# FCC SAR REPORT

**For**

**Product Name: 4G Smartphone**
**Brand Name: Mobiwire，Altice**
**Model No.: MobiWire Huritt, Altice S61**
**Series Model: N/A**
**Test Report Number: C180816S01-SF**

**Issued for**

**Mobiwire SAS**
**79 avenue Francois Arago, 92000 NANTERRE France**

**Issued by**

**Compliance Certification Services Inc.**
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TESTING CERT #2541.01

# Revision History

| Revision | REPORT NO. | Date | Page Revised | Contents |
|---|---|---|---|---|
| Original | C180816S01-SF | August 28,2018 | N/A | N/A |

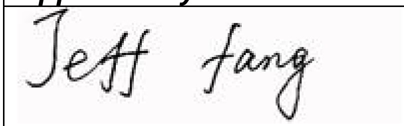
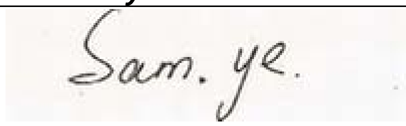
# TABLE OF CONTENTS

# 1. CERTIFICATE OF COMPLIANCE (SAR EVALUATION)

| | |
|---|---|
| **Product Name:** | 4G Smartphone |
| **Brand Name:** | Mobiwire，Altice |
| **Model Name.:** | MobiWire Huritt, Altice S61 |
| **Series Model:** | N/A |
| **Device Category:** | Protable DEVICES |
| **Exposure Category:** | GENERAL POPULATION/UNCONTROLLED EXPOSURE |
| **Date of Test:** | August 20, 2018 & August 21, 2018 |
| **Applicant:**<br>**Address:** | **Mobiwire SAS**<br>79 avenue Francois Arago, 92000 NANTERRE France |
| **Manufacturer:**<br>**Address:** | **Mobiwire SAS**<br>79 avenue Francois Arago, 92000 NANTERRE France |
| **Application Type:** | Certification |

| APPLICABLE STANDARDS AND TEST PROCEDURES | |
|---|---|
| **STANDARDS AND TEST PROCEDURES** | **TEST RESULT** |
| KDB 865664 | No non-compliance noted |
| **Deviation from Applicable Standard** | |
| None | |

The device was tested by Compliance Certification Services Inc. in accordance with the measurement methods and procedures specified in KDB 865664 The test results in this report apply only to the tested sample of the stated device/equipment. Other similar device/equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

| ***Approved by:*** | ***Tested by:*** |
|---|---|
|  |  |
| Jeff.fang<br>RF Manager<br>Compliance Certification Services Inc. | Sam.ye<br>Test Engineer<br>Compliance Certification Services Inc. |

# 2. EUT DESCRIPTION

| | | |
|---|---|---|
| **Product Name:** | 4G Smartphone | |
| **Brand Name:** | Mobiwire，Altice | |
| **Model Name.:** | MobiWire Huritt, Altice S61 | |
| **Series Model:** | N/A | |
| **Model Discrepancy:** | N/A | |
| **FCC ID:** | QPN-S61 | |
| **Software version** | VQ551-EH5511 | |
| **Hardware version** | V01 | |
| **IMEI:** | 356981090005340 | |
| **Power reduction:** | NO | |
| **DTM Description:** | N/A | |
| **Device Category:** | Production unit | |
| **Frequency Range:** | IEEE802.11a mode :5150MHz~5350MHz;5470MHz-5725MHz;<br>5725MHz-5850MHz<br>IEEE802.11n HT20 mode: 5150MHz~5350MHz;5470MHz-5725MHz;<br>5725MHz-5850MHz<br>IEEE802.11n HT40 mode: 5150MHz~5350MHz;5470MHz-5725MHz;<br>5725MHz-5850MHz | |
| **Max. Reported SAR(1g):** | Head:<br>WLAN 5G: 0.274 W/kg | Body:<br>WLAN 5G: 0.374 W/kg |
| **Modulation Technique:** | IEEE 802.11a: OFDM<br>IEEE 802.11n HT20 MHz Mode: OFDM<br>IEEE 802.11n HT40 MHz Mode: OFDM | |
| **Wireless Router (Hotspot)** | Wi-Fi Hotspot mode permits the device to share its cellular data connection with other Wi-Fi enabled devices.<br>Mobile Hotspot (Wi-Fi 5 GHz) | |
| **Accessories:** | Battery(rating):<br>Capacitance: 3020 mAh<br>Rated Voltage: 3.85 V | |
| **Antenna Specification:** | Wifi: PIFA Antenna | |
| **Operating Mode:** | Maximum continuous output | |
| **Remark**：The product details information please refer to the product specification | | |

## 2.1 MAXIMUM RF OUTPUT POWER WITH TEST CHANNEL

**5GHz:**

| Band / Mode | Channel | Tune-up power(dBm) |
|---|---|---|
| 802.11a | 36 | 15.5 |
| | 40 | 15.5 |
| | 44 | 15.5 |
| | 48 | 15.5 |
| | 52 | 15.5 |
| | 56 | 15.5 |
| | 60 | 15.5 |
| | 64 | 15.5 |
| | 100 | 14.5 |
| | 116 | 14.5 |
| | 120 | 14.5 |
| | 132 | 14.5 |
| | 140 | 14.5 |
| | 149 | 12.5 |
| | 157 | 12.5 |
| | 165 | 12.5 |
| 802.11n 20MHz | 36 | 15.5 |
| | 40 | 15.5 |
| | 44 | 15.5 |
| | 48 | 15.5 |
| | 52 | 15.5 |
| | 56 | 15.5 |
| | 60 | 15.5 |
| | 64 | 15.5 |
| | 100 | 14.5 |
| | 116 | 14.5 |
| | 120 | 14.5 |
| | 132 | 14.5 |
| | 140 | 14.5 |
| | 149 | 13 |
| | 157 | 13 |
| | 165 | 13 |
| 802.11n 40MHz | 38 | 16.5 |
| | 46 | 16.5 |
| | 54 | 15.5 |
| | 62 | 15.5 |
| | 102 | 15 |
| | 110 | 15 |
| | 118 | 15 |

| | | |
|---|---|---|
| | 134 | 15 |
| | 151 | 12.5 |
| | 159 | 12.5 |

# 3. REQUIREMENTS FOR COMPLIANCE TESTING DEFINED BY THE FCC

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 W/Kg for an uncontrolled environment and 8.0 W/Kg for an occupational/controlled environment as recommended by the FCC 47 CFR Part 2 (2.1093).

# 4. TEST METHODOLOGY

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

☒ FCC 47 CFR Part 2 (2.1093)
☒ ANSI/IEEE C95.1-1992
☒ IEEE 1528:2013
☒ KDB 248227 D01v02r02 802 11 Wi-Fi SAR
☒ KDB 447498 D01v06 General RF Exposure Guidance
☒ KDB 648474 D04v01r03 Handset SAR
☒ KDB 865664 D01v01r04 SAR Measurement 100 MHz to 6 GHz
☒ KDB 865664 D02v01r02 RF Exposure Reporting
☒ KDB 941225 D06v02r01 Hotspot SAR

# 5. TEST CONFIGURATION

During WLAN SAR testing EUT is configured with the WLAN continuous TX tool, and the transmission duty factor was monitored on the spectrum analyzer with zero-span setting

For WLAN SAR testing, WLAN engineering test software installed on the EUT can provide continuous transmitting RF signal. Duty cycle Form:

| Band | Mode | NII Band | Duty cycle(100%) |
|---|---|---|---|
| 5GHz | 802.11a | U-NII-1 | 97.44 |
| | | U-NII-2A | 97.67 |
| | | U-NII-2C | 97.43 |
| | | U-NII-3 | 97.43 |
| | 802.11 20MHz | U-NII-1 | 97.26 |
| | | U-NII-2A | 97.26 |
| | | U-NII-2C | 97.26 |
| | | U-NII-3 | 97.51 |
| | 802.11 40MHz | U-NII-1 | 95.15 |
| | | U-NII-2A | 95.15 |
| | | U-NII-2C | 95.15 |
| | | U-NII-3 | 95.10 |

# 6. DOSIMETRIC ASSESSMENT SETUP

These measurements were performed with the automated near-field scanning system DASY 5 from SPEAG. The system is based on a high precision robot (working range greater than 0.9 m), 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 the E-field PROBE EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [7] with accuracy of better than ±10%. The spherical isotropy was evaluated with the procedure described in [8] and found to be better than ±0.25 dB. The phantom used was the SAM Twin Phantom as described in FCC supplement C, IEEE 1528 and CENELEC EN 62209.

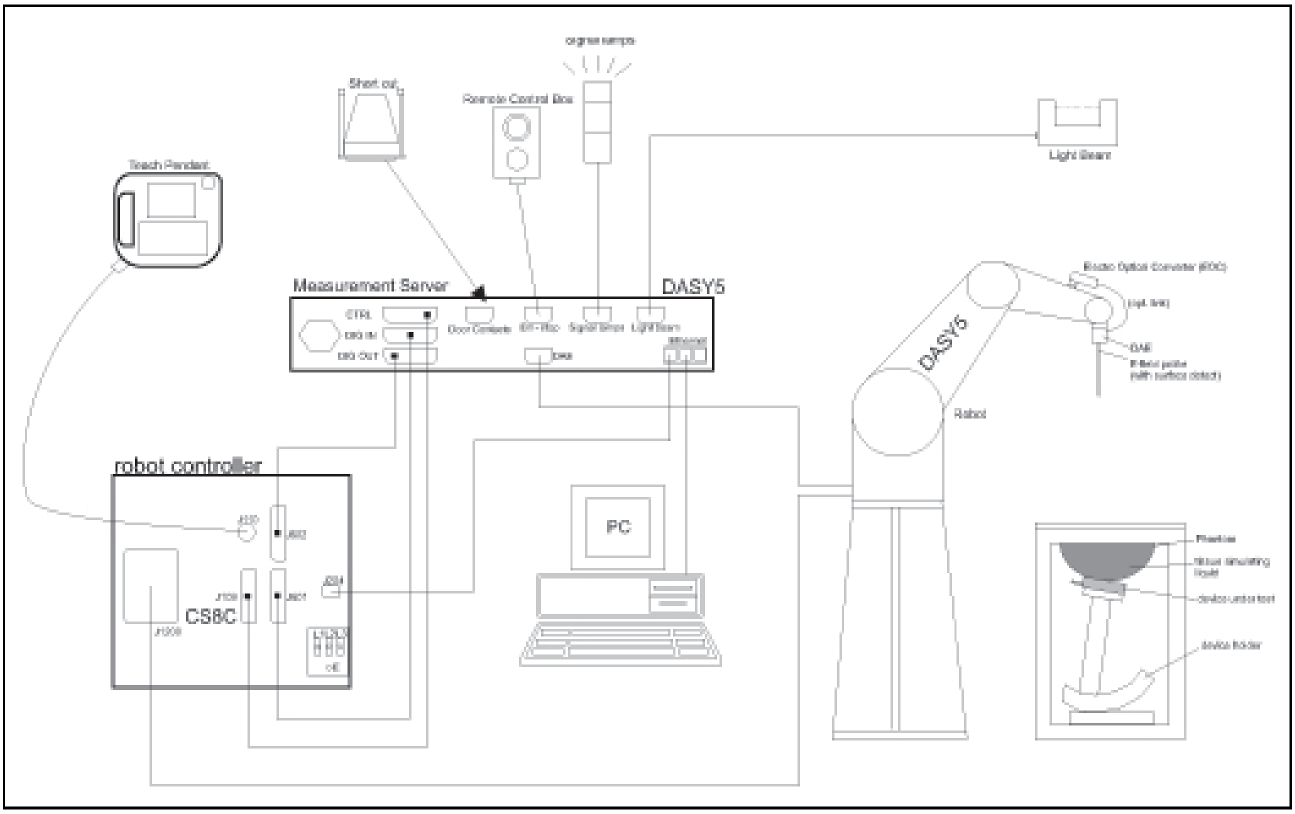
**The following table gives the recipes for tissue simulating liquids.**

| Ingredients (% by weight) | Frequency (MHz) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 450 | | 835 | | 915 | | 1900 | | 2450 | |
| Tissue Type | Head | Body | Head | Body | Head | Body | Head | Body | Head | Body |
| Water | 38.56 | 51.16 | 41.45 | 52.4 | 41.05 | 56.0 | 54.9 | 40.4 | 62.7 | 73.2 |
| Salt (NaCl) | 3.95 | 1.49 | 1.45 | 1.4 | 1.35 | 0.76 | 0.18 | 0.5 | 0.5 | 0.04 |
| Sugar | 56.32 | 46.78 | 56.0 | 45.0 | 56.5 | 41.76 | 0.0 | 58.0 | 0.0 | 0.0 |
| HEC | 0.98 | 0.52 | 1.0 | 1.0 | 1.0 | 1.21 | 0.0 | 1.0 | 0.0 | 0.0 |
| Bactericide | 0.19 | 0.05 | 0.1 | 0.1 | 0.1 | 0.27 | 0.0 | 0.1 | 0.0 | 0.0 |
| Triton X-100 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 36.8 | 0.0 |
| DGBE | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 44.92 | 0.0 | 0.0 | 26.7 |
| Dielectric Constant | 43.42 | 58.0 | 42.54 | 56.1 | 42.0 | 56.8 | 39.9 | 54.0 | 39.8 | 52.5 |
| Conductivity (S/m) | 0.85 | 0.83 | 0.91 | 0.95 | 1.0 | 1.07 | 1.42 | 1.45 | 1.88 | 1.78 |

**Simulating Liquids for 5 GHz, Manufactured by SPEAG**

| Ingredients | (% by weight) |
|---|---|
| Water | 78 |
| Mineral oil | 11 |
| Emulsifiers | 9 |
| Additives and Salt | 2 |

## 6.1 MEASUREMENT SYSTEM DIAGRAM




**The DASY5 system for performing compliance tests consists of the following items:**

- A standard high precision 6-axis robot (St¨aubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected 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.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 7.
- DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.

## 6.2 SYSTEM COMPONENTS


The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV celeron, 128MB chip-disk and 128 MB RAM. The necessary circuits for communication with either the DAE4(or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY5 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation.


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 two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server. Calibration: No calibration required.

**Data Acquisition Electronics (DAE)**


The data acquisition electronics (DAE4) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The 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 the DAE4 box is 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**EX3DV4 Isotropic E-Field Probe for Dosimetric Measurements**

**Construction:** Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., DGBE)

**Calibration:** Basic Broad Band Calibration in air: 10-3000 MHz.
Conversion Factors (CF) for HSL 900 and HSL 1800
CF-Calibration for other liquids and frequencies upon request.

**Frequency:** 10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)

**Directivity:** ± 0.3 dB in HSL (rotation around probe axis)
± 0.5 dB in HSL (rotation normal to probe axis)

**Dynamic Range:** 10 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
(noise: typically < 1 µW/g)

| | |
|---|---|
| **Dimensions:** Overall length: 337 mm (Tip: 9 mm)<br>Tip diameter: 2.5 mm (Body: 10 mm)<br>Distance from probe tip to dipole centers: 1 mm<br>**Application:** High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%. | <br>Interior of probe |
| **SAM Twin Phantom** | |
| **Construction:**<br>The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50360 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.<br>**Shell Thickness:** 2 ±0.2 mm<br>**Filling Volume:** Approx. 25 liters<br>**Dimensions:** Height: 850mm; Length: 1000mm; Width: 750mm |  |
| **SAM Phantom (ELI4 v4.0)** | |
| **Description Construction:**<br>Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with the latest draft of the standard IEC 62209 Part II and all known tissue simulating liquids. ELI4 has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is supported by software version DASY4/DASY5.5 and higher and is compatible with all SPEAG dosimetric probes and dipoles<br>**Shell Thickness:** 2.0 ± 0.2 mm (sagging: <1%)<br>**Filling Volume:** Approx. 25 liters<br>**Dimensions:** Major ellipse axis: 600 mm<br>**Minor axis:** 400 mm 500mm |  |

| Device Holder for SAM Twin Phantom | |
|---|---|
| **Construction:** In combination with the Twin SAM Phantom, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, and flat phantom). |  |

| System Validation Kits for SAM Twin Phantom | |
|---|---|
| **Construction:** Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.<br>**Frequency:** 900,1800,2450,5800 MHz<br>**ReTune loss:** > 20 dB at specified validation position<br>**Power capability:** > 100 W (f < 1GHz); > 40 W (f > 1GHz)<br>**Dimensions:**<br>D835V2: dipole length: 161 mm; overall height: 340 mm<br>D1800V2: dipole length: 72.5 mm; overall height: 300 mm<br>D1900V2: dipole length: 67.7 mm; overall height: 300 mm<br>D2450V2: dipole length: 51.5 mm; overall height: 290 mm<br>D5GHzV2: dipole length: 20.6 mm; overall height: 300mm |  |

| System Validation Kits for ELI4 phantom | |
|---|---|
| **Construction:** Symmetrical dipole with l/4 balun Enables measurement of feedpoint impedance with NWA Matched for use near flat phantoms filled with brain simulating solutions Includes distance holder and tripod adaptor.<br>**Frequency:** 900, 1800, 2450, 5800 MHz<br>**ReTune loss:** > 20 dB at specified validation position<br>**Power capability:** > 100 W (f < 1GHz); > 40 W (f > 1GHz)<br>**Dimensions:**<br>D835V2: dipole length: 161 mm; overall height: 340 mm<br>D1800V2: dipole length: 72.5 mm; overall height: 300 mm<br>D1900V2: dipole length: 67.7 mm; overall height: 300 mm<br>D2450V2: dipole length: 51.5 mm; overall height: 290 mm<br>D5GHzV2: dipole length: 20.6 mm; overall height: 300 mm |  |

# 7. EVALUATION PROCEDURES

**DATA EVALUATION**

The DASY 5 post processing software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

| | | |
|---|---|---|
| Probe parameters: | - Sensitivity | $Norm_i$, $a_{i0}$, $a_{i1}$, $a_{i2}$ |
| | - Conversion factor | $ConvF_i$ |
| | - Diode compression point | $dcp_i$ |
| Device parameters: | - Frequency | $f$ |
| | - Crest factor | $cf$ |
| Media parameters: | - Conductivity | $\sigma$ |
| | - Density | $\rho$ |

These parameters must be set correctly in the software. They can be found in the component documents or be imported into the software from the configuration files issued for the DASY 5 components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with $V_i$ = Compensated signal of channel i (i = x, y, z)
$U_i$ = Input signal of channel i (i = x, y, z)
$cf$ = Crest factor of exciting field (DASY 5 parameter)
$dcp_i$ = Diode compression point (DASY 5 parameter)

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

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \bullet ConvF}}$$

H-field probes:

$$H_i = \sqrt{Vi} \cdot \frac{a_{i10} + a_{i11} f + a_{i12} f^2}{f}$$

with $V_i$ = Compensated signal of channel i (i = x, y, z)
$Norm_i$ = Sensor sensitivity of channel i (i = x, y, z)
$\mu V/(V/m)^2$ for E-field Probes
$ConvF$ = Sensitivity enhancement in solution
$aij$ = Sensor sensitivity factors for H-field probes
$f$ = Carrier frequency (GHz)
$Ei$ = Electric field strength of channel i in V/m
$Hi$ = Magnetic field strength of channel i in A/m

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

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with $SAR$ = local specific absorption rate in mW/g

$E_{tot}$ = total field strength in V/m

$\sigma$ = conductivity in [mho/m] or [Siemens/m]

$\rho$ = equivalent tissue density in g/cm$^3$

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid.

The power flow density is calculated assuming the excitation field as a free space field.

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

with $P_{pwe}$ = Equivalent power density of a plane wave in mW/cm$^2$

$E_{tot}$ = total electric field strength in V/m

$H_{tot}$ = total magnetic field strength in A/m

## SAR EVALUATION PROCEDURES

The procedure for assessing the peak spatial-average SAR value consists of the following steps:

- **Power Reference Measurement**

  The reference and drift jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

- **Area Scan**

  The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY 5 software can find the maximum locations even in relatively coarse grids. The scan area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the area scan's property sheet is brought-up, grid was at to 15 mm by 15 mm and can be edited by a user.

- **Zoom Scan**

  Zoom scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default zoom scan measures 5 x 5 x 7 points within a cube whose base faces are centered around the maximum found in a preceding area scan job within the same procedure. If the preceding Area Scan job indicates more then one maximum, the number of Zoom Scans has to be enlarged accordingly (The default number inserted is 1).

- **Power Drift measurement**

  The drift job measures the field at the same location as the most recent reference job within the same procedure, and with the same settings. The drift measurement gives the field difference in dB from the reading conducted within the last reference measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. In the properties of the Drift job, the user can specify a limit for the drift and have DASY 5 software stop the measurements if this limit is exceeded.

- **Z-Scan**

  The Z Scan job measures points along a vertical straight line. The line runs along the Z-axis of a one-dimensional grid. A user can anchor the grid to the current probe location. As with any other grids, the local Z-axis of the anchor location establishes the Z-axis of the grid.

## SPATIAL PEAK SAR EVALUATION

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE1529 standard. It can be conducted for 1 g and 10 g.

The DASY 5 system allows evaluations that combine measured data and robot positions, such as:

- maximum search
- extrapolation
- boundary correction
- peak search for averaged SAR

During a maximum search, global and local maximum searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.

### Extrapolation

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. Several measurements at different distances are necessary for the extrapolation.

Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Cube Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 5x5x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1 g and 10 g cubes.

### Boundary effect

For measurements in the immediate vicinity of a phantom surface, the field coupling effects between the probe and the boundary influence the probe characteristics. Boundary effect errors of different dosimetric probe types have been analyzed by measurements and using a numerical probe model. As expected, both methods showed an enhanced sensitivity in the immediate vicinity of the boundary. The effect strongly depends on the probe dimensions and disappears with increasing distance from the boundary. The sensitivity can be approximately given as:

$$S \approx S_o + S_b exp(-\frac{z}{a}) cos(\pi \frac{z}{\lambda})$$

Since the decay of the boundary effect dominates for small probes (a<<λ), the cos-term can be omitted. Factors *Sb* (parameter Alpha in the DASY 5 software) and *a* (parameter Delta in the DASY 5 software) are assessed during probe calibration and used for numerical compensation of the boundary effect. Several simulations and measurements have confirmed that the compensation is valid for different field and boundary configurations.

This simple compensation procedure can largely reduce the probe uncertainty near boundaries. It works well as long as:

- the boundary curvature is small
- the probe axis is angled less than 30_ to the boundary normal
- the distance between probe and boundary is larger than 25% of the probe diameter
- the probe is symmetric (all sensors have the same offset from the probe tip)

Since all of these requirements are fulfilled in a DASY 5 system, the correction of the probe boundary effect in the vicinity of the phantom surface is performed in a fully automated manner via the measurement data extraction during post processing.

# 8. 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.

# 9. EXPOSURE LIMIT

(A). Limits for Occupational/Controlled Exposure (W/kg)

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

(B). Limits for General Population/Uncontrolled Exposure (W/kg)

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

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

**Population/Uncontrolled Environments** are defined as locations where there is the exposure of individuals 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).

| NOTE<br>GENERAL POPULATION/UNCONTROLLED EXPOSURE<br>PARTIAL BODY LIMIT<br>1.6 W/kg |
|---|

# 10. EUT ARRANGEMENT

Please refer to IEEE1528-2013 illustration below.

## 10.1 ANTHROPOMORPHIC HEAD PHANTOM

Figure 7-1a shows the front, back and side views of SAM. The point "M" is the reference point for the center of mouth, "LE" is the left ear reference point (ERP), and "RE" is the right ERP. The ERPs are 15 mm posterior to the entrance to ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 7-1b. The plane passing through the two ear reference points and M is defined as the Reference Plane. The line N-F (Neck-Front) perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 7-1c). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines should be marked on the external phantom shell to facilitate handset positioning. Posterior to the N-F line, the thickness of the phantom shell with the shape of an ear is a flat surface 6 mm thick at the ERPs. Anterior to the N-F line, the ear is truncated as illustrated in Figure 7-1b. The ear truncation is introduced to avoid the handset from touching the ear lobe, which can cause unstable handset positioning at the cheek.

Figure 7-1a
Front, back and side view of SAM (model for the phantom shell)

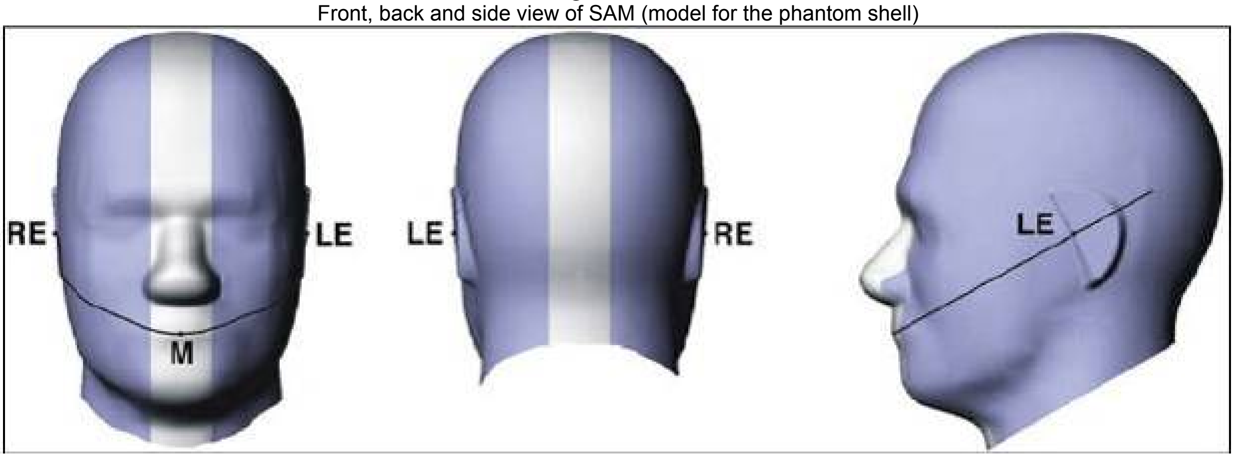
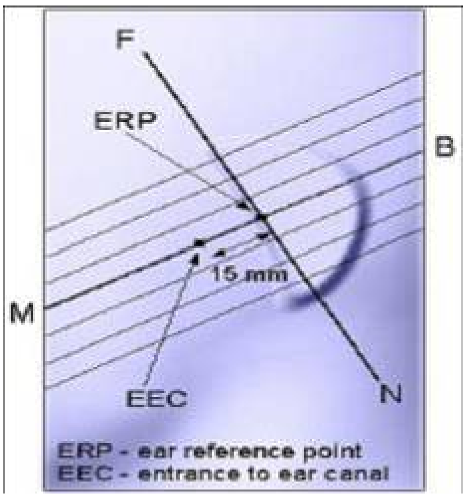



Figure 7-1b
Close up side view of phantom showing the ear region

Figure 7-1c
Side view of the phantom showing relevant markings and the 7 cross sectional plane locations



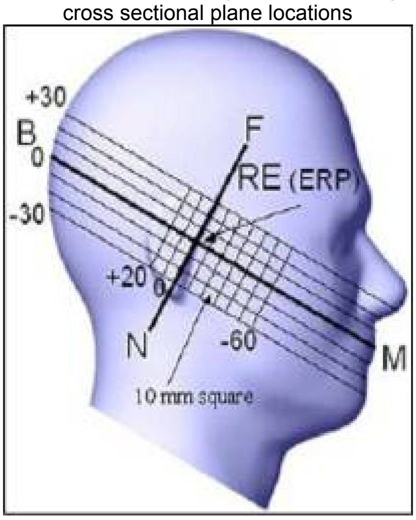




Figure 7-1b
Close up side view of phantom showing the ear region

Figure 7-1c
Side view of the phantom showing relevant markings and the 7 cross sectional plane locations

## 10.2 DEFINITION OF THE "CHEEK/TOUCH" POSITION

The "cheek" or "touch" position is defined as follows:

a. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover. (If the handset can also be used with the cover closed both configurations must be tested.)

b. Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width wt of the handset at the level of the acoustic output (point A on Figures 7-2a and 7-2b), and the midpoint of the width wb of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 7-2a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 7-2b), especially for clamshell handsets, handsets with flip pieces, and other irregularly-shaped handsets.

c. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7-2c), such that the plane defined by the vertical center line and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.

d. Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the pinna.

e. e) While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).

f. Rotate the handset around the vertical centerline until the handset (horizontal line) is symmetrical with respect to the line NF.

g. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the handset contact with the pinna, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the pinna (cheek). See Figure 7-2c. The physical angles of rotation should be noted.

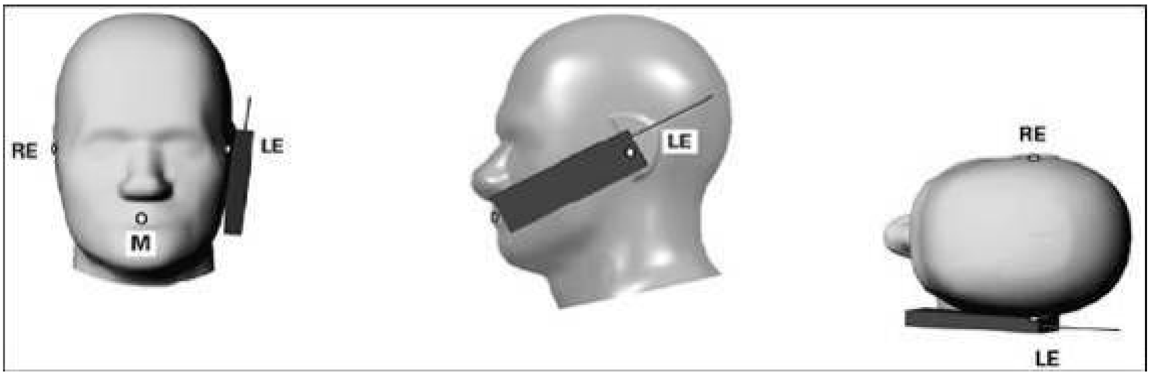



Figure 7.2c
Phone "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for handset positioning, are indicated.

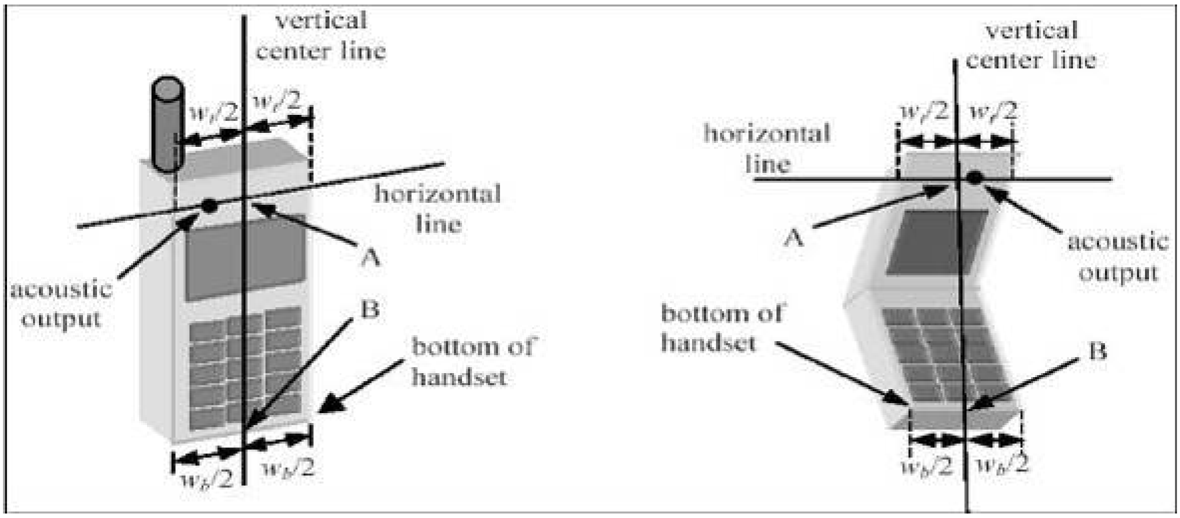



Figure 7.2a Figure 7.2b

## 10.3 DEFINITION OF THE "TILTED" POSITION

The "tilted" position is defined as follows:

a. Repeat steps (a) – (g) of 7.2 to place the device in the "cheek position."

b. While maintaining the orientation of the handset move the handset away from the pinna along the line passing through RE and LE in order to enable a rotation of the handset by 15 degrees.

c. Rotate the handset around the horizontal line by 15 degrees.

d. While maintaining the orientation of the handset, move the handset towards the phantom on a line passing through RE and LE until any part of the handset touches the ear. The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna (e.g., the antenna with the back of the phantom head), the angle of the handset should be reduced. In this case, the tilted position is obtained if any part of the handset is in contact with the pinna as well as a second part of the handset is contact with the phantom (e.g., the antenna with the back of the head).

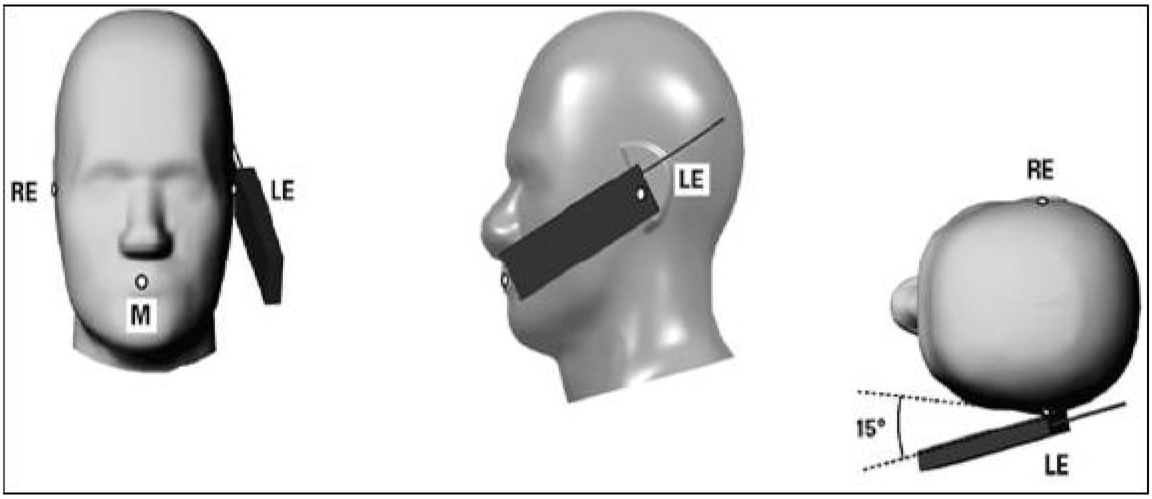



Figure 7-3
Phone "tilted" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for handset positioning, are indicated.

# 11. MEASUREMENT RESULTS

## 11.1 TEST LIQUIDS CONFIRMATION

### SIMULATED TISSUE LIQUID PARAMETER CONFIRMATION

The dielectric parameters were checked prior to assessment using the HP85070C dielectric probe kit. The dielectric parameters measured are reported in each correspondent section.

### KDB865664 D01 RECOMMENDED TISSUE DIELECTRIC PARAMETERS

The head and Body tissue dielectric parameters recommended by the KDB865664 D01 have been incorporated in the following table.

| Target Frequency (MHz) | Head | | Body | |
|---|---|---|---|---|
| | $\varepsilon_r$ | $\sigma$ (S/m) | $\varepsilon_r$ | $\sigma$ (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 |

($\varepsilon_r$ = relative permittivity, $\sigma$ = conductivity and $\rho$ = 1000 kg/m$^3$)

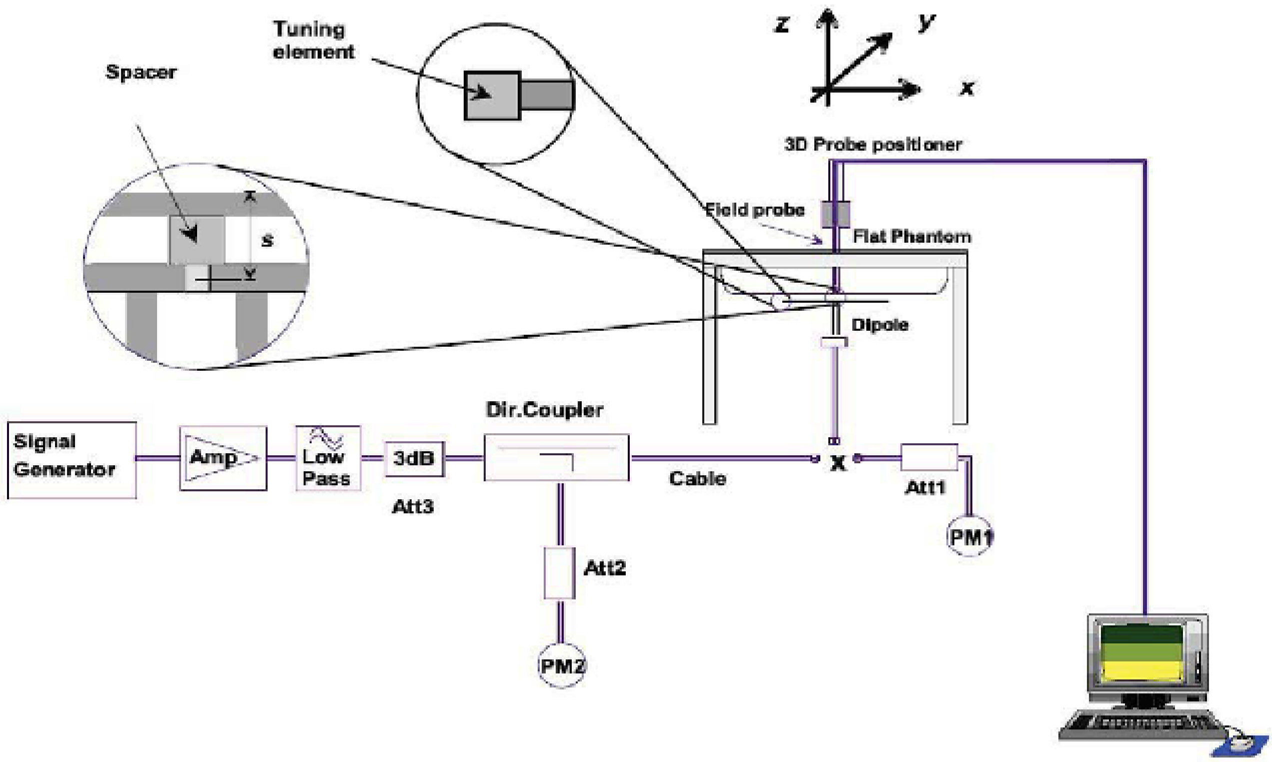
## 11.2 LIQUID MEASUREMENT RESULTS

**The following table show the measuring results for simulating liquid:**

| Liquid Type | Liquid Temp. (°C) | Parameters | Target | Measured | Deviation (%) | Limited (%) | Measured Date |
|---|---|---|---|---|---|---|---|
| Head5200 | 21.5 | Permitivity(ε ) | 36.00 | 35.97 | -0.08 | ± 5 | 2018/8/20 |
| | | Conductivity(σ) | 4.66 | 4.54 | -2.64 | ± 5 | |
| Head5600 | 21.5 | Permitivity(ε ) | 35.00 | 35.03 | 0.10 | ± 5 | 2018/8/20 |
| | | Conductivity(σ) | 5.07 | 4.98 | -1.85 | ± 5 | |
| Head5800 | 21.5 | Permitivity(ε ) | 35.30 | 34.57 | -2.07 | ± 5 | 2018/8/20 |
| | | Conductivity(σ) | 5.27 | 5.19 | -1.44 | ± 5 | |
| Body5200 | 21.5 | Permitivity(ε ) | 49.03 | 48.87 | -0.33 | ± 5 | 2018/8/21 |
| | | Conductivity(σ) | 5.35 | 5.32 | -0.54 | ± 5 | |
| Body5600 | 21.5 | Permitivity(ε ) | 48.48 | 48.08 | -0.82 | ± 5 | 2018/8/21 |
| | | Conductivity(σ) | 5.79 | 5.93 | 2.45 | ± 5 | |
| Body5800 | 21.5 | Permitivity(ε ) | 48.20 | 47.55 | -1.35 | ± 5 | 2018/8/21 |
| | | Conductivity(σ) | 6.00 | 6.23 | 3.83 | ± 5 | |

## 11.3 SYSTEM PERFORMANCE CHECK

The system performance check is performed prior to any usage of the system in order to guarantee reproducible results. The system performance check verifies that the system operates within its specifications of ±10%. The system performance check results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.
System check is performed regularly on all frequency bands where tests are performed with the DASY5 system .

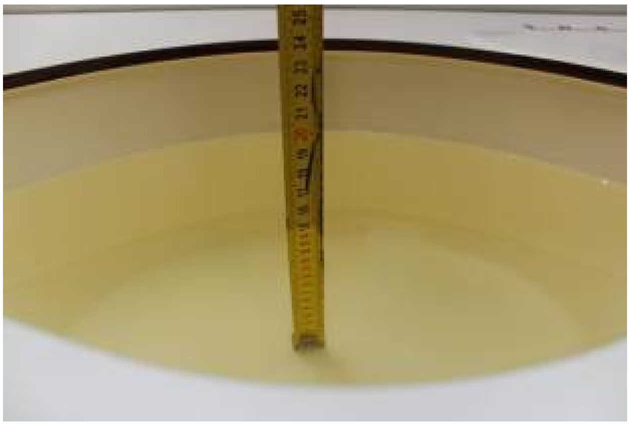



### SYSTEM PERFORMANCE CHECK MEASUREMENT CONDITIONS

- The measurements were performed in the flat section of the SAM twin phantom filled with head and body simulating liquid of the following parameters.
- The DASY5 system withan E-fileld probe EX3DV4：3801 was used for the measurements.
- The dipole was mounted on the small tripod so that the dipole feed point was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15 cm (above 1 GHz) from dipole center to the simulating liquid surface.
- The coarse grid with a grid spacing of 10mm was aligned with the dipole.
- Special 7x7x7 fine cube was chosen for cube integration (dx= 5 mm, dy= 5 mm, dz= 5 mm).
- Distance between probe sensors and phantom surface was set to 2 mm.
- The dipole input power was 250mW±3%.
- The results are normalized to 1 W input power.

**Depth of Liquid**

Liquid depth in the head Phantom (5GHz 15cm depth)



Liquid depth in the Body Phantom (5GHz 15cm depth)

### <Tissue Dielectric Parameter Check Results>

| Liquid Type | Ambient Temp. (°C) | Liquid Temp. (°C) | Input Power (W) | Measured SAR1g (W/Kg) | 1W Target SAR1g(W/Kg) | 1W Normalized SAR1g(W/Kg) | Deviation (%) | Limited (%) | Date |
|---|---|---|---|---|---|---|---|---|---|
| Head5200 | 22 | 21.5 | 0.1 | 7.89 | 77.90 | 78.90 | 1.28 | ± 10 | 2018/8/20 |
| Head5600 | 22 | 21.5 | 0.1 | 8.08 | 82.20 | 80.80 | -1.70 | ± 10 | 2018/8/20 |
| Head5800 | 22 | 21.5 | 0.1 | 7.81 | 78.60 | 78.10 | -0.64 | ± 10 | 2018/8/20 |
| Body5200 | 22 | 21.5 | 0.1 | 7.55 | 74.50 | 75.50 | 1.34 | ± 10 | 2018/8/21 |
| Body5600 | 22 | 21.5 | 0.1 | 8.12 | 79.80 | 81.20 | 1.75 | ± 10 | 2018/8/21 |
| Body5800 | 22 | 21.5 | 0.1 | 7.92 | 77.20 | 79.20 | 2.59 | ± 10 | 2018/8/21 |

## 11.4 EUT TUNE-UP PROCEDURES AND TEST MODE

**5GHz**

**WLAN Conducted output power(dBm):**

**U-NII-1**

| Mode | Channel | Frequency (MHZ) | Target power(dBm) | Tune up tolerance (dBm) | Maximum Tune up power (dBm) | Average Power (dBm) |
|---|---|---|---|---|---|---|
| 802.11 a | 36 | 5180 | 14.5 | ±1 | 15.5 | 15.22 |
| | 40 | 5200 | 14.5 | ±1 | 15.5 | 14.98 |
| | 44 | 5220 | 14.5 | ±1 | 15.5 | 15.08 |
| | 48 | 5240 | 14.5 | ±1 | 15.5 | 14.96 |
| 802.11 n HT20 | 36 | 5180 | 14.5 | ±1 | 15.5 | 15.27 |
| | 40 | 5200 | 14.5 | ±1 | 15.5 | 15.01 |
| | 44 | 5220 | 14.5 | ±1 | 15.5 | 15.39 |
| | 48 | 5240 | 14.5 | ±1 | 15.5 | 15.00 |
| 802.11 n HT40 | 38 | 5190 | 15.5 | ±1 | 16.5 | 16.50 |
| | 46 | 5230 | 15.5 | ±1 | 16.5 | 16.31 |

**U-NII-2A**

| Mode | Channel | Frequency (MHZ) | Target power(dBm) | Tune up tolerance (dBm) | Maximum Tune up power (dBm) | Average Power (dBm) |
|---|---|---|---|---|---|---|
| 802.11 a | 52 | 5260 | 14.5 | ±1 | 15.5 | 15.00 |
| | 56 | 5280 | 14.5 | ±1 | 15.5 | 14.89 |
| | 60 | 5300 | 14.5 | ±1 | 15.5 | 15.01 |
| | 64 | 5320 | 14.5 | ±1 | 15.5 | 15.20 |
| 802.11 n HT20 | 52 | 5260 | 14.5 | ±1 | 15.5 | 15.00 |
| | 56 | 5280 | 14.5 | ±1 | 15.5 | 14.84 |
| | 60 | 5300 | 14.5 | ±1 | 15.5 | 15.12 |
| | 64 | 5320 | 14.5 | ±1 | 15.5 | 15.20 |
| 802.11 n HT40 | 54 | 5270 | 14.5 | ±1 | 15.5 | 15.31 |
| | 62 | 5310 | 14.5 | ±1 | 15.5 | 14.12 |

U-NII-2C

| Mode | Channel | Frequency (MHZ) | Target power(dBm) | Tune up tolerance (dBm) | Maximum Tune up power (dBm) | Average Power (dBm) |
|---|---|---|---|---|---|---|
| 802.11 a | 100 | 5500 | 13.5 | ±1 | 14.5 | 14.11 |
| | 116 | 5580 | 13.5 | ±1 | 14.5 | 13.38 |
| | 120 | 5600 | 13.5 | ±1 | 14.5 | 14.13 |
| | 132 | 5660 | 13.5 | ±1 | 14.5 | 13.87 |
| | 140 | 5700 | 13.5 | ±1 | 14.5 | 13.17 |
| 802.11 n HT20 | 100 | 5500 | 13.5 | ±1 | 14.5 | 13.65 |
| | 116 | 5580 | 13.5 | ±1 | 14.5 | 13.36 |
| | 120 | 5600 | 13.5 | ±1 | 14.5 | 14.08 |
| | 132 | 5660 | 13.5 | ±1 | 14.5 | 13.86 |
| | 140 | 5700 | 13.5 | ±1 | 14.5 | 13.22 |
| 802.11 n HT40 | 102 | 5510 | 14 | ±1 | 15 | 14.05 |
| | 110 | 5550 | 14 | ±1 | 15 | 13.81 |
| | 118 | 5590 | 14 | ±1 | 15 | 14.36 |
| | 134 | 5670 | 14 | ±1 | 15 | 14.23 |

U-NII-3

| Mode | Channel | Frequency | Target power(dBm) | Tune up tolerance (dBm) | Maximum Tune up power (dBm) | Average power (dBm) |
|---|---|---|---|---|---|---|
| 802.11 a | 149 | 5745 | 11.5 | ±1 | 12.5 | 12.02 |
| | 157 | 5785 | 11.5 | ±1 | 12.5 | 11.32 |
| | 165 | 5825 | 11.5 | ±1 | 12.5 | 11.11 |
| 802.11 n HT20 | 149 | 5745 | 12 | ±1 | 13 | 12.55 |
| | 157 | 5785 | 12 | ±1 | 13 | 11.30 |
| | 165 | 5825 | 12 | ±1 | 13 | 11.15 |
| 802.11 n HT40 | 151 | 5755 | 11.5 | ±1 | 12.5 | 12.31 |
| | 159 | 5795 | 11.5 | ±1 | 12.5 | 11.72 |

## 11.5 SAR TEST CONFIGURATIONS

**Body-worn Accessory Exposure Conditions**

(1) To position the EUT parallel to the phantom surface.
(2) To adjust the EUT parallel to the flat phantom.
(3) To adjust the distance between the EUT surface and the flat phantom to 10mm.

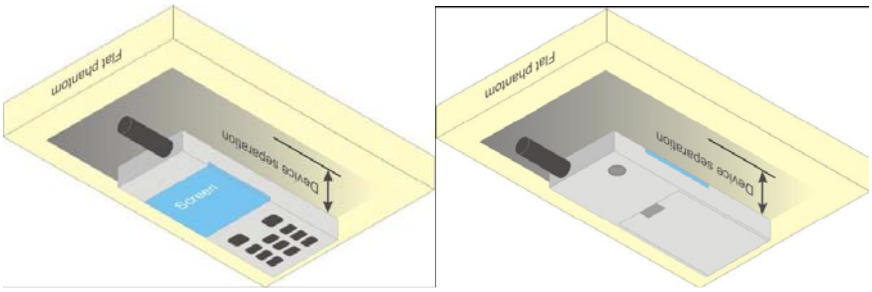
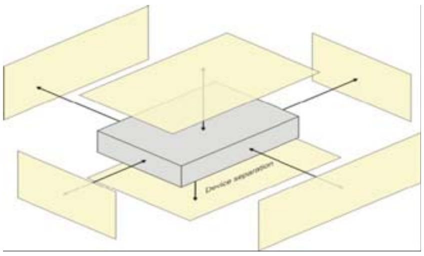


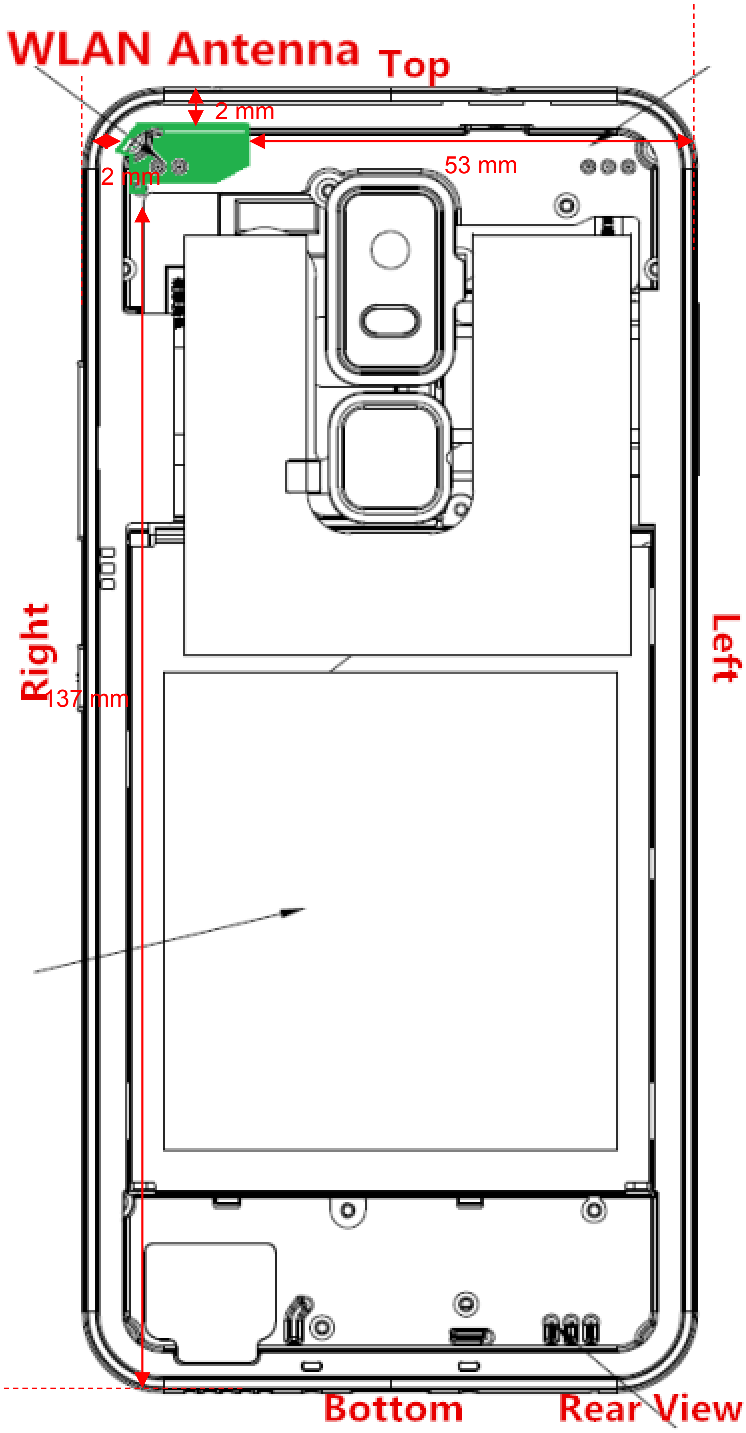

**Illustration for Body Worn Position**

**Hotspot Mode Exposure conditions**

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225 D06. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm.
(1) To position the EUT parallel to the phantom surface.
(2) To adjust the EUT parallel to the flat phantom.
(3) To adjust the distance between the EUT surface and the flat phantom to 10mm.



## 11.6 ANTENNA POSITION




Device dimensions (H x W): 150 x70 mm

| Antenna | Wireless Interface |
|---|---|
| Wi-Fi Antenna | WLAN 5G |

**Test Mode**

| | |
|---|---|
| WLAN 5GHz | Data transmission mode(802.11n20;n40) |

## Body Exposure Condition

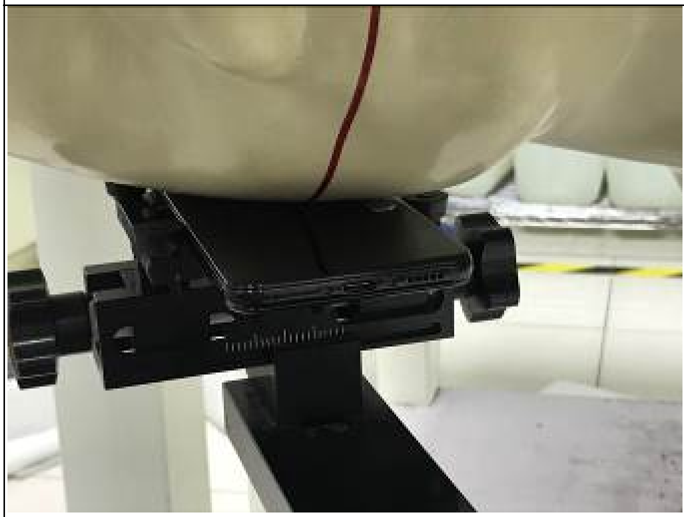
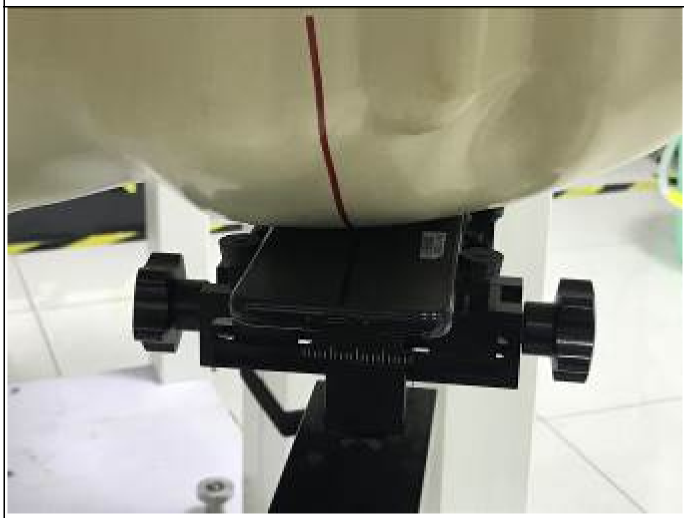
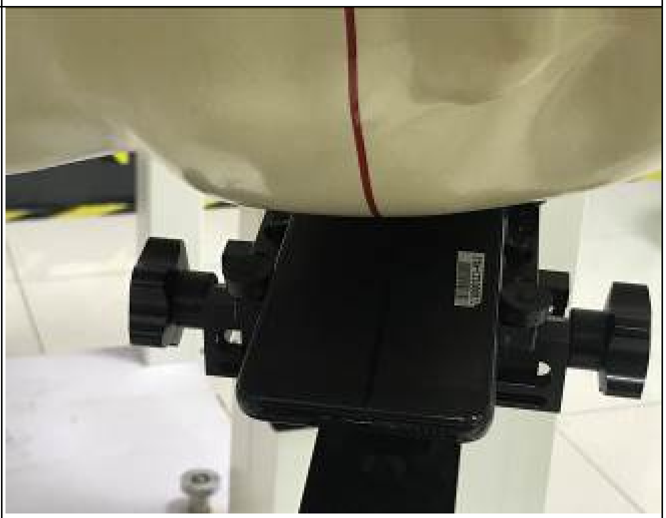
| Distance of the Antenna to the EUT surface/edge<br>Test distance: 10 mm | | | | | | |
|---|---|---|---|---|---|---|
| Antenna | Front（mm） | Rear（mm） | Right side（mm） | Left side（mm） | Top side（mm） | Bottom side（mm） |
| WLAN | 6<25 | 2<25 | 2<25 | 53>25 | 2<25 | 137>25 |

## Body test position

| Distance of the Antenna to the EUT surface/edge<br>Test distance: 10 mm | | | | | | |
|---|---|---|---|---|---|---|
| Antenna | Front | Rear | Right side | Left side | Top side | Bottom side |
| WLAN | Yes | Yes | Yes | No | Yes | No |

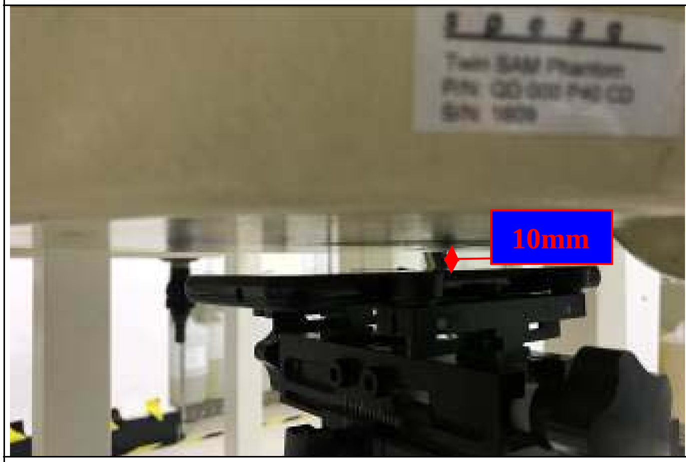
## 11.7 EUT SETUP PHOTOS

### Head position

| Cheek device with right head phantom. | Tilt device with right head phantom |
|---|---|
|  |  |
| **EUT Setup Configuration 1** | **EUT Setup Configuration 2** |
| Cheek device with left head phantom. | Tilt device with left head phantom |
|  |  |
| **EUT Setup Configuration 3** | **EUT Setup Configuration 4** |

## Body worn test position

**Front in body position**



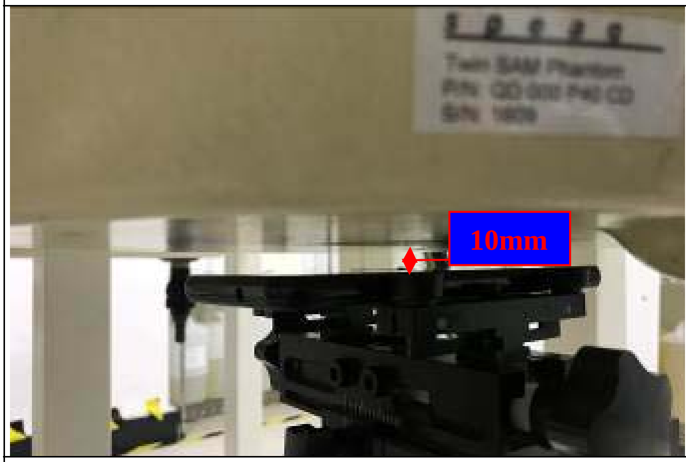

**EUT Setup Configuration 5**

**Rear in body position**


**EUT Setup Configuration 6**

## Hotspot test position

**Front in body position**




**EUT Setup Configuration 7**

**Rear in body position**


**EUT Setup Configuration 8**

**Right Side in body position**


**EUT Setup Configuration 9**

**Top Side in body position**


**EUT Setup Configuration 10**

## 11.8 SAR MEASUREMENT RESULTS

### Head SAR Test Records

| Band | Mode | Test Position | Ch. | Freq. (MHZ) | max Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Duty Cycle Scaling Factor | SAR1g (mW/g) | Scaled SAR1g (mW/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WLAN 5G | 802.11 n40 | Right Cheek | 38 | 5190 | 16.5 | 16.5 | 1.000 | 0.08 | 1.05 | 0.133 | 0.140 |
| WLAN 5G | 802.11 n40 | Right Tilted | 38 | 5190 | 16.5 | 16.5 | 1.000 | 0.07 | 1.05 | 0.267 | 0.281 |
| WLAN 5G | 802.11 n40 | Right Cheek | 118 | 5590 | 14.36 | 15 | 1.159 | -0.14 | 1.05 | 0.040 | 0.049 |
| WLAN 5G | 802.11 n40 | Right Tilted | 118 | 5590 | 14.36 | 15 | 1.159 | 0.02 | 1.05 | 0.048 | 0.058 |
| WLAN 5G | 802.11 n20 | Right Cheek | 149 | 5745 | 12.55 | 13 | 1.109 | 0.10 | 1.03 | 0.031 | 0.035 |
| WLAN 5G | 802.11 n20 | Right Tilted | 149 | 5745 | 12.55 | 13 | 1.109 | -0.07 | 1.03 | 0.036 | 0.041 |
| WLAN 5G | 802.11 n40 | Left Cheek | 38 | 5190 | 16.5 | 16.5 | 1.000 | 0.07 | 1.05 | 0.200 | 0.210 |
| WLAN 5G | 802.11 n40 | Left Tilted | 38 | 5190 | 16.5 | 16.5 | 1.000 | 0.06 | 1.05 | 0.261 | 0.274 |
| WLAN 5G | 802.11 n40 | Left Cheek | 118 | 5590 | 14.36 | 15 | 1.159 | 0.11 | 1.05 | 0.031 | 0.038 |
| WLAN 5G | 802.11 n40 | Left Tilted | 118 | 5590 | 14.36 | 15 | 1.159 | -0.10 | 1.05 | 0.037 | 0.045 |
| WLAN 5G | 802.11 n20 | Left Cheek | 149 | 5745 | 12.55 | 13 | 1.109 | -0.16 | 1.03 | 0.022 | 0.025 |
| WLAN 5G | 802.11 n20 | Left Tilted | 149 | 5745 | 12.55 | 13 | 1.109 | 0.16 | 1.03 | 0.024 | 0.027 |

### SAR for Body-Worn Test Records

| Band | Mode | Test Position | Dist. (mm) | Ch. | Freq. (MHZ) | max Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Duty Cycle Scaling Factor | SAR1g (mW/g) | Scaled SAR1g (mW/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WLAN 5G | 802.11 n40 | Front | 10 | 38 | 5190 | 16.5 | 16.5 | 1.000 | -0.14 | 1.05 | 0.070 | 0.074 |
| WLAN 5G | 802.11 n40 | Rear | 10 | 38 | 5190 | 16.5 | 16.5 | 1.000 | 0.07 | 1.05 | 0.356 | 0.374 |
| WLAN 5G | 802.11 n40 | Front | 10 | 118 | 5590 | 14.36 | 15 | 1.159 | 0.03 | 1.05 | 0.010 | 0.012 |
| WLAN 5G | 802.11 n40 | Rear | 10 | 118 | 5590 | 14.36 | 15 | 1.159 | -0.14 | 1.05 | 0.055 | 0.067 |
| WLAN 5G | 802.11 n20 | Front | 10 | 149 | 5745 | 12.55 | 13 | 1.109 | 0.13 | 1.03 | 0.012 | 0.014 |
| WLAN 5G | 802.11 n20 | Rear | 10 | 149 | 5745 | 12.55 | 13 | 1.109 | -0.10 | 1.03 | 0.054 | 0.062 |

## SAR for Hotspot Test Records

| Band | Mode | Test Position | Dist. (mm) | Ch. | Freq. (MHZ) | max Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | Duty Cycle Scaling Factor | SAR1g (mW/g) | Scaled SAR1g (mW/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WLAN 5G | 802.11 n40 | Front | 10 | 38 | 5190 | 16.5 | 16.5 | 1.000 | -0.14 | 1.05 | 0.070 | 0.074 |
| WLAN 5G | 802.11 n40 | Rear | 10 | 38 | 5190 | 16.5 | 16.5 | 1.000 | 0.07 | 1.05 | 0.356 | 0.374 |
| WLAN 5G | 802.11 n40 | Front | 10 | 118 | 5590 | 14.36 | 15 | 1.159 | 0.03 | 1.05 | 0.010 | 0.012 |
| WLAN 5G | 802.11 n40 | Rear | 10 | 118 | 5590 | 14.36 | 15 | 1.159 | -0.14 | 1.05 | 0.055 | 0.067 |
| WLAN 5G | 802.11 n20 | Front | 10 | 149 | 5745 | 12.55 | 13 | 1.109 | 0.13 | 1.03 | 0.012 | 0.014 |
| WLAN 5G | 802.11 n20 | Rear | 10 | 149 | 5745 | 12.55 | 13 | 1.109 | -0.10 | 1.03 | 0.054 | 0.062 |
| WLAN 5G | 802.11 n40 | Right | 10 | 38 | 5190 | 16.5 | 16.5 | 1.000 | -0.10 | 1.05 | 0.029 | 0.030 |
| WLAN 5G | 802.11 n40 | Top | 10 | 38 | 5190 | 16.5 | 16.5 | 1.000 | -0.15 | 1.05 | 0.203 | 0.213 |
| WLAN 5G | 802.11 n40 | Right | 10 | 118 | 5590 | 14.36 | 15 | 1.159 | -0.12 | 1.05 | 0.011 | 0.013 |
| WLAN 5G | 802.11 n40 | Top | 10 | 118 | 5590 | 14.36 | 15 | 1.159 | 0.04 | 1.05 | 0.030 | 0.037 |
| WLAN 5G | 802.11 n20 | Right | 10 | 149 | 5745 | 12.55 | 13 | 1.109 | -0.04 | 1.03 | 0.006 | 0.007 |
| WLAN 5G | 802.11 n20 | Top | 10 | 149 | 5745 | 12.55 | 13 | 1.109 | 0.04 | 1.03 | 0.025 | 0.029 |

## Repeated SAR Test Records

| Band | Mode | Test Position | Dist. (mm) | Ch. | Freq. (MHZ) | max Power (dBm) | Tune-Up Limit (dBm) | Scaling Factor | Power Drift (dB) | SAR1g (mW/g) | Scaled SAR1g (mW/g) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

## 11.9 REPEATED SAR MEASUREMENT

| Band | Mode | Test Position | Dist. (mm) | Ch. | Original Measured SAR1g (mW/g) | 1st Repeated SAR1g (mW/g) | Ratio | Original Measured SAR1g (mW/g) | 2nd Repeated SAR1g (mW/g) | Ratio |
|---|---|---|---|---|---|---|---|---|---|---|
| -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

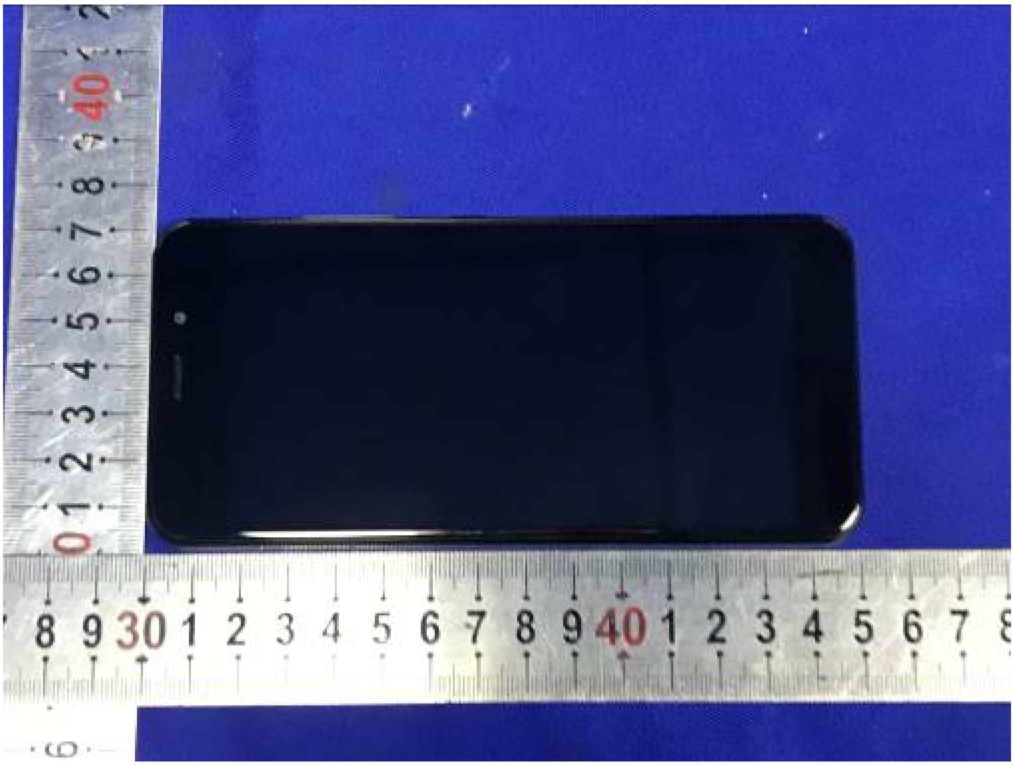
**Note:**

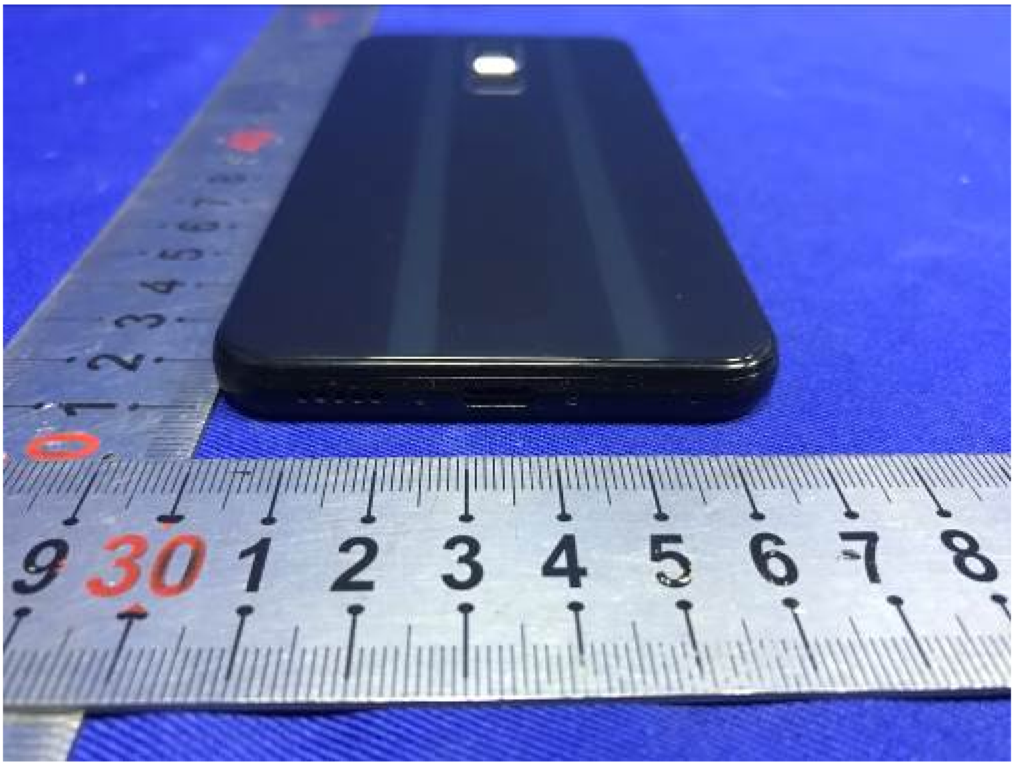
1. Per KDB 865664 D01v01,for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8W/Kg
2. Per KDB 865664 D01v01,if the ratio of largest to smallest SAR for the original and first repeated measurement is ≤1.2 and the measured SAR ＜1.45W/Kg,only one repeated measurement is required.
3. Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg
4. The ratio is the difference in percentage between original and repeated measured SAR.

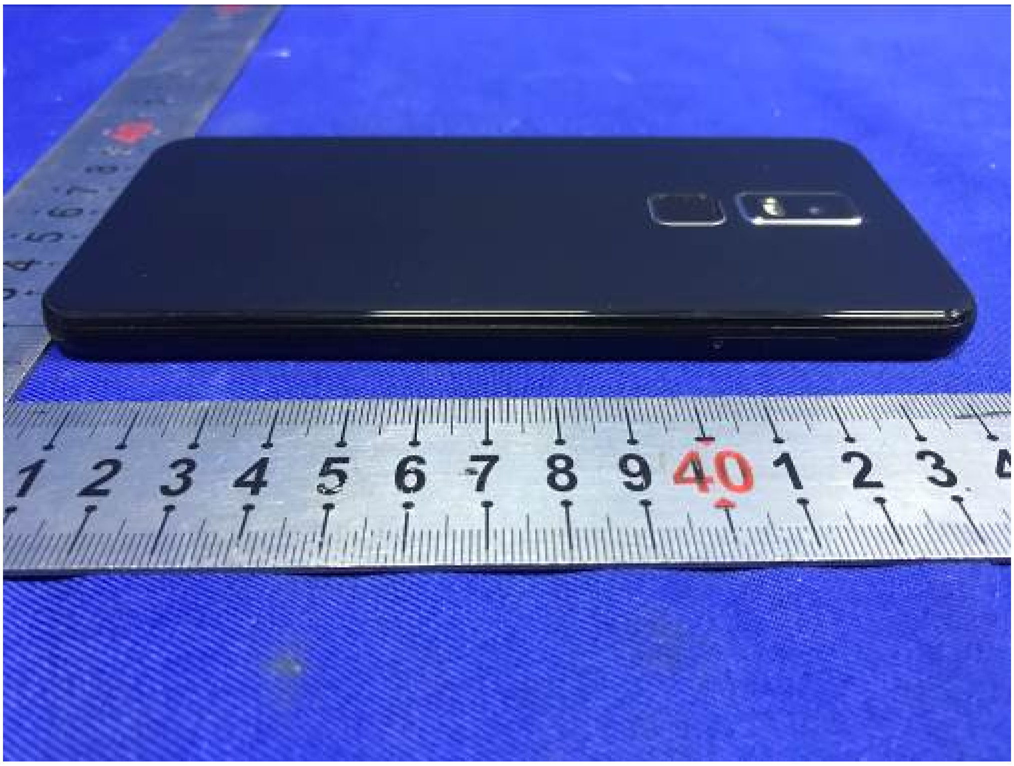
# 12. SAR HANDSETS MULTI XMITER ASSESSMENT

| | Position | Applicable Combination |
|---|---|---|
| Simultaneous Transmission | Head | N/A |
| | Body-worn | N/A |
| | Hotspot | N/A |

# 13. EUT PHOTO








- VK 405974PU 3020mAh 3.85V +

# 14. EQUIPMENT LIST & CALIBRATION STATUS

| Name of Equipment | Manufacturer | Type/Model | Serial Number | Last Calibration | Calibration Due |
|---|---|---|---|---|---|
| P C | HP | Core(rm)3.16G | CZCO48171H | N/A | N/A |
| Signal Generator | Agilent | E8257C | US37101915 | 02/26/2018 | 02/25/2019 |
| S-Parameter Network Analyzer | Agilent | E5071B | MY42301382 | 02/26/2018 | 02/25/2019 |
| Power meter | Anritsu | ML2495A | 1445010 | 04/26/2018 | 04/25/2019 |
| Power sensor | Anritsu | MA2411B | 1339220 | 04/26/2018 | 04/25/2019 |
| E-field PROBE | SPEAG | EX3DV4 | 3801 | 06/26/2018 | 06/25/2019 |
| DAE | SPEAG | DAE4 | 910 | 06/21/2018 | 06/20/2019 |
| DIPOLE 5GHZ ANTENNA | SPEAG | D5GHzV2 | 1095 | 05/22/2018 | 05/21/2019 |
| Electro Thermometer | DTM | DTM3000 | 3030 | 12/26/2017 | 12/25/2018 |
| Amplifier | Mini-circuits | ZVE-8G | 110405 | N/A | N/A |
| Amplifier | Mini-circuits | ZHL-42 | QA1331003 | N/A | N/A |
| 3db ATTENUATOR | MINI | MCL BW-S3W5 | 0533 | N/A | N/A |
| DUMMY PROBE | SPEAG | DP_2 | SPDP2001AA | N/A | N/A |
| Dual Directional Coupler | Woken | 20W couple | DOM2BHW1A1 | N/A | N/A |
| SAM PHANTOM (ELI4 v4.0) | SPEAG | QDOVA001BB | 1102 | N/A | N/A |
| Twin SAM Phantom | SPEAG | QD000P40CD | 1609 | N/A | N/A |
| ROBOT | SPEAG | TX60 | F10/5E6AA1/A101 | N/A | N/A |
| ROBOT KRC | SPEAG | CS8C | F10/5E6AA1/C101 | N/A | N/A |
| LIQUID CALIBRATION KIT | ANTENNESSA | 41/05 OCP9 | 00425167 | N/A | N/A |

# 15. FACILITIES

All measurement facilities used to collect the measurement data are located at

☒ No.10, Weiye Rd., Innovation Park, Eco & Tec. Development Part, Kunshan City, Jiangsu Province, China.

# 16. REFERENCES

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# 17. LABORATORY ACCREDITATIONS AND LISTING

FCC –Designation Number: CN1172.

Compliance Certification Services Inc. Kun shan Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Designation Number: CN1172.

# APPENDIX A: PLOTS OF PERFORMANCE CHECK

**The plots are showing as followings.**

Test Laboratory: Compliance Certification Services Inc. Date: 8/20/2018

**SystemPerformanceCheck-Head D5200**

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1095**

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; $\sigma$ = 4.537 S/m; $\varepsilon_r$ = 35.97; $\rho$ = 1000 kg/m$^3$

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3801; ConvF(4.93, 4.93, 4.93); Calibrated: 6/26/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/21/2018
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5200 MHz/Area Scan (10x10x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 13.8 W/kg

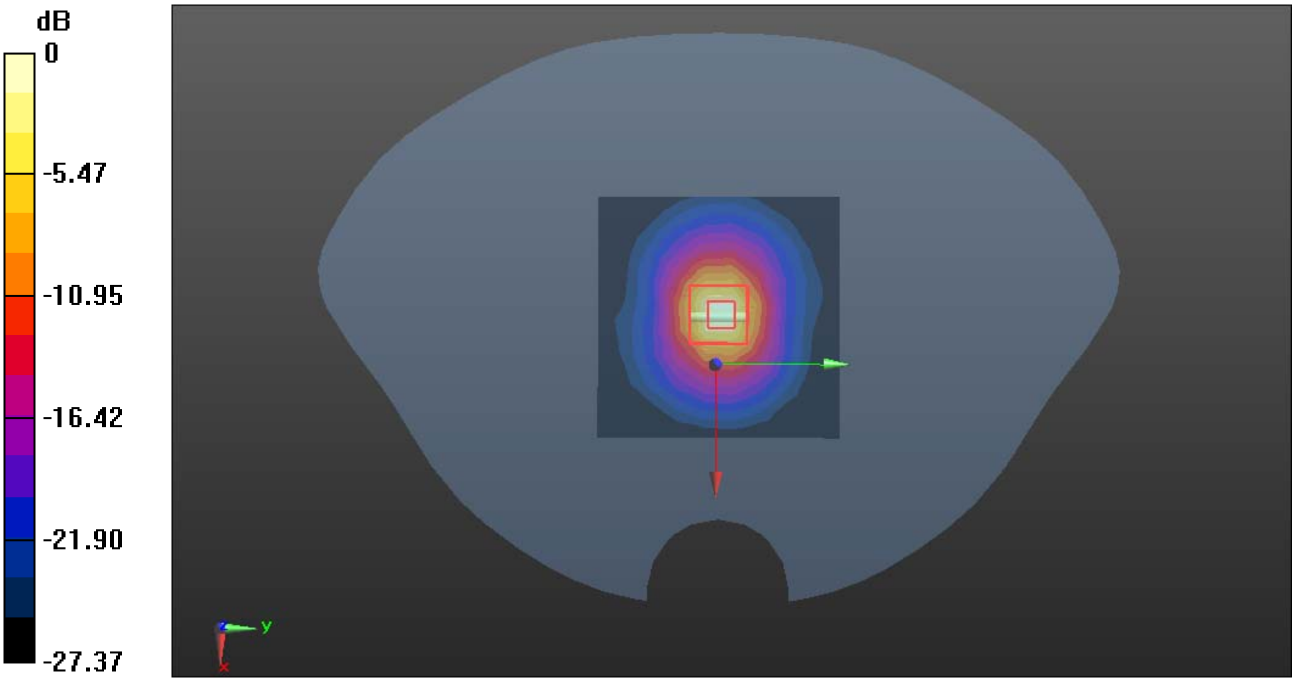
**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5200 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 73.46 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 30.7 W/kg

**SAR(1 g) = 7.89 W/kg; SAR(10 g) = 2.28 W/kg**

Maximum value of SAR (measured) = 18.8 W/kg




0 dB = 18.8 W/kg = 12.74 dBW/kg

Test Laboratory: Compliance Certification Services Inc. Date: 8/20/2018

**SystemPerformanceCheck-Head D5600**

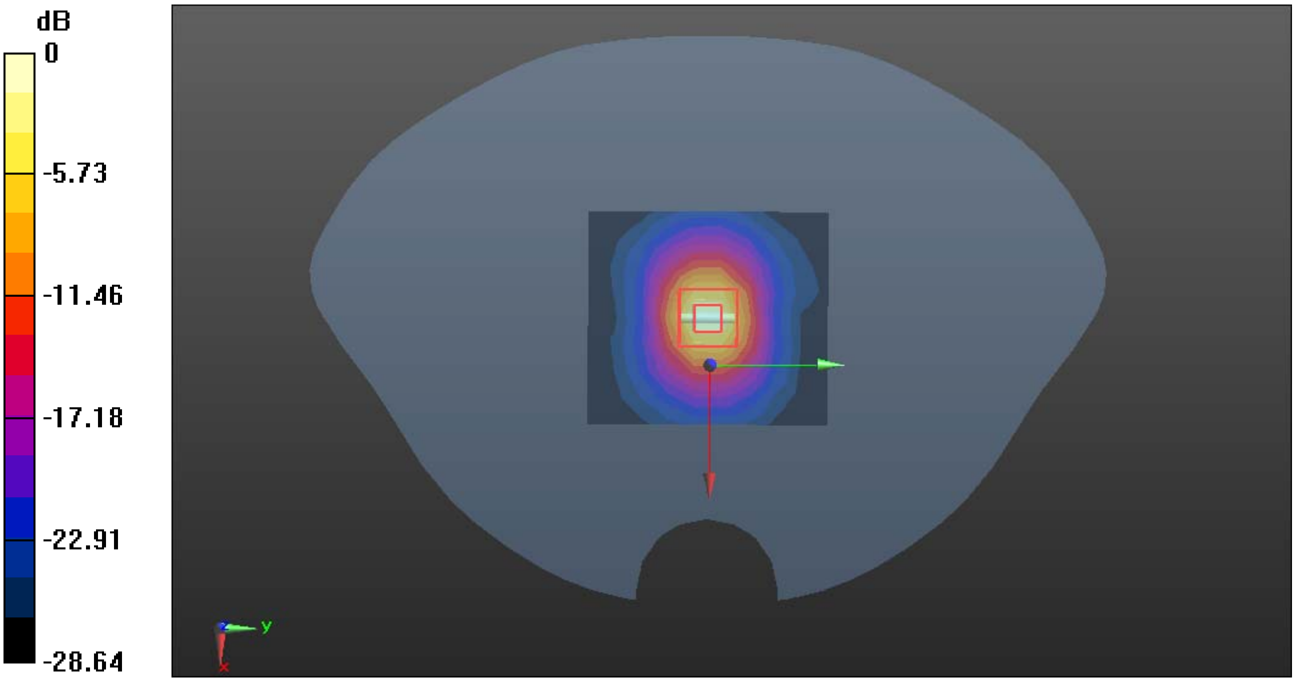
**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1095**

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz);
Frequency: 5600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5600 MHz; $\sigma$ = 4.976 S/m; $\varepsilon_r$ = 35.034; $\rho$ = 1000 kg/m$^3$
Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)
DASY Configuration:

- Probe: EX3DV4 - SN3801; ConvF(4.69, 4.69, 4.69); Calibrated: 6/26/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/21/2018
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5600 MHz/Area Scan (9x10x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 14.8 W/kg

**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.25 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 32.8 W/kg
**SAR(1 g) = 8.08 W/kg; SAR(10 g) = 2.31 W/kg**
Maximum value of SAR (measured) = 18.5 W/kg




0 dB = 18.5 W/kg = 12.67 dBW/kg

Test Laboratory: Compliance Certification Services Inc. Date: 8/20/2018

**SystemPerformanceCheck-Head D5800**

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1095**

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5800 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5800 MHz; $\sigma$ = 5.194 S/m; $\varepsilon_r$ = 34.57; $\rho$ = 1000 kg/m$^3$

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3801; ConvF(4.61, 4.61, 4.61); Calibrated: 6/26/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/21/2018
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800 MHz/Area Scan (9x10x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 15.8 W/kg

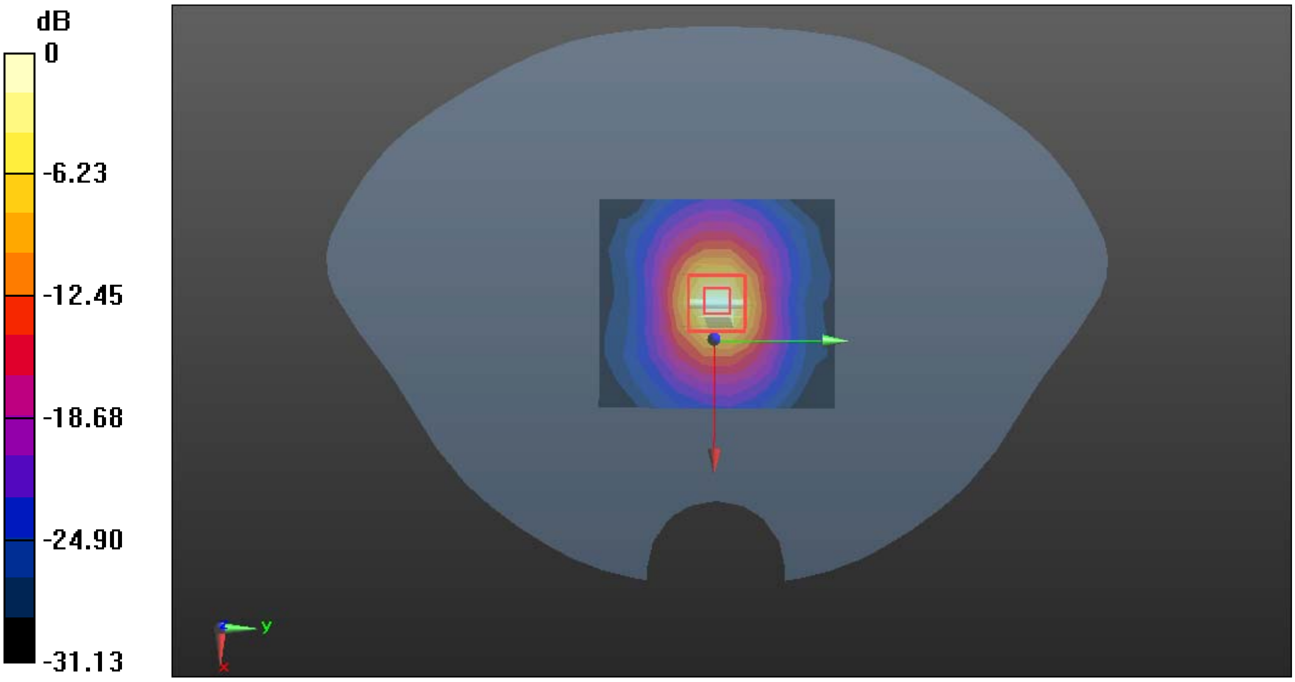
**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.47 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 35.6 W/kg

**SAR(1 g) = 7.81 W/kg; SAR(10 g) = 2.24 W/kg**

Maximum value of SAR (measured) = 19.3 W/kg




0 dB = 19.3 W/kg = 12.86 dBW/kg

Test Laboratory: Compliance Certification Services Inc. Date: 8/21/2018

**SystemPerformanceCheck-Body D5200**

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1095**

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5200 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5200 MHz; $\sigma$ = 5.321 S/m; $\varepsilon_r$ = 48.87; $\rho$ = 1000 kg/m$^3$

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3801; ConvF(4.23, 4.23, 4.23); Calibrated: 6/26/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/21/2018
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5200 MHz 20/Area Scan (10x10x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 10.2 W/kg

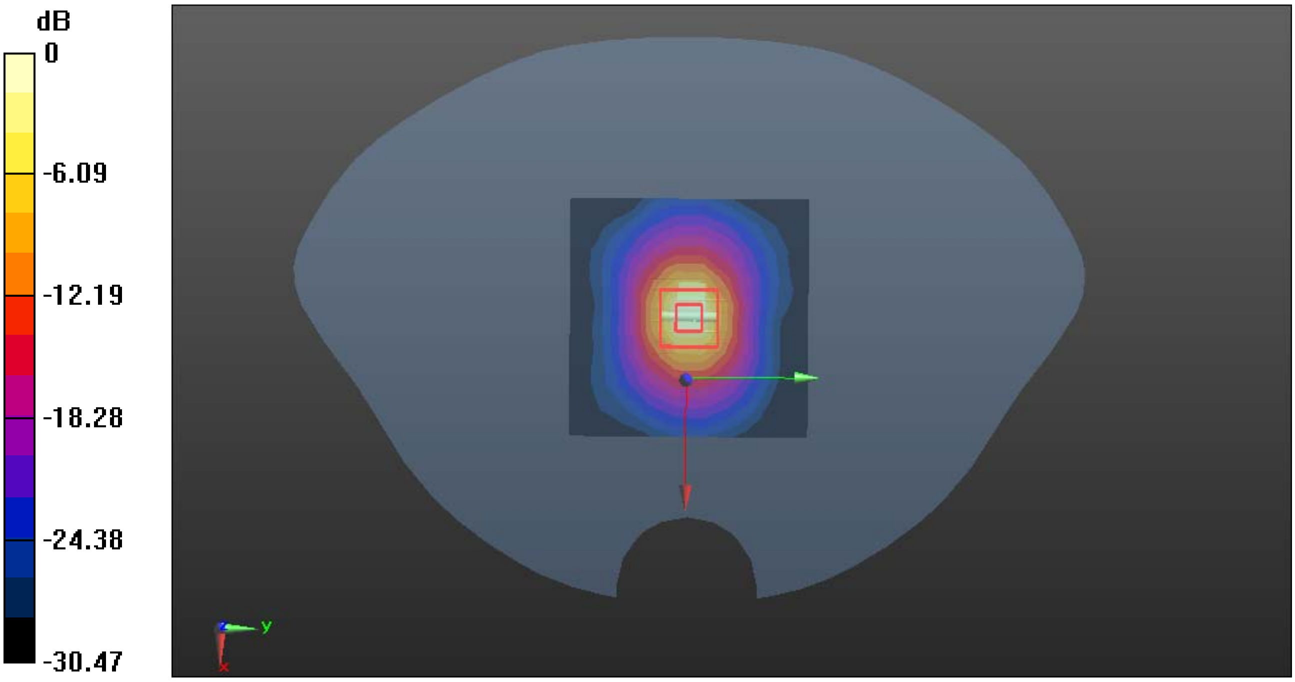
**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5200 MHz 20/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.00 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 27.7 W/kg

**SAR(1 g) = 7.55 W/kg; SAR(10 g) = 2.17 W/kg**

Maximum value of SAR (measured) = 15.9 W/kg




0 dB = 15.9 W/kg = 12.01 dBW/kg

Test Laboratory: Compliance Certification Services Inc. Date: 8/21/2018

**SystemPerformanceCheck-Body D5600**

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1095**

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5600 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5600 MHz; σ = 5.932 S/m; $\varepsilon_r$ = 48.081; ρ = 1000 kg/m$^3$

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

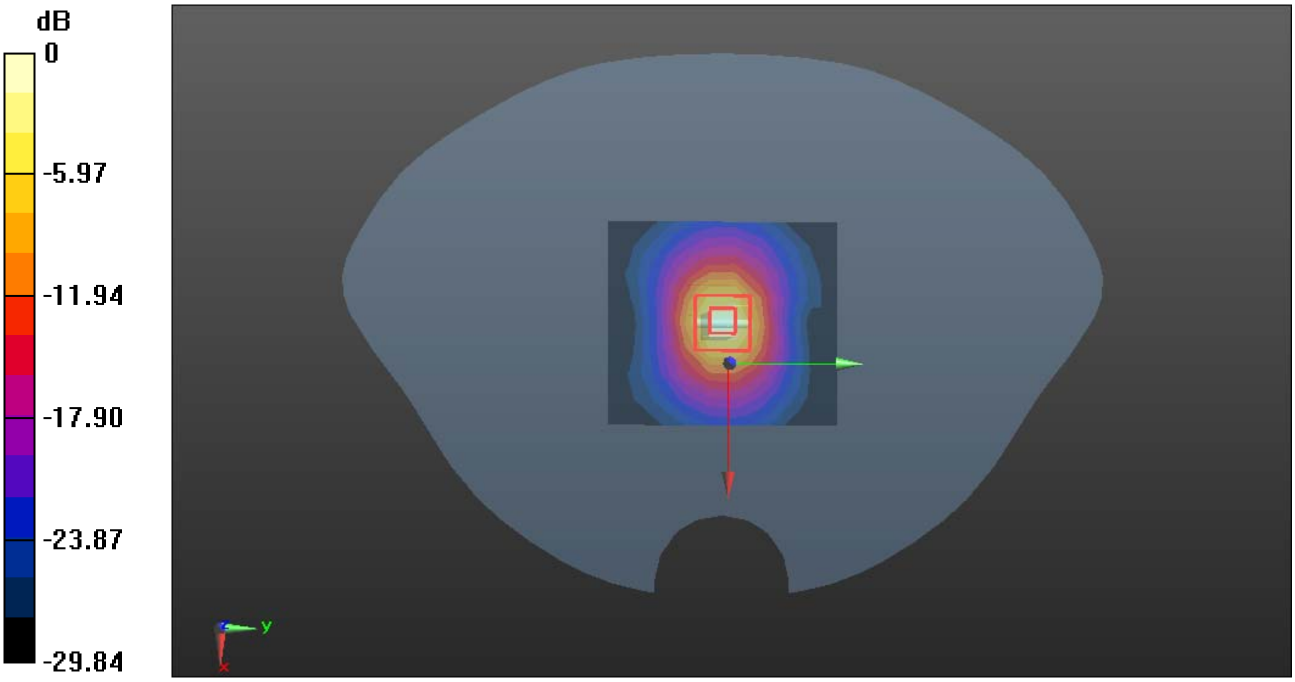
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY Configuration:

- Probe: EX3DV4 - SN3801; ConvF(3.8, 3.8, 3.8); Calibrated: 6/26/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/21/2018
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5600 MHz/Area Scan (9x10x1):** Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 15.9 W/kg

**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5600 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 68.97 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 34.4 W/kg
**SAR(1 g) = 8.12 W/kg; SAR(10 g) = 2.33 W/kg**
Maximum value of SAR (measured) = 19.8 W/kg




0 dB = 19.8 W/kg = 12.97 dBW/kg

Test Laboratory: Compliance Certification Services Inc. Date: 8/21/2018

**SystemPerformanceCheck-Body D5800**

**DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: 1095**

Communication System: UID 0, CW (0); Communication System Band: D5GHz (5000.0 - 6000.0 MHz); Frequency: 5800 MHz;Duty Cycle: 1:1

Medium parameters used: f = 5800 MHz; $\sigma$ = 6.23 S/m; $\varepsilon_r$ = 47.551; $\rho$ = 1000 kg/m$^3$

Room Ambient Temperature: 22°C; Liquid Temperature: 21.5°C

Phantom section: Flat Section

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

DASY Configuration:

- Probe: EX3DV4 - SN3801; ConvF(3.95, 3.95, 3.95); Calibrated: 6/26/2018;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn910; Calibrated: 6/21/2018
- Phantom: Twin SAM Phantom; Type: QD 000 P40 CD; Serial: 1609
- DASY52 52.8.8(1222);
- SEMCAD X Version 14.6.10 (7331)

**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800 MHz/Area Scan (9x10x1):** Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 16.2 W/kg

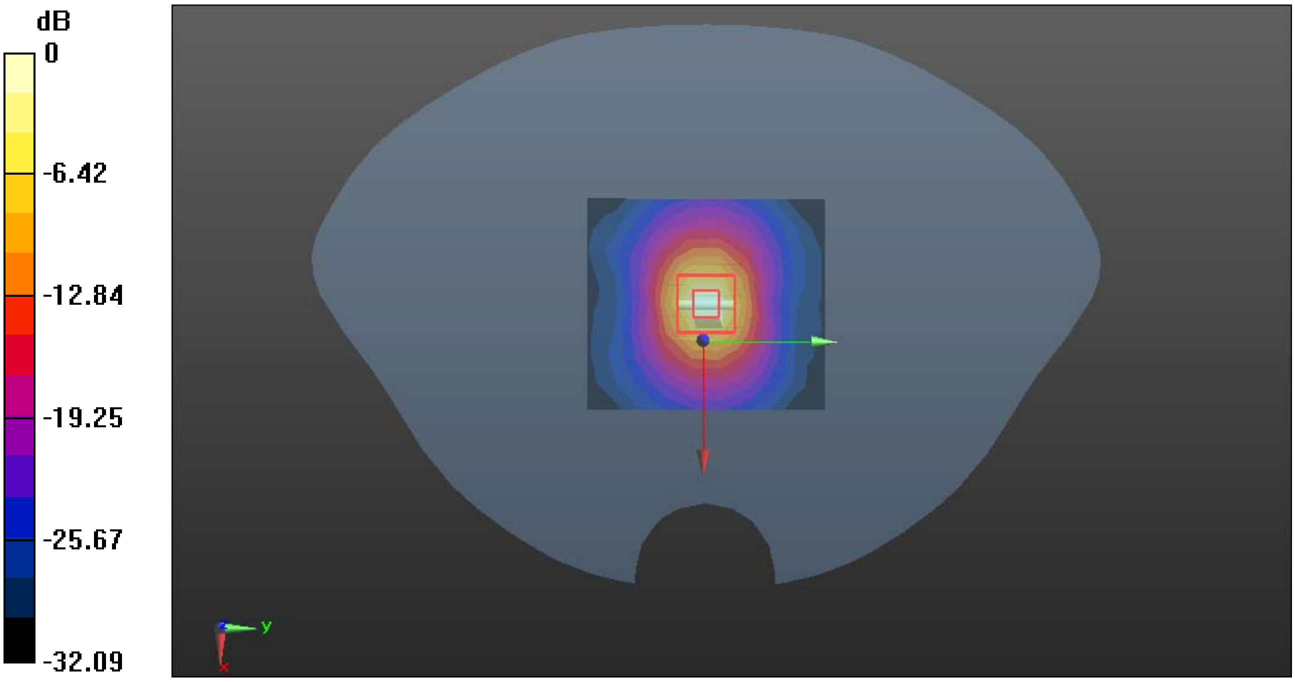
**System Performance Check with D5GHzV2 Dipole (graded grid)/d=10mm, Pin=100mW, f=5800 MHz/Zoom Scan (4x4x1.4mm, graded), dist=1.4mm (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.22 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 35.2 W/kg

**SAR(1 g) = 7.92 W/kg; SAR(10 g) = 2.35 W/kg**

Maximum value of SAR (measured) = 20.0 W/kg




0 dB = 20.0 W/kg = 13.01 dBW/kg

## APPENDIX B: DASY CALIBRATION CERTIFICATE

**The DASY Calibration Certificates are showing in the file named Appendix B DASY Calibration Certificate.**

## APPENDIX C: PLOTS OF HIGHEST SAR TEST RESULT

**The plots are showing in the file named Appendix C Plots of Highest SAR Test Result**

**END REPORT**