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CERTIFICATE OF COMPLIANCE
SAR EVALUATION

iMetrikus, Inc. DBA Numera, Inc.		Dates of Test:	March 18 - 21, 2013
1511 3rd Ave., Suite 808		Test Report Number:	SAR.20130306
Seattle, WA 98101			Revision A

FCC ID:	RLU-NL-100
Model(s):	Libris
Test Sample:	Engineering Unit Same as Production
S/N Number:	933
Equipment Type:	Wireless mPERS
Classification:	Portable Transmitter Next to Face and Body
TX Frequency Range:	824 – 848 MHz; 1850 – 1910 MHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	850 MHz (GSM) – 32.3 dBm, 850 MHz (WCDMA) – 23.6 dBm, 1900 MHz (GSM) – 29.6 dBm, 1900 MHz (WCDMA) – 23.9 dBm Conducted
Signal Modulation:	WCDMA, GMSK, 8-PSK
Antenna Type:	PCB
Application Type:	Certification
FCC Rule Parts:	Part 2, 22, 24
KDB Test Methodology:	KDB 447498 D01 v05
Max. Face SAR Value:	0.770 W/kg – 1 gram average – Reported
Max. Body SAR Value:	1.436 W/kg – 1 gram average – Reported
Max. Extremity SAR Value:	2.813 W/kg – 10 gram average – Reported
Separation Distance (Face):	10 mm
Separation Distance (Body):	Lanyard – 14 mm; Belt Clip – 10 mm
Separation Distance (Extremity):	0 mm

This wireless mobile and/or portable device has been shown to be compliant for localized specific absorption rate (SAR) for uncontrolled environment/general exposure limits specified in ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in IEEE 1528-2003, and OET Bulletin 65 Supp. C (See test report).

I attest to the accuracy of the data. All measurements were performed by myself 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.

RF Exposure Lab, LLC certifies that no party to this application is 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. 853(a).

Jay M. Moulton
Vice President

ACCREDITED
Certificate # 2387.01

Table of Contents

1. Introduction

This measurement report shows compliance of the iMetrikus, Inc. DBA Numera, Inc. Model Libris FCC ID: RLU-NL-100 with FCC Part 2, 1093, ET Docket 93-62 Rules for mobile and portable devices. The FCC have adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on August 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC regulated portable devices. [1], [6]

The test results recorded herein are based on a single type test of iMetrikus, Inc. DBA Numera, Inc. Model Libris and therefore apply only to the tested sample.

The device will issue a voice prompt to the user before each incoming and outgoing call is initiated. The voice prompt will instruct the user how to hold the device during the call. The voice prompt will state “Calling your response team now. Please hold the device and position the microphone near your mouth to complete your call.”

The test procedures, as described in ANSI C95.1 – 1999 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [2], ANSI C95.3 – 2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields [3], FCC OET Bulletin 65 Supp. C – 2001 [4], IEEE Std.1528 – 2003 Recommended Practice [5], and Industry Canada Safety Code 6 Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz were employed.

The following table indicates all the wireless technologies operating in the Libris wireless mPERS. The table also shows the tolerance for the power level for each mode.

Band	Technology	Class	3GPP Nominal Power dBm	Calibrated Nominal Power dBm	Tolerance dBm	Lower Tolerance dBm	Upper Tolerance dBm
Band 2 – 1900 MHz	WCDMA/HSPA	3	23	23	±1.0	22	24
Band 5 – 850 MHz	WCDMA/HSPA	3	23	23	±1.0	22	24
Band 5 – 850 MHz	GSM	4	32	32	±1.0	31	33
Band 5 – 850 MHz	EDGE	E2	29	29	±1.0	27	30
Band 2 – 1900 MHz	GSM	1	29	29	±1.0	28	30
Band 2 – 1900 MHz	EDGE	E2	25	25	±1.0	24	26

SAR Definition [5]

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (*dW*) absorbed by (dissipated in) an incremental mass (*dm*) contained in a volume element (*dV*) of a given density (ρ).

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

SAR is expressed in units of watts per kilogram (W/kg). *SAR* can be related to the electric field at a point by

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

where:

σ = conductivity of the tissue (S/m)

ρ = mass density of the tissue (kg/m^3)

E = rms electric field strength (V/m)

2. SAR Measurement Setup

Robotic System

These measurements are performed using the DASY52 automated dosimetric assessment system. The DASY52 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, Intel Core2 computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain 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 Fig. 2.1).

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 HP Intel Core2 computer with Windows XP system and SAR Measurement Software DASY52, 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, AD-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 of the DAE and transfers data to the PC plug-in card.

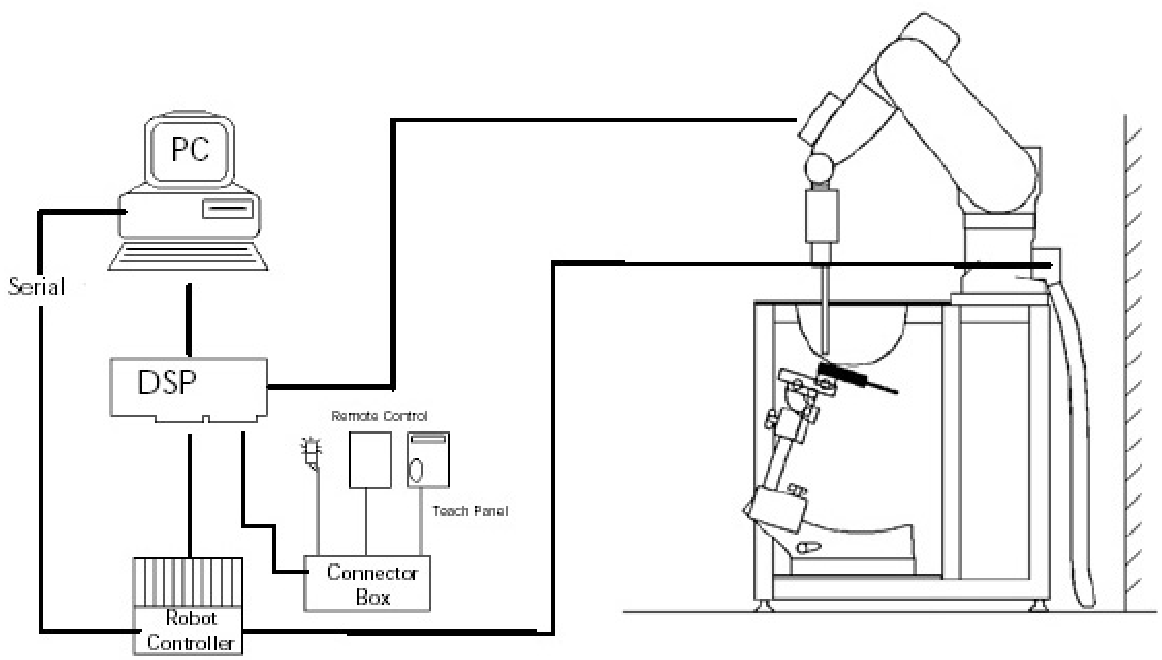


Figure 2.1 SAR Measurement System Setup

System Electronics

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the 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. The system is described in detail in.

Probe Measurement System

The SAR measurements were conducted with the dosimetric probe EX3DV4, designed in the classical triangular configuration (see Fig. 2.2) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi fiber line ending at the front of the probe tip. (see Fig. 2.3) 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 DASY52 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.

DAE System

Probe Specifications

Calibration: In air from 10 MHz to 6.0 GHz
In brain and muscle simulating tissue at Frequencies of 450 MHz, 835 MHz, 1750 MHz, 1900 MHz, 2450 MHz, 2600 MHz, 3500 MHz, 5200 MHz, 5300 MHz, 5600 MHz, 5800 MHz

Frequency: 10 MHz to 6 GHz

Linearity: ±0.2dB (30 MHz to 6 GHz)

Dynamic: 10 mW/kg to 100 W/kg

Range: Linearity: ±0.2dB

Dimensions: Overall length: 330 mm

Tip length: 20 mm

Body diameter: 12 mm

Tip diameter: 2.5 mm

Distance from probe tip to sensor center: 1 mm

Application: SAR Dosimetry Testing
Compliance tests of wireless device

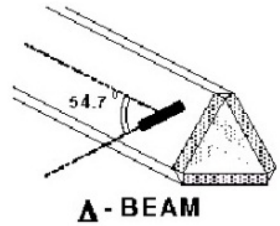


Figure 2.2 Triangular Probe Configurations

Figure 2.3 Probe Thick-Film Technique

Probe Calibration Process

Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described in with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in and found to be better than +/-0.25dB. The sensitivity parameters (Norm X, Norm Y, Norm Z), the diode compression parameter (DCP) and the conversion factor (Conv F) of the probe is tested.

Free Space Assessment

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies below 1 GHz, and in a waveguide above 1GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity at the proper orientation with the field. The probe is then rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm^2.

Temperature Assessment *

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

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

where:

Δt = exposure time (30 seconds),

C = heat capacity of tissue (brain or muscle),

ΔT = temperature increase due to RF exposure.

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

where:

σ = simulated tissue conductivity,

ρ = Tissue density (1.25 g/cm^3 for brain tissue)

SAR is proportional to ΔT / Δt , the initial rate of tissue heating, before thermal diffusion takes place.
Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

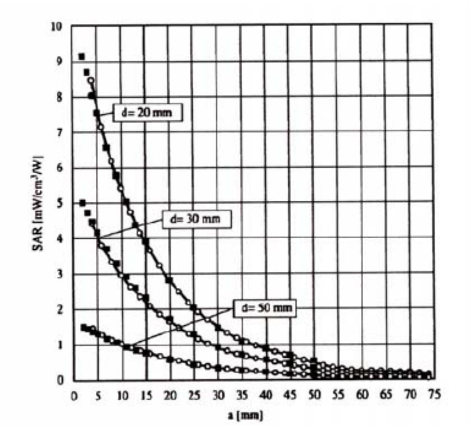


Figure 2.4 E-Field and Temperature Measurements at 900MHz

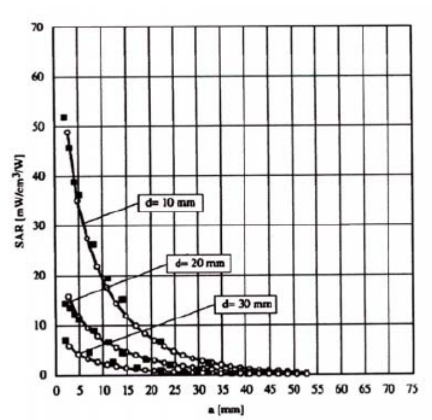


Figure 2.5 E-Field and Temperature Measurements at 1800MHz

Data Extrapolation

The DASY52 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given like below;

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

with V_i = compensated signal of channel i (i=x,y,z)
U_i = input signal of channel i (i=x,y,z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

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

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

with V_i = compensated signal of channel i (i = x,y,z)
$Norm_i$ = sensor sensitivity of channel i (i = x,y,z) $\mu V/(V/m)^2$ for E-field probes
ConvF = sensitivity of enhancement in solution
E_i = electric field strength of channel i in V/m

The RSS value of the field components gives the total field strength (Hermetian magnitude):

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

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

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

with SAR = local specific absorption rate in W/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

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

$$P_{pwe} = \frac{E_{tot}^2}{3770}$$

with P_{pwe} = equivalent power density of a plane wave in W/cm^2
E_{tot} = total electric field strength in V/m

SAM PHANTOM

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid. 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. (see Fig. 2.6)

Phantom Specification

Phantom: SAM Twin Phantom (V4.0)
Shell Material: Vivac Composite
Thickness: 2.0 ± 0.2 mm

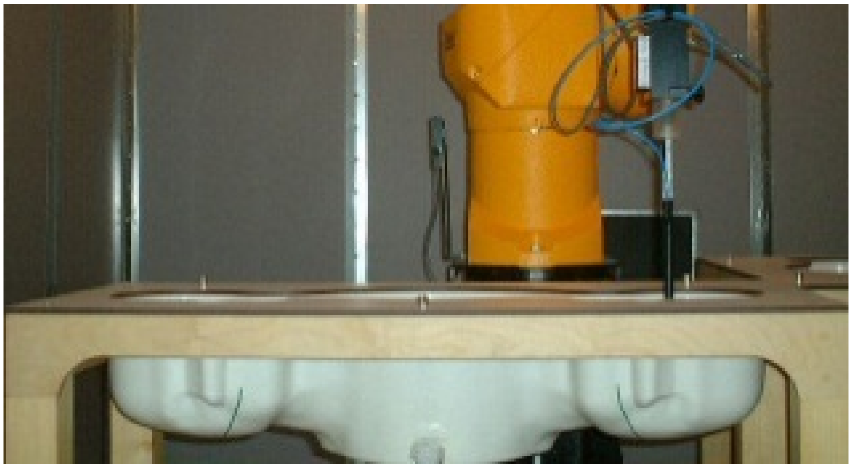


Figure 2.6 SAM Twin Phantom

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0 the Mounting Device (see Fig. 2.7), enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can be easily, accurately, and repeat ably be positioned according to the FCC, CENELEC, IEC and IEEE specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produce infinite number of configurations. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

3. Probe and Dipole Calibration

See Appendix D and E.

4. Simulating Tissue Specifications

Head & Body Simulating Mixture Characterization

The head and body mixtures consist of the material based on the table listed below. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. Body tissue parameters that have not been specified in P1528 are derived from the issue dielectric parameters computed from the 4-Cole-Cole equations.

Table 4.1 Typical Composition of Ingredients for Tissue

Ingredients		Simulating Tissue	
		835 MHz Body	1900 MHz Body
Mixing Percentage			
Water		52.50	69.91
Sugar		45.00	0.00
Salt		1.40	0.13
HEC		1.00	0.00
Bactericide		0.10	0.00
DGBE		0.00	29.96
Dielectric Constant	Target	55.20	53.30
Conductivity (S/m)	Target	0.97	1.52

5. ANSI/IEEE C95.1 – 1992 RF Exposure Limits [2]

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.

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 5.1 Human Exposure Limits

	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIROMENT Professional Population (W/kg) or (mW/g)
SPATIAL PEAK SAR[1] Head	1.60	8.00
SPATIAL AVERAGE SAR[2] Whole Body	0.08	0.40
SPATIAL PEAK SAR[3] Hands, Feet, Ankles, Wrists	4.00	20.00

[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.

6. Measurement Uncertainty

Measurement uncertainty table is not required per KDB 865664 D01 v01 section 2.8.2 page 12. SAR measurement uncertainty analysis is required in the SAR report only when the highest measured SAR in a frequency band is ≥ 1.5 W/kg for 1-g SAR. The equivalent ratio (1.5/1.6) should be applied to extremity and occupational exposure conditions. Using the ratio calculation of (1.5/1.6)*4=3.75 W/kg, shows that the measurement uncertainty table is not required since no SAR value in this report is above the respective limit.

7. System Validation

Tissue Verification

Table 7.1 Measured Tissue Parameters

		835 MHz Head		835 MHz Body		1900 MHz Head	
Date(s)		Mar. 20, 2013		Mar. 21, 2013		Mar. 20, 2013	
Liquid Temperature (˚C)	20.0	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ε		41.50	41.33	55.20	55.91	40.00	39.15
Conductivity: σ		0.905	0.935	0.97	0.99	1.40	1.43
		1900 MHz Body					
Date(s)		Mar. 18, 2013					
Liquid Temperature (˚C)	20.0	Target	Measured				
Dielectric Constant: ε		53.30	53.00				
Conductivity: σ		1.52	1.57				

See Appendix A for data printout.

Test System Verification

Prior to assessment, the system is verified to the ±10% of the specifications at the test frequency by using the system kit. Power is normalized to 1 watt. (Graphic Plots Attached)

Table 7.2 System Dipole Validation Target & Measured

	Test Frequency	Targeted SAR_{1g} (W/kg)	Measure SAR_{1g} (W/kg)	Tissue Used for Verification	Deviation (%)	Plot Number
20-Mar-2013	835 MHz	9.36	9.77	Head	+ 4.38	1
21-Mar-2013	835 MHz	9.51	9.41	Body	- 1.05	2
20-Mar-2013	1900 MHz	40.10	40.20	Head	+ 0.25	3
18-Mar-2013	1900 MHz	40.20	40.60	Body	+ 1.00	4

See Appendix A for data plots.

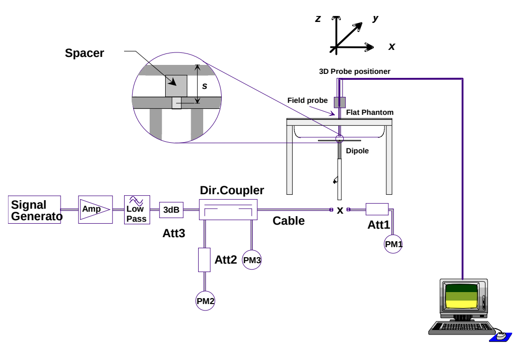


Figure 7.1 Dipole Validation Test Setup

8. SAR Test Data Summary

See Measurement Result Data Pages

See Appendix B for SAR Test Data Plots.
See Appendix C for SAR Test Setup Photos.

Procedures Used To Establish Test Signal

The device was either placed into simulated transmit mode using the manufacturer's test codes or the actual transmission is activated through a base station simulator or similar equipment. See data pages for actual procedure used in measurement.

Device Test Condition

In order to verify that the device was tested at full power, conducted output power measurements were performed before and after each SAR measurement to confirm the output power unless otherwise noted. If a conducted power deviation of more than 5% occurred, the test was repeated. The power drift of each test is measured at the start of the test and again at the end of the test. The drift percentage is calculated by the formula ((end/start)-1)*100 and rounded to three decimal places. The drift percentage is calculated into the resultant SAR value on the data sheet for each test.

The testing was conducted per KDB 447498 D01 v05 page 20. The device was tested in front of the face with a 10 mm gap between the flat surface and the flat phantom using head tissue for in front of face SAR. The device was then tested on the back with the lanyard connected maintaining a separation of 14 mm from the back of the body of the device and the flat phantom using body tissue for body SAR. The device was then tested on the back with the belt clip connected maintaining a separation of 10 mm from the back of the body of the device and the flat phantom using body tissue for body SAR. The device was then tested on the top edge, right side and left side with a separation of 0 mm from the body of the device and the flat phantom using body tissue for extremity SAR. The face and body measurements were averaged over 1 gram of tissue and the extremity measurements were averaged over 10 grams of tissue. All test reductions are shown on pages 21-22. See the photo in Appendix C for a pictorial of the setups and antenna locations.

The device will issue a voice prompt to the user before each incoming and outgoing call is initiated. The voice prompt will instruct the user how to hold the device during the call. The voice prompt will state "Calling your response team now. Please hold the device and position the microphone near your mouth to complete your call."

This device is capable of operating in 850/1900 GSM/GPRS/EDGE frequency bands. In GSM/GPRS mode, the device is in Class 4 for 850 MHz and Class 1 for 1900 MHz. In EDGE mode, the device is in Class E2 for 850/1900 MHz.

The WCDMA testing was conducted using 12.2 kbps RMC configured in Test Loop Mode 1. The HSPA testing was conducted with HS-DPCCH, E-DPCCH and E-DPDCH all enabled and a 12.2 kbps RMC. FRC was configured according to HS-DPCCH Sub-Test 1 using H-set 1 and QPSK.

9. FCC 3G Measurement Procedures

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

9.1 Procedures Used to Establish RF Signal for SAR

The device was placed into a simulated call using a base station simulator in a screen room. Such test signals offer a consistent means for testing SAR and recommended for evaluating SAR. The SAR measurement software calculates a reference point at the start and end of the test to check for power drifts. If conducted power deviations of more than 5% occurred, the tests were repeated.

9.2 SAR Measurement Conditions for WCDMA/HSDPA/HSUPA

Configure the call box 8960 to support all WCDMA tests in respect to the 3GPP 34.121 (listed in Table below). Measure the power at Ch4132, 4182 and 4233 for US cell; Ch9262, 9400 and 9538 for US PCS band.

For Rel99

- Set a Test Mode 1 loop back with a 12.2kbps Reference Measurement Channel (RMC).
- Set and send continuously Up power control commands to the device
- Measure the power at the device antenna connector using the power meter with average detector.

For HSDPA Rel 6

- Establish a Test Mode 1 look back with both 1 12.2kbps RMC channel and a H-Set1 Fixed Reference Channel (FRC). With the 8960 this is accomplished by setting the signal Channel Coding to “Fixed Reference Channel” and configuring for HSET-1 QKSP.
- Set beta values and HSDPA settings for HSDPA Subtest1 according to Table below.
- Send continuously Up power control commands to the device
- Measure the power at the device antenna connector using the power meter with modulated average detector.
- Repeat the measurement for the HSDPA Subtest2, 3 and 4 as given in Table below.

For HSUPA Rel 6

- Use UL RMC 12.2kbps and FRC H-Set1 QPSK, Test Mode 1 loop back. With the 8960 this is accomplished by setting the signal Channel Coding to “E-DCH Test Channel” and configuring the equipment category to Cat5_10ms.
- Set the Absolute Grant for HSUPA Subtest1 according to Table below.
- Set the device power to be at least 5dB lower than the Maximum output power
- Send power control bits to give one TPC_cmd = +1 command to the device. If device doesn’t send any E-DPCH data with decreased E-TFCI within 500ms, then repeat this process until the decreased E-TFCI is reported.
- Confirm that the E-TFCI transmitted by the device is equal to the target E-TFCI in Table below. If the E-TFCI transmitted by the device is not equal to the target E-TFCI, then send power control bits to give one TPC_cmd = -1 command to the UE. If UE sends any E-DPCH data with decreased E-TFCI within 500 ms, send new power control bits to give one TPC_cmd = -1 command to the UE. Then confirm that the E-TFCI transmitted by the UE is equal to the target E-TFCI in Table below.
- Measure the power using the power meter with modulated average detector.
- Repeat the measurement for the HSUPA Subtest2, 3, 4 and 5 as given in Table below.

9.3 SAR Measurement Conditions for GSM

Configure the 8960 box to support GMSK and 8PSK call respectively, and set one timeslot and two timeslot transmission for GMSK GSM/GPRS and 8PSK EDGE. Measure and record power outputs for both modulations.

3GPP Release Version	Mode	Cellular Band [dBm]			Sub-Test (See Table Below)	MPR
		4132	4183	4233		
99	**WCDMA**	23.4	23.6	23.3	-	-
6	**HSDPA**	23.2	23.4	23.1	**1**	**0**
6		23.3	23.1	23.0	**2**	**0**
6		22.8	22.6	22.2	**3**	**0.5**
6		22.7	22.4	22.4	**4**	**0.5**
6	**HSUPA**	23.0	23.3	23.1	**1**	**0**
6		21.4	21.7	21.0	**2**	**2**
6		22.3	22.4	22.2	**3**	**1**
6		21.2	21.3	20.9	**4**	**2**
6		23.2	23.4	23.1	**5**	**0**

3GPP Release Version	Mode	PCS Band [dBm]			Sub-Test (See Table Below)	MPR
		9262	9400	9538		
99	**WCDMA**	23.7	23.9	23.8	-	-
6	**HSDPA**	23.2	23.4	23.3	**1**	**0**
6		23.4	23.6	23.4	**2**	**0**
6		23.1	23.2	23.1	**3**	**0.5**
6		22.8	23.3	22.9	**4**	**0.5**
6	**HSUPA**	23.5	23.7	23.6	**1**	**0**
6		21.8	21.5	21.2	**2**	**2**
6		22.6	22.9	22.6	**3**	**1**
6		21.5	21.6	21.7	**4**	**2**
6		23.6	23.4	23.5	**5**	**0**

Sub-Test Setup for Release 6 HSDPA

Sub-Test	β_c	β_d	B_c/β_d	β_{hs}
1	2/15	15/15	2/15	4/15
2	12/15	15/15	15/15	24/15
3	15/15	8/15	15/8	30/15
4	15/15	4/15	15/4	30/15
Δ_{ack}, Δ_{nack} and Δ_{cqi} = 8				

Sub-Test Setup for Release 6 HSUPA

Sub-Test	β_c	β_d	B_c/β_d	β_{hs}	B_{ec}	B_{ed}	MPR	AG Index	E-TFCI
1	11/15	15/15	11/15	22/15	209/225	1039/225	0.0	20	75
2	6/15	15/15	6/15	12/15	12/15	94/75	2.0	12	67
3	15/15	9/15	15/9	30/15	30/15	47/15	1.0	15	92
4	2/15	15/15	2/15	4/15	2/15	56/15	2.0	17	71
5	15/15	15/15	15/15	30/15	24/15	134/15	0.0	21	81
Δ_{ack}, Δ_{nack} and Δ_{cqi} = 8									

GSM			
Band	Channel	Peak Power	Frame Average
Cellular	128	32.3	23.27
	190	32.3	23.27
	251	32.3	23.27
PCS	512	29.5	20.47
	661	29.6	20.57
	810	29.4	20.37

GPRS-GMSK/1 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	32.4	23.37
	190	32.3	23.27
	251	32.6	23.57
PCS	512	29.2	20.17
	661	29.4	20.37
	810	29.3	20.27

GPRS-GMSK/2 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	31.5	25.48
	190	31.7	25.68
	251	31.2	25.18
PCS	512	28.9	22.88
	661	29.2	23.18
	810	29.3	23.28

GPRS-GMSK/3 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	28.7	24.44
	190	28.6	24.34
	251	28.7	24.44
PCS	512	25.6	21.34
	661	25.4	21.14
	810	25.5	21.24

GPRS-GMSK/4 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	27.1	24.09
	190	27.4	24.39
	251	27.3	24.29
PCS	512	24.6	21.59
	661	24.5	21.49
	810	24.5	21.19

EDGE-8PSK/1 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	28.2	19.17
	190	28.3	19.27
	251	28.4	19.37
PCS	512	25.5	16.47
	661	25.5	16.47
	810	25.4	16.37

EDGE-8PSK/2 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	27.8	21.78
	190	27.5	21.48
	251	27.7	21.68
PCS	512	24.8	19.78
	661	24.9	18.88
	810	25.0	18.98

EDGE-8PSK/3 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	24.2	19.94
	190	24.3	20.04
	251	24.1	19.84
PCS	512	21.5	17.24
	661	21.4	17.14
	810	21.4	17.14

EDGE-8PSK/4 slot			
Band	Channel	Peak Power	Frame Average
Cellular	128	23.2	20.19
	190	23.4	20.39
	251	23.3	20.29
PCS	512	20.3	17.29
	661	20.2	17.19
	810	20.2	17.19

Figure 9.3.1 Test Reduction Table – 2G/3G

Band/ Frequency (MHz)	Technology	Configuration	Required Channel	Tested/ Reduced
Band 5 824-849 MHz	GSM	Face	128	Reduced[1]
			190	Tested
			251	Reduced[1]
	WCDMA		4132	Reduced[1]
			4183	Tested
			4233	Reduced[1]
	GSM	Lanyard (Back)	128	Reduced[1]
			190	Tested
			251	Reduced[1]
	WCDMA		4132	Reduced[1]
			4183	Tested
			4233	Reduced[1]
	GSM	Belt Clip (Back)	128	Reduced[1]
			190	Tested
			251	Reduced[1]
	WCDMA		4132	Reduced[1]
			4183	Tested
			4233	Reduced[1]
	GSM	Top Edge	128	Reduced[1]
			190	Tested
			251	Reduced[1]
	WCDMA		4132	Reduced[1]
			4183	Tested
			4233	Reduced[1]
	GSM	Right Side	128	Reduced[1]
			190	Tested
			251	Reduced[1]
	WCDMA		4132	Reduced[1]
			4183	Tested
			4233	Reduced[1]
	GSM	Left Side	128	Reduced[1]
			190	Tested
			251	Reduced[1]
	WCDMA		4132	Reduced[1]
			4183	Tested
			4233	Reduced[1]

Reduced[1] – When the mid channel is ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz, the remaining channels are not required per KDB 447498 D01 v05 section 4.3.3 page 13.

Figure 9.3.1 Test Reduction Table – 2G/3G

Band/ Frequency (MHz)	Technology	Configuration	Required Channel	Tested/ Reduced
Band 2 1850-1910 MHz	GSM	Face	512	Reduced[1]
			661	Tested
			810	Reduced[1]
	WCDMA		9262	Reduced[1]
			9400	Tested
			9538	Reduced[1]
	GSM	Lanyard (Back)	512	Tested
			661	Tested
			810	Tested
	WCDMA		9262	Tested
			9400	Tested
			9538	Tested
	GSM	Belt Clip (Back)	512	Tested
			661	Tested
			810	Tested
	WCDMA		9262	Tested
			9400	Tested
			9538	Tested
	GSM	Top Edge	512	Reduced[1]
			661	Tested
			810	Reduced[1]
	WCDMA		9262	Reduced[1]
			9400	Tested
			9538	Reduced[1]
	GSM	Right Side	512	Reduced[1]
			661	Tested
			810	Reduced[1]
	WCDMA		9262	Tested
			9400	Tested
			9538	Tested
	GSM	Left Side	512	Reduced[1]
			661	Tested
			810	Reduced[1]
	WCDMA		9262	Reduced[1]
			9400	Tested
			9538	Reduced[1]

Reduced[1] – When the mid channel is ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz, the remaining channels are not required per KDB 447498 D01 v05 section 4.3.3 page 13.

SAR Data Summary – Face

<table>
<tr><th colspan="10">MEASUREMENT RESULTS</th></tr>
<tr><th rowspan="2">Gap</th><th rowspan="2">Plot</th><th colspan="2">Frequency</th><th rowspan="2">Modulation</th><th rowspan="2">Tissue</th><th>End Power</th><th rowspan="2">RMC</th><th rowspan="2">Test Set Up</th><th rowspan="2">SAR (W/kg)</th></tr>
<tr><th>MHz</th><th>Ch.</th><th>(dBm)</th></tr>
<tr><td rowspan="4">10 mm</td><td>1</td><td>836.6</td><td>4183</td><td rowspan="2">WCDMA</td><td rowspan="4">Head</td><td>23.6</td><td>12.2 kbps</td><td>Test Loop 1</td><td>0.702</td></tr>
<tr><td>2</td><td>1880.0</td><td>9400</td><td>23.9</td><td>12.2 kbps</td><td>Test Loop 1</td><td>0.645</td></tr>
<tr><td>-----</td><td>836.6</td><td>190</td><td rowspan="2">GMSK</td><td>32.3</td><td>-----</td><td>-----</td><td>0.395</td></tr>
<tr><td>-----</td><td>1880.0</td><td>661</td><td>29.6</td><td>-----</td><td>-----</td><td>0.554</td></tr>
<tr><td colspan="6"></td><td colspan="4">Body
1.6 W/kg (mW/g)
averaged over 1 gram</td></tr>
</table>

1. SAR Measurement
   Phantom Configuration ☐ Left Head ☒ Eli4 ☐ Right Head
   SAR Configuration ☒ Head ☐ Body
2. Test Signal Call Mode ☐ Test Code ☒ Base Station Simulator
3. Test Configuration ☐ With Belt Clip ☐ Without Belt Clip ☒ N/A
4. Tissue Depth is at least 15.0 cm

SAR Data Summary – Body

MEASUREMENT RESULTS

Gap	Plot	Frequency		Modulation	Tissue/ Configuration	End Power	RMC/ TX Level	Test Set Up/ Multislot Configuration	SAR (W/kg)
		MHz	Ch.			(dBm)			
14 mm	3	836.6	4183	WCDMA	Body/Lanyard (Back)	23.6	12.2 kbps	Test Loop 1	0.277
	-----	1852.4	9262			23.7	12.2 kbps	Test Loop 1	0.740
	4	1880.0	9400			23.9	12.2 kbps	Test Loop 1	0.957
	-----	1907.6	9538			23.8	12.2 kbps	Test Loop 1	0.504
	-----	836.6	190	GMSK		31.7	0	2 Slot	0.267
	-----	1850.2	512			28.9	0	2 Slot	0.657
	-----	1880.0	661			29.2	0	2 Slot	0.873
	-----	1909.8	810			29.3	0	2 Slot	0.733
10 mm	-----	836.6	4183	WCDMA	Body/Belt Clip (Back)	23.6	12.2 kbps	Test Loop 1	0.502
	6	1852.4	9262			23.7	12.2 kbps	Test Loop 1	1.340
	-----	1880.0	9400			23.9	12.2 kbps	Test Loop 1	1.280
	-----	1907.6	9538			23.8	12.2 kbps	Test Loop 1	0.806
	5	836.6	190	GMSK		31.7	0	2 Slot	0.547
	-----	1850.2	512			28.9	0	2 Slot	1.040
	-----	1880.0	661			29.2	0	2 Slot	1.240
	-----	1909.8	810			29.3	0	2 Slot	1.080
	7	1852.4	9262	WCDMA	Repeated	23.7	12.2 kbps	Test Loop 1	1.360

Body
1.6 W/kg (mW/g)
averaged over 1 gram

1. SAR Measurement
   Phantom Configuration ☐ Left Head ☒ Eli4 ☐ Right Head
   SAR Configuration ☒ Head ☐ Body
2. Test Signal Call Mode ☐ Test Code ☒ Base Station Simulator
3. Test Configuration ☐ With Belt Clip ☐ Without Belt Clip ☒ N/A
4. Tissue Depth is at least 15.0 cm

SAR Data Summary – Extremity

MEASUREMENT RESULTS									
Gap	Plot	Frequency MHz	Frequency Ch.	Modulation	Tissue/ Configuration	End Power (dBm)	RMC/ TX Level	Test Set Up/ Multislot Configuration	SAR (W/kg)
0 mm	-----	836.6	4183	WCDMA	Body/Top Edge	23.6	12.2 kbps	Test Loop 1	0.322
	-----	1880.0	9400			23.9	12.2 kbps	Test Loop 1	0.383
	8	836.6	190	GMSK		31.7	0	2 Slot	0.876
	9	1880.0	661			29.2	0	2 Slot	0.413
	-----	836.6	4183	WCDMA	Body/Right Side	23.6	12.2 kbps	Test Loop 1	0.578
	-----	1880.0	9400			23.9	12.2 kbps	Test Loop 1	1.820
	10	836.6	190	GMSK		31.7	0	2 Slot	1.060
	-----	1850.2	512			28.9	0	2 Slot	1.950
	11	1880.0	661			29.2	0	2 Slot	2.340
	-----	1909.8	810			29.3	0	2 Slot	2.000
	12	1880.0	661		Repeated	29.2	0	2 Slot	2.300
	-----	836.6	4183	WCDMA	Body/Left Side	23.6	12.2 kbps	Test Loop 1	0.746
	-----	1880.0	9400			23.9	12.2 kbps	Test Loop 1	1.120
	13	836.6	190	GMSK		31.7	0	2 Slot	0.766
	14	1880.0	661			29.2	0	2 Slot	1.320
						Body 4.0 W/kg (mW/g) averaged over 10 gram			

1. SAR Measurement
   Phantom Configuration ☐ Left Head ☒ Eli4 ☐ Right Head
   SAR Configuration ☐ Head ☒ Body
2. Test Signal Call Mode ☐ Test Code ☒ Base Station Simulator
3. Test Configuration ☐ With Belt Clip ☐ Without Belt Clip ☒ N/A
4. Tissue Depth is at least 15.0 cm

Calculated SAR value at the upper limit of the tolerance.

For 835 MHz Face: The highest SAR value is in WCDMA and the conducted power tested was 23.6 dB. The upper limit of the tolerance is 24.0 dB. Extrapolating the SAR value to the upper limit for 835 MHz Face results in a 9.65% increase in SAR. The reported SAR value is 0.770 W/kg.

For 835 MHz Body: The highest SAR value is in GPRS and the conducted power tested was 31.7 dB. The upper limit of the tolerance is 32.0 dB peak. Extrapolating the SAR value to the upper limit for 835 MHz Body results in a 7.15% increase in SAR. The reported SAR value is 0.586 W/kg.

For 835 MHz Extremity: The highest SAR value is in GPRS and the conducted power tested was 31.7 dB. The upper limit of the tolerance is 32.0 dB peak. Extrapolating the SAR value to the upper limit for 835 MHz Extremity results in a 7.15% increase in SAR. The reported SAR value is 1.136 W/kg.

For 1900 MHz Face: The highest SAR value is in WCDMA and the conducted power tested was 23.9 dB. The upper limit of the tolerance is 24.0 dB. Extrapolating the SAR value to the upper limit for 1900 MHz Face results in a 2.33% increase in SAR. The reported SAR value is 0.660 W/kg.

For 1900 MHz Body: The highest SAR value is in WCDMA and the conducted power tested was 23.7 dB. The upper limit of the tolerance is 24.0 dB. Extrapolating the SAR value to the upper limit for 1900 MHz Body results in a 7.15% increase in SAR. The reported SAR value is 1.436 W/kg.

For 1900 MHz Extremity: The highest SAR value is in GPRS and the conducted power tested was 29.2 dB. The upper limit of the tolerance is 30.0 dB peak. Extrapolating the SAR value to the upper limit for 1900 MHz Extremity results in a 20.2% increase in SAR. The reported SAR value is 2.813 W/kg.

10. Test Equipment List

Table 10.1 Equipment Specifications

Type	Calibration Due Date	Calibration Done Date	Serial Number
Staubli Robot TX60L	N/A	N/A	F07/55M6A1/A/01
Measurement Controller CS8c	N/A	N/A	1012
ELI4 Flat Phantom	N/A	N/A	1065
Device Holder	N/A	N/A	N/A
Data Acquisition Electronics 4	08/15/2012	08/15/2013	759
SAR Software V52.8.2.969	N/A	N/A	N/A
SPEAG E-Field Probe EX3DV4	08/20/2013	08/20/2012	3693
Speag Validation Dipole D835V2	12/03/2013	12/03/2012	4d089
Speag Validation Dipole D1900V2	12/06/2013	12/06/2012	5d116
Agilent N1911A Power Meter	03/29/2013	03/29/2012	GB45100254
Agilent N1922A Power Sensor	03/29/2013	03/29/2012	MY45240464
Advantest R3261A Spectrum Analyzer	03/29/2013	03/29/2012	31720068
Agilent (HP) 8350B Signal Generator	03/29/2013	03/29/2012	2749A10226
Agilent (HP) 83525A RF Plug-In	03/29/2013	03/29/2012	2647A01172
Agilent (HP) 8753C Vector Network Analyzer	03/29/2013	03/29/2012	3135A01724
Agilent (HP) 85047A S-Parameter Test Set	04/03/2013	04/03/2012	2904A00595
Agilent (HP) 8960 Base Station Sim.	04/05/2014	04/05/2012	MY48360364
Anritsu MT8820C	08/03/2014	08/03/2012	6201176199
Aprel Dielectric Probe Assembly	N/A	N/A	0011
Body Equivalent Matter (835/900 MHz)	N/A	N/A	N/A
Head Equivalent Matter (835/900 MHz)	N/A	N/A	N/A
Body Equivalent Matter (1800/1900 MHz)	N/A	N/A	N/A
Head Equivalent Matter (1800/1900 MHz)	N/A	N/A	N/A

11. Conclusion

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

Please note that the absorption and distribution of electromagnetic energy in the body is a very complex phenomena that depends 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 innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

12. References

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation, August 1996

[2] ANSI/IEEE C95.1 – 1992, American National Standard Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300kHz to 100GHz, New York: IEEE, 1992.

[3] ANSI/IEEE C95.3 – 1992, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, 1992.

[4] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields, June 2001.

[5] IEEE Standard 1528 – 2003, IEEE Recommended Practice for Determining the Peak-Spatial Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communication Devices: Measurement Techniques, October 2003.

[6] Industry Canada, RSS – 102e, Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands), March 2010.

[7] Health Canada, Safety Code 6, Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3kHz to 300 GHz, 2009.

Appendix A – System Validation Plots and Data

```
**************************************************************
Test Result for UIM Dielectric Parameter
Wed 20/Mar/2013 02:09:34
Freq  Frequency(GHz)
FCC_eH      FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH      FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e      Epsilon  of  UIM
Test_s      Sigma of UIM
**************************************************************
```

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.8000	41.68	0.90	41.51	0.91
0.8100	41.63	0.90	41.46	0.92
0.8200	41.58	0.90	41.40	0.92
0.8300	41.53	0.90	41.35	0.93
0.8350	41.50	0.905	41.33	0.935*
0.8366	41.50	0.907	41.324	0.937*
0.8400	41.50	0.91	41.31	0.94
0.8500	41.50	0.92	41.28	0.95
0.8600	41.50	0.93	41.25	0.96
0.8700	41.50	0.94	41.23	0.98

* value interpolated

```
**************************************************************
Test Result for UIM Dielectric Parameter
Thu 21/Mar/2013 07:08:38
Freq  Frequency(GHz)
FCC_eH      FCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon
FCC_sH      FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB      FCC Limits for Body Epsilon
FCC_sB      FCC Limits for Body Sigma
Test_e      Epsilon  of  UIM
Test_s      Sigma of UIM
**************************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.8050	55.32	0.97	56.05	0.96
0.8150	55.28	0.97	56.00	0.98
0.8250	55.24	0.97	55.95	0.98
0.8350	55.20	0.97	55.91	0.99
0.8366	55.195	0.972	55.902	0.99*
0.8450	55.17	0.98	55.86	0.99
0.8550	55.14	0.99	55.84	1.00
0.8650	55.11	1.01	55.80	1.01
0.8750	55.08	1.02	55.78	1.03
0.8850	55.05	1.03	55.73	1.03
0.8950	55.02	1.04	55.70	1.04

* value interpolated

```
**************************************************************
Test Result for UIM Dielectric Parameter
Wed 20/Mar/2013 10:31:18
Freq  Frequency(GHz)
FCC_eH      FCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon
FCC_sH      FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB      FCC Limits for Body Epsilon
FCC_sB      FCC Limits for Body Sigma
Test_e      Epsilon  of  UIM
Test_s      Sigma of UIM
**************************************************************
```

Freq	FCC_eH	FCC_sH	Test_e	Test_s
1.8500	40.00	1.40	39.23	1.38
1.8600	40.00	1.40	39.22	1.39
1.8700	40.00	1.40	39.20	1.40
1.8800	40.00	1.40	39.19	1.41
1.8900	40.00	1.40	39.17	1.42
1.9000	40.00	1.40	39.15	1.43
1.9100	40.00	1.40	39.14	1.44

```
**************************************************************
Test Result for UIM Dielectric Parameter
Mon 18/Mar/2013 07:02:41
Freq  Frequency(GHz)
FCC_eH      FCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon
FCC_sH      FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB      FCC Limits for Body Epsilon
FCC_sB      FCC Limits for Body Sigma
Test_e      Epsilon  of  UIM
Test_s      Sigma of UIM
**************************************************************
```

Freq	FCC_eB	FCC_sB	Test_e	Test_s
1.8500	53.30	1.52	53.13	1.50
1.8502	53.30	1.52	53.129	1.50*
1.8524	53.30	1.52	53.123	1.502*
1.8600	53.30	1.52	53.10	1.51
1.8700	53.30	1.52	53.08	1.53
1.8800	53.30	1.52	53.05	1.54
1.8900	53.30	1.52	53.03	1.55
1.9000	53.30	1.52	53.00	1.57
1.9076	53.30	1.52	52.977	1.585*
1.9098	53.30	1.52	52.97	1.59*
1.9100	53.30	1.52	52.97	1.59

* value interpolated

RF Exposure Lab

Plot 1

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:4d089

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): f = 835 MHz; σ = 0.935 S/m; ε_r = 41.33; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/20/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(8.55, 8.55, 8.55); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

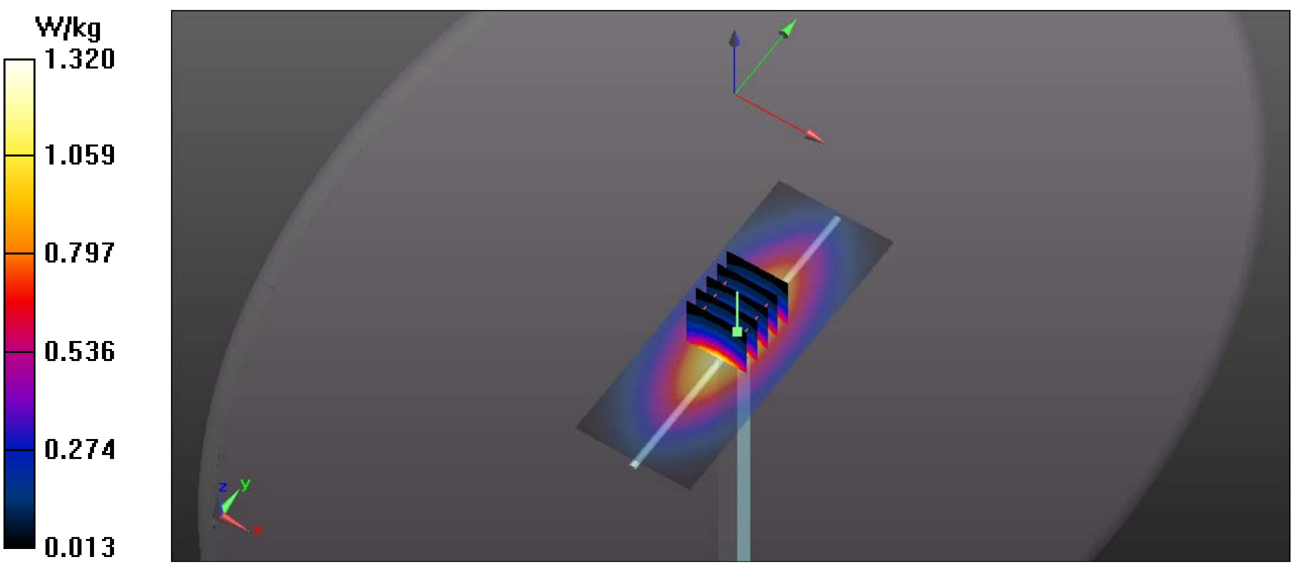
Procedure Notes:

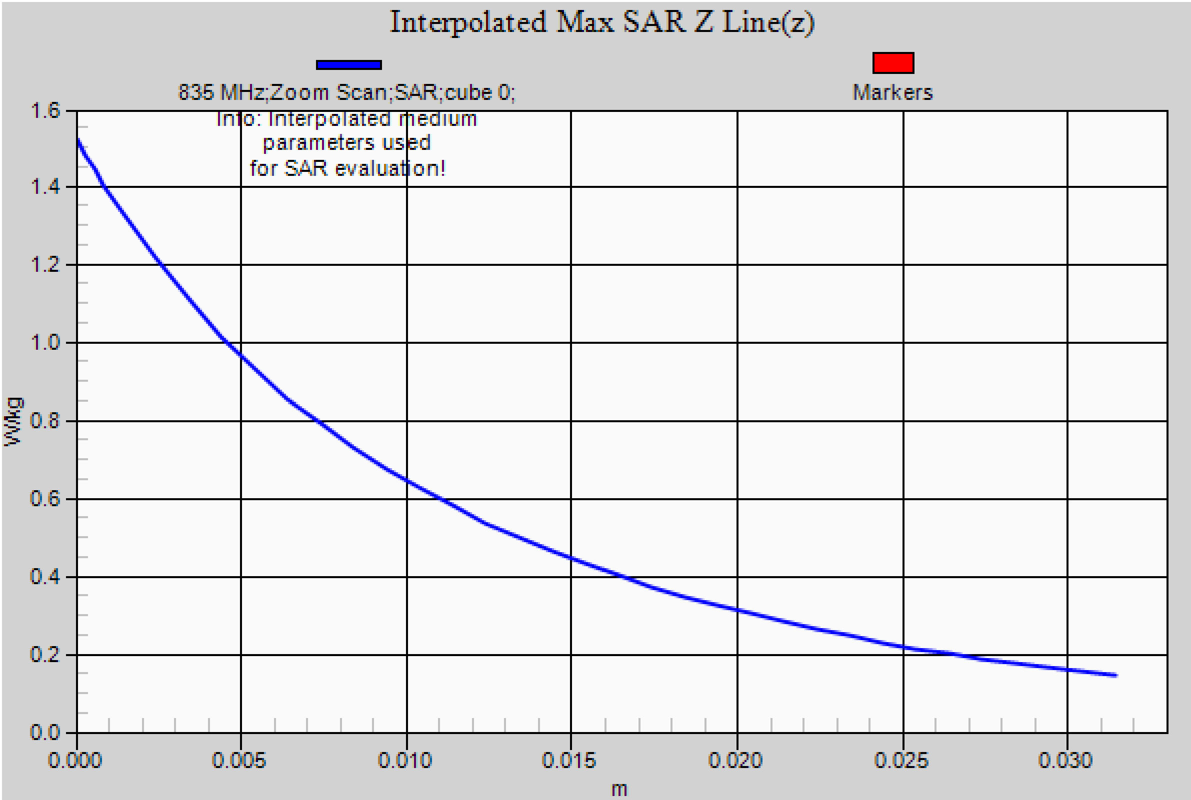
835 MHz Head Verification/Area Scan (61x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.32 W/kg

835 MHz Head Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.283 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 0.977 W/kg; SAR(10 g) = 0.634 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.33 W/kg




Interpolated Max SAR Z Line(z)
835 MHz;Zoom Scan;SAR;cube 0;
Info: Interpolated medium parameters used for SAR evaluation!
Markers
W/kg
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 2

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:4d089

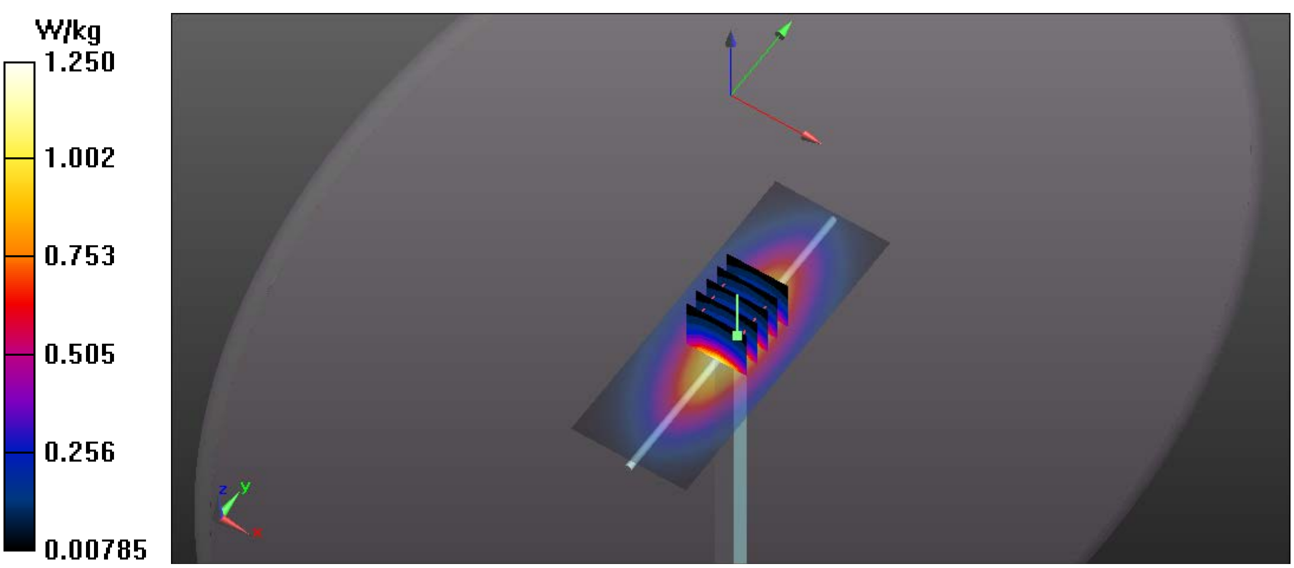
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 55.91; ρ = 1000 kg/m^3
Phantom section: Flat Section

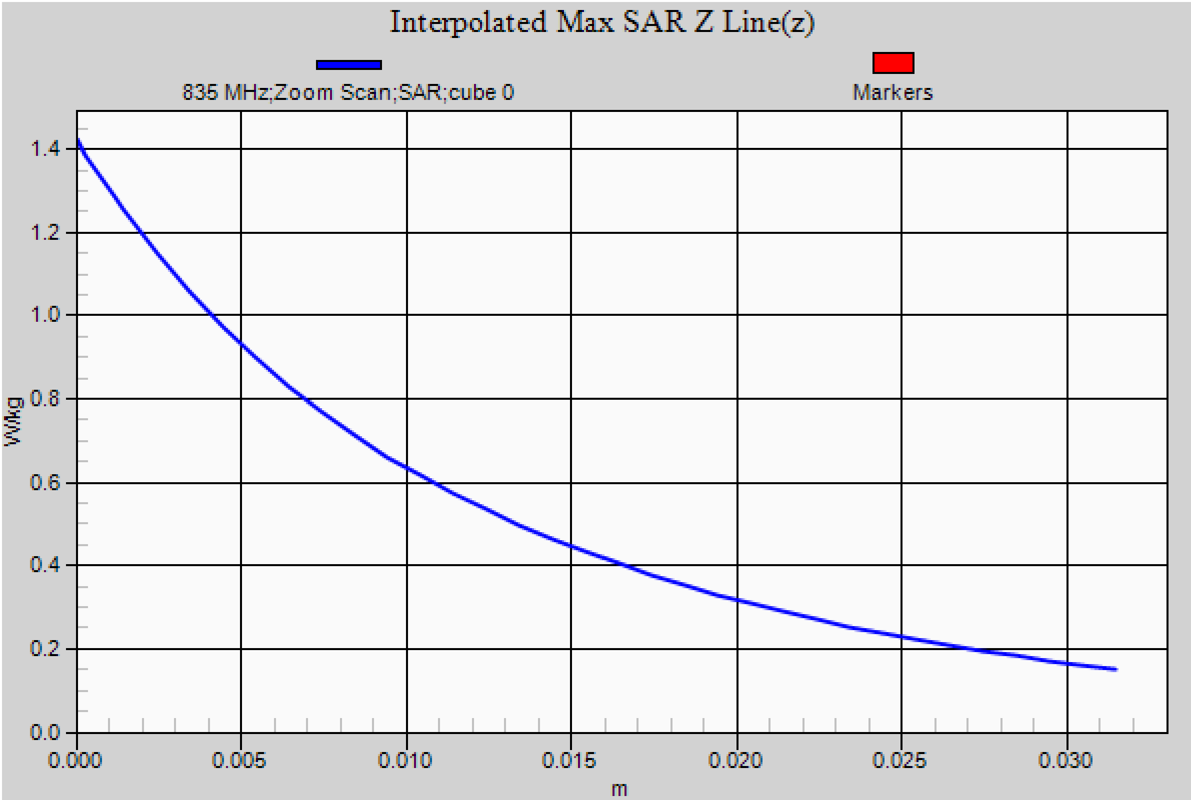
Test Date: Date: 3/21/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 1.44mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Procedure Notes:

835 MHz Body Verification/Area Scan (61x161x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.25 W/kg

835 MHz Body Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.283 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.42 W/kg
SAR(1 g) = 0.941 W/kg; SAR(10 g) = 0.618 W/kg
Maximum value of SAR (measured) = 1.25 W/kg




Interpolated Max SAR Z Line(z)
835 MHz;Zoom Scan;SAR;cube 0
Markers
W/kg
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 3

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d116

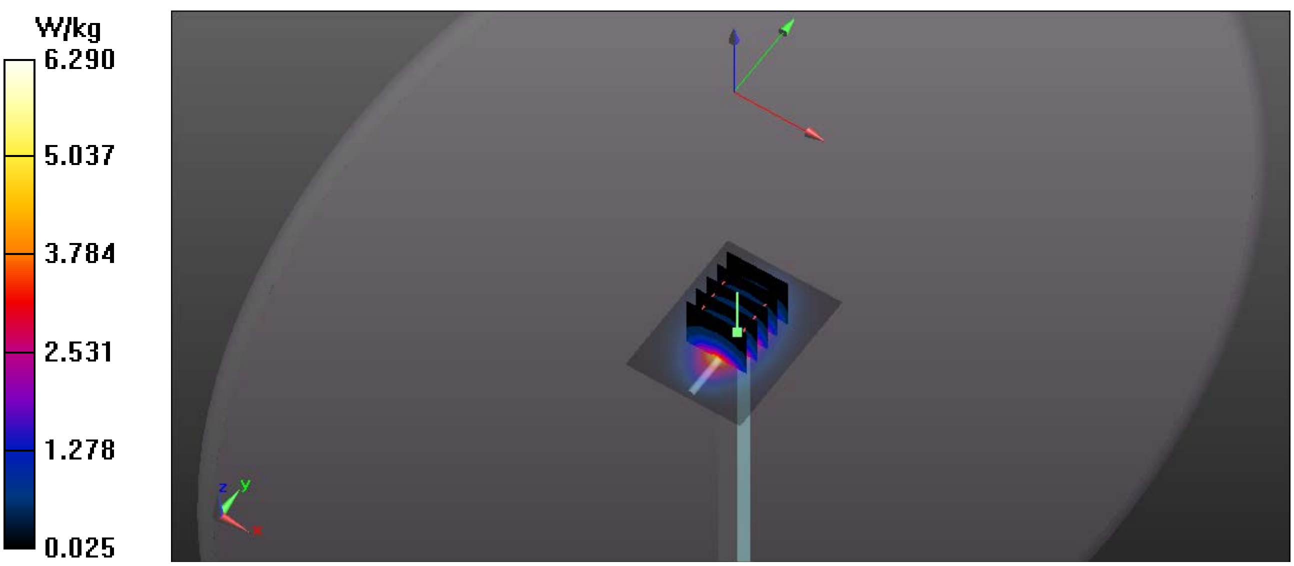
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900; Medium parameters used: f = 1900 MHz; σ = 1.43 S/m; ε_r = 39.15; ρ = 1000 kg/m^3
Phantom section: Flat Section

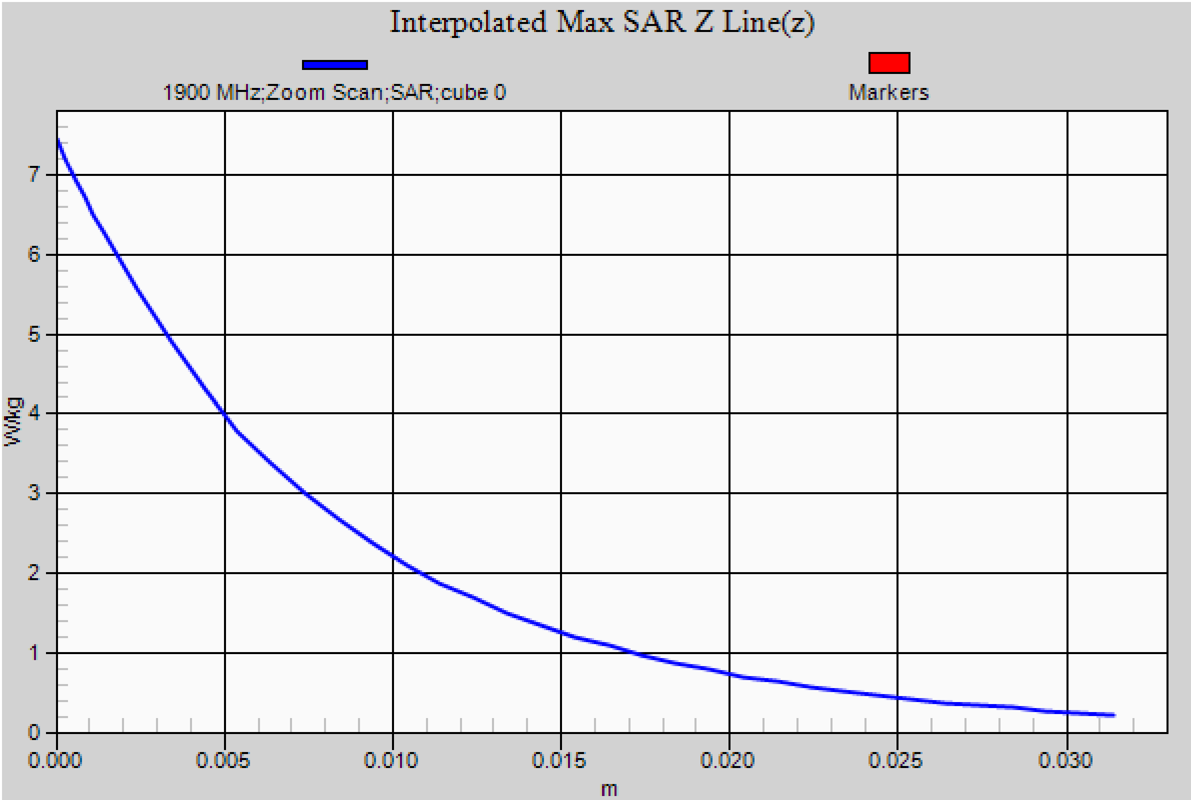
Test Date: Date: 3/20/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.67, 7.67, 7.67); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Procedure Notes:

1900 MHz Head Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 6.29 W/kg

1900 MHz Head Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.218 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 7.45 W/kg
SAR(1 g) = 4.02 W/kg; SAR(10 g) = 2.08 W/kg
Maximum value of SAR (measured) = 6.29 W/kg




Interpolated Max SAR Z Line(z)
1900 MHz;Zoom Scan;SAR;cube 0
Markers
W/kg
0
1
2
3
4
5
6
7
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

RF Exposure Lab

Plot 4

DUT: Dipole 1900 MHz D1900V2; Type: D1900V2; Serial: D1900V2 - SN:5d116

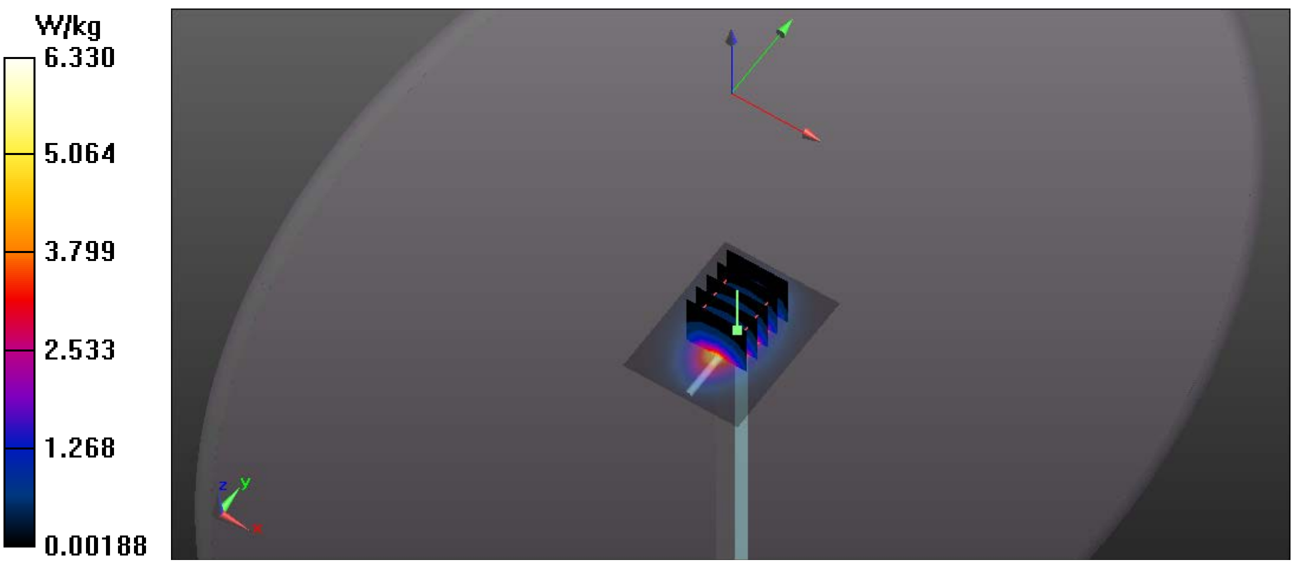
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used: f = 1900 MHz; σ = 1.57 S/m; ε_r = 53; ρ = 1000 kg/m^3
Phantom section: Flat Section

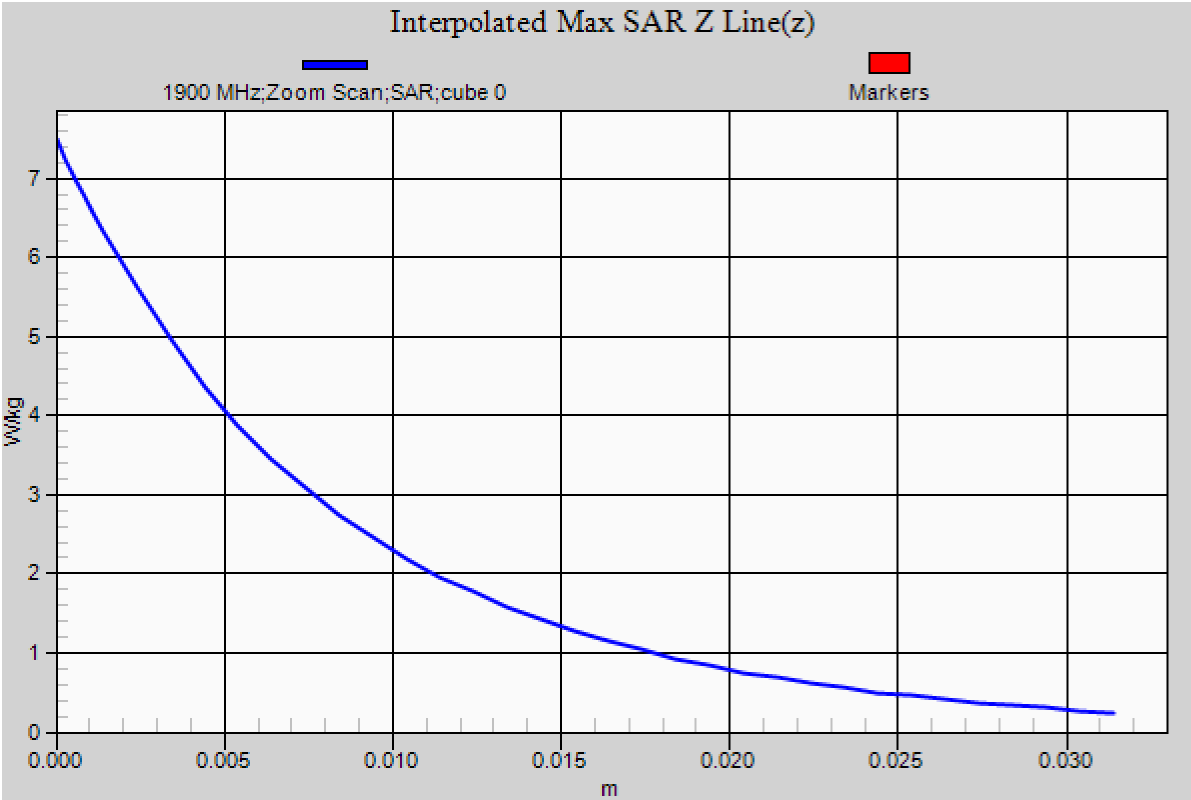
Test Date: Date: 3/18/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.13, 7.13, 7.13); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Procedure Notes:

1900 MHz Body Verification/Area Scan (61x81x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 6.33 W/kg

1900 MHz Body Verification/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.218 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 7.49 W/kg
SAR(1 g) = 4.06 W/kg; SAR(10 g) = 2.1 W/kg
Maximum value of SAR (measured) = 6.30 W/kg




Interpolated Max SAR Z Line(z)
1900 MHz;Zoom Scan;SAR;cube 0
Markers
W/kg
0
1
2
3
4
5
6
7
0.000
0.005
0.010
0.015
0.020
0.025
0.030
m

Appendix B – SAR Test Data Plots

RF Exposure Lab

Plot 1

DUT: Libris Responder; Type: mPERS; Serial: 933

Communication System: UMTS (WCDMA); Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: HSL835; Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.937 S/m; ε_r = 41.324; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/20/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(8.55, 8.55, 8.55); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

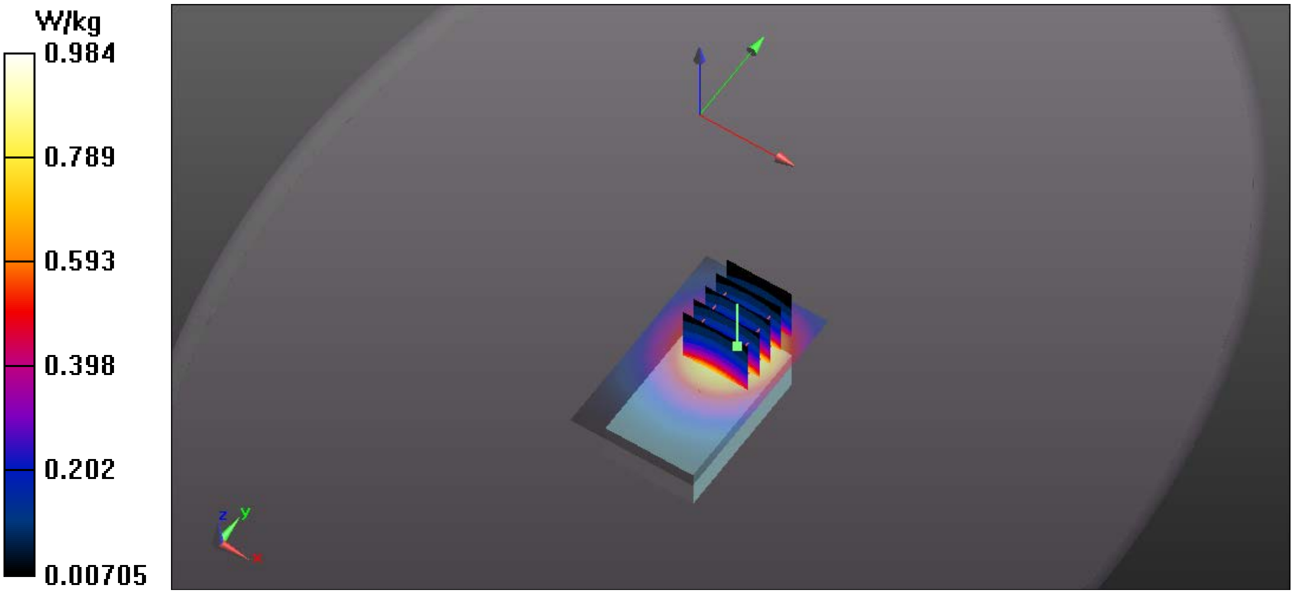
Procedure Notes:

835 MHz Face/WCDMA Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.984 W/kg

835 MHz Face/WCDMA Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.747 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.04 W/kg
SAR(1 g) = 0.702 W/kg; SAR(10 g) = 0.469 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.919 W/kg



RF Exposure Lab

Plot 2

DUT: Libris Responder; Type: mPERS; Serial: 933

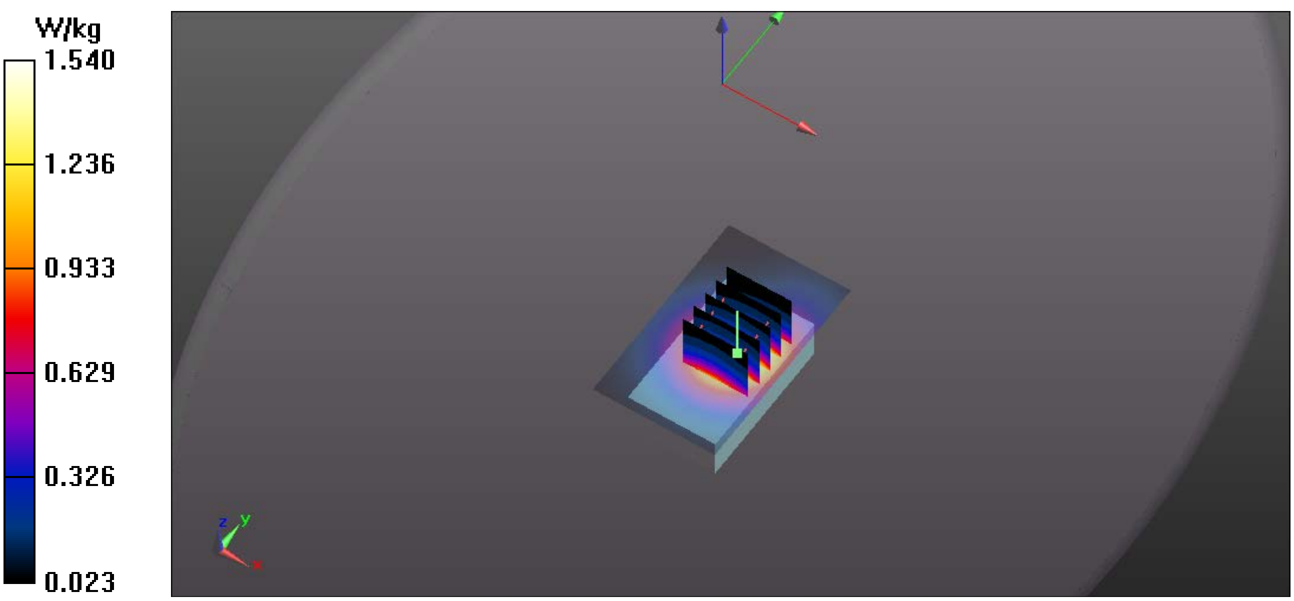
Communication System: UMTS (WCDMA); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: HSL1900; Medium parameters used: f = 1880 MHz; σ = 1.41 S/m; ε_r = 39.19; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/20/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.67, 7.67, 7.67); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Procedure Notes:

1900 MHz Face/WCDMA Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.54 W/kg

1900 MHz Face/WCDMA Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.505 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.74 W/kg
SAR(1 g) = 1.07 W/kg; SAR(10 g) = 0.645 W/kg
Maximum value of SAR (measured) = 1.50 W/kg



RF Exposure Lab

Plot 3

DUT: Libris Responder; Type: mPERS; Serial: 933

Communication System: UMTS (WCDMA); Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: MSL835; Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.99 S/m; ε_r = 55.902; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/21/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 1.44mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

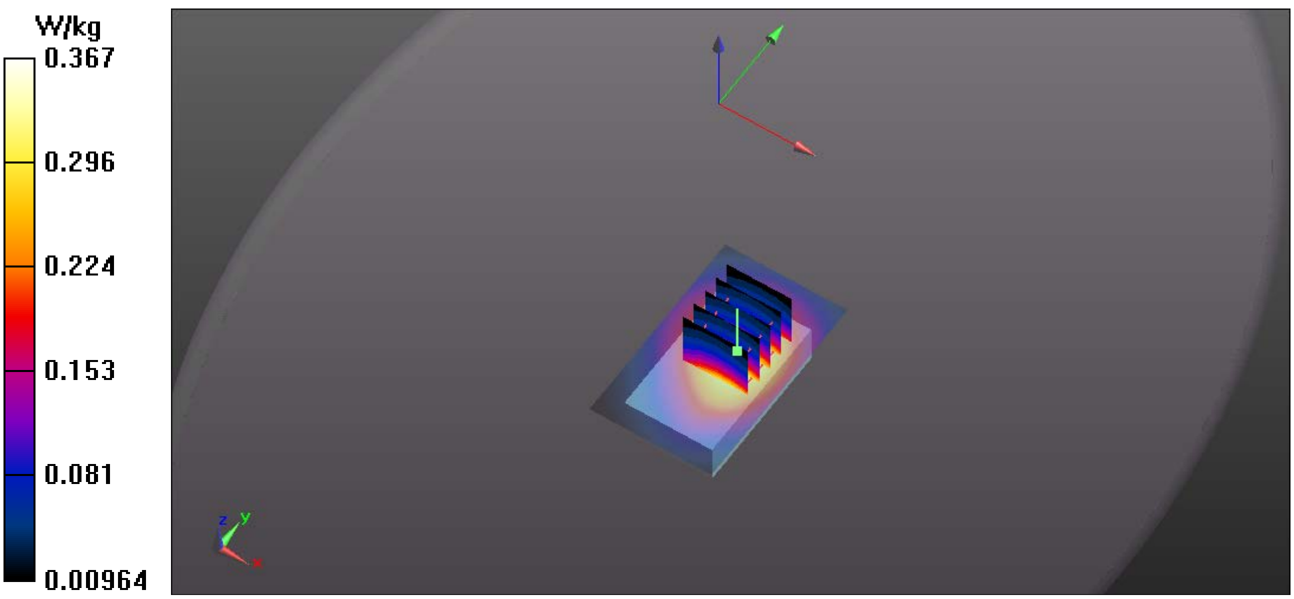
Procedure Notes:

835 MHz Lanyard/WCDMA Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.367 W/kg

835 MHz Lanyard/WCDMA Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.319 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.385 W/kg
SAR(1 g) = 0.277 W/kg; SAR(10 g) = 0.195 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.349 W/kg



RF Exposure Lab

Plot 4

DUT: Libris Responder; Type: mPERS; Serial: 933

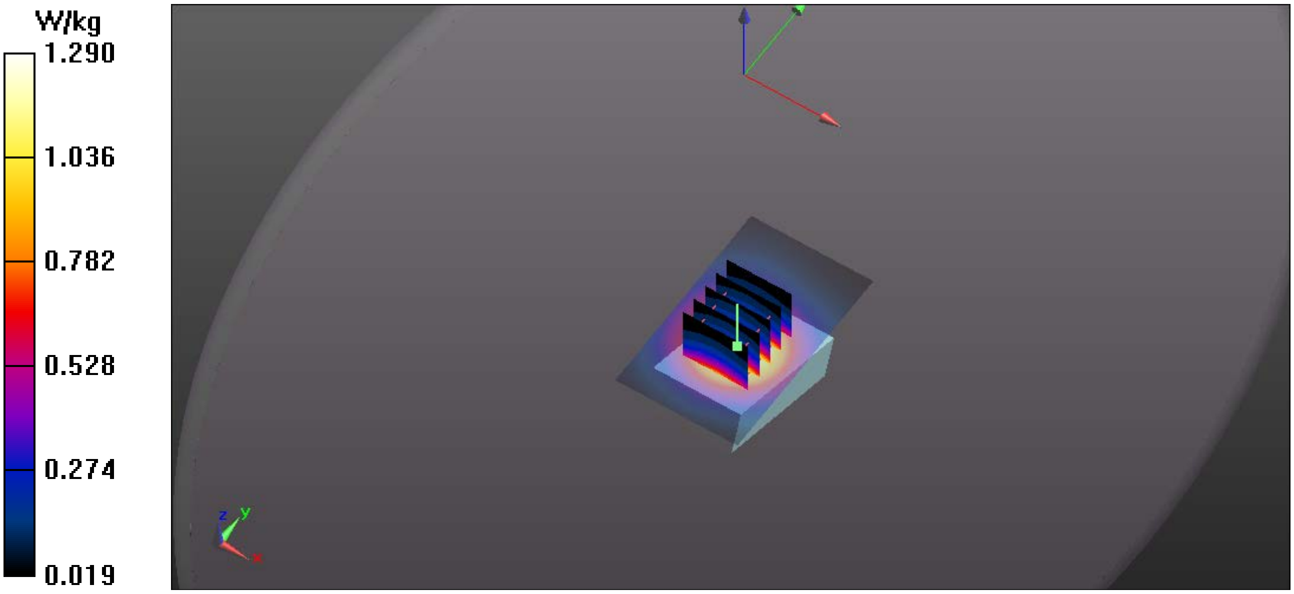
Communication System: UMTS (WCDMA); Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used: f = 1880 MHz; σ = 1.54 S/m; ε_r = 53.05; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/19/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.13, 7.13, 7.13); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Procedure Notes:

1900 MHz Lanyard/WCDMA Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.29 W/kg

1900 MHz Lanyard/WCDMA Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.505 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.48 W/kg
SAR(1 g) = 0.957 W/kg; SAR(10 g) = 0.602 W/kg
Maximum value of SAR (measured) = 1.30 W/kg



RF Exposure Lab

Plot 5

DUT: Libris Responder; Type: mPERS; Serial: 933

Communication System: GPRS 2-Slot (GMSK); Frequency: 836.6 MHz; Duty Cycle: 1:4.00037
Medium: MSL835; Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.99 S/m; ε_r = 55.902; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/21/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 1.44mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

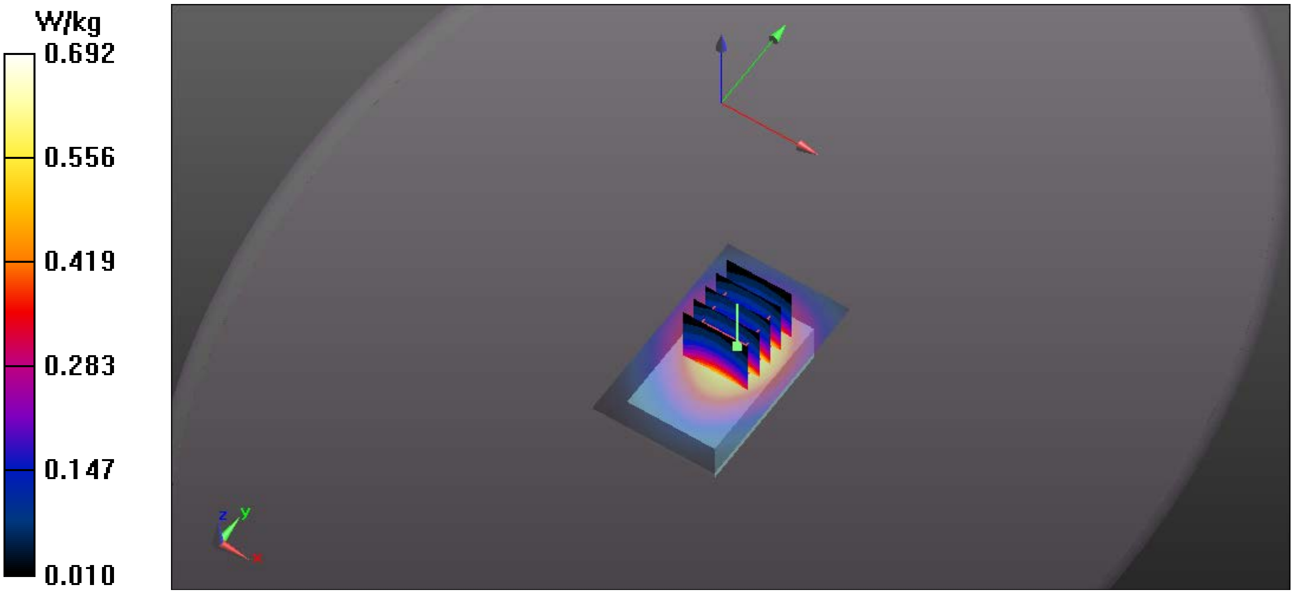
Procedure Notes:

835 MHz Belt Clip/GSM Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.692 W/kg

835 MHz Belt Clip/GSM Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.624 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.767 W/kg
SAR(1 g) = 0.547 W/kg; SAR(10 g) = 0.381 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.692 W/kg



RF Exposure Lab

Plot 6

DUT: Libris Responder; Type: mPERS; Serial: 933

Communication System: UMTS (WCDMA); Frequency: 1852.4 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.502 S/m; ε_r = 53.123; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/18/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.13, 7.13, 7.13); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

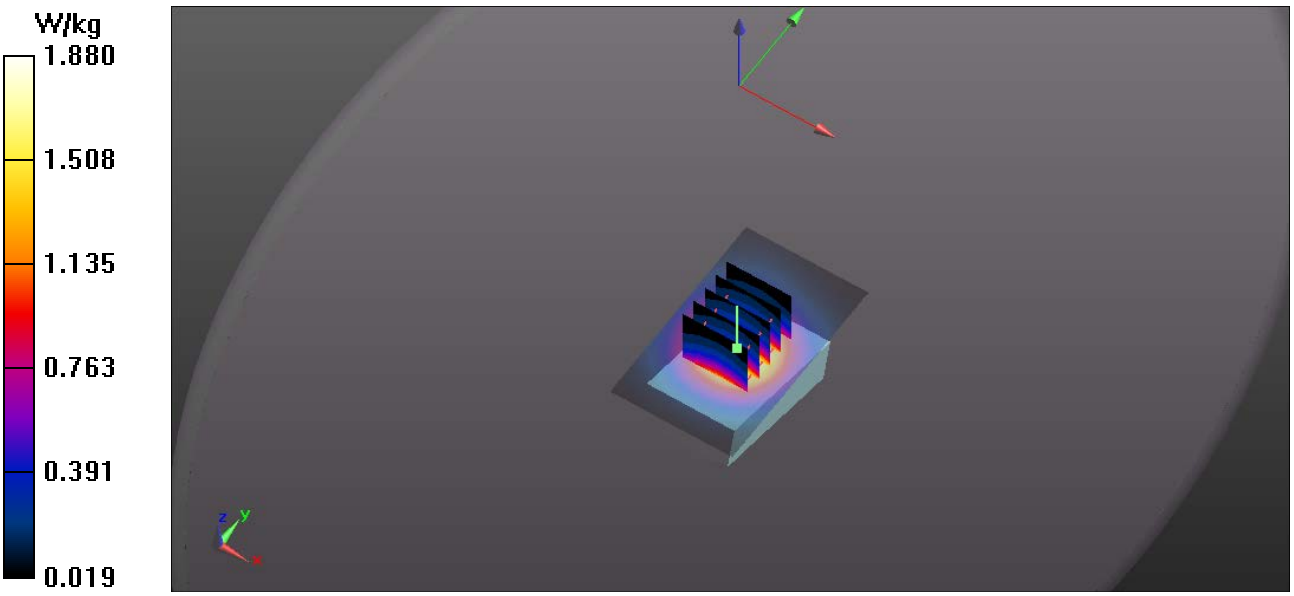
Procedure Notes:

1900 MHz Belt Clip/WCDMA Low/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.88 W/kg

1900 MHz Belt Clip/WCDMA Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.840 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 2.19 W/kg
SAR(1 g) = 1.34 W/kg; SAR(10 g) = 0.877 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.93 W/kg



RF Exposure Lab

Plot 7

DUT: Libris Responder; Type: mPERS; Serial: 933

Communication System: UMTS (WCDMA); Frequency: 1852.4 MHz; Duty Cycle: 1:1
Medium: MSL1900; Medium parameters used (interpolated): f = 1852.4 MHz; σ = 1.502 S/m; ε_r = 53.123; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/21/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.13, 7.13, 7.13); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

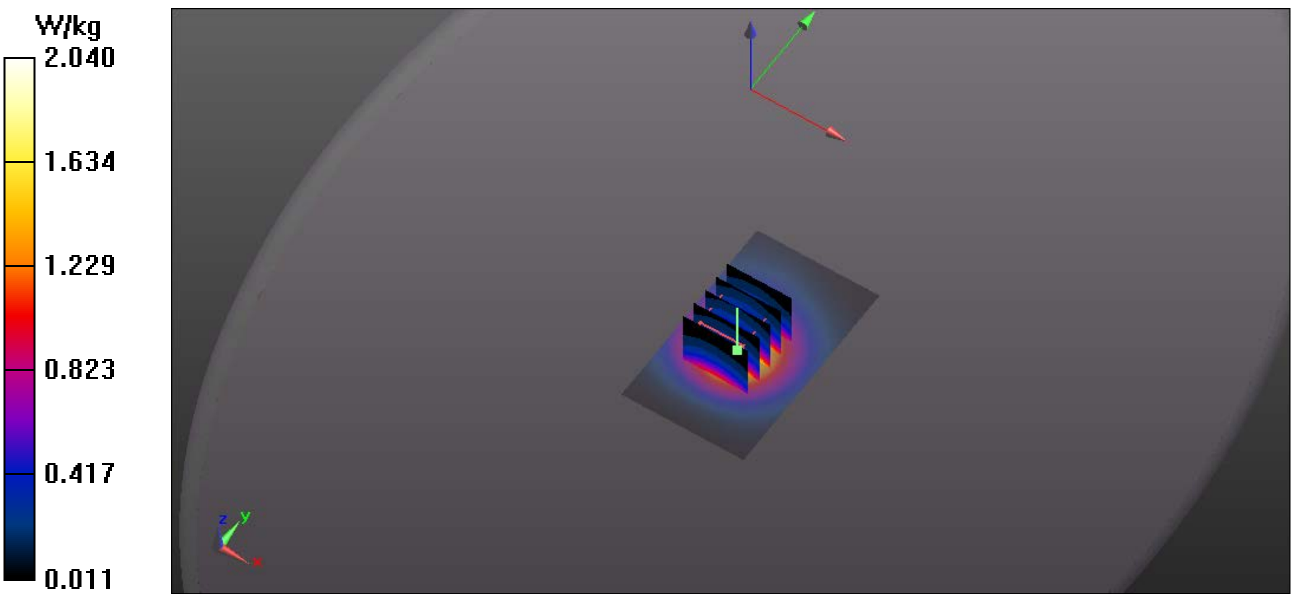
Procedure Notes:

1900 MHz Belt Clip/WCDMA Low/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.04 W/kg

1900 MHz Belt Clip/WCDMA Low/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.140 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 2.27 W/kg
SAR(1 g) = 1.36 W/kg; SAR(10 g) = 0.906 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.98 W/kg



RF Exposure Lab

Plot 8

DUT: Libris Responder; Type: mPERS; Serial: 933

Communication System: GPRS 2-Slot (GMSK); Frequency: 836.6 MHz; Duty Cycle: 1:4.00037
Medium: MSL835; Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.99 S/m; ε_r = 55.902; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/21/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 1.44mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

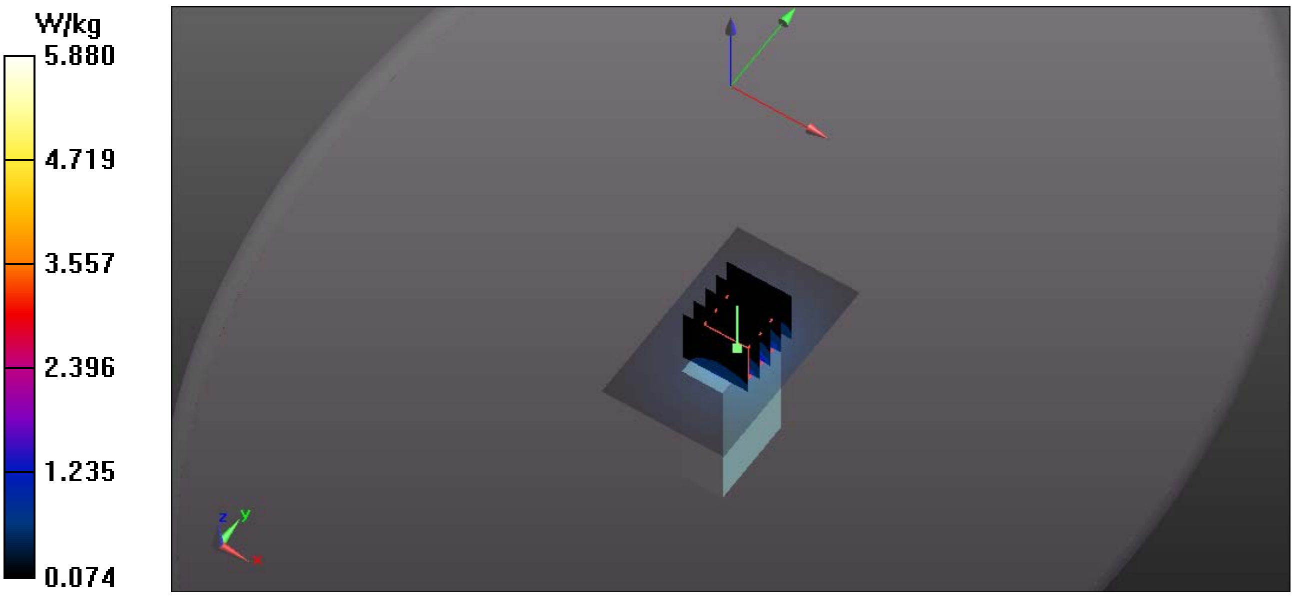
Procedure Notes:

835 MHz Top/GSM Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 5.88 W/kg

835 MHz Top/GSM Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.624 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 7.54 W/kg
SAR(1 g) = 2.24 W/kg; SAR(10 g) = 0.876 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 5.06 W/kg



RF Exposure Lab

Plot 9

DUT: Libris Responder; Type: mPERS; Serial: 933

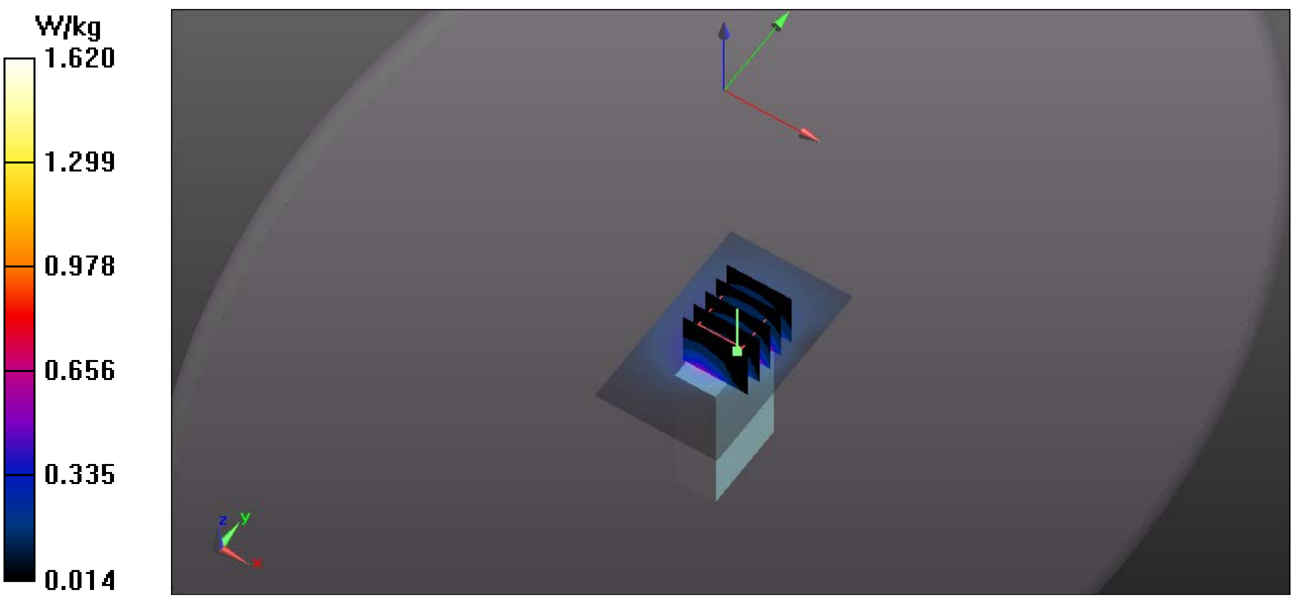
Communication System: GPRS 2-Slot (GMSK); Frequency: 1880 MHz; Duty Cycle: 1:4.00037
Medium: MSL1900; Medium parameters used: f = 1880 MHz; σ = 1.54 S/m; ε_r = 53.05; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/20/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.13, 7.13, 7.13); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Procedure Notes:

1900 MHz Top/GSM Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 1.62 W/kg

1900 MHz Top/GSM Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.298 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.78 W/kg
SAR(1 g) = 0.853 W/kg; SAR(10 g) = 0.413 W/kg
Maximum value of SAR (measured) = 1.44 W/kg



RF Exposure Lab

Plot 10

DUT: Libris Responder; Type: mPERS; Serial: 933

Communication System: GPRS 2-Slot (GMSK); Frequency: 836.6 MHz; Duty Cycle: 1:4.00037
Medium: MSL835; Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.99 S/m; ε_r = 55.902; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/21/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 1.44mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

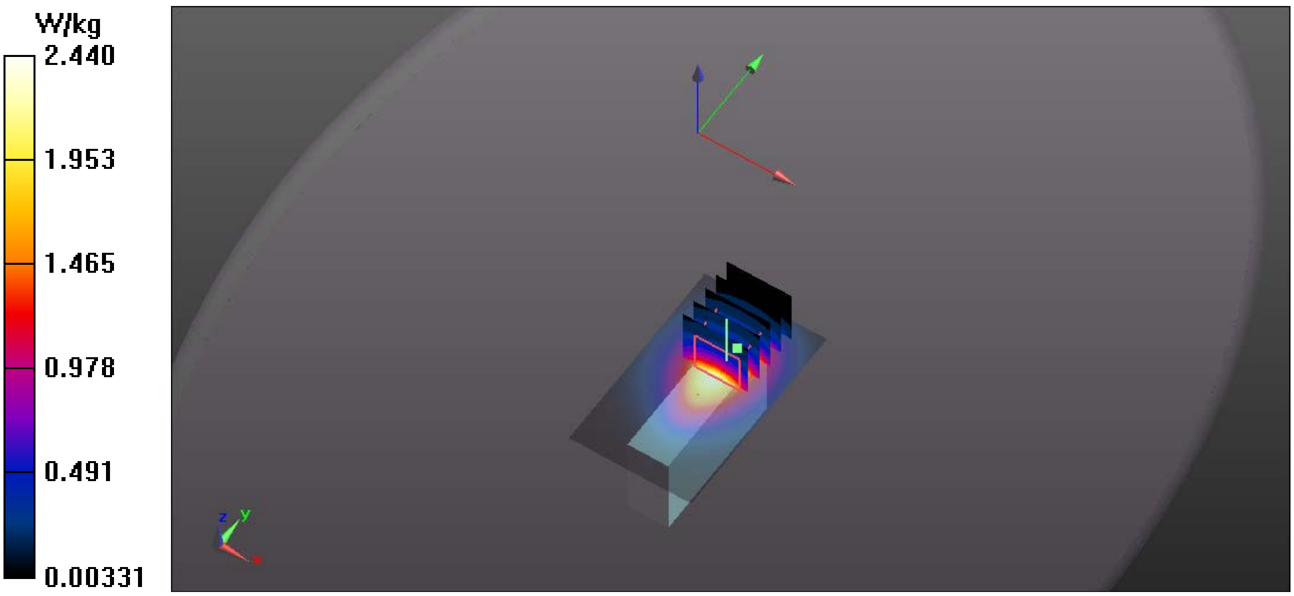
Procedure Notes:

835 MHz Right/GSM Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 2.44 W/kg

835 MHz Right/GSM Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 37.843 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 2.83 W/kg
SAR(1 g) = 1.76 W/kg; SAR(10 g) = 1.06 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.41 W/kg



RF Exposure Lab

Plot 11

DUT: Libris Responder; Type: mPERS; Serial: 933

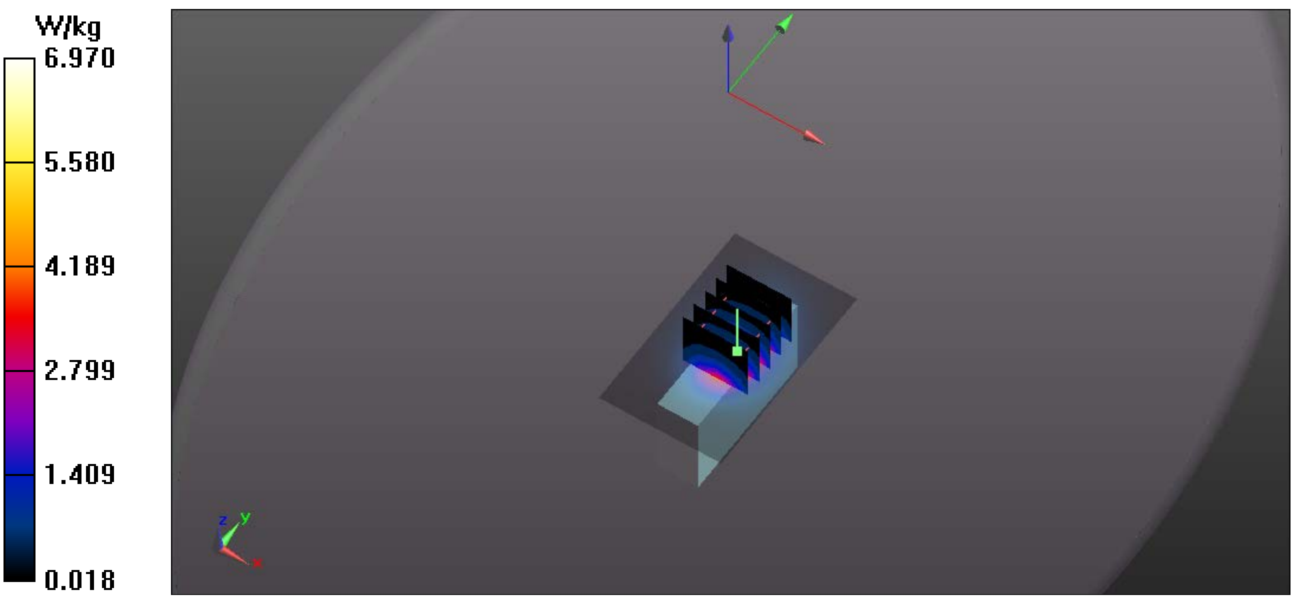
Communication System: GPRS 2-Slot (GMSK); Frequency: 1880 MHz; Duty Cycle: 1:4.00037
Medium: MSL1900; Medium parameters used: f = 1880 MHz; σ = 1.54 S/m; ε_r = 53.05; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/20/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.13, 7.13, 7.13); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Procedure Notes:

1900 MHz Right/GSM Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 6.97 W/kg

1900 MHz Right/GSM Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 55.346 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 8.12 W/kg
SAR(1 g) = 4.48 W/kg; SAR(10 g) = 2.34 W/kg
Maximum value of SAR (measured) = 6.89 W/kg



RF Exposure Lab

Plot 12

DUT: Libris Responder; Type: mPERS; Serial: 933

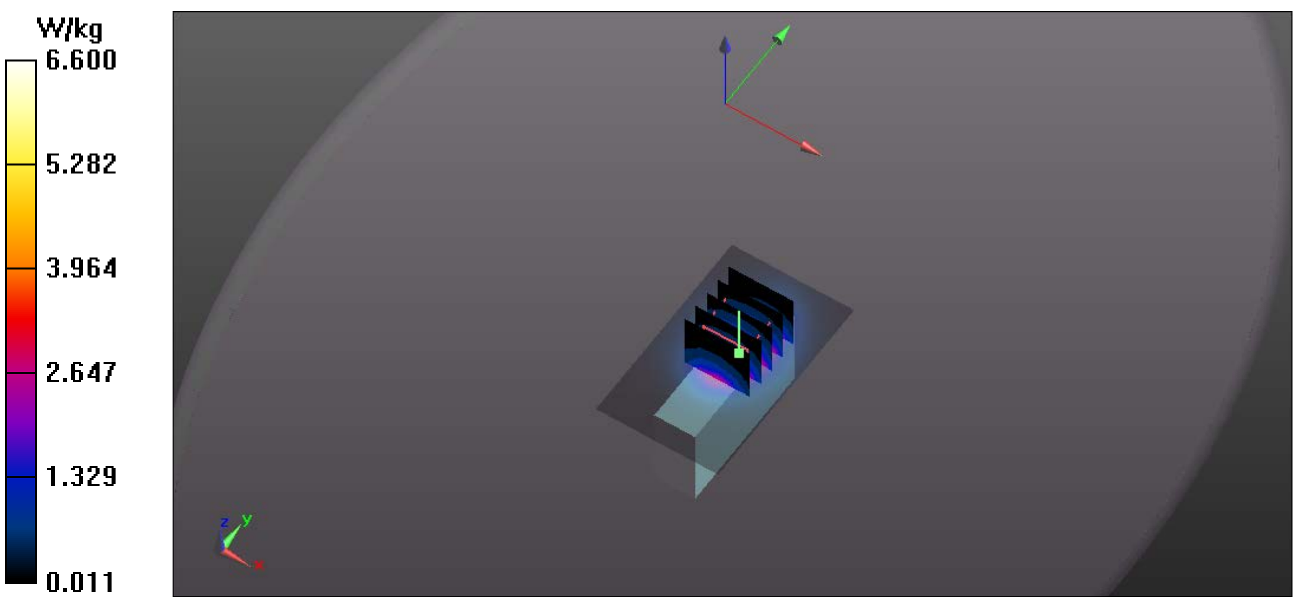
Communication System: GPRS 2-Slot (GMSK); Frequency: 1880 MHz; Duty Cycle: 1:4.00037
Medium: MSL1900; Medium parameters used: f = 1880 MHz; σ = 1.54 S/m; ε_r = 53.05; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/21/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.13, 7.13, 7.13); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Procedure Notes:

1900 MHz Right/GSM Mid Repeat/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 6.60 W/kg

1900 MHz Right/GSM Mid Repeat/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 52.941 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 7.69 W/kg
SAR(1 g) = 4.3 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 6.45 W/kg



RF Exposure Lab

Plot 13

DUT: Libris Responder; Type: mPERS; Serial: 933

Communication System: GPRS 2-Slot (GMSK); Frequency: 836.6 MHz; Duty Cycle: 1:4.00037
Medium: MSL835; Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.99 S/m; ε_r = 55.902; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/21/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(8.87, 8.87, 8.87); Calibrated: 8/20/2012;
Sensor-Surface: 1.44mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

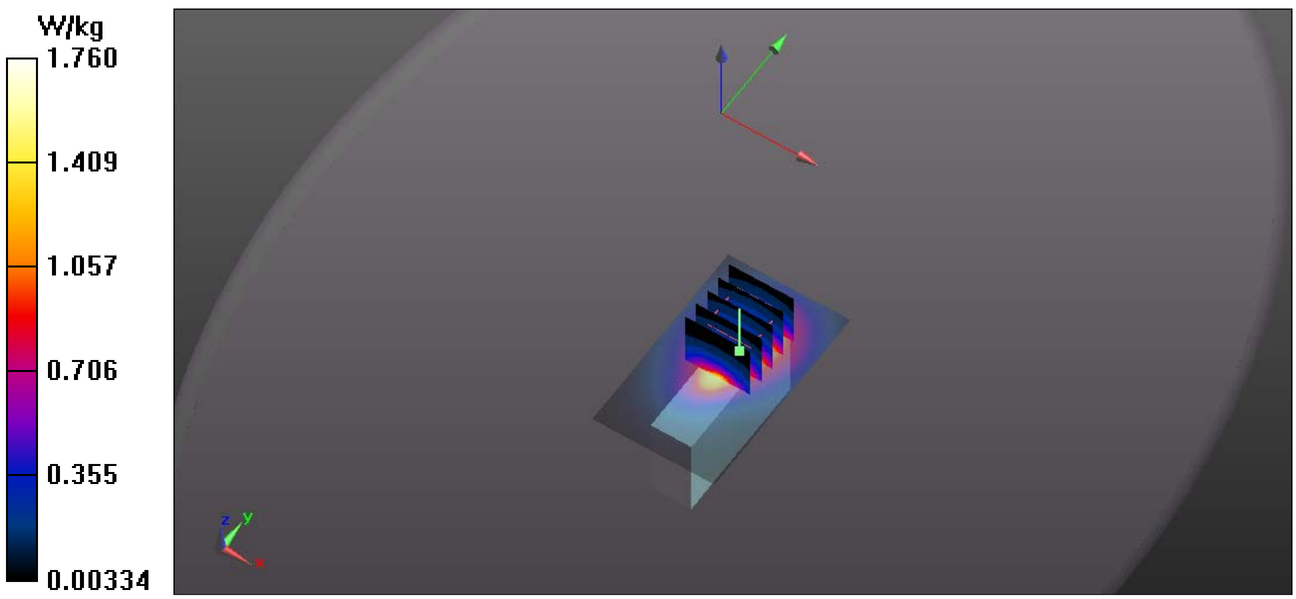
Procedure Notes:

835 MHz Left/GSM Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 1.76 W/kg

835 MHz Left/GSM Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 37.843 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.97 W/kg
SAR(1 g) = 1.23 W/kg; SAR(10 g) = 0.766 W/kg

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.70 W/kg



RF Exposure Lab

Plot 14

DUT: Libris Responder; Type: mPERS; Serial: 933

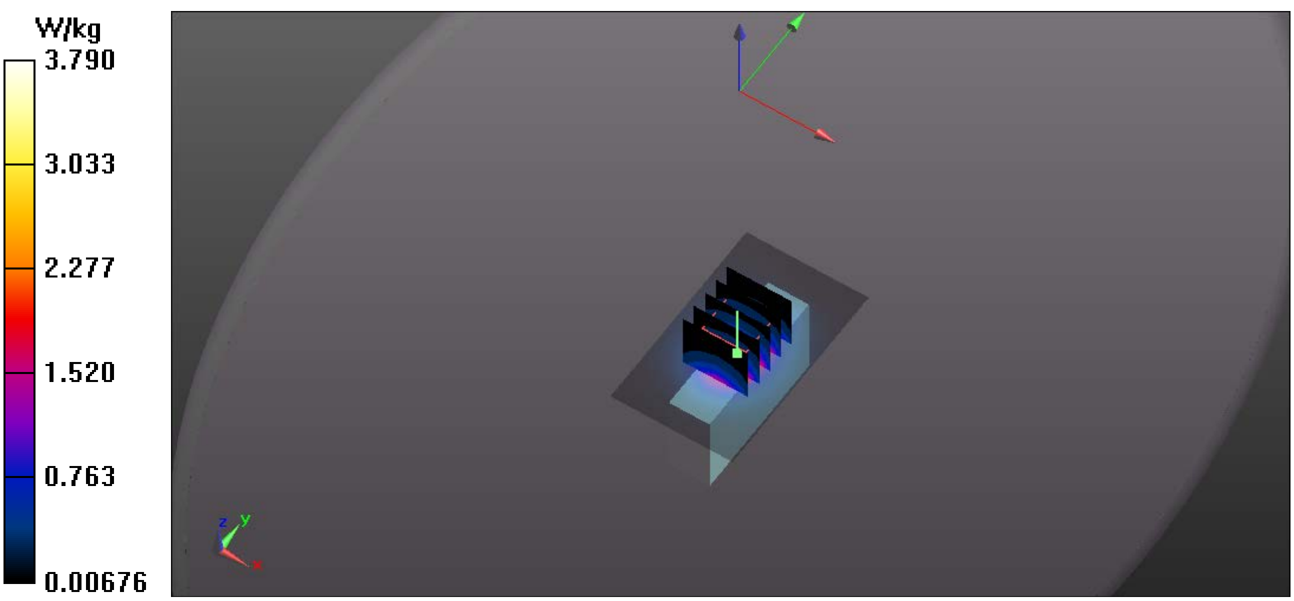
Communication System: GPRS 2-Slot (GMSK); Frequency: 1880 MHz; Duty Cycle: 1:4.00037
Medium: MSL1900; Medium parameters used: f = 1880 MHz; σ = 1.54 S/m; ε_r = 53.05; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: Date: 3/20/2013; Ambient Temp: 23 °C; Tissue Temp: 21 °C
Probe: EX3DV4 - SN3693; ConvF(7.13, 7.13, 7.13); Calibrated: 8/20/2012;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn759; Calibrated: 8/15/2012
Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1065
Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

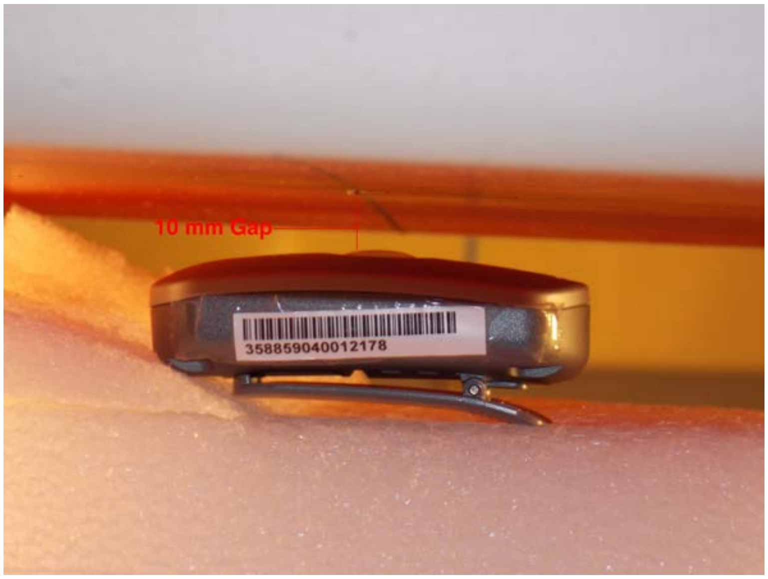
Procedure Notes:

1900 MHz Left/GSM Mid/Area Scan (61x101x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Maximum value of SAR (interpolated) = 3.79 W/kg

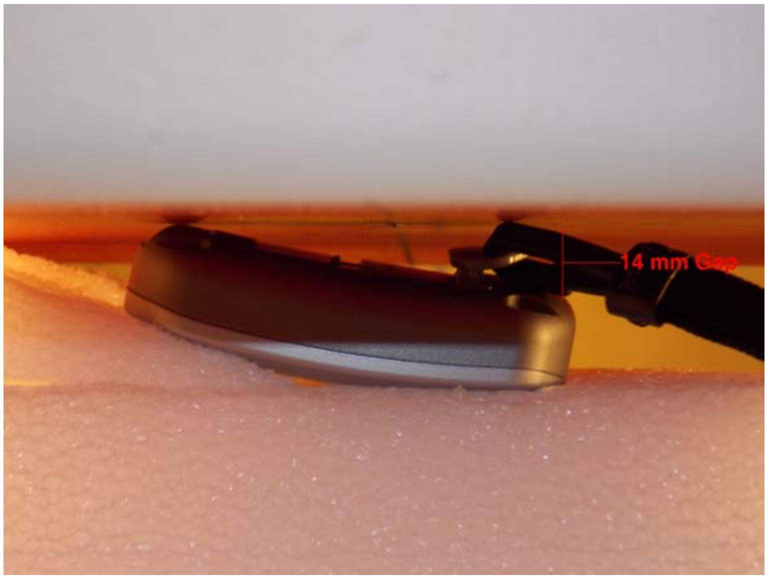
1900 MHz Left/GSM Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 41.706 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 4.56 W/kg
SAR(1 g) = 2.55 W/kg; SAR(10 g) = 1.32 W/kg
Maximum value of SAR (measured) = 3.88 W/kg



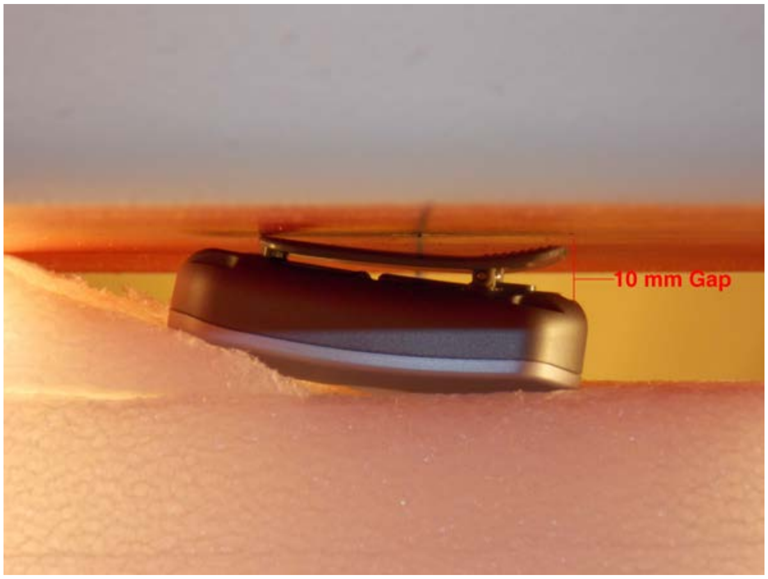
Appendix C – SAR Test Setup Photos



Test Position Face 10 mm Gap



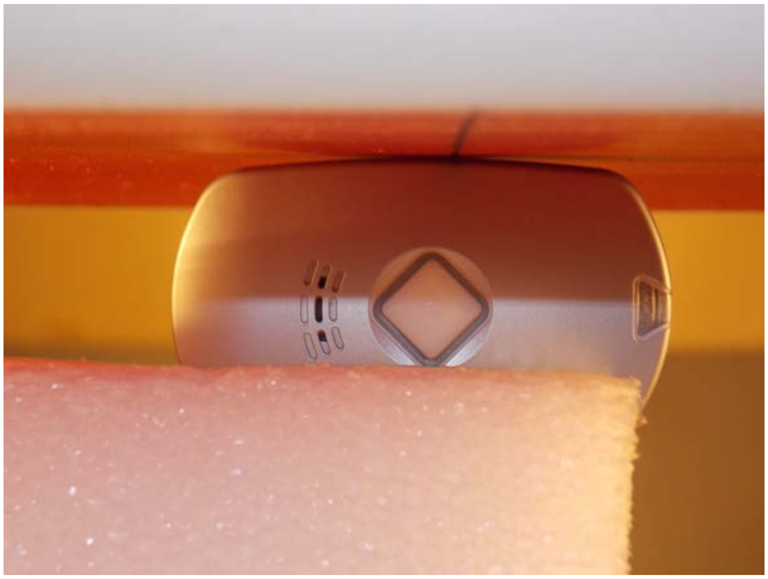
**Test Position Back with Lanyard
14 mm Gap at Antenna**



Test Position Back with Belt Clip
10 mm Gap at Antenna

Test Position Top 0 mm Gap

Test Position Right Side 0 mm Gap



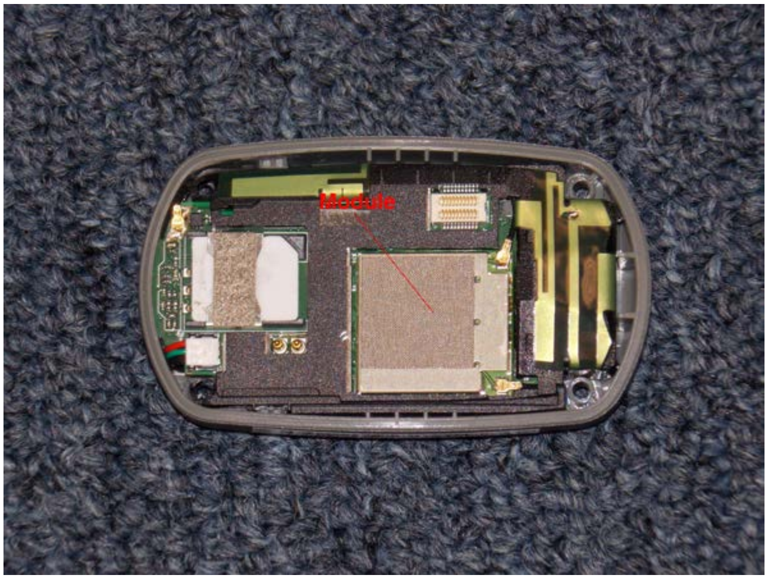
Test Position Left Side 0 mm Gap

Front of Device

Back of Device with Belt Clip

Back of Device with Lanyard

Front Cover Removed



RF Module

Appendix D – Probe Calibration Data Sheets

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

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

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

Accreditation No.: SCS 108

Client **RF Exposure Lab**

Certificate No: EX3-3693_Aug12

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3693
Calibration procedure(s)	QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	August 20, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: August 20, 2012

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3693

Manufactured: April 22, 2009
Calibrated: August 20, 2012

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3693

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.49	0.48	0.46	± 10.1 %
DCP (mV)[B]	98.3	100.5	98.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	161.4	±3.0 %
			Y	0.00	0.00	1.00	154.4	
			Z	0.00	0.00	1.00	158.9	

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

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3693

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	8.99	8.99	8.99	0.23	1.20	± 12.0 %
835	41.5	0.90	8.55	8.55	8.55	0.18	1.56	± 12.0 %
1750	40.1	1.37	8.00	8.00	8.00	0.51	0.76	± 12.0 %
1900	40.0	1.40	7.67	7.67	7.67	0.75	0.63	± 12.0 %
2450	39.2	1.80	6.72	6.72	6.72	0.29	1.09	± 12.0 %
2550	39.1	1.91	6.55	6.55	6.55	0.39	0.93	± 12.0 %
5200	36.0	4.66	4.97	4.97	4.97	0.30	1.80	± 13.1 %
5300	35.9	4.76	4.78	4.78	4.78	0.30	1.80	± 13.1 %
5600	35.5	5.07	4.22	4.22	4.22	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.34	4.34	4.34	0.40	1.80	± 13.1 %

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

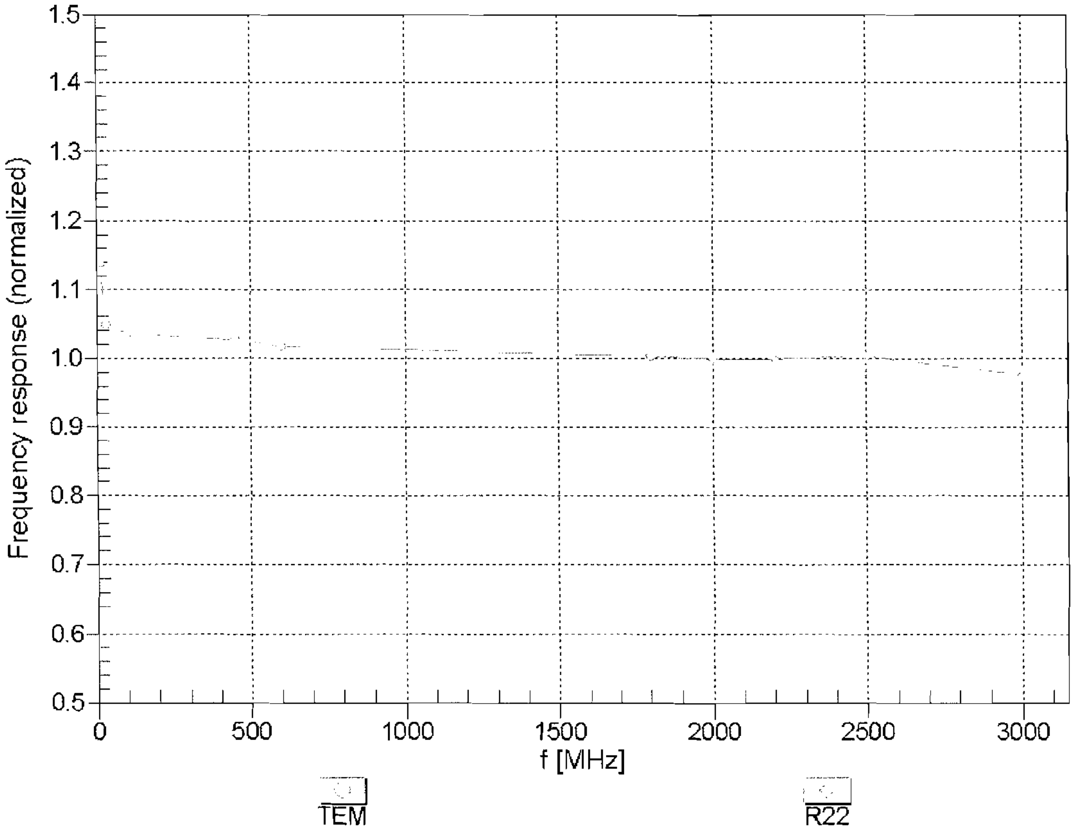
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3693

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	8.84	8.84	8.84	0.29	1.09	± 12.0 %
835	55.2	0.97	8.87	8.87	8.87	0.60	0.71	± 12.0 %
1750	53.4	1.49	7.43	7.43	7.43	0.41	0.85	± 12.0 %
1900	53.3	1.52	7.13	7.13	7.13	0.41	0.82	± 12.0 %
2450	52.7	1.95	6.76	6.76	6.76	0.80	0.50	± 12.0 %
2550	52.6	2.09	6.75	6.75	6.75	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.31	4.31	4.31	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.24	4.24	4.24	0.40	1.90	± 13.1 %
5600	48.5	5.77	3.76	3.76	3.76	0.45	1.90	± 13.1 %
5800	48.2	6.00	4.08	4.08	4.08	0.50	1.90	± 13.1 %

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

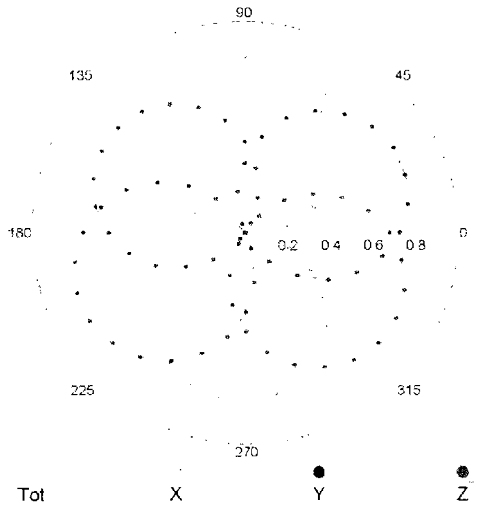
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



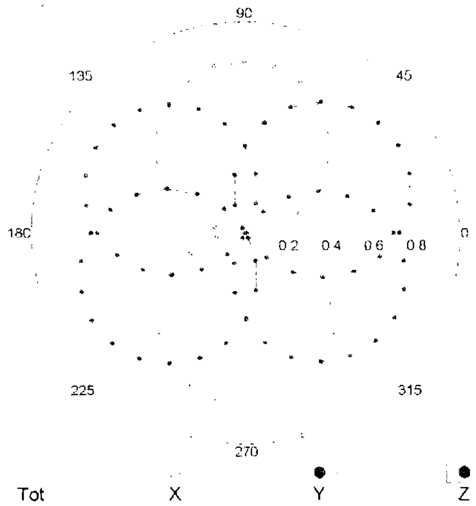
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

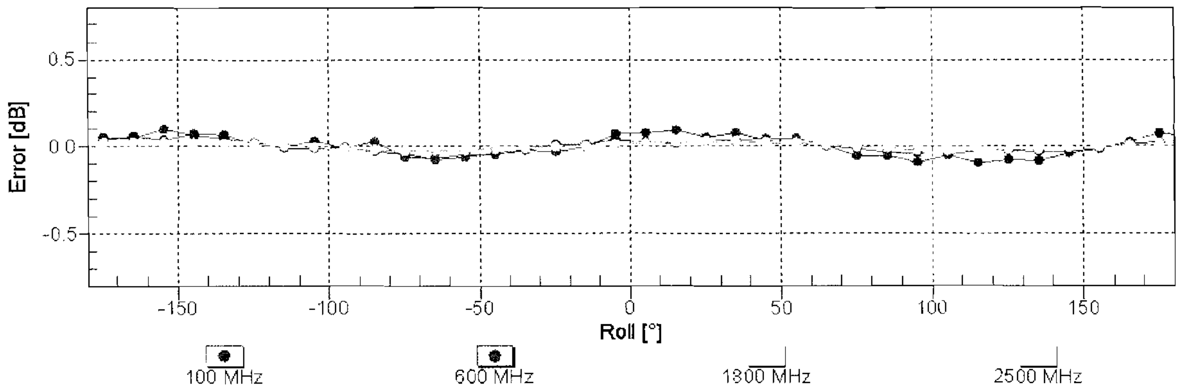
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



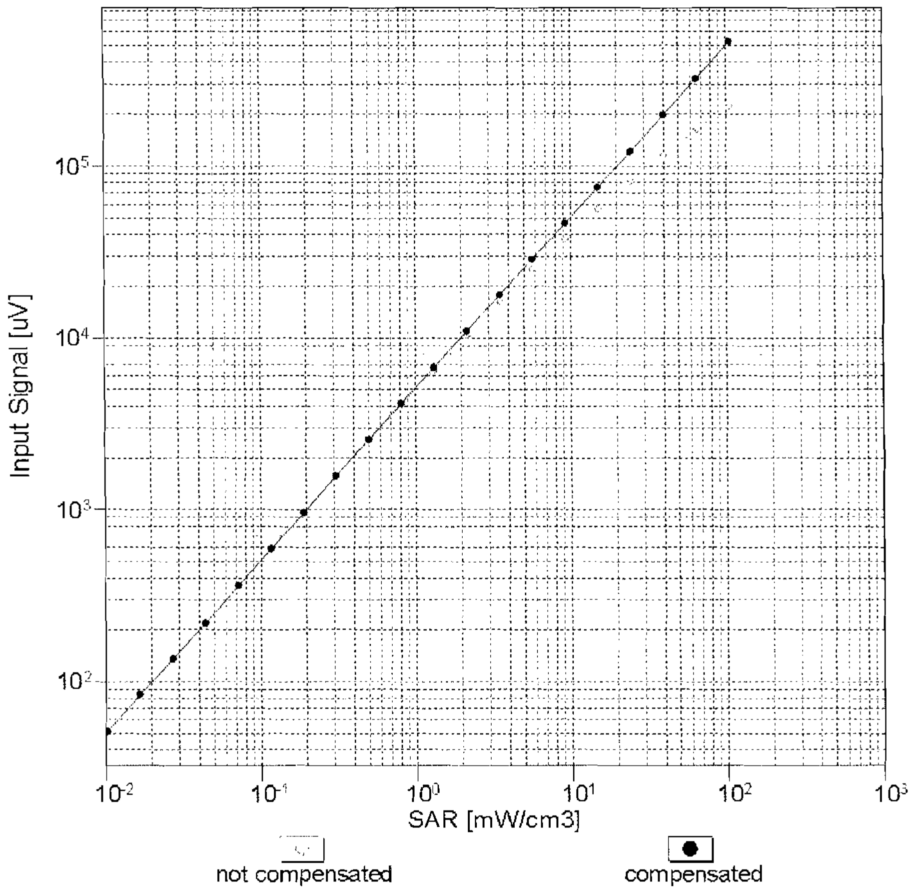
f=1800 MHz,R22

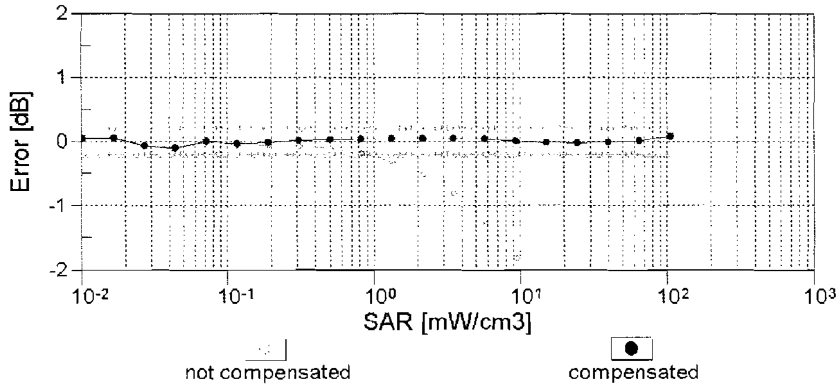




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

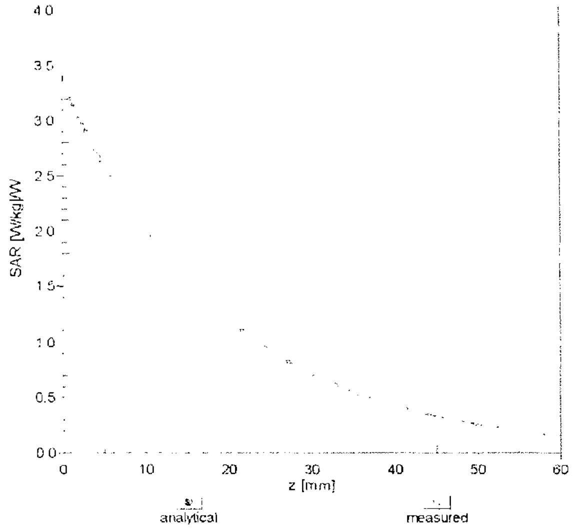




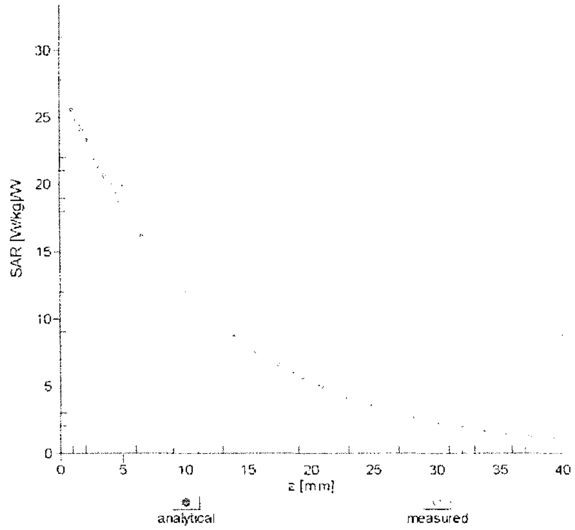
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

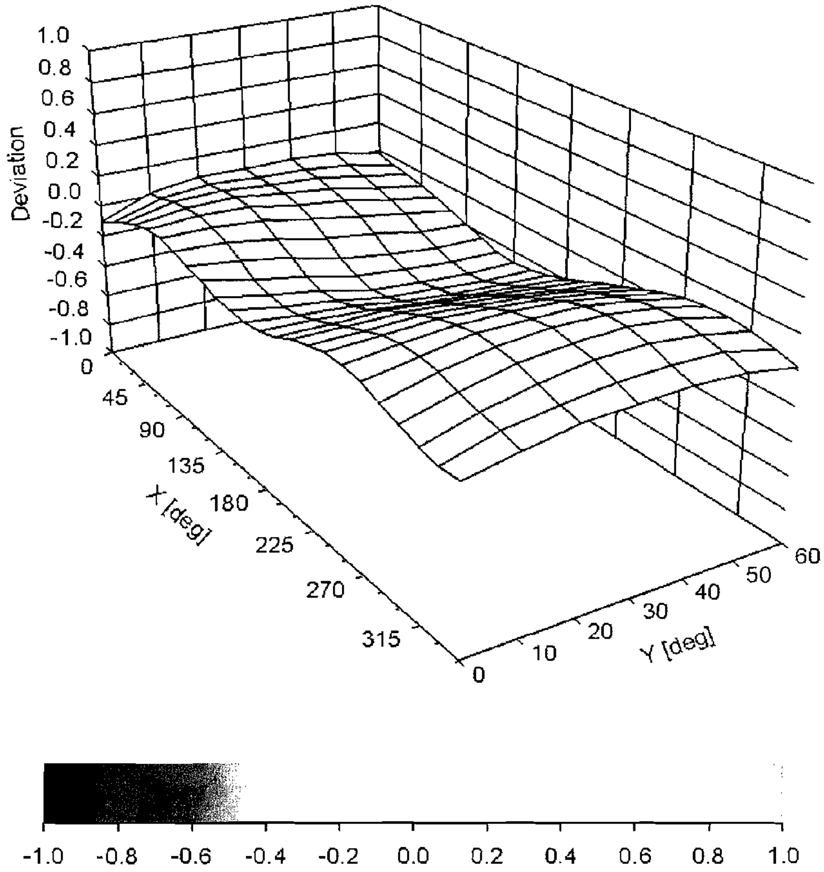


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3693

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	155.3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Appendix E – Dipole Calibration Data Sheets

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

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

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

Accreditation No.: SCS 108

Client **RF Exposure Lab**

Certificate No: D835V2-4d089_Dec12

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d089
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	December 03, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

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

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

Issued: December 3, 2012

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.36 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.12 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.5 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.51 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.27 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.7 Ω - 2.5 jΩ
Return Loss	- 30.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 4.8 jΩ
Return Loss	- 25.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 17, 2008

Date: 03.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d089

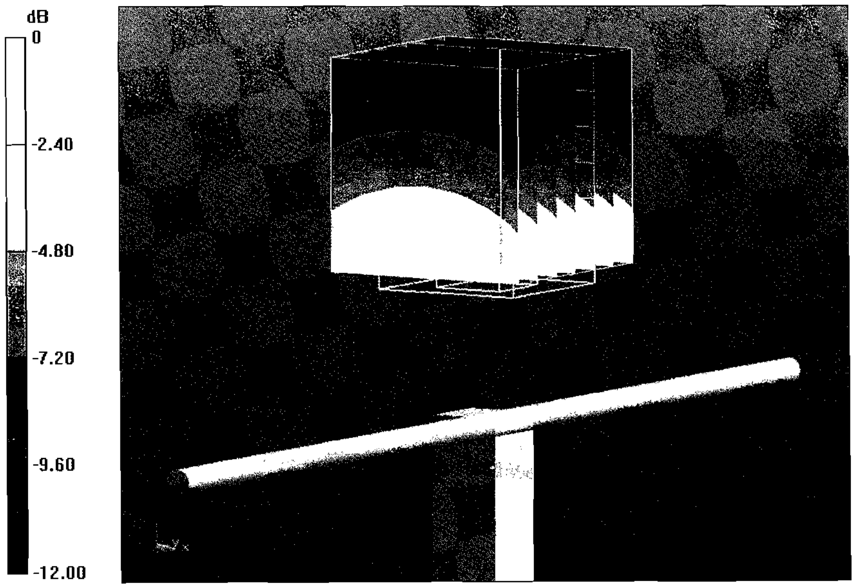
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

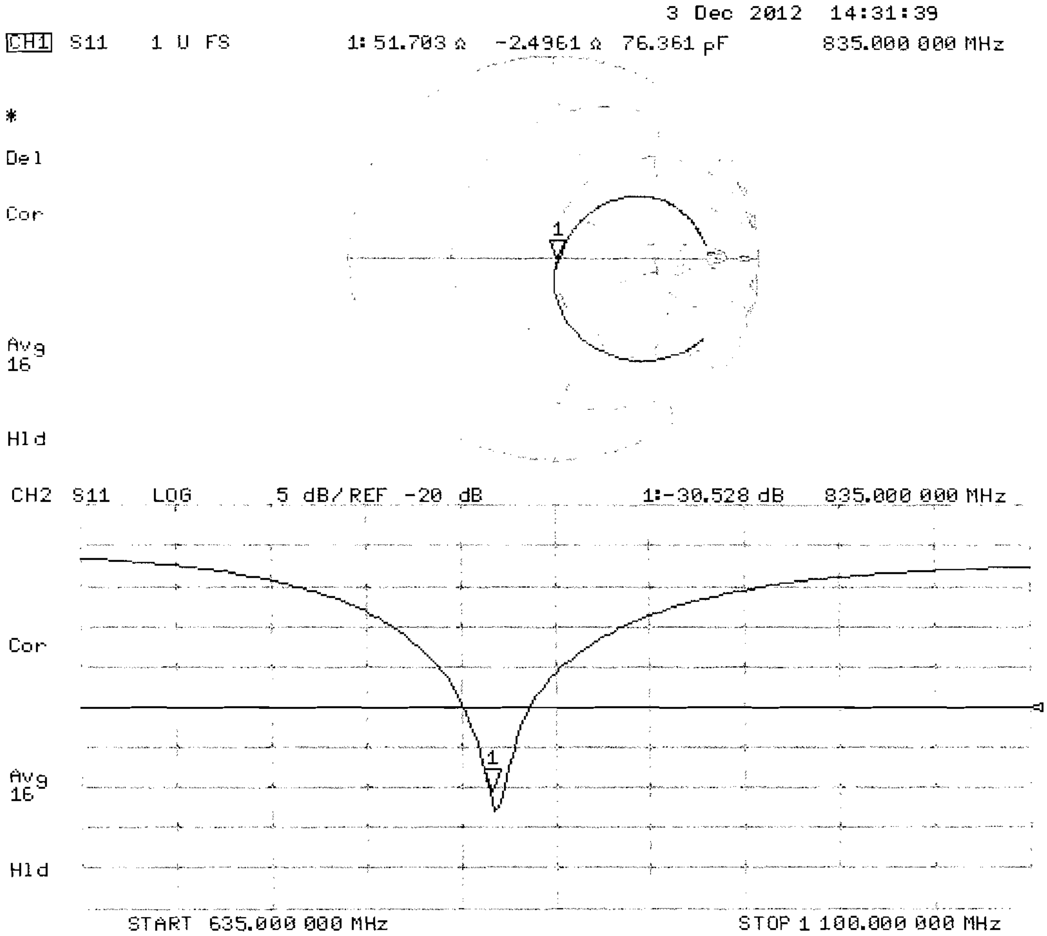
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.782 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 2.79 W/kg



0 dB = 2.79 W/kg = 4.46 dBW/kg

Impedance Measurement Plot for Head TSL



Date: 03.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d089

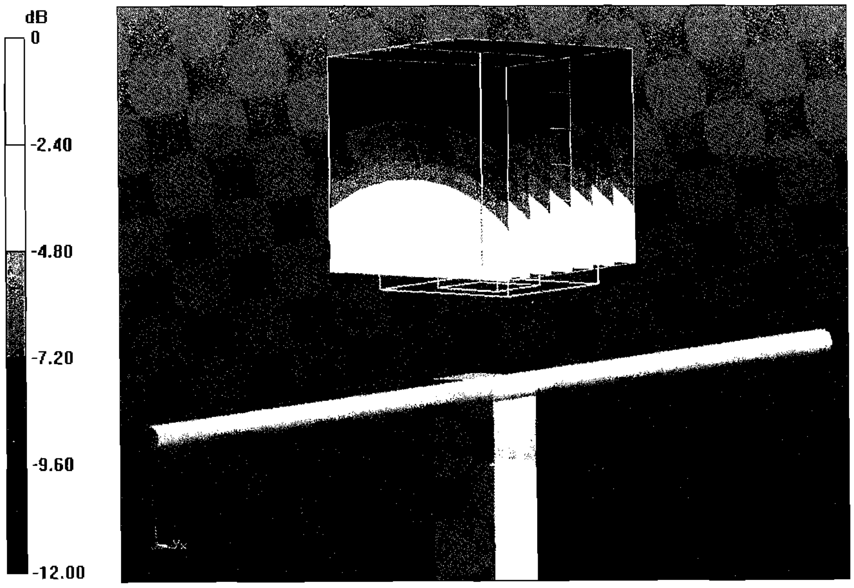
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

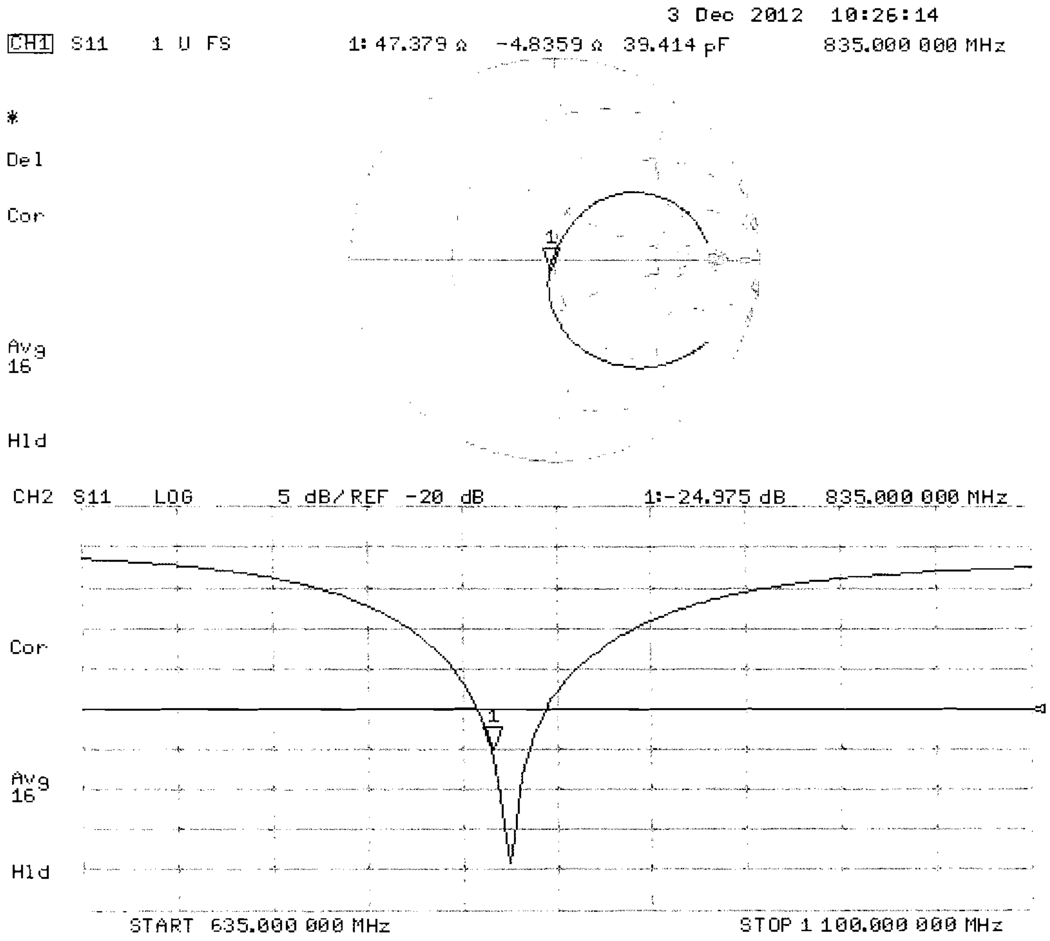
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.384 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.54 W/kg
SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 2.82 W/kg



0 dB = 2.82 W/kg = 4.50 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: **SCS 108**

Client **RF Exposure Lab**

Certificate No: **D1900V2-5d116_Dec12**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d116
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	December 06, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

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

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

Issued: December 6, 2012

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.3
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.5 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.97 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 W/kg ± 16.5 % (k=2)**

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	52.2 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.31 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.2 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω + 6.6 jΩ
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω + 6.7 jΩ
Return Loss	- 22.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 21, 2009

Date: 06.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d116

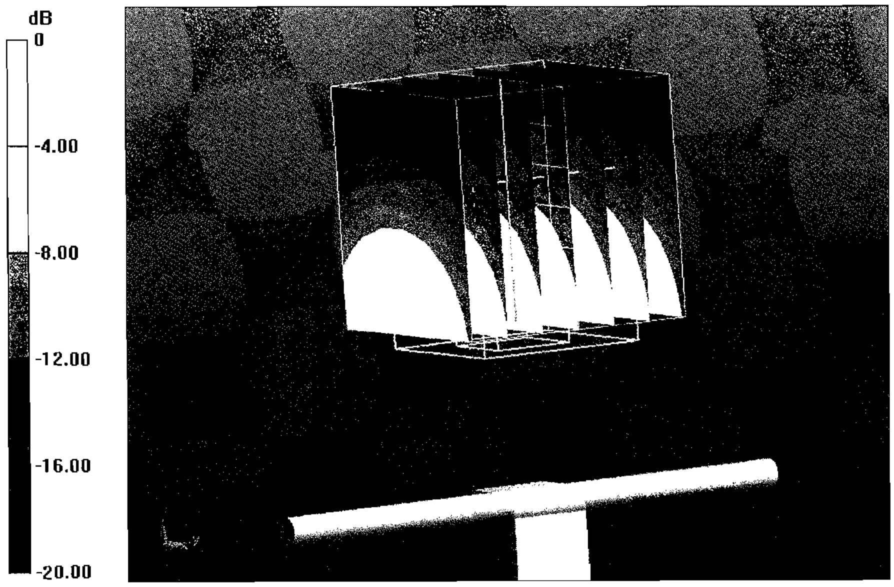
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

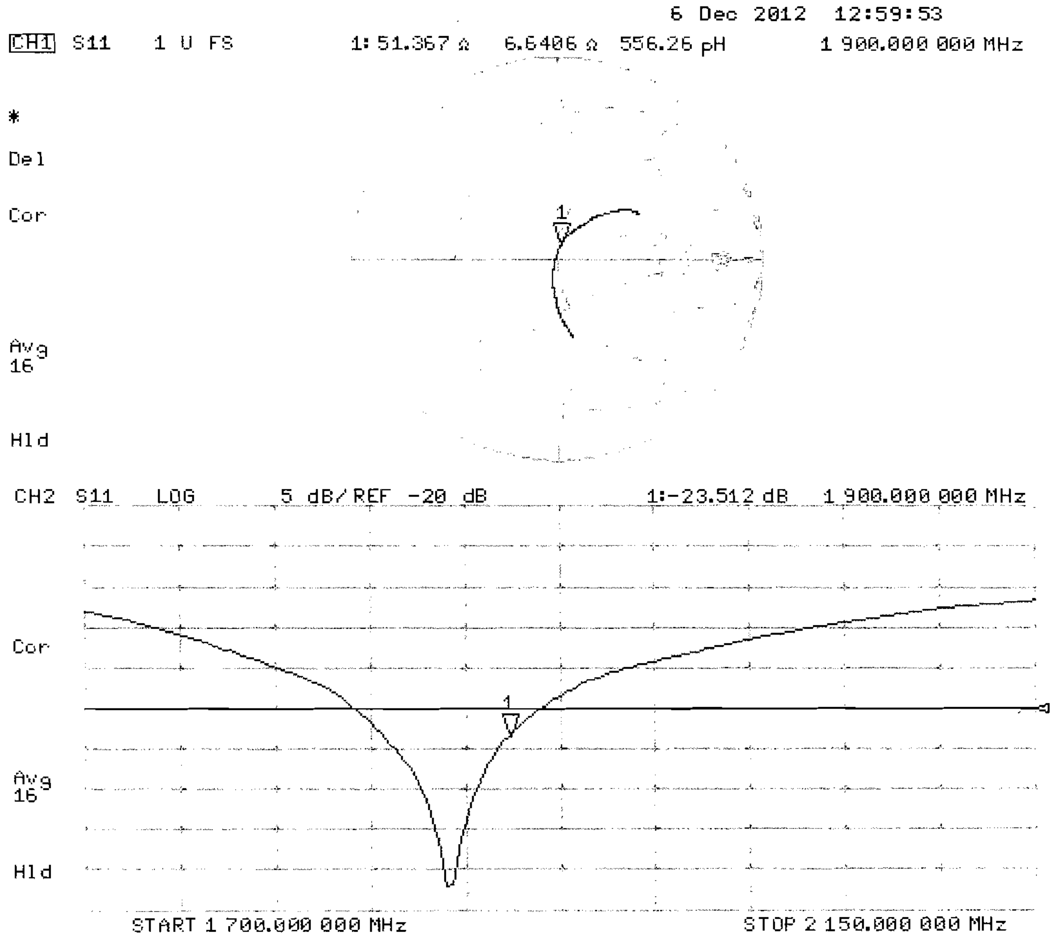
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.363 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 9.97 W/kg; SAR(10 g) = 5.24 W/kg
Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg

Impedance Measurement Plot for Head TSL



Date: 06.12.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d116

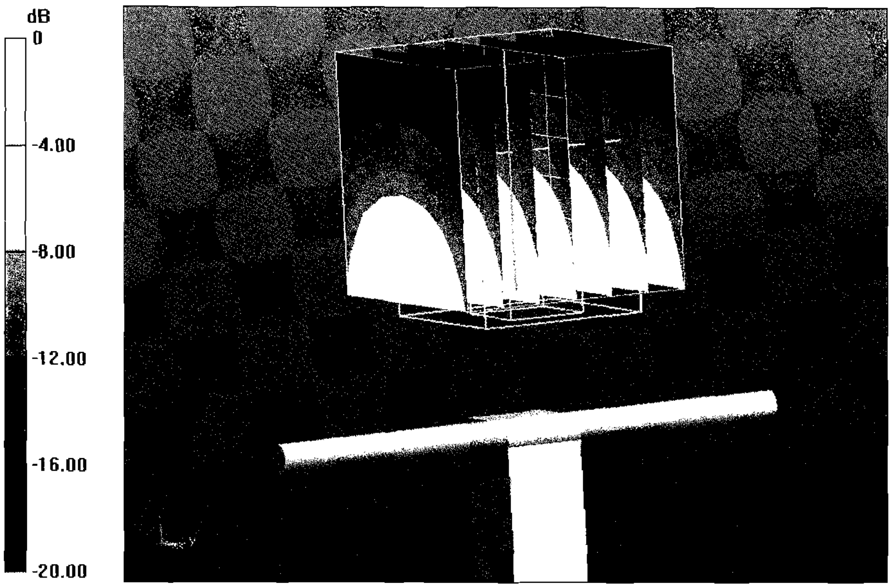
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.3(988); SEMCAD X 14.6.7(6848)

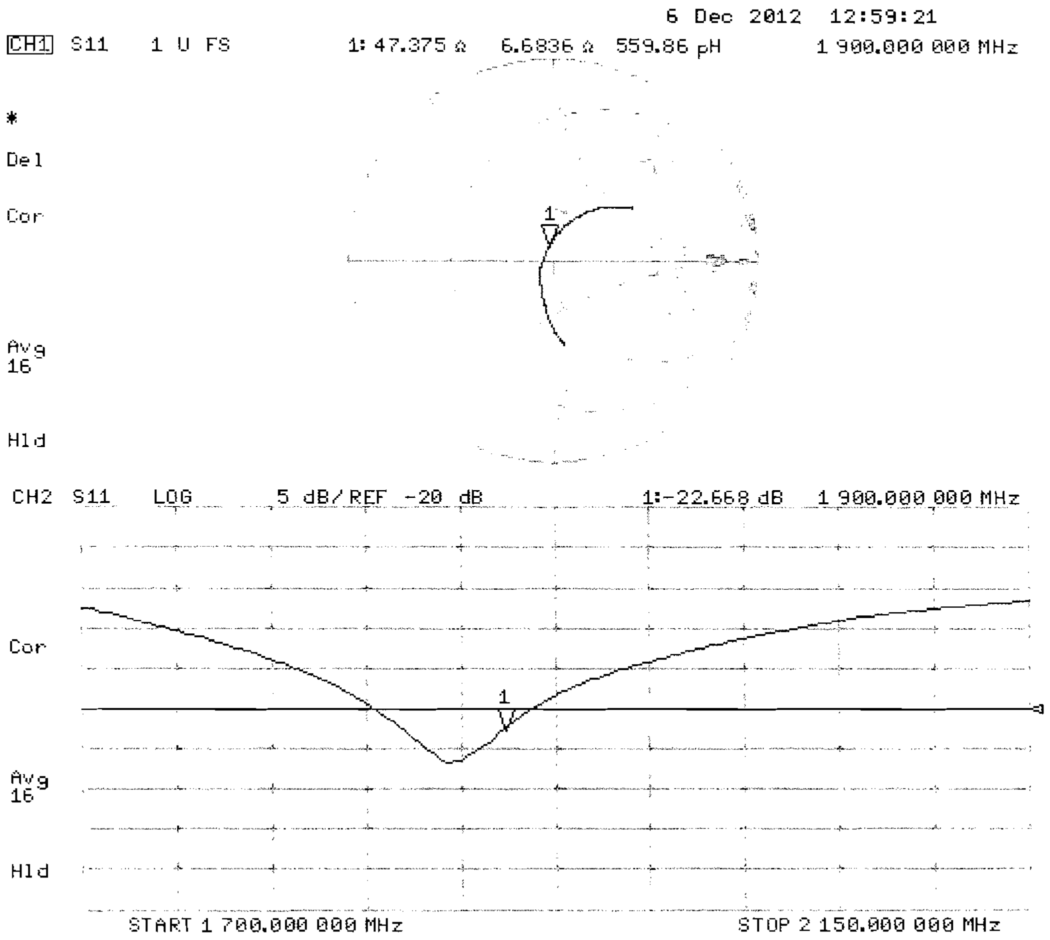
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 95.415 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 17.7 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.31 W/kg
Maximum value of SAR (measured) = 12.7 W/kg



0 dB = 12.7 W/kg = 11.04 dBW/kg

Impedance Measurement Plot for Body TSL



Appendix F – Phantom Calibration Data Sheets

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Certificate of Conformity / First Article Inspection

Item	Oval Flat Phantom ELI 4.0
Type No	QD OVA 001 B
Series No	1003 and higher
Manufacturer	Untersee Composites Knebelstrasse 8 CH-8268 Mannenbach, Switzerland

Tests

Complete tests were made on the prototype units QD OVA 001 AA 1001, QD OVA 001 AB 1002, pre-series units QD OVA 001 BA 1003-1005 as well as on the series units QD OVA 001 BB, 1006 ff.

Test	Requirement	Details	Units tested
Material thickness	Compliant with the standard requirements	Bottom plate: 2.0mm +/- 0.2mm	all
Material parameters	Dielectric parameters for required frequencies	< 6 GHz: Rel. permittivity = 4 +/-1, Loss tangent ≤ 0.05	Material sample
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions.	DGBE based simulating liquids. Observe Technical Note for material compatibility.	Equivalent phantoms, Material sample
Shape	Thickness of bottom material, Internal dimensions, Sagging compatible with standards from minimum frequency	Bottom elliptical 600 x 400 mm Depth 190 mm, Shape is within tolerance for filling height up to 155 mm, Eventual sagging is reduced or eliminated by support via DUT	Prototypes, Sample testing

Standards

[1] CENELEC EN 50361-2001, « Basic standard for the measurement of the Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz – 3 GHz) », July 2001

[2] IEEE 1528-2003, "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques, December 2003

[3] IEC 62209 – 1, "Specific Absorption Rate (SAR) in the frequency range of 300 MHz to 3 GHz – Measurement Procedure, Part 1: Hand-held mobile wireless communication devices", February 2005

[4] IEC 62209 – 2, Draft, "Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices – Human models, Instrumentation and Procedures – Part 2: Procedure to determine the Specific Absorption Rate (SAR) in the head and body for 30 MHz to 6 GHz Handheld and Body-Mounted Devices used in close proximity to the Body.", February 2005

[5] OET Bulletin 65, Supplement C, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", Edition January 2001

Based on the tests above, we certify that this item is in compliance with the standards [1] to [5] if operated according to the specific requirements and considering the thickness. The dimensions are fully compliant with [4] from 30 MHz to 6 GHz. For the other standards, the minimum lower frequency limit is limited due to the dimensional requirements ([1]: 450 MHz, [2]: 300 MHz, [3]: 800 MHz, [5]: 375 MHz) and possibly further by the dimensions of the DUT.

Date 28.4.2008 **Signature / Stamp**

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