TEST REPORT

1. Applicant

Name	: Pantech Co., Ltd.
Address	: Pantech Bldg, I-2, DMC, Sangam-dong, Mapo-gu, Seoul, Korea

2. Products

Name	: GSM Phone
Model	: C320
Manufacturer	: Pantech Co., Ltd.

3. Test Standard	: FCC 47 CFR § 2.1093
4. Test Method	: OET Bulletin 65, Supplement C(July 2001)
5. Test Result	: Positive
6. Date of Application	: September 19 , 2008
7. Date of Issue	: September 24, 2008

Tested by

Jong-Gon Ban

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Korea Testing Laboratory

TABLE OF CONTENTS

.

Appendix A. SAR PLOTS

Appendix B. Calibration Data Sheets

Appendix C. SAR measurement setup photos

1. EQUIPMENT UNDER TEST

1.1 General Information

1) Name : GSM Phone

2) Device Category : Portable Device

3) Model Number : C320

4) FCC ID : PYCC320

5) Test Device : Production Unit

6) Applicant & Address : Pantech Co., Ltd.
Pantech Bldg, I-2, DMC, Sangam-dong, Mapo-gu, Seoul, Korea

7) Contact : Mr. B.W.Kim, bwkim@pantech.com (Tel : +82-2-2030-1320, Fax : +82-2-2030-2519)

8) Rule and Test Standard : FCC 47 CFR § 2.1093; OET Bulletin 65, Supplement C(July 2001)

9) FCC Classification : Liscensed Portable Transmitter Held to Ear (PCE)

10) RF exposure Category : General Population/Uncontrolled

11) Maximum SAR : 0.453 W/kg GSM850 Head SAR / 0.503 W/kg GSM850 Body SAR
0.247 W/kg GSM1900 Head SAR / 0.278 W/kg GSM1900 Body SAR

1.2 Description of Device :

Operation Modes	GSM850/1900, GPRS850/1900, Bluetooth Class2
GSM850/1900/Bluetooth Max Conducted RF Power	31.91 dBm / 28.83 dBm / 3.98 dBm
Tx Frequency Range	824.2 ~ 848.8 MHz (GSM/GPRS850) 1850.2 ~ 1909.8MHz (GSM/GPRS1900) 2402.0 ~ 2480.0MHz (Bluetooth)
GPRS Mode	GPRS CLASS 10
Duty Cycle	1: 8.3 (GSM850/1900) , 1: 4.15 (GPRS850/1900)
Antenna Type	Internal Antenna
Separation distance between main & Bluetooth Ant	80 mm
Battery Type	3.7 VDC 770mAh, Li-Ion

2. INTRODUCTION

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

The safety limits used for the environmental evaluation measurements are based on the criteria published by American National Standards Institude (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. (c) 1992 by the Institute of Electical and Electronics Engineers, Inc., New York, New York 10017.[2] The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromgnetic Fields – RF and Microwave[3] is used for guidance in measureing SAR due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements(NCRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields "NCRP Report No. 86 (c) NCRP, 1986, Bethesda, MD 20814.[4] SAR is a measure of the rate of energy absorption due to exaposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

2.1 SAR Definition

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

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

Figure 1. SAR Mathematical Equation

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

$$SAR = \sigma E^2 / p$$

Where :

σ = conductivity of the tissue-simulant material (S/m)

p = mass density of the tissue-simulant material (kg/m^3)

E = Total RMS electric field strength (V/m)

Note: The primary factors that control rate or energy absortion were found to be the wavelength of the incident field in realtions to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflectinf surfaces, and whether conductive contact is made by the organism with a ground plane.[4]

3. DESCRIPTION OF SAR MEASREMENT SYSTEM

3.1 SAR Measurement System

These measurements are performed using the DASY4 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, measurement server, Measurement computer, near-field probe, probe alignment sensor, and the SAM 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).

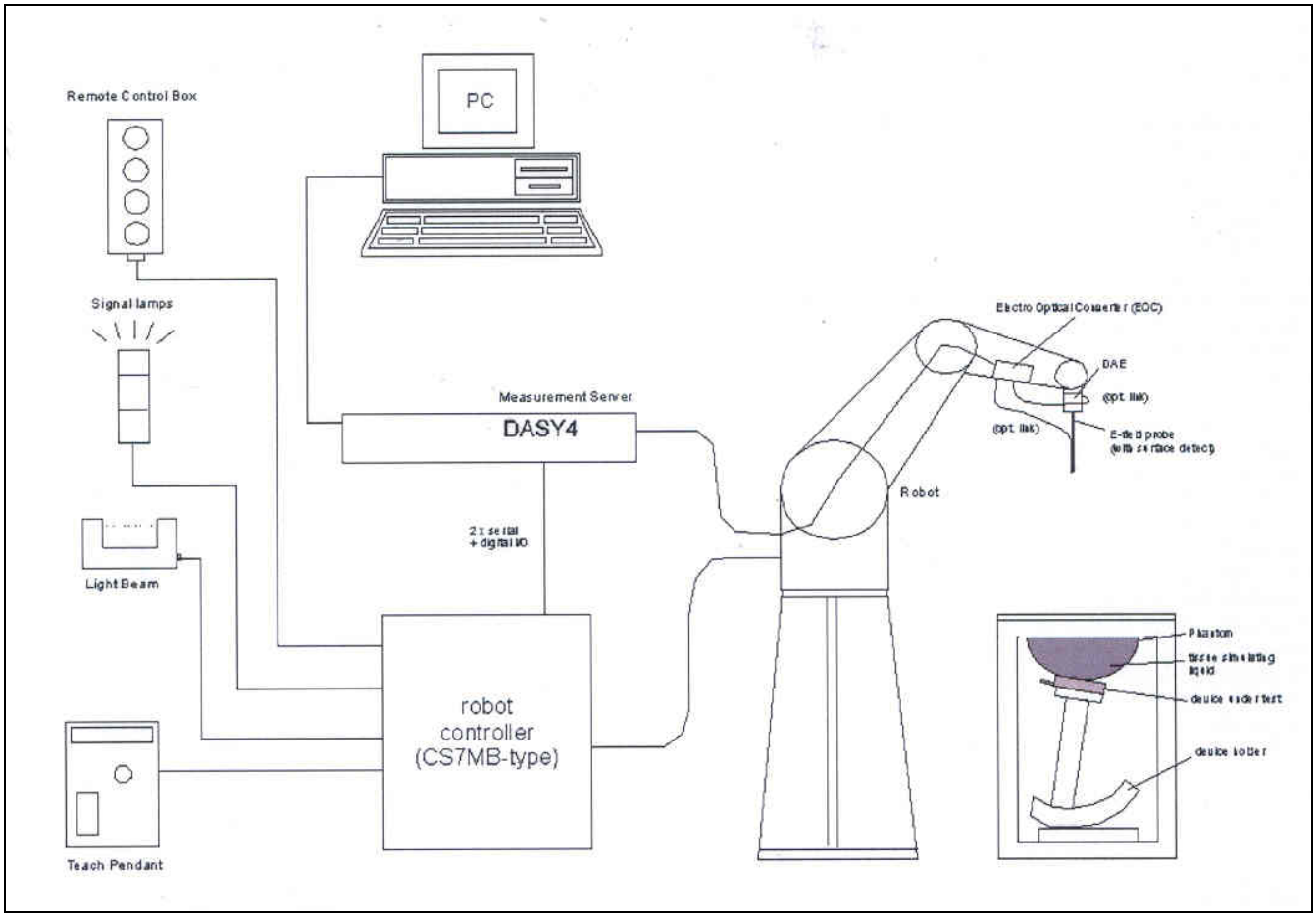

Figure 2. SAR Measurement System

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 [5].

3.2 E-Field Probe Type and Performance

The SAR measurements were conducted with the dosimetric probe ET3DV6, (see Fifure.4) designed in the classical triangular configuration [5] and optimised for dosimetric evaluation. The probe has been is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical mortifier line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approace and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.

Figure 3. Probe and DAE

Probe Specifications

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System Built-in shielding against static charges
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at Frequencies of 450 MHz, 900 MHz and 1.8 GHz (accuracy. 8%)
Frequency	10 MHz to > 6 GHz; Linearity: . 0.2 dB (30 MHz to 3 GHz)
Directivity	. 0.2 dB in brain tissue (rotation around probe axis) . 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic Range Linearity	5 uW/g to > 100 mW/g; 0.2 dB
Surface Detection	0.2 mm repeatability in air and clear liquids Over diffuse reflecting surfaces.
Dimensions	Overall length: 330 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dissymmetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

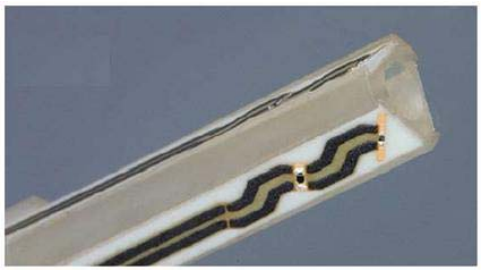

Figure 4. ET3DV6 E-Field Probe

3.3 Probe Calibration Process

Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described [6] with an accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure described in [7] and found to be better than +/- 0.25dB. The sensitivity parameters (NornX, NornY, NornZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

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

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

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

where:

Δt = exposure time (30 seconds),

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

ΔT = temperature increase due to RF exposure.

SAR is proportional to $\Delta T / \Delta t$, 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;

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

where:

σ = simulated tissue conductivity,

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

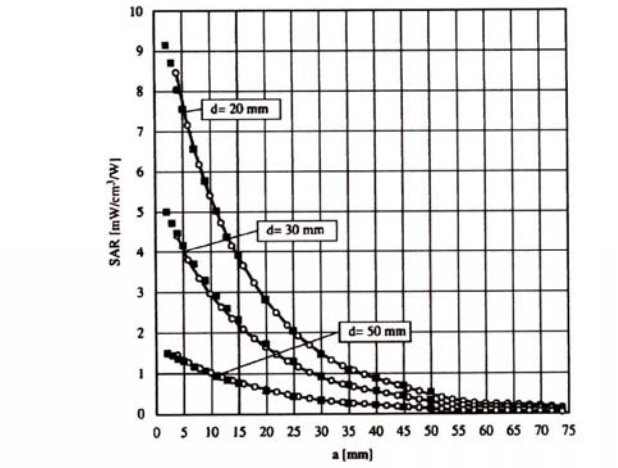

Figure B.1. E-Field and Temperature measurements at 900MHz[5]

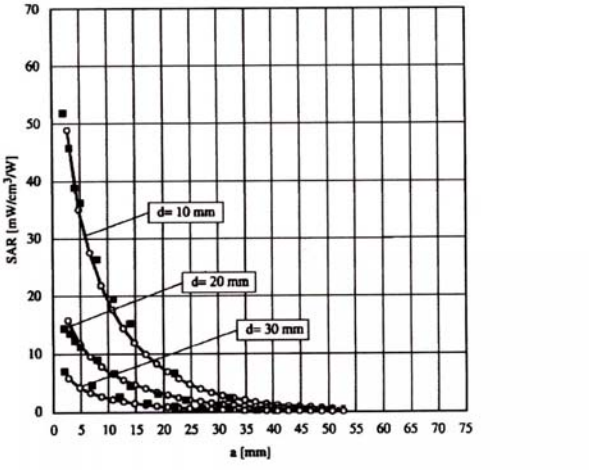

Figure B.2. E -field and temperature measurements at 1.8GHz[5]

3.4 Data Acquisition Electronics

The data acquisition electronics (DAE4) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. The input impedance of the DAE4 box is 200 Mohm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.Transmission to the PC-card is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.
The mechanical probe-mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection.

3.5 Phantom Properties

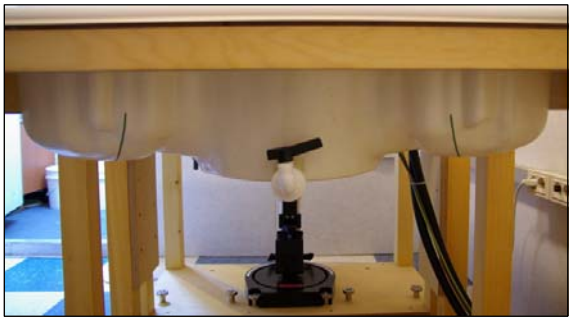

Figure 5. SAM twin phantom

The SAM Phantom 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 [9][10]. 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.

Phantom Properties	Requirement for specific EUT	Measured
Depth of Phantom	> 150 mm	200 mm
Width of flat section	> 10 cm (Twice EUT Width)	20 cm
Length of flat section	> 26 cm (Twice EUT Length)	30 cm
Thickness of flat section	2 mm ± 0.2 mm	2.08 ~ 2.20 mm

Table 1. Flat Section Properties of SAM Twin Phantom

3.6 Device Holder for DASY4

In combination with the SAM Phantom V4.0, the Mounting Device(POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatable positioned according to the FCC CENELEC 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 produced infinite number of configurations [10]. To produce the Worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Figure 4. Device Holder

3.7 Brain & Muscle Simulating Mixture Characteristic

The brain and muscle mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution (see Table 2). Preservation with bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Hartsgrove [11].

Ingredients	835MHz Brain	835MHz Muscle	1900MHz Brain	1900MHz Muscle
Water	40.29%	50.75%	55.24%	70.23%
Sugar	57.90%	48.21%	-	-
Salt	1.38%	0.94%	0.31%	0.29%
DGBE	-	-	44.45%	29.47%
Bacteriacide	0.18%	0.10%	-	-
HEC	0.24%	-	-	-

Table 2 : Composition of Tissue Equivalent Matter

4. System Verification

4.1 Tissue Verification

The dielectric parameters of the brain and muscle simulating liquid were measured prior to SAR assessment using the HP85070D dielectric probe kit and Agilent 8753D Network Analyzer. The actual dielectric parameters are shown in the following table.

Freq. [MHz]	Liquid	Date	Liquid Temp [°C]	parameters	Target Value	Measured Value	Deviation (%)	Limit (%)
835	Head	Sept. 18th 2008	22.4	εr	41.5	40.8	-2.7	± 5
				σ	0.90	0.89	-1.2	± 5
	Body	Sept. 18th 2008	22.2	εr	55.2	54.2	-1.9	± 5
				σ	0.97	0.96	-1.1	± 5
1900	Head	Sept. 19th 2008	22.5	εr	40.0	39.5	-1.2	± 5
				σ	1.40	1.41	+0.7	± 5
	Body	Sept. 19th 2008	22.6	εr	53.3	52.5	-1.6	± 5
				σ	1.52	1.56	+2.6	± 5

Table 3 : Measured Simulating Liquid Dielectric Values

The humidity and dielectric/ambient temperatures are recorded during the assessment of the tissue material dielectric parameters. The difference between the ambient temperature of the liquid during the dielectric measurement and the temperature during tests was less than |2|°C.

4.2 System Validation

Figure 5. Validation setup

Prior to the SAR assessment, the system validation kit was used to verify that the DASY4 was operating within its specifications. The validation dipoles are highly symmetric and matched at the centre frequency for the specified liquid and distance to the phantom. The accurate distance between the liquid surface and the dipole centre is achieved with a distance holder that snaps onto the dipole.
System validation is performed by feeding a known power level into a reference dipole, set at a know distance from the phantom.
The measured SAR is compared to the theoretically derived level.

The reference SAR values are derived using a reference dipole and flat phantom suitable. The forward power into the reference dipole for each SAR validation was adjusted to 250 mW.

These reference SAR values are obtained from the IEEE Std 1528 and are normalized to 1 W. The measured 1g(10g) SAR should be within 10 % of the expected target reference values shown in table 4 below.

System Validation Kit	Date	Tissue	Liquid Temp.(˚C)	Ambient Temp.(˚C)	Targeted SAR_{1g} (mW/g)	Measured SAR 1 g (mW/g)	Deviation (%)
D835V2 S/N:481	Sept. 18th 2008	835MHz Brain	22.4	22.0	9.5	9.4	+ 1.9
D1900V2 S/N:5d038	Sept. 19th 2008	1900MHz Brain	22.5	22.0	39.7	41.6	+4.7

Table 4 : Deviation from Reference Validation Values

During the SAR measurement process the liquid depth was maintained to a level of a least 15 tolerance of ± 0.2cm.
The following photo shows the depth of the liquid depth of the liquid maintained during the testing.

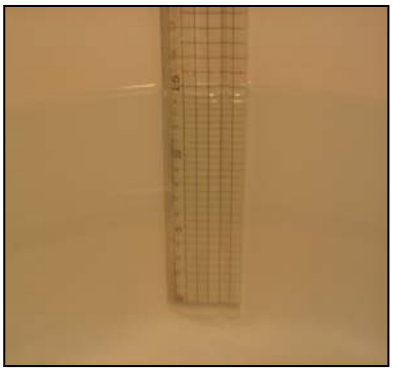

Figure 6. Liquid Depth

5. SAR MEASUREMENT PROCEDURE USING DASY4

The SAR evaluation was performed with the SPEAG DASY4 system. A summary of the procedure follows ;

a) A measurement of the SAR value at a fixed location is used as a reference value for assessing the power drop of the EUT. The SAR at this point is measured at the start of the test and then again at the end of the test.

b) The SAR distribution at the exposed side of the phantom is measured at a distance of 3.9 mm from the inner surface of the shell. The area covers the entire dimension of the EUT and the horizontal grid spacing is 15 mm x 15 mm(or 20mm x 20mm). The actual Area Scan has dimensions surrounding the test device. Based on this data, the area of the maximum absorption is determined by Spline interpolation.

c) Around this point, a volume is assessed by measuring 5 x 5 x 7 (7 x 7 x 7) points. On the basis of this data set, the spatial peak SAR value is evaluated with the following procedure ;

(i) The data at the surface are extrapolated, since the centre of the dipoles is 2.7 mm 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[13]. A polynomial of the fourth order is calculated through the points in z-axes. This polynomial is then used to evaluate the points between the surface and the probe tip.

(ii) The maximum interpolated value is searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g and 10 g) are computed using the 3D-Spline interpolation algorithm. The 3D-Spline is composed of three one-dimensional splines with the “Not a knot”- condition (in x, y and z-direction)[13][14]. The volume is integrated with the trapezoidal-algorithm. One thousand points (10 x 10 x 10) are interpolated to calculate the averages.

(iii) All neighbouring volumes are evaluated until no neighbouring volume with a higher average value is found.

(iv) The SAR value at the same location as in Step (a) is again measured (If the value changed by more than 5%, the evaluation is repeatd.)

6. MEASUREMENT UNCERTAINTY

The uncertainty analysis is based on the template listed in the IEEE Std 1528-2003 for both EUT SAR tests and Validation uncertainty. The measurement uncertainty of a specific device is evaluated independently and the total uncertainty for both evaluations (95 % confidence level) must be less than 25 %.

a	b	c	d	e= f(d,k)	f	g	h=cxf/e	i=cxg/e	k
Uncertainty Component	Sec.	Tol. (%)	Prob. Dist.	Div.	Ci (1 g)	Ci (10 g)	1 g Ui (± %)	10 g Ui (± %)	vi
Measurement System									
Probe Calibration (k=1)	E.2.1	5.9	N	1	1	1	5.9	5.9	∞
Axial Isotropy	E.2.2	4.7	R	√ 3	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	R	√ 3	0.7	0.7	3.9	3.9	∞
Boundary Effect	E.2.3	1.0	R	√ 3	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	R	√ 3	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1.0	R	√ 3	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	R	√ 3	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	√ 3	1	1	1.5	1.5	∞
RF Ambient Noise	E.6.1	3.0	R	√ 3	1	1	1.7	1.7	∞
RF Ambient Refections	E.6.1	3.0	R	√ 3	1	1	1.7	1.7	∞
Probe Positioner	E.6.2	0.4	R	√ 3	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	E.6.3	2.9	R	√ 3	1	1	1.7	1.7	∞
Algorithms for Max. SAR Evaluation	E.5	1.0	R	√ 3	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	2.9	N	1	1	1	2.9	2.9	145
Device Holder Uncertainty	E.4.1	3.6	N	1	1	1	3.6	3.6	5
Output Power Variation — SAR Drift Measurement	6.6.2	5.0	R	√ 3	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty (shape and thickness tolerances)	E.3.1	4.0	R	√ 3	1	1	2.3	2.3	∞
Liquid Conductivity — Deviation from target values	E.3.2	5.0	R	√ 3	0.64	0.43	1.8	1.2	∞
Liquid Conductivity — Measurement uncertainty	E.3.3	2.5	N	1	0.64	0.43	1.6	1.1	∞
Liquid Permititivity — Deviation from target values	E.3.2	5.0	R	√ 3	0.6	0.49	1.7	1.4	∞
Liquid Pemiittivity — Measurement uncertainty	E.3.3	2.5	N	1	0.6	0.49	1.5	1.2	∞
Cornbined standard Uncertainty			RSS				± 10.9	± 10.7	387
Expanded Uncertainty (95% CONFIDENCE LEVEL)			K=2				± 21.9	± 21.4	

Table 5. EUT SAR Test - Uncertainty Budget for DASY4 Version V4.6 Build 19

Estimated total measurement uncertainity for the DASY4 measurement system was ± 10.9 %.
The extended uncertainity (K=2) was assessed to be ± 21.9 % based on 95 % confidence level.
The uncertainity is not added to the measurement result.

7. Description of Test Position

SAR measurements were performed in the “cheek” and “tilted” positions on left and right sides of the phantom. Both were measured in the head section of the SAM Twin Phantom . For the “Belt ” position , it was measured in the flat section of the SAM Twin Phantom .

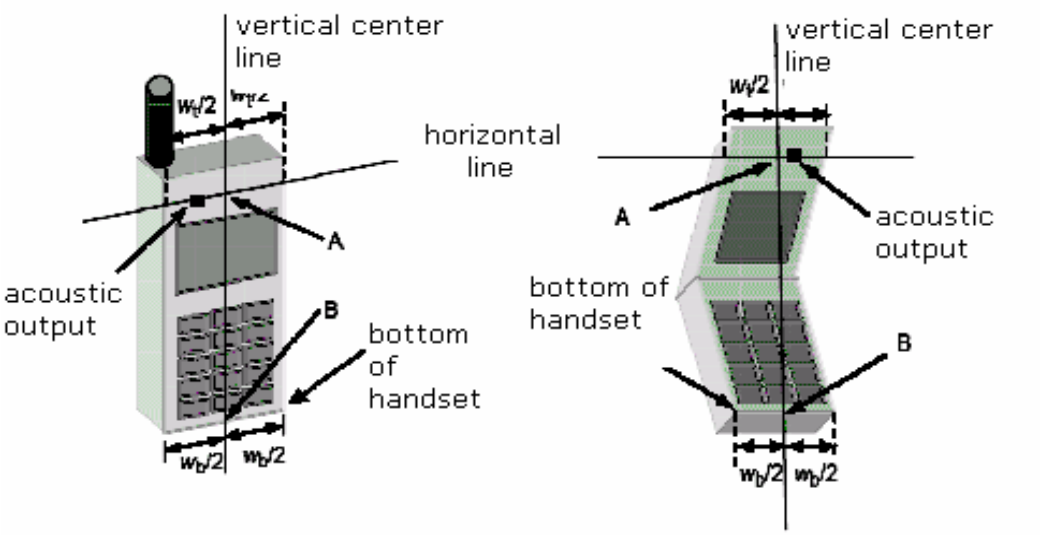

Figure 7. Handset vertical and horizontal reference line

7.1 Cheek Position

The device was positioned with the vertical center line of the body of the device and the horizontal line crossing the center (see Figure 7) of the ear piece in a plane parallel to the sagittal plane of the phantom(see Figure 8). While maintaining the device in this plane, it was aligned the vertical center line with the reference plane containing the three ear and mouth reference points(M, RE and LE) and aligned the center of the ear piece with the line RE-LE. Then device was translated towards the phantom with the ear piece aligned with the line LE-RE until it touched the ear. While maintaining the device in the reference plane and maintaining the device contact with the ear, the bottom of the device was moved until any point on the front side is in contact with the cheek of the phantom.(see Figure 9)

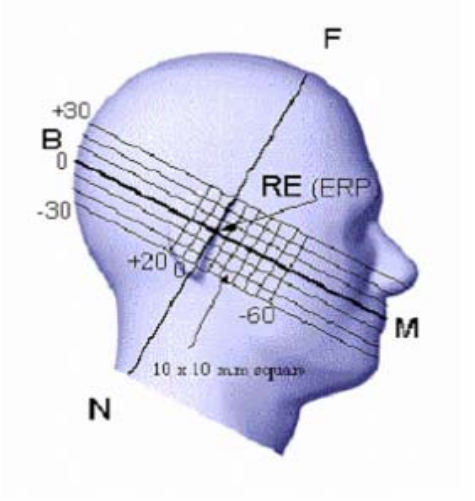

Figure 8. Side view of SAM phantom

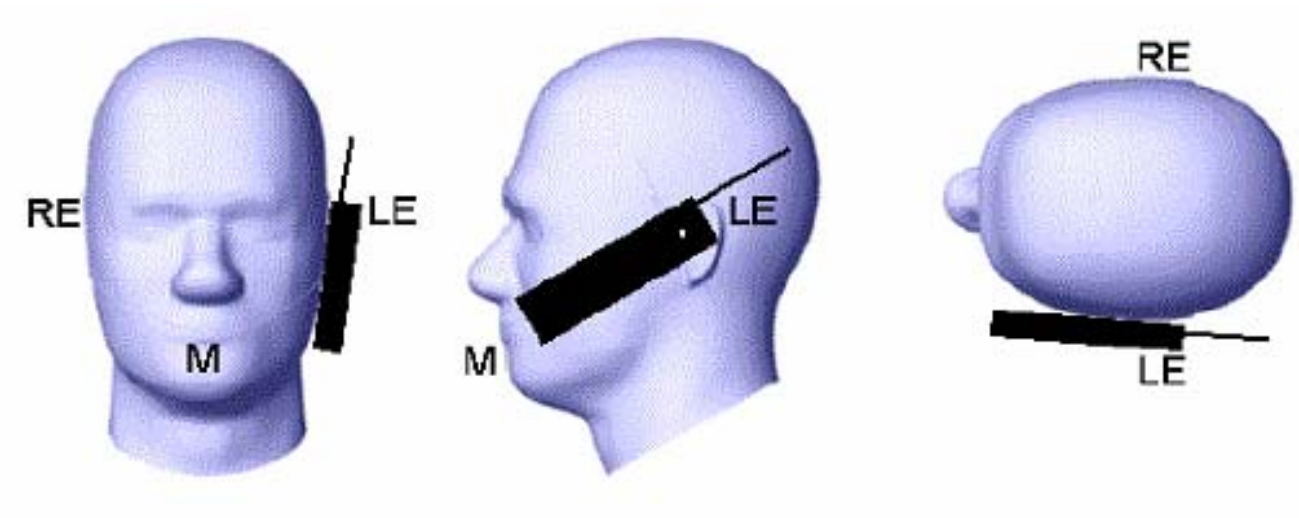

Figure 9. Cheek/Touch Position

2)

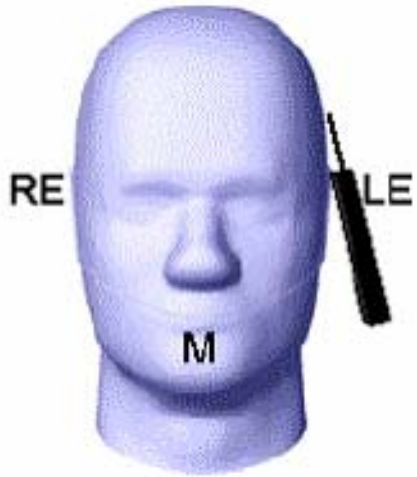

Figure 10. Ear /Tilt Position

Figure 11. Belt Position set up without holster

7.2 Tilt Position

The device was positioned in the "Cheek" position. While maintaining the device in the reference plane described above cheek position and pivoting against the ear, device was moved outward away from the mouth by an angle of 15 degrees. (see Figure 10)

7.3 Body Holster/Belt-Clip Position

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration .A device with a headset output is tested with a headset connectd to the device.
Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that

dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component(i.e. 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 devices intented to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented.

Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are test for SAR compliance with the front of the device positioned to face the flat phantom in brain fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worst-case positioning is then documented and used to perform Body SAR testing.

In this test case, a belt position maintained a distance of approximately 1.5 cm between the device and the flat phantom(see Figure 11). The device was placed under the flat section of the phantom and suspended. The device is not provided with belt-clip.

8. FCC RF Exposure Limits

HUMAN EXPOSURE	UNCONTROLLED ENVIRONMENT General Population (W/Kg) or (mW/g)	CONTROLLED ENVIRONMENT Occupational (W/Kg) or (mW/g)
SPATIAL PEAK SAR (Brain)	1.60	8.00
SPATIAL AVERAGE SAR (Whole Body)	0.08	0.40
SPATIAL PEAK SAR (Hand / Feet / Ankle / Wrist)	4.00	20.00

Table. 8 Safety Limits for Partial Body Exposure

NOTE 1 : **Whole-Body SAR** is averaged over the entire body, **partial-body SAR** is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. **SAR for hands, wrists, feet and ankles** is averaged ower any 10 grams of tissue defined as a tissue volume in the shape of cube

NOTE 2 : At frequencies above 6.0 GHz, SAR limits ajre not applicable and MPE limits for power density should be appoied at 5 cm or more from the transmitting device.

NOTE 3 : The time averaging criteria for field strength and power density do not apply to general population SAR limit of 47 CFR § 2.1093.

9. FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

9.1 Introduction

The following procedures adopted from "FCC SAR Considerations for Cell Phones with Multiple Transmitters" from February 2008 are applicable to handsets with built-in unlicensed transmitters such as 802.11 a/b/g and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

9.2 FCC Power Tables & Conditions

	2.45	5.15 – 5.35	5.47 – 5.85	GHz
P_{Ref}	12	6	5	mW
Device output power should be rounded to the nearest mW to compare with values specified in this table.				

9.3 Output Power Thresholds for Unlicensed Transmitters

	Individual Transmitter	Simultaneous Transmission
Licensed Transmitters	**Routine evaluation required**	**SAR not required:** **Unlicensed only** o when stand-alone 1-g SAR is not required and antenna is > 5 cm from other antennas **Licensed & Unlicensed** o when the sum of the 1-g SAR is <1.6 W/kg for all simultaneous transmitting antennas o when SAR to antenna separation ratio of simultaneous transmitting antenna pair is < 0.3 **SAR required:** **Licensed & Unlicensed** antenna pairs with SAR to antenna separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in standalone configuration for each wireless mode and exposure condition Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply
Unlicensed Transmitters	**When there is no simultaneous transmission –** o output < 60/f: SAR not required o output ≥ 60/f: stand-alone SAR required **When there is simultaneous transmission –** **Stand-alone SAR not required when** O output ≤ 2.P_{Ref} and antenna is > 5.0 cm from other antennas o output ≤ P_{Ref} and antenna is > 2.5 cm from other antennas, each either output power output ≤ P_{Ref} or 1-g SAR < 1.2 W/Kg **Otherwise stand-alone SAR is required** **When stand-alone SAR is required** o test SAR on highest output channel for each wireless mode and exposure condition o if SAR for highest output channel is > 50% of SAR limit, evaluate all channels according to normal procedures	

For FCC ID: UDTUR80 Separatioin Distance of Antenna is **8.0 cm**
RF Conducted Power of Secondary Tx of Bluetooth is **2.5 mW**

→Based on the output power and antenna separation distance, a stand-alone BT SAR. and a simultaneous SAR evaluation are not required.

10. SAR MEASUREMENT RESULTS

1) GSM850 Head SAR Measurement Result

Date of Test : 18th September 2008
Mixture Type : 835MHz Brain
Ambient Temperature (C) : 22.00
Dielectric Constant : 40.8

Liquid Temperature (C) : 22.4
Humidity (%) : 46
Conductivuty : 0.89

Band	Antenna Position	Head Position	Device Position	Frequency		Power(dBm)		SAR 1g (W/kg)
				MHz	CH	Begin	End	
GSM850	Internal Ant	Left Slide-Down	Cheek /Touch	824.2	128	31.72	31.71	0.258
				836.6	190	31.81	31.80	0.357
				848.8	251	31.91	31.90	**0.453**
		Left Slide-Up	Cheek /Touch	836.6	190	31.81	31.80	0.262
		Left Slide-Down	Ear/Tilt	836.6	190	31.81	31.81	0.088
GSM850	Internal Ant	Right Slide-Down	Cheek /Touch	824.2	128	-	-	-
				836.6	190	31.81	31.80	0.298
				848.8	251	-	-	-
		Right Slide-Up	Cheek /Touch	836.6	190	31.81	31.80	0.276
		Right Slide-Down	Ear/Tilt	836.6	190	31.81	31.80	0.076

NOTES:
1.The test data reported are the worst-case SAR value with the position set in a typical configuration
2.All modes of operation were investigated and the worst-case are reported.
3.Battery : Standard Batteries are used and fully charged for all readings
4.Power Measured : Conducted
5.SAR Configuration : Head
6.Test Signal Call mode : Base Station Simulator (CMU200)
7.Justification for reduced test configurations: per FCC/OET Supplement C (July,2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

2) GSM850 Body SAR Measurement Result

Date of Test : 18th September 2008
Mixture Type : 835MHz Muscle
Ambient Temperature (C) : 22.0
Dielectric Constant : 54.2

Liquid Temperature (C) : 22.2
Humidity (%) : 46
Conductivuty : 0.96

Band	Antenna Position	Device Position & Distance	Body Position	Frequency		Power(dBm)		SAR 1g (W/kg)
				MHz	CH	Begin	End	
GSM850	Internal Ant.	Belt without Holster 1.5 cm	Front facing Phantom Slide-Up	836.6	190	31.81	31.80	0.233
GPRS850	Internal Ant. Internal Ant.	Belt without Holster 1.5 cm	Front facing Phantom Slide-Up	824.2	128	31.72	31.71	0.387
				836.6	190	31.81	31.80	0.447
				848.8	251	31.91	31.90	**0.503**
			Front facing Phantom Slide-Down	836.6	190	31.81	31.80	0.284
			Rear facing Phantom Slide-Up	836.6	190	31.81	31.79	0.446
			Rear facing Phantom Slide-Down	836.6	190	31.81	31.80	0.349

NOTES:
1.The test data reported are the worst-case SAR value with the position set in a typical configuration
2.All modes of operation were investigated and the worst-case are reported.
3.Battery : Standard Batteries are used and fully charged for all readings.
4.Power Measured : Conducted
5.SAR Configuration : Body (worst case found in front facing phantom and Slide-up for GPRS850)
6.Test Signal Call mode : Base Station Simulator (CMU200)
7.Justification for reduced test configurations: per FCC/OET Supplement C (July,2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

3) GSM1900 Head SAR Measurement Result

Date of Test : 19th September, 2008
Mixture Type : 1900MHz Brain
Ambient Temperature (C) : 22.0
Dielectric Constant : 39.5

Liquid Temperature (C) : 22.5
Humidity (%) : 45
Conductivuty : 1.41

Band	Antenna Position	Head Position	Device Position	Frequency		Power(dBm)		SAR 1g (W/kg)
				MHz	CH	Begin	End	
GSM1900	Internal Ant	Left Slide-Down	Cheek /Touch	1850.2	512	28.81	28.79	0.202
				1880.0	661	28.83	28.81	**0.247**
				1909.8	810	28.80	28.78	0.239
		Left Slide-Up	Cheek /Touch	1880.0	661	28.83	28.81	0.204
		Left Slide-Down	Ear/Tilt	1880.0	661	28.83	28.81	0.110
GSM1900	Internal Ant	Right Slide-Down	Cheek /Touch	1850.2	512	-	-	-
				1880.0	661	28.83	28.81	0.191
				1909.8	810	-	-	-
		Right Slide-Up	Cheek /Touch	1880.0	661	28.83	28.82	0.241
		Right Slide-Up	Ear/Tilt	1880.0	661	28.83	28.82	0.106

NOTES:
1.The test data reported are the worst-case SAR value with the position set in a typical configuration
2.All modes of operation were investigated and the worst-case are reported.
3.Battery : Standard Batteries are used and fully charged for all readings.
4.Power Measured : Conducted
5.SAR Configuration : Head
6.Test Signal Call mode : Base Station Simulator (CMU200)
7.Justification for reduced test configurations: per FCC/OET Supplement C (July,2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

4) GSM1900 Body SAR Measurement Result

Date of Test : 19th September 2008
Mixture Type : 1900MHz Muscle
Ambient Temperature (C) : 22.0
Dielectric Constant : 52.5

Liquid Temperature (C) : 22.6
Humidity (%) : 45
Conductivuty : 1.56

Band	Antenna Position	Device Position & Distance	Body Position	Frequency		Power(dBm)		SAR 1g (W/kg)
				MHz	CH	Begin	End	
GSM1900	Internal Ant.	Belt without Holster 1.5 cm	Rear facing Phantom Slide-Down	1880.0	661	28.91	28.90	0.131
GPRS1900	Internal Ant.	Belt without Holster 1.5 cm	Rear facing Phantom Slide-Down	1850.2	512	28.81	28.79	0.225
				1880.0	661	28.83	28.81	**0.278**
				1909.8	810	28.80	28.78	0.260
			Rear facing Phantom Slide-Up	1880.0	661	28.83	28.81	0.261
			Front facing Phantom Slide-Down	1880.0	661	28.83	28.81	0.129
			Front facing Phantom Slide-Up	1880.0	661	28.83	28.82	0.266

NOTES:
1.The test data reported are the worst-case SAR value with the position set in a typical configuration
2.All modes of operation were investigated and the worst-case are reported.
3.Battery : Standard Batteries are used and fully charged for all readings.
4. Power Measured : Conducted
5.SAR Configuration : Body (worst case found in rear facing phantom for PCS1900)
6.Test Signal Call mode : Base Station Simulator
7.Justification for reduced test configurations: per FCC/OET Supplement C (July,2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

11. CONCLUSION

The SAR evaluation indicates that C320 complies with the RF radiation exposure limits of the FCC.
These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions.
Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

12. EQUIPMENT LIST AND CALIBRATION DETAILS

Equipment Type	Manufacturer	Model Number	Serial Number	Calibration Due	Used For this Test?
Robot - Six Axes	Staubli	RX60	N/A	N/A	Yes
Robot Remote Control	SPEAG	CS7MB	F03/5U96A1 /C/01	N/A	Yes
SAM Twin Phantom	SPEAG	TP1276	QD000P40CA	N/A	Yes
Flat Phantom V4.4	SPEAG	QD000P44BA, BB	1001, higher	N/A	No
Data Acquisition Electronics	SPEAG	DAE4	559	2009.03.13	Yes
Probe E-Field	SPEAG	ES3DV3	3020	2009.07.21	Yes
Antenna Dipole 835 MHz	SPEAG	D835V2	481	2009.05.24	Yes
Antenna Dipole 900 MHz	SPEAG	D900V2	194	2009.11.19	No
Antenna Dipole 1800 MHz	SPEAG	D1800V2	2d066	2009.05.23	No
Antenna Dipole 1900 MHz	SPEAG	D1900V2	5d038	2009.11.20	Yes
Antenna Dipole 1950 MHz	SPEAG	D1950V2	1027	2009.03.14	No
Antenna Dipole 2450 MHz	SPEAG	D2450V2	746	2009.02.20	No
High power RF Amplifier	EMPOWER	2057-BBS3Q5KCK	1002D/C0321	2008.10.12	Yes
Universal Radio Communication Tester	R&S	CMU200	110019	2008.08.29	Yes
Signal Generator	Agilent	E8257D	MY44320379	2009.01.02	Yes
RF Power Meter Dual	Hewlett Packard	E4419A	GB37170495	2009.04.24	Yes
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481A	US37299851	2009.01.12	Yes
RF Power Sensor 0.01 - 18 GHz	Hewlett Packard	8481A	3318A92872	2009.01.12	Yes
S-Parameter Network Analyzer	Agilent	8753D	3410A07251	2009.04.06	Yes
Dual Directional Coupler	Hewlett Packard	778D	1144AO4576	2008.10.12	Yes
Directional Coupler	Agilent	773D	MY28390213	2008.10.12	No
Bluetooth Test Set	Anritsu	MT8852B	6K00006994	2009.03.03	No

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Appendix A. C320 SAR Plots

Test Laboratory: KTL

835MHz Validation - D835V2; SN:481

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.4, Ambient Temperature(℃) : 22.0

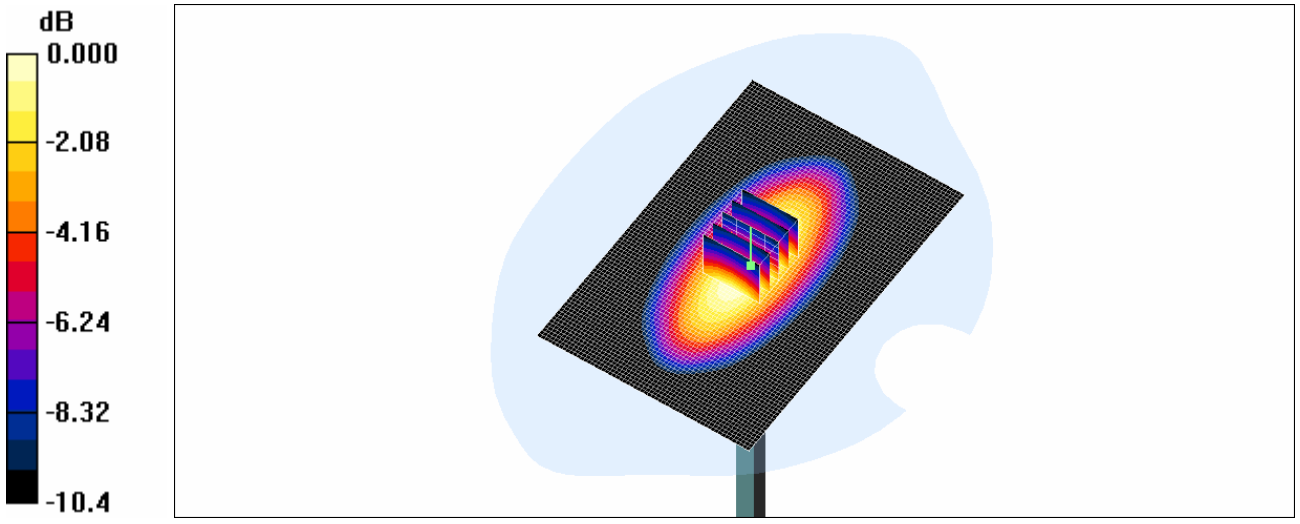
Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.12, 6.12, 6.12); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (61x91x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 2.59 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 54.5 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 3.40 W/kg
SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.55 mW/g
Maximum value of SAR (measured) = 2.53 mW/g



0 dB = 2.53mW/g

Test Laboratory: KTL

C320 GSM850 190CH LEFT CHEEK TOUCH –SLIDE DOWN

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.4, Ambient Temperature(℃) : 22.0

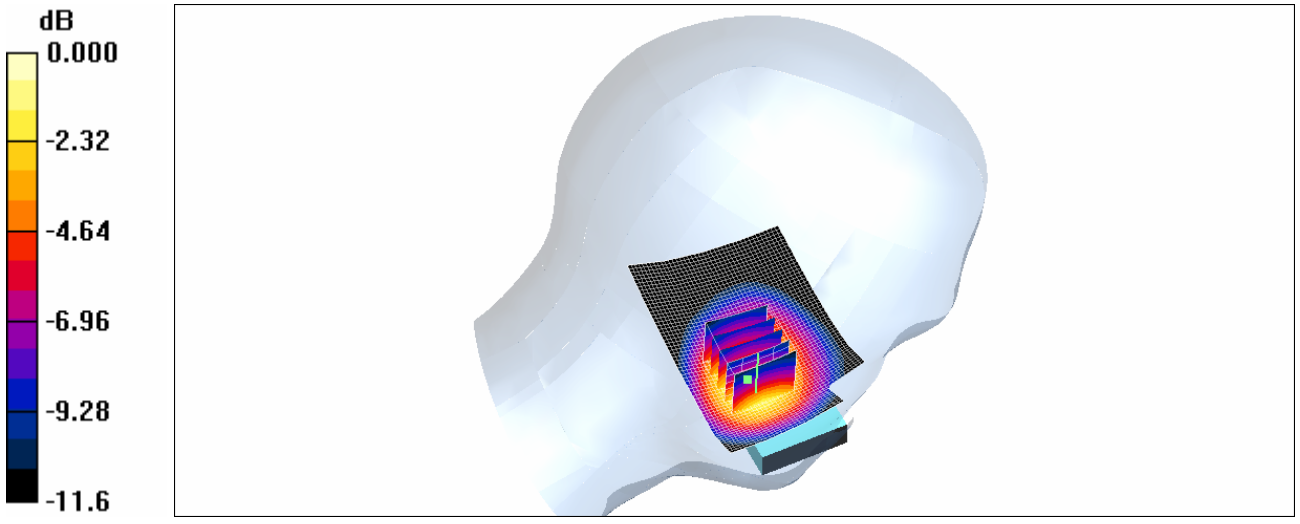
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.89 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.12, 6.12, 6.12); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.401 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.72 V/m; Power Drift = -0.458 dB
Peak SAR (extrapolated) = 0.554 W/kg
SAR(1 g) = 0.357 mW/g; SAR(10 g) = 0.228 mW/g
Maximum value of SAR (measured) = 0.389 mW/g



0 dB = 0.389mW/g

Test Laboratory: KTL

C320 GSM850 190CH LEFT CHEEK TOUCH –SLIDE UP

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.4, Ambient Temperature(℃) : 22.0

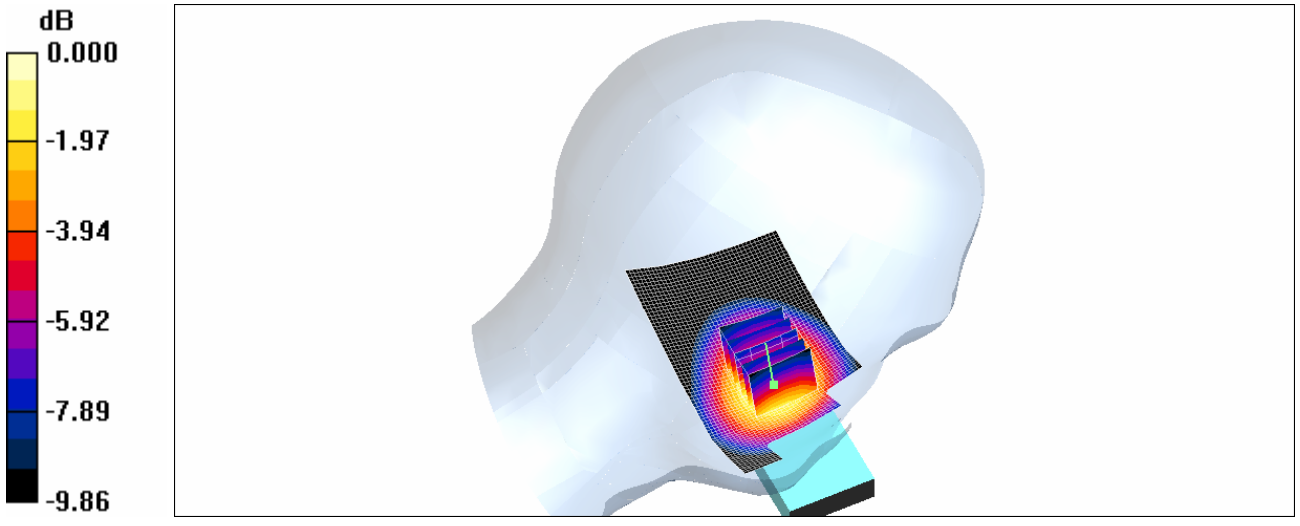
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.89 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.12, 6.12, 6.12); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.286 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.55 V/m; Power Drift = 0.198 dB
Peak SAR (extrapolated) = 0.351 W/kg
SAR(1 g) = 0.262 mW/g; SAR(10 g) = 0.182 mW/g
Maximum value of SAR (measured) = 0.281 mW/g



0 dB = 0.281mW/g

Test Laboratory: KTL

C320 GSM850 190CH LEFT EAR TILT –SLIDE UP

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.4, Ambient Temperature(℃) : 22.0

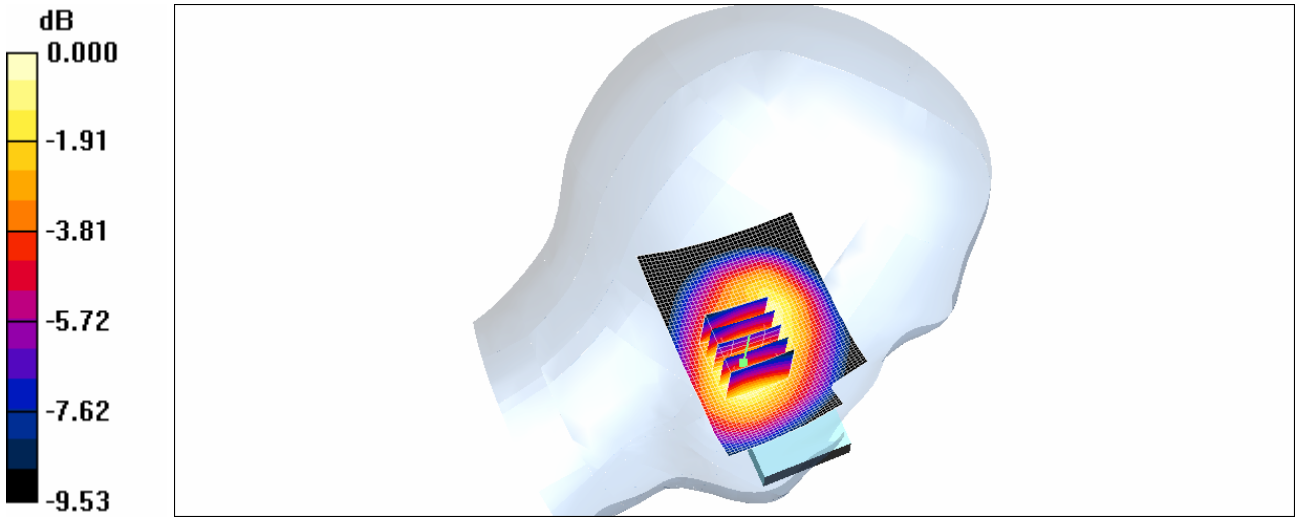
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.89 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.12, 6.12, 6.12); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.097 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.18 V/m; Power Drift = -0.059 dB
Peak SAR (extrapolated) = 0.113 W/kg
SAR(1 g) = 0.088 mW/g; SAR(10 g) = 0.064 mW/g
Maximum value of SAR (measured) = 0.093 mW/g



0 dB = 0.093mW/g

Test Laboratory: KTL

C320 GSM850 190CH RIGHT CHEEK TOUCH-SLIDE DOWN

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.4, Ambient Temperature(℃) : 22.0

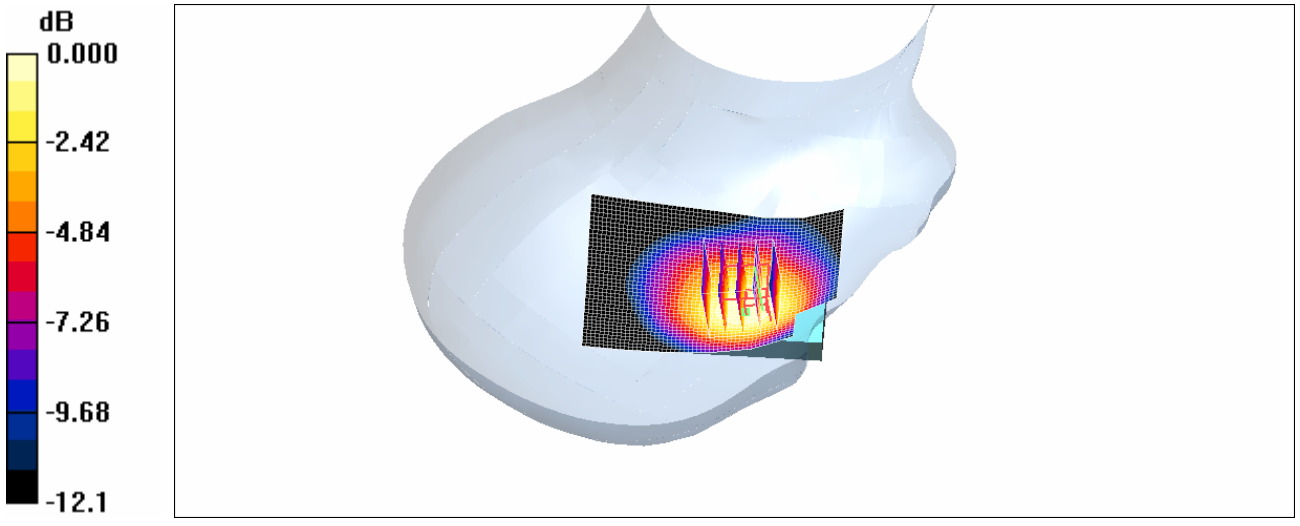
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.89 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.12, 6.12, 6.12); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.344 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.51 V/m; Power Drift = -0.005 dB
Peak SAR (extrapolated) = 0.445 W/kg
SAR(1 g) = 0.298 mW/g; SAR(10 g) = 0.194 mW/g
Maximum value of SAR (measured) = 0.317 mW/g



0 dB = 0.317mW/g

Test Laboratory: KTL

C320 GSM850 190CH RIGHT CHEEK TOUCH-SLIDE UP

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.4, Ambient Temperature(℃) : 22.0

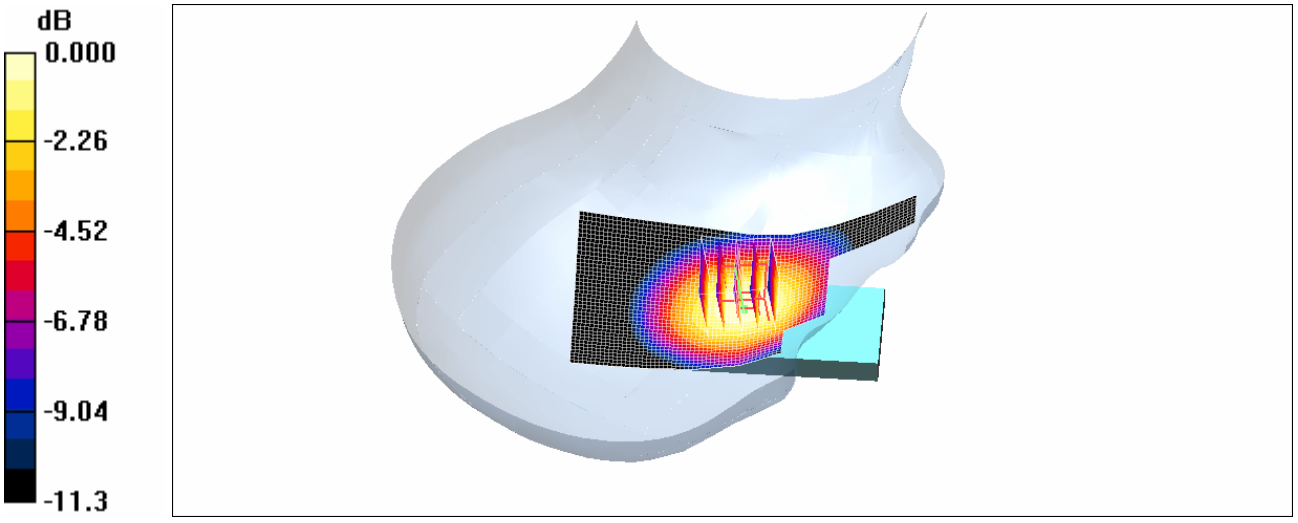
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.89 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.12, 6.12, 6.12); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.288 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.34 V/m; Power Drift = -0.032 dB
Peak SAR (extrapolated) = 0.364 W/kg
SAR(1 g) = 0.276 mW/g; SAR(10 g) = 0.194 mW/g
Maximum value of SAR (measured) = 0.294 mW/g



0 dB = 0.294mW/g

Test Laboratory: KTL

C320 GSM850 190CH RIGHT EAR TILT-SLIDE DOWN

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.4, Ambient Temperature(℃) : 22.0

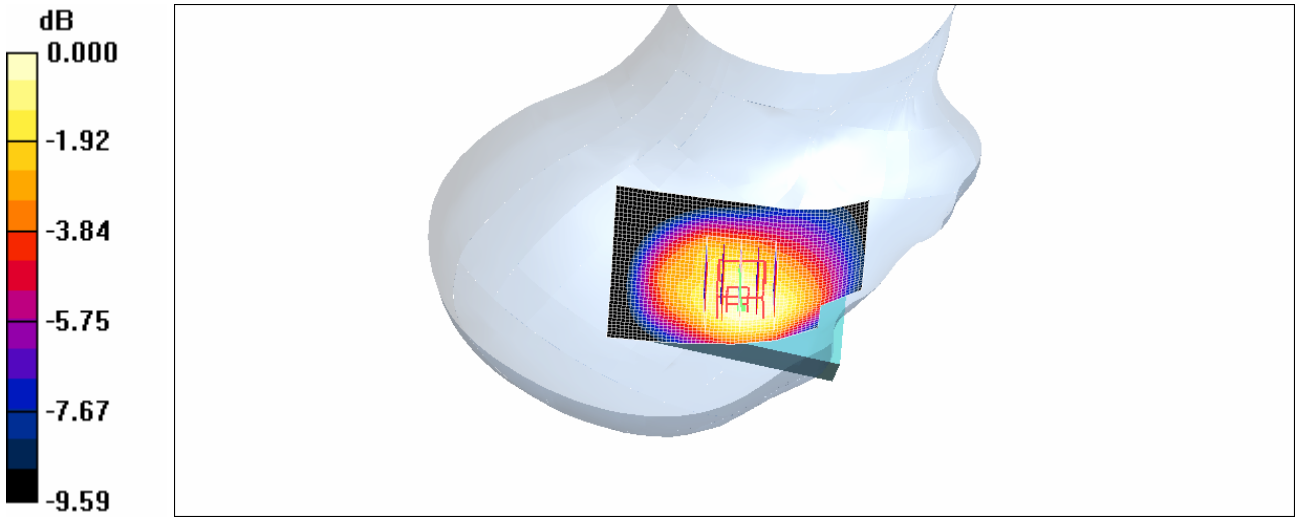
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.89 mho/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.12, 6.12, 6.12); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.083 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.84 V/m; Power Drift = 0.133 dB
Peak SAR (extrapolated) = 0.097 W/kg
SAR(1 g) = 0.076 mW/g; SAR(10 g) = 0.055 mW/g
Maximum value of SAR (measured) = 0.080 mW/g



0 dB = 0.080mW/g

Test Laboratory: KTL

C320 GSM850 128CH LEFT CHEEK TOUCH-SLIDE DOWN

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.4, Ambient Temperature(℃) : 22.0

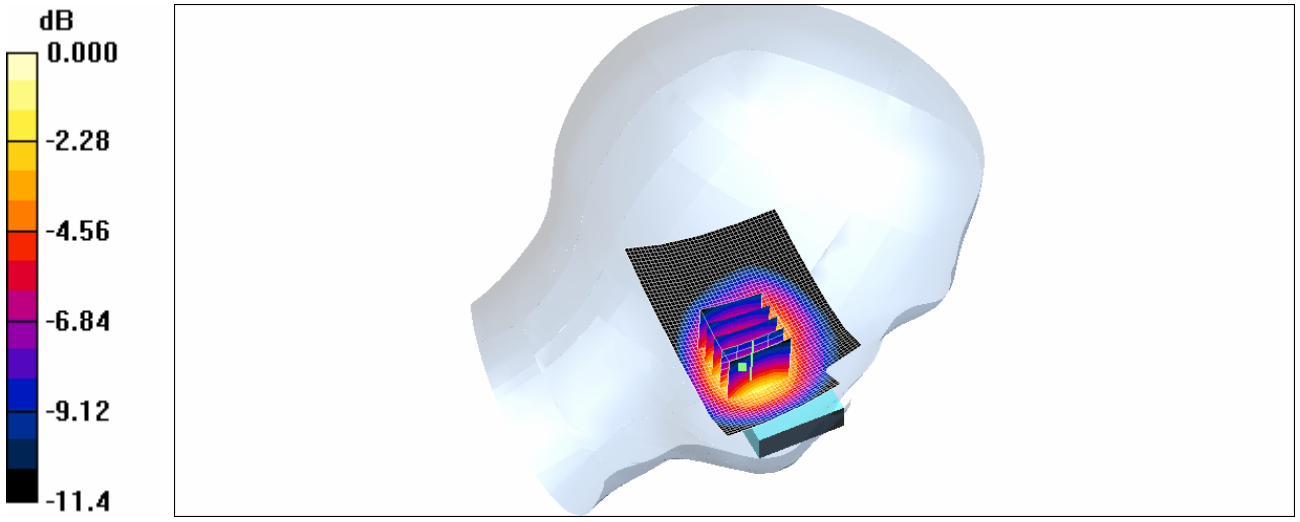
Communication System: GSM 850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium: HSL835 Medium parameters used: f = 824.2 MHz; σ = 0.88 mho/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.12, 6.12, 6.12); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.281 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.50 V/m; Power Drift = 0.042 dB
Peak SAR (extrapolated) = 0.422 W/kg
SAR(1 g) = 0.258 mW/g; SAR(10 g) = 0.163 mW/g
Maximum value of SAR (measured) = 0.279 mW/g



0 dB = 0.279mW/g

Test Laboratory: KTL

C320 GSM850 128CH LEFT CHEEK TOUCH-SLIDE DOWN

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.4, Ambient Temperature(℃) : 22.0

Communication System: GSM 850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3
Medium: HSL835 Medium parameters used: f = 848.8 MHz; σ = 0.91 mho/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

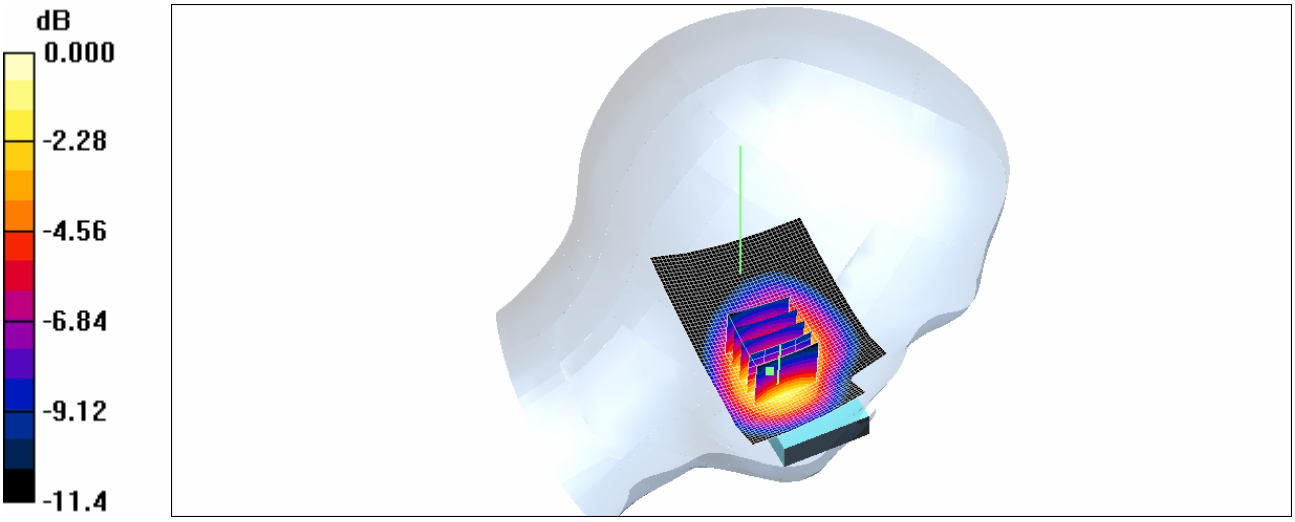
DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.12, 6.12, 6.12); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

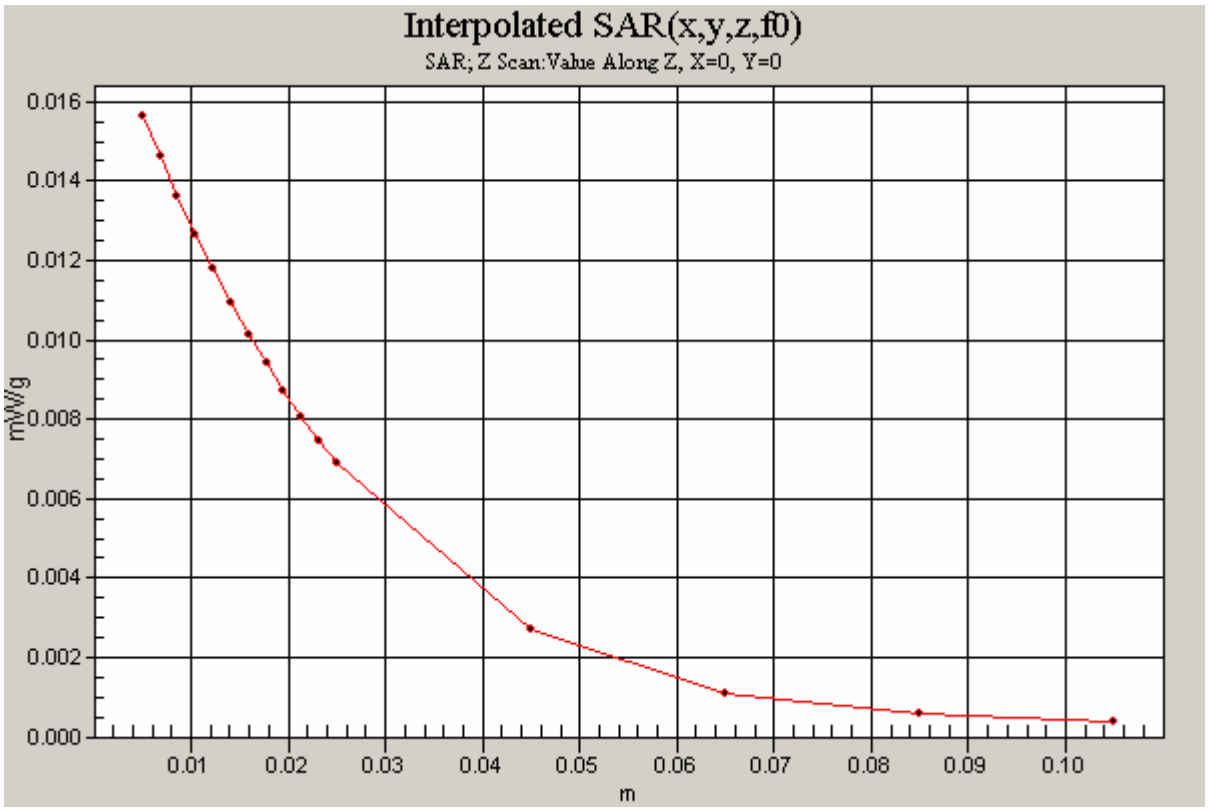
Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.514 mW/g

Z Scan (1x1x16): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Maximum value of SAR (interpolated) = 0.016 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.46 V/m; Power Drift = 0.121 dB
Peak SAR (extrapolated) = 0.708 W/kg
SAR(1 g) = 0.453 mW/g; SAR(10 g) = 0.290 mW/g
Maximum value of SAR (measured) = 0.492 mW/g


dB
0.000
-2.28
-4.56
-6.84
-9.12
-11.4

0 dB = 0.492mW/g


Interpolated SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
0.016
0.014
0.012
0.010
0.008
0.006
0.004
0.002
0.000
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
m

Test Laboratory: KTL

C320 GPRS850 190CH BODY - Rear side facing phantom(distance : 1.5cm) -SLIDE DOWN

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.2, Ambient Temperature(℃) : 22.0

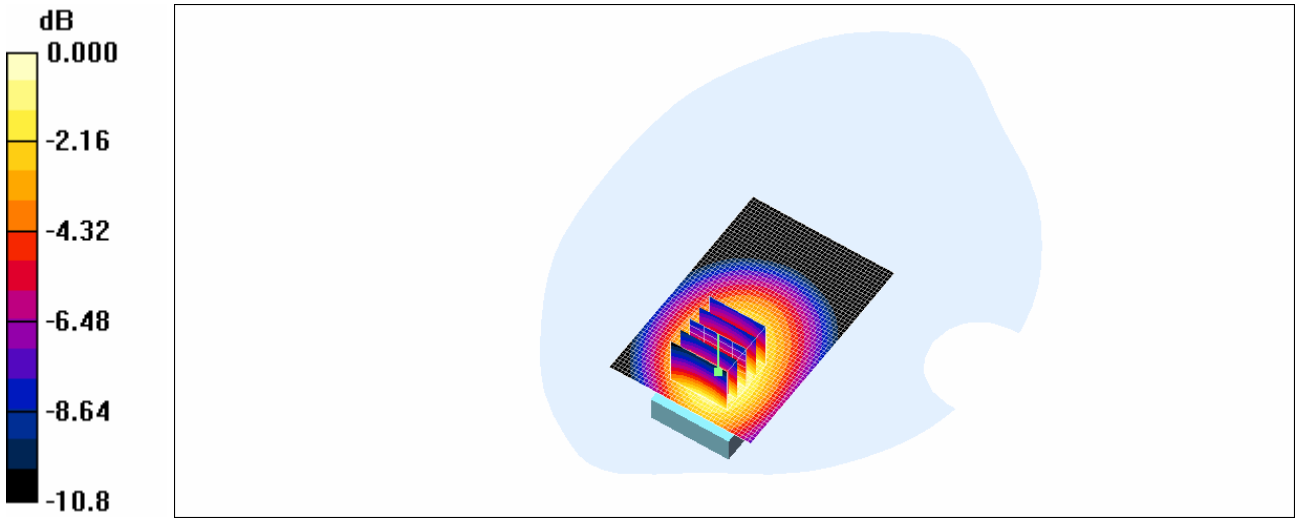
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.96 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.21, 6.21, 6.21); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.388 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.43 V/m; Power Drift = -0.016 dB
Peak SAR (extrapolated) = 0.473 W/kg
SAR(1 g) = 0.349 mW/g; SAR(10 g) = 0.243 mW/g
Maximum value of SAR (measured) = 0.374 mW/g



0 dB = 0.374mW/g

Test Laboratory: KTL

C320 GPRS850 190CH BODY-Rear side facing phantom(distance : 1.5cm) -SLIDE UP

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.2, Ambient Temperature(℃) : 22.0

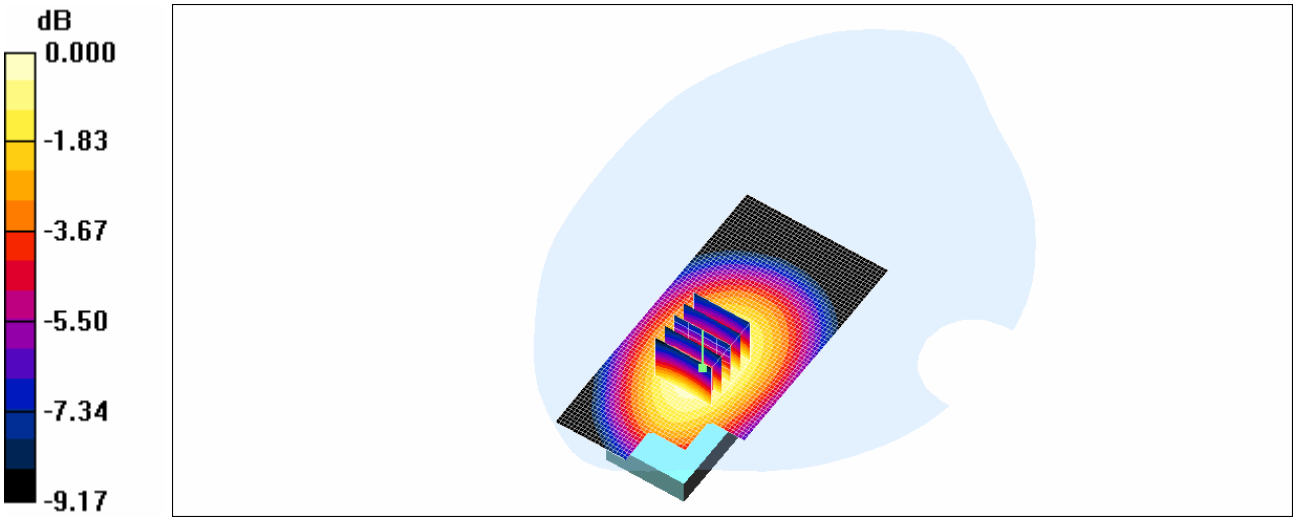
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.96 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.21, 6.21, 6.21); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.475 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.94 V/m; Power Drift = 0.161 dB
Peak SAR (extrapolated) = 0.581 W/kg
SAR(1 g) = 0.446 mW/g; SAR(10 g) = 0.323 mW/g
Maximum value of SAR (measured) = 0.470 mW/g



0 dB = 0.470mW/g

Test Laboratory: KTL

C320 GPRS850 190CH BODY- Front side facing phantom(distance : 1.5cm) -SLIDE DOWN

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.2, Ambient Temperature(℃) : 22.0

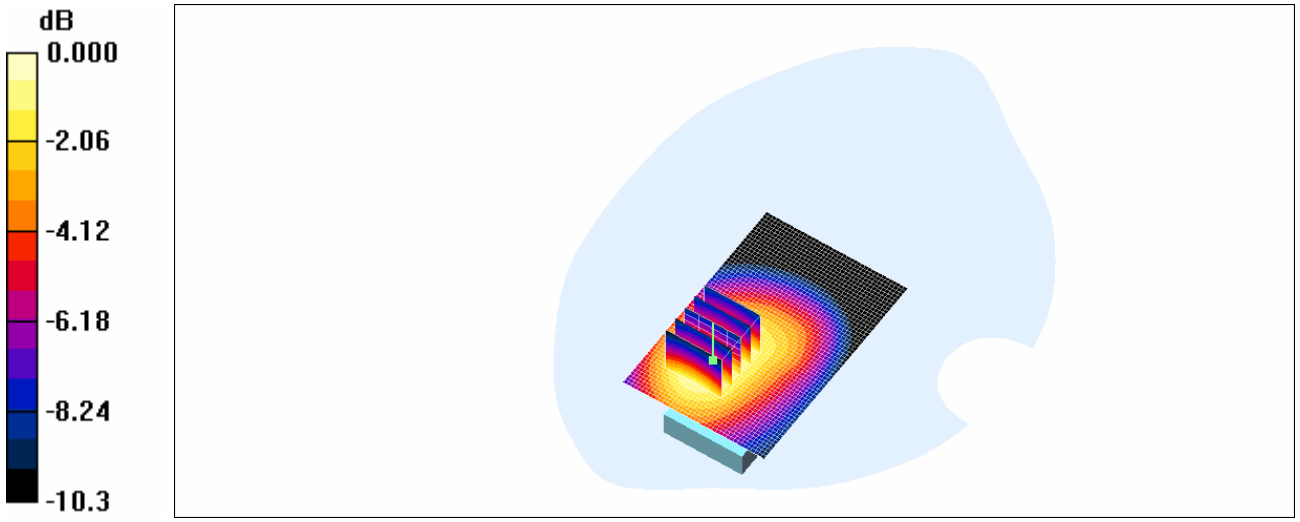
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.96 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.21, 6.21, 6.21); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.301 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.70 V/m; Power Drift = 0.048 dB
Peak SAR (extrapolated) = 0.394 W/kg
SAR(1 g) = 0.284 mW/g; SAR(10 g) = 0.195 mW/g
Maximum value of SAR (measured) = 0.302 mW/g



0 dB = 0.302mW/g

Test Laboratory: KTL

C320 GPRS850 190CH BODY- Front side facing phantom(distance : 1.5cm) -SLIDE UP

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.2, Ambient Temperature(℃) : 22.0

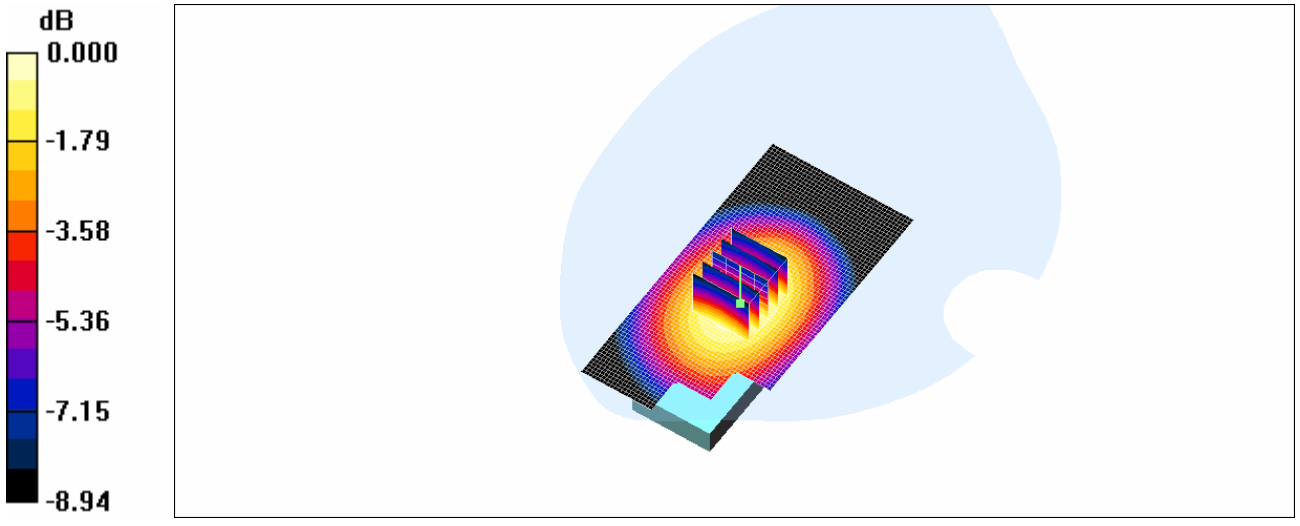
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.96 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.21, 6.21, 6.21); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.473 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.45 V/m; Power Drift = 0.101 dB
Peak SAR (extrapolated) = 0.580 W/kg
SAR(1 g) = 0.447 mW/g; SAR(10 g) = 0.324 mW/g
Maximum value of SAR (measured) = 0.475 mW/g



0 dB = 0.475mW/g

Test Laboratory: KTL

C320 GSM850 190CH BODY- Front side facing phantom(distance : 1.5cm) -SLIDE UP

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.2, Ambient Temperature(℃) : 22.0

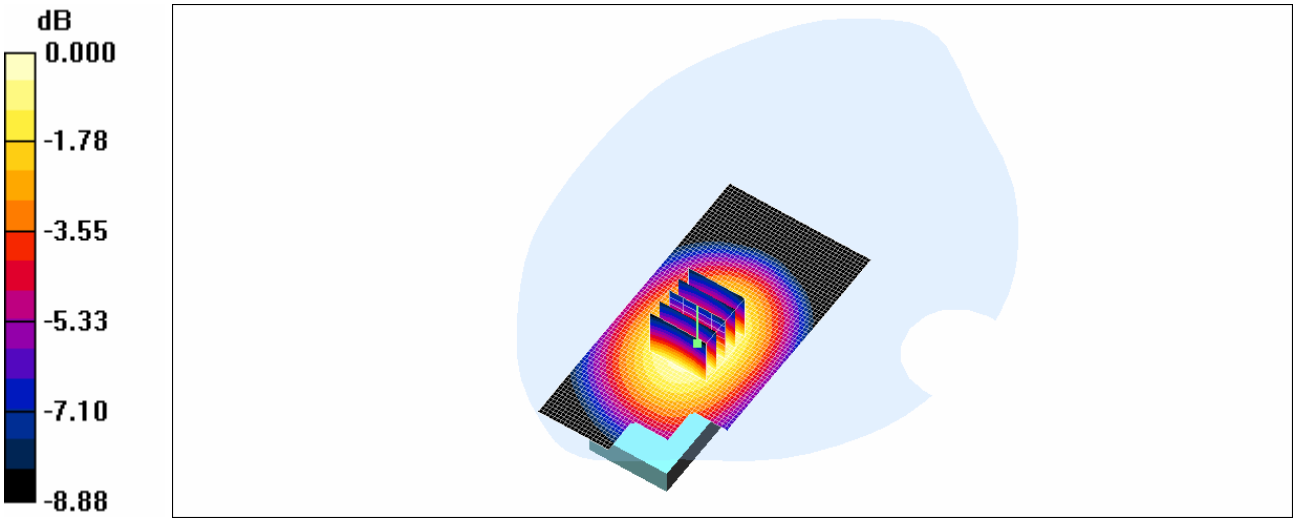
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium: HSL835 Medium parameters used: f = 836.6 MHz; σ = 0.96 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.21, 6.21, 6.21); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.250 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.51 V/m; Power Drift = 0.019 dB
Peak SAR (extrapolated) = 0.302 W/kg
SAR(1 g) = 0.233 mW/g; SAR(10 g) = 0.169 mW/g
Maximum value of SAR (measured) = 0.247 mW/g



0 dB = 0.247mW/g

Test Laboratory: KTL

C320 GSM850 128CH BODY- Front side facing phantom(distance : 1.5cm) -SLIDE UP

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.2, Ambient Temperature(℃) : 22.0

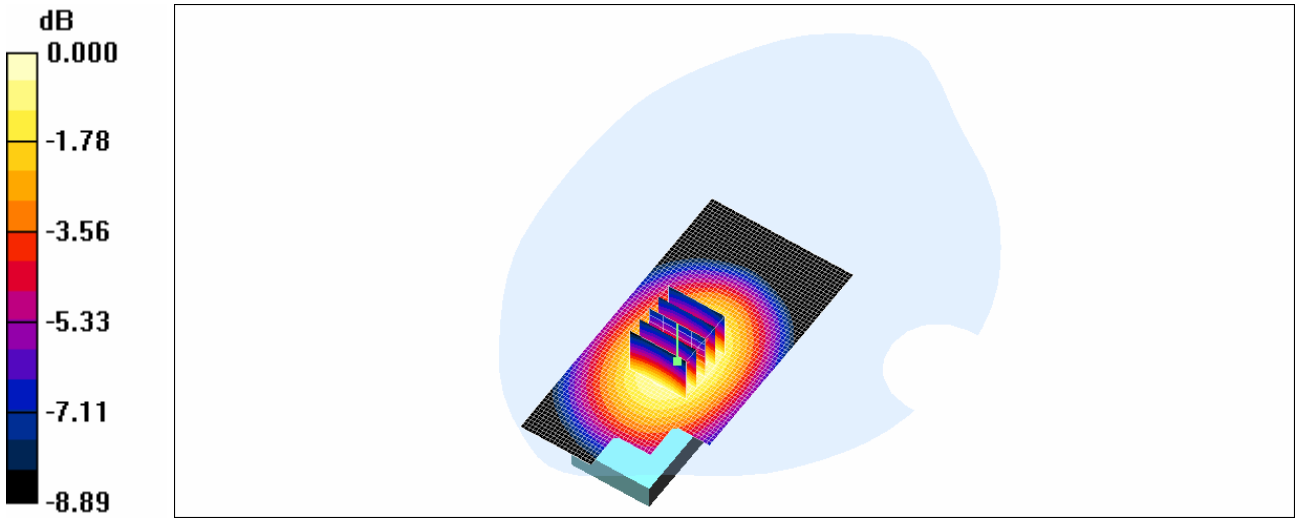
Communication System: GSM 850; Frequency: 824.2 MHz;Duty Cycle: 1:4.15
Medium: HSL835 Medium parameters used: f = 824.2 MHz; σ = 0.95 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.21, 6.21, 6.21); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.408 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.02 V/m; Power Drift = 0.055 dB
Peak SAR (extrapolated) = 0.498 W/kg
SAR(1 g) = 0.387 mW/g; SAR(10 g) = 0.282 mW/g
Maximum value of SAR (measured) = 0.410 mW/g



0 dB = 0.410mW/g

Test Laboratory: KTL

C320 GSM850 251CH BODY- Front side facing phantom(distance : 1.5cm) -SLIDE UP

***Test Date : 18th/September/2008**

Measured Liquid Temperature(℃) : 22.2, Ambient Temperature(℃) : 22.0

Communication System: GSM 850; Frequency: 848.8 MHz;Duty Cycle: 1:4.15
Medium: HSL835 Medium parameters used: f = 848.8 MHz; σ = 0.97 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

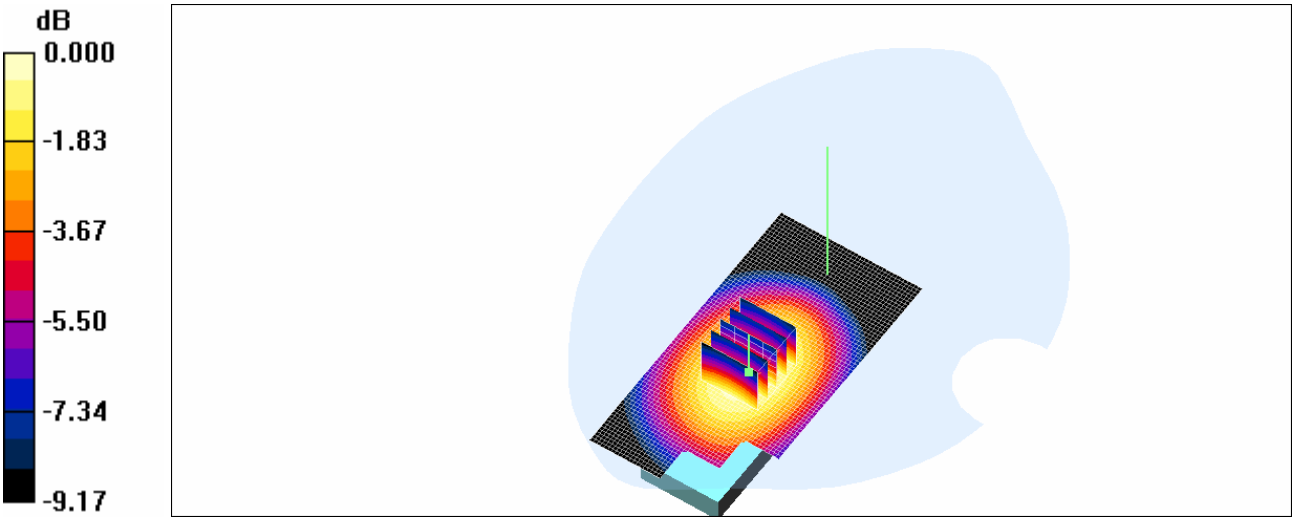
DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(6.21, 6.21, 6.21); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_835MHz; Type: SAM; Serial: TP-1276
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

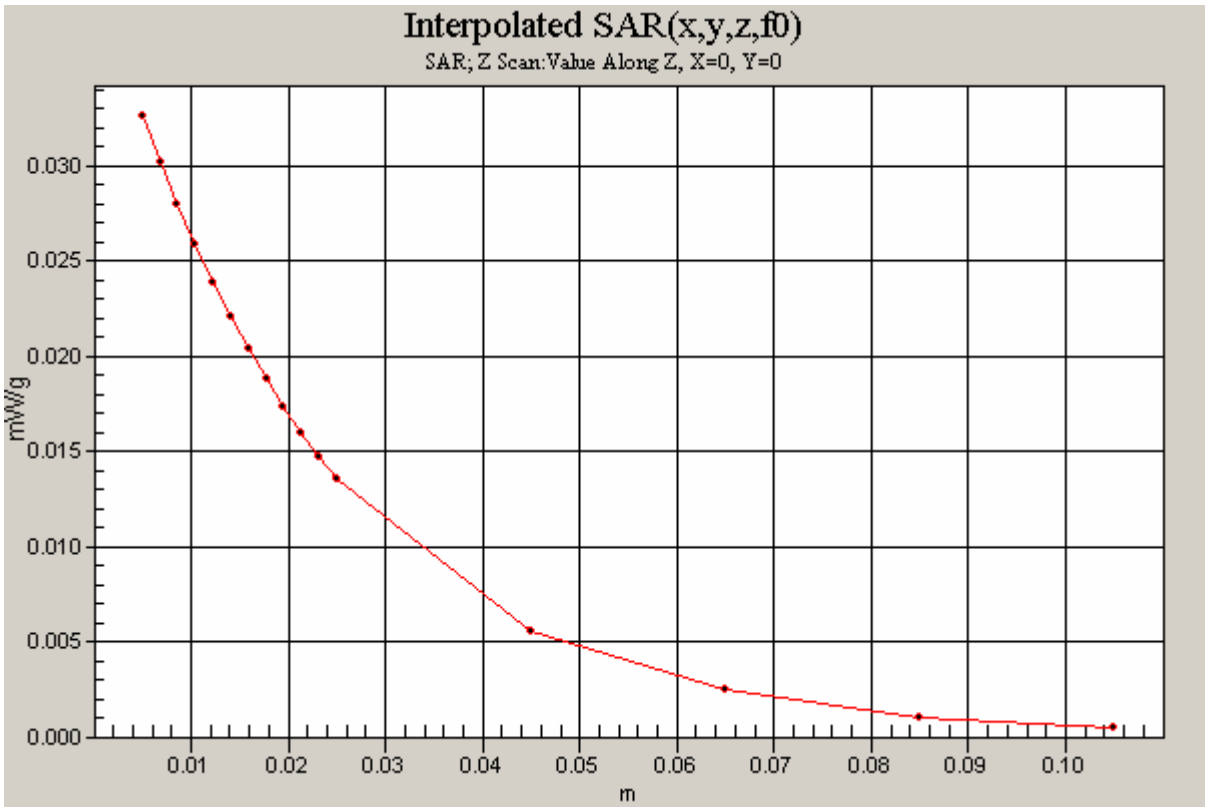
Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.539 mW/g

Z Scan (1x1x16): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Maximum value of SAR (interpolated) = 0.033 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.95 V/m; Power Drift = -0.035 dB
Peak SAR (extrapolated) = 0.657 W/kg
SAR(1 g) = 0.503 mW/g; SAR(10 g) = 0.363 mW/g
Maximum value of SAR (measured) = 0.534 mW/g


dB
0.000
-1.83
-3.67
-5.50
-7.34
-9.17

0 dB = 0.534mW/g


Interpolated SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
m

Test Laboratory: KTL

1900MHz Validation – D1900V2; SN:

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.5, Ambient Temperature(℃) : 22.0

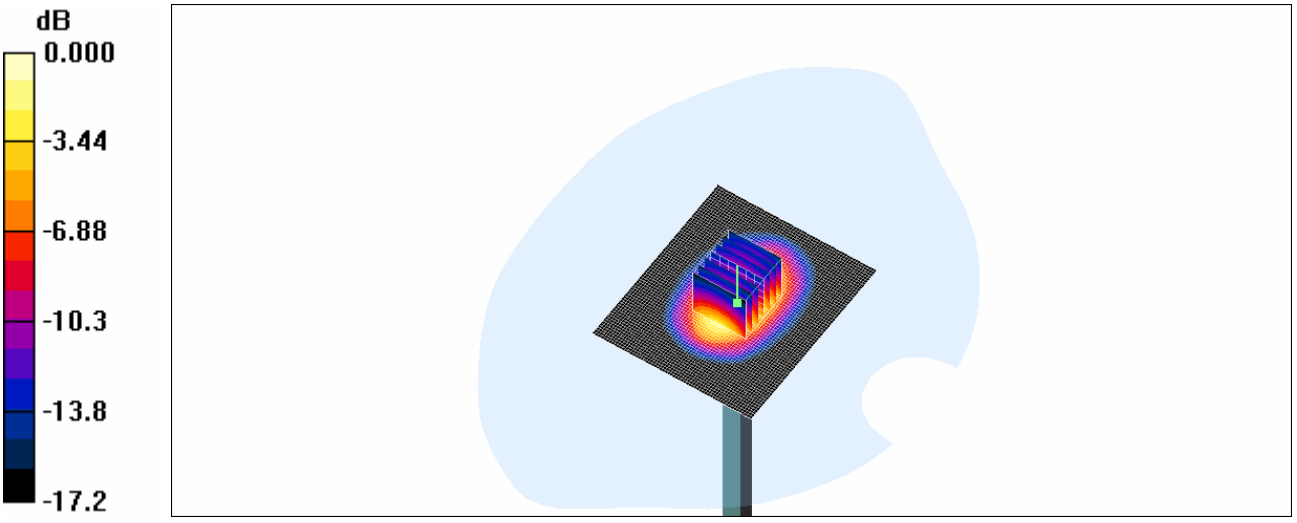
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.41 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(5.03, 5.03, 5.03); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (61x71x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 12.7 mW/g

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.9 V/m; Power Drift = -0.039 dB
Peak SAR (extrapolated) = 18.9 W/kg
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.47 mW/g
Maximum value of SAR (measured) = 11.6 mW/g



0 dB = 11.6mW/g

Test Laboratory: KTL

C320 GSM1900 661CH LEFT CHEEK TOUCH –SLIDE DOWN

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.5, Ambient Temperature(℃) : 22.0

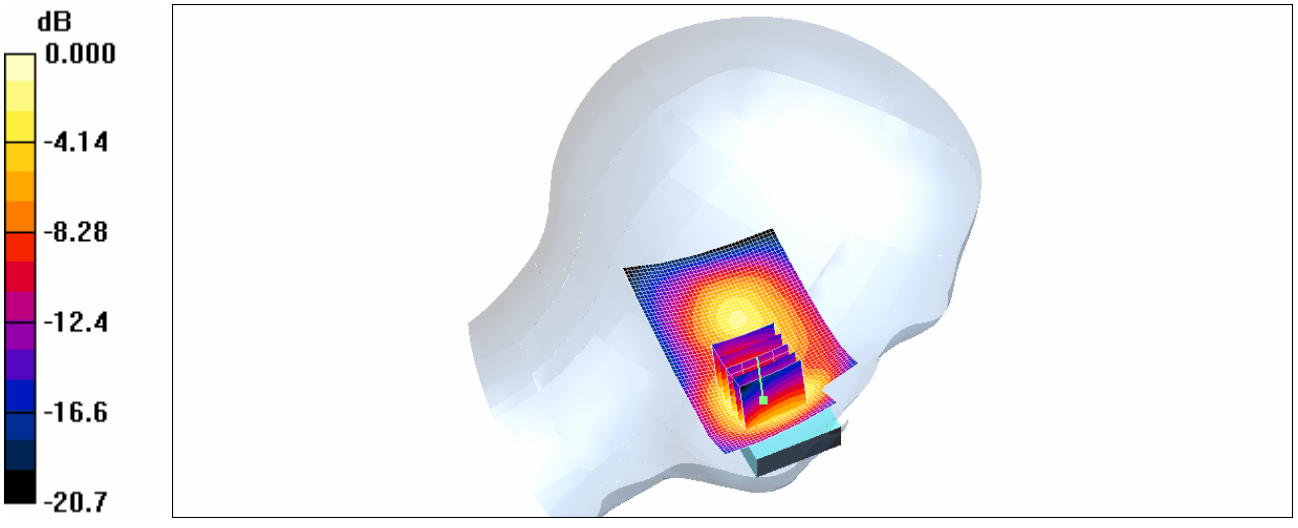
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.39 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(5.03, 5.03, 5.03); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.283 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.36 V/m; Power Drift = -0.433 dB
Peak SAR (extrapolated) = 0.426 W/kg
SAR(1 g) = 0.247 mW/g; SAR(10 g) = 0.135 mW/g
Maximum value of SAR (measured) = 0.262 mW/g



0 dB = 0.262mW/g

Test Laboratory: KTL

C320 GSM1900 661CH LEFT CHEEK TOUCH –SLIDE UP

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.5, Ambient Temperature(℃) : 22.0

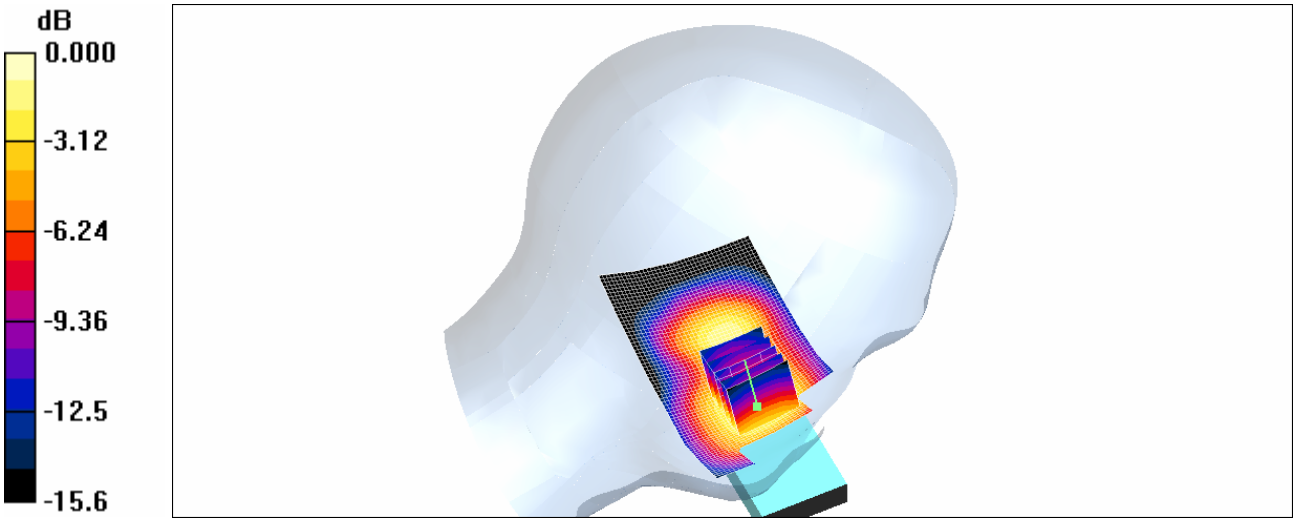
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.39 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(5.03, 5.03, 5.03); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.218 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.28 V/m; Power Drift = 0.008 dB
Peak SAR (extrapolated) = 0.303 W/kg
SAR(1 g) = 0.204 mW/g; SAR(10 g) = 0.125 mW/g
Maximum value of SAR (measured) = 0.227 mW/g



0 dB = 0.227mW/g

Test Laboratory: KTL

C320 GSM1900 661CH LEFT EAR TILT –SLIDE DOWN

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.5, Ambient Temperature(℃) : 22.0

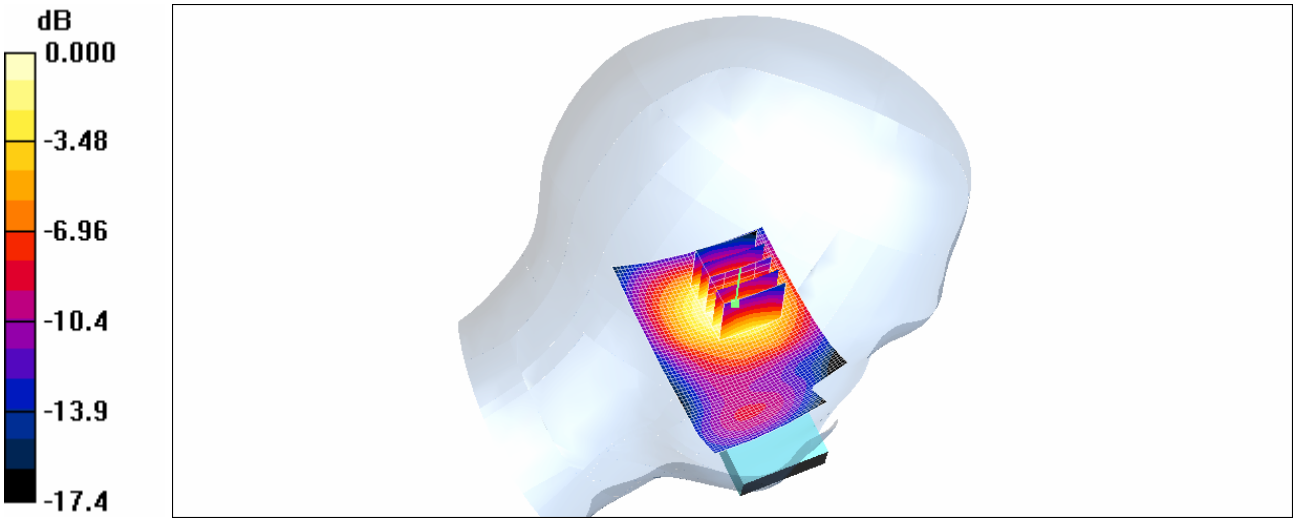
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.39 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(5.03, 5.03, 5.03); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.126 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.07 V/m; Power Drift = -0.022 dB
Peak SAR (extrapolated) = 0.167 W/kg
SAR(1 g) = 0.110 mW/g; SAR(10 g) = 0.067 mW/g
Maximum value of SAR (measured) = 0.120 mW/g



0 dB = 0.120mW/g

Test Laboratory: KTL

C320 GSM1900 661CH RIGHT CHEEK TOUCH-SLIDE DOWN

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.5, Ambient Temperature(℃) : 22.0

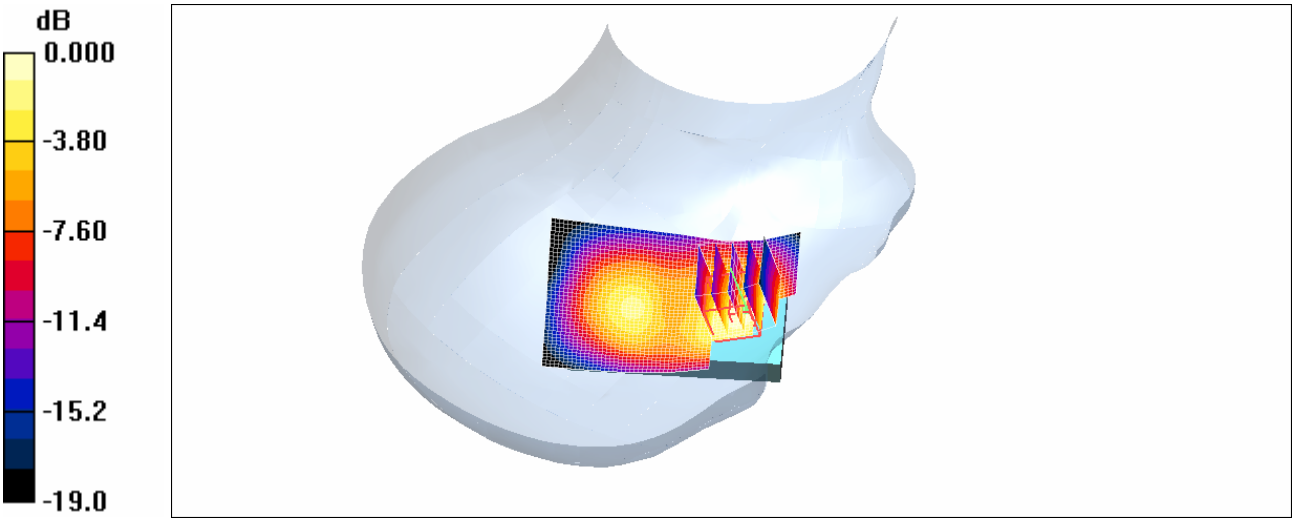
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.39 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(5.03, 5.03, 5.03); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.221 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.01 V/m; Power Drift = 0.009 dB
Peak SAR (extrapolated) = 0.343 W/kg
SAR(1 g) = 0.191 mW/g; SAR(10 g) = 0.105 mW/g
Maximum value of SAR (measured) = 0.217 mW/g



0 dB = 0.217mW/g

Test Laboratory: KTL

C320 GSM1900 661CH RIGHT CHEEK TOUCH-SLIDE UP

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.5, Ambient Temperature(℃) : 22.0

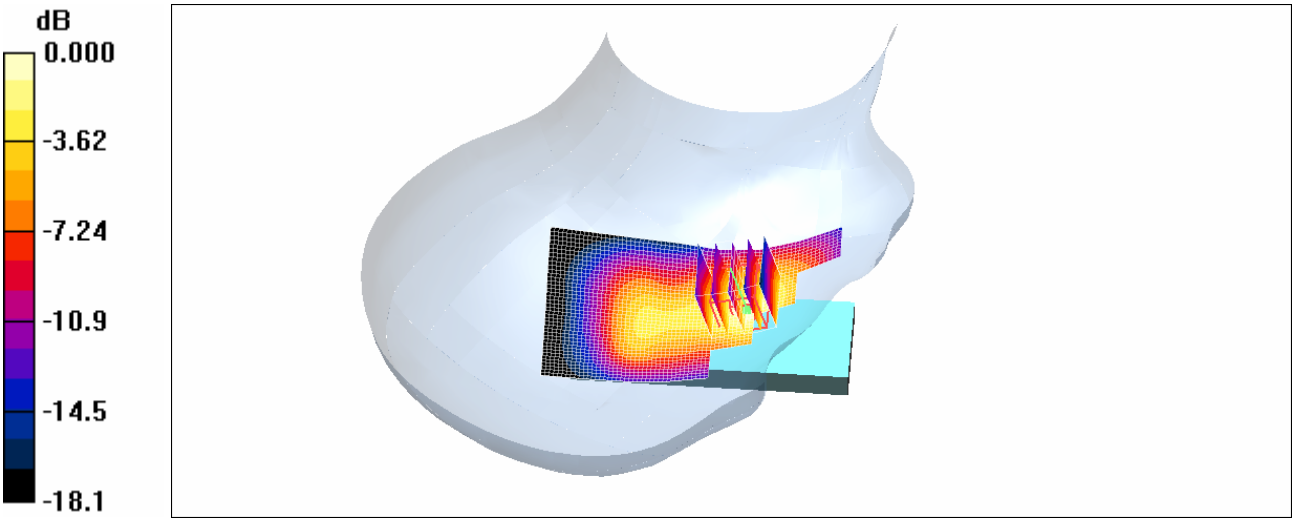
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.39 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(5.03, 5.03, 5.03); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.232 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.39 V/m; Power Drift = 0.280 dB
Peak SAR (extrapolated) = 0.378 W/kg
SAR(1 g) = 0.241 mW/g; SAR(10 g) = 0.140 mW/g
Maximum value of SAR (measured) = 0.263 mW/g



0 dB = 0.263mW/g

Test Laboratory: KTL

C320 GSM1900 661CH RIGHT EAR TILT-SLIDE UP

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.5, Ambient Temperature(℃) : 22.0

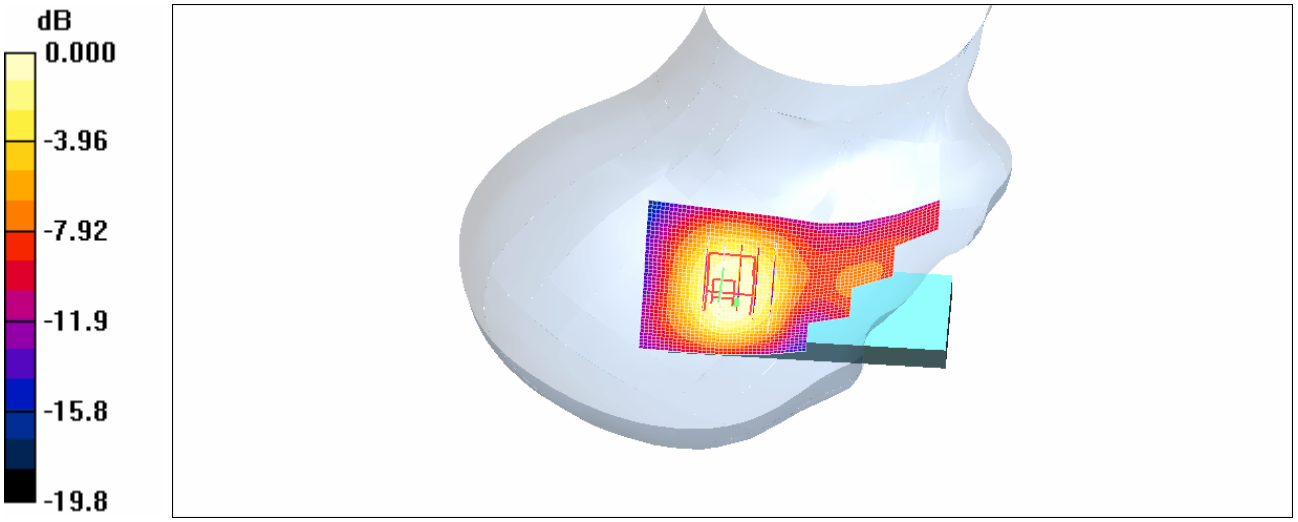
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1880 MHz; σ = 1.39 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(5.03, 5.03, 5.03); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x81x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.121 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.55 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 0.153 W/kg
SAR(1 g) = 0.106 mW/g; SAR(10 g) = 0.068 mW/g
Maximum value of SAR (measured) = 0.114 mW/g



0 dB = 0.114mW/g

Test Laboratory: KTL

C320 GSM1900 512CH LEFT CHEEK THOCH – SLIDE DOWN

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.5, Ambient Temperature(℃) : 22.0

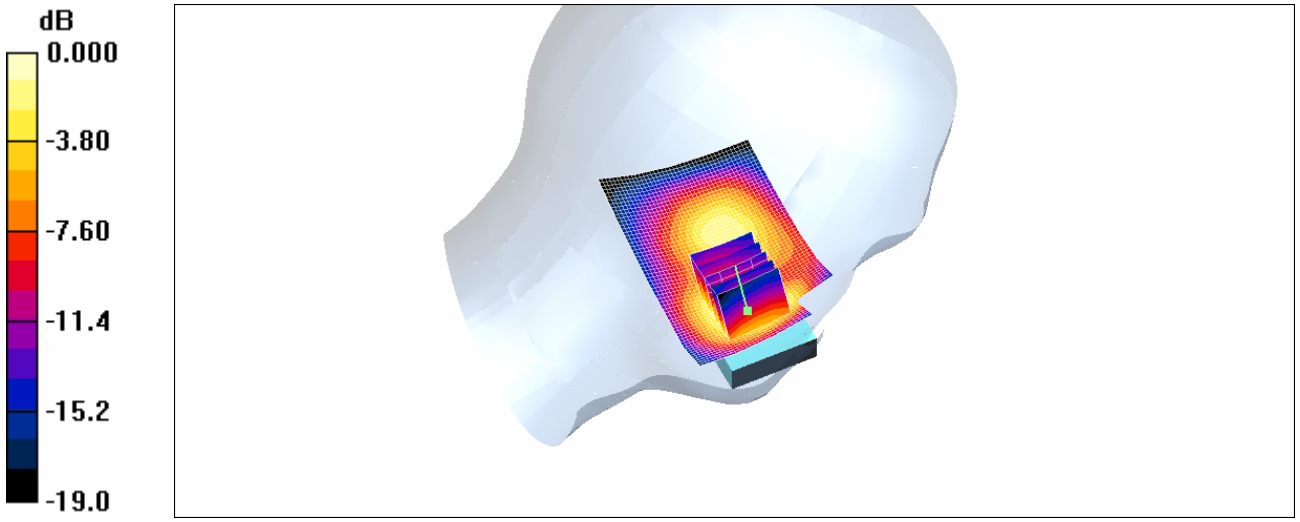
Communication System: DCS 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1850.2 MHz; σ = 1.38 mho/m; ε_r = 39.7; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(5.03, 5.03, 5.03); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.233 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.31 V/m; Power Drift = -0.355 dB
Peak SAR (extrapolated) = 0.336 W/kg
SAR(1 g) = 0.202 mW/g; SAR(10 g) = 0.112 mW/g
Maximum value of SAR (measured) = 0.212 mW/g



0 dB = 0.212mW/g

Test Laboratory: KTL

C320 GSM1900 810CH LEFT CHEEK THOCH – SLIDE DOWN

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.5, Ambient Temperature(℃) : 22.0

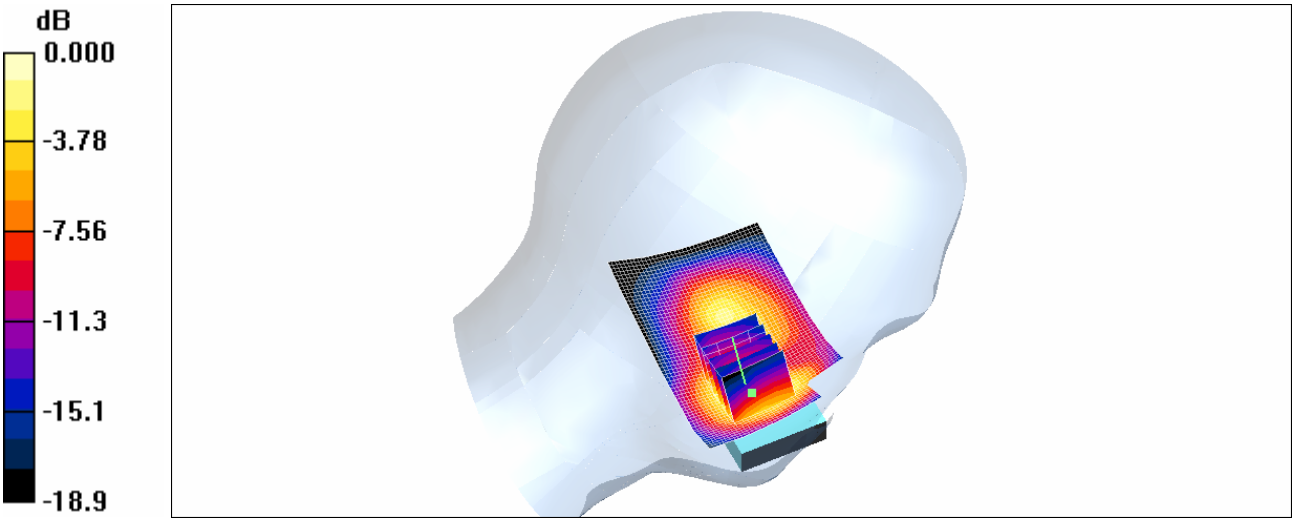
Communication System: DCS 1900; Frequency: 1909.8 MHz;Duty Cycle: 1:8.3
Medium: HSL1900 Medium parameters used: f = 1909.8 MHz; σ = 1.42 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(5.03, 5.03, 5.03); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.270 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.19 V/m; Power Drift = 0.077 dB
Peak SAR (extrapolated) = 0.389 W/kg
SAR(1 g) = 0.239 mW/g; SAR(10 g) = 0.132 mW/g
Maximum value of SAR (measured) = 0.258 mW/g



0 dB = 0.258mW/g

Test Laboratory: KTL

C320 GPRS1900 661CH BODY - Rear side facing phantom(distance : 1.5cm) -SLIDE DOWN

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.6, Ambient Temperature(℃) : 22.0

Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: MSL1900 Medium parameters used: f = 1880 MHz; σ = 1.52 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

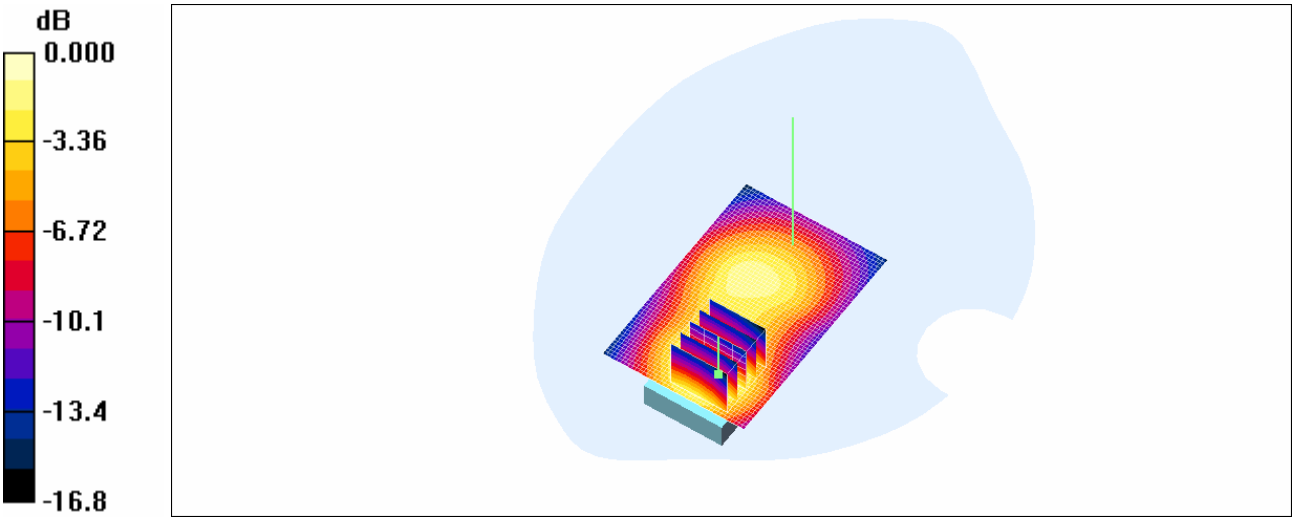
DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(4.58, 4.58, 4.58); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

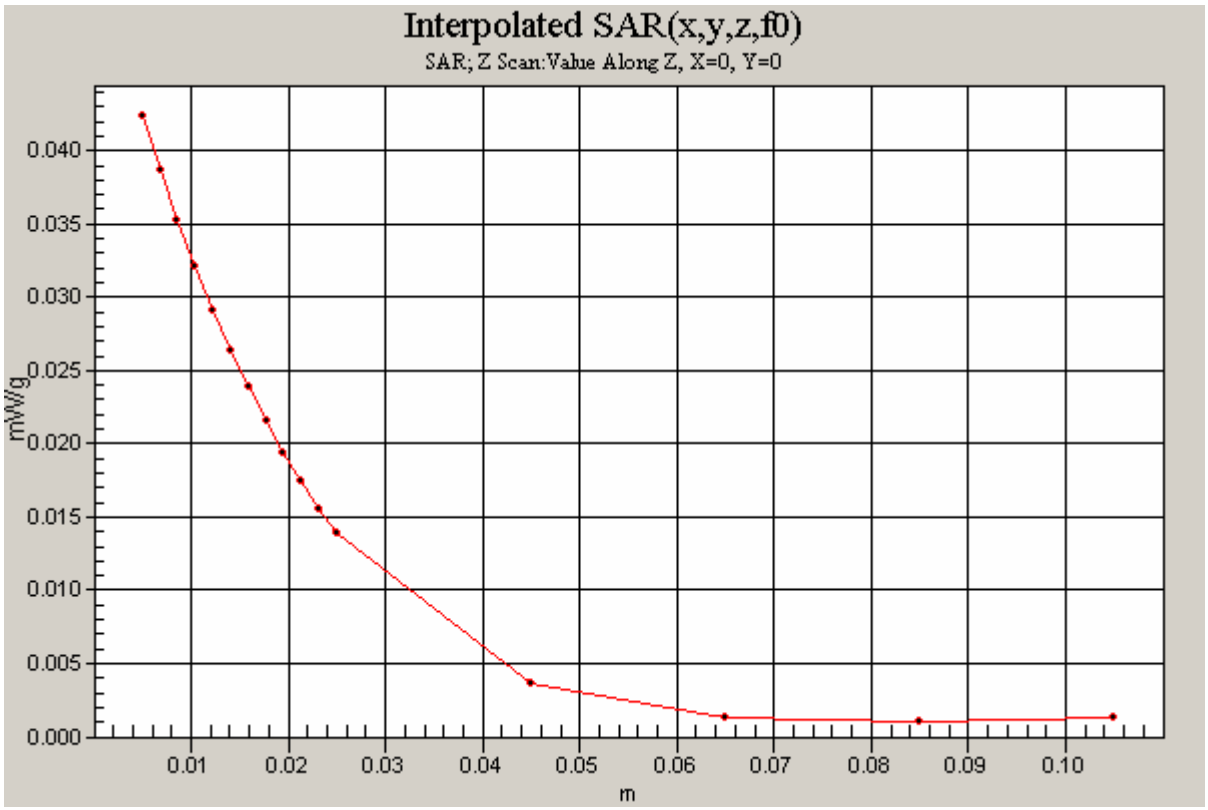
Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.319 mW/g

Z Scan (1x1x16): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Maximum value of SAR (interpolated) = 0.042 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.97 V/m; Power Drift = 0.118 dB
Peak SAR (extrapolated) = 0.458 W/kg
SAR(1 g) = 0.278 mW/g; SAR(10 g) = 0.164 mW/g
Maximum value of SAR (measured) = 0.300 mW/g


dB
0.000
-3.36
-6.72
-10.1
-13.4
-16.8

0 dB = 0.300mW/g


Interpolated SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
m

Test Laboratory: KTL

C320 GPRS1900 661CH BODY - Rear side facing phantom(distance : 1.5cm) -SLIDE UP

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.6, Ambient Temperature(℃) : 22.0

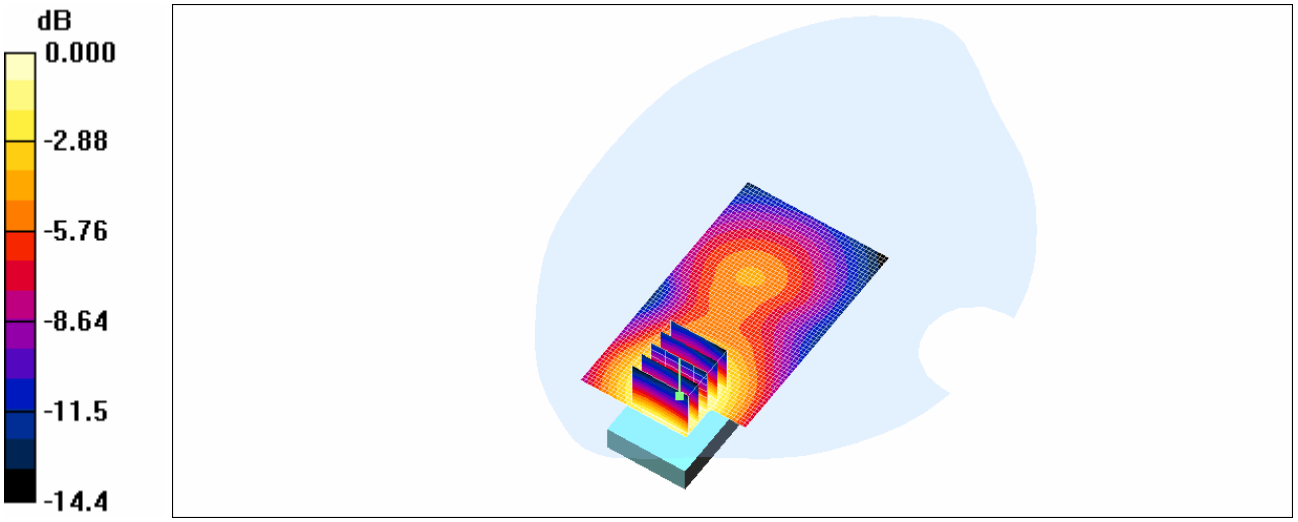
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: MSL1900 Medium parameters used: f = 1880 MHz; σ = 1.52 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(4.58, 4.58, 4.58); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.282 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.12 V/m; Power Drift = -0.020 dB
Peak SAR (extrapolated) = 0.394 W/kg
SAR(1 g) = 0.261 mW/g; SAR(10 g) = 0.164 mW/g
Maximum value of SAR (measured) = 0.280 mW/g



0 dB = 0.280mW/g

Test Laboratory: KTL

C320 GPRS1900 661CH BODY - Front side facing phantom(distance : 1.5cm) -SLIDE DOWN

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.6, Ambient Temperature(℃) : 22.0

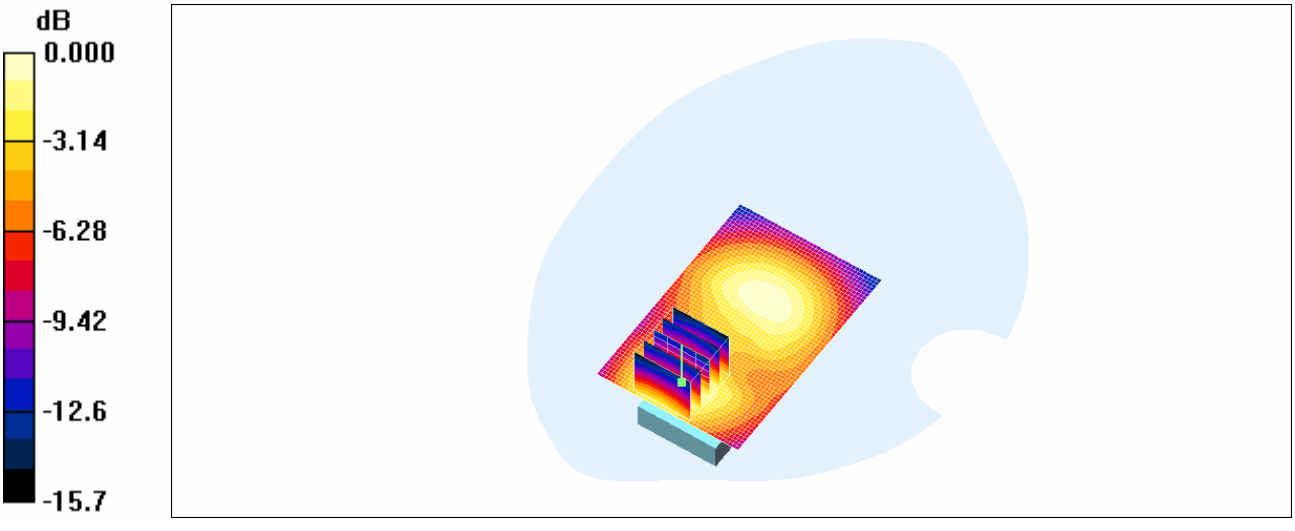
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: MSL1900 Medium parameters used: f = 1880 MHz; σ = 1.52 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(4.58, 4.58, 4.58); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.140 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.79 V/m; Power Drift = -0.021 dB
Peak SAR (extrapolated) = 0.209 W/kg
SAR(1 g) = 0.129 mW/g; SAR(10 g) = 0.076 mW/g
Maximum value of SAR (measured) = 0.141 mW/g



0 dB = 0.141mW/g

Test Laboratory: KTL

C320 GPRS1900 661CH BODY - Front side facing phantom(distance : 1.5cm) -SLIDE UP

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.6, Ambient Temperature(℃) : 22.0

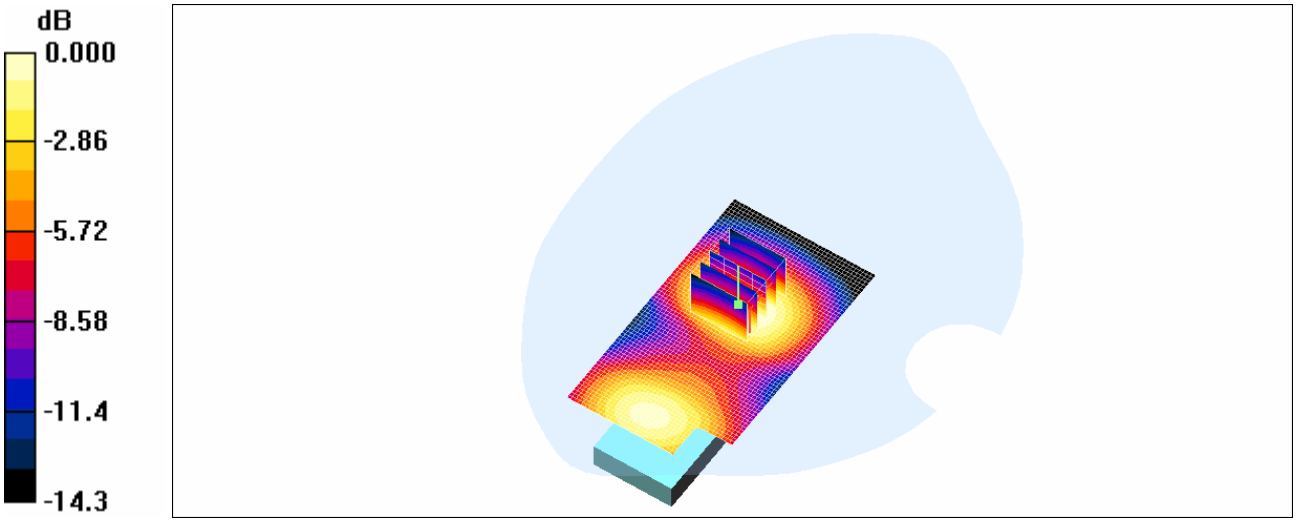
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: MSL1900 Medium parameters used: f = 1880 MHz; σ = 1.52 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(4.58, 4.58, 4.58); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.304 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.74 V/m; Power Drift = 0.166 dB
Peak SAR (extrapolated) = 0.383 W/kg
SAR(1 g) = 0.266 mW/g; SAR(10 g) = 0.171 mW/g
Maximum value of SAR (measured) = 0.283 mW/g



0 dB = 0.283mW/g

Test Laboratory: KTL

C320 GSM1900 661CH BODY - Front side facing phantom(distance : 1.5cm) -SLIDE UP

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.6, Ambient Temperature(℃) : 22.0

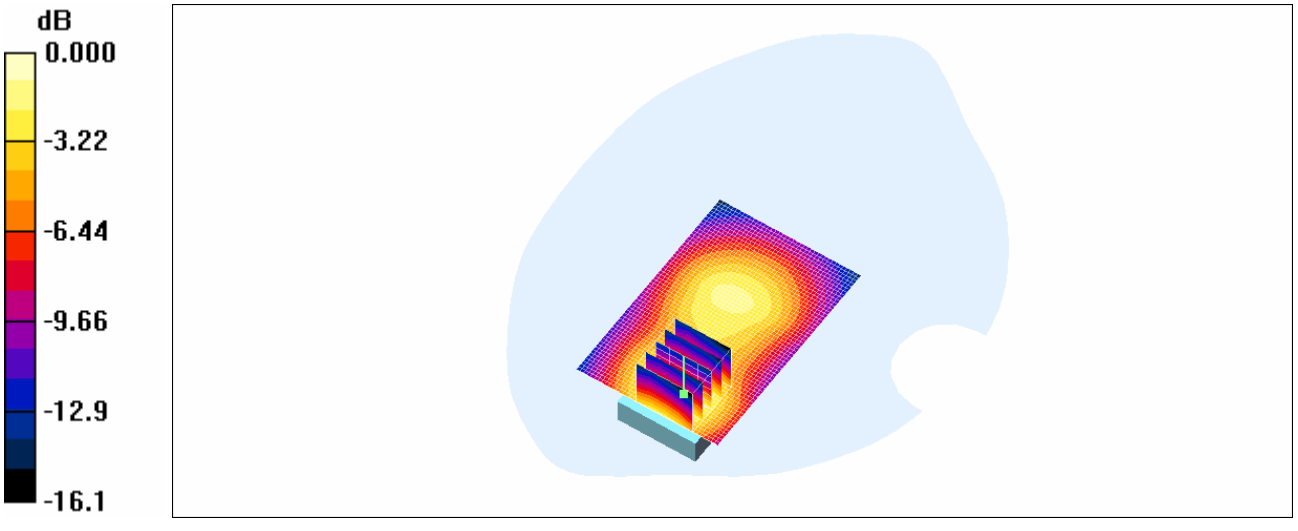
Communication System: DCS 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: MSL1900 Medium parameters used: f = 1880 MHz; σ = 1.52 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(4.58, 4.58, 4.58); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.143 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.42 V/m; Power Drift = 0.065 dB
Peak SAR (extrapolated) = 0.215 W/kg
SAR(1 g) = 0.131 mW/g; SAR(10 g) = 0.077 mW/g
Maximum value of SAR (measured) = 0.143 mW/g



0 dB = 0.143mW/g

Test Laboratory: KTL

C320 GPRS1900 512CH BODY - Rear side facing phantom(distance : 1.5cm) -SLIDE DOWN

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.6, Ambient Temperature(℃) : 22.0

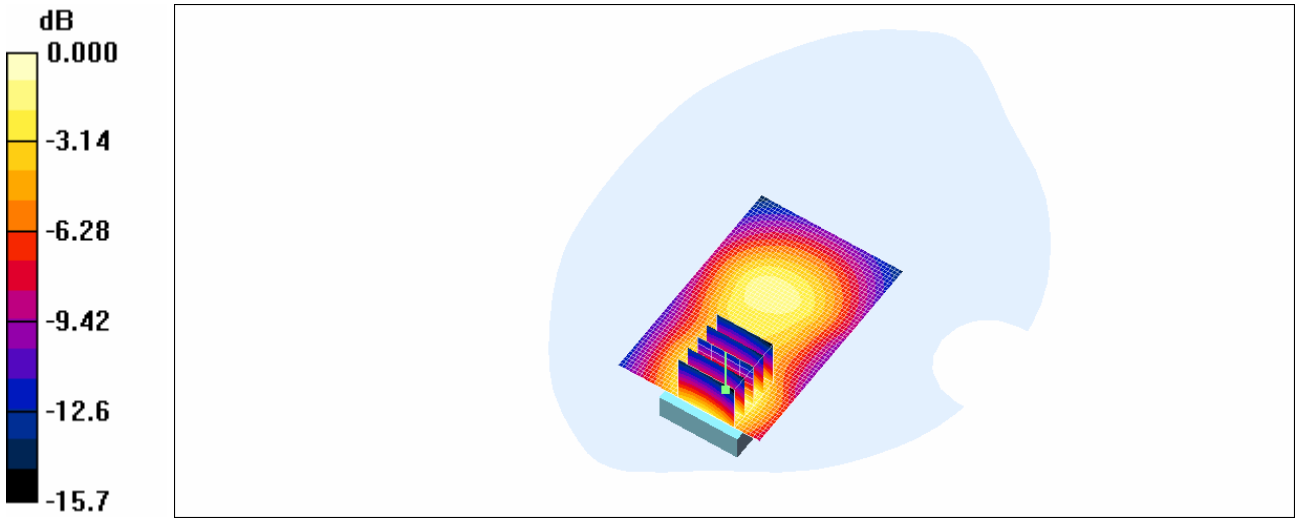
Communication System: DCS 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:4.15
Medium: MSL1900 Medium parameters used: f = 1850.2 MHz; σ = 1.49 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(4.58, 4.58, 4.58); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.248 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.42 V/m; Power Drift = -0.425 dB
Peak SAR (extrapolated) = 0.366 W/kg
SAR(1 g) = 0.225 mW/g; SAR(10 g) = 0.133 mW/g
Maximum value of SAR (measured) = 0.247 mW/g



0 dB = 0.247mW/g

Test Laboratory: KTL

C320 GPRS1900 810CH BODY - Rear side facing phantom(distance : 1.5cm) -SLIDE DOWN

***Test Date : 19th/September/2008**

Measured Liquid Temperature(℃) : 22.6, Ambient Temperature(℃) : 22.0

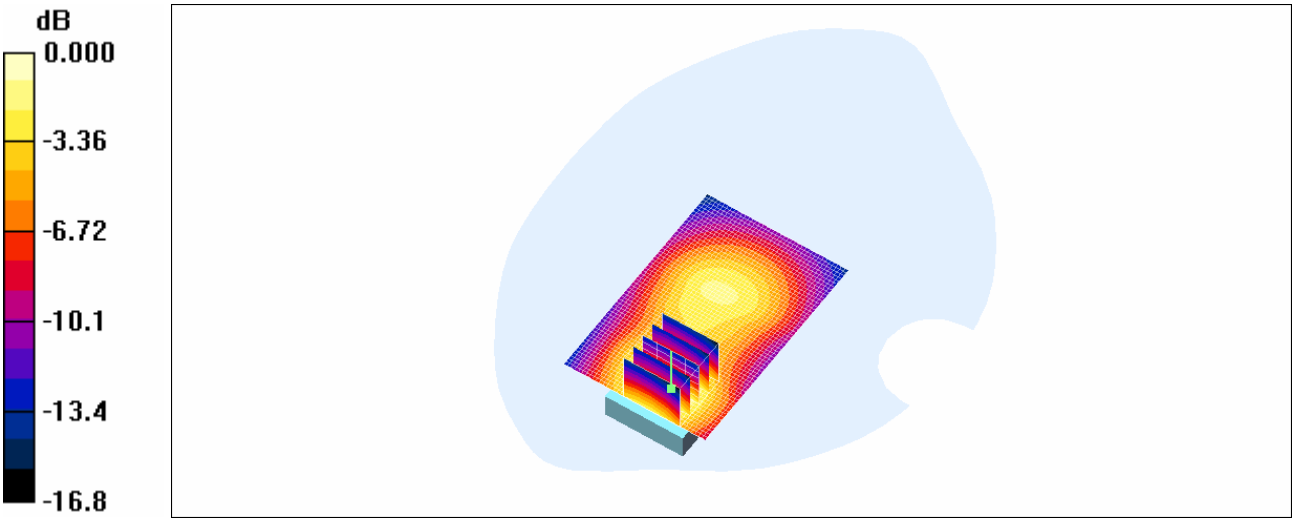
Communication System: DCS 1900; Frequency: 1909.8 MHz;Duty Cycle: 1:4.15
Medium: MSL1900 Medium parameters used: f = 1909.8 MHz; σ = 1.56 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3020; ConvF(4.58, 4.58, 4.58); Calibrated: 2008-07-21
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn559; Calibrated: 2008-03-13
- Phantom: SAM Twin Phantom_1800MHz; Type: SAM; Serial: TP-1433
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

Area Scan (41x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.282 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.29 V/m; Power Drift = 0.094 dB
Peak SAR (extrapolated) = 0.427 W/kg
SAR(1 g) = 0.260 mW/g; SAR(10 g) = 0.153 mW/g
Maximum value of SAR (measured) = 0.281 mW/g



0 dB = 0.281mW/g

Appendix B. Calibration Data Sheets

E-Field Probe 3020
DAE4 559
Dipole Antenna D835V2 481
Dipole Antenna D1900V2 5d038

1271-12, Sa-dong, Sangnok-gu, Ansan-si, Gyeonggi-do, 426-901 KOREA
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S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S 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 KTL (Dymstec)

Certificate No: ES3-3020_Jul08

CALIBRATION CERTIFICATE

Object	ES3DV2 - SN:3020
Calibration procedure(s)	QA CAL-01.v6 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	July 21, 2008
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 E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	3-Sep-07 (No. DAE4-660_Sep07)	Sep-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: July 21, 2008

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

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

Accredited by the Swiss Accreditation Service (SAS)
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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
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 (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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 ES3DV2

SN:3020

Manufactured:	December 5, 2002
Last calibrated:	July 18, 2007
Recalibrated:	July 21, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV2 SN:3020

Sensitivity in Free Space[A]

Diode Compression[B]

NormX	**1.10** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**95** mV
NormY	**0.99** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**95** mV
NormZ	**1.03** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**95** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

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

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	7.1	4.3
SAR_{be} [%]	With Correction Algorithm	0.8	0.5

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

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	6.8	4.1
SAR_{be} [%]	With Correction Algorithm	0.8	0.6

Sensor Offset

Probe Tip to Sensor Center	**2.1** mm

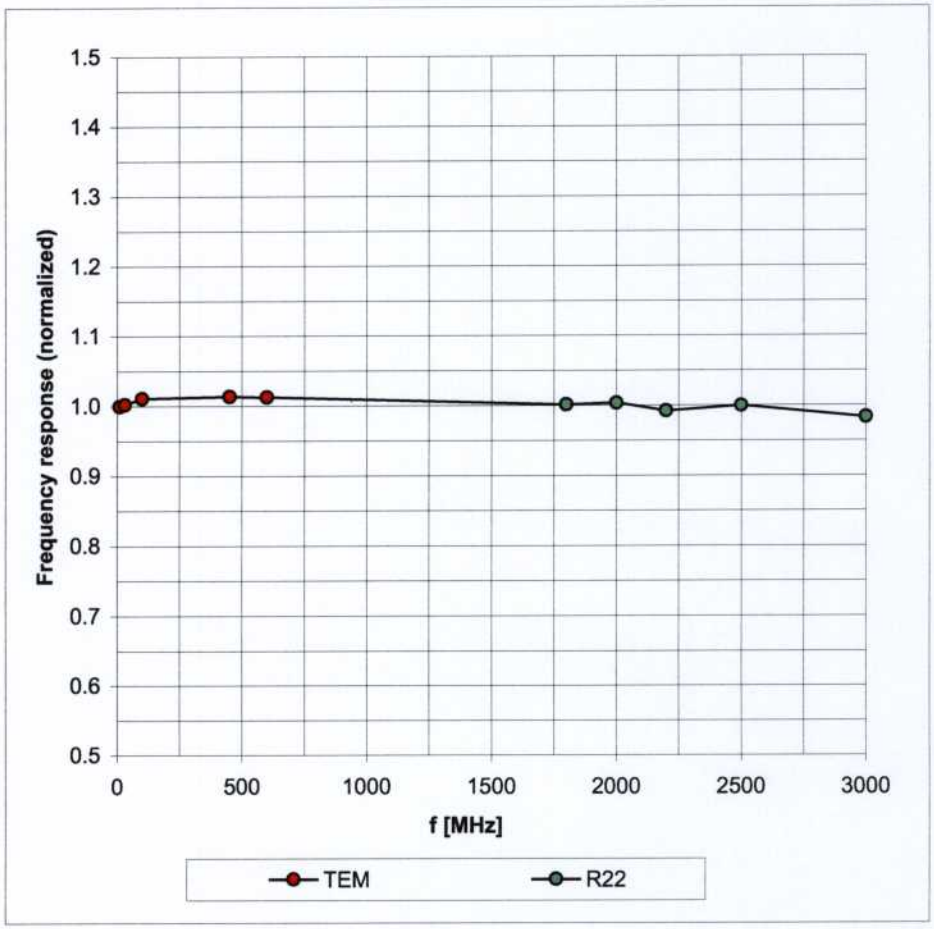
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

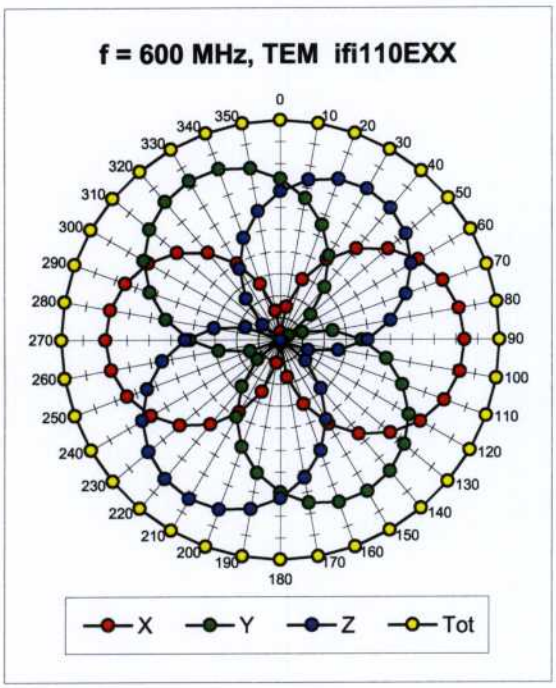
Frequency Response of E-Field

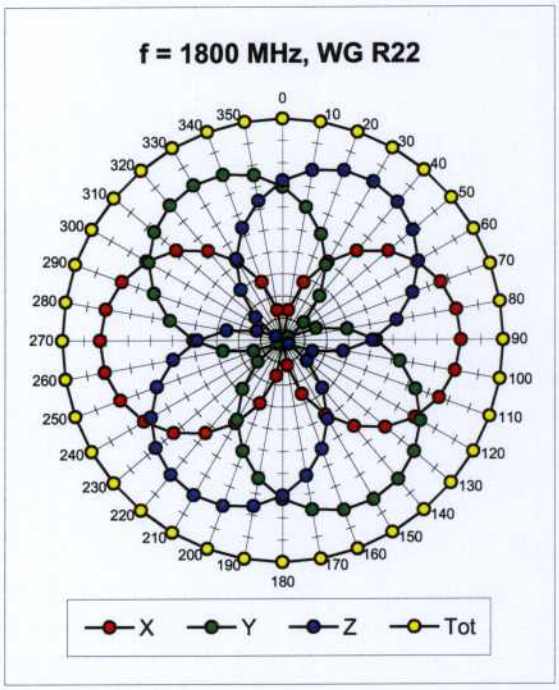
(TEM-Cell:ifi110 EXX, Waveguide: R22)

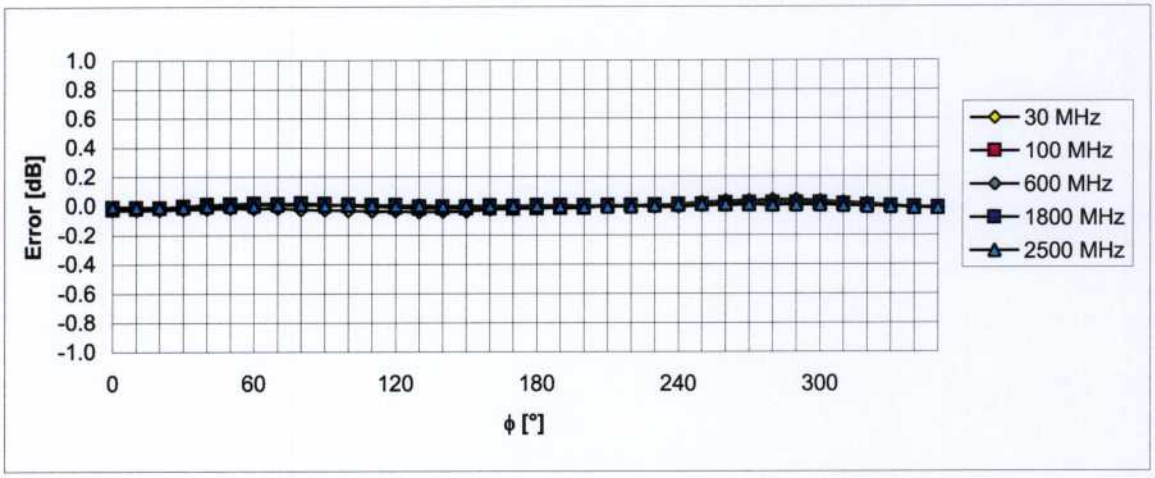


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



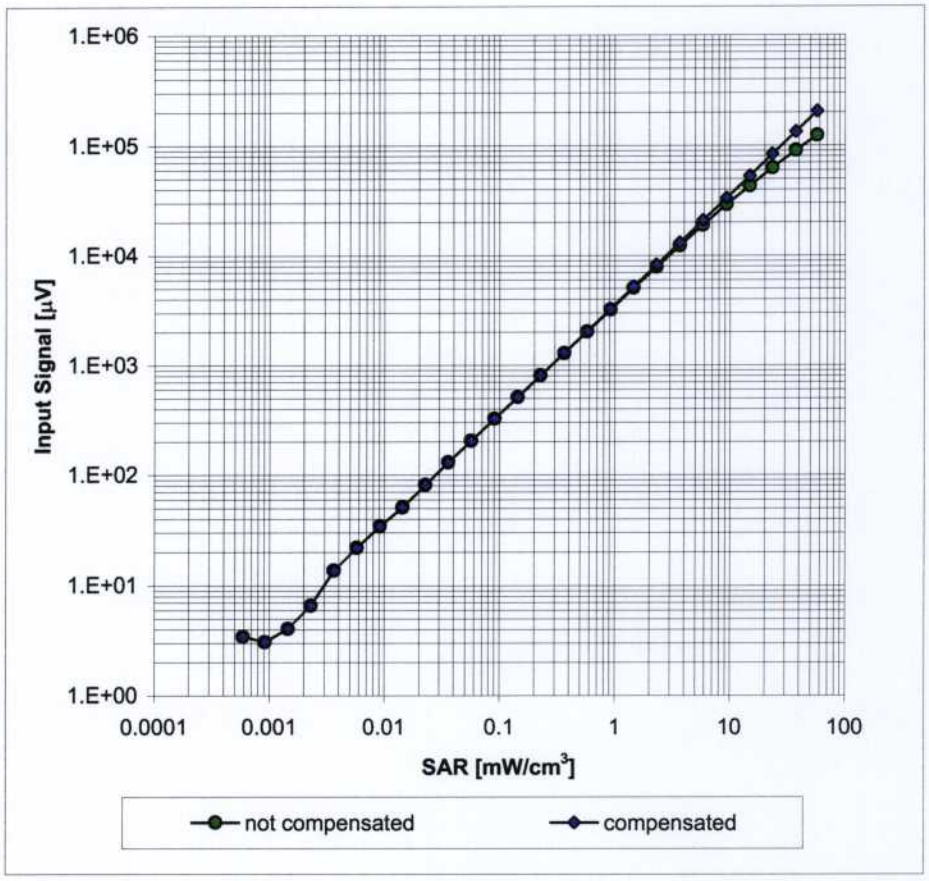


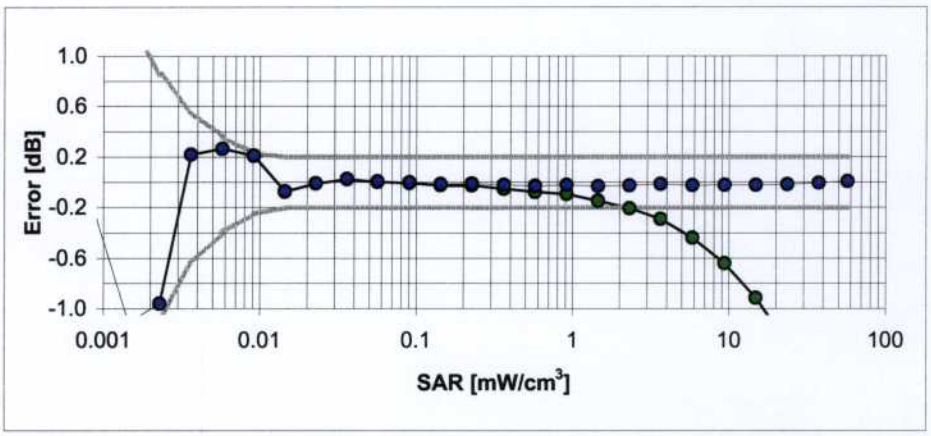


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

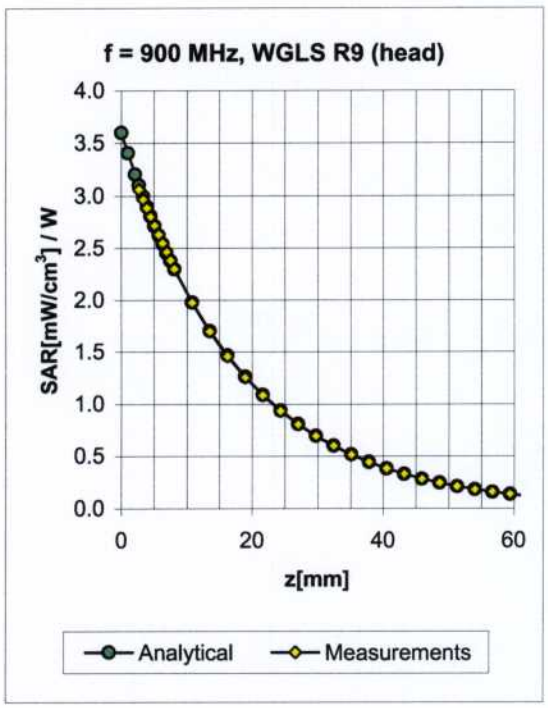
(Waveguide R22, f = 1800 MHz)

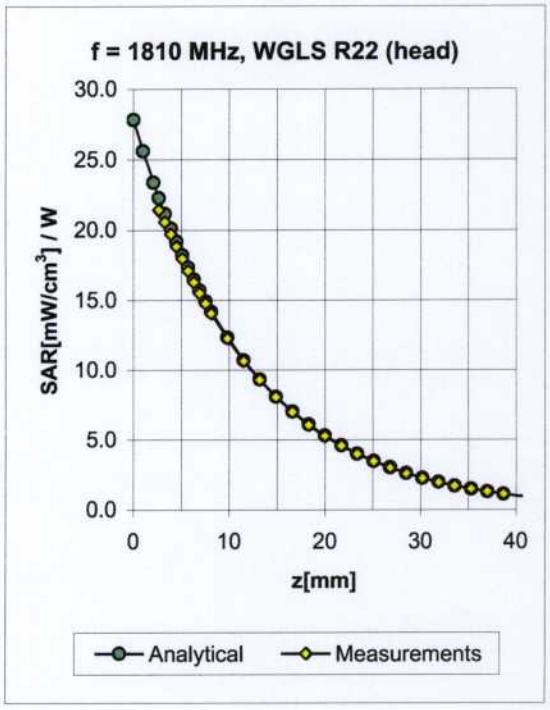




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



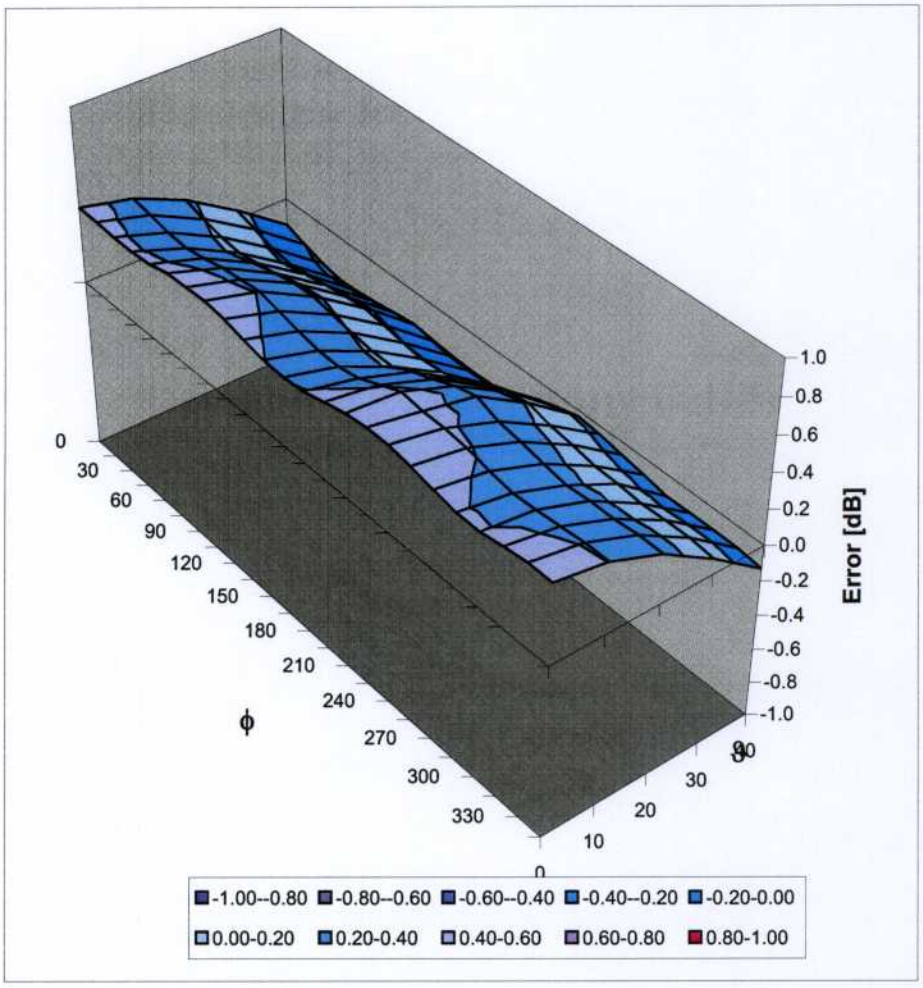


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.52	1.43	6.12 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.48	1.48	5.03 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.51	1.38	4.77 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.52	1.31	4.33 ± 11.0% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.54	1.37	6.21 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.38	1.84	4.58 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.45	1.42	3.82 ± 11.0% (k=2)

[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.**

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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