# SAR Evaluation Report
# for
# IEEE Std1528-2013, FCC KDB Publication 648474 D04 Handset SAR v01r01 and 47CFR § 2.1093

## Report No.:SEF1408065

| | | |
|---|---|---|
| Client | : | KIMUS TRADING, INC |
| Product | : | TABLET PC |
| Trade Brand | : | Achieve HighPoints |
| Model | : | H8336 |
| Manufacturer/ supplier | : | Hengdi Digital Technology (ShenZhen) Co., Ltd. |
| Date test campaign completed | : | August 17th,2014 |
| Date of issue | : | August 19th,2014 |
| Test Result | : | ■Compliance ☐Not Compliance |

Statement of Compliance:

The SAR values measured for the test sample are below the maximum recommended level of 1.6 W/kg averaged over any 1g tissue according to FCC KDBs and IEEE Std.1528-2013.

**The test result only corresponds to the tested sample. It is not permitted to copy this report, in part or in full, without the permission of the test laboratory.**

*Total number of pages of this test report: 119pages*

The testing described in this report has been carried out to the best of our knowledge and ability, and our responsibility is limited to the exercise of reasonable care. This certification is not intended to believe the sellers from their legal and/or contractual obligations.

| Test Engineer: | Approved by: |
|---|---|
| Leo Chen | Miro Chueh |

## Applicant Information

| | | |
|---|---|---|
| **Client** | **:** | KIMUS TRADING, INC |
| **Address** | **:** | 6436 Shadow CT. Douglasville, GA 30134 USA |
| **Manufacturer** | **:** | Hengdi Digital Technology (ShenZhen) Co., Ltd. |
| **Address** | **:** | Guanjie Industrial Park, Xinshiqiao, Guihua Village, Guanlan Street, Bao'an Dist, Shenzhen City, China, PRC' |
| **EUT** | **:** | TABLET PC |
| **Model No.** | **:** | H8336 |
| **Standard Applied** | **:** | IEEE Std1528-2013 and 47CFR § 2.1093<br>FCC KDB Publication 648474 D04 Handset SAR v01r02<br>FCC KDB Publication 447498 D01v05r02<br>FCC KDB Publication 865664 D01v01r03 |
| **Laboratory** | **:** | CERPASS TECHNOLOGY CORP.<br>No.66,Tangzhuang Road, Suzhou Industrial Park, Jiangsu 215006, China. |
| **Max. Average Output Power** | **:** | GSM850: 30.40dBm<br>GSM1900: 30.46dBm<br>WCDMA Band IV:22.21dBm<br>WCDMA Band V: 23.54dBm |
| **Max. Reported SAR Value** | **:** | Body<br>GSM850: 0.432W/kg(1g)<br>PCS1900: 0.750 W/kg(1g)<br>WCDMA Band IV: 0.793 W/kg(1g)<br>WCDMA Band V: 0.568 W/kg(1g) |
| **Max. Simultaneous SAR Value** | **:** | Body<br>WCDMA Band IV+802.11b: 1.181 W/kg(1g) |

## Contents

# 1. General Information

## 1.1. Executive Summary

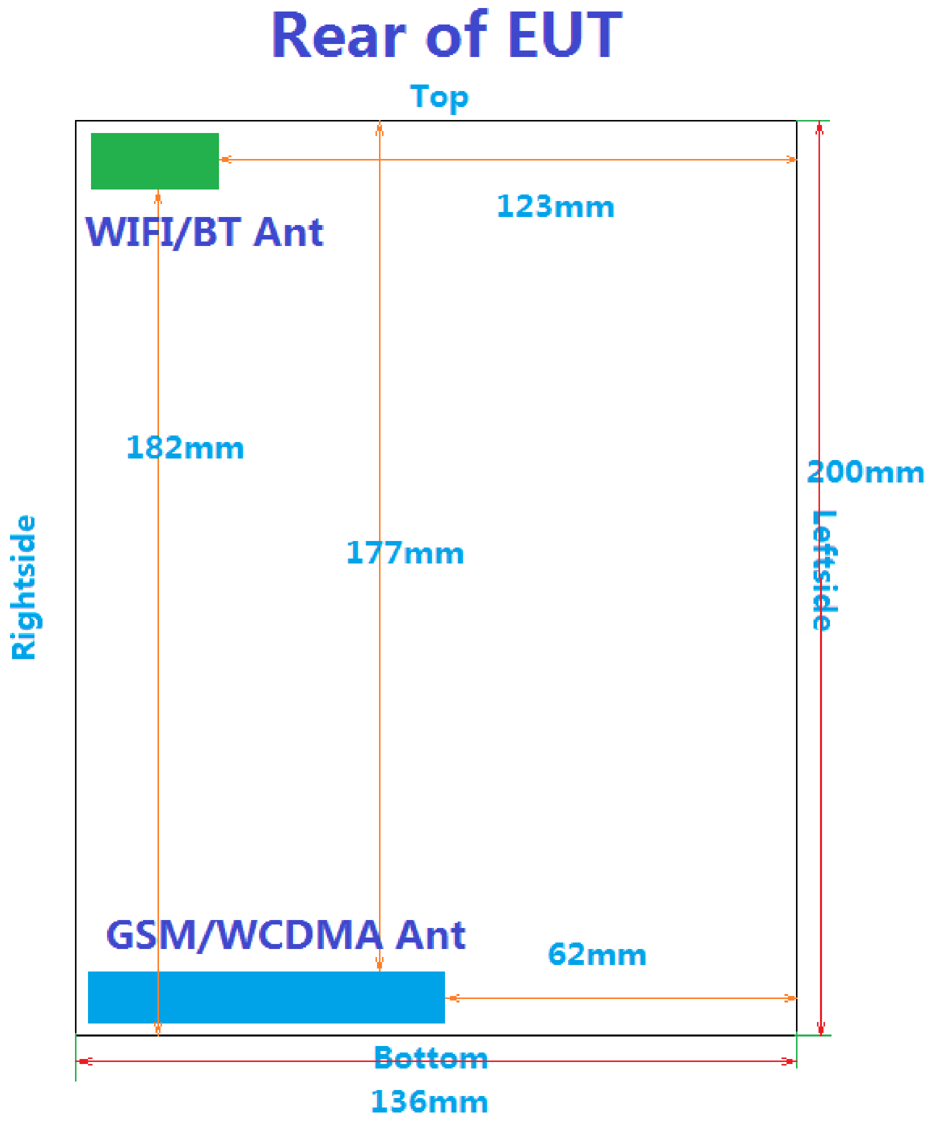
The EUT is a Tablet PC with operations in 850MHz, 1700MHz, 1900MHz and 2450MHz frequency ranges. It contains GSM/GPRS/EDGE, WCDMA band IV, WCDMA band V, 802.11b/g/n and BT functions for SAR testing. The measurement was conducted by CERPASS, carried out with the dosimetric assessment system under DASY5. And it conducts according to the IEEE Std.1528-2013 and FCC KDBs for SAR evaluating compliance.

## 1.2. Description of Equipment under Test

| | |
|---|---|
| **Product Name** | TABLET PC |
| **Model No.** | H8336 |
| **Device Category** | Portable |
| **RF Exposure Environment** | Uncontrolled |
| **Antenna Type** | Internal |
| **2G** | |
| **Support Band** | GSM850/PCS1900 |
| **GPRS Type** | Class B |
| **GPRS Class** | Class 12 |
| **Uplink** | GSM 850: 824~849MHz<br>PCS 1900: 1850~1910MHz |
| **Downlink** | GSM 850: 869~894MHz<br>PCS 1900: 1930~1990MHz |
| **Release Version** | R99 |
| **Type of modulation** | GMSK for GSM/GPRS; 8PSK for EDGE |
| **Antenna Gain** | GSM 850: -0.8dBi<br>PCS1900: -0.8dBi |

| | |
|---|---|
| **3G** | |
| **Support Band** | WCDMA Band IV/WCDMA Band V |
| **Uplink** | WCDMA Band IV: 1710~1755MHz<br>WCDMA Band V: 824~849MHz |
| **Downlink** | WCDMA Band IV: 2110~2155MHz<br>WCDMA Band V: 869~894MHz |
| **Release Version** | Rel-6 |
| **Type of modulation** | QPSK |
| **Antenna Gain** | WCDMA Band IV: -0.8dBi<br>WCDMA Band V: -0.8dBi |
| **Bluetooth** | |
| **Bluetooth Frequency** | 2402~2480MHz |
| **Bluetooth Version** | V3.0+ HS |
| **Type of modulation** | FHSS |
| **Data Rate** | 1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps (8DPSK) |
| **Antenna Gain** | 1.0dBi |
| **Wi-Fi** | |
| **Hotspots Function** | YES |
| **Wi-Fi Frequency** | 802.11b/g/n(20MHz): 2412 ~ 2462 MHz<br>802.11n(40MHz):2422~2452 MHz |
| **Type of modulation** | 802.11b: DSSS; 802.11g/n: OFDM |
| **Data Rate** | 802.11b: 1/2/5.5/11 Mbps |
| | 802.11g: 6/9/12/18/24/36/48/54 Mbps |
| | 802.11n: up to 150 Mbps |
| **Antenna Gain** | 1.0dBi |

## 1.3. Antenna Location




## 1.4. Simultaneous Transmission Configurations

**Simultaneous Transmission Scenarios**

| Mode | Back | Front | Top | Bottom | Right | Left |
|---|---|---|---|---|---|---|
| GPRS850 | Yes | No | No | Yes | Yes | No |
| GPRS1900 | Yes | No | No | Yes | Yes | No |
| WCDMA Band IV | Yes | No | No | Yes | Yes | No |
| WCDMA Band V | Yes | No | No | Yes | Yes | No |
| Wi-Fi | Yes | No | Yes | No | Yes | No |

**Simultaneous Transmission Condition**

| RF Exposure Condition | Capable Transmit Configurations |
|---|---|
| Head | 1. N/A |
| Body-worn Accessory | 1. GSM 850/1900 Voice +BT<br>2. GSM 850/1900(GPRS/EDGE) + BT<br>3. WCDMA Band IV/V (Voice)+ BT<br>4. WCDMA Band IV/V (RMC) + BT<br>5. GSM 850/1900(GPRS/EDGE) + WiFi 2.4GHz<br>6. WCDMA Band IV/V (RMC)+ WiFi 2.4GHz |
| Wireless Router (Hotspot) | 1. GSM 850/1900 (GPRS/EDGE) + WiFi 2.4GHz<br>2. WCDMA Band IV/V + WiFi 2.4GHz |

Notes:

1. GPRS/EDGE and WCDMA support Hotspot.
2. By reason of their independent modules and antennas, when GSM/GPRS or WCDMA is on, BT function also can be at work.
3. WiFi 2.4GHz Radio cannot transmit simultaneously with Bluetooth Radio.
4. According to FCC KDB Publication 447498 D01v05r02 section5.3, transmitter are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneously transmission analysis.

## 1.5. SAR Test Exclusions Applied

**Wi-Fi/Bluetooth**

Per FCC KDB 447498 D01v05r02, the SAR exclusion threshold for distances<50mm is defined by the following equation:

$$\frac{\textit{Max Power of Channel(mW)}}{\textit{Test Separation Distance(mm)}} \times \sqrt{\textit{Frequency(GHz)}} \leq 3.0$$

Based on the maximum conducted power and the antenna to use separation distance, Max. averaged output power Bluetooth are lower the $P_{re}$, therefore BT SAR is not required;

*[(1.85mW/10)* √2.402] = 0.287 <3.0, Bluetooth for Body.*

Note: 1.85mW comes from 2.67dBm.

**Licensed Transmitter(s)**

GSM/GPRS/EDGE DTM is not supported for US bands. Therefore, the GSM Voice modes in this report do not transmit simultaneously with GPRS/EDGE Data.

This device is capable of QPSK HSUPA/HSDPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA/HSDPA in KDB 941225 D01v02.

When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.

## 1.6. Power Reduction for SAR

There is no power reduction used for any band/mode implemented in this device for SAR purposes.

## 1.7. Environment Condition

| Item | Target | Measured |
|---|---|---|
| Ambient Temperature(℃) | 18~25 | 21.5±2 |
| Temperature of Simulant(℃) | 20~22 | 21±2 |
| Relative Humidity(%RH) | 30~70 | 52 |

## 1.8. Test Standards

1. IEEE Std.1528-2013
2. FCC KDB Publication 447498 D01 General RF Exposure Guidance v05r02
3. FCC KDB Publication 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r03
4. FCC KDB Publication 941225 D01 SAR test for 3G devices v02
5. FCC KDB Publication 941225 D02 HSPA and 1x Advanced v02r02
6. FCC KDB Publication 941225 D03 SAR Test Reduction GSM GPRS EDGE v01
7. FCC KDB Publication 941225 D04 SAR for GSM EGPRS Dual Xfer Mode v01
8. FCC KDB Publication 941225 D06 Hotspot Mode SAR v01r01
9. FCC KDB Publication 648474 D04 Handset SAR v01r02
10. FCC KDB Publication 248227 D01 SAR measurement for 802 11 a b g v01r02

## 1.9. RF Exposure Limits

| Human Exposure | Basic restrictions for electric, magnetic and electromagnetic fields. (Unit in mW/g or W/kg) |
|---|---|
| Spatial Peak SAR[1] (Head and Body) | 1.60 |
| Spatial Average SAR[2] (Whole Body) | 0.08 |
| Spatial Peak SAR[3] (Arms and Legs) | 4.00 |

**Notes:**

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

# 2. The SAR Measurement Procedure

## 2.1. System Performance Check

### 2.1.1 Purpose

1. To verify the simulating liquids are valid for testing.
2. To verify the performance of testing system is valid for testing.

### 2.1.2 Tissue Dielectric Parameters for Head and Body Phantoms

| Target Frequency | Head | | Body | |
|---|---|---|---|---|
| (MHz) | $\varepsilon_r$ | $\sigma$ (S/m) | $\varepsilon_r$ | $\sigma$ (S/m) |
| 150 | 52.3 | 0.76 | 61.9 | 0.80 |
| 300 | 45.3 | 0.87 | 58.2 | 0.92 |
| 450 | 43.5 | 0.87 | 56.7 | 0.94 |
| 835 | 41.5 | 0.90 | 55.2 | 0.97 |
| **850** | 41.5 | 0.92 | **55.2** | **0.99** |
| 900 | 41.5 | 0.97 | 55.0 | 1.05 |
| 915 | 41.5 | 0.98 | 55.0 | 1.06 |
| 1450 | 40.5 | 1.20 | 54.0 | 1.30 |
| 1610 | 40.3 | 1.29 | 53.8 | 1.40 |
| **1800 – 2000** | 40.0 | 1.40 | **53.3** | **1.52** |
| 2450 | 39.2 | 1.80 | **52.7** | **1.95** |
| 3000 | 38.5 | 2.40 | 52.0 | 2.73 |
| 5800 | 35.3 | 5.27 | 48.2 | 6.00 |

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

### 2.1.3 Tissue Calibration Result

- The dielectric parameters of the liquids were verified prior to the SAR evaluation using DASY5 Dielectric Assessment Kit and Agilent Vector Network Analyzer E5071C.

**Body Tissue Simulant Measurement**

| Frequency [MHz] | Description | Dielectric Parameters | | Tissue Temp. [°C] |
|---|---|---|---|---|
| | | $\varepsilon_r$ | σ [s/m] | |
| 850 MHz | Reference result<br>± 5% window | 55.2<br>52.44 to 57.96 | 0.99<br>0.94 to 1.04 | N/A |
| | 17-08-2014 | 55.69 | 0.97 | 21.0 |
| 1750MHz | Reference result<br>± 5% window | 53.4<br>50.73 to 56.07 | 1.49<br>1.42 to 1.57 | N/A |
| | 17-08-2014 | 53.09 | 1.47 | 21.0 |
| 1900 MHz | Reference result<br>± 5% window | 53.3<br>50.64 to 55.97 | 1.52<br>1.44 to 1.60 | N/A |
| | 17-08-2014 | 51.08 | 1.54 | 21.0 |
| 2450MHz | Reference result<br>± 5% window | 52.7<br>50.07 to 55.34 | 1.95<br>1.85 to 2.05 | N/A |
| | 17-08-2014 | 51.12 | 1.96 | 21.0 |

- Refer to KDB 865664 D01 v01r01, The depth of body tissue-equivalent liquid in a phantom must be ≥ 15.0 cm with ≤ ± 0.5 cm variation for SAR measurements ≤ 3 GHz and ≥ 10.0 cm with ≤ ± 0.5 cm variation for measurements > 3 GHz.

### 2.1.4 System Performance Check Procedure

The DASY5 installation includes predefined files with recommended procedures for measurements and the system performance check. They are read-only document files and destined as fully defined but unmeasured masks, so the finished system performance check must be saved under a different name. The system performance check document requires the SAM Twin Phantom or ELI4 Phantom, so the phantom must be properly installed in your system. (User defined measurement procedures can be created by opening a new document or editing an existing document file). Before you start the system performance check, you need only to tell the system with which components (probe, medium, and device) you are performing the system performance check; the system will take care of all parameters.

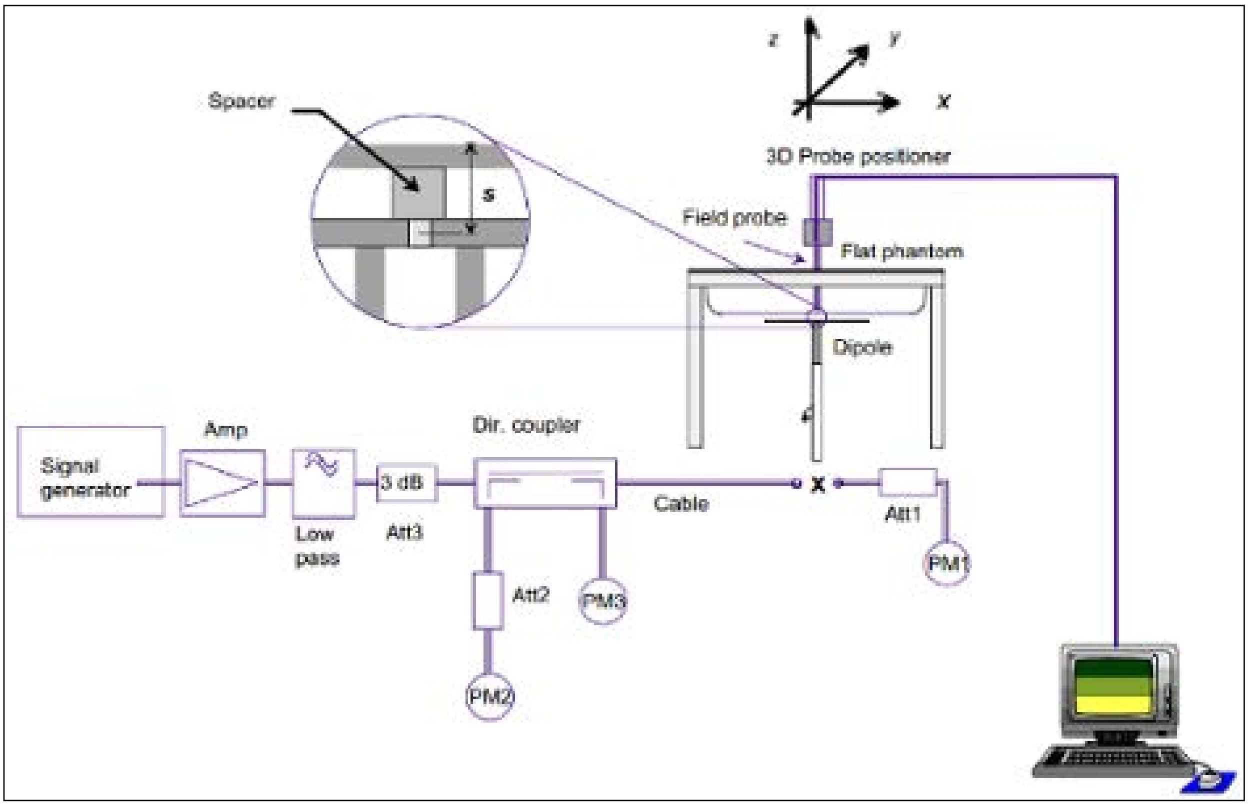
• **The Power Reference Measurement and Power Drift Measurement** jobs are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the Dipole output power. If it is too high (above ±0.2 dB), the system performance check should be repeated;

• **The Surface Check** job tests the optical surface detection system of the DASY5 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ±0.1mm). In that case it is better to abort the system performance check and stir the liquid;

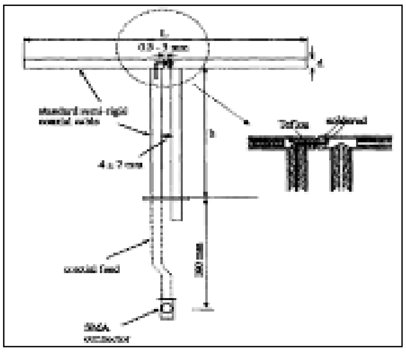
• **The Area Scan** job measures the SAR above the dipole on a plane parallel to the surface. It is used to locate the approximate location of the peak SAR. The proposed scan uses large grid spacing for faster measurement; due to the symmetric field, the peak detection is reliable;

• **The Zoom Scan j**ob measures the field in a volume around the peak SAR value assessed in the previous Area Scan job (for more information see the application note on SAR evaluation). If the system performance check gives reasonable results. The dipole input power(forward power) was 250mW, 1 g and 10 g spatial average SAR values normalized to 1W dipole input power give reference data for comparisons and it's equal to 10x(dipole forward power). The next sections analyze the expected uncertainties of these values, as well as additional checks for further information or troubleshooting.

### 2.1.5 System Performance Check Setup




### 2.1.6 Validation Dipoles



The dipoles use is based on the IEEE Std.1528-2013 and FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r01standard, and is complied with mechanical and electrical specifications in line with the requirements of both EN62209-1 and EN62209-2. The table below provides details for the mechanical and electrical specifications for the dipoles.

| Frequency | L (mm) | h (mm) | d (mm) |
|---|---|---|---|
| 850MHz | 158 | 88 | 3.6 |
| 1750MHz | 75.2 | 42.5 | 3.6 |
| 1900MHz | 68.0 | 39.5 | 3.6 |
| 2450MHz | 53.5 | 30.4 | 3.6 |

### 2.1.7 Result of System Performance Check: Valid Result

**System Performance Check at 850MHz, 1700MHz, 1900MHz and 2450MHz for Body.**

**Validation Kit: D850V2-SN: 1008**

| Frequency [MHz] | Description | SAR [w/kg] 1g | SAR [w/kg] 10g | Tissue Temp. [°C] |
|---|---|---|---|---|
| 850 MHz | Reference result<br>± 10% window | 9.62<br>8.66 to 10.58 | 6.27<br>5.64 to 6.90 | N/A |
| | 17-08-2014 | 9.64 | 6.36 | 21.0 |

**Validation Kit: D1750V2-SN: 1097**

| Frequency [MHz] | Description | SAR [w/kg] 1g | SAR [w/kg] 10g | Tissue Temp. [°C] |
|---|---|---|---|---|
| 1750 MHz | Reference result<br>± 10% window | 37.2<br>33.48 to 40.92 | 20.1<br>18.09 to 22.11 | N/A |
| | 17-08-2014 | 38.16 | 20.0 | 21.0 |

**Validation Kit: D1900V2-SN: 5d174**

| Frequency [MHz] | Description | SAR [w/kg] 1g | SAR [w/kg] 10g | Tissue Temp. [°C] |
|---|---|---|---|---|
| 1900 MHz | Reference result<br>± 10% window | 40.4<br>36.36 to 44.44 | 21.5<br>19.35 to 23.65 | N/A |
| | 17-08-2014 | 39.68 | 21.08 | 21.0 |

**Validation Kit: D2450V2-SN: 914**

| Frequency [MHz] | Description | SAR [w/kg] 1g | SAR [w/kg] 10g | Tissue Temp. [°C] |
|---|---|---|---|---|
| 2450 MHz | Reference result<br>± 10% window | 51.5<br>46.35 to 56.65 | 23.9<br>21.51 to 26.29 | N/A |
| | 17-08-2014 | 51.2 | 23.76 | 21.0 |

## 2.2. Test Requirements

### 2.2.1 Test Procedures

**Step 1 Setup a Connection**

First, engineer should record the conducted power before the test. Then establish a call in handset at the maximum power level with a base station simulator via air interface, or make the EUT estimate by itself in testing band. Place the EUT to the specific test location. After the testing, must export SAR test data by SEMCAD. Then writing down the conducted power of the EUT into the report, also the SAR values tested.

**Step 2 Power Reference Measurements**

To measure the local E-field value at a fixed location which value will be taken as a reference value for calculating a possible power drift.

**Step 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 locations even in relatively coarse grids. When an Area Scan has measured all reachable points, it computes the field maximal found in the scanned area, within a range of the global maximum. The range (in dB) 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 KDB 865664 D01v01r03**

| | $\leq$ 3 GHz | > 3 GHz |
|---|---|---|
| Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface | 5 ± 1 mm | $\frac{1}{2}\cdot\delta\cdot\ln(2) \pm 0.5$ mm |
| Maximum probe angle from probe axis to phantom surface normal at the measurement location | 30° ± 1° | 20° ± 1° |
| Maximum area scan spatial resolution: $\Delta x_{Area}$, $\Delta y_{Area}$ | $\leq$ 2 GHz: $\leq$ 15 mm<br>2 – 3 GHz: $\leq$ 12 mm | 3 – 4 GHz: $\leq$ 12 mm<br>4 – 6 GHz: $\leq$ 10 mm |
| | When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device. | |

**Step 4 Zoom Scan**

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The Zoom Scan measures points (refer to table below) within a cube whose 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 g and 10 g and displays these values next to the job's label.

**Zoom Scan Parameters extracted from KDB 865664 D01 v01r01**

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

**Step 5 Power Drift Measurements**

Repetition of the E-field measurement at the fixed location mentioned in Step 1 to make sure the two results differ by less than ± 0.2 dB.

### 2.2.2 Standards of Mobile Phone SAR testing

According to IEEE std.1528-2013, head SAR testing of the mobile phone is a matter of course. Also, per FCC KDB 941225 D06 Hotspot Mode SAR v01r01, when the overall device length and width are ≥ 9 cm x 5 cm respectively, a test separation of 10 mm is required. SAR must be measured for all sides (edges) and surfaces with a transmitting antenna located at ≤ 25 mm from that surface or edge, for the data modes, wireless technologies and frequency bands supporting hotspot mode.

### 2.2.3 Test Channel Choosing

1. Per FCC KDB 941225 D03 SAR Test Reduction GSM GPRS EDGE v01, when the 1-g SAR is ≤0.8 W/kg, testing for low and high channel is optional.
2. Per FCC KDB 941225 D01 SAR test for 3G devices v02, body SAR is not required for handsets with HSUPA/HSDPA capabilities when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75% of the SAR limit.
   Here are HSDPA/HSUPA sub-test setups as show blow, per FCC KDB 941225 D01 v02.

**Sub-Test 1 Setup for Release 5 HSDPA**

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

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

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

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

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

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

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

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

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

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

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

# 3. DASY5 Measurement System

**DASY5 Measurement System**

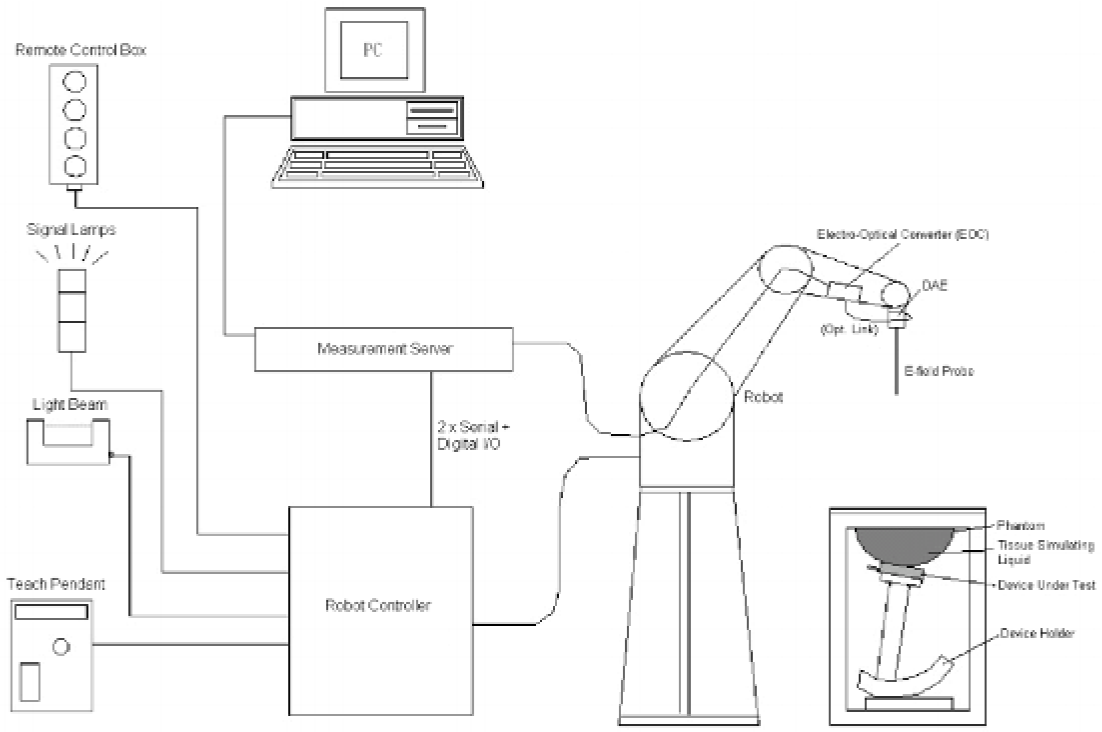



**Figure 2.1 SPEAG DASY5 System Configurations**

The DASY5 system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic(DAE)attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter(ECO)performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows 7
- DASY5 software
- Remove control with teach pendant additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

## 3.1. Uncertainty of Inter-/Extrapolation and Averaging

In order to evaluate the uncertainty of the interpolation, extrapolation and averaged SAR calculation algorithms of the Postprocessor, DASY5 allows the generation of measurement grids which are artificially predefined by analytically based test functions. Therefore, the grids of area scans and zoom scans can be filled with uncertainty test data, according to the SAR benchmark functions of IEEE 1528.The three analytical functions shown in equations as below are used to describe the possible range of the expected SAR distributions for the tested handsets. The field gradients are covered by the spatially flat distribution f1, the spatially steep distribution f3 and f2 accounts for H-field cancellation on the phantom/tissue surface.

$$f_1(x,y,z) = Ae^{-\frac{z}{2a}} \cos^2\left(\frac{\pi}{2}\frac{\sqrt{x'^2+y'^2}}{5a}\right)$$

$$f_2(x,y,z) = Ae^{-\frac{z}{a}} \frac{a^2}{a^2+x'^2}\left(3-e^{-\frac{2z}{a}}\right)\cos^2\left(\frac{\pi}{2}\frac{y'}{3a}\right)$$

$$f_3(x,y,z) = A\frac{a^2}{\frac{a^2}{4}+x'^2+y'^2}\left(e^{-\frac{2z}{a}}+\frac{a^2}{2(a+2z)^2}\right)$$

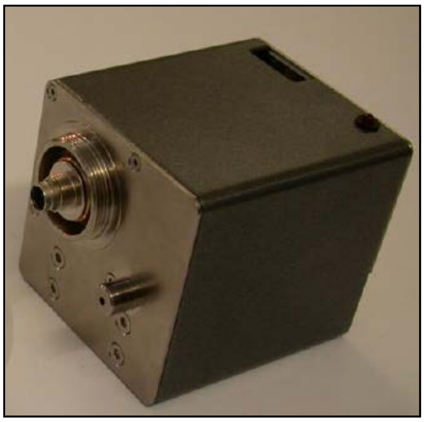
## 3.2. DASY5 E-Field Probe

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.

SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN 62209-1, IEC 62209, etc.) under ISO 17025. The calibration data are in Appendix D**.**

<table>
<tr><th>Model</th><th colspan="2">EX3DV4</th></tr>
<tr><td>Construction</td><td colspan="2">Symmetrical design with triangular core Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE)</td></tr>
<tr><td>Frequency</td><td>10 MHz to 6 GHz<br>Linearity: ± 0.2 dB (30 MHz to 6 GHz)</td><td rowspan="4"></td></tr>
<tr><td>Directivity</td><td>± 0.3 dB in HSL (rotation around probe axis)<br>± 0.5 dB in tissue material (rotation normal to probe axis)</td></tr>
<tr><td>Dynamic Range</td><td>10 µW/g to 100 mW/g<br>Linearity: ± 0.2 dB (noise: typically < 1 µW/g)</td></tr>
<tr><td>Dimensions</td><td>Overall length: 330 mm (Tip: 20 mm)<br>Tip diameter: 2.5 mm (Body: 12 mm)<br>Typical distance from probe tip to dipole centers: 1 mm</td></tr>
<tr><td>Application</td><td colspan="2">High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.</td></tr>
</table>

## 3.3. 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 DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.

## 3.4. Robot

The DASY5 system uses the high precision robots TX90 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY5 system, the CS8C robot controller version from Stäubli is used.

The XL robot series have many features that are important for our application:

- High precision (repeatability 0.02 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)
- 6-axis controller

## 3.5. Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.

The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

### 3.6. Measurement Server


The DASY5 measurement server is based on a PC/104 CPU board with a 400MHz intel ULV Celeron, 128MB chipdisk and 128MB RAM. The necessary circuits for communication with the DAE electronics box, as well as the 16 bit AD converter system for optical detection and digital I/O interface are contained on the DASY5 I/O board, which is directly connected to the PC/104 bus of the CPU board.

### 3.7. SAM Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

- Left head
- Right head
- Flat phantom

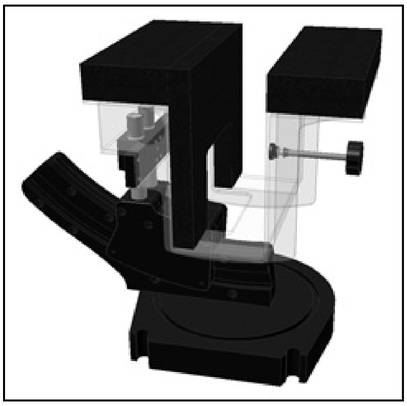
The ELI4 Phantom also is a fiberglass shell phantom with 2mm shell thickness. It has 30 liters filling volume, and with a dimension of 600mm for major ellipse axis , 400mm for minor axis. It is intended for compliance testing of handheld and body-mounted wireless devices in frequency range of 30 MHz to 6GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

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.

## 3.8. Device Holder

- The DASY5 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).Thus the device needs no repositioning when changing the angles.The DASY5 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\varepsilon r$ =3 and loss tangent $\delta$ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

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



## 3.9. Test Equipment List

| Instrument | Manufacturer | Model No. | Serial No. | Cali. Due Date |
|---|---|---|---|---|
| Stäubli Robot TX60L | Stäubli | TX60L | 5P6VA1/A/01 | only once |
| Robot Controller | Stäubli | CS8C | 5P6VA1/C/01 | only once |
| Dipole Validation Kits | Speag | D850V2 | 1008 | 2015.06.12 |
| Dipole Validation Kits | Speag | D1750V2 | 1097 | 2015.06.10 |
| Dipole Validation Kits | Speag | D1900V2 | 5d174 | 2015.06.09 |
| Dipole Validation Kits | Speag | D2450V2 | 914 | 2015.06.06 |
| SAM Twin Phantom | Speag | SAM | 1767 | N/A |
| SAM ELI Phantom | Speag | SAM | 1211 | N/A |
| Device Holder | Speag | SD 000 H01 KA | N/A | N/A |
| Laptop Holder | Speag | SM LH1 001CD | N/A | N/A |
| Data Acquisition Electronic | Speag | DAE4 | 1739 | 2015.05.23 |
| E-Field Probe | Speag | EX3DV4 | 3927 | 2015.05.19 |
| SAR Software | Speag | DASY5 | V5.2 Build 162 | N/A |
| Power Amplifier | Mini-Circuit | ZVA-183W-S+ | MN136701248 | N/A |
| Directional Coupler | Agilent | 778D | MY52180185 | N/A |
| Universal Radio Communication Tester | R&S | CMU 200 | 108823 | 2015.01.08 |
| Vector Network | Agilent | E5071C | MY4631693 | 2015.01.15 |
| Signal Generator | R&S | SML | 103287 | 2015.03.09 |
| Power Meter | BONN | BLWA0830-160/100/40D | 76659 | 2015.11.10 |
| AUG Power Sensor | R&S | NRP-Z91 | 100384 | 2015.03.09 |

# 4. Results

## 4.1. Conducted power (Averaged)

- **GSM/GPRS/EDGE**

| Mode | Frequency (MHz) | Avg. Burst Power(dBm | Duty Cycle Factor (dB) | Frame Power (dBm) | Max. Power (dBm) | Scaling Factor |
|---|---|---|---|---|---|---|
| GSM850 | 824.2 | 32.32 | -9 | 23.32 | 32.5 | 1.04 |
| | 836.6 | 32.28 | -9 | 23.28 | 32.5 | 1.05 |
| | 848.8 | 32.40 | -9 | 23.40 | 32.5 | 1.02 |
| GPRS850(1Slot) | 824.2 | 32.23 | -9 | 23.23 | 32.5 | 1.06 |
| | 836.6 | 32.01 | -9 | 23.01 | 32.5 | 1.12 |
| | 848.8 | 32.12 | -9 | 23.12 | 32.5 | 1.09 |
| **GPRS850(2Slot)** | **824.2** | **31.48** | **-6** | **25.48** | **32.0** | **1.13** |
| | **836.6** | **31.47** | **-6** | **25.47** | **32.0** | **1.13** |
| | **848.8** | **31.60** | **-6** | **25.60** | **32.0** | **1.10** |
| GPRS850(3Slot) | 824.2 | 29.56 | -4.25 | 25.31 | 30.0 | 1.11 |
| | 836.6 | 29.55 | -4.25 | 25.30 | 30.0 | 1.11 |
| | 848.8 | 29.77 | -4.25 | 25.52 | 30.0 | 1.05 |
| GPRS850(4Slot) | 824.2 | 28.33 | -3 | 25.33 | 29.0 | 1.17 |
| | 836.6 | 28.34 | -3 | 25.34 | 29.0 | 1.16 |
| | 848.8 | 28.53 | -3 | 25.53 | 29.0 | 1.11 |
| Edge850(1Slot) | 824.2 | 27.27 | -9 | 18.27 | 28.0 | 1.18 |
| | 836.6 | 27.39 | -9 | 18.39 | 28.0 | 1.15 |
| | 848.8 | 27.46 | -9 | 18.46 | 28.0 | 1.13 |
| Edge850(2Slot) | 824.2 | 26.26 | -6 | 20.26 | 27.0 | 1.19 |
| | 836.6 | 26.38 | -6 | 20.38 | 27.0 | 1.15 |
| | 848.8 | 26.49 | -6 | 20.49 | 27.0 | 1.12 |
| Edge850(3Slot) | 824.2 | 24.34 | -4.25 | 20.09 | 25.0 | 1.16 |
| | 836.6 | 24.41 | -4.25 | 20.16 | 25.0 | 1.15 |
| | 848.8 | 24.39 | -4.25 | 20.14 | 25.0 | 1.15 |
| Edge850(4Slot) | 824.2 | 23.23 | -3 | 20.23 | 24.0 | 1.19 |
| | 836.6 | 23.33 | -3 | 20.33 | 24.0 | 1.17 |
| | 848.8 | 23.32 | -3 | 20.32 | 24.0 | 1.17 |

| Mode | Frequency (MHz) | Avg. Burst Power(dBm) | Duty Cycle Factor (dB) | Frame Power (dBm) | Max. Power (dBm) | Scaling Factor |
|---|---|---|---|---|---|---|
| PCS1900 | 1850.2 | 30.46 | -9 | 21.46 | 30.5 | 1.01 |
| | 1880 | 29.91 | -9 | 20.91 | 30.5 | 1.15 |
| | 1909.8 | 29.64 | -9 | 20.64 | 30.5 | 1.22 |
| GPRS1900(1Slot) | 1850.2 | 30.21 | -9 | 21.21 | 30.5 | 1.07 |
| | 1880 | 29.60 | -9 | 20.60 | 30.5 | 1.23 |
| | 1909.8 | 29.48 | -9 | 20.48 | 30.5 | 1.26 |
| GPRS1900(2Slot) | 1850.2 | 29.69 | -6 | 23.69 | 30.0 | 1.07 |
| | 1880 | 29.20 | -6 | 23.20 | 30.0 | 1.20 |
| | 1909.8 | 28.97 | -6 | 22.97 | 30.0 | 1.27 |
| GPRS1900(3Slot) | 1850.2 | 27.87 | -4.25 | 23.62 | 28.0 | 1.03 |
| | 1880 | 27.44 | -4.25 | 23.19 | 28.0 | 1.14 |
| | 1909.8 | 27.43 | -4.25 | 23.18 | 28.0 | 1.14 |
| **GPRS1900(4Slot)** | **1850.2** | **26.68** | **-3** | **23.68** | **27.0** | **1.08** |
| | **1880** | **26.28** | **-3** | **23.28** | **27.0** | **1.18** |
| | **1909.8** | **26.42** | **-3** | **23.42** | **27.0** | **1.14** |
| EDGE1900(1Slot) | 1850.2 | 26.27 | -9 | 17.27 | 26.5 | 1.05 |
| | 1880 | 25.84 | -9 | 16.84 | 26.5 | 1.16 |
| | 1909.8 | 25.72 | -9 | 16.72 | 26.5 | 1.20 |
| EDGE1900(2Slot) | 1850.2 | 25.02 | -6 | 19.02 | 25.5 | 1.12 |
| | 1880 | 24.53 | -6 | 18.53 | 25.5 | 1.25 |
| | 1909.8 | 24.42 | -6 | 18.42 | 25.5 | 1.28 |
| EDGE1900(3Slot) | 1850.2 | 22.77 | -4.25 | 18.52 | 23.0 | 1.05 |
| | 1880 | 22.36 | -4.25 | 18.11 | 23.0 | 1.16 |
| | 1909.8 | 22.24 | -4.25 | 17.99 | 23.0 | 1.19 |
| EDGE1900(4Slot) | 1850.2 | 21.41 | -3 | 18.41 | 21.5 | 1.02 |
| | 1880 | 20.97 | -3 | 17.97 | 21.5 | 1.13 |
| | 1909.8 | 20.83 | -3 | 17.83 | 21.5 | 1.17 |

Note：1. Scaling Factor = Max. Power (mW) / Avg. Burst Power (mW), Max. Power is the tune-up power.

2. This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v05.

3. Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged powers were calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.

4. The bolded GPRS modes were selected for SAR testing according to the highest frame-averaged output power table per KDB 941225 D03v01.

- **WCDMA/HSDPA/HSUPA**

| Mode | 3GPP Subtest | Band IV (1700MHz) Channel | | | Band V (850MHz) Channel | | | MPR |
|---|---|---|---|---|---|---|---|---|
| | | Conducted Power (dBm) | | | | | | |
| | | 1312 | 1413 | 1513 | 4132 | 4183 | 4233 | |
| WCDMA R99 | 1 | 21.94 | 21.97 | 22.21 | 23.54 | 23.38 | 23.41 | N/A |
| Rel5 HSDPA | 1 | **20.84** | **20.86** | **20.82** | **22.53** | **22.43** | **22.42** | 0 |
| | 2 | 20.51 | 20.55 | 20.80 | 22.19 | 22.00 | 22.06 | 0 |
| | 3 | 19.07 | 19.05 | 19.15 | 20.74 | 20.46 | 20.59 | 0.5 |
| | 4 | 19.09 | 19.13 | 19.12 | 20.74 | 20.51 | 20.60 | 0.5 |
| Rel6 HSUPA | 1 | **20.85** | **20.84** | **21.15** | **22.50** | **22.28** | **22.36** | 0.0 |
| | 2 | 20.84 | 20.85 | 21.20 | 22.51 | 22.38 | 22.40 | 2.0 |
| | 3 | 19.09 | 19.04 | 19.14 | 20.69 | 20.43 | 20.64 | 1.0 |
| | 4 | 20.87 | 20.87 | 21.23 | 22.54 | 22.41 | 22.41 | 2.0 |
| | 5 | 20.03 | 20.07 | 20.32 | 21.68 | 21.44 | 21.55 | 0.0 |

| Mode | Band IV (1700MHz) Channel | Normal Power (dBm) | Max. Power (dBm) | Scaling Factor |
|---|---|---|---|---|
| WCDMA R99 | 1312 | 21.94 | 22.5 | 1.14 |
| | 1413 | 21.77 | 22.5 | 1.18 |
| | 1513 | 22.21 | 22.5 | 1.07 |
| Rel5 HSDPA | 1312 | 20.84 | 21.5 | 1.16 |
| | 1413 | 20.86 | 21.5 | 1.16 |
| | 1513 | 20.82 | 21.5 | 1.17 |
| Rel6 HSUPA | 1312 | 20.85 | 21.5 | 1.16 |
| | 1413 | 20.84 | 21.5 | 1.16 |
| | 1513 | 21.15 | 21.5 | 1.08 |
| **Mode** | **Band V (850MHz) Channel** | **Normal Power (dBm)** | **Max. Power (dBm)** | **Scaling Factor** |
| WCDMA R99 | 4132 | 23.54 | 24.0 | 1.11 |
| | 4183 | 23.38 | 24.0 | 1.15 |
| | 4233 | 23.41 | 24.0 | 1.15 |
| Rel5 HSDPA | 4132 | 22.53 | 23.0 | 1.11 |
| | 4183 | 22.43 | 23.0 | 1.14 |
| | 4233 | 22.42 | 23.0 | 1.14 |
| Rel6 HSUPA | 4132 | 22.5 | 23.0 | 1.12 |
| | 4183 | 22.28 | 23.0 | 1.18 |
| | 4233 | 22.36 | 23.0 | 1.16 |

- **WLAN**

| Test Mode | Channel No. | Frequency (MHz) | Average Power (dBm) | Max. Power (dBm) | Scaling Factor |
|---|---|---|---|---|---|
| 802.11b | 1 | 2412 | 17.98 | 18.5 | 1.13 |
| | 6 | 2437 | 18.04 | 18.5 | 1.11 |
| | 11 | 2462 | 18.45 | 18.5 | 1.01 |
| 802.11g | 1 | 2412 | 19.04 | 19.5 | 1.11 |
| | 6 | 2437 | 20.63 | 20.7 | 1.02 |
| | 11 | 2462 | 19.58 | 20.7 | 1.29 |
| 802.11n (20MHz) | 1 | 2412 | 19.07 | 20.5 | 1.39 |
| | 6 | 2437 | 20.35 | 20.5 | 1.04 |
| | 11 | 2462 | 19.76 | 20.5 | 1.19 |
| 802.11n (40MHz) | 3 | 2422 | 16.95 | 17.0 | 1.01 |
| | 6 | 2437 | 19.14 | 19.5 | 1.09 |
| | 9 | 2452 | 17.19 | 18.0 | 1.21 |

- **Bluetoothss**

| BT3.0 | Low | Mid | High |
|---|---|---|---|
| 1DH | 2.67 | 2.49 | 1.98 |
| 2DH | 1.81 | 1.76 | 1.27 |
| 3DH | 1.82 | 1.78 | 1.27 |

## 4.2. Estimated SAR

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05r02, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is≤1.6W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05r02 4.3.2 2, the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated SAR}=\frac{\sqrt{f(GHz)}}{7.5}\cdot\frac{\text{(Max Power of channel, mW)}}{\text{Min. Separation Distance, mm}}$$

| Mode | Frequency | Maximum Allowed Power | Separation Distance (Body) | Estimated SAR (Body) |
|---|---|---|---|---|
| Bluetooth | [MHz] | [dBm] | [mm] | [W/kg] |
| | 2402 | 2.67 | 10 | 0.038 |

### 4.3. SAR Test Results Summary

| SAR MEASUREMENT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ambient Temperature (°C) : 21.5 ± 2 | | | | | Relative Humidity (%): 52 | | | | |
| Liquid Temperature (°C) : 21.0 ± 2 | | | | | Depth of Liquid (cm):>15 | | | | |
| Product: Tablet PC | | | | | | | | | |
| Test Mode: GSM850 | | | | | | | | | |
| Tune-up power: 32.5dBm | | | | | | | | | |
| Test Position Body (**0mm gap**) | Antenna Position | Frequency | | Avg. Power (dBm) | Power Drift (<±0.2) | SAR 1g (W/kg) | Scaling Factor | Scaled SAR 1g (W/kg) | Limit (W/kg) |
| | | Channel | MHz | | | | | | |
| Back | Fixed | 128 | 824.2 | 32.32 | -- | -- | 1.04 | -- | 1.6 |
| Back | Fixed | 190 | 836.6 | 32.28 | 0.04 | 0.179 | 1.05 | 0.188 | 1.6 |
| Back | Fixed | 251 | 848.8 | 32.40 | -- | -- | 1.02 | -- | 1.6 |
| Test Mode: GPRS850-2slot | | | | | | | | | |
| Tune-up power: 32.0dBm | | | | | | | | | |
| Back | Fixed | 128 | 824.2 | 32.32 | -- | -- | 1.04 | -- | 1.6 |
| Back | Fixed | 190 | 836.6 | 32.28 | 0.01 | **0.411** | 1.05 | **0.432** | 1.6 |
| Back | Fixed | 251 | 848.8 | 32.40 | -- | -- | 1.02 | -- | 1.6 |
| Right-Side | Fixed | 190 | 836.6 | 32.28 | 0.11 | 0.011 | 1.05 | 0.012 | 1.6 |
| Bottom | Fixed | 190 | 836.6 | 32.28 | -0.12 | 0.113 | 1.05 | 0.119 | 1.6 |
| Note 1: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional, refer to KDB 447498; | | | | | | | | | |

| SAR MEASUREMENT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ambient Temperature (°C) : 21.5 ± 2 | | | | | Relative Humidity (%): 52 | | | | |
| Liquid Temperature (°C) : 21.0 ± 2 | | | | | Depth of Liquid (cm):>15 | | | | |
| Product: Tablet PC | | | | | | | | | |
| Test Mode: PCS1900 | | | | | | | | | |
| Tune-up power: 30.5dBm | | | | | | | | | |
| Test Position Body (**0mm gap**) | Antenna Position | Frequency | | Avg. Power (dBm) | Power Drift (<±0.2) | SAR 1g (W/kg) | Scaling Factor | Scaled SAR 1g (W/kg) | Limit (W/kg) |
| | | Channel | MHz | | | | | | |
| Back | Fixed | s512 | 1850.2 | 30.46 | -- | -- | 1.01 | -- | 1.6 |
| Back | Fixed | 661 | 1880 | 29.91 | 0.14 | 0.167 | 1.15 | 0.192 | 1.6 |
| Back | Fixed | 810 | 1909.8 | 29.64 | -- | -- | 1.22 | -- | 1.6 |
| Test Mode: GPRS1900-4slot | | | | | | | | | |
| Tune-up power: 27.0dBm | | | | | | | | | |
| Back | Fixed | 512 | 1850.2 | 30.46 | -- | -- | 1.08 | -- | 1.6 |
| Back | Fixed | 661 | 1880 | 29.91 | -0.13 | **0.636** | 1.18 | **0.750** | 1.6 |
| Back | Fixed | 810 | 1909.8 | 29.64 | -- | -- | 1.14 | -- | 1.6 |
| Right-Side | Fixed | 661 | 1880 | 29.91 | 0.07 | 0.018 | 1.18 | 0.021 | 1.6 |
| Bottom | Fixed | 661 | 1880 | 29.91 | 0.10 | 0.177 | 1.18 | 0.209 | 1.6 |
| Note 1: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional, refer to KDB 447498; | | | | | | | | | |

| SAR MEASUREMENT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ambient Temperature (°C): 21.5 ±2 | | | | | Relative Humidity (%): 52 | | | | |
| Liquid Temperature (°C): 21.0 ±2 | | | | | Depth of Liquid (cm):>15 | | | | |
| Product: Tablet PC | | | | | | | | | |
| Test Mode: WCDMA Band IV | | | | | | | | | |
| Tune-up power: 22.5dBm | | | | | | | | | |
| Test Position Body (**0mm gap**) | Antenna Position | Frequency | | Conducted Power (dBm) | Power Drift (<±0.2) | SAR 1g (W/kg) | Scaling Factor | Scaled SAR 1g (W/kg) | Limit (W/kg) |
| | | Channel | MHz | | | | | | |
| Back | Fixed | 1312 | 1712.4 | 21.94 | -- | -- | 1.14 | -- | 1.6 |
| Back | Fixed | 1413 | 1732.6 | 21.97 | 0.12 | **0.702** | 1.13 | **0.793** | 1.6 |
| Back | Fixed | 1513 | 1752.6 | 22.21 | -- | -- | 1.07 | -- | 1.6 |
| Right-Side | Fixed | 1413 | 1732.6 | 21.97 | -0.10 | 0.00432 | 1.16 | 0.005 | 1.6 |
| Bottom | Fixed | 1413 | 1732.6 | 21.97 | -0.15 | 0.307 | 1.16 | 0.356 | 1.6 |
| Note 1: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional, refer to KDB 447498; | | | | | | | | | |

| SAR MEASUREMENT | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ambient Temperature (°C): 21.5 ±2 | | | | | Relative Humidity (%): 52 | | | | |
| Liquid Temperature (°C): 21.0 ±2 | | | | | Depth of Liquid (cm):>15 | | | | |
| Product: Tablet PC | | | | | | | | | |
| Test Mode: WCDMA Band V | | | | | | | | | |
| Tune-up power: 24.0dBm | | | | | | | | | |
| Test Position Body (**0mm gap**) | Antenna Position | Frequency | | Conducted Power (dBm) | Power Drift (<±0.2) | SAR 1g (W/kg) | Scaling Factor | Scaled SAR 1g (W/kg) | Limit (W/kg) |
| | | Channel | MHz | | | | | | |
| Back | Fixed | 4183 | 836.6 | 23.38 | 0.19 | **0.494** | 1.15 | **0.568** | 1.6 |
| Left-Side | Fixed | 4183 | 836.6 | 23.38 | 0.14 | 0.041 | 1.15 | 0.047 | 1.6 |
| Bottom | Fixed | 4183 | 836.6 | 23.38 | -0.04 | 0.269 | 1.15 | 0.309 | 1.6 |
| Note 1: when the 1-g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional, refer to KDB 447498; | | | | | | | | | |

| SAR Measurement | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Ambient Temperature (°C): 21.5 ± 2 | | | | | Relative Humidity (%): 52 | | | | |
| Liquid Temperature (°C): 21.0 ± 2 | | | | | Depth of Liquid (cm):>15 | | | | |
| Product: Tablet PC | | | | | | | | | |
| Test Mode: 802.11g | | | | | | | | | |
| Tune-up power: 20.7dBm | | | | | | | | | |
| Test Position Body (**0mm gap**) | Antenna Position | Frequency | | Average Power (dBm) | Power Drift (<±0.2) | SAR 1g (W/kg) | Scaling Factor | Scaled SAR 1g (W/kg) | Limit (W/kg) |
| | | Channel | MHz | | | | | | |
| Back | Fixed | 1 | 2412 | 19.04 | 0.05 | 0.292 | 1.11 | 0.324 | 1.6 |
| Back | Fixed | 6 | 2437 | 20.63 | -0.15 | **0.302** | 1.02 | 0.308 | 1.6 |
| Back | Fixed | 11 | 2462 | 19.58 | 0.14 | 0.301 | 1.29 | **0.388** | 1.6 |
| Right-Side | Fixed | 6 | 2437 | 20.63 | 0.16 | 0.19 | 1.02 | 0.194 | 1.6 |
| Bottom | Fixed | 6 | 2437 | 20.63 | -0.13 | 0.113 | 1.02 | 0.115 | 1.6 |

# 5. The Description of Test Procedure

## 5.1. General Notes:

1. Batteries are fully charged at the beginning of the SAR measurements.
2. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
3. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05r02.
4. Per FCC KDB 616217 D04 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v05 was applied to determine SAR test exclusion for adjacent edge configurations. SAR tests were required for bottom and primary landscape for the BT/WLAN Antenna.

**WLAN/BT Notes:**

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and April 2010 FCC/TCB Meeting Notes for 2.4 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. WIFI transmission was verified using a spectrum analyzer.
3. When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other default channels is not required.

## 5.2. Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05r02, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is≤1.6W/kg.

## 5.3. Simultaneous Transmission Analysis

Simultaneous Transmission Scenario with Wi-Fi

| Configuration | Mode | Max. Scaled SAR(W/kg) | Wi-Fi SAR(W/kg) | ∑ SAR(W/kg) |
|---|---|---|---|---|
| Body | GSM850 | 0.432 | 0.388 | 0.820 |
| Body | PCS1900 | 0.750 | 0.388 | 1.138 |
| Body | WCDMA Band IV | 0.793 | 0.388 | **1.181** |
| Body | WCDMA Band V | 0.568 | 0.388 | 0.956 |

Simultaneous Transmission Scenario with Bluetooth

| Configuration | Mode | Max. Scaled SAR(W/kg) | Bluetooth SAR(W/kg) | ∑ SAR(W/kg) |
|---|---|---|---|---|
| Back | GSM850 | 0.432 | 0.038 | 0.470 |
| Back | PCS1900 | 0.750 | 0.038 | 0.788 |
| Back | WCDMA Band IV | 0.793 | 0.038 | 0.831 |
| Back | WCDMA Band V | 0.568 | 0.038 | 0.606 |

Note : Bluetooth SAR was not required to be measured per FCC KDB 447498. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

Simultaneous Transmission Scenario with Wi-Fi & Bluetooth

Note: Bluetooth and WIFI cannot be transmit at same time, due to they share the same antenna.

Simultaneous Transmission Scenario (Hotspot)

| Simult Tx | Configuration | GPRS850 SAR(W/kg) | Wi-Fi SAR(W/kg) | ∑ SAR(W/kg) |
|---|---|---|---|---|
| Body | Back | 0.432 | 0.388 | 0.820 |
| | Right side | 0.012 | 0.194 | 0.206 |
| | Top | N/A | 0.115 | 0.115 |
| | Bottom | 0.119 | N/A | 0.119 |
| Simult Tx | Configuration | GPRS1900 SAR(W/kg) | Wi-Fi SAR(W/kg) | ∑ AR(W/kg) |
| Body | Back | 0.750 | 0.388 | 1.138 |
| | Right side | 0.021 | 0.194 | 0.215 |
| | Top | N/A | 0.115 | 0.115 |
| | Bottom | 0.209 | N/A | 0.209 |
| Simult Tx | Configuration | WCDMA Band IV SAR(W/kg) | Wi-Fi SAR(W/kg) | ∑ SAR(W/kg) |
| Body | Back | 0.793 | 0.388 | **1.181** |
| | Right side | 0.05 | 0.194 | 0.244 |
| | Top | N/A | 0.115 | 0.115 |
| | Bottom | 0.356 | N/A | 0.356 |
| Simult Tx | Configuration | WCDMA Band V SAR(W/kg) | Wi-Fi SAR (W/kg) | ∑ SAR(W/kg) |
| Body | Back | 0.568 | 0.388 | 0.956 |
| | Right side | 0.047 | 0.194 | 0.241 |
| | Top | N/A | 0.115 | 0.115 |
| | Bottom | 0.369 | N/A | 0.369 |

## 5.4. Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v05r02.

## 6. Measurement Uncertainty

| DASY5 Uncertainty Budget<br>according to IEEE 1528/2011 (0.3-3GHz range) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Error Description | Uncert. value | Prob. Dist. | Div. | (ci) 1g | (ci) 10g | Std.Unc. (1g) | Std. nc. (10g) | (vi) veff |
| **Measurement System** | | | | | | | | |
| Probe Calibration | ±6.0% | N | 1 | 1 | 1 | ±6.0% | ±6.0% | ∞ |
| Axial Isotropy | ±4.7% | R | $\sqrt{3}$ | 0.7 | 0.7 | ±1.9% | ±1.9% | ∞ |
| Hemispherical Isotropy | ±9.6% | R | $\sqrt{3}$ | 0.7 | 0.7 | ±3.9% | ±3.9% | ∞ |
| Boundary Effects | ±1.0% | R | $\sqrt{3}$ | 1 | 1 | ±0.6% | ±0.6% | ∞ |
| Linearity | ±4.7% | R | $\sqrt{3}$ | 1 | 1 | ±2.7% | ±2.7% | ∞ |
| System Detection Limits | ±1.0% | R | $\sqrt{3}$ | 1 | 1 | ±0.6% | ±0.6% | ∞ |
| Modulation Response | ±2.4% | R | $\sqrt{3}$ | 1 | 1 | ±1.4% | ±1.4% | ∞ |
| Readout Electronics | ±0.3% | N | 1 | 1 | 1 | ±0.3% | ±0.3% | ∞ |
| Response Time | ±0.8% | R | $\sqrt{3}$ | 1 | 1 | ±0.5% | ±0.5% | ∞ |
| Integration Time | ±2.6% | R | $\sqrt{3}$ | 1 | 1 | ±1.5% | ±1.5% | ∞ |
| RF Ambient Noise | ±3.0% | R | $\sqrt{3}$ | 1 | 1 | ±1.7% | ±1.7% | ∞ |
| RF Ambient Reflections | ±3.0% | R | $\sqrt{3}$ | 1 | 1 | ±1.7% | ±1.7% | ∞ |
| Probe Positioner | ±0.4% | R | $\sqrt{3}$ | 1 | 1 | ±0.2% | ±0.2% | ∞ |
| Probe Positioning | ±2.9% | R | $\sqrt{3}$ | 1 | 1 | ±1.7% | ±1.7% | ∞ |
| Max.SAR Eval. | ±2.0% | R | $\sqrt{3}$ | 1 | 1 | ±1.2% | ±1.2% | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | ±2.9% | N | 1 | 1 | 1 | ±2.9% | ±2.9% | 145 |
| Device Holder | ±3.6% | N | 1 | 1 | 1 | ±3.6% | ±3.6% | 5 |
| Power Drift | ±5.0% | R | $\sqrt{3}$ | 1 | 1 | ±2.9% | ±2.9% | ∞ |
| Power Scaling$^{p}$ | ±0% | R | $\sqrt{3}$ | 0 | 0 | ±0% | ±0% | ∞ |
| **Phantom and Setup** | | | | | | | | |
| Phantom Uncertainty | ±6.1% | R | $\sqrt{3}$ | 1 | 1 | ±3.5% | ±3.5% | ∞ |
| SAR correction | ±1.9% | R | $\sqrt{3}$ | 1 | 0.84 | ±1.1% | ±0.9% | ∞ |
| Liquid Conductivity (mea.)$^{DAK}$ | ±2.5% | R | $\sqrt{3}$ | 0.78 | 0.71 | ±1.1% | ±1.0% | ∞ |
| Liquid Permittivity (mea.)$^{DAK}$ | ±2.5% | R | $\sqrt{3}$ | 0.26 | 0.26 | ±0.3% | ±0.4% | ∞ |
| Temp. unc. –Conductivity$^{BB}$ | ±3.4% | R | $\sqrt{3}$ | 0.78 | 0.71 | ±1.5% | ±1.4% | ∞ |
| Temp. unc. – Permittivity$^{BB}$ | ±0.4% | R | $\sqrt{3}$ | 0.23 | 0.26 | ±0.1% | ±0.1% | ∞ |
| **Combined Std. Uncertainty** | | | | | | ±11.2% | ±11.1% | 361 |
| **Expanded STD Uncertainty(Coverage factor=2)** | | | | | | **±22.3%** | **±22.2%** | |

# 7. APPENDIX A. SAR System Verification Data

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

SystemPerformanceCheck-D850 Body

**DUT: Dipole 850 MHz D850V2; Type: D850V2; Serial: D850V2**

Communication System: CW; Frequency: 850 MHz

Medium parameters used: f = 850 MHz; σ = 0.97 S/m; εr = 55.69; ρ = 1000 kg/m3

Phantom section: Flat Section; Meas. Ambient Temp (celsius) -22℃; Input power-250mW

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

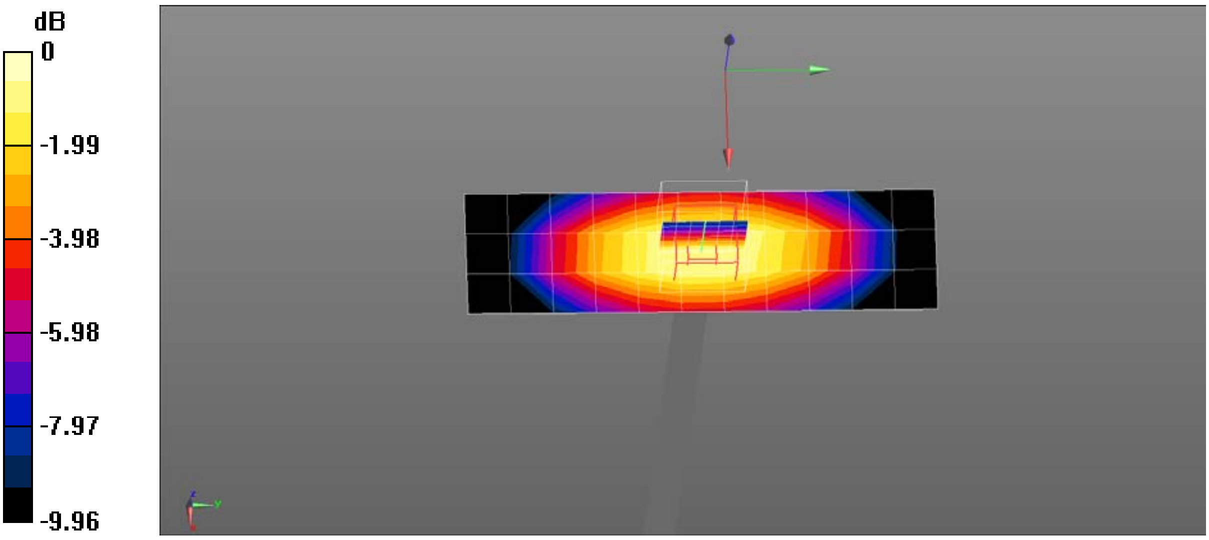
- Probe: EX3DV4 - SN3927; ConvF(9.91, 9.91, 9.91); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/SystemPerformanceCheck-D850 Body/Area Scan (4x12x1):** Measurement grid: dx=15mm, dy=15mm, Maximum value of SAR (measured) = 2.21 W/kg

**Configuration/SystemPerformanceCheck-D850 Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm, Reference Value = 52.81 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.53 W/kg

**SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.59 W/kg** Maximum value of SAR (measured) = 2.60 W/kg




0 dB = 2.60 W/kg = 4.15 dBW/kg

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

SystemPerformanceCheck-D1750 Body

**DUT: Dipole 1750 MHz D1750V2; Type: D1750V2; Serial: D1750V2**

Communication System: CW; Frequency: 1750 MHz

Medium parameters used: f = 1750 MHz; σ = 1.47 S/m; εr = 53.09; ρ = 1000 kg/m3

Phantom section: Flat Section; Meas. Ambient Temp (celsius) -22℃; Input power-250mW

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

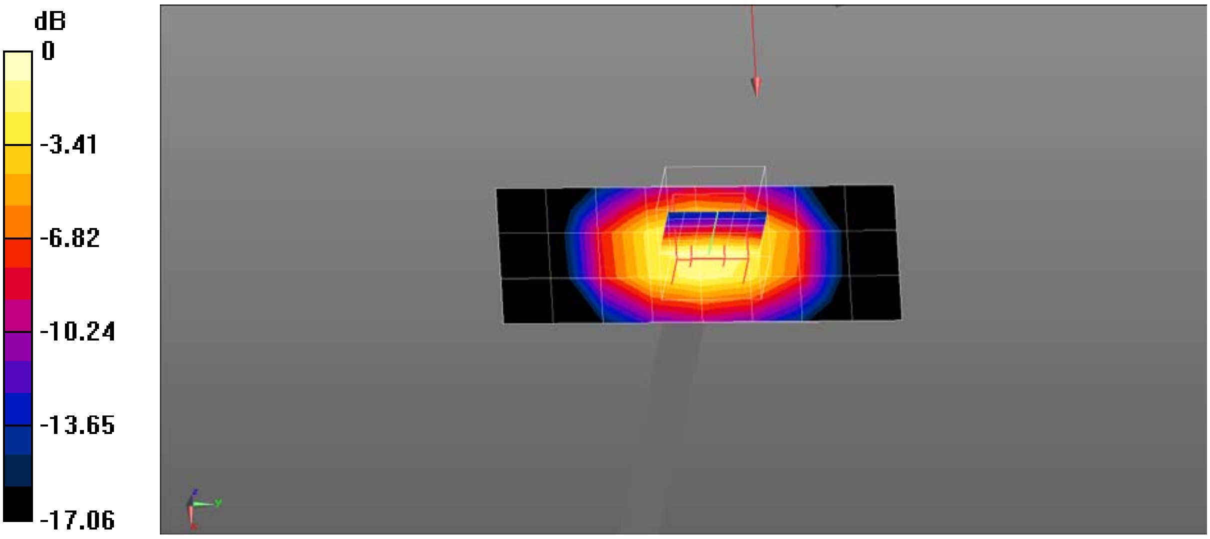
DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(8.45, 8.45, 8.45); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/SystemPerformanceCheck-D1750 Body/Area Scan (4x9x1):** Measurement grid: dx=15mm, dy=15mm, Maximum value of SAR (measured) = 8.42 W/kg

**Configuration/SystemPerformanceCheck-D1750 Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm, Reference Value = 87.85 V/m; Power Drift = -0.06 dB, Peak SAR (extrapolated) = 17.8 W/kg

**SAR(1 g) = 9.54 W/kg; SAR(10 g) = 5 W/kg** Maximum value of SAR (measured) = 10.7 W/kg




0 dB = 10.7 W/kg = 10.29 dBW/kg

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

SystemPerformanceCheck-D1900 Body

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

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: f = 1900 MHz; σ = 1.54 S/m; εr = 51.08; ρ = 1000 kg/m3

Phantom section: Flat Section; Meas. Ambient Temp (celsius) -22℃; Input power-250mW

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

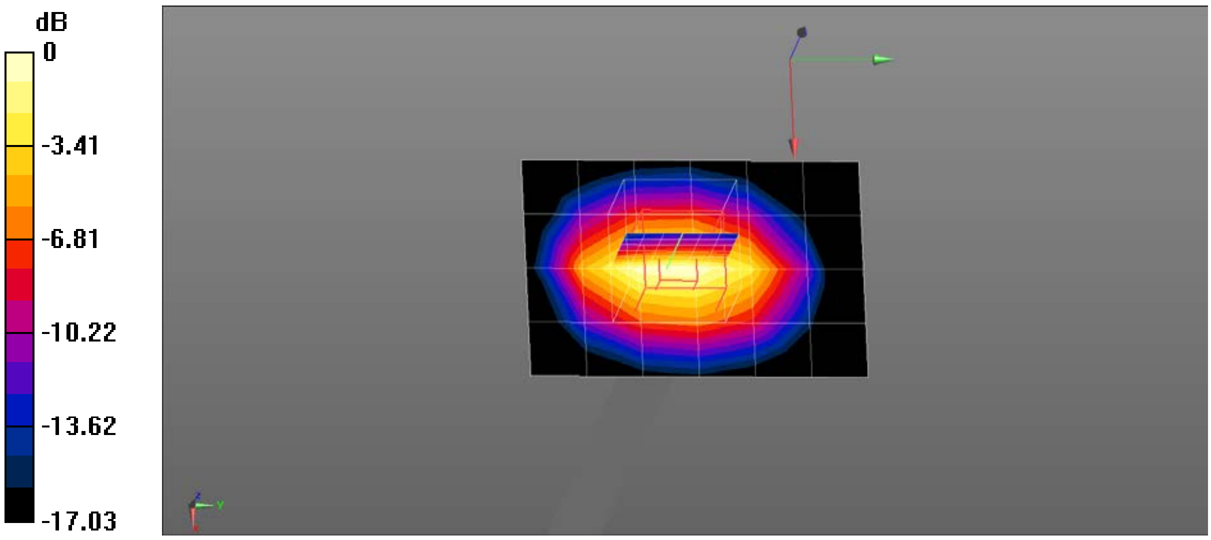
DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(8.1, 8.1, 8.1); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**System Performance Check at Frequencies above 1 GHz/Systemcheck-D1900 Body/Area Scan (5x7x1):** Measurement grid: dx=15mm, dy=15mm, Maximum value of SAR (measured) = 13.3 W/kg

**System Performance Check at Frequencies above 1 GHz/Systemcheck-D1900 Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm, Reference Value = 95.93 V/m; Power Drift = -0.01 dB, Peak SAR (extrapolated) = 17.4 W/kg

**SAR(1 g) = 9.92 W/kg; SAR(10 g) = 5.27 W/kg** Maximum value of SAR (measured) = 14.0 W/kg




0 dB = 14.0 W/kg = 11.46 dBW/kg

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

SystemPerformanceCheck-D2450 Body

**DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2**

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: f = 2450 MHz; σ = 1.96 S/m; εr = 51.12; ρ = 1000 kg/m3

Phantom section: Flat Section; Meas. Ambient Temp (celsius) -22℃; Input power-250mW

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

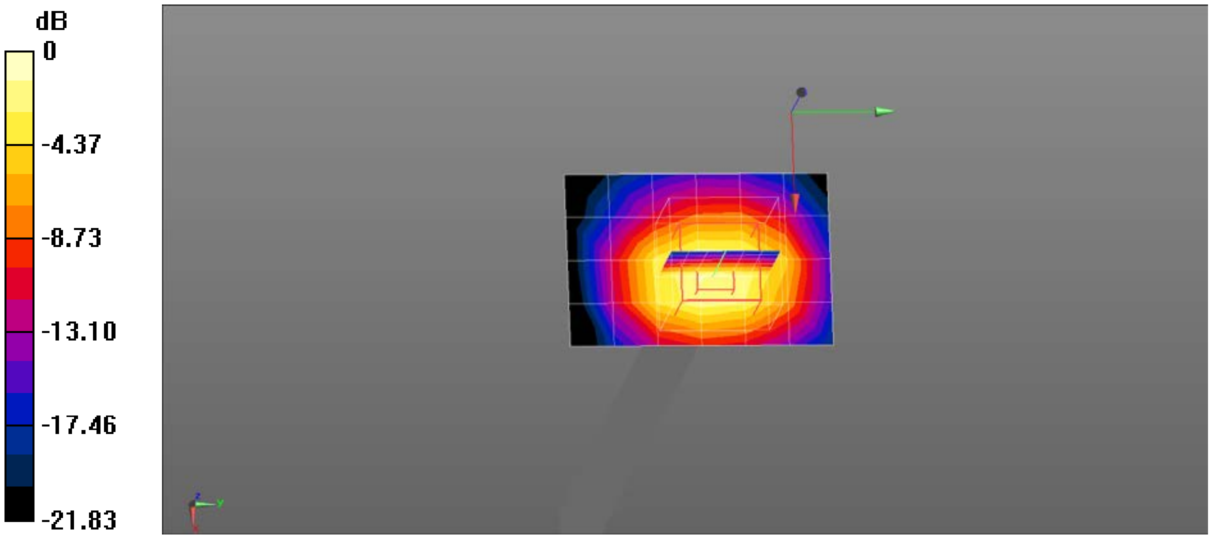
DASY Configuration:

- Probe: EX3DV4 - SN3927; ConvF(7.63, 7.63, 7.63); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = 1.0, 31.0
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

**Configuration/SystemPerformanceCheck-D2450 Body/Area Scan (5x7x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 11.9 W/kg

**Configuration/SystemPerformanceCheck-D2450 Body/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm, Reference Value = 78.28 V/m; Power Drift = 0.02 dB, Peak SAR (extrapolated) = 26.6 W/kg

**SAR(1 g) = 12.8 W/kg; SAR(10 g) = 5.94 W/kg** Maximum value of SAR (measured) = 14.8 W/kg




0 dB = 14.8 W/kg = 11.70 dBW/kg

# 8. APPENDIX B. SAR measurement Data

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: GSM850MHz Mid Body-Back**

Communication System Band: GSM850MHz ; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used: f = 836.6 MHz; $\sigma$ = 0.96 S/m; $\varepsilon r$ = 55.86; $\rho$ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

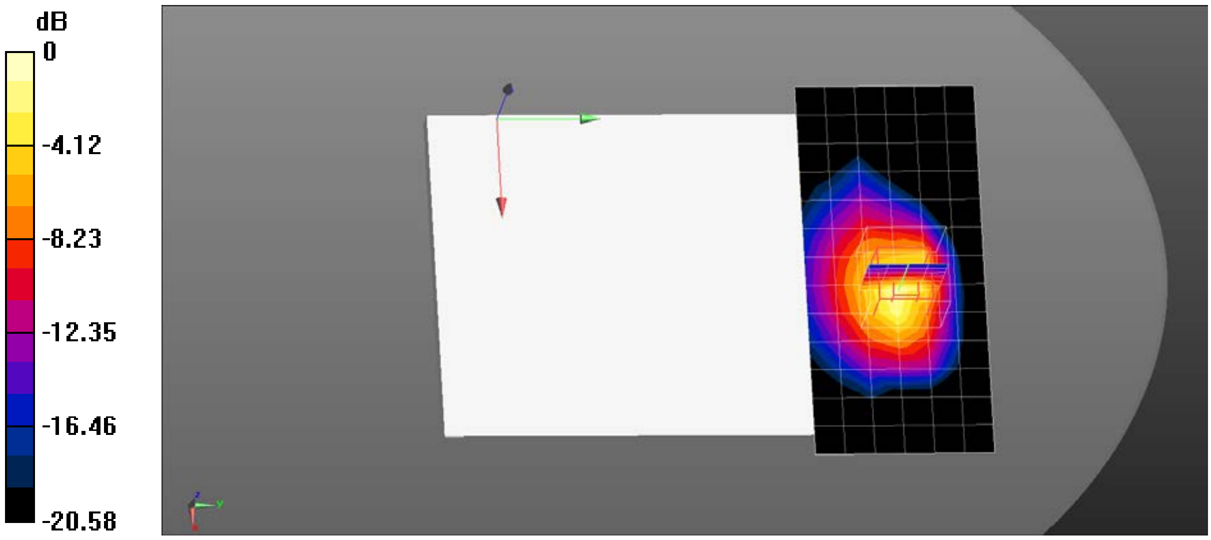
- Probe: EX3DV4 - SN3927; ConvF(9.91, 9.91, 9.91); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/GSM850MHz Mid Body-Back/Area Scan (14x7x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.242 W/kg

**Configuration/GSM850MHz Mid Body-Back/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 0 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.369 W/kg

**SAR(1 g) = 0.179 W/kg; SAR(10 g) = 0.083 W/kg** Maximum value of SAR (measured) = 0.287 W/kg




0 dB = 0.287 W/kg = -5.42 dBW/kg

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: GPRS850MHz Mid Body-Back(2up)**

Communication System Band: GPRS850MHz(2up); Frequency: 836.6 MHz; Duty Cycle: 1:4.2

Medium parameters used: f = 836.6 MHz; σ = 0.96 S/m; εr = 55.86; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

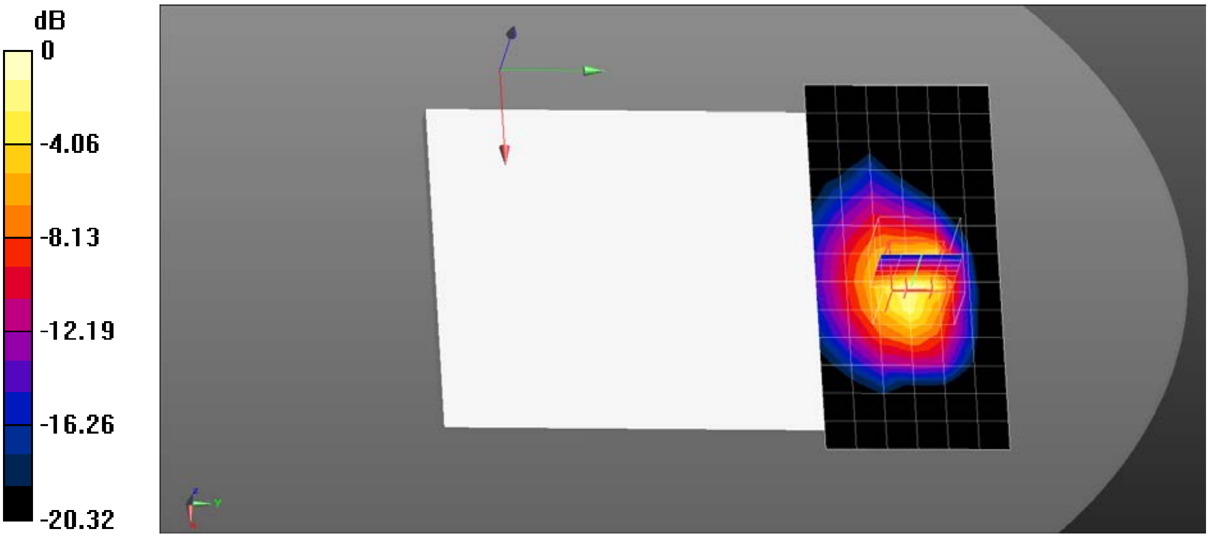
- Probe: EX3DV4 - SN3927; ConvF(9.91, 9.91, 9.91); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/GPRS850MHz Mid Body-Back(2up)/Area Scan (14x7x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.553 W/kg

**Configuration/GPRS850MHz Mid Body-Back(2up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 0 V/m; Power Drift = 0.01 dB

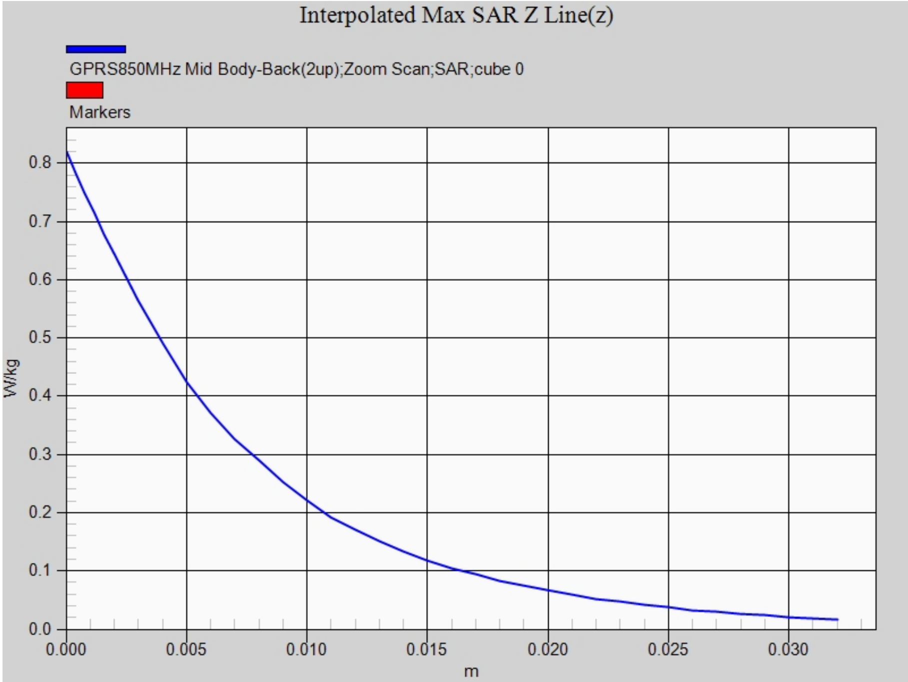
Peak SAR (extrapolated) = 0.821 W/kg

**SAR(1 g) = 0.411 W/kg; SAR(10 g) = 0.193 W/kg** Maximum value of SAR (measured) = 0.648 W/kg




0 dB = 0.648 W/kg = -1.88 dBW/kg

**Z-Axis Plot**


Interpolated Max SAR Z Line(z)
GPRS850MHz Mid Body-Back(2up);Zoom Scan;SAR;cube 0
Markers
W/kg
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: GPRS850MHz Mid Body-Rightside(2up)**

Communication System Band: GPRS850MHz(2up); Frequency: 836.6 MHz; Duty Cycle: 1:4.2

Medium parameters used: f = 836.6 MHz; σ = 0.96 S/m; εr = 55.86; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

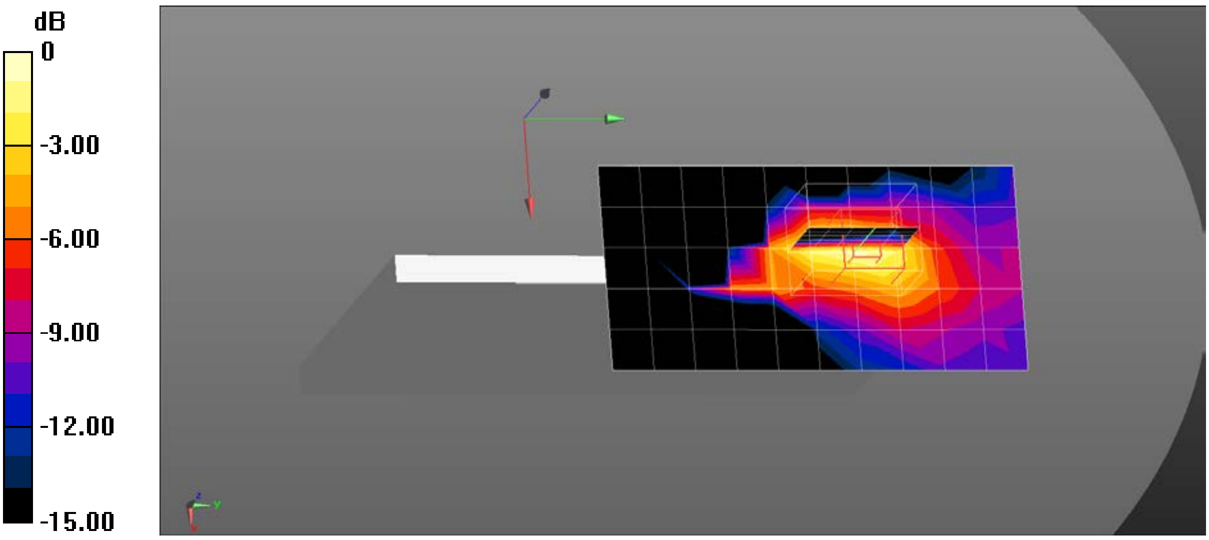
- Probe: EX3DV4 - SN3927; ConvF(9.91, 9.91, 9.91); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/GPRS850MHz Mid Body-Rightside(2up)/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm, Maximum value of SAR (measured) = 0.0160 W/kg

**Configuration/GPRS850MHz Mid Body-Rightside(2up)/Zoom Scan (5x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 0 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.0230 W/kg

**SAR(1 g) = 0.011 W/kg; SAR(10 g) = 0.00512 W/kg** Maximum value of SAR (measured) = 0.0165 W/kg




0 dB = 0.0165 W/kg = -17.83 dBW/kg

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: GPRS850MHz Mid Body-Bottom(2up)**

Communication System Band: GPRS850MHz(2up); Frequency: 836.6 MHz; Duty Cycle: 1:4.2

Medium parameters used: f = 836.6 MHz; σ = 0.96 S/m; εr = 55.86; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

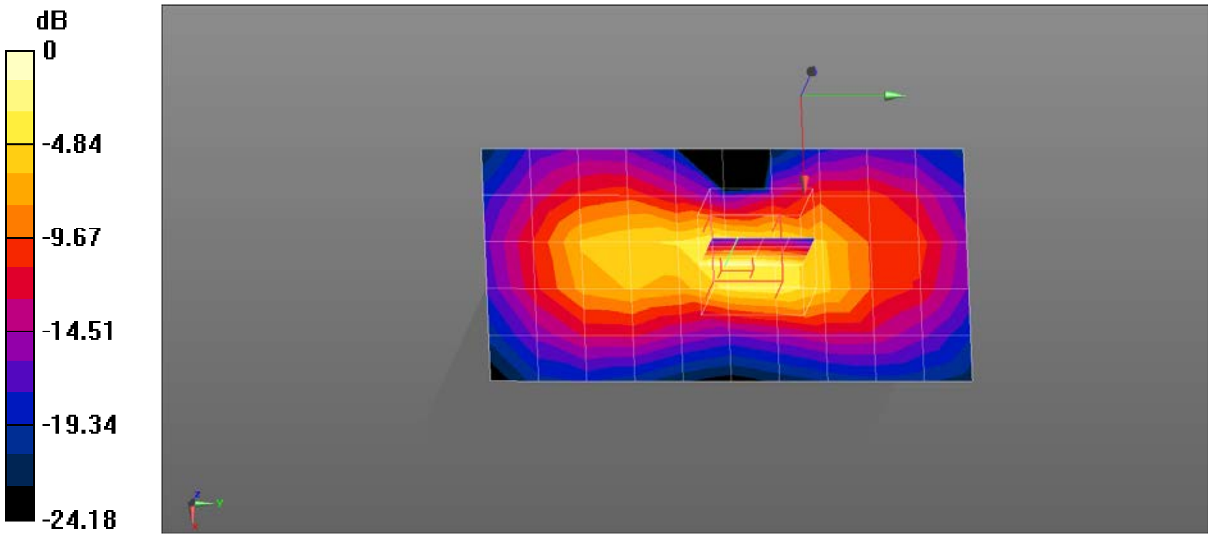
- Probe: EX3DV4 - SN3927; ConvF(9.91, 9.91, 9.91); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/GPRS850MHz Mid Body-Bottom(2up)/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm, Maximum value of SAR (measured) = 0.0907 W/kg

**Configuration/GPRS850MHz Mid Body-Bottom(2up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 11.84 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.230 W/kg

**SAR(1 g) = 0.113 W/kg; SAR(10 g) = 0.052 W/kg** Maximum value of SAR (measured) = 0.186 W/kg




0 dB = 0.186 W/kg = -7.30 dBW/kg

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: PCS1900MHz Mid Body-Back**

Communication System Band: PCS1900MHz ; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used: f = 1880 MHz; σ = 1.53 S/m; εr = 51.14; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

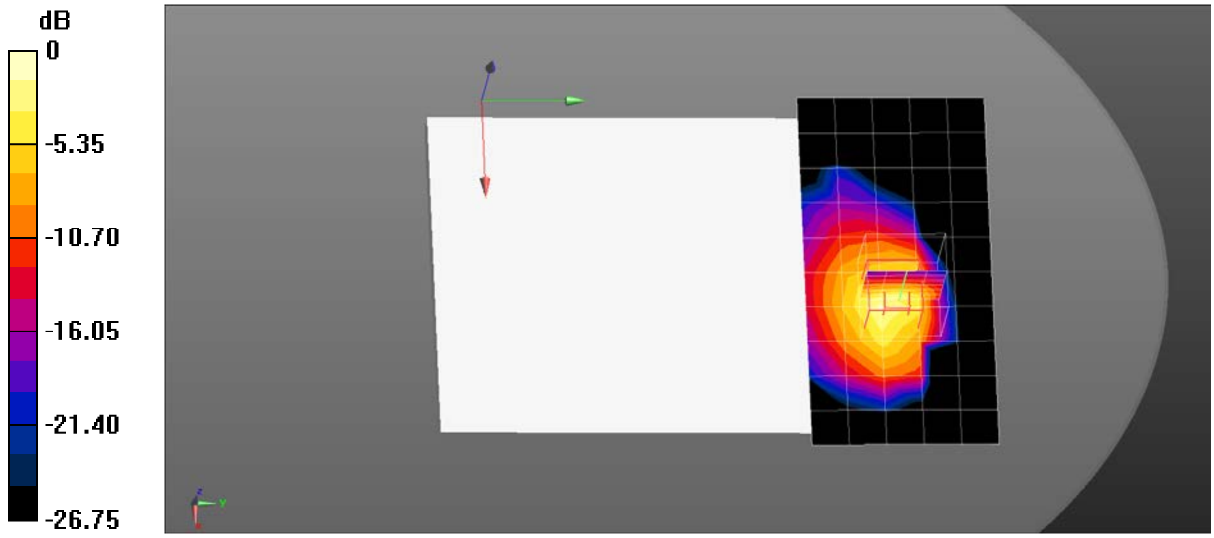
- Probe: EX3DV4 - SN3927; ConvF(8.1, 8.1, 8.1); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/PCS1900MHz Mid Body-Back/Area Scan (11x6x1):** Measurement grid: dx=15mm, dy=15mm, Maximum value of SAR (measured) = 0.198 W/kg

**Configuration/PCS1900MHz Mid Body-Back/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 0 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.349 W/kg

**SAR(1 g) = 0.167 W/kg; SAR(10 g) = 0.078 W/kg** Maximum value of SAR (measured) = 0.273 W/kg




0 dB = 0.273 W/kg = -5.64 dBW/kg

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: GPRS1900MHz Mid Body-Back(4up)**

Communication System Band: GPRS1900MHz(4up); Frequency: 1880 MHz; Duty Cycle: 1:2.1

Medium parameters used: f = 1880 MHz; σ = 1.53 S/m; εr = 51.14; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

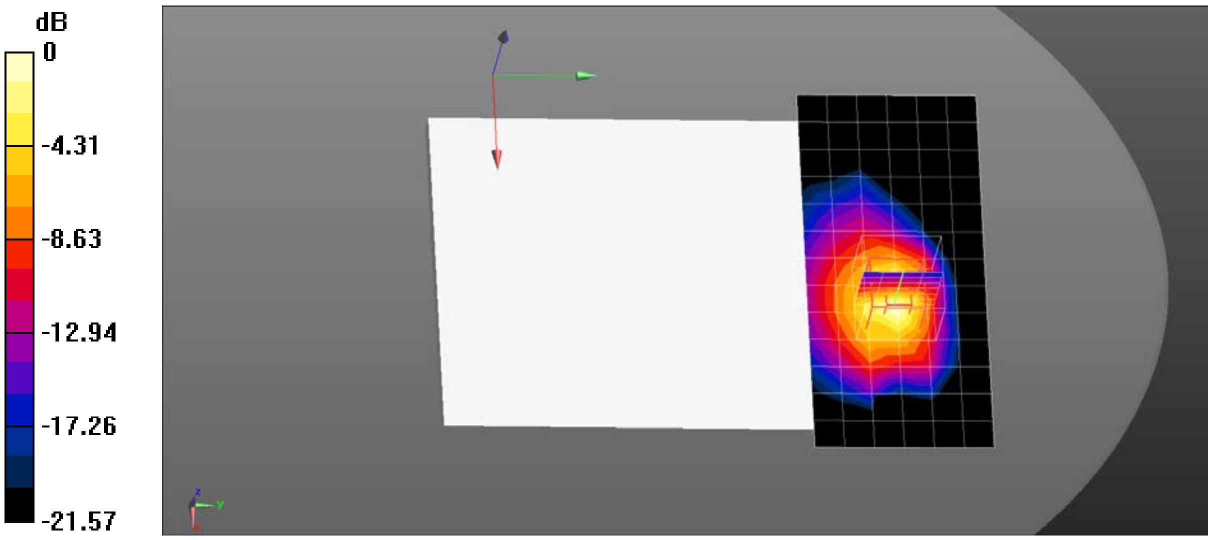
- Probe: EX3DV4 - SN3927; ConvF(8.1, 8.1, 8.1); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/GPRS1900MHz Mid Body-Back(4up)/Area Scan (14x7x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.897 W/kg

**Configuration/GPRS1900MHz Mid Body-Back(4up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 0.3830 V/m; Power Drift = -0.13 dB

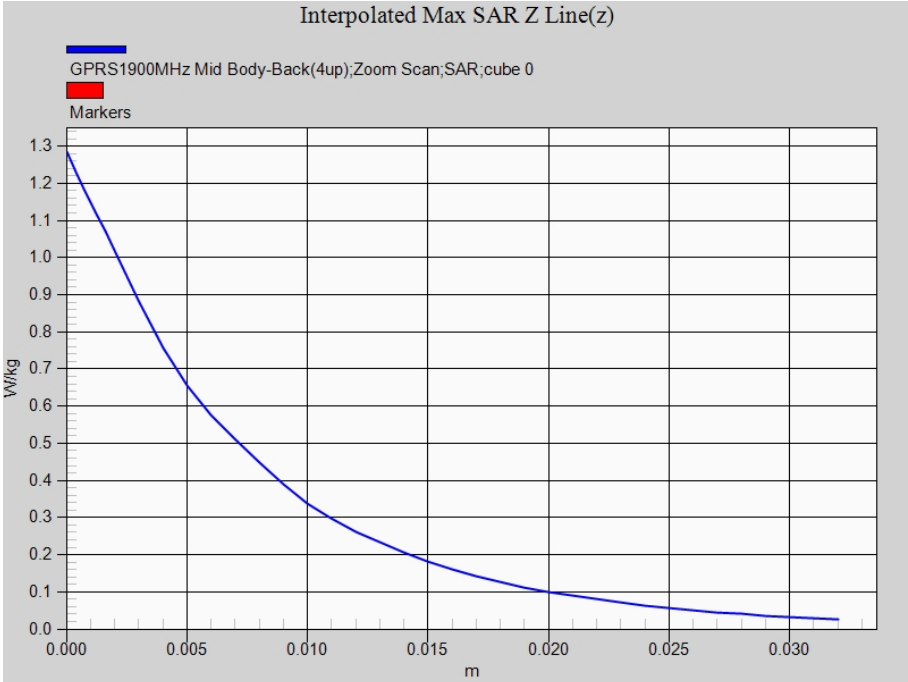
Peak SAR (extrapolated) = 1.29 W/kg

**SAR(1 g) = 0.636 W/kg; SAR(10 g) = 0.298 W/kg** Maximum value of SAR (measured) = 1.03 W/kg




0 dB = 1.03 W/kg = 0.13 dBW/kg

**Z-Axis Plot**


Interpolated Max SAR Z Line(z)
GPRS1900MHz Mid Body-Back(4up);Zoom Scan;SAR;cube 0
Markers
W/kg
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: GPRS1900MHz Mid Body-Rightside(4up)**

Communication System Band: GPRS1900MHz(4up); Frequency: 1880 MHz; Duty Cycle: 1:2.1

Medium parameters used: f = 1880 MHz; σ = 1.53 S/m; εr = 51.14; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

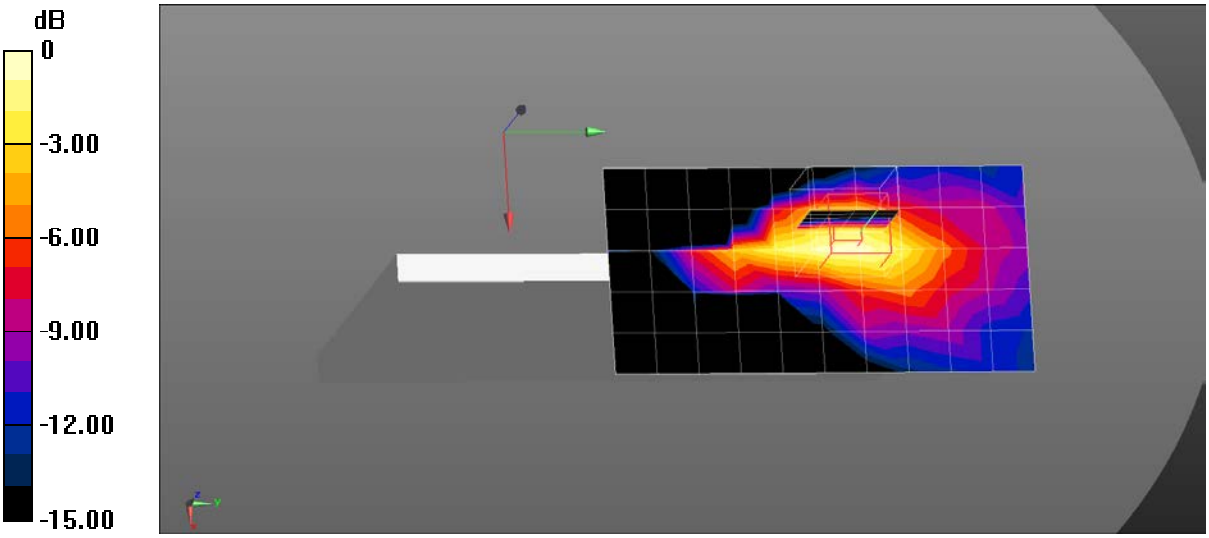
- Probe: EX3DV4 - SN3927; ConvF(8.1, 8.1, 8.1); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/GPRS1900MHz Mid Body-Rightside(4up)/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm, Maximum value of SAR (measured) = 0.0236 W/kg

**Configuration/GPRS1900MHz Mid Body-Rightside(4up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 0 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.0330 W/kg

**SAR(1 g) = 0.018 W/kg; SAR(10 g) = 0.00797 W/kg** Maximum value of SAR (measured) = 0.0253 W/kg




0 dB = 0.0253 W/kg = -15.97 dBW/kg

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: GPRS1900MHz Mid Body-Bottom(4up)**

Communication System Band: GPRS1900MHz(4up); Frequency: 1880 MHz; Duty Cycle: 1:2.1

Medium parameters used: f = 1880 MHz; σ = 1.53 S/m; εr = 51.14; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

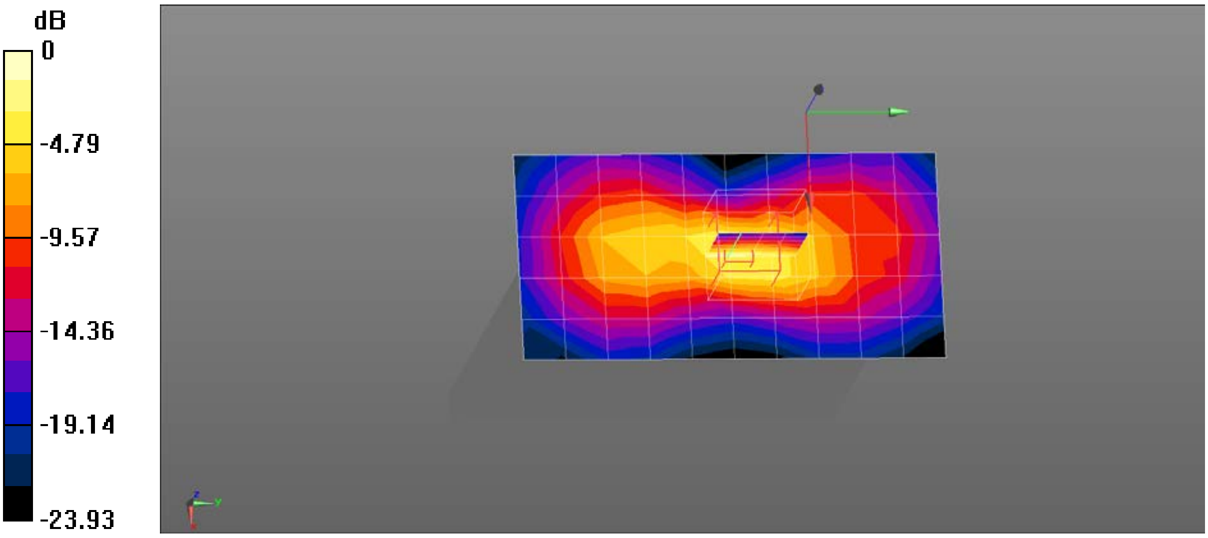
- Probe: EX3DV4 - SN3927; ConvF(8.1, 8.1, 8.1); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/GPRS1900MHz Mid Body-Bottom(4up)/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm, Maximum value of SAR (measured) = 0.141 W/kg

**Configuration/GPRS1900MHz Mid Body-Bottom(4up)/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 11.38 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.369 W/kg

**SAR(1 g) = 0.177 W/kg; SAR(10 g) = 0.082 W/kg** Maximum value of SAR (measured) = 0.295 W/kg




0 dB = 0.295 W/kg = -5.30 dBW/kg

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: WCDMA Band IV Mid Body-Back**

Communication System Band: WCDMA Band IV; Frequency: 1732.6 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1732.6 MHz; σ = 1.47 S/m; εr = 53.16; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

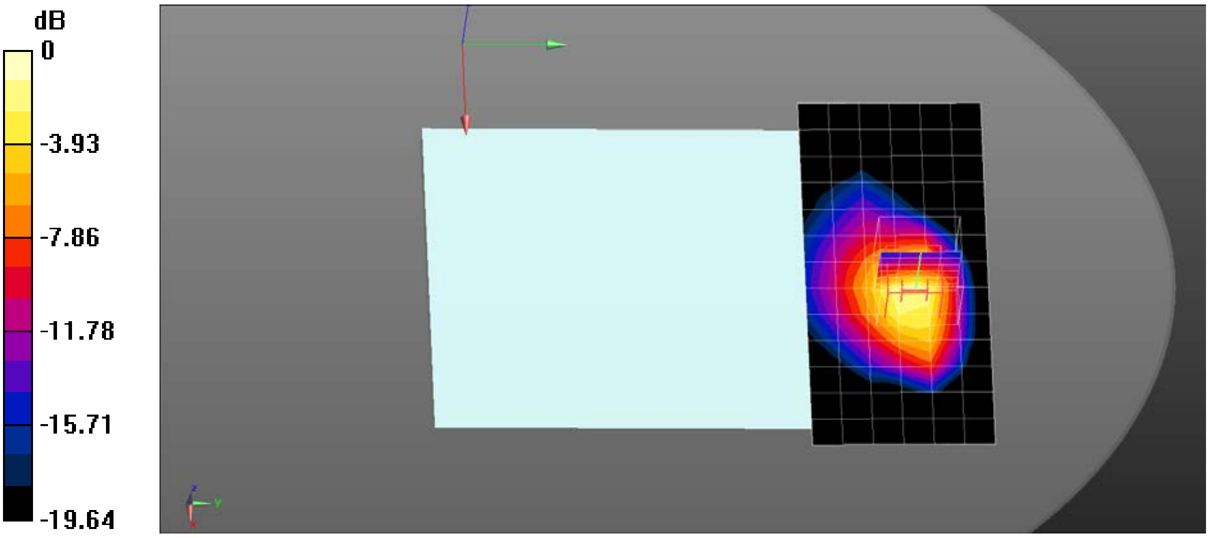
- Probe: EX3DV4 - SN3927; ConvF(8.45, 8.45, 8.45); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/WCDMA Band IV Mid Body-Back/Area Scan (14x7x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.770 W/kg

**Configuration/WCDMA Band IV Mid Body-Back/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 0 V/m; Power Drift = 0.12 dB

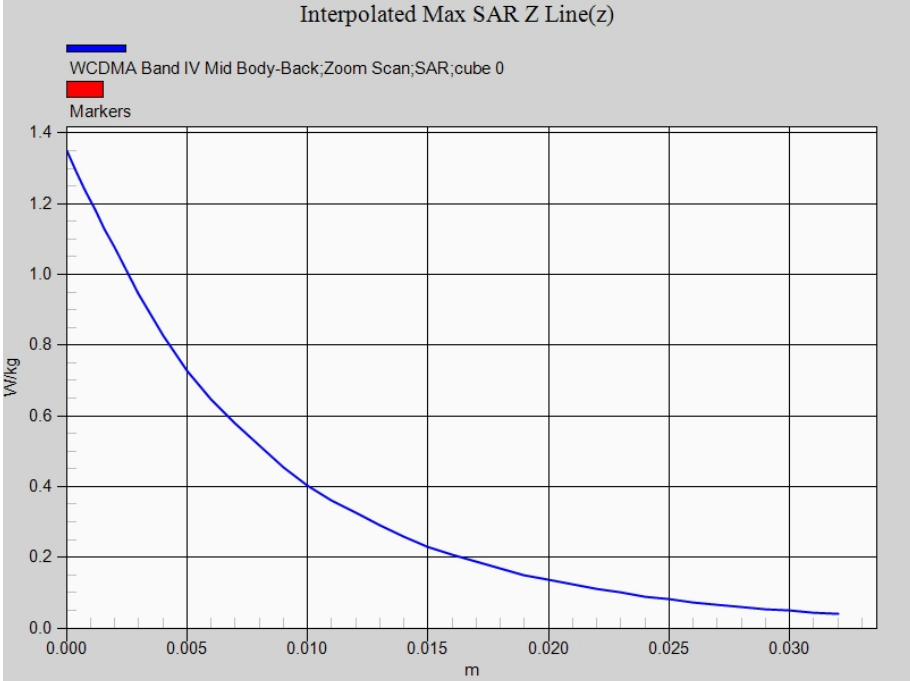
Peak SAR (extrapolated) = 1.35 W/kg

**SAR(1 g) = 0.702 W/kg; SAR(10 g) = 0.348 W/kg** Maximum value of SAR (measured) = 1.06 W/kg




0 dB = 1.06 W/kg = 0.25 dBW/kg

## Z-Axis Plot


Interpolated Max SAR Z Line(z)
WCDMA Band IV Mid Body-Back;Zoom Scan;SAR;cube 0
Markers
W/kg
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: WCDMA Band IV Mid Body-Rightside**

Communication System Band: WCDMA Band IV; Frequency: 1732.6 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1732.6 MHz; σ = 1.47 S/m; εr = 53.16; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

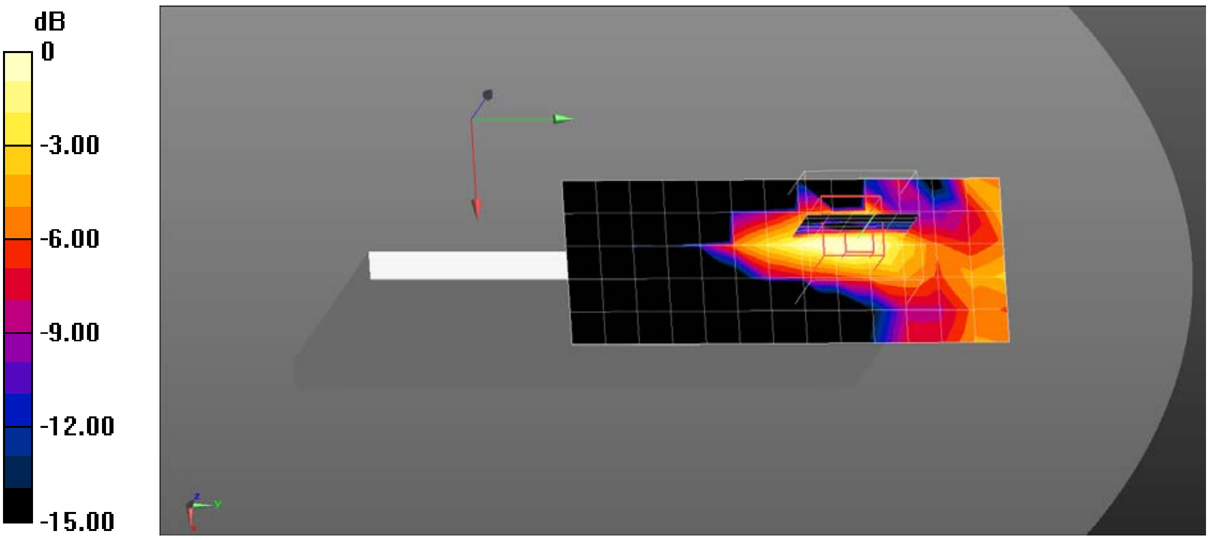
- Probe: EX3DV4 - SN3927; ConvF(8.45, 8.45, 8.45); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/WCDMA Band IV Mid Body-Rightside/Area Scan (6x14x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.00827 W/kg

**Configuration/WCDMA Band IV Mid Body-Rightside/Zoom Scan (6x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 0 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.0110 W/kg

**SAR(1 g) = 0.00432 W/kg; SAR(10 g) = 0.0013 W/kg** Maximum value of SAR (measured) = 0.00677 W/kg




0 dB = 0.00677 W/kg = -21.69 dBW/kg

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: WCDMA Band IV Mid Body-Bottom**

Communication System Band: WCDMA Band IV; Frequency: 1732.6 MHz; Duty Cycle: 1:1

Medium parameters used: f = 1732.6 MHz; σ = 1.47 S/m; εr = 53.16; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

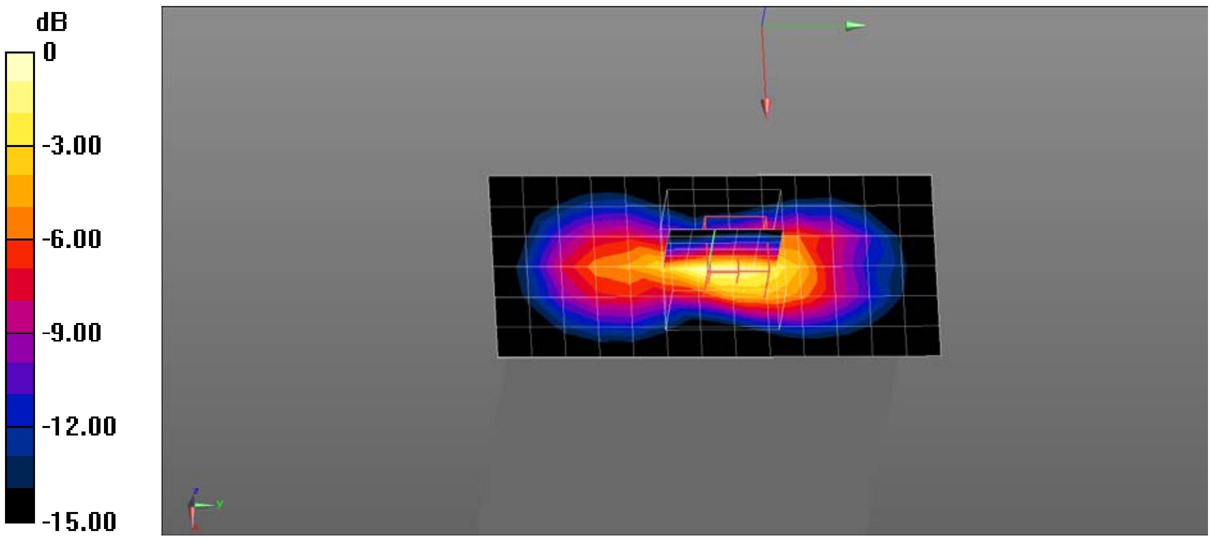
- Probe: EX3DV4 - SN3927; ConvF(8.45, 8.45, 8.45); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/WCDMA Band IV Mid Body-Bottom/Area Scan (7x14x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.460 W/kg

**Configuration/WCDMA Band IV Mid Body-Bottom/Zoom Scan (6x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 14.57 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.637 W/kg

**SAR(1 g) = 0.307 W/kg; SAR(10 g) = 0.151 W/kg** Maximum value of SAR (measured) = 0.495 W/kg




0 dB = 0.495 W/kg = -3.05 dBW/kg

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: WCDMA Band V Mid Body-Back**

Communication System Band: WCDMA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: f = 836.6 MHz; σ = 0.96 S/m; εr = 55.86; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

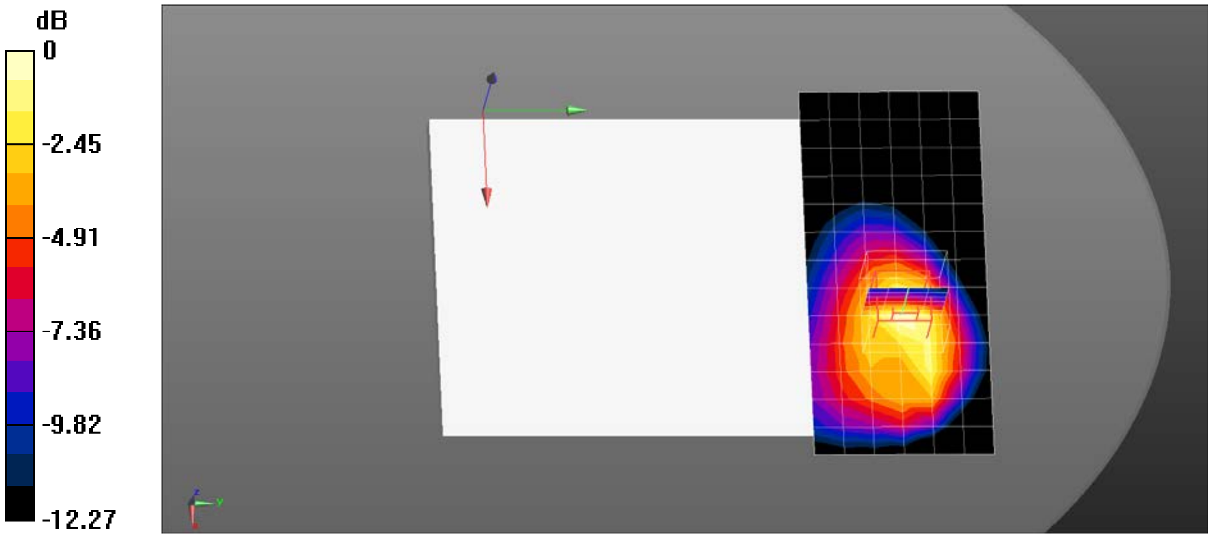
- Probe: EX3DV4 - SN3927; ConvF(9.91, 9.91, 9.91); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/WCDMA Band V Mid Body-Back/Area Scan (14x7x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.653 W/kg

**Configuration/WCDMA Band V Mid Body-Back/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 1.257 V/m; Power Drift = 0.19 dB

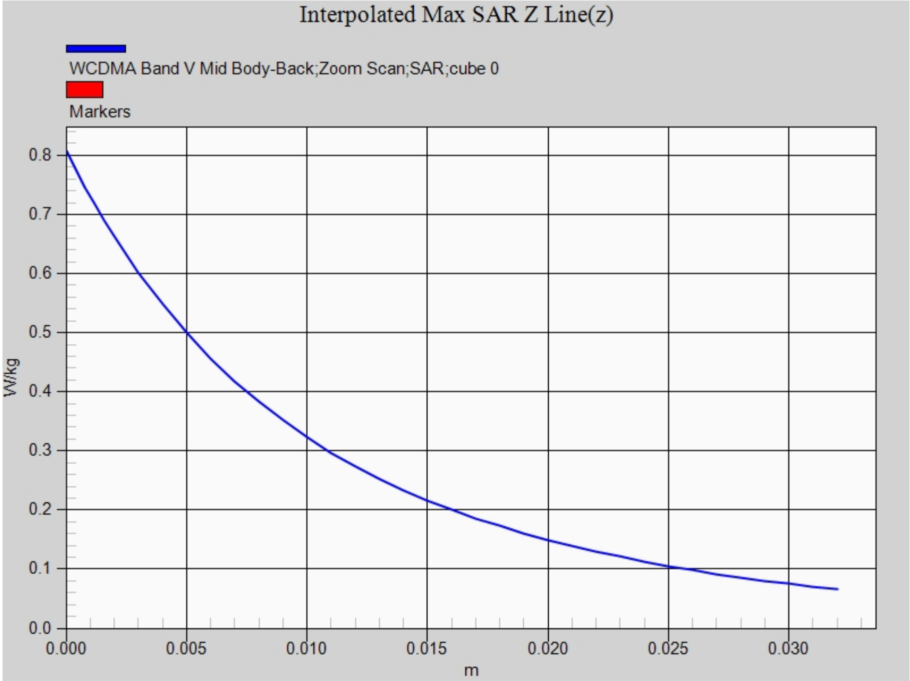
Peak SAR (extrapolated) = 0.808 W/kg

**SAR(1 g) = 0.494 W/kg; SAR(10 g) = 0.296 W/kg** Maximum value of SAR (measured) = 0.658 W/kg




0 dB = 0.658 W/kg = -1.82 dBW/kg

**Z-Axis Plot**


Interpolated Max SAR Z Line(z)
WCDMA Band V Mid Body-Back;Zoom Scan;SAR;cube 0
Markers
W/kg
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: WCDMA Band V Mid Body-Rightside**

Communication System Band: WCDMA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: f = 836.6 MHz; σ = 0.96 S/m; εr = 55.86; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

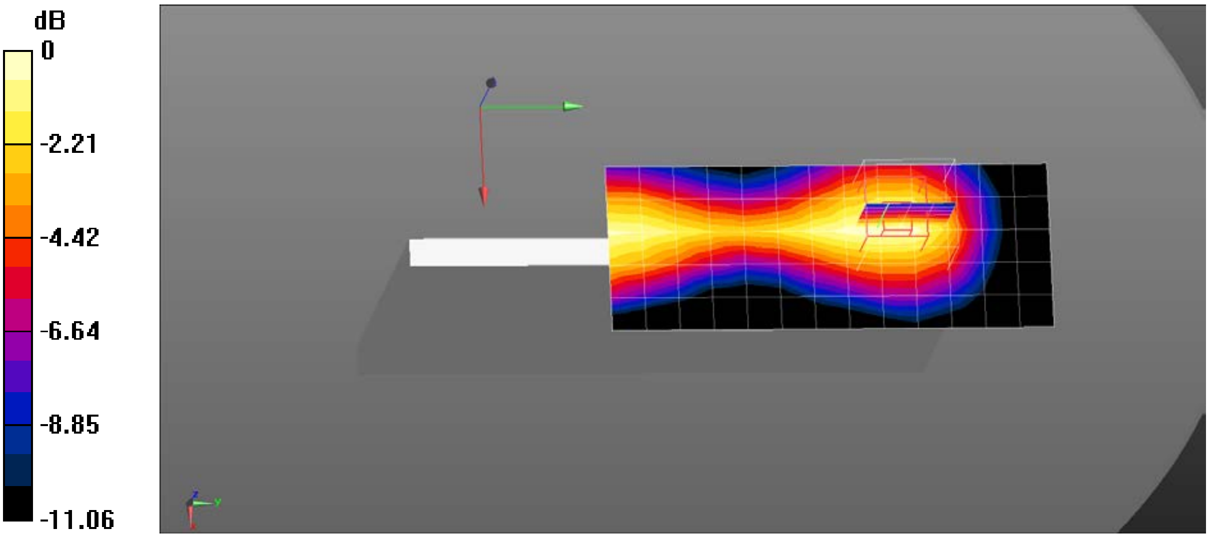
- Probe: EX3DV4 - SN3927; ConvF(9.91, 9.91, 9.91); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/WCDMA Band V Mid Body-Rightside/Area Scan (6x14x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.0531 W/kg

**Configuration/WCDMA Band V Mid Body-Rightside/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 1.590 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.0650 W/kg

**SAR(1 g) = 0.041 W/kg; SAR(10 g) = 0.027 W/kg** Maximum value of SAR (measured) = 0.0542 W/kg




0 dB = 0.0542 W/kg = -12.66 dBW/kg

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: WCDMA Band V Mid Body-Bottom**

Communication System Band: WCDMA Band V; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium parameters used: f = 836.6 MHz; σ = 0.96 S/m; εr = 55.86; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

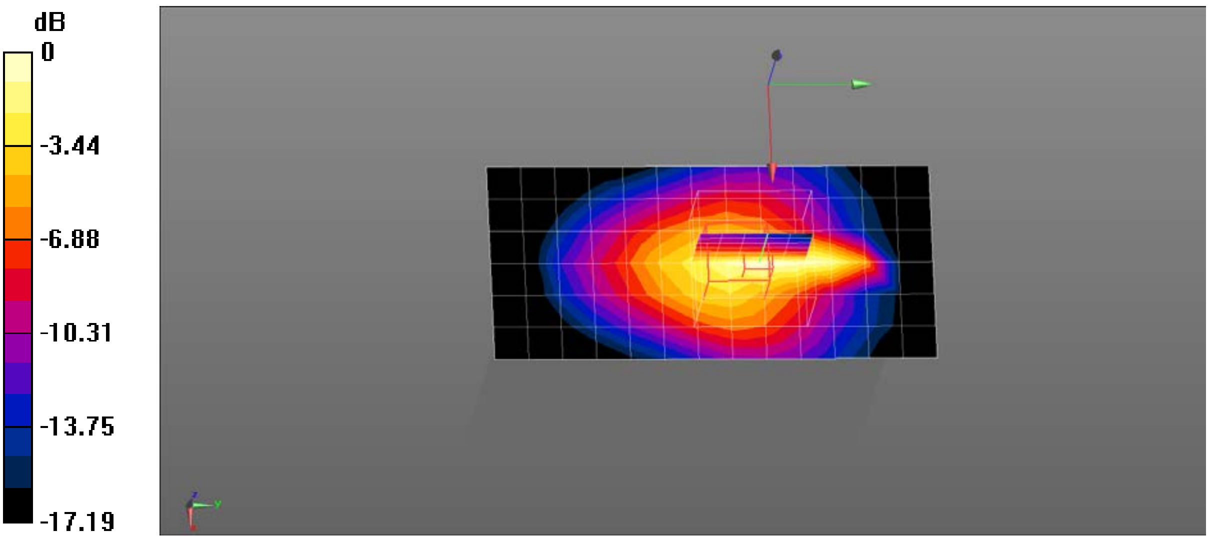
- Probe: EX3DV4 - SN3927; ConvF(9.91, 9.91, 9.91); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/WCDMA Band V Mid Body-Bottom/Area Scan (7x14x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.465 W/kg

**Configuration/WCDMA Band V Mid Body-Bottom/Zoom Scan (6x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 15.59 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.644 W/kg

**SAR(1 g) = 0.269 W/kg; SAR(10 g) = 0.145 W/kg** Maximum value of SAR (measured) = 0.473 W/kg




0 dB = 0.473 W/kg = -3.25 dBW/kg

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: 802.11g 2412MHz Low Body-Back**

Communication System Band: 802.11g; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.92 S/m; εr = 51.4; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

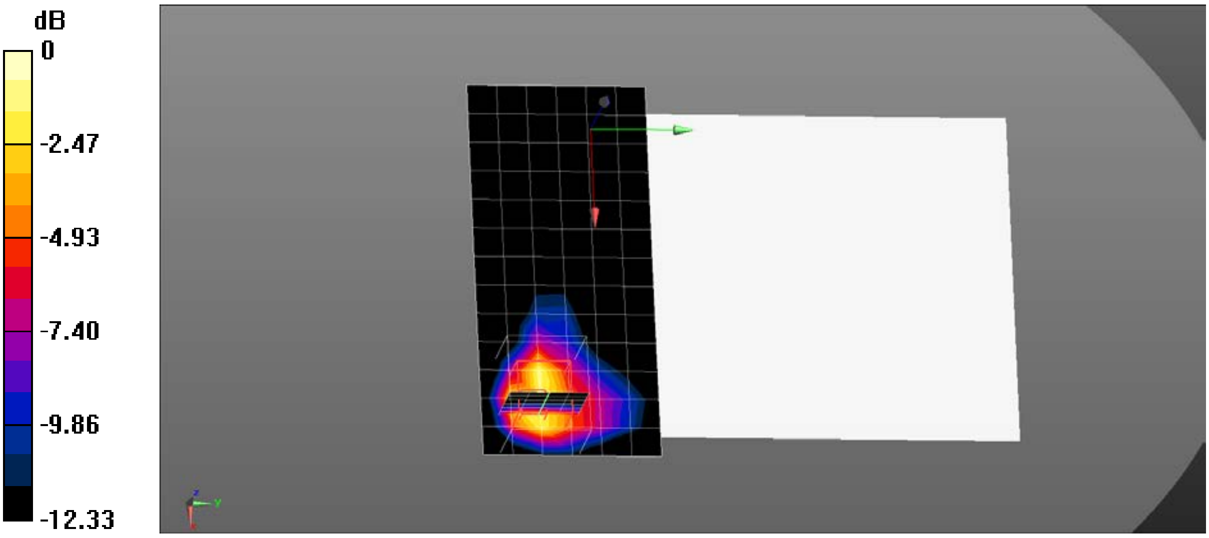
- Probe: EX3DV4 - SN3927; ConvF(7.63, 7.63, 7.63); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/802.11g 2412MHz Low Body-Back/Area Scan (14x7x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.371 W/kg

**Configuration/802.11g 2412MHz Low Body-Back/Zoom Scan (6x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 4.624 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.743 W/kg

**SAR(1 g) = 0.292 W/kg; SAR(10 g) = 0.131 W/kg** Maximum value of SAR (measured) = 0.489 W/kg




0 dB = 0.489 W/kg = -3.11 dBW/kg

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: 802.11g 2437MHz Mid Body-Back**

Communication System Band: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; σ = 1.95 S/m; εr = 51.27; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

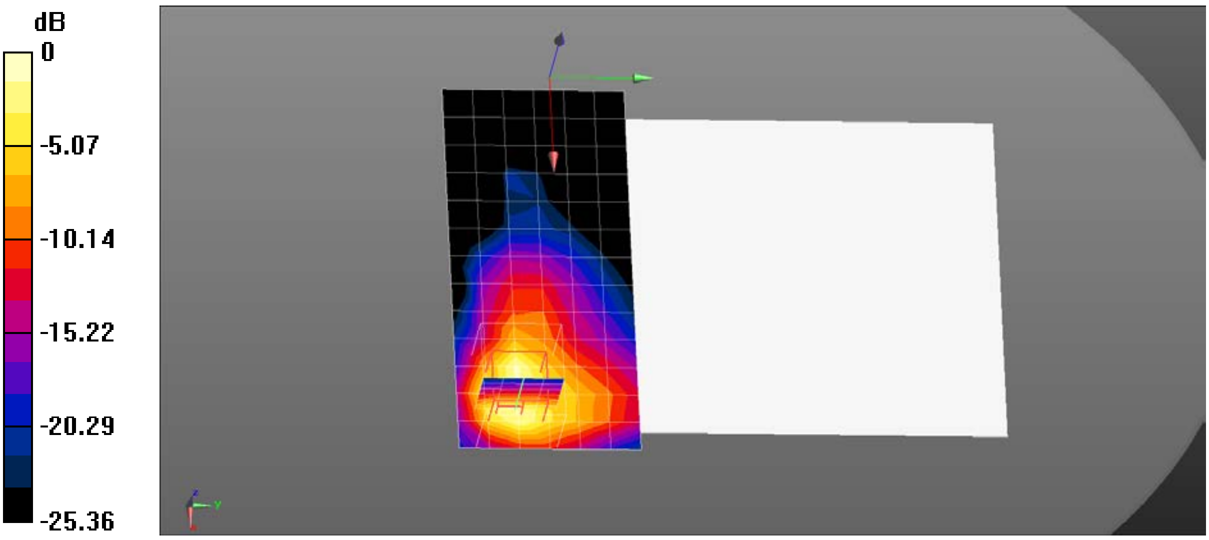
- Probe: EX3DV4 - SN3927; ConvF(7.63, 7.63, 7.63); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/802.11g 2437MHz Mid Body-Back/Area Scan (14x7x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.383 W/kg

**Configuration/802.11g 2437MHz Mid Body-Back/Zoom Scan (6x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 4.643 V/m; Power Drift = -0.15 dB

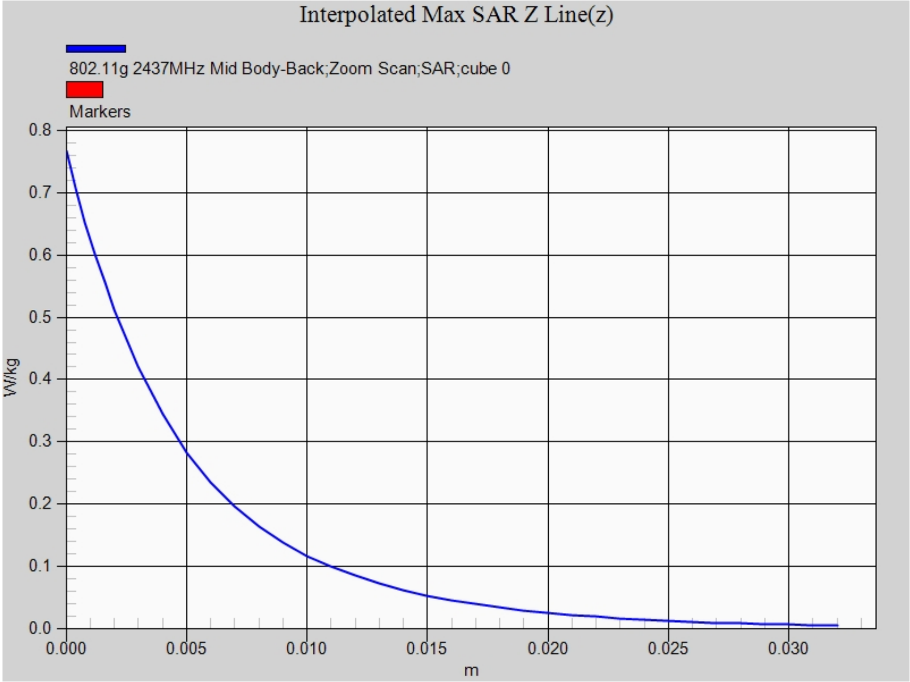
Peak SAR (extrapolated) = 0.768 W/kg

**SAR(1 g) = 0.302 W/kg; SAR(10 g) = 0.135 W/kg** Maximum value of SAR (measured) = 0.505 W/kg




0 dB = 0.505 W/kg = -2.97 dBW/kg

## Z-Axis Plot


Interpolated Max SAR Z Line(z)
802.11g 2437MHz Mid Body-Back;Zoom Scan;SAR;cube 0
Markers
W/kg
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: 802.11g 2462MHz High Body-Back**

Communication System Band: 802.11g; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2462 MHz; σ = 1.98 S/m; εr = 51.2; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

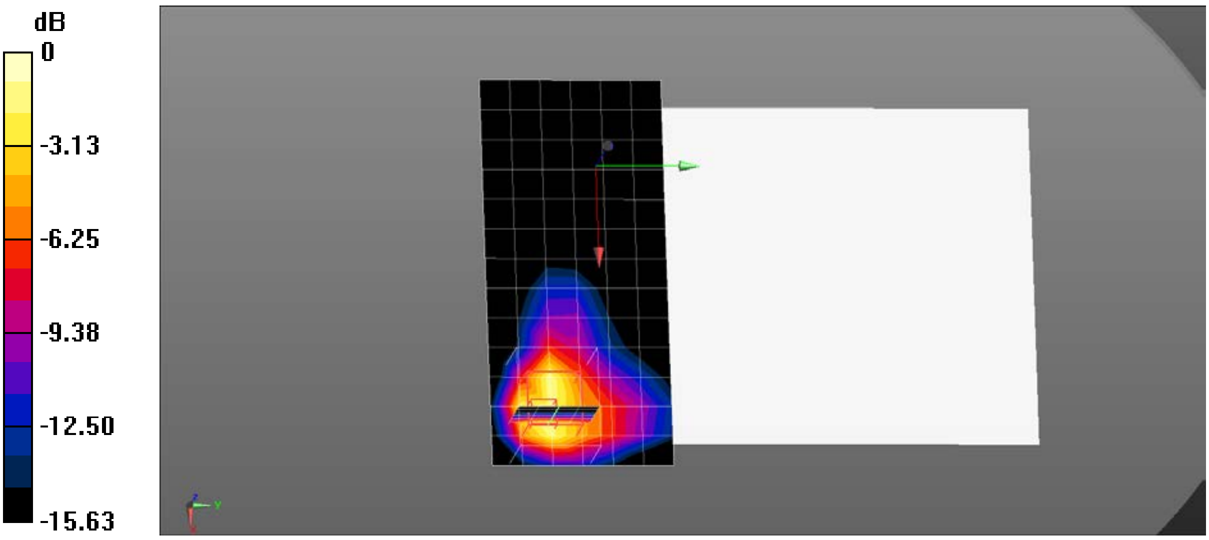
- Probe: EX3DV4 - SN3927; ConvF(7.63, 7.63, 7.63); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/802.11g 2462MHz High Body-Back/Area Scan (14x7x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.381 W/kg

**Configuration/802.11g 2462MHz High Body-Back/Zoom Scan (6x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 4.662 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.765 W/kg

**SAR(1 g) = 0.301 W/kg; SAR(10 g) = 0.135 W/kg** Maximum value of SAR (measured) = 0.503 W/kg




0 dB = 0.503 W/kg = -2.98 dBW/kg

Date/Time: 17/08/2014

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: 802.11g 2437MHz Mid Body-Rightside**

Communication System Band: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; σ = 1.95 S/m; εr = 51.27; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

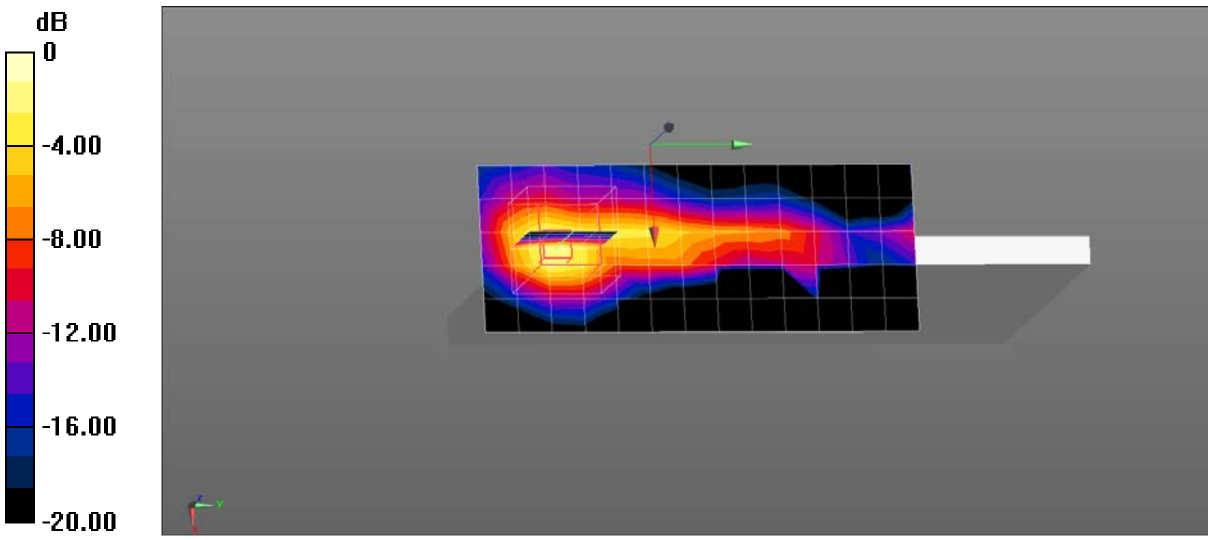
- Probe: EX3DV4 - SN3927; ConvF(7.63, 7.63, 7.63); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/802.11g 2437MHz Mid Body-Rightside/Area Scan (6x14x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.206 W/kg

**Configuration/802.11g 2437MHz Mid Body-Rightside/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 15.68 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 0.430 W/kg

**SAR(1 g) = 0.190 W/kg; SAR(10 g) = 0.082 W/kg** Maximum value of SAR (measured) = 0.308 W/kg




0 dB = 0.308 W/kg = -5.11 dBW/kg

**Date/Time: 17/08/2014**

Test Laboratory: Cerpass Lab

DUT: Tablet PC; Type: H8336

**Procedure Name: 802.11g 2437MHz Mid Body-Top**

Communication System Band: 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium parameters used: f = 2437 MHz; σ = 1.95 S/m; εr = 51.27; ρ = 1000 kg/m3

Phantom section: Flat Section; Tissue Temp(celsius)- 21℃

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY5 Configuration:

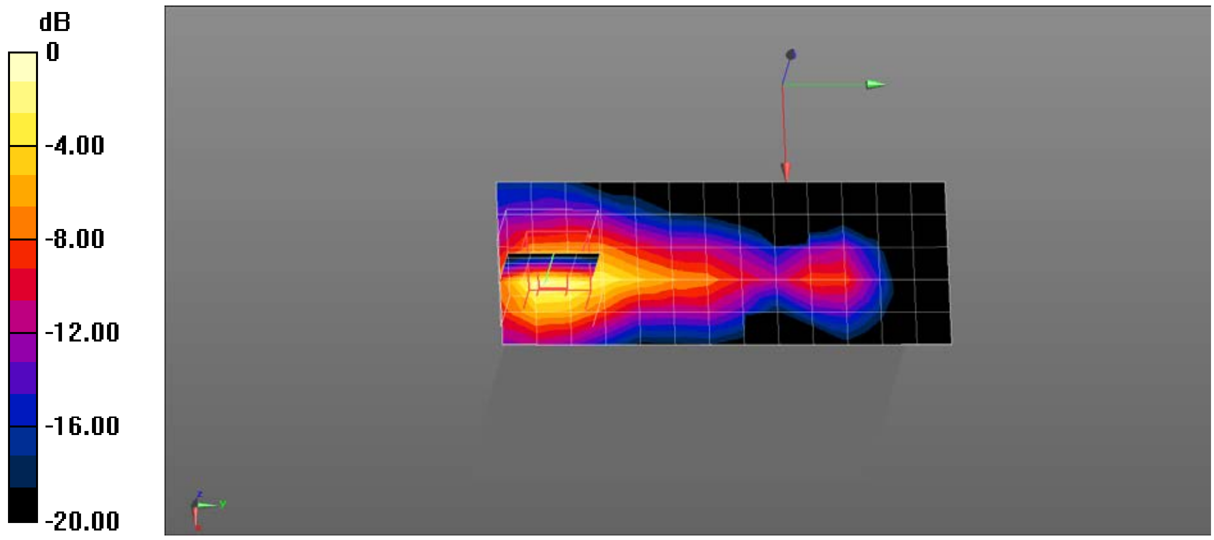
- Probe: EX3DV4 - SN3927; ConvF(7.63, 7.63, 7.63); Calibrated: 2014/5/23;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1379; Calibrated: 2014/5/19
- Phantom: ELI v5.0; Type: QDOVA002AA
- Measurement SW: DASY52, Version 52.8 (8);

**Configuration/802.11g 2437MHz Mid Body-Top/Area Scan (6x14x1):** Measurement grid: dx=12mm, dy=12mm, Maximum value of SAR (measured) = 0.170 W/kg

**Configuration/802.11g 2437MHz Mid Body-Top/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm, Reference Value = 4.858 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.264 W/kg

**SAR(1 g) = 0.113 W/kg; SAR(10 g) = 0.048 W/kg** Maximum value of SAR (measured) = 0.195 W/kg




0 dB = 0.195 W/kg = -7.10 dBW/kg

# 8. APPENDIX C Antenna Location, EUT and Test Setup Photographs

Note: Antenna Location, EUT and test setup photographs, see separate documents in PDF, named FCC SAR-Appendix C-Antenna internal view, outside view and Test Setup Photographs.

# 9. APPENDIX D. Probe Calibration Data

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Cerpass (Auden)**

Certificate No: **EX3-3927_May14**

## CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3927

Calibration procedure(s): QA CAL-01.v9, QA CAL-12.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: May 23, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 03-Apr-14 (No. 217-01911) | Apr-15 |
| Power sensor E4412A | MY41498087 | 03-Apr-14 (No. 217-01911) | Apr-15 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 03-Apr-14 (No. 217-01915) | Apr-15 |
| Reference 20 dB Attenuator | SN: S5277 (20x) | 03-Apr-14 (No. 217-01919) | Apr-15 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 03-Apr-14 (No. 217-01920) | Apr-15 |
| Reference Probe ES3DV2 | SN: 3013 | 30-Dec-13 (No. ES3-3013_Dec13) | Dec-14 |
| DAE4 | SN: 660 | 13-Dec-13 (No. DAE4-660_Dec13) | Dec-14 |
| | | | |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (in house check Apr-13) | In house check: Apr-16 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (in house check Oct-13) | In house check: Oct-14 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Claudio Leubler | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: May 23, 2014



Certificate No: EX3-3927_May14 Page 1 of 11

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

Accreditation No.: **SCS 108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

## Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the $E^2$-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

# Probe EX3DV4

## SN:3927

Manufactured: March 8, 2013
Calibrated: May 23, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3927

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|---|---|---|---|
| Norm ($\mu V/(V/m)^2$)[A] | 0.57 | 0.33 | 0.61 | ± 10.1 % |
| DCP (mV)[B] | 96.7 | 96.5 | 92.4 | |

## Modulation Calibration Parameters

| UID | Communication System Name | | A dB | B dB$\sqrt{\mu V}$ | C | D dB | VR mV | Unc[E] (k=2) |
|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 133.2 | ±3.3 % |
| | | Y | 0.0 | 0.0 | 1.0 | | 148.7 | |
| | | Z | 0.0 | 0.0 | 1.0 | | 135.9 | |

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

[A] The uncertainties of NormX,Y,Z do not affect the $E^2$-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3927

## Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 450 | 43.5 | 0.87 | 11.02 | 11.02 | 11.02 | 0.15 | 1.30 | ± 13.3 % |
| 850 | 41.5 | 0.92 | 10.23 | 10.23 | 10.23 | 0.43 | 0.81 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 8.55 | 8.55 | 8.55 | 0.40 | 0.90 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 8.31 | 8.31 | 8.31 | 0.60 | 0.66 | ± 12.0 % |
| 2100 | 39.8 | 1.49 | 8.47 | 8.47 | 8.47 | 0.56 | 0.65 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 7.48 | 7.48 | 7.48 | 0.68 | 0.59 | ± 12.0 % |
| 5200 | 36.0 | 4.66 | 5.35 | 5.35 | 5.35 | 0.30 | 1.80 | ± 13.1 % |
| 5500 | 35.6 | 4.96 | 4.97 | 4.97 | 4.97 | 0.35 | 1.80 | ± 13.1 % |
| 5600 | 35.5 | 5.07 | 4.78 | 4.78 | 4.78 | 0.40 | 1.80 | ± 13.1 % |
| 5800 | 35.3 | 5.27 | 4.65 | 4.65 | 4.65 | 0.40 | 1.80 | ± 13.1 % |

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

[F] At frequencies below 3 GHz, the validity of tissue parameters ($\varepsilon$ and $\sigma$) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ($\varepsilon$ and $\sigma$) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3927

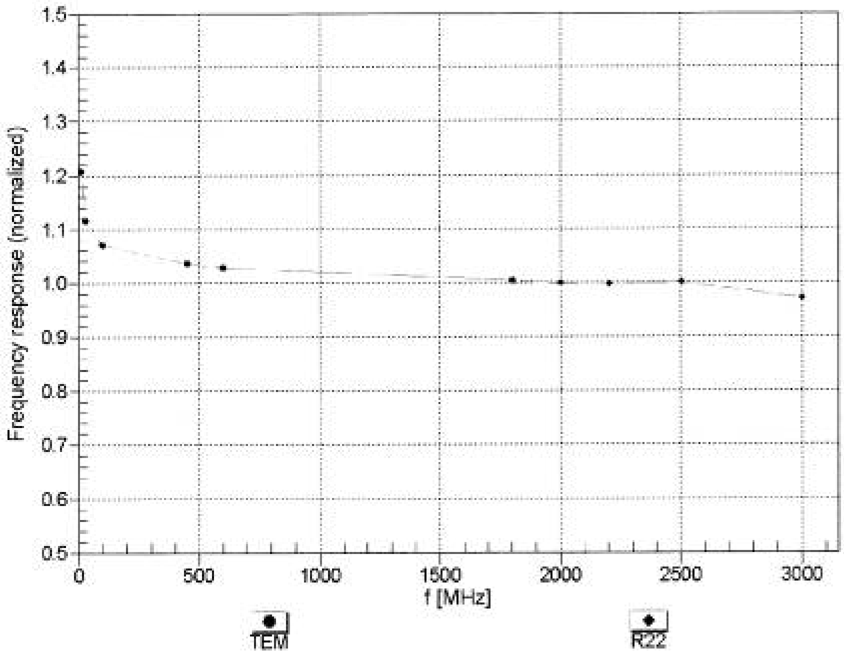
### Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha [G] | Depth [G] (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 450 | 56.7 | 0.94 | 11.67 | 11.67 | 11.67 | 0.10 | 1.20 | ± 13.3 % |
| 850 | 55.2 | 0.99 | 9.91 | 9.91 | 9.91 | 0.28 | 1.18 | ± 12.0 % |
| 1750 | 53.4 | 1.49 | 8.45 | 8.45 | 8.45 | 0.71 | 0.64 | ± 12.0 % |
| 1900 | 53.3 | 1.52 | 8.10 | 8.10 | 8.10 | 0.38 | 0.91 | ± 12.0 % |
| 2100 | 53.2 | 1.62 | 8.40 | 8.40 | 8.40 | 0.40 | 0.87 | ± 12.0 % |
| 2450 | 52.7 | 1.95 | 7.63 | 7.63 | 7.63 | 0.80 | 0.50 | ± 12.0 % |
| 5200 | 49.0 | 5.30 | 4.61 | 4.61 | 4.61 | 0.40 | 1.90 | ± 13.1 % |
| 5500 | 48.6 | 5.65 | 4.30 | 4.30 | 4.30 | 0.40 | 1.90 | ± 13.1 % |
| 5600 | 48.5 | 5.77 | 4.23 | 4.23 | 4.23 | 0.40 | 1.90 | ± 13.1 % |
| 5800 | 48.2 | 6.00 | 4.25 | 4.25 | 4.25 | 0.45 | 1.90 | ± 13.1 % |

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Above 5 GHz frequency validity can be extended to ± 110 MHz. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively.
[F] At frequencies below 3 GHz, the validity of tissue parameters ($\varepsilon$ and $\sigma$) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ($\varepsilon$ and $\sigma$) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.
[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

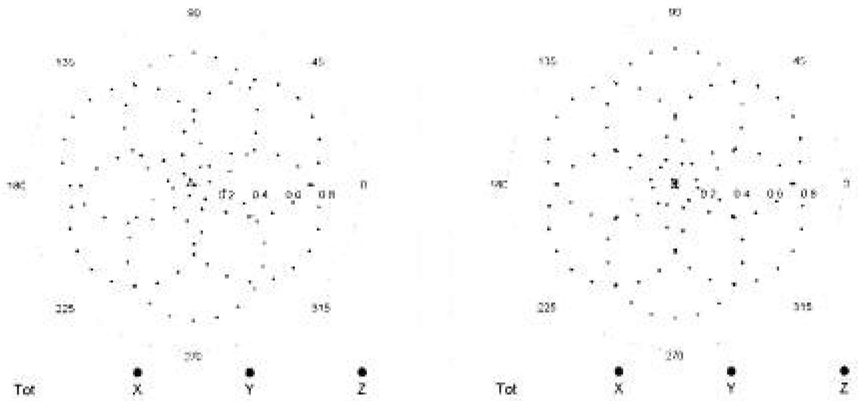
# Frequency Response of E-Field

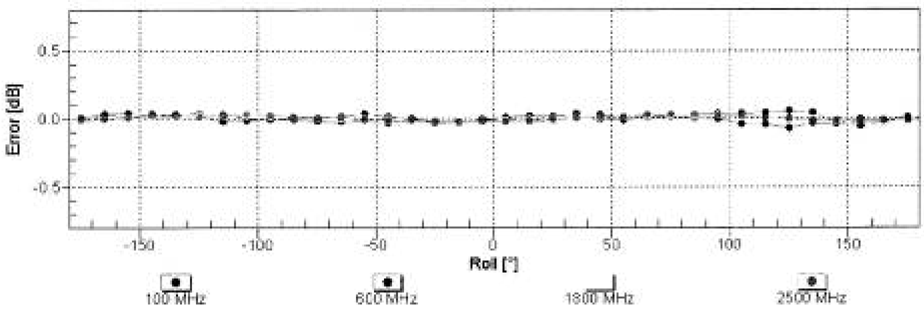
(TEM-Cell:ifi110 EXX, Waveguide: R22)




Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

## Receiving Pattern (ϕ), $\vartheta = 0°$



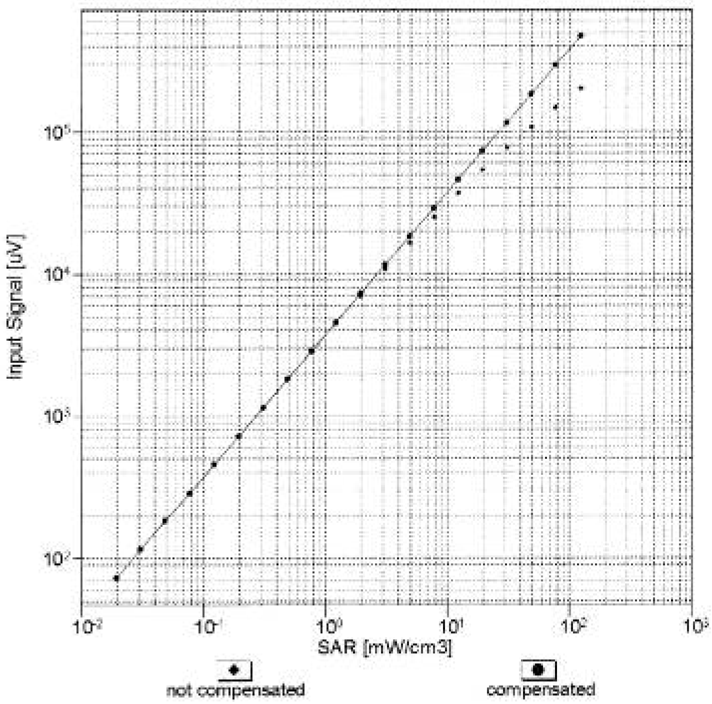



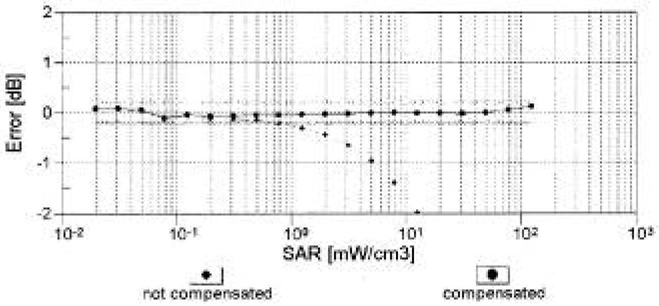

**Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)**

EX3DV4– SN:3927 May 23, 2014

## Dynamic Range f($SAR_{head}$)

(TEM cell , $f_{eval}$= 1900 MHz)




**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

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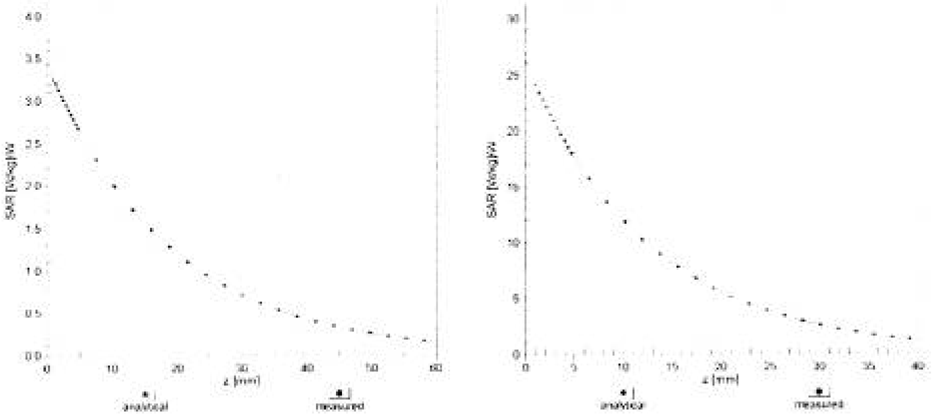
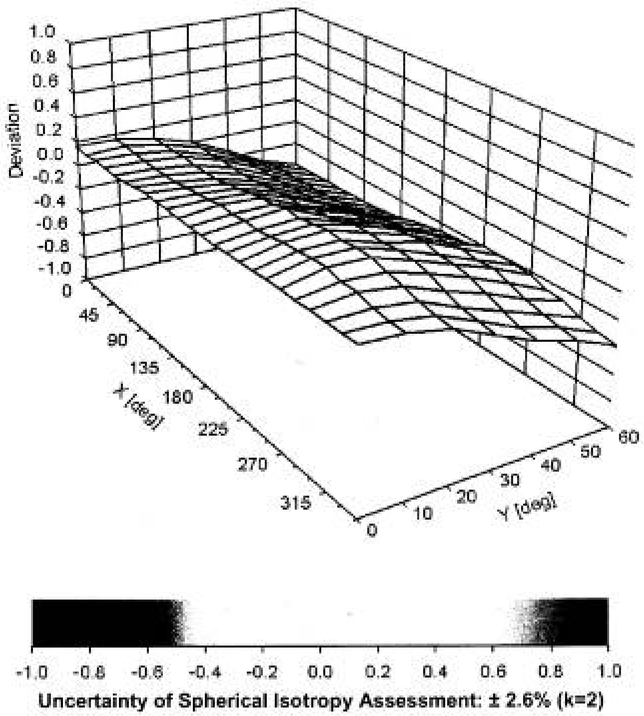
EX3DV4– SN:3927 May 23, 2014

# Conversion Factor Assessment




# Deviation from Isotropy in Liquid

**Error (ϕ, ϑ), f = 900 MHz**




**Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)**

Certificate No: EX3-3927_May14 Page 10 of 11

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3927

## Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | 25.1 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 9 mm |
| Tip Diameter | 2.5 mm |
| Probe Tip to Sensor X Calibration Point | 1 mm |
| Probe Tip to Sensor Y Calibration Point | 1 mm |
| Probe Tip to Sensor Z Calibration Point | 1 mm |
| Recommended Measurement Distance from Surface | 2 mm |

# 10. Appendix E. Dipole Calibration Data

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
**Zeughausstrasse 43, 8004 Zurich, Switzerland**

**S** Schweizerischer Kalibrierdienst
**C** Service suisse d'étalonnage
Servizio svizzero di taratura
**S** Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
**The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates**

Accreditation No.: **SCS 108**

Client **Cerpass (Auden)**

Certificate No: **D450V3-1086_Jun13**

## CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D450V3 - SN: 1086 |
| Calibration procedure(s) | QA CAL-15.v7<br>Calibration procedure for dipole validation kits below 700 MHz |
| Calibration date: | June 14, 2013 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 04-Apr-13 (No. 217-01733) | Apr-14 |
| Power sensor E4412A | MY41498087 | 04-Apr-13 (No. 217-01733) | Apr-14 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 04-Apr-13 (No. 217-01737) | Apr-14 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-13 (No. 217-01736) | Apr-14 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739) | Apr-14 |
| Reference Probe ET3DV6 | SN: 1507 | 28-Dec-12 (No. ET3-1507_Dec12) | Dec-13 |
| DAE4 | SN: 654 | 10-Apr-13 (No. DAE4-654_Apr13) | Apr-14 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (in house check Oct-11) | In house check: Oct-13 |
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-11) | In house check: Oct-13 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-12) | In house check: Oct-13 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Jeton Kastrati | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: June 14, 2013

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

Certificate No: D450V3-1086_Jun13 Page 1 of 8

**Calibration Laboratory of**
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

**Glossary:**

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

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

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

**Measurement Conditions**

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | ELI4 Flat Phantom | Shell thickness: 2 ± 0.2 mm |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 450 MHz ± 1 MHz | |

**Head TSL parameters**

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 43.5 | 0.87 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 44.2 ± 6 % | 0.90 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

**SAR result with Head TSL**

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.21 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **4.73 W/kg ± 18.1 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 0.802 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **3.14 W/kg ± 17.6 % (k=2)** |

**Body TSL parameters**

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 56.7 | 0.94 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 57.1 ± 6 % | 0.96 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

**SAR result with Body TSL**

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.17 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **4.61 W/kg ± 18.1 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 0.776 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **3.06 W/kg ± 17.6 % (k=2)** |

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 51.1 Ω - 8.2 jΩ |
| Return Loss | - 21.8 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 56.2 Ω - 6.2 jΩ |
| Return Loss | - 21.7 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.349 ns |

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

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

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | October 10, 2012 |

**DASY5 Validation Report for Head TSL**

Date: 14.06.2013

Test Laboratory: The name of your organization

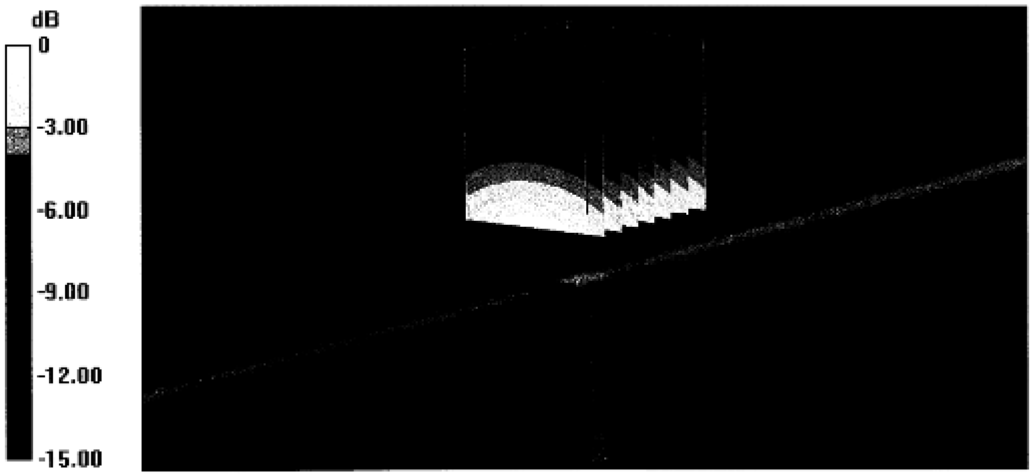
**DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN: 1086**

Communication System: UID 0 - CW ; Frequency: 450 MHz
Medium parameters used: f = 450 MHz; $\sigma$ = 0.9 S/m; $\varepsilon_r$ = 44.2; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

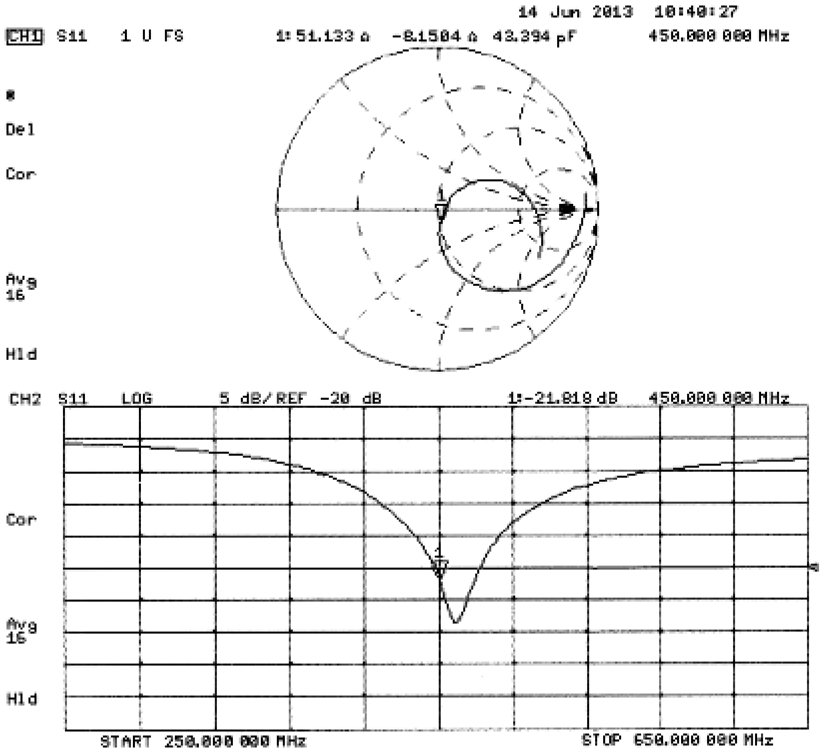
- Probe: ET3DV6 - SN1507; ConvF(6.59, 6.59, 6.59); Calibrated: 28.12.2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 10.04.2013
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Head Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.197 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.85 W/kg
**SAR(1 g) = 1.21 W/kg; SAR(10 g) = 0.802 W/kg**
Maximum value of SAR (measured) = 1.30 W/kg




0 dB = 1.30 W/kg = 1.14 dBW/kg

**Impedance Measurement Plot for Head TSL**




Certificate No: D450V3-1086_Jun13 Page 6 of 8

**DASY5 Validation Report for Body TSL**

Date: 14.06.2013

Test Laboratory: The name of your organization

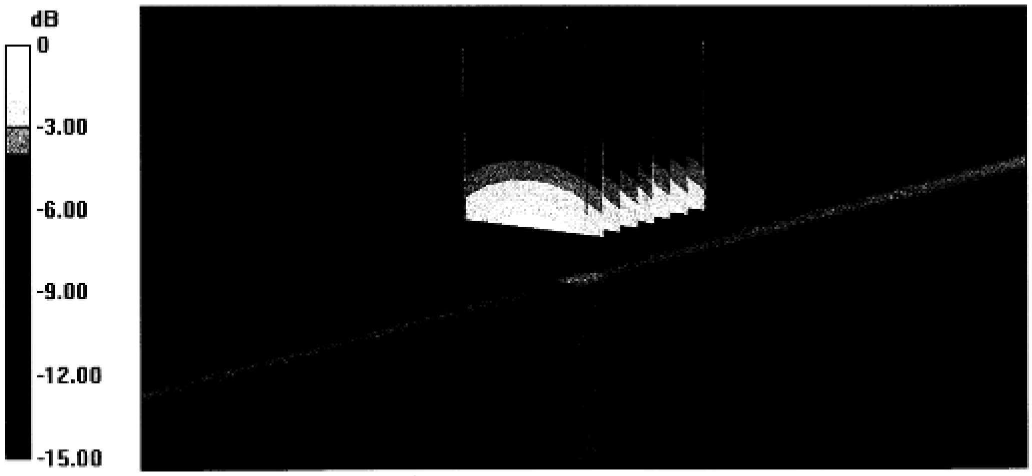
**DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN: 1086**

Communication System: UID 0 - CW ; Frequency: 450 MHz
Medium parameters used: f = 450 MHz; $\sigma$ = 0.96 S/m; $\varepsilon_r$ = 57.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

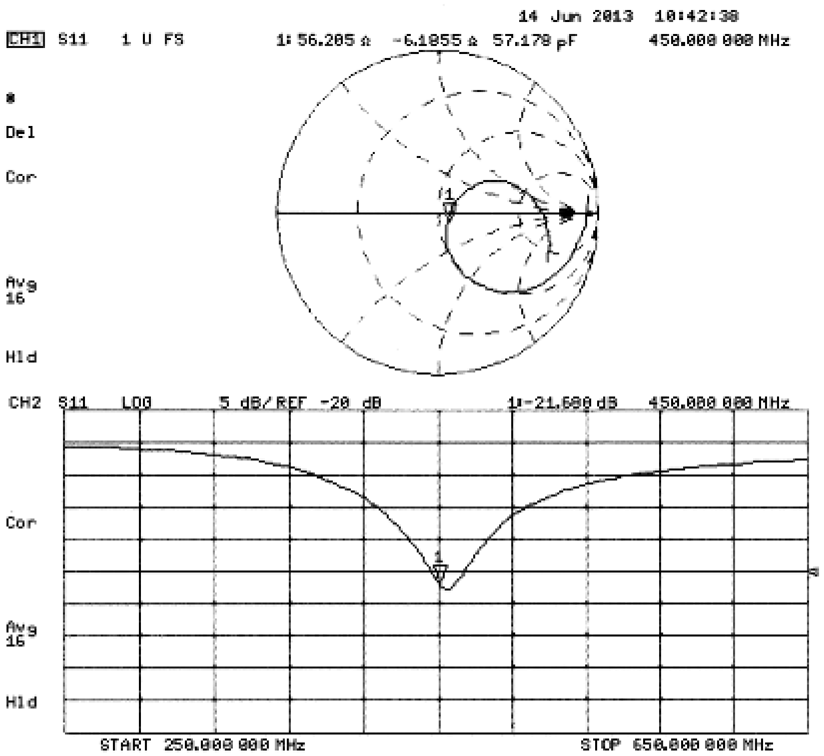
- Probe: ET3DV6 - SN1507; ConvF(7.03, 7.03, 7.03); Calibrated: 28.12.2012;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 10.04.2013
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Body Tissue/d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 39.197 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.81 W/kg
**SAR(1 g) = 1.17 W/kg; SAR(10 g) = 0.776 W/kg**
Maximum value of SAR (measured) = 1.25 W/kg



0 dB = 1.25 W/kg = 0.97 dBW/kg

**Impedance Measurement Plot for Body TSL**




Certificate No: D450V3-1086_Jun13 Page 8 of 8

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**Accreditation No.: SCS 108**

Client **Cerpass (Auden)**

Certificate No: **D850V2-1008_Jun13**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D850V2 - SN: 1008 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | June 13, 2013 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 01-Nov-12 (No. 217-01640) | Oct-13 |
| Power sensor HP 8481A | US37292783 | 01-Nov-12 (No. 217-01640) | Oct-13 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-13 (No. 217-01736) | Apr-14 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739) | Apr-14 |
| Reference Probe ES3DV3 | SN: 3205 | 28-Dec-12 (No. ES3-3205_Dec12) | Dec-13 |
| DAE4 | SN: 601 | 25-Apr-13 (No. DAE4-601_Apr13) | Apr-14 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (in house check Oct-11) | In house check: Oct-13 |
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-11) | In house check: Oct-13 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-12) | In house check: Oct-13 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Leif Klysner | Laboratory Technician | Leif Klysner |
| Approved by: | Katja Pokovic | Technical Manager | Katja Pokovic |

Issued: June 13, 2013

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Accreditation No.: **SCS 108**

**Glossary:**

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

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

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

### Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 850 MHz ± 1 MHz | |

### Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 41.5 | 0.92 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 40.5 ± 6 % | 0.95 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

### SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.53 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.83 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.63 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.37 W/kg ± 16.5 % (k=2)** |

### Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 55.2 | 0.99 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 53.9 ± 6 % | 1.03 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

### SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.49 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **9.62 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.61 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **6.27 W/kg ± 16.5 % (k=2)** |

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 52.2 Ω - 3.1 jΩ |
| Return Loss | - 28.6 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 47.5 Ω - 5.3 jΩ |
| Return Loss | - 24.4 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.382 ns |

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

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

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | January 30, 2009 |

### DASY5 Validation Report for Head TSL

Date: 13.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

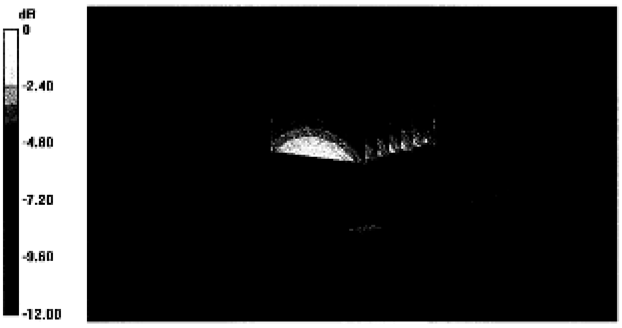
**DUT: Dipole 850 MHz; Type: D850V2; Serial: D850V2 - SN: 1008**

Communication System: UID 0 - CW ; Frequency: 850 MHz
Medium parameters used: f = 850 MHz; $\sigma$ = 0.95 S/m; $\varepsilon_r$ = 40.5; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

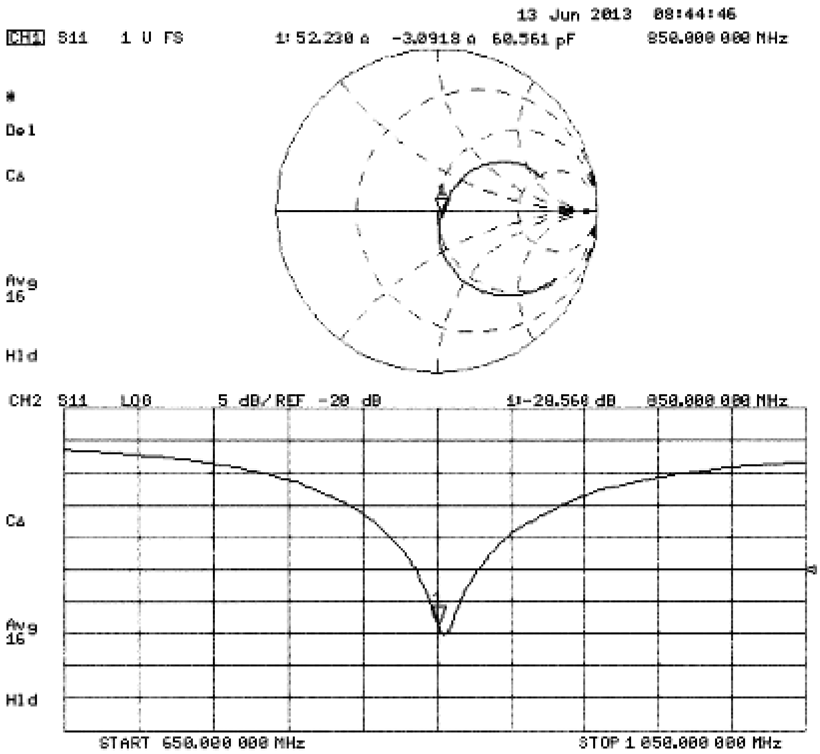
- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.472 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.82 W/kg
**SAR(1 g) = 2.53 W/kg; SAR(10 g) = 1.63 W/kg**
Maximum value of SAR (measured) = 2.96 W/kg




0 dB = 2.96 W/kg = 4.71 dBW/kg

**Impedance Measurement Plot for Head TSL**




Certificate No: D850V2-1008_Jun13 Page 6 of 8

**DASY5 Validation Report for Body TSL**

Date: 12.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

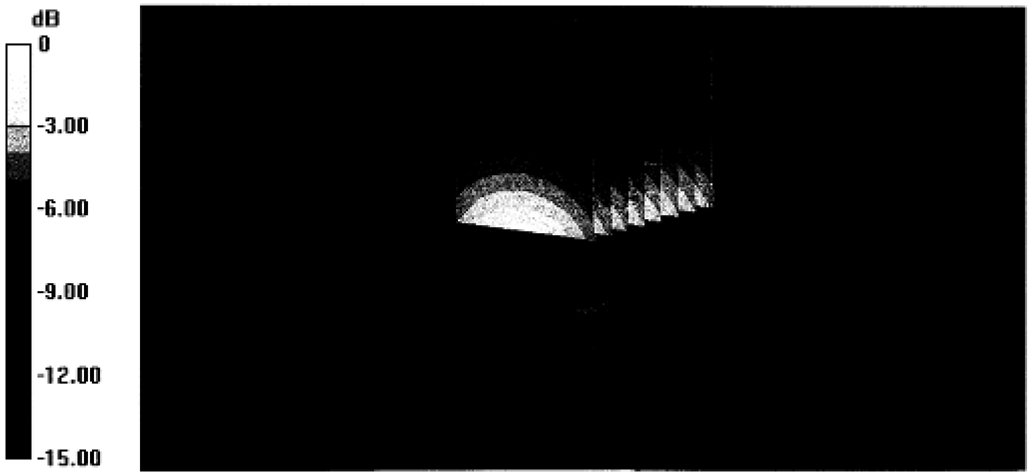
**DUT: Dipole 850 MHz; Type: D850V2; Serial: D850V2 - SN: 1008**

Communication System: UID 0 - CW ; Frequency: 850 MHz
Medium parameters used: f = 850 MHz; $\sigma$ = 1.03 S/m; $\varepsilon_r$ = 53.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.01, 6.01, 6.01); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

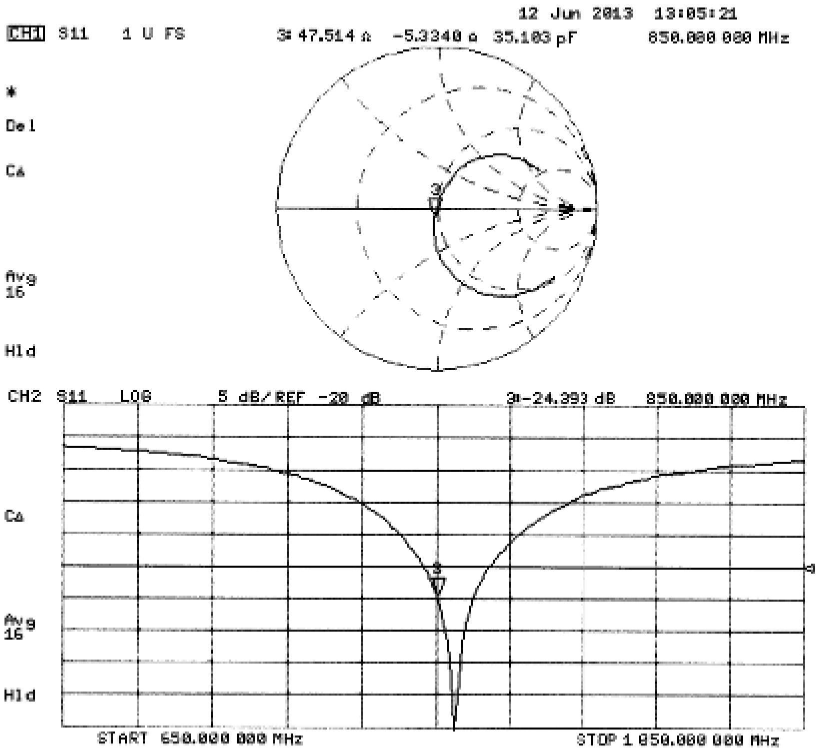
**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7) (7x8x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.836 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.67 W/kg
**SAR(1 g) = 2.49 W/kg; SAR(10 g) = 1.61 W/kg**
Maximum value of SAR (measured) = 2.91 W/kg




0 dB = 2.91 W/kg = 4.64 dBW/kg

Certificate No: D850V2-1008_Jun13 Page 7 of 8

**Impedance Measurement Plot for Body TSL**




Certificate No: D850V2-1008_Jun13 Page 8 of 8

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**Accreditation No.: SCS 108**

**Client** **Cerpass (Auden)**

**Certificate No: D1750V2-1097_Jun13**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1750V2 - SN: 1097 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | June 11, 2013 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 01-Nov-12 (No. 217-01640) | Oct-13 |
| Power sensor HP 8481A | US37292783 | 01-Nov-12 (No. 217-01640) | Oct-13 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-13 (No. 217-01736) | Apr-14 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739) | Apr-14 |
| Reference Probe ES3DV3 | SN: 3205 | 28-Dec-12 (No. ES3-3205_Dec12) | Dec-13 |
| DAE4 | SN: 601 | 25-Apr-13 (No. DAE4-601_Apr13) | Apr-14 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (in house check Oct-11) | In house check: Oct-13 |
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-11) | In house check: Oct-13 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-12) | In house check: Oct-13 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Jeton Kastrati | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: June 13, 2013

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Certificate No: D1750V2-1097_Jun13 Page 1 of 8

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Accreditation No.: **SCS 108**

**Glossary:**

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

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

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1750 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.1 | 1.37 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 39.1 ± 6 % | 1.32 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.07 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **36.9 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 4.85 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **19.6 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.4 | 1.49 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 51.7 ± 6 % | 1.51 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.46 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **37.2 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.08 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **20.1 W/kg ± 16.5 % (k=2)** |

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 51.0 Ω + 0.5 jΩ |
| Return Loss | - 38.8 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 46.6 Ω + 0.2 jΩ |
| Return Loss | - 29.2 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.218 ns |

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

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

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | May 16, 2013 |

## DASY5 Validation Report for Head TSL

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

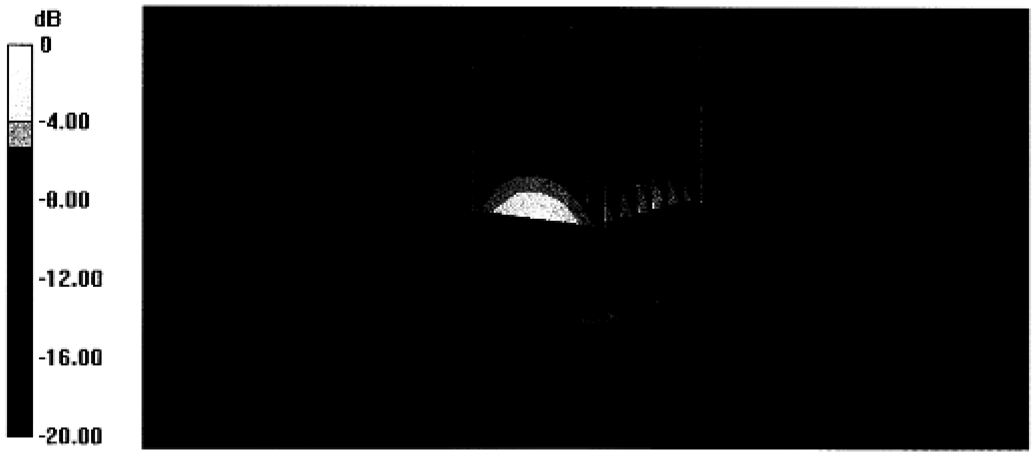
**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1097**

Communication System: UID 0 - CW ; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.32 S/m; $\varepsilon_r$ = 39.1; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.18, 5.18, 5.18); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

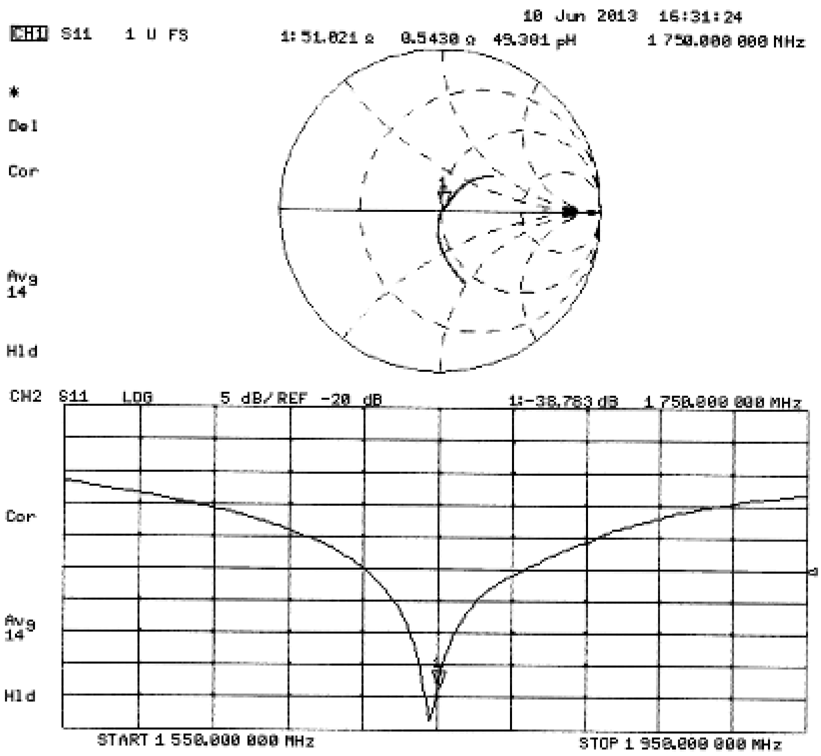
**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.679 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 16.2 W/kg
**SAR(1 g) = 9.07 W/kg; SAR(10 g) = 4.85 W/kg**
Maximum value of SAR (measured) = 11.4 W/kg




0 dB = 11.4 W/kg = 10.57 dBW/kg

Certificate No: D1750V2-1097_Jun13 Page 5 of 8

**Impedance Measurement Plot for Head TSL**




Certificate No: D1750V2-1097_Jun13 Page 6 of 8

## DASY5 Validation Report for Body TSL

Date: 11.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1097**

Communication System: UID 0 - CW ; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma$ = 1.51 S/m; $\varepsilon_r$ = 51.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

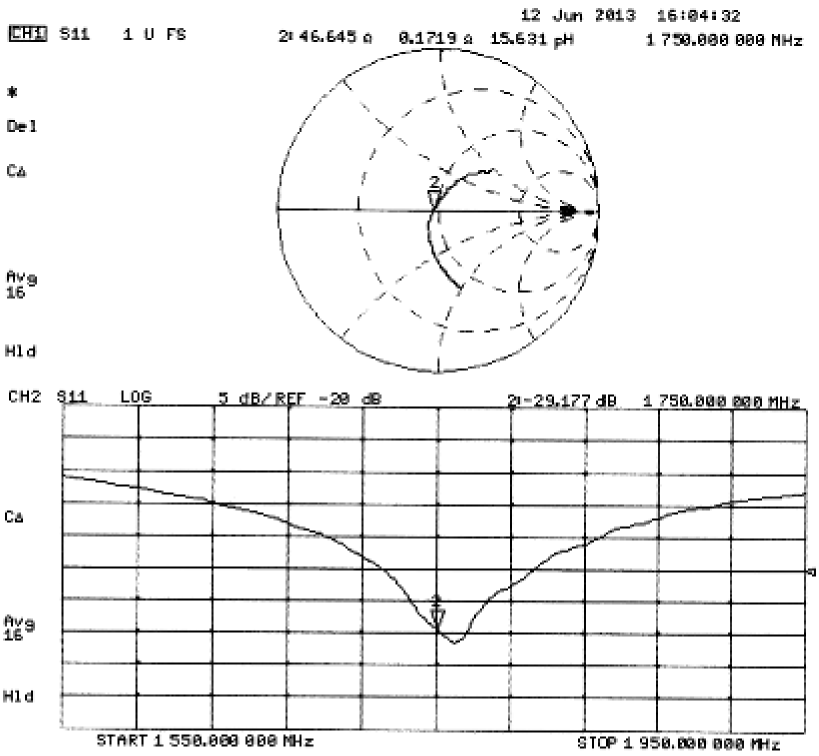
DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.83, 4.83, 4.83); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.830 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 16.3 W/kg
**SAR(1 g) = 9.46 W/kg; SAR(10 g) = 5.08 W/kg**
Maximum value of SAR (measured) = 11.8 W/kg


0 dB = 11.8 W/kg = 10.72 dBW/kg

**Impedance Measurement Plot for Body TSL**




Certificate No: D1750V2-1097_Jun13 Page 8 of 8

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**Accreditation No.: SCS 108**

Client **Cerpass (Auden)**

**Certificate No: D1900V2-5d174_Jun13**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D1900V2 - SN: 5d174 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | June 10, 2013 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 01-Nov-12 (No. 217-01640) | Oct-13 |
| Power sensor HP 8481A | US37292783 | 01-Nov-12 (No. 217-01640) | Oct-13 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-13 (No. 217-01736) | Apr-14 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739) | Apr-14 |
| Reference Probe ES3DV3 | SN: 3205 | 28-Dec-12 (No. ES3-3205_Dec12) | Dec-13 |
| DAE4 | SN: 601 | 25-Apr-13 (No. DAE4-601_Apr13) | Apr-14 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (in house check Oct-11) | In house check: Oct-13 |
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-11) | In house check: Oct-13 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-12) | In house check: Oct-13 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Jeton Kastrati | Laboratory Technician | |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: June 11, 2013

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Accreditation No.: **SCS 108**

**Glossary:**

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

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

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

### Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 1900 MHz ± 1 MHz | |

### Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 40.0 | 1.40 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 39.3 ± 6 % | 1.34 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

### SAR result with Head TSL

| **SAR averaged over 1 cm³ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 9.76 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **39.9 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.15 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **20.9 W/kg ± 16.5 % (k=2)** |

### Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 53.3 | 1.52 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 53.7 ± 6 % | 1.50 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

### SAR result with Body TSL

| **SAR averaged over 1 cm³ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 10.00 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **40.4 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 cm³ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 5.34 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **21.5 W/kg ± 16.5 % (k=2)** |

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 53.2 Ω + 3.9 jΩ |
| Return Loss | - 26.2 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 48.3 Ω + 5.0 jΩ |
| Return Loss | - 25.4 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.202 ns |

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

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

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | June 08, 2012 |

## DASY5 Validation Report for Head TSL

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d174**

Communication System: UID 0 - CW ; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.34 S/m; $\varepsilon_r$ = 39.3; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.712 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 17.6 W/kg
**SAR(1 g) = 9.76 W/kg; SAR(10 g) = 5.15 W/kg**
Maximum value of SAR (measured) = 12.0 W/kg


0 dB = 12.0 W/kg = 10.79 dBW/kg

Certificate No: D1900V2-5d174_Jun13 Page 5 of 8

## DASY5 Validation Report for Body TSL

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d174**

Communication System: UID 0 - CW ; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma$ = 1.5 S/m; $\varepsilon_r$ = 53.7; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

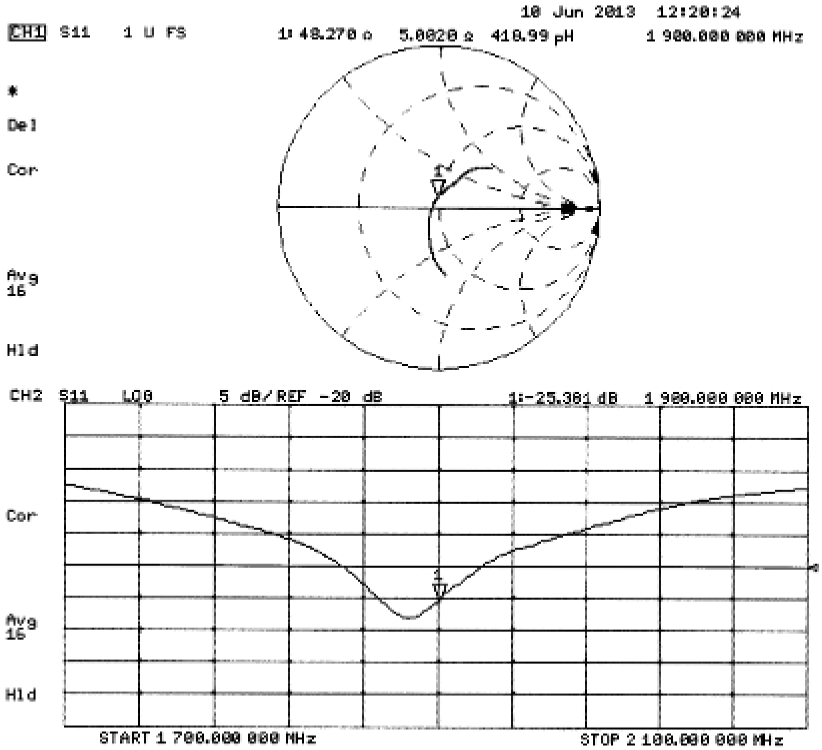
DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.712 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 17.1 W/kg
**SAR(1 g) = 10 W/kg; SAR(10 g) = 5.34 W/kg**
Maximum value of SAR (measured) = 12.7 W/kg


0 dB = 12.7 W/kg = 11.04 dBW/kg

**Impedance Measurement Plot for Body TSL**




Certificate No: D1900V2-5d174_Jun13 Page 8 of 8

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Accreditation No.: **SCS 108**

**Client** Cerpass (Auden)

**Certificate No: D2450V2-914_Jun13**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | D2450V2 - SN: 914 |
| Calibration procedure(s) | QA CAL-05.v9<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | June 07, 2013 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 01-Nov-12 (No. 217-01640) | Oct-13 |
| Power sensor HP 8481A | US37292783 | 01-Nov-12 (No. 217-01640) | Oct-13 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 04-Apr-13 (No. 217-01736) | Apr-14 |
| Type-N mismatch combination | SN: 5047.3 / 06327 | 04-Apr-13 (No. 217-01739) | Apr-14 |
| Reference Probe ES3DV3 | SN: 3205 | 28-Dec-12 (No. ES3-3205_Dec12) | Dec-13 |
| DAE4 | SN: 601 | 25-Apr-13 (No. DAE4-601_Apr13) | Apr-14 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (in house check Oct-11) | In house check: Oct-13 |
| RF generator R&S SMT-06 | 100005 | 04-Aug-99 (in house check Oct-11) | In house check: Oct-13 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-12) | In house check: Oct-13 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Leif Klysner | Laboratory Technician | Leif Klysner |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: June 7, 2013

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Accreditation No.: **SCS 108**

**Glossary:**

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

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

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

**Additional Documentation:**

d) DASY4/5 System Handbook

**Methods Applied and Interpretation of Parameters:**

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.7 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 10 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 2450 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 39.2 | 1.80 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 37.8 ± 6 % | 1.81 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.5 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **53.4 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.24 W/kg |
| SAR for nominal Head TSL parameters | normalized to 1W | **24.8 W/kg ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 52.7 | 1.95 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 50.9 ± 6 % | 2.02 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 13.2 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **51.5 W/kg ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 6.07 W/kg |
| SAR for nominal Body TSL parameters | normalized to 1W | **23.9 W/kg ± 16.5 % (k=2)** |

## Appendix

### Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 57.0 Ω + 1.9 jΩ |
| Return Loss | - 23.3 dB |

### Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 52.1 Ω + 3.5 jΩ |
| Return Loss | - 28.0 dB |

### General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 1.160 ns |

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

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

### Additional EUT Data

| | |
|---|---|
| Manufactured by | SPEAG |
| Manufactured on | December 19, 2012 |

**DASY5 Validation Report for Head TSL**

Date: 07.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 914**

Communication System: UID 0 - CW ; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.81 S/m; $\varepsilon_r$ = 37.8; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.695 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 28.3 W/kg
**SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.24 W/kg**
Maximum value of SAR (measured) = 17.6 W/kg


0 dB = 17.6 W/kg = 12.46 dBW/kg

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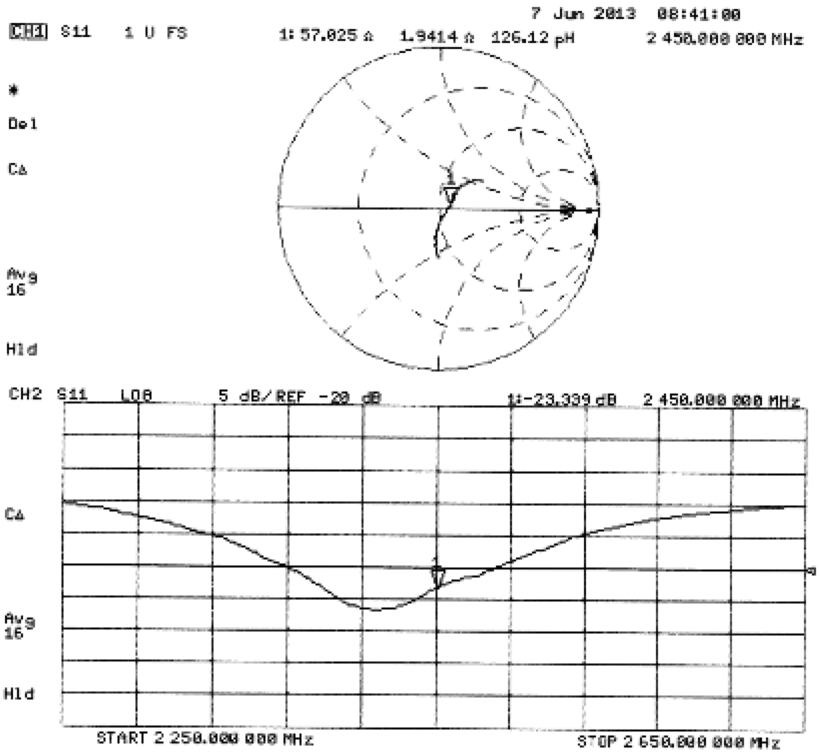
**Impedance Measurement Plot for Head TSL**




Certificate No: D2450V2-914_Jun13 Page 6 of 8

## DASY5 Validation Report for Body TSL

Date: 07.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 914**

Communication System: UID 0 - CW ; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma$ = 2.02 S/m; $\varepsilon_r$ = 50.9; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

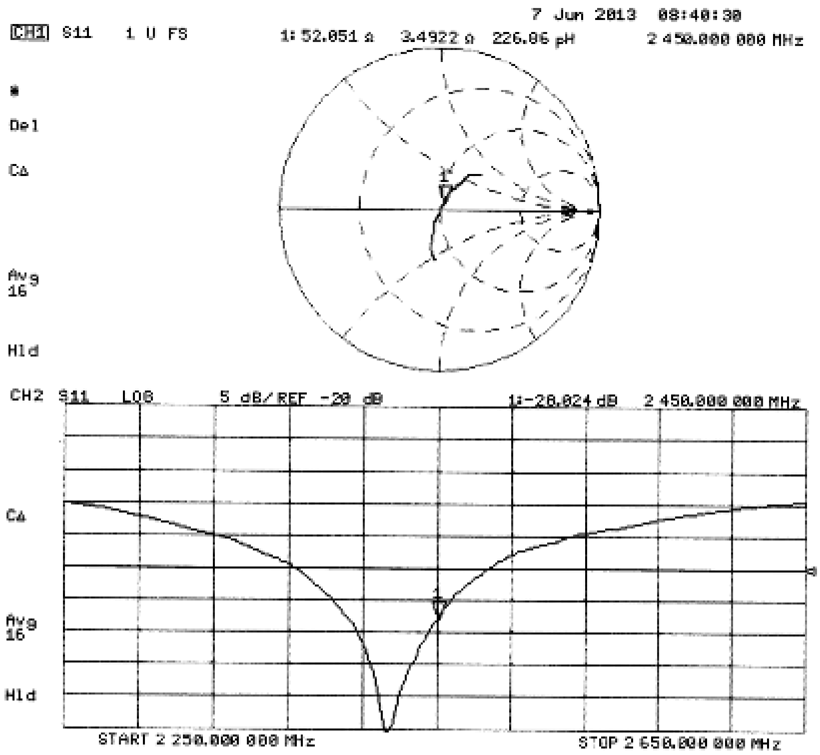
DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.695 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.6 W/kg
**SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.07 W/kg**
Maximum value of SAR (measured) = 17.5 W/kg


0 dB = 17.5 W/kg = 12.43 dBW/kg

**Impedance Measurement Plot for Body TSL**




Certificate No: D2450V2-914_Jun13 Page 8 of 8

## 11. Appendix F. DAE Calibration Data

**Calibration Laboratory of**
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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C Service suisse d'étalonnage
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Accreditation No.: **SCS 108**

Client **Cerpass (Auden)**

Certificate No: **DAE4-1379_May14**

## CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BJ - SN: 1379

Calibration procedure(s): QA CAL-06.v26
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: May 19, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Keithley Multimeter Type 2001 | SN: 0810278 | 01-Oct-13 (No:13976) | Oct-14 |

| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
|---|---|---|---|
| Auto DAE Calibration Unit | SE UWS 053 AA 1001 | 07-Jan-14 (in house check) | In house check: Jan-15 |
| Calibrator Box V2.1 | SE UMS 006 AA 1002 | 07-Jan-14 (in house check) | In house check: Jan-15 |

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Dominique Steffen | Technician | |
| Approved by: | Fin Bomholt | Deputy Technical Manager | i.V. |

Issued: May 19, 2014

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

Certificate No: DAE4-1379_May14 Page 1 of 5

**Calibration Laboratory of**
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Engineering AG
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

**Glossary**

| | |
|---|---|
| DAE | data acquisition electronics |
| Connector angle | information used in DASY system to align probe sensor X to the robot coordinate system. |

**Methods Applied and Interpretation of Parameters**

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

## DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| Calibration Factors | X | Y | Z |
|---|---|---|---|
| High Range | 403.805 ± 0.02% (k=2) | 404.075 ± 0.02% (k=2) | 404.011 ± 0.02% (k=2) |
| Low Range | 3.99838 ± 1.50% (k=2) | 3.99504 ± 1.50% (k=2) | 4.00152 ± 1.50% (k=2) |

## Connector Angle

| | |
|---|---|
| **Connector Angle** to be used in DASY system | 149.5 ° ± 1 ° |

## Appendix

### 1. DC Voltage Linearity

| High Range | | Reading (µV) | Difference (µV) | Error (%) |
|---|---|---|---|---|
| Channel X | + Input | 199994.29 | -1.98 | -0.00 |
| Channel X | + Input | 19999.30 | -1.30 | -0.01 |
| Channel X | - Input | -19998.41 | 2.90 | -0.01 |
| Channel Y | + Input | 199996.73 | 0.29 | 0.00 |
| Channel Y | + Input | 19996.72 | -3.84 | -0.02 |
| Channel Y | - Input | -20001.24 | -0.12 | 0.00 |
| Channel Z | + Input | 199995.04 | -1.34 | -0.00 |
| Channel Z | + Input | 19998.92 | -1.47 | -0.01 |
| Channel Z | - Input | -20002.08 | -0.85 | 0.00 |

| Low Range | | Reading (µV) | Difference (µV) | Error (%) |
|---|---|---|---|---|
| Channel X | + Input | 2001.97 | 1.11 | 0.06 |
| Channel X | + Input | 201.61 | 0.19 | 0.10 |
| Channel X | - Input | -198.88 | -0.22 | 0.11 |
| Channel Y | + Input | 2001.25 | 0.31 | 0.02 |
| Channel Y | + Input | 201.42 | 0.07 | 0.03 |
| Channel Y | - Input | -199.14 | -0.59 | 0.30 |
| Channel Z | + Input | 2001.40 | 0.60 | 0.03 |
| Channel Z | + Input | 199.50 | -1.64 | -0.82 |
| Channel Z | - Input | -199.24 | -0.49 | 0.25 |

### 2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Common mode Input Voltage (mV) | High Range Average Reading (µV) | Low Range Average Reading (µV) |
|---|---|---|---|
| Channel X | 200 | -17.61 | -19.05 |
| | - 200 | 20.93 | 18.82 |
| Channel Y | 200 | -4.43 | -4.39 |
| | - 200 | 4.21 | 4.00 |
| Channel Z | 200 | -10.49 | -10.31 |
| | - 200 | 8.62 | 8.36 |

### 3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | Input Voltage (mV) | Channel X (µV) | Channel Y (µV) | Channel Z (µV) |
|---|---|---|---|---|
| Channel X | 200 | - | -0.60 | -5.10 |
| Channel Y | 200 | 8.15 | - | 0.34 |
| Channel Z | 200 | 10.42 | 5.32 | - |

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## 4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

| | High Range (LSB) | Low Range (LSB) |
|---|---|---|
| Channel X | 16034 | 13894 |
| Channel Y | 16256 | 12489 |
| Channel Z | 15825 | 15529 |

## 5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

| | Average (μV) | min. Offset (μV) | max. Offset (μV) | Std. Deviation (μV) |
|---|---|---|---|---|
| Channel X | -1.79 | -3.29 | -0.79 | 0.47 |
| Channel Y | -0.21 | -2.44 | 1.81 | 0.71 |
| Channel Z | -0.03 | -1.33 | 2.40 | 0.79 |

## 6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

## 7. Input Resistance (Typical values for information)

| | Zeroing (kOhm) | Measuring (MOhm) |
|---|---|---|
| Channel X | 200 | 200 |
| Channel Y | 200 | 200 |
| Channel Z | 200 | 200 |

## 8. Low Battery Alarm Voltage (Typical values for information)

| Typical values | Alarm Level (VDC) |
|---|---|
| Supply (+ Vcc) | +7.9 |
| Supply (- Vcc) | -7.6 |

## 9. Power Consumption (Typical values for information)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|---|---|---|---|
| Supply (+ Vcc) | +0.01 | +6 | +14 |
| Supply (- Vcc) | -0.01 | -8 | -9 |