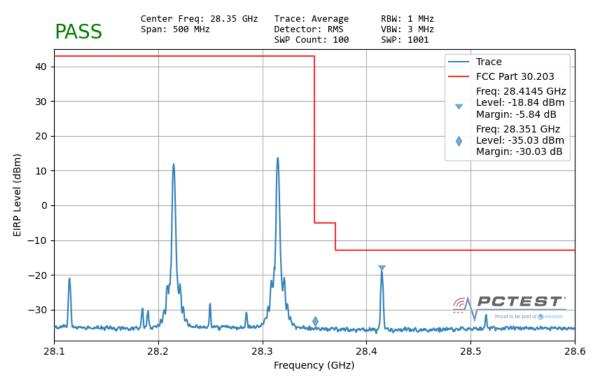


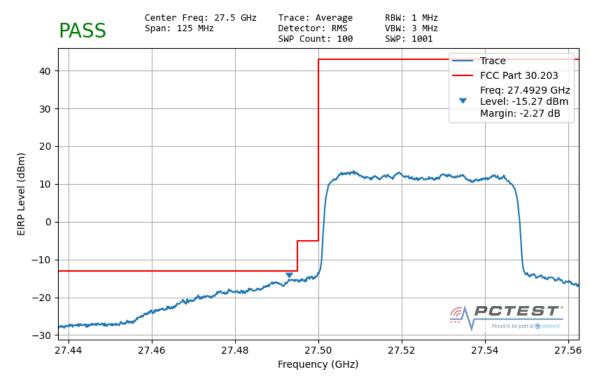
Plot 7-69. Ant 1 Upper Band Edge (100MHz-1CC – QPSK Full RB)



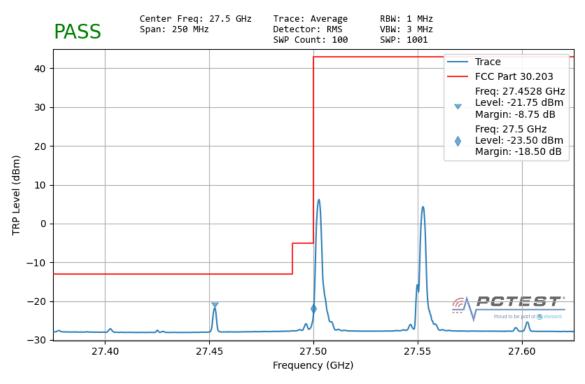
Plot 7-70. Ant 1 Upper Band Edge (100MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|--------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Daga 70 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 79 of 114 |
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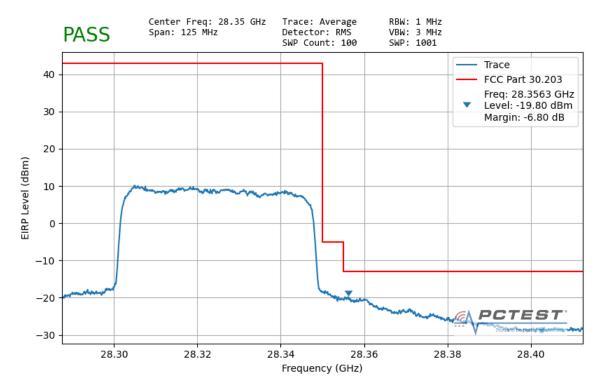
Plot 7-71. Ant 2 Lower Band Edge (50MHz-1CC - QPSK Full RB)



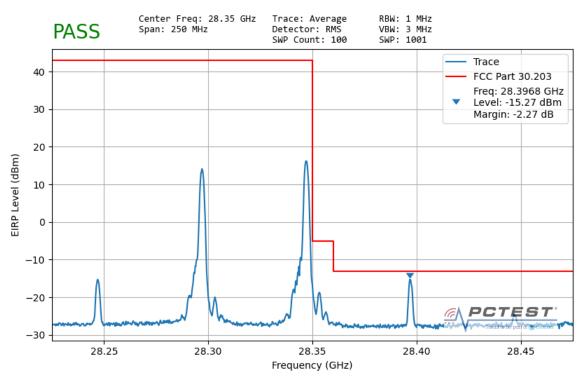
Plot 7-72. Ant 2 Lower Band Edge - TRP (50MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|--------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogg 90 of 444 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 80 of 114 |
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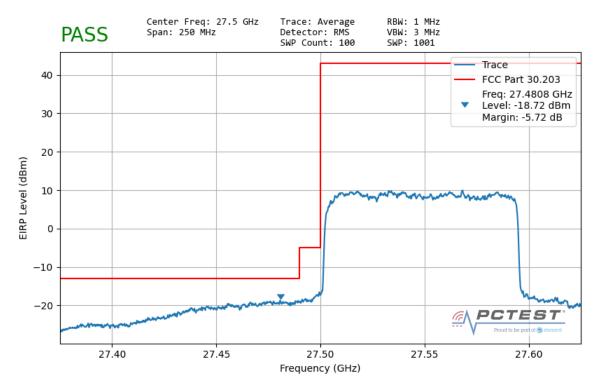
Plot 7-73. Ant 2 Upper Band Edge (50MHz-1CC - QPSK Full RB)



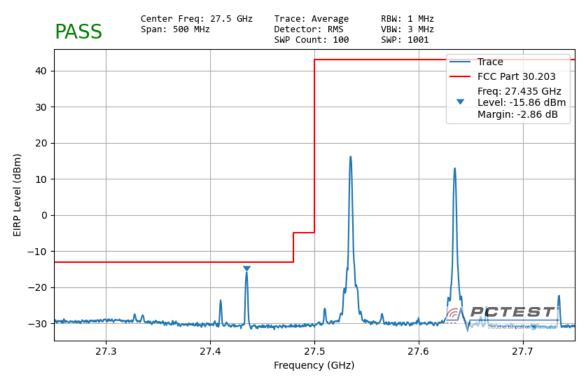
Plot 7-74. Ant 2 Upper Band Edge – (50MHz-2CC – QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Page 81 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 81 01 114 |
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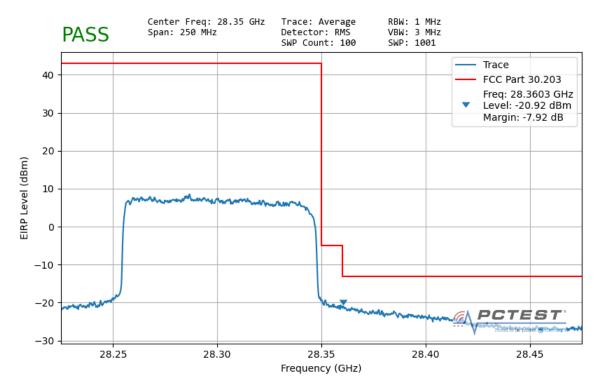
Plot 7-75. Ant 2 Lower Band Edge (100MHz-1CC – QPSK Full RB)



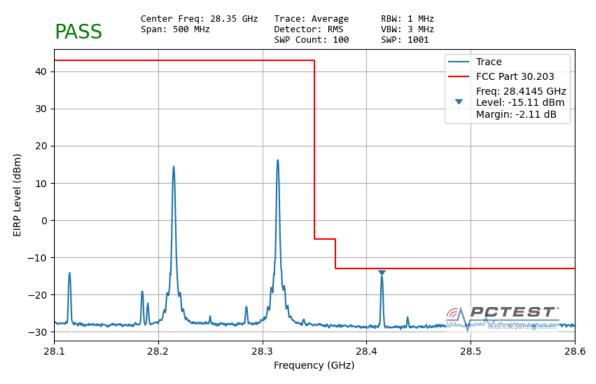
Plot 7-76. Ant 2 Lower Band Edge - (100MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 92 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 82 of 114 |
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Plot 7-77. Ant 2 Upper Band Edge (100MHz-1CC - QPSK Full RB)

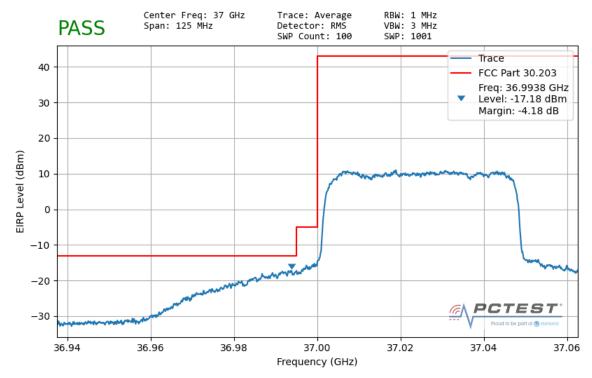


Plot 7-78. Ant 2 Upper Band Edge (100MHz-2CC - QPSK 1 RB)

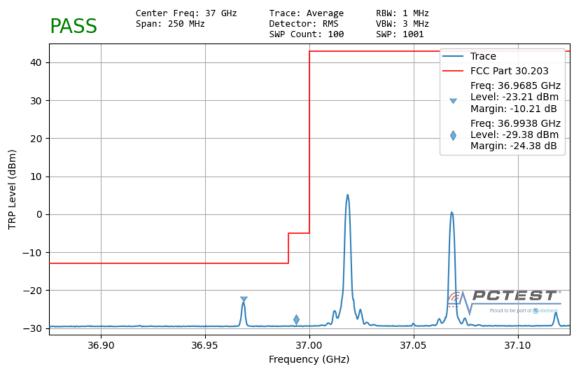
| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|---------------------------------------|---------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Dogo 92 of 444 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 83 of 114 |
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Band n260 - Worst Case - Open



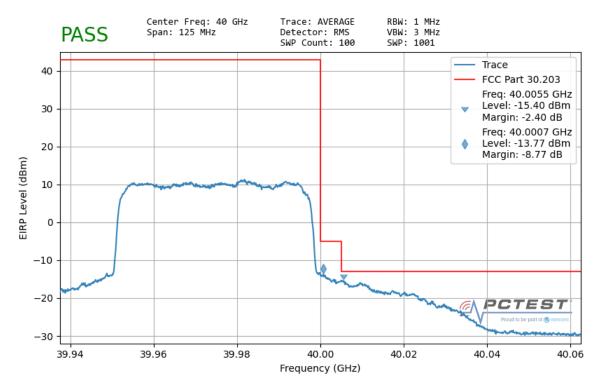
Plot 7-79. Ant 1 Lower Band Edge (50MHz-1CC - QPSK Full RB)



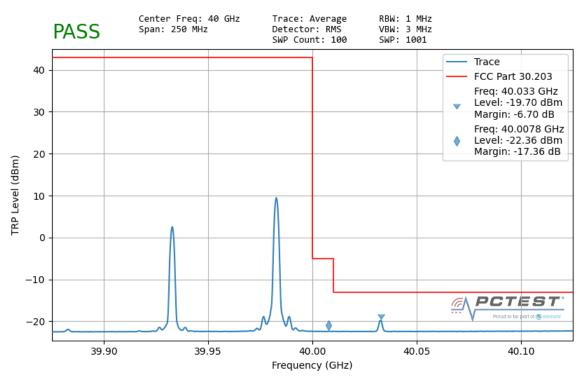
Plot 7-80. Ant 1 Lower Band Edge - TRP (50MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|---------------------------------------|---------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Dogo 94 of 444 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 84 of 114 |
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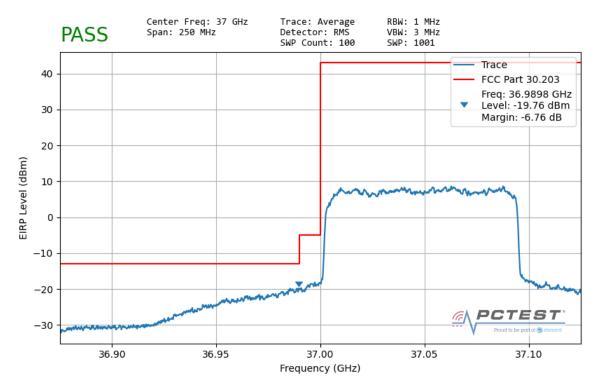
Plot 7-81. Ant 1 Upper Band Edge (50MHz-1CC - QPSK Full RB)



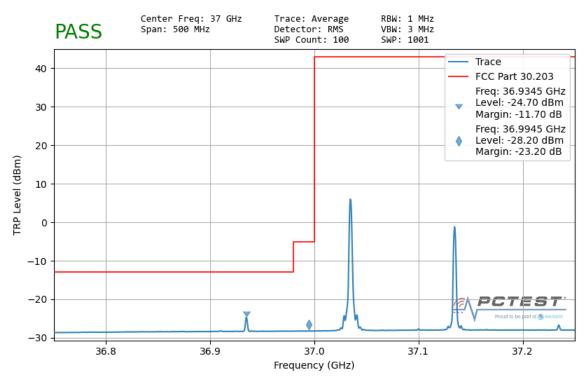
Plot 7-82. Ant 1 Upper Band Edge - TRP (50MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|---------------------------------------|---------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Dogo 05 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 85 of 114 |
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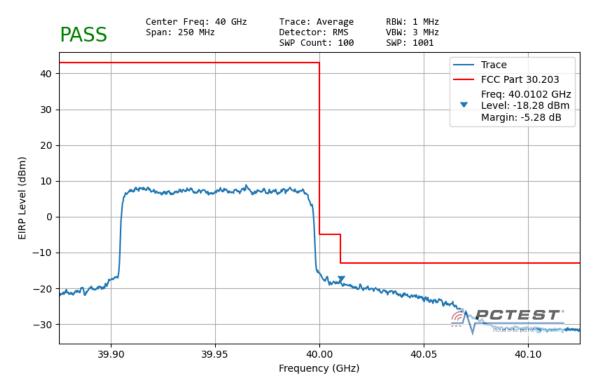
Plot 7-83. Ant 1 Lower Band Edge (100MHz-1CC – QPSK Full RB)



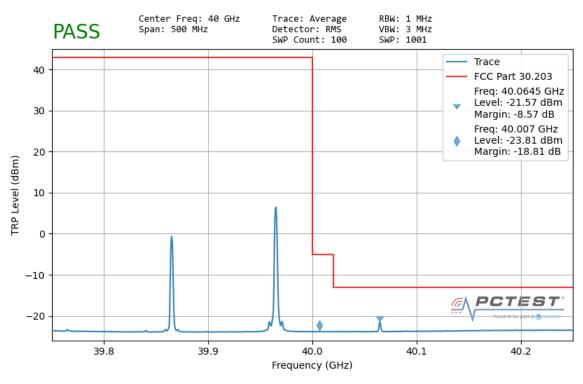
Plot 7-84. Ant 1 Lower Band Edge - TRP (100MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 96 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 86 of 114 |
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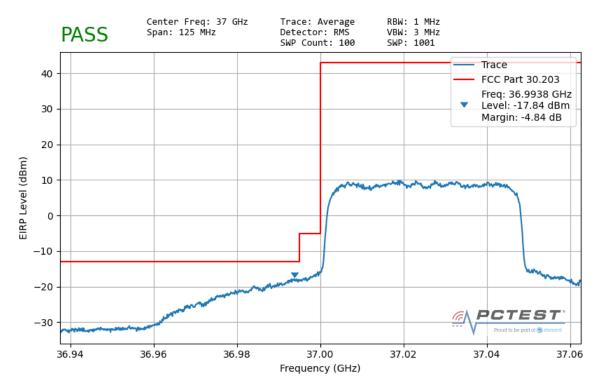
Plot 7-85. Ant 1 Upper Band Edge (100MHz-1CC – QPSK Full RB)



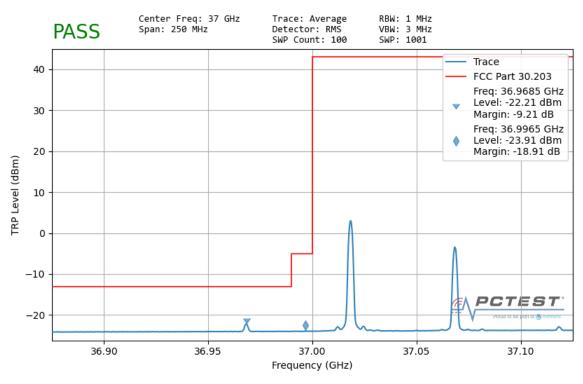
Plot 7-86. Ant 1 Upper Band Edge - TRP (100MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|---------------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 97 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 87 of 114 |





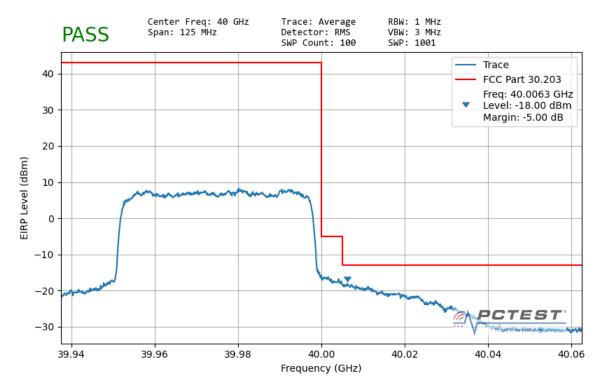
Plot 7-87. Ant 2 Lower Band Edge (50MHz-1CC - QPSK Full RB)



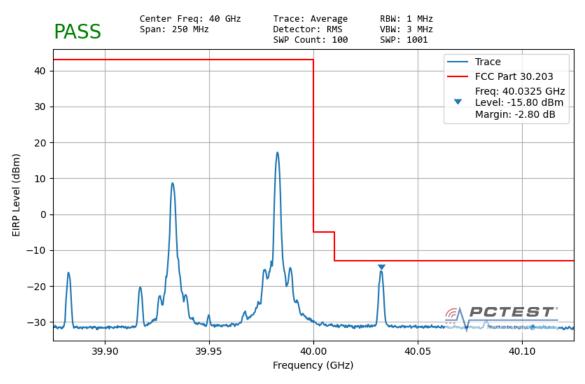
Plot 7-88. Ant 2 Lower Band Edge - TRP (50MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|--------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dags 99 of 444 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 88 of 114 |
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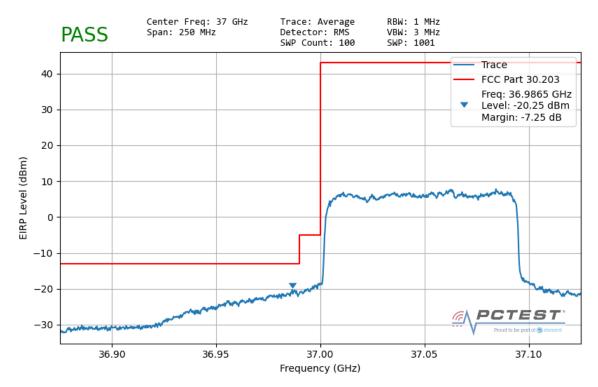
Plot 7-89. Ant 2 Upper Band Edge (50MHz-1CC - QPSK Full RB)



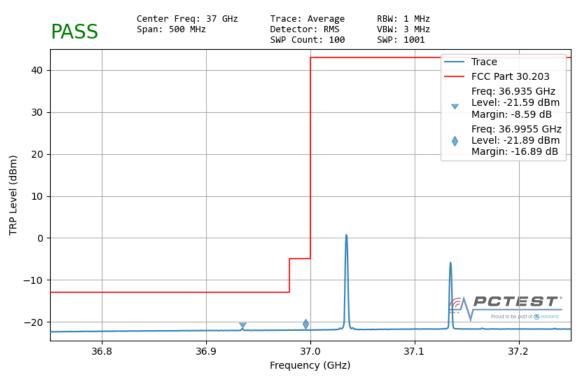
Plot 7-90. Ant 2 Upper Band Edge (50MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|---------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Dags 90 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 89 of 114 |
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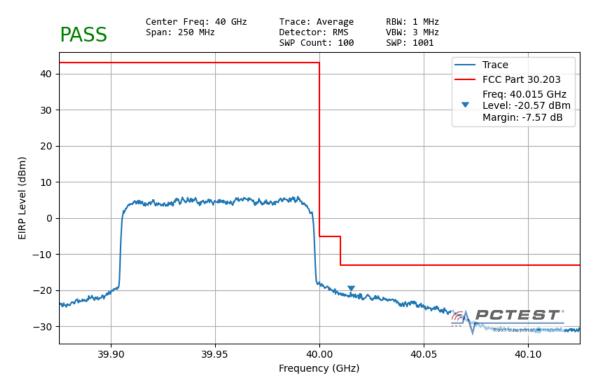
Plot 7-91. Ant 2 Lower Band Edge (100MHz-1CC – QPSK Full RB)



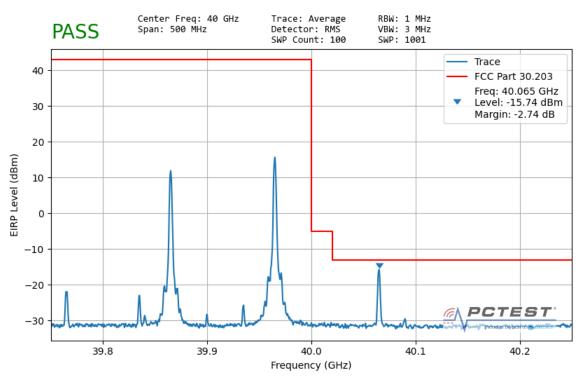
Plot 7-92. Ant 2 Lower Band Edge - TRP (100MHz-2CC - QPSK 1 RB)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dama 00 of 111 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 90 of 114 |
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Plot 7-93. Ant 2 Upper Band Edge (100MHz-1CC - QPSK Full RB)



Plot 7-94. Ant 2 Upper Band Edge (100MHz-2CC - QPSK 1 RB)

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|---------------------|-------------------------------|------------------------------------|--------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dog 01 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 91 of 114 |
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7.6 Frequency Stability / Temperature Variation §2.1055

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.

Test Procedure Used

ANSI C63.5-2015 Section 5.6 KDB 842590 D01 v01r02 Section 4.5

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 placed inside an environmental chamber that uses a foam plug to maintain the temperature condition inside the chamber. The horn antenna measured the frequency of the fundamental signal.

Test Notes

The Frequency Deviation column in the table below is the amount of deviation measured from the center frequency of the Reference measurement (first row).

| FCC ID: A3LSMF711U1 | Proud to be part of element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-----------------------------|------------------------------------|--------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 02 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 92 of 114 |



Frequency Stability Measurements (Band n261) §2.1055

OPERATING FREQUENCY: 27,922,080,000 Hz

CHANNEL: 2077867

REFERENCE VOLTAGE: 4.43 VDC

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|----------------|----------------|-------------------|-------------------|--------------------|------------------|
| 100 % | 4.43 | + 20 (Ref) | 27,922,790,364 | 0 | 0.0000000 |
| 100 % | | - 30 | 27,922,701,713 | 88,651 | 0.0003175 |
| 100 % | | - 20 | 27,922,918,720 | -128,356 | -0.0004597 |
| 100 % | | - 10 | 27,923,025,904 | -235,540 | -0.0008436 |
| 100 % | | 0 | 27,922,936,519 | -146,155 | -0.0005234 |
| 100 % | | + 10 | 27,922,916,436 | -126,072 | -0.0004515 |
| 100 % | | + 20 | 27,922,720,238 | 70,126 | 0.0002511 |
| 100 % | | + 30 | 27,922,667,095 | 123,269 | 0.0004415 |
| 100 % | | + 40 | 27,922,786,365 | 3,999 | 0.0000143 |
| 100 % | | + 50 | 27,921,881,350 | 909,014 | 0.0032555 |
| BATT. ENDPOINT | 3.36 | + 20 | 27,921,645,220 | 1,145,144 | 0.0041012 |

Table 7-55. Frequency Stability Data (n261)

Note:

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

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|---------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Page 93 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 93 01 114 |



Frequency Stability Measurements (Band n261) §2.1055

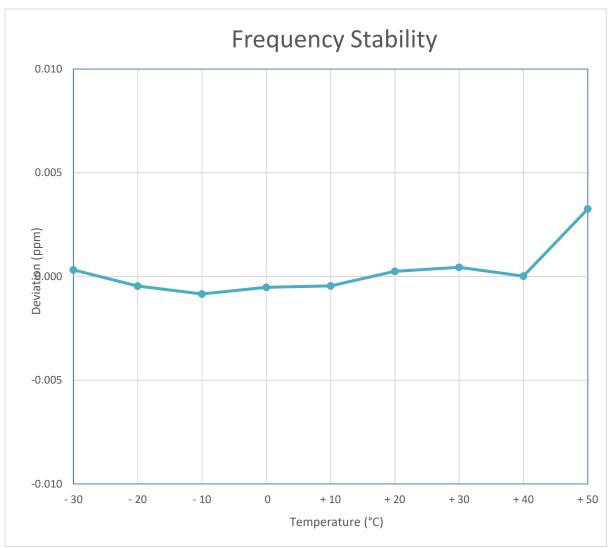


Figure 7-1. Frequency Stability Graph (n261)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|---------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Page 94 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 94 01 114 |



Frequency Stability Measurements (Band n260) §2.1055

OPERATING FREQUENCY: 37,004,280,000 Hz

CHANNEL: 2229237

REFERENCE VOLTAGE: 4.43 VDC

| VOLTAGE (%) | POWER (VDC) | TEMP (°C) | FREQUENCY (Hz) | Freq. Dev. (Hz) | Deviation (%) |
|----------------|----------------|------------------|-------------------|--------------------|------------------|
| 100 % | 4.43 | + 20 (Ref) | 37,003,559,343 | 0 | 0.0000000 |
| 100 % | | - 30 | 37,003,692,652 | -133,309 | -0.0003603 |
| 100 % | | - 20 | 37,003,773,363 | -214,020 | -0.0005784 |
| 100 % | | - 10 | 37,003,666,245 | -106,902 | -0.0002889 |
| 100 % | | 0 | 37,003,111,699 | 447,644 | 0.0012097 |
| 100 % | | + 10 | 37,003,254,211 | 305,132 | 0.0008246 |
| 100 % | | + 20 | 37,003,508,745 | 50,598 | 0.0001367 |
| 100 % | | + 30 | 37,003,104,222 | 455,121 | 0.0012299 |
| 100 % | | + 40 | 37,003,982,666 | -423,323 | -0.0011440 |
| 100 % | | + 50 | 37,003,322,416 | 236,927 | 0.0006403 |
| BATT. ENDPOINT | 3.36 | + 20 | 37,003,528,172 | 31,171 | 0.0000842 |

Table 7-56. Frequency Stability Data (n260)

Note:

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

| FCC ID: A3LSMF711U1 | Proud to be part of element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-----------------------------|------------------------------------|---------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Page 95 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 95 01 114 |



Frequency Stability Measurements (Band n260) §2.1055

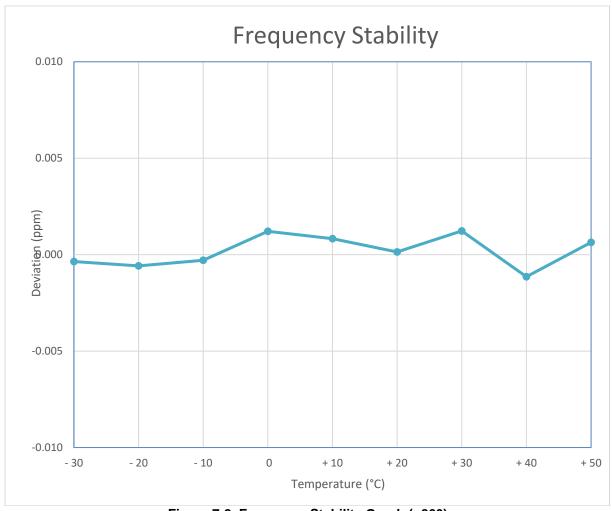


Figure 7-2. Frequency Stability Graph (n260)

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|---------------------------------------|---------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Page 96 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 96 01 114 |

V1.0



8.0 CONCLUSION

The data collected relate only to the item(s) tested and show that the **Samsung Portable Handset FCC ID: A3LSMF711U1** complies with all the requirements of Part 30.

| FCC ID: A3LSMF711U1 | Proud to be part of element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-----------------------------|------------------------------------|--------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 07 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 97 of 114 |



APPENDIX A

VDI Mixer Verification Certificate 9.1



Virginia Diodes, Inc

979 2nd St. SE Suite 309 Charlottesville, VA 22902 Phone: 434-297-3257 Fax: 434-297-3258

Certificate of Conformance

To: PCTEST Engineering Laboratory 7185 Oakland Mills Road Columbia, MD 21046 United States

From: Virginia Diodes, Inc 979 2nd St. SE Suite 309 Charlottesville, VA 22902

Packing List No: 202943 Shipping Date: 08/28/20 Today's Date: 08/28/20 PO Number: 200414.DP2

Quantity

Shipped 1

Description

<u>Unit</u> EΑ

VDIWR19.0SAX-M-M4

WR19SAX-M-M4 / SN: SAX 679

(NIST) and through NIST to the International System of Units (SI).

Order-Job Number 20177A-01

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology

> Authorized Signature Virginia Diodes, Inc

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 09 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 98 of 114 |





Virginia Diodes, Inc

979 2nd St. SE Suite 309 Charlottesville, VA 22902 Phone: 434-297-3257 Fax: 434-297-3258

Certificate of Conformance

To: PCTEST Engineering Laboratory 7185 Oakland Mills Road Columbia, MD 21046 **United States**

From: Virginia Diodes, Inc 979 2nd St. SE Suite 309 Charlottesville, VA 22902

Packing List No: 202695 Shipping Date: 08/12/20 Today's Date: 08/14/20 PO Number: 200414.DP2

Quantity

Shipped <u>Unit</u> Description

EΑ

VDIWR12.0SAX-M-M6 S/N: SAX 680

Order-Job <u>Number</u>

20177B-01

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

> Authorized Signature Virginia Diodes, Inc.

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
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| Test Report S/N: | Test Dates: | EUT Type: | Dogo 00 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 99 of 114 |





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Certificate of Conformance

To: PCTEST Engineering Laboratory 7185 Oakland Mills Road Columbia, MD 21046 **United States**

From: Virginia Diodes, Inc 979 2nd St. SE Suite 309 Charlottesville, VA 22902

Packing List No: 203623 Shipping Date: 10/22/20 Today's Date: 10/22/20 PO Number: 200414.DP2

Quantity

Shipped 1

Description

<u>Unit</u>

EΑ

VDIWR8.0SAX-M-M9 S/N: SAX 681

Order-Job Number

20177C-01

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Virginia Diodes, Inc

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SUNG | Approved by: Technical Manager | |
|---------------------|-------------------------------|------------------------------------|------|-----------------------------------|----|
| Test Report S/N: | Test Dates: | EUT Type: | | Dags 100 of 114 | |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 100 of 114 | |
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979 2nd St. SE Suite 309 Charlottesville, VA 22902 Phone: 434-297-3257 Fax: 434-297-3258

Certificate of Conformance

To: PCTEST Engineering Laboratory 7185 Oakland Mills Road Columbia, MD 21046 **United States**

From: Virginia Diodes, Inc 979 2nd St. SE Suite 309 Charlottesville, VA 22902

Today's Date: 09/24/20 Packing List No: 203281 Shipping Date: 09/24/20 PO Number: 200414.DP2

Quantity

Shipped <u>Unit</u>

Description

1 EΑ

SN: SAX 682.

VDIWR5.1SAX-M-M18

WR5.1SAX-M-M18 - Mini Spectrum Analyzer Extension Module;

Order-Job Number

20177D-01

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

> Authorized Signature Virginia Diodes, Inc

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|---------------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Page 101 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 101 01 114 |



9.2 Test Scope Accreditation

Test Technology:

Emissions



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

PCTEST ENGINEERING LABORATORY, LLC 7185 Oakland Mills Road Columbia, MD 21046 Randy Ortanez Phone: 410 290 6652

ELECTRICAL1

Valid To: May 31, 2022 Certificate Number: 2041.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory at the location listed above, *as well as the two satellite laboratory locations listed below*, to perform the following <u>Electromagnetic Compatibility</u>, <u>SAR</u>, <u>HAC</u>, <u>Telecommunications</u>, <u>OTA</u>, <u>Battery</u>, <u>RF</u>, and <u>Conformance and Protocol testing of wireless devices:</u>

Test Method(s) 2:

| Radiated and Conducted | ANSI C63.10:2013, ANSI C63.17:2013, and FCC KDB 905462 |
|------------------------|---|
| | D02 (v02)), 18 (using MP-5:1986); |
| | ANSI C63.10:2020; KDB 987594; |
| | ETSI TS 134 124 Universal Mobile Telecommunications System |
| | (UMTS); (3GPP TS 34.124); (3GPP TS38.124 NR; |
| | Electromagnetic Compatibility (EMC) Requirements for Mobile |
| | Terminals and Ancillary Equipment); |
| | ETSI TS 136 124 LTE; Evolved Universal Terrestrial Radio Access |
| | (E-UTRA); (3GPP TS 36.124); |
| | ETSI TS 151 010-1 Digital Cellular Telecommunications System |
| | (Phase 2+) (GSM); |
| | company that a state of the state of the state of |

3GPP TS 51.010-1, Section 12 (Conducted and Radiated Spurious Emissions); EN55011; EN 55032; CNS 13438 (up to 6 GHz); AS/NZS CISPR 11; IEC/CISPR 11; CISPR 32; FCC OET/MP-5; ICES-003; KN 11; KN 32; VCCI V-3(2016.11);

CFR 47, FCC Parts 15B/C/D/E/F/G/H (using ANSI C63.4:2014,

VCCI V-3 (2015.04); VCCI 32-1: VCCI-CISPR 32

Accessibility CFR 47, FCC Part 14

Transmitter/Receiver

RSS 111; RSS 112; RSS 117; RSS 119; RSS 123; RSS 125; RSS 127; RSS 130; RSS 131; RSS 132; RSS 133; RSS 134; RSS 135; RSS 137; RSS 139; RSS 140; RSS 141; RSS 142; RSS 170; RSS 181; RSS 182; RSS 191; RSS 192; RSS 194; RSS 195; RSS 196; RSS 197; RSS 199; RSS 210; RSS 211; RSS 213; RSS 215; RSS 216; RSS 220; RSS 222; RSS 236; RSS 238; RSS 243; RSS 244; RSS 246; RSS 247; RSS 251;

RSS 252; RSS 287; RSS 288; RSS 310; RSS Gen

(A2LA Cert. No. 2041.01) Revised 04/06/2021

Page 1 of 13

5202 Presidents Court, Suite 220 | Frederick, MD 21703-8515 | Phone: 301 644 3248 | Fax: 240 454 9449 | www.A2LA.org

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Page 102 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 102 01 114 |



Test Technology: Test Method(s) 2:

IEEE 1528-2013; RSS 102 Issue 5 (2015); SAR/RF Exposure

EN 50360-2017, EN 62209-1:2016; EN 62209-2:2010; IEC 62209-1 2nd Edition 2016; IEC 62209-2 2010;

IEC PAS 63083-2017; EN 50566-2017; IEC 62209-2 AMD 1; Australian Communications Authority Radio Communications (Electromagnetic Radiation - Human Exposure) Standard 2014; FCC KDB 248227 D01; FCC KDB 447498 D01, D02, and D03;

FCC KDB 615223 D01; FCC KDB 616217 D04;

FCC KDB 643646 D01; FCC KDB 648474 D03 and D04; FCC KDB 680106 D01; FCC KDB 865664 D01 and D02; FCC KDB 941225 D01, D05, D05A, D06, and D07; EN 50401:2017; EN 50385:2017; IEC 62311:2008; IEC 62479:2010; EN 62479:2010; EN 50663:2017; EN 62311:2007; EN 62232:2017; IEC 62232:2017; IEEE C95.1-2005; IEEE C95.1-1992; IEEE C95.3-2002; RSS-102 (SAR. RF Exposure, NS), SPR-002; SPR-001; IEC TR 62630:2010; IEEE C95.3.1:2010; IEC TR 63170:2018; AS/NZS 2772.2:2016; IEC 62209-3: 2019; IEC 62209-3:2019;

C95.1: 2019; ICNIRP (100KHz - 300 GHz): 2020; IEC 62311:2019; EN 62311:2020; IEC/IEEE 62209-1528:2020;

RRA Public Notification 2018-18, December 7, 2018

ANSI C63.19:2007; ANSI C63.19:2011; ANSI C63.19:2019; Hearing Aid Compatibility

CTIA Test Plan for Hearing Aid Compatibility v.3.1.1 (2017);

FCC KDB 285076, D01 & D02; RSS-HAC

United States Radio 47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95,

96, 97, 101 (using ANSI/TIA-603-E, TIA-102.CAAA-E, ANSI C63.26:2015); ANSI/TIA-603-D; TIA-102.CAAA-D; FCC KDB 935210 D03 (v04); FCC KDB 935210 D04 (v02);

FCC KDB 935210 D05 (v01)

European Radio ETSI EN 302 065-1 Version 2.1.1 (2016-11);

ETSI EN 302 065-2 Version 2.1.1 (2016-11); ETSI EN 302 065-3 Version 2.1.1 (2016-11); ETSI EN 302 065-4 Version 1.1.1 (2016-11);

ETSI EN 302 291-1 Version 1.1.1 (2005-07); ETSI EN 302 291-2 Version 1.1.1 (2005-07); ETSI EN 302 502 Version 2.1.3 (2017-07);

ETSI EN 302 510-1 Version 1.1.1; ETSI EN 302 510-2 Version 1.1.1:

ETSI EN 302 537 Version 2.1.1 (2016-10); ETSI EN 301 511 Version 12.5.1 (2017-03);

ETSI EN 301 839 Version 2.1.1 (2016-04);

ETSI EN 301 893 Version 2.1.1 (2017-05):

ETSI EN 301 893 Version 1.8.1 (2015-03); ETSI EN 301 908-1 Version 13.1.1 (2019-11);

ETSI EN 301 908-13 Version 13.1.1 (2019-11); ETSI EN 300 220-1 Version 3.1.1 (2017-02);

(A2LA Cert. No. 2041.01) Revised 04/06/2021

Page 2 of 13

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|---------------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Page 103 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 103 01 114 |



Test Technology: Test Method(s) 2:

ETSI EN 300 220-2 Version 3.2.1 (2018-06); European Radio (cont'd) ETSI EN 300 328 Version 2.1.1 (2016-11);

ETSI EN 300 328 Version 2.2.2 (2019-07); ETSI EN 300 330 Version 2.1.1 (2017-02); ETSI EN 300 440 Version 2. (22.1 (2018-07); ETSI EN 300 440-2 Version 1.4.1 (2010-08); KS X 3123, KS X 3142, KS X 3270, KS X 3271;

LP0002; DGT LP0002;

Korean Radio Regulations on Radio Equipment

> (MSIT Ordinance MSIT No. 63, Dec. 24, 2020); Unlicensed Radio Equipment Established Without Notice (MSIT Public Notification 2020-59, Oct. 16, 2020); Technical Requirements for the Human Protection against

Electromagnetic Waves

(MSIT Public Notification 2019-4, January 16, 2019);

Equipment to be Subject of the Test Procedure for Electromagnetic

Field Strength and Specific Absorption Rate

(RRA Public Notification 2019-1, January 17, 2019); Technical Requirements for Radio Equipment for Telecommunication Services

(RRA Public Notification 2019-9, June 3, 2019);

Technical Requirements for Measurement and Test Procedure of

Specific Absorption Rate

(RRA Public Notification 2018-18, Dec 7, 2018);

Technical Requirements for Measurement of Electromagnetic Field Strength (RRA Public Notification 2019-3, March 4, 2019)

Australia/New Zealand Radio AS/NZS 4268:2017

Licensed Wireless Devices ANSI C63.26:2015

Wired and Wireless Conformance

5G NR 3GPP TS 38.508-1; 3GPP TS 38.508-2; 3GPP TS 38.521-1;

3GPP TS 38.521-2; 3GPP TS 38.521-3; 3GPP TS 38.521-4; 3GPP TS 38.522; 3GPP TS 38.523-1; 3GPP TS 38.523-2; 3GPP 38.523-3; 3GPP TS 38.533; VZW 5G NR FR2 RFOTA;

VZW 5G Protocol Pre-Conformance (TS 38.523-1);

VZW 5G NR FR1 Supp RF;

VZW 5G NR RF Pre Conformance (TS 38.521-3); VZW 5G NR Radio Resource Management (RRM)

Pre-Confromance (TS 38.533)

(A2LA Cert. No. 2041.01) Revised 04/06/2021

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|---------|--------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Page 104 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 104 01 114 |



Test Technology: Test Method(s) 2:

LTE 3GPP TS 36.521-1; 3GPP TS 36.521-3; 3GPP TS 36.523-1;

3GPP 37.571-1; 3GPP 37.571-2; 3GPP TS 34.229;

3GPP Carrier Aggregation;

PTCRB NAPRD.03; PTCRB PPMD; PTCRB Cat-M (per RFT132 eMTC);

PVG.09 LTE Data Throughput & TR 37.901 Data Throughput

Performance:

PVG.04 PTCRB Radiated Spurious Emissions:

Global Certification Forum (GCF-CC) Certification / LTE Field

Test (TS.11) 3;

3GPP Cat-NB & Cat-M;

MetroPCS Lab Conformance; AT&T LTE Conformance;

AT&T IoT Accelerator Conformance, 19263; VZW Lab Conformance; VZW Supl RF;

VZW FR2 Supplementary RF, VZW FR1 Supplementary RF;

VZW Supl Signaling Conformance;

VZW Supl RRM;

VZW LTE LBS Performance;

VZW Safe for Network (SFN), VZW Phase 1, VZW Open Development and Field Interoperability Testing (FIT) ³; VZW Network Extender; VZW PCO; VZW Data Retry; VZW Data Throughput; VZW SMS; VZW AT Commands; VZW CMAS; VZW eMBMS; VZW APN; VZW Cat-M Vol.TE;

Live Network Extender and Android Test Plan;

Sprint LTE Test Plan; Sprint LTE Safe for Network (SFN);

Sprint LTE Conformance, Sprint LTE IoT;

Sprint Lab Conformance; USCC Lab Conformance; KDDI LTE Device Testing; SoftBank LTE Testing

WCDMA (UTRA) 3GPP TS 34.121-1; 3GPP TS 34.123-1;

SoftBank Mobile WCDMA Testing

SVLTE / Multimode CDMA-LTE Inter-RAT (iRAT); CDMA-LTE Inter-RAT SVD;

SVLTE: 1x RF with LTE Data Cal; SVLTE: LTE RF with 1x Voice Call;

SVD and SVLTE: LTE Data Throughput with 1x Voice Call; eHRPD; GMSS; SVD GMSS; E911 Data Call Processing; Stress Testing; RSSI for MM Devices; SVD Interband; LTE LBS Performance; VZW Multimode Supl Signaling; VZW Multimode SMS; VZW Multimode Data Retry

VoLTE IMS VoIP; Rich Communication Services (RCS);

VoLTE to 1xRTT Fallback for SVLTE (1xRTT Fallback);

IMS Registration and Retry; ePDG Live Network;

E911 for VoLTE; VZW hVoLTE; VZW VoIP and VT Performance; VZW Interband RRM and Protocol

(A2LA Cert. No. 2041.01) Revised 04/06/2021

age 4 of 13

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|---------------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 105 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 105 of 114 |



<u>Test Technology:</u> <u>Test Method(s) ²:</u>

Carrier Aggregation VZW Carrier Aggregation Supplementary RF;

VZW Carrier Aggregation Data Throughout

UICC USIM/USAT/CSIM/ISIM Interaction Test Plan

(LTE/WCDMA/GSM/CDMA/MM); 3GPP TS 31.121; 3GPP TS 31.124;

ETSI TS 102 230;

SIM Application Interaction Test Plan;

UICC USIM ISIM Electrical; UICC USIM ISIM Protocol (LTE/WCDMA/GSM/CDMA);

SWP/HCI ETSI TS 102 694-1; ETSI TS 102 695-1

SunSpec Alliance SunSpec - CSIP (Common Smart Inverter Profile) Conformance

Test Procedures;

SunSpec - Advanced Function Inverter Test Lab Specification; SunSpec - UL1741 Supplement SA/Rule 21 Implementation

Guide;

IEEE 2030.5-2018 Smart Energy Profile Application Protocol

CBRS (OnGo) / WInnForum CBRS Alliance Certification Test Plan;

WInnForum Conformance and Performance Test Technical

Standards

¹ This accreditation covers testing performed at the main laboratory listed above, and the two satellite laboratories listed below:

(A2LA Cert. No. 2041.01) Revised 04/06/2021

Page 5 (

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|------------------------------------|---------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Page 106 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 106 01 114 |



PCTEST ENGINEERING LABORATORY, LLC. 7195 Oakland Mills Rd, Suite A Columbia, MD 2016

Test Technology: Test Method(s) 2:

Wireless

3GPP2 C.S0011-C 20-Feb-2006 (TIA-98D/E/F)

(excluding Sections 3.2.1.3, 3.2.3.2, 3.3.3, 3.3.4, 3.3.5, 3.3.6, 3.4.6, 3.4.8, 3.4.10, 3.4.11, 3.4.12, 3.4.13, 3.7.2, 4.4.8, 4.4.9.2.1,

4.4.10, 4.4.11);

3GPP2 C.S0043-0 24-Sep-2004 (TIA-1035);

3GPP2 C.S0036-0 11-Mar-2002 (TIA-916);

3GPP2 C.S0036-A 23-May-2011 (TIA-916-A);

3GPP2 C.S0037-0 19-Apr-2002 (TIA-918);

3GPP2 C.S0056-0 22-Jul-2005 (TIA-1042);

3GPP2 C.S0059-0 20-Aug-2008 (TIA-1038);

3GPP2 C.S0060-0 06-Dec-2005 (TIA-1044);

3GPP2 C.S0061-0 22-Jun-2005 (TIA-1045);

3GPP2 C.S0062-0 14-May-2007 (TIA-1046);

3GPP2 C.S0073-0 26-Sep-2005 (TIA-1084);

3GPP2 C.S0073-B 21-Aug-2009 (TIA n/a);

3GPP2 C.S0094-0 30-Oct-2008 (TIA-1157);

CTIA Conformance Test Plan for CDMA Wireless Devices;

GCF Certification Criteria 2 (CAG2) Test Plan;

VZW Wireless Priority Services (WPS);

VZW Safe for Network (SFN);

VZW Open Development (OD) Device Specifications;

VZW Location Based Services (LBS);

VZW CMAS; VZW NBPCD; VZW Phase 1

EVDO 3GPP2 C.S0033-0 12-Dec-2003 (TIA-866);

3GPP2 C.S0033-A 14-Dec-2005 (TIA-866);

3GPP2 C.S0038-0 19-Apr-2002 (TIA-919);

3GPP2 C.S0038-A 26-Sep-2005 (TIA-919);

3GPP2 C.S0038-B 30-Mar-2009 (TIA n/a);

3GPP2 C.S0037-0 19-Apr-2002 (TIA-918); CTIA Conformance Test Plan for CDMA Wireless Devices;

GCF Certification Criteria 2 (CAG2) Test Plan

(A2LA Cert. No. 2041.01) Revised 04/06/2021

Page 6 of 13

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|---------------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 107 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 107 of 114 |



<u>Test Technology:</u> <u>Test Method(s) ²:</u>

 Emissions
 CFR 47, FCC Parts 15B/C/D/E/F/G/H (using ANSI C63.4:2014,

 Radiated and Conducted
 ANSI C63.10:2020, ANSI C63.10:2013; ANSI C63.17:2013, FCC

KDB 905462, and KDB 987594, 18 (using MP-5:1986); ANSI

C63.10:2013; ETSI TS 134 124 Universal Mobile Telecommunications System (UMTS); (3GPP TS 34.124); ETSI TS 136 124 LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); (3GPP TS 36.124); (3GPP TS38.124 NR; Electromagnetic Compatibility (EMC) Requirements for Mobile

Terminals and Ancillary Equipment);

ETSI TS 151 010-1 Digital Cellular Telecommunications System (Phase 2+) (GSM); 3GPP TS 51.010-1, Section 12 (Conducted and Radiated Spurious Emissions); EN55011; EN 55032; CNS 13438 (up to 6 GHz); AS/NZS CISPR 11; IEC/CISPR 11; CISPR 32; FCC OET/MP-5; ICES-003; KN 11; KN 32; VCCI V-3(2016.11); VCCI V-3 (2015.04); VCCI 32-1: VCCI-CISPR 32

Accessibility CFR 47, FCC Part 14

Transmitter/Receiver RSS 111; RSS 112; RSS 117; RSS 119; RSS 123; RSS 125;

RSS 127; RSS 130; RSS 131; RSS 132; RSS 133; RSS 134; RSS 135; RSS 137; RSS 139; RSS 140; RSS 141; RSS 142; RSS 170; RSS 181; RSS 182; RSS 191; RSS 192; RSS 194; RSS 195; RSS 196; RSS 197; RSS 199; RSS 210; RSS 211; RSS 213; RSS 215; RSS 216; RSS 220; RSS 222; RSS 236; RSS 238; RSS 243; RSS 244; RSS 246; RSS 247; RSS 251;

RSS 252; RSS 287; RSS 288; RSS 310; RSS Gen

Hearing Aid Compatibility ANSI C63.19:2007; ANSI C63.19:2011; ANSI C63.19:2019;

CTIA Test Plan for Hearing Aid Compatibility v.3.1.1 (2017);

FCC KDB 285076, D01 & D02; RSS-HAC

United States Radio 47 CFR FCC Parts 20, 22, 24, 25, 27, 30, 73, 74, 80, 87, 90, 95,

96, 97, 101 (using ANSI/TIA-603-E, TIA-102.CAAA-E,

ANSI C63.26:2015); FCC KDB 935210;

European Radio ETSI EN 302 065-1 Version 2.1.1 (2016-11);

ETSI EN 302 065-2 Version 2.1.1 (2016-11); ETSI EN 302 065-3 Version 2.1.1 (2016-11); ETSI EN 302 065-4 Version 1.1.1 (2016-11);

ETSI EN 302 291-1 Version 1.1.1 (2005-07); ETSI EN 302 291-2 Version 1.1.1 (2005-07); ETSI EN 302 502 Version 2.1.3 (2017-07);

ETSI EN 302 510-1 Version 1.1.1; ETSI EN 302 510-2 Version 1.1.1;

ETSI EN 302 510-2 Version 1.1.1; ETSI EN 302 537 Version 2.1.1 (2016-10);

ETSI EN 301 511 Version 12.5.1 (2016-10); ETSI EN 301 511 Version 12.5.1 (2017-03); ETSI EN 301 839 Version 2.1.1 (2016-04); ETSI EN 301 893 Version 2.1.1 (2017-05);

ETSI EN 301 893 Version 1.8.1 (2015-03);

(A2LA Cert. No. 2041.01) Revised 04/06/2021

Page 7 of 13

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|---------------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 100 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 108 of 114 |



<u>Test Technology:</u> <u>Test Method(s) ²:</u>

ETSI EN 301 908-1 Version 13.1.1 (2019-11);
European Radio (cont'd)

ETSI EN 301 908-13 Version 13.1.1 (2019-11);
ETSI EN 300 220-1 Version 3.1.1 (2017-02);
ETSI EN 300 220-2 Version 3.2.1 (2018-06);
ETSI EN 300 328 Version 2.1.1 (2016-11);
ETSI EN 300 330 Version 2.2.2 (2019-07);
ETSI EN 300 330 Version 2.1.1 (2017-02);
ETSI EN 300 440 Version 2. (22.1 (2018-07);
ETSI EN 300 440-2 Version 1.4.1 (2010-08);

KS X 3123, KS X 3142, KS X 3270, KS X 3271;

LP0002; DGT LP0002;

Korean Radio Regulations on Radio Equipment

(MSIT Ordinance MSIT No. 1 July 26, 2017);

Unlicensed Radio Equipment Established Without Notice (MSIT Public Notification 2019-105, December 23, 2019); Technical Requirements for the Human Protection against

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Electromagnetic Field Strength and Specific Absorption Rate (RRA Public Notification 2019-1, January 17, 2019); Technical Requirements for Radio Equipment for

Telecommunication Services

(RRA Public Notification 2019-9, June 3, 2019);

Technical Requirements for Measurement of Electromagnetic Field Strength (RRA Public Notification 2019-3, March 4, 2019)

Australia/New Zealand Radio AS/NZS 4268:2017

Licensed Wireless Devices ANSI C63.26:2015

(A2LA Cert. No. 2041.01) Revised 04/06/2021

Page 8 of 13

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|---------------------------------------|------------------------------------|---------|--------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Page 109 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | rage 109 01 114 |



Test Method(s) 2: **Test Technology:**

OTA

OTA Anechoic Chambers

CTIA Test Plan for Wireless Device Over-the-Air Performance for CDMA, 1xEVDO Rev0/A, GSM, GPRS, EGPRS, UMTS (W-CDMA), LTE, CDMA A-GPS, GSM A-GPS, UMTS WCDMA A-GPS:

LTE A-GPS A-Glonass and SIB8 / SIB16; PTCRB NAPRD03; PTCRB PPMD;

OTA Carrier Aggregation; OTA ECC Measurements:

VZW OTA Radiated Performance for CDMA & LTE Multimode

Devices;

VZW Location Determination Test Plan; VZW LTE-LBS Performance Test Plan; SPRINT OTA Antenna Performance Test Plan;

AT&T 13340 OTA; AT&T IoT Accelerator;

USCC CDMA Over The Air Radiated Test Plan; USCC LTE Over The Air Radiated Test Plan;

CTIA Test Plan for RF Performance Evaluation of Wi-Fi Mobile

Converged Devices (Wi-Fi Alliance);

GSMA TS.24 Operator Acceptance Values for Device Antenna Performance;

3GPP TS 34.114 Technical Specification UE/MS OTA Antenna

Performance:

3GPP TS 37.544 Technical Specification UTRA & E-UTRA UE

OTA Antenna Performance

CTIA IoT Security CTIA Cybersecurity Certification Test Plan for IoT Devices

SunSpec Alliance SunSpec - CSIP (Common Smart Inverter Profile) Conformance

Test Procedures;

SunSpec - Advanced Function Inverter Test Lab Specification; SunSpec – UL1741 Supplement SA/Rule 21 Implementation Guide:

IEEE 2030.5-2018 Smart Energy Profile Application Protocol

CBRS (OnGo) / WInnForum CBRS Alliance Certification Test Plan;

WInnForum Conformance and Performance Test Technical

Standards

(A2LA Cert. No. 2041.01) Revised 04/06/2021

Page 9 of 13

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|---------------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 110 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 110 of 114 |
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PCTEST ENGINEERING LABORATORY, LLC.

9017-F/G Mendenhall Court Columbia, MD 21045

Test Technology: Test Method(s) 2:

Battery Safety IEEE 1725 Standard for Rechargeable Batteries for Cellular

Telephones;

CTIA Certification Requirements for Battery System Compliance

to IEEE 1725:

IEEE 1625 Standard for Rechargeable Batteries for Multi-Cell

Mobile Computing Devices;

CTIA Certification Requirements for Battery System Compliance

to IEEE 1625;

UL1642 Standard for Lithium Batteries; UL 2054 Household and Commercial Batteries;

UL 62133; IEC 62133 Secondary Cells and Batteries containing Alkaline or other Non-Acid Electrolytes - Safety Requirements for Portable Sealed Secondary Cells & Batteries made from them, for

use in Portable Applications

UNDOT

United Nations Document ST/SG/AC.10/11/Section 38.3 Battery Transportation Safety Recommendations on the Transport of Dangerous Goods;

Manual of Tests and Criteria;

IEC 62281 - Safety of Primary and Secondary Lithium Cells and

Batteries During Transport Altitude Simulation Temperature Cycling Mechanical Shock Vibration Short Circuit Overcharge Impact/Crush

Forced Discharge

Aerospace

NASA Specification for Acceptance Testing of Commercial Battery Performance and Safety

Lithium Ion Cell Lots Engineering Directorate Propulsion & Power

Division, EP-WI-031

Hardware Reliability CTIA Device Hardware Reliability Test Plan

Determining Battery Life CTIA Battery Life Test Plan

Safety Requirement for Portable Sealed

Secondary Cells

IEC 62133; EN 62133

(A2LA Cert. No. 2041.01) Revised 04/06/2021

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager |
|---------------------|---------------------------------------|------------------------------------|-----------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 111 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 111 of 114 |



Test Technology: Test Method(s) 2:

CEC: Energy Efficient Battery Charger

Uniform Test Method for Measuring the Energy Consumption of

System Battery Chargers

Immunity EN/IEC 61000-4-2

> 3801 E. Plano Parkway, Ste 150 Plano, TX 75074

Test Technology: Test Method(s) 2:

Radiated Emissions CFR 47, FCC Parts 15B (using ANSI C63.4:2014)

(10 Meter Test Distance) EN55011; EN 55032; CNS 13438 (up to 6 GHz); AS/NZS CISPR 11; IEC/CISPR 11; CISPR 32; FCC OET/MP-5; ICES-003; KN 11; (Frequency Range, 30 MHz - 1 GHz)

KN 32; VCCI V-3(2016.11);

VCCI V-3 (2015.04); VCCI 32-1: VCCI-CISPR 32

Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.14:

| Rule Subpart/Technology | Test Method | Maximum Frequency |
|--|--------------------------|----------------------|
| Unintentional Radiators Part 15B | ANSI C63.4:2014 | 40000 MHz |
| Industrial, Scientific, and Medical Equipment Part 18 | FCC MP-5 (February 1986) | 333000 MHz |
| Intentional Radiators Part 15C | ANSI C63.10:2013 | 333000 MHz |
| Unlicensed Personal Communication Systems Devices Part 15D | ANSI C63.17:2013 | 20000 MHz |
| U-NIII without DFS Intentional Radiators Part 15E | ANSI C63.10:2013 | 40000 MHz |

(A2LA Cert. No. 2041.01) Revised 04/06/2021

| FCC ID: A3LSMF711U1 | PCTEST* Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | Approved by: Technical Manager | |
|---------------------|---------------------------------------|------------------------------------|-----------------------------------|--|
| Test Report S/N: | Test Dates: | EUT Type: | Dogo 112 of 114 | |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | Page 112 of 114 | |

² When the date, revision or edition of a test method standard is not identified on the scope of accreditation, the laboratory is expected to be using the current version within one year of the date of publication, per part C., Section 1 of A2LA R101 - General Requirements - Accreditation of ISO-IEC 17025 Laboratories.

³ This laboratory meets A2LA R104 – General Requirements: Accreditation of Field Testing and Field Calibration Laboratories for these tests.



Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.14:

| Rule Subpart/Technology | Test Method | Maximum Frequency |
|--|---|----------------------|
| U-NIII with DFS Intentional Radiators Part 15E | FCC KDB 905462 D02 (v02) | 40000 MHz |
| UWB Intentional Radiators Part 15F | ANSI C63.10:2013 | 200000 MHz |
| BPL Intentional Radiators Part 15G White Space Device Intentional Radiators | ANSI C63.10:2013 | 40000 MHz |
| Part 15H | ANSI C63.10:2013 | 40000 MHz |
| Commercial Mobile Services (FCC Licensed Radio Service Equipment) Parts 22 (cellular), 24, 25 (below 3 GHz), and 27 | ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015 | 333000 MHz |
| General Mobile Radio Services (FCC Licensed Radio Service Equipment) Parts 22 (non-cellular), 90 (below 3 GHz), 95, 97 (below 3 GHz), and 101 (below 3 GHz) | ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015 | 333000 MHz |
| Citizens Broadband Radio Services (FCC Licensed Radio Service Equipment) Part 96 | ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015 | 333000 MHz |
| Maritime and Aviation Radio Services Parts 80 and 87 | ANSI/TIA-603-E; ANSI C63.26:2015 | 333000 MHz |
| Microwave and Millimeter Bands Radio Services | | |
| Parts 25, 30, 74, 90 (M, DSRC, Y, Z), 95 (M and L), and 101 | ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015 | 333000 MHz |
| Broadcast Radio Services Parts 73 and 74 (below 3 GHz) | ANSI/TIA-603-E; TIA-102.CAAA-E; ANSI C63.26:2015 | 333000 MHz |
| RF Exposure Devices Subject to SAR Requirements | IEEE Std 1528:2013 | 6000 MHz |
| Hearing Aid Compatibility Part 20 (HAC for Commercial Mobile Services) | ANSI C63.19:2011 | 6000 MHz |

(A2LA Cert. No. 2041.01) Revised 04/06/2021

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager |
|---------------------|-------------------------------|---------------------------------------|---------|--------------------------------|
| Test Report S/N: | Test Dates: | EUT Type: | | Page 113 of 114 |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 113 01 114 |



Testing Activities Performed in Support of FCC Declaration of Conformity and Certification in Accordance with 47 Code of Federal Regulations and FCC KDB 974614, Appendix A, Table A.14:

| Rule Subpart/Technology | Test Method | Maximum Frequency |
|--|--------------------|----------------------|
| Signal Boosters | | |
| Part 20 | ANSI C63.26:2015 | 333000 MHz |
| (Wideband Consumer Signal Boosters, | | |
| Provider-specific signal boosters, and | | |
| Industrial Signal Boosters) | | |
| Section 90.219 | | |

⁴Accreditation does not imply acceptance to the FCC equipment authorization program. Please see the FCC website (https://apps.fcc.gov/oetcf/eas/) for a listing of FCC approved laboratories.

(A2LA Cert. No. 2041.01) Revised 04/06/2021

| FCC ID: A3LSMF711U1 | Proud to be part of @ element | MEASUREMENT REPORT (CERTIFICATION) | SAMSUNG | Approved by: Technical Manager | |
|---------------------|-------------------------------|------------------------------------|---------|-----------------------------------|--|
| Test Report S/N: | Test Dates: | EUT Type: | | Page 114 of 114 | |
| 1M2107290086-08.A3L | 04/19/2021-06/04/2021 | Portable Handset | | Page 114 01 114 | |