**SGS-CSTC Standards Technical Services Co., Ltd.**
**Shenzhen Branch**



# *FCC SAR TEST REPORT*

| | |
|---|---|
| **Application No.:** | ZEWM2308001256RG |
| **Applicant:** | MIO LABS INC. |
| **Manufacturer:** | MIO LABS INC. |
| **Product Name:** | Blood Glucose Meter |
| **Model No.(EUT):** | TeleBGM 2283-A, TeleBGM 2284-A |
| **FCC ID:** | 2A7JQTELEBGM2283-A |
| **Standards:** | FCC 47CFR §2.1093 |
| **Date of Receipt:** | 2023/08/25 |
| **Date of Test:** | 2023/08/27 to 2023/09/16 |
| **Date of Issue:** | 2023/09/19 |
| **Test conclusion:** | **PASS *** |

* In the configuration tested, the EUT detailed in this report complied with the standards specified above.

Authorized Signature:

Ervin Li

Ervin Li

Regulatory Manager

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# REVISION HISTORY

| Report Number | Revision | Description | Issue Date |
|---|---|---|---|
| ZEWM2308001256RG01 | 01 | Original | 2023/09/19 |
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| | |
|---|---|
| **Prepared By** | Vito Wang<br>**Vito Wang** |
| **Checked By** | Roman Pan<br>**Roman Pan** |

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# TEST SUMMARY

| Frequency Band | Maximum Reported SAR1g(W/kg) |
|---|---|
| | CAT-M1 Extremity 0mm |
| CatM1 LTE Band 2 | 0.70 |
| CatM1 LTE Band 4 | **0.99** |
| CatM1 LTE Band 12 | 0.37 |
| CatM1 LTE Band 13 | 0.31 |
| SAR Limited(W/kg) | 4.0 |

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# CONTENTS

1 GENERAL INFORMATION ..... 6
1.1 DETAILS OF CLIENT ..... 6
1.2 TEST LOCATION ..... 6
1.3 TEST FACILITY ..... 7
1.4 GENERAL DESCRIPTION OF EUT ..... 8
*1.4.1 DUT Antenna Locations (Back View) ..... 9*
*1.4.2 Stand-alone SAR test evaluation ..... 9*
1.5 TEST SPECIFICATION ..... 11
1.6 RF EXPOSURE LIMITS ..... 12
2 LABORATORY ENVIRONMENT ..... 13
3 SAR MEASUREMENTS SYSTEM CONFIGURATION ..... 14
3.1 THE SAR MEASUREMENT SYSTEM ..... 14
3.2 ISOTROPIC E-FIELD PROBE EX3DV4 ..... 15
3.3 DATA ACQUISITION ELECTRONICS (DAE) ..... 16
3.4 SAM TWIN PHANTOM ..... 16
3.5 ELI PHANTOM ..... 17
3.6 DEVICE HOLDER FOR TRANSMITTERS ..... 18
3.7 MEASUREMENT PROCEDURE ..... 19
*3.7.1 Scanning procedure ..... 19*
*3.7.2 Data Storage ..... 21*
*3.7.3 Data Evaluation by SEMCAD ..... 21*
4 SAR MEASUREMENT VARIABILITY AND UNCERTAINTY ..... 23
4.1 SAR MEASUREMENT VARIABILITY ..... 23
4.2 SAR MEASUREMENT UNCERTAINTY ..... 23
5 DESCRIPTION OF TEST POSITION ..... 24
5.1 EXTREMITY EXPOSURE CONDITION ..... 24
6 SAR SYSTEM VERIFICATION PROCEDURE ..... 25
6.1 TISSUE SIMULATE LIQUID ..... 25
*6.1.1 Recipes for Tissue Simulate Liquid ..... 25*
*6.1.2 Measurement for Tissue Simulate Liquid ..... 26*
6.2 SAR SYSTEM CHECK ..... 27
*6.2.1 Justification for Extended SAR Dipole Calibrations ..... 28*
*6.2.2 Summary System Check Result(s) ..... 29*
*6.2.3 Detailed System Check Results ..... 29*
7 TEST CONFIGURATION ..... 30
7.1 OPERATION CONFIGURATIONS ..... 30
*7.1.1 LTE CAT-M1 Test Configuration ..... 30*
8 TEST RESULT ..... 32

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**8.1 MEASUREMENT OF RF CONDUCTED POWER** ..... 32
*8.1.1 Conducted Power of LTE* ..... *32*
**8.2 MEASUREMENT OF SAR DATA** ..... 38
*8.2.1 SAR Result of LTE Band 2* ..... *39*
*8.2.2 SAR Result of LTE Band 4* ..... *40*
*8.2.3 SAR Result of LTE Band 12* ..... *41*
*8.2.4 SAR Result of LTE Band 13* ..... *42*
**9 EQUIPMENT LIST** ..... **43**
**10 CALIBRATION CERTIFICATE** ..... **44**
**11 PHOTOGRAPHS** ..... **44**
**APPENDIX A: DETAILED SYSTEM CHECK RESULTS** ..... **44**
**APPENDIX B: DETAILED TEST RESULTS** ..... **44**
**APPENDIX C: CALIBRATION CERTIFICATE** ..... **44**
**APPENDIX D: PHOTOGRAPHS** ..... **44**

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# 1 General Information

## 1.1 Details of Client

| | |
|---|---|
| Applicant: | MIO LABS INC. |
| Address: | #1023, ZGC Innovation Center 4500 Great America Pkwy, Santa Clara, California 95054, United States |
| Manufacturer: | MIO LABS INC. |
| Address: | #1023, ZGC Innovation Center, 4500 Great America Pkwy, Santa Clara, CA 95054 |

## 1.2 Test Location

| | |
|---|---|
| Company: | SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch |
| Address: | No. 1 Workshop, M-10, Middle section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China |
| Post code: | 518057 |
| Test engineer: | Messi Chen |

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## 1.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

**• A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

**• Innovation, Science and Economic Development Canada**

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0006.

IC#: 4620C.

**• FCC –Designation Number: CN1336**

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch has been recognized as an accredited testing laboratory.

Designation Number: CN1336. Test Firm Registration Number: 787754.

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## 1.4 General Description of EUT

| | | | |
|---|---|---|---|
| Device Type : | portable device | | |
| Exposure Category: | uncontrolled environment / general population | | |
| Product Name: | Blood Glucose Meter | | |
| Model No.(EUT): | TeleBGM 2283-A, TeleBGM 2284-A<br>Note: The model TeleBGM 2283-A and TeleBGM 2284-A were fully tested, since according to the declaration from the applicant, the electrical circuit design, layout, components used, internal wiring and functions were identical for all the above models, with only difference on the shell and antenna. | | |
| FCC ID: | 2A7JQTELEBGM2283-A | | |
| Product Phase: | Identical Prototype | | |
| SN: | G03BG00132100001 | | |
| Hardware Version: | 01 | | |
| Software Version: | SW2071279 | | |
| Antenna Type: | PIFA antenna | | |
| Device Operating Configurations : | | | |
| Modulation Mode: | **LTE CAT-M1:** QPSK,16QAM | | |
| Power Class: | 3, tested with power control Max power | | |
| Frequency Bands: | Band | Tx (MHz) | Rx (MHz) |
| | CatM1 Band 2 | 1850-1910 | 1930-1990 |
| | CatM1 Band 4 | 1710-1755 | 2110-2155 |
| | CatM1 Band 12 | 699-716 | 729-746 |
| | CatM1 Band 13 | 777-787 | 746-756 |
| Battery Information: | Model: | ZWD633248M | |
| | Normal Voltage: | DC 3.7V | |
| | Rated capacity: | 1080mAh, 3.996Wh | |
| | Battery Type: | Rechargeable Li-ion Battery | |
| | Manufacturer: | Zhongshan Zhongwangde New Energy Technology Co., Ltd | |
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### 1.4.1 DUT Antenna Locations (Back View)

The DUT Antenna Locations can be referred to Appendix D

### 1.4.2 Stand-alone SAR test evaluation

The following SAR test exclusion Thresholds based on KDB 447498 D04 Interim General RF Exposure Guidance v01 Appendix B B.4

| Bnad | Exposure Condition | f (GHz) | Pmax (dBm) | Pmax (mw) | separation distance(cm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Front side | Back side | Left side | Right side | Top side | Bottom side |
| LTE B2 | Extremity 0mm | 1.9 | 21 | 125.89 | 0.50 | 0.50 | 2.63 | 0.50 | 7.26 | 0.50 |
| LTE B4 | Extremity 0mm | 1.75 | 21 | 125.89 | 0.50 | 0.50 | 2.63 | 0.50 | 7.26 | 0.50 |
| LTE B12 | Extremity 0mm | 0.75 | 21 | 125.89 | 0.50 | 0.50 | 2.63 | 0.50 | 7.26 | 0.50 |
| LTE B13 | Extremity 0mm | 0.75 | 21 | 125.89 | 0.50 | 0.50 | 2.63 | 0.50 | 7.26 | 0.50 |

| Bnad | Blank 1mW Blanket Exemption (mW) | MPE Based Exemption (mm) | MPE Based Exemption (mW) | SAR based Exemption(mW) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Front side | Back side | Left side | Right side | Top side | Bottom side |
| LTE B2 | 1 | 25 | 12.00 | 8.4 | 8.4 | 180.0 | 8.4 | 1175.8 | 8.4 |
| LTE B4 | 1 | 27 | 14.21 | 9.0 | 9.0 | 186.9 | 9.0 | 1197.9 | 9.0 |
| LTE B12 | 1 | 67 | 40.76 | 28.7 | 28.7 | 254.0 | 28.7 | 964.4 | 28.7 |
| LTE B13 | 1 | 61 | 37.08 | 25.1 | 25.1 | 246.4 | 25.1 | 995.9 | 25.1 |

| Bnad | SAR Test(Yes or No) | | | | | |
|---|---|---|---|---|---|---|
| | Front side | Back side | Left side | Right side | Top side | Bottom side |
| LTE B2 | Yes | Yes | Yes | Yes | No | Yes |
| LTE B4 | Yes | Yes | Yes | Yes | No | Yes |
| LTE B12 | Yes | Yes | Yes | Yes | No | Yes |
| LTE B13 | Yes | Yes | Yes | Yes | No | Yes |

**Note:**

1. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
2. Per KDB 447498 D04, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
3. Per KDB 447498 D04, standalone SAR test exclusion threshold is applied; If the distance of the antenna to the user is < 5mm, 5mm is used to determine SAR exclusion threshold
4. Per KDB 447498 D04, the 1-g and 10-g SAR test exclusion thresholds for 300 MHz to 6 GHz

**Blanket 1 mW Blanket Exemption**

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance

**MPE-based Exemption**

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of § 1.1307(b)(1) (i)(C)] to support an exemption from further evaluation from300 kHz through 100 GHz.

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TABLE B.1—THRESHOLDS FOR SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

| RF Source Frequency | | | Minimum Distance | | | Threshold ERP |
|---|---|---|---|---|---|---|
| $f_L$ MHz | | $f_H$ MHz | $\lambda_L / 2\pi$ | | $\lambda_H / 2\pi$ | W |
| 0.3 | – | 1.34 | 159 m | – | 35.6 m | 1,920 $R^2$ |
| 1.34 | – | 30 | 35.6 m | – | 1.6 m | 3,450 $R^2/f^2$ |
| 30 | – | 300 | 1.6 m | – | 159 mm | 3.83 $R^2$ |
| 300 | – | 1,500 | 159 mm | – | 31.8 mm | 0.0128 $R^2f$ |
| 1,500 | – | 100,000 | 31.8 mm | – | 0.5 mm | 19.2$R^2$ |
| Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns. | | | | | | |

**SAR-based Exemption**

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). Pth is given by Formula (B.2).

$$P_{\text{th}}\ (\text{mW}) = ERP_{20\ \text{cm}}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \qquad (\text{B.1})$$

$$P_{\text{th}}\ (\text{mW}) = \begin{cases} ERP_{20\ \text{cm}}(d/20\ \text{cm})^x & d \le 20\ \text{cm} \\ ERP_{20\ \text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \qquad (\text{B.2})$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ \text{cm}}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and ERP20cm is per Formula (B.1).
The example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

| Frequency (MHz) | Distance (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 |
| 300 | 39 | 65 | 88 | 110 | 129 | 148 | 166 | 184 | 201 | 217 |
| 450 | 22 | 44 | 67 | 89 | 112 | 135 | 158 | 180 | 203 | 226 |
| 835 | 9 | 25 | 44 | 66 | 90 | 116 | 145 | 175 | 207 | 240 |
| 1900 | 3 | 12 | 26 | 44 | 66 | 92 | 122 | 157 | 195 | 236 |
| 2450 | 3 | 10 | 22 | 38 | 59 | 83 | 111 | 143 | 179 | 219 |
| 3600 | 2 | 8 | 18 | 32 | 49 | 71 | 96 | 125 | 158 | 195 |
| 5800 | 1 | 6 | 14 | 25 | 40 | 58 | 80 | 106 | 136 | 169 |

5. when 10-g extremity SAR applies, SAR test exemption may be considered by applying a factor of 2.5 to the SAR-based exemption thresholds.

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## 1.5 Test Specification

| Identity | Document Title |
|---|---|
| FCC 47CFR §2.1093 | Radiofrequency Radiation Exposure Evaluation: Portable Devices |
| ANSI/IEEE C95.1-1992 | IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz. |
| IEEE 1528-2013 | Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques |
| KDB 447498 D04 | Interim General RF Exposure Guidance v01 |
| KDB 941225 D05 | SAR for LTE Devices v02r05 |
| KDB 865664 D01 | SAR Measurement 100 MHz to 6 GHz v01r04 |
| KDB 865664 D02 | RF Exposure Reporting v01r02 |

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## 1.6 RF exposure limits

| Human Exposure | Uncontrolled Environment General Population | Controlled Environment Occupational |
|---|---|---|
| **Spatial Peak SAR*** (Brain*Trunk) | 1.60 mW/g | 8.00 mW/g |
| **Spatial Average SAR**** (Whole Body) | 0.08 mW/g | 0.40 mW/g |
| **Spatial Peak SAR***** (Hands/Feet/Ankle/Wrist) | 4.00 mW/g | 20.00 mW/g |

**Notes:**

* 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

** The Spatial Average value of the SAR averaged over the whole body.

*** 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.

**Uncontrolled Environments** are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

**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.)

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# 2 Laboratory Environment

| | |
|---|---|
| Temperature | Min. = 18°C, Max. = 25 °C |
| Relative humidity | Min. = 30%, Max. = 70% |
| Ambient noise is checked and found very low and in compliance with requirement of standards.<br>Reflection of surrounding objects is minimized and in compliance with requirement of standards. | |

Table 1： The Ambient Conditions

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# 3 SAR Measurements System Configuration

## 3.1 The SAR Measurement System

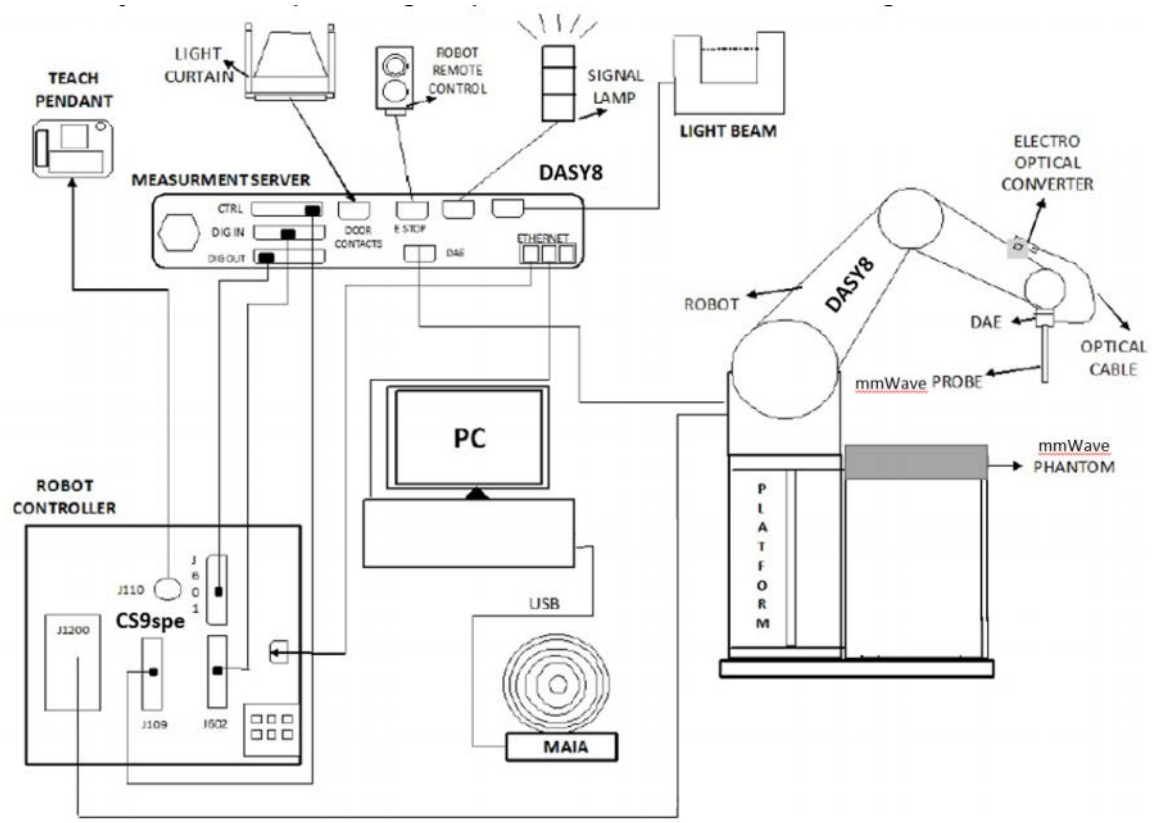
This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (SPEAG DASY professional system). A E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ (|Ei|2)/ ρ where σ and ρ are the conductivity and mass density of the tissue-Simulate.

The DASY system for performing compliance tests consists of the following items:
A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software An arm extension for accommodation the data acquisition electronics (DAE).

A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.

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 between optical and electrical of the signals for the digital communication to DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.




F-1. SAR Measurement System Configuration

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- 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.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows series.
- DASY software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand, right-hand and Body Worn usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to be validating the proper functioning of the system.

## 3.2 Isotropic E-field Probe EX3DV4

| | |
|---|---|
| | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |
| **Calibration** | ISO/IEC 17025 calibration service available. |
| **Frequency** | 10 MHz to > 6 GHz<br>Linearity: ± 0.2 dB (30 MHz to 6 GHz) |
| **Directivity** | ± 0.3 dB in TSL (rotation around probe axis)<br>± 0.5 dB in TSL (rotation normal to probe axis) |
| **Dynamic Range** | 10 µW/g to > 100 mW/g<br>Linearity: ± 0.2 dB (noise: typically < 1 µW/g) |
| **Dimensions** | 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 |
| **Application** | High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%. |
| **Compatibility** | DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI |

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## 3.3 Data Acquisition Electronics (DAE)

| | | |
|---|---|---|
| **Model** | DAE | |
| **Construction** | Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY embedded system (fully remote controlled). Two step probe touch detectors for mechanical surface detection and emergency robot stop. | |
| **Measurement Range** | -100 to +300 mV (16-bit resolution and two range settings: 4mV,400mV) | |
| **Input Offset Voltage** | < 5μV (with auto zero) | |
| **Input Bias Current** | < 50 f A | |
| **Dimensions** | 60 x 60 x 68 mm | |

## 3.4 SAM Twin Phantom

| | | |
|---|---|---|
| **Material** | Vinylester, glass fiber reinforced (VE-GF) | |
| **Liquid Compatibility** | Compatible with all SPEAG tissue simulating liquids (incl. DGBE type) | |
| **Shell Thickness** | 2 ± 0.2 mm (6 ± 0.2 mm at ear point) | |
| **Dimensions (incl. Wooden Support)** | Length: 1000 mm<br>Width: 500 mm<br>Height: adjustable feet | |
| **Filling Volume** | approx. 25 liters | |
| **Wooden Support** | SPEAG standard phantom table | |

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left- and right-hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Twin SAM V5.0 has the same shell geometry and is manufactured from the same material as Twin SAM V4.0 but has reinforced top structure.

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## 3.5 ELI Phantom

| | | |
|---|---|---|
| **Material** | Vinylester, glass fiber reinforced (VE-GF) | |
| **Liquid Compatibility** | Compatible with all SPEAG tissue simulating liquids (incl. DGBE type) | |
| **Shell Thickness** | 2.0 ± 0.2 mm (bottom plate) | |
| **Dimensions** | Major axis: 600 mm<br>Minor axis: 400 mm | |
| **Filling Volume** | approx. 30 liters | |
| **Wooden Support** | SPEAG standard phantom table | |

Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.

ELI V5.0 has the same shell geometry and is manufactured from the same material as ELI4 but has reinforced top structure.

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## 3.6 Device Holder for Transmitters

F-2. **Device Holder for Transmitters**

- The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centres for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.
- The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε=3 and loss tangent δ=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

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## 3.7 Measurement procedure

### 3.7.1 Scanning procedure

**Step 1: Power reference measurement**

The “reference” and “drift” measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure.

**Step 2: *Area scan***

The SAR distribution at the exposed side of the head was measured at a distance of 4mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm*15mm or 12mm*12mm or 10mm*10mm.Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

**Step 3: *Zoom scan***

Around this point, a volume of 32mm*32mm*30mm (f≤2GHz), 30mm*30mm*30mm (f for 2-3GHz) and 24mm*24mm*22mm (f for 5-6GHz) was assessed by measuring 5x5x7 points (f≤2GHz), 7x7x7 points (f for 2-3GHz) and 7x7x12 points (f for 5-6GHz). On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

The data at the surface was extrapolated, since the centre of the dipoles is 2.0mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. (This can be variable. Refer to the probe specification).The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The volume was integrated with the trapezoidal algorithm. One thousand points were interpolated to calculate the average. All neighbouring volumes were evaluated until no neighboring volume with a higher average value was found.

The area and zoom scan resolutions specified in the table below must be applied to the SAR measurements Probe boundary effect error compensation is required for measurements with the probe tip closer than half a probe tip diameter to the phantom surface. Both the probe tip diameter and sensor offset distance must satisfy measurement protocols; to ensure probe boundary effect errors are minimized and the higher fields closest to the phantom surface can be correctly measured and extrapolated to the phantom surface for computing 1-g SAR. Tolerances of the post-processing algorithms must be verified by the test laboratory for the scan resolutions used in the SAR measurements, according to the reference distribution functions specified in IEEE Std. 1528-2013.

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| | | | ≤ 3 GHz | > 3 GHz |
|---|---|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | | | 5 ± 1 mm | ½·δ·ln(2) ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | | | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | | | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 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 ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |
| Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$ | | | ≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm* | 3 – 4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm* |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{Zoom}(n)$ | | ≤ 5 mm | 3 – 4 GHz: ≤ 4 mm<br>4 – 5 GHz: ≤ 3 mm<br>5 – 6 GHz: ≤ 2 mm |
| | graded grid | $\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface | ≤ 4 mm | 3 – 4 GHz: ≤ 3 mm<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm |
| | | $\Delta z_{Zoom}(n>1)$: between subsequent points | ≤ 1.5·$\Delta z_{Zoom}(n-1)$ | |
| Minimum zoom scan volume | x, y, z | | ≥ 30 mm | 3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>5 – 6 GHz: ≥ 22 mm |

## Step 4: Power reference measurement (drift)

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The indicated drift is mainly the variation of the DUT's output power and should vary max. ± 5 %

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### 3.7.2 Data Storage

The DASY software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DAE4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated. The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [m W/g], [m W/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

### 3.7.3 Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

| | | |
|---|---|---|
| Probe parameters: | - Sensitivity | Normi, ai0, ai1, ai2 |
| | - Conversion factor | ConvFi |
| | - Diode compression point | Dcpi |
| Device parameters: | - Frequency | f |
| | - Crest factor | cf |
| Media parameters: | - Conductivity | ε |
| | - Density | ρ |

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot cf / dcp_i$$

With Vi = compensated signal of channel i ( i = x, y, z )
Ui = input signal of channel i ( i = x, y, z )
cf = crest factor of exciting field (DASY parameter)
dcp i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:

$$E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$$

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H-field probes:

$$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$$

With Vi = compensated signal of channel i (i = x, y, z)
Normi = sensor sensitivity of channel I (i = x, y, z)
[mV/(V/m)2] for E-field Probes
ConvF = sensitivity enhancement in solution
aij = sensor sensitivity factors for H-field probes
f = carrier frequency [GHz]
Ei = electric field strength of channel i in V/m
Hi = magnetic field strength of channel i in A/m

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}$$

The primary field data are used to calculate the derived field units.

$$SAR = (Etot^2 \cdot \sigma) / (\varepsilon \cdot 1000)$$

with SAR = local specific absorption rate in mW/g
Etot = total field strength in V/m
σ= conductivity in [mho/m] or [Siemens/m]
ε= equivalent tissue density in g/cm3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = Etot^2 2 / 3770 \quad \text{or} \quad P_{pwe} = H_{tot}^2 \cdot 37.7$$

with Ppwe = equivalent power density of a plane wave in mW/cm2
Etot = total electric field strength in V/m
Htot = total magnetic field strength in A/m

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# 4 SAR measurement variability and uncertainty

## 4.1 SAR measurement variability

Per KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04, SAR measurement variability must be assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. The additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ⩾ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ⩾ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ⩾1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

The same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.

## 4.2 SAR measurement uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

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# 5 Description of Test Position

## 5.1 Extremity Exposure Condition

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.
The closest distance from the antenna to an adjacent device surface is used to determine if SAR testing is required for the adjacent surfaces, with the adjacent surface positioned against the phantom and the surface containing the antenna positioned perpendicular to the phantom

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# 6 SAR System Verification Procedure

## 6.1 Tissue Simulate Liquid

### 6.1.1 Recipes for Tissue Simulate Liquid

The bellowing tables give the recipes for tissue simulating liquids to be used in different frequency bands：

| Ingredients (% by weight) | Frequency (MHz) | | | | |
|---|---|---|---|---|---|
| | 450 | 700-900 | 1750-2000 | 2300-2500 | 2500-2700 |
| Water | 38.56 | 40.30 | 55.24 | 55.00 | 54.92 |
| Salt (NaCl) | 3.95 | 1.38 | 0.31 | 0.2 | 0.23 |
| Sucrose | 56.32 | 57.90 | 0 | 0 | 0 |
| HEC | 0.98 | 0.24 | 0 | 0 | 0 |
| Bactericide | 0.19 | 0.18 | 0 | 0 | 0 |
| Tween | 0 | 0 | 44.45 | 44.80 | 44.85 |
| Salt: 99+% Pure Sodium Chloride<br>Water: De-ionized, 16 MΩ+ resistivity<br>Tween: Polyoxyethylene (20) sorbitan monolaurate | | | Sucrose: 98+% Pure Sucrose<br>HEC: Hydroxyethyl Cellulose | | |
| HSL5GHz is composed of the following ingredients：(Manufactured by SPEAG)<br>Water：50-65%<br>Mineral oil：10-30%<br>Emulsifiers：8-25%<br>Sodium salt：0-1.5% | | | | | |

Table 2： Recipe of Tissue Simulate Liquid

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### 6.1.2 Measurement for Tissue Simulate Liquid

The Conductivity (σ) and Permittivity ($\varepsilon_r$) are listed in bellow table. For the SAR measurement given in this report. The temperature variation of the Tissue Simulate Liquids was 22±2°C.

| Tissue Type | Measured Frequency (MHz) | Measured Tissue | | Target Tissue (±5%) | | Deviation (Within ±5% ) | | Liquid Temp. (℃) | Test Date |
|---|---|---|---|---|---|---|---|---|---|
| | | $\varepsilon_r$ | σ(S/m) | $\varepsilon_r$ | σ(S/m) | $\varepsilon_r$ | σ(S/m) | | |
| 750 Head | 750 | 42.700 | 0.885 | 41.90 | 0.89 | 1.91% | -0.56% | 21.8 | 2023/8/27 |
| 1750 Head | 1750 | 40.500 | 1.390 | 40.10 | 1.37 | 1.00% | 1.46% | 21.8 | 2023/8/27 |
| 1950 Head | 1950 | 40.200 | 1.430 | 40.00 | 1.40 | 0.50% | 2.14% | 21.8 | 2023/8/27 |

Table 3： Measurement result of Tissue electric parameters

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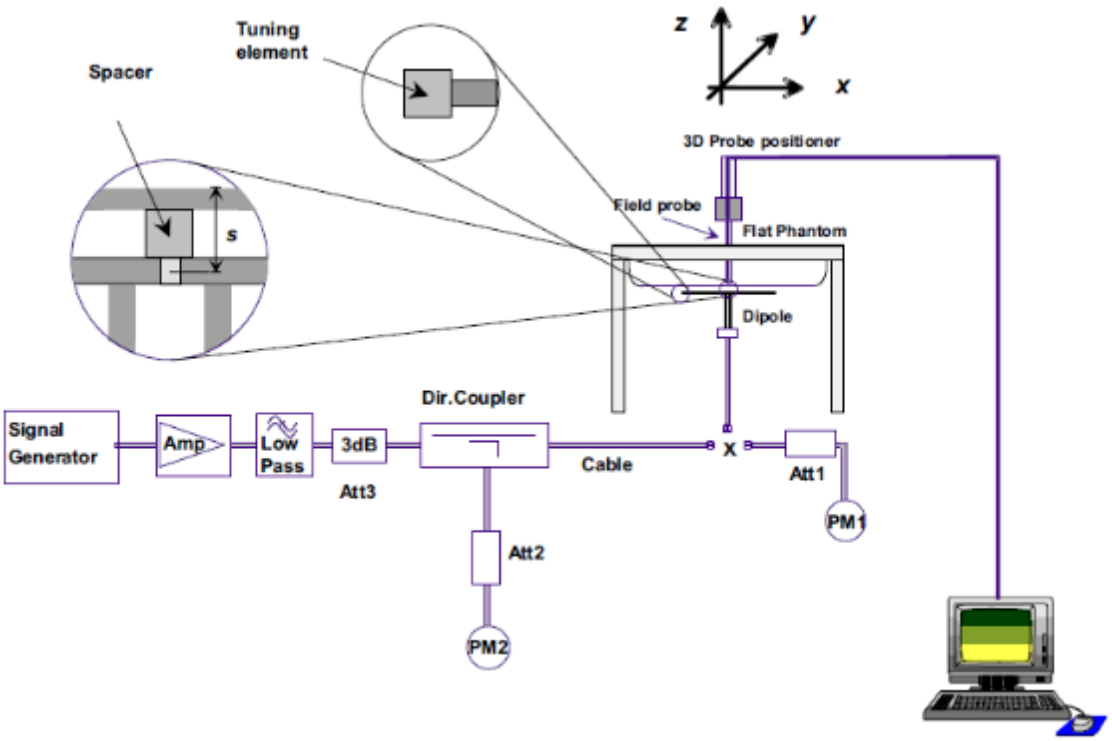
## 6.2 SAR System Check

The microwave circuit arrangement for system Check is sketched as below. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. The tests were conducted on the same days as the measurement of the EUT. The obtained results from the system accuracy verification are displayed in the following table (A power level of 250mW (below 3GHz) or 100mW (3-6GHz) was input to the dipole antenna). During the tests, the ambient temperature of the laboratory was in the range 22±2°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15±0.5 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.




F-1. the microwave circuit arrangement used for SAR system check

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### 6.2.1 Justification for Extended SAR Dipole Calibrations

1) Referring to KDB 865664 D01 requirements for dipole calibration, instead of the typical annual calibration recommended by measurement standards, longer calibration intervals of up to three years may be considered when it is demonstrated that the SAR target, impedance and return loss of a dipole have remain stable according to the following requirements. Each measured dipole is expected to evaluate with the following criteria at least on annual interval in Appendix C.
a) There is no physical damage on the dipole.
b) System check with specific dipole is within 10% of calibrated value.
c) Return-loss is within 10% of calibrated measurement.
d) Impedance is within 5Ω from the previous measurement.

2) Network analyzer probe calibration against air, distilled water and a shorting block performed before measuring liquid parameters.

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### 6.2.2 Summary System Check Result(s)

| Validation Kit | | Measured SAR 250mW | Measured SAR 250mW | Measured SAR (normalized to 1W) | Measured SAR (normalized to 1W) | Target SAR (normalized to 1W) | Target SAR (normalized to 1W) | Deviation (Within ±10%) | | Liquid Temp. (℃) | Test Date |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1g (W/kg) | 10g (W/kg) | 1g (W/kg) | 10g (W/kg) | 1-g(W/kg) | 10-g(W/kg) | 1-g(W/kg) | 10-g(W/kg) | | |
| D750V3 | Head | 2.20 | 1.48 | 8.80 | 5.92 | 8.37 | 5.53 | 5.14% | 7.05% | 21.8 | 2023/8/27 |
| D1750V2 | Head | 9.26 | 5.00 | 37.04 | 20.00 | 36.60 | 19.30 | 1.20% | 3.63% | 21.8 | 2023/8/27 |
| D1950V3 | Head | 10.90 | 5.67 | 43.60 | 22.68 | 40.50 | 20.80 | 7.65% | 9.04% | 21.8 | 2023/8/27 |

Table 4： SAR System Check Result

### 6.2.3 Detailed System Check Results

Please see the Appendix A

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# 7 Test Configuration

## 7.1 Operation Configurations

### 7.1.1 LTE CAT-M1 Test Configuration

Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The Radio Communication Analyzer was used for LTE output power measurements and SAR testing. Max power control was used so the UE transmits with maximum output power during SAR testing. SAR must be measured with the maximum TTI (transmit time interval) supported by the device in each LTE configuration.

**A) 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.
**B) 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 TS36.521-1 Section 6.2.3EA under Table 6.2.3EA-2.

| Modulation | Channel bandwidth / Transmission bandwidth ($N_{RB}$) | | | | | | MPR (dB) |
|---|---|---|---|---|---|---|---|
| | 1.4 MHz | 3.0 MHz | 5 MHz | 10 MHz | 15 MHz | 20 MHz | |
| QPSK | >2 | >2 | >3 | >5 | - | - | ≤ 1 |
| QPSK | >5 | >5 | - | - | - | - | ≤ 2 |
| 16 QAM | ≤ 2 | ≤ 2 | >3 | >5 | - | - | ≤ 1 |
| 16QAM | >2 | >2 | >5 | - | - | - | ≤ 2 |

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

**D) Largest channel bandwidth standalone SAR test requirements**
1) QPSK with 1 RB allocation
Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 50% limit SAR value, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel. When the reported SAR of a required test channel is >90% limit SAR value, SAR is required for all three RB offset configurations for that required test channel.

2) QPSK with 50%RB
For QPSK with 50%RB, SAR is not required when the highest maximum output power for 50%RB is not higher than the maximum output power in 1 RB allocations and the highest reported SAR for 1 RB in 1) is ≤ 75% limit SAR value. Otherwise, SAR is only required measure for the worst case of 1RB allocation used the highest maximum output power channel and if the reported SAR is> 90% limit SAR value, the remaining required test channels must also be tested.

3) QPSK 100%RB allocation
For QPSK 100% RB allocation, SAR is not required when the highest maximum output power for 100%RB allocation is not higher than the maximum output power in 1 RB allocations and the highest reported SAR for 1

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RB in 1) is ≤ 75% limit SAR value. Otherwise, SAR is only required measure for the worst case of 1RB allocation used the highest maximum output power channel and if the reported SAR is> 90% limit SAR value, the remaining required test channels must also be tested.

4) Higher order modulations
For each modulation besides QPSK; e.g., 16QAM, apply the QPSK procedures in above sections to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 90% limit SAR value.

**E) Other channel bandwidth standalone SAR test requirements**

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section A) to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 90% limit SAR value.

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# 8 Test Result

## 8.1 Measurement of RF conducted Power

### 8.1.1 Conducted Power of LTE

| LTE CatM1 Band 2 | | | | Conducted Power(dBm) | | | |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | Modulation | RB size | RB offset | Channel 18607 | Channel 18900 | Channel 19193 | Tune up |
| **1.4MHz** | QPSK | 1 | 0 | 19.98 | 19.78 | 19.99 | 20.0 |
| | | 1 | 2 | 19.83 | 19.9 | 19.76 | 20.0 |
| | | 1 | 5 | 19.69 | 19.69 | 19.86 | 20.0 |
| | | 3 | 0 | 19.35 | 19.76 | 19.52 | 20.0 |
| | | 3 | 2 | 19.62 | 19.79 | 19.46 | 20.0 |
| | | 3 | 3 | 19.96 | 19.59 | 19.46 | 20.0 |
| | | 6 | 0 | 19.67 | 19.81 | 19.52 | 20.0 |
| | 16QAM | 1 | 0 | 19.61 | 19.54 | 19.45 | 20.5 |
| | | 1 | 2 | 19.64 | 20 | 19.66 | 20.5 |
| | | 1 | 5 | 19.59 | 19.45 | 19.4 | 20.0 |
| | | 3 | 0 | 19.86 | 19.9 | 19.4 | 20.0 |
| | | 3 | 2 | 19.78 | 19.63 | 19.43 | 20.0 |
| | | 3 | 3 | 19.7 | 19.45 | 19.45 | 20.0 |
| | | 6 | 0 | 19.57 | 19.21 | 19.15 | 20.0 |
| **Bandwidth** | Modulation | RB size | RB offset | Channel 18615 | Channel 18900 | Channel 19185 | Tune up |
| **3MHz** | QPSK | 1 | 0 | 19.82 | 19.85 | 19.88 | 20.0 |
| | | 1 | 2 | 19.36 | 19.65 | 19.94 | 20.0 |
| | | 1 | 5 | 19.68 | 19.76 | 19.74 | 20.0 |
| | | 3 | 0 | 19.26 | 19.63 | 19.46 | 20.0 |
| | | 3 | 2 | 19.43 | 19.55 | 19.34 | 20.0 |
| | | 3 | 3 | 19.33 | 19.47 | 19.48 | 20.0 |
| | | 6 | 0 | 19.45 | 19.38 | 19.38 | 20.0 |
| | 16QAM | 1 | 0 | 19.55 | 19.4 | 19.35 | 20.0 |
| | | 1 | 2 | 19.41 | 18.91 | 19.24 | 20.0 |
| | | 1 | 5 | 19.36 | 19.4 | 19.38 | 20.0 |
| | | 3 | 0 | 19.25 | 19.31 | 19.02 | 20.0 |
| | | 3 | 2 | 19.12 | 19.15 | 18.84 | 20.0 |
| | | 3 | 3 | 19.26 | 19.25 | 18.8 | 20.0 |
| | | 6 | 0 | 19.34 | 18.99 | 19.22 | 20.0 |
| **Bandwidth** | Modulation | RB size | RB offset | Channel 18625 | Channel 18900 | Channel 19175 | Tune up |
| **5MHz** | QPSK | 1 | 0 | 20.21 | 20.27 | 20.18 | 20.5 |
| | | 1 | 2 | 19.53 | 19.76 | 20.17 | 20.5 |
| | | 1 | 5 | 19.69 | 19.78 | 19.97 | 20.0 |
| | | 3 | 0 | 19.26 | 19.53 | 19.41 | 20.0 |
| | | 3 | 2 | 19.33 | 19.56 | 19.19 | 20.0 |
| | | 3 | 3 | 19.27 | 19.43 | 19.31 | 20.0 |
| | | 6 | 0 | 19.34 | 19.29 | 19.38 | 20.0 |
| | 16QAM | 1 | 0 | 19.93 | 20.06 | 20.06 | 20.5 |
| | | 1 | 2 | 19.32 | 18.61 | 19.36 | 20.0 |
| | | 1 | 5 | 19.78 | 19.65 | 19.66 | 20.0 |
| | | 3 | 0 | 19.54 | 19.49 | 19.07 | 20.0 |
| | | 3 | 2 | 19.33 | 19.19 | 18.87 | 20.0 |
| | | 3 | 3 | 19.14 | 19.16 | 18.84 | 20.0 |
| | | 6 | 0 | 19.24 | 18.85 | 19.21 | 20.0 |
| **Bandwidth** | Modulation | RB size | RB offset | Channel | Channel | Channel | Tune up |

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| | | | | 18650 | 18900 | 19150 | |
|---|---|---|---|---|---|---|---|
| 10MHz | QPSK | 1 | 0 | 20.26 | 20.27 | 20.36 | 20.5 |
| | | 1 | 2 | 19.95 | 19.78 | 20.13 | 20.5 |
| | | 1 | 5 | 19.71 | 20.01 | 19.91 | 20.5 |
| | | 3 | 0 | 19.32 | 19.71 | 19.54 | 20.0 |
| | | 3 | 2 | 19.62 | 19.61 | 19.4 | 20.0 |
| | | 3 | 3 | 19.35 | 19.47 | 19.44 | 20.0 |
| | | 6 | 0 | 19.35 | 19.43 | 19.49 | 20.0 |
| | 16QAM | 1 | 0 | 19.9 | 20.14 | 20.14 | 20.5 |
| | | 1 | 2 | 19.63 | 19.69 | 19.65 | 20.0 |
| | | 1 | 5 | 19.79 | 19.78 | 19.72 | 20.0 |
| | | 3 | 0 | 19.56 | 19.41 | 19.07 | 20.0 |
| | | 3 | 2 | 19.22 | 19.14 | 18.94 | 20.0 |
| | | 3 | 3 | 19.56 | 19.16 | 18.81 | 20.0 |
| | | 6 | 0 | 19.44 | 18.9 | 19.12 | 20.0 |
| **Bandwidth** | Modulation | RB size | RB offset | Channel 18675 | Channel 18900 | Channel 19125 | Tune up |
| 15MHz | QPSK | 1 | 0 | 20.3 | 20.3 | 20.27 | 20.5 |
| | | 1 | 2 | 19.97 | 20.04 | 20.13 | 20.5 |
| | | 1 | 5 | 19.63 | 19.95 | 19.83 | 20.0 |
| | | 3 | 0 | 19.43 | 19.62 | 19.5 | 20.0 |
| | | 3 | 2 | 19.56 | 19.51 | 19.34 | 20.0 |
| | | 3 | 3 | 19.27 | 19.51 | 19.41 | 20.0 |
| | | 6 | 0 | 19.54 | 19.39 | 19.47 | 20.0 |
| | 16QAM | 1 | 0 | 20.05 | 20.11 | 20.02 | 20.5 |
| | | 1 | 2 | 19.34 | 19.68 | 19.34 | 20.0 |
| | | 1 | 5 | 19.61 | 19.72 | 19.8 | 20.0 |
| | | 3 | 0 | 19.36 | 19.48 | 19.04 | 20.0 |
| | | 3 | 2 | 19.23 | 19.14 | 18.94 | 20.0 |
| | | 3 | 3 | 19.45 | 19.17 | 18.86 | 20.0 |
| | | 6 | 0 | 19.55 | 18.92 | 18.77 | 20.0 |
| **Bandwidth** | Modulation | RB size | RB offset | Channel 18700 | Channel 18900 | Channel 19100 | Tune up |
| 20MHz | QPSK | 1 | 0 | 20.21 | 20.24 | 20.19 | 21.0 |
| | | 1 | 2 | 20.09 | 20.11 | 20.27 | 21.0 |
| | | 1 | 5 | 19.71 | 19.94 | 19.98 | 21.0 |
| | | 3 | 0 | 19.39 | 19.67 | 19.4 | 20.0 |
| | | 3 | 2 | 19.68 | 19.58 | 19.43 | 20.0 |
| | | 3 | 3 | 19.48 | 19.5 | 19.46 | 20.0 |
| | | 6 | 0 | 19.65 | 19.38 | 19.37 | 20.0 |
| | 16QAM | 1 | 0 | 19.91 | 20.06 | 20.05 | 20.5 |
| | | 1 | 2 | 19.66 | 20.08 | 19.42 | 20.5 |
| | | 1 | 5 | 19.94 | 19.5 | 19.9 | 20.0 |
| | | 3 | 0 | 19.53 | 19.29 | 19.09 | 20.0 |
| | | 3 | 2 | 19.42 | 19.18 | 18.95 | 20.0 |
| | | 3 | 3 | 19.52 | 19.07 | 18.87 | 20.0 |
| | | 6 | 0 | 19.27 | 19.05 | 18.58 | 20.0 |

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| LTE CatM1 Band 4 | | | | Conducted Power(dBm) | | | |
|---|---|---|---|---|---|---|---|
| **Bandwidth** | Modulation | RB size | RB offset | Channel 19957 | Channel 20175 | Channel 20393 | Tune up |
| **1.4MHz** | QPSK | 1 | 0 | 20.32 | 20.04 | 20.33 | 20.5 |
| | | 1 | 2 | 19.82 | 19.25 | 20.2 | 20.5 |
| | | 1 | 5 | 19.82 | 19.61 | 19.53 | 20.0 |
| | | 3 | 0 | 19.71 | 19.63 | 19.52 | 20.0 |
| | | 3 | 2 | 19.9 | 19.57 | 19.59 | 20.0 |
| | | 3 | 3 | 19.32 | 19.26 | 19.66 | 20.0 |
| | | 6 | 0 | 19.8 | 18.93 | 18.97 | 20.0 |
| | 16QAM | 1 | 0 | 19.41 | 19.97 | 19.28 | 20.0 |
| | | 1 | 2 | 19.48 | 19.69 | 19.36 | 20.0 |
| | | 1 | 5 | 19.56 | 19.6 | 19.43 | 20.0 |
| | | 3 | 0 | 19.35 | 19.67 | 19.14 | 20.0 |
| | | 3 | 2 | 19.12 | 19.28 | 19.06 | 20.0 |
| | | 3 | 3 | 19.4 | 19.1 | 19.09 | 20.0 |
| | | 6 | 0 | 19.35 | 18.57 | 19.17 | 20.0 |
| **Bandwidth** | Modulation | RB size | RB offset | Channel 19965 | Channel 20175 | Channel 20385 | Tune up |
| **3MHz** | QPSK | 1 | 0 | 20.3 | 20.24 | 20.25 | 20.5 |
| | | 1 | 2 | 19.79 | 19.42 | 19.49 | 20.5 |
| | | 1 | 5 | 19.83 | 19.73 | 19.56 | 20.5 |
| | | 3 | 0 | 19.69 | 20.06 | 19.85 | 20.5 |
| | | 3 | 2 | 19.92 | 19.93 | 19.51 | 20.0 |
| | | 3 | 3 | 19.79 | 19.68 | 19.55 | 20.0 |
| | | 6 | 0 | 19.85 | 19.4 | 18.92 | 20.0 |
| | 16QAM | 1 | 0 | 19.46 | 19.69 | 19.65 | 20.5 |
| | | 1 | 2 | 19.83 | 18.61 | 19.4 | 20.5 |
| | | 1 | 5 | 20.15 | 18.65 | 19.47 | 20.5 |
| | | 3 | 0 | 19.31 | 19.49 | 19.12 | 20.0 |
| | | 3 | 2 | 19.15 | 19.23 | 19.1 | 20.0 |
| | | 3 | 3 | 19.44 | 19.39 | 18.83 | 20.0 |
| | | 6 | 0 | 18.81 | 18.99 | 18.74 | 19.0 |
| **Bandwidth** | Modulation | RB size | RB offset | Channel 19975 | Channel 20175 | Channel 20375 | Tune up |
| **5MHz** | QPSK | 1 | 0 | 20.21 | 20.17 | 20.33 | 20.5 |
| | | 1 | 2 | 20.19 | 19.4 | 19.65 | 20.5 |
| | | 1 | 5 | 19.8 | 19.53 | 19.64 | 20.0 |
| | | 3 | 0 | 19.77 | 19.41 | 19.5 | 20.0 |
| | | 3 | 2 | 19.84 | 19.55 | 19.5 | 20.0 |
| | | 3 | 3 | 19.7 | 19.34 | 19.56 | 20.0 |
| | | 6 | 0 | 19.82 | 19.38 | 19.03 | 20.0 |
| | 16QAM | 1 | 0 | 19.94 | 19.66 | 19.33 | 20.0 |
| | | 1 | 2 | 19.77 | 19.56 | 19.34 | 20.0 |
| | | 1 | 5 | 19.14 | 19.01 | 19.46 | 20.0 |
| | | 3 | 0 | 19.34 | 19.63 | 19.57 | 20.0 |
| | | 3 | 2 | 19.14 | 19.57 | 18.98 | 20.0 |
| | | 3 | 3 | 18.96 | 19.19 | 19.04 | 20.0 |
| | | 6 | 0 | 18.86 | 19.02 | 19.35 | 20.0 |

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| Bandwidth | Modulation | RB size | RB offset | Channel 20000 | Channel 20175 | Channel 20350 | Tune up |
|---|---|---|---|---|---|---|---|
| 10MHz | QPSK | 1 | 0 | 20.29 | 20.32 | 20.12 | 20.5 |
| | | 1 | 2 | 20 | 19.95 | 19.6 | 20.5 |
| | | 1 | 5 | 19.82 | 19.65 | 19.62 | 20.0 |
| | | 3 | 0 | 19.75 | 19.61 | 19.68 | 20.0 |
| | | 3 | 2 | 19.86 | 19.6 | 19.59 | 20.0 |
| | | 3 | 3 | 19.72 | 19.66 | 19.62 | 20.0 |
| | | 6 | 0 | 19.77 | 18.95 | 19.03 | 20.0 |
| | 16QAM | 1 | 0 | 19.89 | 19.43 | 19.75 | 20.5 |
| | | 1 | 2 | 19.78 | 19.52 | 19.79 | 20.5 |
| | | 1 | 5 | 20.01 | 19.43 | 19.76 | 20.5 |
| | | 3 | 0 | 19.33 | 19.41 | 19.57 | 20.0 |
| | | 3 | 2 | 19.49 | 19.09 | 19.23 | 20.0 |
| | | 3 | 3 | 19.45 | 19.11 | 19.11 | 20.0 |
| | | 6 | 0 | 18.84 | 19.01 | 19.24 | 20.0 |
| **Bandwidth** | Modulation | RB size | RB offset | Channel 20025 | Channel 20175 | Channel 20325 | Tune up |
| 15MHz | QPSK | 1 | 0 | 20.38 | 20.33 | 19.98 | 20.5 |
| | | 1 | 2 | 19.82 | 19.48 | 19.66 | 20.0 |
| | | 1 | 5 | 19.41 | 19.64 | 19.47 | 20.5 |
| | | 3 | 0 | 19.73 | 19.68 | 19.62 | 20.0 |
| | | 3 | 2 | 19.64 | 19.55 | 19.54 | 20.0 |
| | | 3 | 3 | 19.78 | 19.6 | 19.68 | 20.0 |
| | | 6 | 0 | 19.85 | 18.97 | 19.12 | 20.0 |
| | 16QAM | 1 | 0 | 19.41 | 19.37 | 19.65 | 20.5 |
| | | 1 | 2 | 20.05 | 19.56 | 19.49 | 20.5 |
| | | 1 | 5 | 19.95 | 19.64 | 19.77 | 20.0 |
| | | 3 | 0 | 19.34 | 19.71 | 19.15 | 20.0 |
| | | 3 | 2 | 19.33 | 19.55 | 19.01 | 20.0 |
| | | 3 | 3 | 19.39 | 19.1 | 18.92 | 20.0 |
| | | 6 | 0 | 18.81 | 18.6 | 18.8 | 19.0 |
| **Bandwidth** | Modulation | RB size | RB offset | Channel 20050 | Channel 20175 | Channel 20300 | Tune up |
| 20MHz | QPSK | 1 | 0 | 20.52 | 20.39 | 20.44 | 21.0 |
| | | 1 | 2 | 19.99 | 20.2 | 20.22 | 21.0 |
| | | 1 | 5 | 19.43 | 19.61 | 19.93 | 21.0 |
| | | 3 | 0 | 19.77 | 19.6 | 19.53 | 20.0 |
| | | 3 | 2 | 19.86 | 19.61 | 19.62 | 20.0 |
| | | 3 | 3 | 19.75 | 19.58 | 19.55 | 20.0 |
| | | 6 | 0 | 19.81 | 19.35 | 18.96 | 20.0 |
| | 16QAM | 1 | 0 | 19.46 | 19.62 | 19.87 | 20.5 |
| | | 1 | 2 | 19.81 | 19.6 | 19.78 | 20.5 |
| | | 1 | 5 | 20.16 | 19.46 | 19.77 | 20.5 |
| | | 3 | 0 | 19.32 | 19.31 | 19.31 | 20.0 |
| | | 3 | 2 | 19.11 | 19.29 | 19.33 | 20.0 |
| | | 3 | 3 | 19.4 | 19.1 | 18.95 | 20.0 |
| | | 6 | 0 | 18.84 | 18.62 | 18.86 | 19.0 |

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| LTE CatM1 Band 12 | | | | Conducted Power(dBm) | | | |
|---|---|---|---|---|---|---|---|
| Bandwidth | Modulation | RB size | RB offset | Channel 23017 | Channel 23095 | Channel 23173 | Tune up |
| 1.4MHz | QPSK | 1 | 0 | 20.03 | 19.71 | 20.14 | 20.5 |
| | | 1 | 2 | 19.91 | 20.03 | 19.88 | 20.5 |
| | | 1 | 5 | 19.91 | 19.7 | 19.92 | 20.5 |
| | | 3 | 0 | 19.6 | 19.88 | 20.03 | 20.5 |
| | | 3 | 2 | 19.83 | 19.88 | 19.87 | 20.0 |
| | | 3 | 3 | 19.62 | 19.86 | 19.89 | 20.0 |
| | | 6 | 0 | 19.6 | 19.19 | 19.3 | 20.0 |
| | 16QAM | 1 | 0 | 19.75 | 19.93 | 20.09 | 20.5 |
| | | 1 | 2 | 19.47 | 19.41 | 19.75 | 20.5 |
| | | 1 | 5 | 19.64 | 19.48 | 19.46 | 20.0 |
| | | 3 | 0 | 19.45 | 19.3 | 19.4 | 20.0 |
| | | 3 | 2 | 19.06 | 19.43 | 19.53 | 20.0 |
| | | 3 | 3 | 19.24 | 18.93 | 19.43 | 20.0 |
| | | 6 | 0 | 18.65 | 18.79 | 19.47 | 20.0 |
| Bandwidth | Modulation | RB size | RB offset | Channel 23025 | Channel 23095 | Channel 23165 | Tune up |
| 3MHz | QPSK | 1 | 0 | 20.07 | 19.8 | 19.76 | 20.5 |
| | | 1 | 2 | 19.82 | 19.34 | 19.8 | 20.5 |
| | | 1 | 5 | 19.77 | 19.66 | 19.66 | 20.5 |
| | | 3 | 0 | 19.63 | 19.93 | 20.01 | 20.5 |
| | | 3 | 2 | 19.67 | 19.89 | 20.01 | 20.5 |
| | | 3 | 3 | 19.63 | 19.84 | 20.01 | 20.5 |
| | | 6 | 0 | 19.68 | 19.27 | 19.37 | 20.0 |
| | 16QAM | 1 | 0 | 19.64 | 19.7 | 19.68 | 20.0 |
| | | 1 | 2 | 19.44 | 19.47 | 19.49 | 20.0 |
| | | 1 | 5 | 19.4 | 19.65 | 19.7 | 20.0 |
| | | 3 | 0 | 19.62 | 19.4 | 19.78 | 20.0 |
| | | 3 | 2 | 19.49 | 19.09 | 19.72 | 20.0 |
| | | 3 | 3 | 19.37 | 19.08 | 19.46 | 20.0 |
| | | 6 | 0 | 19.36 | 18.85 | 19.45 | 20.0 |
| Bandwidth | Modulation | RB size | RB offset | Channel 23035 | Channel 23095 | Channel 23155 | Tune up |
| 5MHz | QPSK | 1 | 0 | 20.02 | 20.11 | 20.09 | 20.5 |
| | | 1 | 2 | 19.89 | 19.61 | 19.93 | 20.0 |
| | | 1 | 5 | 19.44 | 19.43 | 19.83 | 20.0 |
| | | 3 | 0 | 19.52 | 19.51 | 19.67 | 20.0 |
| | | 3 | 2 | 19.76 | 19.44 | 19.85 | 20.0 |
| | | 3 | 3 | 19.69 | 19.5 | 19.61 | 20.0 |
| | | 6 | 0 | 19.77 | 19.28 | 19.41 | 20.0 |
| | 16QAM | 1 | 0 | 19.84 | 20.08 | 20.02 | 20.5 |
| | | 1 | 2 | 19.74 | 19.36 | 19.98 | 20.0 |
| | | 1 | 5 | 19.66 | 19.58 | 19.55 | 20.0 |
| | | 3 | 0 | 19.55 | 19.36 | 19.75 | 20.0 |
| | | 3 | 2 | 19.47 | 19.12 | 19.46 | 20.0 |
| | | 3 | 3 | 19.42 | 19.05 | 19.39 | 20.0 |
| | | 6 | 0 | 19.26 | 18.92 | 19.2 | 20.0 |
| Bandwidth | Modulation | RB size | RB offset | Channel | Channel | Channel | Tune up |

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| | | | | 23060 | 23095 | 23130 | |
|---|---|---|---|---|---|---|---|
| 10MHz | QPSK | 1 | 0 | 20.36 | 20.47 | 20.17 | 21.0 |
| | | 1 | 2 | 19.89 | 19.65 | 19.97 | 21.0 |
| | | 1 | 5 | 19.76 | 19.83 | 19.83 | 21.0 |
| | | 3 | 0 | 19.6 | 19.99 | 19.83 | 20.5 |
| | | 3 | 2 | 19.86 | 19.89 | 19.96 | 20.5 |
| | | 3 | 3 | 19.69 | 19.83 | 19.96 | 20.5 |
| | | 6 | 0 | 19.77 | 19.24 | 19.35 | 20.0 |
| | 16QAM | 1 | 0 | 19.6 | 19.86 | 19.73 | 20.0 |
| | | 1 | 2 | 19.63 | 19.7 | 19.69 | 20.0 |
| | | 1 | 5 | 19.52 | 19.44 | 19.81 | 20.0 |
| | | 3 | 0 | 19.19 | 19.78 | 19.65 | 20.0 |
| | | 3 | 2 | 19.08 | 19.15 | 19.51 | 20.0 |
| | | 3 | 3 | 19.02 | 19.35 | 19.51 | 20.0 |
| | | 6 | 0 | 19.03 | 18.89 | 19.35 | 20.0 |

| LTE CatM1 Band 13 | | | | Conducted Power(dBm) | | | |
|---|---|---|---|---|---|---|---|
| Bandwidth | Modulation | RB size | RB offset | Channel 23205 | Channel 23230 | Channel 23255 | Tune up |
| 5MHz | QPSK | 1 | 0 | 20.19 | 19.83 | 19.59 | 20.5 |
| | | 1 | 2 | 20.14 | 19.64 | 19.69 | 20.5 |
| | | 1 | 5 | 19.92 | 19.73 | 19.72 | 20.5 |
| | | 3 | 0 | 19.94 | 20 | 20 | 20.5 |
| | | 3 | 2 | 20.09 | 19.85 | 19.89 | 20.5 |
| | | 3 | 3 | 19.92 | 19.87 | 20.01 | 20.5 |
| | | 6 | 0 | 20.03 | 19.29 | 19.45 | 20.5 |
| | 16QAM | 1 | 0 | 19.68 | 19.95 | 20.51 | 20.5 |
| | | 1 | 2 | 19.99 | 19.47 | 20.21 | 20.5 |
| | | 1 | 5 | 20.26 | 18.74 | 19.77 | 20.5 |
| | | 3 | 0 | 19.65 | 19.76 | 19.65 | 20.0 |
| | | 3 | 2 | 19.44 | 19.47 | 19.76 | 20.0 |
| | | 3 | 3 | 19.77 | 19.38 | 19.46 | 20.0 |
| | | 6 | 0 | 19.56 | 19.1 | 19.85 | 20.0 |
| Bandwidth | Modulation | RB size | RB offset | Channel 23230 | Channel 23230 | Channel 23230 | Tune up |
| 10MHz | QPSK | 1 | 0 | 20.28 | 20.34 | 19.97 | 21.0 |
| | | 1 | 2 | 19.3 | 19.26 | 19.36 | 21.0 |
| | | 1 | 5 | 19.83 | 20.02 | 20.09 | 21.0 |
| | | 3 | 0 | 19.98 | 20.15 | 20.05 | 20.5 |
| | | 3 | 2 | 19.97 | 20.01 | 19.85 | 20.5 |
| | | 3 | 3 | 19.82 | 19.92 | 19.94 | 20.5 |
| | | 6 | 0 | 20.04 | 19.46 | 19.84 | 20.5 |
| | 16QAM | 1 | 0 | 19.34 | 19.45 | 19.96 | 20.0 |
| | | 1 | 2 | 19.86 | 19.15 | 19.96 | 20.0 |
| | | 1 | 5 | 19.99 | 18.96 | 19.74 | 20.0 |
| | | 3 | 0 | 19.97 | 19.93 | 19.83 | 20.0 |
| | | 3 | 2 | 19.38 | 19.28 | 19.18 | 20.0 |
| | | 3 | 3 | 19.59 | 19.42 | 19.34 | 20.0 |
| | | 6 | 0 | 19.33 | 19.15 | 19.66 | 20.0 |

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## 8.2 Measurement of SAR Data

**Note:**

1) The maximum Scaled SAR value is marked in bold. Graph results refer to Appendix B.

2) Per KDB447498 D04, testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is:

- ≤ 0.8W/kg for 1-g or 2.0W/kg for 10-g respectively, when the transmission band is ≤ 100MHz.
- ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz.
- ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz.

3) If the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg(2.0W/kg for 10g) then testing at the other channels is not required for such test configuration(s).

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### 8.2.1 SAR Result of LTE Band 2

| LTE Band 2 SAR Test Record (TeleBGM 2284-A) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test position | BW. | Test mode | Test ch./Freq. | Duty Cycle | SAR (W/kg) 1-g | Power drift (dB) | Conducted Power(dBm) | Tune up Limit(dBm) | Scaled factor | Scaled SAR 1-g (W/kg) | Liquid Temp.(℃) |
| Extremity Test data (Separate 0mm 1RB) | | | | | | | | | | | |
| Front side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.286 | 0.02 | 20.27 | 21.00 | 1.183 | 0.338 | 21.8 |
| Back side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.541 | 0.03 | 20.27 | 21.00 | 1.183 | 0.640 | 21.8 |
| Left side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.063 | -0.14 | 20.27 | 21.00 | 1.183 | 0.075 | 21.8 |
| Right side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.308 | 0.15 | 20.27 | 21.00 | 1.183 | 0.364 | 21.8 |
| Bottom side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.591 | -0.02 | 20.27 | 21.00 | 1.183 | **0.699** | 21.8 |
| Extremity Test data (Separate 0mm 50%RB) | | | | | | | | | | | |
| Front side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.294 | 0.02 | 19.68 | 20.00 | 1.076 | 0.316 | 21.8 |
| Back side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.515 | 0.15 | 19.68 | 20.00 | 1.076 | 0.554 | 21.8 |
| Left side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.057 | -0.13 | 19.68 | 20.00 | 1.076 | 0.061 | 21.8 |
| Right side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.287 | 0.00 | 19.68 | 20.00 | 1.076 | 0.309 | 21.8 |
| Bottom side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.632 | -0.05 | 19.68 | 20.00 | 1.076 | 0.680 | 21.8 |

| LTE Band 2 SAR Test Record (TeleBGM 2283-A) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test position | BW. | Test mode | Test ch./Freq. | Duty Cycle | SAR (W/kg) 1-g | Power drift (dB) | Conducted Power(dBm) | Tune up Limit(dBm) | Scaled factor | Scaled SAR 1-g (W/kg) | Liquid Temp.(℃) |
| Extremity Test data (Separate 0mm 1RB) | | | | | | | | | | | |
| Front side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.383 | 0.03 | 20.27 | 21.00 | 1.183 | 0.453 | 21.8 |
| Back side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.422 | 0.05 | 20.27 | 21.00 | 1.183 | 0.499 | 21.8 |
| Left side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.057 | 0.07 | 20.27 | 21.00 | 1.183 | 0.067 | 21.8 |
| Right side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.270 | -0.05 | 20.27 | 21.00 | 1.183 | 0.319 | 21.8 |
| Bottom side | 20 | QPSK 1_2 | 19100/1900 | 1:1 | 0.508 | 0.12 | 20.27 | 21.00 | 1.183 | 0.601 | 21.8 |
| Extremity Test data (Separate 0mm 50%RB) | | | | | | | | | | | |
| Front side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.430 | -0.10 | 19.68 | 20.00 | 1.076 | 0.463 | 21.8 |
| Back side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.460 | -0.08 | 19.68 | 20.00 | 1.076 | 0.495 | 21.8 |
| Left side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.077 | 0.13 | 19.68 | 20.00 | 1.076 | 0.083 | 21.8 |
| Right side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.266 | 0.10 | 19.68 | 20.00 | 1.076 | 0.286 | 21.8 |
| Bottom side | 20 | QPSK 3_2 | 18700/1860 | 1:1 | 0.584 | 0.02 | 19.68 | 20.00 | 1.076 | 0.629 | 21.8 |

Table 5： SAR of LTE CAT-M1 Band 2 for Extremity.

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### 8.2.2 SAR Result of LTE Band 4

| LTE Band 4 SAR Test Record (TeleBGM 2284-A) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test position | BW. | Test mode | Test ch./Freq. | Duty Cycle | SAR (W/kg) 1-g | Power drift (dB) | Conducted Power(dBm) | Tune up Limit(dBm) | Scaled factor | Scaled SAR 1-g (W/kg) | Liquid Temp.(℃) |
| Extremity Test data (Separate 0mm 1RB) | | | | | | | | | | | |
| Front side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.458 | -0.02 | 20.52 | 21.00 | 1.117 | 0.512 | 21.8 |
| Back side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.551 | -0.01 | 20.52 | 21.00 | 1.117 | 0.615 | 21.8 |
| Left side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.109 | -0.13 | 20.52 | 21.00 | 1.117 | 0.122 | 21.8 |
| Right side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.318 | -0.14 | 20.52 | 21.00 | 1.117 | 0.355 | 21.8 |
| Bottom side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.882 | 0.04 | 20.52 | 21.00 | 1.117 | **0.985** | 21.8 |
| Bottom side Repeated | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.866 | -0.01 | 20.52 | 21.00 | 1.117 | 0.967 | 21.8 |
| Bottom side | 20 | QPSK 1_2 | 20175/1732.5 | 1:1 | 0.809 | -0.01 | 20.20 | 21.00 | 1.202 | 0.973 | 21.8 |
| Bottom side | 20 | QPSK 1_0 | 20300/1745 | 1:1 | 0.803 | 0.06 | 20.44 | 21.00 | 1.138 | 0.914 | 21.8 |
| Extremity Test data (Separate 0mm 50%RB) | | | | | | | | | | | |
| Front side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.417 | -0.10 | 19.86 | 20.00 | 1.033 | 0.431 | 21.8 |
| Back side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.572 | -0.15 | 19.86 | 20.00 | 1.033 | 0.591 | 21.8 |
| Left side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.101 | 0.06 | 19.86 | 20.00 | 1.033 | 0.104 | 21.8 |
| Right side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.294 | 0.07 | 19.86 | 20.00 | 1.033 | 0.304 | 21.8 |
| Bottom side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.831 | -0.04 | 19.86 | 20.00 | 1.033 | 0.858 | 21.8 |
| Bottom side | 20 | QPSK 3_3 | 20175/1732.5 | 1:1 | 0.850 | -0.13 | 19.61 | 20.00 | 1.094 | 0.930 | 21.8 |
| Bottom side | 20 | QPSK 3_0 | 20300/1745 | 1:1 | 0.837 | 0.00 | 19.62 | 20.00 | 1.091 | 0.914 | 21.8 |
| Extremity Test data (Separate 0mm 100%RB) | | | | | | | | | | | |
| Bottom side | 20 | QPSK 6_0 | 20175/1732.5 | 1:1 | 0.818 | -0.01 | 19.81 | 20.00 | 1.045 | 0.855 | 21.8 |

| LTE Band 4 SAR Test Record (TeleBGM 2283-A) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test position | BW. | Test mode | Test ch./Freq. | Duty Cycle | SAR (W/kg) 1-g | Power drift (dB) | Conducted Power(dBm) | Tune up Limit(dBm) | Scaled factor | Scaled SAR 1-g (W/kg) | Liquid Temp.(℃) |
| Extremity Test data (Separate 0mm 1RB) | | | | | | | | | | | |
| Front side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.529 | 0.03 | 20.52 | 21.00 | 1.117 | 0.591 | 21.8 |
| Back side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.517 | 0.08 | 20.52 | 21.00 | 1.117 | 0.577 | 21.8 |
| Left side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.095 | -0.02 | 20.52 | 21.00 | 1.117 | 0.106 | 21.8 |
| Right side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.245 | -0.13 | 20.52 | 21.00 | 1.117 | 0.274 | 21.8 |
| Bottom side | 20 | QPSK 1_0 | 20050/1720 | 1:1 | 0.693 | 0.05 | 20.52 | 21.00 | 1.117 | 0.774 | 21.8 |
| Extremity Test data (Separate 0mm 50%RB) | | | | | | | | | | | |
| Front side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.457 | 0.07 | 19.86 | 20.00 | 1.033 | 0.472 | 21.8 |
| Back side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.363 | 0.09 | 19.86 | 20.00 | 1.033 | 0.375 | 21.8 |
| Left side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.076 | -0.10 | 19.86 | 20.00 | 1.033 | 0.078 | 21.8 |
| Right side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.222 | 0.04 | 19.86 | 20.00 | 1.033 | 0.229 | 21.8 |
| Bottom side | 20 | QPSK 3_3 | 20050/1720 | 1:1 | 0.633 | 0.06 | 19.86 | 20.00 | 1.033 | 0.654 | 21.8 |

Table 6： SAR of LTE CAT-M1 Band 4 for Extremity.

| Test Position | Channel/ Frequency (MHz) | Measured SAR (1g) | 1st Repeated SAR (1g) | Ratio | 2nd Repeated SAR (1g) | 3rd Repeated SAR (1g) |
|---|---|---|---|---|---|---|
| Bottom side | 20050/1720 | 0.882 | 0.866 | 1.018 | N/A | N/A |
| Note: 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once. | | | | | | |
| 2) A second repeated measurement was preformed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit). | | | | | | |
| 3) A third repeated measurement was preformed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20. | | | | | | |
| 4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg | | | | | | |

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### 8.2.3 SAR Result of LTE Band 12

| LTE Band 12 SAR Test Record (TeleBGM 2284-A) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test position | BW. | Test mode | Test ch./Freq. | Duty Cycle | SAR (W/kg) 1-g | Power drift (dB) | Conducted Power(dBm) | Tune up Limit(dBm) | Scaled factor | Scaled SAR 1-g (W/kg) | Liquid Temp.(℃) |
| Extremity Test data (Separate 0mm 1RB) | | | | | | | | | | | |
| Front side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.245 | -0.08 | 20.47 | 21.00 | 1.130 | 0.277 | 21.8 |
| Back side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.329 | -0.01 | 20.47 | 21.00 | 1.130 | **0.372** | 21.8 |
| Left side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.194 | -0.06 | 20.47 | 21.00 | 1.130 | 0.219 | 21.8 |
| Right side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.191 | 0.06 | 20.47 | 21.00 | 1.130 | 0.216 | 21.8 |
| Bottom side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.185 | 0.00 | 20.47 | 21.00 | 1.130 | 0.209 | 21.8 |
| Extremity Test data (Separate 0mm 50%RB) | | | | | | | | | | | |
| Front side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.235 | -0.05 | 19.99 | 20.50 | 1.125 | 0.264 | 21.8 |
| Back side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.327 | -0.01 | 19.99 | 20.50 | 1.125 | 0.368 | 21.8 |
| Left side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.194 | -0.10 | 19.99 | 20.50 | 1.125 | 0.218 | 21.8 |
| Right side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.190 | 0.00 | 19.99 | 20.50 | 1.125 | 0.214 | 21.8 |
| Bottom side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.177 | -0.03 | 19.99 | 20.50 | 1.125 | 0.199 | 21.8 |

| LTE Band 12 SAR Test Record (TeleBGM 2283-A) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test position | BW. | Test mode | Test ch./Freq. | Duty Cycle | SAR (W/kg) 1-g | Power drift (dB) | Conducted Power(dBm) | Tune up Limit(dBm) | Scaled factor | Scaled SAR 1-g (W/kg) | Liquid Temp.(℃) |
| Extremity Test data (Separate 0mm 1RB) | | | | | | | | | | | |
| Front side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.242 | 0.04 | 20.47 | 21.00 | 1.130 | 0.273 | 21.8 |
| Back side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.270 | 0.09 | 20.47 | 21.00 | 1.130 | 0.305 | 21.8 |
| Left side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.280 | -0.01 | 20.47 | 21.00 | 1.130 | 0.316 | 21.8 |
| Right side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.298 | -0.06 | 20.47 | 21.00 | 1.130 | 0.337 | 21.8 |
| Bottom side | 10 | QPSK 1_0 | 23095/707.5 | 1:1 | 0.210 | 0.13 | 20.47 | 21.00 | 1.130 | 0.237 | 21.8 |
| Extremity Test data (Separate 0mm 50%RB) | | | | | | | | | | | |
| Front side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.270 | 0.12 | 19.99 | 20.50 | 1.125 | 0.304 | 21.8 |
| Back side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.238 | -0.05 | 19.99 | 20.50 | 1.125 | 0.268 | 21.8 |
| Left side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.267 | -0.06 | 19.99 | 20.50 | 1.125 | 0.300 | 21.8 |
| Right side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.279 | 0.05 | 19.99 | 20.50 | 1.125 | 0.314 | 21.8 |
| Bottom side | 10 | QPSK 3_2 | 23130/711 | 1:1 | 0.130 | 0.08 | 19.99 | 20.50 | 1.125 | 0.146 | 21.8 |

Table 7： SAR of LTE CAT-M1 Band 12 for Extremity.

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### 8.2.4 SAR Result of LTE Band 13

| LTE Band 13 SAR Test Record (TeleBGM 2284-A) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test position | BW. | Test mode | Test ch./Freq. | Duty Cycle | SAR (W/kg) 1-g | Power drift (dB) | Conducted Power(dBm) | Tune up Limit(dBm) | Scaled factor | Scaled SAR 1-g (W/kg) | Liquid Temp.(℃) |
| Extremity Test data (Separate 0mm 1RB) | | | | | | | | | | | |
| Front side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.239 | 0.17 | 20.34 | 21.00 | 1.164 | 0.278 | 21.8 |
| Back side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.269 | 0.02 | 20.34 | 21.00 | 1.164 | **0.313** | 21.8 |
| Left side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.156 | 0.01 | 20.34 | 21.00 | 1.164 | 0.182 | 21.8 |
| Right side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.148 | 0.00 | 20.34 | 21.00 | 1.164 | 0.172 | 21.8 |
| Bottom side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.161 | 0.02 | 20.34 | 21.00 | 1.164 | 0.187 | 21.8 |
| Extremity Test data (Separate 0mm 50%RB) | | | | | | | | | | | |
| Front side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.203 | -0.16 | 20.15 | 20.50 | 1.084 | 0.220 | 21.8 |
| Back side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.253 | -0.04 | 20.15 | 20.50 | 1.084 | 0.274 | 21.8 |
| Left side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.144 | -0.04 | 20.15 | 20.50 | 1.084 | 0.156 | 21.8 |
| Right side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.160 | -0.01 | 20.15 | 20.50 | 1.084 | 0.173 | 21.8 |
| Bottom side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.150 | -0.01 | 20.15 | 20.50 | 1.084 | 0.163 | 21.8 |

| LTE Band 13 SAR Test Record (TeleBGM 2283-A) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Test position | BW. | Test mode | Test ch./Freq. | Duty Cycle | SAR (W/kg) 1-g | Power drift (dB) | Conducted Power(dBm) | Tune up Limit(dBm) | Scaled factor | Scaled SAR 1-g (W/kg) | Liquid Temp.(℃) |
| Extremity Test data (Separate 0mm 1RB) | | | | | | | | | | | |
| Front side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.193 | -0.02 | 20.34 | 21.00 | 1.164 | 0.225 | 21.8 |
| Back side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.207 | 0.02 | 20.34 | 21.00 | 1.164 | 0.241 | 21.8 |
| Left side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.128 | 0.05 | 20.34 | 21.00 | 1.164 | 0.149 | 21.8 |
| Right side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.219 | 0.03 | 20.34 | 21.00 | 1.164 | 0.255 | 21.8 |
| Bottom side | 10 | QPSK 1_0 | 23230/782 | 1:1 | 0.133 | 0.13 | 20.34 | 21.00 | 1.164 | 0.155 | 21.8 |
| Extremity Test data (Separate 0mm 50%RB) | | | | | | | | | | | |
| Front side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.197 | 0.05 | 20.15 | 20.50 | 1.084 | 0.214 | 21.8 |
| Back side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.200 | -0.04 | 20.15 | 20.50 | 1.084 | 0.217 | 21.8 |
| Left side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.164 | 0.07 | 20.15 | 20.50 | 1.084 | 0.178 | 21.8 |
| Right side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.202 | -0.03 | 20.15 | 20.50 | 1.084 | 0.219 | 21.8 |
| Bottom side | 10 | QPSK 3_0 | 23230/782 | 1:1 | 0.122 | 0.06 | 20.15 | 20.50 | 1.084 | 0.132 | 21.8 |

Table 8： SAR of LTE CAT-M1 Band 13 for Extremity.

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# 9 Equipment list

| Test Platform | SPEAG DASY Professional | | | | | |
|---|---|---|---|---|---|---|
| Description | SAR Test System (Frequency range 300MHz-6GHz) | | | | | |
| Software Reference | DASY8 Module SAR V16.2.4.2524 | | | | | |
| **Hardware Reference** | | | | | | |
| Equipment | | Manufacturer | Model | Serial Number | Calibration Date | Due date of calibration |
| ☒ | Twin Phantom | SPEAG | SAM 8 | 2146 | NCR | NCR |
| ☒ | DAE | SPEAG | DAE4ip | 1803 | 2023/07/14 | 2024/07/13 |
| ☒ | E-Field Probe | SPEAG | EX3DV4 | 7821 | 2023/07/17 | 2024/07/16 |
| ☒ | Validation Kits | SPEAG | D750V3 | 1160 | 2022/06/06 | 2025/06/05 |
| ☒ | Validation Kits | SPEAG | D1750V2 | 1149 | 2022/06/17 | 2025/06/16 |
| ☒ | Validation Kits | SPEAG | D1950V3 | 1138 | 2022/10/31 | 2025/10/30 |
| ☒ | Dielectric parameter probes | SPEAG | DAKS-3.5 | 0005 | 2023/6/15 | 2024/6/14 |
| ☒ | Vector Network Analyzer and Vector Reflectometer | SPEAG | DAKS_VNA R140 | 0140913 | 2023/6/7 | 2024/6/6 |
| ☒ | Radio Communication Analyzer | Anritsu | MT8820C | 6201616273 | 2023/02/16 | 2024/02/15 |
| ☒ | Universal Radio Communication tester | R&S | CMW500 | 154501 | 2023/03/20 | 2024/03/19 |
| ☒ | RF Bi-Directional Coupler | Agilent | 86205-60001 | MY31400031 | NCR | NCR |
| ☒ | Signal Generator | Agilent | N5171B | MY53050736 | 2023/02/16 | 2024/02/15 |
| ☒ | Preamplifier | Mini-Circuits | ZHL-42W | 15542 | NCR | NCR |
| ☒ | Preamplifier | Compliance Directions Systems Inc. | AMP28-3W | 073501433 | NCR | NCR |
| ☒ | Power Meter | Agilent | E4416A | GB41292095 | 2023/02/16 | 2024/02/15 |
| ☒ | Power Sensor | Agilent | 8481H | MY41091234 | 2023/02/16 | 2024/02/15 |
| ☒ | Power Sensor | R&S | NRP-Z92 | 100025 | 2023/02/16 | 2024/02/15 |
| ☒ | Attenuator | SHX | TS2-3dB | 30704 | NCR | NCR |
| ☒ | Speed reading thermometer | MingGao | T809 | NA | 2023/05/26 | 2024/05/25 |
| ☒ | Humidity and Temperature Indicator | KIMTOKA | KIMTOKA | NA | 2023/02/17 | 2024/02/16 |
| ☒ | Humidity and Temperature Indicator | CHIGAO | HTC-1 | ZGL2020120550471 | 2023/05/26 | 2024/05/25 |
| ☒ | Humidity and Temperature Indicator | CHIGAO | HTC-1 | ZGL2020120550472 | 2023/05/26 | 2024/05/25 |

Note: All the equipments are within the valid period when the tests are performed.

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## 10 Calibration certificate

Please see the Appendix C

## 11 Photographs

Please see the Appendix D

## Appendix A: Detailed System Check Results

## Appendix B: Detailed Test Results

## Appendix C: Calibration certificate

## Appendix D: Photographs

**---END---**

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