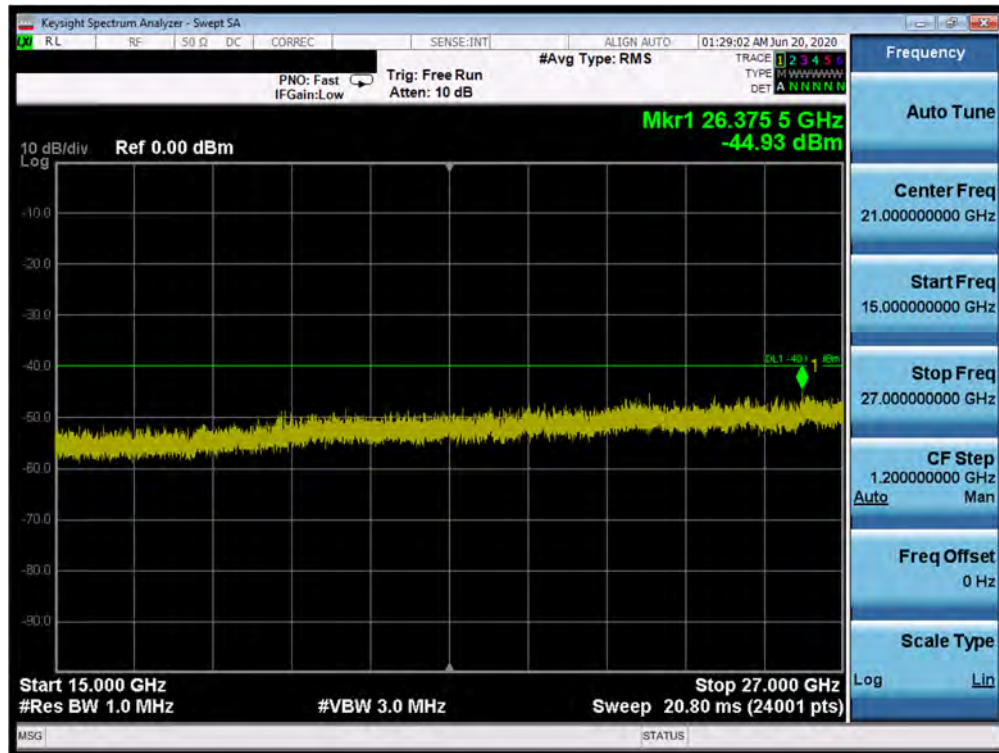


Plot 7-55. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Mid Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 49 of 76

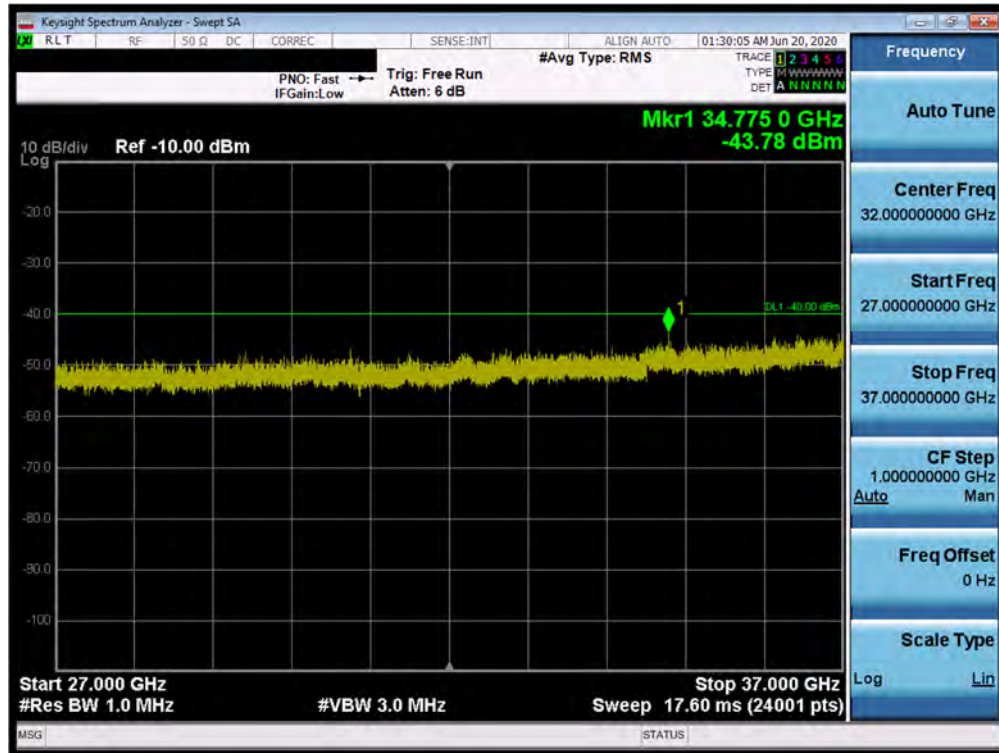


Plot 7-56. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Mid Channel)

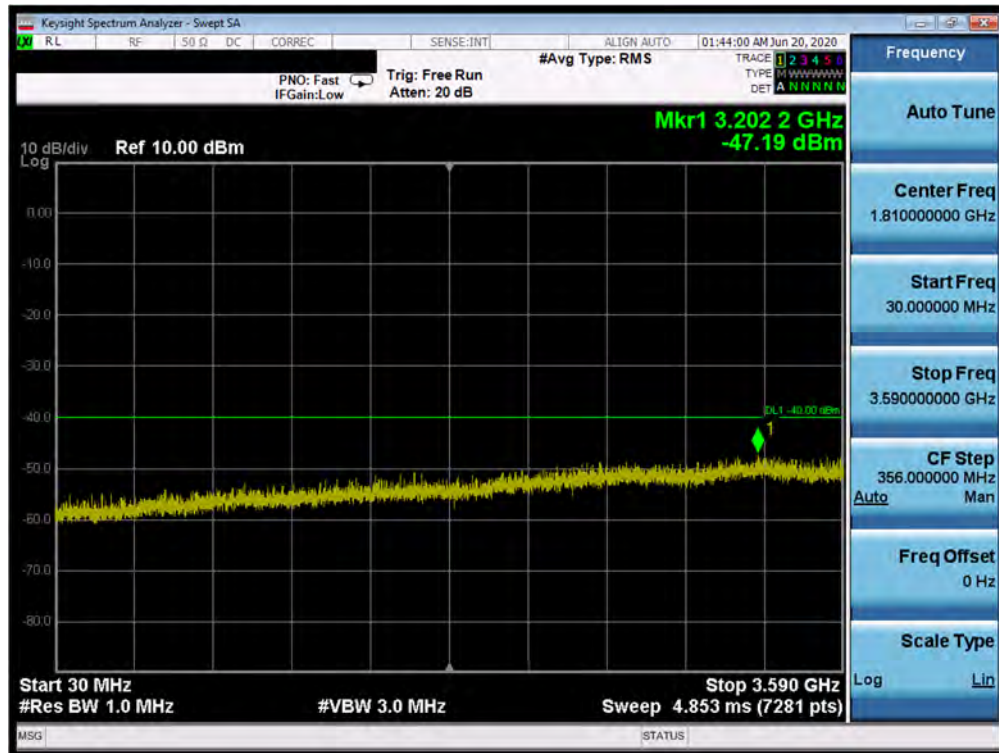


Plot 7-57. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Mid Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 50 of 76

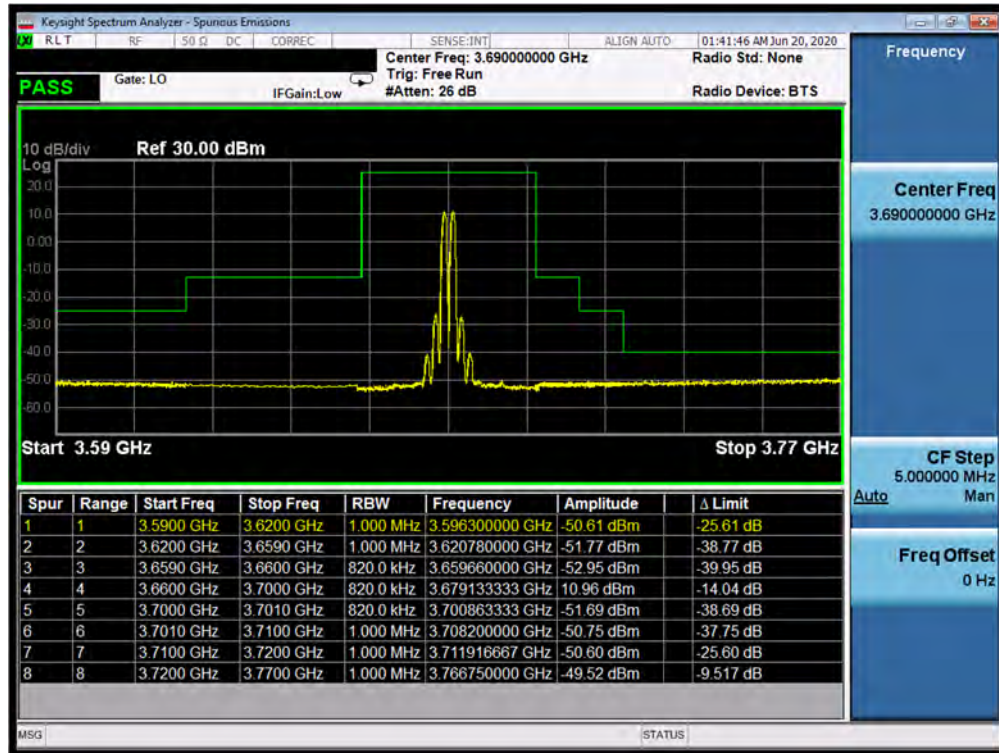


Plot 7-58. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/99 SCC 1/0 - Mid Channel)

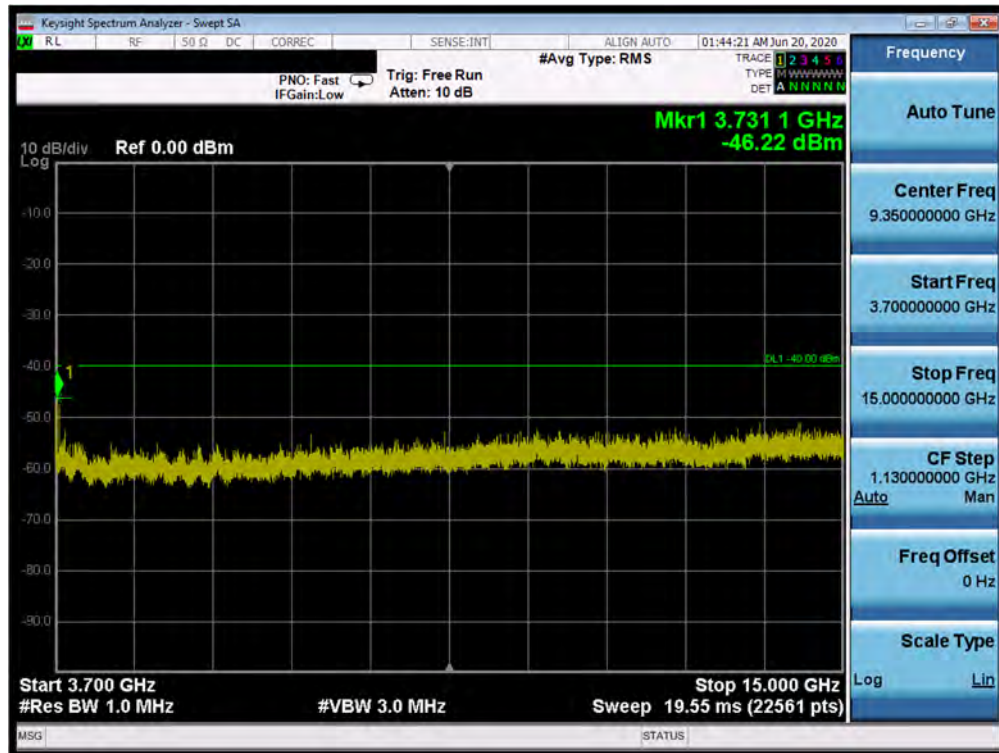


Plot 7-59. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/0 SCC 1/99 - High Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 51 of 76

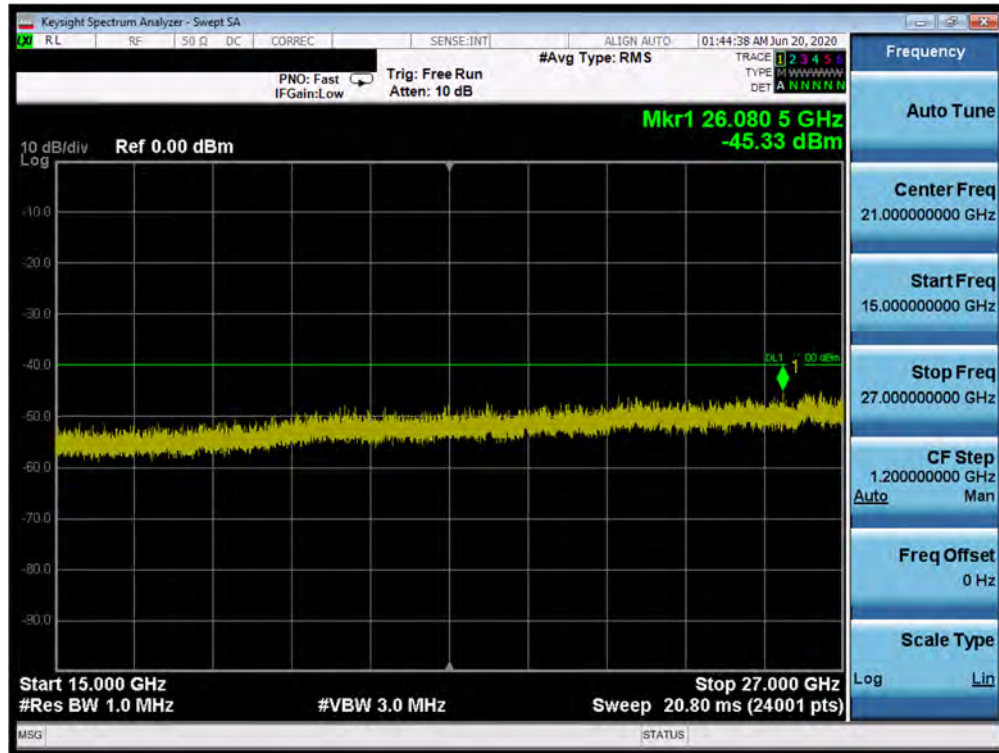


Plot 7-60. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/0 SCC 1/99 - High Channel)

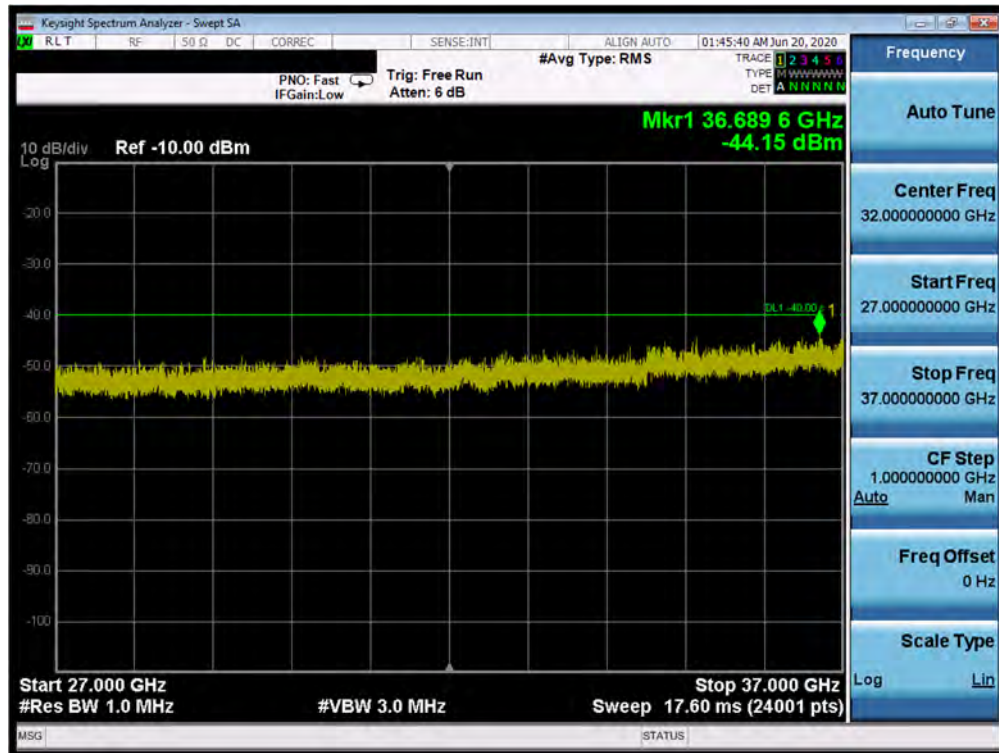


Plot 7-61. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK - PCC 1/0 SCC 1/99 - High Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 52 of 76

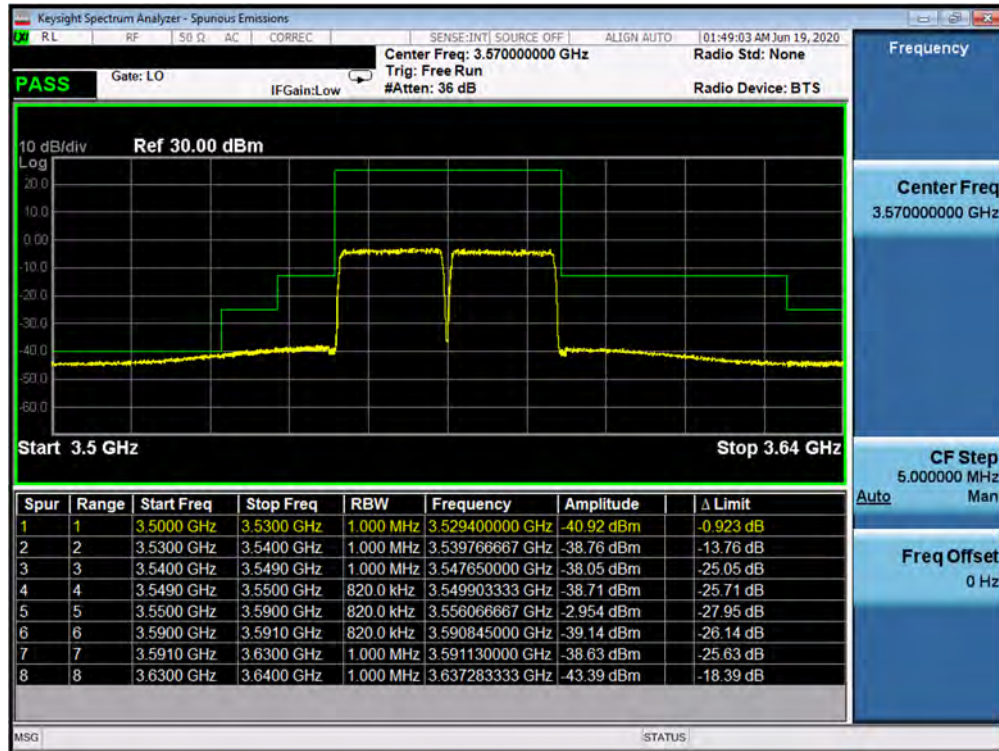


Plot 7-62. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK – PCC 1/0 SCC 1/99 - High Channel)

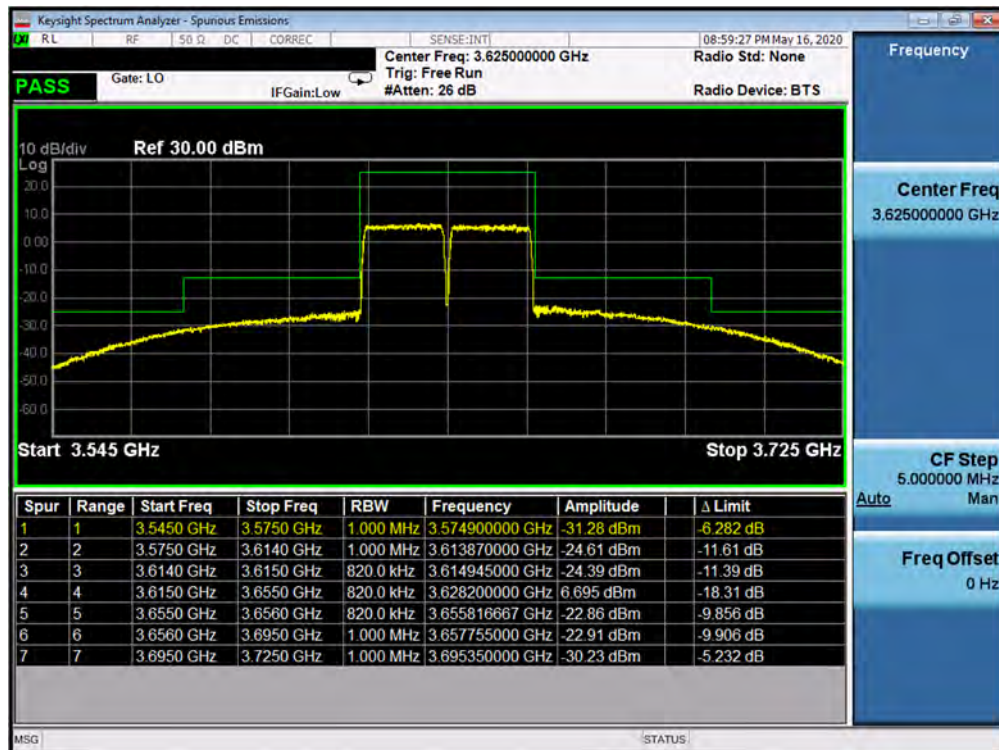


Plot 7-63. Conducted Spurious Plot (LTE Band 48 - 20.0MHz QPSK – PCC 1/0 SCC 1/99 - High Channel)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 53 of 76

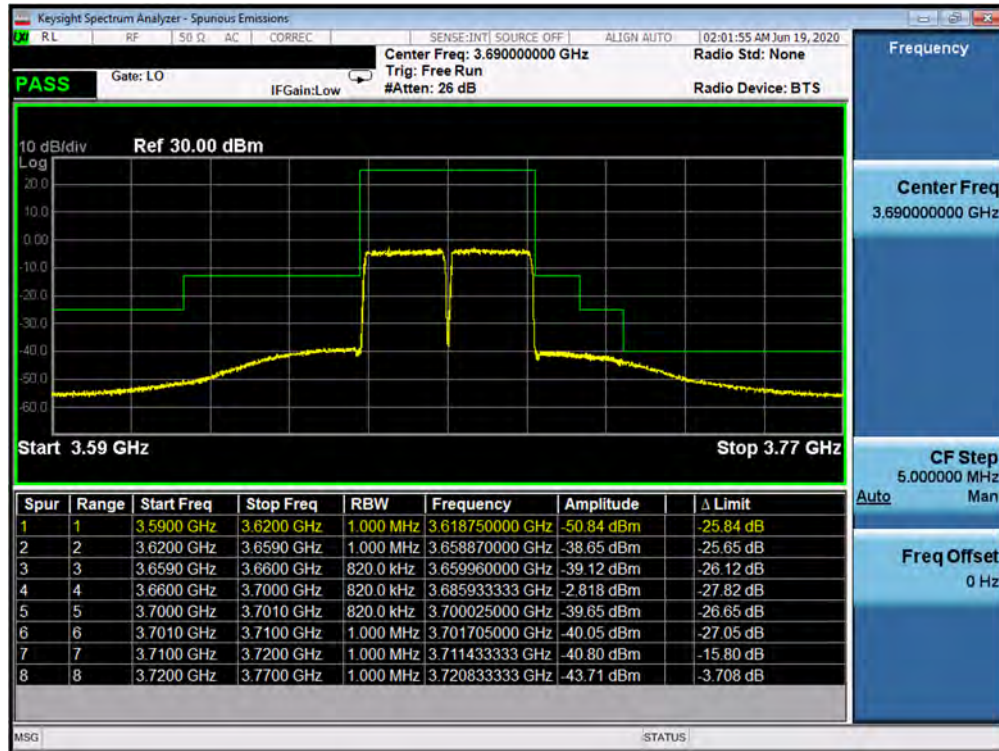


Plot 7-64. Lower Band Edge Plot (Band 48 QPSK – PCC:20 MHz SCC:20 MHz – Full RB)



Plot 7-65. Mid Band Edge Plot (Band 48 QPSK – PCC:20 MHz SCC:20 MHz – Full RB)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 54 of 76



Plot 7-66. Upper Band Edge Plot (Band 48 QPSK – PCC:20 MHz SCC:20 MHz – Full RB)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 55 of 76

7.8 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: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 56 of 76

Test Setup

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

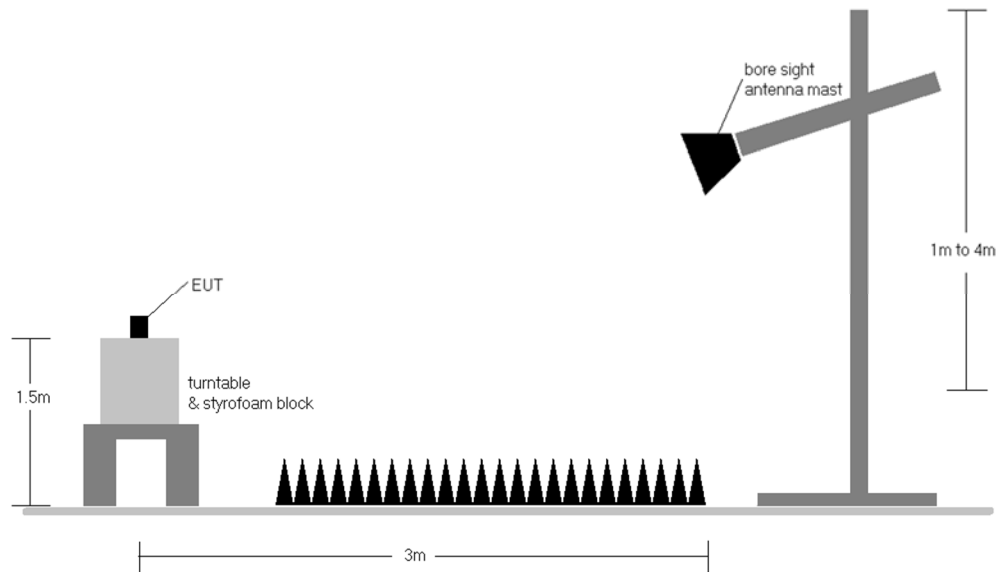


Figure 7-7. Radiated Test Setup >1GHz

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 while powered by an DC power source.
- 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).

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 57 of 76

Frequency [MHz]	Channel Bandwidth [MHz]	Frequency [MHz]	Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [mW/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
3552.50	5	3552.50	5	QPSK	V	170	254	1 / 24	12.61	7.26	19.87	96.952	23.00	-3.13
3625.00	5	3625.00	5	QPSK	V	167	255	12 / 6	14.54	6.99	21.53	142.255	23.00	-1.47
3697.50	5	3697.50	5	QPSK	V	180	266	1 / 24	14.57	6.44	21.01	126.198	23.00	-1.99
3625.00	5	3625.00	5	16-QAM	V	167	255	12 / 6	14.10	6.44	20.54	113.254	23.00	-2.46
3625.00	5	3625.00	5	64-QAM	V	167	255	12 / 6	13.40	6.44	19.84	96.395	23.00	-3.16
3555.00	10	3555.00	10	QPSK	V	177	253	25 / 12	13.81	7.25	21.06	127.651	23.00	-1.94
3625.00	10	3625.00	10	QPSK	V	173	265	25 / 12	14.70	6.99	21.69	147.594	23.00	-1.31
3695.00	10	3695.00	10	QPSK	V	174	259	25 / 12	14.61	6.46	21.07	127.961	23.00	-1.93
3625.00	10	3625.00	10	16-QAM	V	173	265	25 / 12	14.41	6.46	20.87	122.201	23.00	-2.13
3625.00	10	3625.00	10	64-QAM	V	173	265	25 / 12	13.05	6.46	19.51	89.346	23.00	-3.49
3557.50	15	3557.50	15	QPSK	V	180	256	36 / 18	13.72	7.24	20.96	124.880	23.00	-2.04
3625.00	15	3625.00	15	QPSK	V	177	258	36 / 18	14.57	6.99	21.56	143.241	23.00	-1.44
3692.50	15	3692.50	15	QPSK	V	174	263	36 / 18	14.46	6.48	20.94	124.194	23.00	-2.06
3625.00	15	3625.00	15	16-QAM	V	177	258	36 / 18	14.53	6.48	21.01	126.212	23.00	-1.99
3625.00	15	3625.00	15	64-QAM	V	177	258	36 / 18	13.19	6.48	19.67	92.704	23.00	-3.33
3560.00	20	3560.00	20	QPSK	V	176	256	1 / 99	13.28	7.16	20.44	110.558	23.00	-2.56
3625.00	20	3625.00	20	QPSK	V	174	262	1 / 99	14.09	6.87	20.96	124.880	23.00	-2.04
3690.00	20	3690.00	20	QPSK	V	180	265	1 / 99	14.15	6.30	20.45	110.791	23.00	-2.55
3625.00	20	3625.00	20	16-QAM	V	174	262	1 / 99	13.64	6.87	20.51	112.588	23.00	-2.49
3625.00	20	3625.00	20	64-QAM	V	174	262	1 / 99	12.80	6.87	19.67	92.788	23.00	-3.33
3625.00	10	3625.00	10	QPSK	H	237	354	50 / 0	11.26	6.87	18.13	65.087	23.00	-4.87

Table 7-10. EIRP Data (Band 48)

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 58 of 76

Frequency [MHz]	Channel Bandwidth [MHz]	SCC Frequency [MHz]	SCC Channel Bandwidth [MHz]	Mod.	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	SCC RB Size/Offset	Substitute Level [dBm]	Ant. Gain [dBi]	EIRP [dBm/10MHz]	EIRP [mW/10MHz]	EIRP Limit [dBm/10MHz]	Margin [dB]
3560.00	20	3571.70	5	QPSK	V	124	20	1 / 0	15.27	7.16	20.28	106.559	23.00	-2.72
3625.00	20	3636.70	5	QPSK	V	118	23	1 / 0	16.24	6.87	20.96	124.880	23.00	-2.04
3690.00	20	3678.30	5	QPSK	V	117	25	1 / 24	16.71	6.30	20.86	121.760	23.00	-2.14
3625.00	20	3636.70	5	16-QAM	V	118	23	1 / 0	15.67	6.87	20.39	109.520	23.00	-2.61
3625.00	20	3636.70	5	64-QAM	V	118	23	1 / 0	14.75	6.87	19.47	88.612	23.00	-3.53
3560.00	20	3574.40	10	QPSK	V	121	22	1 / 0	16.33	7.16	21.34	136.016	23.00	-1.66
3625.00	20	3639.40	10	QPSK	V	121	24	1 / 0	17.08	6.87	21.80	151.528	23.00	-1.20
3690.00	20	3675.60	10	QPSK	V	117	20	1 / 49	17.65	6.30	21.80	151.183	23.00	-1.20
3625.00	20	3639.40	10	16-QAM	V	121	24	1 / 0	16.90	6.87	21.62	145.376	23.00	-1.38
3560.00	20	3574.40	10	64-QAM	V	121	22	1 / 0	14.56	7.16	19.57	90.488	23.00	-3.43
3560.00	20	3577.10	15	QPSK	V	118	22	1 / 0	16.47	7.16	21.48	140.472	23.00	-1.52
3625.00	20	3642.10	15	QPSK	V	123	29	1 / 0	17.01	6.87	21.73	149.106	23.00	-1.27
3690.00	20	3672.90	15	QPSK	V	107	24	1 / 74	16.60	6.30	20.75	118.714	23.00	-2.25
3625.00	20	3642.10	15	16-QAM	V	123	29	1 / 0	16.91	6.87	21.63	145.712	23.00	-1.37
3625.00	20	3642.10	15	64-QAM	V	123	29	1 / 0	15.62	6.87	20.34	108.266	23.00	-2.66
3560.00	20	3579.80	20	QPSK	V	106	18	1 / 0	16.11	7.16	21.12	129.297	23.00	-1.88
3625.00	20	3644.80	20	QPSK	V	121	31	1 / 0	17.17	6.87	21.89	154.701	23.00	-1.11
3690.00	20	3670.20	20	QPSK	V	102	22	1 / 99	16.88	6.30	21.03	126.620	23.00	-1.97
3625.00	20	3644.80	20	16-QAM	V	121	31	1 / 0	16.60	6.87	21.32	135.673	23.00	-1.68
3625.00	20	3644.80	20	64-QAM	V	121	31	1 / 0	16.11	6.87	20.83	121.198	23.00	-2.17
3690.00	20	3644.80	20	QPSK	H	107	43	1 / 0	16.39	6.87	21.11	129.269	23.00	-1.89

Table 7-11. EIRP Data (Band 48 ULCA)

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 59 of 76

7.9 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

ANSI C63.26-2015 – Section 5.5.4

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: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 60 of 76

Test Setup

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

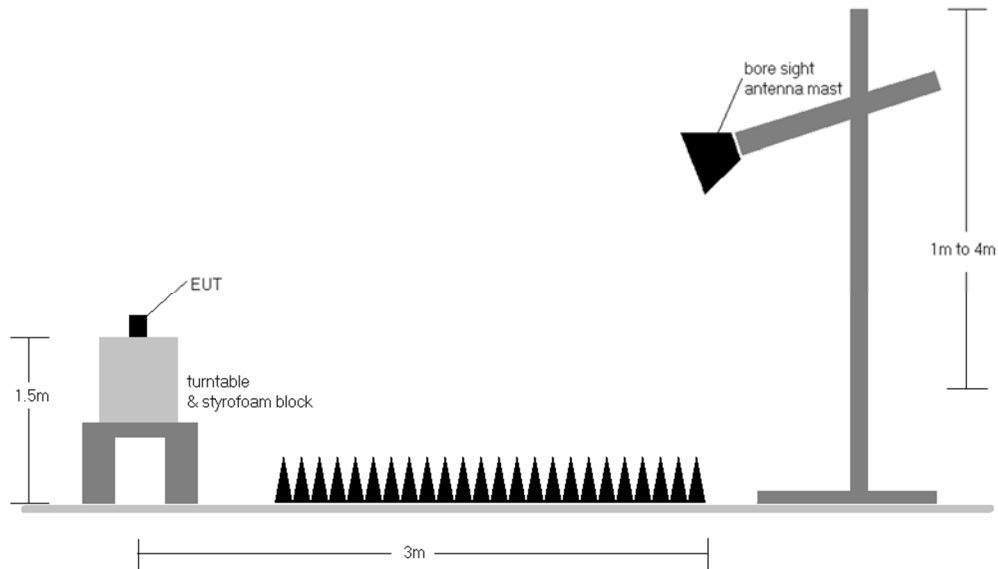


Figure 7-8. Test Instrument & Measurement Setup

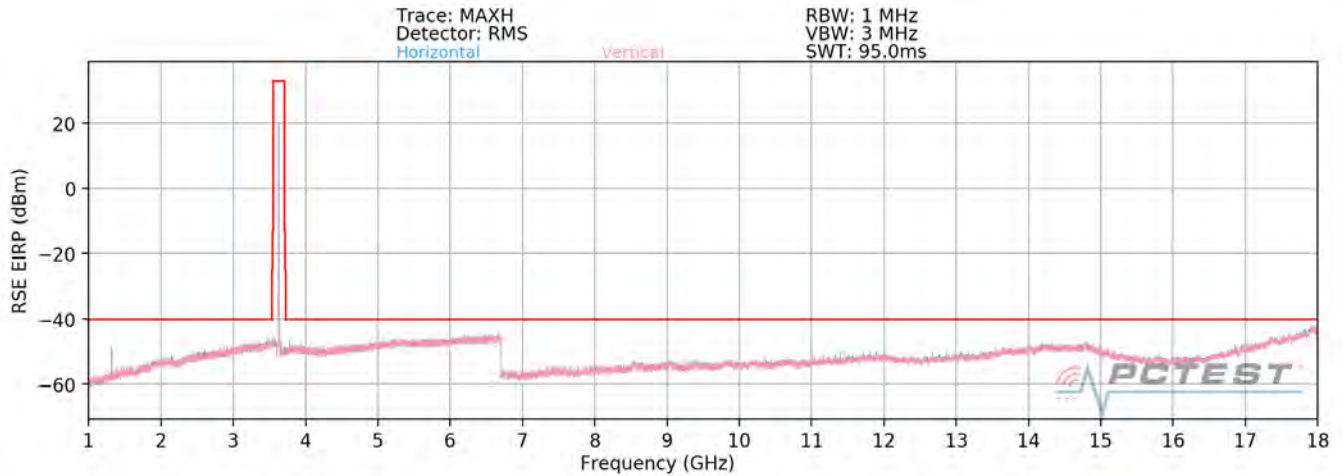
Test Notes

- 1) 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 while powered by an DC power source.
- 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):

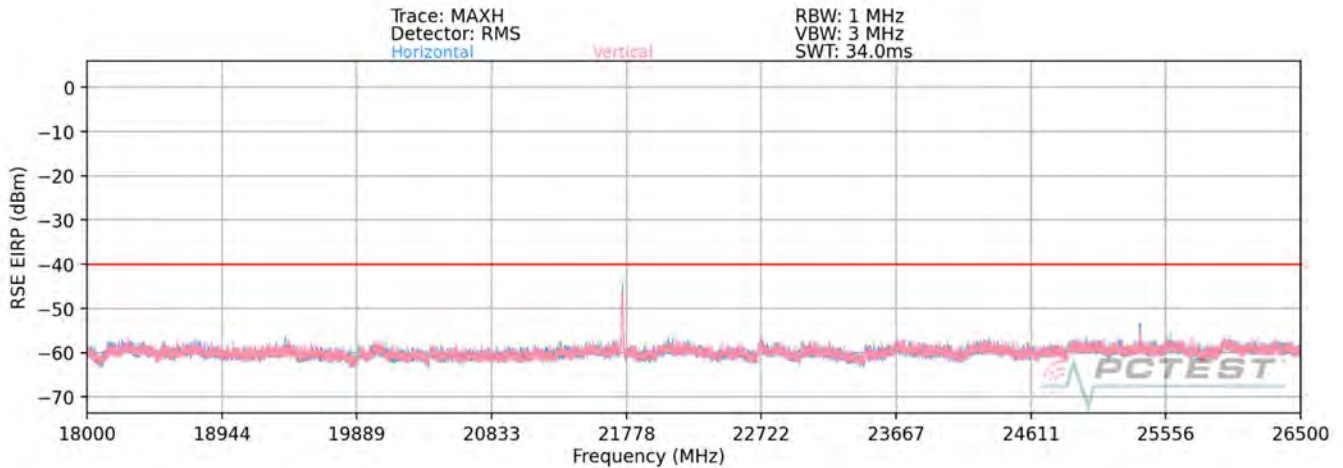
$$\text{EIRP (dBm)} = E (\text{dB}\mu\text{V/m}) + 20 \log D - 104.8; \text{ where } D \text{ is the measurement distance in meters}$$

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 61 of 76

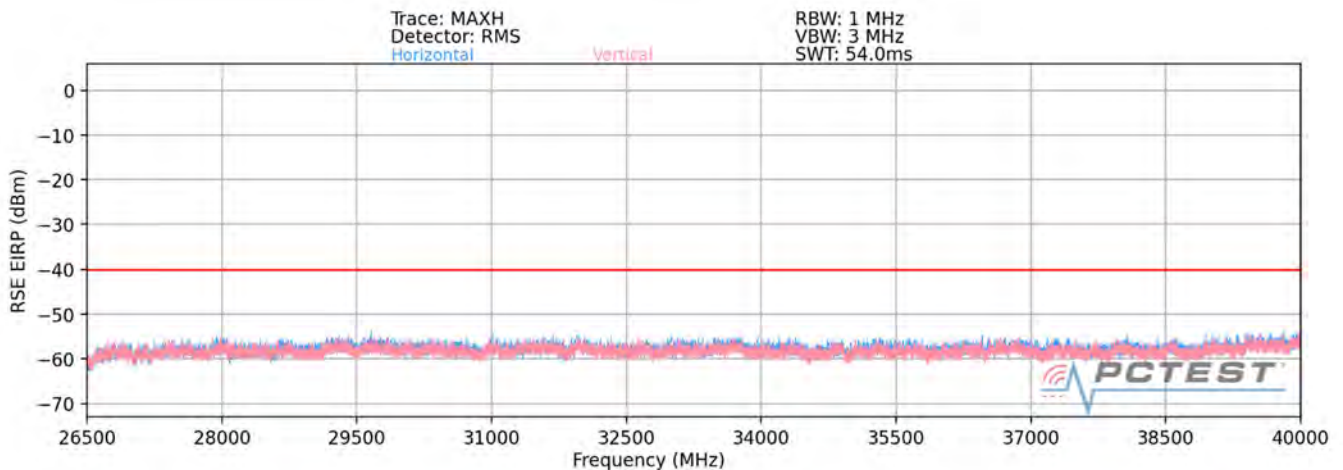
LTE Band 48



Plot 7-67. Radiated Spurious Plot 1 - 18GHz (Band 48)



Plot 7-68. Radiated Spurious Plot 18 - 26.5GHz (Band 48)



Plot 7-69. Radiated Spurious Plot 26.5 - 40GHz (Band 48)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 62 of 76

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]
1245.8	H	205	247	-68.98	3.97	41.99	-53.27	-40.00	-13.27
7120.0	H	174	276	-74.70	7.54	39.84	-55.42	-40.00	-15.42
10680.0	H	400	52	-79.79	13.12	40.33	-54.93	-40.00	-14.93
14240.0	H	400	117	-80.50	17.70	44.20	-51.06	-40.00	-11.06
17800.0	H	400	198	-80.51	21.87	48.36	-46.90	-40.00	-6.90

Table 7-12. Radiated Spurious Data (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]
1311.4	H	208	226	-72.43	4.14	38.71	-56.55	-40.00	-16.55
7250.0	H	222	304	-72.86	8.62	42.76	-52.50	-40.00	-12.50
10875.0	H	400	28	-79.31	12.03	39.72	-55.54	-40.00	-15.54
14500.0	H	400	313	-79.22	18.01	45.79	-49.46	-40.00	-9.46
21748.3	H	150	46	-56.66	-3.38	46.96	-57.84	-40.00	-17.84

Table 7-13. Radiated Spurious Data (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]
1375.96	H	216	251	-67.98	5.19	44.21	-51.05	-40.00	-11.05
7380.00	H	400	305	-78.37	9.69	38.32	-56.94	-40.00	-16.94
11070.00	H	154	6	-81.06	12.11	38.05	-57.21	-40.00	-17.21
14760.00	H	398	69	-80.52	15.97	42.45	-52.81	-40.00	-12.81

Table 7-14. Radiated Spurious Data (Band 48 – High Channel)

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 63 of 76

7.10 Uplink Carrier Aggregation Radiated 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. All measurements are performed as peak 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 v02r02 – 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. No. of sweep points $\geq 2 \times$ span / RBW
4. Detector = RMS
5. Trace mode = trace average for continuous emissions, max hold for pulse emissions
6. The trace was allowed to stabilize

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 64 of 76

Test Setup

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

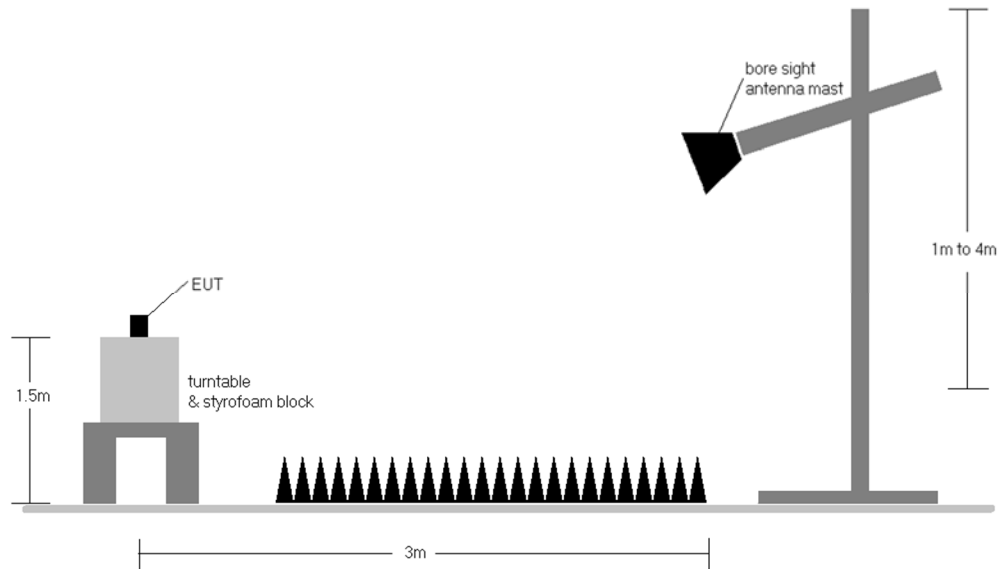


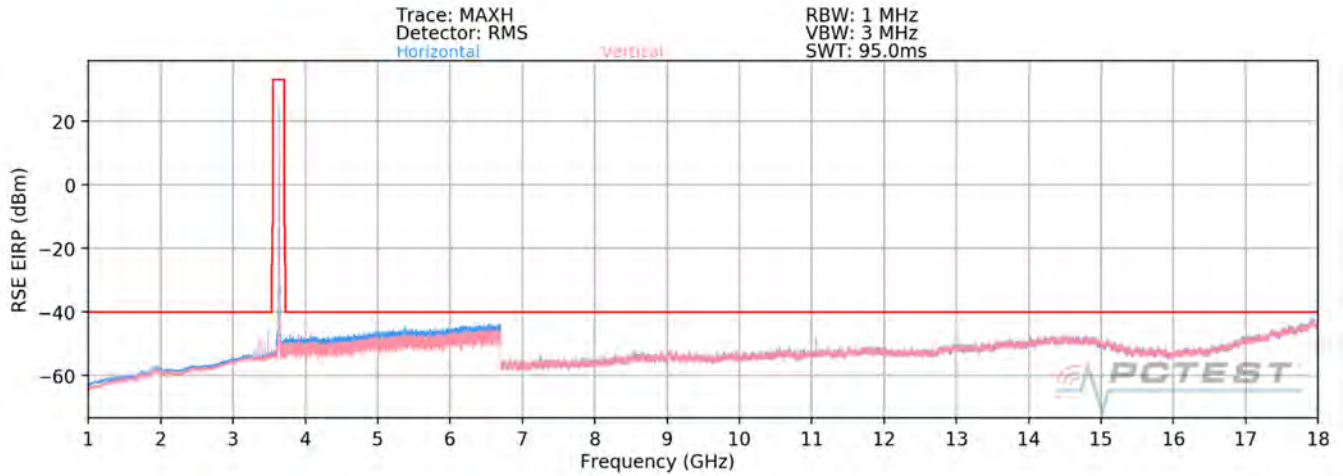
Figure 7-9. Test Instrument & Measurement Setup

Test Notes

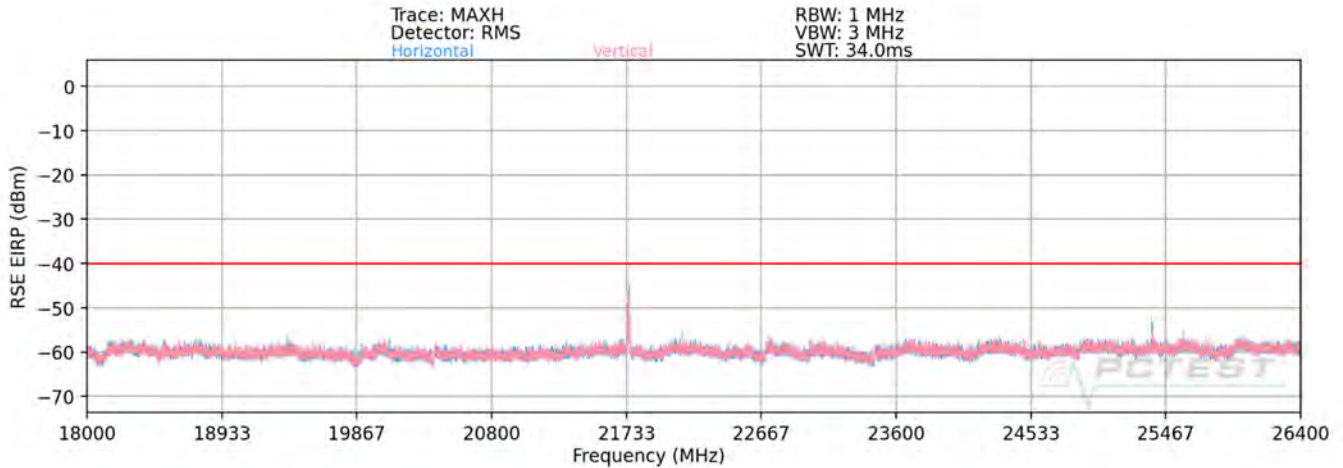
- 1) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 2) This unit was tested while powered by an DC power source.
- 3) Radiated spurious emissions measurements were evaluated for the two contiguous channels using various combinations of RB size, RB offset, modulation, and channel bandwidth. The worst case (highest) emissions were found while operating with QPSK modulation with both carriers set to transmit using 1RB.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) Emissions below 18GHz were measured at a 3 meter test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)	Page 65 of 76

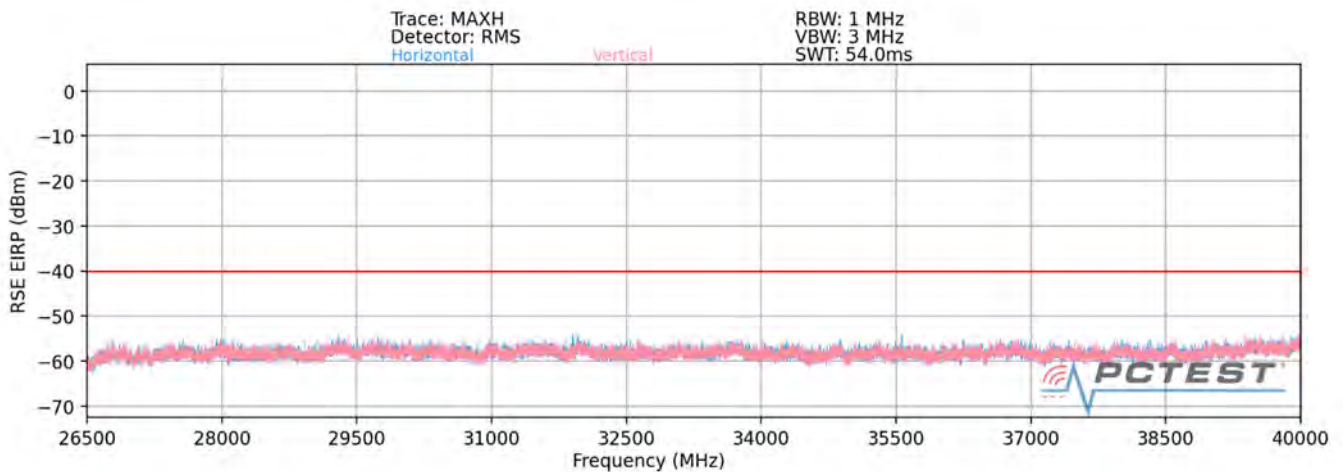
ULCA Band 48



Plot 7-70. Radiated Spurious Plot 1GHz - 18GHz (ULCA Band 48) Mid Channel – PCC/SCC: 1RB)



Plot 7-71. Radiated Spurious Plot 18GHz – 26.5GHz (ULCA Band 48)



Plot 7-72. Radiated Spurious Plot 26.5 - 40GHz (Band 48)

FCC ID: A3LSMH204V	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 66 of 76

OPERATING FREQUENCY (PCC): 3560.00 MHz
 OPERATING FREQUENCY (SCC): 3669.80 MHz
 CHANNEL (PCC): 55340
 CHANNEL (SCC): 55538
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 20.0 MHz
 DISTANCE: 3 meters
 LIMIT: -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7120.00	V	183	226	-61.68	8.63	-53.05	-13.0
10680.00	V	143	13	-66.91	9.41	-57.50	-17.5
14240.00	V	230	63	-56.17	8.82	-47.35	-7.4
17800.00	V	-	-	-56.92	7.64	-49.28	-9.3
21360.00	V	150	182	-70.24	16.40	-53.84	-13.8
24920.00	V	150	166	-71.86	17.63	-54.23	-14.2

Table 7-15. Radiated Spurious Data (ULCA 48) PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Low Channel)

OPERATING FREQUENCY (PCC): 3615.10 MHz
 OPERATING FREQUENCY (SCC): 3634.90 MHz
 CHANNEL (PCC): 55891
 CHANNEL (SCC): 56089
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 20.0 MHz
 DISTANCE: 3 meters
 LIMIT: -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7230.20	V	115	23	-59.87	8.47	-51.40	-11.4
10845.30	V	112	358	-65.56	9.28	-56.28	-16.3
14460.40	V	283	53	-52.60	8.77	-43.83	-3.8
18075.50	V	-	-	-78.29	14.63	-63.66	-23.7
21690.60	V	150	193	-60.71	16.42	-44.29	-4.3
25305.70	V	150	182	-72.02	17.75	-54.26	-14.3

Table 7-16. Radiated Spurious Data (ULCA 48) PCC: RB 1 Offset 99, SCC: RB 1 Offset 0 – Mid Channel)

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 67 of 76

OPERATING FREQUENCY (PCC): 3690.00 MHz
 OPERATING FREQUENCY (SCC): 3670.20 MHz
 CHANNEL (PCC): 56640
 CHANNEL (SCC): 56442
 MODULATION SIGNAL: QPSK
 BANDWIDTH: 20.0 MHz
 DISTANCE: 3 meters
 LIMIT: -40 dBm

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Level at Antenna Terminals [dBm]	Substitute Antenna Gain [dBi]	Spurious Emission Level [dBm]	Margin [dB]
7380.00	V	121	33	-64.55	8.41	-56.14	-16.1
11070.00	V	120	3	-66.07	9.31	-56.77	-16.8
14760.00	V	155	17	-59.74	8.72	-51.02	-11.0
18450.00	V	-	-	-78.19	14.94	-63.25	-23.2
22140.00	V	150	124	-70.33	16.59	-53.75	-13.7
25830.00	V	150	203	-75.92	17.90	-58.02	-18.0

Table 7-17. Radiated Spurious Data (ULCA 48) PCC: RB 1 Offset 0, SCC: RB 1 Offset 99 – High Channel)

FCC ID: A3LSMH204V		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Quality Manager
Test Report S/N: 1M2004140062-04.A3L	Test Dates: 4/29 - 8/12/2020	EUT Type: Indoor Customer Premises Equipment (CPE)		Page 68 of 76

7.11 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

9. The carrier frequency of the transmitter is measured at room temperature (20°C to provide a reference).
10. 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.
11. 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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LTE Band 48 Frequency Stability Measurements

OPERATING FREQUENCY: 3,625,000,000 Hz
CHANNEL: 55990
REFERENCE VOLTAGE: 20.00 VDC

VOLTAGE (%)	POWER (VDC)	TEMP (°C)	FREQUENCY (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	20.00	- 30	3,625,000,167	167	0.0000046
100 %		- 20	3,624,999,978	-22	-0.0000006
100 %		- 10	3,624,999,990	-10	-0.0000003
100 %		0	3,625,000,106	106	0.0000029
100 %		+ 10	3,624,999,739	-261	-0.0000072
100 %		+ 20	3,625,000,214	214	0.0000059
100 %		+ 30	3,624,999,849	-151	-0.0000042
100 %		+ 40	3,624,999,981	-19	-0.0000005
100 %		+ 50	3,624,999,807	-193	-0.0000053
85 %	17.00	+ 20	3,624,999,840	-160	-0.0000044

Table 7-18. Frequency Stability Data (LTE Band 48)

Note:

Based on the results of the frequency stability test at the center channel the frequency deviation results measured are very small. As such it is determined that the channels at the band edge would remain in-band when the maximum measured frequency deviation noted during the frequency stability tests is applied. Therefore the device is determined to remain operating in band over the temperature and voltage range as tested.

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LTE Band 48 Frequency Stability Measurements

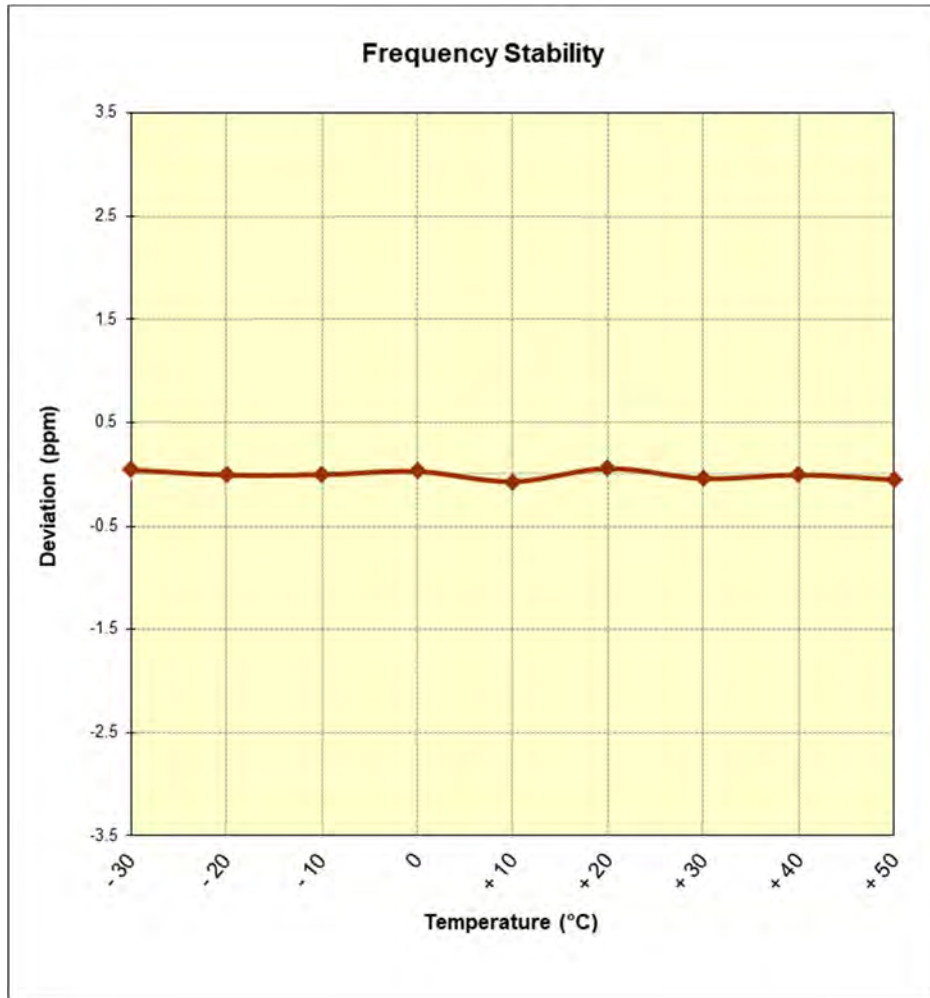


Figure 7-10. Frequency Stability Graph (LTE Band 48)

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7.12 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.

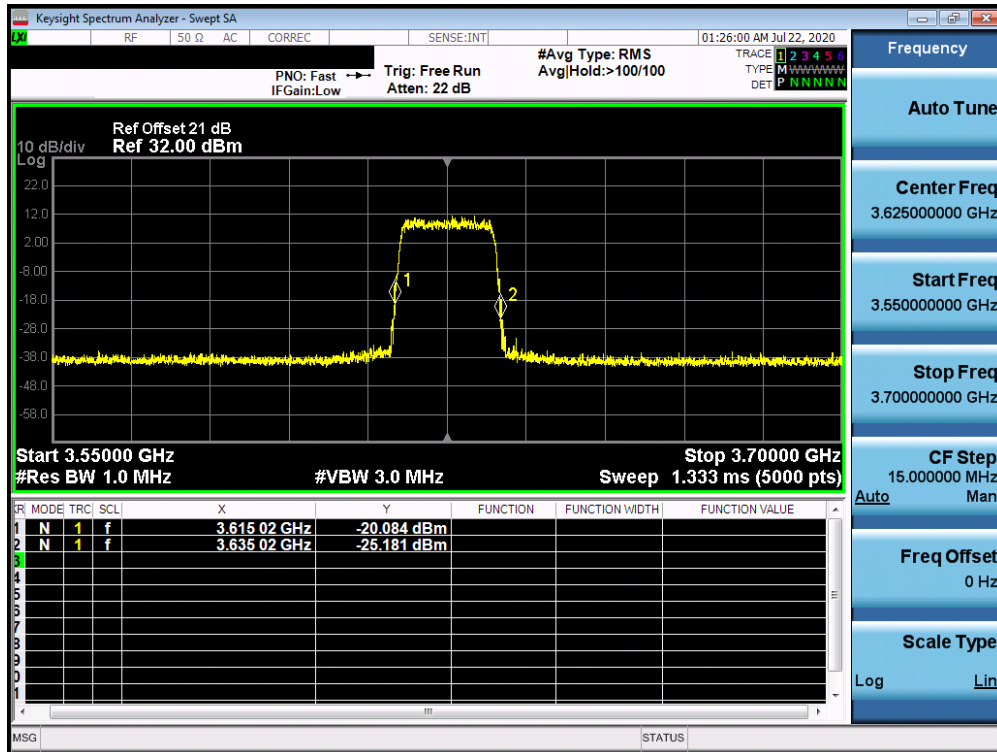
1. Run#1:
 - a. Setup WINNF.PT.C.HBT.1 with 3615MHz – 3635MHz.
 - b. Enable AP service from Ruckus Cloud management.
 - c. Check EUT Tx frequency.
 - d. Disable AP service from Ruckus Cloud management and check EUT stop transmission within 10s.
2. Run#2:
 - a. Setup WINNF.PT.C.HBT.1 with 3660MHz – 3680MHz.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

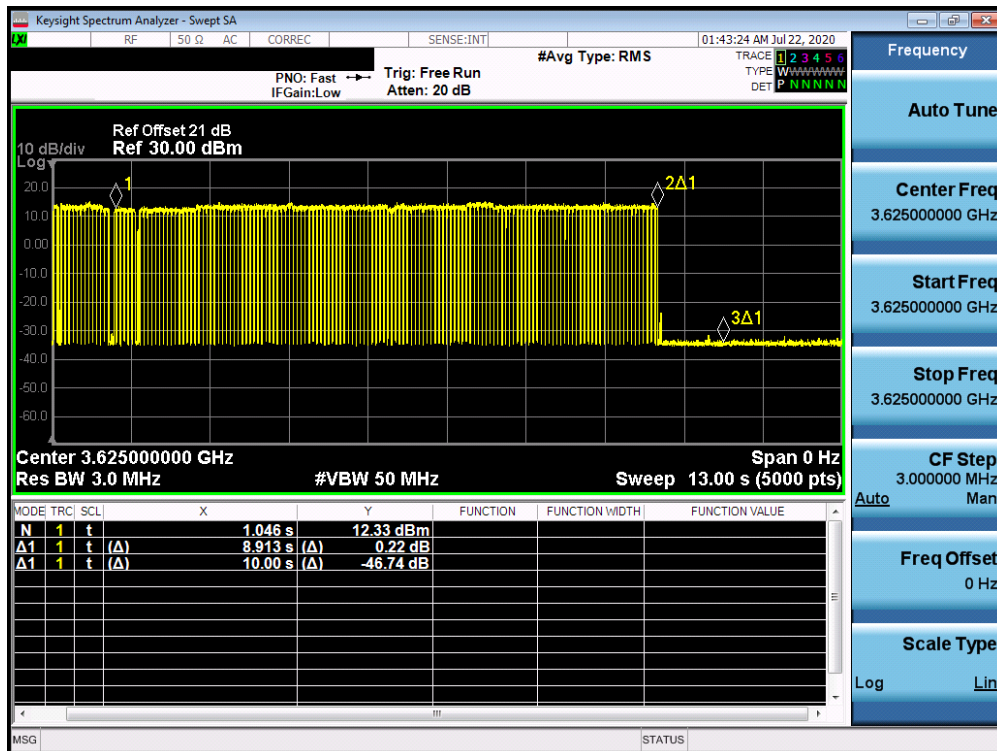
The EUT is an End User Device.

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Run#1:



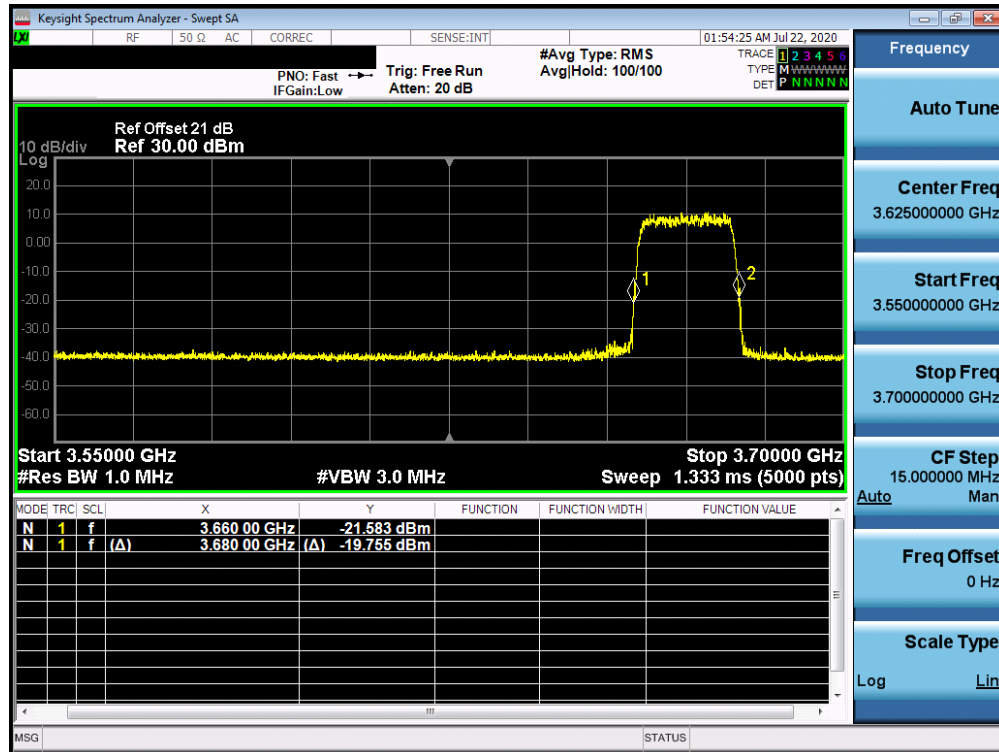
Plot 7-73. Run#1 End User Device Frequency of Operations



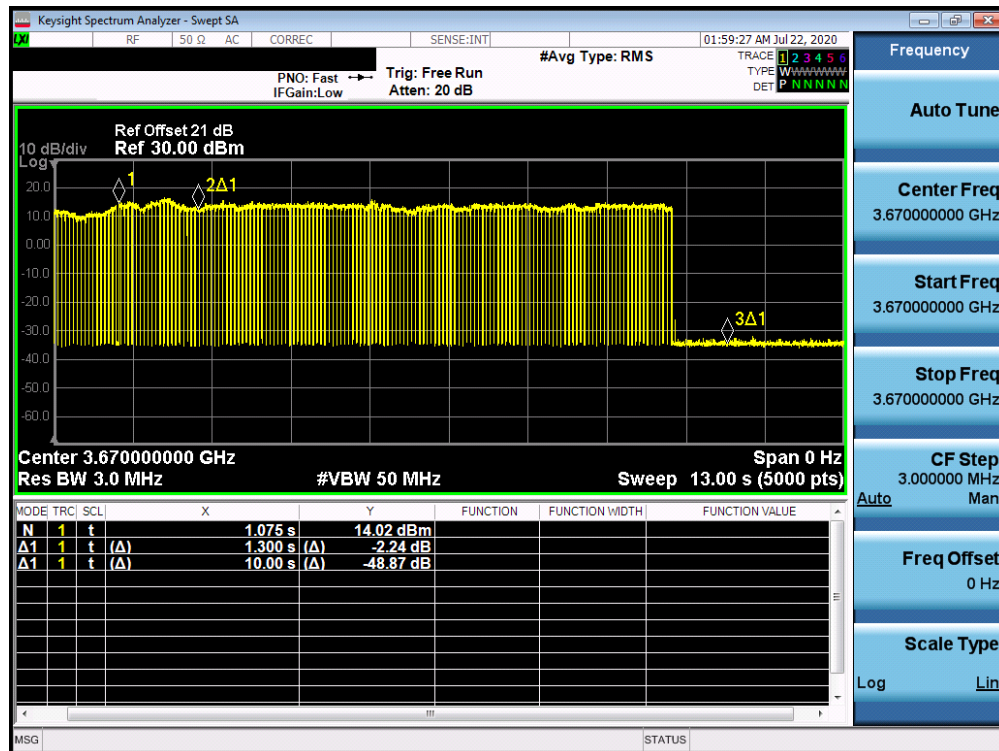
Plot 7-74. Run#1 End User Device Discontinues Operations within 10s

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Run#2:



Plot 7-75. Run#2 End User Device Frequency of Operations



Plot 7-76. 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 Indoor Customer Premises Equipment (CPE) FCC ID: A3LSMH204V** complies with all of the End User Device requirements of Part 96 of the FCC Rules for LTE operation only.

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