



Specific Absorption Rate (SAR) Test Report
for
FIC (First International Computer, Inc.)
on the
Neo 1973

Report No. : TA7O1104
Trade Name : FIC
Model Name : GTA02
Date of Testing : Dec. 10-11, 2007
Date of Report : Dec. 26, 2007
Date of Review : Dec. 26, 2007

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Table of Contents

| | | |
|-----------|---------------------------------------------------|-----------|
| 1 | Statement of Compliance | 1 |
| 2 | Administration Data | 2 |
| 2.1 | Testing Laboratory | 2 |
| 2.2 | Detail of Applicant | 2 |
| 2.3 | Detail of Manufacturer | 2 |
| 2.4 | Application Detail | 2 |
| 3 | General Information | 3 |
| 3.1 | Description of Device Under Test (DUT) | 3 |
| 3.2 | Accessory List | 4 |
| 3.3 | Product Photo | 5 |
| 3.4 | Applied Standards | 6 |
| 3.5 | Device Category and SAR Limits | 7 |
| 3.6 | Test Conditions | 7 |
| 3.6.1 | Ambient Condition | 7 |
| 3.6.2 | Test Configuration | 7 |
| 4 | Specific Absorption Rate (SAR) | 8 |
| 4.1 | Introduction | 8 |
| 4.2 | SAR Definition | 8 |
| 5 | SAR Measurement Setup | 9 |
| 5.1 | DASY4 E-Field Probe System | 10 |
| 5.1.1 | ET3DV6 E-Field Probe Specification | 11 |
| 5.1.2 | ET3DV6 E-Field Probe Calibration | 11 |
| 5.2 | DATA Acquisition Electronics (DAE) | 12 |
| 5.3 | Robot | 13 |
| 5.4 | Measurement Server | 13 |
| 5.5 | SAM Twin Phantom | 13 |
| 5.6 | Device Holder for SAM Twin Phantom | 15 |
| 5.7 | Data Storage and Evaluation | 16 |
| 5.7.1 | Data Storage | 16 |
| 5.7.2 | Data Evaluation | 16 |
| 5.8 | Test Equipment List | 19 |
| 6 | Tissue Simulating Liquids | 20 |
| 7 | Uncertainty Assessment | 22 |
| 8 | SAR Measurement Evaluation | 24 |
| 8.1 | Purpose of System Performance check | 24 |
| 8.2 | System Setup | 24 |
| 8.3 | Validation Results | 26 |
| 9 | Description for DUT Testing Position | 27 |
| 10 | Measurement Procedures | 31 |
| 10.1 | Spatial Peak SAR Evaluation | 31 |
| 10.2 | Scan Procedures | 32 |
| 10.3 | SAR Averaged Methods | 32 |
| 11 | SAR Test Results | 33 |
| 11.1 | Right Cheek | 33 |
| 11.2 | Right Tilted | 33 |
| 11.3 | Left Cheek | 33 |
| 11.4 | Left Tilted | 33 |
| 12 | References | 34 |

Appendix A - System Performance Check Data

Appendix B - SAR Measurement Data

Appendix C - Calibration Data



1 Statement of Compliance

The Specific Absorption Rate (SAR) maximum results found during testing for the **FIC (First International Computer, Inc.) Neo 1973 FIC GTA02** are **0.894 W/kg for GSM SAR and 0.985 W/kg for DCS SAR** with expanded uncertainty 21.4%. They are in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits specified in CNS 14959 and had been tested in accordance with the measurement methods and procedures specified in IEC 62209-1 and IEEE Std 1528.

Approved by

Jones Tsai
Manager



2 Administration Data

2.1 Testing Laboratory

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2.2 Detail of Applicant

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2.3 Detail of Manufacturer

Company Name : First International Computer (Suzhou) Inc.
Address : No. 200 Central Suhong Road, SuZhou Industrial Park, China

2.4 Application Detail

Date of reception of application: Oct. 11, 2007
Start of test : Dec. 10, 2007
End of test : Dec. 11, 2007



3 General Information

3.1 Description of Device Under Test (DUT)

| Specifications | |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DUT Type : | Neo 1973 |
| Brand Name : | FIC |
| Model Name : | GTA02 |
| Tx Frequency : | GSM900 : 890-915MHz DCS1800 : 1710-1785MHz PCS1900 : 1850 ~1910MHz Bluetooth / Bluetooth EDR : 2400-2483.5MHz 802.11b / 802.11g : 2400-2483.5MHz GPS : 1575.42MHz |
| Rx Frequency : | GSM900 : 935-960MHz DCS1800 : 1805-1880MHz PCS1900 : 1930 ~ 1990 MHz Bluetooth / Bluetooth EDR : 2400-2483.5MHz 802.11b / 802.11g : 2400-2483.5MHz GPS : 1575.42MHz |
| Number of Channels : | Bluetooth / Bluetooth EDR: 79 Channels WLAN: 11 Channels |
| Carrier Frequency of Each Channel : | Bluetooth / Bluetooth ED: 2402+n x 1 MHz; n = 0~78 802.11b / 802.11g: 2412+(n-1) x 5 MHz; n = 1~11 |
| Data Rate / Channel Spacing : | Bluetooth: 1Mbps Bluetooth EDR: 2/3Mbps 802.11b: 1/2/5/11Mbps 802.11g: 6/12/18/24/32/48/54Mmps |
| Antenna Connector : | GSM900 / DCS1800 / PCS1900: Coaxial Connector Bluetooth / Bluetooth EDR: NA 802.11b: Coaxial Connector 802.11g: Coaxial Connector GPS : Coaxial Connector |
| Antenna Type : | GSM900 / DCS1800 / PCS1900: Monopole Antenna Bluetooth / Bluetooth EDR: Chip Antenna 802.11b / 802.11g: Chip Antenna GPS : Ceramic Antenna |
| Antenna Gain : | GSM900 / DCS1800 / PCS1900: 0.07 dBi Bluetooth / Bluetooth EDR: -4.84 dBi 802.11b / 802.11g: -3 dBi GPS: 0.5 dBi |
| IMEI Code : | 354651000000010 |
| HW Version : | A5 |
| SW Version : | Moko5 |
| Maximum Output Power to Antenna : | GSM900: 31.80 dBm DCS1800:29.67 dBm PCS1900:29.27 dBm Bluetooth: 2.25 dBm (1Mbps) |

| Specifications | | | |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------|
| | Bluetooth EDR: 2.4 dBm (2Mbps) Bluetooth EDR: 2.53 dBm (3Mbps) 802.11b: 14.02 dBm 802.11g:14.89 dBm | | |
| Digital Modulation Emission : | GSM900 / DCS1800 / PCS1900 : 300KGXW Bluetooth / Bluetooth EDR : FHSS 802.11b: DSSS 802.11g: OFDM | | |
| Type of Modulation : | GSM900 / DCS1800 / PCS1900 : GMSK Bluetooth : GFSK Bluetooth EDR : $\pi/4$ -DQPSK, 8-DPSK 802.11b: DBPSK, DQPSK, CCK 802.11g: BPSK, QPSK, 16QAM, 64QAM | | |
| DUT Stage : | Identical Prototype | | |
| Function Type : | Transmitter | | Transceiver V |

3.2 Accessory List

| | | |
|-------------------|---------------------------|-----------------------------------------------------|
| AC Adapter | Manufacture | AKII TECHNOLOGY CO., LTD. |
| | Brand Name | AKII Technology |
| | Model Name | A10P1-05MP |
| | Power Rating | I/P:100-240 Vac, 47-63 Hz, 0.3A; O/P: 5Vdc, 2.0A |
| | AC Power Cord Type | 1.5 meter non-shielded cable without ferrite core |
| Battery | Manufacture | WELLDONE COMPANY |
| | Brand Name | FIC |
| | Model Name | GTC-01 / GTA-01 |
| | Rating | 3.7Vdc, 1200mAh |
| | Type | Li-ion |
| Earphone | Brand Name | Xport |
| | Model Name | Ko-11-1020a |
| | Type | 1.42 meter non-shielded cable without ferrite core |
| USB Cable | Brand Name | Golden Bridge |
| | Model Name | AS52-0607007 |
| | Type | 1.29 meter non-shielded cable without ferrite core |

Remark: Above EUT's information was declared by manufacturer. Please refer to the specifications of manufacturer or User's Manual for more detailed features description.

3.3 Product Photo





3.4 Applied Standards

The Specific Absorption Rate (SAR) testing specification, method and procedure for this Neo 1973 is in accordance with the following standards:

CNS 14959,
IEEE P1528, and
IEC 62209-1

3.5 Device Category and SAR Limits

Each of these devices 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 public exposure should be applied for this device which is 2.0 W/kg as averaged over any 10 gram of tissue.

3.6 Test Conditions

3.6.1 Ambient Condition

| Item | HSL_900 | HSL_1800 |
|--------------------------------------------------|----------------|-----------------|
| Ambient Temperature (°C) | 20-24°C | |
| Tissue simulating liquid temperature (°C) | 21.9°C | 22.0°C |
| Humidity (%) | <60% | |

3.6.2 Test Configuration

The device was controlled by using a base station emulator CMU 200. Communication between the devices 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.

Measurements were performed on the low, middle and high channels of both bands for each testing position.

The DUT was set from the emulator to radiate maximum output power during all tests.

For head SAR testing, EUT is in GSM link mode. In GSM link mode, its crest factor is 8.3.

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 general public group.

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:

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

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

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

$$\mathbf{SAR} = C \frac{\delta T}{\delta t}$$

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

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

, 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 Setup

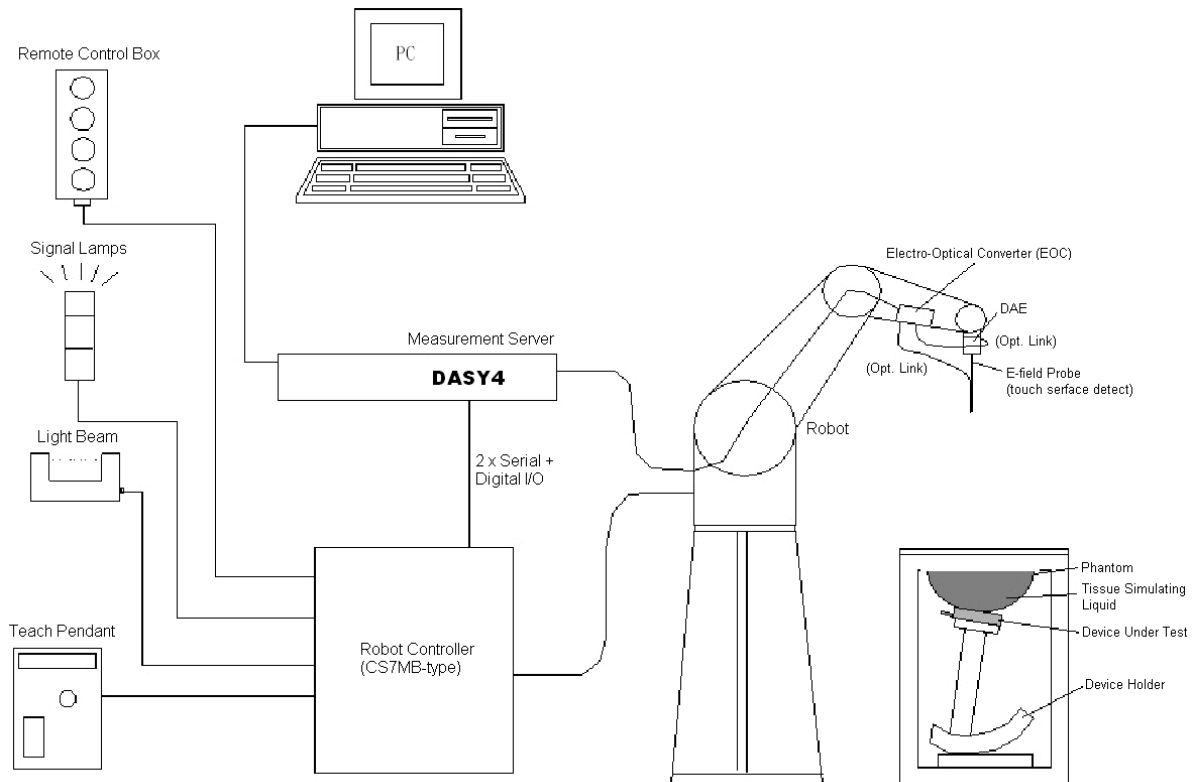


Fig. 5.1 DASY4 System

The DASY4 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 software
- Remote control with teach pendant and additional circuitry for robot safety such as warning 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 DASY4 E-Field Probe System

The SAR measurement is conducted with the dosimetric probe ET3DV6 (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 ET3DV6 E-Field Probe Specification

| | |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Construction | Symmetrical design with triangular core Built-in optical fiber for surface detection system Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents) |
| Calibration | Simulating tissue at frequencies of 900MHz, 1.8GHz and 2.45GHz for brain and muscle (accuracy $\pm 8\%$) |
| Frequency | 10 MHz to > 3 GHz |
| Directivity | ± 0.2 dB in brain tissue (rotation around probe axis) ± 0.4 dB in brain tissue (rotation perpendicular to probe axis) |
| Dynamic Range | 5μ W/g to > 100mW/g; Linearity: ± 0.2 dB |
| Surface Detection | ± 0.2 mm repeatability in air and clear liquids on reflecting surface |
| Dimensions | Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diameter: 6.8mm Distance from probe tip to dipole centers: 2.7mm |
| Application | General dosimetry up to 3GHz Compliance tests for mobile phones and Wireless LAN Fast automatic scanning in arbitrary phantoms |



Fig. 5.2 Probe Setup on Robot

5.1.2 ET3DV6 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 are as below:

➤ **ET3DV6 sn1787**

| | | | | |
|--------------------------------------------|----------------------------|-----------------------|-----------------------|---------------|
| Sensitivity | X axis : 1.63 μ V | Y axis : 1.66 μ V | Z axis : 2.08 μ V | |
| Diode compression point | X axis : 92 mV | Y axis : 96 mV | Z axis : 91 mV | |
| Conversion factor (Head / Body) | Frequency (MHz) | X axis | Y axis | Z axis |
| | 800~1000 | 6.58 / 6.10 | 6.58 / 6.10 | 6.58 / 6.10 |
| | 1710~1910 | 5.16 / 4.68 | 5.16 / 4.68 | 5.16 / 4.68 |
| Boundary effect (Head / Body) | Frequency (MHz) | Alpha | Depth | |
| | 800~1000 | 0.32 / 0.36 | 2.42 / 2.52 | |
| | 1710~1910 | 0.50 / 0.61 | 2.61 / 2.56 | |

NOTE: The probe parameters have been calibrated by the SPEAG.

5.2 DATA Acquisition Electronics (DAE)

The data acquisition electronics (DAE4) 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 mechanical probe mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

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

5.3 Robot

The DASY4 system uses the high precision robots RX90BL type out of the newer series from Stäubli SA (France). For the 6-axis controller DASYS system, the CS7MB robot controller version from Stäubli is used. The RX robot series have many features that are important for our application:

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

5.4 Measurement Server

The DASY4 measurement server is based on a PC/104 CPU board with
166 MHz CPU
32 MB chipset and
64 MB RAM.

Communication with
the DAE4 electronic box
the 16-bit AD-converter system for optical detection and digital I/O interface.

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

5.5 SAM Twin Phantom

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

- Left head
- Right head
- Flat phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters.

On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

The phantom can be used with the following tissue simulating liquids:

*Water-sugar based liquid

*Glycol based liquids

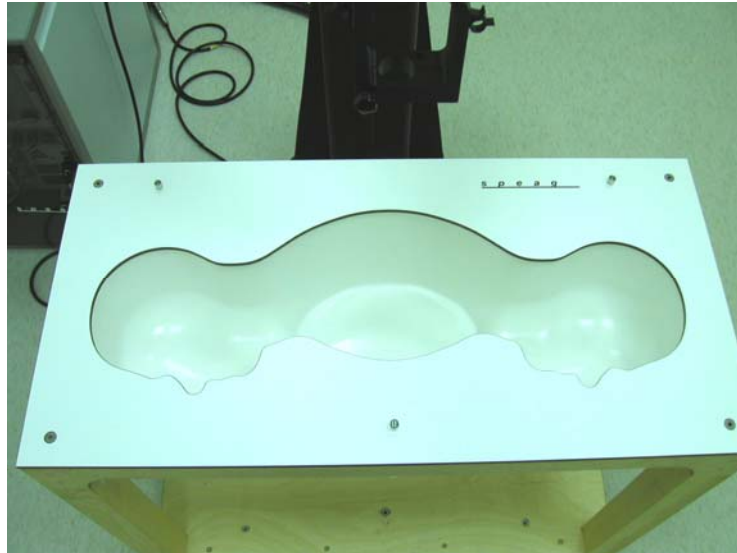


Fig. 5.3 Top View of Twin Phantom



Fig. 5.4 Bottom View of Twin Phantom

5.6 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 in 5 mm distance, a positioning uncertainty of $\pm 0.5\text{mm}$ would produce a SAR uncertainty of $\pm 20\%$. An accurate device position is therefore crucial for accurate and repeatable measurement. The position 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 centers for both scales are the ear reference point (EPR).

Thus the device needs no repositioning when changing the angles.

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



Fig. 5.5 Device Holder

5.7 Data Storage and Evaluation

5.7.1 Data Storage

The DASY4 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 with the extension .DA4. 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 DASY4 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 :

$$\text{E-field probes : } E_i = \sqrt{\frac{V_i}{Norm_i ConvF}}$$

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

with $V_i =$ compensated signal of channel i ($i = x, y, z$)
 $Norm_i =$ sensor sensitivity of channel i ($i = x, y, z$)
 $\mu V/(V/m)^2$ 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) :

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

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

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

with $SAR =$ local specific absorption rate in mW/g
 $Etot =$ total field strength in V/m
 $\sigma =$ conductivity in [mho/m] or [Siemens/m]
 $\rho =$ 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.

The power flow density is calculated assuming the excitation field to be a free space field.

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

with P_{pwe} = equivalent power density of a plane wave in mW/cm²
 E_{tot} = total electric field strength in V/m
 H_{tot} = total magnetic field strength in A/m



5.8 Test Equipment List

| Manufacture | Name of Equipment | Type/Model | Serial Number | Calibration | |
|-------------|---------------------------------|-----------------------|-----------------|---------------|---------------|
| | | | | Last Cal. | Due Date |
| SPEAG | Dosimetric E-Filed Probe | ET3DV6 | 1787 | Aug. 28, 2007 | Aug. 28, 2008 |
| SPEAG | 900MHz System Validation Kit | D900V2 | 190 | Jul. 16, 2007 | Jul. 16, 2009 |
| SPEAG | 1800MHz System Validation Kit | D1800V2 | 2d076 | Jul. 10, 2007 | Jul. 10, 2009 |
| SPEAG | Data Acquisition Electronics | DAE4 | 778 | Sep. 17, 2007 | Sep. 17, 2008 |
| SPEAG | Device Holder | N/A | N/A | NCR | NCR |
| SPEAG | Phantom | QD 000 P40 C | TP-1150 | NCR | NCR |
| SPEAG | Robot | Staubli RX90BL | F03/5W15A1/A/01 | NCR | NCR |
| SPEAG | Software | DASY4 V4.7 Build 55 | N/A | NCR | NCR |
| SPEAG | Software | SEMCAD V1.8 Build 176 | N/A | NCR | NCR |
| SPEAG | Measurement Server | SE UMS 001 BA | 1021 | NCR | NCR |
| Agilent | ENA Series Network Analyzer | E5071C | MY46100746 | Feb. 21, 2007 | Feb. 21, 2008 |
| Agilent | Wireless Communication Test Set | E5515C | GB46311322 | Dec. 22, 2006 | Dec. 22, 2008 |
| Agilent | Dielectric Probe Kit | 85070D | US01440205 | NCR | NCR |
| Agilent | Dual Directional Coupler | 778D | 50422 | NCR | NCR |
| Agilent | Power Amplifier | 8449B | 3008A01917 | NCR | NCR |
| Agilent | Power Meter | E4416A | GB41292344 | Feb. 08, 2007 | Feb. 08, 2008 |
| Agilent | Power Sensor | E9327A | US40441548 | Feb. 08, 2007 | Feb. 08, 2008 |
| Agilent | Signal Generator | E8247C | MY43320596 | Mar. 01, 2006 | Mar. 01, 2008 |

Table 5.1 Test Equipment List

6 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY4, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. The liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm.

The following ingredients for tissue simulating liquid are used:

- **Water:** deionized water (pure H₂O), resistivity $\geq 16M\Omega$ - as basis for the liquid
- **Sugar:** refined sugar in crystals, as available in food shops – to reduce relative permittivity
- **Salt:** pure NaCl – to increase conductivity
- **Cellulose:** Hydroxyethyl-cellulose, medium viscosity (75-125 mPa.s, 2% in water, 20°C), CAS#54290-to increase viscosity and to keep sugar in solution.
- **Preservative:** Preventol D-7 Bayer AG, D-51368 Leverkusen, CAS#55965-84-9- to prevent the spread of bacteria and molds.
- **DGMBE:** Deithlenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS#112-34-5 – to reduce relative permittivity.

Table 6.1 gives the recipes for one liter of head tissue simulating liquid for frequency bands 900 MHz, 1800 MHz.

| Ingredient | HSL-900 | HSL-1800 |
|--------------------------------------------|-------------------------------------------------------------------------|---------------------------------------------------------------------------|
| Water | 532.98 g | 552.42 g |
| Cellulose | 3.2 g | 0 g |
| Salt | 18.3 g | 3.06 g |
| Preventol D-7 | 2.4 g | 0 g |
| Sugar | 766.0 g | 0 g |
| DGMBE | 0 g | 444.52 g |
| Total amount | 1 liter (1.3 kg) | 1 liter (1.0 kg) |
| Dielectric Parameters target at 22° | f=900 MHz $\epsilon_r = 42.0\pm 5\%$, $\sigma = 0.99\pm 5\%$ S/m | f = 1800MHz $\epsilon_r = 40.0\pm 5\%$, $\sigma = 1.38\pm 5\%$ S/m |

Table 6.1 Recipes for 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.

Table 6.2 shows the measuring results for head simulating liquid.

| Bands | Frequency(MHz) | Permittivity (ϵ_r) | Conductivity (σ) | Measurement date |
|-------------------------------|----------------|-------------------------------|---------------------------|------------------|
| GSM band (880 ~ 960 MHz) | 890.2 | 40.6 | 0.968 | Dec. 10, 2007 |
| | 902.4 | 40.5 | 0.976 | |
| | 914.8 | 40.4 | 0.987 | |
| DCS band (1710 ~ 1880 MHz) | 1710.2 | 39.6 | 1.35 | Dec. 11, 2007 |
| | 1747.6 | 39.6 | 1.38 | |
| | 1784.8 | 39.3 | 1.4 | |

Table 6.2 Measuring Results for Simulating Liquid

The measuring data are consistent with $\epsilon_r = 42.0 \pm 5\%$ and $\sigma = 0.99 \pm 5\%$ for head PGSM, $\epsilon_r = 40.0 \pm 5\%$ and $\sigma = 1.38 \pm 5\%$ for head DCS.

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, manufacture’s specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in Table 7.1

| Uncertainty Distributions | Normal | Rectangular | Triangular | U-shape |
|-----------------------------------------|--------------------|-------------|------------|---------|
| Multiplying factor^(a) | 1/k ^(b) | 1/√3 | 1/√6 | 1/√2 |

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

(b) κ is the coverage factor

Table 7.1 Multiplying Factors for Various Distributions

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 DAS4 uncertainty Budget is showed in Table 7.2.



| Error Description | Uncertainty Value ± % | Probability Distribution | Divisor | Ci 10g | Standard Unc. (10g) | vi or Veff |
|---------------------------------------------------|-----------------------|--------------------------|---------|--------|---------------------|------------|
| Measurement System | | | | | | |
| Probe Calibration | ±5.9 % | Normal | 1 | 1 | ±5.9 % | ∞ |
| Axial Isotropy | ±4.7 % | Rectangular | √3 | 0.7 | ±1.9 % | ∞ |
| Hemispherical Isotropy | ±9.6 % | Rectangular | √3 | 0.7 | ±3.9 % | ∞ |
| Boundary Effects | ±1.0 % | Rectangular | √3 | 1 | ±0.6 % | ∞ |
| Linearity | ±4.7 % | Rectangular | √3 | 1 | ±2.7 % | ∞ |
| System Detection Limits | ±1.0 % | Rectangular | √3 | 1 | ±0.6 % | ∞ |
| Readout Electronics | ±0.3 % | Normal | 1 | 1 | ±0.3 % | ∞ |
| Response Time | ±0.8 % | Rectangular | √3 | 1 | ±0.5 % | ∞ |
| Integration Time | ±2.6 % | Rectangular | √3 | 1 | ±1.5 % | ∞ |
| RF Ambient Noise | ±3.0 % | Rectangular | √3 | 1 | ±1.7 % | ∞ |
| RF Ambient Reflections | ±3.0 % | Rectangular | √3 | 1 | ±1.7 % | ∞ |
| Probe Positioner | ±0.4 % | Rectangular | √3 | 1 | ±0.2 % | ∞ |
| Probe Positioning | ±2.9 % | Rectangular | √3 | 1 | ±1.7 % | ∞ |
| Max. SAR Eval. | ±1.0 % | Rectangular | √3 | 1 | ±0.6 % | ∞ |
| Test Sample Related | | | | | | |
| Device Positioning | ±2.9 % | Normal | 1 | 1 | ±2.9 % | 145 |
| Device Holder | ±3.6 % | Normal | 1 | 1 | ±3.6 % | 5 |
| Power Drift | ±5.0 % | Rectangular | √3 | 1 | ±2.9 % | ∞ |
| Phantom and Setup | | | | | | |
| Phantom Uncertainty | ±4.0 % | Rectangular | √3 | 1 | ±2.3 % | ∞ |
| Liquid Conductivity (target) | ±5.0 % | Rectangular | √3 | 0.43 | ±1.2 % | ∞ |
| Liquid Conductivity (meas.) | ±2.5 % | Normal | 1 | 0.43 | ±1.1 % | ∞ |
| Liquid Permittivity (target) | ±5.0 % | Rectangular | √3 | 0.49 | ±1.4 % | ∞ |
| Liquid Permittivity (meas.) | ±2.5 % | Normal | 1 | 0.49 | ±1.2 % | ∞ |
| Combined Standard Uncertainty | | | | | ±10.7% | 387 |
| Coverage Factor for 95 % | | K=2 | | | | |
| Expanded Uncertainty (Coverage factor = 2) | | | | | ±21.4 | |

Table 7.2 Uncertainty Budget of DASYS

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 at frequency 900 and 1800 MHz. 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:

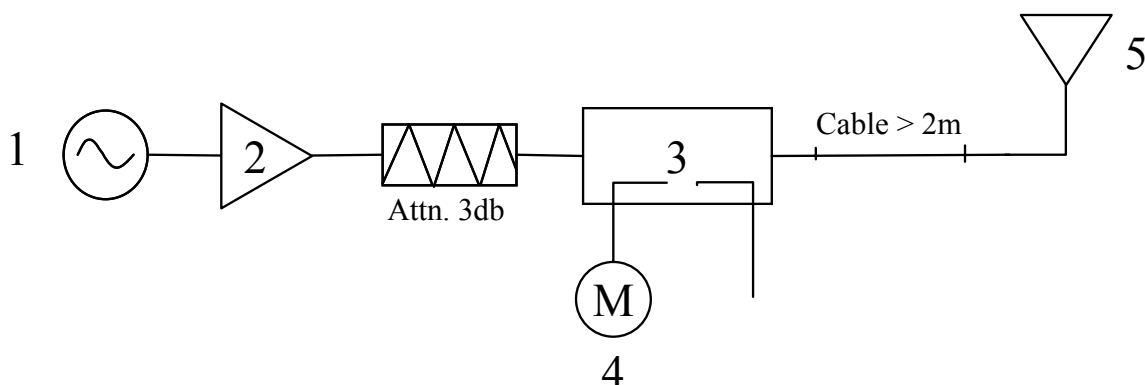


Fig. 8.1 System Setup for System Evaluation

1. Signal Generator
2. Amplifier
3. Directional Coupler
4. Power Meter
5. 900 MHz or 1800 MHz Dipole

The output power on dipole port must be calibrated to 20dBm (100mW) before dipole is connected.



Fig 8.2 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.

| Band | SAR | Target (W/kg) | Measurement data (W/kg) | Variation | Measurement date |
|------------------------|-----------|---------------|-------------------------|-----------|------------------|
| GSM band (900 MHz) | SAR (1g) | 10.3 | 10.6 | 2.9 % | Dec. 10, 2007 |
| | SAR (10g) | 6.6 | 6.79 | 2.9 % | |
| DCS band (1800 MHz) | SAR (1g) | 37.2 | 37.3 | 0.3 % | Dec. 11, 2007 |
| | SAR (10g) | 20.0 | 19.5 | -2.5 % | |

Table 8.1 Target and Measurement Data Comparison

The table above indicates the system performance check can meet the variation criterion.

9 Description for DUT Testing Position

This DUT was tested in 4 different positions. They are left cheek, left tilted, right cheek, and right tilted as illustrated below:

1) “Cheek Position”

i) 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, RE and LE) and align the center of the ear piece with the line RE-LE.

ii) 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. 9.1).

2) “Tilted Position”

i) To position the device in the “cheek” position described above

ii) While maintaining the device the reference planes described above and pivoting against the ear, move it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig. 9.2).

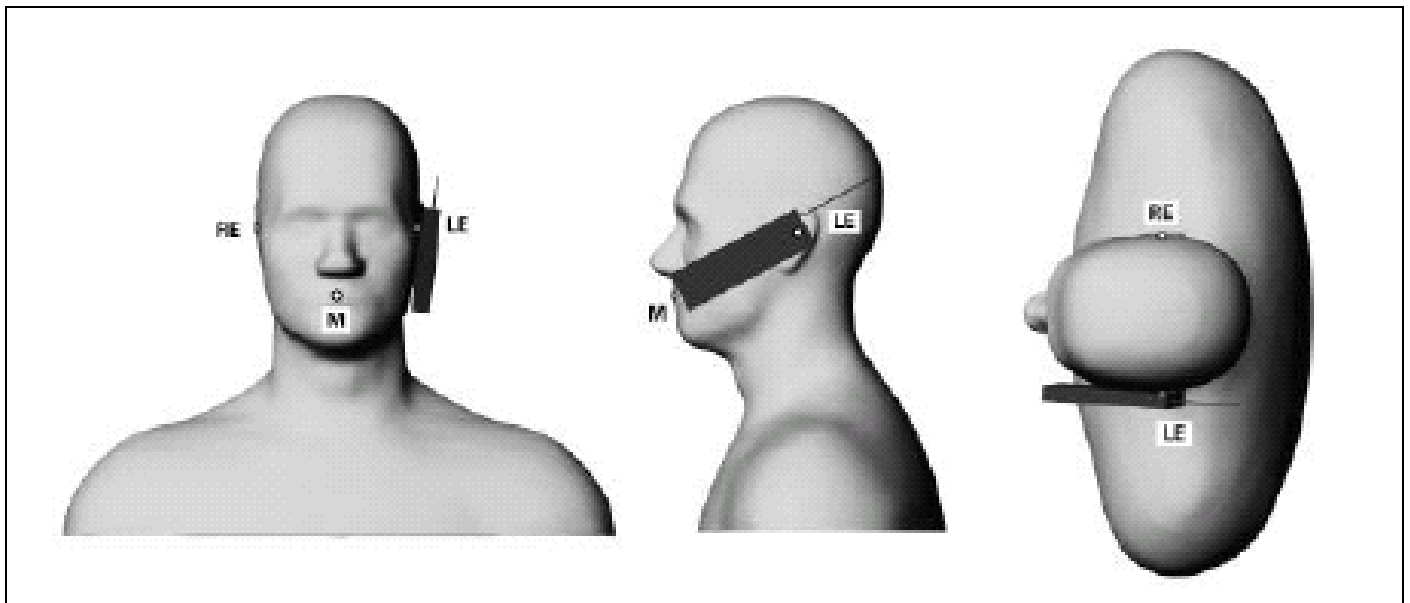


Fig. 9.1 Phone Position 1, “Cheeked or Touch Position”. The reference points for the right ear (RE), left ear (LE) and mouth (M), which defines the plane for phone positioning, are indicated.

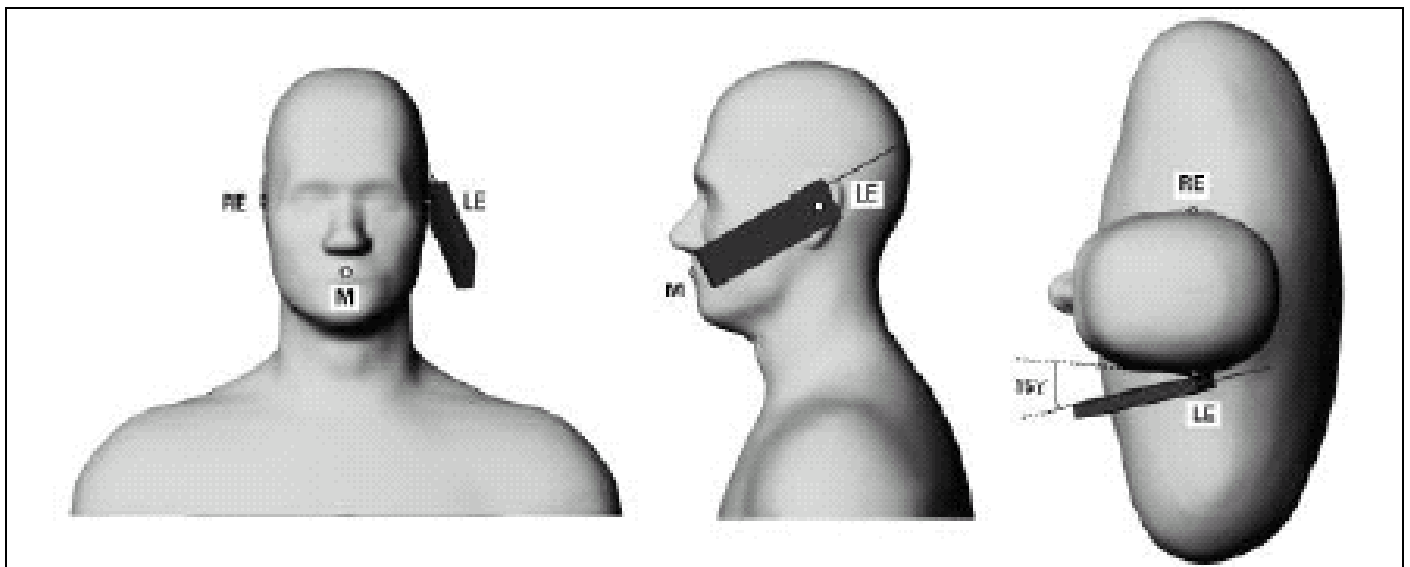


Fig. 9.2 Phone Position 2, “Tilted Position”. The reference point for the right ear (RE), left ear (LE) and mouth (M), which defines the plane for phone positioning, are indicated.

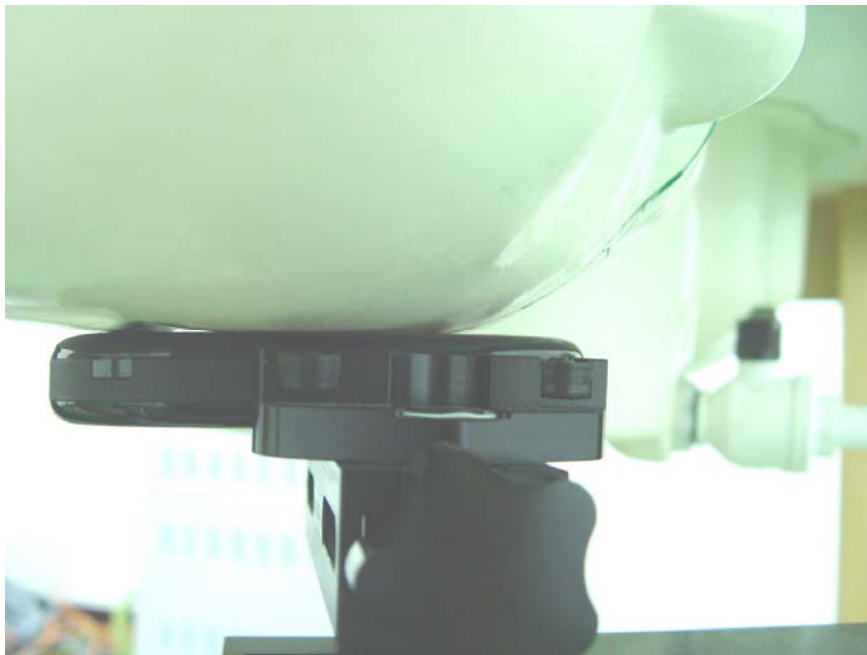


Fig. 9.3 Right Cheek



Fig. 9.4 Right Tilted

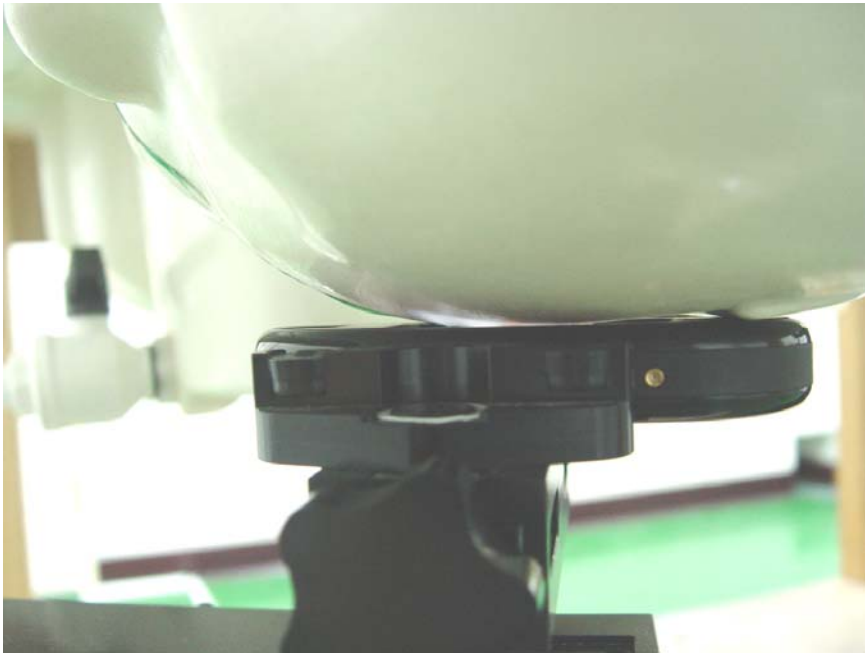


Fig. 9.5 Left Cheek

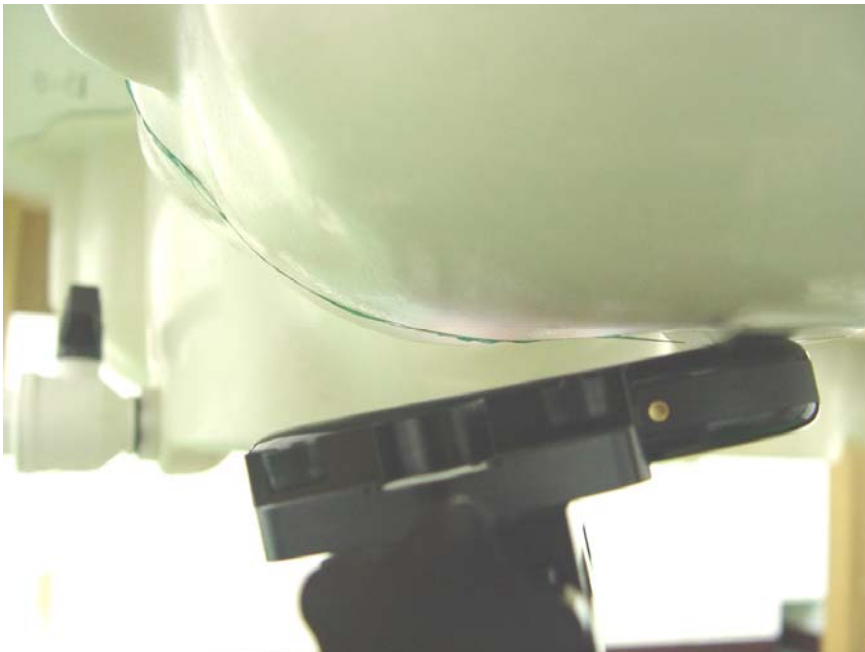


Fig. 9.6 Left Tilted

10 Measurement Procedures

The measurement procedures are as follows:

- Linking DUT with base station simulator CMU200 in middle channel for GSM or DCS band
- Setting PCL=5 for GSM and PCL=0 for DCS on CMU200 to allow DUT to radiate maximum output power
- Measuring output power through RF cable and power meter
- Placing the DUT in the positions described in the last section
- Setting scan area, grid size and other setting on the DASY4 software
- Taking data for the middle channel on each testing position
- Finding out the largest SAR result on these testing positions of each band
- Measuring output power and SAR results for the low and high channels in this worst case testing position

According to the IEEE P1528 draft standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- Power reference measurement
- Area scan
- Zoom scan
- Power reference measurement

10.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the IEEE P1528-2003 standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY4 software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

Base on the Draft: SCC-34, SC-2, WG-2-Computational Dosimetry, IEEE P1528/D1.2 (Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head From Wireless Communications Devices: Measurement Techniques), a new algorithm has been implemented. The spatial-peak SAR can be computed over any required mass.

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:

- extraction of the measured data (grid and values) from the Zoom Scan
- calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- generation of a high-resolution mesh within the measured volume

- interpolation of all measured values from the measurement grid to the high-resolution grid
- extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- calculation of the averaged SAR within masses of 1g and 10g

10.2 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. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

10.3 SAR Averaged Methods

In DASy4, 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.



11 SAR Test Results

11.1 Right Cheek

| Bands | Chan. | Freq. (MHz) | Modulation type | Conducted Power (dBm) | Power Drift (dB) | Measured 10g SAR (W/kg) | Limits (W/Kg) | Results |
|-------|------------|-------------|-----------------|-----------------------|------------------|-------------------------|---------------|---------|
| GSM | 1 (Low) | 890.2 | GMSK | 31.80 | -0.07 | 0.894 | 2.0 | Pass |
| | 62 (Mid) | 902.4 | GMSK | 31.59 | -0.097 | 0.789 | 2.0 | Pass |
| | 124 (High) | 914.8 | GMSK | 31.42 | 0.015 | 0.687 | 2.0 | Pass |
| DCS | 512 (Low) | 1710.2 | GMSK | 29.67 | -0.1 | 0.985 | 2.0 | Pass |
| | 699 (Mid) | 1747.6 | GMSK | 29.07 | -0.152 | 0.801 | 2.0 | Pass |
| | 885 (High) | 1784.8 | GMSK | 28.49 | -0.005 | 0.674 | 2.0 | Pass |

11.2 Right Tilted

| Bands | Chan. | Freq. (MHz) | Modulation type | Conducted Power (dBm) | Power Drift (dB) | Measured 10g SAR (W/kg) | Limits (W/Kg) | Results |
|-------|------------|-------------|-----------------|-----------------------|------------------|-------------------------|---------------|---------|
| GSM | 1 (Low) | 890.2 | GMSK | 31.80 | - | - | - | - |
| | 62 (Mid) | 902.4 | GMSK | 31.59 | -0.083 | 0.47 | 2.0 | Pass |
| | 124 (High) | 914.8 | GMSK | 31.42 | - | - | - | - |
| DCS | 512 (Low) | 1710.2 | GMSK | 29.67 | - | - | - | - |
| | 699 (Mid) | 1747.6 | GMSK | 29.07 | -0.053 | 0.275 | 2.0 | Pass |
| | 885 (High) | 1784.8 | GMSK | 28.49 | - | - | - | - |

11.3 Left Cheek

| Bands | Chan. | Freq. (MHz) | Modulation type | Conducted Power (dBm) | Power Drift (dB) | Measured 10g SAR (W/kg) | Limits (W/Kg) | Results |
|-------|------------|-------------|-----------------|-----------------------|------------------|-------------------------|---------------|---------|
| GSM | 1 (Low) | 890.2 | GMSK | 31.80 | - | - | - | - |
| | 62 (Mid) | 902.4 | GMSK | 31.59 | -0.186 | 0.787 | 2.0 | Pass |
| | 124 (High) | 914.8 | GMSK | 31.42 | - | - | - | - |
| DCS | 512 (Low) | 1710.2 | GMSK | 29.67 | - | - | - | - |
| | 699 (Mid) | 1747.6 | GMSK | 29.07 | -0.04 | 0.66 | 2.0 | Pass |
| | 885 (High) | 1784.8 | GMSK | 28.49 | - | - | - | - |

11.4 Left Tilted

| Bands | Chan. | Freq. (MHz) | Modulation type | Conducted Power (dBm) | Power Drift (dB) | Measured 10g SAR (W/kg) | Limits (W/Kg) | Results |
|-------|------------|-------------|-----------------|-----------------------|------------------|-------------------------|---------------|---------|
| GSM | 1 (Low) | 890.2 | GMSK | 31.80 | - | - | - | - |
| | 62 (Mid) | 902.4 | GMSK | 31.59 | -0.085 | 0.413 | 2.0 | Pass |
| | 124 (High) | 914.8 | GMSK | 31.42 | - | - | - | - |
| DCS | 512 (Low) | 1710.2 | GMSK | 29.67 | - | - | - | - |
| | 699 (Mid) | 1747.6 | GMSK | 29.07 | 0.004 | 0.224 | 2.0 | Pass |
| | 885 (High) | 1784.8 | GMSK | 28.49 | - | - | - | - |

Test Engineer : Eric Huang



12 References

- [1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”
- [2] IEEE Std. P1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, April 21, 2003
- [3] Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01), “Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to RF Emissions”, June 2001
- [4] IEEE Std. C95.3-2002, “IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields-RF and Microwave”, 2002
- [5] IEEE Std. C95.1-1999, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, 1999
- [6] Robert J. Renka, “Multivariate Interpolation Of Large Sets Of Scattered Data”, University of North Texas ACM Transactions on Mathematical Software, vol. 14, no. 2, June 1988, pp. 139-148
- [7] DAYS4 System Handbook
- [8] IEC 62209-1, “Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine 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
- [9] CNS 14959, “Limits for exposing to time-varying electric, magnetic and electromagnetic fields (up to 300 GHz)”, December 5, 2005

Appendix A - System Performance Check Data

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/10

System Check_Head_900MHz

DUT: Dipole 900 MHz

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1

Medium: HSL_900 Medium parameters used: $f = 900 \text{ MHz}$; $\sigma = 0.975 \text{ mho/m}$; $\epsilon_r = 40.5$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 22.6 °C; Liquid Temperature : 21.9 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(6.58, 6.58, 6.58); Calibrated: 2007/8/28

- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection) Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn778; Calibrated: 2007/9/17

- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303

- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Pin=100mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.16 mW/g

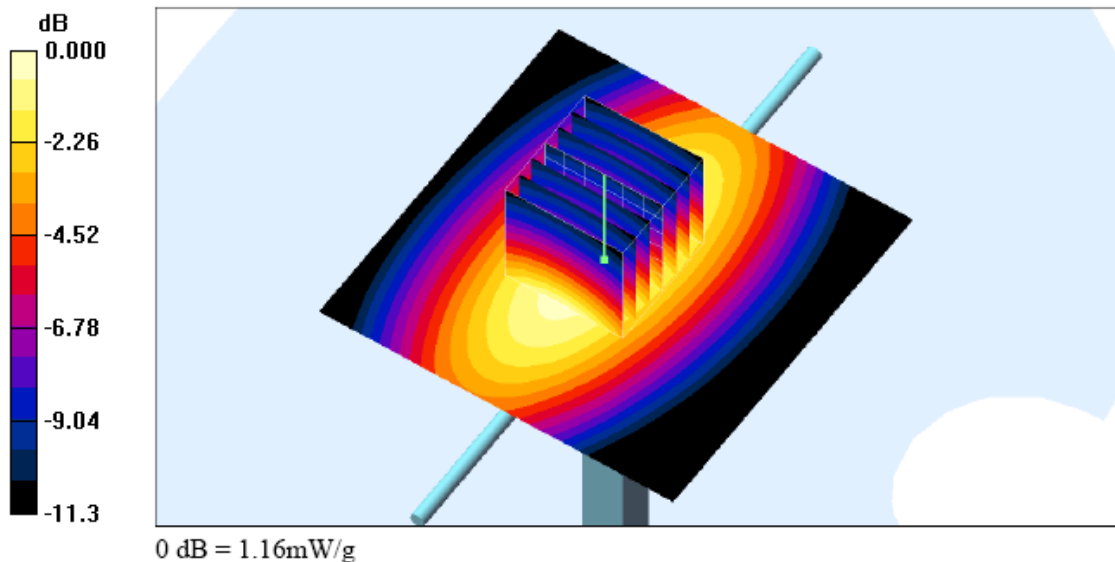
Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 35.1 V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 1.61 W/kg

SAR(1 g) = 1.06 mW/g; SAR(10 g) = 0.679 mW/g

Maximum value of SAR (measured) = 1.16 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/11

System Check_Head_1800MHz

DUT: Dipole 1800 MHz

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1

Medium: HSL_1800 Medium parameters used: $f = 1800 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 39.3$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 22.5 °C; Liquid Temperature : 22.0 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(5.16, 5.16, 5.16); Calibrated: 2007/8/28
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection) Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Pin=100mW/Area Scan (41x41x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 4.37 mW/g

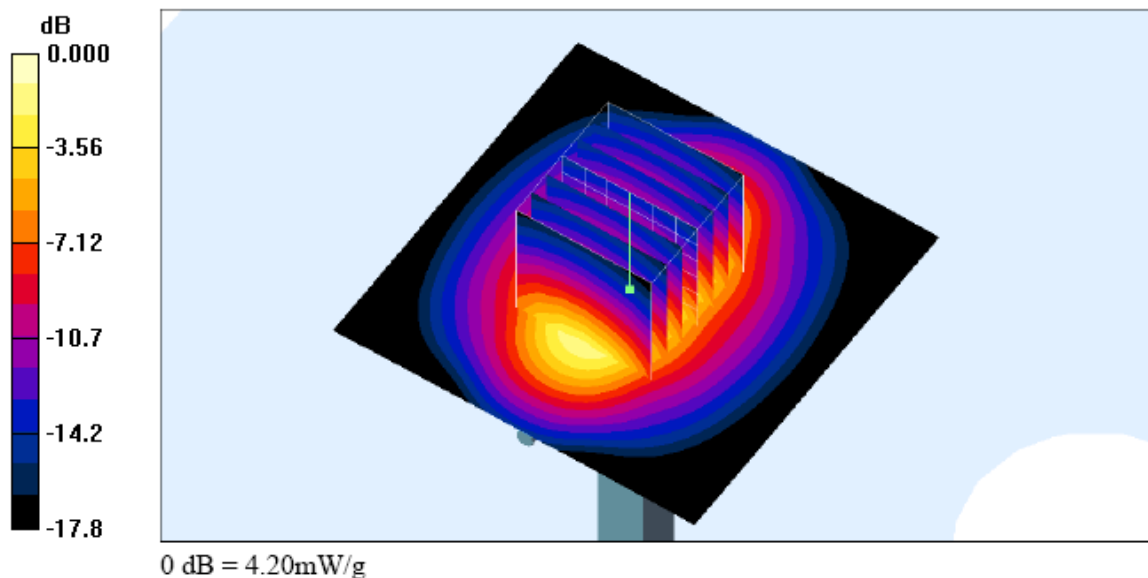
Pin=100mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 58.8 V/m; Power Drift = -0.013 dB

Peak SAR (extrapolated) = 6.51 W/kg

SAR(1 g) = 3.73 mW/g; SAR(10 g) = 1.95 mW/g

Maximum value of SAR (measured) = 4.20 mW/g



Appendix B - SAR Measurement Data

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/10

Right Cheek_GSM900 Ch1

DUT: 7O1104

Communication System: EGSM; Frequency: 890.2 MHz; Duty Cycle: 1:8.3

Medium: HSL_900 Medium parameters used : $f = 890.2 \text{ MHz}$; $\sigma = 0.968 \text{ mho/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.9 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(6.58, 6.58, 6.58); Calibrated: 2007/8/28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch1/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.36 mW/g

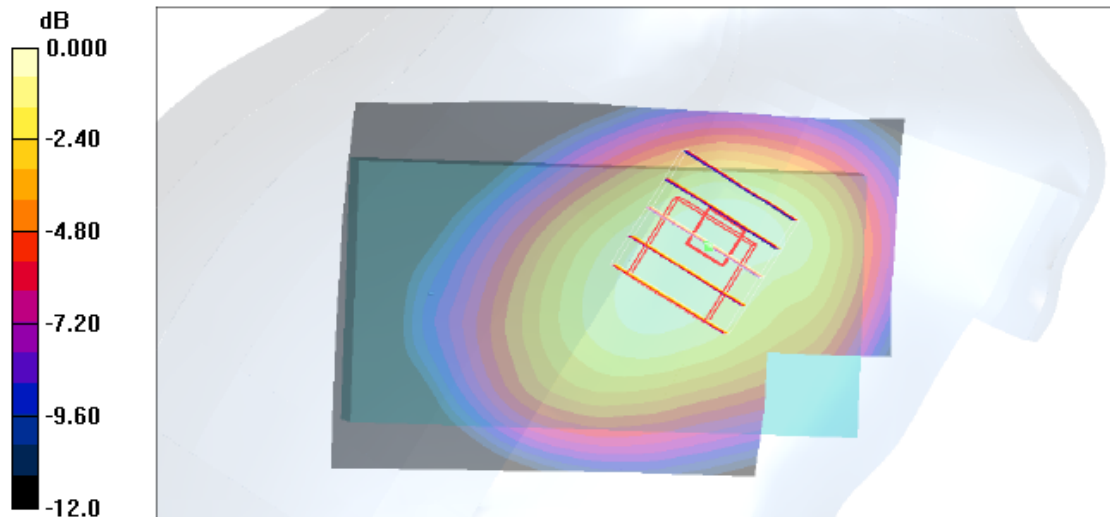
Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.9 V/m; Power Drift = -0.070 dB

Peak SAR (extrapolated) = 1.90 W/kg

SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.894 mW/g

Maximum value of SAR (measured) = 1.33 mW/g



0 dB = 1.33mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/10

Right Tilted_GSM900 Ch62

DUT: 701104

Communication System: EGSM; Frequency: 902.4 MHz; Duty Cycle: 1:8.3

Medium: HSL_900 Medium parameters used : $f = 902.4 \text{ MHz}$; $\sigma = 0.976 \text{ mho/m}$; $\epsilon_r = 40.5$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 22.6 °C; Liquid Temperature : 21.9 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(6.58, 6.58, 6.58); Calibrated: 2007/8/28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch62/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.671 mW/g

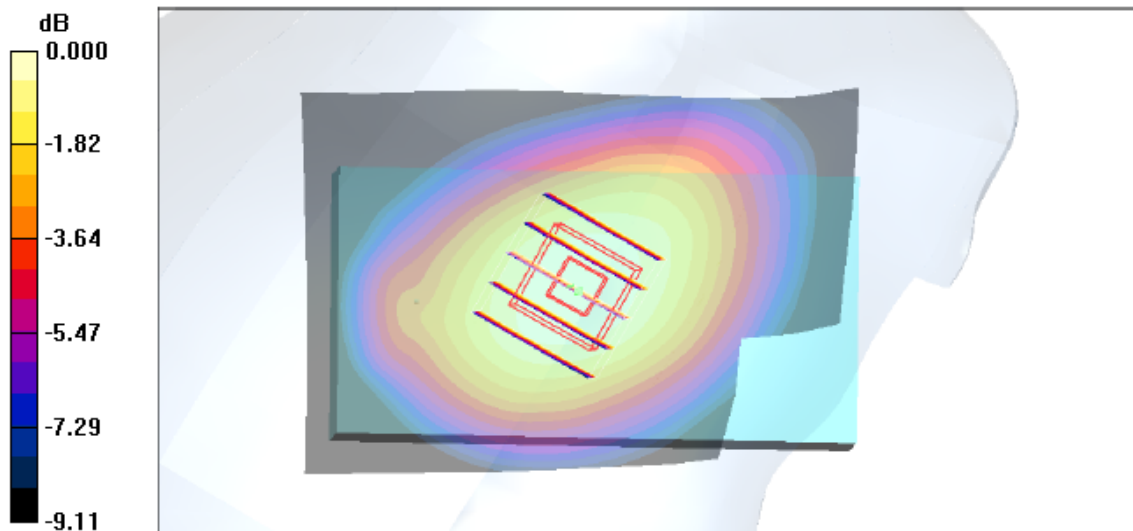
Ch62/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.7 V/m; Power Drift = -0.083 dB

Peak SAR (extrapolated) = 0.767 W/kg

SAR(1 g) = 0.628 mW/g; SAR(10 g) = 0.470 mW/g

Maximum value of SAR (measured) = 0.664 mW/g



0 dB = 0.664mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/10

Left Cheek_GSM900 Ch62

DUT: 7O1104

Communication System: EGSM; Frequency: 902.4 MHz; Duty Cycle: 1:8.3

Medium: HSL_900 Medium parameters used: $f = 902.4 \text{ MHz}$; $\sigma = 0.976 \text{ mho/m}$; $\epsilon_r = 40.5$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 22.7 °C; Liquid Temperature : 21.9 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(6.58, 6.58, 6.58); Calibrated: 2007/8/28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch62/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

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

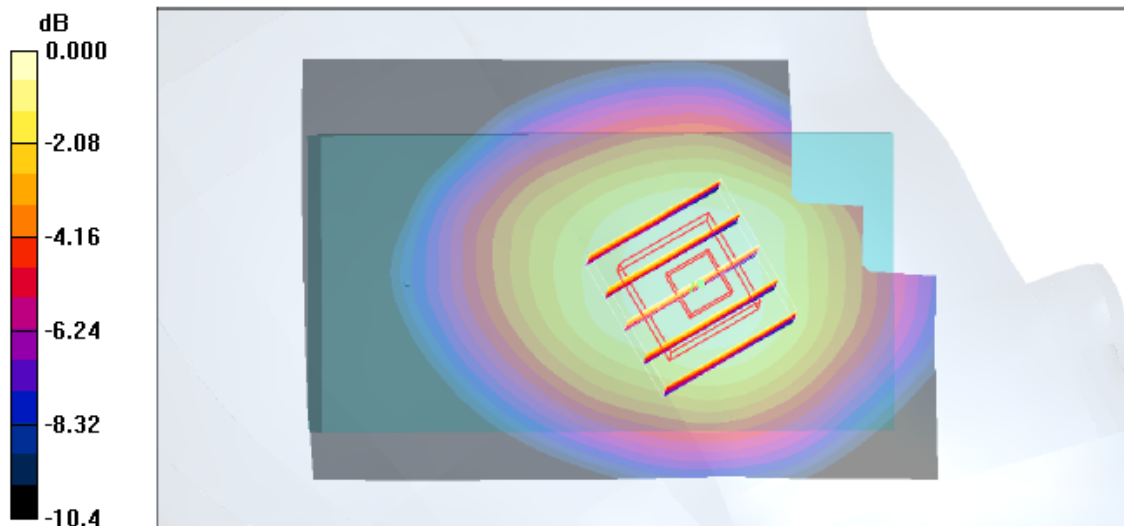
Ch62/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.0 V/m; Power Drift = -0.186 dB

Peak SAR (extrapolated) = 1.26 W/kg

SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.787 mW/g

Maximum value of SAR (measured) = 1.09 mW/g



0 dB = 1.09mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/10

Left Tilted_GSM900 Ch62

DUT: 701104

Communication System: EGSM; Frequency: 902.4 MHz; Duty Cycle: 1:8.3

Medium: HSL_900 Medium parameters used : $f = 902.4 \text{ MHz}$; $\sigma = 0.976 \text{ mho/m}$; $\epsilon_r = 40.5$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 22.6 °C; Liquid Temperature : 21.9 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(6.58, 6.58, 6.58); Calibrated: 2007/8/28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: SAM-B; Type: QD 000 P40 C; Serial: TP-1383
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch62/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.574 mW/g

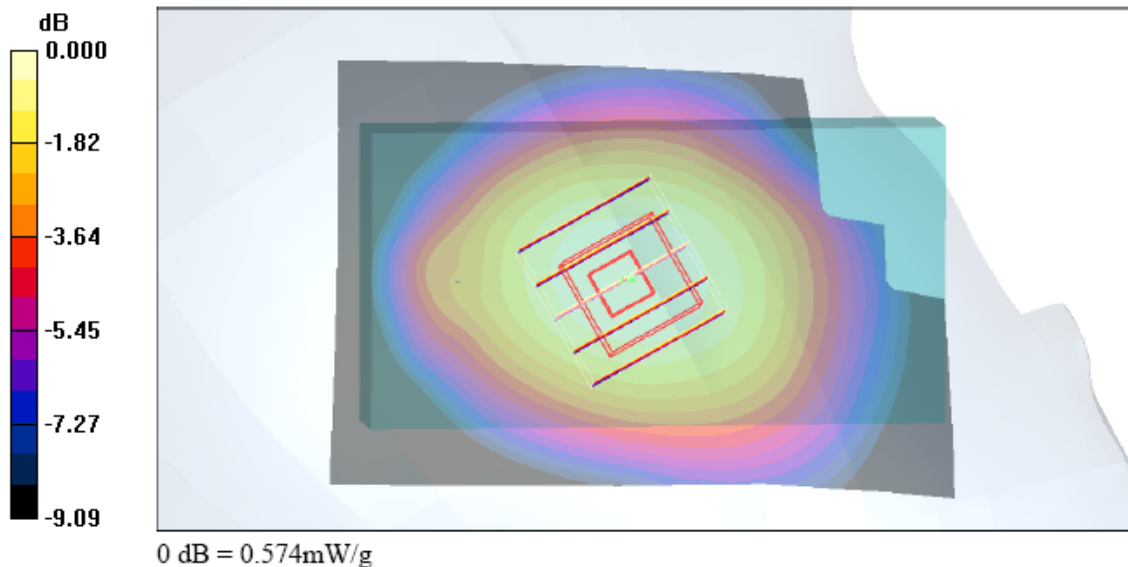
Ch62/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.6 V/m; Power Drift = -0.085 dB

Peak SAR (extrapolated) = 0.666 W/kg

SAR(1 g) = 0.545 mW/g; SAR(10 g) = 0.413 mW/g

Maximum value of SAR (measured) = 0.574 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/11

Right Cheek_DCS Ch512

DUT: 701104

Communication System: DCS; Frequency: 1710.2 MHz; Duty Cycle: 1:8.3

Medium: HSL_1800 Medium parameters used : $f = 1710.2$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.6 °C; Liquid Temperature : 22.0 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(5.16, 5.16, 5.16); Calibrated: 2007/8/28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch512/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.91 mW/g

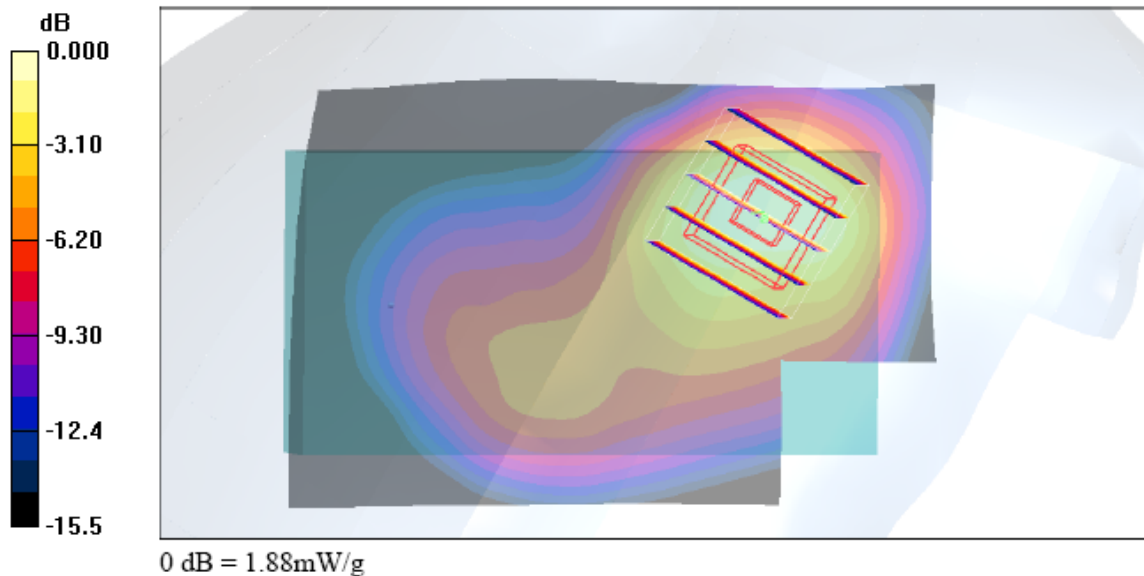
Ch512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.9 V/m; Power Drift = -0.100 dB

Peak SAR (extrapolated) = 2.62 W/kg

SAR(1 g) = 1.69 mW/g; SAR(10 g) = 0.985 mW/g

Maximum value of SAR (measured) = 1.88 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/11

Right Tilted_DCS Ch699

DUT: 7O1104

Communication System: DCS; Frequency: 1747.6 MHz; Duty Cycle: 1:8.3

Medium: HSL_1800 Medium parameters used: $f = 1748$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.6 °C; Liquid Temperature : 22.0 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(5.16, 5.16, 5.16); Calibrated: 2007/8/28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch699/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.476 mW/g

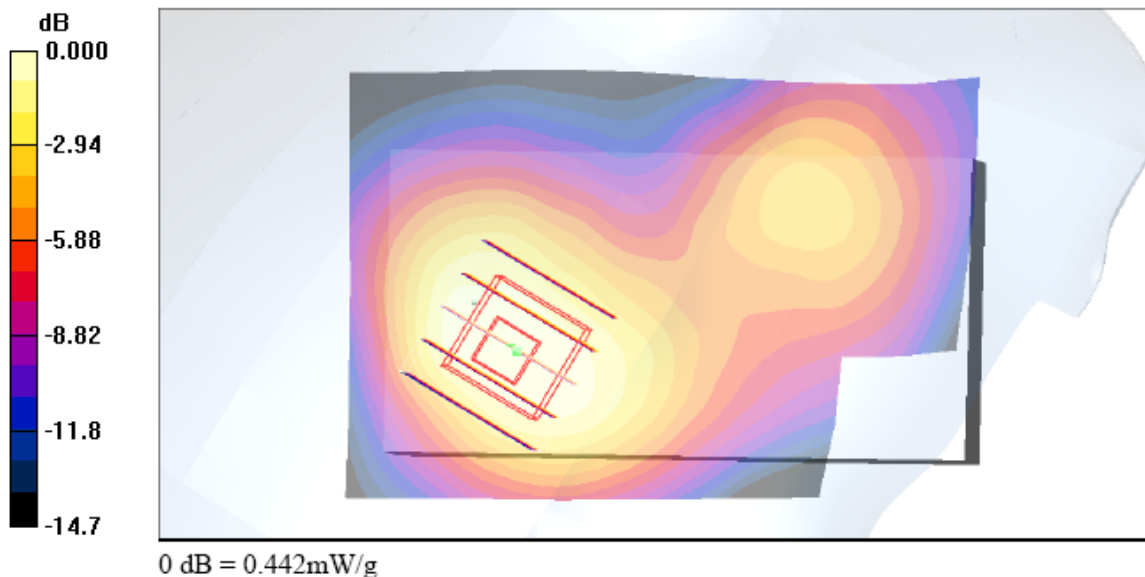
Ch699/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.9 V/m; Power Drift = -0.053 dB

Peak SAR (extrapolated) = 0.563 W/kg

SAR(1 g) = 0.416 mW/g; SAR(10 g) = 0.275 mW/g

Maximum value of SAR (measured) = 0.442 mW/g



Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/11

Left Cheek_DCS Ch699

DUT: 701104

Communication System: DCS; Frequency: 1747.6 MHz; Duty Cycle: 1:8.3

Medium: HSL_1800 Medium parameters used: $f = 1748 \text{ MHz}$; $\sigma = 1.38 \text{ mho/m}$; $\epsilon_r = 39.6$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 22.6 °C; Liquid Temperature : 22.0 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(5.16, 5.16, 5.16); Calibrated: 2007/8/28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch699/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.21 mW/g

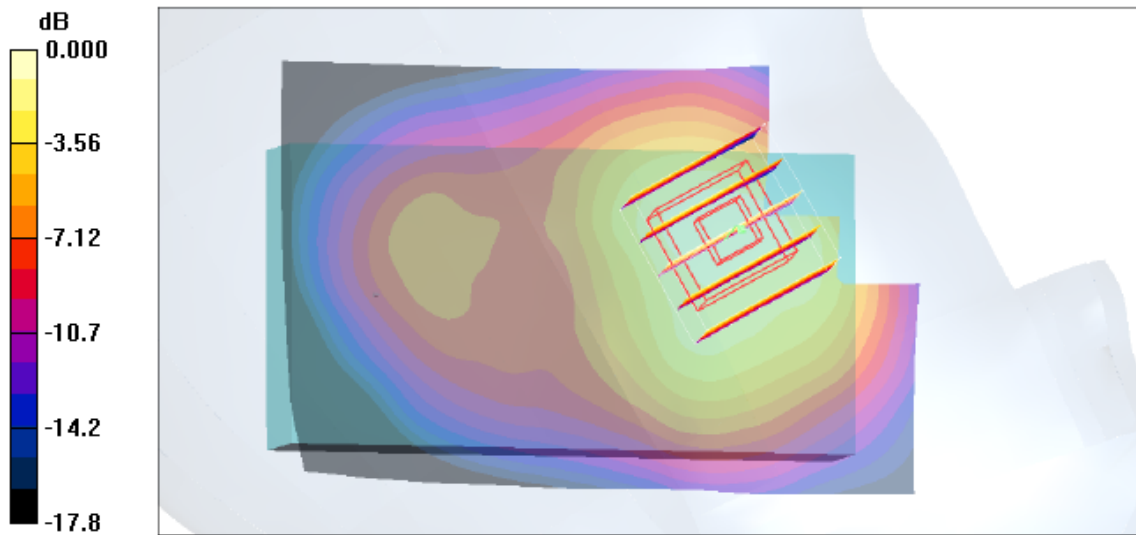
Ch699/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.4 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 1.58 W/kg

SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.660 mW/g

Maximum value of SAR (measured) = 1.18 mW/g



0 dB = 1.18mW/g

Test Laboratory: Sporton International Inc. SAR/HAC Testing Lab

Date: 2007/12/11

Left Tilted_DCS Ch699

DUT: 701104

Communication System: DCS; Frequency: 1747.6 MHz; Duty Cycle: 1:8.3

Medium: HSL_1800 Medium parameters used: $f = 1748$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.7 °C; Liquid Temperature : 22.0 °C

DASY4 Configuration:

- Probe: ET3DV6 - SN1787; ConvF(5.16, 5.16, 5.16); Calibrated: 2007/8/28
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn778; Calibrated: 2007/9/17
- Phantom: SAM-A; Type: QD 000 P40 C; Serial: TP-1303
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 176

Ch699/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.377 mW/g

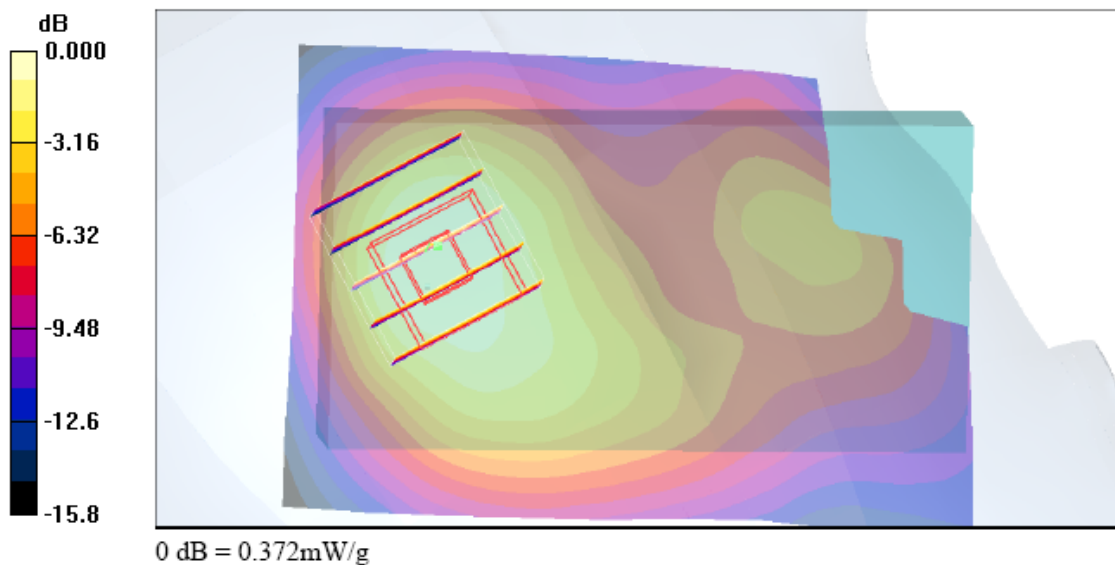
Ch699/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.0 V/m; Power Drift = 0.004 dB

Peak SAR (extrapolated) = 0.489 W/kg

SAR(1 g) = 0.349 mW/g; SAR(10 g) = 0.224 mW/g

Maximum value of SAR (measured) = 0.372 mW/g





Appendix C – Calibration Data

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: D900V2-190_Jul07

CALIBRATION CERTIFICATE

Object D900V2 - SN: 190

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

Calibration date: July 16, 2007

Condition of the calibrated item In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards | ID # | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|-----------------------------|-----------------------|-------------------------------------------|------------------------|
| Power meter EPM-442A | GB37480704 | 03-Oct-06 (METAS, No. 217-00608) | Oct-07 |
| Power sensor HP 8481A | US37292783 | 03-Oct-06 (METAS, No. 217-00608) | Oct-07 |
| Reference 20 dB Attenuator | SN: 5086 (20g) | 10-Aug-06 (METAS, No 217-00591) | Aug-07 |
| Reference 10 dB Attenuator | SN: 5047.2 (10r) | 10-Aug-06 (METAS, No 217-00591) | Aug-07 |
| Reference Probe ET3DV6 (HF) | SN 1507 | 19-Oct-06 (SPEAG, No. ET3-1507_Oct06) | Oct-07 |
| DAE4 | SN 601 | 30-Jan-07 (SPEAG, No. DAE4-601_Jan07) | Jan-08 |
| Secondary Standards | ID # | Check Date (in house) | Scheduled Check |
| Power sensor HP 8481A | MY41092317 | 18-Oct-02 (SPEAG, in house check Oct-05) | In house check: Oct-07 |
| RF generator Agilent E4421B | MY41000675 | 11-May-05 (SPEAG, in house check Nov-05) | In house check: Nov-07 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (SPEAG, in house check Oct-06) | In house check: Oct-07 |
| Calibrated by: | Name Marcel Fehr | Function Laboratory Technician | Signature |
| Approved by: | Name Katja Pokovic | Function Technical Manager | Signature |

Issued: July 16, 2007

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



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Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: D1800V2-2d076_Jul07

CALIBRATION CERTIFICATE

Object D1800V2 - SN: 2d076
Calibration procedure(s) QA CAL-05.v7
Calibration date: July 10 2007
Condition of the calibrated item In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Table with 4 columns: Primary Standards, ID #, Cal Date (Calibrated by, Certificate No.), Scheduled Calibration. Includes items like Power meter EPM-442A, Power sensor HP 8481A, Reference 20 dB Attenuator, etc.

Calibrated by: Name Mike Meili, Function Laboratory Technician, Signature [Handwritten]
Approved by: Name Katja Pokovic, Function Technical Manager, Signature [Handwritten]

Issued: July 11, 2007

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



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Accreditation No.: SCS 108

Client Sporton (Auden)

Certificate No: ET3-1787_Aug07

CALIBRATION CERTIFICATE

Object: ET3DV6 - SN:1787
Calibration procedure(s): QA CAL-01.v6 Calibration procedure for dosimetric E-field probes
Calibration date: August 28, 2007
Condition of the calibrated item: In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Table with 4 columns: Primary Standards, ID #, Cal Date (Calibrated by, Certificate No.), Scheduled Calibration. Lists various power meters, sensors, attenuators, and probes with their respective IDs and calibration dates.

Calibrated by: Katja Pokovic, Technical Manager
Approved by: Niels Kuster, Quality Manager

Handwritten signatures of Katja Pokovic and Niels Kuster.

Issued: August 28, 2007

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



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Accreditation No.: SCS 108

Client Sporton (Autoren)

Certificate No: DAE4-778_Sep07

CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BG - SN: 778
Calibration procedure(s): QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date: September 17, 2007
Condition of the calibrated item: In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Table with 4 columns: Primary Standards, ID #, Cal Date (Calibrated by, Certificate No.), Scheduled Calibration. Includes entries for Fluke Process Calibrator Type 702 and Keithley Multimeter Type 2001.

Table with 4 columns: Secondary Standards, ID #, Check Date (in house), Scheduled Check. Includes entry for Calibrator Box V1.1.

Calibrated by: Dominique Steffen, Technician
Approved by: Fin Bornholt, R&D Director

Issued: September 17, 2007

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