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SAR Compliance Test Report

APPLICANT NAME & ADDRESS :LG Electronics Inc.
459-9, Kasan-dong, Keumchun-ku,
Seoul 153-023, Korea**DATA & LOCATION OF TESTING**Dates of testing : 12 January 2007 ~ 29 January 2007
Test Site : ESTECH Co., Ltd. Korea**Test Device :**

Models : ME830d

FCC ID : BEJME830D

TYPE : GSM/GPRS Phone with Bluetooth (Prototype)

Test report no :

ESTSAR0701-005

Number of page :

23

Contact person :

Bong Hyo, Han

Responsible test Engineer :

I.K.Hong

Testing has been
Carried out in
Accordance with :

IEEE 1528(Dec.2003)

Recommended Practice for Determining the Peak Spatial-Average Specific
Absorption Rate(SAR) in the Human Body Due to Wireless Communications

Device : Experimental Techniques

Applicant Type :

Certification

FCC CLASSIFICATION :

Licensed Non-Broadcast Transmitter Held to Ear (TNE)
Licensed Portable Transmitter Held to Ear (PCE)

FCC Rule Part(s)

§2.1093; FCC/OET Bulletin 65 Supplement C (July 2001)

Test results :

The Tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced receipt in full, without written approval of the laboratory.

Date and Signatures : 29 January2007

Report Prepared By : Engineer/ I.K.Hong

(Signature)

Engineering Manager/ Jay Kim

(Signature)

Test report no : ESTSAR0701-005

FCC ID : BEJME830D

Web : www. estech. co. kr

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1. SUMMARY FOR TEST REPORT

FCC ID	BEJME830D
Date of test	12 January 2007 ~ 29 January 2007
Responsible test engineer	Jay Kim
Measurement performed by	I.K.Hong
EUT Type	GSM Phone (Prototype)
Tx Frequency	824.2~848.8MHz(GSM850), 1850.2~1909.8MHz(PCS1900)
Rx Frequency	869.2~893.8MHz(GSM850), 1930.2~1989.8MHz(PCS1900)
Max. RF Output Power	GSM850(32.5 dBm) PCS1900 (29.5 dBm)

1.1 Head Configuration

Max. SAR Measurement

FREQUENCY		Modulation	Conducted Power(dBm)		Device test position	SAR (W/kg)
MHz	Ch		dBm	Battery		
836.6	190	GSM	32.5	Standard	Left touch	0.463
1880.00	661	GSM	29.5	Standard	Right touch	0.351

1.2 Body Worn Configuration

Max. SAR Measurement

FREQUENCY		Modulation	Conducted Power(dBm)		Separation test position	SAR (W/kg)
MHz	Ch		dBm	Battery		
836.6	190	GSM	32.5	Standard	2cm [w/o Holster]	0.908
1880.0	661	GSM	29.5	Standard	2cm [w/o Holster]	0.766

1.3 Measurement Uncertainty

Combine Standard Uncertainty	± 11.00 (k=1)
Extended Standard Uncertainty	± 22.00 (k=2, 95% CONFIDENCE LEVEL)



2. INTRODUCTION

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

The safety limits used for the environmental evaluation measurements are the criteria published by the based on American National Standards Institute (ANSI) For localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for safety Levels with Respect to Human Exposure to Radio Frequency Electronic Fields, 3 kHz to 300 GHz. (c) 1992 by the institute of Electrical 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 Electromagnetic Fields – RF and Microwave[3] is used for guidance in measuring 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 (IC NRP) in Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields," IC NRP Report No. 86 (c) IC NRP, 1986, Bethesda, MD 20814.[6] SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

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 (ρ). it is also defined as the rate of rf energy absorption per unit mass at a point in an absorbing body (see Fig. 2.1.).

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

Figure 2.1 SAR Mathematical Equation

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

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

Where:

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

E = mass density of the tissue-simulant material (kg/m³)

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

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3. DESCRIPTION OF THE DEVICE UNDER TEST

The FCC rules for evaluating portable devices for RF exposure compliance are contained in 47 CFR §2.1093. For purposes of RF exposure evaluation, a portable device is defined as a transmitting device designed to be used with any part of its radiating structure in direct contact with the user's body or within 20 centimeters of the body of a user or bystanders under normal operating conditions. This category of devices would include hand-held cellular and PCS telephones that incorporate the radiating antenna into the hand-piece and wireless transmitters that are carried next to the body. Portable devices are evaluated with respect to SAR limits for RF exposure. The applicable SAR limit for portable transmitters used by consumers is 1.6 watts/kg, which is averaged over any one gram of tissue defined as a tissue volume in the shape of a cube.

2.1 Antenna Description

Type	Internal Antenna
Location	the Top of the device
Radiator Material	Copper

2.2 Device Description

FCC ID	FCC ID : BEJME830D
Serial numbers	-
Exposure environment	Uncontrolled exposure
Device category	Portable device
Mode(s) of Operation	GSM/GPRS
Modulation Mode(s)	GSM
Duty Cycle	8.3/4.15
Transmitting Frequency Range(s)	824.2~848.8MHz(GSM850), 1850.2~1909.8MHz(PCS1900)
test signal method	☒ Base station simulator ☐ Internal test code

2.3 Battery Options

There is only one battery option available for tested device,



4. TEST CONDITIONS

4.1 Ambient Conditions

Ambient Temperature (°C)	22
Tissue simulating liquid temperature (°C)	22
Humidity (%)	45

4.2 RF Characteristics of The Test Site

Tests were performed in a fully enclosed RF Shielded environment

4.3 Test Signal, Frequencies, And Output Power

The handset was placed into simulated call mode (850MHz GSM,1900MHz PCS modes)

In all operation bands the measurements were performed on lowest, middle and highest channels.

The phone was set to maximum power level during the all tests and at the beginning of the each test the battery was fully charged.

DASY4 system measures power drift during SAR testing by comparing e-field in the same location at the beginning and at the end of measurement. These records were used to monitor stability of power output.

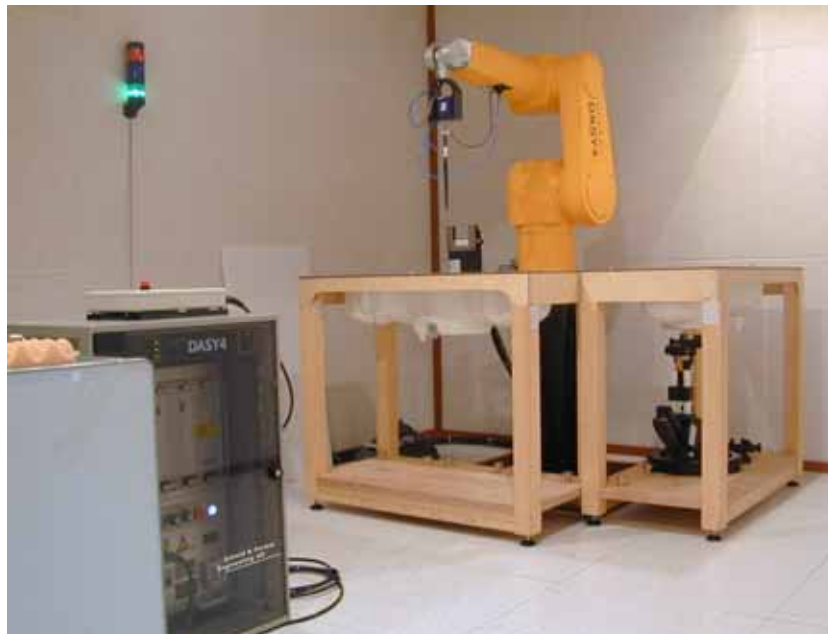


Fig. 4.1 SAR Measurement System



5. DESCRIPTION OF THE TEST EQUIPMENT

An SAR measurement system usually consists of a small diameter isotropic electric field probe, a multiple axis probe positioning system, a test device holder, one or more phantom models, the field probe instrumentation, a computer and other electronic equipment for controlling the probe and making the measurements. Other supporting equipment, such as a network analyzer, power meters and RF signal generators, are also required to measure the dielectric parameters of the simulated tissue media and to verify the measurement accuracy of the SAR system.

5.1 Test System Specifications

Test Equipment	Model	Serial Number	Cal.Due Date
DAE	DAE4	551	2007-04-27
E-Field Probe	ET3DV3	3123	2007-10-17
Dipole validation kit	D1900V2	5d058	2007-09-13
	D835V2	475	2007-09-12
Network analyzer	8753ES	MY40000609	2007-10-09
Signal generator	E4432B	GB40050840	2007-03-03
RF Power meter	EPM-442A	GB37170412	2007-10-11
Power Sensor	8481A	3318A90368	2007-03-08
RF Power meter	E4418A	GB38272722	2007-03-03
Power Sensor	8481A	3318A90368	2007-03-08
Dielectric Probe	85070D	US01440154	-
Power Amplifier	BBS3Q7ECK	NONE	2007-12-16
LP Filter	LA-15N	NONE	2007-10-30
	LA-30N	NONE	2007-10-30
Attenuator	8491B	21828	2007-06-03
Dual Directional Coupler	778D	17575	2007-05-02
Wireless Communications Test Set	E5515C	GB42230119	2007-02-06

5.2 SAR Measurement Setup

Measurement are performed using the DASY4 dosimetric assessment system. The DASY4 is made by Schmid & Partner Engineering AG(SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, Pentium IV 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. 5.1) A cell controller system contains the power supply, robot controller, teach pendant(Joystick), and a remote control used to drive the robot motors. The pc consists of the Intel Pentium IV 2.4 GHz computer with WindowsXP system and SAR measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc.



5. DESCRIPTION OF THE TEST EQUIPMENT(continued)

Is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

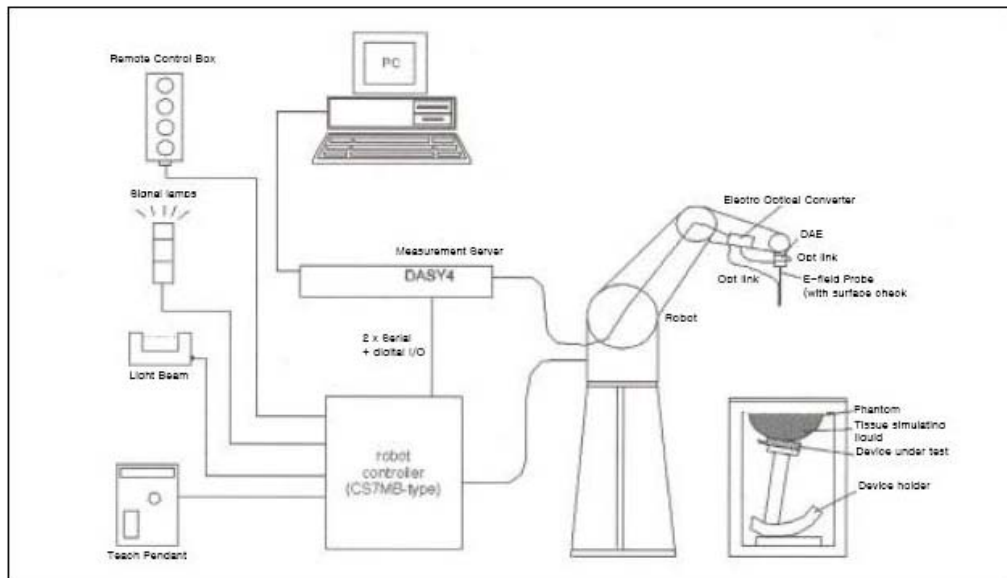


Fig. 5.1 SAR Measurement System Setup

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gainswitching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the Ethernet 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 [7].

5.3 DASY4 E-Field Probe System

The SAR measurements were conducted with the dosimetric probe ET3DV6, designed in the classical triangular configuration [7] (see Fig.5.2) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box in the robot arm and provides an automatic detection transmitter, the other half to a synchronized receiver.



5. DESCRIPTION OF THE TEST EQUIPMENT(continued)

As the probe approach 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 coupling is zero. The distance of the coupling maximum to the surface is probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting (see Fig. 5.2). The approach is stopped at reaching the maximum.

 Isotropic E-Field Probe	Isotropic E-Field Probe for Dosimetric Measurements	
	Construction	Symmetrical design with triangular core Interleafed sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., glycol)
	Calibration	In air from 10 MHz to 3 GHz In brain and muscle simulating tissue at frequencies of 450 MHz, 900 MHz and 1.8 GHz (accuracy $\pm 8\%$) Calibration for other liquids and frequencies upon request
	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) ± 0.3 dB in brain tissue (rotation normal to probe axis)
	Dynamic Range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
	Dimensions	Overall length: 330 mm Tip length: 20 mm Body diameter: 12 mm Tip diameter: 3.9 mm Distance from probe tip to dipole centers: 2.7 mm

Fig. 5.2 Probe Specifications



5. DESCRIPTION OF THE TEST EQUIPMENT(continued)

5.4 Phantom & Equivalent Tissues

SAM Phantom

The SAM Twin Phantom V4.0 is constructed of the 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 [11][12]. 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.

Head & Muscle simulation Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydroxethylcellulose(HEC) gelling agent and saline solution (see Fig 5.3). Preservation with a bactericide 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 head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 have been specified in 1528(Dec.2003) are derived from the issue dielectric parameters computed from

the 4-Cole-Cole equations The mixture characterizations used for the brain and muscle tissue simulation liquids are according to the data by C. Gabriel and G. Hartgrove [13]. (see Fig. 5.3)

Frequency	Head		Body	
(MHz)	ϵ_r	σ (S/m)	ϵ_r	σ (S/m)
150	52.3	0.76	61.9	0.8
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.9	55.2	0.97
900	41.5	0.97	55	1.05
915	41.5	0.98	55	1.06
1450	40.5	1.2	54	1.3
1610	40.3	1.29	53.8	1.4
1800-2000	40	1.4	53.3	1.52
2450	39.2	1.8	52.7	1.95
3000	38.5	2.4	52	2.73
5800	35.3	5.27	48.2	6

Fig.5.3 Head and body tissue parameters by the IEEE SCC-34/SC-2 in P1528



5. DESCRIPTION OF THE TEST EQUIPMENT(continued)

835MHz			1900MHz		
	Head	Body		Head	Body
Sugar	47.31%	34.31%	DGBE(diethylene Glycol buty Ether)	44.91%	29.96%
Deionized water	51.07%	65.45%	Deionized water	54.88%	69.91%
Salt	1.15%	0.62%	Salt	0.21%	0.13%
HEC (hydroxyethy cellulose)	0.24%				
Preventol	0.24%	0.10%			
ϵ	$41.0 \pm 5\%$	$55.2 \pm 5\%$	ϵ	$40.0 \pm 5\%$	$53.3 \pm 5\%$
σ	$0.89 \pm 10\%$	$0.97 \pm 10\%$	σ	$1.45 \pm 10\%$	$1.52 \pm 10\%$

Fig. 5.4 Composition of the Tissue Equivalent Matter

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the accurately, and repeatably be positioned according to the FCC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Note : A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produce infinite number of configurations [12]. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.



6. DESCRIPTION OF THE TEST PROCEDURE

6.1 Definition of Reference Point

EAR Reference point

The point “M” is the reference point for the center of the mouth, “ERP” is the ear reference point. The ERP are 15mm posterior to the entrance to the ear canal(EEC) along the B–M line (Back–Mouth), as shown is figure 6.1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N–F (Neck–Front) is perpendicular to the reference plane and passing through the ERP is called the Reference Pivoting Line (see Figure 6.1) B–M is perpendicular to the N–F line. Both N–F and B–M lines are marked on the external phantom shell to facilitate handset positioning [5].

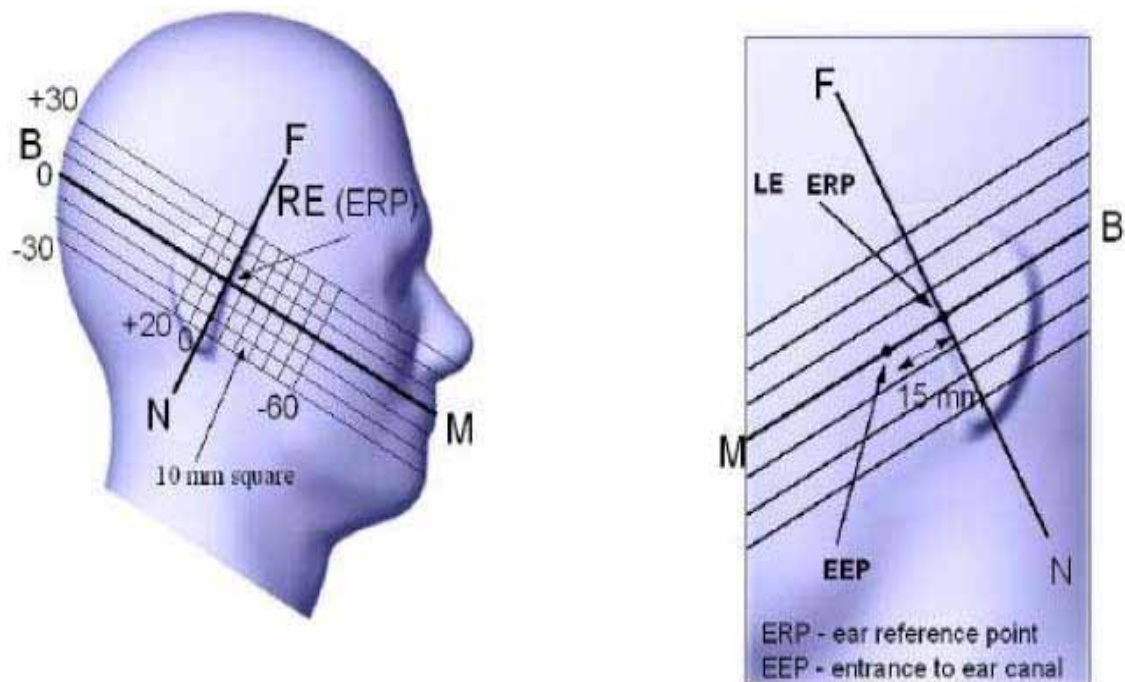


Figure 6.1 Close-up side view of ERP

Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (see Fig. 6.2). The “test device reference point” was then located at the same level as the center of the ear reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at its top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.

6. DESCRIPTION OF THE TEST PROCEDURE(continued)

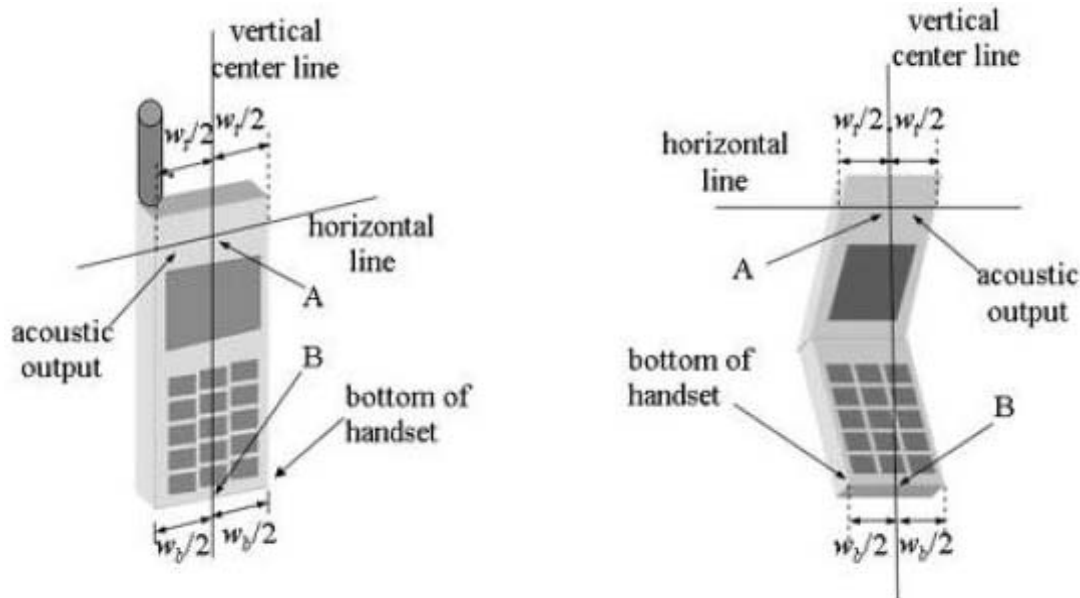


Figure 6.2 Handset Vertical Center & Horizontal Line Reference Points

6.2 Test Configuration Positions

Positioning for Cheek/Touch

- 1) Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece, open the cover. (If the phone can also be used with the cover closed, both configurations must be tested.)
- 2) Define two imaginary lines on the handset: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width w_t of the handset at the level of the acoustic output (point A on Figures 6.2), and the midpoint of the width w_b of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 6.2). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 6.2), especially for clamshell handsets, handsets with lip pieces, and other irregularly-shaped handsets.
- 3) Position the handset close to the surface of the phantom touch that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6.3), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.



6. DESCRIPTION OF THE TEST PROCEDURE(continued)

- 4) Translate the handset towards the phantom along the line passing through RE and LE until the handset touches the ear.
- 5) While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to MB-NF including the line MB (called the reference plane).
- 6) Rotate the phone around the vertical centerline until the phone (horizontal line) is symmetrical with respect to the line NF.
- 7) While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, rotate the handset about the line NF until any point on the handset is in contact with a phantom point

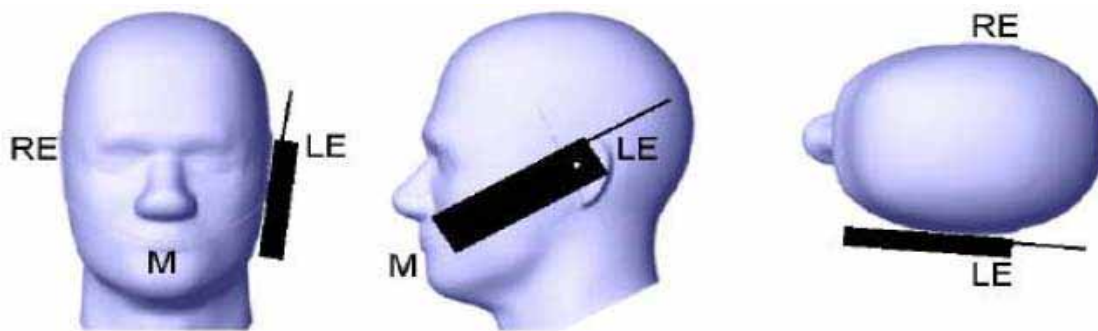


Figure 6.3 "Cheek" or "Touch" Position.

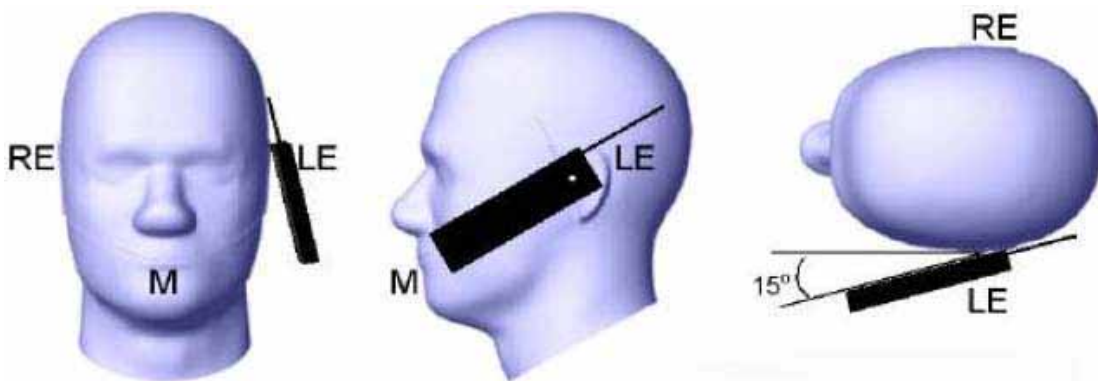


Figure 6.4 "Tilted" Position.



6. DESCRIPTION OF THE TEST PROCEDURE(continued)

Positioning for Ear / 15° Tilted

- 1) Repeat steps 1 to 7 of 6.2(Positioning for Cheek/Touch) to place the device in the "cheek position."
- 2) While maintaining the orientation of the phone retract the phone parallel to the reference plane far enough to enable a rotation of the phone by 15 degree.
- 3) Rotate the phone around the horizontal line by 15 degree.
- 4) While maintaining the orientation of the phone, move the phone parallel to the reference plane until any part of the phone touches the head. (In this position, point A will be located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact is at any location other than the pinna, the angle of the phone shall be reduced. The tilted position is obtained if any part of the phone is in contact of the ear as well as a second part of the phone is contact with the head.

Body Holder / Belt Clip Configurations

Body-worn operation 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 connected to the device. Body dielectric parameters are used.

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 supplied with the device, the device is tested with each accessory that contains a unique metallic component. 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 of available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration where a separation distance between the back of the device and the flat phantom is used. All test position spacings are documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance is tested with the accessory(ies), including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration. In all case SAR measurements are performed to investigate the worst case positioning. Worst-case positioning is then documented and used to perform Body SAR testing.

In order for users to be aware of the body-worn operation requirements for meeting RF exposure compliance, operation instructing instructions and cautions statements are included in the user's manual.



6. DESCRIPTION OF THE TEST PROCEDURE(continued)

6.3 Scan Procedures

First coarse scans are used for quick determination of the field distribution. Nest cube scan, 5x5x7 points; spacing between each point 5x5x5 mm, is performed around the highest E-field value to determine the averaged SAR-distribution over 1g.

6.4 SAR Averaging Methods

The maximum SAR value is averaged over its volume using interpolation and extrapolation.

The interpolation of the points is done with a 3d-Spline. The 3d-Spline is composed of three one-dimensional splines with the "Not a Knot" condition [W.Gander, Computermathematik, p. 141-150](x, y and z directions) [Numerical Recipes in C, Second Edition, p 123].

The extrapolation is based on least square algorithm [W.Gander, Computermathematik, p. 168-180]. Through the points in the first 30 mm in all z-axis, polynomials of order four are calculated. This polynomial is then used to evaluate the points between the surface and the probe tip. The points calculated from the surface, have a distance of 1mm from one another.



7. MEASUREMENT UNCERTAINTY

According to CENELEC [17], typical worst-case uncertainty of field measurements is 5 dB.

For well-defined modulation characteristics the uncertainty can be reduced to 3 dB.

ERROR Description	Uncertainty	Probability	Divisor	ci 1	Standard unc.	vi or
	value ±%	Distribution		1g	(1g)	Veff
MEASUREMENT SYSTEM						
Probe Calibration	± 11.7 %	normal	1	1	± 4.8 %	∞
Axial Isotropy	± 4.7	rectangular	√3	(1-cp) ^{1/2}	± 1.9%	∞
Hemispherical Isotropy	± 9.6	rectangular	√3	(cp) ^{1/2}	± 3.9%	∞
Boundary Effects	± 1.0	rectangular	√3	1	± 0.6%	∞
Linearity	± 4.7	rectangular	√3	1	± 2.7%	∞
System Detection Limits	± 1.0	rectangular	√3	1	± 0.6%	∞
Readout Electronics	± 1.0	normal	1	1	± 1.0%	∞
Response time	± 0.8	rectangular	√3	1	± 0.5%	∞
Integration time	± 2.6	rectangular	√3	1	± 1.5%	∞
RF Amnient Conditions	± 3.0	rectangular	√3	1	± 1.7%	∞
Probe Positioner Mechanical Tolerance	± 0.4	rectangular	√3	1	± 0.2%	∞
Probe Positioning with respect to Phantom Shell	± 2.9	rectangular	√3	1	± 1.7%	∞
Extrapolation, Interpolation and Integration Algorithms for Max. SAR Evaluation	± 1.0	rectangular	√3	1	± 0.6%	∞
Test Sample Related						
Test Sample Positioning	± 2.9	normal	1	1	± 2.97%	145
Device Holder Uncertainty	± 3.6	normal	0.84	1	± 3.69%	5
Output Power Validation – SAR drift measurement	± 5.0	rectangular	√3	1	± 2.9%	∞
Phantom and Tissue Parameters						
Phantom Uncertainty (shape and thickness tolerances)	± 4.0	rectangular	√3	1	± 2.3%	∞
Liquid conductivity Target – tolerance	± 5.0	rectangular	√3	0.64	± 1.8%	∞
Liquid Conductivity – measurement uncertainty	± 5.0	normal	1	0.64	± 3.2%	∞
Liquid permittivity Target – tolerance	± 5.0	rectangular	√3	0.6	± 1.7%	∞
Liquid Permittivity – measurement uncertainty	± 5.0	normal	1	0.6	± 3.0%	∞
Combined Standard Uncertainty					±11.00 %	330
Coverage Factor for 95%				K = 2		
Expanded Standard Uncertainty					± 22.00 %	



8. SYSTEM VERIFICATION

Tissue Verification

Table 8.1 Simulated Tissue Verification [5]

MEASURED TISSUE PARAMETERS										
Liquid Temperature (°C)			22		Liquid Depth(mm)		150			
Date	2007-01-25		2007-01-25		2007-01-25		2007-01-25			
Tissue	1900MHz Brain		1900MHz Muscle		835MHz Brain		835MHz Muscle			
	Target	Measured	Target	Measured	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ϵ	40	39.51	53.3	51.26	41.5	40.80	55.2	53.63		
Conductivity: σ	1.4	1.44	1.52	1.56	0.9	0.914	0.97	0.965		
Deviation (%)	ϵ : -1.23%		ϵ : -3.83%		ϵ : -1.69%		ϵ : -2.84%			
	σ : 2.86%		σ : 2.63%		σ : 1.56%		σ : -0.52%			

Test System Validation

- Prior to assessment, the system is verified to the $\pm 10\%$ of the specifications at 835MHz, 1900MHz (Graphic Plots Attached)
- The results are nominalized to 1W input power

Table 8.2 System Validation [5]

SYSTEM DIPOLE VALIDATION TARGET & MEASURED						
Tissue	System Validation Kit:	Forward Power (W)	Targeted SAR1g (mW/g)	Measured SAR1g (mW/g)	Deviation (%)	Test Date
1900MHz Brain	D1900V2(S/N :5d058)	1.0	39.7	40.8	2.77%	2007-01-25
835MHz Brain	D835V2(S/N:475)	1.0	9.5	9.48	-0.21%	2007-01-25

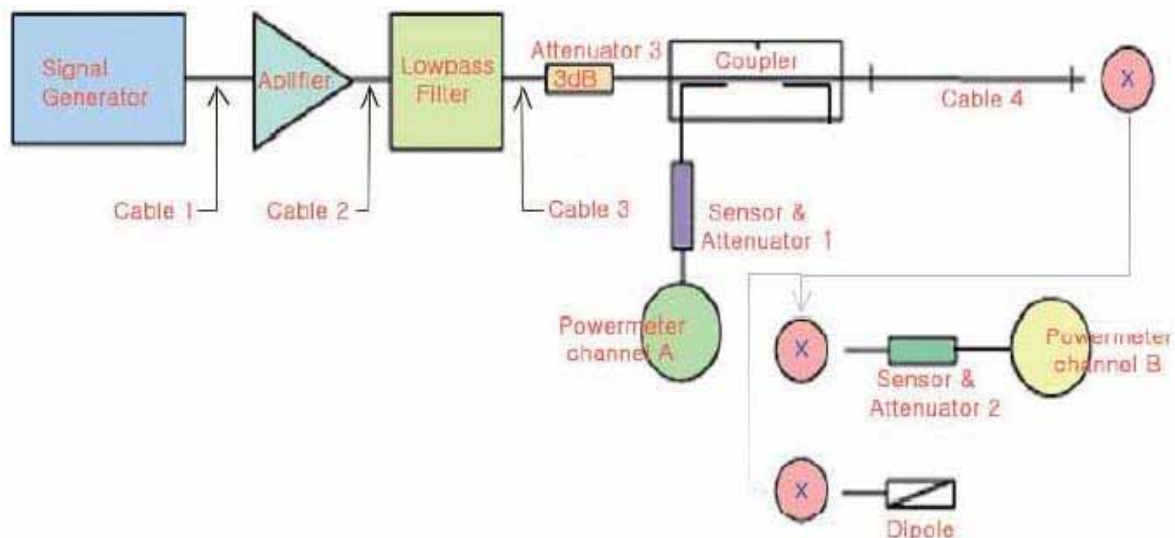


Figure 12.1 Dipole Validation Test Setup



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9. RESULTS(continued)

Ambient TEMPERATURE (C) : 22.0

Relative HUMIDITY (%) : 45

Mixture Type : 835MHz Brain

Dielectric Constant : 40.81

Conductivity: 0.915

Measurement Results (GSM Head SAR)

ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population	Brain 1.6 W/kg (mW/g) averaged over 1 gram
---	--

MEASUREMENT RESULTS (GSM Head SAR)

Frequency		Mod	Conducted Power(dBm)		battery	Device Test position	Slider	BT	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End						
836.60	190	GSM	32.50	32.53	Standrd	Left Touch	UP	–	Fixed	0.430
836.60	190	GSM	32.50	32.48	Standrd	Left Touch	UP	ON	Fixed	0.463
836.60	190	GSM	32.50	32.59	Standrd	Right Touch	UP	–	Fixed	0.420
836.60	190	GSM	32.50	32.51	Standrd	Left Tilt	UP	–	Fixed	0.182
836.60	190	GSM	32.50	32.53	Standrd	Right Tilt	UP	–	Fixed	0.421

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration.
2. All modes of operation were investigated and the worst-case are reported.
3. Battery Type : Standard
Radiated measurements indicate that the Standard-life battery produces lower ERP and EIRP, therefore the Standard-life battery is used in SAR testing.
Justification for reduced test configuration: Per FCC/OET Bulletin 65 Supplement C[July 2001], if the SAR measured at the middle channel for each test configuration (left,light,cheek/touch,tilt/ear, extended and retracted)is at least 3.0dB lower than the SAR limit, testing at the hiah and low
4. Power Measured : Conducted
5. SAR Measurement System : SPEAG
6. SAR Configuration : Head

Engineer I.K.Hong

Test report no : ESTSAR0701-005

FCC ID : BEJME830D

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9. RESULTS(continued)

Ambient TEMPERATURE (C) : 22.0

Relative HUMIDITY (%) : 45

Mixture Type : 835MHz Body

Dielectric Constant : 53.64

Conductivity: 0.966

Measurement Results (GSM BODY SAR without Holster)

ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population	Brain 1.6 W/kg (mW/g) averaged over 1 gram
---	--

MEASUREMENT RESULTS (GSM Body SAR Without Holster)

Frequency		Mod	Conducted Power(dBm)		battery	Device Test position	Slider	BT	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End						
836.60	190	GSM	32.50	32.56	Standard	2[w/o Holster]FRONT	UP	–	Fixed	0.258
836.60	190	GSM	32.50	32.47	Standard	2[w/o Holster]REAR	UP	–	Fixed	0.522

MEASUREMENT RESULTS (GSM Body SAR Without Holster – GPRS)

Frequency		Mod	Conducted Power(dBm)		battery	Device Test position	Slider	BT	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End						
836.60	190	GSM	32.50	32.50	Standard	2[w/o Holster]REAR	UP	ON	Fixed	0.908

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration.

2. All modes of operation were investigated and the worst-case are reported.

3. Battery Type : Standard

Radiated measurements indicate that the Standard-life battery produces lower ERP and EIRP, therefore the Standard-life battery is used in SAR testing.

Justification for reduced test configuration: Per FCC/OET Bulletin 65 Supplement C[July 2001], if the SAR measured at the middle channel for each test configuration (left,light,cheek/touch,tilt/ear, extended and retracted)is at least 3.0dB lower than the SAR limit, testing at the hiah and low channels is optional for such test configuration(s).

4. Power Measured : Conducted

5. SAR Measurement System : SPEAG

6. SAR Configuration : Body, GPRS mode function enable, Class 10 (multi slot mode)

Engineer I.K.Hong

(Signa

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FCC ID : BEJME830D

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426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, KoreaTEL: 82-2-867-3201
FAX: 82-2-867-3204**9. RESULTS(continued)**Ambient TEMPERATURE (C) : **22.0**Relative HUMIDITY (%) : **45**Mixture Type : **1900MHz Brain**Dielectric Constant : **39.51**Conductivity: **1.44****Measurement Results (GSM Head SAR)**

ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population	Brain 1.6 W/kg (mW/g) averaged over 1 gram
---	--

MEASUREMENT RESULTS (GSM Head SAR)										
Frequency		Mod	Conducted Power(dBm)		battery	Device Test position	Slider	BT	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End						
1880.00	661	GSM	29.50	29.43	Standard	Left Touch	UP	–	Fixed	0.266
1880.00	661	GSM	29.50	29.54	Standard	Right Touch	UP	–	Fixed	0.351
1880.00	661	GSM	29.50	29.40	Standard	Right Touch	UP	ON	Fixed	0.304
1880.00	661	GSM	29.50	29.52	Standard	Left Tilt	UP	–	Fixed	0.201
1880.00	661	GSM	29.50	29.39	Standard	Right Tilt	UP	–	Fixed	0.220

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration.

2. All modes of operation were investigated and the worst-case are reported.

3. Battery Type : **Standard**

Radiated measurements indicate that the Standard-life battery produces lower ERP and EIRP, therefore the Standard-life battery is used in SAR testing.

Justification for reduced test configuration: Per FCC/OET Bulletin 65 Supplement C[July 2001], if the SAR measured at the middle channel for each test configuration (left,light,cheek/touch,tilt/ear, extended and retracted)is at least 3.0dB lower than the SAR limit, testing at the hiah and low channels is optional for such test configuration(s).

4. Power Measured : **Conducted**

5. SAR Measurement System : **SPEAG**

6. SAR Configuration : **Head**

Engineer I.K.Hong

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9. RESULTS(continued)

Ambient TEMPERATURE (C) : 22

Relative HUMIDITY (%) : 45

Mixture Type : 1900MHz Body

Dielectric Constant : 51.26

Conductivity: 1.56

Measurement Results (GSM BODY SAR without Holster)

ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population	Body 1.6 W/kg (mW/g) averaged over 1 gram
---	---

MEASUREMENT RESULTS (GSM Body SAR Without Holster)

Frequency		Mod	Conducted Power(dBm)		battery	Device Test position	Slider	BT	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End						
1880.00	661	GSM	29.50	29.38	Standard	2[w/o Holster]FRONT	UP	–	Fixed	0.092
1880.00	661	GSM	29.50	29.62	Standard	2[w/o Holster]REAR	UP	–	Fixed	0.408

MEASUREMENT RESULTS (GSM Body SAR Without Holster – GPRS)

Frequency		Mod	Conducted Power(dBm)		battery	Device Test position	Slider	BT	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End						
1880.00	661	GSM	29.50	29.50	Standard	2[w/o Holster]REAR	UP	ON	Fixed	0.766

NOTES:

1. The test data were reported the worst-case SAR value with the antenna-head position set in a typical configuration.

2. All modes of operation were investigated and the worst-case are reported.

3. Battery Type : Standard

Radiated measurements indicate that the Extended-life battery produces lower ERP and EIRP, therefore the Standard-life battery is used in SAR testing.

Justification for reduced test configuration: Per FCC/OET Bulletin 65 Supplement C[July 2001], if the SAR measured at the middle channel for each test configuration (left,light,cheek/touch,tilt/ear, extended and retracted)is at least 3.0dB lower than the SAR limit, testing at the hiah and low channels is optional for such test configuration(s).

4. Power Measured : Conducted

5. SAR Measurement System : SPEAG

6. SAR Configuration : Body, GPRS mode function enable, Class 10 (multi slot mode)

Engineer I.K.Hong

Test report no : ESTSAR0701-005

FCC ID : BEJME830D

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10. REFERENCE

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APPENDIX A : Validation Test Data of Tissue



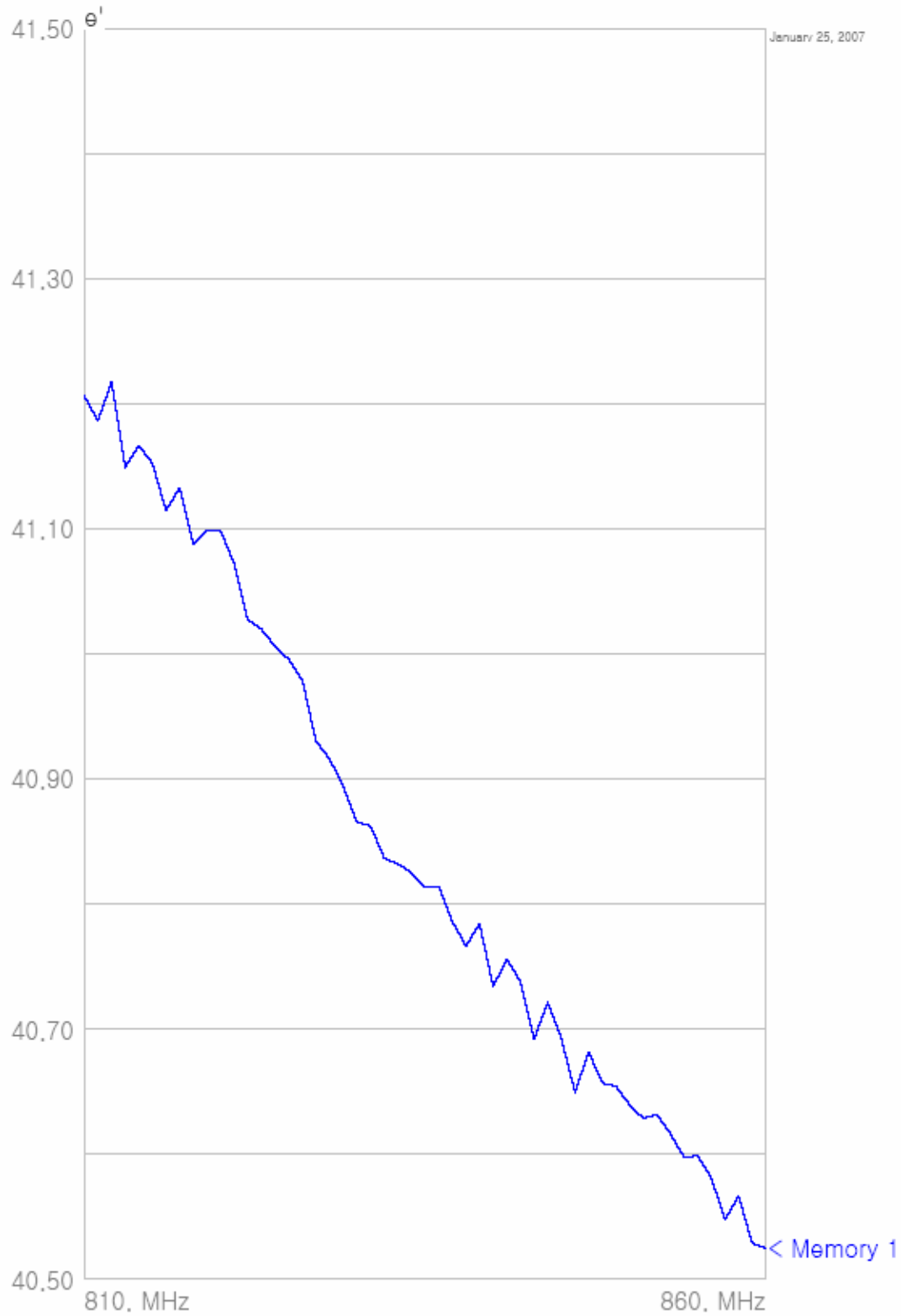
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– Head Tissue(GSM850)

Title
SubTitle



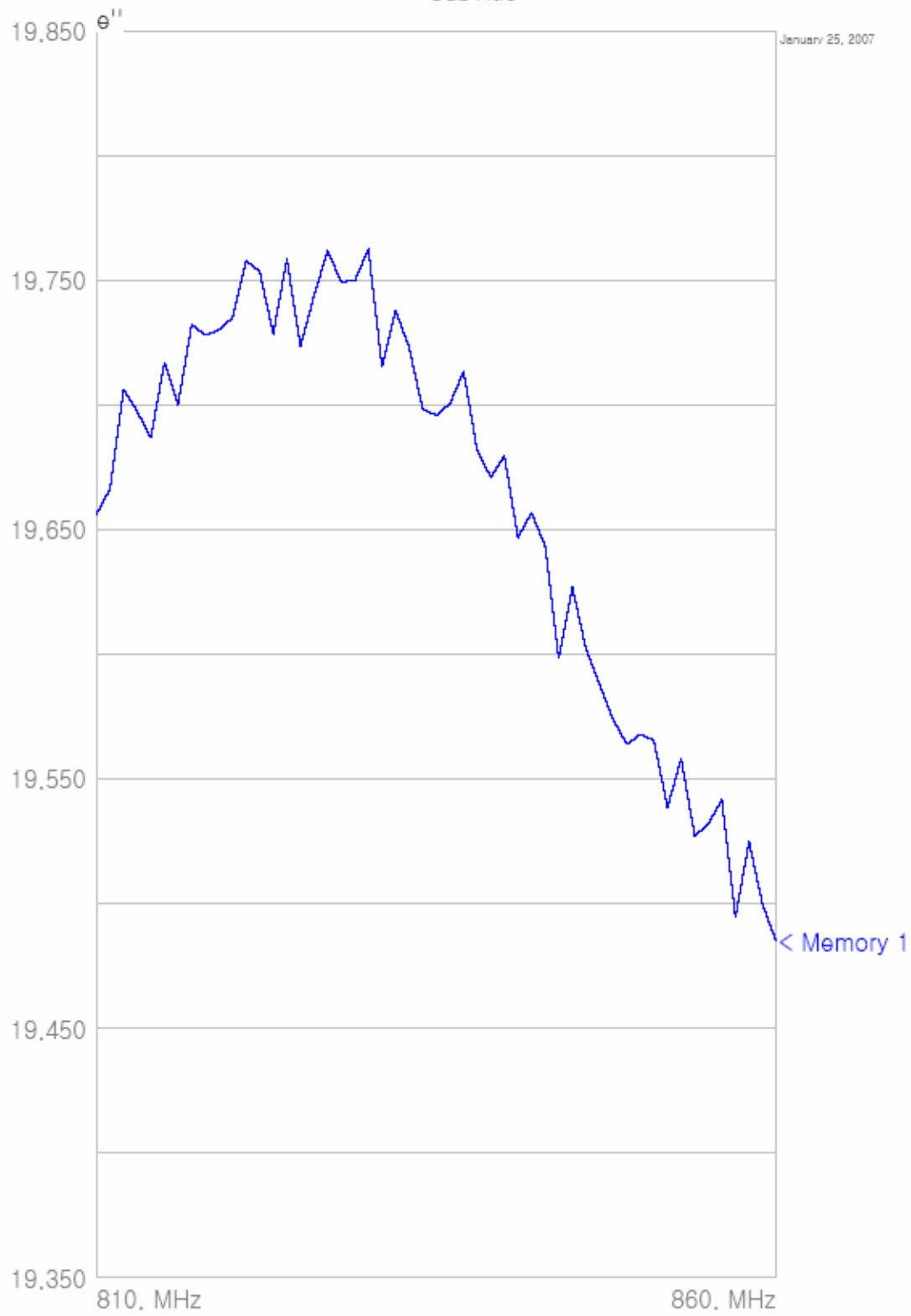


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January 23, 2007

Frequency	e'	e''
810.000000 MHz	41.2065	19.6562
810.973262 MHz	41.1865	19.6666
811.946524 MHz	41.2175	19.7063
812.919785 MHz	41.1494	19.6974
813.893047 MHz	41.1669	19.6869
814.866309 MHz	41.1525	19.7172
815.845418 MHz	41.1147	19.7002
816.824527 MHz	41.1331	19.7324
817.803636 MHz	41.0881	19.7281
818.782745 MHz	41.0985	19.7302
819.761854 MHz	41.0988	19.7350
820.746845 MHz	41.0721	19.7579
821.731836 MHz	41.0275	19.7536
822.716828 MHz	41.0199	19.7286
823.701819 MHz	41.0060	19.7586
824.686810 MHz	40.9958	19.7237
825.677719 MHz	40.9793	19.7438
826.668628 MHz	40.9306	19.7619
827.659537 MHz	40.9160	19.7496
828.650446 MHz	40.8944	19.7498
829.641354 MHz	40.8656	19.7626
830.638216 MHz	40.8628	19.7154
831.635078 MHz	40.8369	19.7380
832.631941 MHz	40.8323	19.7231
833.628803 MHz	40.8252	19.6984
834.625665 MHz	40.8136	19.6960
835.628516 MHz	40.8145	19.7007
836.631367 MHz	40.7862	19.7134
837.634218 MHz	40.7667	19.6817
838.637068 MHz	40.7845	19.6712
839.639919 MHz	40.7342	19.6796
840.648795 MHz	40.7564	19.6470
841.657671 MHz	40.7381	19.6570
842.666547 MHz	40.6923	19.6433
843.675423 MHz	40.7215	19.5985
844.684299 MHz	40.6928	19.6270
845.699236 MHz	40.6495	19.6024
846.714173 MHz	40.6818	19.5880
847.729110 MHz	40.6571	19.5739
848.744047 MHz	40.6543	19.5641
849.758984 MHz	40.6398	19.5679
850.780018 MHz	40.6288	19.5656
851.801053 MHz	40.6317	19.5387
852.822087 MHz	40.6165	19.5583
853.843122 MHz	40.5976	19.5273
854.864157 MHz	40.5990	19.5319
855.891325 MHz	40.5813	19.5418
856.918494 MHz	40.5476	19.4945
857.945663 MHz	40.5667	19.5250
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860.000000 MHz	40.5251	19.4850



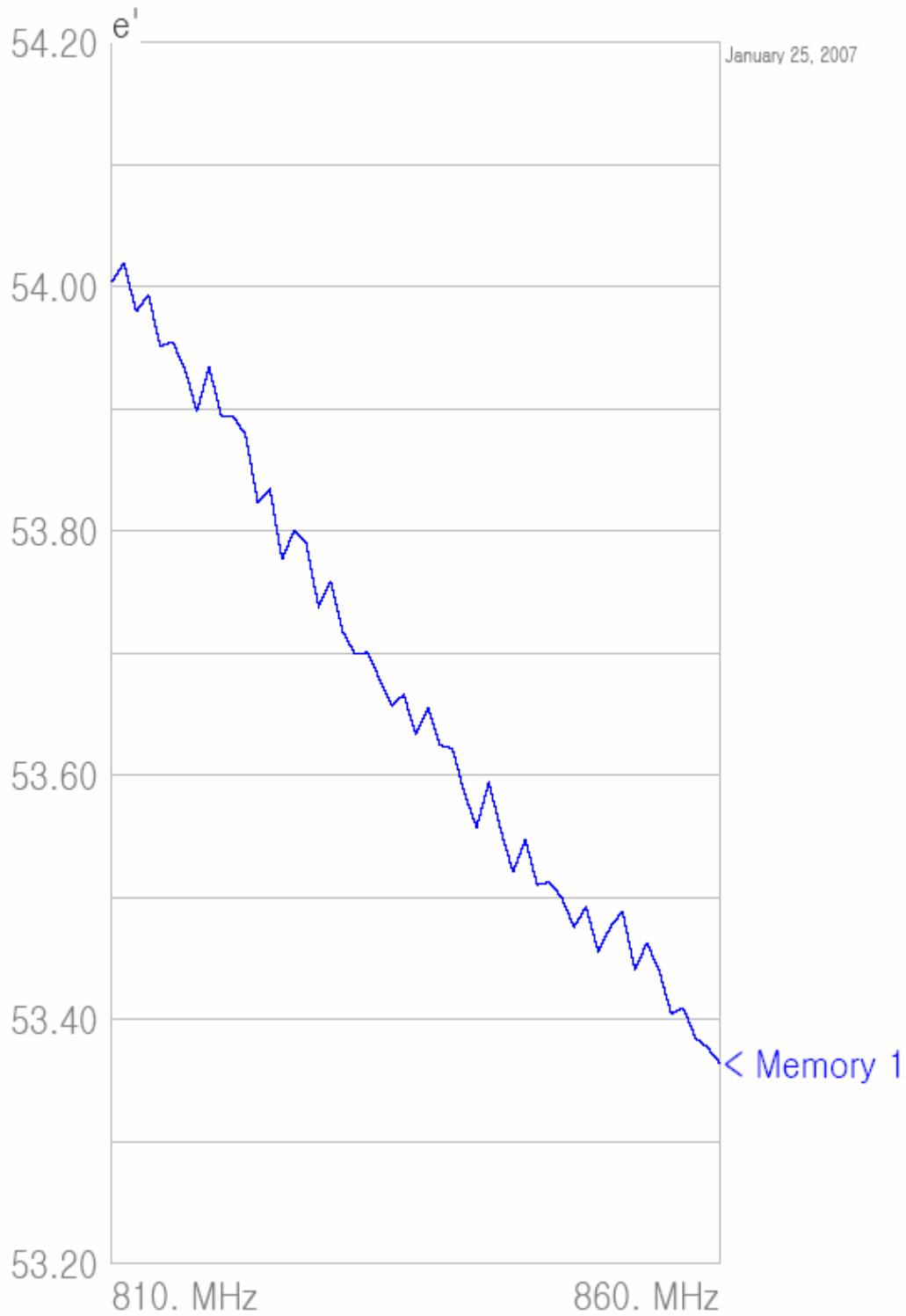
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– GSM850 Body Tissue

Title
SubTitle



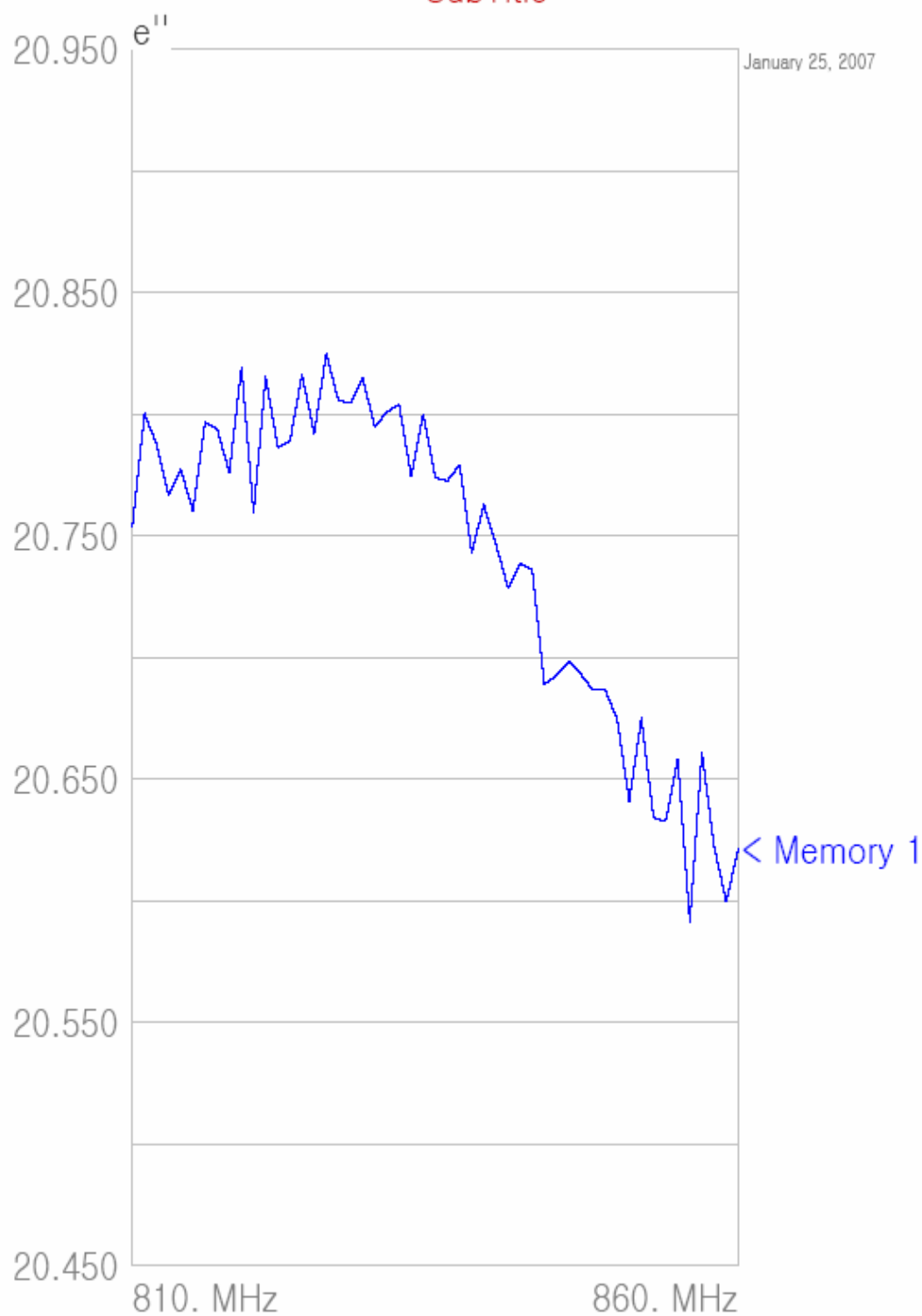


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January 28, 2007

Frequency	e'	e''
810.000000 MHz	54.0045	20.7542
810.973262 MHz	54.0196	20.8004
811.946524 MHz	53.9799	20.7875
812.919785 MHz	53.9936	20.7668
813.893047 MHz	53.9513	20.7773
814.866309 MHz	53.9551	20.7602
815.845418 MHz	53.9335	20.7969
816.824527 MHz	53.8978	20.7939
817.803636 MHz	53.9350	20.7760
818.782745 MHz	53.8938	20.8197
819.761854 MHz	53.8934	20.7594
820.746845 MHz	53.8793	20.8156
821.731836 MHz	53.8234	20.7866
822.716828 MHz	53.8346	20.7891
823.701819 MHz	53.7769	20.8164
824.686810 MHz	53.8008	20.7922
825.677719 MHz	53.7897	20.8249
826.668628 MHz	53.7378	20.8058
827.659537 MHz	53.7589	20.8047
828.650446 MHz	53.7178	20.8150
829.641354 MHz	53.6991	20.7951
830.638216 MHz	53.7008	20.8010
831.635078 MHz	53.6794	20.8042
832.631941 MHz	53.6573	20.7747
833.628803 MHz	53.6661	20.8000
834.625665 MHz	53.6343	20.7740
835.628516 MHz	53.6556	20.7727
836.631367 MHz	53.6248	20.7794
837.634218 MHz	53.6222	20.7430
838.637068 MHz	53.5855	20.7629
839.639919 MHz	53.5576	20.7467
840.648795 MHz	53.5946	20.7287
841.657671 MHz	53.5546	20.7389
842.666547 MHz	53.5207	20.7359
843.675423 MHz	53.5471	20.6890
844.684299 MHz	53.5103	20.6927
845.699236 MHz	53.5125	20.6984
846.714173 MHz	53.4998	20.6932
847.729110 MHz	53.4758	20.6867
848.744047 MHz	53.4924	20.6870
849.758984 MHz	53.4554	20.6746
850.780018 MHz	53.4758	20.6410
851.801053 MHz	53.4887	20.6751
852.822087 MHz	53.4413	20.6342
853.843122 MHz	53.4827	20.6327
854.864157 MHz	53.4401	20.6583
855.891325 MHz	53.4048	20.5914
856.918494 MHz	53.4095	20.6608
857.945663 MHz	53.3849	20.6225
858.972831 MHz	53.3769	20.5996
860.000000 MHz	53.3641	20.6215



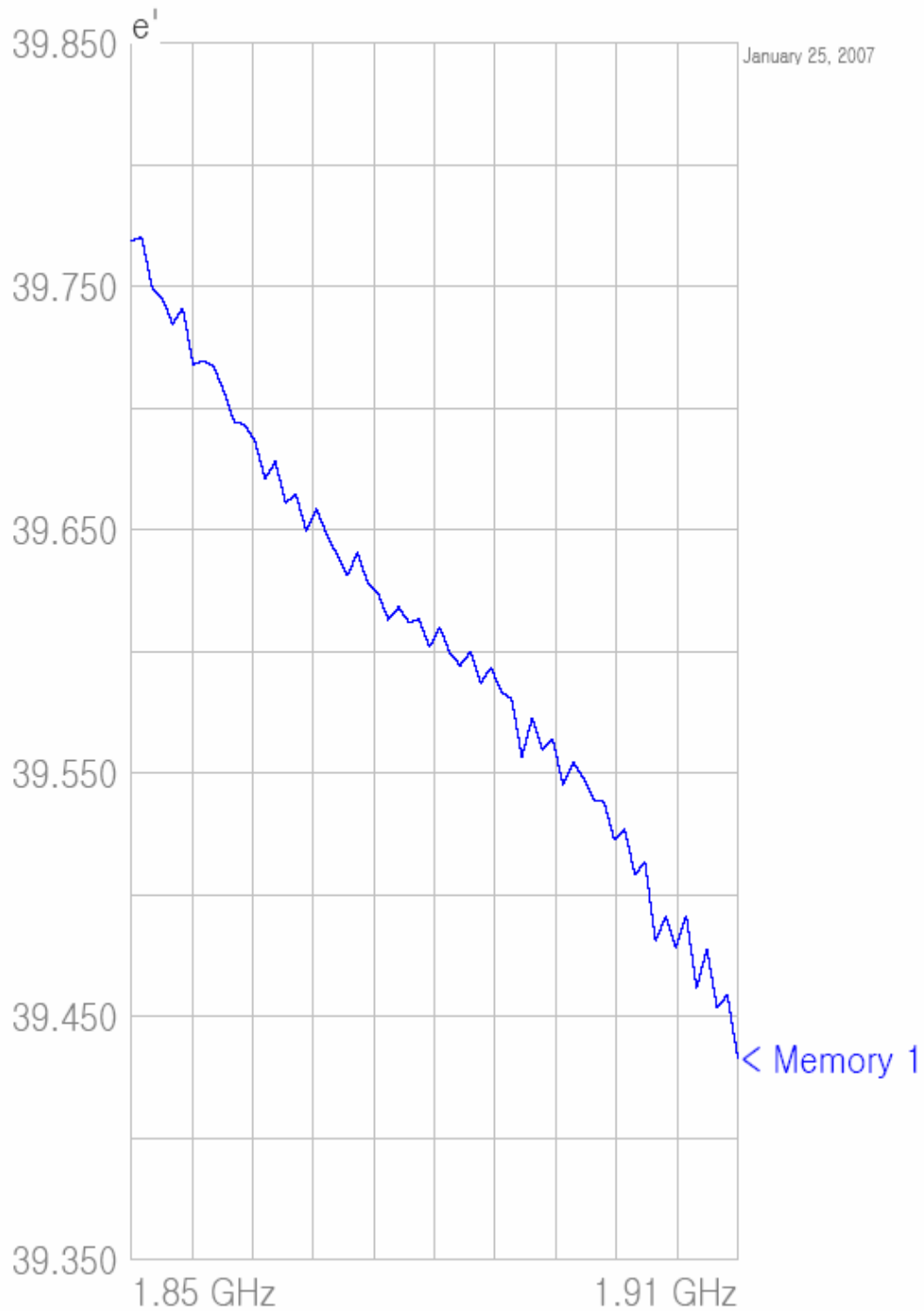
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– Head Tissue(PCS1900)

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January 25, 2007

Frequency	e ⁱ	e ⁱⁱ
1.850000000 GHz	39.7689	13.4902
1.851016949 GHz	39.7704	13.5010
1.852033898 GHz	39.7497	13.4956
1.853050847 GHz	39.7453	13.4920
1.854067797 GHz	39.7347	13.4833
1.855084746 GHz	39.7412	13.4970
1.856101695 GHz	39.7181	13.5022
1.857118644 GHz	39.7195	13.5221
1.858135593 GHz	39.7175	13.5080
1.859152542 GHz	39.7070	13.5233
1.860169492 GHz	39.6945	13.5068
1.861186441 GHz	39.6935	13.5132
1.862203390 GHz	39.6868	13.5201
1.863220339 GHz	39.6711	13.5177
1.864237288 GHz	39.6781	13.5130
1.865254237 GHz	39.6812	13.5083
1.866271186 GHz	39.6648	13.5268
1.867288136 GHz	39.6498	13.5300
1.868305085 GHz	39.6587	13.5331
1.869322034 GHz	39.6482	13.5244
1.870338983 GHz	39.6400	13.5383
1.871355932 GHz	39.6312	13.5226
1.872372881 GHz	39.6407	13.5313
1.873389831 GHz	39.6282	13.5240
1.874406780 GHz	39.6241	13.5443
1.875423729 GHz	39.6131	13.5300
1.876440678 GHz	39.6184	13.5414
1.877457627 GHz	39.6120	13.5391
1.878474576 GHz	39.6133	13.5441
1.879491525 GHz	39.6019	13.5480
1.880508475 GHz	39.6101	13.5545
1.881525424 GHz	39.5993	13.5640
1.882542373 GHz	39.5944	13.5639
1.883559322 GHz	39.6000	13.5661
1.884576271 GHz	39.5873	13.5679
1.885593220 GHz	39.5934	13.5757
1.886610169 GHz	39.5835	13.5817
1.887627119 GHz	39.5805	13.5893
1.888644068 GHz	39.5569	13.5831
1.889661017 GHz	39.5727	13.5967
1.890677966 GHz	39.5596	13.5928
1.891694915 GHz	39.5640	13.5837
1.892711864 GHz	39.5453	13.6133
1.893728814 GHz	39.5545	13.6071
1.894745763 GHz	39.5478	13.6321
1.895762712 GHz	39.5391	13.6164
1.896779661 GHz	39.5382	13.6316
1.897796610 GHz	39.5226	13.6145
1.898813559 GHz	39.5272	13.6382
1.899830508 GHz	39.5085	13.6349
1.900847458 GHz	39.5134	13.6404
1.901864407 GHz	39.4809	13.6341
1.902881356 GHz	39.4912	13.6481
1.903898305 GHz	39.4784	13.6352
1.904915254 GHz	39.4915	13.6534
1.905932203 GHz	39.4617	13.6513
1.906949153 GHz	39.4778	13.6556
1.907966102 GHz	39.4536	13.6620
1.908983051 GHz	39.4589	13.6494



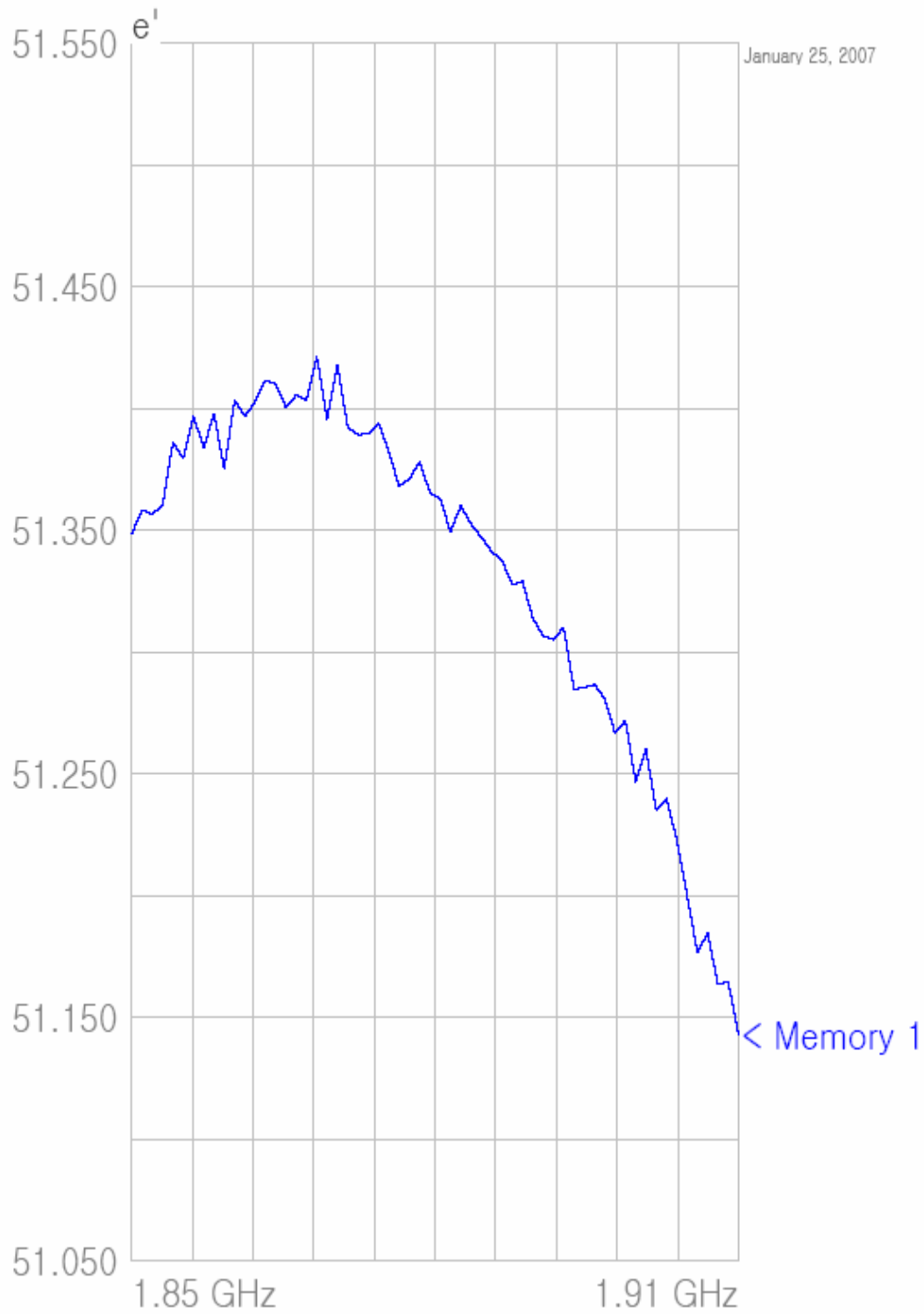
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– PCS1900 Body Tissue

Title
SubTitle

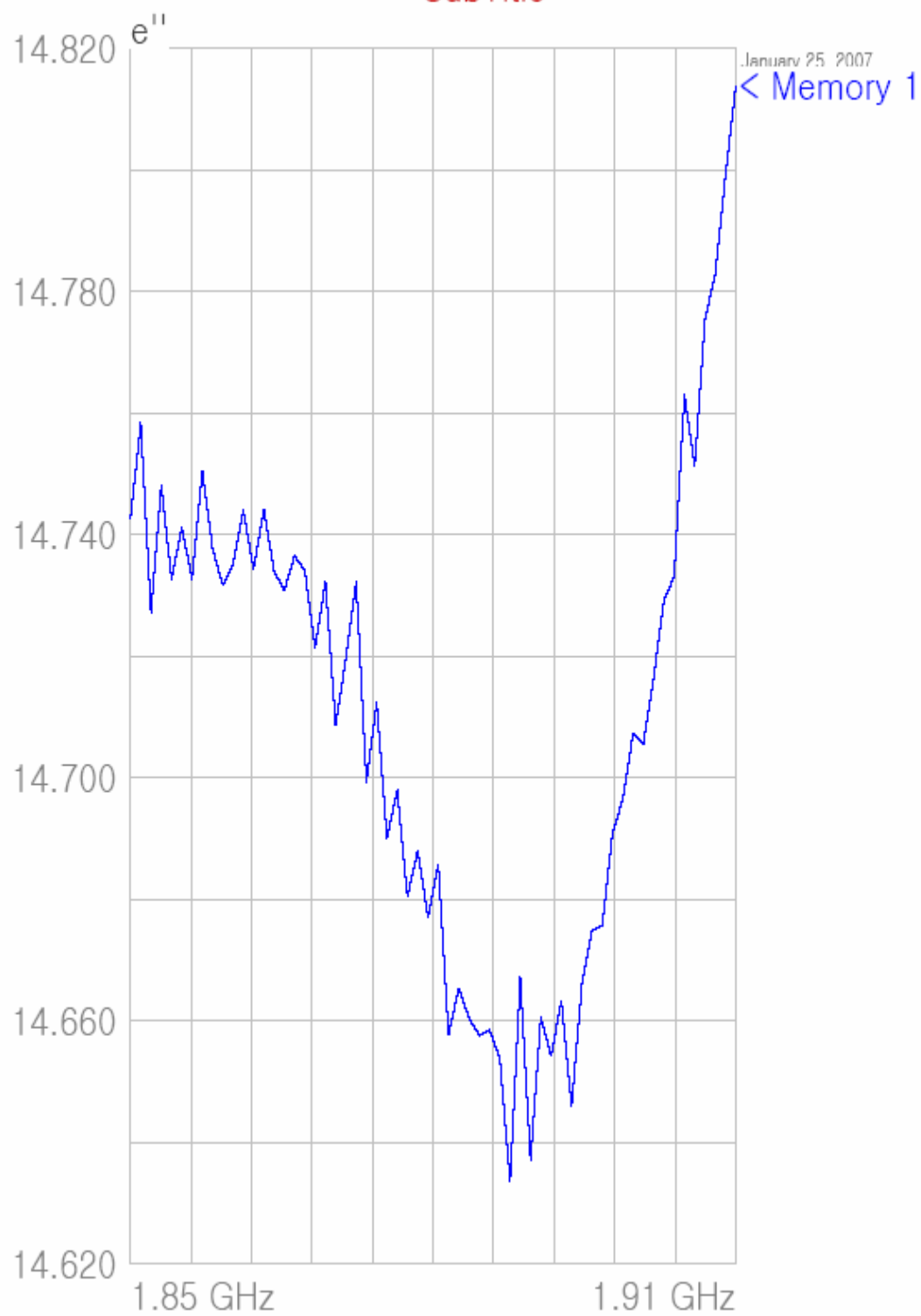


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Title

SubTitle

January 23, 2007

Frequency	e'	e''
1.950000000 GHz	51.3485	14.7426
1.951016949 GHz	51.3584	14.7584
1.952033898 GHz	51.3567	14.7272
1.953050847 GHz	51.3605	14.7482
1.954067797 GHz	51.3863	14.7326
1.955084746 GHz	51.3796	14.7413
1.956101695 GHz	51.3972	14.7327
1.957118644 GHz	51.3840	14.7505
1.958135593 GHz	51.3981	14.7377
1.959152542 GHz	51.3753	14.7317
1.960169492 GHz	51.4035	14.7353
1.961186441 GHz	51.3968	14.7440
1.962203390 GHz	51.4030	14.7344
1.963220339 GHz	51.4116	14.7442
1.964237288 GHz	51.4102	14.7340
1.965254237 GHz	51.4006	14.7309
1.966271186 GHz	51.4057	14.7366
1.967288136 GHz	51.4037	14.7340
1.968305085 GHz	51.4216	14.7214
1.969322034 GHz	51.3957	14.7324
1.970338983 GHz	51.4182	14.7087
1.971355932 GHz	51.3924	14.7197
1.972372881 GHz	51.3894	14.7323
1.973389831 GHz	51.3897	14.6993
1.974406780 GHz	51.3943	14.7124
1.975423729 GHz	51.3823	14.6901
1.976440678 GHz	51.3683	14.6960
1.977457627 GHz	51.3713	14.6805
1.978474576 GHz	51.3782	14.6860
1.979491525 GHz	51.3655	14.6771
1.980508475 GHz	51.3629	14.6858
1.981525424 GHz	51.3495	14.6577
1.982542373 GHz	51.3602	14.6654
1.983559322 GHz	51.3528	14.6605
1.984576271 GHz	51.3472	14.6576
1.985593220 GHz	51.3414	14.6585
1.986610169 GHz	51.3378	14.6539
1.987627119 GHz	51.3277	14.6336
1.988644068 GHz	51.3292	14.6672
1.989661017 GHz	51.3141	14.6371
1.890677966 GHz	51.3068	14.6606
1.891694915 GHz	51.3052	14.6542
1.892711864 GHz	51.3103	14.6633
1.893728814 GHz	51.2849	14.6459
1.894745763 GHz	51.2855	14.6660
1.895762712 GHz	51.2868	14.6749
1.896779661 GHz	51.2810	14.6758
1.897796610 GHz	51.2668	14.6911
1.898813559 GHz	51.2722	14.6965
1.899830508 GHz	51.2469	14.7074
1.900847458 GHz	51.2603	14.7056
1.901864407 GHz	51.2351	14.7165
1.902881356 GHz	51.2400	14.7293
1.903898305 GHz	51.2229	14.7331
1.904915254 GHz	51.2003	14.7630
1.905932203 GHz	51.1766	14.7513
1.906949153 GHz	51.1847	14.7755
1.907966102 GHz	51.1636	14.7828
1.908983051 GHz	51.1646	14.7991



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APPENDIX B : Validation Test Data

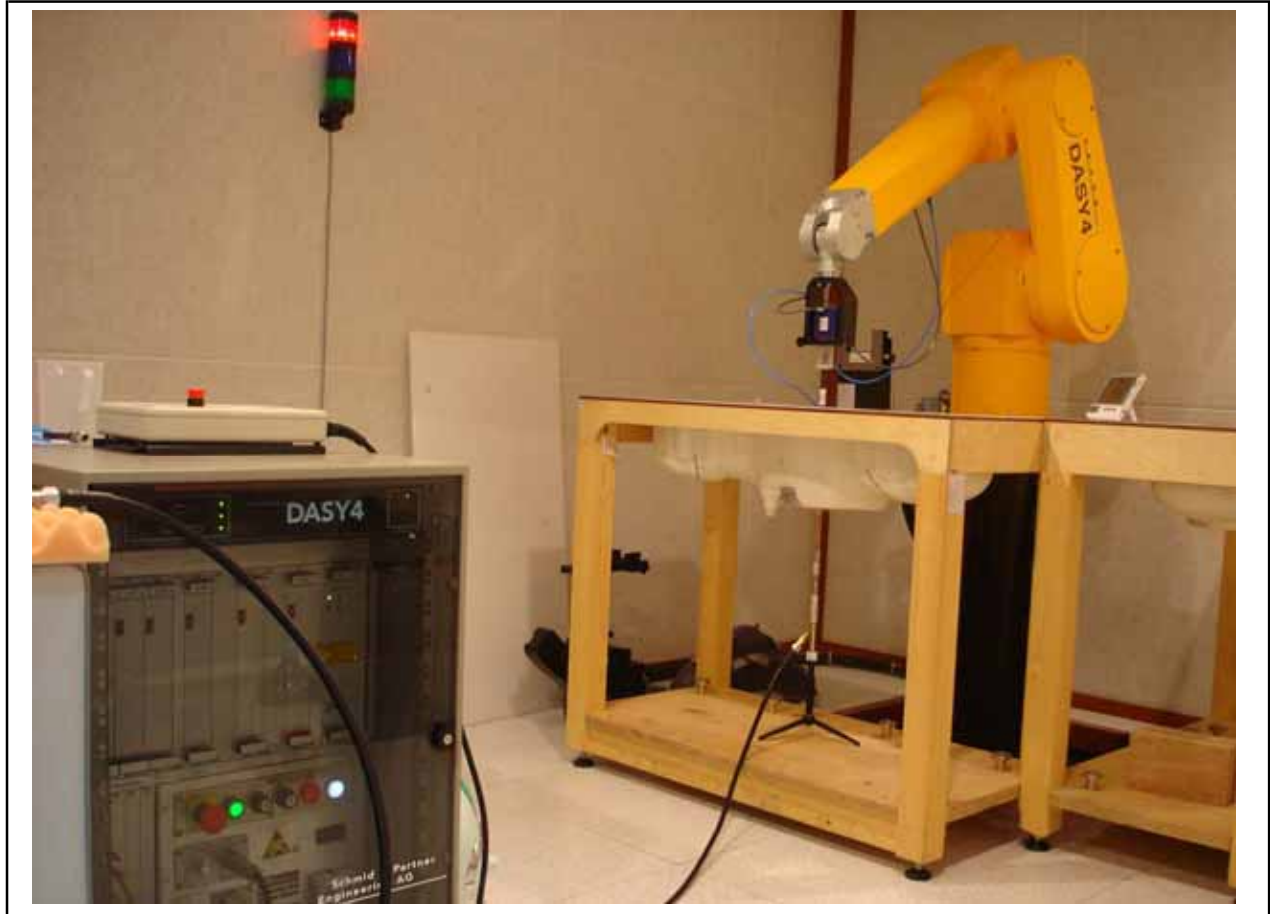


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Dipole Validation





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– GSM850 Validation

Date: 2007-01-25

Test Laboratory: ESTECH

VALIDATION

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:xxx

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

Medium parameters used: $f = 835$ MHz; $\sigma = 0.915$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASYS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.42, 6.42, 6.42); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.54 mW/g

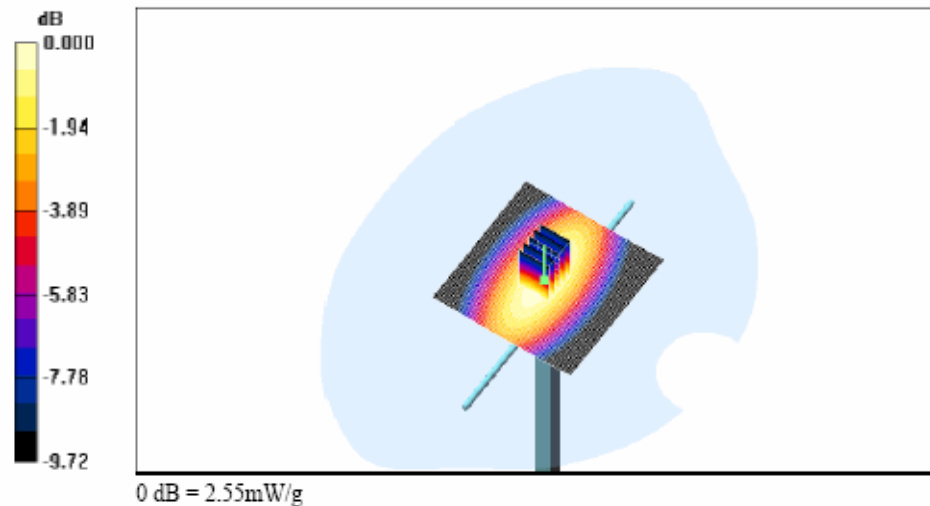
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.5 V/m; Power Drift = -0.016 dB

Peak SAR (extrapolated) = 3.53 W/kg

SAR(1 g) = 2.37 mW/g

Maximum value of SAR (measured) = 2.55 mW/g



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- PCS1900 Validation

Date: 2007-01-25

Test Laboratory: ESTECH

VALIDATION

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:xxx

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

Medium parameters used (interpolated): $f = 1900$ MHz; $\sigma = 1.44$ mho/m; $\epsilon_r = 39.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(5.08, 5.08, 5.08); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800MHz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 11.9 mW/g

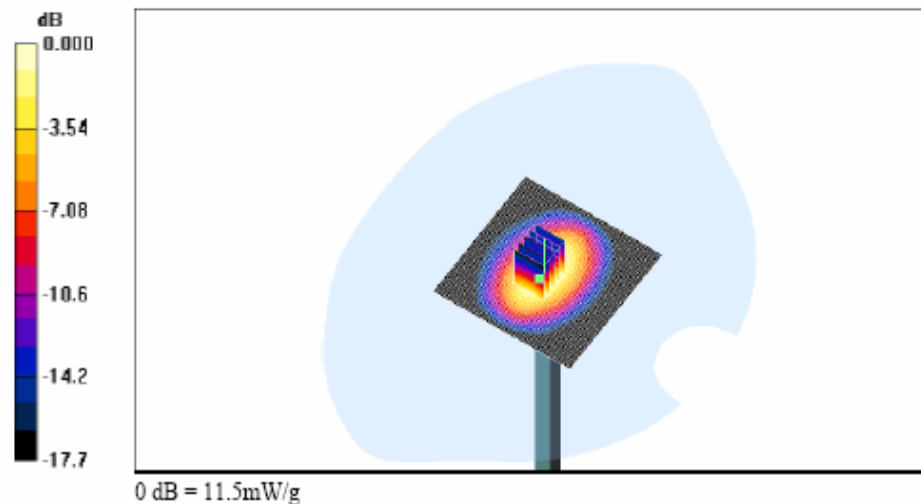
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.5 V/m; Power Drift = -0.019 dB

Peak SAR (extrapolated) = 19.6 W/kg

SAR(1 g) = 10.2 mW/g

Maximum value of SAR (measured) = 11.5 mW/g





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APPENDIX C : SAR Test Data

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– GSM850

Date: 2007-01-25

Test Laboratory: ESTECH

LEFT TOUCH 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 837$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.42, 6.42, 6.42); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.461 mW/g

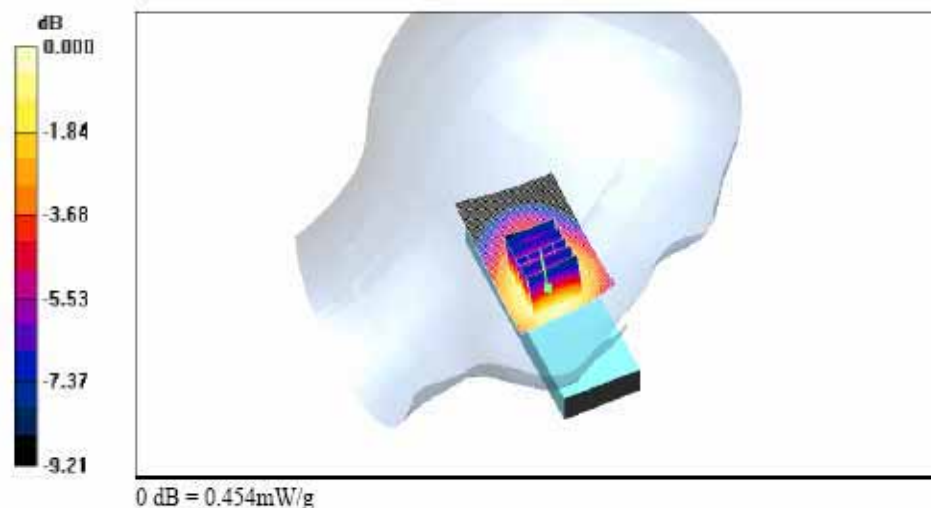
Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=6mm

Reference Value = 8.91 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 0.559 W/kg

SAR(1 g) = 0.430 mW/g; SAR(10 g) = 0.312 mW/g

Maximum value of SAR (measured) = 0.454 mW/g



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Date: 2007-01-25

Test Laboratory: ESTECH

LEFT TOUCH BT-ON 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 837$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.42, 6.42, 6.42); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.500 mW/g

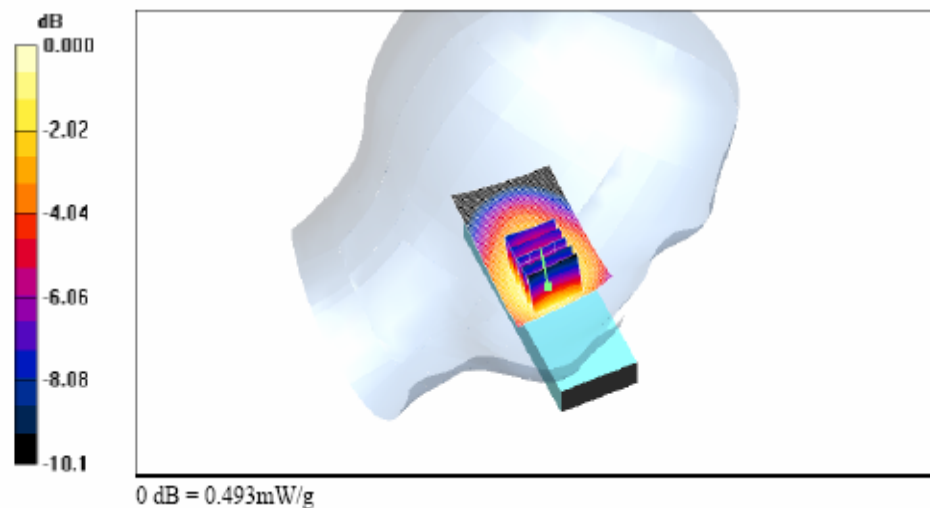
Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=6mm

Reference Value = 10.8 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 0.639 W/kg

SAR(1 g) = 0.463 mW/g; SAR(10 g) = 0.328 mW/g

Maximum value of SAR (measured) = 0.493 mW/g



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Date: 2007-01-25

Test Laboratory: ESTECH

LEFT TOUCH BT-ON 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

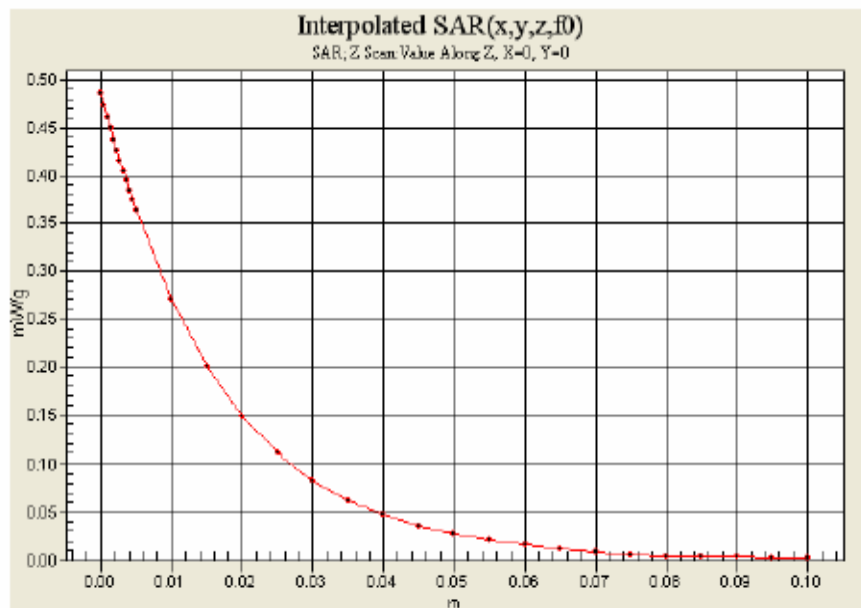
Medium parameters used: $f = 837$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.42, 6.42, 6.42); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%



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Date: 2007-01-25

Test Laboratory: ESTECH

RIGHT TOUCH 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 837$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.42, 6.42, 6.42); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.448 mW/g

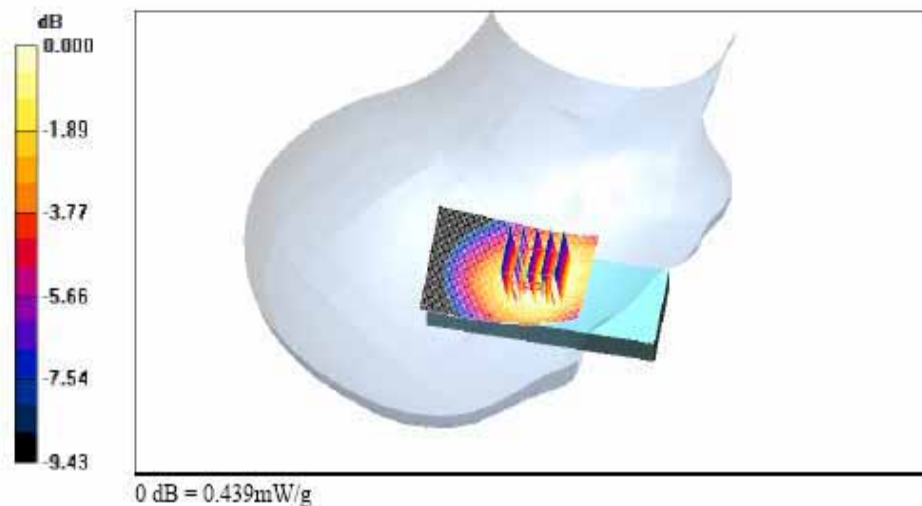
Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=6mm

Reference Value = 9.07 V/m; Power Drift = 0.095 dB

Peak SAR (extrapolated) = 0.538 W/kg

SAR(1 g) = 0.420 mW/g; SAR(10 g) = 0.303 mW/g

Maximum value of SAR (measured) = 0.439 mW/g



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Date: 2007-01-25

Test Laboratory: ESTECH

LEFT TILT 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.918 \text{ mho/m}$; $\epsilon_r = 40.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.42, 6.42, 6.42); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.196 mW/g

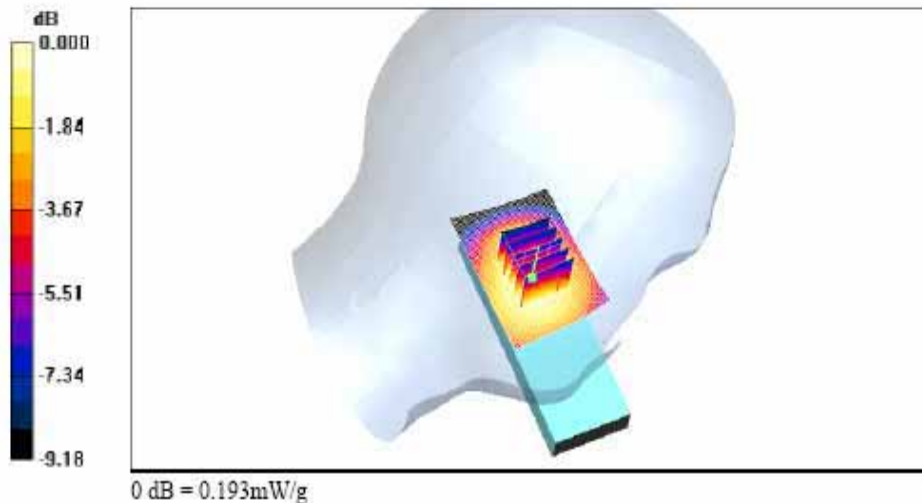
Zoom Scan (5x5x6)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=6\text{mm}$

Reference Value = 9.65 V/m; Power Drift = 0.009 dB

Peak SAR (extrapolated) = 0.239 W/kg

SAR(1 g) = 0.182 mW/g; SAR(10 g) = 0.134 mW/g

Maximum value of SAR (measured) = 0.193 mW/g



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Date: 2007-01-25

Test Laboratory: ESTECH

RIGHT TILT 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 837$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DAS4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.42, 6.42, 6.42); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.455 mW/g

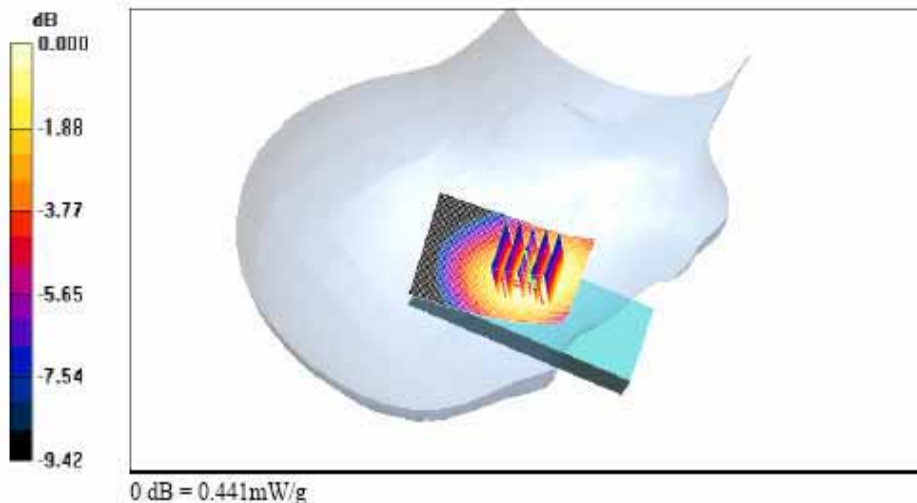
Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=6mm

Reference Value = 9.15 V/m; Power Drift = 0.032 dB

Peak SAR (extrapolated) = 0.546 W/kg

SAR(1 g) = 0.421 mW/g; SAR(10 g) = 0.304 mW/g

Maximum value of SAR (measured) = 0.441 mW/g



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Date: 2007-01-25

Test Laboratory: ESTECH

BODY FRONT 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 837 \text{ MHz}$; $\sigma = 0.968 \text{ mho/m}$; $\epsilon_r = 53.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.32, 6.32, 6.32); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%

Area Scan (41x71x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.271 mW/g

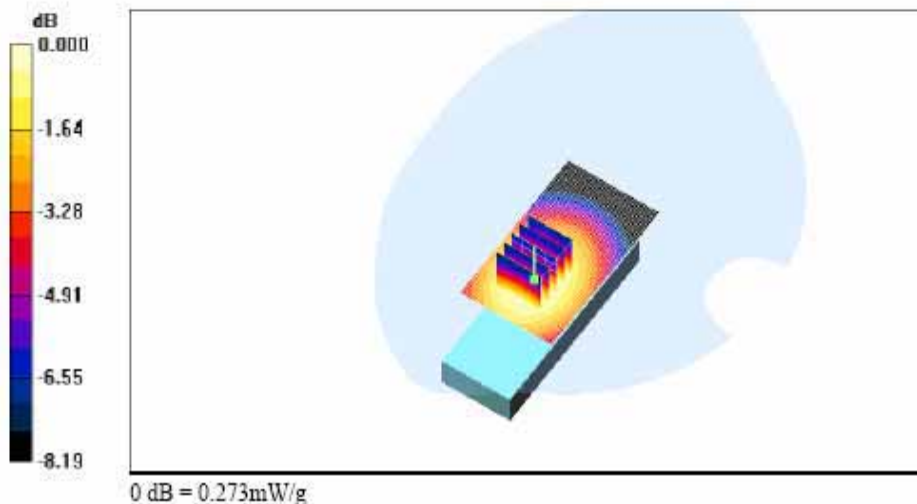
Zoom Scan (5x5x6)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=6\text{mm}$

Reference Value = 7.41 V/m; Power Drift = 0.060 dB

Peak SAR (extrapolated) = 0.325 W/kg

SAR(1 g) = 0.258 mW/g; SAR(10 g) = 0.192 mW/g

Maximum value of SAR (measured) = 0.273 mW/g



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Date: 2007-01-25

Test Laboratory: ESTECH

BODY REAR 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 837$ MHz; $\sigma = 0.968$ mho/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.32, 6.32, 6.32); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%

Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.553 mW/g

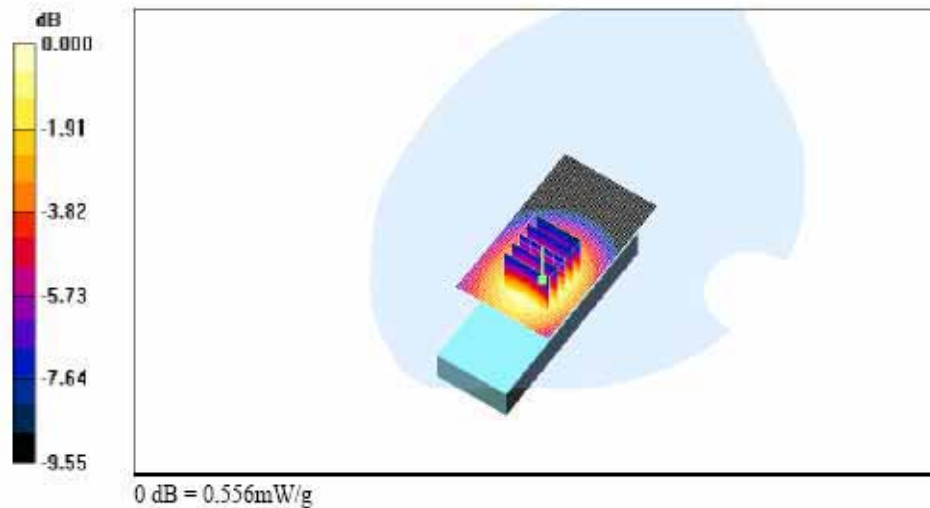
Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=6mm

Reference Value = 5.47 V/m; Power Drift = -0.026 dB

Peak SAR (extrapolated) = 0.697 W/kg

SAR(1 g) = 0.522 mW/g; SAR(10 g) = 0.368 mW/g

Maximum value of SAR (measured) = 0.556 mW/g



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Date: 2007-01-25

Test Laboratory: ESTECH

BODY REAR GPRS BT-ON 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used: $f = 837$ MHz; $\sigma = 0.968$ mho/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.32, 6.32, 6.32); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%

Area Scan (41x71x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.965 mW/g

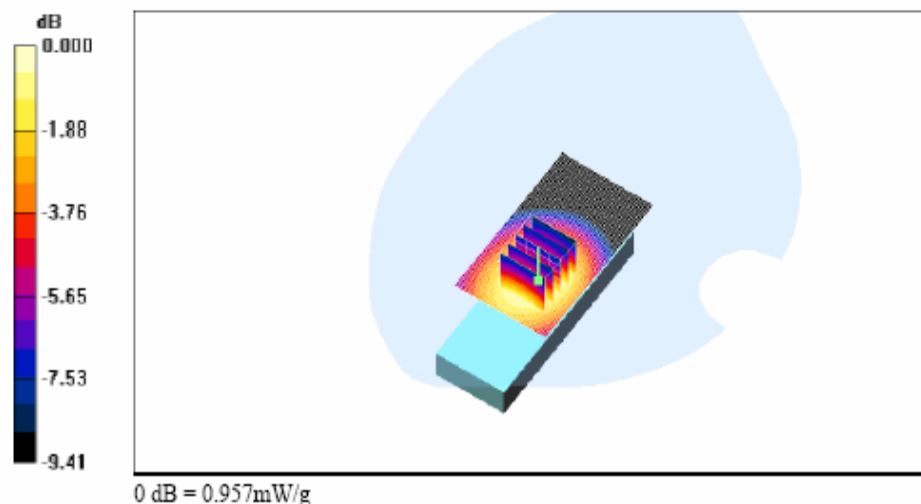
Zoom Scan (5x5x6)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=6mm

Reference Value = 7.19 V/m; Power Drift = -0.003 dB

Peak SAR (extrapolated) = 1.20 W/kg

SAR(1 g) = 0.908 mW/g; SAR(10 g) = 0.644 mW/g

Maximum value of SAR (measured) = 0.957 mW/g



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BODY REAR GPRS BT-ON 190

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

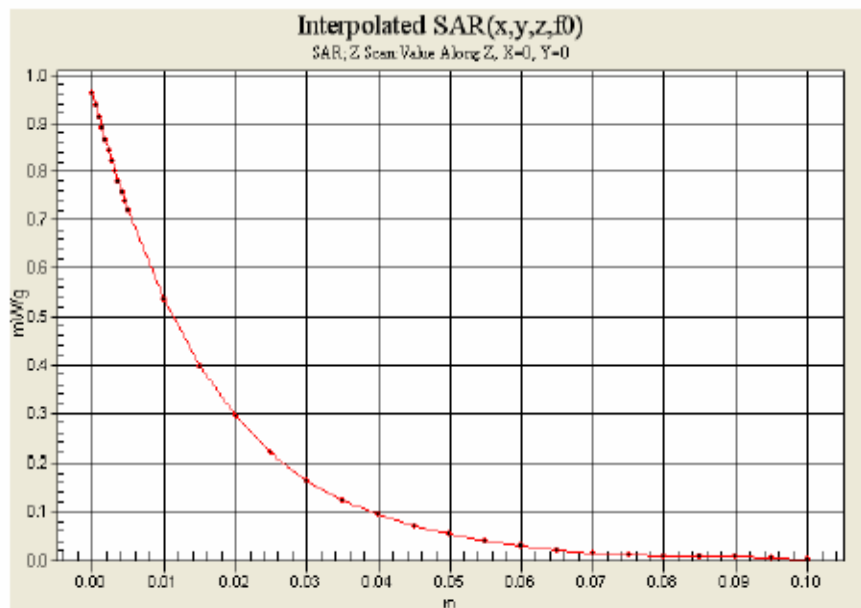
Medium parameters used: $f = 837$ MHz; $\sigma = 0.968$ mho/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(6.32, 6.32, 6.32); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%



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– PCCS1900

Date: 2007-01-25

Test Laboratory: ESTECH

LEFT TOUCH 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(5.08, 5.08, 5.08); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800Mhz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.289 mW/g

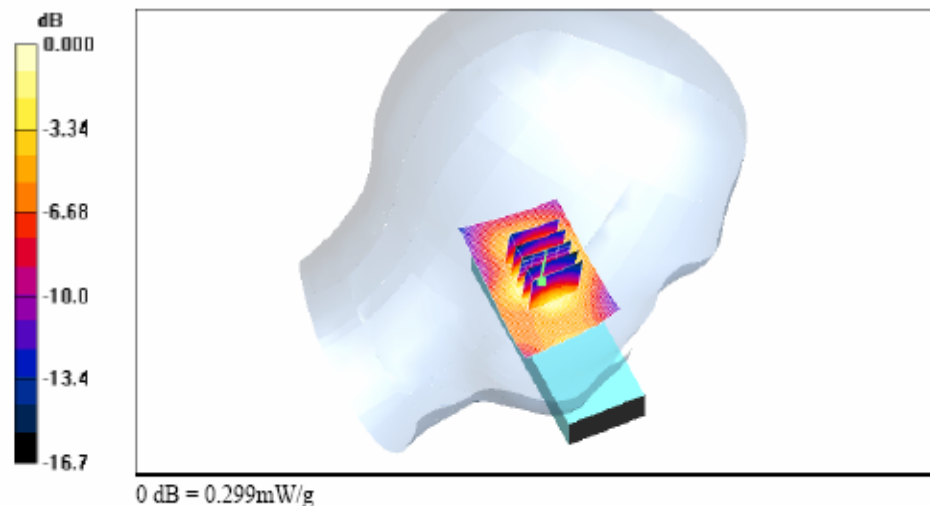
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 7.50 V/m; Power Drift = -0.070 dB

Peak SAR (extrapolated) = 0.448 W/kg

SAR(1 g) = 0.266 mW/g; SAR(10 g) = 0.149 mW/g

Maximum value of SAR (measured) = 0.299 mW/g



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Test Laboratory: ESTECH

RIGHT TOUCH 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(5.08, 5.08, 5.08); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800MHz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.404 mW/g

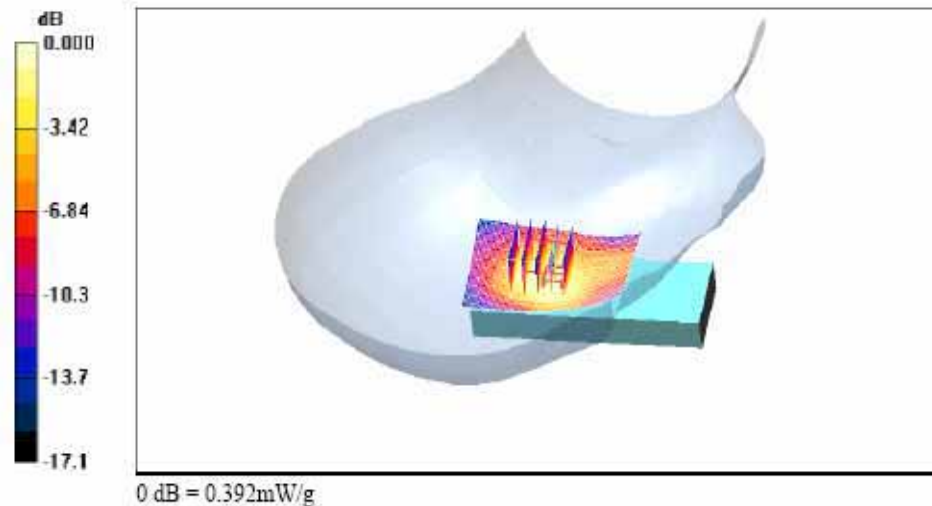
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 6.07 V/m; Power Drift = 0.038 dB

Peak SAR (extrapolated) = 0.581 W/kg

SAR(1 g) = 0.351 mW/g; SAR(10 g) = 0.207 mW/g

Maximum value of SAR (measured) = 0.392 mW/g



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RIGHT TOUCH 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

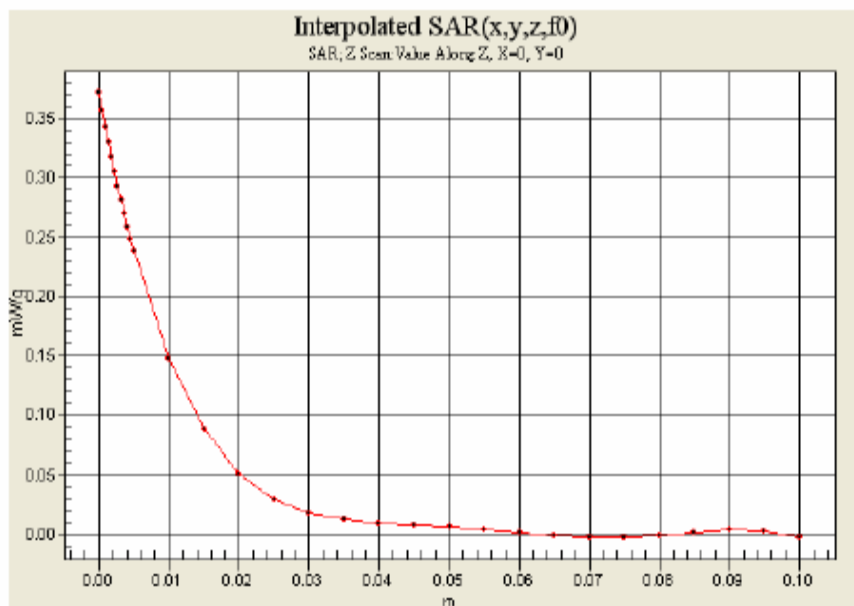
Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(5.08, 5.08, 5.08); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800Mhz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%



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Test Laboratory: ESTECH

RIGHT TOUCH BT-ON 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(5.08, 5.08, 5.08); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800MHz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.341 mW/g

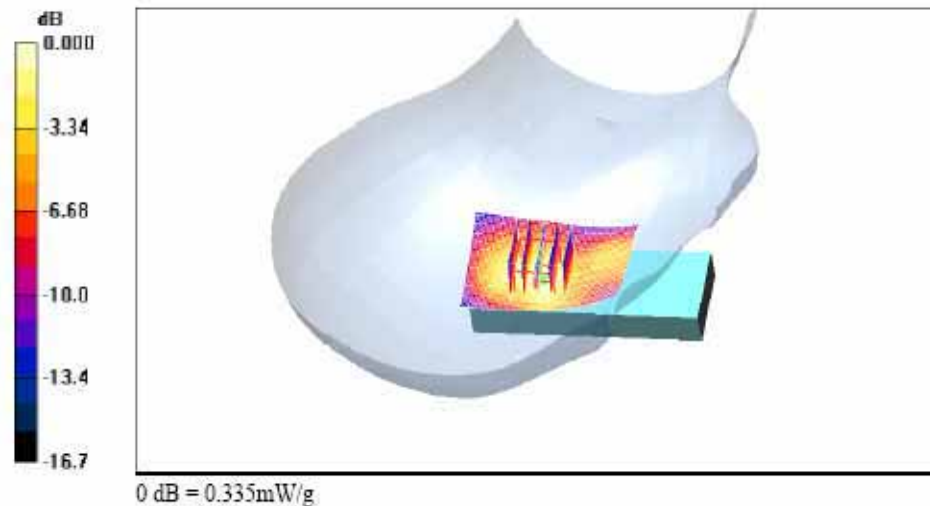
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 8.22 V/m; Power Drift = -0.103 dB

Peak SAR (extrapolated) = 0.542 W/kg

SAR(1 g) = 0.304 mW/g; SAR(10 g) = 0.173 mW/g

Maximum value of SAR (measured) = 0.335 mW/g



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LEFT TILT 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(5.08, 5.08, 5.08); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800MHz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.209 mW/g

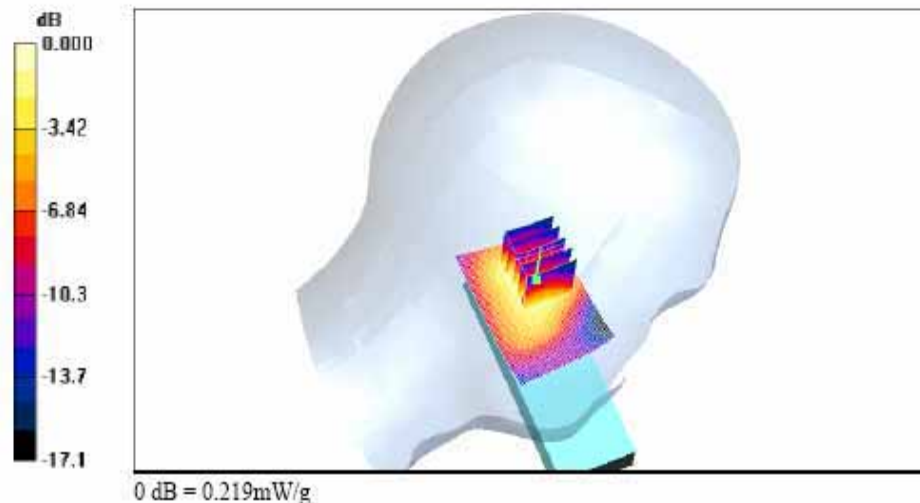
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 8.90 V/m; Power Drift = 0.025 dB

Peak SAR (extrapolated) = 0.314 W/kg

SAR(1 g) = 0.201 mW/g; SAR(10 g) = 0.118 mW/g

Maximum value of SAR (measured) = 0.219 mW/g



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Test Laboratory: ESTECH

RIGHT TILT 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.6$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(5.08, 5.08, 5.08); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800MHz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.232 mW/g

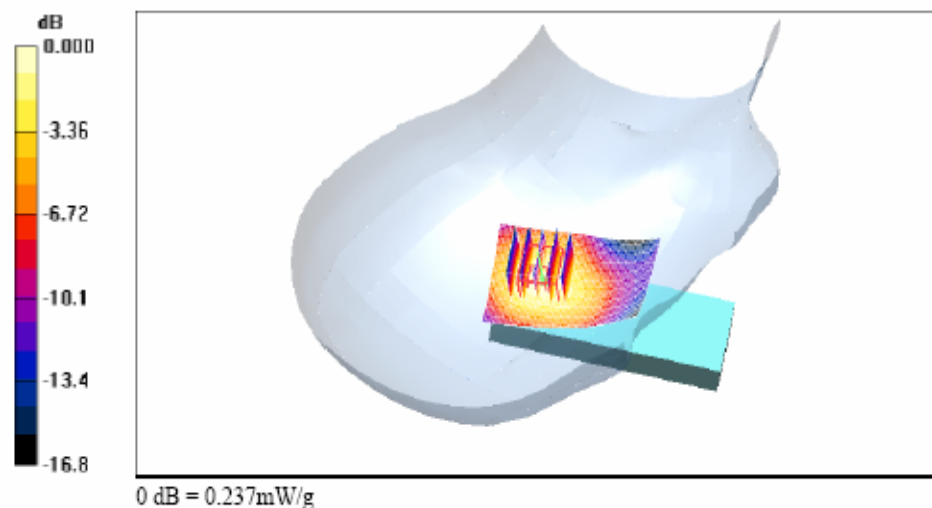
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 8.97 V/m; Power Drift = -0.113 dB

Peak SAR (extrapolated) = 0.347 W/kg

SAR(1 g) = 0.220 mW/g; SAR(10 g) = 0.127 mW/g

Maximum value of SAR (measured) = 0.237 mW/g



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Date: 2007-01-25

Test Laboratory: ESTECH

BODY FRONT 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.65, 4.65, 4.65); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800MHz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.099 mW/g

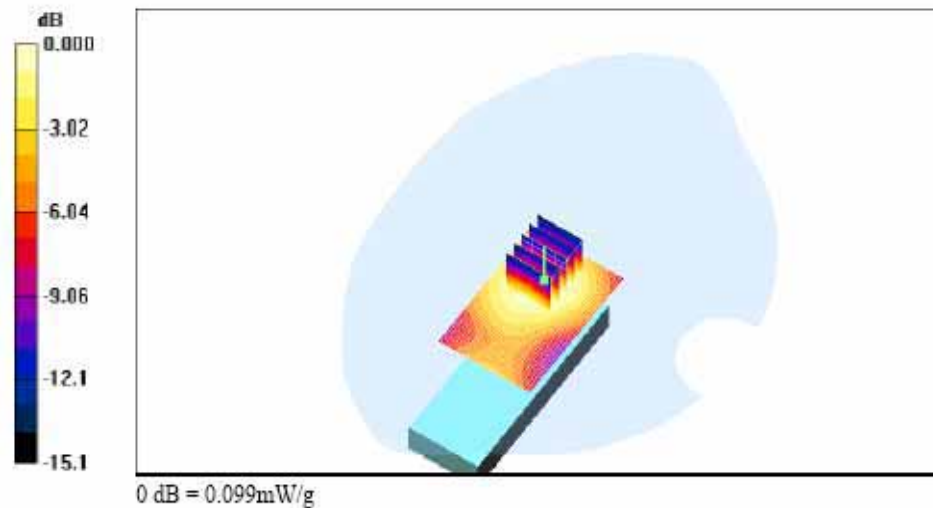
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 7.01 V/m; Power Drift = -0.116 dB

Peak SAR (extrapolated) = 0.144 W/kg

SAR(1 g) = 0.092 mW/g; SAR(10 g) = 0.057 mW/g

Maximum value of SAR (measured) = 0.099 mW/g



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Date: 2007-01-25

Test Laboratory: ESTECH

BODY REAR 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.65, 4.65, 4.65); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800Mhz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.498 mW/g

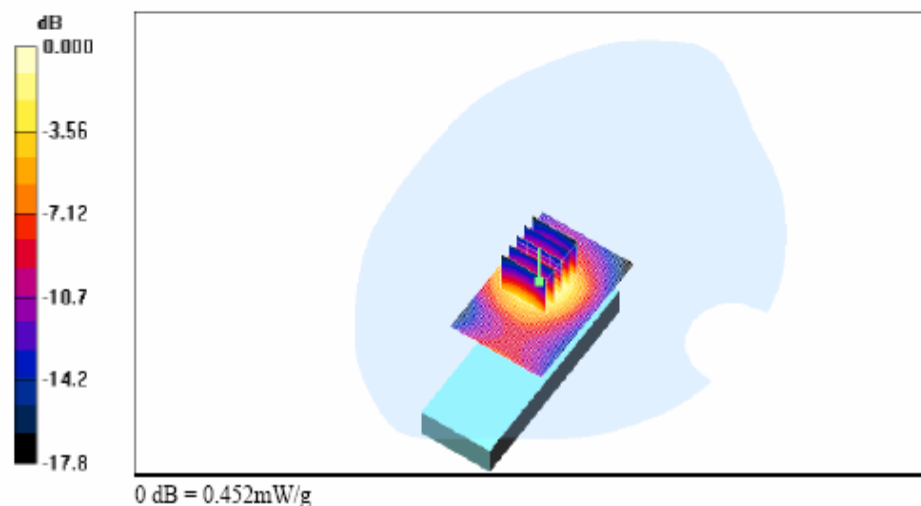
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 6.09 V/m; Power Drift = 0.119 dB

Peak SAR (extrapolated) = 0.716 W/kg

SAR(1 g) = 0.408 mW/g; SAR(10 g) = 0.221 mW/g

Maximum value of SAR (measured) = 0.452 mW/g



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Test Laboratory: ESTECH

BODY REAR GPRS BT-ON 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.65, 4.65, 4.65); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800MHz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22 °C, Humidity : 45%

Area Scan (41x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.926 mW/g

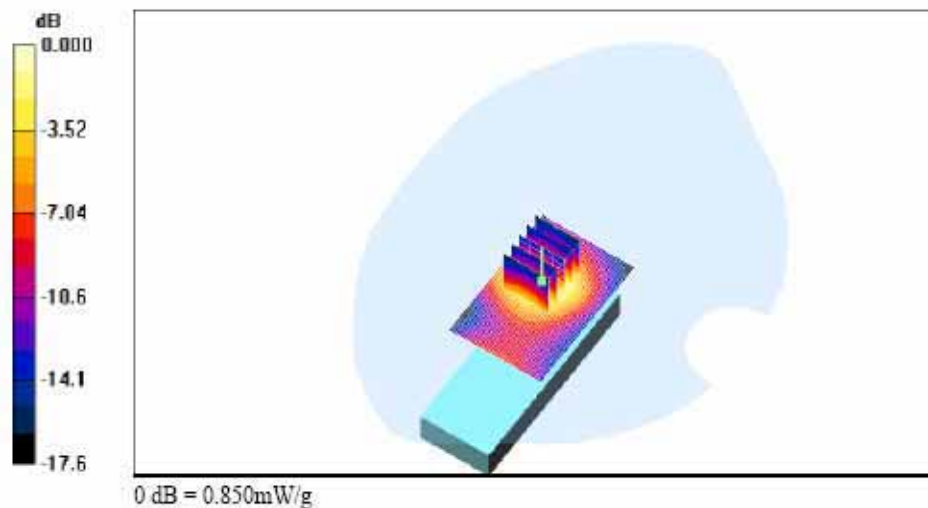
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 9.79 V/m; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 1.35 W/kg

SAR(1 g) = 0.766 mW/g; SAR(10 g) = 0.413 mW/g

Maximum value of SAR (measured) = 0.850 mW/g



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BODY REAR GPRS BT-ON 661

DUT: ME830d; Type: SLIDE UP; Serial: NONE

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:4.15

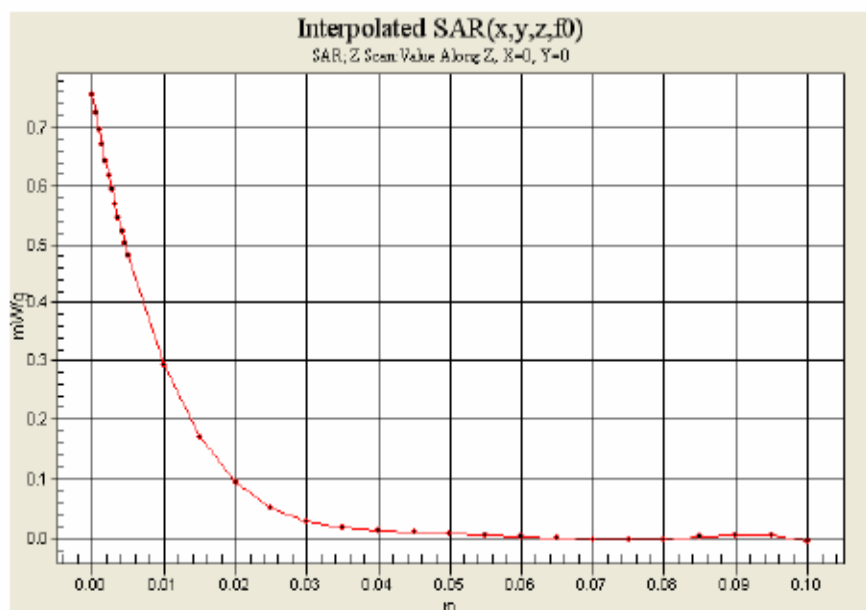
Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV3 - SN3123; ConvF(4.65, 4.65, 4.65); Calibrated: 2006-10-17
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn551; Calibrated: 2006-04-27
- Phantom: SAM MIC 1800MHz; Type: SAM MIC 1800MHz; Serial: TP-1263
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 161
- Temperature : 22°C, Humidity : 45%





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APPENDIX D : Calibration Certificates

IMPORTANT NOTICE

USAGE OF PROBES IN ORGANIC SOLVENTS

Diethylene Glycol Monobutyl Ether (the basis for liquids above 1 GHz), as many other organic solvents, is a very effective softener for synthetic materials. These solvents can cause irreparable damage to certain SPEAG products, except those which are explicitly declared as compliant with organic solvents.

Compatible Probes:

- ET3DV6
- ET3DV6R
- ES3DVx
- EX3DVx
- ER3DV6
- H3DV6

Important Note for ET3DV6 Probes:

The ET3DV6 probes shall not be exposed to solvents longer than necessary for the measurements and shall be cleaned daily after use with warm water and stored dry.



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Schmid & Partner Engineering AG



Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Estech (Dymstec)**

Certificate No: **ES3-3123_Oct06**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3123**

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

Calibration date: **October 17, 2006**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

Calibrated by: **Name: Katja Pokovic, Function: Technical Manager**

Approved by: **Name: Niels Kuster, Function: Quality Manager**

Issued: October 17, 2006

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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConF	sensitivity in TSL / NORM _{x,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., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z}** = NORM_{x,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*.
- DCP_{x,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 $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,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 ES3DV3

SN:3123

Manufactured:	July 11, 2006
Calibrated:	October 17, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3123

Sensitivity in Free Space^A

Diode Compression^B

NormX	1.31 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	96 mV
NormY	1.34 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	94 mV
NormZ	1.10 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	96 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	5.7	2.3
SAR _{be} [%]	With Correction Algorithm	0.0	0.1

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	3.8	1.5
SAR _{be} [%]	With Correction Algorithm	0.0	0.2

Sensor Offset

Probe Tip to Sensor Center **2.0 mm**

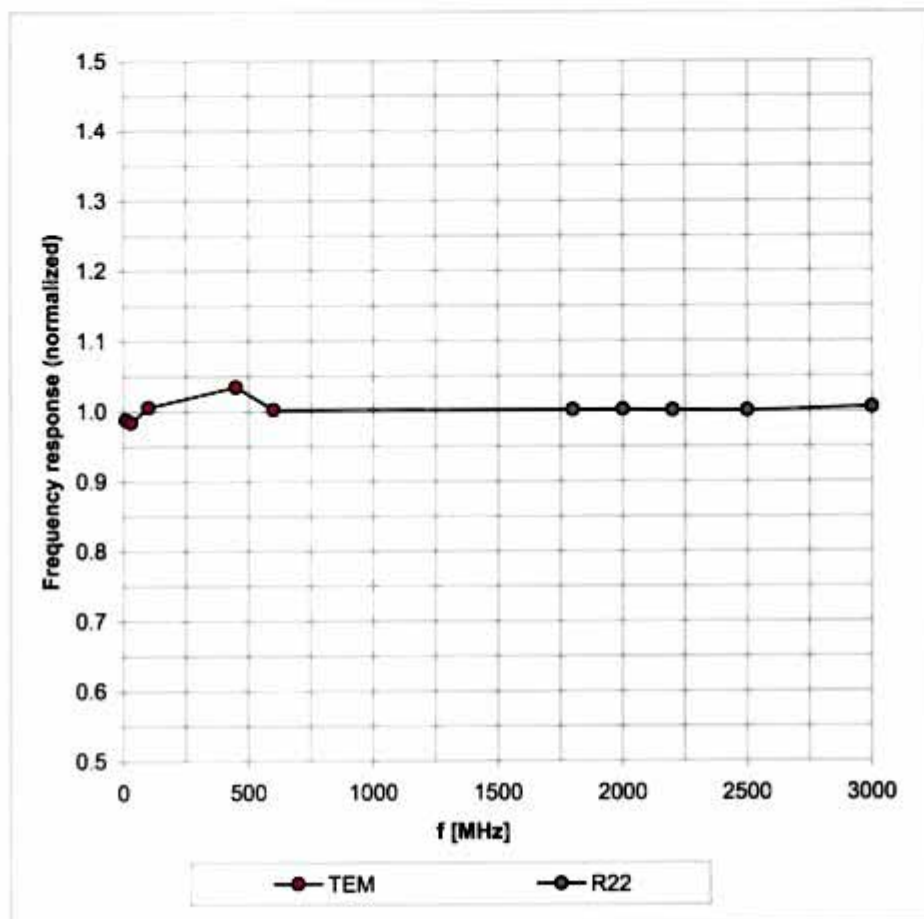
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

^B Numerical linearization parameter: uncertainty not required.

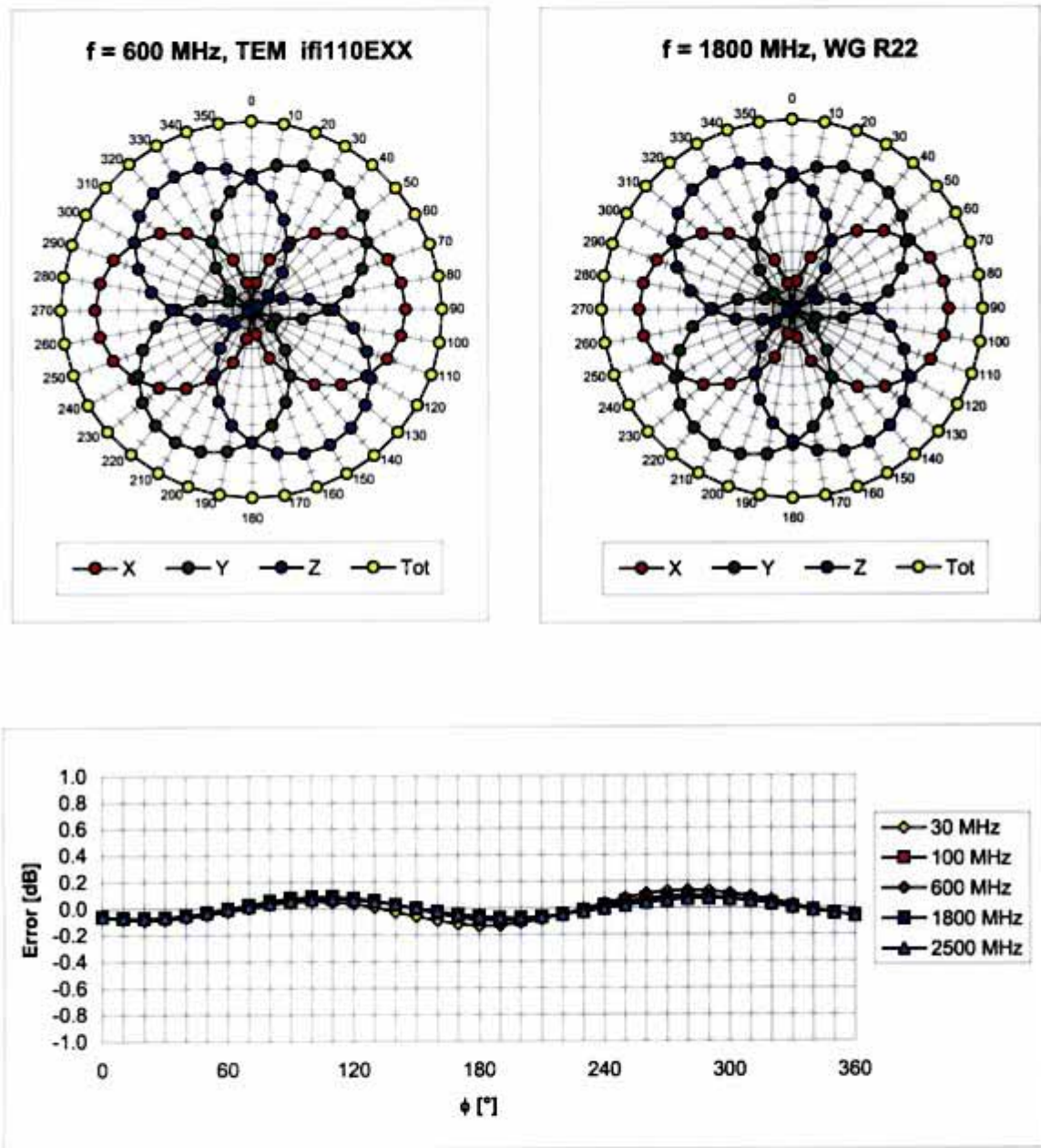
Frequency Response of E-Field

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



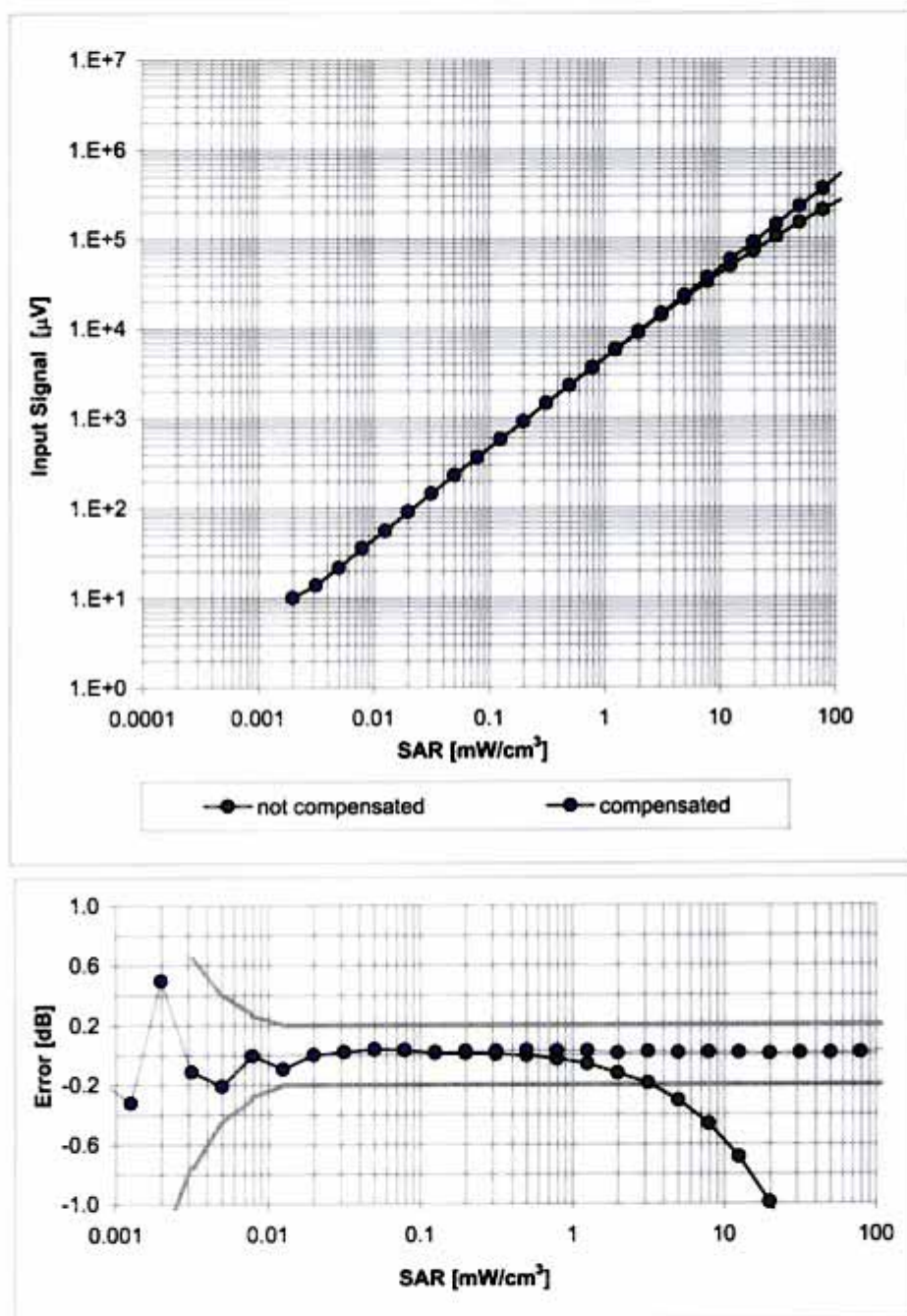
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$



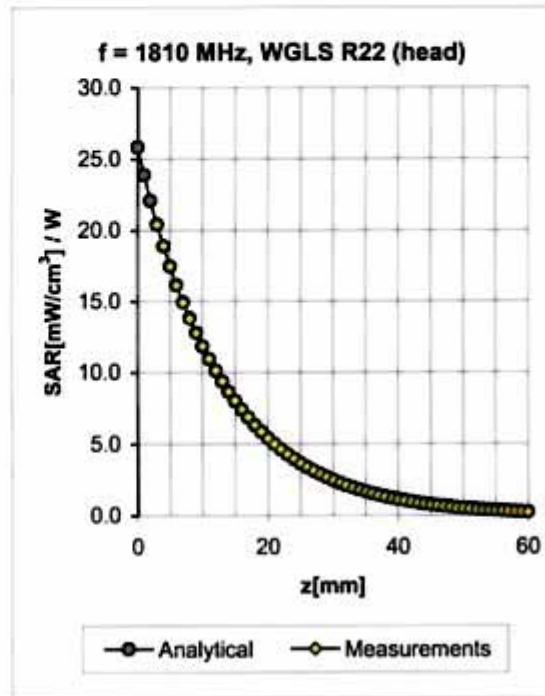
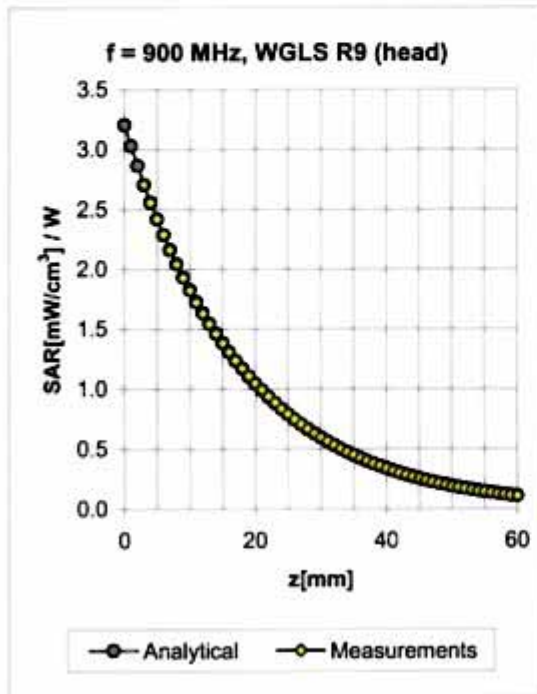
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



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

Conversion Factor Assessment

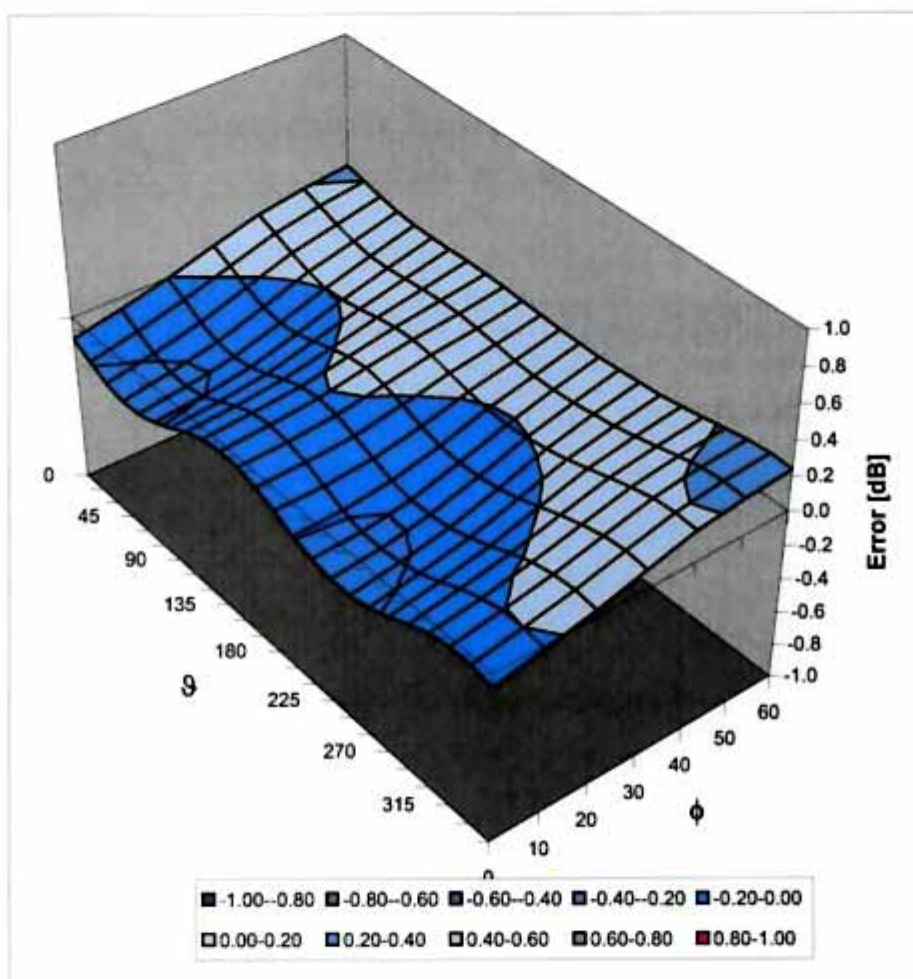


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.00	1.09	6.42 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.92	1.16	5.23 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.79	1.29	5.08 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.87	1.17	4.66 ± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	1.00	1.17	6.32 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.85	1.26	4.81 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.75	1.37	4.65 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.87	0.91	4.32 ± 11.8% (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: $\pm 2.6\%$ ($k=2$)



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Accreditation No.: **SCS 108**

Client **Estech (Dymstec)**

Certificate No: **D835V2-475_Sep06**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 475**

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

Calibration date: **September 12, 2006**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ET3DV6	SN 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 13, 2006

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.7 $\pm$ 6 %	0.89 mho/m $\pm$ 6 %
Head TSL temperature during test	(23.6 $\pm$ 0.2) °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	2.29 mW / g
SAR normalized	normalized to 1W	9.16 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	9.25 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.49 mW / g
SAR normalized	normalized to 1W	5.96 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	6.00 mW / g $\pm$ 16.5 % (k=2)

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$51.7 \Omega - 0.5 j\Omega$
Return Loss	- 35.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.383 ns
----------------------------------	----------

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 15, 2002

DASY4 Validation Report for Head TSL

Date/Time: 12.09.2006 18:38:05

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 475

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

Medium: HSL 900 MHz;

Medium parameters used: $f = 835$ MHz; $\sigma = 0.893$ mho/m; $\epsilon_r = 42.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(6.09, 6.09, 6.09); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:

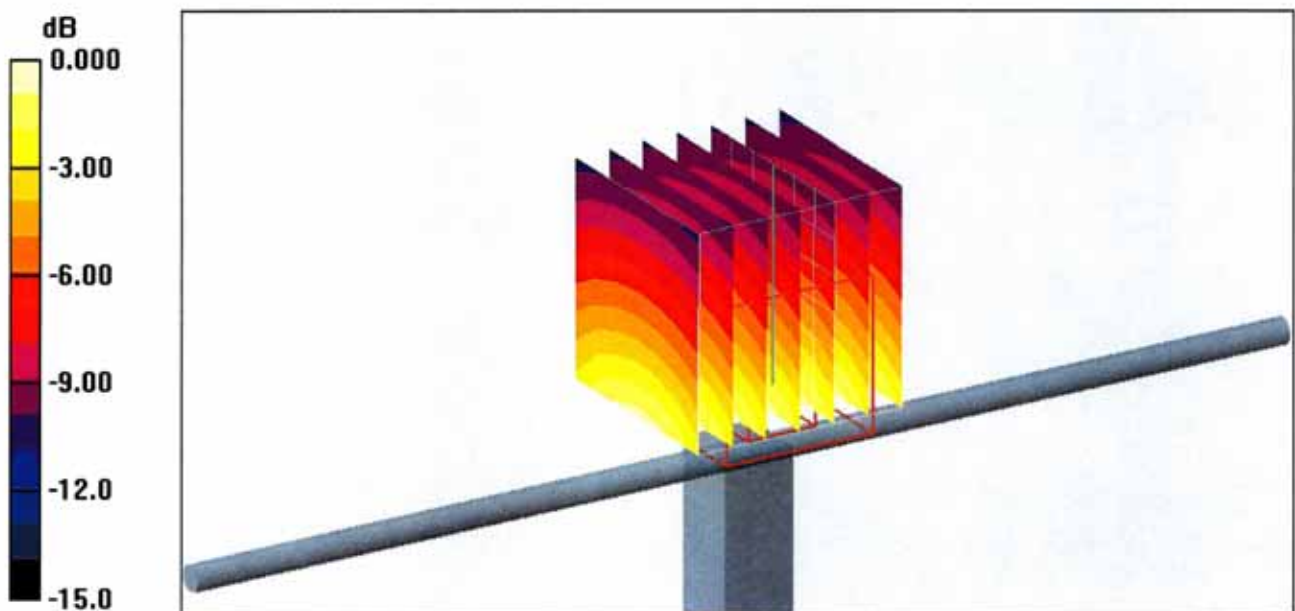
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.6 V/m; Power Drift = -0.033 dB

Peak SAR (extrapolated) = 3.41 W/kg

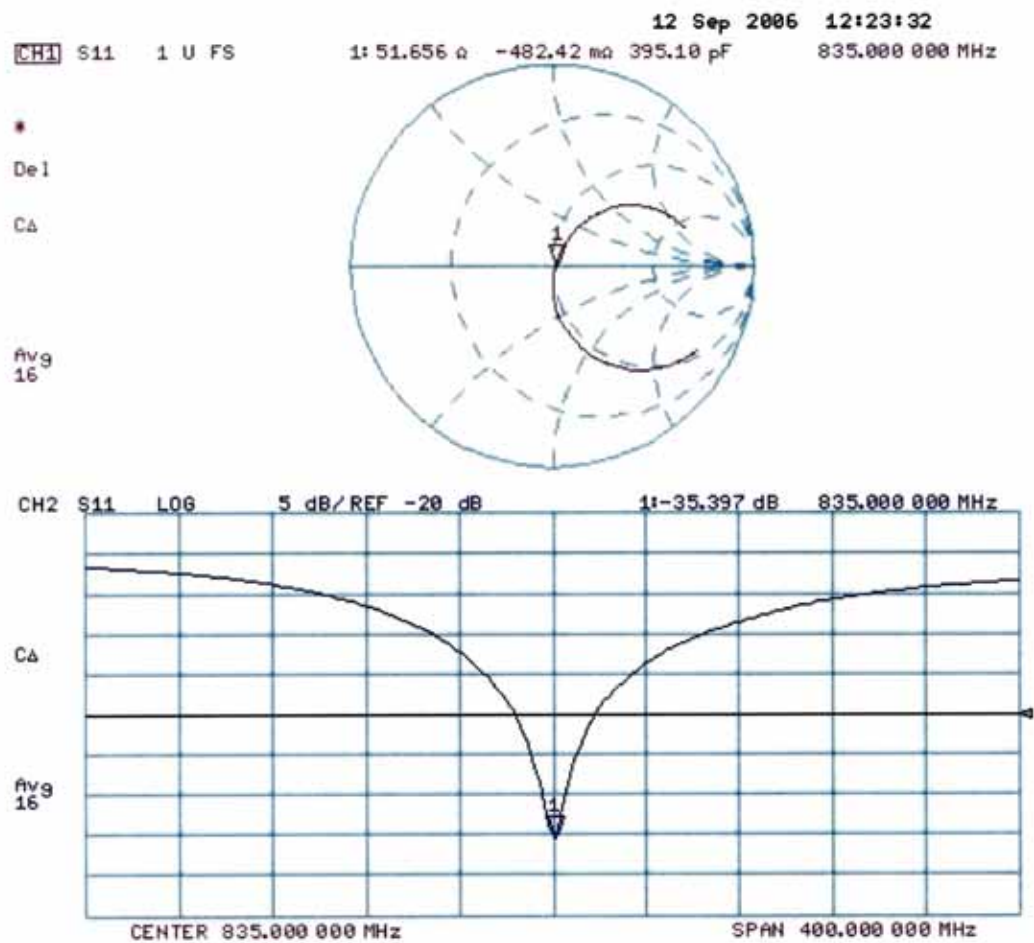
SAR(1 g) = 2.29 mW/g; SAR(10 g) = 1.49 mW/g

Maximum value of SAR (measured) = 2.48 mW/g



0 dB = 2.48mW/g

Impedance Measurement Plot for Head TSL





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Accreditation No.: **SCS 108**

Client **Estech (Dymstec)**

Certificate No: **D1900V2-5d058_Sep06**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d058**

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

Calibration date: **September 13, 2006**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ET3DV6	SN: 1507	28-Oct-05 (SPEAG, No. ET3-1507_Oct05)	Oct-06
DAE4	SN: 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

Calibrated by: **Name** **Marcel Fehr** **Function** **Laboratory Technician**

Signature

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

Issued: September 20, 2006

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	38.6 $\pm$ 6 %	1.41 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.4 $\pm$ 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	9.33 mW / g
SAR normalized	normalized to 1W	37.3 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	36.5 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	4.95 mW / g
SAR normalized	normalized to 1W	19.8 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	19.5 mW / g $\pm$ 16.5 % (k=2)

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$54.9\ \Omega + 3.4\ j\Omega$
Return Loss	- 24.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.202 ns
----------------------------------	----------

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 19, 2004

DASY4 Validation Report for Head TSL

Date/Time: 13.09.2006 15:41:51

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d058

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

Medium: HSL U10 BB;

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.41$ mho/m; $\epsilon_r = 38.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.74, 4.74, 4.74); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

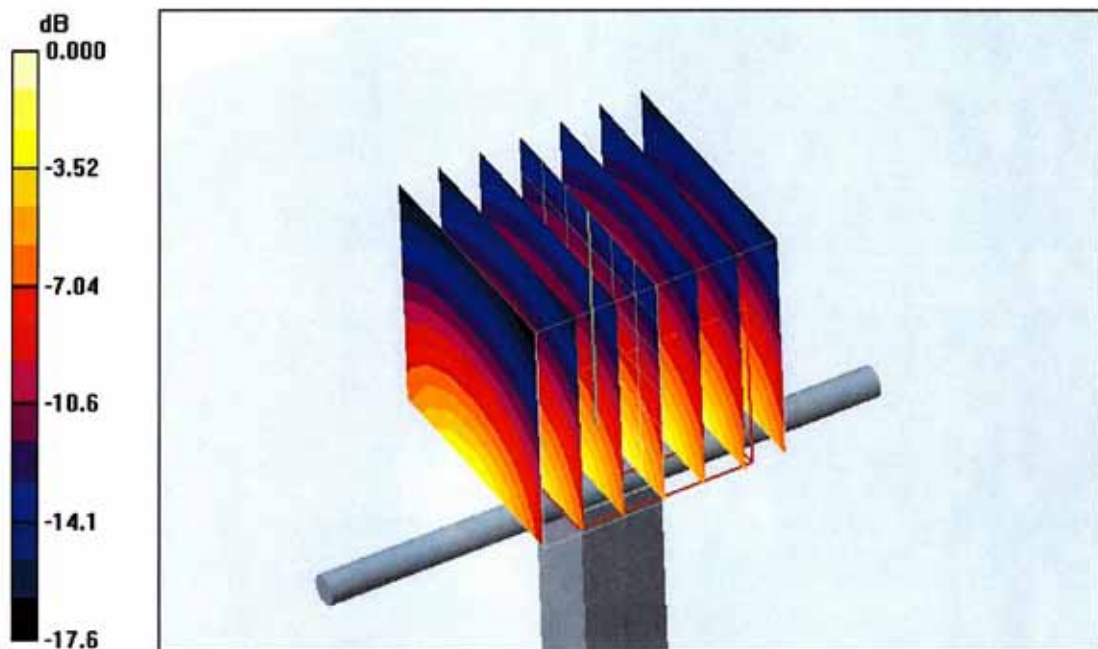
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 92.6 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 15.8 W/kg

SAR(1 g) = 9.33 mW/g; SAR(10 g) = 4.95 mW/g

Maximum value of SAR (measured) = 10.5 mW/g



0 dB = 10.5mW/g

Impedance Measurement Plot for Head TSL

