



# ELEMENT WASHINGTON DC LLC

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## PART 22 & 90 MEASUREMENT REPORT

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

**Date of Testing:**  
9/8/2022 – 12/14/2022  
**Test Report Issue Date:**  
02/24/2023  
**Test Site/Location:**  
Element lab., Columbia, MD, USA  
**Test Report Serial No.:**  
1M2212080137-18-R1.A3L

<b>FCC ID:</b>	<b>A3LSMS918JPN</b>
<b>APPLICANT:</b>	<b>Samsung Electronics Co., Ltd.</b>

**Application Type:** Certification  
**Model(s):** SC-52D, SCG20  
**EUT Type:** Portable Handset  
**FCC Classification:** PCS Licensed Transmitter Held to Ear (PCE)  
**FCC Rule Part:** §22(H), §90(S)  
**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.

Note: This revised Test Report (S/N: 1M2212080137-18-R1.A3L) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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**



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### FCC Part 22 & 90

Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Measurement	Max. Power [W]	Max. Power [dBm]	Emission Designator
LTE Band 26	15 MHz	QPSK	821.5	ERP	0.141	21.49	13M5G7D
		16QAM	821.5	ERP	0.118	20.73	13M5W7D
	15 MHz	QPSK	821.5	Conducted	0.287	24.57	13M5G7D
		16QAM	821.5	Conducted	0.226	23.55	13M5W7D
	10 MHz	QPSK	819.0	Conducted	0.301	24.78	9M02G7D
		16QAM	819.0	Conducted	0.246	23.91	9M03W7D
	5 MHz	QPSK	816.5 - 821.5	Conducted	0.316	25.00	4M57G7D
		16QAM	816.5 - 821.5	Conducted	0.252	24.02	4M54W7D
	3 MHz	QPSK	815.5 - 822.5	Conducted	0.303	24.81	2M73G7D
		16QAM	815.5 - 822.5	Conducted	0.248	23.94	2M73W7D
	1.4 MHz	QPSK	814.7 - 823.3	Conducted	0.294	24.69	1M11G7D
		16QAM	814.7 - 823.3	Conducted	0.247	23.92	1M12W7D

#### EUT Overview

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# 1.0 INTRODUCTION

## 1.1 Scope

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

## 1.2 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.

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## 2.0 PRODUCT INFORMATION

### 2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMS918JPN**. 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 90 and 22H.

**Test Device Serial No.:** 0943M, 0990M

### 2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850 WCDMA/HSPA, Multi-band LTE, Multi-band 5G NR (FR1), 802.11b/g/n/ax WLAN, 802.11a/n/ac/ax UNII (5GHz and 6GHz), Bluetooth (1x, EDR, LE), NFC, Wireless Power Transfer, Ultra Wideband

### 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.

### 2.4 Software and Firmware

Testing was performed on device(s) using software/firmware version S918USQU0AVJH installed on the EUT.

### 2.5 EMI Suppression Device(s)/Modifications

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

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## 3.0 DESCRIPTION OF TESTS

### 3.1 Evaluation Procedure

The measurement procedures described in the “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.

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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  $U_{\text{CISPR}}$  measurement uncertainty values specified in CISPR 16-4-2 and, thus, can be compared directly to specified limits to determine compliance.

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

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## 5.0 TEST EQUIPMENT CALIBRATION DATA

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

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
-	AP2	EMC Cable and Switch System	8/11/2022	Annual	8/11/2023	AP2
-	AP1	EMC Cable and Switch System	8/15/2022	Annual	8/15/2023	AP1
-	ETS	EMC Cable and Switch System	8/11/2022	Annual	8/11/2023	ETS
-	LTX1	Licensed Transmitter Cable Set	7/29/2022	Annual	7/29/2023	LTX1
-	LTX2	Licensed Transmitter Cable Set	8/15/2022	Annual	8/15/2023	LTX2
-	LTX3	Licensed Transmitter Cable Set	8/15/2022	Annual	8/15/2023	LTX3
-	LTX4	Licensed Transmitter Cable Set	7/29/2022	Annual	7/29/2023	LTX4
-	LTX5	Licensed Transmitter Cable Set	7/29/2022	Annual	7/29/2023	LTX5
Agilent	E5515C	Wireless Communications Test Set		N/A		G845360985
Agilent	E5515C	Wireless Communications Test Set		N/A		G846310798
Anritsu	MT8820C	Radio Communication Analyzer		N/A		6201300731
Anritsu	MT8821C	Radio Communication Analyzer		N/A		6201381794
Anritsu	MT8821C	Radio Communication Analyzer		N/A		6200901190
Anritsu	MT8821C	Radio Communication Analyzer		N/A		6201525694
Com-Power	AL-130R	Active Loop Antenna	1/19/2022	Biennial	1/19/2024	121085
Emco	3115	Horn Antenna (1-18GHz)	8/8/2022	Biennial	8/8/2024	9704-5182
Espec	ESX-2CA	Environmental Chamber	5/25/2022	Biennial	5/25/2024	17620
ETS Lindgren	3117	1-18 GHz DRG Horn (Medium)	4/20/2021	Biennial	4/20/2023	00125518
ETS Lindgren	3164-10	Quad Ridge Horn 400MHz - 10000MHz	5/10/2021	Biennial	5/10/2023	00166283
ETS Lindgren	3816/2NM	LISN	8/11/2022	Biennial	8/11/2024	00114451
Keysight Technologies	N9020A	MXA Signal Analyzer	3/15/2022	Annual	3/15/2023	MY54500644
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	8/18/2022	Annual	8/18/2023	MY49430494
Keysight Technologies	N9030A	PXA Signal Analyzer (44GHz)	2/14/2022	Annual	2/14/2023	MY52350166
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator		N/A		11208010032
Mini-Circuits	SSG-4000HP	Synthesized Signal Generator		N/A		11403100002
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		836371/0079
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		833855/0010
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		107826
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		109892
Rohde & Schwarz	CMU200	Base Station Simulator		N/A		836536/0005
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		100976
Rohde & Schwarz	CMW500	Radio Communication Tester		N/A		112347
Rohde & Schwarz	ESU26	EMI Test Receiver (26.5GHz)	8/29/2022	Annual	8/29/2023	100342
Rohde & Schwarz	ESU40	EMI Test Receiver (40GHz)	8/25/2022	Annual	8/25/2023	100348
Rohde & Schwarz	ESW44	EMI Test Receiver 2Hz to 44 GHz	3/28/2022	Annual	3/28/2023	101716
Rohde & Schwarz	FSW26	2Hz-26.5GHz Signal and Spectrum Analyzer	4/14/2022	Annual	4/14/2023	103187
Sunoi	JB6	LB6 Antenna	11/13/2020	Biennial	11/13/2022	A082816

Table 5-1. Test Equipment

### Notes:

1. 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.
2. 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 2<sup>nd</sup> Harmonic (1564 MHz)**

The average spectrum analyzer reading at 3 meters with the EUT on the turntable was  $-81.0$  dBm. The gain of the substituted antenna is 8.1 dBi. The signal generator connected to the substituted antenna terminals is adjusted to produce a reading of  $-81.0$  dBm on the spectrum analyzer. The loss of the cable between the signal generator and the terminals of the substituted antenna is 2.0 dB at 1564 MHz. So 6.1 dB is added to the signal generator reading of  $-30.9$  dBm yielding  $-24.80$  dBm. The fundamental EIRP was 25.501 dBm so this harmonic was  $25.501$  dBm  $- (-24.80) = 50.3$  dBc.

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## 7.0 TEST RESULTS

### 7.1 Summary

Company Name: Samsung Electronics Co., Ltd.  
 FCC ID: A3LSMS918JPN  
 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), 90.635(b)	< 100 Watts	PASS	Section 7.2
	Occupied Bandwidth	2.1049(h)	N/A	PASS	Section 7.3
	Conducted Band Edge / Spurious Emissions (LTE Band 28)	2.1051, 90.691(a)	> 43 + 10 log <sub>10</sub> (P[Watts]) for all out-of-band emissions except emissions beyond 37.5kHz from the block edge > 50 + 10 log <sub>10</sub> (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge	PASS	Sections 7.4, 7.5
	Peak-to-Average Ratio	N/A	≤ 13 dB	PASS	Section 7.6
	Frequency Stability	2.1055, 90.213	< 2.5 ppm **Fundamental emissions stay within authorized frequency block	PASS	Section 7.9
RADIATED	Effective Radiated Power (LTE Band 28)	22.913(a)(2)	< 7 Watts max. ERP	PASS	Section 7.7
	Radiated Spurious Emissions (LTE Band 28)	2.1053, 90.691(a)	> 43 + 10 log <sub>10</sub> (P[Watts]) for all out-of-band emissions except emissions beyond 37.5kHz from the block edge > 50 + 10 log <sub>10</sub> (P[Watts]) at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge	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**

#### 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 V1.0.

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## 7.2 Conducted Output Power Data

### Test Overview

All 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.

### Test Procedure Used

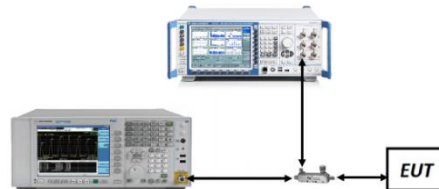
ANSI C63.26-2015 – Section 5.2

### Test Settings

1. Span = 2 x OBW to 3 x OBW
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 7-1. Test Instrument & Measurement Setup**

### Test Notes

1. For LTE mode, the device was tested under all modulations, RB sizes and offsets, and channel bandwidth configurations and the worst case emissions are reported with 1 RB.
2. This unit was tested with its standard battery.
3. Conducted power measurements were evaluated 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.
4. All other conducted power measurements are contained in the RF exposure report for this filing.

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Bandwidth	Modulation	Channel	Frequency [MHz]	RB Size/Offset	Conducted Power [dBm]	Conducted Power [Watts]	Conducted Power Limit [dBm]	Margin [dB]
15 MHz	QPSK	26765	821.5	1 / 37	24.57	0.287	50.00	-25.43
	16-QAM	26765	821.5	1 / 37	23.55	0.226	50.00	-26.45
10 MHz	QPSK	26740	819.0	1 / 25	24.78	0.301	50.00	-25.22
	16-QAM	26740	819.0	1 / 25	23.91	0.246	50.00	-26.09
5 MHz	QPSK	26715	816.5	1 / 12	24.69	0.294	50.00	-25.31
		26765	821.5	1 / 12	25.00	0.316	50.00	-25.00
	16-QAM	26715	816.5	1 / 12	23.91	0.246	50.00	-26.09
		26765	821.5	1 / 12	24.02	0.252	50.00	-25.98
3 MHz	QPSK	26705	815.5	1 / 0	24.81	0.303	50.00	-25.19
		26775	822.5	1 / 7	24.70	0.295	50.00	-25.30
	16-QAM	26705	815.5	1 / 0	23.88	0.245	50.00	-26.12
		26775	822.5	1 / 7	23.94	0.248	50.00	-26.06
1.4 MHz	QPSK	26697	814.7	1 / 3	24.69	0.294	50.00	-25.31
		26783	823.3	1 / 3	24.57	0.287	50.00	-25.43
	16-QAM	26697	814.7	1 / 3	23.92	0.247	50.00	-26.08
		26783	823.3	1 / 3	23.83	0.242	50.00	-26.17

Table 7-2. Conducted Power Output Data (LTE Band 26)

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### 7.3 Occupied Bandwidth

#### Test Overview

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

#### Test Procedure Used

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  $\geq 3 \times$  RBW
4. Detector = Peak
5. Trace mode = max hold
6. Sweep = auto couple
7. The trace was allowed to stabilize
8. If necessary, steps 2 – 7 were repeated after changing the RBW such that it would be within 1 – 5% of the 99% occupied bandwidth observed in Step 7

#### Test Setup

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

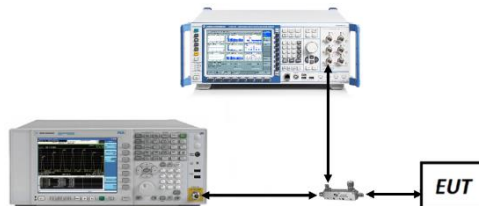


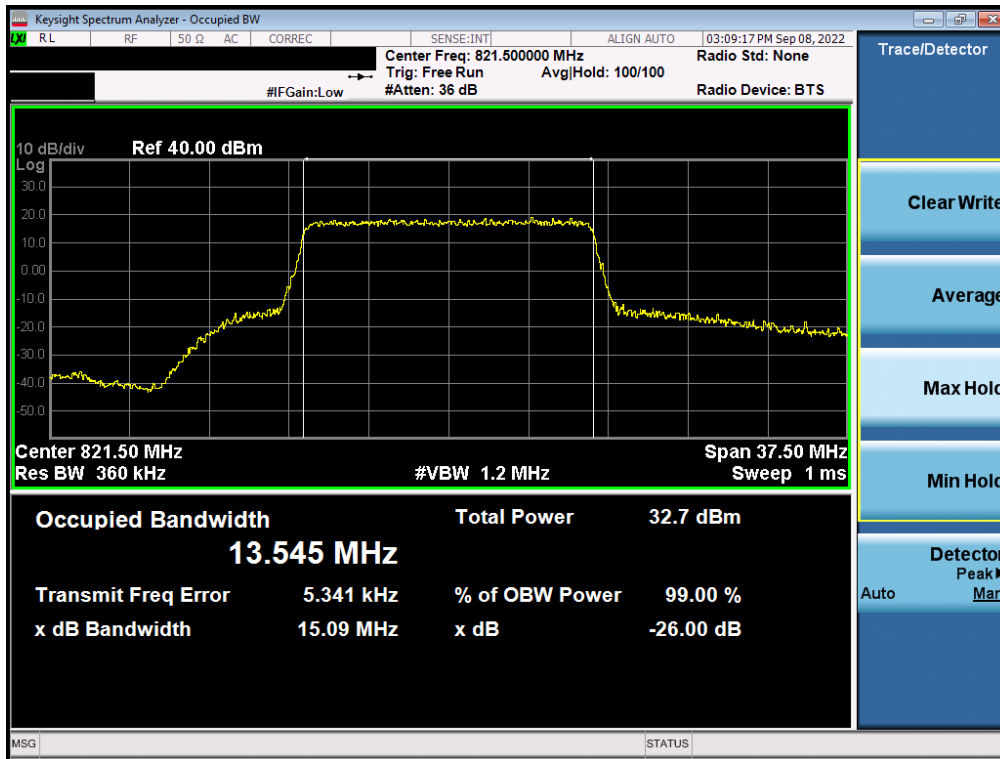
Figure 7-2. Test Instrument & Measurement Setup

#### Test Notes

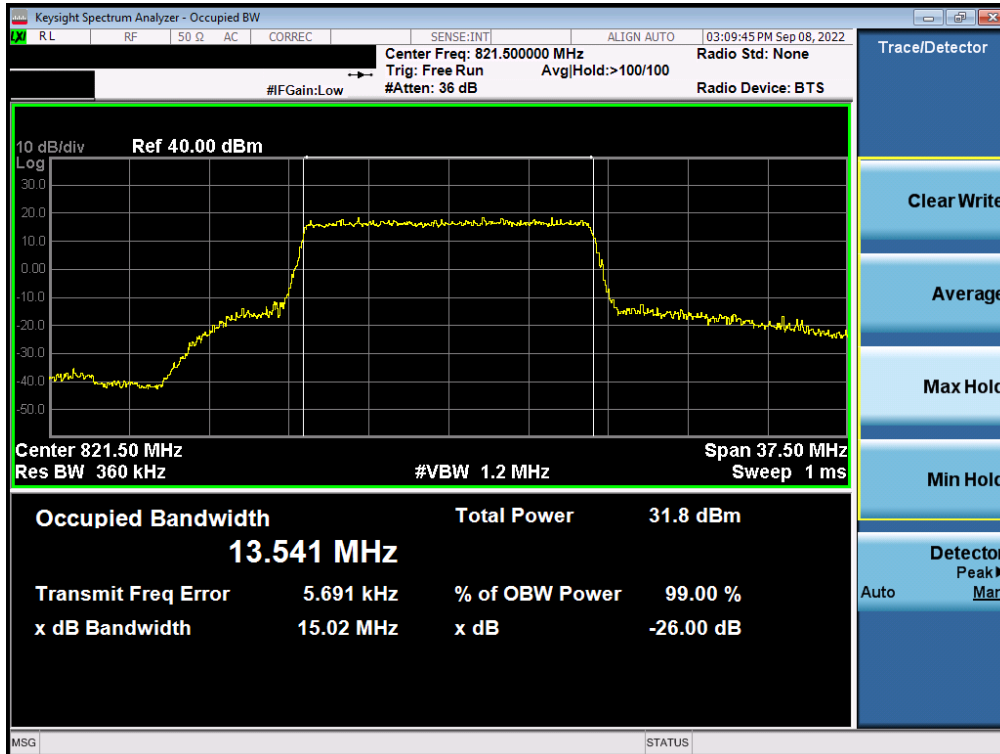
None

FCC ID: A3LSMS918JPN	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
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# LTE Band 26

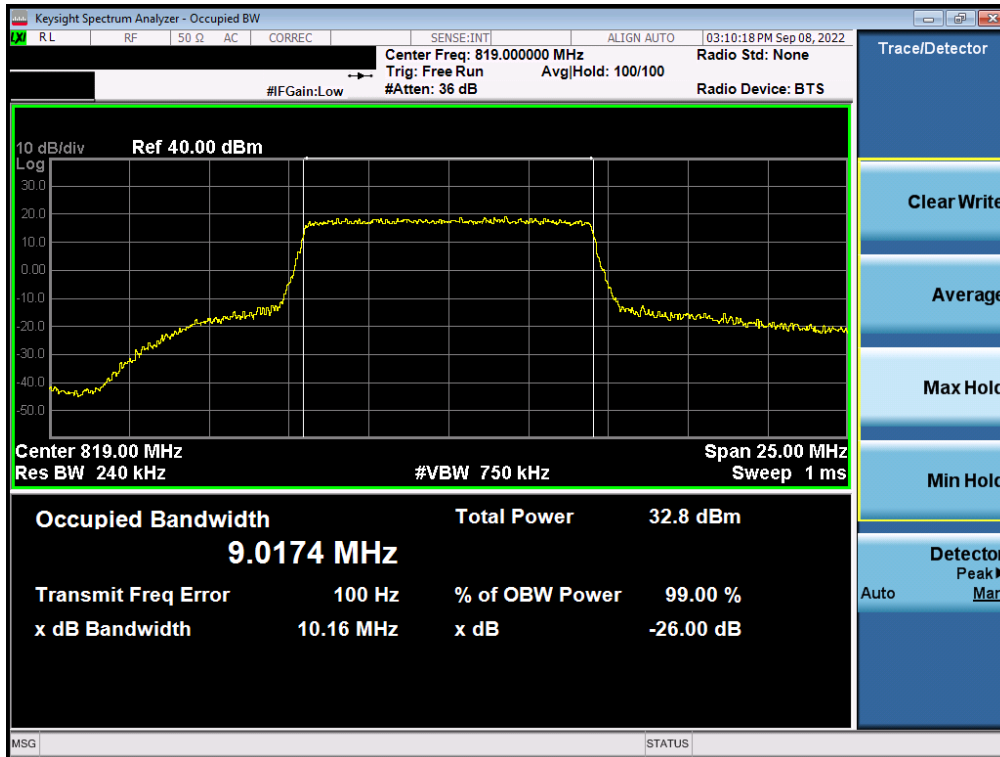


Plot 7-1. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB)



Plot 7-2. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB)

FCC ID: A3LSMS918JPN	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 14 of 38

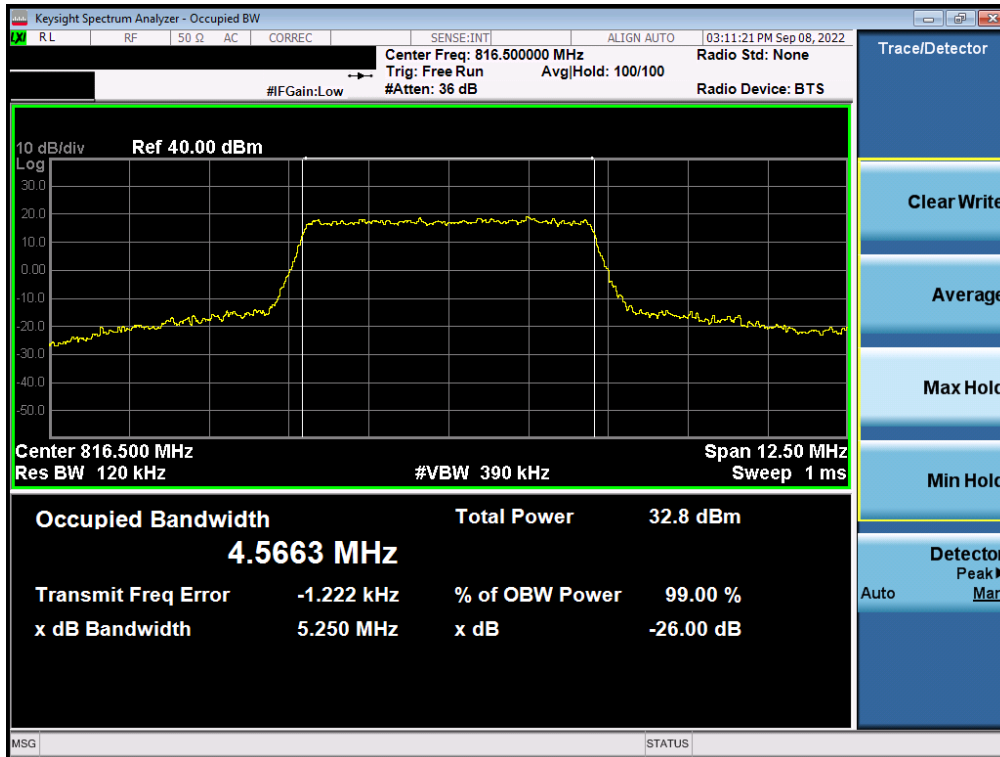


Plot 7-3. Occupied Bandwidth Plot (LTE Band 26 - 10MHz QPSK - Full RB)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 16-QAM - Full RB)

FCC ID: A3LSMS918JPN		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset		Page 15 of 38



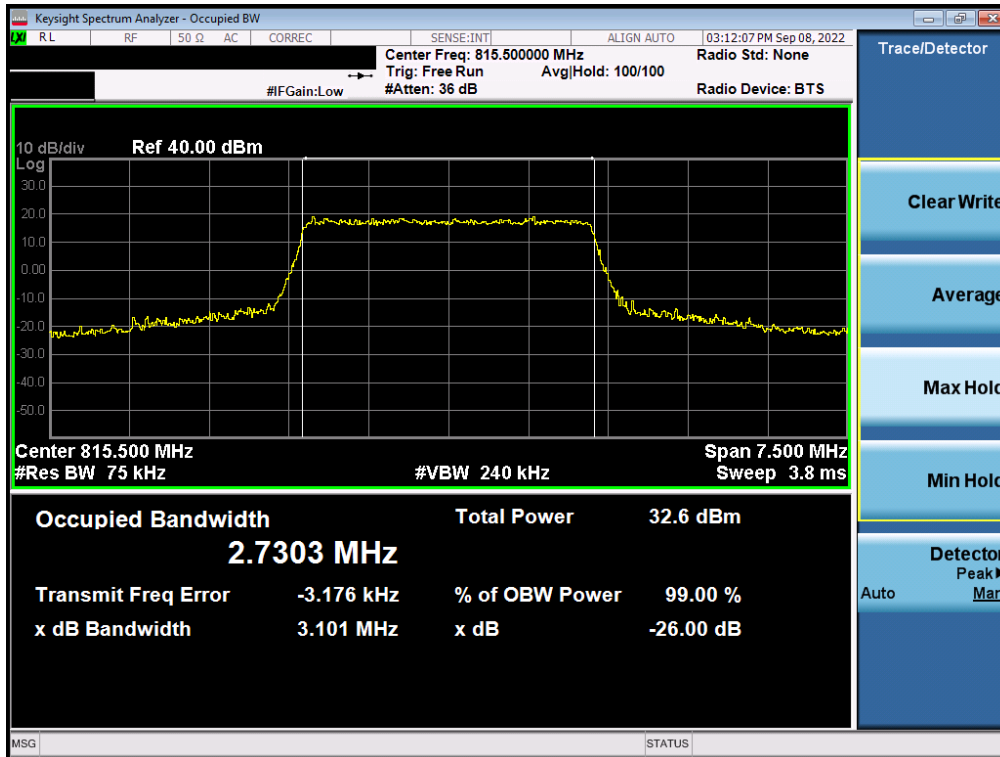
Plot 7-5. Occupied Bandwidth Plot (LTE Band 26 - 5MHz QPSK - Full RB)



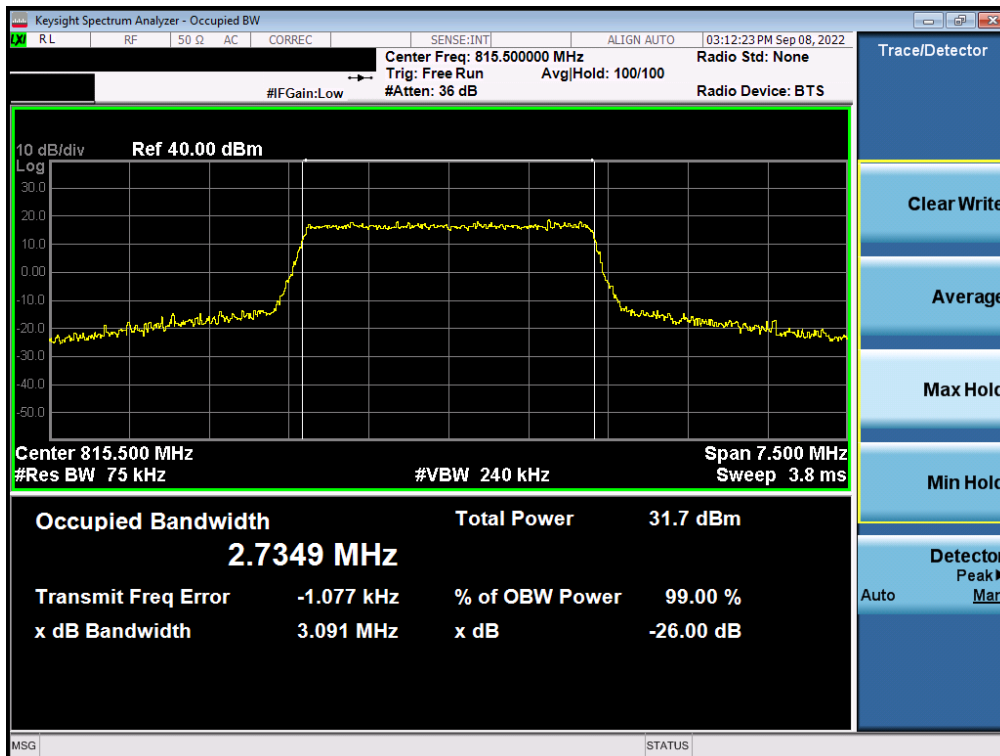
Plot 7-6. Occupied Bandwidth Plot (LTE Band 26 - 5MHz 16-QAM - Full RB)

FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 16 of 38



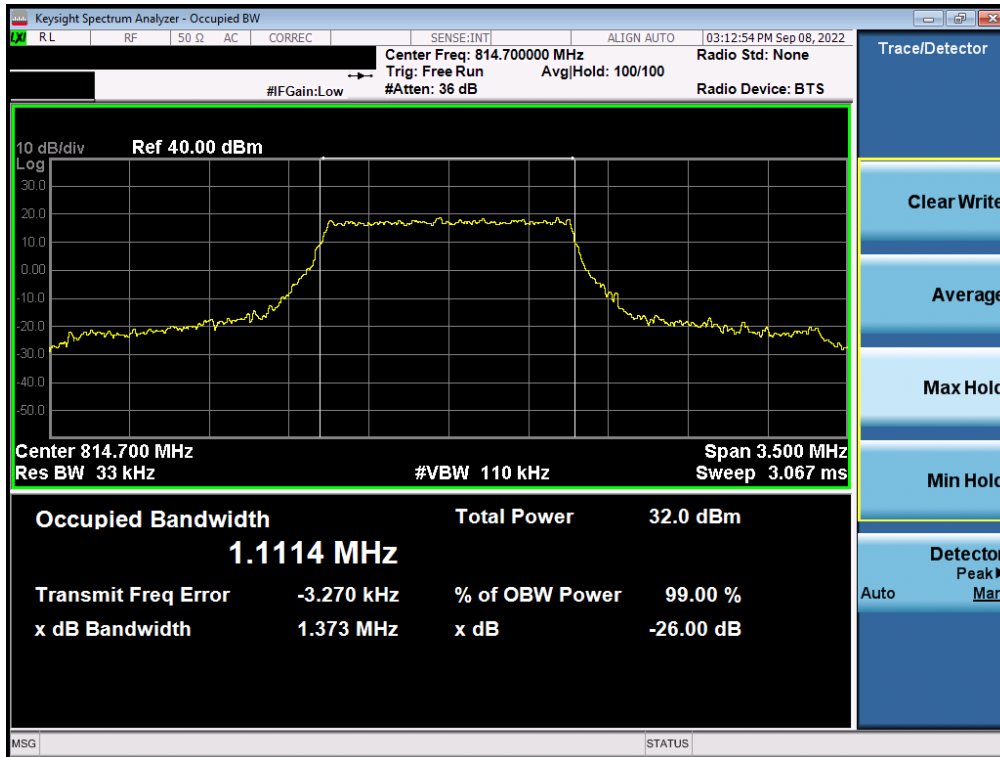


Plot 7-7. Occupied Bandwidth Plot (LTE Band 26 - 3MHz QPSK - Full RB)



Plot 7-8. Occupied Bandwidth Plot (LTE Band 26 - 3MHz 16-QAM - Full RB)

FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 17 of 38



Plot 7-9. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz QPSK - Full RB)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 16-QAM - Full RB)

FCC ID: A3LSMS918JPN	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 18 of 38

## 7.4 Spurious and Harmonic Emissions at Antenna Terminal

### Test Overview

The level of the carrier and the various conducted spurious and harmonic frequencies is measured by means of a calibrated spectrum analyzer. The spectrum is scanned from the lowest frequency generated in the equipment up to a frequency including its 10<sup>th</sup> 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

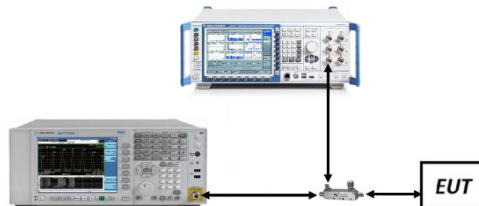
ANSI C63.26-2015 – Section 5.7.4

### Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 10GHz (separated into at least two plots per channel)
2. RBW  $\geq$  100kHz
3. VBW  $\geq$  3 x RBW
4. Detector = RMS
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

### Test Setup

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



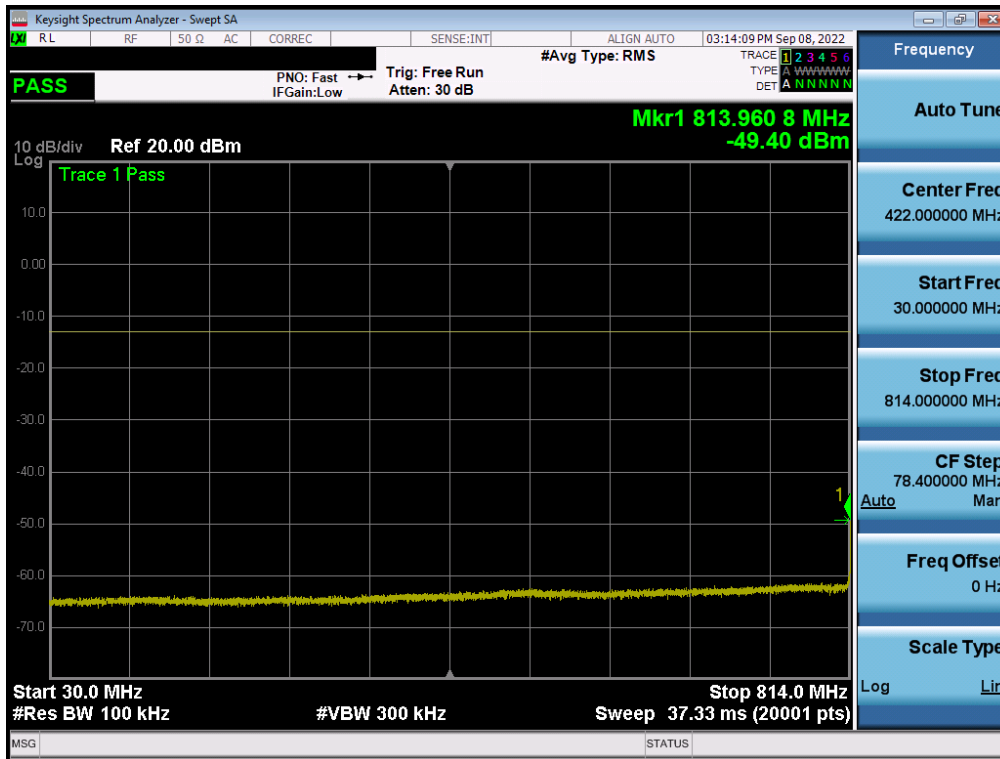
**Figure 7-3. Test Instrument & Measurement Setup**

### Test Notes

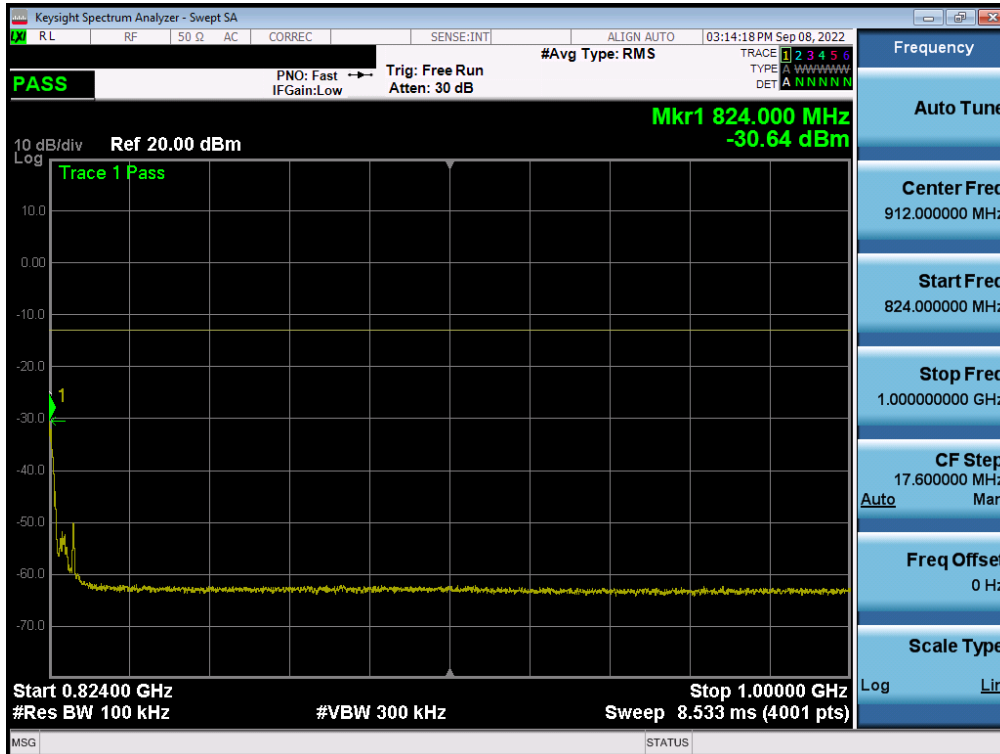
Per Part 22H and 90, compliance with the applicable limits is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater.

FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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# LTE Band 26

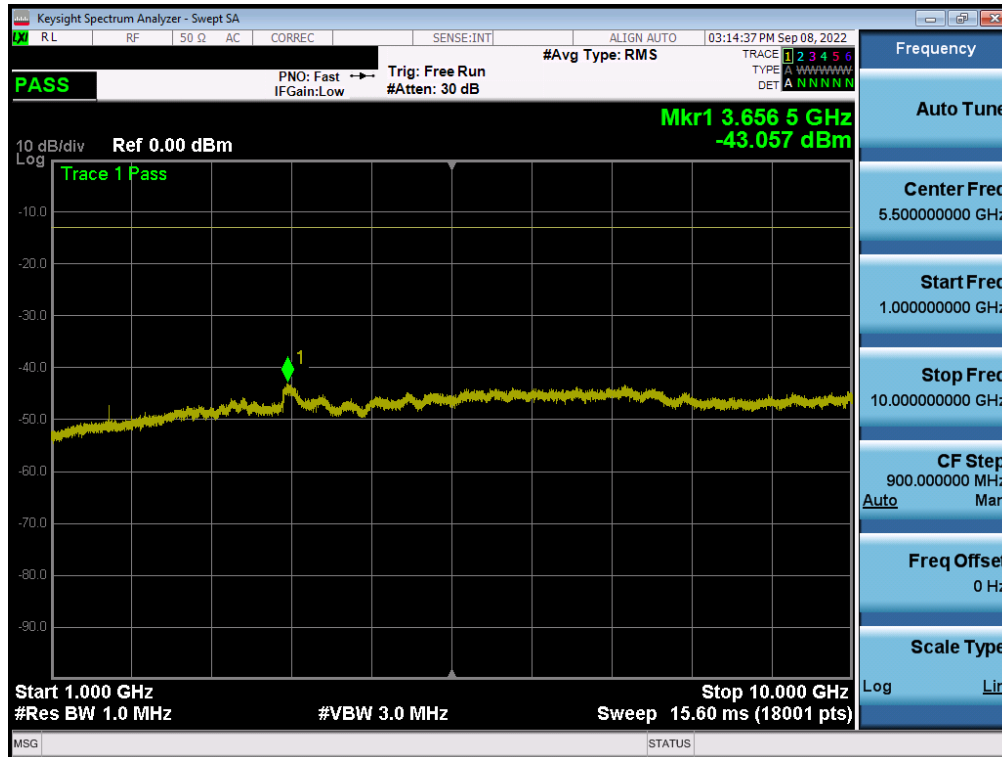


Plot 7-11. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)



Plot 7-12. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 20 of 38



Plot 7-13. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 21 of 38

## 7.5 Band Edge Emissions at Antenna Terminal

### Test Overview

All out of band emissions are measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at 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.

***For LTE B26 operation under Part 90.691, the minimum permissible attenuation level of any spurious emission removed from the EA licensee's frequency block by greater than 37.5 kHz is  $43 + 10\log_{10}(P_{[Watts]})$ , where  $P$  is the transmitter power in Watts. The minimum permissible attenuation level of any spurious emission removed from the EA licensee's frequency block by up to and including 37.5 kHz is  $50 + 10\log_{10}(P_{[Watts]})$ , where  $P$  is the transmitter power in Watts.***

### Test Procedure Used

ANSI C63.26-2015 – Section 5.7.3

### Test Settings

1. Span was set large enough so as to capture all out of band emissions near the band edge
2. RBW = 100 kHz
3. VBW = 300 kHz
4. Detector = RMS
5. Trace mode = trace average
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.

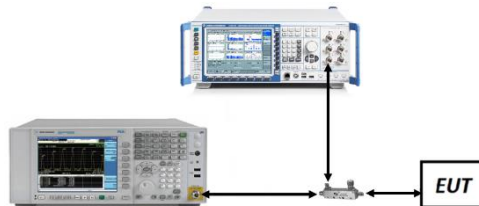


Figure 7-4. Test Instrument & Measurement Setup

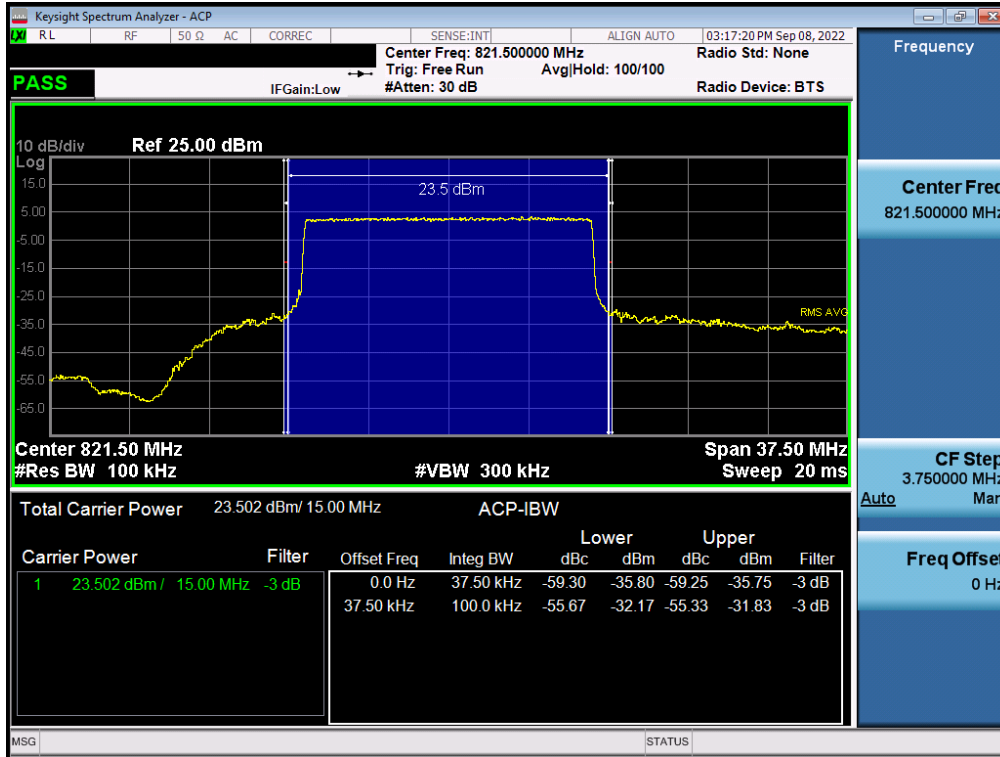
FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 22 of 38

**Test Notes**

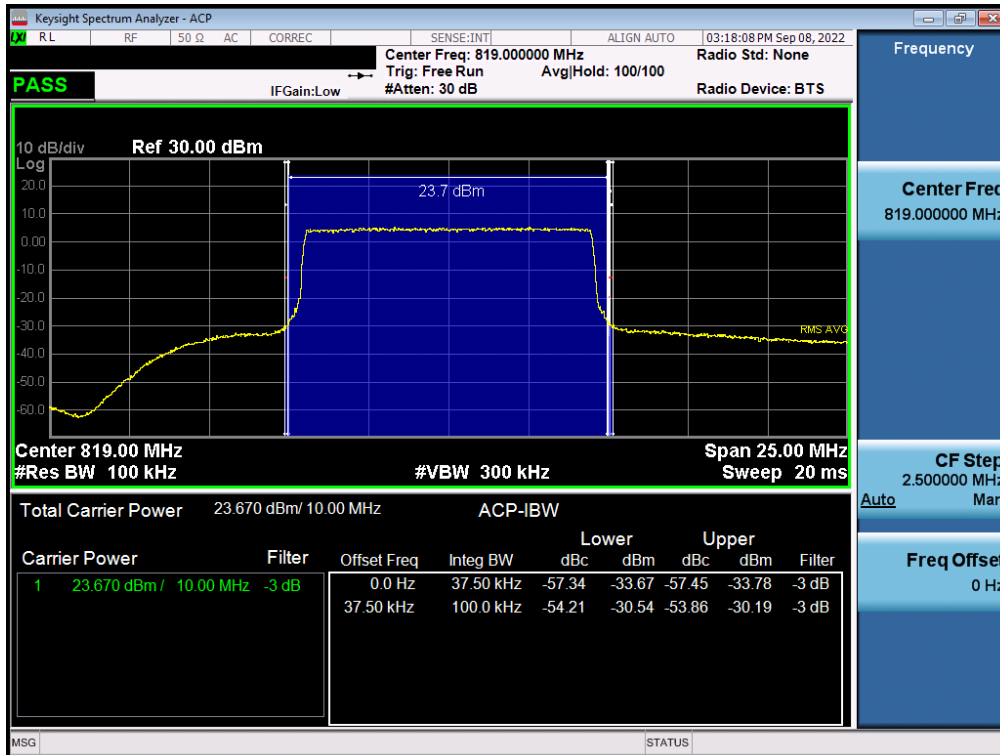
1. For channel edge emission, the signal analyzer’s “ACP” measurement capability is used.
2. Per 22.917(b) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter 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.

<b>FCC ID:</b> A3LSMS918JPN	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2212080137-18-R1.A3L	<b>Test Dates:</b> 9/8/2022 – 12/14/2022	<b>EUT Type:</b> Portable Handset	Page 23 of 38

## LTE Band 26



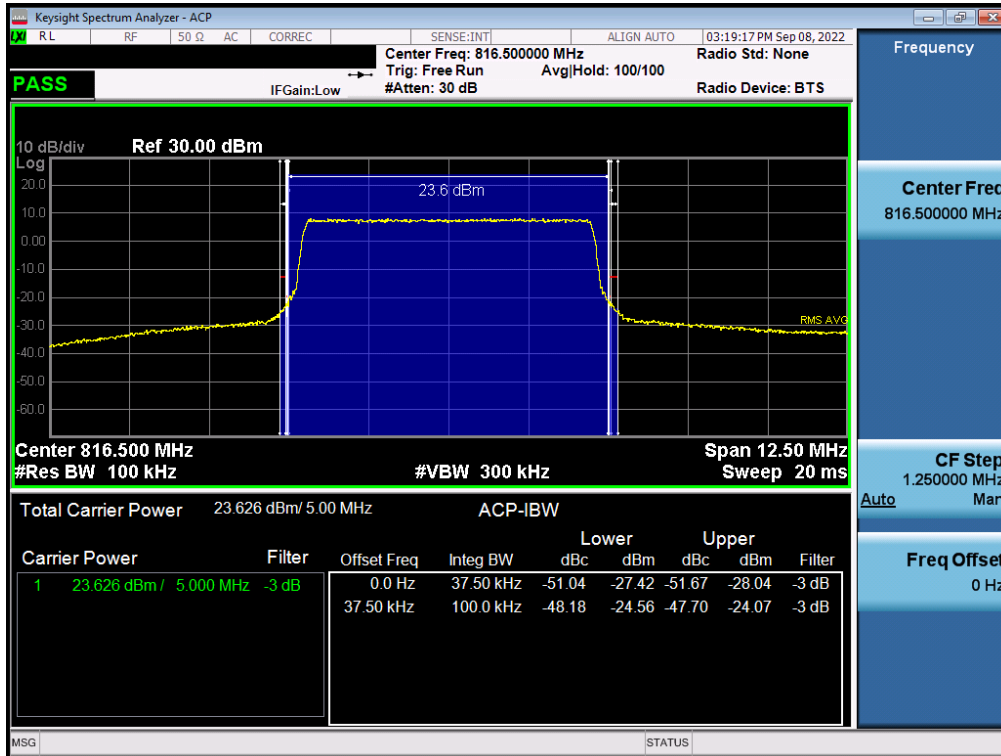
Plot 7-14. Channel Edge Plot (LTE Band 26 - 15MHz QPSK - Mid Channel)



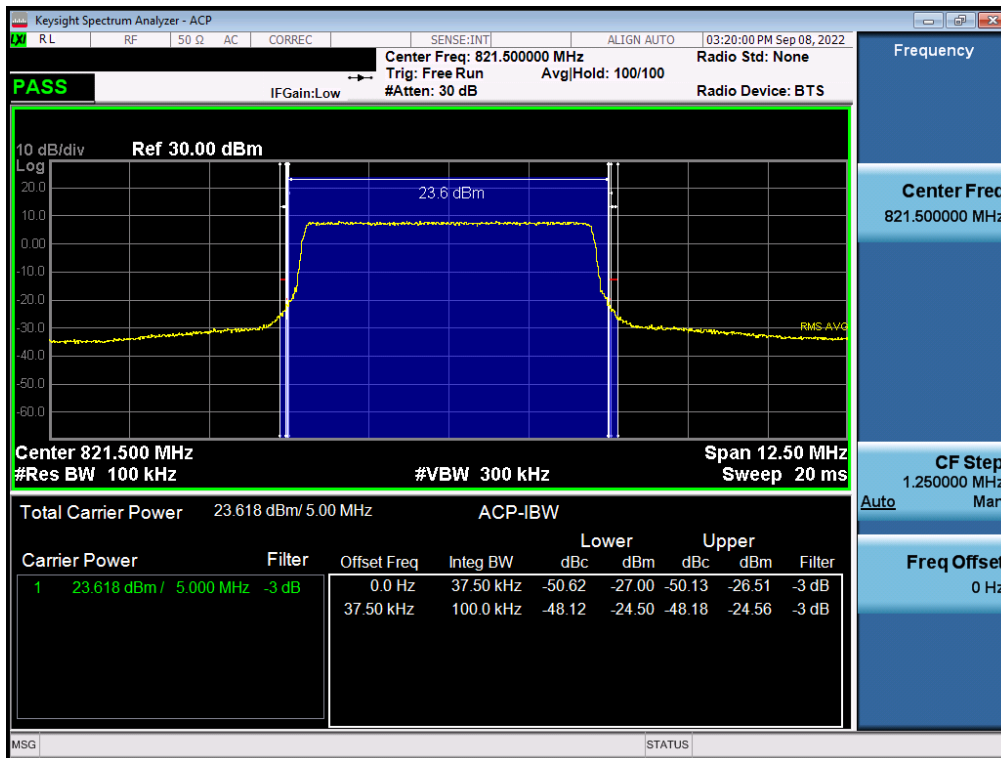
Plot 7-15. Channel Edge Plot (LTE Band 26 - 10MHz QPSK - Mid Channel)

FCC ID: A3LSMS918JPN		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset		Page 24 of 38



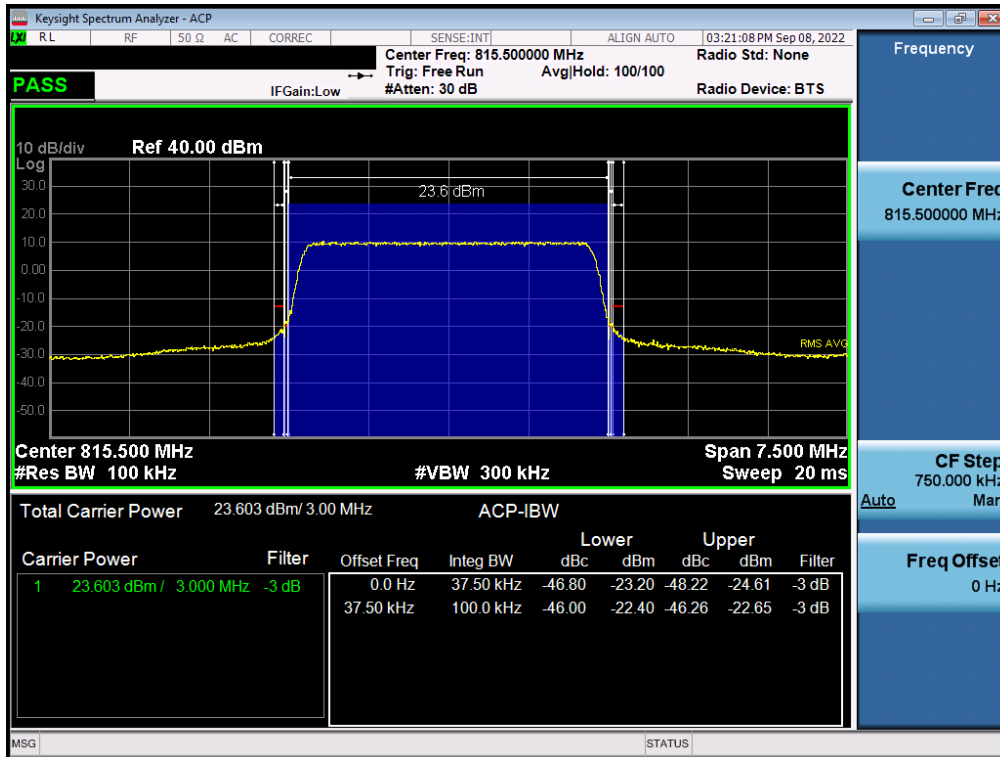


Plot 7-16. Channel Edge Plot (LTE Band 26 - 5MHz QPSK - Low Channel)

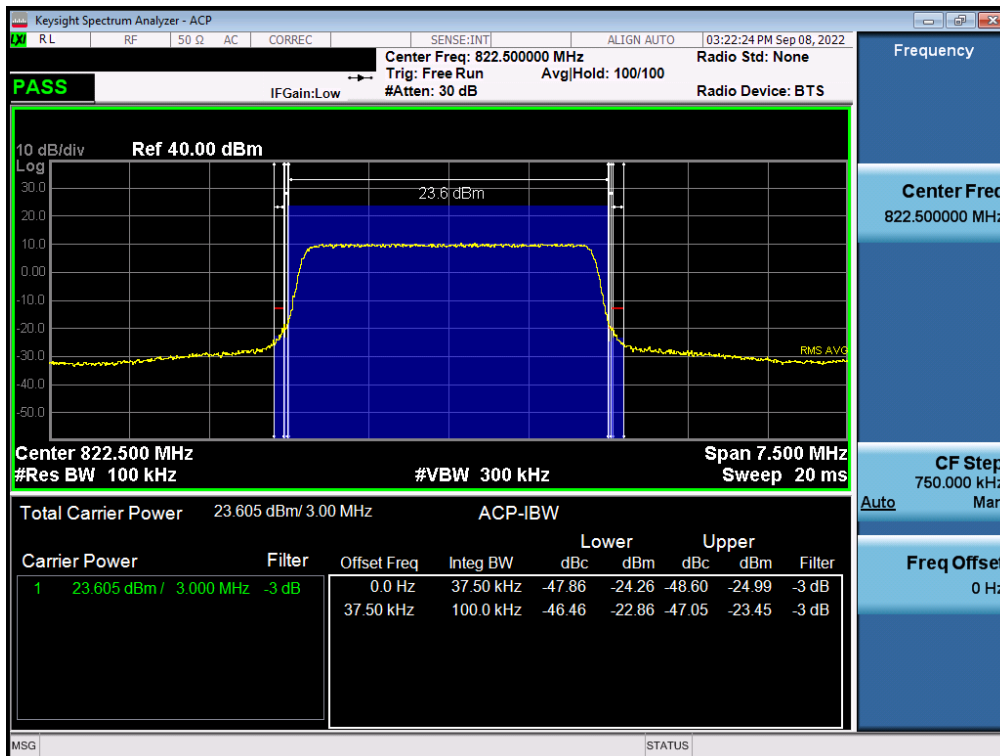


Plot 7-17. Channel Edge Plot (LTE Band 26 - 5MHz QPSK - High Channel)

FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 25 of 38

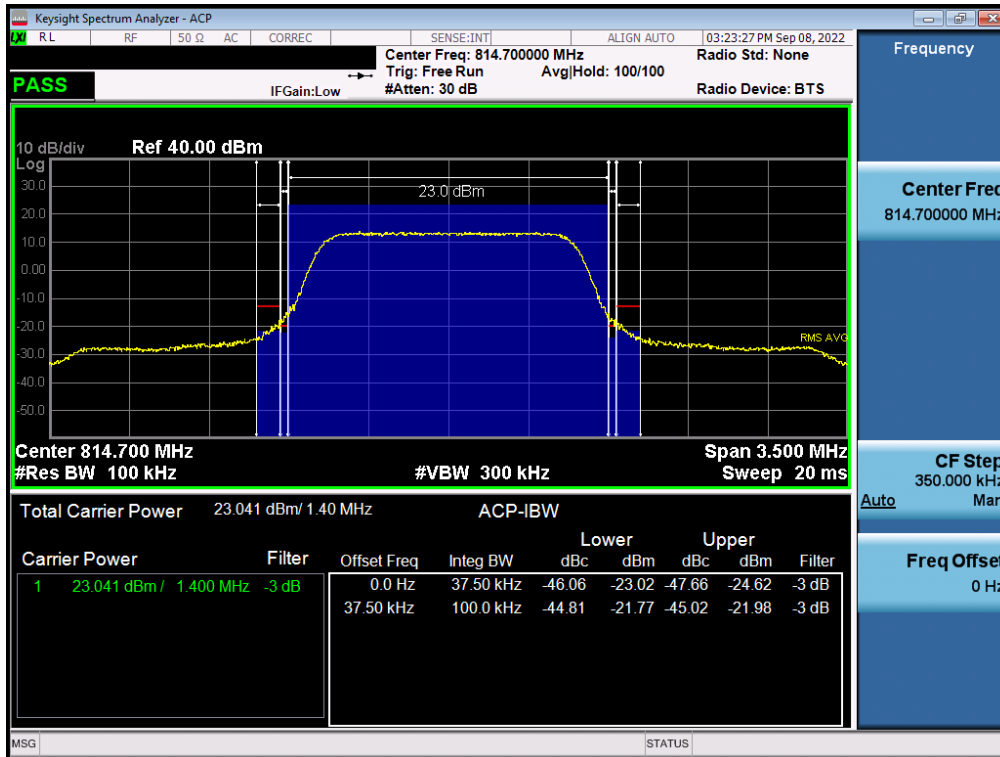


Plot 7-18. Channel Edge Plot (LTE Band 26 - 3MHz QPSK - Low Channel)

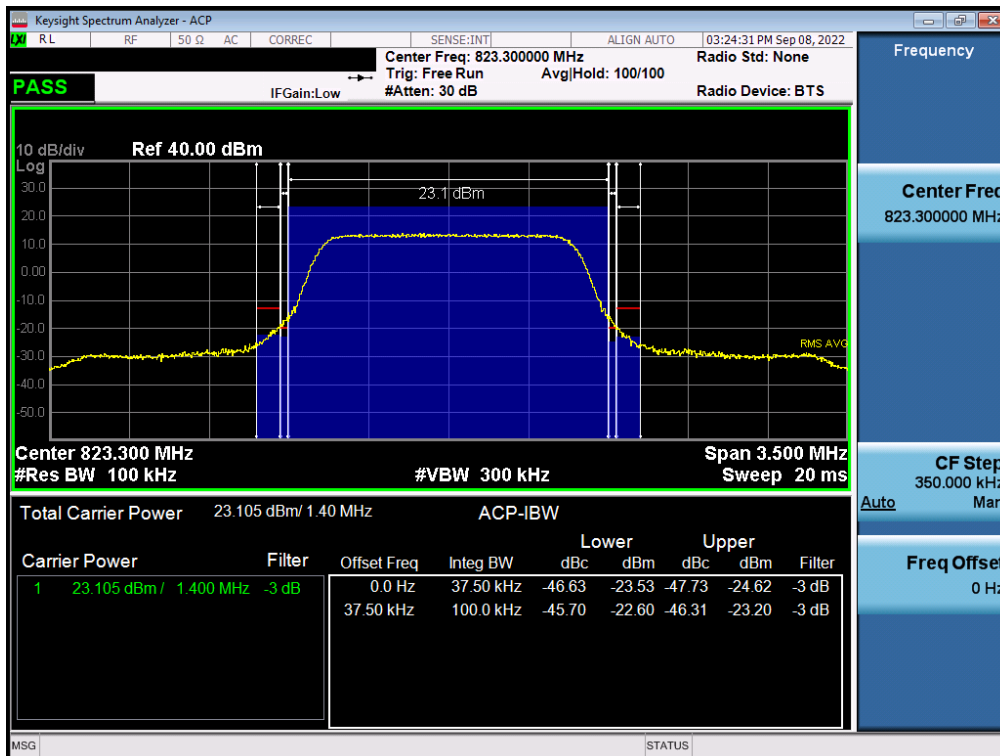


Plot 7-19. Channel Edge Plot (LTE Band 26 - 3MHz QPSK - High Channel)

FCC ID: A3LSMS918JPN		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset		Page 26 of 38



Plot 7-20. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - Low Channel)



Plot 7-21. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - High Channel)

FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 27 of 38



## 7.6 Radiated Power (ERP)

### Test Overview

Effective Radiated Power (ERP) measurements are performed using the substitution method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS average measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

### Test Procedures Used

ANSI C63.26-2015 – Section 5.2.4.4

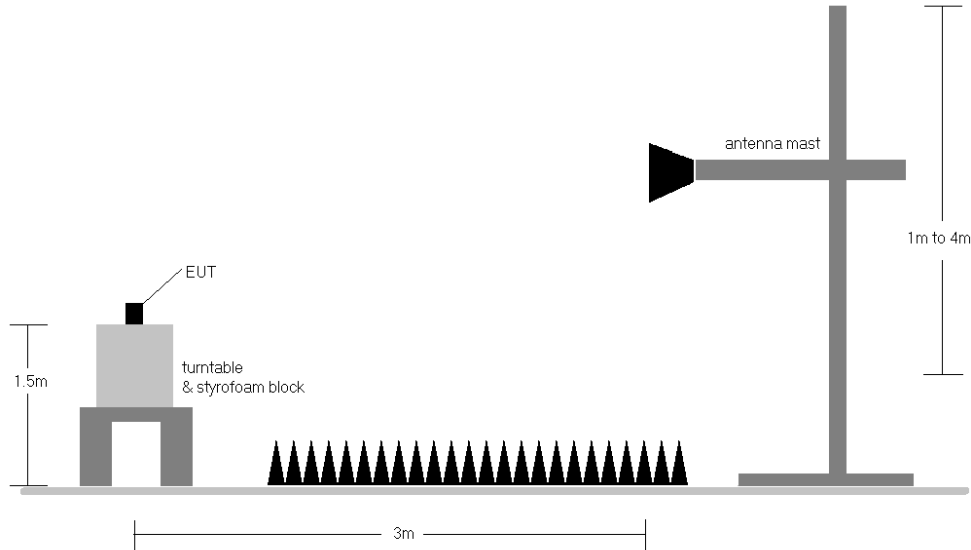
### Test Settings

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
3. VBW  $\geq$  3 x RBW
4. Span = 1.5 times the OBW
5. No. of sweep points  $\geq$  2 x span / RBW
6. Detector = RMS
7. Trigger is set to “free run” for signals with continuous operation with the sweep times set to “auto”.
8. The integration bandwidth was roughly set equal to the measured OBW of the signal for signals with continuous operation.
9. Trace mode = trace averaging (RMS) over 100 sweeps
10. The trace was allowed to stabilize.

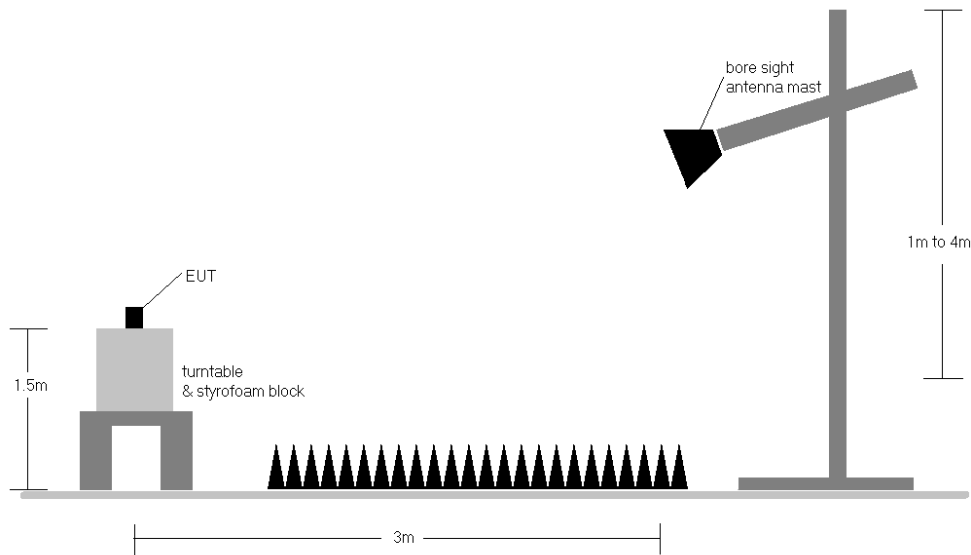
FCC ID: A3LSMS918JPN	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 28 of 38

**Test Setup**

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



**Figure 7-5. Radiated Test Setup <1GHz**



**Figure 7-6. Radiated Test Setup > 1GHz**

**Test Notes**

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

FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 29 of 38



Bandwidth	Mod.	Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Ant. Gain [dBi]	RB Size/Offset	Substitute Level [dBm]	ERP [dBm]	ERP [Watts]	ERP Limit [dBm]	Margin [dB]	EIRP [dBm]	EIRP [Watts]	EIRP Limit [dBm]	Margin [dB]
15 MHz	QPSK	821.5	V	149	115	1.24	1 / 0	22.40	21.49	0.141	38.45	-16.96	23.64	0.231	40.61	-16.97
	16-QAM	821.5	V	149	115	1.24	1 / 0	21.64	20.73	0.118	38.45	-17.72	22.88	0.194	40.61	-17.73
	QPSK	816.5	H	238	69	1.24	1 / 0	18.70	17.79	0.060	38.45	-20.66	19.94	0.099	40.61	-20.67
	QPSK (WCP)	821.5	V	136	66	1.24	1 / 0	19.25	18.34	0.068	38.45	-20.11	20.49	0.112	40.61	-20.12

Table 7-3. ERP Data (LTE Band 26)

FCC ID: A3LSMS918JPN	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 30 of 38



## 7.7 Radiated Spurious Emissions Measurements

### Test Overview

Radiated spurious emissions measurements are performed using the field strength conversion method described in ANSI C63.26-2015 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using hybrid (biconical/log) antennas. Measurements on signals operating above 1GHz are performed using vertically and horizontally polarized broadband horn antennas. All measurements are performed as RMS measurements while the EUT is operating at maximum power, and at the appropriate frequencies.

### Test Procedures Used

ANSI C63.26-2015 – Section 5.5.4

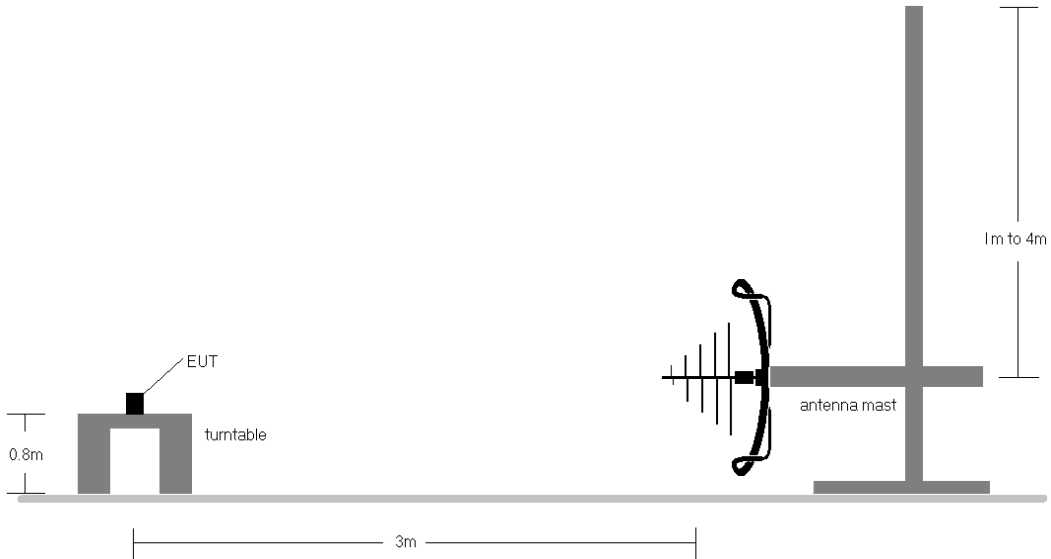
### Test Settings

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 = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

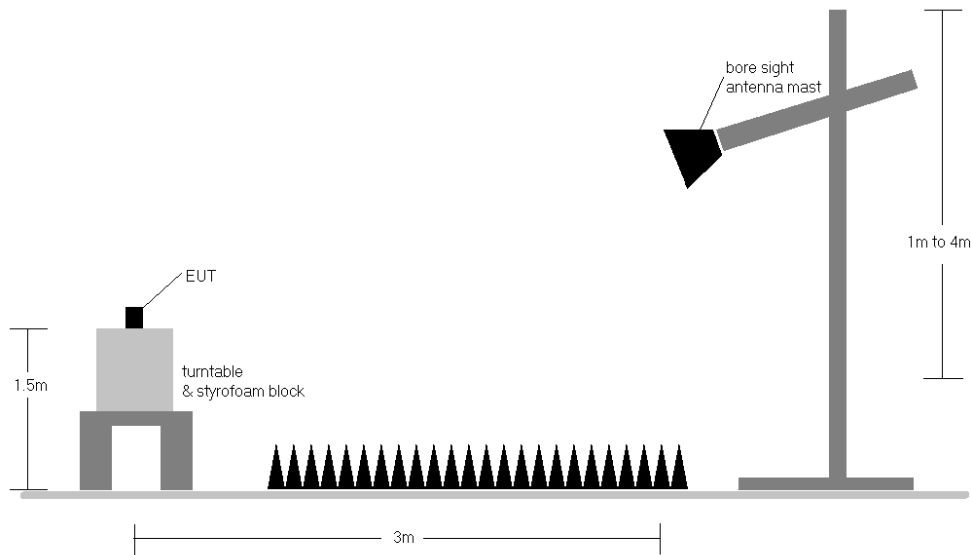
FCC ID: A3LSMS918JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 31 of 38

**Test Setup**

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



**Figure 7-7. Test Instrument & Measurement Setup < 1GHz**



**Figure 7-8. Test Instrument & Measurement Setup >1 GHz**

<b>FCC ID:</b> A3LSMS918JPN	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2212080137-18-R1.A3L	<b>Test Dates:</b> 9/8/2022 – 12/14/2022	<b>EUT Type:</b> Portable Handset	Page 32 of 38

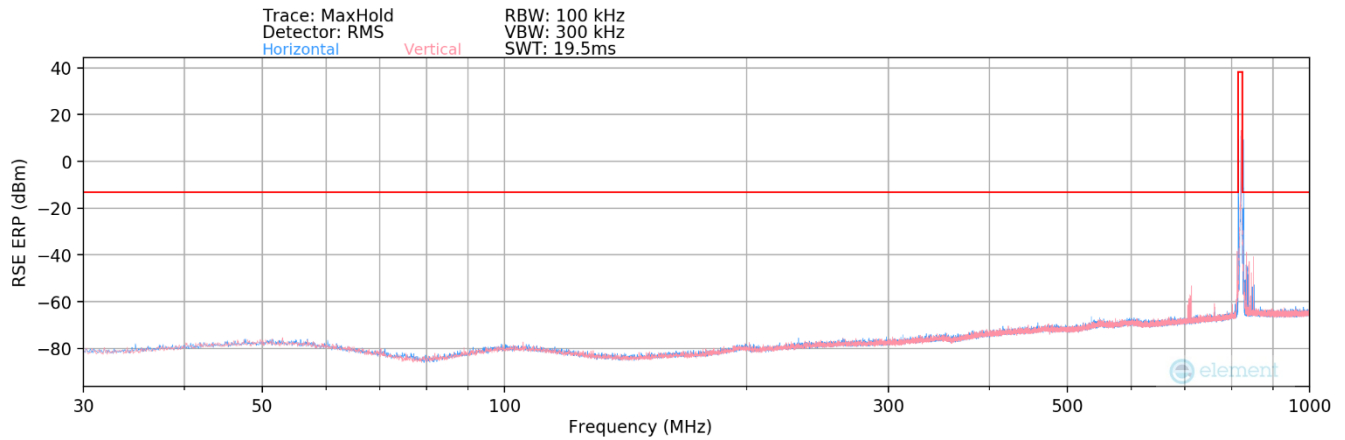


**Test Notes**

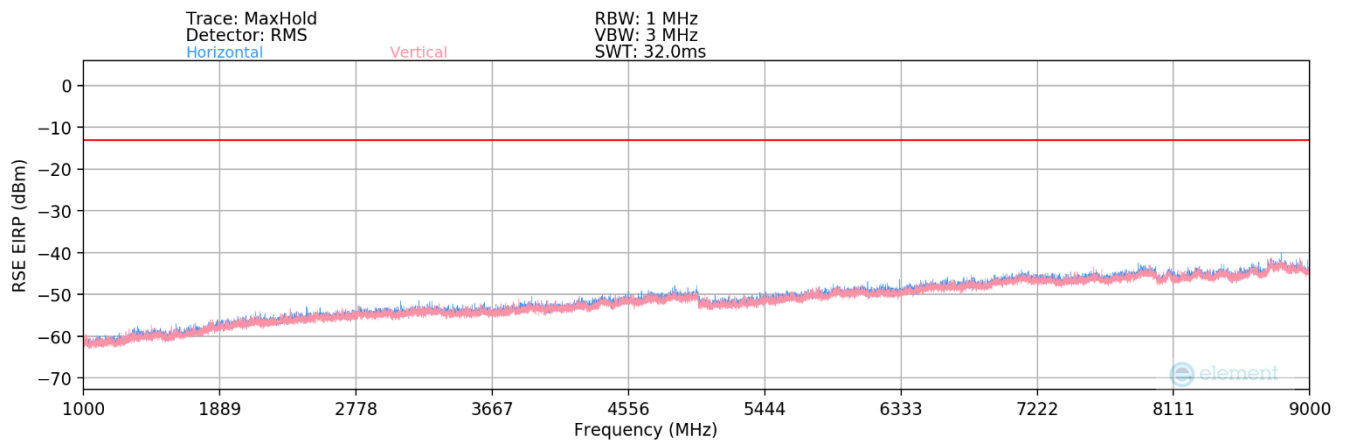
- 1) Field strengths are calculated using the Measurement quantity conversions in ANSI C63.26-2015 Section 5.2.7:
  - a)  $E(\text{dB}\mu\text{V}/\text{m}) = \text{Measured amplitude level (dBm)} + 107 + \text{Cable Loss (dB)} + \text{Antenna Factor (dB/m)}$
  - b)  $\text{EIRP (dBm)} = E(\text{dB}\mu\text{V}/\text{m}) + 20\log D - 104.8$ ; where D is the measurement distance in meters.
- 2) The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst-case emissions are reported with the EUT positioning, modulations, RB sizes and offsets, and channel bandwidth configurations shown in the tables below.
- 3) This unit was tested with its standard battery.
- 4) The spectrum is measured from 9kHz to the 10th harmonic of the fundamental frequency of the transmitter. The worst-case emissions are reported.
- 5) Emissions below 18GHz were measured at a 3-meter test distance while emissions above 18GHz were measured at a 1-meter test distance with the application of a distance correction factor.
- 6) The "-" shown in the following RSE tables are used to denote a noise floor measurement.

<b>FCC ID:</b> A3LSMS918JPN	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2212080137-18-R1.A3L	<b>Test Dates:</b> 9/8/2022 – 12/14/2022	<b>EUT Type:</b> Portable Handset	Page 33 of 38

## LTE Band 26



Plot 7-22. Radiated Spurious Plot (LTE Band 26 – Below 1GHz)



Plot 7-23. Radiated Spurious Plot (LTE Band 26 – Above 1GHz)

FCC ID: A3LSMS918JPN	<b>MEASUREMENT REPORT (CERTIFICATION)</b>		Approved by: Technical Manager
Test Report S/N: 1M2212080137-18-R1.A3L	Test Dates: 9/8/2022 – 12/14/2022	EUT Type: Portable Handset	Page 34 of 38



Bandwidth (MHz):	15
Frequency (MHz):	821.5
RB Config (Size / Offset):	1 / 37

Frequency [MHz]	Ant. Pol. [H/V]	Antenna Height [cm]	Turntable Azimuth [degree]	Analyzer Level [dBm]	AFCL [dB/m]	Field Strength [dBμV/m]	ERP Spurious Emission Level [dBm]	Limit [dBm]	Margin [dB]
714.57	V	-	-	-81.07	-6.50	19.43	-77.98	-13.00	-64.98

Table 7-4. Radiated Spurious Data (LTE Band 26 – Mid Channel – Below 1GHz)

Bandwidth (MHz):	15
Frequency (MHz):	821.5
RB Config (Size / Offset):	1 / 37

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]
1643.00	V	-	-	-78.22	0.37	29.15	-66.11	-13.00	-53.11
2464.50	V	-	-	-79.15	4.55	32.40	-62.86	-13.00	-49.86
3286.00	V	-	-	-79.66	6.72	34.06	-61.19	-13.00	-48.19

Table 7-5. Radiated Spurious Data (LTE Band 26 – Mid Channel – Below 1GHz)

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## 7.8 Frequency Stability / Temperature Variation

### Test Overview and Limit

Frequency stability testing is performed in accordance with the guidelines of ANSI C63.26-2015. 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.

***The frequency stability of the transmitter shall be maintained within ±0.00025% (±2.5 ppm) of the center frequency.***

### Test Procedure Used

ANSI C63.26-2015 – Section 5.6

### Test Settings

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

### Test Setup

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

### Test Notes

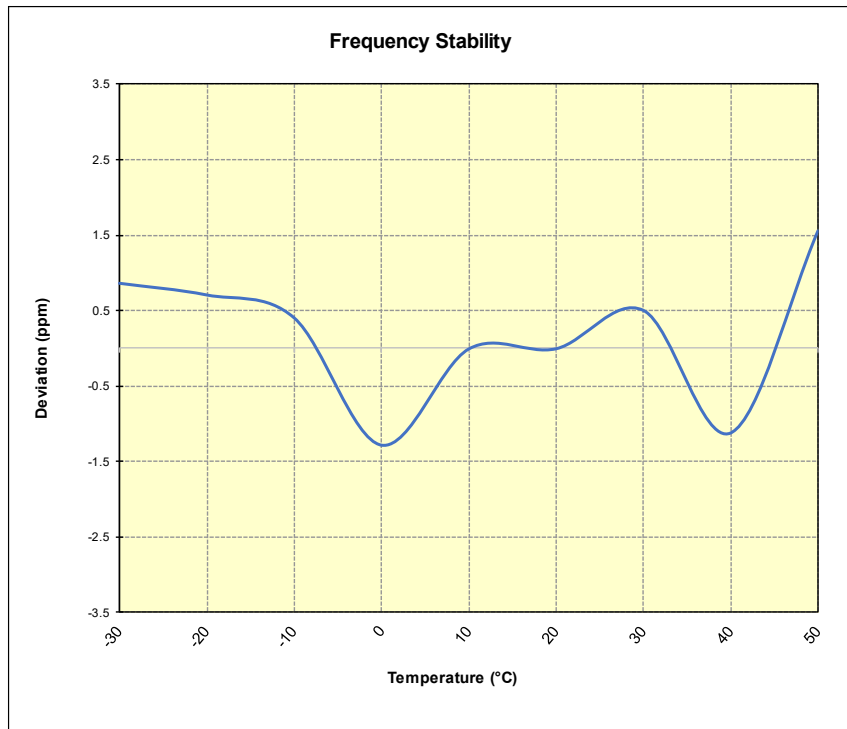
None

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## Frequency Stability / Temperature Variation

LTE Band 26					
		Operating Frequency (Hz):		819,000,000	
		Ref. Voltage (VDC):		4.35	
		Deviation Limit:		± 0.00025% or 2.5 ppm	
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.35	- 30	819,003,389	710	0.0000867
		- 20	819,003,262	583	0.0000712
		- 10	819,003,015	336	0.0000410
		0	819,001,635	-1,044	-0.0001275
		+ 10	819,002,676	-3	-0.0000004
		+ 20 (Ref)	819,002,679	0	0.0000000
		+ 30	819,003,095	416	0.0000508
		+ 40	819,001,767	-912	-0.0001114
Battery Endpoint	3.69	+ 20	819,003,387	708	0.0000864

Table 7-6. LTE Band 26 Frequency Stability Data



Plot 7-24. LTE Band 26 Frequency Stability Chart

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## 8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMS918JPN** complies with all the requirements of Parts 22(H) and 90 of the FCC rules.

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