



## SAR EVALUATION REPORT

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

**Date of Testing:**  
 12/06/21  
**Test Site/Location:**  
 PCTEST Lab, Columbia, MD, USA  
**Document Serial No.:**  
 1M2112030143-01.A3L

**FCC ID:** A3LSMS901U

**APPLICANT:** SAMSUNG ELECTRONICS CO., LTD.

**DUT Type:** Portable Handset  
**Application Type:** Class II Permissive Change  
**FCC Rule Part(s):** CFR §2.1093  
**Model(s):** SM-S901U, SM-S901U1  
**Permissive Change(s):** See FCC Change Document  
**Date of Original Certification:** 12/07/2021

| Equipment Class                                   | Band & Mode       | Tx Frequency        | SAR            |
|---------------------------------------------------|-------------------|---------------------|----------------|
|                                                   |                   |                     | 1g Head (W/kg) |
| PCE                                               | NR Band n25 (PCS) | 1852.5 - 1912.5 MHz | 0.74           |
| PCE                                               | NR Band n2 (PCS)  | 1852.5 - 1907.5 MHz | N/A            |
| <b>Simultaneous SAR per KDB 690783 D01v01r03:</b> |                   |                     | <b>1.55</b>    |

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.9 of this report; for North American frequency bands only.

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. Test results reported herein relate only to the item(s) tested.

  
 Randy Ortanez  
 President



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|                                             |                                                                                                                                  |                                      |                                                                                       |                                        |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of element | <b>SAR EVALUATION REPORT</b>         |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2112030143-01.A3L | <b>Test Date:</b><br>12/06/21                                                                                                    | <b>DUT Type:</b><br>Portable Handset |                                                                                       | Page 1 of 28                           |

# TABLE OF CONTENTS

|                                                              |                                      |    |
|--------------------------------------------------------------|--------------------------------------|----|
| 1                                                            | DEVICE UNDER TEST .....              | 3  |
| 2                                                            | LTE AND NR INFORMATION .....         | 9  |
| 3                                                            | INTRODUCTION .....                   | 11 |
| 4                                                            | DOSIMETRIC ASSESSMENT .....          | 12 |
| 5                                                            | DEFINITION OF REFERENCE POINTS ..... | 13 |
| 6                                                            | TEST CONFIGURATION POSITIONS .....   | 14 |
| 7                                                            | RF EXPOSURE LIMITS .....             | 17 |
| 8                                                            | FCC MEASUREMENT PROCEDURES.....      | 18 |
| 9                                                            | RF CONDUCTED POWERS.....             | 20 |
| 10                                                           | SYSTEM VERIFICATION.....             | 21 |
| 11                                                           | SAR DATA SUMMARY .....               | 22 |
| 12                                                           | SAR MEASUREMENT VARIABILITY .....    | 23 |
| 13                                                           | EQUIPMENT LIST.....                  | 24 |
| 14                                                           | MEASUREMENT UNCERTAINTIES.....       | 25 |
| 15                                                           | CONCLUSION.....                      | 26 |
| 16                                                           | REFERENCES .....                     | 27 |
| APPENDIX A: SAR TEST PLOTS                                   |                                      |    |
| APPENDIX B: SAR DIPOLE VERIFICATION PLOTS                    |                                      |    |
| APPENDIX C: SAR TISSUE SPECIFICATIONS                        |                                      |    |
| APPENDIX D: SIMULTANEOUS NUMERICAL CALCULATIONS              |                                      |    |
| APPENDIX E: DUT ANTENNA DIAGRAM & SAR TEST SETUP PHOTOGRAPHS |                                      |    |
| APPENDIX F: SAR SYSTEM VALIDATION                            |                                      |    |
| APPENDIX G: NR LOWER BANDWIDTH RF CONDUCTED POWERS           |                                      |    |
| APPENDIX H: PROBE AND DIPOLE CALIBRATION CERTIFICATES        |                                      |    |

|                                             |                                                                                                                                                 |                                      |                                                                                       |                                        |
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# 1 DEVICE UNDER TEST

## 1.1 Device Overview

| Band & Mode        | Operating Modes | Tx Frequency                            |
|--------------------|-----------------|-----------------------------------------|
| GSM/GPRS/EDGE 850  | Voice/Data      | 824.20 - 848.80 MHz                     |
| GSM/GPRS/EDGE 1900 | Voice/Data      | 1850.20 - 1909.80 MHz                   |
| UMTS 850           | Voice/Data      | 826.40 - 846.60 MHz                     |
| UMTS 1750          | Voice/Data      | 1712.4 - 1752.6 MHz                     |
| UMTS 1900          | Voice/Data      | 1852.4 - 1907.6 MHz                     |
| LTE Band 71        | Voice/Data      | 665.5 - 695.5 MHz                       |
| LTE Band 12        | Voice/Data      | 699.7 - 715.3 MHz                       |
| LTE Band 13        | Voice/Data      | 779.5 - 784.5 MHz                       |
| LTE Band 14        | Voice/Data      | 790.5 - 795.5 MHz                       |
| LTE Band 26 (Cell) | Voice/Data      | 814.7 - 848.3 MHz                       |
| LTE Band 5 (Cell)  | Voice/Data      | 824.7 - 848.3 MHz                       |
| LTE Band 66 (AWS)  | Voice/Data      | 1710.7 - 1779.3 MHz                     |
| LTE Band 4 (AWS)   | Voice/Data      | 1710.7 - 1754.3 MHz                     |
| LTE Band 25 (PCS)  | Voice/Data      | 1850.7 - 1914.3 MHz                     |
| LTE Band 2 (PCS)   | Voice/Data      | 1850.7 - 1914.3 MHz                     |
| LTE Band 30        | Voice/Data      | 2307.5 - 2312.3 MHz                     |
| LTE Band 7         | Voice/Data      | 2502.5 - 2567.5 MHz                     |
| LTE Band 48        | Voice/Data      | 3552.5 - 3649.2 MHz                     |
| LTE Band 41        | Voice/Data      | 2498.5 - 2687.5 MHz                     |
| LTE Band 38        | Voice/Data      | 2572.5 - 2617.5 MHz                     |
| NR Band n71        | Voice/Data      | 665.5 - 695.5 MHz                       |
| NR Band n12        | Voice/Data      | 701.5 - 713.5 MHz                       |
| NR Band n5 (Cell)  | Voice/Data      | 826.5 - 846.5 MHz                       |
| NR Band n66 (AWS)  | Voice/Data      | 1712.5 - 1777.5 MHz                     |
| NR Band n25 (PCS)  | Voice/Data      | 1852.5 - 1912.5 MHz                     |
| NR Band n2 (PCS)   | Voice/Data      | 1852.5 - 1907.5 MHz                     |
| NR Band n30        | Voice/Data      | 2307.5 - 2312.5 MHz                     |
| NR Band n7         | Voice/Data      | 2502.5 - 2567.5 MHz                     |
| NR Band n41        | Voice/Data      | 2506.02 - 2679.99 MHz                   |
| NR Band n38        | Voice/Data      | 2575 - 2615 MHz                         |
| NR Band n77 DoD    | Voice/Data      | 3455.01 - 3544.98 MHz                   |
| NR Band n77        | Voice/Data      | 3705 - 3975 MHz                         |
| 2.4 GHz WLAN       | Voice/Data      | 2412 - 2462 MHz                         |
| U-NII-1            | Voice/Data      | 5180 - 5240 MHz                         |
| U-NII-2A           | Voice/Data      | 5260 - 5320 MHz                         |
| U-NII-2C           | Voice/Data      | 5500 - 5720 MHz                         |
| U-NII-3            | Voice/Data      | 5745 - 5825 MHz                         |
| U-NII-4            | Voice/Data      | 5845 - 5885 MHz                         |
| Bluetooth          | Data            | 2402 - 2480 MHz                         |
| NFC Data           | Data            | 13.56 MHz                               |
| NR Band n258       | Data            | 24250 - 24450 MHz;<br>24750 - 25250 MHz |
| NR Band n260       | Data            | 37000 - 40000 MHz                       |
| NR Band n261       | Data            | 27500 - 28350 MHz                       |

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
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## 1.2 Time-Averaging Algorithm for RF Exposure Compliance

This Device is enabled with the Qualcomm® Smart Transmit Gen2 feature. This feature performs time averaging algorithm in real time to control and manage transmitting power and ensure the time-averaged RF exposure is in compliance with FCC requirements all the time. Refer to Compliance Summary document in the original filing for detailed description of Qualcomm® Smart Transmit feature.

Note that WLAN operations are not enabled with Smart Transmit.

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of *SAR\_design\_target*, below the predefined time-averaged power limit (i.e.,  $P_{limit}$  for sub-6 radio), for each characterized technology and band (see RF Exposure Part 0 Test Report, report SN could be found in Section 1.11 - Bibliography).

The Smart Transmit algorithm maintains the time-averaged transmit power, in turn, time-averaged RF exposure of *SAR\_design\_target* or *PD\_design\_target*, below the predefined time-averaged power limit (i.e.,  $P_{limit}$  for sub-6 radio, and *input.power.limit* for 5G mmW NR), for each characterized technology and band (see RF Exposure Part 0 Test Report, report SN can be found in Section 1.11 - Bibliography).

Smart Transmit allows the device to transmit at higher power instantaneously, as high as  $P_{max}$ , when needed, but enforces power limiting to maintain time-averaged transmit power to  $P_{limit}$ . Below table shows  $P_{limit}$  EFS settings and maximum tune up output power  $P_{max}$  configured for this EUT for various transmit conditions (Device State Index DSI). Note that the device uncertainty for sub-6GHz WWAN is 1.0dB for this EUT.

|                     |         |               |      |                               |
|---------------------|---------|---------------|------|-------------------------------|
| Exposure Scenario   |         |               | Head | Maximum Tune-Up Output Power* |
| Averaging Volume    |         |               | 1g   |                               |
| Spacing             |         |               | 0 mm |                               |
| DSI                 |         |               | 2    |                               |
| Technology/Band     | Antenna | Antenna Group |      | Pmax                          |
| NR Band n25/2 (PCS) | F       | AG1           | 18.5 | 24.0                          |

\*Maximum tune up output power  $P_{max}$  is used to configure EUT during RF tune up procedure. The maximum allowed output power is equal to maximum Tune up output power + 1dB device design uncertainty.

The maximum time-averaged output power (dBm) for any 2G/3G/4G/5G Sub6 WWAN technology, band, and DSI = minimum of " $P_{limit}$  EFS" and "Maximum tune up output power  $P_{max}$ " + 1dB device uncertainty. SAR values in this report were scaled to this maximum time-averaged output power to determine compliance per KDB Publication 447498 D01v06.

The purpose of this report (Part 1 test) is to demonstrate that the EUT meets FCC SAR limits when transmitting in static transmission scenario at maximum allowable time-averaged power levels.

**Measurement Condition: All conducted power and SAR measurements in this report (Part 1 test) were performed by setting *Reserve\_power\_margin* (Smart Transmit EFS entry) to 0dB.**

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
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### 1.3 Power Reduction for SAR

This device used an independent fixed level power reduction mechanism for WLAN/BT when 5G NR is active and also for WLAN/BT during all voice or VoIP held to ear scenarios. Per FCC Guidance, the held-to-ear exposure conditions were evaluated at reduced power according to the head SAR positions described in IEEE 1528-2013. Detailed descriptions of the power reduction mechanism are included in the operational description.

### 1.4 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

#### 1.4.1 5G Output Power

| Mode / Band       | Antenna |                   | Modulated Average Output Power (in dBm) |
|-------------------|---------|-------------------|-----------------------------------------|
|                   |         |                   | DSI =2 (Head)                           |
| NR Band n25 (PCS) | F       | Max Allowed Power | 19.5                                    |
|                   |         | Nominal           | 18.5                                    |
| NR Band n2 (PCS)  | F       | Max Allowed Power | 19.5                                    |
|                   |         | Nominal           | 18.5                                    |

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
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| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 5 of 28                    |

## 1.5 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the device for this model. Therefore, all SAR tests were performed with the device which already incorporates the NFC antenna. A diagram showing the location of the NFC antenna can be found in Appendix E.

## 1.6 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v06 4.3.2 procedures.

**Table 1-1**  
**Simultaneous Transmission Scenarios**

| No. | Capable Transmit Configuration                                        | Head             | Body-Worn Accessory | Wireless Router  | Phablet | Notes                                          |
|-----|-----------------------------------------------------------------------|------------------|---------------------|------------------|---------|------------------------------------------------|
| 1   | GSM voice + 2.4 GHz WLAN MIMO                                         | Yes              | Yes                 | N/A              | Yes     |                                                |
| 2   | GSM voice + 5 GHz WLAN Ant 1                                          | Yes              | Yes                 | N/A              | Yes     |                                                |
| 3   | GSM voice + 5 GHz WLAN MIMO                                           | Yes              | Yes                 | N/A              | Yes     |                                                |
| 4   | GSM voice + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO                       | Yes              | Yes                 | N/A              | Yes     |                                                |
| 5   | GSM voice + 2.4 GHz Bluetooth                                         | Yes <sup>A</sup> | Yes                 | N/A              | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 6   | GSM voice + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2                    | Yes <sup>A</sup> | Yes                 | N/A              | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 7   | GSM voice + 2.4 GHz Bluetooth + 5 GHz WLAN Ant 1                      | Yes <sup>A</sup> | Yes                 | N/A              | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 8   | GSM voice + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO                       | Yes <sup>A</sup> | Yes                 | N/A              | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 9   | GSM voice + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1 | Yes <sup>A</sup> | Yes                 | N/A              | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 10  | GSM voice + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO  | Yes <sup>A</sup> | Yes                 | N/A              | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 11  | UMTS + 2.4 GHz WLAN MIMO                                              | Yes              | Yes                 | Yes              | Yes     |                                                |
| 12  | UMTS + 5 GHz WLAN Ant 1                                               | Yes              | Yes                 | Yes              | Yes     |                                                |
| 13  | UMTS + 5 GHz WLAN MIMO                                                | Yes              | Yes                 | Yes              | Yes     |                                                |
| 14  | UMTS + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO                            | Yes              | Yes                 | Yes              | Yes     |                                                |
| 15  | UMTS + 2.4 GHz Bluetooth                                              | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 16  | UMTS + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2                         | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 17  | UMTS + 2.4 GHz Bluetooth + 5 GHz WLAN Ant 1                           | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 18  | UMTS + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO                            | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 19  | UMTS + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1      | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 20  | UMTS + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO       | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 21  | LTE + 2.4 GHz WLAN MIMO                                               | Yes              | Yes                 | Yes              | Yes     |                                                |
| 22  | LTE + 5 GHz WLAN Ant 1                                                | Yes              | Yes                 | Yes              | Yes     |                                                |
| 23  | LTE + 5 GHz WLAN MIMO                                                 | Yes              | Yes                 | Yes              | Yes     |                                                |
| 24  | LTE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO                             | Yes              | Yes                 | Yes              | Yes     |                                                |
| 25  | LTE + 2.4 GHz Bluetooth                                               | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 26  | LTE + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2                          | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 27  | LTE + 2.4 GHz Bluetooth + 5 GHz WLAN Ant 1                            | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 28  | LTE + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO                             | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 29  | LTE + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1       | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 30  | LTE + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO        | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 31  | LTE + NR                                                              | Yes              | Yes                 | N/A              | Yes     |                                                |
| 32  | LTE + NR + 2.4 GHz WLAN MIMO                                          | Yes              | Yes                 | Yes              | Yes     |                                                |
| 33  | LTE + NR + 5 GHz WLAN Ant 1                                           | Yes              | Yes                 | Yes              | Yes     |                                                |
| 34  | LTE + NR + 5 GHz WLAN MIMO                                            | Yes              | Yes                 | Yes              | Yes     |                                                |
| 35  | LTE + NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO                        | Yes              | Yes                 | Yes              | Yes     |                                                |
| 36  | LTE + NR + 2.4 GHz Bluetooth                                          | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 37  | LTE + NR + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2                     | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 38  | LTE + NR + 2.4 GHz Bluetooth + 5 GHz WLAN Ant 1                       | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 39  | LTE + NR + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO                        | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 40  | LTE + NR + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1  | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 41  | LTE + NR + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO   | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 42  | NR + 2.4 GHz WLAN MIMO                                                | Yes              | Yes                 | Yes              | Yes     |                                                |
| 43  | NR + 5 GHz WLAN Ant 1                                                 | Yes              | Yes                 | Yes              | Yes     |                                                |
| 44  | NR + 5 GHz WLAN MIMO                                                  | Yes              | Yes                 | Yes              | Yes     |                                                |
| 45  | NR + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO                              | Yes              | Yes                 | Yes              | Yes     |                                                |
| 46  | NR + 2.4 GHz Bluetooth                                                | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 47  | NR + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2                           | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 48  | NR + 2.4 GHz Bluetooth + 5 GHz WLAN Ant 1                             | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 49  | NR + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO                              | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 50  | NR + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1        | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 51  | NR + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO         | Yes <sup>A</sup> | Yes                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 52  | GPRS/EDGE + 2.4 GHz WLAN MIMO                                         | N/A              | N/A                 | Yes              | Yes     |                                                |
| 53  | GPRS/EDGE + 5 GHz WLAN Ant 1                                          | N/A              | N/A                 | Yes              | Yes     |                                                |
| 54  | GPRS/EDGE + 5 GHz WLAN MIMO                                           | N/A              | N/A                 | Yes              | Yes     |                                                |
| 55  | GPRS/EDGE + 2.4 GHz WLAN MIMO + 5 GHz WLAN MIMO                       | N/A              | N/A                 | Yes              | Yes     |                                                |
| 56  | GPRS/EDGE + 2.4 GHz Bluetooth                                         | N/A              | N/A                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 57  | GPRS/EDGE + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2                    | N/A              | N/A                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 58  | GPRS/EDGE + 2.4 GHz Bluetooth + 5 GHz WLAN Ant 1                      | N/A              | N/A                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 59  | GPRS/EDGE + 2.4 GHz Bluetooth + 5 GHz WLAN MIMO                       | N/A              | N/A                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 60  | GPRS/EDGE + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN Ant 1 | N/A              | N/A                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |
| 61  | GPRS/EDGE + 2.4 GHz Bluetooth + 2.4 GHz WLAN Ant 2 + 5 GHz WLAN MIMO  | N/A              | N/A                 | Yes <sup>A</sup> | Yes     | <sup>A</sup> Bluetooth Tethering is considered |

|                                             |                                                                                                                                                                                                              |                                      |                                                                                       |                                        |
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1. 2.4 GHz WLAN Antenna 1 and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
2. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
3. Per the manufacturer, WIFI Direct is not expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.
4. 5 GHz Wireless Router is only supported for the U-NII-3 by S/W, therefore U-NII-1, U-NII2A, U-NII2C, and U-NII4 were not evaluated for wireless router conditions.
5. This device supports 2x2 MIMO Tx for WLAN 802.11a/b/g/n/ac/ax. 802.11a/b/g/n/ac/ax supports CDD and STBC and 802.11n/ac/ax additionally supports SDM.
6. This device supports VoWIFI.
7. This device supports Bluetooth Tethering.
8. This device supports VoLTE.
9. This device supports VoNR.
10. LTE + 5G NR FR1 Scenarios are limited to EN-DC combinations with anchor bands as shown in the NR FR1 checklist.
11. 5G NR FR2 n258, n260, and n261 cannot transmit simultaneously.
12. LTE + 5G NR FR2 Scenarios are limited to EN-DC combinations with anchor bands as shown in the NR FR2 checklist.

## 1.7 Miscellaneous SAR Test Considerations

### (A) WIFI/BT

There were no changes made to the WIFI and BT operations within this device. Please see original compliance evaluation in RF Technical Report S/N 1M2109080099-01.A3L (Rev2) for complete evaluation of these operating modes.

### (B) Licensed Transmitter(s)

Only operations relevant to this permissive change were evaluated for compliance. Please see original compliance evaluation in RF Exposure Technical Report S/N 1M2109080099-01.A3L(Rev2) for complete evaluation of all other operating modes. The operational description includes a description of all changed items.

This device supports NR capabilities with overlapping transmission frequency ranges. When the supported frequency range of an NR Band falls completely within an NR band with a larger transmission frequency range, both NR bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both NR bands share the same transmission path and signal characteristics, SAR was only assessed for the band with the larger transmission frequency range.

NR implementation supports SA and NSA mode. In EN-DC mode, NR operates with the LTE Bands shown in the NR FR1 checklist acting as anchor bands. Per FCC guidance, SAR tests for NR Bands and LTE Anchors Bands were performed separately due to limitations in SAR probe calibration factors.

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 7 of 28                    |

## 1.8 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D05v02r04, D05Av01r02
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)

## 1.9 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 11.

## 1.10 Bibliography

| Report Type                    | Report Serial Number |
|--------------------------------|----------------------|
| RF Exposure Part 0 Test Report | 1M2112030143-03.A3L  |

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
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| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 8 of 28                    |

| LTE Information                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                 |                |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-----------------|----------------|
| Form Factor                                                                                                       | Portable Handset                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                 |                |
| Frequency Range of each LTE transmission band                                                                     | LTE Band 71 (665.5 - 696.5 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                 |                |
|                                                                                                                   | LTE Band 12 (699.7 - 715.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                 |                |
|                                                                                                                   | LTE Band 13 (779.5 - 784.5 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                 |                |
|                                                                                                                   | LTE Band 14 (790.5 - 795.5 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                 |                |
|                                                                                                                   | LTE Band 26 (Cell) (814.7 - 848.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                 |                |
|                                                                                                                   | LTE Band 5 (Cell) (824.7 - 848.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                 |                |
|                                                                                                                   | LTE Band 66 (AWS) (1710.7 - 1779.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                 |                |
|                                                                                                                   | LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                 |                |
|                                                                                                                   | LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                |                 |                |
|                                                                                                                   | LTE Band 2 (PCS) (1850.7 - 1914.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                |                 |                |
|                                                                                                                   | LTE Band 30 (2307.5 - 2312.3 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                 |                |
|                                                                                                                   | LTE Band 7 (2502.5 - 2567.5 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                |                 |                |
|                                                                                                                   | LTE Band 48 (3552.5 - 3649.2 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                 |                |
|                                                                                                                   | LTE Band 41 (2498.5 - 2687.5 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                 |                |
|                                                                                                                   | LTE Band 38 (2572.5 - 2617.5 MHz)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                |                 |                |
|                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                |                 |                |
| Channel Bandwidths                                                                                                | LTE Band 71: 5 MHz, 10 MHz, 15 MHz, 20 MHz<br>LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz<br>LTE Band 13: 5 MHz, 10 MHz<br>LTE Band 14: 5 MHz, 10 MHz<br>LTE Band 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz<br>LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz<br>LTE Band 66 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz<br>LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz<br>LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz<br>LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz<br>LTE Band 30: 5 MHz, 10 MHz<br>LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz<br>LTE Band 48: 5 MHz, 10 MHz, 15 MHz, 20 MHz<br>LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz<br>LTE Band 38: 5 MHz, 10 MHz, 15 MHz, 20 MHz |                |                 |                |
| Channel Numbers and Frequencies (MHz)                                                                             | Low                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Low-Mid        | Mid             | Mid-High       |
| LTE Band 71: 5 MHz                                                                                                | 665.5 (133147)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 680.5 (133297) | 695.5 (133447)  |                |
| LTE Band 71: 10 MHz                                                                                               | 668 (133172)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 680.5 (133297) | 693 (133422)    |                |
| LTE Band 71: 15 MHz                                                                                               | 670.5 (133197)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 680.5 (133297) | 690.5 (133397)  |                |
| LTE Band 71: 20 MHz                                                                                               | 673 (133222)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 680.5 (133297) | 688 (133372)    |                |
| LTE Band 12: 1.4 MHz                                                                                              | 699.7 (23017)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 707.5 (23095)  | 715.3 (23173)   |                |
| LTE Band 12: 3 MHz                                                                                                | 700.5 (23025)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 707.5 (23095)  | 714.5 (23165)   |                |
| LTE Band 12: 5 MHz                                                                                                | 701.5 (23035)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 707.5 (23095)  | 713.5 (23155)   |                |
| LTE Band 12: 10 MHz                                                                                               | 704 (23060)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 707.5 (23095)  | 711 (23130)     |                |
| LTE Band 13: 5 MHz                                                                                                | 779.5 (23205)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 782 (23230)    | 784.5 (23255)   |                |
| LTE Band 13: 10 MHz                                                                                               | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 782 (23230)    | N/A             |                |
| LTE Band 14: 5 MHz                                                                                                | 790.5 (23205)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 783 (23230)    | 795.5 (23355)   |                |
| LTE Band 14: 10 MHz                                                                                               | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 783 (23230)    | N/A             |                |
| LTE Band 26 (Cell): 1.4 MHz                                                                                       | 814.7 (26697)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 831.5 (26865)  | 848.3 (27033)   |                |
| LTE Band 26 (Cell): 3 MHz                                                                                         | 815.5 (26705)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 831.5 (26865)  | 847.5 (27025)   |                |
| LTE Band 26 (Cell): 5 MHz                                                                                         | 816.5 (26715)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 831.5 (26865)  | 846.5 (27015)   |                |
| LTE Band 26 (Cell): 10 MHz                                                                                        | 819 (26740)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 831.5 (26865)  | 844 (26990)     |                |
| LTE Band 26 (Cell): 15 MHz                                                                                        | 821.5 (26765)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 831.5 (26865)  | 841.5 (26965)   |                |
| LTE Band 5 (Cell): 1.4 MHz                                                                                        | 824.7 (26407)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 836.5 (26525)  | 848.3 (26643)   |                |
| LTE Band 5 (Cell): 3 MHz                                                                                          | 825.5 (26415)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 836.5 (26525)  | 847.5 (26635)   |                |
| LTE Band 5 (Cell): 5 MHz                                                                                          | 826.5 (26425)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 836.5 (26525)  | 846.5 (26625)   |                |
| LTE Band 5 (Cell): 10 MHz                                                                                         | 829 (26450)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 836.5 (26525)  | 844 (26600)     |                |
| LTE Band 66 (AWS): 1.4 MHz                                                                                        | 1710.7 (131979)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1745 (132322)  | 1779.3 (132665) |                |
| LTE Band 66 (AWS): 3 MHz                                                                                          | 1711.5 (131987)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1745 (132322)  | 1778.5 (132657) |                |
| LTE Band 66 (AWS): 5 MHz                                                                                          | 1712.5 (131997)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1745 (132322)  | 1777.5 (132647) |                |
| LTE Band 66 (AWS): 10 MHz                                                                                         | 1715 (132022)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1745 (132322)  | 1775 (132622)   |                |
| LTE Band 66 (AWS): 15 MHz                                                                                         | 1717.5 (132047)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1745 (132322)  | 1772.5 (132597) |                |
| LTE Band 66 (AWS): 20 MHz                                                                                         | 1720 (132072)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 1745 (132322)  | 1770 (132572)   |                |
| LTE Band 4 (AWS): 1.4 MHz                                                                                         | 1710.7 (131979)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1732.5 (20175) | 1754.3 (20395)  |                |
| LTE Band 4 (AWS): 3 MHz                                                                                           | 1711.5 (131985)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1732.5 (20175) | 1753.5 (20385)  |                |
| LTE Band 4 (AWS): 5 MHz                                                                                           | 1712.5 (131995)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 1732.5 (20175) | 1752.5 (20375)  |                |
| LTE Band 4 (AWS): 10 MHz                                                                                          | 1715 (20000)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1732.5 (20175) | 1750 (20350)    |                |
| LTE Band 4 (AWS): 15 MHz                                                                                          | 1717.5 (20025)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1732.5 (20175) | 1747.5 (20325)  |                |
| LTE Band 4 (AWS): 20 MHz                                                                                          | 1720 (20050)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1732.5 (20175) | 1745 (20300)    |                |
| LTE Band 25 (PCS): 1.4 MHz                                                                                        | 1850.7 (26947)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1882.5 (26365) | 1914.3 (26693)  |                |
| LTE Band 25 (PCS): 3 MHz                                                                                          | 1851.5 (26955)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1882.5 (26365) | 1913.5 (26675)  |                |
| LTE Band 25 (PCS): 5 MHz                                                                                          | 1852.5 (26965)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1882.5 (26365) | 1912.5 (26665)  |                |
| LTE Band 25 (PCS): 10 MHz                                                                                         | 1855 (26990)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1882.5 (26365) | 1910 (26640)    |                |
| LTE Band 25 (PCS): 15 MHz                                                                                         | 1857.5 (26115)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1882.5 (26365) | 1907.5 (26615)  |                |
| LTE Band 25 (PCS): 20 MHz                                                                                         | 1860 (26140)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1882.5 (26365) | 1905 (26590)    |                |
| LTE Band 2 (PCS): 1.4 MHz                                                                                         | 1850.7 (18607)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1880 (18900)   | 1908.5 (19185)  |                |
| LTE Band 2 (PCS): 3 MHz                                                                                           | 1851.5 (18615)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1880 (18900)   | 1907.5 (19175)  |                |
| LTE Band 2 (PCS): 5 MHz                                                                                           | 1852.5 (18625)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1880 (18900)   | 1905 (19150)    |                |
| LTE Band 2 (PCS): 10 MHz                                                                                          | 1855 (18650)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1880 (18900)   | 1902.5 (19125)  |                |
| LTE Band 2 (PCS): 15 MHz                                                                                          | 1857.5 (18675)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 1880 (18900)   | 1900 (19100)    |                |
| LTE Band 2 (PCS): 20 MHz                                                                                          | 1860 (18700)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 1880 (18900)   | 1897.5 (19075)  |                |
| LTE Band 30: 5 MHz                                                                                                | 2307.5 (27685)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2310 (27710)   | 2312.5 (27735)  |                |
| LTE Band 30: 10 MHz                                                                                               | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 2310 (27710)   | N/A             |                |
| LTE Band 7: 5 MHz                                                                                                 | 2502.5 (20775)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2535 (21100)   | 2567.5 (21425)  |                |
| LTE Band 7: 10 MHz                                                                                                | 2505 (20800)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2535 (21100)   | 2565 (21400)    |                |
| LTE Band 7: 15 MHz                                                                                                | 2507.5 (20825)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2535 (21100)   | 2562.5 (21375)  |                |
| LTE Band 7: 20 MHz                                                                                                | 2510 (20850)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2535 (21100)   | 2560 (21350)    |                |
| LTE Band 48: 5 MHz                                                                                                | 3552.5 (55265)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3600.8 (55748) | N/A             | 3649.2 (56232) |
| LTE Band 48: 10 MHz                                                                                               | 3555 (55290)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 3601.7 (55757) | N/A             | 3648.3 (56223) |
| LTE Band 48: 15 MHz                                                                                               | 3557.5 (55315)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 3602.5 (55765) | N/A             | 3647.5 (56215) |
| LTE Band 48: 20 MHz                                                                                               | 3560 (55340)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 3603.3 (55773) | N/A             | 3646.7 (56207) |
| LTE Band 41: 5 MHz                                                                                                | 2506 (39750)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2549.5 (40185) | 2593 (40620)    | 2636.5 (41055) |
| LTE Band 41: 10 MHz                                                                                               | 2506 (39750)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2549.5 (40185) | 2593 (40620)    | 2636.5 (41055) |
| LTE Band 41: 15 MHz                                                                                               | 2506 (39750)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2549.5 (40185) | 2593 (40620)    | 2636.5 (41055) |
| LTE Band 41: 20 MHz                                                                                               | 2506 (39750)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2549.5 (40185) | 2593 (40620)    | 2636.5 (41055) |
| LTE Band 38: 5 MHz                                                                                                | 2572.5 (37775)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2595 (38000)   | 2617.5 (38225)  |                |
| LTE Band 38: 10 MHz                                                                                               | 2575 (37800)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2595 (38000)   | 2615 (38200)    |                |
| LTE Band 38: 15 MHz                                                                                               | 2577.5 (37825)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 2595 (38000)   | 2612.5 (38175)  |                |
| LTE Band 38: 20 MHz                                                                                               | 2580 (37850)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 2595 (38000)   | 2610 (38150)    |                |
| UE Category                                                                                                       | DL UE Cat 20, UL UE Cat 18                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                 |                |
| Modulations Supported in UL                                                                                       | QPSK, 16QAM, 64QAM, 256QAM                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                 |                |
| LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3-6.2.5? (manufacturer attestation to be provided) | YES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                 |                |
| A-MPR (Additional MPR) disabled for SAR Testing?                                                                  | YES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                |                 |                |
| LTE Carrier Aggregation Possible Combinations                                                                     | The technical description includes all the possible carrier aggregation combinations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |                 |                |
| LTE Additional Information                                                                                        | This device does not support full CA features on 3GPP Release 16. It supports carrier aggregation, downlink MIMO, LAA features as shown in Section 9 and Appendix J in the original filing. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. The following LTE Release 16 Features are not supported: Relay, HetNet, Enhanced MIMO, eICIC, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA                                                                                                                                                                                                                                                                                                          |                |                 |                |

|                                      |                                                                                     |                               |                                                                                       |                                 |
|--------------------------------------|-------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                              | DUT Type:<br>Portable Handset |                                                                                       | Page 9 of 28                    |

| NR Information                                    |                                                                                                          |                  |                                                                                           |                  |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------------------------------------------------|------------------|
| Form Factor                                       | Portable Handset                                                                                         |                  |                                                                                           |                  |
| Frequency Range of each NR transmission band      | NR Band n71 (665.5 - 695.5 MHz)                                                                          |                  |                                                                                           |                  |
|                                                   | NR Band n12 (701.5 - 713.5 MHz)                                                                          |                  |                                                                                           |                  |
|                                                   | NR Band n5 (Cell) (826.5 - 846.5 MHz)                                                                    |                  |                                                                                           |                  |
|                                                   | NR Band n66 (AWS) (1712.5 - 1777.5 MHz)                                                                  |                  |                                                                                           |                  |
|                                                   | NR Band n25 (PCS) (1852.5 - 1912.5 MHz)                                                                  |                  |                                                                                           |                  |
|                                                   | NR Band n2 (PCS) (1882.5 - 1907.5 MHz)                                                                   |                  |                                                                                           |                  |
|                                                   | NR Band n30 (2307.5 - 2312.5 MHz)                                                                        |                  |                                                                                           |                  |
|                                                   | NR Band n7 (2502.5 - 2567.5 MHz)                                                                         |                  |                                                                                           |                  |
|                                                   | NR Band n41 (2506.02 - 2679.99 MHz)                                                                      |                  |                                                                                           |                  |
|                                                   | NR Band n38 (2575 - 2615 MHz)                                                                            |                  |                                                                                           |                  |
|                                                   | NR Band n77 DoD (3455.01 - 3544.99 MHz)                                                                  |                  |                                                                                           |                  |
|                                                   | NR Band n77 (3705 - 3975 MHz)                                                                            |                  |                                                                                           |                  |
|                                                   | NR Band n71: 5 MHz, 10 MHz, 15 MHz, 20 MHz                                                               |                  |                                                                                           |                  |
| Channel Bandwidths                                | NR Band n12: 5 MHz, 10 MHz, 15 MHz                                                                       |                  |                                                                                           |                  |
|                                                   | NR Band n5 (Cell): 5 MHz, 10 MHz, 15 MHz, 20 MHz                                                         |                  |                                                                                           |                  |
|                                                   | NR Band n66 (AWS): 5 MHz, 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz                                         |                  |                                                                                           |                  |
|                                                   | NR Band n25 (PCS): 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz                                 |                  |                                                                                           |                  |
|                                                   | NR Band n2 (PCS): 5 MHz, 10 MHz, 15 MHz, 20 MHz                                                          |                  |                                                                                           |                  |
|                                                   | NR Band n30: 5 MHz, 10 MHz                                                                               |                  |                                                                                           |                  |
|                                                   | NR Band n7: 5 MHz, 10 MHz, 15 MHz, 20 MHz, 25 MHz, 30 MHz, 40 MHz                                        |                  |                                                                                           |                  |
|                                                   | NR Band n41: 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz                     |                  |                                                                                           |                  |
|                                                   | NR Band n38: 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz                                                      |                  |                                                                                           |                  |
|                                                   | NR Band n77 DoD: 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz |                  |                                                                                           |                  |
|                                                   | NR Band n77: 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz     |                  |                                                                                           |                  |
|                                                   |                                                                                                          |                  |                                                                                           |                  |
|                                                   |                                                                                                          |                  |                                                                                           |                  |
| Channel Numbers and Frequencies (MHz)             |                                                                                                          |                  |                                                                                           |                  |
| NR Band n71: 5 MHz                                | 665.5 (133147)                                                                                           | 690.5 (136100)   | 695.5 (133447)                                                                            |                  |
| NR Band n71: 10 MHz                               | 669 (133600)                                                                                             | 690.5 (136100)   | 693 (138600)                                                                              |                  |
| NR Band n71: 15 MHz                               | 670.5 (134100)                                                                                           | 690.5 (136100)   | 690.5 (138100)                                                                            |                  |
| NR Band n71: 20 MHz                               | 673 (134600)                                                                                             | 690.5 (136100)   | 688 (137600)                                                                              |                  |
| NR Band n12: 5 MHz                                | 701.5 (140300)                                                                                           | 707.5 (141500)   | 713.5 (142700)                                                                            |                  |
| NR Band n12: 10 MHz                               | 704 (140800)                                                                                             | 707.5 (141500)   | 711 (142200)                                                                              |                  |
| NR Band n12: 15 MHz                               | 706.5 (141300)                                                                                           | 707.5 (141500)   | 708.5 (141700)                                                                            |                  |
| NR Band n5 (Cell): 5 MHz                          | 826.5 (165300)                                                                                           | 836.5 (167300)   | 846.5 (169300)                                                                            |                  |
| NR Band n5 (Cell): 10 MHz                         | 829 (165800)                                                                                             | 836.5 (167300)   | 844 (168800)                                                                              |                  |
| NR Band n5 (Cell): 15 MHz                         | 831.5 (166300)                                                                                           | 836.5 (167300)   | 841.5 (168300)                                                                            |                  |
| NR Band n5 (Cell): 20 MHz                         | 834 (166800)                                                                                             | 836.5 (167300)   | 839 (167800)                                                                              |                  |
| NR Band n66 (AWS): 5 MHz                          | 1712.5 (342500)                                                                                          | 1745 (349000)    | 1775 (355500)                                                                             |                  |
| NR Band n66 (AWS): 10 MHz                         | 1715 (343000)                                                                                            | 1745 (349000)    | 1775 (355000)                                                                             |                  |
| NR Band n66 (AWS): 15 MHz                         | 1717.5 (343500)                                                                                          | 1745 (349000)    | 1772.5 (354500)                                                                           |                  |
| NR Band n66 (AWS): 20 MHz                         | 1720 (344000)                                                                                            | 1745 (349000)    | 1770 (354000)                                                                             |                  |
| NR Band n66 (AWS): 30 MHz                         | 1725 (345000)                                                                                            | 1745 (349000)    | 1765 (353000)                                                                             |                  |
| NR Band n66 (AWS): 40 MHz                         | 1730 (346000)                                                                                            | 1745 (349000)    | 1760 (352000)                                                                             |                  |
| NR Band n25 (PCS): 5 MHz                          | 1852.5 (370500)                                                                                          | 1882.5 (376500)  | 1912.5 (382500)                                                                           |                  |
| NR Band n25 (PCS): 10 MHz                         | 1855 (371000)                                                                                            | 1882.5 (376500)  | 1910 (382000)                                                                             |                  |
| NR Band n25 (PCS): 15 MHz                         | 1857.5 (371500)                                                                                          | 1882.5 (376500)  | 1907.5 (381500)                                                                           |                  |
| NR Band n25 (PCS): 20 MHz                         | 1860 (372000)                                                                                            | 1882.5 (376500)  | 1905 (381000)                                                                             |                  |
| NR Band n25 (PCS): 25 MHz                         | 1862.5 (372500)                                                                                          | 1882.5 (376500)  | 1902.5 (380500)                                                                           |                  |
| NR Band n25 (PCS): 30 MHz                         | 1865 (373000)                                                                                            | 1882.5 (376500)  | 1900 (380000)                                                                             |                  |
| NR Band n25 (PCS): 40 MHz                         | 1870 (374000)                                                                                            | 1882.5 (376500)  | 1895 (379000)                                                                             |                  |
| NR Band n2 (PCS): 5 MHz                           | 1882.5 (370500)                                                                                          | 1880 (376000)    | 1907.5 (381500)                                                                           |                  |
| NR Band n2 (PCS): 10 MHz                          | 1885 (371000)                                                                                            | 1880 (376000)    | 1905 (381000)                                                                             |                  |
| NR Band n2 (PCS): 15 MHz                          | 1887.5 (371500)                                                                                          | 1880 (376000)    | 1902.5 (380500)                                                                           |                  |
| NR Band n2 (PCS): 20 MHz                          | 1890 (372000)                                                                                            | 1880 (376000)    | 1900 (380000)                                                                             |                  |
| NR Band n30: 5 MHz                                | 2307.5 (461500)                                                                                          | 2310 (462000)    | 2312.5 (462500)                                                                           |                  |
| NR Band n30: 10 MHz                               | N/A                                                                                                      | 2310 (462000)    | N/A                                                                                       |                  |
| NR Band n7: 5 MHz                                 | 2502.5 (500500)                                                                                          | 2535 (507000)    | 2567.5 (513500)                                                                           |                  |
| NR Band n7: 10 MHz                                | 2505 (501000)                                                                                            | 2535 (507000)    | 2565 (513000)                                                                             |                  |
| NR Band n7: 15 MHz                                | 2507.5 (501500)                                                                                          | 2535 (507000)    | 2562.5 (512500)                                                                           |                  |
| NR Band n7: 20 MHz                                | 2510 (502000)                                                                                            | 2535 (507000)    | 2560 (512000)                                                                             |                  |
| NR Band n7: 25 MHz                                | 2512.5 (502500)                                                                                          | 2535 (507000)    | 2557.5 (511500)                                                                           |                  |
| NR Band n7: 30 MHz                                | 2515 (503000)                                                                                            | 2535 (507000)    | 2555 (511000)                                                                             |                  |
| NR Band n7: 40 MHz                                | 2520 (504000)                                                                                            | 2535 (507000)    | 2550 (510000)                                                                             |                  |
| NR Band n41: 20 MHz                               | 2506.02 (501204)                                                                                         | 2549.49 (509898) | 2592.99 (518598)                                                                          | 2636.49 (527298) |
| NR Band n41: 30 MHz                               | 2511 (502200)                                                                                            | 2552.01 (510402) | 2592.99 (518598)                                                                          | 2634 (526800)    |
| NR Band n41: 40 MHz                               | 2516.01 (503201)                                                                                         | 2567.34 (513468) | N/A                                                                                       | 2618.67 (523734) |
| NR Band n41: 50 MHz                               | 2521.02 (504204)                                                                                         | 2572.99 (514468) | 2592.99 (518598)                                                                          | 2654.99 (532998) |
| NR Band n41: 60 MHz                               | 2526 (505200)                                                                                            | 2592.99 (518598) | 2592.99 (518598)                                                                          | 2659.98 (531998) |
| NR Band n41: 70 MHz                               | 2531.01 (506202)                                                                                         | N/A              | 2592.99 (518598)                                                                          | 2665 (531000)    |
| NR Band n41: 80 MHz                               | 2536.02 (507204)                                                                                         | N/A              | N/A                                                                                       | 2649.99 (529998) |
| NR Band n41: 90 MHz                               | 2541 (508200)                                                                                            | N/A              | N/A                                                                                       | 2644.98 (528998) |
| NR Band n41: 100 MHz                              | 2546.01 (509202)                                                                                         | 2592.99 (518598) | 2592.99 (518598)                                                                          | 2640 (528000)    |
| NR Band n38: 10 MHz                               | 2575 (515000)                                                                                            | 2593 (518600)    | 2615 (523000)                                                                             |                  |
| NR Band n38: 15 MHz                               | 2577.5 (515500)                                                                                          | 2594 (518800)    | 2612.5 (522500)                                                                           |                  |
| NR Band n38: 20 MHz                               | 2580 (516000)                                                                                            | 2595 (519000)    | 2610 (522000)                                                                             |                  |
| NR Band n38: 30 MHz                               | 2585 (517000)                                                                                            | 2595 (519000)    | 2605 (521000)                                                                             |                  |
| NR Band n38: 40 MHz                               | 2590 (518000)                                                                                            | 2595 (519000)    | 2600 (520000)                                                                             |                  |
| NR Band n77 DoD: 10 MHz                           | 3455.01 (630334)                                                                                         | 3500.01 (633334) | 3544.98 (636332)                                                                          |                  |
| NR Band n77 DoD: 15 MHz                           | 3457.5 (630500)                                                                                          | 3500.01 (633334) | 3542.49 (636166)                                                                          |                  |
| NR Band n77 DoD: 20 MHz                           | 3460.02 (630668)                                                                                         | 3500.01 (633334) | 3540 (636000)                                                                             |                  |
| NR Band n77 DoD: 30 MHz                           | 3465 (631000)                                                                                            | 3500.01 (633334) | 3534.99 (635666)                                                                          |                  |
| NR Band n77 DoD: 40 MHz                           | 3470.01 (631334)                                                                                         | N/A              | 3470.01 (631334)                                                                          |                  |
| NR Band n77 DoD: 50 MHz                           | 3475.02 (631668)                                                                                         | N/A              | 3475.02 (631668)                                                                          |                  |
| NR Band n77 DoD: 60 MHz                           | N/A                                                                                                      | 3500.01 (633334) | N/A                                                                                       |                  |
| NR Band n77 DoD: 70 MHz                           | N/A                                                                                                      | 3500.01 (633334) | N/A                                                                                       |                  |
| NR Band n77 DoD: 80 MHz                           | N/A                                                                                                      | 3500.01 (633334) | N/A                                                                                       |                  |
| NR Band n77 DoD: 90 MHz                           | N/A                                                                                                      | 3500.01 (633334) | N/A                                                                                       |                  |
| NR Band n77 DoD: 100 MHz                          | N/A                                                                                                      | 3500.01 (633334) | N/A                                                                                       |                  |
| NR Band n77: 10 MHz                               | 3705 (647000)                                                                                            | 3759 (650600)    | 3813 (654200)                                                                             | 3921 (661400)    |
| NR Band n77: 15 MHz                               | 3707.52 (647168)                                                                                         | 3760.5 (650700)  | 3813.51 (654234)                                                                          | 3915.5 (661300)  |
| NR Band n77: 20 MHz                               | 3710.01 (647334)                                                                                         | 3762 (650800)    | 3811.99 (654266)                                                                          | 3918 (661200)    |
| NR Band n77: 30 MHz                               | 3715.02 (647668)                                                                                         | 3765 (651000)    | 3815.01 (654334)                                                                          | 3921 (661000)    |
| NR Band n77: 40 MHz                               | 3720 (648000)                                                                                            | 3768 (651200)    | 3816 (654400)                                                                             | 3912 (660800)    |
| NR Band n77: 50 MHz                               | 3725.01 (648334)                                                                                         | 3782.49 (652166) | 3840 (656000)                                                                             | 3917.51 (659834) |
| NR Band n77: 60 MHz                               | 3730.02 (648668)                                                                                         | 3803.34 (653556) | N/A                                                                                       | 3876.66 (658444) |
| NR Band n77: 70 MHz                               | 3735 (649000)                                                                                            | 3804.99 (653666) | N/A                                                                                       | 3875.01 (658334) |
| NR Band n77: 80 MHz                               | 3740.01 (649334)                                                                                         | N/A              | 3840 (656000)                                                                             | 3934.99 (662666) |
| NR Band n77: 90 MHz                               | 3745.02 (649668)                                                                                         | N/A              | 3840 (656000)                                                                             | 3934.98 (662332) |
| NR Band n77: 100 MHz                              | 3750 (650000)                                                                                            | N/A              | N/A                                                                                       | 3930 (662000)    |
| SCS for NR Band n71n12/n5/n66/n25/n2/n30/n7       |                                                                                                          |                  | 15 kHz                                                                                    |                  |
| SCS for NR Band n41/n38/n48/n77                   |                                                                                                          |                  | 30 kHz                                                                                    |                  |
| Modulations Supported in UL                       |                                                                                                          |                  | DFT-s-OFDM: m2 BPSK, QPSK, 16QAM, 64QAM, 256QAM<br>CP-OFDM: m2 BPSK, 16QAM, 64QAM, 256QAM |                  |
| A-MPR (Additional MPDR) disabled for SAR Testing? |                                                                                                          |                  | YES                                                                                       |                  |
| EN-DC Carrier Aggregation Possible Combinations   |                                                                                                          |                  | The technical description includes all the possible carrier aggregation combinations      |                  |
| LTE Anchor Bands for NR Band n71                  |                                                                                                          |                  | LTE Band 66/2/48                                                                          |                  |
| LTE Anchor Bands for NR Band n12                  |                                                                                                          |                  | LTE Band 66/2                                                                             |                  |
| LTE Anchor Bands for NR Band n5 (Cell)            |                                                                                                          |                  | LTE Band 2/6/30/48                                                                        |                  |
| LTE Anchor Bands for NR Band n66 (AWS)            |                                                                                                          |                  | LTE Band 12/13/14/5/2/30/48                                                               |                  |
| LTE Anchor Bands for NR Band n25 (PCS)            |                                                                                                          |                  | LTE Band 12/66                                                                            |                  |
| LTE Anchor Bands for NR Band n2 (PCS)             |                                                                                                          |                  | LTE Band 12/13/14/5/66/48/30                                                              |                  |
| LTE Anchor Bands for NR Band n30                  |                                                                                                          |                  | LTE Band 12/14/5/66/2                                                                     |                  |
| LTE Anchor Bands for NR Band n7                   |                                                                                                          |                  | N/A                                                                                       |                  |
| LTE Anchor Bands for NR Band n41                  |                                                                                                          |                  | LTE Band 66/2/52                                                                          |                  |
| LTE Anchor Bands for NR Band n38                  |                                                                                                          |                  | N/A                                                                                       |                  |
| LTE Anchor Bands for NR Band n77                  |                                                                                                          |                  | LTE Band 12/13/14/5/66/2/30                                                               |                  |

|                                      |                                                                                                                           |                               |                                                                                       |                                 |
|--------------------------------------|---------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  PCTEST<br>Proud to be part of element | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                    | DUT Type:<br>Portable Handset |                                                                                       | Page 10 of 28                   |

## 3 INTRODUCTION

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

### 3.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density ( $\rho$ ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 3-1).

Equation 3-1  
SAR Mathematical Equation

$$SAR = \frac{d}{dt} \left( \frac{dU}{dm} \right) = \frac{d}{dt} \left( \frac{dU}{\rho dv} \right)$$

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

where:

- $\sigma$  = conductivity of the tissue-simulating material (S/m)
- $\rho$  = mass density of the tissue-simulating material (kg/m<sup>3</sup>)
- E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

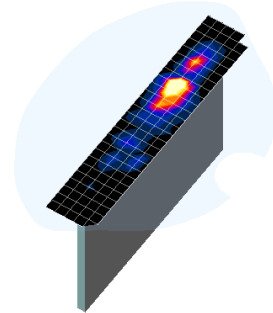
|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 11 of 28                   |

## 4 DOSIMETRIC ASSESSMENT

### 4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
  - a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
  - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
  - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.



**Figure 4-1**  
**Sample SAR Area Scan**

**Table 4-1**  
**Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04\***

| Frequency | Maximum Area Scan Resolution (mm)<br>( $\Delta x_{\text{area}}, \Delta y_{\text{area}}$ ) | Maximum Zoom Scan Resolution (mm)<br>( $\Delta x_{\text{zoomTV}}, \Delta y_{\text{zoom}}$ ) | Maximum Zoom Scan Spatial Resolution (mm) |                             |                                      | Minimum Zoom Scan Volume (mm)<br>(x,y,z) |
|-----------|-------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|-------------------------------------------|-----------------------------|--------------------------------------|------------------------------------------|
|           |                                                                                           |                                                                                             | Uniform Grid                              | Graded Grid                 |                                      |                                          |
|           |                                                                                           |                                                                                             |                                           | $\Delta z_{\text{zoom}}(n)$ | $\Delta z_{\text{zoom}}(1)^*$        |                                          |
| ≤ 2 GHz   | ≤ 15                                                                                      | ≤ 8                                                                                         | ≤ 5                                       | ≤ 4                         | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 30                                     |
| 2-3 GHz   | ≤ 12                                                                                      | ≤ 5                                                                                         | ≤ 5                                       | ≤ 4                         | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 30                                     |
| 3-4 GHz   | ≤ 12                                                                                      | ≤ 5                                                                                         | ≤ 4                                       | ≤ 3                         | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 28                                     |
| 4-5 GHz   | ≤ 10                                                                                      | ≤ 4                                                                                         | ≤ 3                                       | ≤ 2.5                       | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 25                                     |
| 5-6 GHz   | ≤ 10                                                                                      | ≤ 4                                                                                         | ≤ 2                                       | ≤ 2                         | ≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$ | ≥ 22                                     |

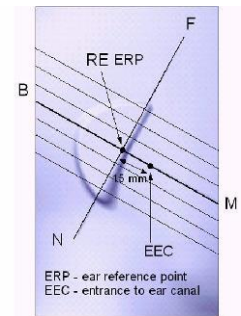
\*Also compliant to IEEE 1528-2013 Table 6

|                                             |                                                                                                                                                                                                              |                                      |  |                                                                                       |                                        |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--|---------------------------------------------------------------------------------------|----------------------------------------|
| FCC ID: A3LSMS901U                          |  <b>PCTEST</b><br>Proud to be part of  | <b>SAR EVALUATION REPORT</b>         |  |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2112030143-01.A3L | <b>Test Date:</b><br>12/06/21                                                                                                                                                                                | <b>DUT Type:</b><br>Portable Handset |  | Page 12 of 28                                                                         |                                        |

## 5 DEFINITION OF REFERENCE POINTS

### 5.1 EAR REFERENCE POINT

Figure 5-2 shows the front, back and side views of the SAM Twin Phantom. The point “M” is the reference point for the center of the mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERP is 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5-1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front), also called the Reference Pivoting Line, is not perpendicular to the reference plane (see Figure 5-1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].



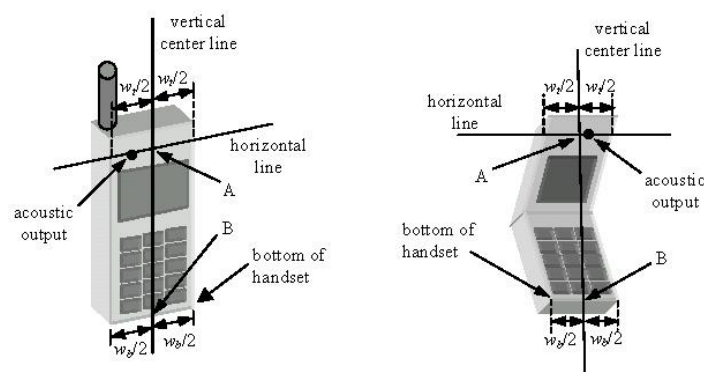
**Figure 5-1**  
Close-Up Side view  
of ERP

### 5.2 HANDSET REFERENCE POINTS

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the acoustic output located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (See Figure 5-3). The acoustic output was then located at the same level as the center of the ear reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at its top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.



**Figure 5-2**  
Front, back and side view of SAM Twin Phantom



**Figure 5-3**  
Handset Vertical Center & Horizontal Line Reference Points

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 13 of 28                   |

## 6 TEST CONFIGURATION POSITIONS

### 6.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity  $\epsilon = 3$  and loss tangent  $\delta = 0.02$ .

### 6.2 Positioning for Cheek

1. The test device was positioned with the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6-1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

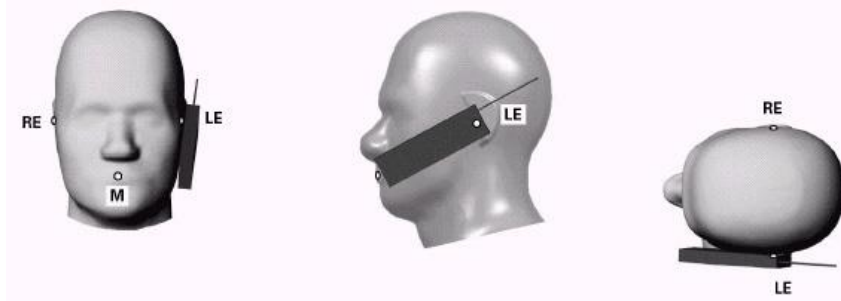


Figure 6-1 Front, Side and Top View of Cheek Position

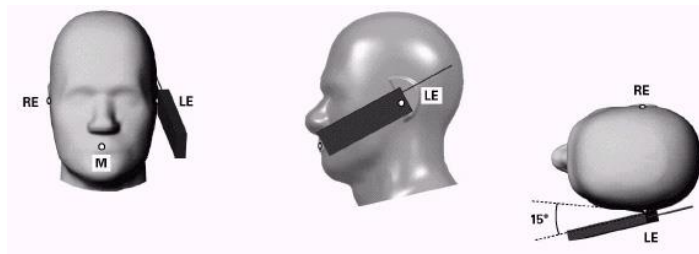
2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the pinna.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the reference plane.
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical with respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the device contact with the ear, the device was rotated about the NF line until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 6-2).

### 6.3 Positioning for Ear / 15° Tilt

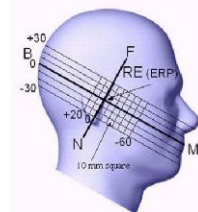
With the test device aligned in the “Cheek Position”:

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degrees.
2. The phone was then rotated around the horizontal line by 15 degrees.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the handset touched the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. In this situation, the tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6-2).

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 14 of 28                   |



**Figure 6-2 Front, Side and Top View of Ear/15° Tilt Position**



**Figure 6-3 Side view w/ relevant markings**

## 6.4 SAR Evaluations near the Mouth/Jaw Regions of the SAM Phantom

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones. Per IEEE 1528-2013, a rotated SAM phantom is necessary to allow probe access to such regions. Both SAM heads of the TwinSAM-Chin20 are rotated 20 degrees around the NF line. Each head can be removed from the table for emptying and cleaning.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04v01r03. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR location identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

## 6.5 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1g body and 10g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D01v06 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v06, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

## 6.6 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing

|                                             |                                                                                                                                                                                                              |                                      |                                                                                       |                                        |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| FCC ID: A3LSMS901U                          |  <b>PCTEST</b><br>Proud to be part of  | <b>SAR EVALUATION REPORT</b>         |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2112030143-01.A3L | <b>Test Date:</b><br>12/06/21                                                                                                                                                                                | <b>DUT Type:</b><br>Portable Handset |                                                                                       | Page 15 of 28                          |

transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

|                                             |                                                                                                                                                                                                                             |                                      |                                                                                       |                                        |
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| <b>FCC ID:</b> A3LSMS901U                   |  <b>PCTEST</b><br><small>Proud to be part of</small>  | <b>SAR EVALUATION REPORT</b>         |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2112030143-01.A3L | <b>Test Date:</b><br>12/06/21                                                                                                                                                                                               | <b>DUT Type:</b><br>Portable Handset |                                                                                       | Page 16 of 28                          |

## 7 RF EXPOSURE LIMITS

### 7.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

### 7.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

**Table 7-1**  
**SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6**

| HUMAN EXPOSURE LIMITS                                               |                                                                              |                                                                      |
|---------------------------------------------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------|
|                                                                     | UNCONTROLLED<br>ENVIRONMENT<br><i>General Population</i><br>(W/kg) or (mW/g) | CONTROLLED<br>ENVIRONMENT<br><i>Occupational</i><br>(W/kg) or (mW/g) |
| <b>Peak Spatial Average SAR</b><br>Head                             | 1.6                                                                          | 8.0                                                                  |
| <b>Whole Body SAR</b>                                               | 0.08                                                                         | 0.4                                                                  |
| <b>Peak Spatial Average SAR</b><br>Hands, Feet, Ankle, Wrists, etc. | 4.0                                                                          | 20                                                                   |

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

|                                             |                                                                                                                                                                                                              |                                      |                                                                                       |                                        |
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| FCC ID: A3LSMS901U                          |  <b>PCTEST</b><br>Proud to be part of  | <b>SAR EVALUATION REPORT</b>         |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2112030143-01.A3L | <b>Test Date:</b><br>12/06/21                                                                                                                                                                                | <b>DUT Type:</b><br>Portable Handset | Page 17 of 28                                                                         |                                        |

## 8 FCC MEASUREMENT PROCEDURES

Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

### 8.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

### 8.2 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.”

The device is placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test are evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device is tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviates by more than 5%, the SAR test and drift measurements are repeated.

### 8.3 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r04 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

#### 8.3.1 Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

#### 8.3.2 MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

#### 8.3.3 A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 18 of 28                   |

### 8.3.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

- a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
  - i. The required channel and offset combination with the highest maximum output power is required for SAR.
  - ii. When the reported SAR is  $\leq 0.8$  W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
  - iii. When the reported SAR for a required test channel is  $> 1.45$  W/kg, SAR is required for all RB offset configurations for that channel.
- b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
- c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is  $< 0.8$  W/kg.
- d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to  $\frac{1}{2}$  dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is  $< 1.45$  W/kg.

### 8.3.5 TDD

LTE TDD testing is performed using the SAR test guidance provided in FCC KDB 941225 D05v02r04. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05v02r04. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4.

### 8.3.6 Downlink Only Carrier Aggregation

Conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band. Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for downlink only carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 19 of 28                   |

## 9 RF CONDUCTED POWERS

All conducted power measurements for 5G Sub6 WWAN technologies and bands in this section were performed by setting *Reserve\_power\_margin* (Qualcomm® Smart Transmit EFS entry) to 0dB, so that the EUT transmits continuously at minimum ( $P_{limit}$ , maximum tune up output power  $P_{max}$ ).

### 9.1 NR Conducted Powers

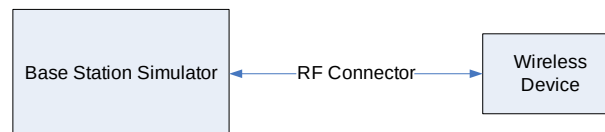
Per October 2020 TCB Workshop Guidance, NR FR1 SAR evaluations are being generally based on adapting the existing LTE SAR procedures (FCC KDB Publication 941225 D05v02r05). Therefore, NR SAR for the lower bandwidths was not required for testing based on the measured output power and the reported NR SAR for the highest bandwidth. Lower bandwidth conducted powers for all NR bands can be found in Appendix G.

Note: Some bands do not support non-overlapping channels. Per FCC Guidance, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

#### 9.1.1 NR Band n25 Antenna F

**Table 9-1**  
**NR Band n25 Antenna F Measured  $P_{Limit}$  for DSI = 2 (Head) - 40 MHz Bandwidth**

| NR Band n25<br>40 MHz Bandwidth |         |           |                                                        |                                    |             |
|---------------------------------|---------|-----------|--------------------------------------------------------|------------------------------------|-------------|
| Modulation                      | RB Size | RB Offset | Channel                                                | MPR<br>Allowed per<br>3GPP<br>[dB] | MPR<br>[dB] |
|                                 |         |           | 376500<br>(1882.5 MHz)<br><br>Conducted<br>Power [dBm] |                                    |             |
| DFT-s-OFDM<br>$\pi/2$ BPSK      | 1       | 1         | 19.01                                                  | 0                                  | 0.0         |
|                                 | 1       | 108       | 19.16                                                  |                                    | 0.0         |
|                                 | 1       | 214       | 19.15                                                  |                                    | 0.0         |
|                                 | 108     | 0         | 19.23                                                  | 0-0.5                              | 0.0         |
|                                 | 108     | 54        | 19.27                                                  | 0                                  | 0.0         |
|                                 | 108     | 108       | 19.39                                                  | 0-0.5                              | 0.0         |
|                                 | 216     | 0         | 19.30                                                  |                                    | 0.0         |
| DFT-s-OFDM<br>QPSK              | 1       | 1         | 18.99                                                  | 0                                  | 0.0         |
|                                 | 1       | 108       | <b>19.08</b>                                           |                                    | 0.0         |
|                                 | 1       | 214       | 19.06                                                  |                                    | 0.0         |
|                                 | 108     | 0         | 19.26                                                  | 0-1                                | 0.0         |
|                                 | 108     | 54        | 19.32                                                  | 0                                  | 0.0         |
|                                 | 108     | 108       | <b>19.39</b>                                           | 0-1                                | 0.0         |
|                                 | 216     | 0         | 19.05                                                  |                                    | 0.0         |
| DFT-s-OFDM<br>16QAM             | 1       | 1         | 19.44                                                  | 0-1                                | 0.0         |
| CP-OFDM<br>QPSK                 | 1       | 1         | 19.06                                                  | 0-1.5                              | 0.0         |



**Figure 9-1**  
**Power Measurement Setup – NR FDD**

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 20 of 28                   |

## 10 SYSTEM VERIFICATION

### 10.1 Tissue Verification

**Table 10-1**  
**Measured Head Tissue Properties**

| Calibrated for Tests Performed on: | Tissue Type | Tissue Temp During Calibration (°C) | Measured Frequency (MHz) | Measured Conductivity, $\sigma$ (S/m) | Measured Dielectric Constant, $\epsilon$ | TARGET Conductivity, $\sigma$ (S/m) | TARGET Dielectric Constant, $\epsilon$ | % dev $\sigma$ | % dev $\epsilon$ |
|------------------------------------|-------------|-------------------------------------|--------------------------|---------------------------------------|------------------------------------------|-------------------------------------|----------------------------------------|----------------|------------------|
| 12/06/2021                         | 1900 Head   | 25.0                                | 1850                     | 1.340                                 | 39.784                                   | 1.400                               | 40.000                                 | -4.29%         | -0.54%           |
|                                    |             |                                     | 1860                     | 1.351                                 | 39.738                                   | 1.400                               | 40.000                                 | -3.50%         | -0.66%           |
|                                    |             |                                     | 1880                     | 1.373                                 | 39.664                                   | 1.400                               | 40.000                                 | -1.93%         | -0.84%           |
|                                    |             |                                     | 1900                     | 1.393                                 | 39.613                                   | 1.400                               | 40.000                                 | -0.50%         | -0.97%           |
|                                    |             |                                     | 1905                     | 1.398                                 | 39.598                                   | 1.400                               | 40.000                                 | -0.14%         | -1.01%           |
|                                    |             |                                     | 1910                     | 1.402                                 | 39.582                                   | 1.400                               | 40.000                                 | 0.14%          | -1.05%           |

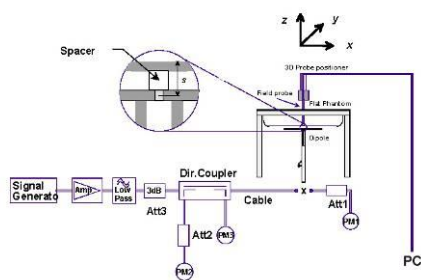
The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2. The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

### 10.2 Test System Verification

Prior to SAR assessment, the system is verified to  $\pm 10\%$  of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in Appendix F.

**Table 10-2**  
**System Verification Results**

| System Verification<br>TARGET & MEASURED |                        |             |            |                |                  |                 |           |          |                       |                        |                             |                 |
|------------------------------------------|------------------------|-------------|------------|----------------|------------------|-----------------|-----------|----------|-----------------------|------------------------|-----------------------------|-----------------|
| SAR System                               | Tissue Frequency (MHz) | Tissue Type | Date       | Amb. Temp. (C) | Liquid Temp. (C) | Input Power (W) | Source SN | Probe SN | Measured SAR1g (W/kg) | 1W Target SAR1g (W/kg) | 1W Normalized SAR 1g (W/kg) | Deviation1g (%) |
| A                                        | 1900                   | HEAD        | 12/06/2021 | 22.9           | 23.0             | 0.10            | 5d149     | 7406     | 4.230                 | 40.50                  | 42.300                      | 4.44%           |



**Figure 10-1**  
**System Verification Setup Diagram**



**Figure 10-2**  
**System Verification Setup Photo**

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 21 of 28                   |

# 11 SAR DATA SUMMARY

## 11.1 Standalone Head SAR Data

**Table 11-1**  
**NR Band n25 Head SAR**

| MEASUREMENT RESULTS                                                                               |        |      |                   |                             |                       |                |                  |          |      |                                                 |          |            |         |           |               |            |          |                |                   |        |    |
|---------------------------------------------------------------------------------------------------|--------|------|-------------------|-----------------------------|-----------------------|----------------|------------------|----------|------|-------------------------------------------------|----------|------------|---------|-----------|---------------|------------|----------|----------------|-------------------|--------|----|
| FREQUENCY                                                                                         |        | Mode | Bandwidth [MHz]   | Maximum Allowed Power [dBm] | Conducted Power [dBm] | Antenna Config | Power Drift [dB] | MPR [dB] | Side | Test Position                                   | Waveform | Modulation | RB Size | RB Offset | Serial Number | Duty Cycle | SAR (1g) | Scaling Factor | Reported SAR (1g) | Plot # |    |
| MHz                                                                                               | Ch.    |      |                   |                             |                       |                |                  |          |      |                                                 |          |            |         |           |               |            | (W/kg)   |                | (W/kg)            |        |    |
| 1882.50                                                                                           | 376500 | Mid  | NR Band n25 (PC5) | 40                          | 19.5                  | 19.08          | F                | -0.05    | 0    | Right                                           | Cheek    | DFT-S-OFDM | QPSK    | 1         | 108           | 0198M      | 1:1      | 0.279          | 1.102             | 0.307  |    |
| 1882.50                                                                                           | 376500 | Mid  | NR Band n25 (PC5) | 40                          | 19.5                  | 19.39          | F                | 0.04     | 0    | Right                                           | Cheek    | DFT-S-OFDM | QPSK    | 108       | 108           | 0198M      | 1:1      | 0.302          | 1.026             | 0.310  |    |
| 1882.50                                                                                           | 376500 | Mid  | NR Band n25 (PC5) | 40                          | 19.5                  | 19.08          | F                | -0.07    | 0    | Right                                           | Tilt     | DFT-S-OFDM | QPSK    | 1         | 108           | 0198M      | 1:1      | 0.433          | 1.102             | 0.477  |    |
| 1882.50                                                                                           | 376500 | Mid  | NR Band n25 (PC5) | 40                          | 19.5                  | 19.39          | F                | -0.03    | 0    | Right                                           | Tilt     | DFT-S-OFDM | QPSK    | 108       | 108           | 0198M      | 1:1      | 0.457          | 1.026             | 0.469  |    |
| 1882.50                                                                                           | 376500 | Mid  | NR Band n25 (PC5) | 40                          | 19.5                  | 19.08          | F                | -0.01    | 0    | Left                                            | Cheek    | DFT-S-OFDM | QPSK    | 1         | 108           | 0198M      | 1:1      | 0.527          | 1.102             | 0.581  |    |
| 1882.50                                                                                           | 376500 | Mid  | NR Band n25 (PC5) | 40                          | 19.5                  | 19.39          | F                | 0.06     | 0    | Left                                            | Cheek    | DFT-S-OFDM | QPSK    | 108       | 108           | 0198M      | 1:1      | 0.552          | 1.026             | 0.566  |    |
| 1882.50                                                                                           | 376500 | Mid  | NR Band n25 (PC5) | 40                          | 19.5                  | 19.08          | F                | -0.02    | 0    | Left                                            | Tilt     | DFT-S-OFDM | QPSK    | 1         | 108           | 0198M      | 1:1      | 0.649          | 1.102             | 0.715  |    |
| 1882.50                                                                                           | 376500 | Mid  | NR Band n25 (PC5) | 40                          | 19.5                  | 19.39          | F                | 0.04     | 0    | Left                                            | Tilt     | DFT-S-OFDM | QPSK    | 108       | 108           | 0198M      | 1:1      | 0.676          | 1.026             | 0.694  | AI |
| 1882.50                                                                                           | 376500 | Mid  | NR Band n25 (PC5) | 40                          | 19.5                  | 19.06          | F                | 0.01     | 0    | Left                                            | Tilt     | CP-OFDM    | QPSK    | 1         | 1             | 0198M      | 1:1      | 0.664          | 1.107             | 0.735  |    |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |        |      |                   |                             |                       |                |                  |          |      | Head<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |          |            |         |           |               |            |          |                |                   |        |    |

## 11.2 SAR Test Notes

### General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Per FCC KDB 865664 D01v01r04, variability SAR tests were not required since measured SAR for all frequency bands were less than 0.8 W/kg.
7. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.6 for more details).
8. This device uses Qualcomm Smart Transmit for 2G/3G/4G/5G operations to control and manage transmitting power in real time to ensure RF Exposure compliance. Per FCC Guidance, compliance for was assessed at the minimum of the time averaged power and the maximum output power for each band/mode/exposure condition (DSI).

### NR Notes:

1. NR implementation supports SA and NSA mode. In EN-DC mode, NR operates with the LTE Bands shown in the NR FR1 checklist acting as anchor bands. Per FCC guidance, SAR tests for NR Bands and LTE Anchors Bands were performed separately due to limitations in SAR probe calibration factors.
2. Simultaneous transmission analysis for EN-DC operations is addressed in the Part 2 Test Report in the original filing S/N 1M2109080099-23.A3L (Rev1)
3. This device additionally supports some EN-DC conditions where additional LTE carriers are added on the downlink only.
4. Per FCC Guidance, NR modulations and RB Sizes/Offsets were selected for testing such that configurations with the highest output power were evaluated for SAR tests.

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | <b>SAR EVALUATION REPORT</b>  |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 22 of 28                   |

## 12 SAR MEASUREMENT VARIABILITY

### 12.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, variability SAR tests were not required since measured SAR results for all frequency bands were less than 0.8 W/kg.

### 12.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for 1g and <3.75 W/kg for 10g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | SAR EVALUATION REPORT         |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 23 of 28                   |

## 13 EQUIPMENT LIST

| Manufacturer          | Model      | Description                                   | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|-----------------------|------------|-----------------------------------------------|------------|--------------|------------|---------------|
| Agilent               | 8594A      | (9kHz-2.9GHz) Spectrum Analyzer               | N/A        | N/A          | N/A        | 3051A00187    |
| Agilent               | 85033E     | 3.5mm Standard Calibration Kit                | 7/7/2021   | Annual       | 7/7/2022   | MY53402352    |
| Agilent               | N5182A     | MXG Vector Signal Generator                   | 6/21/2021  | Annual       | 6/21/2022  | MY47420603    |
| Agilent               | 8753ES     | S-Parameter Vector Network Analyzer           | 2/2/2021   | Annual       | 2/2/2022   | US39170122    |
| Amplifier Research    | 15S1G6     | Amplifier                                     | CBT        | N/A          | CBT        | 353317        |
| Anritsu               | ML2496A    | Power Meter                                   | 3/3/2021   | Annual       | 3/3/2022   | 1306009       |
| Anritsu               | ML2496A    | Power Meter                                   | 4/21/2021  | Annual       | 4/21/2022  | 1351001       |
| Anritsu               | MA2411B    | Pulse Power Sensor                            | 12/18/2020 | Annual       | 12/18/2021 | 1126066       |
| Anritsu               | MA2411B    | Pulse Power Sensor                            | 3/9/2021   | Annual       | 3/9/2022   | 1207470       |
| Anritsu               | MT8000A    | Radio Communication Test Station              | 7/28/2021  | Annual       | 7/28/2022  | 6272337419    |
| Anritsu               | MA24106A   | USB Power Sensor                              | 3/2/2021   | Annual       | 3/2/2022   | 1244524       |
| Anritsu               | MA24106A   | USB Power Sensor                              | 1/15/2021  | Annual       | 1/15/2022  | 1344554       |
| Control Company       | 4352       | Long Stem Thermometer                         | 1/24/2020  | Biennial     | 1/24/2022  | 200043588     |
| Control Company       | 4352       | Long Stem Thermometer                         | 1/24/2020  | Biennial     | 1/24/2022  | 200043634     |
| Control Company       | 4040       | Therm./ Clock/ Humidity Monitor               | 2/17/2020  | Biennial     | 2/17/2022  | 200113269     |
| Control Company       | 4040       | Therm./ Clock/ Humidity Monitor               | 2/17/2020  | Biennial     | 2/17/2022  | 200113274     |
| Insize                | 1108-150   | Digital Caliper                               | 1/17/2020  | Biennial     | 1/17/2022  | 409193536     |
| Keysight              | 772D       | Dual Directional Coupler                      | CBT        | N/A          | CBT        | MY52180215    |
| Keysight Technologies | N6705B     | DC Power Analyzer                             | 5/5/2021   | Triennial    | 5/5/2024   | MY53004059    |
| MCL                   | BW-N6W5+   | 6dB Attenuator                                | CBT        | N/A          | CBT        | 1139          |
| Mini-Circuits         | BW-N20W5+  | DC to 18 GHz Precision Fixed 20 dB Attenuator | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | NLP-2950+  | Low Pass Filter DC to 2700 MHz                | CBT        | N/A          | CBT        | N/A           |
| Mini-Circuits         | BW-N20W5   | Power Attenuator                              | CBT        | N/A          | CBT        | 1226          |
| Mini-Circuits         | TVA-11-422 | RF Power Amp                                  | CBT        | N/A          | CBT        | QA1303002     |
| Narda                 | BW-S3W2    | Attenuator (3dB)                              | CBT        | N/A          | CBT        | 120           |
| Narda                 | 4772-3     | Attenuator (3dB)                              | CBT        | N/A          | CBT        | 9406          |
| Pasternack            | PE2208-6   | Bidirectional Coupler                         | CBT        | N/A          | CBT        | N/A           |
| SPEAG                 | D1900V2    | 1900 MHz SAR Dipole                           | 9/21/2021  | Annual       | 9/21/2022  | 5d149         |
| SPEAG                 | DAE4       | Dasy Data Acquisition Electronics             | 6/21/2021  | Annual       | 6/21/2022  | 1676          |
| SPEAG                 | DAK-3.5    | Dielectric Assessment Kit                     | 12/9/2020  | Annual       | 12/9/2021  | 1278          |
| SPEAG                 | MAIA       | Modulation and Audio Interference Analyzer    | N/A        | N/A          | N/A        | N/A           |
| SPEAG                 | EX3DV4     | SAR Probe                                     | 7/20/2021  | Annual       | 7/20/2022  | 7406          |

Note:

1. CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.
2. Each equipment item was used solely within its respective calibration period.

|                                      |                                                                                                                                                                                                              |                               |                                                                                       |                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: A3LSMS901U                   |  <b>PCTEST</b><br>Proud to be part of  | <b>SAR EVALUATION REPORT</b>  |  | Approved by:<br>Quality Manager |
| Document S/N:<br>1M2112030143-01.A3L | Test Date:<br>12/06/21                                                                                                                                                                                       | DUT Type:<br>Portable Handset |                                                                                       | Page 24 of 28                   |

## 14 MEASUREMENT UNCERTAINTIES

| a                                                                             | b                    | c             | d              | e=<br>f(d,k) | f                     | g                        | h =<br>c x f/e                 | i =<br>c x g/e                   | k              |
|-------------------------------------------------------------------------------|----------------------|---------------|----------------|--------------|-----------------------|--------------------------|--------------------------------|----------------------------------|----------------|
| Uncertainty Component                                                         | IEEE<br>1528<br>Sec. | Tol.<br>(± %) | Prob.<br>Dist. | Div.         | c <sub>i</sub><br>1gm | c <sub>i</sub><br>10 gms | 1gm<br>u <sub>i</sub><br>(± %) | 10gms<br>u <sub>i</sub><br>(± %) | v <sub>i</sub> |
| <b>Measurement System</b>                                                     |                      |               |                |              |                       |                          |                                |                                  |                |
| Probe Calibration                                                             | E.2.1                | 7             | N              | 1            | 1                     | 1                        | 7.0                            | 7.0                              | ∞              |
| Axial Isotropy                                                                | E.2.2                | 0.25          | N              | 1            | 0.7                   | 0.7                      | 0.2                            | 0.2                              | ∞              |
| Hemishperical Isotropy                                                        | E.2.2                | 1.3           | N              | 1            | 0.7                   | 0.7                      | 0.9                            | 0.9                              | ∞              |
| Boundary Effect                                                               | E.2.3                | 2             | R              | 1.732        | 1                     | 1                        | 1.2                            | 1.2                              | ∞              |
| Linearity                                                                     | E.2.4                | 0.3           | N              | 1            | 1                     | 1                        | 0.3                            | 0.3                              | ∞              |
| System Detection Limits                                                       | E.2.4                | 0.25          | R              | 1.732        | 1                     | 1                        | 0.1                            | 0.1                              | ∞              |
| Modulation Response                                                           | E.2.5                | 4.8           | R              | 1.732        | 1                     | 1                        | 2.8                            | 2.8                              | ∞              |
| Readout Electronics                                                           | E.2.6                | 0.3           | N              | 1            | 1                     | 1                        | 0.3                            | 0.3                              | ∞              |
| Response Time                                                                 | E.2.7                | 0.8           | R              | 1.732        | 1                     | 1                        | 0.5                            | 0.5                              | ∞              |
| Integration Time                                                              | E.2.8                | 2.6           | R              | 1.732        | 1                     | 1                        | 1.5                            | 1.5                              | ∞              |
| RF Ambient Conditions - Noise                                                 | E.6.1                | 3             | R              | 1.732        | 1                     | 1                        | 1.7                            | 1.7                              | ∞              |
| RF Ambient Conditions - Reflections                                           | E.6.1                | 3             | R              | 1.732        | 1                     | 1                        | 1.7                            | 1.7                              | ∞              |
| Probe Positioner Mechanical Tolerance                                         | E.6.2                | 0.8           | R              | 1.732        | 1                     | 1                        | 0.5                            | 0.5                              | ∞              |
| Probe Positioning w/ respect to Phantom                                       | E.6.3                | 6.7           | R              | 1.732        | 1                     | 1                        | 3.9                            | 3.9                              | ∞              |
| Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation | E.5                  | 4             | R              | 1.732        | 1                     | 1                        | 2.3                            | 2.3                              | ∞              |
| <b>Test Sample Related</b>                                                    |                      |               |                |              |                       |                          |                                |                                  |                |
| Test Sample Positioning                                                       | E.4.2                | 3.12          | N              | 1            | 1                     | 1                        | 3.1                            | 3.1                              | 35             |
| Device Holder Uncertainty                                                     | E.4.1                | 1.67          | N              | 1            | 1                     | 1                        | 1.7                            | 1.7                              | 5              |
| Output Power Variation - SAR drift measurement                                | E.2.9                | 5             | R              | 1.732        | 1                     | 1                        | 2.9                            | 2.9                              | ∞              |
| SAR Scaling                                                                   | E.6.5                | 0             | R              | 1.732        | 1                     | 1                        | 0.0                            | 0.0                              | ∞              |
| <b>Phantom &amp; Tissue Parameters</b>                                        |                      |               |                |              |                       |                          |                                |                                  |                |
| Phantom Uncertainty (Shape & Thickness tolerances)                            | E.3.1                | 7.6           | R              | 1.73         | 1.0                   | 1.0                      | 4.4                            | 4.4                              | ∞              |
| Liquid Conductivity - measurement uncertainty                                 | E.3.3                | 4.3           | N              | 1            | 0.78                  | 0.71                     | 3.3                            | 3.0                              | 76             |
| Liquid Permittivity - measurement uncertainty                                 | E.3.3                | 4.2           | N              | 1            | 0.23                  | 0.26                     | 1.0                            | 1.1                              | 75             |
| Liquid Conductivity - Temperature Uncertainty                                 | E.3.4                | 3.4           | R              | 1.732        | 0.78                  | 0.71                     | 1.5                            | 1.4                              | ∞              |
| Liquid Permittivity - Temperature Uncertainty                                 | E.3.4                | 0.6           | R              | 1.732        | 0.23                  | 0.26                     | 0.1                            | 0.1                              | ∞              |
| Liquid Conductivity - deviation from target values                            | E.3.2                | 5.0           | R              | 1.73         | 0.64                  | 0.43                     | 1.8                            | 1.2                              | ∞              |
| Liquid Permittivity - deviation from target values                            | E.3.2                | 5.0           | R              | 1.73         | 0.60                  | 0.49                     | 1.7                            | 1.4                              | ∞              |
| <b>Combined Standard Uncertainty (k=1)</b>                                    |                      |               |                |              |                       |                          | RSS                            | 12.2                             | 12.0           |
| <b>Expanded Uncertainty</b><br>(95% CONFIDENCE LEVEL)                         |                      |               |                |              |                       |                          | k=2                            | 24.4                             | 24.0           |

The above measurement uncertainties are according to IEEE Std. 1528-2013

|                                             |                                                                                                                                                                                                              |                                      |                                                                                       |                                        |
|---------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| FCC ID: A3LSMS901U                          |  <b>PCTEST</b><br>Proud to be part of  | <b>SAR EVALUATION REPORT</b>         |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2112030143-01.A3L | <b>Test Date:</b><br>12/06/21                                                                                                                                                                                | <b>DUT Type:</b><br>Portable Handset |                                                                                       | Page 25 of 28                          |

## 15 CONCLUSION

### 15.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

|                                             |                                                                                                                                                                                                                             |                                      |                                                                                       |                                        |
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| FCC ID: A3LSMS901U                          |  <b>PCTEST</b><br><small>Proud to be part of</small>  | <b>SAR EVALUATION REPORT</b>         |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2112030143-01.A3L | <b>Test Date:</b><br>12/06/21                                                                                                                                                                                               | <b>DUT Type:</b><br>Portable Handset |                                                                                       | Page 26 of 28                          |

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| <b>FCC ID:</b> A3LSMS901U                   |  <b>PCTEST</b><br><small>Proud to be part of element</small> | <b>SAR EVALUATION REPORT</b>         |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2112030143-01.A3L | <b>Test Date:</b><br>12/06/21                                                                                                                   | <b>DUT Type:</b><br>Portable Handset |                                                                                       | Page 27 of 28                          |

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|                                             |                                                                                                                                                 |                                      |                                                                                       |                                        |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> A3LSMS901U                   |  <b>PCTEST</b><br><small>Proud to be part of element</small> | <b>SAR EVALUATION REPORT</b>         |  | <b>Approved by:</b><br>Quality Manager |
| <b>Document S/N:</b><br>1M2112030143-01.A3L | <b>Test Date:</b><br>12/06/21                                                                                                                   | <b>DUT Type:</b><br>Portable Handset |                                                                                       | Page 28 of 28                          |