



Report No.: RZA2010-0921



# OET 65

## TEST REPORT

**Product Name** CDMA 1X Digital Mobile Telephone

**FCC ID** QISC5120

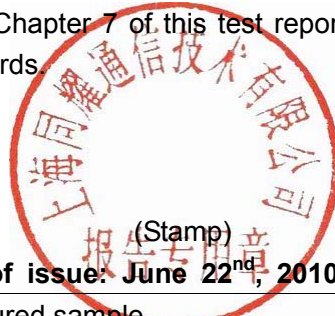
**Model** HUAWEI C5120

**Client** Huawei Technologies Co., Ltd.

**TA Technology (Shanghai) Co., Ltd.**



## GENERAL SUMMARY

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |              |              |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------|
| <b>Product Name</b> | CDMA 1X Digital Mobile Telephone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Model</b> | HUAWEI C5120 |
| <b>FCC ID</b>       | QISC5120                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |              |              |
| <b>Report No.</b>   | RZA2010-0921                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |              |              |
| <b>Client</b>       | Huawei Technologies Co., Ltd.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |              |
| <b>Manufacturer</b> | Huawei Technologies Co., Ltd.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |              |              |
| <b>Standard(s)</b>  | <p><b>IEEE Std C95.1, 1999:</b> IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.</p> <p><b>IEEE Std 1528™-2003:</b> IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.</p> <p><b>SUPPLEMENT C Edition 01-01 to OET BULLETIN 65 Edition 97-01 June 2001 including DA 02-1438, published June 2002:</b> Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields Additional Information for Evaluation Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radio frequency Emissions.</p> |              |              |
| <b>Conclusion</b>   | <p>This portable wireless equipment has been measured in all cases requested by the relevant standards. Test results in Chapter 7 of this test report are below limits specified in the relevant standards.</p> <p>General Judgment: <b>Pass</b></p> <div style="text-align: right;"> <br/>             (Stamp)<br/>             Date of issue: June 22<sup>nd</sup>, 2010         </div>                                                                                                                                                                                                                                                                                              |              |              |
| <b>Comment</b>      | The test result only responds to the measured sample.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |              |              |

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## **1. General Information**

### **1.1. Notes of the Test Report**

**TA Technology (Shanghai) Co., Ltd.** guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

**TA Technology (Shanghai) Co., Ltd.** is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

### **1.2. Testing Laboratory**

|            |                                                                                |
|------------|--------------------------------------------------------------------------------|
| Company:   | TA Technology (Shanghai) Co., Ltd.                                             |
| Address:   | No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai, China             |
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| Fax:       | +86-021-50791141/2/3-8000                                                      |
| Website:   | <a href="http://www.ta-shanghai.com">http://www.ta-shanghai.com</a>            |
| E-mail:    | <a href="mailto:yangweizhong@ta-shanghai.com">yangweizhong@ta-shanghai.com</a> |

### **1.3. Applicant Information**

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Fax: 0755-28780808

### **1.4. Manufacturer Information**

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Fax: 0755-28780808

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### 1.5. Information of EUT

#### General information

|                                        |                                               |                 |                |
|----------------------------------------|-----------------------------------------------|-----------------|----------------|
| Device Type :                          | Portable Device                               |                 |                |
| Exposure Category:                     | Uncontrolled Environment / General Population |                 |                |
| Name of EUT:                           | CDMA 1X Digital Mobile Telephone              |                 |                |
| SN:                                    | XP9MAA1051800057                              |                 |                |
| Device Operating Configurations :      |                                               |                 |                |
| Operating Mode(s):                     | CDMA Cellular                                 |                 |                |
| Test Modulation:                       | QPSK                                          |                 |                |
| Operating Frequency Range(s):          | Band                                          | Tx (MHz)        | Rx (MHz)       |
|                                        | CDMA Cellular                                 | 824.7 ~ 848.31  | 869.7 ~ 893.31 |
| Test Channel:<br>(Low - Middle - High) | 1013 - 384 - 777                              | (CDMA Cellular) | (tested)       |
| Power Class:                           | Tested with Power Control All up bits         |                 |                |
| Hardware Version:                      | Ver.A                                         |                 |                |
| Software Version:                      | C5120C16B101                                  |                 |                |
| Antenna Type:                          | Internal Antenna                              |                 |                |

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### Auxiliary Equipment Details

#### AE1: Battery

Model: HB5D1  
Manufacturer: Huawei Technologies Co., Ltd.  
SN: GAGA323XF1107268

#### AE2: Travel Adapter

Model: HS-050040E1  
Manufacturer: Huawei Technologies Co., Ltd.  
SN: BYAA40817145

Equipment Under Test (EUT) is a model of CDMA 1X Digital Mobile Telephone with internal antenna. The detail about Mobile phone, Lithium Battery and AC/DC Adapter is in chapter 1.5 in this report. SAR is tested for CDMA Cellular only.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

### 1.6. The Maximum SAR<sub>1g</sub> Values of each Tested Band

| Band          | SAR <sub>1g</sub> (W/kg) |              |
|---------------|--------------------------|--------------|
|               | Head                     | Body         |
| CDMA Cellular | <b>0.863</b>             | <b>1.060</b> |

### 1.7. Test Date

The test is performed from June 19, 2010 to June 20, 2010.



## **2. Operational Conditions during Test**

### **2.1. General Description of Test Procedures**

A communication link is set up with a System Simulator (SS) by air link, and a call is established. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 1013, 384 and 777 respectively in the case of CDMA Cellular. The EUT is commanded to operate at maximum transmitting power.

Connection to the EUT is established via air interface with E5515C, and the EUT is set to maximum output power by E5515C. Power control is set "All Up Bits" of CDMA Cellular. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.

The antenna connected to the output of the base station simulator shall be placed at least 50 cm away from the EUT. The signal transmitted by the simulator to the antenna feeding point shall be lower than the output power level of the EUT by at least 30 dB.

### **2.2. Information for the Measurement of CDMA 1x Devices**

#### **2.2.1. Output Power Verification**

Test Parameter setup for maximum RF output power according to section 4.4.5 of 3GPP2

| <b>Parameter</b> | <b>Units</b> | <b>Value</b> |
|------------------|--------------|--------------|
| I or             | dBm/1.23MHz  | -104         |
| PilotE c /I or   | dB           | -7           |
| TrafficE c /I or | dB           | -7.4         |

For SAR test, the maximum power output is very important and essential; it is identical under the measurement uncertainty. It is proper to use typical Test Mode 3 (FW RC3, RVS RC3, SO55) as the worst case for SAR test.

#### **2.2.2. Head SAR Measurement**

SAR is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required because the maximum average output of each channel is less than 0.25 dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

#### **2.2.3. Body SAR Measurement**

SAR is measured in RC3 with the EUT configured to transmit at full rate using TDSO/SO32, transmit at full rate on FCH with all other code channels disabled. SAR for multiple code channels (FCH+SCHn) is not required when the maximum average output of each RF channel is less than 0.25dB higher than measured with FCH only.

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Body SAR in RC1 is not required because the maximum average output of each channel is less than 0.25 dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate using the body exposure configuration that results in the highest SAR for that channel in RC3.

Test communication setup meet as followings:

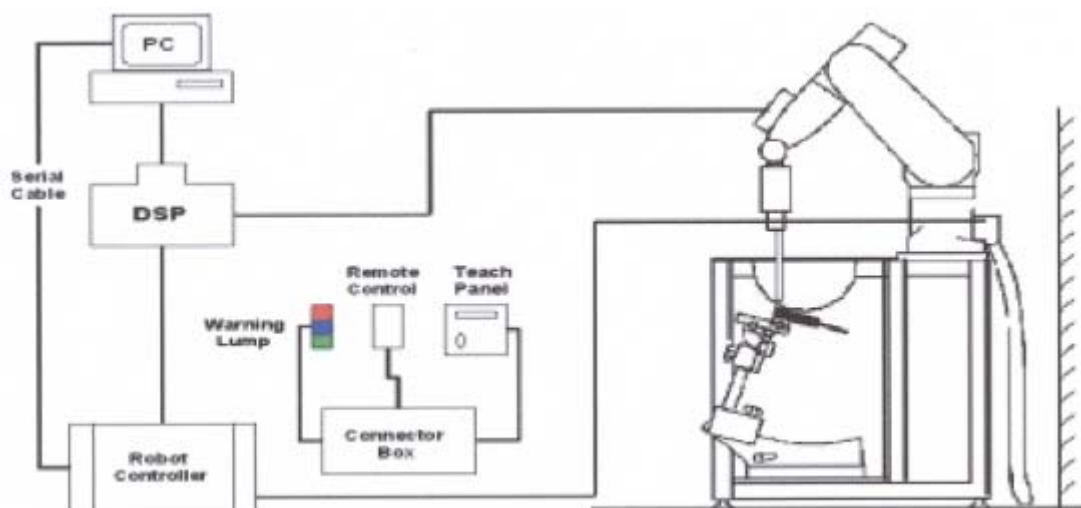
|                                                                          |                                                   |
|--------------------------------------------------------------------------|---------------------------------------------------|
| Communication standard between mobile station and base station simulator | 3GPP2 C.S0011-B                                   |
| Radio configuration                                                      | RC3 (Supporting CDMA 1X)                          |
| Spreading Rate                                                           | SR1                                               |
| Data Rate                                                                | 9600bps                                           |
| Service Options                                                          | SO55 (loop back mode)                             |
| Service Options                                                          | SO32 (test data service mode)                     |
| Multiplex Options                                                        | The mobile station does not support this service. |

### 3. SAR Measurements System Configuration

#### 3.1. SAR Measurement Set-up

The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e. an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronic (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY4 measurement server.
- The DASY4 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003
- DASY4 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.



**Figure 1. SAR Lab Test Measurement Set-up**

### 3.2. DASY4 E-field Probe System

The SAR measurements were conducted with the dosimetric probe EX3DV4 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

#### 3.2.1. EX3DV4 Probe Specification

|               |                                                                                                                                                                                                               |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction  | Symmetrical design with triangular core<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, e.g., DGBE)                                                   |
| Calibration   | ISO/IEC 17025 calibration service available                                                                                                                                                                   |
| Frequency     | 10 MHz to > 6 GHz<br>Linearity: $\pm 0.2$ dB<br>(30 MHz to 6 GHz)                                                                                                                                             |
| Directivity   | $\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)                                                                                              |
| Dynamic Range | 10 $\mu$ W/g to > 100 mW/g Linearity:<br><br>$\pm 0.2$ dB (noise: typically < 1 $\mu$ W/g)                                                                                                                    |
| Dimensions    | 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                                                                          |
| Application   | High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields).<br>Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%. |



**Figure 2. EX3DV4 E-field Probe**



**Figure 3. EX3DV4 E-field probe**

### 3.2.2. E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than  $\pm 10\%$ . The spherical isotropy was evaluated and found to be better than  $\pm 0.25\text{dB}$ . The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$\text{SAR} = C \frac{\Delta T}{\Delta t}$$

Where:  $\Delta t$  = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

$\Delta T$  = Temperature increase due to RF exposure.

Or

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

Where:

$\sigma$  = Simulated tissue conductivity,

$\rho$  = Tissue density (kg/m<sup>3</sup>).

### 3.3. Other Test Equipment

#### 3.3.1. Device Holder for Transmitters

The DASY device holder is designed to cope with the different positions given in the standard.

It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the inference of the clamp on the test results could thus be lowered.



**Figure 4. Device Holder**

### 3.3.2. Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden Figure. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

|                 |                                 |
|-----------------|---------------------------------|
| Shell Thickness | 2±0.1 mm                        |
| Filling Volume  | Approx. 20 liters               |
| Dimensions      | 810 x 1000 x 500 mm (H x L x W) |
| Available       | Special                         |



**Figure 5. Generic Twin Phantom**

### 3.4. Scanning Procedure

The DASY4 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The “reference” and “drift” measurements 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 DUT’s output power and should vary max.  $\pm 5\%$ .
- The “surface check” measurement tests the optical surface detection system of the DASY4 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  $\pm 0.1\text{mm}$ ). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within  $\pm 30^\circ$ .)
- Area Scan  
The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot. Before starting the area scan a grid

spacing of 15 mm x 15 mm is set. During the scan the distance of the probe to the phantom remains unchanged.

After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

- Zoom Scan

Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

- Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses. The DASY4 system allows evaluations that combine measured data and robot positions, such as:

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

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

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

### **3.5. Data Storage and Evaluation**

#### **3.5.1. Data Storage**

The DASY4 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension “.DA4”. The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm<sup>2</sup>], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

#### **3.5.2. Data Evaluation by SEMCAD**

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

|                    |                           |                                       |
|--------------------|---------------------------|---------------------------------------|
| Probe parameters:  | - Sensitivity             | Normi, $a_{i0}$ , $a_{i1}$ , $a_{i2}$ |
|                    | - Conversion factor       | ConvF <sub>i</sub>                    |
|                    | - Diode compression point | Dcp <sub>i</sub>                      |
| Device parameters: | - Frequency               | f                                     |
|                    | - Crest factor            | cf                                    |
| Media parameters:  | - Conductivity            |                                       |
|                    | - Density                 |                                       |

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY4 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal,



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the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot c f / d c p_i$$

With  $V_i$  = compensated signal of channel i (i = x, y, z)

$U_i$  = input signal of channel i (i = x, y, z)

$cf$  = crest factor of exciting field (DASY parameter)

$dcp_i$  = diode compression point (DASY parameter)

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

E-field probes:  $E_i = (V_i / Norm_i \cdot ConvF)^{1/2}$

H-field probes:  $H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) / f$

With  $V_i$  = compensated signal of channel i (i = x, y, z)

$Norm_i$  = sensor sensitivity of channel i (i = x, y, z)  
[mV/(V/m)<sup>2</sup>] for E-field Probes

$ConvF$  = sensitivity enhancement in solution

$a_{ij}$  = sensor sensitivity factors for H-field probes

$f$  = carrier frequency [GHz]

$E_i$  = electric field strength of channel i in V/m

$H_i$  = magnetic field strength of channel i in A/m

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

$$E_{tot} = (E_x^2 + E_y^2 + E_z^2)^{1/2}$$

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

$$SAR = (E_{tot}^2 \cdot \rho) / (4 \pi \cdot 1000)$$

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

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

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

**$\rho$**  = equivalent tissue density in g/cm<sup>3</sup>

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

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

with  **$P_{pwe}$**  = equivalent power density of a plane wave in mW/cm<sup>2</sup>

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

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

### 3.6. System Check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulants were measured every day using the dielectric probe kit and the network analyser. A system check measurement was made following the determination of the dielectric parameters of the simulant, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the table 7 and table 8.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system ( $\pm 10\%$ ).

System check is performed regularly on all frequency bands where tests are performed with the DASY4 system.

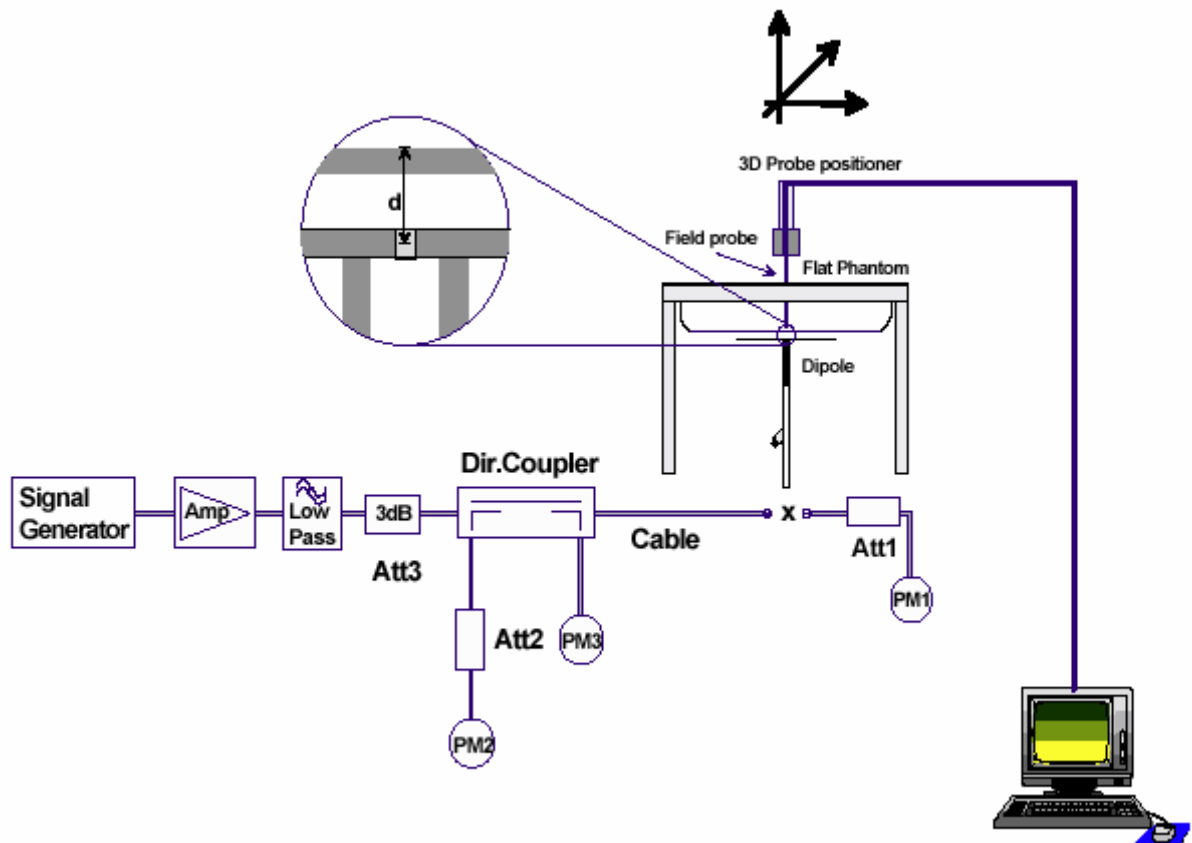


Figure 6. System Check Set-up

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### 3.7. Equivalent Tissues

The liquid is consisted of water, sugar, salt, Preventol and Cellulose. The liquid has previously been proven to be suited for worst-case. The Table 1 and Table 2 show the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

**Table 1: Composition of the Head Tissue Equivalent Matter**

| MIXTURE%                              | FREQUENCY(Brain) 835MHz               |
|---------------------------------------|---------------------------------------|
| Water                                 | 41.45                                 |
| Sugar                                 | 56                                    |
| Salt                                  | 1.45                                  |
| Preventol                             | 0.1                                   |
| Cellulose                             | 1.0                                   |
| Dielectric Parameters<br>Target Value | f=835MHz $\epsilon=41.5$ $\sigma=0.9$ |

**Table 2: Composition of the Body Tissue Equivalent Matter**

| MIXTURE%                              | FREQUENCY(Body)835MHz                  |
|---------------------------------------|----------------------------------------|
| Water                                 | 52.5                                   |
| Sugar                                 | 45                                     |
| Salt                                  | 1.4                                    |
| Preventol                             | 0.1                                    |
| Cellulose                             | 1.0                                    |
| Dielectric Parameters<br>Target Value | f=835MHz $\epsilon=55.2$ $\sigma=0.97$ |

## 4. Laboratory Environment

**Table 3: The Ambient Conditions during Test**

|                                                                                                                                                                                                 |                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Temperature                                                                                                                                                                                     | Min. = 20°C, Max. = 25 °C |
| Relative humidity                                                                                                                                                                               | Min. = 30%, Max. = 70%    |
| Ground system resistance                                                                                                                                                                        | < 0.5 $\Omega$            |
| Ambient noise is checked and found very low and in compliance with requirement of standards.<br>Reflection of surrounding objects is minimized and in compliance with requirement of standards. |                           |

## 5. Characteristics of the Test

### 5.1. Applicable Limit Regulations

**IEEE Std C95.1, 1999:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

### 5.2. Applicable Measurement Standards

**IEEE Std 1528™-2003:** IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

**SUPPLEMENT C Edition 01-01 to OET BULLETIN 65 Edition 97-01 June 2001 including DA 02-1438, published June 2002:** Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields Additional Information for Evaluation Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radio frequency Emissions.

## 6. Conducted Output Power Measurement

### 6.1. Summary

The DUT is tested using an E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted power.

Conducted output power was measured using an integrated RF connector and attached RF cable. This result contains conducted output power for the EUT.

### 6.2. Conducted Power Results

**Table 4: Conducted Power Measurement Results**

| <b>CDMA Cellular<br/>(RC3)</b> | <b>Conducted Power (dBm)</b> |             |             |
|--------------------------------|------------------------------|-------------|-------------|
|                                | Channel 1013                 | Channel 384 | Channel 777 |
| Before test                    | 24.20                        | 24.10       | 24.10       |
| After test                     | 24.10                        | 24.10       | 24.10       |
| <b>CDMA Cellular<br/>(RC1)</b> | <b>Conducted Power (dBm)</b> |             |             |
|                                | Channel 1013                 | Channel 384 | Channel 777 |
| Before test                    | 24.20                        | 24.10       | 24.10       |
| After test                     | 24.10                        | 24.10       | 24.20       |

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## 7. Test Results

### 7.1. Dielectric Performance

Table 5: Dielectric Performance of Head Tissue Simulating Liquid

| Frequency        | Description                    | Dielectric Parameters |                     | Temp<br>℃ |
|------------------|--------------------------------|-----------------------|---------------------|-----------|
|                  |                                | $\epsilon_r$          | $\sigma(s/m)$       |           |
| 835MHz<br>(head) | Target value<br>±5% window     | 41.5<br>39.43 — 43.58 | 0.90<br>0.86 — 0.95 | /         |
|                  | Measurement value<br>2010-6-19 | 42.06                 | 0.93                | 22.5      |

Table 6: Dielectric Performance of Body Tissue Simulating Liquid

| Frequency        | Description                    | Dielectric Parameters  |                     | Temp<br>℃ |
|------------------|--------------------------------|------------------------|---------------------|-----------|
|                  |                                | $\epsilon_r$           | $\sigma(s/m)$       |           |
| 835MHz<br>(body) | Target value<br>±5% window     | 55.20<br>52.44 — 57.96 | 0.97<br>0.92 — 1.02 | /         |
|                  | Measurement value<br>2010-6-19 | 54.67                  | 1.00                | 22.5      |

### 7.2. System Checking Results

Table 7: System Checking for Head Tissue Simulating Liquid

| Frequency | Description                      | SAR(W/kg)           |                     | Dielectric Parameters |               | Temp<br>℃ |
|-----------|----------------------------------|---------------------|---------------------|-----------------------|---------------|-----------|
|           |                                  | 10g                 | 1g                  | $\epsilon_r$          | $\sigma(s/m)$ |           |
| 835MHz    | Recommended value<br>±10% window | 1.58<br>1.42 — 1.74 | 2.42<br>2.18 — 2.66 | 40.5                  | 0.89          | /         |
|           | Measurement value<br>2010-6-19   | 1.62                | 2.48                | 42.06                 | 0.93          | 22.5      |

Note: 1. The graph results see ANNEX B.

2. Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the calibrated dipole.

Table 8: System Check for body Tissue Simulating Liquid

| Frequency | Description                      | SAR(W/kg)           |                     | Dielectric Parameters |               | Temp<br>℃ |
|-----------|----------------------------------|---------------------|---------------------|-----------------------|---------------|-----------|
|           |                                  | 10g                 | 1g                  | $\epsilon_r$          | $\sigma(s/m)$ |           |
| 835MHz    | Recommended value<br>±10% window | 1.68<br>1.51 — 1.85 | 2.56<br>2.30 — 2.82 | 53                    | 0.99          | /         |
|           | Measurement value<br>2010-6-19   | 1.68                | 2.56                | 54.67                 | 1.00          | 21.9      |

Note: 1. The graph results see ANNEX B.

2. Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the Calibrated dipole.

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### 7.3. Summary of Measurement Results

#### 7.3.1. CDMA Cellular

**Table 9: SAR Values (CDMA Cellular)**

| Limit of SAR (W/kg)                                       |         | 10 g Average             | 1 g Average     | Power Drift (dB) | Graph Results |
|-----------------------------------------------------------|---------|--------------------------|-----------------|------------------|---------------|
|                                                           |         | 2.0                      | 1.6             | ± 0.21           |               |
| Different Test Position                                   | Channel | Measurement Result(W/kg) |                 | Power Drift(dB)  |               |
|                                                           |         | 10 g Average             | 1 g Average     |                  |               |
| Test position of Head                                     |         |                          |                 |                  |               |
| Left hand, Touch cheek                                    | High    | 0.629                    | 0.863           | -0.087           | Figure 9      |
|                                                           | Middle  | 0.618                    | 0.842           | -0.015           | Figure 10     |
|                                                           | Low     | 0.578                    | 0.789           | 0.078            | Figure 11     |
| Left hand, Tilt 15 Degree                                 | Middle  | 0.403                    | 0.563           | 0.095            | Figure 12     |
| Right hand, Touch cheek                                   | High    | 0.612                    | 0.856           | -0.031           | Figure 13     |
|                                                           | Middle  | 0.607                    | 0.850           | -0.020           | Figure 14     |
|                                                           | Low     | 0.550                    | 0.764           | 0.011            | Figure 15     |
| Right hand, Tilt 15 Degree                                | Middle  | 0.425                    | 0.620           | -0.147           | Figure 16     |
| Test position of Body (Distance 15mm)                     |         |                          |                 |                  |               |
| Towards Ground                                            | High    | 0.655                    | 0.947           | -0.090           | Figure 17     |
|                                                           | Middle  | 0.733                    | 1.060           | 0.087            | Figure 18     |
|                                                           | Low     | 0.682                    | 0.986           | -0.095           | Figure 19     |
| Towards Phantom                                           | Middle  | 0.294                    | 0.403           | -0.001           | Figure 20     |
| Worst case position of Body with Earphone (Distance 15mm) |         |                          |                 |                  |               |
| Towards Ground                                            | Middle  | 0.372(max.cube)          | 0.540(max.cube) | 0.005            | Figure 21     |

Note: 1. The value with blue color is the maximum SAR Value of each test band.

- Upper and lower frequencies were measured at the worst position.
- The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB lower than the SAR<sub>1g</sub> limit (< 0.8W/kg), testing at the high and low channels is optional.
- The (max.cube) labeling indicates that during the grid scanning an additional peak was found which was within 2.0dB of the highest peak. The value of the highest cube is given in the table above; the value from the second assessed cube is given in the SAR distribution plots (See ANNEX C).



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|                                                    |                                                |                                             |     |   |            |      |      |          |
|----------------------------------------------------|------------------------------------------------|---------------------------------------------|-----|---|------------|------|------|----------|
| 20                                                 | -phantom                                       | B                                           | 4.0 | R | $\sqrt{3}$ | 1    | 2.3  | $\infty$ |
| 21                                                 | -liquid conductivity (deviation from target)   | B                                           | 5.0 | R | $\sqrt{3}$ | 0.64 | 1.8  | $\infty$ |
| 22                                                 | -liquid conductivity (measurement uncertainty) | B                                           | 5.0 | N | 1          | 0.64 | 3.2  | $\infty$ |
| 23                                                 | -liquid permittivity (deviation from target)   | B                                           | 5.0 | R | $\sqrt{3}$ | 0.6  | 1.7  | $\infty$ |
| 24                                                 | -liquid permittivity (measurement uncertainty) | B                                           | 5.0 | N | 1          | 0.6  | 3.0  | $\infty$ |
| Combined standard uncertainty                      |                                                | $u'_c = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$ |     |   |            |      | 12.0 |          |
| Expanded uncertainty (confidence interval of 95 %) |                                                | $u_e = 2u_c$                                |     | N | k=2        |      | 24.0 |          |

## 9. Main Test Instruments

**Table 10: List of Main Instruments**

| No. | Name                  | Type           | Serial Number | Calibration Date         | Valid Period |
|-----|-----------------------|----------------|---------------|--------------------------|--------------|
| 01  | Network analyzer      | Agilent 8753E  | US37390326    | September 13, 2009       | One year     |
| 02  | Dielectric Probe Kit  | Agilent 85070E | US44020115    | No Calibration Requested |              |
| 03  | Power meter           | Agilent E4417A | GB41291714    | March 13, 2010           | One year     |
| 04  | Power sensor          | Agilent 8481H  | MY41091316    | March 26, 2010           | One year     |
| 05  | Signal Generator      | HP 8341B       | 2730A00804    | September 13, 2009       | One year     |
| 06  | Amplifier             | IXA-020        | 0401          | No Calibration Requested |              |
| 07  | BTS                   | E5515C         | MY48360988    | December 4, 2009         | One year     |
| 08  | E-field Probe         | EX3DV4         | 3677          | September 23, 2009       | One year     |
| 09  | DAE                   | DAE4           | 871           | November 11, 2009        | One year     |
| 10  | Validation Kit 835MHz | D835V2         | 4d082         | July 13, 2009            | One year     |

\*\*\*\*\*END OF REPORT BODY\*\*\*\*\*

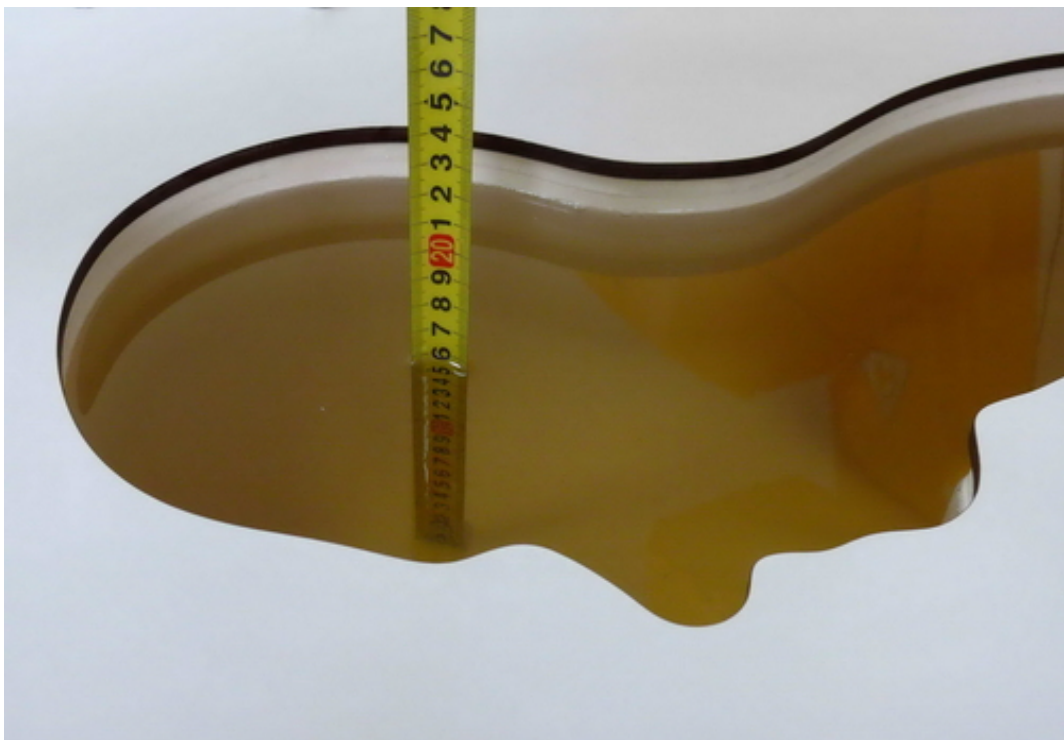
## ANNEX A: Test Layout



Picture 1: Specific Absorption Rate Test Layout



Picture 2: Liquid Depth in the Flat Phantom (835 MHz, 15.3cm depth)



Picture 3: Liquid Depth in the Head Phantom (835 MHz, 15.4cm depth)

## ANNEX B: System Check Results

### System Performance Check at 835 MHz Head TSL

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d082**

Date/Time: 6/19/2010 10:02:02 PM

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.93 \text{ mho/m}$ ;  $\epsilon_r = 42.06$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $22.3^\circ\text{C}$       Liquid Temperature:  $21.5^\circ\text{C}$

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.2, 9.2, 9.2); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**d=15mm, Pin=250mW/Area Scan (41x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) =  $2.71 \text{ mW/g}$

**d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =  $55.5 \text{ V/m}$ ; Power Drift =  $-0.092 \text{ dB}$

Peak SAR (extrapolated) =  $3.75 \text{ W/kg}$

**SAR(1 g) =  $2.48 \text{ mW/g}$ ; SAR(10 g) =  $1.62 \text{ mW/g}$**

Maximum value of SAR (measured) =  $2.67 \text{ mW/g}$

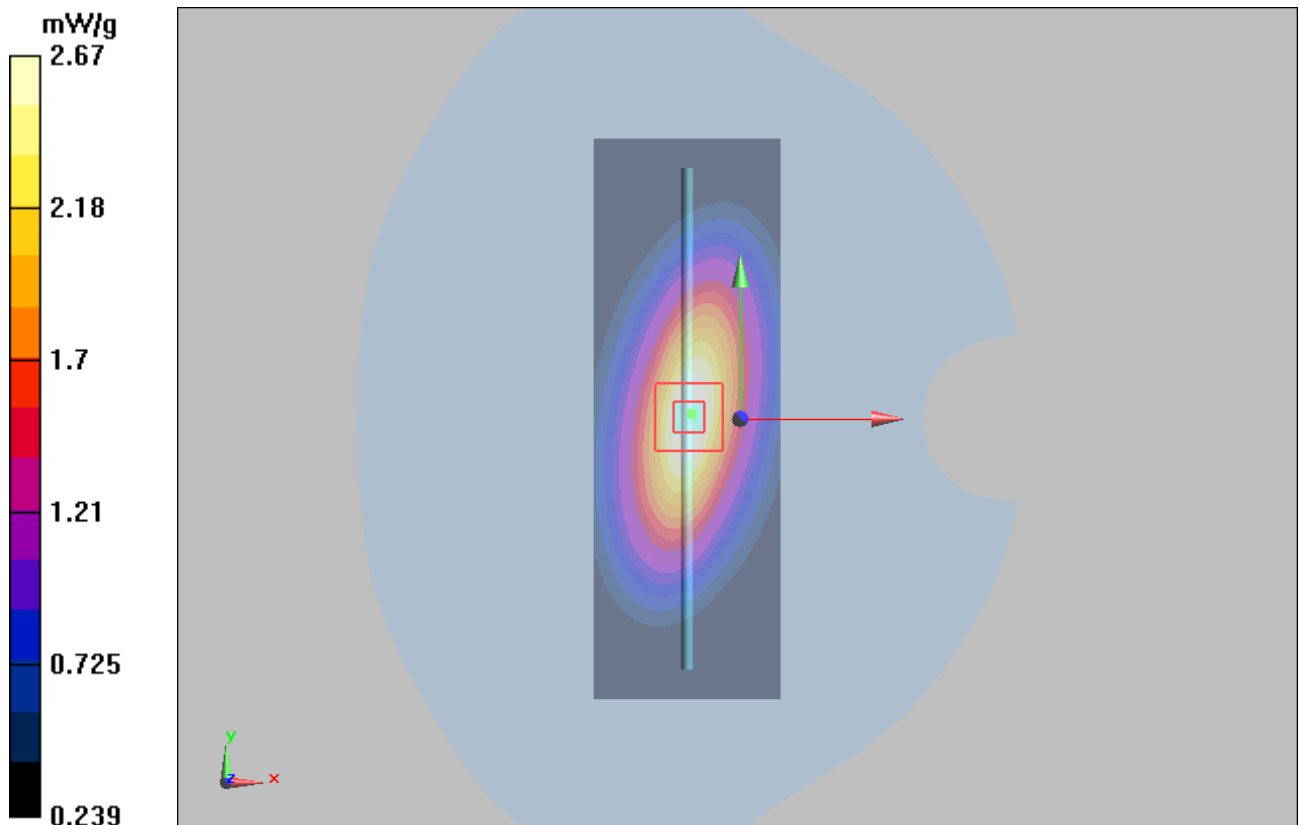


Figure 7 System Performance Check 835MHz 250mW

### System Performance Check at 835 MHz Body TSL

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d082**

Date/Time: 6/19/2010 11:27:20 PM

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1.00 \text{ mho/m}$ ;  $\epsilon_r = 54.67$ ;  $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature:  $22.3^\circ\text{C}$       Liquid Temperature:  $21.5^\circ\text{C}$

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**d=15mm, Pin=250mW/Area Scan (61x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) =  $2.77 \text{ mW/g}$

**d=15mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value =  $50.9 \text{ V/m}$ ; Power Drift =  $0.023 \text{ dB}$

Peak SAR (extrapolated) =  $3.68 \text{ W/kg}$

**SAR(1 g) =  $2.56 \text{ mW/g}$ ; SAR(10 g) =  $1.68 \text{ mW/g}$**

Maximum value of SAR (measured) =  $2.77 \text{ mW/g}$

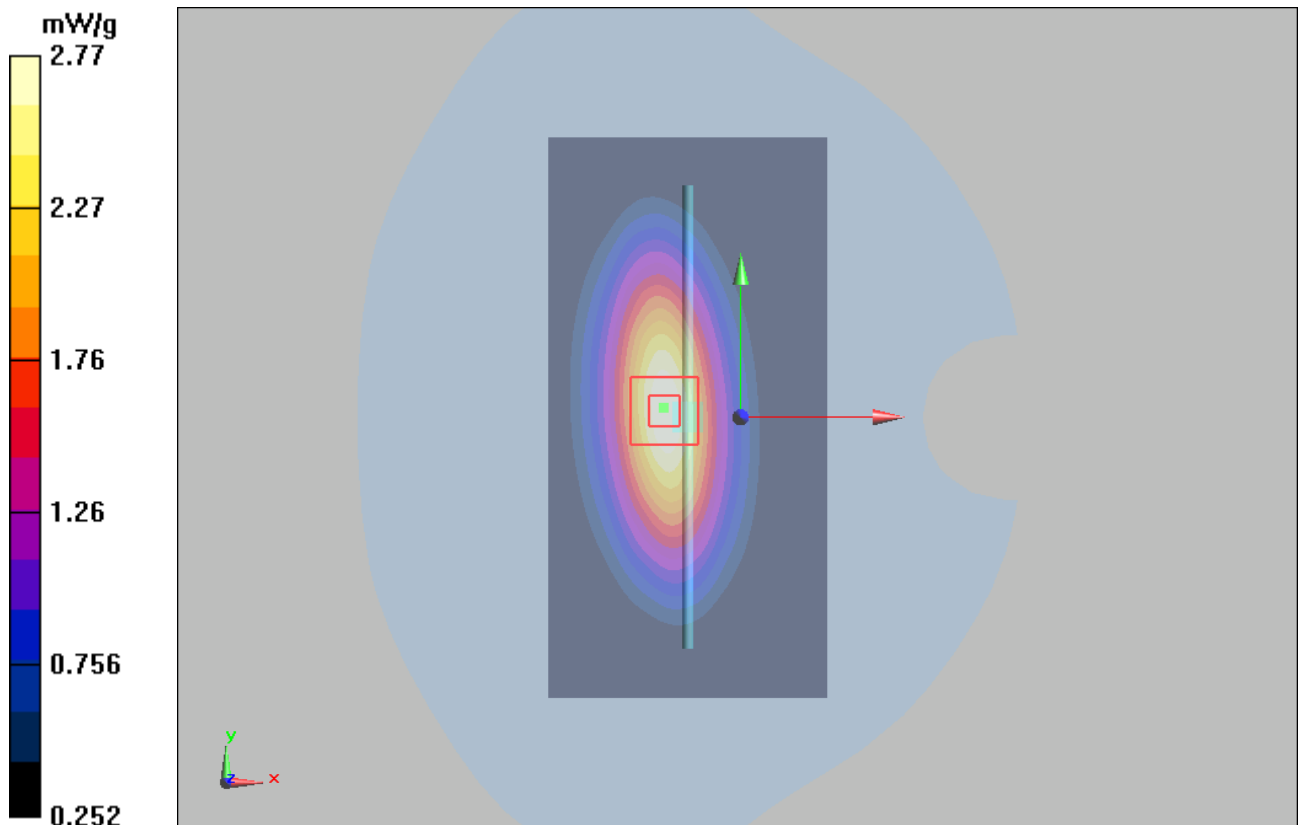


Figure 8 System Performance Check 835MHz 250mW

## ANNEX C: Graph Results

### CDMA Cellular Left Cheek High

Date/Time: 6/20/2010 4:32:17 AM

Communication System: CDMA Cellular; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 848.31$  MHz;  $\sigma = 0.943$  mho/m;  $\epsilon_r = 41.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.2, 9.2, 9.2); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Cheek High/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.966 mW/g

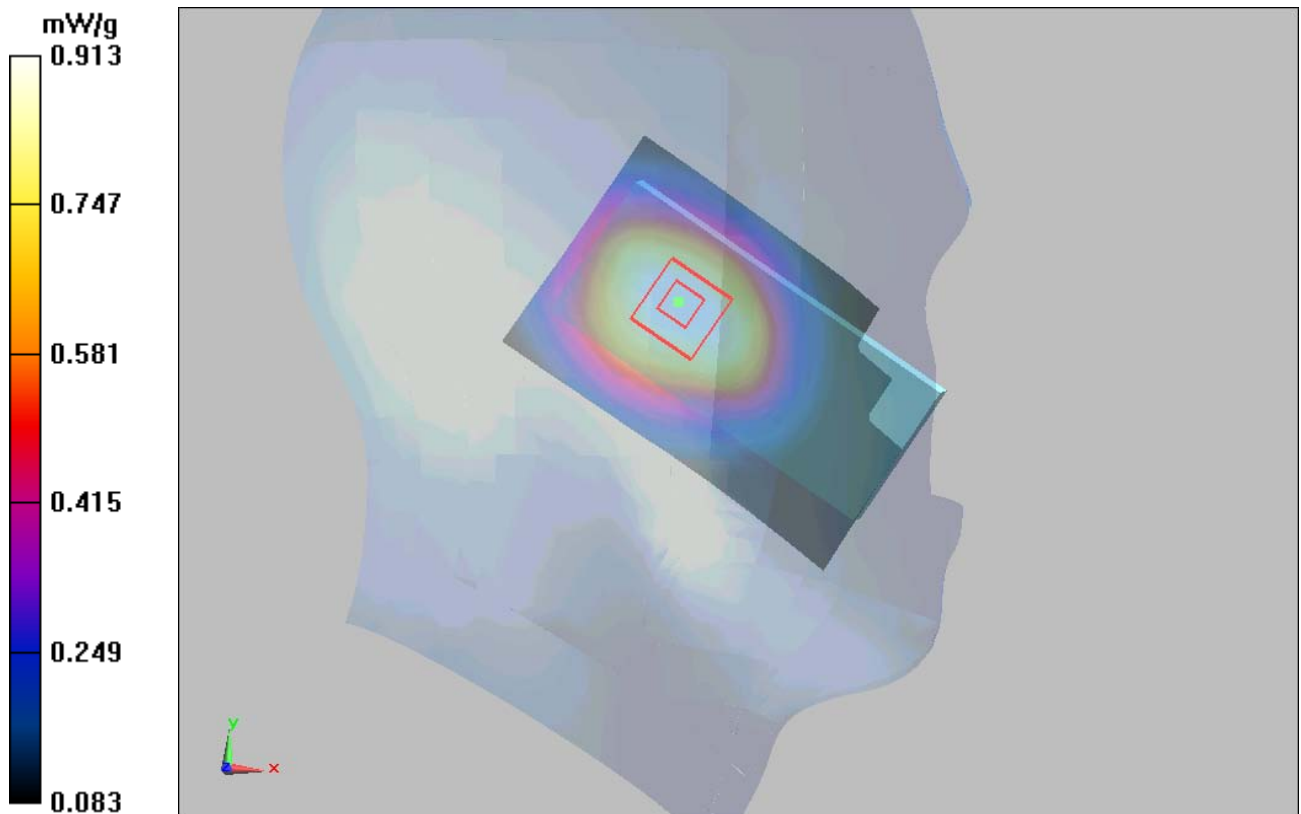
**Cheek High/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 25.8 V/m; Power Drift = -0.087 dB

Peak SAR (extrapolated) = 1.1 W/kg

**SAR(1 g) = 0.863 mW/g; SAR(10 g) = 0.629 mW/g**

Maximum value of SAR (measured) = 0.913 mW/g



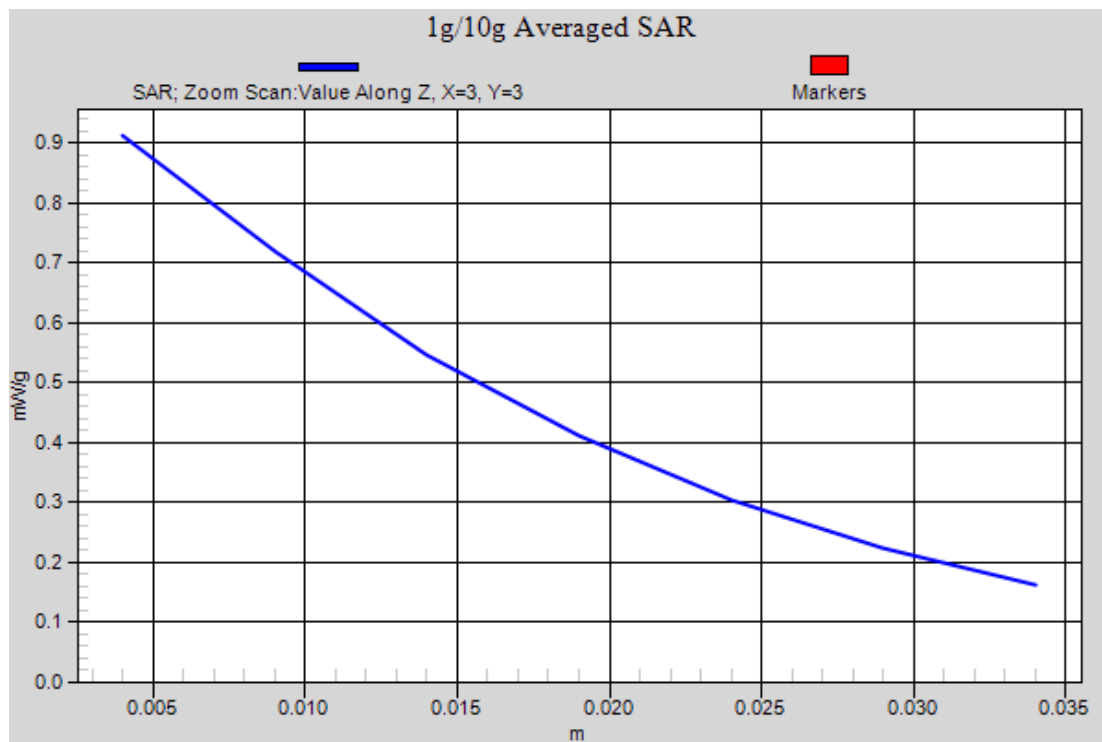


Figure 9 Left Hand Touch Cheek CDMA Cellular Channel 777



### CDMA Cellular Left Cheek Middle

Date/Time: 6/20/2010 3:32:49 AM

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.933$  mho/m;  $\epsilon_r = 42$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.2, 9.2, 9.2); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Cheek Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.908 mW/g

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

Reference Value = 25.8 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 1.07 W/kg

**SAR(1 g) = 0.842 mW/g; SAR(10 g) = 0.618 mW/g**

Maximum value of SAR (measured) = 0.889 mW/g

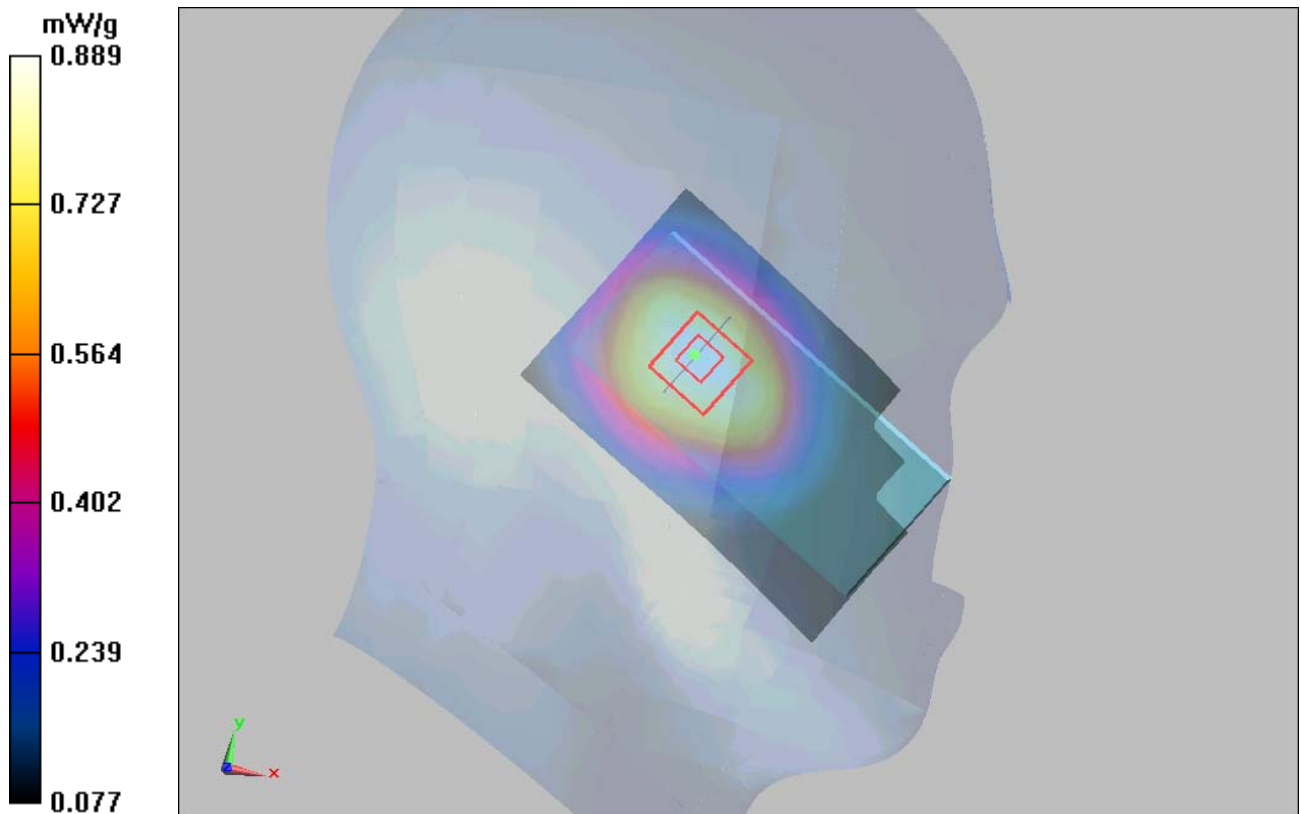


Figure 10 Left Hand Touch Cheek CDMA Cellular Channel 384

### CDMA Cellular Left Cheek Low

Date/Time: 6/20/2010 3:52:56 AM

Communication System: CDMA Cellular; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 825$  MHz;  $\sigma = 0.926$  mho/m;  $\epsilon_r = 42.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.2, 9.2, 9.2); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Cheek Low/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.851 mW/g

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

Reference Value = 24.4 V/m; Power Drift = 0.078 dB

Peak SAR (extrapolated) = 1.02 W/kg

**SAR(1 g) = 0.789 mW/g; SAR(10 g) = 0.578 mW/g**

Maximum value of SAR (measured) = 0.834 mW/g

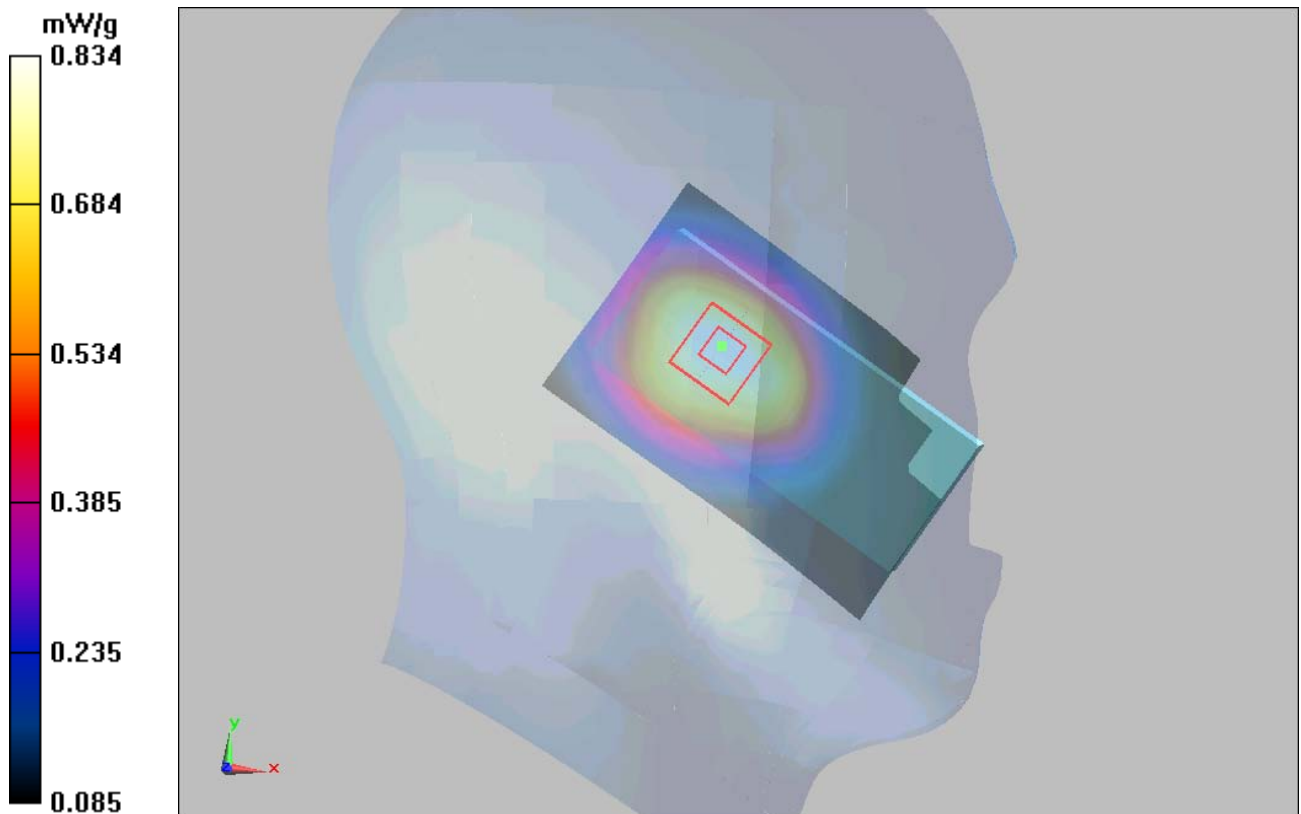


Figure 11 Left Hand Touch Cheek CDMA Cellular Channel 1013

### CDMA Cellular Left Tilt Middle

Date/Time: 6/20/2010 4:52:36 AM

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.933$  mho/m;  $\epsilon_r = 42$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.2, 9.2, 9.2); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Tilt Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.611 mW/g

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

Reference Value = 23.1 V/m; Power Drift = 0.095 dB

Peak SAR (extrapolated) = 0.726 W/kg

**SAR(1 g) = 0.563 mW/g; SAR(10 g) = 0.403 mW/g**

Maximum value of SAR (measured) = 0.601 mW/g

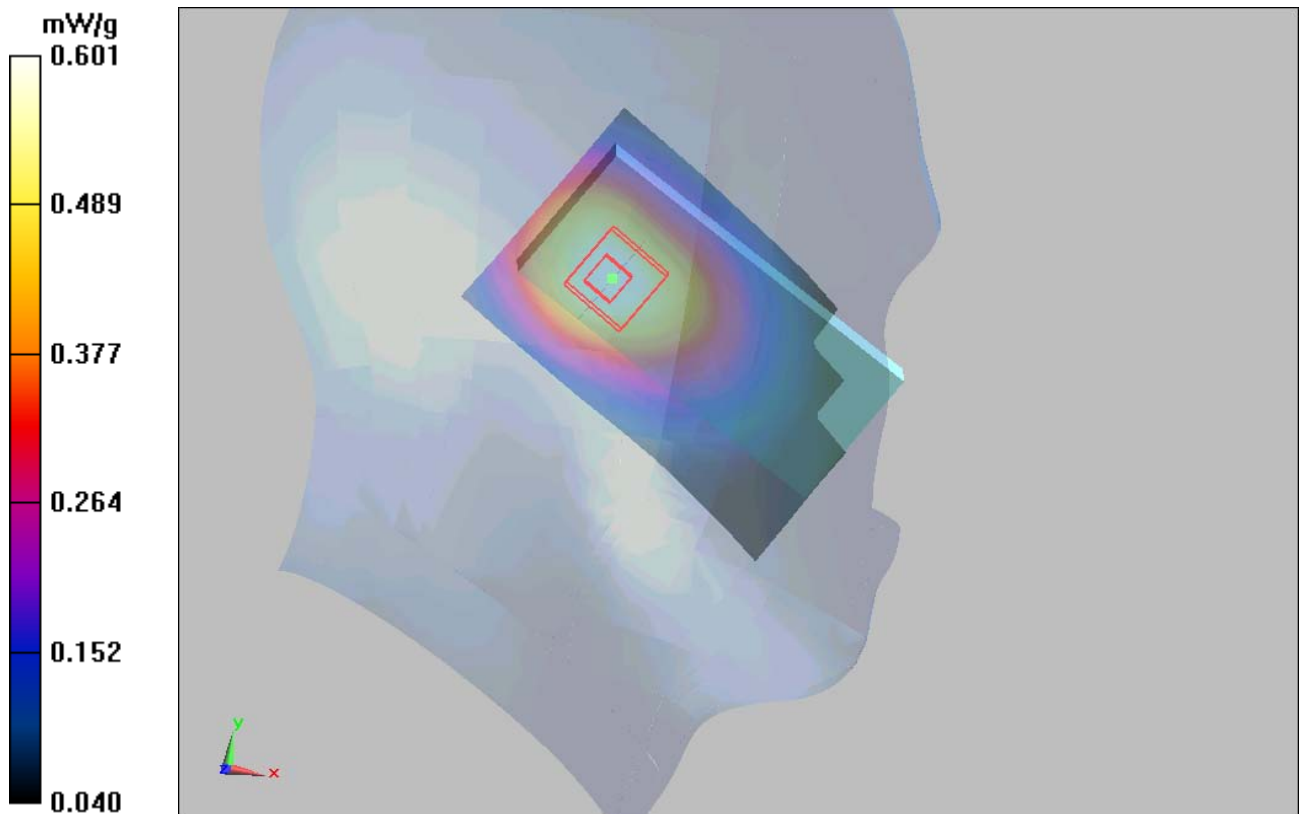


Figure 12 Left Hand Tilt 15° CDMA Cellular Channel 384

### CDMA Cellular Right Cheek High

Date/Time: 6/20/2010 6:16:13 AM

Communication System: CDMA Cellular; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 848.31$  MHz;  $\sigma = 0.943$  mho/m;  $\epsilon_r = 41.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.2, 9.2, 9.2); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Cheek High/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.928 mW/g

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

Reference Value = 25.7 V/m; Power Drift = -0.031 dB

Peak SAR (extrapolated) = 1.27 W/kg

**SAR(1 g) = 0.856 mW/g; SAR(10 g) = 0.612 mW/g**

Maximum value of SAR (measured) = 0.912 mW/g

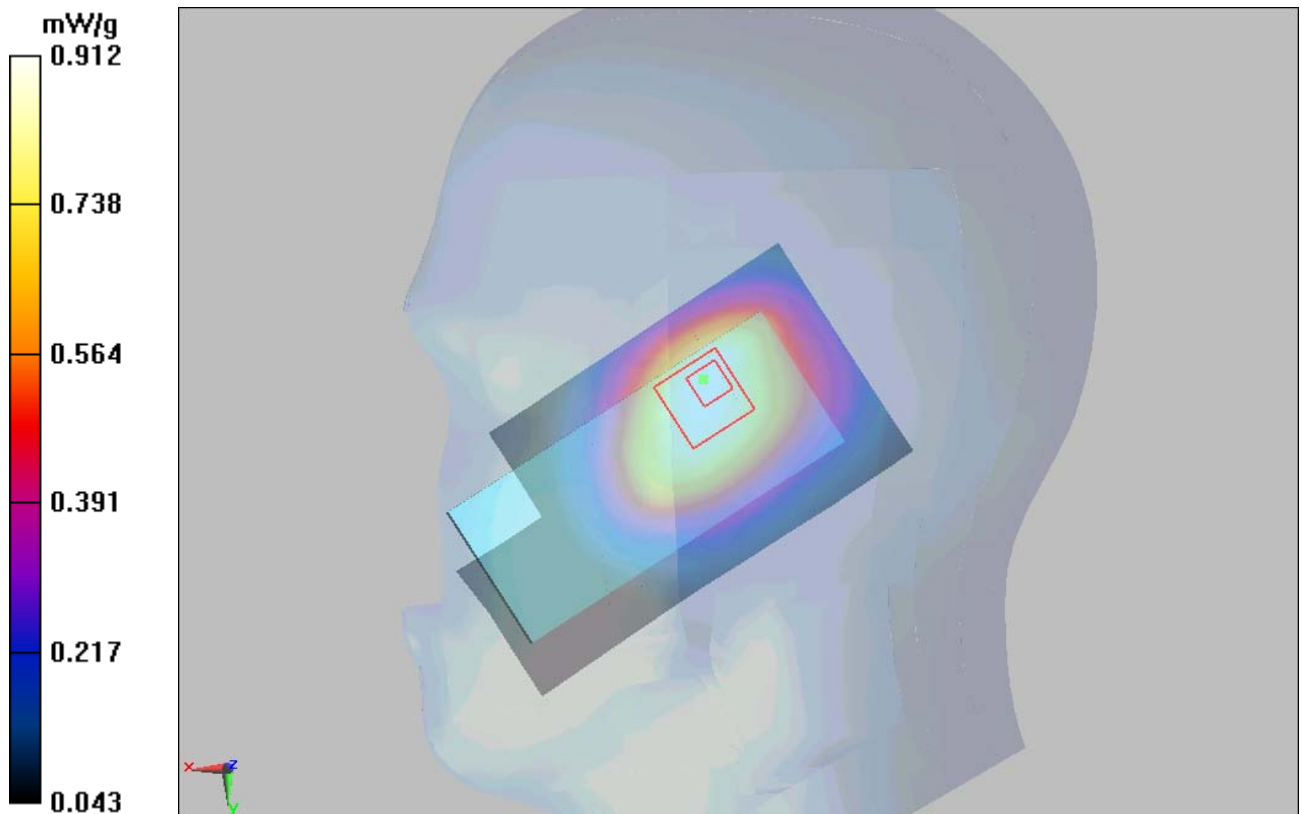


Figure 13 Right Hand Touch Cheek CDMA Cellular Channel 777

### CDMA Cellular Right Cheek Middle

Date/Time: 6/20/2010 5:17:13 AM

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.933$  mho/m;  $\epsilon_r = 42$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.2, 9.2, 9.2); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Cheek Middle/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.915 mW/g

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

Reference Value = 25.4 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 1.29 W/kg

**SAR(1 g) = 0.850 mW/g; SAR(10 g) = 0.607 mW/g**

Maximum value of SAR (measured) = 0.905 mW/g

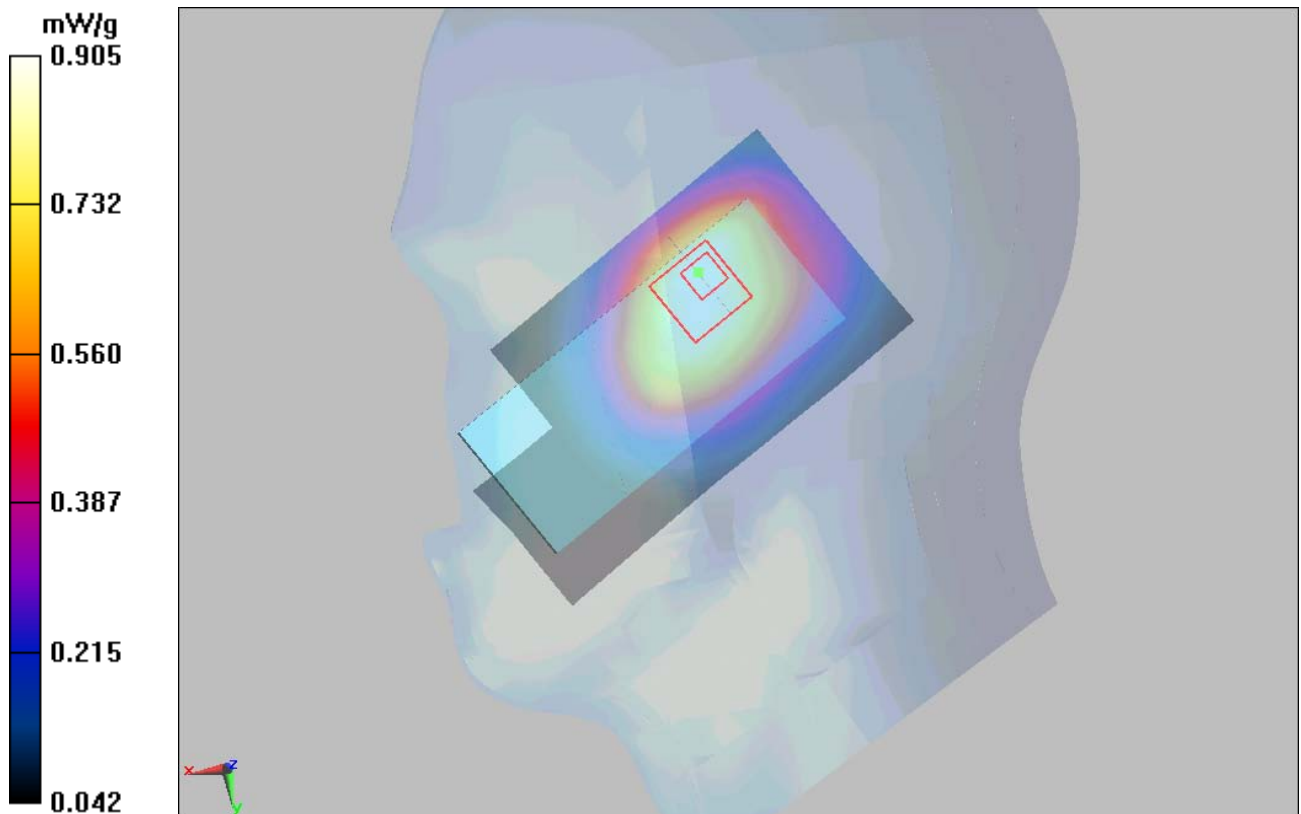


Figure 14 Right Hand Touch Cheek CDMA Cellular Channel 384

### CDMA Cellular Right Cheek Low

Date/Time: 6/20/2010 6:38:50 AM

Communication System: CDMA Cellular; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 825$  MHz;  $\sigma = 0.926$  mho/m;  $\epsilon_r = 42.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.2, 9.2, 9.2); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Cheek Low/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.830 mW/g

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

Reference Value = 24.5 V/m; Power Drift = 0.011 dB

Peak SAR (extrapolated) = 1.11 W/kg

**SAR(1 g) = 0.764 mW/g; SAR(10 g) = 0.550 mW/g**

Maximum value of SAR (measured) = 0.814 mW/g

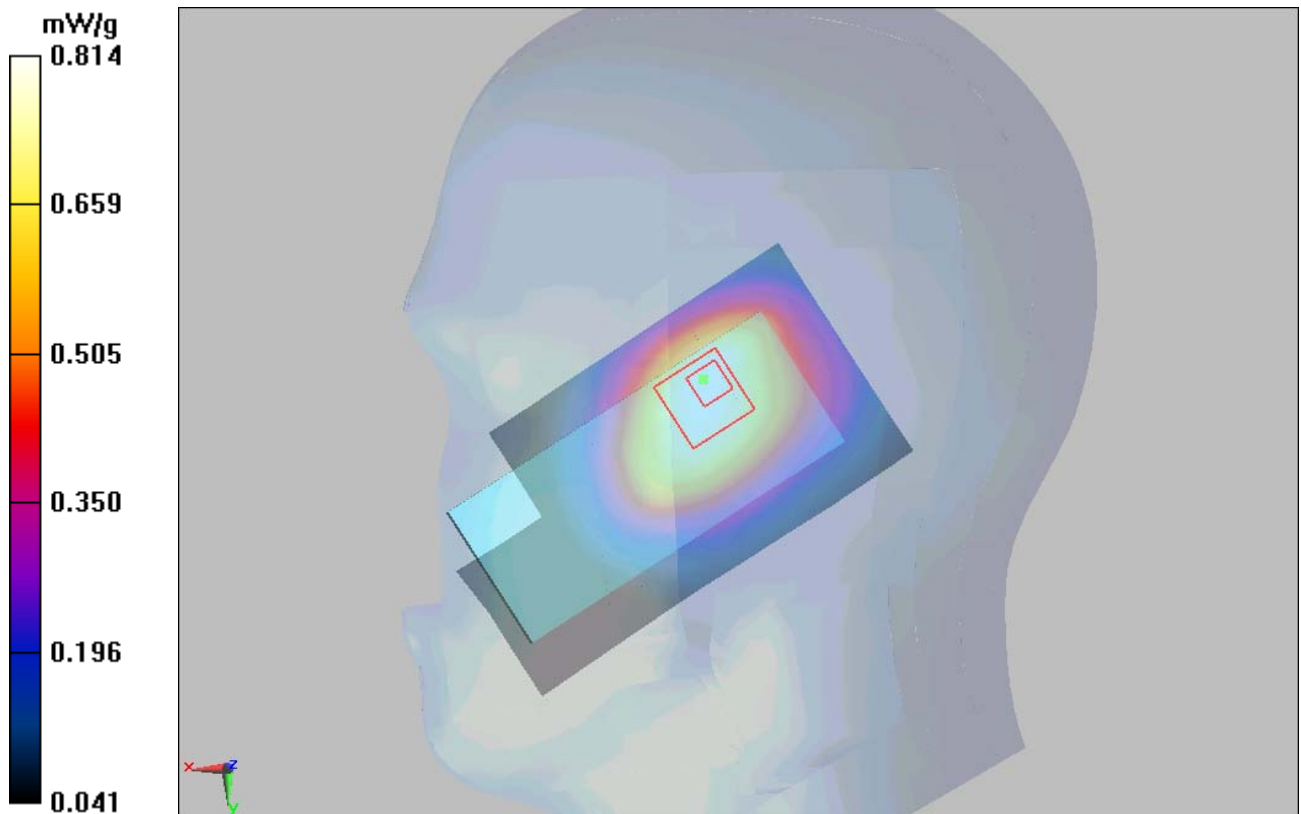


Figure 15 Right Hand Touch Cheek CDMA Cellular Channel 1013



### CDMA Cellular Right Tilt Middle

Date/Time: 6/20/2010 7:21:44 AM

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 0.933$  mho/m;  $\epsilon_r = 42$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.2, 9.2, 9.2); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Tilt Middle/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.638 mW/g

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

Reference Value = 23.6 V/m; Power Drift = -0.147 dB

Peak SAR (extrapolated) = 0.894 W/kg

**SAR(1 g) = 0.620 mW/g; SAR(10 g) = 0.425 mW/g**

Maximum value of SAR (measured) = 0.666 mW/g

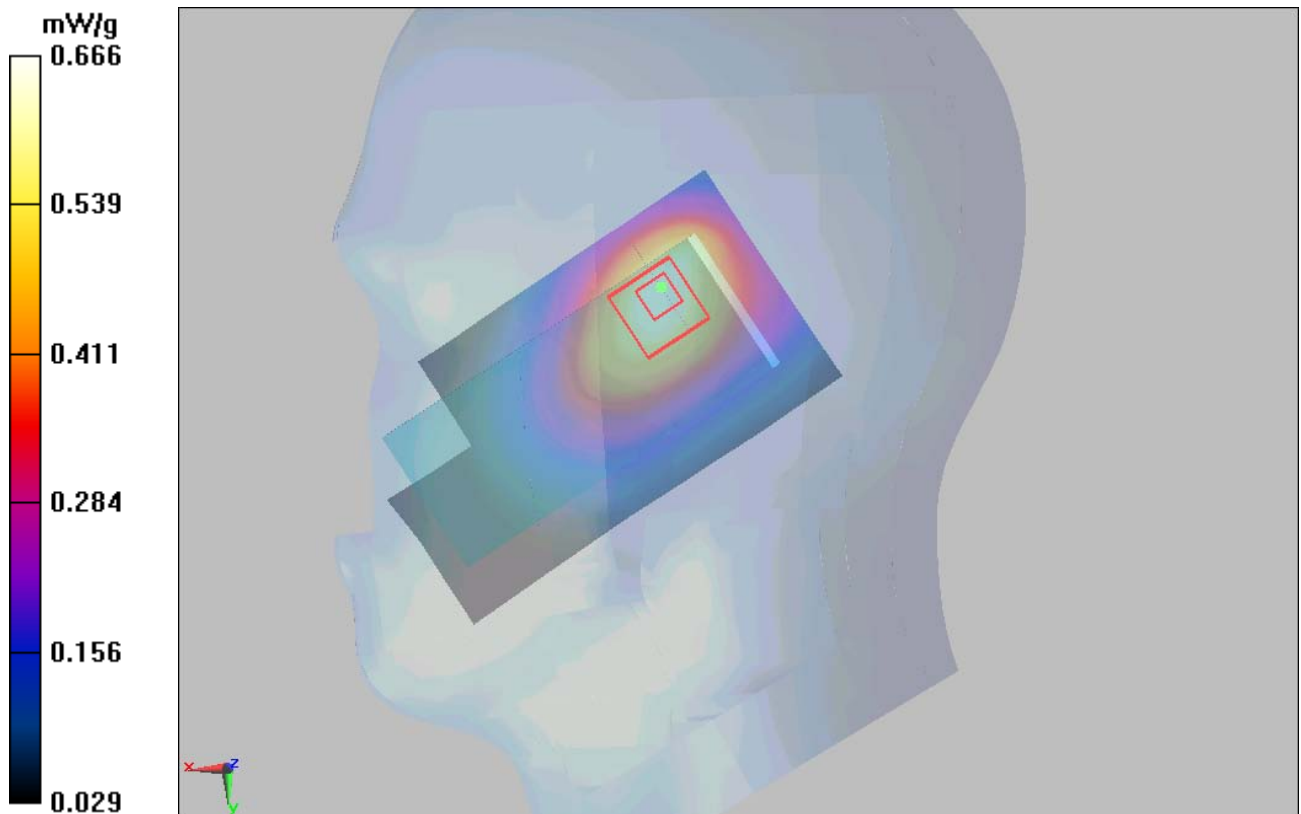


Figure 16 Right Hand Tilt 15° CDMA Cellular Channel 384

### CDMA Cellular Towards Ground High

Date/Time: 6/20/2010 2:06:33 AM

Communication System: CDMA Cellular; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated):  $f = 848.31$  MHz;  $\sigma = 1.02$  mho/m;  $\epsilon_r = 54.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Towards Ground High/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.04 mW/g

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

Reference Value = 24.2 V/m; Power Drift = -0.090 dB

Peak SAR (extrapolated) = 1.28 W/kg

**SAR(1 g) = 0.947 mW/g; SAR(10 g) = 0.655 mW/g**

Maximum value of SAR (measured) = 1.01 mW/g

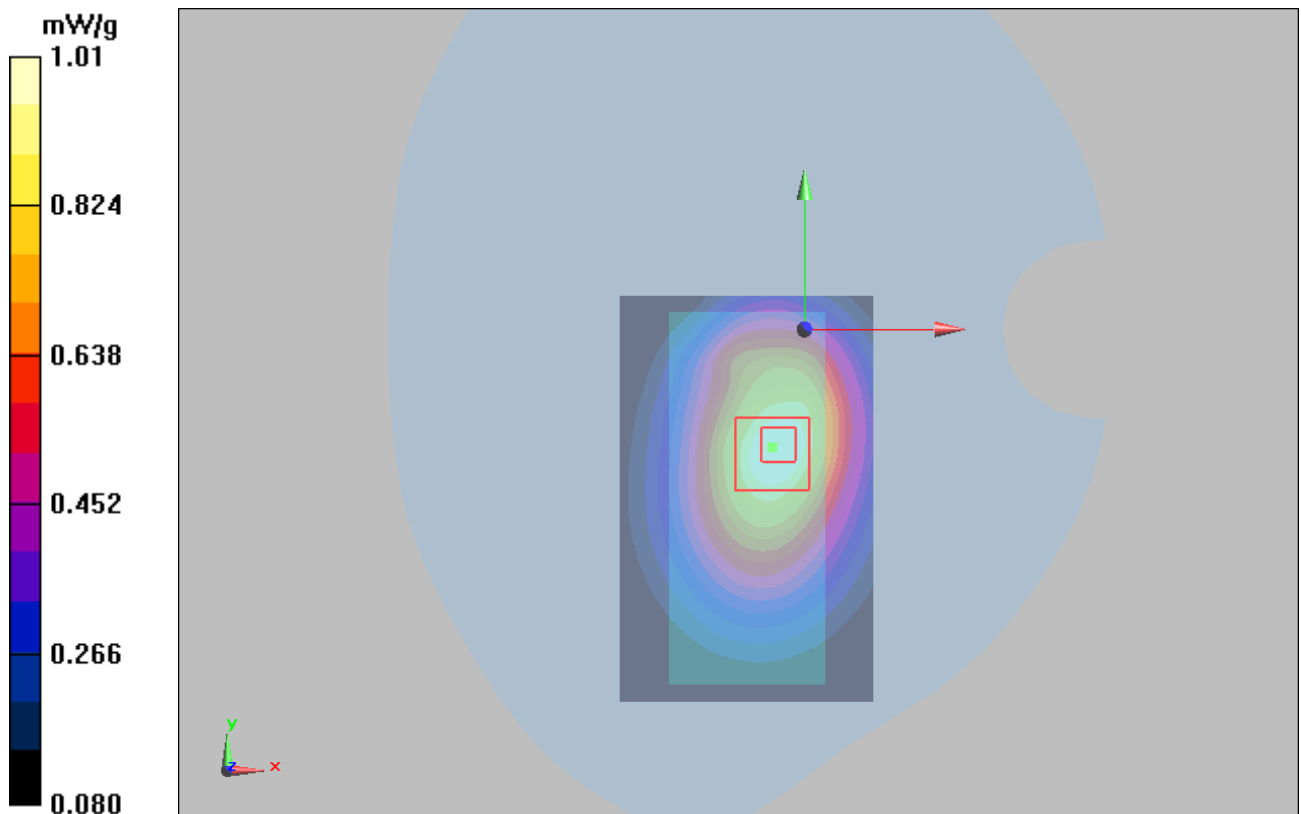


Figure 17 Body, Towards Ground, CDMA Cellular Channel 777



### CDMA Cellular Towards Ground Middle

Date/Time: 6/20/2010 1:23:54 AM

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 54.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Towards Ground Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.12 mW/g

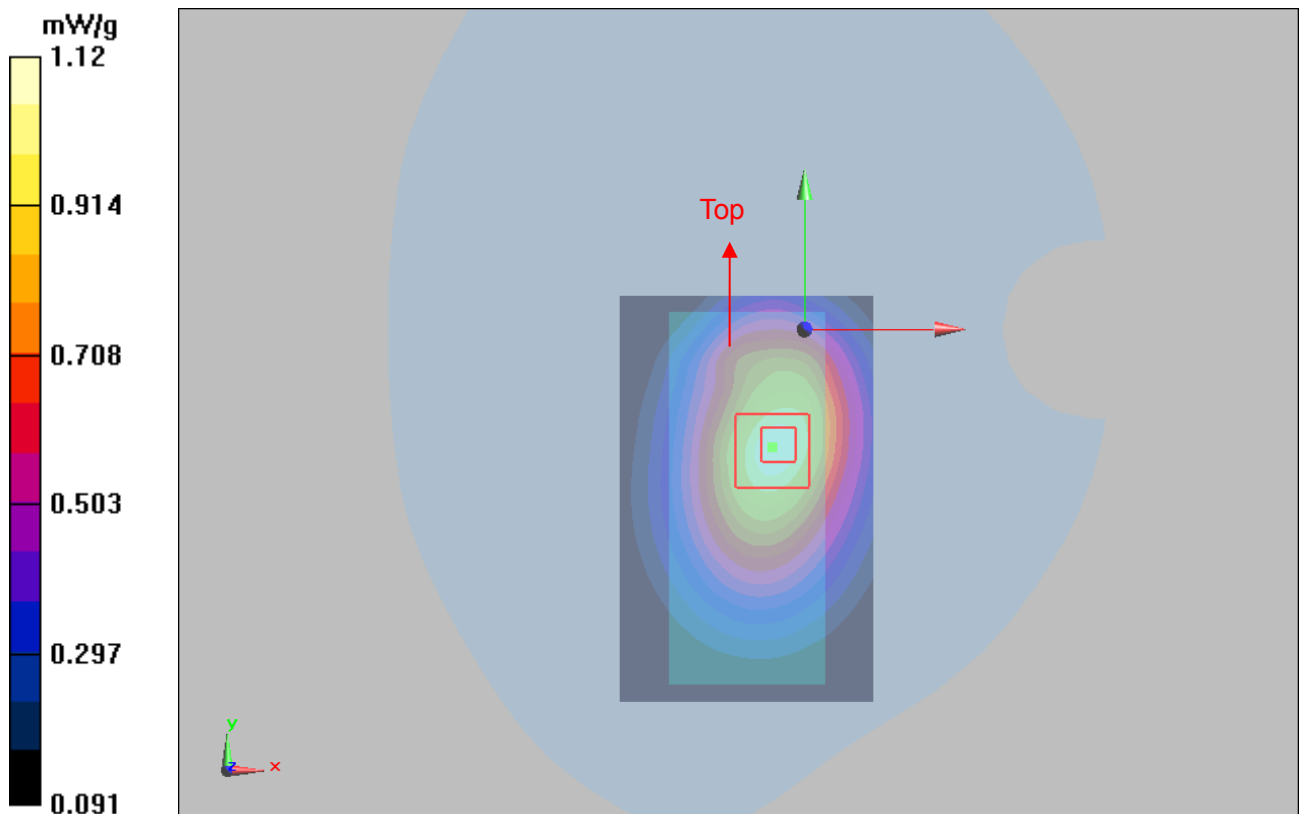
**Towards Ground Middle/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 24.7 V/m; Power Drift = 0.087 dB

Peak SAR (extrapolated) = 1.44 W/kg

**SAR(1 g) = 1.06 mW/g; SAR(10 g) = 0.733 mW/g**

Maximum value of SAR (measured) = 1.12 mW/g



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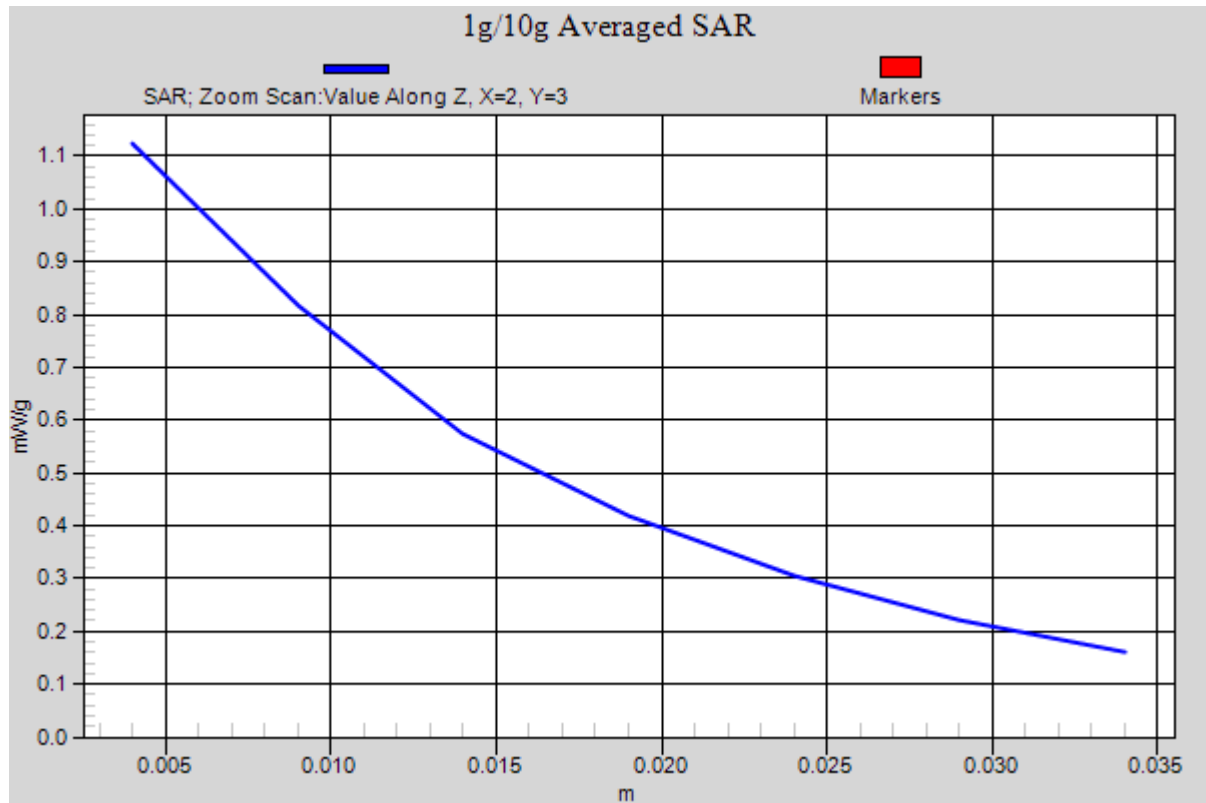


Figure 18 Body, Towards Ground, CDMA Cellular Channel 384

### CDMA Cellular Towards Ground Low

Date/Time: 6/20/2010 1:44:51 AM

Communication System: CDMA Cellular; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 825$  MHz;  $\sigma = 0.995$  mho/m;  $\epsilon_r = 54.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Towards Ground Low/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 1.04 mW/g

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

Reference Value = 24.5 V/m; Power Drift = -0.095 dB

Peak SAR (extrapolated) = 1.33 W/kg

**SAR(1 g) = 0.986 mW/g; SAR(10 g) = 0.682 mW/g**

Maximum value of SAR (measured) = 1.06 mW/g

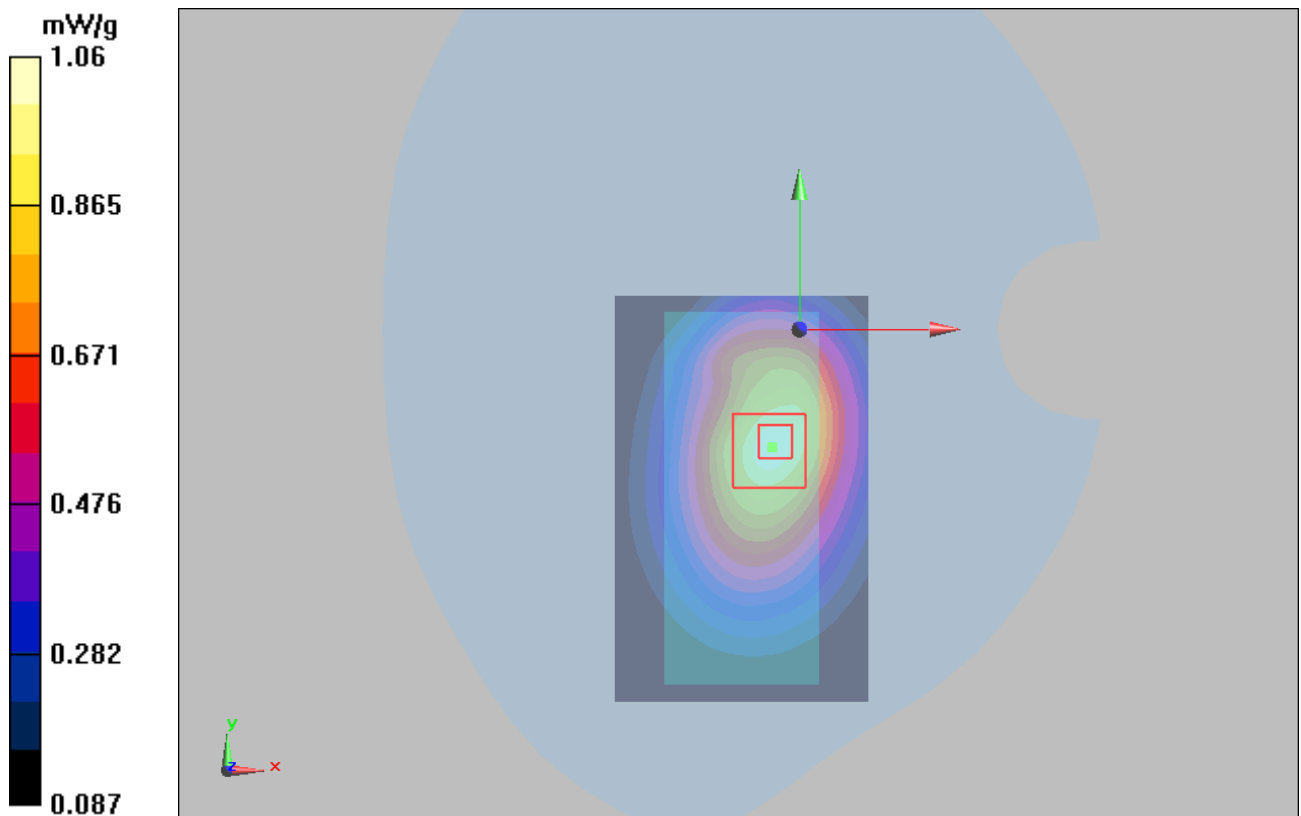


Figure 19 Body, Towards Ground, CDMA Cellular Channel 1013

### CDMA Cellular Towards Phantom Middle

Date/Time: 6/20/2010 12:58:23 AM

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 54.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Towards Phantom Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.420 mW/g

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

Reference Value = 14.3 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 0.562 W/kg

**SAR(1 g) = 0.403 mW/g; SAR(10 g) = 0.294 mW/g**

Maximum value of SAR (measured) = 0.454 mW/g

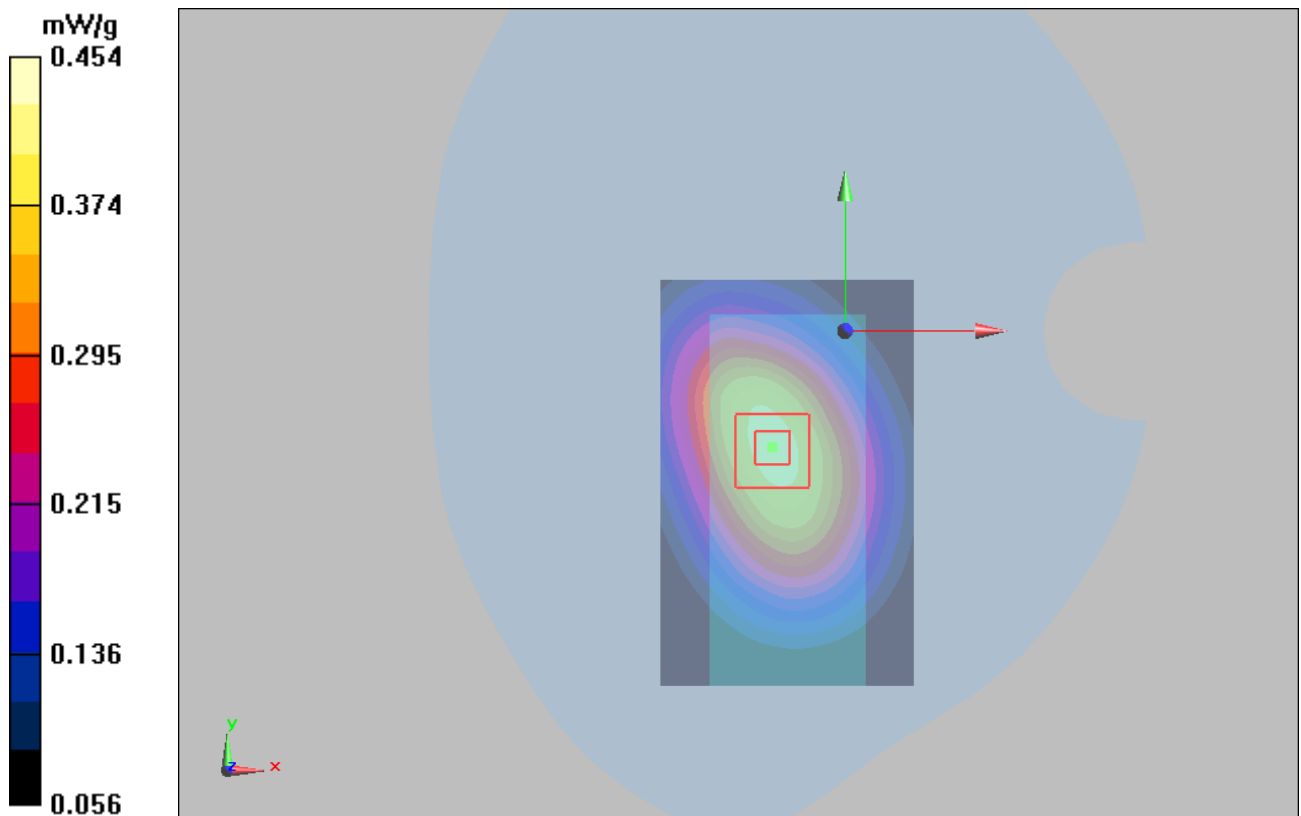


Figure 20 Body, Towards Phantom, CDMA Cellular Channel 384

### CDMA Cellular with Earphone Towards Ground Middle

Date/Time: 6/20/2010 2:32:04 AM

Communication System: CDMA Cellular; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 837$  MHz;  $\sigma = 1.01$  mho/m;  $\epsilon_r = 54.7$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Ambient Temperature: 22.3 °C      Liquid Temperature: 21.5 °C

DASY4 Configuration:

Probe: EX3DV4 - SN3677; ConvF(9.11, 9.11, 9.11); Calibrated: 9/23/2009

Electronics: DAE4 Sn871; Calibrated: 11/11/2009

Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Towards Ground Middle/Area Scan (51x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.539 mW/g

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

Reference Value = 18.6 V/m; Power Drift = 0.005 dB

Peak SAR (extrapolated) = 0.750 W/kg

**SAR(1 g) = 0.540 mW/g; SAR(10 g) = 0.372 mW/g**

Maximum value of SAR (measured) = 0.582 mW/g

**Towards Ground Middle/Zoom Scan (7x7x7)/Cube 1:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 18.6 V/m; Power Drift = 0.005 dB

Peak SAR (extrapolated) = 0.743 W/kg

**SAR(1 g) = 0.425 mW/g; SAR(10 g) = 0.265 mW/g**

Maximum value of SAR (measured) = 0.549 mW/g

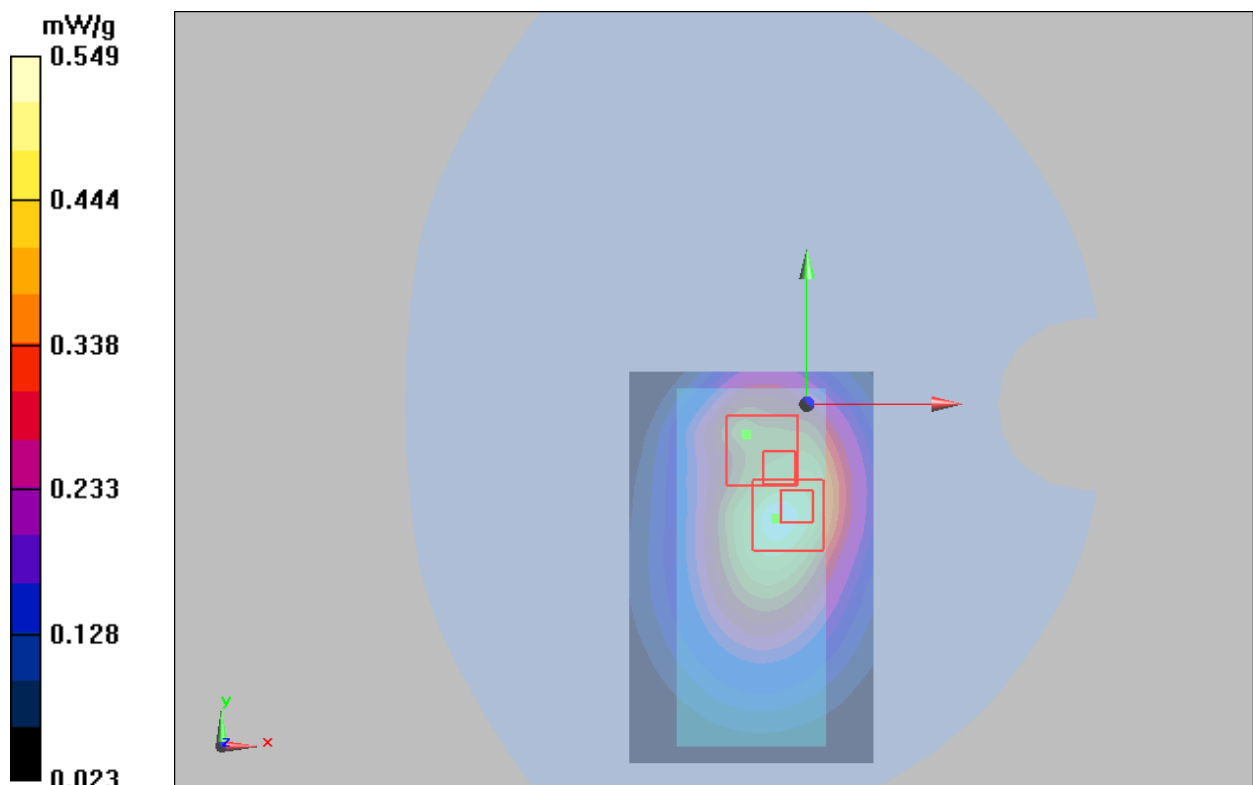


Figure 21 Body with Earphone, Towards Ground, CDMA Cellular Channel 384

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### ANNEX D: Probe Calibration Certificate

**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  
**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 **TA (Auden)**

Certificate No: **EX3-3677\_Sep09**

#### CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3677**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v5, QA CAL-23.v3 and QA CAL-25.v2 - Calibration procedure for dosimetric E-field probes**

Calibration date: **September 23, 2009**

Condition of the calibrated item **In Tolerance**

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 ( $22 \pm 3$ )°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      | 1-Apr-09 (No. 217-01030)      | Apr-10                |
| Power sensor E4412A        | MY41495277      | 1-Apr-09 (No. 217-01030)      | Apr-10                |
| Power sensor E4412A        | MY41498087      | 1-Apr-09 (No. 217-01030)      | Apr-10                |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 31-Mar-09 (No. 217-01026)     | Mar-10                |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 31-Mar-09 (No. 217-01028)     | Mar-10                |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 31-Mar-09 (No. 217-01027)     | Mar-10                |
| Reference Probe ES3DV2     | SN: 3013        | 2-Jan-09 (No. ES3-3013_Jan09) | Jan-10                |
| DAE4                       | SN: 660         | 9-Sep-08 (No. DAE4-660_Sep08) | Sep-09                |

| Secondary Standards       | ID #         | Check Date (in house)             | Scheduled Check        |
|---------------------------|--------------|-----------------------------------|------------------------|
| RF generator HP 8648C     | US3642U01700 | 4-Aug-99 (in house check Oct-07)  | In house check: Oct-09 |
| Network Analyzer HP 8753E | US37390585   | 18-Oct-01 (in house check Oct-08) | In house check: Oct-09 |

Calibrated by: **Claudio Leubler** Function **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

Issued: September 23, 2009

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

Certificate No: EX3-3677\_Sep09

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**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  
**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**

### Glossary:

|                          |                                                                                                                                                      |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| TSL                      | tissue simulating liquid                                                                                                                             |
| NORM <sub>x,y,z</sub>    | sensitivity in free space                                                                                                                            |
| ConvF                    | sensitivity in TSL / NORM <sub>x,y,z</sub>                                                                                                           |
| DCP                      | diode compression point                                                                                                                              |
| Polarization $\varphi$   | $\varphi$ rotation around probe axis                                                                                                                 |
| Polarization $\vartheta$ | $\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis |

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

- 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
- 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:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the  $E^2$ -field uncertainty inside TSL (see below **ConvF**).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* 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**.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  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 NORM<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  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.

EX3DV4 SN:3677

September 23, 2009

# Probe EX3DV4

## SN:3677

|                  |                    |
|------------------|--------------------|
| Manufactured:    | September 9, 2008  |
| Last calibrated: | November 7, 2008   |
| Recalibrated:    | September 23, 2009 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)



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EX3DV4 SN:3677

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### DASY - Parameters of Probe: EX3DV4 SN:3677

#### Sensitivity in Free Space<sup>A</sup>

#### Diode Compression<sup>B</sup>

|       |                     |                                     |       |              |
|-------|---------------------|-------------------------------------|-------|--------------|
| NormX | <b>0.42</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP X | <b>91</b> mV |
| NormY | <b>0.47</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Y | <b>92</b> mV |
| NormZ | <b>0.40</b> ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Z | <b>93</b> mV |

#### Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

#### Boundary Effect

TSL                      900 MHz      Typical SAR gradient: 5 % per mm

|                                           |                              |               |               |
|-------------------------------------------|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>2.0 mm</b> | <b>3.0 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 8.2           | 4.4           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.8           | 0.5           |

TSL                      1750 MHz      Typical SAR gradient: 10 % per mm

|                                           |                              |               |               |
|-------------------------------------------|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>2.0 mm</b> | <b>3.0 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 7.5           | 3.9           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.8           | 0.4           |

#### Sensor Offset

Probe Tip to Sensor Center                      **1.0 mm**

**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%.**

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).

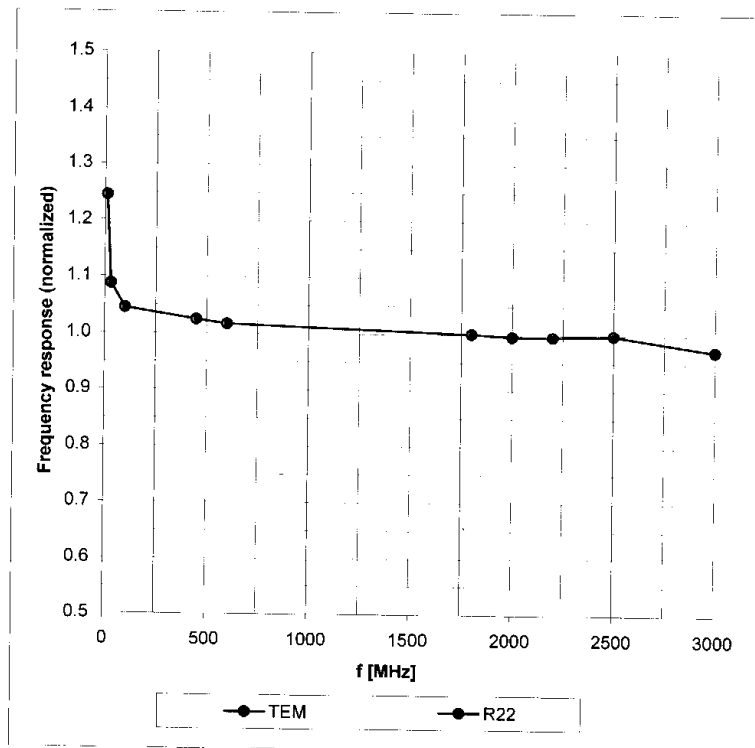
<sup>B</sup> Numerical linearization parameter: uncertainty not required.

EX3DV4 SN:3677

September 23, 2009

### Frequency Response of E-Field

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



Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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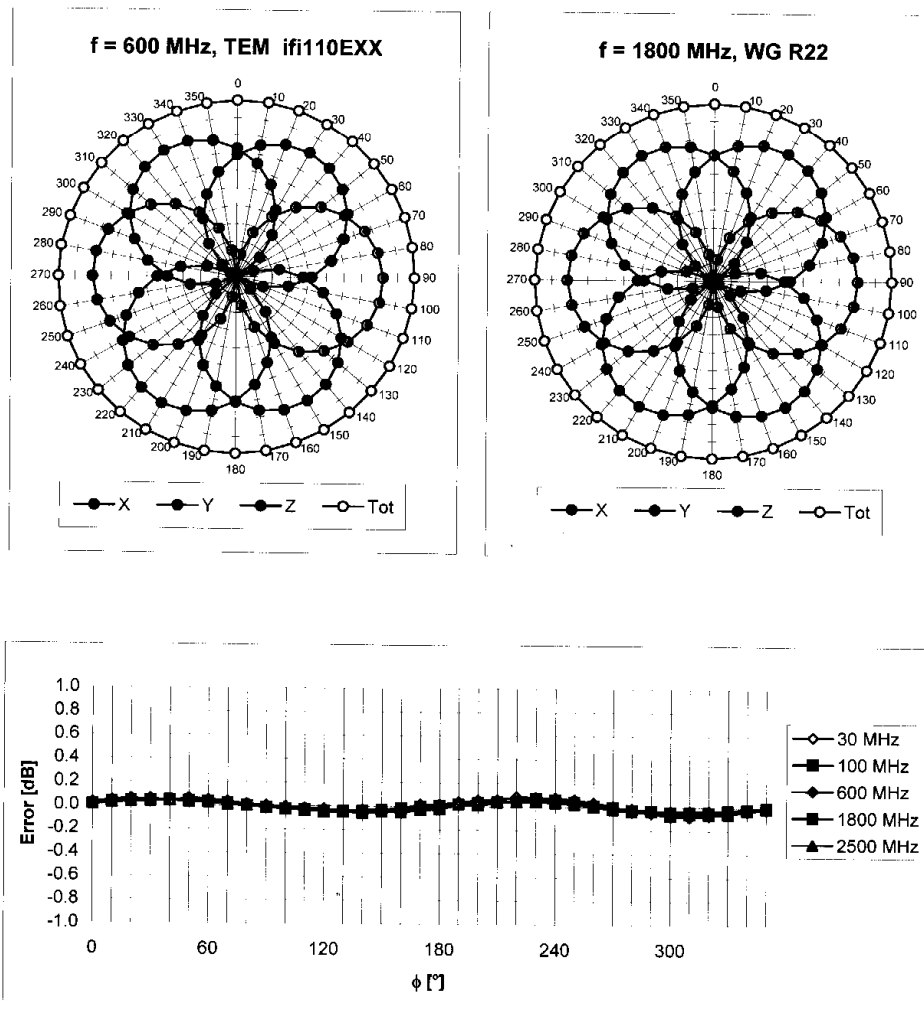
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EX3DV4 SN:3677

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Receiving Pattern ( $\phi$ ),  $\theta = 0^\circ$

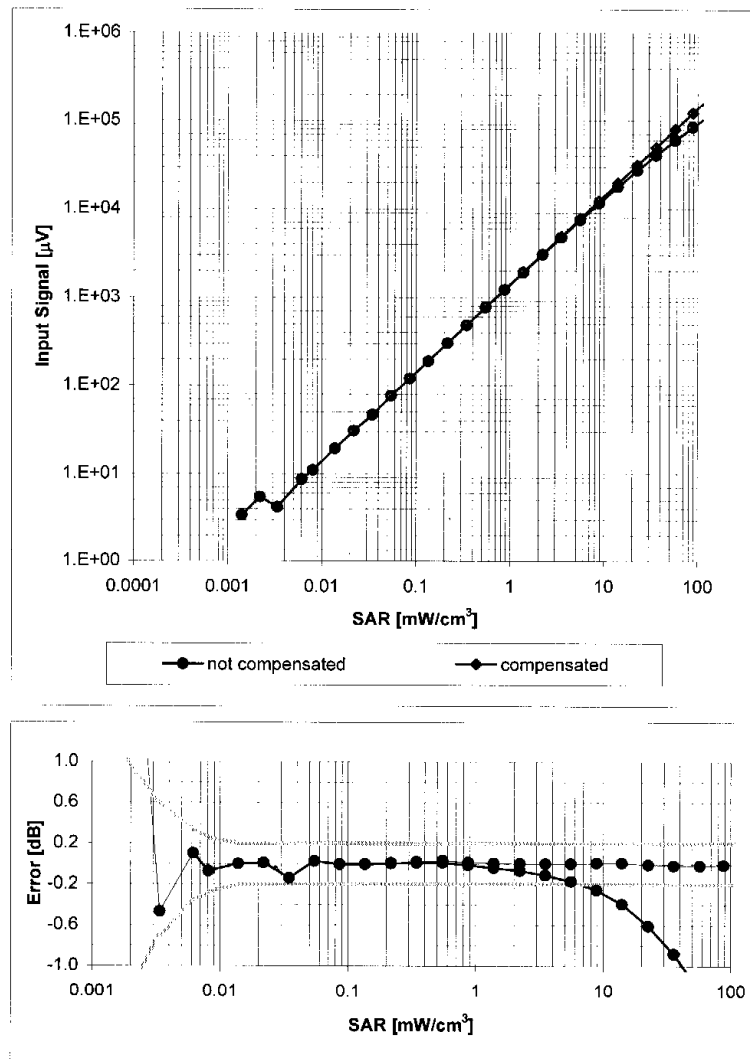


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

EX3DV4 SN:3677

September 23, 2009

**Dynamic Range  $f(\text{SAR}_{\text{head}})$**   
(Waveguide R22,  $f = 1800 \text{ MHz}$ )

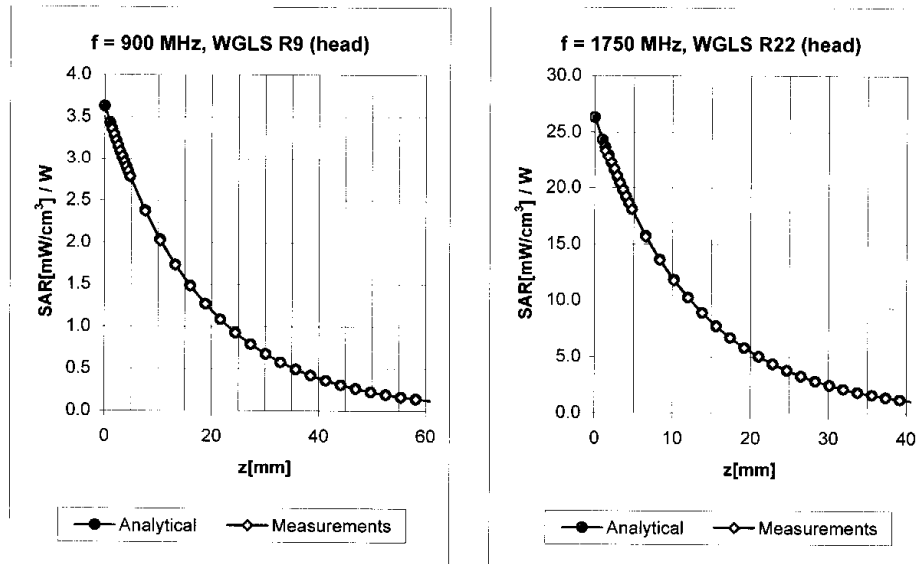


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

EX3DV4 SN:3677

September 23, 2009

### Conversion Factor Assessment



| f [MHz] | Validity [MHz] <sup>c</sup> | TSL  | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty   |
|---------|-----------------------------|------|--------------|--------------|-------|-------|---------------------|
| 835     | ± 50 / ± 100                | Head | 41.5 ± 5%    | 0.90 ± 5%    | 0.68  | 0.64  | 9.20 ± 11.0% (k=2)  |
| 900     | ± 50 / ± 100                | Head | 41.5 ± 5%    | 0.97 ± 5%    | 0.71  | 0.62  | 8.91 ± 11.0% (k=2)  |
| 1750    | ± 50 / ± 100                | Head | 40.1 ± 5%    | 1.37 ± 5%    | 0.68  | 0.62  | 8.04 ± 11.0% (k=2)  |
| 1950    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.70  | 0.60  | 7.53 ± 11.0% (k=2)  |
| 450     | ± 50 / ± 100                | Body | 56.7 ± 5%    | 0.94 ± 5%    | 0.32  | 0.49  | 10.43 ± 13.3% (k=2) |
| 835     | ± 50 / ± 100                | Body | 55.2 ± 5%    | 0.97 ± 5%    | 0.54  | 0.73  | 9.11 ± 11.0% (k=2)  |
| 900     | ± 50 / ± 100                | Body | 55.0 ± 5%    | 1.05 ± 5%    | 0.63  | 0.71  | 8.89 ± 11.0% (k=2)  |
| 1750    | ± 50 / ± 100                | Body | 53.4 ± 5%    | 1.49 ± 5%    | 0.55  | 0.74  | 7.70 ± 11.0% (k=2)  |
| 1950    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.30  | 1.01  | 7.62 ± 11.0% (k=2)  |
| 2450    | ± 50 / ± 100                | Body | 52.7 ± 5%    | 1.95 ± 5%    | 0.56  | 0.68  | 7.28 ± 11.0% (k=2)  |

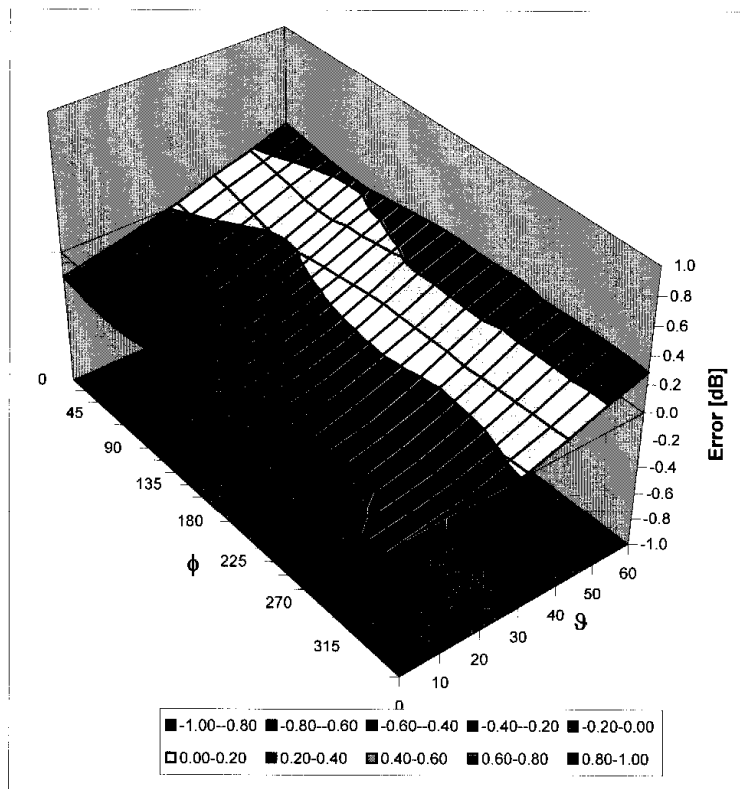
<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

EX3DV4 SN:3677

September 23, 2009

### Deviation from Isotropy in HSL

Error ( $\phi$ ,  $\vartheta$ ),  $f = 900$  MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )

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### ANNEX E: D835V2 Dipole Calibration Certificate

**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  
**S** Swiss Calibration Service

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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**

Client **ATL (Auden)**

Certificate No: **D835V2-4d082\_Jul09**

#### CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d082**

Calibration procedure(s) **QA CAL-05.v7**  
**Calibration procedure for dipole validation kits**

Calibration date: **July 13, 2009**

Condition of the calibrated item **In Tolerance**

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  $(22 \pm 3)^\circ\text{C}$  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         | 08-Oct-08 (No. 217-00898)         | Oct-09                 |
| Power sensor HP 8481A       | US37292783         | 08-Oct-08 (No. 217-00898)         | Oct-09                 |
| Reference 20 dB Attenuator  | SN: 5086 (20g)     | 31-Mar-09 (No. 217-01025)         | Mar-10                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 31-Mar-09 (No. 217-01029)         | Mar-10                 |
| Reference Probe ES3DV2      | SN: 3025           | 30-Apr-09 (No. ES3-3025_Apr09)    | Apr-10                 |
| DAE4                        | SN: 601            | 07-Mar-09 (No. DAE4-601_Mar09)    | Mar-10                 |
| Secondary Standards         | ID #               | Check Date (in house)             | Scheduled Check        |
| Power sensor HP 8481A       | MY41092317         | 18-Oct-02 (in house check Oct-07) | In house check: Oct-09 |
| RF generator R&S SMT-06     | 100005             | 4-Aug-99 (in house check Oct-07)  | In house check: Oct-09 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-08) | In house check: Oct-09 |

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

Issued: July 13, 2009

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

Certificate No: D835V2-4d082\_Jul09

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**Calibration Laboratory of**  
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**Engineering AG**  
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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:

- 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
- 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
- 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:

- 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.



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### Measurement Conditions

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

|                              |                           |             |
|------------------------------|---------------------------|-------------|
| DASY Version                 | DASY5                     | V5.0        |
| Extrapolation                | Advanced Extrapolation    |             |
| Phantom                      | Modular Flat Phantom V4.9 |             |
| Distance Dipole Center - TSL | 15 mm                     | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm         |             |
| Frequency                    | 835 MHz $\pm$ 1 MHz       |             |

### Head TSL parameters

The following parameters and calculations were applied.

|                                  | Temperature         | Permittivity   | Conductivity         |
|----------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters      | 22.0 °C             | 41.5           | 0.90 mho/m           |
| Measured Head TSL parameters     | (22.0 $\pm$ 0.2) °C | 40.4 $\pm$ 6 % | 0.89 mho/m $\pm$ 6 % |
| Head TSL temperature during test | (22.2 $\pm$ 0.2) °C | ----           | -----                |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                |
|-------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                          | 250 mW input power | 2.42 mW / g                    |
| SAR normalized                                        | normalized to 1W   | 9.68 mW / g                    |
| SAR for nominal Head TSL parameters <sup>1</sup>      | normalized to 1W   | 9.71 mW / g $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                            | 250 mW input power | 1.58 mW / g                    |
| SAR normalized                                          | normalized to 1W   | 6.32 mW / g                    |
| SAR for nominal Head TSL parameters <sup>1</sup>        | normalized to 1W   | 6.34 mW / g $\pm$ 16.5 % (k=2) |

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

# TA Technology (Shanghai) Co., Ltd.

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### Body TSL parameters

The following parameters and calculations were applied.

|                                  | Temperature     | Permittivity | Conductivity     |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters      | 22.0 °C         | 55.2         | 0.97 mho/m       |
| Measured Body TSL parameters     | (22.0 ± 0.2) °C | 53.0 ± 6 %   | 0.99 mho/m ± 6 % |
| Body TSL temperature during test | (22.5 ± 0.2) °C | ---          | ---              |

### SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                                   |
|-------------------------------------------------------|--------------------|-----------------------------------|
| SAR measured                                          | 250 mW input power | 2.56 mW / g                       |
| SAR normalized                                        | normalized to 1W   | 10.2 mW / g                       |
| SAR for nominal Body TSL parameters <sup>2</sup>      | normalized to 1W   | <b>10.0 mW / g ± 17.0 % (k=2)</b> |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                                   |
|---------------------------------------------------------|--------------------|-----------------------------------|
| SAR measured                                            | 250 mW input power | 1.68 mW / g                       |
| SAR normalized                                          | normalized to 1W   | 6.72 mW / g                       |
| SAR for nominal Body TSL parameters <sup>2</sup>        | normalized to 1W   | <b>6.61 mW / g ± 16.5 % (k=2)</b> |

<sup>2</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

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### Appendix

#### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 52.3 $\Omega$ - 2.5 j $\Omega$ |
| Return Loss                          | - 29.5 dB                      |

#### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 48.3 $\Omega$ - 4.3 j $\Omega$ |
| Return Loss                          | - 26.6 dB                      |

#### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.390 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.

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 17, 2008 |

**DASY5 Validation Report for Head TSL**

Date/Time: 13.07.2009 11:31:45

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d082**

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: HSL 900 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.89$  mho/m;  $\epsilon_r = 40.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(5.86, 5.86, 5.86); Calibrated: 30.04.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

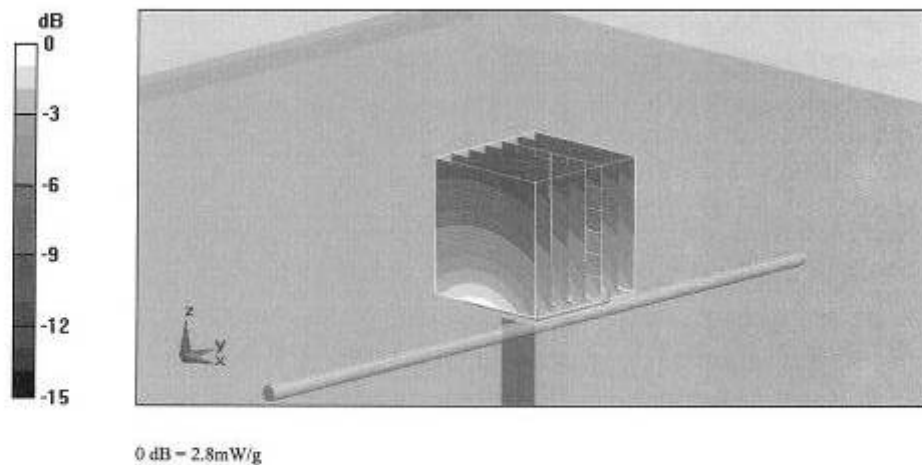
**Pin=250mW; dip=15mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.4 V/m; Power Drift = 0.00639 dB

Peak SAR (extrapolated) = 3.62 W/kg

**SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.58 mW/g**

Maximum value of SAR (measured) = 2.8 mW/g



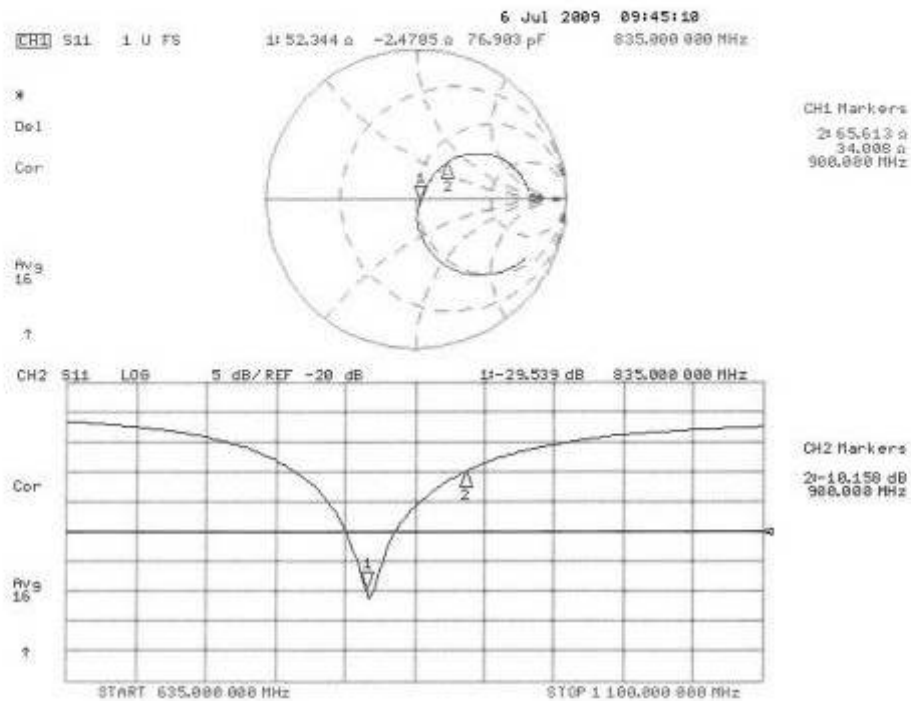
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### Impedance Measurement Plot for Head TSL



**DASY5 Validation Report for Body TSL**

Date/Time: 13.07.2009 11:50:13

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d082**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: MSL900

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.99$  mho/m;  $\epsilon_r = 53$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

**DASY5 Configuration:**

- Probe: ES3DV2 - SN3025; ConvF(5.79, 5.79, 5.79); Calibrated: 30.04.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

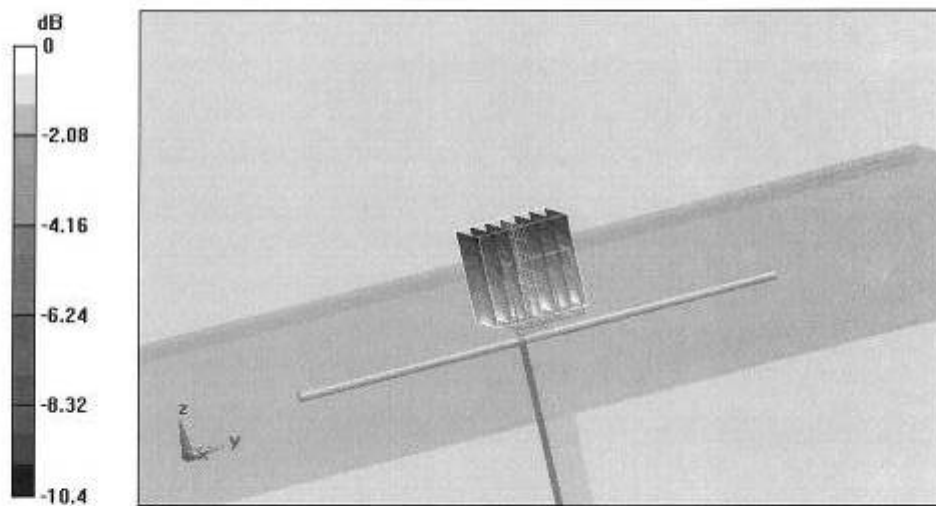
**Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.4 V/m; Power Drift = 0.013 dB

Peak SAR (extrapolated) = 3.76 W/kg

**SAR(1 g) = 2.56 mW/g; SAR(10 g) = 1.68 mW/g**

Maximum value of SAR (measured) = 2.97 mW/g



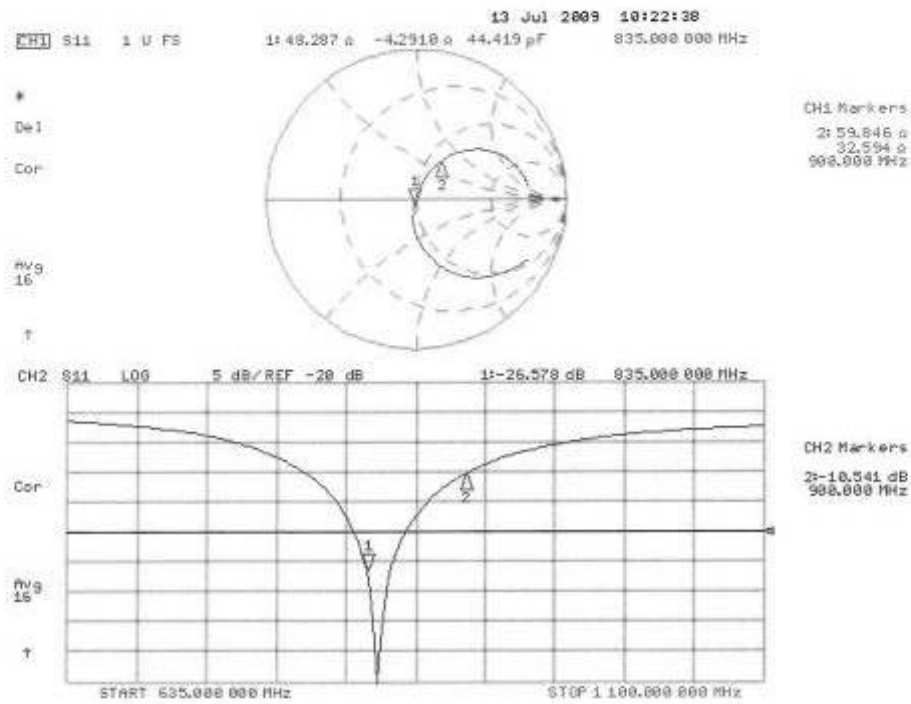
0 dB = 2.97mW/g

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Impedance Measurement Plot for Body TSL



TA Technology (Shanghai) Co., Ltd.  
Test Report

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ANNEX F: DAE4 Calibration Certificate

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client TA - SH (Auden)

Certificate No: DAE4-871\_Nov09

CALIBRATION CERTIFICATE

Object DAE4 - SD 000 D04 BJ - SN: 871

Calibration procedure(s) QA CAL-06.v12  
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: November 11, 2009

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  $(22 \pm 3)^{\circ}\text{C}$  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        | 1-Oct-09 (No: 9055)        | Oct-10                 |
| Secondary Standards           | ID #               | Check Date (in house)      | Scheduled Check        |
| Calibrator Box V1.1           | SE UMS 006 AB 1004 | 05-Jun-09 (in house check) | In house check: Jun-10 |

|                |               |            |           |
|----------------|---------------|------------|-----------|
| Calibrated by: | Name          | Function   | Signature |
|                | Andrea Guntli | Technician |           |

|              |             |              |           |
|--------------|-------------|--------------|-----------|
| Approved by: | Name        | Function     | Signature |
|              | Fin Bomholt | R&D Director |           |

Issued: November 11, 2009

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Certificate No: DAE4-871\_Nov09

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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:** 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.

# TA Technology (Shanghai) Co., Ltd.

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### DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ V , 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          | 404.813 $\pm$ 0.1% (k=2) | 404.794 $\pm$ 0.1% (k=2) | 405.237 $\pm$ 0.1% (k=2) |
| Low Range           | 3.98191 $\pm$ 0.7% (k=2) | 3.98417 $\pm$ 0.7% (k=2) | 3.98912 $\pm$ 0.7% (k=2) |

### Connector Angle

|                                           |                  |
|-------------------------------------------|------------------|
| Connector Angle to be used in DASY system | 90.0 ° $\pm$ 1 ° |
|-------------------------------------------|------------------|

# TA Technology (Shanghai) Co., Ltd.

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### Appendix

#### 1. DC Voltage Linearity

| High Range        | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 199994.0                  | 1.84                         | 0.00      |
| Channel X + Input | 19999.85                  | 0.05                         | 0.00      |
| Channel X - Input | -19997.97                 | 1.83                         | -0.01     |
| Channel Y + Input | 200010.3                  | -3.71                        | -0.00     |
| Channel Y + Input | 19999.12                  | -0.48                        | -0.00     |
| Channel Y - Input | -20000.18                 | -0.78                        | 0.00      |
| Channel Z + Input | 200010.2                  | -2.80                        | -0.00     |
| Channel Z + Input | 19998.54                  | -0.86                        | -0.00     |
| Channel Z - Input | -19999.82                 | 0.00                         | 0.00      |

| Low Range         | Reading ( $\mu\text{V}$ ) | Difference ( $\mu\text{V}$ ) | Error (%) |
|-------------------|---------------------------|------------------------------|-----------|
| Channel X + Input | 2000.3                    | 0.22                         | 0.01      |
| Channel X + Input | 200.20                    | 0.30                         | 0.15      |
| Channel X - Input | -199.89                   | 0.21                         | -0.10     |
| Channel Y + Input | 1999.8                    | -0.13                        | -0.01     |
| Channel Y + Input | 200.06                    | -0.04                        | -0.02     |
| Channel Y - Input | -200.43                   | -0.73                        | 0.36      |
| Channel Z + Input | 1999.5                    | -0.57                        | -0.03     |
| Channel Z + Input | 199.58                    | -0.72                        | -0.36     |
| Channel Z - Input | -201.11                   | -1.01                        | 0.51      |

#### 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 ( $\mu\text{V}$ ) | Low Range Average Reading ( $\mu\text{V}$ ) |
|-----------|--------------------------------|----------------------------------------------|---------------------------------------------|
| Channel X | 200                            | 13.79                                        | 12.75                                       |
|           | - 200                          | -12.26                                       | -13.72                                      |
| Channel Y | 200                            | -11.82                                       | -11.47                                      |
|           | - 200                          | 10.67                                        | 10.68                                       |
| Channel Z | 200                            | -1.08                                        | -1.35                                       |
|           | - 200                          | 0.32                                         | 0.12                                        |

#### 3. Channel separation

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

|           | Input Voltage (mV) | Channel X ( $\mu\text{V}$ ) | Channel Y ( $\mu\text{V}$ ) | Channel Z ( $\mu\text{V}$ ) |
|-----------|--------------------|-----------------------------|-----------------------------|-----------------------------|
| Channel X | 200                | -                           | 3.36                        | 1.06                        |
| Channel Y | 200                | 1.52                        | -                           | 3.59                        |
| Channel Z | 200                | 2.55                        | 1.41                        | -                           |

# TA Technology (Shanghai) Co., Ltd.

## Test Report

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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 | 15928            | 16288           |
| Channel Y | 16188            | 15745           |
| Channel Z | 15790            | 16219           |

### 5. Input Offset Measurement

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

Input 10M $\Omega$

|           | Average ( $\mu$ V) | min. Offset ( $\mu$ V) | max. Offset ( $\mu$ V) | Std. Deviation ( $\mu$ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 0.06               | -3.43                  | 1.18                   | 0.52                      |
| Channel Y | -0.71              | -2.66                  | 0.96                   | 0.57                      |
| Channel Z | -0.95              | -1.94                  | 0.04                   | 0.41                      |

### 6. Input Offset Current

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

### 7. Input Resistance

|           | Zeroing (MOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 0.1999         | 204.4            |
| Channel Y | 0.1999         | 203.6            |
| Channel Z | 0.1999         | 203.8            |

### 8. Low Battery Alarm Voltage (verified during pre test)

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

### 9. Power Consumption (verified during pre test)

| Typical values | Switched off (mA) | Stand by (mA) | Transmitting (mA) |
|----------------|-------------------|---------------|-------------------|
| Supply (+ Vcc) | +0.0              | +6            | +14               |
| Supply (- Vcc) | -0.01             | -8            | -9                |