



FCC SAR Test Report

APPLICANT : Brightstar Corporation
EQUIPMENT : Mobile phone
BRAND NAME : Avvio
MODEL NAME : AVVIO 265
FCC ID : WVBA265
STANDARD : FCC 47 CFR Part 2 (2.1093)
IEEE C95.1-1991
IEEE 1528-2003
FCC OET Bulletin 65 Supplement C (Edition 01-01)

The product was received on Oct. 24, 2011 and completely tested on Nov. 03, 2011. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the procedures and shown the compliance with the applicable technical standards.

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

Reviewed by:

Jones Tsai / Manager



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Revision History



1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Brightstar Corporation Mobile phone Avvio AVVIO 265** are as follows (with expanded uncertainty 21.97 % for 300 MHz to 3 GHz).

<Standalone SAR>

| Band | Position | SAR _{1g} (W/kg) |
|---------|---------------|-----------------------------|
| GSM850 | Head | 0.687 |
| | Body (1.5 cm) | 0.5 |
| GSM1900 | Head | 0.335 |
| | Body (1.5 cm) | 0.257 |

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1991, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2003 and FCC OET Bulletin 65 Supplement C (Edition 01-01).



2 Administration Data

2.1 Testing Laboratory

| | |
|--------------------|--|
| Test Site | SPORTON INTERNATIONAL (KUNSHAN) INC. |
| Test Site Location | No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P.R.C. TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958 |

2.2 Applicant

| | |
|--------------|---|
| Company Name | Brightstar Corporation |
| Address | 9725 NW 117th Ave., Miami, Florida, United States |

2.3 Manufacturer

| | |
|--------------|---|
| Company Name | mingyitech |
| Address | Room 1703-1706, international chamber of commerce building-b, No.138 fuhua road 1, futian area ,shenzhen, PRC |

2.4 Application Details

| | |
|--------------------------------|---------------|
| Date of Receipt of Application | Oct. 24, 2011 |
| Date of Start during the Test | Nov. 03, 2011 |
| Date of End during the Test | Nov. 03, 2011 |



3 General Information

3.1 Description of Device Under Test (DUT)

| Product Feature & Specification | |
|---------------------------------|--|
| DUT Type | Mobile phone |
| Brand Name | Avvio |
| Model Name | AVVIO 265 |
| IMEI Code | 35674015882055 |
| FCC ID | WVBA265 |
| Tx Frequency | GSM850 : 824 MHz ~ 849 MHz GSM1900 : 1850 MHz ~ 1910 MHz |
| Rx Frequency | GSM850 : 869 MHz ~ 894 MHz GSM1900 : 1930 MHz ~ 1990 MHz |
| Maximum Output Power to Antenna | GSM850 : 32.10 dBm GSM1900 : 29.48 dBm |
| Antenna Type | Fixed Internal Antenna |
| HW Version | X350 |
| SW Version | X350_S03_C02B_B001SP05_TXD180_ILI9163C_WB_SKY7 7542_EnEs_2011.11.09 |
| Type of Modulation | GMSK |
| DUT Stage | Production Unit |

Remark:

The above DUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

3.2 Product Photos

Please refer to Appendix D.



3.3 Applied Standards

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

- FCC 47 CFR Part 2 (2.1093)
- IEEE C95.1-1991
- IEEE 1528-2003
- FCC OET Bulletin 65 Supplement C (Edition 01-01)
- FCC KDB 447498 D01 v04

3.4 Device Category and SAR Limits

This device belongs to portable device category because its radiating structure is allowed to be used within 20 centimeters of the body of the user. Limit for General Population/Uncontrolled exposure should be applied for this device, it is 1.6 W/kg as averaged over any 1 gram of tissue.

3.5 Test Conditions

3.4.1 Ambient Condition

| | |
|---------------------|-------------|
| Ambient Temperature | 20 to 24 °C |
| Humidity | < 60 % |

3.4.2 Test Configuration

The device was controlled by using a base station emulator. Communication between the device and the emulator was established by air link. The distance between the DUT and the antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of DUT. The DUT was set from the emulator to radiate maximum output power during all tests.

For WWAN SAR testing, the DUT is in GSM link mode. In general, the crest factor is 8.3 for GSM.



4 Specific Absorption Rate (SAR)

4.1 Introduction

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

4.2 SAR Definition

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

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

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

SAR measurement can be either related to the temperature elevation in tissue by

$$\text{SAR} = C \left(\frac{\delta T}{\delta t} \right)$$

Where: C is the specific heat capacity, δT is the temperature rise and δt is the exposure duration, or related to the electrical field in the tissue by

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

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

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

5 SAR Measurement System

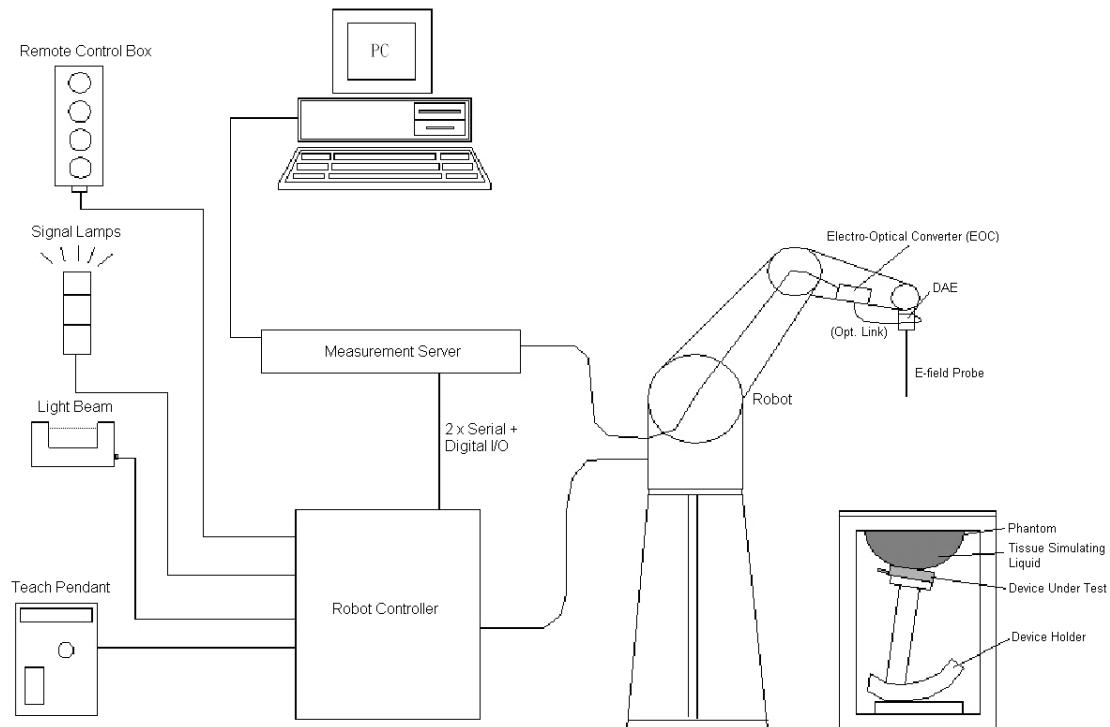


Fig 5.1 SPEAG DASY4 or DASY5 System Configurations

The DASY4 or DASY5 system for performance compliance tests is illustrated above graphically. This system consists of the following items:

- A standard high precision 6-axis robot with controller, a teach pendant and software
- A data acquisition electronic (DAE) attached to the robot arm extension
- A dosimetric probe equipped with an optical surface detector system
- The electro-optical converter (ECO) performs the conversion between optical and electrical signals
- A measurement server performs the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the accuracy of the probe positioning
- A computer operating Windows XP
- DASY4 or DASY5 software
- Remote control with teach pendant and additional circuitry for robot safety such as warming lamps, etc.
- The SAM twin phantom
- A device holder
- Tissue simulating liquid
- Dipole for evaluating the proper functioning of the system

Some of the components are described in details in the following sub-sections.

5.1 E-Field Probe

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

5.1.1 *E-Field Probe Specification*

<EX3DV4 Probe>

| | | |
|----------------------|---|--|
| 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; Linearity: ± 0.2 dB | |
| Directivity | ± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis) | |
| Dynamic Range | 10 μ W/g to 100 mW/g; Linearity: ± 0.2 dB (noise: typically < 1 μ W/g) | |
| Dimensions | Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm | |

Fig 5.2 Photo of EX3DV4

5.1.2 *E-Field Probe Calibration*

Each probe needs to be calibrated according to a dosimetric assessment procedure with accuracy better than $\pm 10\%$. The spherical isotropy shall be evaluated and within ± 0.25 dB. The sensitivity parameters (NormX, NormY, and NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested. The calibration data can be referred to appendix C of this report.

5.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

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



Fig 5.3 Photo of DAE

5.3 Robot

The SPEAG DASY system uses the high precision robots (DASY5: TX90XL) type from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ± 0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



Fig 5.4 Photo of DASY5



5.4 Measurement Server

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

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



Fig 5.1 Photo of Server for DASY5

5.5 Phantom

<SAM Twin Phantom>

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



A photograph of the SAM Twin Phantom. It is a rectangular wooden frame containing two white, semi-circular phantom shells. A black device holder is positioned between them. The entire assembly sits on a light-colored wooden base.

Fig 5.2 Photo of SAM 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.

<ELI4 Phantom>

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



A photograph of the ELI4 Phantom. It is a white rectangular frame with a red circular top. The frame is supported by four legs. A black device holder is visible through the frame's opening.

Fig 5.3 Photo of ELI4 Phantom

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

5.6 Device Holder

<Device Holder for SAM Twin Phantom>

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source at 5 mm distance, a positioning uncertainty of ± 0.5 mm would produce a SAR uncertainty of $\pm 20\%$. Accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions in which the devices must be measured are defined by the standards.

The DASY 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 DASY device holder is constructed of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ 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.



Fig 5.4 Device Holder



5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY software stores the assessed data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all the necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files. The post-processing 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 erroneous parameter settings. For example, if a measurement has been performed with an incorrect crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be reevaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type (e.g., [V/m], [A/m], [mW/g]). Some of these units are not available in certain situations or give meaningless results, e.g., a SAR-output in a non-lose media, will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

5.7.2 Data Evaluation

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

| | | |
|----------------------------|---------------------------|---|
| Probe parameters : | - Sensitivity | Norm _i , a _{i0} , a _{i1} , a _{i2} |
| | - Conversion factor | ConvF _i |
| | - Diode compression point | dcp _i |
| Device parameters : | - Frequency | f |
| | - Crest factor | cf |
| Media parameters : | - Conductivity | σ |
| | - Density | ρ |

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 DASY components. In the direct measuring mode of the multi-meter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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



The formula for each channel can be given as :

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

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

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

cf = crest factor of exciting field (DASY parameter)

dcp_i = diode compression point (DASY parameter)

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

$$\text{E-field Probes : } E_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConvF}}}$$

$$\text{H-field Probes : } H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

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

Norm_i = sensor sensitivity of channel i, ($i = x, y, z$), $\mu\text{V}/(\text{V}/\text{m})^2$ 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) :

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

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

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

with SAR = local specific absorption rate in mW/g

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

σ = conductivity in [mho/m] or [Siemens/m]

ρ = equivalent tissue density in g/cm³

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid.



5.8 Test Equipment List

| Manufacturer | Name of Equipment | Type/Model | Serial Number | Calibration | |
|--------------|---------------------------------|---------------|---------------|---------------|---------------|
| | | | | Last Cal. | Due Date |
| SPEAG | Dosimetric E-Field Probe | EX3DV4 | 3697 | Sep. 02, 2011 | Sep. 01, 2012 |
| SPEAG | Data Acquisition Electronics | DAE4 | Sn679 | Jun. 24, 2011 | Jun. 23, 2012 |
| SPEAG | 835MHz System Validation Kit | D835V2 | 4d091 | Nov. 23, 2009 | Nov. 22, 2011 |
| SPEAG | 1900MHz System Validation Kit | D1900V2 | 5d118 | Nov. 24, 2009 | Nov. 23, 2011 |
| SPEAG | SAM Twin Phantom | QD 000 P40 CB | TP-1477 | NCR | NCR |
| SPEAG | SAM Twin Phantom | QD 000 P40 CB | TP-1479 | NCR | NCR |
| Agilent | ENA Series Network Analyzer | E5071C | MY46111157 | Apr. 07, 2011 | Apr. 06, 2012 |
| Agilent | Wireless Communication Test Set | E5515C | MY50264165 | Mar. 30, 2011 | Mar. 29, 2012 |
| Agilent | Dielectric Probe Kit | 85070E | MY44300475 | NCR | NCR |
| Agilent | Base Station | E5515C | GB47050646 | Aug. 18, 2011 | Aug. 17, 2012 |
| AR | Amplifier | 551G4 | 333096 | NCR | NCR |
| R&S | Spectrum Analyzer | FSP30 | 101400 | Jun.02, 2011 | Jun. 01, 2012 |
| R&S | Signal Generator | SMR40 | 100455 | Jan. 06, 2011 | Jan. 05, 2012 |

Table 5.1 Test Equipment List

Note: The calibration certificate of DASY can be referred to appendix C of this report. Referring to KDB 450824, the justification of dipole extended calibration is needed beyond 1 year. The justification data of dipole D835V2, SN: 4d091, D1900V2, SN: 5d118, can be found in appendix C.

6 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 6.2.

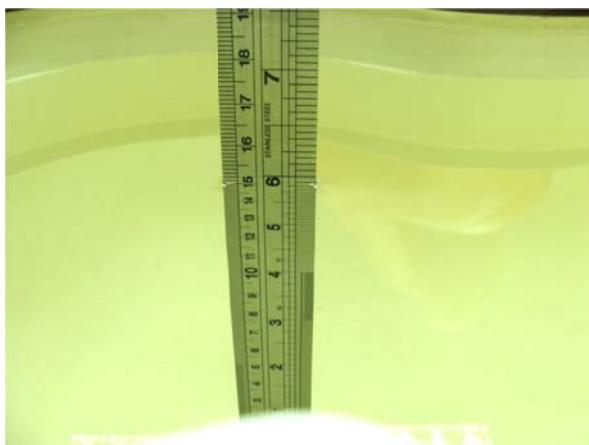


Fig 6.1 Photo of Liquid Height for Head SAR



Fig 6.2 Photo of Liquid Height for Body SAR

The following table gives the recipes for tissue simulating liquid.

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

Table 6.1 Recipes of Tissue Simulating Liquid



The following table gives the targets for tissue simulating liquid.

| Frequency (MHz) | Liquid Type | Conductivity (σ) | $\pm 5\%$ Range | Permittivity (ϵ_r) | $\pm 5\%$ Range |
|--------------------|-------------|------------------------------|-----------------|----------------------------------|-----------------|
| 835 | Head | 0.90 | 0.86 ~ 0.95 | 41.5 | 39.4 ~ 43.6 |
| 1800, 1900, 2000 | Head | 1.40 | 1.33 ~ 1.47 | 40.0 | 38.0 ~ 42.0 |
| 835 | Body | 0.97 | 0.92 ~ 1.02 | 55.2 | 52.4 ~ 58.0 |
| 1800, 1900, 2000 | Body | 1.52 | 1.44 ~ 1.60 | 53.3 | 50.6 ~ 56.0 |

Table 6.2 Targets of Tissue Simulating Liquid

The dielectric parameters of the liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

The following table shows the measuring results for simulating liquid.

| Frequency (MHz) | Liquid Type | Temperature (°C) | Conductivity (σ) | Permittivity (ϵ_r) | Measurement Date |
|--------------------|----------------|---------------------|------------------------------|----------------------------------|---------------------|
| 835 | Head | 21.2 | 0.897 | 40.8 | Nov. 03, 2011 |
| 835 | Body | 21.3 | 0.974 | 54.2 | Nov. 03, 2011 |
| 1900 | Head | 21.6 | 1.42 | 40.5 | Nov. 03, 2011 |
| 1900 | Body | 21.5 | 1.54 | 54.6 | Nov. 03, 2011 |

Table 6.3 Measuring Results for Simulating Liquid

| CH | Frequency (MHz) | Liquid Type | Conductivity (σ) | Permittivity (ϵ_r) | Measurement Date |
|-----|--------------------|----------------|------------------------------|----------------------------------|---------------------|
| 128 | 824.2 | Head | 0.888 | 40.9 | Nov. 03, 2011 |
| 128 | 824.2 | Body | 0.964 | 54.3 | Nov. 03, 2011 |
| 512 | 1850.2 | Head | 1.37 | 40.7 | Nov. 03, 2011 |
| 512 | 1850.2 | Body | 1.47 | 54.7 | Nov. 03, 2011 |

Table 6.4 Low/mid/High channel for liquid validation



7 Uncertainty Assessment

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

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

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience and knowledge of the behavior and properties of relevant materials and instruments, manufacturer's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 7.1

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

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

Table 7.1 Standard Uncertainty for Assumed Distribution

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

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is showed in Table 7.2.



| Error Description | Uncertainty Value (±%) | Probability Distribution | Divisor | Ci (1g) | Standard Uncertainty (1g) |
|--------------------------------------|---------------------------|--------------------------|------------|------------|------------------------------|
| Measurement System | | | | | |
| Probe Calibration | 6.0 | Normal | 1 | 1 | ± 6.0 % |
| Axial Isotropy | 4.7 | Rectangular | $\sqrt{3}$ | 0.7 | ± 1.9 % |
| Hemispherical Isotropy | 9.6 | Rectangular | $\sqrt{3}$ | 0.7 | ± 3.9 % |
| Boundary Effects | 1.0 | Rectangular | $\sqrt{3}$ | 1 | ± 0.6 % |
| Linearity | 4.7 | Rectangular | $\sqrt{3}$ | 1 | ± 2.7 % |
| System Detection Limits | 1.0 | Rectangular | $\sqrt{3}$ | 1 | ± 0.6 % |
| Readout Electronics | 0.3 | Normal | 1 | 1 | ± 0.3 % |
| Response Time | 0.8 | Rectangular | $\sqrt{3}$ | 1 | ± 0.5 % |
| Integration Time | 2.6 | Rectangular | $\sqrt{3}$ | 1 | ± 1.5 % |
| RF Ambient Noise | 3.0 | Rectangular | $\sqrt{3}$ | 1 | ± 1.7 % |
| RF Ambient Reflections | 3.0 | Rectangular | $\sqrt{3}$ | 1 | ± 1.7 % |
| Probe Positioner | 0.4 | Rectangular | $\sqrt{3}$ | 1 | ± 0.2 % |
| Probe Positioning | 2.9 | Rectangular | $\sqrt{3}$ | 1 | ± 1.7 % |
| Max. SAR Eval. | 1.0 | Rectangular | $\sqrt{3}$ | 1 | ± 0.6 % |
| Test Sample Related | | | | | |
| Device Positioning | 2.9 | Normal | 1 | 1 | ± 2.9 % |
| Device Holder | 3.6 | Normal | 1 | 1 | ± 3.6 % |
| Power Drift | 5.0 | Rectangular | $\sqrt{3}$ | 1 | ± 2.9 % |
| Phantom and Setup | | | | | |
| Phantom Uncertainty | 4.0 | Rectangular | $\sqrt{3}$ | 1 | ± 2.3 % |
| Liquid Conductivity (Target) | 5.0 | Rectangular | $\sqrt{3}$ | 0.64 | ± 1.8 % |
| Liquid Conductivity (Meas.) | 2.5 | Normal | 1 | 0.64 | ± 1.6 % |
| Liquid Permittivity (Target) | 5.0 | Rectangular | $\sqrt{3}$ | 0.6 | ± 1.7 % |
| Liquid Permittivity (Meas.) | 2.5 | Normal | 1 | 0.6 | ± 1.5 % |
| Combined Standard Uncertainty | | | | | |
| Coverage Factor for 95 % | | | | | |
| Expanded Uncertainty | | | | | |

Table 7.2 Uncertainty Budget of DASY for frequency range 300 MHz to 3 GHz

8 SAR Measurement Evaluation

Each DASY system is equipped with one or more system validation kits. These units, together with the predefined measurement procedures within the DASY software, enable the user to conduct the system performance check and system validation. System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder.

8.1 Purpose of System Performance check

The system performance check verifies that the system operates within its specifications. System and operator errors can be detected and corrected. It is recommended that the system performance check be performed prior to any usage of the system in order to guarantee reproducible results. The system performance check uses normal SAR measurements in a simplified setup with a well characterized source. This setup was selected to give a high sensitivity to all parameters that might fail or vary over time. The system check does not intend to replace the calibration of the components, but indicates situations where the system uncertainty is exceeded due to drift or failure.

8.2 System Setup

In the simplified setup for system evaluation, the DUT is replaced by a calibrated dipole and the power source is replaced by a continuous wave that comes from a signal generator. The calibrated dipole must be placed beneath the flat phantom section of the SAM twin phantom with the correct distance holder. The distance holder should touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The equipment setup is shown below:

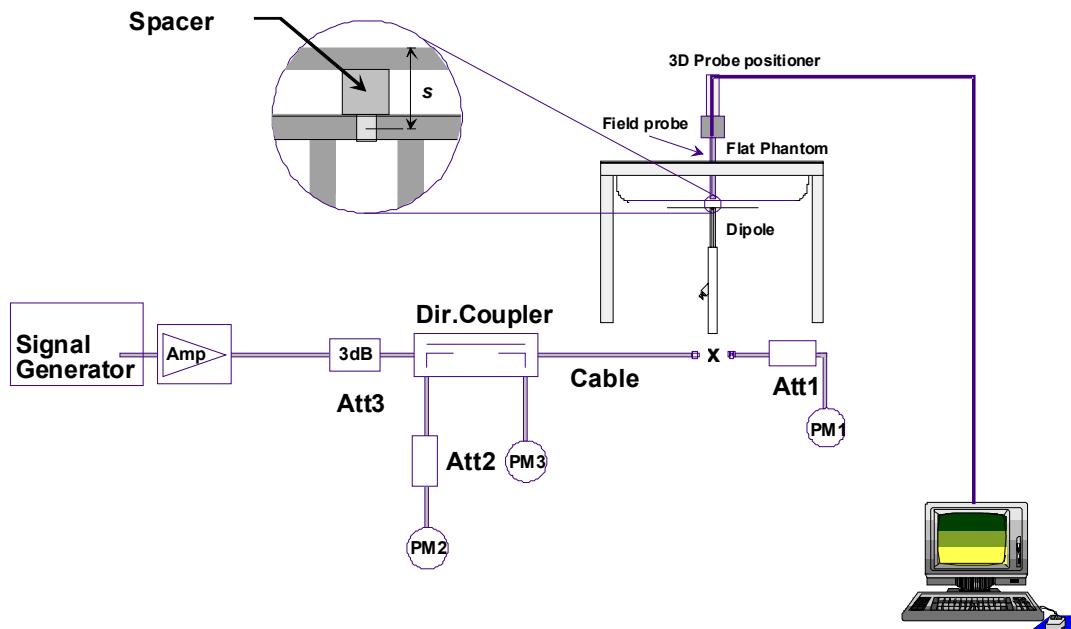


Fig 8.1 System Setup for System Evaluation

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. Calibrated Dipole

The output power on dipole port must be calibrated to 24 dBm (250 mW) before dipole is connected.



Fig 8.2 Photo of Dipole Setup

8.3 Validation Results

Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %. Table 8.1 shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

| Measurement Date | Frequency (MHz) | Targeted SAR _{1g} (W/kg) | Measured SAR _{1g} (W/kg) | Normalized SAR _{1g} (W/kg) | Deviation (%) |
|------------------|-----------------|-----------------------------------|-----------------------------------|-------------------------------------|---------------|
| Nov. 03, 2011 | 835 | 9.600 | 2.280 | 9.12 | -5.00 |
| Nov. 03, 2011 | 835 | 9.800 | 2.390 | 9.56 | -2.45 |
| Nov. 03, 2011 | 1900 | 39.200 | 9.020 | 36.08 | -7.96 |
| Nov. 03, 2011 | 1900 | 39.600 | 9.660 | 38.64 | -2.42 |

Table 8.1 Target and Measurement SAR after Normalized

9 DUT Testing Position

This DUT was tested in six different positions. They are right cheek, right tilted, left cheek, left tilted, face of the DUT with phantom 1.5 cm gap, bottom of the DUT with phantom 1.5 cm gap, as illustrated below:

1. Define two imaginary lines on the handset

- (a) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.
- (b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
- (c) 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, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

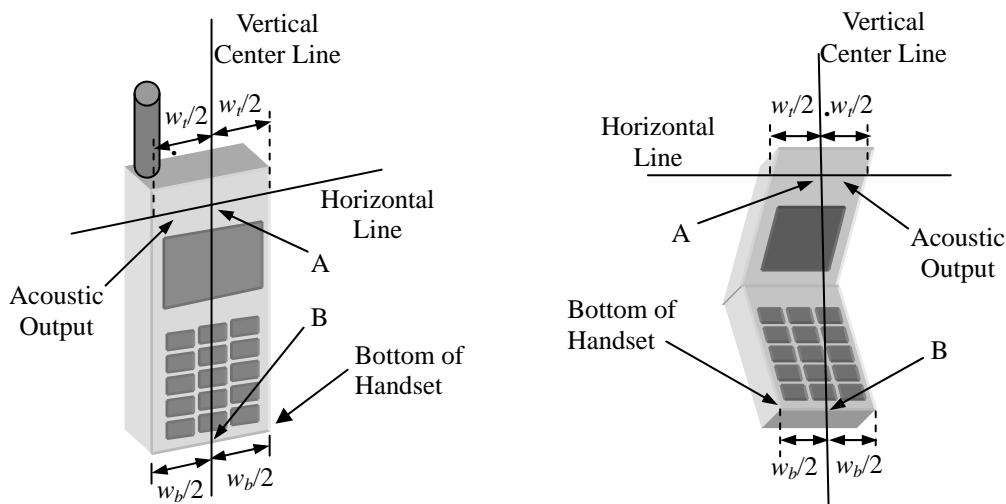


Fig 9.1 Illustration for Handset Vertical and Horizontal Reference Lines

2. Cheek Position

- (a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
- (b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig. 9.2).

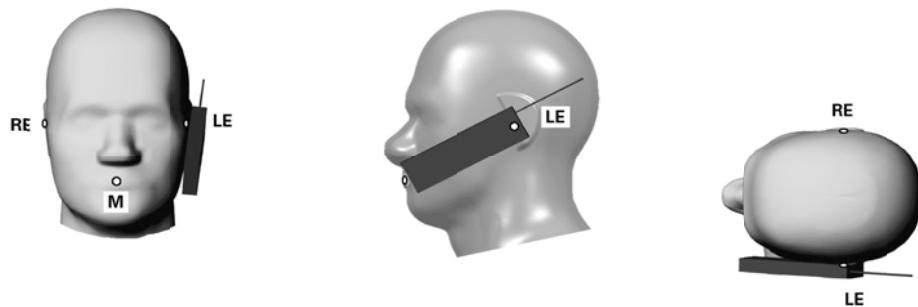


Fig 9.2 Illustration for Cheek Position

3. Tilted Position

- (a) To position the device in the "cheek" position described above.
- (b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig. 9.3).

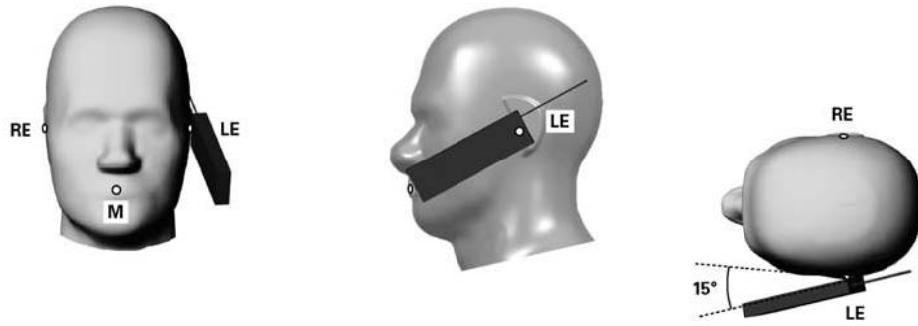


Fig 9.3 Illustration for Tilted Position

4. Body Worn Position

- (a) To position the device parallel to the phantom surface with either keypad up or down.
- (b) To adjust the device parallel to the flat phantom.
- (c) To adjust the distance between the device surface and the flat phantom to 1.5 cm.

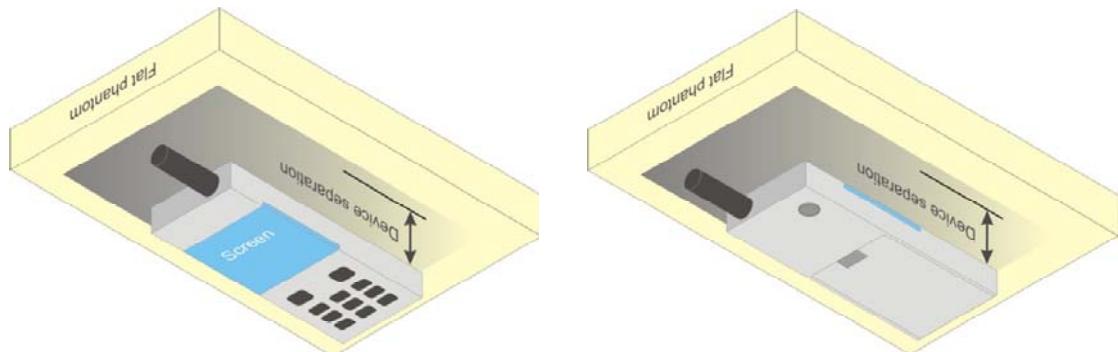


Fig 9.4 Illustration for Body Worn Position

<DUT Setup Photos>

Please refer to Appendix D for the test setup photos.



10 Measurement Procedures

The measurement procedures are as follows:

- (a) For WWAN function, link DUT with base station emulator in highest power channel
- (b) Set base station emulator to allow DUT to radiate maximum output power
- (c) Measure output power through RF cable and power meter
- (d) Place the DUT in the positions described in the last section
- (e) Set scan area, grid size and other setting on the DASY software
- (f) Taking data for the highest power channel on each testing position
- (g) Find out the largest SAR result on these testing positions of each band
- (h) Measure SAR results for other channels in worst SAR testing position if the SAR of highest power channel is larger than 0.8 W/kg

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

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

10.1 Spatial Peak SAR Evaluation

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

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

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

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



10.2 Area & Zoom Scan Procedures

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz, and 8x8x8 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

10.3 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the DUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing (step-size is 4, 4 and 2.5 mm). When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

10.4 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

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. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

10.5 Power Drift Monitoring

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



11 SAR Test Results

11.1 Conducted Power (Unit: dBm)

<GSM>

| GSM Burst Average Power | | | | | | |
|-------------------------|--------|-------|-------|---------|--------|--------|
| Band | GSM850 | | | GSM1900 | | |
| Channel | 128 | 189 | 251 | 512 | 661 | 810 |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 | 1850.2 | 1880.0 | 1909.8 |
| GSM (1 Uplink) | 32.10 | 31.98 | 31.89 | 29.48 | 29.43 | 29.37 |

Note: Maximum burst average power in the table above.

| Source-Based Time-Averaged Power | | | | | | |
|----------------------------------|--------|-------|-------|---------|--------|--------|
| Band | GSM850 | | | GSM1900 | | |
| Channel | 128 | 189 | 251 | 512 | 661 | 810 |
| Frequency (MHz) | 824.2 | 836.4 | 848.8 | 1850.2 | 1880.0 | 1909.8 |
| GSM (1 Uplink) | 23.10 | 22.98 | 22.89 | 20.48 | 20.43 | 20.37 |

Remark:

The source-based time-averaged power is linearly scaled the maximum burst averaged power based on time slots. The calculated method are shown as below:

Source based time averaged power = Maximum burst averaged power (1 Uplink) - 9 dB

Note:

Per 2010/10 workshop, the maximum output power channel is used for SAR testing and for further SAR test reduction.



11.2 Test Records for Head SAR Test

<GSM>

| Plot No. | Band | Mode | Test Position | Ch. | SAR _{1g} (W/kg) |
|----------|----------------|------------|--------------------|------------|--------------------------|
| 1 | GSM850 | GSM | Right Cheek | 128 | 0.633 |
| 2 | GSM850 | GSM | Right Tilted | 128 | 0.296 |
| 3 | GSM850 | GSM | Left Cheek | 128 | 0.687 |
| 4 | GSM850 | GSM | Left Tited | 128 | 0.333 |
| 5 | GSM1900 | GSM | Right Cheek | 512 | 0.335 |
| 6 | GSM1900 | GSM | Right Tilted | 512 | 0.186 |
| 7 | GSM1900 | GSM | Left Cheek | 512 | 0.287 |
| 8 | GSM1900 | GSM | Left Tited | 512 | 0.143 |

Note:

Per KDB 447498, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

11.3 Test Records for Body SAR Test

<GSM>

| Plot No. | Band | Mode | Test Position | Gap (cm) | Ch. | SAR _{1g} (W/kg) |
|-----------|----------------|------------|---------------|------------|------------|--------------------------|
| 9 | GSM850 | GSM | Face | 1.5 | 128 | 0.309 |
| 10 | GSM850 | GSM | Bottom | 1.5 | 128 | 0.5 |
| 11 | GSM1900 | GSM | Face | 1.5 | 512 | 0.164 |
| 12 | GSM1900 | GSM | Bottom | 1.5 | 512 | 0.257 |

Note:

Per KDB 447498, if the highest output channel SAR for each exposure position ≤ 0.8 W/kg other channels SAR tests are not necessary.

Test Engineer : Eric Huang and A-Rod Chen



12 References

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] IEEE Std. C95.1-1991, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", 1991
- [3] IEEE Std. 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- [4] FCC OET Bulletin 65 (Edition 97-01) Supplement C (Edition 01-01), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", June 2001
- [5] SPEAG DASY System Handbook
- [6] FCC KDB 248227 D01 v01r02, "SAR Measurement Procedures for 802.11 a/b/g Transmitters", May 2007
- [7] FCC KDB 447498 D01 v04, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", November 2009
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- [9] FCC KDB 616217 D01 v01r01, "SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens", November 2009
- [10] FCC KDB 616217 D03 v01, "SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers", November 2009
- [11] FCC KDB 648474 D01 v01r05, "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas", September 2008
- [12] FCC KDB 941225 D01 v02, "SAR Measurement Procedures for 3G Devices – CDMA 2000 / Ev-Do / WCDMA / HSDPA / HSPA", October 2007
- [13] FCC KDB 941225 D02 v02 "3GPP R6 HSPA and R7 HSPA+ SAR Guidance", December 2009.
- [14] FCC KDB 941225 D03 v01, "Recommended SAR Test Reduction Procedures for GSM / GPRS / EDGE", December 2008
- [15] FCC KDB 941225 D04 v01, "Evaluating SAR for GSM/(E)GPRS Dual Transfer Mode", January 27 2010



Appendix A. Plots of System Performance Check

The plots are shown as follows.

System Check_Head_835MHz_111103**DUT: Dipole 835 MHz**

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

Medium: HSL_835_111103 Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.897 \text{ mho/m}$; $\epsilon_r = 40.781$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.3 °C; Liquid Temperature : 21.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.45, 8.45, 8.45); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.455 mW/g

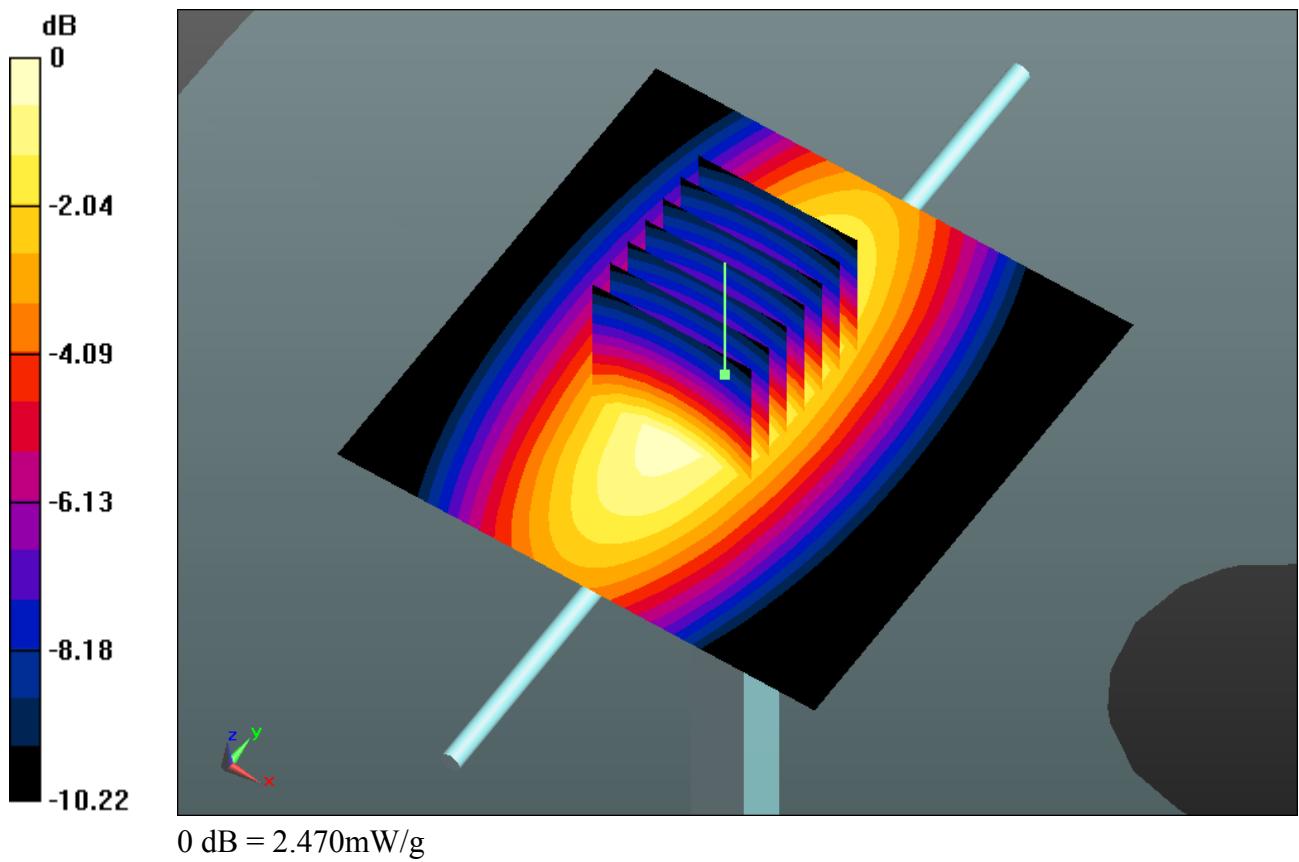
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.815 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.420 W/kg

SAR(1 g) = 2.28 mW/g; SAR(10 g) = 1.5 mW/g

Maximum value of SAR (measured) = 2.471 mW/g



System Check_Body_835MHz_111103**DUT: Dipole 835 MHz**

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

Medium: MSL_835_111103 Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.974 \text{ mho/m}$; $\epsilon_r = 54.204$;
 $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.4 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.67, 8.67, 8.67); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.586 mW/g

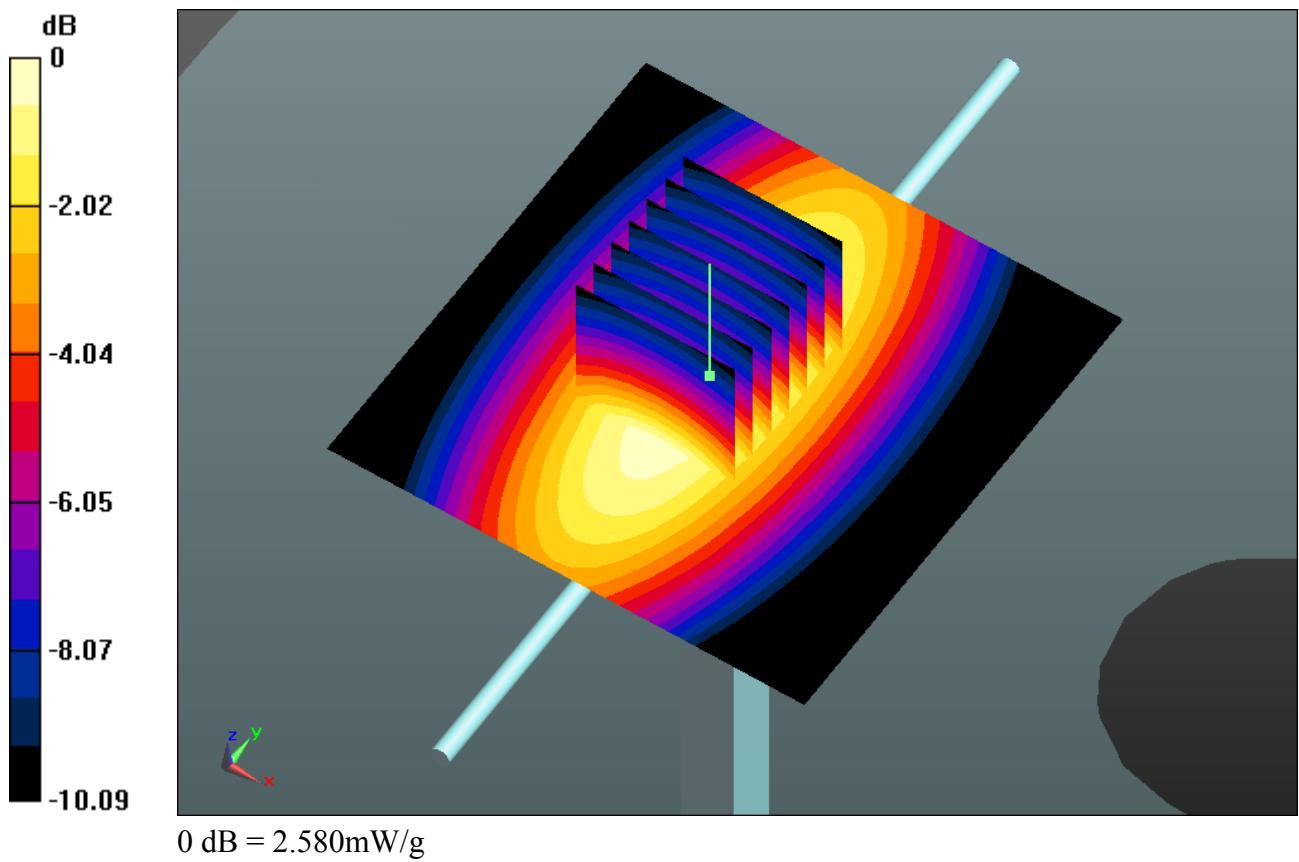
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.275 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.537 W/kg

SAR(1 g) = 2.39 mW/g; SAR(10 g) = 1.58 mW/g

Maximum value of SAR (measured) = 2.578 mW/g



System Check_Head_1900MHz_111103**DUT: Dipole 1900 MHz**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL_1900_111103 Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.415 \text{ mho/m}$; $\epsilon_r = 40.527$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5 °C; Liquid Temperature : 21.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(7.46, 7.46, 7.46); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 10.265 mW/g

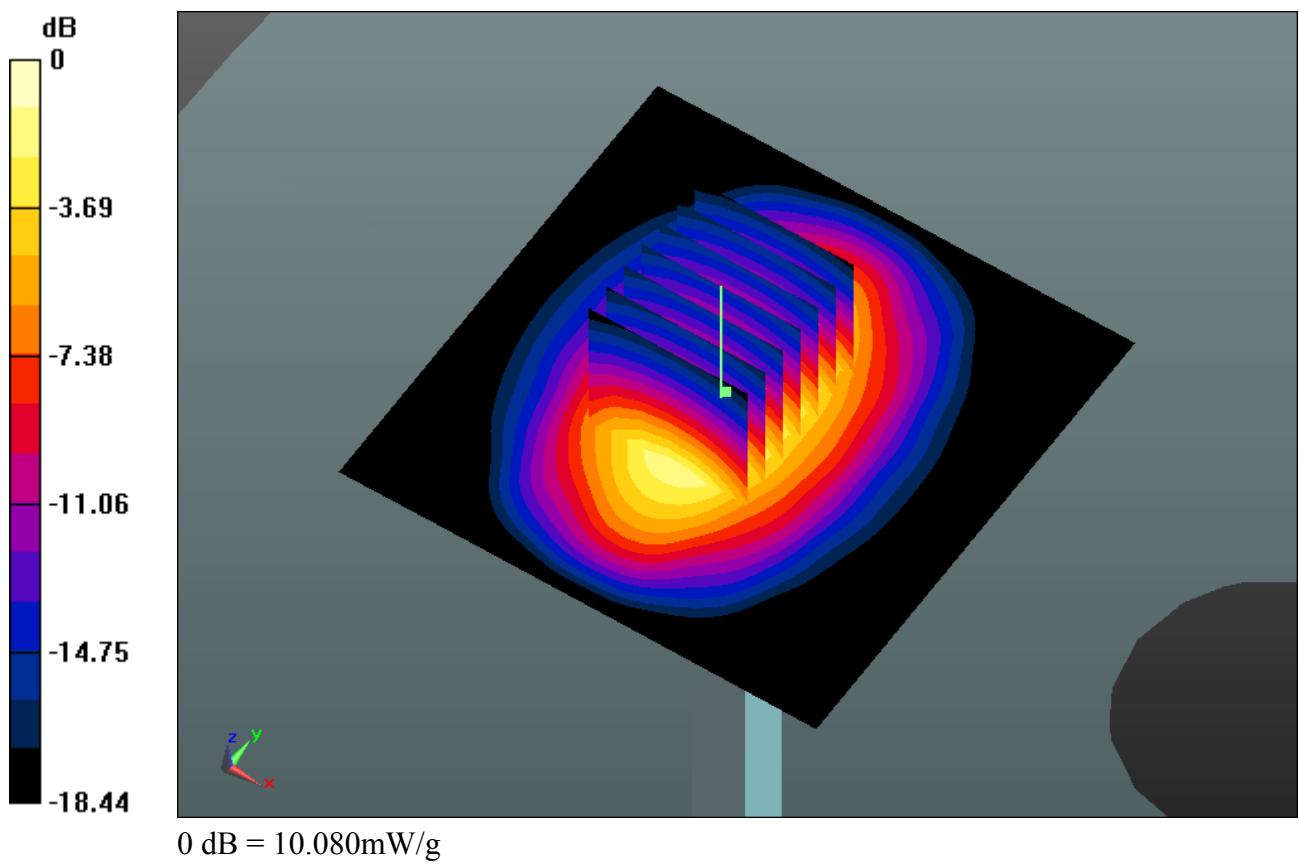
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 84.019 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 17.547 W/kg

SAR(1 g) = 9.02 mW/g; SAR(10 g) = 4.59 mW/g

Maximum value of SAR (measured) = 10.078 mW/g



System Check_Body_1900MHz_111103**DUT: Dipole 1900 MHz**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL_1900_111103 Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.535 \text{ mho/m}$; $\epsilon_r = 54.579$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.3 °C; Liquid Temperature : 21.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 10.968 mW/g

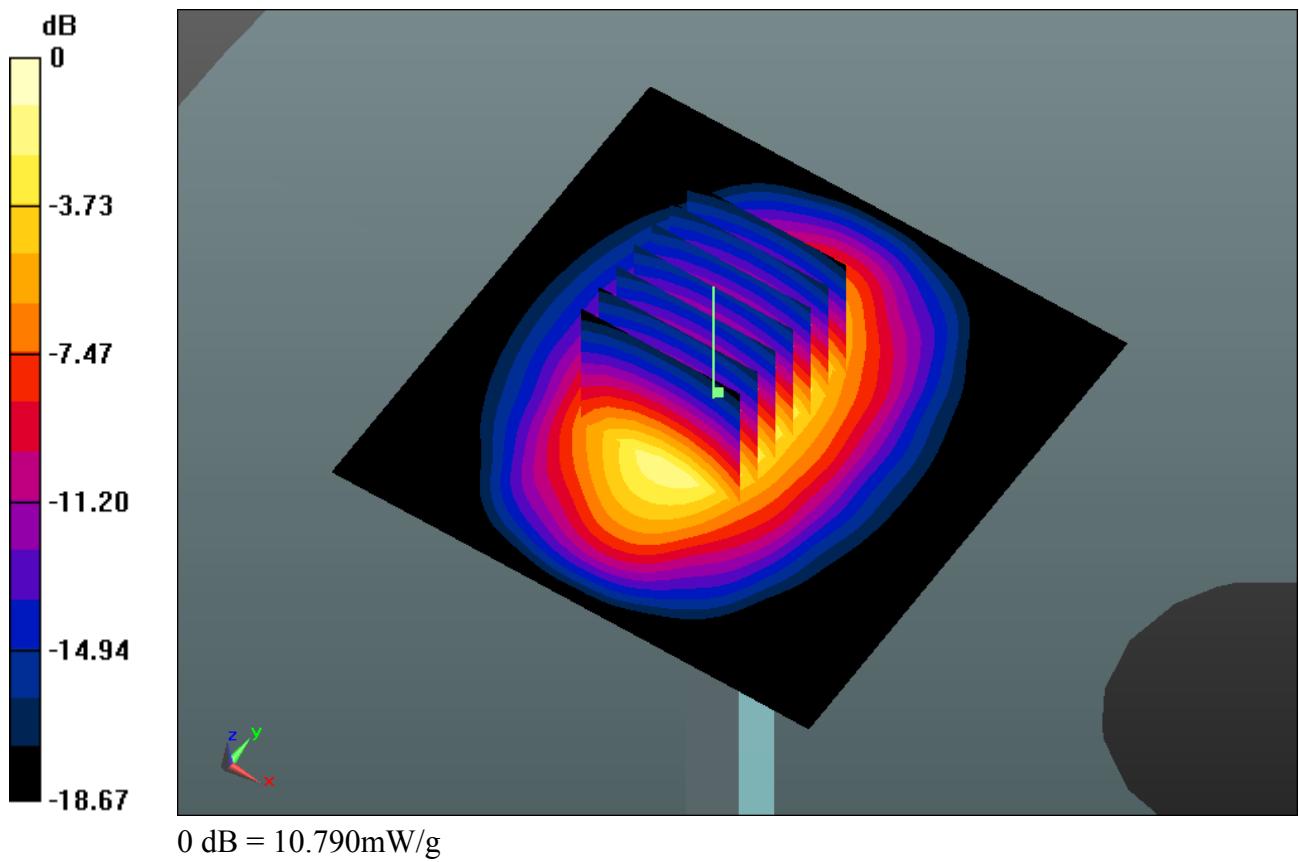
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 83.211 V/m; Power Drift = -0.0045 dB

Peak SAR (extrapolated) = 18.891 W/kg

SAR(1 g) = 9.66 mW/g; SAR(10 g) = 4.9 mW/g

Maximum value of SAR (measured) = 10.787 mW/g





Appendix B. Plots of SAR Measurement

The plots are shown as follows.

#01 GSM850_Right Cheek_Ch128**DUT: 102406**

Communication System: Generic GSM; Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: HSL_835_111103 Medium parameters used: $f = 824.2 \text{ MHz}$; $\sigma = 0.888 \text{ mho/m}$; $\epsilon_r = 40.885$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : 23.3 °C; Liquid Temperature : 21.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.45, 8.45, 8.45); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch128/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.698 mW/g

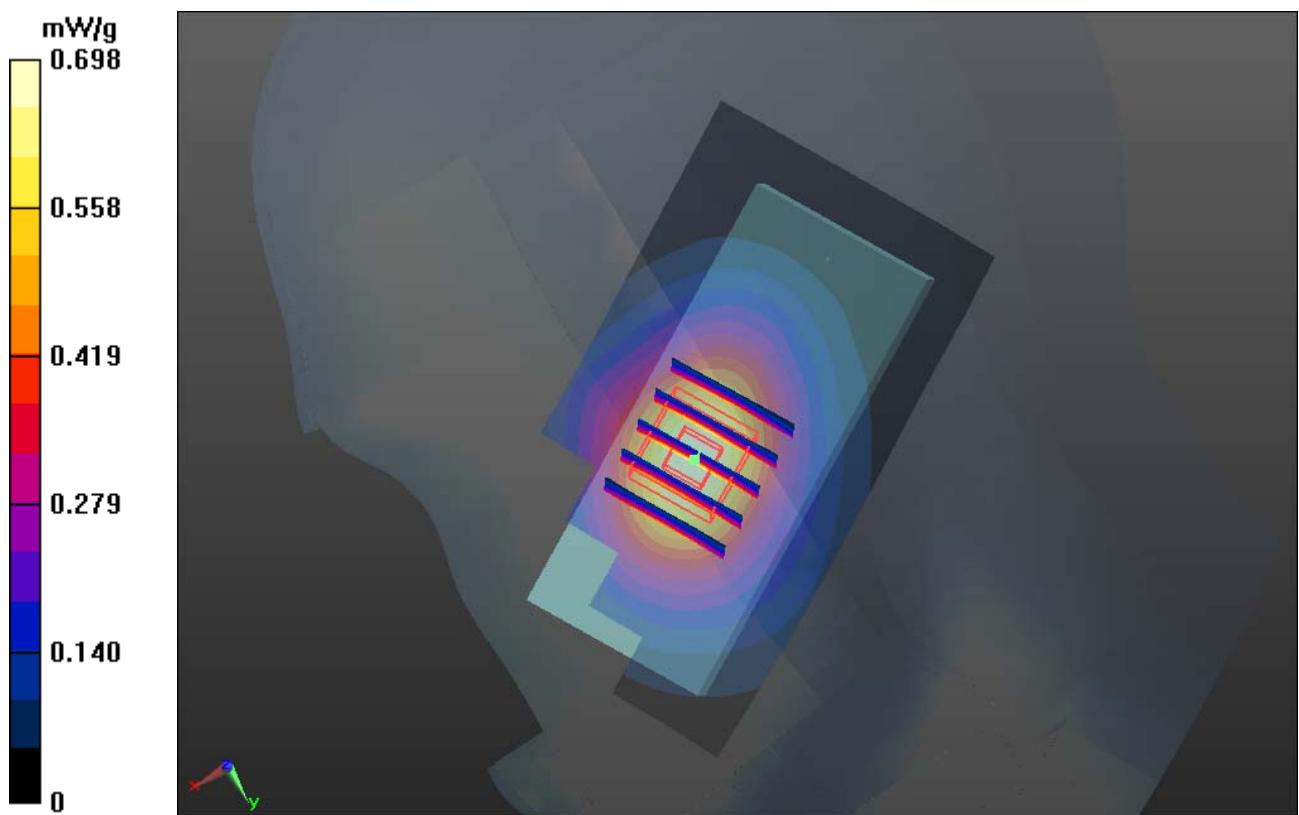
Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.941 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.850 W/kg

SAR(1 g) = 0.633 mW/g; SAR(10 g) = 0.433 mW/g

Maximum value of SAR (measured) = 0.676 mW/g



#02 GSM850_Right Tilted_Ch128**DUT: 102406**

Communication System: Generic GSM; Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: HSL_835_111103 Medium parameters used: $f = 824.2 \text{ MHz}$; $\sigma = 0.888 \text{ mho/m}$; $\epsilon_r = 40.885$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : 23.3 °C; Liquid Temperature : 21.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.45, 8.45, 8.45); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

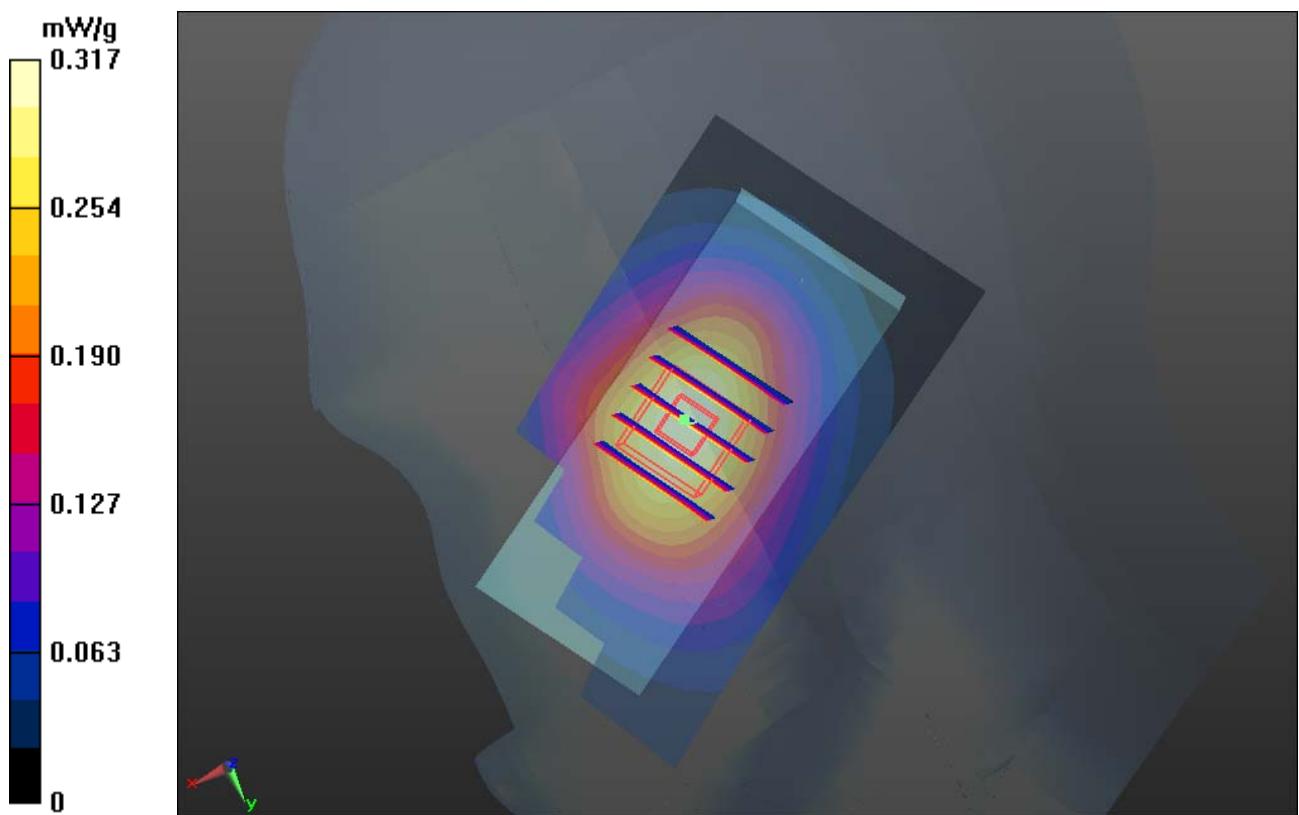
Ch128/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.317 mW/g

Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.331 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.391 W/kg

SAR(1 g) = 0.296 mW/g; SAR(10 g) = 0.213 mW/g

Maximum value of SAR (measured) = 0.313 mW/g



#03 GSM850_Left Cheek_Ch128**DUT: 102406**

Communication System: Generic GSM; Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: HSL_835_111103 Medium parameters used: $f = 824.2 \text{ MHz}$; $\sigma = 0.888 \text{ mho/m}$; $\epsilon_r = 40.885$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : 23.3 °C; Liquid Temperature : 21.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.45, 8.45, 8.45); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

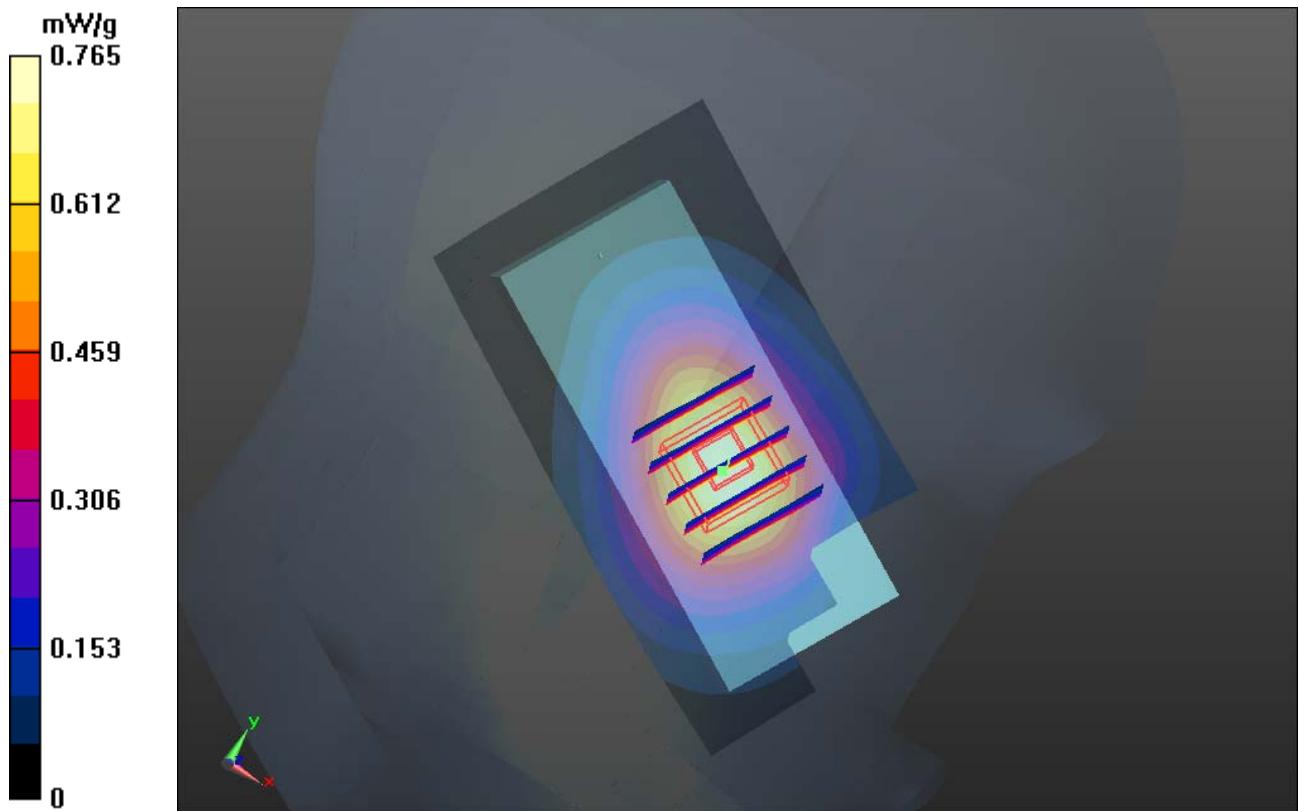
Ch128/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.765 mW/g

Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.882 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.917 W/kg

SAR(1 g) = 0.687 mW/g; SAR(10 g) = 0.475 mW/g

Maximum value of SAR (measured) = 0.731 mW/g



#03 GSM850_Left Cheek_Ch128_2D**DUT: 102406**

Communication System: Generic GSM; Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: HSL_835_111103 Medium parameters used: $f = 824.2 \text{ MHz}$; $\sigma = 0.888 \text{ mho/m}$; $\epsilon_r = 40.885$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : 23.3 °C; Liquid Temperature : 21.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.45, 8.45, 8.45); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

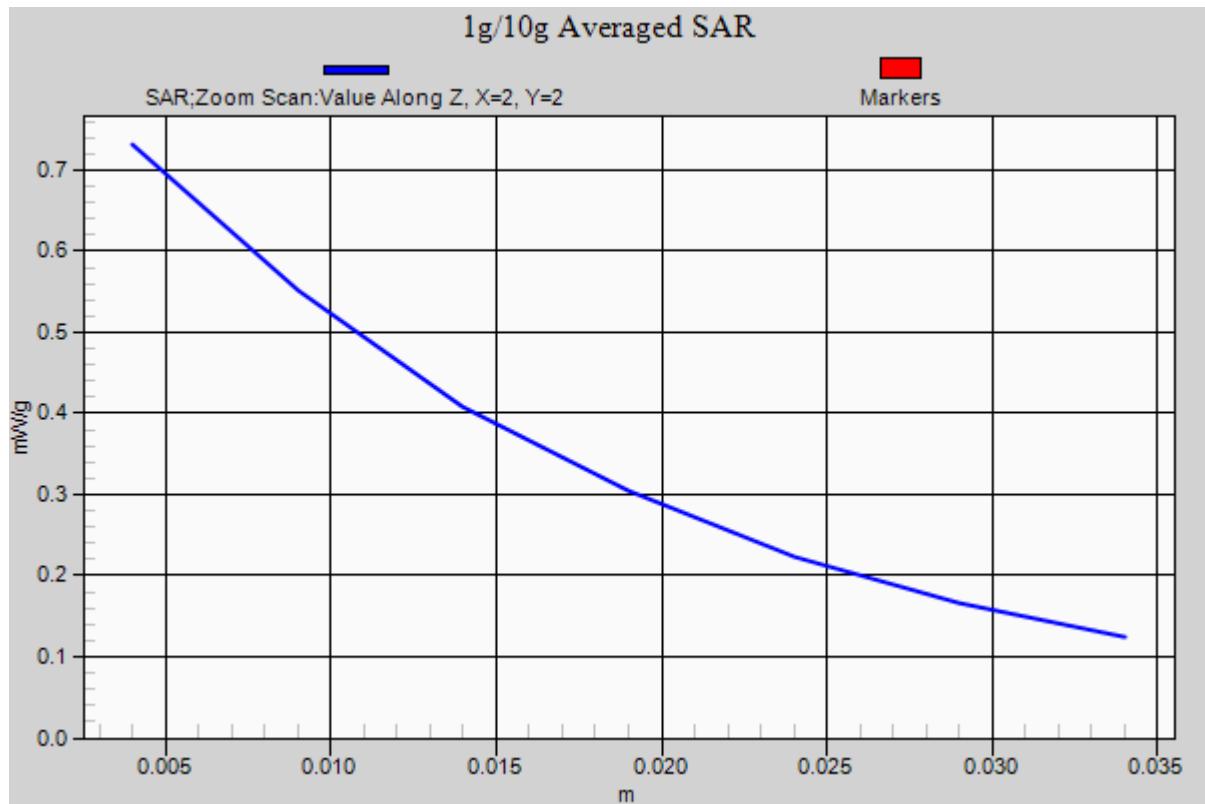
Ch128/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.765 mW/g

Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.882 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.917 W/kg

SAR(1 g) = 0.687 mW/g; SAR(10 g) = 0.475 mW/g

Maximum value of SAR (measured) = 0.731 mW/g



#04 GSM850_Left Tilted_Ch128**DUT: 102406**

Communication System: Generic GSM; Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: HSL_835_111103 Medium parameters used: $f = 824.2 \text{ MHz}$; $\sigma = 0.888 \text{ mho/m}$; $\epsilon_r = 40.885$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : 23.3 °C; Liquid Temperature : 21.2 °C

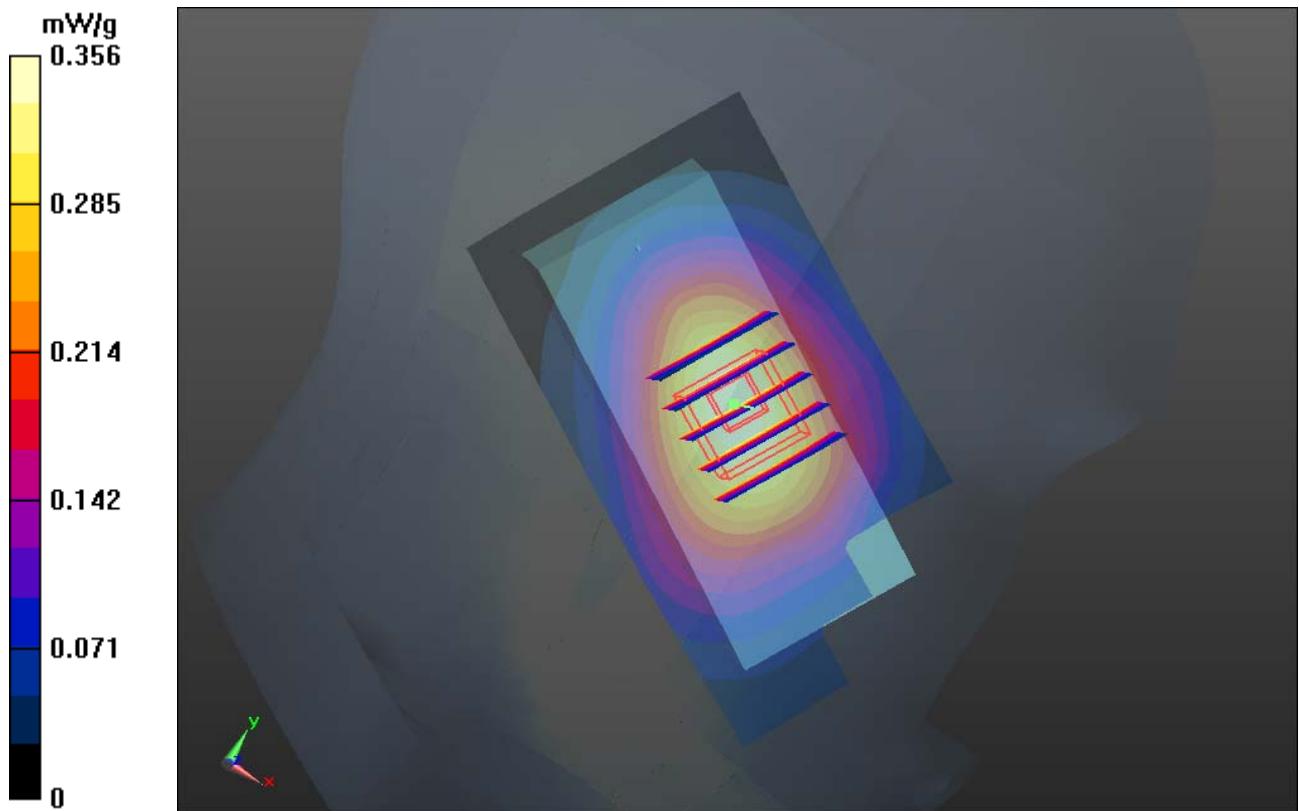
DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.45, 8.45, 8.45); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch128/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.356 mW/g

Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.260 V/m; Power Drift = -0.0015 dB
Peak SAR (extrapolated) = 0.442 W/kg

SAR(1 g) = 0.333 mW/g; SAR(10 g) = 0.240 mW/g
Maximum value of SAR (measured) = 0.351 mW/g



#05 GSM1900_Right Cheek_Ch512**DUT: 102406**

Communication System: Generic GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: HSL_1900_111103 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.369 \text{ mho/m}$; $\epsilon_r = 40.694$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5 °C; Liquid Temperature : 21.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(7.46, 7.46, 7.46); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch512/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.383 mW/g

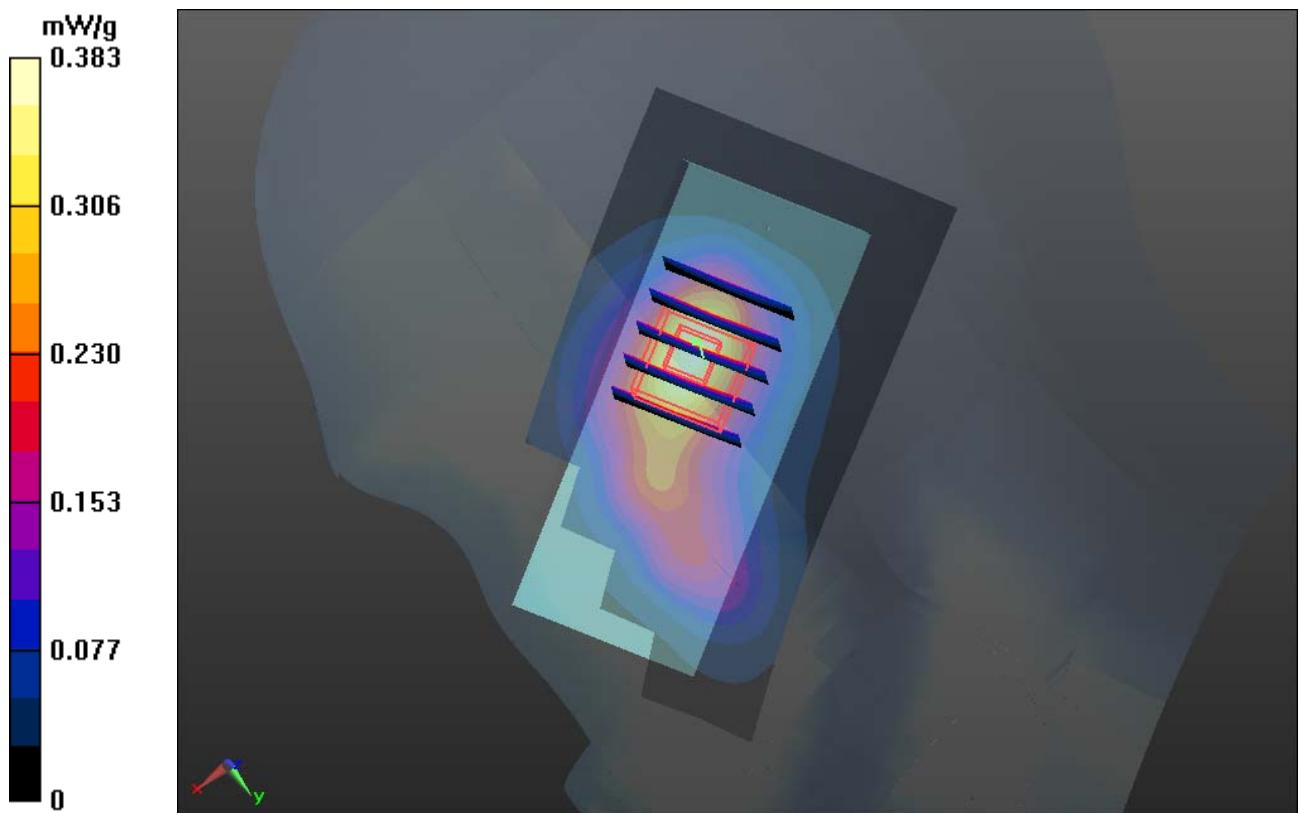
Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.321 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.523 W/kg

SAR(1 g) = 0.335 mW/g; SAR(10 g) = 0.197 mW/g

Maximum value of SAR (measured) = 0.365 mW/g



#05 GSM1900_Right Cheek_Ch512_2D**DUT: 102406**

Communication System: Generic GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: HSL_1900_111103 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.369 \text{ mho/m}$; $\epsilon_r = 40.694$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5 °C; Liquid Temperature : 21.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(7.46, 7.46, 7.46); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch512/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.383 mW/g

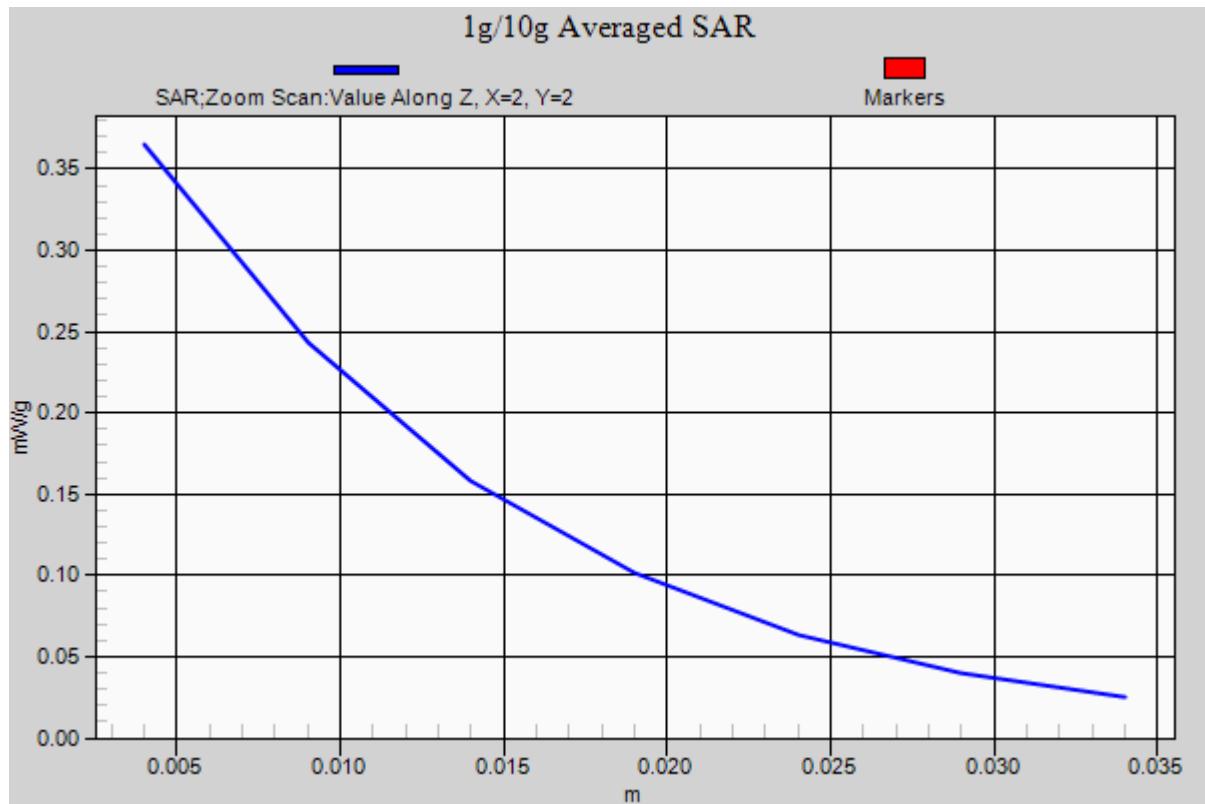
Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.321 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.523 W/kg

SAR(1 g) = 0.335 mW/g; SAR(10 g) = 0.197 mW/g

Maximum value of SAR (measured) = 0.365 mW/g



#06 GSM1900_Right Tilted_Ch512**DUT: 102406**

Communication System: Generic GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: HSL_1900_111103 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.369 \text{ mho/m}$; $\epsilon_r = 40.694$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5 °C; Liquid Temperature : 21.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(7.46, 7.46, 7.46); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch512/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.210 mW/g

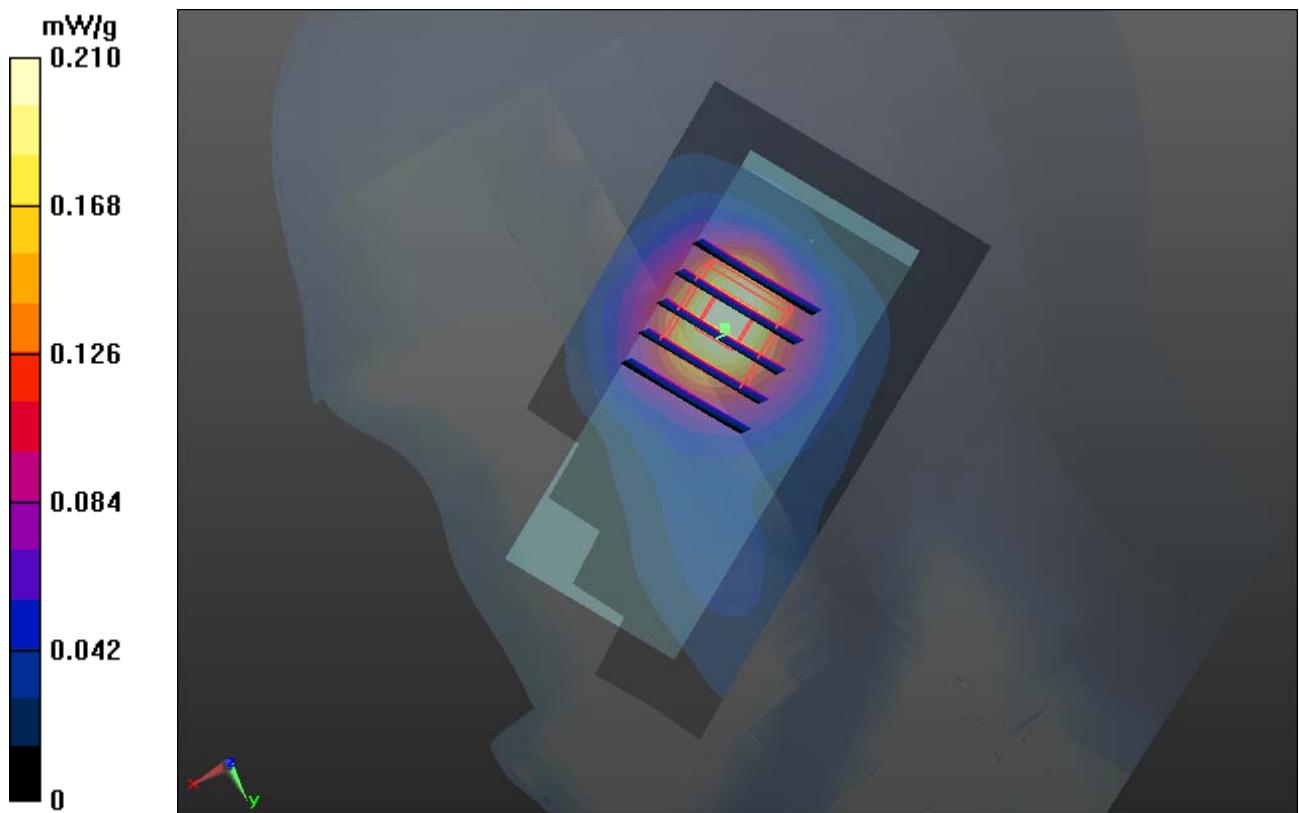
Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.811 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.296 W/kg

SAR(1 g) = 0.186 mW/g; SAR(10 g) = 0.108 mW/g

Maximum value of SAR (measured) = 0.201 mW/g



#07 GSM1900_Left Cheek_Ch512**DUT: 102406**

Communication System: Generic GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: HSL_1900_111103 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.369 \text{ mho/m}$; $\epsilon_r = 40.694$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5 °C; Liquid Temperature : 21.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(7.46, 7.46, 7.46); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch512/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.317 mW/g

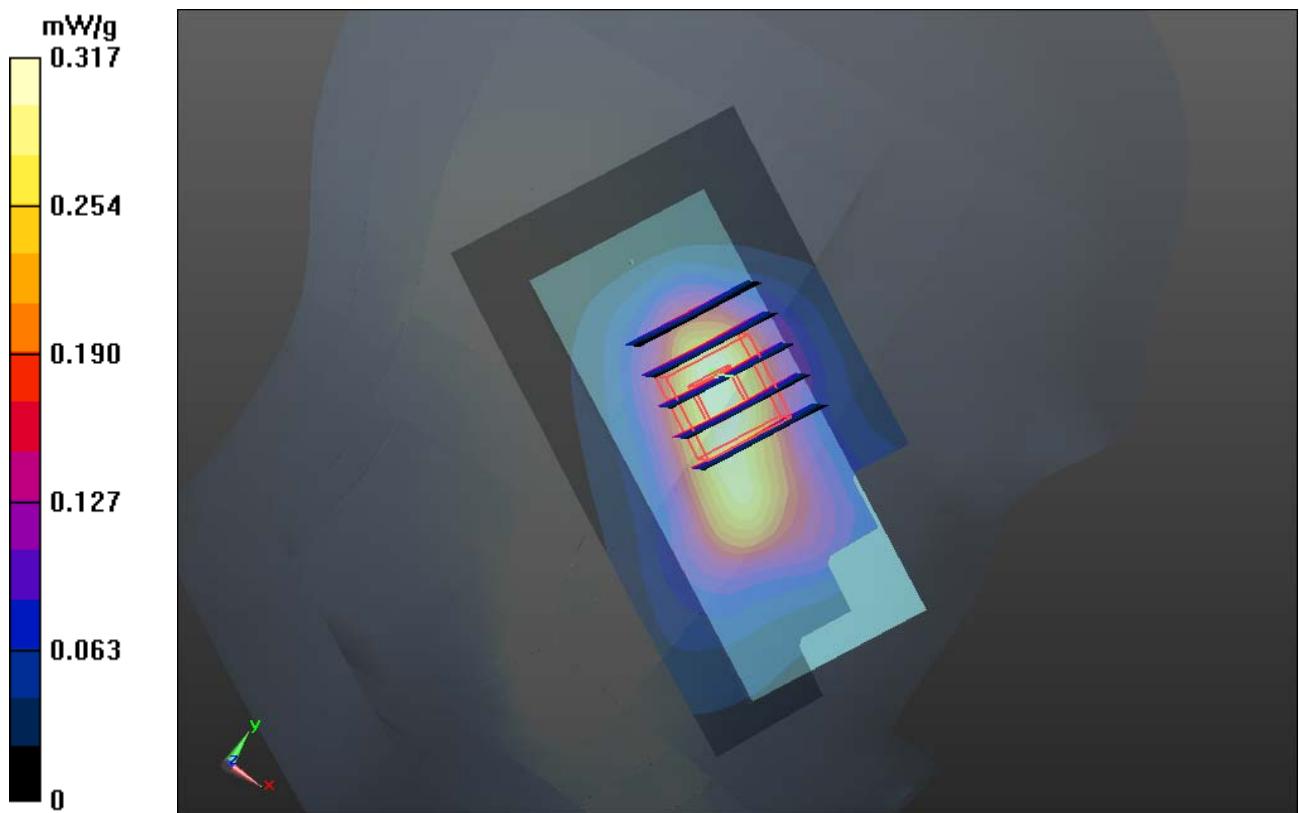
Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.208 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.438 W/kg

SAR(1 g) = 0.287 mW/g; SAR(10 g) = 0.171 mW/g

Maximum value of SAR (measured) = 0.310 mW/g



#08 GSM1900_Left Tilted_Ch512**DUT: 102406**

Communication System: Generic GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: HSL_1900_111103 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.369 \text{ mho/m}$; $\epsilon_r = 40.694$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.5 °C; Liquid Temperature : 21.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(7.46, 7.46, 7.46); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch512/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.169 mW/g

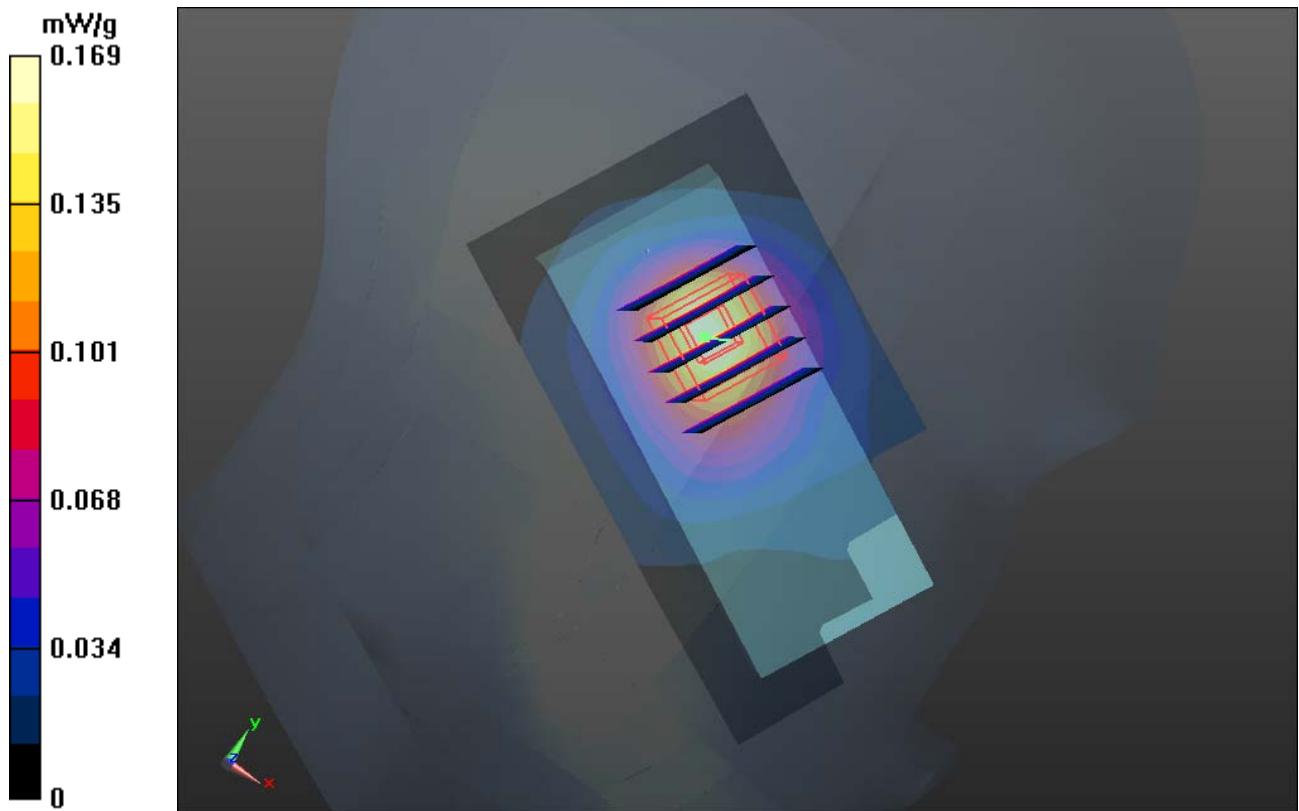
Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.073 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.227 W/kg

SAR(1 g) = 0.143 mW/g; SAR(10 g) = 0.085 mW/g

Maximum value of SAR (measured) = 0.156 mW/g



#09 GSM850_GSM_Face_1.5cm_Ch128**DUT: 102406**

Communication System: Generic GSM; Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: MSL_835_111103 Medium parameters used: $f = 824.2 \text{ MHz}$; $\sigma = 0.964 \text{ mho/m}$; $\epsilon_r = 54.288$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : 23.4 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.67, 8.67, 8.67); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

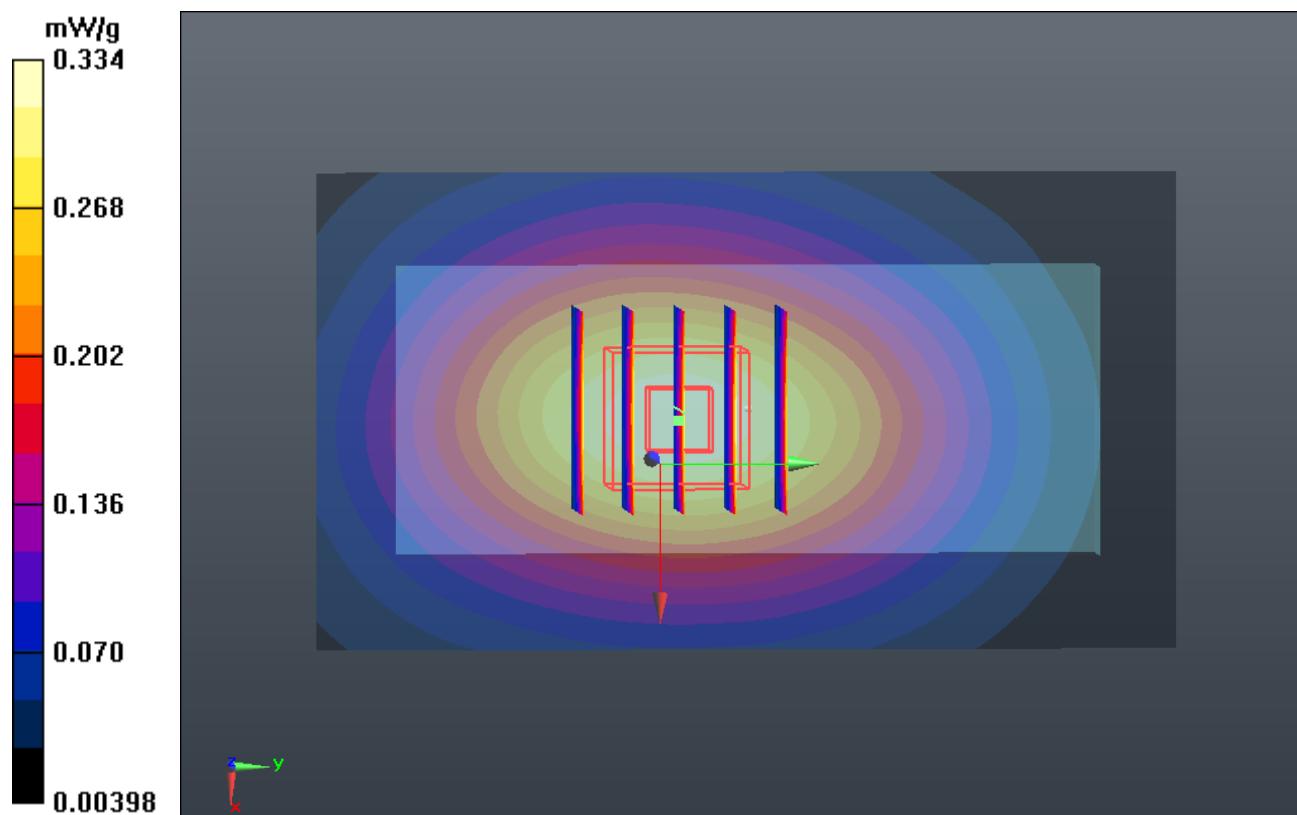
Ch128/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.334 mW/g

Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.165 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.404 W/kg

SAR(1 g) = 0.309 mW/g; SAR(10 g) = 0.224 mW/g

Maximum value of SAR (measured) = 0.328 mW/g



#10 GSM850_GSM_Bottom_1.5cm_Ch128**DUT: 102406**

Communication System: Generic GSM; Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: MSL_835_111103 Medium parameters used: $f = 824.2 \text{ MHz}$; $\sigma = 0.964 \text{ mho/m}$; $\epsilon_r = 54.288$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : 23.4 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.67, 8.67, 8.67); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

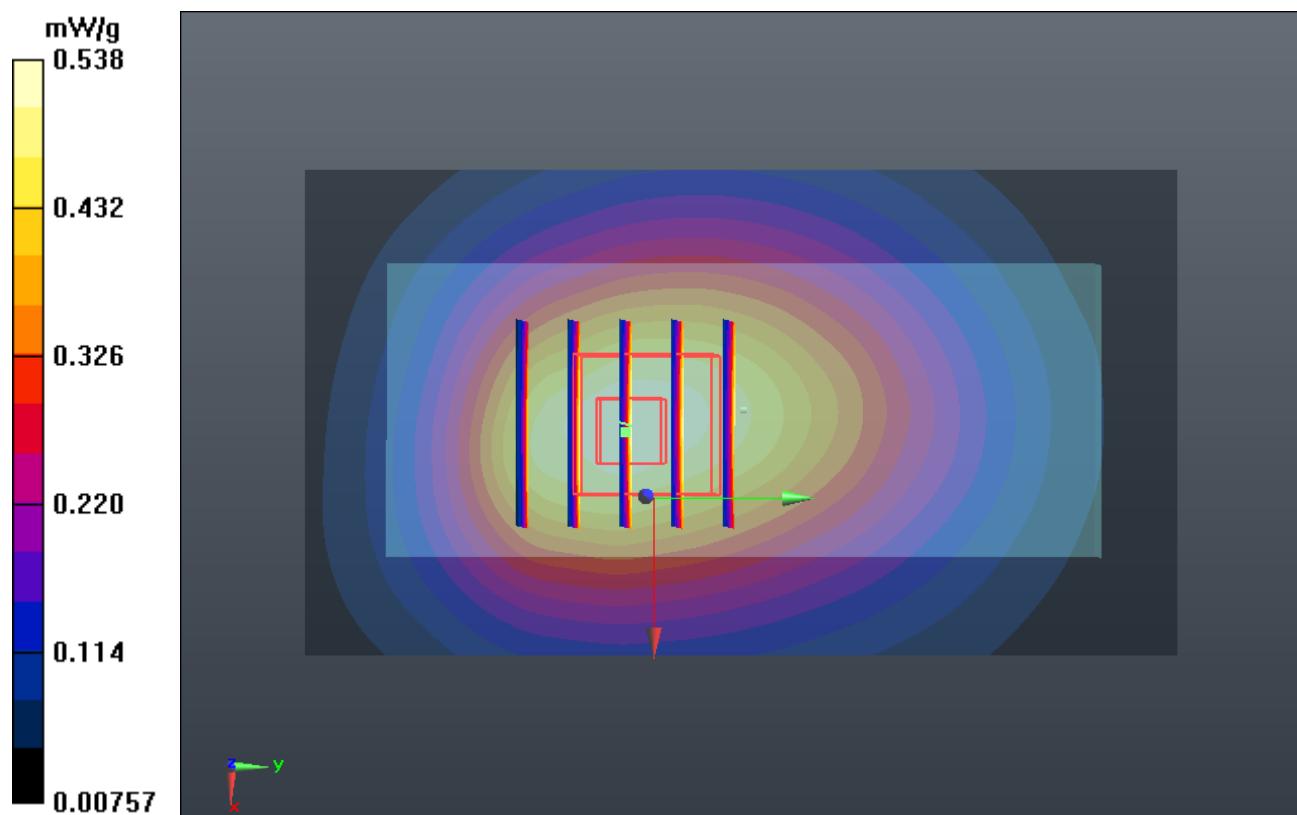
Ch128/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.538 mW/g

Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.614 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.652 W/kg

SAR(1 g) = 0.500 mW/g; SAR(10 g) = 0.364 mW/g

Maximum value of SAR (measured) = 0.528 mW/g



#10 GSM850_GSM_Bottom_1.5cm_Ch128_2D**DUT: 102406**

Communication System: Generic GSM; Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: MSL_835_111103 Medium parameters used: $f = 824.2 \text{ MHz}$; $\sigma = 0.964 \text{ mho/m}$; $\epsilon_r = 54.288$; $\rho = 1000 \text{ kg/m}^3$
Ambient Temperature : 23.4 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(8.67, 8.67, 8.67); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM2; Type: SAM; Serial: TP-1477
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

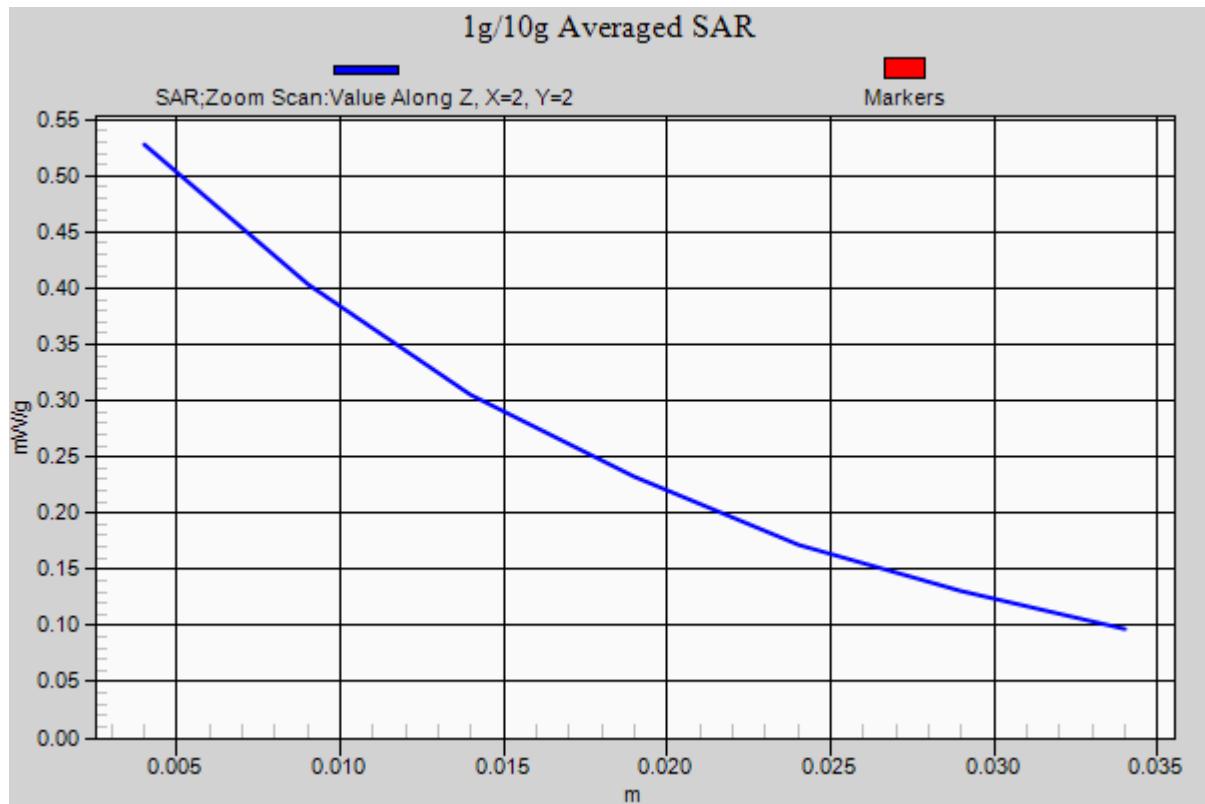
Ch128/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.538 mW/g

Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.614 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 0.652 W/kg

SAR(1 g) = 0.500 mW/g; SAR(10 g) = 0.364 mW/g

Maximum value of SAR (measured) = 0.528 mW/g



#11 GSM1900_GSM_Face_1.5cm_Ch512**DUT: 102406**

Communication System: Generic GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: MSL_1900_111103 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.472 \text{ mho/m}$; $\epsilon_r = 54.682$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.3 °C; Liquid Temperature : 21.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch512/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.180 mW/g

Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.107 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.267 W/kg

SAR(1 g) = 0.164 mW/g; SAR(10 g) = 0.094 mW/g

Maximum value of SAR (measured) = 0.187 mW/g

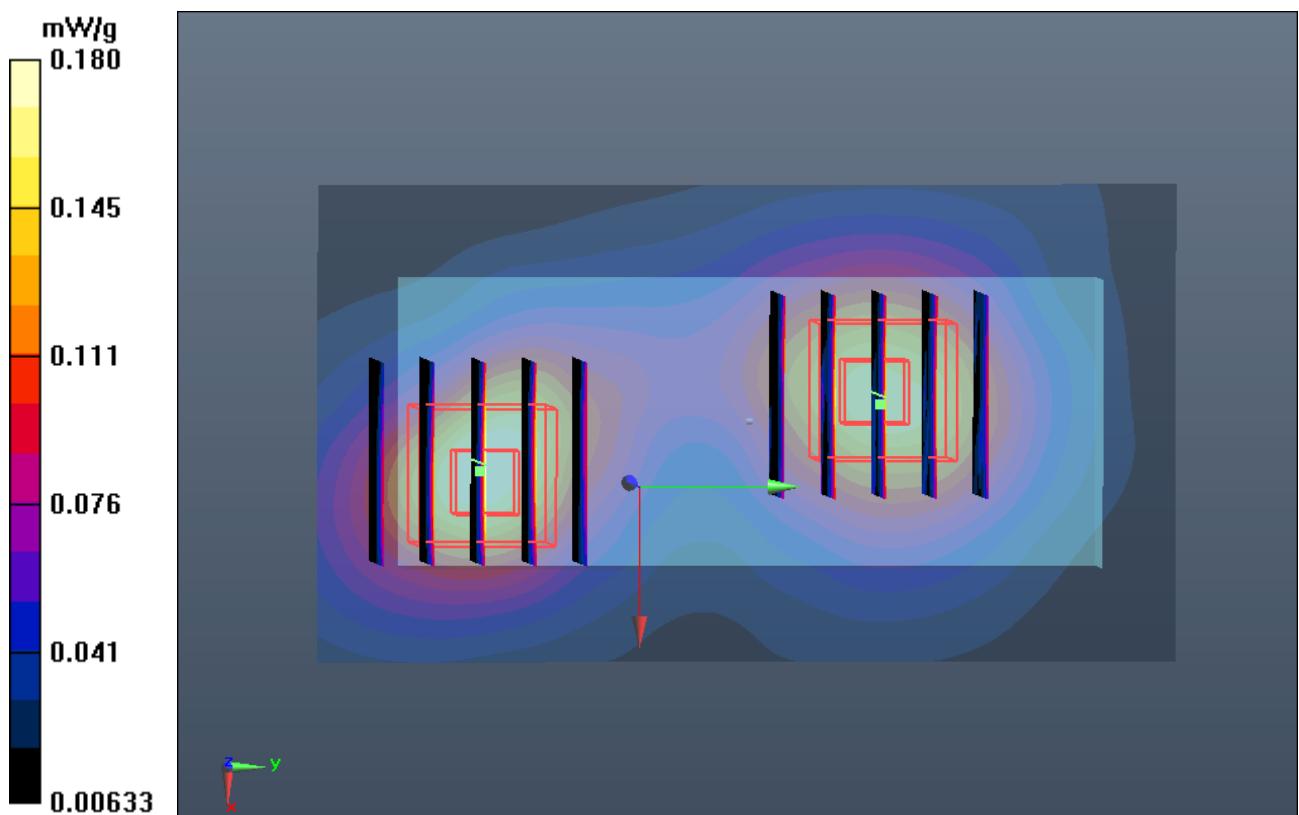
Ch512/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.107 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.203 W/kg

SAR(1 g) = 0.145 mW/g; SAR(10 g) = 0.083 mW/g

Maximum value of SAR (measured) = 0.160 mW/g



#12 GSM1900_GSM_Bottom_1.5cm_Ch512**DUT: 102406**

Communication System: Generic GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: MSL_1900_111103 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.472 \text{ mho/m}$; $\epsilon_r = 54.682$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.3 °C; Liquid Temperature : 21.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch512/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.279 mW/g

Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.206 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.434 W/kg

SAR(1 g) = 0.257 mW/g; SAR(10 g) = 0.148 mW/g

Maximum value of SAR (measured) = 0.285 mW/g

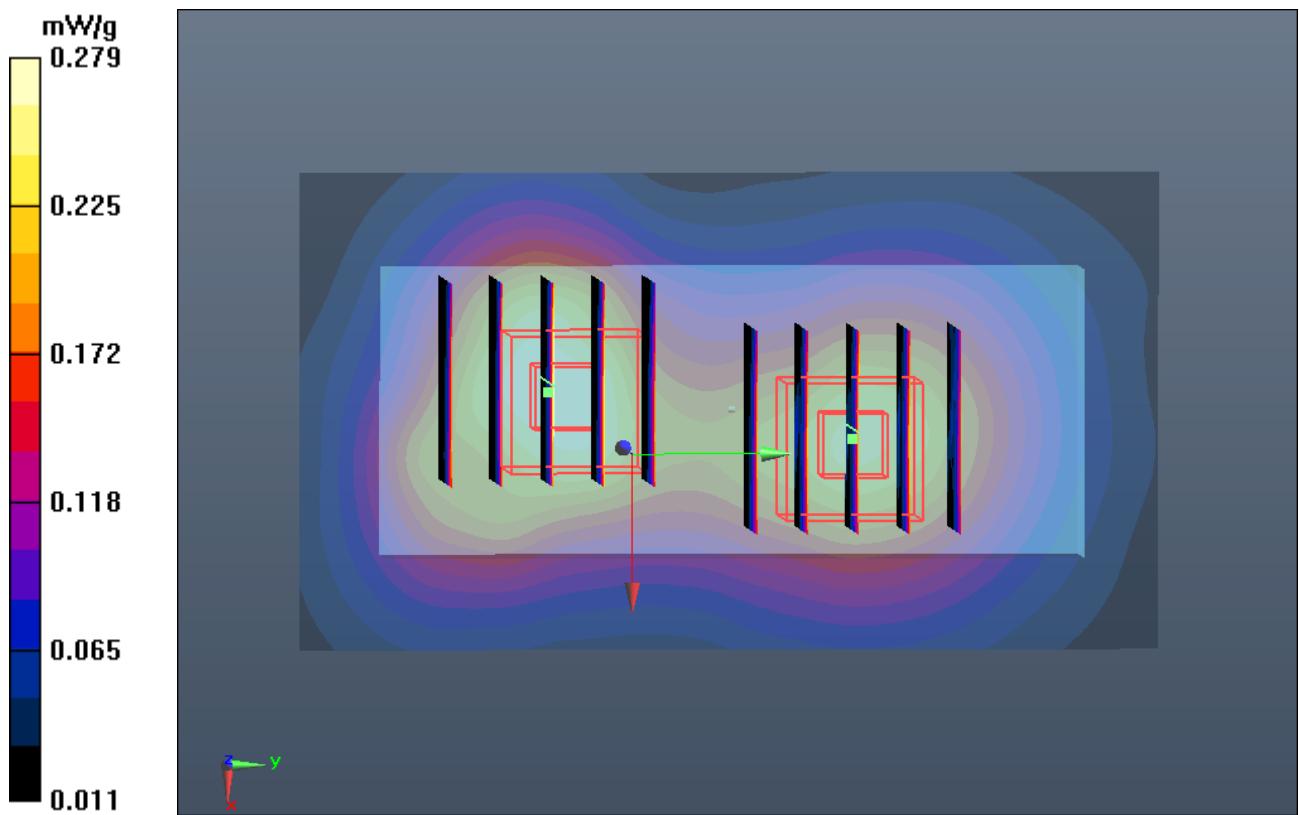
Ch512/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.206 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.350 W/kg

SAR(1 g) = 0.231 mW/g; SAR(10 g) = 0.140 mW/g

Maximum value of SAR (measured) = 0.251 mW/g



#12 GSM1900_GSM_Bottom_1.5cm_Ch512_2D**DUT: 102406**

Communication System: Generic GSM; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: MSL_1900_111103 Medium parameters used: $f = 1850.2 \text{ MHz}$; $\sigma = 1.472 \text{ mho/m}$; $\epsilon_r = 54.682$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 23.3 °C; Liquid Temperature : 21.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3697; ConvF(6.96, 6.96, 6.96); Calibrated: 2011-9-2
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn679; Calibrated: 2011-6-24
- Phantom: SAM1; Type: SAM; Serial: TP-1479
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch512/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.279 mW/g

Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.206 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.434 W/kg

SAR(1 g) = 0.257 mW/g; SAR(10 g) = 0.148 mW/g

Maximum value of SAR (measured) = 0.285 mW/g

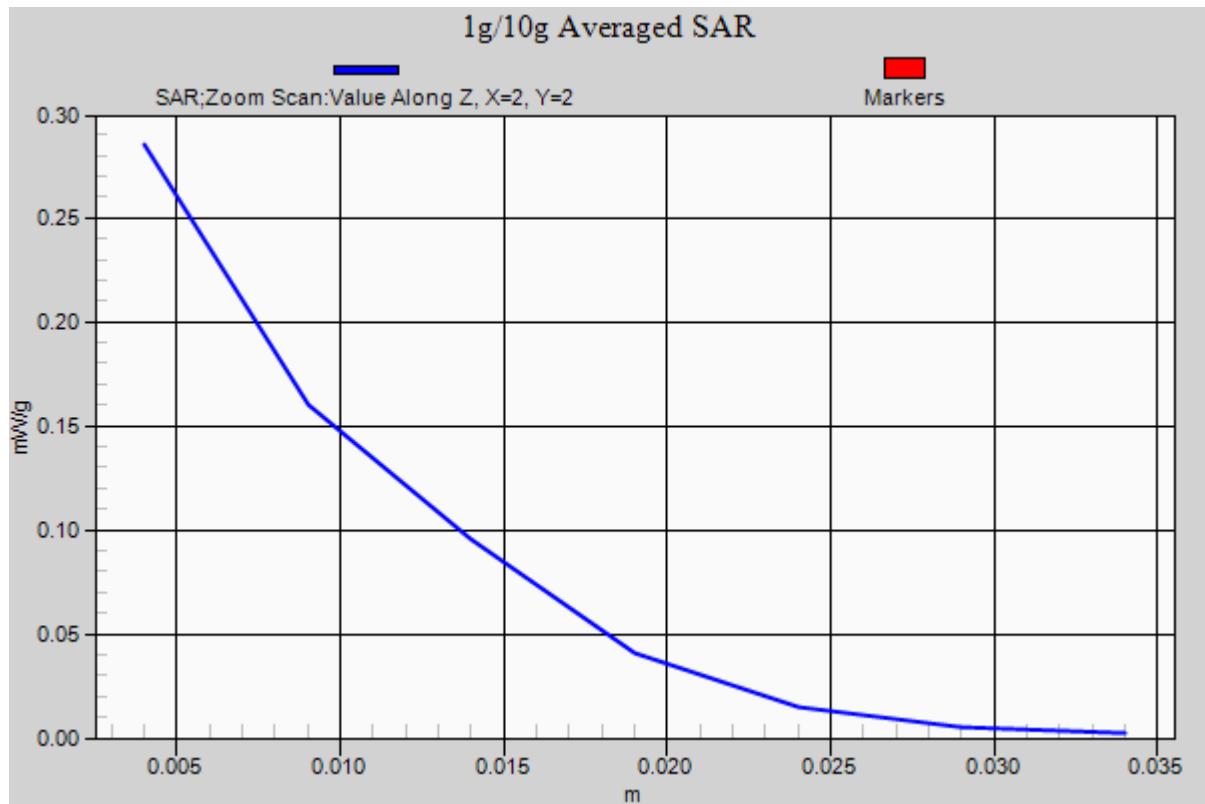
Ch512/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.206 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.350 W/kg

SAR(1 g) = 0.231 mW/g; SAR(10 g) = 0.140 mW/g

Maximum value of SAR (measured) = 0.251 mW/g





Appendix C. DASY Calibration Certificate

The DASY calibration certificates are shown as follows.



Calibration Certificate of DASY

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 Sporton (Auden)

Certificate No: D835V2-4d091_Nov09

CALIBRATION CERTIFICATE

Object D835V2 - SN: 4d091
Calibration procedure(s) QA.CAL-05.v7
Calibration procedure for dipole validation kits
Calibration date: November 23, 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 |
|-----------------------------|--------------------|-----------------------------------|------------------------|
| Power meter EPM-442A | GB37480704 | 08-Oct-09 (No. 217-01096) | Oct-10 |
| Power sensor HP 8481A | US37292783 | 08-Oct-09 (No. 217-01096) | Oct-10 |
| 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 ES3DV3 | SN: 3205 | 28-Jun-09 (No. ES3-3205_Jun09) | Jun-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-09) | In house check: Oct-11 |
| RF generator R&S SMT-08 | 100005 | 4-Aug-99 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-09) | In house check: Oct-10 |

Calibrated by: Name Jeton Kastrati Function Laboratory Technician

Signature

Approved by: Name Katja Pokovic Function Technical Manager

Issued: November 24, 2009

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



Calibration Certificate of DASY

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

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.



Calibration Certificate of DASY

Measurement Conditions

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

| | | |
|------------------------------|-------------------------------------|-------------|
| DASY Version | DASY5 | V5.2 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom V4.9 | |
| Distance Dipole Center - TSL | 15 mm | with Spacer |
| Zoom Scan Resolution | $dx, dy, dz = 5 \text{ mm}$ | |
| Frequency | $835 \text{ MHz} \pm 1 \text{ MHz}$ | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|----------------------------------|---|-------------------------|---------------------------------------|
| Nominal Head TSL parameters | $22.2 \text{ }^{\circ}\text{C}$ | 41.5 | 0.90 mho/m |
| Measured Head TSL parameters | $(22.0 \pm 0.2) \text{ }^{\circ}\text{C}$ | $41.6 \pm 6 \text{ \%}$ | $0.89 \text{ mho/m} \pm 6 \text{ \%}$ |
| Head TSL temperature during test | $(22.0 \pm 0.2) \text{ }^{\circ}\text{C}$ | --- | --- |

SAR result with Head TSL

| SAR averaged over 1 cm^3 (1 g) of Head TSL | Condition | |
|--|--------------------|---|
| SAR measured | 250 mW input power | 2.38 mW/g |
| SAR normalized | normalized to 1W | 9.52 mW/g |
| SAR for nominal Head TSL parameters | normalized to 1W | $9.60 \text{ mW/g} \pm 17.0 \text{ \% (k=2)}$ |
| SAR averaged over 10 cm^3 (10 g) of Head TSL | condition | |
| SAR measured | 250 mW input power | 1.56 mW/g |
| SAR normalized | normalized to 1W | 6.24 mW/g |
| SAR for nominal Head TSL parameters | normalized to 1W | $6.28 \text{ mW/g} \pm 16.5 \text{ \% (k=2)}$ |



Calibration Certificate of DASY

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 | 53.2 ± 6 % | 1.01 mho/m ± 6 % |
| Body TSL temperature during test | (21.8 ± 0.2) °C | | |

SAR result with Body TSL

| SAR averaged over 1 cm ³ (1 g) of Body TSL | Condition | |
|---|--------------------|----------------------------|
| SAR measured | 250 mW input power | 2.55 mW / g |
| SAR normalized | normalized to 1W | 10.2 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 9.80 mW / g ± 17.0 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Body TSL | Condition | |
|---|--------------------|----------------------------|
| SAR measured | 250 mW input power | 1.67 mW / g |
| SAR normalized | normalized to 1W | 6.68 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 6.49 mW / g ± 16.5 % (k=2) |



Calibration Certificate of DASY

Appendix

Antenna Parameters with Head TSL

| | |
|--------------------------------------|-------------------------------|
| Impedance, transformed to feed point | 52.0 Ω - 1.4 $j\Omega$ |
| Return Loss | -32.3 dB |

Antenna Parameters with Body TSL

| | |
|--------------------------------------|-------------------------------|
| Impedance, transformed to feed point | 48.5 Ω - 3.1 $j\Omega$ |
| Return Loss | -29.2 dB |

General Antenna Parameters and Design

| | |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.406 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 | September 15, 2008 |



Calibration Certificate of DASY

DASY5 Validation Report for Head TSL

Date/Time: 23.11.2009 10:32:03

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d091

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

Medium: HSL900

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.89 \text{ mho/m}$; $\epsilon_r = 41.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 26.06.2009
- 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, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

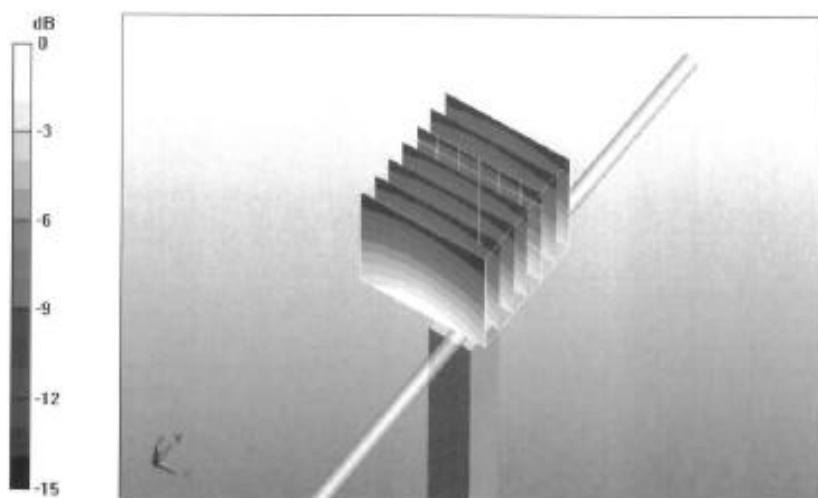
Pin=250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.3 V/m; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 3.56 W/kg

SAR(1 g) = 2.38 mW/g; SAR(10 g) = 1.56 mW/g

Maximum value of SAR (measured) = 2.78 mW/g

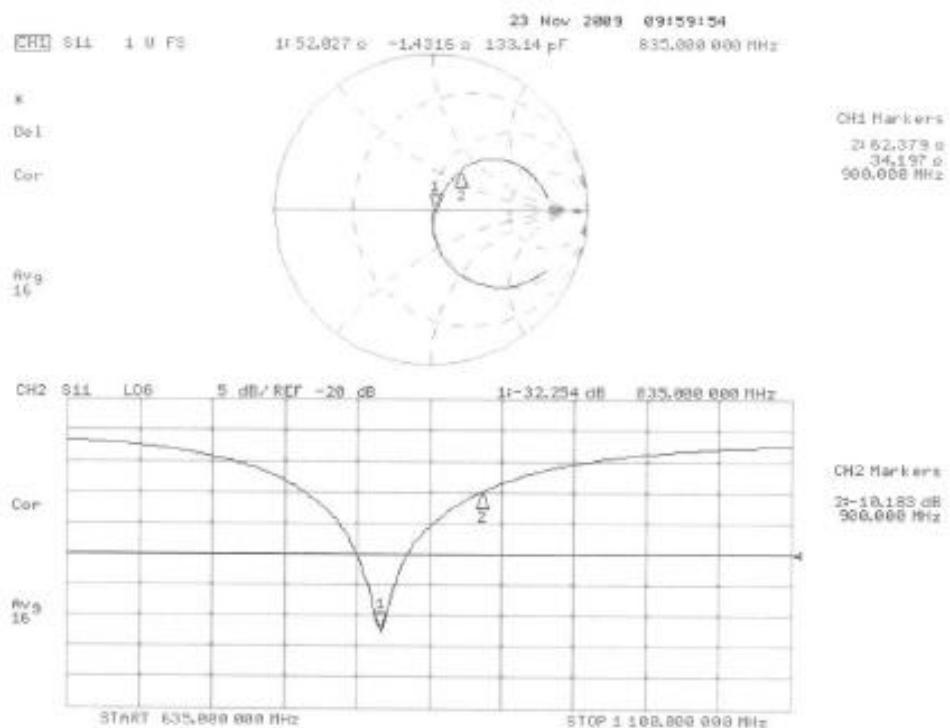


0 dB = 2.78mW/g



Calibration Certificate of DASY

Impedance Measurement Plot for Head TSL





Calibration Certificate of DASY

DASY5 Validation Report for Body

Date/Time: 16.11.2009 10:48:20

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d091

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

Medium: MSL900

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.97, 5.97, 5.97); Calibrated: 26.06.2009
- 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, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

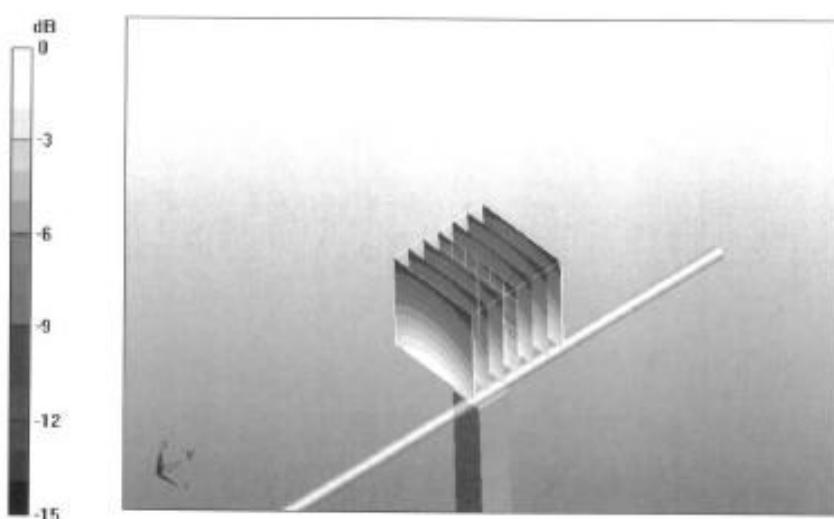
Pin250 mW /d=15mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.7 V/m; Power Drift = 0.016 dB

Peak SAR (extrapolated) = 3.79 W/kg

SAR(1 g) = 2.55 mW/g; SAR(10 g) = 1.67 mW/g

Maximum value of SAR (measured) = 2.95 mW/g

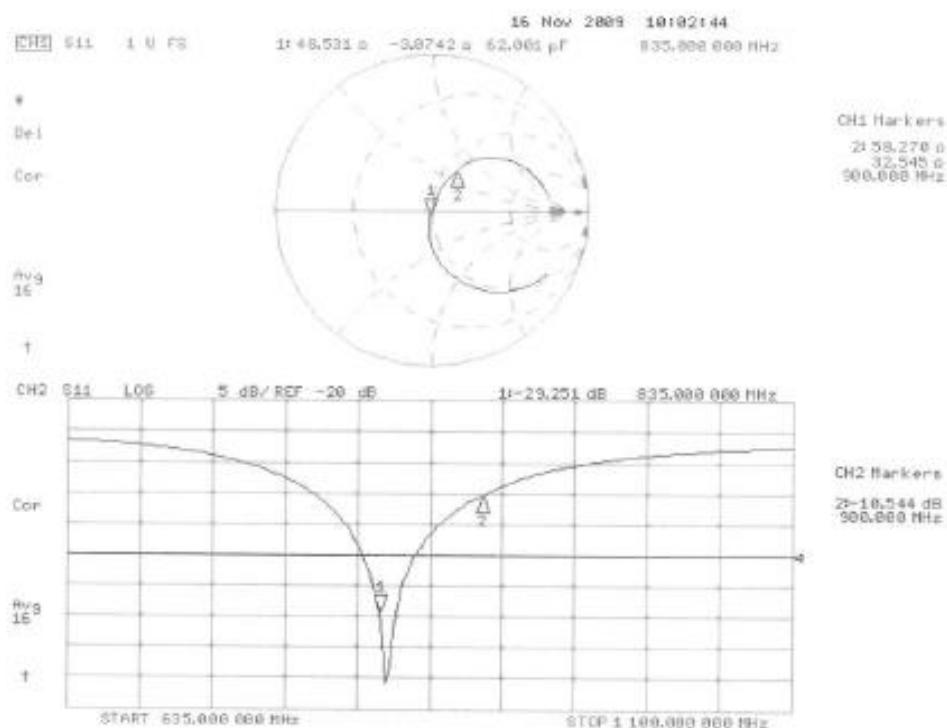


0 dB = 2.95mW/g



Calibration Certificate of DASY

Impedance Measurement Plot for Body TSL





Calibration Certificate of DASY

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Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: D1900V2-5d118_Nov09

CALIBRATION CERTIFICATE

Object D1900V2 - SN: 5d118
Calibration procedure(s) QA CAL-05.v7
Calibration procedure for dipole validation kits

Calibration date: November 24, 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 ± 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 | 06-Oct-09 (No. 217-01086) | Oct-10 |
| Power sensor HP 8481A | US37292783 | 06-Oct-09 (No. 217-01086) | Oct-10 |
| 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 ES3DV3 | SN: 3205 | 26-Jun-09 (No. ES3-3205_Jun09) | Jun-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-09) | In house check: Oct-11 |
| RF generator R&S SMT-06 | 100005 | 4-Aug-09 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-09) | In house check: Oct-10 |

Calibrated by: Name Jelon Kastrali Function Laboratory Technician

Signature

Approved by: Name Katja Pokovic Function Technical Manager

Issued: November 25, 2009

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



Calibration Certificate of DASY

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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.



Calibration Certificate of DASY

Measurement Conditions

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

| | | |
|------------------------------|---------------------------|-------------|
| DASY Version | DASY5 | V5.2 |
| Extrapolation | Advanced Extrapolation | |
| Phantom | Modular Flat Phantom V5.0 | |
| Distance Dipole Center - TSL | 10 mm | with Spacer |
| Zoom Scan Resolution | dx, dy, dz = 5 mm | |
| Frequency | 1900 MHz ± 1 MHz | |

Head TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters | 22.0 °C | 40.0 | 1.40 mho/m |
| Measured Head TSL parameters | (22.0 ± 0.2) °C | 39.8 ± 6 % | 1.44 mho/m ± 6 % |
| Head TSL temperature during test | (21.5 ± 0.2) °C | — | — |

SAR result with Head TSL

| SAR averaged over 1 cm ³ (1 g) of Head TSL | Condition | |
|---|--------------------|----------------------------|
| SAR measured | 250 mW input power | 9.97 mW / g |
| SAR normalized | normalized to 1W | 39.9 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | 39.2 mW / g ± 17.0 % (k=2) |
| SAR averaged over 10 cm ³ (10 g) of Head TSL | condition | |
| SAR measured | 250 mW input power | 5.20 mW / g |
| SAR normalized | normalized to 1W | 20.8 mW / g |
| SAR for nominal Head TSL parameters | normalized to 1W | 20.6 mW / g ± 16.5 % (k=2) |



Calibration Certificate of DASY

Body TSL parameters

The following parameters and calculations were applied.

| | Temperature | Permittivity | Conductivity |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters | 22.0 °C | 53.3 | 1.52 mho/m |
| Measured Body TSL parameters | (22.0 ± 0.2) °C | 53.5 ± 6 % | 1.58 mho/m ± 6 % |
| Body TSL temperature during test | (21.2 ± 0.2) °C | — | — |

SAR result with Body TSL

| SAR averaged over 1 cm ³ (1 g) of Body TSL | Condition | |
|---|--------------------|----------------------------|
| SAR measured | 250 mW input power | 10.1 mW / g |
| SAR normalized | normalized to 1W | 40.4 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 39.6 mW / g ± 17.0 % (k=2) |

| SAR averaged over 10 cm ³ (10 g) of Body TSL | condition | |
|---|--------------------|----------------------------|
| SAR measured | 250 mW input power | 5.30 mW / g |
| SAR normalized | normalized to 1W | 21.2 mW / g |
| SAR for nominal Body TSL parameters | normalized to 1W | 21.0 mW / g ± 16.5 % (k=2) |



Calibration Certificate of DASY

Appendix

Antenna Parameters with Head TSL

| | |
|--------------------------------------|-------------------------------|
| Impedance, transformed to feed point | 52.2 Ω + 6.0 $j\Omega$ |
| Return Loss | -24.1 dB |

Antenna Parameters with Body TSL

| | |
|--------------------------------------|-------------------------------|
| Impedance, transformed to feed point | 46.8 Ω + 7.1 $j\Omega$ |
| Return Loss | -21.9 dB |

General Antenna Parameters and Design

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

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

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 | August 21, 2009 |



Calibration Certificate of DASY

DASY5 Validation Report for Head TSL

Date/Time: 24.11.2009 14:53:56

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d118

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: HSL U11 BB

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.44 \text{ mho/m}$; $\epsilon_r = 39.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAB4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

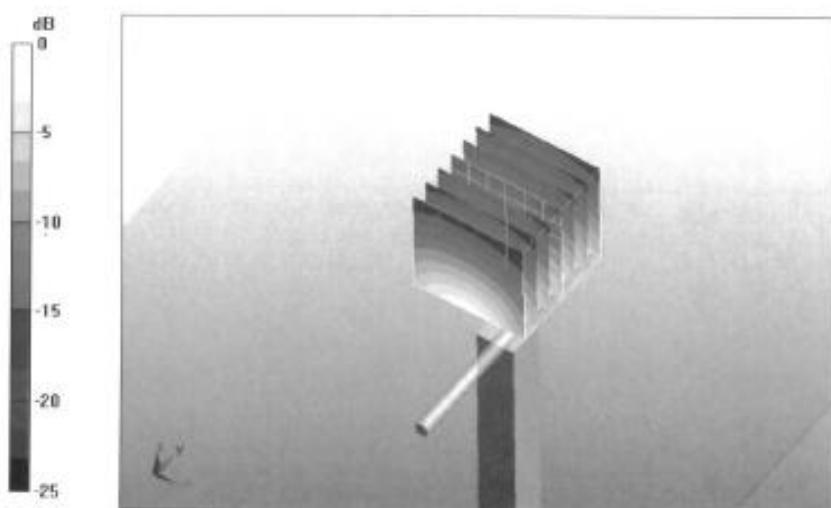
Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.5 V/m; Power Drift = 0.028 dB

Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 9.97 mW/g; SAR(10 g) = 5.2 mW/g

Maximum value of SAR (measured) = 12.5 mW/g

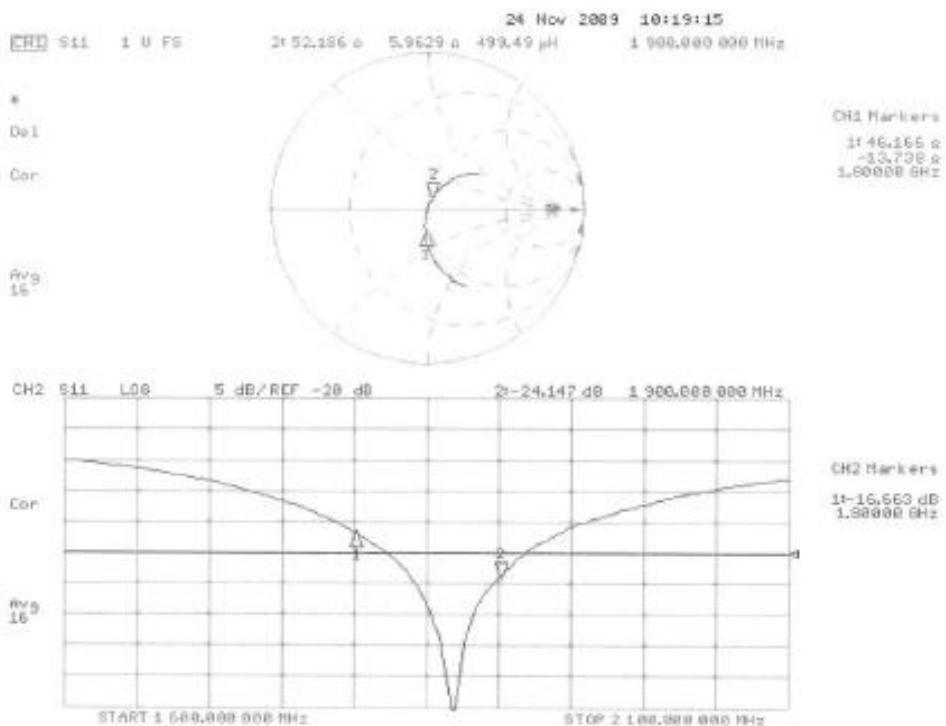


0 dB = 12.5mW/g



Calibration Certificate of DASY

Impedance Measurement Plot for Head TSL





Calibration Certificate of DASY

DASY5 Validation Report for Body

Date/Time: 17.11.2009 14:25:42

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d118

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB

Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.58 \text{ mho/m}$; $\epsilon_r = 53.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

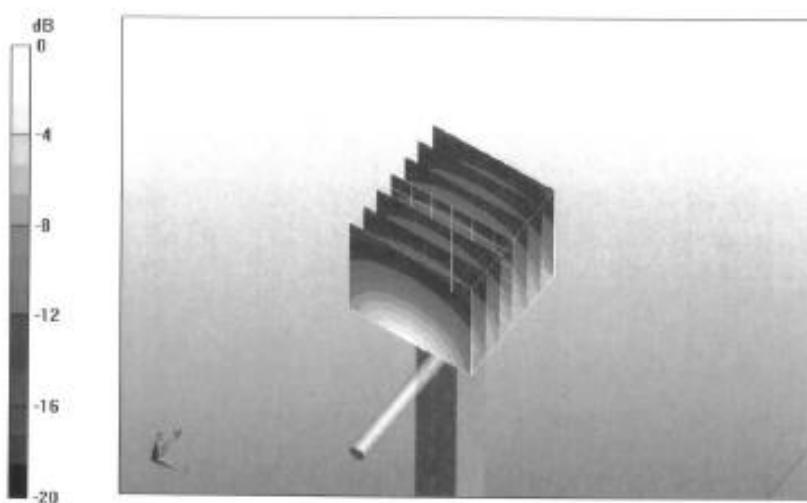
Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.1 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 17.5 W/kg

SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.3 mW/g

Maximum value of SAR (measured) = 12.8 mW/g

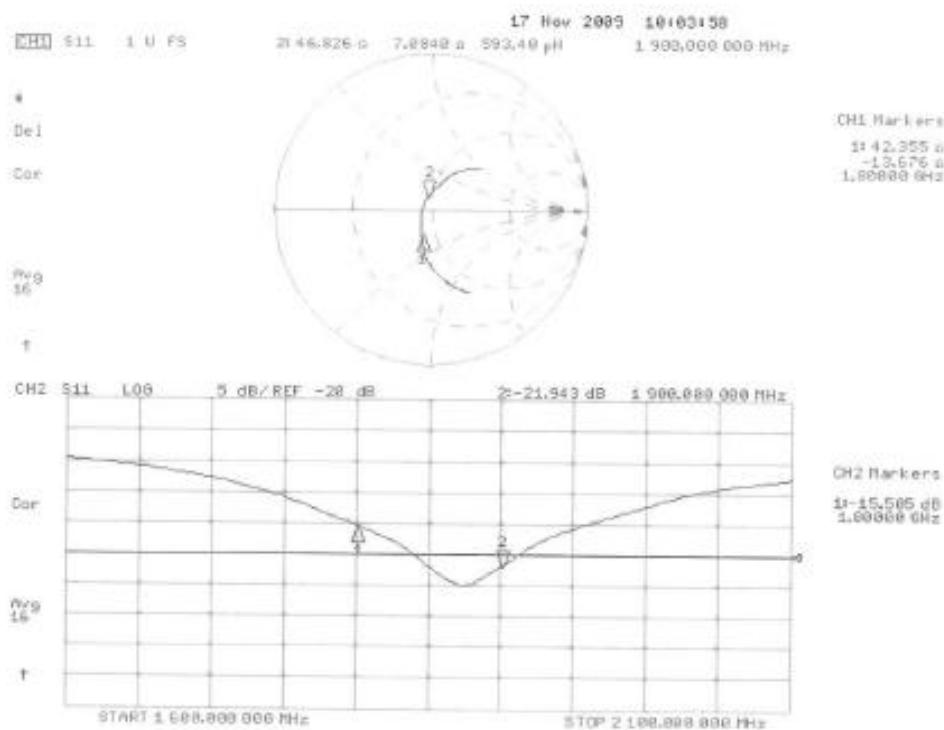


0 dB = 12.8mW/g



Calibration Certificate of DASY

Impedance Measurement Plot for Body TSL



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info@speag.com, http://www.speag.com

IMPORTANT NOTICE

USAGE OF THE DAE 4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is closed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:

Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:

Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:

To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.

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Accreditation No.: **SCS 108**

Client

Auden

Certificate No: **DAE4-679_Jun11**

CALIBRATION CERTIFICATE

| | |
|--------------------------|--|
| Object | DAE4 - SD 000 D04 BJ - SN: 679 |
| Calibration procedure(s) | QA CAL-06.v23 Calibration procedure for the data acquisition electronics (DAE) |
| Calibration date: | June 24, 2011 |

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Certificate No.) | Scheduled Calibration |
|-------------------------------|--------------------|----------------------------|------------------------|
| Keithley Multimeter Type 2001 | SN: 0810278 | 28-Sep-10 (No:10376) | Sep-11 |
| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
| Calibrator Box V1.1 | SE UMS 006 AB 1004 | 08-Jun-11 (in house check) | In house check: Jun-12 |

| Calibrated by: | Name | Function | Signature |
|----------------|--------------------------|--------------|-----------|
| | Dominique Steffen | Technician | |
| Approved by: | Fin Bornholz | R&D Director | |

Issued: June 24, 2011

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Accreditation No.: SCS 108

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = $6.1\mu V$, 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 | $404.451 \pm 0.1\% (k=2)$ | $404.898 \pm 0.1\% (k=2)$ | $405.032 \pm 0.1\% (k=2)$ |
| Low Range | $3.98048 \pm 0.7\% (k=2)$ | $3.95978 \pm 0.7\% (k=2)$ | $3.98468 \pm 0.7\% (k=2)$ |

Connector Angle

| | |
|---|---------------------------|
| Connector Angle to be used in DASY system | $316.0^\circ \pm 1^\circ$ |
|---|---------------------------|

Appendix

1. DC Voltage Linearity

| High Range | | Reading (μ V) | Difference (μ V) | Error (%) |
|------------|---------|--------------------|-----------------------|-----------|
| Channel X | + Input | 199987.9 | -2.58 | -0.00 |
| Channel X | + Input | 19999.87 | 0.07 | 0.00 |
| Channel X | - Input | -19995.28 | 4.12 | -0.02 |
| Channel Y | + Input | 200007.3 | -1.59 | -0.00 |
| Channel Y | + Input | 20000.42 | 0.52 | 0.00 |
| Channel Y | - Input | -19999.78 | -0.38 | 0.00 |
| Channel Z | + Input | 199995.5 | -3.20 | -0.00 |
| Channel Z | + Input | 19998.26 | -1.44 | -0.01 |
| Channel Z | - Input | -19999.47 | 0.83 | -0.00 |

| Low Range | | Reading (μ V) | Difference (μ V) | Error (%) |
|-----------|---------|--------------------|-----------------------|-----------|
| Channel X | + Input | 2000.4 | 0.35 | 0.02 |
| Channel X | + Input | 200.90 | 1.00 | 0.50 |
| Channel X | - Input | -199.34 | 0.76 | -0.38 |
| Channel Y | + Input | 2000.5 | 0.67 | 0.03 |
| Channel Y | + Input | 199.95 | 0.15 | 0.08 |
| Channel Y | - Input | -199.95 | 0.25 | -0.12 |
| Channel Z | + Input | 1999.7 | -0.18 | -0.01 |
| Channel Z | + Input | 200.33 | 0.33 | 0.16 |
| Channel Z | - Input | -199.92 | -0.02 | 0.01 |

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 (μ V) | Low Range Average Reading (μ V) |
|-----------|-----------------------------------|--|---|
| Channel X | 200 | 3.71 | 2.37 |
| | -200 | -1.43 | -2.69 |
| Channel Y | 200 | 4.26 | 4.13 |
| | -200 | -6.01 | -5.91 |
| Channel Z | 200 | -4.42 | -4.52 |
| | -200 | 3.55 | 3.28 |

3. Channel separation

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

| | Input Voltage (mV) | Channel X (μ V) | Channel Y (μ V) | Channel Z (μ V) |
|-----------|--------------------|----------------------|----------------------|----------------------|
| Channel X | 200 | - | 1.43 | -0.05 |
| Channel Y | 200 | 2.49 | - | 2.93 |
| Channel Z | 200 | 2.21 | 1.32 | - |

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 | 16151 | 16737 |
| Channel Y | 15471 | 15918 |
| Channel Z | 16048 | 16506 |

5. Input Offset Measurement

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

Input 10MΩ

| | Average (μ V) | min. Offset (μ V) | max. Offset (μ V) | Std. Deviation (μ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | 1.43 | 0.14 | 2.46 | 0.42 |
| Channel Y | -1.24 | -3.08 | 0.25 | 0.65 |
| Channel Z | 0.80 | -0.58 | 1.95 | 0.49 |

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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

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



S Schweizerischer Kalibrierdienst
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S Servizio svizzero di taratura
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Accreditation No.: **SCS 108**

Client **Sporton-CN (Auden)**

Certificate No: **EX3-3697_Sep11**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3697**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4**
Calibration procedure for dosimetric E-field probes

Calibration date: **September 2, 2011**

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 | 31-Mar-11 (No. 217-01372) | Apr-12 |
| Power sensor E4412A | MY41498087 | 31-Mar-11 (No. 217-01372) | Apr-12 |
| Reference 3 dB Attenuator | SN: S5054 (3c) | 29-Mar-11 (No. 217-01369) | Apr-12 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 29-Mar-11 (No. 217-01367) | Apr-12 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 29-Mar-11 (No. 217-01370) | Apr-12 |
| Reference Probe ES3DV2 | SN: 3013 | 29-Dec-10 (No. ES3-3013_Dec10) | Dec-11 |
| DAE4 | SN: 654 | 3-May-11 (No. DAE4-654_May11) | May-12 |
| | | | |
| Secondary Standards | ID | Check Date (in house) | Scheduled Check |
| RF generator HP 8648C | US3642U01700 | 4-Aug-99 (in house check Oct-09) | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585 | 18-Oct-01 (in house check Oct-10) | In house check: Oct-11 |

| Calibrated by: | Name | Function | Signature |
|----------------|---------------|-------------------|-----------|
| | Katja Pokovic | Technical Manager | |
| Approved by: | Niels Kuster | Quality Manager | |

Issued: September 2, 2011

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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 | 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., $\theta = 0$ 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 $\theta = 0$ ($f \leq 900$ 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 E²-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, VRx,y,z:** A, B, C 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 $f \leq 800$ 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 $NORMx,y,z * ConvF$ 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:3697

Manufactured: April 22, 2009
Calibrated: September 2, 2011

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3697

Basic Calibration Parameters

| | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|---|----------|----------|----------|---------------|
| Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A | 0.47 | 0.47 | 0.51 | $\pm 10.1 \%$ |
| DCP (mV) ^B | 96.1 | 98.5 | 98.1 | |

Modulation Calibration Parameters

| UID | Communication System Name | PAR | | A dB | B dB | C dB | VR mV | Unc ^E (k=2) |
|-------|---------------------------|------|---|---------|---------|---------|----------|---------------------------|
| 10000 | CW | 0.00 | X | 0.00 | 0.00 | 1.00 | 109.5 | $\pm 2.7 \%$ |
| | | | Y | 0.00 | 0.00 | 1.00 | 113.5 | |
| | | | Z | 0.00 | 0.00 | 1.00 | 114.9 | |

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

^A The uncertainties of NormX,Y,Z do not affect the E²-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:3697

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 | 8.77 | 8.77 | 8.77 | 0.80 | 0.66 | ± 12.0 % |
| 835 | 41.5 | 0.90 | 8.45 | 8.45 | 8.45 | 0.78 | 0.66 | ± 12.0 % |
| 900 | 41.5 | 0.97 | 8.29 | 8.29 | 8.29 | 0.68 | 0.73 | ± 12.0 % |
| 1450 | 40.5 | 1.20 | 8.38 | 8.38 | 8.38 | 0.61 | 0.74 | ± 12.0 % |
| 1750 | 40.1 | 1.37 | 7.71 | 7.71 | 7.71 | 0.80 | 0.61 | ± 12.0 % |
| 1900 | 40.0 | 1.40 | 7.46 | 7.46 | 7.46 | 0.80 | 0.60 | ± 12.0 % |
| 2000 | 40.0 | 1.40 | 7.87 | 7.87 | 7.87 | 0.55 | 0.72 | ± 12.0 % |
| 2300 | 39.5 | 1.67 | 7.09 | 7.09 | 7.09 | 0.66 | 0.64 | ± 12.0 % |
| 2450 | 39.2 | 1.80 | 6.67 | 6.67 | 6.67 | 0.72 | 0.64 | ± 12.0 % |
| 2600 | 39.0 | 1.96 | 6.55 | 6.55 | 6.55 | 0.66 | 0.68 | ± 12.0 % |
| 3500 | 37.9 | 2.91 | 6.51 | 6.51 | 6.51 | 0.38 | 1.04 | ± 13.1 % |
| 5200 | 36.0 | 4.66 | 4.66 | 4.66 | 4.66 | 0.40 | 1.80 | ± 13.1 % |
| 5500 | 35.6 | 4.96 | 4.32 | 4.32 | 4.32 | 0.45 | 1.80 | ± 13.1 % |
| 5600 | 35.5 | 5.07 | 4.03 | 4.03 | 4.03 | 0.45 | 1.80 | ± 13.1 % |
| 5800 | 35.3 | 5.27 | 4.28 | 4.28 | 4.28 | 0.43 | 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:3697

Calibration Parameter Determined in Body Tissue Simulating Media

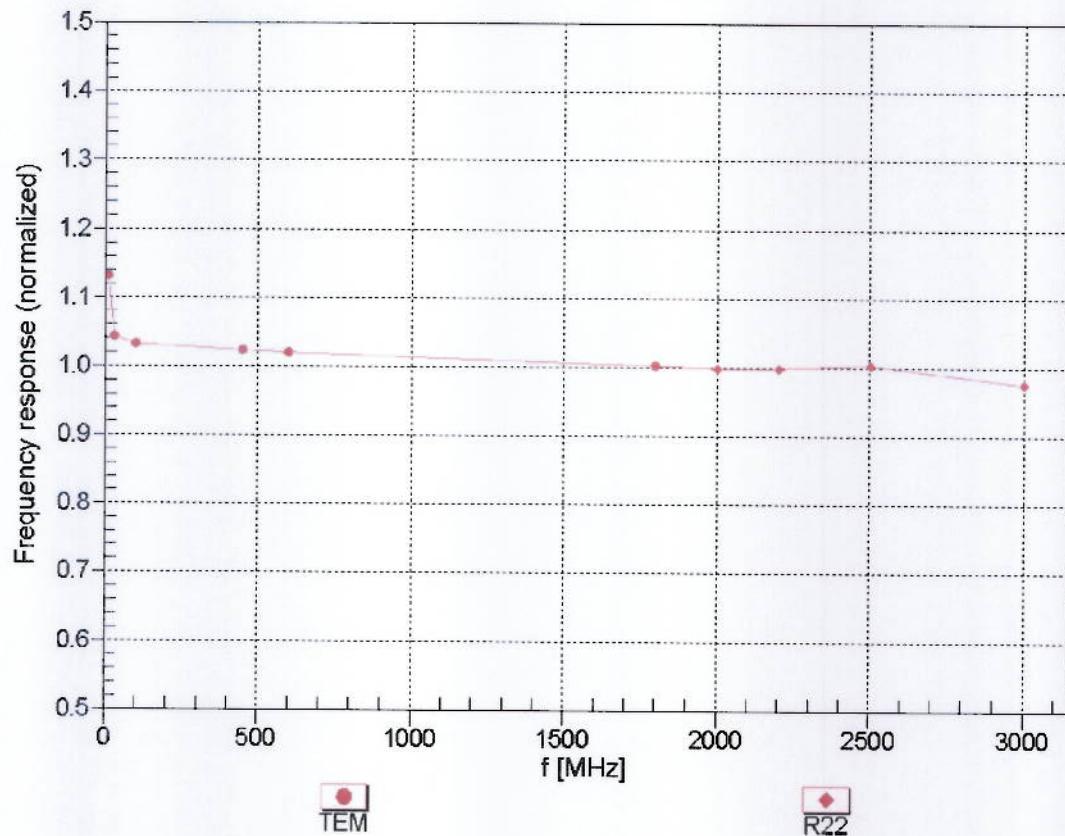
| f (MHz) ^C | Relative Permittivity ^F | Conductivity (S/m) ^F | ConvF X | ConvF Y | ConvF Z | Alpha | Depth (mm) | Unct. (k=2) |
|----------------------|------------------------------------|---------------------------------|---------|---------|---------|-------|------------|-------------|
| 750 | 55.5 | 0.96 | 8.79 | 8.79 | 8.79 | 0.80 | 0.72 | ± 12.0 % |
| 835 | 55.2 | 0.97 | 8.67 | 8.67 | 8.67 | 0.80 | 0.69 | ± 12.0 % |
| 900 | 55.0 | 1.05 | 8.54 | 8.54 | 8.54 | 0.80 | 0.68 | ± 12.0 % |
| 1450 | 54.0 | 1.30 | 7.88 | 7.88 | 7.88 | 0.80 | 0.65 | ± 12.0 % |
| 1750 | 53.4 | 1.49 | 7.16 | 7.16 | 7.16 | 0.80 | 0.66 | ± 12.0 % |
| 1900 | 53.3 | 1.52 | 6.96 | 6.96 | 6.96 | 0.80 | 0.64 | ± 12.0 % |
| 2000 | 53.3 | 1.52 | 7.37 | 7.37 | 7.37 | 0.80 | 0.66 | ± 12.0 % |
| 2300 | 52.9 | 1.81 | 6.96 | 6.96 | 6.96 | 0.80 | 0.65 | ± 12.0 % |
| 2450 | 52.7 | 1.95 | 6.73 | 6.73 | 6.73 | 0.80 | 0.57 | ± 12.0 % |
| 2600 | 52.5 | 2.16 | 6.58 | 6.58 | 6.58 | 0.80 | 0.58 | ± 12.0 % |
| 3500 | 51.3 | 3.31 | 6.06 | 6.06 | 6.06 | 0.36 | 1.23 | ± 13.1 % |
| 5200 | 49.0 | 5.30 | 4.13 | 4.13 | 4.13 | 0.50 | 1.95 | ± 13.1 % |
| 5500 | 48.6 | 5.65 | 3.64 | 3.64 | 3.64 | 0.55 | 1.95 | ± 13.1 % |
| 5600 | 48.5 | 5.77 | 3.51 | 3.51 | 3.51 | 0.57 | 1.95 | ± 13.1 % |
| 5800 | 48.2 | 6.00 | 3.74 | 3.74 | 3.74 | 0.60 | 1.95 | ± 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.

Frequency Response of E-Field

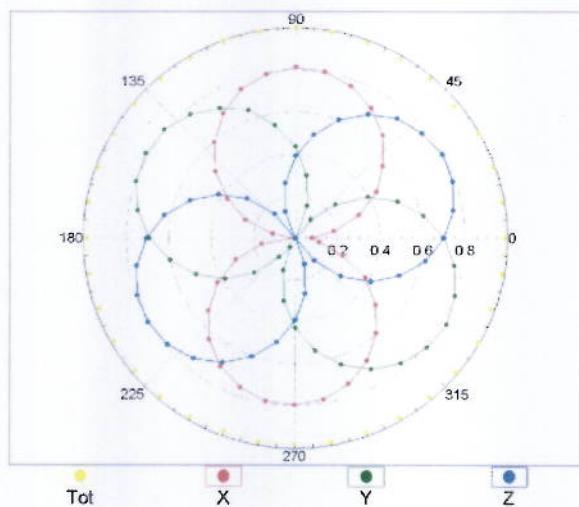
(TEM-Cell:ifi110 EXX, Waveguide: R22)



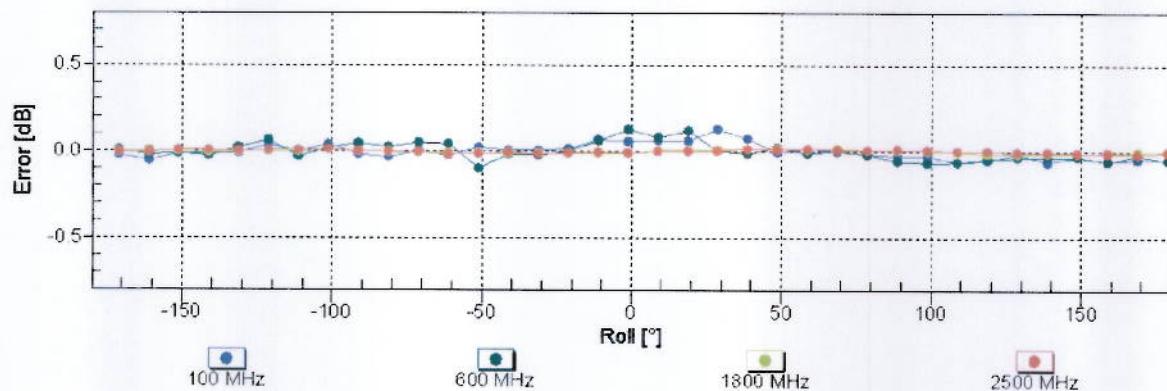
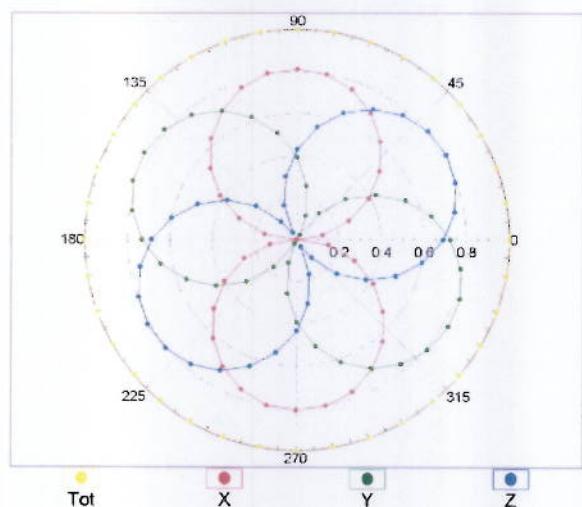
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz, TEM

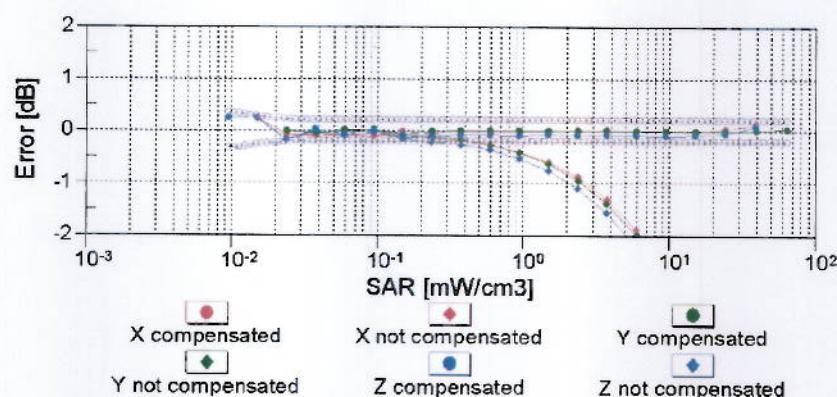
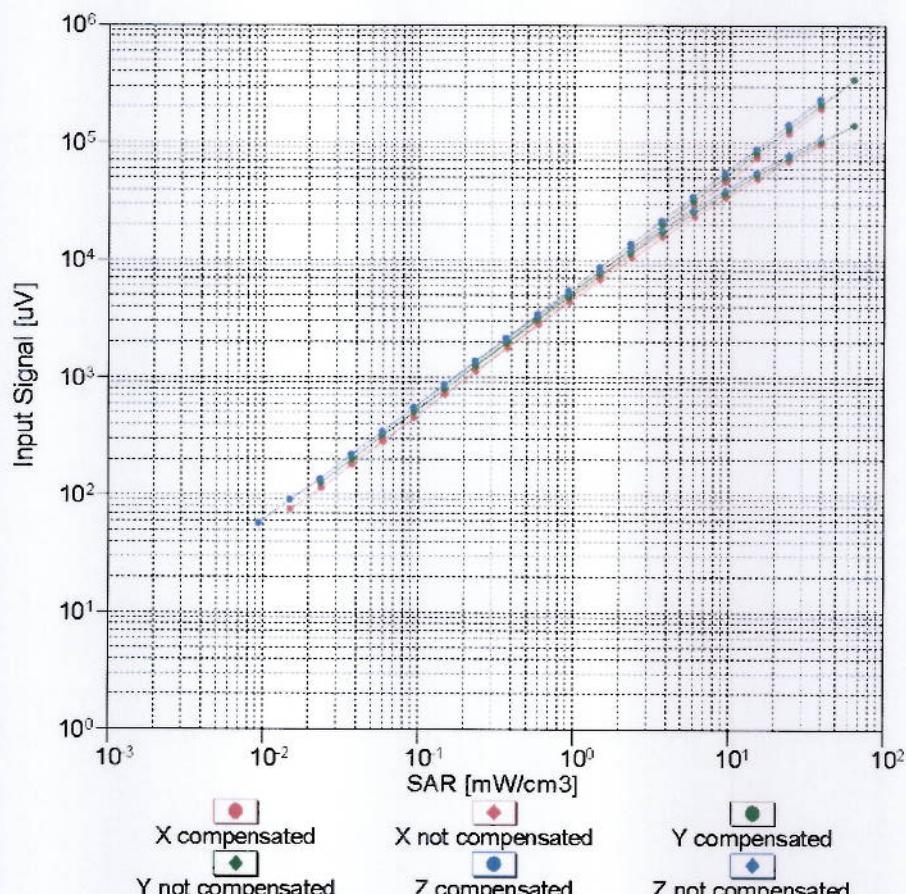


f=1800 MHz, R22

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

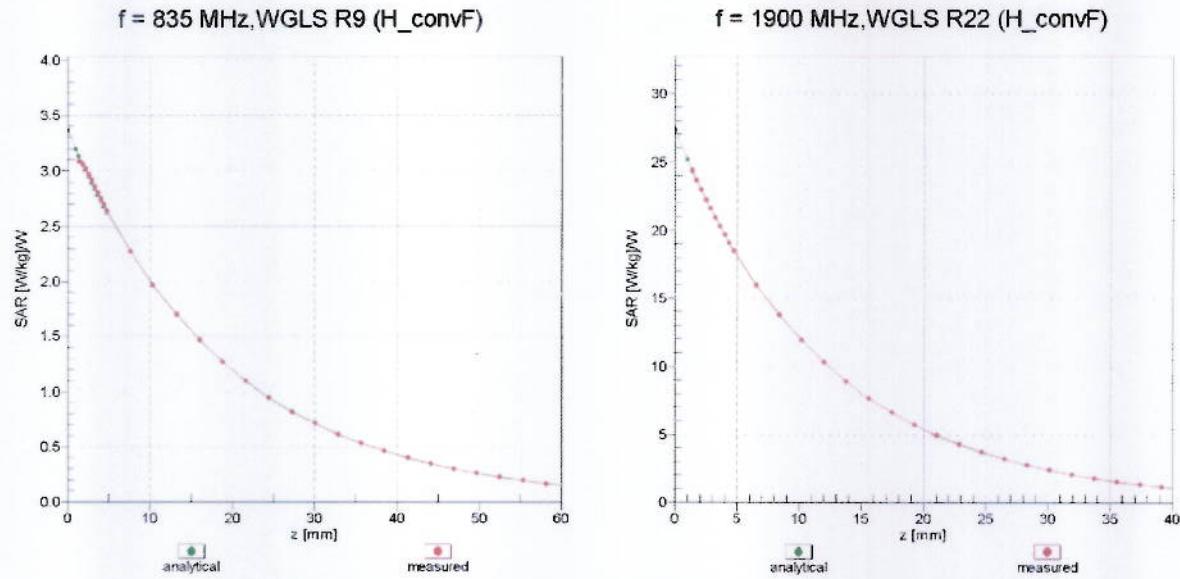
Dynamic Range f(SAR_{head})

(TEM cell , f = 900 MHz)

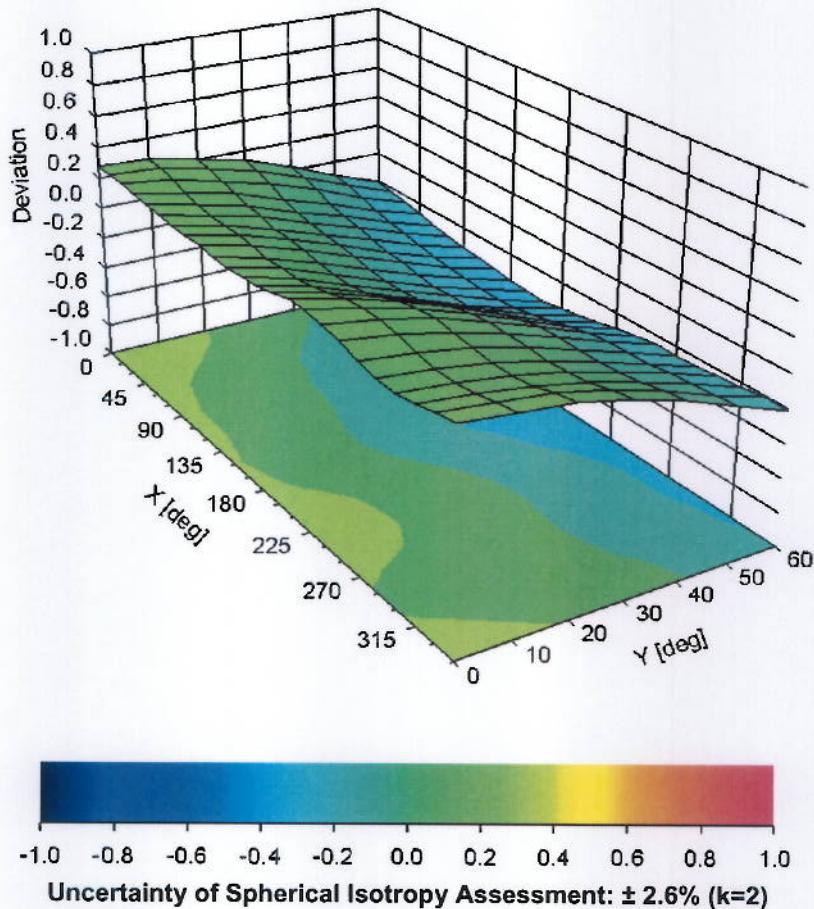


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: EX3DV4 - SN:3697

Other Probe Parameters

| | |
|---|----------------|
| Sensor Arrangement | Triangular |
| Connector Angle (°) | Not applicable |
| 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 |



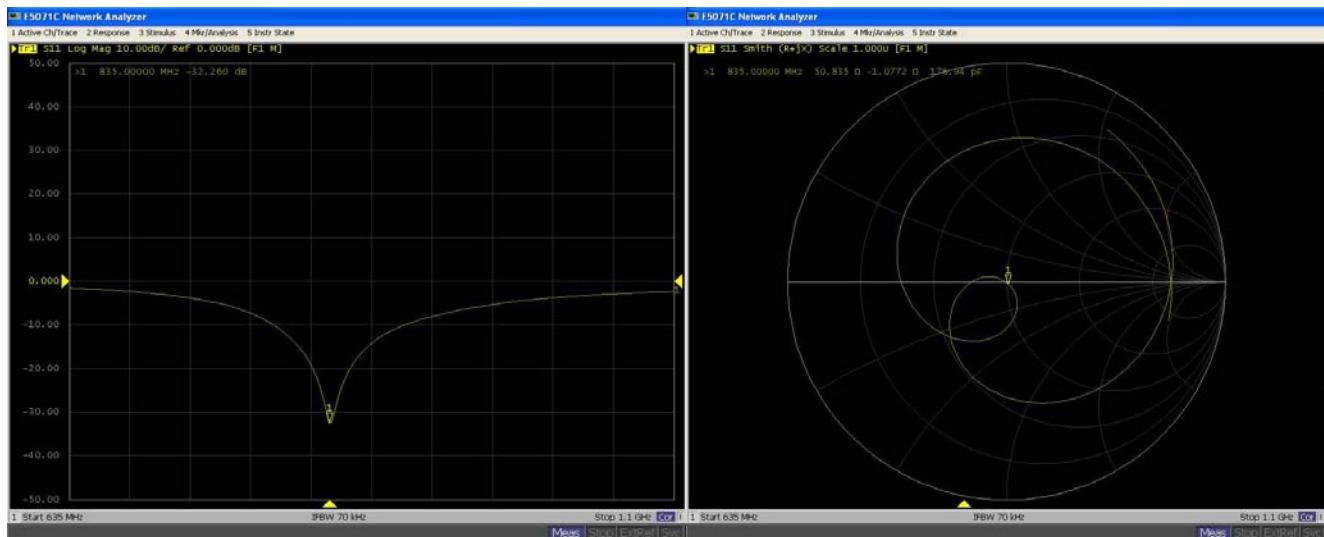
Appendix C. DASY Calibration Certificate -Extended Dipole

Calibrations

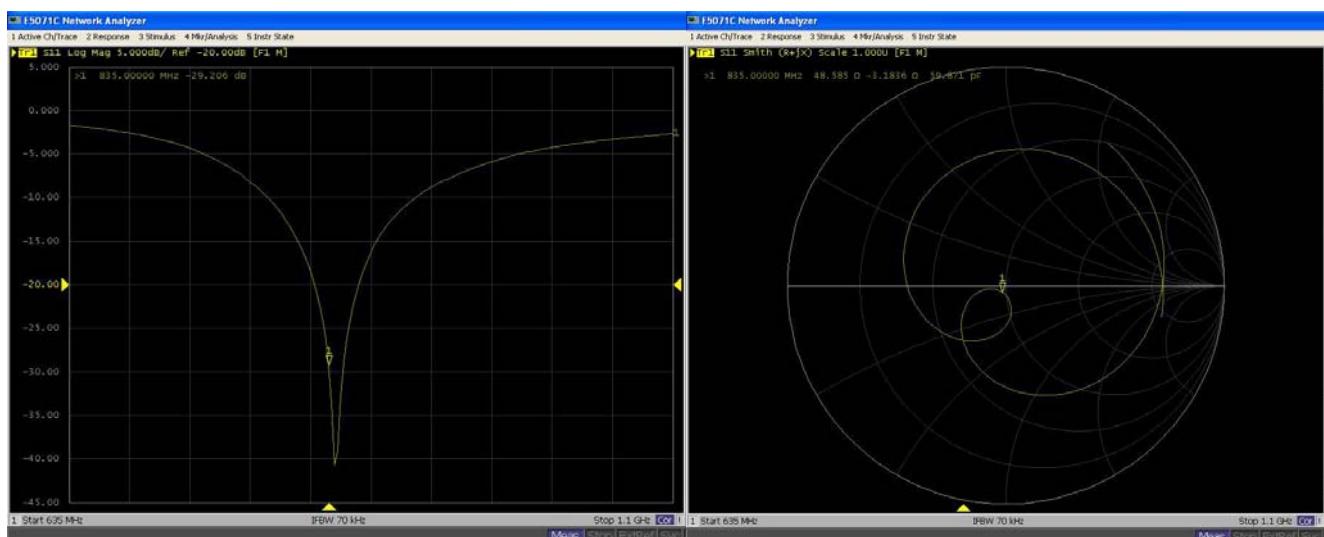
Referring to KDB 450824, if dipoles are verified in return loss (<-20dB, within 20% of prior calibration), and in impedance (within 5 ohm of prior calibration), the annual calibration is not necessary and the calibration interval can be extended.

<Dipole Verification Data> - D835V2, serial no. 4d091

835MHz - Head



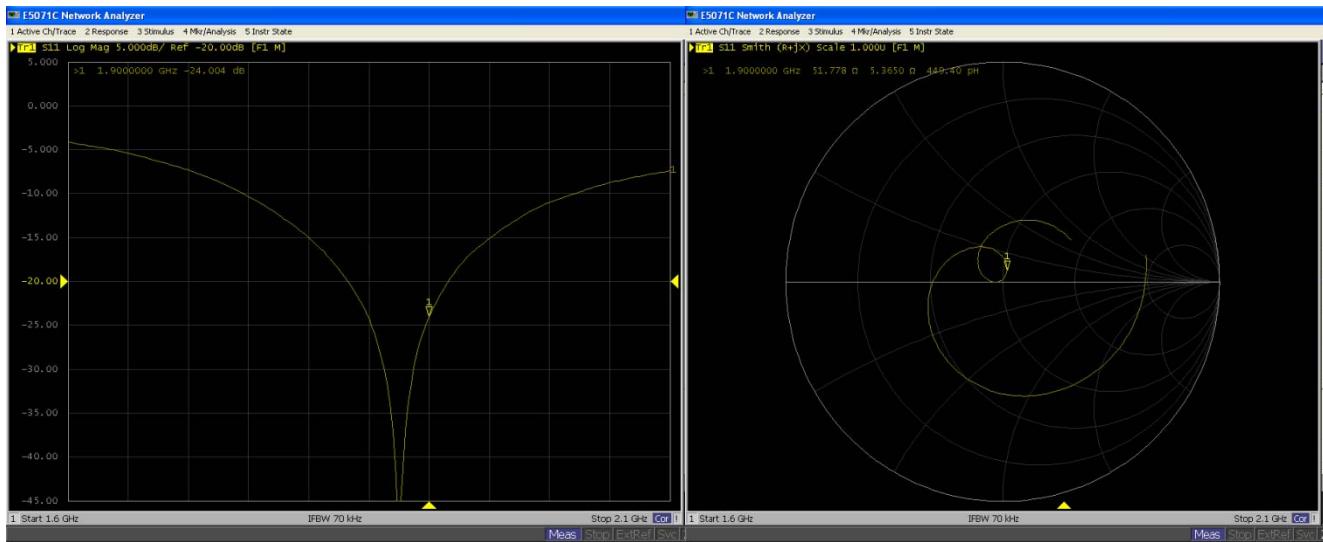
835MHz – Body



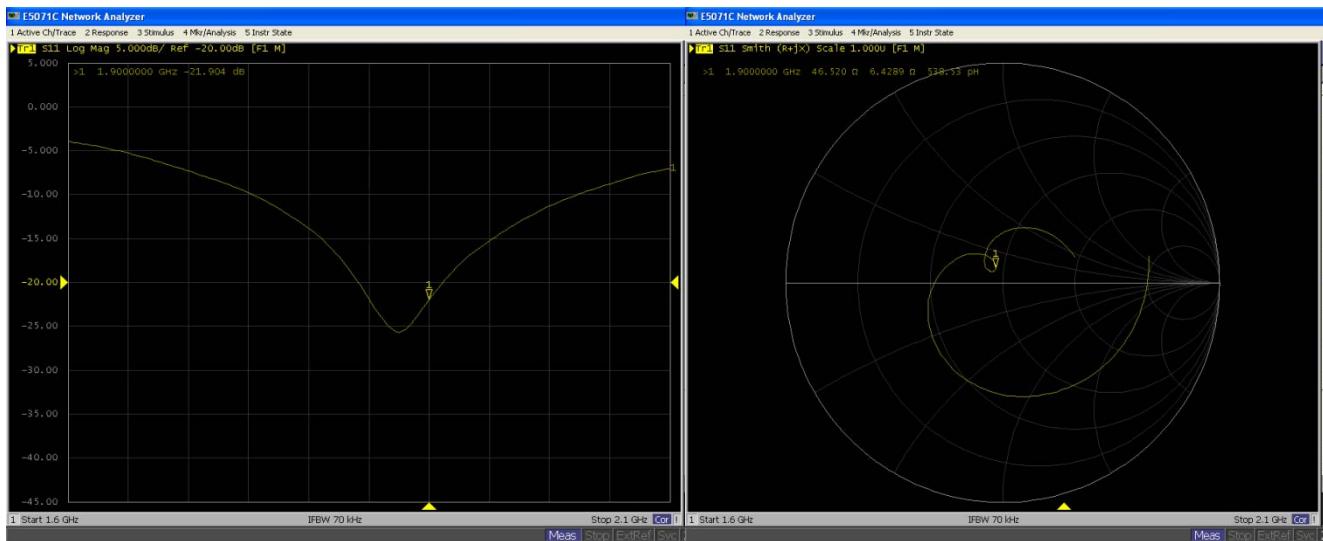


<Dipole Verification Data>- D1900V2, serial no. 5d118

1900MHz – Head



1900MHz - Body





<Justification of the extended calibration>

| D835V2 – serial no. 4d091 | | | | | | | | | | | | |
|---------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
| | 835 Head | | | | | | 835 Body | | | | | |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 11.23.2009 | -32.254 | | 52.027 | | -1.4316 | | -29.251 | | 48.531 | | -3.0742 | |
| 11.22.2010 | -32.26 | 0.006 | 50.835 | 1.192 | -1.0772 | 0.3544 | -29.206 | 0.045 | 48.585 | 0.054 | -3.1836 | 0.1094 |

| D1900V2 – serial no. 5d118 | | | | | | | | | | | | |
|----------------------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|------------------|-----------|----------------------|-------------|---------------------------|-------------|
| | 1900 Head | | | | | | 1900 Body | | | | | |
| Date of Measurement | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) | Return-Loss (dB) | Delta (%) | Real Impedance (ohm) | Delta (ohm) | Imaginary Impedance (ohm) | Delta (ohm) |
| 11.24.2009 | -24.147 | | 52.186 | | 5.9629 | | -21.943 | | 46.826 | | 7.084 | |
| 11.23.2010 | -24.004 | 0.143 | 51.778 | 0.408 | 5.365 | 0.5979 | -21.904 | 0.039 | 46.52 | 0.306 | 6.4289 | 0.6551 |

The return loss is < -20dB, within 20% of prior calibration; the impedance is within 5 ohm of prior calibration.

Therefore the verification result should support extended calibration.