

MEASUREMENT REPORT FCC Part 22 & 90

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

Date of Testing:
01/03/2022 - 01/26/2022
Test Report Issue Date:
02/09/2022
Test Site/Location:
PCTEST Lab. Yongin-Si, Gyeonggi-do, South Korea
Test Report Serial No.:
1M2112270166-06.A3L

FCC ID: **A3LSMA135U**
APPLICANT: **Samsung Electronics Co., Ltd.**

Application Type: Certification
Model: SM-A135U
Additional Model(s): SM-A135U1, SM-A135U1/DS
EUT Type: Portable Handset
FCC Classification: PCS Licensed Transmitter Held to Ear (PCE)
FCC Rule Part: §2.1049, §22(H), §90(S), §90(R)
Test Procedure(s): ANSI C63.26-2015, ANSI/TIA-603-E-2016, KDB 971168 D01 v03r01

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.



Prepared by



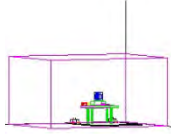
Reviewed by

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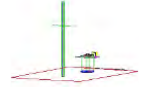
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Mode	Bandwidth	Modulation	Tx Frequency Range [MHz]	Measurement	Max. Power [W]	Max. Power [dBm]	Emission Designator
LTE Band 14	10 MHz	QPSK	793.0	ERP	0.059	17.71	9M00G7D
		16QAM	793.0	ERP	0.044	16.46	9M03W7D
	5 MHz	QPSK	790.5 - 795.5	ERP	0.058	17.61	4M53G7D
		16QAM	790.5 - 795.5	ERP	0.045	16.48	4M53W7D
LTE Band 26	15 MHz	QPSK	821.5	ERP	0.103	20.11	13M5G7D
		16QAM	821.5	ERP	0.082	19.15	13M5W7D
	15 MHz	QPSK	821.5	Conducted	0.271	24.33	13M5G7D
		16QAM	821.5	Conducted	0.208	23.18	13M5W7D
	10 MHz	QPSK	819.0	Conducted	0.260	24.15	9M02G7D
		16QAM	819.0	Conducted	0.200	23.01	9M01W7D
	5 MHz	QPSK	816.5 - 821.5	Conducted	0.256	24.08	4M56G7D
		16QAM	816.5 - 821.5	Conducted	0.201	23.04	4M54W7D
	3 MHz	QPSK	815.5 - 822.5	Conducted	0.256	24.09	2M72G7D
		16QAM	815.5 - 822.5	Conducted	0.198	22.96	2M72W7D
	1.4 MHz	QPSK	814.7 - 823.3	Conducted	0.252	24.02	1M10G7D
		16QAM	814.7 - 823.3	Conducted	0.195	22.91	1M10W7D

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 PCTEST Test Location

These measurement tests were conducted at the PCTEST facility located at 13, Heungdeok 1-ro, Giheung-gu, Yongin-si, Gyeonggi-do, 16954, South Korea. The measurement facility is compliant with the test site requirements specified in ANSI C63.4-2014.

1.3 Test Facility / Accreditations

Measurements were performed at PCTEST located in Yongin-si, Gyeonggi-do, 16954, South Korea.

- PCTEST is an ISO 17025-2017 accredited test facility under the National Voluntary Laboratory Accreditation Program (NVLAP) with Certificate number 600143-0 for Specific Absorption Rate (SAR), where applicable, and Electromagnetic Compatibility (EMC) testing for FCC and Innovation, Science, and Economic Development Canada rules.
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC 17065-2012 by A2LA (Certificate number 2041.03) in all scopes of FCC Rules and ISED Standards (RSS).
- PCTEST facility is a registered (26168) test laboratory with the site description on file with ISED.

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2.0 PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the **Samsung Portable Handset FCC ID: A3LSMA135U**. 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.

Test Device Serial No.: 0336M, 0436M, 0444M, 0736M, 0764M, 0767M, 0874M, 4500M

2.2 Device Capabilities

This device contains the following capabilities:

850/1900 GSM/GPRS/EDGE, 850/1900 WCDMA/HSPA, Multi-band LTE, 802.11b/g/n WLAN, 802.11a/n/ac UNII (5GHz), BT (1x, EDR, LE), NFC

2.3 Test Configuration

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

2.4 EMI Suppression Device(s)/Modifications

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

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3.0 DESCRIPTION OF TESTS

3.1 Evaluation Procedure

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

3.2 Radiated Power and Radiated Spurious Emissions

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

The equipment under test was transmitting while connected to its integral antenna and is placed on a wooden turntable 80cm above the ground plane and 3 meters from the receive antenna. The receive antenna height is adjusted between 1 and 4 meter height, the turntable is rotated through 360 degrees, and the EUT is manipulated through all orthogonal planes representative of its typical use to achieve the highest reading on the receive spectrum analyzer. Radiated power levels are also investigated with the receive antenna horizontally and vertically polarized. The maximized power level is recorded using the spectrum analyzer “Channel Power” function with the integration band set to the emissions’ occupied bandwidth, a RMS detector, RBW = 100kHz, VBW = 300kHz, and a 1 second sweep time over a minimum of 10 sweeps, per the guidelines of KDB 971168 D01 v03r01.

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

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

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

For fundamental radiated power measurements, the guidance of KDB 971168 D01 v03r01 is used to record the EUT power level that is subsequently matched via the aforementioned substitution method given in ANSI/TIA-603-E-2016.

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.

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4.0 MEASUREMENT UNCERTAINTY

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

Contribution	Expanded Uncertainty (\pm dB)
Conducted Bench Top Measurements	1.20
Radiated Disturbance (<1GHz)	3.01
Radiated Disturbance (>1GHz)	5.56
Radiated Disturbance (>18GHz)	3.16

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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
Agilent	E5515C	WIRELESS COMMUNICATION TEST SET	2021-02-19	Annual	2022-02-18	MY50262130
Agilent	N9030A	PXA Signal Analyzer	2021-07-06	Annual	2022-07-05	MY49432391
Anritsu	S820E	Cable and Antenna Analyzer	2021-07-07	Annual	2022-07-06	6201300731
Anritsu	MA24106A	USB Power Sensor	2021-07-07	Annual	2022-07-06	1244512
Com-Power	AL-130	9kHz - 30MHz Loop Antenna	2020-10-29	Biennial	2022-10-28	10160045
Com-Power	PAM-118A	Preamplifier	2021-07-07	Annual	2022-07-06	551042
Espec	SH-242	Environmental Chamber	2021-09-15	Annual	2022-09-14	93011064
Fairview Microwave	FM2CP1122-10	Coupler	2021-07-07	Annual	2022-07-06	1946
Keysight Technologies	N9030B	MXA Signal Analyzer	2021-05-11	Annual	2022-05-10	MY57142018
Mini Circuits	ZUDC10-83-S+	Coupler	2021-09-15	Annual	2022-09-14	2111
Mini-Circuits	BW-N10W5+	Attenuator	2021-07-06	Annual	2022-07-05	1607
Mini-Circuits	BW-N10W5+	Attenuator	2021-07-06	Annual	2022-07-05	1607
Rohde & Schwarz	SMBV100B	Signal Generator	2021-11-04	Annual	2022-11-03	101568
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2021-07-06	Annual	2022-07-05	116851
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2021-02-19	Annual	2022-02-18	131453
Rohde & Schwarz	ESW	EMI Test Receiver	2021-07-06	Annual	2022-07-05	101761
Rohde & Schwarz	SFUNIT-Rx	Shielded Filter Unit	2021-02-19	Annual	2022-02-18	102131
Schwarzbeck	VULB9162	Broadband TRILOG Antenna	2021-07-13	Biennial	2023-07-12	9162-217
Schwarzbeck	UHA9105	Dipole Antenna	2020-07-09	Biennial	2022-07-08	91052522
Sunol	DRH-118	Horn Antenna	2021-07-14	Biennial	2023-07-13	A102416-1
Sunol	DRH-118	Horn Antenna	2021-01-12	Biennial	2023-01-11	A060215

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.

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6.0 SAMPLE CALCULATIONS

Emission Designator

QPSK Modulation

Emission Designator = 8M62G7D

LTE BW = 8.62 MHz

G = Phase Modulation

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

QAM Modulation

Emission Designator = 8M45W7D

LTE BW = 8.45 MHz

W = Amplitude/Angle Modulated

7 = Quantized/Digital Info

D = Data transmission, telemetry, telecommand

Spurious Radiated Emission – LTE Band

Example: Middle Channel LTE Mode 2nd Harmonic (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).

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7.0 TEST RESULTS

7.1 Summary

Company Name: Samsung Electronics Co., Ltd.
 FCC ID: A3LSMA135U
 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	Occupied Bandwidth	2.1049	N/A	PASS	Section 7.2
	Conducted Band Edge / Spurious Emissions (LTE Band 14)	2.1051, 90.543(c)(e)	On all frequencies between 769-775 MHz and 799-805 MHz, attenuation by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations. On any frequency between 775-788 MHz, above 805 MHz, and below 758 MHz, attenuation by at least $43 + 10 \log(P)$ dB > $43 + 10 \log_{10}(P[\text{Watts}])$ for all out-of-band emissions outside of those specified in 90.543(e)	PASS	Sections 7.3, 7.4
	Conducted Band Edge / Spurious Emissions (LTE Band 26)	2.1051, 90.691(a)	> $43 + 10 \log_{10}(P[\text{Watts}])$ for all out-of-band emissions except emissions beyond 37.5kHz from the block edge > $50 + 10 \log_{10}(P[\text{Watts}])$ at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge	PASS	Sections 7.3, 7.4
	Frequency Stability	2.1055, 90.213	< 2.5 ppm	PASS	Section 7.8
	Conducted Power	2.1046, 90.635	< 100 Watts	PASS	Section 7.5
RADIATED	Effective Radiated Power (LTE Band 14)	90.542(a)(7)	< 3 Watts max. ERP	PASS	Section 7.6
	Effective Radiated Power (LTE Band 26)	22.913(a)(2)	< 7 Watts max. ERP	PASS	Section 7.6
	Radiated Spurious Emissions (LTE Band 14)	2.1053, 90.543(e)(f)	> $43 + 10 \log_{10}(P[\text{Watts}])$ for all out-of-band emissions except emissions in the 1559 - 1610MHz band are subject to a limit of -40dBm/MHz for wideband signals	PASS	Section 7.7
	Radiated Spurious Emissions (LTE Band 26)	2.1053, 90.691(a)	> $43 + 10 \log_{10}(P[\text{Watts}])$ for all out-of-band emissions except emissions beyond 37.5kHz from the block edge > $50 + 10 \log_{10}(P[\text{Watts}])$ at Band Edge and for all out-of-band emissions within 37.5kHz of Block Edge	PASS	Section 7.7

Table 7-1. Summary of Test Results

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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 PCTEST EMC Software Tool v1.0.
- 5) For LTE B14 conducted spurious emissions, automated test software was used to measure emissions and capture the corresponding plots necessary to show compliance. The measurement software utilized is PCTEST “LTE Automation,” Version.5.3.

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7.2 Occupied Bandwidth

Test Overview

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

Test Procedure Used

KDB 971168 D01 v03r01 – Section 4.2

Test Settings

1. The signal analyzer’s automatic bandwidth measurement capability was used to perform the 99% occupied bandwidth and the 26dB bandwidth. The bandwidth measurement was not influenced by any intermediate power nulls in the fundamental emission.
2. RBW = 1 – 5% of the expected OBW
3. VBW \geq 3 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.

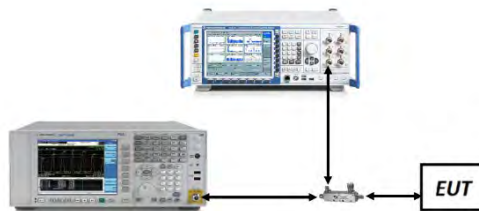


Figure 7-1. Test Instrument & Measurement Setup

Test Notes

None.

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LTE Band 14



Plot 7-2. Occupied Bandwidth Plot (LTE Band 14 - 10MHz 16-QAM - Full RB)

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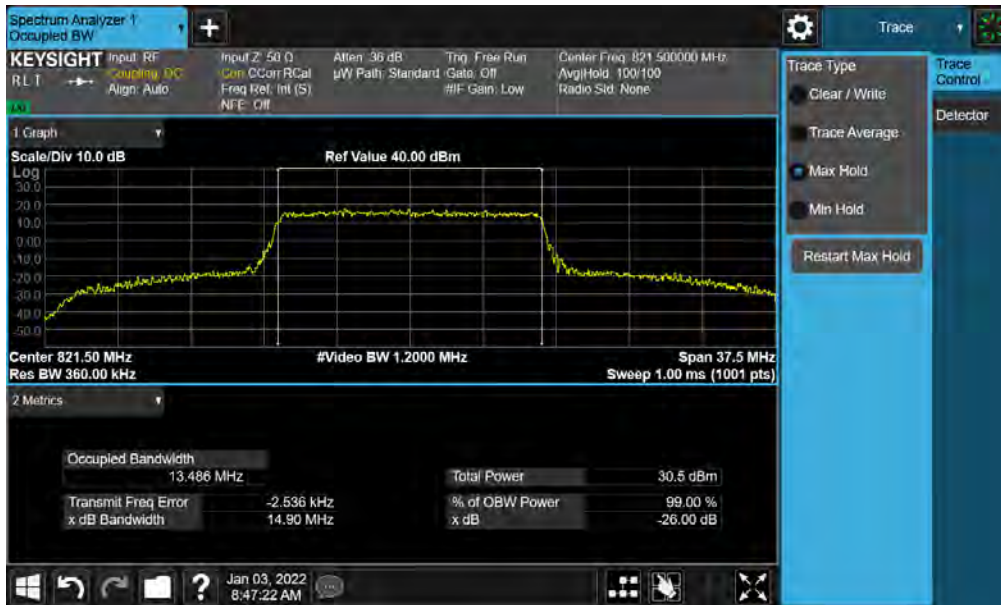
Plot 7-3. Occupied Bandwidth Plot (LTE Band 14 - 5MHz QPSK - Full RB)



Plot 7-4. Occupied Bandwidth Plot (LTE Band 14 - 5MHz 16-QAM - Full RB)

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LTE Band 26



Plot 7-5. Occupied Bandwidth Plot (LTE Band 26 - 15MHz QPSK - Full RB)



Plot 7-6. Occupied Bandwidth Plot (LTE Band 26 - 15MHz 16-QAM - Full RB)

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



Plot 7-8. Occupied Bandwidth Plot (LTE Band 26 - 10MHz 16-QAM - Full RB)

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Plot 7-9. Occupied Bandwidth Plot (LTE Band 26 - 5MHz QPSK - Full RB)



Plot 7-10. Occupied Bandwidth Plot (LTE Band 26 - 5MHz 16-QAM - Full RB)

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Plot 7-11. Occupied Bandwidth Plot (LTE Band 26 - 3MHz QPSK - Full RB)



Plot 7-12. Occupied Bandwidth Plot (LTE Band 26 - 3MHz 16-QAM - Full RB)

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Plot 7-13. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz QPSK - Full RB)



Plot 7-14. Occupied Bandwidth Plot (LTE Band 26 - 1.4MHz 16-QAM - Full RB)

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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

KDB 971168 D01 v03r01 – Section 6.0

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 = trace average for continuous emissions, max hold for pulse emissions
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.

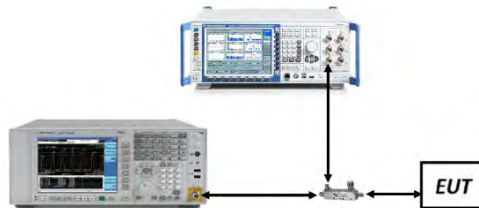


Figure 7-2. Test Instrument & Measurement Setup

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 20 of 48

LTE Band 14



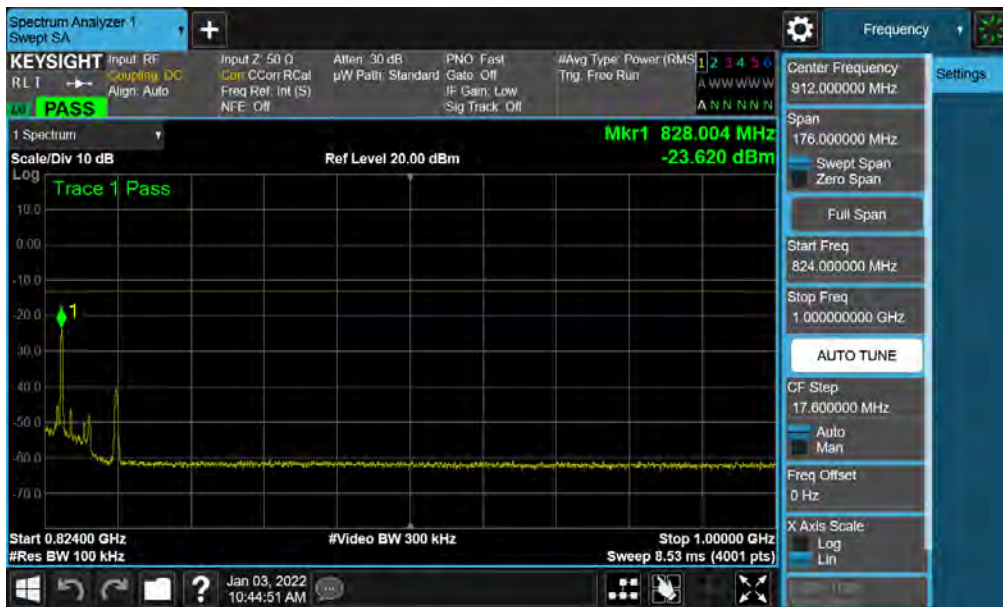
FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset	Page 21 of 48



Plot 7-17. Conducted Spurious Plot (LTE Band 14 - 10MHz QPSK - RB Size 1, RB Offset 0)

<p>FCC ID: A3LSMA135U</p>		<p>MEASUREMENT REPORT (CERTIFICATION)</p>	<p>Approved by: Technical Manager</p>
<p>Test Report S/N: 1M2112270166-06.A3L</p>	<p>Test Dates: 01/03/2022 - 01/26/2022</p>	<p>EUT Type: Portable Handset</p>	<p>Page 22 of 48</p>

LTE Band 26



FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 23 of 48



Plot 7-20. Conducted Spurious Plot (LTE Band 26 - 15MHz QPSK - RB Size 1, RB Offset 0)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 24 of 48

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 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.

For LTE Band 14 operation under Part 90.543, the power of any emission must be reduced below the mean output power (P) by at least $43 + 10\log(P)$ dB measured in a 100 kHz bandwidth for frequencies less than 1 GHz, and in a 1 MHz bandwidth for frequencies greater than 1 GHz.

Additionally, for LTE Band 14 operation, on all frequencies between 769-775 MHz and 799-805 MHz, the power of any emission shall be attenuated by a factor not less than $65 + 10 \log(P)$ dB in a 6.25 kHz band segment, for mobile and portable stations.

Test Procedure Used

KDB 971168 D01 v03r01 – Section 6.0

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.

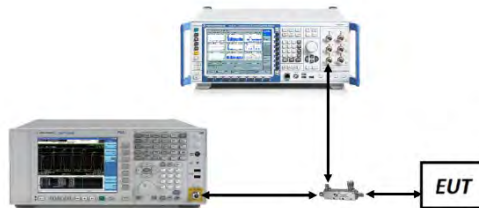


Figure 7-3. Test Instrument & Measurement Setup

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 25 of 48

Test Notes

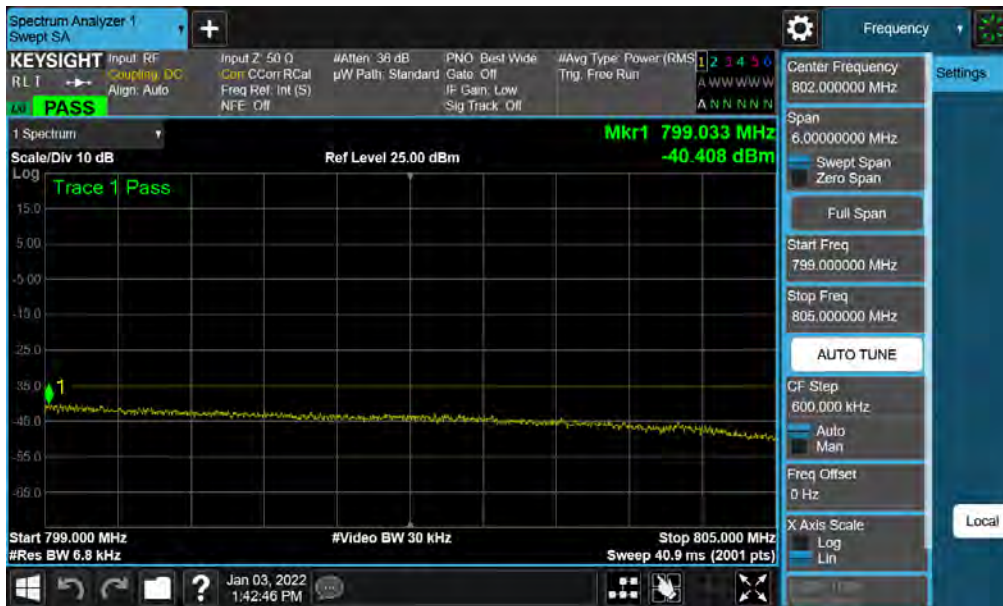
Per 22.917(b) in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed to demonstrate compliance with the out-of-band emissions limit. The emission 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.

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset	Page 26 of 48

LTE Band 14



FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 27 of 48



FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 28 of 48

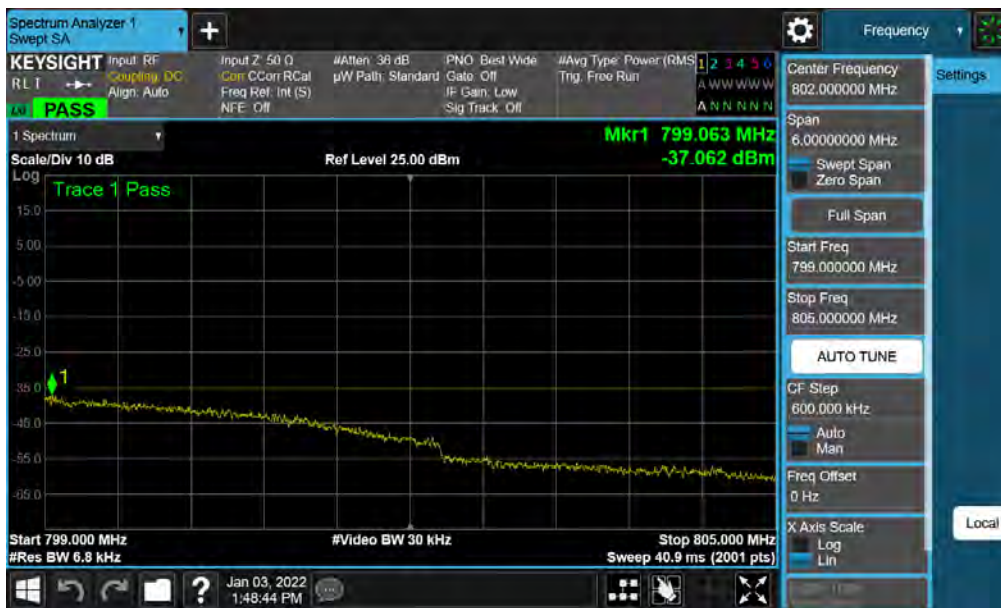


Plot 7-25. Lower Band Edge Plot (LTE Band 14, 5MHz QPSK - RB Size 25)



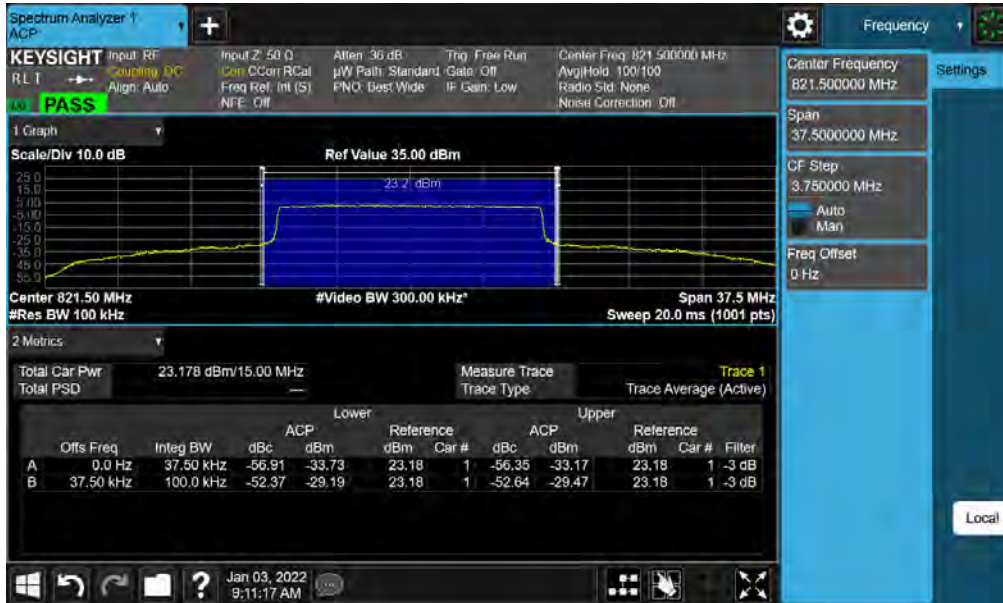
Plot 7-26. Lower Emission Mask Plot (LTE Band 14, 5MHz QPSK - RB Size 25)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 29 of 48



FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 30 of 48

LTE Band 26

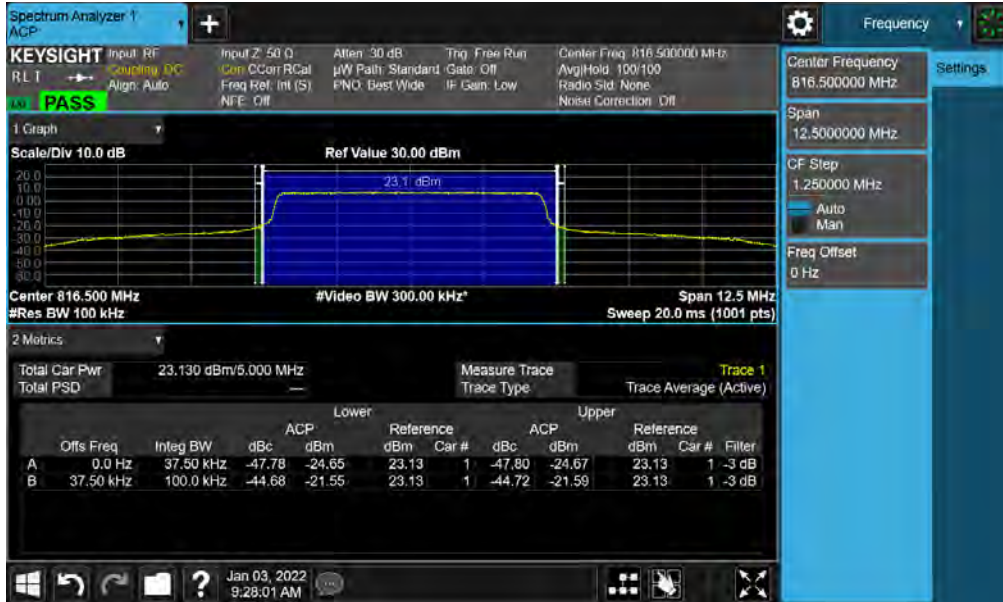


Plot 7-29. Channel Edge Plot (LTE Band 26 - 15MHz QPSK - Mid Channel)



Plot 7-30. Channel Edge Plot (LTE Band 26 - 10MHz QPSK - Mid Channel)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset	Page 31 of 48

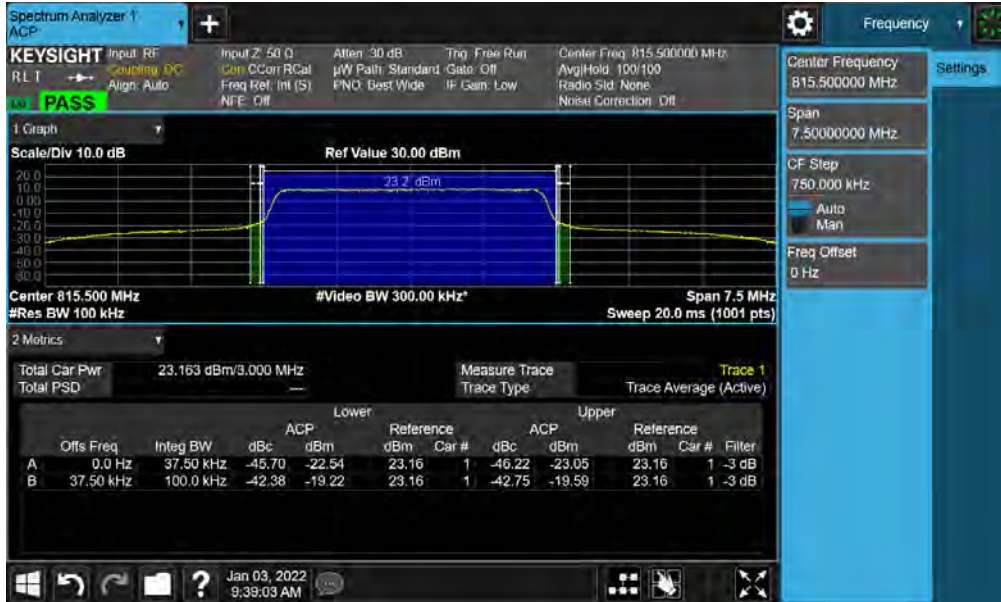


Plot 7-31. Channel Edge Plot (LTE Band 26 - 5MHz QPSK - Low Channel)



Plot 7-32. Channel Edge Plot (LTE Band 26 - 5MHz QPSK - High Channel)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 32 of 48



Plot 7-33. Channel Edge Plot (LTE Band 26 - 3MHz QPSK - Low Channel)



Plot 7-34. Channel Edge Plot (LTE Band 26 - 3MHz QPSK - High Channel)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 33 of 48



Plot 7-35. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - Low Channel)



Plot 7-36. Channel Edge Plot (LTE Band 26 - 1.4MHz QPSK - High Channel)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 34 of 48

7.5 Conducted Power Output Data

\$2.1046 \$2.1046 \$90.635

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.

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 / 0	24.33	0.271	50.00	-25.67
	16-QAM	26765	821.5	1 / 0	23.18	0.208	50.00	-26.82
	64-QAM	26765	821.5	1 / 0	21.71	0.148	50.00	-28.29
10 MHz	QPSK	26740	819.0	1 / 25	24.15	0.260	50.00	-25.85
	16-QAM	26740	819.0	1 / 0	23.01	0.200	50.00	-26.99
	64-QAM	26740	819.0	1 / 49	21.68	0.147	50.00	-28.32
5 MHz	QPSK	26715	816.5	1 / 12	24.06	0.255	50.00	-25.94
		26765	821.5	1 / 0	24.08	0.256	50.00	-25.92
	16-QAM	26715	816.5	1 / 12	23.04	0.201	50.00	-26.96
		26765	821.5	1 / 0	22.94	0.197	50.00	-27.06
	64-QAM	26715	816.5	1 / 12	21.87	0.154	50.00	-28.13
		26765	821.5	1 / 12	21.88	0.154	50.00	-28.12
3 MHz	QPSK	26705	815.5	1 / 0	24.09	0.256	50.00	-25.91
		26775	822.5	1 / 14	23.98	0.250	50.00	-26.02
	16-QAM	26705	815.5	1 / 7	22.96	0.198	50.00	-27.04
		26775	822.5	1 / 0	22.78	0.190	50.00	-27.22
	64-QAM	26705	815.5	1 / 7	21.64	0.146	50.00	-28.36
		26775	822.5	1 / 7	21.69	0.148	50.00	-28.31
1.4 MHz	QPSK	26697	814.7	1 / 5	24.02	0.252	50.00	-25.98
		26783	823.3	1 / 0	23.90	0.245	50.00	-26.10
	16-QAM	26697	814.7	1 / 3	22.91	0.195	50.00	-27.09
		26783	823.3	1 / 3	22.84	0.192	50.00	-27.16
	64-QAM	26697	814.7	1 / 0	21.89	0.154	50.00	-28.11
		26783	823.3	1 / 5	21.68	0.147	50.00	-28.32

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

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 35 of 48

7.6 Radiated Power (ERP)

Test Overview

Effective Radiated Power (ERP) measurements are performed using the substitution method described in ANSI/TIA-603-E-2016 with the EUT transmitting into an integral antenna. Measurements on signals operating below 1GHz are performed using vertically and horizontally polarized tuned dipole antennas. All measurements are performed as RMS average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.2.1

ANSI/TIA-603-E-2016 – Section 2.2.17

Test Settings

1. Radiated power measurements are performed using the signal analyzer's "channel power" measurement capability for signals with continuous operation.
2. RBW = 1 – 5% of the expected OBW, not to exceed 1MHz
3. VBW \geq 3 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: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 36 of 48

Test Setup

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

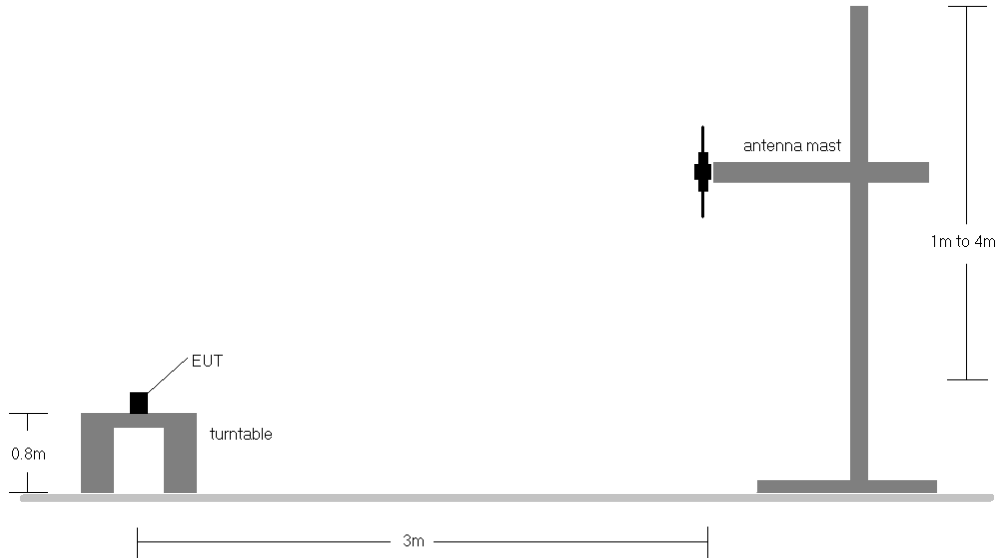


Figure 7-4. Radiated Test Setup <1GHz

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.

<p>FCC ID: A3LSMA135U</p>		<p>MEASUREMENT REPORT (CERTIFICATION)</p>	<p>Approved by: Technical Manager</p>
<p>Test Report S/N: 1M2112270166-06.A3L</p>	<p>Test Dates: 01/03/2022 - 01/26/2022</p>	<p>EUT Type: Portable Handset</p>	<p>Page 37 of 48</p>

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]
10 MHz	QPSK	793.0	V	150	207	1.01	1 / 49	18.85	17.71	0.059	34.77	-17.06
	16-QAM	793.0	V	150	207	1.01	1 / 49	17.60	16.46	0.044	34.77	-18.31
5 MHz	QPSK	790.5	V	150	207	1.02	1 / 0	18.75	17.61	0.058	34.77	-17.16
	QPSK	793.0	V	150	207	1.01	1 / 12	18.67	17.53	0.057	34.77	-17.24
	QPSK	795.5	V	150	207	1.01	1 / 12	18.55	17.41	0.055	34.77	-17.36
	16-QAM	790.5	V	150	207	1.02	1 / 0	17.62	16.48	0.045	34.77	-18.29
10 MHz	QPSK	793.0	H	253	298	1.01	1 / 0	18.07	16.93	0.049	34.77	-17.84

Table 7-3. ERP Data (LTE Band 14)

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]
15 MHz	QPSK	821.5	V	158	203	1.24	1 / 0	21.02	20.11	0.103	38.45	-18.34
	16-QAM	821.5	V	158	203	1.24	1 / 0	20.06	19.15	0.082	38.45	-19.30

Table 7-4. ERP Data (LTE Band 26)

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 38 of 48

7.7 Radiated Spurious Emissions Measurements

Test Overview

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

Test Procedures Used

KDB 971168 D01 v03r01 – Section 5.8

ANSI/TIA-603-E-2016 – Section 2.2.12

Test Settings

1. RBW = 100kHz for emissions below 1GHz and 1MHz for emissions above 1GHz
2. VBW \geq 3 x RBW
3. Span = 1.5 times the OBW
4. No. of sweep points \geq 2 x span / RBW
5. Detector = RMS
6. Trace mode = Average (Max Hold for pulsed emissions)
7. The trace was allowed to stabilize

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset	Page 39 of 48

Test Setup

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

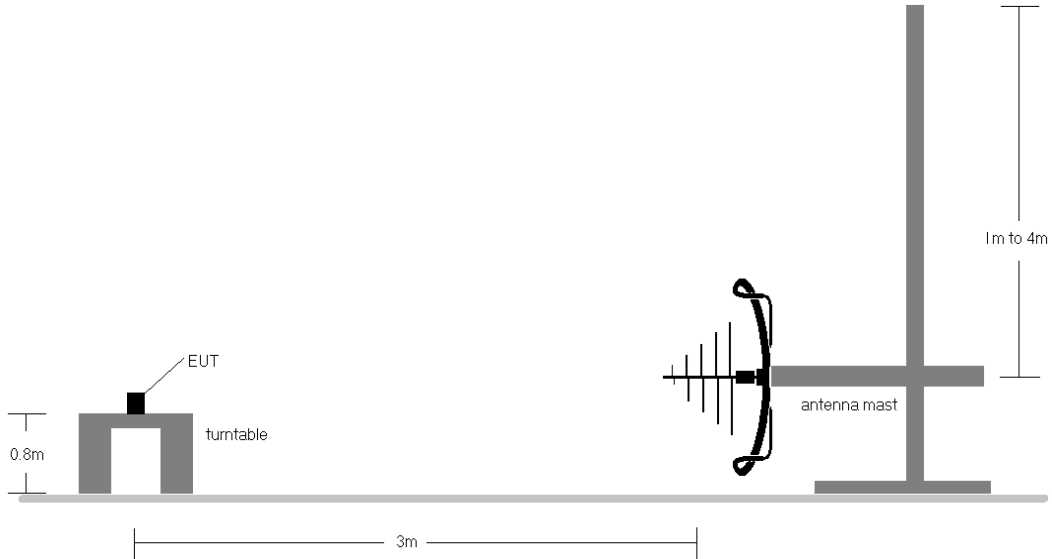


Figure 7-5. Test Instrument & Measurement Setup < 1GHz

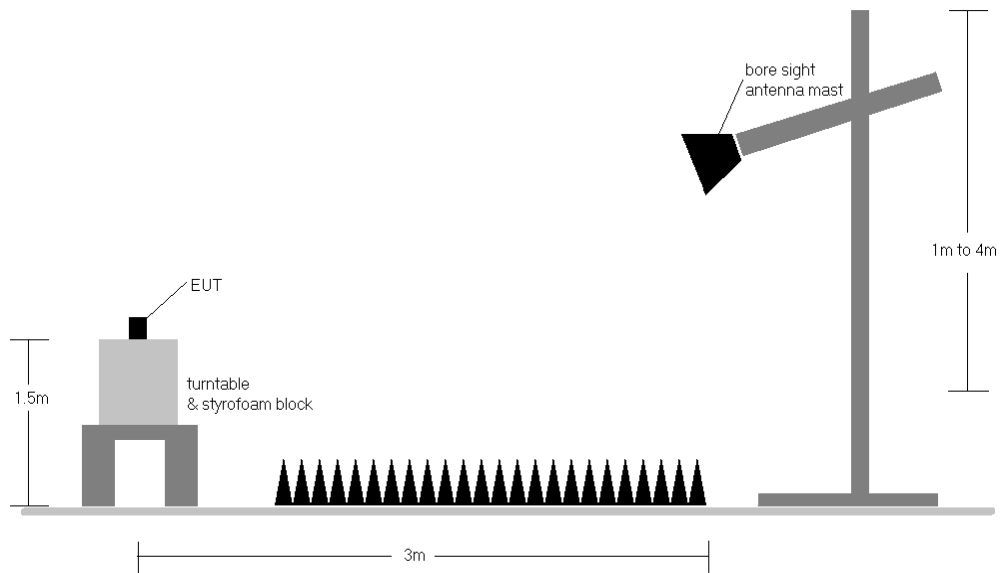


Figure 7-6. Test Instrument & Measurement Setup >1 GHz

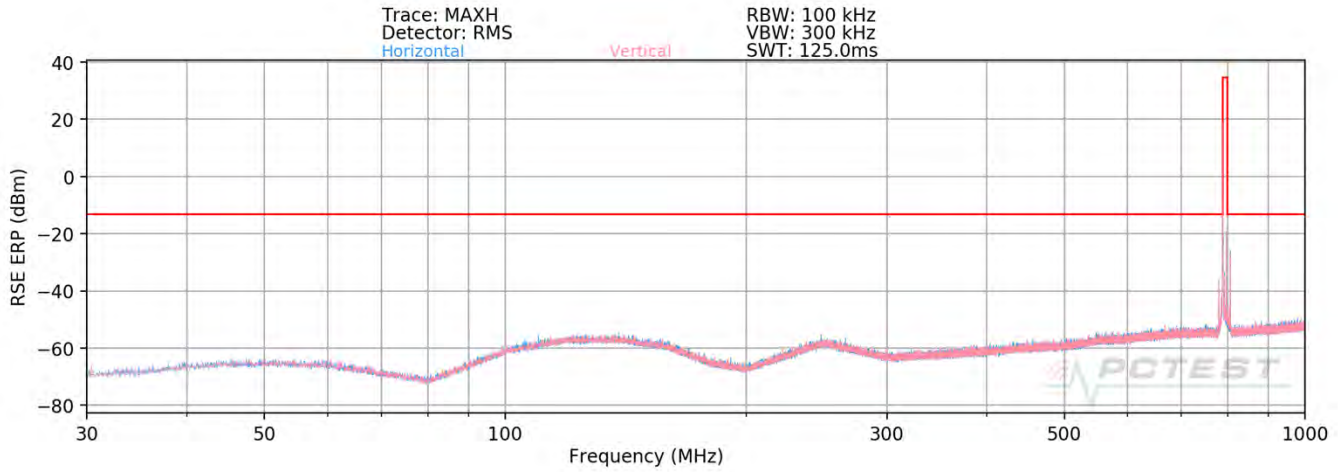
<p>FCC ID: A3LSMA135U</p>		<p>MEASUREMENT REPORT (CERTIFICATION)</p>	<p>Approved by: Technical Manager</p>
<p>Test Report S/N: 1M2112270166-06.A3L</p>	<p>Test Dates: 01/03/2022 - 01/26/2022</p>	<p>EUT Type: Portable Handset</p>	<p>Page 40 of 48</p>

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. The EUT was tested in three orthogonal planes and in all possible test configurations and positioning. The worst case setup is reported in the tables below.
4. The "-" shown in the following RSE tables are used to denote a noise floor measurement.

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset	Page 41 of 48

LTE Band 14



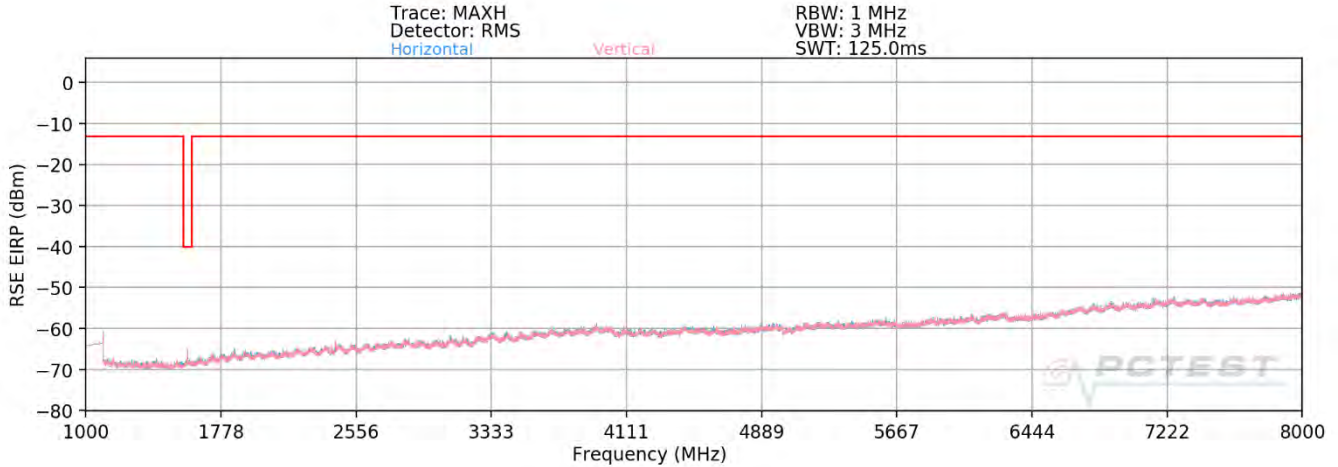
Plot 7-37. Radiated Spurious Plot Below 1GHz (LTE Band 14)

Bandwidth (MHz):	10
Frequency (MHz):	793
RB Config (Size / Offset):	1 / 0

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]
806.22	H	189	292	-65.49	23.92	65.43	-29.83	-13.00	-16.83

Table 7-5. Radiated Spurious Data (LTE Band 14 – Mid Channel)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 42 of 48



Plot 7-38. Radiated Spurious Plot Above 1GHz (LTE Band 14)

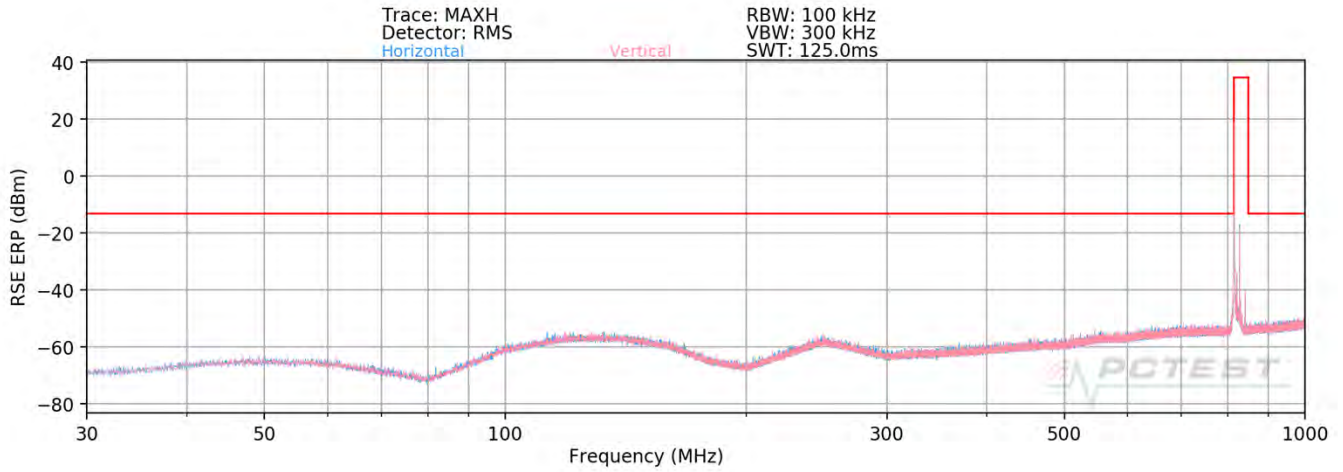
Bandwidth (MHz):	10
Frequency (MHz):	793
RB Config (Size / Offset):	1 / 25

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]
1586.00	H	132	24	-69.87	-8.32	28.81	-66.45	-40.00	-26.45
2379.00	H	-	-	-76.04	-4.62	26.34	-68.92	-13.00	-55.92
3172.00	H	159	50	-74.32	-1.96	30.72	-64.54	-13.00	-51.54
3965.00	H	-	-	-78.55	1.50	29.95	-65.31	-13.00	-52.31
4758.00	H	-	-	-78.68	1.74	30.06	-65.20	-13.00	-52.20
5551.00	H	-	-	-79.32	4.53	32.21	-63.05	-13.00	-50.05

Table 7-6. Radiated Spurious Data (LTE Band 14 – Mid Channel)

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 43 of 48

LTE Band 26



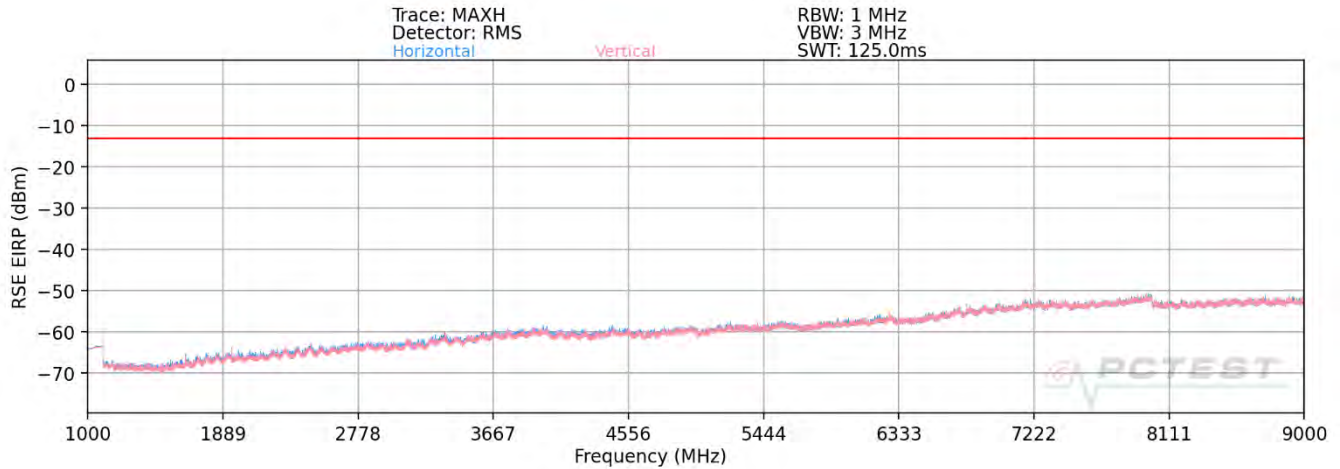
Plot 7-39. Radiated Spurious Plot Below 1GHz (LTE Band 26)

Bandwidth (MHz):	15
Frequency (MHz):	821.5
RB Config (Size / Offset):	1 / 0

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]
841.53	H	102	309	-77.98	24.49	53.51	-41.75	-13.00	-28.75

Table 7-7. Radiated Spurious Data (LTE Band 26 – Mid Channel)

FCC ID: A3LSMA135U	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 44 of 48



Plot 7-40. Radiated Spurious Plot Above 1GHz (LTE Band 26)

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	H	153	26	-71.34	-7.83	27.83	-67.43	-13.00	-54.43
2464.50	H	138	358	-73.94	-4.15	28.91	-66.35	-13.00	-53.35
3286.00	H	107	352	-76.29	-1.05	29.66	-65.60	-13.00	-52.60
4107.50	H	-	-	-77.34	1.10	30.76	-64.49	-13.00	-51.49
4929.00	H	-	-	-78.69	1.93	30.24	-65.01	-13.00	-52.01
5750.50	H	-	-	-79.05	3.70	31.65	-63.61	-13.00	-50.61

Table 7-8. Radiated Spurious Data (LTE Band 26 – Mid Channel)

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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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/TIA-603-E-2016. The frequency stability of the transmitter is measured by:

- a.) **Temperature:** The temperature is varied from -30°C to +50°C in 10°C increments using an environmental chamber.
- b.) **Primary Supply Voltage:** The primary supply voltage is varied from 85% to 115% of the nominal value for non hand-carried battery and AC powered equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating end point which shall be specified by the manufacturer.

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

Test Procedure Used

ANSI/TIA-603-E-2016

Test Settings

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

Test Setup

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

Test Notes

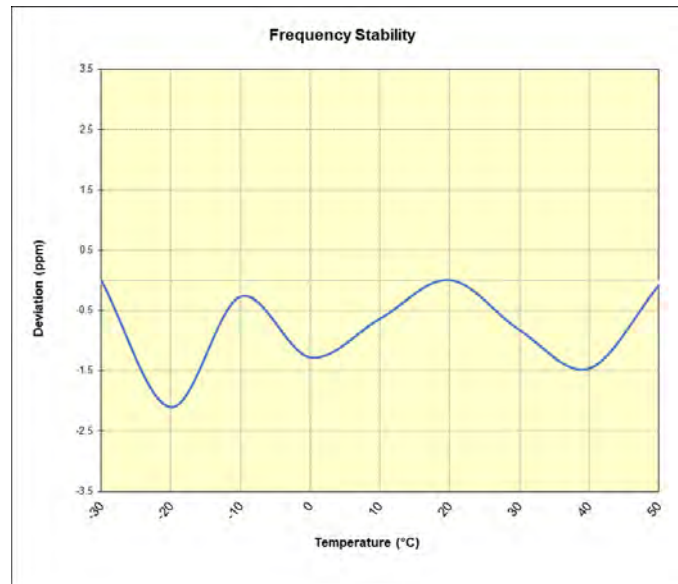
None

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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LTE Band 26

LTE Band 26					
Operating Frequency (Hz):		819,000,000			
Ref. Voltage (VDC):		4.31			
Deviation Limit:		± 0.00025% or 2.5 ppm			
Voltage (%)	Power (VDC)	Temp (°C)	Frequency (Hz)	Freq. Dev. (Hz)	Deviation (%)
100 %	4.31	- 30	819,000,675	0	0.0000000
		- 20	818,998,950	-1,725	-0.0002106
		- 10	819,000,450	-225	-0.0000275
		0	818,999,625	-1,050	-0.0001282
		+ 10	819,000,150	-525	-0.0000641
		+ 20 (Ref)	819,000,675	0	0.0000000
		+ 30	819,000,000	-675	-0.0000824
		+ 40	818,999,475	-1,200	-0.0001465
Battery Endpoint	3.58	+ 20	819,000,225	-450	-0.0000549

Table 7-9. LTE Band 26 Frequency Stability Data



Plot 7-41. LTE Band 26 Frequency Stability Chart

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Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset		Page 47 of 48

8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMA135U** complies with all the requirements of Parts 22(H) and 90 of the FCC rules.

FCC ID: A3LSMA135U		MEASUREMENT REPORT (CERTIFICATION)	 Approved by: Technical Manager
Test Report S/N: 1M2112270166-06.A3L	Test Dates: 01/03/2022 - 01/26/2022	EUT Type: Portable Handset	Page 48 of 48