

# FCC SAR Test Report

APPLICANT : Motorola Mobility LLC  
EQUIPMENT : Mobile Phone  
BRAND NAME : Motorola  
MODEL NAME : XT2159-1, XT2159-2, XT2159-10  
FCC ID : IHDT56ZW6  
STANDARD : FCC 47 CFR Part 2 (2.1093)

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.



Approved by: Si Zhang

**Sporton International Inc. (Kunshan)**

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People's Republic of China**



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### Revision History

| REPORT NO.  | VERSION | DESCRIPTION             | ISSUED DATE   |
|-------------|---------|-------------------------|---------------|
| FA161824-18 | Rev. 01 | Initial issue of report | Jun. 06, 2022 |
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### 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Motorola Mobility LLC, Mobile Phone, XT2159-1, XT2159-2, XT2159-10**, are as follows.

| Highest 1g SAR Summary  |                |             |  |                          |                            |
|---|----------------|-------------|--|--------------------------|----------------------------|
| Equipment Class   | Frequency Band |             | Head (Separation 0mm)                            | Hotspot (Separation 5mm) | Body-worn (Separation 5mm) |
|   |                |             | 1g SAR (W/kg)                                    |                          |                            |
| Licensed  | WCDMA          | Band II     |  | <b>1.24</b>              |                            |
|   | LTE            | Band 2      |  |                          | <b>1.24</b>                |
| DTS   | WLAN           | 2.4GHz WLAN | <b>0.12</b>                                      |                          |                            |
| Highest 10g SAR Summary   |                |             |  |                          |                            |
| Equipment Class   | Frequency Band |             | Product Specific 10g SAR (W/kg) (Separation 0mm) |                          |                            |
| Licensed  | GSM            | GSM1900     | <b>1.44</b>                                      |                          |                            |
| Date of Testing:  |                |             | 2022/6/1   |                          |                            |
| <b>Remark:</b> This is a variant report for XT2159-1, XT2159-2, XT2159-10, the change note please refer to the XT2159-1, XT2159-2, XT2159-10_ Class II Permissive Change letter which is exhibit separately. Based on the similarity between two models, only the worst cases from original test report (Sporton Report Number FA162824) were verified for the differences. |                |             |  |                          |                            |

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR, 4.0 W/kg for Product Specific 10g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.



### 2. Administration Data

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

| Testing Laboratory |  |                     |                                |
|--------------------|--|---------------------|--------------------------------|
| Test Firm          | Sporton International Inc. (Kunshan)   |                     |                                |
| Test Site Location | No. 1098, Pengxi North Road, Kunshan Economic Development Zone<br>Jiangsu Province 215300 People's Republic of China<br>TEL : +86-512-57900158<br>FAX : +86-512-57900958 |                     |                                |
| Test Site No.      | Sporton Site No.   | FCC Designation No. | FCC Test Firm Registration No. |
|                    | SAR03-KS   | CN1257              | 314309                         |

| Applicant    |   |
|--------------|---|
| Company Name | Motorola Mobility LLC                               |
| Address      | 222 W, Merchandise Mart Plaza, Chicago, IL60654 USA |

| Manufacturer |   |
|--------------|---|
| Company Name | Motorola Mobility LLC                               |
| Address      | 222 W, Merchandise Mart Plaza, Chicago, IL60654 USA |

### 3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

**4. Equipment Under Test (EUT) Information**

**4.1 General Information**

| Product Feature & Specification  |   |
|--|---|
| <b>Equipment Name</b>  | Mobile Phone  |
| <b>Brand Name</b>  | Motorola  |
| <b>Model Name</b>  | XT2159-1, XT2159-2, XT2159-10   |
| <b>FCC ID</b>  | IHDT56ZW6   |
| <b>IMEI Code</b>   | SIM1: 359094540007838<br>SIM2: 359094540007846  |
| <b>Wireless Technology and Frequency Range</b>   | GSM850: 824 MHz ~ 849 MHz<br>GSM1900: 1850 MHz ~ 1910 MHz<br>WCDMA Band II: 1850 MHz ~ 1910 MHz<br>WCDMA Band IV: 1710 MHz ~ 1755 MHz<br>WCDMA Band V: 824 MHz ~ 849 MHz<br>LTE Band 2: 1850 MHz ~ 1910 MHz<br>LTE Band 4: 1710 MHz ~ 1755 MHz<br>LTE Band 5: 824 MHz ~ 849 MHz<br>LTE Band 7: 2500 MHz ~ 2570 MHz<br>LTE Band 66: 1710 MHz ~ 1780 MHz<br>WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz |
| <b>Mode</b>  | GSM/GPRS/EGPRS<br>RMC/AMR 12.2Kbps<br>HSDPA<br>HSUPA<br>DC-HSDPA<br>HSPA+(16QAM uplink)<br>LTE: QPSK, 16QAM, 64QAM<br>WLAN 2.4GHz 802.11b/g/n HT20<br>Bluetooth BR/EDR/LE   |
| <b>HW Version</b>  | PVT   |
| <b>SW Version</b>  | ROQ31.429   |
| <b>GSM / (E)GPRS Transfer mode</b>   | Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.  |
| <b>EUT Stage</b>   | Identical Prototype   |
| <b>Remark:</b>   |   |
| <ol style="list-style-type: none"> <li>802.11n-HT40 is not supported in 2.4GHz WLAN.</li> <li>This device supports VoIP in GPRS, EGPRS, WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.</li> <li>This device 2.4GHz WLAN support hotspot operation and Bluetooth support tethering applications.</li> <li>This device does not support DTM operation and supports GPRS/EGPRS mode up to multi-slot class 12.</li> <li>The device implements receiver detect mechanism/hotspot trigger reduced power for the power management for SAR compliance at different exposure conditions (head, body-worn, hotspot, extremity). The device will invoke corresponding work scenarios power level, which are provided in the operational description.</li> <li>For dual SIM card mobile has two SIM slots and supports dual SIM dual standby. The WWAN radio transmission will be enabled by either one SIM at a time (single active).</li> <li>There are two headsets, only supplier different, so only chose one headset to perform SAR testing.</li> </ol> |   |



4.2 General LTE SAR Test and Reporting Considerations

| Summarized necessary items addressed in KDB 941225 D05 v02r05 |   |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
|---|---|------------|---|--------|--------|--------|----------|--|----------|---------|---------|-------|--------|--------|--------|------|-----|-----|-----|------|------|------|-----|--------|-----|-----|-----|------|------|------|-----|--------|-----|-----|-----|------|------|------|-----|--------|-----|-----|-----|------|------|------|-----|--------|-----|-----|-----|------|------|------|-----|---------|-----|--|--|--|--|--|-----|
| FCC ID  | IHDT56ZW6   |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| Equipment Name  | Mobile Phone  |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| Operating Frequency Range of each LTE transmission band       | LTE Band 2: 1850 MHz ~ 1910 MHz<br>LTE Band 4: 1710 MHz ~ 1755 MHz<br>LTE Band 5: 824 MHz ~ 849 MHz<br>LTE Band 7: 2500 MHz ~ 2570 MHz<br>LTE Band 66: 1710 MHz ~ 1780 MHz  |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| Channel Bandwidth   | LTE Band 2: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 4: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 5: 1.4MHz, 3MHz, 5MHz, 10MHz<br>LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz<br>LTE Band 66: 1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz  |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| uplink modulations used                                       | QPSK / 16QAM / 64QAM  |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| LTE Voice / Data requirements                                 | Voice and Data  |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| LTE Release Version   | R11, Cat5   |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| CA Support  | Not supported   |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| LTE MPR permanently built-in by design                        | <p><b>Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (<math>N_{RB}</math>)</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>&gt; 5</td> <td>&gt; 4</td> <td>&gt; 8</td> <td>&gt; 12</td> <td>&gt; 16</td> <td>&gt; 18</td> <td>≤ 3</td> </tr> <tr> <td>256 QAM</td> <td colspan="6">≥ 1</td> <td>≤ 5</td> </tr> </tbody> </table> | Modulation | Channel bandwidth / Transmission bandwidth ( $N_{RB}$ ) |        |        |        |          |  | MPR (dB) | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | QPSK | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 1 | 16 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 1 | 16 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 2 | 64 QAM | ≤ 5 | ≤ 4 | ≤ 8 | ≤ 12 | ≤ 16 | ≤ 18 | ≤ 2 | 64 QAM | > 5 | > 4 | > 8 | > 12 | > 16 | > 18 | ≤ 3 | 256 QAM | ≥ 1 |  |  |  |  |  | ≤ 5 |
| Modulation  | Channel bandwidth / Transmission bandwidth ( $N_{RB}$ )   |            |   |        |        |        | MPR (dB) |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
|   | 1.4 MHz   | 3.0 MHz    | 5 MHz   | 10 MHz | 15 MHz | 20 MHz |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| QPSK  | > 5   | > 4        | > 8   | > 12   | > 16   | > 18   | ≤ 1      |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| 16 QAM  | ≤ 5   | ≤ 4        | ≤ 8   | ≤ 12   | ≤ 16   | ≤ 18   | ≤ 1      |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| 16 QAM  | > 5   | > 4        | > 8   | > 12   | > 16   | > 18   | ≤ 2      |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| 64 QAM  | ≤ 5   | ≤ 4        | ≤ 8   | ≤ 12   | ≤ 16   | ≤ 18   | ≤ 2      |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| 64 QAM  | > 5   | > 4        | > 8   | > 12   | > 16   | > 18   | ≤ 3      |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| 256 QAM   | ≥ 1   |            |   |        |        |        | ≤ 5      |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| LTE A-MPR   | In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)   |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| Spectrum plots for RB configuration                           | A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.  |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |
| Power reduction applied to satisfy SAR compliance             | Yes, body-worn, hotspot, extremity will trigger reduced power for some LTE bands, the detail please referred to section 12.   |            |   |        |        |        |          |  |          |         |         |       |        |        |        |      |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |        |     |     |     |      |      |      |     |         |     |  |  |  |  |  |     |



| Transmission (H, M, L) channel numbers and frequencies in each LTE band |                   |             |                  |             |                  |             |                  |             |                  |             |                  |             |
|---|-------------------|-------------|------------------|-------------|------------------|-------------|------------------|-------------|------------------|-------------|------------------|-------------|
| LTE Band 2  |                   |             |                  |             |                  |             |                  |             |                  |             |                  |             |
|   | Bandwidth 1.4 MHz |             | Bandwidth 3 MHz  |             | Bandwidth 5 MHz  |             | Bandwidth 10 MHz |             | Bandwidth 15 MHz |             | Bandwidth 20 MHz |             |
|   | Ch. #             | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) |
| L   | 18607             | 1850.7      | 18615            | 1851.5      | 18625            | 1852.5      | 18650            | 1855        | 18675            | 1857.5      | 18700            | 1860        |
| M   | 18900             | 1880        | 18900            | 1880        | 18900            | 1880        | 18900            | 1880        | 18900            | 1880        | 18900            | 1880        |
| H   | 19193             | 1909.3      | 19185            | 1908.5      | 19175            | 1907.5      | 19150            | 1905        | 19125            | 1902.5      | 19100            | 1900        |
| LTE Band 4  |                   |             |                  |             |                  |             |                  |             |                  |             |                  |             |
|   | Bandwidth 1.4 MHz |             | Bandwidth 3 MHz  |             | Bandwidth 5 MHz  |             | Bandwidth 10 MHz |             | Bandwidth 15 MHz |             | Bandwidth 20 MHz |             |
|   | Ch. #             | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) |
| L   | 19957             | 1710.7      | 19965            | 1711.5      | 19975            | 1712.5      | 20000            | 1715        | 20025            | 1717.5      | 20050            | 1720        |
| M   | 20175             | 1732.5      | 20175            | 1732.5      | 20175            | 1732.5      | 20175            | 1732.5      | 20175            | 1732.5      | 20175            | 1732.5      |
| H   | 20393             | 1754.3      | 20385            | 1753.5      | 20375            | 1752.5      | 20350            | 1750        | 20325            | 1747.5      | 20300            | 1745        |
| LTE Band 5  |                   |             |                  |             |                  |             |                  |             |                  |             |                  |             |
|   | Bandwidth 1.4 MHz |             | Bandwidth 3 MHz  |             | Bandwidth 5 MHz  |             | Bandwidth 10 MHz |             |                  |             |                  |             |
|   | Ch. #             | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) |
| L   | 20407             | 824.7       | 20415            | 825.5       | 20425            | 826.5       | 20450            | 829         |                  |             |                  |             |
| M   | 20525             | 836.5       | 20525            | 836.5       | 20525            | 836.5       | 20525            | 836.5       | 20525            | 836.5       | 20525            | 836.5       |
| H   | 20643             | 848.3       | 20635            | 847.5       | 20625            | 846.5       | 20600            | 844         |                  |             |                  |             |
| LTE Band 7  |                   |             |                  |             |                  |             |                  |             |                  |             |                  |             |
|   | Bandwidth 5 MHz   |             | Bandwidth 10 MHz |             | Bandwidth 15 MHz |             | Bandwidth 20 MHz |             |                  |             |                  |             |
|   | Ch. #             | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) |
| L   | 20775             | 2502.5      | 20800            | 2505        | 20825            | 2507.5      | 20850            | 2510        |                  |             |                  |             |
| M   | 21100             | 2535        | 21100            | 2535        | 21100            | 2535        | 21100            | 2535        | 21100            | 2535        | 21100            | 2535        |
| H   | 21425             | 2567.5      | 21400            | 2565        | 21375            | 2562.5      | 21350            | 2560        |                  |             |                  |             |
| LTE Band 66   |                   |             |                  |             |                  |             |                  |             |                  |             |                  |             |
|   | Bandwidth 1.4 MHz |             | Bandwidth 3 MHz  |             | Bandwidth 5 MHz  |             | Bandwidth 10 MHz |             | Bandwidth 15 MHz |             | Bandwidth 20 MHz |             |
|   | Ch. #             | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) | Ch. #            | Freq. (MHz) |
| L   | 131979            | 1710.7      | 131987           | 1711.5      | 131997           | 1712.5      | 132022           | 1715        | 132047           | 1717.5      | 132072           | 1720        |
| M   | 132322            | 1745        | 132322           | 1745        | 132322           | 1745        | 132322           | 1745        | 132322           | 1745        | 132322           | 1745        |
| H   | 132665            | 1779.3      | 132657           | 1778.5      | 132647           | 1777.5      | 132622           | 1775        | 132597           | 1772.5      | 132572           | 1770        |



## 5. RF Exposure Limits

### 5.1 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.

### 5.2 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. The 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.

**Limits for Occupational/Controlled Exposure (W/kg)**

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|------------|--------------|--------------------------------|
| 0.4        | 8.0          | 20.0                           |

**Limits for General Population/Uncontrolled Exposure (W/kg)**

| Whole-Body | Partial-Body | Hands, Wrists, Feet and Ankles |
|------------|--------------|--------------------------------|
| 0.08       | 1.6          | 4.0                            |

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

## 6. Specific Absorption Rate (SAR)

### 6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

### 6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density ( $\rho$ ). The equation description is as below:

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

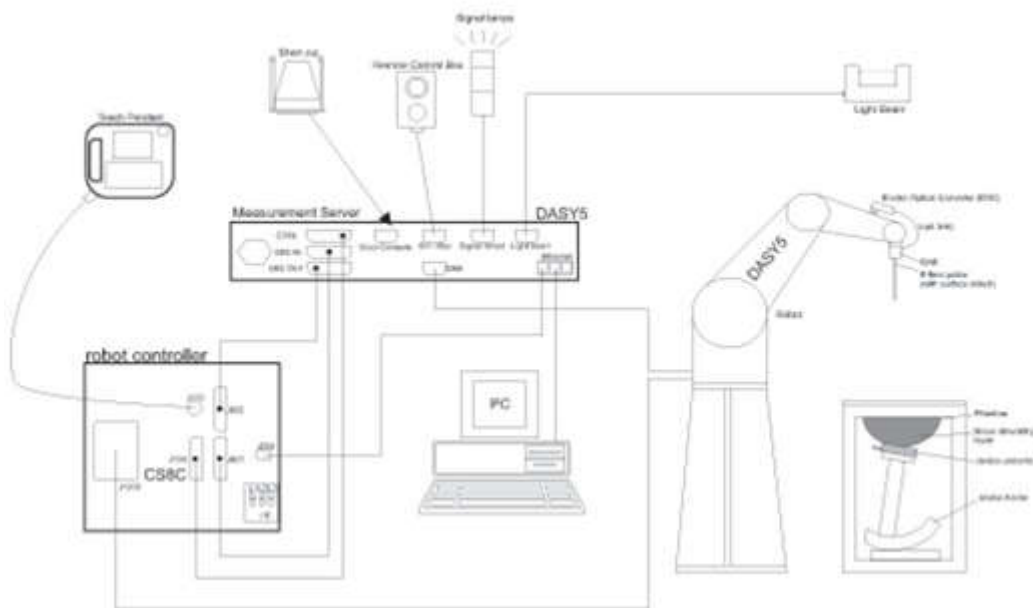
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where:  $\sigma$  is the conductivity of the tissue,  $\rho$  is the mass density of the tissue and E is the RMS electrical field strength.

## **7. System Description and Setup**

The DASY system used for performing compliance tests consists of the following items:




- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

**7.1 E-Field Probe**

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

**<EX3DV4 Probe>**

|                      |   |  |
|----------------------|---|--|
| <b>Construction</b>  | Symmetric design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |  |
| <b>Frequency</b>     | 10 MHz – >6 GHz<br>Linearity: ±0.2 dB (30 MHz – 6 GHz)  |  |
| <b>Directivity</b>   | ±0.3 dB in TSL (rotation around probe axis)<br>±0.5 dB in TSL (rotation normal to probe axis)   |  |
| <b>Dynamic Range</b> | 10 µW/g – >100 mW/g<br>Linearity: ±0.2 dB (noise: typically <1 µW/g)  |  |
| <b>Dimensions</b>    | Overall length: 337 mm (tip: 20 mm)<br>Tip diameter: 2.5 mm (body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm                      |  |

**7.2 Data Acquisition Electronics (DAE)**

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.


The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



**Photo of DAE**


**7.3 Phantom**

**<SAM Twin Phantom>**

|                          |   |  |
|--------------------------|---|--|
| <b>Shell Thickness</b>   | 2 ± 0.2 mm;<br>Center ear point: 6 ± 0.2 mm             |  |
| <b>Filling Volume</b>    | Approx. 25 liters                                       |  |
| <b>Dimensions</b>        | Length: 1000 mm; Width: 500 mm; Height: adjustable feet |  |
| <b>Measurement Areas</b> | Left Hand, Right Hand, Flat Phantom                     |  |

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

**<ELI Phantom>**

|                        |  |   |
|------------------------|--|---|
| <b>Shell Thickness</b> | 2 ± 0.2 mm (sagging: <1%)                        |  |
| <b>Filling Volume</b>  | Approx. 30 liters                                |   |
| <b>Dimensions</b>      | Major ellipse axis: 600 mm<br>Minor axis: 400 mm |   |

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

## 7.4 Device Holder

### <Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

### <Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.



Mounting Device for Laptops

## 8. Measurement Procedures

The measurement procedures are as follows:

### <Conducted power measurement>

- (a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- (b) Read the WWAN RF power level from the base station simulator.
- (c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
- (d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

### <SAR measurement>

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- (b) Place the EUT in the positions as Appendix D demonstrates.
- (c) Set scan area, grid size and other setting on the DASY software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

### 8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

### 8.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

### 8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

|  | $\leq 3$ GHz   | $> 3$ GHz  |
|--|--|--|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | $5 \pm 1$ mm   | $\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm     |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location              | $30^\circ \pm 1^\circ$   | $20^\circ \pm 1^\circ$                                 |
| Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$                            | $\leq 2$ GHz: $\leq 15$ mm<br>$2 - 3$ GHz: $\leq 12$ mm  | $3 - 4$ GHz: $\leq 12$ mm<br>$4 - 6$ GHz: $\leq 10$ mm |
|  | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device. |  |



### 8.4 Zoom Scan

Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

|  |                                    | $\leq 3$ GHz   | $> 3$ GHz   |  |
|--|------------------------------------|--|---|--|
| Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$ , $\Delta y_{Zoom}$  |                                    | $\leq 2$ GHz: $\leq 8$ mm<br>2 – 3 GHz: $\leq 5$ mm*                                 | 3 – 4 GHz: $\leq 5$ mm*<br>4 – 6 GHz: $\leq 4$ mm*                            |  |
| Maximum zoom scan spatial resolution, normal to phantom surface  | uniform grid: $\Delta z_{Zoom}(n)$ | $\leq 5$ mm  | 3 – 4 GHz: $\leq 4$ mm<br>4 – 5 GHz: $\leq 3$ mm<br>5 – 6 GHz: $\leq 2$ mm    |  |
|  | graded grid                        | $\Delta z_{Zoom}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface | $\leq 4$ mm   | 3 – 4 GHz: $\leq 3$ mm<br>4 – 5 GHz: $\leq 2.5$ mm<br>5 – 6 GHz: $\leq 2$ mm |
|  |                                    | $\Delta z_{Zoom}(n>1)$ : between subsequent points                                   | $\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$   |  |
| Minimum zoom scan volume   | x, y, z                            | $\geq 30$ mm   | 3 – 4 GHz: $\geq 28$ mm<br>4 – 5 GHz: $\geq 25$ mm<br>5 – 6 GHz: $\geq 22$ mm |  |
| <p>Note: <math>\delta</math> is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.</p> <p>* When zoom scan is required and the <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is <math>\leq 1.4</math> W/kg, <math>\leq 8</math> mm, <math>\leq 7</math> mm and <math>\leq 5</math> mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</p> |                                    |  |   |  |

### 8.5 Volume Scan Procedures

The volume scan is used to assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

### 8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASy measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.



**9. Test Equipment List**

| Manufacturer    | Name of Equipment             | Type/Model  | Serial Number | Calibration |            |
|-----------------|-------------------------------|-------------|---------------|-------------|------------|
|                 |                               |             |               | Last Cal.   | Due Date   |
| SPEAG           | 1900MHz System Validation Kit | D1900V2     | 5d182         | 2021/12/20  | 2022/12/19 |
| SPEAG           | 2450MHz System Validation Kit | D2450V2     | 924           | 2020/9/2    | 2023/9/1   |
| SPEAG           | Data Acquisition Electronics  | DAE4        | 916           | 2021/12/30  | 2022/12/29 |
| SPEAG           | Dosimetric E-Field Probe      | EX3DV4      | 3857          | 2021/11/24  | 2022/11/23 |
| SPEAG           | SAM Twin Phantom              | SAM Twin    | TP-1697       | NCR         | NCR        |
| Testo           | Thermo-Hygrometer             | 608-H1      | 1241332102    | 2022/1/6    | 2023/1/5   |
| SPEAG           | Phone Positioner              | N/A         | N/A           | NCR         | NCR        |
| Anritsu         | Radio Communication Analyzer  | MT8821C     | 6262306173    | 2021/7/15   | 2022/7/14  |
| Agilent         | ENA Series Network Analyzer   | E5071C      | MY46106933    | 2021/7/31   | 2022/7/30  |
| SPEAG           | Dielectric Probe Kit          | DAK-3.5     | 1138          | 2021/6/9    | 2022/6/8   |
| Anritsu         | Vector Signal Generator       | MG3710A     | 6201682672    | 2022/1/6    | 2023/1/5   |
| Rohde & Schwarz | Power Meter                   | NRVD        | 102081        | 2021/8/12   | 2022/8/11  |
| Rohde & Schwarz | Power Sensor                  | NRV-Z5      | 100538        | 2021/8/12   | 2022/8/11  |
| Rohde & Schwarz | Power Sensor                  | NRV-Z5      | 100539        | 2021/8/12   | 2022/8/11  |
| R&S             | CBT BLUETOOTH TESTER          | CBT         | 100641        | 2022/1/5    | 2023/1/4   |
| EXA             | Spectrum Analyzer             | FSV7        | 101631        | 2021/10/14  | 2022/10/13 |
| FLUKE           | DIGITAC THERMOMETER           | 51II        | 97240029      | 2021/10/23  | 2022/10/22 |
| BONN            | POWER AMPLIFIER               | BLMA 0830-3 | 087193A       | Note 1      |            |
| BONN            | POWER AMPLIFIER               | BLMA 2060-2 | 087193B       | Note 1      |            |
| Agilent         | Dual Directional Coupler      | 778D        | 20500         | Note 1      |            |
| Agilent         | Dual Directional Coupler      | 11691D      | MY48151020    | Note 1      |            |
| ARRA            | Power Divider                 | A3200-2     | N/A           | Note 1      |            |
| MCL             | Attenuation1                  | BW-S10W5+   | N/A           | Note 1      |            |
| MCL             | Attenuation2                  | BW-S10W5+   | N/A           | Note 1      |            |
| MCL             | Attenuation3                  | BW-S10W5+   | N/A           | Note 1      |            |

**Note:**

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

## 10. System Verification

### 10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

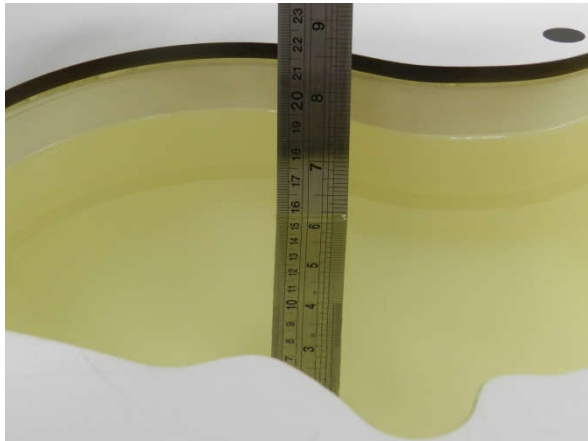


Fig 10.1 Photo of Liquid Height for Head SAR

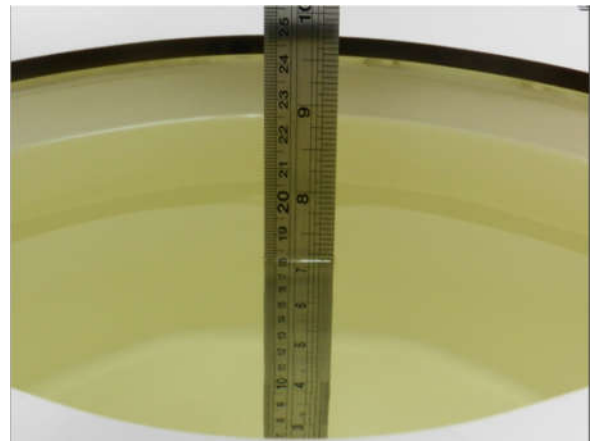


Fig 10.2 Photo of Liquid Height for Body SAR

### 10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

| Frequency (MHz)  | Water (%) | Sugar (%) | Cellulose (%) | Salt (%) | Preventol (%) | DGBE (%) | Conductivity ( $\sigma$ ) | Permittivity ( $\epsilon_r$ ) |
|------------------|-----------|-----------|---------------|----------|---------------|----------|---------------------------|-------------------------------|
| For Head         |           |           |               |          |               |          |                           |                               |
| 835              | 40.3      | 57.9      | 0.2           | 1.4      | 0.2           | 0        | 0.90                      | 41.5                          |
| 1800, 1900, 2000 | 55.2      | 0         | 0             | 0.3      | 0             | 44.5     | 1.40                      | 40.0                          |
| 2450             | 55.0      | 0         | 0             | 0        | 0             | 45.0     | 1.80                      | 39.2                          |
| 2600             | 54.8      | 0         | 0             | 0.1      | 0             | 45.1     | 1.96                      | 39.0                          |

#### <Tissue Dielectric Parameter Check Results>

| Frequency (MHz) | Tissue Type | Liquid Temp. (°C) | Conductivity ( $\sigma$ ) | Permittivity ( $\epsilon_r$ ) | Conductivity Target ( $\sigma$ ) | Permittivity Target ( $\epsilon_r$ ) | Delta ( $\sigma$ ) (%) | Delta ( $\epsilon_r$ ) (%) | Limit (%) | Date     |
|-----------------|-------------|-------------------|---------------------------|-------------------------------|----------------------------------|--------------------------------------|------------------------|----------------------------|-----------|----------|
| 1900            | Head        | 22.5              | 1.422                     | 39.142                        | 1.40                             | 40.00                                | 1.57                   | -2.14                      | ±5        | 2022/6/1 |
| 2450            | Head        | 22.5              | 1.869                     | 38.892                        | 1.80                             | 39.20                                | 3.83                   | -0.79                      | ±5        | 2022/6/1 |

### 10.3 System Performance Check Results

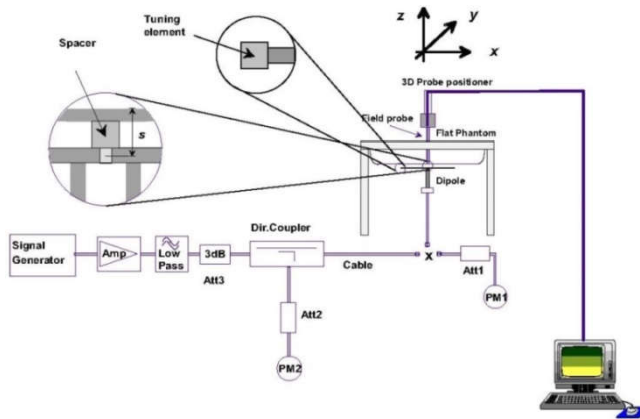
Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

**<1g SAR>**

| Date     | Frequency (MHz) | Tissue Type | Input Power (mW) | Dipole S/N | Probe S/N | DAE S/N | Measured 1g SAR (W/kg) | Targeted 1g SAR (W/kg) | Normalized 1g SAR (W/kg) | Deviation (%) |
|----------|-----------------|-------------|------------------|------------|-----------|---------|------------------------|------------------------|--------------------------|---------------|
| 2022/6/1 | 1900            | Head        | 50               | 5d182      | 3857      | 916     | 1.880                  | 39.60                  | 37.6                     | -5.05         |
| 2022/6/1 | 2450            | Head        | 50               | 924        | 3857      | 916     | 2.590                  | 51.40                  | 51.8                     | 0.78          |

**<10g SAR>**

| Date     | Frequency (MHz) | Tissue Type | Input Power (mW) | Dipole S/N | Probe S/N | DAE S/N | Measured 10g SAR (W/kg) | Targeted 10g SAR (W/kg) | Normalized 10g SAR (W/kg) | Deviation (%) |
|----------|-----------------|-------------|------------------|------------|-----------|---------|-------------------------|-------------------------|---------------------------|---------------|
| 2022/6/1 | 1900            | Head        | 50               | 5d182      | 3857      | 916     | 0.934                   | 20.20                   | 18.68                     | -7.52         |
| 2022/6/1 | 2450            | Head        | 50               | 924        | 3857      | 916     | 1.200                   | 24.00                   | 24                        | 0.00          |



**Fig 11.3.1 System Performance Check Setup**



**Fig 11.3.2 Setup Photo**

## 11. RF Exposure Positions

### 11.1 Ear and handset reference point

Figure 12.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled “M,” the left ear reference point (ERP) is marked “LE,” and the right ERP is marked “RE.” Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 12.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 12.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 12.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

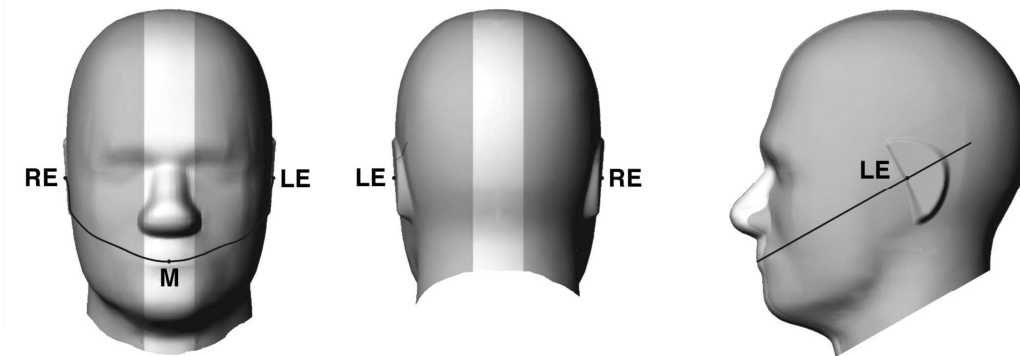


Fig 12.1.1 Front, back, and side views of SAM twin phantom

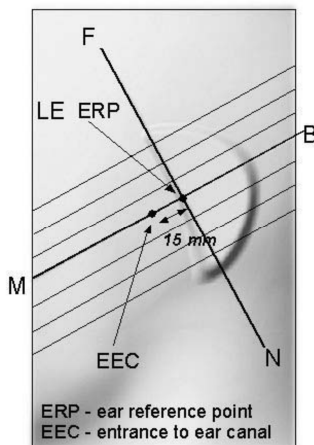


Fig 12.1.2 Close-up side view of phantom showing the ear region.

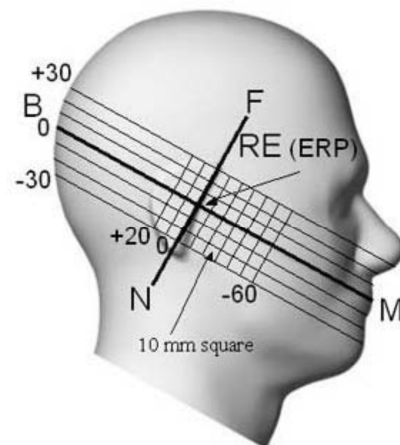


Fig 12.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

### 11.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width  $w_t$  of the handset at the level of the acoustic output (point A in Figure 12.2.1 and Figure 12.2.2), and the midpoint of the width  $w_b$  of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 12.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 12.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset 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 12.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 12.2.3. The actual rotation angles should be documented in the test report.

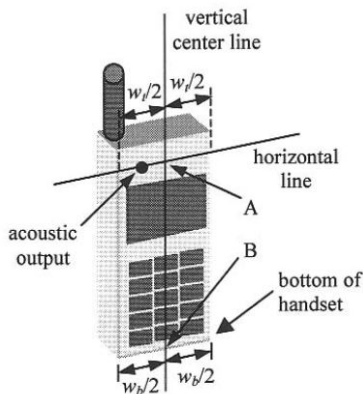


Fig 12.2.1 Handset vertical and horizontal reference lines—“fixed case”

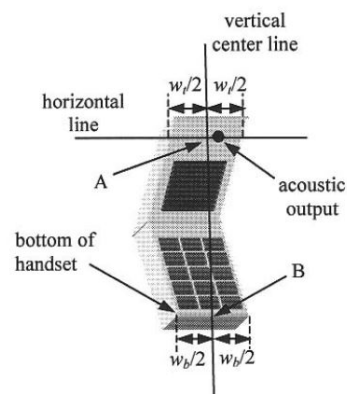


Fig 12.2.2 Handset vertical and horizontal reference lines—“clam-shell case”

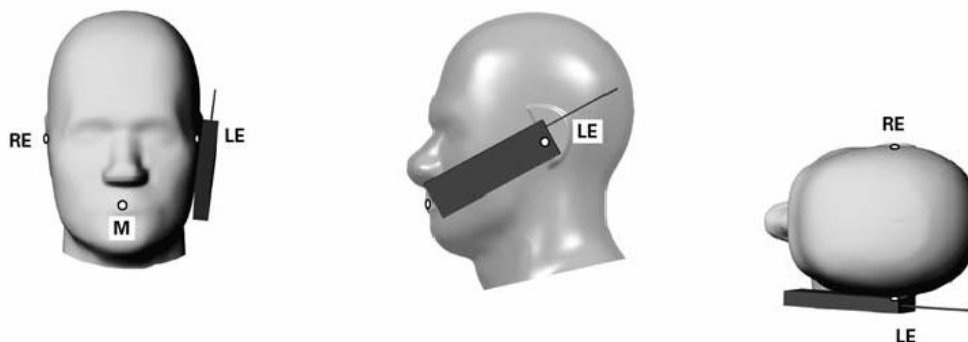


Fig 12.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

### 11.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 12.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

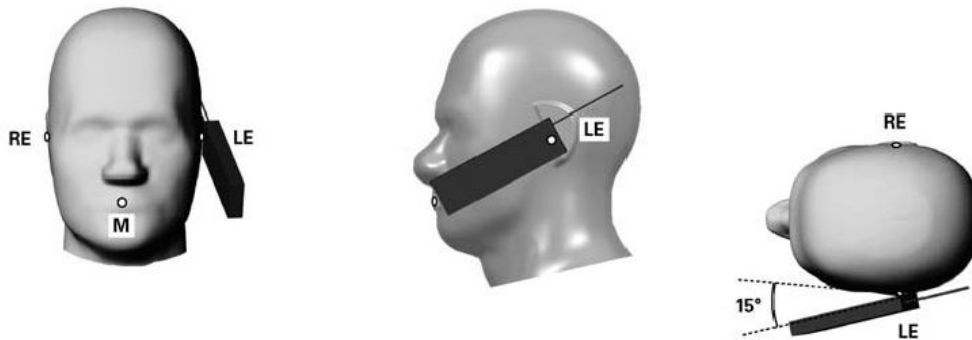


Fig 12.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

### 11.4 Body Worn Accessory

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 12.4). Per KDB648474 D04v01r03, body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for body-worn accessory, measured without a headset connected to the handset is  $> 1.2 \text{ W/kg}$ , the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Accessories for body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

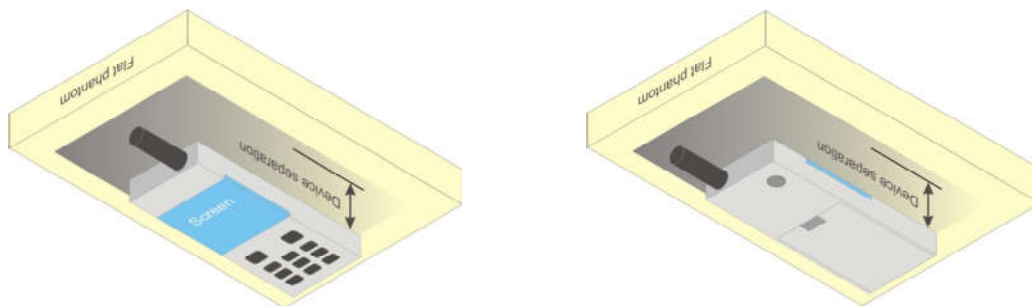


Fig 12.4 Body Worn Position



### 11.5 Product Specific 10g SAR Exposure

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, According to KDB648474 D04v01r03, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.
2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at  $\leq 25$  mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions.6 The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

### 11.6 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets ( $L \times W \geq 9$  cm x 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm 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 publication 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.



## 12. SAR Test Results

### 12.1 Head SAR

#### <WLAN2.4G SAR>

| Plot No. | Band       | Mode          | Test Position | Gap (mm) | Power Reduction | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Duty Cycle Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|----------|------------|---------------|---------------|----------|-----------------|-----|-------------|---------------------|---------------------|------------------------|--------------|---------------------------|------------------|------------------------|------------------------|
| 01       | WLAN2.4GHz | 802.11b 1Mbps | Left Cheek    | 0mm      | Full            | 1   | 2412        | 15.14               | 16.50               | 1.368                  | 98.23        | 1.018                     | -0.05            | 0.085                  | <b>0.119</b>           |

### 12.2 Hotspot SAR

#### <WCDMA SAR>

| Plot No. | Band     | Mode         | Test Position | Gap (mm) | Power Reduction | Ch.  | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|----------|----------|--------------|---------------|----------|-----------------|------|-------------|---------------------|---------------------|------------------------|------------------|------------------------|------------------------|
| 02       | WCDMA II | RMC 12.2Kbps | Bottom Side   | 5mm      | Hotspot on      | 9400 | 1880        | 18.17               | 19.00               | 1.211                  | 0.05             | 1.02                   | <b>1.235</b>           |

### 12.3 Body Worn Accessory SAR

#### <FDD LTE SAR>

| Plot No. | Band       | BW (MHz) | Modulation | RB Size | RB offset | Test Position | Gap (mm) | Headset | Power Reduction | Ch.   | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|----------|------------|----------|------------|---------|-----------|---------------|----------|---------|-----------------|-------|-------------|---------------------|---------------------|------------------------|------------------|------------------------|------------------------|
| 03       | LTE Band 2 | 20M      | QPSK       | 1       | 0         | Back          | 5mm      | -       | Receiver off    | 19100 | 1900        | 20.61               | 21.50               | 1.227                  | -0.08            | 1.01                   | <b>1.240</b>           |

### 12.4 Product specific 10g SAR

#### <GSM SAR>

| Plot No. | Band    | Mode              | Test Position | Gap (mm) | Power Reduction | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 10g SAR (W/kg) | Reported 10g SAR (W/kg) |
|----------|---------|-------------------|---------------|----------|-----------------|-----|-------------|---------------------|---------------------|------------------------|------------------|-------------------------|-------------------------|
| 04       | GSM1900 | GPRS (2 Tx slots) | Bottom Side   | 0mm      | Receiver off    | 512 | 1850.2      | 25.28               | 26.50               | 1.324                  | 0.02             | 1.09                    | <b>1.444</b>            |

Note: The verified maximum SAR from chapter 12.1 to 12.4 are all less than original report, so no need to consider co-located SAR for original report has been performed conservatively.



### 12.5 Repeated SAR Measurement

<1g>

| Plot No. | Band     | Mode         | Test Position | Gap (mm) | Power Reduction | Ch.  | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Ratio | Reported 1g SAR (W/kg) |
|----------|----------|--------------|---------------|----------|-----------------|------|-------------|---------------------|---------------------|------------------------|------------------|------------------------|-------|------------------------|
| 1st      | WCDMA II | RMC 12.2Kbps | Bottom Side   | 5mm      | Hotspot on      | 9400 | 1880        | 18.17               | 19.00               | 1.211                  | 0.05             | 1.02                   | 1     | 1.235                  |
| 2nd      | WCDMA II | RMC 12.2Kbps | Bottom Side   | 5mm      | Hotspot on      | 9400 | 1880        | 18.17               | 19.00               | 1.211                  | 0.05             | 1.01                   | 1.010 | 1.223                  |

**General Note:**

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is  $\geq 0.8W/kg$ .
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is  $\leq 1.2$  and the measured SAR  $< 1.45W/kg$ , only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

**Test Engineer** : Martin Li, Varus Wang, Ricky Gu, Light Wang, Damon Zhu



### **13. Uncertainty Assessment**

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be  $\leq 30\%$ , for a confidence interval of  $k = 2$ . If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.



## **14. References**

- [1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”
- [2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992
- [3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [6] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.
- [7] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015
- [8] FCC KDB 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.
- [9] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.
- [10] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015
- [11] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015
- [12] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.

-----THE END-----



## **Appendix A. Plots of System Performance Check**

The plots are shown as follows.

### System Check\_Head\_1900MHz

**DUT: D1900V2 - SN:5d182**

Communication System: UID 0, CW (0); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL\_1900 Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.422$  S/m;  $\epsilon_r = 39.142$ ;  $\rho = 1000$  kg/m<sup>3</sup>

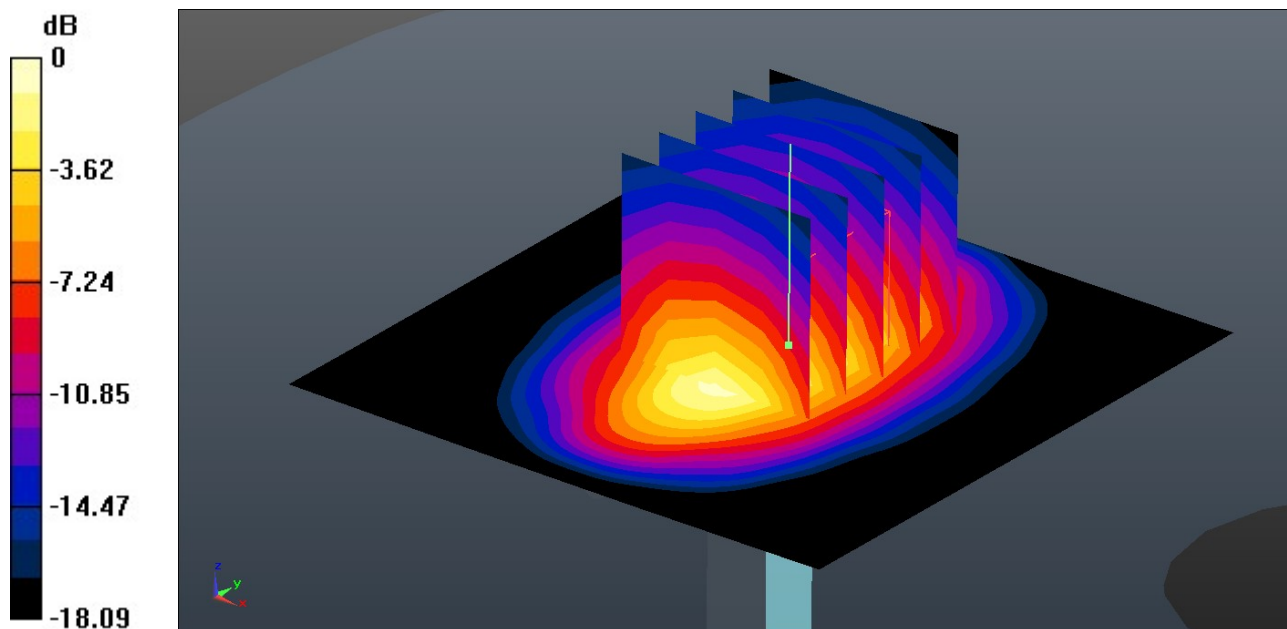
Ambient Temperature : 23.2 °C; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.86, 7.86, 7.86); Calibrated: 2021/11/24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn916; Calibrated: 2021/12/30
- Phantom: SAM Twin Phantom; Type: SAM Twin; Serial: TP-1697
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**Pin=50mW/Area Scan (61x61x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm  
Maximum value of SAR (interpolated) = 2.78 W/kg

**Pin=50mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 45.14 V/m; Power Drift = -0.11 dB  
Peak SAR (extrapolated) = 3.24 W/kg  
**SAR(1 g) = 1.88 W/kg; SAR(10 g) = 0.934 W/kg**  
Maximum value of SAR (measured) = 2.72 W/kg



0 dB = 2.72 W/kg = 4.35 dBW/kg

### System Check\_Head\_2450MHz

**DUT: D2450V2 - SN:924**

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL\_2450 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.869$  S/m;  $\epsilon_r = 38.892$ ;  $\rho = 1000$  kg/m<sup>3</sup>

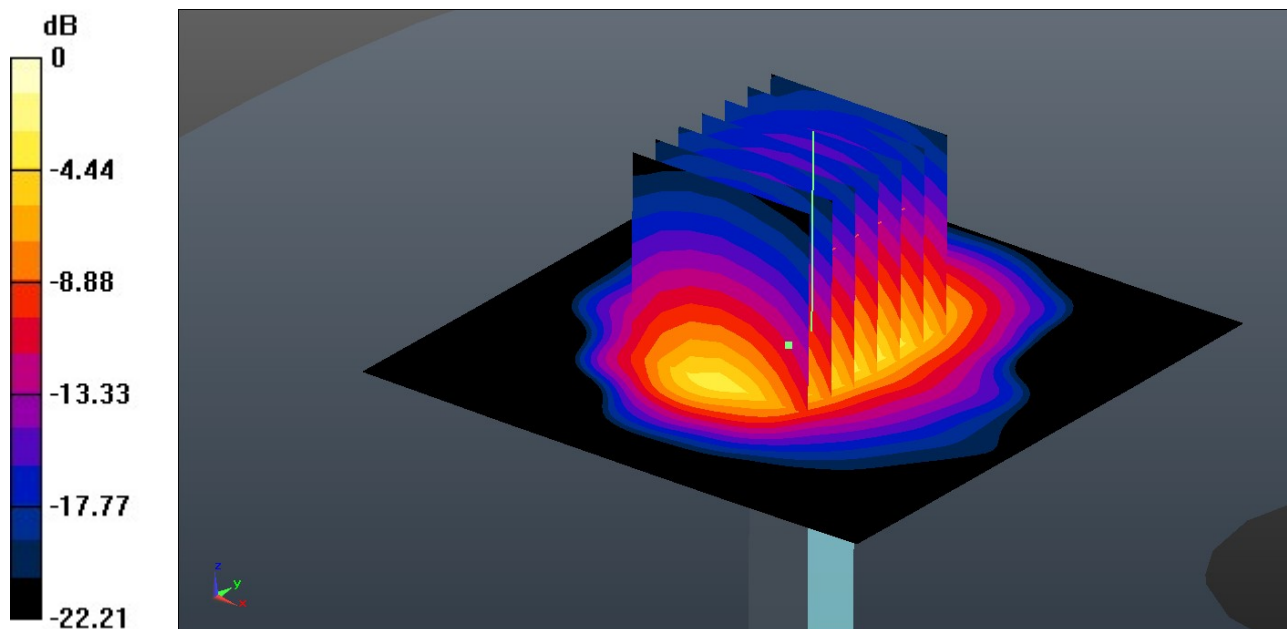
Ambient Temperature : 23.2 °C; Liquid Temperature : 22.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.53, 7.53, 7.53); Calibrated: 2021/11/24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn916; Calibrated: 2021/12/30
- Phantom: SAM Twin Phantom; Type: SAM Twin; Serial: TP-1697
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**Pin=50mW/Area Scan (71x71x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm  
Maximum value of SAR (interpolated) = 4.25 W/kg

**Pin=50mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 49.23 V/m; Power Drift = 0.09 dB  
Peak SAR (extrapolated) = 5.43 W/kg  
**SAR(1 g) = 2.59 W/kg; SAR(10 g) = 1.2 W/kg**  
Maximum value of SAR (measured) = 4.27 W/kg



0 dB = 4.27 W/kg = 6.30 dBW/kg





**Appendix B. Plots of High SAR Measurement**

The plots are shown as follows.

### 01\_WLAN2.4GHz\_802.11b 1Mbps\_Left Cheek\_0mm\_Ch1

Communication System: UID 0, WLAN2.4GHz (0); Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: HSL\_2450 Medium parameters used:  $f = 2412$  MHz;  $\sigma = 1.823$  S/m;  $\epsilon_r = 39.055$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature : 23.2 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.53, 7.53, 7.53); Calibrated: 2021/11/24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn916; Calibrated: 2021/12/30
- Phantom: SAM Twin Phantom; Type: SAM Twin; Serial: TP-1697
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**Area Scan (91x141x1):** Interpolated grid: dx=1.200 mm, dy=1.200 mm

Maximum value of SAR (interpolated) = 0.182 W/kg

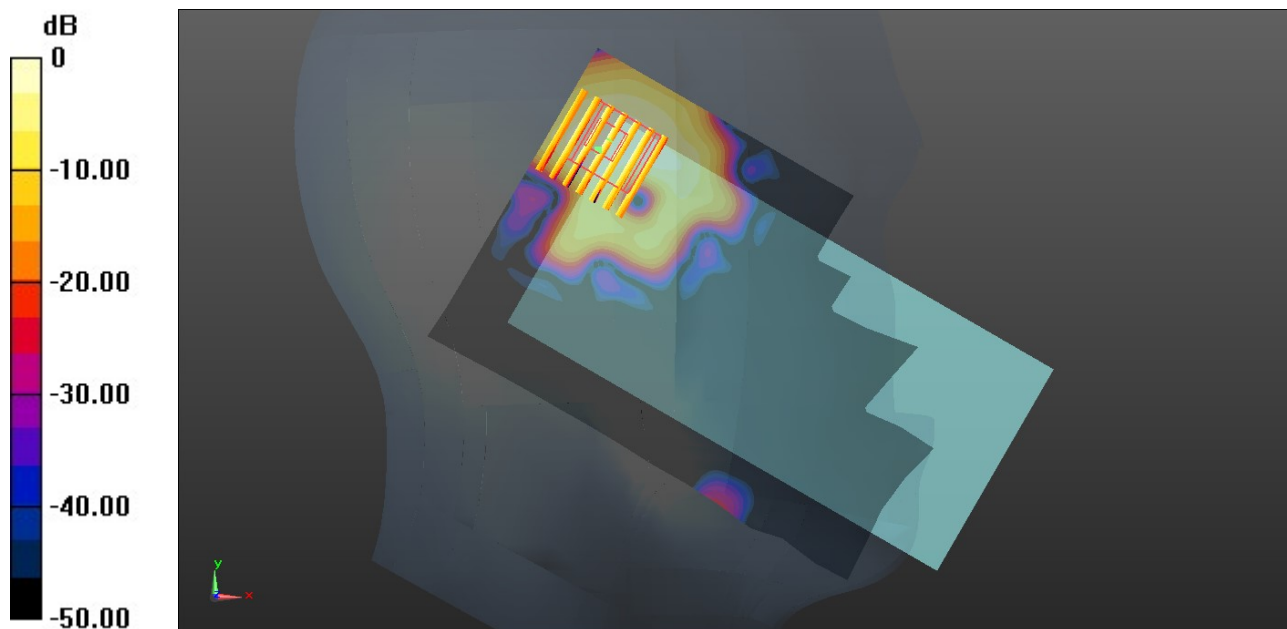
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.504 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.184 W/kg

**SAR(1 g) = 0.085 W/kg; SAR(10 g) = 0.039 W/kg**

Maximum value of SAR (measured) = 0.147 W/kg



0 dB = 0.147 W/kg = -8.33 dBW/kg

### 02\_WCDMA II\_RMC 12.2Kbps\_Bottom Side\_5mm\_Ch9400

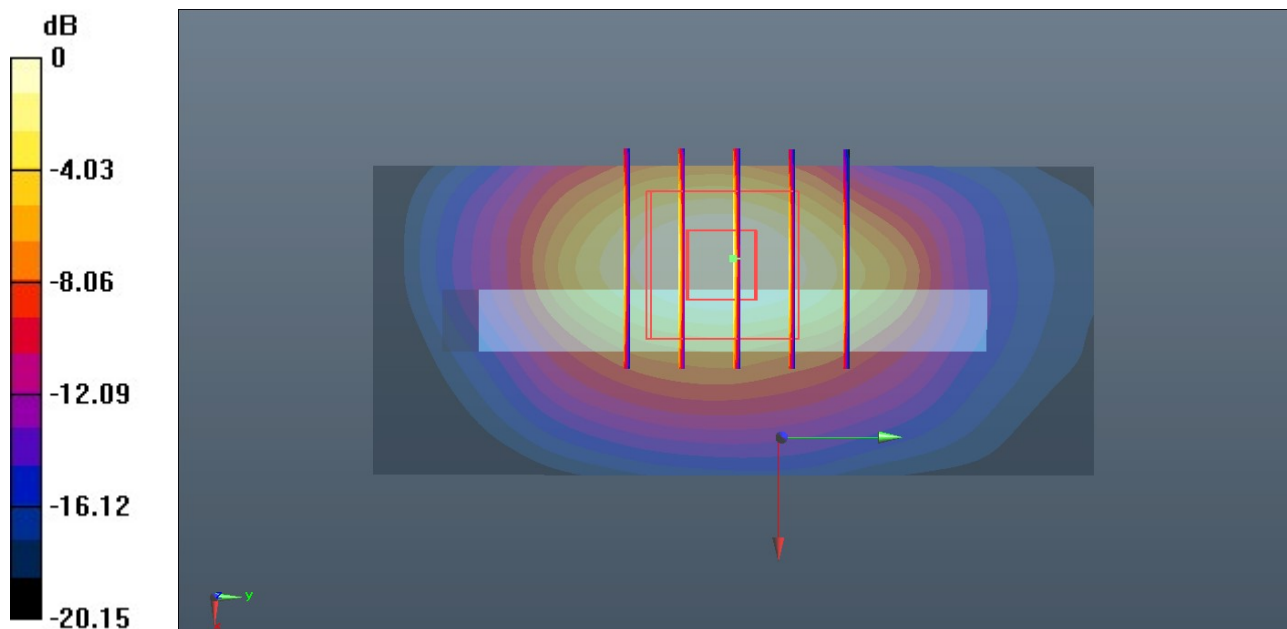
Communication System: UID 0, WCDMA (0); Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium: HSL\_1900 Medium parameters used:  $f = 1880$  MHz;  $\sigma = 1.452$  S/m;  $\epsilon_r = 39.922$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.2 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.86, 7.86, 7.86); Calibrated: 2021/11/24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn916; Calibrated: 2021/12/30
- Phantom: SAM Twin Phantom; Type: SAM Twin; Serial: TP-1697
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**Area Scan (31x71x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm  
Maximum value of SAR (interpolated) = 1.76 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 26.12 V/m; Power Drift = 0.05 dB  
Peak SAR (extrapolated) = 1.88 W/kg  
**SAR(1 g) = 1.02 W/kg; SAR(10 g) = 0.525 W/kg**  
Maximum value of SAR (measured) = 1.55 W/kg



0 dB = 1.55 W/kg = 1.90 dBW/kg

### 03\_LTE Band 2\_20M\_QPSK\_1RB\_0Offset\_Back\_5mm\_Ch19100

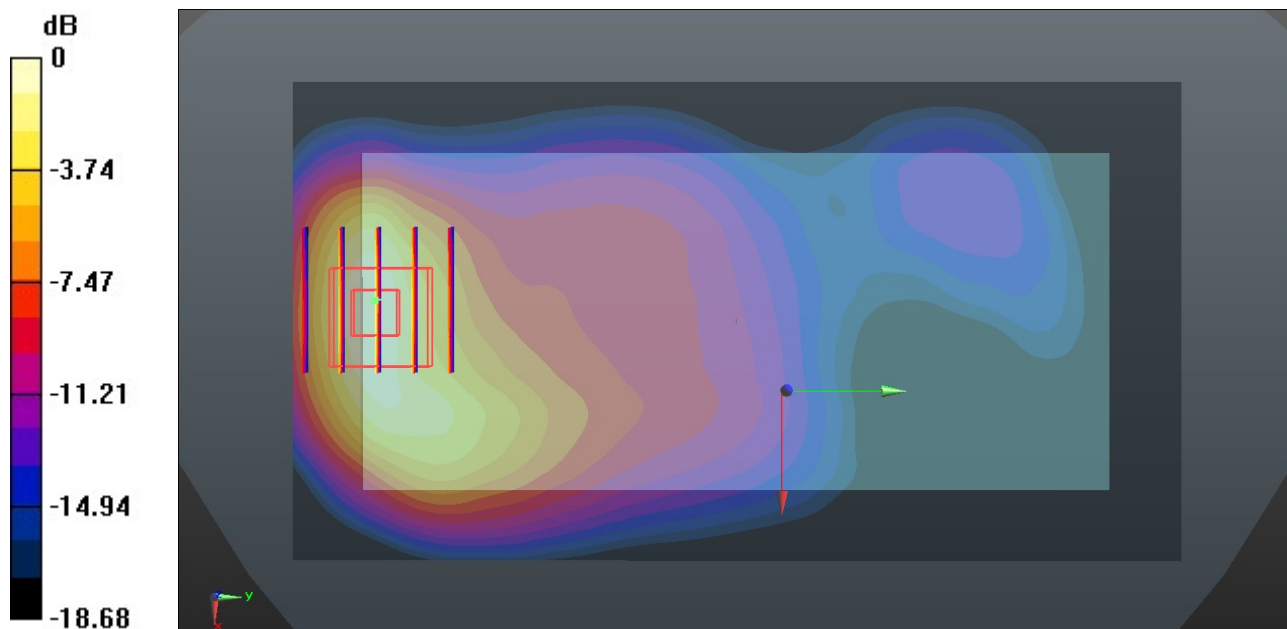
Communication System: UID 0, LTE-FDD (0); Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium: HSL\_1900 Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.422$  S/m;  $\epsilon_r = 39.142$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.2 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.86, 7.86, 7.86); Calibrated: 2021/11/24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn916; Calibrated: 2021/12/30
- Phantom: SAM Twin Phantom; Type: SAM Twin; Serial: TP-1697
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**Area Scan (71x131x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm  
Maximum value of SAR (interpolated) = 1.62 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 1.358 V/m; Power Drift = -0.08 dB  
Peak SAR (extrapolated) = 1.83 W/kg  
**SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.545 W/kg**  
Maximum value of SAR (measured) = 1.55 W/kg



0 dB = 1.55 W/kg = 1.90 dBW/kg

### 04\_GSM1900\_GPRS (2 Tx slots)\_Bottom Side\_0mm\_Ch512

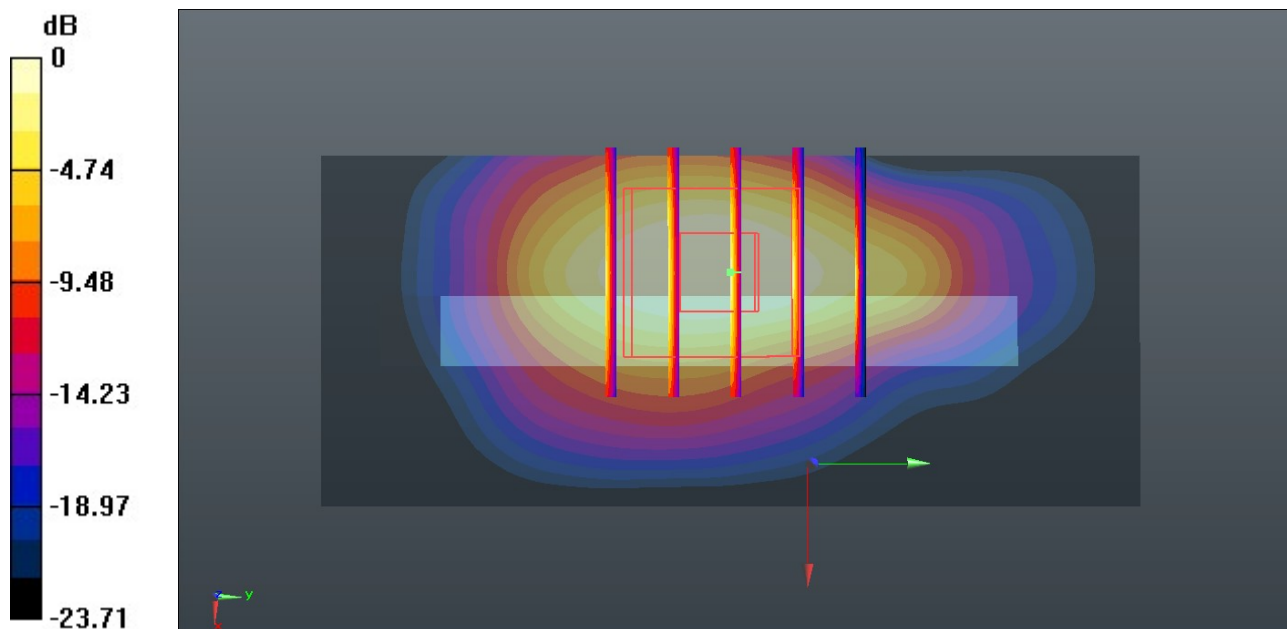
Communication System: UID 0, PCS (0); Frequency: 1850.2 MHz; Duty Cycle: 1:4.15  
Medium: HSL\_1900 Medium parameters used:  $f = 1850.2$  MHz;  $\sigma = 1.423$  S/m;  $\epsilon_r = 40.034$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Ambient Temperature : 23.2 °C; Liquid Temperature : 22.5 °C

#### DASY5 Configuration:

- Probe: EX3DV4 - SN3857; ConvF(7.86, 7.86, 7.86); Calibrated: 2021/11/24
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn916; Calibrated: 2021/12/30
- Phantom: SAM Twin Phantom; Type: SAM Twin; Serial: TP-1697
- Measurement SW: DASY52, Version 52.10 (4); SEMCAD X Version 14.6.14 (7483)

**Area Scan (31x71x1):** Interpolated grid: dx=1.500 mm, dy=1.500 mm  
Maximum value of SAR (interpolated) = 4.89 W/kg

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 39.24 V/m; Power Drift = 0.02 dB  
Peak SAR (extrapolated) = 4.92 W/kg  
**SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.09 W/kg**  
Maximum value of SAR (measured) = 3.96 W/kg



0 dB = 3.96 W/kg = 5.98 dBW/kg



**Appendix C. DASYS Calibration Certificate**

The DASYS calibration certificates are shown as follows.