

# SAR EVALUATION REPORT

For

## Hisense Communication Co., Ltd.

Hisense Information Industrial Park,  
Economic and Technology Development District,  
Qingdao 26651, Shandong, China

**FCC ID: SARHISENSEC306**

|   |  |  |  |
|---|--|--|--|
| <b>This Report Concerns:</b><br><input checked="" type="checkbox"/> Original Report |  | <b>Equipment Type:</b><br>800MHz CDMA1X Cellular Phone |  |
| <b>Test Engineer:</b>   | Eric Hong/ <i>Hong</i>   |  |  |
| <b>Report Number:</b>   | R0703085-SAR   |  |  |
| <b>Report Date:</b>   | 2007-03-16   |  |  |
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## DECLARATION OF COMPLIANCE SAR EVALUATION

|                                     |  |
|-------------------------------------|--|
| <b>Rule Part(s):</b>                | <b>CFR 47 2.1093</b>                                       |
| <b>Test Procedure(s):</b>           | <b>FCC OET Bulletin 65 Supplement C<br/>IEEE 1528-2003</b> |
| <b>Device Category:</b>             | <b>Portable Device</b>                                     |
| <b>Exposure Category:</b>           | <b>General Population/Uncontrolled Exposure</b>            |
| <b>Device Type:</b>                 | <b>Cellular Phone</b>                                      |
| <b>Modulation Type:</b>             | <b>CDMA 1X</b>   |
| <b>TX Frequency Range:</b>          | <b>824.70-848.31 MHz</b>                                   |
| <b>Max. Conducted Power Tested:</b> | <b>23.68 dBm</b>   |
| <b>Antenna Type(s):</b>             | <b>Internal Antenna</b>                                    |
| <b>Body-Worn Accessories:</b>       | <b>EUT is body worn portable device</b>                    |
| <b>Face-Head Accessories:</b>       | <b>None</b>  |

**Max. SAR Level(s) Measured: 1.03 W/Kg (Head Tissue); 0.373 W/Kg (Body Tissue)**

**This wireless device has been shown to be capable of compliance for localized specific absorption rate (SAR) for General Population/Uncontrolled Exposure limits specified in ANSI/IEEE Standards and has been tested in accordance with the measurement procedures specified in FCC OET 65 Supplement C.**

**The results and statements contained in this report pertain only to the device(s) evaluated.**

Tested By:

*HONG*

Eric Hong

Test Engineer

Bay Area Compliance Laboratory Corp.



**EUT Photo**

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## REFERENCE, STANDARDS, AND GUIDELINES

---

### **FCC:**

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g as recommended by the ANSI/IEEE standard C95.1-1992 [6] for an uncontrolled environment (Paragraph 65). According to the Supplement C of OET Bulletin 65 "Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 mW/g average over 1 gram of tissue mass.

### **CE:**

The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 2 mW/g as recommended by the EN50360 for an uncontrolled environment. According to the Standard, the device should be evaluated at maximum output power (radiated from the antenna) under "worst-case" conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

This report describes the methodology and results of experiments performed on wireless data terminal. The objective was to determine if there is RF radiation and if radiation is found, what is the extent of radiation with respect to safety limits. SAR (Specific Absorption Rate) is the measure of RF exposure determined by the amount of RF energy absorbed by human body (or its parts) – to determine how the RF energy couples to the body or head which is a primary health concern for body worn devices. The limit below which the exposure to RF is considered safe by regulatory bodies in Europe is 2 mW/g average over 10 gram of tissue mass.

The test configurations were laid out on a specially designed test fixture to ensure the reproducibility of measurements. Each configuration was scanned for SAR. Analysis of each scan was carried out to characterize the above effects in the device.

**SAR Limits**

FCC Limit (1g)

| EXPOSURE LIMITS  | SAR (W/kg)   |  |
|--|--|--|
|  | (General Population /<br>Uncontrolled Exposure<br>Environment) | (Occupational /<br>Controlled Exposure<br>Environment) |
| Spatial Average<br>(averaged over the whole body)                | 0.08   | 0.4  |
| Spatial Peak<br>(averaged over any 1 g of tissue)                | 1.60   | 8.0  |
| Spatial Peak<br>(hands/wrists/feet/ankles<br>averaged over 10 g) | 4.0  | 20.0   |

CE Limit (10g)

| EXPOSURE LIMITS  | SAR (W/kg)   |  |
|--|--|--|
|  | (General Population /<br>Uncontrolled Exposure<br>Environment) | (Occupational /<br>Controlled Exposure<br>Environment) |
| Spatial Average<br>(averaged over the whole body)                | 0.08   | 0.4  |
| Spatial Peak<br>(averaged over any 1 g of tissue)                | 2.0  | 10   |
| Spatial Peak<br>(hands/wrists/feet/ankles<br>averaged over 10 g) | 4.0  | 20.0   |

Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

Occupational/Controlled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure (i.e. as a result of employment or occupation).

## EUT DESCRIPTION

The *Hisense Communication product*, the “EUT” C306 as referred to in this report is a mobile phone, which is designed and developed for CDMA2000 1X network.

| Item                | Content                                |
|---------------------|--|
| Mode                | CDMA                                   |
| Frequency Band      | Tx: 824 ~ 849 MHz<br>Rx: 869 ~ 894 MHz |
| Dimensions (L*W*D)  | 88mm×47mm×17mm                         |
| Weight              | 79 g                                   |
| Working temperature | -20 ~ +50 °C                           |
| Storage temperature | -30 ~ +60 °C                           |
| Relative humidity   | 5% ~ 95%                               |
| Frequency accuracy  | <± 300 Hz                              |
| Wave quality factor | >0.99                                  |
| Channel bandwidth   | 1.25 MHz                               |
| Battery capacity    | 900 mAh                                |

\* The test data gathered are from typical production sample serial number: 071066 provided by the manufacturer.

## **FACILITIES AND ACCREDITATION**

The test site used by Bay Area Compliance Laboratories Corp. (BACL) to collect data is located at 1274 Anvilwood Ave, Sunnyvale, California 94089, USA.

BACL is a National Institute of Standards and Technology (NIST) accredited laboratory under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0).



The current scope of accreditations can be found at:

<http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm>

## DESCRIPTION OF TEST SYSTEM

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG) which is the fourth generation of the system shown in the figure hereinafter:



The system is based on a high precision robot (working range greater than 0.9m), which positions the probes with a positional repeatability of better than  $\pm 0.02\text{mm}$ . Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit.

The SAR measurements were conducted with the dosimetric probe ET3DV6 SN: 1604 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure with accuracy of better than  $\pm 10\%$ . The spherical isotropy was evaluated with the procedure and found to be better than  $\pm 0.25\text{dB}$ .



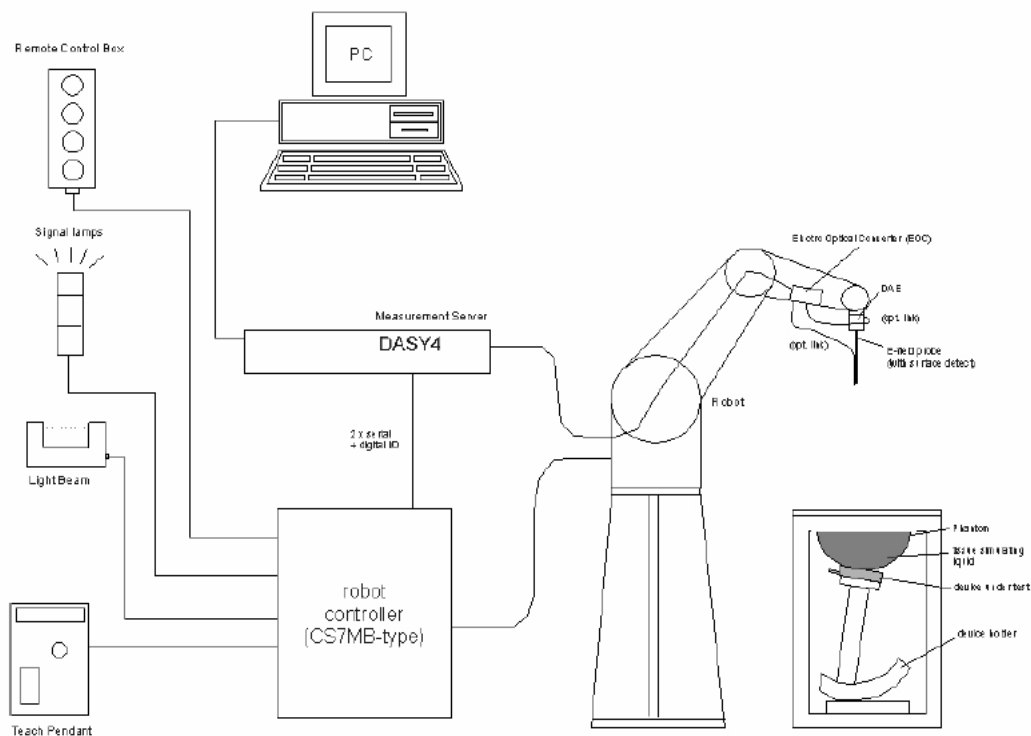
The phantom used was the Generic Twin Phantom". The ear was simulated as a spacer of 4 mm thickness between the earpiece of the phone and the tissue simulating liquid. The Tissue simulation liquid used for each test is in according with the FCC OET65 supplement C as listed below.

| Ingredients<br>(% by weight) | Frequency (MHz) |       |       |      |       |       |       |      |      |      |
|------------------------------|-----------------|-------|-------|------|-------|-------|-------|------|------|------|
|                              | 450             |       | 835   |      | 915   |       | 1900  |      | 2450 |      |
| Tissue Type                  | Head            | Body  | Head  | Body | Head  | Body  | Head  | Body | Head | Body |
| Water                        | 38.56           | 51.16 | 41.45 | 52.4 | 41.05 | 56.0  | 54.9  | 40.4 | 62.7 | 73.2 |
| Salt (Nacl)                  | 3.95            | 1.49  | 1.45  | 1.4  | 1.35  | 0.76  | 0.18  | 0.5  | 0.5  | 0.04 |
| Sugar                        | 56.32           | 46.78 | 56.0  | 45.0 | 56.5  | 41.76 | 0.0   | 58.0 | 0.0  | 0.0  |
| HEC                          | 0.98            | 0.52  | 1.0   | 1.0  | 1.0   | 1.21  | 0.0   | 1.0  | 0.0  | 0.0  |
| Bactericide                  | 0.19            | 0.05  | 0.1   | 0.1  | 0.1   | 0.27  | 0.0   | 0.1  | 0.0  | 0.0  |
| Triton x-100                 | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 0.0   | 0.0  | 36.8 | 0.0  |
| DGBE                         | 0.0             | 0.0   | 0.0   | 0.0  | 0.0   | 0.0   | 44.92 | 0.0  | 0.0  | 26.7 |
| Dielectric Constant          | 43.42           | 58.0  | 42.54 | 56.1 | 42.0  | 56.8  | 39.9  | 54.0 | 39.8 | 52.5 |
| Conductivity (s/m)           | 0.85            | 0.83  | 0.91  | 0.95 | 1.0   | 1.07  | 1.42  | 1.45 | 1.88 | 1.78 |

#### IEEE SCC-34/SC-2 P1528 Recommended Tissue Dielectric Parameters

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

## Measurement System Diagram



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

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.

- DASY4 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.

## System Components

- DASY4 Measurement Server
- Data Acquisition Electronics
- Probes
- Light Beam Unit
- Medium
- SAM Twin Phantom
- Device Holder for SAM Twin Phantom
- System Validation Kits
- Robot

## DASY4 Measurement Server

The DASY4 measurement server is based on a PC/104 CPU board with a 166MHz low-power Pentium, 32MB chip disk and 64MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board.



The measurement server performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. The PC-operating system cannot interfere with these time critical processes. All connections are supervised by a watchdog, and disconnection of any of the cables to the measurement server will automatically disarm the robot and disable all program-controlled robot movements. Furthermore, the measurement server is equipped with two expansion slots which are reserved for future applications. Please note that the expansion slots do not have a standardized pinout and therefore only the expansion cards provided by SPEAG can be inserted. Expansion cards from any other supplier could seriously damage the measurement server.

## Data Acquisition Electronics

The data acquisition electronics DAE3 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.



## Probes

The DASY system can support many different probe types.

**Dosimetric Probes:** These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor ( $\pm 2$  dB). The dosimetric probes have special calibrations in various liquids at different frequencies.

**Free Space Probes:** These are electric and magnetic field probes specially designed for measurements in free space. The z-sensor is aligned to the probe axis and the rotation angle of the x-sensor is specified. This allows the DASY system to automatically align the probe to the measurement grid for field component measurement. The free space probes are generally not calibrated in liquid. (The H-field probes can be used in liquids without any change of parameters.)

**Temperature Probes:** Small and sensitive temperature probes for general use. They use a completely different parameter set and different evaluation procedures. Temperature rise features allow direct SAR evaluations with these probes.

### ET3DV6 Probe Specification

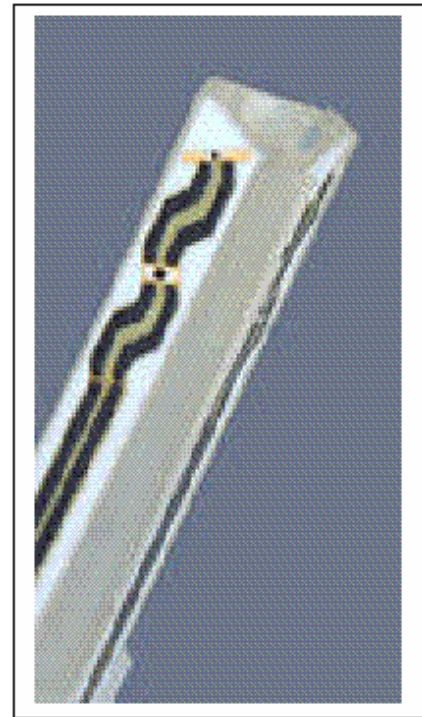
Construction Symmetrical design with triangular core  
 Built-in optical fiber for surface detection System  
 Built-in shielding against static charges  
 Calibration In air from 10 MHz to 2.5 GHz  
 In brain and muscle simulating tissue at  
 Frequencies of 450 MHz, 900 MHz and  
 1.8 GHz (accuracy  $\pm 8\%$ )  
 Frequency 10 MHz to  $> 6$  GHz; Linearity:  $\pm 0.2$  dB  
 (30 MHz to 3 GHz)  
 Directivity  $\pm 0.2$  dB in brain tissue (rotation around  
 probe axis)  
 $\pm 0.4$  dB in brain tissue (rotation normal probe axis)  
 Dynamic 5 mW/g to  $> 100$  mW/g;  
 Range Linearity:  $\pm 0.2$  dB  
 Surface  $\pm 0.2$  mm repeatability in air and clear liquids  
 Detection over diffuse reflecting surfaces.  
 Dimensions Overall length: 330 mm  
 Tip length: 16 mm



Photograph of the probe

Body diameter: 12 mm  
 Tip diameter: 6.8 mm  
 Distance from probe tip to dipole centers: 2.7 mm  
 Application General dosimetric up to 3 GHz  
 Compliance tests of mobile phones  
 Fast automatic scanning in arbitrary phantoms

The SAR measurements were conducted with the dosimetric probe ET3DV6 designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY3 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped when reaching the maximum.



**Inside view of  
ET3DV6 E-field Probe**

### **E-Field Probe Calibration Process**

Each probe is calibrated according to a dosimetric assessment procedure described in [6] with accuracy better than  $\pm 10\%$ . The spherical isotropy was evaluated with the procedure described in [7] and found to be better than  $\pm 0.25\text{dB}$ . The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

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

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

### **Data Evaluation**

The DASY4 postprocessing 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 | Normi, ai0, ai1, ai2 |
| - Conversion factor             | ConvFi               |
| - Diode compression point       | dcpi                 |

|                                  |          |
|----------------------------------|----------|
| Device parameters: - Frequency   | f        |
| - Crest factor                   | cf       |
| Media parameters: - Conductivity | $\sigma$ |
| - Density                        | $\rho$   |

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 multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

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

$$\text{E - fieldprobes : } E_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConuF}}}$$

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

With  $V_i$  = compensated signal of channel i (i=x, y, z)  
 $\text{Norm}_i$  = sensor sensitivity of channel i (i=x, y, z)  
 $\mu\text{V}/(\text{V/m})^2$  for E-field probes  
 $\text{ConF}$  = sensitivity enhancement in solution  
 $a_{ij}$  = sensor sensitivity factors for H-field probes  
 f = carrier frequency [GHz]  
 $E_i$  = electric field strenggy of channel i in V/m  
 $H_i$  = diode compression point (DASY parameter)

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.

$$\text{SAR} = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

With SAR = local specific absorption rate in mW/g  
 $E_{\text{tot}}$  = total field strength in V/m  
 $\sigma$  = conductivity in [mho/m] or [Siemens/m]  
 $\rho$  = equivalent tissue density in g/cm<sup>3</sup>

Note that the density is normally set to 1, to account for actual brain density rather than the density of the simulation liquid.

### Light Beam Unit

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

### Medium

#### Parameters

The parameters of the tissue simulating liquid strongly influence the SAR in the liquid. The parameters for the different frequencies are defined in the corresponding compliance standards (e.g., EN 50361, IEEE 1528-2003).

#### Parameter measurements

Several measurement systems are available for measuring the dielectric parameters of liquids:

- The open coax test method (e.g., HP85070 dielectric probe kit) is easy to use, but has only moderate accuracy. It is calibrated with open, short, and deionized water and the calibrations a critical process.
- The transmission line method (e.g., model 1500T from DAMASKOS, INC.) measures the transmission and reflection in a liquid filled high precision line. It needs standard two port calibration and is probably more accurate than the open coax method.
- The reflection line method measures the reflection in a liquid filled shorted precision lined. The method is not suitable for these liquids because of its low sensitivity.
- The slotted line method scans the field magnitude and phase along a liquid filled line. The evaluation is straight forward and only needs a simple response calibration. The method is very accurate, but can only be used in high loss liquids and at frequencies above 100 to 200MHz. Cleaning the line can be tedious.

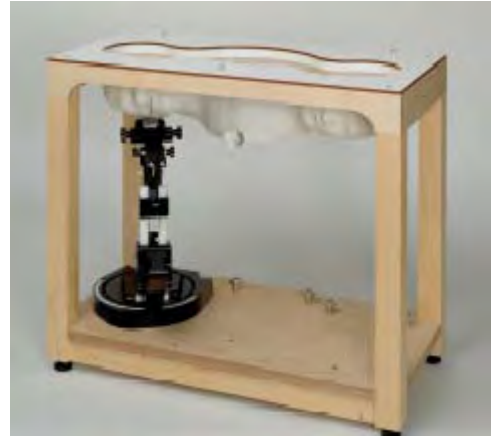


## SAM Twin Phantom

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 hand
- Right hand
- Flat phantom

The phantom table comes in two sizes: A 100 x 50 x 85 cm (L x W x H) table for use with free standing robots (DASY4 professional system option) or as a second phantom and a 100 x 75 x 85 cm(L x W x H) table with reinforcements for table mounted robots (DASY4 compact system option) .



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. Only one device holder is necessary if two phantoms are used (e.g., for different liquids) A white cover is provided to tap the phantom during o\_-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on the cover are possible. 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 liquids can be left permanently in the phantom. Always cover the liquid if the system is not used, otherwise the parameters will change due to water evaporation.
- Glycol based liquids should be used with care. As glycol is a softener for most plastics, the liquid should be taken out of the phantom and the phantom should be dried when the system is not used (desirable at least once a week).
- Do not use other organic solvents without previously testing the phantom resistiveness.

## 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 5mm distance, a positioning uncertainty of  $\pm 0.5\text{mm}$  would produce a SAR uncertainty of  $\pm 20\%$ . An 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 centers for both scales is the ear reference point ERP). 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  $\tan \delta=0.02$ . 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.

### System Validation Kits

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. For that purpose a well defined SAR distribution in the flat section of the SAM twin phantom is produced.

System validation kit includes a dipole, tripod holder to fix it underneath the flat phantom and a corresponding distance holder. Dipoles are available for the variety of frequencies between 300MHz and 6 GHz (dipoles for other frequencies or media and other calibration conditions are available upon request).

The dipoles are highly symmetric and matched at the center frequency for the specified liquid and distance to the flat phantom (or flat section of the SAM-twin phantom). The accurate distance between the liquid surface and the dipole center is achieved with a distance holder that snaps on the dipole.

### Robot

The DASY4 system uses the high precision industrial robots RX60L, RX90 and RX90L, as well as the RX60BL and RX90BL types out of the newer series from Staubli SA (France). The RX robot series offers many features that are important for our application:

- High precision (repeatability 0.02mm)
- High reliability (industrial design)
- Low maintenance costs (virtually maintenance-free due to direct drive gears; no belt drives)
- Jerk-free straight movements (brushless synchron motors; no stepper motors)
- Low ELF interference (the closed metallic construction shields against motor control fields)

For the newly delivered DASY4 systems as well as for the older DASY3 systems delivered since 1999, the CS7MB robot controller version from Stäubli is used. Previously delivered systems have either a CS7 or CS7M controller; the differences to the CS7MB are mainly in the hardware, but some procedures in the robot software from Stäubli are also not completely the same. The following descriptions about robot hard- and software correspond to CS7MB controller with software version 13.1 (edit S5). The actual commands, procedures and configurations, also including details in hardware, might differ if an older robot controller is in use. In this case please also refer to the Stäubli manuals for further information.



**RX60L**

## **EQUIPMENT LIST AND CALIBRATION**

### **Equipments List & Calibration Info**

| <b>Type / Model</b>                            | <b>Cal. Due Date</b> | <b>Serial Number</b> |
|--|----------------------|----------------------|
| DASY4 Professional Dosimetric System           | NA                   | NA                   |
| Robot – Six Axes RX60L                         | NA                   | CS7MBSP / 467        |
| Robot Controller                               | NA                   | F01/5J72A1/A/01      |
| Dell Computer Demension 3000                   | NA                   | NA                   |
| SPEAG EDC3                                     | NA                   | NA                   |
| SPEAG DAE3                                     | 2007-11-22           | 456                  |
| DASY4 Measurement Server                       | NA                   | 1176                 |
| SPEAG E-Field Probe ET3DV6                     | 2007-5-2             | 1604                 |
| Antenna, Dipole, D900V2                        | 2007-6-16            | 122                  |
| SPEAG Generic Twin Phantom                     | NA                   | TP-1032              |
| SPEAG Light Alignment Sensor                   | NA                   | 278                  |
| Phone Holder                                   | NA                   | NA                   |
| Agilent, Spectrum Analyzer 8565EC              | 2007-11-6            | 2240A01930           |
| Power Meter Agilent E4419B                     | 2007-9-13            | MY4121511            |
| Power Sensor Agilent E4412A                    | 2007-10-12           | MY41497252           |
| Agilent, Wireless Communications Test Set 8960 | 2007-8-8             | GB44051221           |
| Dielectric Probe Kit HP85070A                  | NA                   | US99360201           |
| HP, Microwave Frequency Counter 5342A          | 2006-12-12           | 2232A06383           |
| Amplifier, ST181-20                            | NA                   | E012-0101            |
| Antenna, Horn SAS-200/571                      | 2007-4-20            | A052704              |

# SAR MEASUREMENT SYSTEM VERIFICATION

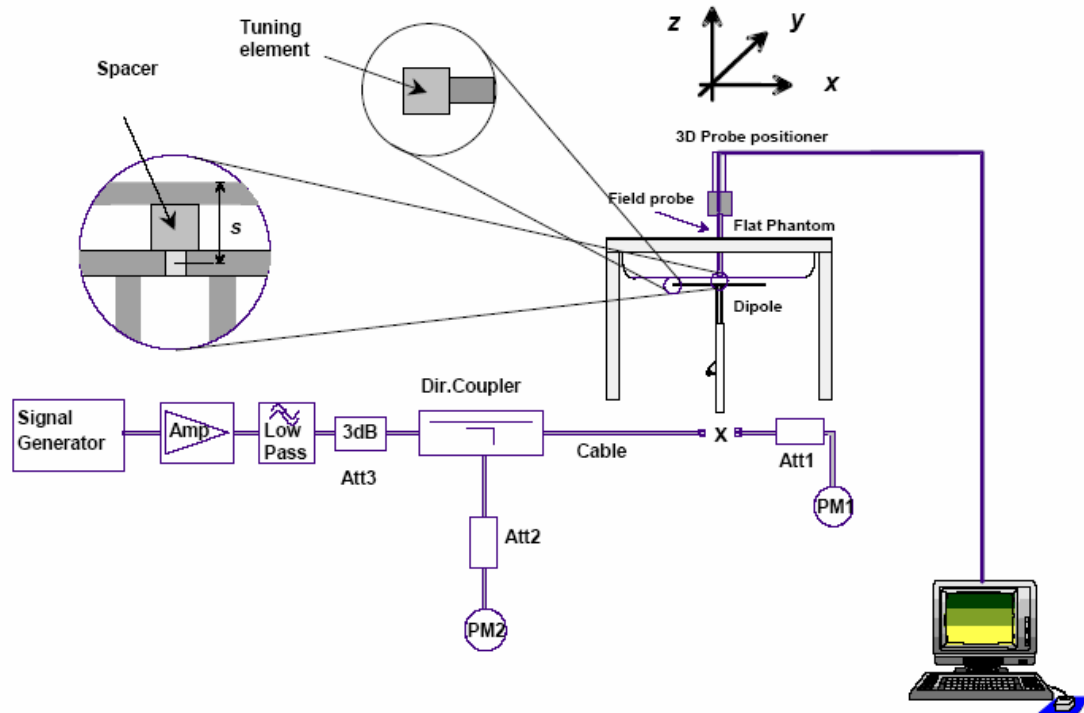
## System Accuracy Verification

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of  $\pm 10\%$ . The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

### IEEE P1528 recommended reference value for head

| Frequency (MHz) | 1 g SAR (W/Kg) | 10 g SAR (W/Kg) | Local SAR at surface (above feed point) | Local SAR at surface ( $v=2\text{cm}$ offset from feed point) |
|-----------------|----------------|-----------------|---|---|
| 300             | 3.0            | 2.0             | 4.4                                     | 2.1   |
| 450             | 4.9            | 3.3             | 7.2                                     | 3.2   |
| 835             | 9.5            | 6.2             | 14.1                                    | 4.9   |
| 900             | 10.8           | 6.9             | 16.4                                    | 5.4   |
| 1450            | 29.0           | 16.0            | 50.2                                    | 6.5   |
| 1800            | 38.1           | 19.8            | 69.5                                    | 6.8   |
| 1900            | 39.7           | 20.5            | 72.1                                    | 6.6   |
| 2000            | 41.1           | 21.1            | 74.6                                    | 6.5   |
| 2450            | 52.4           | 24.0            | 104.2                                   | 7.7   |
| 3000            | 63.8           | 25.7            | 140.2                                   | 9.5   |

## System Setup Block Diagram



## **SAR MEASUREMENT CONDITIONS FOR CDMA2000 1x**

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These Procedures were followed according to FCC “SAR Measurement Procedures for 3G Devices”, June 2006.

### **Output Power Verification**

Maximum output power is verified on the high, middle, and low channels according to procedures defined in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in “All Up” condition.

### **Head SAR Measurement**

SAR for head exposure configurations is measured in RC3 with DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

### **Body SAR Measurement**

SAR for body exposure configurations is measured in RC3 with DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCHn) is not required when maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCHn) with FCH at full rate and SCH0 enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only.

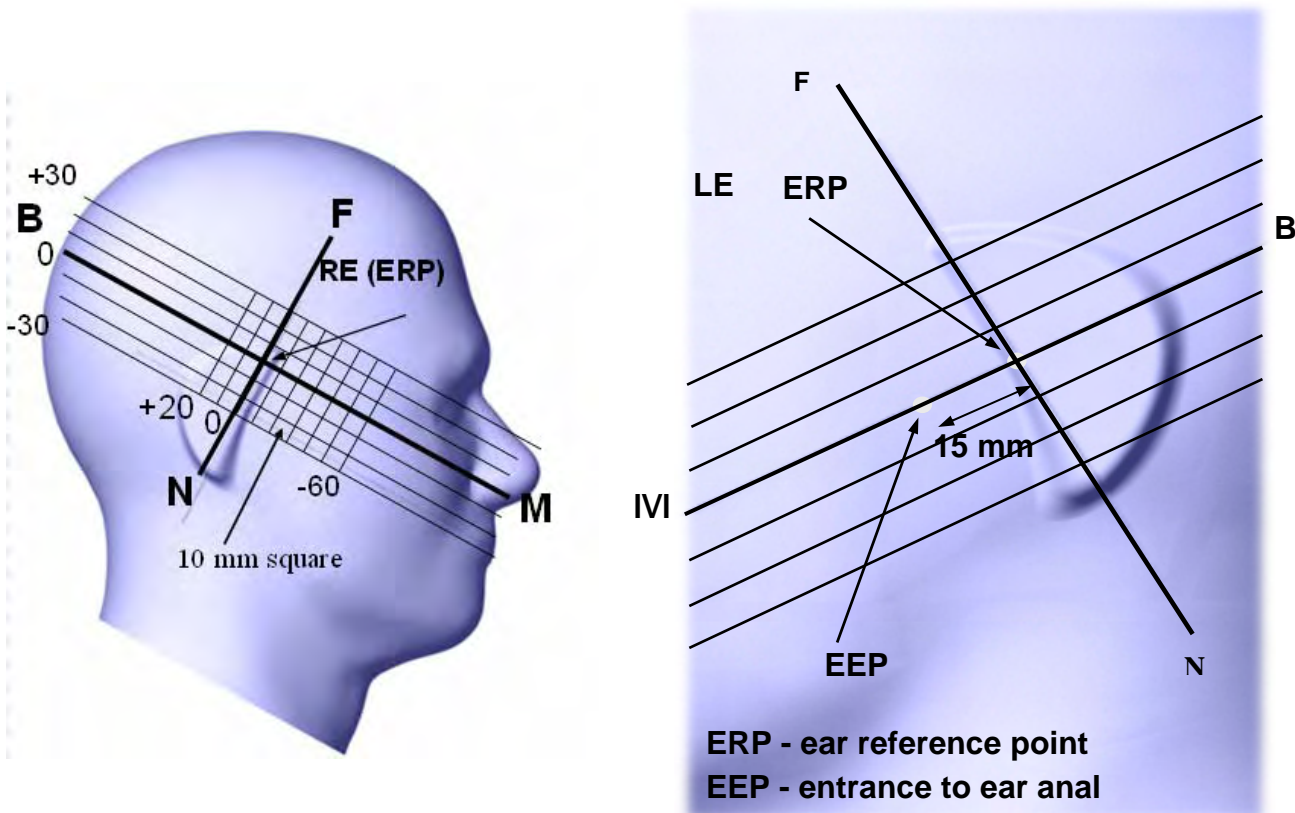
When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts. Body SAR in RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

## EUT TEST STRATEGY AND METHODOLOGY

### Test Positions for Device Operating Next to a Person's Ear

This category includes most wireless handsets with fixed, retractable or internal antennas located toward the top half of the device, with or without a foldout, sliding or similar keypad cover. The handset should have its earpiece located within the upper ¼ of the device, either along the centerline or off-centered, as perceived by its users. This type of handset should be positioned in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point”. The “test device reference point” should be located at the same level as the center of the earpiece region. The “vertical centerline” should bisect the front surface of the handset at its top and bottom edges. A “ear reference point” is located on the outer surface of the head phantom on each ear spacer. It is located 1.5 cm above the center of the ear canal entrance in the “phantom reference plane” defined by the three lines joining the center of each “ear reference point” (left and right) and the tip of the mouth.

A handset should be initially positioned with the earpiece region pressed against the ear spacer of a head phantom. For the SCC-34/SC-2 head phantom, the device should be positioned parallel to the “N-F” line defined along the base of the ear spacer that contains the “ear reference point”. For interim head phantoms, the device should be positioned parallel to the cheek for maximum RF energy coupling. The “test device reference point” is aligned to the “ear reference point” on the head phantom and the “vertical centerline” is aligned to the “phantom reference plane”. This is called the “initial ear position”. While maintaining these three alignments, the body of the handset is gradually adjusted to each of the following positions for evaluating SAR:



## Check/Touch Position

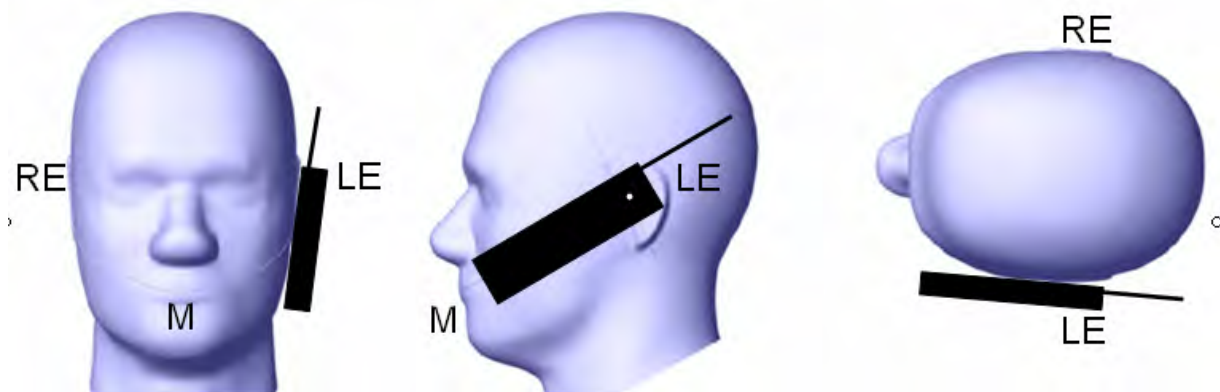
The device is brought toward the mouth of the head phantom by pivoting against the “ear reference point” or along the “N-F” line for the SCC-34/SC-2 head phantom.

This test position is established:

- 1) When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
- 2) (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

For existing head phantoms – when the handset loses contact with the phantom at the pivoting point, rotation should continue until the device touches the cheek of the phantom or breaks its last contact from the ear spacer.

### Check /Touch Position



## Ear/Tilt Position

With the handset aligned in the “Cheek/Touch Position”:

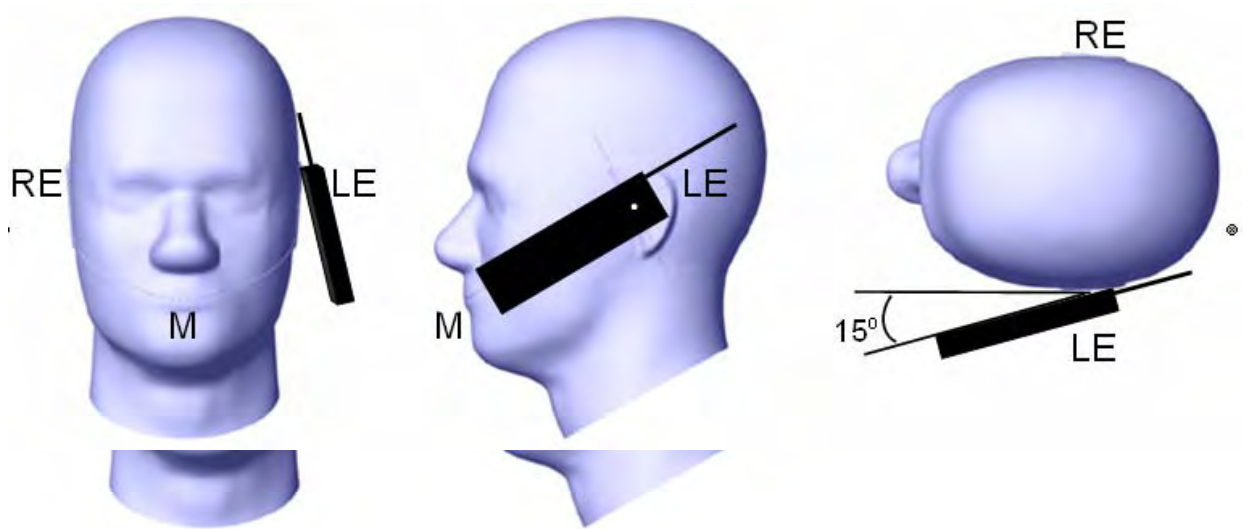
- 1) If the earpiece of the handset is not in full contact with the phantom’s ear spacer (in the “Cheek/Touch position”) and the peak SAR location for the “Cheek/Touch” position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the “initial ear position” by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.
- 2) (otherwise) The handset should be moved (translated) away from the cheek perpendicular to the line passes through both “ear reference points” (note: one of these ear reference points may not physically exist on a split head model) for approximate 2-3 cm. While it is in this position, the device handset is tilted away from the mouth with respect to the “test device reference point” until the inside angle between the vertical centerline on the front surface of the phone and the horizontal line passing through the ear reference point is by 15 80°. After the tilt, it is then moved (translated) back toward the head perpendicular to the line passes through both “ear reference points” until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15 80° so that the



device and its antenna would touch the phantom simultaneously. This test position may require a device holder or positioner to achieve the translation and tilting with acceptable positioning repeatability.

If a device is also designed to transmit with its keypad cover closed for operating in the head position, such positions should also be considered in the SAR evaluation. The device should be tested on the left and right side of the head phantom in the “Cheek/Touch” and “Ear/Tilt” positions. When applicable, each configuration should be tested with the antenna in its fully extended and fully retracted positions. These test configurations should be tested at the high, middle and low frequency channels of each operating mode; for example, AMPS, CDMA, and TDMA. If the SAR measured at the middle channel for each test configuration (left, right, Cheek/Touch, Tile/Ear, extended and retracted) is at least 2.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s). If the transmission band of the test device is less than 10 MHz, testing at the high and low frequency channels is optional.

### Ear /Tilt 15° Position



### **Test positions for body-worn and other configurations**

Body-worn operating configurations should be tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in normal use configurations. Devices with a headset output should be tested with a headset connected to the device. When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body must be tested.

Body-worn accessories may not always be supplied or available as options for some devices that are intended to be authorized for body-worn use. A separation distance of 1.5 cm between the back of the device and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these

cases, the device may use body-worn accessories that provide a separation distance greater than that tested for the device provided however that the accessory contains no metallic components.

## SAR Evaluation Procedure

The evaluation was performed with the following procedure:

**Step 1:** Measurement of the SAR value at a fixed location above the ear point or central position was used as a reference value for assessing the power drop. The SAR at this point is measured at the start of the test and then again at the end of the testing.

**Step 2:** The SAR distribution at the exposed side of the head was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the head or EUT and the horizontal grid spacing was 15 mm x 15 mm. Based on these data, the area of the maximum absorption was determined by spline interpolation. The first Area Scan covers the entire dimension of the EUT to ensure that the hotspot was correctly identified.

**Step 3:** Around this point, a volume of 30 mm x 30 mm x 21 mm was assessed by measuring 5 x 5 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

1. The data at the surface were extrapolated, since the center of the dipoles is 1.2 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
2. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one dimensional splines with the "Not a knot"-condition (in x, y and z-directions). The volume was integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the averages.
3. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

**Step 4:** Re-measurement of the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation was repeated.

## DASY4 SAR Evaluation Procedure

### Step 1: Power Reference Measurement

The Power Reference Measurement and Power Drift Measurement jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method. The Minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. By default, the Minimum distance of probe sensors to surface is 4mm. This distance can be modified by the user, but cannot be smaller than the Distance of sensor calibration points to probe tip as defined in the probe properties (for example, 2.7mm for an ET3DV6 probe type).

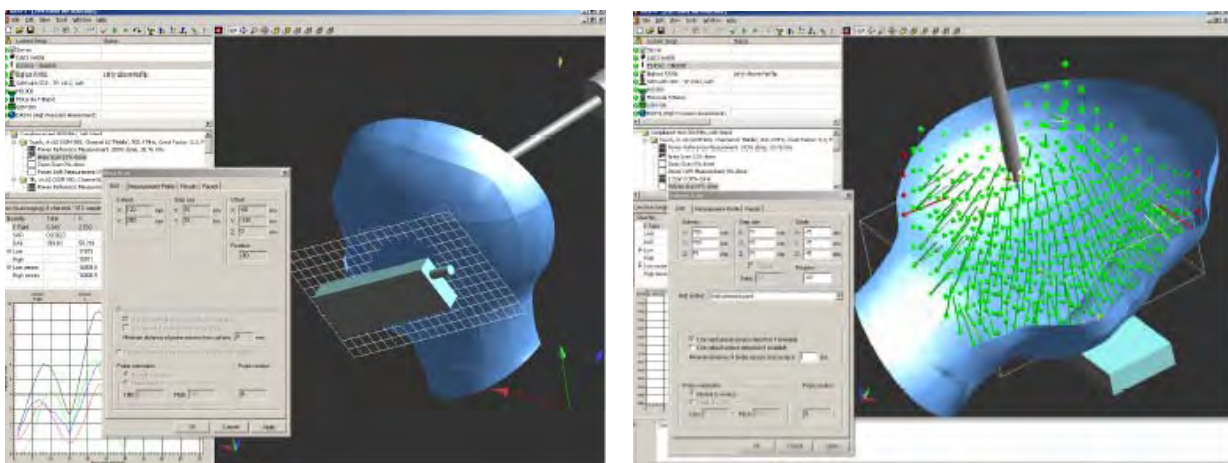
### Step 2: Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids.

The scanning area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the Area Scan's property sheet is brought-up, grid settings can be edited by a user.

When an Area Scan has measured all reachable points, it computes the field maxima found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE 1528-2003, EN 50361 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan). If only one Zoom Scan follows the Area Scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of Zoom Scans has to be increased accordingly.

After measurement is completed, all maxima and their coordinates are listed in the Results property page. The maximum selected in the list is highlighted in the 3-D view. For the secondary maxima returned from an Area Scan, the user can specify a lower limit (peak SAR value), in addition to the Find secondary maxima within x dB condition. Only the primary maximum and any secondary maxima within x dB from the primary maximum and above this limit will be measured.



### Step 3: Zoom Scan

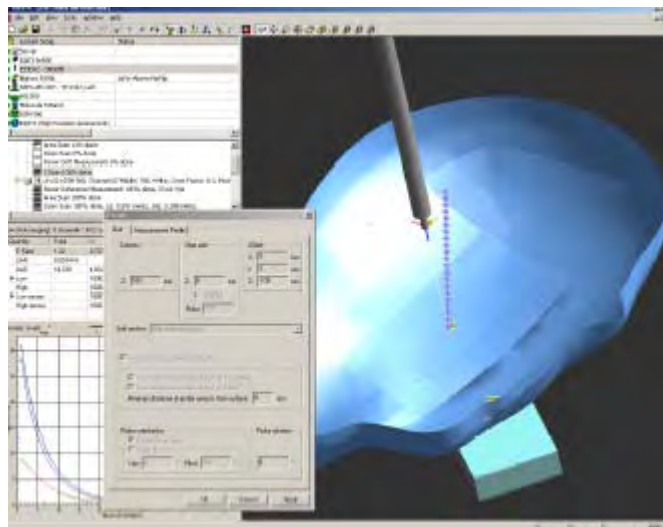
Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan measures 5 x 5 x 7 points within a cube whose base faces are centered around the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the Zoom Scan evaluates the averaged SAR for 1 g and 10 g and displays these values next to the job's label.

### Step 4: Power drift measurement

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement. Several drift measurements are possible for one reference measurement. This allows a user to monitor the power drift of the device under test within a batch process. The measurement procedure is the same as Step 1.

### Step 5: Z-Scan

The Z Scan job measures points along a vertical straight line. The line runs along the Z axis of a one-dimensional grid. A user can anchor the grid to the section reference point, to any defined user point or to the current probe location. As with any other grids, the local Z axis of the anchor location establishes the Z axis of the grid.



## CONCLUSION

This page summarizes the results of the performed dosimetric evaluation. The plots with the corresponding SAR distributions, which reveal information about the location of the maximum SAR with respect to the device, could be found in Appendix E.

### SAR Test Data

#### Environmental Conditions

|                      |           |
|----------------------|-----------|
| Ambient Temperature: | 22° C     |
| Relative Humidity:   | 72%       |
| ATM Pressure:        | 1033 mbar |

\* Testing was performed by Eric Hong on 2007-03-16.

| EUT position                      | Frequency (MHz) | Output Power (mW) | Phantom | Measured (mW/1g) | Limit (mw/1g) | Plot # |
|-----------------------------------|-----------------|-------------------|---------|------------------|---------------|--------|
| Right head cheek                  | 836.52          | 233.3             | Head    | 0.820            | 1.6           | 1      |
| Right head cheek                  | 824.7           | 216.8             | Head    | 0.881            | 1.6           | 2      |
| Right head cheek                  | 848.31          | 228.0             | Head    | 1.03             | 1.6           | 3      |
| Right head tilt                   | 836.52          | 233.3             | Head    | 0.368            | 1.6           | 4      |
| Right head tilt                   | 824.7           | 216.8             | Head    | 0.396            | 1.6           | 5      |
| Right head tilt                   | 848.31          | 228.0             | Head    | 0.711            | 1.6           | 6      |
| Left head cheek                   | 836.52          | 233.3             | Head    | 0.873            | 1.6           | 7      |
| Left head cheek                   | 824.7           | 216.8             | Head    | 0.884            | 1.6           | 8      |
| Left head cheek                   | 848.31          | 228.0             | Head    | 0.898            | 1.6           | 9      |
| Left head tilt                    | 836.52          | 233.3             | Head    | 0.357            | 1.6           | 10     |
| Left head tilt                    | 824.7           | 216.8             | Head    | 0.365            | 1.6           | 11     |
| Left head tilt                    | 848.31          | 228.0             | Head    | 0.678            | 1.6           | 12     |
| 1.5 cm separation to flat phantom | 836.52          | 233.3             | Body    | 0.373            | 1.6           | 13     |

## APPENDIX A – MEASUREMENT UNCERTAINTY

The uncertainty budget has been determined for the DASY4 measurement system and is given in the following Table.

| <b>SASY4 Uncertainty Budget</b> |                   |             |            |             |              |                   |                    |               |
|---------------------------------|-------------------|-------------|------------|-------------|--------------|-------------------|--------------------|---------------|
| <b>According to IEEE 1528</b>   |                   |             |            |             |              |                   |                    |               |
| Error Description               | Uncertainty Value | Prob. Dist. | Div.       | (c i)<br>1g | (c i)<br>10g | Std. Unc.<br>(1g) | Std. Unc.<br>(10g) | (v i)<br>veff |
| <b>Measurement System</b>       |                   |             |            |             |              |                   |                    |               |
| Probe Calibration               | ± 5.9%            | N           | 1          | 1           | 1            | ± 5.9%            | ± 5.9%             | ∞             |
| Axial Isotropy                  | ± 4.7%            | R           | $\sqrt{3}$ | 0.7         | 0.7          | ± 1.9%            | ± 1.9%             | ∞             |
| Hemispherical Isotropy          | ± 9.6%            | R           | $\sqrt{3}$ | 0.7         | 0.7          | ± 3.9%            | ± 3.9%             | ∞             |
| Boundary Effects                | ± 1.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 0.6%            | ± 0.6%             | ∞             |
| Linearity                       | ± 4.7%            | R           | $\sqrt{3}$ | 1           | 1            | ± 2.7%            | ± 2.7%             | ∞             |
| System Detection Limits         | ± 1.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 0.6%            | ± 0.6%             | ∞             |
| Readout Electronics             | ± 0.3%            | N           | 1          | 1           | 1            | ± 0.3%            | ± 0.3%             | ∞             |
| Response Time                   | ± 0.8%            | R           | $\sqrt{3}$ | 1           | 1            | ± 0.5%            | ± 0.5%             | ∞             |
| Integration Time                | ± 2.6%            | R           | $\sqrt{3}$ | 1           | 1            | ± 1.5%            | ± 1.5%             | ∞             |
| RF Ambient Conditions           | ± 3.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 1.7%            | ± 1.7%             | ∞             |
| Probe Positioner                | ± 0.4%            | R           | $\sqrt{3}$ | 1           | 1            | ± 0.2%            | ± 0.2%             | ∞             |
| Probe Positioning               | ± 2.9%            | R           | $\sqrt{3}$ | 1           | 1            | ± 1.7%            | ± 1.7%             | ∞             |
| Max. SAR Eval.                  | ± 1.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 0.6%            | ± 0.6%             | ∞             |
| <b>Test Sample Related</b>      |                   |             |            |             |              |                   |                    |               |
| Device Positioning              | ± 2.9%            | N           | 1          | 1           | 1            | ± 2.9%            | ± 2.9%             | 145           |
| Device Holder                   | ± 3.6%            | N           | 1          | 1           | 1            | ± 3.6%            | ± 2.6%             | 5             |
| Power Drift                     | ± 5.0%            | R           |            | 1           | 1            | ± 2.9%            | ± 2.9%             | ∞             |
| <b>Phantom and Setup</b>        |                   |             |            |             |              |                   |                    |               |
| Phantom Uncertainty             | ± 4.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 2.3%            | ± 2.3%             | ∞             |
| Liquid Conductivity (Target)    | ± 5.0%            | R           | $\sqrt{3}$ | 0.64        | 0.43         | ± 1.8%            | ± 1.2%             | ∞             |
| Liquid Conductivity (meas.)     | ± 2.5%            | N           | 1          | 0.64        | 0.43         | ± 1.6%            | ± 1.1%             | ∞             |
| Liquid Permittivity (Target)    | ± 5.0%            | R           | $\sqrt{3}$ | 0.6         | 0.49         | ± 1.7%            | ± 1.4%             | ∞             |
| Liquid Permittivity (Target)    | ± 2.5%            | N           | 1          | 0.6         | 0.49         | ± 1.5%            | ± 1%               | ∞             |
| Combined Std. Uncertainty       | -                 | -           | -          | -           | -            | ± 10.8%           | ± 10.6%            | 330           |
| Expanded STD Uncertainty        | -                 | -           | -          | -           | -            | ± 21.6%           | ± 21.1%            | -             |

## SASY4 Uncertainty Budget According to CENELEC EN 50361

| Error Description                        | Uncertainty Value | Prob. Dist. | Div.       | (c i)<br>1g | (c i)<br>10g | Std. Unc.<br>(1g) | Std. Unc.<br>(10g) | (v i)<br>veff |
|--|-------------------|-------------|------------|-------------|--------------|-------------------|--------------------|---------------|
| <b>Measurement System</b>                |                   |             |            |             |              |                   |                    |               |
| Probe Calibration                        | ± 5.9%            | N           | 1          | 1           | 1            | ± 5.9%            | ± 5.9%             | ∞             |
| Axial Isotropy                           | ± 4.7%            | R           | $\sqrt{3}$ | 0.7         | 0.7          | ± 1.9%            | ± 1.9%             | ∞             |
| Spherical Isotropy                       | ± 9.6%            | R           | $\sqrt{3}$ | 0.7         | 0.7          | ± 3.9%            | ± 3.9%             | ∞             |
| Probe Linearity                          | ± 4.7%            | R           | $\sqrt{3}$ | 1           | 1            | ± 2.7%            | ± 0.6%             | ∞             |
| Detection Limits                         | ± 1.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 0.6%            | ± 2.7%             | ∞             |
| Boundary Effects                         | ± 1.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 0.6%            | ± 0.6%             | ∞             |
| Readout Electronics                      | ± 0.3%            | N           | 1          | 1           | 1            | ± 0.3%            | ± 0.3%             | ∞             |
| Response Time                            | ± 0.8%            | N           | 1          | 1           | 1            | ± 0.8%            | ± 0.5%             | ∞             |
| Noise                                    | ± 0.0%            | N           | 1          | 1           | 1            | ± 0.0%            | ± 1.5%             | ∞             |
| Integration Time                         | ± 2.6%            | N           | 1          | 1           | 1            | ± 2.6%            | ± 1.7%             | ∞             |
| <b>Mechanical Constraints</b>            |                   |             |            |             |              |                   |                    |               |
| Scanning System                          | ± 0.4%            | R           | $\sqrt{3}$ | 1           | 1            | ± 0.2%            | ± 1.7%             | ∞             |
| Phantom Shell                            | ± 4.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 2.3%            | ± 0.6%             | ∞             |
| Probe Positioning                        | ± 2.9%            | R           | $\sqrt{3}$ | 1           | 1            | ± 1.7%            | ± 2.9%             | ∞             |
| Device Positioning                       | ± 2.9%            | N           | 1          | 1           | 1            | ± 2.9%            | ± 2.6%             | 145           |
| <b>Physical Parameters<sup>0.5</sup></b> |                   |             |            |             |              |                   |                    |               |
| Liquid Conductivity (Target)             | ± 5.0%            | R           | $\sqrt{3}$ | 0.7         | 0.5          | ± 2.0%            | ± 1.2%             | ∞             |
| Liquid Conductivity (meas.)              | ± 4.3%            | R           | $\sqrt{3}$ | 0.7         | 0.5          | ± 1.7%            | ± 1.1%             | ∞             |
| Liquid Permittivity (Target)             | ± 5.0%            | R           | $\sqrt{3}$ | 0.6         | 0.5          | ± 1.7%            | ± 1.4%             | ∞             |
| Liquid Permittivity (Target)             | ± 4.3%            | R           | $\sqrt{3}$ | 0.6         | 0.5          | ± 1.5%            | ± 1%               | ∞             |
| Power Drift                              | ± 5.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 2.9%            | ± 10.6%            | ∞             |
| RF Ambient Conditions                    | ± 3.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 1.7%            | ± 21.1%            | ∞             |
| <b>Post-Processing</b>                   |                   |             |            |             |              |                   |                    |               |
| Extrap. and Integration                  | ± 1.0%            | R           | $\sqrt{3}$ | 1           | 1            | ± 0.6%            | ± 2.3%             | ∞             |
| Combined Std. Uncertainty                | -                 | -           | -          | -           | -            | ± 10.9%           | ± 10.6%            | 18125         |
| Expanded Std. Uncertainty                | -                 | -           | -          | -           | -            | ± 21.7%           | ± 12.1%            | -             |

# APPENDIX B – PROBE CALIBRATION CERTIFICATES

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Bay Area**

Certificate No: **ET3-1604\_May06**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN: 1604**

Calibration procedure(s) **QA CAL-01.v5 and QA CAL-12.v4  
Calibration procedure for dosimetric E-field probes**

Calibration date: **May 2, 2006**

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 E4419B         | GB41293674      | 5-Apr-06 (METAS, No. 251-00557)           | Apr-07                 |
| Power sensor E4412A        | MY41495277      | 5-Apr-06 (METAS, No. 251-00557)           | Apr-07                 |
| Power sensor E4412A        | MY41498087      | 5-Apr-06 (METAS, No. 251-00557)           | Apr-07                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 11-Aug-05 (METAS, No. 251-00499)          | Aug-06                 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 4-Apr-06 (METAS, No. 251-00558)           | Apr-07                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 11-Aug-05 (METAS, No. 251-00500)          | Aug-06                 |
| Reference Probe ES3DV2     | SN: 3013        | 2-Jan-06 (SPEAG, No. ES3-3013_Jan06)      | Jan-07                 |
| DAE4                       | SN: 654         | 2-Feb-06 (SPEAG, No. DAE4-654_Feb06)      | Feb-07                 |
| Secondary Standards        | ID #            | Check Date (in house)                     | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (SPEAG, in house check Nov-05)   | in house check: Nov-07 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (SPEAG, in house check Nov-05)  | in house check: Nov 06 |

Calibrated by: **Katja Pokovic** (Name), **Technical Manager** (Function), *[Signature]* (Signature)

Approved by: **Niels Kuster** (Name), **Quality Manager** (Function), *[Signature]* (Signature)

Issued: May 3, 2006

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Accreditation No.: **SCS 108**

#### Glossary:

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

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

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

#### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* frequency\_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

**ET3DV6 SN:1604**

**May 2, 2006**

# Probe ET3DV6

## SN:1604

|                  |                |
|------------------|----------------|
| Manufactured:    | July 30, 2001  |
| Last calibrated: | March 18, 2005 |
| Recalibrated:    | May 2, 2006    |

**Calibrated for DASYS Systems**

(Note: non-compatible with DASYS2 system!)

ET3DV6 SN:1604

May 2, 2006

**DASY - Parameters of Probe: ET3DV6 SN:1604**Sensitivity in Free Space<sup>A</sup>Diode Compression<sup>B</sup>

|       |              |                                     |       |       |
|-------|--------------|-------------------------------------|-------|-------|
| NormX | 1.87 ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP X | 93 mV |
| NormY | 1.80 ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Y | 93 mV |
| NormZ | 1.91 ± 10.1% | $\mu\text{V}/(\text{V}/\text{m})^2$ | DCP Z | 93 mV |

## Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

## Boundary Effect

TSL                    **900 MHz**    Typical SAR gradient: 5 % per mm

|   |                              |               |               |
|---|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>3.7 mm</b> | <b>4.7 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 7.9           | 4.1           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.1           | 0.2           |

TSL                    **1810 MHz**    Typical SAR gradient: 10 % per mm

|   |                              |               |               |
|---|------------------------------|---------------|---------------|
| Sensor Center to Phantom Surface Distance |                              | <b>3.7 mm</b> | <b>4.7 mm</b> |
| SAR <sub>be</sub> [%]                     | Without Correction Algorithm | 7.0           | 4.1           |
| SAR <sub>be</sub> [%]                     | With Correction Algorithm    | 0.1           | 0.3           |

## Sensor Offset

Probe Tip to Sensor Center                    **2.7 mm**

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

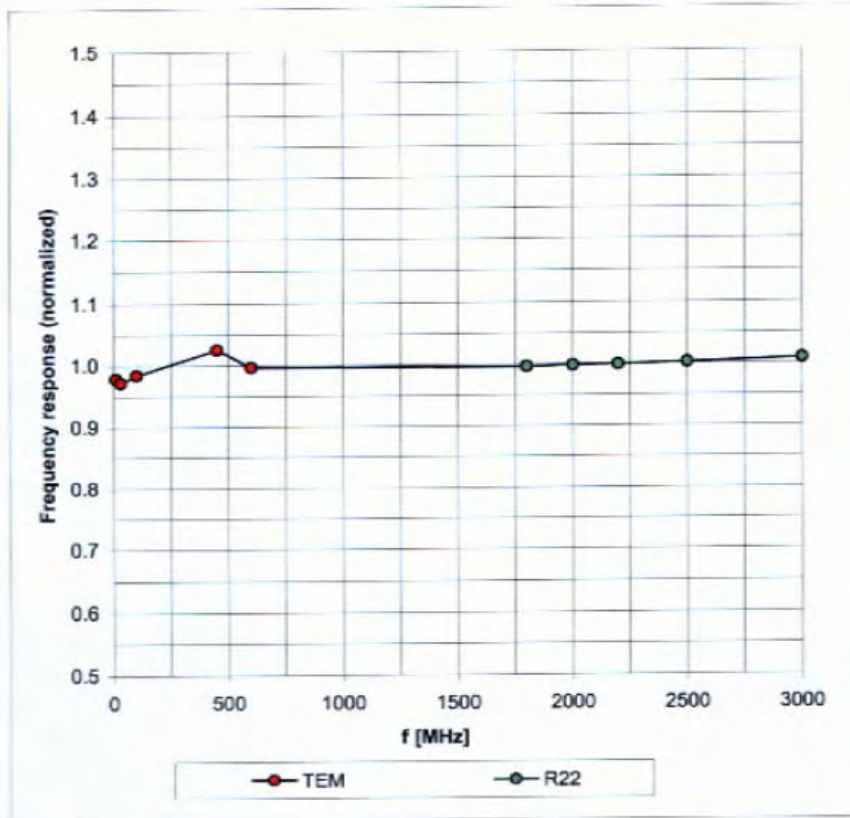
<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).<sup>B</sup> Numerical linearization parameter; uncertainty not required.

ET3DV6 SN:1604

May 2, 2006

### Frequency Response of E-Field

(TEM-Cell:ifi1110 EXX, Waveguide: R22)

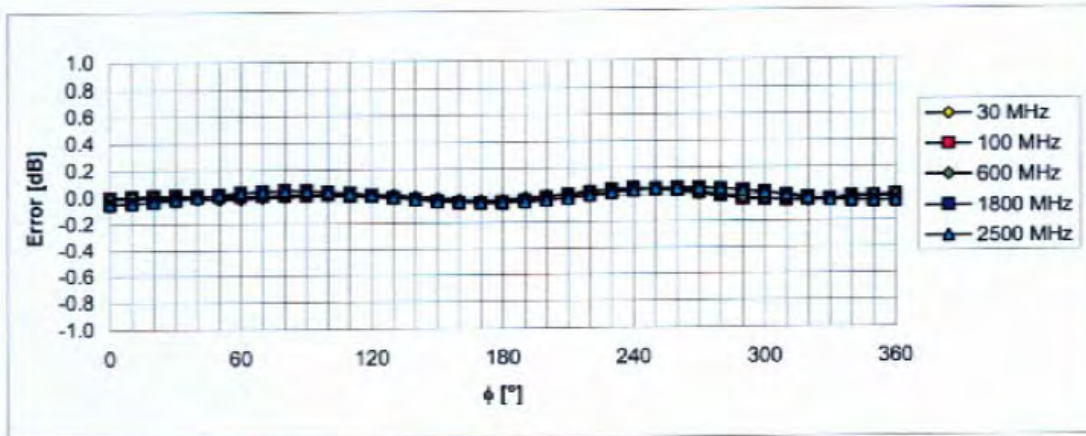
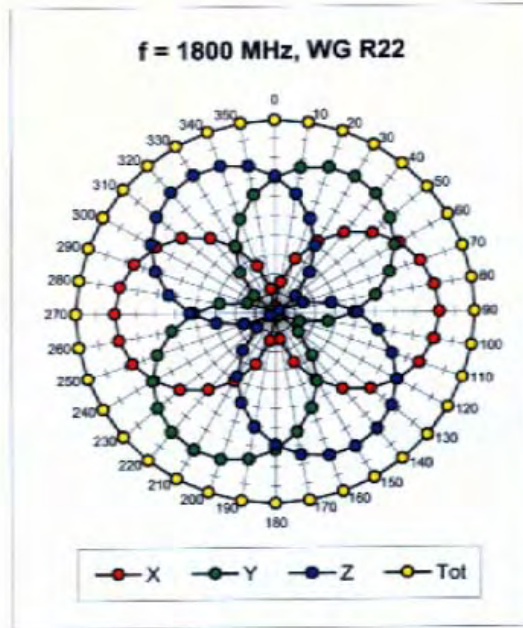
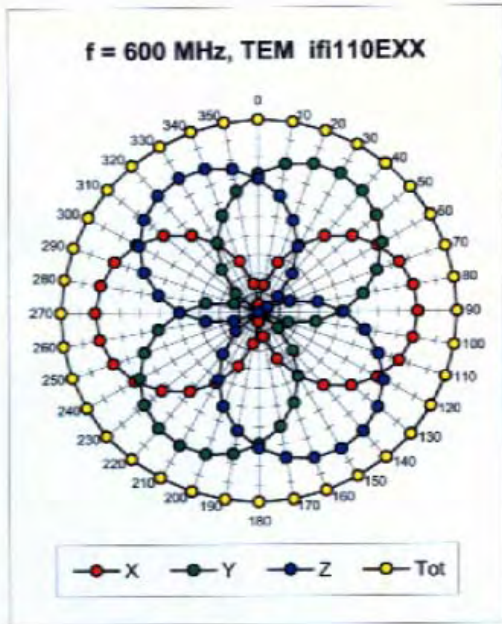


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

ET3DV6 SN:1604

May 2, 2006

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

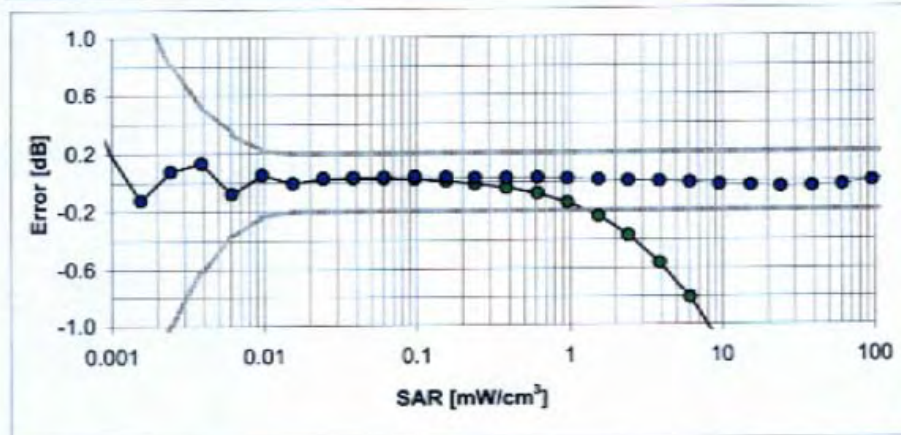
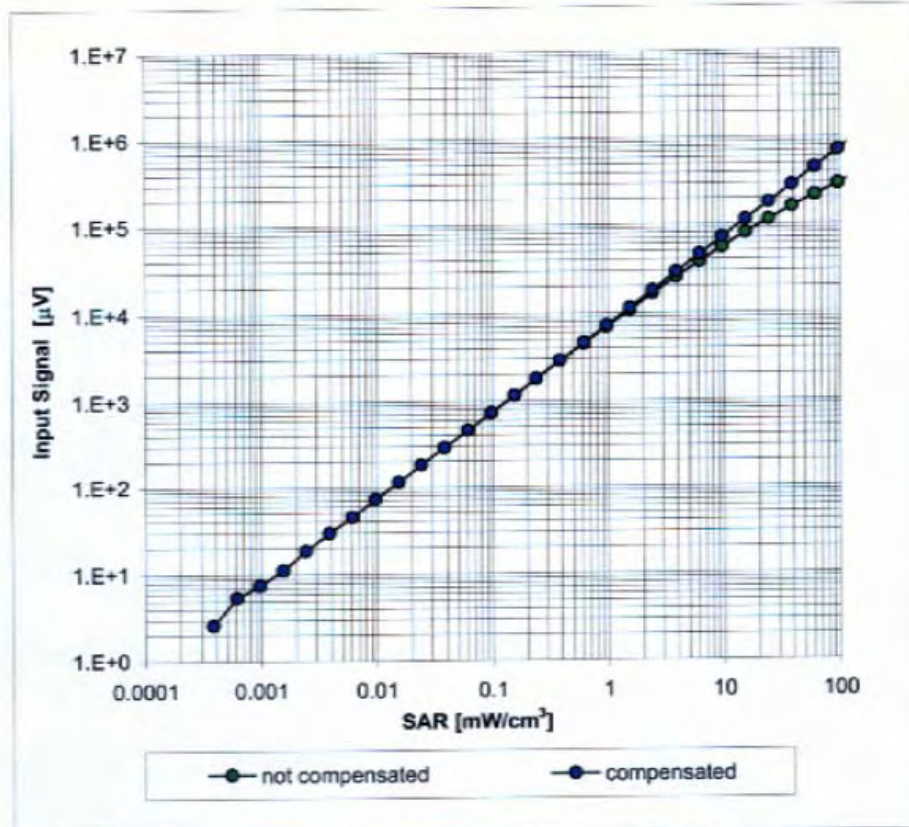


Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

ET3DV6 SN:1604

May 2, 2006

### Dynamic Range $f(SAR_{head})$ (Waveguide R22, $f = 1800$ MHz)

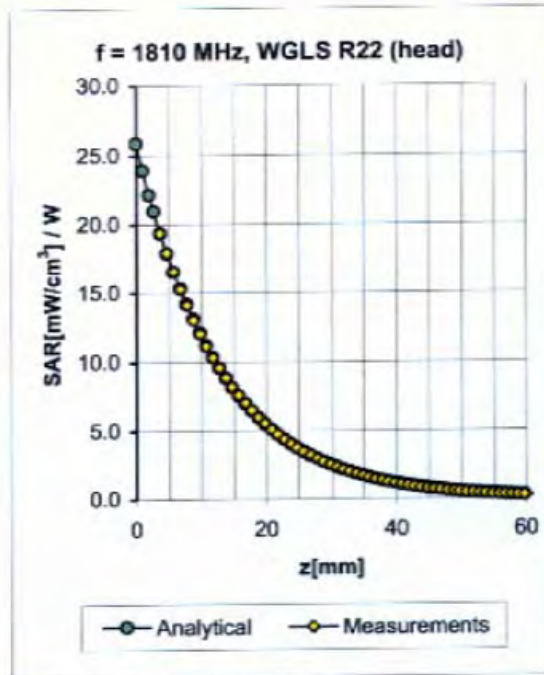
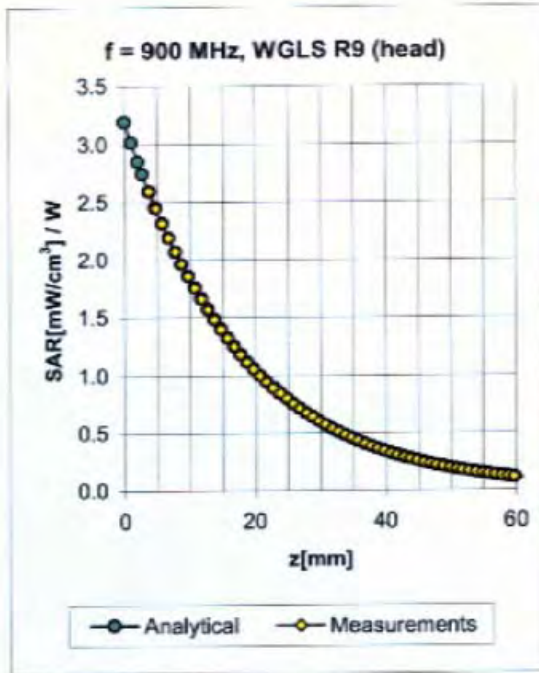


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

ET3DV6 SN:1604

May 2, 2006

### Conversion Factor Assessment



| f [MHz] | Validity [MHz] <sup>c</sup> | TSL  | Permittivity | Conductivity | Alpha | Depth | ConvF Uncertainty  |
|---------|-----------------------------|------|--------------|--------------|-------|-------|--------------------|
| 450     | ± 50 / ± 100                | Head | 43.5 ± 5%    | 0.87 ± 5%    | 0.26  | 2.94  | 7.14 ± 13.3% (k=2) |
| 900     | ± 50 / ± 100                | Head | 41.5 ± 5%    | 0.97 ± 5%    | 0.56  | 1.81  | 6.60 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Head | 40.0 ± 5%    | 1.40 ± 5%    | 0.50  | 2.59  | 5.29 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Head | 39.2 ± 5%    | 1.80 ± 5%    | 0.68  | 1.85  | 4.60 ± 11.8% (k=2) |
| 450     | ± 50 / ± 100                | Body | 56.7 ± 5%    | 0.94 ± 5%    | 0.25  | 4.44  | 7.42 ± 13.3% (k=2) |
| 900     | ± 50 / ± 100                | Body | 55.0 ± 5%    | 1.05 ± 5%    | 0.47  | 2.08  | 6.27 ± 11.0% (k=2) |
| 1810    | ± 50 / ± 100                | Body | 53.3 ± 5%    | 1.52 ± 5%    | 0.56  | 2.66  | 4.88 ± 11.0% (k=2) |
| 2450    | ± 50 / ± 100                | Body | 52.7 ± 5%    | 1.95 ± 5%    | 0.66  | 1.95  | 4.27 ± 11.8% (k=2) |

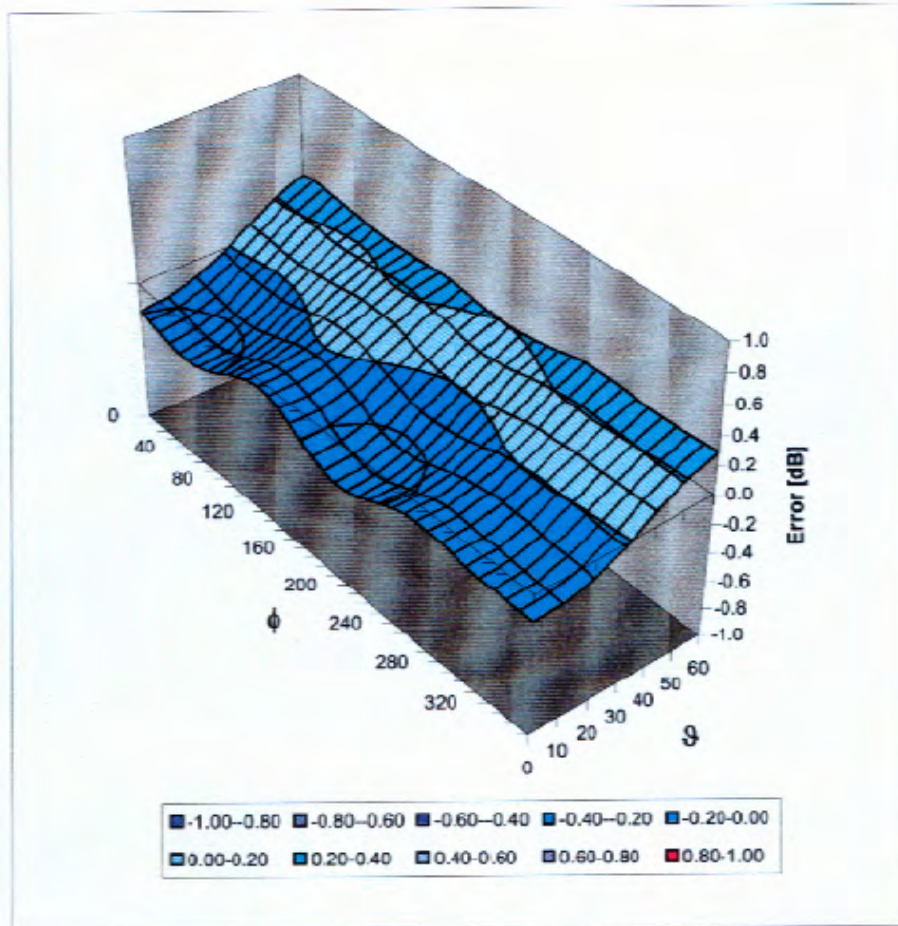
<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

ET3DV6 SN:1604

May 2, 2006

### Deviation from Isotropy in HSL

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



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



# APPENDIX C – DIPOLE CALIBRATION CERTIFICATES

**Calibration Laboratory of Schmid & Partner Engineering AG**  
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Accreditation No.: **SCS 108**

Client **BACL**

Certificate No: **D900V2-122\_Jun06**

## CALIBRATION CERTIFICATE

Object **D900V2 - SN: 122**

Calibration procedure(s) **QA CAL-05.v6  
 Calibration procedure for dipole validation kits**

Calibration date: **June 16, 2006**

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       | 04-Oct-05 (METAS, No. 251-00516)          | Oct-06                 |
| Power sensor HP 8481A       | US37292783       | 04-Oct-05 (METAS, No. 251-00516)          | Oct-06                 |
| Reference 20 dB Attenuator  | SN: 5086 (20g)   | 11-Aug-05 (METAS, No 251-00498)           | Aug-06                 |
| Reference 10 dB Attenuator  | SN: 5047.2 (10r) | 11-Aug-05 (METAS, No 251-00498)           | Aug-06                 |
| Reference Probe ET3DV6 (HF) | SN 1507          | 28-Oct-05 (SPEAG, No. ET3-1507_Oct05)     | Oct-06                 |
| DAE4                        | SN 601           | 15-Dec-05 (SPEAG, No. DAE4-601_Dec05)     | Dec-06                 |
| 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 Nov-05)  | In house check: Nov-06 |

Calibrated by: **Claudio Leubler** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

Approved by: **Katja Pokovic** (Name), **Technical Manager** (Function), *[Signature]* (Signature)

Issued: June 19, 2006

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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:

- 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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

### Additional Documentation:

- DASY4 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.

## APPENDIX C – DIPOLE CALIBRATION CERTIFICATES

### Measurement Conditions

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

|                              |                           |             |
|------------------------------|---------------------------|-------------|
| DASY Version                 | DASY4                     | V4.7        |
| Extrapolation                | Advanced Extrapolation    |             |
| Phantom                      | Modular Flat Phantom V5.0 |             |
| Distance Dipole Center - TSL | 15 mm                     | with Spacer |
| Area Scan resolution         | dx, dy = 15 mm            |             |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm         |             |
| Frequency                    | 900 MHz ± 1 MHz           |             |

### Head TSL parameters

The following parameters and calculations were applied.

|                                  | Temperature     | Permittivity | Conductivity     |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Head TSL parameters      | 22.0 °C         | 41.5         | 0.97 mho/m       |
| Measured Head TSL parameters     | (22.0 ± 0.2) °C | 41.1 ± 6 %   | 0.96 mho/m ± 6 % |
| Head TSL temperature during test | (22.0 ± 0.2) °C | —            | —                |

### SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                   |
|---|--------------------|-----------------------------------|
| SAR measured  | 250 mW input power | 2.73 mW / g                       |
| SAR normalized  | normalized to 1W   | 10.9 mW / g                       |
| SAR for nominal Head TSL parameters <sup>1</sup>      | normalized to 1W   | <b>10.9 mW / g ± 17.0 % (k=2)</b> |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                   |
|---|--------------------|-----------------------------------|
| SAR measured  | 250 mW input power | 1.75mW / g                        |
| SAR normalized  | normalized to 1W   | 7.00 mW / g                       |
| SAR for nominal Head TSL parameters <sup>1</sup>        | normalized to 1W   | <b>6.99 mW / g ± 16.5 % (k=2)</b> |

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

## Appendix

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.2 $\Omega$ - 6.4 j $\Omega$ |
| Return Loss                          | - 24.0 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.412 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 | July 04, 2001 |

**DASY4 Validation Report for Head TSL**

Date/Time: 16.06.2006 11:35:14

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:122**

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

Medium: HSL 900 MHz;

Medium parameters used:  $f = 900$  MHz;  $\sigma = 0.961$  mho/m;  $\epsilon_r = 41.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

**DASY4 Configuration:**

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.8, 5.8, 5.8); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 171

**Pin = 250 mW; d = 10 mm/Area Scan (71x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.94 mW/g

**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.7 V/m; Power Drift = -0.103 dB

Peak SAR (extrapolated) = 4.12 W/kg

**SAR(1 g) = 2.73 mW/g; SAR(10 g) = 1.75 mW/g**

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

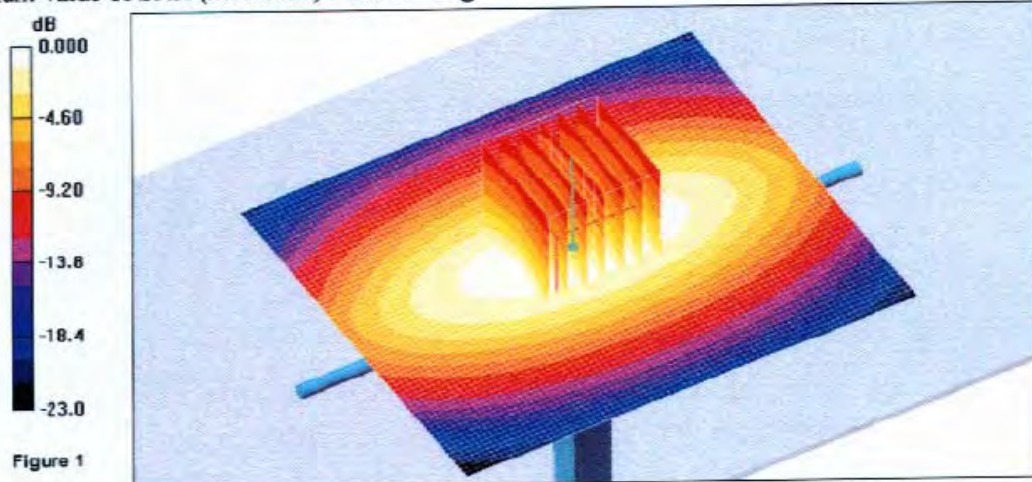
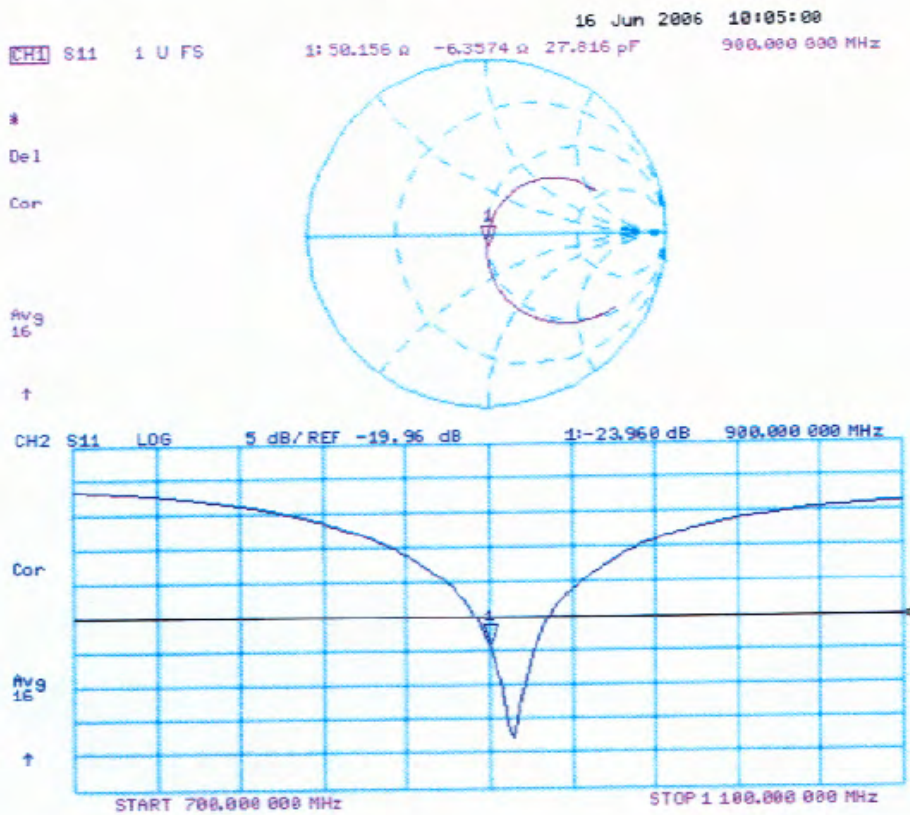


Figure 1

0 dB = 2.97mW/g

### Impedance Measurement Plot for Head TSL



**APPENDIX D – DAE3 CALIBRATION CERTIFICATES**

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



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

Accredited by the Swiss Federal Office of Metrology and Accreditation  
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 **BACL**

Certificate No: **DAE3-456\_Nov06**

**CALIBRATION CERTIFICATE**

Object **DAE3 - SD 000 D03 AA - SN: 456**

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

Calibration date: **November 22, 2006**

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 |
|-----------------------------------|--------------------|---|-----------------------|
| Fluke Process Calibrator Type 702 | SN: 6295803        | 13-Oct-06 (Elcal AG, No: 5492)            | Oct-07                |
| Keithley Multimeter Type 2001     | SN: 0810278        | 03-Oct-06 (Elcal AG, No: 5478)            | Oct-07                |
| Secondary Standards               | ID #               | Check Date (in house)                     | Scheduled Check       |
| Calibrator Box V1.1               | SE UMS 006 AB 1002 | 15-Jun-06 (SPEAG, in house check)         | In house check Jun-07 |

|                |               |              |           |
|----------------|---------------|--------------|-----------|
|                | Name          | Function     | Signature |
| Calibrated by: | Eric Hairfeld | Technician   |           |
| Approved by:   | Fin Bomholt   | R&D Director |           |

Issued: November 22, 2006

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

**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 Federal Office of Metrology and Accreditation  
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

**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 contain technical information as a result from the performance test and require no uncertainty.
- **DC Voltage Measurement Linearity:** Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
- **Common mode sensitivity:** Influence of a positive or negative common mode voltage on the differential measurement.
- **Channel separation:** Influence of a voltage on the neighbor channels not subject to an input voltage.
- **AD Converter Values with inputs shorted:** Values on the internal AD converter corresponding to zero input voltage
- **Input Offset Measurement:** Output voltage and statistical results over a large number of zero voltage measurements.
- **Input Offset Current:** Typical value for information; Maximum channel input offset current, not considering the input resistance.
- **Input resistance:** DAE input resistance at the connector, during internal auto-zeroing and during measurement.
- **Low Battery Alarm Voltage:** Typical value for information. Below this voltage, a battery alarm signal is generated.
- **Power consumption:** Typical value for information. Supply currents in various operating modes.



**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          | 404.439 $\pm$ 0.1% (k=2) | 403.906 $\pm$ 0.1% (k=2) | 403.969 $\pm$ 0.1% (k=2) |
| Low Range           | 3.93438 $\pm$ 0.7% (k=2) | 3.91686 $\pm$ 0.7% (k=2) | 3.94495 $\pm$ 0.7% (k=2) |

**Connector Angle**

|   |                                   |
|---|-----------------------------------|
| Connector Angle to be used in DASY system | 146 $^{\circ}$ $\pm$ 1 $^{\circ}$ |
|---|-----------------------------------|

## Appendix

### 1. DC Voltage Linearity

| High Range        | Input ( $\mu\text{V}$ ) | Reading ( $\mu\text{V}$ ) | Error (%) |
|-------------------|-------------------------|---------------------------|-----------|
| Channel X + Input | 200000                  | 200000                    | 0.00      |
| Channel X + Input | 20000                   | 20006.42                  | 0.03      |
| Channel X - Input | 20000                   | -20005.03                 | 0.03      |
| Channel Y + Input | 200000                  | 199999.6                  | 0.00      |
| Channel Y + Input | 20000                   | 20004.36                  | 0.02      |
| Channel Y - Input | 20000                   | -20008.05                 | 0.04      |
| Channel Z + Input | 200000                  | 199999.8                  | 0.00      |
| Channel Z + Input | 20000                   | 20005.63                  | 0.03      |
| Channel Z - Input | 20000                   | -20006.88                 | 0.03      |

| Low Range         | Input ( $\mu\text{V}$ ) | Reading ( $\mu\text{V}$ ) | Error (%) |
|-------------------|-------------------------|---------------------------|-----------|
| Channel X + Input | 2000                    | 2000.1                    | 0.00      |
| Channel X + Input | 200                     | 200.25                    | 0.13      |
| Channel X - Input | 200                     | -200.34                   | 0.17      |
| Channel Y + Input | 2000                    | 2000.1                    | 0.00      |
| Channel Y + Input | 200                     | 199.41                    | -0.30     |
| Channel Y - Input | 200                     | -200.64                   | 0.32      |
| Channel Z + Input | 2000                    | 2000.1                    | 0.00      |
| Channel Z + Input | 200                     | 199.56                    | -0.22     |
| Channel Z - Input | 200                     | -200.99                   | 0.50      |

### 2. Common mode sensitivity

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

|           | Common mode Input Voltage (mV) | High Range Average Reading ( $\mu\text{V}$ ) | Low Range Average Reading ( $\mu\text{V}$ ) |
|-----------|--------------------------------|--|---|
| Channel X | 200                            | -3.41  | -4.27                                       |
|           | -200                           | 4.45   | 4.86  |
| Channel Y | 200                            | -7.35  | -6.80                                       |
|           | -200                           | 5.01   | 5.93  |
| Channel Z | 200                            | 9.73   | 10.44                                       |
|           | -200                           | -12.17                                       | -11.92                                      |

### 3. Channel separation

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

|           | Input Voltage (mV) | Channel X ( $\mu\text{V}$ ) | Channel Y ( $\mu\text{V}$ ) | Channel Z ( $\mu\text{V}$ ) |
|-----------|--------------------|-----------------------------|-----------------------------|-----------------------------|
| Channel X | 200                | -                           | -0.13                       | -2.47                       |
| Channel Y | 200                | 0.11                        | -                           | 1.24                        |
| Channel Z | 200                | -1.80                       | -0.38                       | -                           |

**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 | 16305            | 15799           |
| Channel Y | 15832            | 14878           |
| Channel Z | 16026            | 16094           |

**5. Input Offset Measurement**

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

Input 10M $\Omega$ 

|           | Average ( $\mu$ V) | min. Offset ( $\mu$ V) | max. Offset ( $\mu$ V) | Std. Deviation ( $\mu$ V) |
|-----------|--------------------|------------------------|------------------------|---------------------------|
| Channel X | -0.23              | -1.20                  | 1.19                   | 0.30                      |
| Channel Y | -0.80              | -1.80                  | 0.08                   | 0.26                      |
| Channel Z | -0.31              | -1.66                  | 1.10                   | 0.31                      |

**6. Input Offset Current**

Nominal Input circuitry offset current on all channels: &lt;25fA

**7. Input Resistance**

|           | Zeroing (MOhm) | Measuring (MOhm) |
|-----------|----------------|------------------|
| Channel X | 0.2001         | 199.8            |
| Channel Y | 0.2001         | 199.5            |
| Channel Z | 0.2000         | 199.8            |

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

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

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

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

## APPENDIX E - TEST SYSTEM VERIFICATIONS SCANS

### Measurement Result

2007-03-16

| <i>Freq [MHz]</i> | <i>Parameters</i> | <i>Liquid Temp [°C]</i> | <i>Target Value</i> | <i>Measured Value</i> | <i>Deviation [%]</i> | <i>Limits [%]</i> |
|-------------------|-------------------|-------------------------|---------------------|-----------------------|----------------------|-------------------|
| 835               | $\epsilon_r$      | 22                      | 41.5                | 41.6                  | 0.24                 | ±5                |
|                   | $\sigma$          | 22                      | 0.90                | 0.91                  | 1.11                 | ±5                |
|                   | <i>Ig SAR</i>     | 22                      | 9.5                 | 9.67                  | 1.79                 | ±10               |

$\epsilon_r$  = relative permittivity,  $\sigma$  = conductivity and  $\rho=1000\text{kg/m}^3$

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**

**System Performance Check**

**DUT: Dipole 900 MHz; Type: D900V2; Serial: 122**

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

Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 0.91 \text{ mho/m}$ ;  $\epsilon_r = 41.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

**DASY4 Configuration:**

- Probe: ET3DV6 - SN1604; ConvF (6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**d=15mm, Pin=1W/Area Scan (61x121x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 9.69 mW/g

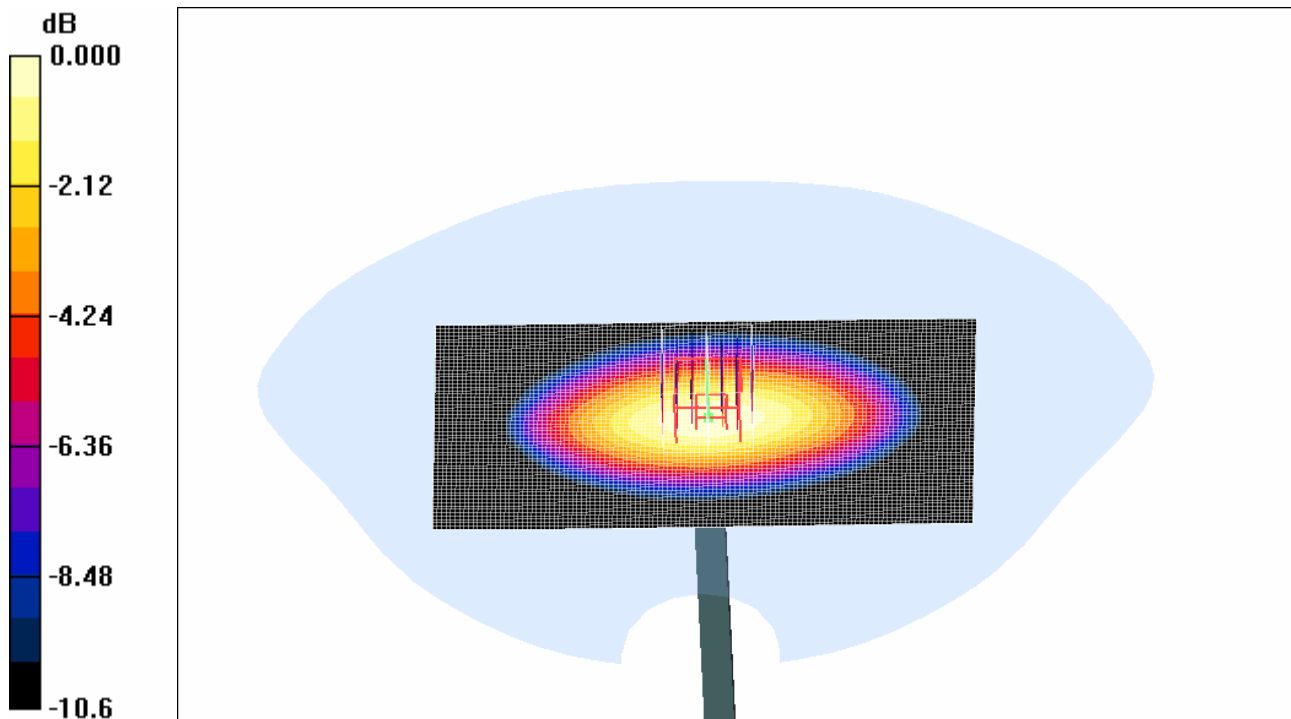
**d=15mm, Pin=1W/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 84.4 V/m; Power Drift = -0.083 dB

Peak SAR (extrapolated) = 9.78 W/kg

**SAR(1 g) = 9.67 mW/g; SAR(10 g) = 6.36 mW/g**

Maximum value of SAR (measured) = 9.75 mW/g



0 dB = 9.75 mW/g

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**

**Right Head Cheek (Middle Channel)**

**Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Right Section

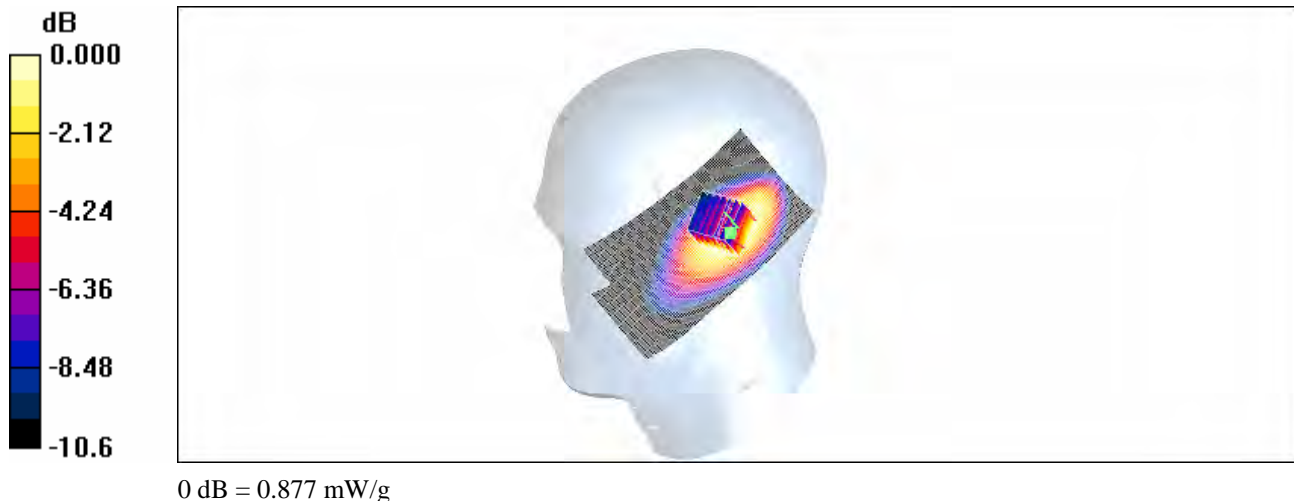
DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Right Head Cheek/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.906 mW/g

**Right Head Cheek/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 31.4 V/m; Power Drift = -0.04 dB  
 Peak SAR (extrapolated) = 1.09 W/kg  
**SAR(1 g) = 0.820 mW/g; SAR(10 g) = 0.574 mW/g**

Maximum value of SAR (measured) = 0.877 mW/g



**Plot#1**

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**

**Right Head Cheek (Low Channel)**

**Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 824.7 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Right Head Cheek/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.947 mW/g

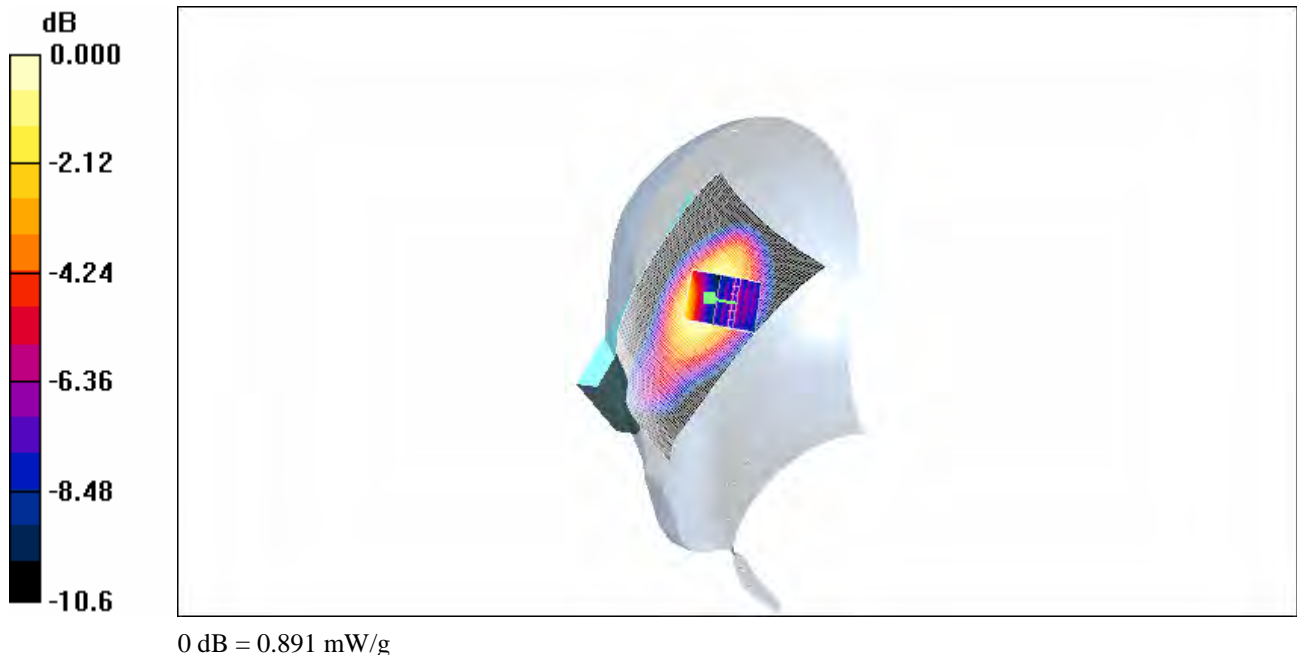
**Right Head Cheek/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 30.7 V/m; Power Drift = -0.007 dB

Peak SAR (extrapolated) = 1.09 W/kg

**SAR(1 g) = 0.881 mW/g; SAR(10 g) = 0.568 mW/g**

Maximum value of SAR (measured) = 0.891 mW/g



**Plot#2**

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)****Right Head Cheek (High Channel)****Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 848.31 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Right Section

## DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Right Head Cheek/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 1.12 mW/g

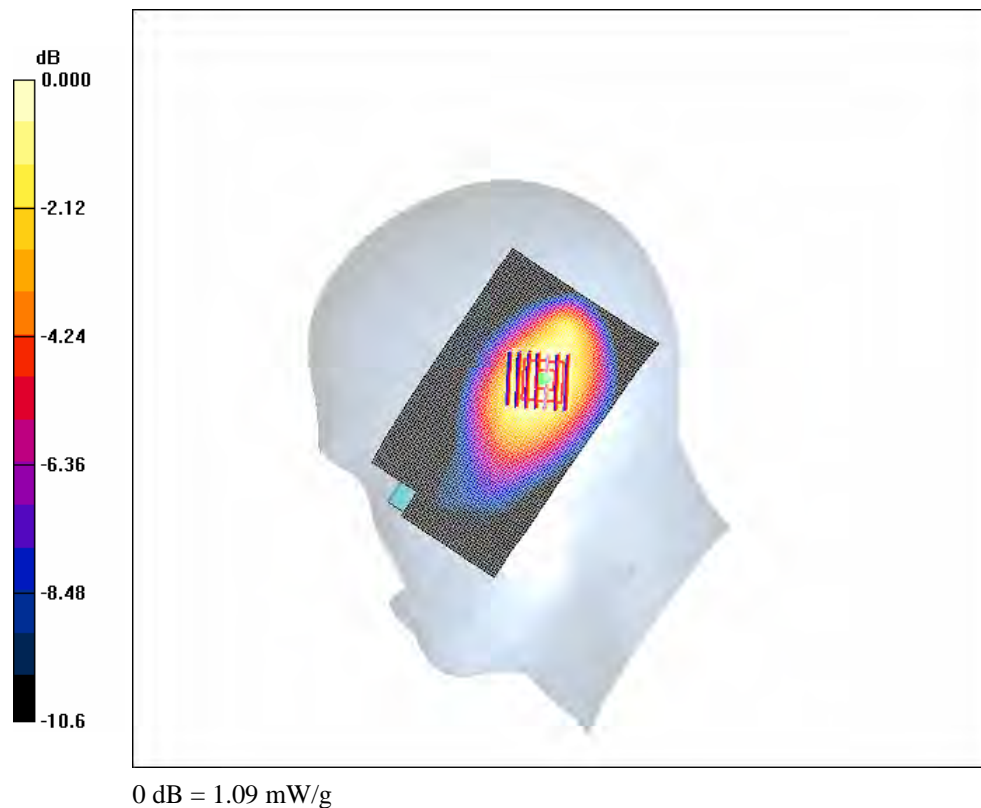
**Right Head Cheek/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 34.7 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 1.36 W/kg

**SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.718 mW/g**

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

**Plot#3**



**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**

**Right Tilt Position (Middle Channel)**

**Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Right Head Tilt/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.416 mW/g

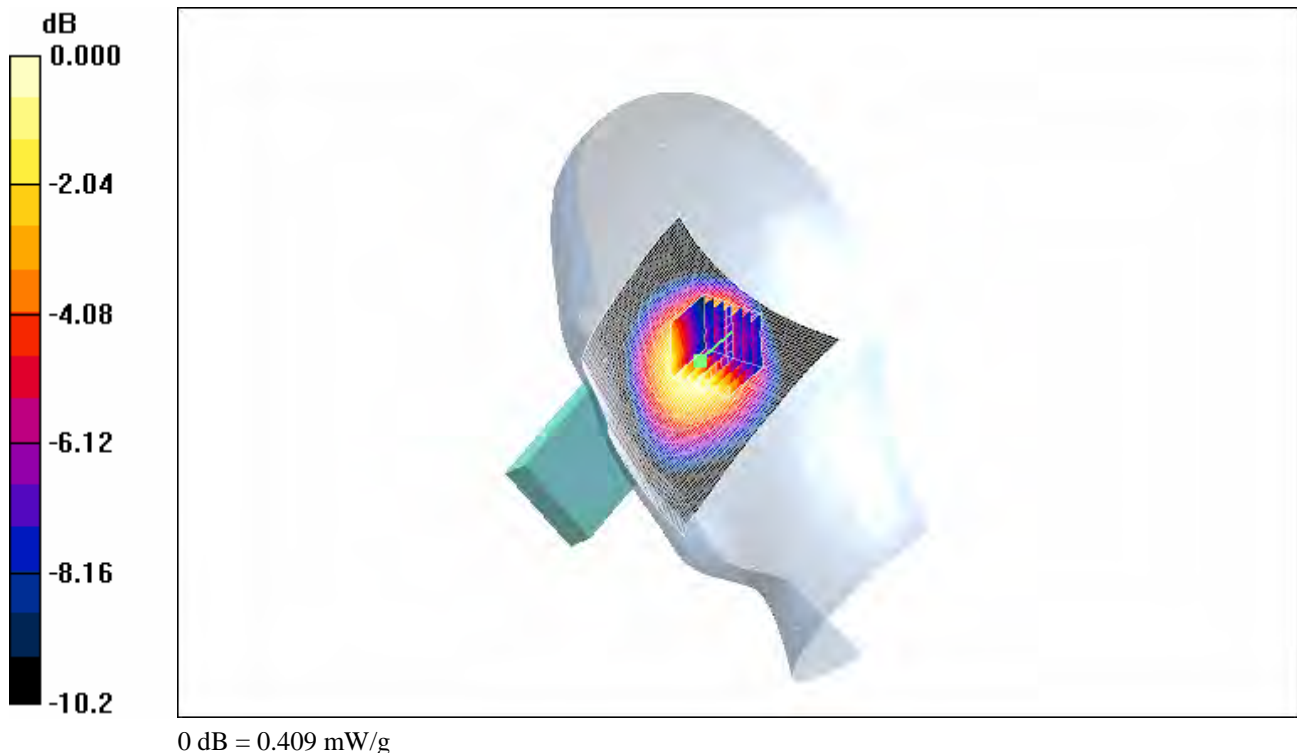
**Right Head Tilt/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 26.8 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.497 W/kg

**SAR(1 g) = 0.368 mW/g; SAR(10 g) = 0.271 mW/g**

Maximum value of SAR (measured) = 0.409 mW/g



**Plot#4**

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**

**Right Head Tilt (Low Channel)**

**Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 824.7 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Right Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Right Head Tilt/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.424 mW/g

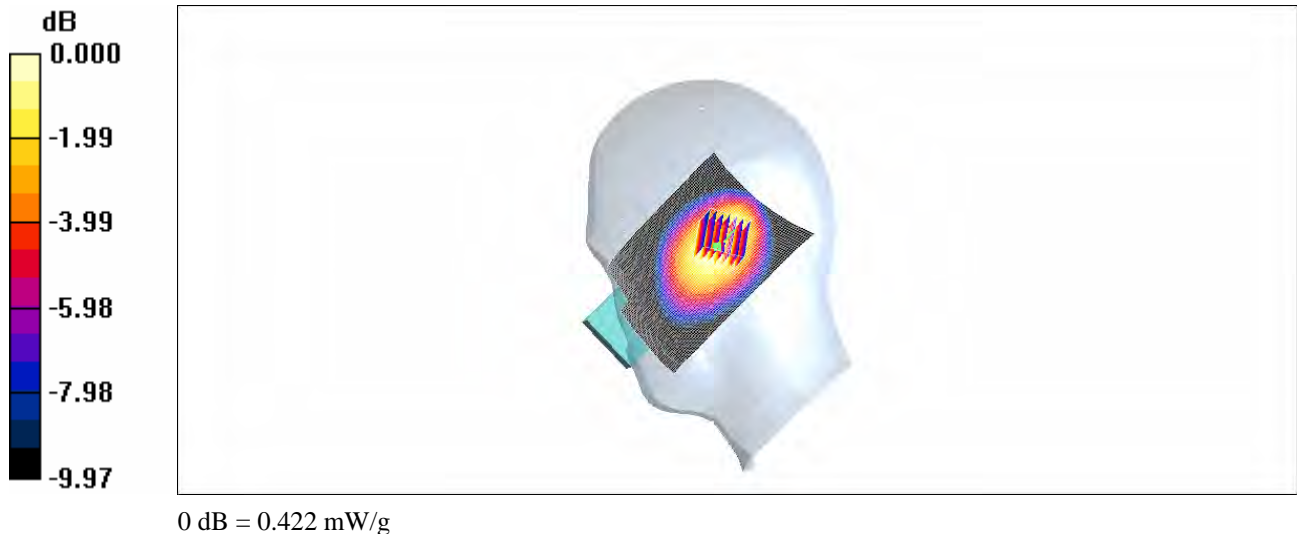
**Right Head Tilt/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 21.2 V/m; Power Drift = -0.227 dB

Peak SAR (extrapolated) = 0.520 W/kg

**SAR(1 g) = 0.396 mW/g; SAR(10 g) = 0.282 mW/g**

Maximum value of SAR (measured) = 0.422 mW/g



**Plot#5**

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)****Right Head Tilt (High Channel)****Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 848.31 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Right Section

## DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Right Head Tilt/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.772 mW/g

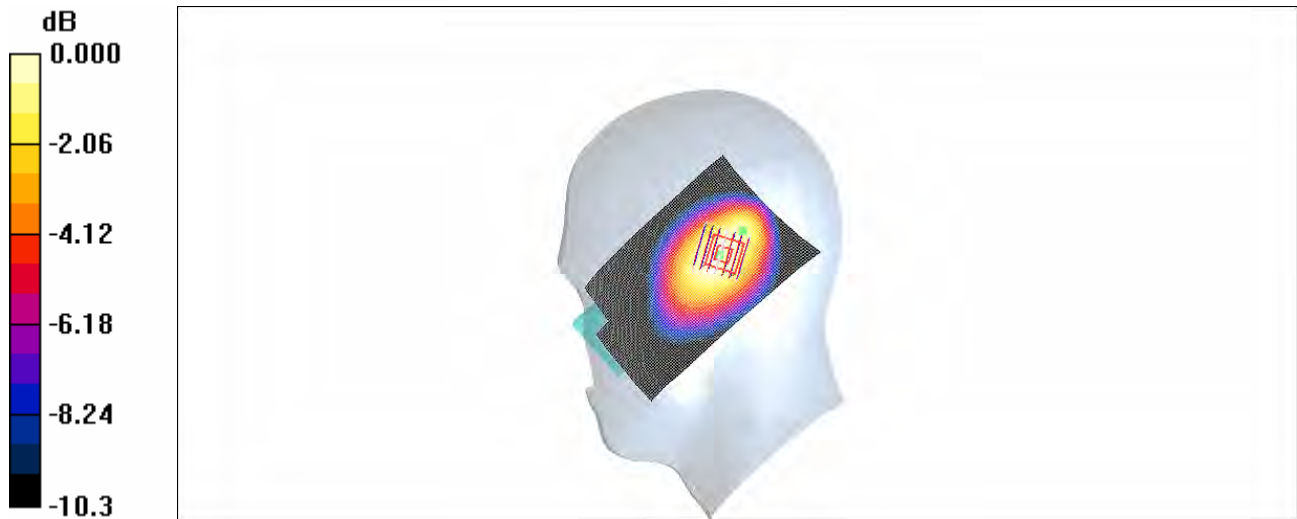
**Right Head Tilt/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 28.0 V/m; Power Drift = -0.373 dB

Peak SAR (extrapolated) = 0.942 W/kg

**SAR(1 g) = 0.711 mW/g; SAR(10 g) = 0.500 mW/g**

Maximum value of SAR (measured) = 0.753 mW/g



0 dB = 0.753 mW/g

**Plot#6**

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)****Left Head Cheek (Middle Channel)****Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Left Section

## DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Left Head Cheek/Area Scan (61x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.894 mW/g

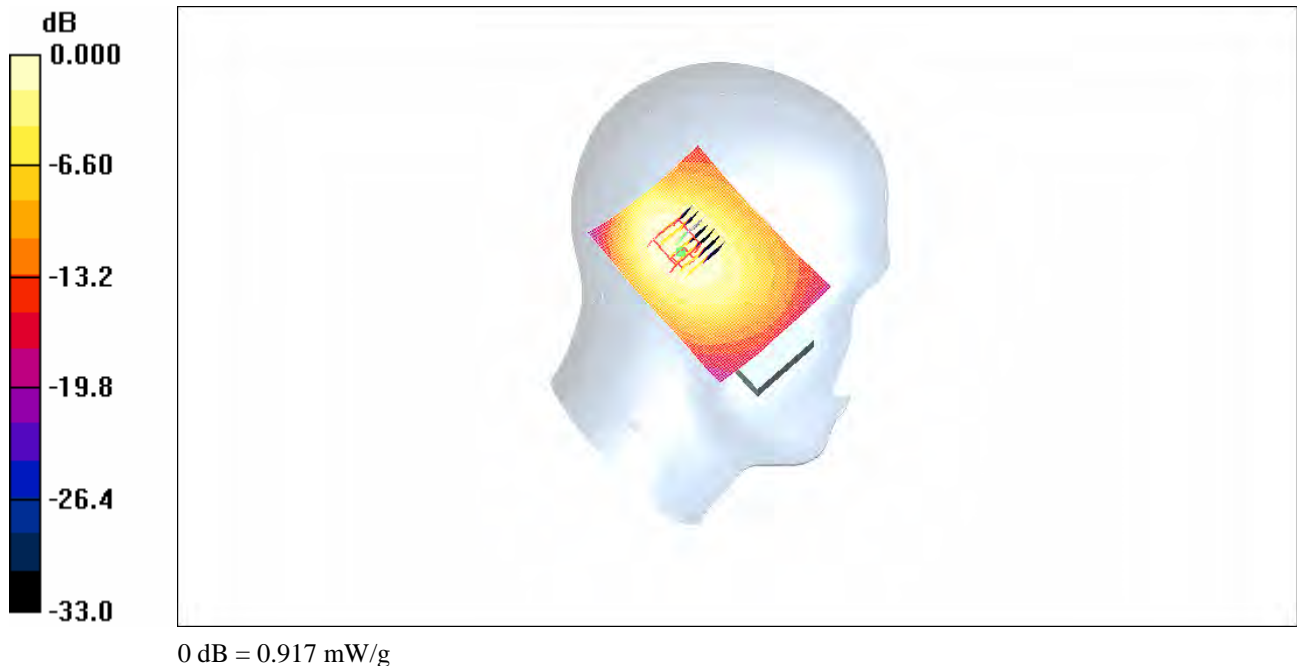
**Left Head Cheek/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.0 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 1.05 W/kg

**SAR(1 g) = 0.873 mW/g; SAR(10 g) = 0.508 mW/g**

Maximum value of SAR (measured) = 0.917 mW/g

**Plot#7**

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)****Left Head Cheek (Low Channel)****Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 824.7 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Left Section

## DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Left Head Cheek/Area Scan (61x91x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.885 mW/g

**Left Head Cheek/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 23.7 V/m; Power Drift = 0.429 dB  
 Peak SAR (extrapolated) = 0.892 W/kg  
**SAR(1 g) = 0.884 mW/g; SAR(10 g) = 0.593 mW/g**  
 Maximum value of SAR (measured) = 0.906 mW/g



0 dB = 0.906 mW/g

Plot#8

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**

**Left Head Cheek (High Channel)**

**Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 848.31 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Left Head Cheek/Area Scan (61x101x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.944 mW/g

**Left Head Cheek/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 32.5 V/m; Power Drift = -0.03 dB  
 Peak SAR (extrapolated) = 1.16 W/kg  
**SAR(1 g) = 0.898 mW/g; SAR(10 g) = 0.602 mW/g**  
 Maximum value of SAR (measured) = 0.938 mW/g



0 dB = 0.938 mW/g

**Plot#9**

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)****Left Head Tilt (Middle Channel)****Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Left Section

## DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Left Head Tilt/Area Scan (61x81x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.412 mW/g

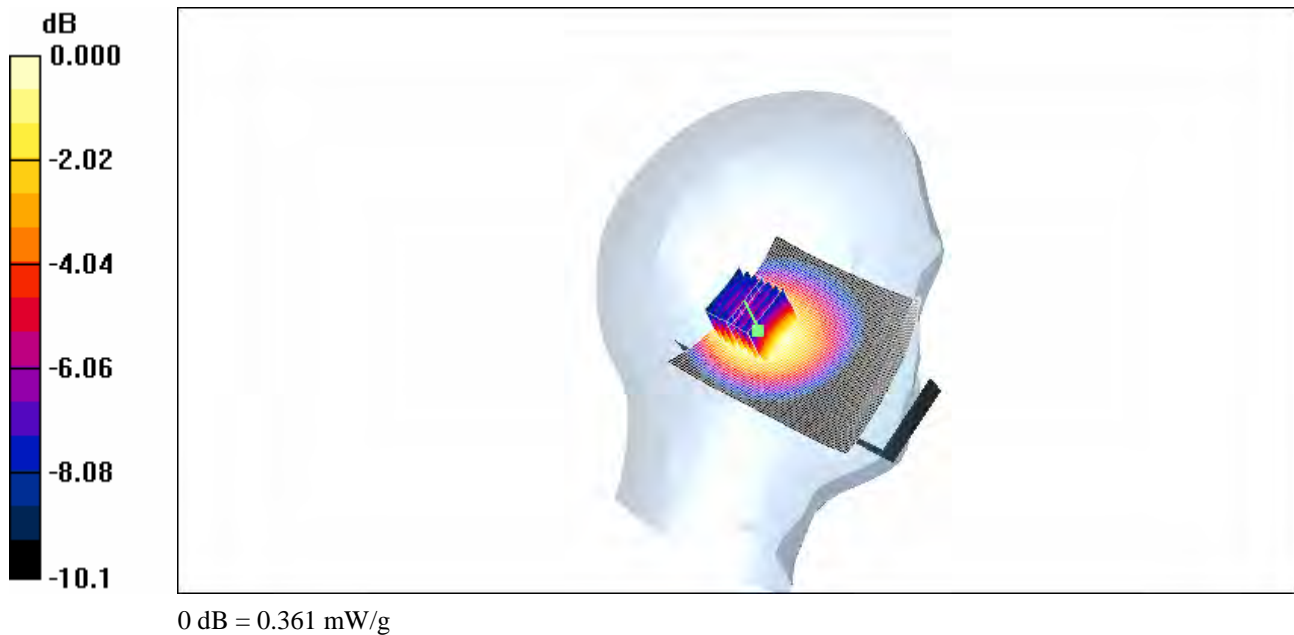
**Left Head Tilt/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 23.1 V/m; Power Drift = -0.014 dB

Peak SAR (extrapolated) = 0.363 W/kg

**SAR(1 g) = 0.357 mW/g; SAR(10 g) = 0.226 mW/g**

Maximum value of SAR (measured) = 0.361 mW/g

**Plot#10**

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)****Left Head Tilt (Low Channel)****Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

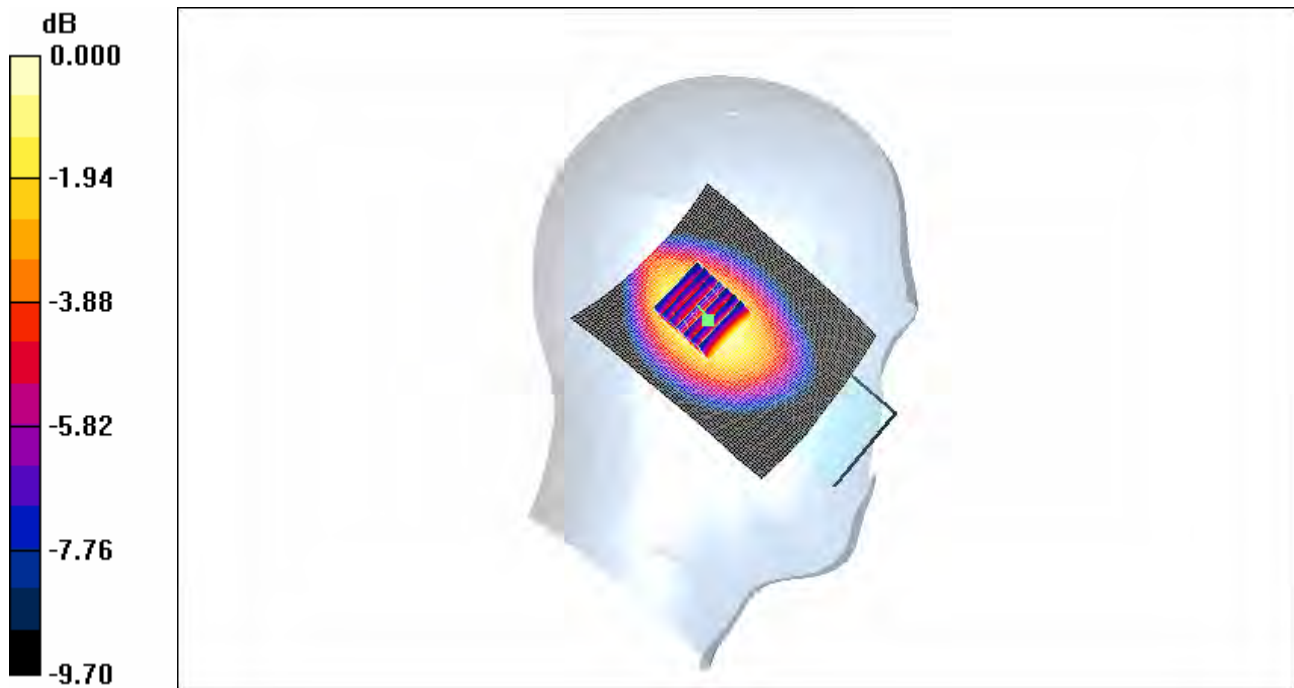
Communication System: 800 MHz CDMA; Frequency: 824.7 MHz; Duty Cycle: 1:1  
 Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Left Section

## DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Left Head Tilt/Area Scan (61x81x1):** Measurement grid: dx=15mm, dy=15mm  
 Maximum value of SAR (interpolated) = 0.395 mW/g

**Left Head Tilt/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 19.5 V/m; Power Drift = 0.04 dB  
 Peak SAR (extrapolated) = 0.399 W/kg  
**SAR(1 g) = 0.365 mW/g; SAR(10 g) = 0.255 mW/g**  
 Maximum value of SAR (measured) = 0.387 mW/g

**Plot#11**



**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)****Left Head Tilt (High Channel)****Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.91$  mho/m;  $\epsilon_r = 41.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

## DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.6, 6.6, 6.6); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Left Head Tilt/Area Scan (61x81x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.689 mW/g

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

Reference Value = 26.1 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.791 W/kg

**SAR(1 g) = 0.678 mW/g; SAR(10 g) = 0.339 mW/g**

Maximum value of SAR (measured) = 0.685 mW/g



0 dB = 0.685 mW/g

**Plot#12**

**Test Laboratory: Bay Area Compliance Lab Corp. (BACL)**

**Body Worn, 1.5 cm separation to flat phantom (Middle Channel)**

**Hisense Communication; DUT Type: HS-C306; Serial Number: 1MC86001CN2BB0SABH20003**

Communication System: 800 MHz CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.98$  mho/m;  $\epsilon_r = 55.3$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1604; ConvF(6.27, 6.27, 6.27); Calibrated: 5/2/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn456; Calibrated: 11/22/2006
- Phantom: SAM with CRP; Type: Twin SAM; Serial: TP-1032
- Measurement SW: DASY4, V4.6 Build 23; Post processing SW: SEMCAD, V1.8 Build 161

**Body Worn, 1.5 cm separation to flat phantom/Area Scan (71x81x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 0.422 mW/g

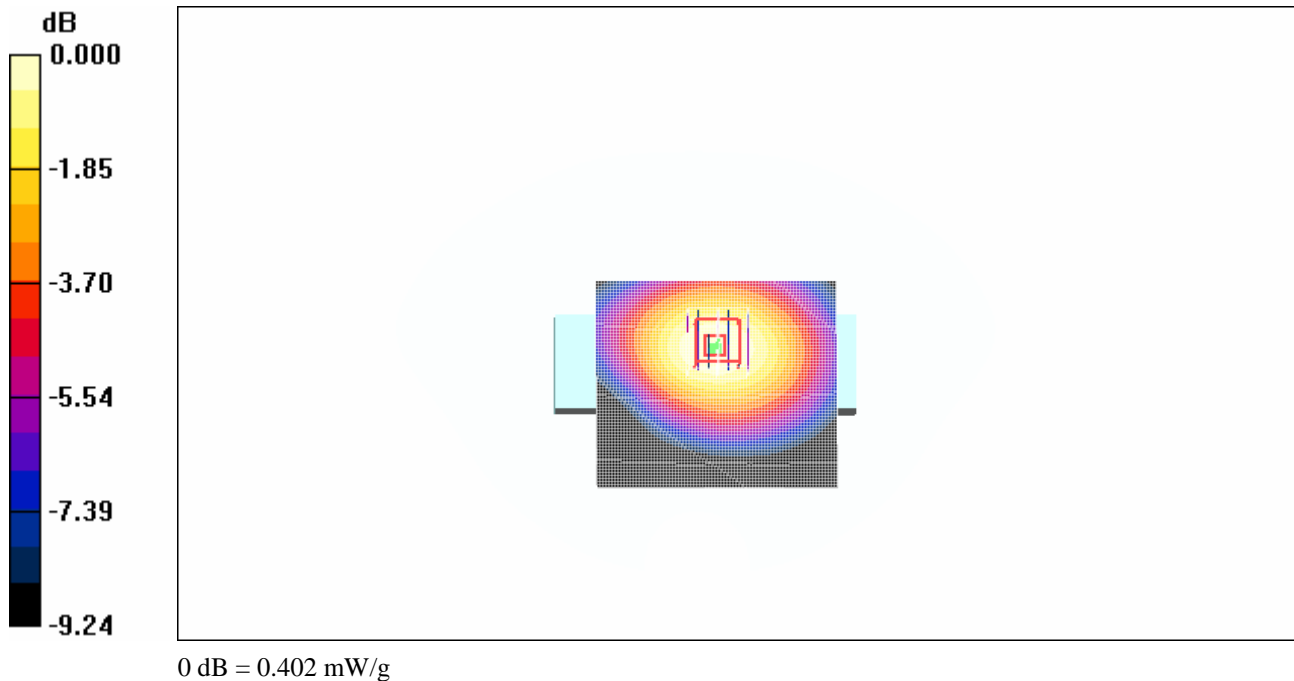
**Body Worn, 1.5 cm separation to flat phantom/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 20.7 V/m; Power Drift = -0.503 dB

Peak SAR (extrapolated) = 0.515 W/kg

**SAR(1 g) = 0.373 mW/g; SAR(10 g) = 0.263 mW/g**

Maximum value of SAR (measured) = 0.402 mW/g



**Plot#13**

## **APPENDIX F – CONDUCTED OUTPUT POWER MEASUREMENT**

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### **Provision Applicable**

The measured peak output power should be greater and within 5% than EMI measurement.

### **Test Procedure**

The RF output of the transmitter was connected to the input of the spectrum analyzer through sufficient attenuation.

### **Test equipment**

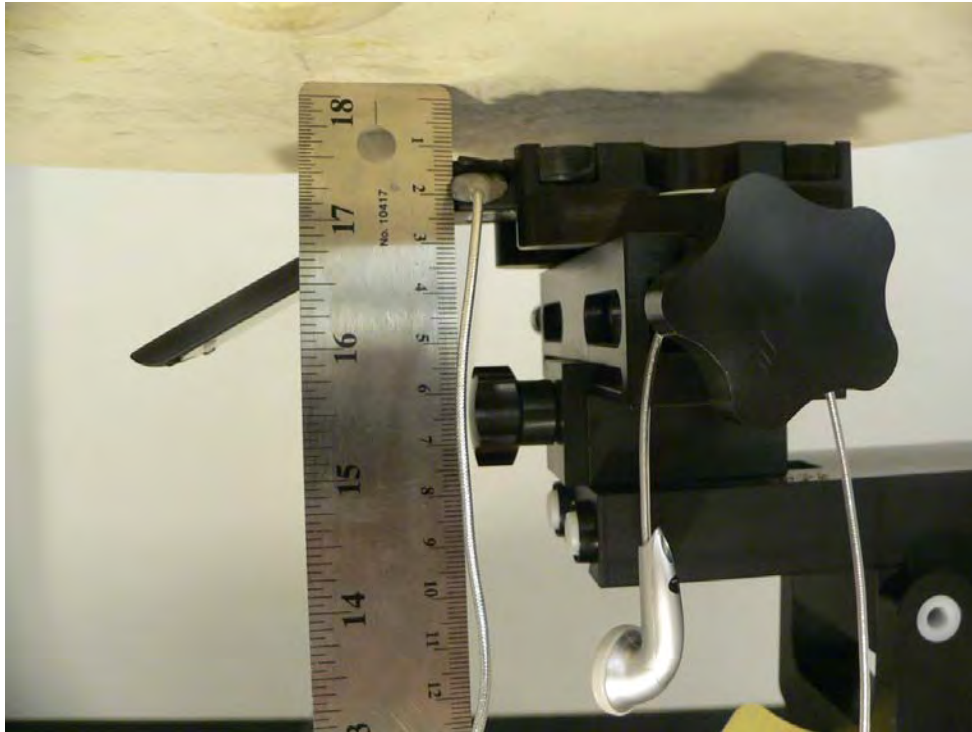
Agilent PSA E4446A Spectrum Analyzer, Calibration Due Date: 2007-03-16.

### **Test Results**

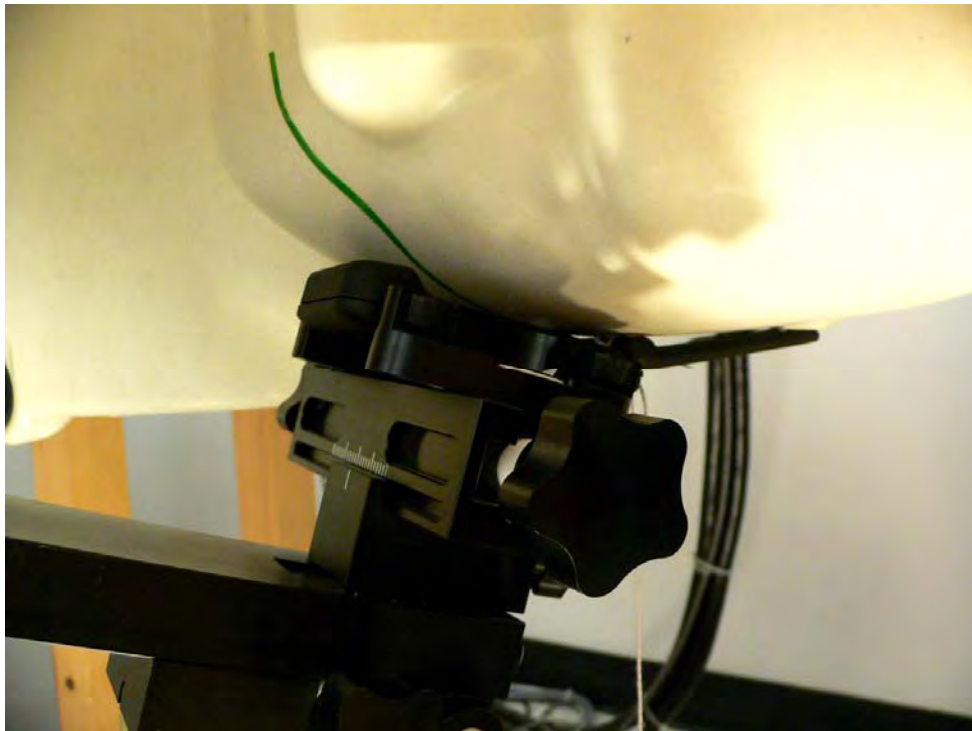
| <b>Frequency (MHz)</b> | <b>Output Power (dBm)</b> |
|------------------------|---------------------------|
| 824.7                  | 23.36                     |
| 836.52                 | 23.68                     |
| 848.31                 | 23.58                     |

## APPENDIX G – EUT TEST POSITION PHOTOS

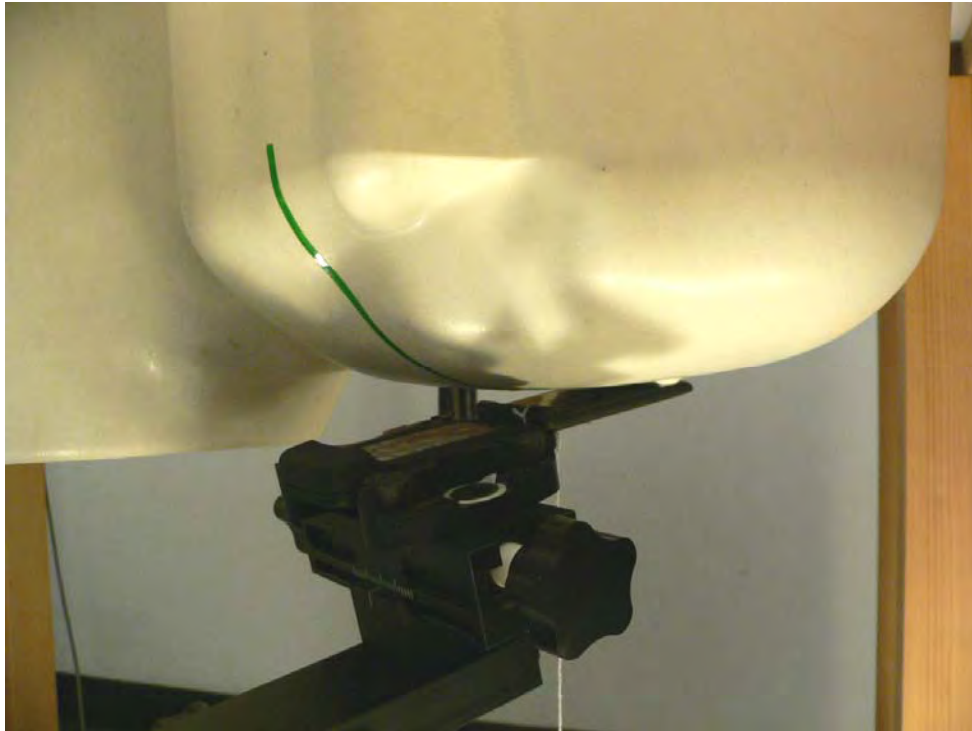
### 1.5 cm body worm setup photo with headset



### Left head cheek setup photo



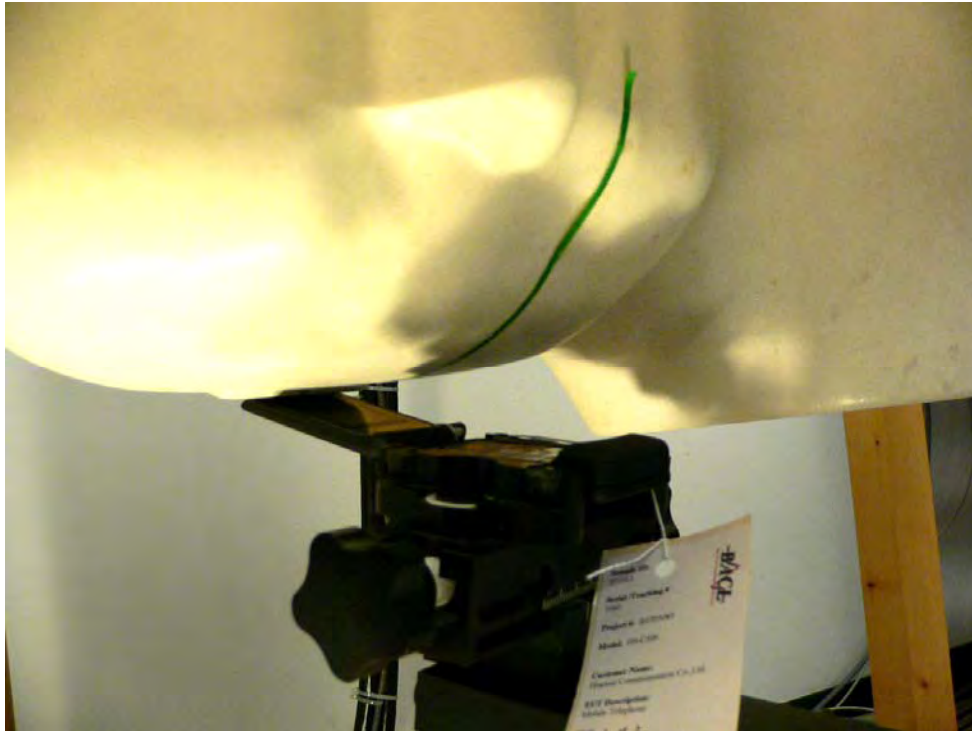
**Left head tilt setup photo**



**Right head cheek setup photo**



**Right head tilt setup photo**



## APPENDIX H – EUT & ACCESSORIES PHOTOS

### EUT - Top View



### EUT – Cover Open View



**EUT - Bottom View**



**EUT Accessories - Headset**





## APPENDIX I - INFORMATIVE REFERENCES

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- [1] Federal Communications Commission, \Report and order: Guidelines for evaluating the environmental effects of radiofrequency radiation", Tech. Rep. FCC 96-326, FCC, Washington, D.C. 20554, 1996.
- [2] David L. Means Kwok Chan, Robert F. Cleveland, \Evaluating compliance with FCC guidelines for human exposure to radiofrequency electromagnetic fields", Tech. Rep., Federal Communication Commission, Office of Engineering & Technology, Washington, DC, 1997.
- [3] Thomas Schmid, Oliver Egger, and Niels Kuster, \Automated E-field scanning system for dosimetric assessments", IEEE Transactions on Microwave Theory and Techniques, vol. 44, pp. 105{113, Jan. 1996.
- [4] Niels Kuster, Ralph Kastle, and Thomas Schmid, \Dosimetric evaluation of mobile communications equipment with known precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp. 645{652, May 1997.
- [5] CENELEC, \Considerations for evaluating of human exposure to electromagnetic fields (EMFs) from mobile telecommunication equipment (MTE) in the frequency range 30MHz - 6GHz", Tech. Rep., CENELEC, European Committee for Electrotechnical Standardization, Brussels, 1997.
- [6] ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
- [7] Katja Pokovic, Thomas Schmid, and Niels Kuster, \Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM \_ 97, Dubrovnik, October 15{17, 1997, pp. 120-24.
- [8] Katja Pokovic, Thomas Schmid, and Niels Kuster, \E-field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23{25 June, 1996, pp. 172-175.
- [9] Volker Hombach, Klaus Meier, Michael Burkhardt, Eberhard Kuhn, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 900 MHz", IEEE Transactions on Microwave Theory and Techniques, vol. 44, no. 10, pp. 1865-1873, Oct. 1996.
- [10] Klaus Meier, Ralf Kastle, Volker Hombach, Roger Tay, and Niels Kuster, \The dependence of EM energy absorption upon human head modeling at 1800 MHz", IEEE Transactions on Microwave Theory and Techniques, Oct. 1997, in press.
- [11] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
- [12] W. H. Press, S. A. Teukolsky, W. T. Vetterling, and B. P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992. Dosimetric Evaluation of Sample device, month 1998 9
- [13] NIS81 NAMAS, \The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddington, Middlesex, England, 1994.
- [14] Barry N. Taylor and Christ E. Kuyatt, \Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994. Dosimetric Evaluation of Sample device, month 1998 10.
- [15] SAR Measurement Procedures for 3G Devices \Laboratory Division, Office of Engineering and Technology, Federal Communications Commission.