

# SAR TEST REPORT

Report No.: BCTC2212840337E

---

Applicant: Shenzhen Huikun Technology Co.,Ltd.

---

Product Name: Tablet PC

---

Model/Type Ref.: CM77

---

Tested Date: 2022-12-23 to 2023-01-13

---

Issued Date: 2023-04-13

---



**Shenzhen BCTC Testing Co., Ltd.**



**FCC ID:2A9MG-CM77**

Product Name: Tablet PC

Trademark: C idea

Model/Type Ref.: CM77  
CM82, CM90, CM93, CM95, CM97, CM99

Applicant: Shenzhen Huikun Technology Co.,Ltd.

Address: Floor 3-4, Building 3, Saitu Digital Industrial Factory, 137 Bulan Road, Gankeng Community, Jihua Street, Longgang District, Shenzhen, Guangdong China.

Manufacturer: Shenzhen Huikun Technology Co.,Ltd.

Address: Building 3, Saitu Digital Industrial Factory, 137 Bulan Road, Gankeng Community, Jihua Street, Longgang District, Shenzhen, Guangdong China.

Prepared By: Shenzhen BCTC Testing Co., Ltd.

Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China

Sample Received Date: 2022-12-23

Sample tested Date: 2022-12-23 to 2023-01-13

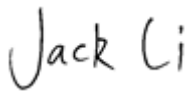
Issue Date: 2023-04-13

Test Standards: IEEE Std C95.1, 2019/ IEEE Std 1528™-2013/FCC Part 2.1093

Test Results: PASS

Remark: This is SAR test report

Tested by:



Jack Li/Project Handler

Approved by:



Zero Zhou/Reviewer

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen BCTC Testing Co., Ltd, this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

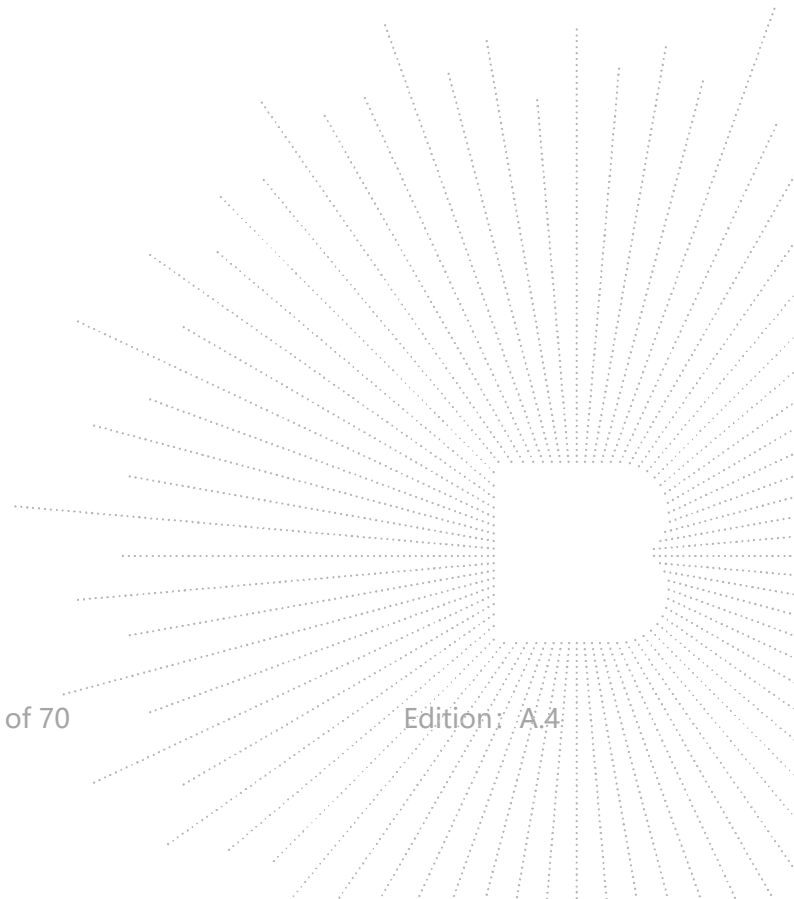
## Table Of Content

| Test Report Declaration                                   | Page |
|-----------------------------------------------------------|------|
| 1. Version .....                                          | 5    |
| 2. Test Standards .....                                   | 6    |
| 3. Test Summary .....                                     | 7    |
| 4. SAR Limits .....                                       | 8    |
| 5. Measurement Uncertainty .....                          | 9    |
| 6. Product Information And Test Setup .....               | 11   |
| 6.1 Product Information .....                             | 11   |
| 6.2 Test Setup Configuration .....                        | 12   |
| 6.3 Support Equipment .....                               | 12   |
| 6.4 Test Environment .....                                | 12   |
| 7. Test Facility And Test Instrument Used .....           | 13   |
| 7.1 Test Facility .....                                   | 13   |
| 7.2 Test Instrument Used .....                            | 13   |
| 8. Specific Absorption Rate (SAR) .....                   | 15   |
| 8.1 Introduction .....                                    | 15   |
| 8.2 SAR Definition .....                                  | 15   |
| 9. SAR Measurement System .....                           | 16   |
| 9.1 The Measurement System .....                          | 16   |
| 9.2 Probe .....                                           | 16   |
| 9.3 Test Procedure .....                                  | 18   |
| 9.4 Phantom .....                                         | 19   |
| 9.5 Phantom .....                                         | 19   |
| 10. Tissue Simulating Liquids .....                       | 20   |
| 10.1 Composition of Tissue Simulating Liquid .....        | 20   |
| 10.2 Limit .....                                          | 21   |
| 10.3 Tissue Calibration Result .....                      | 22   |
| 11. SAR Measurement Evaluation .....                      | 23   |
| 11.1 Purpose of System Performance Check .....            | 23   |
| 11.2 System Setup .....                                   | 23   |
| 11.3 Validation Results .....                             | 23   |
| 12. EUT Testing Position .....                            | 24   |
| 12.1 Body Position .....                                  | 24   |
| 13. SAR Measurement Procedures .....                      | 25   |
| 13.1 Measurement Procedures .....                         | 25   |
| 13.2 Spatial Peak SAR Evaluation .....                    | 25   |
| 13.3 Area & Zoom Scan Procedures .....                    | 26   |
| 13.4 Volume Scan Procedures .....                         | 26   |
| 13.5 SAR Averaged Methods .....                           | 26   |
| 13.6 Power Drift Monitoring .....                         | 26   |
| 14. SAR Test Result .....                                 | 28   |
| 14.1 Conducted RF Output Power .....                      | 28   |
| 14.2 Transmit Antennas and SAR Measurement Position ..... | 30   |
| 14.3 Test Results for Standalone SAR Test .....           | 31   |

|      |                                                                      |    |
|------|----------------------------------------------------------------------|----|
| 14.4 | Standalone SAR Test Exclusion Considerations and Estimated SAR ..... | 32 |
| 14.5 | Simultaneous TX SAR Considerations.....                              | 32 |
| 14.6 | SAR Measurement Variability .....                                    | 32 |
| 14.7 | General description of test procedures .....                         | 33 |
| 15.  | Test Plots .....                                                     | 35 |
| 15.1 | System Performance Check .....                                       | 35 |
| 15.2 | SAR Test Graph Results.....                                          | 37 |
| 16.  | CALIBRATION CERTIFICATES.....                                        | 41 |
| 17.  | EUT Photographs .....                                                | 66 |
| 18.  | EUT Test Setup Photographs.....                                      | 68 |

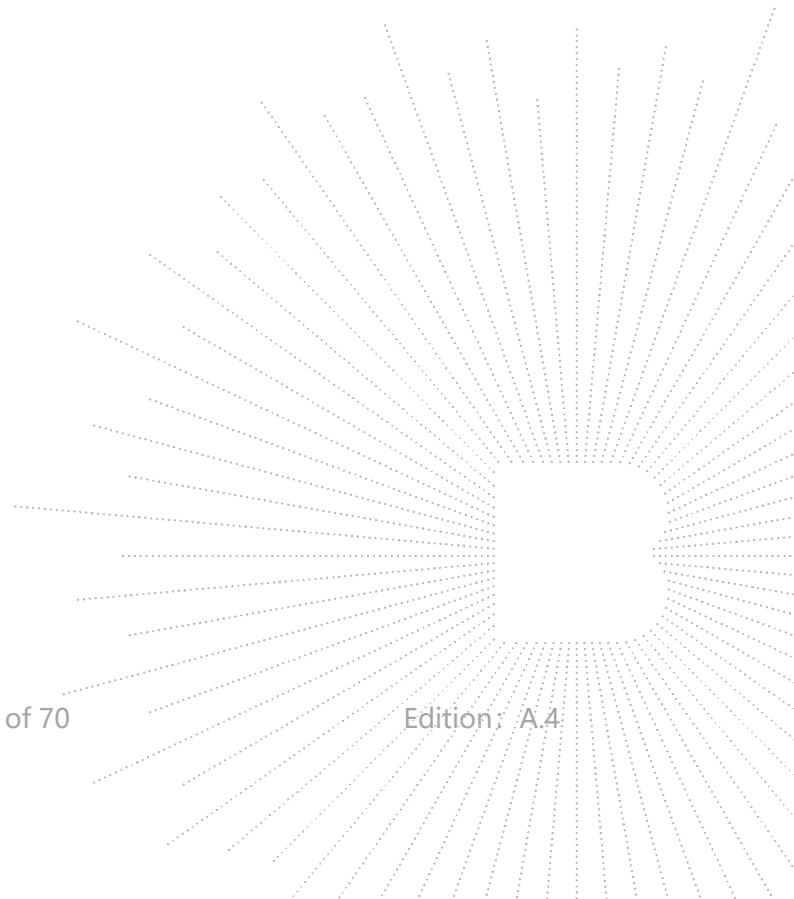
(Note: N/A Means Not Applicable)

TEST  
TC  
OVER  
檢



**1. Version**

| Report No.      | Issue Date | Description | Approved |
|-----------------|------------|-------------|----------|
| BCTC2212840337E | 2023-04-13 | Original    | Valid    |
|                 |            |             |          |



## 2. Test Standards

IEEE Std C95.1-2019: IEEE Standard for Safety Levels with Respect to Human Exposure to Electric, Magnetic, and Electromagnetic Fields, 0 Hz to 300 GHz. It specifies the maximum exposure limit of 1.6 W/kg as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

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.

FCC Part 2.1093 Radiofrequency Radiation Exposure Evaluation: Portable Devices

KDB447498 D01 General RF Exposure Guidance v06 : Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies

KDB447498 D02 SAR Procedures for Dongle Xmtr v02r01: SAR Measurement Procedures For USB Dongle Transmitters.

KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04 : SAR Measurement Requirements for 100 MHz to 6 GHz

KDB865664 D02 RF Exposure Reporting v01r02: RF Exposure Compliance Reporting and Documentation Considerations

KDB 248227 D01 802.11 Wi-Fi SAR v02r02: SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS

KDB 616217 D04 SAR for laptop and tablets v01r02: SAR EVALUATION CONSIDERATIONS FOR LAPTOP, NOTEBOOK, NETBOOK AND TABLET COMPUTERS

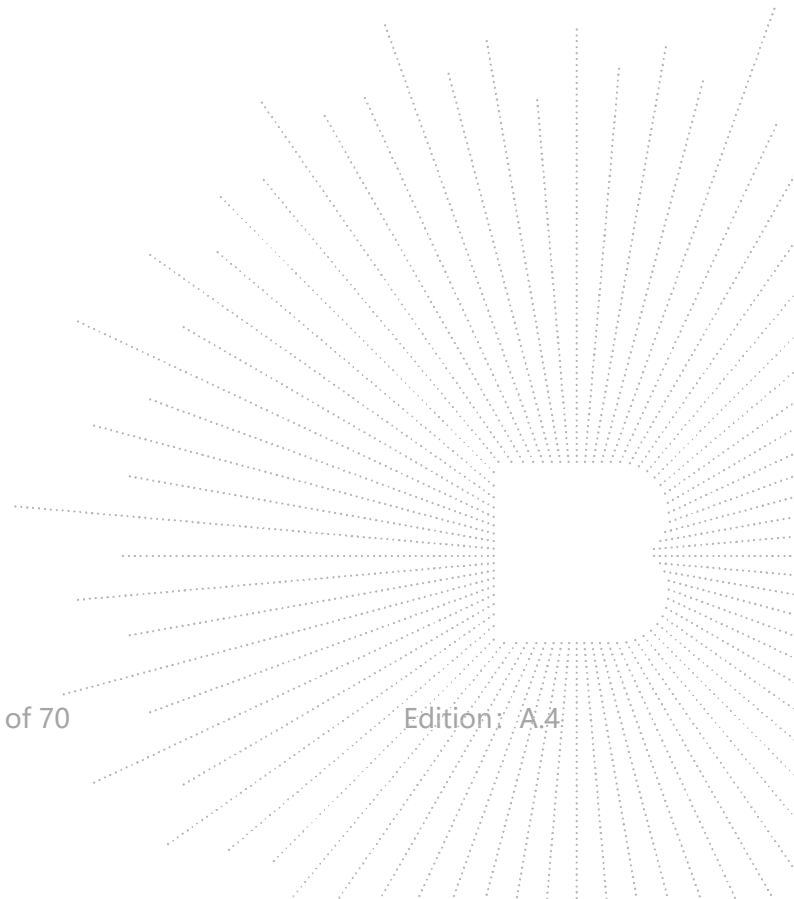
CO., LTD.

### 3. Test Summary

The maximum results of Specific Absorption Rate (SAR) have found during testing are as follows:

| Frequency Band | Head SAR                        | Body (0mm Gap)                  | SAR <sub>1g</sub><br>Limit<br>(W/kg) |
|----------------|---------------------------------|---------------------------------|--------------------------------------|
|                | Report SAR <sub>1g</sub> (W/kg) | Report SAR <sub>1g</sub> (W/kg) |                                      |
| WIFI2.4G       | NA                              | <b>0.479</b>                    | 1.6                                  |
| BT             | NA                              | 0.180                           | 1.6                                  |

The device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-2019, and had been tested in accordance with the measurement methods and procedure specified in IEEE 1528-2013.

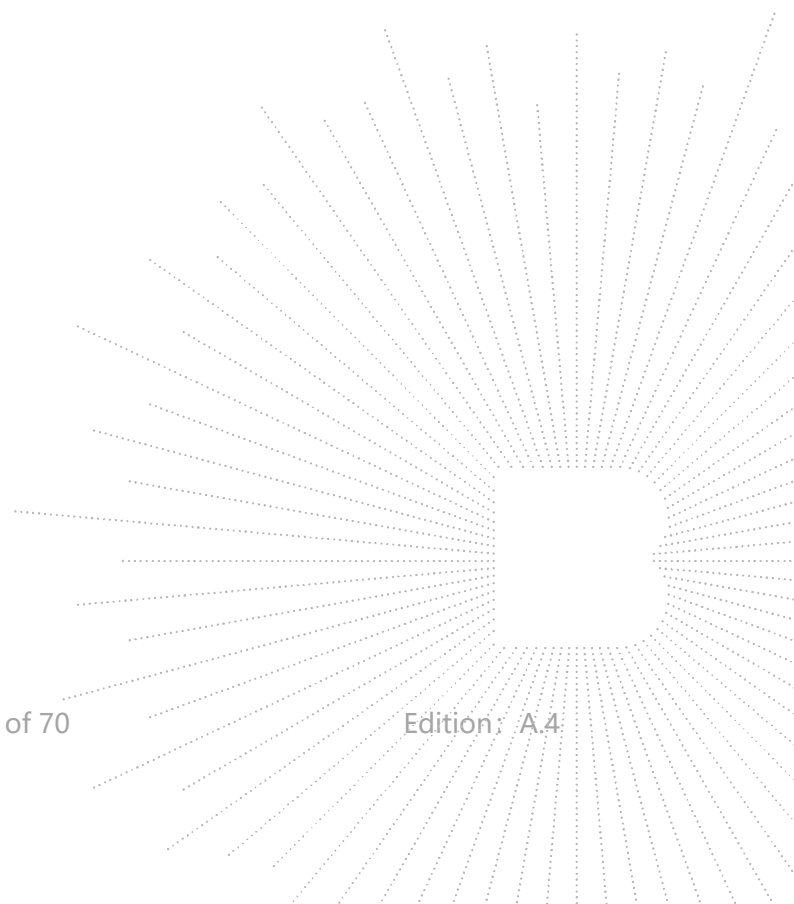


#### 4. SAR Limits

| EXPOSURE LIMITS                                              | FCC Limit (1g Tissue)                                          |                                                        |
|--------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------------------|
|                                                              | SAR (W/kg)                                                     |                                                        |
|                                                              | (General Population /<br>Uncontrolled Exposure<br>Environment) | (Occupational /<br>Controlled Exposure<br>Environment) |
| Spatial Average(averaged over the whole body)                | 0.08                                                           | 0.4                                                    |
| Spatial Peak(averaged over any 1 g of tissue)                | 1.6                                                            | 8.0                                                    |
| Spatial Peak(hands/wrists/<br>feet/anklesaveraged over 10 g) | 4.0                                                            | 20.0                                                   |

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

Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

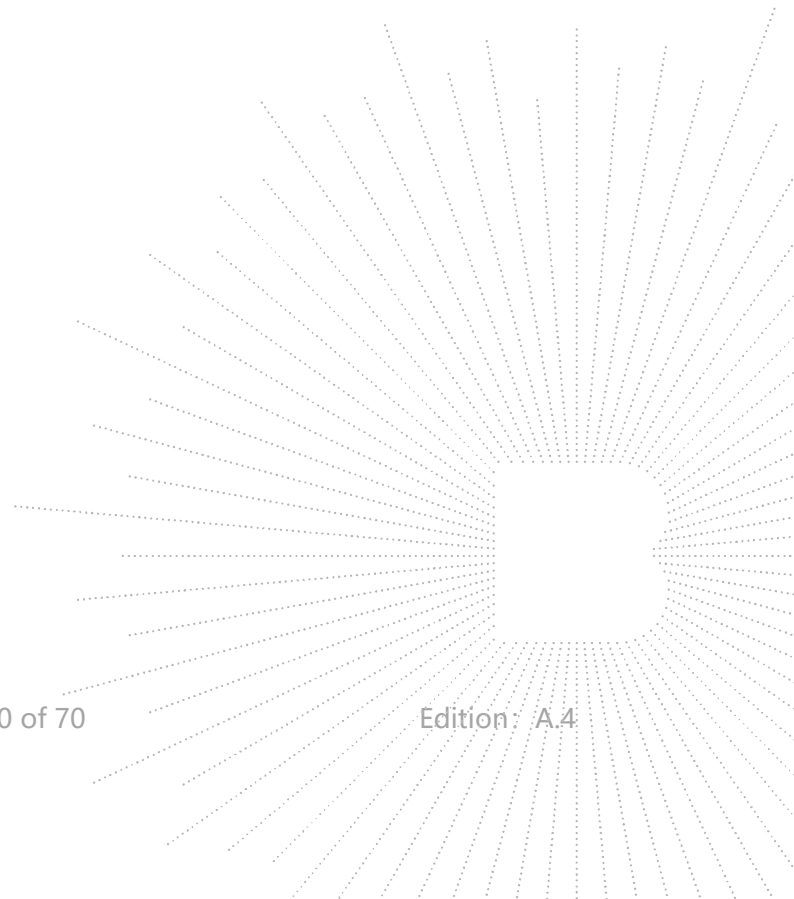


## 5. Measurement Uncertainty

Not required as SAR measurement uncertainty analysis is required in SAR reports only when the highest measured SAR in a frequency band is  $\geq 1.5$  W/kg for 1-g SAR according to KDB865664D01.

| Uncertainty Component                           | Tol<br>(+-%) | Prob.<br>Dist. | Div.                                    | Ci (1g)          | Ci (10g)         | 1g Ui<br>(+-%) | 10g Ui<br>(+-%) | Veff     |
|-------------------------------------------------|--------------|----------------|-----------------------------------------|------------------|------------------|----------------|-----------------|----------|
| <b>Measurement System</b>                       |              |                |                                         |                  |                  |                |                 |          |
| Probe calibration                               | 5.8          | N              | 1                                       | 1                | 1                | 5.80           | 5.80            | $\infty$ |
| Axial Isotropy                                  | 3.5          | R              | $\sqrt{3}$                              | $\sqrt{1 - C_p}$ | $\sqrt{1 - C_p}$ | 1.43           | 1.43            | $\infty$ |
| Hemispherical Isotropy                          | 5.9          | R              | $\sqrt{3}$                              | $\sqrt{C_p}$     | $\sqrt{C_p}$     | 2.41           | 2.41            | $\infty$ |
| Boundary effect                                 | 1.0          | R              | $\sqrt{3}$                              | 1                | 1                | 0.58           | 0.58            | $\infty$ |
| Linearity                                       | 4.7          | R              | $\sqrt{3}$                              | 1                | 1                | 2.71           | 2.71            | $\infty$ |
| System detection limits                         | 1.0          | R              | $\sqrt{3}$                              | 1                | 1                | 0.58           | 0.58            | $\infty$ |
| Readout Electronics                             | 0.5          | N              | 1                                       | 1                | 1                | 0.50           | 0.50            | $\infty$ |
| Response Time                                   | 0.0          | R              | $\sqrt{3}$                              | 1                | 1                | 0.00           | 0.00            | $\infty$ |
| Integration Time                                | 1.4          | R              | $\sqrt{3}$                              | 1                | 1                | 0.81           | 0.81            | $\infty$ |
| RF ambient Conditions - Noise                   | 3.0          | R              | $\sqrt{3}$                              | 1                | 1                | 1.73           | 1.73            | $\infty$ |
| RF ambient Conditions - Reflections             | 3.0          | R              | $\sqrt{3}$                              | 1                | 1                | 1.73           | 1.73            | $\infty$ |
| Probe positioner Mechanical Tolerance           | 1.4          | R              | $\sqrt{3}$                              | 1                | 1                | 0.81           | 0.81            | $\infty$ |
| Probe positioning with respect to Phantom Shell | 1.4          | R              | $\sqrt{3}$                              | 1                | 1                | 0.81           | 0.81            | $\infty$ |
| Max. SAR Evaluation                             | 1.0          | R              | $\sqrt{3}$                              | 1                | 1                | 0.6            | 0.6             | $\infty$ |
| <b>Test sample Related</b>                      |              |                |                                         |                  |                  |                |                 |          |
| Device positioning                              | 2.6          | N              | 1                                       | 1                | 1                | 2.6            | 2.6             | 11       |
| Device holder                                   | 3.0          | N              | 1                                       | 1                | 1                | 3.0            | 3.0             | 7        |
| Drift of output power                           | 5.0          | N              | $\sqrt{3}$                              | 1                | 1                | 2.89           | 2.89            | $\infty$ |
| <b>Phantom and Tissue Parameters</b>            |              |                |                                         |                  |                  |                |                 |          |
| Phantom uncertainty                             | 4.00         | R              | $\sqrt{3}$                              | 1                | 1                | 2.31           | 2.31            | $\infty$ |
| Liquid conductivity (target)                    | 2.50         | N              | 1                                       | 0.78             | 0.71             | 1.95           | 1.78            | 5        |
| Liquid conductivity (meas)                      | 4.00         | N              | 1                                       | 0.23             | 0.26             | 0.92           | 1.04            | 5        |
| Liquid Permittivity (target)                    | 2.50         | N              | 1                                       | 0.78             | 0.71             | 1.95           | 1.78            | $\infty$ |
| Liquid Permittivity (meas)                      | 5.00         | N              | 1                                       | 0.23             | 0.26             | 1.15           | 1.30            | $\infty$ |
| Combined Standard                               |              | RSS            | $U_c = \sqrt{\sum_{i=1}^n C_i^2 U_i^2}$ |                  |                  | 10.63 %        | 10.54 %         |          |

|                                                   |                         |            |        |  |
|---------------------------------------------------|-------------------------|------------|--------|--|
| Expanded Uncertainty<br>(95% Confidence interval) | $U = k \text{ UC}, k=2$ | 21.26<br>% | 21.08% |  |
|---------------------------------------------------|-------------------------|------------|--------|--|



## 6. Product Information And Test Setup

### 6.1 Product Information

|                    |                                                                                                                                 |
|--------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Model/Type Ref.:   | CM77<br>CM82, CM90, CM93, CM95, CM97, CM99                                                                                      |
| Model differences: | All the model are the same circuit and RF module, except model names.                                                           |
| Hardware Version:  | N/A                                                                                                                             |
| Software Version:  | N/A                                                                                                                             |
| Remark:            | The antenna gain of the product is provided by the customer, and the test data is affected by the customer information.         |
| Ratings:           | DC 5V From Adapter, DC 3.85V From Battery                                                                                       |
| Adapter:           | Manufacture: Shenzhen weikeye Technology CO., LTD<br>Model No.:WKY-0502000DM<br>Input:100-240~ 50/60Hz 0.3A<br>Output: DC 5V 2A |

#### WIFI2.4G

|                          |                                                                                      |
|--------------------------|--------------------------------------------------------------------------------------|
| Operation Frequency:     | 802.11b/g/n20MHz:2412~2462 MHz<br>802.11n40MHz:2422~2452 MHz                         |
| Bit Rate of Transmitter: | 802.11b:11/5.5/2/1Mbps<br>802.11g:54/48/36/24/18/12/9/6Mbps<br>802.11n Up to 150Mbps |
| Type of Modulation:      | WIFI: OFDM/DSSS                                                                      |
| Number Of Channel:       | 802.11b/g/n20MHz:11 CH<br>802.11n40MHz: 7 CH                                         |
| Antenna installation:    | FPCB antenna                                                                         |
| Antenna Gain:            | 1.92 dBi                                                                             |

#### BT

|                       |                                       |
|-----------------------|---------------------------------------|
| Operation Frequency:  | Bluetooth: 2402-2480MHz               |
| Type of Modulation:   | Bluetooth: GFSK, $\pi/4$ DQPSK, 8DPSK |
| Number Of Channel:    | 79CH                                  |
| Antenna installation: | FPCB antenna                          |
| Antenna Gain:         | 1.92 dBi                              |

## 6.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

## 6.3 Support Equipment

Cable of Product

| No. | Cable Type | Quantity | Provider  | Length (m) | Shielded | Note |
|-----|------------|----------|-----------|------------|----------|------|
| 1   | --         | --       | Applicant | ---        | Yes/No   | --   |
| 2   | --         | --       | BCTC      | --         | Yes/No   | --   |

| No. | Device Type | Brand | Model | Series No. | Note |
|-----|-------------|-------|-------|------------|------|
| 1.  | ---         | ---   | ---   | ---        | ---  |
| 2.  | --          | --    | --    | --         | --   |

### Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

## 6.4 Test Environment

### 1. Normal Test Conditions:

|                            |     |
|----------------------------|-----|
| Humidity(%):               | 54  |
| Atmospheric Pressure(kPa): | 101 |
| Temperature(°C):           | 22  |

### 2. Extreme Test Conditions:

N/A

## 7. Test Facility And Test Instrument Used

### 7.1 Test Facility

All measurement facilities used to collect the measurement data are located at Shenzhen BCTC Testing Co., Ltd. Address: 1-2/F., Building B, Pengzhou Industrial Park, No.158, Fuyuan 1st Road, Zhancheng, Fuhai Subdistrict, Bao'an District, Shenzhen, Guangdong, China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

### 7.2 Test Instrument Used

| Equipment                           | Manufacturer  | Model#   | Serial#                | Last Cal.     | Next Cal.     |
|-------------------------------------|---------------|----------|------------------------|---------------|---------------|
| PC                                  | DELL          | \        | \                      | N/A           | N/A           |
| SAR Measurement system              | SATIMO        | \        | \                      | N/A           | N/A           |
| Signal Generator                    | Agilent       | 83712A   | \                      | May 24, 2022  | May 23, 2023  |
| Multimeter                          | Keithley      | 1160271  | \                      | Nov. 10, 2022 | Nov 09, 2023  |
| S-parameter Network Analyzer        | R&S           | ZVB 8    | 101353                 | Dec. 07, 2022 | Dec. 06, 2023 |
| Wideband Radio Communication Tester | R&S           | CMW500   | \                      | Nov. 10, 2022 | Nov 09, 2023  |
| E SAR PROBE 6GHz                    | MVG           | SSE2     | SN EPGO373             | June 29, 2022 | June 28, 2023 |
| DIPOLE 2450                         | SATIMO        | SID 2450 | SN 47/21 DIP 0G835-621 | Nov. 20, 2021 | Nov. 19, 2024 |
| COMOSAR OPENCoaxial Probe           | SATIMO        | \        | \                      | Nov. 18, 2022 | Nov. 17, 2023 |
| SAR Locator                         | SATIMO        | \        | \                      | Nov. 18, 2022 | Nov. 17, 2023 |
| Communication Antenna               | SATIMO        | \        | \                      | Nov. 18, 2022 | Nov. 17, 2023 |
| FEATURE PHONEPOSITIONING DEVICE     | SATIMO        | \        | \                      | N/A           | N/A           |
| DUMMY PROBE                         | SATIMO        | \        | \                      | N/A           | N/A           |
| SAM Phantom                         | MVG           | \        | SN 13/09 SAM68         | N/A           | N/A           |
| Liquid measurement Kit              | HP            | 85033D   | 3423A08186             | Nov. 18, 2022 | Nov. 17, 2023 |
| Power meter                         | Agilent       | E4419    | \                      | May 24, 2022  | May 23, 2023  |
| Power meter                         | Agilent       | E4419    | \                      | May 24, 2022  | May 23, 2023  |
| Power sensor                        | Agilent       | E9300A   | \                      | May 24, 2022  | May 23, 2023  |
| Power sensor                        | Agilent       | E9300A   | \                      | May 24, 2022  | May 23, 2023  |
| Directional Coupler                 | Krytar 158020 | 131467   | \                      | Nov. 10, 2022 | Nov 09, 2023  |

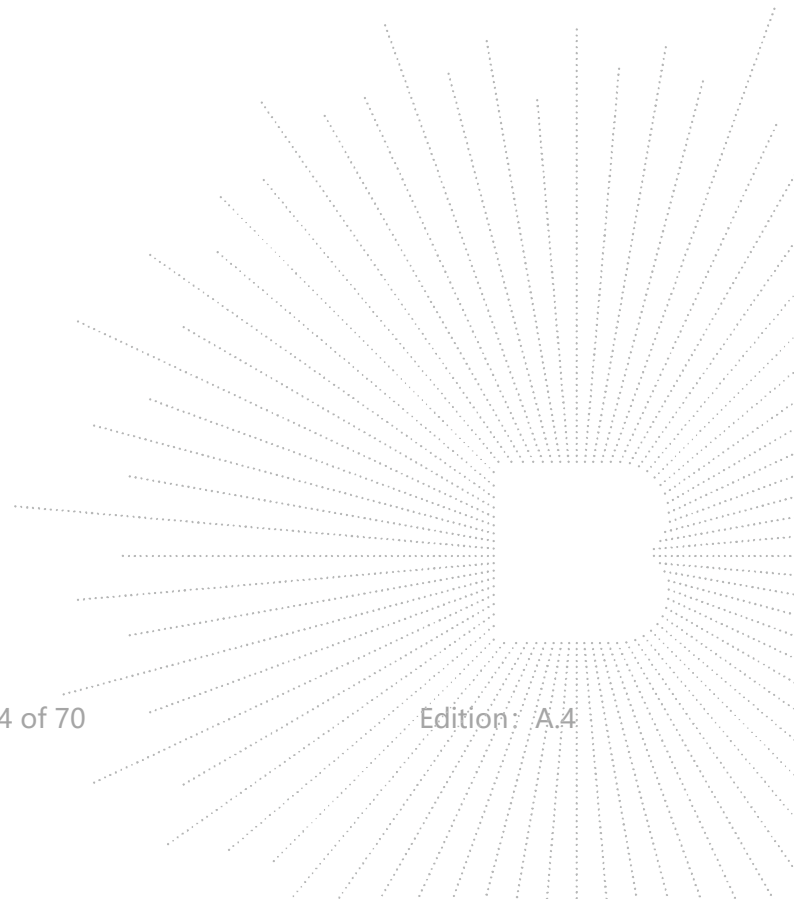
**Note:**

Per KDB865664D01 requirements for dipole calibration, the test laboratory has adopted three year extended calibration interval. Each measured dipole is expected to evaluate with following criteria at least on annual interval.

- There is no physical damage on the dipole;
- System check with specific dipole is within 10% of calibrated values;
- The most recent return-loss results, measured at least annually, deviates by no more than 20% from the previous measurement;

The most recent measurement of the real or imaginary parts of the impedance, measured at least annually is within  $5\Omega$  from the previous measurement.

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



## 8. Specific Absorption Rate (SAR)

### 8.1 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.

### 8.2 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 measurement can be either related to the temperature elevation in tissue by

$$SAR = C \left( \frac{\delta T}{\delta t} \right)$$

Where: C is the specific heat capacity,  $\delta T$  is the temperature rise and  $\delta t$  is the exposure duration, or related to the

electrical field in the tissue by

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

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

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

## 9. SAR Measurement System

### 9.1 The Measurement System

Comosar is a system that is able to determine the SAR distribution inside a phantom of human being according to different standards. The Comosar system consists of the following items:

- Main computer to control all the system
- 6 axis robot
- Data acquisition system
- Miniature E-field probe
- Phone holder
- Head simulating tissue

The following figure shows the system.



The EUT under test operating at the maximum power level is placed in the phone holder, under the phantom, which is filled with head simulating liquid. The E-Field probe measures the electric field inside the phantom. The OpenSAR software computes the results to give a SAR value in a 1g or 10g mass.

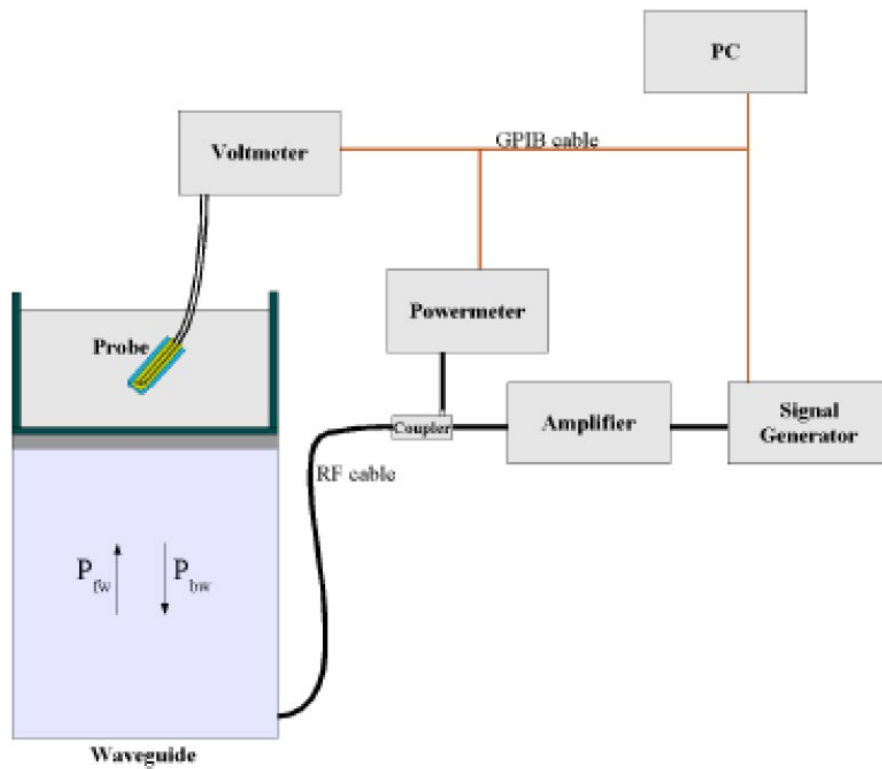
### 9.2 Probe

For the measurements the Specific Dosimetric E-Field Probe SN 46/21 EPG0362 with following specifications is used

- Dynamic range: 0.01-100 W/kg
- Tip Diameter : 5 mm
- Distance between probe tip and sensor center: 2.10mm
- Distance between sensor center and the inner phantom surface: 4 mm (repeatability better than +/- 1mm)
- Probe linearity: <0.25 dB
- Axial Isotropy: <0.25 dB
- Spherical Isotropy: <0.50 dB
- Calibration range: 835 to 2500MHz for head & body simulating liquid.

Angle between probe axis (evaluation axis) and surface normal line: less than 30°

Probe calibration is realized, in compliance with EN 62209-1 and IEEE 1528 STD, with CALISAR, Antenna proprietary calibration system. The calibration is performed with the EN 62209-1 annex technique using reference guide at the five frequencies.



$$SAR = \frac{4(P_{fw} - P_{bw})}{ab\delta} \cos^2\left(\pi \frac{y}{a}\right) e^{(2\pi/\delta)z}$$

Where :

$P_{fw}$  = Forward Power

$P_{bw}$  = Backward Power

a and b = Waveguide dimensions

$\delta$  = Skin depth

Keithley configuration:

Rate = Medium; Filter = ON; RDGS = 10; Filter type = Moving Average; Range auto after each calibration, a SAR measurement is performed on a validation dipole and compared with a NPL calibrated probe, to verify it.

The calibration factors, CF(N), for the 3 sensors corresponding to dipole 1, dipole 2 and dipole 3 are:

$$CF(N) = SAR(N)/V_{lin}(N) \quad (N=1,2,3)$$

The linearised output voltage  $V_{lin}(N)$  is obtained from the displayed output voltage  $V(N)$  using

$$V_{lin}(N) = V(N) * (1 + V(N)/DCP(N)) \quad (N=1,2,3)$$

where DCP is the diode compression point in mV.

### 9.3 Test Procedure

#### Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. SATIMO Probe calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm<sup>2</sup>) using an with CALISAR, Antenna proprietary calibration system.

#### Free Space Assessment Procedure

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1mW/cm<sup>2</sup>.

#### Temperature Assessment Procedure

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated head tissue. The E-field in the medium correlates with the temperature rise in the dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

Where:

$$SAR = C \frac{\Delta T}{\Delta t}$$

$\Delta t$  = exposure time (30 seconds),

$C$  = heat capacity of tissue (brain or muscle),

$\Delta T$  = temperature increase due to RF exposure.

SAR is proportional to  $\Delta T/\Delta t$ , the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

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

Where:

$\sigma$  = simulated tissue conductivity,

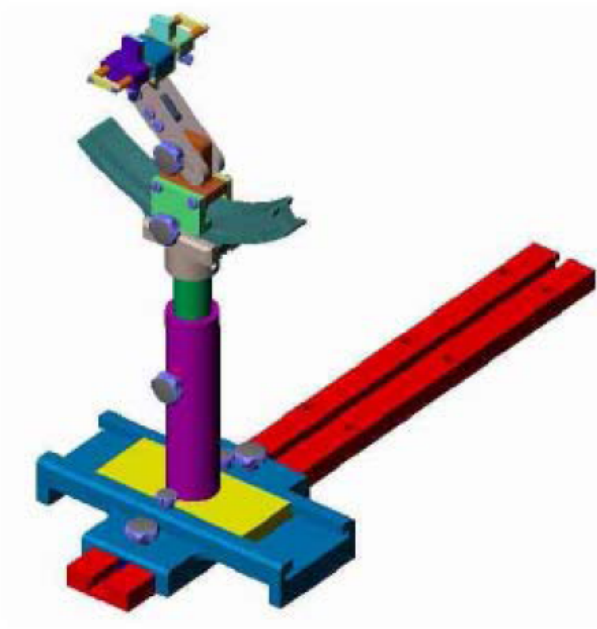
$\rho$  = Tissue density (1.25 g/cm<sup>3</sup> for brain tissue)

#### 9.4 Phantom

For the measurements the Specific Anthropomorphic Mannequin (SAM) defined by the IEEE SCC-34/SC2 group is used. The phantom is a polyurethane shell integrated in a wooden table. The thickness of the phantom amounts to 2mm +/- 0.2mm. It enables the dosimetric evaluation of left and right phone usage and includes an additional flat phantom part for the simplified performance check. The phantom set-up includes a cover, which prevents the evaporation of the liquid.

#### 9.5 Phantom

The positioning system allows obtaining cheek and tilting position with a very good accuracy. In compliance with CENELEC, the tilt angle uncertainty is lower than 1°.



| System Material | Permittivity | Loss Tangent |
|-----------------|--------------|--------------|
| Delrin          | 3.7          | 0.005        |

## 10. Tissue Simulating Liquids

### 10.1 Composition of Tissue Simulating Liquid

For the measurement of the field distribution inside the SAM phantom with SMTIMO, 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. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. Please see the following photos for the liquid height.



Liquid Height for Body SAR

The Composition of Tissue Simulating Liquid

| Frequency (MHz)  | Water (%) | Salt (%) | 1,2-Propane diol (%) | HEC (%) | Preventol (%) | DGBE (%) |
|------------------|-----------|----------|----------------------|---------|---------------|----------|
| <b>Head/Body</b> |           |          |                      |         |               |          |
| 835              | 40.3      | 1.4      | 57.9                 | 0.2     | 0.2           | 0        |
| 900              | 40.3      | 1.4      | 57.9                 | 0.2     | 0.2           | 0        |
| 1800-2000        | 55.2      | 0.3      | 0                    | 0       | 0             | 44.5     |
| 2450             | 55.0      | 0.1      | 0                    | 0       | 0             | 44.9     |
| 2600             | 54.9      | 0.1      | 0                    | 0       | 0             | 45.0     |

| Frequency (MHz)  | Water (%) | Hexyl Carbitol (%) | Triton X-100 (%) |
|------------------|-----------|--------------------|------------------|
| <b>Head/Body</b> |           |                    |                  |
| 5000-6000        | 65.52     | 17.24              | 17.24            |

## 10.2 Limit

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters

computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

| Target Frequency (MHz) | Head/Body                 |                               |
|------------------------|---------------------------|-------------------------------|
|                        | Conductivity ( $\sigma$ ) | Permittivity ( $\epsilon_r$ ) |
| 150                    | 0.76                      | 52.3                          |
| 300                    | 0.87                      | 45.3                          |
| 450                    | 0.87                      | 43.5                          |
| 750                    | 0.89                      | 41.9                          |
| <b>835</b>             | <b>0.90</b>               | <b>41.5</b>                   |
| <b>900</b>             | <b>0.97</b>               | <b>41.5</b>                   |
| 915                    | 0.98                      | 41.5                          |
| 1450                   | 1.20                      | 40.5                          |
| 1610                   | 1.29                      | 40.3                          |
| <b>1800-2000</b>       | <b>1.40</b>               | <b>40.0</b>                   |
| <b>2450</b>            | <b>1.80</b>               | <b>39.2</b>                   |
| <b>2600</b>            | <b>1.96</b>               | <b>39.0</b>                   |
| 3000                   | 2.40                      | 38.5                          |
| 5200                   | 4.66                      | 36.0                          |
| 5400                   | 4.86                      | 35.8                          |
| 5600                   | 5.07                      | 35.5                          |
| 5800                   | 5.27                      | 35.3                          |

### 10.3 Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an R&S ZVB 8. Dielectric Probe Kit and an Agilent Network Analyzer.

Calibration Result for Dielectric Parameters of Tissue Simulating Liquid

| Frequency(MHz) | Liquid | Target Permittivity (F/m) | Target Conductivity (S/m) | Measured Permittivity (F/m) | Measured Conductivity (S/m) | Deviation Percentage(%) | Tolerance (%) | Date       | Temp. Ambient TSL (°C) |
|----------------|--------|---------------------------|---------------------------|-----------------------------|-----------------------------|-------------------------|---------------|------------|------------------------|
| 2450           | Head   | 39.20                     | 1.80                      | 39.09                       | 1.89                        | 0 5                     | ±5            | 12/23/2022 | 20.0   20.0            |

TE  
TC  
OVER  
檢

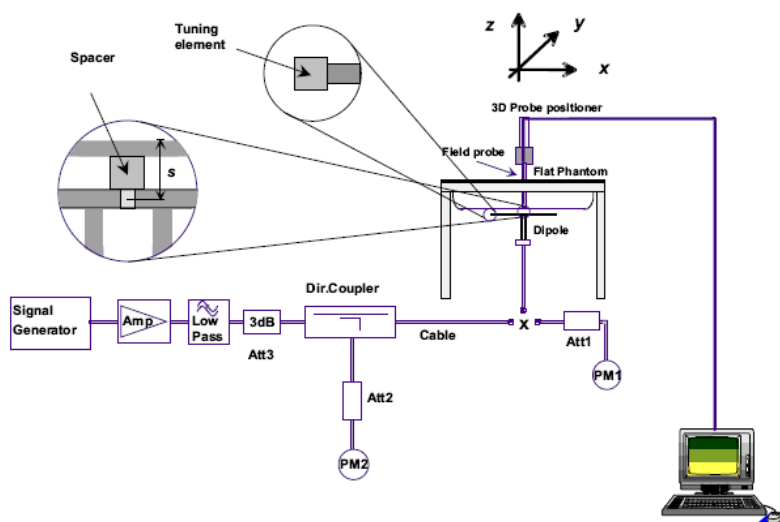
## 11. SAR Measurement Evaluation

### 11.1 Purpose of System Performance Check

At the device test frequencies. System check verifies the measurement repeatability of a SAR system before compliance testing and is not a validation of all system specifications. The latter is not required for testing a device but is mandatory before the system is deployed. The system check detects possible short-term drift and unacceptable measurement errors or uncertainties in the system.

### 11.2 System Setup

In the simplified setup for system evaluation, the EUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave which comes from a signal generator at frequency 850MHz,900 MHz,1800MHz,2000MHz, 2450MHz,2600MHz. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The output power on dipole port must be calibrated to 24 dBm (250 mW) before dipole is connected.



### 11.3 Validation Results

Comparing to the original SAR value provided by SATIMO, the validation data should be within its specification of 10 %. The following 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.

| Mixture Type | Frequency (MHz) | Power               | SAR <sub>1g</sub> (W/Kg) | SAR <sub>10g</sub> (W/Kg) | Drift (%) | 1W Target                |                           | Difference percentage |     | Liquid Temp | Date       |
|--------------|-----------------|---------------------|--------------------------|---------------------------|-----------|--------------------------|---------------------------|-----------------------|-----|-------------|------------|
|              |                 |                     |                          |                           |           | SAR <sub>1g</sub> (W/Kg) | SAR <sub>10g</sub> (W/Kg) | 1g                    | 10g |             |            |
| Head         | 2450            | 100 mW              | 5.085                    | 2.457                     | 0.36      | 55.2                     | 24.2                      | 8%                    | -2% | 20.0        | 12/23/2022 |
|              |                 | Normalize to 1 Watt | 50.85                    | 24.57                     |           |                          |                           |                       |     |             |            |

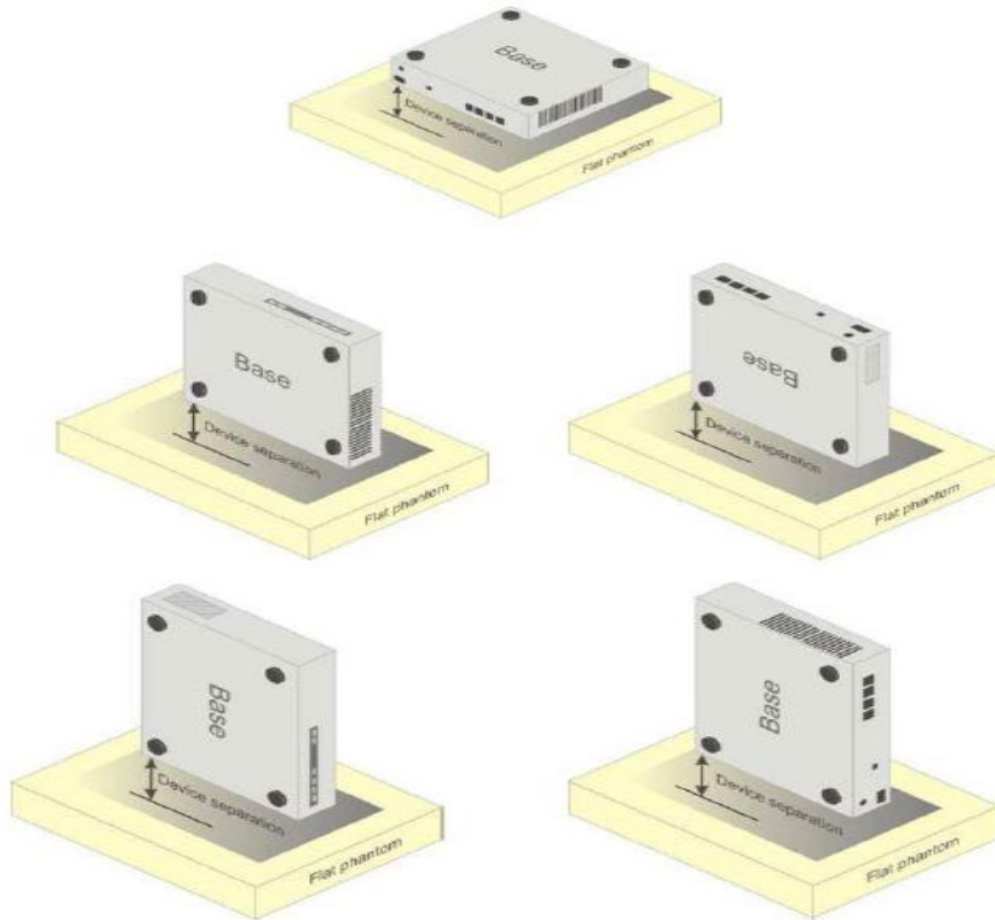
## 12. EUT Testing Position

### 12.1 Body Position

#### Desktop device

A typical example of a desktop device is a wireless enabled desktop computer placed on a table or desk when used.

The DUT shall be positioned at the distance and in the orientation to the phantom that corresponds to the intended use as specified by the manufacturer in the user instructions. For devices that employ an external antenna with variable positions, tests shall be performed for all antenna positions specified. Picture 14 shows positions for desktop device SAR tests. If the intended use is not specified, the device shall be tested directly against the flat phantom.



Test positions for desktop devices

## 13. SAR Measurement Procedures

### 13.1 Measurement Procedures

The measurement procedures are as follows:

- (a) Use base station simulator (if applicable) or engineering software to transmit RF power continuously (continuous Tx) in the highest power channel.
- (b) Keep EUT to radiate maximum output power or 100% factor (if applicable)
- (c) Measure output power through RF cable and power meter.
- (d) Place the EUT in the positions as Annex D demonstrates.
- (e) Set scan area, grid size and other setting on the SATIMO software.
- (f) Measure SAR results for the highest power channel on each testing position.
- (g) Find out the largest SAR result on these testing positions of each band
- (h) Measure SAR results for other channels in worst SAR testing position if the 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

### 13.2 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 SATIMO 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. 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
- (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 3D 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

### 13.3 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz, and 8x8x8 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

### 13.4 Volume Scan Procedures

The volume scan is used for 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 (step-size is 4, 4 and 2.5 mm). When all volume scan were completed, the software can combine and subsequently superpose these measurement data to calculating the multiband SAR.

### 13.5 SAR Averaged Methods

The local SAR inside the phantom is measured using small dipole sensing elements inside a probe body. The probe tip must not be in contact with the phantom surface in order to minimize measurements errors, but the highest local SAR will occur at the surface of the phantom.

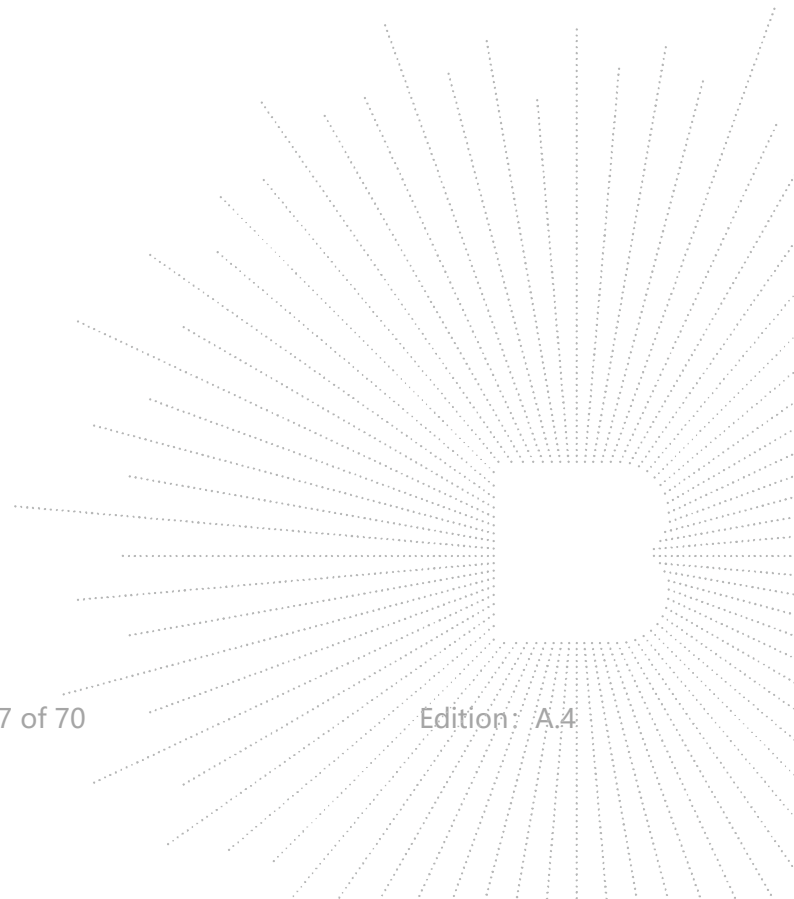
An extrapolation is using to determinate this highest local SAR values. The extrapolation is based on a fourth-order least-square polynomial fit of measured data. The local SAR value is then extrapolated from the liquid surface with a 1mm step.

The measurements have to be performed over a limited time (due to the duration of the battery) so the step of measurement is high. It could vary between 5 and 8 mm. To obtain an accurate assessment of the maximum SAR averaged over 10g and 1 g requires a very fine resolution in the three dimensional scanned data array.

### 13.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In SATIMO 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 drift more than 5%, the SAR will be retested.



## 14. SAR Test Result

### 14.1 Conducted RF Output Power

According KDB 447498 D01 General RF Exposure Guidance v06 Section 4.1 2) states that “Unless it is specified differently in the published RF exposure KDB procedures, these requirements also apply to test reduction and test exclusion considerations. Time-averaged maximum conducted output power applies to SAR and, as required by § 2.1091(c), time-averaged ERP applies to MPE. When an antenna port is not available on the device to support conducted power measurement, such as FRS and certain Part 15 transmitters with built-in integral antennas, the maximum output power allowed for production units should be used to determine RF exposure test exclusion and compliance.”

#### WIFI2.4G

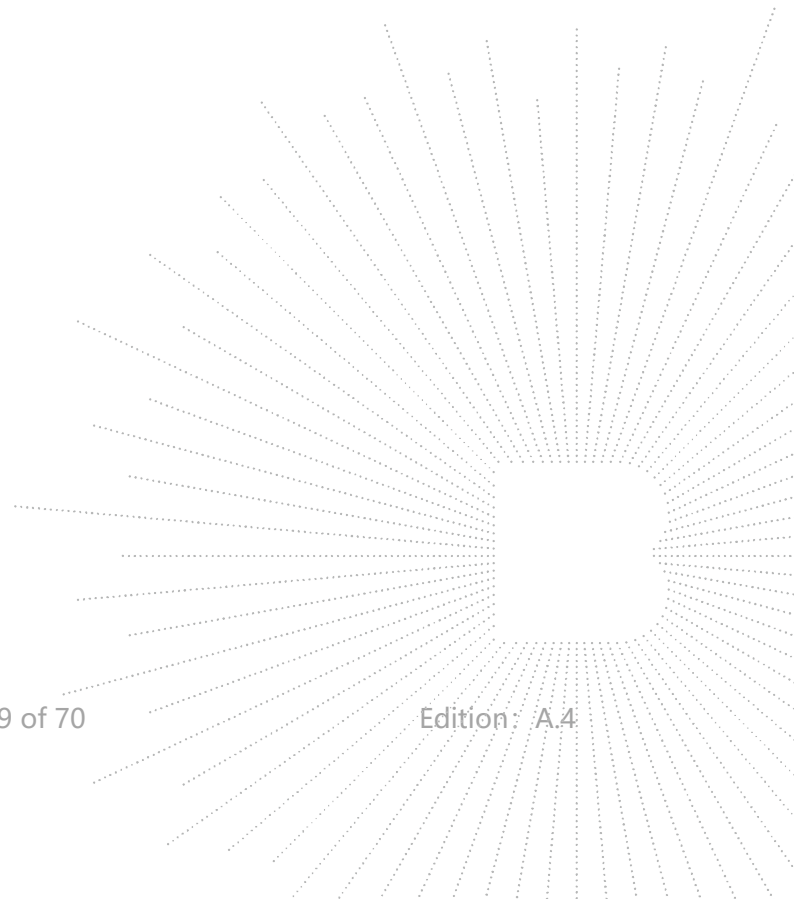
| Mode      | Frequency | Maximum Conducted Output Power(PK) |
|-----------|-----------|------------------------------------|
|           | (MHz)     | (dBm)                              |
| 802.11b   | 2412      | 15.83                              |
|           | 2437      | 15.52                              |
|           | 2462      | 15.45                              |
| 802.11g   | 2412      | 14.41                              |
|           | 2437      | 14.06                              |
|           | 2462      | 13.91                              |
| 802.11n20 | 2412      | 13.32                              |
|           | 2437      | 13.02                              |
|           | 2462      | 12.91                              |
| 802.11n40 | 2422      | 12.88                              |
|           | 2437      | 12.59                              |
|           | 2452      | 12.43                              |

Note: SAR is not required for the following 2.4 GHz OFDM conditions as the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

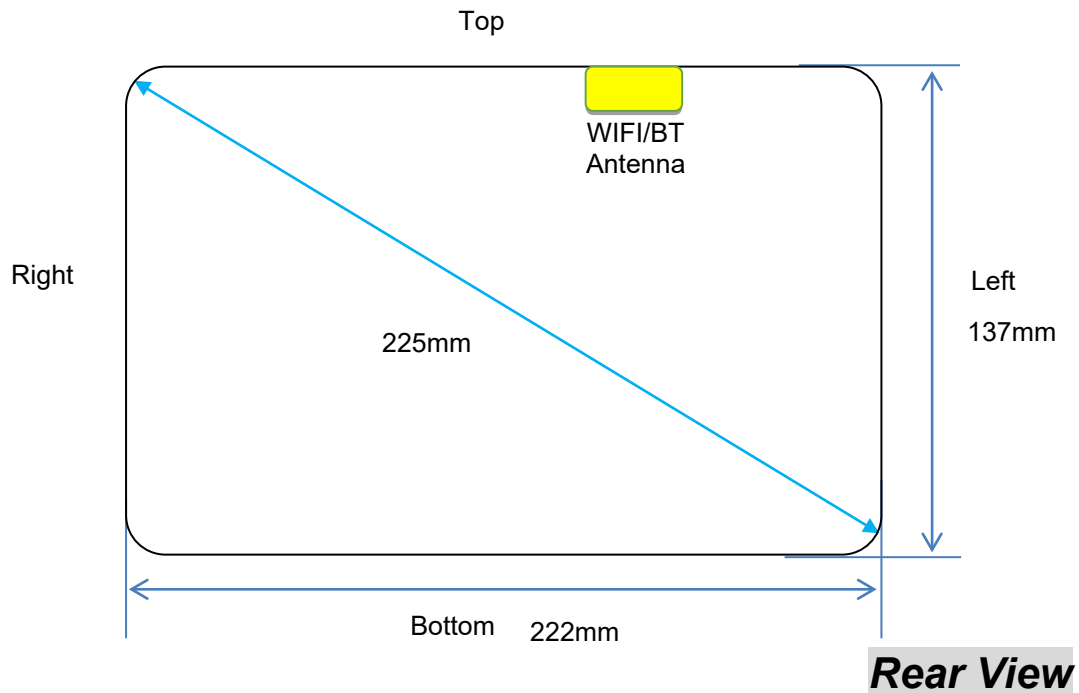
| Modulation    | Test Channel | Output Power (dBm) |
|---------------|--------------|--------------------|
| GFSK          | Low          | -0.1               |
| GFSK          | Middle       | -1.19              |
| GFSK          | High         | -2.27              |
| $\pi/4$ DQPSK | Low          | 0.08               |
| $\pi/4$ DQPSK | Middle       | -0.93              |
| $\pi/4$ DQPSK | High         | -1.99              |
| 8DPSK         | Low          | 0.47               |



|       |        |       |
|-------|--------|-------|
| 8DPSK | Middle | -0.61 |
| 8DPSK | High   | -1.61 |



## 14.2 Transmit Antennas and SAR Measurement Position



### Antenna information:

|                     |       |
|---------------------|-------|
| WIFI2.4G/BT Antenna | TX/RX |
|---------------------|-------|

### Note:

- 1). Per KDB648474 D04, 10-g extremity SAR is not required when Body-Worn mode 1-g reported SAR < 1.2 W/Kg.
- 2). According to the KDB941225 D06 Hot Spot SAR v02, the edges with less than 25 mm distance to the antennas need to be tested for SAR.

| Distance of The Antenna to the EUT surface and edge (mm) |       |      |          |             |           |            |
|----------------------------------------------------------|-------|------|----------|-------------|-----------|------------|
| Antennas                                                 | Front | Back | Top Side | Bottom Side | Left Side | Right Side |
| WIFI2.4G/BT                                              | <5    | <5   | <5       | 128         | 63        | 123        |

| Positions for SAR tests; Hotspot mode |       |      |          |             |           |            |
|---------------------------------------|-------|------|----------|-------------|-----------|------------|
| Antennas                              | Front | Back | Top Side | Bottom Side | Left Side | Right Side |
| WIFI2.4G/BT                           | Yes   | Yes  | Yes      | No          | No        | No         |

General Note: Referring to KDB 941225 D06 v02, When the overall device length and width are 9cm\*5cm, the test distance is 0mm, SAR must be measured for all sides and surfaces with a transmitting antenna located with 25mm from that surface or edge.

### 14.3 Test Results for Standalone SAR Test

The calculated SAR is obtained by the following formula:

$$\text{Reported SAR} = \text{Measured SAR} \times 10^{(P_{\text{target}} - P_{\text{measured}})/10}$$

$$\text{Scaling factor} = 10^{(P_{\text{target}} - P_{\text{measured}})/10}$$

$$\text{Reported SAR} = \text{Measured SAR} \times \text{Scaling factor}$$

Where

$P_{\text{target}}$  is the power of manufacturing upper limit;

$P_{\text{measured}}$  is the measured power;

Measured SAR is measured SAR at measured power which including power drift)

Reported SAR which including Power Drift and Scaling factor

Duty Cycle

| Test Mode   | Duty Cycle |
|-------------|------------|
| WIFI2.4G/BT | 1:1        |

SAR Values [WIFI2.4G]

| Ch.                                                                 | Freq. (MHz) | Service | Test Position | Conducted Power (dBm) | Maximum Allowed Power (dBm) | Power Drift (%) | Scaling Factor | SAR1-g results(W/kg) |          | Graph Results |
|---------------------------------------------------------------------|-------------|---------|---------------|-----------------------|-----------------------------|-----------------|----------------|----------------------|----------|---------------|
|                                                                     |             |         |               |                       |                             |                 |                | Measured             | Reported |               |
| measured / reported SAR numbers - Body (hotspot open, distance 0mm) |             |         |               |                       |                             |                 |                |                      |          |               |
| 1                                                                   | 2412        | 802.11b | Back          | 15.83                 | 17.00                       | -0.57           | 1.309          | 0.366                | 0.479    | Plot 1        |
| 1                                                                   | 2412        | 802.11b | Front         | 15.83                 | 17.00                       | 1.23            | 1.309          | 0.320                | 0.419    |               |
| 1                                                                   | 2412        | 802.11b | Top           | 15.83                 | 17.00                       | 3.10            | 1.309          | 0.278                | 0.364    |               |

Remark:

1. The value with The bold is the maximum SAR Value of each test band.

2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is  $\leq 0.8$  W/kg then testing at the other channels is optional for such test configuration(s).

SAR Values [BT]

| Ch.                                                                 | Freq. (MHz) | Service | Test Position | Conducted Power (dBm) | Maximum Allowed Power (dBm) | Power Drift (%) | Scaling Factor | SAR1-g results(W/kg) |              | Graph Results |
|---------------------------------------------------------------------|-------------|---------|---------------|-----------------------|-----------------------------|-----------------|----------------|----------------------|--------------|---------------|
|                                                                     |             |         |               |                       |                             |                 |                | Measured             | Reported     |               |
| measured / reported SAR numbers - Body (hotspot open, distance 0mm) |             |         |               |                       |                             |                 |                |                      |              |               |
| 00                                                                  | 2402        | 8DPSK   | Back          | 0.47                  | 1.50                        | -2.76           | 1.268          | <b>0.142</b>         | <b>0.180</b> | Plot 2        |
| 00                                                                  | 2402        | 8DPSK   | Front         | 0.47                  | 1.50                        | 0.15            | 1.268          | 0.118                | 0.150        |               |
| 00                                                                  | 2402        | 8DPSK   | Top           | 0.47                  | 1.50                        | 2.36            | 1.268          | 0.087                | 0.110        |               |

Remark:

1. The value with The bold is the maximum SAR Value of each test band.

2. Per FCC KDB Publication 447498 D01, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is  $\leq 0.8$  W/kg then testing at the other channels is optional for such test configuration(s).

## 14.4 Standalone SAR Test Exclusion Considerations and Estimated SAR

Per KDB447498 requires when the standalone SAR test exclusion of section 4.3.1 is applied to an antenna that transmits simultaneously with other antennas, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion;

- $(\text{max. power of channel, including tune-up tolerance, mW})/(\text{min. test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})}/x] \text{ W/kg}$  for test separation distances  $\leq 50 \text{ mm}$ ;  
where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.
  - $0.4 \text{ W/kg}$  for 1-g SAR and  $1.0 \text{ W/kg}$  for 10-g SAR, when the test separation distances is  $> 50 \text{ mm}$
- Per FCC KD B447498 D01, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the transmitting antenna in a specific a physical test configuration is  $\leq 1.6 \text{ W/Kg}$ . When the sum is greater than the SAR limit, SAR test exclusion is determined by the SAR to peak location separation ratio.

$$\text{Ratio} = \frac{(\text{SAR}_1 + \text{SAR}_2)^{1.5}}{(\text{peak location separation, mm})} < 0.04$$

| Estimated stand alone SAR |                 |               |                     |                          |                         |
|---------------------------|-----------------|---------------|---------------------|--------------------------|-------------------------|
| Communication system      | Frequency (MHz) | Configuration | Maximum Power (dBm) | Separation Distance (mm) | Estimated SAR1-g (W/kg) |
| Bluetooth*                | 2450            | Body-worn     | N/A                 | 5                        | N/A                     |

Remark:

1. Bluetooth\*- Including Lower power Bluetooth
2. Maximum average power including tune-up tolerance;
3. When the minimum test separation distance is  $< 5 \text{ mm}$ , a distance of  $5 \text{ mm}$  is applied to determine SAR test exclusion
4. Body as body use distance is  $5 \text{ mm}$  from manufacturer declaration of user manual

## 14.5 Simultaneous TX SAR Considerations

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. The device has 1 antenna, WWAN main antenna.;

Application Simultaneous Transmission information:

| Combination No. | Mode |
|-----------------|------|
| 1               | N/A  |

## 14.6 SAR Measurement Variability

According to KDB865664, Repeated measurements are required only when the measured SAR is  $\geq 0.80 \text{ W/kg}$ . If the measured SAR value of the initial repeated measurement is  $< 1.45 \text{ W/kg}$  with  $\leq 20\%$  variation, only one repeated measurement is required to reaffirm that the results are not expected to have substantial variations, which may introduce significant compliance concerns. A second repeated measurement is required only if the measured result for the initial repeated measurement is within  $10\%$  of the SAR limit and vary by more than  $20\%$ , which are often related to device and measurement setup difficulties. The following procedures are applied to determine if repeated measurements are required. 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.<sup>19</sup> The repeated measurement results must be clearly identified in the SAR report. All measured SAR, including the repeated results, must be considered to determine compliance and for reporting according to KDB 690783. Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

- 1) When the original highest measured SAR is  $\geq 0.80$  W/kg, repeat that measurement once.
- 2) 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  $\geq 1.45$  W/kg (~ 10% from the 1-g SAR limit).
- 3) Perform a third repeated measurement only if the original, first or second repeated measurement is  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is  $\geq 1.5$  W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is  $> 1.20$ .

| Frequency Band (MHz) | Air Interface | RF Exposure Configuration | Test Position | Repeated SAR (yes/no) | Highest Measured SAR1-g (W/kg) | First Repeated         |                               |
|----------------------|---------------|---------------------------|---------------|-----------------------|--------------------------------|------------------------|-------------------------------|
|                      |               |                           |               |                       |                                | Measured SAR1-g (W/kg) | Largest to Smallest SAR Ratio |
| 2412                 | WIFI2.4G      | Standalone                | Body-Back     | no                    | 0.366                          | n/a                    | n/a                           |
| 2402                 | BT            | Standalone                | Body-Back     | no                    | 0.142                          | n/a                    | n/a                           |

Remark:

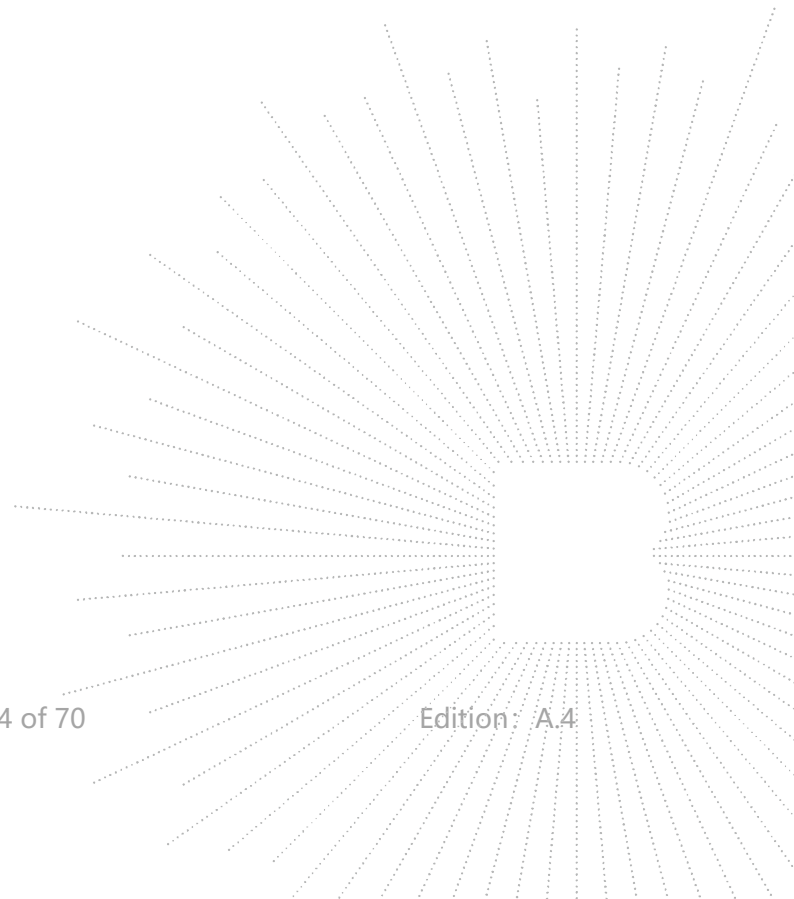
1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not  $> 1.20$  or 3 (1-g or 10-g respectively)

## 14.7 General description of test procedures

1. The DUT is tested using CMU 200 communications testers as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted peak power.
2. Test positions as described in the tables above are in accordance with the specified test standard.
3. Tests in body position were performed in that configuration, which generates the highest time based averaged output power (see conducted power results).
4. Tests in head position with GSM were performed in voice mode with 1 timeslot unless GPRS/EGPRS/DTM function allows parallel voice and data traffic on 2 or more timeslots.
5. UMTS was tested in RMC mode with 12.2 kbit/s and TPC bits set to 'all 1'.
6. WiFi was tested in 802.11b/g/n mode with 1 Mbit/s and 6 Mbit/s. According to KDB 248227 the SAR testing for 802.11g/n is not required since When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.
7. Required WiFi test channels were selected according to KDB 248227
8. According to FCC KDB pub 248227 D01, When there are multiple test channels with the same measured maximum output power, the channel closest to mid-band frequency is selected for SAR measurement and when there are multiple test channels with the same measured maximum output power and equal separation from mid-band frequency; for example, high and low channels or two mid-band channels, the higher frequency (number) channel is selected for SAR measurement.
9. According to FCC KDB pub 941225 D06 this device has been tested with 10 mm distance to the phantom for operation in WiFi hot spot mode.

10. Per FCC KDB pub 941225 D06 the edges with antennas within 2.5 cm are required to be evaluated for SAR to cover WiFi hot spot function.
11. According to IEEE 1528 the SAR test shall be performed at middle channel. Testing of top and bottom channel is optional.
12. According to KDB 447498 D01 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:
  - $\leq 0.8$  W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
  - $\leq 0.6$  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
  - $\leq 0.4$  W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz
13. IEEE 1528 require the middle channel to be tested first. This generally applies to wireless devices that are designed to operate in technologies with tight tolerances for maximum output power variations across channels in the band.
14. Per KDB648474 D04 require when the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is  $< 1.2$  W/kg.
15. Per KDB648474 D04 require when the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, using the same wireless mode test configuration for voice and data, such as UMTS, LTE and Wi-Fi, and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface)
16. 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g SAR  $> 1.2$  W/kg.
17. Per KDB648474 D04 require for phablet SAR test considerations , For Smart phones with a display diagonal dimension  $> 15.0$  cm or an overall diagonal dimension  $> 16.0$  cm, 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.
18. 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g SAR  $> 1.2$  W/kg.

TE  
TC  
OV  
檢



## 15. Test Plots

### 15.1 System Performance Check

System check at 2450 MHz

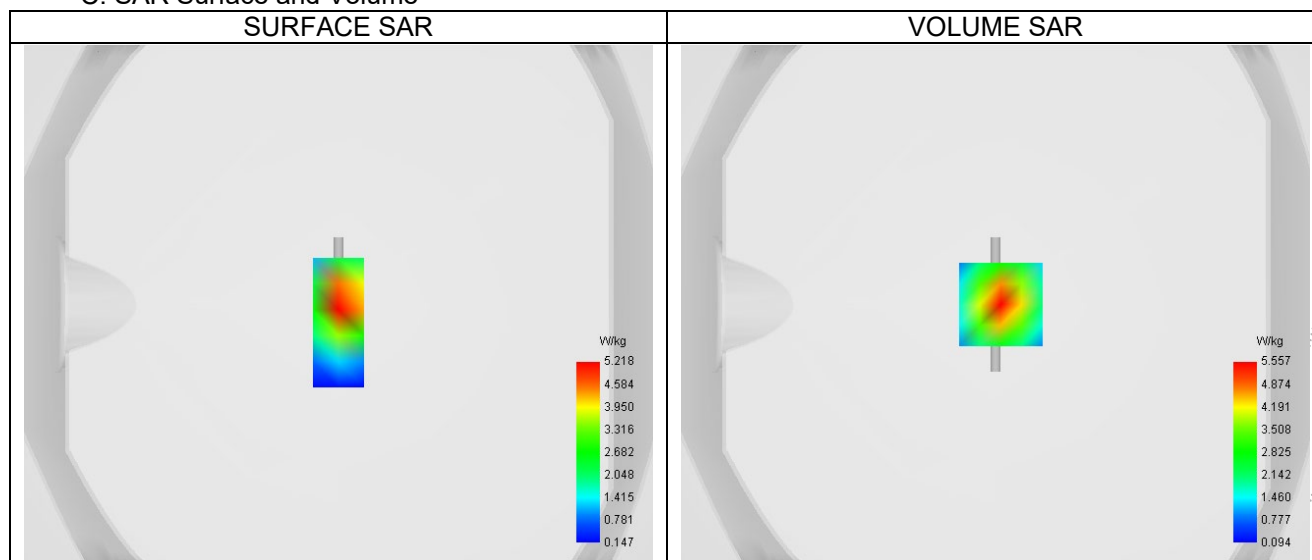
#### A. Experimental conditions.

|                 |                                        |
|-----------------|----------------------------------------|
| In power        | 100mw                                  |
| Probe           | SN EPG0373                             |
| ConvF           | 3.96                                   |
| Area Scan       | dx=10mm dy=10mm, Adaptive 2 max        |
| Zoom Scan       | 5x5x7, dx=8mm dy=8mm dz=5mm, Very fast |
| Phantom         | Validation plane                       |
| Device Position | Dipole                                 |
| Band            | CW2450                                 |
| Channels        | Middle                                 |
| Signal          | CW (Crest factor: 1.0)                 |

#### B. Permittivity

|                                        |          |
|----------------------------------------|----------|
| Frequency (MHz)                        | 2450.000 |
| Relative permittivity (real part)      | 52.700   |
| Relative permittivity (imaginary part) | 14.330   |
| Conductivity (S/m)                     | 1.950    |

#### C. SAR Surface and Volume



Maximum location: X=2.00, Y=0.00 ; SAR Peak: 9.11 W/kg

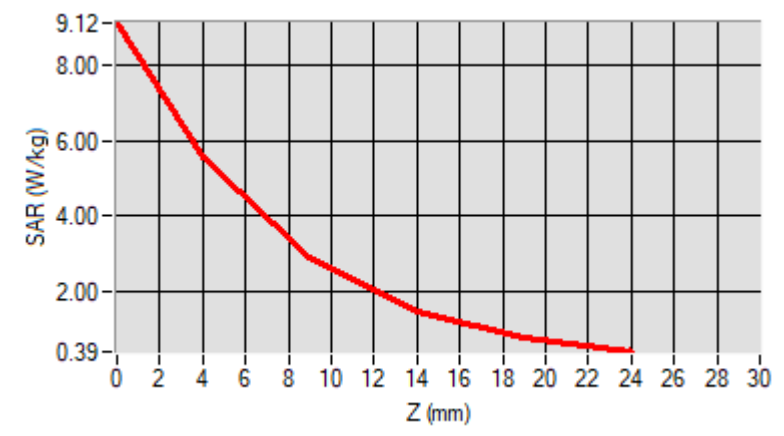
#### D. SAR 1g & 10g

|                                                       |          |
|-------------------------------------------------------|----------|
| SAR 10g (W/Kg)                                        | 2.457    |
| SAR 1g (W/Kg)                                         | 5.085    |
| Variation (%)                                         | 0.360    |
| Horizontal validation criteria: minimum distance (mm) | 0.000000 |
| Vertical validation criteria: SAR ratio M2/M1 (%)     | 0.000000 |

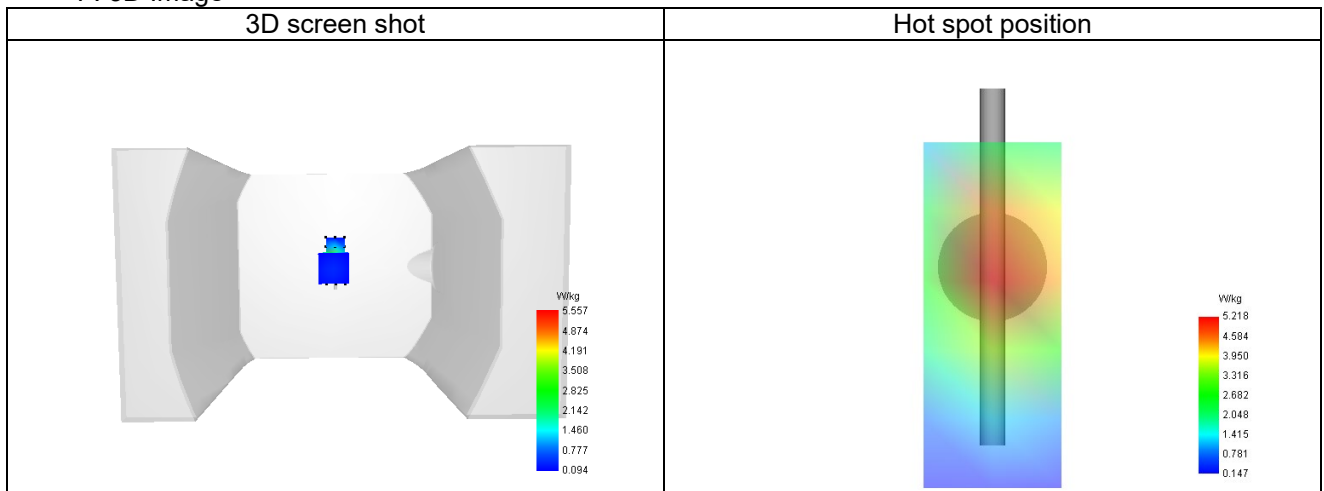
#### E. Z Axis Scan

|        |      |      |      |       |       |
|--------|------|------|------|-------|-------|
| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 |
|--------|------|------|------|-------|-------|

|            |       |       |       |       |       |
|------------|-------|-------|-------|-------|-------|
| SAR (W/Kg) | 9.121 | 5.557 | 2.866 | 1.459 | 0.770 |
|------------|-------|-------|-------|-------|-------|



F. 3D Image



CO., LTD.

## 15.2 SAR Test Graph Results

SAR plots for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination according to FCC KDB 865664 D02

### Plot 1

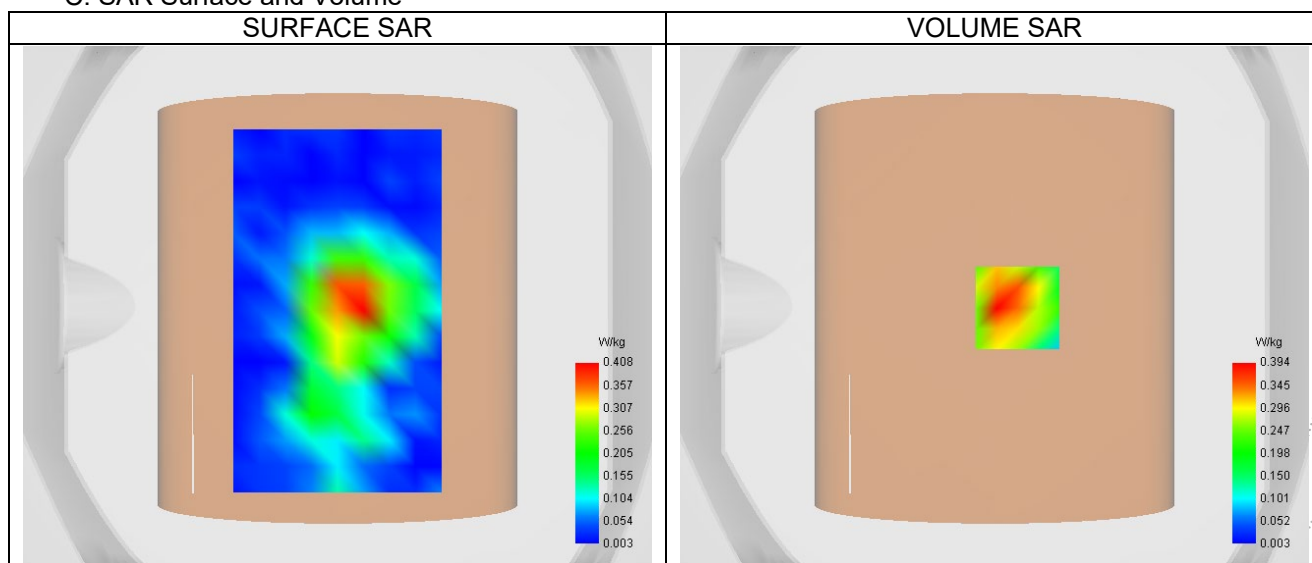
#### A. Experimental conditions.

|                 |                                     |
|-----------------|-------------------------------------|
| Probe           | SN 25/22 EPG0373                    |
| ConvF           | 3.96                                |
| Area Scan       | surf_sam_plan.txt                   |
| Zoom Scan       | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom         | Validation plane                    |
| Device Position | Body                                |
| Band            | IEEE 802.11b ISM                    |
| Channels        | Low (1)                             |
| Signal          | IEEE802.b (Crest factor: 1.0)       |

#### B. Permittivity

|                                        |          |
|----------------------------------------|----------|
| Frequency (MHz)                        | 2412.000 |
| Relative permittivity (real part)      | 39.226   |
| Relative permittivity (imaginary part) | 13.207   |
| Conductivity (S/m)                     | 1.788    |

#### C. SAR Surface and Volume



Maximum location: X=9.00, Y=-1.00 ; SAR Peak: 0.73 W/kg

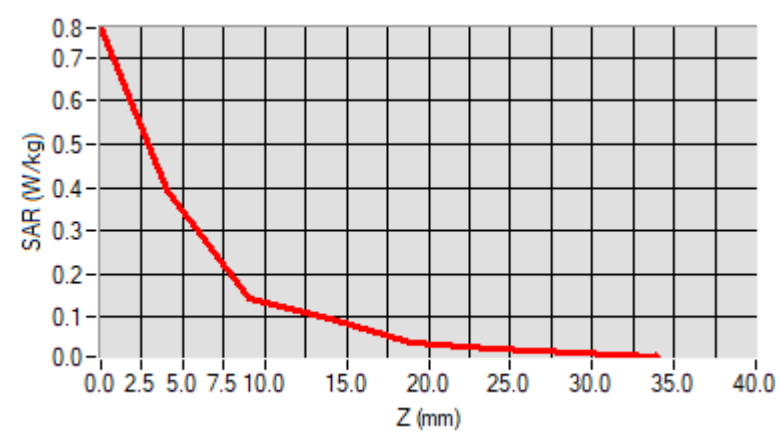
#### D. SAR 1g & 10g

|                                                       |           |
|-------------------------------------------------------|-----------|
| SAR 10g (W/Kg)                                        | 0.178     |
| SAR 1g (W/Kg)                                         | 0.366     |
| Variation (%)                                         | -0.570    |
| Horizontal validation criteria: minimum distance (mm) | 22.627417 |
| Vertical validation criteria: SAR ratio M2/M1 (%)     | 39.642461 |

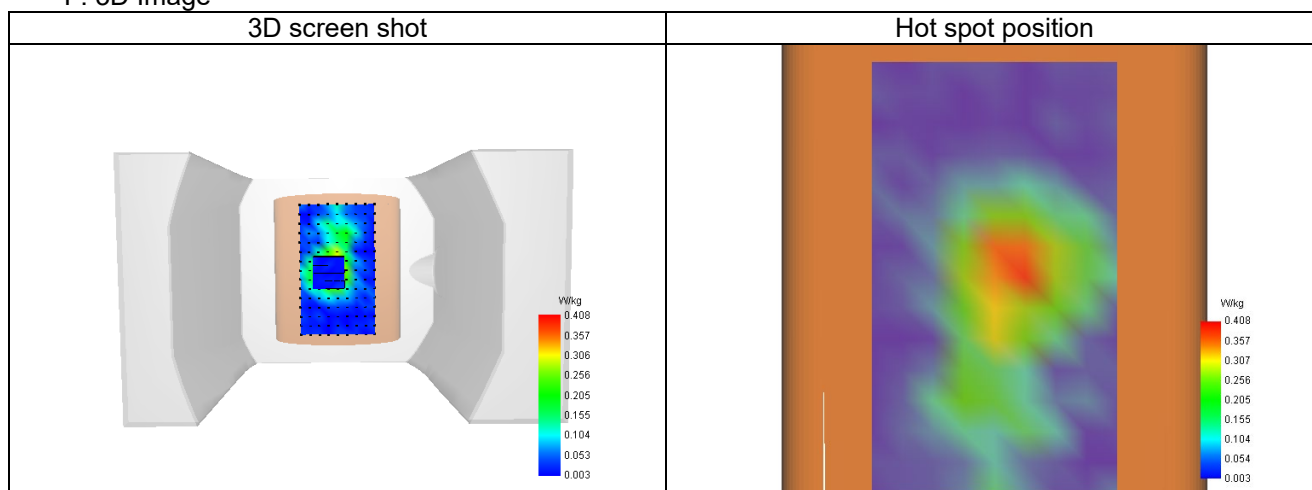
#### E. Z Axis Scan

| Z (mm) | 0.00 | 4.00 | 9.00 | 14.00 | 19.00 | 24.00 | 29.00 |
|--------|------|------|------|-------|-------|-------|-------|
|--------|------|------|------|-------|-------|-------|-------|

|            |       |       |       |       |       |       |       |
|------------|-------|-------|-------|-------|-------|-------|-------|
| SAR (W/Kg) | 0.769 | 0.394 | 0.146 | 0.099 | 0.043 | 0.027 | 0.020 |
|------------|-------|-------|-------|-------|-------|-------|-------|



### F. 3D Image



## Plot 2

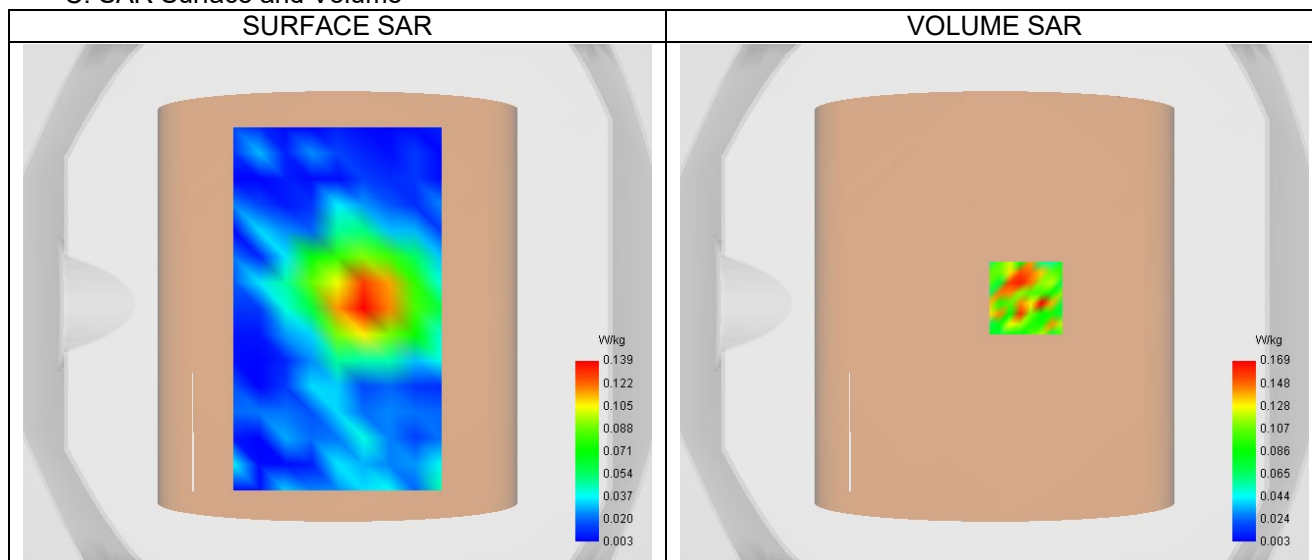
### A. Experimental conditions.

|                 |                                      |
|-----------------|--------------------------------------|
| Probe           | SN 25/22 EPGO373                     |
| ConvF           | 3.96                                 |
| Area Scan       | surf_sam_plan.txt                    |
| Zoom Scan       | 8x8x15,dx=4mm dy=4mm dz=2mm,Complete |
| Phantom         | Validation plane                     |
| Device Position | Body                                 |
| Band            | Bluetooth                            |
| Channels        | Low (00)                             |
| Signal          | Bluetooth (Crest factor: 1.0)        |

### B. Permittivity

|                                        |          |
|----------------------------------------|----------|
| Frequency (MHz)                        | 2402.000 |
| Relative permittivity (real part)      | 39.202   |
| Relative permittivity (imaginary part) | 13.219   |
| Conductivity (S/m)                     | 1.799    |

### C. SAR Surface and Volume

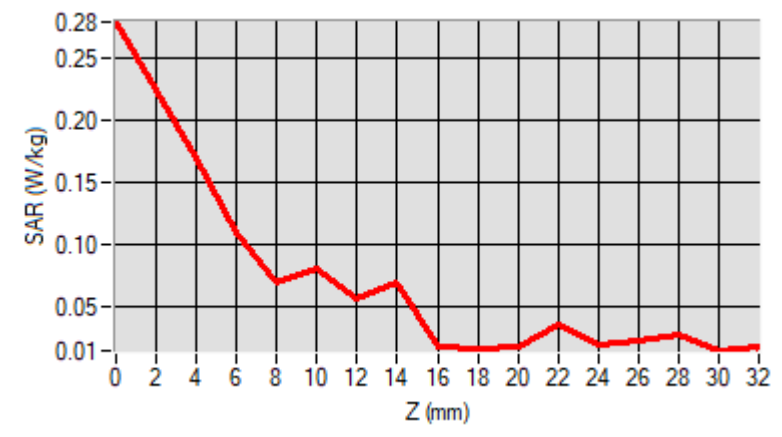


### D. SAR 1g & 10g

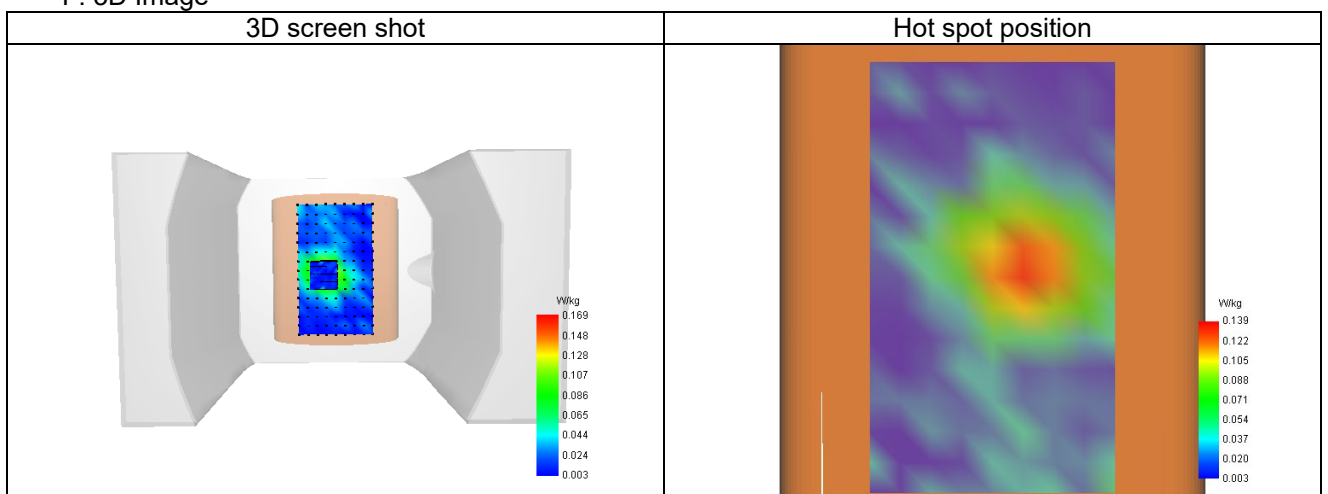
|                                                       |           |
|-------------------------------------------------------|-----------|
| SAR 10g (W/Kg)                                        | 0.070     |
| SAR 1g (W/Kg)                                         | 0.142     |
| Variation (%)                                         | -2.760    |
| Horizontal validation criteria: minimum distance (mm) | 8.000000  |
| Vertical validation criteria: SAR ratio M2/M1 (%)     | 54.555657 |

### E. Z Axis Scan

| Z (mm)     | 0.00  | 4.00  | 6.00  | 8.00  | 10.0  | 12.0  | 14.0  | 16.0  | 18.0  | 20.0  | 22.0  | 24.0  | 26.0  | 28.0  | 30.0  |
|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| SAR (W/Kg) | 0.279 | 0.169 | 0.110 | 0.069 | 0.080 | 0.056 | 0.069 | 0.017 | 0.016 | 0.017 | 0.035 | 0.019 | 0.022 | 0.027 | 0.014 |



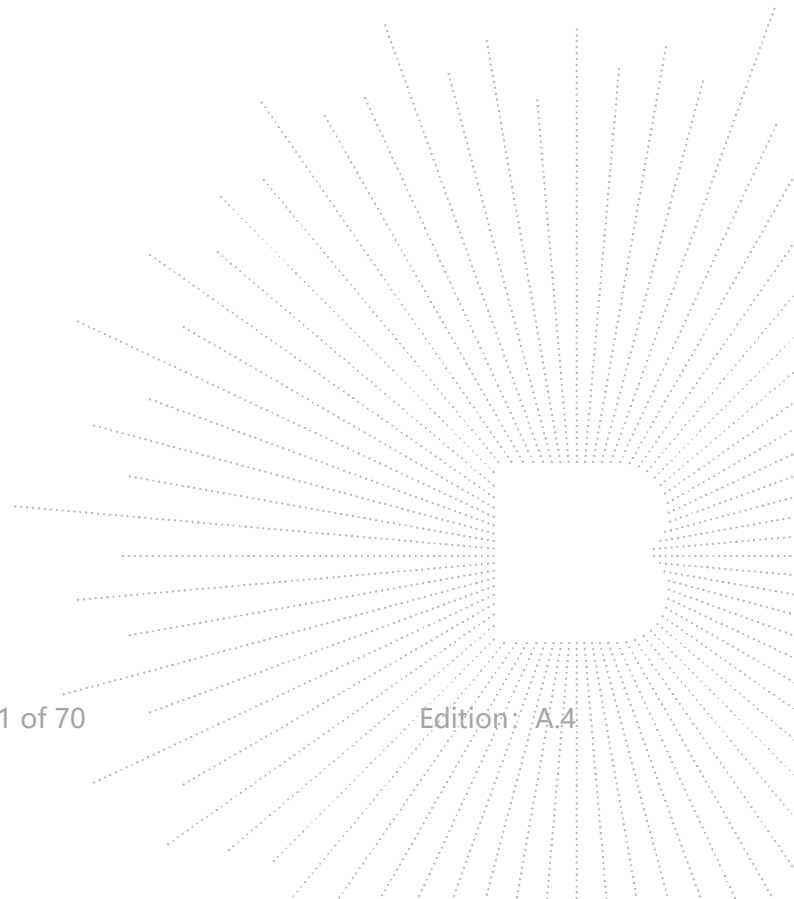
F. 3D Image



TEST  
TO  
OVER  
检

**16. CALIBRATION CERTIFICATES**

**Probe-EPGO373 Calibration Certificate**  
**SID2450Dipole Calibration Certificate**



**COMOSAR E-Field Probe Calibration Report**

Ref : ACR.180.5.22.BES.A

**SHENZHEN BCTC TECHNOLOGY CO., LTD.**  
1 ~2/ F, NO. B FACTORY BUILDING, PENGZHOU INDUSTRIAL  
PARK, FUYUAN 1ST ROAD,  
TANGWEI COMMUNITY, FUHAI STREET, BAO'AN DISTRICT,  
SHENZHEN, GUANGDONG, CHINA  
**MVG COMOSAR DOSIMETRIC E-FIELD PROBE**  
SERIAL NO.: SN 25/22 EPG0373

**Calibrated at MVG**  
**Z.I. de la pointe du diable**  
**Technopôle Brest Iroise – 295 avenue Alexis de Rochon**  
**29280 PLOUZANE - FRANCE**

Calibration date: 06/29/2022



Accreditations #2-6789  
Scope available on [www.cofrac.fr](http://www.cofrac.fr)

The use of the Cofrac brand and the accreditation references is prohibited from any reproduction.

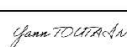
**Summary:**

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed at MVG, using the CALIPROBE test bench, for use with a MVG COMOSAR system only. The test results covered by accreditation are traceable to the International System of Units (SI).

Page: 1/11


**COMOSAR E-FIELD PROBE CALIBRATION REPORT**

Ref: ACR.180.5.22.BES.A

|                                   | <i>Name</i>    | <i>Function</i>         | <i>Date</i> | <i>Signature</i>                                                                    |
|-----------------------------------|----------------|-------------------------|-------------|-------------------------------------------------------------------------------------|
| <i>Prepared by :</i>              | Jérôme Le Gall | Measurement Responsible | 6/30/2022   |  |
| <i>Checked &amp; approved by:</i> | Jérôme Luc     | Technical Manager       | 6/30/2022   |  |
| <i>Authorized by:</i>             | Yann Toutain   | Laboratory Director     | 6/30/2022   |  |

2022.06.30  
13:38:42 +02'00'

|                       | <i>Customer Name</i>                     |
|-----------------------|------------------------------------------|
| <i>Distribution :</i> | Shenzhen BCTC<br>Technology Co.,<br>Ltd. |

| <i>Issue</i> | <i>Name</i>    | <i>Date</i> | <i>Modifications</i> |
|--------------|----------------|-------------|----------------------|
| A            | Jérôme Le Gall | 6/30/2022   | Initial release      |
|              |                |             |                      |
|              |                |             |                      |

Page: 2/11

**Template\_ACR.DDD.N.YY.MVGB.ISSUE\_COMOSAR Probe vK**

*This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.*



## TABLE OF CONTENTS

|     |                                       |    |
|-----|---------------------------------------|----|
| 1   | Device Under Test .....               | 4  |
| 2   | Product Description .....             | 4  |
| 2.1 | General Information .....             | 4  |
| 3   | Measurement Method .....              | 4  |
| 3.1 | Linearity .....                       | 4  |
| 3.2 | Sensitivity .....                     | 4  |
| 3.3 | Lower Detection Limit .....           | 5  |
| 3.4 | Isotropy .....                        | 5  |
| 3.1 | Boundary Effect .....                 | 5  |
| 4   | Measurement Uncertainty .....         | 6  |
| 5   | Calibration Measurement Results ..... | 6  |
| 5.1 | Sensitivity in air .....              | 6  |
| 5.2 | Linearity .....                       | 7  |
| 5.3 | Sensitivity in liquid .....           | 8  |
| 5.4 | Isotropy .....                        | 9  |
| 6   | List of Equipment .....               | 10 |

Page: 3/11

**Template\_ACR.DDD.N.YY.MVGB.ISSUE\_COMOSAR Probe vK**

*This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.*

SHENZHEN



## 1 DEVICE UNDER TEST

| Device Under Test                        |                                                                         |
|------------------------------------------|-------------------------------------------------------------------------|
| Device Type                              | COMOSAR DOSIMETRIC E FIELD PROBE                                        |
| Manufacturer                             | MVG                                                                     |
| Model                                    | SSE2                                                                    |
| Serial Number                            | SN 25/22 EPG0373                                                        |
| Product Condition (new / used)           | New                                                                     |
| Frequency Range of Probe                 | 0.15 GHz-6GHz                                                           |
| Resistance of Three Dipoles at Connector | Dipole 1: R1=0.234 MΩ<br>Dipole 2: R2=0.195 MΩ<br>Dipole 3: R3=0.250 MΩ |

## 2 PRODUCT DESCRIPTION

### 2.1 GENERAL INFORMATION

MVG's COMOSAR E field Probes are built in accordance to the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards.



**Figure 1** – MVG COMOSAR Dosimetric E field Probe

|                                            |        |
|--------------------------------------------|--------|
| Probe Length                               | 330 mm |
| Length of Individual Dipoles               | 2 mm   |
| Maximum external diameter                  | 8 mm   |
| Probe Tip External Diameter                | 2.5 mm |
| Distance between dipoles / probe extremity | 1 mm   |

## 3 MEASUREMENT METHOD

The IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their affect. All calibrations / measurements performed meet the fore mentioned standards.

### 3.1 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

### 3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.

Page: 4/11

**Template: ACR.DDD.N.YY.MVGB.ISSUE\_COMOSAR\_Probe\_vK**

This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.



### 3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

### 3.4 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 to 360 degrees in 15-degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

### 3.1 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

The boundary effect uncertainty can be estimated according to the following uncertainty approximation formula based on linear and exponential extrapolations between the surface and  $d_{be} + d_{step}$  along lines that are approximately normal to the surface:

$$SAR_{uncertainty} [\%] = \Delta SAR_{be} \frac{(d_{be} + d_{step})^2}{2d_{step}} \frac{(e^{-d_{be}/\delta})}{\delta/2} \quad \text{for } (d_{be} + d_{step}) < 10 \text{ mm}$$

where

$SAR_{uncertainty}$

is the uncertainty in percent of the probe boundary effect

$d_{be}$

is the distance between the surface and the closest *zoom-scan* measurement point, in millimetre

$\Delta_{step}$

is the separation distance between the first and second measurement points that are closest to the phantom surface, in millimetre, assuming the boundary effect at the second location is negligible

$\delta$

is the minimum penetration depth in millimetres of the head tissue-equivalent liquids defined in this standard, i.e.,  $\delta \approx 14$  mm at 3 GHz;

$\Delta SAR_{be}$

in percent of SAR is the deviation between the measured SAR value, at the distance  $d_{be}$  from the boundary, and the analytical SAR value.

The measured worst case boundary effect SAR uncertainty[%] for scanning distances larger than 4mm is 1.0% Limit ,2%).

Page: 5/11

Template: ACR.DDD.N.YY.MVGB.ISSUE: COMOSAR Probe vK

This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.



#### 4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEC/IEEE 62209-1528 and FCC KDB865664 D01 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

| Uncertainty analysis of the probe calibration in waveguide |                       |                          |         |    |                          |
|------------------------------------------------------------|-----------------------|--------------------------|---------|----|--------------------------|
| ERROR SOURCES                                              | Uncertainty value (%) | Probability Distribution | Divisor | ci | Standard Uncertainty (%) |
| Expanded uncertainty<br>95 % confidence level k = 2        |                       |                          |         |    | 14 %                     |

#### 5 CALIBRATION MEASUREMENT RESULTS

| Calibration Parameters |             |
|------------------------|-------------|
| Liquid Temperature     | 20 +/- 1 °C |
| Lab Temperature        | 20 +/- 1 °C |
| Lab Humidity           | 30-70 %     |

##### 5.1 SENSITIVITY IN AIR

| Normx dipole<br>1 (μV/(V/m) <sup>2</sup> ) | Normy dipole<br>2 (μV/(V/m) <sup>2</sup> ) | Normz dipole<br>3 (μV/(V/m) <sup>2</sup> ) |
|--------------------------------------------|--------------------------------------------|--------------------------------------------|
| 1.19                                       | 0.77                                       | 1.05                                       |

| DCP dipole 1<br>(mV) | DCP dipole 2<br>(mV) | DCP dipole 3<br>(mV) |
|----------------------|----------------------|----------------------|
| 108                  | 109                  | 110                  |

Calibration curves  $e_i=f(V)$  (i=1,2,3) allow to obtain E-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$

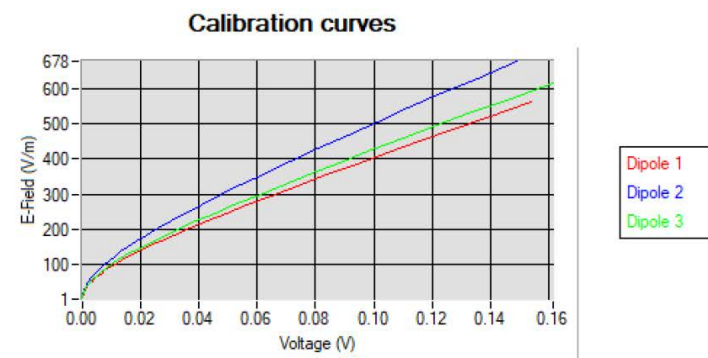
Page: 6/11

Template: ACR.DDD.N.YY.MVGB.ISSUE\_COMOSAR Probe vK

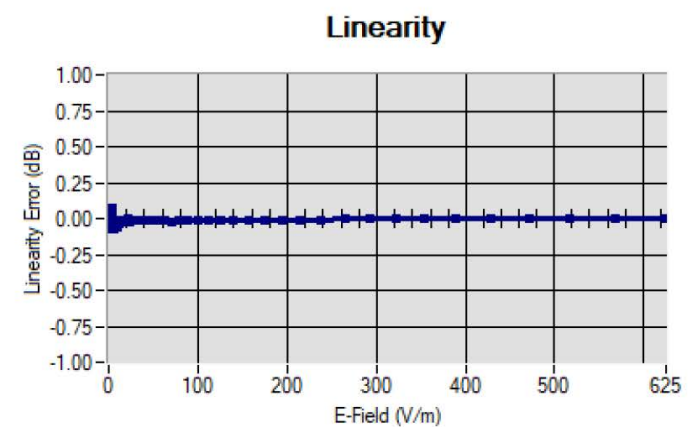
This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.


**COMOSAR E-FIELD PROBE CALIBRATION REPORT**

Ref: ACR.180.5.22.BES.A



## 5.2 LINEARITY



**Linearity:  $\pm 1.77\%$  ( $\pm 0.08\text{dB}$ )**

Page: 7/11

*Template: ACR.DDD.N.YY.MVGB.ISSUE\_COMOSAR Probe vK*

*This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.*



### 5.3 SENSITIVITY IN LIQUID

| Liquid | Frequency<br>(MHz +/-<br>100MHz) | ConvF |
|--------|----------------------------------|-------|
| HL450* | 450*                             | 3.00* |
| BL450* | 450*                             | 2.83* |
| HL750  | 750                              | 2.96  |
| BL750  | 750                              | 3.07  |
| HL850  | 835                              | 3.01  |
| BL850  | 835                              | 3.13  |
| HL900  | 900                              | 3.08  |
| BL900  | 900                              | 3.18  |
| HL1800 | 1800                             | 3.35  |
| BL1800 | 1800                             | 3.42  |
| HL1900 | 1900                             | 3.27  |
| BL1900 | 1900                             | 3.55  |
| HL2100 | 2100                             | 3.77  |
| BL2100 | 2100                             | 3.92  |
| HL2300 | 2300                             | 3.77  |
| BL2300 | 2300                             | 3.94  |
| HL2450 | 2450                             | 3.96  |
| BL2450 | 2450                             | 4.13  |
| HL2600 | 2600                             | 3.63  |
| BL2600 | 2600                             | 3.79  |
| HL5200 | 5200                             | 2.72  |
| BL5200 | 5200                             | 2.45  |
| HL5400 | 5400                             | 2.92  |
| BL5400 | 5400                             | 2.74  |
| HL5600 | 5600                             | 3.09  |
| BL5600 | 5600                             | 2.90  |
| HL5800 | 5800                             | 2.86  |
| BL5800 | 5800                             | 2.72  |

\* Frequency not cover by COFRAC scope, calibration not accredited

LOWER DETECTION LIMIT: 7mW/kg

Page: 8/11

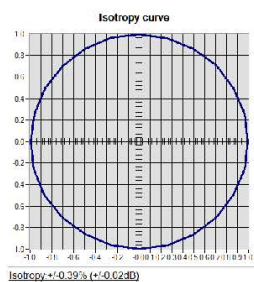
**Template\_ACR.DDD.N.YY.MVGB.ISSUE\_COMOSAR Probe vK**

*This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.*



#### 5.4 ISOTROPY

##### HL1800 MHz



Page: 9/11

**Template: ACR.DDD.N.YY.MVGB.ISSUE\_COMOSAR\_Probe\_vK**

This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.



## 6 LIST OF EQUIPMENT

| Equipment Summary Sheet            |                      |                         |                                               |                                               |
|------------------------------------|----------------------|-------------------------|-----------------------------------------------|-----------------------------------------------|
| Equipment Description              | Manufacturer / Model | Identification No.      | Current Calibration Date                      | Next Calibration Date                         |
| CALIPROBE Test Bench               | Version 2            | NA                      | Validated. No cal required.                   | Validated. No cal required.                   |
| Network Analyzer                   | Rohde & Schwarz ZVM  | 100203                  | 08/2021                                       | 08/2024                                       |
| Network Analyzer                   | Agilent 8753ES       | MY40003210              | 10/2019                                       | 10/2022                                       |
| Network Analyzer – Calibration kit | HP 85033D            | 3423A08186              | 06/2021                                       | 06/2027                                       |
| Multimeter                         | Keithley 2000        | 1160271                 | 02/2020                                       | 02/2023                                       |
| Signal Generator                   | Rohde & Schwarz SMB  | 106589                  | 03/2022                                       | 03/2025                                       |
| Amplifier                          | MVG                  | MODU-023-C-0002         | Characterized prior to test. No cal required. | Characterized prior to test. No cal required. |
| Power Meter                        | NI-USB 5680          | 170100013               | 06/2021                                       | 06/2024                                       |
| Power Meter                        | Rohde & Schwarz NRVD | 832839-056              | 11/2019                                       | 11/2022                                       |
| Directional Coupler                | Krytar 158020        | 131467                  | Characterized prior to test. No cal required. | Characterized prior to test. No cal required. |
| Waveguide                          | MVG                  | SN 32/16 WG4_1          | Validated. No cal required.                   | Validated. No cal required.                   |
| Liquid transition                  | MVG                  | SN 32/16 WGLIQ_0G900_1  | Validated. No cal required.                   | Validated. No cal required.                   |
| Waveguide                          | MVG                  | SN 32/16 WG6_1          | Validated. No cal required.                   | Validated. No cal required.                   |
| Liquid transition                  | MVG                  | SN 32/16 WGLIQ_1G500_1  | Validated. No cal required.                   | Validated. No cal required.                   |
| Waveguide                          | MVG                  | SN 32/16 WG8_1          | Validated. No cal required.                   | Validated. No cal required.                   |
| Liquid transition                  | MVG                  | SN 32/16 WGLIQ_1G800B_1 | Validated. No cal required.                   | Validated. No cal required.                   |
| Liquid transition                  | MVG                  | SN 32/16 WGLIQ_1G800H_1 | Validated. No cal required.                   | Validated. No cal required.                   |
| Waveguide                          | MVG                  | SN 32/16 WG10_1         | Validated. No cal required.                   | Validated. No cal required.                   |
| Liquid transition                  | MVG                  | SN 32/16 WGLIQ_3G500_1  | Validated. No cal required.                   | Validated. No cal required.                   |
| Waveguide                          | MVG                  | SN 32/16 WG12_1         | Validated. No cal required.                   | Validated. No cal required.                   |

Page: 10/11

Template\_ACR.DDD.N.YY.MVGB.ISSUE\_COMOSAR Probe vK

This document shall not be reproduced, except in full or in part, without the written approval of MVG. The information contained herein is to be used only for the purpose for which it is submitted and is not to be released in whole or part without written approval of MVG.