# TEST REPORT

| | |
|---|---|
| Applicant/ Manufacturer: | Shenzhen Youmi Intelligent Technology Co., Ltd. |
| Address: | 406-407 Jinqi Zhigu Building, 4/F, 1 Tangling Road, Nanshan District, Shenzhen City, China |
| Report Number: | SZ1231103-64998E-SAA |

**Test Standard (s)**

EN 50360: 2017; EN 50566:2017; EN 50663:2017; EN 62479:2010

BS EN 50360: 2017; BS EN 50566:2017; BS EN 50663:2017; BS EN 62479:2010

**Sample Description**

| | |
|---|---|
| Product Type: | Smart phone |
| Model No.: | PG2309GBA |
| Multiple Model(s) No.: | PG3NBG7YB (Please refer to DOS for model difference) |
| Trade Mark: | UMIDIGI |
| Date Received: | 2023/11/16 |
| Report Date: | 2023/12/27 |
| Test Result: | Pass▲ |

▲In the configuration tested, the EUT complied with the standards above.

**Prepared and Checked By:**

Luke Jiang
SAR Engineer

**Approved By:**

Alvin Huang
Lab Manager

Note: The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. Customer model name, addresses, names, trademarks etc. are included.

| Attestation of Test Results | | |
|---|---|---|
| **EUT Information** | **Company Name** | Shenzhen Youmi Intelligent Technology Co., Ltd. |
| | **EUT Description** | Smart phone |
| | **Model Number** | PG2309GBA |
| | **Multiple Model(s) No.** | PG3NBG7YB |
| | **Serial Number** | 2DKY-1 |
| | **Test Date** | 2023/12/15 |

| Frequency Band | Highest Reported SAR | Limit(W/Kg) |
|---|---|---|
| **5G NR n1** | 1.140 W/kg 10g Head SAR<br>0.630 W/kg 10g Body SAR | **2.0** |
| **5G NR n1** | 2.290 W/kg 10g Limb SAR | **4.0** |
| **Simultaneous** | 1.231 W/kg 10g Head SAR<br>0.765 W/kg 10g Body SAR | **2.0** |
| **Simultaneous** | 2.632 W/kg 10g Limb SAR | **4.0** |

| | |
|---|---|
| **Applicable Standards** | **EN50360: 2017, BS EN50360: 2017**<br>Product standard to demonstrate the compliance of wireless communication devices, with the basic restrictions and exposure limit values related to human exposure to electromagnetic fields in the frequency range from 300 MHz to 6 GHz: devices used next to the ear |
| | **EN50566: 2017, BS EN50566: 2017**<br>Product standard to demonstrate the compliance of wireless communication devices with the basic restrictions and exposure limit values related to human exposure to electromagnetic fields in the frequency range from 30 MHz to 6 GHz: hand-held and body mounted devices in close proximity to the human body |
| | **EN62209-1:2016, BS EN62209-1:2016**<br>Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices –<br>Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz |
| | **EN62209-2:2010, BS EN62209-2:2010**<br>Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures –<br>Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body<br>(frequency range of 30 MHz to 6 GHz) |
| | **EN 62479:2010, BS EN 62479:2010**<br>Assessment of the compliance of low power electronic and electrical equipment with the basic restrictions related to human exposure to electromagnetic fields (10 MHz to 300 GHz) |
| | **EN 50663:2017, BS EN 50663:2017**<br>Generic standard for assessment of low power electronic and electrical equipment related to human exposure restrictions for electromagnetic fields (10 MHz - 300 GHz) |
| | **REDCA Technical Guidance Note 20**<br>SAR Testing and Assessment Guidance |
| | **IEEE1528:2013**<br>Draft Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques. |

**Note:** This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in **Council Recommendation 1999/519/EC** and has been tested in accordance with the measurement procedures specified in EN62209-1:2016 & EN62209-2:2010.

**The results and statements contained in this report pertain only to the device(s) evaluated.**

# TABLE OF CONTENTS

# DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|---|---|---|---|
| 0 | SZ1231103-64998E-SAA | Original Report | 2023/12/27 |

# EUT DESCRIPTION

This report has been prepared on behalf of ***Shenzhen Youmi Intelligent Technology Co., Ltd.*** and their product ***Smart phone***, *Model:* ***PG2309GBA*** *and* ***PG3NBG7YB****,* Tested Model: ***PG2309GBA*** the EUT (Equipment Under Test) as referred to in the rest of this report.

**All measurement and test data in this report was gathered from production sample serial number: 2DKY-1 (Assigned by BACL, Shenzhen).The EUT supplied by the applicant was received on 2023-11-16.*

## Technical Specification

| | |
|---|---|
| **Product Type:** | Portable |
| **Exposure Category:** | Population / Uncontrolled |
| **Antenna Type(s):** | Internal Antenna |
| **Body-Worn Accessories:** | Headset |
| **Face-Head Accessories:** | None |
| **Operation Mode:** | 5G NR |
| **Frequency Band:** | 5G NR n1: 1920-1980MHz(TX), 2110-2170MHz(RX) |
| **Power Source:** | Rechargeable Battery |
| **Normal Operation:** | Head, Body-worn and Limb |

# REFERENCE, STANDARDS, AND GUILDELINES

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by EN62209-1 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

## SAR Limits

CE Limit (10g Tissue)

| EXPOSURE LIMITS | SAR (W/kg) | |
|---|---|---|
| | (General Population / Uncontrolled Exposure Environment) | (Occupational / Controlled Exposure Environment) |
| Spatial Average (averaged over the whole body) | 0.08 | 0.4 |
| Spatial Peak (averaged over any 10 g of tissue) | **2.0** | 10 |
| Spatial Peak (hands/wrists/feet/ankles averaged over 10 g) | 4.0 | 20.0 |

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

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

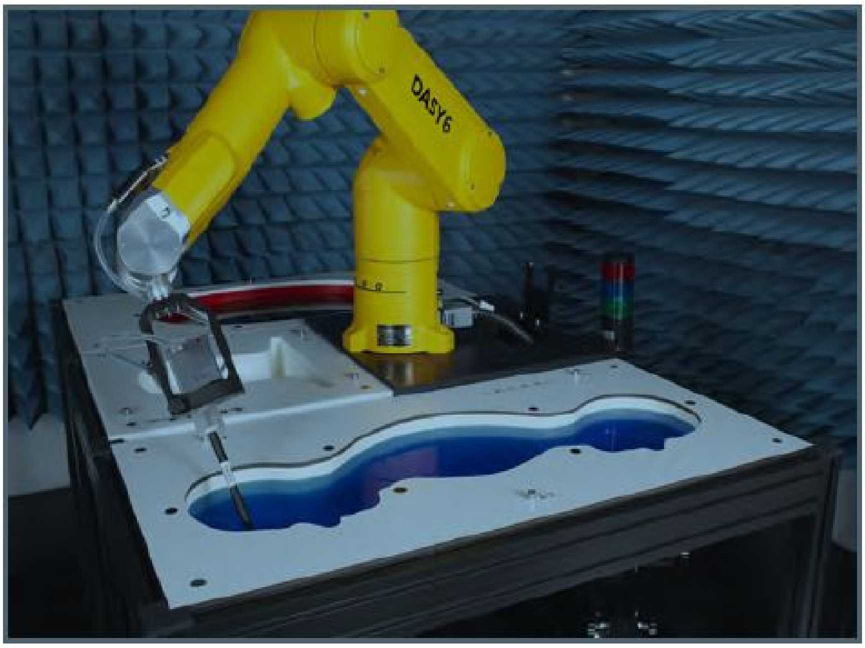
General Population/Uncontrolled environments Spatial Peak limit 2.0W/kg (Head & Body) and Spatial Peak limit 4.0W/kg (Limb) applied to the EUT.

# FACILITIES

The test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect data is located at 5F(B-West) , 6F, 7F, the 3rd Phase of Wan Li Industrial Building D, Shihua Rd, FuTian Free Trade Zone, Shenzhen, China.

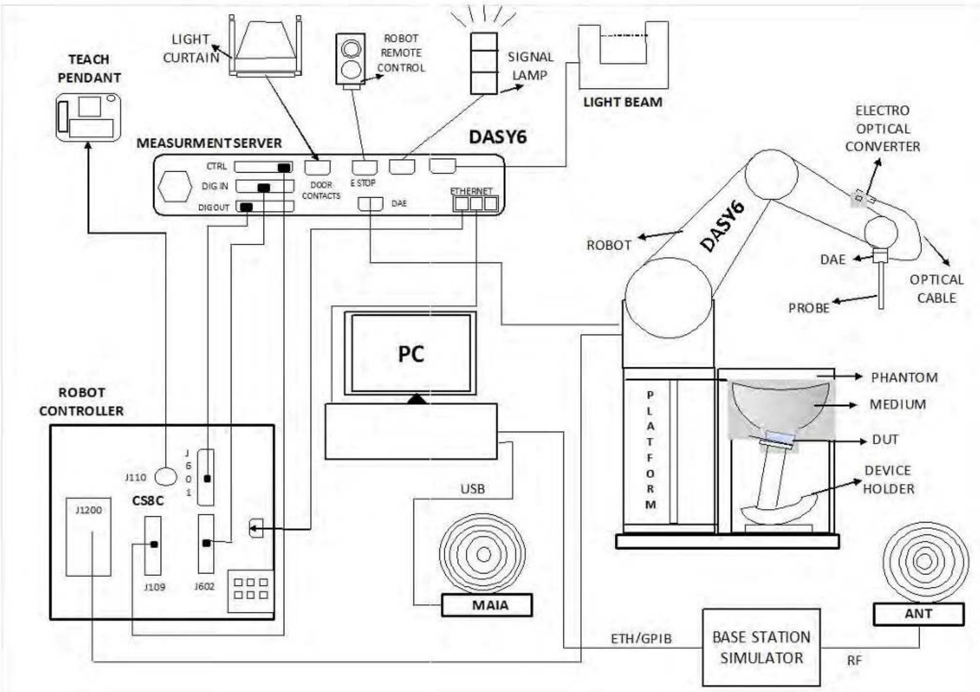
# DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY6 from Schmid & Partner Engineering AG (SPEAG) which is the Fifth generation of the system shown in the figure hereinafter:




## DASY6 System Description

The DASY6 system for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot (Staubli TX=RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal application, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running Win7 professional operating system and the DASY52 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

**DASY6 Measurement Server**


The DASY6 measurement server is based on a PC/104 CPU board with a 400 MHz Intel ULV Celeron, 128 MB chip-disk and 128 MB RAM. The necessary circuits for communication with the DAE4 (or DAE3) electronics box, as well as the 16-bit AD converter system for optical detection and digital I/O interface are contained on the DASY6 I/O board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluations of field measurements and surface detection, controls robot movements, and handles safety operations. The PC operating system cannot interfere with these time-critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program- controlled robot movements. Furthermore, the measurement server is equipped with an expansion port, which is reserved for future applications. Please note that this expansion port does not have a standardized pinout, and therefore only devices provided by SPEAG can be connected. Connection of devices from any other supplier could seriously damage the measurement server.

**Data Acquisition Electronics**

The data acquisition electronics (DAE4) consist of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder with a control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information, as well as an optical uplink for commands and the clock.

The mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

The input impedance of both the DAE4 as well as of the DAE3 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**EX3DV4 E-Field Probes**

| | |
|---|---|
| **Frequency** | 4MHz -10GHz<br>Linearity: ± 0.2 dB (30 MHz - 10GHz) |
| **Directivity** | ± 0.1 dB in TSL (rotation around probe axis)<br>± 0.3 dB in TSL (rotation normal to probe axis) |
| **Dynamic Range** | 10 µW/g to > 100 mW/g<br>Linearity: ± 0.2 dB (noise: typically < 1 µW/g) |
| **Dimensions** | Overall length: 337 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm |
| **Application** | High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better 30%. |
| **Compatibility** | DASY3, DASY4, DASY52, SAR and higher, EASY6, EASY4/MRI |

**SAM Twin Phantom**

The SAM Twin Phantom (shown in front of DASY6) is a fiberglass shell phantom with shell thickness 2 mm, except in the ear region where the thickness is increased to 6 mm. The phantom has three measurement areas: 1) Left Head, 2) Right Head, and 3) Flat Section. For larger devices, the use of the ELI-Phantom (shown behind DASY6) is required. For devices such as glasses with a wireless link, the Face Down Phantom is the most suitable (between the SAM Twin and ELI phantoms).

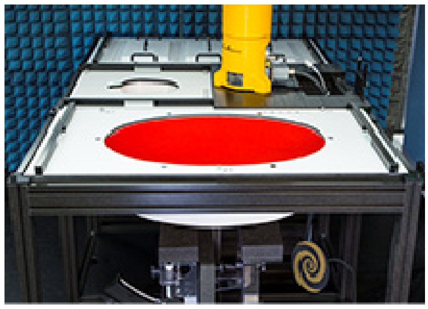
When the phantom is mounted inside allocated slot of the DASY6 platform, phantom reference points can be taught directly in the DASY5 V5.2 software. When the DASY6 platform is used to mount the

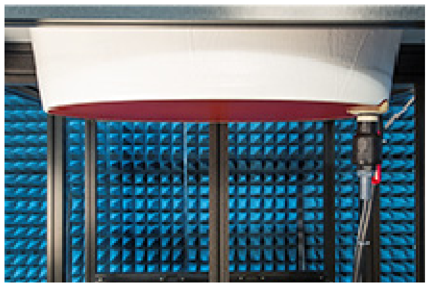
Phantom, some of the phantom teaching points cannot be reached by the robot in DASY5 V5.2. A special tool called P1a-P2aX-Former is provided to transform two of the three points, P1 and P2, to reachable locations. To use these new teaching points, a revised phantom configuration file is required.
In addition to our standard broadband liquids, the phantom can be used with the following tissue simulating liquids:

Sugar-water-based liquids can be left permanently in the phantom. Always cover the liquid when the system is not in use to prevent changes in liquid parameters due to water evaporation.
DGBE-based liquids should be used with care. As DGBE is a softener for most plastics, the liquid should be taken out of the phantom, and the phantom should be dried when the system is not in use (desirable at least once a week).

Do not use other organic solvents without previously testing the solvent resistivity of the phantom.
Approximately 25 liters of liquid is required to fill the SAM Twin phantom.

**ELI Phantom**





The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30MHz to 6 GHz. ELI is fully compatible with the latest draft of the standard IEC 62209-2 and the use of all known tissue simulating liquids. ELI has been optimized for performance and can be integrated into a SPEAG standard phantom table. A cover is provided to prevent evaporation of water and changes in liquid parameters. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points.

The phantom can be used with the following tissue simulating liquids:

- Sugar-water-based liquids can be left permanently in the phantom. Always cover the liquid when the system is not in use to prevent changes in liquid parameters due to water evaporation.

- DGBE-based liquids should be used with care. As DGBE is a softener for most plastics, the liquid should be taken out of the phantom, and the phantom should be dried when the system is not in use (desirable at least once a week).

- Do not use other organic solvents without previously testing the solvent resistivity of the phantom.

Approximately 25 liters of liquid is required to _fill the ELI phantom.

**Robots**

The DASY6 system uses the high-precision industrial robots TX60L, TX90XL, and RX160L from St  aubli SA (France). The TX robot family - the successor of the well-known RX robot family - continues to offer the features important for DASY6 applications:

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

The robots are controlled by the Staubli CS8c robot controllers. All information regarding the use and maintenance of the robot arm and the robot controller is provided

**Calibration Frequency Points for EX3DV4 E-Field Probes SN: 7382 Calibrated: 2023/09/27**

| Calibration Frequency Point (MHz) | Frequency Range (MHz) | | Conversion Factor | | |
|---|---|---|---|---|---|
| | From | To | X | Y | Z |
| 750 Head | 650 | 850 | 10.65 | 10.65 | 10.65 |
| 900 Head | 850 | 1000 | 10.19 | 10.19 | 10.19 |
| 1750 Head | 1650 | 1850 | 8.60 | 8.60 | 8.60 |
| 1900 Head | 1850 | 2000 | 8.30 | 8.30 | 8.30 |
| 2300 Head | 2200 | 2400 | 8.16 | 8.16 | 8.16 |
| 2450 Head | 2400 | 2550 | 7.89 | 7.89 | 7.89 |
| 2600 Head | 2550 | 2700 | 7.65 | 7.65 | 7.65 |
| 3300 Head | 3200 | 3400 | 7.39 | 7.39 | 7.39 |
| 3500 Head | 3400 | 3600 | 7.24 | 7.24 | 7.24 |
| 3700 Head | 3600 | 3800 | 7.10 | 7.10 | 7.10 |
| 3900 Head | 3800 | 4000 | 6.98 | 6.98 | 6.98 |
| 5250 Head | 5140 | 5360 | 5.62 | 5.62 | 5.62 |
| 5500 Head | 5390 | 5610 | 5.10 | 5.10 | 5.10 |
| 5750 Head | 5640 | 5860 | 5.08 | 5.08 | 5.08 |

**Area Scans**

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a 15mm 2 step integral, with 1.5mm interpolation used to locate the peak SAR area used for zoom scan assessments.

Where the system identifies multiple SAR peaks (which are within 25% of peak value) the system will provide the user with the option of assessing each peak location individually for zoom scan averaging.

**Zoom Scan (Cube Scan Averaging)**

The averaging zoom scan volume utilized in the DASY5 software is in the shape of a cube and the side dimension of a 1 g or 10 g mass is dependent on the density of the liquid representing the simulated tissue. A density of 1000 kg/m$^3$ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1g cube is 10mm,with the side length of the 10g cube is 21.5mm.

When the cube intersects with the surface of the phantom, it is oriented so that 3 vertices touch the surface of the shell or the center of a face is tangent to the surface. The face of the cube closest to the surface is modified in order to conform to the tangent surface.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 7 x7 x 7 (5mmx5mmx5mm) providing a volume of 30 mm in the X & Y & Z axis.

## Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the EN 62209-1:2016

**Recommended Tissue Dielectric Parameters for Head liquid**

**Table A.3 – Dielectric properties of the head tissue-equivalent liquid**

| **Frequency** MHz | **Relative permittivity** $\varepsilon_r$ | **Conductivity ($\sigma$)** S/m |
|---|---|---|
| 300 | 45,3 | 0,87 |
| 450 | 43,5 | 0,87 |
| *750* | *41,9* | *0,89* |
| 835 | 41,5 | 0,90 |
| 900 | 41,5 | 0,97 |
| 1 450 | 40,5 | 1,20 |
| *1 500* | *40,4* | *1,23* |
| *1 640* | *40,2* | *1,31* |
| *1 750* | *40,1* | *1,37* |
| 1 800 | 40,0 | 1,40 |
| 1 900 | 40,0 | 1,40 |
| 2 000 | 40,0 | 1,40 |
| *2 100* | *39,8* | *1,49* |
| *2 300* | *39,5* | *1,67* |
| 2 450 | 39,2 | 1,80 |
| *2 600* | *39,0* | *1,96* |
| 3 000 | 38,5 | 2,40 |
| *3 500* | *37,9* | *2,91* |
| *4 000* | *37,4* | *3,43* |
| *4 500* | *36,8* | *3,94* |
| *5 000* | *36,2* | *4,45* |
| *5 200* | *36,0* | *4,66* |
| *5 400* | *35,8* | *4,86* |
| *5 600* | *35,5* | *5,07* |
| *5 800* | *35,3* | *5,27* |
| *6 000* | *35,1* | *5,48* |

NOTE For convenience, permittivity and conductivity values at those frequencies which are not part of the original data provided by Drossos et al. [33] or the extension to 5 800 MHz are provided (i.e. the values shown *in italics*). These values were linearly interpolated between the values in this table that are immediately above and below these values, except the values at 6 000 MHz that were linearly extrapolated from the values at 3 000 MHz and 5 800 MHz.

# EQUIPMENT LIST AND CALIBRATION

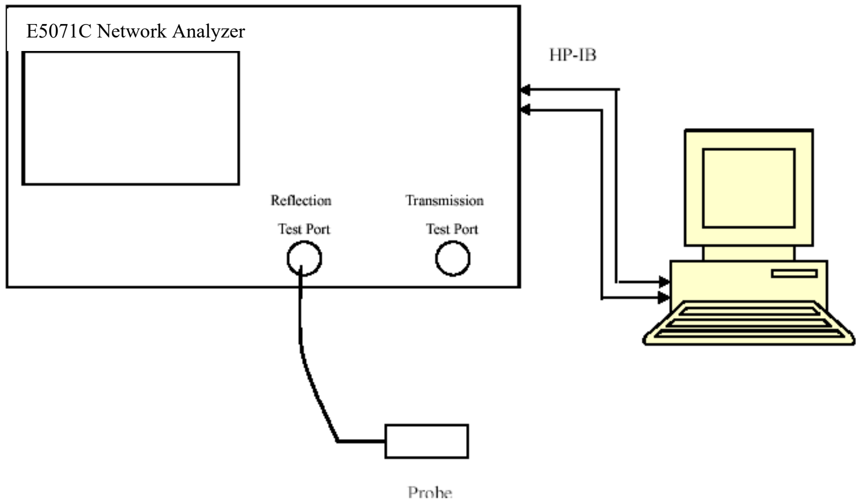
## Equipments List & Calibration Information

| Equipment | Model | S/N | Calibration Date | Calibration Due Date |
|---|---|---|---|---|
| DASY5 Test Software | DASY52 52.10.2 | N/A | NCR | NCR |
| DASY6 Measurement Server | DASY6 6.0.31 | N/A | NCR | NCR |
| Data Acquisition Electronics | DAE4 | 1325 | 2023/09/27 | 2024/09/26 |
| E-Field Probe | EX3DV4 | 7382 | 2023/09/27 | 2024/09/26 |
| Mounting Device | MD4HHTV5 | SD 000 H01 KA | NCR | NCR |
| SAM Twin Phantom | SAM-Twin V8.0 | 1962 | NCR | NCR |
| Dipole, 1900MHz | D1900V2 | 5d231 | 2023/02/17 | 2026/02/16 |
| Simulated Tissue Liquid Head | HBBL600-10000V6 | 180622-2 | Each Time | / |
| Network Analyzer | E5071C | SER MT46519680 | 2023/06/08 | 2024/06/07 |
| Dielectric Assessment Kit | DAK-3.5 | 1248 | NCR | NCR |
| MXG Analog Signal Generator | N5181A | MY48180408 | 2023/06/08 | 2024/06/07 |
| USB wideband power sensor | U2021XA | MY52350001 | 2023/06/08 | 2024/06/07 |
| Power Amplifier | 5S1G4 | 71377 | NCR | NCR |
| Directional Coupler | 4242-10 | 3307 | NCR | NCR |
| Attenuator | 6dB | 773-6 | NCR | NCR |
| Radio Communication Test Station 5G | MT8000A | 6262309799 | 2023/04/15 | 2024/04/14 |

**NCR:** No Calibration Required.

# SA R MEASUREMENT SYSTEM VERIFICATION

## Liquid Verification




Liquid Verification Setup Block Diagram

### Liquid Verification Results

| Frequency (MHz) | Liquid Type | Liquid Parameter | | Target Value | | Delta (%) | | Tolerance (%) |
|---|---|---|---|---|---|---|---|---|
| | | $\varepsilon_r$ | Ơ (S/m) | $\varepsilon_r$ | Ơ (S/m) | $\Delta\varepsilon_r$ | ΔƠ | |
| 1900 | Simulated Tissue Liquid Head | 38.681 | 1.447 | 40.00 | 1.40 | -3.30 | 3.36 | ±5 |
| 1930 | Simulated Tissue Liquid Head | 40.155 | 1.428 | 40.00 | 1.40 | 0.39 | 2.00 | ±5 |
| 1950 | Simulated Tissue Liquid Head | 41.138 | 1.416 | 40.00 | 1.40 | 2.85 | 1.14 | ±5 |
| 1970 | Simulated Tissue Liquid Head | 41.193 | 1.411 | 40.00 | 1.40 | 2.98 | 0.79 | ±5 |

**Liquid Verification was performed on 2023/12/15.*

## System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

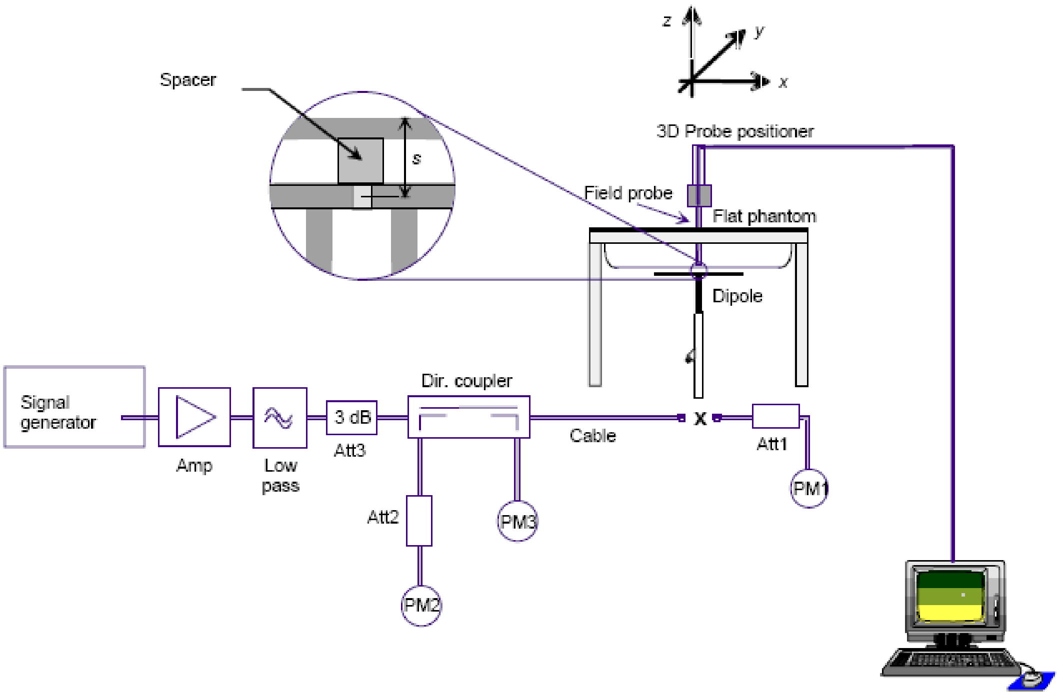
The spacing distance*s* in the **System Verification Setup Block Diagram** is given by the following:

a) s = 15 mm ± 0,2 mm for 300 MHz ≤ f ≤ 1 000 MHz;

b) s = 10 mm ± 0,2 mm for 1 000 MHz < f ≤ 3 000 MHz;

c) s = 10 mm ± 0,2 mm for 3 000 MHz < f ≤ 6 000 MHz.

### System Verification Setup Block Diagram




### System Accuracy Check Results

| Date | Frequency Band (MHz) | Liquid Type | Input Power (mW) | Measured SAR (W/kg) | | Normalized to 1W (W/kg) | Target Value (W/Kg) | Delta (%) | Tolerance (%) |
|---|---|---|---|---|---|---|---|---|---|
| 2023/12/15 | 1900 | Head | 100 | 10g | 2.01 | 20.1 | 20.8 | -3.365 | ±10 |

*The SAR values above are normalized to 1 Watt forward power.

# SAR SYSTEM VALIDATION DATA

## System Performance 1900 MHz Head

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d231**

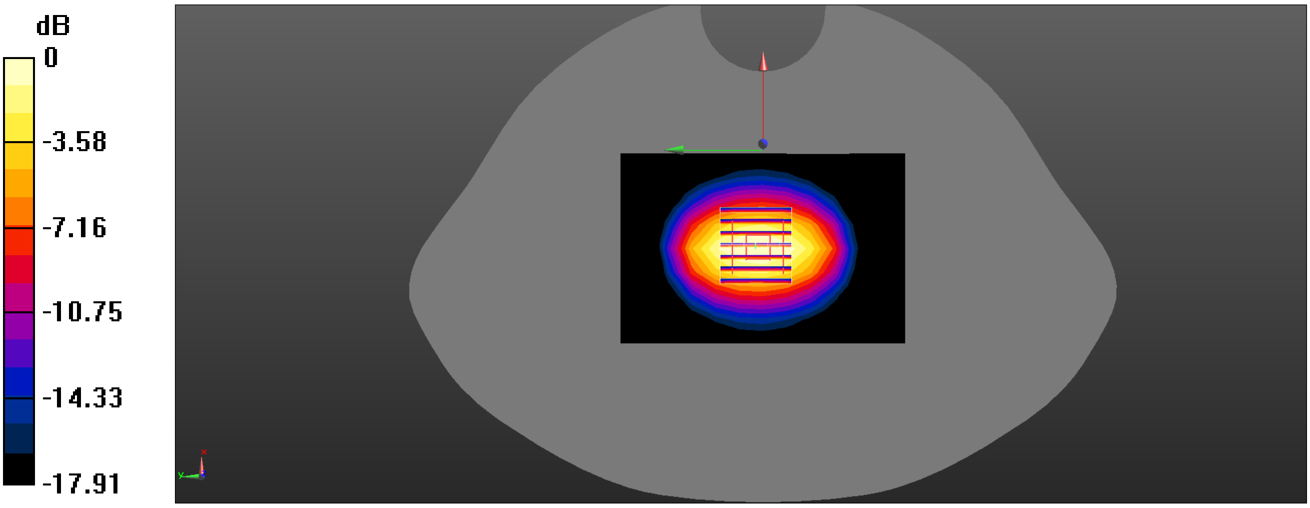
Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.447 S/m; $\varepsilon_r$ = 38.681; $\rho$ = 1000 kg/m³
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 – SN7382; ConvF(8.3, 8.3, 8.3) @ 1900 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 9/27/2023
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

**Head 1900MHz Pin=100mW/Area Scan (6x9x1):** Measurement grid: dx=15 mm, dy=15 mm
Maximum value of SAR (measured) = 5.66 W/kg

**Head 1900MHz Pin=100mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 44.89 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 8.91 W/kg
**SAR(1 g) = 4.08 W/kg; SAR(10 g) = 2.01 W/kg**
Maximum value of SAR (measured) = 5.43 W/kg



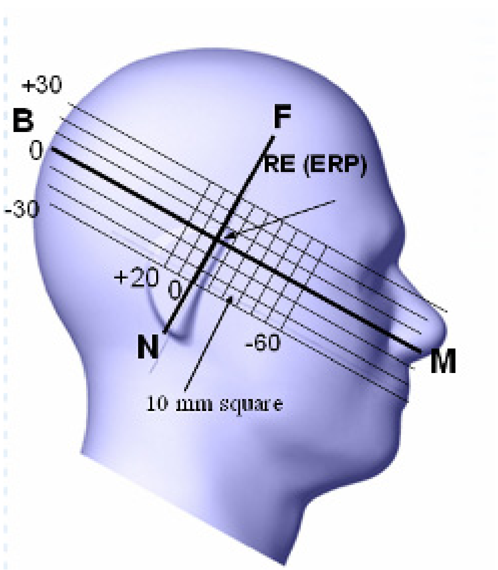

0 dB = 5.43 W/kg = 7.35 dBW/kg

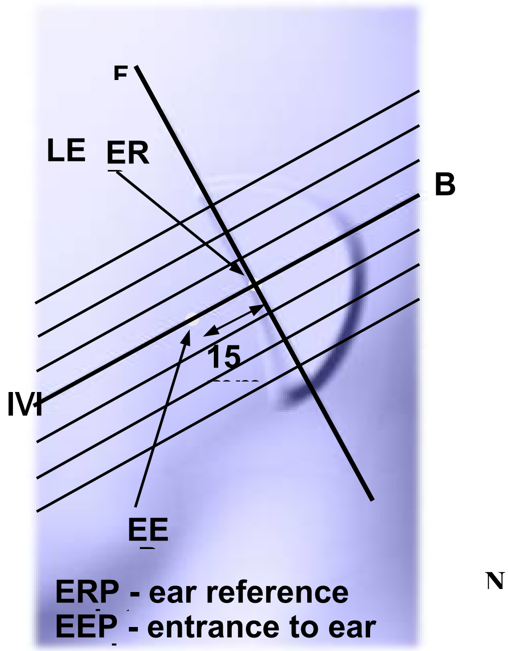
# EUT TEST STRATEGY AND METHODOLOGY

## Test Positions for Device Operating Next to a Person's Ear

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point". The "test device reference point" should be located at the same level as the center of the earpiece region. The "vertical centerline" should bisect the front surface of the handset at its top and bottom edges. A "ear reference point" is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the "phantom reference plane" defined by the three lines joining the center of each "ear reference point" (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the "N-F" line defined along the base of the ear spacer that contains the "ear reference point". For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The "test device reference point" is aligned to the "ear reference point" on the head phantom and the "vertical centerline" is aligned to the "phantom reference plane". This is called the "initial ear position". While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:



## Cheek/Touch Position

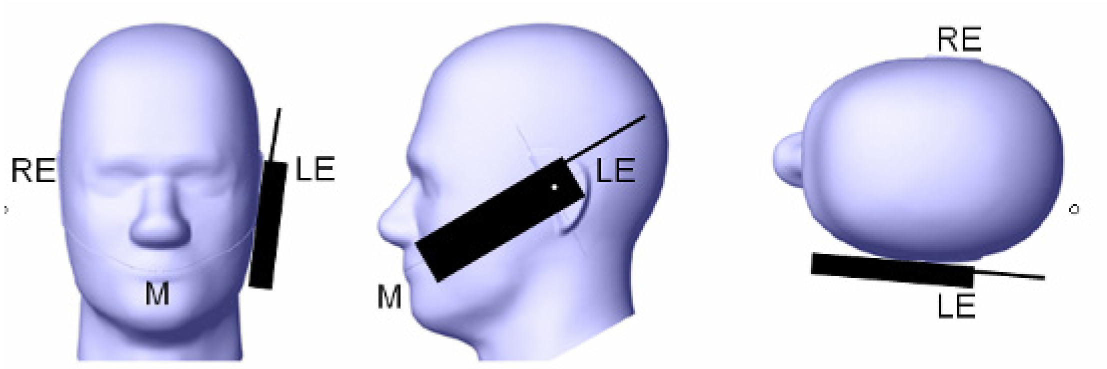
The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line for the SCC-34/SC-2 head phantom.

This test position is established:

- When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
- (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

**Cheek /Touch Position**




## Ear/Tilt Position

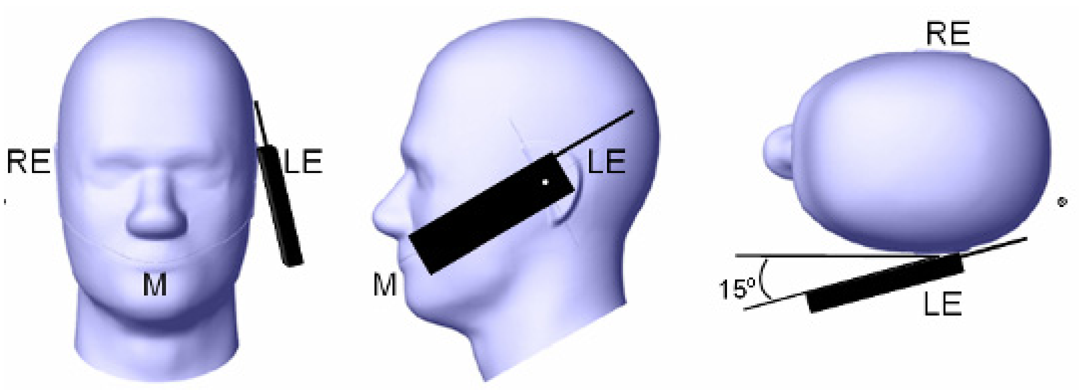
With the handset aligned in the "Cheek/Touch Position":

1) If the earpiece of the handset is not in full contact with the phantom's ear spacer (in the "Cheek/Touch position") and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.

2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both "ear reference points" (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the "test device reference point" until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the "Cheek/Touch" and "Ear/Tilt" positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tile/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

**Ear /Tilt 15° Position**




### Test positions for body-worn and other configurations

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

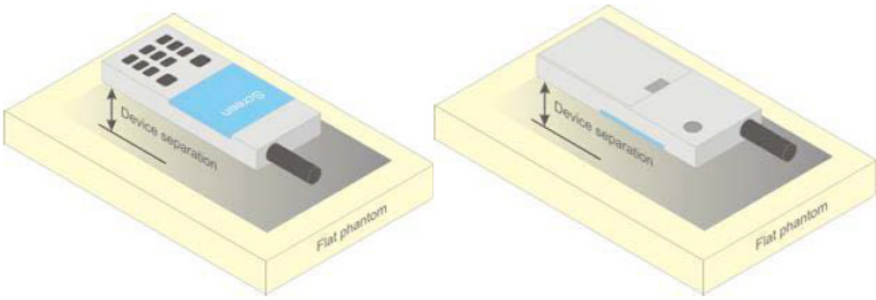



**Figure 5 – Test positions for body-worn devices**

## SAR Evaluation Procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

Step 2: The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or EUT and the horizontal grid spacing was 10 mm x 10 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1) The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

2) The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the “Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.
All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

# CONDUCTED OUTPUT POWER MEASUREMENT

**Test Results:**

**5G NR n1:**

| Mode | Value (dBm) |
|---|---|
| n1_5MHz_15kHz_1922.5MHz_DFT-s-OFDM PI/2 BPSK_RB12@6 | 24.45 |
| n1_5MHz_15kHz_1922.5MHz_DFT-s-OFDM PI/2 BPSK_RB1@1 | 24.35 |
| n1_5MHz_15kHz_1922.5MHz_DFT-s-OFDM PI/2 BPSK_RB1@23 | 23.28 |
| n1_5MHz_15kHz_1922.5MHz_DFT-s-OFDM QPSK_RB12@6 | 24.54 |
| n1_5MHz_15kHz_1922.5MHz_DFT-s-OFDM QPSK_RB1@1 | 23.21 |
| n1_5MHz_15kHz_1922.5MHz_DFT-s-OFDM QPSK_RB1@23 | 23.23 |
| n1_5MHz_15kHz_1950MHz_DFT-s-OFDM PI/2 BPSK_RB12@6 | 24.12 |
| n1_5MHz_15kHz_1950MHz_DFT-s-OFDM PI/2 BPSK_RB1@1 | 23.83 |
| n1_5MHz_15kHz_1950MHz_DFT-s-OFDM PI/2 BPSK_RB1@23 | 23.87 |
| n1_5MHz_15kHz_1950MHz_DFT-s-OFDM QPSK_RB12@6 | 24.24 |
| n1_5MHz_15kHz_1950MHz_DFT-s-OFDM QPSK_RB1@1 | 23.85 |
| n1_5MHz_15kHz_1950MHz_DFT-s-OFDM QPSK_RB1@23 | 23.88 |
| n1_5MHz_15kHz_1977.5MHz_DFT-s-OFDM PI/2 BPSK_RB12@6 | 23.68 |
| n1_5MHz_15kHz_1977.5MHz_DFT-s-OFDM PI/2 BPSK_RB1@1 | 23.48 |
| n1_5MHz_15kHz_1977.5MHz_DFT-s-OFDM PI/2 BPSK_RB1@23 | 23.39 |
| n1_5MHz_15kHz_1977.5MHz_DFT-s-OFDM QPSK_RB12@6 | 23.79 |
| n1_5MHz_15kHz_1977.5MHz_DFT-s-OFDM QPSK_RB1@1 | 23.41 |
| n1_5MHz_15kHz_1977.5MHz_DFT-s-OFDM QPSK_RB1@23 | 23.35 |

| Mode | Value (dBm) |
|---|---|
| n1_10MHz_15kHz_1925MHz_DFT-s-OFDM PI/2 BPSK_RB1@50 | 24.15 |
| n1_10MHz_15kHz_1925MHz_DFT-s-OFDM PI/2 BPSK_RB1@1 | 24.22 |
| n1_10MHz_15kHz_1925MHz_DFT-s-OFDM PI/2 BPSK_RB25@12 | 24.45 |
| n1_10MHz_15kHz_1925MHz_DFT-s-OFDM QPSK_RB1@50 | 24.14 |
| n1_10MHz_15kHz_1925MHz_DFT-s-OFDM QPSK_RB1@1 | 24.16 |
| n1_10MHz_15kHz_1925MHz_DFT-s-OFDM QPSK_RB25@12 | 24.48 |
| n1_10MHz_15kHz_1950MHz_DFT-s-OFDM PI/2 BPSK_RB1@50 | 23.83 |
| n1_10MHz_15kHz_1950MHz_DFT-s-OFDM PI/2 BPSK_RB1@1 | 23.89 |
| n1_10MHz_15kHz_1950MHz_DFT-s-OFDM PI/2 BPSK_RB25@12 | 24.16 |
| n1_10MHz_15kHz_1950MHz_DFT-s-OFDM QPSK_RB1@50 | 23.97 |
| n1_10MHz_15kHz_1950MHz_DFT-s-OFDM QPSK_RB1@1 | 23.85 |
| n1_10MHz_15kHz_1950MHz_DFT-s-OFDM QPSK_RB25@12 | 24.24 |
| n1_10MHz_15kHz_1975MHz_DFT-s-OFDM PI/2 BPSK_RB1@50 | 23.47 |
| n1_10MHz_15kHz_1975MHz_DFT-s-OFDM PI/2 BPSK_RB1@1 | 23.65 |
| n1_10MHz_15kHz_1975MHz_DFT-s-OFDM PI/2 BPSK_RB25@12 | 23.72 |
| n1_10MHz_15kHz_1975MHz_DFT-s-OFDM QPSK_RB1@50 | 23.40 |
| n1_10MHz_15kHz_1975MHz_DFT-s-OFDM QPSK_RB1@1 | 23.59 |
| n1_10MHz_15kHz_1975MHz_DFT-s-OFDM QPSK_RB25@12 | 23.78 |

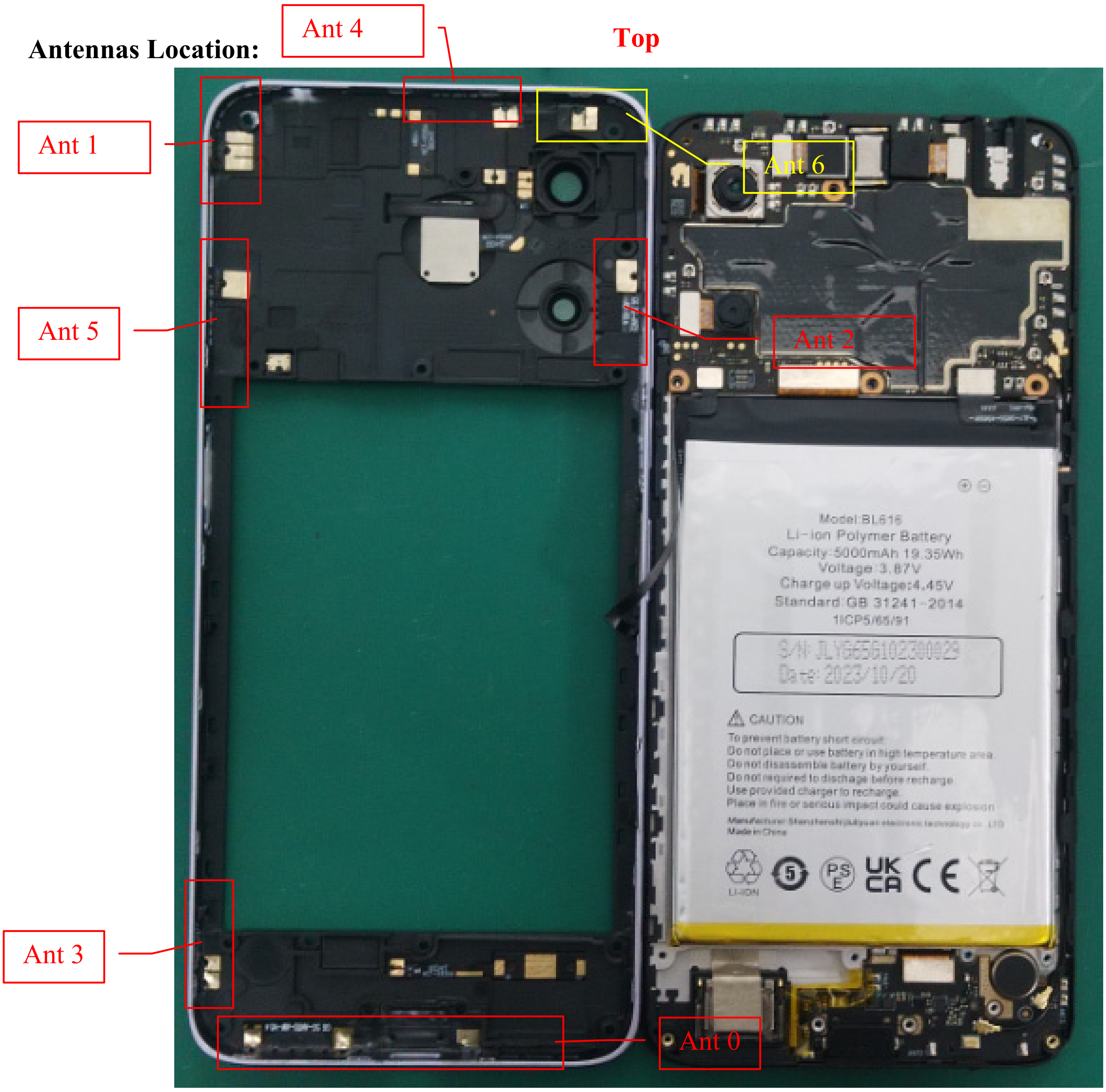
| Mode | Value (dBm) |
|---|---|
| n1_20MHz_15kHz_1930MHz_DFT-s-OFDM PI/2 BPSK_RB50@25 | 24.52 |
| n1_20MHz_15kHz_1930MHz_DFT-s-OFDM PI/2 BPSK_RB1@1 | 24.25 |
| n1_20MHz_15kHz_1930MHz_DFT-s-OFDM PI/2 BPSK_RB1@104 | 24.08 |
| n1_20MHz_15kHz_1930MHz_DFT-s-OFDM QPSK_RB50@25 | 24.56 |
| n1_20MHz_15kHz_1930MHz_DFT-s-OFDM QPSK_RB1@1 | 24.16 |
| n1_20MHz_15kHz_1930MHz_DFT-s-OFDM QPSK_RB1@104 | 24.05 |
| n1_20MHz_15kHz_1950MHz_DFT-s-OFDM PI/2 BPSK_RB50@25 | 24.27 |
| n1_20MHz_15kHz_1950MHz_DFT-s-OFDM PI/2 BPSK_RB1@1 | 23.97 |
| n1_20MHz_15kHz_1950MHz_DFT-s-OFDM PI/2 BPSK_RB1@104 | 23.85 |
| n1_20MHz_15kHz_1950MHz_DFT-s-OFDM QPSK_RB50@25 | 24.28 |
| n1_20MHz_15kHz_1950MHz_DFT-s-OFDM QPSK_RB1@1 | 23.91 |
| n1_20MHz_15kHz_1950MHz_DFT-s-OFDM QPSK_RB1@104 | 23.82 |
| n1_20MHz_15kHz_1970MHz_DFT-s-OFDM PI/2 BPSK_RB50@25 | 23.92 |
| n1_20MHz_15kHz_1970MHz_DFT-s-OFDM PI/2 BPSK_RB1@1 | 23.78 |
| n1_20MHz_15kHz_1970MHz_DFT-s-OFDM PI/2 BPSK_RB1@104 | 23.49 |
| n1_20MHz_15kHz_1970MHz_DFT-s-OFDM QPSK_RB50@25 | 23.96 |
| n1_20MHz_15kHz_1970MHz_DFT-s-OFDM QPSK_RB1@1 | 23.71 |
| n1_20MHz_15kHz_1970MHz_DFT-s-OFDM QPSK_RB1@104 | 23.43 |

## Maximum Target Output Power

| Max Target Power(dBm) | | | |
|---|---|---|---|
| Mode/Band | Channel | | |
| | Low | Middle | High |
| 5G NR FR1 | 25.0 | 25.0 | 25.0 |

# STANDALONE SAR TEST EXCLUSION CONSIDERATIONS

**Antennas Location:**




**EUT Front View**

| ANT | Description |
|---|---|
| ANT1 | TX: 5G NR n1 |
| ANT2 | RX: 5G NR n1 |

# SAR MEASUREMENT RESULTS

This page summarizes the results of the performed dosimetric evaluation.

## Test Results:

### Environmental Conditions:

| | |
|---|---|
| **Temperature:** | 22.4~23.5℃ |
| **Relative Humidity:** | 35~48 % |
| **ATM Pressure:** | 101.3 kPa |
| **Test Date:** | *2023/12/15* |

** Testing was performed by Win Kuang, and Sid Luo.*

### 5G NR n1:

| EUT Position | Frequency (MHz) | Modulation Type | Bandwidth (MHz) | RB | Max. Meas. Power (dBm) | Max. Rated Power (dBm) | 10g SAR (W/Kg) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Scaled Factor | Meas. | Scaled SAR | Limit | Plot |
| Head Left Cheek | 1930 | QPSK | 20 | 1 | / | / | / | / | / | 2.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 0.588 | 0.70 | 2.0 | / |
| | 1970 | QPSK | 20 | 1 | / | / | / | / | / | 2.0 | / |
| Head Left Tilt | 1930 | QPSK | 20 | 1 | / | / | / | / | / | 2.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 0.713 | 0.85 | 2.0 | / |
| | 1970 | QPSK | 20 | 1 | / | / | / | / | / | 2.0 | / |
| Head Right Cheek | 1930 | QPSK | 20 | 1 | 24.56 | 25.0 | 1.107 | 0.965 | 1.07 | 2.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 0.960 | 1.14 | 2.0 | / |
| | 1970 | QPSK | 20 | 1 | 23.96 | 25.0 | 1.271 | 0.880 | 1.12 | 2.0 | / |
| | 1930 | QPSK | 20 | 50% | 24.56 | 25.0 | 1.107 | 1.030 | **1.14** | 2.0 | **1#** |
| | 1930 | QPSK | 20 | 100% | 24.56 | 25.0 | 1.107 | 1.030 | 1.14 | 2.0 | / |
| Head Right Tilt | 1930 | QPSK | 20 | 1 | / | / | / | / | / | 2.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 0.696 | 0.83 | 2.0 | / |
| | 1970 | QPSK | 20 | 1 | / | / | / | / | / | 2.0 | / |
| Body Front (5 mm) | 1930 | QPSK | 20 | 1 | / | / | / | / | / | 2.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 0.330 | 0.39 | 2.0 | / |
| | 1970 | QPSK | 20 | 1 | / | / | / | / | / | 2.0 | / |
| Body Back (5 mm) | 1930 | QPSK | 20 | 1 | 24.56 | 25.0 | 1.107 | 0.348 | 0.39 | 2.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 0.507 | 0.60 | 2.0 | / |
| | 1970 | QPSK | 20 | 1 | 23.96 | 25.0 | 1.271 | 0.451 | 0.58 | 2.0 | / |
| | 1950 | QPSK | 20 | 50% | 24.28 | 25.0 | 1.180 | 0.526 | **0.63** | 2.0 | **2#** |
| | 1950 | QPSK | 20 | 100% | 24.28 | 25.0 | 1.180 | 0.519 | 0.62 | 2.0 | / |

| EUT Position | Frequency (MHz) | Modulation Type | Bandwidth (MHz) | RB | Max. Meas. Power (dBm) | Max. Rated Power (dBm) | 10g SAR (W/Kg) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | Scaled Factor | Meas. | Scaled SAR | Limit | Plot |
| Limb Front (0 mm) | 1930 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 1.640 | 1.94 | 4.0 | / |
| | 1970 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |
| Limb Back (0 mm) | 1930 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 1.540 | 1.82 | 4.0 | / |
| | 1970 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |
| Limb Left (0 mm) | 1930 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 1.600 | 1.89 | 4.0 | / |
| | 1970 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |
| Limb Right (0 mm) | 1930 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 0.199 | 0.24 | 4.0 | / |
| | 1970 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |
| Limb Top (0 mm) | 1930 | QPSK | 20 | 1 | 24.56 | 25.0 | 1.107 | 1.590 | 1.76 | 4.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 1.720 | 2.04 | 4.0 | / |
| | 1970 | QPSK | 20 | 1 | 23.96 | 25.0 | 1.271 | 1.620 | 2.06 | 4.0 | / |
| | 1950 | QPSK | 20 | 50% | 24.28 | 25.0 | 1.180 | 1.940 | **2.29** | 4.0 | **3#** |
| | 1950 | QPSK | 20 | 100% | 24.28 | 25.0 | 1.180 | 1.890 | 2.24 | 4.0 | / |
| Limb Bottom (0 mm) | 1930 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |
| | 1950 | QPSK | 20 | 1 | 24.28 | 25.0 | 1.180 | 0.062 | 0.08 | 4.0 | / |
| | 1970 | QPSK | 20 | 1 | / | / | / | / | / | 4.0 | / |

**Note**:
1. This device supports 5G NR n1 bands, including NSA mode and SA mode.
2. NSA and SA mode should perform SAR separately. For the maximum power of SA mode is the same as NSA total power level, so SA standalone total power level SAR can represent NSA mode SAR.
3. 5G NR NSA mode, the power level is the same as 5G NR SA mode, so 5G NR NSA mode and SA mode power table only show one time.
4. For 5G NR, the simultaneous transmission analysis is used standalone SAR at total power level to show compliance.
5. 5G NR supports CP-OFDM and DFT-s-OFDM modulation, for DFT-s-OFDM power is higher than CP-OFDM, so only show DFT-S-OFDM power table and chose DFT-s-OFDM to perform SAR testing.
6. For DFT-S-OFDM and CP-OFDM output power measurement reduction, according to 38.101 maximum power reduction for the CP-OFDM mode will not higher than DFT-s-OFDM mode, therefore, CP-OFDM measurement is unnecessary.
7. SAR test for NR bands and LTE anchor Bands were performed separately due to limitations in SAR probe calibration factors. And, due to test setup limitations, SAR testing for NR was performed using test mode software to establish the connection.
8. All SAR datas are tested start with the **largest channel bandwidth** and measure SAR for QPSK with 1 RB allocation. According to the worst case, SAR datas for QPSK with 50% and 100% RB allocation are tested.

# SAR SIMULTANEOUS TRANSMISSION DESCRIPTION

**Simultaneous Transmission:**

| Description of Simultaneous Transmit Capabilities | |
|---|---|
| **Transmitter Combination** | **Simultaneous?** |
| WWAN(GSM/WCDMA/LTE/5G NR) + Bluetooth | √ |
| WWAN(GSM/WCDMA/LTE/5G NR) + WLAN | √ |
| WLAN + Bluetooth | × |

**Simultaneous Transmission evaluation:**

| Mode (LTE+5G NR) | Position | Reported SAR(W/kg) | | ΣSAR < 2.0W/kg (Head & Body) ΣSAR < 4.0W/kg (Limb) |
|---|---|---|---|---|
| | | LTE | 5G NR | |
| DC_8A_n1A | Head | 0.091 | 1.140 | 1.231 |
| | Body | 0.125 | 0.630 | 0.765 |
| | Limb | 0.342 | 2.290 | 2.632 |

Note:
The LTE Band 8 test data are from the SAR report SZ1231103-64998E-20A.

**Simultaneous Transmission Consideration Detail**

| Mode (SAR $1_{Max}$+SAR $2_{Max}$) | Position | Reported SAR(W/kg) | | ΣSAR < 2.0W/kg (Head & Body) ΣSAR < 4.0W/kg (Limb) |
|---|---|---|---|---|
| | | SAR1 | SAR2 | |
| WWAN (5G NR) + Wi-Fi | Head | 1.231 | 0.256 | 1.487 |
| WWAN (5G NR) + Wi-Fi | Body | 0.765 | 0.174 | 0.939 |
| WWAN (5G NR) + Wi-Fi | Limb | 2.632 | 0.325 | 2.957 |

Note:
The Wi-Fi test data are from the SAR report SZ1231103-64998E-20A.

**Simultaneous Transmission Conclusion:**

1. 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.

## SAR Plots (Summary of the Highest SAR Values)

**Plot 1#**

**DUT: Smart phone; Type: PG2309GBA; Serial: 2DKY-1**

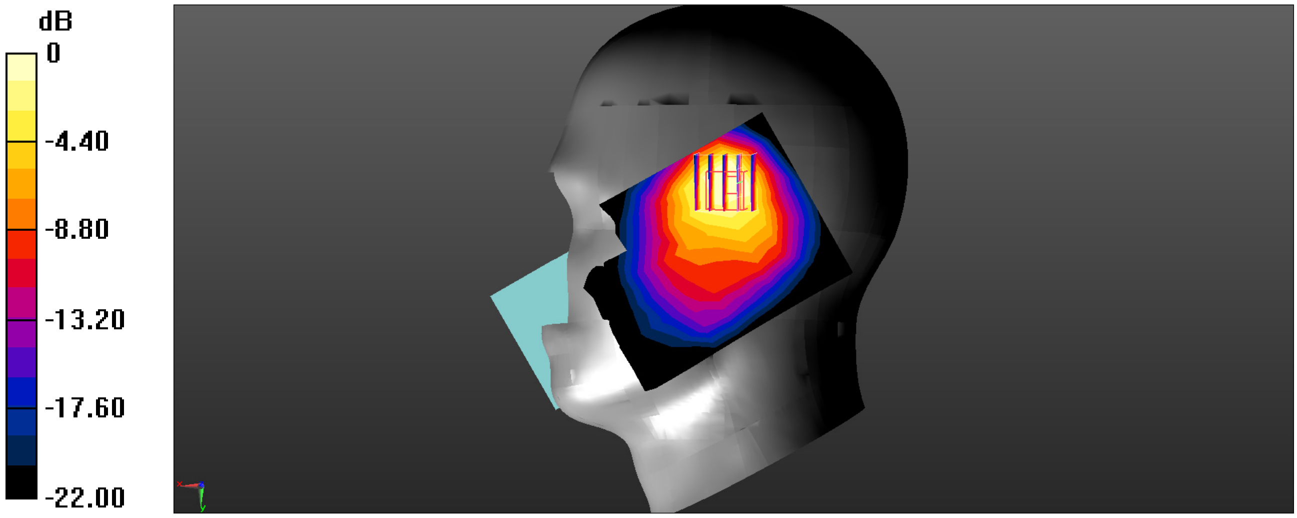
Communication System: UID 0, FDD-5G NR (0); Frequency: 1930 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1930 MHz; σ = 1.428 S/m; $\varepsilon_r$ = 40.155; ρ = 1000 kg/m$^3$
Phantom section: Right Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7382; ConvF(8.3, 8.3, 8.3) @ 1930 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 9/27/2023
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

**Head Right Cheek/FR1 n1 50%RB Low/Area Scan (8x10x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.40 W/kg

**Head Right Cheek/FR1 n1 50%RB Low/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.86 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 4.19 W/kg
**SAR(1 g) = 1.97 W/kg; SAR(10 g) = 1.03 W/kg**
Maximum value of SAR (measured) = 2.99 W/kg




0 dB = 2.99 W/kg = 4.76 dBW/kg

**Plot 2#**

**DUT: Smart phone; Type: PG2309GBA; Serial: 2DKY-1**

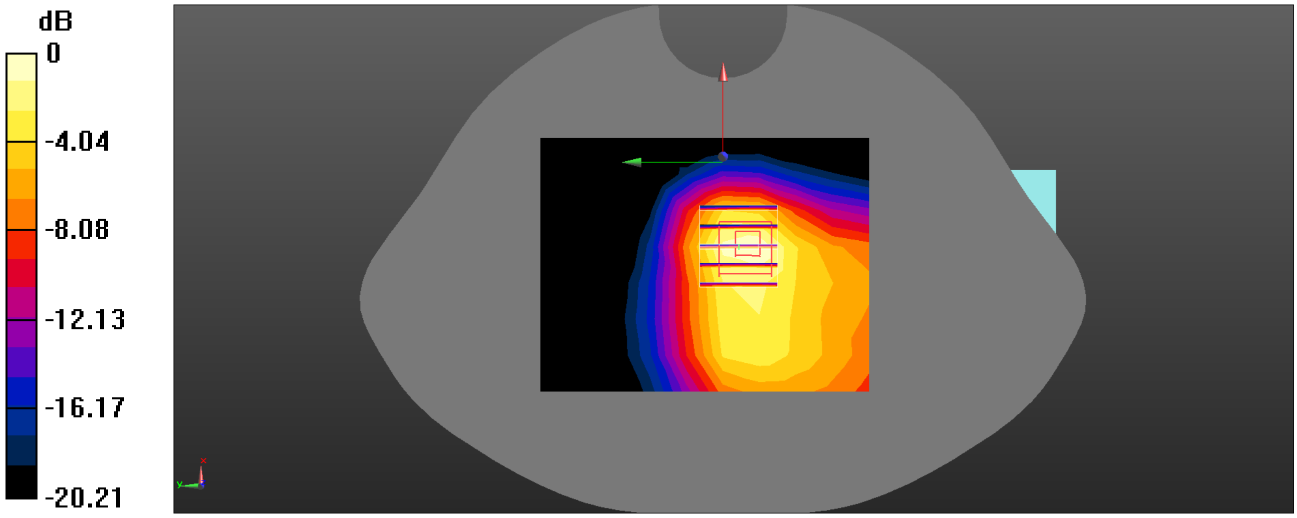
Communication System: UID 0, Generic FDD-5G NR (0); Frequency: 1950 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1950 MHz; σ = 1.416 S/m; $\varepsilon_r$ = 41.138; ρ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7382; ConvF(8.3, 8.3, 8.3) @ 1950 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 9/27/2023
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

**Body Back/FR1 n1 50%RB Mid/Area Scan (8x10x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.51 W/kg

**Body Back/FR1 n1 50%RB Mid/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.23 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.07 W/kg
**SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.526 W/kg**
Maximum value of SAR (measured) = 1.55 W/kg




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

**Plot 3#**

**DUT: Smart phone; Type: PG2309GBA; Serial: 2DKY-1**

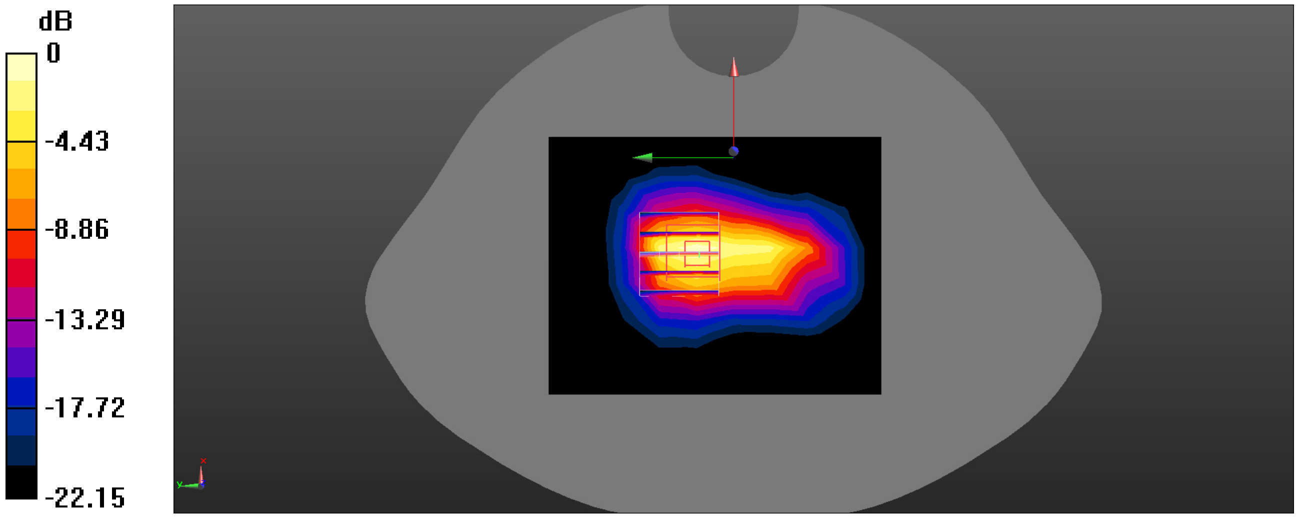
Communication System: UID 0, Generic FDD-5G NR (0); Frequency: 1950 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1950 MHz; σ = 1.416 S/m; $\varepsilon_r$ = 41.138; ρ = 1000 kg/m$^3$
Phantom section: Flat Section

DASY5 Configuration:

- Probe: EX3DV4 - SN7382; ConvF(8.3, 8.3, 8.3) @ 1950 MHz;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1325; Calibrated: 9/27/2023
- Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962
- Measurement SW: DASY52, Version 52.10 (2);

**Limb Top/FR1 n1 50%RB Mid/Area Scan (8x10x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.83 W/kg

**Limb Top/FR1 n1 50%RB Mid/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 47.98 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 8.13 W/kg
**SAR(1 g) = 3.96 W/kg; SAR(10 g) = 1.94 W/kg**
Maximum value of SAR (measured) = 6.70 W/kg




0 dB = 6.70 W/kg = 8.26 dBW/kg

# APPENDIX A MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the measurement system and is given in the following Table.

**Measurement uncertainty evaluation for EN 62209-1:2016 SAR test**

| Source of uncertainty | Tolerance/ uncertainty ± % | Probability distribution | Divisor | ci (1 g) | ci (10 g) | Standard uncertainty ± %, (1 g) | Standard uncertainty ± %, (10 g) |
|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | |
| System calibration | 6.55 | N | 1 | 0 | 0 | 6.55 | 6.55 |
| Isotropy | 4.7 | R | √3 | 1 | 1 | 2.7 | 2.7 |
| Boundary effect | 9.6 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| Linearity | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | R | √3 | 1 | 1 | 2.7 | 2.7 |
| System detection limits | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 |
| Modulation response | 0.3 | R | 1 | 0 | 0 | 0.3 | 0.3 |
| Readout electronics | 0.0 | N | √3 | 0 | 0 | 0.0 | 0.0 |
| Response time | 0.0 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| Integration time | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 |
| RF ambient conditions – noise | 1.0 | R | √3 | 0 | 0 | 0.6 | 0.6 |
| RF ambient conditions – reflections | 0.8 | R | √3 | 1 | 1 | 0.5 | 0.5 |
| Sensor positioning uncertainty | 6.7 | R | √3 | 1 | 1 | 3.9 | 3.9 |
| Sensor location sensitivity | 2.0 | R | √3 | 1 | 1 | 1.2 | 1.2 |
| Spatial resolution, x-direction | 4.0 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| Spatial resolution, y-direction | 3.0 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| Post-processing of measurement data | 2.0 | R | √3 | 1 | 1 | 1.2 | 1.2 |
| Mutual sensor coupling | 0.6 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| Sensor coupling with DUT | 1.5 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| Measurement system immunity | 2.0 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| **Test sample related** | | | | | | | |
| Test sample positioning | 2.8 | N | 1 | 1 | 1 | 2.8 | 2.8 |
| Device holder uncertainty | 6.3 | N | 1 | 1 | 1 | 6.3 | 6.3 |
| Output power variation – SAR drift measurement | 4.5 | R | √3 | 1 | 1 | 2.6 | 2.6 |
| SAR scaling | 5.0 | R | √3 | 0 | 0 | 2.9 | 2.9 |

| Phantom and Tissue Parameters | | | | | | | |
|---|---|---|---|---|---|---|---|
| Phantom shell uncertainty -shape thickness and permittivity | 4.0 | R | √3 | 1 | 1 | 2.3 | 2.3 |
| Deviations in phantom shape | 5.0 | R | √3 | 1 | 1 | 1.8 | 1.2 |
| Uncertainty in SAR correction for deviations in permittivity and conductivity | 2.5 | N | 1 | 0 | 0 | 1.6 | 1.1 |
| Liquid conductivity measurement | 2.5 | N | 1 | 0 | 0 | 1.6 | 1.1 |
| Liquid permittivity measurement | 2.5 | N | 1 | 0 | 0 | 1.5 | 1.2 |
| Liquid conductivity – temperature uncertainty | 1.7 | R | √3 | 0 | 0 | 0.8 | 0.7 |
| Liquid permittivity – temperature uncertainty | 0.3 | R | √3 | 0 | 0 | 0.0 | 0.0 |
| Spatial variation in conductivity | 2.0 | R | √3 | 0.78 | 0.71 | 1.0 | 1.0 |
| Spatial variation in permittivity | 2.0 | R | √3 | 0.23 | 0.26 | 1.0 | 1.0 |
| Combined standard uncertainty | | RSS | | | | 12.2 | 12.0 |
| Expanded uncertainty (95 % CONFIDENCEINTERVAL) | | $k$ = 2 | | | | 24.4 | 24.0 |

**Measurement uncertainty evaluation for EN62209-2:2010 SAR test**

| Source of uncertainty | Tolerance/ uncertainty ± % | Probability distribution | Divisor | ci (1 g) | ci (10 g) | Standard uncertainty ± %, (1 g) | Standard uncertainty ± %, (10 g) |
|---|---|---|---|---|---|---|---|
| **Measurement system** | | | | | | | |
| Probe calibration | 6.55 | N | 1 | 1 | 1 | 6.6 | 6.6 |
| Axial Isotropy | 4.7 | R | √3 | 1 | 1 | 2.7 | 2.7 |
| Hemispherical Isotropy | 9.6 | R | √3 | 0 | 0 | 0.0 | 0.0 |
| Linearity | 4.7 | R | √3 | 1 | 1 | 2.7 | 2.7 |
| Modulation Response | 0.0 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| Detection limits | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 |
| Boundary effect | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 |
| Readout electronics | 0.3 | N | 1 | 1 | 1 | 0.3 | 0.3 |
| Response time | 0.0 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| Integration time | 0.0 | R | √3 | 1 | 1 | 0.0 | 0.0 |
| RF ambient conditions – noise | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 |
| RF ambient conditions–reflections | 1.0 | R | √3 | 1 | 1 | 0.6 | 0.6 |
| Probe positioner mech. Restrictions | 0.8 | R | √3 | 1 | 1 | 0.5 | 0.5 |
| Probe positioning with respect to phantom shell | 6.7 | R | √3 | 1 | 1 | 3.9 | 3.9 |
| Post-processing | 2.0 | R | √3 | 1 | 1 | 1.2 | 1.2 |
| **Test sample related** | | | | | | | |
| Device holder Uncertainty | 6.3 | N | 1 | 1 | 1 | 6.3 | 6.3 |
| Test sample positioning | 2.8 | N | 1 | 1 | 1 | 2.8 | 2.8 |
| Power scaling | 4.5 | R | √3 | 1 | 1 | 2.6 | 2.6 |
| Drift of output power | 5.0 | R | √3 | 1 | 1 | 2.9 | 2.9 |
| **Phantom and set-up** | | | | | | | |
| Phantom uncertainty (shape and thickness tolerances) | 4.0 | R | √3 | 1 | 1 | 2.3 | 2.3 |
| Algorithm for correcting SAR for deviations in permittivity and conductivity | 1.9 | N | 1 | 1 | 0.84 | 1.1 | 0.9 |
| Liquid conductivity (meas.) | 2.5 | N | 1 | 0.64 | 0.43 | 1.6 | 1.1 |
| Liquid permittivity (meas.) | 2.5 | N | 1 | 0.6 | 0.49 | 1.5 | 1.2 |
| Temp. unc. - Conductivity | 1.7 | R | √3 | 0.78 | 0.71 | 0.8 | 0.7 |
| Temp. unc. - Permittivity | 0.3 | R | √3 | 0.23 | 0.26 | 0.0 | 0.0 |
| Combined standard uncertainty | | RSS | | | | 12.2 | 12.1 |
| Expanded uncertainty 95 % confidence interval) | | | | | | 24.5 | 24.2 |

# APPENDIX B PROBE CALIBRATION CERTIFICATES

In Collaboration with speag CALIBRATION LABORATORY
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

中国认可 国际互认 校准 CALIBRATION CNAS L0570

Client BACL Certificate No: J23Z60359

## CALIBRATION CERTIFICATE

Object: EX3DV4 - SN : 7382

Calibration Procedure(s): FF-Z11-004-02
Calibration Procedures for Dosimetric E-field Probes

Calibration date: September 27, 2023

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements(SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature(22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date(Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRP2 | 101919 | 12-Jun-23(CTTL, No.J23X05435) | Jun-24 |
| Power sensor NRP-Z91 | 101547 | 12-Jun-23(CTTL, No.J23X05435) | Jun-24 |
| Power sensor NRP-Z91 | 101548 | 12-Jun-23(CTTL, No.J23X05435) | Jun-24 |
| Reference 10dBAttenuator | 18N50W-10dB | 19-Jan-23(CTTL, No.J23X00212) | Jan-25 |
| Reference 20dBAttenuator | 18N50W-20dB | 19-Jan-23(CTTL, No.J23X00211) | Jan-25 |
| Reference Probe EX3DV4 | SN 3846 | 31-May-23(SPEAG, No.EX-3846_May23) | May-24 |
| DAE4 | SN 1555 | 24-Aug-23(SPEAG, No.DAE4-1555_Aug23) | Aug-24 |
| DAE4 | SN 549 | 24-Jan-23(SPEAG, No.DAE4-549_Jan23) | Jan-24 |
| **Secondary Standards** | **ID #** | **Cal Date(Calibrated by, Certificate No.)** | **Scheduled Calibration** |
| SignalGenerator MG3700A | 6201052605 | 12-Jun-23(CTTL, No.J23X05434) | Jun-24 |
| Network Analyzer E5071C | MY46110673 | 10-Jan-23(CTTL, No.J23X00104) | Jan-24 |
| Reference 10dBAttenuator | BT0520 | 11-May-23(CTTL, No.J23X04061) | May-25 |
| Reference 20dBAttenuator | BT0267 | 11-May-23(CTTL, No.J23X04062) | May-25 |
| OCP DAK-3.5 | SN 1040 | 18-Jan-23(SPEAG, No.OCP-DAK3.5-1040_Jan23) | Jan-24 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Yu Zongying | SAR Test Engineer | |
| Reviewed by: | Lin Hao | SAR Test Engineer | |
| Approved by: | Qi Dianyuan | SAR Project Leader | |

Issued: October 05, 2023

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| NORMx,y,z | sensitivity in free space |
| ConvF | sensitivity in TSL / NORMx,y,z |
| DCP | diode compression point |
| CF | crest factor (1/duty_cycle) of the RF signal |
| A,B,C,D | modulation dependent linearization parameters |
| Polarization Φ | Φ rotation around probe axis |
| Polarization θ | θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i θ=0 is normal to probe axis |
| Connector Angle | information used in DASY system to align probe sensor X to the robot coordinate system |

**Calibration is Performed According to the Following Standards:**

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013

b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016

c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010

d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Methods Applied and Interpretation of Parameters:**

- *NORMx,y,z:* Assessed for E-field polarization θ=0 (f≤900MHz in TEM-cell; f＞1800MHz: waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the $E^2$ -field uncertainty inside TSL (see below ConvF).
- *NORM(f)x,y,z = NORMx,y,z* frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- PAR: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics.
- *Ax,y,z; Bx,y,z; Cx,y,z;VRx,y,z:*A,B,C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f≤800MHz) and inside waveguide using analytical field distributions based on power measurements for f >800MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORMx,y,z* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from±50MHz to±100MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle:* The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

# DASY/EASY – Parameters of Probe: EX3DV4 – SN:7382

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (*k*=2) |
|---|---|---|---|---|
| Norm(μV/(V/m)$^2$)[A] | 0.42 | 0.42 | 0.47 | ±10.0% |
| DCP(mV)[B] | 100.8 | 101.0 | 103.5 | |

## Modulation Calibration Parameters

| UID | Communication System Name | | A dB | B dB√μV | C | D dB | VR mV | Unc[E] (*k*=2) |
|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 160.9 | ±2.0% |
| | | Y | 0.0 | 0.0 | 1.0 | | 159.5 | |
| | | Z | 0.0 | 0.0 | 1.0 | | 178.1 | |

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor *k*=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of Norm X, Y, Z do not affect the $E^2$-field uncertainty inside TSL (see Page 4).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainly is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

# DASY/EASY – Parameters of Probe: EX3DV4 – SN:7382

## Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz][C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha[G] | Depth[G] (mm) | Unct. (*k*=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.9 | 0.89 | 10.65 | 10.65 | 10.65 | 0.17 | 1.24 | ±12.7% |
| 900 | 41.5 | 0.97 | 10.19 | 10.19 | 10.19 | 0.20 | 1.15 | ±12.7% |
| 1750 | 40.1 | 1.37 | 8.60 | 8.60 | 8.60 | 0.26 | 0.97 | ±12.7% |
| 1900 | 40.0 | 1.40 | 8.30 | 8.30 | 8.30 | 0.25 | 1.01 | ±12.7% |
| 2300 | 39.5 | 1.67 | 8.16 | 8.16 | 8.16 | 0.60 | 0.68 | ±12.7% |
| 2450 | 39.2 | 1.80 | 7.89 | 7.89 | 7.89 | 0.45 | 0.86 | ±12.7% |
| 2600 | 39.0 | 1.96 | 7.65 | 7.65 | 7.65 | 0.53 | 0.77 | ±12.7% |
| 3300 | 38.2 | 2.71 | 7.39 | 7.39 | 7.39 | 0.49 | 0.86 | ±13.9% |
| 3500 | 37.9 | 2.91 | 7.24 | 7.24 | 7.24 | 0.41 | 1.03 | ±13.9% |
| 3700 | 37.7 | 3.12 | 7.10 | 7.10 | 7.10 | 0.43 | 1.03 | ±13.9% |
| 3900 | 37.5 | 3.32 | 6.98 | 6.98 | 6.98 | 0.40 | 1.25 | ±13.9% |
| 5250 | 35.9 | 4.71 | 5.62 | 5.62 | 5.62 | 0.50 | 1.25 | ±13.9% |
| 5500 | 35.6 | 4.96 | 5.10 | 5.10 | 5.10 | 0.40 | 1.50 | ±13.9% |
| 5750 | 35.4 | 5.22 | 5.08 | 5.08 | 5.08 | 0.40 | 1.52 | ±13.9% |

[C] Frequency validity above 300 MHz of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequency up to 6 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for the frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

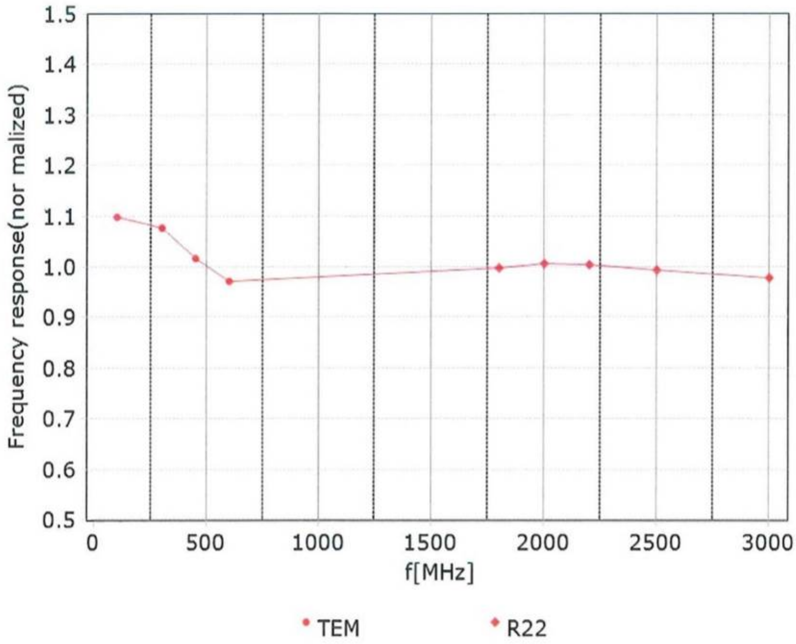
Certificate No:J23Z60359 Page 4 of 9

In Collaboration with
speag
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

## Frequency Response of E-Field
### (TEM-Cell: ifi110 EXX, Waveguide: R22)




**Uncertainty of Frequency Response of E-field: ±7.4% (*k*=2)**

Certificate No:J23Z60359 Page 5 of 9

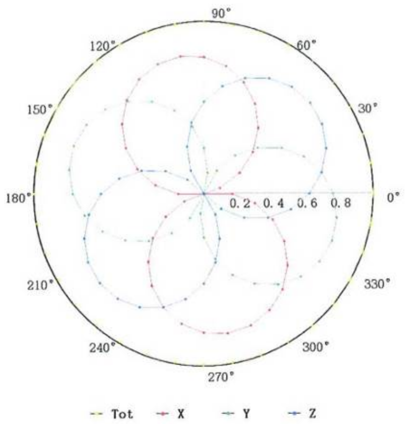
In Collaboration with
**s p e a g**
CALIBRATION LABORATORY

CAICT

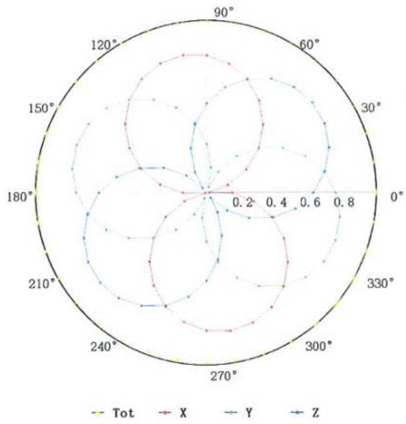
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

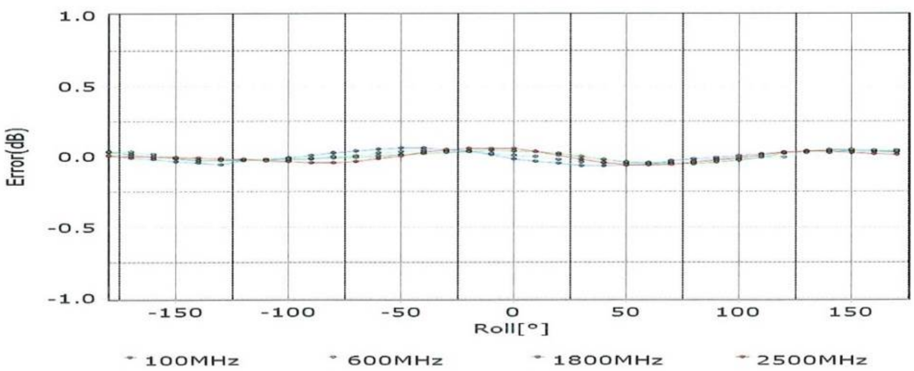
## Receiving Pattern (Φ), θ=0°

### f=600 MHz, TEM




### f=1800 MHz, R22




Uncertainty of Axial Isotropy Assessment: ±1.2% (*k*=2)

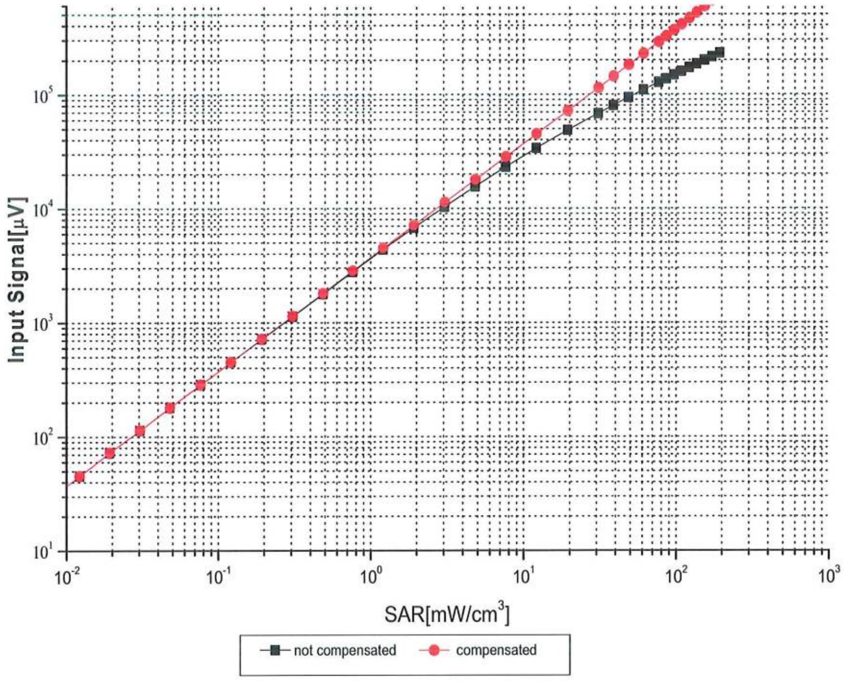
Certificate No:J23Z60359 Page 6 of 9

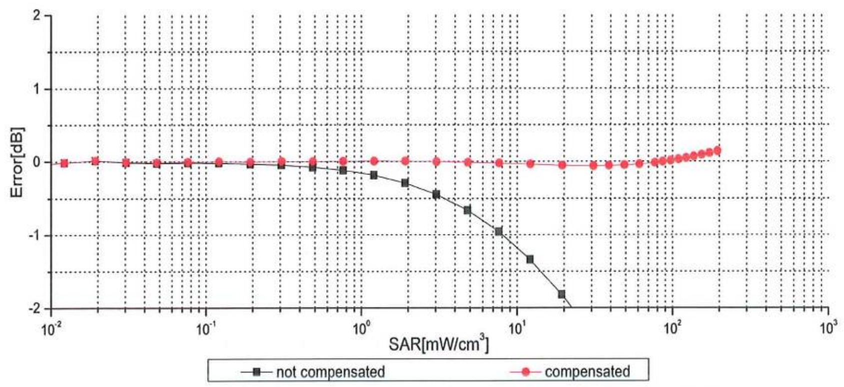
In Collaboration with s p e a g CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

## Dynamic Range f($SAR_{head}$)
## (TEM cell, f = 900 MHz)




**Uncertainty of Linearity Assessment: ±0.9% (*k*=2)**

Certificate No:J23Z60359 Page 7 of 9

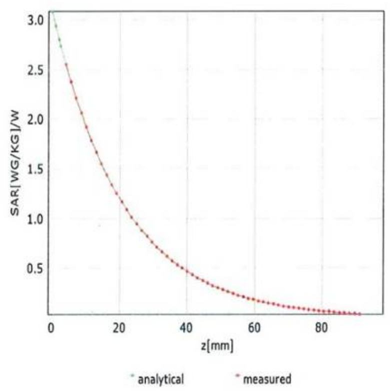
In Collaboration with
speag
CALIBRATION LABORATORY

CAICT

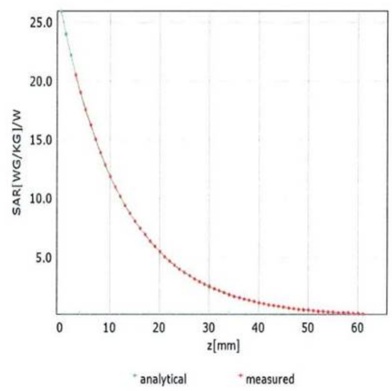
Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

# Conversion Factor Assessment

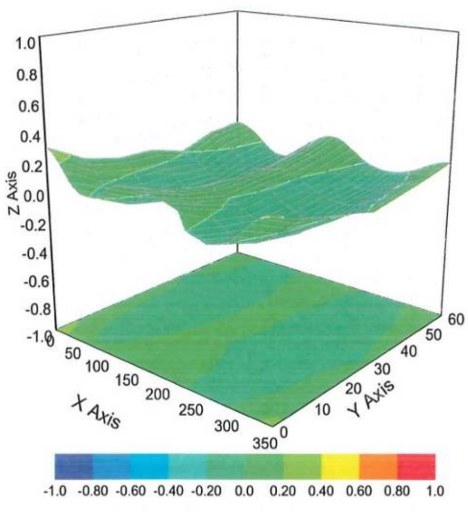
**f=750 MHz,WGLS R9(H_convF)**




**f=1750 MHz,WGLS R22(H_convF)**




# Deviation from Isotropy in Liquid




**Uncertainty of Spherical Isotropy Assessment: ±3.2% (*k*=2)**

Certificate No:J23Z60359 Page 8 of 9

In Collaboration with
speag
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

# DASY/EASY – Parameters of Probe: EX3DV4 – SN:7382

## Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | 65.4 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disable |
| Probe Overall Length | 337mm |
| Probe Body Diameter | 10mm |
| Tip Length | 9mm |
| Tip Diameter | 2.5mm |
| Probe Tip to Sensor X Calibration Point | 1mm |
| Probe Tip to Sensor Y Calibration Point | 1mm |
| Probe Tip to Sensor Z Calibration Point | 1mm |
| Recommended Measurement Distance from Surface | 1.4mm |

# APPENDIX C DIPOLE CALIBRATION CERTIFICATES

In Collaboration with s p e a g CALIBRATION LABORATORY

中国认可 国际互认 校准 CALIBRATION CNAS L0570

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191
Tel: +86-10-62304633-2117
E-mail: emf@caict.ac.cn http://www.caict.ac.cn

Client **BACL** Certificate No: **Z23-60084**

## CALIBRATION CERTIFICATE

Object: D1900V2 - SN: 5d231

Calibration Procedure(s): FF-Z11-003-01
Calibration Procedures for dipole validation kits

Calibration date: February 17, 2023

This calibration Certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22±3)℃ and humidity<70%.

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power Meter NRP2 | 106276 | 10-May-22 (CTTL, No.J22X03103) | May-23 |
| Power sensor NRP6A | 101369 | 10-May-22 (CTTL, No.J22X03103) | May-23 |
| Reference Probe EX3DV4 | SN 7464 | 19-Jan-23 (CTTL-SPEAG,No.Z22-60565) | Jan-24 |
| DAE4 | SN 1556 | 11-Jan-23(CTTL-SPEAG,No.Z23-60034) | Jan-24 |
| Secondary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
| Signal Generator E4438C | MY49070393 | 17-May-23 (CTTL, No.J22X03157) | May-24 |
| NetworkAnalyzer E5071C | MY46110673 | 10-Jan-23 (CTTL, No. J23X00104) | Jan-24 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Zhao Jing | SAR Test Engineer | |
| Reviewed by: | Lin Hao | SAR Test Engineer | |
| Approved by: | Qi Dianyuan | SAR Project Leader | |

Issued: February 24, 2023

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: cttl@chinattl.com http://www.caict.ac.cn

**Glossary:**

| | |
|---|---|
| TSL | tissue simulating liquid |
| ConvF | sensitivity in TSL / NORMx,y,z |
| N/A | not applicable or not measured |

**Calibration is Performed According to the Following Standards:**

a) IEC/IEEE 62209-1528, "Measurement Procedure for The Assessment of Specific Absorption Rate of Human Exposure to Radio Frequency Fields from Hand-held and Body-mounted Wireless Communication Devices- Part 1528: Human Models, Instrumentation and Procedures (Frequency range of 4 MHz to 10 GHz)", October 2020

b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

**Additional Documentation:**

c) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of Measurement multiplied by the coverage factor k=2, which for a normal distribution Corresponds to a coverage probability of approximately 95%.

Certificate No: Z23-60084 Page 2 of 6

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: cttl@chinattl.com http://www.caict.ac.cn

## Measurement Conditions

DASY system configuration, as far as not given on page 1.

| | | |
|---|---|---|
| **DASY Version** | DASY52 | 52.10.4 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Triple Flat Phantom 5.1C | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1900 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 ℃ | 40.0 | 1.40 mho/m |
| **Measured Head TSL parameters** | (22.0 ±0.2) ℃ | 39.0 ±6 % | 1.39 mho/m ±6 % |
| **Head TSL temperature change during test** | <1.0 ℃ | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 10.0 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **39.9 W/kg ± 18.8 % (k=2)** |
| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | Condition | |
| SAR measured | 250 mW input power | 5.21 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **20.8 W/kg ± 18.7 % (k=2)** |

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: cttl@chinattl.com http://www.caict.ac.cn

## Appendix (Additional assessments outside the scope of CNAS L0570)

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 50.3Ω+ 4.99jΩ |
| Return Loss | - 26.1dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.105 ns |

After long term use with 100W radiated power, only a slight warming of the dipole near the feed-point can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feed-point may be damaged.

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |

Certificate No: Z23-60084 Page 4 of 6

In Collaboration with
s p e a g
CALIBRATION LABORATORY

CAICT

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: cttl@chinattl.com http://www.caict.ac.cn

**DASY5 Validation Report for Head TSL** Date: 2023-02-17

Test Laboratory: CTTL, Beijing, China

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d231**

Communication System: UID 0, CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz; σ = 1.393 S/m; $\varepsilon_r$ = 38.96; ρ = 1000 kg/m$^3$

Phantom section: Right Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN7464; ConvF(8.13, 8.13, 8.13) @ 1900 MHz; Calibrated: 2023-01-19
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1556; Calibrated: 2023-01-11
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1062
- DASY52 52.10.4(1535); SEMCAD X 14.6.14(7501)

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

Reference Value = 100.8 V/m; Power Drift = -0.04 dB

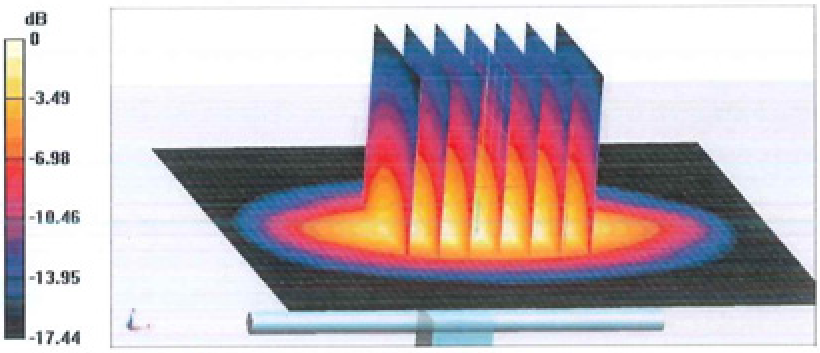
Peak SAR (extrapolated) = 18.9 W/kg

**SAR(1 g) = 10 W/kg; SAR(10 g) = 5.21 W/kg**

Smallest distance from peaks to all points 3 dB below = 10 mm

Ratio of SAR at M2 to SAR at M1 = 53.6%

Maximum value of SAR (measured) = 15.7 W/kg



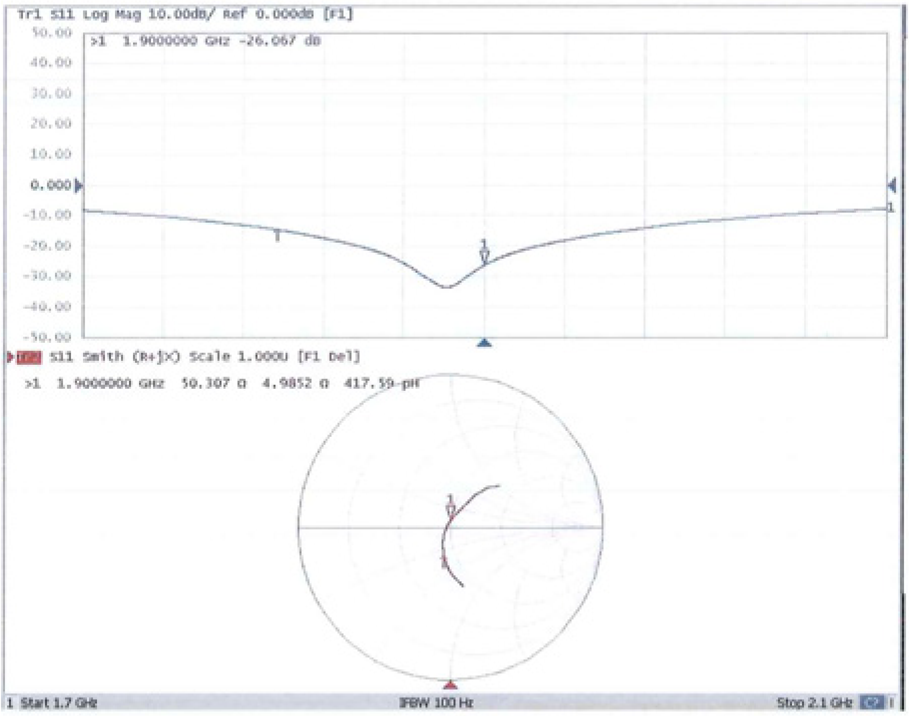

0 dB = 15.7 W/kg = 11.96 dBW/kg

Certificate No: Z23-60084 Page 5 of 6

In Collaboration with
s p e a g
CALIBRATION LABORATORY

Add: No.52 HuaYuanBei Road, Haidian District, Beijing, 100191, China
Tel: +86-10-62304633-2117
E-mail: cttl@chinattl.com http://www.caict.ac.cn

**Impedance Measurement Plot for Head TSL**

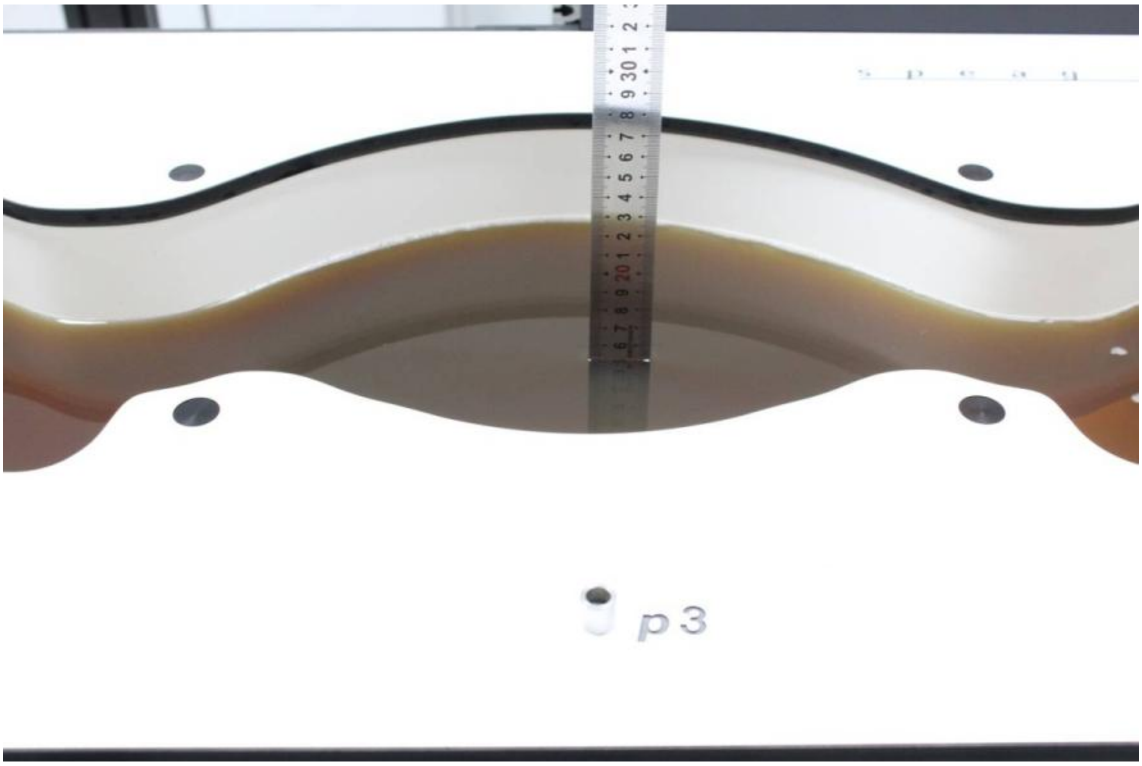



Certificate No: Z23-60084 Page 6 of 6

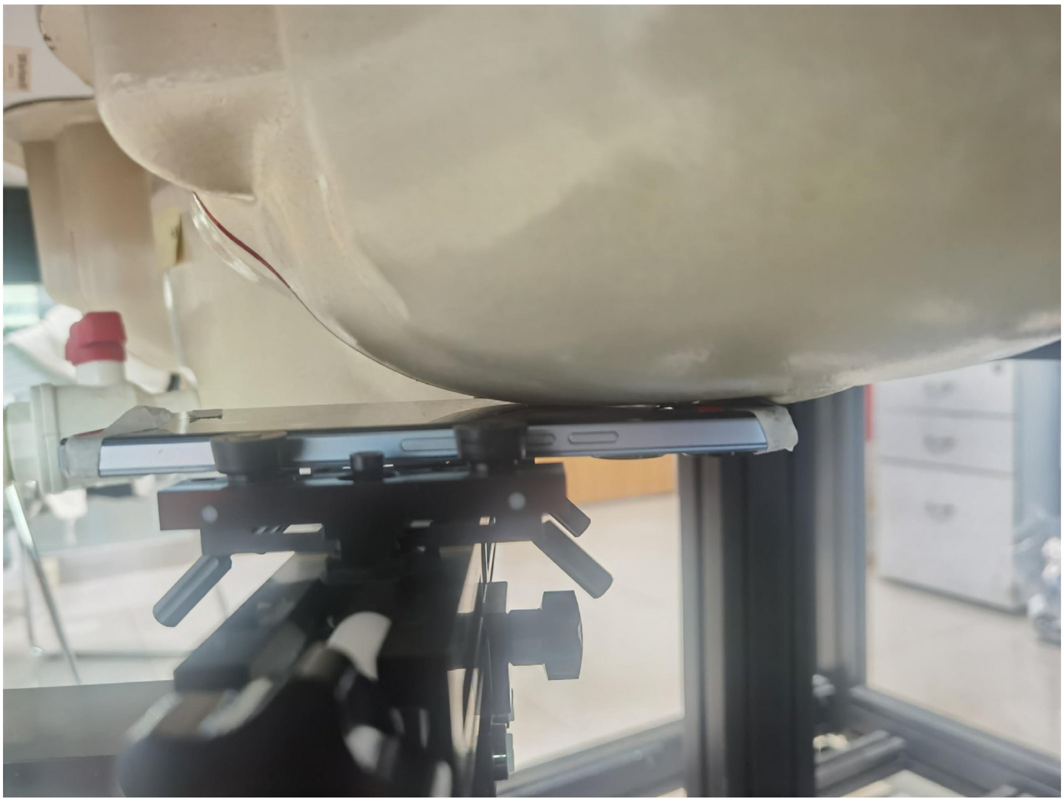
# APPENDIX D EUT TEST POSITION PHOTOS

**Liquid depth ≥ 15cm**

Phantom: SAM-Twin V8.0 P1aP2a; Type: QD 000 P41 AA ; Serial: 1962

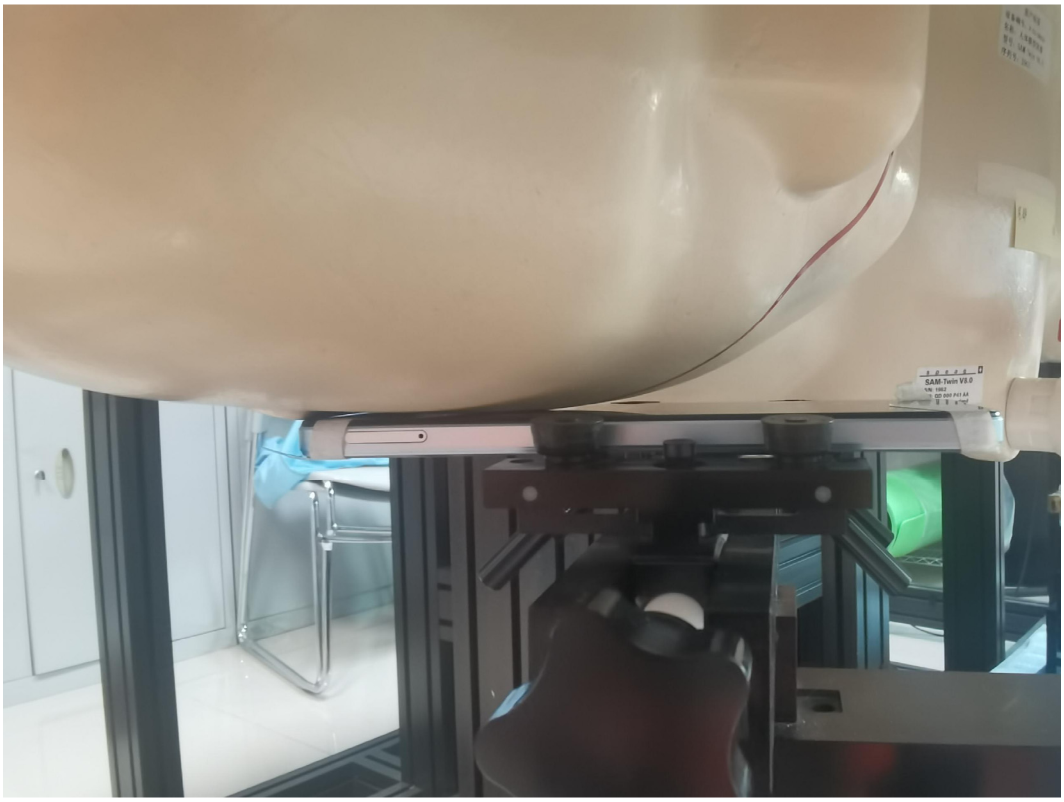


**Head Left Cheek Setup Photo**



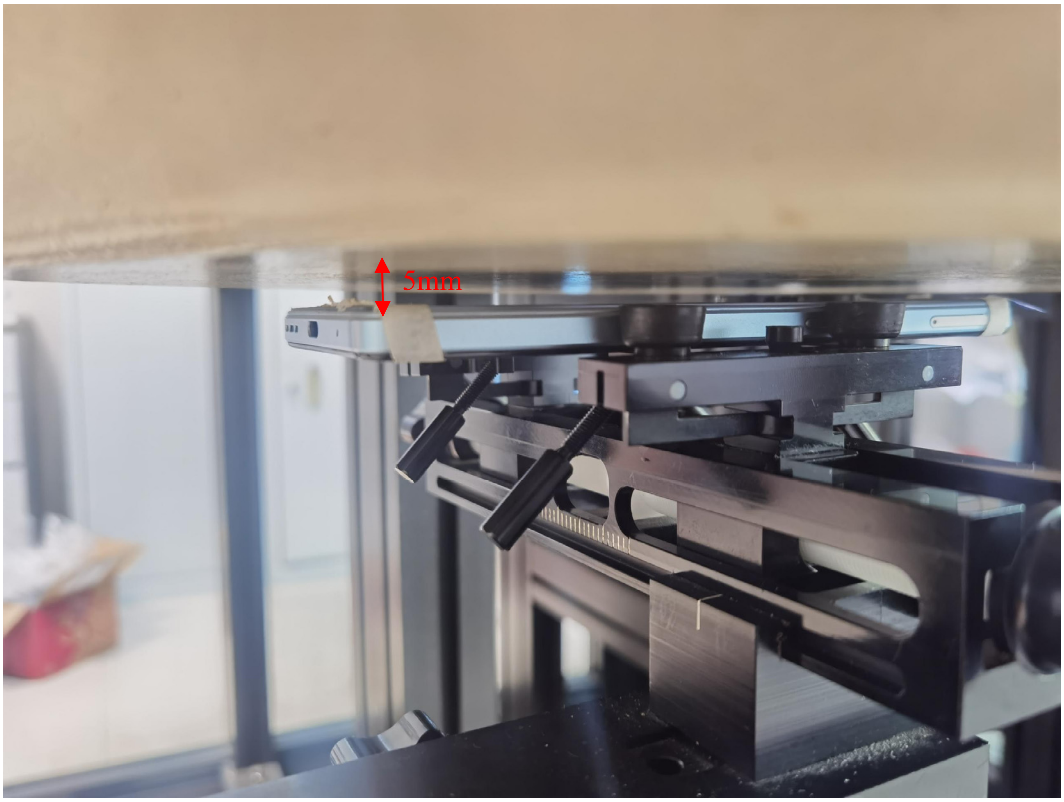
**Head Left Tilt Setup Photo**

**Head Right Cheek Setup Photo**

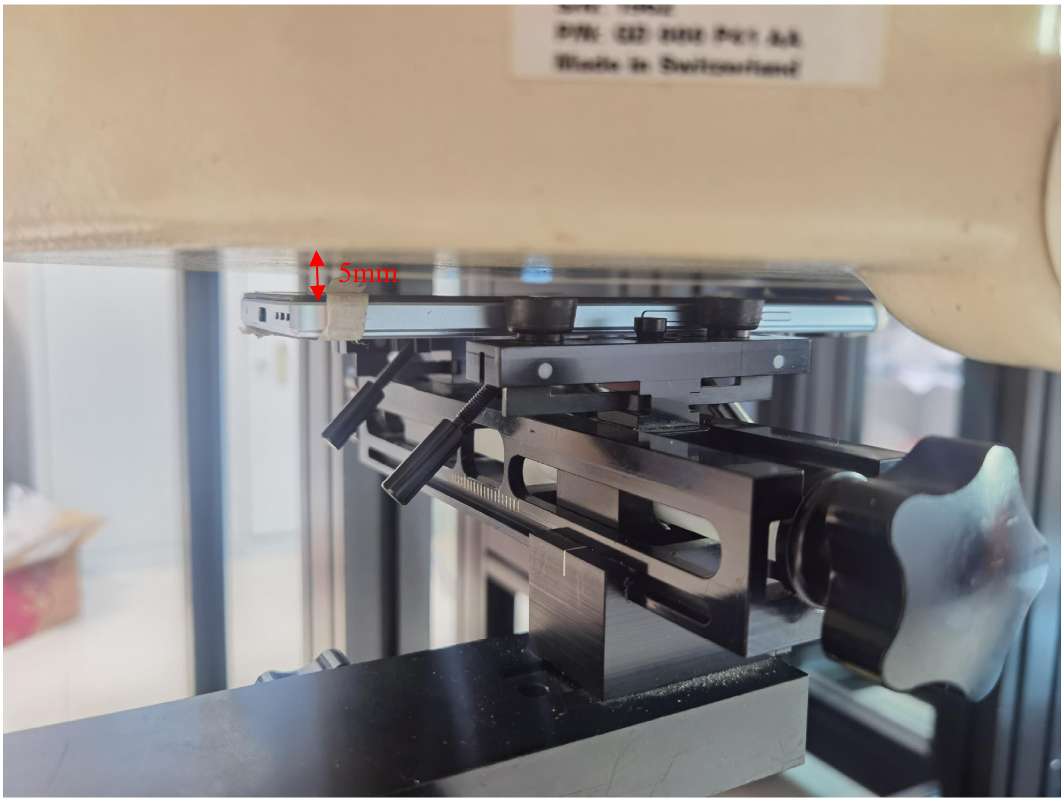


**Head Right Tilt Setup Photo**

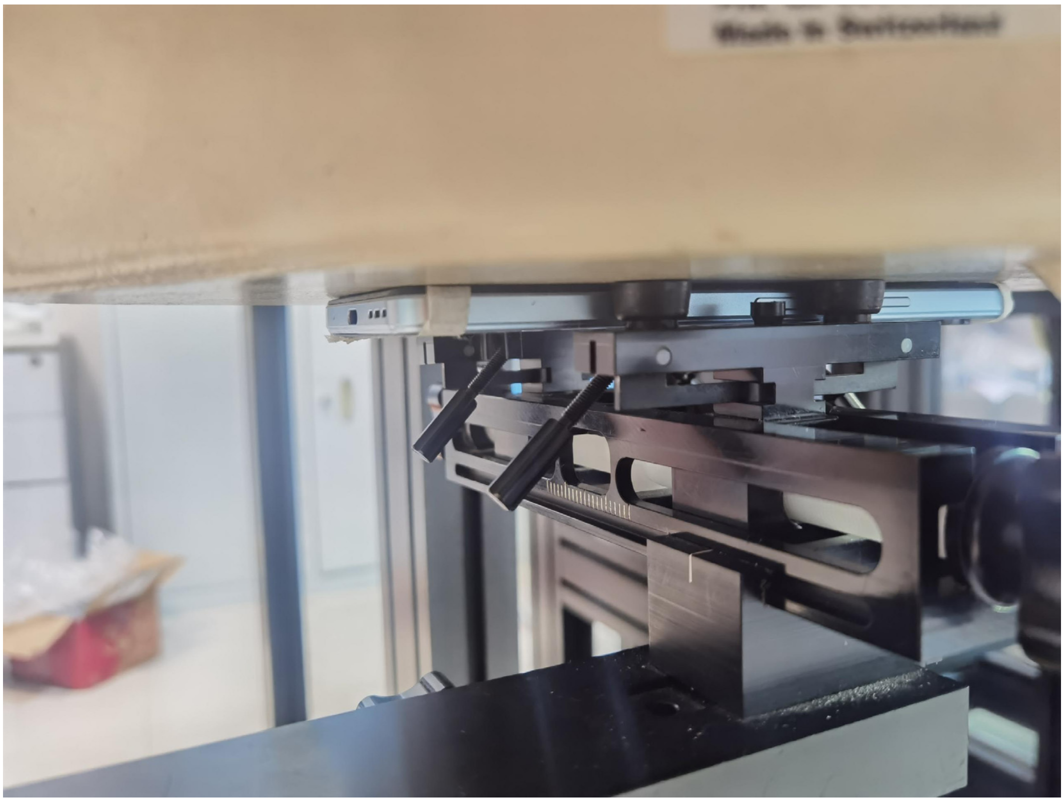
**Body（Worn）Back Setup Photo (5 mm)**




**Body Front Setup Photo (5 mm)**

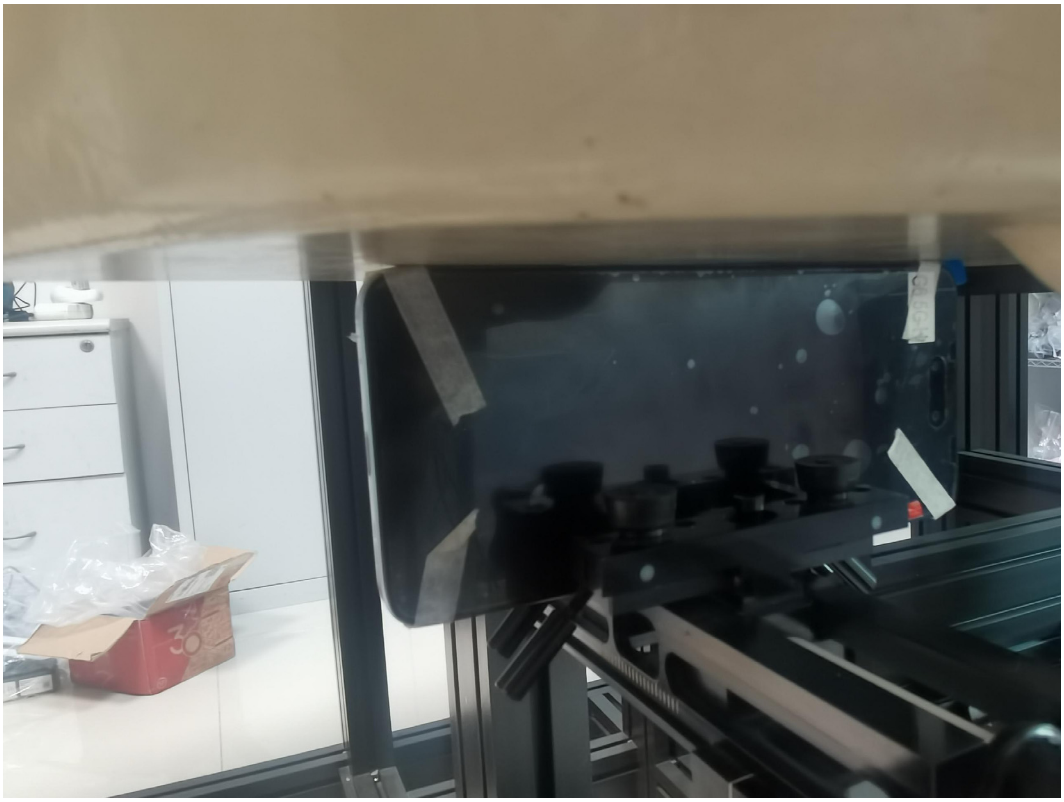


**Body Front Setup Photo (0 mm)**



**Body Back Setup Photo (0 mm)**

**Body Left Setup Photo (0 mm)**



**Body Right Setup Photo (0 mm)**

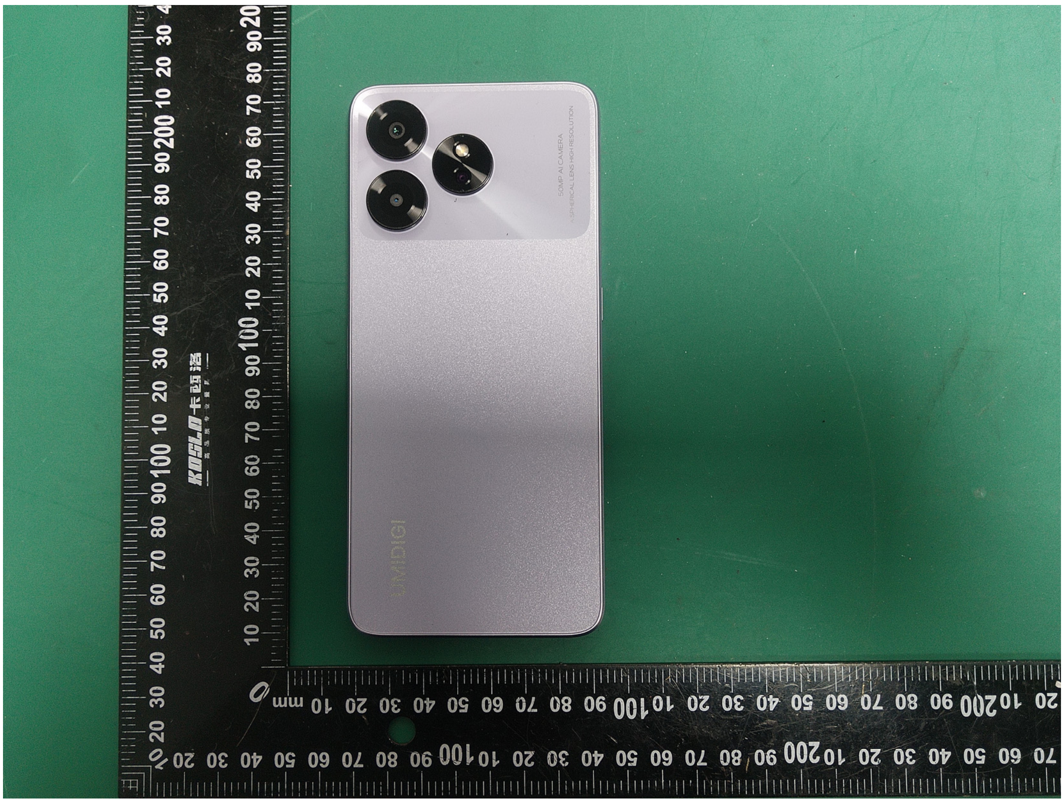
**Body Top Back Setup Photo (0 mm)**

**Body Bottom Setup Photo (0 mm)**

# APPENDIX E EUT PHOTOS

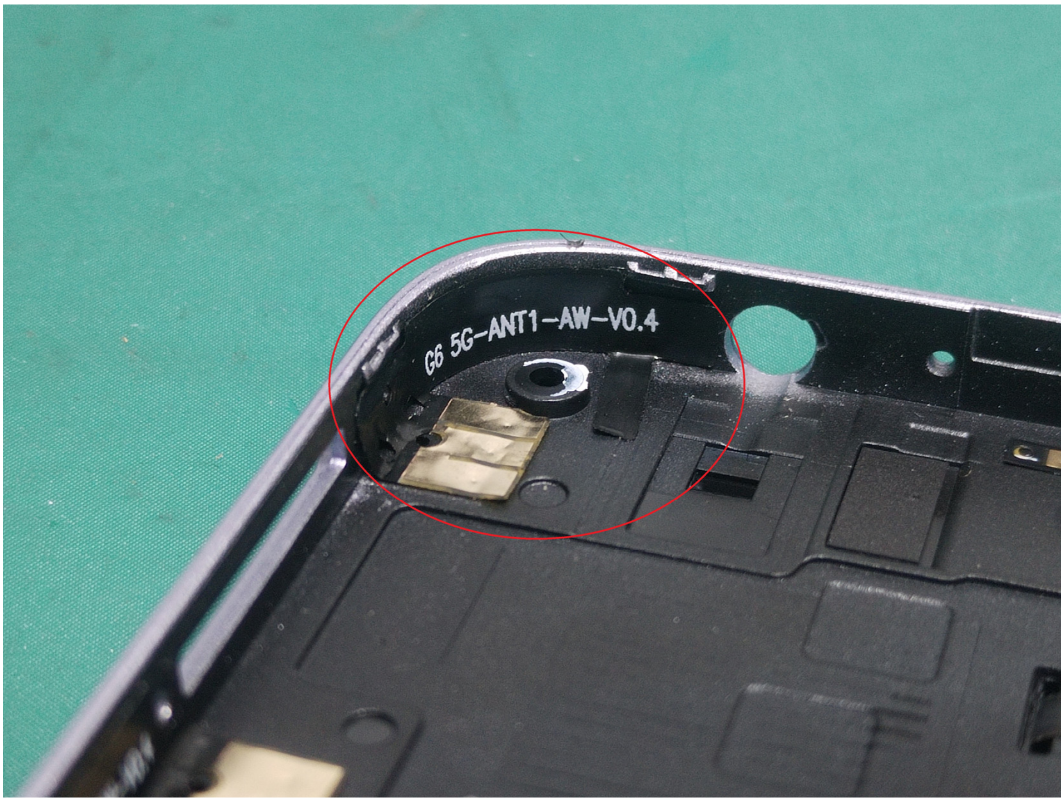
**EUT – Front View**

**EUT – Rear View**

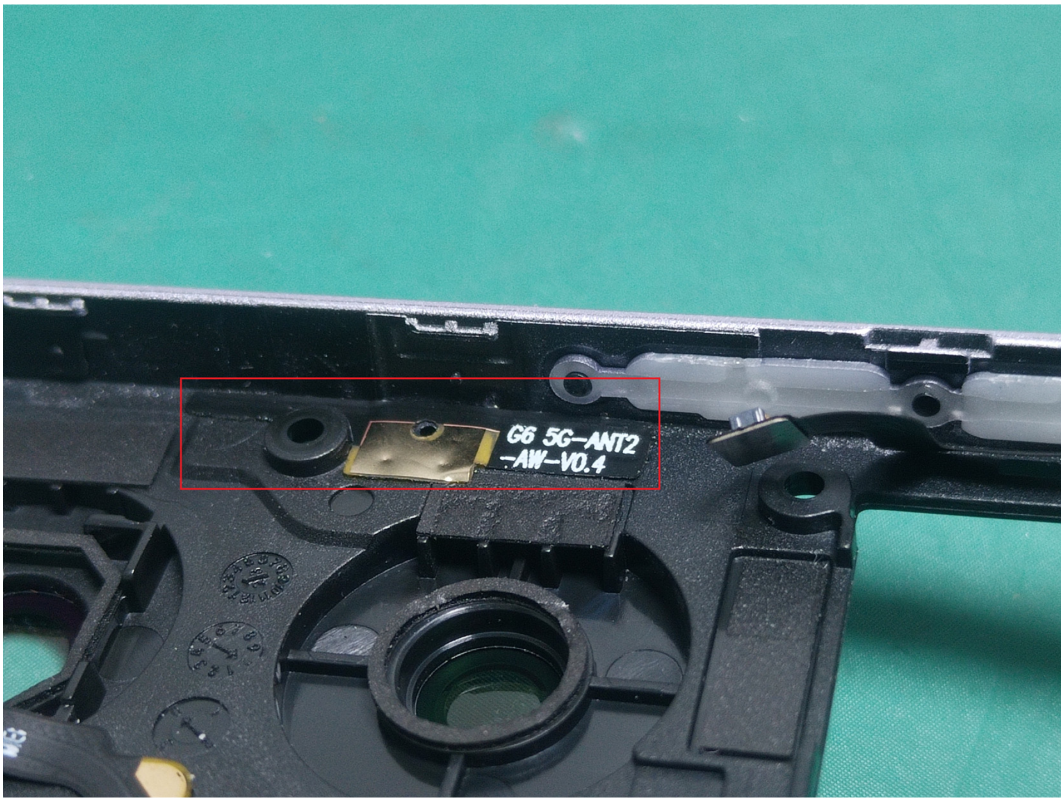


**Ant0 Antenna View**

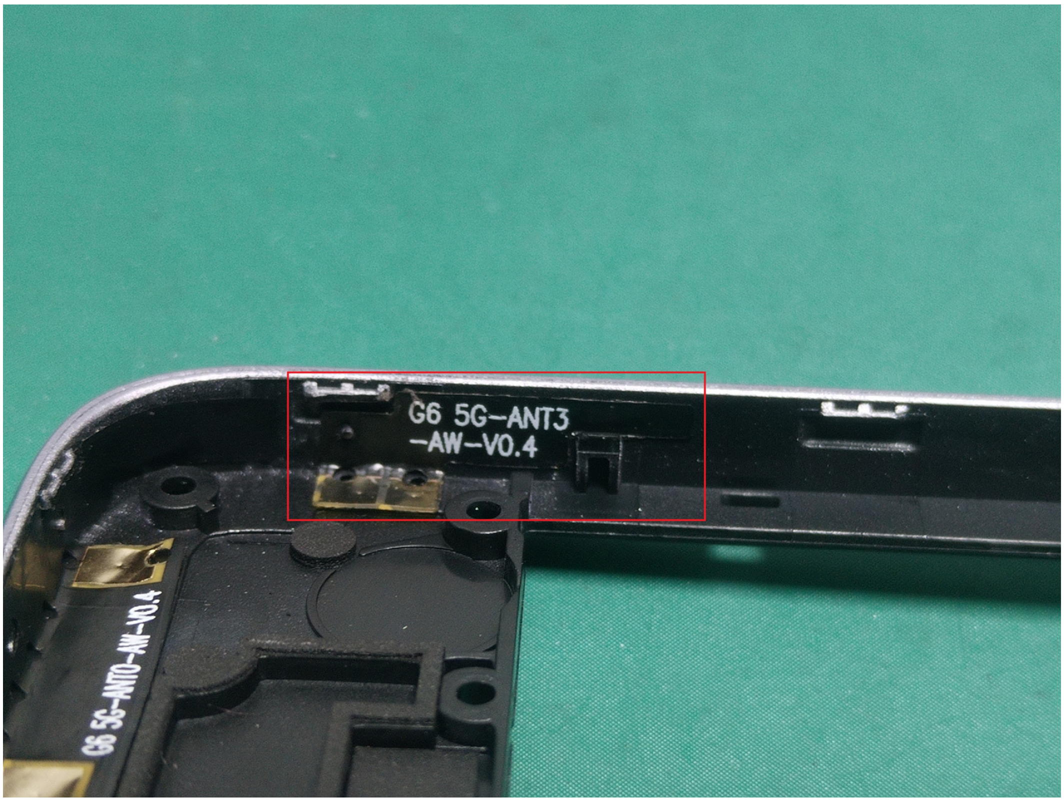

**Ant1 Antenna View**



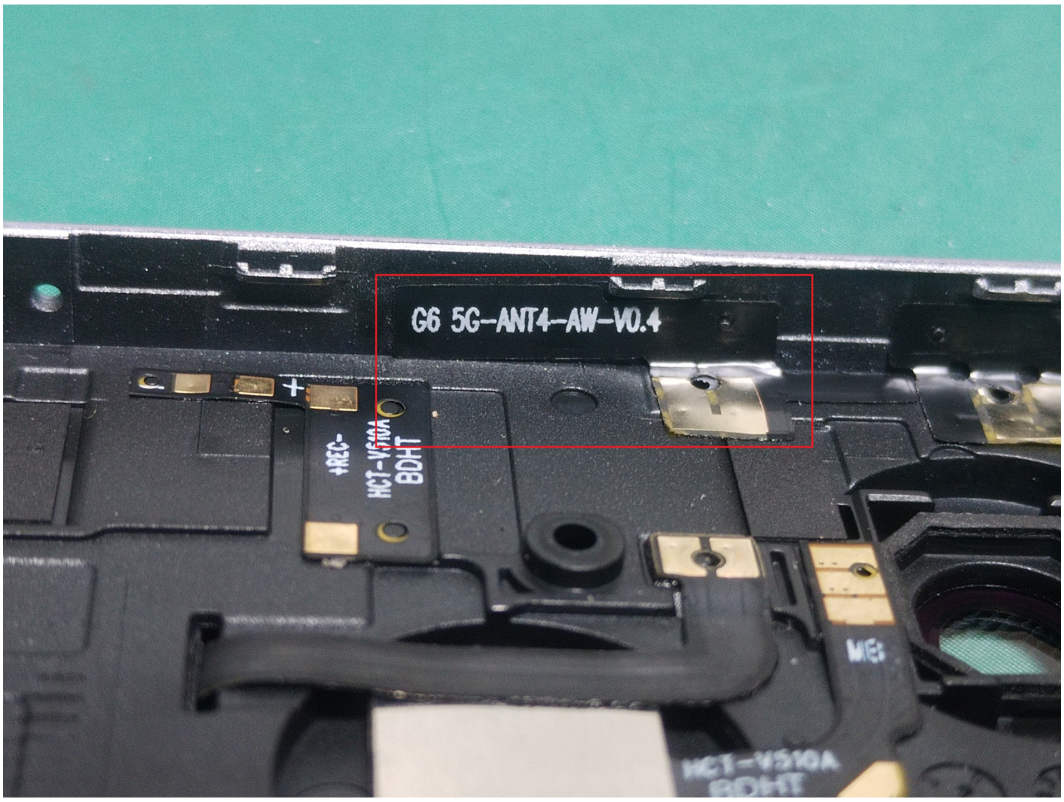
**Ant2 Antenna View**



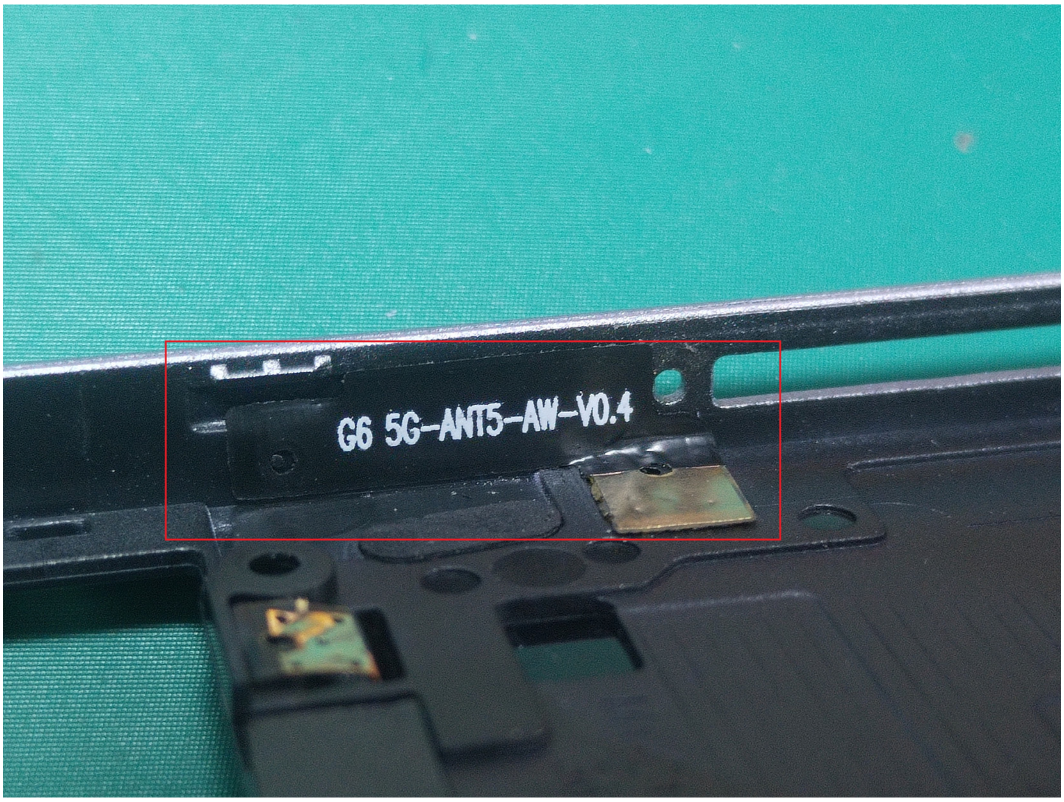

**Ant3 Antenna View**



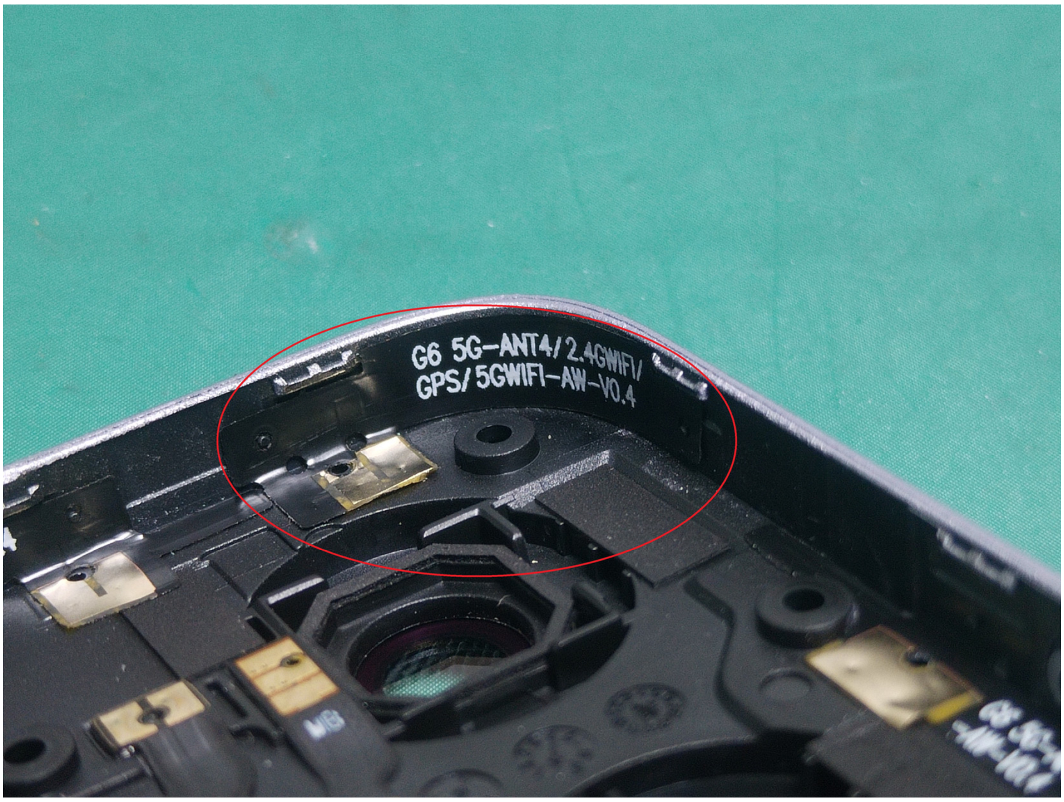
**Ant4 Antenna View**




**Ant5 Antenna View**



## Ant6 Antenna View



# APPENDIX F INFORMATIVE REFERENCES

[1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.

[2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, O_ce of Engineering & Technology, Washington, DC, 1997.

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-_eld scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.

[4] Niels Kuster, Ralph K.astle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.

[5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.

[6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.

[7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM _ 97, Dubrovnik, October 15{17, 1997, pp. 120-24.

[8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172-175.

[9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard K. uhn, and Niels Kuster, \The depen-dence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.

[10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.

[11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.

[12] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.Dosimetric Evaluation of Sample device, month 1998 9

[13] NIS81 NAMAS, \The treatment of uncertainity in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.

[14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10.

******* END OF REPORT *******