



# PCTEST ENGINEERING LABORATORY, INC.

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## SAR COMPLIANCE EVALUATION REPORT FCC CFR §2.1093 / INDUSTRY CANADA RSS-102

**Applicant Name:**  
LG Electronics USA  
1000 Sylvan Avenue  
Englewood Cliffs, NJ 07632  
United States

**Date of Testing:**  
12/30/10 - 02/22/11  
**Test Site/Location:**  
PCTEST Lab, Columbia, MD, USA  
**Test /Technical Report Serial No.:**  
0Y1012272073.BEJ

|                              |                           |
|------------------------------|---------------------------|
| <b>FCC ID:</b>               | <b>BEJV905</b>            |
| <b>IC CERTIFICATION No.:</b> | <b>20703C-V905</b>        |
| <b>APPLICANT:</b>            | <b>LG ELECTRONICS USA</b> |

|                                 |                                                                                                                                                            |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EUT Type:</b>                | 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN                                                                                           |
| <b>Application Type:</b>        | Certification                                                                                                                                              |
| <b>FCC Rule Part(s):</b>        | CFR §2.1093; FCC/OET Bulletin 65 Supplement C [June 2001]                                                                                                  |
| <b>IC Specification (s):</b>    | RSS-102 Issue 4; Health Canada Safety Code 6                                                                                                               |
| <b>IC Radio Equipment Type:</b> | Cellular Communications Apparatus                                                                                                                          |
| <b>Model(s):</b>                | V905, V905R, LG-V905, LG-V905R                                                                                                                             |
| <b>IC Model(s):</b>             | V905, V905R, LG-V905, LG-V905R                                                                                                                             |
| <b>Tx Frequency:</b>            | 824.20 - 848.80 MHz (GSM 850) / 1850.20 - 1909.80 MHz (GSM 1900)<br>826.40 - 846.60 MHz (UMTS V) / 1852.4 - 1907.6 MHz (UMTS II)<br>2412 - 2462 MHz (WLAN) |
| <b>Conducted Power:</b>         | 32.89 dBm GSM 850 / 30.07 dBm GSM 1900<br>23.34 dBm UMTS V / 22.77 dBm UMTS II<br>11.23 dBm 2.4 GHz WLAN                                                   |
| <b>Max. SAR Measurement:</b>    | 1.09 W/kg GSM 850 Body SAR / 0.92 W/kg GSM 1900 Body SAR<br>1.09 W/kg UMTS V Body SAR / 1.25 W/kg UMTS II Body SAR<br>0.65 W/kg 2.4 GHz WLAN Body SAR      |
| <b>Test Device Serial No.:</b>  | Pre-Production [S/N: Body SAR #1, SAR #2, BT/WIFI]                                                                                                         |

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in FCC/OET Bulletin 65 Supplement C (2001), IEEE 1528-2003 and in applicable Industry Canada Radio Standards Specifications (RSS); for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

PCTEST certifies that no party to this application has been subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

  
Randy Ortanez  
President



|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BEJV905<br>IC Cert No: 20703C-V905           |  | SAR COMPLIANCE REPORT/ INDUSTRY<br>CANADA TECHNICAL REPORT (RSS-102)          |  | Reviewed by:<br>Quality Manager |
| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                  | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN |                                                                                       | Page 1 of 37                    |

# T A B L E O F C O N T E N T S

|    |                                                          |    |
|----|----------------------------------------------------------|----|
| 1  | INTRODUCTION .....                                       | 3  |
| 2  | TEST SITE LOCATION .....                                 | 4  |
| 3  | SAR MEASUREMENT SETUP .....                              | 5  |
| 4  | DASY E-FIELD PROBE SYSTEM .....                          | 7  |
| 5  | PROBE CALIBRATION PROCESS .....                          | 8  |
| 6  | PHANTOM AND EQUIVALENT TISSUES.....                      | 9  |
| 7  | DOSIMETRIC ASSESSMENT & PHANTOM SPECS.....               | 10 |
| 8  | FCC/ HEALTH CANADA SAFETY CODE 6 RF EXPOSURE LIMITS..... | 11 |
| 9  | SAR TEST CONFIGURATIONS .....                            | 12 |
| 10 | ANTENNA LOCATIONS AND KEY FEATURES .....                 | 13 |
| 11 | SAR TESTING CONSIDERATIONS & FCC KDB INQUIRIES .....     | 14 |
| 12 | FCC 3G MEASUREMENT PROCEDURES.....                       | 15 |
| 13 | SAR TESTING WITH IEEE 802.11 TRANSMITTERS.....           | 17 |
| 14 | SYSTEM VERIFICATION.....                                 | 20 |
| 15 | SAR DATA SUMMARY .....                                   | 22 |
| 16 | SIMULTANEOUS TRANSMISSION ANALYSIS.....                  | 25 |
| 17 | EQUIPMENT LIST.....                                      | 29 |
| 18 | MEASUREMENT UNCERTAINTIES .....                          | 30 |
| 19 | CONCLUSION.....                                          | 31 |
| 20 | REFERENCES .....                                         | 32 |
| 21 | SAR TEST SETUP PHOTOGRAPHS.....                          | 34 |

|                                                             |                                                                                     |                                                                                      |                                                                                       |                                        |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> BEJV905<br><b>IC Cert No:</b> 20703C-V905    |  | <b>SAR COMPLIANCE REPORT/ INDUSTRY<br/>CANADA TECHNICAL REPORT (RSS-102)</b>         |  | <b>Reviewed by:</b><br>Quality Manager |
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# 1 INTRODUCTION

The FCC AND Industry Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 and Health Canada Safety code 6 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [24]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

## 1.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density ( $\rho$ ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Fig. 1-1).

$$SAR = \frac{d}{dt} \left( \frac{dU}{dm} \right) = \frac{d}{dt} \left( \frac{dU}{\rho dV} \right)$$

Figure 1-1  
SAR Mathematical Equation

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

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

where:

- $\sigma$  = conductivity of the tissue-simulating material (S/m)
- $\rho$  = mass density of the tissue-simulating material ( $\text{kg/m}^3$ )
- E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

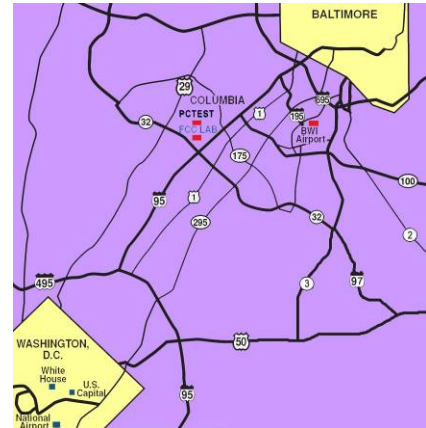
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|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 2 TEST SITE LOCATION

### 2.1 INTRODUCTION

The map at the right shows the location of the PCTEST LABORATORY in Columbia, Maryland. It is in proximity to the FCC Laboratory, the Baltimore-Washington International (BWI) airport, the city of Baltimore and Washington, DC.

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49' 38" W longitude. The facility is 1.5 miles north of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on January 27, 2006 and Industry Canada.



## 3

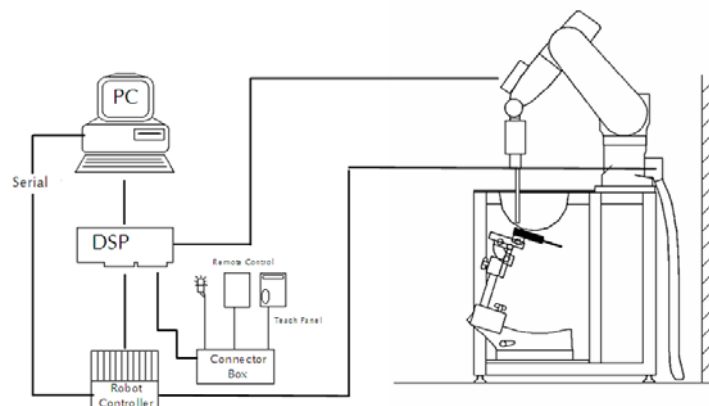
### 3.1 Robotic System

Measurements are performed using the DASY4 automated dosimetric assessment system. The DASY4 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of a high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the SAM phantom containing the head or body equivalent material. The robot is a six-axis industrial robot, performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Figure 3-1).

### 3.2 System Hardware

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and a remote control used to drive the robot motors. The PC consists of the SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, A/D conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal from the DAE and transfers data to the PC card.

### 3.3 System Electronics



### Figure 3-1 SAR Measurement System Setup

The DAE consists of a highly sensitive electrometer-grade auto-zeroing preamplifier, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

|                                                             |                                           |                                                                                                                                                                        |  |                                                                                       |                                        |
|-------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------------------------------------------------------------------------------|----------------------------------------|
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### 3.4 Automated Test System Specifications

Test Software: SPEAG DASY4 version 4.7 Measurement Software  
Robot: Stäubli Unimation Corp. Robot RX60L  
Repeatability: 0.02 mm  
No. of Axes: 6

Data Acquisition Electronic System (DAE)

Data Converter

Features: Signal Amplifier, multiplexer, A/D converter & control logic  
Software: SEMCAD software  
Connecting Lines: Optical Downlink for data and status info  
Optical upload for commands and clock

PC Interface Card

Function: Link to DAE  
16-bit A/D converter for surface detection system  
Two Serial & Ethernet link to robotics  
Direct emergency stop output for robot

Phantom

Type: SAM Twin Phantom (V4.0)  
Shell Material: Composite  
Thickness:  $2.0 \pm 0.2$  mm



**Figure 3-2**  
**SAR Measurement System**

|                                                             |                                                                                     |                                                                                      |                                                                                       |                                        |
|-------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
| <b>FCC ID:</b> BEJV905<br><b>IC Cert No:</b> 20703C-V905    |  | <b>SAR COMPLIANCE REPORT/ INDUSTRY</b><br><b>CANADA TECHNICAL REPORT (RSS-102)</b>   |  | <b>Reviewed by:</b><br>Quality Manager |
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### 4.1 Probe Measurement System



**Figure 4-1  
SAR System**

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration (see Figure 4-3) and optimized for dosimetric evaluation [9]. 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 DASY4 software reads the reflection during a software approach and looks for the

maximum using a 2nd order curve fitting (see Figure 5-1). The approach is stopped at reaching the maximum.

### 4.2 Probe Specifications

|                          |                                                                                                   |
|--------------------------|---------------------------------------------------------------------------------------------------|
| <b>Model(s):</b>         | ES3DV2, ES3DV3, EX3DV4                                                                            |
| <b>Frequency Range:</b>  | 10 MHz – 6.0 GHz (EX3DV4)<br>10 MHz – 4 GHz (ES3DV3)                                              |
| <b>Calibration:</b>      | In head and body simulating tissue at<br>Frequencies from 300 up to 6000MHz                       |
| <b>Linearity:</b>        | ± 0.2 dB (30 MHz to 6 GHz) for EX3DV4<br>± 0.2 dB (30 MHz to 4 GHz) for ES3DV3                    |
| <b>Dynamic Range:</b>    | 10 mW/kg – 100 W/kg                                                                               |
| <b>Probe Length:</b>     | 330 mm                                                                                            |
| <b>Probe Tip Length:</b> | 20 mm                                                                                             |
| <b>Body Diameter:</b>    | 12 mm                                                                                             |
| <b>Tip Diameter:</b>     | 2.5 mm (3.9mm for ES3DV3)                                                                         |
| <b>Tip-Center:</b>       | 1 mm (2.0 mm for ES3DV3)                                                                          |
| <b>Application:</b>      | SAR Dosimetry Testing<br>Compliance tests of mobile phones<br>Dosimetry in strong gradient fields |



**Figure 4-2  
Near-Field Probe**



**Figure 4-3  
Triangular Probe  
Configuration**

|                                                      |                                                                                                                                   |                                                                               |                                                                                                 |                                        |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------|
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## 5 PROBE CALIBRATION PROCESS

### 5.1 Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm<sup>2</sup>) using an RF Signal generator, TEM cell, and RF Power Meter.

### 5.2 Free Space Assessment

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies 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 rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm<sup>2</sup>.

### 5.3 Temperature Assessment

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

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

where:

$\Delta t$  = exposure time (30 seconds),  
 $C$  = heat capacity of tissue (brain or muscle),  
 $\Delta T$  = temperature increase due to RF exposure.

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

where:

$\sigma$  = simulated tissue conductivity,  
 $\rho$  = Tissue density (1.25 g/cm<sup>3</sup> for brain tissue)

SAR is proportional to  $\Delta T/\Delta t$ , the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

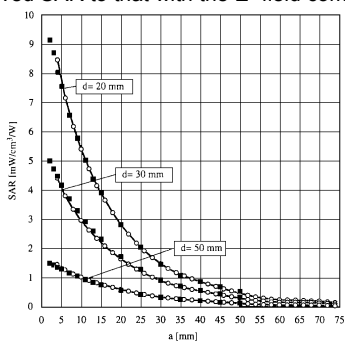


Figure 5-1 E-Field and Temperature measurements at 900MHz [9]

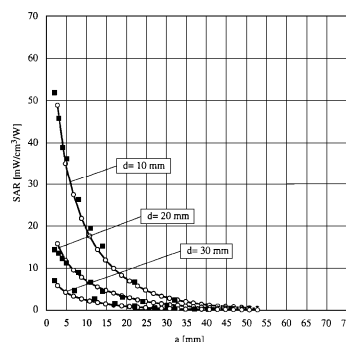


Figure 5-2 E-Field and temperature measurements at 1.9GHz [9]

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 6 PHANTOM AND EQUIVALENT TISSUES

### 6.1 SAM Phantoms



**Figure 6-1  
SAM Phantoms**

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to represent the 90<sup>th</sup> percentile of the population [12][13]. The phantom enables the dosimetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

### 6.2 Tissue Simulating Mixture Characterization



**Figure 6-2  
SAM Phantom with  
Simulating Tissue**

The mixture is characterized to obtain proper dielectric constant (permittivity) and conductivity of the tissue of interest. The tissue dielectric parameters recommended in IEEE 1528 and IEC 62209 have been used as targets for the compositions, and are to match within 5%, per the FCC recommendations.

**Table 6-1**  
Composition of the Tissue Equivalent Matter

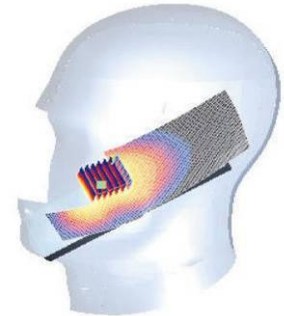
| Frequency<br>(MHz)        | 835   | 1900  | 2450 |
|---------------------------|-------|-------|------|
| Tissue                    | Body  | Body  | Body |
| Ingredients (% by weight) |       |       |      |
| Bactericide               | 0.1   |       |      |
| DGBE                      |       | 29.44 | 26.7 |
| HEC                       | 1     |       |      |
| NaCl                      | 0.94  | 0.39  | 0.1  |
| Sucrose                   | 44.9  |       |      |
| Water                     | 53.06 | 70.17 | 73.2 |

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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### 7.1 Measurement Procedure

The evaluation was performed using the following procedure:

1. The SAR distribution at the exposed side of the head was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm x 15mm.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during testing the 1 gram cube. This fixed point was measured and used as a reference value.
3. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation. Around this point, a volume of 32mm x 32mm x 30mm (fine resolution volume scan, zoom scan) was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual for more details):
  - a. The data was extrapolated to the surface of the outer-shell of the phantom. The combined distance extrapolated was the combined distance from the center of the dipoles 2.7mm away from the tip of the probe housing plus the 1.2 mm distance between the surface and the lowest measuring point. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
  - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 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 then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
  - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete. If the value deviated by more than 5%, the evaluation was repeated.
5. For 5 GHz testing finer resolution zoom scans were performed as specified by FCC SAR Measurement Requirements for 3 – 6 GHz, KDB pub 865664. The 5 GHz zoom scan requires a minimum volume of 24mm x 24mm x 20mm and 7 x 7 x 11 points.



**Figure 7-1**  
**Sample SAR Area Scan**

### 7.2 Specific Anthropomorphic Mannequin (SAM) Specifications

The phantom for handset SAR assessment testing is a low-loss dielectric shell, with shape and dimensions derived from the anthropometric data of the 90th percentile adult male head dimensions as tabulated by the US Army. The SAM Twin Phantom shell is bisected along the mid-sagittal plane into right and left halves (see Figure 7-2). The perimeter sidewalls of each phantom halves are extended to allow filling with liquid to a depth that is sufficient to minimize reflections from the upper surface. The liquid depth is maintained at a minimum depth of 15 cm.



**Figure 7-2**  
**SAM Twin Phantom Shell**

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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### 8.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

### 8.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

**Table 8-1**  
**SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6**

| HUMAN EXPOSURE LIMITS                           |                                                                           |                                                                   |
|-------------------------------------------------|---------------------------------------------------------------------------|-------------------------------------------------------------------|
|                                                 | UNCONTROLLED ENVIRONMENT<br><i>General Population</i><br>(W/kg) or (mW/g) | CONTROLLED ENVIRONMENT<br><i>Occupational</i><br>(W/kg) or (mW/g) |
| SPATIAL PEAK SAR<br>Brain                       | 1.6                                                                       | 8.0                                                               |
| SPATIAL AVERAGE SAR<br>Whole Body               | 0.08                                                                      | 0.4                                                               |
| SPATIAL PEAK SAR<br>Hands, Feet, Ankles, Wrists | 4.0                                                                       | 20                                                                |

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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## 9 SAR TEST CONFIGURATIONS

### 9.1 SAR for Notebooks and Lap-touching Devices

Lap-touching devices that have transmitting antennas located less than 20 cm from the lap of the user require routine SAR evaluation. Such devices are considered portable and are capable of being held to the body. Devices are to be setup touching the phantom and are configured with maximum output power during SAR assessment for a worst-case SAR evaluation.

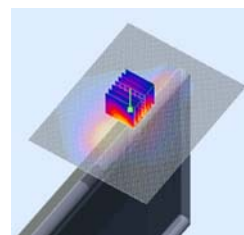


**Figure 9-1**  
**Notebook Setup for SAR**

### 9.2 Positioning for Convertible and Slate Tablet Computers



**Figure 9-2**  
**Tablet Computer Form Factors**



**Figure 9-3**  
**Tablet PC Body SAR**

KDB Publication 447498. Tablet (notepad) computers are tested in a lap-held position with the bottom of the computer in direct contact against a flat phantom for all user-enabled portrait and landscape positions.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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## 10 ANTENNA LOCATIONS AND KEY FEATURES

### 10.1 Antenna and Key Feature Information for BEJV905

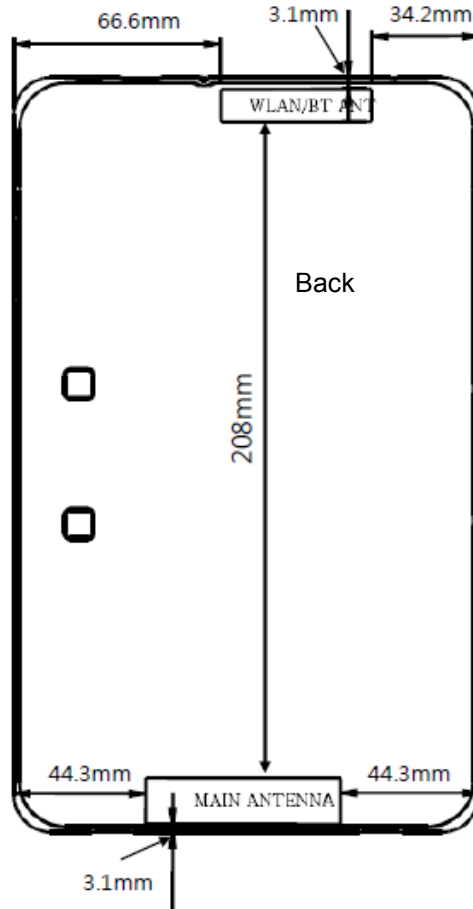


Figure 10-1 Antenna & Key feature Diagram

Note: Rear camera is not for video calls but for standard digital camera functions

### 10.2 Display Orientations Capabilities

The device is capable of all display orientations for all transmit capabilities via software automation.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                  | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN |                                                                                       | Page 13 of 37                   |

# 11 SAR TESTING CONSIDERATIONS & FCC KDB INQUIRIES

## 11.1 Tablet testing for SAR

Lap-touching devices that have transmitting antennas located less than 20 cm from the lap of the user require routine SAR evaluation. Such devices are considered portable and are capable of being held to the body. Devices are to be setup touching the phantom and are configured with maximum output power during SAR assessment for a worst-case SAR evaluation. Per FCC KDB Publication 447498, Tablet (notepad) computers are tested in a lap-held position with the bottom of the computer in direct contact against a flat phantom for all user-enabled portrait and landscape positions.

## 11.2 Distance Thresholds for SAR Testing

Per KDB 447498 Publication 4. b) i), SAR is required for each antenna located within 5 cm of the tablet edge closest to the user for the applicable display orientation, but for antenna(s) located  $\geq 5$  cm from this edge, the test reduction and exclusion procedures for laptop computers in KDB 616217 are applied.

| Antenna Output Power (mW)         | $\leq 60/f_{\text{(GHz)}}$ | $> 60/f_{\text{(GHz)}}$                                                                                                                                                   |
|-----------------------------------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Individual Transmitter or Antenna | SAR not required           | Antenna-to-user distance –<br>$\geq (5 + \frac{1}{2}n)$ cm: test SAR on highest output channel only<br>$< (5 + \frac{1}{2}n)$ cm: test SAR according to normal procedures |

Table 11-1 Distance Thresholds per KDB 616217 Publication

| Mode       | Freq (GHz) | Power (mW) | $60/f$ | $n=P/(60/f)-1$ | distance thres in cm $(5+1/2n)$ |
|------------|------------|------------|--------|----------------|---------------------------------|
| GSM 850    | 0.824      | 1945.360   | 72.80  | 25.72          | 17.9                            |
| GSM 1900   | 1.850      | 1016.249   | 32.43  | 30.34          | 20.2                            |
| WCDMA 850  | 0.837      | 215.774    | 71.72  | 2.01           | 6.0                             |
| WCDMA 1900 | 1.908      | 189.234    | 31.45  | 5.02           | 7.5                             |
| WIFI b     | 2.462      | 13.274     | 24.37  | -0.46          | 4.8                             |
| WIFI g     | 2.462      | 9.078      | 24.37  | -0.63          | 4.7                             |
| WIFI n     | 2.462      | 7.852      | 24.37  | -0.68          | 4.7                             |
| Bluetooth  | 2.480      | 0.869      | 24.19  | -0.96          | 4.5                             |

\*GSM modes represent burst power

According to KDB 616217 publication and the antenna distances from the user to the edges of the device, the main WWAN antenna is required to be tested for SAR at the back, bottom edge, right edge, and left edge of the device for all technologies. While the WLAN antenna is not required to be tested for SAR, it was additionally evaluated at the back, top edge, right edge, and left edge. Bluetooth is not required to be tested.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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## 12 FCC 3G MEASUREMENT PROCEDURES

Power measurements were performed using a base station simulator under digital average power.

### 12.1 Procedures Used to Establish RF Signal for SAR

The device was placed into a simulated call using a base station simulator in a shielded chamber. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR [4]. SAR measurements were taken with a fully charged battery. In order to verify that the device was tested and maintained at full power, it was configured with the base station simulator. The SAR measurement software calculates a reference point at the start and end of the test to check for power drifts. If SAR deviations of more than 5% occurred, the tests were repeated.

### 12.2 SAR Measurement Conditions for UMTS

#### 12.2.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1s".

#### 12.2.2 Head SAR Measurements

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all "1s". SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that results in the highest SAR for that RF channel in 12.2 RMC.

#### 12.2.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s".

#### 12.2.4 Handsets with HSDPA

Body SAR is not required for handsets with HSDPA capabilities when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75% of the SAR limit. Otherwise, SAR is measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that results in the highest SAR in 12.2 kbps RMC for that RF channel.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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| FCC ID: BEJV905<br>IC Cert No: 20703C-V905           |  | SAR COMPLIANCE REPORT/ INDUSTRY<br>CANADA TECHNICAL REPORT (RSS-102)          |  | Reviewed by:<br>Quality Manager |
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## 12.3 RF Conducted Powers

### 12.3.1 GSM Conducted Powers (Burst Power)

|          |         | RF Conducted Power Table |                         |                         |                         |                         |                         |                         |                         |
|----------|---------|--------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
|          |         | GPRS Data                |                         |                         |                         | EDGE Data               |                         |                         |                         |
| Band     | Channel | GPRS [dBm]<br>1 Tx Slot  | GPRS [dBm]<br>2 Tx Slot | GPRS [dBm]<br>3 Tx Slot | GPRS [dBm]<br>4 Tx Slot | EDGE [dBm]<br>1 Tx Slot | EDGE [dBm]<br>2 Tx Slot | EDGE [dBm]<br>3 Tx Slot | EDGE [dBm]<br>4 Tx Slot |
| Cellular | 128     | 32.89                    | 29.17                   | 27.28                   | 26.01                   | 25.14                   | 24.98                   | 24.82                   | 24.85                   |
|          | 190     | 32.83                    | 29.22                   | 27.23                   | 25.87                   | 25.12                   | 24.97                   | 24.86                   | 24.83                   |
|          | 251     | 32.86                    | 29.24                   | 27.29                   | 25.95                   | 25.19                   | 24.98                   | 24.92                   | 24.87                   |
| PCS      | 512     | 30.07                    | 28.61                   | 26.22                   | 24.81                   | 24.91                   | 24.41                   | 24.31                   | 24.31                   |
|          | 661     | 30.03                    | 28.13                   | 26.11                   | 24.47                   | 24.66                   | 24.13                   | 24.08                   | 24.09                   |
|          | 810     | 30.01                    | 28.21                   | 26.02                   | 24.58                   | 24.61                   | 24.07                   | 24.03                   | 23.98                   |

**GSM Class: C**

**GPRS Multislot class: 12 (max 4 Tx Uplink slots)**

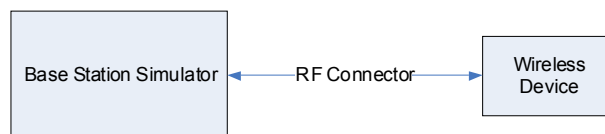
**EDGE Multislot class: 12 (max 4Tx Uplink slots)**

**DTM Multislot Class: N/A**

### 12.3.2 HSPA Conducted Powers

| 3GPP Release Version | Mode  | 3GPP 34.121 Subtest | Cellular Band [dBm] |       |       | PCS Band [dBm] |       |       | $\beta_c$ | $\beta_d$ | $\Delta E-DPCCH$ | # of E-TFCI's | MPR |
|----------------------|-------|---------------------|---------------------|-------|-------|----------------|-------|-------|-----------|-----------|------------------|---------------|-----|
|                      |       |                     | 4132                | 4183  | 4233  | 9262           | 9400  | 9538  |           |           |                  |               |     |
| 99                   | WCDMA | 12.2 kbps RMC       | 23.25               | 23.34 | 23.14 | 22.75          | 22.76 | 22.77 | -         | -         | -                | -             | -   |
| 99                   |       | 12.2 kbps AMR       | 23.23               | 23.09 | 23.06 | 22.69          | 22.77 | 22.75 | -         | -         | -                | -             | -   |
| 6                    | HSDPA | Subtest 1           | 23.34               | 23.34 | 23.35 | 22.87          | 22.87 | 23.02 | 2         | 15        | -                | -             | 0   |
| 6                    |       | Subtest 2           | 22.31               | 22.49 | 22.41 | 22.24          | 22.32 | 22.31 | 11        | 15        | -                | -             | 0   |
| 6                    |       | Subtest 3           | 21.74               | 21.79 | 21.67 | 21.33          | 21.39 | 21.69 | 15        | 8         | 5                | 1             | 0.5 |
| 6                    |       | Subtest 4           | 21.58               | 21.69 | 21.68 | 21.34          | 21.19 | 21.57 | 15        | 4         | 5                | 1             | 0.5 |
| 6                    | HSUPA | Subtest 1           | 22.25               | 22.29 | 22.22 | 22.52          | 22.00 | 22.40 | 10        | 15        | 6                | 5             | 0   |
| 6                    |       | Subtest 2           | 21.48               | 21.40 | 21.54 | 21.07          | 21.08 | 21.23 | 6         | 15        | 8                | 5             | 2   |
| 6                    |       | Subtest 3           | 22.20               | 21.67 | 21.68 | 21.47          | 21.50 | 21.40 | 15        | 9         | 8                | 2             | 1   |
| 6                    |       | Subtest 4           | 21.77               | 21.92 | 22.00 | 21.11          | 21.45 | 21.10 | 2         | 15        | 5                | 5             | 2   |
| 6                    |       | Subtest 5           | 22.55               | 22.25 | 22.25 | 22.21          | 22.64 | 22.67 | 14        | 15        | 7                | 5             | 0   |

MPR applied are within applicant's expectations and specifications. MPR may be as low as 0 dB and as much as 1 dB more than the expected MPR. Please see technical descriptions for more information.



**Figure 12-1**  
**Power Measurement Setup**

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BEJV905<br>IC Cert No: 20703C-V905           |  | SAR COMPLIANCE REPORT/ INDUSTRY<br>CANADA TECHNICAL REPORT (RSS-102)          |  | Reviewed by:<br>Quality Manager |
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## 13 SAR TESTING WITH IEEE 802.11 TRANSMITTERS

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable.

### 13.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

### 13.2 Frequency Channel Configurations [27]

802.11 a/b/g and 4.9 GHz operating modes are tested independently according to the service requirements in each frequency band. 802.11 b/g modes are tested on channels 1, 6 and 11. 802.11a is tested for UNII operations on channels 36 and 48 in the 5.15-5.25 GHz band; channels 52 and 64 in the 5.25-5.35 GHz band; channels 104, 116, 124 and 136 in the 5.470-5.725 GHz band; and channels 149 and 161 in the 5.8 GHz band. When 5.8 GHz §15.247 is also available, channels 149, 157 and 165 should be tested instead of the UNII channels. 4.9 GHz is tested on channels 1, 10 and 5 or 6, whichever has the higher output power, for 5 MHz channels; channels 11, 15 and 19 for 10 MHz channels; and channels 21 and 25 for 20 MHz channels. These are referred to as the “default test channels”. 802.11g mode was evaluated only if the output power was 0.25 dB higher than the 802.11b mode.

**Table 13-1**  
**802.11 Test Channels per FCC Requirements**

| Mode            | GHz   | Channel | Turbo Channel  | “Default Test Channels” |         | UNII |
|-----------------|-------|---------|----------------|-------------------------|---------|------|
|                 |       |         |                | §15.247                 | 802.11g |      |
| 802.11 b/g      | 2.412 | 1       |                | √                       | √       |      |
|                 | 2.437 | 6       | 6              | √                       | √       |      |
|                 | 2.462 | 11      |                | √                       | √       |      |
| 802.11a         | 5.18  | 36      |                |                         |         | √    |
|                 | 5.20  | 40      | 42 (5.21 GHz)  |                         |         | *    |
|                 | 5.22  | 44      |                |                         |         |      |
|                 | 5.24  | 48      | 50 (5.25 GHz)  |                         |         | √    |
|                 | 5.26  | 52      |                |                         |         | √    |
|                 | 5.28  | 56      | 58 (5.29 GHz)  |                         |         | *    |
|                 | 5.30  | 60      |                |                         |         | *    |
|                 | 5.32  | 64      |                |                         |         | √    |
|                 | 5.500 | 100     |                |                         |         | *    |
|                 | 5.520 | 104     |                |                         |         | √    |
|                 | 5.540 | 108     |                |                         |         | *    |
|                 | 5.560 | 112     |                |                         |         | *    |
|                 | 5.580 | 116     |                |                         |         | √    |
|                 | 5.600 | 120     | Unknown        |                         |         | *    |
|                 | 5.620 | 124     |                |                         |         | √    |
|                 | 5.640 | 128     |                |                         |         | *    |
|                 | 5.660 | 132     |                |                         |         | *    |
|                 | 5.680 | 136     |                |                         |         | √    |
|                 | 5.700 | 140     |                |                         |         | *    |
|                 | 5.745 | 149     |                | √                       | √       | *    |
| UNII or §15.247 | 5.765 | 153     | 152 (5.76 GHz) |                         | *       | *    |
|                 | 5.785 | 157     |                | √                       |         | *    |
|                 | 5.805 | 161     | 160 (5.80 GHz) |                         | *       | √    |
| §15.247         | 5.825 | 165     |                | √                       |         |      |

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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| FCC ID: BEJV905<br>IC Cert No: 20703C-V905           |  | SAR COMPLIANCE REPORT/ INDUSTRY<br>CANADA TECHNICAL REPORT (RSS-102)          |  | Reviewed by:<br>Quality Manager |
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**Table 13-2**  
**IEEE 802.11b Average RF Power**

| Freq [MHz] | Channel | Data Rate [Mbps] | Average Power (dBm) |
|------------|---------|------------------|---------------------|
| 2412       | 1       | 1                | 11.23               |
|            |         | 2                | 10.72               |
|            |         | 5.5              | 10.83               |
|            |         | 11               | 11.13               |
| 2437       | 6       | 1                | 10.35               |
|            |         | 2                | 10.04               |
|            |         | 5.5              | 9.96                |
|            |         | 11               | 10.43               |
| 2462       | 11      | 1                | 10.69               |
|            |         | 2                | 10.84               |
|            |         | 5.5              | 10.62               |
|            |         | 11               | 10.68               |

**Table 13-3**  
**IEEE 802.11g Average RF Power**

| Freq [MHz] | Channel | Data Rate [Mbps] | Average Power (dBm) |
|------------|---------|------------------|---------------------|
| 2412       | 1       | 6                | 9.58                |
|            |         | 9                | 9.16                |
|            |         | 12               | 9.15                |
|            |         | 18               | 8.93                |
|            |         | 24               | 9.13                |
|            |         | 36               | 9.22                |
|            |         | 48               | 9.15                |
|            |         | 54               | 9.14                |
| 2437       | 6       | 6                | 9.35                |
|            |         | 9                | 8.92                |
|            |         | 12               | 8.89                |
|            |         | 18               | 8.88                |
|            |         | 24               | 8.81                |
|            |         | 36               | 8.79                |
|            |         | 48               | 8.89                |
|            |         | 54               | 9.15                |
| 2462       | 11      | 6                | 9.54                |
|            |         | 9                | 9.1                 |
|            |         | 12               | 9.06                |
|            |         | 18               | 9.11                |
|            |         | 24               | 9.03                |
|            |         | 36               | 9.04                |
|            |         | 48               | 9.09                |
|            |         | 54               | 9.14                |

**Table 13-4**  
**IEEE 802.11n Average RF Power**

| Freq [MHz] | Channel | MCS Index | Data Rate [Mbps] | Average Power (dBm) |
|------------|---------|-----------|------------------|---------------------|
| 2412       | 1       | 0         | 6.5/7.2          | 8.95                |
|            |         | 1         | 13/14.4          | 8.56                |
|            |         | 2         | 19.5/21.7        | 8.44                |
|            |         | 3         | 26/28.9          | 8.49                |
|            |         | 4         | 39/43.3          | 7.87                |
|            |         | 5         | 52/57.8          | 7.64                |
|            |         | 6         | 58.5/65          | 7.13                |
|            |         | 7         | 65/72.2          | 7.13                |
| 2437       | 6       | 0         | 6.5/7.2          | 8.79                |
|            |         | 1         | 13/14.4          | 8.43                |
|            |         | 2         | 19.5/21.7        | 8.35                |
|            |         | 3         | 26/28.9          | 8.55                |
|            |         | 4         | 39/43.3          | 8.43                |
|            |         | 5         | 52/57.8          | 8.25                |
|            |         | 6         | 58.5/65          | 8.23                |
|            |         | 7         | 65/72.2          | 8.49                |
| 2462       | 11      | 0         | 6.5/7.2          | 8.91                |
|            |         | 1         | 13/14.4          | 8.53                |
|            |         | 2         | 19.5/21.7        | 8.51                |
|            |         | 3         | 26/28.9          | 8.64                |
|            |         | 4         | 39/43.3          | 8.54                |
|            |         | 5         | 52/57.8          | 8.68                |
|            |         | 6         | 58.5/65          | 8.67                |
|            |         | 7         | 65/72.2          | 8.83                |



**Figure 13-1**  
**Power Measurement Setup**

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BEJV905<br>IC Cert No: 20703C-V905           |  | <b>SAR COMPLIANCE REPORT/ INDUSTRY<br/>CANADA TECHNICAL REPORT (RSS-102)</b>  |  | Reviewed by:<br>Quality Manager |
| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                  | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN | Page 19 of 37                                                                         |                                 |

## 14 SYSTEM VERIFICATION

### 14.1 Tissue Verification

Table 14-1  
Measured Tissue Properties

| Calibrated for Tests Performed on: | Tissue Type | Measured Frequency (MHz) | Measured Conductivity, $\sigma$ (S/m) | Measured Dielectric Constant, $\epsilon$ | TARGET Conductivity, $\sigma$ (S/m) | TARGET Dielectric Constant, $\epsilon$ | % dev $\sigma$ | % dev $\epsilon$ |
|------------------------------------|-------------|--------------------------|---------------------------------------|------------------------------------------|-------------------------------------|----------------------------------------|----------------|------------------|
| 02/16/2011                         | 835B        | 820                      | 0.986                                 | 54.56                                    | 0.97                                | 55.28                                  | 1.75%          | -1.31%           |
|                                    |             | 835                      | 0.997                                 | 54.36                                    | 0.97                                | 55.20                                  | 2.78%          | -1.52%           |
|                                    |             | 850                      | 1.010                                 | 54.29                                    | 0.99                                | 55.15                                  | 2.23%          | -1.57%           |
| 12/30/2010                         | 1900B       | 1850                     | 1.449                                 | 51.73                                    | 1.52                                | 53.30                                  | -4.67%         | -2.95%           |
|                                    |             | 1880                     | 1.485                                 | 51.62                                    | 1.52                                | 53.30                                  | -2.30%         | -3.15%           |
|                                    |             | 1910                     | 1.528                                 | 51.77                                    | 1.52                                | 53.30                                  | 0.53%          | -2.87%           |
| 02/22/2011                         | 1900B       | 1850                     | 1.466                                 | 51.17                                    | 1.52                                | 53.30                                  | -3.55%         | -4.00%           |
|                                    |             | 1880                     | 1.484                                 | 51.00                                    | 1.52                                | 53.30                                  | -2.37%         | -4.32%           |
|                                    |             | 1910                     | 1.516                                 | 50.94                                    | 1.52                                | 53.30                                  | -0.26%         | -4.43%           |
| 01/19/2011                         | 2450B       | 2401                     | 1.968                                 | 51.46                                    | 1.90                                | 52.77                                  | 3.42%          | -2.47%           |
|                                    |             | 2450                     | 2.027                                 | 51.26                                    | 1.95                                | 52.70                                  | 3.95%          | -2.73%           |
|                                    |             | 2499                     | 2.101                                 | 51.07                                    | 2.02                                | 52.64                                  | 4.06%          | -2.98%           |

Note: KDB Publication 450824 was ensured to be applied for probe calibration frequencies greater than or equal to 50 MHz of the DUT frequencies.

The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies (per IEEE 1528 6.6.1.2). The SAR test plots may slightly differ from the table above since the DASY software rounds to three significant digits.

### 14.2 Measurement Procedure for Tissue verification

- 1) The network analyzer and probe system was configured and calibrated.
- 2) The probe was immersed in the sample which was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
- 3) The complex admittance with respect to the probe aperture was measured
- 4) The complex relative permittivity, for example from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\epsilon_r\epsilon_0}{[\ln(b/a)]^2} \int_a^b \int_a^b \int_0^\pi \cos\phi' \frac{\exp[-j\omega r(\mu_0\epsilon_r'\epsilon_0)^{1/2}]}{r} d\phi' d\rho' d\rho$$

where Y is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively,  $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$ ,  $\omega$  is the angular frequency, and  $j = \sqrt{-1}$ .

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BEJV905<br>IC Cert No: 20703C-V905           |  | SAR COMPLIANCE REPORT/ INDUSTRY<br>CANADA TECHNICAL REPORT (RSS-102)          |  | Reviewed by:<br>Quality Manager |
| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                  | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN |                                                                                       | Page 20 of 37                   |

### 14.3 Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 2 years ago but more than 1 year ago were confirmed in maintaining return loss ( $< -20$  dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 450824:

| D835V2 SN: 4d026    |                  |            |                        |                |
|---------------------|------------------|------------|------------------------|----------------|
| Date of Measurement | Return Loss (dB) | $\Delta$ % | Impedance ( $\Omega$ ) | $\Delta\Omega$ |
| 8/24/2009           | -22.5            |            | 51                     |                |
| 8/19/2010           | -21.4            | -5%        | 50.1                   | -0.9           |

| D1900V2 SN:5d080    |                  |            |                        |                |
|---------------------|------------------|------------|------------------------|----------------|
| Date of Measurement | Return Loss (dB) | $\Delta$ % | Impedance ( $\Omega$ ) | $\Delta\Omega$ |
| 8/18/2009           | -24.3            |            | 50                     |                |
| 8/19/2010           | -22.4            | -7.8%      | 51                     | 1.0            |

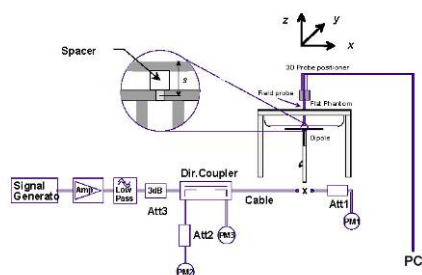
| D2450V2 SN: 719     |                  |            |                        |                |
|---------------------|------------------|------------|------------------------|----------------|
| Date of Measurement | Return Loss (dB) | $\Delta$ % | Impedance ( $\Omega$ ) | $\Delta\Omega$ |
| 8/27/2009           | -28.6            |            | 53.4                   |                |
| 8/19/2010           | -27.5            | -3.8%      | 51                     | -2.4           |

### 14.4 Test System Verification

Prior to assessment, the system is verified to  $\pm 10\%$  of the manufacturer SAR measurement on the reference dipole at the time of calibration.

**Table 14-2**  
**System Verification Results**

| System Verification<br>TARGET & MEASURED |                |                  |                 |                        |           |             |                                   |                                     |                                         |               |
|------------------------------------------|----------------|------------------|-----------------|------------------------|-----------|-------------|-----------------------------------|-------------------------------------|-----------------------------------------|---------------|
| Date:                                    | Amb. Temp (°C) | Liquid Temp (°C) | Input Power (W) | Tissue Frequency (MHz) | Dipole SN | Tissue Type | Measured SAR <sub>1g</sub> (W/kg) | 1 W Target SAR <sub>1g</sub> (W/kg) | 1 W Normalized SAR <sub>1g</sub> (W/kg) | Deviation (%) |
| 02/16/2011                               | 23.9           | 22.2             | 0.063           | 835                    | 4d026     | Body        | 0.647                             | 9.780                               | 10.27                                   | 5.01%         |
| 12/30/2010                               | 24.0           | 22.5             | 0.100           | 1900                   | 5d080     | Body        | 3.74                              | 40.500                              | 37.40                                   | -7.65%        |
| 02/22/2011                               | 23.5           | 21.6             | 0.040           | 1900                   | 5d080     | Body        | 1.61                              | 40.500                              | 40.25                                   | -0.62%        |
| 01/19/2011                               | 23.7           | 21.8             | 0.025           | 2450                   | 719       | Body        | 1.22                              | 51.400                              | 48.80                                   | -5.06%        |



**Figure 14-1**  
**System Verification Setup Diagram**



**Figure 14-2**  
**System Verification Setup Photo**

|                                                      |                                                                                                                            |                                                                               |                                                                                          |                                 |
|------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|---------------------------------|
| FCC ID: BEJV905<br>IC Cert No: 20703C-V905           |  PCTEST<br>ENGINEERING LABORATORY, INC. | SAR COMPLIANCE REPORT/ INDUSTRY<br>CANADA TECHNICAL REPORT (RSS-102)          |  LG | Reviewed by:<br>Quality Manager |
| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                                                         | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN | Page 21 of 37                                                                            |                                 |

Table 15-1 Body SAR Results

| MEASUREMENT RESULTS                                                                               |      |          |         |              |       |            |                                                 |                 |        |                    |
|---------------------------------------------------------------------------------------------------|------|----------|---------|--------------|-------|------------|-------------------------------------------------|-----------------|--------|--------------------|
| FREQUENCY                                                                                         |      | Mode     | Service | C_Power[dBm] |       | Drift [dB] | Spacing                                         | # of GPRS Slots | Side   | SAR (1g)<br>(W/kg) |
| MHz                                                                                               | Ch.  |          |         | Start        | End   |            |                                                 |                 |        |                    |
| 824.20                                                                                            | 128  | GSM 850  | GPRS    | 32.89        | 32.88 | -0.01      | 0.0 cm                                          | 1               | back   | 0.849              |
| 836.60                                                                                            | 190  | GSM 850  | GPRS    | 32.83        | 32.83 | 0.00       | 0.0 cm                                          | 1               | back   | 1.030              |
| 848.80                                                                                            | 251  | GSM 850  | GPRS    | 32.86        | 32.87 | 0.01       | 0.0 cm                                          | 1               | back   | 1.090              |
| 836.60                                                                                            | 190  | GSM 850  | GPRS    | 32.83        | 32.83 | 0.00       | 0.0 cm                                          | 1               | right  | 0.110              |
| 836.60                                                                                            | 190  | GSM 850  | GPRS    | 32.83        | 32.90 | 0.07       | 0.0 cm                                          | 1               | left   | 0.053              |
| 824.20                                                                                            | 128  | GSM 850  | GPRS    | 32.89        | 32.88 | -0.01      | 0.0 cm                                          | 1               | bottom | 0.823              |
| 836.60                                                                                            | 190  | GSM 850  | GPRS    | 32.83        | 32.79 | -0.04      | 0.0 cm                                          | 1               | bottom | 0.973              |
| 848.80                                                                                            | 251  | GSM 850  | GPRS    | 32.86        | 32.87 | 0.01       | 0.0 cm                                          | 1               | bottom | 0.971              |
| 1880.00                                                                                           | 661  | GSM 1900 | GPRS    | 28.13        | 28.17 | 0.04       | 0.0 cm                                          | 2               | back   | 0.612              |
| 1880.00                                                                                           | 661  | GSM 1900 | GPRS    | 28.13        | 28.11 | -0.02      | 0.0 cm                                          | 2               | right  | 0.274              |
| 1880.00                                                                                           | 661  | GSM 1900 | GPRS    | 28.13        | 28.16 | 0.03       | 0.0 cm                                          | 2               | left   | 0.059              |
| 1850.20                                                                                           | 512  | GSM 1900 | GPRS    | 28.61        | 28.54 | -0.07      | 0.0 cm                                          | 2               | bottom | 0.889              |
| 1880.00                                                                                           | 661  | GSM 1900 | GPRS    | 28.13        | 28.12 | -0.01      | 0.0 cm                                          | 2               | bottom | 0.919              |
| 1909.80                                                                                           | 810  | GSM 1900 | GPRS    | 28.21        | 28.16 | -0.05      | 0.0 cm                                          | 2               | bottom | 0.920              |
| 826.40                                                                                            | 4132 | UMTS V   | RMC     | 23.25        | 23.31 | 0.06       | 0.0 cm                                          | N/A             | back   | 1.070              |
| 836.60                                                                                            | 4183 | UMTS V   | RMC     | 23.34        | 23.52 | 0.18       | 0.0 cm                                          | N/A             | back   | 1.090              |
| 846.60                                                                                            | 4233 | UMTS V   | RMC     | 23.14        | 23.15 | 0.01       | 0.0 cm                                          | N/A             | back   | 1.040              |
| 836.60                                                                                            | 4183 | UMTS V   | RMC     | 23.34        | 23.40 | 0.06       | 0.0 cm                                          | N/A             | right  | 0.087              |
| 836.60                                                                                            | 4183 | UMTS V   | RMC     | 23.34        | 23.42 | 0.08       | 0.0 cm                                          | N/A             | left   | 0.055              |
| 826.40                                                                                            | 4132 | UMTS V   | RMC     | 23.25        | 23.24 | -0.01      | 0.0 cm                                          | N/A             | bottom | 0.956              |
| 836.60                                                                                            | 4183 | UMTS V   | RMC     | 23.34        | 23.32 | -0.02      | 0.0 cm                                          | N/A             | bottom | 0.995              |
| 846.60                                                                                            | 4233 | UMTS V   | RMC     | 23.14        | 23.18 | 0.04       | 0.0 cm                                          | N/A             | bottom | 0.897              |
| 1852.40                                                                                           | 9262 | UMTS II  | RMC     | 22.75        | 22.69 | -0.11      | 0.0 cm                                          | N/A             | back   | 0.956              |
| 1880.00                                                                                           | 9400 | UMTS II  | RMC     | 22.76        | 22.66 | -0.15      | 0.0 cm                                          | N/A             | back   | 0.904              |
| 1907.60                                                                                           | 9538 | UMTS II  | RMC     | 22.77        | 22.80 | 0.03       | 0.0 cm                                          | N/A             | back   | 0.900              |
| 1880.00                                                                                           | 9400 | UMTS II  | RMC     | 22.76        | 22.69 | -0.07      | 0.0 cm                                          | N/A             | right  | 0.423              |
| 1880.00                                                                                           | 9400 | UMTS II  | RMC     | 22.76        | 22.65 | -0.11      | 0.0 cm                                          | N/A             | left   | 0.082              |
| 1852.40                                                                                           | 9262 | UMTS II  | RMC     | 22.75        | 22.70 | -0.11      | 0.0 cm                                          | N/A             | bottom | 1.240              |
| 1880.00                                                                                           | 9400 | UMTS II  | RMC     | 22.76        | 22.69 | -0.12      | 0.0 cm                                          | N/A             | bottom | 1.250              |
| 1907.60                                                                                           | 9538 | UMTS II  | RMC     | 22.77        | 22.87 | 0.20       | 0.0 cm                                          | N/A             | bottom | 1.240              |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |      |          |         |              |       |            | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |                 |        |                    |

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                  | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN | Page 22 of 37                                                                         |                                 |

Notes:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE 1528-2003 and RSS-102.
2. All modes of operation were investigated, and worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plots.
4. Batteries are fully charged for all readings. Standard battery was used.
5. Liquid tissue depth was at least 15.0 cm.
6. Device was tested using a fixed spacing.
7. WCDMA mode in Body SAR was tested under RMC 12.2 kbps with HSPA Inactive.
8. Justification for reduced test configurations per KDB Publication 941225: The source-based time-averaged output power was evaluated for all multi-slot operations. In addition to the worst-case reported, all source-based time-averaged powers within 10% of the worst-case were additionally included in the evaluation.
9. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June 2001) and Public Notice DA-02-1438, if the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                  | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN | Page 23 of 37                                                                         |                                 |

**Table 15-2**  
**2.4 GHz Body SAR Results**

| MEASUREMENT RESULTS                                                                               |     |              |         |              |       |            |                                                 |                  |       |            |
|---------------------------------------------------------------------------------------------------|-----|--------------|---------|--------------|-------|------------|-------------------------------------------------|------------------|-------|------------|
| FREQUENCY                                                                                         |     | Mode         | Service | C_Power[dBm] |       | Drift [dB] | Spacing                                         | Data Rate (Mbps) | Side  | SAR (W/kg) |
| MHz                                                                                               | Ch. |              |         | Start        | End   |            |                                                 |                  |       |            |
| 2412                                                                                              | 1   | IEEE 802.11b | DSSS    | 11.23        | 11.16 | -0.07      | 0.0 cm                                          | 1                | back  | 0.651      |
| 2412                                                                                              | 1   | IEEE 802.11b | DSSS    | 11.23        | 11.28 | 0.05       | 0.0 cm                                          | 1                | Right | 0.047      |
| 2412                                                                                              | 1   | IEEE 802.11b | DSSS    | 11.23        | 11.32 | 0.09       | 0.0 cm                                          | 1                | Left  | 0.016      |
| 2412                                                                                              | 1   | IEEE 802.11b | DSSS    | 11.23        | 11.29 | 0.06       | 0.0 cm                                          | 1                | Top   | 0.418      |
| ANSI / IEEE C95.1 1992 - SAFETY LIMIT<br>Spatial Peak<br>Uncontrolled Exposure/General Population |     |              |         |              |       |            | Body<br>1.6 W/kg (mW/g)<br>averaged over 1 gram |                  |       |            |

Notes:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used were according to FCC/OET Bulletin 65, Supplement C [June 2001], IEEE 1528-2003 and RSS-102.
2. All modes of operation were investigated, and worst-case results are reported.
3. Batteries are fully charged for all readings. Standard battery was used.
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Liquid tissue depth is was at least 15.0 cm.
6. Device was tested using a fixed spacing.
7. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11b mode.
8. WLAN transmission was verified using a spectrum analyzer.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                  | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN | Page 24 of 37                                                                         |                                 |

## 16 SIMULTANEOUS TRANSMISSION ANALYSIS

### 16.1 Simultaneous Transmission Information

This device contains multiple transmitters that may operate simultaneously and therefore, require a simultaneous transmission analysis (See Section 16.2)

Bluetooth and WIFI cannot transmit simultaneously since it shares the same circuit path and are switched by the radio.

### 16.2 Simultaneous Transmission Analysis

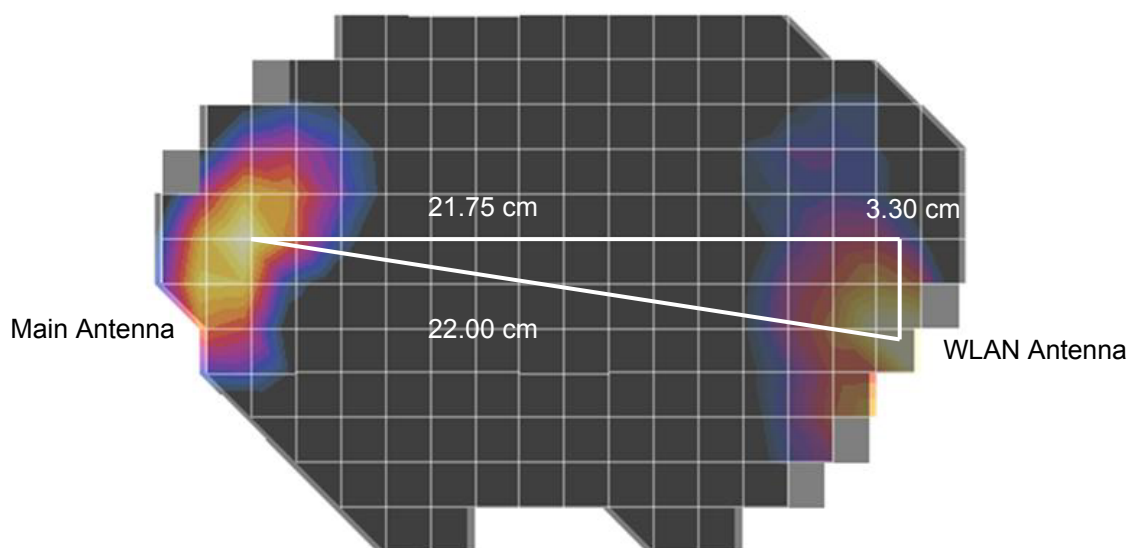
**Table 16-1**  
**GSM1900 + WIFI Simultaneous Transmission Scenario**

| Simult Tx | Configuration | 1900 GSM SAR (W/kg) | WIFI SAR (W/kg) | $\Sigma$ SAR (W/kg) |
|-----------|---------------|---------------------|-----------------|---------------------|
| Body SAR  | Back          | 0.612               | 0.651           | <b>1.263</b>        |
|           | Right Edge    | 0.274               | 0.047           | <b>0.321</b>        |
|           | Left Edge     | 0.059               | 0.016           | <b>0.075</b>        |
|           | Top Edge      | -                   | 0.418           | <b>0.418</b>        |
|           | Bottom Edge   | 0.920               | -               | <b>0.920</b>        |

Note: “-” SAR results shown in the table are zero for summation purposes. SAR was not required to be measured due to exclusions mentioned in Section 11.2.

Per FCC KDB 648474 the above numerical summed SAR is below the SAR Limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission the above simultaneous transmission cases will not exceed the SAR limit.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------|
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| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                  | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN |                                                                                       | Page 25 of 37                   |



**Table 16-2**  
**GSM850+ WIFI Simultaneous Transmission Scenario**

| Simult Tx | Configuration | 850 GSM SAR (W/kg) | WIFI SAR (W/kg) | Σ SAR (W/kg) |
|-----------|---------------|--------------------|-----------------|--------------|
| Body SAR  | Back          | 1.090              | 0.651           | <b>1.741</b> |
|           | Right Edge    | 0.110              | 0.047           | <b>0.157</b> |
|           | Left Edge     | 0.053              | 0.016           | <b>0.070</b> |
|           | Top Edge      | -                  | 0.418           | <b>0.418</b> |
|           | Bottom Edge   | 0.973              | -               | <b>0.973</b> |

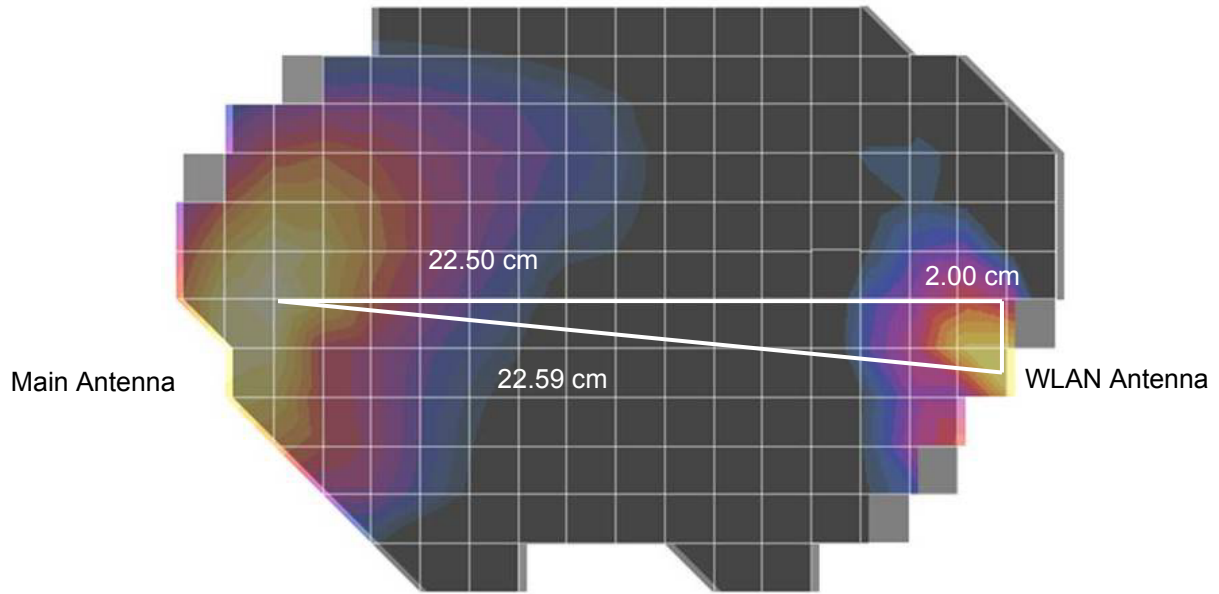
Note: “-” SAR results shown in the table are zero for summation purposes. SAR was not required to be measured due to exclusions mentioned in Section 11.2.

Per FCC KDB 648474 the summation of the body WLAN SAR and body licensed transmitter SAR is greater than 1.6 W/kg. However, the distance between the peak GSM850 body SAR and WLAN body SAR is 22.00 cm.

The ratio of the summed max SAR and the distance between the peaks is

$$\text{Ratio} = \frac{\text{SAR}_1 + \text{SAR}_2}{\text{DISTANCE (cm)}} = \frac{1.09 + 0.651}{22.00} = 0.0791$$

which is less than 0.3. Therefore, a SAR evaluation is not required for volumetric multiband aggregate.



**Table 16-3**  
**Cell WCDMA + WIFI Simultaneous Transmission Scenario**

| Simult Tx | Configuration | CELL WCDMA SAR (W/kg) | WIFI SAR (W/kg) | Σ SAR (W/kg) |
|-----------|---------------|-----------------------|-----------------|--------------|
| Body SAR  | Back          | 1.090                 | 0.651           | <b>1.741</b> |
|           | Right Edge    | 0.087                 | 0.047           | <b>0.135</b> |
|           | Left Edge     | 0.055                 | 0.016           | <b>0.072</b> |
|           | Top Edge      | -                     | 0.418           | <b>0.418</b> |
|           | Bottom Edge   | 0.995                 | -               | <b>0.995</b> |

Note: “-” SAR results shown in the table are zero for summation purposes. SAR was not required to be measured due to exclusions mentioned in Section 11.2.

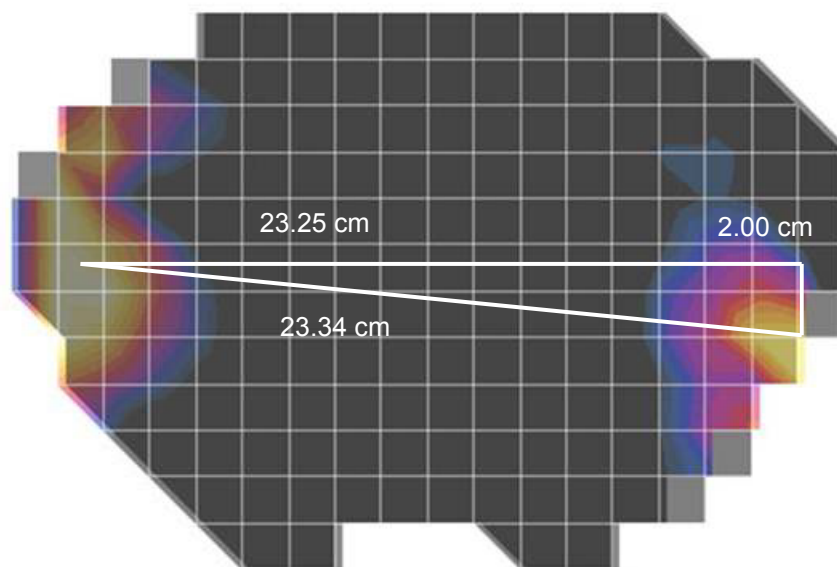
Per FCC KDB 648474 the summation of the body WLAN SAR and body licensed transmitter SAR is greater than 1.6 W/kg. However, the distance between the peak Cell WCDMA body SAR and WLAN body SAR is 22.59 cm.

The ratio of the summed max SAR and the distance between the peaks is

$$\text{Ratio} = \frac{\text{SAR}_1 + \text{SAR}_2}{\text{DISTANCE (cm)}} = \frac{1.09 + 0.651}{22.59} = 0.0771$$

which is less than 0.3. Therefore, a SAR evaluation is not required for volumetric multiband aggregate.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                        |
|------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------|
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| Filename / Technical Report S/N:<br>0Y1012272073.BEJ | Test Dates:<br>12/30/10 - 02/22/11                                                  | EUT Type:<br>850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet with Bluetooth and WLAN |                                                                                       | Page 27 of 37                          |



**Table 16-4**  
**PCS WCDMA + WIFI Simultaneous Transmission Scenario**

| Simult Tx | Configuration | PCS WCDMA SAR (W/kg) | WIFI SAR (W/kg) | Σ SAR (W/kg) |
|-----------|---------------|----------------------|-----------------|--------------|
| Body SAR  | Back          | 0.956                | 0.651           | <b>1.607</b> |
|           | Right Edge    | 0.423                | 0.047           | <b>0.470</b> |
|           | Left Edge     | 0.082                | 0.016           | <b>0.099</b> |
|           | Top Edge      | -                    | 0.418           | <b>0.418</b> |
|           | Bottom Edge   | 1.250                | -               | <b>1.250</b> |

Note: “-” SAR results shown in the table are zero for summation purposes. SAR was not required to be measured due to exclusions mentioned in Section 11.2.

Per FCC KDB 648474 the summation of the body WLAN SAR and body licensed transmitter SAR is greater than 1.6 W/kg. However, the distance between the peak Cell WCDMA body SAR and WLAN body SAR is 23.34 cm.

The ratio of the summed max SAR and the distance between the peaks is

$$\text{Ratio} = \frac{\text{SAR}_1 + \text{SAR}_2}{\text{DISTANCE (cm)}} = \frac{0.956 + 0.651}{23.35} = 0.0688$$

which is less than 0.3. Therefore, a SAR evaluation is not required for volumetric multiband aggregate.

### 16.3 Simultaneous Transmission Conclusion

The numerical summed SAR tables were either below the SAR limit or below the ratio analysis limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit. Consequently, no volumetric SAR summation is required per FCC KDB Publication 648474.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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## 17 EQUIPMENT LIST

| Manufacturer       | Model       | Description                             | Cal Date   | Cal Interval | Cal Due    | Serial Number |
|--------------------|-------------|-----------------------------------------|------------|--------------|------------|---------------|
| Agilent            | 85070B      | Dielectric Probe Kit                    | 8/22/2010  | Annual       | 8/22/2011  | US33020316    |
| Agilent            | 8648D       | (9kHz-4GHz) Signal Generator            | 10/13/2010 | Annual       | 10/13/2011 | 3613A00315    |
| Agilent            | 8753E       | (30kHz-6GHz) Network Analyzer           | 3/31/2010  | Annual       | 3/31/2011  | JP38020182    |
| Agilent            | E5515C      | Wireless Communications Test Set        | 10/11/2010 | Annual       | 10/11/2011 | GB46110872    |
| Agilent            | E5515C      | Wireless Communications Test Set        | 10/8/2010  | Annual       | 10/8/2011  | GB46310798    |
| Agilent            | E5515C      | Wireless Communications Test Set        | 8/13/2010  | Annual       | 8/13/2011  | GB41450275    |
| Agilent            | E8257D      | (250kHz-20GHz) Signal Generator         | 3/30/2010  | Annual       | 3/30/2011  | MY45470194    |
| Gigatronics        | 80701A      | (0.05-18GHz) Power Sensor               | 10/11/2010 | Annual       | 10/11/2011 | 1833460       |
| Gigatronics        | 8651A       | Universal Power Meter                   | 10/11/2010 | Annual       | 10/11/2011 | 8650319       |
| Index SAR          | IXTL-010    | Dielectric Measurement Kit              | N/A        |              | N/A        | N/A           |
| Index SAR          | IXTL-030    | 30MM TEM line for 6 GHz                 | N/A        |              | N/A        | N/A           |
| Pasternack         | PE2208-6    | Bidirectional Coupler                   | N/A        |              | N/A        | N/A           |
| Pasternack         | PE2209-10   | Bidirectional Coupler                   | N/A        |              | N/A        | N/A           |
| Rohde & Schwarz    | CMU200      | Base Station Simulator                  | 11/11/2010 | Annual       | 11/11/2011 | 836371/0079   |
| Rohde & Schwarz    | CMU200      | Base Station Simulator                  | 6/21/2010  | Annual       | 6/21/2011  | 833855/0010   |
| SPEAG              | D1450V2     | 1450 MHz SAR Dipole                     | 5/20/2009  | Biennial     | 5/20/2011  | 1025          |
| SPEAG              | D1765V2     | 1765 MHz SAR Dipole                     | 5/19/2009  | Biennial     | 5/19/2011  | 1008          |
| SPEAG              | D1900V2     | 1900 MHz SAR Dipole                     | 8/18/2009  | Biennial     | 8/18/2011  | 5d080         |
| SPEAG              | D2450V2     | 2450 MHz SAR Dipole                     | 8/27/2009  | Biennial     | 8/27/2011  | 719           |
| SPEAG              | D2600V2     | 2600 MHz SAR Dipole                     | 8/12/2009  | Biennial     | 8/12/2011  | 1004          |
| SPEAG              | D5GHzV2     | 5 GHz SAR Dipole                        | 8/19/2009  | Biennial     | 8/19/2011  | 1007          |
| SPEAG              | D835V2      | 835 MHz SAR Dipole                      | 8/24/2009  | Biennial     | 8/24/2011  | 4d026         |
| SPEAG              | DAE3        | Dasy Data Acquisition Electronics       | 11/18/2010 | Annual       | 11/18/2011 | 455           |
| SPEAG              | DAE4        | Dasy Data Acquisition Electronics       | 3/22/2010  | Annual       | 3/22/2011  | 704           |
| SPEAG              | DAE4        | Dasy Data Acquisition Electronics       | 4/21/2010  | Annual       | 4/21/2011  | 665           |
| SPEAG              | DAE4        | Dasy Data Acquisition Electronics       | 1/22/2010  | Annual       | 1/22/2011  | 649           |
| SPEAG              | ES3DV2      | SAR Probe                               | 9/21/2010  | Annual       | 9/21/2011  | 3022          |
| SPEAG              | EX3DV4      | SAR Probe                               | 8/19/2010  | Annual       | 8/19/2011  | 3561          |
| SPEAG              | EX3DV4      | SAR Probe                               | 2/14/2011  | Annual       | 2/14/2012  | 3550          |
| SPEAG              | DAE4        | Dasy Data Acquisition Electronics       | 7/8/2010   | Annual       | 7/8/2011   | 859           |
| SPEAG              | D750V3      | 750 MHz Dipole                          | 2/14/2011  | Biennial     | 2/14/2013  | 1003          |
| SPEAG              | ES3DV3      | SAR Probe                               | 3/16/2010  | Annual       | 3/16/2011  | 3213          |
| SPEAG              | ES3DV3      | SAR Probe                               | 4/20/2010  | Annual       | 4/20/2011  | 3209          |
| Rohde & Schwarz    | SMIQ03B     | Signal Generator                        | 4/1/2010   | Annual       | 4/1/2011   | DE27259       |
| SPEAG              | D1640V2     | 1640 MHz Dipole                         | 8/17/2010  | Biennial     | 8/17/2012  | 321           |
| Rohde & Schwarz    | CMW500      | LTE Radio Communication Tester          | 8/30/2010  | Annual       | 8/30/2011  | 100976        |
| Agilent            | 8648D       | Signal Generator                        | 4/1/2010   | Annual       | 4/1/2011   | 3629U00687    |
| Apriel             | ALS-PR-DIEL | Dielectric Probe Kit                    | N/A        |              | N/A        | 260-00959     |
| Agilent            | E5515C      | Wireless Communications Test Set        | 8/13/2010  | Annual       | 8/13/2011  | GB43304447    |
| Agilent            | E5515C      | Wireless Communications Tester          | 4/14/2010  | Annual       | 4/14/2011  | US41140256    |
| Amplifier Research | 5S1G4       | 5W, 800MHz-4.2GHz                       | N/A        |              |            | 17042         |
| Mini-Circuits      | BW-N20W5+   | 18 GHz Precision Fixed 20 dB Attenuator | N/A        |              |            | N/A           |
| Speag              | DAE4        | Dasy Data Acquisition Electronics       | 1/25/2011  | Annual       | 1/25/2012  | 907           |
| Agilent            | E5515C      | Wireless Communications Test Set        | 2/8/2011   | Annual       | 2/8/2012   | GB45360985    |

Justification for 2-year calibration cycle for SAR dipoles is found in Section 14.3.

Probe 3550 and DAE 649 were used only for testing on 01-19-2011.

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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## 18 MEASUREMENT UNCERTAINTIES

Applicable for 800 – 3000 MHz.

| a                                                                             | b                    | c             | d              | e=<br>f(d,k) | f                     | g                        | h =<br>c x f/e                 | i =<br>c x g/e                   | k              |
|-------------------------------------------------------------------------------|----------------------|---------------|----------------|--------------|-----------------------|--------------------------|--------------------------------|----------------------------------|----------------|
| Uncertainty<br>Component                                                      | IEEE<br>1528<br>Sec. | Tol.<br>(± %) | Prob.<br>Dist. | Div.         | c <sub>i</sub><br>1gm | c <sub>i</sub><br>10 gms | 1gm<br>u <sub>i</sub><br>(± %) | 10gms<br>u <sub>i</sub><br>(± %) | v <sub>i</sub> |
| <b>Measurement System</b>                                                     |                      |               |                |              |                       |                          |                                |                                  |                |
| Probe Calibration                                                             | E.2.1                | 5.5           | N              | 1            | 1.0                   | 1.0                      | 5.5                            | 5.5                              | ∞              |
| Axial Isotropy                                                                | E.2.2                | 0.25          | N              | 1            | 0.7                   | 0.7                      | 0.2                            | 0.2                              | ∞              |
| Hemishperical Isotropy                                                        | E.2.2                | 1.3           | N              | 1            | 1.0                   | 1.0                      | 1.3                            | 1.3                              | ∞              |
| Boundary Effect                                                               | E.2.3                | 0.4           | N              | 1            | 1.0                   | 1.0                      | 0.4                            | 0.4                              | ∞              |
| Linearity                                                                     | E.2.4                | 0.3           | N              | 1            | 1.0                   | 1.0                      | 0.3                            | 0.3                              | ∞              |
| System Detection Limits                                                       | E.2.5                | 5.1           | N              | 1            | 1.0                   | 1.0                      | 5.1                            | 5.1                              | ∞              |
| Readout Electronics                                                           | E.2.6                | 1.0           | N              | 1            | 1.0                   | 1.0                      | 1.0                            | 1.0                              | ∞              |
| Response Time                                                                 | E.2.7                | 0.8           | R              | 1.73         | 1.0                   | 1.0                      | 0.5                            | 0.5                              | ∞              |
| Integration Time                                                              | E.2.8                | 2.6           | R              | 1.73         | 1.0                   | 1.0                      | 1.5                            | 1.5                              | ∞              |
| RF Ambient Conditions                                                         | E.6.1                | 3.0           | R              | 1.73         | 1.0                   | 1.0                      | 1.7                            | 1.7                              | ∞              |
| Probe Positioner Mechanical Tolerance                                         | E.6.2                | 0.4           | R              | 1.73         | 1.0                   | 1.0                      | 0.2                            | 0.2                              | ∞              |
| Probe Positioning w/ respect to Phantom                                       | E.6.3                | 2.9           | R              | 1.73         | 1.0                   | 1.0                      | 1.7                            | 1.7                              | ∞              |
| Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation | E.5                  | 1.0           | R              | 1.73         | 1.0                   | 1.0                      | 0.6                            | 0.6                              | ∞              |
| <b>Test Sample Related</b>                                                    |                      |               |                |              |                       |                          |                                |                                  |                |
| Test Sample Positioning                                                       | E.4.2                | 6.0           | N              | 1            | 1.0                   | 1.0                      | 6.0                            | 6.0                              | 287            |
| Device Holder Uncertainty                                                     | E.4.1                | 3.32          | R              | 1.73         | 1.0                   | 1.0                      | 1.9                            | 1.9                              | ∞              |
| Output Power Variation - SAR drift measurement                                | 6.6.2                | 5.0           | R              | 1.73         | 1.0                   | 1.0                      | 2.9                            | 2.9                              | ∞              |
| <b>Phantom &amp; Tissue Parameters</b>                                        |                      |               |                |              |                       |                          |                                |                                  |                |
| Phantom Uncertainty (Shape & Thickness tolerances)                            | E.3.1                | 4.0           | R              | 1.73         | 1.0                   | 1.0                      | 2.3                            | 2.3                              | ∞              |
| Liquid Conductivity - deviation from target values                            | E.3.2                | 5.0           | R              | 1.73         | 0.64                  | 0.43                     | 1.8                            | 1.2                              | ∞              |
| Liquid Conductivity - measurement uncertainty                                 | E.3.3                | 3.8           | N              | 1            | 0.64                  | 0.43                     | 2.4                            | 1.6                              | 6              |
| Liquid Permittivity - deviation from target values                            | E.3.2                | 5.0           | R              | 1.73         | 0.60                  | 0.49                     | 1.7                            | 1.4                              | ∞              |
| Liquid Permittivity - measurement uncertainty                                 | E.3.3                | 4.5           | N              | 1            | 0.60                  | 0.49                     | 2.7                            | 2.2                              | 6              |
| <b>Combined Standard Uncertainty (k=1)</b>                                    |                      |               |                |              |                       |                          | RSS                            | 11.8                             | 11.5           |
| <b>Expanded Uncertainty</b><br>(95% CONFIDENCE LEVEL)                         |                      |               |                |              |                       |                          | k=2                            | 23.7                             | 23.0           |
|                                                                               |                      |               |                |              |                       |                          |                                |                                  | 299            |

The above measurement uncertainties are according to IEEE Std. 1528-2003

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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## 19 CONCLUSION

### 19.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Industry Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

|                                                      |                                                                                     |                                                                               |                                                                                       |                                 |
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|                                                      |                                                                                                                                   |                                                                               |                                                                              |                                                                                                 |                                        |
|------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|----------------------------------------|
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**APPENDIX A: SAR TEST DATA**

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: GSM850 GPRS; 1 Tx slots; Frequency: 848.8 MHz; Duty Cycle: 1:8.3

Medium: 835 Body Medium parameters used (interpolated):

$f = 848.8 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 54.3$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: GPRS 850, Body SAR, Back side, High.ch, 1 Tx Slots**

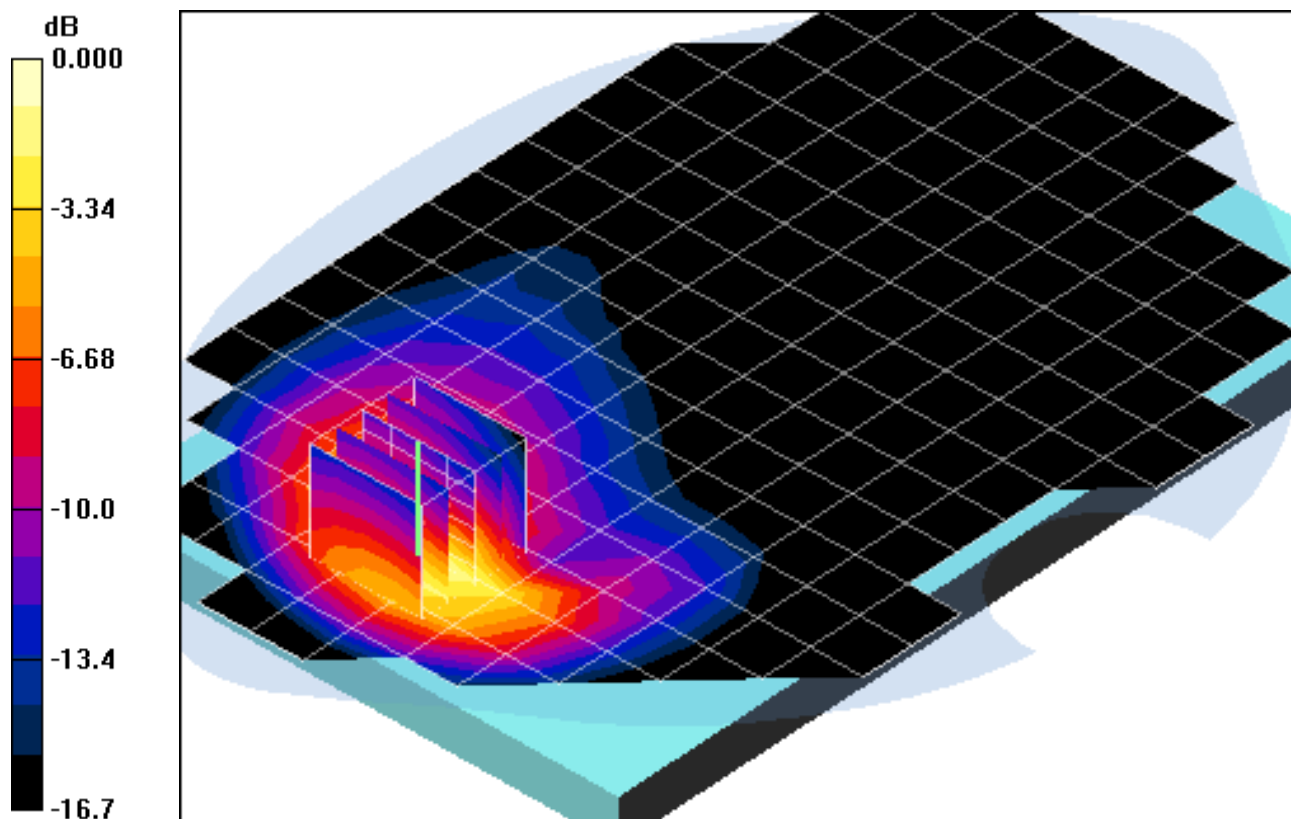
**Area Scan (13x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 35.2 V/m

Peak SAR (extrapolated) = 1.99 W/kg

**SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.605 mW/g**



0 dB = 1.22mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: GSM850 GPRS; 1 Tx slots; Frequency: 848.8 MHz; Duty Cycle: 1:8.3

Medium: 835 Body Medium parameters used (interpolated):

$f = 848.8 \text{ MHz}$ ;  $\sigma = 1.01 \text{ mho/m}$ ;  $\epsilon_r = 54.3$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: GPRS 850, Body SAR, Back side, High.ch, 1 Tx Slots**

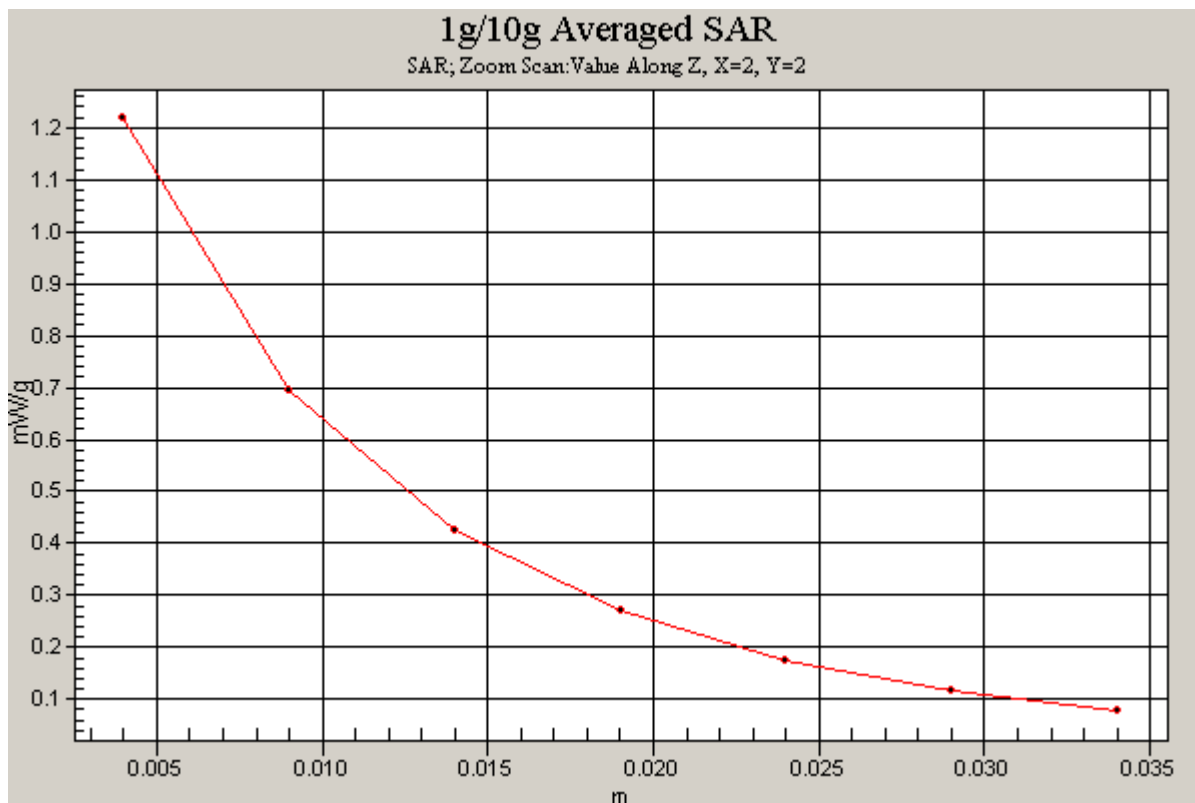
**Area Scan (13x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 35.2 V/m

Peak SAR (extrapolated) = 1.99 W/kg

**SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.605 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: GSM850 GPRS; 1 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$ ;  $\sigma = 0.998 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: GPRS 850, Body SAR, Right side, Mid.ch, 1 Tx Slots**

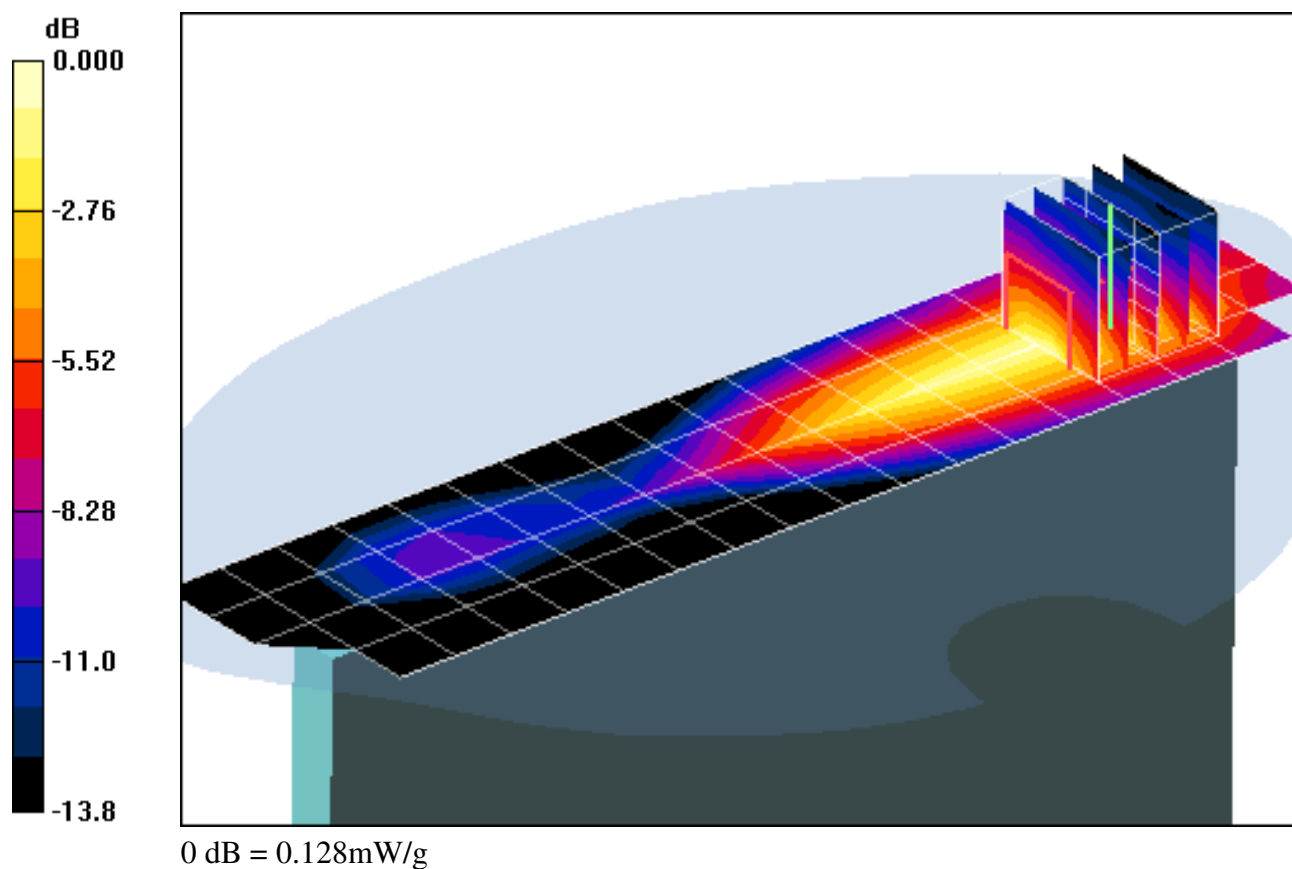
**Area Scan (5x19x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 10.4 V/m

Peak SAR (extrapolated) = 0.235 W/kg

**SAR(1 g) = 0.110 mW/g; SAR(10 g) = 0.059 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: GSM850 GPRS; 1 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$ ;  $\sigma = 0.998 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: GPRS 850, Body SAR, Left side, Mid.ch, 1 Tx Slots**

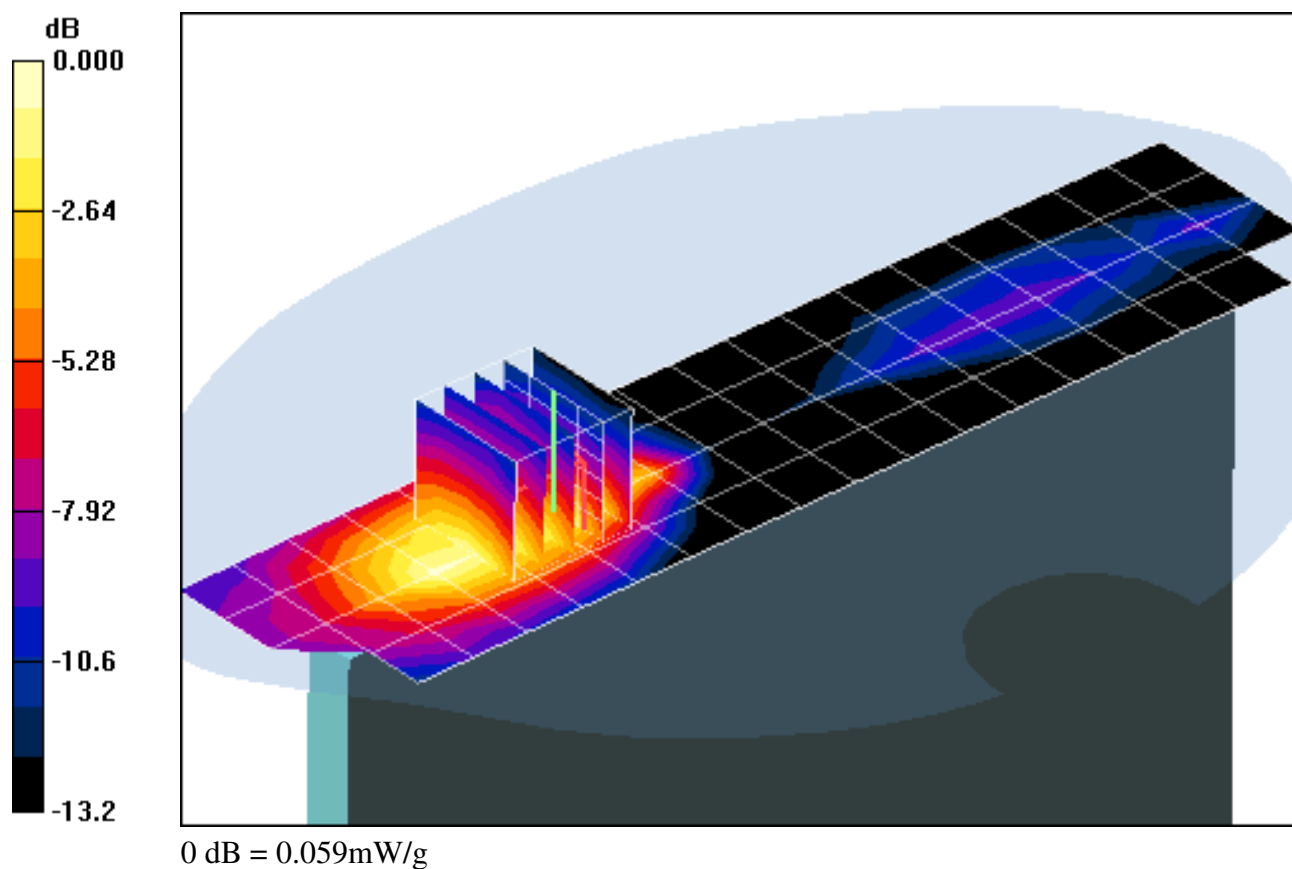
**Area Scan (5x19x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 7.11 V/m

Peak SAR (extrapolated) = 0.107 W/kg

**SAR(1 g) = 0.053 mW/g; SAR(10 g) = 0.031 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: GSM850 GPRS; 1 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$ ;  $\sigma = 0.998 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: GPRS 850, Body SAR, Bottom side, Mid.ch, 1 Tx Slots**

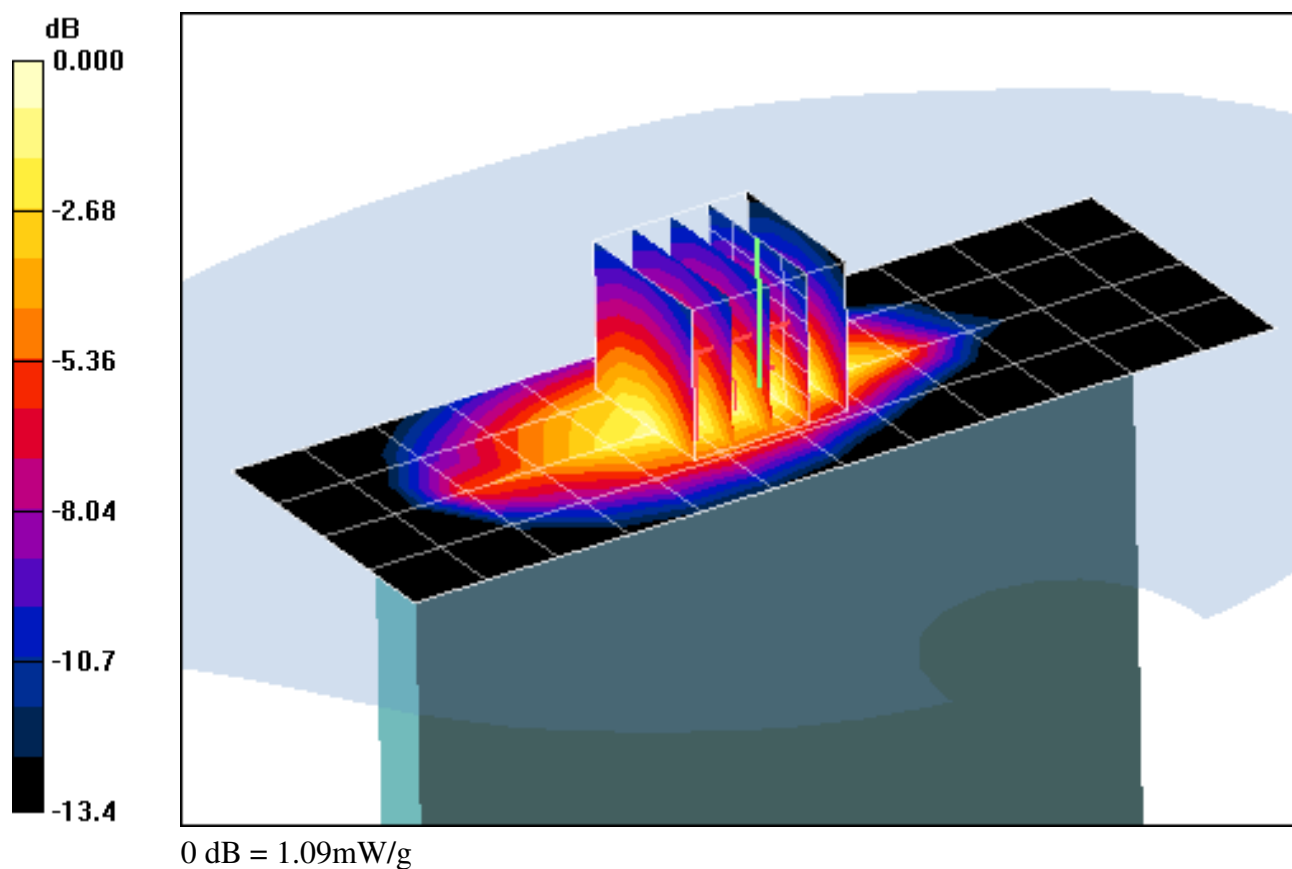
**Area Scan (5x13x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 31.7 V/m

Peak SAR (extrapolated) = 1.68 W/kg

**SAR(1 g) = 0.973 mW/g; SAR(10 g) = 0.582 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: SAR #2**

Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.49 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-30-2010; Ambient Temp: 24.0° C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3561; ConvF(6.59, 6.59, 6.59); Calibrated: 8/19/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 2 Tx Slots**

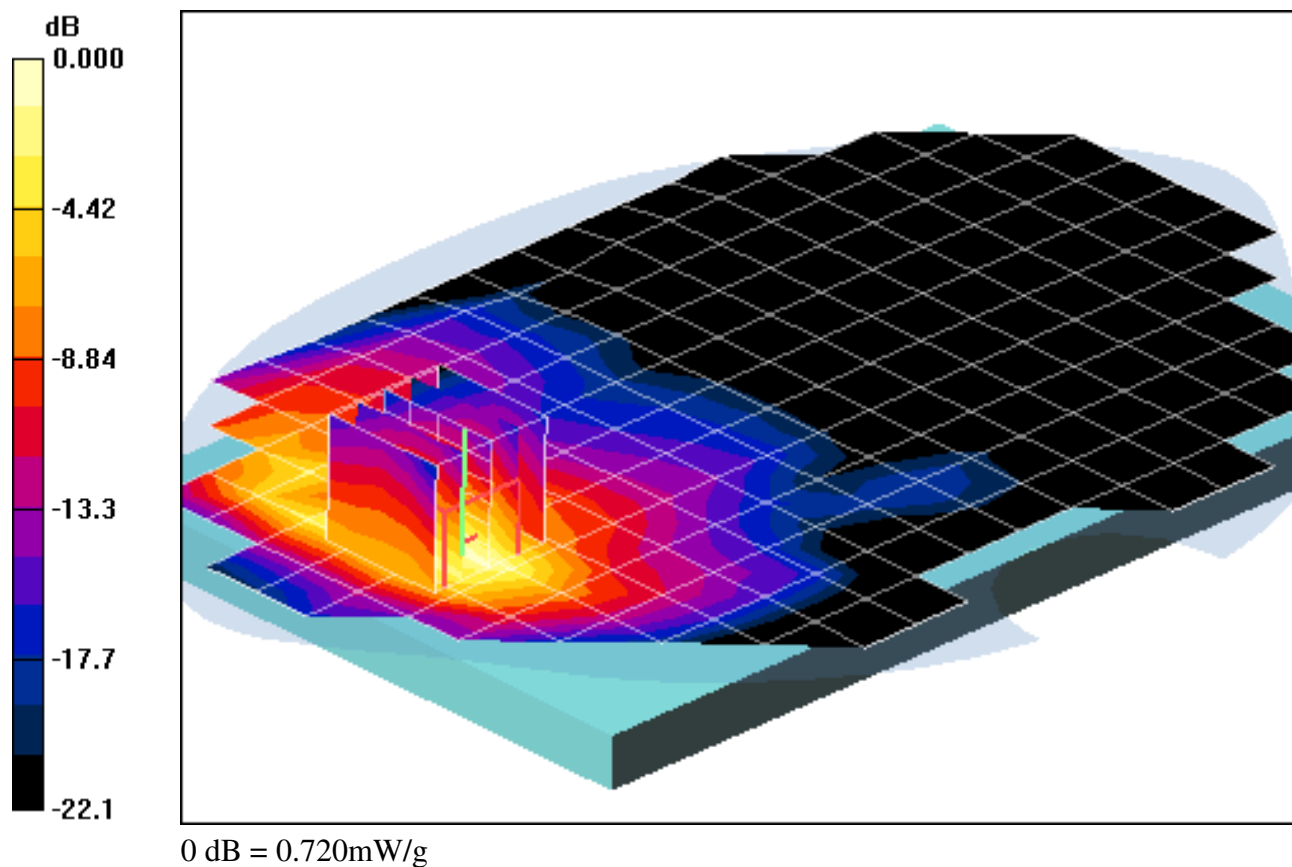
**Area Scan (13x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 1.93 V/m

Peak SAR (extrapolated) = 1.16 W/kg

**SAR(1 g) = 0.612 mW/g; SAR(10 g) = 0.308 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: SAR #2**

Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.49 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-30-2010; Ambient Temp: 24.0° C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3561; ConvF(6.59, 6.59, 6.59); Calibrated: 8/19/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: GPRS 1900, Body SAR, Right side, Mid.ch, 2 Tx Slots**

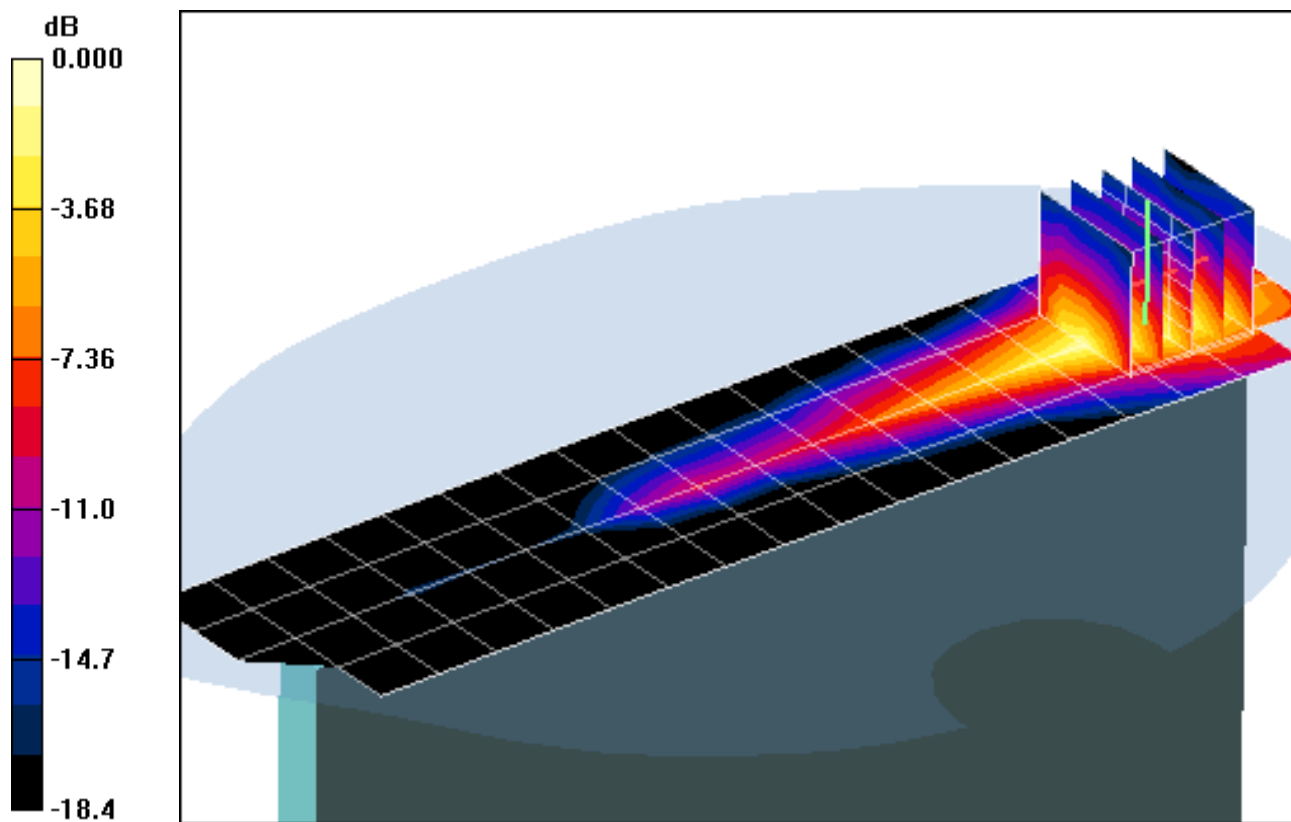
**Area Scan (5x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 7.27 V/m

Peak SAR (extrapolated) = 0.569 W/kg

**SAR(1 g) = 0.274 mW/g; SAR(10 g) = 0.134 mW/g**



0 dB = 0.315mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: SAR #2**

Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.49 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-30-2010; Ambient Temp: 24.0° C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3561; ConvF(6.59, 6.59, 6.59); Calibrated: 8/19/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: GPRS 1900, Body SAR, Left side, Mid.ch, 2 Tx Slots**

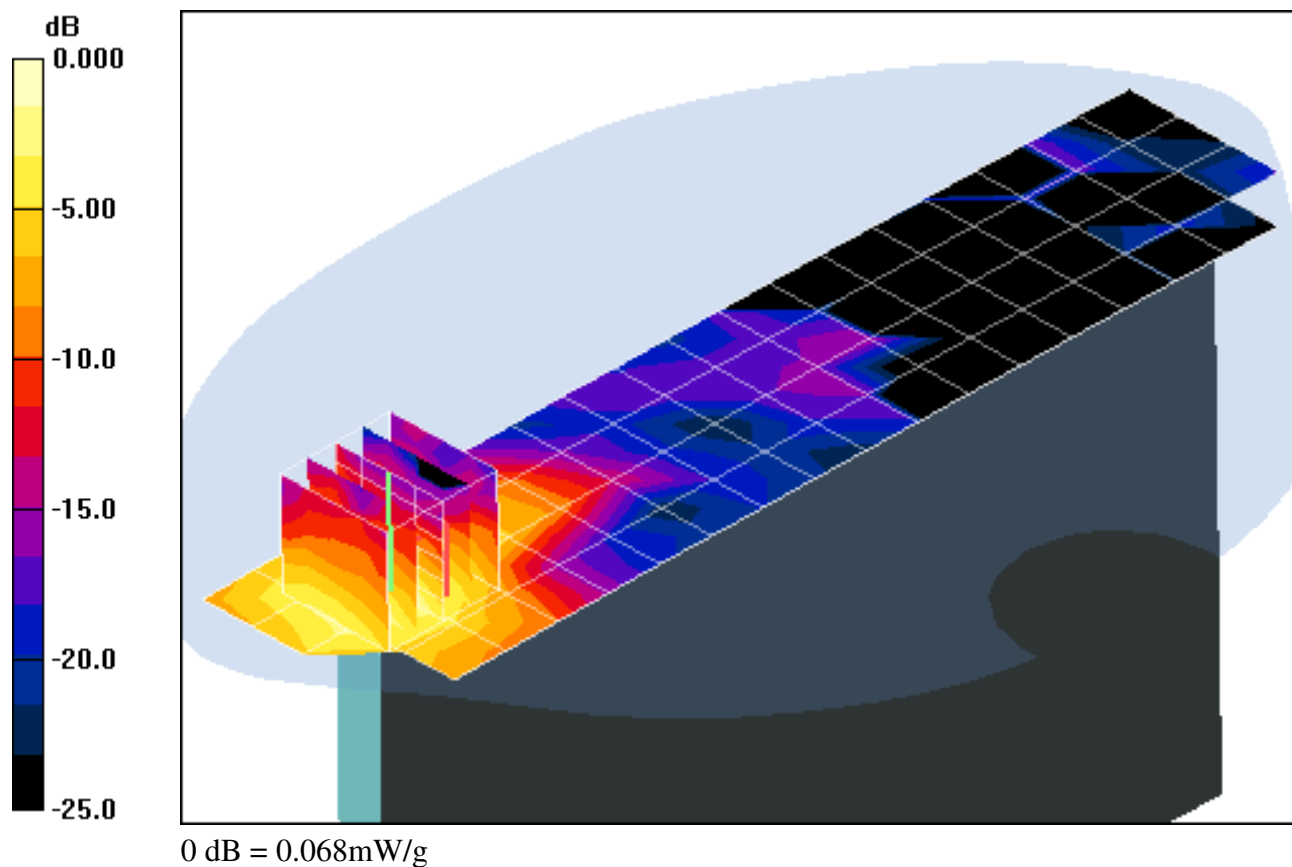
**Area Scan (5x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 5.04 V/m

Peak SAR (extrapolated) = 0.121 W/kg

**SAR(1 g) = 0.059 mW/g; SAR(10 g) = 0.030 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: SAR #2**

Communication System: GSM1900 GPRS; 2 Tx slots; 1909.8 MHz; Duty Cycle: 1:4.15

Medium: 1900 Body Medium parameters used:

$f = 1910 \text{ MHz}$ ;  $\sigma = 1.528 \text{ mho/m}$ ;  $\epsilon_r = 51.77$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-30-2010; Ambient Temp: 24.0° C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3561; ConvF(6.59, 6.59, 6.59); Calibrated: 8/19/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

**Mode: GPRS 1900, Body SAR, Bottom side, High.ch, 2 Tx Slots**

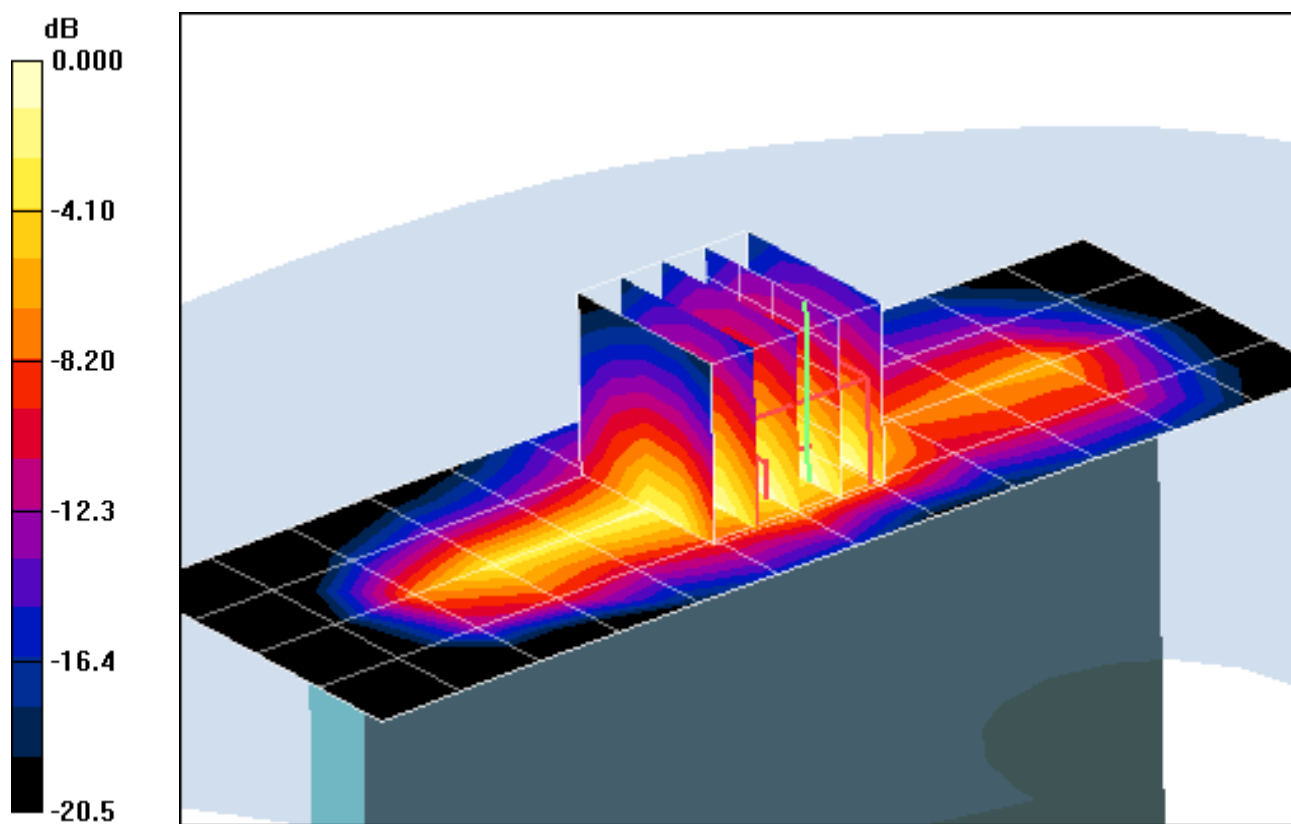
**Area Scan (5x13x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 25.1 V/m

Peak SAR (extrapolated) = 1.63 W/kg

**SAR(1 g) = 0.920 mW/g; SAR(10 g) = 0.477 mW/g**



0 dB = 0.914mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$ ;  $\sigma = 0.998 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: WCDMA 850, Body SAR, Back side, Mid.ch**

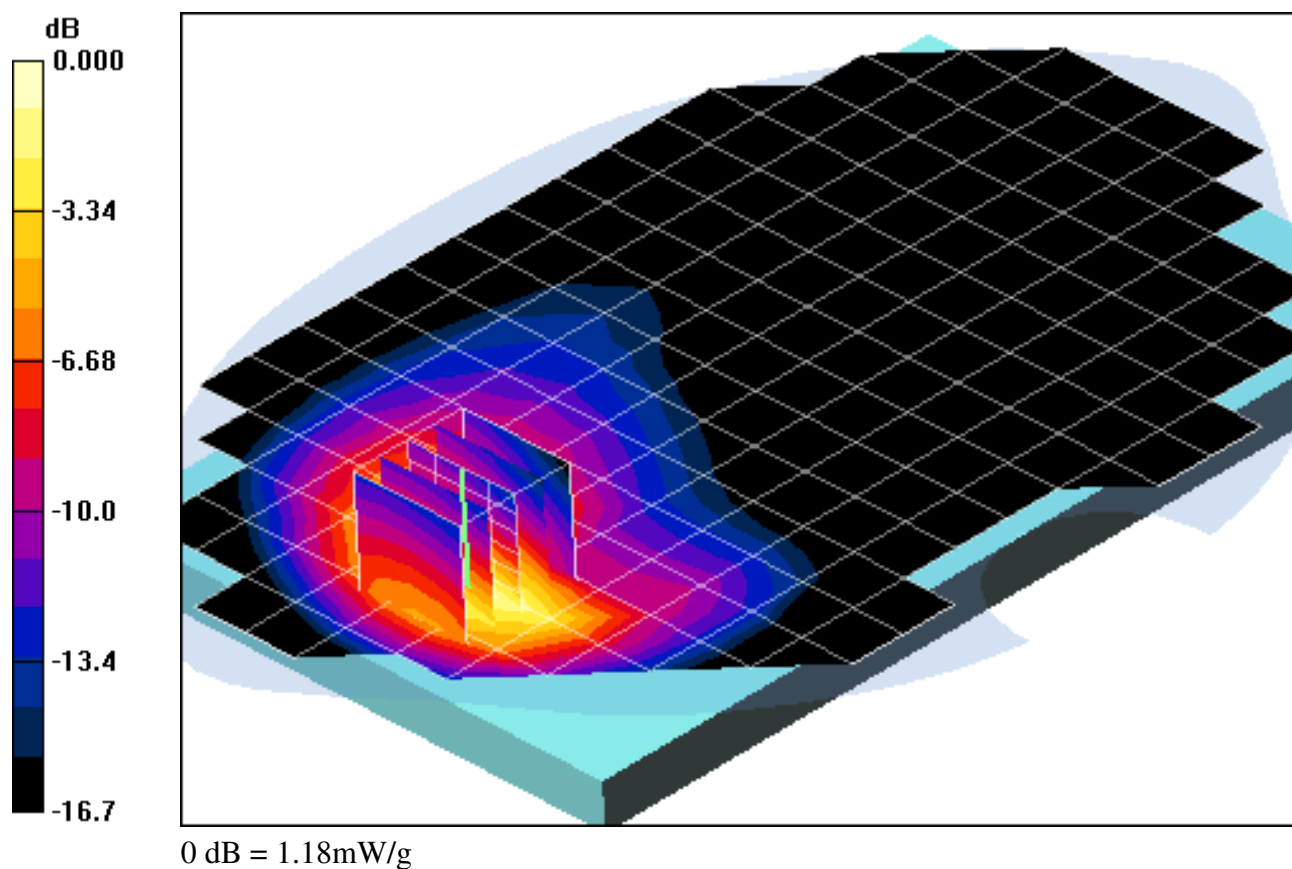
**Area Scan (13x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 3.43 V/m

Peak SAR (extrapolated) = 1.97 W/kg

**SAR(1 g) = 1.09 mW/g; SAR(10 g) = 0.602 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$ ;  $\sigma = 0.998 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: WCDMA 850, Body SAR, Right side, Mid.ch**

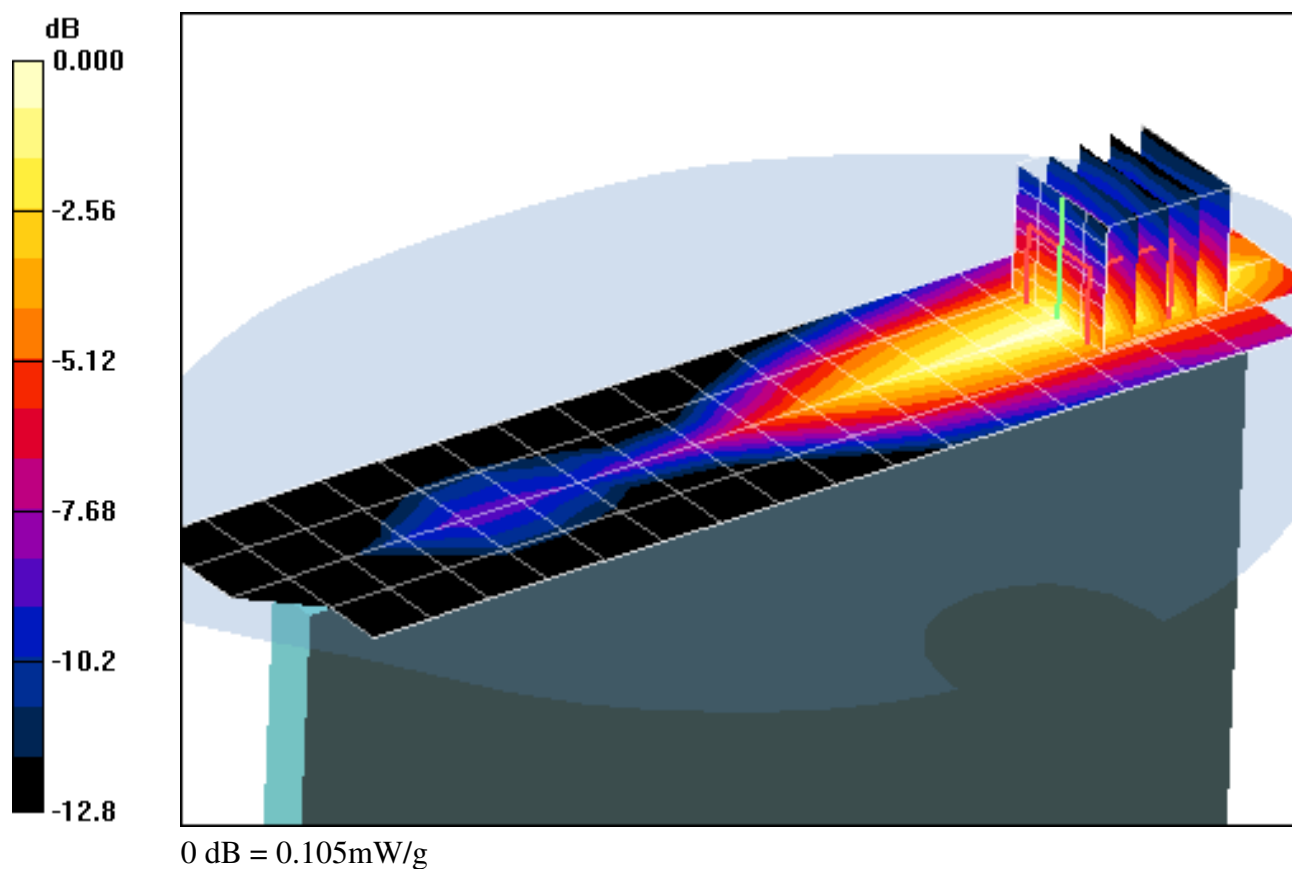
**Area Scan (5x19x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 5.51 V/m

Peak SAR (extrapolated) = 0.174 W/kg

**SAR(1 g) = 0.087 mW/g; SAR(10 g) = 0.050 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$ ;  $\sigma = 0.998 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: WCDMA 850, Body SAR, Left side, Mid.ch**

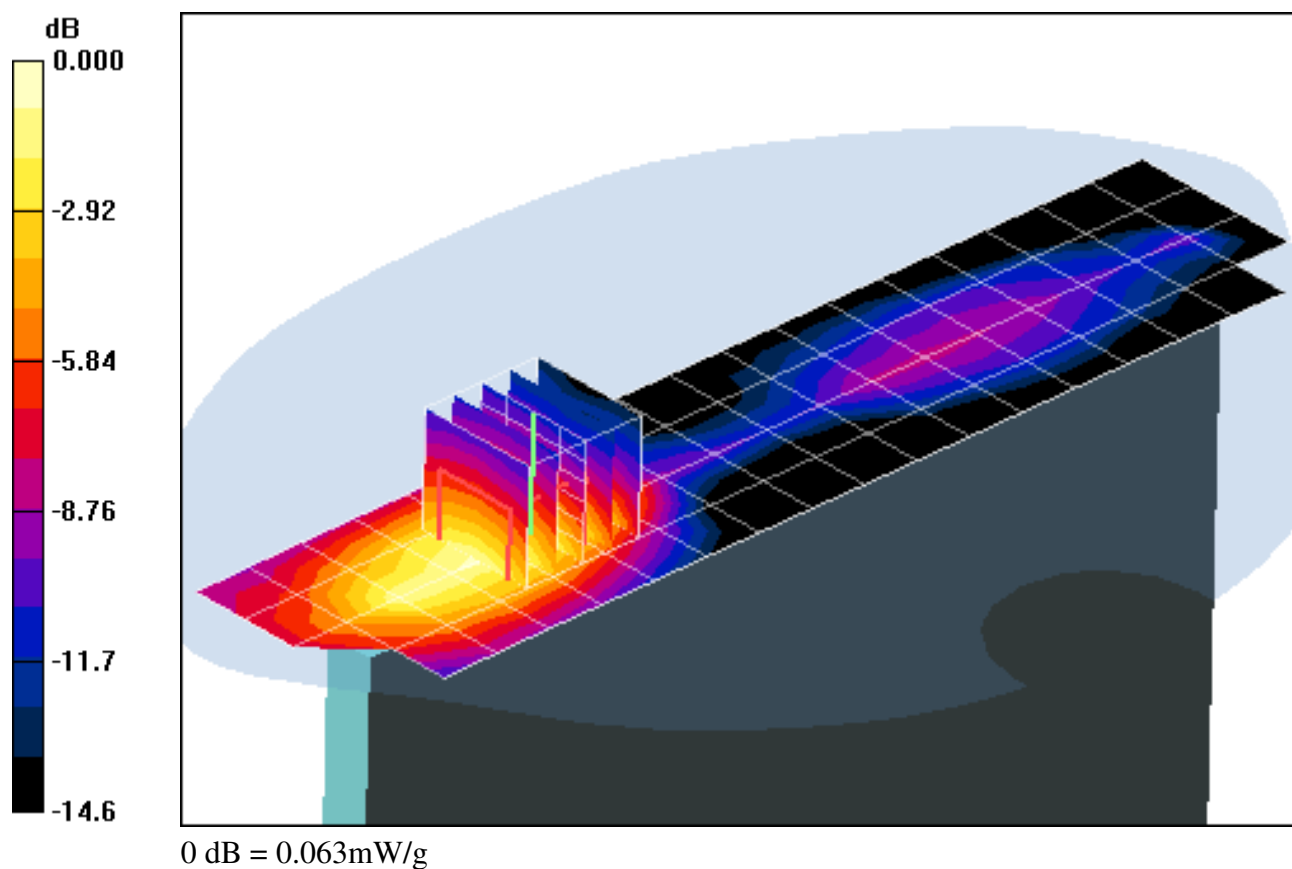
**Area Scan (5x19x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 7.74 V/m

Peak SAR (extrapolated) = 0.104 W/kg

**SAR(1 g) = 0.055 mW/g; SAR(10 g) = 0.032 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: WCDMA850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$ ;  $\sigma = 0.998 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

**Mode: WCDMA 850, Body SAR, Bottom side, Mid.ch**

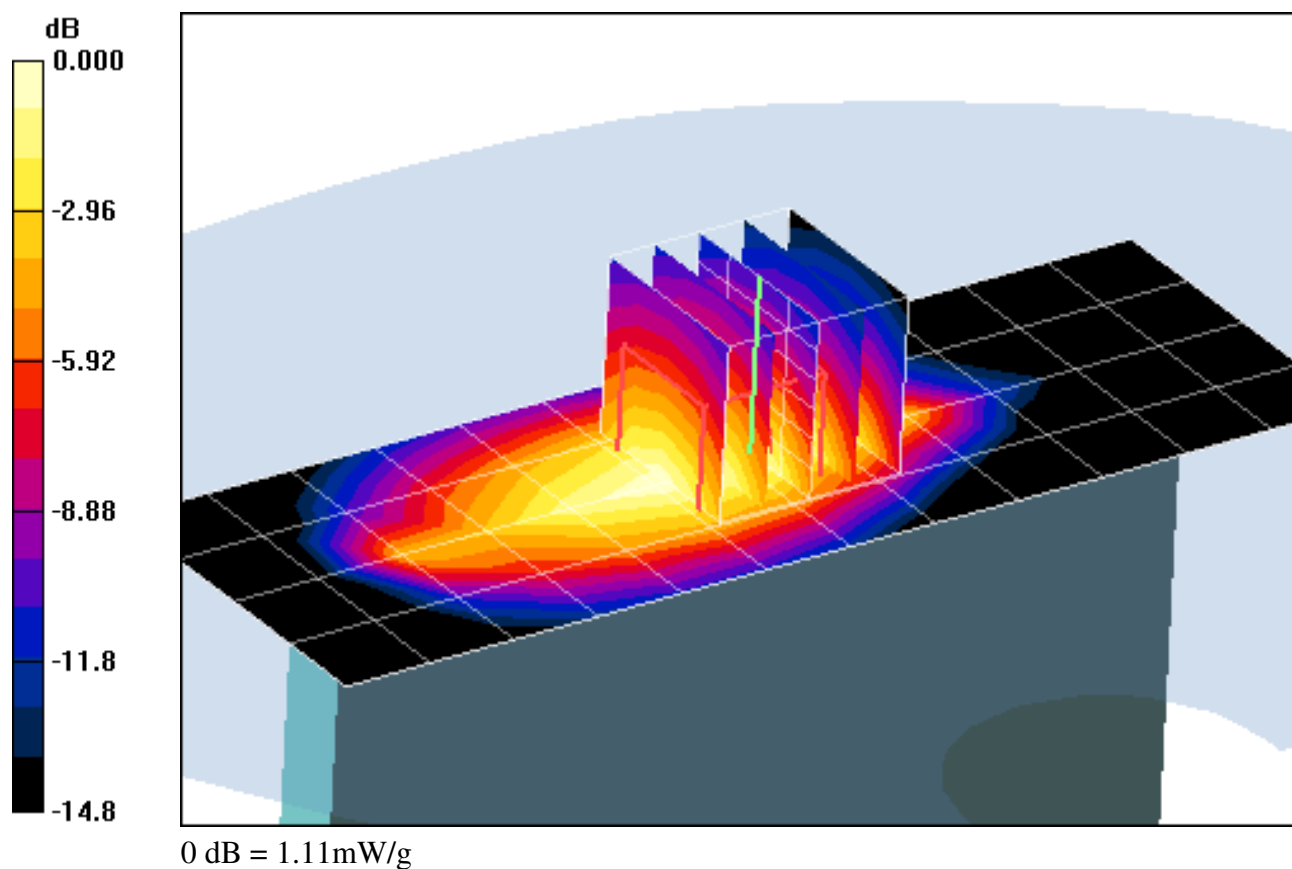
**Area Scan (5x13x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 33.8 V/m

Peak SAR (extrapolated) = 1.74 W/kg

**SAR(1 g) = 0.995 mW/g; SAR(10 g) = 0.599 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: WCDMA1900; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1852.4 \text{ MHz}$ ;  $\sigma = 1.47 \text{ mho/m}$ ;  $\epsilon_r = 51.17$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-22-2011; Ambient Temp: 23.5°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.65, 4.65, 4.65); Calibrated: 4/20/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 7/8/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: WCDMA 1900, Body SAR, Back side, Low.ch**

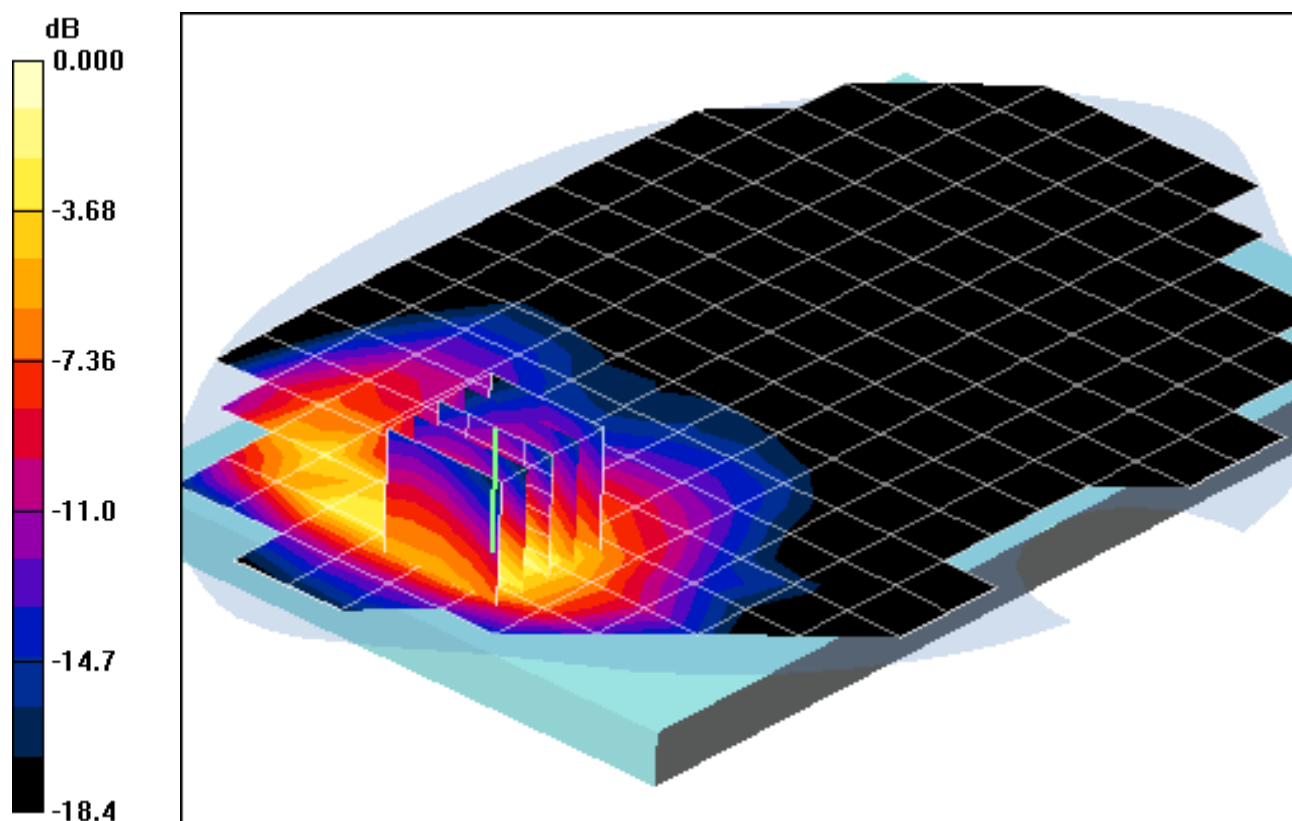
**Area Scan (13x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 28.3 V/m

Peak SAR (extrapolated) = 1.66 W/kg

**SAR(1 g) = 0.956 mW/g; SAR(10 g) = 0.519 mW/g**



0 dB = 1.09mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 51$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-22-2011; Ambient Temp: 23.5°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.65, 4.65, 4.65); Calibrated: 4/20/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 7/8/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: WCDMA 1900, Body SAR, Right side, Mid.ch**

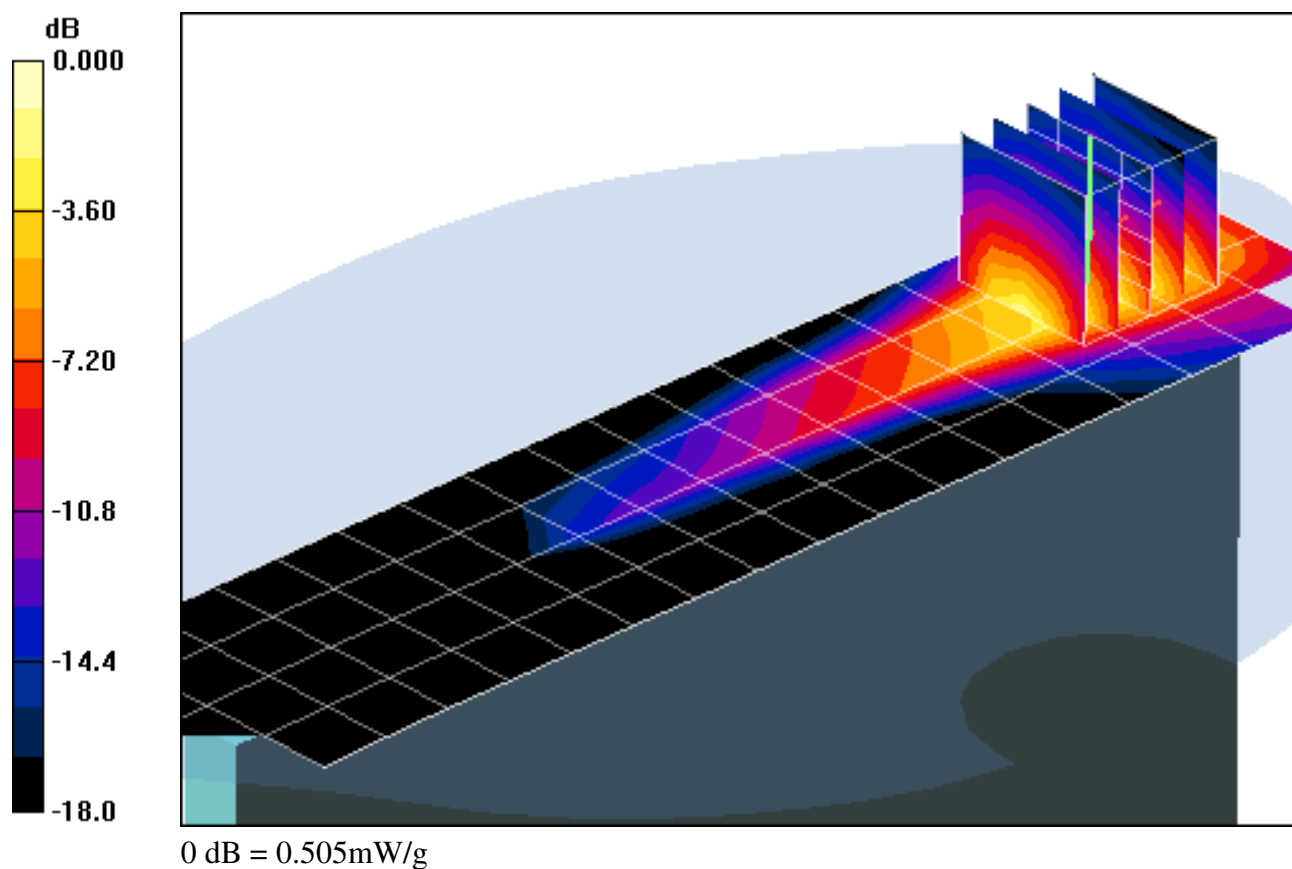
**Area Scan (5x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.8 V/m

Peak SAR (extrapolated) = 0.850 W/kg

**SAR(1 g) = 0.423 mW/g; SAR(10 g) = 0.206 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 51$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-22-2011; Ambient Temp: 23.5°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.65, 4.65, 4.65); Calibrated: 4/20/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 7/8/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: WCDMA 1900, Body SAR, Left side, Mid.ch**

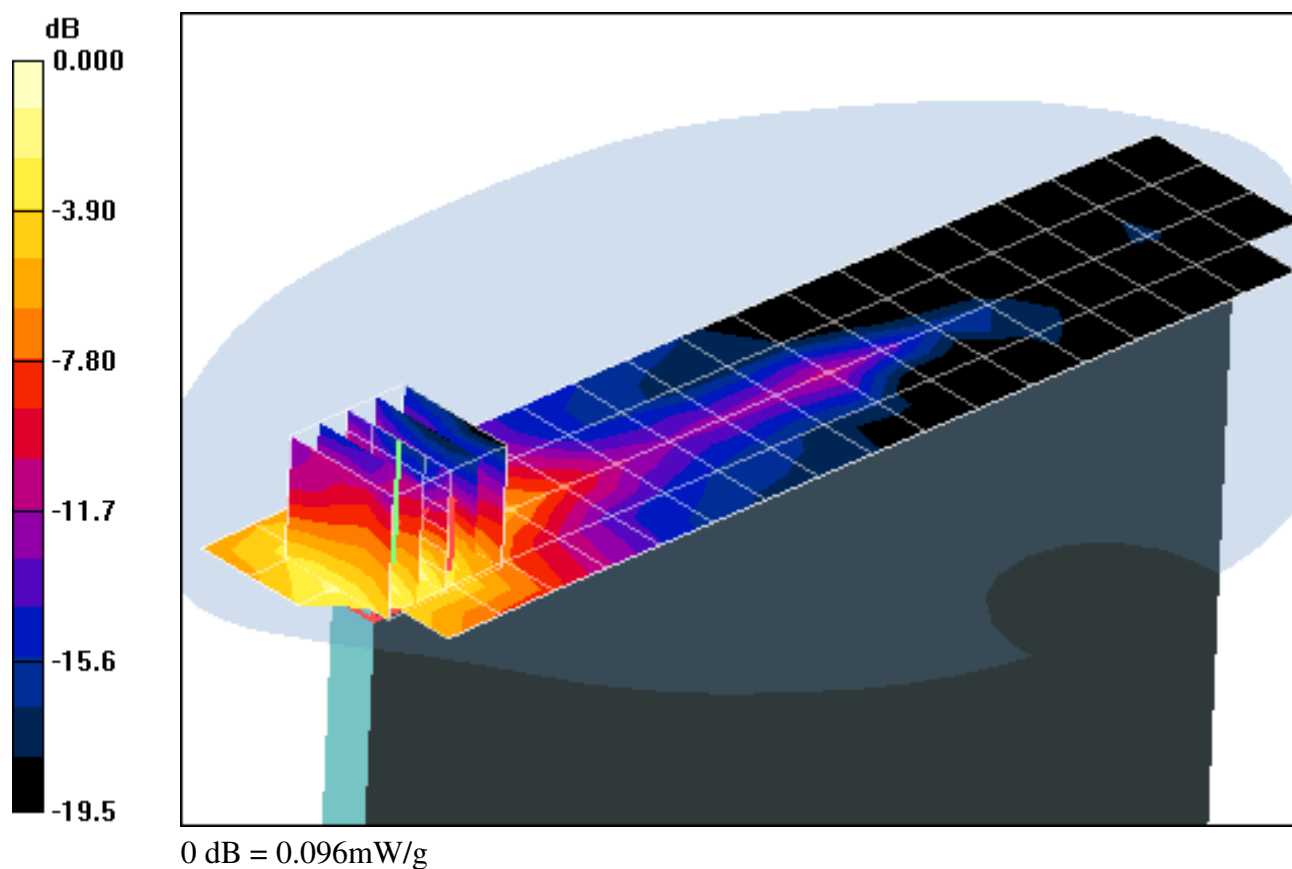
**Area Scan (5x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 8.46 V/m

Peak SAR (extrapolated) = 0.161 W/kg

**SAR(1 g) = 0.082 mW/g; SAR(10 g) = 0.043 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 51$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-22-2011; Ambient Temp: 23.5°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.65, 4.65, 4.65); Calibrated: 4/20/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 7/8/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: WCDMA 1900, Body SAR, Bottom side, Mid.ch**

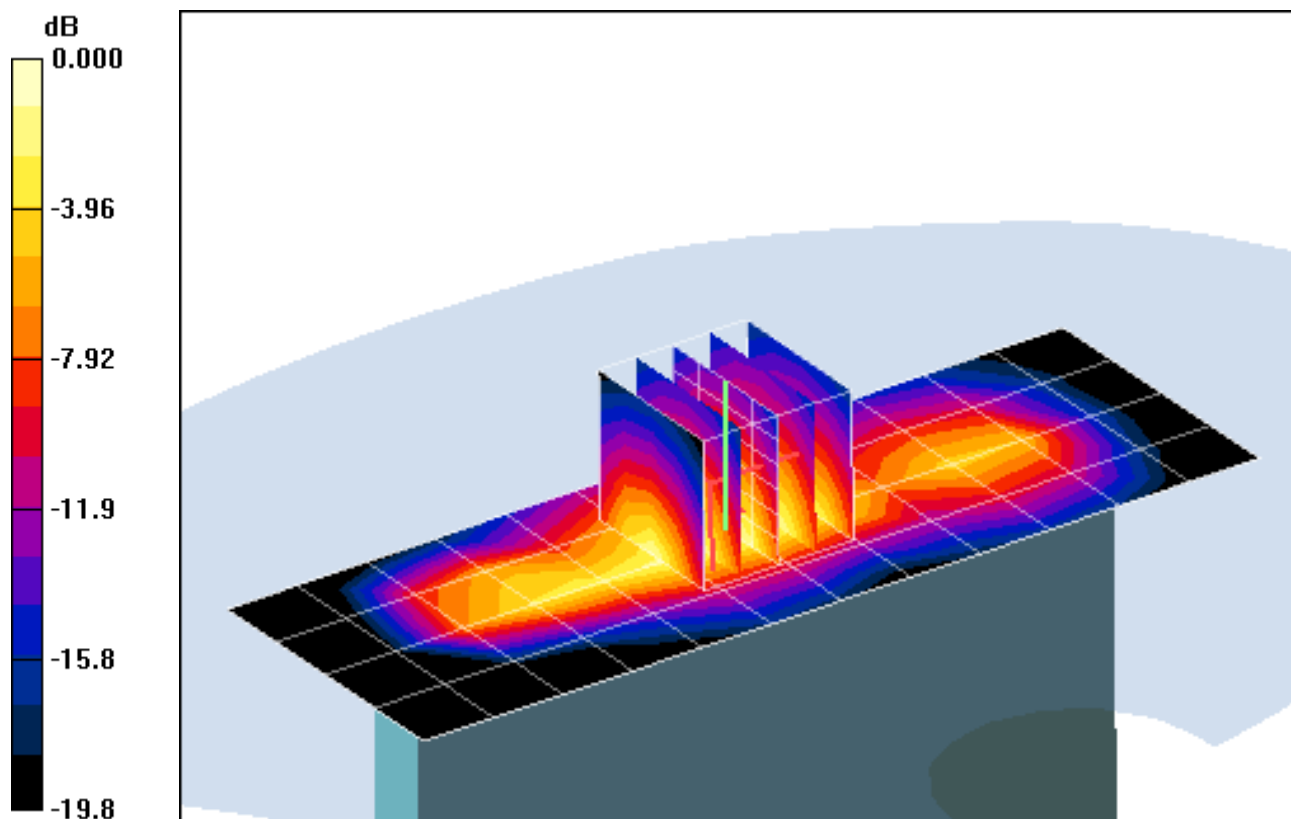
**Area Scan (5x13x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 31.9 V/m

Peak SAR (extrapolated) = 2.19 W/kg

**SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.645 mW/g**



0 dB = 1.44mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: Body SAR #1**

Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.48 \text{ mho/m}$ ;  $\epsilon_r = 51$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-22-2011; Ambient Temp: 23.5°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.65, 4.65, 4.65); Calibrated: 4/20/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 7/8/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: WCDMA 1900, Body SAR, Bottom side, Mid.ch**

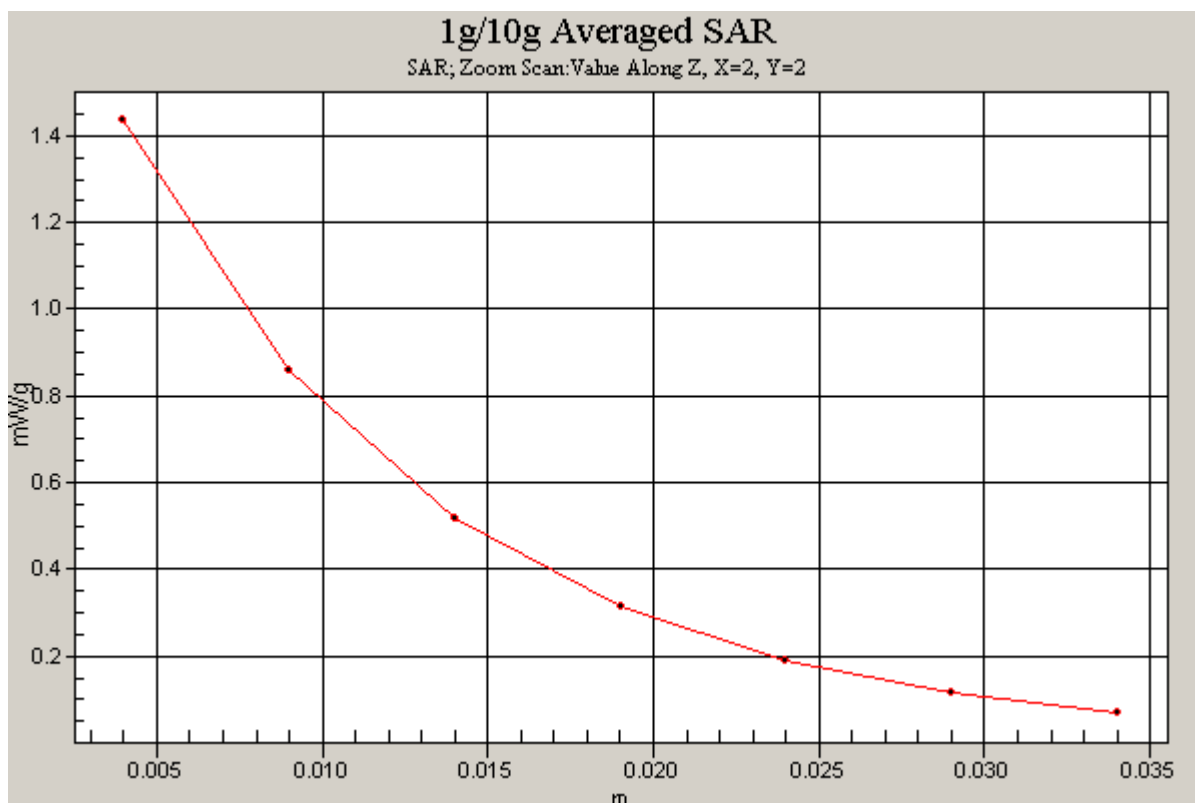
**Area Scan (5x13x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 31.9 V/m

Peak SAR (extrapolated) = 2.19 W/kg

**SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.645 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: BT/WIFI**

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$ ;  $\sigma = 1.98 \text{ mho/m}$ ;  $\epsilon_r = 51.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-19-2011; Ambient Temp: 23.7°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(6.4, 6.4, 6.4); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: IEEE 802.11b, Body SAR, Ch.01, 1Mbps, Back Side**

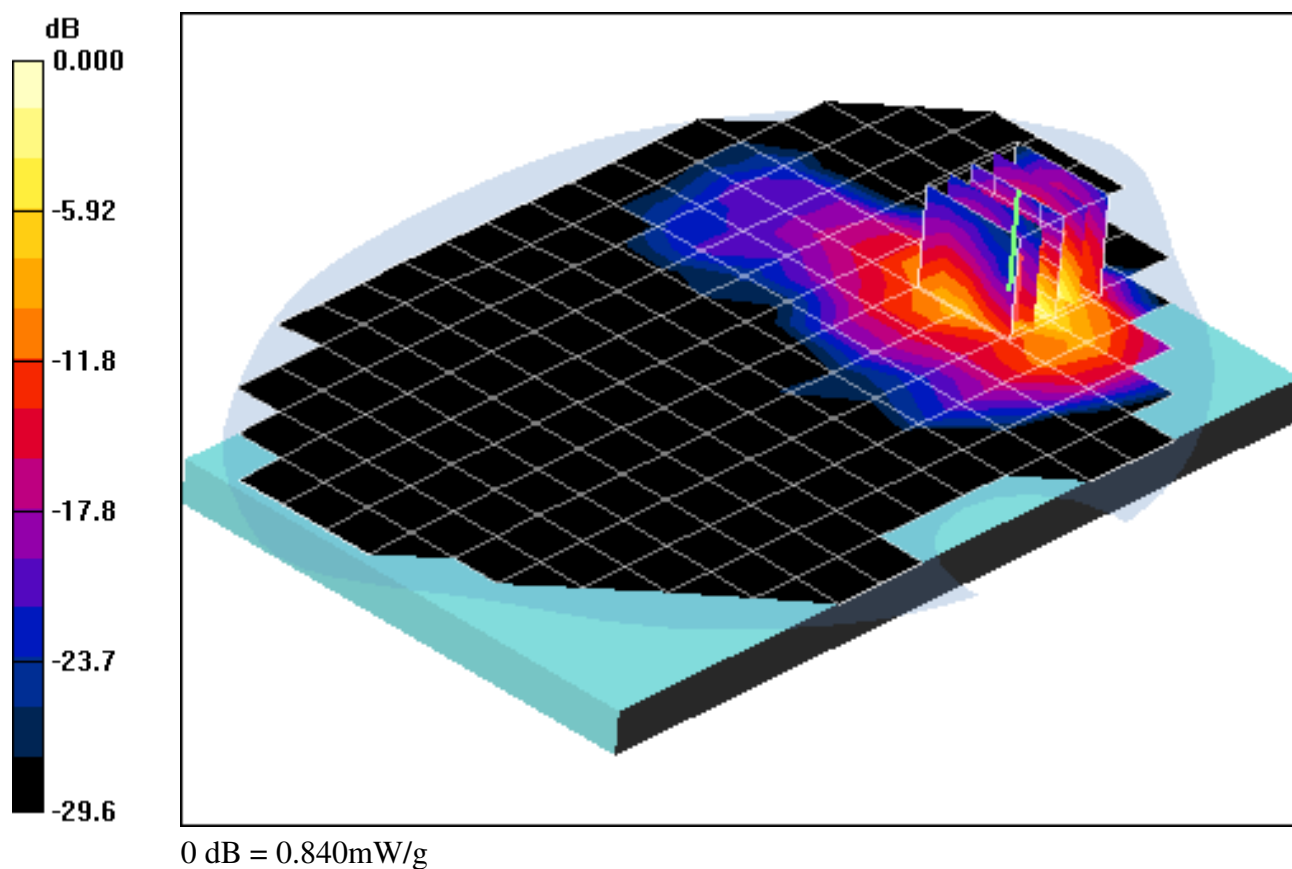
**Area Scan (13x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.3 V/m

Peak SAR (extrapolated) = 1.67 W/kg

**SAR(1 g) = 0.651 mW/g; SAR(10 g) = 0.234 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: BT/WIFI**

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$ ;  $\sigma = 1.98 \text{ mho/m}$ ;  $\epsilon_r = 51.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-19-2011; Ambient Temp: 23.7°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(6.4, 6.4, 6.4); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: IEEE 802.11b, Body SAR, Ch.01, 1Mbps, Back Side**

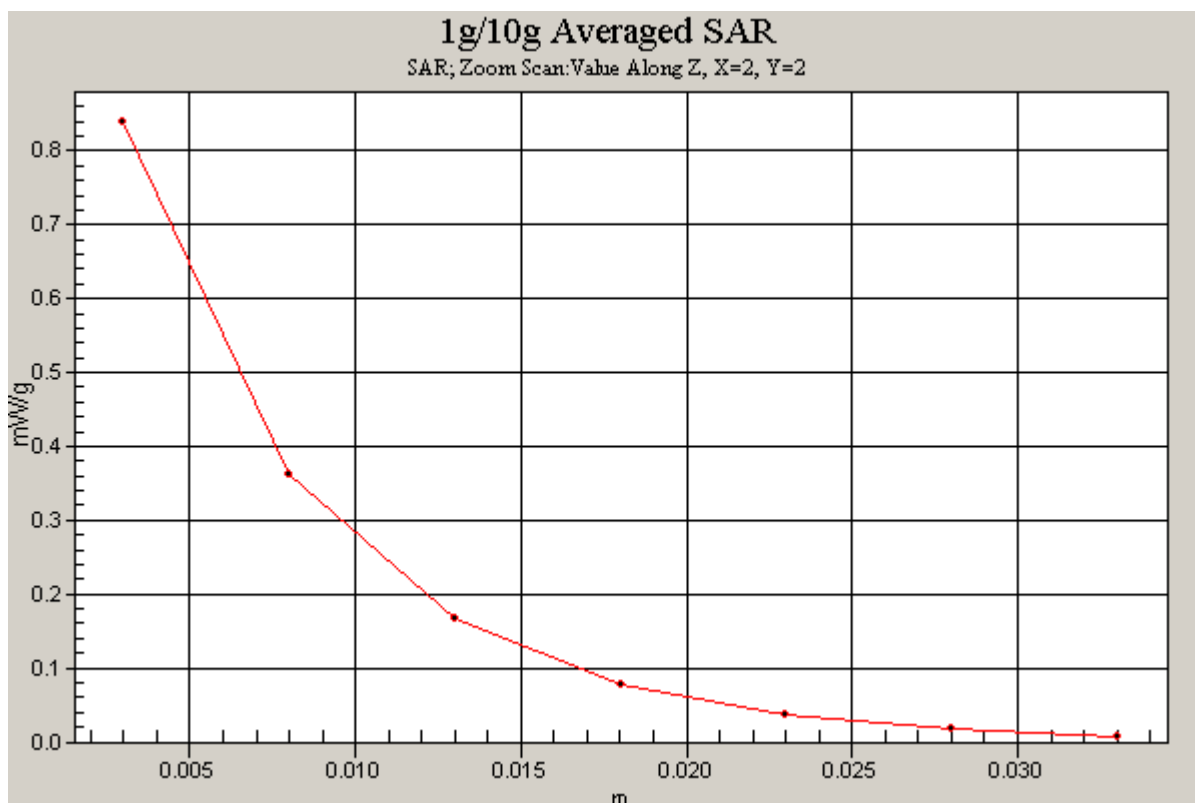
**Area Scan (13x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.3 V/m

Peak SAR (extrapolated) = 1.67 W/kg

**SAR(1 g) = 0.651 mW/g; SAR(10 g) = 0.234 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: BT/WIFI**

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$ ;  $\sigma = 1.98 \text{ mho/m}$ ;  $\epsilon_r = 51.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-19-2011; Ambient Temp: 23.7°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(6.4, 6.4, 6.4); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: IEEE 802.11b, Body SAR, Ch.01, 1Mbps, Right Edge**

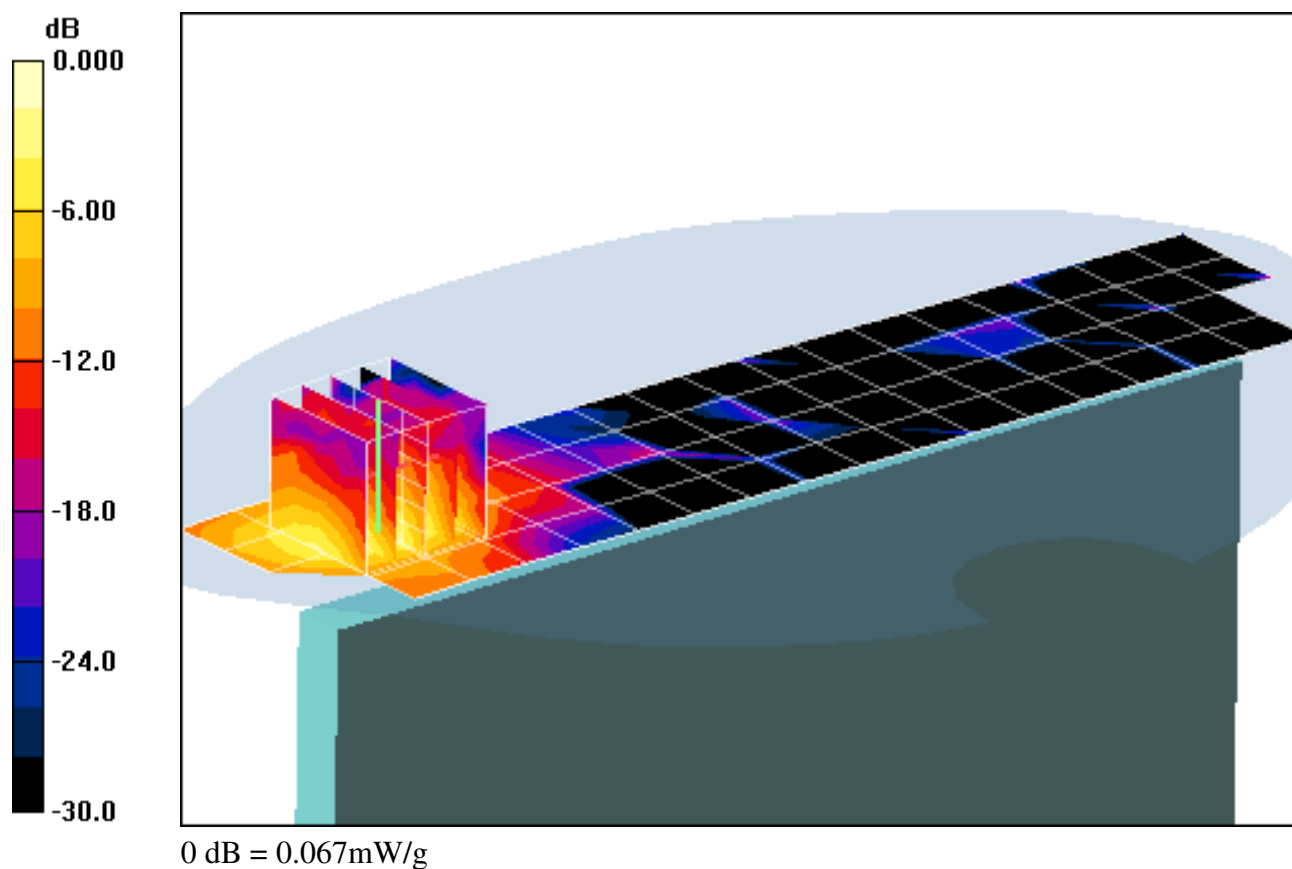
**Area Scan (5x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 4.96 V/m

Peak SAR (extrapolated) = 0.099 W/kg

**SAR(1 g) = 0.047 mW/g; SAR(10 g) = 0.022 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: BT/WIFI**

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$ ;  $\sigma = 1.98 \text{ mho/m}$ ;  $\epsilon_r = 51.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-19-2011; Ambient Temp: 23.7°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(6.4, 6.4, 6.4); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: IEEE 802.11b, Body SAR, Ch.01, 1Mbps, Left Edge**

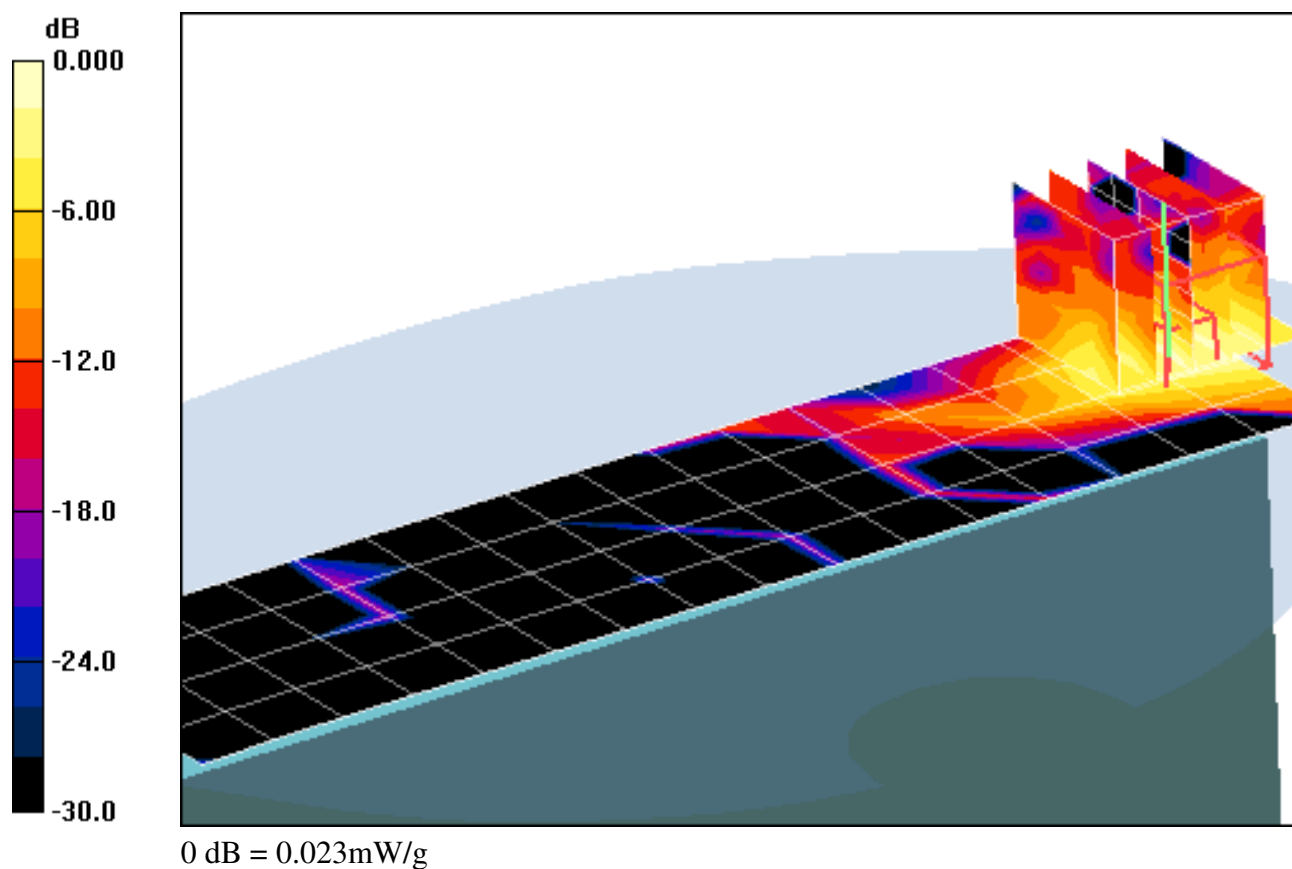
**Area Scan (5x19x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 2.53 V/m

Peak SAR (extrapolated) = 0.033 W/kg

**SAR(1 g) = 0.016 mW/g; SAR(10 g) = 0.00712 mW/g**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: BEJV905; Type: 850/1900 GSM/GPRS/EDGE/WCDMA/HSPA Tablet  
with Bluetooth and WLAN; Serial: BT/WIFI**

Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$ ;  $\sigma = 1.98 \text{ mho/m}$ ;  $\epsilon_r = 51.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-19-2011; Ambient Temp: 23.7°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(6.4, 6.4, 6.4); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

**Mode: IEEE 802.11b, Body SAR, Ch.01, 1Mbps, Top Edge**

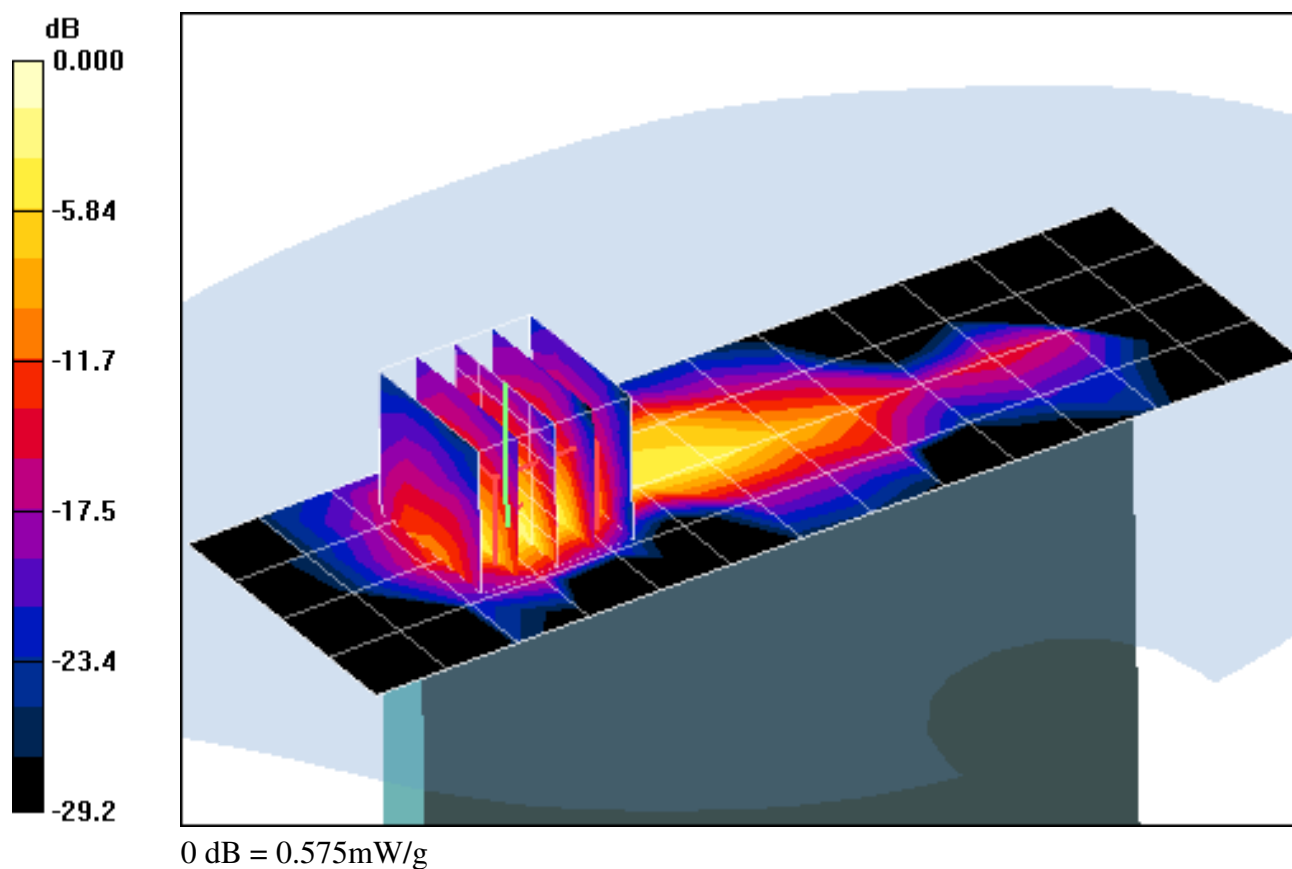
**Area Scan (5x14x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 13.3 V/m

Peak SAR (extrapolated) = 0.990 W/kg

**SAR(1 g) = 0.418 mW/g; SAR(10 g) = 0.158 mW/g**



## **APPENDIX B: DIPOLE VALIDATION**

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d026**

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$ ;  $\sigma = 0.997 \text{ mho/m}$ ;  $\epsilon_r = 54.4$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-16-2011; Ambient Temp: 23.9°C; Tissue Temp: 22.2°C

Probe: ES3DV2 - SN3022; ConvF(5.89, 5.89, 5.89); Calibrated: 9/21/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn907; Calibrated: 1/25/2011

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

## 835MHz System Verification

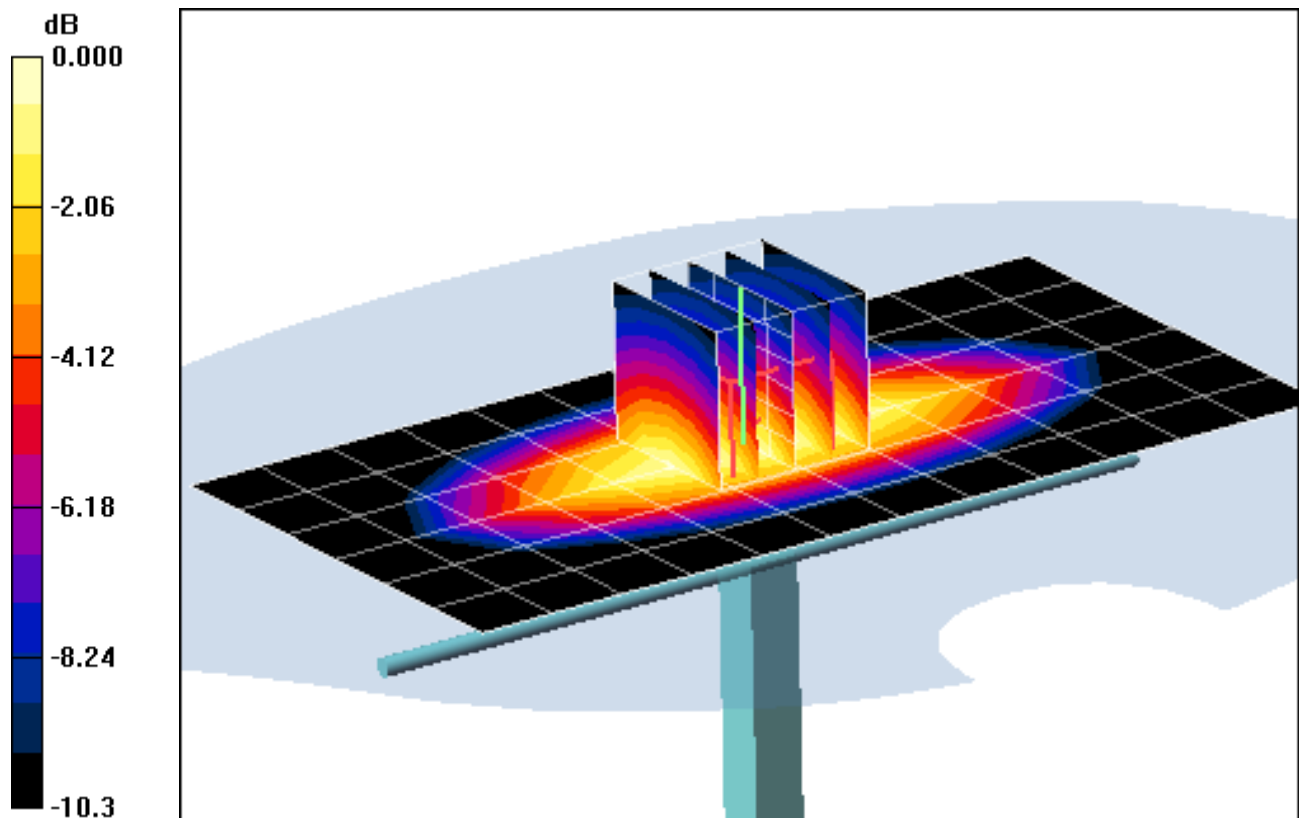
**Area Scan (7x13x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Input Power = 18 dBm (63 mW)

**SAR(1 g) = 0.647 mW/g; SAR(10 g) = 0.424 mW/g**

Deviation= 5.01 %



0 dB = 0.700mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 5d080**

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$ ;  $\sigma = 1.51 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-30-2010; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN3561; ConvF(6.59, 6.59, 6.59); Calibrated: 8/19/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/21/2010

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

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

## 1900MHz System Verification

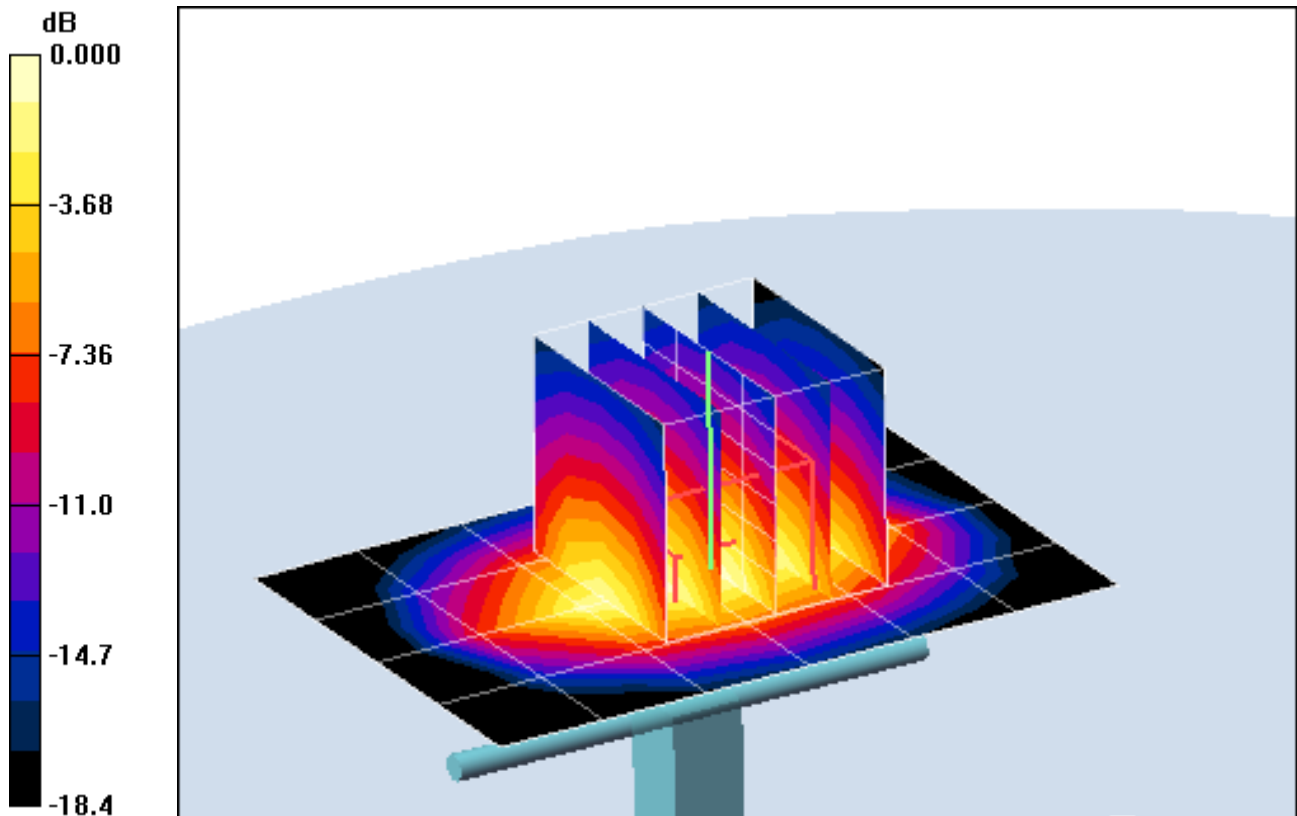
**Area Scan (5x7x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Input Power = 20 dBm (100 mW)

**SAR(1 g) = 3.74 mW/g; SAR(10 g) = 1.94 mW/g**

Deviation = -7.65%



0 dB = 4.14mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 5d080**

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$ ;  $\sigma = 1.51 \text{ mho/m}$ ;  $\epsilon_r = 51$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-22-2011; Ambient Temp: 23.5°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.65, 4.65, 4.65); Calibrated: 4/20/2010

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 7/8/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

## 1900MHz System Verification

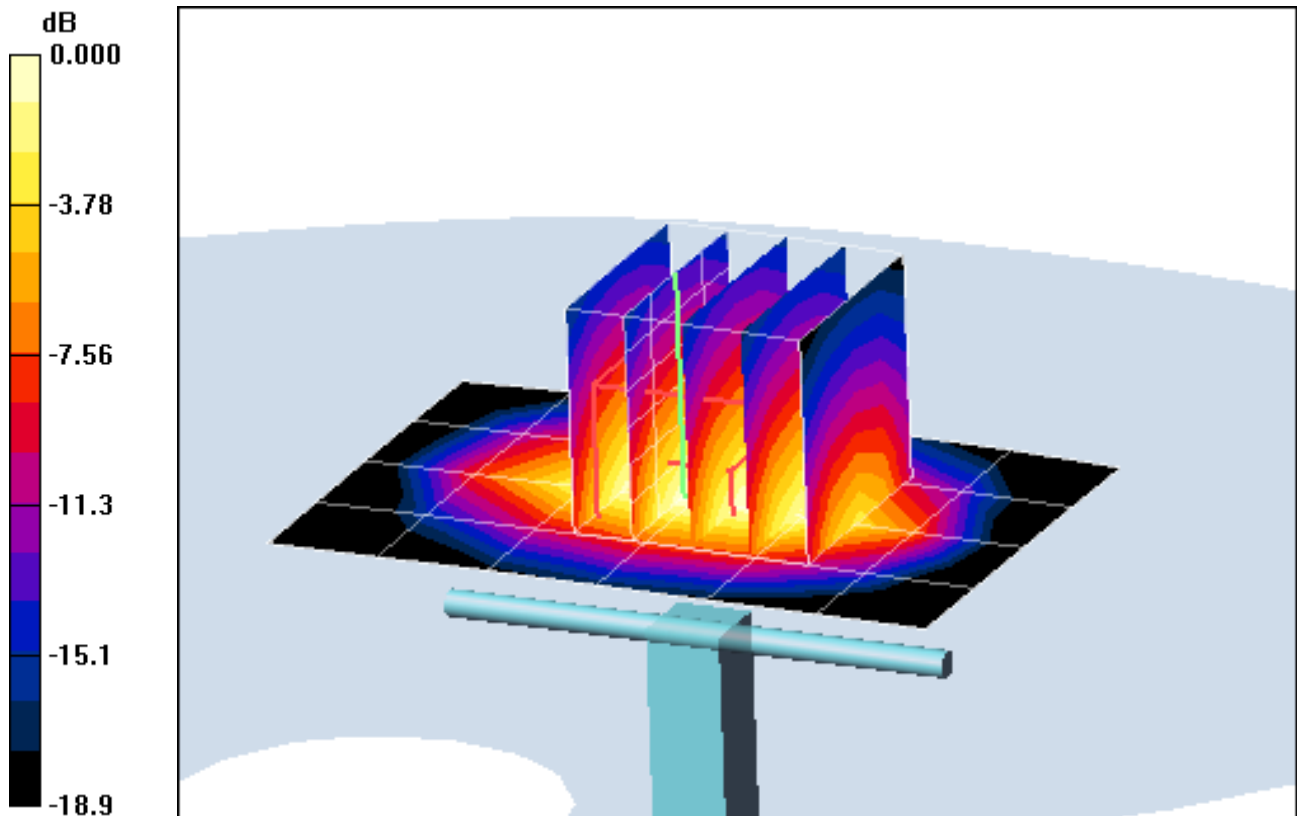
**Area Scan (5x7x1):** Measurement grid: dx=15mm, dy=15mm

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

Input Power = 16 dBm (40 mW)

**SAR(1 g) = 1.61 mW/g; SAR(10 g) = 0.827 mW/g**

Deviation = -0.62 %



0 dB = 1.79mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 2450 MHz; Type: D2450V2; Serial: 719**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$ ;  $\sigma = 2.03 \text{ mho/m}$ ;  $\epsilon_r = 51.3$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-19-2011; Ambient Temp: 23.7°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3550; ConvF(6.4, 6.4, 6.4); Calibrated: 1/26/2010

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 1/22/2010

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

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

## 2450MHz System Verification

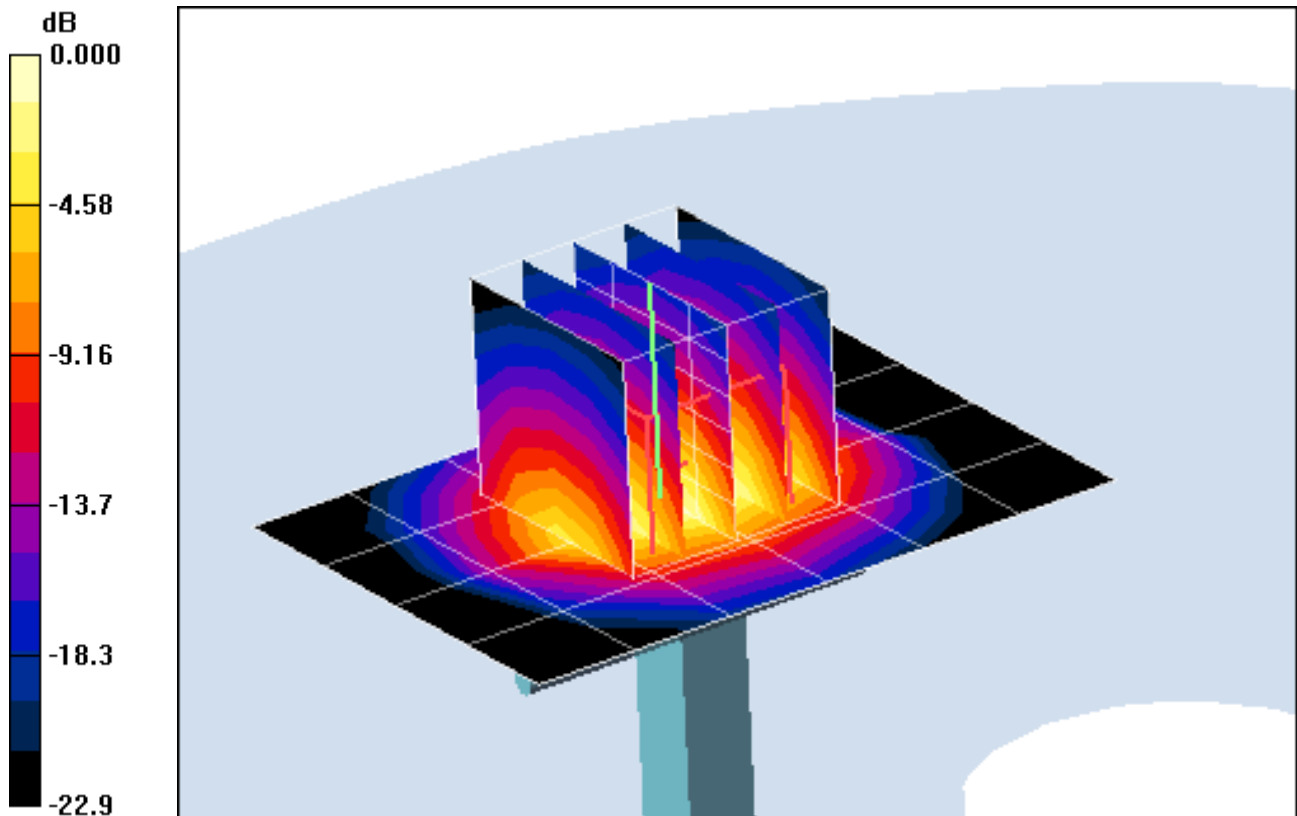
**Area Scan (5x7x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Input Power = 14 dBm (25 mW)

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.550 mW/g**

Deviation = -5.06%



0 dB = 1.60mW/g

## **APPENDIX C: PROBE CALIBRATION**



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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **ES3-3022\_Sep10**

## CALIBRATION CERTIFICATE

Object **ES3DV2 - SN:3022**

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

Calibration date: **September 21, 2010**

✓  
 KOK  
 9/29/10

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #            | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Power sensor E4412A        | MY41495277      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Power sensor E4412A        | MY41498087      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 30-Mar-10 (No. 217-01159)         | Mar-11                 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 30-Mar-10 (No. 217-01161)         | Mar-11                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 30-Mar-10 (No. 217-01160)         | Mar-11                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-09 (No. ES3-3013_Dec09)    | Dec-10                 |
| DAE4                       | SN: 660         | 20-Apr-10 (No. DAE4-660_Apr10)    | Apr-11                 |
| Secondary Standards        | ID #            | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Oct-09)  | In house check: Oct-11 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-09) | In house check: Oct10  |

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

Issued: September 22, 2010

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



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

Accreditation No.: **SCS 108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the  $E^2$ -field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* frequency\_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>:** DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>:** A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to 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.

# Probe ES3DV2

## SN:3022

|                  |                    |
|------------------|--------------------|
| Manufactured:    | April 15, 2003     |
| Last calibrated: | September 18, 2009 |
| Recalibrated:    | September 21, 2010 |

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

**DASY/EASY - Parameters of Probe: ES3DV2 SN:3022****Basic Calibration Parameters**

|                                                    | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|----------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V/m})^2$ ) <sup>A</sup> | 1.01     | 1.05     | 1.01     | ± 10.1%   |
| DCP (mV) <sup>B</sup>                              | 92.8     | 92.5     | 89.7     |           |

**Modulation Calibration Parameters**

| UID   | Communication System Name | PAR  |   | A<br>dB | B<br>dBuV | C    | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-------|---------------------------|------|---|---------|-----------|------|----------|---------------------------|
| 10000 | CW                        | 0.00 | X | 0.00    | 0.00      | 1.00 | 300.0    | ± 1.5%                    |
|       |                           |      | Y | 0.00    | 0.00      | 1.00 | 300.0    |                           |
|       |                           |      | Z | 0.00    | 0.00      | 1.00 | 300.0    |                           |

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 Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV2 SN:3022

### Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 750     | ± 50 / ± 100                | 41.9 ± 5%    | 0.89 ± 5%    | 6.32    | 6.32    | 6.32    | 0.87  | 1.01 ± 11.0%    |
| 835     | ± 50 / ± 100                | 41.5 ± 5%    | 0.90 ± 5%    | 6.02    | 6.02    | 6.02    | 0.62  | 1.20 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 40.1 ± 5%    | 1.37 ± 5%    | 5.01    | 5.01    | 5.01    | 0.27  | 2.23 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 40.0 ± 5%    | 1.40 ± 5%    | 4.83    | 4.83    | 4.83    | 0.25  | 2.29 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 39.2 ± 5%    | 1.80 ± 5%    | 4.21    | 4.21    | 4.21    | 0.25  | 2.62 ± 11.0%    |
| 2600    | ± 50 / ± 100                | 39.0 ± 5%    | 1.96 ± 5%    | 4.14    | 4.14    | 4.14    | 0.25  | 2.64 ± 11.0%    |

<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.

## DASY/EASY - Parameters of Probe: ES3DV2 SN:3022

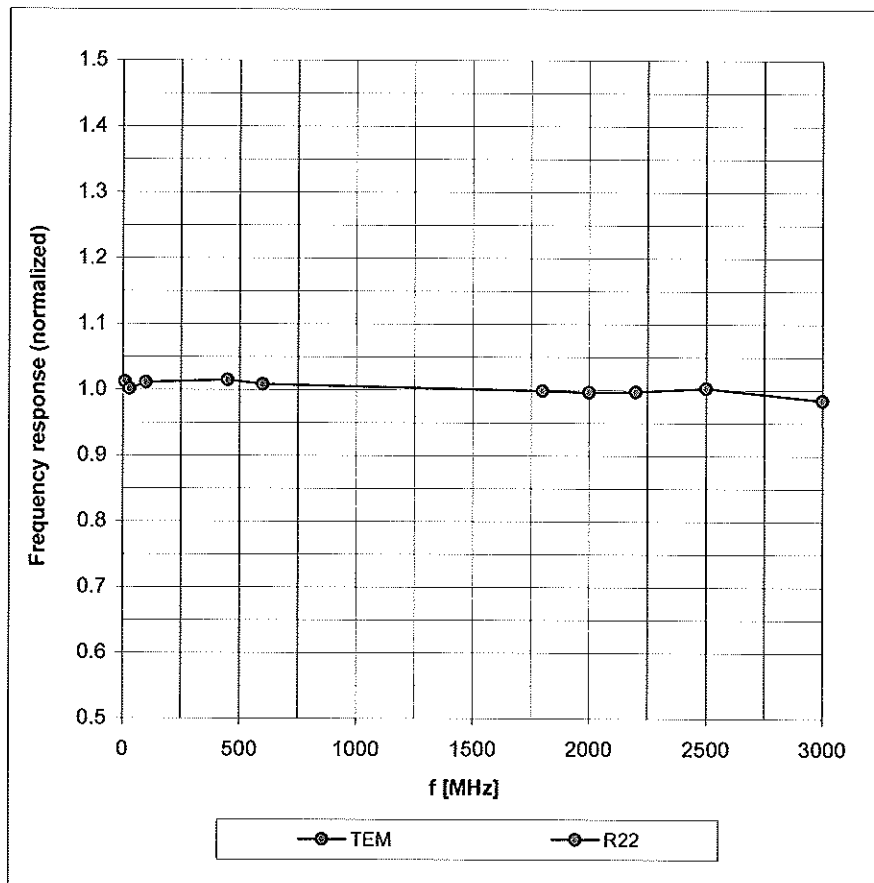
### Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 750     | ± 50 / ± 100                | 55.5 ± 5%    | 0.96 ± 5%    | 6.09    | 6.09    | 6.09    | 0.68  | 1.20 ± 11.0%    |
| 835     | ± 50 / ± 100                | 55.2 ± 5%    | 0.97 ± 5%    | 5.89    | 5.89    | 5.89    | 0.65  | 1.20 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 53.4 ± 5%    | 1.49 ± 5%    | 4.59    | 4.59    | 4.59    | 0.23  | 2.83 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 53.3 ± 5%    | 1.52 ± 5%    | 4.34    | 4.34    | 4.34    | 0.22  | 3.71 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 52.7 ± 5%    | 1.95 ± 5%    | 4.06    | 4.06    | 4.06    | 0.41  | 1.42 ± 11.0%    |
| 2600    | ± 50 / ± 100                | 52.5 ± 5%    | 2.16 ± 5%    | 4.06    | 4.06    | 4.06    | 0.53  | 1.23 ± 11.0%    |

<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.

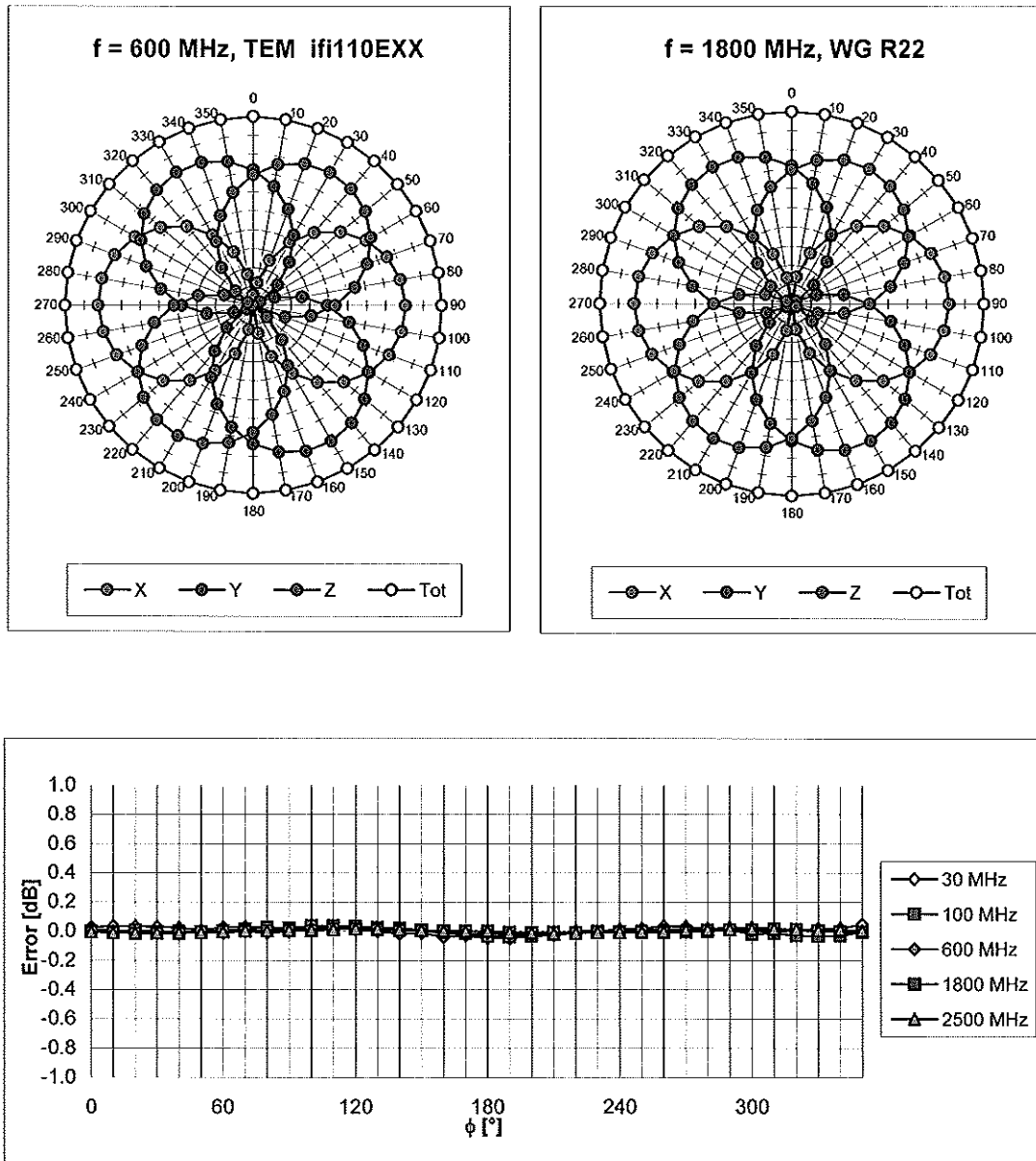
## Frequency Response of E-Field

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



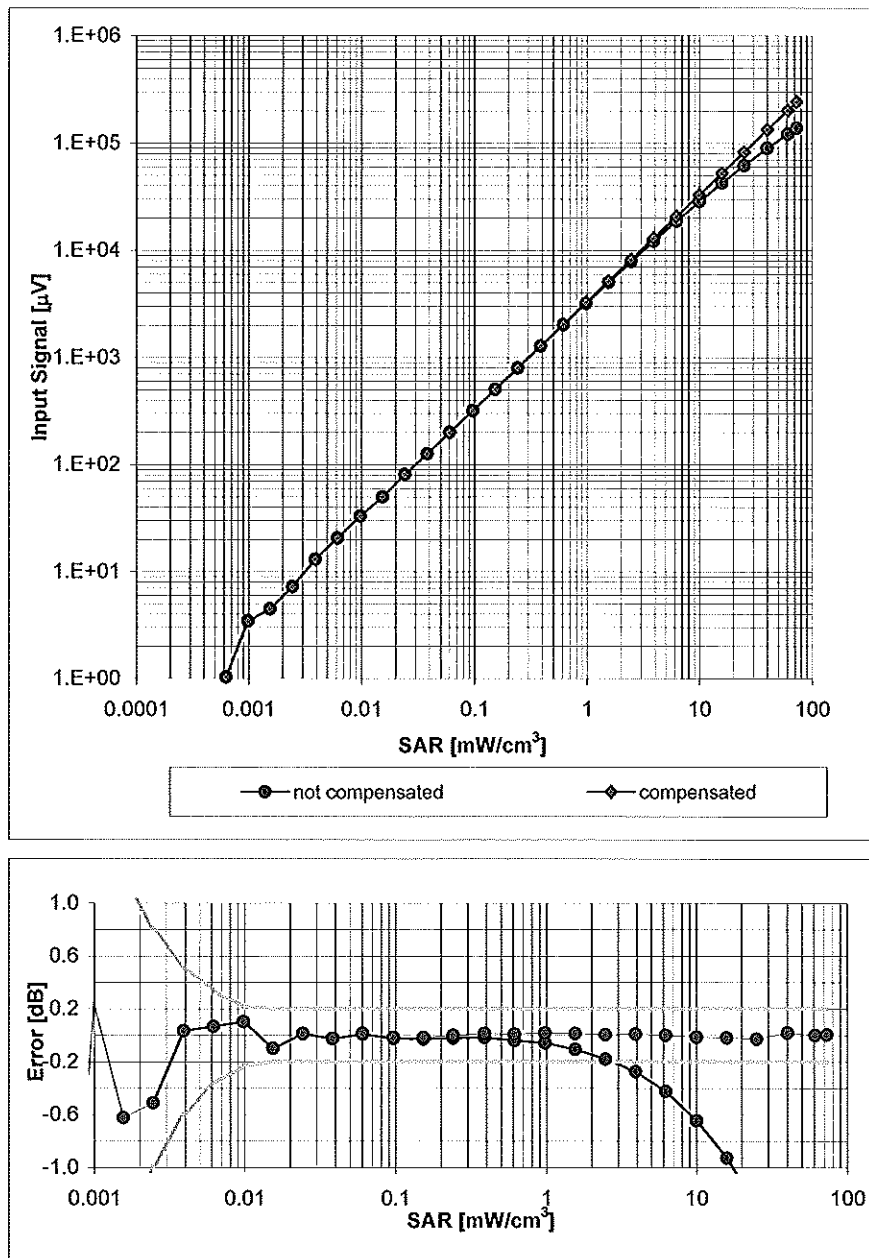
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



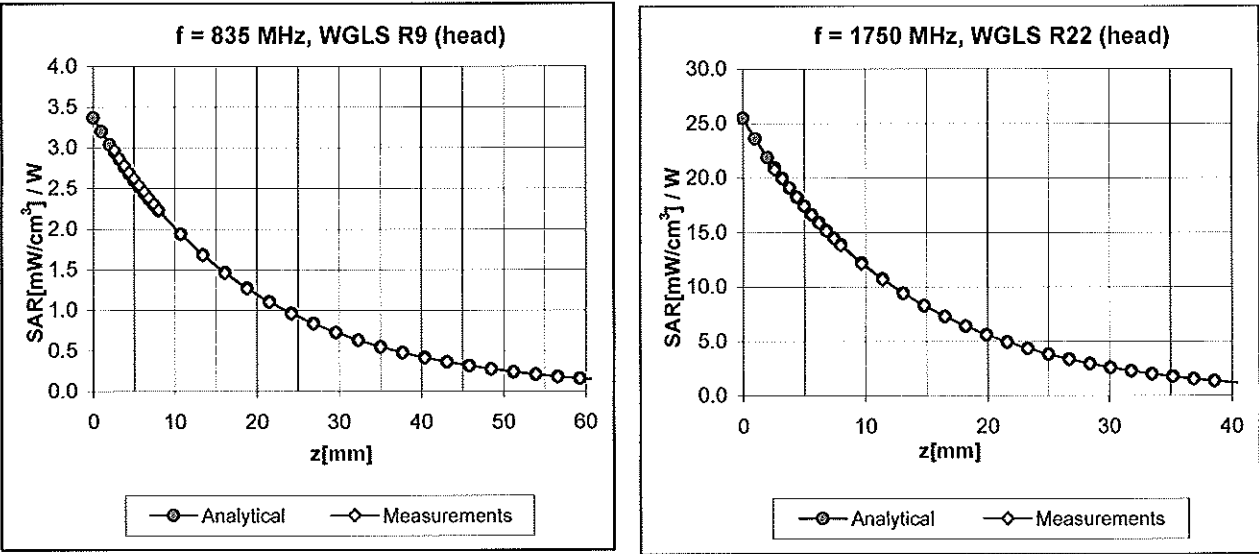
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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



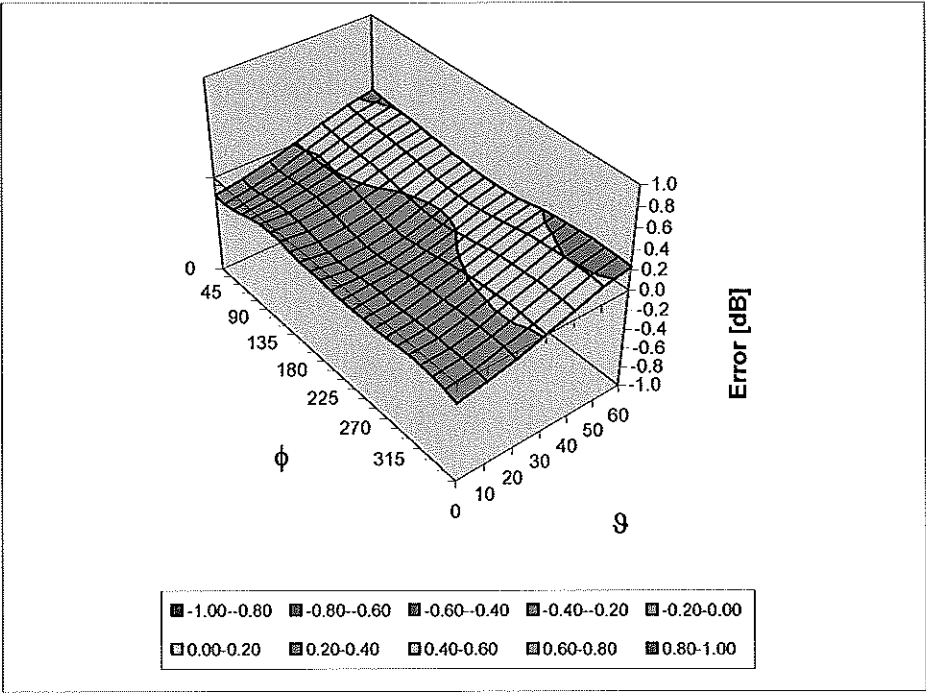
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

Conversion Factor Assessment



Deviation from Isotropy in HSL

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



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

## Other Probe Parameters

|                                               |                |
|-----------------------------------------------|----------------|
| Sensor Arrangement                            | Triangular     |
| Connector Angle (°)                           | Not applicable |
| Mechanical Surface Detection Mode             | enabled        |
| Optical Surface Detection Mode                | disabled       |
| Probe Overall Length                          | 337 mm         |
| Probe Body Diameter                           | 10 mm          |
| Tip Length                                    | 10 mm          |
| Tip Diameter                                  | 4.0 mm         |
| Probe Tip to Sensor X Calibration Point       | 2 mm           |
| Probe Tip to Sensor Y Calibration Point       | 2 mm           |
| Probe Tip to Sensor Z Calibration Point       | 2 mm           |
| Recommended Measurement Distance from Surface | 3 mm           |



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Client **PC Test**

Certificate No: **ES3-3209\_Apr10**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3209**

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

Calibration date: **April 20, 2010**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #            | Cal Date (Certificate No.)     | Scheduled Calibration |
|----------------------------|-----------------|--------------------------------|-----------------------|
| Power meter E4419B         | GB41293874      | 1-Apr-10 (No. 217-01136)       | Apr-11                |
| Power sensor E4412A        | MY41495277      | 1-Apr-10 (No. 217-01136)       | Apr-11                |
| Power sensor E4412A        | MY41498087      | 1-Apr-10 (No. 217-01136)       | Apr-11                |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 30-Mar-10 (No. 217-01159)      | Mar-11                |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 30-Mar-10 (No. 217-01161)      | Mar-11                |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 30-Mar-10 (No. 217-01160)      | Mar-11                |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-09 (No. ES3-3013_Dec09) | Dec-10                |
| DAE4                       | SN: 660         | 29-Sep-09 (No. DAE4-660_Sep09) | Sep-10                |

| Secondary Standards       | ID #         | Check Date (in house)             | Scheduled Check        |
|---------------------------|--------------|-----------------------------------|------------------------|
| RF generator HP 8648C     | US3642U01700 | 4-Aug-99 (in house check Oct-09)  | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585   | 18-Oct-01 (in house check Oct-09) | In house check: Oct10  |

|                | Name          | Function              | Signature |
|----------------|---------------|-----------------------|-----------|
| Calibrated by: | Marcel Fehr   | Laboratory Technician |           |
| Approved by:   | Katja Pokovic | Technical Manager     |           |

Issued: April 22, 2010

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## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the  $E^2$ -field uncertainty inside TSL (see below ConvF).
- NORM( $f$ )<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* frequency\_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>:** DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>:** A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to 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.

# Probe ES3DV3

## SN:3209

|                  |                  |
|------------------|------------------|
| Manufactured:    | October 14, 2008 |
| Last calibrated: | April 15, 2009   |
| Recalibrated:    | April 20, 2010   |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

**DASY - Parameters of Probe: ES3DV3 SN:3209****Basic Calibration Parameters**

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-----------------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 1.35     | 1.35     | 1.15     | ± 10.1%   |
| DCP (mV) <sup>B</sup>                                     | 94.4     | 93.7     | 94.1     |           |

**Modulation Calibration Parameters**

| UID   | Communication System Name | PAR  |   | A<br>dB | B<br>dBuV | C    | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-------|---------------------------|------|---|---------|-----------|------|----------|---------------------------|
| 10000 | CW                        | 0.00 | X | 0.00    | 0.00      | 1.00 | 300.0    | ± 1.5%                    |
|       |                           |      | Y | 0.00    | 0.00      | 1.00 | 300.0    |                           |
|       |                           |      | Z | 0.00    | 0.00      | 1.00 | 300.0    |                           |

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 Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY - Parameters of Probe: ES3DV3 SN:3209

### Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 750     | ± 50 / ± 100                | 41.5 ± 5%    | 0.90 ± 5%    | 6.39    | 6.39    | 6.39    | 0.99  | 1.03 ± 11.0%    |
| 835     | ± 50 / ± 100                | 41.5 ± 5%    | 0.90 ± 5%    | 6.12    | 6.12    | 6.12    | 0.92  | 1.07 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 40.1 ± 5%    | 1.37 ± 5%    | 5.34    | 5.34    | 5.34    | 0.62  | 1.33 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 40.0 ± 5%    | 1.40 ± 5%    | 5.16    | 5.16    | 5.16    | 0.48  | 1.52 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 39.2 ± 5%    | 1.80 ± 5%    | 4.56    | 4.56    | 4.56    | 0.47  | 1.66 ± 11.0%    |

<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.

## DASY - Parameters of Probe: ES3DV3 SN:3209

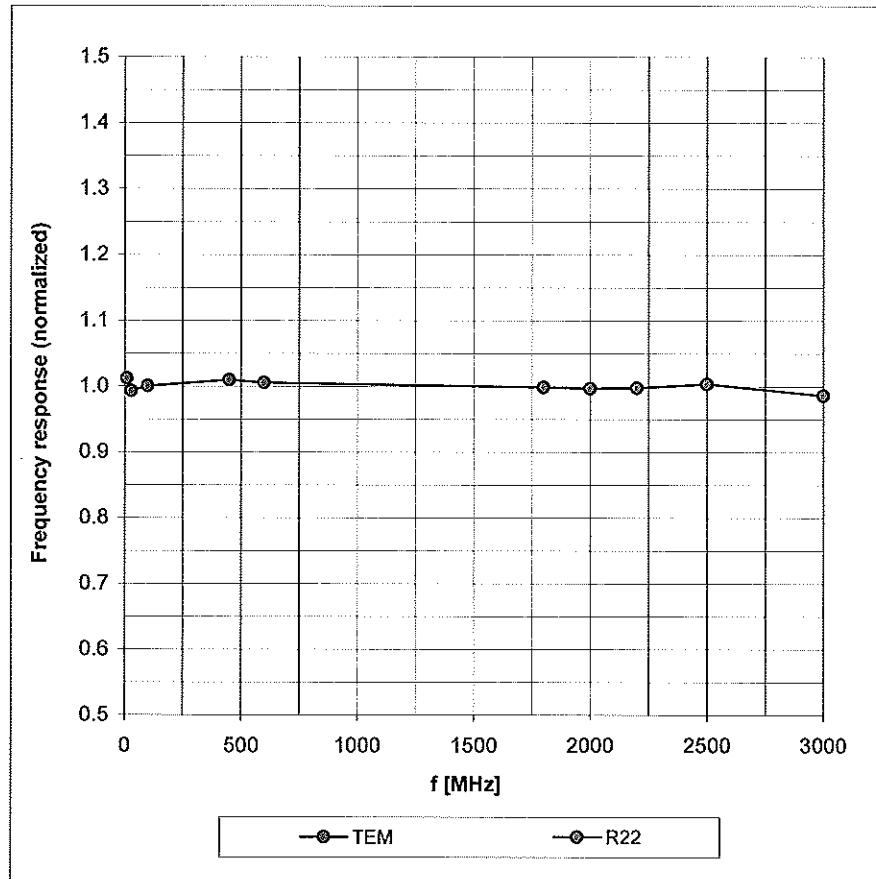
### Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 750     | ± 50 / ± 100                | 55.5 ± 5%    | 0.96 ± 5%    | 6.24    | 6.24    | 6.24    | 0.99  | 1.08 ± 11.0%    |
| 835     | ± 50 / ± 100                | 55.2 ± 5%    | 0.97 ± 5%    | 6.09    | 6.09    | 6.09    | 0.89  | 1.15 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 53.4 ± 5%    | 1.49 ± 5%    | 4.85    | 4.85    | 4.85    | 0.32  | 2.16 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 53.3 ± 5%    | 1.52 ± 5%    | 4.65    | 4.65    | 4.65    | 0.36  | 2.14 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 52.7 ± 5%    | 1.95 ± 5%    | 4.35    | 4.35    | 4.35    | 0.74  | 1.25 ± 11.0%    |
| 2600    | ± 50 / ± 100                | 52.5 ± 5%    | 2.16 ± 5%    | 4.25    | 4.25    | 4.25    | 0.99  | 1.06 ± 11.0%    |

<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.

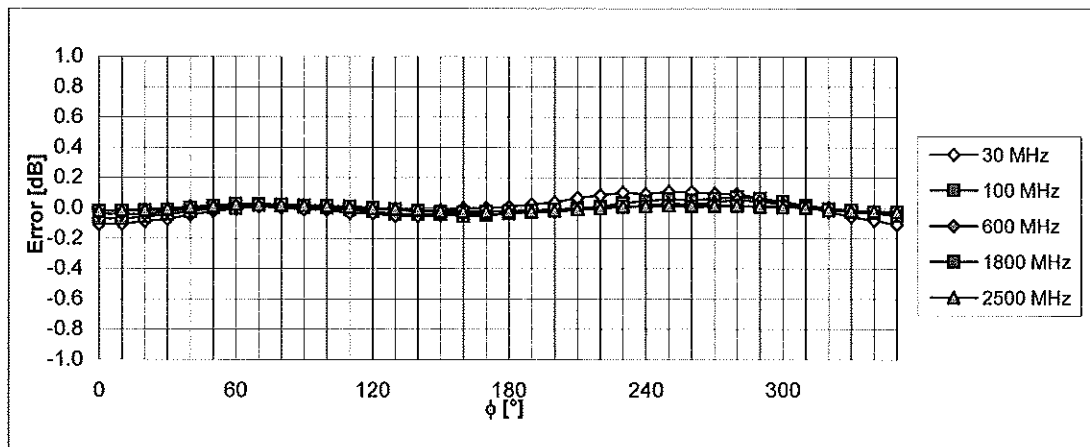
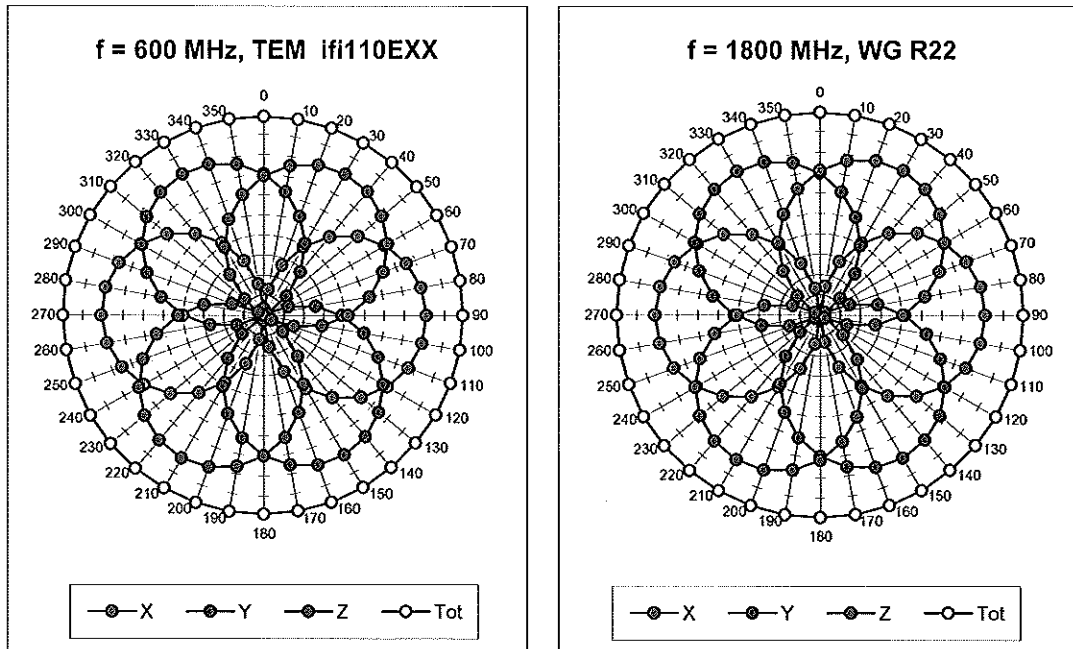
## Frequency Response of E-Field

(TEM-Cell: lfi110 EXX, Waveguide: R22)



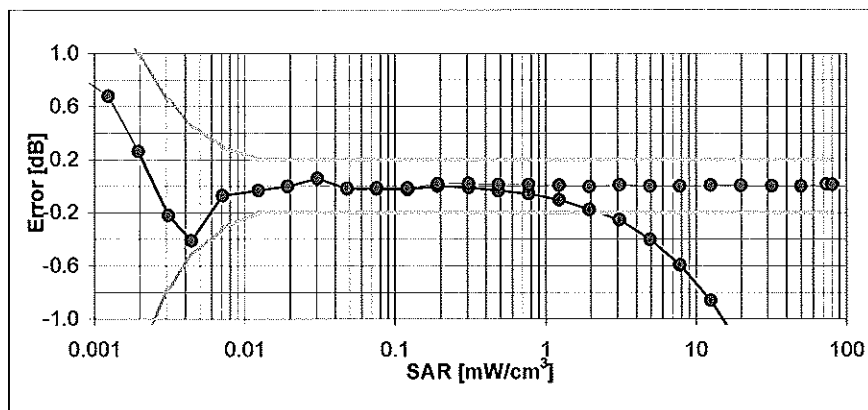
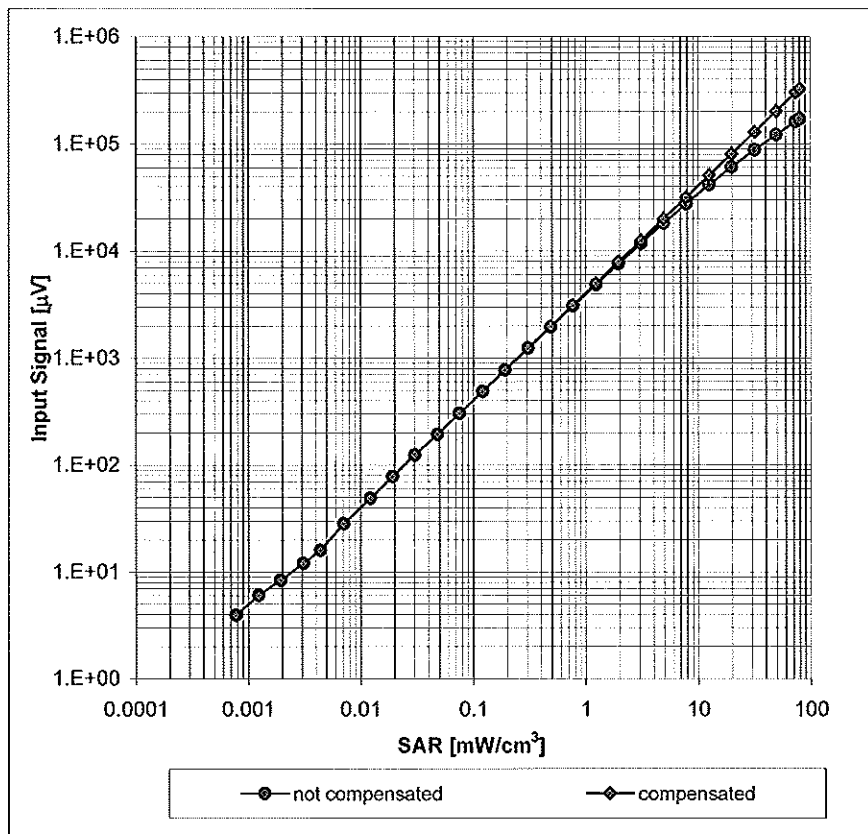
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



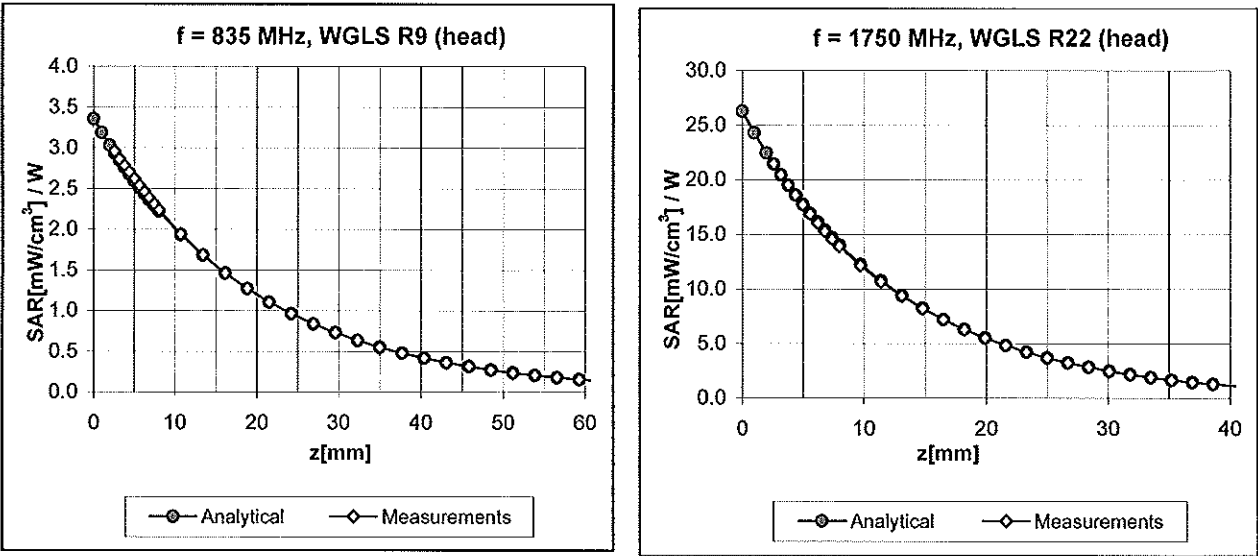
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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



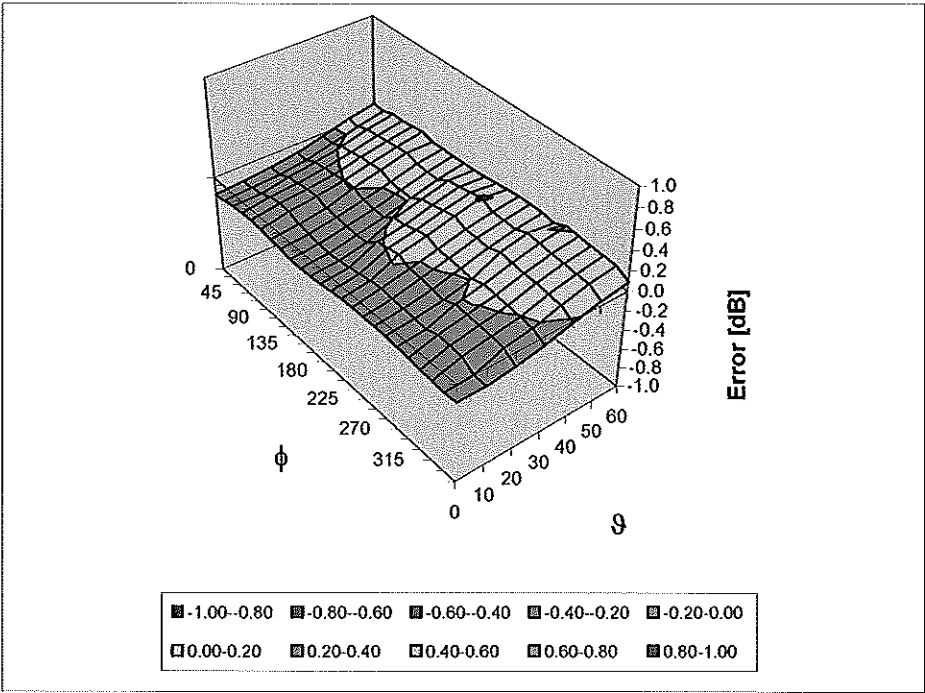
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

# Conversion Factor Assessment



# Deviation from Isotropy in HSL

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



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

## Other Probe Parameters

|                                               |                |
|-----------------------------------------------|----------------|
| Sensor Arrangement                            | Triangular     |
| Connector Angle (°)                           | Not applicable |
| Mechanical Surface Detection Mode             | enabled        |
| Optical Surface Detection Mode                | disabled       |
| Probe Overall Length                          | 337 mm         |
| Probe Body Diameter                           | 10 mm          |
| Tip Length                                    | 10 mm          |
| Tip Diameter                                  | 4.0 mm         |
| Probe Tip to Sensor X Calibration Point       | 2 mm           |
| Probe Tip to Sensor Y Calibration Point       | 2 mm           |
| Probe Tip to Sensor Z Calibration Point       | 2 mm           |
| Recommended Measurement Distance from Surface | 3 mm           |



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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **EX3-3550\_Jan10**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3550**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2  
Calibration procedure for dosimetric E-field probes**

Calibration date: **January 26, 2010**

✓  
1/26/10

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #            | Cal Date (Certificate No.)     | Scheduled Calibration |
|----------------------------|-----------------|--------------------------------|-----------------------|
| Power meter E4419B         | GB41293874      | 1-Apr-09 (No. 217-01030)       | Apr-10                |
| Power sensor E4412A        | MY41495277      | 1-Apr-09 (No. 217-01030)       | Apr-10                |
| Power sensor E4412A        | MY41498087      | 1-Apr-09 (No. 217-01030)       | Apr-10                |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 31-Mar-09 (No. 217-01026)      | Mar-10                |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 31-Mar-09 (No. 217-01028)      | Mar-10                |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 31-Mar-09 (No. 217-01027)      | Mar-10                |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-09 (No. ES3-3013_Dec09) | Dec-10                |
| DAE4                       | SN: 660         | 29-Sep-09 (No. DAE4-660_Sep09) | Sep-10                |

| Secondary Standards       | ID #         | Check Date (in house)             | Scheduled Check        |
|---------------------------|--------------|-----------------------------------|------------------------|
| RF generator HP 8648C     | US3642U01700 | 4-Aug-99 (in house check Oct-09)  | In house check: Oct-11 |
| Network Analyzer HP 8753E | US37390585   | 18-Oct-01 (in house check Oct-09) | In house check: Oct10  |

|                |               |                   |           |
|----------------|---------------|-------------------|-----------|
|                | Name          | Function          | Signature |
| Calibrated by: | Katja Pokovic | Technical Manager |           |
| Approved by:   | Fin Bornholt  | R&D Director      |           |

Issued: January 26, 2010

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Accreditation No.: **SCS 108**

### Glossary:

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

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

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

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<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 with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to 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.

# Probe EX3DV4

## SN:3550

|                  |                  |
|------------------|------------------|
| Manufactured:    | May 19, 2004     |
| Last calibrated: | January 21, 2009 |
| Recalibrated:    | January 26, 2010 |

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

**DASY - Parameters of Probe: EX3DV4 SN:3550****Basic Calibration Parameters**

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-----------------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.48     | 0.47     | 0.48     | ± 10.1%   |
| DCP (mV) <sup>B</sup>                                     | 92.9     | 88.4     | 91.4     |           |

**Modulation Calibration Parameters**

| UID   | Communication System Name | PAR  |   | A<br>dB | B<br>dBuV | C    | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-------|---------------------------|------|---|---------|-----------|------|----------|---------------------------|
| 10000 | CW                        | 0.00 | X | 0.00    | 0.00      | 1.00 | 300      | ± 1.5%                    |
|       |                           |      | Y | 0.00    | 0.00      | 1.00 | 300      |                           |
|       |                           |      | Z | 0.00    | 0.00      | 1.00 | 300      |                           |

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 Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

## DASY - Parameters of Probe: EX3DV4 SN:3550

### Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 835     | ± 50 / ± 100                | 41.5 ± 5%    | 0.90 ± 5%    | 8.28    | 8.28    | 8.28    | 0.45  | 0.70 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 40.1 ± 5%    | 1.37 ± 5%    | 7.03    | 7.03    | 7.03    | 0.39  | 0.75 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 40.0 ± 5%    | 1.40 ± 5%    | 6.81    | 6.81    | 6.81    | 0.32  | 0.81 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 39.2 ± 5%    | 1.80 ± 5%    | 6.21    | 6.21    | 6.21    | 0.22  | 1.07 ± 11.0%    |

<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.

## DASY - Parameters of Probe: EX3DV4 SN:3550

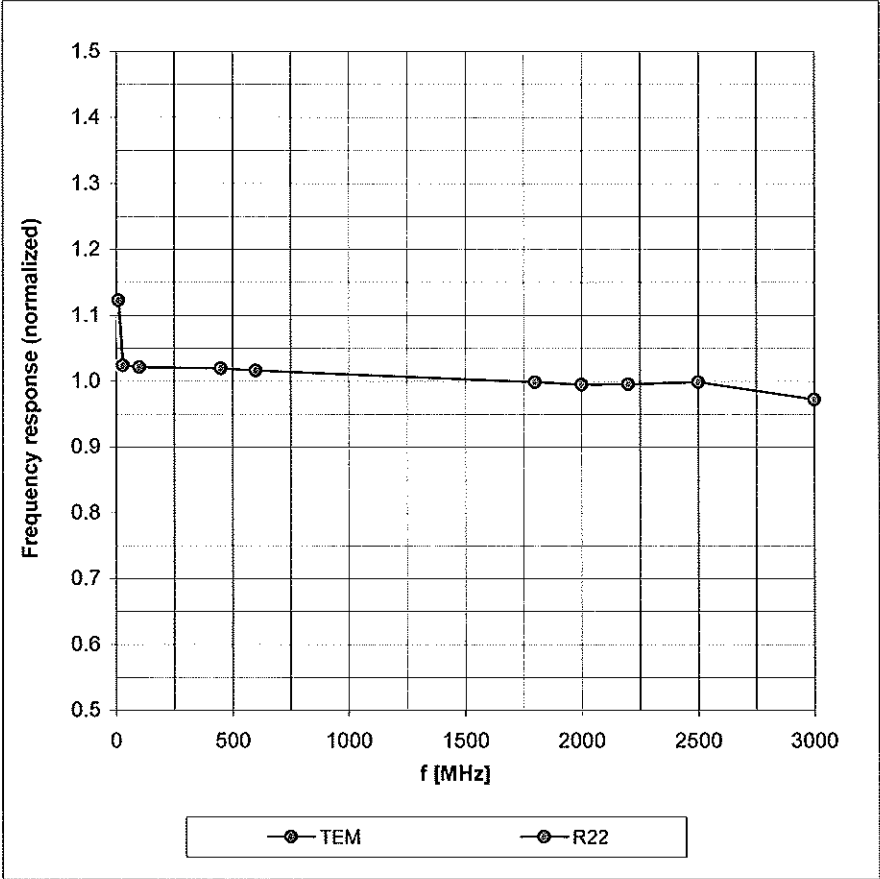
### Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 835     | ± 50 / ± 100                | 55.2 ± 5%    | 0.97 ± 5%    | 8.30    | 8.30    | 8.30    | 0.47  | 0.76 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 53.4 ± 5%    | 1.49 ± 5%    | 6.90    | 6.90    | 6.90    | 0.49  | 0.69 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 53.3 ± 5%    | 1.52 ± 5%    | 6.63    | 6.63    | 6.63    | 0.76  | 0.54 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 52.7 ± 5%    | 1.95 ± 5%    | 6.40    | 6.40    | 6.40    | 0.22  | 1.09 ± 11.0%    |
| 2600    | ± 50 / ± 100                | 52.5 ± 5%    | 2.16 ± 5%    | 6.26    | 6.26    | 6.26    | 0.19  | 1.42 ± 11.0%    |
| 4950    | ± 50 / ± 100                | 49.4 ± 5%    | 5.01 ± 5%    | 3.64    | 3.64    | 3.64    | 0.50  | 1.75 ± 13.1%    |
| 5200    | ± 50 / ± 100                | 49.0 ± 5%    | 5.30 ± 5%    | 3.73    | 3.73    | 3.73    | 0.50  | 1.75 ± 13.1%    |
| 5300    | ± 50 / ± 100                | 48.5 ± 5%    | 5.42 ± 5%    | 3.52    | 3.52    | 3.52    | 0.52  | 1.75 ± 13.1%    |
| 5500    | ± 50 / ± 100                | 48.6 ± 5%    | 5.65 ± 5%    | 3.26    | 3.26    | 3.26    | 0.55  | 1.80 ± 13.1%    |
| 5600    | ± 50 / ± 100                | 48.5 ± 5%    | 5.77 ± 5%    | 3.16    | 3.16    | 3.16    | 0.65  | 1.80 ± 13.1%    |
| 5800    | ± 50 / ± 100                | 48.2 ± 5%    | 6.00 ± 5%    | 3.30    | 3.30    | 3.30    | 0.60  | 1.75 ± 13.1%    |

<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.

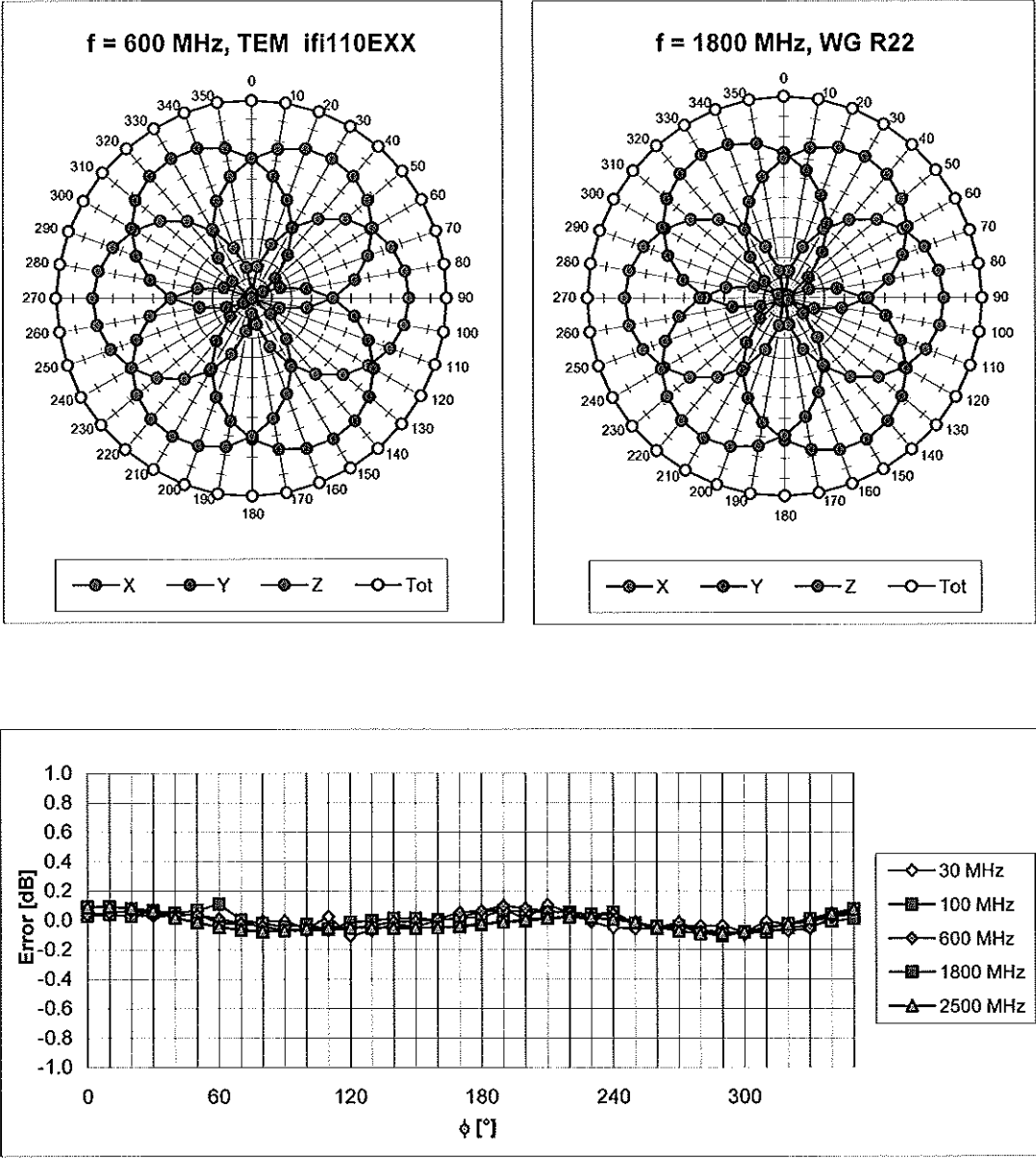
# Frequency Response of E-Field

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



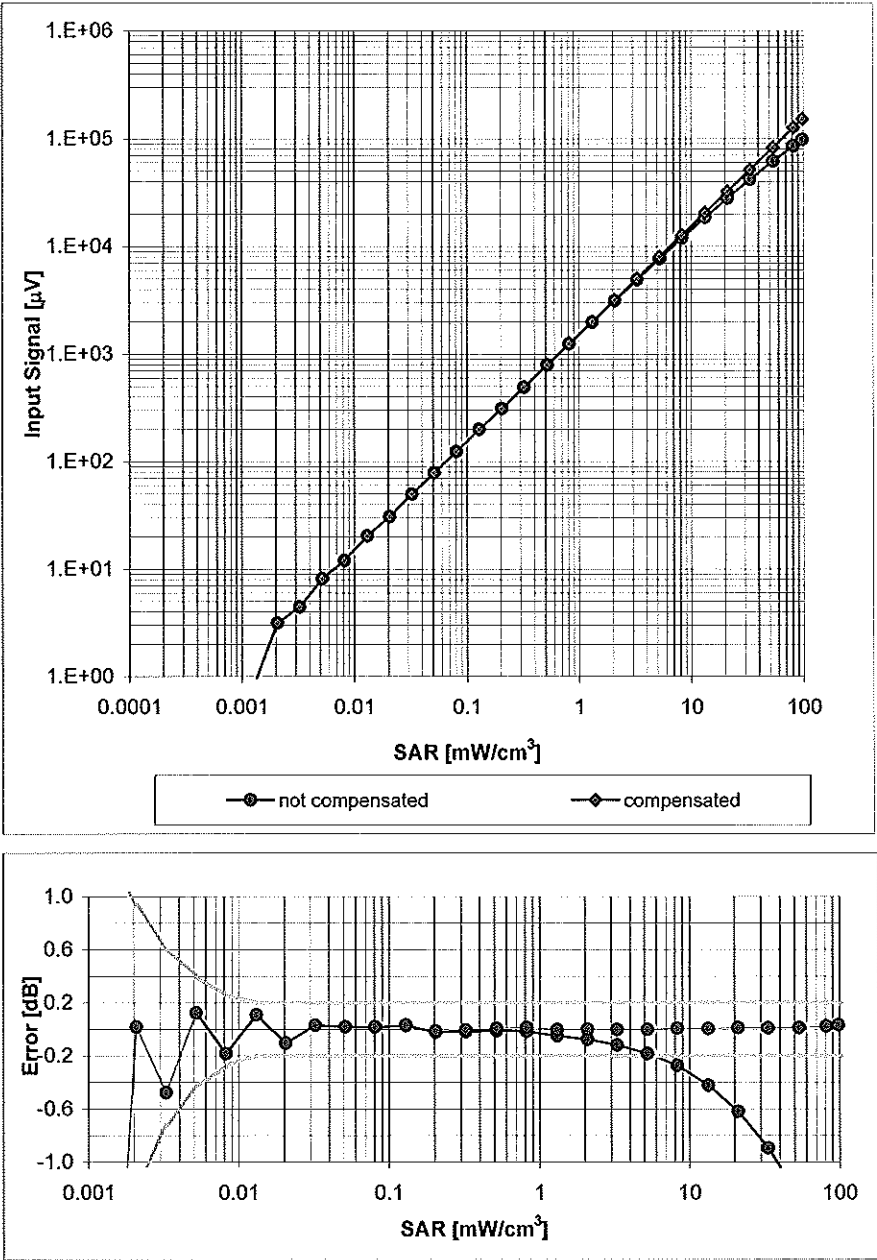
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

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



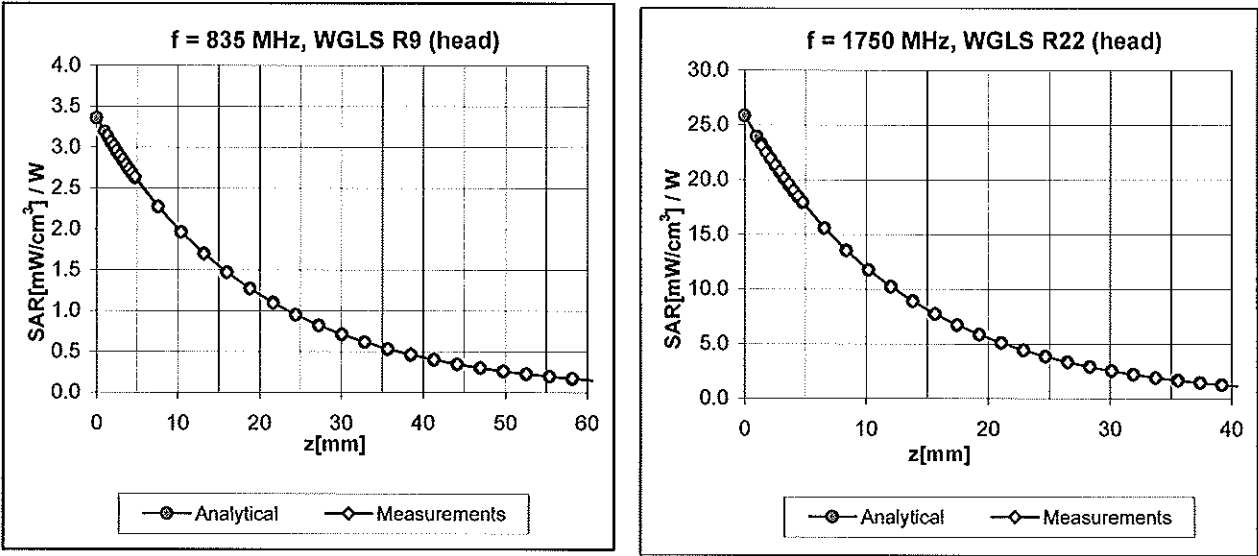
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

Dynamic Range f(SAR<sub>head</sub>)  
(Waveguide R22, f = 1800 MHz)



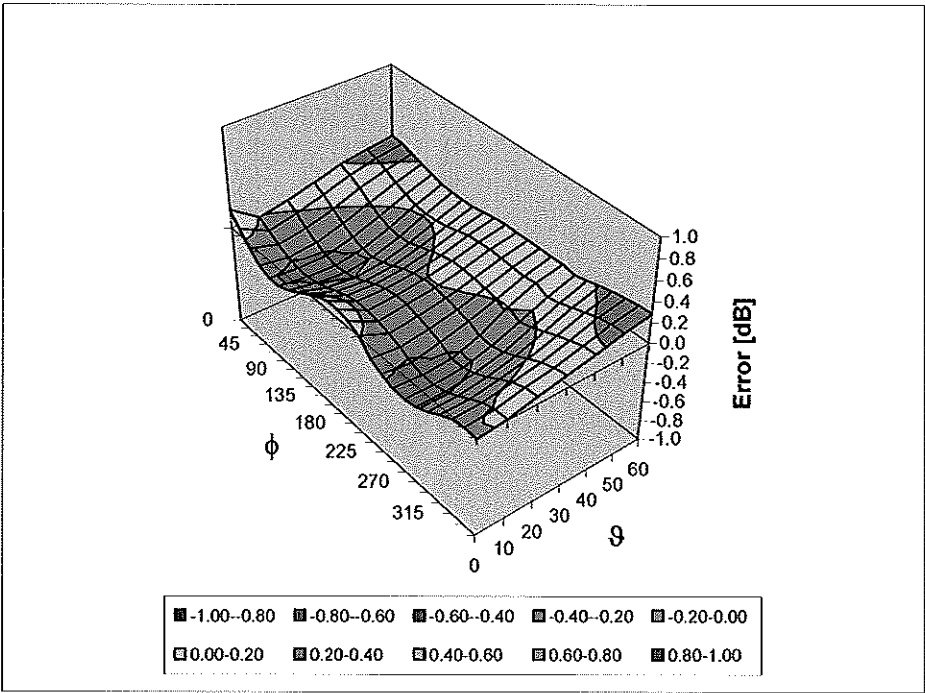
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ, θ), f = 900 MHz



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

## Other Probe Parameters

|                                               |                |
|-----------------------------------------------|----------------|
| Sensor Arrangement                            | Triangular     |
| Connector Angle (°)                           | Not applicable |
| Mechanical Surface Detection Mode             | enabled        |
| Optical Surface Detection Mode                | disabled       |
| Probe Overall Length                          | 337 mm         |
| Probe Body Diameter                           | 10 mm          |
| Tip Length                                    | 9 mm           |
| Tip Diameter                                  | 2.5 mm         |
| Probe Tip to Sensor X Calibration Point       | 1 mm           |
| Probe Tip to Sensor Y Calibration Point       | 1 mm           |
| Probe Tip to Sensor Z Calibration Point       | 1 mm           |
| Recommended Measurement Distance from Surface | 2 mm           |



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **EX3-3561\_Aug10**

## CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3561**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2  
Calibration procedure for dosimetric E-field probes**

Calibration date: **August 19, 2010**

*KOK  
8/30/10*

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards          | ID #            | Cal Date (Certificate No.)        | Scheduled Calibration  |
|----------------------------|-----------------|-----------------------------------|------------------------|
| Power meter E4419B         | GB41293874      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Power sensor E4412A        | MY41495277      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Power sensor E4412A        | MY41498087      | 1-Apr-10 (No. 217-01136)          | Apr-11                 |
| Reference 3 dB Attenuator  | SN: S5054 (3c)  | 30-Mar-10 (No. 217-01159)         | Mar-11                 |
| Reference 20 dB Attenuator | SN: S5086 (20b) | 30-Mar-10 (No. 217-01161)         | Mar-11                 |
| Reference 30 dB Attenuator | SN: S5129 (30b) | 30-Mar-10 (No. 217-01160)         | Mar-11                 |
| Reference Probe ES3DV2     | SN: 3013        | 30-Dec-09 (No. ES3-3013_Dec09)    | Dec-10                 |
| DAE4                       | SN: 660         | 20-Apr-10 (No. DAE4-660_Apr10)    | Apr-11                 |
| Secondary Standards        | ID #            | Check Date (in house)             | Scheduled Check        |
| RF generator HP 8648C      | US3642U01700    | 4-Aug-99 (in house check Oct-09)  | In house check: Oct-11 |
| Network Analyzer HP 8753E  | US37390585      | 18-Oct-01 (in house check Oct-09) | In house check: Oct10  |

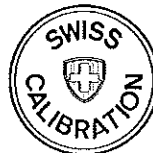
Calibrated by: **Katja Pokovic** **Technical Manager**

Approved by: **Niels Kuster** **Quality Manager**

*[Signatures]*

Issued: August 20, 2010

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



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## Glossary:

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

## Calibration is Performed According to the Following Standards:

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

## Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the  $E^2$ -field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to 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.

# Probe EX3DV4

## SN:3561

|                  |                   |
|------------------|-------------------|
| Manufactured:    | February 14, 2005 |
| Last calibrated: | August 26, 2008   |
| Recalibrated:    | August 19, 2010   |

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

**DASY/EASY - Parameters of Probe: EX3DV4 SN:3561****Basic Calibration Parameters**

|                                                           | Sensor X | Sensor Y | Sensor Z | Unc (k=2) |
|-----------------------------------------------------------|----------|----------|----------|-----------|
| Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup> | 0.45     | 0.48     | 0.43     | ± 10.1%   |
| DCP (mV) <sup>B</sup>                                     | 87.4     | 89.6     | 88.5     |           |

**Modulation Calibration Parameters**

| UID   | Communication System Name | PAR  |   | A<br>dB | B<br>dBuV | C    | VR<br>mV | Unc <sup>E</sup><br>(k=2) |
|-------|---------------------------|------|---|---------|-----------|------|----------|---------------------------|
| 10000 | CW                        | 0.00 | X | 0.00    | 0.00      | 1.00 | 300      | ± 1.5%                    |
|       |                           |      | Y | 0.00    | 0.00      | 1.00 | 300      |                           |
|       |                           |      | Z | 0.00    | 0.00      | 1.00 | 300      |                           |

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  $\hat{E}$  field uncertainty inside TSL (see Pages 5 and 6).

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

<sup>E</sup> Uncertainty is determined using the maximum deviation from linear response applying rectangular distribution and is expressed for the square of the field value

## DASY/EASY - Parameters of Probe: EX3DV4 SN:3561

### Calibration Parameter Determined in Head Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 750     | ± 50 / ± 100                | 41.9 ± 5%    | 0.89 ± 5%    | 8.36    | 8.36    | 8.36    | 0.76  | 0.64 ± 11.0%    |
| 835     | ± 50 / ± 100                | 41.5 ± 5%    | 0.90 ± 5%    | 7.96    | 7.96    | 7.96    | 0.75  | 0.64 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 40.1 ± 5%    | 1.37 ± 5%    | 6.92    | 6.92    | 6.92    | 0.90  | 0.57 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 40.0 ± 5%    | 1.40 ± 5%    | 6.69    | 6.69    | 6.69    | 0.76  | 0.63 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 39.2 ± 5%    | 1.80 ± 5%    | 6.11    | 6.11    | 6.11    | 0.42  | 0.83 ± 11.0%    |
| 2600    | ± 50 / ± 100                | 39.0 ± 5%    | 1.96 ± 5%    | 6.09    | 6.09    | 6.09    | 0.36  | 0.93 ± 11.0%    |

<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.

## DASY/EASY - Parameters of Probe: EX3DV4 SN:3561

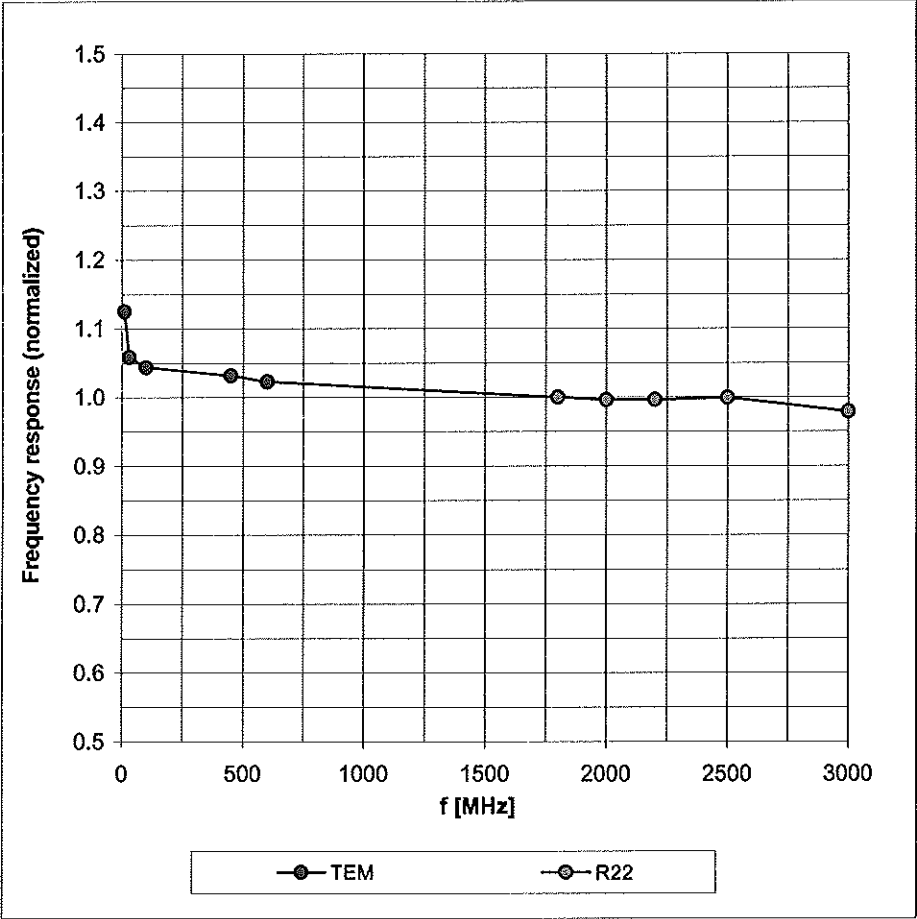
### Calibration Parameter Determined in Body Tissue Simulating Media

| f [MHz] | Validity [MHz] <sup>c</sup> | Permittivity | Conductivity | ConvF X | ConvF Y | ConvF Z | Alpha | Depth Unc (k=2) |
|---------|-----------------------------|--------------|--------------|---------|---------|---------|-------|-----------------|
| 835     | ± 50 / ± 100                | 55.2 ± 5%    | 0.97 ± 5%    | 8.09    | 8.09    | 8.09    | 0.74  | 0.65 ± 11.0%    |
| 1750    | ± 50 / ± 100                | 53.4 ± 5%    | 1.49 ± 5%    | 6.84    | 6.84    | 6.84    | 0.43  | 0.82 ± 11.0%    |
| 1900    | ± 50 / ± 100                | 53.3 ± 5%    | 1.52 ± 5%    | 6.59    | 6.59    | 6.59    | 0.56  | 0.71 ± 11.0%    |
| 2450    | ± 50 / ± 100                | 52.7 ± 5%    | 1.95 ± 5%    | 6.44    | 6.44    | 6.44    | 0.37  | 0.87 ± 11.0%    |
| 2600    | ± 50 / ± 100                | 52.5 ± 5%    | 2.16 ± 5%    | 6.45    | 6.45    | 6.45    | 0.37  | 0.95 ± 11.0%    |
| 4950    | ± 50 / ± 100                | 49.4 ± 5%    | 5.01 ± 5%    | 3.80    | 3.80    | 3.80    | 0.53  | 1.90 ± 13.1%    |
| 5200    | ± 50 / ± 100                | 49.0 ± 5%    | 5.30 ± 5%    | 3.67    | 3.67    | 3.67    | 0.60  | 1.95 ± 13.1%    |
| 5300    | ± 50 / ± 100                | 48.5 ± 5%    | 5.42 ± 5%    | 3.42    | 3.42    | 3.42    | 0.63  | 1.95 ± 13.1%    |
| 5500    | ± 50 / ± 100                | 48.6 ± 5%    | 5.65 ± 5%    | 3.31    | 3.31    | 3.31    | 0.63  | 1.95 ± 13.1%    |
| 5600    | ± 50 / ± 100                | 48.5 ± 5%    | 5.77 ± 5%    | 3.12    | 3.12    | 3.12    | 0.65  | 1.95 ± 13.1%    |
| 5800    | ± 50 / ± 100                | 48.2 ± 5%    | 6.00 ± 5%    | 3.25    | 3.25    | 3.25    | 0.65  | 1.95 ± 13.1%    |

<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.

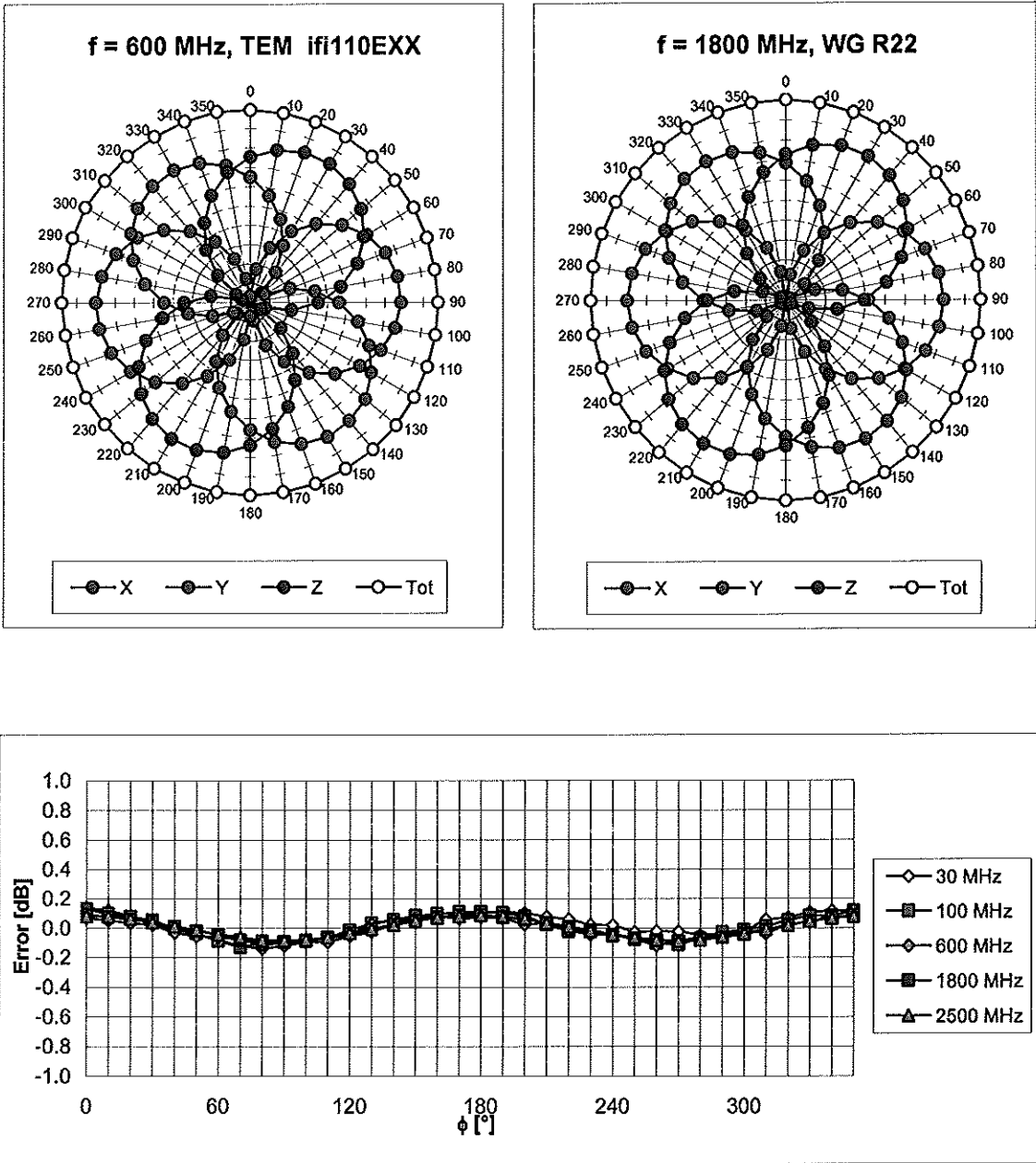
# Frequency Response of E-Field

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



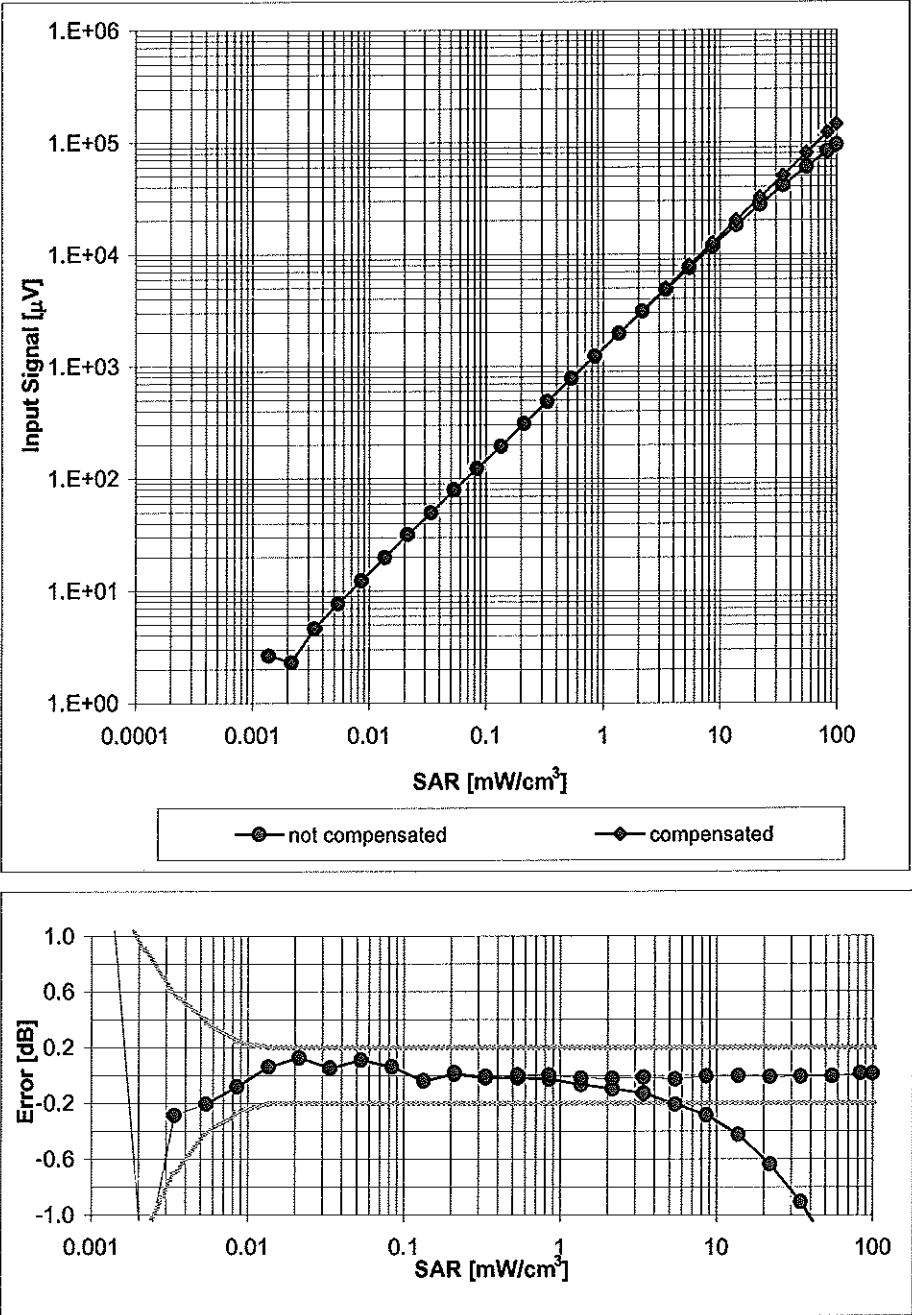
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



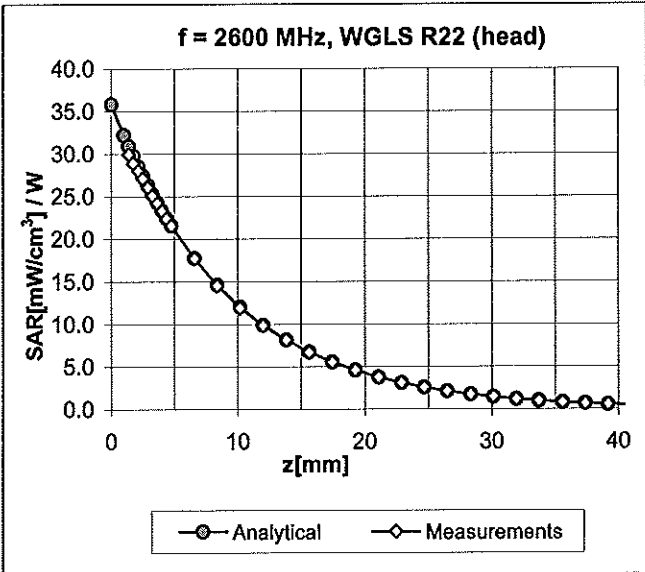
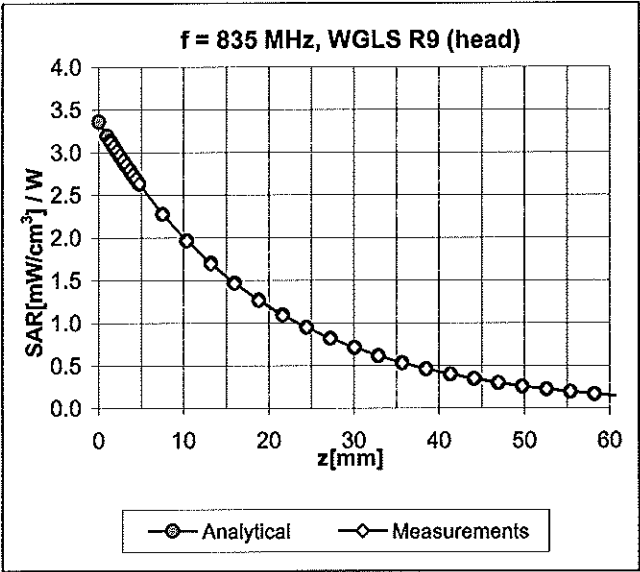
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

Dynamic Range f(SAR<sub>head</sub>)  
(Waveguide R22, f = 1800 MHz)



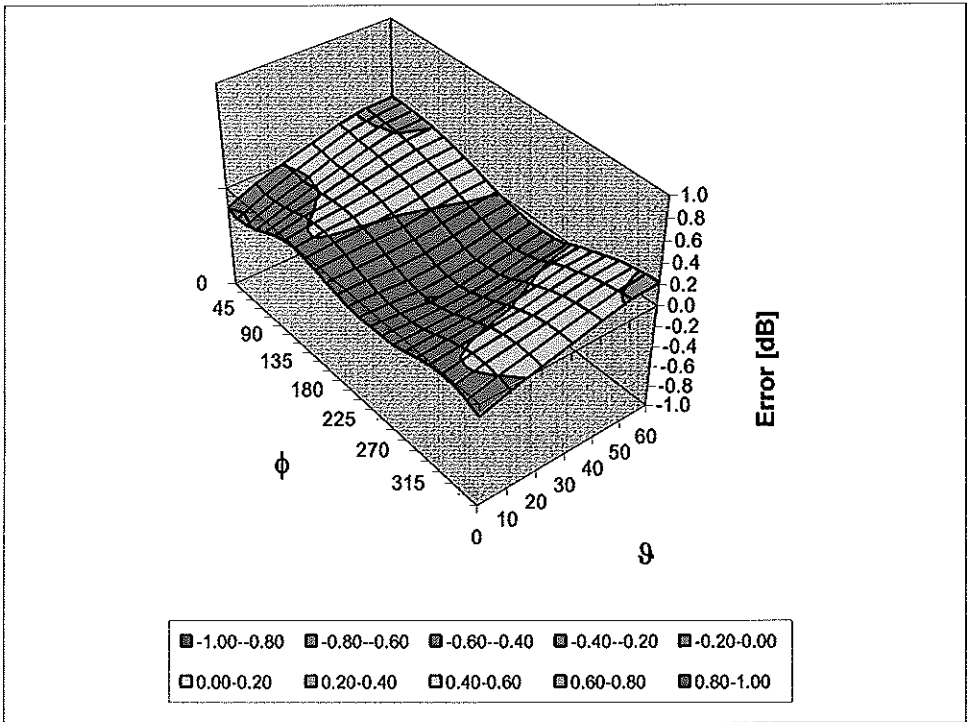
Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

Conversion Factor Assessment



Deviation from Isotropy in HSL

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



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

## Other Probe Parameters

|                                               |                |
|-----------------------------------------------|----------------|
| Sensor Arrangement                            | Triangular     |
| Connector Angle (°)                           | Not applicable |
| Mechanical Surface Detection Mode             | enabled        |
| Optical Surface Detection Mode                | disabled       |
| Probe Overall Length                          | 337 mm         |
| Probe Body Diameter                           | 10 mm          |
| Tip Length                                    | 9 mm           |
| Tip Diameter                                  | 2.5 mm         |
| Probe Tip to Sensor X Calibration Point       | 1 mm           |
| Probe Tip to Sensor Y Calibration Point       | 1 mm           |
| Probe Tip to Sensor Z Calibration Point       | 1 mm           |
| Recommended Measurement Distance from Surface | 2 mm           |



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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d026\_Aug09**

## CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d026**

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

Calibration date: **August 24, 2009**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Certificate No.)     | Scheduled Calibration |
|-----------------------------|--------------------|--------------------------------|-----------------------|
| Power meter EPM-442A        | GB37480704         | 08-Oct-08 (No. 217-00898)      | Oct-09                |
| Power sensor HP 8481A       | US37292783         | 08-Oct-08 (No. 217-00898)      | Oct-09                |
| Reference 20 dB Attenuator  | SN: 5086 (20g)     | 31-Mar-09 (No. 217-01025)      | Mar-10                |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 31-Mar-09 (No. 217-01029)      | Mar-10                |
| Reference Probe ES3DV3      | SN: 3205           | 26-Jun-09 (No. ES3-3205_Jun09) | Jun-10                |
| DAE4                        | SN: 601            | 07-Mar-09 (No. DAE4-601_Mar09) | Mar-10                |

| Secondary Standards       | ID #             | Check Date (In house)             | Scheduled Check        |
|---------------------------|------------------|-----------------------------------|------------------------|
| Power sensor HP 8481A     | MY41092317       | 18-Oct-02 (in house check Oct-07) | In house check: Oct-09 |
| RF generator R&S SMT-06   | 100005           | 4-Aug-99 (in house check Oct-07)  | In house check: Oct-09 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-08) | In house check: Oct-09 |

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

Issued: August 25, 2009

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Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

### Glossary:

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

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

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

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

## Measurement Conditions

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

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

## Head TSL parameters

The following parameters and calculations were applied.

|                                  | Temperature         | Permittivity   | Conductivity         |
|----------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters      | 22.0 °C             | 41.5           | 0.90 mho/m           |
| Measured Head TSL parameters     | (22.0 $\pm$ 0.2) °C | 41.2 $\pm$ 6 % | 0.90 mho/m $\pm$ 6 % |
| Head TSL temperature during test | (22.0 $\pm$ 0.2) °C | ----           | ----                 |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                |
|-------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                          | 250 mW input power | 2.37 mW / g                    |
| SAR normalized                                        | normalized to 1W   | 9.48 mW / g                    |
| SAR for nominal Head TSL parameters <sup>1</sup>      | normalized to 1W   | 9.46 mW / g $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                            | 250 mW input power | 1.55 mW / g                    |
| SAR normalized                                          | normalized to 1W   | 6.20 mW / g                    |
| SAR for nominal Head TSL parameters <sup>1</sup>        | normalized to 1W   | 6.19 mW / g $\pm$ 16.5 % (k=2) |

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

## Body TSL parameters

The following parameters and calculations were applied.

|                                  | Temperature     | Permittivity | Conductivity     |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters      | 22.0 °C         | 55.2         | 0.97 mho/m       |
| Measured Body TSL parameters     | (22.0 ± 0.2) °C | 53.4 ± 6 %   | 0.99 mho/m ± 6 % |
| Body TSL temperature during test | (22.5 ± 0.2) °C | ----         | ----             |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                            |
|-------------------------------------------------------|--------------------|----------------------------|
| SAR measured                                          | 250 mW input power | 2.50 mW / g                |
| SAR normalized                                        | normalized to 1W   | 10.0 mW / g                |
| SAR for nominal Body TSL parameters <sup>2</sup>      | normalized to 1W   | 9.78 mW / g ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                            |
|---------------------------------------------------------|--------------------|----------------------------|
| SAR measured                                            | 250 mW input power | 1.63 mW / g                |
| SAR normalized                                          | normalized to 1W   | 6.52 mW / g                |
| SAR for nominal Body TSL parameters <sup>2</sup>        | normalized to 1W   | 6.42 mW / g ± 16.5 % (k=2) |

---

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

## Appendix

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 51.0 $\Omega$ - 7.5 j $\Omega$ |
| Return Loss                          | - 22.5 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 46.9 $\Omega$ - 8.6 j $\Omega$ |
| Return Loss                          | - 20.6 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.388 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 | December 17, 2004 |

## DASY5 Validation Report for Head TSL

Date/Time: 24.08.2009 13:11:23

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d026**

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

Medium: HSL 900 MHz

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.9$  mho/m;  $\epsilon_r = 41.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

### DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

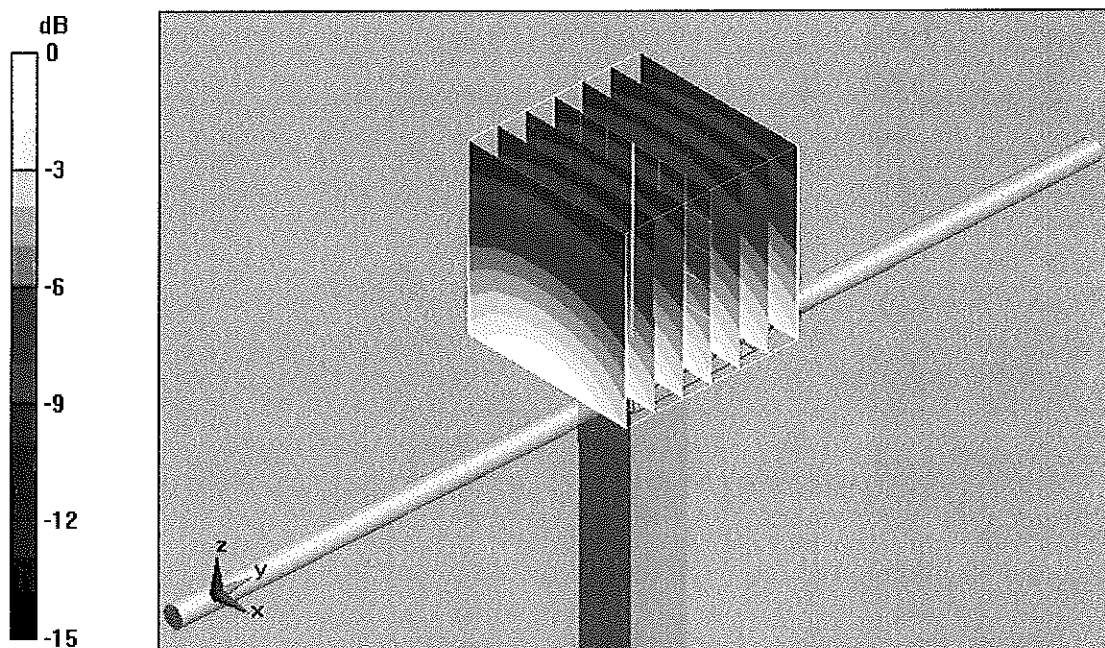
**Pin=250mW; dip=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm**

Reference Value = 57.1 V/m; Power Drift = 0.016 dB

Peak SAR (extrapolated) = 3.55 W/kg

**SAR(1 g) = 2.37 mW/g; SAR(10 g) = 1.55 mW/g**

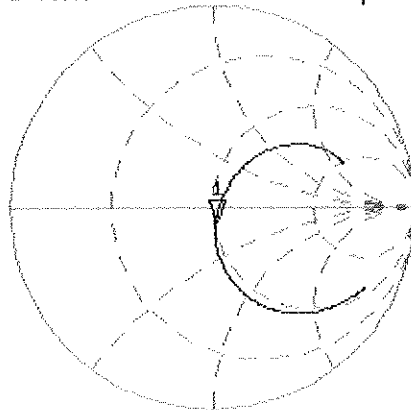
Maximum value of SAR (measured) = 2.77 mW/g



# Impedance Measurement Plot for Head TSL

24 Aug 2009 11:32:41  
 [CH1] S11 1 U FS 1: 50.971  $\Omega$  -7.4922  $\Omega$  25.440 pF 835.000 000 MHz

\*  
 Del  
 CA



Avg  
 16

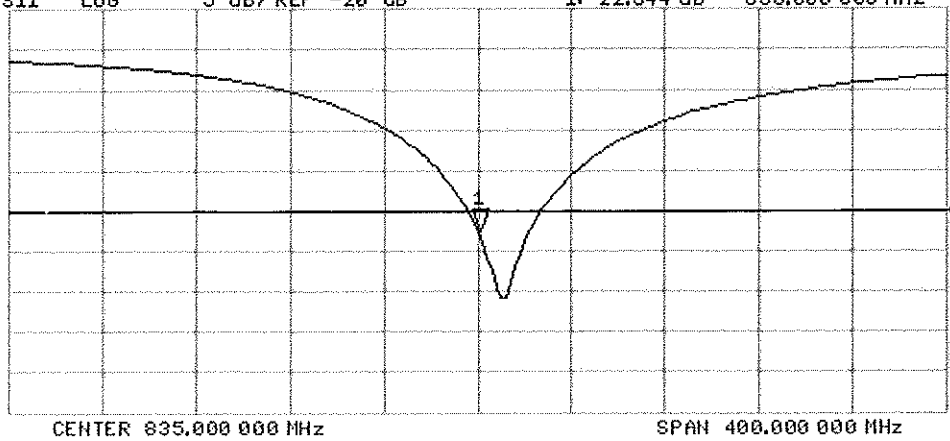
↑

CH2 S11 LOG 5 dB/REF -20 dB 1:-22.544 dB 835.000 000 MHz

CA

Avg  
 16

↑



## DASY5 Validation Report for Body TSL

Date/Time: 17.08.2009 09:50:53

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d026**

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

Medium: MSL900

Medium parameters used:  $f = 835$  MHz;  $\sigma = 0.99$  mho/m;  $\epsilon_r = 53.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

### DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.97, 5.97, 5.97); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

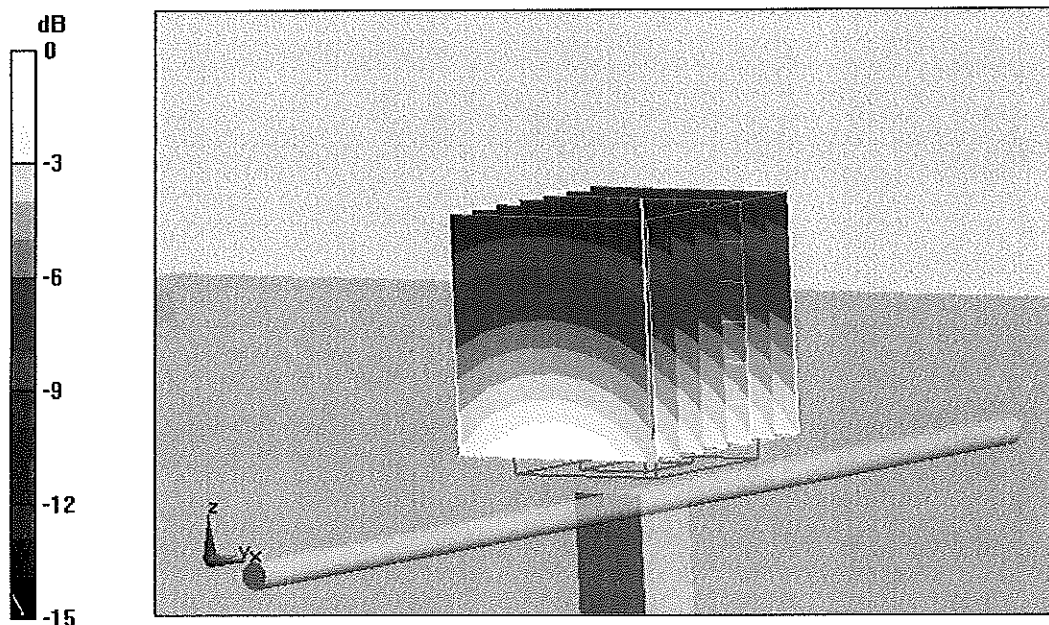
**Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.8 V/m; Power Drift = 0.014 dB

Peak SAR (extrapolated) = 3.71 W/kg

**SAR(1 g) = 2.5 mW/g; SAR(10 g) = 1.63 mW/g**

Maximum value of SAR (measured) = 2.92 mW/g



0 dB = 2.92mW/g

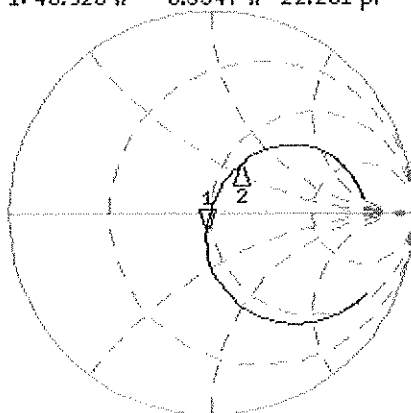
# Impedance Measurement Plot for Body TSL

17 Aug 2009 08:48:23  
 [CH1] S11 1 U FS 1: 46.928  $\Omega$  -8.5547  $\Omega$  22.281 pF 835.000 000 MHz

\*  
 Del  
 Cor

Avg  
 16

↑



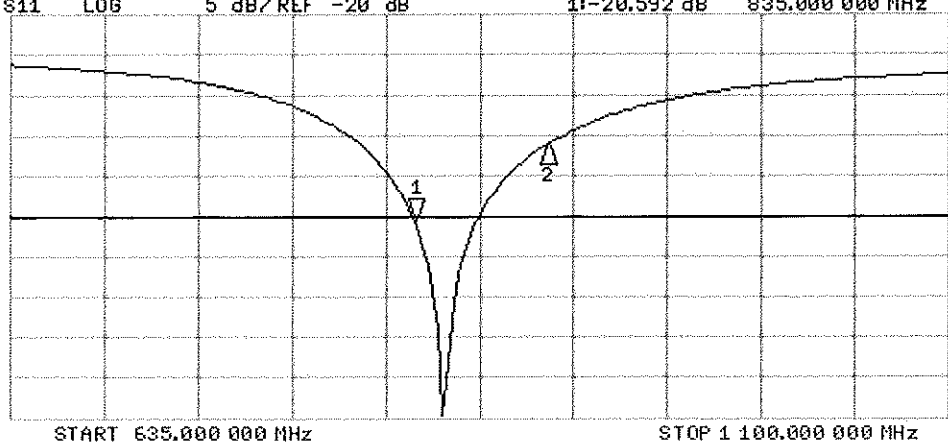
CH1 Markers  
 2: 58.551  $\Omega$   
 30.164  $\Omega$   
 900.000 MHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -20.592 dB 835.000 000 MHz

Cor

Avg  
 16

↑



CH2 Markers  
 2: -11.110 dB  
 900.000 MHz



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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1900V2-5d080-Aug09**

## CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d080**

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

Calibration date: **August 18, 2009**

Condition of the calibrated item **In Tolerance**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration  |
|-----------------------------|--------------------|-------------------------------------------|------------------------|
| Power meter EPM-442A        | GB37480704         | 08-Oct-08 (No. 217-00898)                 | Oct-09                 |
| Power sensor HP 8481A       | US37292783         | 08-Oct-08 (No. 217-00898)                 | Oct-09                 |
| Reference 20 dB Attenuator  | SN: 5086 (20g)     | 31-Mar-09 (No. 217-01025)                 | Mar-10                 |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 31-Mar-09 (No. 217-01029)                 | Mar-10                 |
| Reference Probe ES3DV3      | SN: 3205           | 26-Jun-09 (No. ES3-3205_Jun09)            | Jun-10                 |
| DAE4                        | SN: 601            | 07-Mar-09 (No. DAE4-601_Mar09)            | Mar-10                 |
| Secondary Standards         | ID #               | Check Date (in house)                     | Scheduled Check        |
| Power sensor HP 8481A       | MY41092317         | 18-Oct-02 (in house check Oct-07)         | In house check: Oct-09 |
| RF generator R&S SMT-06     | 100005             | 4-Aug-99 (in house check Oct-07)          | In house check: Oct-09 |
| Network Analyzer HP 8753E   | US37390585 S4206   | 18-Oct-01 (in house check Oct-08)         | In house check: Oct-09 |

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

Approved by: **Katja Pokovic** **Technical Manager**

Issued: August 19, 2009

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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:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

## Measurement Conditions

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

|                                     |                           |             |
|-------------------------------------|---------------------------|-------------|
| <b>DASY Version</b>                 | DASY5                     | V5.0        |
| <b>Extrapolation</b>                | Advanced Extrapolation    |             |
| <b>Phantom</b>                      | Modular Flat Phantom V5.0 |             |
| <b>Distance Dipole Center - TSL</b> | 10 mm                     | with Spacer |
| <b>Zoom Scan Resolution</b>         | dx, dy, dz = 5 mm         |             |
| <b>Frequency</b>                    | 1900 MHz $\pm$ 1 MHz      |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                         | Temperature         | Permittivity   | Conductivity         |
|-----------------------------------------|---------------------|----------------|----------------------|
| <b>Nominal Head TSL parameters</b>      | 22.0 °C             | 40.0           | 1.40 mho/m           |
| <b>Measured Head TSL parameters</b>     | (22.0 $\pm$ 0.2) °C | 40.8 $\pm$ 6 % | 1.45 mho/m $\pm$ 6 % |
| <b>Head TSL temperature during test</b> | (22.0 $\pm$ 0.2) °C | ----           | ----                 |

## SAR result with Head TSL

| <b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b> | condition          |                                                  |
|-------------------------------------------------------------|--------------------|--------------------------------------------------|
| SAR measured                                                | 250 mW input power | 10.2 mW / g                                      |
| SAR normalized                                              | normalized to 1W   | 40.8 mW / g                                      |
| SAR for nominal Head TSL parameters <sup>1</sup>            | normalized to 1W   | <b>40.1 mW / g <math>\pm</math> 17.0 % (k=2)</b> |

| <b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b> | Condition          |                                                  |
|---------------------------------------------------------------|--------------------|--------------------------------------------------|
| SAR measured                                                  | 250 mW input power | 5.30 mW / g                                      |
| SAR normalized                                                | normalized to 1W   | 21.2 mW / g                                      |
| SAR for nominal Head TSL parameters <sup>1</sup>              | normalized to 1W   | <b>21.0 mW / g <math>\pm</math> 16.5 % (k=2)</b> |

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

## Body TSL parameters

The following parameters and calculations were applied.

|                                  | Temperature     | Permittivity | Conductivity     |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters      | 22.0 °C         | 53.3         | 1.52 mho/m       |
| Measured Body TSL parameters     | (22.0 ± 0.2) °C | 53.9 ± 6 %   | 1.57 mho/m ± 6 % |
| Body TSL temperature during test | (22.0 ± 0.2) °C | ----         | ----             |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                            |
|-------------------------------------------------------|--------------------|----------------------------|
| SAR measured                                          | 250 mW input power | 10.3 mW / g                |
| SAR normalized                                        | normalized to 1W   | 41.2 mW / g                |
| SAR for nominal Body TSL parameters <sup>2</sup>      | normalized to 1W   | 40.5 mW / g ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                            |
|---------------------------------------------------------|--------------------|----------------------------|
| SAR measured                                            | 250 mW input power | 5.41 mW / g                |
| SAR normalized                                          | normalized to 1W   | 21.6 mW / g                |
| SAR for nominal Body TSL parameters <sup>2</sup>        | normalized to 1W   | 21.5 mW / g ± 16.5 % (k=2) |

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

## Appendix

### Antenna Parameters with Head TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 50.0 $\Omega$ + 6.1 j $\Omega$ |
| Return Loss                          | - 24.3 dB                      |

### Antenna Parameters with Body TSL

|                                      |                                |
|--------------------------------------|--------------------------------|
| Impedance, transformed to feed point | 47.1 $\Omega$ + 5.7 j $\Omega$ |
| Return Loss                          | - 23.6 dB                      |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.193 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 | June 28, 2006 |

## DASY5 Validation Report for Head TSL

Date/Time: 05.08.2009 14:25:51

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d080**

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

Medium: HSL U11 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.45$  mho/m;  $\epsilon_r = 40.8$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

### DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.09, 5.09, 5.09); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

**Pin = 250 mW; dip = 10 mm, scan at 3.0 mm/Zoom Scan (dist=3.0 mm, probe 0deg)**

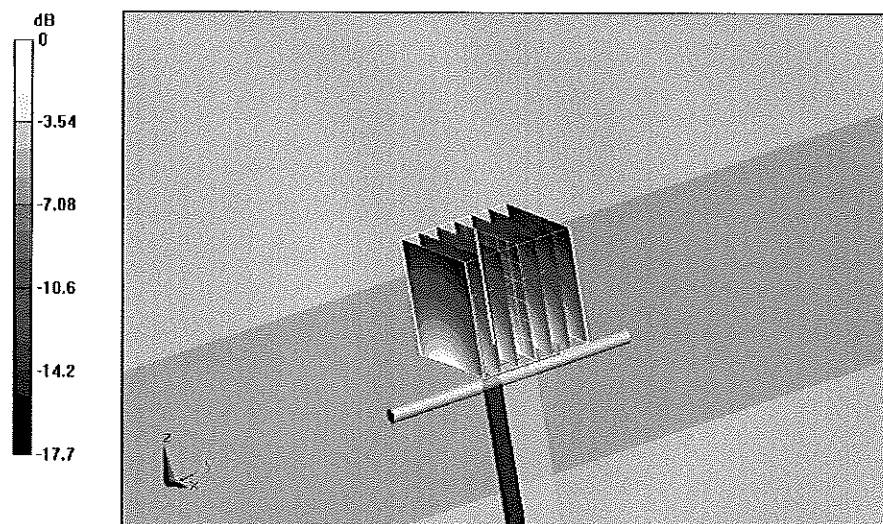
**(7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.9 V/m; Power Drift = 0.040 dB

Peak SAR (extrapolated) = 18.7 W/kg

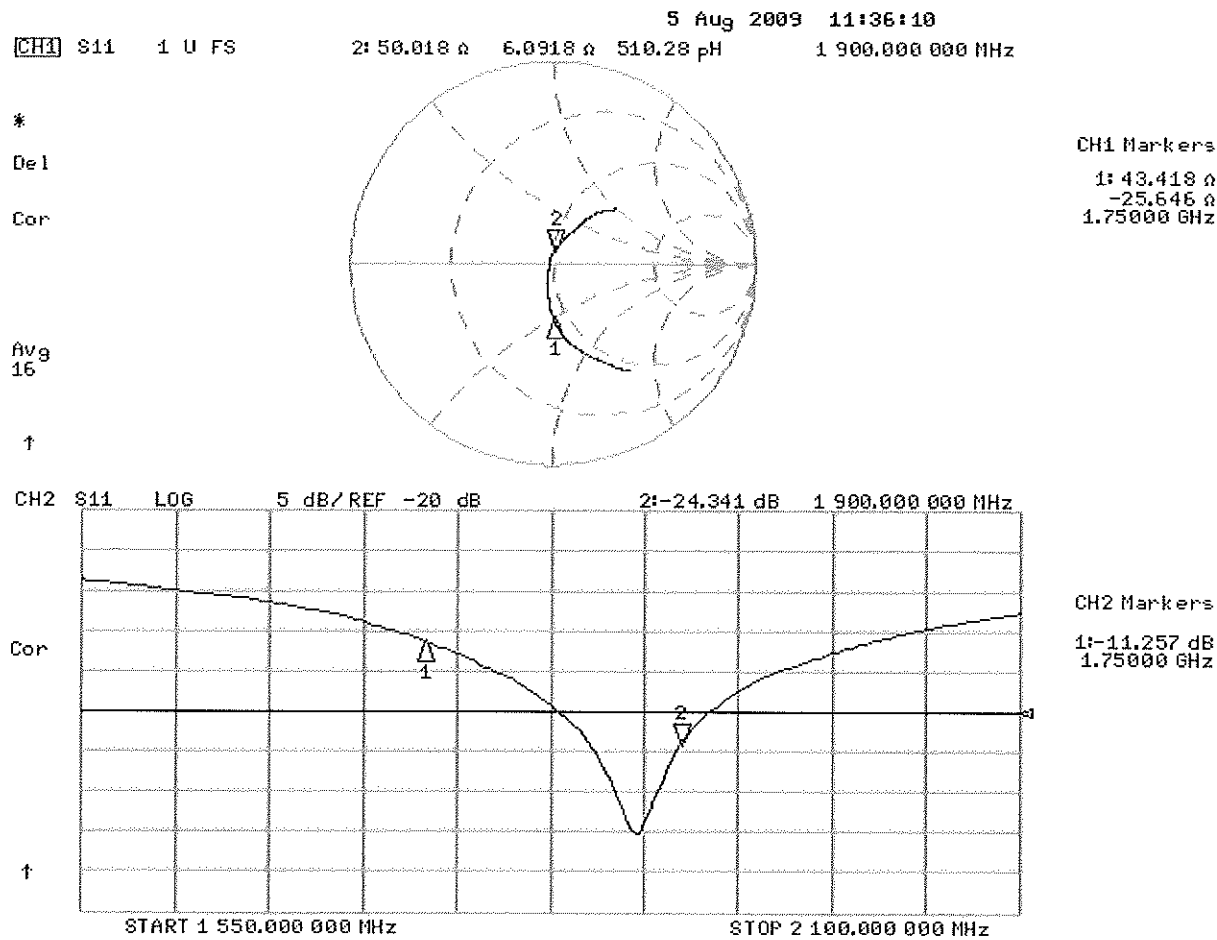
**SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.3 mW/g**

Maximum value of SAR (measured) = 12.6 mW/g



0 dB = 12.6mW/g

Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date/Time: 18.08.2009 14:14:25

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d080**

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

Medium: MSL U10 BB

Medium parameters used:  $f = 1900$  MHz;  $\sigma = 1.57$  mho/m;  $\epsilon_r = 53.9$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

### DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.59, 4.59, 4.59); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

**Pin = 250 mW; dip = 10 mm, scan at 3.0mm/Zoom Scan (dist=3.0mm, probe 0deg)**

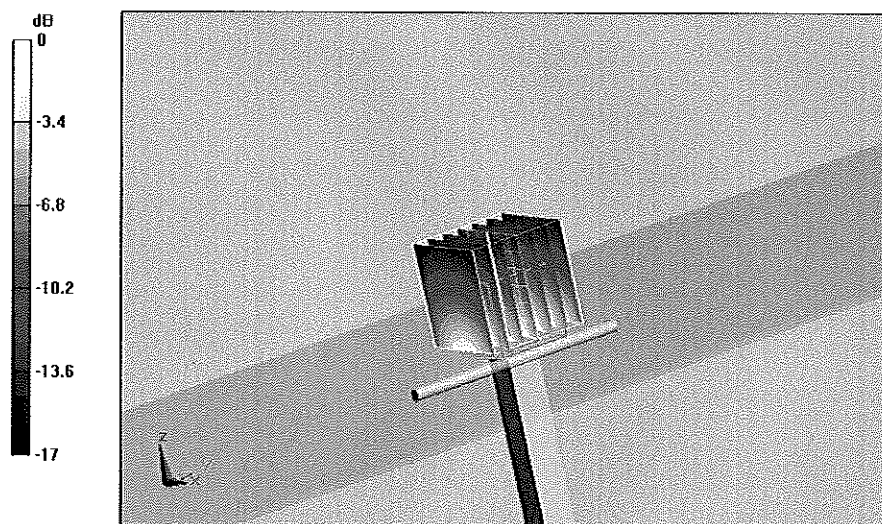
**(7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.7 V/m; Power Drift = -0.00545 dB

Peak SAR (extrapolated) = 17.7 W/kg

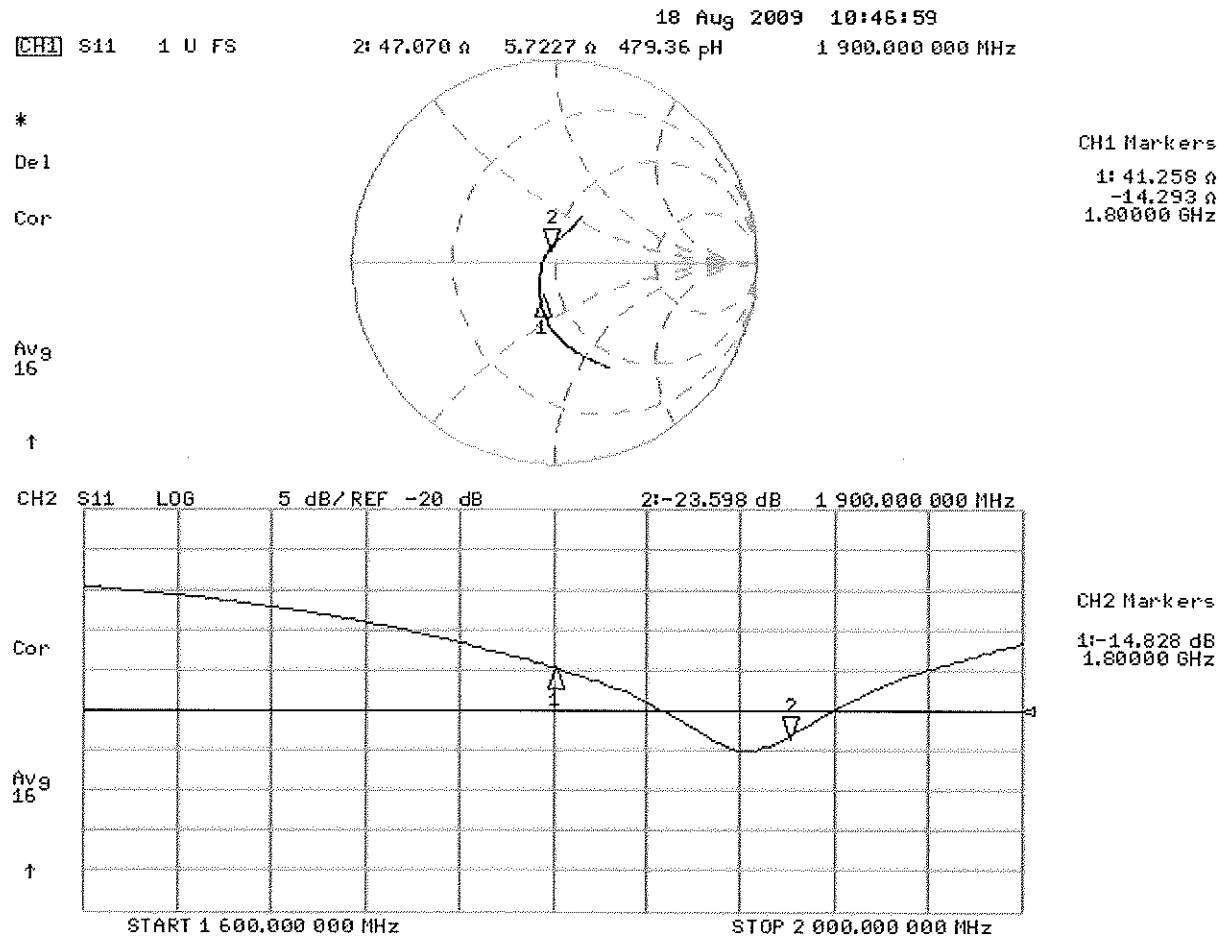
**SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.41 mW/g**

Maximum value of SAR (measured) = 13.1 mW/g



0 dB = 13.1mW/g

Impedance Measurement Plot for Body TSL





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D2450V2-719\_Aug09**

## CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 719**

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

Calibration date: **August 27, 2009**

Condition of the calibrated item **In Tolerance**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^{\circ}\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

| Primary Standards           | ID #               | Cal Date (Calibrated by, Certificate No.) | Scheduled Calibration |
|-----------------------------|--------------------|-------------------------------------------|-----------------------|
| Power meter EPM-442A        | GB37480704         | 08-Oct-08 (No. 217-00898)                 | Oct-09                |
| Power sensor HP 8481A       | US37292783         | 08-Oct-08 (No. 217-00898)                 | Oct-09                |
| Reference 20 dB Attenuator  | SN: 5086 (20g)     | 31-Mar-09 (No. 217-01025)                 | Mar-10                |
| Type-N mismatch combination | SN: 5047.2 / 06327 | 31-Mar-09 (No. 217-01029)                 | Mar-10                |
| Reference Probe ES3DV3      | SN: 3205           | 26-Jun-09 (No. ES3-3205_Jun09)            | Jun-10                |
| DAE4                        | SN: 601            | 07-Mar-09 (No. DAE4-601_Mar09)            | Mar-10                |

| Secondary Standards       | ID #             | Check Date (in house)             | Scheduled Check        |
|---------------------------|------------------|-----------------------------------|------------------------|
| Power sensor HP 8481A     | MY41092317       | 18-Oct-02 (in house check Oct-07) | In house check: Oct-09 |
| RF generator R&S SMT-06   | 100005           | 4-Aug-99 (in house check Oct-07)  | In house check: Oct-09 |
| Network Analyzer HP 8753E | US37390585 S4206 | 18-Oct-01 (in house check Oct-08) | In house check: Oct-09 |

|                |                       |                              |                  |
|----------------|-----------------------|------------------------------|------------------|
|                | <b>Name</b>           | <b>Function</b>              | <b>Signature</b> |
| Calibrated by: | <b>Jeton Kastrali</b> | <b>Laboratory Technician</b> |                  |

|              |                      |                          |
|--------------|----------------------|--------------------------|
|              | <b>Name</b>          | <b>Technical Manager</b> |
| Approved by: | <b>Katja Pokovic</b> |                          |

Issued: August 27, 2009

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



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Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

### Glossary:

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

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

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

### Additional Documentation:

- d) DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

## Measurement Conditions

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

|                              |                           |             |
|------------------------------|---------------------------|-------------|
| DASY Version                 | DASY5                     | V5.0        |
| Extrapolation                | Advanced Extrapolation    |             |
| Phantom                      | Modular Flat Phantom V5.0 |             |
| Distance Dipole Center - TSL | 10 mm                     | with Spacer |
| Zoom Scan Resolution         | dx, dy, dz = 5 mm         |             |
| Frequency                    | 2450 MHz $\pm$ 1 MHz      |             |

## Head TSL parameters

The following parameters and calculations were applied.

|                                  | Temperature         | Permittivity   | Conductivity         |
|----------------------------------|---------------------|----------------|----------------------|
| Nominal Head TSL parameters      | 22.0 °C             | 39.2           | 1.80 mho/m           |
| Measured Head TSL parameters     | (22.0 $\pm$ 0.2) °C | 40.1 $\pm$ 6 % | 1.80 mho/m $\pm$ 6 % |
| Head TSL temperature during test | (22.3 $\pm$ 0.2) °C | ----           | ----                 |

## SAR result with Head TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL | Condition          |                                |
|-------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                          | 250 mW input power | 13.3 mW / g                    |
| SAR normalized                                        | normalized to 1W   | 53.2 mW / g                    |
| SAR for nominal Head TSL parameters <sup>1</sup>      | normalized to 1W   | 53.5 mW / g $\pm$ 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL | condition          |                                |
|---------------------------------------------------------|--------------------|--------------------------------|
| SAR measured                                            | 250 mW input power | 6.23 mW / g                    |
| SAR normalized                                          | normalized to 1W   | 24.9 mW / g                    |
| SAR for nominal Head TSL parameters <sup>1</sup>        | normalized to 1W   | 25.0 mW / g $\pm$ 16.5 % (k=2) |

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

## Body TSL parameters

The following parameters and calculations were applied.

|                                  | Temperature     | Permittivity | Conductivity     |
|----------------------------------|-----------------|--------------|------------------|
| Nominal Body TSL parameters      | 22.0 °C         | 52.7         | 1.95 mho/m       |
| Measured Body TSL parameters     | (22.0 ± 0.2) °C | 53.2 ± 6 %   | 2.01 mho/m ± 6 % |
| Body TSL temperature during test | (22.5 ± 0.2) °C | ----         | ----             |

## SAR result with Body TSL

| SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL | Condition          |                           |
|-------------------------------------------------------|--------------------|---------------------------|
| SAR measured                                          | 250 mW input power | 13.0 mW / g               |
| SAR normalized                                        | normalized to 1W   | 52.0 mW / g               |
| SAR for nominal Body TSL parameters <sup>2</sup>      | normalized to 1W   | 51.4 mW /g ± 17.0 % (k=2) |

| SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL | condition          |                           |
|---------------------------------------------------------|--------------------|---------------------------|
| SAR measured                                            | 250 mW input power | 6.00 mW / g               |
| SAR normalized                                          | normalized to 1W   | 24.0 mW / g               |
| SAR for nominal Body TSL parameters <sup>2</sup>        | normalized to 1W   | 23.9 mW /g ± 16.5 % (k=2) |

---

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

## Appendix

### Antenna Parameters with Head TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $53.4 \Omega + 1.8 j\Omega$ |
| Return Loss                          | - 28.6 dB                   |

### Antenna Parameters with Body TSL

|                                      |                             |
|--------------------------------------|-----------------------------|
| Impedance, transformed to feed point | $48.2 \Omega + 3.9 j\Omega$ |
| Return Loss                          | - 27.2 dB                   |

### General Antenna Parameters and Design

|                                  |          |
|----------------------------------|----------|
| Electrical Delay (one direction) | 1.150 ns |
|----------------------------------|----------|

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

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

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

### Additional EUT Data

|                 |                    |
|-----------------|--------------------|
| Manufactured by | SPEAG              |
| Manufactured on | September 10, 2002 |

## DASY5 Validation Report for Head TSL

Date/Time: 27.08.2009 11:14:47

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN719**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL U11 BB

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.8$  mho/m;  $\epsilon_r = 40.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

### DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

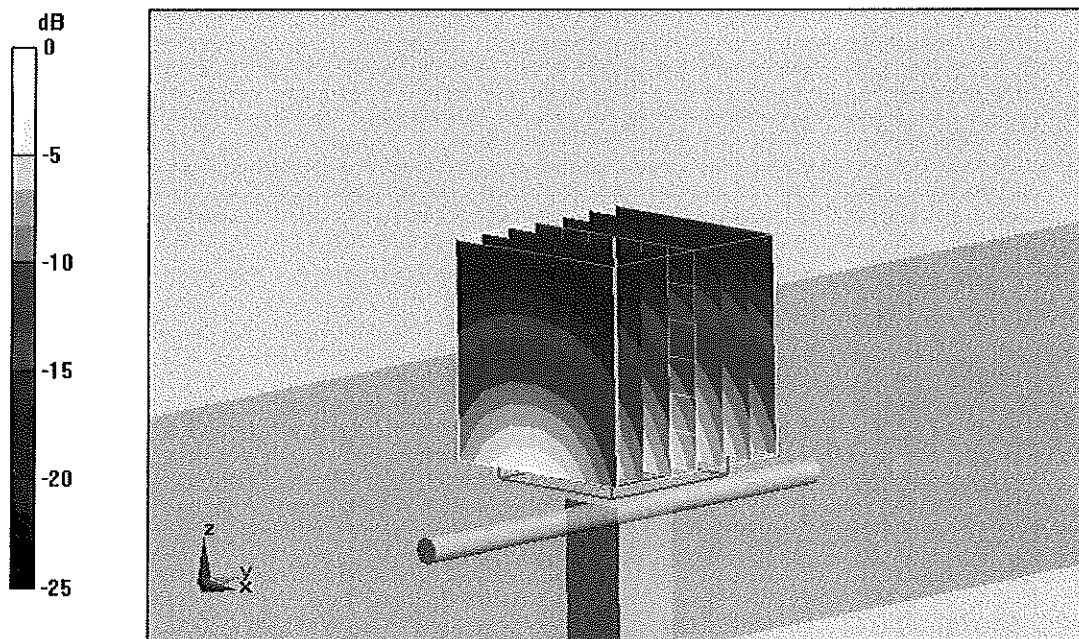
**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm**

Reference Value = 101.4 V/m; Power Drift = 0.025 dB

Peak SAR (extrapolated) = 27 W/kg

**SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.23 mW/g**

Maximum value of SAR (measured) = 17.2 mW/g

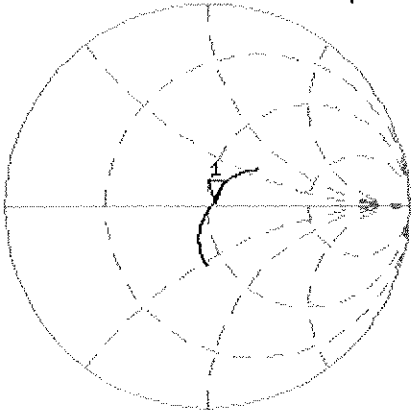


0 dB = 17.2mW/g

Impedance Measurement Plot for Head TSL

27 Aug 2009 09:14:09  
[CH1] S11 1 U FS 1: 53.385  $\Omega$  1.7910  $\Omega$  116.35 pF 2 450.000 000 MHz

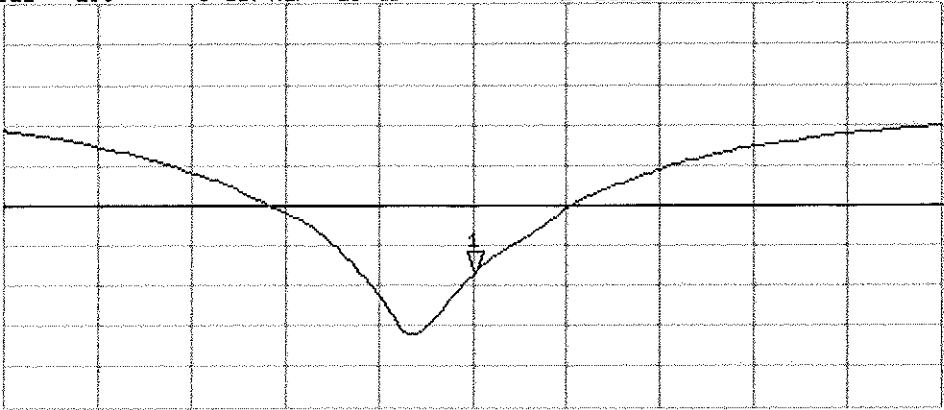
\*  
De1  
Cor



↑

CH2 S11 LOG 5 dB/REF -20 dB 1:-28.624 dB 2 450.000 000 MHz

Cor



↑

START 2 250.000 000 MHz

STOP 2 650.000 000 MHz

## DASY5 Validation Report for Body TSL

Date/Time: 17.08.2009 15:35:28

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:719**

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: MSL U10 BB

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.01$  mho/m;  $\epsilon_r = 53.1$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC)

### DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

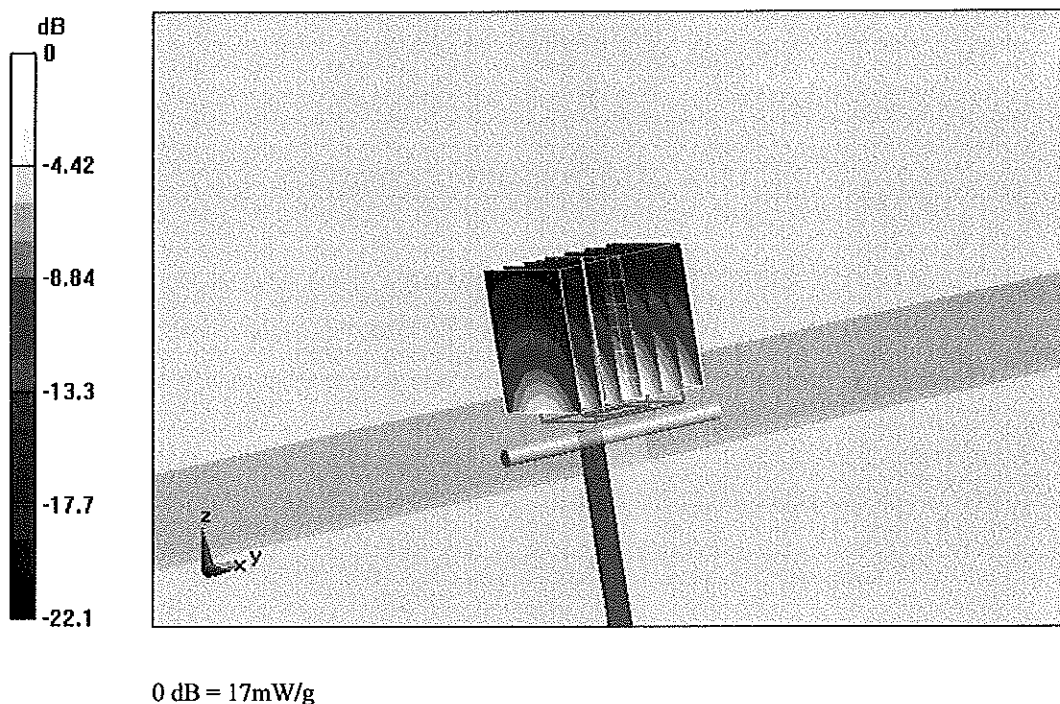
**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm**

Reference Value = 94.8 V/m; Power Drift = -0.00649 dB

Peak SAR (extrapolated) = 27.2 W/kg

**SAR(1 g) = 13 mW/g; SAR(10 g) = 6 mW/g**

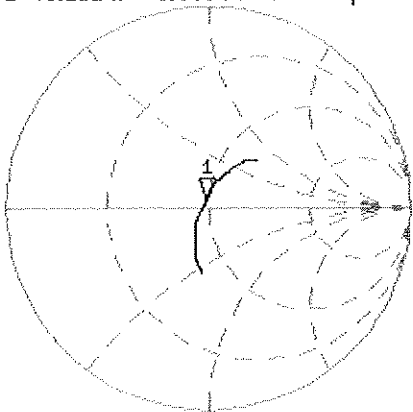
Maximum value of SAR (measured) = 17 mW/g



Impedance Measurement Plot for Body TSL

17 Aug 2009 15:56:32  
[CH1] S11 1 U FS 1: 48.221  $\Omega$  3.9004  $\Omega$  253.37 pF 2 450.000 000 MHz

\*  
De1  
Cor  
  
Avg  
16  
  
↑



CH2 S11 LOG 5 dB/REF -20 dB 1: -27.205 dB 2 450.000 000 MHz

Cor  
  
Avg  
16  
  
↑

