# FCC SAR REPORT

| | |
|---|---|
| **Applicant:** | SKY PHONE LLC |
| **Address of Applicant:** | 1348 Washington Av. Suite 350, Miami Beach, FL33139 |
| **Equipment Under Test (EUT)** | |
| Product Name: | SMART PHONE |
| Model No.: | Elite N55Max,Premier5Max |
| Trade mark | SKY DEVICES |
| **FCC ID:** | 2ABOSSYUN55X |
| **Applicable standards:** | FCC 47 CFR Part 2.1093 |
| **Date of Test:** | 02 Dec., 2022 ~ 10 Dec., 2022 |
| **Test Result:** | Maximum Reported 1-g SAR (W/kg)<br>Head: 0.508 Body: 0.768 Hotspot: 0.768 |

Authorized Signature:

Bruce Zhang
Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the JYT product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards.

## 2 Version

| Version No. | Date | Description |
|---|---|---|
| *00* | *16 Jan., 2023* | *Original* |
| | | |
| | | |
| | | |
| | | |

***Tested by:*** Zora . Huang ***Date:*** *16 Jan., 2023*

***Test Engineer***

***Reviewed by:*** Janet . Wei ***Date:*** *16 Jan., 2023*

***Project Engineer***

# 3 Contents

# 4 SAR Results Summary

The maximum results of Specific Absorption Rate (SAR) found during test as below:

<Highest Reported standalone SAR Summary>

| Exposure Position | Frequency Band | Reported 1-g SAR (W/kg) | Equipment Class | Highest Reported 1-g SAR (W/kg) |
|---|---|---|---|---|
| Head | GSM 850 | 0.508 | PCE | 0.508 |
| | PCS 1900 | 0.163 | | |
| | WCDMA Band II | 0.207 | | |
| | WCDMA Band V | 0.278 | | |
| | LTE Band 2 | 0.314 | | |
| | LTE Band 5 | 0.370 | | |
| | LTE Band 12&Band 17 | 0.080 | | |
| | LTE Band 41 | 0.100 | | |
| | LTE Band 66&Band 4 | 0.422 | | |
| | LTE Band 71 | 0.061 | | |
| | WLAN 2.4 GHz | 0.158 | DTS | |
| | Bluetooth | 0.028 | DSS | |
| Body (10 mm Gap) | GSM 850 | 0.421 | PCE | 0.768 |
| | PCS 1900 | 0.364 | | |
| | WCDMA Band II | 0.634 | | |
| | WCDMA Band V | 0.327 | | |
| | LTE Band 2 | 0.734 | | |
| | LTE Band 5 | 0.345 | | |
| | LTE Band 12&Band 17 | 0.112 | | |
| | LTE Band 41 | 0.232 | | |
| | LTE Band 66&Band 4 | 0.768 | | |
| | LTE Band 71 | 0.085 | | |
| | WLAN 2.4GHz | 0.051 | DTS | |
| | Bluetooth | 0.021 | DSS | |
| Hotspot (10 mm Gap) | GSM 850 | 0.421 | PCE | 0.768 |
| | PCS 1900 | 0.364 | | |
| | WCDMA Band II | 0.634 | | |
| | WCDMA Band V | 0.327 | | |
| | LTE Band 2 | 0.734 | | |
| | LTE Band 5 | 0.345 | | |
| | LTE Band 12&Band 17 | 0.112 | | |
| | LTE Band 41 | 0.232 | | |
| | LTE Band 66&Band 4 | 0.768 | | |
| | LTE Band 71 | 0.085 | | |
| | WLAN 2.4 GHz | 0.051 | DTS | |
| | Bluetooth | 0.021 | DSS | |

< Highest Reported simultaneous SAR Summary>

| Exposure Position | Frequency Band | Reported 1-g SAR (W/kg) | Equipment Class | Highest Reported Simultaneous Transmission 1-g SAR (W/kg) |
|---|---|---|---|---|
| Back | WWAN | 0.768 | PCE | 0.803 |
| | WLAN 2.4 GHz | 0.035 | DTS | |

**Note:**

1. The highest simultaneous transmission is scalar summation of Reported standalone SAR per FCC KDB 690783 D01 v01r03, and scalar SAR summation of all possible simultaneous transmission scenarios are < 1.6W/kg.
2. This device is 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 C95.1-2005, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013.
3. For FDD-LTE Band 17 is full covered by FDD-LTE Band 12, so only FDD-LTE Band 12 was tested.
4. For FDD-LTE Band 4 is full covered by FDD-LTE Band 66, so only FDD-LTE Band 66 was tested.

# 5 General Information

## 5.1 Client Information

| | |
|---|---|
| Applicant: | SKY PHONE LLC |
| Address of Applicant: | 1348 Washington Av. Suite 350, Miami Beach, FL33139 |
| Manufacturer: | SKY PHONE LLC |
| Address of Manufacturer: | 1348 Washington Av. Suite 350, Miami Beach, FL33139 |

## 5.2 General Description of EUT

| | | | | |
|---|---|---|---|---|
| Product Name: | SMART PHONE | | | |
| Model No.: | Elite N55Max,Premier5Max | | | |
| Category of device | Portable device | | | |
| Operation Frequency: | GSM : | GSM850: 824.2~848.8 MHz | PCS 1900: 1850.2~1909.8 MHz | |
| | WCDMA : | Band II: 1852.4~1907.6 MHz | Band V: 826.4~846.6 MHz | |
| | LTE : | Band 2 :1850MHz~1910MHz | Band 4 :1710MHz~1755MHz | |
| | | Band 5 :824MHz~849MHz | Band 12: 698MHz~716MHz | |
| | | Band 17: 704MHz~716MHz | Band 41: 2535MHz~2655MHz | |
| | | Band 66 :1710MHz~1780MHz | Band 71: 663MHz~698MHz | |
| | Wi-Fi: | 2412MHz~2462MHz | | |
| | Bluetooth: 2402 MHz ~ 2480 MHz | | | |
| Modulation technology: | GSM: | ☒Voice(GMSK) | ☒GPRS(GMSK) | ☒EGPRS(GMSK, 8PSK) |
| | WCDMA: | ☒RMC(QPSK) | ☒HSUPA(QPSK) | ☒HSDPA(QPSK,16QAM) |
| | LTE: | ☒QPSK | ☒16QAM | ☒64QAM<br>(only support downlink) |
| | Wi-Fi: | ☒802.11b(DSSS) | ☒802.11g/n (OFDM) | |
| | Bluetooth: | ☒BDR(GFSK) | ☒EDR(π/4-DQPSK, 8DPSK) | ☒LE(GFSK) |
| Antenna Type: | Internal Antenna | | | |
| Antenna Gain: | GSM 850: 0.56dBi; PCS 1900: 1.39dBi<br>WCDMA Band II: 1.32dBi; WCDMA Band V: 0.56 dBi<br>LTE Band 2: 0.93dBi; LTE Band 4: 1.69dBi<br>LTE Band 5: 0.56dBi; LTE Band 12: 0.49dBi<br>LTE Band 17: 0.51dBi; LTE Band 41: 1.02dBi<br>LTE Band 66: 1.59dBi; LTE Band 71: 0.35dBi<br>Bluetooth: -0.61dBi; 2.4G Wi-Fi: -0.61dBi | | | |
| (E)GPRS Class: | (E)GPRS Class: 12 | | | |
| Dimensions (L*W*H): | 150 mm (L)× 73 mm (W)× 10 mm (H) | | | |
| Accessories information: | Adapter:<br>Model:ZHY-QU050100S<br>Input:100-240V AC,50/60Hz 0.2A<br>Output:5.0V DC 1000mA | Battery:<br>Rechargeable Li-ion Battery 3.7V/2000mAh<br>Headset:<br>Support headset (shipped without) | | |
| Remake: | Elite N55Max,Premier5Max were identical inside, the electrical circuit design, layout, components used and internal wiring, with only difference being model name. | | | |

## 5.3 Maximum RF Output Power

| Mode | Average Power (dBm) | |
|---|---|---|
| | GSM 850 | PCS 1900 |
| GSM (Voice) | 33.38 | 29.97 |
| GPRS (1 TX Slot) | 33.33 | 30.03 |
| GPRS (2 TX Slots) | 31.13 | 27.69 |
| GPRS (3 TX Slots) | 29.21 | 26.17 |
| GPRS (4 TX Slots) | 26.84 | 24.08 |
| EGPRS (1 TX Slot) | 26.58 | 25.76 |
| EGPRS (2 TX Slots) | 26.42 | 25.63 |
| EGPRS (3 TX Slots) | 25.19 | 24.12 |
| EGPRS (4 TX Slots) | 22.70 | 21.86 |

| Mode | Average Power (dBm) | |
|---|---|---|
| | WCDMA Band II | WCDMA Band V |
| AMR 12.2 kbps | 22.93 | 23.16 |
| RMC 12.2 kbps | 22.91 | 23.20 |
| HSDPA Sub-test 1 | 22.64 | 22.14 |
| HSDPA Sub-test 2 | 22.32 | 21.97 |
| HSDPA Sub-test 3 | 22.09 | 21.55 |
| HSDPA Sub-test 4 | 22.16 | 21.63 |
| HSUPA Sub-test 1 | 20.27 | 21.06 |
| HSUPA Sub-test 2 | 20.89 | 21.14 |
| HSUPA Sub-test 3 | 20.71 | 20.98 |
| HSUPA Sub-test 4 | 20.98 | 20.86 |
| HSUPA Sub-test 5 | 22.83 | 22.24 |

| Mode | Average Power (dBm) | | | | | |
|---|---|---|---|---|---|---|
| | LTE Band 2 | LTE Band 5 | LTE Band 12 | LTE Band 41 | LTE Band 66 | LTE Band 71 |
| BW/1.4 MHz | 23.96 | 23.96 | 23.92 | / | 23.80 | / |
| BW/3.0 MHz | 23.95 | 23.75 | 23.87 | / | 23.85 | / |
| BW/5.0 MHz | 24.07 | 23.64 | 23.73 | 23.96 | 23.87 | 23.73 |
| BW/10 MHz | 23.93 | 23.70 | 23.77 | 24.18 | 23.68 | 23.65 |
| BW/15 MHz | 23.93 | / | / | 24.08 | 23.74 | 23.81 |
| BW/20 MHz | 24.13 | / | / | 24.13 | 23.82 | 23.73 |

| WLAN 2.4 GHz Band Average Power (dBm) | | | |
|---|---|---|---|
| Mode/Band | b | g | n (HT-20) |
| WLAN 2.4GHz | 15.25 | 13.85 | 12.86 |

| Bluetooth Average Power (dBm) | | | | |
|---|---|---|---|---|
| Mode/Band | 1 Mbps(GFSK) | 2 Mbps(π/4DQPSK) | 3 Mbps (8DPSK) | LE (BT 4.0) |
| Bluetooth | 6.09 | 6.25 | 6.58 | -3.05 |

## 5.4 Environment of Test Site

| | |
|---|---|
| **Temperature:** | 18°C ~25 °C |
| **Humidity:** | 35%~75% RH |
| **Atmospheric Pressure:** | 1010 mbar |

## 5.5 Test Sample Plan

| Sample Number | Used for Test Items |
|---|---|
| 5# | SAR |
| ***Remark**: JianYan Testing Group Shenzhen Co., Ltd. is only responsible for the test project data of the above samples, and will keep the above samples for a month.* | |

## 5.6 Test Location

JianYan Testing Group Shenzhen Co., Ltd.
No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community,Xinqiao Street, Bao'an District, Shenzhen, Guangdong,People's Republic of China.
Tel: +86-755-23118282, Fax: +86-755-23116366
Email: info-JYTee@lets.com, Website: http://jyt.lets.com

# 6 Introduction

## 6.1 Introduction

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

## 6.2 SAR Definition

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

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

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

SAR 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

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

Where: σ is the conductivity of the tissue, ρ 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.

# 7 RF Exposure Limits

## 7.1 Uncontrolled Environment

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

## 7.2 Controlled Environment

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

## 7.3 RF Exposure Limits

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

| HUMAN EXPOSURE LIMITS | | |
|---|---|---|
| | UNCONTROLLED ENVIRONMENT<br>*General Population*<br>(W/kg) or (mW/g) | CONTROLLED ENVIRONMENT<br>*Occupational*<br>(W/kg) or (mW/g) |
| SPATIAL PEAK SAR<br>Brain | 1.6 | 8.0 |
| SPATIAL AVERAGE SAR<br>Whole Body | 0.08 | 0.4 |
| SPATIAL PEAK SAR<br>Hands, Feet, Ankles, Wrists | 4.0 | 20 |

**Note:**

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

# 8 SAR Measurement System

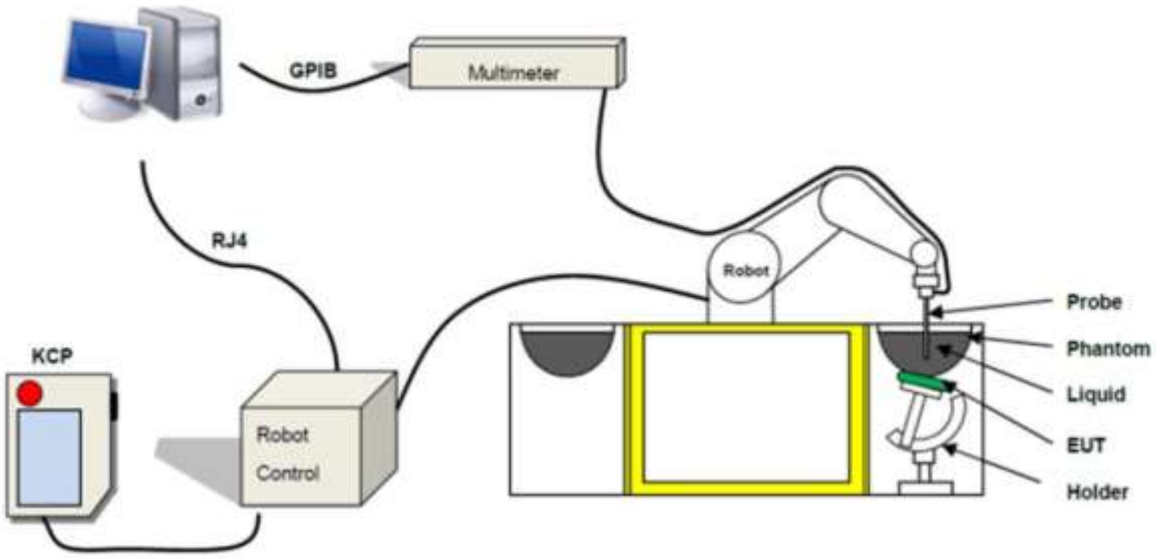



**Fig. 8.1 MVG COMOSAR System Configurations**

These measurements were performed with the automated near-field scanning system COMOSAR from MVG. The system is based on a high precision robot (working range: 850 mm), which positions the probes with a positional repeatability of better than ± 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit.

The SAR measurements were conducted with dosimetric probe (manufactured by MVG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in SAR standard with accuracy of better than ±10%.The spherical isotropy was evaluated with the procedure described in SAR standard and found to be better than ±0.25 dB. The phantom used was the SAM Phantom as described in FCC supplement C, IEEE P1528.

The MVG COMOSAR system for performance compliance tests is illustrated above graphically. This 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

## 8.1 E-Field Probe

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

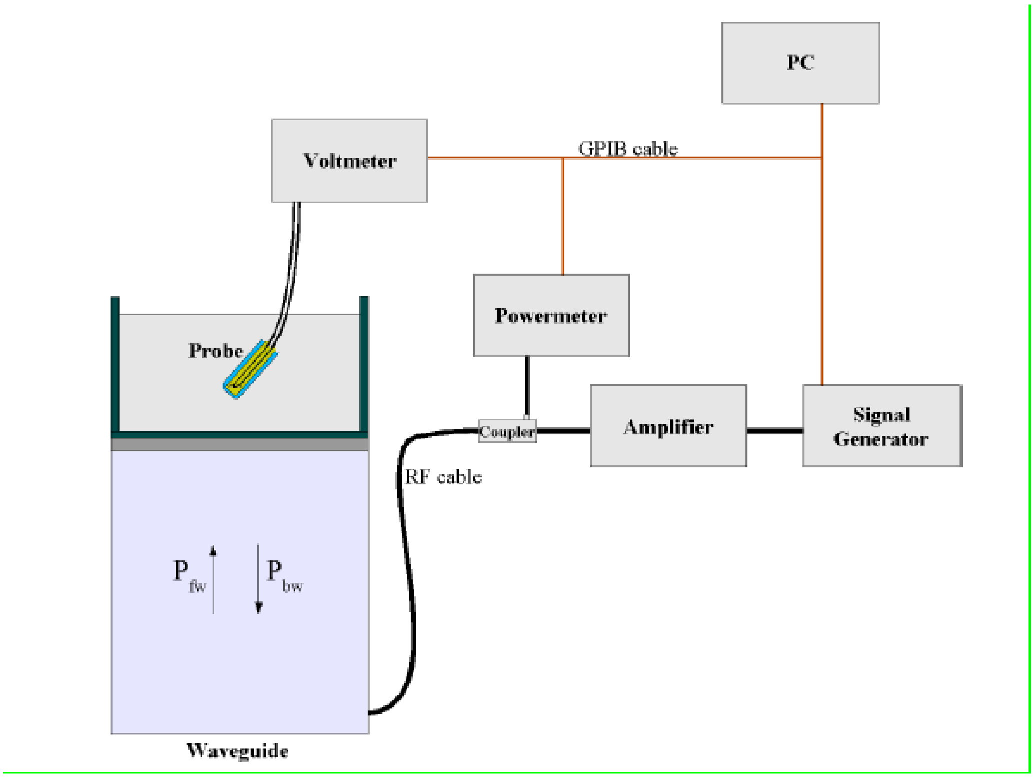
➢ **E-Field Probe Specification**

| | |
|---|---|
| Device Type | COMOSAR DOSIMETRIC E FIELD PROBE |
| Model | SSE2 |
| Frequency Range | 150 MHz to 6 GHz |
| **Dynamic Range** | 0.01W/kg to 100W/kg |
| **Probe linearity** | <0.25dB |
| **Dimensions** | Overall length: 330 mm<br>Tip diameter: 2.5 mm<br>Distance between dipoles / probe extremity: 1 mm |

**Fig. 8.2 Photo of E-Field Probe**

➢ **E-Field Probe Calibration**

Probe calibration is realized, in compliance with EN/IEC 62209-1/-2 and IEEE 1528 std, with CALISAR, MVG proprietary calibration system. The calibration is performed with the technique using reference waveguide.



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

Where :

| | | |
|---|---|---|
| Pfw | = | Forward Power |
| Pbw | = | Backward Power |
| a and b | = | Waveguide Dimensions |
| ı | = | Skin Depth |

Keithley configuration

Rate=Medium; Filter=ON; RDGS=10; FILTER TYPE=MOVING AVERAGE; RANGE AUTO

After each calibration, a SAR measurement 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)/Vlin(N)    (N=1,2,3)

The linearized output voltage Vlin(N) is obtained from the displayed output voltage V(N) using

Vlin(N)=V(N)*(1+V(N)/DCP(N))   N=1,2,3

Where the DCP is the dipole compression point in mV

## 8.2 Robot

The COMOSAR system uses the high precision robots from KUKA. For the 6-axis controller system, the robot controller version (KUKA-KRC2sr) from KUKA is used. The KUKA robot series have many features that are important for our application:

- High precision (repeatability  0.02 mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance free due to direct drive gears; no belt drives)
- Jerk-free straight movements
- Low ELF interference (motor control fields shielded via the closed metallic construction shields)

**Fig. 8.4 Photo of Robot**

## 8.3 Phantom

**<SAM Phantom>**

| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm;<br>Center ear point: 6 ± 0.2 mm |
| **Filling Volume Dimensions** | Approx. 27 liters<br>Length: 1000mm; Width: 500mm;<br>Height: 200mm |
| **Material** | Fiberglass based |
| **Relative permittivity** | 3-4 |
| **Loss tangent** | 0.02 |
| **Measurement Areas** | Left Head, Right Head, Flat phantom |

**Fig. 8.7 Photo of SAM Phantom**

The phantom developed by MVG is produced in accordance with the specified in the standards. It has been designed to fit the COMOSAR phantom tables and is delivered with a plastic cover to prevent liquid evaporation.

## 8.4 Device Holder

The positioning system is made of an extremely stable material, which ensures easy handling and reproducible positioning. It also allows correct positioning of the dipoles referenced by the IEEE, ANSI and IEC.

**<Device Holder for SAM Phantom>**

| | |
|---|---|
| **Model** | Handset Positioning System |
| **Material properties** | The positioning system is made of PETP. This material offers a low permittivity of 3.2 and low loss, with a loss tangent of 0.005 to minimize the influence of the DUT on measurement results. |
| **Mechanical properties** | The positioning system developed by MVG allows a positioning resolution better than 1 mm. The system is fixed on a bottom rail “x axis” so that the positioning system can be quickly moved from the right to the left part of the phantom.<br>In addition, it can be moved on a perpendicular “y axis” and the height can be adapted. The system is also composed of three rotation points for accurate positioning of the device’s acoustical output. |
| **Accuracy and precision** | A curved rail on the top part allows the fast switch from the cheek to the tilt position. The required 15° angle for the tilt position can be easily checked thanks to a printed scale on the curved rail with a tolerance of ± 1° |

**Fig. 8.9 Photo of Device Holder**

## 8.5 Test Equipment List

| Manufacturer | Equipment Description | Model | Management Number | Cal. Information | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| MVG | COMOSAR DOSIMETRIC E FIELD PROBE | SSE2 | WXJ076 | 06.30.2022 | 06.29.2023 |
| MVG | COMOSAR 750 MHz REFERENCE DIPOLE | SID750 | WXJ076-4 | 01.14.2021 | 01.13.2024 |
| MVG | COMOSAR 835 MHz REFERENCE DIPOLE | SID835 | WXJ076-5 | 01.14.2021 | 01.13.2024 |
| MVG | COMOSAR 1750 MHz REFERENCE DIPOLE | SID1750 | WXJ076-8 | 01.14.2021 | 01.13.2024 |
| MVG | COMOSAR 1900 MHz REFERENCE DIPOLE | SID1900 | WXJ076-9 | 01.14.2021 | 01.13.2024 |
| MVG | COMOSAR 2450 MHz REFERENCE DIPOLE | SID2450 | WXJ076-12 | 01.14.2021 | 01.13.2024 |
| MVG | COMOSAR 2600 MHz REFERENCE DIPOLE | SID2600 | WXJ076-13 | 01.14.2021 | 01.13.2024 |
| KEITHLEY | DIGIT MULTIMETER | DMM6500 | WXJ076-1 | 10.17.2022 | 10.16.2025 |
| MVG | MVG Measurement Software | OpenSAR | Version: V5_01_09 | N.C.R | N.C.R |
| MVG | COMOSAR IEEE SAM PHANTOM | N/A | WXG009-2 | N.C.R | N.C.R |
| MVG | COMOSAR IEEE SAM PHANTOM | N/A | WXG009-3 | N.C.R | N.C.R |
| MVG | MOBILE PHONE POSITIONNING SYSTEM | N/A | WXG009-4 | N.C.R | N.C.R |
| KUKA | Robot | KR 6 R900 sixx | WXG009-1 | N.C.R | N.C.R |
| Anritsu | Universal Radio Communication Analyzer | MT8820C | WXJ008-5 | 03.03.2021 | 03.02.2023 |
| R&S | Universal Radio Communication Tester | CMU200 | WXJ008-2 | 03.30.2022 | 03.29.2024 |
| KEYSIGHT | Network Analyzer | E5071C | WXJ091 | 03.30.2022 | 03.29.2023 |
| KEYSIGHT | EPM Series Power Meter | N1914A | WXJ075 | 06.29.2022 | 06.28.2023 |
| KEYSIGHT | E-Series Power Sensor | E9300H | WXJ075-1 | 06.29.2022 | 06.28.2023 |
| KEYSIGHT | E-Series Power Sensor | E9300H | WXJ075-2 | 06.29.2022 | 06.28.2023 |
| KEYSIGHT | Signal Generator | N5173B | WXJ006-3 | 06.29.2022 | 06.28.2023 |
| Huber Suhner | RF Cable | SUCOFLEX | WXG008-13 | See Note 3 | |
| Huber Suhner | RF Cable | SUCOFLEX | WXG008-14 | See Note 3 | |
| Huber Suhner | RF Cable | SUCOFLEX | WXG008-15 | See Note 3 | |
| Weinschel | Attenuator | 23-3-34 | WXG008-16 | See Note 3 | |
| Anritsu | Directional Coupler | MP654A | WXG008-17 | See Note 3 | |
| MVG | LIMESAR DIELECTRIC PROBE | SCLMP | WXG009-5 | See Note 4 | |
| TXC | Broadband Amplifier | BBA018000 | WXG008-11 | See Note 5 | |

**Note:**

1. The calibration certificate of MVG can be referred to appendix C of this report.
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The Insertion Loss calibration of Dual Directional Coupler and Attenuator were characterized via the network analyzer and compensated during system check.
4. The dielectric probe kit was calibrated via the network analyzer, with the specified procedure (calibrated in pure water) and calibration kit (standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by MVG.
5. In system check we need to monitor the level on the spectrum analyzer, and adjust the power amplifier level to have precise power level to the dipole; the measured SAR will be normalized to 1 W input power according to the ratio of 1 W to the input power to the dipole. For system check, the calibration of the power amplifier is deemed not critically required for correct measurement; the spectrum analyzer is critical and we do have calibration for it
6. Attenuator insertion loss is calibrated by the network Analyzer, which the calibration is valid, before system check.
7. N.C.R means No Calibration Requirement.

# 9 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 9.1, for body SAR testing, the liquid height from the center of the flat phantom to liquid top surface is larger than 15 cm, which is shown in Fig. 9.2.

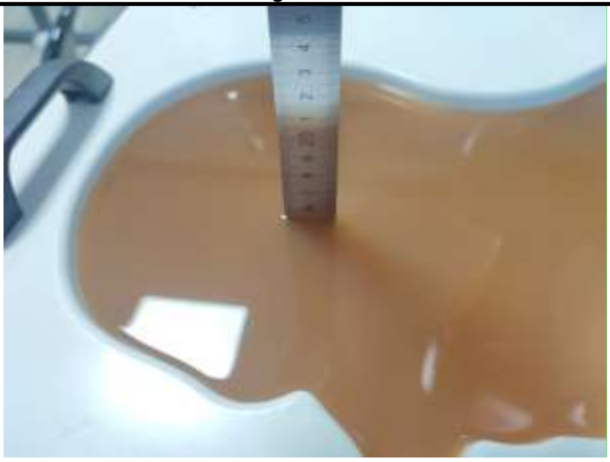


Fig. 9.1 Photo of Liquid Height for Head SAR (depth>15cm)

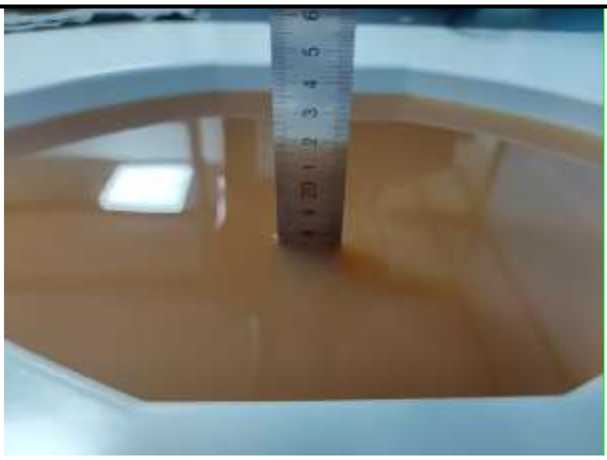


Fig. 9.2 Photo of Liquid Height for Body SAR (depth>15cm)

The relative permittivity and conductivity of the tissue material should be within ±5% of the values given in the table below recommended by the FCC OET 65 supplement C and RSS 102 Issue 5.

| Target Frequency | Head | | Body | |
|---|---|---|---|---|
| (MHz) | εr | σ(S/m) | εr | σ(S/m) |
| 150 | 52.3 | 0.76 | 61.9 | 0.80 |
| 300 | 45.3 | 0.87 | 58.2 | 0.92 |
| 450 | 43.5 | 0.87 | 56.7 | 0.94 |
| 835 | 41.5 | 0.90 | 55.2 | 0.97 |
| 900 | 41.5 | 0.97 | 55.0 | 1.05 |
| 915 | 41.5 | 0.98 | 55.0 | 1.06 |
| 1450 | 40.5 | 1.20 | 54.0 | 1.30 |
| 1610 | 40.3 | 1.29 | 53.8 | 1.40 |
| 1800-2000 | 40.0 | 1.40 | 53.3 | 1.52 |
| 2450 | 39.2 | 1.80 | 52.7 | 1.95 |
| 3000 | 38.5 | 2.40 | 52.0 | 2.73 |
| 5800 | 35.3 | 5.27 | 48.2 | 6.00 |

( εr = relative permittivity, σ = conductivity and ρ = 1000 kg/m

The dielectric parameters of liquids were verified prior to the SAR evaluation using a MVG Liquid measurement Kit and an Agilent Network Analyser.
The following table shows the measuring results for simulating liquid.

| Frequency (MHz) | Liquid Temp. (℃) | Conductivity (σ) | Permittivity (εr) | Conductivity Target(σ) | Permittivity Target(εr) | Delta (σ)% | Delta (εr)% | Limit (%) | Date (mm/dd/yy) |
|---|---|---|---|---|---|---|---|---|---|
| 750 | 22.8 | 0.90 | 42.53 | 0.89 | 41.90 | 1.12 | 1.50 | ±5 | 12.02.2022 |
| 835 | 22.8 | 0.92 | 42.33 | 0.90 | 41.50 | 2.22 | 2.00 | ±5 | 12.02.2022 |
| 1750 | 22.4 | 1.35 | 39.66 | 1.37 | 40.10 | -1.46 | -1.10 | ±5 | 12.06.2022 |
| 1900 | 22.4 | 1.39 | 39.70 | 1.40 | 40.00 | -0.71 | -0.75 | ±5 | 12.06.2022 |
| 2450 | 22.5 | 1.82 | 39.88 | 1.80 | 39.20 | 1.11 | 1.73 | ±5 | 12.10.2022 |
| 2600 | 22.5 | 1.97 | 39.55 | 1.96 | 39.00 | 0.51 | 1.41 | ±5 | 12.10.2022 |

# 10 SAR System Verification

Each ComoSAR system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the OpenSAR software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

- **Purpose of System Performance check**

  The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

- **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 that comes from a signal generator. 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 equipment setup is shown below:

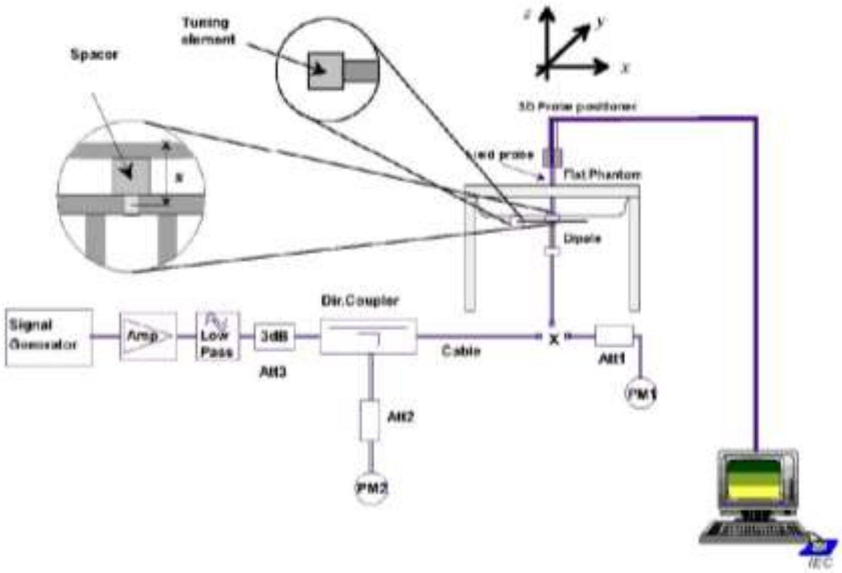



**Fig.10.1 System Verification Setup Diagram**

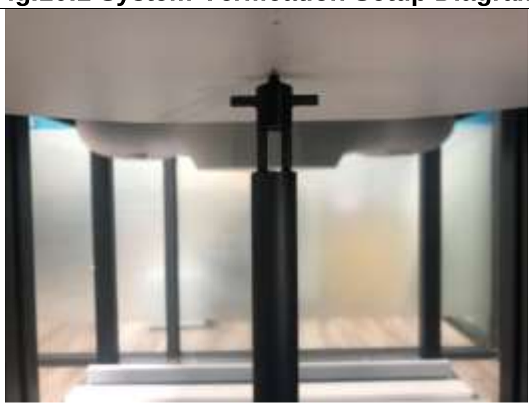


**Fig.10.2 Photo of Dipole setup**

➢

- **System Verification Results**
  Comparing to the original SAR value provided by MVG, the verification data should be within its specification of 10%. The table as below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix C of this report.

| Date (mm/dd/yy) | Frequency (MHz) | Power fed onto dipole (mW) | Measured 1g SAR (W/kg) | Normalized to 1W 1g SAR (W/kg) | 1W Target 1g SAR (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|
| 12.02.2022 | 750 | 100 | 0.869 | 8.69 | 8.57 | 1.40 |
| 12.02.2022 | 835 | 100 | 0.966 | 9.66 | 9.57 | 0.94 |
| 12.06.2022 | 1750 | 100 | 3.590 | 35.90 | 36.5 | -1.64 |
| 12.06.2022 | 1900 | 100 | 3.942 | 39.42 | 39.6 | -0.45 |
| 12.10.2022 | 2450 | 40 | 2.137 | 53.43 | 52.92 | 0.95 |
| 12.10.2022 | 2600 | 40 | 2.250 | 56.25 | 55.47 | 1.41 |

# 11 EUT Testing Position

This EUT was tested in ten different positions. They are right cheek/right tilted/left cheek/left tilted for head, Front/Back/Left /Right /Top/Bottom of the EUT with phantom 10 mm gap, as illustrated below, please refer to Appendix B for the test setup photos.

## 11.1 Handset Reference Points

- The vertical centreline passes through two points on the front side of the handset – the midpoint of the width $w_t$ of the handset at the level of the acoustic output, and the midpoint of the width $w_b$ of the bottom of the handset.
- The horizontal line is perpendicular to the vertical centreline and passes the center of the acoustic output. The horizontal line is also tangential to the handset at point A.
- The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centreline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.


**Fig.11.1 Illustration for Front, Back and Side of SAM Phantom**

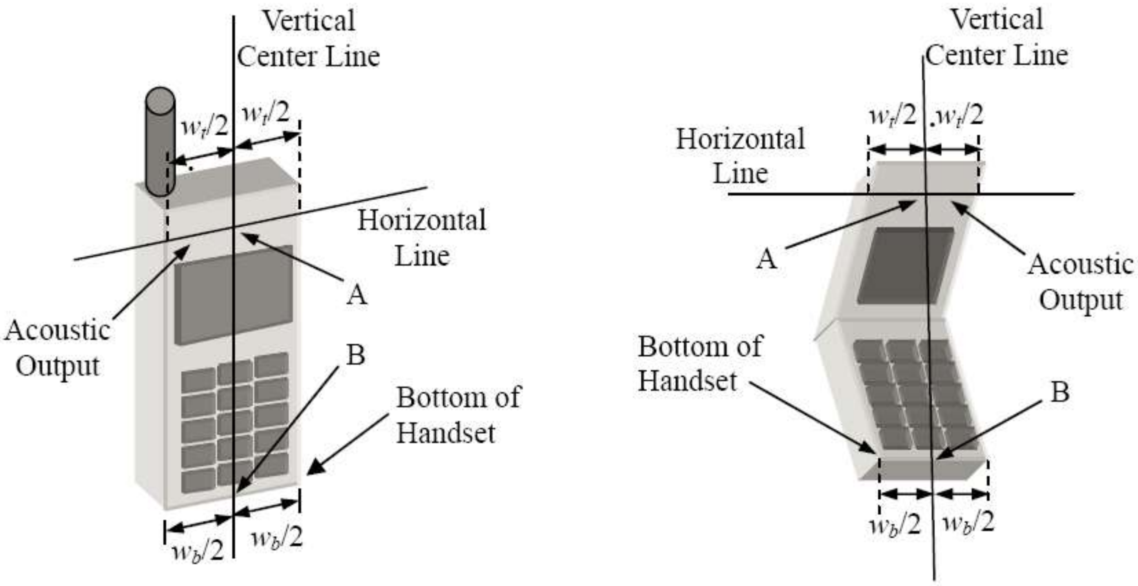



**Fig. 11.2 Illustration for Handset Vertical and Horizontal Reference Lines**

## 11.2 Positioning for Cheek / Touch

- To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
- To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see below figure)


**Fig. 11.3 Illustration for Cheek Position**

## 11.3 Positioning for Ear / 15º Tilt

- To position the device in the “cheek” position described above.
- While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see figure below).


**Fig.11.4 Illustration for Tilted Position**

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

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones.

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

## 11.5 Body Worn Accessory Configurations

- To position the device parallel to the phantom surface with either keypad up or down.
- To adjust the device parallel to the flat phantom.
- To adjust the distance between the device surface and the flat phantom to 10 mm or holster surface and the flat phantom to 0 mm.

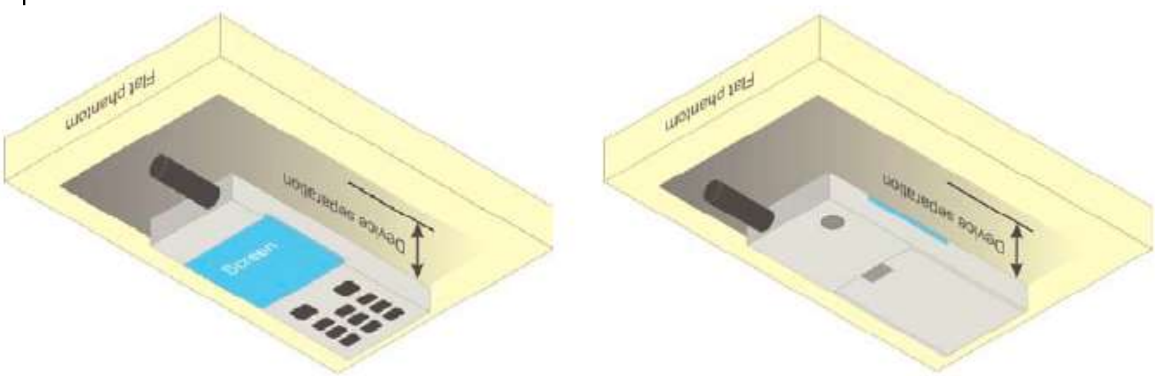



**Fig.11.5 Illustration for Body Worn Position**

## 11.6 Wireless Router (Hotspot) Configurations

Some battery-operated handsets have the capability to transmit and receive internet connectivity through simultaneous transmission of WIFI in conjunction with a separate licensed transmitter. The FCC has provided guidance in KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device with antennas 2.5 cm or closer to the edge of the device, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. Therefore, SAR must be evaluated for each frequency transmission and mode separately and summed with the WIFI transmitter according to KDB 648474 publication procedures. The “Portable Hotspot” feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.

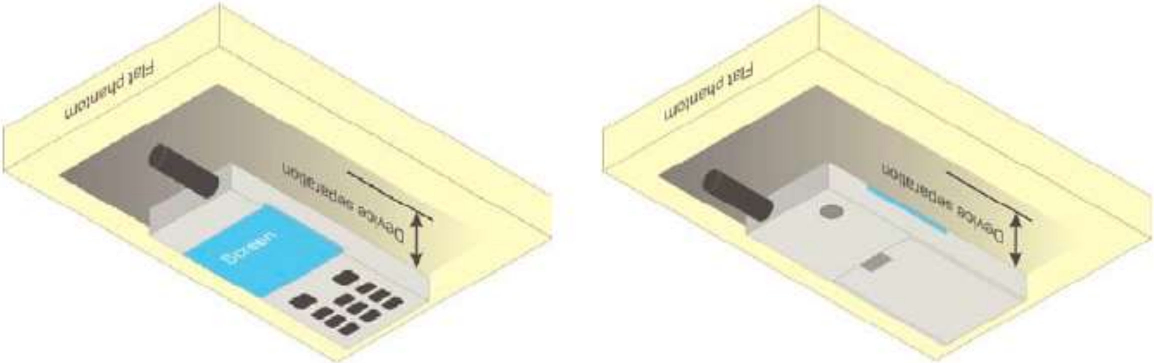



**Fig.11.6 Illustration for Hotspot Position**

# 12 Measurement Procedures

The measurement procedures are as below:

<Conducted power measurement>
- For WWAN power measurement, use base station simulator to configure EUT WWAN transition in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- Read the WWAN RF power level from the base station simulator.
- For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band.
- Connect EUT RF port through RF cable to the power meter or spectrum analyzer, and measure WLAN/BT output power.

<Conducted power measurement>
- Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- Place the EUT in positions as Appendix B demonstrates.
- Set scan area, grid size and other setting on the OpenSAR software.
- Measure SAR results for the highest power channel on each testing position.
- Find out the largest SAR result on these testing positions of each band.
- Measure SAR results for other channels in worst SAR testing position if the Reported SAR or 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:

- Power reference measurement
- Area scan
- Zoom scan
- Power drift measurement

## 12.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The OpenSAR 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 10 g 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 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:
- Extraction of the measured data (grid and values) from the Zoom Scan.
- Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters).
- Generation of a high-resolution mesh within the measured volume.
- Interpolation of all measured values form the measurement grid to the high-resolution grid
- Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- Calculation of the averaged SAR within masses of 1g and 10g.

## 12.2 Power Reference Measurement

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

## 12.3 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 is performed around the highest E-field value to determine the averaged SAR-distribution over 10g. Area scan and zoom scan resolution setting follows KDB 865664 D01v01r04 quoted below.

| | | | ≤ 3 GHz | > 3 GHz |
|---|---|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | | | 5 ± 1 mm | ½·δ·ln(2) ± 0.5 mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | | | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | | | ≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm | 3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm |
| | | | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |
| Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$ | | | ≤ 2 GHz: ≤ 8 mm<br>2 – 3 GHz: ≤ 5 mm* | 3 – 4 GHz: ≤ 5 mm*<br>4 – 6 GHz: ≤ 4 mm* |
| Maximum zoom scan spatial resolution, normal to phantom surface | uniform grid: $\Delta z_{Zoom}(n)$ | | ≤ 5 mm | 3 – 4 GHz: ≤ 4 mm<br>4 – 5 GHz: ≤ 3 mm<br>5 – 6 GHz: ≤ 2 mm |
| | graded grid | $\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface | ≤ 4 mm | 3 – 4 GHz: ≤ 3 mm<br>4 – 5 GHz: ≤ 2.5 mm<br>5 – 6 GHz: ≤ 2 mm |
| | | $\Delta z_{Zoom}(n>1)$: between subsequent points | ≤ 1.5·$\Delta z_{Zoom}(n-1)$ | |
| Minimum zoom scan volume | x, y, z | | ≥ 30 mm | 3 – 4 GHz: ≥ 28 mm<br>4 – 5 GHz: ≥ 25 mm<br>5 – 6 GHz: ≥ 22 mm |
| Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.<br>* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz. | | | | |

## 12.4 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. When all volume scan were completed, the software can combine and subsequently superpose these measurement data to calculating the multiband SAR.

## 12.5 SAR Averaged Methods

In COMOSAR system, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1g and 10g cubes, the extrapolation distance should not be larger than 5 mm.

## 12.6 Power Drift Monitoring

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

# 13 Conducted RF Output Power

## 13.1 GSM Conducted Power

| Band: GSM 850 | Burst Average Power (dBm) | | | Frame-Average Power(dBm) | | |
|---|---|---|---|---|---|---|
| Channel | 128 | 190 | 251 | 128 | 190 | 251 |
| Frequency (MHz) | 824.2 | 836.6 | 848.8 | 824.2 | 836.6 | 848.8 |
| GSM (GMSK, Voice) | 33.30 | **33.38** | 33.29 | 24.27 | 24.35 | 24.26 |
| GPRS (GMSK, 1 TX slot) | 33.27 | 33.33 | 33.28 | 24.24 | 24.30 | 24.25 |
| GPRS (GMSK, 2 TX slots) | 31.11 | **31.13** | 31.05 | 25.09 | **25.11** | 25.03 |
| GPRS (GMSK, 3 TX slots) | 29.14 | 29.21 | 29.12 | 24.88 | 24.95 | 24.86 |
| GPRS (GMSK, 4 TX slots) | 26.69 | 26.84 | 26.75 | 23.68 | 23.83 | 23.74 |
| EGPRS (8PSK, 1 TX slot) | 26.58 | 26.46 | 26.26 | 17.55 | 17.43 | 17.23 |
| EGPRS (8PSK, 2 TX slots) | 26.42 | 26.39 | 26.00 | 20.40 | 20.37 | 19.98 |
| EGPRS (8PSK, 3 TX slots) | 25.11 | 25.19 | 24.70 | 20.85 | 20.93 | 20.44 |
| EGPRS (8PSK, 4 TX slots) | 22.70 | 22.61 | 22.15 | 19.69 | 19.60 | 19.14 |

**Remark:**

1. The frame-averaged power is linearly reported the maximum burst averaged power over 8 time slots. The calculated method are shown as below:
   The duty cycle "x" of different time slots as below:
   1 TX slot is 1/8, 2 TX slots is 2/8, 3 TX slots is 3/8 and 4 TX slots is 4/8
   Based on the calculation formula:
   Frame-averaged power = Burst averaged power + 10 1og (x)
   So,
   Frame-averaged power (1 TX slot) = Burst averaged power (1 TX slot)– 9.03
   Frame-averaged power (2 TX slots) = Burst averaged power (2 TX slots)– 6.02
   Frame-averaged power (3 TX slots) = Burst averaged power (3 TX slots)– 4.26
   Frame-averaged power (4 TX slots) = Burst averaged power (4 TX slots) – 3.01
2. CS1 coding scheme was used in GPRS conducted power measurements and SAR testing, MCS5 coding scheme was used in EGPRS conducted power measurements and SAR testing (if necessary).

**Note:**

1. For Head SAR testing, GSM Voice mode should be evaluated, therefore the EUT was set in GSM 850 Voice mode.
2. For Body worn SAR testing, GSM Voice, GPRS and EGPRS mode should be evaluated, therefore the EUT was set in GPRS 2 TX slots mode due to the highest frame-averaged power..
3. For Hotspot mode SAR testing, GPRS and EGPRS mode should be evaluated, therefore the EUT was set in GPRS 2 TX slots mode due to the highest frame-averaged power.
4. For GPRS multi time slots SAR measurement, when the measured maximum output power levels are within 0.25 dB of each other, test the configuration with the most number of time slots.
5. Per KDB447498 D04v01, the maximum output power channel is used for SAR testing and for further SAR test reduction.
6. The EUT do not support DTM and VoIP function.

| Band: PCS 1900 | Burst Average Power (dBm) | | | Frame-Average Power(dBm) | | |
|---|---|---|---|---|---|---|
| Channel | 512 | 661 | 810 | 512 | 661 | 810 |
| Frequency (MHz) | 1850.2 | 1880.0 | 1909.8 | 1850.2 | 1880.0 | 1909.8 |
| GSM (GMSK, Voice) | 29.90 | **29.97** | 29.96 | 20.87 | 20.94 | 20.93 |
| GPRS (GMSK, 1 TX slot) | 29.76 | 29.96 | 30.03 | 20.73 | 20.93 | 21.00 |
| GPRS (GMSK, 2 TX slots) | 27.69 | 27.49 | 27.26 | 21.67 | 21.47 | 21.24 |
| GPRS (GMSK, 3 TX slots) | **26.17** | 25.99 | 25.75 | **21.91** | 21.73 | 21.49 |
| GPRS (GMSK, 4 TX slots) | 24.08 | 23.91 | 23.66 | 21.07 | 20.90 | 20.65 |
| EGPRS (8PSK, 1 TX slot) | 25.56 | 25.76 | 25.36 | 16.53 | 16.73 | 16.33 |
| EGPRS (8PSK, 2 TX slots) | 25.32 | 25.63 | 25.21 | 19.30 | 19.61 | 19.19 |
| EGPRS (8PSK, 3 TX slots) | 23.85 | 24.12 | 23.52 | 19.59 | 19.86 | 19.26 |
| EGPRS (8PSK, 4 TX slots) | 21.73 | 21.86 | 20.78 | 18.72 | 18.85 | 17.77 |

**Remark:**

3. The frame-averaged power is linearly reported the maximum burst averaged power over 8 time slots. The calculated method are shown as below:
   The duty cycle "x" of different time slots as below:
   1 TX slot is 1/8, 2 TX slots is 2/8, 3 TX slots is 3/8 and 4 TX slots is 4/8
   Based on the calculation formula:
   Frame-averaged power = Burst averaged power + 10 1og (x)
   So,
   Frame-averaged power (1 TX slot) = Burst averaged power (1 TX slot)– 9.03
   Frame-averaged power (2 TX slots) = Burst averaged power (2 TX slots)– 6.02
   Frame-averaged power (3 TX slots) = Burst averaged power (3 TX slots)– 4.26
   Frame-averaged power (4 TX slots) = Burst averaged power (4 TX slots) – 3.01
4. CS1 coding scheme was used in GPRS conducted power measurements and SAR testing, MCS5 coding scheme was used in EGPRS conducted power measurements and SAR testing (if necessary).

**Note:**

7. For Head SAR testing, GSM Voice mode should be evaluated, therefore the EUT was set in GSM 1900 Voice mode.
8. For Body worn SAR testing, GSM Voice, GPRS and EGPRS mode should be evaluated, therefore the EUT was set in GPRS 3 TX slots mode due to the highest frame-averaged power..
9. For Hotspot mode SAR testing, GPRS and EGPRS mode should be evaluated, therefore the EUT was set in GPRS 3 TX slots mode due to the highest frame-averaged power.
10. For GPRS multi time slots SAR measurement, when the measured maximum output power levels are within 0.25 dB of each other, test the configuration with the most number of time slots.
11. Per KDB447498 D04v01, the maximum output power channel is used for SAR testing and for further SAR test reduction.
12. The EUT do not support DTM and VoIP function.

## 13.2 WCDMA Conducted Power

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification. A summary of these settings are illustrated below:

**HSDPA Setup Configuration:**

a. The EUT was connected to Base Station Rohde & Schwarz CMU200 referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors ($\beta_c$ and $\beta_d$) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

**Table 1**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{hs}$ (1) | CM (dB) (2) |
|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 |
| 2 | 12/15 (3) | 15/15 (3) | 64 | 12/15 (3) | 24/15 | 1.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 |

Note 1: $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$.

Note 3: For subtest 2 the $\beta_c/\beta_d$ ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

**HSDPA Sub-test setup configuration**

**HSUPA Setup Configuration:**

a. The EUT was connected to Base Station Rohde & Schwarz CMU200 referred to the Setup Configuration.

b. The RF path losses were compensated into the measurements.

c. A call was established between EUT and Base Station with following setting * :

   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors ($\beta_c$ and $\beta_d$) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI

d. The transmitted maximum output power was recorded.

**Table 2**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{hs}$ (1) | $\beta_{ec}$ | $\beta_{ed}$ | $\beta_{ed}$ (SF) | $\beta_{ed}$ (codes) | CM(2) (dB) | MPR (dB) | AG(4) Index | E-TFCI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15(3) | 15/15(3) | 64 | 11/15(3) | 22/15 | 209/225 | 1039/225 | 4 | 1 | 1.0 | 0.0 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 94/75 | 4 | 1 | 3.0 | 2.0 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | $\beta_{ed1}$: 47/15<br>$\beta_{ed2}$: 47/15 | 4 | 2 | 2.0 | 1.0 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 2/15 | 56/75 | 4 | 1 | 3.0 | 2.0 | 17 | 71 |
| 5 | 15/15(4) | 15/15(4) | 64 | 15/15(4) | 30/15 | 24/15 | 134/15 | 4 | 1 | 1.0 | 0.0 | 21 | 81 |

Note 1: $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the $\beta_c/\beta_d$ ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 10/15 and $\beta_d$ = 15/15.

Note 4: For subtest 5 the $\beta_c/\beta_d$ ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 14/15 and $\beta_d$ = 15/15.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.

Note 6: $\beta_{ed}$ cannot be set directly; it is set by Absolute Grant Value.

**HSUPA Sub-test setup configuration**

**WCDMA Conducted Power:**

| WCDMA Average power (dBm) | | | |
|---|---|---|---|
| Band | WCDMA Band V | | |
| Channel | 4132 | 4183 | 4233 |
| Frequency (MHz) | 826.4 | 836.6 | 846.6 |
| AMR 12.2 kbps | 23.05 | 23.16 | 23.05 |
| RMC 12.2 kbps | 23.06 | **23.20** | 23.09 |
| HSDPA Sub-test 1 | 22.04 | 22.14 | 21.94 |
| HSDPA Sub-test 2 | 21.86 | 21.97 | 21.79 |
| HSDPA Sub-test 3 | 21.48 | 21.55 | 21.44 |
| HSDPA Sub-test 4 | 21.55 | 21.63 | 21.46 |
| HSUPA Sub-test 1 | 21.06 | 20.33 | 20.42 |
| HSUPA Sub-test 2 | 21.14 | 20.84 | 20.96 |
| HSUPA Sub-test 3 | 20.98 | 20.46 | 20.56 |
| HSUPA Sub-test 4 | 20.86 | 20.57 | 20.69 |
| HSUPA Sub-test 5 | 22.19 | 22.24 | 22.12 |

| WCDMA Average power (dBm) | | | |
|---|---|---|---|
| Band | WCDMA Band II | | |
| Channel | 9262 | 9400 | 9538 |
| Frequency (MHz) | 1852.4 | 1880.0 | 1907.6 |
| AMR 12.2 kbps | 22.81 | 22.92 | 22.93 |
| RMC 12.2 kbps | 22.76 | 22.86 | **22.91** |
| HSDPA Sub-test 1 | 22.64 | 22.37 | 22.16 |
| HSDPA Sub-test 2 | 22.32 | 22.05 | 21.85 |
| HSDPA Sub-test 3 | 22.09 | 21.88 | 21.67 |
| HSDPA Sub-test 4 | 22.16 | 21.93 | 21.76 |
| HSUPA Sub-test 1 | 20.27 | 19.69 | 19.45 |
| HSUPA Sub-test 2 | 20.89 | 20.45 | 20.42 |
| HSUPA Sub-test 3 | 20.71 | 20.14 | 19.87 |
| HSUPA Sub-test 4 | 20.98 | 20.54 | 20.49 |
| HSUPA Sub-test 5 | 22.83 | 22.57 | 22.37 |

**Note:**

1. Applying the subtest setup in Table C.11.1.3 of 3GPP TS 34.121-1
2. Per KDB 941225 D01, RMC 12.2kbps mode is used to evaluate SAR due the highest output power. If AMR 12.2 kbps power is < 0.25dB higher than RMC 12.2kbps, SAR tests with AMR 12.2 kbps can be excluded.
3. AMR, HSDPA RF power will not be larger than RMC 12.2kbps, detailed information is included in Tune-up Procure exhibit.

## 13.3 LTE Conducted Power

### 13.3.1 Largest channel bandwidth standalone SAR test requirements

**QPSK with 1 RB allocation**

Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required for 1 RB allocation; otherwise, SAR is required for the remaining required test channels and only for the RB offset configuration with the highest output power for that channel.8 When the reported SAR of a required test channel is > 1.45 W/kg, SAR is required for all three RB offset configurations for that required test channel.

**QPSK with 50% RB allocation**

The procedures required for 1 RB allocation in section 4.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.9

**QPSK with 100% RB allocation**

For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation in sections 4.2.1 and 4.2.2 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.

**Higher order modulations**

For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in sections 4.2.1, 5.2.2 and 4.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the reported SAR for the QPSK configuration is > 1.45 W/kg.

### 13.3.2 Other channel bandwidth standalone SAR test requirements

For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in section 4.2 to determine the channels and RB configurations that need SAR testing and only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration or the reported SAR of a configuration for the largest channel bandwidth is > 1.45 W/kg. The equivalent channel configuration for the RB allocation, RB offset and modulation etc. is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.

### 13.3.3 TDD LTE configuration setup for SAR measurement

According to KDB 941225 D05v02r03 and April 2013 TCB workshop slides, SAR must be tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

- see 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
- “special subframe S” contains both uplink and downlink transmissions and must be taken into consideration to determine the transmission duty factor
  - according to the worst case uplink and downlink cyclic prefix requirements for UpPTS to determine the highest SAR test duty factor

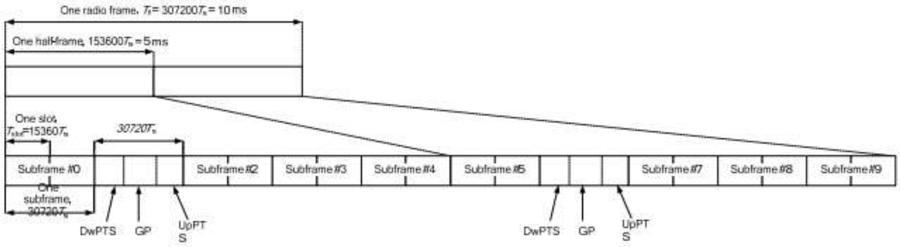



**Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity)**

**Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)**

| Special subframe configuration | Normal cyclic prefix in downlink | | | Extended cyclic prefix in downlink | | |
|---|---|---|---|---|---|---|
| | DwPTS | UpPTS | | DwPTS | UpPTS | |
| | | Normal cyclic prefix in uplink | Extended cyclic prefix in uplink | | Normal cyclic prefix in uplink | Extended cyclic prefix in uplink |
| 0 | $6592 \cdot T_s$ | $2192 \cdot T_s$ | $2560 \cdot T_s$ | $7680 \cdot T_s$ | $2192 \cdot T_s$ | $2560 \cdot T_s$ |
| 1 | $19760 \cdot T_s$ | | | $20480 \cdot T_s$ | | |
| 2 | $21952 \cdot T_s$ | | | $23040 \cdot T_s$ | | |
| 3 | $24144 \cdot T_s$ | | | $25600 \cdot T_s$ | | |
| 4 | $26336 \cdot T_s$ | | | $7680 \cdot T_s$ | $4384 \cdot T_s$ | $5120 \cdot T_s$ |
| 5 | $6592 \cdot T_s$ | $4384 \cdot T_s$ | $5120 \cdot T_s$ | $20480 \cdot T_s$ | | |
| 6 | $19760 \cdot T_s$ | | | $23040 \cdot T_s$ | | |
| 7 | $21952 \cdot T_s$ | | | $12800 \cdot T_s$ | | |
| 8 | $24144 \cdot T_s$ | | | - | - | - |
| 9 | $13168 \cdot T_s$ | | | - | - | - |

Per 3GPP 36.211 section 4.2, each radio frame of length $T_f$=37200·*Ts* = 10 ms consists of two half-frames of length 153600·Ts = 5ms each. Each half-frame consists of five subframes of length 30720 ·*Ts* = 1ms. So, the uplink duty factor in special subframe as below:

| Special Subframe configuration | Normal cyclic prefix in downlink | | Extended cyclic prefix in downlink | |
|---|---|---|---|---|
| | Duty factor of Uplink | | Duty factor of Uplink | |
| | Normal cyclic prefix in uplink | Extended cyclic prefix in uplink | Normal cyclic prefix in uplink | Extended cyclic prefix in uplink |
| 0 | 7.14% | 8.33% | 7.14% | 8.33% |
| 1 | 7.14% | 8.33% | 7.14% | 8.33% |
| 2 | 7.14% | 8.33% | 7.14% | 8.33% |
| 3 | 7.14% | 8.33% | 7.14% | 8.33% |
| 4 | 7.14% | 8.33% | 14.27% | 16.67% |
| 5 | 14.27% | 16.67% | 14.27% | 16.67% |
| 6 | 14.27% | 16.67% | 14.27% | 16.67% |
| 7 | 14.27% | 16.67% | 14.27% | 16.67% |
| 8 | 14.27% | 16.67% | / | / |
| 9 | 14.27% | 16.67% | / | / |

**Table 4.2-2: Uplink-downlink configurations**

| Uplink-downlink configuration | Downlink-to-Uplink Switch-point periodicity | Subframe number | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 5 ms | D | S | U | U | U | D | S | U | U | U |
| 1 | 5 ms | D | S | U | U | D | D | S | U | U | D |
| 2 | 5 ms | D | S | U | D | D | D | S | U | D | D |
| 3 | 10 ms | D | S | U | U | U | D | D | D | D | D |
| 4 | 10 ms | D | S | U | U | D | D | D | D | D | D |
| 5 | 10 ms | D | S | U | D | D | D | D | D | D | D |
| 6 | 5 ms | D | S | U | U | U | D | S | U | U | D |

According to above table:

1. The highest duty factor is configuration 0;
2. The duty factor of uplink in one half-frame with normal cyclic prefix is: (3ms + 0.143ms)/5ms=62.86%;
3. The duty factor of uplink in one half-frame with extended cyclic prefix is: (3ms + 0.167ms)/5ms=63.34%;
4. For purpose to get the worst case SAR test duty factor, the duty factor of normal cyclic prefix in uplink scaled-up to the extended cyclic prefix in uplink, the scaling factor is 63.34%/62.86%=1.008, and the scaling factor will be taken into the final measured SAR.

**LTE Band 2 part:**

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 18607 | 18900 | 19193 |
| | | | | | 1850.7MHz | 1880.0MHz | 1909.3MHz |
| Band 2 | 1.4 | QPSK | 1 | 0 | 23.82 | 23.76 | 23.75 |
| | | | 1 | 2 | 23.80 | 23.84 | 23.77 |
| | | | 1 | 5 | 23.87 | 23.85 | 23.78 |
| | | | 3 | 0 | 23.78 | 23.84 | 23.94 |
| | | | 3 | 1 | 23.77 | 23.87 | 23.91 |
| | | | 3 | 2 | 23.78 | 23.84 | 23.96 |
| | | | 6 | 0 | 22.79 | 22.81 | 22.89 |
| | | 16QAM | 1 | 0 | 22.88 | 23.00 | 22.53 |
| | | | 1 | 2 | 22.78 | 23.11 | 22.55 |
| | | | 1 | 5 | 22.90 | 23.08 | 22.50 |
| | | | 3 | 0 | 22.75 | 22.47 | 22.85 |
| | | | 3 | 1 | 22.80 | 22.43 | 22.86 |
| | | | 3 | 2 | 22.85 | 22.53 | 22.86 |
| | | | 6 | 0 | 21.97 | 22.02 | 22.05 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 18615 | 18900 | 19185 |
| | | | | | 1851.5MHz | 1880.0MHz | 1908.5MHz |
| Band 2 | 3 | QPSK | 1 | 0 | 23.84 | 23.90 | 23.76 |
| | | | 1 | 7 | 23.80 | 23.82 | 23.76 |
| | | | 1 | 14 | 23.67 | 23.95 | 23.75 |
| | | | 8 | 0 | 22.84 | 22.94 | 22.95 |
| | | | 8 | 4 | 22.86 | 22.95 | 22.96 |
| | | | 8 | 7 | 22.74 | 22.88 | 22.96 |
| | | | 15 | 0 | 22.85 | 22.90 | 22.89 |
| | | 16QAM | 1 | 0 | 22.47 | 22.93 | 22.92 |
| | | | 1 | 7 | 22.52 | 22.93 | 22.89 |
| | | | 1 | 14 | 22.39 | 22.95 | 22.95 |
| | | | 8 | 0 | 22.11 | 21.74 | 22.15 |
| | | | 8 | 4 | 22.07 | 21.74 | 22.15 |
| | | | 8 | 7 | 21.98 | 21.95 | 22.13 |
| | | | 15 | 0 | 21.87 | 21.88 | 22.01 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 18625 | 18900 | 19175 |
| | | | | | 1852.5MHz | 1880.0MHz | 1907.5MHz |
| Band 2 | 5 | QPSK | 1 | 0 | 23.82 | 23.83 | 24.07 |
| | | | 1 | 12 | 23.71 | 23.78 | 24.03 |
| | | | 1 | 24 | 23.66 | 23.76 | 23.97 |
| | | | 12 | 0 | 22.79 | 22.97 | 22.87 |
| | | | 12 | 6 | 22.80 | 22.89 | 23.00 |
| | | | 12 | 11 | 22.80 | 22.89 | 23.00 |
| | | | 25 | 0 | 22.85 | 22.85 | 22.90 |
| | | 16QAM | 1 | 0 | 22.25 | 23.10 | 22.73 |
| | | | 1 | 12 | 22.17 | 23.07 | 22.68 |
| | | | 1 | 24 | 22.15 | 23.12 | 23.03 |
| | | | 12 | 0 | 21.87 | 21.93 | 21.95 |
| | | | 12 | 6 | 21.91 | 21.92 | 21.97 |
| | | | 12 | 11 | 21.85 | 21.92 | 21.95 |
| | | | 25 | 0 | 21.92 | 21.76 | 22.03 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 18650 | 18900 | 19150 |
| | | | | | 1855.0MHz | 1880.0MHz | 1905.0MHz |
| Band 2 | 10 | QPSK | 1 | 0 | 23.83 | 23.75 | 23.89 |
| | | | 1 | 24 | 23.79 | 23.67 | 23.93 |
| | | | 1 | 49 | 23.76 | 23.78 | 23.91 |
| | | | 25 | 0 | 22.87 | 22.95 | 22.84 |
| | | | 25 | 12 | 22.88 | 22.88 | 22.94 |
| | | | 25 | 24 | 22.80 | 22.88 | 22.95 |
| | | | 50 | 0 | 22.80 | 22.89 | 22.90 |
| | | 16QAM | 1 | 0 | 22.86 | 22.79 | 23.36 |
| | | | 1 | 24 | 22.83 | 22.84 | 23.41 |
| | | | 1 | 49 | 22.70 | 22.78 | 23.50 |
| | | | 25 | 0 | 21.83 | 22.03 | 22.03 |
| | | | 25 | 12 | 21.84 | 22.05 | 21.95 |
| | | | 25 | 24 | 21.84 | 22.05 | 21.96 |
| | | | 50 | 0 | 21.85 | 21.95 | 21.98 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 18675 | 18900 | 19125 |
| | | | | | 1857.5MHz | 1880.0MHz | 1902.5MHz |
| Band 2 | 15 | QPSK | 1 | 0 | 23.80 | 23.64 | 23.93 |
| | | | 1 | 37 | 23.71 | 23.69 | 23.88 |
| | | | 1 | 74 | 23.78 | 23.74 | 23.90 |
| | | | 36 | 0 | 22.72 | 22.92 | 22.80 |
| | | | 36 | 16 | 22.80 | 22.82 | 22.82 |
| | | | 36 | 35 | 22.79 | 22.83 | 22.92 |
| | | | 75 | 0 | 22.85 | 22.88 | 22.94 |
| | | 16QAM | 1 | 0 | 22.86 | 22.86 | 23.41 |
| | | | 1 | 37 | 22.85 | 23.00 | 23.42 |
| | | | 1 | 74 | 22.78 | 22.98 | 23.37 |
| | | | 36 | 0 | 21.80 | 22.01 | 21.86 |
| | | | 36 | 16 | 21.83 | 22.01 | 21.93 |
| | | | 36 | 35 | 21.86 | 22.02 | 21.93 |
| | | | 75 | 0 | 21.81 | 21.94 | 21.99 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 18700 | 18900 | 19100 |
| | | | | | 1860.0MHz | 1880.0MHz | 1900.0MHz |
| Band 2 | 20 | QPSK | 1 | 0 | 24.00 | 23.90 | 23.91 |
| | | | 1 | 49 | 23.78 | 23.96 | 23.95 |
| | | | 1 | 99 | 23.96 | 24.13 | 23.94 |
| | | | 50 | 0 | 22.80 | 22.93 | 22.85 |
| | | | 50 | 24 | 22.75 | 22.92 | 22.82 |
| | | | 50 | 49 | 22.83 | 22.97 | 22.84 |
| | | | 100 | 0 | 22.79 | 23.01 | 22.82 |
| | | 16QAM | 1 | 0 | 22.85 | 23.16 | 22.81 |
| | | | 1 | 49 | 22.78 | 23.24 | 22.83 |
| | | | 1 | 99 | 22.86 | 23.38 | 22.97 |
| | | | 50 | 0 | 21.99 | 22.05 | 22.01 |
| | | | 50 | 24 | 21.95 | 22.02 | 21.99 |
| | | | 50 | 49 | 22.00 | 23.93 | 22.09 |
| | | | 100 | 0 | 22.21 | 22.03 | 22.21 |

**LTE Band 5 part:**

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20407 | 20525 | 20643 |
| | | | | | 824.7MHz | 836.5MHz | 848.3MHz |
| Band 5 | 1.4 | QPSK | 1 | 0 | 23.71 | 23.61 | 23.53 |
| | | | 1 | 2 | 23.64 | 23.69 | 23.49 |
| | | | 1 | 5 | 23.71 | 23.68 | 23.44 |
| | | | 3 | 0 | 23.70 | 23.81 | 23.56 |
| | | | 3 | 1 | 23.72 | 23.96 | 23.57 |
| | | | 3 | 2 | 23.86 | 23.82 | 23.56 |
| | | | 6 | 0 | 22.66 | 22.54 | 22.38 |
| | | 16QAM | 1 | 0 | 22.85 | 22.83 | 22.11 |
| | | | 1 | 2 | 22.89 | 22.95 | 22.00 |
| | | | 1 | 5 | 22.99 | 22.88 | 22.56 |
| | | | 3 | 0 | 22.20 | 22.27 | 22.49 |
| | | | 3 | 1 | 22.26 | 22.27 | 22.48 |
| | | | 3 | 2 | 22.32 | 22.30 | 22.47 |
| | | | 6 | 0 | 21.91 | 21.77 | 21.59 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20415 | 20525 | 20635 |
| | | | | | 825.5MHz | 836.5MHz | 847.5MHz |
| Band 5 | 3 | QPSK | 1 | 0 | 23.62 | 23.65 | 23.64 |
| | | | 1 | 7 | 23.57 | 23.67 | 23.75 |
| | | | 1 | 14 | 23.57 | 23.71 | 23.52 |
| | | | 8 | 0 | 22.65 | 22.70 | 22.59 |
| | | | 8 | 4 | 22.56 | 22.71 | 22.61 |
| | | | 8 | 7 | 22.56 | 22.68 | 22.51 |
| | | | 15 | 0 | 22.57 | 22.60 | 22.55 |
| | | 16QAM | 1 | 0 | 22.16 | 22.29 | 22.79 |
| | | | 1 | 7 | 22.16 | 22.27 | 22.57 |
| | | | 1 | 14 | 22.25 | 22.23 | 22.57 |
| | | | 8 | 0 | 21.79 | 21.77 | 21.65 |
| | | | 8 | 4 | 21.80 | 21.78 | 21.64 |
| | | | 8 | 7 | 21.82 | 21.89 | 21.56 |
| | | | 15 | 0 | 21.64 | 21.57 | 21.48 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20425 | 20525 | 20625 |
| | | | | | 826.5MHz | 836.5MHz | 846.5MHz |
| Band 5 | 5 | QPSK | 1 | 0 | 23.62 | 23.59 | 23.62 |
| | | | 1 | 12 | 23.58 | 23.63 | 23.64 |
| | | | 1 | 24 | 23.53 | 23.56 | 23.57 |
| | | | 12 | 0 | 22.62 | 22.65 | 22.71 |
| | | | 12 | 6 | 22.52 | 22.69 | 22.73 |
| | | | 12 | 11 | 22.64 | 22.67 | 22.66 |
| | | | 25 | 0 | 22.74 | 22.70 | 22.63 |
| | | 16QAM | 1 | 0 | 21.95 | 22.79 | 22.70 |
| | | | 1 | 12 | 22.02 | 22.72 | 22.54 |
| | | | 1 | 24 | 22.00 | 22.73 | 22.44 |
| | | | 12 | 0 | 21.62 | 21.74 | 21.93 |
| | | | 12 | 6 | 21.63 | 21.74 | 21.94 |
| | | | 12 | 11 | 21.66 | 21.69 | 21.94 |
| | | | 25 | 0 | 21.98 | 21.81 | 21.55 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20450 | 20525 | 20600 |
| | | | | | 829MHz | 836.5MHz | 844MHz |
| Band 5 | 10 | QPSK | 1 | 0 | 23.66 | 23.28 | 23.70 |
| | | | 1 | 24 | 23.57 | 23.62 | 23.68 |
| | | | 1 | 49 | 23.45 | 23.50 | 23.55 |
| | | | 25 | 0 | 22.64 | 22.63 | 22.63 |
| | | | 25 | 12 | 22.65 | 22.73 | 22.66 |
| | | | 25 | 24 | 22.51 | 22.73 | 22.67 |
| | | | 50 | 0 | 22.64 | 22.68 | 22.66 |
| | | 16QAM | 1 | 0 | 22.55 | 22.37 | 22.84 |
| | | | 1 | 24 | 22.37 | 22.52 | 23.04 |
| | | | 1 | 49 | 22.31 | 22.50 | 22.81 |
| | | | 25 | 0 | 21.48 | 21.77 | 21.65 |
| | | | 25 | 12 | 21.60 | 21.74 | 21.68 |
| | | | 25 | 24 | 21.54 | 21.76 | 21.82 |
| | | | 50 | 0 | 21.60 | 21.75 | 22.08 |

**LTE Band 12 part:**

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 23017 | 23095 | 23175 |
| | | | | | 699.7MHz | 707.5MHz | 715.3MHz |
| Band 12 | 1.4 | QPSK | 1 | 0 | 23.44 | 23.59 | 23.65 |
| | | | 1 | 2 | 23.39 | 23.83 | 23.92 |
| | | | 1 | 5 | 23.33 | 23.75 | 23.85 |
| | | | 3 | 0 | 23.51 | 23.74 | 23.67 |
| | | | 3 | 1 | 23.56 | 23.84 | 23.52 |
| | | | 3 | 2 | 23.56 | 23.87 | 23.62 |
| | | | 6 | 0 | 22.24 | 22.76 | 22.89 |
| | | 16QAM | 1 | 0 | 22.75 | 22.11 | 23.12 |
| | | | 1 | 2 | 22.78 | 22.75 | 23.13 |
| | | | 1 | 5 | 22.74 | 22.61 | 23.19 |
| | | | 3 | 0 | 21.99 | 22.49 | 22.58 |
| | | | 3 | 1 | 21.96 | 22.48 | 22.61 |
| | | | 3 | 2 | 21.87 | 22.50 | 22.59 |
| | | | 6 | 0 | 21.67 | 21.70 | 21.74 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 23025 | 23095 | 23165 |
| | | | | | 700.5MHz | 707.5MHz | 714.5MHz |
| Band 12 | 3 | QPSK | 1 | 0 | 23.49 | 23.67 | 23.73 |
| | | | 1 | 7 | 23.58 | 23.76 | 23.72 |
| | | | 1 | 14 | 23.61 | 23.69 | 23.87 |
| | | | 8 | 0 | 22.30 | 22.35 | 22.90 |
| | | | 8 | 4 | 22.38 | 22.40 | 22.80 |
| | | | 8 | 7 | 22.58 | 22.81 | 22.84 |
| | | | 15 | 0 | 22.25 | 22.89 | 22.94 |
| | | 16QAM | 1 | 0 | 22.01 | 22.07 | 23.06 |
| | | | 1 | 7 | 22.28 | 22.44 | 23.07 |
| | | | 1 | 14 | 22.45 | 22.30 | 23.07 |
| | | | 8 | 0 | 21.57 | 22.11 | 22.12 |
| | | | 8 | 4 | 21.70 | 22.14 | 22.10 |
| | | | 8 | 7 | 21.85 | 21.73 | 21.81 |
| | | | 15 | 0 | 21.39 | 21.47 | 22.03 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 23035 | 23095 | 23155 |
| | | | | | 701.5MHz | 707.5MHz | 713.5MHz |
| Band 12 | 5 | QPSK | 1 | 0 | 23.36 | 23.58 | 23.54 |
| | | | 1 | 12 | 23.52 | 23.67 | 23.58 |
| | | | 1 | 24 | 23.73 | 23.60 | 23.73 |
| | | | 12 | 0 | 22.20 | 22.33 | 22.81 |
| | | | 12 | 6 | 22.44 | 22.35 | 22.83 |
| | | | 12 | 11 | 22.28 | 22.38 | 22.82 |
| | | | 25 | 0 | 22.41 | 23.03 | 22.75 |
| | | 16QAM | 1 | 0 | 22.34 | 21.80 | 22.14 |
| | | | 1 | 12 | 22.50 | 22.52 | 22.07 |
| | | | 1 | 24 | 22.67 | 22.48 | 22.17 |
| | | | 12 | 0 | 21.57 | 22.00 | 21.70 |
| | | | 12 | 6 | 21.48 | 21.99 | 21.67 |
| | | | 12 | 11 | 21.50 | 21.99 | 21.56 |
| | | | 25 | 0 | 21.78 | 21.85 | 22.20 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 23060 | 23095 | 23130 |
| | | | | | 704MHz | 707.5MHz | 711MHz |
| Band 12 | 10 | QPSK | 1 | 0 | 23.53 | 23.48 | 23.56 |
| | | | 1 | 24 | 23.73 | 23.58 | 23.59 |
| | | | 1 | 49 | 23.69 | 23.55 | 23.77 |
| | | | 25 | 0 | 22.49 | 22.37 | 22.77 |
| | | | 25 | 12 | 22.35 | 22.39 | 22.70 |
| | | | 25 | 24 | 22.37 | 22.39 | 22.72 |
| | | | 50 | 0 | 22.60 | 22.87 | 22.62 |
| | | 16QAM | 1 | 0 | 22.02 | 22.21 | 22.76 |
| | | | 1 | 24 | 22.61 | 22.45 | 22.97 |
| | | | 1 | 49 | 22.70 | 22.48 | 23.22 |
| | | | 25 | 0 | 21.91 | 22.16 | 21.52 |
| | | | 25 | 12 | 21.52 | 22.18 | 21.66 |
| | | | 25 | 24 | 21.58 | 22.16 | 21.53 |
| | | | 50 | 0 | 21.60 | 21.56 | 21.81 |

**LTE Band 41 part:**

| LTE Band | Band-width (MHz) | Modu-lation | RB Size | RB Offset | Average Power (dBm) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 40065 | 40355 | 40640 | 40750 | 41215 |
| | | | | | 2537.5MHz | 2566.5MHz | 2595.0MHz | 2624.0MHz | 2652.5MHz |
| Band 41 | 5 | QPSK | 1 | 0 | 23.39 | 23.58 | 23.89 | 23.68 | 23.77 |
| | | | 1 | 12 | 23.50 | 23.68 | 23.96 | 23.77 | 23.85 |
| | | | 1 | 24 | 23.41 | 23.55 | 23.85 | 23.65 | 23.69 |
| | | | 12 | 0 | 22.64 | 22.82 | 22.99 | 22.88 | 23.00 |
| | | | 12 | 6 | 22.67 | 22.78 | 22.97 | 22.84 | 22.88 |
| | | | 12 | 11 | 22.58 | 22.74 | 22.98 | 22.82 | 22.89 |
| | | | 25 | 0 | 22.67 | 22.83 | 22.89 | 22.85 | 22.98 |
| | | 16QAM | 1 | 0 | 22.97 | 23.11 | 23.04 | 23.08 | 23.24 |
| | | | 1 | 12 | 22.95 | 23.11 | 23.12 | 23.11 | 23.26 |
| | | | 1 | 24 | 23.01 | 23.12 | 23.06 | 23.10 | 23.23 |
| | | | 12 | 0 | 21.67 | 21.80 | 22.00 | 21.86 | 21.92 |
| | | | 12 | 6 | 21.65 | 21.79 | 22.02 | 21.87 | 21.93 |
| | | | 12 | 11 | 21.65 | 21.80 | 22.02 | 21.87 | 21.94 |
| | | | 25 | 0 | 21.79 | 21.89 | 22.09 | 21.96 | 21.99 |

| LTE Band | Band-width (MHz) | Modu-lation | RB Size | RB Offset | Average Power (dBm) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 40090 | 40365 | 40640 | 40915 | 41190 |
| | | | | | 2540.0MHz | 2567.5MHz | 2595.0MHz | 2622.5MHz | 2650.0MHz |
| Band 41 | 10 | QPSK | 1 | 0 | 23.54 | 23.66 | 24.02 | 23.78 | 23.78 |
| | | | 1 | 24 | 23.54 | 23.70 | 24.00 | 23.80 | 23.86 |
| | | | 1 | 49 | 23.67 | 23.76 | 24.18 | 23.90 | 23.85 |
| | | | 25 | 0 | 22.71 | 22.86 | 22.92 | 22.88 | 23.00 |
| | | | 25 | 12 | 22.73 | 22.88 | 22.92 | 22.89 | 23.02 |
| | | | 25 | 24 | 22.74 | 22.88 | 22.91 | 22.89 | 23.02 |
| | | | 50 | 0 | 22.75 | 22.87 | 23.05 | 22.93 | 22.98 |
| | | 16QAM | 1 | 0 | 22.79 | 22.73 | 23.18 | 22.88 | 22.67 |
| | | | 1 | 24 | 22.84 | 22.77 | 23.29 | 22.94 | 22.70 |
| | | | 1 | 49 | 22.81 | 22.77 | 23.29 | 22.94 | 22.72 |
| | | | 25 | 0 | 21.81 | 22.09 | 22.07 | 22.08 | 22.36 |
| | | | 25 | 12 | 21.82 | 22.09 | 22.07 | 22.08 | 22.36 |
| | | | 25 | 24 | 21.83 | 22.10 | 22.07 | 22.09 | 22.36 |
| | | | 50 | 0 | 21.92 | 21.95 | 22.16 | 22.02 | 21.97 |

| LTE Band | Band-width (MHz) | Modu-lation | RB Size | RB Offset | Average Power (dBm) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 40115 | 40375 | 40640 | 40900 | 41165 |
| | | | | | 2542.5MHz | 2568.5MHz | 2595.0MHz | 2673.5MHz | 2647.5MHz |
| Band 41 | 15 | QPSK | 1 | 0 | 23.54 | 23.70 | 23.96 | 23.79 | 23.86 |
| | | | 1 | 37 | 23.50 | 23.71 | 24.01 | 23.81 | 23.92 |
| | | | 1 | 74 | 23.58 | 23.76 | 24.08 | 23.87 | 23.94 |
| | | | 36 | 0 | 22.75 | 22.81 | 23.03 | 22.88 | 22.86 |
| | | | 36 | 16 | 22.77 | 22.83 | 23.02 | 22.89 | 22.88 |
| | | | 36 | 35 | 22.78 | 22.84 | 23.02 | 22.90 | 22.89 |
| | | | 75 | 0 | 22.70 | 22.80 | 23.08 | 22.89 | 22.89 |
| | | 16QAM | 1 | 0 | 22.73 | 22.63 | 23.20 | 22.82 | 22.53 |
| | | | 1 | 37 | 22.84 | 22.57 | 23.26 | 22.80 | 22.30 |
| | | | 1 | 74 | 22.83 | 22.46 | 23.26 | 22.73 | 22.09 |
| | | | 36 | 0 | 21.80 | 22.01 | 22.11 | 22.04 | 22.22 |
| | | | 36 | 16 | 21.81 | 22.02 | 22.11 | 22.05 | 22.23 |
| | | | 36 | 35 | 21.81 | 22.02 | 22.10 | 22.05 | 22.23 |
| | | | 75 | 0 | 21.93 | 22.02 | 22.17 | 22.07 | 22.10 |

| LTE Band | Band-width (MHz) | Modu-lation | RB Size | RB Offset | Average Power (dBm) | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | 40140 | 40390 | 40640 | 40890 | 41140 |
| | | | | | 2545.0MHz | 2570.0MHz | 2595.0MHz | 2620.0MHz | 2645.0MHz |
| Band 41 | 20 | QPSK | 1 | 0 | 23.68 | 23.82 | 23.94 | 23.86 | 23.96 |
| | | | 1 | 49 | 23.73 | 23.79 | 24.00 | 23.86 | 23.85 |
| | | | 1 | 99 | 23.84 | 23.86 | 24.13 | 23.95 | 23.88 |
| | | | 50 | 0 | 22.76 | 22.87 | 22.98 | 22.90 | 22.97 |
| | | | 50 | 24 | 22.80 | 22.91 | 23.04 | 22.95 | 23.02 |
| | | | 50 | 49 | 22.80 | 22.92 | 23.07 | 22.97 | 23.03 |
| | | | 100 | 0 | 22.81 | 22.91 | 22.99 | 22.94 | 23.01 |
| | | 16QAM | 1 | 0 | 23.05 | 23.06 | 23.37 | 23.16 | 23.06 |
| | | | 1 | 49 | 23.20 | 23.13 | 23.39 | 23.21 | 23.05 |
| | | | 1 | 99 | 23.30 | 23.18 | 23.41 | 23.26 | 23.06 |
| | | | 50 | 0 | 22.04 | 22.11 | 22.25 | 22.15 | 22.17 |
| | | | 50 | 24 | 21.92 | 21.98 | 22.19 | 22.05 | 22.04 |
| | | | 50 | 49 | 21.93 | 21.99 | 22.21 | 22.06 | 22.05 |
| | | | 100 | 0 | 21.86 | 21.96 | 22.15 | 22.02 | 22.06 |

**Note:**

1. Per KDB 447498 D04v01 section 3.1.6, the required test channels number is 5 for LTE Band 41.

**LTE Band 66 part:**

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 131979 | 132322 | 132665 |
| | | | | | 1710.70MHz | 1745.00MHz | 1779.3MHz |
| Band 66 | 1.4 | QPSK | 1 | 0 | 23.60 | 23.77 | 23.75 |
| | | | 1 | 2 | 23.50 | 23.70 | 23.75 |
| | | | 1 | 5 | 23.56 | 23.72 | 23.80 |
| | | | 3 | 0 | 23.63 | 23.63 | 23.67 |
| | | | 3 | 1 | 23.73 | 23.63 | 23.66 |
| | | | 3 | 2 | 23.72 | 23.63 | 23.66 |
| | | | 6 | 0 | 22.66 | 22.57 | 22.81 |
| | | 16QAM | 1 | 0 | 23.40 | 22.52 | 22.85 |
| | | | 1 | 2 | 23.38 | 22.58 | 22.87 |
| | | | 1 | 5 | 23.40 | 22.60 | 22.82 |
| | | | 3 | 0 | 22.40 | 22.15 | 22.77 |
| | | | 3 | 1 | 22.35 | 22.16 | 22.49 |
| | | | 3 | 2 | 22.35 | 22.16 | 22.49 |
| | | | 6 | 0 | 21.87 | 21.75 | 21.74 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 131987 | 132322 | 132657 |
| | | | | | 1711.50MHz | 1745.00MHz | 1778.50MHz |
| Band 66 | 3 | QPSK | 1 | 0 | 23.51 | 23.72 | 23.75 |
| | | | 1 | 7 | 23.60 | 23.85 | 23.79 |
| | | | 1 | 14 | 23.53 | 23.74 | 23.78 |
| | | | 8 | 0 | 22.52 | 22.60 | 22.66 |
| | | | 8 | 4 | 22.66 | 22.62 | 22.69 |
| | | | 8 | 7 | 22.68 | 22.62 | 22.66 |
| | | | 15 | 0 | 22.65 | 22.64 | 22.68 |
| | | 16QAM | 1 | 0 | 22.41 | 22.46 | 22.60 |
| | | | 1 | 7 | 22.38 | 22.73 | 22.60 |
| | | | 1 | 14 | 22.48 | 22.49 | 22.64 |
| | | | 8 | 0 | 21.74 | 21.92 | 21.74 |
| | | | 8 | 4 | 21.78 | 21.85 | 21.75 |
| | | | 8 | 7 | 21.71 | 21.81 | 21.73 |
| | | | 15 | 0 | 21.59 | 21.47 | 21.76 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 131997 | 132322 | 132647 |
| | | | | | 1712.50MHz | 1745.00MHz | 1777.50MHz |
| Band 66 | 5 | QPSK | 1 | 0 | 23.46 | 23.54 | 23.87 |
| | | | 1 | 12 | 23.58 | 23.52 | 23.86 |
| | | | 1 | 24 | 23.54 | 23.57 | 23.84 |
| | | | 12 | 0 | 22.63 | 22.59 | 22.71 |
| | | | 12 | 6 | 22.63 | 22.53 | 22.73 |
| | | | 12 | 11 | 22.50 | 22.54 | 22.73 |
| | | | 25 | 0 | 22.68 | 22.64 | 22.68 |
| | | 16QAM | 1 | 0 | 21.99 | 22.68 | 22.51 |
| | | | 1 | 12 | 21.99 | 22.83 | 22.47 |
| | | | 1 | 24 | 21.95 | 22.86 | 22.55 |
| | | | 12 | 0 | 21.54 | 21.75 | 21.59 |
| | | | 12 | 6 | 21.54 | 21.76 | 21.59 |
| | | | 12 | 11 | 21.54 | 21.76 | 21.71 |
| | | | 25 | 0 | 21.75 | 21.69 | 21.79 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 132022 | 132322 | 132622 |
| | | | | | 1715.00MHz | 1745.00MHz | 1775.00MHz |
| Band 66 | 10 | QPSK | 1 | 0 | 23.48 | 23.59 | 23.63 |
| | | | 1 | 24 | 23.50 | 23.59 | 23.65 |
| | | | 1 | 49 | 23.56 | 23.65 | 23.68 |
| | | | 25 | 0 | 22.65 | 22.63 | 22.69 |
| | | | 25 | 12 | 22.54 | 22.52 | 22.74 |
| | | | 25 | 24 | 22.54 | 22.52 | 22.74 |
| | | | 50 | 0 | 22.49 | 22.66 | 22.71 |
| | | 16QAM | 1 | 0 | 22.59 | 22.47 | 23.22 |
| | | | 1 | 24 | 22.53 | 22.48 | 23.17 |
| | | | 1 | 49 | 22.35 | 22.45 | 23.25 |
| | | | 25 | 0 | 21.60 | 21.79 | 22.08 |
| | | | 25 | 12 | 21.61 | 21.73 | 22.08 |
| | | | 25 | 24 | 21.62 | 21.71 | 22.08 |
| | | | 50 | 0 | 21.71 | 21.70 | 21.82 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 132047 | 132322 | 132597 |
| | | | | | 1717.50MHz | 1745.00MHz | 1772.50MHz |
| Band 66 | 15 | QPSK | 1 | 0 | 23.51 | 23.55 | 23.62 |
| | | | 1 | 37 | 23.59 | 23.57 | 23.66 |
| | | | 1 | 74 | 23.64 | 23.65 | 23.74 |
| | | | 36 | 0 | 22.50 | 22.67 | 22.61 |
| | | | 36 | 16 | 22.52 | 22.74 | 22.57 |
| | | | 36 | 35 | 22.46 | 22.67 | 22.69 |
| | | | 75 | 0 | 22.71 | 22.70 | 22.64 |
| | | 16QAM | 1 | 0 | 22.57 | 22.77 | 23.14 |
| | | | 1 | 37 | 22.69 | 22.77 | 23.22 |
| | | | 1 | 74 | 22.63 | 22.78 | 22.67 |
| | | | 36 | 0 | 21.58 | 22.11 | 21.70 |
| | | | 36 | 16 | 21.65 | 22.11 | 21.72 |
| | | | 36 | 35 | 21.63 | 22.12 | 21.71 |
| | | | 75 | 0 | 21.90 | 21.60 | 22.13 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 132072 | 132322 | 132572 |
| | | | | | 1720.00MHz | 1745.00MHz | 1770.00MHz |
| Band 66 | 20 | QPSK | 1 | 0 | 23.63 | 23.67 | 23.66 |
| | | | 1 | 49 | 23.73 | 23.71 | 23.52 |
| | | | 1 | 99 | 23.75 | 23.82 | 23.72 |
| | | | 50 | 0 | 22.54 | 22.68 | 22.68 |
| | | | 50 | 24 | 22.54 | 22.68 | 22.65 |
| | | | 50 | 49 | 22.54 | 22.59 | 22.68 |
| | | | 100 | 0 | 22.60 | 22.73 | 22.63 |
| | | 16QAM | 1 | 0 | 22.59 | 22.96 | 22.80 |
| | | | 1 | 49 | 22.62 | 22.93 | 22.85 |
| | | | 1 | 99 | 22.63 | 22.99 | 22.62 |
| | | | 50 | 0 | 21.68 | 21.99 | 21.78 |
| | | | 50 | 24 | 21.68 | 21.96 | 21.83 |
| | | | 50 | 49 | 21.68 | 22.06 | 21.73 |
| | | | 100 | 0 | 21.57 | 21.66 | 21.68 |

**LTE Band 71 part:**

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 133147 | 133297 | 133447 |
| | | | | | 665.5MHz | 680.5MHz | 695.5MHz |
| Band 71 | 5 | QPSK | 1 | 0 | 23.10 | 23.37 | 23.54 |
| | | | 1 | 12 | 23.23 | 23.40 | 23.55 |
| | | | 1 | 24 | 23.15 | 23.20 | 23.73 |
| | | | 12 | 0 | 22.35 | 22.86 | 22.77 |
| | | | 12 | 6 | 22.16 | 22.76 | 22.77 |
| | | | 12 | 11 | 22.18 | 22.83 | 22.79 |
| | | | 25 | 0 | 22.26 | 22.74 | 22.92 |
| | | 16QAM | 1 | 0 | 21.60 | 22.21 | 22.65 |
| | | | 1 | 12 | 21.64 | 22.61 | 22.93 |
| | | | 1 | 24 | 21.42 | 22.49 | 22.52 |
| | | | 12 | 0 | 21.51 | 21.72 | 21.89 |
| | | | 12 | 6 | 21.51 | 21.74 | 21.87 |
| | | | 12 | 11 | 21.51 | 21.68 | 21.91 |
| | | | 25 | 0 | 21.47 | 21.66 | 22.00 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 133172 | 133297 | 133422 |
| | | | | | 668MHz | 680.5MHz | 693MHz |
| Band 71 | 10 | QPSK | 1 | 0 | 23.10 | 23.53 | 23.63 |
| | | | 1 | 24 | 23.03 | 23.65 | 23.61 |
| | | | 1 | 49 | 22.86 | 23.46 | 23.63 |
| | | | 25 | 0 | 22.34 | 22.38 | 22.93 |
| | | | 25 | 12 | 22.47 | 22.47 | 22.95 |
| | | | 25 | 24 | 22.46 | 22.52 | 22.87 |
| | | | 50 | 0 | 22.12 | 22.70 | 22.64 |
| | | 16QAM | 1 | 0 | 22.17 | 22.45 | 22.40 |
| | | | 1 | 24 | 21.96 | 23.14 | 22.42 |
| | | | 1 | 49 | 22.42 | 22.74 | 22.48 |
| | | | 25 | 0 | 21.53 | 21.82 | 21.87 |
| | | | 25 | 12 | 21.69 | 21.84 | 21.87 |
| | | | 25 | 24 | 21.83 | 21.79 | 21.89 |
| | | | 50 | 0 | 21.44 | 21.79 | 21.75 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 133197 | 133297 | 133397 |
| | | | | | 670.5MHz | 680.5MHz | 690.5MHz |
| Band 71 | 15 | QPSK | 1 | 0 | 23.08 | 23.42 | 23.34 |
| | | | 1 | 37 | 23.36 | 23.63 | 23.80 |
| | | | 1 | 74 | 23.57 | 23.81 | 23.63 |
| | | | 36 | 0 | 22.01 | 22.52 | 22.81 |
| | | | 36 | 16 | 21.99 | 22.47 | 22.71 |
| | | | 36 | 35 | 22.11 | 22.57 | 22.77 |
| | | | 75 | 0 | 22.57 | 22.74 | 22.95 |
| | | 16QAM | 1 | 0 | 22.53 | 22.72 | 22.07 |
| | | | 1 | 37 | 22.68 | 23.18 | 22.58 |
| | | | 1 | 74 | 22.62 | 23.07 | 22.44 |
| | | | 36 | 0 | 21.67 | 21.71 | 21.91 |
| | | | 36 | 16 | 21.60 | 21.69 | 21.94 |
| | | | 36 | 35 | 21.58 | 21.68 | 21.91 |
| | | | 75 | 0 | 21.37 | 21.80 | 21.96 |

| LTE Band | Bandwidth (MHz) | Modulation | RB Size | RB Offset | Average Power (dBm) | | |
|---|---|---|---|---|---|---|---|
| | | | | | 133222 | 133322 | 133372 |
| | | | | | 673MHz | 683MHz | 688MHz |
| Band 71 | 20 | QPSK | 1 | 0 | 23.00 | 23.23 | 23.45 |
| | | | 1 | 49 | 23.08 | 23.34 | 23.72 |
| | | | 1 | 99 | 23.48 | 23.73 | 23.67 |
| | | | 50 | 0 | 22.11 | 22.43 | 22.47 |
| | | | 50 | 24 | 22.16 | 22.62 | 22.23 |
| | | | 50 | 49 | 21.97 | 22.54 | 22.49 |
| | | | 100 | 0 | 22.62 | 22.75 | 22.68 |
| | | 16QAM | 1 | 0 | 22.63 | 22.30 | 22.07 |
| | | | 1 | 49 | 22.99 | 22.46 | 22.13 |
| | | | 1 | 99 | 23.12 | 22.71 | 22.46 |
| | | | 50 | 0 | 21.37 | 21.76 | 21.95 |
| | | | 50 | 24 | 21.55 | 21.75 | 21.82 |
| | | | 50 | 49 | 21.39 | 21.66 | 21.87 |
| | | | 100 | 0 | 21.73 | 21.50 | 21.83 |

## 13.4 WLAN 2.4 GHz Band Conducted Power

| Average Power (dBm) | | | | |
|---|---|---|---|---|
| Channel | Frequency (MHz) | 802.11 b | 802.11 g | 802.11n (HT20) |
| CH 01 | 2412 | 14.81 | 12.51 | 12.86 |
| CH 06 | 2437 | 13.49 | 12.05 | 11.63 |
| CH 11 | 2462 | **15.25** | 13.85 | 11.12 |

**Note:**

1. SAR test of WLAN 2.4GHz is performed.
2. Per KDB 248227 D01v02r02, choose the highest output power channel to test SAR and determine further SAR exclusion.
3. Per KDB 248227 D01v02r02, In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. SAR is not required for the following 2.4 GHz OFDM conditions:
   1) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
   2) 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 ≤ 1.2 W/kg.
4. The output power of all data rate were pre-scan, just the worst case (the lowest data rate) of all mode were shown in report.
5. Per KDB 248227 D01V02r02 section 2.2, when the EUT in continuously transmitting mode, the actual duty cycle is 100%, so the duty cycle factor is 1.

## 13.5 Bluetooth Conducted Power

| Average Power (dBm) | | | | |
|---|---|---|---|---|
| Channel | Frequency (MHz) | GFSK | π/4-DQPSK | 8DPSK |
| CH 00 | 2402 | 5.37 | 6.25 | **6.58** |
| CH 39 | 2441 | 6.09 | 5.48 | 5.92 |
| CH 78 | 2480 | 4.14 | 4.38 | 4.83 |

| Average Power (dBm) | | |
|---|---|---|
| Channel | Frequency (MHz) | BLE |
| CH 00 | 2402 | -3.47 |
| CH 20 | 2442 | -3.05 |
| CH 39 | 2480 | -3.94 |

**Note:**

1. SAR test of Bluetooth is performed and the mode with highest average power is selected for SAR testing.
2. Per KDB 447498 D04v01 section 2.1.2: 1-mW Test Exemption, SAR test for BLE is not required.
3. The output power of all data rate were pre-scan, just the worst case of all mode were shown in report.
4. Per KDB 248227 D01V02r02 section 2.2, when the EUT in continuously transmitting mode, the actual duty cycle is 100%, so the duty cycle factor is 1.

# 14 Exposure Positions Consideration

## 14.1 EUT Antenna Locations

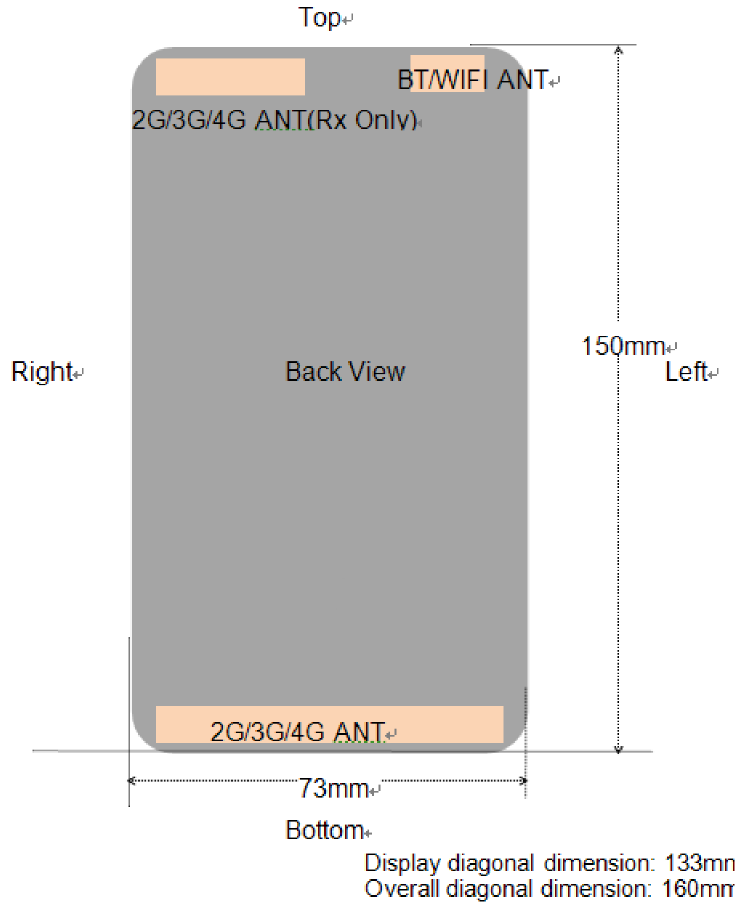



**Fig.14.1 EUT Antenna Locations**

*Note: This antenna diagram is only used as a reference for the distance from the antenna to each edge. For the specific shape of the antenna, please refer to the physical photo.*

## 14.2 Test Positions Consideration

| Distance of Antennas to EUT edge/surface<br>Test distance: 10mm | | | | | | |
|---|---|---|---|---|---|---|
| **Antennas** | **Back** | **Front** | **Top Side** | **Bottom Side** | **Right Side** | **Left Side** |
| 2G/3G/4G | <25mm | <25mm | 126mm | <25mm | <25mm | <25mm |
| WLAN & Bluetooth | <25mm | <25mm | <25mm | 123mm | 59mm | <25mm |

| Test Positions<br>Test distance: 10mm | | | | | | |
|---|---|---|---|---|---|---|
| **Antennas** | **Back** | **Front** | **Top Side** | **Bottom Side** | **Right Side** | **Left Side** |
| 2G/3G/4G | Yes | Yes | No | Yes | Yes | Yes |
| WLAN & Bluetooth | Yes | Yes | Yes | No | No | Yes |

**Note:**

1. Head/Body-worn/Hotspot mode SAR assessments are required.
2. Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm * 5cm, the test distance is 10mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.
3. Per KDB 447498 D04v01, for handsets the test separation distance is determined by the smallest distance between the outer surface of the device and the user, which is 0 mm for head SAR, 10 mm for hotspot SAR, and 10 mm for body-worn SAR.
4. Per KDB 648474 D04 v01r03, 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

# 15 SAR Test Results Summary

## 15.1 Standalone Head SAR Data

➢ GSM Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | GSM850/Voice | Right Cheek | 190 | 836.6 | 33.38 | -1.67 | 33.5 | 0.378 | 1.028 | 0.389 |
| | GSM850/Voice | Right Tilted | 190 | 836.6 | 33.38 | -0.77 | 33.5 | 0.201 | 1.028 | 0.207 |
| 1 | GSM850/Voice | Left Cheek | 190 | 836.6 | 33.38 | -4.82 | 33.5 | **0.494** | 1.028 | 0.508 |
| | GSM850/Voice | Left Tilted | 190 | 836.6 | 33.38 | 1.00 | 33.5 | 0.259 | 1.028 | 0.266 |
| 2 | PCS1900/Voice | Right Cheek | 661 | 1880 | 29.97 | 1.93 | 30.5 | **0.144** | 1.13 | 0.163 |
| | PCS1900/Voice | Right Tilted | 661 | 1880 | 29.97 | -1.02 | 30.5 | 0.080 | 1.13 | 0.090 |
| | PCS1900/Voice | Left Cheek | 661 | 1880 | 29.97 | -0.55 | 30.5 | 0.090 | 1.13 | 0.102 |
| | PCS1900/Voice | Left Tilted | 661 | 1880 | 29.97 | -1.88 | 30.5 | 0.047 | 1.13 | 0.053 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g)<br>Averaged over 1g** | | | | | |

➢ WCDMA Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Band II/RMC | Right Cheek | 9538 | 1907.6 | 22.91 | -0.21 | 23.0 | **0.203** | 1.021 | 0.207 |
| | Band II/RMC | Right Tilted | 9538 | 1907.6 | 22.91 | -0.97 | 23.0 | 0.108 | 1.021 | 0.110 |
| | Band II/RMC | Left Cheek | 9538 | 1907.6 | 22.91 | -0.63 | 23.0 | 0.132 | 1.021 | 0.135 |
| | Band II/RMC | Left Tilted | 9538 | 1907.6 | 22.91 | -1.08 | 23.0 | 0.072 | 1.021 | 0.074 |
| 4 | Band V/RMC | Right Cheek | 4183 | 836.6 | 23.20 | -0.70 | 23.5 | **0.259** | 1.072 | 0.278 |
| | Band V/RMC | Right Tilted | 4183 | 836.6 | 23.20 | -0.33 | 23.5 | 0.136 | 1.072 | 0.146 |
| | Band V/RMC | Left Cheek | 4183 | 836.6 | 23.20 | -0.36 | 23.5 | 0.241 | 1.072 | 0.258 |
| | Band V/RMC | Left Tilted | 4183 | 836.6 | 23.20 | -0.94 | 23.5 | 0.125 | 1.072 | 0.134 |
| **A ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g)<br>Averaged over 1g** | | | | | |

➢ FDD-LTE Band 2(20MHz) QPSK Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| 5 | Band2/1RB#99 | Right Cheek | 18900 | 1880 | 24.13 | -2.07 | 24.5 | **0.288** | 1.089 | 0.314 |
| | Band2/1RB#99 | Right Tilted | 18900 | 1880 | 24.13 | -1.07 | 24.5 | 0.092 | 1.089 | 0.100 |
| | Band2/1RB#99 | Left Cheek | 18900 | 1880 | 24.13 | -0.28 | 24.5 | 0.183 | 1.089 | 0.199 |
| | Band2/1RB#99 | Left Tilted | 18900 | 1880 | 24.13 | 0.73 | 24.5 | 0.063 | 1.089 | 0.069 |
| | Band2/50%RB#49 | Right Cheek | 18900 | 1880 | 22.97 | -1.00 | 23.0 | 0.225 | 1.007 | 0.227 |
| | Band2/50%RB#49 | Right Tilted | 18900 | 1880 | 22.97 | 0.31 | 23.0 | 0.071 | 1.007 | 0.071 |
| | Band2/50%RB#49 | Left Cheek | 18900 | 1880 | 22.97 | 1.49 | 23.0 | 0.156 | 1.007 | 0.157 |
| | Band2/50%RB#49 | Left Tilted | 18900 | 1880 | 22.97 | 0.12 | 23.0 | 0.045 | 1.007 | 0.045 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g)<br>Averaged over 1g** | | | | | |

➢ FDD-LTE Band 5(10MHz) QPSK Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band5/1RB#0 | Right Cheek | 20600 | 844 | 23.70 | -2.41 | 24.0 | 0.303 | 1.072 | 0.325 |
| | Band5/1RB#0 | Right Tilted | 20600 | 844 | 23.70 | -1.60 | 24.0 | 0.166 | 1.072 | 0.178 |
| 6 | Band5/1RB#0 | Left Cheek | 20600 | 844 | 23.70 | -0.78 | 24.0 | **0.345** | 1.072 | 0.370 |
| | Band5/1RB#0 | Left Tilted | 20600 | 844 | 23.70 | -1.18 | 24.0 | 0.189 | 1.072 | 0.203 |
| | Band5/50%RB#12 | Right Cheek | 20525 | 836.5 | 22.73 | -1.82 | 23.0 | 0.256 | 1.064 | 0.272 |
| | Band5/50%RB#12 | Right Tilted | 20525 | 836.5 | 22.73 | 0.38 | 23.0 | 0.128 | 1.064 | 0.136 |
| | Band5/50%RB#12 | Left Cheek | 20525 | 836.5 | 22.73 | 1.28 | 23.0 | 0.311 | 1.064 | 0.331 |
| | Band5/50%RB#12 | Left Tilted | 20525 | 836.5 | 22.73 | -1.27 | 23.0 | 0.152 | 1.064 | 0.162 |

| ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | 1.6 W/kg (mW/g)<br>Averaged over 1g |
|---|---|

➢ FDD-LTE Band 12(10MHz) QPSK Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Band12/1RB#49 | Right Cheek | 23130 | 711 | 23.77 | -2.19 | 24.0 | **0.076** | 1.054 | 0.080 |
| | Band12/1RB#49 | Right Tilted | 23130 | 711 | 23.77 | 0.44 | 24.0 | 0.045 | 1.054 | 0.047 |
| | Band12/1RB#49 | Left Cheek | 23130 | 711 | 23.77 | -0.76 | 24.0 | 0.073 | 1.054 | 0.077 |
| | Band12/1RB#49 | Left Tilted | 23130 | 711 | 23.77 | 1.77 | 24.0 | 0.041 | 1.054 | 0.043 |
| | Band12/50%RB#0 | Right Cheek | 23130 | 711 | 22.77 | 0.85 | 23.0 | 0.060 | 1.054 | 0.063 |
| | Band12/50%RB#0 | Right Tilted | 23130 | 711 | 22.77 | -0.24 | 23.0 | 0.038 | 1.054 | 0.040 |
| | Band12/50%RB#0 | Left Cheek | 23130 | 711 | 22.77 | -1.43 | 23.0 | 0.056 | 1.054 | 0.059 |
| | Band12/50%RB#0 | Left Tilted | 23130 | 711 | 22.77 | 0.17 | 23.0 | 0.032 | 1.054 | 0.034 |
| ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | 1.6 W/kg (mW/g)<br>Averaged over 1g | | | | | |

➢ TDD-LTE Band41(20MHz) QPSK Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | D.C Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 | Band41/1RB#99 | Right Cheek | 40640 | 2595 | 24.13 | -0.38 | 24.5 | **0.091** | 1.089 | 1.008 | 0.100 |
| | Band41/1RB#99 | Right Tilted | 40640 | 2595 | 24.13 | -0.15 | 24.5 | 0.045 | 1.089 | 1.008 | 0.049 |
| | Band41/1RB#99 | Left Cheek | 40640 | 2595 | 24.13 | 2.83 | 24.5 | 0.053 | 1.089 | 1.008 | 0.058 |
| | Band41/1RB#99 | Left Tilted | 40640 | 2595 | 24.13 | -1.72 | 24.5 | 0.028 | 1.089 | 1.008 | 0.031 |
| | Band41/50%RB#49 | Right Cheek | 40640 | 2595 | 23.07 | -1.11 | 23.5 | 0.073 | 1.104 | 1.008 | 0.081 |
| | Band41/50%RB#49 | Right Tilted | 40640 | 2595 | 23.07 | -1.41 | 23.5 | 0.037 | 1.104 | 1.008 | 0.041 |
| | Band41/50%RB#49 | Left Cheek | 40640 | 2595 | 23.07 | -1.27 | 23.5 | 0.043 | 1.104 | 1.008 | 0.048 |
| | Band41/50%RB#49 | Left Tilted | 40640 | 2595 | 23.07 | -1.25 | 23.5 | 0.020 | 1.104 | 1.008 | 0.022 |
| ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | 1.6 W/kg (mW/g)<br>Averaged over 1g | | | | | | |

➢ FDD-LTE Band 66(20MHz) QPSK Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band66/1RB#99 | Right Cheek | 132322 | 1745 | 23.82 | -1.81 | 24.0 | 0.232 | 1.042 | 0.242 |
| | Band66/1RB#99 | Right Tilted | 132322 | 1745 | 23.82 | 1.04 | 24.0 | 0.124 | 1.042 | 0.129 |
| 9 | Band66/1RB#99 | Left Cheek | 132322 | 1745 | 23.82 | -1.91 | 24.0 | **0.405** | 1.042 | 0.422 |
| | Band66/1RB#99 | Left Tilted | 132322 | 1745 | 23.82 | 1.22 | 24.0 | 0.213 | 1.042 | 0.222 |
| | Band66/50%RB#0 | Right Cheek | 132322 | 1745 | 22.68 | 0.42 | 23.0 | 0.189 | 1.076 | 0.203 |
| | Band66/50%RB#0 | Right Tilted | 132322 | 1745 | 22.68 | 1.84 | 23.0 | 0.102 | 1.076 | 0.110 |
| | Band66/50%RB#0 | Left Cheek | 132322 | 1745 | 22.68 | -0.51 | 23.0 | 0.376 | 1.076 | 0.405 |
| | Band66/50%RB#0 | Left Tilted | 132322 | 1745 | 22.68 | -0.95 | 23.0 | 0.177 | 1.076 | 0.190 |
| ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | 1.6 W/kg (mW/g)<br>Averaged over 1g | | | | | |

➢ FDD-LTE Band 71(20MHz) QPSK Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| 10 | Band71/1RB#99 | Right Cheek | 133322 | 683 | 23.73 | 1.75 | 24.0 | **0.057** | 1.064 | 0.061 |
| | Band71/1RB#99 | Right Tilted | 133322 | 683 | 23.73 | 1.94 | 24.0 | 0.040 | 1.064 | 0.043 |
| | Band71/1RB#99 | Left Cheek | 133322 | 683 | 23.73 | 0.70 | 24.0 | 0.052 | 1.064 | 0.055 |
| | Band71/1RB#99 | Left Tilted | 133322 | 683 | 23.73 | 0.46 | 24.0 | 0.035 | 1.064 | 0.037 |
| | Band71/50%RB#24 | Right Cheek | 133322 | 683 | 22.62 | -0.17 | 23.0 | 0.045 | 1.091 | 0.049 |
| | Band71/50%RB#24 | Right Tilted | 133322 | 683 | 22.62 | 0.17 | 23.0 | 0.033 | 1.091 | 0.036 |
| | Band71/50%RB#24 | Left Cheek | 133322 | 683 | 22.62 | 0.18 | 23.0 | 0.041 | 1.091 | 0.045 |
| | Band71/50%RB#24 | Left Tilted | 133322 | 683 | 22.62 | -0.86 | 23.0 | 0.029 | 1.091 | 0.032 |

| ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | 1.6 W/kg (mW/g)<br>Averaged over 1g |
|---|---|

➢ WLAN 2.4 GHz Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | D.C Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 2.4GHz/802.11b | Right Cheek | 11 | 2462 | 15.25 | 0.15 | 15.5 | **0.149** | 1.059 | 1.000 | 0.158 |
| | 2.4GHz/802.11b | Right Tilted | 11 | 2462 | 15.25 | 0.67 | 15.5 | 0.117 | 1.059 | 1.000 | 0.124 |
| | 2.4GHz/802.11b | Left Cheek | 11 | 2462 | 15.25 | -0.47 | 15.5 | 0.130 | 1.059 | 1.000 | 0.138 |
| | 2.4GHz/802.11b | Left Tilted | 11 | 2462 | 15.25 | -3.99 | 15.5 | 0.102 | 1.059 | 1.000 | 0.108 |
| ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | 1.6 W/kg (mW/g)<br>Averaged over 1g | | | | | | |

➢ Bluetooth Head SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | D.C Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 12 | BT/8DPSK | Right Cheek | 0 | 2402 | 6.58 | -0.11 | 7.0 | **0.025** | 1.102 | 1.000 | 0.028 |
| | BT/8DPSK | Right Tilted | 0 | 2402 | 6.58 | -1.90 | 7.0 | 0.018 | 1.102 | 1.000 | 0.020 |
| | BT/8DPSK | Left Cheek | 0 | 2402 | 6.58 | 0.65 | 7.0 | 0.023 | 1.102 | 1.000 | 0.025 |
| | BT/8DPSK | Left Tilted | 0 | 2402 | 6.58 | 0.31 | 7.0 | 0.015 | 1.102 | 1.000 | 0.017 |
| ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population | | | | | 1.6 W/kg (mW/g)<br>Averaged over 1g | | | | | | |

**Note:**

1. Per KDB 447498 D04v01, for each exposure position, if the highest output power channel Reported SAR ≤ 0.8W/kg, other channels SAR testing is not necessary.
2. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥ 0.8W/kg.
3. Per KDB 941225 D05v02r05, 100% RB allocation SAR measurement is not required when the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.
4. Per KDB 248227 D01v02r02, for 802.11b DSSS , when the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required in that exposure configuration.
5. Per KDB 248227 D01v02r02, OFDM SAR is not required 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 ≤ 1.2 W/kg. Cuz the maximum output power specified for OFDM and DSSS are 25.12mW(14.0dBm) and 35.48mW(15.5dBm), the scaled SAR would be 0.158×(25.12/35.48)=0.112W/Kg<1.2 W/kg, therefore, SAR is not required for OFDM.
6. According to KDB 865664 D02v01r02, SAR plot is required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.

## 15.2 Standalone Body SAR

➢ GSM Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | GPRS850/2 slots | Front | 190 | 836.6 | 31.13 | 1.88 | 31.5 | 0.298 | 1.089 | 0.325 |
| 13 | GPRS850/2 slots | Back | 190 | 836.6 | 31.13 | -3.10 | 31.5 | **0.387** | 1.089 | 0.421 |
| | GPRS1900/3 slots | Front | 512 | 1850.2 | 26.17 | -0.03 | 26.5 | 0.243 | 1.079 | 0.262 |
| 14 | GPRS1900/3 slots | Back | 512 | 1850.2 | 26.17 | 2.03 | 26.5 | **0.337** | 1.079 | 0.364 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ WCDMA Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band II/RMC | Front | 9538 | 1907.6 | 22.91 | 0.66 | 23.0 | 0.316 | 1.021 | 0.323 |
| 15 | Band II/RMC | Back | 9538 | 1907.6 | 22.91 | 4.65 | 23.0 | **0.621** | 1.021 | 0.634 |
| | Band V/RMC | Front | 4183 | 836.6 | 23.20 | 2.00 | 23.5 | 0.168 | 1.072 | 0.180 |
| 16 | Band V/RMC | Back | 4183 | 836.6 | 23.20 | -1.30 | 23.5 | **0.305** | 1.072 | 0.327 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ FDD-LTE Band 2(20MHz) QPSK Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band2/1RB#99 | Front | 18900 | 1880 | 24.13 | -0.66 | 24.5 | 0.332 | 1.089 | 0.362 |
| 17 | Band2/1RB#99 | Back | 18900 | 1880 | 24.13 | -1.03 | 24.5 | **0.674** | 1.089 | 0.734 |
| | Band2/50%RB#49 | Front | 18900 | 1880 | 22.97 | 1.89 | 23.0 | 0.310 | 1.007 | 0.312 |
| | Band2/50%RB#49 | Back | 18900 | 1880 | 22.97 | 1.92 | 23.0 | 0.620 | 1.007 | 0.624 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ FDD-LTE Band 5(10MHz) QPSK Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band5/1RB#0 | Front | 20600 | 844 | 23.70 | -0.27 | 24.0 | 0.285 | 1.072 | 0.306 |
| 18 | Band5/1RB#0 | Back | 20600 | 844 | 23.70 | 1.01 | 24.0 | **0.322** | 1.072 | 0.345 |
| | Band5/50%RB#12 | Front | 20525 | 836.5 | 22.73 | -1.61 | 23.0 | 0.234 | 1.064 | 0.249 |
| | Band5/50%RB#12 | Back | 20525 | 836.5 | 22.73 | 0.84 | 23.0 | 0.278 | 1.064 | 0.296 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ FDD-LTE Band 12(10MHz) QPSK Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band12/1RB#49 | Front | 23130 | 711 | 23.77 | -2.25 | 24.0 | 0.091 | 1.054 | 0.096 |
| 19 | Band12/1RB#49 | Back | 23130 | 711 | 23.77 | -4.00 | 24.0 | **0.106** | 1.054 | 0.112 |
| | Band12/50%RB#0 | Front | 23130 | 711 | 22.77 | -0.34 | 23.0 | 0.076 | 1.054 | 0.080 |
| | Band12/50%RB#0 | Back | 23130 | 711 | 22.77 | 1.94 | 23.0 | 0.095 | 1.054 | 0.100 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ TDD-LTE Band 41(20MHz) QPSK Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | D.C Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band41/1RB#99 | Front | 40640 | 2595 | 24.13 | -2.32 | 24.5 | 0.082 | 1.089 | 1.008 | 0.090 |
| 20 | Band41/1RB#99 | Back | 40640 | 2595 | 24.13 | -2.35 | 24.5 | **0.211** | 1.089 | 1.008 | 0.232 |
| | Band41/50%RB#49 | Front | 40640 | 2595 | 23.07 | -0.81 | 23.5 | 0.068 | 1.104 | 1.008 | 0.076 |
| | Band41/50%RB#49 | Back | 40640 | 2595 | 23.07 | -1.98 | 23.5 | 0.186 | 1.104 | 1.008 | 0.207 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | | |

➢ FDD-LTE Band 66(20MHz) QPSK Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band66/1RB#99 | Front | 132322 | 1745 | 23.82 | 1.72 | 24.0 | 0.395 | 1.042 | 0.412 |
| 21 | Band66/1RB#99 | Back | 132322 | 1745 | 23.82 | -0.35 | 24.0 | **0.737** | 1.042 | 0.768 |
| | Band66/50%RB#0 | Front | 132322 | 1745 | 22.68 | 0.13 | 23.0 | 0.354 | 1.076 | 0.381 |
| | Band66/50%RB#0 | Back | 132322 | 1745 | 22.68 | 0.49 | 23.0 | 0.682 | 1.076 | 0.734 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ FDD-LTE Band 71(20MHz) QPSK Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band71/1RB#99 | Front | 133322 | 683 | 23.73 | 1.85 | 24.0 | 0.054 | 1.064 | 0.057 |
| 22 | Band71/1RB#99 | Back | 133322 | 683 | 23.73 | -0.80 | 24.0 | **0.080** | 1.064 | 0.085 |
| | Band71/50%RB#24 | Front | 133322 | 683 | 22.62 | 1.25 | 23.0 | 0.043 | 1.091 | 0.047 |
| | Band71/50%RB#24 | Back | 133322 | 683 | 22.62 | -2.34 | 23.0 | 0.069 | 1.091 | 0.075 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ WLAN 2.4GHz Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | D.C Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 2.4GHz/802.11b | Front | 11 | 2462 | 15.25 | -2.68 | 15.5 | **0.048** | 1.059 | 1.000 | 0.051 |
| | 2.4GHz/802.11b | Back | 11 | 2462 | 15.25 | -3.89 | 15.5 | 0.033 | 1.059 | 1.000 | 0.035 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | | |

➢ Bluetooth Body SAR

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | D.C Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | BT/8DPSK | Front | 0 | 2402 | 6.58 | 0.08 | 7.0 | **0.019** | 1.102 | 1.000 | 0.021 |
| | BT/8DPSK | Back | 0 | 2402 | 6.58 | 0.03 | 7.0 | 0.018 | 1.102 | 1.000 | 0.020 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | | |

**Note:**

1. Body-worn SAR testing was performed at 10mm separation, and this distance is determined by the handset manufacturer that there will be body-worn accessories that users may acquire at the time of equipment certification, to enable users to purchase aftermarket body-worn accessories with the required minimum separation.
2. Per KDB 941225 D06v02r01, when the same wireless modes and device transmission configurations are required for testing body-worn accessories and hotspot mode, it is not necessary to test body-worn accessory SAR for the same device orientation if the test separation distance for hotspot mode is more conservative than that used for body-worn accessories.

3. Per KDB 648474 D04v01r03, when the Reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
4. The WLAN SAR perform the front and back position, due considered the simultaneous SAR for body-worn.
5. Per KDB 447498 D04v01, for each exposure position, if the highest output channel Reported SAR ≤0.8W/kg, other channels SAR testing is not necessary.
6. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥0.8W/kg.
7. Per KDB 941225 D05v02r05, 100% RB allocation SAR measurement is not required when the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg.
8. According to KDB 865664 D02v01r02, SAR plot is required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.
9. Highlight part of test data means repeated test.

## 15.3 Body SAR in Hotspot Mode

➢ GSM Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | GPRS850/2 slots | Front | 190 | 836.6 | 31.13 | 1.88 | 31.5 | 0.298 | 1.089 | 0.325 |
| 13 | GPRS850/2 slots | Back | 190 | 836.6 | 31.13 | -3.10 | 31.5 | **0.387** | 1.089 | 0.421 |
| | GPRS850/2 slots | Left | 190 | 836.6 | 31.13 | 1.31 | 31.5 | 0.135 | 1.089 | 0.147 |
| | GPRS850/2 slots | Right | 190 | 836.6 | 31.13 | 1.32 | 31.5 | 0.112 | 1.089 | 0.122 |
| | GPRS850/2 slots | Bottom | 190 | 836.6 | 31.13 | 0.48 | 31.5 | 0.101 | 1.089 | 0.110 |
| | GPRS1900/3 slots | Front | 512 | 1850.2 | 26.17 | -0.03 | 26.5 | 0.243 | 1.079 | 0.262 |
| 14 | GPRS1900/3 slots | Back | 512 | 1850.2 | 26.17 | 2.03 | 26.5 | **0.337** | 1.079 | 0.364 |
| | GPRS1900/3 slots | Left | 512 | 1850.2 | 26.17 | 0.67 | 26.5 | 0.132 | 1.079 | 0.142 |
| | GPRS1900/3 slots | Right | 512 | 1850.2 | 26.17 | 0.58 | 26.5 | 0.147 | 1.079 | 0.159 |
| | GPRS1900/3 slots | Bottom | 512 | 1850.2 | 26.17 | 1.02 | 26.5 | 0.205 | 1.079 | 0.221 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ WCDMA Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band II/RMC | Front | 9538 | 1907.6 | 22.91 | 0.66 | 23.0 | 0.316 | 1.021 | 0.323 |
| 15 | Band II/RMC | Back | 9538 | 1907.6 | 22.91 | 4.65 | 23.0 | **0.621** | 1.021 | 0.634 |
| | Band II/RMC | Left | 9538 | 1907.6 | 22.91 | 0.53 | 23.0 | 0.245 | 1.021 | 0.250 |
| | Band II/RMC | Right | 9538 | 1907.6 | 22.91 | 0.96 | 23.0 | 0.269 | 1.021 | 0.275 |
| | Band II/RMC | Bottom | 9538 | 1907.6 | 22.91 | -0.96 | 23.0 | 0.418 | 1.021 | 0.427 |
| | Band V/RMC | Front | 4183 | 836.6 | 23.20 | 2.00 | 23.5 | 0.168 | 1.072 | 0.180 |
| 16 | Band V/RMC | Back | 4183 | 836.6 | 23.20 | -1.30 | 23.5 | **0.305** | 1.072 | 0.327 |
| | Band V/RMC | Left | 4183 | 836.6 | 23.20 | -1.59 | 23.5 | 0.100 | 1.072 | 0.107 |
| | Band V/RMC | Right | 4183 | 836.6 | 23.20 | 0.63 | 23.5 | 0.125 | 1.072 | 0.134 |
| | Band V/RMC | Bottom | 4183 | 836.6 | 23.20 | 1.18 | 23.5 | 0.198 | 1.072 | 0.212 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ FDD-LTE Band 2(20MHz) QPSK Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band2/1RB#99 | Front | 18900 | 1880 | 24.13 | -0.66 | 24.5 | 0.332 | 1.089 | 0.362 |
| 17 | Band2/1RB#99 | Back | 18900 | 1880 | 24.13 | -1.03 | 24.5 | **0.674** | 1.089 | 0.734 |
| | Band2/1RB#99 | Left | 18900 | 1880 | 24.13 | -1.43 | 24.5 | 0.215 | 1.089 | 0.234 |
| | Band2/1RB#99 | Right | 18900 | 1880 | 24.13 | 0.65 | 24.5 | 0.257 | 1.089 | 0.280 |
| | Band2/1RB#99 | Bottom | 18900 | 1880 | 24.13 | -1.95 | 24.5 | 0.514 | 1.089 | 0.560 |
| | Band2/50%RB#49 | Front | 18900 | 1880 | 22.97 | 1.89 | 23.0 | 0.310 | 1.007 | 0.312 |
| | Band2/50%RB#49 | Back | 18900 | 1880 | 22.97 | 1.92 | 23.0 | 0.620 | 1.007 | 0.624 |
| | Band2/50%RB#49 | Left | 18900 | 1880 | 22.97 | -1.58 | 23.0 | 0.197 | 1.007 | 0.198 |
| | Band2/50%RB#49 | Right | 18900 | 1880 | 22.97 | 0.11 | 23.0 | 0.206 | 1.007 | 0.207 |
| | Band2/50%RB#49 | Bottom | 18900 | 1880 | 22.97 | 1.29 | 23.0 | 0.478 | 1.007 | 0.481 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ FDD-LTE Band 5(10MHz) QPSK Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band5/1RB#0 | Front | 20600 | 844 | 23.70 | -0.27 | 24.0 | 0.285 | 1.072 | 0.306 |
| 18 | Band5/1RB#0 | Back | 20600 | 844 | 23.70 | 1.01 | 24.0 | **0.322** | 1.072 | 0.345 |
| | Band5/1RB#0 | Left | 20600 | 844 | 23.70 | -3.82 | 24.0 | 0.272 | 1.072 | 0.292 |
| | Band5/1RB#0 | Right | 20600 | 844 | 23.70 | -0.23 | 24.0 | 0.180 | 1.072 | 0.193 |
| | Band5/1RB#0 | Bottom | 20600 | 844 | 23.70 | -3.57 | 24.0 | 0.104 | 1.072 | 0.111 |
| | Band5/50%RB#12 | Front | 20525 | 836.5 | 22.73 | -1.61 | 23.0 | 0.234 | 1.064 | 0.249 |
| | Band5/50%RB#12 | Back | 20525 | 836.5 | 22.73 | 0.84 | 23.0 | 0.278 | 1.064 | 0.296 |
| | Band5/50%RB#12 | Left | 20525 | 836.5 | 22.73 | -0.89 | 23.0 | 0.216 | 1.064 | 0.230 |
| | Band5/50%RB#12 | Right | 20525 | 836.5 | 22.73 | 0.25 | 23.0 | 0.138 | 1.064 | 0.147 |
| | Band5/50%RB#12 | Bottom | 20525 | 836.5 | 22.73 | -1.14 | 23.0 | 0.076 | 1.064 | 0.081 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g)<br>Averaged over 1g** | | | | | |

➢ FDD-LTE Band 12(10MHz) QPSK Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band12/1RB#49 | Front | 23130 | 711 | 23.77 | -2.25 | 24.0 | 0.091 | 1.054 | 0.096 |
| 19 | Band12/1RB#49 | Back | 23130 | 711 | 23.77 | -4.00 | 24.0 | **0.106** | 1.054 | 0.112 |
| | Band12/1RB#49 | Left | 23130 | 711 | 23.77 | 0.21 | 24.0 | 0.035 | 1.054 | 0.037 |
| | Band12/1RB#49 | Right | 23130 | 711 | 23.77 | 1.96 | 24.0 | 0.045 | 1.054 | 0.047 |
| | Band12/1RB#49 | Bottom | 23130 | 711 | 23.77 | -1.67 | 24.0 | 0.063 | 1.054 | 0.066 |
| | Band12/50%RB#0 | Front | 23130 | 711 | 22.77 | -0.34 | 23.0 | 0.076 | 1.054 | 0.080 |
| | Band12/50%RB#0 | Back | 23130 | 711 | 22.77 | 1.94 | 23.0 | 0.095 | 1.054 | 0.100 |
| | Band12/50%RB#0 | Left | 23130 | 711 | 22.77 | -1.85 | 23.0 | 0.026 | 1.054 | 0.027 |
| | Band12/50%RB#0 | Right | 23130 | 711 | 22.77 | 1.49 | 23.0 | 0.033 | 1.054 | 0.035 |
| | Band12/50%RB#0 | Bottom | 23130 | 711 | 22.77 | 1.66 | 23.0 | 0.052 | 1.054 | 0.055 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g)<br>Averaged over 1g** | | | | | |

➢ TDD-LTE Band 41(20MHz) QPSK Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | D.C Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Band41/1RB#99 | Front | 40640 | 2595 | 24.13 | -2.32 | 24.5 | 0.082 | 1.089 | 1.008 | 0.090 |
| 20 | Band41/1RB#99 | Back | 40640 | 2595 | 24.13 | -2.35 | 24.5 | **0.211** | 1.089 | 1.008 | 0.232 |
| | Band41/1RB#99 | Left | 40640 | 2595 | 24.13 | 0.79 | 24.5 | 0.019 | 1.089 | 1.008 | 0.021 |
| | Band41/1RB#99 | Right | 40640 | 2595 | 24.13 | -2.04 | 24.5 | 0.025 | 1.089 | 1.008 | 0.027 |
| | Band41/1RB#99 | Bottom | 40640 | 2595 | 24.13 | -1.68 | 24.5 | 0.064 | 1.089 | 1.008 | 0.070 |
| | Band41/50%RB#49 | Front | 40640 | 2595 | 23.07 | -0.81 | 23.5 | 0.068 | 1.104 | 1.008 | 0.076 |
| | Band41/50%RB#49 | Back | 40640 | 2595 | 23.07 | -1.98 | 23.5 | 0.186 | 1.104 | 1.008 | 0.207 |
| | Band41/50%RB#49 | Left | 40640 | 2595 | 23.07 | 0.01 | 23.5 | 0.016 | 1.104 | 1.008 | 0.018 |
| | Band41/50%RB#49 | Right | 40640 | 2595 | 23.07 | 0.41 | 23.5 | 0.019 | 1.104 | 1.008 | 0.021 |
| | Band41/50%RB#49 | Bottom | 40640 | 2595 | 23.07 | 1.38 | 23.5 | 0.053 | 1.104 | 1.008 | 0.059 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population** | | | | | | **1.6 W/kg (mW/g)<br>Averaged over 1g** | | | | | |

➢ FDD-LTE Band 66(20MHz) QPSK Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band66/1RB#99 | Front | 132322 | 1745 | 23.82 | 1.72 | 24.0 | 0.395 | 1.042 | 0.412 |
| 21 | Band66/1RB#99 | Back | 132322 | 1745 | 23.82 | -0.35 | 24.0 | **0.737** | 1.042 | 0.768 |
| | Band66/1RB#99 | Left | 132322 | 1745 | 23.82 | -0.07 | 24.0 | 0.268 | 1.042 | 0.279 |
| | Band66/1RB#99 | Right | 132322 | 1745 | 23.82 | -1.60 | 24.0 | 0.234 | 1.042 | 0.244 |
| | Band66/1RB#99 | Bottom | 132322 | 1745 | 23.82 | 0.85 | 24.0 | 0.317 | 1.042 | 0.330 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band66/50%RB#0 | Front | 132322 | 1745 | 22.68 | 0.13 | 23.0 | 0.354 | 1.076 | 0.381 |
| | Band66/50%RB#0 | Back | 132322 | 1745 | 22.68 | 0.49 | 23.0 | 0.682 | 1.076 | 0.734 |
| | Band66/50%RB#0 | Left | 132322 | 1745 | 22.68 | 0.97 | 23.0 | 0.236 | 1.076 | 0.254 |
| | Band66/50%RB#0 | Right | 132322 | 1745 | 22.68 | 0.58 | 23.0 | 0.218 | 1.076 | 0.235 |
| | Band66/50%RB#0 | Bottom | 132322 | 1745 | 22.68 | -0.55 | 23.0 | 0.290 | 1.076 | 0.312 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ FDD-LTE Band 71(20MHz) QPSK Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|
| | Band71/1RB#99 | Front | 133322 | 683 | 23.73 | 1.85 | 24.0 | 0.054 | 1.064 | 0.057 |
| 22 | Band71/1RB#99 | Back | 133322 | 683 | 23.73 | -0.80 | 24.0 | **0.080** | 1.064 | 0.085 |
| | Band71/1RB#99 | Left | 133322 | 683 | 23.73 | -0.46 | 24.0 | 0.020 | 1.064 | 0.021 |
| | Band71/1RB#99 | Right | 133322 | 683 | 23.73 | -0.43 | 24.0 | 0.025 | 1.064 | 0.027 |
| | Band71/1RB#99 | Bottom | 133322 | 683 | 23.73 | 0.12 | 24.0 | 0.029 | 1.064 | 0.031 |
| | Band71/50%RB#24 | Front | 133322 | 683 | 22.62 | 1.25 | 23.0 | 0.043 | 1.091 | 0.047 |
| | Band71/50%RB#24 | Back | 133322 | 683 | 22.62 | -2.34 | 23.0 | 0.069 | 1.091 | 0.075 |
| | Band71/50%RB#24 | Left | 133322 | 683 | 22.62 | 0.87 | 23.0 | 0.017 | 1.091 | 0.019 |
| | Band71/50%RB#24 | Right | 133322 | 683 | 22.62 | -1.64 | 23.0 | 0.019 | 1.091 | 0.021 |
| | Band71/50%RB#24 | Bottom | 133322 | 683 | 22.62 | 1.13 | 23.0 | 0.022 | 1.091 | 0.024 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ WLAN 2.4GHz Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | D.C Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 23 | 2.4GHz/802.11b | Front | 11 | 2462 | 15.25 | -2.68 | 15.5 | **0.048** | 1.059 | 1.000 | 0.051 |
| | 2.4GHz/802.11b | Back | 11 | 2462 | 15.25 | -3.89 | 15.5 | 0.033 | 1.059 | 1.000 | 0.035 |
| | 2.4GHz/802.11b | Left | 11 | 2462 | 15.25 | -1.26 | 15.5 | 0.015 | 1.059 | 1.000 | 0.016 |
| | 2.4GHz/802.11b | Top | 11 | 2462 | 15.25 | 1.47 | 15.5 | 0.019 | 1.059 | 1.000 | 0.020 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

➢ Bluetooth Body SAR in Hotspot mode

| Plot No. | Band/Mode | Test Position | CH. | Freq. (MHz) | Ave. Power (dBm) | Power Drift (dB) | Tune-Up Limit (dBm) | Meas. $SAR_{1g}$ (W/kg) | Scaling Factor | D.C Factor | Reported $SAR_{1g}$ (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 24 | BT/8DPSK | Front | 0 | 2402 | 6.58 | 0.08 | 7.0 | **0.019** | 1.102 | 1.000 | 0.021 |
| | BT/8DPSK | Back | 0 | 2402 | 6.58 | 0.03 | 7.0 | 0.018 | 1.102 | 1.000 | 0.020 |
| | BT/8DPSK | Left | 0 | 2402 | 6.58 | 1.11 | 7.0 | 0.006 | 1.102 | 1.000 | 0.007 |
| | BT/8DPSK | Top | 0 | 2402 | 6.58 | 1.10 | 7.0 | 0.008 | 1.102 | 1.000 | 0.009 |
| **ANSI / IEEE C95.1 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population** | | | | | | **1.6 W/kg (mW/g) Averaged over 1g** | | | | | |

**Note:**

1. Per KDB 447498 D04v01, for each exposure position, if the highest output channel Reported SAR ≤0.8W/kg, other channels SAR testing is not necessary.
2. Additional WLAN SAR testing was performed for simultaneous transmission analysis.
3. For Hotspot SAR testing, per KDB 941225 D06v02r01, for EUT dimension ≥ 9cm*5cm, the test distance is 10mm. SAR must be measured for all surfaces and sides with a transmitting antenna located within 2.5cm from that surface or edge.
4. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If HSDPA output power is < 0.25dB higher than RMC 12.2kbps, or Reported SAR with RMC 12.2kbps setting is ≤ 1.2W/kg, HSDPA SAR evaluation can be excluded.
5. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥0.8W/kg.
6. Per KDB 648474 D04v01r03, when the Reported SAR for a body-worn accessory measured without a headset connected to the handset is ＞1.2 W/kg, SAR testing with a headset connected to the handset is required.

7. Per KDB 941225 D05v02r05, 100% RB allocation SAR measurement is not required when the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel.
8. According to KDB 865664 D02v01r02, SAR plot is required for the highest measured SAR in each exposure configuration, wireless mode and frequency band combination.
9. Highlight part of test data means repeated test.

## 15.4 Repeated SAR measurement

Repeated SAR measurement is not required due to themeasuredSAR is ＜0.8W/kgper KDB 865664 D01v01r04.

## 15.5 Multi-Band Simultaneous Transmission Considerations

➢ **Simultaneous Transmission Capabilities**

According to FCC KDB Publication 447498 D04v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the EUT are shown in below Figure and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.

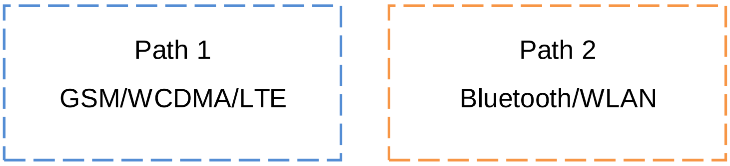



**Fig.15.1 Simultaneous Transmission Paths**

➢ **Multi-Band simultaneous Transmission Consideration**

| | Position | Applicable Combination |
|---|---|---|
| **Simultaneous Transmission Consideration** | Head | WWAN (Voice) + WLAN 2.4 GHz |
| | | WWAN (Voice) + Bluetooth |
| | Body | WWAN (Voice) + WLAN 2.4 GHz |
| | | WWAN (Voice) + Bluetooth |
| | Hotspot | WWAN (Data) + WLAN 2.4 GHz |
| | | WWAN (Data) + Bluetooth |

**Note:**

1. WLAN 2.4GHz Band and Bluetooth share the same antenna, and cannot transmit simultaneously.
2. GSM/WCDMA/LTE shares the same antenna, and cannot transmit simultaneously.
3. The Report SAR summation is calculated based on the same configuration and test position.
4. Per KDB 447498 D04v01, simultaneous transmission SAR is compliant if,
   i. Scalar SAR summation < 1.6 W/kg.
   ii. SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where $(x_1, y_1, z_1)$ and $(x_2, y_2, z_2)$ are the coordinates of the extrapolated peak SAR locations in the zoom scan If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary
   iii. Simultaneously transmission SAR measurement, and the Reported multi-band SAR < 1.6 W/kg

## 15.6 SAR Simultaneous Transmission Analysis

➢ **Simultaneous Transmission**

| Position | | Standalone SAR(W/kg) | | | Σ $SAR_{1g}$ (W/kg) | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 1+2 | 1+3 |
| | | WWAN | 2.4G WLAN | BT | | |
| Head | Right Cheek | 0.389 | 0.158 | 0.028 | 0.547 | 0.417 |
| | Right Tilted | 0.207 | 0.124 | 0.020 | 0.331 | 0.227 |
| | Left Cheek | 0.508 | 0.138 | 0.025 | 0.646 | 0.533 |
| | Left Tilted | 0.266 | 0.108 | 0.017 | 0.374 | 0.283 |
| Body-worn | Front | 0.412 | 0.051 | 0.021 | 0.463 | 0.433 |
| | Back | 0.768 | 0.035 | 0.020 | **0.803** | 0.788 |
| Hotspot | Front | 0.412 | 0.051 | 0.021 | 0.463 | 0.433 |
| | Back | 0.768 | 0.035 | 0.020 | **0.803** | 0.788 |
| | Left | 0.292 | 0.016 | 0.007 | 0.308 | 0.299 |
| | Right | 0.280 | / | / | 0.280 | 0.280 |
| | Top | / | 0.020 | 0.009 | 0.020 | 0.009 |
| | Bottom | 0.560 | / | / | 0.560 | 0.560 |

➢ **Simultaneous Transmission Conclusion**

The above numerical summed SAR results for all the case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D04v01.

## 15.7 Measurement Uncertainty

Per KDB865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg, the extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. The equivalent ratio (1.5/1.6) is applied to extremity and occupational exposure conditions.

# 16 Reference

[1]. FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2]. ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3]. IEEE Std. 1528-2013, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, September2013

[4]. OpenSAR V5 Software User Manual

[5]. FCC KDB 248227 D01 v02r02, “SAR GUIDANCE FOR IEEE 802.11 (Wi-Fi) TRANSMITTERS”, October 2015

[6]. FCC KDB 447498 D04 v01, “RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES”, November 2021

[7]. FCC KDB 648474 D04 v01r03, “SAR EVALUATION CONSIDERATIONS FOR WIRELESS HANDSETS”, October 2015

[8]. FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, October 2015

[9]. FCC KDB 941225 D05 v02r05, “SAR EVALUATION CONSIDERATIONS FOR LTE DEVICES”, Dec 2015

[10]. FCC KDB 941225 D06 v02r01, " SAR EVALUATION PROCEDURES FOR PORTABLE DEVICES WITH WIRELESS ROUTER CAPABILITIES", October 2015

[11]. FCC KDB 865664 D01 v01r04, “SAR MEASUREMENT REQUIREMENTS FOR 100 MHz TO 6 GHz”, August 2015

# Appendix A: Plots of SAR System Check

# System check at 750 MHz

Date of measurement: 2/12/2022

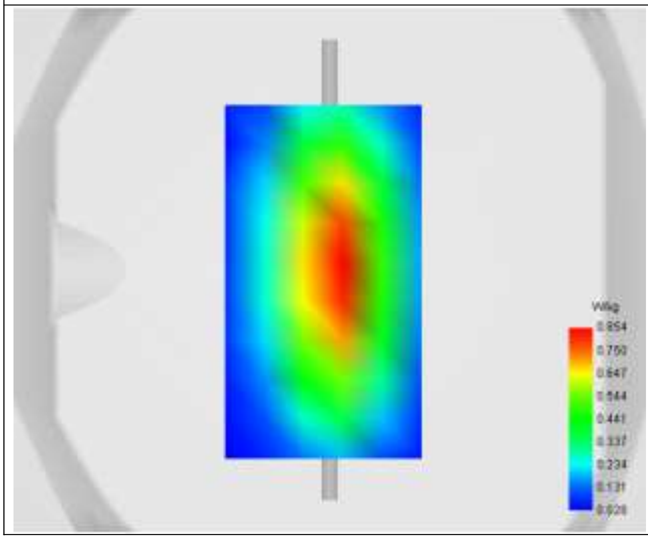
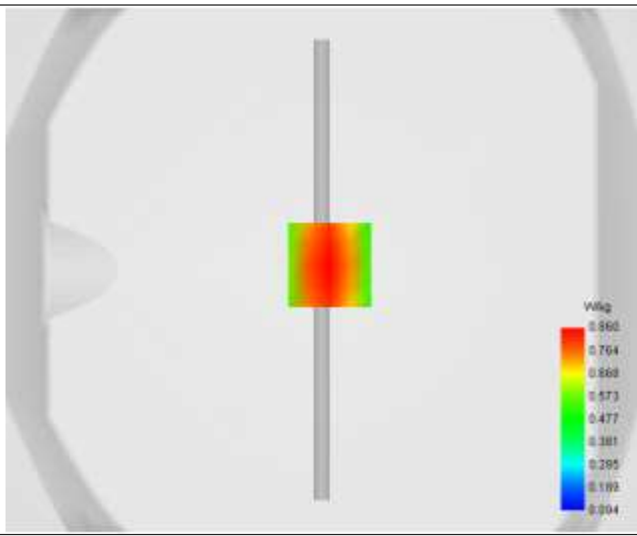
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.70 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Dipole |
| Band | CW750 |
| Channels | Middle |
| Signal | CW (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 750.000000 |
| **Relative permitivity (real part)** | 42.531432 |
| **Conductivity (S/m)** | 0.900000 |

## C. SAR Surface and Volume

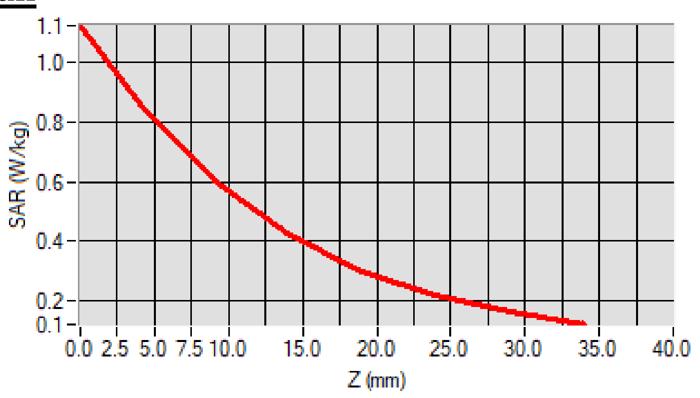
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=3.00, Y=2.00 ; SAR Peak: 1.19 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.570213 |
| SAR 1g (W/Kg) | 0.869024 |
| Variation (%) | 2.390000 |

## E. Z Axis Scan



# System check at 835 MHz

Date of measurement: 2/12/2022

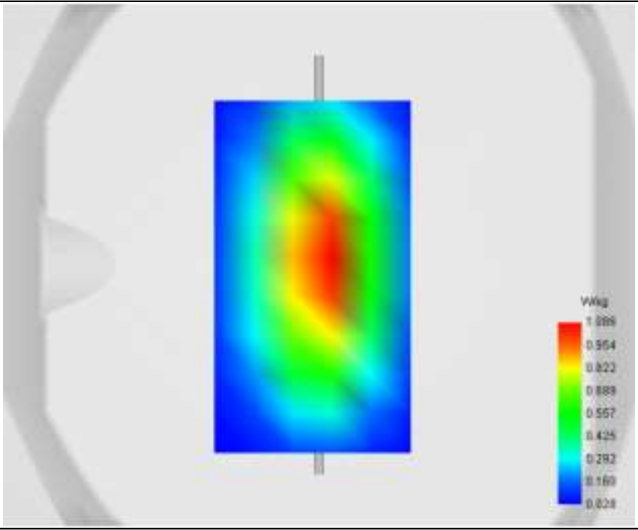
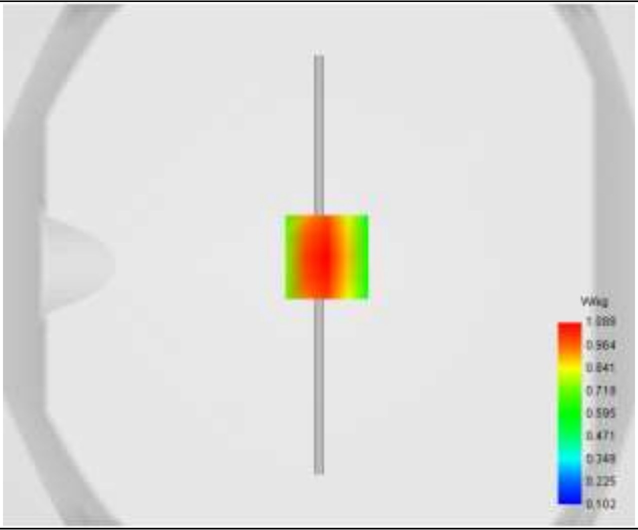
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.73 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Dipole |
| Band | CW835 |
| Channels | Middle |
| Signal | CW (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 835.000000 |
| **Relative permitivity (real part)** | 42.330000 |
| **Conductivity (S/m)** | 0.922044 |

## C. SAR Surface and Volume

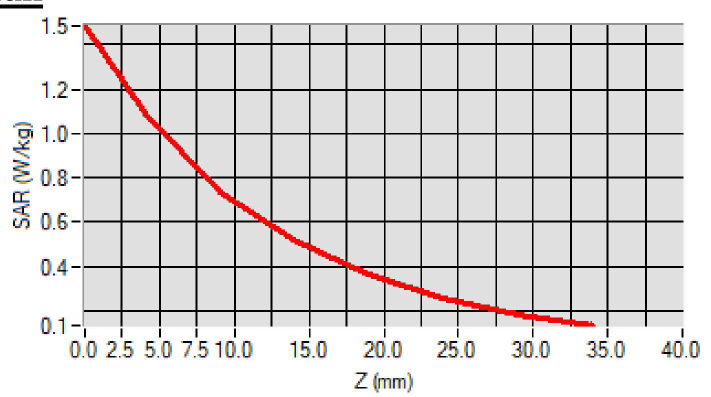
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=3.00, Y=3.00 ; SAR Peak: 1.50 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.620142 |
| SAR 1g (W/Kg) | 0.96630 |
| Variation (%) | 2.740000 |

## E. Z Axis Scan



# System check at 1750 MHz

Date of measurement: 6/12/2022

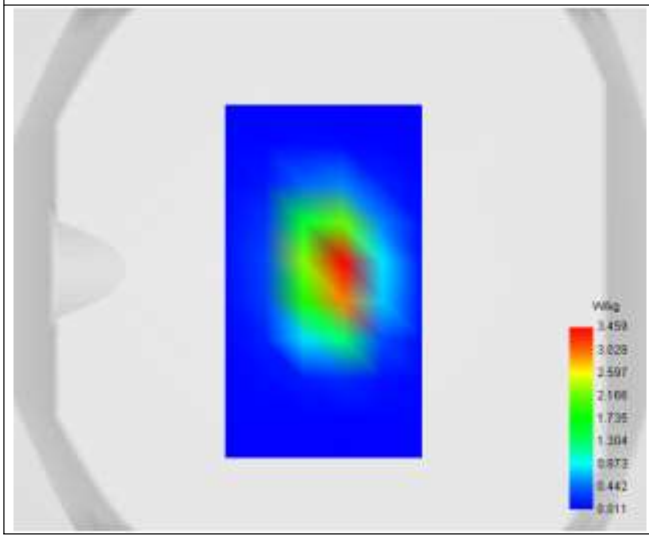
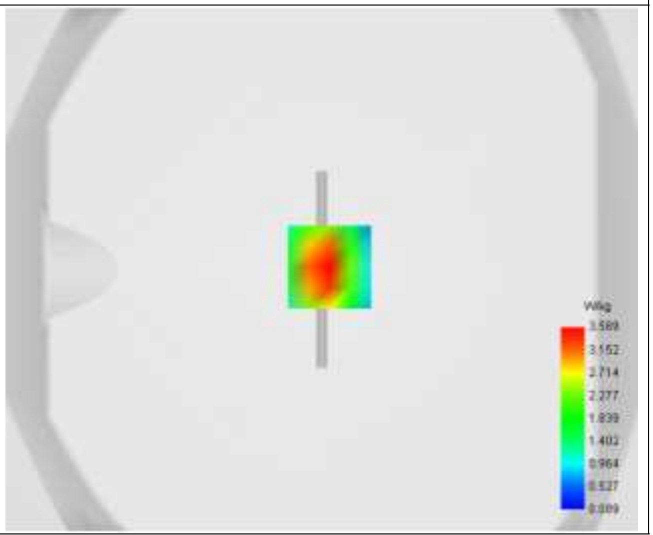
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.05 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Dipole |
| Band | CW1750 |
| Channels | Middle |
| Signal | CW (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1750.000000 |
| **Relative permitivity (real part)** | 39.660422 |
| **Conductivity (S/m)** | 1.350374 |

## C. SAR Surface and Volume

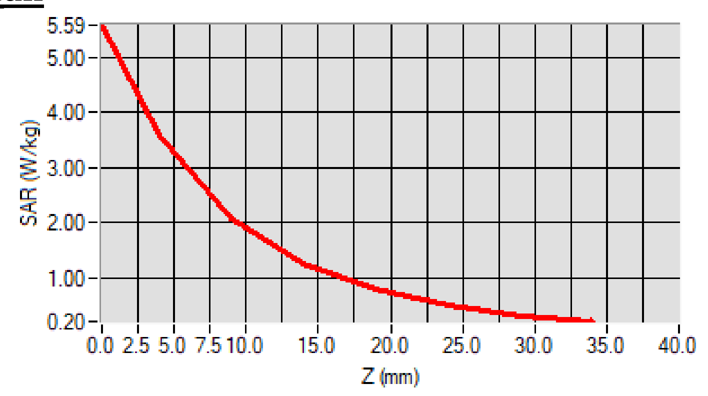
| **SURFACE SAR** | **VOLUME SAR** |
|---|---|
|  |  |

Maximum location: X=3.00, Y=1.00 ; SAR Peak: 5.69 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 1.903010 |
| SAR 1g (W/Kg) | 3.590114 |
| Variation (%) | 1.420000 |

## E. Z Axis Scan



# System check at 1900 MHz

Date of measurement: 6/12/2022

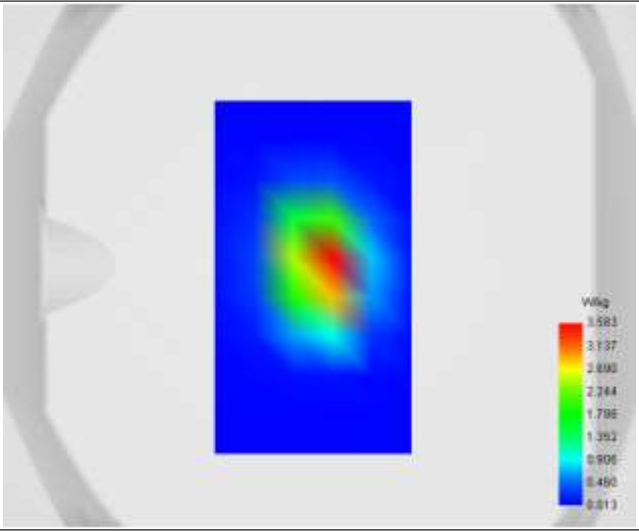
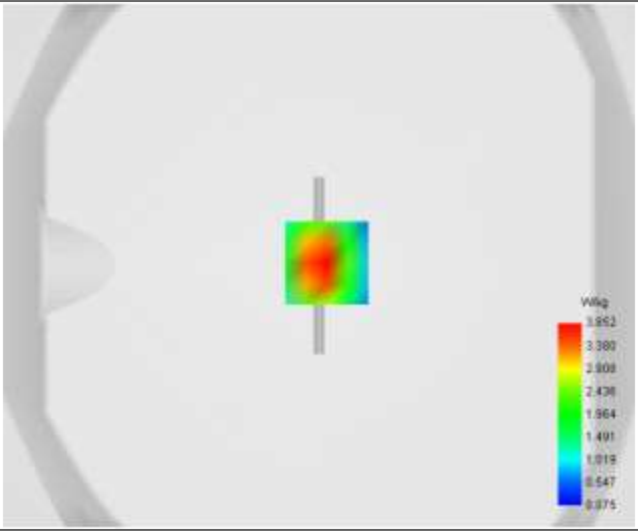
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.00 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Dipole |
| Band | CW1900 |
| Channels | Middle |
| Signal | CW (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1900.000000 |
| **Relative permittivity (real part)** | 39.700000 |
| **Conductivity (S/m)** | 1.390100 |

## C. SAR Surface and Volume

| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |



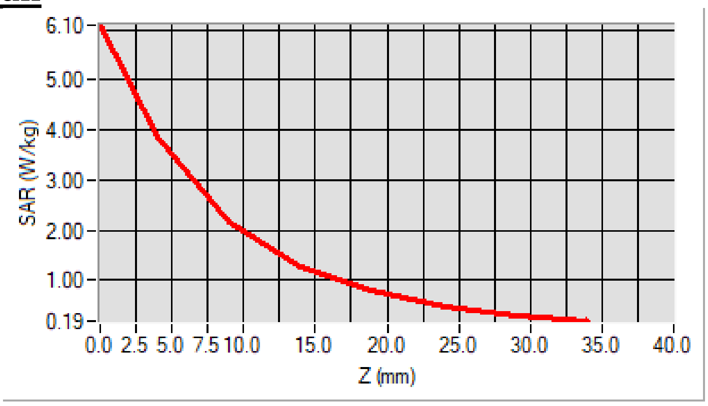


Maximum location: X=3.00, Y=1.00 ; SAR Peak: 6.27 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 2.011121 |
| SAR 1g (W/Kg) | 3.942042 |
| Variation (%) | 0.690000 |

## E. Z Axis Scan



# System check at 2450 MHz

Date of measurement: 10/12/2022

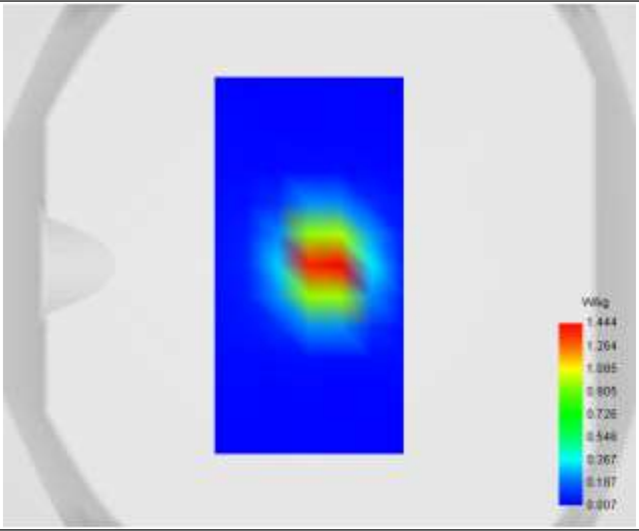
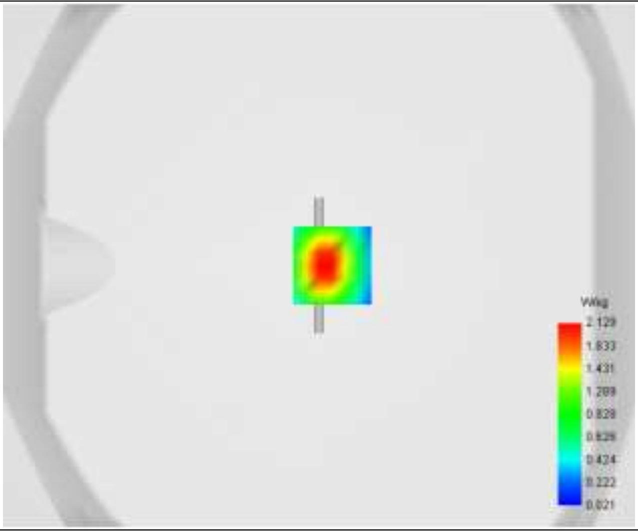
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.46 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 7x7x7,dx=5mm dy=5mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Dipole |
| Band | CW2450 |
| Channels | Middle |
| Signal | CW (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 2450.000000 |
| **Relative permitivity (real part)** | 39.880000 |
| **Conductivity (S/m)** | 1.823051 |

## C. SAR Surface and Volume

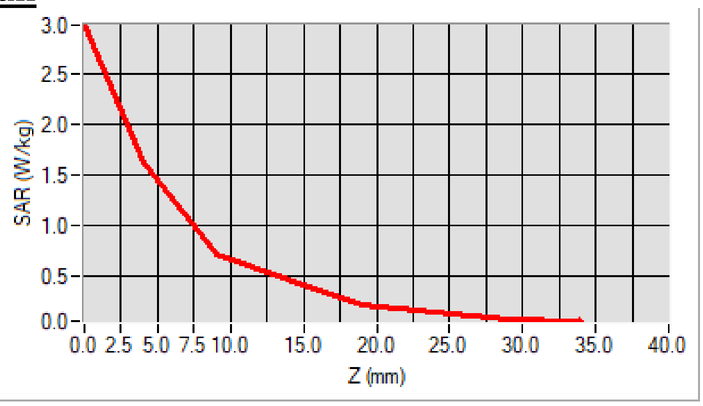
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=5.00, Y=0.00 ; SAR Peak: 2.67 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.968317 |
| SAR 1g (W/Kg) | 2.137017 |
| Variation (%) | -1.620000 |

## E. Z Axis Scan



# System check at 2600 MHz

Date of measurement: 10/12/2022

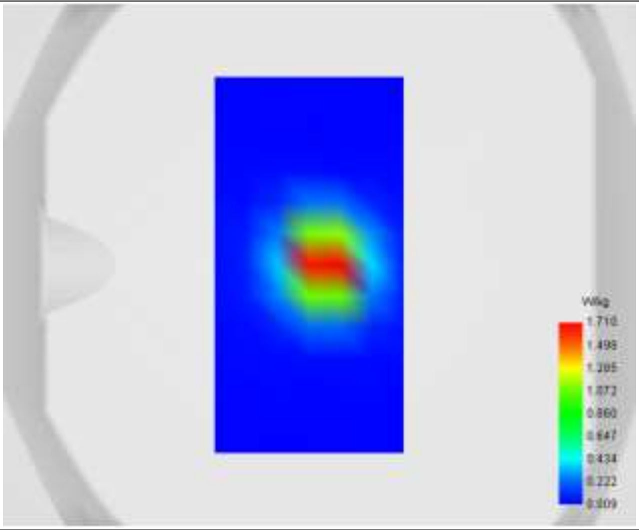
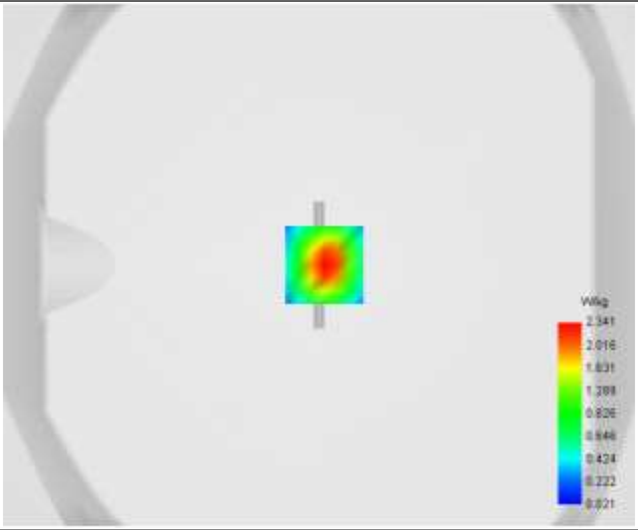
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.27 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 7x7x7,dx=5mm dy=5mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Dipole |
| Band | CW2600 |
| Channels | Middle |
| Signal | CW (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 2600.000000 |
| **Relative permitivity (real part)** | 39.550000 |
| **Conductivity (S/m)** | 1.970122 |

## C. SAR Surface and Volume

| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |



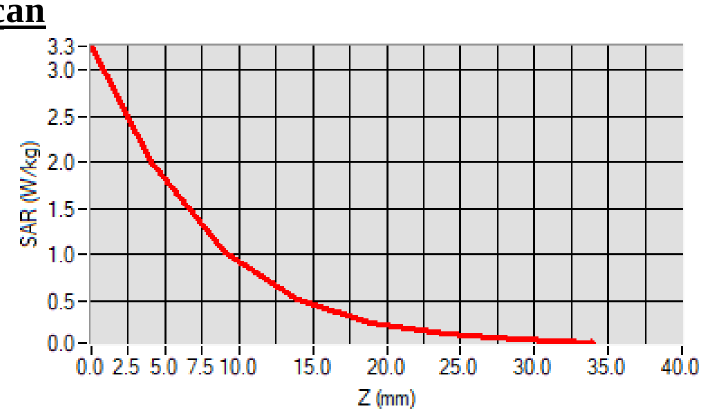


Maximum location: X=3.00, Y=0.00 ; SAR Peak: 3.24 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.976115 |
| SAR 1g (W/Kg) | 2.250112 |
| Variation (%) | -0.120000 |

## E. Z Axis Scan



# Appendix B: Plots of SAR Test Data

# SAR Measurement at GSM850 (Cheek, Left)

Date of measurement: 2/12/2022

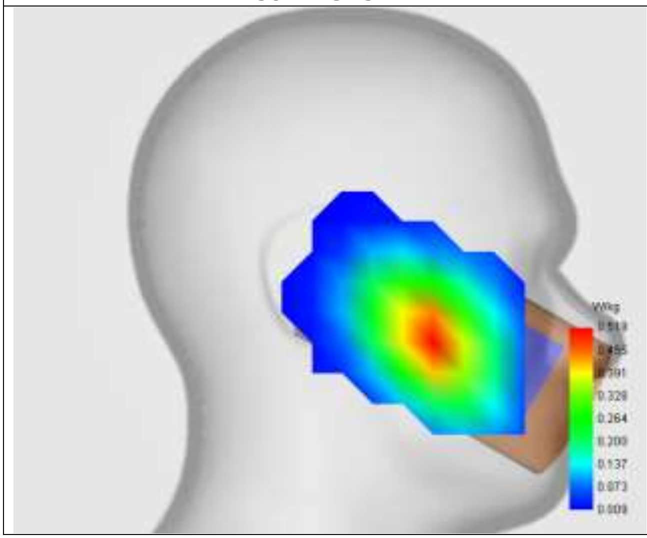
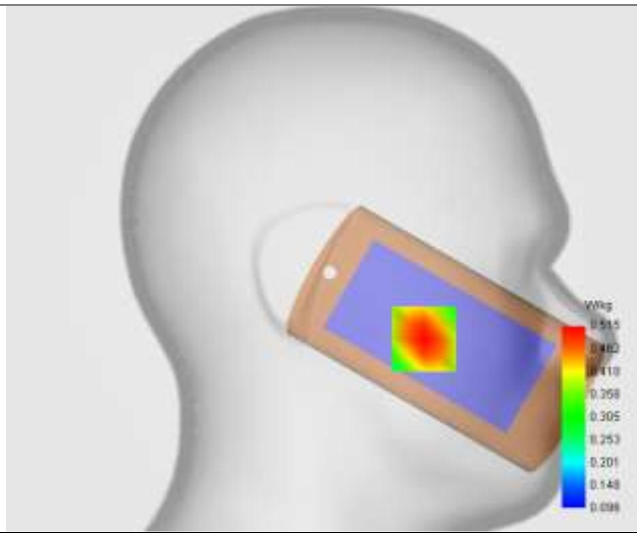
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.73 |
| Area Scan | dx=15mm dy=15mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Left head |
| Device Position | Cheek |
| Band | GSM850 |
| Channels | Middle |
| Signal | TDMA (Crest factor: 8.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 836.600000 |
| **Relative permitivity (real part)** | 42.484302 |
| **Conductivity (S/m)** | 0.923112 |

## C. SAR Surface and Volume

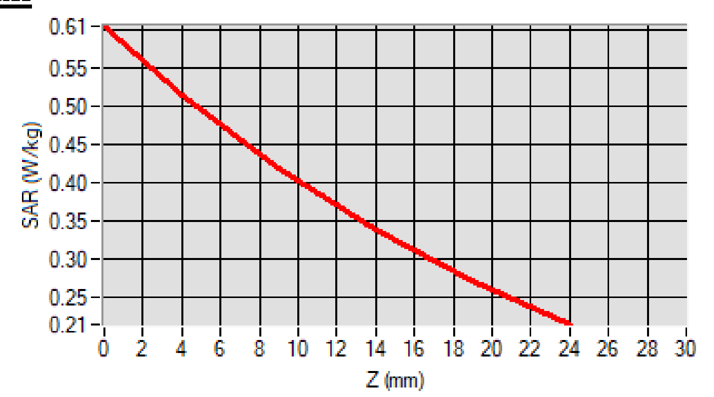
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-50.00, Y=-35.00 ; SAR Peak: 0.61 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.367613 |
| SAR 1g (W/Kg) | 0.494013 |
| Variation (%) | -4.820000 |

## E. Z Axis Scan



## SAR Measurement at GSM1900 (Cheek, Right)

Date of measurement: 6/12/2022

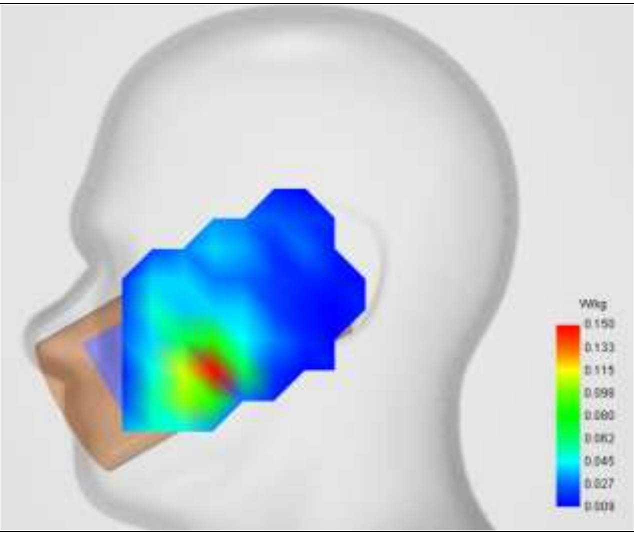
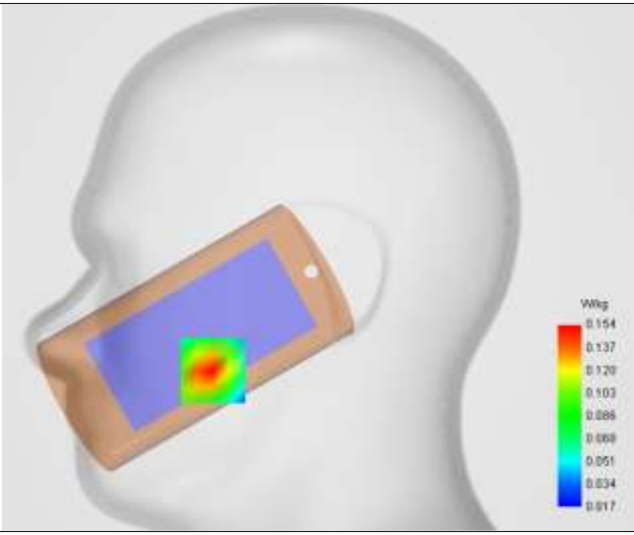
### A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.00 |
| Area Scan | dx=15mm dy=15mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Right head |
| Device Position | Cheek |
| Band | GSM1900 |
| Channels | Middle |
| Signal | TDMA (Crest factor: 8.0) |

### B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1880.000000 |
| **Relative permitivity (real part)** | 39.630000 |
| **Conductivity (S/m)** | 1.393361 |

### C. SAR Surface and Volume

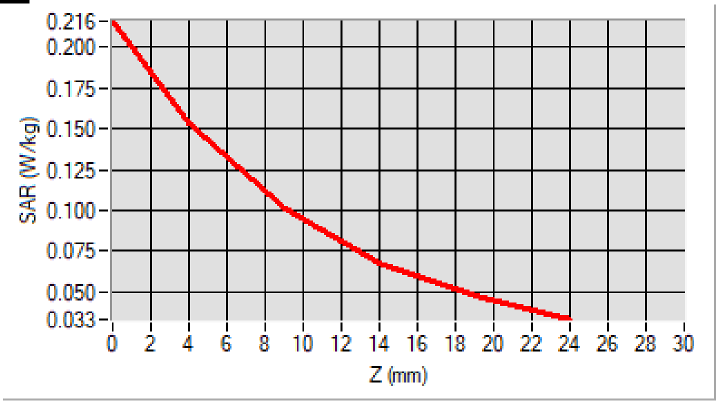
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-52.00, Y=-51.00 ; SAR Peak: 0.22 W/kg

### D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.086989 |
| SAR 1g (W/Kg) | 0.144444 |
| Variation (%) | 1.930000 |

### E. Z Axis Scan



# SAR Measurement at Band2_WCDMA1900 (Cheek, Right)

Date of measurement: 6/12/2022

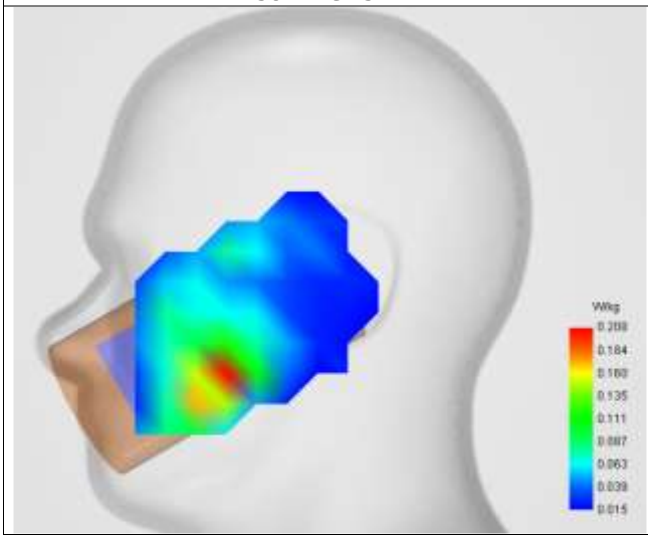
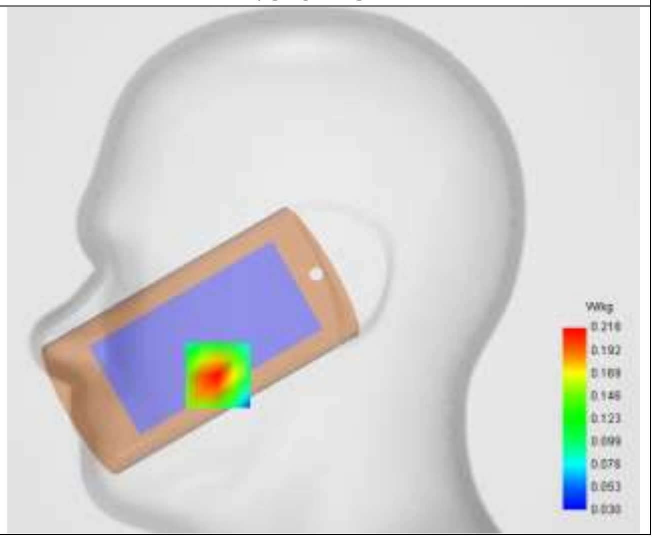
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.00 |
| Area Scan | dx=15mm dy=15mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Right head |
| Device Position | Cheek |
| Band | Band2_WCDMA1900 |
| Channels | High |
| Signal | WCDMA (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1907.600000 |
| **Relative permitivity (real part)** | 39.860000 |
| **Conductivity (S/m)** | 1.391246 |

## C. SAR Surface and Volume

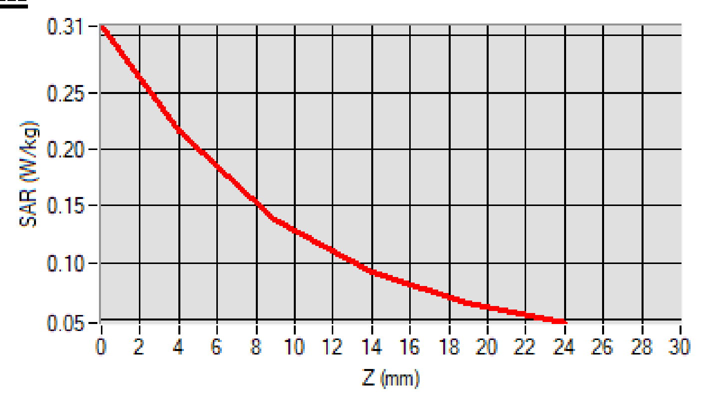
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-52.00, Y=-52.00 ; SAR Peak: 0.31 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.123724 |
| SAR 1g (W/Kg) | 0.203456 |
| Variation (%) | -0.210000 |

## E. Z Axis Scan



# SAR Measurement at Band5_WCDMA850 (Cheek, Right)

Date of measurement: 2/12/2022

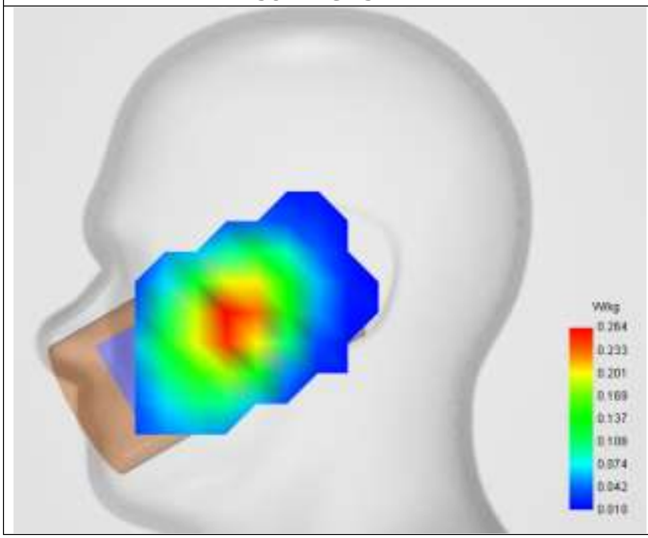
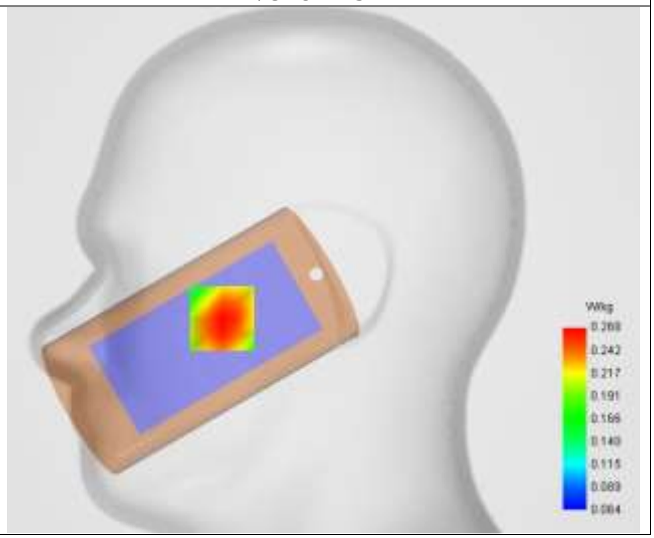
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.73 |
| Area Scan | dx=15mm dy=15mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Right head |
| Device Position | Cheek |
| Band | Band5_WCDMA850 |
| Channels | Middle |
| Signal | WCDMA (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 836.599976 |
| **Relative permitivity (real part)** | 42.350000 |
| **Conductivity (S/m)** | 0.921633 |

## C. SAR Surface and Volume

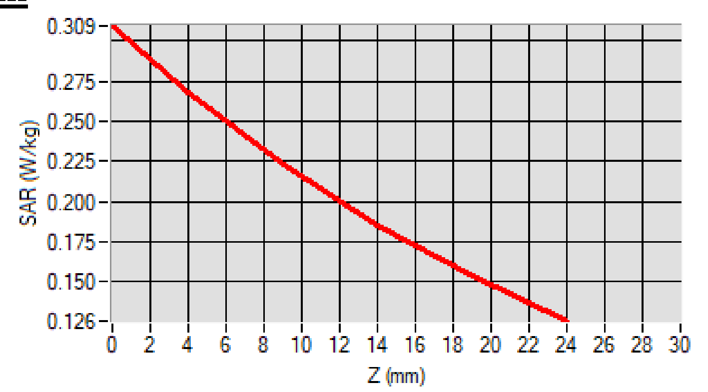
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-50.00, Y=-24.00 ; SAR Peak: 0.31 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.199452 |
| SAR 1g (W/Kg) | 0.259041 |
| Variation (%) | -0.700000 |

## E. Z Axis Scan



# SAR Measurement at LTE band 2 (Cheek, Right)

Date of measurement: 6/12/2022

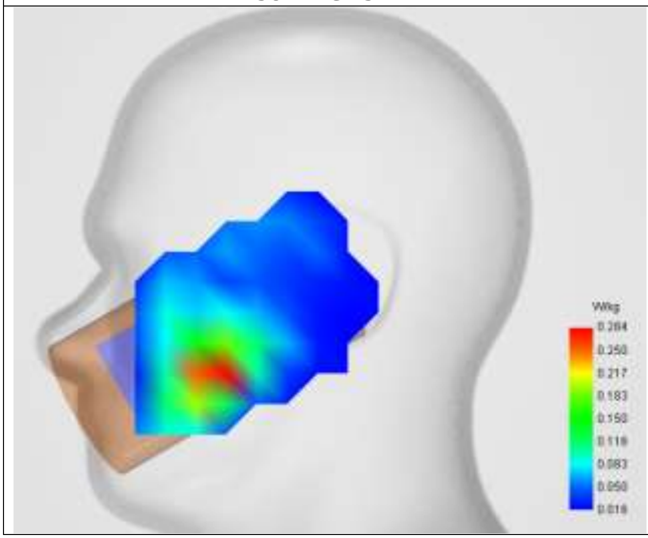
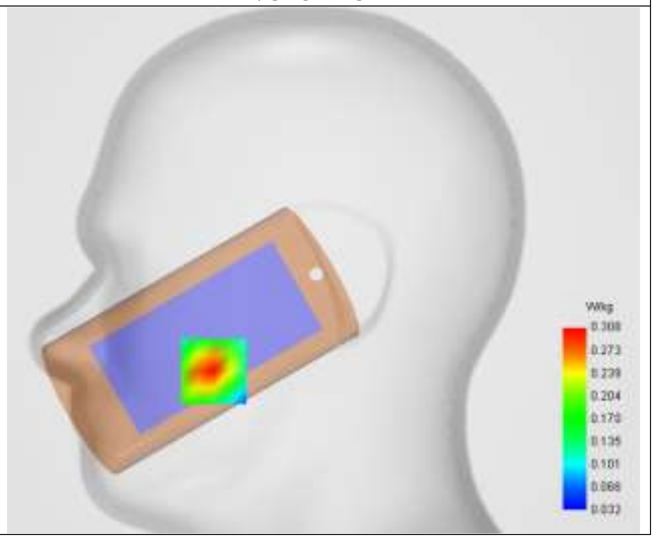
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.00 |
| Area Scan | dx=15mm dy=15mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Right head |
| Device Position | Cheek |
| Band | LTE band 2 |
| Channels | Middle |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1880.000000 |
| **Relative permitivity (real part)** | 39.561684 |
| **Conductivity (S/m)** | 1.388862 |

## C. SAR Surface and Volume

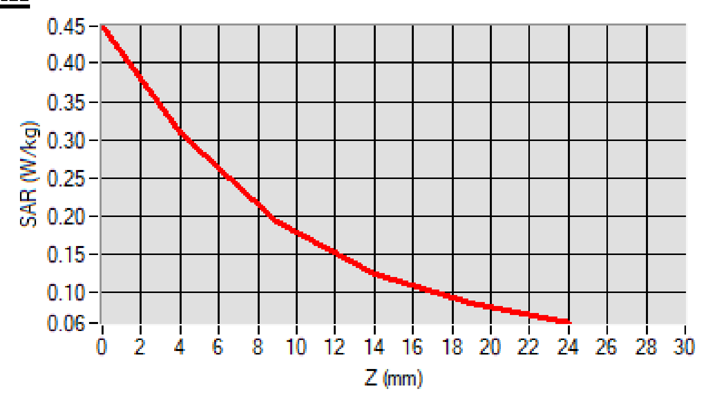
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-54.00, Y=-50.00 ; SAR Peak: 0.45 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.168282 |
| SAR 1g (W/Kg) | 0.288194 |
| Variation (%) | -2.070000 |

## E. Z Axis Scan



# SAR Measurement at LTE band 5 (Cheek, Left)

Date of measurement: 2/12/2022

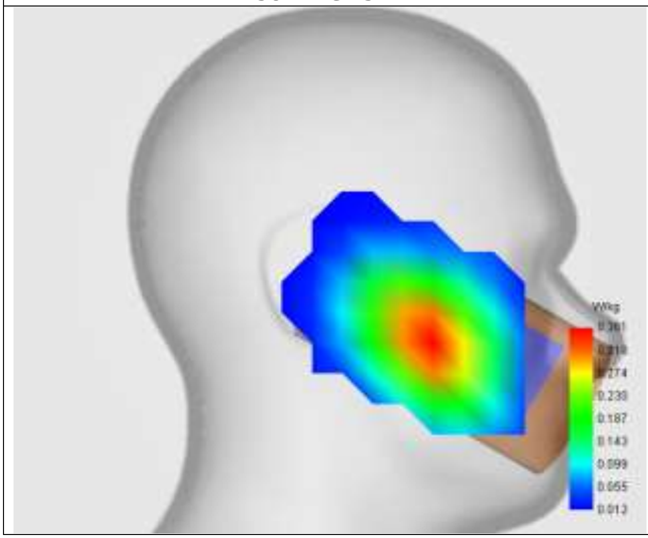
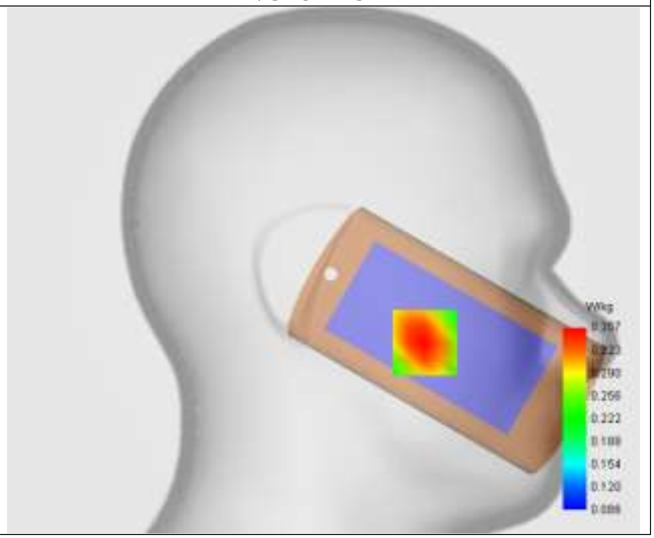
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.73 |
| Area Scan | dx=15mm dy=15mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Left head |
| Device Position | Cheek |
| Band | LTE band 5 |
| Channels | High |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 844.000000 |
| **Relative permitivity (real part)** | 42.250000 |
| **Conductivity (S/m)** | 0.911531 |

## C. SAR Surface and Volume

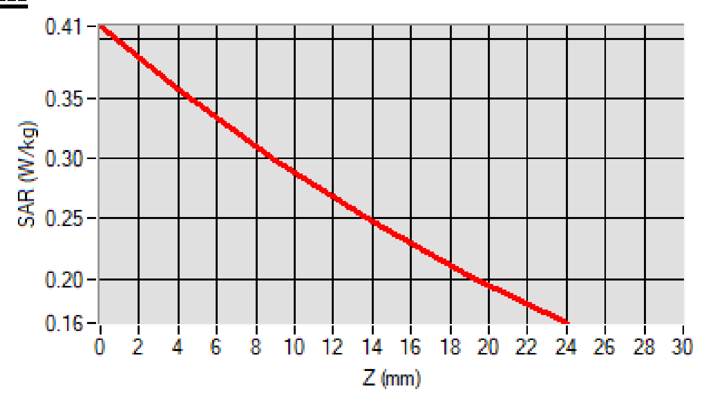
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-50.00, Y=-36.00 ; SAR Peak: 0.41 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.265048 |
| SAR 1g (W/Kg) | 0.344711 |
| Variation (%) | -0.780000 |

## E. Z Axis Scan



# SAR Measurement at LTE band 12 (Cheek, Right)

Date of measurement: 2/12/2022

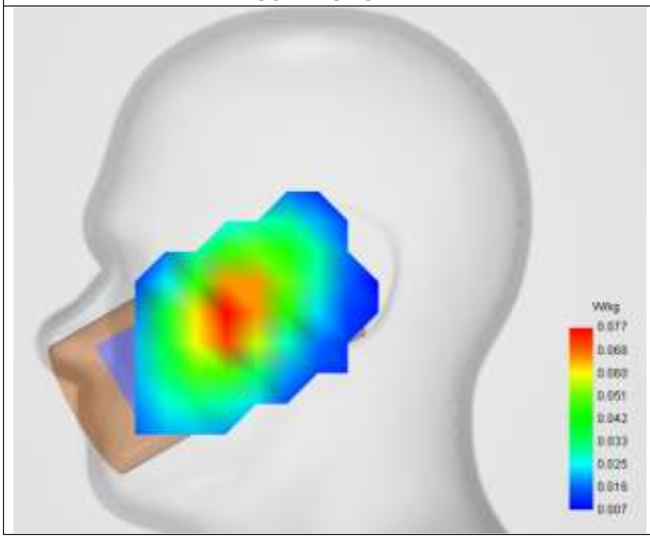
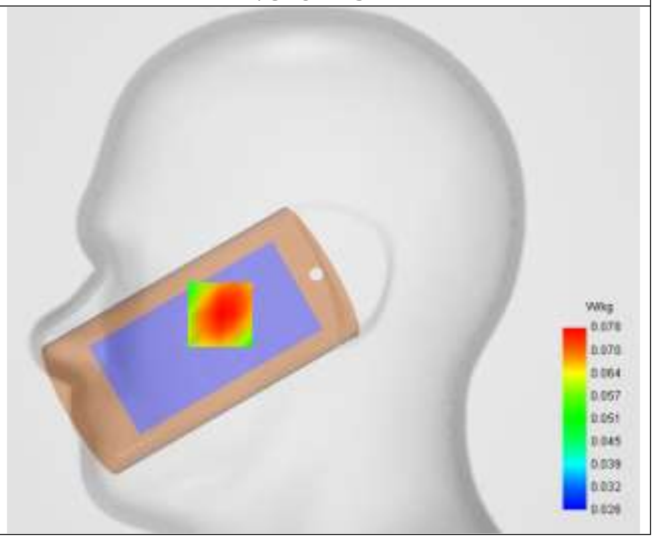
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.70 |
| Area Scan | dx=15mm dy=15mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Right head |
| Device Position | Cheek |
| Band | LTE band 12 |
| Channels | High |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 711.000000 |
| **Relative permitivity (real part)** | 42.226625 |
| **Conductivity (S/m)** | 0.894204 |

## C. SAR Surface and Volume

| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |



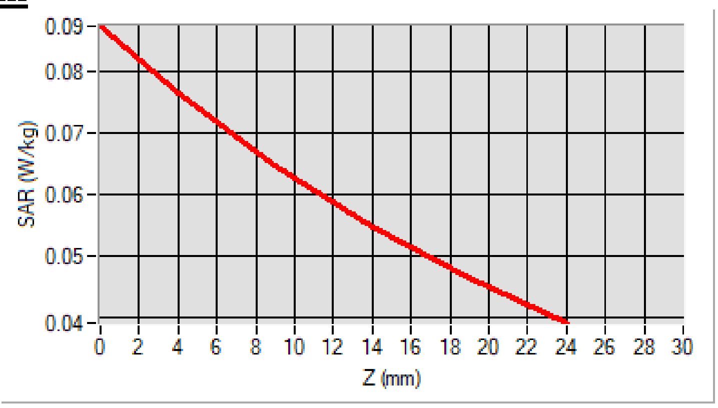


Maximum location: X=-51.00, Y=-22.00 ; SAR Peak: 0.09 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.060302 |
| SAR 1g (W/Kg) | 0.075653 |
| Variation (%) | -2.190000 |

## E. Z Axis Scan



# SAR Measurement at LTE band 41 (Cheek, Right)

Date of measurement: 10/12/2022

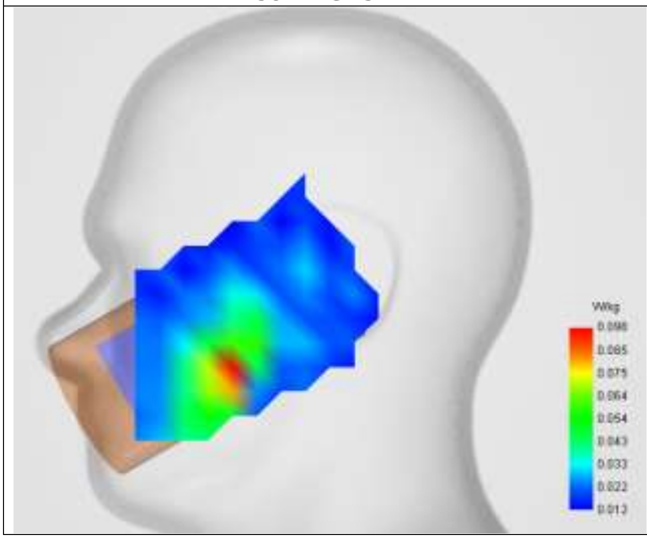
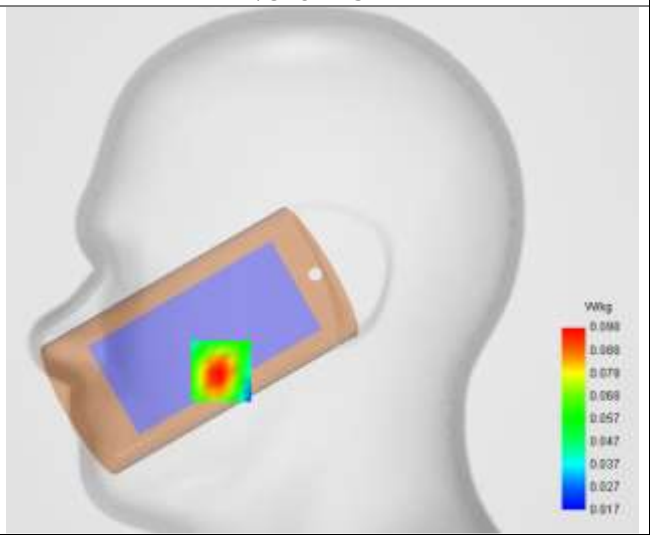
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.27 |
| Area Scan | dx=12mm dy=12mm |
| Zoom Scan | 7x7x7,dx=5mm dy=5mm dz=5mm,Complete |
| Phantom | Right head |
| Device Position | Cheek |
| Band | LTE band 41 |
| Channels | Middle |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 2595.000000 |
| **Relative permitivity (real part)** | 39.593350 |
| **Conductivity (S/m)** | 1.982411 |

## C. SAR Surface and Volume

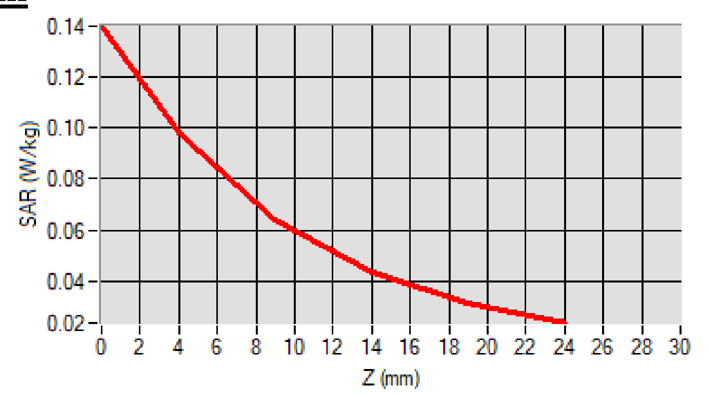
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-50.00, Y=-50.00 ; SAR Peak: 0.14 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.055402 |
| SAR 1g (W/Kg) | 0.090864 |
| Variation (%) | -0.380000 |

## E. Z Axis Scan



# SAR Measurement at CUSTOM (LTE_Band66) (Cheek, Left)

Date of measurement: 6/12/2022

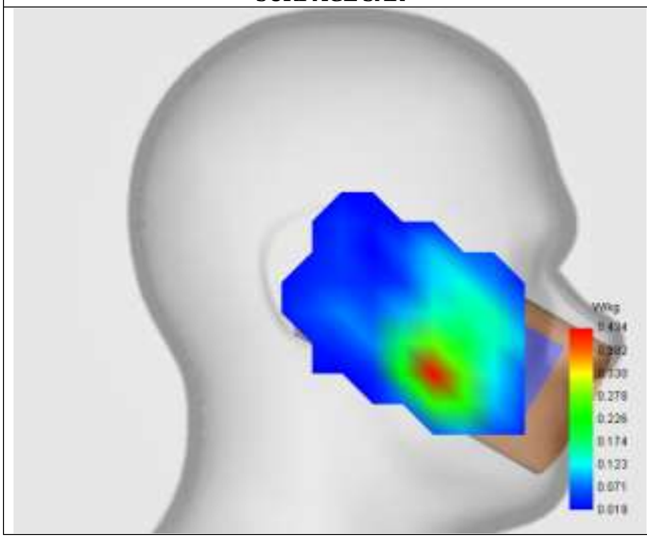
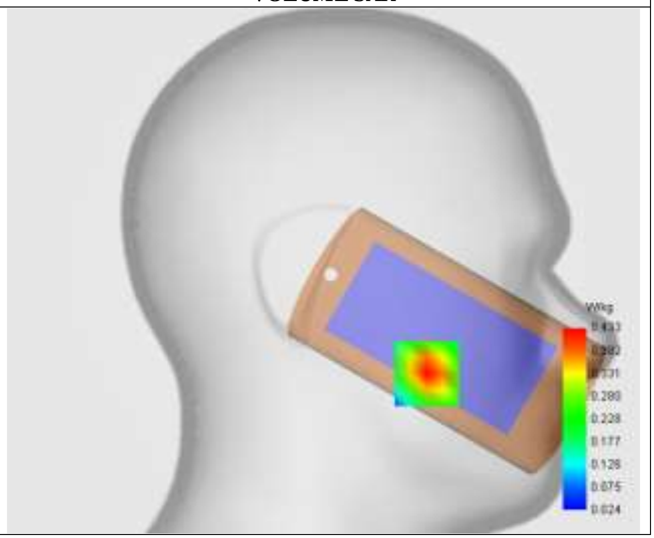
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.05 |
| Area Scan | dx=15mm dy=15mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Left head |
| Device Position | Cheek |
| Band | LTE band 66 |
| Channels | Middle |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1745.000000 |
| **Relative permitivity (real part)** | 39.604541 |
| **Conductivity (S/m)** | 1.348223 |

## C. SAR Surface and Volume

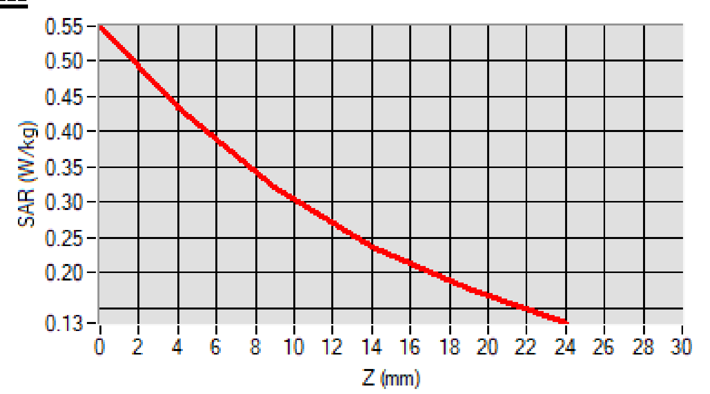
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-51.00, Y=-51.00 ; SAR Peak: 0.55 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.259992 |
| SAR 1g (W/Kg) | 0.405295 |
| Variation (%) | -1.910000 |

## E. Z Axis Scan



# SAR Measurement at CUSTOM (LTE_Band_71) (Cheek, Right)

Date of measurement: 2/12/2022

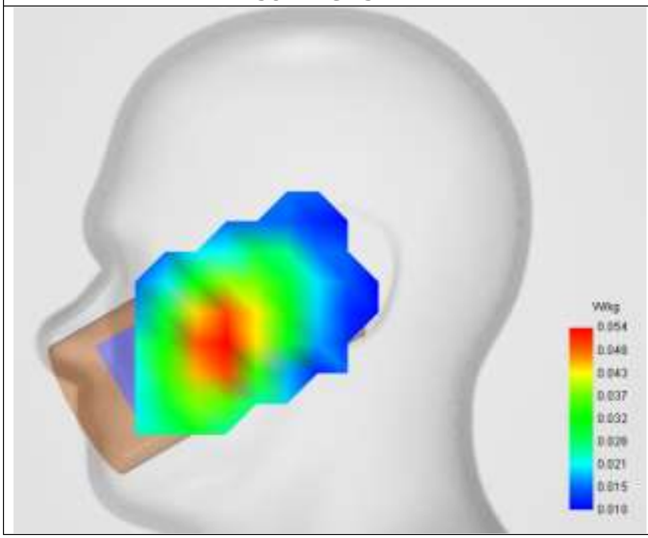
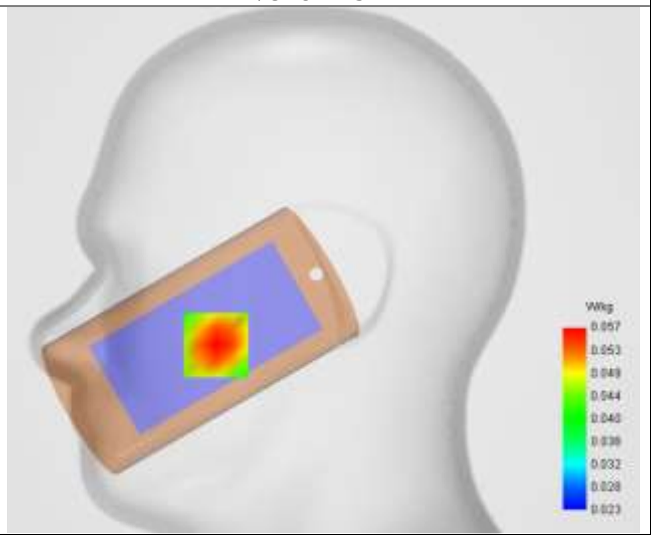
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.70 |
| Area Scan | dx=15mm dy=15mm |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Right head |
| Device Position | Cheek |
| Band | LTE band 71 |
| Channels | Middle |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 683.000000 |
| **Relative permittivity (real part)** | 42.252312 |
| **Conductivity (S/m)** | 0.884336 |

## C. SAR Surface and Volume

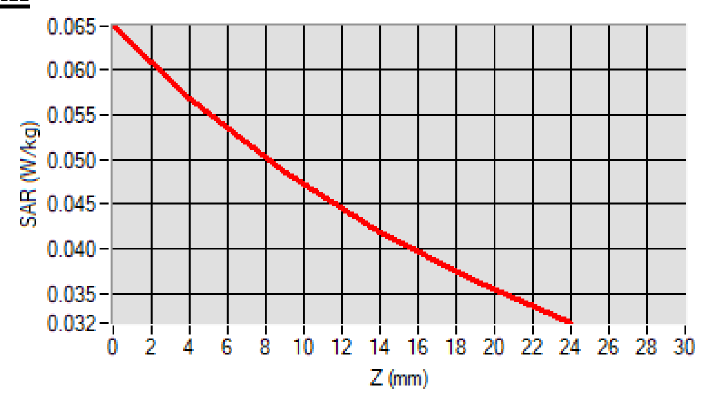
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-53.00, Y=-37.00 ; SAR Peak: 0.07 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.045830 |
| SAR 1g (W/Kg) | 0.056924 |
| Variation (%) | 1.750000 |

## E. Z Axis Scan



# SAR Measurement at IEEE 802.11b ISM (Cheek, Right)

Date of measurement: 10/12/2022

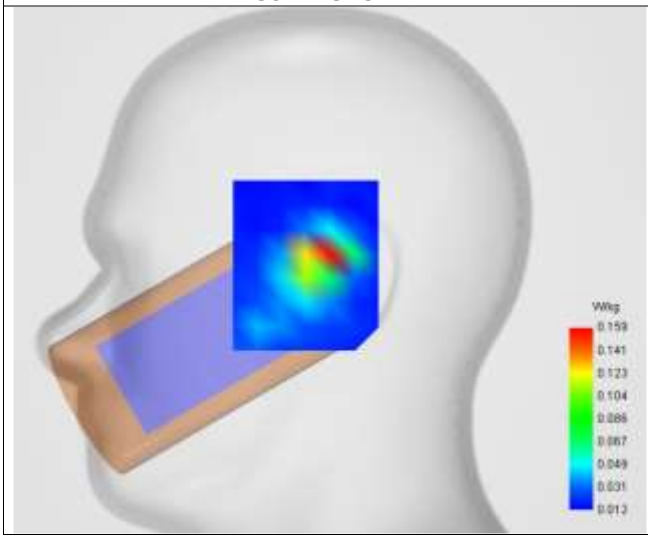
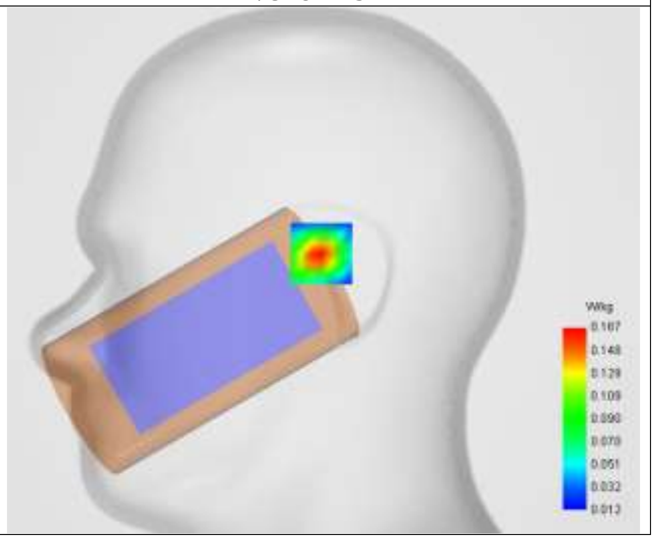
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.46 |
| Area Scan | dx=12mm dy=12mm |
| Zoom Scan | 7x7x7,dx=5mm dy=5mm dz=5mm,Complete |
| Phantom | Right head |
| Device Position | Cheek |
| Band | IEEE 802.11b ISM |
| Channels | High |
| Signal | IEEE802.b (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 2462.000000 |
| **Relative permittivity (real part)** | 39.896002 |
| **Conductivity (S/m)** | 1.821081 |

## C. SAR Surface and Volume

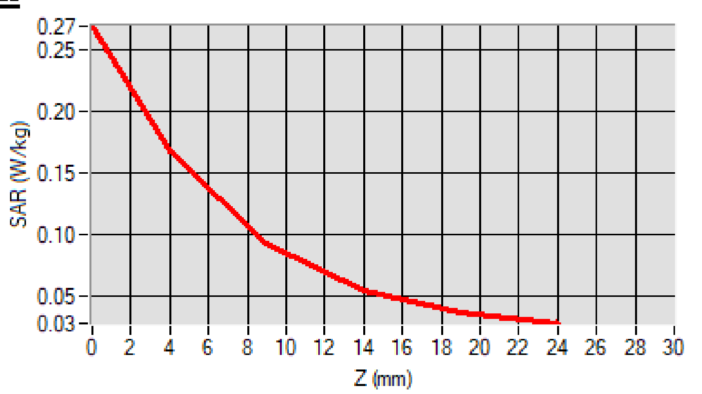
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-1.00, Y=8.00 ; SAR Peak: 0.27 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.076849 |
| SAR 1g (W/Kg) | 0.148947 |
| Variation (%) | 0.150000 |

## E. Z Axis Scan



# SAR Measurement at Bluetooth (Cheek, Right)

Date of measurement: 10/12/2022

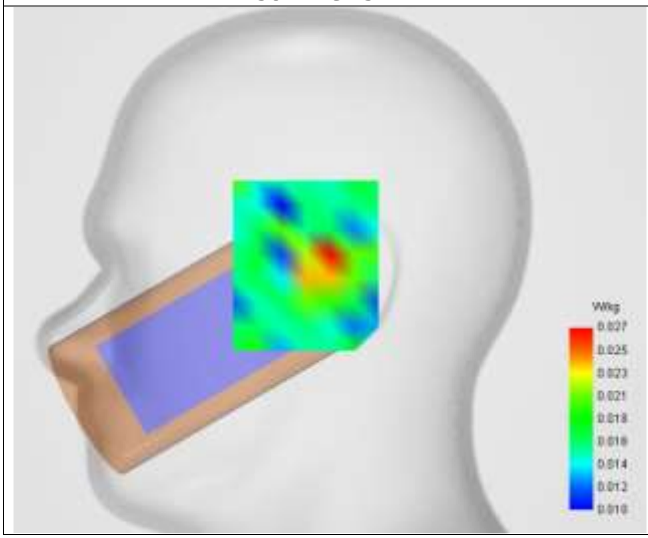
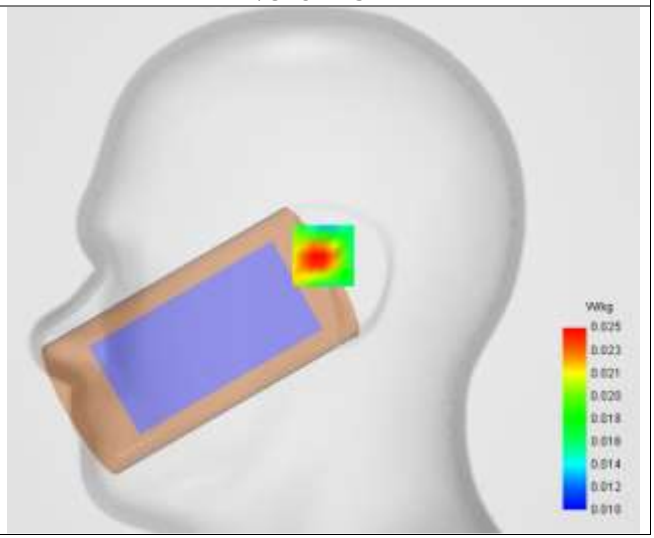
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.46 |
| Area Scan | dx=12mm dy=12mm |
| Zoom Scan | 7x7x7,dx=5mm dy=5mm dz=5mm,Complete |
| Phantom | Right head |
| Device Position | Cheek |
| Band | Bluetooth |
| Channels | Low |
| Signal | Bluetooth (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 2402.000000 |
| **Relative permitivity (real part)** | 39.862544 |
| **Conductivity (S/m)** | 1.811534 |

## C. SAR Surface and Volume

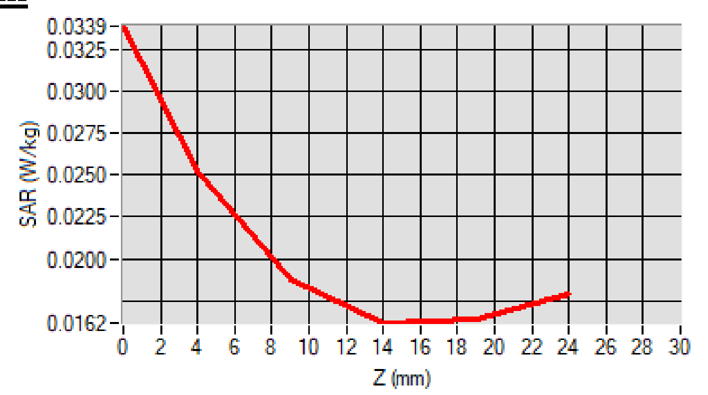
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=0.00, Y=7.00 ; SAR Peak: 0.03 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.019955 |
| SAR 1g (W/Kg) | 0.024779 |
| Variation (%) | -0.110000 |

## E. Z Axis Scan



# SAR Measurement at CUSTOM (GPRS8502Txslots) (Body, Validation Plane)

Date of measurement: 2/12/2022

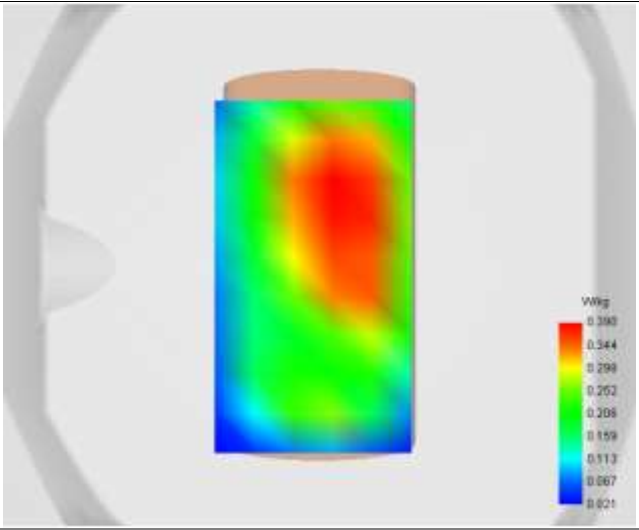
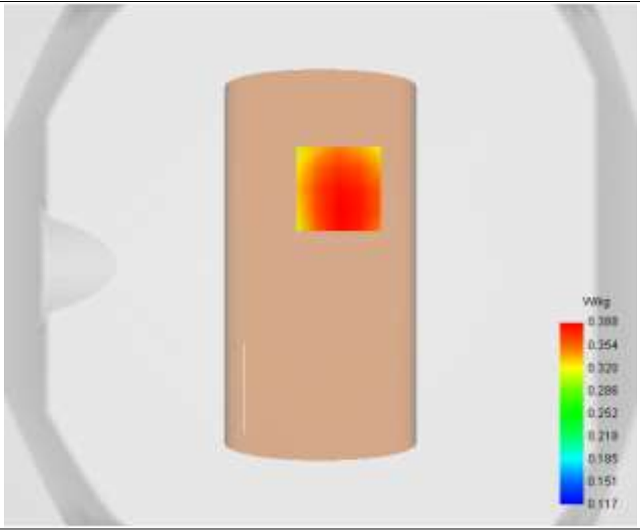
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.70 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | GSM850 |
| Channels | Middle |
| Signal | TDMA (Crest factor: 4.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 836.600000 |
| **Relative permitivity (real part)** | 42.484302 |
| **Conductivity (S/m)** | 0.923112 |

## C. SAR Surface and Volume

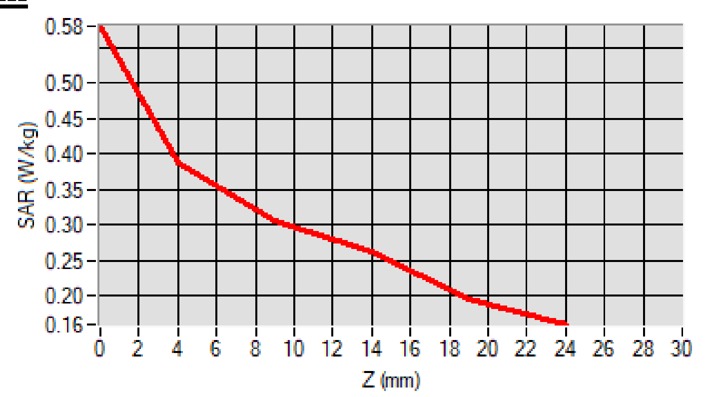
| **SURFACE SAR** | **VOLUME SAR** |
|---|---|
|  |  |

Maximum location: X=7.00, Y=29.00 ; SAR Peak: 0.46 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.300124 |
| SAR 1g (W/Kg) | 0.386689 |
| Variation (%) | -3.100000 |

## E. Z Axis Scan



# SAR Measurement at CUSTOM (GPRS19003Txslots) (Body, Validation Plane)

Date of measurement: 6/12/2022

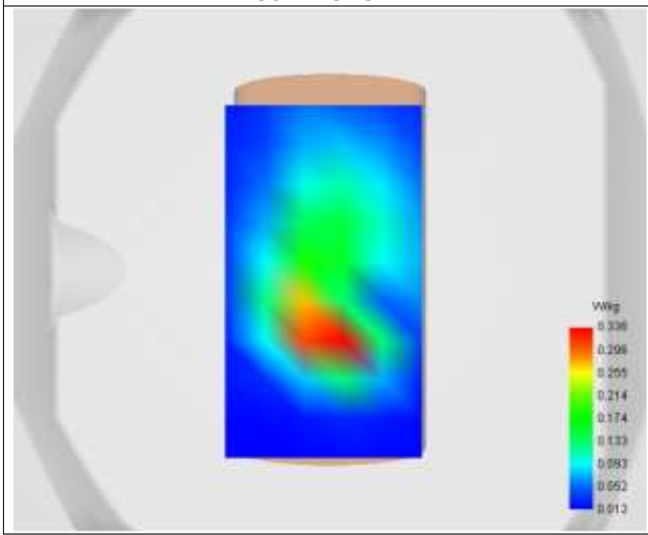
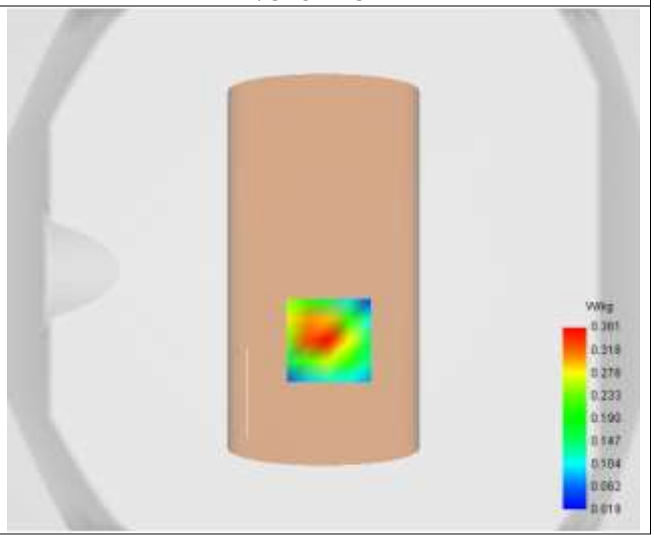
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.00 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | GSM1900 |
| Channels | Low |
| Signal | TDMA (Crest factor: 2.7) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1850.200000 |
| **Relative permitivity (real part)** | 39.500000 |
| **Conductivity (S/m)** | 1.380301 |

## C. SAR Surface and Volume

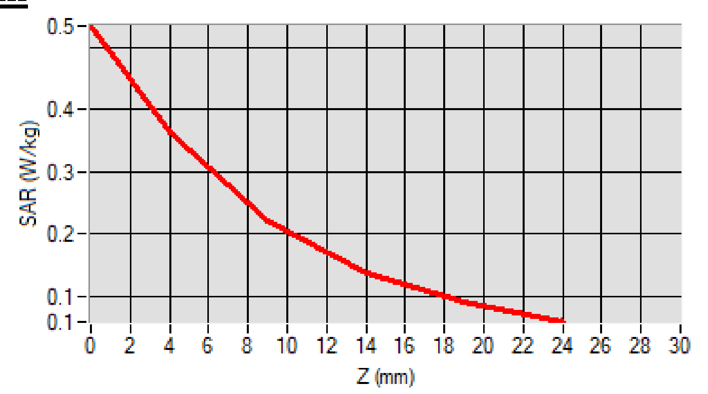
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=2.00, Y=-27.00 ; SAR Peak: 0.54 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.188083 |
| SAR 1g (W/Kg) | 0.337325 |
| Variation (%) | 2.030000 |

## E. Z Axis Scan



# SAR Measurement at Band2_WCDMA1900 (Body, Validation Plane)

Date of measurement: 6/12/2022

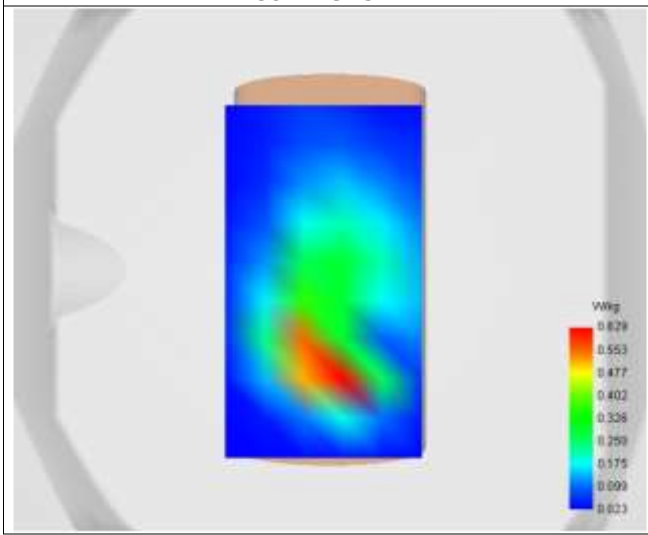
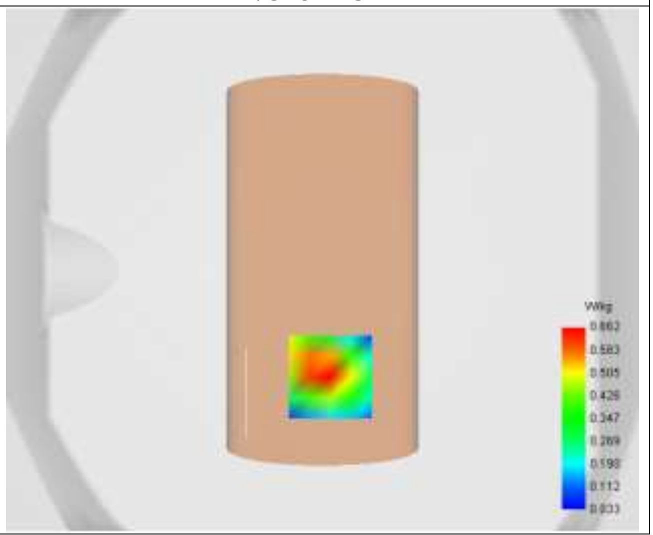
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.00 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | Band2_WCDMA1900 |
| Channels | High |
| Signal | WCDMA (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1907.600000 |
| **Relative permitivity (real part)** | 39.860000 |
| **Conductivity (S/m)** | 1.391246 |

## C. SAR Surface and Volume

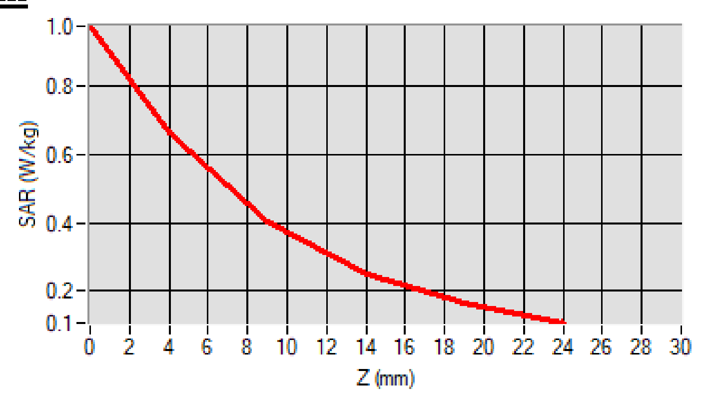
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=3.00, Y=-41.00 ; SAR Peak: 1.00 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.345415 |
| SAR 1g (W/Kg) | 0.620530 |
| Variation (%) | 4.650000 |

## E. Z Axis Scan



# SAR Measurement at Band5_WCDMA850 (Body, Validation Plane)

Date of measurement: 2/12/2022

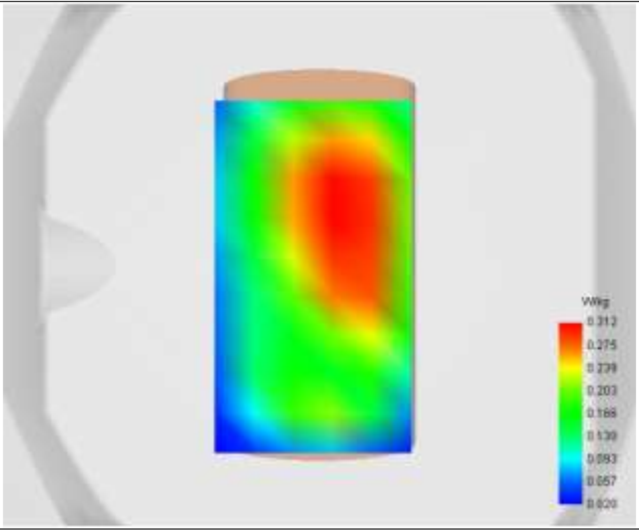
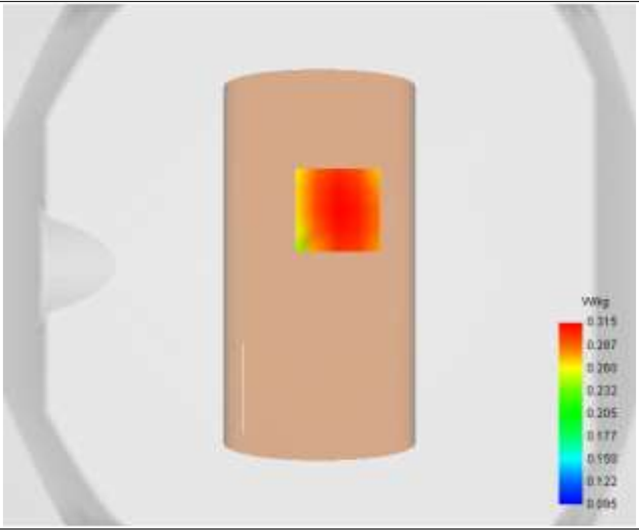
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.73 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | Band5_WCDMA850 |
| Channels | Middle |
| Signal | WCDMA (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 836.599976 |
| **Relative permitivity (real part)** | 42.350000 |
| **Conductivity (S/m)** | 0.921633 |

## C. SAR Surface and Volume

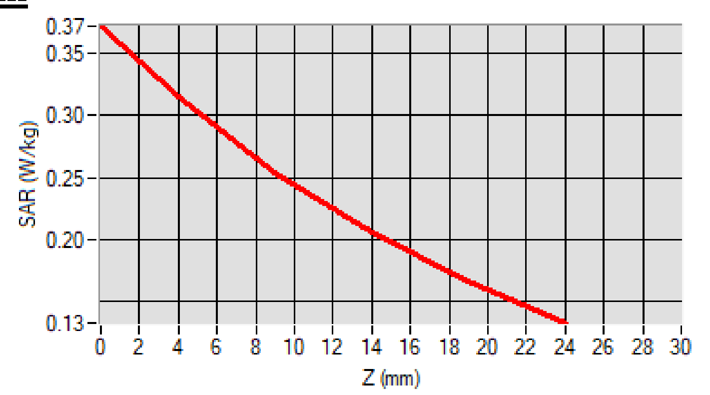
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=7.00, Y=21.00 ; SAR Peak: 0.37 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.236699 |
| SAR 1g (W/Kg) | 0.305355 |
| Variation (%) | -1.300000 |

## E. Z Axis Scan



# SAR Measurement at LTE band 2 (Body, Validation Plane)

Date of measurement: 6/12/2022

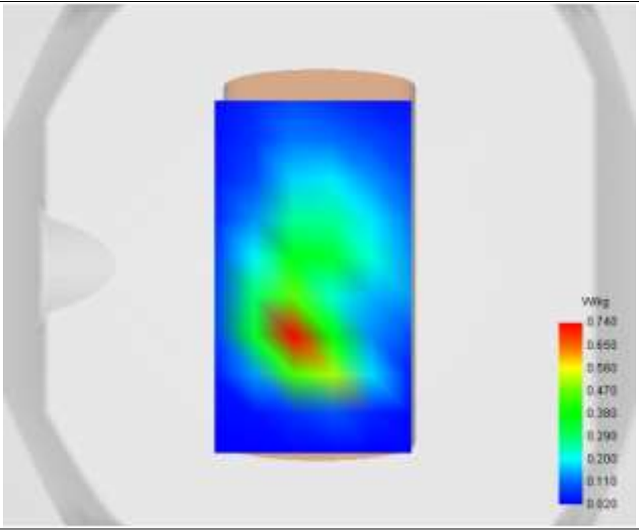
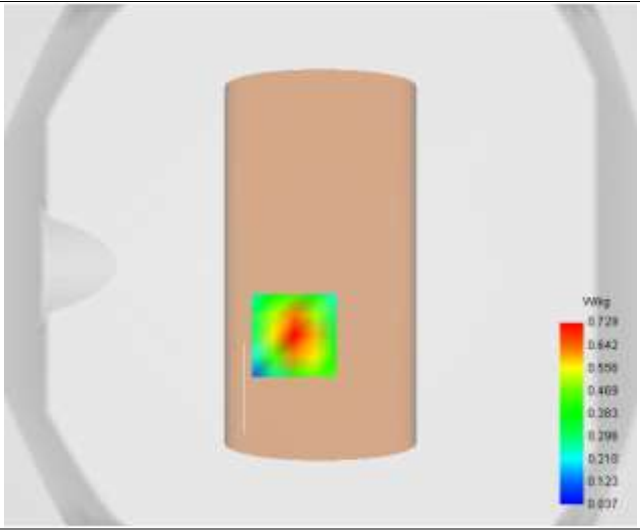
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.00 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | LTE band 2 |
| Channels | Middle |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1880.000000 |
| **Relative permitivity (real part)** | 39.561684 |
| **Conductivity (S/m)** | 1.388862 |

## C. SAR Surface and Volume

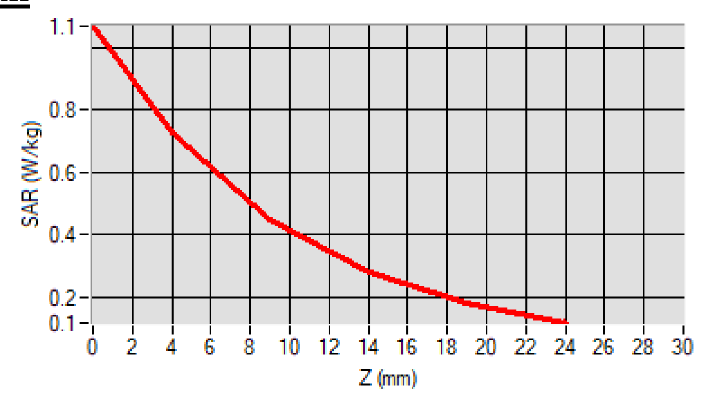
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-10.00, Y=-27.00 ; SAR Peak: 1.07 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.379824 |
| SAR 1g (W/Kg) | 0.674352 |
| Variation (%) | -1.030000 |

## E. Z Axis Scan



# SAR Measurement at LTE band 5 (Body, Validation Plane)

Date of measurement: 2/12/2022

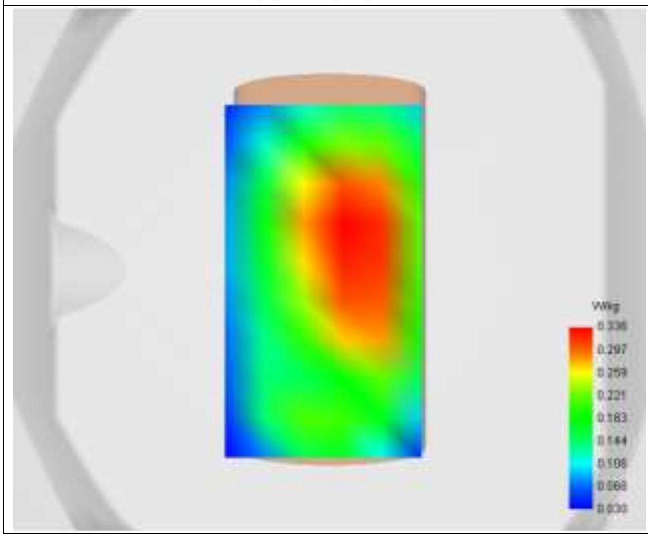
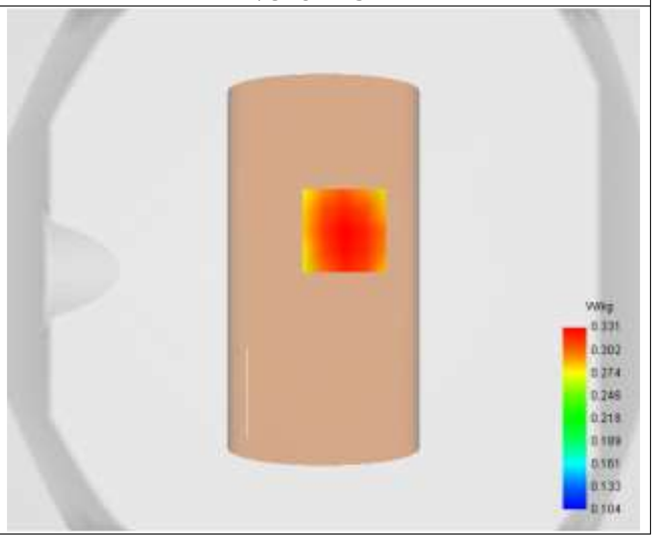
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.73 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | LTE band 5 |
| Channels | High |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 844.000000 |
| **Relative permitivity (real part)** | 42.250000 |
| **Conductivity (S/m)** | 0.911531 |

## C. SAR Surface and Volume

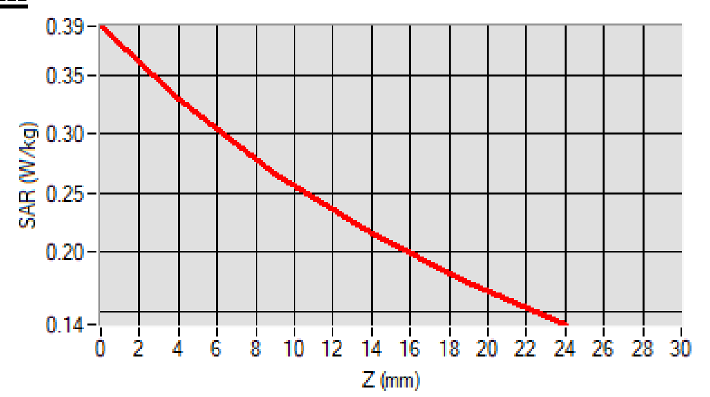
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=8.00, Y=15.00 ; SAR Peak: 0.39 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.249947 |
| SAR 1g (W/Kg) | 0.321508 |
| Variation (%) | 1.010000 |

## E. Z Axis Scan



# SAR Measurement at LTE band 12 (Body, Validation Plane)

Date of measurement: 2/12/2022

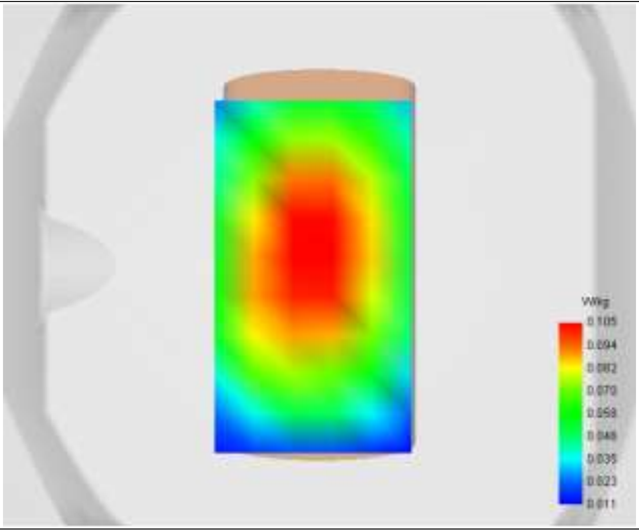
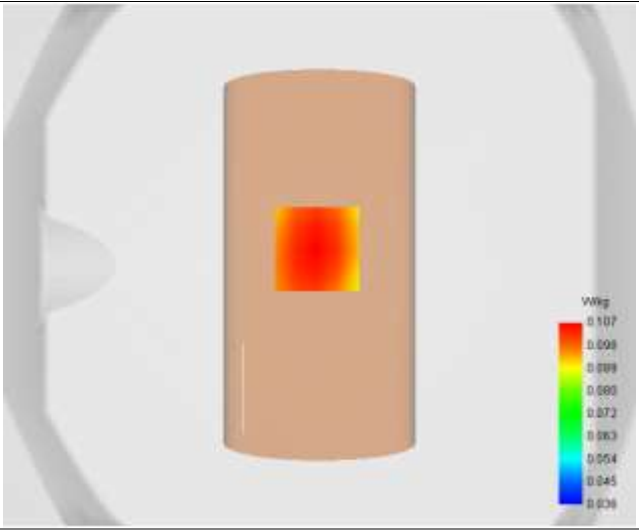
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.70 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | LTE band 12 |
| Channels | High |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 711.000000 |
| **Relative permitivity (real part)** | 42.226625 |
| **Conductivity (S/m)** | 0.894204 |

## C. SAR Surface and Volume

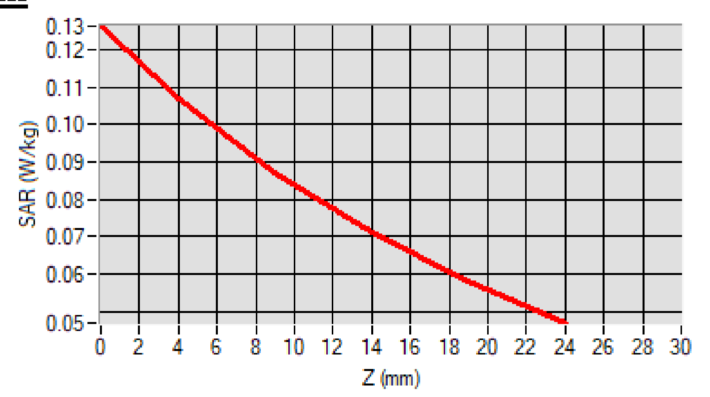
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-1.00, Y=6.00 ; SAR Peak: 0.13 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.082780 |
| SAR 1g (W/Kg) | 0.105975 |
| Variation (%) | -4.000000 |

## E. Z Axis Scan



# SAR Measurement at LTE band 41 (Body, Validation Plane)

Date of measurement: 10/12/2022

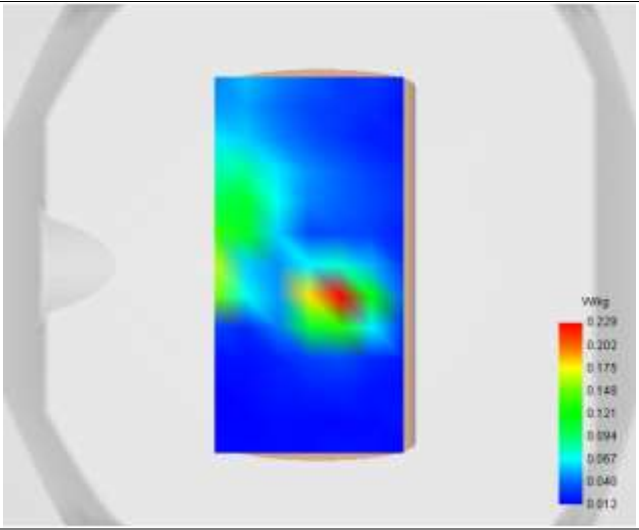
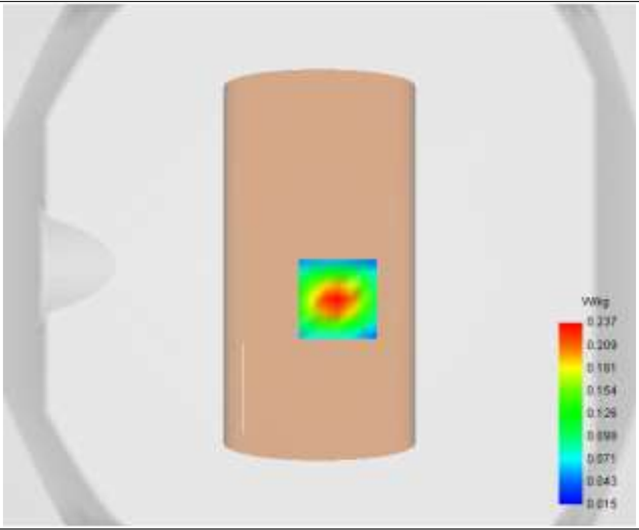
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.27 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 7x7x7,dx=5mm dy=5mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | LTE band 41 |
| Channels | Middle |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 2595.000000 |
| **Relative permitivity (real part)** | 39.593350 |
| **Conductivity (S/m)** | 1.982411 |

## C. SAR Surface and Volume

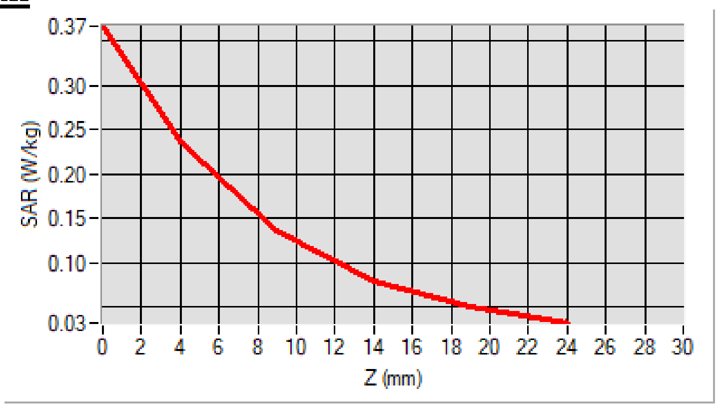
| SURFACE SAR | VOLUME SAR |
|---|---|
|   |   |

Maximum location: X=7.00, Y=-13.00 ; SAR Peak: 0.37 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.109764 |
| SAR 1g (W/Kg) | 0.211434 |
| Variation (%) | -2.350000 |

## E. Z Axis Scan



# SAR Measurement at CUSTOM (LTE_Band66) (Body, Validation Plane)

Date of measurement: 6/12/2022

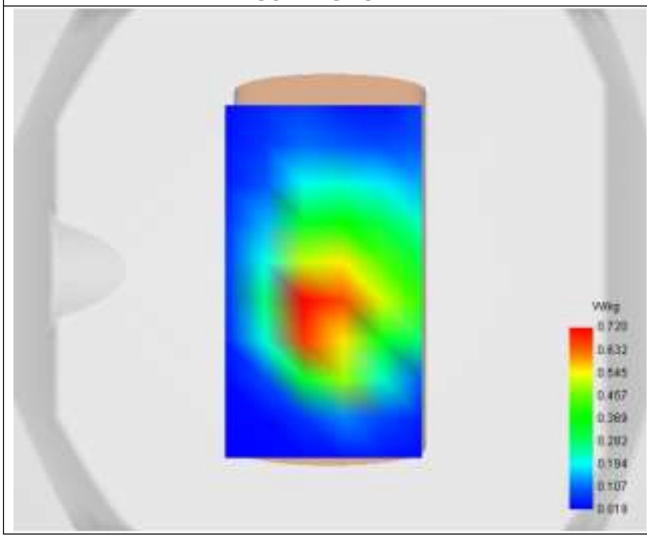
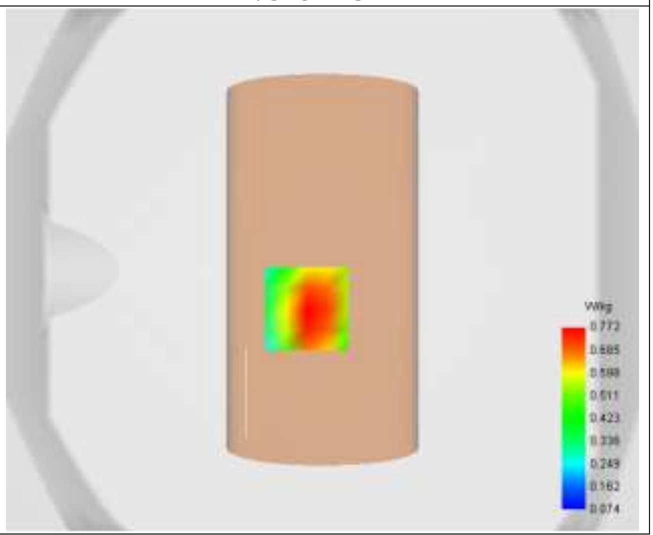
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.05 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | LTE band 66 |
| Channels | Middle |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 1745.000000 |
| **Relative permitivity (real part)** | 39.604541 |
| **Conductivity (S/m)** | 1.348223 |

## C. SAR Surface and Volume

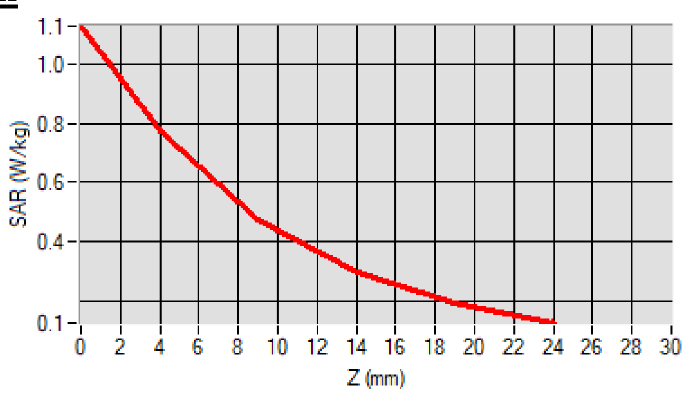
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-6.00, Y=-15.00 ; SAR Peak: 1.15 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.443523 |
| SAR 1g (W/Kg) | 0.738021 |
| Variation (%) | -0.350000 |

## E. Z Axis Scan



# SAR Measurement at CUSTOM (LTE_Band_71) (Body, Validation Plane)

Date of measurement: 2/12/2022

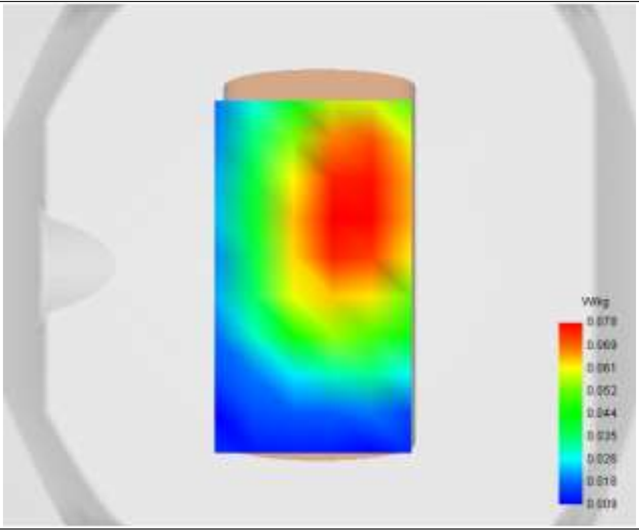
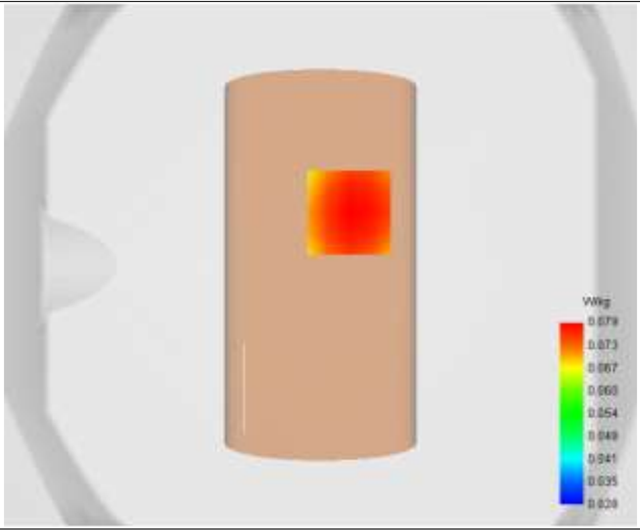
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 1.70 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 5x5x7,dx=8mm dy=8mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | LTE band 71 |
| Channels | Middle |
| Signal | LTE (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 683.000000 |
| **Relative permitivity (real part)** | 42.252312 |
| **Conductivity (S/m)** | 0.884336 |

## C. SAR Surface and Volume

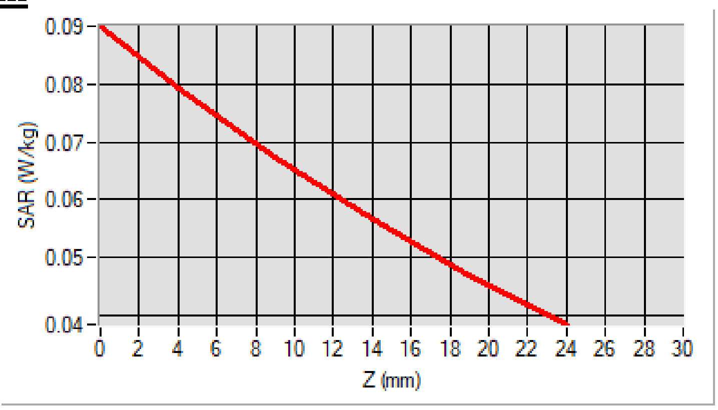
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=11.00, Y=20.00 ; SAR Peak: 0.09 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.064518 |
| SAR 1g (W/Kg) | 0.079940 |
| Variation (%) | -0.800000 |

## E. Z Axis Scan



# SAR Measurement at IEEE 802.11b ISM (Body, Validation Plane)

Date of measurement: 10/12/2022

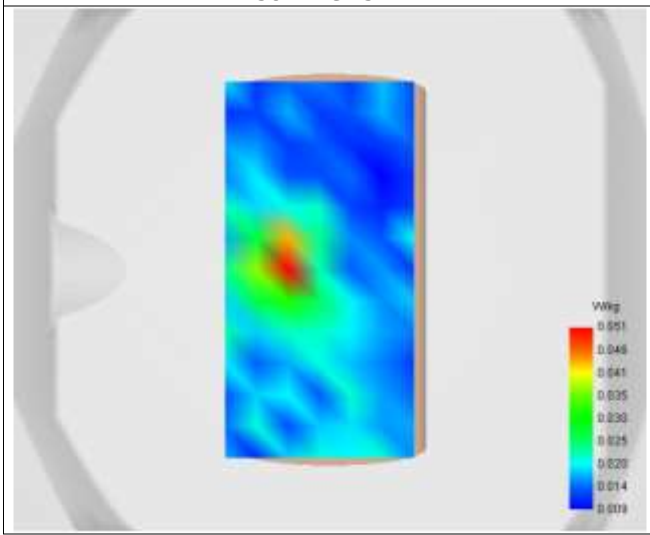
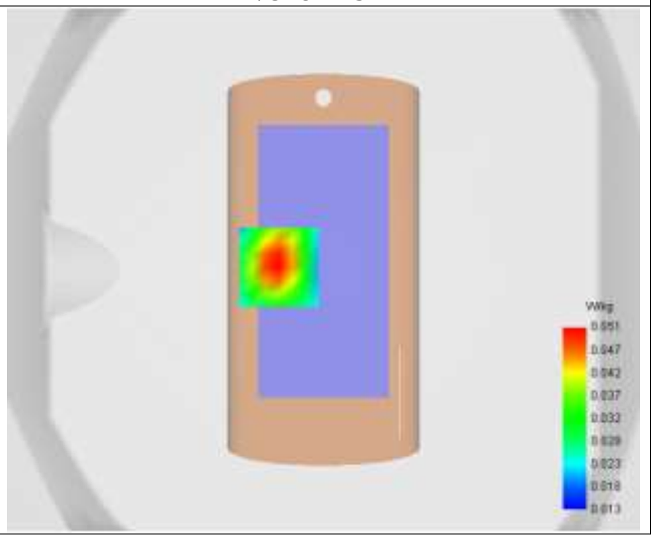
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.46 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 7x7x7,dx=5mm dy=5mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | IEEE 802.11b ISM |
| Channels | High |
| Signal | IEEE802.b (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 2462.000000 |
| **Relative permittivity (real part)** | 39.896002 |
| **Conductivity (S/m)** | 1.821081 |

## C. SAR Surface and Volume

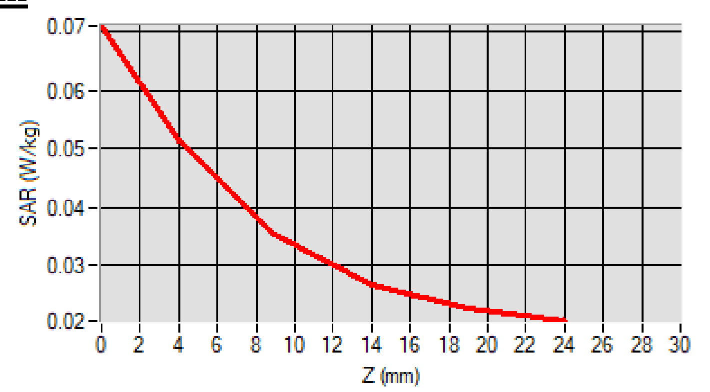
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-17.00, Y=1.00 ; SAR Peak: 0.07 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.031845 |
| SAR 1g (W/Kg) | 0.047789 |
| Variation (%) | -2.680000 |

## E. Z Axis Scan



# SAR Measurement at Bluetooth (Body, Validation Plane)

Date of measurement: 10/12/2022

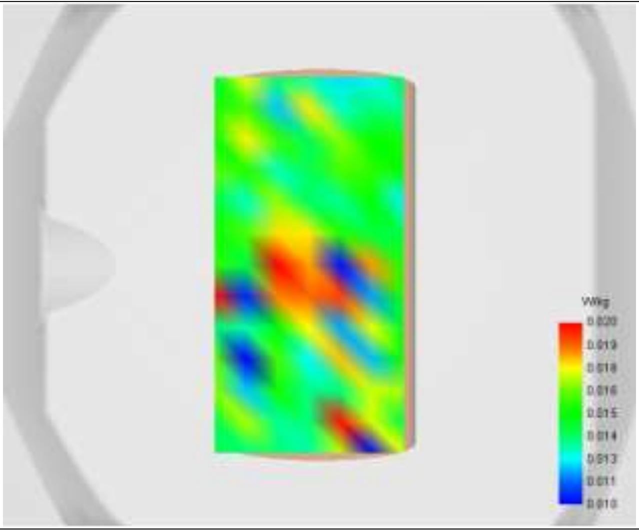
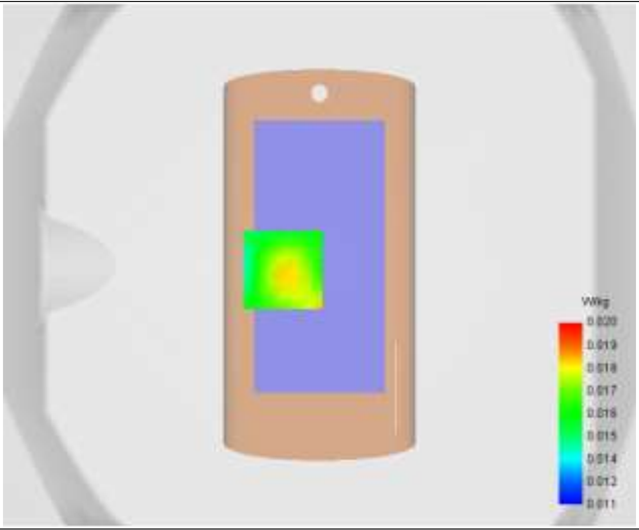
## A. Experimental conditions.

| | |
|---|---|
| Probe | SN 18/21 EPGO354 |
| ConvF | 2.46 |
| Area Scan | surf_sam_plan.txt |
| Zoom Scan | 7x7x7,dx=5mm dy=5mm dz=5mm,Complete |
| Phantom | Validation plane |
| Device Position | Body |
| Band | Bluetooth |
| Channels | Low |
| Signal | Bluetooth (Crest factor: 1.0) |

## B. Permitivity

| | |
|---|---|
| **Frequency (MHz)** | 2402.000000 |
| **Relative permitivity (real part)** | 39.862544 |
| **Conductivity (S/m)** | 1.811534 |

## C. SAR Surface and Volume

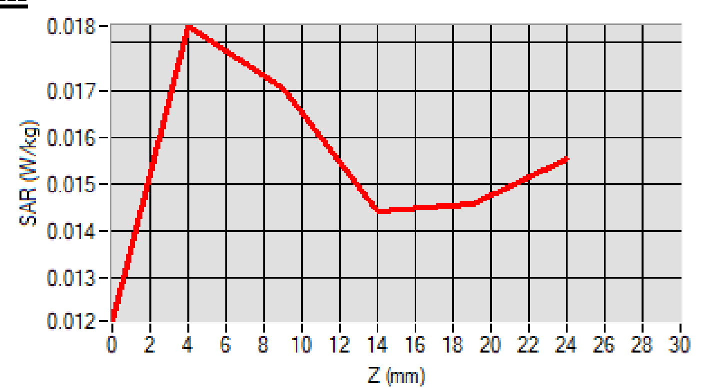
| SURFACE SAR | VOLUME SAR |
|---|---|
|  |  |

Maximum location: X=-14.00, Y=-2.00 ; SAR Peak: 0.02 W/kg

## D. SAR 1g & 10g

| | |
|---|---|
| SAR 10g (W/Kg) | 0.017366 |
| SAR 1g (W/Kg) | 0.018745 |
| Variation (%) | 0.080000 |

## E. Z Axis Scan



# Appendix C: System Calibration Certificate

**Calibration information for E-field probes**

# COMOSAR E-Field Probe Calibration Report

Ref : ACR.181.10.22.BES.B

**JIANYAN TESTING GROUP SHENZHEN CO., LTD.**
**NO.101, BUILDING 8, INNOVATION WISDOM PORT, NO.155 HONGTIAN ROAD, HUANGPU COMMUNITY, XINQIAO STREET, BAO'AN DISTRICT, SHENZHEN, GUANGDONG, PEOPLE'S REPUBLIC OF CHINA**
**MVG COMOSAR DOSIMETRIC E-FIELD PROBE**
**SERIAL NO.: SN 18/21 EPGO354**

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

**Calibration date: 06/30/2022**

Accreditations #2-6789
Scope available on www.cofrac.fr

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*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*

| | Name | Function | Date | Signature |
|---|---|---|---|---|
| *Prepared by :* | Jérôme Le Gall | Measurement Responsible | 6/30/2022 | |
| *Checked & approved by:* | Jérôme Luc | Technical Manager | 6/30/2022 | |
| *Authorized by:* | Yann Toutain | Laboratory Director | 7/11/2022 | Yann TOUTAIN |

2022.07.11
10:36:00 +02'00'

| | Customer Name |
|---|---|
| *Distribution :* | JIANYAN TESTING GROUP SHENZHEN CO.,LTD. |

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

TABLE OF CONTENTS

## 1 DEVICE UNDER TEST

| Device Under Test | |
|---|---|
| Device Type | COMOSAR DOSIMETRIC E FIELD PROBE |
| Manufacturer | MVG |
| Model | SSE2 |
| Serial Number | SN 18/21 EPGO354 |
| Product Condition (new / used) | Used |
| Frequency Range of Probe | 0.15 GHz-6GHz |
| Resistance of Three Dipoles at Connector | Dipole 1: R1=0.202 MΩ<br>Dipole 2: R2=0.216 MΩ<br>Dipole 3: R3=0.224 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.





JianYan Testing Group Shenzhen Co., Ltd.
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Telephone: +86 (0) 755 23118282 Fax: +86 (0) 755 23116366, E-mail: info-JYTee@lets.com

### 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:

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

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%).

## 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 % |

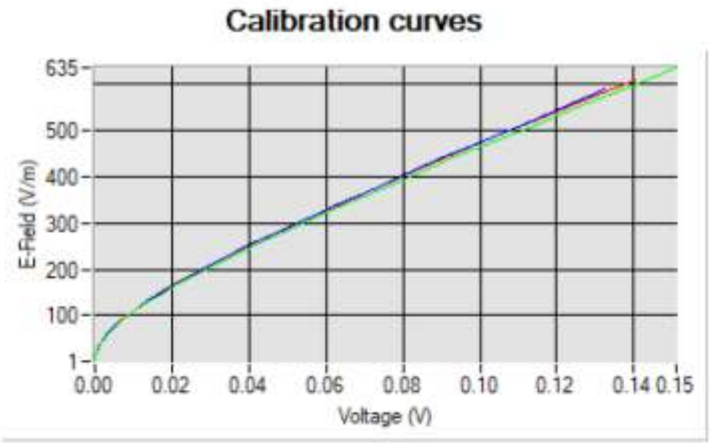
### 5.1 SENSITIVITY IN AIR

| Normx dipole 1 (μV/(V/m)$^2$) | Normy dipole 2 (μV/(V/m)$^2$) | Normz dipole 3 (μV/(V/m)$^2$) |
|---|---|---|
| 0.88 | 0.89 | 0.91 |

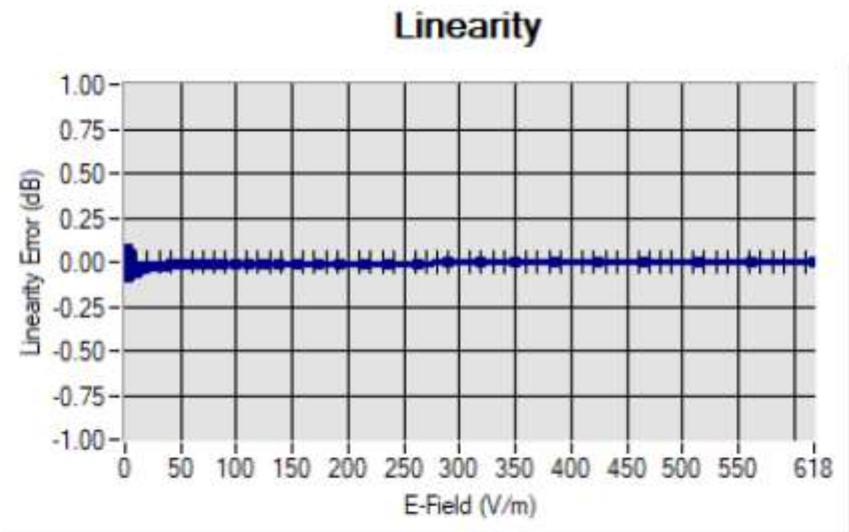
| DCP dipole 1 (mV) | DCP dipole 2 (mV) | DCP dipole 3 (mV) |
|---|---|---|
| 107 | 101 | 106 |

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

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




5.2 LINEARITY



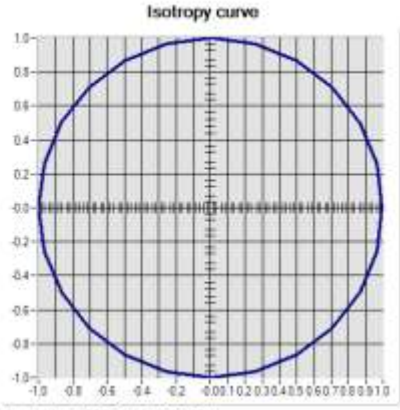

Linearity:+/-1.85% (+/-0.08dB)

## 5.3 SENSITIVITY IN LIQUID

| Liquid | Frequency (MHz +/- 100MHz) | ConvF |
|---|---|---|
| HL750 | 750 | 1.70 |
| HL850 | 835 | 1.73 |
| HL900 | 900 | 1.78 |
| HL1750 | 1750 | 2.05 |
| HL1900 | 1900 | 2.00 |
| HL2100 | 2100 | 2.34 |
| HL2300 | 2300 | 2.40 |
| HL2450 | 2450 | 2.46 |
| HL2600 | 2600 | 2.27 |
| HL3300 | 3300 | 2.07 |
| HL3500 | 3500 | 2.10 |
| HL3700 | 3700 | 2.15 |
| HL3900 | 3900 | 2.41 |
| HL4200 | 4200 | 2.33 |
| HL5200 | 5200 | 1.71 |
| HL5400 | 5400 | 1.91 |
| HL5600 | 5600 | 2.04 |
| HL5800 | 5800 | 1.94 |

LOWER DETECTION LIMIT: 7mW/kg

## 5.4 ISOTROPY




Isotropy +/-0.15% (+/-0.01dB)

## 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. |

| | | | | |
|---|---|---|---|---|
| Liquid transition | MVG | SN 32/16 WGLIQ_5G000_1 | Validated. No cal required. | Validated. No cal required. |
| Temperature / Humidity Sensor | Testo 184 H1 | 44225320 | 06/2021 | 06/2024 |

**Calibration information for Dipole**

# SAR Reference Dipole Calibration Report

Ref : ACR.15.5.21.MVGB.B

Cancel and replace the report ACR.15.5.21.MVGB.A

**JIANYAN TESTING GROUP SHENZHEN CO.,LTD.**
**No.110~116, BUILDING B, JINYUAN BUSINESS BUILDING, XIXIANG ROAD, BAOAN DISTRICT, SHENZHEN, GUANGDONG, PR CHINA**
**MVG COMOSAR REFERENCE DIPOLE**
**FREQUENCY: 750 MHZ**
**SERIAL NO.: SN 50/20 DIP 0G750-506**

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

**Calibration date: 01/14/2021**

Accreditations #2-6789 and #2-6814
Scope available on www.cofrac.fr

*Summary:*

This document presents the method and results from an accredited SAR reference dipole calibration performed in MVG using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

| | *Name* | *Function* | *Date* | *Signature* |
|---|---|---|---|---|
| *Prepared by :* | Jérôme LUC | Technical Manager | 1/15/2021 | JS |
| *Checked by :* | Jérôme LUC | Technical Manager | 1/15/2021 | JS |
| *Approved by :* | Yann Toutain | Laboratory Director | 2/8/2021 | Yann Toutain 2021.02.08 17:46:38 +01'00' |

| | *Customer Name* |
|---|---|
| *Distribution :* | JianYan Testing Group Shenzhen Co.,Ltd. |

| *Issue* | *Name* | *Date* | *Modifications* |
|---|---|---|---|
| A | Jérôme LUC | 1/15/2021 | Initial release |
| B | Jérôme LUC | 2/8/2021 | Change customer name/address |
| | | | |
| | | | |

TABLE OF CONTENTS

# 1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

# 2 DEVICE UNDER TEST

| Device Under Test | |
|---|---|
| Device Type | COMOSAR 750 MHz REFERENCE DIPOLE |
| Manufacturer | MVG |
| Model | SID750 |
| Serial Number | SN 50/20 DIP 0G750-506 |
| Product Condition (new / used) | New |

# 3 PRODUCT DESCRIPTION

## 3.1 GENERAL INFORMATION

MVG's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, FCC KDBs and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

**Figure 1** – *MVG COMOSAR Validation Dipole*

## 4 MEASUREMENT METHOD

The IEEE 1528, FCC KDBs and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

### 4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. A direct method is used with a network analyser and its calibration kit, both with a valid ISO17025 calibration.

### 4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimension's frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness. A direct method is used with a ISO17025 calibrated caliper.

## 5 MEASUREMENT UNCERTAINTY

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.

### 5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

| Frequency band | Expanded Uncertainty on Return Loss |
|---|---|
| 400-6000MHz | 0.08 LIN |

### 5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

| Length (mm) | Expanded Uncertainty on Length |
|---|---|
| 0 - 300 | 0.20 mm |
| 300 - 450 | 0.44 mm |

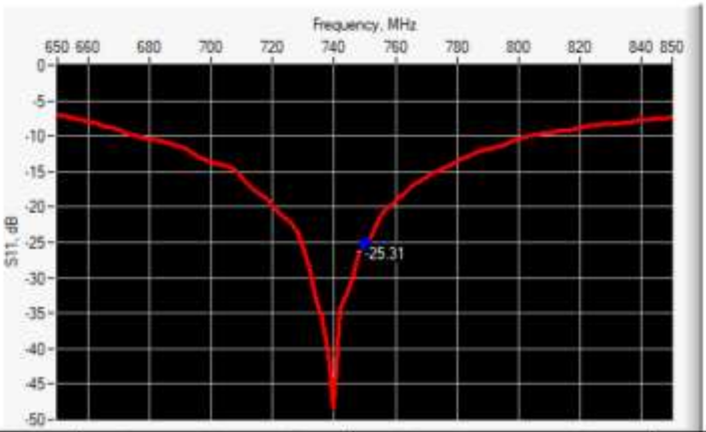
### 5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, FCC KDBs, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

| Scan Volume | Expanded Uncertainty |
|---|---|
| 1 g | 19 % (SAR) |
| 10 g | 19 % (SAR) |

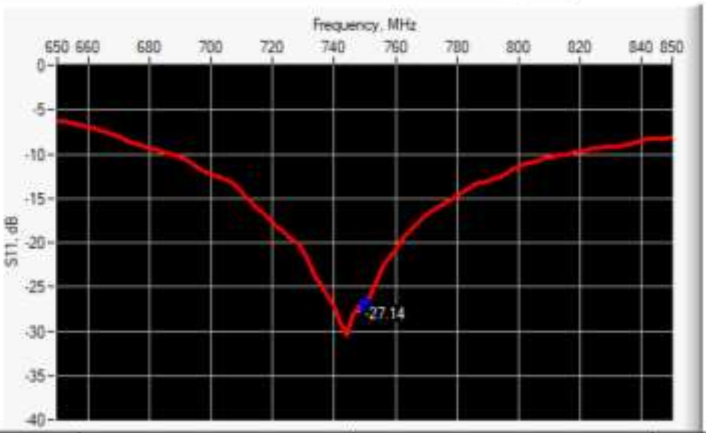
## 6 CALIBRATION MEASUREMENT RESULTS

### 6.1 RETURN LOSS AND IMPEDANCE IN HEAD LIQUID




| Frequency (MHz) | Return Loss (dB) | Requirement (dB) | Impedance |
|---|---|---|---|
| 750 | -25.31 | -20 | 54.0 Ω - 3.7 jΩ |

### 6.2 RETURN LOSS AND IMPEDANCE IN BODY LIQUID




| Frequency (MHz) | Return Loss (dB) | Requirement (dB) | Impedance |
|---|---|---|---|
| 750 | -27.14 | -20 | 54.2 Ω + 1.4 jΩ |





**JianYan Testing Group Shenzhen Co., Ltd.** Project No.: JYTSZR2212020
No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community,Xinqiao Street, Bao'an District, Shenzhen, Guangdong,People's Republic of China.
Telephone: +86 (0) 755 23118282 Fax: +86 (0) 755 23116366, E-mail: info-JYTee@lets.com

### 6.3 MECHANICAL DIMENSIONS

| Frequency MHz | L mm | | h mm | | d mm | |
|---|---|---|---|---|---|---|
| | required | measured | required | measured | required | measured |
| 300 | 420.0 ±1 %. | | 250.0 ±1 %. | | 6.35 ±1 %. | |
| 450 | 290.0 ±1 %. | | 166.7 ±1 %. | | 6.35 ±1 %. | |
| 750 | 176.0 ±1 %. | 177.03 | 100.0 ±1 %. | 100.34 | 6.35 ±1 %. | 6.35 |
| 835 | 161.0 ±1 %. | | 89.8 ±1 %. | | 3.6 ±1 %. | |
| 900 | 149.0 ±1 %. | | 83.3 ±1 %. | | 3.6 ±1 %. | |
| 1450 | 89.1 ±1 %. | | 51.7 ±1 %. | | 3.6 ±1 %. | |
| 1500 | 80.5 ±1 %. | | 50.0 ±1 %. | | 3.6 ±1 %. | |
| 1640 | 79.0 ±1 %. | | 45.7 ±1 %. | | 3.6 ±1 %. | |
| 1750 | 75.2 ±1 %. | | 42.9 ±1 %. | | 3.6 ±1 %. | |
| 1800 | 72.0 ±1 %. | | 41.7 ±1 %. | | 3.6 ±1 %. | |
| 1900 | 68.0 ±1 %. | | 39.5 ±1 %. | | 3.6 ±1 %. | |
| 1950 | 66.3 ±1 %. | | 38.5 ±1 %. | | 3.6 ±1 %. | |
| 2000 | 64.5 ±1 %. | | 37.5 ±1 %. | | 3.6 ±1 %. | |
| 2100 | 61.0 ±1 %. | | 35.7 ±1 %. | | 3.6 ±1 %. | |
| 2300 | 55.5 ±1 %. | | 32.6 ±1 %. | | 3.6 ±1 %. | |
| 2450 | 51.5 ±1 %. | | 30.4 ±1 %. | | 3.6 ±1 %. | |
| 2600 | 48.5 ±1 %. | | 28.8 ±1 %. | | 3.6 ±1 %. | |
| 3000 | 41.5 ±1 %. | | 25.0 ±1 %. | | 3.6 ±1 %. | |
| 3300 | - | | - | | - | |
| 3500 | 37.0±1 %. | | 26.4 ±1 %. | | 3.6 ±1 %. | |
| 3700 | 34.7±1 %. | | 26.4 ±1 %. | | 3.6 ±1 %. | |
| 3900 | - | | - | | - | |
| 4200 | - | | - | | - | |
| 4600 | - | | - | | - | |
| 4900 | - | | - | | - | |

## 7 VALIDATION MEASUREMENT

The IEEE Std. 1528, FCC KDBs and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

## 7.1 HEAD LIQUID MEASUREMENT

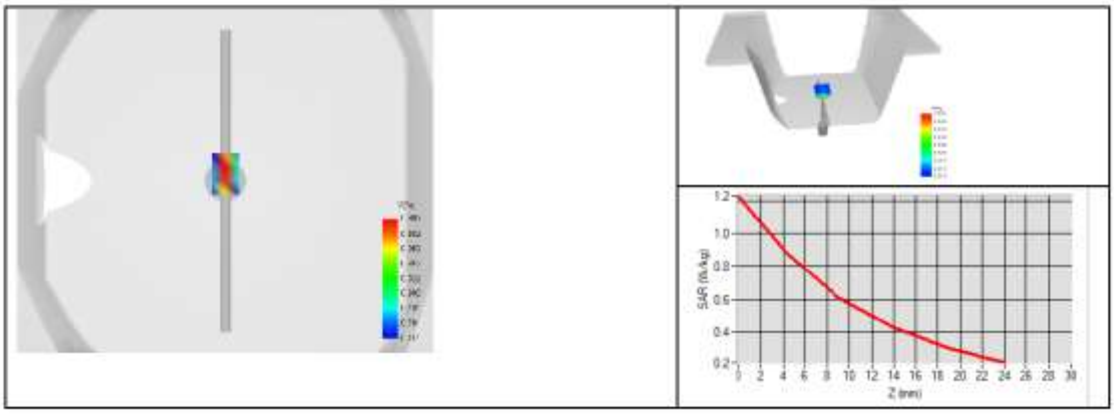
| Frequency MHz | Relative permittivity (εr') | | Conductivity (σ) S/m | |
|---|---|---|---|---|
| | required | measured | required | measured |
| 300 | 45.3 ±10 % | | 0.87 ±10 % | |
| 450 | 43.5 ±10 % | | 0.87 ±10 % | |
| 750 | 41.9 ±10 % | 41.8 | 0.89 ±10 % | 0.82 |
| 835 | 41.5 ±10 % | | 0.90 ±10 % | |
| 900 | 41.5 ±10 % | | 0.97 ±10 % | |
| 1450 | 40.5 ±10 % | | 1.20 ±10 % | |
| 1500 | 40.4 ±10 % | | 1.23 ±10 % | |
| 1640 | 40.2 ±10 % | | 1.31 ±10 % | |
| 1750 | 40.1 ±10 % | | 1.37 ±10 % | |
| 1800 | 40.0 ±10 % | | 1.40 ±10 % | |
| 1900 | 40.0 ±10 % | | 1.40 ±10 % | |
| 1950 | 40.0 ±10 % | | 1.40 ±10 % | |
| 2000 | 40.0 ±10 % | | 1.40 ±10 % | |
| 2100 | 39.8 ±10 % | | 1.49 ±10 % | |
| 2300 | 39.5 ±10 % | | 1.67 ±10 % | |
| 2450 | 39.2 ±10 % | | 1.80 ±10 % | |
| 2600 | 39.0 ±10 % | | 1.96 ±10 % | |
| 3000 | 38.5 ±10 % | | 2.40 ±10 % | |
| 3300 | 38.2 ±10 % | | 2.71 ±10 % | |
| 3500 | 37.9 ±10 % | | 2.91 ±10 % | |
| 3700 | 37.7 ±10 % | | 3.12 ±10 % | |
| 3900 | 37.5 ±10 % | | 3.32 ±10 % | |
| 4200 | 37.1 ±10 % | | 3.63 ±10 % | |
| 4600 | 36.7 ±10 % | | 4.04 ±10 % | |
| 4900 | 36.3 ±10 % | | 4.35 ±10 % | |

## 7.2 SAR MEASUREMENT RESULT WITH HEAD LIQUID

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

| | |
|---|---|
| Software | OPENSAR V5 |
| Phantom | SN 13/09 SAM68 |
| Probe | SN 41/18 EPGO333 |
| Liquid | Head Liquid Values: eps' : 41.8 sigma : 0.82 |
| Distance between dipole center and liquid | 15.0 mm |
| Area scan resolution | dx=8mm/dy=8mm |
| Zoon Scan Resolution | dx=8mm/dy=8mm/dz=5mm |
| Frequency | 750 MHz |
| Input power | 20 dBm |
| Liquid Temperature | 20 +/- 1 °C |
| Lab Temperature | 20 +/- 1 °C |
| Lab Humidity | 30-70 % |

| Frequency MHz | 1 g SAR (W/kg/W) | | 10 g SAR (W/kg/W) | |
|---|---|---|---|---|
| | required | measured | required | measured |
| 300 | 2.85 | | 1.94 | |
| 450 | 4.58 | | 3.06 | |
| 750 | 8.49 | 8.57 (0.86) | 5.55 | 5.56 (0.56) |
| 835 | 9.56 | | 6.22 | |
| 900 | 10.9 | | 6.99 | |
| 1450 | 29 | | 16 | |
| 1500 | 30.5 | | 16.8 | |
| 1640 | 34.2 | | 18.4 | |
| 1750 | 36.4 | | 19.3 | |
| 1800 | 38.4 | | 20.1 | |
| 1900 | 39.7 | | 20.5 | |
| 1950 | 40.5 | | 20.9 | |
| 2000 | 41.1 | | 21.1 | |
| 2100 | 43.6 | | 21.9 | |
| 2300 | 48.7 | | 23.3 | |
| 2450 | 52.4 | | 24 | |
| 2600 | 55.3 | | 24.6 | |
| 3000 | 63.8 | | 25.7 | |
| 3300 | - | | - | |
| 3500 | 67.1 | | 25 | |
| 3700 | 67.4 | | 24.2 | |
| 3900 | - | | - | |
| 4200 | - | | - | |
| 4600 | - | | - | |
| 4900 | - | | - | |


SAR (W/kg)
1.2
1.0
0.8
0.6
0.4
0.2
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Z (mm)

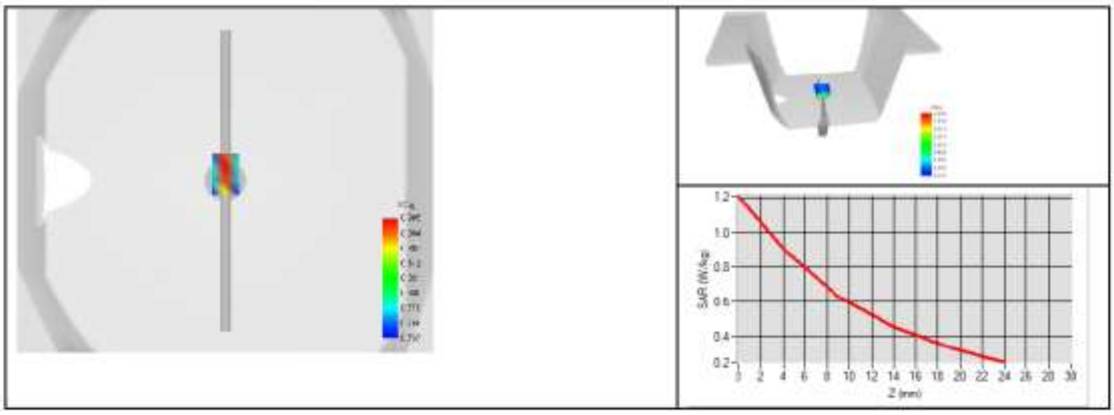
## 7.3 BODY LIQUID MEASUREMENT

| Frequency MHz | Relative permittivity ($\varepsilon_r'$) | | Conductivity ($\sigma$) S/m | |
|---|---|---|---|---|
| | required | measured | required | measured |
| 150 | 61.9 ±10 % | | 0.80 ±10 % | |
| 300 | 58.2 ±10 % | | 0.92 ±10 % | |
| 450 | 56.7 ±10 % | | 0.94 ±10 % | |
| 750 | 55.5 ±10 % | 52.9 | 0.96 ±10 % | 0.89 |
| 835 | 55.2 ±10 % | | 0.97 ±10 % | |
| 900 | 55.0 ±10 % | | 1.05 ±10 % | |
| 915 | 55.0 ±10 % | | 1.06 ±10 % | |
| 1450 | 54.0 ±10 % | | 1.30 ±10 % | |
| 1610 | 53.8 ±10 % | | 1.40 ±10 % | |
| 1800 | 53.3 ±10 % | | 1.52 ±10 % | |
| 1900 | 53.3 ±10 % | | 1.52 ±10 % | |
| 2000 | 53.3 ±10 % | | 1.52 ±10 % | |
| 2100 | 53.2 ±10 % | | 1.62 ±10 % | |
| 2300 | 52.9 ±10 % | | 1.81 ±10 % | |
| 2450 | 52.7 ±10 % | | 1.95 ±10 % | |
| 2600 | 52.5 ±10 % | | 2.16 ±10 % | |
| 3000 | 52.0 ±10 % | | 2.73 ±10 % | |
| 3300 | 51.6 ±10 % | | 3.08 ±10 % | |
| 3500 | 51.3 ±10 % | | 3.31 ±10 % | |
| 3700 | 51.0 ±10 % | | 3.55 ±10 % | |
| 3900 | 50.8 ±10 % | | 3.78 ±10 % | |
| 4200 | 50.4 ±10 % | | 4.13 ±10 % | |
| 4600 | 49.8 ±10 % | | 4.60 ±10 % | |
| 4900 | 49.4 ±10 % | | 4.95 ±10 % | |
| 5200 | 49.0 ±10 % | | 5.30 ±10 % | |
| 5300 | 48.9 ±10 % | | 5.42 ±10 % | |
| 5400 | 48.7 ±10 % | | 5.53 ±10 % | |
| 5500 | 48.6 ±10 % | | 5.65 ±10 % | |
| 5600 | 48.5 ±10 % | | 5.77 ±10 % | |
| 5800 | 48.2 ±10 % | | 6.00 ±10 % | |

## 7.4 SAR MEASUREMENT RESULT WITH BODY LIQUID

| | |
|---|---|
| Software | OPENSAR V5 |
| Phantom | SN 13/09 SAM68 |
| Probe | SN 41/18 EPGO333 |
| Liquid | Body Liquid Values: eps' : 52.9 sigma : 0.89 |
| Distance between dipole center and liquid | 15.0 mm |
| Area scan resolution | dx=8mm/dy=8mm |
| Zoon Scan Resolution | dx=8mm/dy=8mm/dz=5mm |
| Frequency | 750 MHz |
| Input power | 20 dBm |
| Liquid Temperature | 20 +/- 1 °C |
| Lab Temperature | 20 +/- 1 °C |
| Lab Humidity | 30-70 % |

| Frequency MHz | 1 g SAR (W/kg/W) | 10 g SAR (W/kg/W) |
|---|---|---|
| | measured | measured |
| 750 | 8.62 (0.86) | 5.73 (0.57) |








**JianYan Testing Group Shenzhen Co., Ltd.**
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Telephone: +86 (0) 755 23118282 Fax: +86 (0) 755 23116366, E-mail: info-JYTee@lets.com

## 8 LIST OF EQUIPMENT

| Equipment Summary Sheet | | | | |
|---|---|---|---|---|
| **Equipment Description** | **Manufacturer / Model** | **Identification No.** | **Current Calibration Date** | **Next Calibration Date** |
| SAM Phantom | MVG | SN-13/09-SAM68 | Validated. No cal required. | Validated. No cal required. |
| COMOSAR Test Bench | Version 3 | NA | Validated. No cal required. | Validated. No cal required. |
| Network Analyzer | Rohde & Schwarz ZVM | 100203 | 05/2019 | 05/2022 |
| Network Analyzer – Calibration kit | Rohde & Schwarz ZV-Z235 | 101223 | 05/2019 | 05/2022 |
| Calipers | Mitutoyo | SN 0009732 | 10/2019 | 10/2022 |
| Reference Probe | MVG | EPGO333 SN 41/18 | 05/2020 | 05/2021 |
| Multimeter | Keithley 2000 | 1160271 | 02/2020 | 02/2023 |
| Signal Generator | Rohde & Schwarz SMB | 106589 | 04/2019 | 04/2022 |
| Amplifier | Aethercomm | SN 046 | Characterized prior to test. No cal required. | Characterized prior to test. No cal required. |
| Power Meter | NI-USB 5680 | 170100013 | 05/2019 | 05/2022 |
| Directional Coupler | Narda 4216-20 | 01386 | Characterized prior to test. No cal required. | Characterized prior to test. No cal required. |
| Temperature / Humidity Sensor | Testo 184 H1 | 44220687 | 05/2020 | 05/2023 |

# Dipole Impedance and Return Loss calibration Report

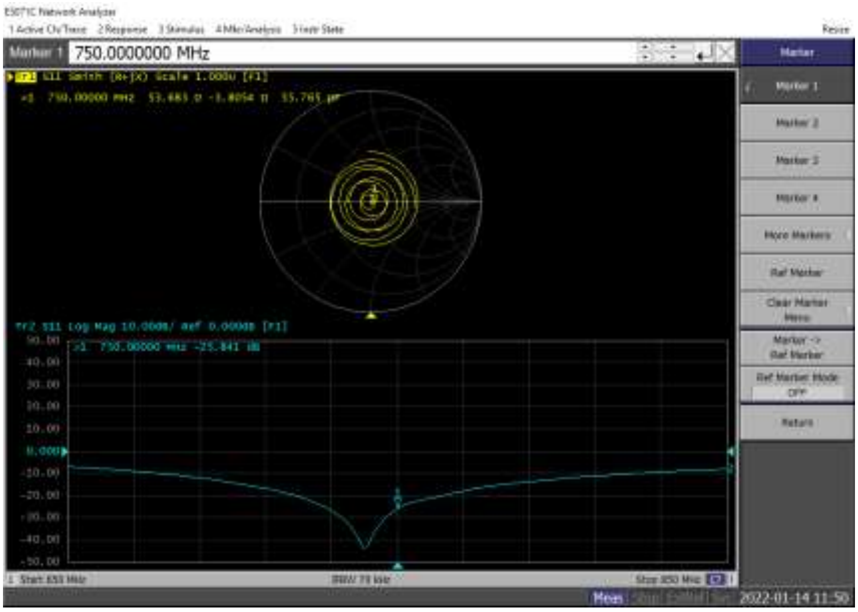
| | |
|---|---|
| **Object:** | SID750- SN 50/20 DIP 0G750-506 |
| **Calibration Date:** | January 14, 2022 |
| **Calibration reference:** | IEEE Std 1528:2013, IEC 62209-1:2016, FCC KDB 865664 D01 |
| **Calibrated By:** | Janet Wei (Janet Wei, SAR project engineer) |
| **Reviewed By:** | Winner Zhang (Winner Zhang, Technical manager) |

**Environment of Test Site**

| | |
|---|---|
| Temperature: | 18 ~ 25 C |
| Humidity: | 50~60% RH |
| Atmospheric Pressure: | 1011 mbar |

**Test Data**

Measurement Plot for Head TSL In 2022




**Comparison with Original report**

| Items | Calibrated By MVG | Calibrated By JYT In 2022 | Deviation | Limit |
|---|---|---|---|---|
| Impendence for Head TSL | 54.0Ω –3.70jΩ | 53.68Ω –3.81jΩ | -0.32Ω -0.11jΩ | ±5Ω |
| Return Loss for Head TSL | -25.31 | -25.84 | 2.09% | ±20%(No less than 20 dB) |

**Result**

Compliance