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PART 27 MEASUREMENT REPORT

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

Date of Testing:
6/15 - 8/2/2022
Test Report Issue Date:
8/2/2022
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2206010070-04.A3L

FCC ID:	A3LSMF936JPN
APPLICANT:	Samsung Electronics Co., Ltd.

Application Type: Certification
Model: SC-55C
Additional Model(s): SCG16
EUT Type: Portable Handset
FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part: 27
Test Procedure(s): ANSI C63.26-2015, 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.

RJ Ortanez
Executive Vice President



FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 1 of 93

TABLE OF CONTENTS

1.0	INTRODUCTION	4
1.1	Scope	4
1.2	Element Test Location.....	4
1.3	Test Facility / Accreditations.....	4
2.0	PRODUCT INFORMATION.....	5
2.1	Equipment Description	5
2.2	Device Capabilities.....	5
2.3	Test Configuration	5
2.4	Software and Firmware	5
2.5	EMI Suppression Device(s)/Modifications	5
3.0	DESCRIPTION OF TESTS	6
3.1	Evaluation Procedure	6
3.2	Radiated Power and Radiated Spurious Emissions	6
4.0	MEASUREMENT UNCERTAINTY	7
5.0	TEST EQUIPMENT CALIBRATION DATA	8
6.0	SAMPLE CALCULATIONS	9
7.0	TEST RESULTS	10
7.1	Summary	10
7.2	Occupied Bandwidth	12
7.3	Spurious and Harmonic Emissions at Antenna Terminal	25
7.4	Band Edge Emissions at Antenna Terminal.....	38
7.5	Peak-Average Ratio	60
7.6	Radiated Power (ERP/EIRP).....	67
7.7	Radiated Spurious Emissions Measurements.....	71
7.8	Frequency Stability / Temperature Variation	89
8.0	CONCLUSION.....	93

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 2 of 93

MEASUREMENT REPORT

FCC Part 27

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	ERP		EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	Max. Power [W]	Max. Power [dBm]	
LTE Band 12	10 MHz	QPSK	704.0 - 711.0	0.034	15.29	0.055	17.44	9M01G7D
		16QAM	704.0 - 711.0	0.029	14.61	0.047	16.76	8M98W7D
	5 MHz	QPSK	701.5 - 713.5	0.035	15.50	0.058	17.65	4M53G7D
		16QAM	701.5 - 713.5	0.029	14.56	0.047	16.71	4M52W7D
	3 MHz	QPSK	700.5 - 714.5	0.035	15.46	0.058	17.61	2M72G7D
		16QAM	700.5 - 714.5	0.028	14.54	0.047	16.69	2M71W7D
	1.4 MHz	QPSK	699.7 - 715.3	0.034	15.35	0.056	17.50	1M10G7D
		16QAM	699.7 - 715.3	0.028	14.45	0.046	16.60	1M10W7D
LTE Band 13	10 MHz	QPSK	782.0	0.061	17.88	0.101	20.03	8M99G7D
		16QAM	782.0	0.053	17.27	0.088	19.42	8M97W7D
	5 MHz	QPSK	779.5 - 784.5	0.063	17.96	0.103	20.11	4M51G7D
		16QAM	779.5 - 784.5	0.056	17.48	0.092	19.63	4M52W7D

Overview Table (<1GHz Bands)

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	EIRP		Emission Designator
				Max. Power [W]	Max. Power [dBm]	
LTE Band 4	20 MHz	QPSK	1720.0 - 1745.0	0.190	22.80	18M0G7D
		16QAM	1720.0 - 1745.0	0.176	22.45	18M0W7D
	15 MHz	QPSK	1717.5 - 1747.5	0.181	22.57	13M5G7D
		16QAM	1717.5 - 1747.5	0.171	22.33	13M5W7D
	10 MHz	QPSK	1715.0 - 1750.0	0.190	22.78	9M03G7D
		16QAM	1715.0 - 1750.0	0.166	22.19	9M02W7D
	5 MHz	QPSK	1712.5 - 1752.5	0.199	22.98	4M52G7D
		16QAM	1712.5 - 1752.5	0.166	22.21	4M55W7D
	3 MHz	QPSK	1711.5 - 1753.5	0.193	22.85	2M72G7D
		16QAM	1711.5 - 1753.5	0.167	22.22	2M73W7D
	1.4 MHz	QPSK	1710.7 - 1754.3	0.188	22.75	1M10G7D
		16QAM	1710.7 - 1754.3	0.166	22.21	1M11W7D

Overview Table (>1GHz Bands)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 3 of 93

1.0 INTRODUCTION

1.1 Scope

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

1.2 Element Test Location

These measurement tests were conducted at the Element laboratory 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 Element lab located in Columbia, MD 21046, U.S.A.

- Element Washington DC LLC 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.
- Element Washington DC LLC TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- Element Washington DC LLC facility is a registered (2451B) test laboratory with the site description on file with ISED.
- Element Washington DC LLC is a Recognized U.S. Certification Assessment Body (CAB # US0110) for ISED Canada as designated by NIST under the U.S. and Canada Mutual Recognition Agreement.

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 4 of 93

2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMF936JPN**. The test data contained in this report pertains only to the emissions due to the EUT's licensed transmitters that operate under the provisions of Part 27.

Test Device Serial No.: 0370M, 0402M, 0421M, 0068M, 0385M, 0497M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5, 6GHz), Bluetooth (1x, EDR, LE), NFC, UWB, Wireless Power Transfer

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

2.3 Test Configuration

The EUT was tested per the guidance of ANSI C63.26-2015. 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. Open, half opened and closed configurations are tested, and the worst case radiated emissions data is shown in this report.

This device supports two additional antenna configurations for LTE Low bands [AFS operation]: one is with two antennas transmitting from one feed, and one is with a singular antenna transmitting. Both configurations are tested, and the worst case radiated emissions data is shown in this report.

2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version SC55COMU0AVEE installed on the EUT.

2.5 EMI Suppression Device(s)/Modifications

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

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 5 of 93

3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

The measurement procedures described in the “American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services” (ANSI C63.26-2015) were used in the measurement of the EUT.

Deviation from Measurement Procedure.....None

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.

For radiated power measurements, substitution method is used per the guidance of ANSI C63.26-2015. For emissions below 1GHz, a half-wave dipole is 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 $P_g \text{ [dBm]} - \text{cable loss [dB]}$.

For radiated spurious emissions measurements, the field strength conversion method is used per the formulas in Section 5.2.7 of ANSI C63.26-2015. Field Strength (EIRP) is calculated using the following formulas:

$$E_{\text{[dB}\mu\text{V/m]}} = \text{Measured amplitude level}_{\text{[dBm]}} + 107 + \text{Cable Loss}_{\text{[dB]}} + \text{Antenna Factor}_{\text{[dB/m]}}$$

And

$$\text{EIRP}_{\text{[dBm]}} = E_{\text{[dB}\mu\text{V/m]}} + 20\log D - 104.8; \text{ where } D \text{ is the measurement distance in meters.}$$

All radiated measurements are performed in a chamber that meets the site requirements per ANSI C63.4-2014. Additionally, radiated emissions below 30MHz are also validated on an Open Area Test Site to assert correlation with the chamber measurements per the requirements of KDB 414788 D01 v01r01.

Radiated power and radiated spurious emission levels are investigated with the receive antenna horizontally and vertically polarized per ANSI C63.26-2015.

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 6 of 93

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

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 7 of 93

5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	AP2-001	EMC Cable and Switch System	1/4/2022	Annual	1/4/2023	AP2-001
-	AP2-002	EMC Cable and Switch System	3/11/2022	Annual	3/11/2023	AP2-002
-	ETS-001	EMC Cable and Switch System	12/9/2021	Annual	12/9/2022	ETS-001
-	ETS-002	EMC Cable and Switch System	3/10/2022	Annual	3/10/2023	ETS-002
-	LTx1	Licensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx1
-	LTx3	Licensed Transmitter Cable Set	8/18/2021	Annual	8/18/2022	LTx3
-	LTx5	Licensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx5
-	LTx6-40	Licensed Transmitter Cable Set	12/19/2021	Annual	12/19/2022	LTx6-40
-	WL40-1	WLAN Cable Set (40GHz)	12/19/2021	Annual	12/19/2022	WL40-1
Anritsu	MT8000A	Radio Communication Test Station	8/2/2021	Annual	8/2/2022	6272337437
Anritsu	MT8821C	Radio Communication Analyzer	N/A			6201525694
Espec	ESX-2CA	Environmental Chamber	8/27/2020	Annual	8/27/2022	17620
ETS-Lindgren	3116C	DRG Horn Antenna	5/11/2021	Biennial	5/11/2023	218893
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	7/21/2021	Annual	7/21/2022	MY49430494
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	2/14/2022	Annual	2/14/2023	MY52350166
Keysight Technologies	N9030B	PXA Signal Analyzer, Multi-touch	1/7/2022	Annual	1/7/2023	MY57141001
Keysight Technologies	N9038A	MXE EMI Receiver	1/21/2022	Annual	1/21/2023	MY51210133
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			100976
Rohde & Schwarz	CMW500	Radio Communication Tester	N/A			112347
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	5/25/2021	Annual	7/25/2022	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/28/2022	Annual	3/28/2023	101716
Rohde & Schwarz	TC-TA18	Cross Polarized Vivaldi Test Antenna	8/13/2020	Biennial	8/13/2022	101073
Sunol	JB5	Bi-Log Antenna (30M - 5GHz)	7/27/2020	Biennial	7/27/2022	A051107
Sunol	JB6	LB6 Antenna	11/13/2020	Biennial	11/13/2022	A082816

Table 5-1. Test Equipment

Notes:

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

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 8 of 93

6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (1564 MHz)

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was -81.0 dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of -81.0 dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of -30.9 dBm yielding -24.80 dBm. The fundamental EIRP was 25.501 dBm so this harmonic was 25.501 dBm $- (-24.80)$.

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 9 of 93

7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMF936JPN
 FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
 Mode(s): LTE

Test Condition	Test Description	FCC Part Section(s)	Test Limit	Test Result	Reference
CONDUCTED	Transmitter Conducted Output Power*	2.1046(a), 2.1046(c)	N/A	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions (LTE Band 13)	2.1051, 27.53(c), 27.53(f)	Undesirable emissions must meet the limits detailed in sections 27.53(c) and 27.53(f)	PASS	Sections 7.4, 7.5
	Conducted Band Edge / Spurious Emissions (LTE Band 12)	2.1051, 27.53(g)	$\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power	PASS	Sections 7.4, 7.5
	Conducted Band Edge / Spurious Emissions (LTE Band 4)	2.1051, 27.53(h)	$\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio (LTE Band 4)	27.50(d)(5)	≤ 13 dB	PASS	Section 7.6
	Frequency Stability	2.1055, 27.54	Fundamental emissions stay within authorized frequency block	PASS	Section 7.9
RADIATED	Effective Radiated Power (LTE Band 13)	27.50(b)(10)	≤ 3 Watts max. ERP	PASS	Section 7.7
	Effective Radiated Power (LTE Band 12)	27.50(c)(10)	≤ 3 Watts max. ERP	PASS	Section 7.7
	Equivalent Isotropic Radiated Power (LTE Band 4)	27.50(d)(4)	≤ 1 Watt max. EIRP	PASS	Section 7.7
	Radiated Spurious Emissions (LTE Band 13)	2.1053, 27.53(c), 27.53(f)	Undesirable emissions must meet the limits detailed in sections 27.53(c) and 27.53(f)	PASS	Section 7.8
	Radiated Spurious Emissions (LTE Band 12)	2.1053, 27.53(g)	$\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power	PASS	Section 7.8
	Radiated Spurious Emissions (LTE Band 4)	2.1053, 27.53(h)(1)	$\geq 43 + 10 \log (P[\text{Watts}])$ dB of attenuation below transmitter power	PASS	Section 7.8

* The only transmitter output conducted powers included in this report are those where the Pmax value, per the tune-up document, is higher than any of the DSI power levels. For the remaining conducted power measurements, see the **RF Exposure Report**.

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

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 10 of 93

Notes:

- 1) All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in Section 7.0 were taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables, directional couplers, and attenuators used as part of the system to maintain a link between the call box and the EUT at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables, attenuators, and couplers.
- 4) For conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is EMC Software Tool v1.1.

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 11 of 93

7.2 Occupied Bandwidth

Test Overview

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.4.4

Test Settings

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

Test Setup

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

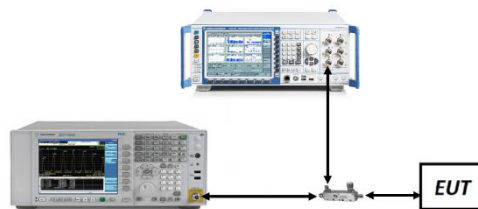


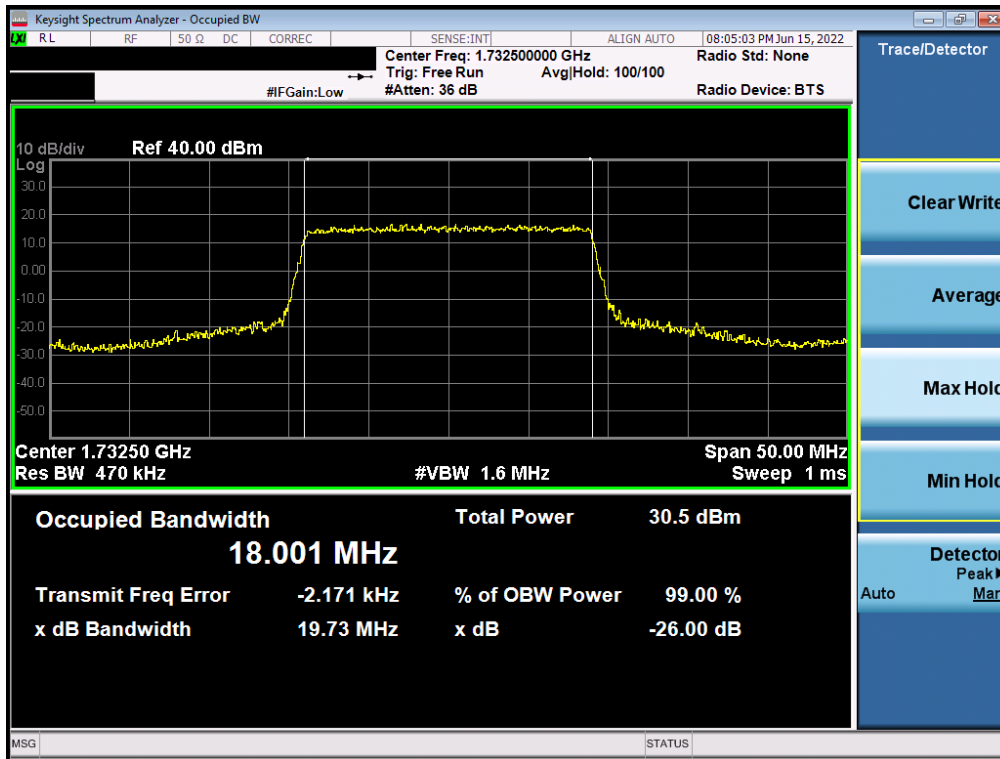
Figure 7-1. Test Instrument & Measurement Setup

Test Notes

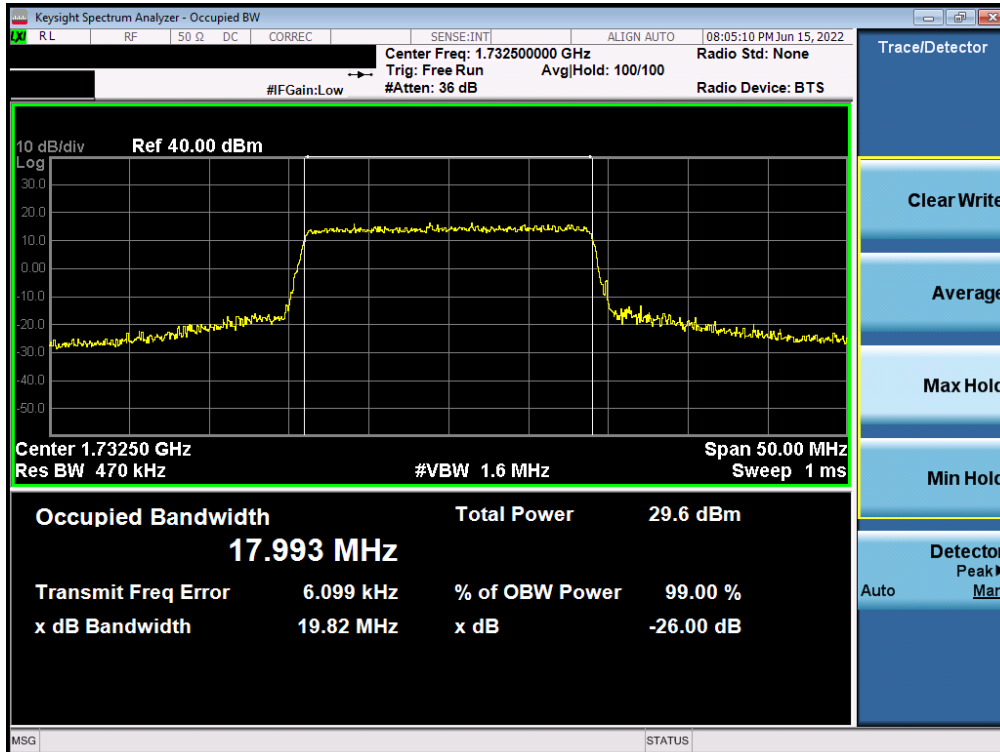
None.

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 12 of 93

LTE Band 4

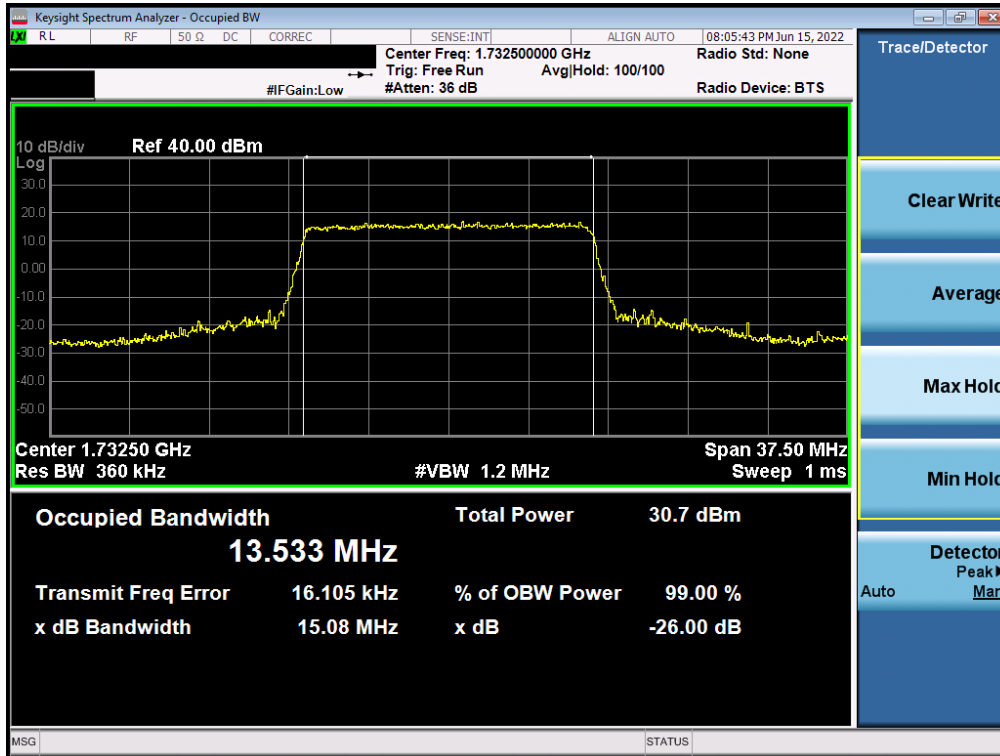


Plot 7-1. Occupied Bandwidth Plot (LTE Band 4 - 20MHz QPSK - Full RB)

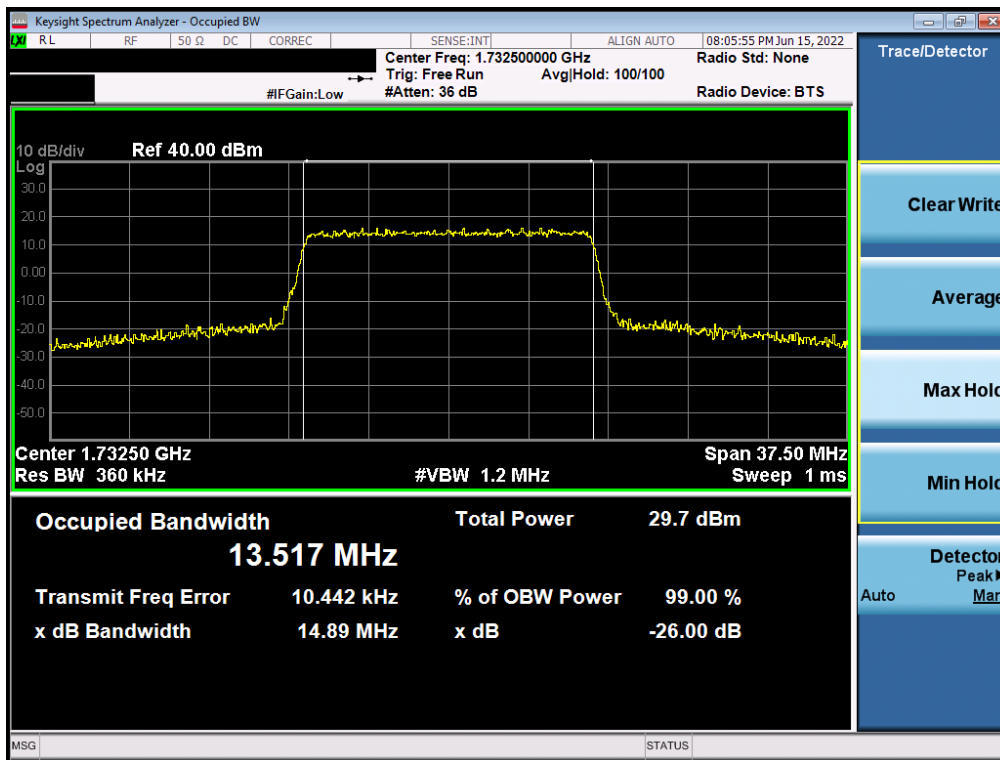


Plot 7-2. Occupied Bandwidth Plot (LTE Band 4 - 20MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 13 of 93

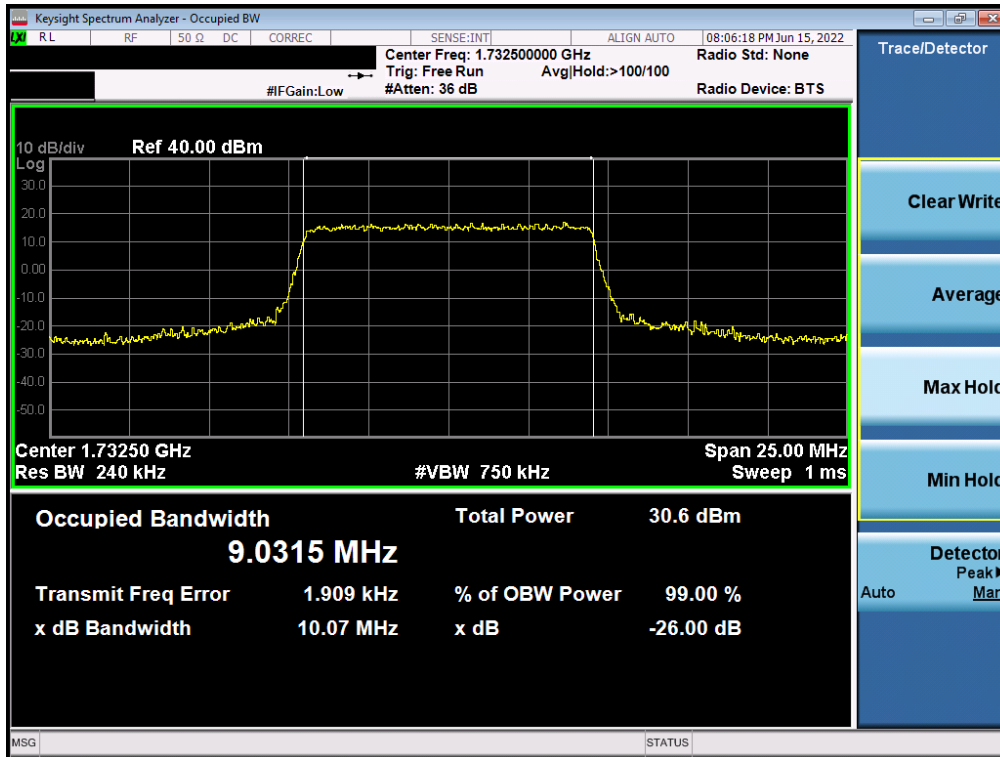


Plot 7-3. Occupied Bandwidth Plot (LTE Band 4 - 15MHz QPSK - Full RB)

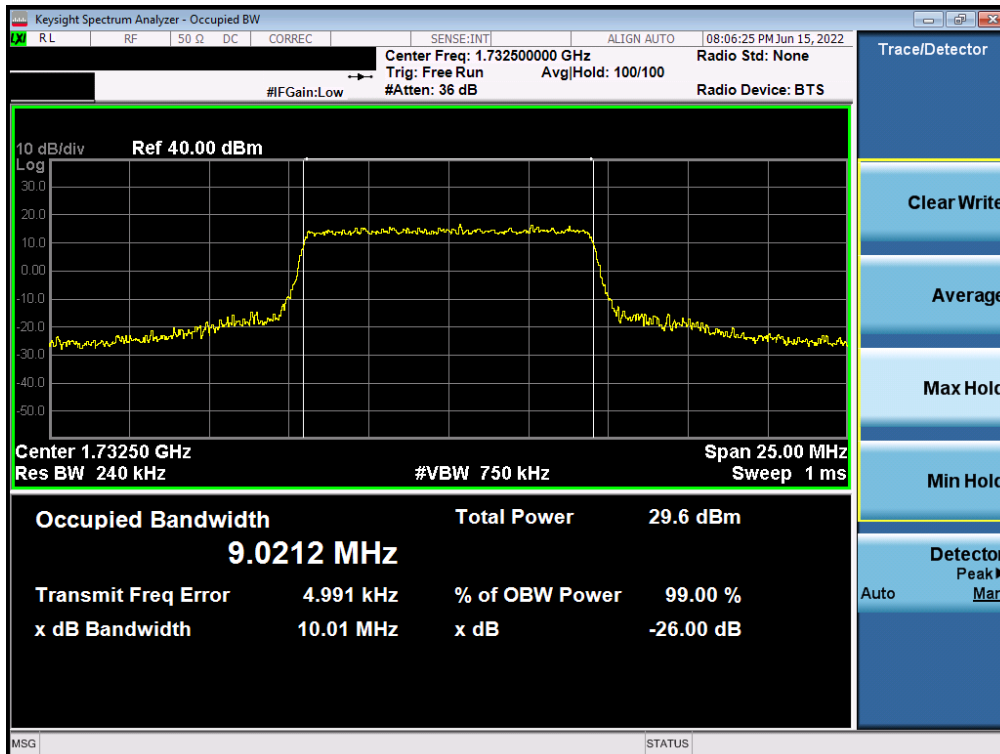


Plot 7-4. Occupied Bandwidth Plot (LTE Band 4 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 14 of 93

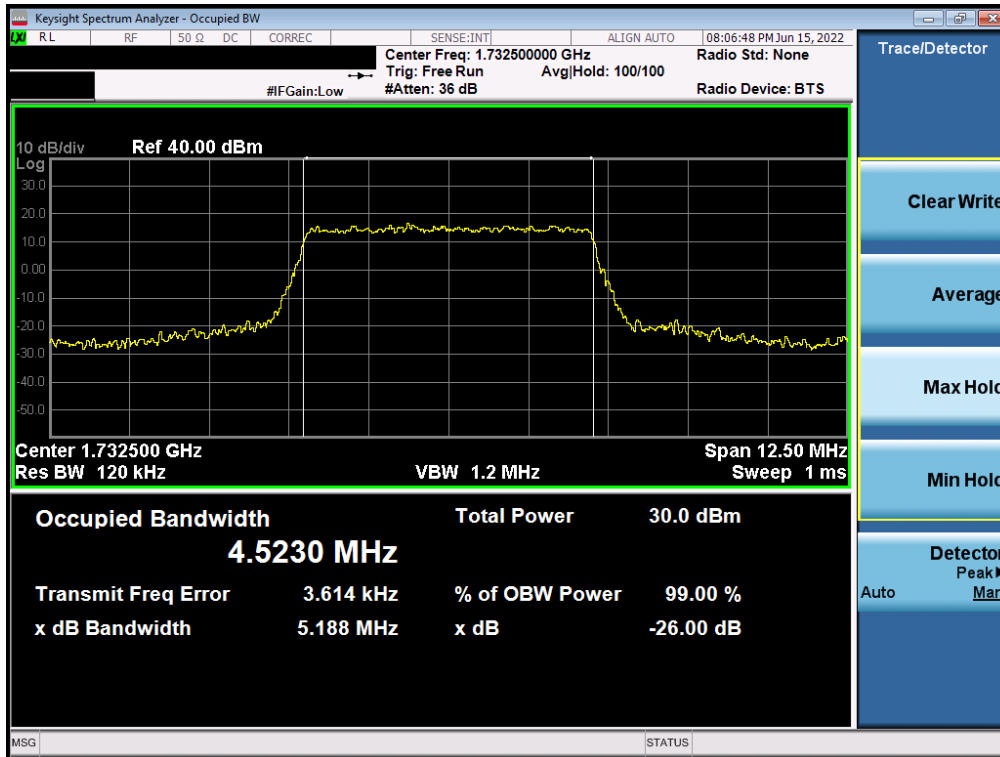


Plot 7-5. Occupied Bandwidth Plot (LTE Band 4 - 10MHz QPSK - Full RB)

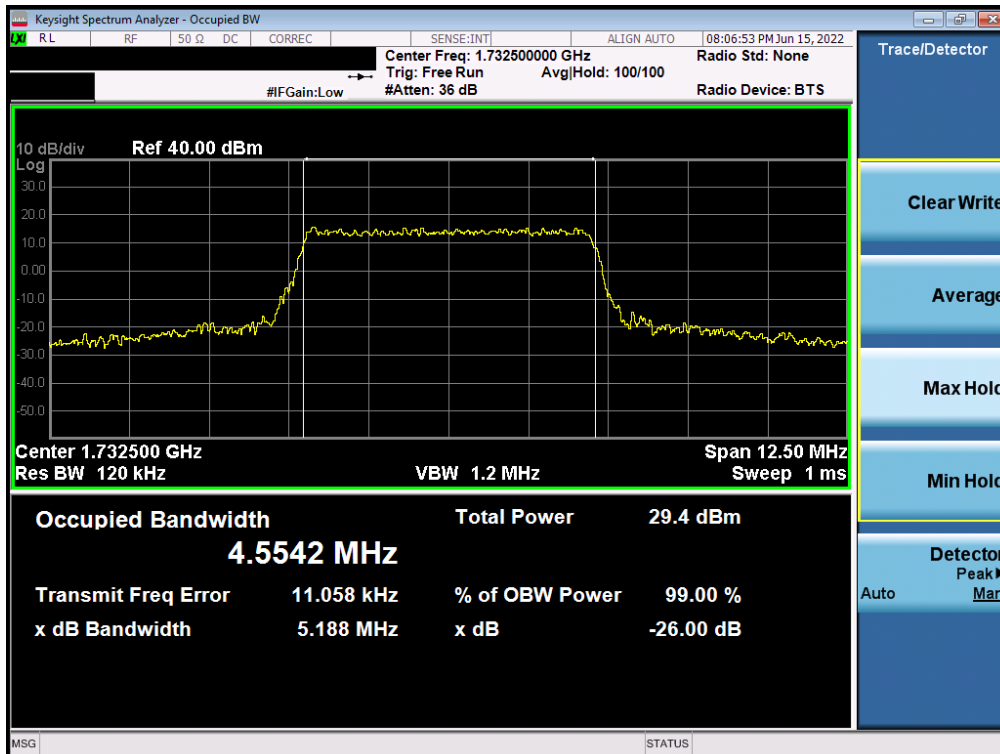


Plot 7-6. Occupied Bandwidth Plot (LTE Band 4 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 15 of 93

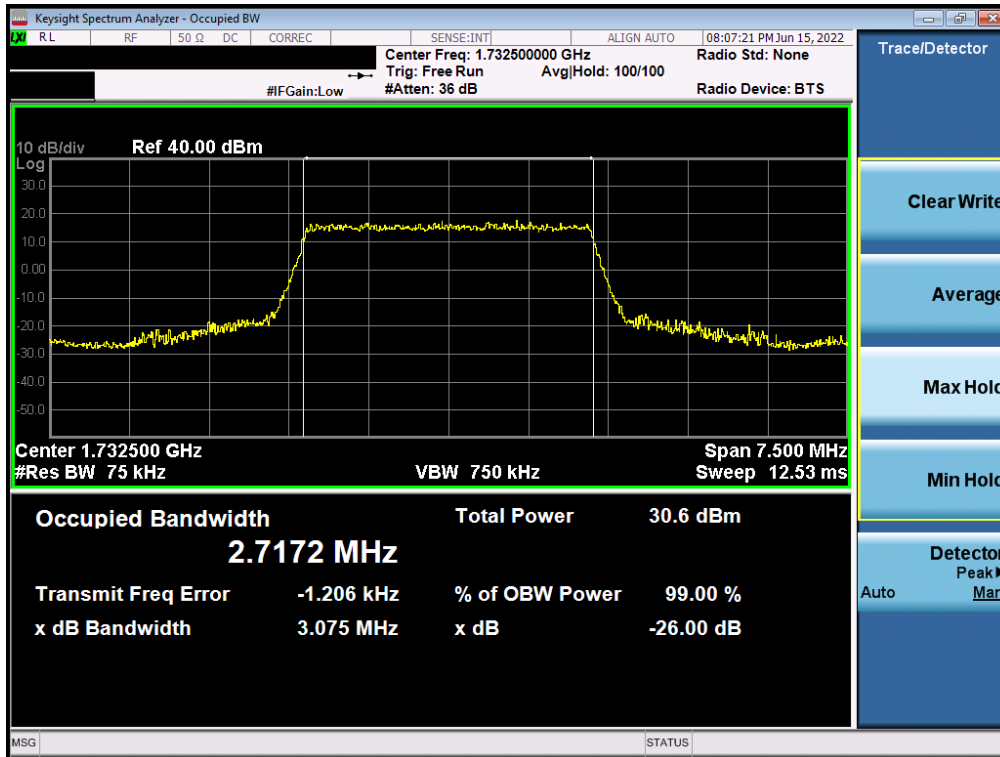


Plot 7-7. Occupied Bandwidth Plot (LTE Band 4 - 5MHz QPSK - Full RB)

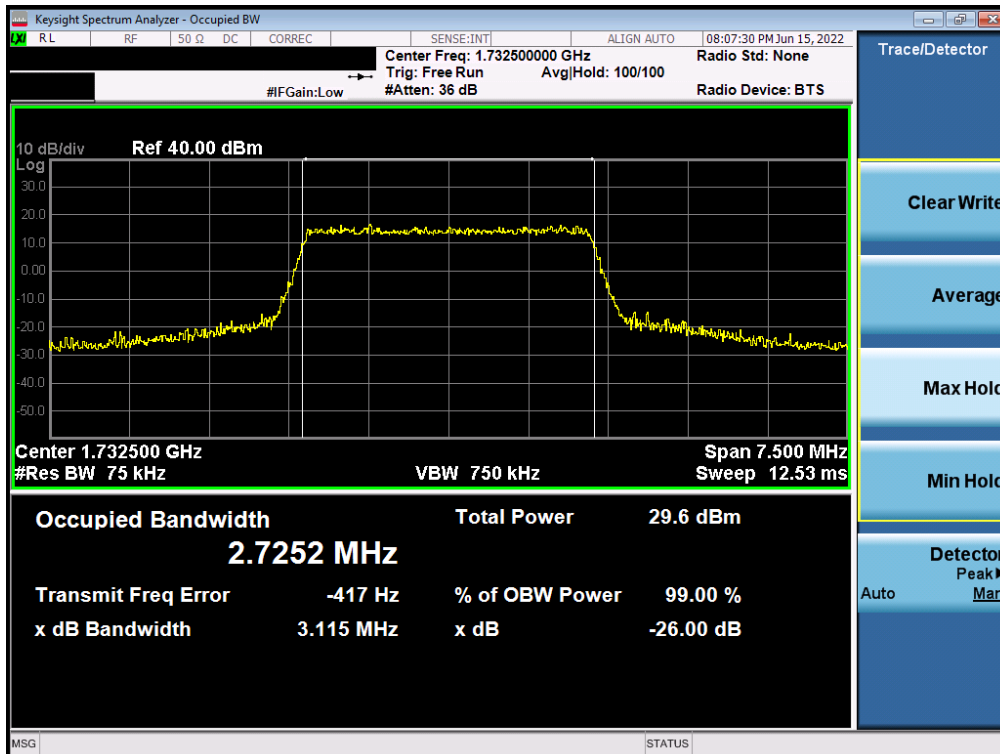


Plot 7-8. Occupied Bandwidth Plot (LTE Band 4 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 16 of 93

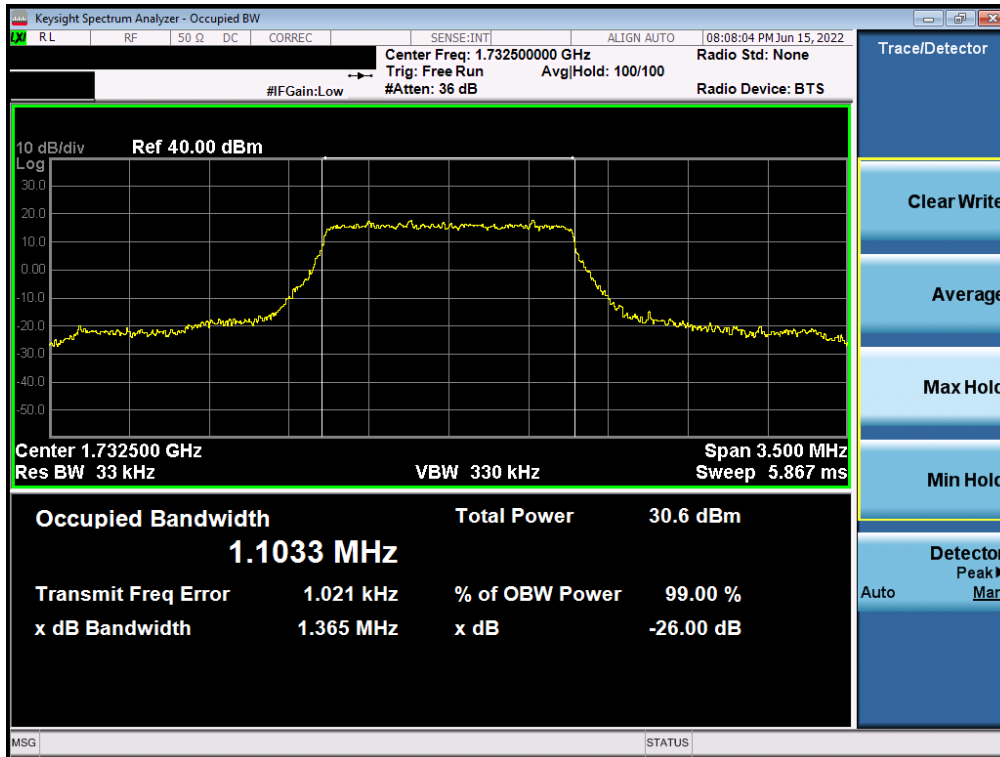


Plot 7-9. Occupied Bandwidth Plot (LTE Band 4 - 3MHz QPSK - Full RB)

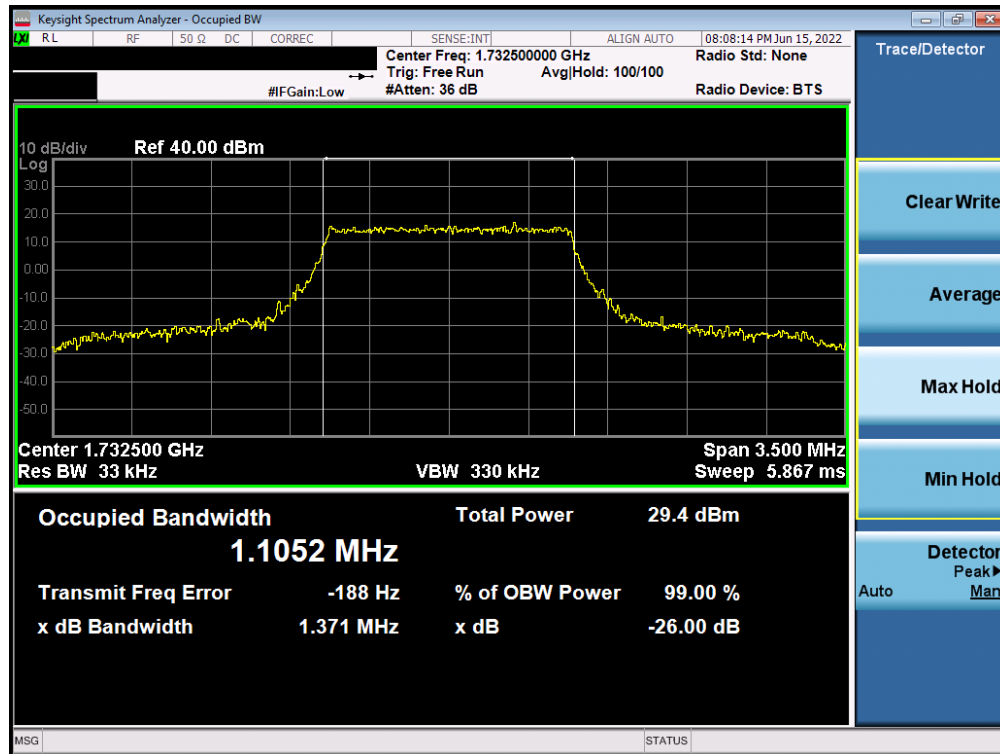


Plot 7-10. Occupied Bandwidth Plot (LTE Band 4 - 3MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 17 of 93



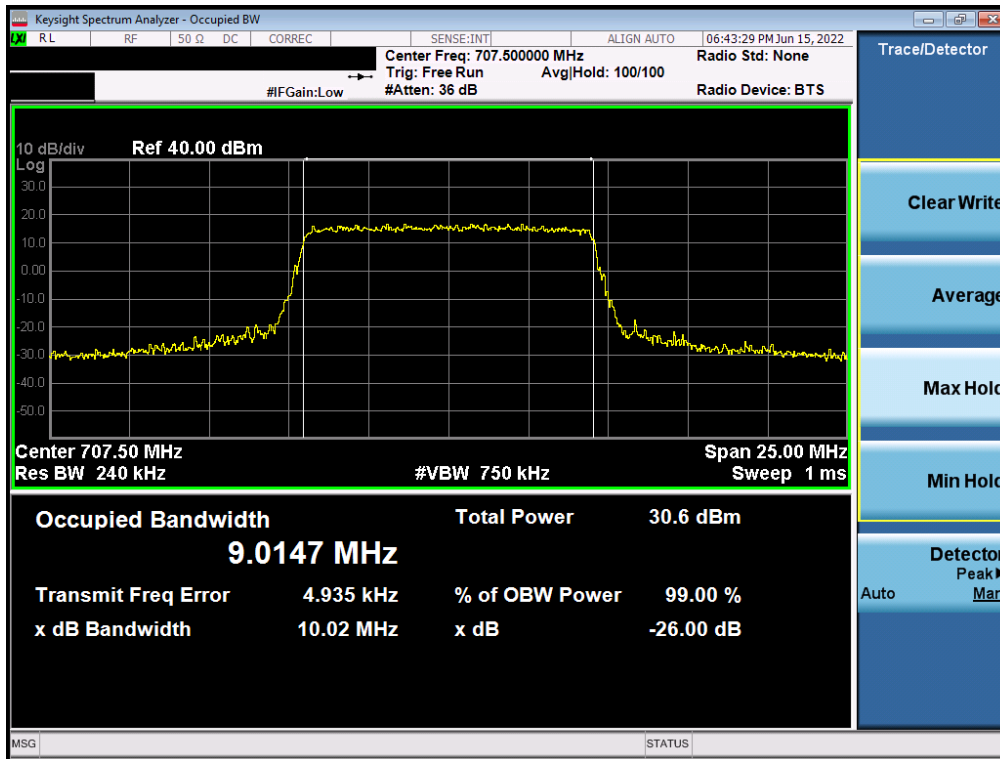
Plot 7-11. Occupied Bandwidth Plot (LTE Band 4 - 1.4MHz QPSK - Full RB)



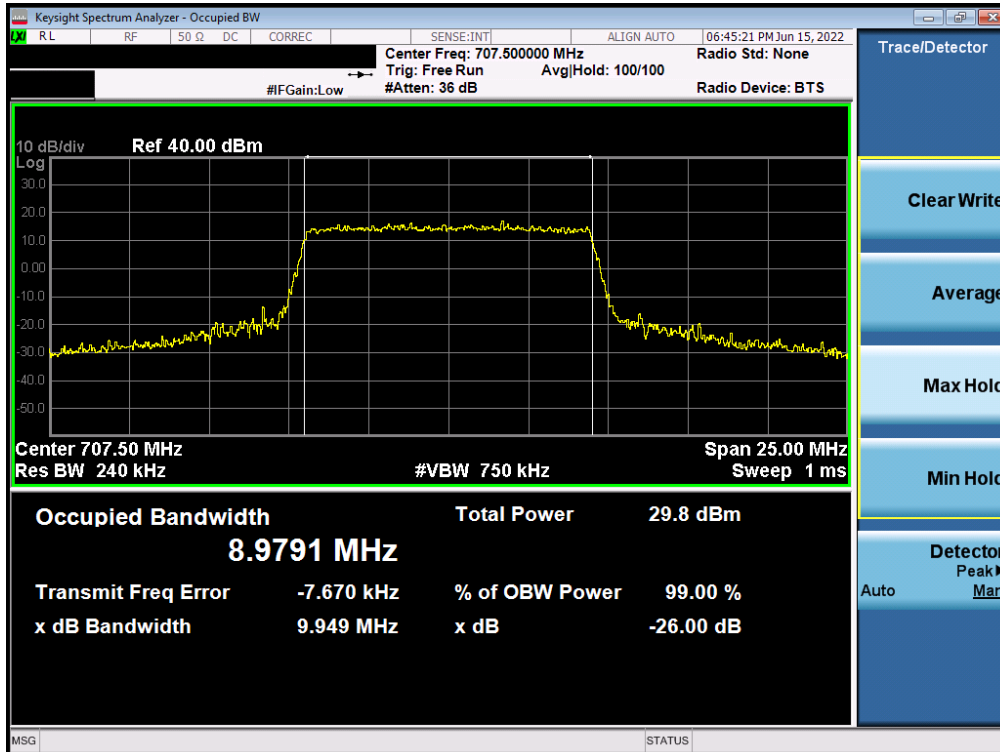
Plot 7-12. Occupied Bandwidth Plot (LTE Band 4 - 1.4MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 18 of 93

LTE Band 12



Plot 7-13. Occupied Bandwidth Plot (LTE Band 12 - 10MHz QPSK - Full RB)

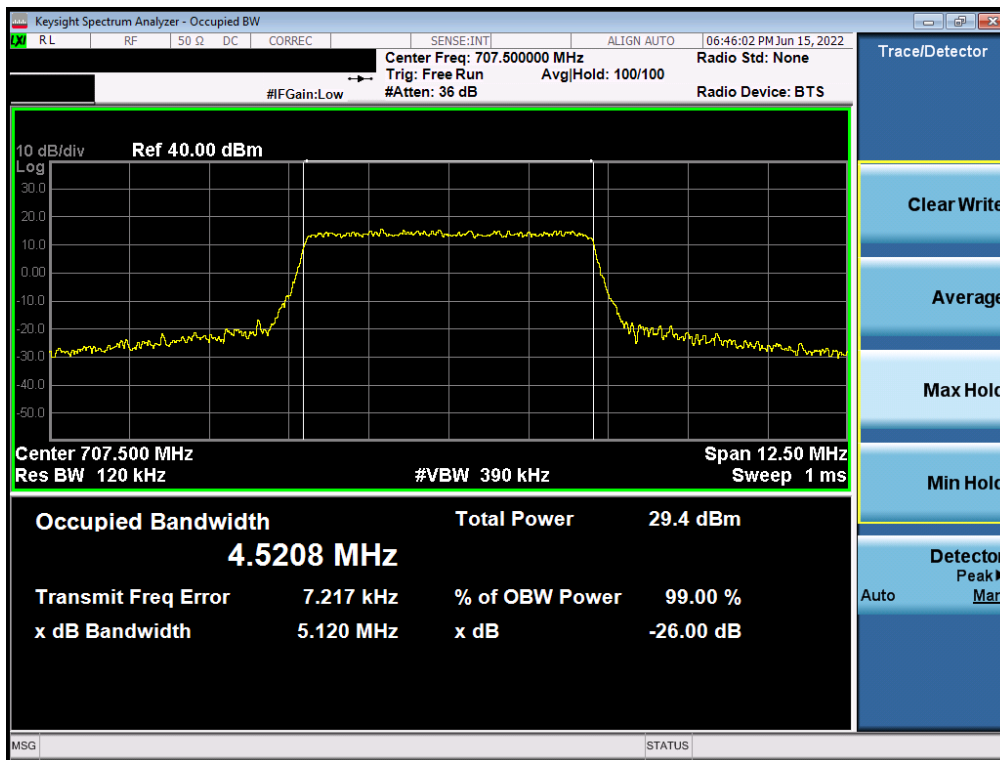


Plot 7-14. Occupied Bandwidth Plot (LTE Band 12 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 19 of 93

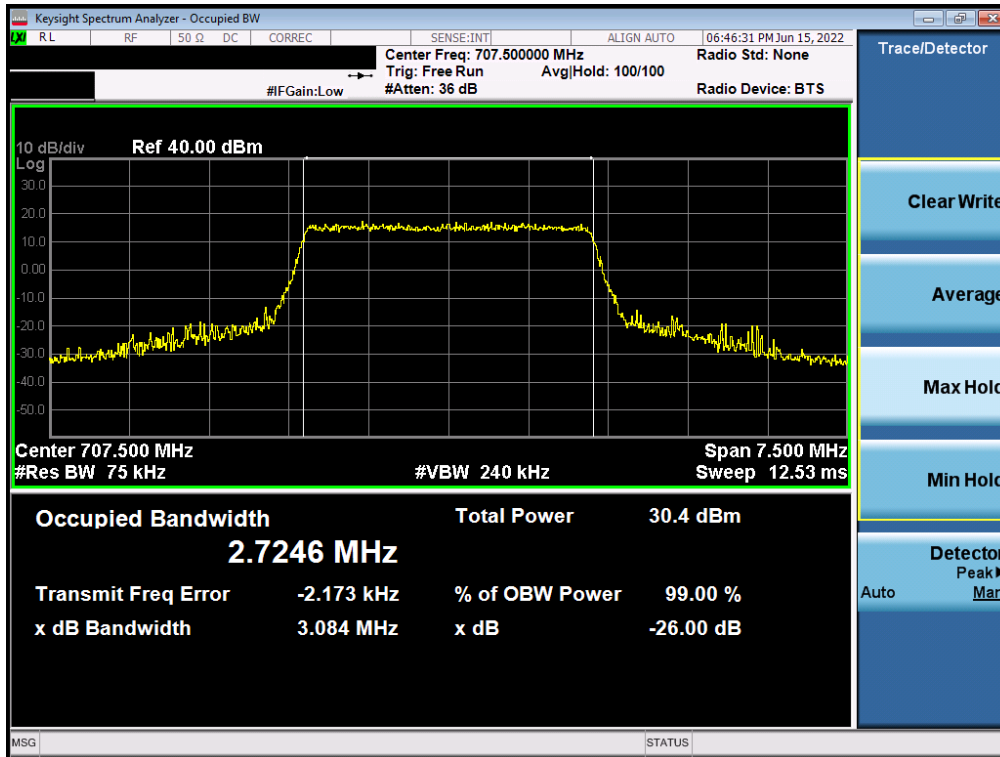


Plot 7-15. Occupied Bandwidth Plot (LTE Band 12 - 5MHz QPSK - Full RB)

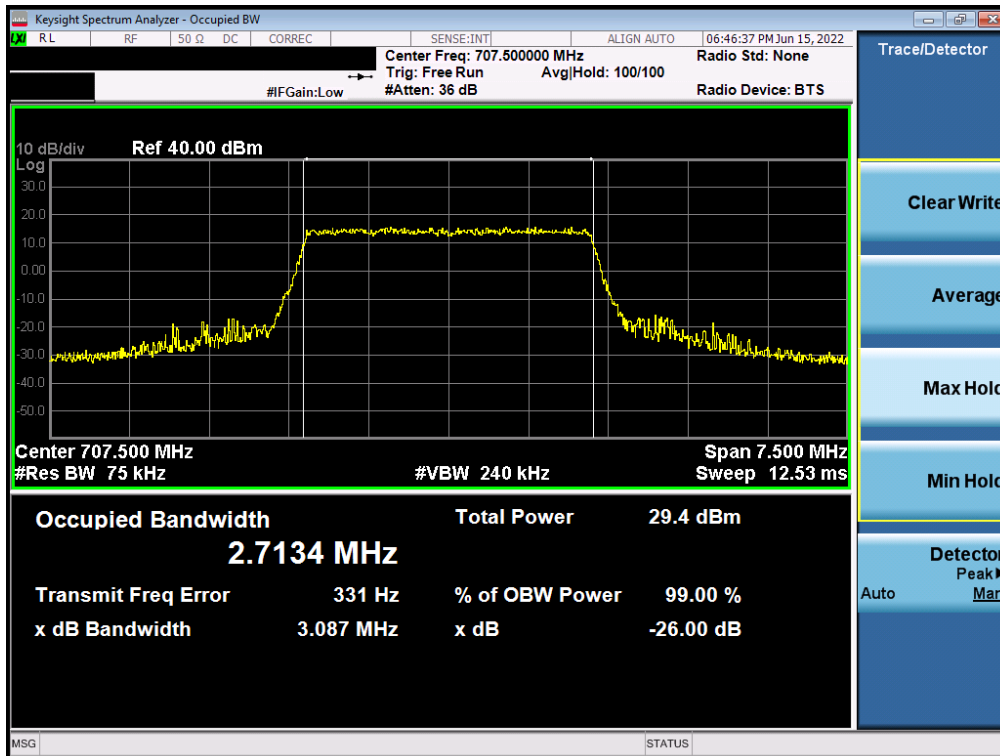


Plot 7-16. Occupied Bandwidth Plot (LTE Band 12 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 20 of 93

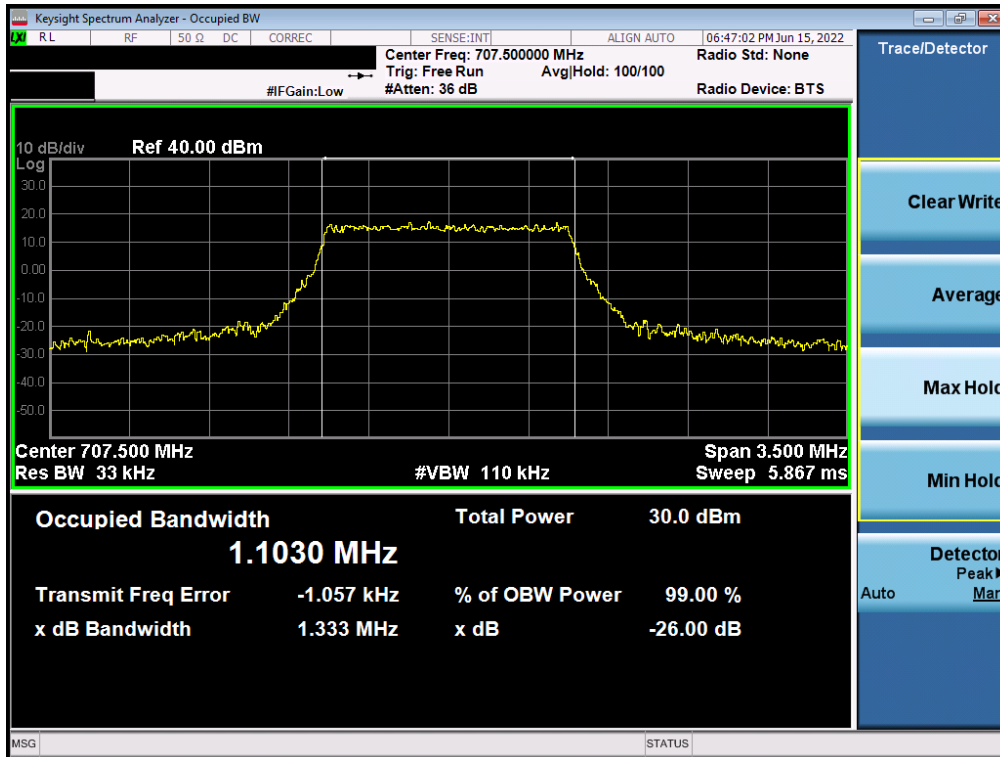


Plot 7-17. Occupied Bandwidth Plot (LTE Band 12 - 3MHz QPSK - Full RB)

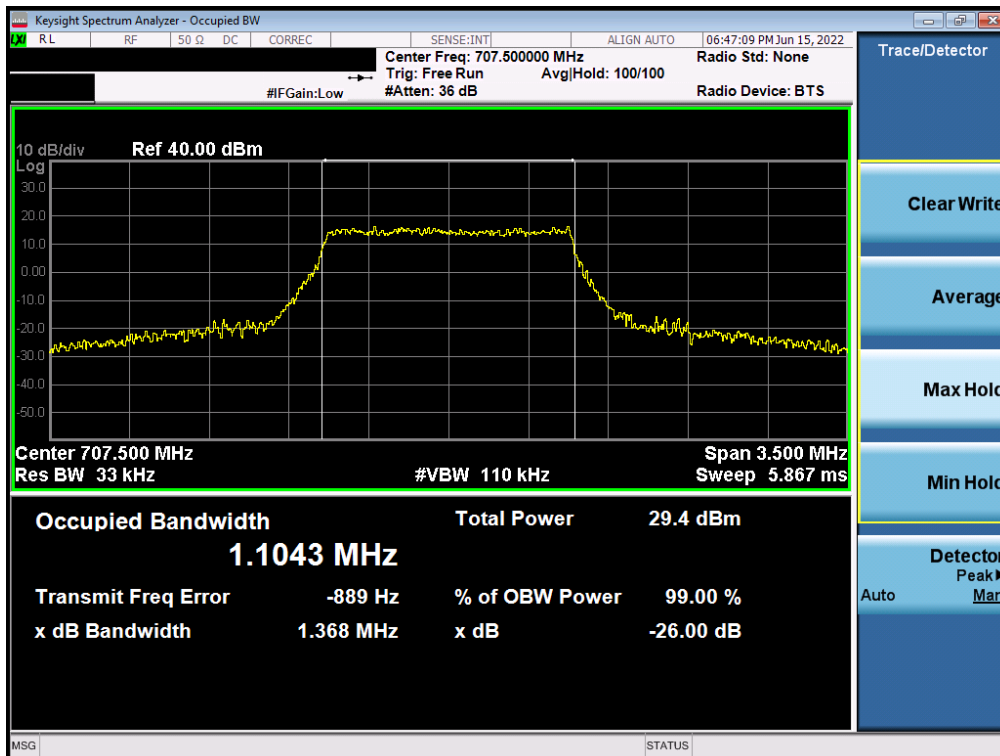


Plot 7-18. Occupied Bandwidth Plot (LTE Band 12 - 3MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 21 of 93



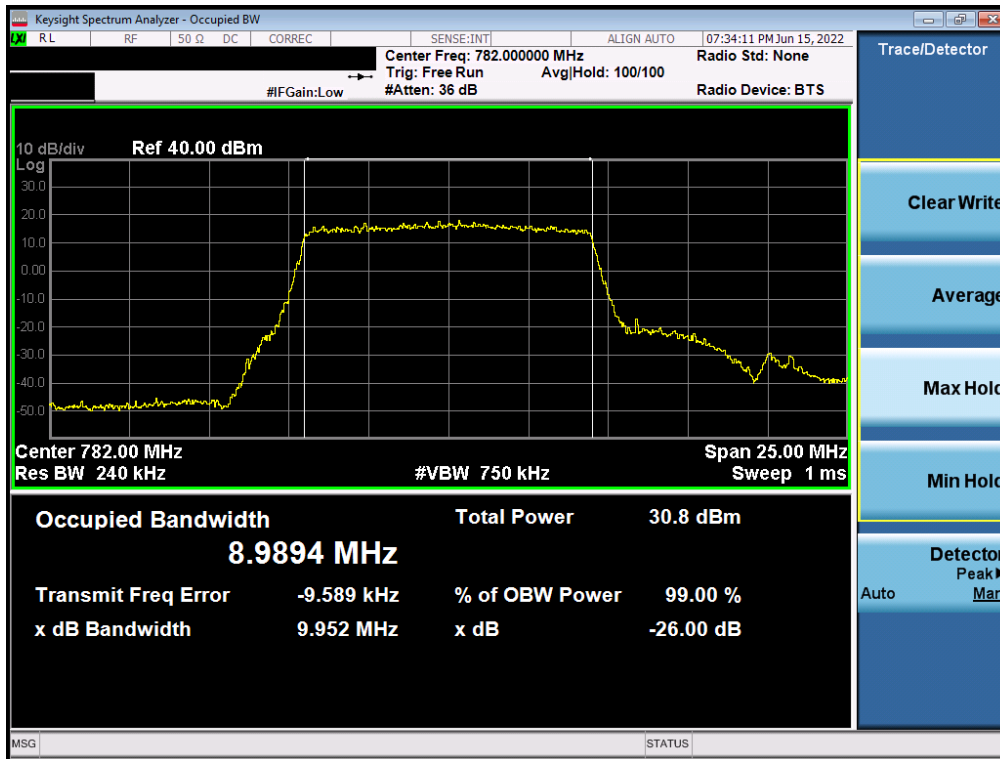
Plot 7-19. Occupied Bandwidth Plot (LTE Band 12 – 1.4MHz QPSK - Full RB)



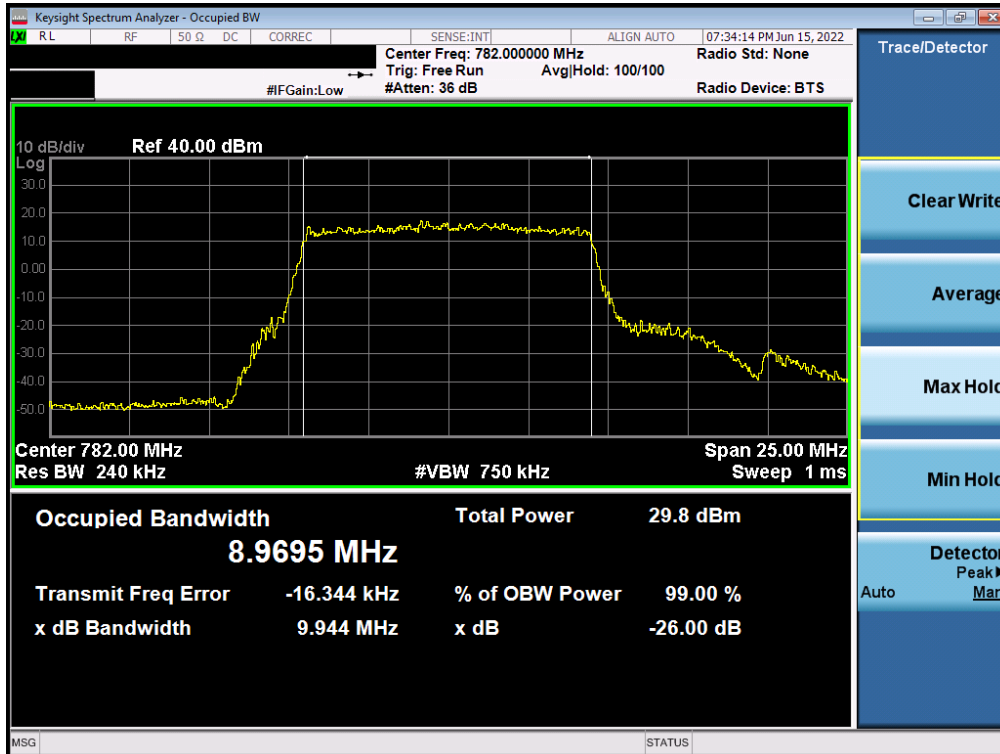
Plot 7-20. Occupied Bandwidth Plot (LTE Band 12 – 1.4MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 22 of 93

LTE Band 13



Plot 7-21. Occupied Bandwidth Plot (LTE Band 13 - 10MHz QPSK - Full RB)

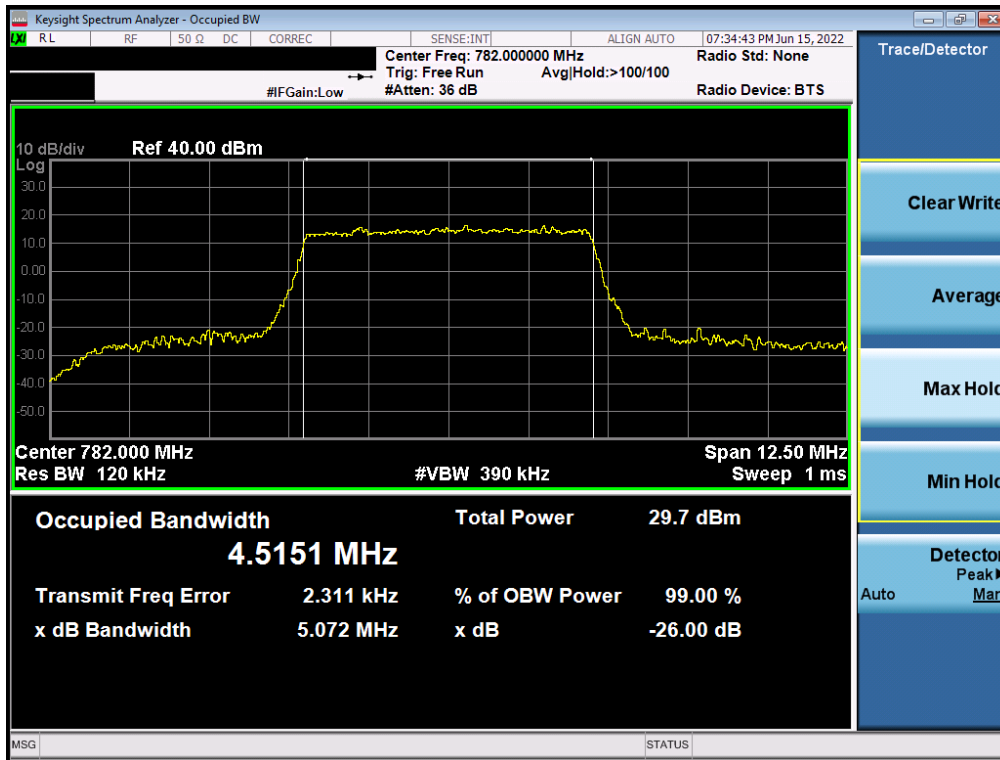


Plot 7-22. Occupied Bandwidth Plot (LTE Band 13 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 23 of 93



Plot 7-23. Occupied Bandwidth Plot (LTE Band 13 - 5MHz QPSK - Full RB)



Plot 7-24. Occupied Bandwidth Plot (LTE Band 13 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 24 of 93

7.3 Spurious and Harmonic Emissions at Antenna Terminal

Test Overview

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

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.4

Test Settings

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

Test Setup

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

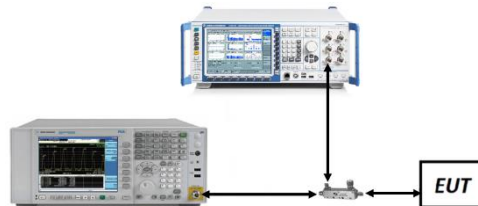


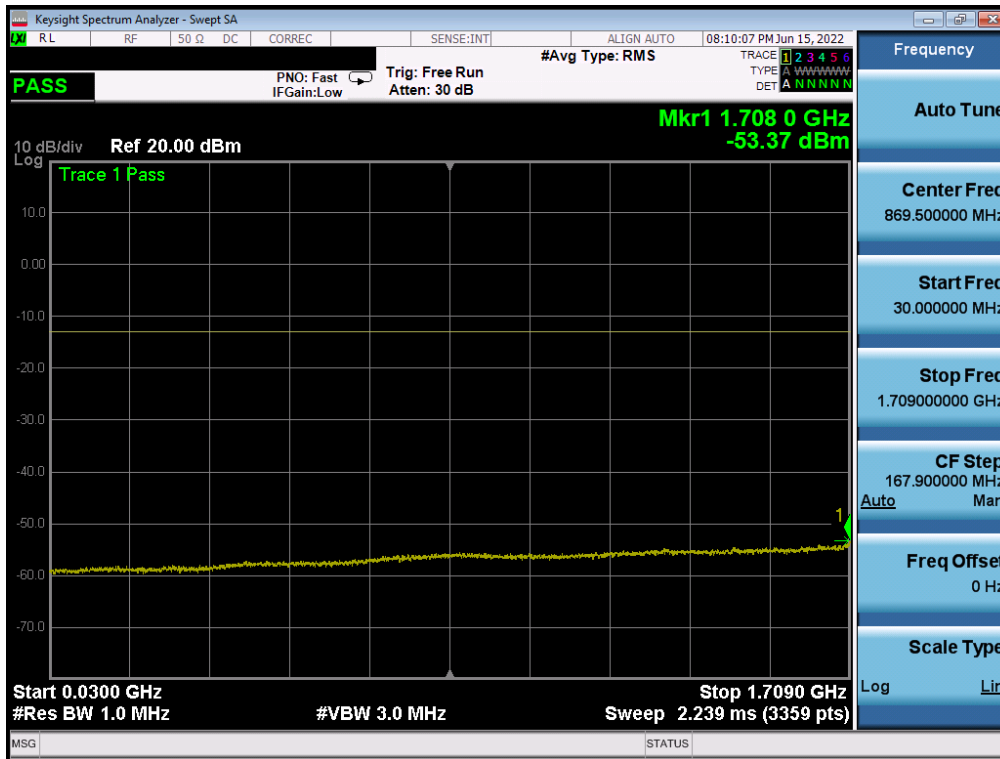
Figure 7-2. Test Instrument & Measurement Setup

Test Notes

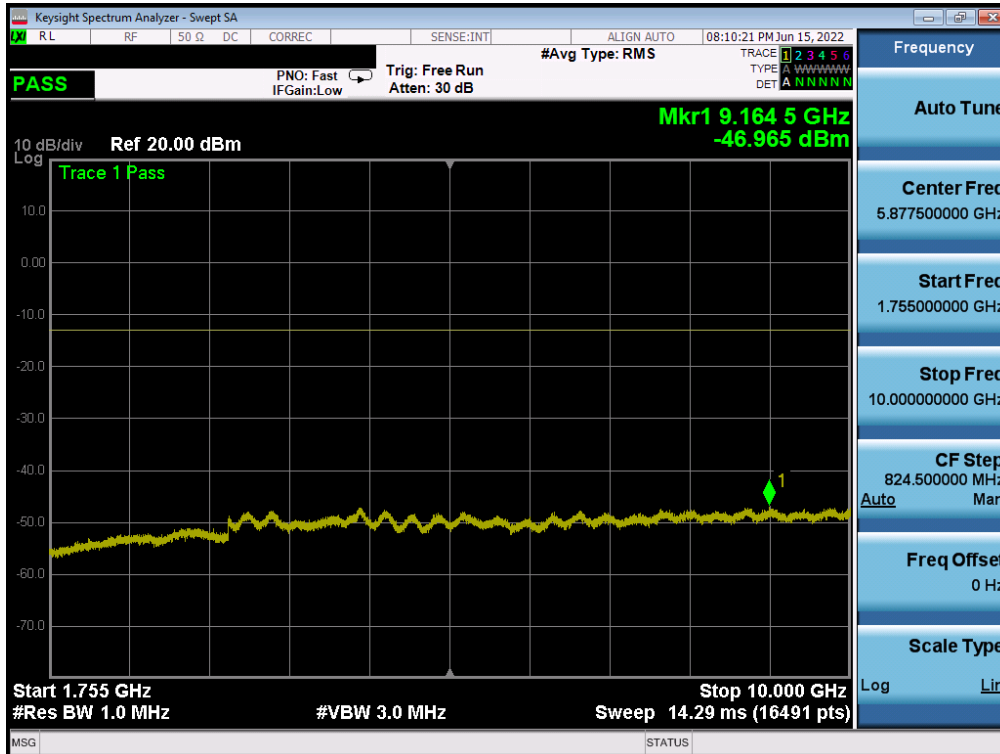
1. Per Part 27, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth 100 kHz or greater for measurements below 1GHz.

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 25 of 93

LTE Band 4

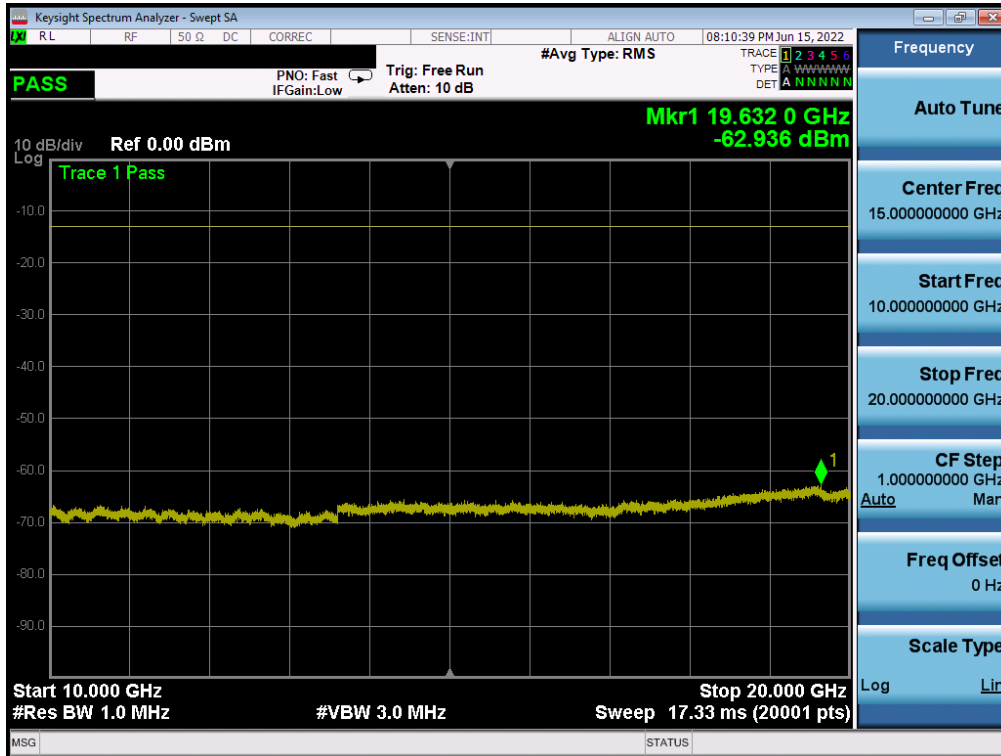


Plot 7-25. Conducted Spurious Plot (LTE Band 4 - 20MHz QPSK - 1 RB - Low Channel)

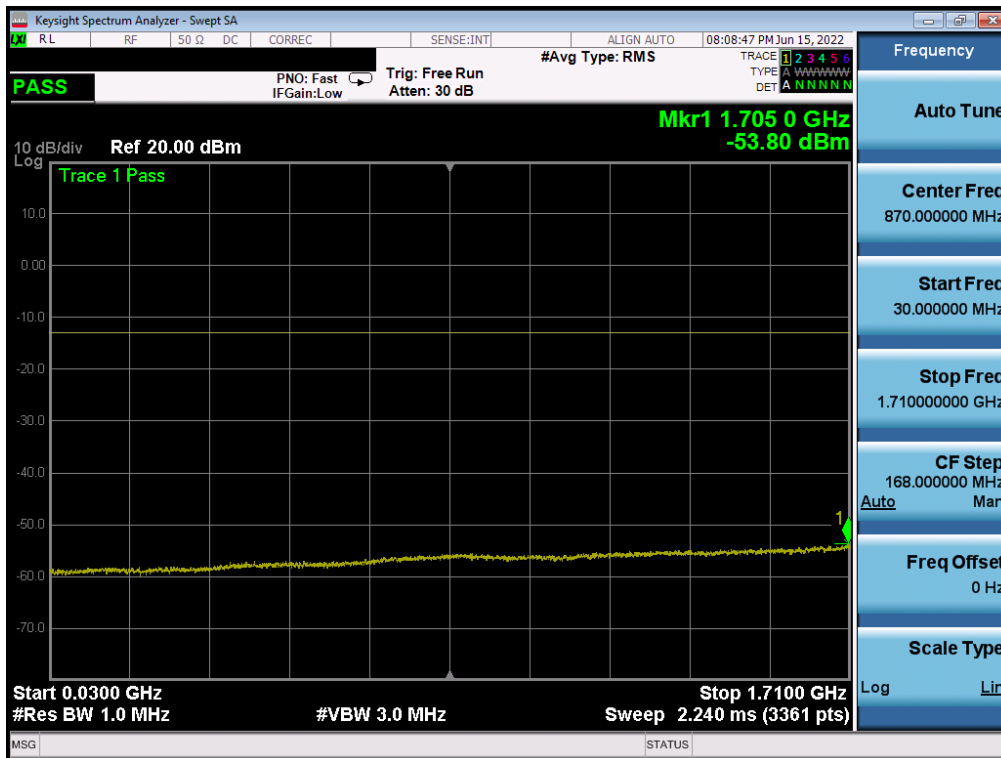


Plot 7-26. Conducted Spurious Plot (LTE Band 4 - 20MHz QPSK - 1 RB - Low Channel)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 26 of 93

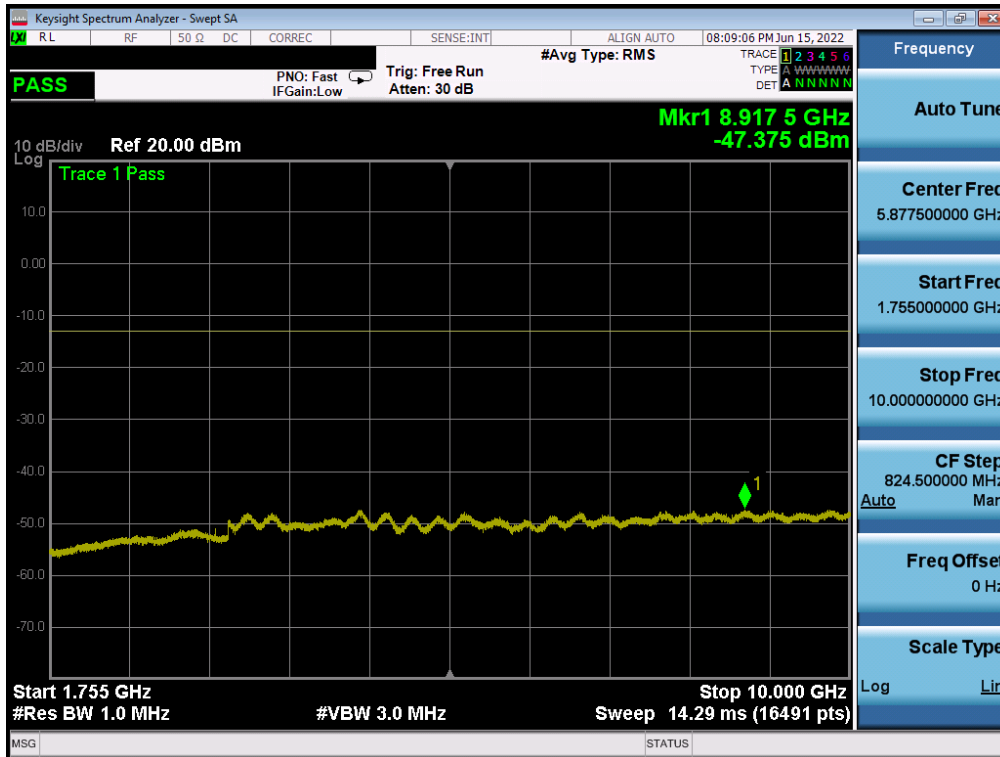


Plot 7-27. Conducted Spurious Plot (LTE Band 4 - 20MHz QPSK - 1 RB - Low Channel)

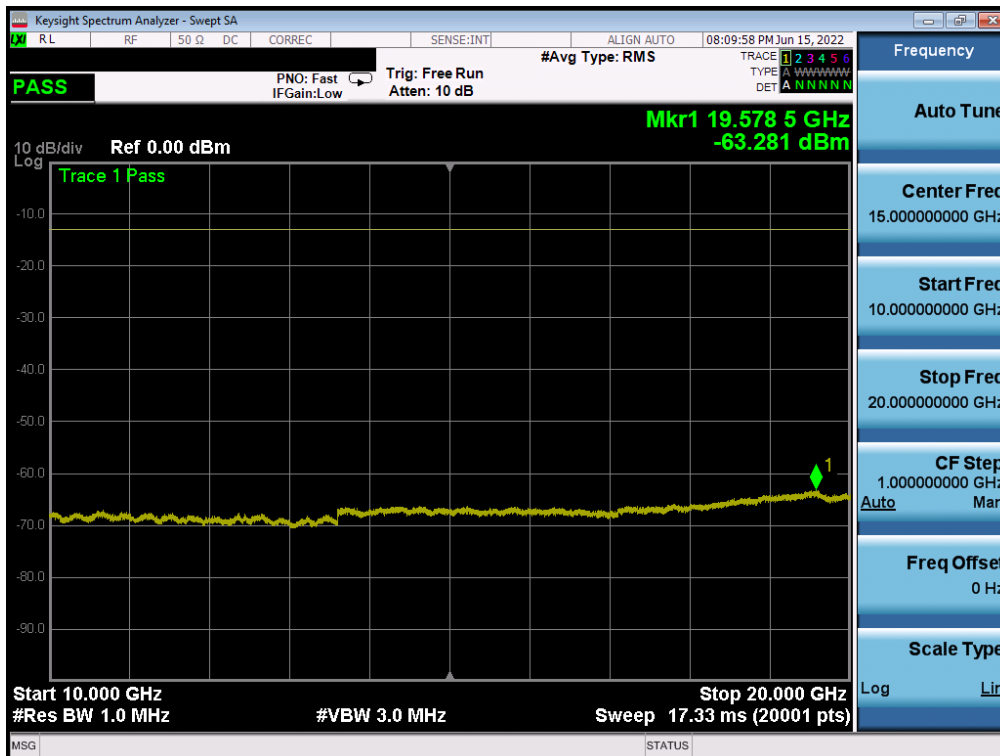


Plot 7-28. Conducted Spurious Plot (LTE Band 4 - 20MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 27 of 93

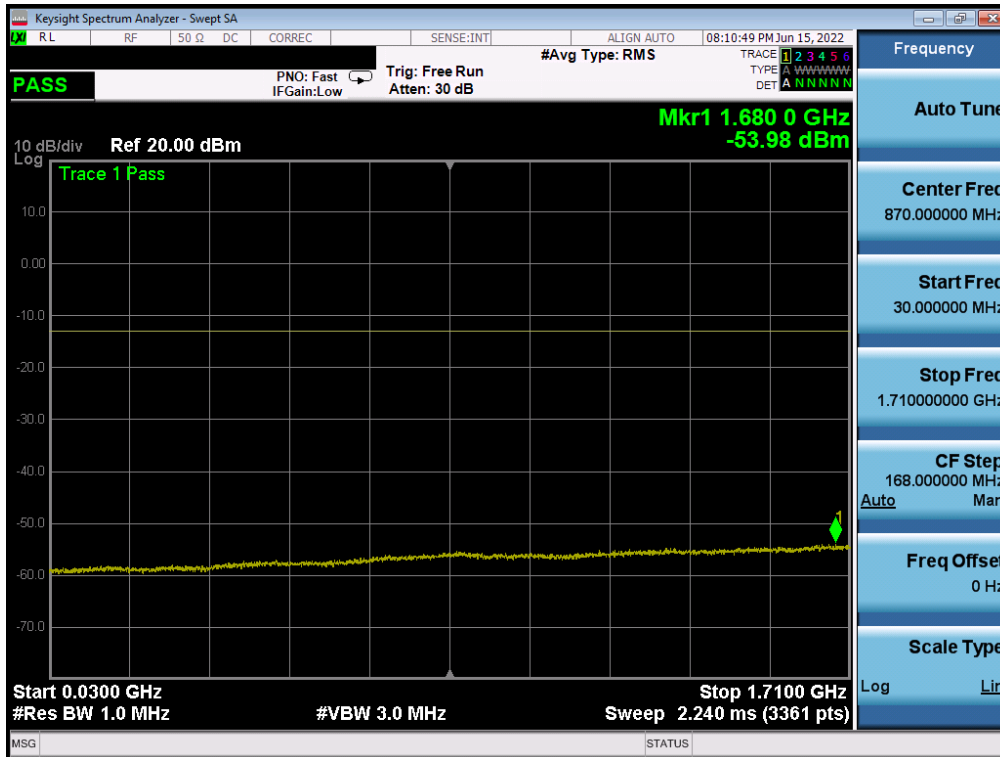


Plot 7-29. Conducted Spurious Plot (LTE Band 4 - 20MHz QPSK - 1 RB - Mid Channel)

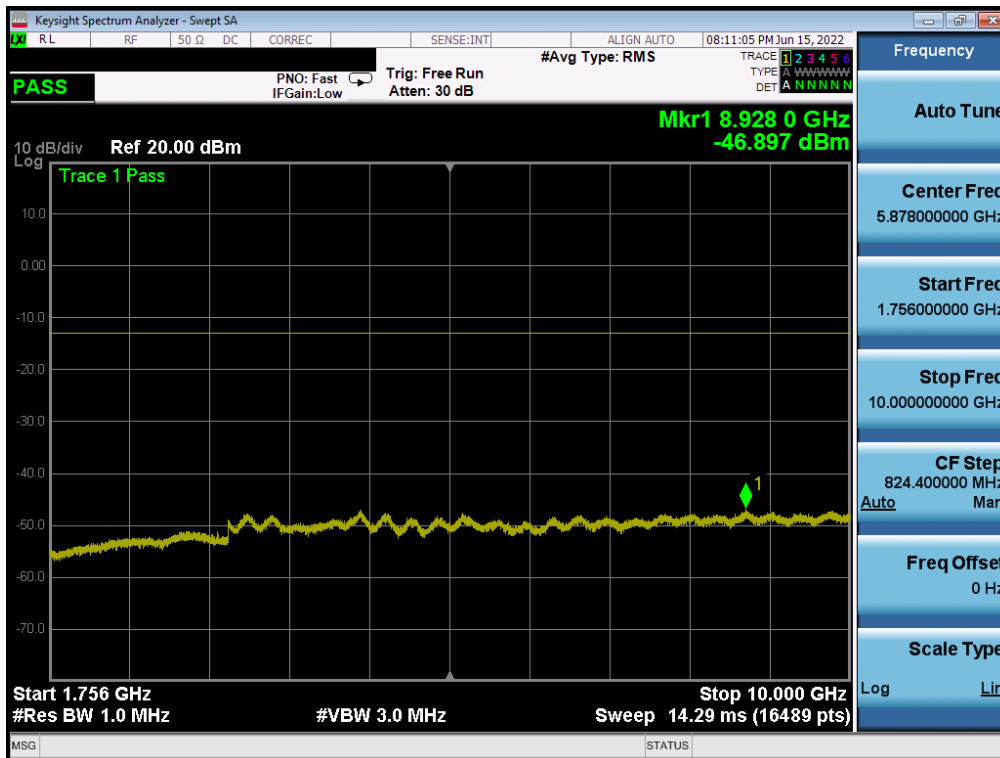


Plot 7-30. Conducted Spurious Plot (LTE Band 4 - 20MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 28 of 93

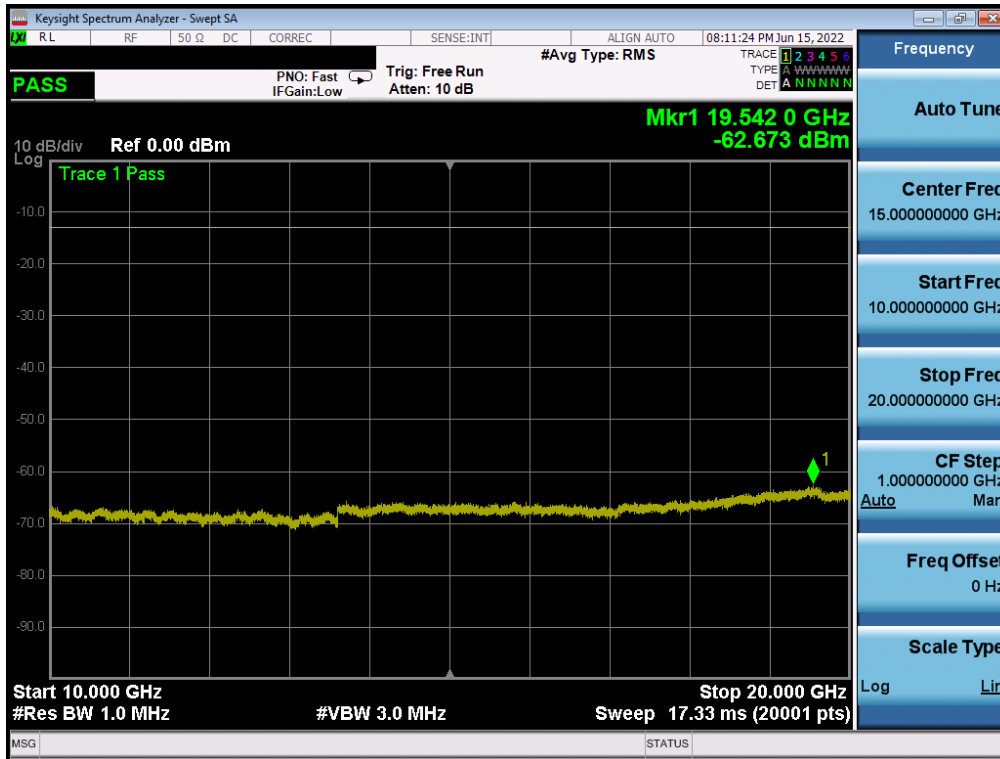


Plot 7-31. Conducted Spurious Plot (LTE Band 4 - 20MHz QPSK - 1 RB - High Channel)



Plot 7-32. Conducted Spurious Plot (LTE Band 4 - 20MHz QPSK - 1 RB - High Channel)

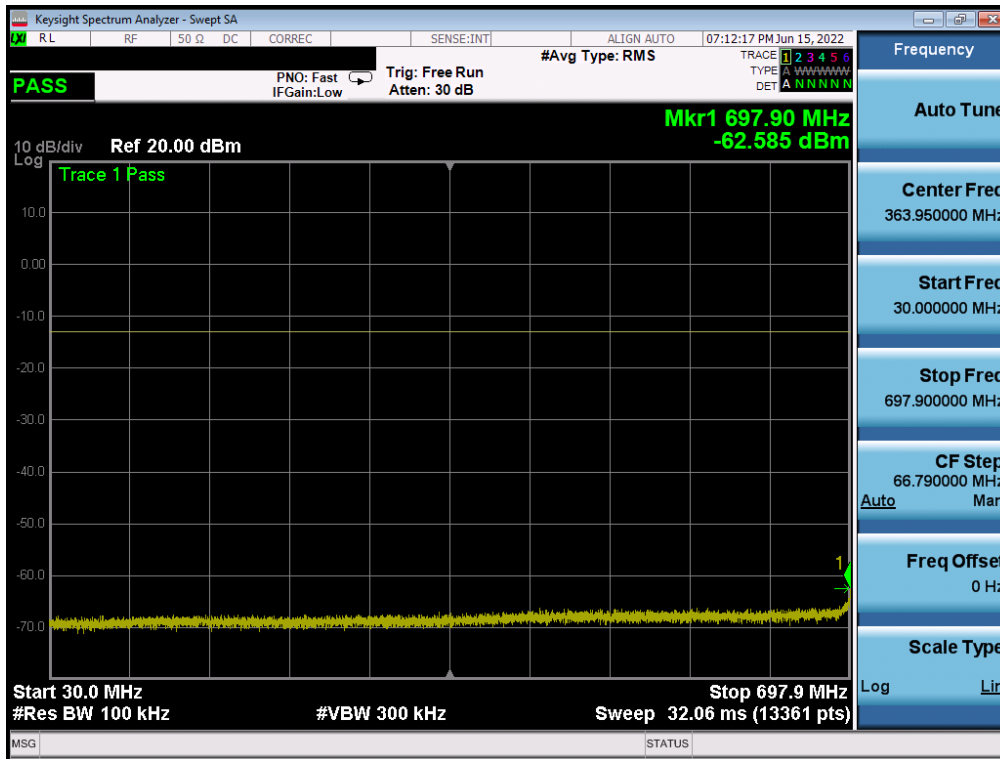
FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 29 of 93



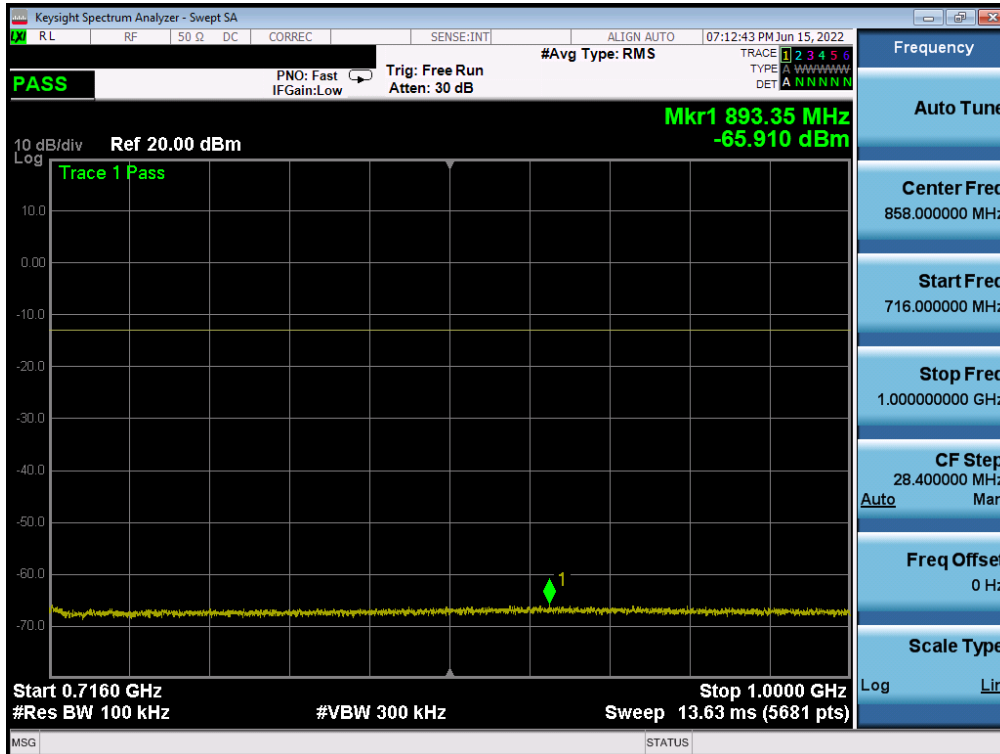
Plot 7-33. Conducted Spurious Plot (LTE Band 4 - 20MHz QPSK - 1 RB - High Channel)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 30 of 93

LTE Band 12

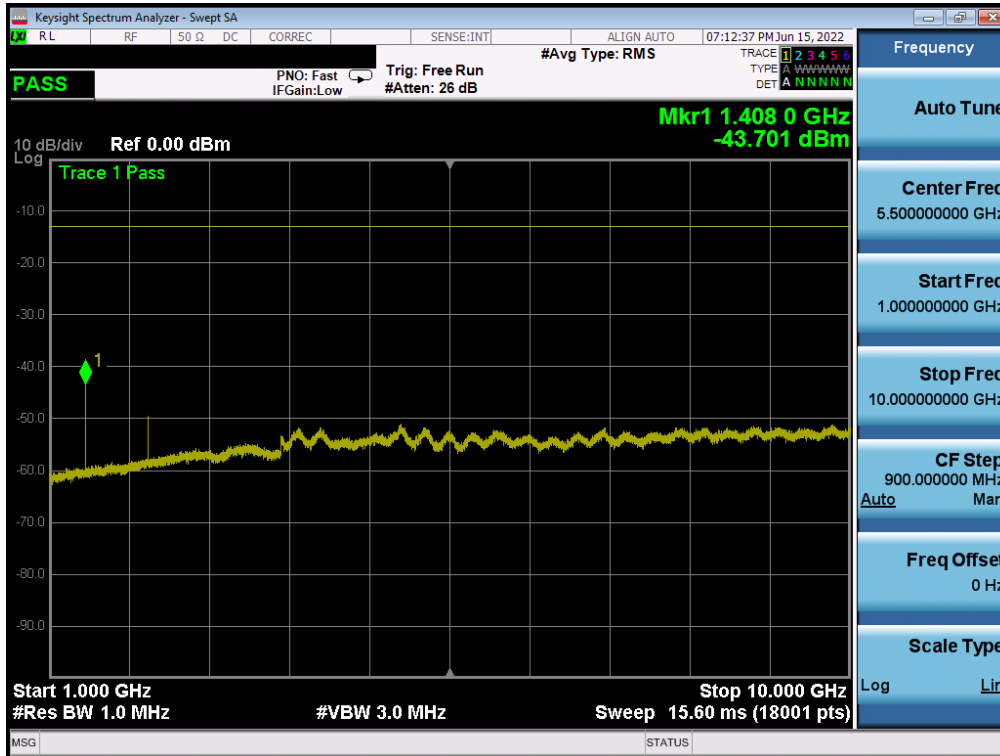


Plot 7-34. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Low Channel)

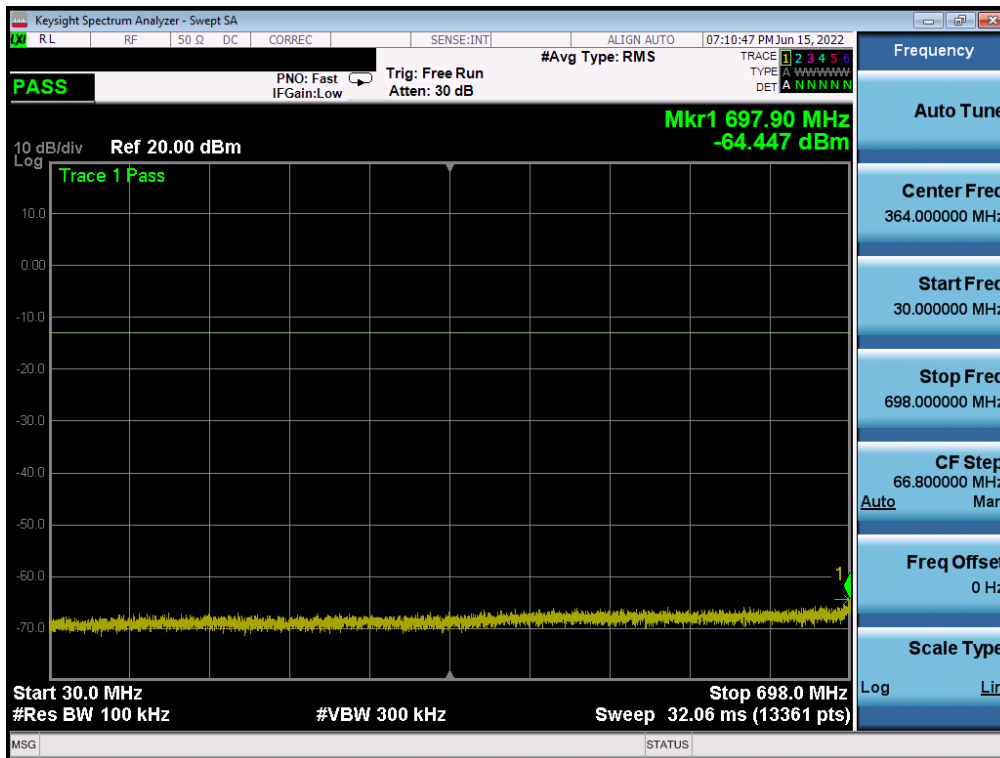


Plot 7-35. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Low Channel)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 31 of 93

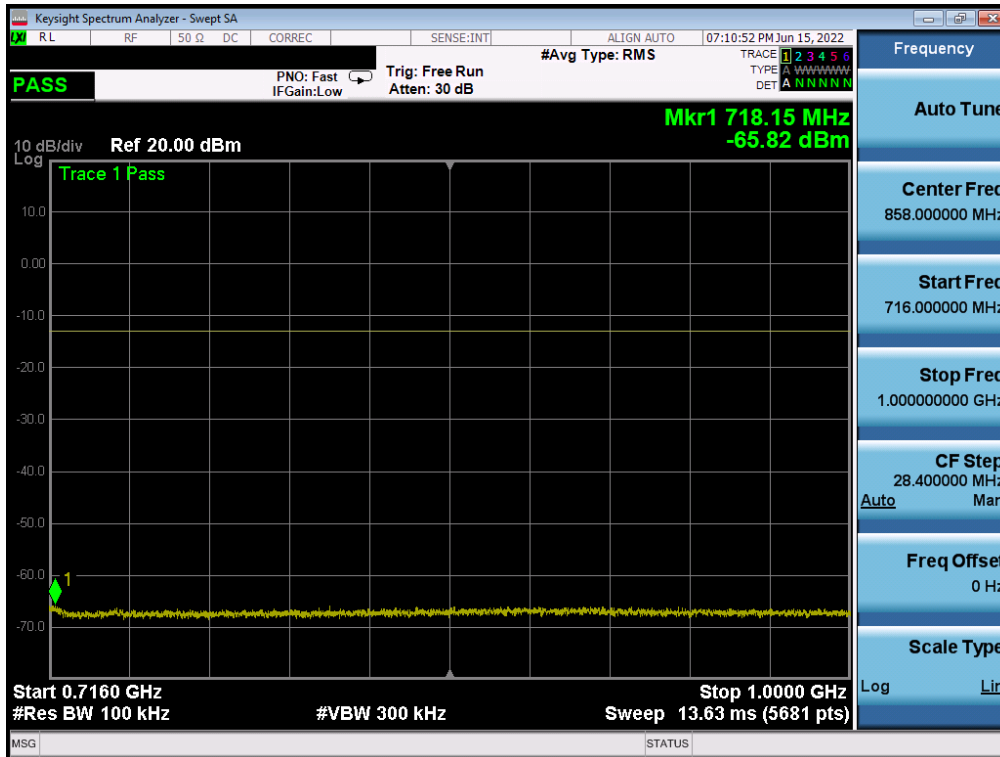


Plot 7-36. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Low Channel)

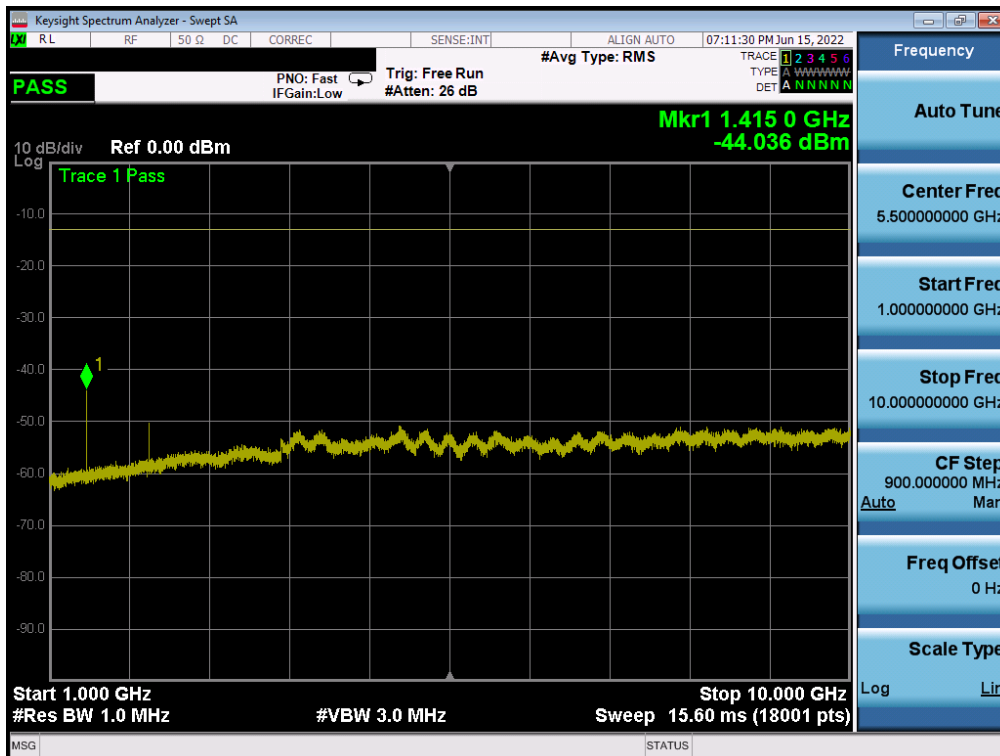


Plot 7-37. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 32 of 93

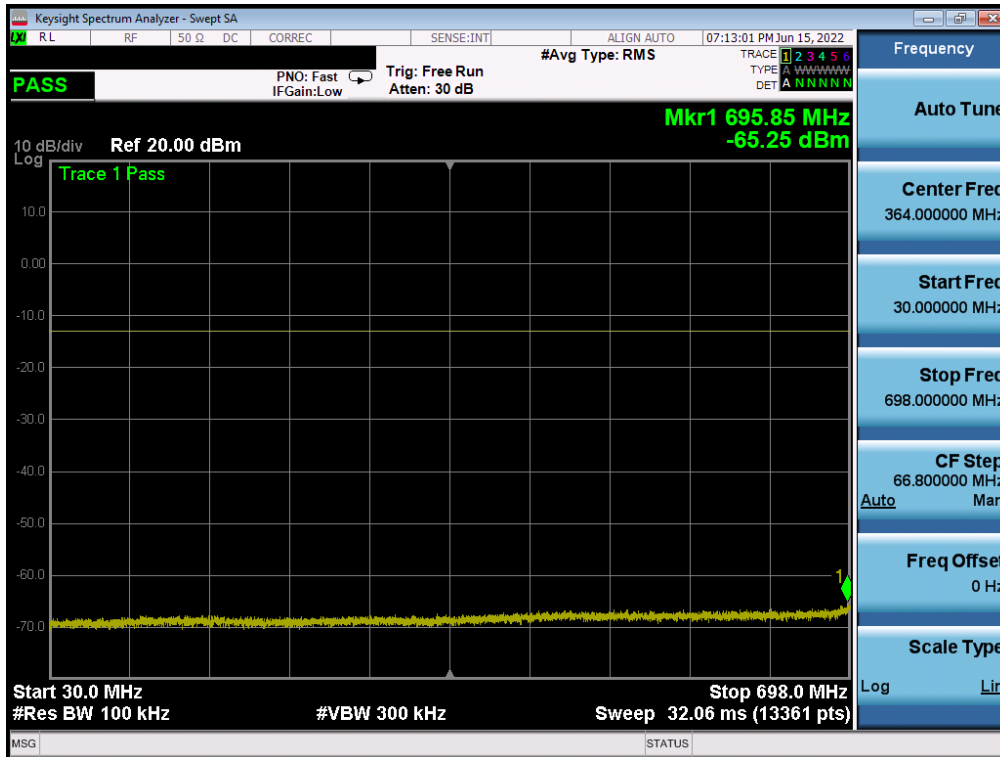


Plot 7-38. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Mid Channel)

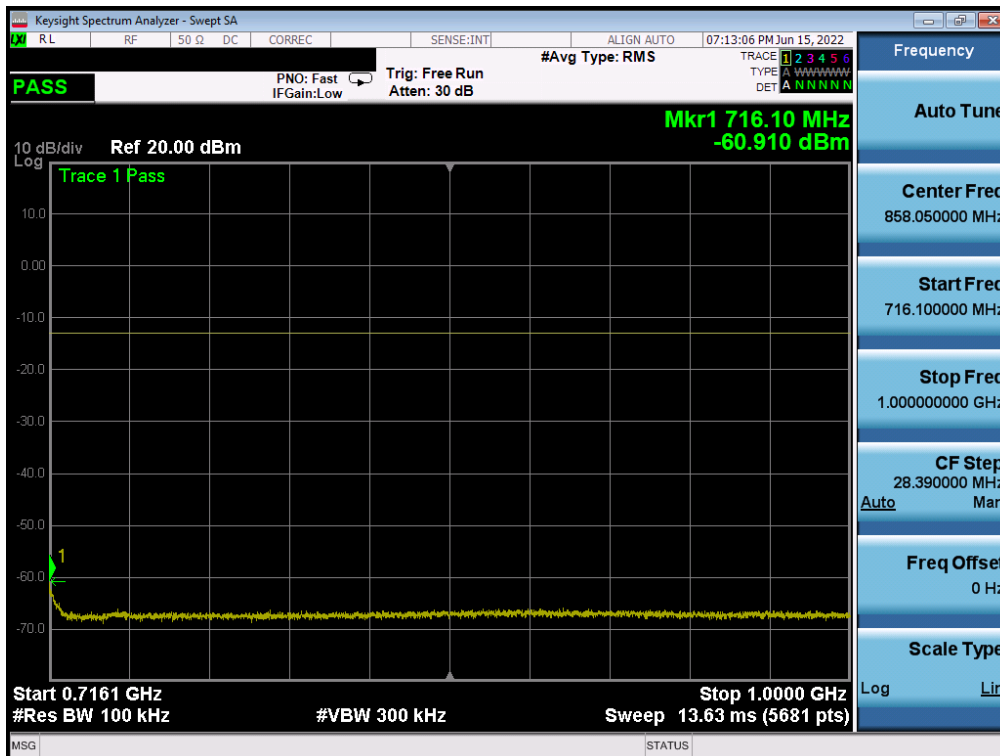


Plot 7-39. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - Mid Channel)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 33 of 93

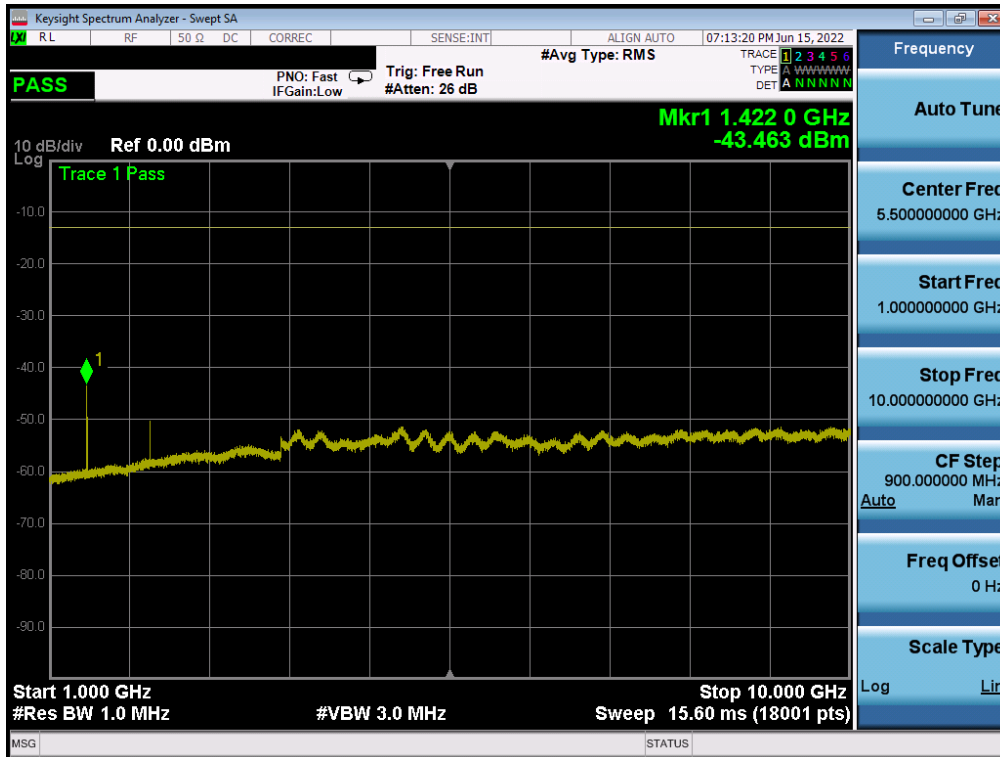


Plot 7-40. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - High Channel)



Plot 7-41. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - High Channel)

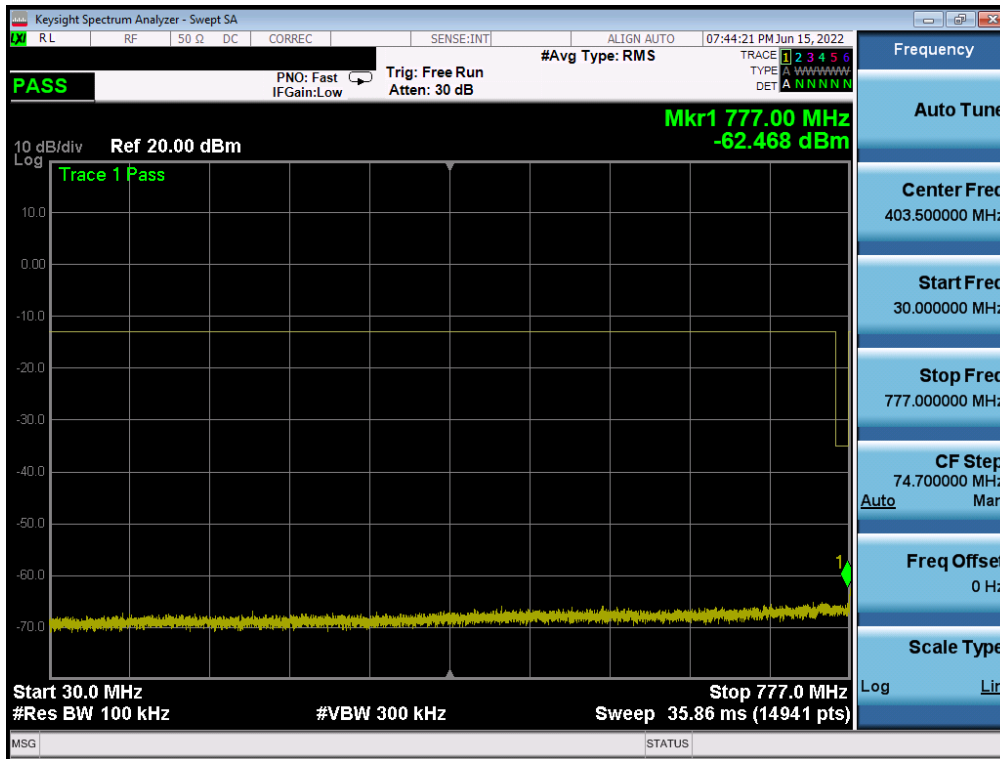
FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 34 of 93



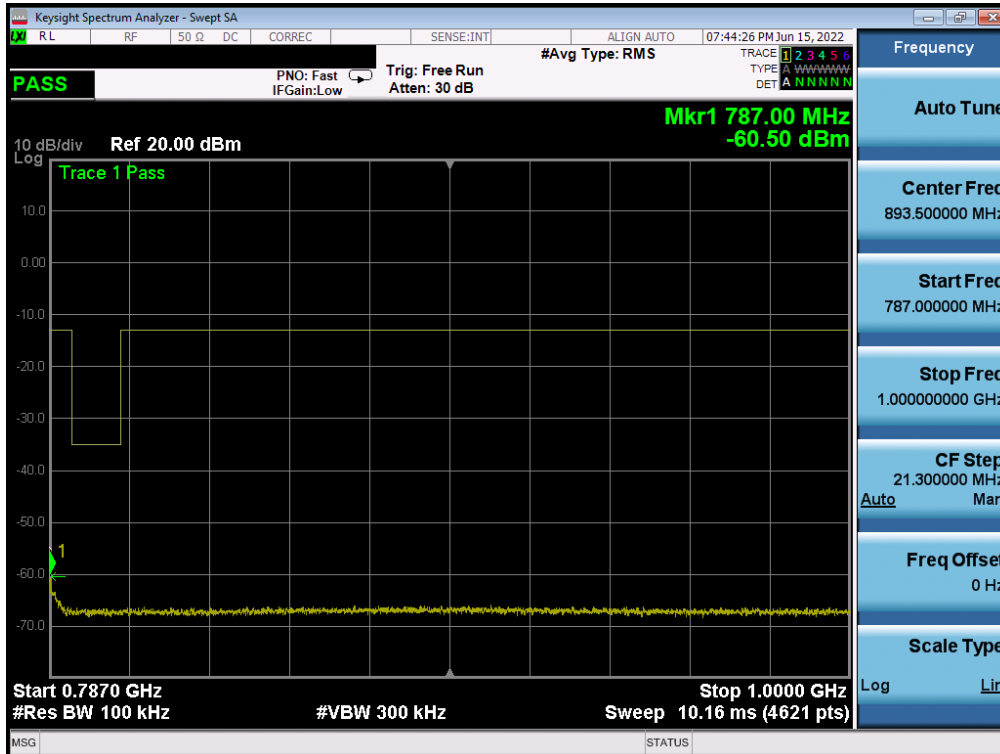
Plot 7-42. Conducted Spurious Plot (LTE Band 12 - 10MHz QPSK - 1 RB - High Channel)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 35 of 93

LTE Band 13

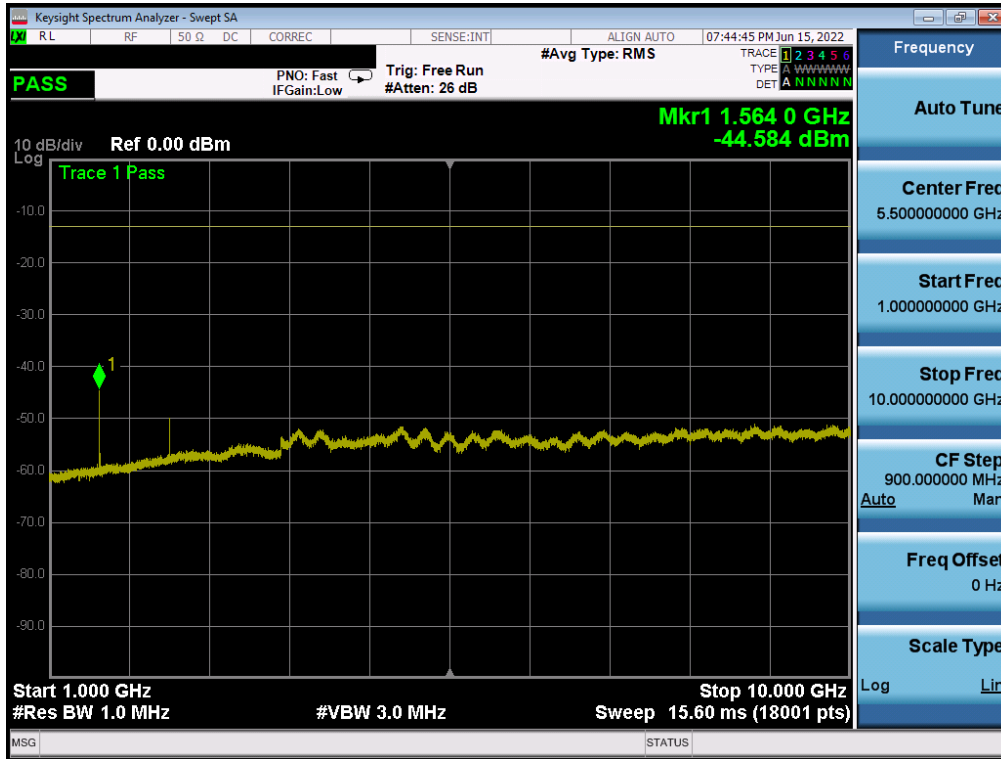


Plot 7-43. Conducted Spurious Plot (LTE Band 13 - 10MHz QPSK - 1 RB)



Plot 7-44. Conducted Spurious Plot (LTE Band 13 - 10MHz QPSK - 1 RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 36 of 93



Plot 7-45. Conducted Spurious Plot (LTE Band 13 - 10MHz QPSK - 1 RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 37 of 93

7.4 Band Edge Emissions at Antenna Terminal

Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates were investigated to determine the worst-case configuration. All modes of operation were investigated and the worst-case configuration results are reported in this section.

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW \geq 1% of the emission bandwidth
4. VBW \geq 3 x RBW
5. Detector = RMS
6. Number of sweep points \geq 2 x Span/RBW
7. Trace mode = trace average for continuous emissions, max hold for pulse emissions
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

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

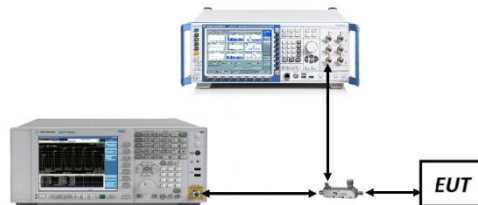


Figure 7-3. Test Instrument & Measurement Setup

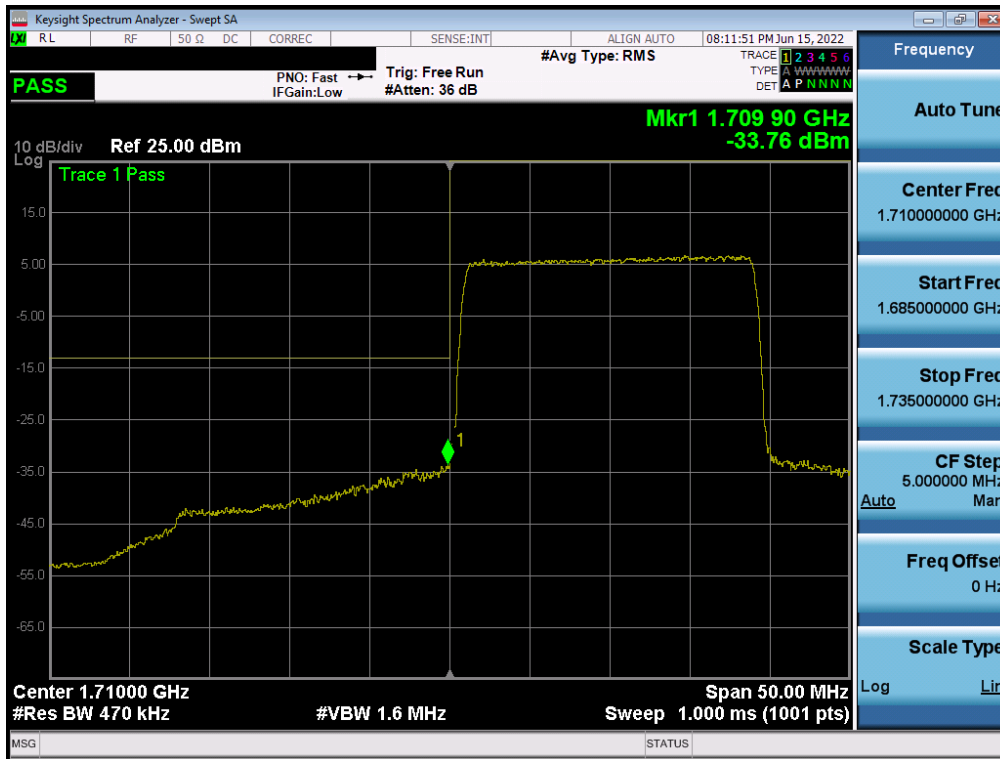
FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 38 of 93

Test Notes

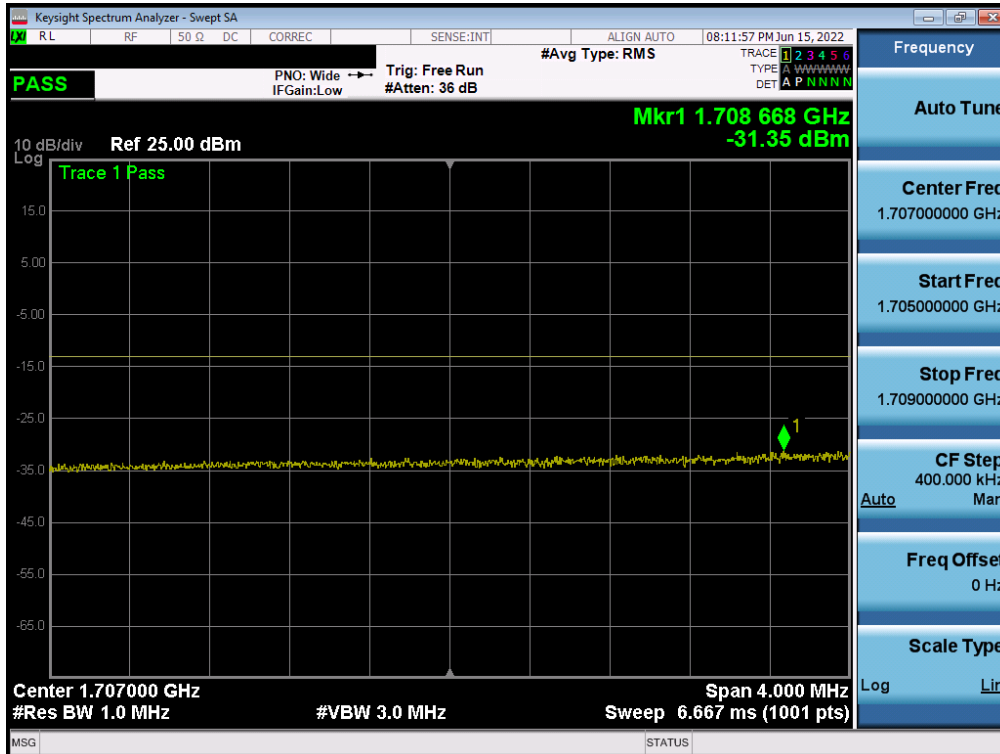
1. Per 27.53(h) for AWS band operation, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emission are attenuated at least 26 dB below the transmitter power.
2. Per 27.53(g) for operations in the 663 - 698 MHz and 698 – 746MHz bands, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.
3. Per 27.53(c)(5) for operations in the 776-788 MHz band, in the 100 kHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least 30 kHz may be employed to demonstrate compliance with the out-of-band emissions limit.
4. For all plots showing emissions in the 763 – 775MHz and 793 – 805MHz band, the FCC limit per 27.53(c)(4) is $65 + 10 \log_{10}(P) = -35\text{dBm}$ in a 6.25kHz bandwidth.

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 39 of 93

LTE Band 4

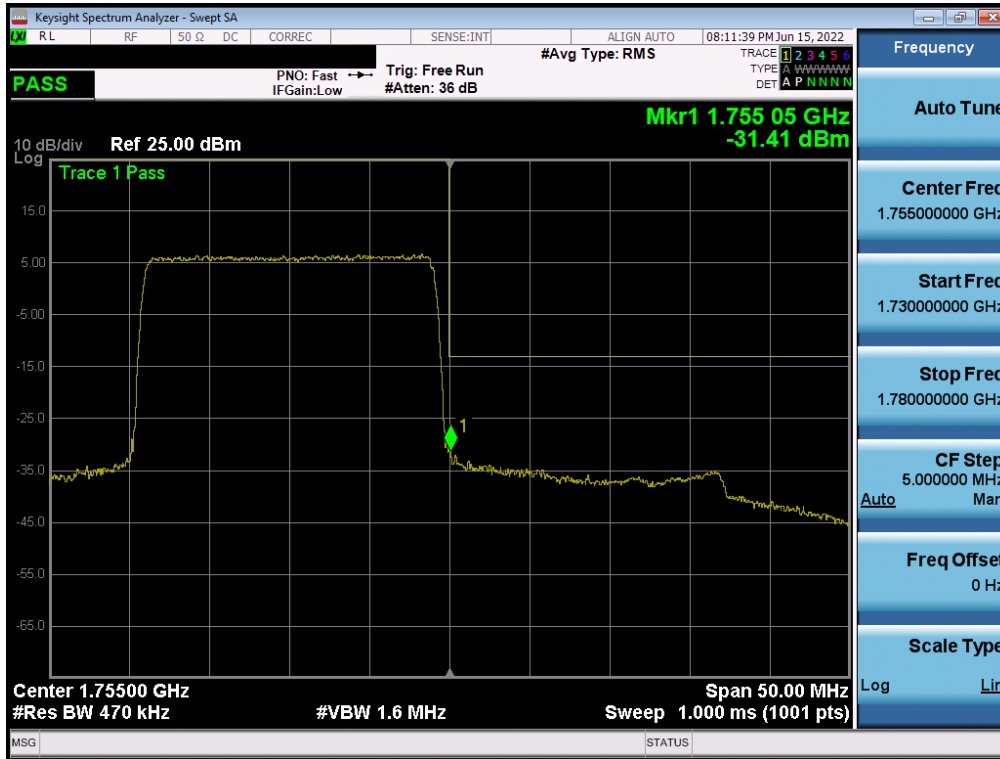


Plot 7-46. Lower Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB)

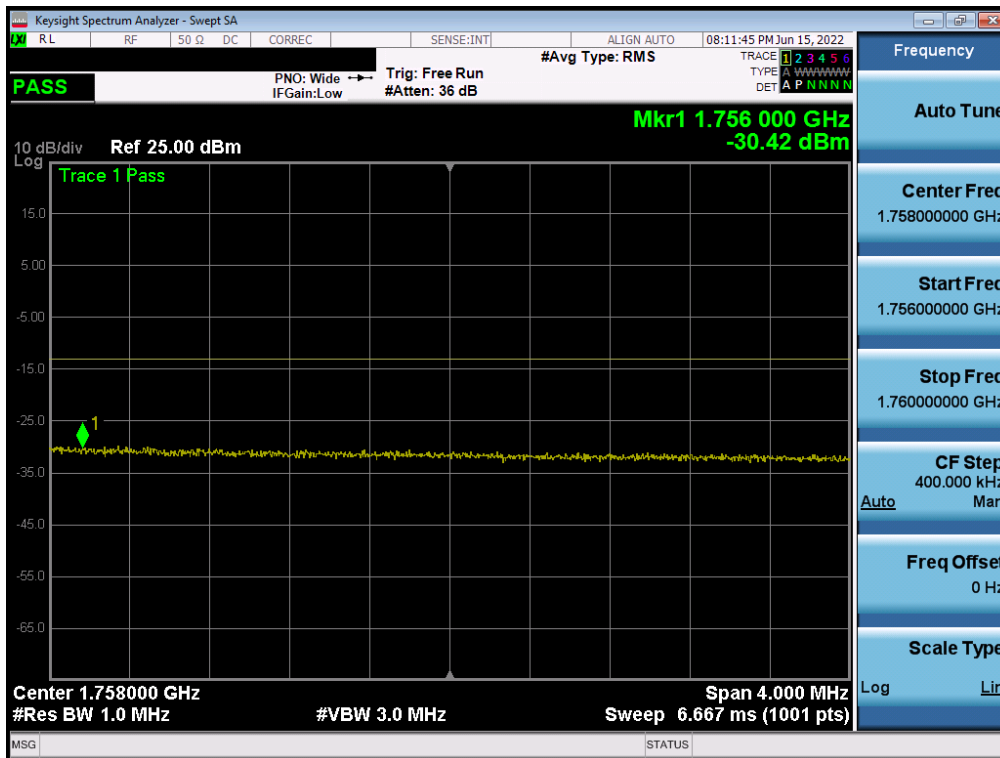


Plot 7-47. Lower Extended Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 40 of 93

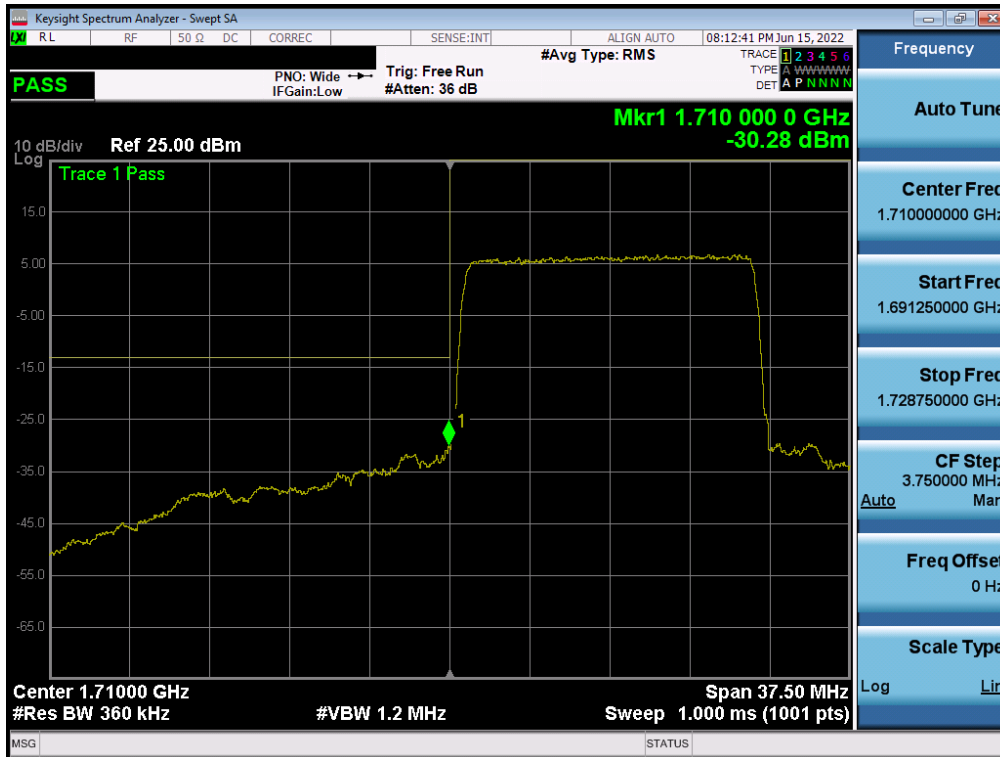


Plot 7-48. Upper Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB)

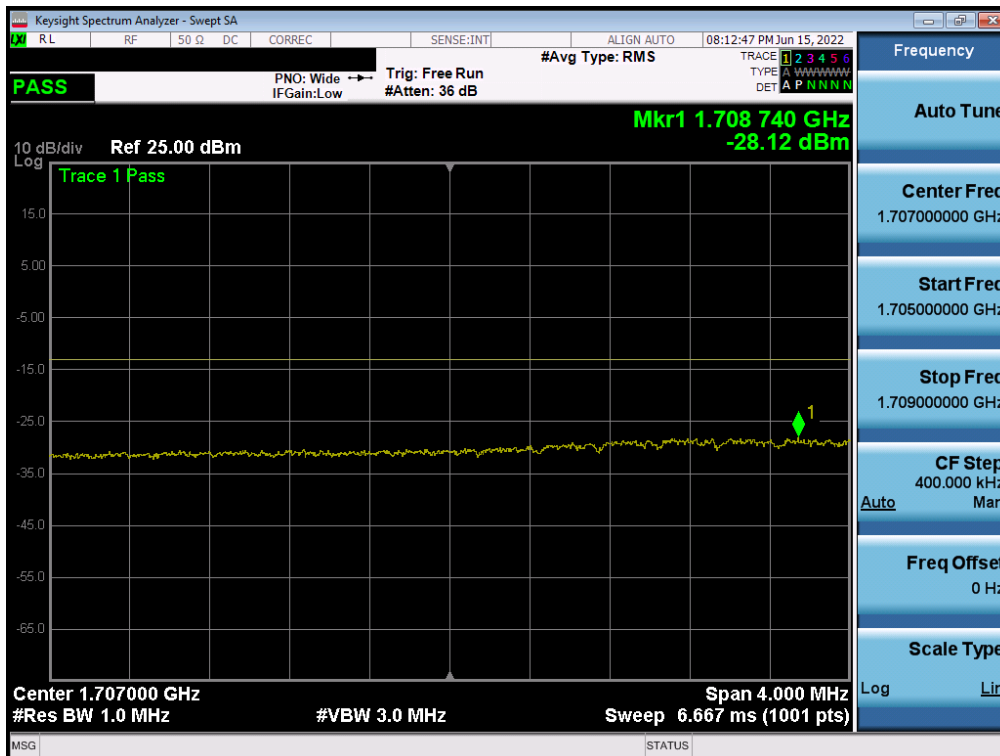


Plot 7-49. Upper Extended Band Edge Plot (LTE Band 4 - 20MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 41 of 93

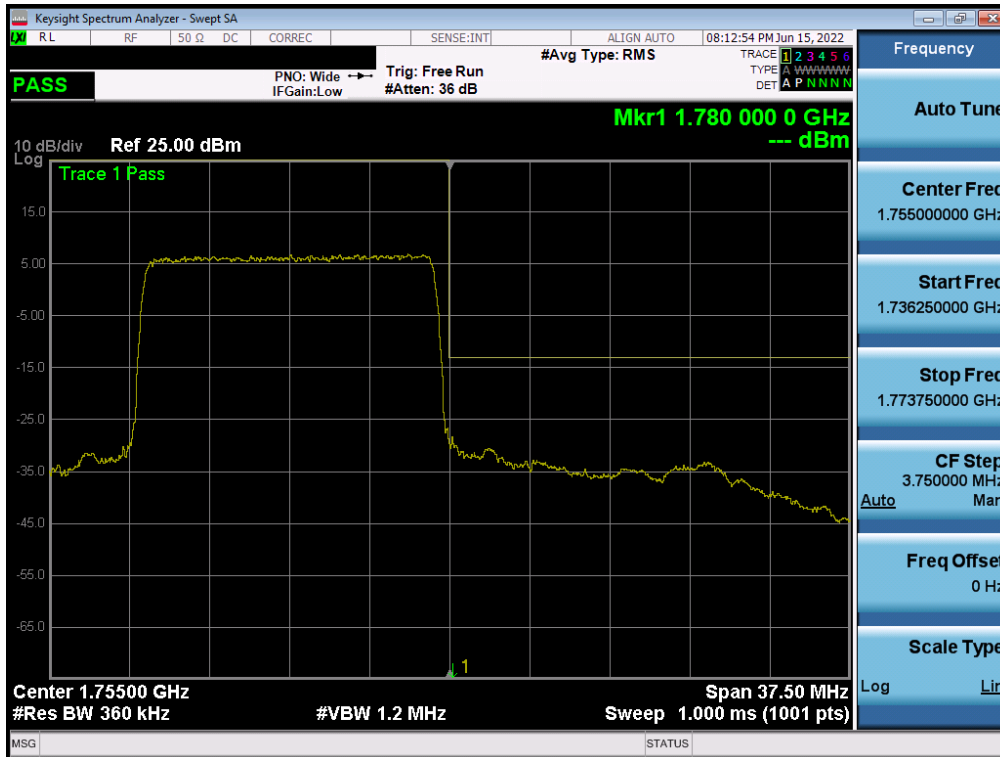


Plot 7-50. Lower Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB)

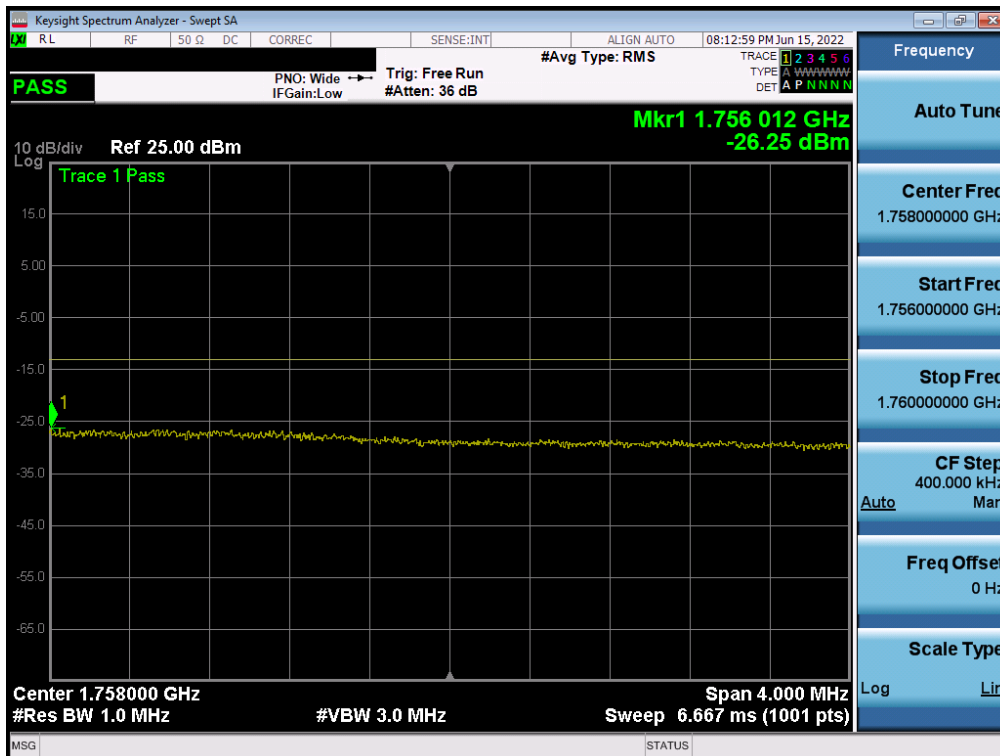


Plot 7-51. Lower Extended Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 42 of 93

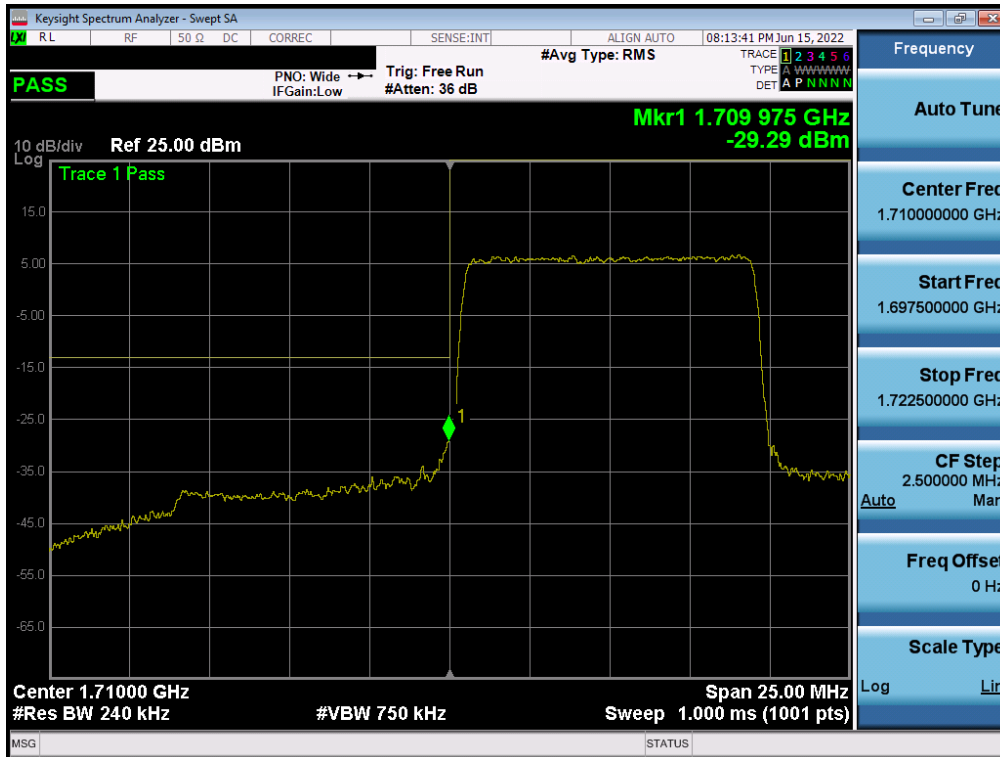


Plot 7-52. Upper Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB)

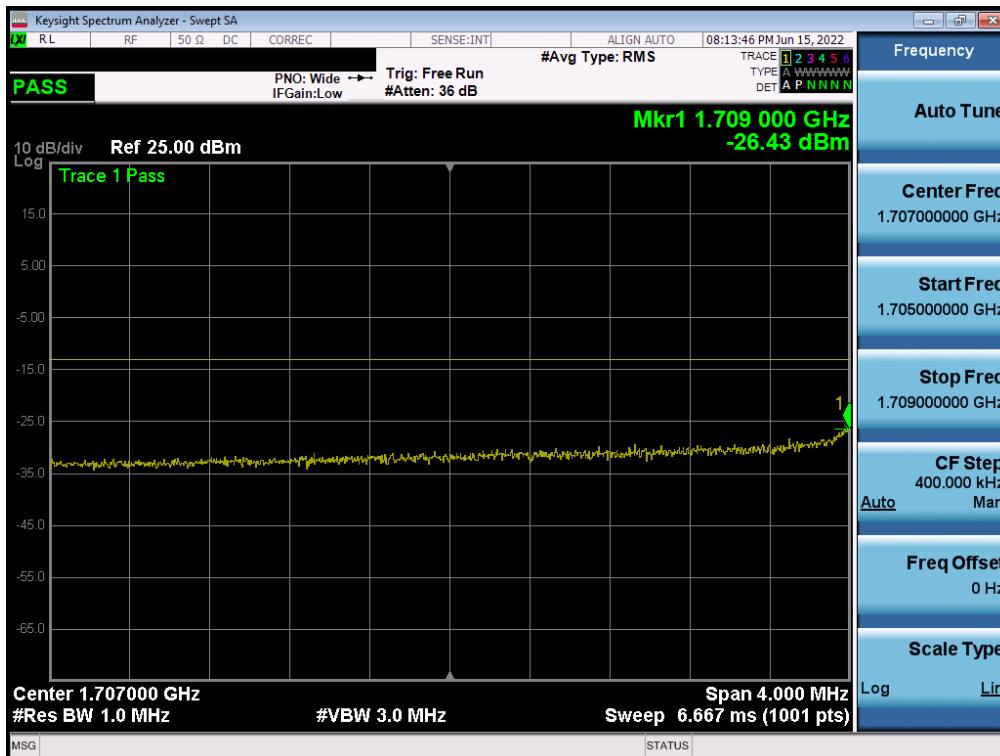


Plot 7-53. Upper Extended Band Edge Plot (LTE Band 4 - 15MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 43 of 93

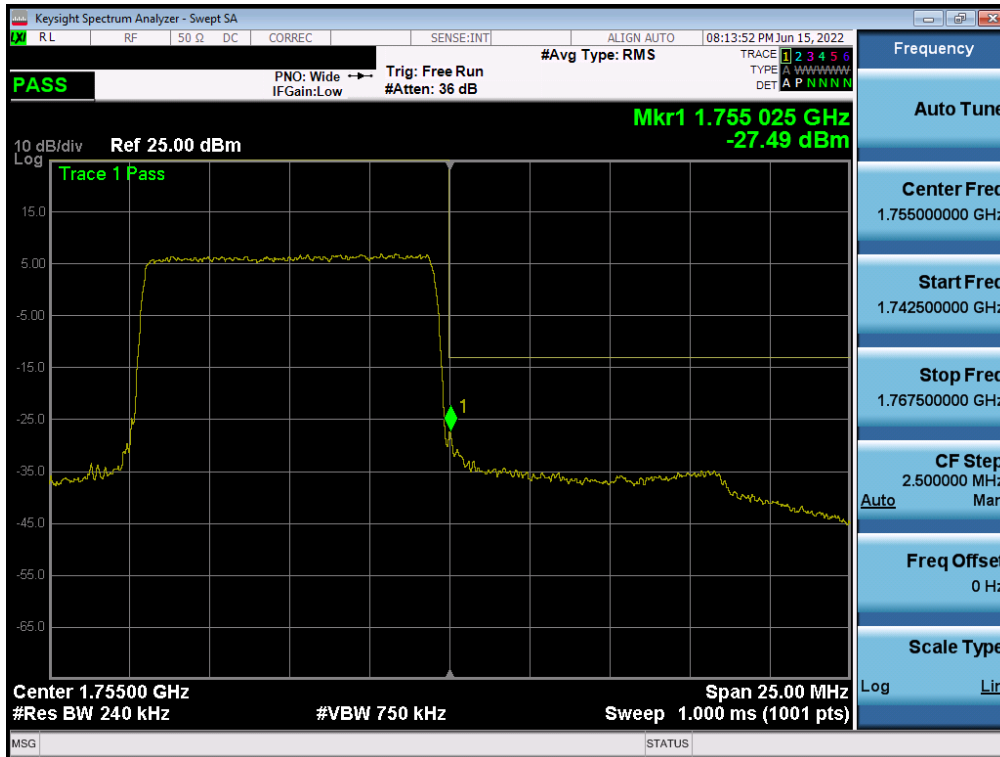


Plot 7-54. Lower Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB)

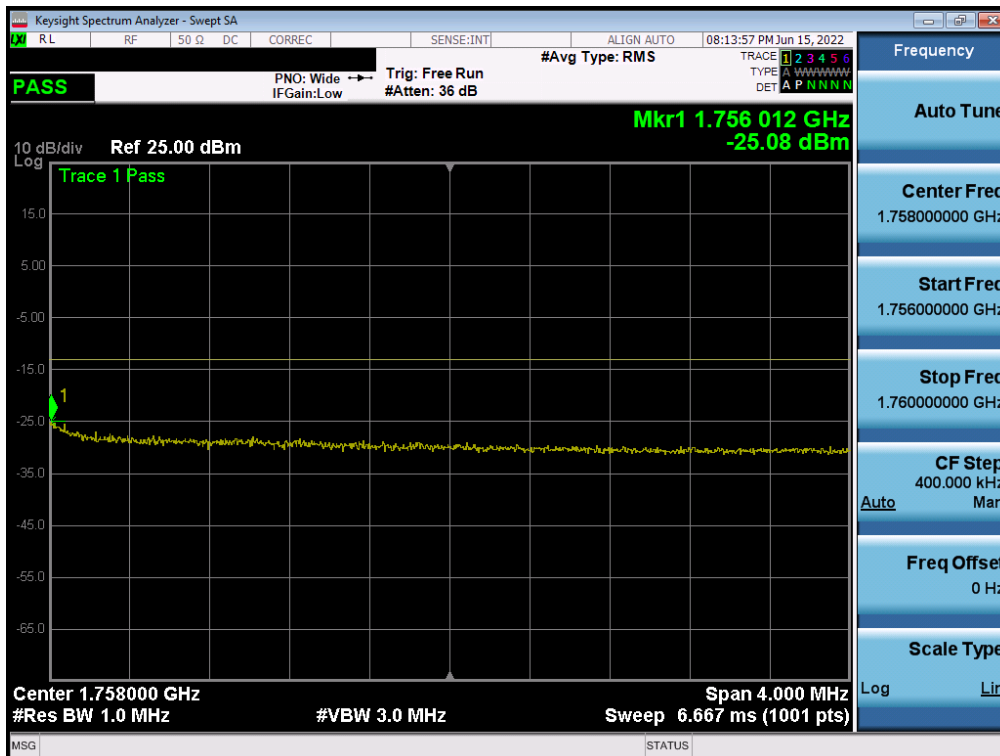


Plot 7-55. Lower Extended Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 44 of 93

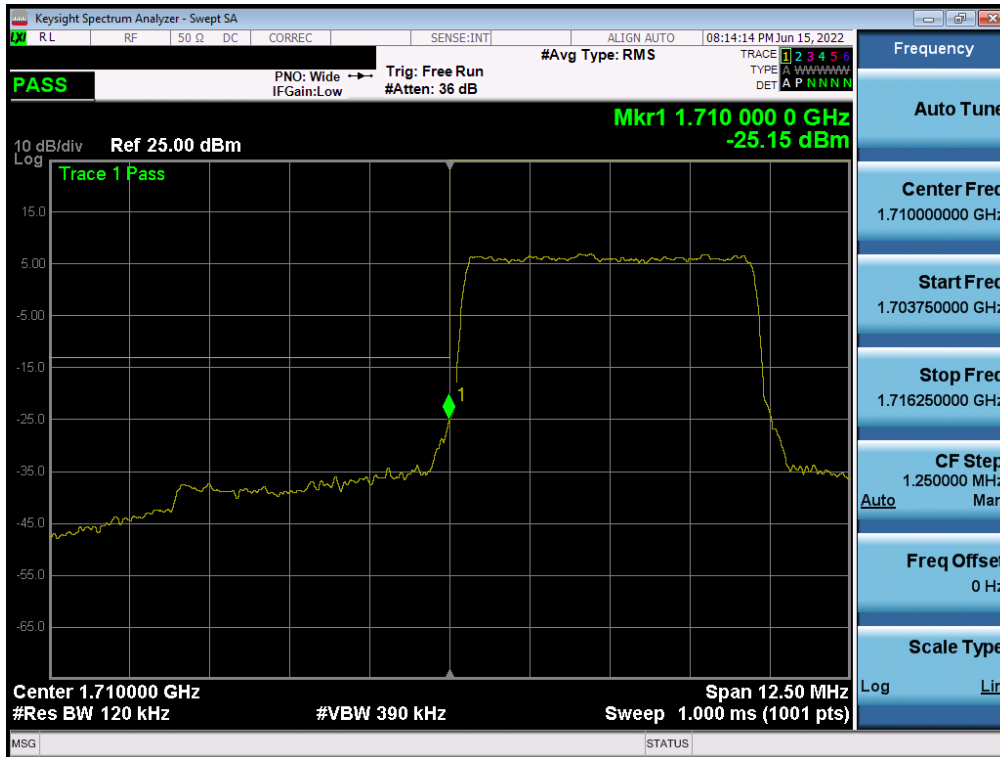


Plot 7-56. Upper Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB)

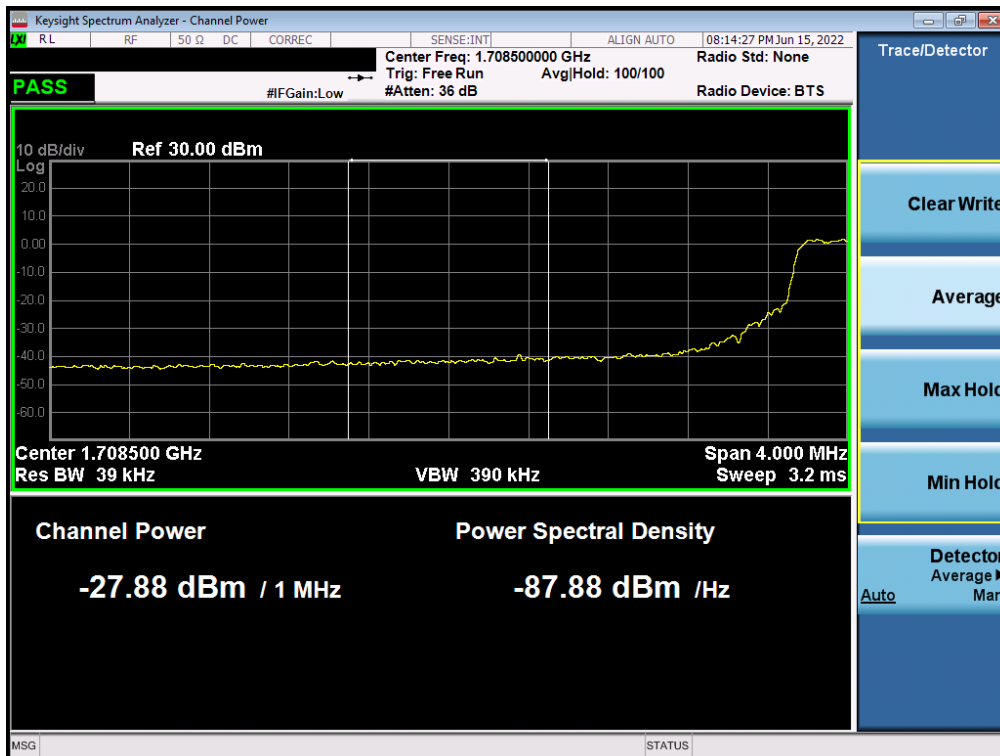


Plot 7-57. Upper Extended Band Edge Plot (LTE Band 4 - 10MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 45 of 93



Plot 7-58. Lower Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB)

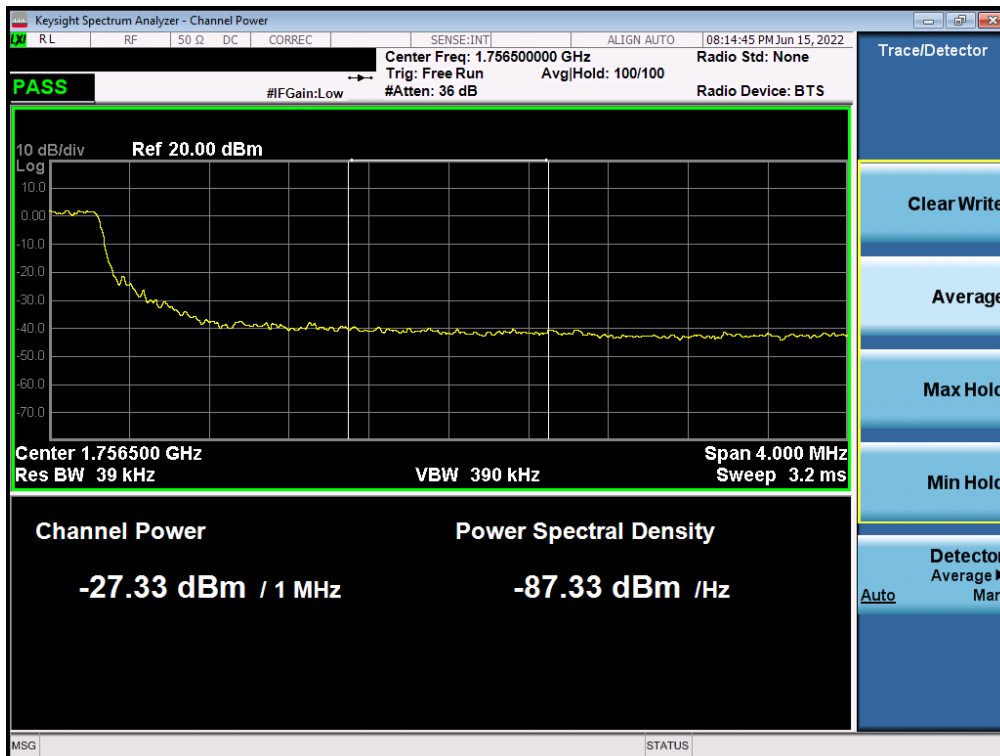


Plot 7-59. Lower Extended Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 46 of 93

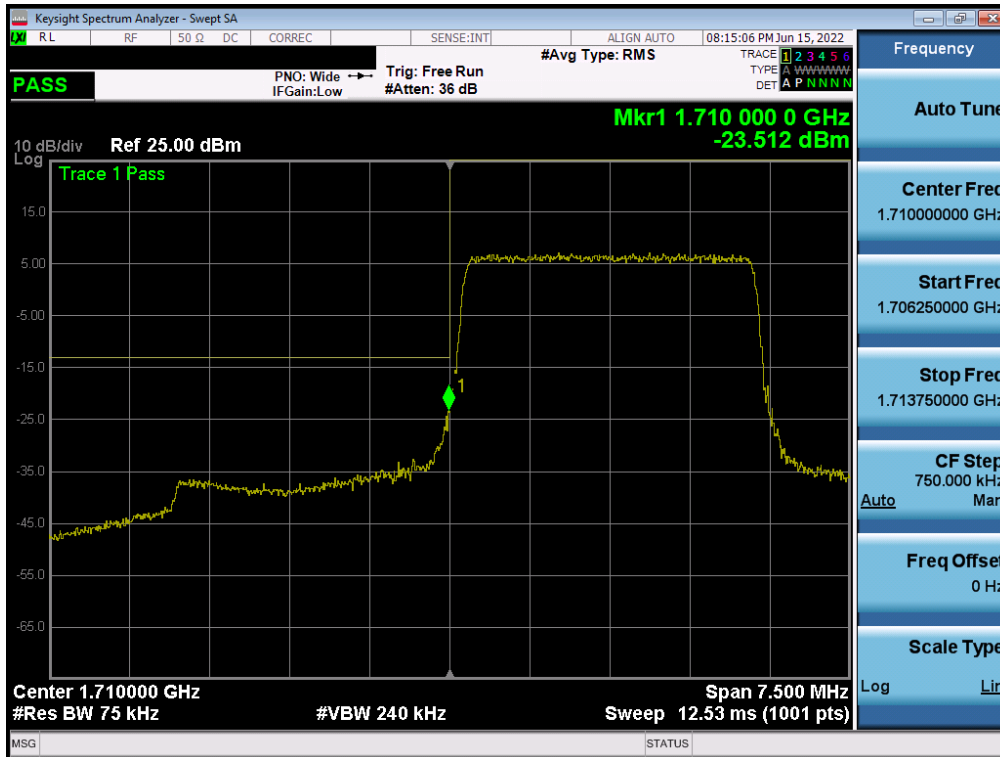


Plot 7-60. Upper Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB)

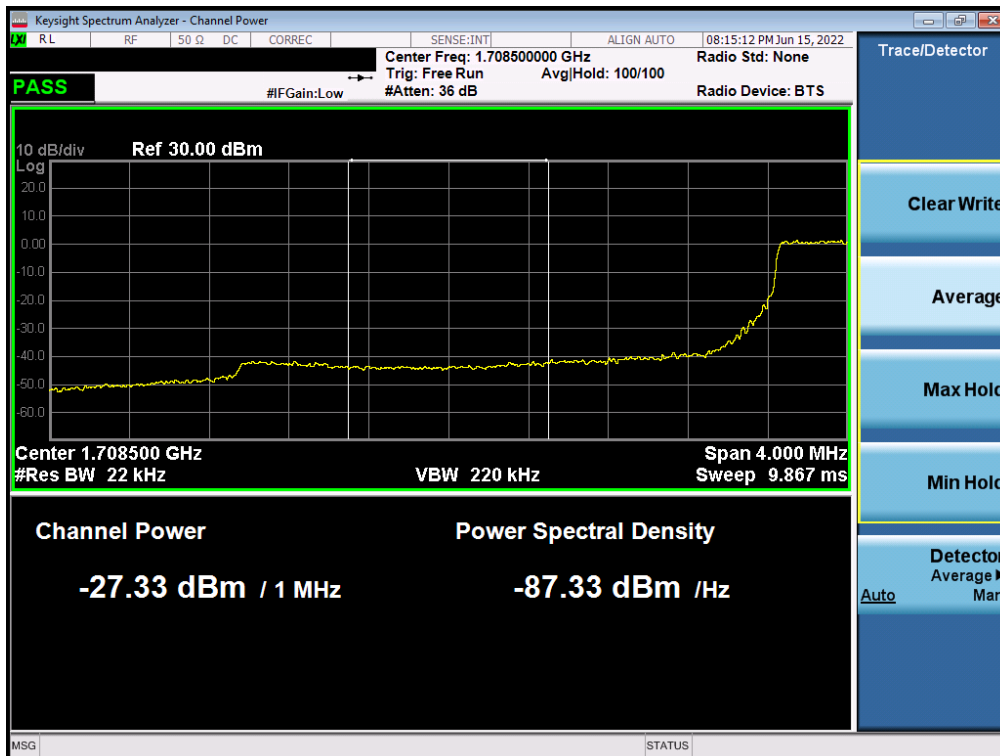


Plot 7-61. Upper Extended Band Edge Plot (LTE Band 4 - 5MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 47 of 93



Plot 7-62. Lower Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB)

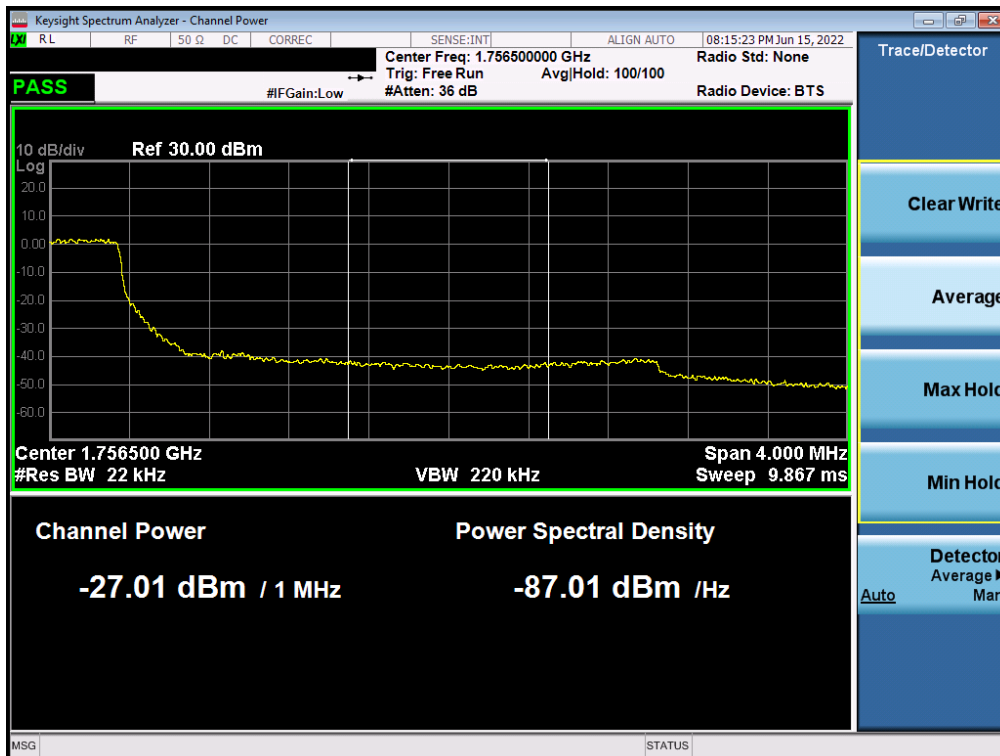


Plot 7-63. Lower Extended Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 48 of 93

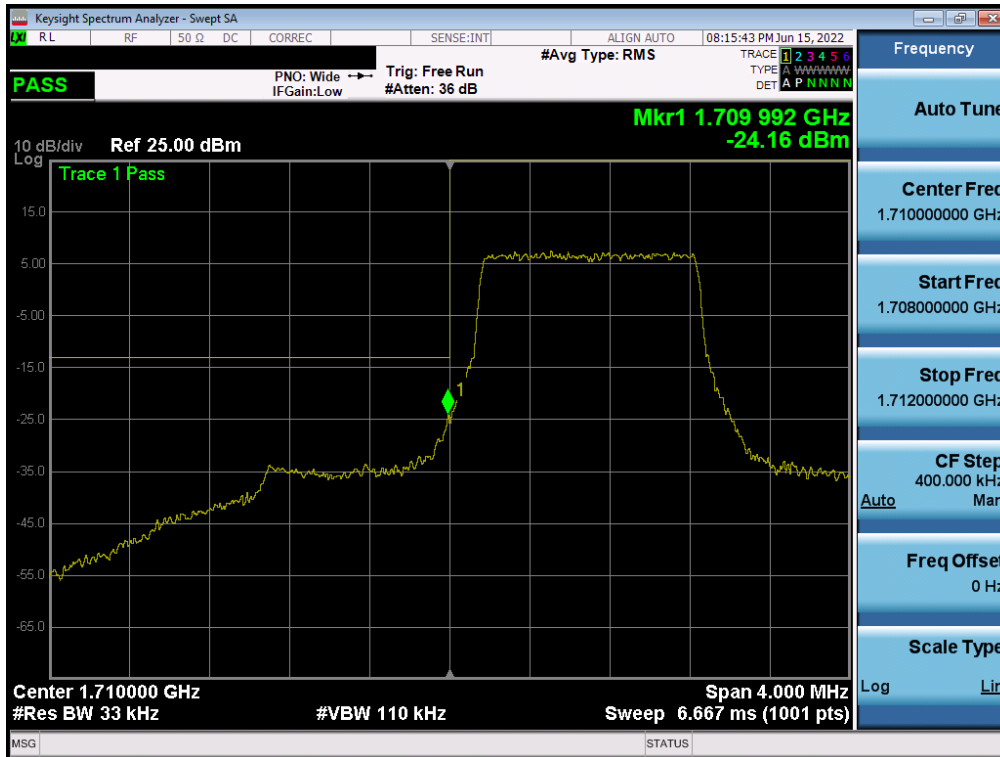


Plot 7-64. Upper Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB)

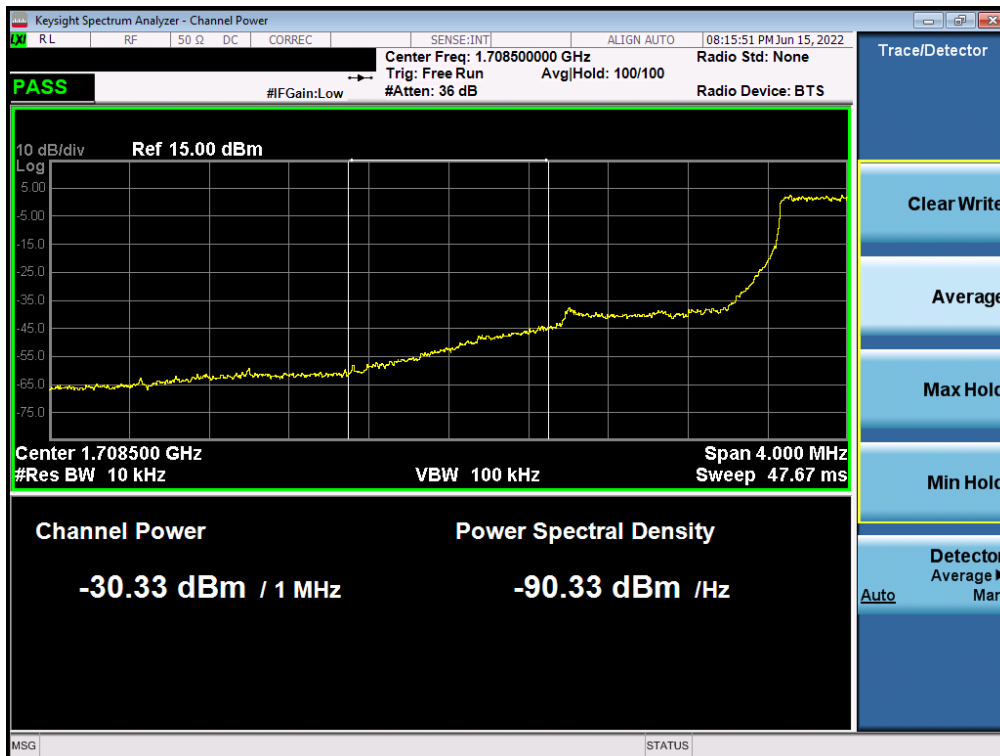


Plot 7-65. Upper Extended Band Edge Plot (LTE Band 4 - 3MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 49 of 93



Plot 7-66. Lower Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB)

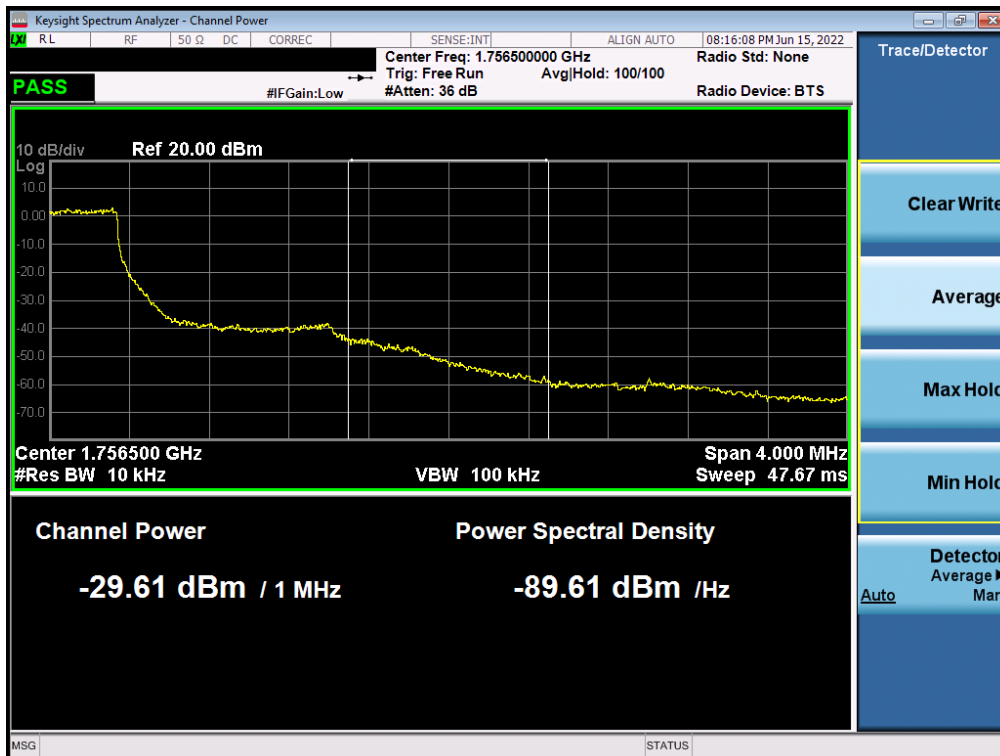


Plot 7-67. Lower Extended Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 50 of 93



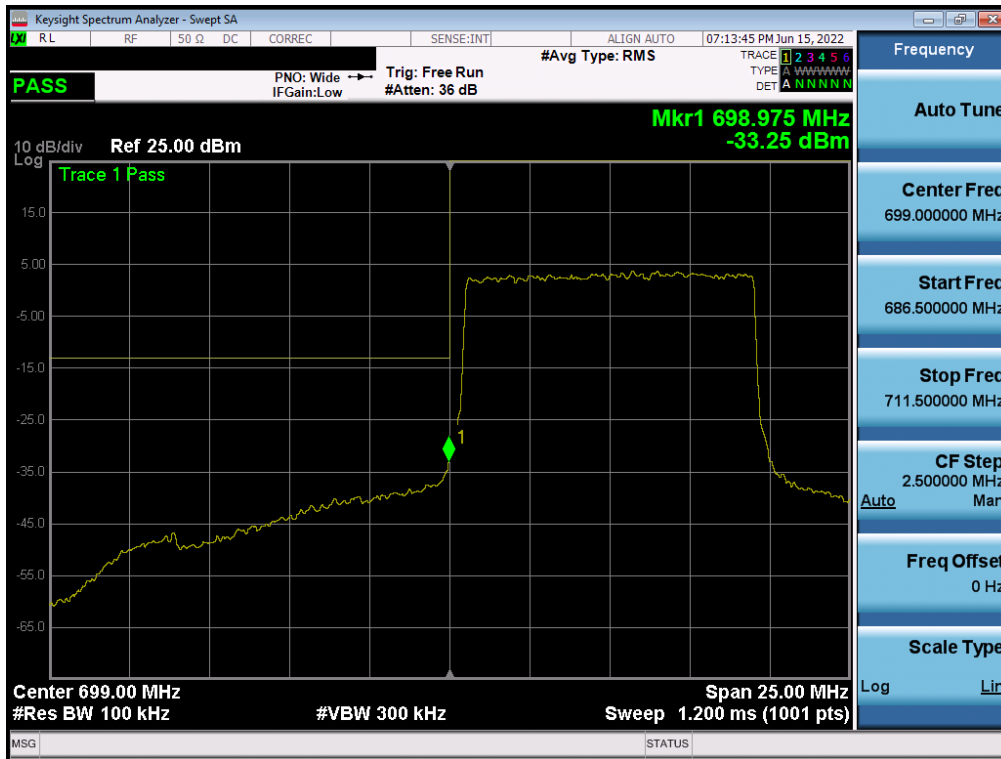
Plot 7-68. Upper Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB)



Plot 7-69. Upper Extended Band Edge Plot (LTE Band 4 – 1.4MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 51 of 93

LTE Band 12

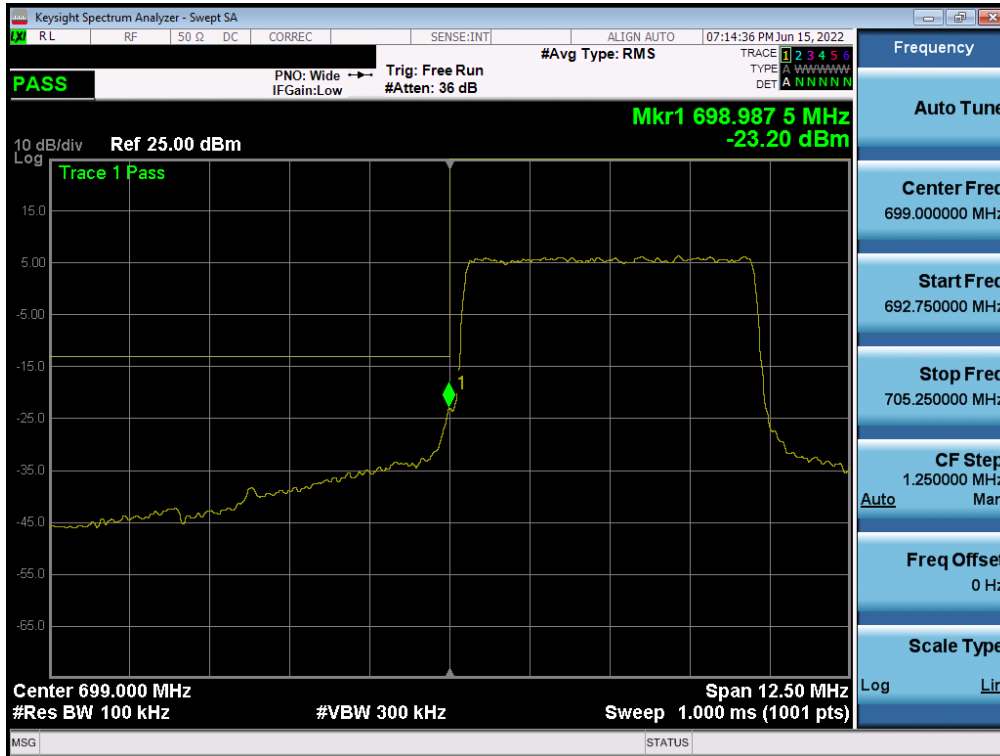


Plot 7-70. Lower Band Edge Plot (LTE Band 12 - 10MHz QPSK – Full RB)



Plot 7-71. Upper Band Edge Plot (LTE Band 12 - 10MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 52 of 93

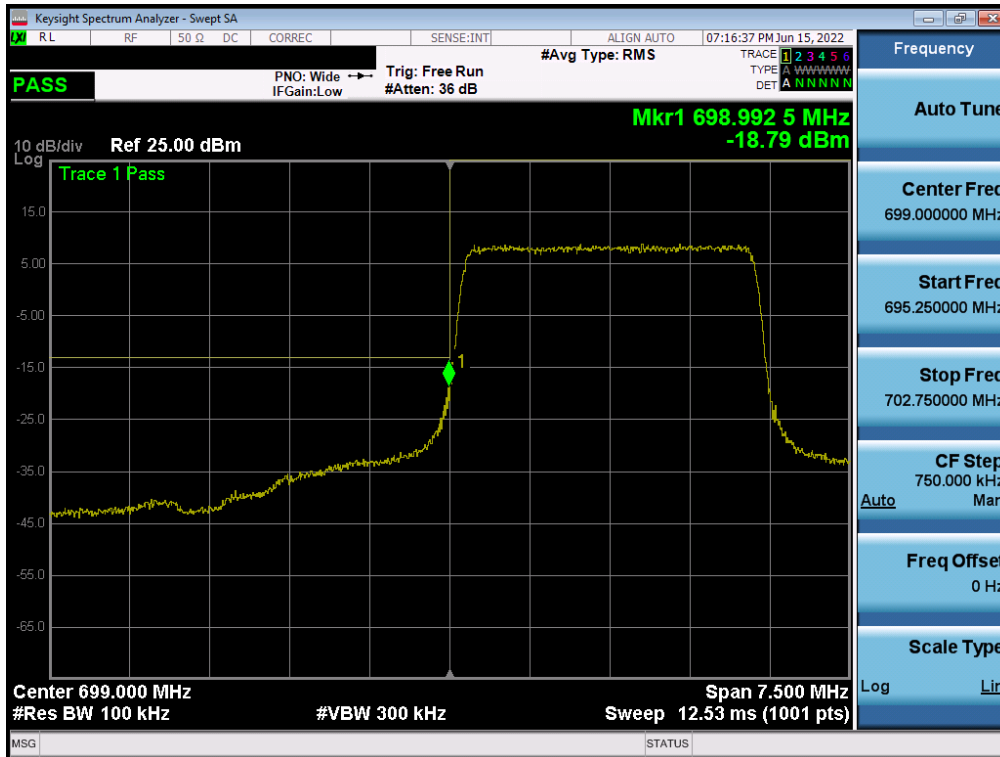


Plot 7-72. Lower Band Edge Plot (LTE Band 12 - 5MHz QPSK – Full RB)



Plot 7-73. Upper Band Edge Plot (LTE Band 12 - 5MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 53 of 93

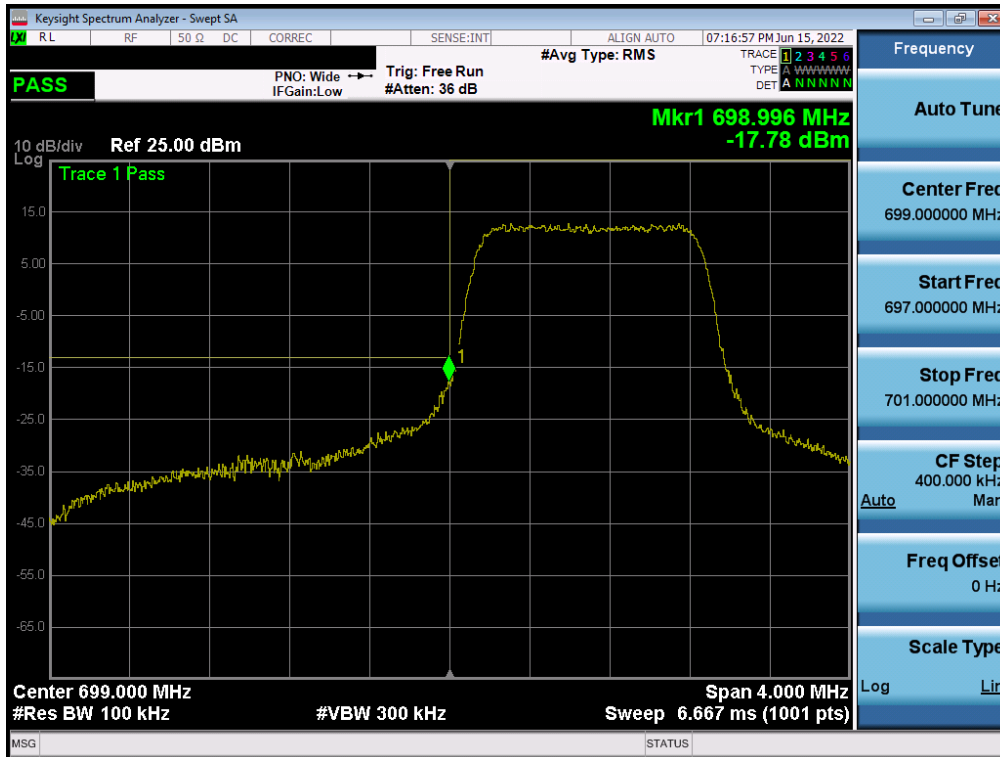


Plot 7-74. Lower Band Edge Plot (LTE Band 12 - 3MHz QPSK – Full RB)

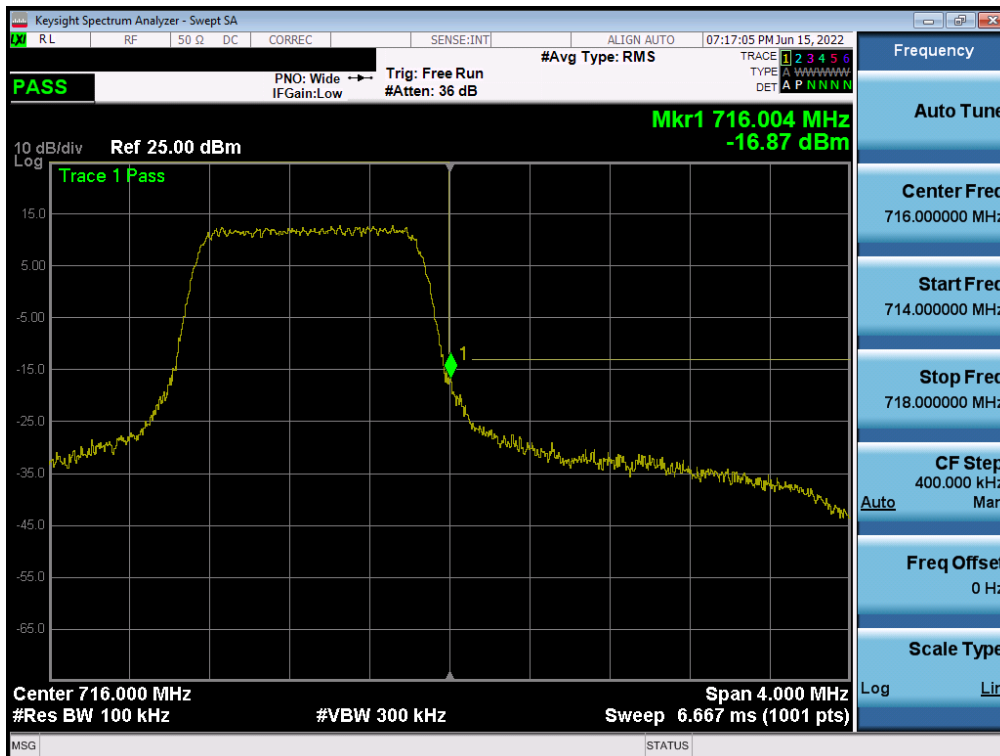


Plot 7-75. Upper Band Edge Plot (LTE Band 12 - 3MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 54 of 93



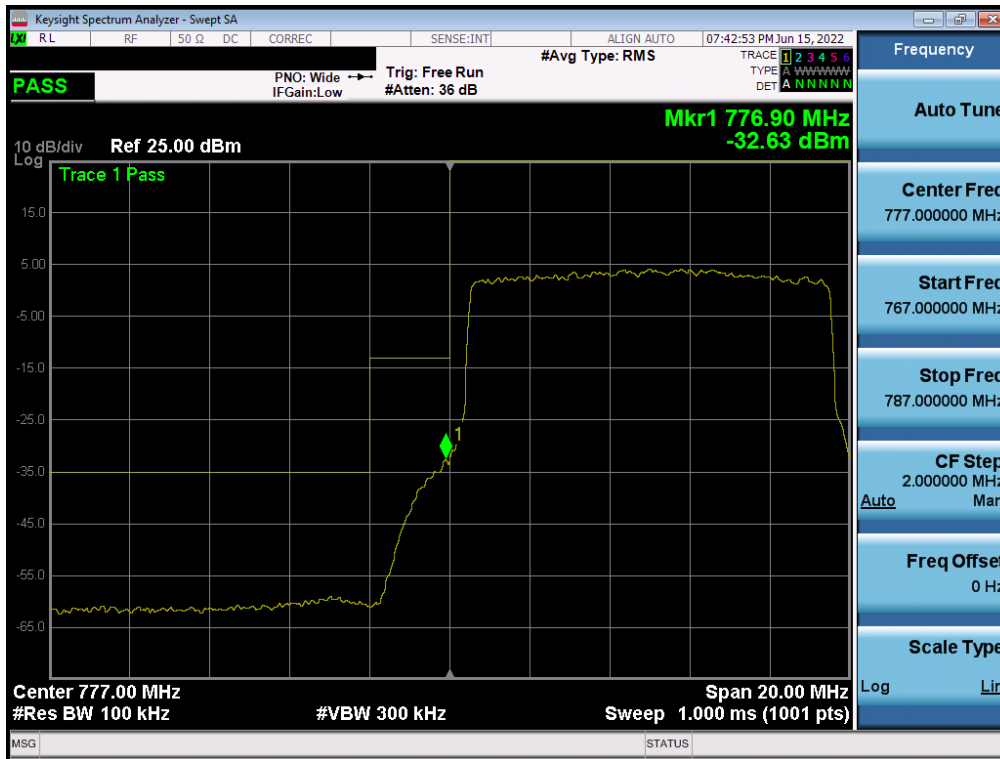
Plot 7-76. Lower Band Edge Plot (LTE Band 12 – 1.4MHz QPSK – Full RB)



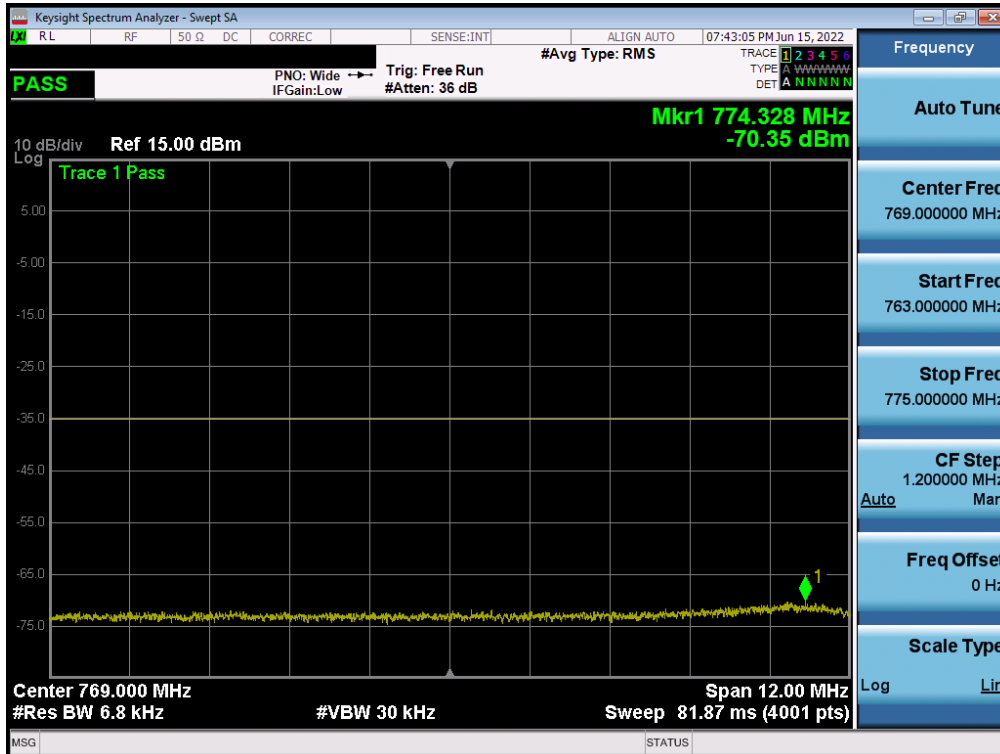
Plot 7-77. Upper Band Edge Plot (LTE Band 12 – 1.4MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 55 of 93

LTE Band 13

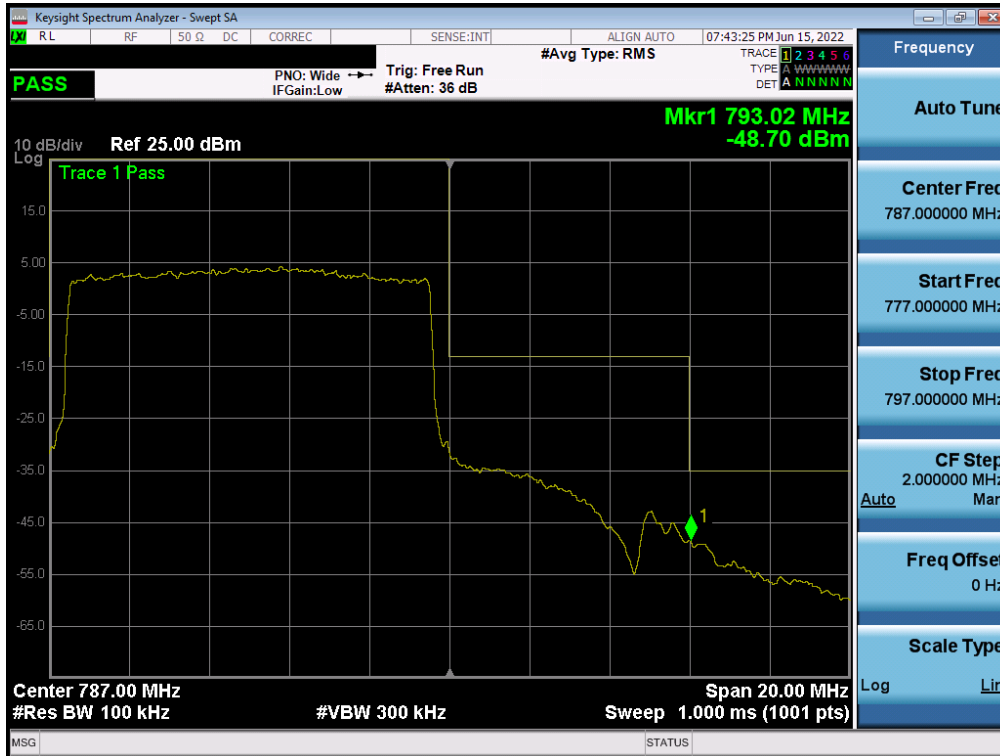


Plot 7-78. Lower Band Edge Plot (LTE Band 13 - 10MHz QPSK – Full RB)



Plot 7-79. Lower Emission Mask Plot (LTE Band 13 - 10MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 56 of 93

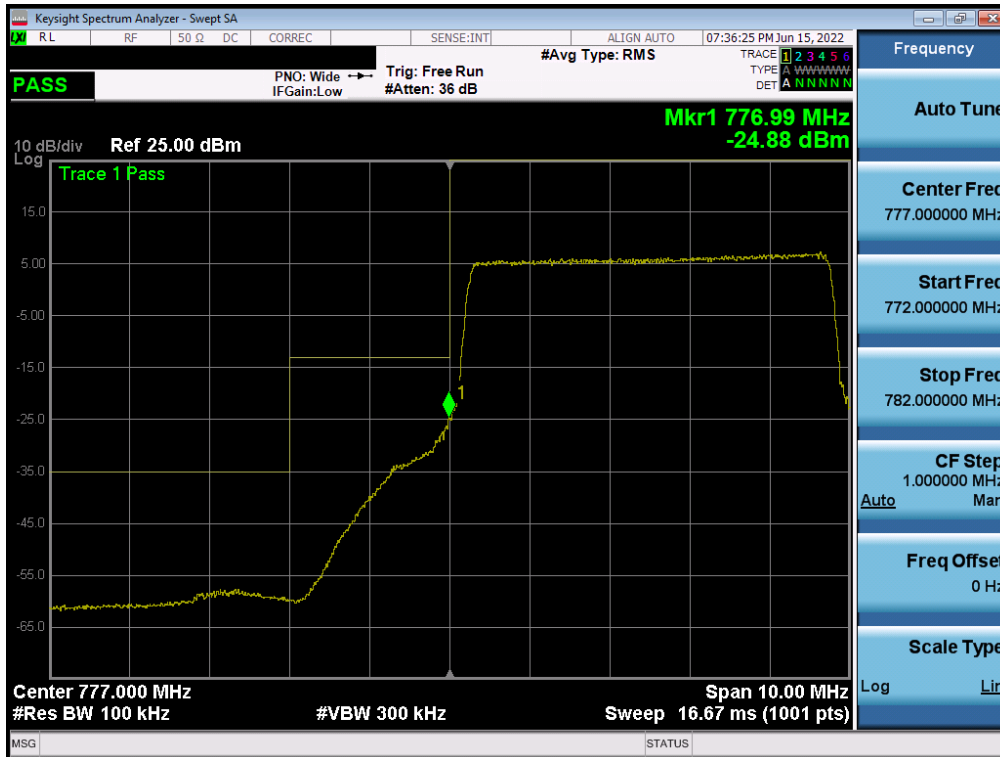


Plot 7-80. Upper Band Edge Plot (LTE Band 13 - 10MHz QPSK – Full RB)

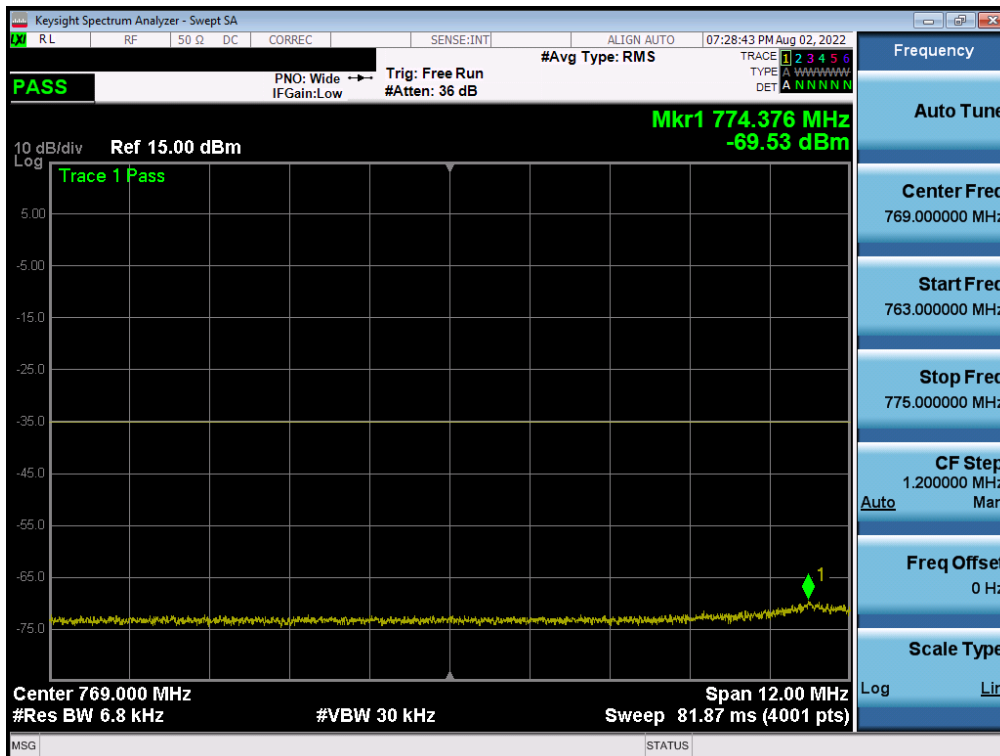


Plot 7-81. Upper Emission Mask Plot (LTE Band 13 - 10MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 57 of 93



Plot 7-82. Lower Band Edge Plot (LTE Band 13 - 5MHz QPSK – Full RB)

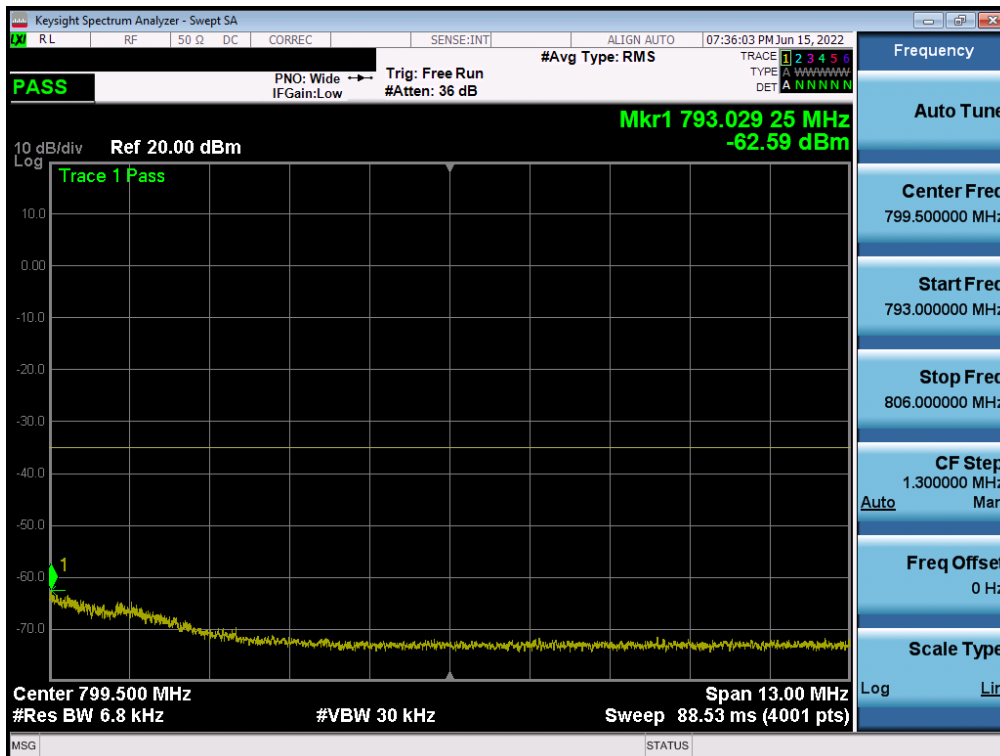


Plot 7-83. Lower Emission Mask Plot (LTE Band 13 - 5MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 58 of 93



Plot 7-84. Upper Band Edge Plot (LTE Band 13 - 5MHz QPSK – Full RB)



Plot 7-85. Upper Emission Mask Plot (LTE Band 13 - 5MHz QPSK – Full RB)

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 59 of 93

7.5 Peak-Average Ratio

Test Overview

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

Test Procedure Used

ANSI C63.26-2015 – Section 5.2.3.4

Test Settings

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

Test Setup

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

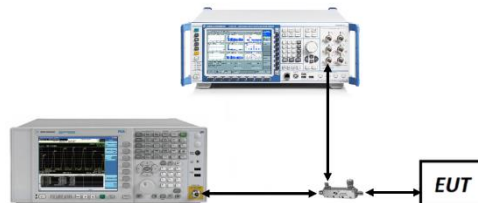


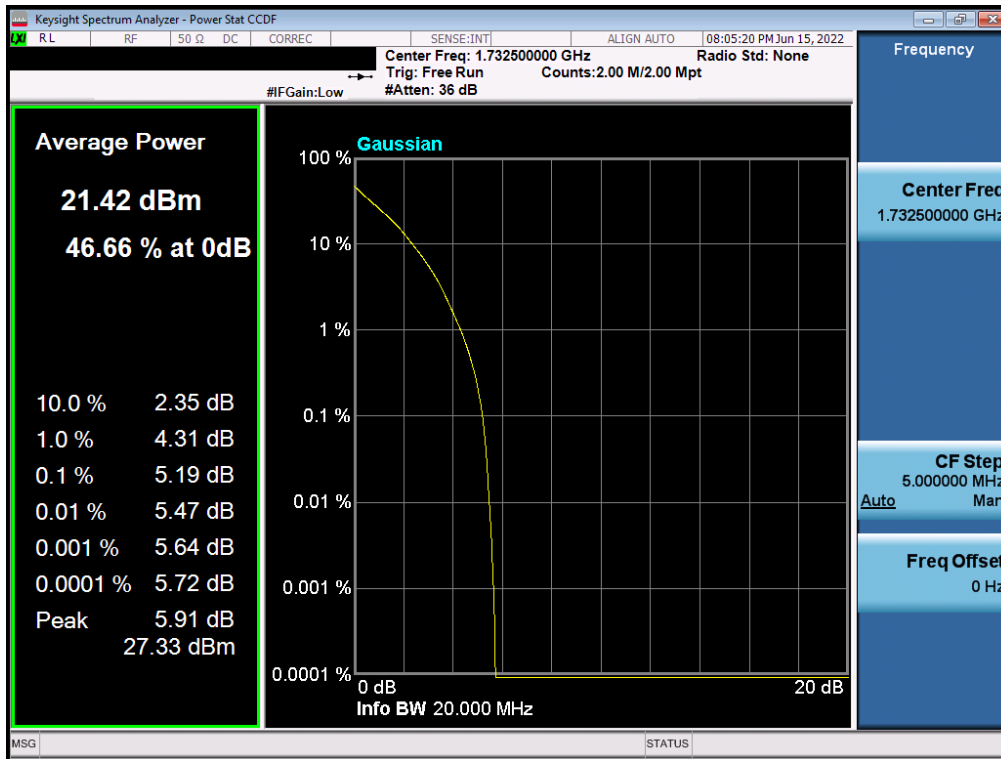
Figure 7-4. Test Instrument & Measurement Setup

Test Notes

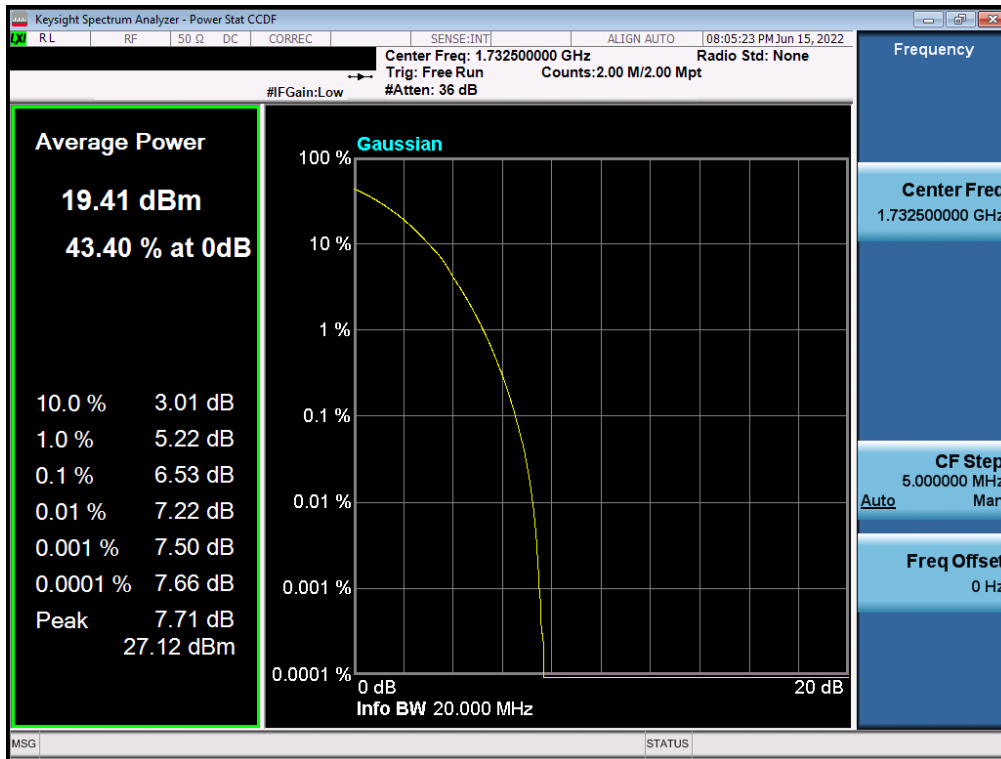
None.

FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 60 of 93

LTE Band 4

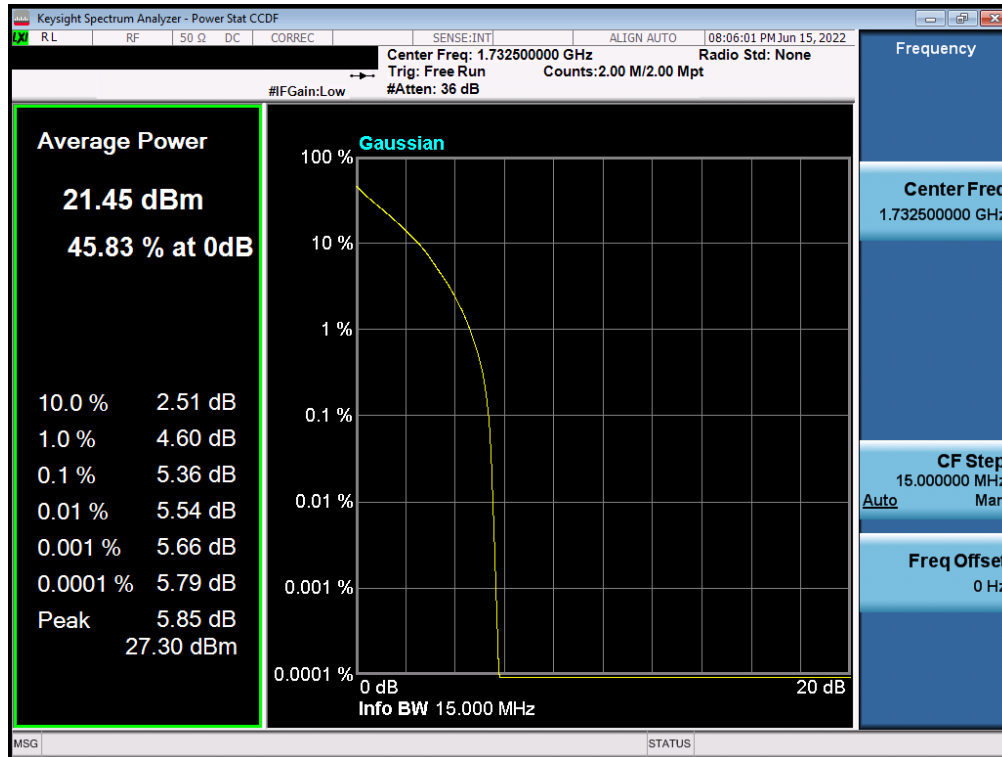


Plot 7-86. PAR Plot (LTE Band 4 - 20MHz QPSK - Full RB)

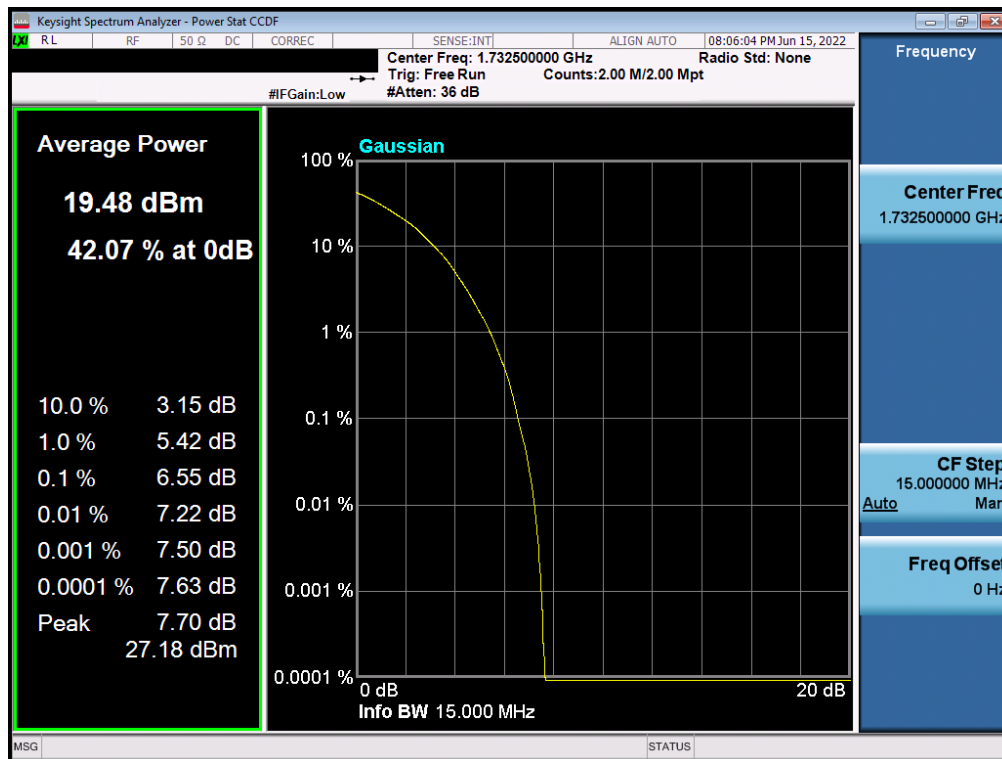


FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 61 of 93

Plot 7-87. PAR Plot (LTE Band 4 - 20MHz 64-QAM - Full RB)

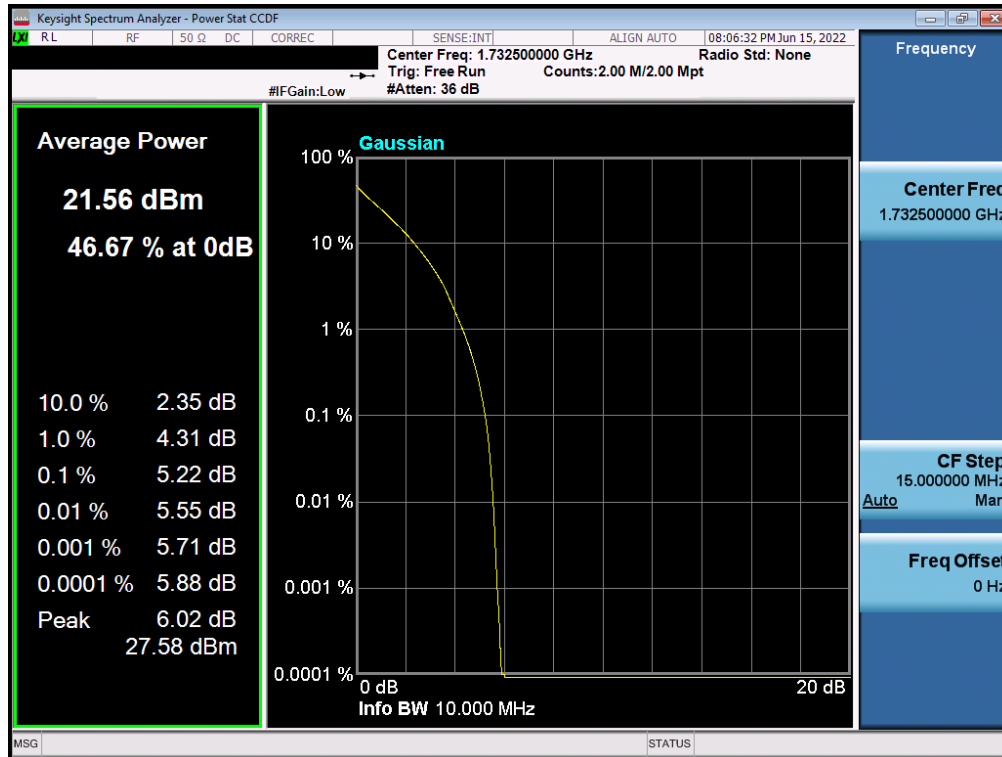


Plot 7-88. PAR Plot (LTE Band 4 - 15MHz QPSK - Full RB)

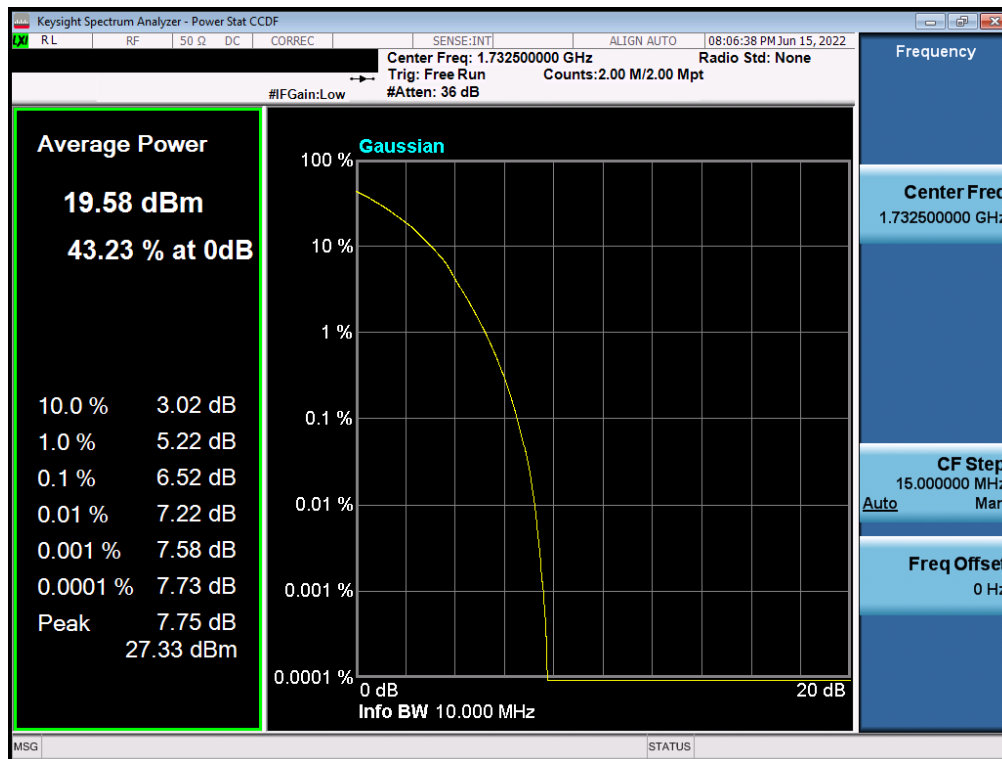


FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 62 of 93

Plot 7-89. PAR Plot (LTE Band 4 - 15MHz 64-QAM - Full RB)

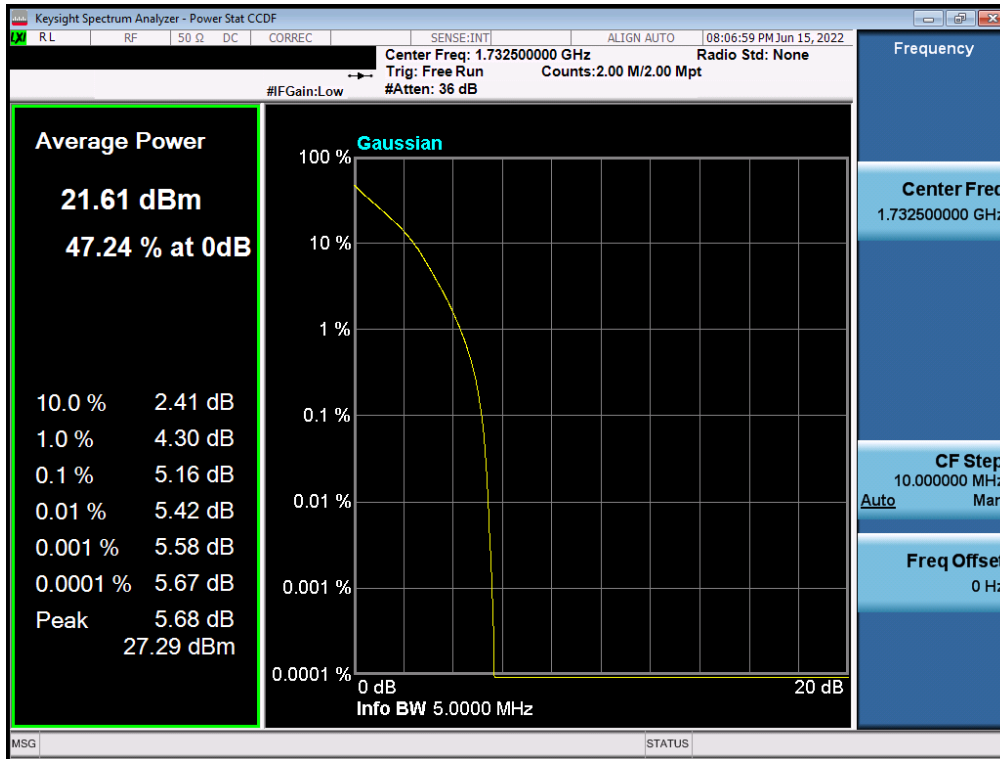


Plot 7-90. PAR Plot (LTE Band 4 - 10MHz QPSK - Full RB)

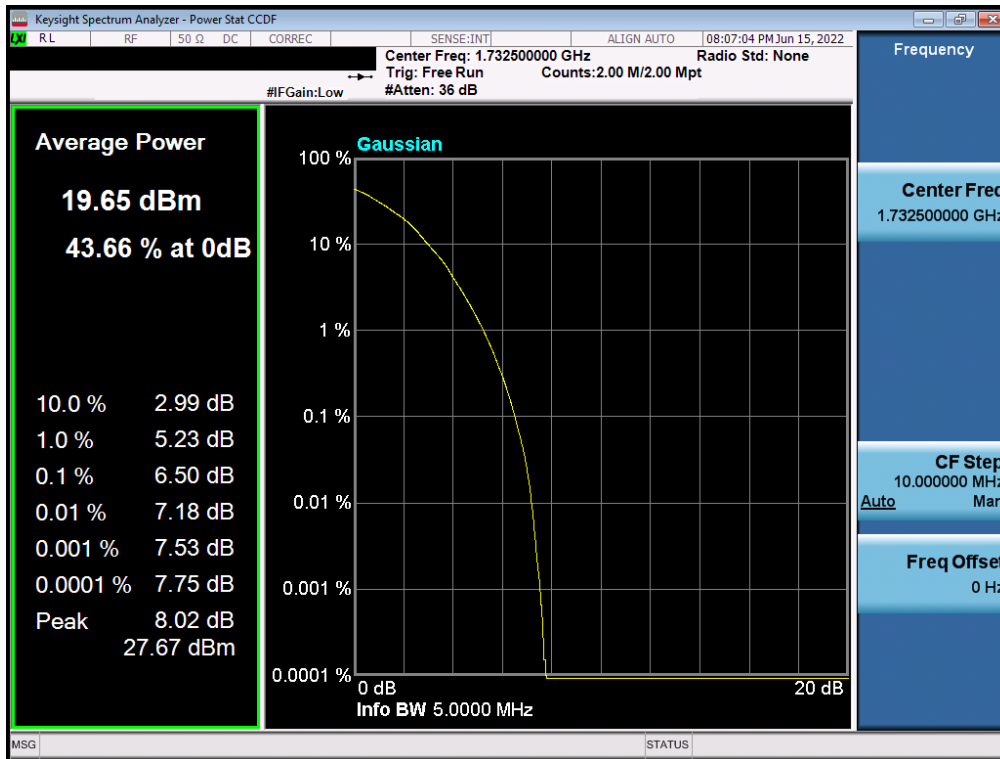


FCC ID: A3LSMF936JPN	PART 27 MEASUREMENT REPORT		Approved by: Technical Manager
Test Report S/N: 1M2206010070-04.A3L	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 63 of 93

Plot 7-91. PAR Plot (LTE Band 4 - 10MHz 64-QAM - Full RB)



Plot 7-92. PAR Plot (LTE Band 4 - 5MHz QPSK - Full RB)



PART 27 MEASUREMENT REPORT			Approved by: Technical Manager
FCC ID: A3LSMF936JPN	Test Dates: 6/15 - 8/2/2022	EUT Type: Portable Handset	Page 64 of 93