# FCC SAR Test Report

Product Name ： Mobile Phone

Model No. ： KYY06

Applicant ： KYOCERA Corporation

Address ： Yokohama Office 2-1-1 Kagahara,Tsuzuki-ku Yokohama-shi,Kanagawa,Japan

Date of Receipt ： 2013/07/16

Issued Date ： 2013/07/26

Report No. ： 137355R-HPUSP10V01

Report Version ： V1.0

Testing Laboratory 0914

# Test Report Certification

Issued Date: 2013/07/26

Report No.: 137355R-HPUSP10V01

QuieTek

| | |
|---|---|
| Product Name | : Mobile Phone |
| Applicant | : KYOCERA Corporation |
| Address | : Yokohama Office 2-1-1 Kagahara,Tsuzuki-ku Yokohama-shi,Kanagawa,Japan |
| Manufacturer | : KYOCERA Corporation |
| Model No. | : KYY06 |
| Trade Name | : Kyocera |
| FCC ID | : JOYKYY06 |
| Applicable Standard | : FCC Oet65 Supplement C June 2001<br>IEEE Std. 1528-2003<br>47CFR § 2.1093 |
| Measurement procedures | : KDB 447498 D01, KDB 941225, KDB 865664 |
| Test Result | : Max. SAR Measurement (1g): **0.898** W/kg<br>Simultaneous SAR (1g) : **0.912** W/Kg |
| Application Type | : Certification |

The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of Quie Tek Corporation.

Documented By : Anny Chou

( Adm. Specialist / Anny Chou )

Tested By : Wen Lee

(Engineer / Wen Lee)

Approved By :

(Manager / Vincent Lin)

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# 1. General Information

## 1.1 EUT Description

| | |
|---|---|
| Product Name | Mobile Phone |
| Trade Name | Kyocera |
| Model No. | KYY06 |
| FCC ID | JOYKYY06 |
| TX Frequency | 824MHz~849MHz |
| RX Frequency | 869MHz~894MHz |
| Type of Modulation | QPSK |
| Antenna Type | Internal |
| Device Category | Portable |
| RF Exposure Environment | Uncontrolled |
| Max. Output Power (Conducted) | CDMA 2000 : 24.10 dBm<br>BT : -0.05 dBm |

* Note : Per FCC 447498 D01, The output power of BT is less than 10mW, so SAR is not required.

## 1.2 Maximum output power and tolerance allowed for production units

| Mode | Band | Nominal power (dBm) | Tolerance (dBm) | Upper Tolerance (dBm) |
|---|---|---|---|---|
| CDMA | 850 | 24 | ±1 | 25 |

### 1.3 Test Environment

Ambient conditions in the laboratory:

| Items | Required | Actual |
|---|---|---|
| Temperature (°C) | 18-25 | 21.4 ± 2 |
| Humidity (%RH) | 30-70 | 50 |

Site Description:

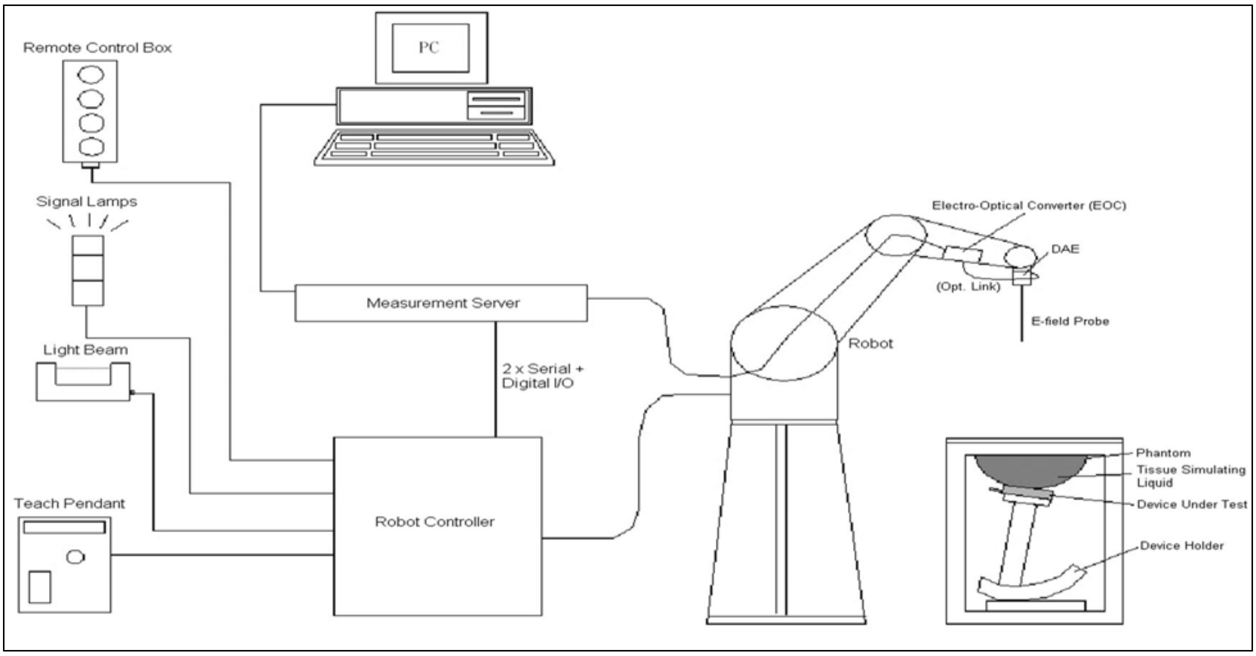
Accredited by TAF
Accredited Number: 0914
Effective through: December 12, 2014

Site Name: Quietek Corporation

Site Address: No. 5-22, Rueishu Keng, Linkou Dist.,
New Taipei City 24451,
Taiwan. R.O.C.
TEL: 886-2-8601-3788 / FAX: 886-2-8601-3789
E-Mail: service@quietek.com

# 2. SAR Measurement System

## 2.1 DASY5 System Description




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

- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

### 2.1.1 Applications

Predefined procedures and evaluations for automated compliance testing with all worldwide standards, e.g., IEEE 1528, OET 65, IEC 62209-1, IEC 62209-2, EN 50360, EN 50383 and others.

### 2.1.2 Area Scans

Area scans are defined prior to the measurement process being executed with a user defined variable spacing between each measurement point (integral) allowing low uncertainty measurements to be conducted. Scans defined for FCC applications utilize a $10mm^2$ step integral, with 1mm interpolation used to locate the peak SAR area used for zoom scan assessments.

When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2003, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan).

### 2.1.3 Zoom Scan (Cube Scan Averaging)

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. A density of 1000 $kg/m^3$ is used to represent the head and body tissue density and not the phantom liquid density, in order to be consistent with the definition of the liquid dielectric properties, i.e. the side length of the 1 g cube is 10mm, with the side length of the 10 g cube 21,5mm.

The zoom scan integer steps can be user defined so as to reduce uncertainty, but normal practice for typical test applications (including FCC) utilize a physical step of 5x5x7 (8mmx8mmx5mm) providing a volume of 32mm in the X & Y axis, and 30mm in the Z axis.

### 2.1.4 Uncertainty of Inter-/Extrapolation and Averaging

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

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

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

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

## 2.2 DASY5 E-Field Probe

The SAR measurement is conducted with the dosimetric probe manufactured by SPEAG. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.
SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN 62209-1, IEC 62209, etc.) under ISO 17025. The calibration data are in Appendix D.

### 2.2.1 Isotropic E-Field Probe Specification

| **Model** | Ex3DV4 | |
|---|---|---|
| **Construction** | Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE) | |
| **Frequency** | 10 MHz to 6 GHz<br>Linearity: ± 0.2 dB (30 MHz to 6 GHz) |  |
| **Directivity** | ± 0.3 dB in HSL (rotation around probe axis)<br>± 0.5 dB in tissue material (rotation normal to probe axis) | |
| **Dynamic Range** | 10 µW/g to 100 mW/g<br>Linearity: ± 0.2 dB (noise: typically < 1 µW/g) | |
| **Dimensions** | Overall length: 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). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%. | |

### 2.3 Boundary Detection Unit and Probe Mounting Device

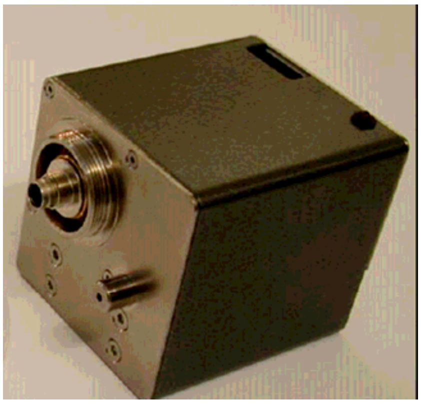
The DASY probes use a precise connector and an additional holder for the probe, consisting of a plastic tube and a flexible silicon ring to center the probe. The connector at the DAE is flexibly mounted and held in the default position with magnets and springs. Two switching systems in the connector mount detect frontal and lateral probe collisions and trigger the necessary software response.

### 2.4 DATA Acquisition Electronics (DAE) and Measurement Server

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit.

Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE4 is 200M Ohm; the inputs are symmetrical and floating. Common mode rejection is above 80dB.



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

## 2.5 Robot

The DASY5 system uses the high precision robots TX90 XL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASY5 system, the CS8C robot controller version from Stäubli is used.
The XL robot series have many features that are important for our application:

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

## 2.6 Light Beam Unit

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip.
The repeatability of this process is better than 0.1 mm. If a position has been taught with an aligned probe, the same position will be reached with another aligned probe within 0.1 mm, even if the other probe has different dimensions. During probe rotations, the probe tip will keep its actual position.

### 2.7 Device Holder

The DASY5 device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation center for both scales is the ear reference point (EPR).

Thus the device needs no repositioning when changing the angles.

The DASY5 device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\varepsilon r$ =3 and loss tangent $\delta$ = 0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

### 2.8 SAM Twin Phantom

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

- Left head
- Right head
- Flat phantom

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

# 3. Tissue Simulating Liquid

## 3.1 The composition of the tissue simulating liquid

| INGREDIENT (% Weight) | 835MHz Head | 835MHz Body | 1900MHz Head | 1900MHz Body |
|---|---|---|---|---|
| **Water** | 40.45 | 52.4 | -- | -- |
| **Salt** | 1.45 | 1.40 | -- | -- |
| **Sugar** | 57.6 | 45.0 | -- | -- |
| **HEC** | 0.40 | 1.00 | -- | -- |
| **Preventol** | 0.10 | 0.20 | -- | -- |
| **DGBE** | 0.00 | 0.00 | -- | -- |

## 3.2 Tissue Calibration Result

The dielectric parameters of the liquids were verified prior to the SAR evaluation using APREL Dielectric Probe Kit and Anritsu MS4623B Vector Network Analyzer.

**Head Tissue Simulate Measurement**

| Frequency [MHz] | Description | Dielectric Parameters | | Tissue Temp. [°C] |
|---|---|---|---|---|
| | | $\varepsilon_r$ | σ [s/m] | |
| 835 MHz | Reference result ± 5% window | 41.5<br>39.425 to 43.575 | 0.92<br>0.874 to 0.966 | N/A |
| | 25-Jul-13 | 43.18 | 0.94 | 20.2 |
| 824.7 MHz | Low channel | 43.33 | 0.93 | 20.2 |
| 836.52 MHz | Mid channel | 43.04 | 0.94 | 20.2 |
| 848.31 MHz | High channel | 42.92 | 0.95 | 20.2 |

**Body Tissue Simulate Measurement**

| Frequency [MHz] | Description | Dielectric Parameters | | Tissue Temp. [°C] |
|---|---|---|---|---|
| | | $\varepsilon_r$ | σ [s/m] | |
| 835 MHz | Reference result ± 5% window | 55.2<br>52.44 to 57.96 | 0.99<br>0.9405 to 1.0395 | N/A |
| | 25-Jul-13 | 53.29 | 0.96 | 20.2 |
| 824.7 MHz | Low channel | 53.52 | 0.95 | 20.2 |
| 836.52 MHz | Mid channel | 53.24 | 0.96 | 20.2 |
| 848.31 MHz | High channel | 52.88 | 0.97 | 20.2 |

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

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness variations in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in Reference [12] and extrapolated according to the head parameters specified in P1528.

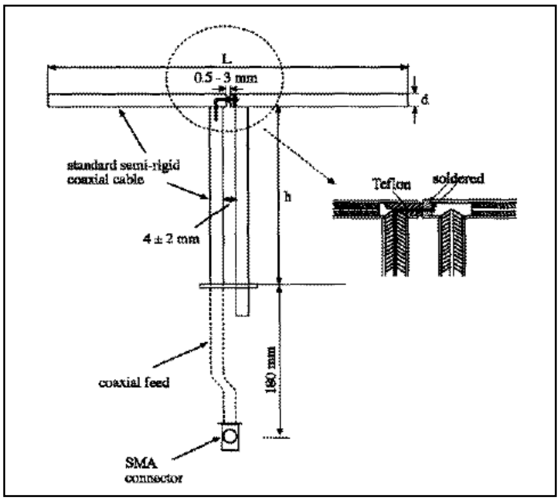
| Target Frequency | Head | | Body | |
|---|---|---|---|---|
| (MHz) | $\varepsilon_r$ | σ (S/m) | $\varepsilon_r$ | σ (S/m) |
| 150 | 52.3 | 0.76 | 61.9 | 0.80 |
| 300 | 45.3 | 0.87 | 58.2 | 0.92 |
| 450 | 43.5 | 0.87 | 56.7 | 0.94 |
| 835 | 41.5 | 0.90 | 55.2 | 0.97 |
| 900 | 41.5 | 0.97 | 55.0 | 1.05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

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

# 4. SAR Measurement Procedure

## 4.1 SAR System Check

### 4.1.1 Dipoles




The dipoles used is based on the IEEE-1528 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE and FCC Supplement C. the table below provides details for the mechanical and electrical specifications for the dipoles.

| Frequency | L (mm) | h (mm) | d (mm) |
|---|---|---|---|
| 835MHz | 161.0 | 89.8 | 3.6 |

### 4.1.2 System Check Result

**System Performance Check at 835MHz**

**Head Dipole Kit: ASL-D-835**

| Frequency [MHz] | Description | SAR [w/kg] 1g | SAR [w/kg] 10g | Tissue Temp. [°C] |
|---|---|---|---|---|
| 835 MHz | Reference result<br>± 10% window | 9.24<br>8.32 to 10.16 | 6.04<br>5.44 to 6.64 | N/A |
| | 25-Jul-13 | 9.12 | 5.96 | 20.2 |

**Body Dipole Kit: ASL-D-835**

| Frequency [MHz] | Description | SAR [w/kg] 1g | SAR [w/kg] 10g | Tissue Temp. [°C] |
|---|---|---|---|---|
| 835 MHz | Reference result<br>± 10% window | 9.54<br>8.68 to 10.6 | 6.32<br>5.69 to 6.95 | N/A |
| | 25-Jul-13 | 9.6 | 6.28 | 20.2 |

Note: All SAR values are normalized to 1W forward power.

**4.2 Arrangement Assessment Setup**

4.2.1 Test Positions of Device Relative to Head

This specifies exactly two test positions for the handset against the head phantom, the "cheek" position and the "tilted" position. The handset should be tested in both positions on the left and right sides of the SAM phantom. If the handset construction is such that it cannot be positioned using the handset positioning procedures described in 4.2.2.1 and 4.2.2.2 to represent normal use conditions (e.g., asymmetric handset), alternative alignment procedures should be considered with details provided in the test report.

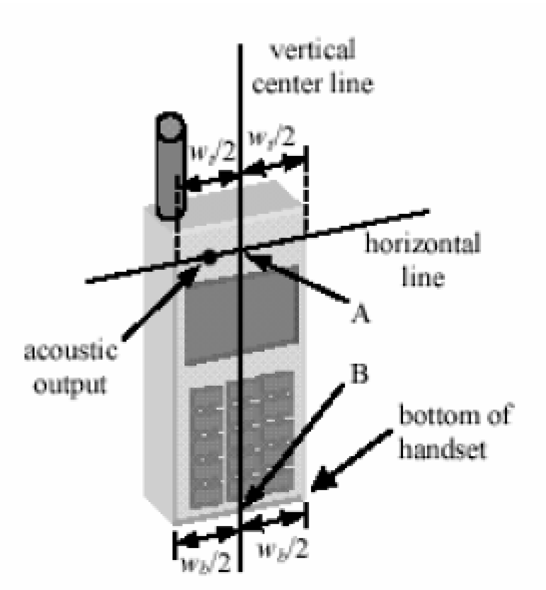



Figure 4.1a Fixed Case

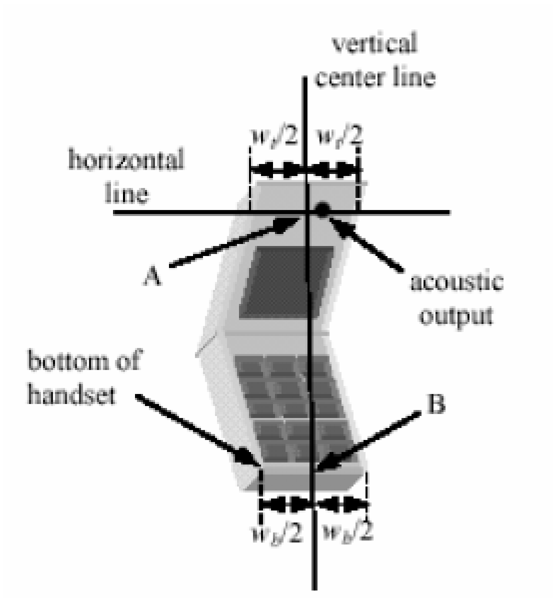



Figure4.1b Clam Shell

**4.2.1.1 Definition of the "Cheek" Position**

The "cheek" position is defined as follows:

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

b. Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width *wt* of the handset at the level of the acoustic output (point A on Figures 4.1a and 4.1b), and the midpoint of the width *wb* of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 4.1a). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 4.1b), especially for clamshell handsets, handsets with flip pieces, and other irregularly-shaped handsets.

c. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 4.2), such that the plane defined by the vertical center line and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.

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

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

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

g. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the handset contact with the pinna, rotate the handset about the line NF until any point on the handset is in contact with a phantom point below the pinna (cheek). See Figure 4.2 the physical angles of rotation should be noted.

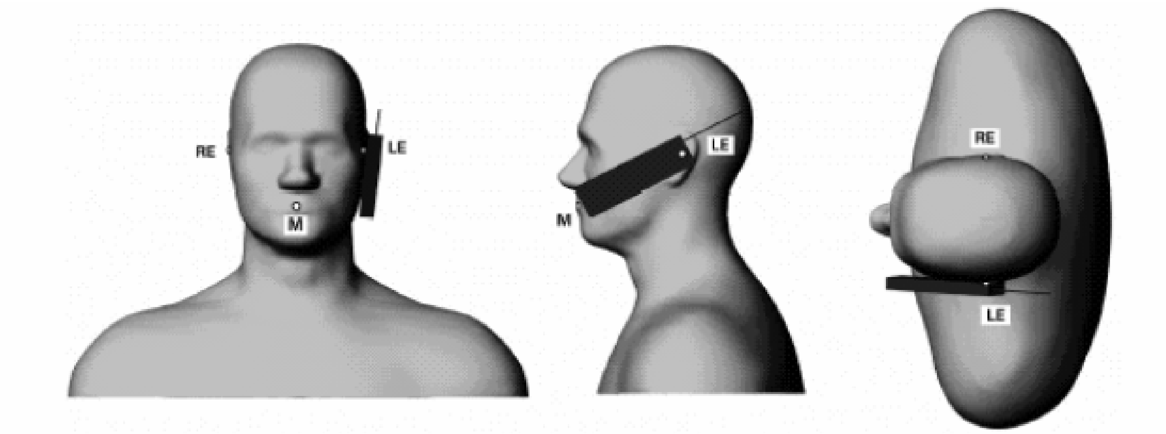



Figure 4.2 – Phone position 1, “cheek” or “touch” position.

### 4.2.1.2 Definition of the "Tilted" Position

The "tilted" position is defined as follows:

a. Repeat steps (a) – (g) of 4.2.1.1 to place the device in the "cheek position."

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

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

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

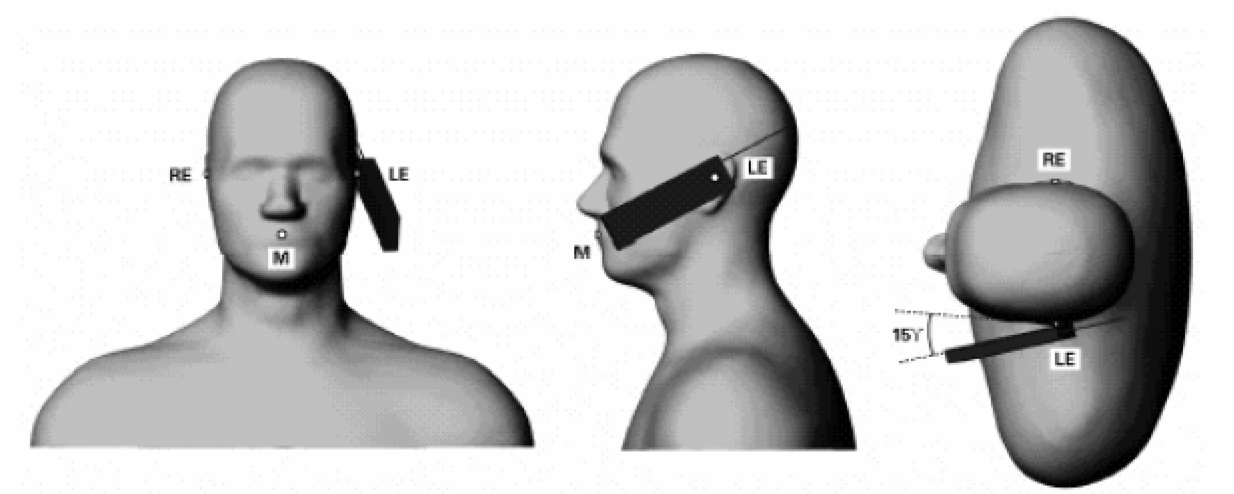



Figure 4.3 – Phone position 2, "tilted" position.

### 4.2.2 Test Positions for body-worn

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distance may be use, but not exceed 2.5 cm.

### 4.3 SAR Measurement Procedure

The Dasy5 calculates SAR using the following equation,

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

σ: represents the simulated tissue conductivity

ρ: represents the tissue density

The EUT is set to transmit at the required power in line with product specification, at each frequency relating to the LOW, MID, and HIGH channel settings.

Pre-scans are made on the device to establish the location for the transmitting antenna, using a large area scan in either air or tissue simulation fluid.

The EUT is placed against the Universal Phantom where the maximum area scan dimensions are larger than the physical size of the resonating antenna. When the scan size is not large enough to cover the peak SAR distribution, it is modified by either extending the area scan size in both the X and Y directions, or the device is shifted within the predefined area.

The area scan is then run to establish the peak SAR location (interpolated resolution set at $1mm^2$ )which is then used to orient the center of the zoom scan. The zoom scan is then executed and the 1g and 10g averages are derived from the zoom scan volume (interpolated resolution set at $1mm^3$).

## 5. SAR Exposure Limits

SAR assessments have been made in line with the requirements of IEEE-1528, FCC Supplement C, and comply with ANSI/IEEE C95.1-1992 “Uncontrolled Environments” limits. These limits apply to a location which is deemed as “Uncontrolled Environment” which can be described as a situation where the general public may be exposed to an RF source with no prior knowledge or control over their exposure.

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

| Type Exposure | Uncontrolled Environment Limit |
|---|---|
| Spatial Peak SAR (1g cube tissue for brain or body) | **1.60 W/kg** |
| Spatial Average SAR (whole body) | **0.08 W/kg** |
| Spatial Peak SAR (10g for hands, feet, ankles and wrist) | **4.00 W/kg** |

# 6. Test Equipment List

| Instrument | Manufacturer | Model No. | Serial No. | Last Calibration | Next Calibration |
|---|---|---|---|---|---|
| Stäubli Robot TX60L | Stäubli | TX60L | F09/5BL1A1/A06 | 2009/05/18 | only once |
| Controller | Speag | CS8c | N/A | 2009/05/18 | only once |
| Aprel Reference Dipole 835Mhz | Aprel | ALS-D-835 | QTK-315 | 2012/05/25 | 2014/05/24 |
| SAM Twin Phantom | Speag | QD000 P40 CA | Tp 1515 | N/A | N/A |
| Device Holder | Speag | N/A | N/A | N/A | N/A |
| Data Acquisition Electronic | Speag | DAE4 | Sn1207 | 2013/05/22 | 2014/05/21 |
| E-Field Probe | Speag | EX3DV4 | 3661 | 2013/01/15 | 2014/01/14 |
| SAR Software | Speag | DASY52 | V52.8 (5) | N/A | N/A |
| Aprel Dipole Spaccer | Aprel | ALS-DS-U | QTK-295 | N/A | N/A |
| Power Amplifier | Mini-Circuit | ZHL-42 | D051404-20 | N/A | N/A |
| Directional Coupler | Agilent | 778D-012 | 50550 | N/A | N/A |
| Universal Radio Communication Tester | R&S | CMU 200 | 104846 | 2013/05/09 | 2014/05/08 |
| Vector Network | Anritsu | MS4623B | 992801 | 2012/07/30 | 2013/07/29 |
| Signal Generator | Anritsu | MG3694A | 041902 | 2012/08/03 | 2013/08/02 |
| Power Meter | Anritsu | ML2487A | 6K00001447 | 2012/12/15 | 2013/12/14 |
| Wide Bandwidth Sensor | Anritsu | MA2491A | 034457 | 2012/12/17 | 2013/12/16 |

Note:

Per KDB 450824 D02 requirements for dipole calibration, the following are recommended FCC procedures for SAR dipole calibration.

1. After a dipole is damaged and properly repaired to meet required specifications

2. When the measured SAR deviates from the calibrated SAR value by more than 10% due to changes in physical, mechanical, electrical or other relevant dipole conditions;

3. When the most recent return-loss, measured at least annually, deviates by more than 20% from the previous measurement (i.e. 0.2 of the dB value) or not meeting the required -20 dB return-loss specification

| | Frequency | Tissue | Return loss | Limit | Verified Date |
|---|---|---|---|---|---|
| Calibration | 835 | Head | -31.8dB | Within 20% | 2013.05.22 |
| Measurement | 835 | Head | -31.76dB | | |

| | Frequency | Tissue | Return loss | Limit | Verified Date |
|---|---|---|---|---|---|
| Calibration | 835 | Body | -25.4dB | Within 20% | 2013.05.22 |
| Measurement | 835 | Body | -24.97B | | |

4. When the most recent measurement of the real or imaginary parts of the impedance, measured at least annually, deviates by more than 5 Ω from the previous measurement

| | Frequency | Tissue | Impedance | Limit | Verified Date |
|---|---|---|---|---|---|
| Calibration | 835 | Head | 49.2Ω | Within 5Ω | 2013.05.22 |
| Measurement | 835 | Head | 52.94Ω | | |

| | Frequency | Tissue | Return loss | Limit | Verified Date |
|---|---|---|---|---|---|
| Calibration | 835 | Body | 45Ω | Within 5Ω | 2013.05.22 |
| Measurement | 835 | Body | 47.70Ω | | |

# 7. Measurement Uncertainty

| DASY5 Uncertainty<br>Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram / 10 gram. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Error Description | Uncert. value | Prob. Dist. | Div. | ($c_i$) 1g | ($c_i$) 10g | Std. Unc. (1g) | Std. Unc. (10g) | ($v_i$) $V_{eff}$ |
| **Measurement System** | | | | | | | | |
| Probe Calibration | ±6.0% | N | 1 | 1 | 1 | ±6.0% | ±6.0% | ∞ |
| Axial Isotropy | ±4.7% | R | $\sqrt{3}$ | 0.7 | 0.7 | ±1.9% | ±1.9% | ∞ |
| Hemispherical Isotropy | ±9.6% | R | $\sqrt{3}$ | 0.7 | 0.7 | ±3.9% | ±3.9% | ∞ |
| Boundary Effects | ±1.0% | R | $\sqrt{3}$ | 1 | 1 | ±0.6% | ±0.6% | ∞ |
| Linearity | ±4.7% | R | $\sqrt{3}$ | 1 | 1 | ±2.7% | ±2.7% | ∞ |
| System Detection Limits | ±1.0% | R | $\sqrt{3}$ | 1 | 1 | ±0.6% | ±0.6% | ∞ |
| Readout Electronics | ±0.3% | N | 1 | 1 | 1 | ±0.3% | ±0.3% | ∞ |
| Response Time | ±0.8% | R | $\sqrt{3}$ | 1 | 1 | ±0.5% | ±0.5% | ∞ |
| Integration Time | ±2.6% | R | $\sqrt{3}$ | 1 | 1 | ±1.5% | ±1.5% | ∞ |
| RF Ambient Noise | ±3.0% | R | $\sqrt{3}$ | 1 | 1 | ±1.7% | ±1.7% | ∞ |
| RF Ambient Reflections | ±3.0% | R | $\sqrt{3}$ | 1 | 1 | ±1.7% | ±1.7% | ∞ |
| Probe Positioner | ±0.4% | R | $\sqrt{3}$ | 1 | 1 | ±0.2% | ±0.2% | ∞ |
| Probe Positioning | ±2.9% | R | $\sqrt{3}$ | 1 | 1 | ±1.7% | ±1.7% | ∞ |
| Max. SAR Eval. | ±1.0% | R | $\sqrt{3}$ | 1 | 1 | ±0.6% | ±0.6% | ∞ |
| **Test Sample Related** | | | | | | | | |
| Device Positioning | ±2.9% | N | 1 | 1 | 1 | ±2.9% | ±2.9% | 145 |
| Device Holder | ±3.6% | N | 1 | 1 | 1 | ±3.6% | ±3.6% | 5 |
| Power Drift | ±5.0% | R | $\sqrt{3}$ | 1 | 1 | ±2.9% | ±2.9% | ∞ |
| **Phantom and Setup** | | | | | | | | |
| Phantom Uncertainty | ±4.0% | R | $\sqrt{3}$ | 1 | 1 | ±2.3% | ±2.3% | ∞ |
| Liquid Conductivity (target) | ±5.0% | R | $\sqrt{3}$ | 0.64 | 0.43 | ±1.8% | ±1.2% | ∞ |
| Liquid Conductivity (meas.) | ±2.5% | N | 1 | 0.64 | 0.43 | ±1.6% | ±1.1% | ∞ |
| Liquid Permittivity (target) | ±5.0% | R | $\sqrt{3}$ | 0.6 | 0.49 | ±1.7% | ±1.4% | ∞ |
| Liquid Permittivity (meas.) | ±2.5% | N | 1 | 0.6 | 0.49 | ±1.5% | ±1.2% | ∞ |
| **Combined Std. Uncertainty** | | | | | | ±11% | ±10.8% | 387 |
| **Expanded STD Uncertainty** | | | | | | ±22% | ±21.5% | |

# 8. Conducted Power Measurement

CDMA 2000 :

| Band | Channel | Frequency (MHz) | RC1/ SO02 | RC3/ SO02 | RC4/ SO02 | RC1/ SO55 | RC3/ SO55 | RC4/ SO55 | RC2/ SO9 | RC5/ SO9 |
|---|---|---|---|---|---|---|---|---|---|---|
| Cellular | 1013 | 824.7 | 23.90 | 24.01 | 24.07 | 24.05 | 23.85 | 23.92 | 23.89 | 23.84 |
| | 384 | 836.52 | 23.81 | 23.91 | 23.92 | 23.97 | 23.77 | 23.82 | 23.78 | 23.75 |
| | 777 | 848.31 | 24.01 | 24.07 | 24.01 | 24.10 | 23.96 | 24.03 | 23.98 | 23.97 |

BT :

| Band | Channel | Frequency (MHz) | 1Mbps | | 3Mbps | |
|---|---|---|---|---|---|---|
| | | | Peak | Average | Peak | Average |
| BT | 00 | 2402 | 1.355 | -0.35 | 2.254 | -0.76 |
| | 39 | 2441 | 1.213 | -0.80 | 2.042 | -1.22 |
| | 78 | 2480 | 1.452 | -0.05 | 2.460 | -0.43 |

# 9. Test Results

## 9.1 SAR Test Results Summary

| SAR MEASUREMENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ambient Temperature (°C) : 21.4 ±2 | | | | | Relative Humidity (%): 50 | | | |
| Liquid Temperature (°C) : 20.2 ±2 | | | | | Depth of Liquid (cm):>15 | | | |
| Test Mode: CDMA 2000 | | | | | | | | |
| Test Position Body | Antenna Position | Frequency | | Conducted Power (dBm) | | **SAR** 1g (W/kg) | | Limit (W/kg) |
| | | Channel | MHz | Measurement | Tune-up Limit | Measurement | Tune-up Scaled | |
| Left-Cheek | Fixed | 1013 | 824.2 | 23.85 | 25 | 0.689 | **0.898** | 1.6 |
| Left-Cheek | Fixed | 384 | 836.52 | 23.77 | 25 | 0.656 | 0.871 | 1.6 |
| Left-Cheek | Fixed | 777 | 848.31 | 23.96 | 25 | 0.701 | 0.891 | 1.6 |
| Left-Tilted | Fixed | 1013 | 824.2 | 23.85 | 25 | ** | ** | 1.6 |
| Left-Tilted | Fixed | 384 | 836.52 | 23.77 | 25 | 0.353 | 0.469 | 1.6 |
| Left-Tilted | Fixed | 777 | 848.31 | 23.96 | 25 | ** | ** | 1.6 |
| Right-Cheek | Fixed | 1013 | 824.2 | 23.85 | 25 | ** | ** | 1.6 |
| Right-Cheek | Fixed | 384 | 836.52 | 23.77 | 25 | 0.503 | 0.668 | 1.6 |
| Right-Cheek | Fixed | 777 | 848.31 | 23.96 | 25 | ** | ** | 1.6 |
| Right-Tilted | Fixed | 1013 | 824.2 | 23.85 | 25 | ** | ** | 1.6 |
| Right-Tilted | Fixed | 384 | 836.52 | 23.77 | 25 | 0.361 | 0.479 | 1.6 |
| Right-Tilted | Fixed | 777 | 848.31 | 23.96 | 25 | ** | ** | 1.6 |
| Note: SAR for RC1 is not required when the maximum average output of each channel is less than 1/4dB higher than that measured in RC3. | | | | | | | | |

| SAR MEASUREMENT | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ambient Temperature (°C) : 21.4 ±2 | | | | Relative Humidity (%): 50 | | | | |
| Liquid Temperature (°C) : 20.2 ±2 | | | | Depth of Liquid (cm):>15 | | | | |
| Test Mode: CDMA 2000 | | | | | | | | |
| Test Position Body | Antenna Position | Frequency | | Conducted Power(dBm) | | **SAR** 1g (W/kg) | | Limit (W/kg) |
| | | Channel | MHz | Measurement | Tune-up Limit | Measurement | Tune-up Scaled | |
| Front | Back | 384 | 824.7 | 23.96 | 25 | 0.282 | 0.358 | 1.6 |
| Back | Fixed | 1013 | 848.31 | 23.77 | 25 | 0.499 | **0.662** | 1.6 |
| Back | Back | 384 | 824.7 | 23.96 | 25 | 0.435 | 0.553 | 1.6 |
| Back | Back | 777 | 836.52 | 23.85 | 25 | 0.467 | 0.609 | 1.6 |

Note: SAR for RC1 is not required when the maximum average output of each channel is less than 1/4dB higher than that measured in RC3.

### 9.2 Simultaneous Transmission

According the KDB 447498 D01 Section 4.3.2, the standalone SAR must be estimated according to the following to determine simultaneous transmission SAR test exclusion

***(max. power of channel, mW)/(min. test separation distance, mm)]·[√f(GHz)/7.5]***

| Frequency | Max. power (dBm) | Test separation distance ,(mm) | Estimated BT SAR (W/Kg) |
|---|---|---|---|
| 2480 | -0.05 | 15 | 0.014 |

When the sum of SAR is larger than the limit, The ratio is determined by ***(SAR1 + SAR2)^1.5/Ri,*** rounded to two decimal digits, and must be ≤ 0.04 for all antenna pairs in the configuration to qualify for 1-g SAR test exclusion . The estimation result as below :

| WLAN SAR (W/Kg) | Estimated BT SAR (W/Kg) | Simultaneous Transmission (W/Kg) | Antenna pair in mm | Peak location separation ratio |
|---|---|---|---|---|
| 0.898 | 0.014 | 0.912 | N/A | N/A |

Since the sum of SAR smaller than the limit, so the simultaneous is not required

## 10. SAR measurement variability

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.

2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

| Frequency | | **SAR** 1g (W/kg) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Channel | MHz | Original | First Repeated | | Second Repeated | | Third Reapeated | |
| | | | Value | Ratio | Value | Ratio | Value | Ratio |
| 777 | 848.31 | 0.701 | N/A | N/A | N/A | N/A | N/A | N/A |

**Appendix**

**Appendix A. SAR System Check Data**

**Appendix B. SAR measurement Data**

**Appendix C. Test Setup Photographs & EUT Photographs**

**Appendix D. Probe Calibration Data**

**Appendix E. Dipole Calibration Data**

## Appendix A. SAR System Check Data

Test Laboratory: QuieTek Date/Time: 7/25/2013

**SystemPerformanceCheck-835MHz_Head**
**DUT: Dipole 835 MHz; Type: ALS-D-835-S-2**

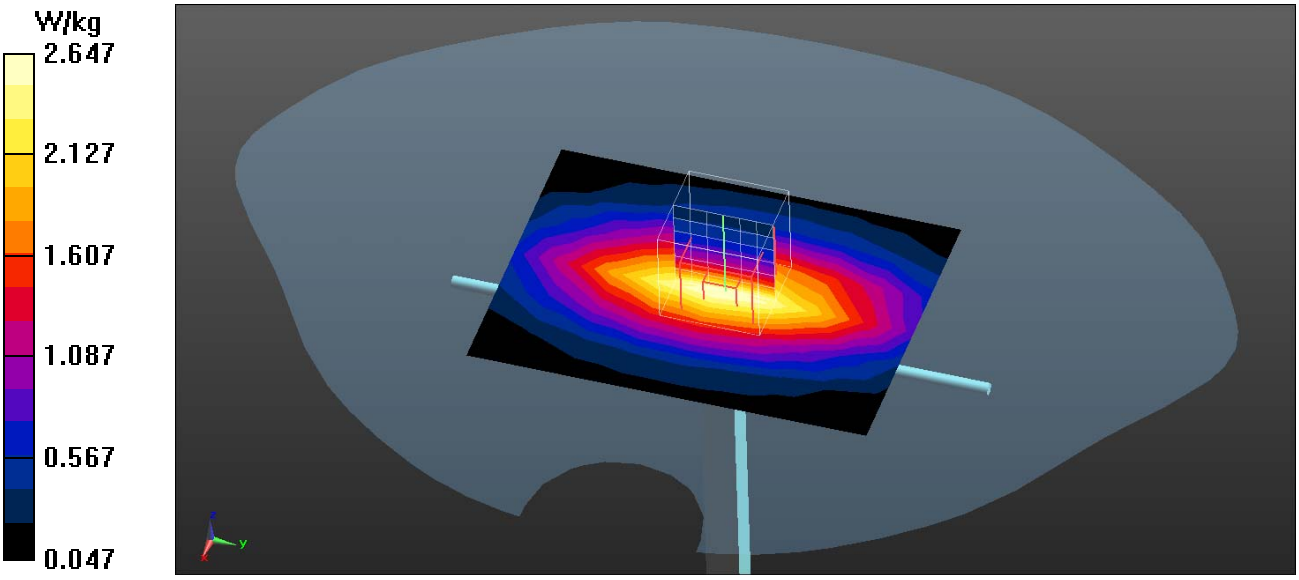
Communication System: CW; Frequency: 835 MHz;Communication System PAR: 0 dB
Medium parameters used: f = 835 MHz; $\sigma$ = 0.94 S/m; $\varepsilon_r$ = 43.18; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.81, 9.81, 9.81); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/835MHz_Head/Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.65 W/kg

**Configuration/835MHz_Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.675 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 3.47 W/kg
**SAR(1 g) = 2.28 W/kg; SAR(10 g) = 1.49 W/kg**
Maximum value of SAR (measured) = 2.68 W/kg



Test Laboratory: QuieTek Date/Time: 7/25/2013

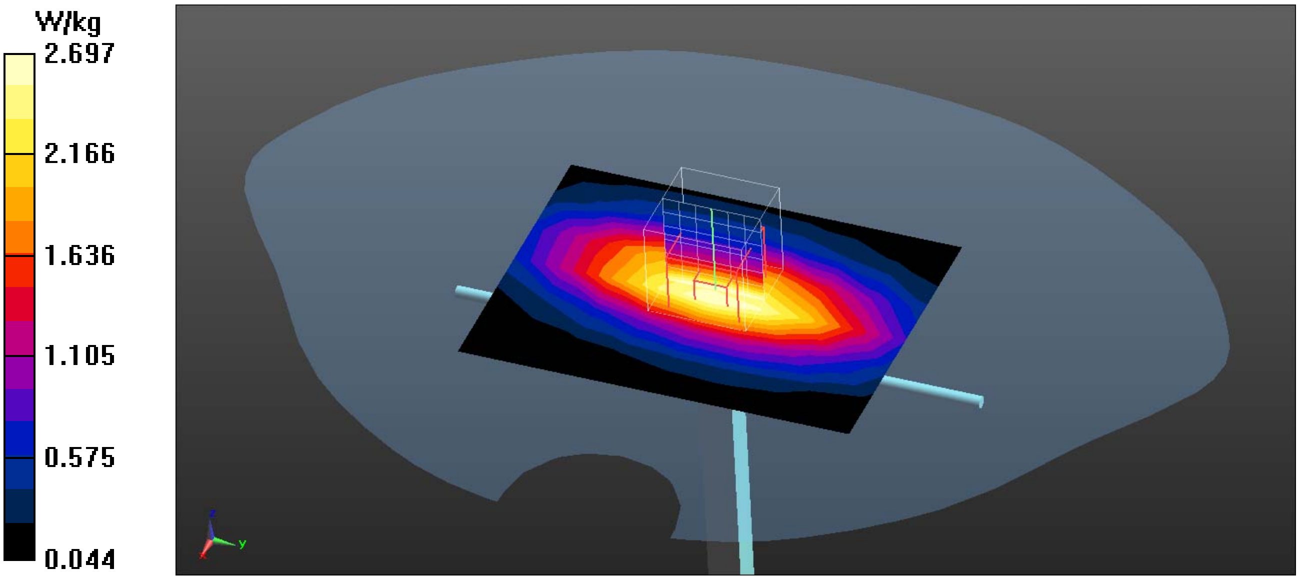
**SystemPerformanceCheck-835MHz_Body**
**DUT: Dipole 835 MHz; Type: ALS-D-835-S-2**
Communication System: CW; Frequency: 835 MHz;Communication System PAR: 0 dB
Medium parameters used: f = 835 MHz; $\sigma$ = 0.96 S/m; $\varepsilon_r$ = 53.29; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/835MHz_Body/Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.70 W/kg

**Configuration/835MHz_Body/Zoom Scan (7x7x7) (7x7x7)/Cube 0:**
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.572 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.61 W/kg
**SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.57 W/kg**
Maximum value of SAR (measured) = 2.81 W/kg



## Appendix B. SAR measurement Data

Test Laboratory: QuieTek Date/Time: 7/25/2013

**CDMA 2000_Left-Cheek_1013**
**DUT: MOBILE PHONE; Type: KYY06**

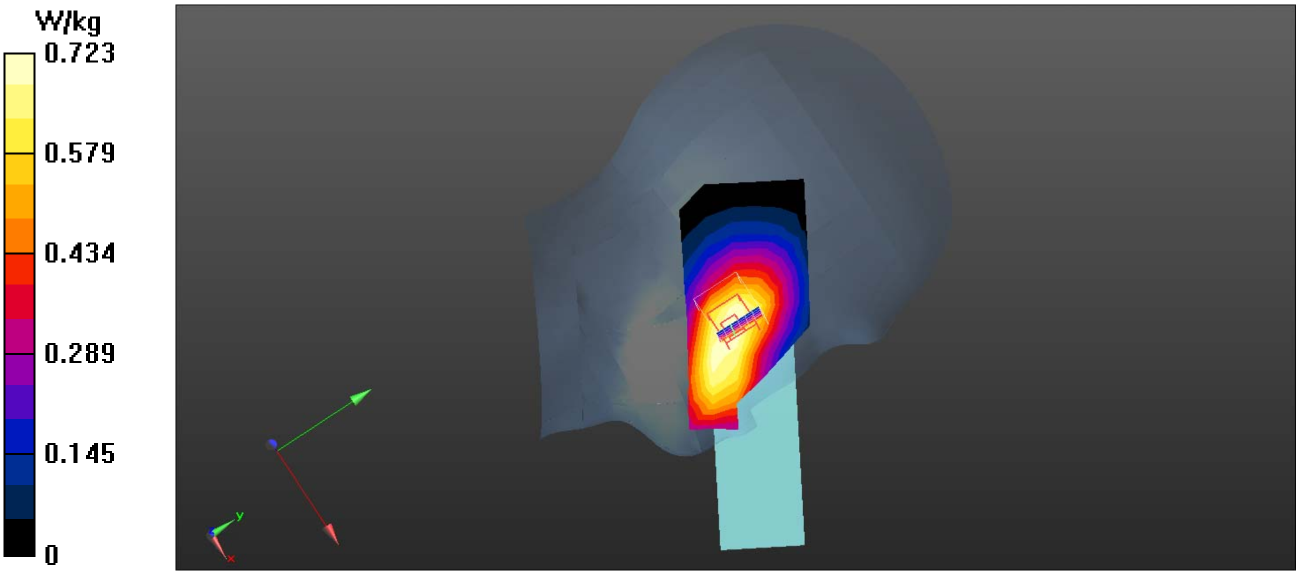
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 824.7 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 824.7 MHz; $\sigma$ = 0.93 S/m; $\varepsilon_r$ = 43.33; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.81, 9.81, 9.81); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/Head/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.723 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.260 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.982 W/kg
**SAR(1 g) = 0.689 W/kg; SAR(10 g) = 0.489 W/kg**
Maximum value of SAR (measured) = 0.779 W/kg



Test Laboratory: QuieTek Date/Time: 7/25/2013

**CDMA 2000_Left-Cheek_384**
**DUT: MOBILE PHONE; Type: KYY06**

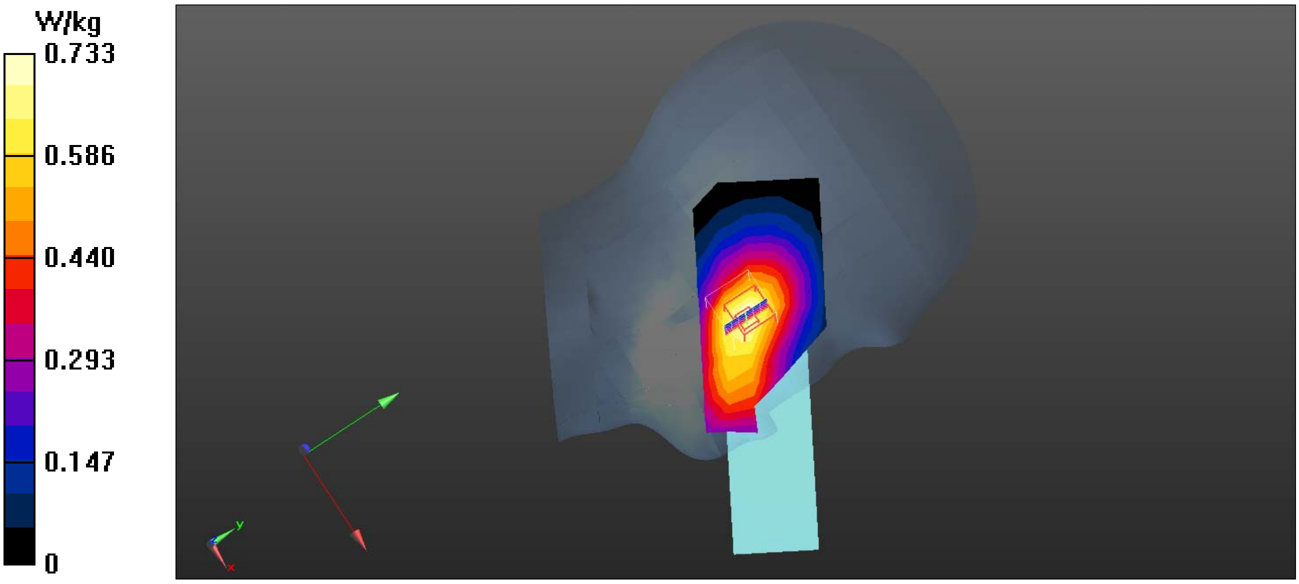
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 836.52 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 836.52 MHz; $\sigma$ = 0.94 S/m; $\varepsilon$ r = 43.04; $\rho$ = 1000 kg/m3
Phantom section: Left Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.81, 9.81, 9.81); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/Head/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.733 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.513 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 0.913 W/kg
**SAR(1 g) = 0.656 W/kg; SAR(10 g) = 0.463 W/kg**
Maximum value of SAR (measured) = 0.748 W/kg



Test Laboratory: QuieTek Date/Time: 7/25/2013

**CDMA 2000_Left-Cheek_777**
**DUT: MOBILE PHONE; Type: KYY06**

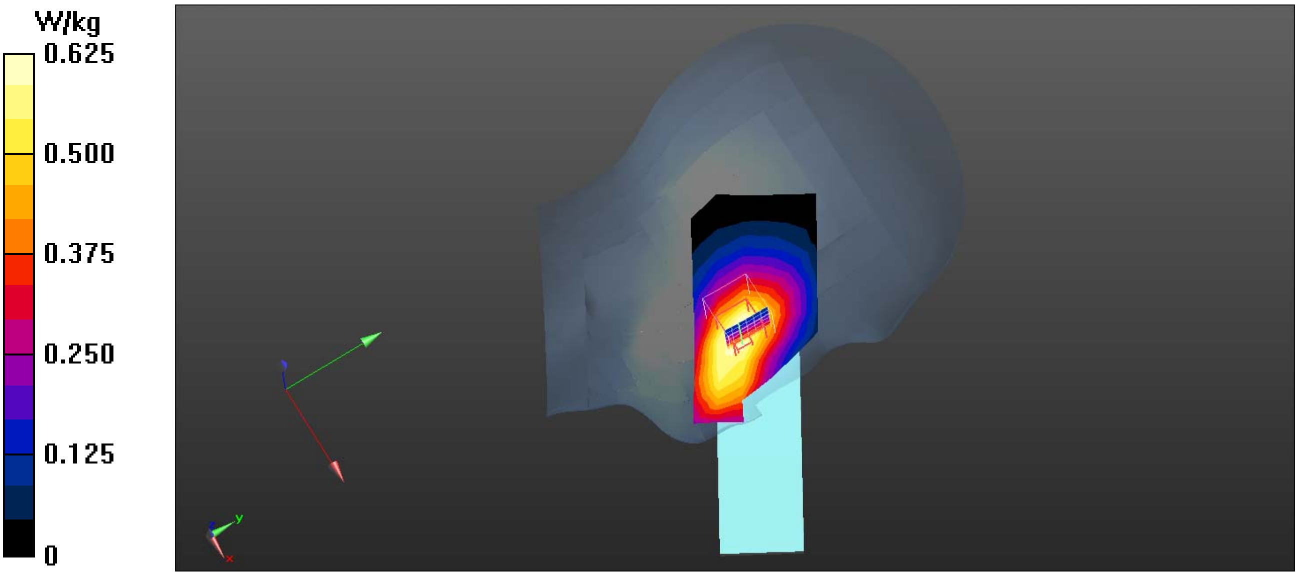
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 848.31 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 848.31 MHz; $\sigma$ = 0.95 S/m; $\varepsilon$ r = 42.92; $\rho$ = 1000 kg/m3
Phantom section: Left Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.81, 9.81, 9.81); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/Head/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.625 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.108 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 1.45 W/kg
**SAR(1 g) = 0.701 W/kg; SAR(10 g) = 0.460 W/kg**
Maximum value of SAR (measured) = 0.677 W/kg



Test Laboratory: QuieTek Date/Time: 7/25/2013

**CDMA 2000_Left-Tilt_384**
**DUT: MOBILE PHONE; Type: KYY06**

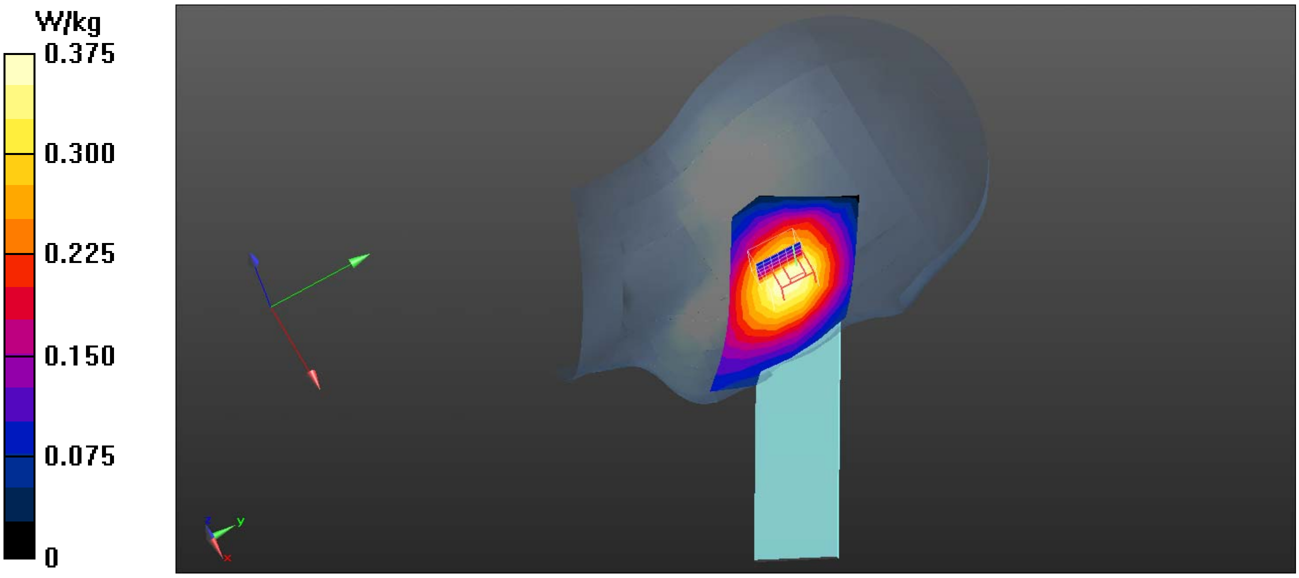
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 836.52 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 836.52 MHz; $\sigma$ = 0.94 S/m; $\varepsilon$ r = 43.04; $\rho$ = 1000 kg/m3
Phantom section: Left Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.81, 9.81, 9.81); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/Head/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.375 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.506 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.455 W/kg
**SAR(1 g) = 0.353 W/kg; SAR(10 g) = 0.262 W/kg**
Maximum value of SAR (measured) = 0.393 W/kg



Test Laboratory: QuieTek Date/Time: 7/25/2013

**CDMA 2000_Right-Cheek_384**
**DUT: MOBILE PHONE; Type: KYY06**

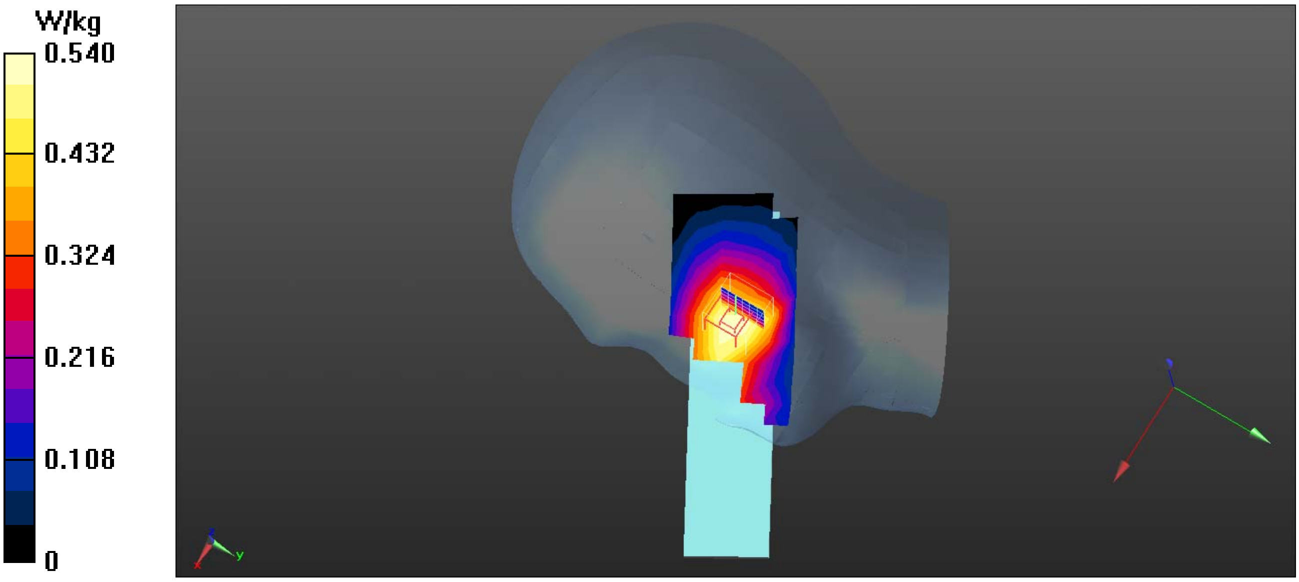
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 836.52 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 836.52 MHz; $\sigma$ = 0.94 S/m; $\varepsilon$ r = 43.04; $\rho$ = 1000 kg/m3
Phantom section: Right Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.81, 9.81, 9.81); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/Head/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.540 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.139 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 0.683 W/kg
**SAR(1 g) = 0.503 W/kg; SAR(10 g) = 0.378 W/kg**
Maximum value of SAR (measured) = 0.555 W/kg



Test Laboratory: QuieTek Date/Time: 7/25/2013

**CDMA 2000_Right-Tilt_384**
**DUT: MOBILE PHONE; Type: KYY06**

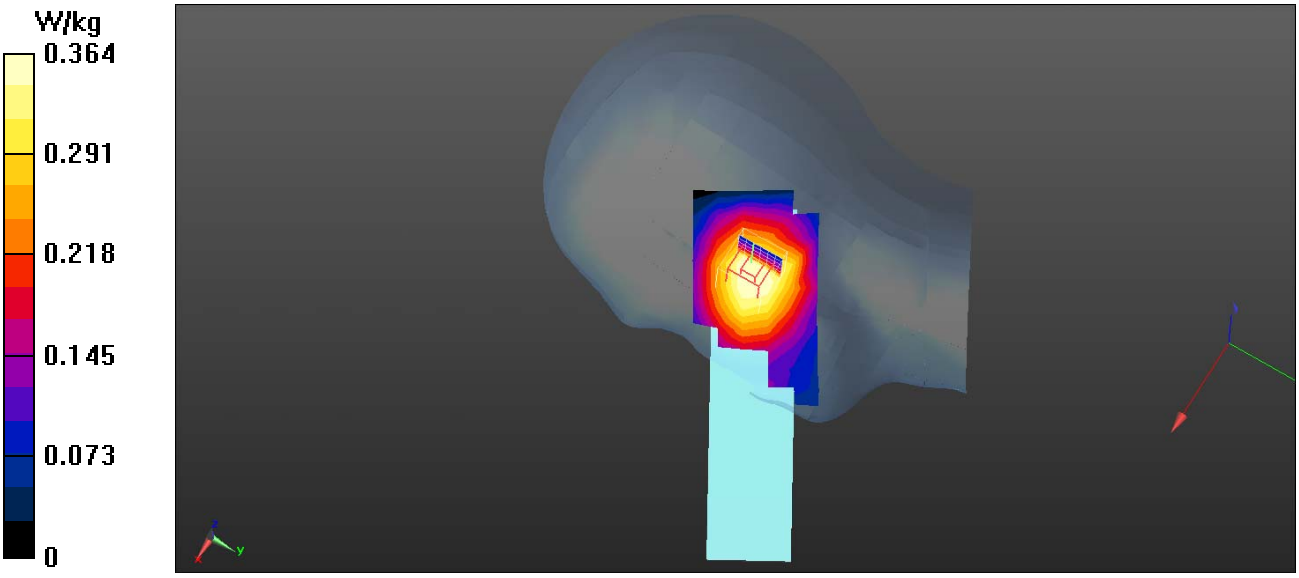
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 836.52 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 836.52 MHz; $\sigma$ = 0.94 S/m; $\varepsilon$ r = 43.04; $\rho$ = 1000 kg/m3
Phantom section: Right Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.81, 9.81, 9.81); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

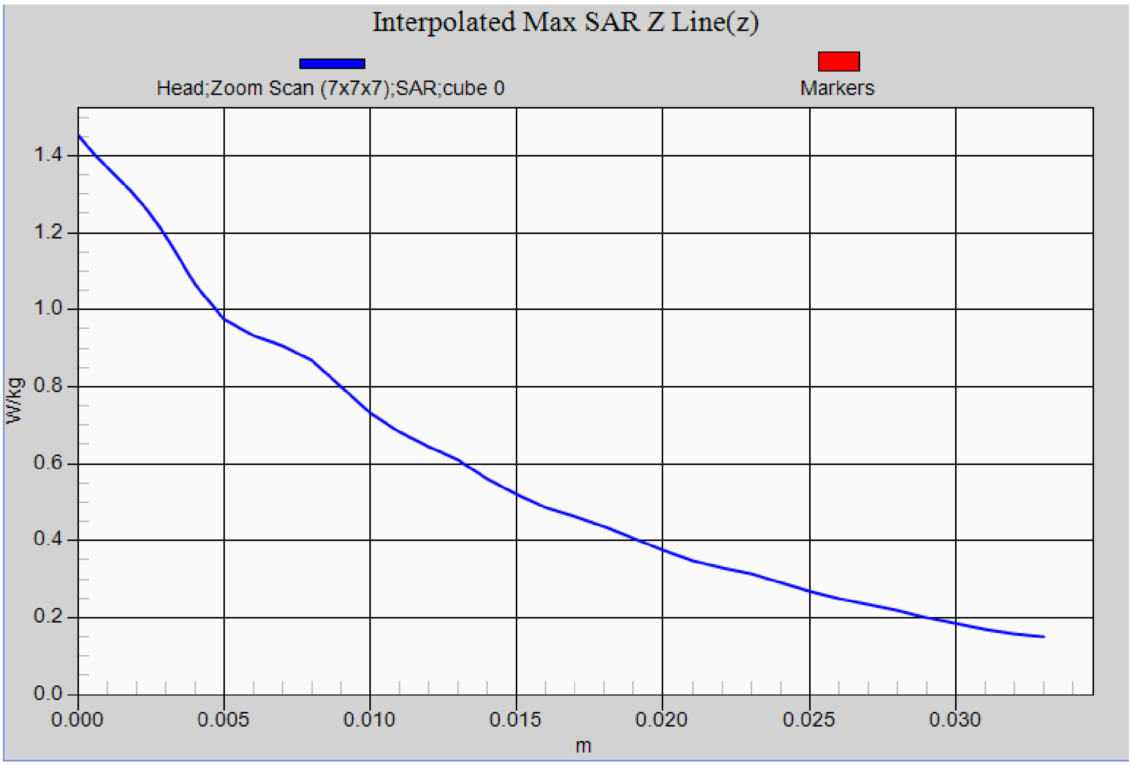
**Configuration/Head/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.364 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.681 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.469 W/kg
**SAR(1 g) = 0.361 W/kg; SAR(10 g) = 0.269 W/kg**
Maximum value of SAR (measured) = 0.401 W/kg



**CDMA 2000 EUT Left-Cheek (Head), Z-Axis plot**

**Channel: 777**



Test Laboratory: QuieTek Date/Time: 7/25/2013

**CDMA 2000_Body-Front_384**
**DUT: MOBILE PHONE; Type: KYY06**

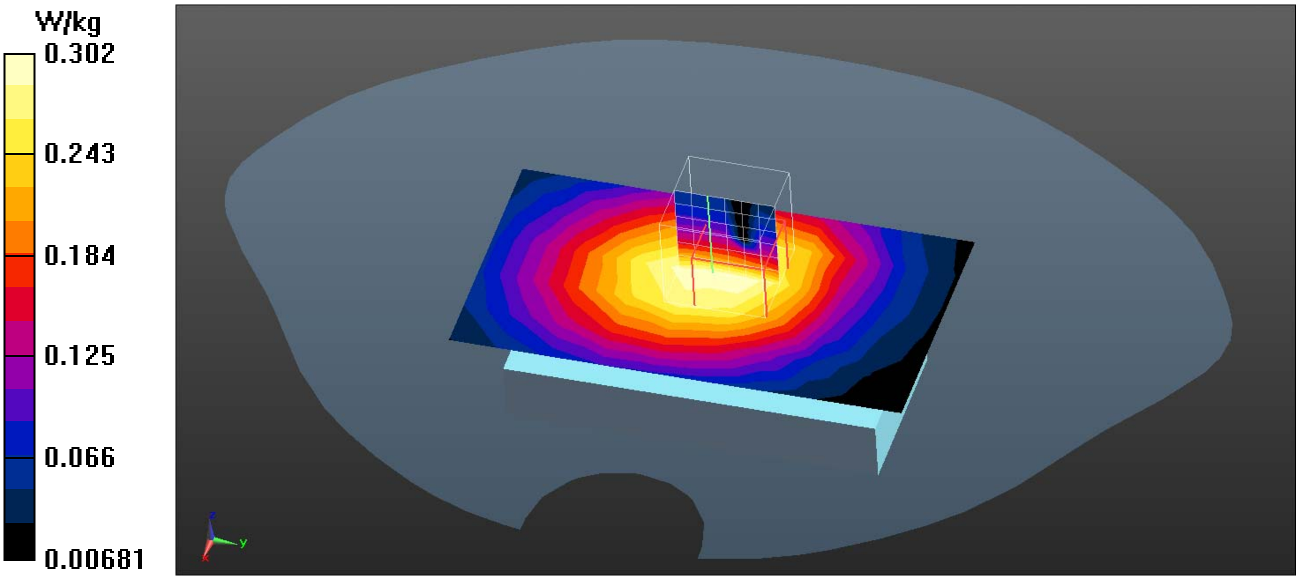
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 836.52 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 836.52 MHz; $\sigma$ = 0.96 S/m; $\varepsilon$ r = 53.24; $\rho$ = 1000 kg/m3
Phantom section: Flat Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/Head/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.302 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.194 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.715 W/kg
**SAR(1 g) = 0.282 W/kg; SAR(10 g) = 0.174 W/kg**
Maximum value of SAR (measured) = 0.301 W/kg



Test Laboratory: QuieTek Date/Time: 7/25/2013

**CDMA 2000_Body-Back_1013**
**DUT: MOBILE PHONE; Type: KYY06**

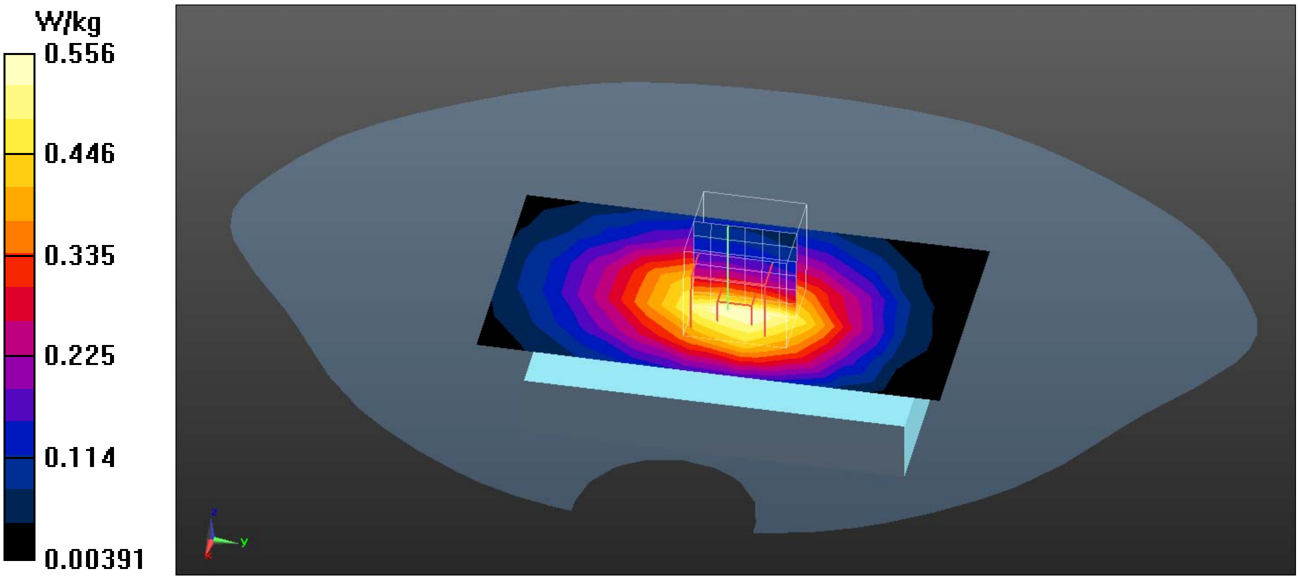
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 824.7 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 824.7 MHz; $\sigma$ = 0.95 S/m; $\varepsilon$ r = 53.52; $\rho$ = 1000 kg/m3
Phantom section: Flat Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/Head/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.556 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.425 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.715 W/kg
**SAR(1 g) = 0.499 W/kg; SAR(10 g) = 0.344 W/kg**
Maximum value of SAR (measured) = 0.585 W/kg



Test Laboratory: QuieTek

Date/Time: 7/25/2013

**CDMA 2000_Body-Back_384**
**DUT: MOBILE PHONE; Type: KYY06**

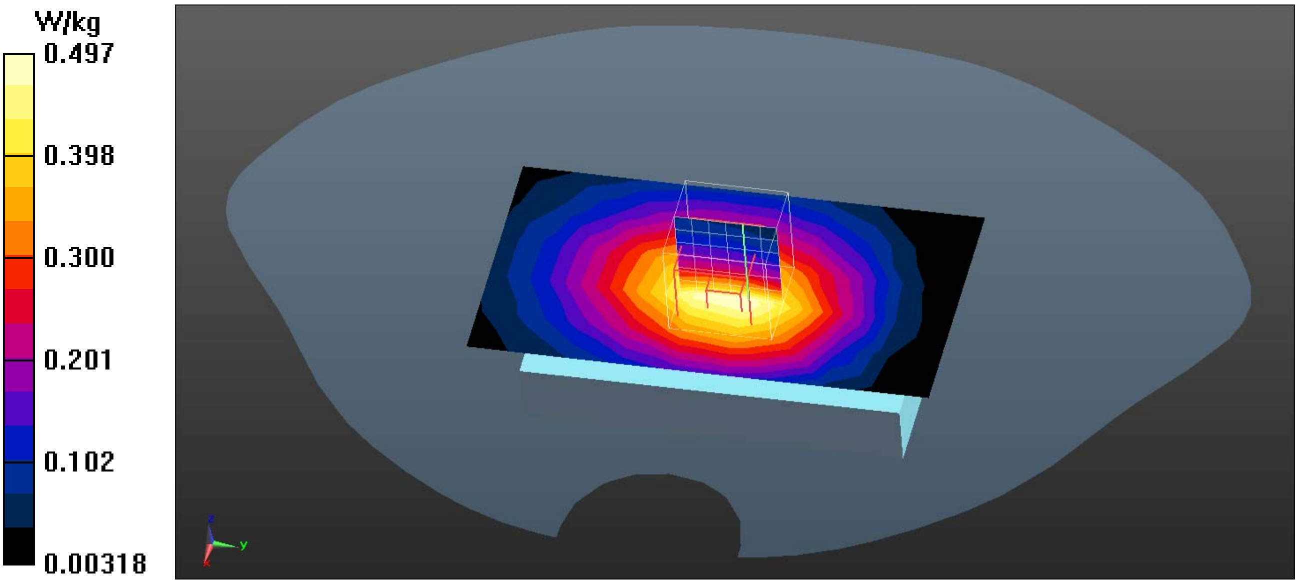
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 836.52 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 836.52 MHz; $\sigma$ = 0.96 S/m; $\varepsilon$ r = 53.24; $\rho$ = 1000 kg/m3
Phantom section: Flat Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

**Configuration/Head/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.497 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.786 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.619 W/kg
**SAR(1 g) = 0.435 W/kg; SAR(10 g) = 0.301 W/kg**
Maximum value of SAR (measured) = 0.496 W/kg



Test Laboratory: QuieTek Date/Time: 7/25/2013

**CDMA 2000_Body-Back_777**
**DUT: MOBILE PHONE; Type: KYY06**

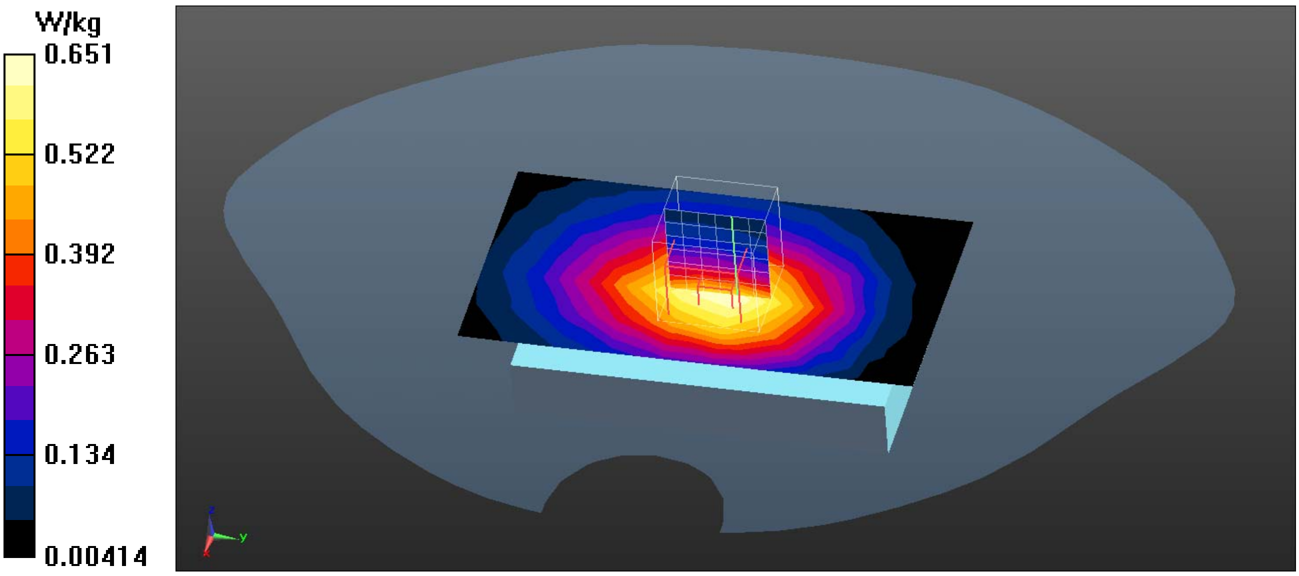
Communication System: NCC CDMA_EVDO-850MHz; Frequency: 848.31 MHz;
Communication System PAR: 0 dB
Medium parameters used: f = 848.31 MHz; $\sigma$ = 0.97 S/m; $\varepsilon$ r = 52.88; $\rho$ = 1000 kg/m3
Phantom section: Flat Section
Ambient Temperature (°C) : 21.4, Liquid Temperature (°C) : 20.2
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3661; ConvF(9.64, 9.64, 9.64); Calibrated: 1/15/2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1207; Calibrated: 5/22/2013
- Phantom: SAM with left table; Type: SAM;
- Measurement SW: DASY52, Version 52.8 (5); SEMCAD X Version 14.6.8 (7028)

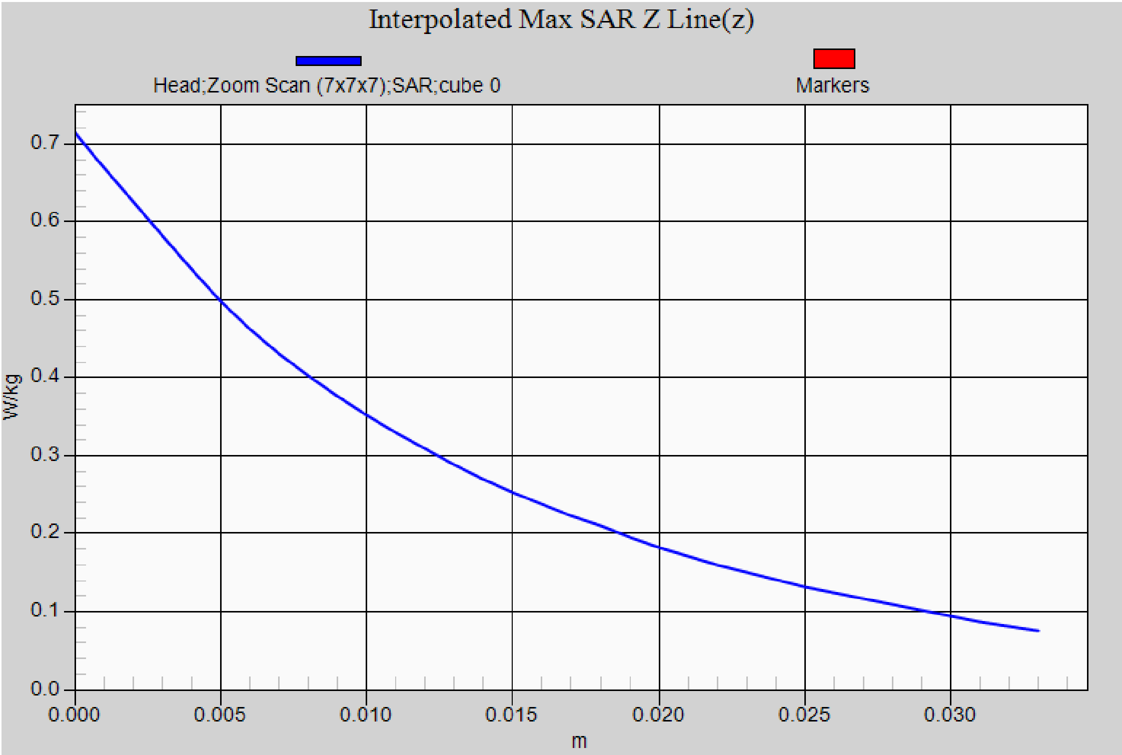
**Configuration/Head/Area Scan (6x10x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.651 W/kg

**Configuration/Head/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 25.656 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.654 W/kg
**SAR(1 g) = 0.467 W/kg; SAR(10 g) = 0.321 W/kg**
Maximum value of SAR (measured) = 0.536 W/kg



**CDMA 2000 EUT Back (Body), Z-Axis plot**

**Channel: 1013**



## Appendix D. Probe Calibration Data

## Object: EX3DV4- SN: 3661

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

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

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

**Accreditation No.: SCS 108**

**Client** **Auden**

**Certificate No: EX3-3661_Jan13**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | EX3DV4 - SN:3661 |
| Calibration procedure(s) | QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4<br>Calibration procedure for dosimetric E-field probes |
| Calibration date: | January 15, 2013 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter E4419B | GB41293874 | 29-Mar-12 (No. 217-01508) | Apr-13 |
| Power sensor E4412A | MY41498087 | 29-Mar-12 (No. 217-01508) | Apr-13 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 27-Mar-12 (No. 217-01531) | Apr-13 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 27-Mar-12 (No. 217-01529) | Apr-13 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 27-Mar-12 (No. 217-01532) | Apr-13 |
| Reference Probe ES3DV2 | SN: 3013 | 28-Dec-12 (No. ES3-3013_Dec12) | Dec-13 |
| DAE4 | SN: 660 | 20-Jun-12 (No. DAE4-660_Jun12) | Jun-13 |
| | | | |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (in house check Apr-11) | In house check: Apr-13 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (in house check Oct-12) | In house check: Oct-13 |

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

Issued: January 15, 2013

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

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Accreditation No.: **SCS 108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

## Methods Applied and Interpretation of Parameters:

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

# Probe EX3DV4

## SN:3661

Manufactured: October 20, 2008
Calibrated: January 15, 2013

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

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3661

## Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|---|---|---|---|
| Norm ($\mu V/(V/m)^2$)[A] | 0.49 | 0.51 | 0.46 | ± 10.1 % |
| DCP (mV)[B] | 96.2 | 97.5 | 99.3 | |

## Modulation Calibration Parameters

| UID | Communication System Name | | A dB | B dB√μV | C | D dB | VR mV | Unc[E] (k=2) |
|---|---|---|---|---|---|---|---|---|
| 0 | CW | X | 0.0 | 0.0 | 1.0 | 0.00 | 147.6 | ±3.3 % |
| | | Y | 0.0 | 0.0 | 1.0 | | 171.7 | |
| | | Z | 0.0 | 0.0 | 1.0 | | 152.3 | |

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

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

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3661

## Calibration Parameter Determined in Head Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha | Depth (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 41.9 | 0.89 | 10.06 | 10.06 | 10.06 | 0.59 | 0.68 | ± 12.0 % |
| 835 | 41.5 | 0.90 | 9.81 | 9.81 | 9.81 | 0.19 | 1.15 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 8.33 | 8.33 | 8.33 | 0.66 | 0.62 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 8.10 | 8.10 | 8.10 | 0.57 | 0.69 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 7.45 | 7.45 | 7.45 | 0.32 | 0.88 | ± 12.0 % |
| 5200 | 36.0 | 4.66 | 5.11 | 5.11 | 5.11 | 0.30 | 1.80 | ± 13.1 % |
| 5300 | 35.9 | 4.76 | 4.93 | 4.93 | 4.93 | 0.30 | 1.80 | ± 13.1 % |
| 5500 | 35.6 | 4.96 | 4.65 | 4.65 | 4.65 | 0.40 | 1.80 | ± 13.1 % |
| 5600 | 35.5 | 5.07 | 4.27 | 4.27 | 4.27 | 0.45 | 1.80 | ± 13.1 % |
| 5800 | 35.3 | 5.27 | 4.40 | 4.40 | 4.40 | 0.45 | 1.80 | ± 13.1 % |

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

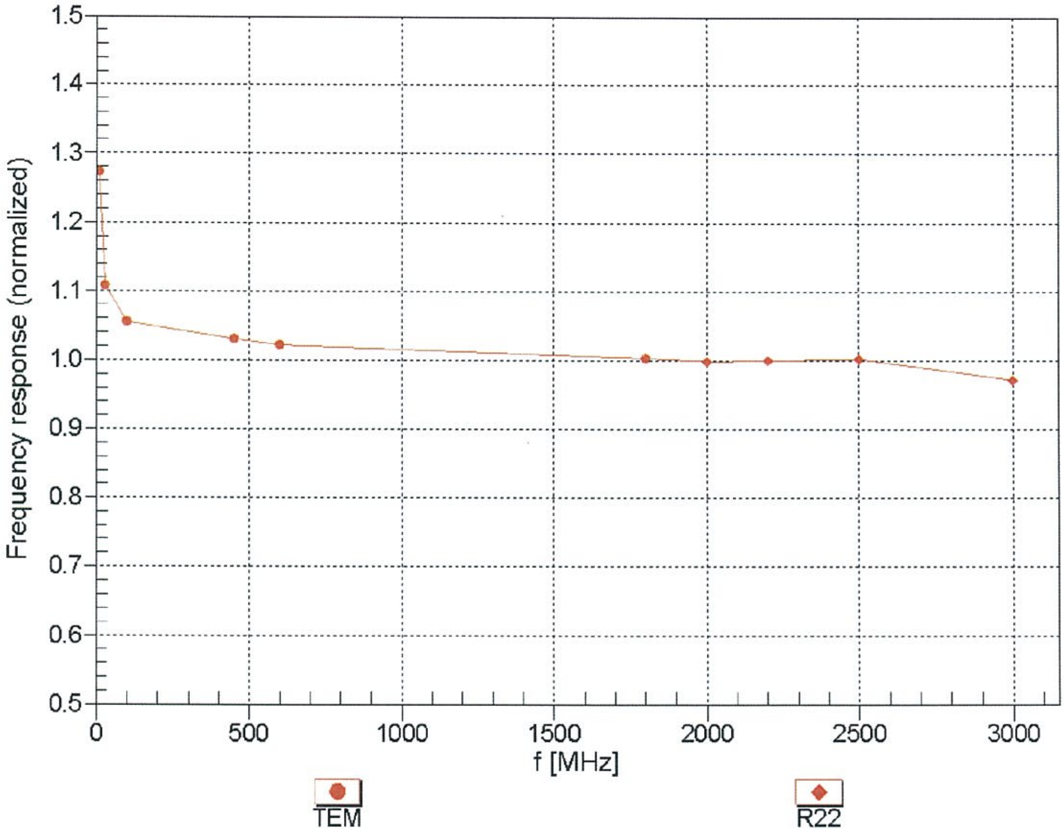
# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3661

## Calibration Parameter Determined in Body Tissue Simulating Media

| f (MHz) [C] | Relative Permittivity [F] | Conductivity (S/m) [F] | ConvF X | ConvF Y | ConvF Z | Alpha | Depth (mm) | Unct. (k=2) |
|---|---|---|---|---|---|---|---|---|
| 750 | 55.5 | 0.96 | 9.83 | 9.83 | 9.83 | 0.48 | 0.84 | ± 12.0 % |
| 835 | 55.2 | 0.97 | 9.64 | 9.64 | 9.64 | 0.42 | 0.88 | ± 12.0 % |
| 1750 | 53.4 | 1.49 | 8.15 | 8.15 | 8.15 | 0.28 | 1.03 | ± 12.0 % |
| 1900 | 53.3 | 1.52 | 7.72 | 7.72 | 7.72 | 0.32 | 0.94 | ± 12.0 % |
| 2450 | 52.7 | 1.95 | 7.35 | 7.35 | 7.35 | 0.76 | 0.55 | ± 12.0 % |
| 5200 | 49.0 | 5.30 | 4.46 | 4.46 | 4.46 | 0.50 | 1.90 | ± 13.1 % |
| 5300 | 48.9 | 5.42 | 4.29 | 4.29 | 4.29 | 0.50 | 1.90 | ± 13.1 % |
| 5500 | 48.6 | 5.65 | 4.16 | 4.16 | 4.16 | 0.50 | 1.90 | ± 13.1 % |
| 5600 | 48.5 | 5.77 | 4.13 | 4.13 | 4.13 | 0.45 | 1.90 | ± 13.1 % |
| 5800 | 48.2 | 6.00 | 3.97 | 3.97 | 3.97 | 0.60 | 1.90 | ± 13.1 % |

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters ($\varepsilon$ and $\sigma$) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ($\varepsilon$ and $\sigma$) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

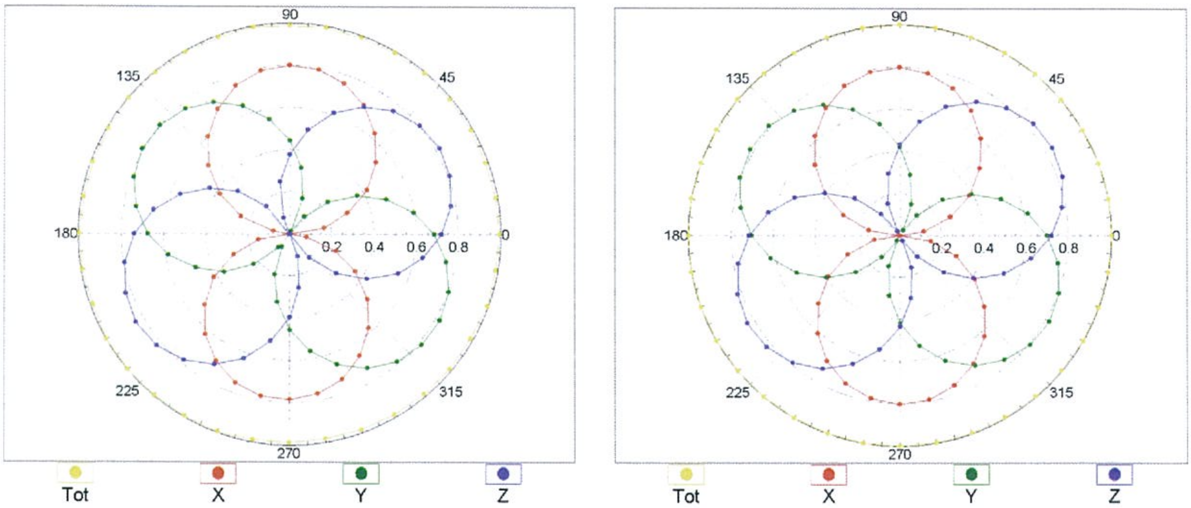
# Frequency Response of E-Field
**(TEM-Cell:ifi110 EXX, Waveguide: R22)**

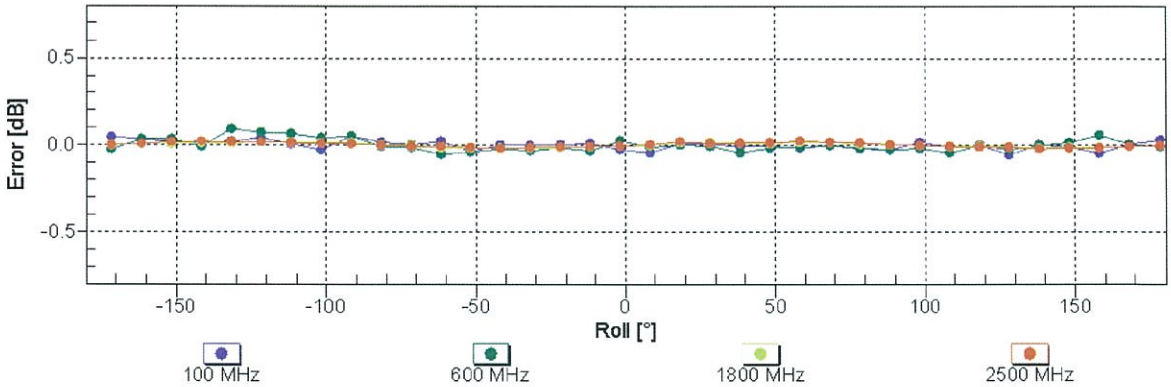



**Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)**

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

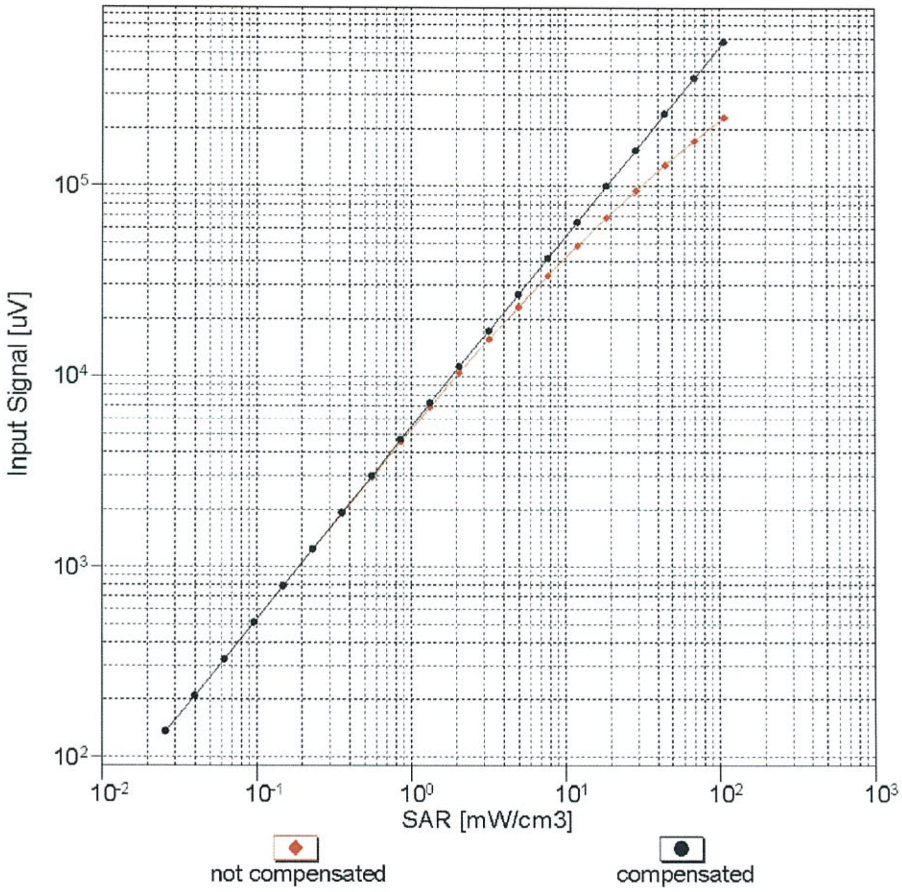
f=600 MHz,TEM f=1800 MHz,R22

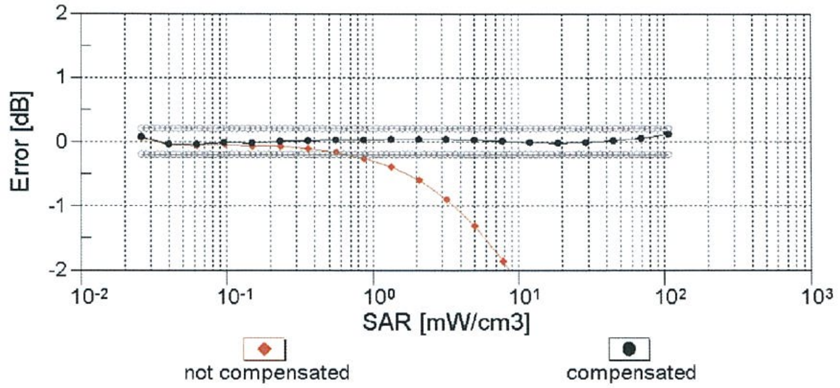



**Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)**

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

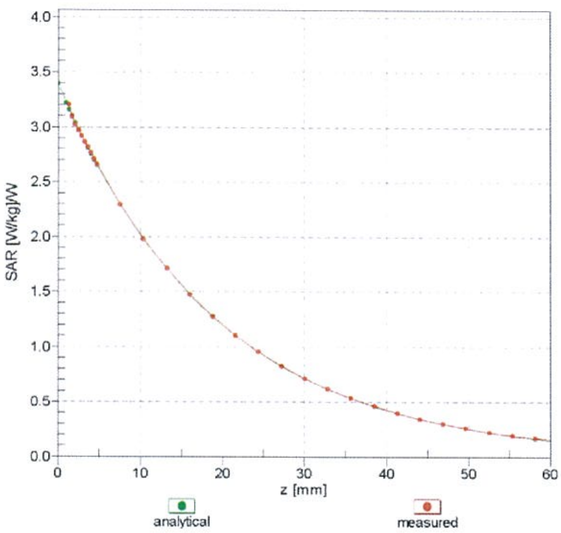


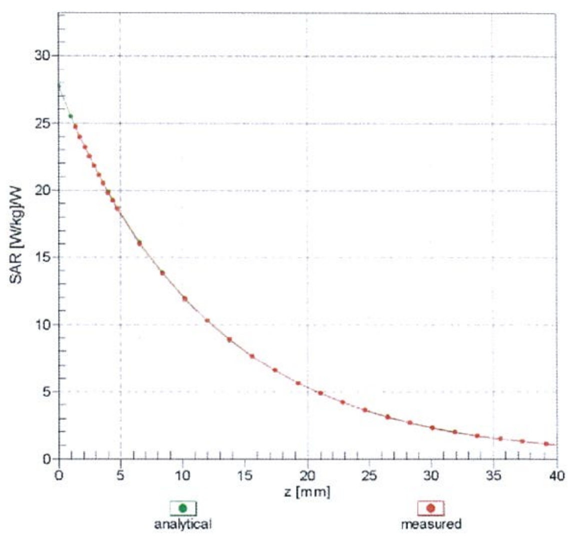

**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

# Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

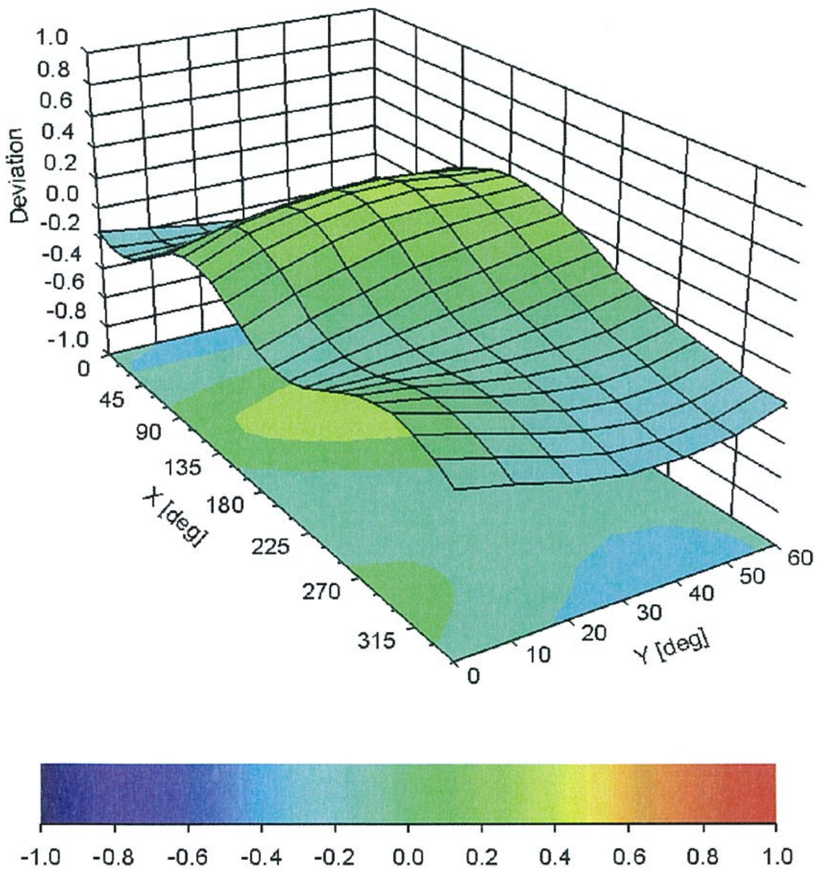



f = 1900 MHz,WGLS R22 (H_convF)




# Deviation from Isotropy in Liquid

**Error (ϕ, ϑ), f = 900 MHz**




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

# DASY/EASY - Parameters of Probe: EX3DV4 - SN:3661

## Other Probe Parameters

| | |
|---|---|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | 18.3 |
| Mechanical Surface Detection Mode | enabled |
| Optical Surface Detection Mode | disabled |
| Probe Overall Length | 337 mm |
| Probe Body Diameter | 10 mm |
| Tip Length | 9 mm |
| Tip Diameter | 2.5 mm |
| Probe Tip to Sensor X Calibration Point | 1 mm |
| Probe Tip to Sensor Y Calibration Point | 1 mm |
| Probe Tip to Sensor Z Calibration Point | 1 mm |
| Recommended Measurement Distance from Surface | 2 mm |

QuieTek

# Appendix E. Dipole Calibration

**Validation Dipole 835 MHz**
**M/N: ALS-D-835**
**S/N: QTK-315**

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

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**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** Quietek-TW (Auden)

**Certificate No: ALS-D-835-QTK-315_May12**

# CALIBRATION CERTIFICATE

| | |
|---|---|
| Object | ALS-D-835 - SN: QTK-315 |
| Calibration procedure(s) | QA CAL-05.v8<br>Calibration procedure for dipole validation kits above 700 MHz |
| Calibration date: | May 25, 2012 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|---|---|---|---|
| Power meter EPM-442A | GB37480704 | 05-Oct-11 (No. 217-01451) | Oct-12 |
| Power sensor HP 8481A | US37292783 | 05-Oct-11 (No. 217-01451) | Oct-12 |
| Reference 20 dB Attenuator | SN: 5058 (20k) | 27-Mar-12 (No. 217-01530) | Apr-13 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 27-Mar-12 (No. 217-01533) | Apr-13 |
| Reference Probe ES3DV3 | SN: 3205 | 30-Dec-11 (No. ES3-3205_Dec11) | Dec-12 |
| DAE4 | SN: 601 | 04-Jul-11 (No. DAE4-601_Jul11) | Jul-12 |

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

| | Name | Function | Signature |
|---|---|---|---|
| Calibrated by: | Israe El-Naouq | Laboratory Technician | Israe El-Naouq |
| Approved by: | Katja Pokovic | Technical Manager | |

Issued: May 25, 2012

**Calibration Laboratory of**
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Engineering AG
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Servizio svizzero di taratura
**S** Swiss Calibration Service

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Accreditation No.: **SCS 108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Additional Documentation:

d) DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

| | | |
|---|---|---|
| **DASY Version** | DASY5 | V52.8.1 |
| **Extrapolation** | Advanced Extrapolation | |
| **Phantom** | Modular Flat Phantom | |
| **Distance Dipole Center - TSL** | 15 mm | with Spacer |
| **Zoom Scan Resolution** | dx, dy, dz = 5 mm | |
| **Frequency** | 835 MHz ± 1 MHz | |

## Head TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Head TSL parameters** | 22.0 °C | 41.5 | 0.90 mho/m |
| **Measured Head TSL parameters** | (22.0 ± 0.2) °C | 40.6 ± 6 % | 0.89 mho/m ± 6 % |
| **Head TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Head TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Head TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.31 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **9.27 mW /g ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Head TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.51 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | **6.06 mW /g ± 16.5 % (k=2)** |

## Body TSL parameters

The following parameters and calculations were applied.

| | **Temperature** | **Permittivity** | **Conductivity** |
|---|---|---|---|
| **Nominal Body TSL parameters** | 22.0 °C | 55.2 | 0.97 mho/m |
| **Measured Body TSL parameters** | (22.0 ± 0.2) °C | 54.3 ± 6 % | 1.00 mho/m ± 6 % |
| **Body TSL temperature change during test** | < 0.5 °C | ---- | ---- |

## SAR result with Body TSL

| **SAR averaged over 1 $cm^3$ (1 g) of Body TSL** | Condition | |
|---|---|---|
| SAR measured | 250 mW input power | 2.41 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **9.39 mW / g ± 17.0 % (k=2)** |

| **SAR averaged over 10 $cm^3$ (10 g) of Body TSL** | condition | |
|---|---|---|
| SAR measured | 250 mW input power | 1.58 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | **6.19 mW / g ± 16.5 % (k=2)** |

## Appendix

## Antenna Parameters with Head TSL

| | |
|---|---|
| Impedance, transformed to feed point | 49.2 Ω + 2.4 jΩ |
| Return Loss | - 31.8 dB |

## Antenna Parameters with Body TSL

| | |
|---|---|
| Impedance, transformed to feed point | 45.0 Ω + 0.8 jΩ |
| Return Loss | - 25.4 dB |

## General Antenna Parameters and Design

| | |
|---|---|
| Electrical Delay (one direction) | 0.984 ns |

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

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

## Additional EUT Data

| | |
|---|---|
| Manufactured by | APREL |
| Manufactured on | Unknown |

## DASY5 Validation Report for Head TSL

Date: 25.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: ALS-D-835; Serial: ALS-D-835 - SN: QTK-315**

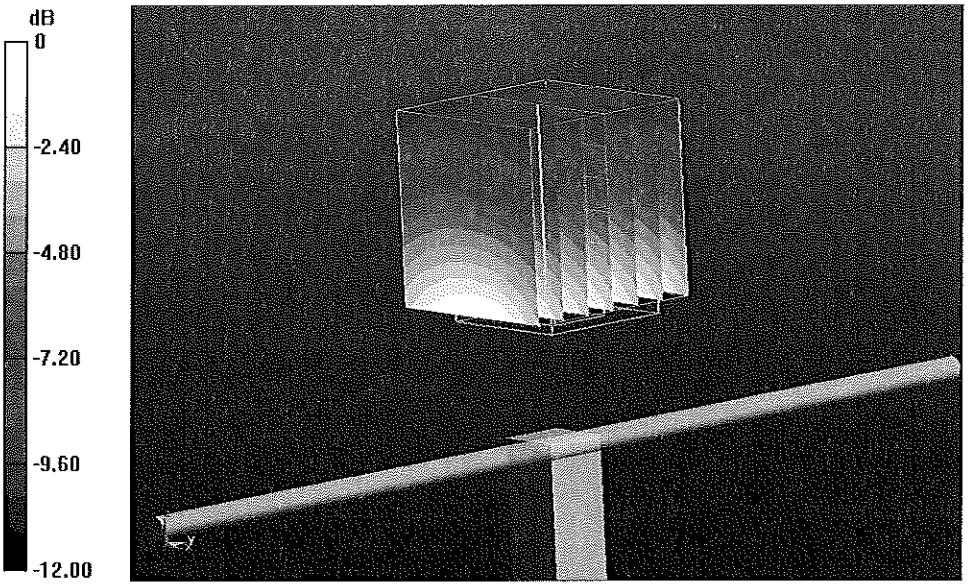
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 0.89 mho/m; $\varepsilon_r$ = 40.6; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

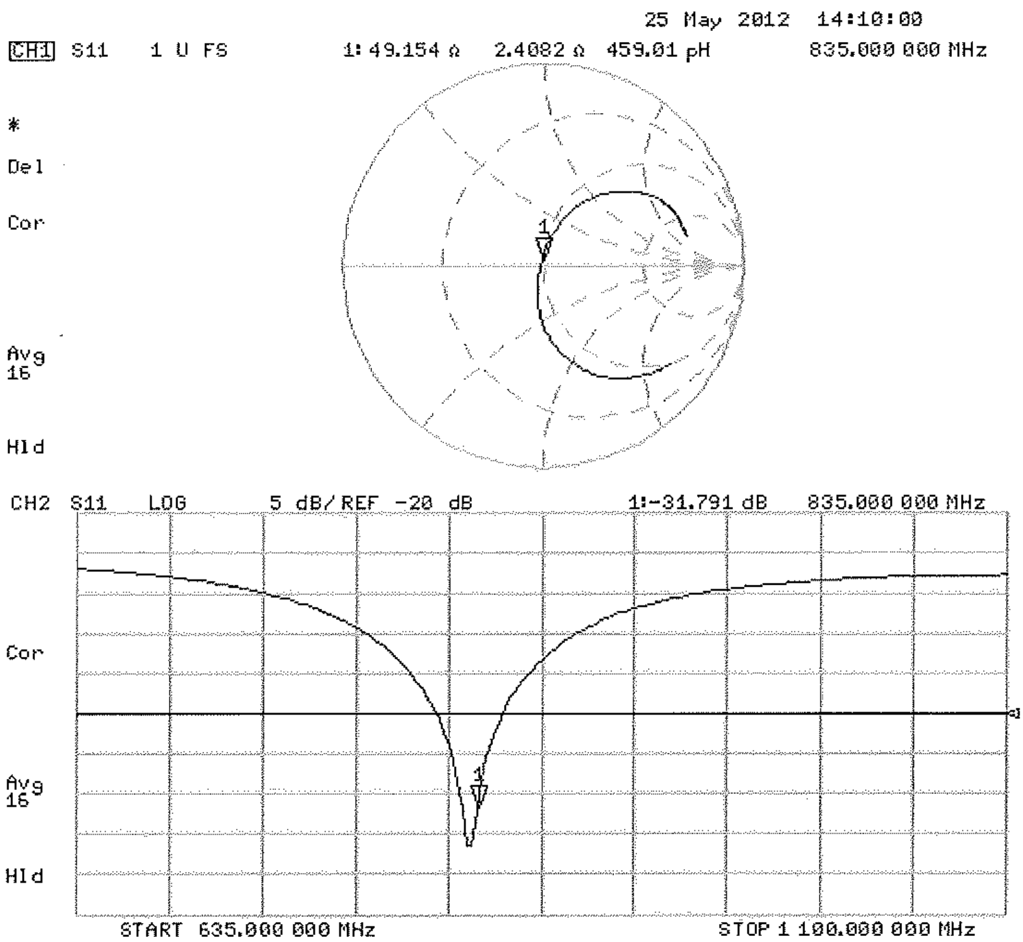
### Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm 2/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.695 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 3.392 mW/g
**SAR(1 g) = 2.31 mW/g; SAR(10 g) = 1.51 mW/g**
Maximum value of SAR (measured) = 2.68 mW/g




0 dB = 2.68 mW/g = 8.56 dB mW/g

## Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 25.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: ALS-D-835; Serial: ALS-D-835 - SN: QTK-315**

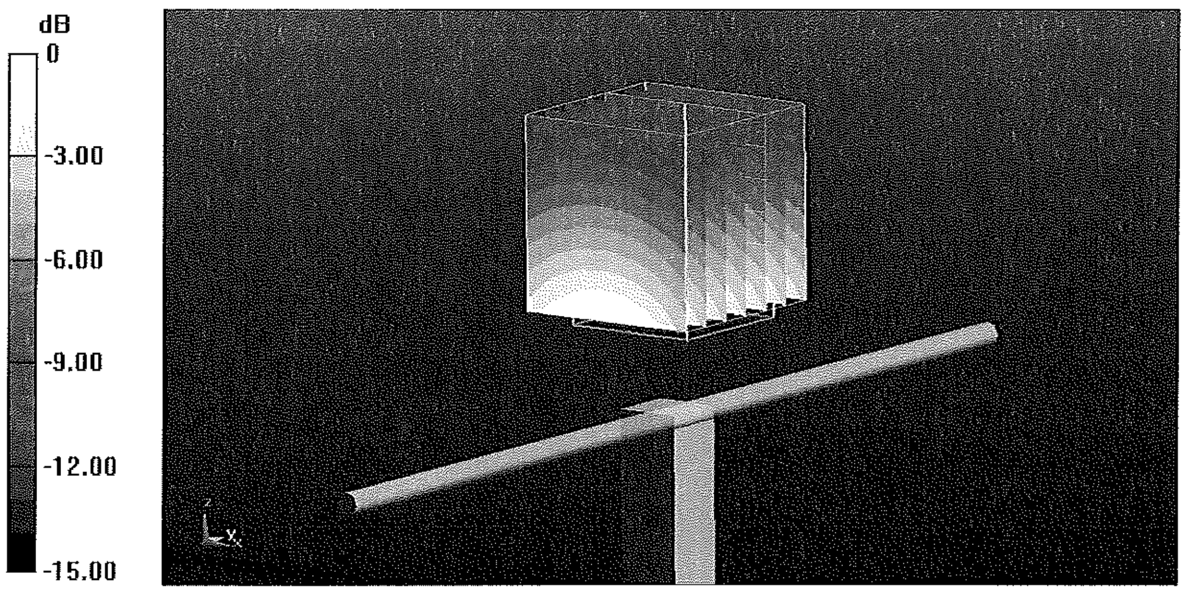
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma$ = 1 mho/m; $\varepsilon_r$ = 54.3; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.783 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.485 mW/g
**SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.58 mW/g**
Maximum value of SAR (measured) = 2.79 mW/g




0 dB = 2.79 mW/g = 8.91 dB mW/g

## Impedance Measurement Plot for Body TSL