TEST REPORT
(SAR EVALUATION)

For

Cellular Phone

In conformity with

FCC 47 CFR Part 2

Model: **CDMA CA007**

Test Item: **Cellular phone**

Report No: **RY1102A23R1**

Issue Date: **February 23 2011**

Prepared for

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1 General information

1.1 Product description

Test item :	Cellular phone	
Manufacturer 1:	FLEXTRONICS INDUSTRIAL CO.,LTD.	
Address 1:	Xin Qing Science& Technology Industrial Park, Jing An, Doumen, Zhuhai, Guangdong, P.R. China	
Manufacturer 2:	TOKAI TEC CO.,LTD.	
Address 2:	1410, Inada, Hitachinaka-shi, Ibaraki, Japan	
Model:	CDMA CA007	
FCC ID:	TYK-RAO1172	
EUT Condition:	Engineering sample	
Hardware version:	PWB-PENGUI-MAIN-2AS	
Software version:	v011a	
Serial numbers:	SCAEN000302	
Tx Frequency:	CDMA Cellular:	824.70MHz - 848.31MHz
	Bluetooth:	2402MHz – 2480MHz
Conducted Power:	CDMA Cellular:	24.27 dBm
	Bluetooth:	1.20 dBm (Peak power)
Max. SAR Measurement:	CDMA Cellular:	Head SAR: 0.398 W/kg, Body SAR: 0.873 W/kg
	Bluetooth:	Not required (Refer to 12.4.2)
Receipt date of EUT:	February 4 2011	
Nominal power source voltages:	3.8 V DC	
Antenna Type:	CDMA Cellular:	Integral, 1/4λ Single Type
	Bluetooth:	Integral, 1/4λ Single Type

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1.2 Test(s) performed/ Summary of test result

Applicable FCC Rule Parts:	CFR§2.1093;
Applicable Test Procedure:	FCC/OET Bulletin 65 Supplement C (June 2001). IEEE Std 1528 (2003) KDB941225 D01(SAR Measurement Procedures for 3G Devices Rev2.0) KDB450824 D01 (SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz – 3GHz) KDB648474 D01 (SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas) FCC Public Notice DA-02-1438
FCC Classification:	Transmitter Held to Ear (PCE)
Test(s) started:	February 9 2011
Test(s) completed:	February 21 2011
Application type:	Certification
Summary of test result:	Complied

Note: The above judgment is only based on the measurement data and it does not include the measurement uncertainty. Accordingly, the statement below is applied to the test result.
The EUT complies with the limit required in the standard in case that the margin is not less than the measurement uncertainty in the Laboratory.
Compliance of the EUT is more probable than non-compliance is case that the margin is less than the measurement uncertainty in the Laboratory.

Prepared by : M. Asano
M.Asano (Test Engineer, EMC Testing Department)

Approved by : K. Ohnishi
K.Ohnishi (Manager, EMC Testing Department)

1.3 Equipment modifications

No modifications have been made to the equipment in order to achieve compliance with the applicable rules described in clause 1.2.

1.4 Deviation from the standard

No deviations from the FCC rules and procedures described in clause 1.2.

2 Introduction

2.1 SAR Definition

The time derivative of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of given density (ρ).

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

The SI unit is the watt per kilogram (W/kg).

SAR can be related to the electric field at a point by

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

Where:

σ is conductivity of the tissue (S/m)
ρ is mass density of the tissue (kg/m^3)
E is rms electric field strength in tissue (V/m)

3 Test Facility / Accreditations

Test Site	: RF Technologies Ltd. Yokohama Laboratory
Address	: 472, Nippa-cho, Kohoku-ku, Yokohama, 223-0057, Japan
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Accredited by The Japan Accreditation Board for Conformity Assessment (JAB) for EMC tests stated in the scope of the certificate under Certificate Number RTL02770

Accredited by National Voluntary Laboratory Accreditation Program (NVLAP) for the emission tests stated in the scope of the certificate under Certificate Number 200780-0

Registered by Voluntary Control Council for Interference by Information Technology Equipment (VCCI);
Each registered facility number is as follows;
Test site (Semi-Anechoic chamber 3m) R-2393
Test site (Shielded room) C-2617

Registered by Industry Canada (IC): The registered facility number is as follows
Test site No.1 (Semi-Anechoic chamber 3m): 6974A-1

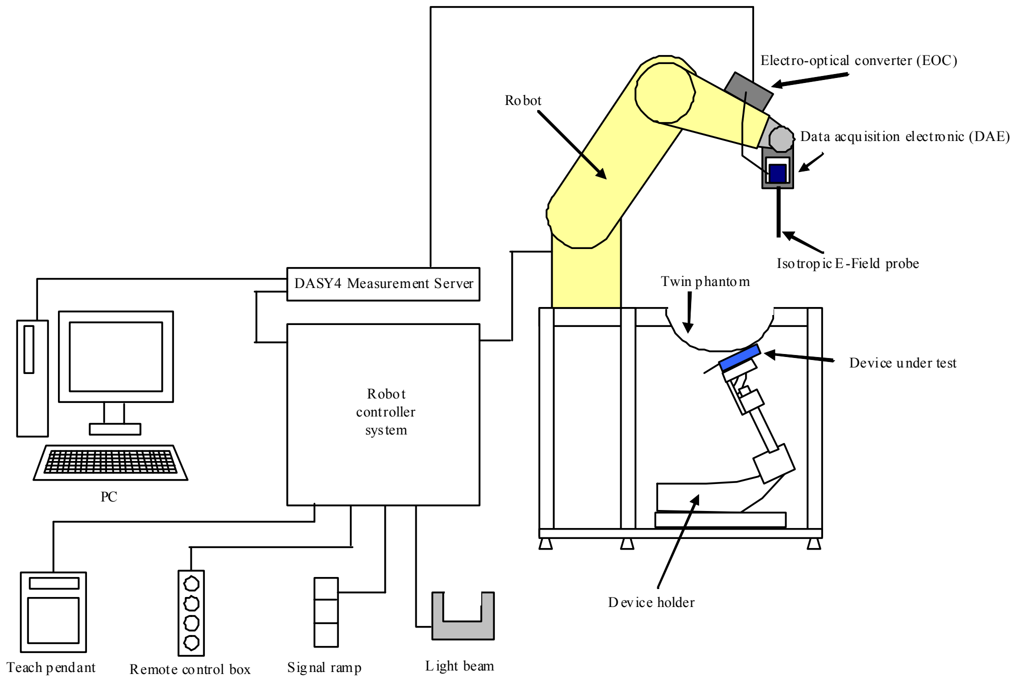
4 SAR Measurement Setup

4.1 Measurement System diagram

Measurements are performed using the DASY4 automated dosimetric assessment system manufactured by Schmid & Partner Engineering AG in Zurich, Switzerland.
Measurement system consists of following instruments.

- Isotropic E-filed probe
- Robot controller system
- DASY4 Measurement server
- Personal computer (PC) with DASY4 software installed
- Data acquisition electronic (DAE)
- Electro-optical converter (EOC)
- Twin phantom
- Device holder

The robot in the system has six-axis industrial robot arms performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). The robot controller system consists of the power supply, the Teach pendant, the Remote control box, the Signal ramp, and the Light beam, and is connected to the DASY4 measurement server. The robot is connected to robot controller system to allow software manipulation of the robot. The isotropic E-field probe, the DAE and the EOC are installed on the robot. The isotropic E-field probe measures Electromagnetic filed in the Twin SAM phantom containing the equivalent tissue. The isotropic E-field probe is connected to the DAE and transfers the data to the DAE. The DAE is connected to the EOC and performs the signal amplification, the signal multiplexing, the AD-conversion, the offset measurements, the mechanical surface detection, the collision detection, etc. The signal from the DAE is optically transmitted to the EOC. The EOC performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the DASY4 measurement server and transfers the data to the DASY4 measurement server. The DASY4 measurement server is connected to the PC that is installed the DASY4 software. The PC analyzes the data, transferred from the DASY4 measurement server, to find the maximum SAR.



5 System components

5.1 Probe Specifications

Model	: ET3DV6
Frequency range	: 10 MHz to 2.3 GHz
Calibration	: 900MHz, 1750MHz, 1900MHz
Linearity	: ± 0.2 dB (30 MHz to 2.3 GHz)
Dynamic range	: 5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Probe length	: 330 mm
Probe tip length	: 16 mm
Body diameter	: 12 mm
Tip diameter	: 6.8 mm
Application	: General dosimetric measurements up to 2.3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

5.2 Twin SAR Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, CENELEC 50361 and IEC 62209.
The SAM twin phantom is a low-loss dielectric, consists of fiberglass. It has three measurement areas, Left head, Right head and Flat phantom. Tissue simulating liquid can be filled up in the shell inside the phantom. The liquid depth is maintained at a minimum depth of 15cm to minimize reflections from the upper surface.
It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.

Shell Thickness	: 2 ± 0.2 mm
Filling Volume	: 25 liters
Dimensions	: 880×1000×500 mm (H×L×W)

5.3 Device Holder

The Device Holder enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat point).

5.4 Brain & Muscle Tissue Simulating Mixture Characterization

The composition of ingredients is in accordance with FCC/OET Bulleting 65 Supplement C.

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

Salt: 99^{+}% Pure Sodium Chloride
Sugar: 98^{+}% Pure Sucrose
Water: De-ionized, 16 $M\Omega^{+}$ resistivity
HEC: Hydroxyethyl Cellulose
DGBE: 99^{+}% Di(ethylene glycol) butyl ether, [2-(2-butoxyethoxy)ethanol]
Triton X-100 (ultra pure): Polyethylene glycol mono [4-(1,1, 3, 3-tetramethylbutyl)phenyl]ether

6 Dosimetric Assessment

6.1 Measurement Procedure

First Area Scan is done to find the approximate location of the local peak SAR, and next Zoom Scan is performed to evaluate the 1g or 10g peak spatial-average SAR in the area identified during the area scan. The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a final measurement around the hot spot. The area of the scan covered the entire dimension of the head and the horizontal grid spacing is 15mm x 15mm. The evaluation on the measured area scan gives the interpolated maximum of the measured area. Based on the area scan data, the area of the maximum absorption is determined by spline interpolation. The Zoom scan is performed around this point. A volume of 32mm x 32mm x 30mm is assessed by measuring 5 x 5 x 7 points. The data at the surface is extrapolated, since the center of the dipoles is 2.7mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation is based on a least square algorithm. The maximum interpolated value is searched with a straight-forward algorithm. The SAR values averaged over the spatial volumes around the maximum location are computed using the 3D-Spline interpolation algorithm. All neighboring volumes are evaluated until no neighboring volume with a higher average value is found.

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7 Definition of reference points

7.1 Ear Reference Point

Front, back and side views of the SAM Twin Phantom are shown in Figure 7-1-1. The point “M” on the SAM is the reference point for the center of the mouth. The point LE on the SAM is the left ear reference point (ERP) and the point RE on the SAM is the right ERP. (The ERP is 15mm posterior to the entrance to the ear canal along the B-M line as shown in Figure 7-1-2. The plane passing through the two canals and M is defined as Reference Plane, and contains the line B-M. The line N-F, perpendicular to the reference plane and passing through the RE (or LE) is defined as Reference Pivoting Line. The N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning.

Figure 7-1-1 Front, Back, and side view of SAM Twin Phantom

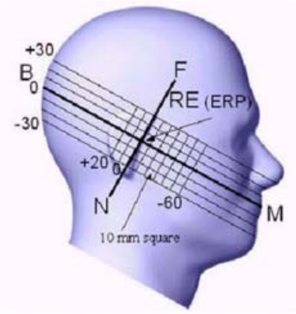

Figure 7-1-2 Closed-up side view on ERP

7.2 Handset Reference points

Two imaginary lines, the vertical centerline and horizontal line, are defined on the handset described in Figure 7-2-1. The vertical centerline passes through two points on the front side of the handset – the midpoint of width w_t of the handset at the level of the acoustic output (Point A in Figure 7-2-1), and the midpoint of the width w_b of the bottom of the handset (Point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The two lines intersect at point A.

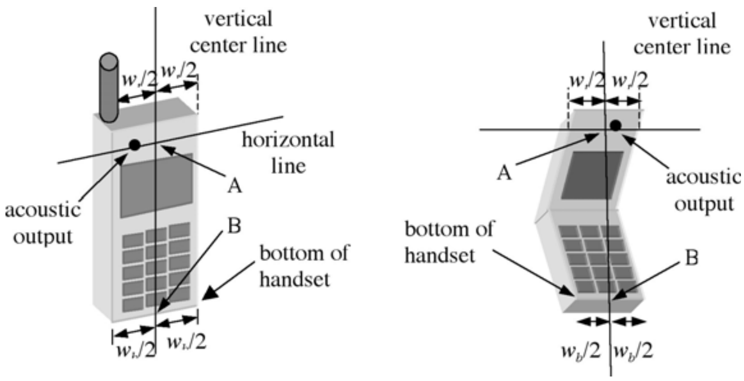

Figure 7-2-1 Vertical centerline and horizontal line on handset

8 Test Configuration Positions

8.1 Positioning for Cheek/Touch

The handset is positioned close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through point RE and LE on the phantom (see Figure 8-1-1), such that the plane defined by the vertical centerline and horizontal line of the handset is approximately parallel to the sagittal plane of the phantom. The handset is translated towards the phantom along the line passing through RE and LE until point A on handset touches the ERP on the phantom. While maintaining the handset in this plane, the handset is rotated around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines. The handset is rotated around the vertical centerline until the handset (horizontal line) is parallel to the N-F line. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the ERP, the handset is rotated about the N-F line until any point on the handset is in contact with a phantom point below the ERP on the cheek.

Figure 8-1-1 Front, Side and Top View of Cheek/Touch position

8.2 Positioning for Ear/15° Tilt

The procedure “Positioning for Cheek/Touch” is repeated to place the handset in the Cheek/Touch position. While maintaining the orientation of the handset, the handset is moved away from the ERP along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15 degrees. The handset is rotated around the horizontal line by 15 degrees. While maintaining the orientation of the handset, the handset is moved towards the phantom on the line passing through RE and LE until any part of the handset touches the head (In this position, point A is located on the line RE and LE). The tilt position is obtained when the contact point is on ERP (See Figure 8-2-1). If the contact is at any location other than ERP, the angle of the handset would then be reduced. In this case, the tilt position is obtained when any point on the handset is in contact with the ERP and a second point on the handset is in contact with the phantom. (e.g., the antenna with the back of the bead).

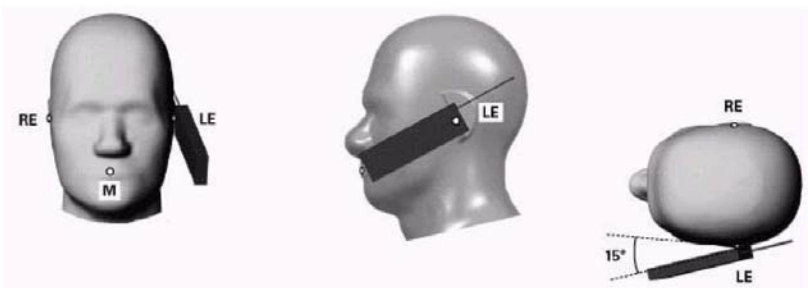

Figure 8-2-1 Front, Side and Top View of Ear /15° Tilt position

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8.3 SAR Evaluations near the Mouth/Jaw Regions of the SAM Phantom

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones. It has been known for some time that there are SAR measurement difficulties in these regions of the SAM phantom. SAR probes are calibrated in tissue-equivalent liquids with sufficient separation between the probe sensors and nearby physical boundaries to ensure scattering does not affect probe calibration. When the probe tip is moved into tight regions with multiple boundaries surrounding its sensors, probe calibration and measurement accuracy can become questionable. In addition, these measurement locations often require a probe to be tilted at steep angles, where it may no longer comply with calibration requirements and measurement protocols, or satisfy the required measurement uncertainty. In some situations it is not feasible to tilt the probe or rotate the phantom, as suggested by measurement standards, to conduct these measurements.

In order to ensure there is sufficient conservativeness for ensuring compliance until practical solutions are available, additional measurement considerations are necessary to address these technical difficulties. When measurements are required near the mouth, nose, jaw or similar tight regions of the SAM phantom, area or zoom scans are often unable to fully enclose the peak SAR location as required by IEEE 1528 and Supplement C, due to probe orientation and positioning difficulties. Even when limited measurements are possible, the test results could be questionable due to probe calibration and measurement uncertainty issues. Under these circumstances, the procedures described in KDB648474 apply. The SAR required in these regions of SAM should be measured using a flat phantom. Rectangular shaped phones should be positioned with its bottom edge positioned from the flat phantom with the same distance provided by the cheek touching position using SAM. The ear reference point (ERP, as defined for SAM) of the phone should be positioned 0.5 cm from the flat phantom shell. Clam-shell phones should be positioned with the hinge against a smooth edge of the flat phantom where the upper half of the phone is unfolded and extended beyond the phantom side wall. The lower half of the phone is secured in the test device holder at a fixed distance below the flat phantom determined by the minimum separation along the lower edge of the phone in the cheek touching position using SAM. If there is substantial variation in separation distance along the lower edge of a clam-shell phone when placed in the cheek touching position using SAM, methodology to position the phone for the SAR is discussed with the FCC Laboratory.

The flat phantom data should allow test results to be compared uniformly across measurement systems, until suitable solutions are available in measurement standards to address certain probe calibration and positioning issues, due to implementation differences between horizontal and up-right SAM configurations. These flat phantom procedures are only applicable to stand-alone SAR evaluation in tight regions of the SAM phantom, where measurement is not feasible or test results can be questionable due to probe calibration and accessibility issues. Details on device positioning and photos showing how separation distances are determined should be included in the SAR report photographs. SAR for other regions of the head must be evaluated using SAM; therefore, a phone with antennas at different locations may require flat and SAM phantom evaluation for the different antennas.

8.4 Body Holster / Belt Clip Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the handset and positioned against the flat phantom in normal use configurations. For purpose of determining test requirements, accessories are divided into two categories: those that do not contain metallic components and those that contains metallic components. When multiple accessories that do not contain metallic components are supplied with the handset, the handset is tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the handset, the handset is tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only the accessory that dictates the closest spacing to the body is tested. Body-worn accessories may not always be supplied or available as options for some handsets that are intended to be authorized for body-worn use. In this case a separation distance of 1.5 cm between the handset and a flat phantom is recommended for testing body-worn SAR compliance under such circumstances. Other separation distances may be used, but they should not exceed 2.5 cm. In these cases, the handset may use body-worn accessories that provide a separation distance greater than that tested for the handset provided however that the accessory contains no metallic components.

For the handset that are carried next to the body such as shoulder, waist or chest, SAR compliance is evaluated with the accessories, including headsets and microphones, attached to the handset and positioned against a flat phantom in a normal use configuration. Test position spacing between the flat phantom and the handset is recorded in the test report.

8.5 Face SAR Configuration

The handset that are designed to operate in front of a person's face, as in push-to-talk configurations, are evaluated for SAR compliance with the front of the handset positioned to face the flat phantom in head tissue. Test position spacing between the flat phantom and the handset is 2.5cm.

9 RF Exposure Limits

9.1 Uncontrolled Environment

Uncontrolled environments are defined as locations where there is the exposure of individual 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.

9.2 Controlled Environment

Controlled environments are defined as location where there is exposure that may be incurred by persons who are aware of the potential for exposure. 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.

9.3 Exposure Limits

	Uncontrolled environment General Population	Controlled environment Occupational
SPATIAL PEAK SAR Brain (SAR averaged over any 1gram of tissue)	1.6 W/kg	8.0 W/kg
SPATIAL AVERAGE SAR Whole Body (SAR averaged over the entire body)	0.08 W/kg	0.4 W/kg
SPATIAL PEAK SAR Hands, Feet, Ankles, Wrists (SAR averaged over any 10gram of tissue)	4.0 W/kg	20 W/kg

10 Measurement Uncertainties

a	b	c	d	e = f(d,k)	f	g	h = cxf/e	i = cxg/e	k
Uncertainty Component	IEEE 1528 Sec	Tol. (±%)	Prob. Dist	Div.	c_i 1gm	c_i 10gm	1gm u_i (±%)	10gms u_i (±%)	vi
Measurement System									
Probe Calibration	E2.1	5.9	N	1	1.0	1.0	5.9	5.9	∞
Axial Isotoropy	E2.2	0.4	N	1	0.7	0.7	0.3	0.3	∞
Hemispherical Isotropy	E2.2	3.2	R	1.73	0.7	0.7	1.3	1.3	∞
Boundary Effect	E2.3	0.9	R	1.73	1.0	1.0	0.5	0.5	∞
Linearity	E2.4	0.9	R	1.73	1.0	1.0	0.3	0.3	∞
System Detection Limits	E2.5	5.8	R	1.73	1.0	1.0	3.4	3.4	∞
Readout Electronics	E2.6	0.3	N	1	1.0	1.0	0.3	0.3	∞
Response Time	E2.7	0.0	R	1.73	1.0	1.0	0.0	0.0	∞
Integration Time	E2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions - Noise	E6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
RF Ambient Conditions - Reflections	E6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E6.2	1.5	R	1.73	1.0	1.0	0.9	0.9	∞
Probe Positioning with respect to Phantom	E6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Rerated									
Test Sample Positioning	E4.2	5.7	N	1	1.0	1.0	5.7	5.7	71
Device Holder Uncertainty	E4.1	5.8	N	1	1.0	1.0	5.8	5.8	5
Output Power Variation – SAR drift mesurement	6.6.3	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity – deviation from target values	E3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity – measurement uncertainty	E3.3	3.9	N	1	0.64	0.43	2.5	1.7	5
Liquid Permittivity – deviation from target values	E3.2	5.0	R	1.73	0.6	0.49	1.7	1.4	∞
Liquid Permittivity – measurement uncertainty	E3.3	3.7	N	1	0.6	0.49	2.2	1.8	5
Conbined Standard Uncertainty							12.1	11.8	
Expanded Uncertainty (95% Confidence level)							24.2	23.5	

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

11 Measurement Conditions

11.1 Procedures Used to Establish RF Signal for SAR

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

11.2 SAR Measurement Conditions for CDMA2000

11.2.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. Step 3 and 4 are measured using SO55 with power control bits in “All up” condition. Step 10 is measured using TDSO / SO32 with power control bits in the “Bits Hold” condition (i.e. alternative Up/Down Bits).

11.2.2 Head SAR Measurements

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than 1/4 dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC 1 using the exposure configuration that results in the highest SAR for that channel in RC3.

11.2.3 Body SAR Measurements

SAR for body exposure configurations is measured in RC3 with the DUT configured using TDSO / SO32, to Transmit at full rate on FCH with all other code channels disabled. SAR for multiple code channels (FCH + SCH_n) is not required when the maximum average output of each RF channel is less than 1/4 dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCH_n) with FCH at full rate and SCH_0 enabled at 9600 bps, using the exposure configuration that results in the highest SAR with FCH only for that channel. When multiple code channels are enabled, the DUT output is shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts.

Body SAR in RC1 is not required when the maximum average output of each channel is less than 1/4 dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channels in RC3.

12 System Verification

12.1 Measurement Procedure for Tissue Verification

The dielectric probe connected to network analyzer is immersed in the sample which is in a non-metallic container to measure relative permittivity and relative permittivity loss.
The conductivity is derived from following formula.

$$\sigma = \varepsilon_r'' \varepsilon_o \omega$$

Where σ : Conductivity (S/m), ε_r": relative permittivity loss,
ε_o: permittivity of free space (F/m), ω : Angular velocity (rad/s)

12.2 Tissue Verification

Prior to SAR measurement, the Measured Conductivity and Measured Relative permittivity are verified to +/-5% of the TARGET Conductivity and TARGET Relative permittivity specified in FCC/OET Bulletin 65, Supplement C. The measured tissue parameters shown below are used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies.

Date	Tissue Type	Tissue Temp [℃]	Measured Frequency [MHz]	Measured Dielectric Constant, ε	Measured Conductivity,σ [S/m]	TARGET Dielectric Constant, ε	TARGET Conductivity, σ [S/m]	% dev ε	% dev σ
2011/2/9	Muscle (Body) 835MHz	22.1	820	55.10	0.94	55.20	0.97	-0.17%	-3.40%
			835	55.52	0.95	55.20	0.97	0.58%	-1.86%
			850	55.36	0.97	55.20	0.97	0.29%	-0.31%
2011/2/11	Head 835MHz	22.0	820	42.41	0.89	41.50	0.90	2.19%	-1.44%
			835	42.18	0.91	41.50	0.90	1.65%	0.56%
			850	41.96	0.92	41.50	0.90	1.12%	1.89%
2011/2/21	Head 835MHz	22.0	820	43.14	0.90	41.50	0.90	3.95%	-0.44%
			835	42.94	0.91	41.50	0.90	3.47%	1.33%
			850	42.75	0.93	41.50	0.90	3.01%	2.78%

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12.3 Test System Verification

Prior to SAR measurement, the system is verified to +/-10% of the manufacturer SAR result on the reference dipole at the time of calibration.

Date	Ambient Temp [℃]	Tissue Temp [℃]	Frequency [MHz]	Tissue type	Input Power [mW]	Measured SAR [mW/g]	TARGET SAR [mW/g]	Deviation [%]	Dipole S/N
2011/2/9	22.2	22.1	835	Body	200	1.89	1.99	-4.83%	4d083
2011/2/11	22.5	22.0	835	Head	200	2.01	1.91	5.24%	4d083
2011/2/21	22.7	22.0	835	Head	200	2.02	1.91	5.76%	4d083

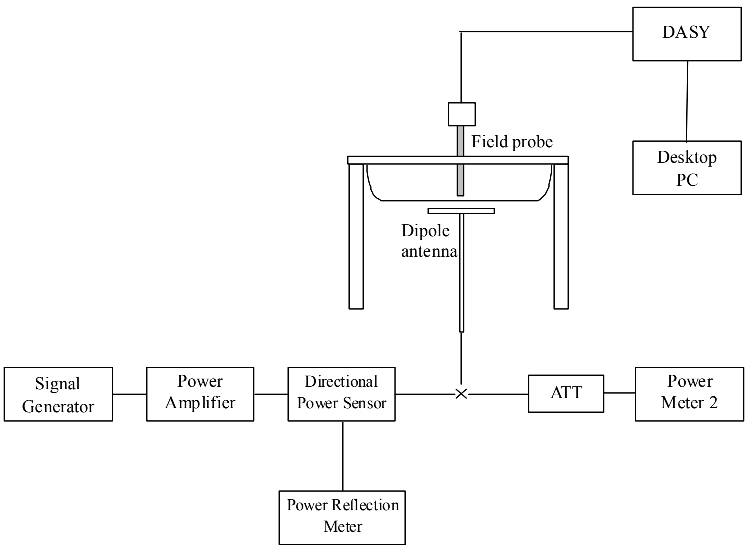


Figure 7-3 System Verification Setup Diagram

12.4 RF Conducted Powers

12.4.1 CDMA2000

Band	Freq [MHz]	Ch	SO2		SO55		TDSO SO32	
			RC 1/1 [dBm]	RC 3/3 [dBm]	RC 1/1 [dBm]	RC 3/3 [dBm]	FCH [dBm]	FCH+SCH [dBm]
CDMA2000 Cellular	824.70	1013	24.24	24.21	24.23	24.19	24.18	24.27
	836.52	384	24.21	24.25	24.27	24.18	24.25	24.27
	848.31	777	24.08	24.09	24.08	24.05	24.10	24.06

12.4.2 Bluetooth

According to KDB648474, Stand-alone SAR for Bluetooth is not required, since the Bluetooth antenna is over 60 mm away from CDMA antenna and its output power is below 2*P_{rer}(*). (* P_{ref} = 1/2 * 60/f [GHz] [mW])

13 SAR Data Summary

13.1 Head SAR Results

13.1.1 CDMA2000 Cellular

Mode /Band	Freq [MHz]	Ch.	Side	Test Position	Antenna Position	Battery Type	Conducted Power [dBm]		SAR(1g) [W/kg]
							Start	End	
CDMA Cellular	824.70	1013	Right,Left	Mouth Jaw	Integral	Standard	24.11	23.40	0.235
CDMA Cellular	836.52	384	Right,Left	Mouth Jaw	Integral	Standard	24.04	24.15	0.162
CDMA Cellular	848.31	777	Right,Left	Mouth Jaw	Integral	Standard	24.06	24.03	0.188
CDMA Cellular	824.70	1013	Right	Tilt	Integral	Standard	-	-	-
CDMA Cellular	836.52	384	Right	Tilt	Integral	Standard	24.20	24.17	0.034
CDMA Cellular	848.31	777	Right	Tilt	Integral	Standard	-	-	-
CDMA Cellular	824.70	1013	Left	Tilt	Integral	Standard	-	-	-
CDMA Cellular	836.52	384	Left	Tilt	Integral	Standard	24.22	23.60	0.042
CDMA Cellular	848.31	777	Left	Tilt	Integral	Standard	-	-	-
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population							Brain 1.6 W/kg (mW/g) averaged over 1 gram		

* SAR test of Right and Left cheek position are measured at body position, since the cube can not be scanned completely at Right and Left head cheek position. Test method in KDB648474 D01(*SAR Tests in Mouth and Jaw Regions of the SAM Phantom*) is applied to the measurement at body position.

Notes:
1. Test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [June 2001].
2. Batteries are fully charged for all readings.
3. Tissue parameters and temperatures are listed on the SAR plots.
4. Liquid tissue depth is 15.0 +/- 0.5 cm.
5. Justification for reduced test configurations: Based on Per FCC/OET Bulletin 65 Supplement C (June 2001) and Public Notice DA-02-1438, if the SAR measured at the middle channel for each test configuration(left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
6. SAR for head exposure configurations is measured in RC3 with the EUT configured to transmit at full rate using Loopback Service Option 55.

13.2 Body SAR Results

13.2.1 CDMA2000 Cellular

Mode /Band	Service	Freq [MHz]	Ch.	Side	Test Position	Spacing [cm]	Antenna Position	Battery Type	Conducted Power [dBm]		SAR(1g) [W/kg]
									Start	End	
CDMA Cellular	Voice	824.70	1013	Body	Front	1.5	Integral	Standard	-	-	-
CDMA Cellular	Voice	836.52	384	Body	Front	1.5	Integral	Standard	24.10	24.08	0.357
CDMA Cellular	Voice	848.31	777	Body	Front	1.5	Integral	Standard	-	-	-
CDMA Cellular	Voice	824.70	1013	Body	Rear	1.5	Integral	Standard	24.03	24.00	0.778
CDMA Cellular	Voice	836.52	384	Body	Rear	1.5	Integral	Standard	24.09	24.04	0.873
CDMA Cellular	Voice	848.31	777	Body	Rear	1.5	Integral	Standard	24.08	24.00	0.685
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population									Muscle 1.6 W/kg (mW/g) averaged over 1 gram		

Note
1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [June 2001].
2. Tissue parameters and temperatures are listed on the SAR plots.
3. Liquid tissue depth is 15.0+/-0.5 cm
4. The spacing between the handset and the phantom was 1.5cm.
5. SAR for body exposure configurations is measured in RC3 with the EUT configured using TDSO/SO32, to transmit at full rate on FCH with all other code channels disabled.

14 Equipment List

RFT ID No.	Kind of Equipment and Precision	Manufacturer	Model No.	Serial Number	Calibration Date	Calibration Due Date
NA02	Network Analyzer	Agilent	8753ES	US39175208	2010/11/19	2011/11/30
DP01	Dielectric probe	Agilent Technologies	85070C	545	2010/9/14	2011/9/30
EM04	E-Field Probe	SPEAG	ET3DV6	1563	2010/8/11	2011/8/31
DE01	DAE (Data Acquisition Electro.)	SPEAG	DAE3	414	2010/8/10	2011/8/31
DA02	Dipole Antenna (835MHz)	SPEAG	D835V2	4d083	2009/8/17	2011/8/31
SG10	Signal Generator	Agilent Technologies	E8257D	US49060100	2010/12/30	2011/12/31
RP06	RF Power Amplifier 2.5G 10W	Stealth Microwave	SL0825-40	12611	2010/8/25	2011/8/31
RC02	Radio communication tester (F/W : V5.00)	Rohde & Schwarz	CMU200	105097	2010/9/13	2011/9/30
PM03	Power Meter	Anritsu	ML2438A	99070001	2010/7/7	2011/7/31
PU03	Power Sensor (CW)	Anritsu	MA2472A	990103	2010/7/7	2011/7/31
PM51	Power reflection meter	Rohde & Schwarz	NRT	838490/023	2010/8/25	2011/8/31
PU51	Directional power sensor	Rohde & Schwarz	NRT-Z44	838188/061	2010/8/25	2011/8/31
AT27	Attenuator 10dB 5W 18GHz	Weinschel	WA2-10-34	A1026	2010/3/8	2011/3/31

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

Appendix A

System Validation

RFT

Test Laboratory: RF Technologies Ltd.

Mode: System Validation (Head, 835MHz)

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d083

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.905 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

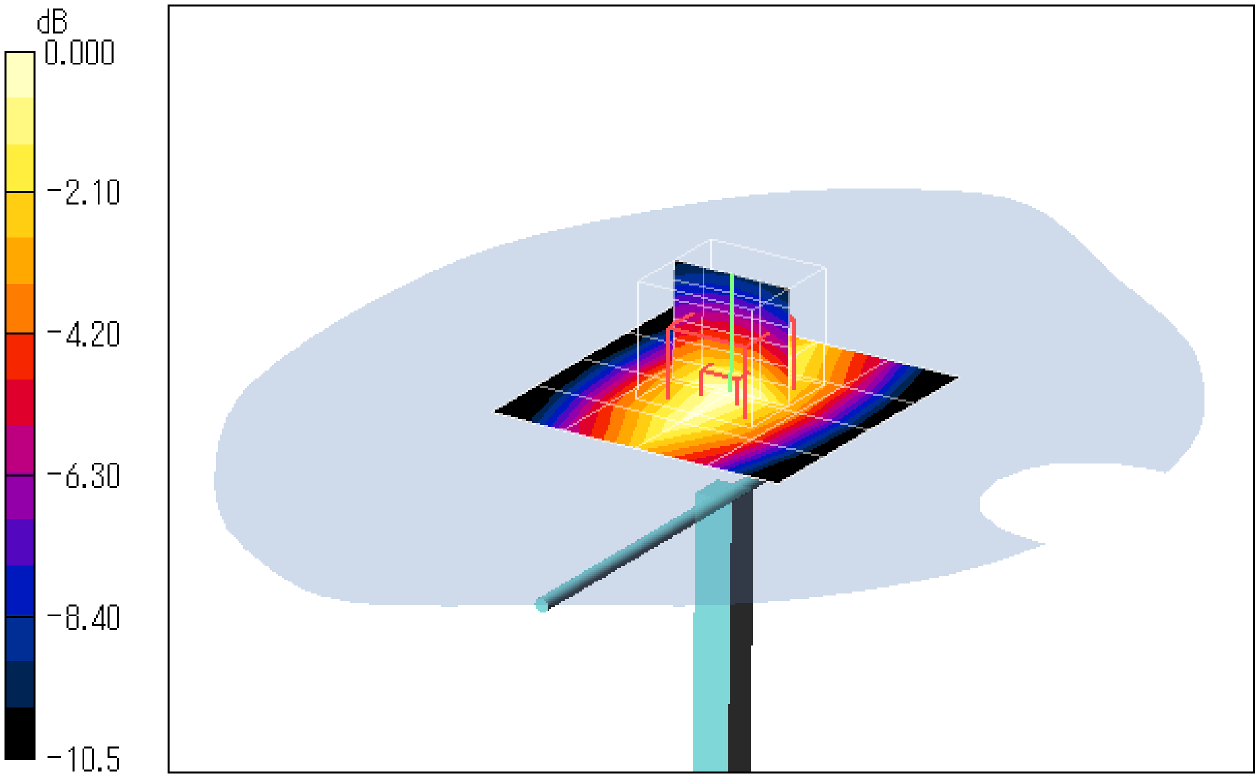
Test Date: 2011-02-11; Ambient Temp 22.5 ˚C; Tissue Temp: 22.0 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.57, 6.57, 6.57); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Right(TP1063); Type: SAM; Serial: TP1063
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

d=15mm, Pin=200mW/Area Scan (5x5x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 2.19 mW/g

d=15mm, Pin=200mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 50.8 V/m; Power Drift = 0.015 dB
Peak SAR (extrapolated) = 2.93 W/kg
SAR(1 g) = 2.01 mW/g; SAR(10 g) = 1.33 mW/g
Maximum value of SAR (measured) = 2.17 mW/g



0 dB = 2.17mW/g

RFT

Test Laboratory: RF Technologies Ltd.

Mode: System Validation (Head, 835MHz)

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d083

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.912 mho/m; ε_r = 42.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

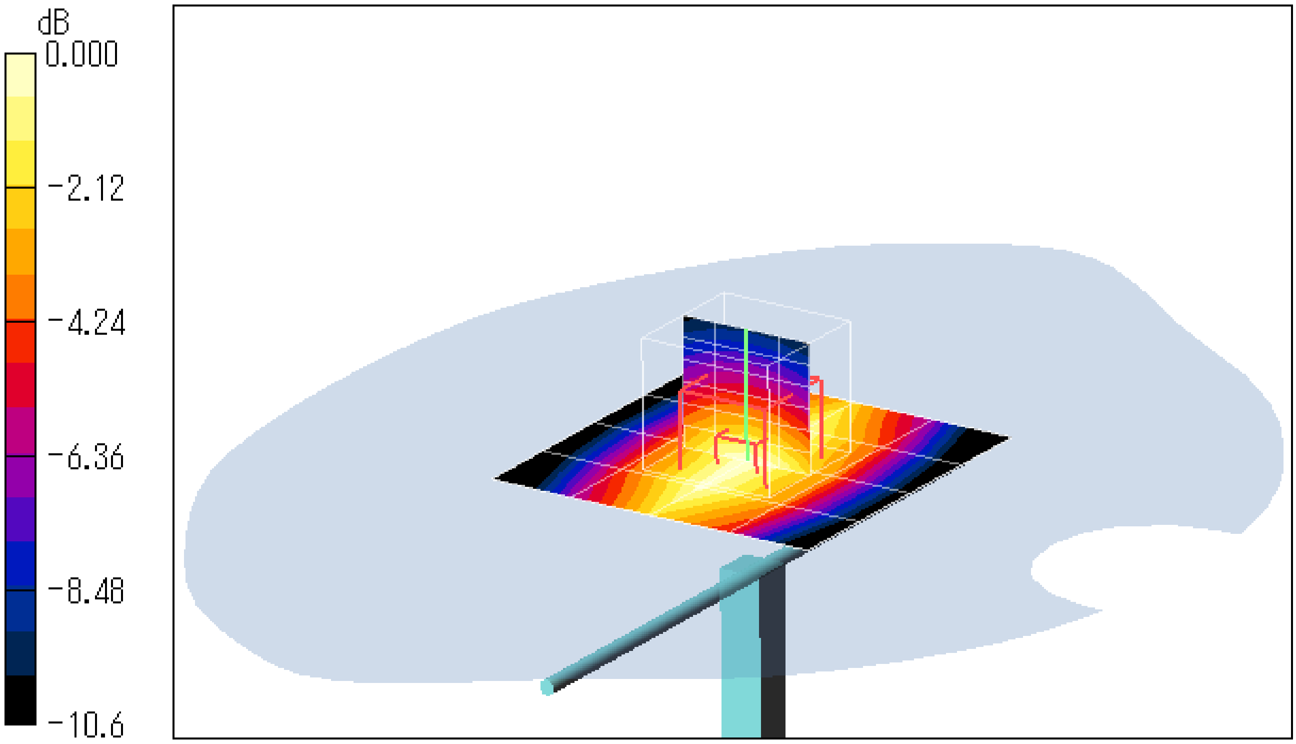
Test Date: 2011-02-21; Ambient Temp 22.7˚C; Tissue Temp: 22.0 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.57, 6.57, 6.57); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Right(TP1063); Type: SAM; Serial: TP1063
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

d=15mm, Pin=200mW/Area Scan (5x5x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 2.20 mW/g

d=15mm, Pin=200mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 50.8 V/m; Power Drift = -0.016 dB
Peak SAR (extrapolated) = 2.93 W/kg
SAR(1 g) = 2.02 mW/g; SAR(10 g) = 1.33 mW/g
Maximum value of SAR (measured) = 2.19 mW/g



0 dB = 2.19mW/g

Test Laboratory: RF Technologies Ltd.

Mode: System Validation (Body, 835MHz)

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d083

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.952 mho/m; ε_r = 55.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

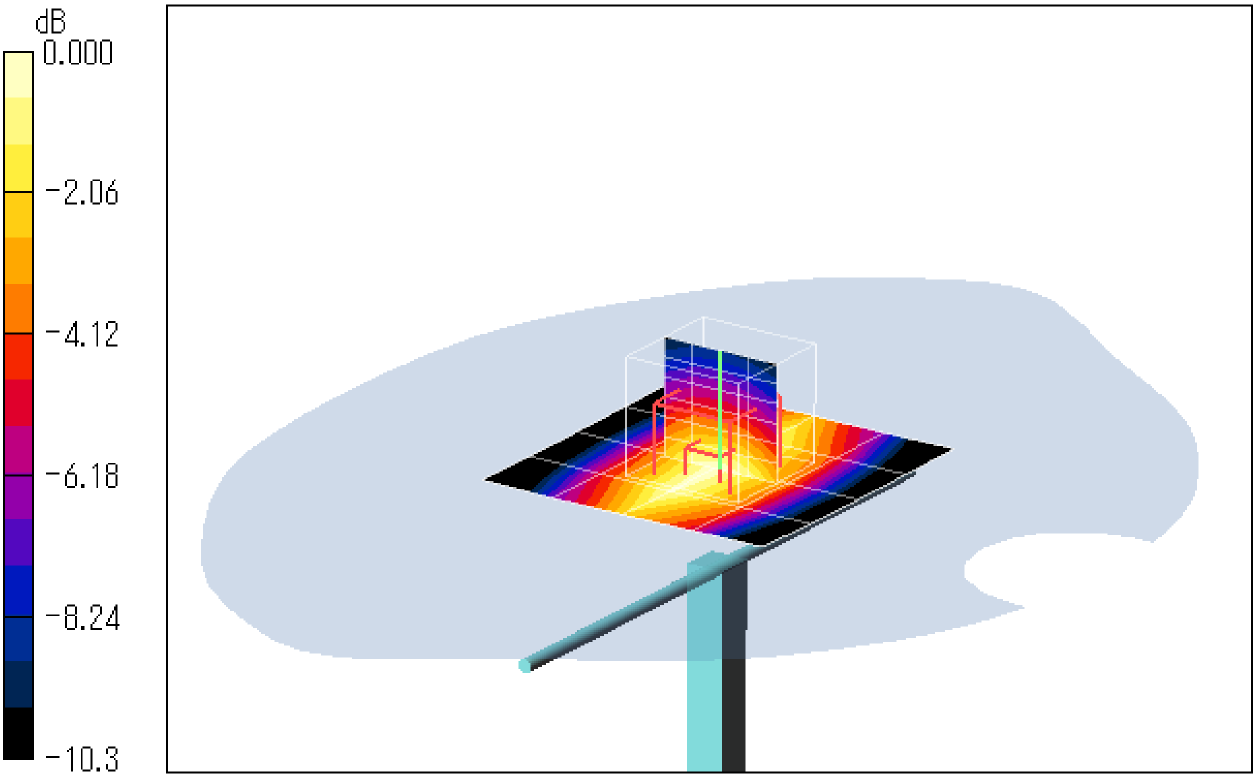
Test Date: 2011-02-09; Ambient Temp 22.2 ˚C; Tissue Temp: 22.1 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.44, 6.44, 6.44); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Left(TP1027); Type: SAM; Serial: TP1027
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

d=15mm, Input Power=200mW/Area Scan (5x5x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 2.03 mW/g

d=15mm, Input Power=200mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 48.0 V/m; Power Drift = -0.022 dB
Peak SAR (extrapolated) = 2.69 W/kg
SAR(1 g) = 1.89 mW/g; SAR(10 g) = 1.25 mW/g
Maximum value of SAR (measured) = 2.04 mW/g



0 dB = 2.04mW/g

Appendix B

Test Data

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Test Laboratory: RF Technologies Ltd.

Mode: Mouth Jaw SAR, replacing Right/Left head Cheek 1013ch (824.70MHz)

DUT: Cellular Phone; Type: CDMA CA007; Serial: SCAEN000302

Communication System: CDMA2000 Cellular; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium parameters used : f = 824.7 MHz; σ = 0.901 mho/m; ε_r = 43.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

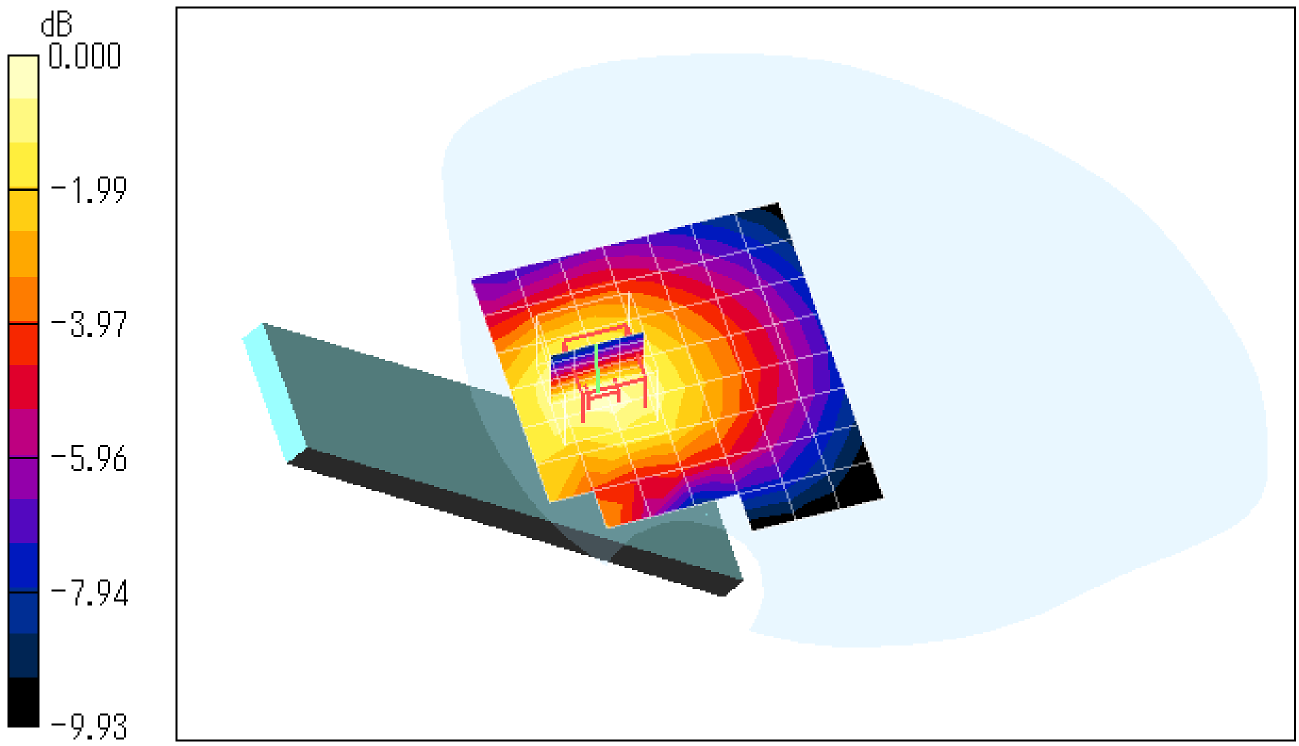
Test Date: 2011-02-21; Ambient Temp 22.7 ˚C; Tissue Temp: 22.0 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.57, 6.57, 6.57); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Right(TP1063); Type: SAM; Serial: TP1063
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Mouth Jaw - Low.ch/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.234 mW/g

Mouth Jaw - Low.ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.41 V/m; Power Drift = -0.143 dB
Peak SAR (extrapolated) = 0.313 W/kg
SAR(1 g) = 0.235 mW/g; SAR(10 g) = 0.166 mW/g
Maximum value of SAR (measured) = 0.253 mW/g



0 dB = 0.253mW/g

Test Laboratory: RF Technologies Ltd.

Mode: Mouth Jaw SAR, replacing Right/Left head Cheek 384ch (836.52MHz)

DUT: Cellular Phone; Type: CDMA CA007; Serial: SCAEN000302

Communication System: CDMA2000 Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used : f = 836.52 MHz; σ = 0.913 mho/m; ε_r = 42.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

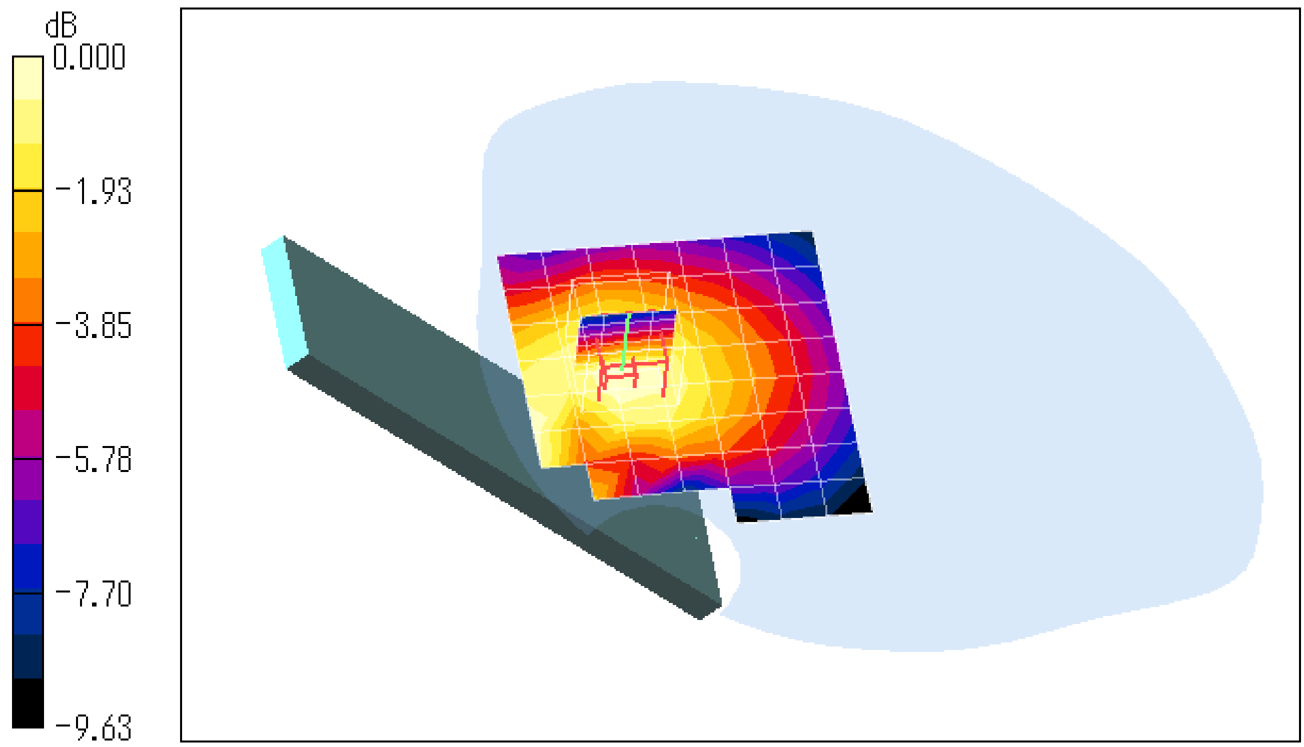
Test Date: 2011-02-21; Ambient Temp 22.7 ˚C; Tissue Temp: 22.0 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.57, 6.57, 6.57); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Right(TP1063); Type: SAM; Serial: TP1063
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Mouth Jaw - Middle.ch/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.168 mW/g

Mouth Jaw - Middle.ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.87 V/m; Power Drift = 0.028 dB
Peak SAR (extrapolated) = 0.216 W/kg
SAR(1 g) = 0.162 mW/g; SAR(10 g) = 0.116 mW/g
Maximum value of SAR (measured) = 0.171 mW/g



0 dB = 0.171mW/g

Test Laboratory: RF Technologies Ltd.

Mode: Mouth Jaw SAR, replacing Right/Left head Cheek 777ch (848.37MHz)

DUT: Cellular Phone; Type: CDMA CA007; Serial: SCAEN000302

Communication System: CDMA2000 Cellular; Frequency: 848.37 MHz;Duty Cycle: 1:1
Medium parameters used : f = 848.37 MHz; σ = 0.924 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

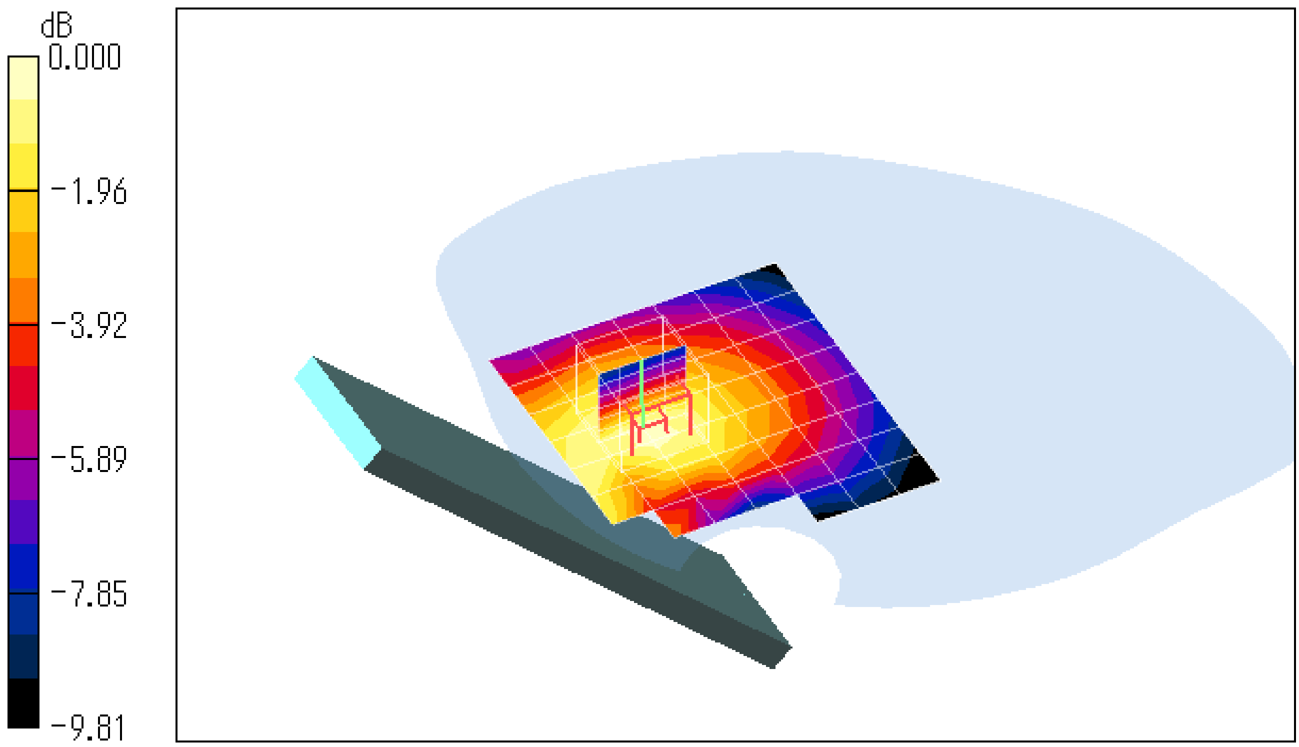
Test Date: 2011-02-21; Ambient Temp 22.7 ˚C; Tissue Temp: 22.0 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.57, 6.57, 6.57); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Right(TP1063); Type: SAM; Serial: TP1063
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Mouth Jaw - High.ch/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.189 mW/g

Mouth Jaw - High.ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.88 V/m; Power Drift = -0.006 dB
Peak SAR (extrapolated) = 0.248 W/kg
SAR(1 g) = 0.188 mW/g; SAR(10 g) = 0.133 mW/g
Maximum value of SAR (measured) = 0.201 mW/g



0 dB = 0.201mW/g

RFT

Test Laboratory: RF Technologies Ltd.

Mode: Right Head, Ear/Tilt 384ch (836.52MHz)

DUT: Cellular Phone; Type: CDMA CA007; Serial: SCAEN000302

Communication System: CDMA2000 Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used : f = 836.52 MHz; σ = 0.906 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

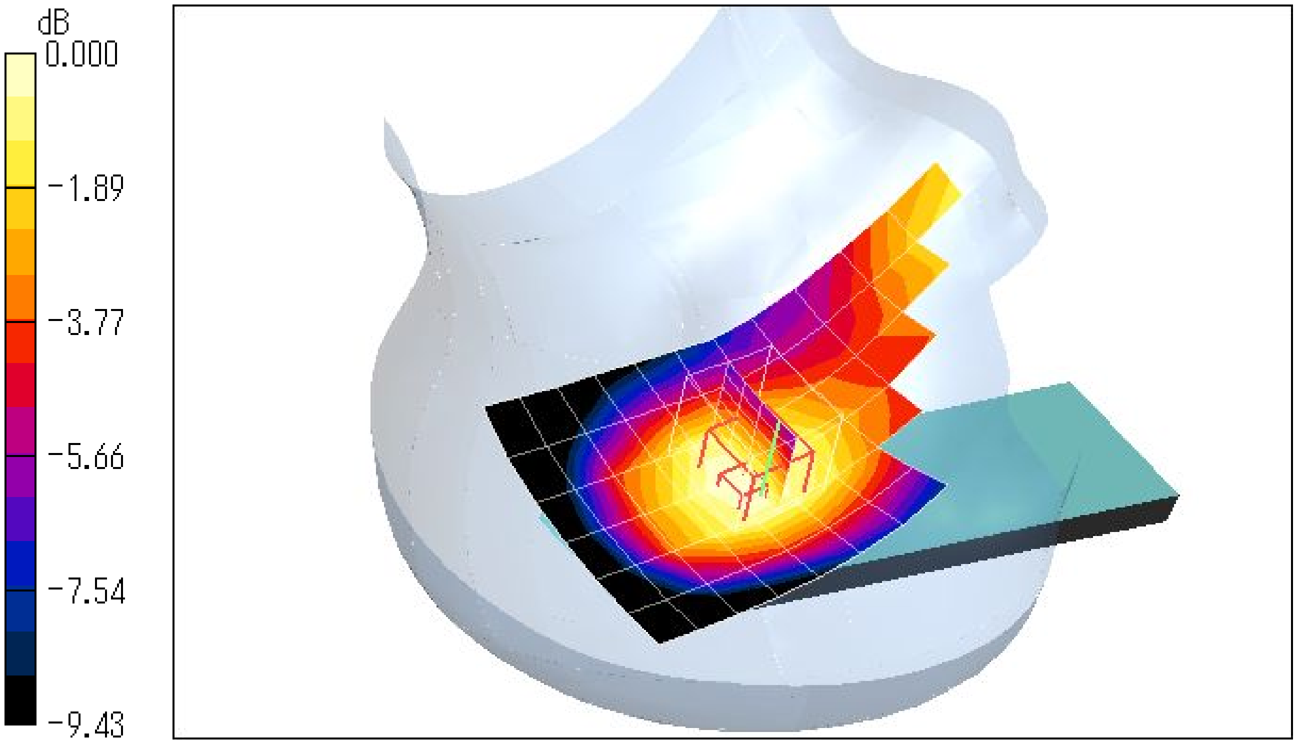
Test Date: 2011-02-11; Ambient Temp 22.5 ˚C; Tissue Temp: 22.1 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.57, 6.57, 6.57); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Right(TP1063); Type: SAM; Serial: TP1063
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Tilt position - Middle.ch/Area Scan (7x18x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.037 mW/g

Tilt position - Middle.ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.88 V/m; Power Drift = -0.077 dB
Peak SAR (extrapolated) = 0.041 W/kg
SAR(1 g) = 0.034 mW/g; SAR(10 g) = 0.026 mW/g
Maximum value of SAR (measured) = 0.036 mW/g



0 dB = 0.036mW/g

RFT

Test Laboratory: RF Technologies Ltd.

Mode: Left Head, Ear/Tilt 384ch (836.52MHz)

DUT: Cellular Phone; Type: CDMA CA007; Serial: SCAEN000302

Communication System: CDMA2000 Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used : f = 836.52 MHz; σ = 0.906 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

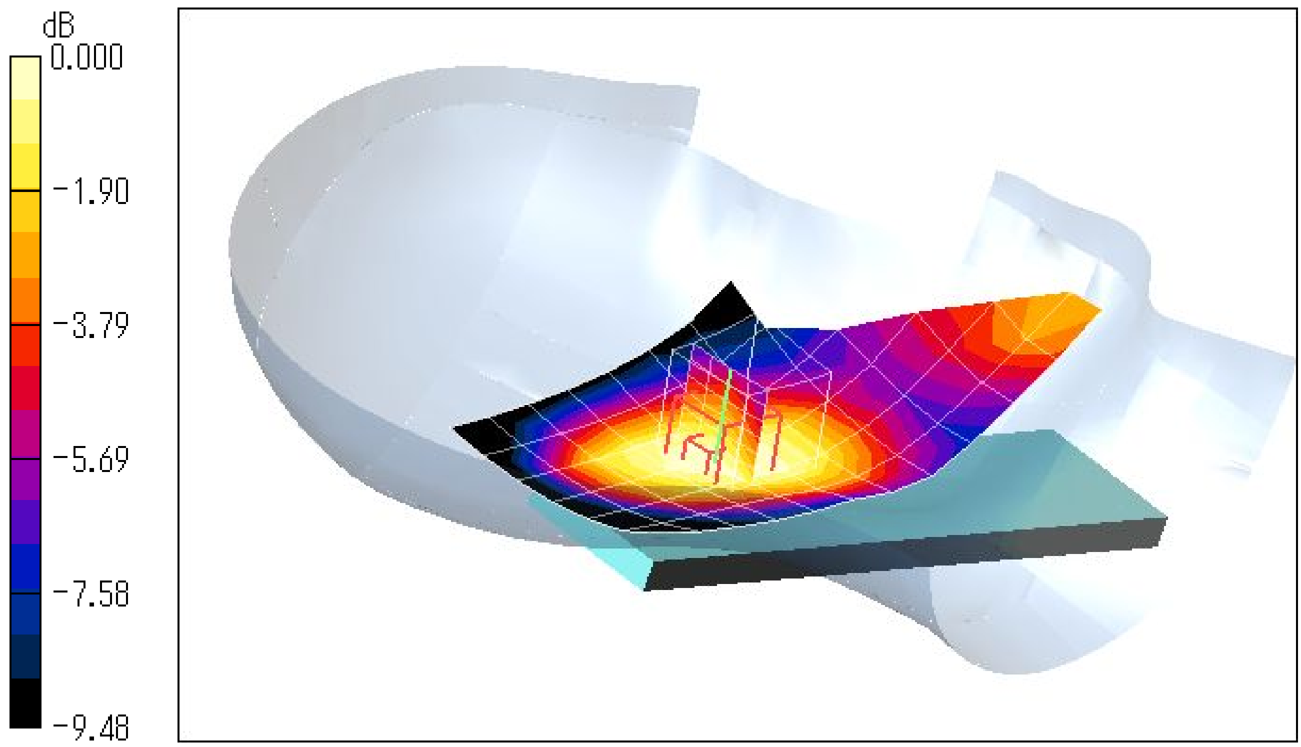
Test Date: 2011-02-11; Ambient Temp 22.5˚C; Tissue Temp: 22.0 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.57, 6.57, 6.57); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Right(TP1063); Type: SAM; Serial: TP1063
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Tilt position - Middle.ch/Area Scan (7x18x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.046 mW/g

Tilt position - Middle.ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.94 V/m; Power Drift = -0.139 dB
Peak SAR (extrapolated) = 0.051 W/kg
SAR(1 g) = 0.042 mW/g; SAR(10 g) = 0.032 mW/g
Maximum value of SAR (measured) = 0.044 mW/g



0 dB = 0.044mW/g

RFT

Test Laboratory: RF Technologies Ltd.

Mode: Body-worn, Front, 384ch (836.52MHz)

DUT: Cellular Phone; Type: CDMA CA007; Serial: SCAEN000302

Communication System: CDMA2000 Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used : f = 836.52 MHz; σ = 0.954 mho/m; ε_r = 55.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

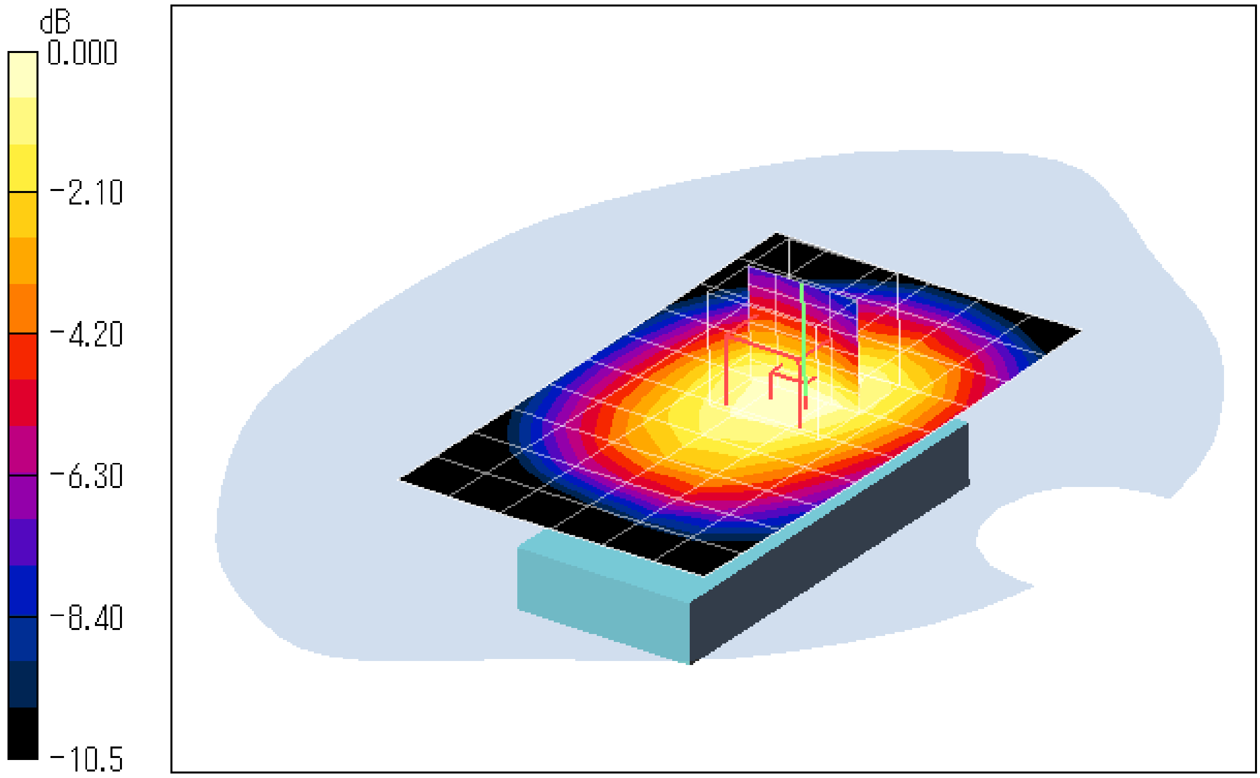
Test Date: 2011-02-09; Ambient Temp 22.2 ˚C; Tissue Temp: 22.0 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.44, 6.44, 6.44); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Left(TP1027); Type: SAM; Serial: TP1027
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Front position - Middle.ch 2/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.371 mW/g

Front position - Middle.ch 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.4 V/m; Power Drift = -0.144 dB
Peak SAR (extrapolated) = 0.461 W/kg
SAR(1 g) = 0.357 mW/g; SAR(10 g) = 0.261 mW/g
Maximum value of SAR (measured) = 0.377 mW/g



0 dB = 0.377mW/g

RFT

Test Laboratory: RF Technologies Ltd.

Mode: Body-worn, Rear, 1013ch (824.70MHz)

DUT: Cellular Phone; Type: CDMA CA007; Serial: SCAEN000302

Communication System: CDMA2000 Cellular; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium parameters used : f = 824.7 MHz; $\sigma = 0.942$ mho/m; $\varepsilon_r = 55.2$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

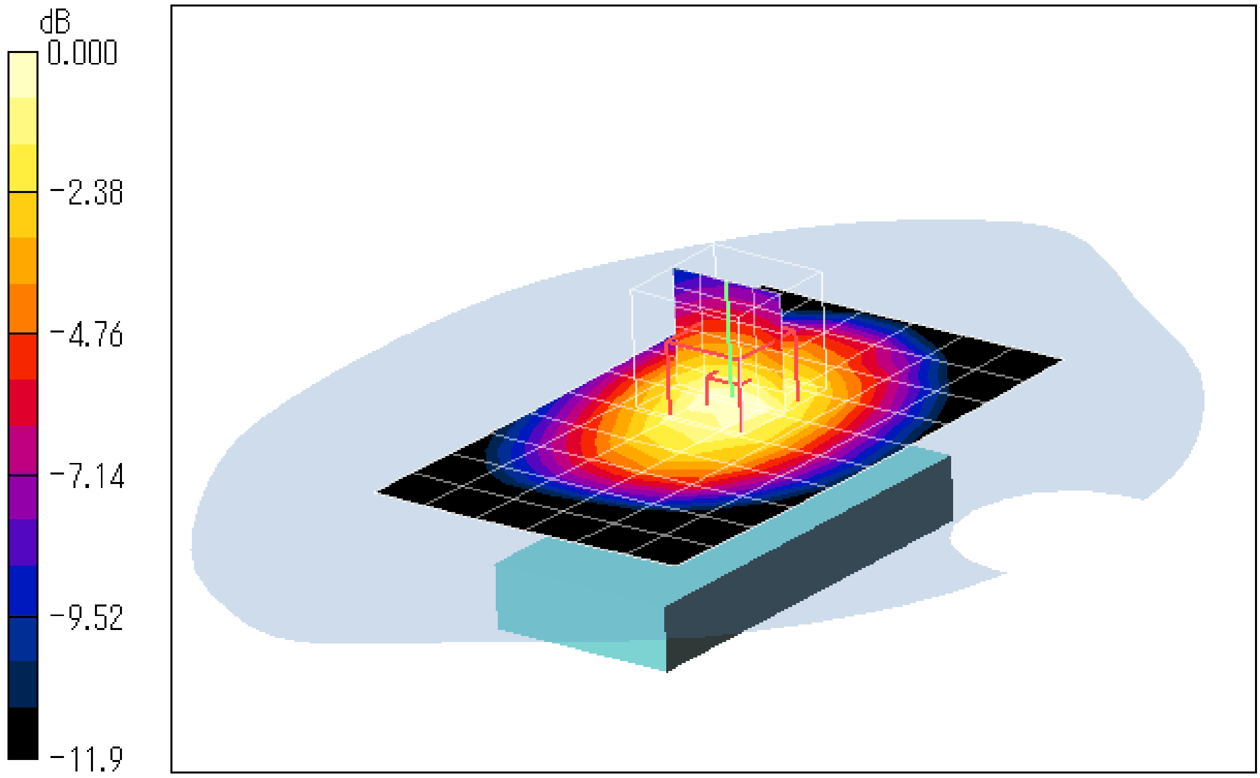
Test Date: 2011-02-09; Ambient Temp 22.2 ˚C; Tissue Temp: 21.9 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.44, 6.44, 6.44); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Left(TP1027); Type: SAM; Serial: TP1027
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Rear position - Low.ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.786 mW/g

Rear position - Low.ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.7 V/m; Power Drift = -0.001 dB
Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.778 mW/g; SAR(10 g) = 0.544 mW/g
Maximum value of SAR (measured) = 0.829 mW/g



0 dB = 0.829mW/g

Test Laboratory: RF Technologies Ltd.

Mode: Body-worn, Rear, 384ch (836.52MHz)

DUT: Cellular Phone; Type: CDMA CA007; Serial: SCAEN000302

Communication System: CDMA2000 Cellular; Frequency: 836.52 MHz;Duty Cycle: 1:1
Medium parameters used : f = 836.52 MHz; σ = 0.954 mho/m; ε_r = 55.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

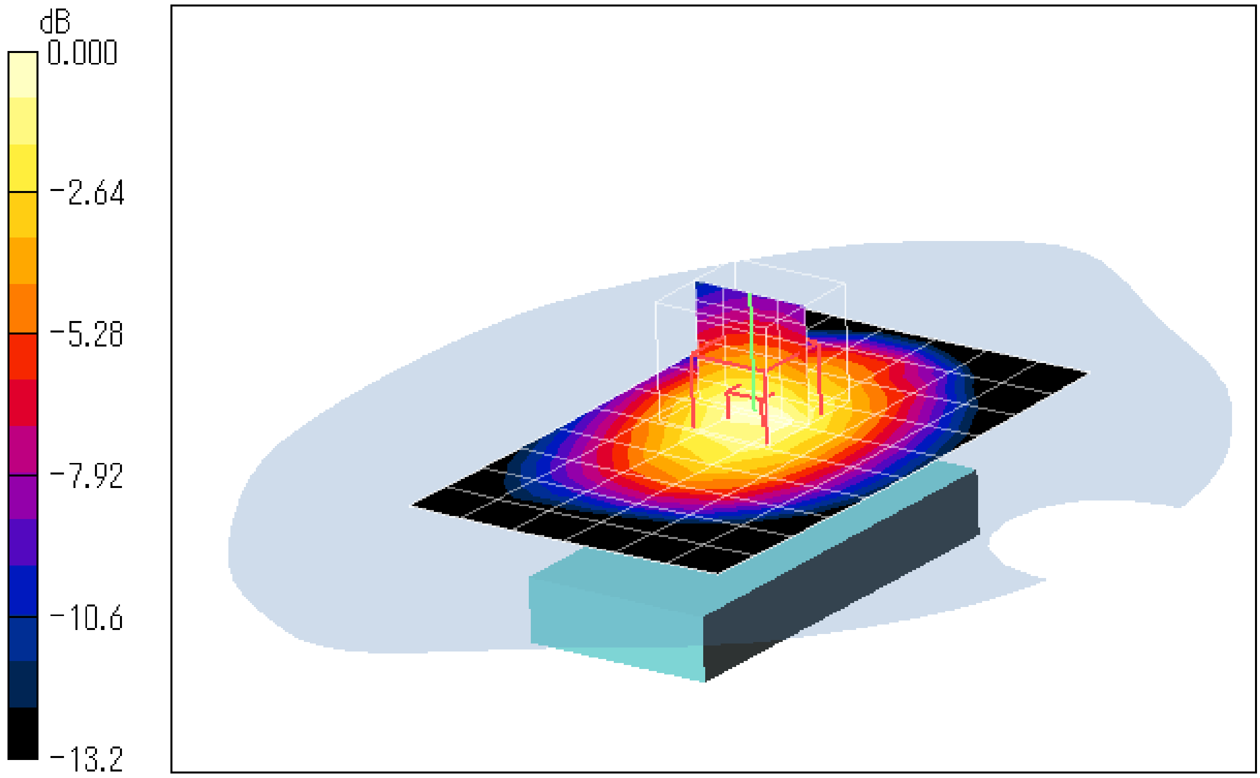
Test Date: 2011-02-09; Ambient Temp 22.2 ˚C; Tissue Temp: 21.9 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.44, 6.44, 6.44); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Left(TP1027); Type: SAM; Serial: TP1027
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Rear position - Middle.ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.882 mW/g

Rear position - Middle.ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.8 V/m; Power Drift = -0.128 dB
Peak SAR (extrapolated) = 1.23 W/kg
SAR(1 g) = 0.873 mW/g; SAR(10 g) = 0.588 mW/g
Maximum value of SAR (measured) = 0.938 mW/g



0 dB = 0.938mW/g

RFT

Test Laboratory: RF Technologies Ltd.

Mode: Body-worn, Rear, 777ch (848.37MHz)

DUT: Cellular Phone; Type: CDMA CA007; Serial: SCAEN000302

Communication System: CDMA2000 Cellular; Frequency: 848.37 MHz;Duty Cycle: 1:1
Medium parameters used : f = 848.37 MHz; σ = 0.965 mho/m; ε_r = 55.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

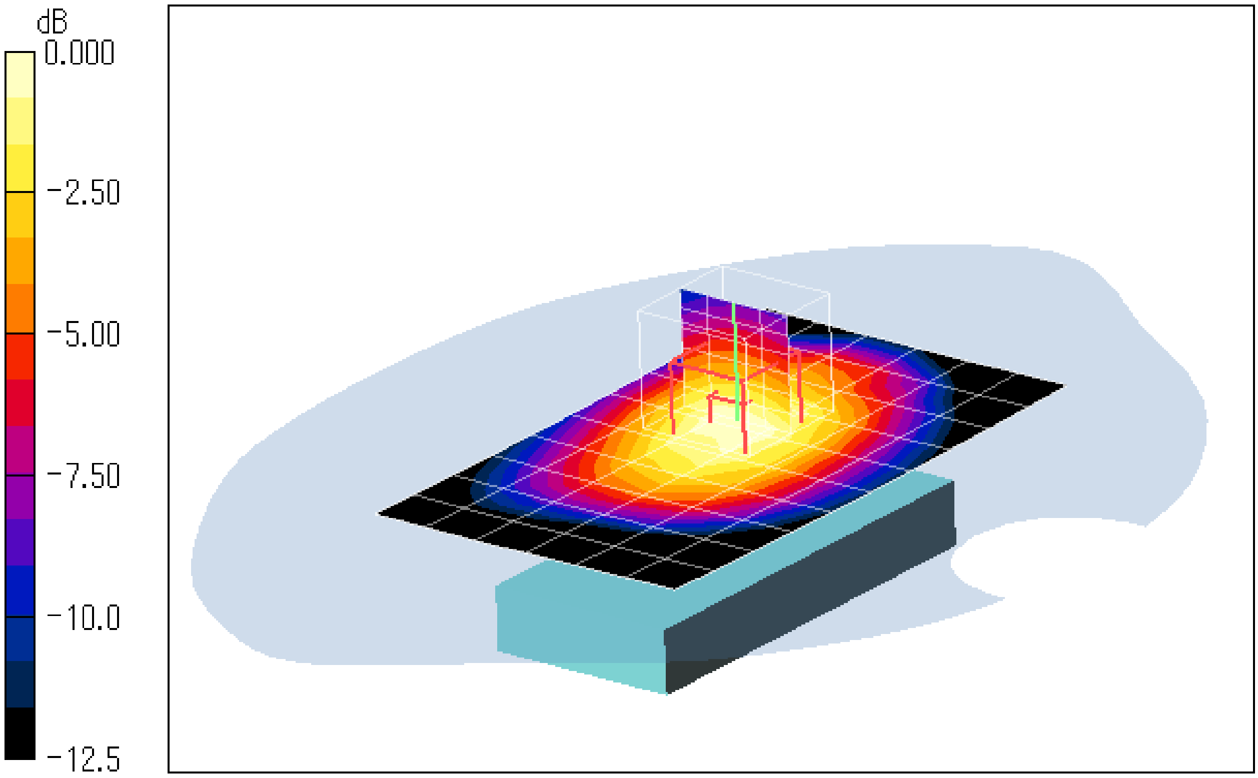
Test Date: 2011-02-09; Ambient Temp 22.2˚C; Tissue Temp: 21.8 ˚C

DASY4 Configuration:

- Probe: ET3DV6 - SN1563; ConvF(6.44, 6.44, 6.44); Calibrated: 2010/08/11
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn414; Calibrated: 2010/08/10
- Phantom: SAM with CRP Left(TP1027); Type: SAM; Serial: TP1027
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Rear position - High.ch/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.691 mW/g

Rear position - High.ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.9 V/m; Power Drift = -0.027 dB
Peak SAR (extrapolated) = 0.940 W/kg
SAR(1 g) = 0.685 mW/g; SAR(10 g) = 0.475 mW/g
Maximum value of SAR (measured) = 0.726 mW/g



0 dB = 0.726mW/g

Appendix C

Calibration Data

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

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Accreditation No.: SCS 108

Client **RF Technology (PTT)**

Certificate No: ET3-1563_Aug10

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1563
Calibration procedure(s)	QA CAL-01.v6, QA CAL-23.v3 and QA CAL-25.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	August 11, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11

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

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 14, 2010

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

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Accreditation No.: **SCS 108**

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 effect 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.
- *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 ET3DV6

SN:1563

Manufactured:	December 1, 2000
Last calibrated:	August 14, 2009
Recalibrated:	August 11, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ET3DV6 SN:1563

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	2.06	2.14	1.65	± 10.1%
DCP (mV)[B]	97.6	95.0	98.0	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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

[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 maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ET3DV6 SN:1563

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	6.57	6.57	6.57	0.32	2.56	± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	5.27	5.27	5.27	0.57	2.25	± 11.0%

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

DASY/EASY - Parameters of Probe: ET3DV6 SN:1563

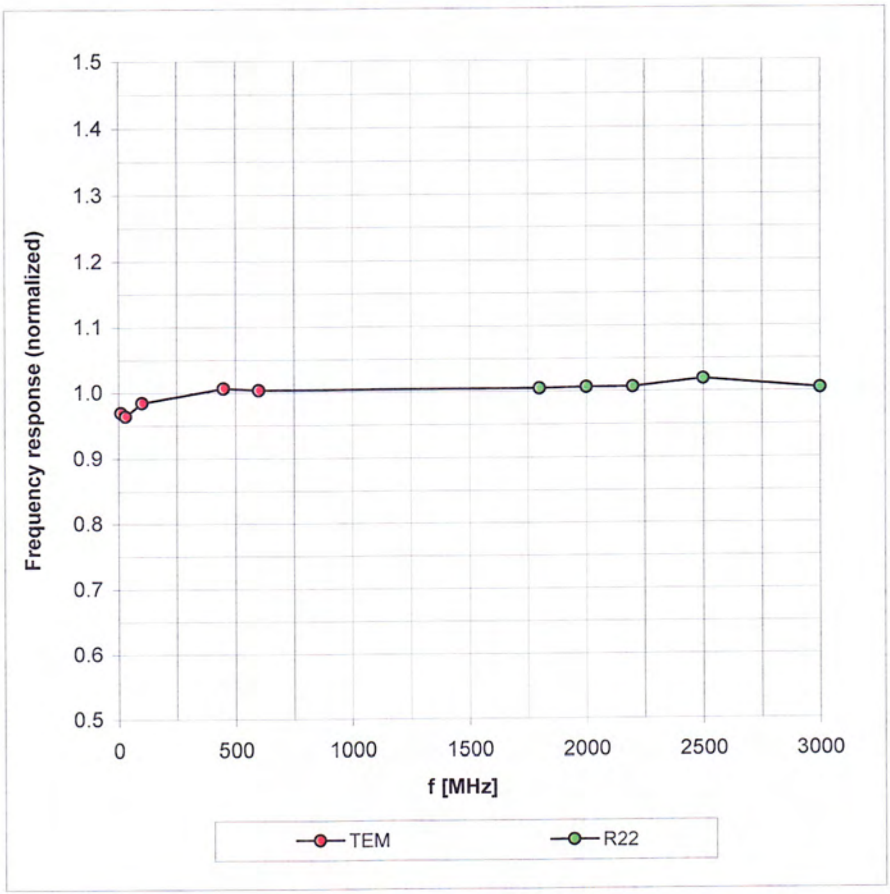
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	6.44	6.44	6.44	0.29	2.71	± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.77	4.77	4.77	0.71	2.69	± 11.0%

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

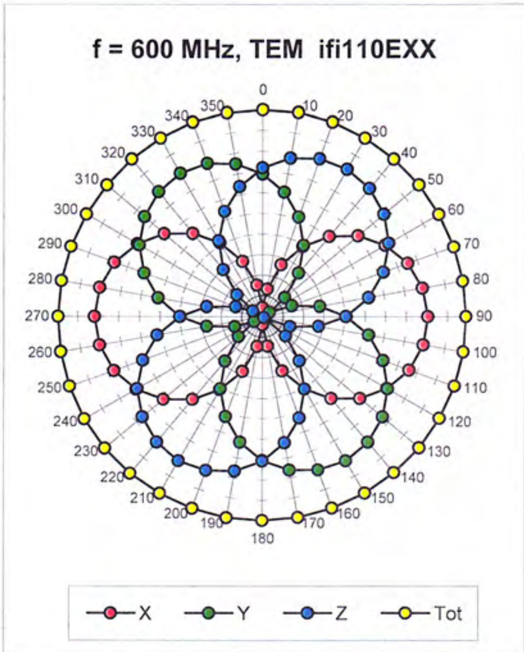
Frequency Response of E-Field

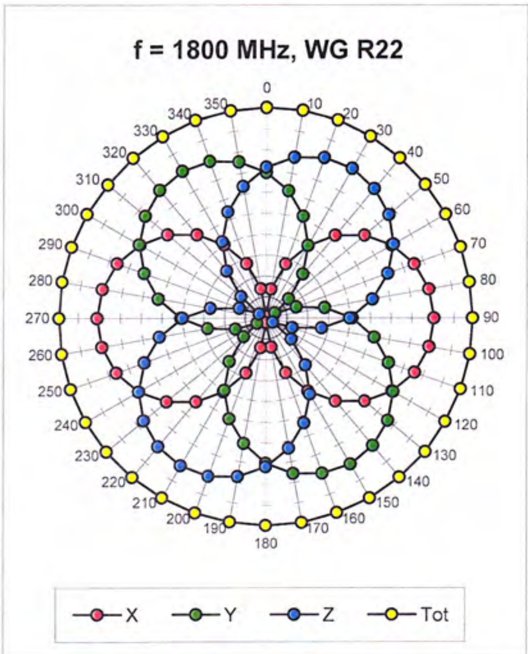
(TEM-Cell:ifi110 EXX, Waveguide: R22)

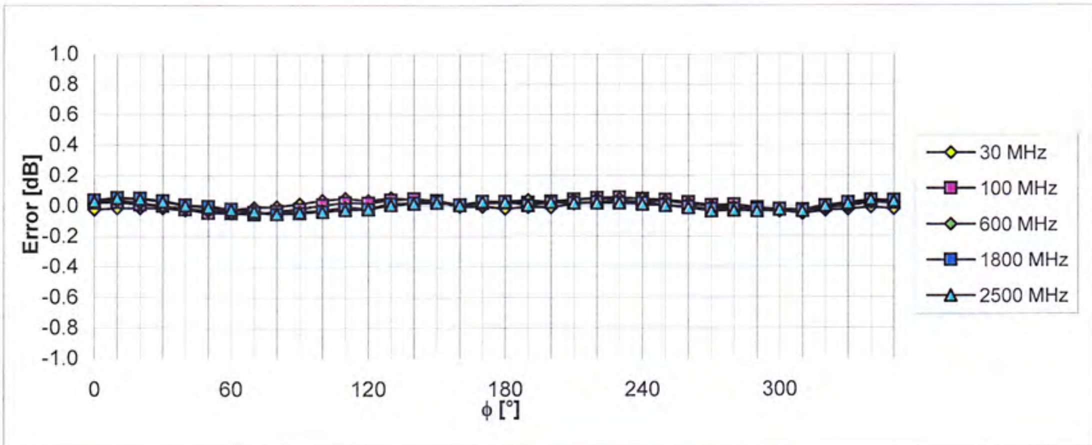


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$



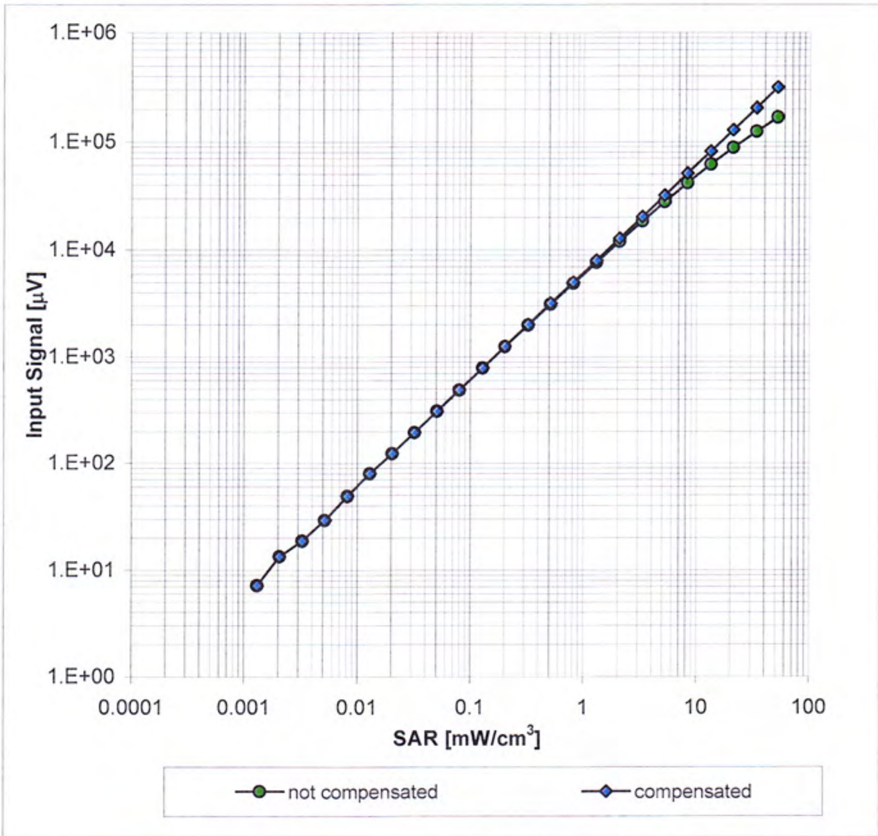


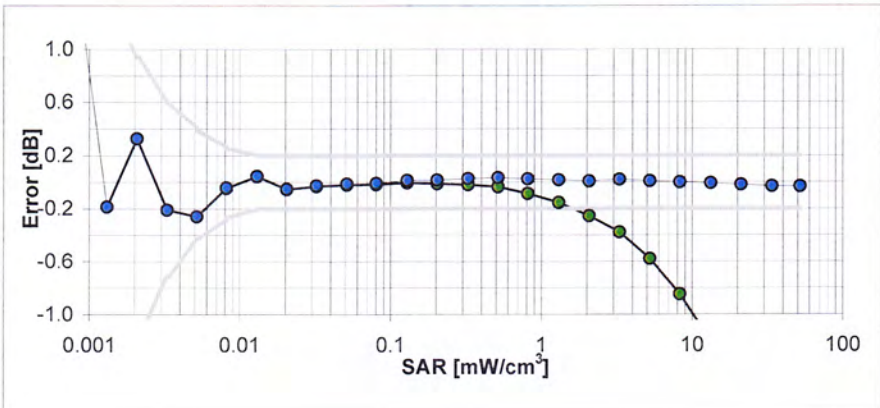


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

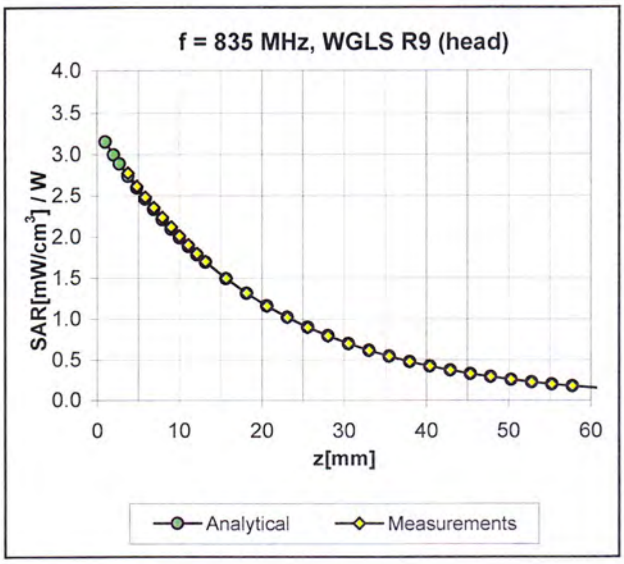
(Waveguide R22, f = 1800 MHz)

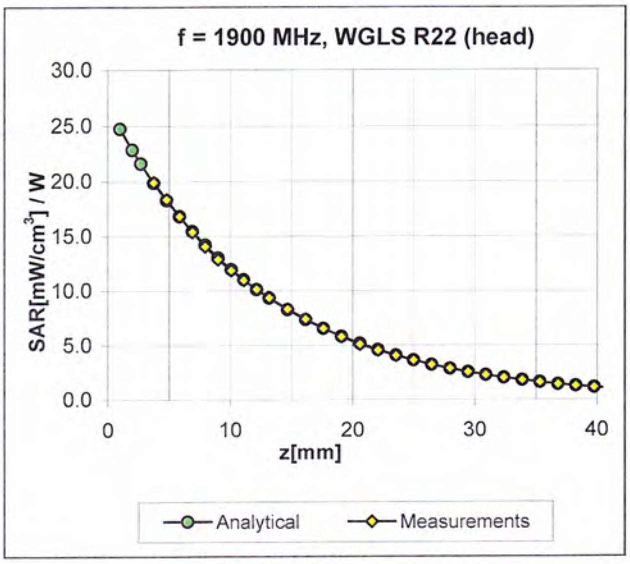




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

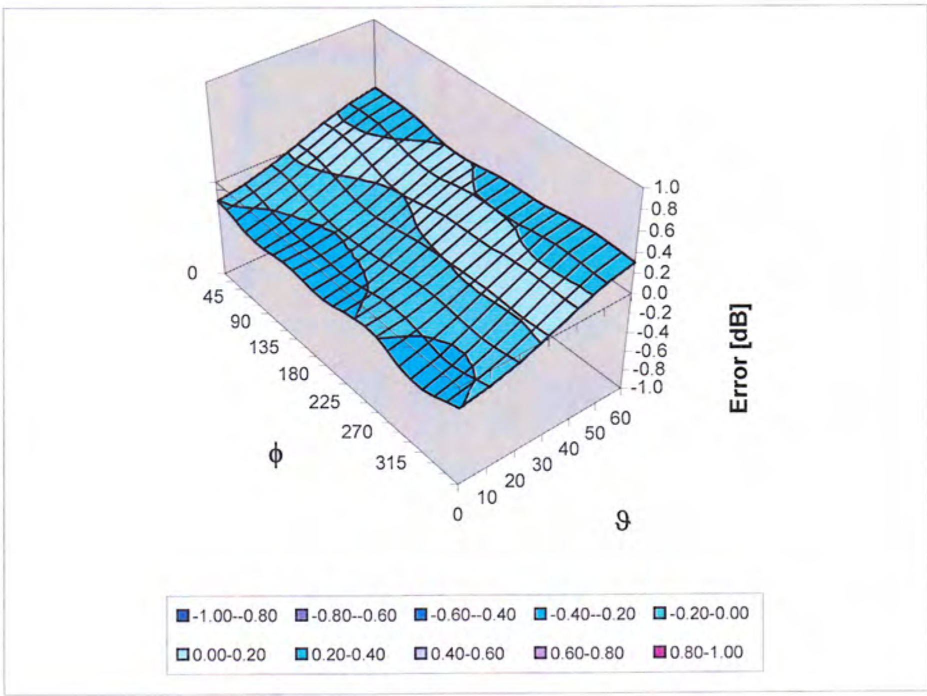
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	enabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

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Accreditation No.: SCS 108

Client **RF Technology (PTT)**

Certificate No: DAE3-414_Aug10

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 414
Calibration procedure(s)	QA CAL-06.v22 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	August 10, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	1-Oct-09 (No: 9055)	Oct-10
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	07-Jun-10 (in house check)	In house check: Jun-11

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	R&D Director	i. V.

Issued: August 17, 2010

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

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Accreditation No.: **SCS 108**

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

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

Calibration Factors	X	Y	Z
High Range	404.506 ± 0.1% (k=2)	404.411 ± 0.1% (k=2)	404.396 ± 0.1% (k=2)
Low Range	3.96206 ± 0.7% (k=2)	3.97642 ± 0.7% (k=2)	3.95539 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	326.0 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199993.5	0.79	0.00
Channel X	+ Input	20000.51	0.41	0.00
Channel X	- Input	-19997.01	2.39	-0.01
Channel Y	+ Input	200003.8	2.66	0.00
Channel Y	+ Input	20002.38	2.38	0.01
Channel Y	- Input	-19998.09	1.31	-0.01
Channel Z	+ Input	200010.8	0.35	0.00
Channel Z	+ Input	19998.31	-1.59	-0.01
Channel Z	- Input	-19998.69	0.51	-0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.2	0.15	0.01
Channel X	+ Input	199.90	0.00	0.00
Channel X	- Input	-200.36	-0.16	0.08
Channel Y	+ Input	2000.0	-0.21	-0.01
Channel Y	+ Input	199.08	-0.92	-0.46
Channel Y	- Input	-201.29	-1.29	0.64
Channel Z	+ Input	1999.7	-0.29	-0.01
Channel Z	+ Input	198.58	-1.42	-0.71
Channel Z	- Input	-201.33	-1.43	0.71

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	12.27	10.27
	- 200	-9.06	-10.78
Channel Y	200	5.65	4.79
	- 200	-5.13	-5.94
Channel Z	200	-20.84	-21.30
	- 200	20.30	20.14

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	4.43	1.62
Channel Y	200	-2.38	-	-0.91
Channel Z	200	2.98	0.91	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	16235	16570
Channel Y	15651	15321
Channel Z	15758	16681

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	1.74	0.52	2.23	0.26
Channel Y	-0.40	-1.51	0.41	0.27
Channel Z	-0.81	-2.12	0.07	0.36

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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

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s p e a g

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IMPORTANT NOTICE

USAGE OF THE DAE 3

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

Battery Exchange: The battery cover of the DAE3 unit is connected to a fragile 3-pin battery connector. Customer is responsible to apply outmost caution not to bend or damage the connector when changing batteries.

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

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

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

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

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

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

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

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 Technologies (PTT)**

Certificate No: D835V2-4d083_Aug09

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d083
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	August 17, 2009
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

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

Issued: August 17, 2009

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
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	41.2 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature during test	(22.1 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 mW / g
SAR normalized	normalized to 1W	9.56 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**9.55 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.56 mW / g
SAR normalized	normalized to 1W	6.24 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**6.23 mW /g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

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

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.54 mW / g
SAR normalized	normalized to 1W	10.2 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**9.93 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.66 mW / g
SAR normalized	normalized to 1W	6.64 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**6.54 mW / g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.0 Ω - 2.4 jΩ
Return Loss	- 30.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.6 Ω - 3.8 jΩ
Return Loss	- 27.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.393 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 17, 2008

DASY5 Validation Report for Head TSL

Date/Time: 04.08.2009 13:20:01

Test Laboratory: SPEAG, Zurich, Switzerland

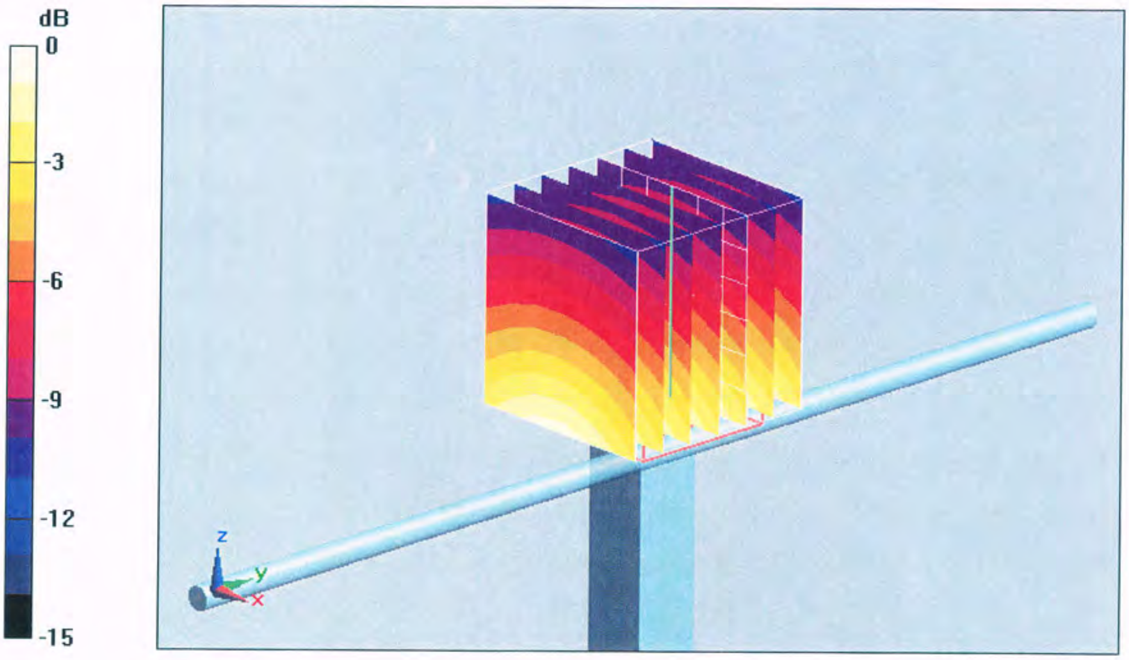
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d083

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz
Medium parameters used: f = 835 MHz; σ = 0.9 mho/m; ε_r = 41.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

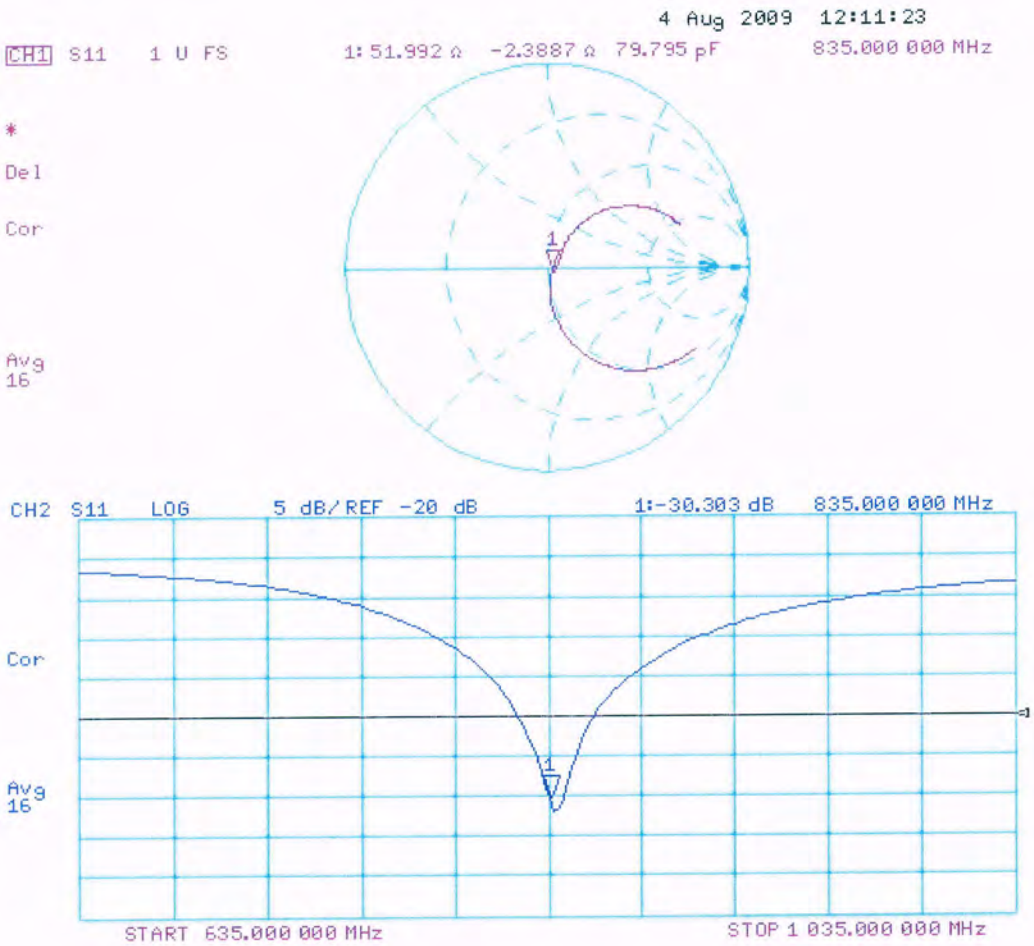
- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4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

Pin=250mW; dip=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.3 V/m; Power Drift = 0.011 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 2.39 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.78 mW/g



0 dB = 2.78mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 17.08.2009 10:09:16

Test Laboratory: SPEAG, Zurich, Switzerland

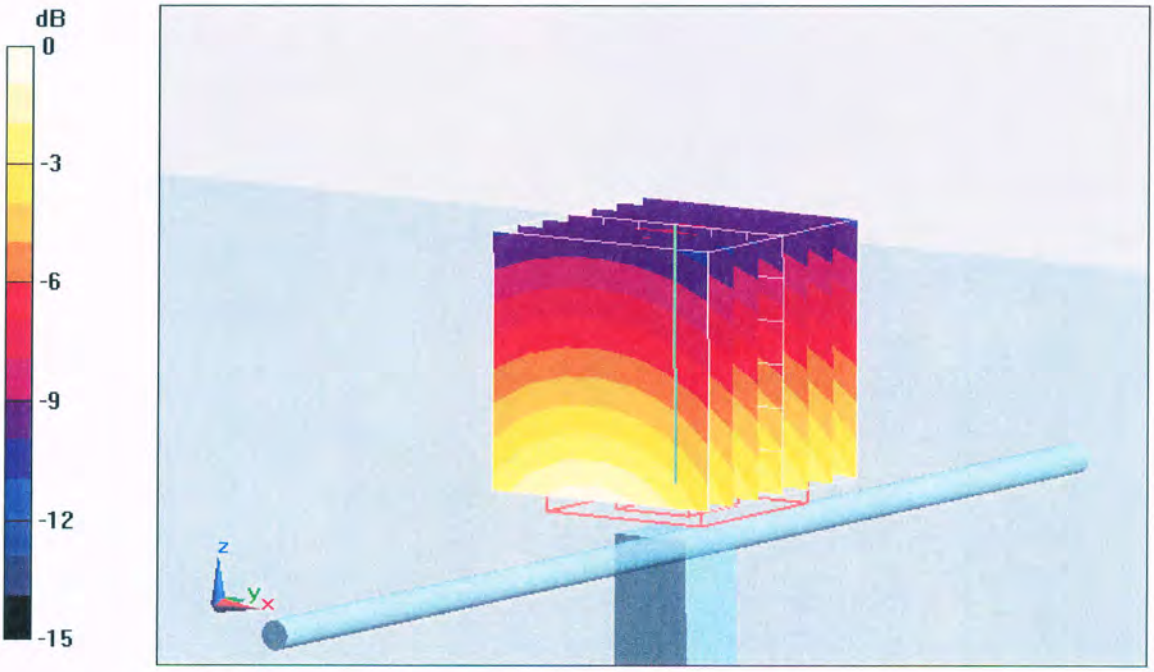
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d083

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL900
Medium parameters used: f = 835 MHz; σ = 0.99 mho/m; ε_r = 53.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

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

Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.2 V/m; Power Drift = 0.017 dB
Peak SAR (extrapolated) = 3.77 W/kg
SAR(1 g) = 2.54 mW/g; SAR(10 g) = 1.66 mW/g
Maximum value of SAR (measured) = 2.95 mW/g



0 dB = 2.95mW/g

Impedance Measurement Plot for Body TSL