# FCC SAR Test Report

| | | |
|---|---|---|
| APPLICANT | : | BLU Products, Inc. |
| EQUIPMENT | : | Tablet |
| BRAND NAME | : | BLU |
| MODEL NAME | : | TOUCHBOOK M7 |
| MARKETING NAME | : | TOUCHBOOK M7 |
| FCC ID | : | YHLBLUTBM7 |
| STANDARD | : | FCC 47 CFR Part 2 (2.1093)<br>ANSI/IEEE C95.1-1992<br>IEEE 1528-2013 |

**We, SPORTON INTERNATIONAL (SHENZHEN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.**

**The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (SHENZHEN) INC., the test report shall not be reproduced except in full.**

Mark Qu

**Prepared by: Mark Qu / Manager**

Jones Tsai

**Approved by: Jones Tsai / Manager**

ilac-MRA

TAF
Testing Laboratory
2353

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# Table of Contents

# Revision History

| REPORT NO. | VERSION | DESCRIPTION | ISSUED DATE |
|---|---|---|---|
| FA631831 | Rev. 01 | Initial issue of report | Apr. 11, 2016 |
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# 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **BLU Products, Inc., Tablet, TOUCHBOOK M7**, are as follows.

| Equipment Class | Frequency Band | | Highest 1g SAR Summary | | Highest Simultaneous Transmission 1g SAR (W/kg) |
|---|---|---|---|---|---|
| | | | Head (Separation 0mm) | Body (Separation 0mm) | |
| | | | 1g SAR (W/kg) | | |
| Licensed | GSM | GSM850 | <0.10 | 0.46 | 1.48 |
| | | GSM1900 | <0.10 | 0.72 | |
| | WCDMA | WCDMA Band V | <0.10 | 0.37 | |
| | | WCDMA Band II | <0.10 | **1.05** | |
| DTS | WLAN | 2.4GHz WLAN | **0.20** | 0.76 | 1.48 |
| Date of Testing: | | | 2016/03/25 ~ 2016/03/29 | | |

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

## 2. Administration Data

| Testing Laboratory | |
|---|---|
| Test Site | SPORTON INTERNATIONAL (SHENZHEN) INC. |
| Test Site Location | 1F & 2F,Building A, Morning Business Center, No. 4003 ShiGu Rd., Xili Town, Nanshan District, Shenzhen, Guangdong, P. R. China<br>TEL: +86-755-8637-9589<br>FAX: +86-755-8637-9595 |

| Applicant | |
|---|---|
| Company Name | BLU Products, Inc. |
| Address | 10814 NW 33rd St # 100 Doral, FL 33172 |

| Manufacturer | |
|---|---|
| Company Name | BLU Products, Inc. |
| Address | 10814 NW 33rd St # 100 Doral, FL 33172 |

## 3. Guidance Standard

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
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01

# 4. Equipment Under Test (EUT) Information

## 4.1 General Information

| Product Feature & Specification | |
|---|---|
| Equipment Name | Tablet |
| Brand Name | BLU |
| Model Name | TOUCHBOOK M7 |
| Marketing Name | TOUCHBOOK M7 |
| FCC ID | YHLBLUTBM7 |
| IMEI Code | SIM1: 356848062078813<br>SIM2: 356848062078821 |
| Wireless Technology and Frequency Range | GSM850: 824.2 MHz ~ 848.8 MHz<br>GSM1900: 1850.2 MHz ~ 1909.8 MHz<br>WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz<br>WCDMA Band V: 826.4 MHz ~ 846.6 MHz<br>WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz<br>Bluetooth: 2402 MHz ~ 2480 MHz |
| Mode | · GSM/GPRS<br>· RMC/AMR 12.2Kbps<br>· HSDPA<br>· HSUPA<br>· HSPA+ (16QAM uplink is not supported)<br>· 802.11b/g/n HT20<br>· Bluetooth v3.0+EDR, Bluetooth v4.0 LE |
| HW Version | PX7S706RR220-X722J |
| SW Version | BLU_W7413_V02_GENRIC03-03-2016 |
| GSM / (E)GPRS Transfer mode | Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network. |
| EUT Stage | Pre-Production |

**Remark:**
1. 802.11n-HT40 is not supported in 2.4GHz WLAN.
2. This device supported VoIP in GPRS, WCDMA (e.g. 3rd party VoIP).
3. This device supports GRPS mode up to multi-slot class 12.
4. This device has voice function.
5. This device does not support DTM operation.
6. This device has 2 SIM slots and supports dual SIM dual Standby. The WWAN radio transmission will be enabled by either one SIM at a time (Single active). After pre-scan two SIM cards power, we found test result of the SIM1 was the worse, so we chose dual SIM1 card to perform all tests.

# 5. RF Exposure Limits

## 5.1 Uncontrolled Environment

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

## 5.2 Controlled Environment

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

**Limits for Occupational/Controlled Exposure (W/kg)**

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

**Limits for General Population/Uncontrolled Exposure (W/kg)**

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

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram 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.

# 6. Specific Absorption Rate (SAR)

## 6.1 Introduction

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

## 6.2 SAR Definition

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

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

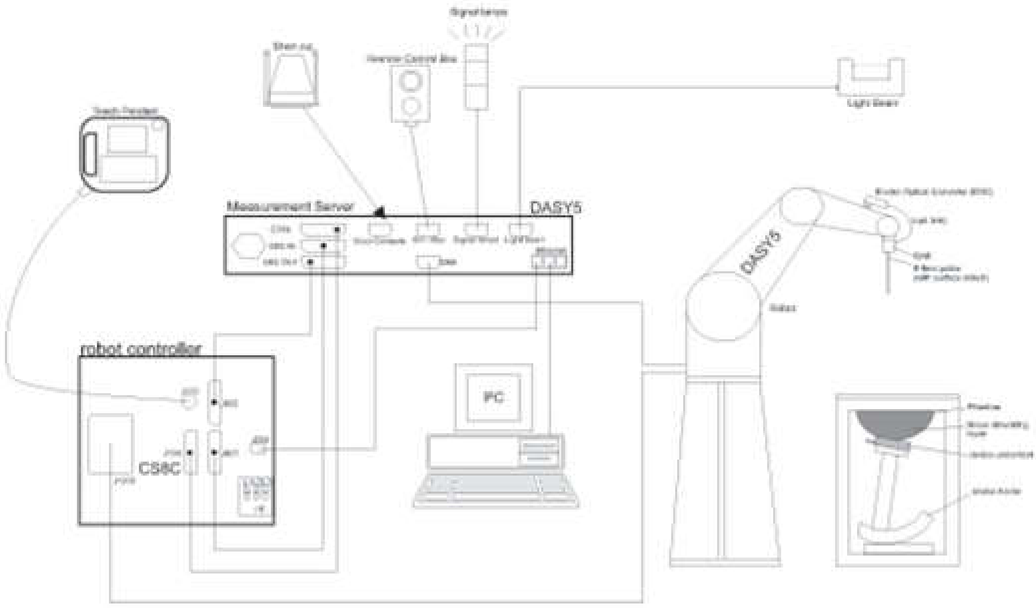
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

# 7. System Description and Setup

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




- A standard high precision 6-axis robot 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 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 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 WinXP or Win7 and the DASY5 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.

## 7.1 E-Field Probe

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

**<EX3DV4 Probe>**

| | | |
|---|---|---|
| **Construction** | Symmetric design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE) |  |
| **Frequency** | 10 MHz – >6 GHz<br>Linearity: ±0.2 dB (30 MHz – 6 GHz) | |
| **Directivity** | ±0.3 dB in TSL (rotation around probe axis)<br>±0.5 dB in TSL (rotation normal to probe axis) | |
| **Dynamic Range** | 10 µW/g – >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 | |

## 7.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) 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 input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

**Fig 5.1 Photo of DAE**

## 7.3 Phantom

**<SAM Twin Phantom>**

| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm;<br>Center ear point: 6 ± 0.2 mm |
| **Filling Volume** | Approx. 25 liters |
| **Dimensions** | Length: 1000 mm; Width: 500 mm; Height: adjustable feet |
| **Measurement Areas** | Left Hand, Right Hand, Flat Phantom |

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

**<ELI Phantom>**

| | |
|---|---|
| **Shell Thickness** | 2 ± 0.2 mm (sagging: <1%) |
| **Filling Volume** | Approx. 30 liters |
| **Dimensions** | Major ellipse axis: 600 mm<br>Minor axis: 400 mm |

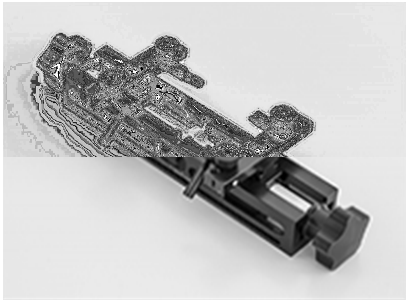
The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

## 7.4 Device Holder

**<Mounting Device for Hand-Held Transmitter>**

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

**<Mounting Device for Laptops and other Body-Worn Transmitters>**

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

# 8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

## 8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

## 8.2 Power Reference Measurement

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

## 8.3 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 fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><th></th><th>≤ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td>Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5 ± 1 mm</td><td>½·δ·ln(2) ± 0.5 mm</td></tr>
<tr><td>Maximum probe angle from probe axis to phantom surface normal at the measurement location</td><td>30° ± 1°</td><td>20° ± 1°</td></tr>
<tr><td rowspan="2">Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$</td><td>≤ 2 GHz: ≤ 15 mm<br>2 – 3 GHz: ≤ 12 mm</td><td>3 – 4 GHz: ≤ 12 mm<br>4 – 6 GHz: ≤ 10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
</table>

## 8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

<table>
<tr><th colspan="3"></th><th>$\le$ 3 GHz</th><th>> 3 GHz</th></tr>
<tr><td colspan="3">Maximum zoom scan spatial resolution: $\Delta x_{Zoom}$, $\Delta y_{Zoom}$</td><td>$\le$ 2 GHz: $\le$ 8 mm<br>2 – 3 GHz: $\le$ 5 mm*</td><td>3 – 4 GHz: $\le$ 5 mm*<br>4 – 6 GHz: $\le$ 4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan spatial resolution, normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{Zoom}(n)$</td><td>$\le$ 5 mm</td><td>3 – 4 GHz: $\le$ 4 mm<br>4 – 5 GHz: $\le$ 3 mm<br>5 – 6 GHz: $\le$ 2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface</td><td>$\le$ 4 mm</td><td>3 – 4 GHz: $\le$ 3 mm<br>4 – 5 GHz: $\le$ 2.5 mm<br>5 – 6 GHz: $\le$ 2 mm</td></tr>
<tr><td>$\Delta z_{Zoom}(n>1)$: between subsequent points</td><td colspan="2">$\le 1.5 \cdot \Delta z_{Zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>$\ge$ 30 mm</td><td>3 – 4 GHz: $\ge$ 28 mm<br>4 – 5 GHz: $\ge$ 25 mm<br>5 – 6 GHz: $\ge$ 22 mm</td></tr>
<tr><td colspan="5">Note: $\delta$ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.<br>* When zoom scan is required and the <u>reported</u> SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is $\le$ 1.4 W/kg, $\le$ 8 mm, $\le$ 7 mm and $\le$ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

## 8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

## 8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

# 9. Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial Number | Calibration | |
|---|---|---|---|---|---|
| | | | | Last Cal. | Due Date |
| SPEAG | 835MHz System Validation Kit | D835V2 | 4d200 | Aug. 20, 2015 | Aug. 19, 2016 |
| SPEAG | 1900MHz System Validation Kit | D1900V2 | 5d210 | Aug. 19, 2015 | Aug. 18, 2016 |
| SPEAG | 2450MHz System Validation Kit | D2450V2 | 926 | Jul. 24, 2015 | Jul. 23, 2016 |
| SPEAG | Data Acquisition Electronics | DAE4 | 1386 | Feb. 16, 2016 | Feb. 15, 2017 |
| SPEAG | Data Acquisition Electronics | DAE4 | 1338 | Nov. 23, 2015 | Nov. 22, 2016 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3958 | Jul. 23, 2015 | Jul. 22, 2016 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3935 | Nov. 27, 2015 | Nov. 26, 2016 |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3819 | Nov. 27, 2015 | Nov. 26, 2016 |
| SPEAG | SAM Twin Phantom | QD 000 P40 CD | TP-1670 | NCR | NCR |
| SPEAG | ELI4 Phantom | QD OVA 001 BB | TP-1233 | NCR | NCR |
| SPEAG | ELI4 Phantom | ELI5.0 | 1225 | NCR | NCR |
| SPEAG | Phone Positioner | N/A | N/A | NCR | NCR |
| Agilent | Wireless Communication Test Set | E5515C | MY50267224 | Aug. 07, 2015 | Aug. 06, 2016 |
| Agilent | Network Analyzer | E5071C | MY46523671 | Dec. 31, 2015 | Dec. 30, 2016 |
| Speag | Dielectric Assessment KIT | DAK-3.5 | 1071 | Nov. 24, 2015 | Nov. 23, 2016 |
| Agilent | Signal Generator | N5181A | MY50145381 | Jan. 12, 2016 | Jan. 11, 2017 |
| Anritsu | Power Sensor | MA2411B | 1306099 | Jan. 12, 2016 | Jan. 11, 2017 |
| Anritsu | Power Meter | ML2495A | 1349001 | Jan. 12, 2016 | Jan. 11, 2017 |
| Anritsu | Power Sensor | MA2411B | 1207253 | Jan. 12, 2016 | Jan. 11, 2017 |
| Anritsu | Power Meter | ML2495A | 1218010 | Jan. 12, 2016 | Jan. 11, 2017 |
| ARRA | Power Divider | A3200-2 | N/A | NA | NA |
| R&S | Spectrum Analyzer | FSP7 | 101634 | Aug. 07, 2015 | Aug. 06, 2016 |
| Agilent | Dual Directional Coupler | 778D | 50422 | Note | |
| PASTERNACK | Dual Directional Coupler | PE2214-10 | N/A | Note | |
| MCL | Attenuation1 | BW-S10W5 | N/A | Note | |
| Weinschel | Attenuation2 | 3M-20 | N/A | Note | |
| Zhongjilianhe | Attenuation3 | MVE2214-03 | N/A | Note | |
| AR | Amplifier | 5S1G4 | 333096 | Note | |
| mini-circuits | Amplifier | ZVE-3W-83+ | 162601250 | Note | |

**Note:**
Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.

# 10. System Verification

## 10.1 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

| Frequency (MHz) | Water (%) | Sugar (%) | Cellulose (%) | Salt (%) | Preventol (%) | DGBE (%) | Conductivity (σ) | Permittivity (εr) |
|---|---|---|---|---|---|---|---|---|
| For Head | | | | | | | | |
| 835 | 40.3 | 57.9 | 0.2 | 1.4 | 0.2 | 0 | 0.90 | 41.5 |
| 1800, 1900, 2000 | 55.2 | 0 | 0 | 0.3 | 0 | 44.5 | 1.40 | 40.0 |
| 2450 | 55.0 | 0 | 0 | 0 | 0 | 45.0 | 1.80 | 39.2 |
| For Body | | | | | | | | |
| 835 | 50.8 | 48.2 | 0 | 0.9 | 0.1 | 0 | 0.97 | 55.2 |
| 1800, 1900, 2000 | 70.2 | 0 | 0 | 0.4 | 0 | 29.4 | 1.52 | 53.3 |
| 2450 | 68.6 | 0 | 0 | 0 | 0 | 31.4 | 1.95 | 52.7 |

**<Tissue Dielectric Parameter Check Results>**

| Frequency (MHz) | Tissue Type | Liquid Temp. (℃) | Conductivity (σ) | Permittivity ($\varepsilon_r$) | Conductivity Target (σ) | Permittivity Target ($\varepsilon_r$) | Delta (σ) (%) | Delta ($\varepsilon_r$) (%) | Limit (%) | Date |
|---|---|---|---|---|---|---|---|---|---|---|
| 835 | Head | 22.5 | 0.887 | 41.987 | 0.90 | 41.50 | -1.44 | 1.17 | ±5 | 2016/3/28 |
| 1900 | Head | 22.6 | 1.421 | 41.283 | 1.40 | 40.00 | 1.50 | 3.21 | ±5 | 2016/3/28 |
| 2450 | Head | 22.7 | 1.750 | 39.767 | 1.80 | 39.20 | -2.78 | 1.45 | ±5 | 2016/3/29 |
| 835 | Body | 22.8 | 0.954 | 55.682 | 0.97 | 55.20 | -1.65 | 0.87 | ±5 | 2016/3/26 |
| 1900 | Body | 22.5 | 1.547 | 53.803 | 1.52 | 53.30 | 1.78 | 0.94 | ±5 | 2016/3/25 |
| 2450 | Body | 22.9 | 1.951 | 53.859 | 1.95 | 52.70 | 0.05 | 2.20 | ±5 | 2016/3/29 |

## 10.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

| Date | Frequency (MHz) | Tissue Type | Input Power (mW) | Dipole S/N | Probe S/N | DAE S/N | Measured 1g SAR (W/kg) | Targeted 1g SAR (W/kg) | Normalized 1g SAR (W/kg) | Deviation (%) |
|---|---|---|---|---|---|---|---|---|---|---|
| 2016/3/28 | 835 | Head | 250 | 4d200 | 3958 | 1386 | 2.20 | 9.15 | 8.80 | -3.83 |
| 2016/3/28 | 1900 | Head | 250 | 5d210 | 3958 | 1386 | 10.00 | 41.10 | 40.00 | -2.68 |
| 2016/3/29 | 2450 | Head | 250 | 926 | 3958 | 1386 | 12.50 | 52.10 | 50.00 | -4.03 |
| 2016/3/26 | 835 | Body | 250 | 4d200 | 3958 | 1386 | 2.21 | 9.55 | 8.84 | -7.43 |
| 2016/3/25 | 1900 | Body | 250 | 5d210 | 3935 | 1338 | 10.30 | 40.00 | 41.20 | 3.00 |
| 2016/3/29 | 2450 | Body | 250 | 926 | 3819 | 1386 | 12.90 | 51.70 | 51.60 | -0.19 |

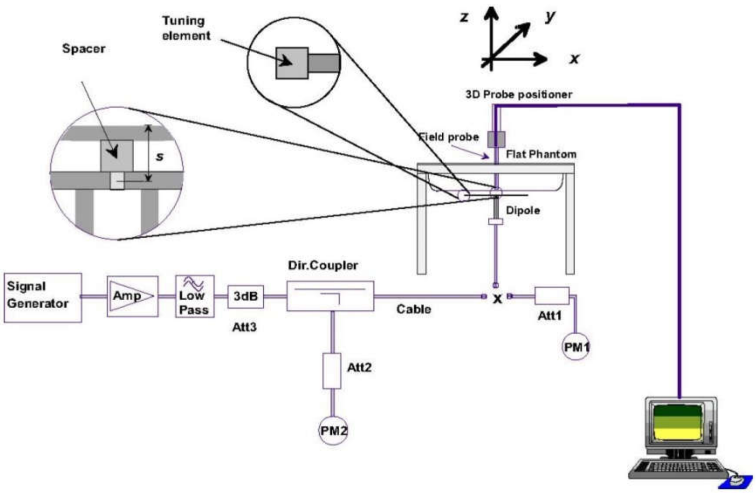



Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

# 11. RF Exposure Positions

## 11.1 Ear and handset reference point

Figure 9.1.1 shows the front, back, and side views of the SAM phantom. The center-of-mouth reference point is labeled “M,” the left ear reference point (ERP) is marked “LE,” and the right ERP is marked “RE.” Each ERP is 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 9.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 9.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 9.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

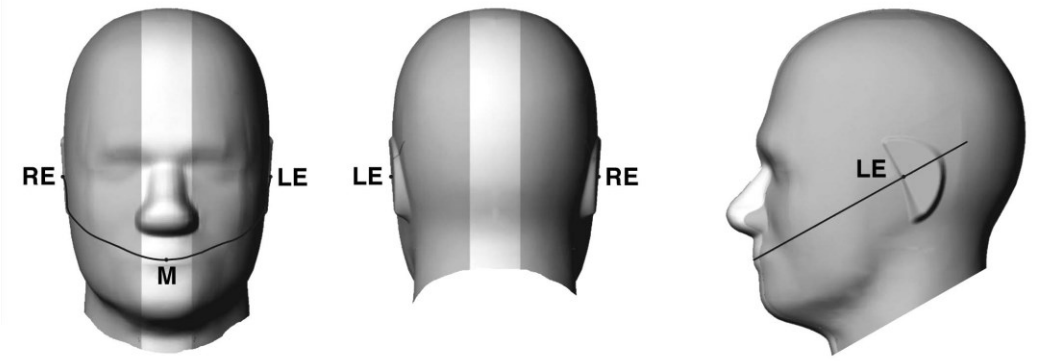



**Fig 9.1.1 Front, back, and side views of SAM twin phantom**

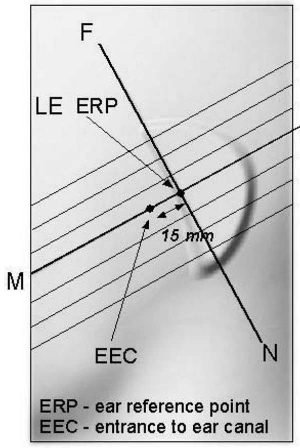



**Fig 9.1.2 Close-up side view of phantom showing the ear region.**

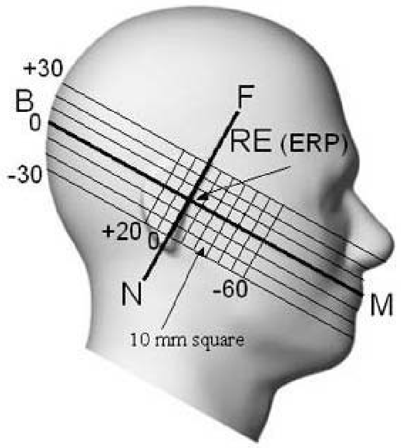



**Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations**

## 11.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. 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 in Figure 9.2.1 and Figure 9.2.2), 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 9.2.1). 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 9.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. 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 9.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. 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 N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 9.2.3. The actual rotation angles should be documented in the test report.

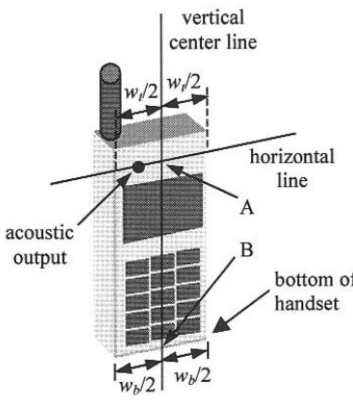



**Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case**

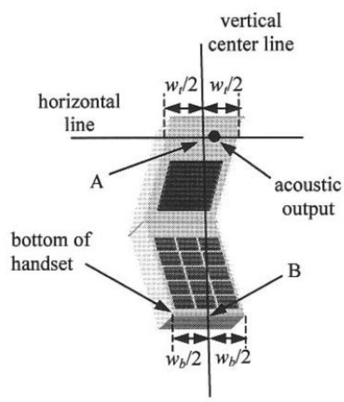



**Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"**

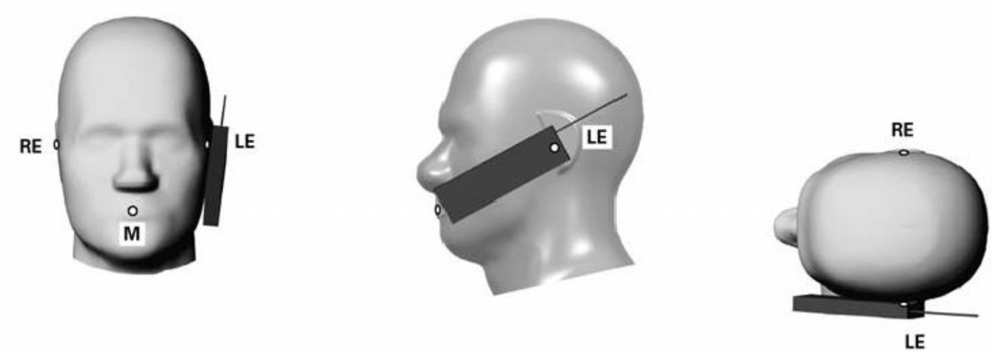



**Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.**

## 11.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 9.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

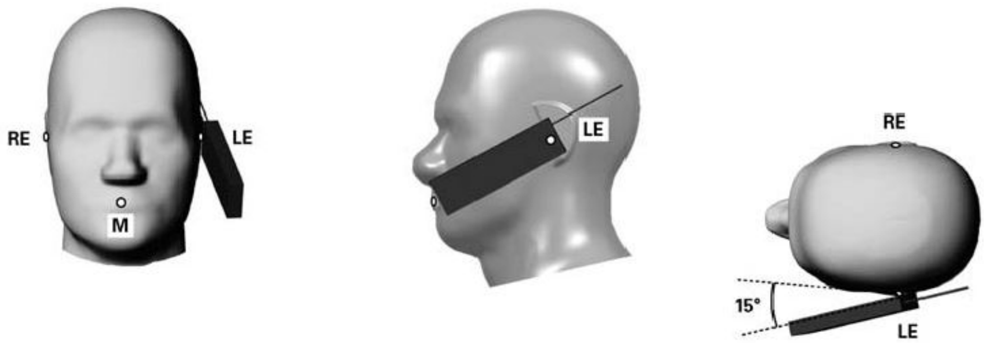



**Fig 9.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.**

## 11.4 SAR Testing for Tablet

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR exclusion threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

# 12. Conducted RF Output Power (Unit: dBm)

## <GSM Conducted Power>

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for SAR test reduction for GSM and GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the EUT was set in GPRS (4Tx slots) for GSM850/GSM1900.

**SIM1:**

| Band GSM850 | Burst Average Power (dBm) | | | Tune-up Limit (dBm) | Frame-Average Power (dBm) | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|
| TX Channel | 128 | 189 | 251 | | 128 | 189 | 251 | |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 | | 824.2 | 836.4 | 848.8 | |
| GSM 1 Tx slot | **33.33** | 33.28 | 33.25 | 34.00 | **24.33** | 24.28 | 24.25 | 25.00 |
| GPRS 1 Tx slot | 33.32 | 33.25 | 33.24 | 34.00 | 24.32 | 24.25 | 24.24 | 25.00 |
| GPRS 2 Tx slots | 30.30 | 30.28 | 30.27 | 31.00 | 24.30 | 24.28 | 24.27 | 25.00 |
| GPRS 3 Tx slots | 28.55 | 28.45 | 28.43 | 29.00 | 24.29 | 24.19 | 24.17 | 24.74 |
| GPRS 4 Tx slots | 27.26 | 27.23 | 27.21 | 28.00 | 24.26 | 24.23 | 24.21 | 25.00 |

| Band GSM1900 | Burst Average Power (dBm) | | | Tune-up Limit (dBm) | Frame-Average Power (dBm) | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|
| TX Channel | 512 | 661 | 810 | | 512 | 661 | 810 | |
| Frequency (MHz) | 1850.2 | 1880 | 1909.8 | | 1850.2 | 1880 | 1909.8 | |
| GSM 1 Tx slot | 30.75 | 30.76 | **30.78** | 31.50 | 21.75 | 21.76 | 21.78 | 22.50 |
| GPRS 1 Tx slot | 30.73 | 30.74 | 30.75 | 31.50 | 21.73 | 21.74 | 21.75 | 22.50 |
| GPRS 2 Tx slots | 27.78 | 27.81 | 27.84 | 28.50 | 21.78 | 21.81 | 21.84 | 22.50 |
| GPRS 3 Tx slots | 25.97 | 26.02 | 26.08 | 26.50 | 21.71 | 21.76 | 21.82 | 22.24 |
| GPRS 4 Tx slots | 24.72 | 24.77 | 24.85 | 25.50 | 21.72 | 21.77 | **21.85** | 22.50 |

**<WCDMA Conducted Power>**

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.

A summary of these settings are illustrated below:

**HSDPA Setup Configuration:**

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting:
   i. Set Gain Factors ($\beta_c$ and $\beta_d$) and parameters were set according to each
   ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
   iii. Set RMC 12.2Kbps + HSDPA mode.
   iv. Set Cell Power = -86 dBm
   v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
   vi. Select HSDPA Uplink Parameters
   vii. Set Delta ACK, Delta NACK and Delta CQI = 8
   viii. Set Ack-Nack Repetition Factor to 3
   ix. Set CQI Feedback Cycle (k) to 4 ms
   x. Set CQI Repetition Factor to 2
   xi. Power Ctrl Mode = All Up bits
d. The transmitted maximum output power was recorded.

**Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ (SF) | $\beta_c/\beta_d$ | $\beta_{HS}$ (Note1, Note 2) | CM (dB) (Note 3) | MPR (dB) (Note 3) |
|---|---|---|---|---|---|---|---|
| 1 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 0.0 | 0.0 |
| 2 | 12/15 (Note 4) | 15/15 (Note 4) | 64 | 12/15 (Note 4) | 24/15 | 1.0 | 0.0 |
| 3 | 15/15 | 8/15 | 64 | 15/8 | 30/15 | 1.5 | 0.5 |
| 4 | 15/15 | 4/15 | 64 | 15/4 | 30/15 | 1.5 | 0.5 |

Note 1: $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 30/15 with $\beta_{hs} = 30/15 \cdot \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, $\Delta_{ACK}$ and $\Delta_{NACK}$ = 30/15 with $\beta_{hs} = 30/15 \cdot \beta_c$, and $\Delta_{CQI}$ = 24/15 with $\beta_{hs} = 24/15 \cdot \beta_c$.

Note 3: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the $\beta_c/\beta_d$ ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 11/15 and $\beta_d$ = 15/15.

**Setup Configuration**

**HSUPA Setup Configuration:**

a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
b. The RF path losses were compensated into the measurements.
c. A call was established between EUT and Base Station with following setting * :
   i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
   ii. Set the Gain Factors ($\beta_c$ and $\beta_d$) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
   iii. Set Cell Power = -86 dBm
   iv. Set Channel Type = 12.2k + HSPA
   v. Set UE Target Power
   vi. Power Ctrl Mode= Alternating bits
   vii. Set and observe the E-TFCI
   viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
d. The transmitted maximum output power was recorded.

**Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH**

| Sub-test | $\beta_c$ | $\beta_d$ | $\beta_d$ *(SF)* | $\beta_c/\beta_d$ | $\beta_{HS}$ *(Note1)* | $\beta_{ec}$ | $\beta_{ed}$ *(Note 5)* *(Note 6)* | $\beta_{ed}$ *(SF)* | $\beta_{ed}$ *(Codes)* | CM (dB) *(Note 2)* | MPR (dB) *(Note 2)* | *AG Index* *(Note 6)* | *E-TFCI* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11/15 *(Note 3)* | 15/15 *(Note 3)* | 64 | 11/15 *(Note 3)* | 22/15 | 209/225 | 1309/225 | 4 | 1 | 1.0 | 0.0 | 20 | 75 |
| 2 | 6/15 | 15/15 | 64 | 6/15 | 12/15 | 12/15 | 94/75 | 4 | 1 | 3.0 | 2.0 | 12 | 67 |
| 3 | 15/15 | 9/15 | 64 | 15/9 | 30/15 | 30/15 | $\beta_{ed}$1: 47/15<br>$\beta_{ed}$2: 47/15 | 4<br>4 | 2 | 2.0 | 1.0 | 15 | 92 |
| 4 | 2/15 | 15/15 | 64 | 2/15 | 4/15 | 2/15 | 56/75 | 4 | 1 | 3.0 | 2.0 | 17 | 71 |
| 5 | 15/15 *(Note 4)* | 15/15 *(Note 4)* | 64 | 15/15 *(Note 4)* | 30/15 | 24/15 | 134/15 | 4 | 1 | 1.0 | 0.0 | 21 | 81 |

Note 1: $\Delta_{ACK}$, $\Delta_{NACK}$ and $\Delta_{CQI}$ = 30/15 with $\beta_{hs}$ = 30/15 * $\beta_c$ .
Note 2: CM = 1 for $\beta_c/\beta_d$ =12/15, $\beta_{hs}/\beta_c$=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the $\beta_c/\beta_d$ ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 10/15 and $\beta_d$ = 15/15.
Note 4: For subtest 5 the $\beta_c/\beta_d$ ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c$ = 14/15 and $\beta_d$ = 15/15.
Note 5: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
Note 6: $\beta_{ed}$ can not be set directly, it is set by Absolute Grant Value.

**Setup Configuration**

## <WCDMA Conducted Power>

**General Note:**

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA.

**SIM1:**

| Band | | WCDMA Band V | | | Tune-up Limit (dBm) | WCDMA Band II | | | Tune-up Limit (dBm) |
|---|---|---|---|---|---|---|---|---|---|
| TX Channel | | 4132 | 4182 | 4233 | | 9262 | 9400 | 9538 | |
| Rx Channel | | 4357 | 4407 | 4458 | | 9662 | 9800 | 9938 | |
| Frequency (MHz) | | 826.4 | 836.4 | 846.6 | | 1852.4 | 1880 | 1907.6 | |
| 3GPP Rel 99 | AMR 12.2Kbps | 23.04 | 23.12 | 22.88 | 23.50 | 23.16 | 23.01 | 22.87 | 23.50 |
| 3GPP Rel 99 | RMC 12.2Kbps | 23.05 | **23.13** | 22.90 | 23.50 | **23.18** | 23.02 | 22.88 | 23.50 |
| 3GPP Rel 6 | HSDPA Subtest-1 | 22.83 | 23.03 | 22.90 | 23.50 | 22.39 | 22.48 | 22.29 | 22.50 |
| 3GPP Rel 6 | HSDPA Subtest-2 | 22.06 | 22.25 | 22.13 | 22.50 | 21.64 | 21.80 | 21.60 | 22.00 |
| 3GPP Rel 6 | HSDPA Subtest-3 | 21.79 | 21.93 | 21.88 | 22.50 | 21.40 | 21.53 | 21.39 | 22.00 |
| 3GPP Rel 6 | HSDPA Subtest-4 | 21.56 | 21.70 | 21.67 | 22.50 | 21.15 | 21.29 | 21.06 | 21.50 |
| 3GPP Rel 6 | HSUPA Subtest-1 | 22.01 | 22.21 | 22.15 | 22.50 | 21.70 | 21.79 | 21.77 | 22.00 |
| 3GPP Rel 6 | HSUPA Subtest-2 | 20.01 | 20.12 | 20.09 | 20.50 | 19.63 | 19.67 | 19.66 | 20.00 |
| 3GPP Rel 6 | HSUPA Subtest-3 | 20.72 | 20.96 | 20.89 | 21.00 | 20.39 | 20.46 | 20.44 | 20.50 |
| 3GPP Rel 6 | HSUPA Subtest-4 | 20.42 | 20.38 | 20.31 | 20.50 | 19.81 | 19.88 | 19.88 | 20.00 |
| 3GPP Rel 6 | HSUPA Subtest-5 | 22.20 | 22.40 | 22.20 | 22.50 | 21.70 | 21.80 | 21.70 | 22.00 |

## <WLAN Conducted Power>

**General Note:**

1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

| | Mode | Channel | Frequency (MHz) | Data Rate | Average power (dBm) | Tune-Up Limit | Duty Cycle % |
|---|---|---|---|---|---|---|---|
| 2.4GHz WLAN | 802.11b | CH 1 | 2412 | 1Mbps | **17.23** | 17.50 | 100.00 |
| | | CH 6 | 2437 | | 17.05 | 17.50 | |
| | | CH 11 | 2462 | | 16.70 | 17.50 | |
| | 802.11g | CH 1 | 2412 | 6Mbps | 13.81 | 14.00 | 99.18 |
| | | CH 6 | 2437 | | 13.69 | 14.00 | |
| | | CH 11 | 2462 | | 13.16 | 14.00 | |
| | 802.11n-HT20 | CH 1 | 2412 | MCS0 | 12.99 | 13.50 | 98.31 |
| | | CH 6 | 2437 | | 12.95 | 13.50 | |
| | | CH 11 | 2462 | | 12.47 | 13.50 | |

# 13. Bluetooth Exclusions Applied

| Mode Band | Average power(dBm) | |
|---|---|---|
| | Bluetooth v3.0+EDR | Bluetooth v4.0 LE |
| 2.4GHz Bluetooth | 5.0 | 5.0 |

**Note:**

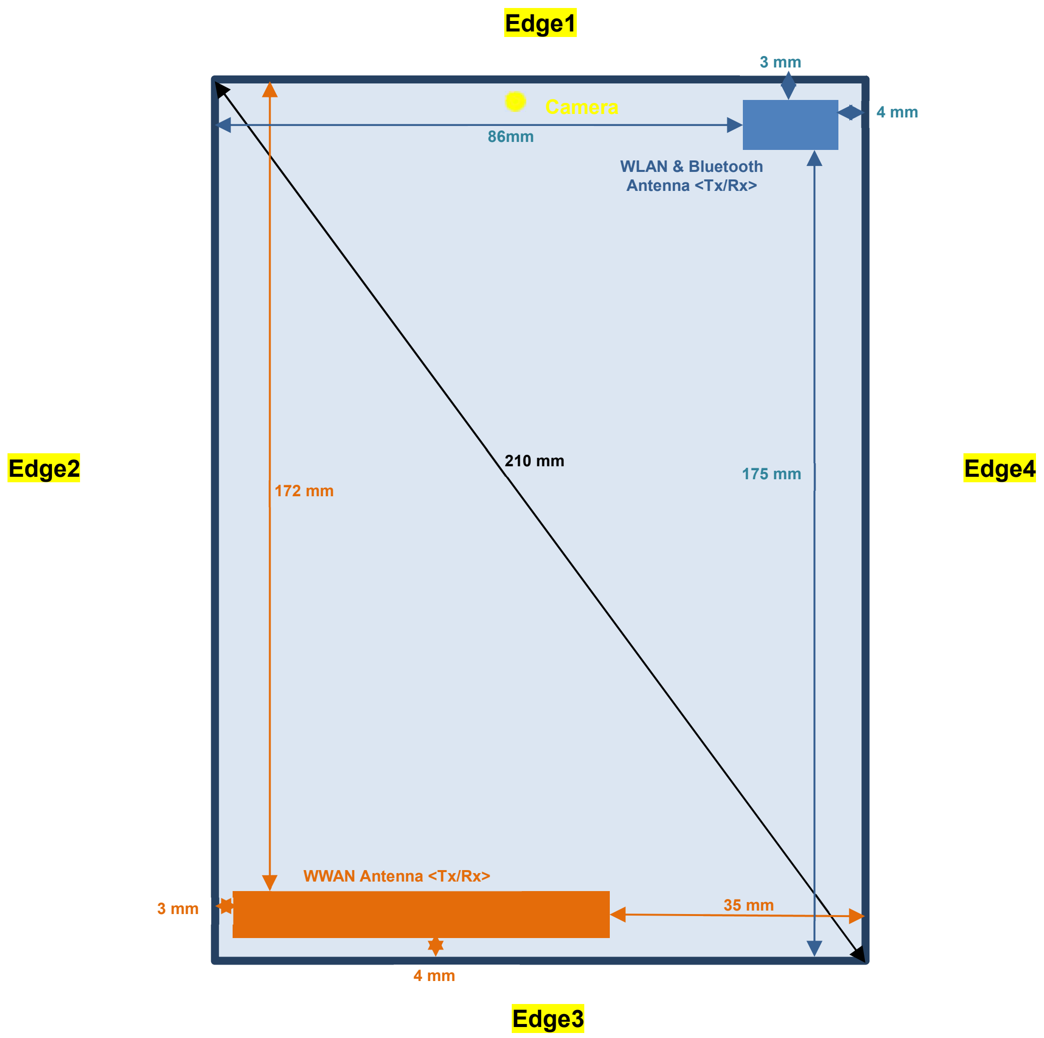
1. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[$\sqrt{f(GHz)}$] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison

| Bluetooth Max Power (dBm) | Separation Distance (mm) | Frequency (GHz) | exclusion thresholds |
|---|---|---|---|
| 5.0 | 0 | 2.48 | 0.9 |

**Note:**

Per KDB 447498 D01v06, when the minimum test separation distance is < 5 mm, a distance of 10 mm is applied to determine SAR test exclusion. The test exclusion threshold is 0.9 which is <= 3, SAR testing is not required.

# 14. Antenna Location




**Back View**

## <SAR test exclusion table>

**General Note:**

1. The below table, when the distance is < 50 mm exclusion threshold is "Ratio", when the distance is > 50 mm exclusion threshold is "mW"
2. Maximum power is the source-based time-average power and represents the maximum RF output power among production units
3. Per KDB 447498 D01v06, for larger devices, the test separation distance of adjacent edge configuration is determined by the closest separation between the antenna and the user.
4. Per KDB 447498 D01v06, standalone SAR test exclusion threshold is applied; If the test separation distance is < 5mm, 5mm is used to determine SAR exclusion threshold.
5. Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:
   [(*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)] ·[√f(GHz)] ≤ 3.0 for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
   - f(GHz) is the RF channel transmit frequency in GHz
   - Power and distance are rounded to the nearest mW and mm before calculation
   - The result is rounded to one decimal place for comparison
6. Per KDB 447498 D01v06, at 100 MHz to 6 GHz and for *test separation distances* > 50 mm, the SAR test exclusion threshold is determined according to the following
   a) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·( f(MHz)/150)] mW, at 100 MHz to 1500 MHz
   b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm)·10] mW at > 1500 MHz and ≤ 6 GHz

| Exposure Position | Wireless Interface | GPRS 850 4 Tx slots | GPRS 1900 4 Tx slots | WCDMA Band V | WCDMA Band II | 2.4GHz WLAN |
|---|---|---|---|---|---|---|
| | Calculated Frequency | 848MHz | 1909MHz | 846MHz | 1907MHz | 2462MHz |
| | Maximum power (dBm) | 25.00 | 22.50 | 23.50 | 23.50 | 17.50 |
| | Maximum rated power(mW) | 316.0 | 178.0 | 224.0 | 224.0 | 56.0 |
| Bottom Face | Separation distance(mm) | 5 | | | | 5.0 |
| | exclusion threshold | 58.2 | 49.2 | 41.2 | 61.9 | 17.6 |
| | Testing required? | Yes | Yes | Yes | Yes | Yes |
| Edge 1 | Separation distance(mm) | 172 | | | | 3.0 |
| | exclusion threshold | 853.0 | 1329.0 | 851.0 | 1329.0 | 17.6 |
| | Testing required? | No | No | No | No | Yes |
| Edge 2 | Separation distance(mm) | 3 | | | | 86 |
| | exclusion threshold | 58.2 | 49.2 | 41.2 | 61.9 | 456.0 |
| | Testing required? | Yes | Yes | Yes | Yes | No |
| Edge 3 | Separation distance(mm) | 4 | | | | 175 |
| | exclusion threshold | 58.2 | 49.2 | 41.2 | 61.9 | 1346.0 |
| | Testing required? | Yes | Yes | Yes | Yes | No |
| Edge 4 | Separation distance(mm) | 35 | | | | 4 |
| | exclusion threshold | 8.3 | 7.0 | 5.9 | 8.8 | 17.6 |
| | Testing required? | Yes | Yes | Yes | Yes | Yes |

# 15. SAR Test Results

**General Note:**

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.

**GSM Note:**

1. Per KDB 941225 D01v03r01, for SAR test reduction for GSM and GPRS modes is determined by the source-based time-averaged output power including tune-up tolerance. The mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested. Therefore, the EUT was set in GPRS (4Tx slots) for GSM850/GSM1900.

**UMTS Note:**

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. If the maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA.

**WLAN Note:**

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
3. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

## 15.1 Head SAR

### <GSM SAR>

| Plot No. | Band | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | GSM850 | GPRS (4 Tx slots) | Right Cheek | 128 | 824.2 | 27.26 | 28.00 | 1.186 | -0.07 | 0.017 | 0.020 |
| | GSM850 | GPRS (4 Tx slots) | Right Tilted | 128 | 824.2 | 27.26 | 28.00 | 1.186 | -0.18 | 0.011 | 0.013 |
| | GSM850 | GPRS (4 Tx slots) | Left Cheek | 128 | 824.2 | 27.26 | 28.00 | 1.186 | 0.08 | 0.022 | 0.026 |
| | GSM850 | GPRS (4 Tx slots) | Left Tilted | 128 | 824.2 | 27.26 | 28.00 | 1.186 | 0.05 | 0.00952 | 0.011 |
| | GSM850 | GPRS (4 Tx slots) | Left Cheek | 189 | 836.4 | 27.23 | 28.00 | 1.194 | 0.11 | 0.028 | 0.033 |
| #01 | GSM850 | GPRS (4 Tx slots) | Left Cheek | 251 | 848.8 | 27.21 | 28.00 | 1.199 | 0.09 | 0.033 | 0.040 |
| #02 | GSM1900 | GPRS (4 Tx slots) | Right Cheek | 810 | 1909.8 | 24.85 | 25.50 | 1.161 | 0.02 | 0.037 | 0.043 |
| | GSM1900 | GPRS (4 Tx slots) | Right Tilted | 810 | 1909.8 | 24.85 | 25.50 | 1.161 | -0.07 | 0.013 | 0.015 |
| | GSM1900 | GPRS (4 Tx slots) | Left Cheek | 810 | 1909.8 | 24.85 | 25.50 | 1.161 | 0.01 | 0.023 | 0.027 |
| | GSM1900 | GPRS (4 Tx slots) | Left Tilted | 810 | 1909.8 | 24.85 | 25.50 | 1.161 | 0.18 | 0.017 | 0.020 |
| | GSM1900 | GPRS (4 Tx slots) | Right Cheek | 512 | 1850.2 | 24.72 | 25.50 | 1.197 | 0.02 | 0.029 | 0.035 |
| | GSM1900 | GPRS (4 Tx slots) | Right Cheek | 661 | 1880 | 24.77 | 25.50 | 1.183 | 0.02 | 0.031 | 0.037 |

### <WCDMA SAR>

| Plot No. | Band | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | WCDMA Band V | RMC 12.2Kbps | Right Cheek | 4182 | 836.4 | 23.13 | 23.50 | 1.089 | 0.08 | 0.017 | 0.019 |
| | WCDMA Band V | RMC 12.2Kbps | Right Tilted | 4182 | 836.4 | 23.13 | 23.50 | 1.089 | -0.14 | 0.011 | 0.012 |
| | WCDMA Band V | RMC 12.2Kbps | Left Cheek | 4182 | 836.4 | 23.13 | 23.50 | 1.089 | 0.14 | 0.025 | 0.027 |
| | WCDMA Band V | RMC 12.2Kbps | Left Tilted | 4182 | 836.4 | 23.13 | 23.50 | 1.089 | 0.11 | 0.011 | 0.012 |
| | WCDMA Band V | RMC 12.2Kbps | Left Cheek | 4132 | 826.4 | 23.05 | 23.50 | 1.109 | 0.09 | 0.020 | 0.022 |
| #03 | WCDMA Band V | RMC 12.2Kbps | Left Cheek | 4233 | 846.6 | 22.90 | 23.50 | 1.148 | 0.05 | 0.028 | 0.032 |
| | WCDMA Band II | RMC 12.2Kbps | Right Cheek | 9262 | 1852.4 | 23.18 | 23.50 | 1.076 | -0.05 | 0.050 | 0.054 |
| | WCDMA Band II | RMC 12.2Kbps | Right Tilted | 9262 | 1852.4 | 23.18 | 23.50 | 1.076 | 0.07 | 0.019 | 0.020 |
| | WCDMA Band II | RMC 12.2Kbps | Left Cheek | 9262 | 1852.4 | 23.18 | 23.50 | 1.076 | -0.03 | 0.030 | 0.032 |
| | WCDMA Band II | RMC 12.2Kbps | Left Tilted | 9262 | 1852.4 | 23.18 | 23.50 | 1.076 | 0.13 | 0.025 | 0.027 |
| | WCDMA Band II | RMC 12.2Kbps | Right Cheek | 9400 | 1880 | 23.02 | 23.50 | 1.117 | -0.05 | 0.047 | 0.052 |
| #04 | WCDMA Band II | RMC 12.2Kbps | Right Cheek | 9538 | 1907.6 | 22.88 | 23.50 | 1.153 | -0.08 | 0.050 | 0.058 |

**<WLAN SAR>**

| Plot No. | Band | Mode | Test Position | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Duty Cycle Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WLAN2.4GHz | 802.11b, 1Mbps | Right Cheek | 1 | 2412 | 17.23 | 17.50 | 1.064 | 100 | 1.000 | 0.07 | 0.098 | 0.104 |
| | WLAN2.4GHz | 802.11b, 1Mbps | Right Tilted | 1 | 2412 | 17.23 | 17.50 | 1.064 | 100 | 1.000 | 0.01 | 0.056 | 0.060 |
| | WLAN2.4GHz | 802.11b, 1Mbps | Left Cheek | 1 | 2412 | 17.23 | 17.50 | 1.064 | 100 | 1.000 | 0.19 | 0.052 | 0.055 |
| | WLAN2.4GHz | 802.11b, 1Mbps | Left Tilted | 1 | 2412 | 17.23 | 17.50 | 1.064 | 100 | 1.000 | 0.17 | 0.047 | 0.050 |
| | WLAN2.4GHz | 802.11b, 1Mbps | Right Cheek | 6 | 2437 | 17.05 | 17.50 | 1.109 | 100 | 1.000 | -0.09 | 0.130 | 0.144 |
| #05 | WLAN2.4GHz | 802.11b, 1Mbps | Right Cheek | 11 | 2462 | 16.70 | 17.50 | 1.202 | 100 | 1.000 | 0.16 | 0.164 | **0.197** |

## 15.2 Body SAR

### <GSM SAR>

| Plot No. | Band | Mode | Test Position | Gap (mm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | GSM850 | GPRS (4 Tx slots) | Bottom Face | 0 | 128 | 824.2 | 27.26 | 28.00 | 1.186 | -0.09 | 0.377 | 0.447 |
| | GSM850 | GPRS (4 Tx slots) | Edge 1 | 0 | 128 | 824.2 | 27.26 | 28.00 | 1.186 | -0.08 | 0.00505 | 0.006 |
| | GSM850 | GPRS (4 Tx slots) | Edge 2 | 0 | 128 | 824.2 | 27.26 | 28.00 | 1.186 | -0.02 | 0.039 | 0.046 |
| | GSM850 | GPRS (4 Tx slots) | Edge 3 | 0 | 128 | 824.2 | 27.26 | 28.00 | 1.186 | -0.06 | 0.140 | 0.166 |
| | GSM850 | GPRS (4 Tx slots) | Edge 4 | 0 | 128 | 824.2 | 27.26 | 28.00 | 1.186 | 0.04 | 0.041 | 0.049 |
| | GSM850 | GPRS (4 Tx slots) | Bottom Face | 0 | 189 | 836.4 | 27.23 | 28.00 | 1.194 | 0.12 | 0.374 | 0.447 |
| #06 | GSM850 | GPRS (4 Tx slots) | Bottom Face | 0 | 251 | 848.8 | 27.21 | 28.00 | 1.199 | 0.07 | 0.380 | **0.456** |
| #07 | GSM1900 | GPRS (4 Tx slots) | Bottom Face | 0 | 810 | 1909.8 | 24.85 | 25.50 | 1.161 | -0.07 | 0.622 | **0.722** |
| | GSM1900 | GPRS (4 Tx slots) | Edge 2 | 0 | 810 | 1909.8 | 24.85 | 25.50 | 1.161 | -0.07 | 0.156 | 0.181 |
| | GSM1900 | GPRS (4 Tx slots) | Edge 3 | 0 | 810 | 1909.8 | 24.85 | 25.50 | 1.161 | 0.07 | 0.290 | 0.337 |
| | GSM1900 | GPRS (4 Tx slots) | Edge 4 | 0 | 810 | 1909.8 | 24.85 | 25.50 | 1.161 | 0.07 | 0.0078 | 0.009 |
| | GSM1900 | GPRS (4 Tx slots) | Bottom Face | 0 | 512 | 1850.2 | 24.72 | 25.50 | 1.197 | -0.19 | 0.576 | 0.689 |
| | GSM1900 | GPRS (4 Tx slots) | Bottom Face | 0 | 661 | 1880 | 24.77 | 25.50 | 1.183 | 0.02 | 0.598 | 0.707 |

**<WCDMA SAR>**

| Plot No. | Band | Mode | Test Position | Gap (mm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| #08 | WCDMA Band V | RMC 12.2Kbps | Bottom Face | 0 | 4182 | 836.4 | 23.13 | 23.50 | 1.089 | 0.04 | 0.339 | 0.369 |
| | WCDMA Band V | RMC 12.2Kbps | Edge 1 | 0 | 4182 | 836.4 | 23.13 | 23.50 | 1.089 | 0.01 | 0.00657 | 0.007 |
| | WCDMA Band V | RMC 12.2Kbps | Edge 2 | 0 | 4182 | 836.4 | 23.13 | 23.50 | 1.089 | 0.01 | 0.037 | 0.040 |
| | WCDMA Band V | RMC 12.2Kbps | Edge 3 | 0 | 4182 | 836.4 | 23.13 | 23.50 | 1.089 | 0.04 | 0.119 | 0.130 |
| | WCDMA Band V | RMC 12.2Kbps | Edge 4 | 0 | 4182 | 836.4 | 23.13 | 23.50 | 1.089 | -0.04 | 0.042 | 0.046 |
| | WCDMA Band V | RMC 12.2Kbps | Bottom Face | 0 | 4132 | 826.4 | 23.05 | 23.50 | 1.109 | 0.19 | 0.309 | 0.343 |
| | WCDMA Band V | RMC 12.2Kbps | Bottom Face | 0 | 4233 | 846.6 | 22.90 | 23.50 | 1.148 | -0.16 | 0.300 | 0.344 |
| #09 | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 0 | 9262 | 1852.4 | 23.18 | 23.50 | 1.153 | 0.06 | 0.906 | 1.045 |
| | WCDMA Band II | RMC 12.2Kbps | Edge 2 | 0 | 9262 | 1852.4 | 23.18 | 23.50 | 1.076 | 0.02 | 0.247 | 0.266 |
| | WCDMA Band II | RMC 12.2Kbps | Edge 3 | 0 | 9262 | 1852.4 | 23.18 | 23.50 | 1.076 | -0.08 | 0.539 | 0.580 |
| | WCDMA Band II | RMC 12.2Kbps | Edge 4 | 0 | 9262 | 1852.4 | 23.18 | 23.50 | 1.076 | 0.02 | 0.00708 | 0.008 |
| | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 0 | 9400 | 1880 | 23.02 | 23.50 | 1.117 | 0.05 | 0.896 | 1.001 |
| | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 0 | 9538 | 1907.6 | 22.88 | 23.50 | 1.153 | 0.08 | 0.882 | 1.017 |

**<WLAN SAR>**

| Plot No. | Band | Mode | Test Position | Gap (mm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Duty Cycle % | Duty Cycle Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | WLAN2.4GHz | 802.11b, 1Mbps | Bottom Face | 0 | 1 | 2412 | 17.23 | 17.50 | 1.064 | 100 | 1.000 | 0.13 | 0.505 | 0.537 |
| | WLAN2.4GHz | 802.11b, 1Mbps | Edge 1 | 0 | 1 | 2412 | 17.23 | 17.50 | 1.064 | 100 | 1.000 | -0.04 | 0.110 | 0.117 |
| | WLAN2.4GHz | 802.11b, 1Mbps | Edge 4 | 0 | 1 | 2412 | 17.23 | 17.50 | 1.064 | 100 | 1.000 | 0.14 | 0.040 | 0.043 |
| | WLAN2.4GHz | 802.11b, 1Mbps | Bottom Face | 0 | 6 | 2437 | 17.05 | 17.50 | 1.109 | 100 | 1.000 | 0.13 | 0.679 | 0.753 |
| #10 | WLAN2.4GHz | 802.11b, 1Mbps | Bottom Face | 0 | 11 | 2462 | 16.70 | 17.50 | 1.202 | 100 | 1.000 | 0.09 | 0.634 | 0.762 |

## 15.3 Repeated SAR Measurement

| No. | Band | Mode | Test Position | Gap (mm) | Ch. | Freq. (MHz) | Average Power (dBm) | Tune-Up Limit (dBm) | Tune-up Scaling Factor | Power Drift (dB) | Measured 1g SAR (W/kg) | Ratio | Reported 1g SAR (W/kg) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1st | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 0 | 9262 | 1852.4 | 23.18 | 23.50 | 1.153 | 0.06 | 0.906 | 1 | 1.045 |
| 2nd | WCDMA Band II | RMC 12.2Kbps | Bottom Face | 0 | 9262 | 1852.4 | 23.18 | 23.50 | 1.153 | 0.05 | 0.899 | 1.008 | 1.037 |

**General Note:**

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is ≤ 1.2 and the measured SAR <1.45W/kg, only one repeated measurement is required.
3. The ratio is the difference in percentage between original and repeated *measured SAR*.
4. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

# 16. Simultaneous Transmission Analysis

| NO. | Simultaneous Transmission Configurations | Tablet | | Note |
|---|---|---|---|---|
| | | Head | Body | |
| 1. | GSM Voice + WLAN2.4GHz | Yes | Yes | |
| 2. | GPRS + WLAN2.4GHz | Yes | Yes | Hotspot |
| 3. | WCDMA + WLAN2.4GHz | Yes | Yes | Hotspot |
| 4. | GSM Voice + Bluetooth | | Yes | |
| 5. | GPRS + Bluetooth | | Yes | WWAN VoIP |
| 6. | WCDMA+ Bluetooth | | Yes | WWAN VoIP |

**General Note:**

1. This device supported VoIP in GPRS, WCDMA (e.g. 3rd party VoIP).
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. EUT will choose each GSM and WCDMA according to the network signal condition; therefore, they will not operate simultaneously at any moment.
4. The reported SAR summation is calculated based on the same configuration and test position.
5. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*), and the peak separation distance is determined from the square root of $[(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2]$, where $(x_1, y_1, z_1)$ and $(x_2, y_2, z_2)$ are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
6. For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
   i) (*max. power of channel, including tune-up tolerance, mW*)/(*min. test separation distance, mm*)]·[√f(GHz)/*x*] W/kg for *test separation distances* ≤ 50 mm; where *x* = 7.5 for 1-g SAR, and *x* = 18.75 for 10-g SAR.
   ii) When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
   iii) 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the *test separation distances* is > 50 mm.
   iv) Bluetooth estimated SAR is conservatively determined by 5mm separation, for all applicable exposure positions.

| Bluetooth<br>Max Power (dBm) | Exposure<br>Position | All Positions |
|---|---|---|
| 5.0 | Estimated<br>SAR (W/kg) | 0.126 |

## 16.1 Head Exposure Conditions

| WWAN Band | | Exposure Position | 1 WWAN 1g SAR (W/kg) | 2 2.4GHz WLAN 1g SAR (W/kg) | 3 Bluetooth Estimated 1g SAR (W/kg) | 1+2 Summed 1g SAR (W/kg) | 1+3 Summed 1g SAR (W/kg) | SPLSR | Case No |
|---|---|---|---|---|---|---|---|---|---|
| GSM | GSM850 | Right Cheek | 0.020 | 0.197 | 0.126 | 0.22 | 0.15 | | |
| | | Right Tilted | 0.013 | 0.060 | 0.126 | 0.07 | 0.14 | | |
| | | Left Cheek | 0.040 | 0.055 | 0.126 | 0.10 | 0.17 | | |
| | | Left Tilted | 0.011 | 0.050 | 0.126 | 0.06 | 0.14 | | |
| | GSM1900 | Right Cheek | 0.043 | 0.197 | 0.126 | 0.24 | 0.17 | | |
| | | Right Tilted | 0.015 | 0.060 | 0.126 | 0.08 | 0.14 | | |
| | | Left Cheek | 0.027 | 0.055 | 0.126 | 0.08 | 0.15 | | |
| | | Left Tilted | 0.020 | 0.050 | 0.126 | 0.07 | 0.15 | | |
| WCDMA | Band V | Right Cheek | 0.019 | 0.197 | 0.126 | 0.22 | 0.15 | | |
| | | Right Tilted | 0.012 | 0.060 | 0.126 | 0.07 | 0.14 | | |
| | | Left Cheek | 0.032 | 0.055 | 0.126 | 0.09 | 0.16 | | |
| | | Left Tilted | 0.012 | 0.050 | 0.126 | 0.06 | 0.14 | | |
| | Band II | Right Cheek | 0.058 | 0.197 | 0.126 | 0.26 | 0.18 | | |
| | | Right Tilted | 0.020 | 0.060 | 0.126 | 0.08 | 0.15 | | |
| | | Left Cheek | 0.032 | 0.055 | 0.126 | 0.09 | 0.16 | | |
| | | Left Tilted | 0.027 | 0.050 | 0.126 | 0.08 | 0.15 | | |

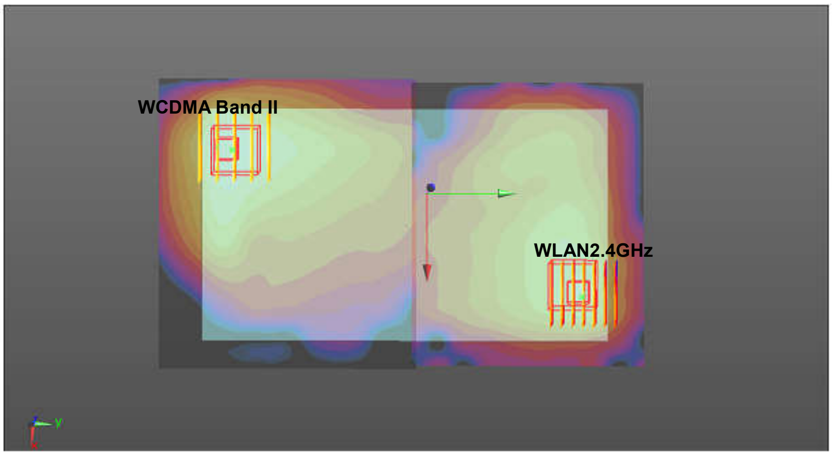
## 16.2 Body Exposure Conditions

| WWAN Band | | Exposure Position | 1 WWAN 1g SAR (W/kg) | 2 2.4GHz WLAN 1g SAR (W/kg) | 3 Bluetooth Estimated 1g SAR (W/kg) | 1+2 Summed 1g SAR (W/kg) | 1+3 Summed 1g SAR (W/kg) | SPLSR | Case No |
|---|---|---|---|---|---|---|---|---|---|
| GSM | GSM850 | Bottom Face | 0.456 | 0.762 | 0.126 | 1.22 | 0.58 | | |
| | | Edge 1 | 0.006 | 0.117 | 0.126 | 0.12 | 0.13 | | |
| | | Edge 2 | 0.046 | | 0.126 | 0.05 | 0.17 | | |
| | | Edge 3 | 0.166 | | 0.126 | 0.17 | 0.29 | | |
| | | Edge 4 | 0.049 | 0.043 | 0.126 | 0.09 | 0.18 | | |
| | GSM1900 | Bottom Face | 0.722 | 0.762 | 0.126 | 1.48 | 0.85 | | |
| | | Edge 1 | | 0.117 | 0.126 | 0.12 | 0.13 | | |
| | | Edge 2 | 0.181 | | 0.126 | 0.18 | 0.31 | | |
| | | Edge 3 | 0.337 | | 0.126 | 0.34 | 0.46 | | |
| | | Edge 4 | 0.009 | 0.043 | 0.126 | 0.05 | 0.14 | | |
| WCDMA | Band V | Bottom Face | 0.369 | 0.762 | 0.126 | 1.13 | 0.50 | | |
| | | Edge 1 | 0.007 | 0.117 | 0.126 | 0.12 | 0.13 | | |
| | | Edge 2 | 0.040 | | 0.126 | 0.04 | 0.17 | | |
| | | Edge 3 | 0.130 | | 0.126 | 0.13 | 0.26 | | |
| | | Edge 4 | 0.046 | 0.043 | 0.126 | 0.09 | 0.17 | | |
| | Band II | Bottom Face | 1.045 | 0.762 | 0.126 | **1.81** | 1.17 | **0.01** | **#01** |
| | | Edge 1 | | 0.117 | 0.126 | 0.12 | 0.13 | | |
| | | Edge 2 | 0.266 | | 0.126 | 0.27 | 0.39 | | |
| | | Edge 3 | 0.580 | | 0.126 | 0.58 | 0.71 | | |
| | | Edge 4 | 0.008 | 0.043 | 0.126 | 0.05 | 0.13 | | |

## 16.3 SPLSR Evaluation and Analysis

**General Note:**
SPLSR = $(SAR_1 + SAR_2)^{1.5}$ / (*min. separation distance, mm*). If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary

| Case | Band | Position | SAR (W/kg) | Gap | SAR peak location (m) | | | 3D distance (mm) | Summed SAR (W/kg) | SPLSR Results | Simultaneous SAR |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | (mm) | X | Y | Z | | | | |
| #01 | WCDMA Band II | Bottom Face | 1.045 | 0 | -0.0345 | -0.0805 | -0.182 | 176.4 | 1.81 | 0.01 | Not required |
| | WLAN2.4GHz | | 0.762 | 0 | 0.0336 | 0.0822 | -0.181 | | | | |




**Test Engineer:** Luke Lu

# 17. Uncertainty Assessment

The component of uncertainly may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainly by the statistical analysis of a series of observations is termed a Type An evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

| Uncertainty Distributions | Normal | Rectangular | Triangular | U-Shape |
|---|---|---|---|---|
| Multi-plying Factor[(a)] | 1/k[(b)] | $1/\sqrt{3}$ | $1/\sqrt{6}$ | $1/\sqrt{2}$ |

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b) $\kappa$ is the coverage factor

**Table 17.1. Standard Uncertainty for Assumed Distribution**

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

| Error Description | Uncertainty Value (±%) | Probability | Divisor | (Ci) 1g | (Ci) 10g | Standard Uncertainty (1g) (±%) | Standard Uncertainty (10g) (±%) |
|---|---|---|---|---|---|---|---|
| **Measurement System** | | | | | | | |
| Probe Calibration | 6.0 | N | 1 | 1 | 1 | 6.0 | 6.0 |
| Axial Isotropy | 4.7 | R | 1.732 | 0.7 | 0.7 | 1.9 | 1.9 |
| Hemispherical Isotropy | 9.6 | R | 1.732 | 0.7 | 0.7 | 3.9 | 3.9 |
| Boundary Effects | 1.0 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| Linearity | 4.7 | R | 1.732 | 1 | 1 | 2.7 | 2.7 |
| System Detection Limits | 1.0 | R | 1.732 | 1 | 1 | 0.6 | 0.6 |
| Modulation Response | 3.2 | R | 1.732 | 1 | 1 | 1.8 | 1.8 |
| Readout Electronics | 0.3 | N | 1 | 1 | 1 | 0.3 | 0.3 |
| Response Time | 0.0 | R | 1.732 | 1 | 1 | 0.0 | 0.0 |
| Integration Time | 2.6 | R | 1.732 | 1 | 1 | 1.5 | 1.5 |
| RF Ambient Noise | 3.0 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| RF Ambient Reflections | 3.0 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| Probe Positioner | 0.4 | R | 1.732 | 1 | 1 | 0.2 | 0.2 |
| Probe Positioning | 2.9 | R | 1.732 | 1 | 1 | 1.7 | 1.7 |
| Max. SAR Eval. | 2.0 | R | 1.732 | 1 | 1 | 1.2 | 1.2 |
| **Test Sample Related** | | | | | | | |
| Device Positioning | 3.0 | N | 1 | 1 | 1 | 3.0 | 3.0 |
| Device Holder | 3.6 | N | 1 | 1 | 1 | 3.6 | 3.6 |
| Power Drift | 5.0 | R | 1.732 | 1 | 1 | 2.9 | 2.9 |
| Power Scaling | 0.0 | R | 1.732 | 1 | 1 | 0.0 | 0.0 |
| **Phantom and Setup** | | | | | | | |
| Phantom Uncertainty | 6.1 | R | 1.732 | 1 | 1 | 3.5 | 3.5 |
| SAR correction | 0.0 | R | 1.732 | 1 | 0.84 | 0.0 | 0.0 |
| Liquid Conductivity Repeatability | 0.2 | N | 1 | 0.78 | 0.71 | 0.1 | 0.1 |
| Liquid Conductivity (target) | 5.0 | R | 1.732 | 0.78 | 0.71 | 2.3 | 2.0 |
| Liquid Conductivity (mea.) | 2.5 | R | 1.732 | 0.78 | 0.71 | 1.1 | 1.0 |
| Temp. unc. - Conductivity | 3.4 | R | 1.732 | 0.78 | 0.71 | 1.5 | 1.4 |
| Liquid Permittivity Repeatability | 0.15 | N | 1 | 0.23 | 0.26 | 0.0 | 0.0 |
| Liquid Permittivity (target) | 5.0 | R | 1.732 | 0.23 | 0.26 | 0.7 | 0.8 |
| Liquid Permittivity (mea.) | 2.5 | R | 1.732 | 0.23 | 0.26 | 0.3 | 0.4 |
| Temp. unc. - Permittivity | 0.83 | R | 1.732 | 0.23 | 0.26 | 0.1 | 0.1 |
| **Combined Std. Uncertainty** | | | | | | 11.4% | 11.4% |
| **Coverage Factor for 95 %** | | | | | | K=2 | K=2 |
| **Expanded STD Uncertainty** | | | | | | 22.9% | 22.7% |

**Table 17.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz**

# 18. References


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

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

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

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[8] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015

[9] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[10] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.

# Appendix A. Plots of System Performance Check

The plots are shown as follows.

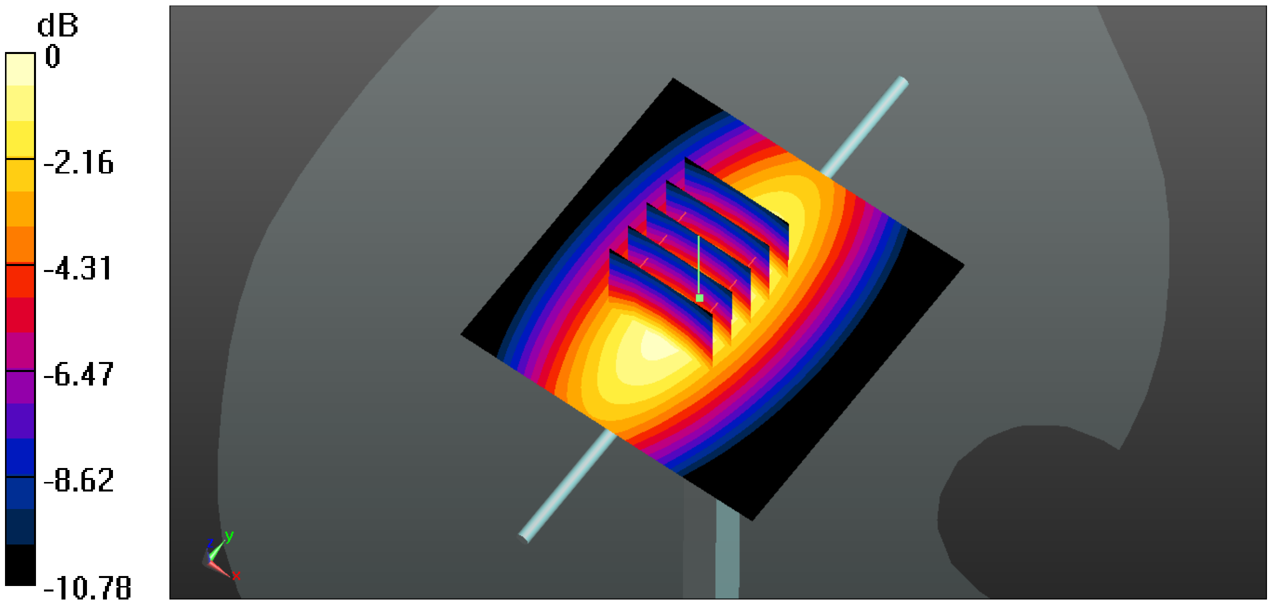
# #System Check_Head_835MHz_160328

Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL_835_160328 Medium parameters used: f = 835 MHz; $\sigma$ = 0.887 S/m; $\varepsilon_r$ = 41.987; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.5 ℃ ; **Liquid Temperature**: 22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(9.96, 9.96, 9.96); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.79 W/kg

**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 56.55 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.30 W/kg
**SAR(1 g) = 2.2 W/kg; SAR(10 g) = 1.44 W/kg**
Maximum value of SAR (measured) = 2.79 W/kg




0 dB = 2.79 W/kg

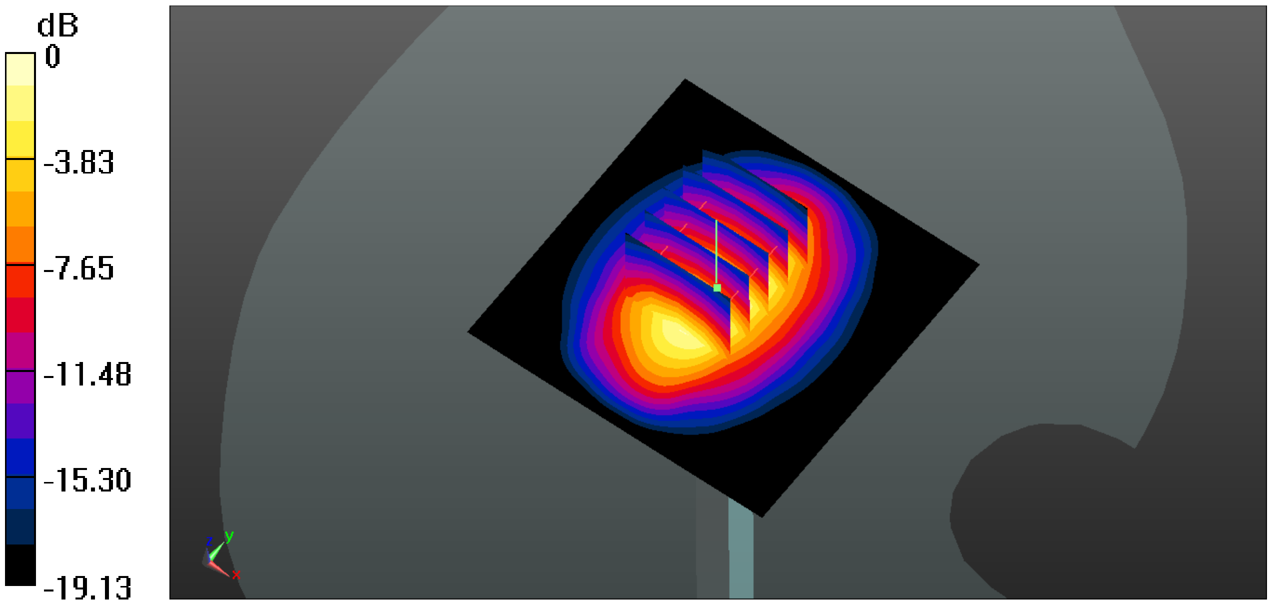
# #System Check_Head_1900MHz_160328

Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL_1900_160328 Medium parameters used: f = 1900 MHz; $\sigma$ = 1.421 S/m; $\varepsilon_r$ = 41.283; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.2 ℃ ; **Liquid Temperature**: 22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(8.22, 8.22, 8.22); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.4 W/kg

**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 101.6 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 18.7 W/kg
**SAR(1 g) = 10 W/kg; SAR(10 g) = 5.15 W/kg**
Maximum value of SAR (measured) = 14.1 W/kg




0 dB = 14.1 W/kg

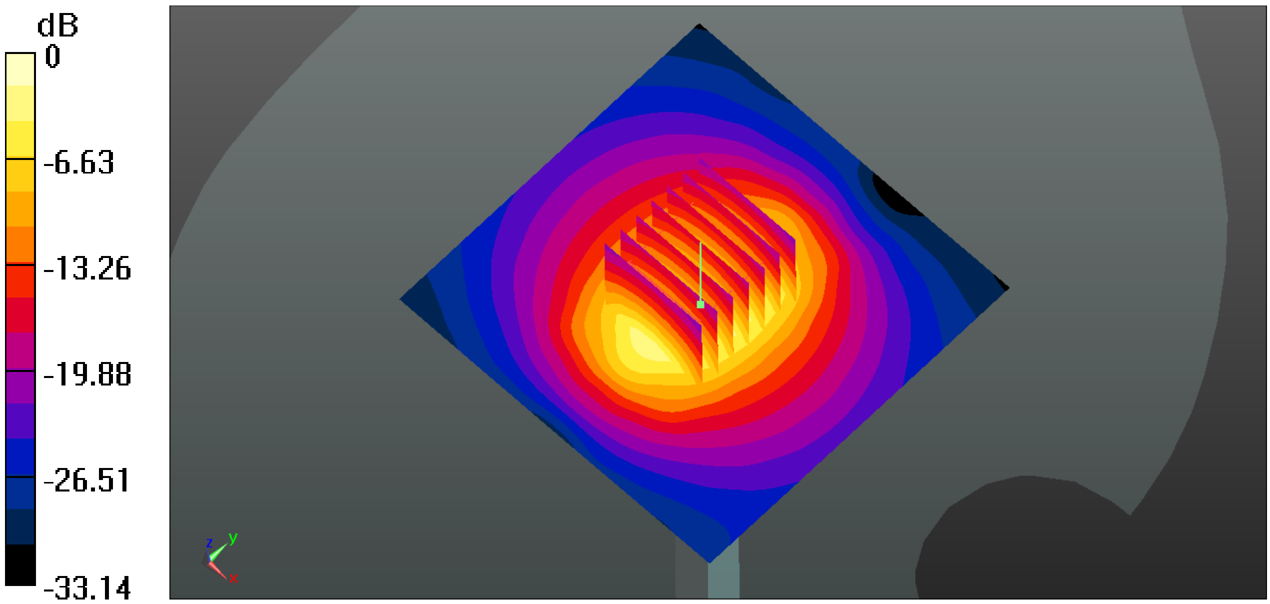
# #System Check_Head_2450MHz_160329

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL_2450_160329 Medium parameters used: f = 2450 MHz; $\sigma$ = 1.75 S/m; $\varepsilon_r$ = 39.767; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.3 ℃ ; **Liquid Temperature**: 22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(7.58, 7.58, 7.58); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (81x81x1):** Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 19.5 W/kg

**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.11 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 25.4 W/kg
**SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.85 W/kg**
Maximum value of SAR (measured) = 19.1 W/kg




0 dB = 19.1 W/kg

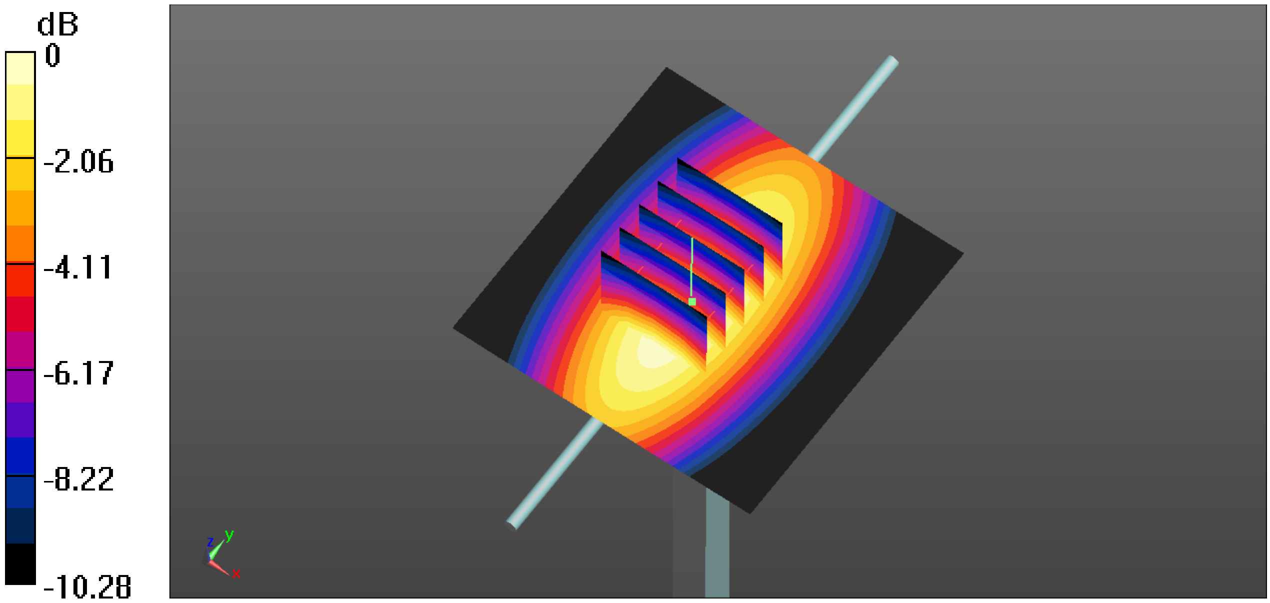
## #System Check_Body_835MHz_160326

Communication System: UID 0, CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: MSL_835_160326 Medium parameters used: f = 835 MHz; $\sigma$ = 0.954 S/m; $\varepsilon_r$ = 55.682; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.3 ℃ ; **Liquid Temperature**: 22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(9.99, 9.99, 9.99); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QDOVA001BB; Serial: TP:1233
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.38 W/kg

**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 49.85 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.24 W/kg
**SAR(1 g) = 2.21 W/kg; SAR(10 g) = 1.46 W/kg**
Maximum value of SAR (measured) = 2.37 W/kg




0 dB = 2.38 W/kg

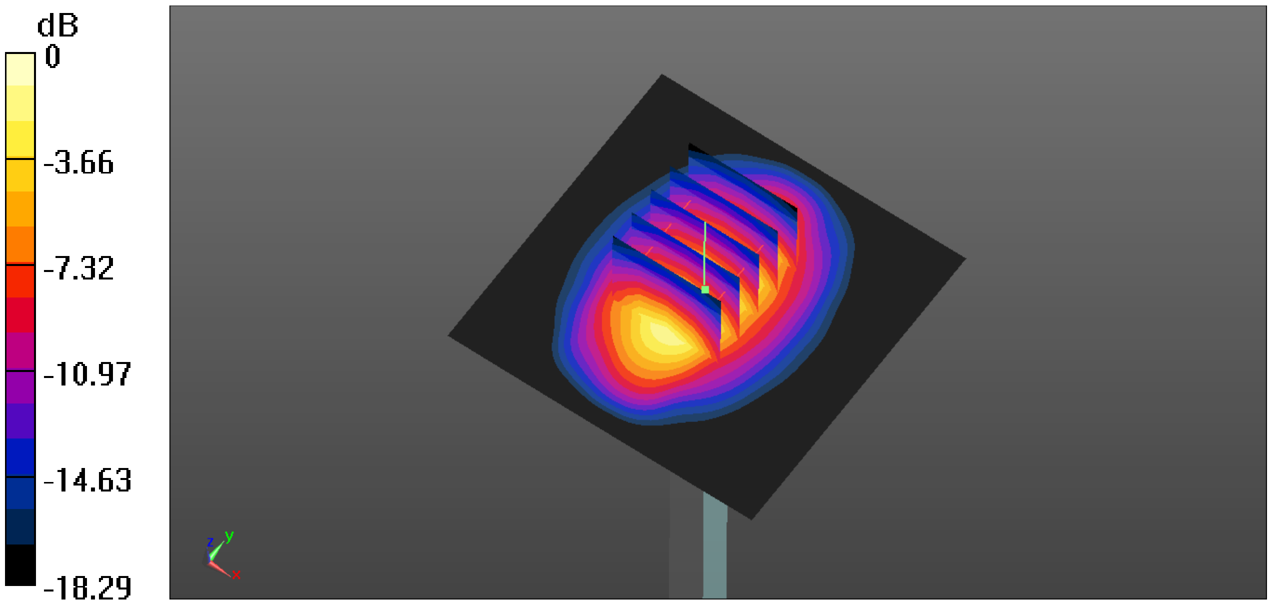
# #System Check_Body_1900MHz_160325

Communication System: UID 0, CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: MSL_1900_160325 Medium parameters used: f = 1900 MHz; $\sigma$ = 1.547 S/m; $\varepsilon_r$ = 53.803; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.3 ℃ ; **Liquid Temperature**: 22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3935; ConvF(7.99, 7.99, 7.99); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (61x61x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.7 W/kg

**Pin=250mW/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 85.87 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 18.7 W/kg
**SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.34 W/kg**
Maximum value of SAR (measured) = 14.8 W/kg




0 dB = 14.8 W/kg

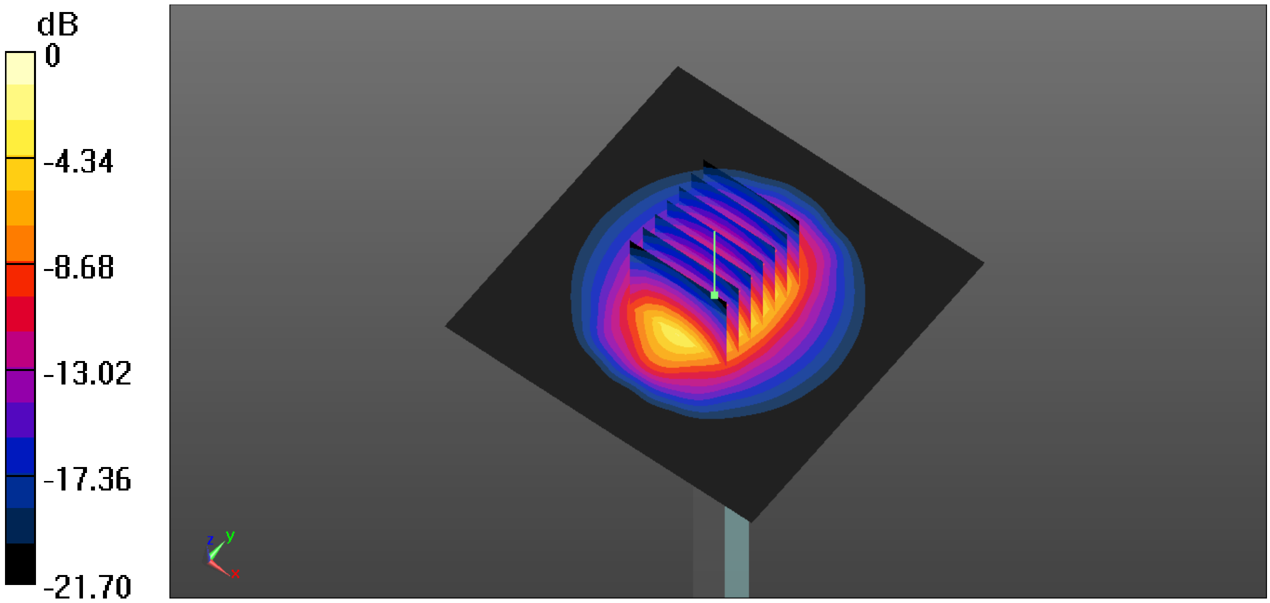
# #System Check_Body_2450MHz_160329

Communication System: UID 0, CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160329 Medium parameters used: f = 2450 MHz; $\sigma$ = 1.951 S/m; $\varepsilon_r$ = 53.859; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.5 ℃ ; **Liquid Temperature**: 22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(7.08, 7.08, 7.08); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QDOVA001BB; Serial: TP:1233
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Pin=250mW/Area Scan (81x81x1):** Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 19.9 W/kg

**Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.48 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 26.6 W/kg
**SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.96 W/kg**
Maximum value of SAR (measured) = 19.8 W/kg




0 dB = 19.9 W/kg

# Appendix B. Plots of High SAR Measurement

The plots are shown as follows.

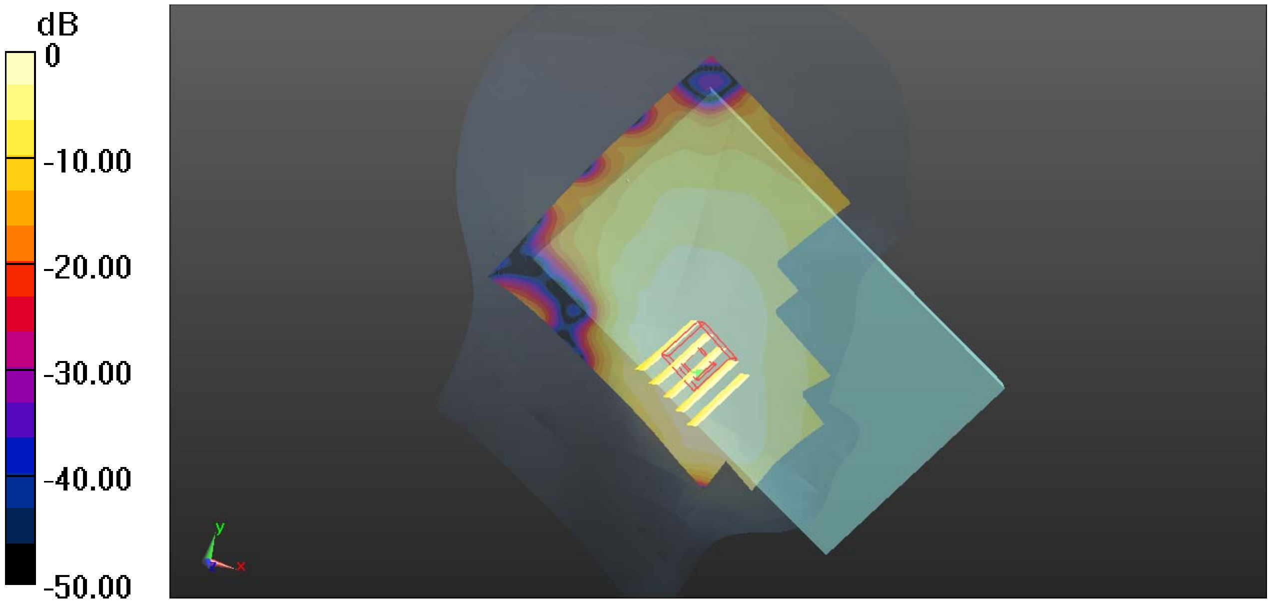
# #01_GSM850_GPRS(4 Tx slots)_Left Cheek_Ch251

Communication System: UID 0, GPRS/EDGE12 (0); Frequency: 848.8 MHz;Duty Cycle: 1:2.08
Medium: HSL_835_160328 Medium parameters used: f = 848.8 MHz; $\sigma$ = 0.883 S/m; $\varepsilon_r$ = 41.543; $\rho$= 1000 kg/m$^3$
**Ambient Temperature**: 23.5 ℃ ; **Liquid Temperature**: 22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(9.96, 9.96, 9.96); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch251/Area Scan (91x151x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.0382 W/kg

**Ch251/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.3960 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.0410 W/kg
**SAR(1 g) = 0.033 W/kg; SAR(10 g) = 0.026 W/kg**
Maximum value of SAR (measured) = 0.0377 W/kg




0 dB = 0.0377 W/kg

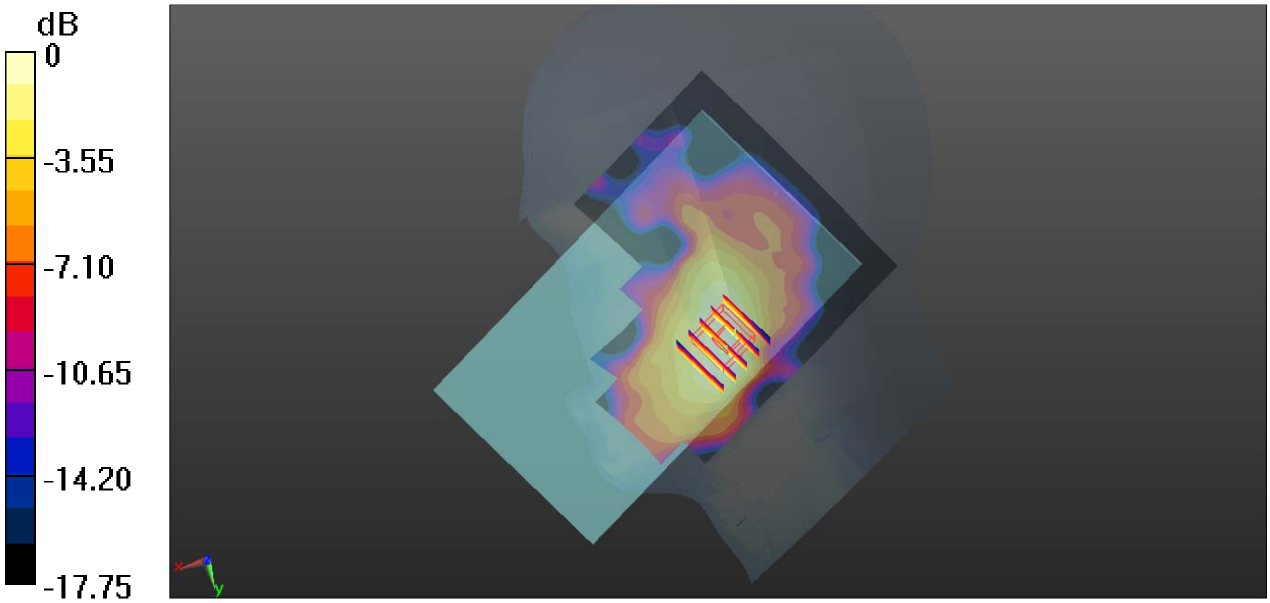
## #02_GSM1900_GPRS(4 Tx slots)_Right Cheek_Ch810

Communication System: UID 0, GPRS/EDGE12 (0); Frequency: 1909.8 MHz;Duty Cycle: 1:2.08
Medium: HSL_1900_160328 Medium parameters used: f = 1909.8 MHz; $\sigma$ = 1.43 S/m; $\varepsilon_r$ = 41.238; $\rho$= 1000 kg/m$^3$
**Ambient Temperature**: 23.2 ℃ ; **Liquid Temperature**: 22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(8.22, 8.22, 8.22); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch810/Area Scan (91x151x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.0496 W/kg

**Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.0530 W/kg
**SAR(1 g) = 0.037 W/kg; SAR(10 g) = 0.024 W/kg**
Maximum value of SAR (measured) = 0.0446 W/kg




0 dB = 0.0496 W/kg

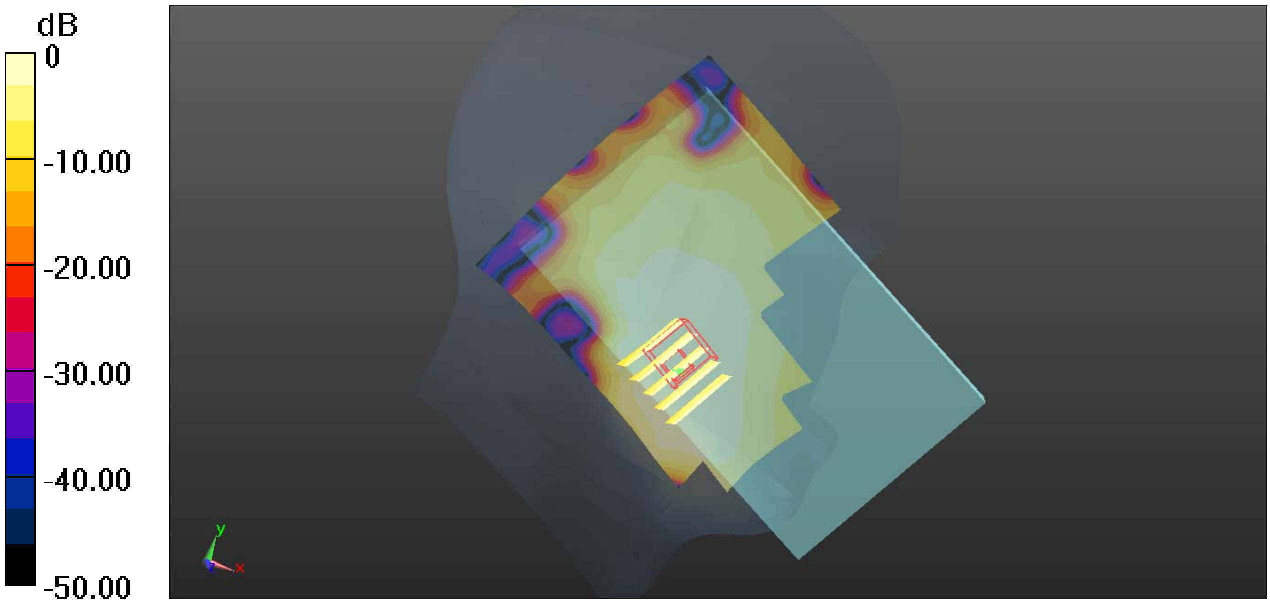
# #03_WCDMA Band V_RMC 12.2Kbps_Left Cheek_Ch4233

Communication System: UID 0, UMTS (0); Frequency: 846.6 MHz;Duty Cycle: 1:1
Medium: HSL_835_160328 Medium parameters used: f = 846.6 MHz; $\sigma$ = 0.884 S/m; $\varepsilon_r$ = 41.628; $\rho$= 1000 kg/m$^3$
**Ambient Temperature**: 23.5 ℃ ; **Liquid Temperature**: 22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(9.96, 9.96, 9.96); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch4233/Area Scan (91x151x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.0320 W/kg

**Ch4233/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.0360 W/kg
**SAR(1 g) = 0.028 W/kg; SAR(10 g) = 0.022 W/kg**
Maximum value of SAR (measured) = 0.0321 W/kg




0 dB = 0.0321 W/kg

Test Laboratory:Sporton International Inc SAR Testing Lab Date: 2016.03.28

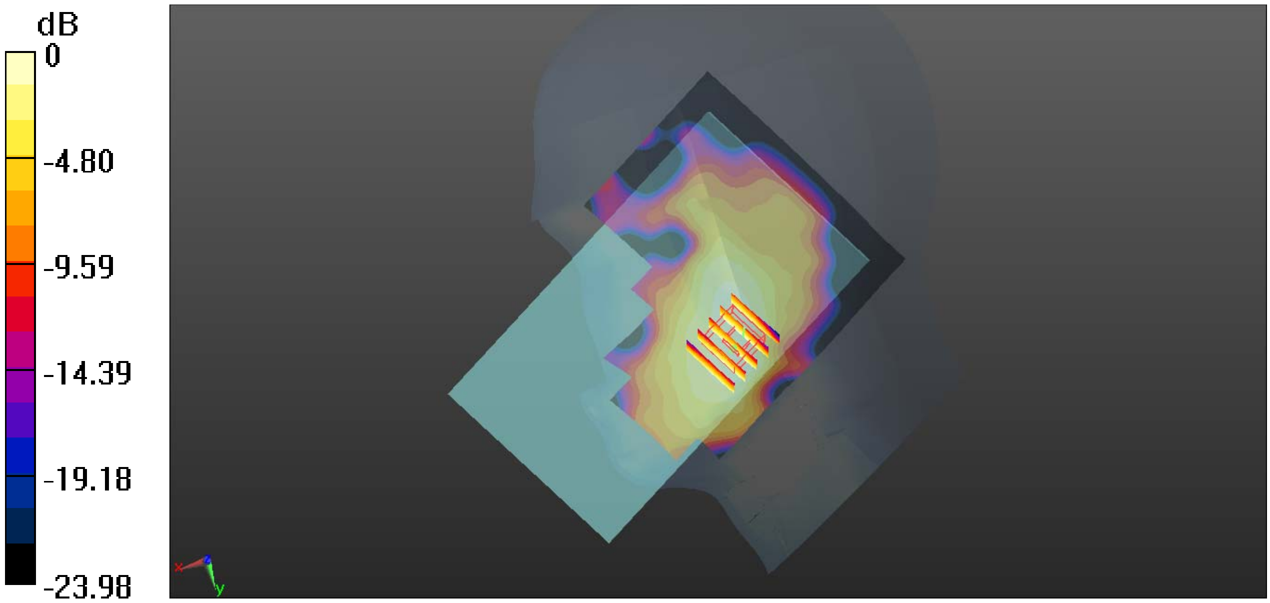
## #04_WCDMA Band II_RMC 12.2Kbps_Right Cheek_Ch9538

Communication System: UID 0, UMTS (0); Frequency: 1907.6 MHz;Duty Cycle: 1:1
Medium: HSL_1900_160328 Medium parameters used: f = 1907.6 MHz; $\sigma$ = 1.429 S/m; $\varepsilon_r$ = 41.247;$\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.2 ℃ ; **Liquid Temperature**: 22.6 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(8.22, 8.22, 8.22); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch9538/Area Scan (91x151x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.0609 W/kg

**Ch9538/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.3470 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.0720 W/kg
**SAR(1 g) = 0.050 W/kg; SAR(10 g) = 0.032 W/kg**
Maximum value of SAR (measured) = 0.0607 W/kg




0 dB = 0.0609 W/kg

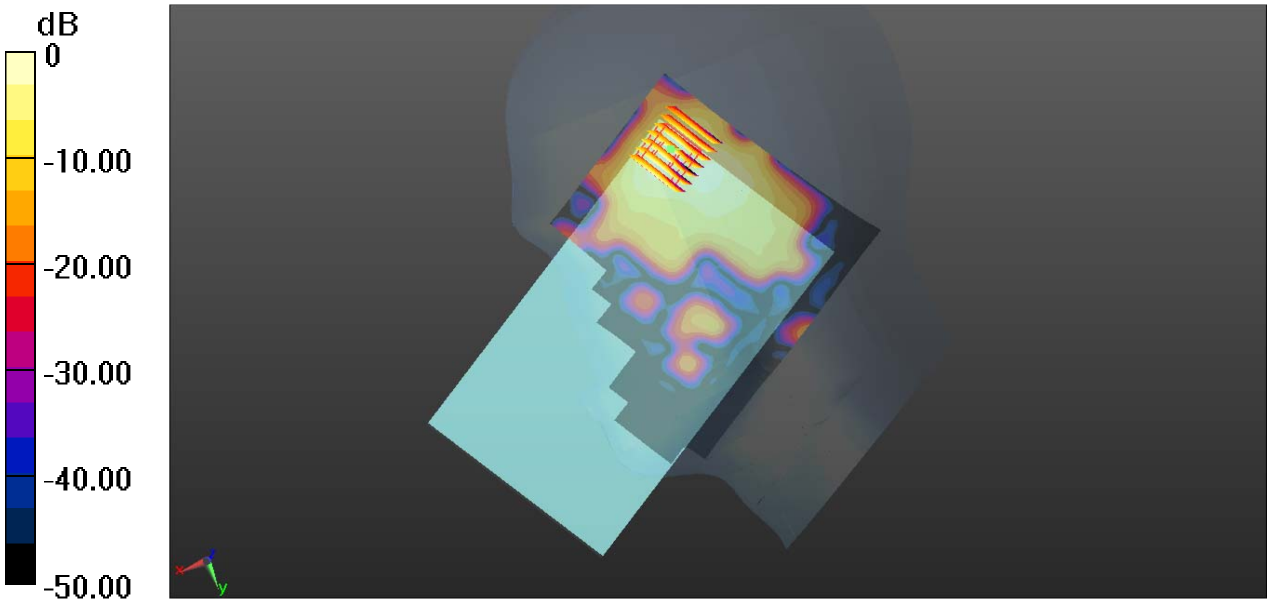
# #05_WLAN2.4GHz_802.11b 1Mbps_Right Cheek_Ch11

Communication System: UID 0, WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: HSL_2450_160329 Medium parameters used: f = 2462 MHz; $\sigma$ = 1.763 S/m; $\varepsilon_r$ = 39.729; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.3 ℃ ; **Liquid Temperature**: 22.7 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(7.58, 7.58, 7.58); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM1; Type: QD000P40CD; Serial: TP:1670
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch11/Area Scan (111x191x1):** Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.296 W/kg

**Ch11/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.5740 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.424 W/kg
**SAR(1 g) = 0.164 W/kg; SAR(10 g) = 0.064 W/kg**
Maximum value of SAR (measured) = 0.286 W/kg




0 dB = 0.286 W/kg

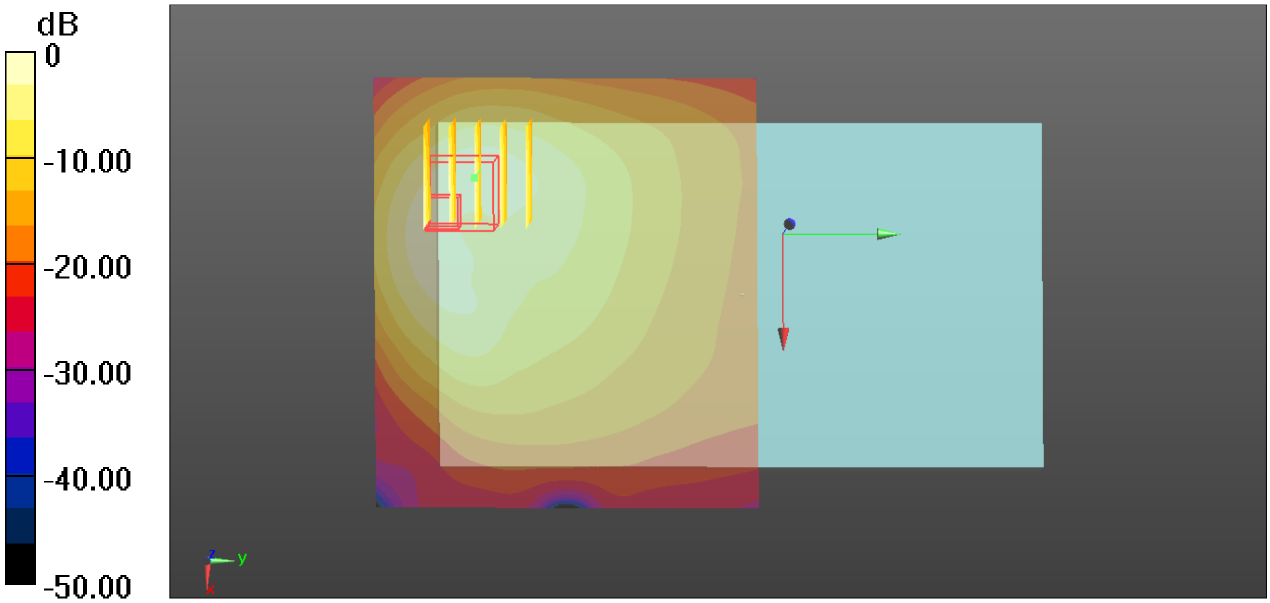
## #06_GSM850_GPRS(4 Tx slots)_Bottom Face_0mm_Ch251

Communication System: UID 0, GPRS/EDGE12 (0); Frequency: 848.8 MHz;Duty Cycle: 1:2.08
Medium: MSL_835_160326 Medium parameters used: f = 848.8 MHz; σ = 0.972 S/m; $\varepsilon_r$ = 55.608; ρ= 1000 kg/m$^3$
**Ambient Temperature**: 23.3 ℃ ; **Liquid Temperature**: 22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(9.99, 9.99, 9.99); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QDOVA001BB; Serial: TP:1233
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch251/Area Scan (91x81x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.599 W/kg

**Ch251/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.105 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.758 W/kg
**SAR(1 g) = 0.380 W/kg; SAR(10 g) = 0.208 W/kg**
Maximum value of SAR (measured) = 0.571 W/kg




0 dB = 0.571 W/kg

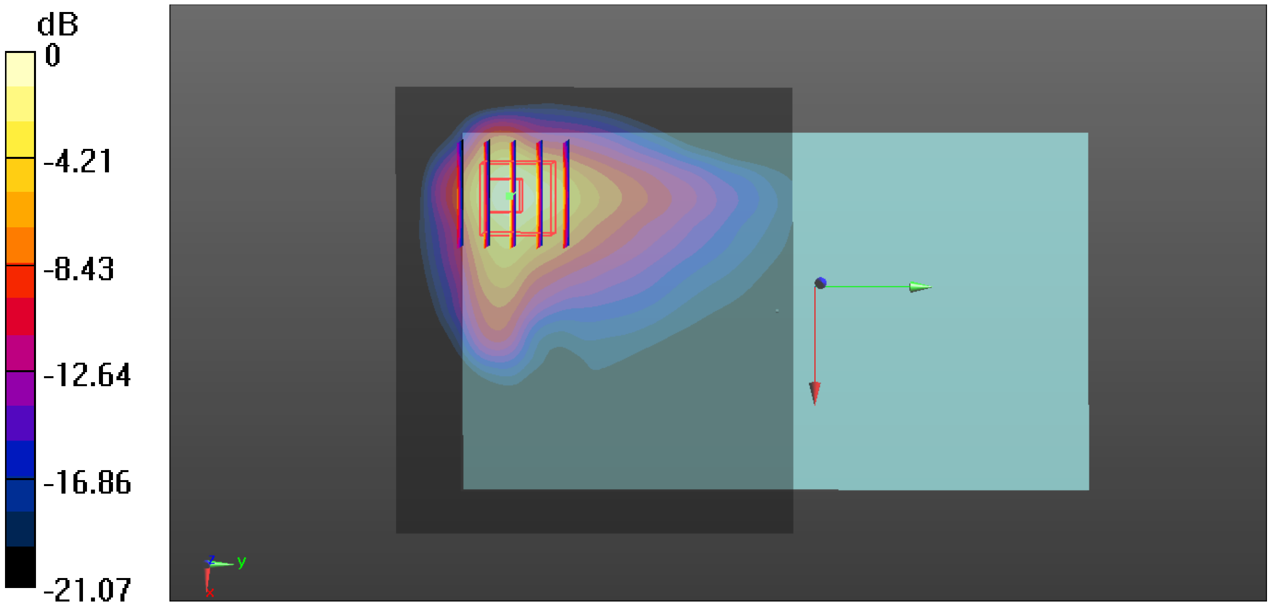
## #07_GSM1900_GPRS(4 Tx slots)_Bottom Face_0mm_Ch810

Communication System: UID 0, GPRS/EDGE12 (0); Frequency: 1909.8 MHz;Duty Cycle: 1:2.08
Medium: MSL_1900_160325 Medium parameters used: f = 1909.8 MHz; $\sigma$ = 1.557 S/m; $\varepsilon_r$ = 53.783; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.3 ℃ ; **Liquid Temperature**: 22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3935; ConvF(7.99, 7.99, 7.99); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch810/Area Scan (91x81x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.19 W/kg

**Ch810/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.6270 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.44 W/kg
**SAR(1 g) = 0.622 W/kg; SAR(10 g) = 0.311 W/kg**
Maximum value of SAR (measured) = 0.893 W/kg




0 dB = 1.19 W/kg

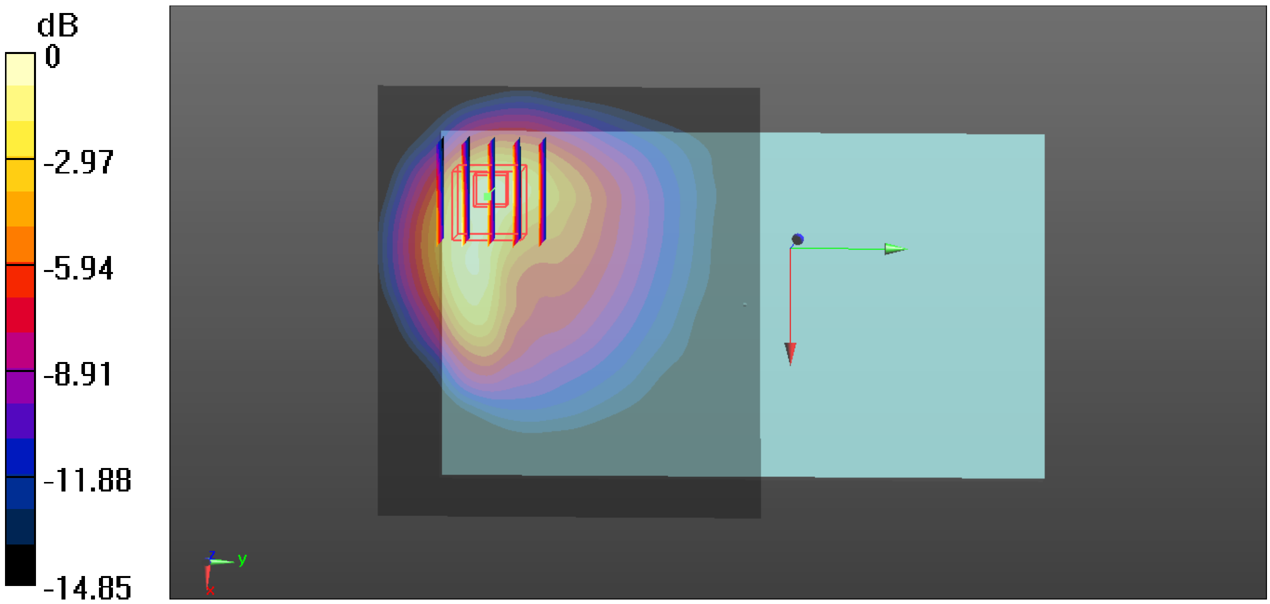
# #08_WCDMA Band V_RMC 12.2Kbps_Bottom Face_0mm_Ch4182

Communication System: UID 0, UMTS (0); Frequency: 836.4 MHz;Duty Cycle: 1:1
Medium: MSL_835_160326 Medium parameters used: f = 836.4 MHz; $\sigma$ = 0.956 S/m; $\varepsilon_r$ = 55.675; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.3 ℃ ; **Liquid Temperature**: 22.8 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3958; ConvF(9.99, 9.99, 9.99); Calibrated: 2015.07.23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QDOVA001BB; Serial: TP:1233
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch4182/Area Scan (91x81x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.554 W/kg

**Ch4182/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.374 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.654 W/kg
**SAR(1 g) = 0.339 W/kg; SAR(10 g) = 0.188 W/kg**
Maximum value of SAR (measured) = 0.495 W/kg




0 dB = 0.554 W/kg

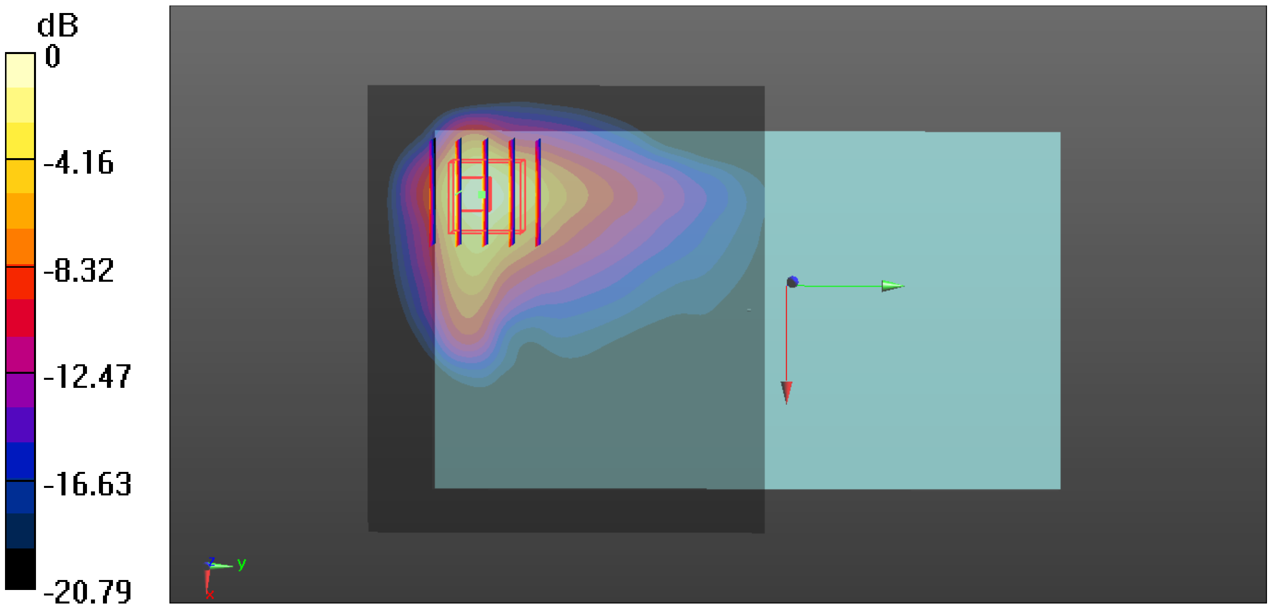
## #09_WCDMA Band II_RMC 12.2Kbps_Bottom Face_0mm_Ch9262

Communication System: UID 0, UMTS (0); Frequency: 1852.4 MHz;Duty Cycle: 1:1
Medium: MSL_1900_160325 Medium parameters used: f = 1852.4 MHz; $\sigma$ = 1.492 S/m; $\varepsilon_r$ = 53.874; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.3 ℃ ; **Liquid Temperature**: 22.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3935; ConvF(7.99, 7.99, 7.99); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1338; Calibrated: 2015.11.23
- Phantom: ELI v5.0(Right); Type: QDOVA001BB; Serial: TP:1225
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch9262/Area Scan (91x81x1):** Interpolated grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.76 W/kg

**Ch9262/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 2.08 W/kg
**SAR(1 g) = 0.906 W/kg; SAR(10 g) = 0.460 W/kg**
Maximum value of SAR (measured) = 1.32 W/kg




0 dB = 1.76 W/kg

Test Laboratory:Sporton International Inc SAR Testing Lab Date: 2016.03.29

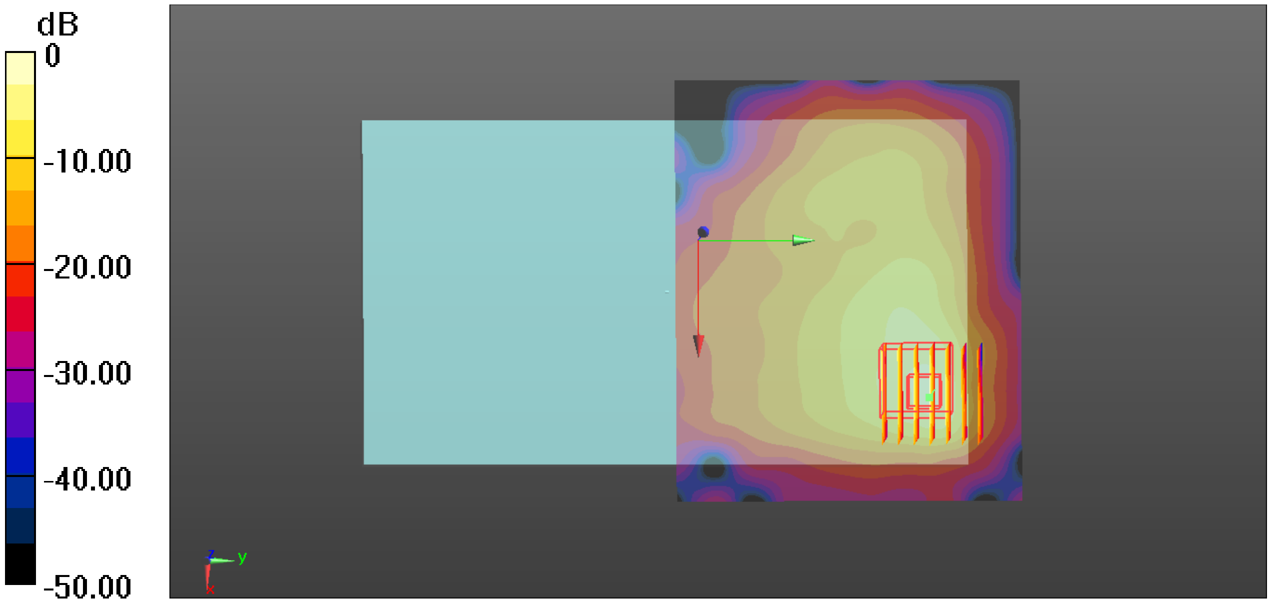
## #10_WLAN2.4GHz_802.11b 1Mbps_Bottom Face_0mm_Ch11

Communication System: UID 0, WIFI (0); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL_2450_160329 Medium parameters used: f = 2462 MHz; $\sigma$ = 1.977 S/m; $\varepsilon_r$ = 53.795; $\rho$ = 1000 kg/m$^3$
**Ambient Temperature**: 23.5 ℃ ; **Liquid Temperature**: 22.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3819; ConvF(7.08, 7.08, 7.08); Calibrated: 2015.11.27;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1386; Calibrated: 2016.02.16
- Phantom: SAM2; Type: QDOVA001BB; Serial: TP:1233
- Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

**Ch11/Area Scan (111x91x1):** Interpolated grid: dx=12mm, dy=12mm
Maximum value of SAR (interpolated) = 0.782 W/kg

**Ch11/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 2.24 W/kg
**SAR(1 g) = 0.634 W/kg; SAR(10 g) = 0.211 W/kg**
Maximum value of SAR (measured) = 1.26 W/kg




0 dB = 1.26 W/kg