



ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

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 : 9 February 2007 ~ 26 February 2007
Test Site : ESTECH Co., Ltd. Korea

Test Device :

Models : PW560

FCC ID : BEJPW560

TYPE : Dual Band CDMA Phone (Prototype)

Test report no :

ESTSAR0702-002

Number of page :

25

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 : 26 February2007

Report Prepared By : Engineer/ I.K.Hong

(Signatur

Engineering Manager/ Jay Kim

(Signature)

Test report no : ESTSAR0702-002

FCC ID : BEJPW560

Web : www. estech. co. kr

Page 1 of 25



Table of Contents

1. SUMMARY FOR SAR TET REPORT	3
1.1 Head Configuration	3
1.2 Body Worn Configuration	3
1.3 Measurement Uncertainty	3
2. INTRODUCTION	4
3. DESCRIPTION OF THE DEVICE UNDER TEST	5
3.1 Antenna Description	5
3.2 Device Description	5
3.3 Battery Option	5
4. TEST CONDITIONS	6
4.1 Ambient Conditions	6
4.2 RF Characteristics of The Test Site	6
4.3 Test Signal, Frequencies, And Output Power	6
5. DESCRIPTION OF THE TEST EQUIPMENT	7
5.1 Test System Specifications	7
5.2 SAR Measurement Setup	7
5.3 DASY 4 E-Field Probe System	8
5.4 Phantom & Equivalent Tissues	10
6. DESCRIPTION OF THE TEST PROCEDURE	12
6.1 Definition of Reference Point	12
6.2 Test Configuration Positions	13
6.3 Scan Procedures	16
6.4 SAR Averaging Methods	16
7. MEASUREMENT UNCERTAINTY	17
8. SYSTEM VERIFICATION	18
8.1 Tissue Verification	18
8.2 Test System Validation	18
9. RESULTS	19
10. REFERENCES	25
APPENDIX A : Validation Test Data of Tissue	
APPENDIX B : Validation Test Data	
APPENDIX C : SAR Test Data	
APPENDIX D : Calibration Certificates	



1. SUMMARY FOR TEST REPORT

FCC ID	BEJPW560
Date of test	9 February 2007 ~ 26 February 2007
Responsible test engineer	Jay Kim
Measurement performed by	I.K.Hong
EUT Type	Dual Band CDMA Phone (Prototype)
Tx Frequency	824.70 ~ 848.31 MHz(CDMA850), 1851.25 ~ 1908.75(CDMA1900)
Rx Frequency	869.70 ~ 893.31 MHz(CDMA850), 1931.25 ~ 1988.75(CDMA1900)
Max. RF Output Power	CDMA850(24.0 dBm) PCS1900 (24.0 dBm)

1.1 Head Configuration

Max. SAR Measurement

FREQUENCY		Modulation	Conducted Power(dBm)		Device test position	SAR (W/kg)
MHz	Ch		dBm	Battery		
848.31	777	CDMA	24.0	Standard	Right touch	1.17
1880.00	600	CDMA	24.0	Standard	Left touch	1.42

1.2 Body Worn Configuration

Max. SAR Measurement

FREQUENCY		Modulation	Conducted Power(dBm)		Separation test position	SAR (W/kg)
MHz	Ch		dBm	Battery		
835.89	363	CDMA	24.0	Standard	2cm [w/o Holster]	0.537
1880.0	600	CDMA	24.0	Standard	2cm [w/o Holster]	0.341

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)

**ESTECH Co., Ltd.**Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, KoreaTEL: 82-2-867-3201
FAX: 82-2-867-3204

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 : BEJPW560
Serial numbers	—
Exposure environment	Uncontrolled exposure
Device category	Portable device
Mode(s) of Operation	CDMA
Modulation Mode(s)	CDMA
Duty Cycle	1
Transmitting Frequency Range(s)	824.70 ~ 848.31 MHz(CDMA850), 1851.25 ~ 1908.75(CDMA1900)
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 (%)	48

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 CDMA, 1900MHz CDMA 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.

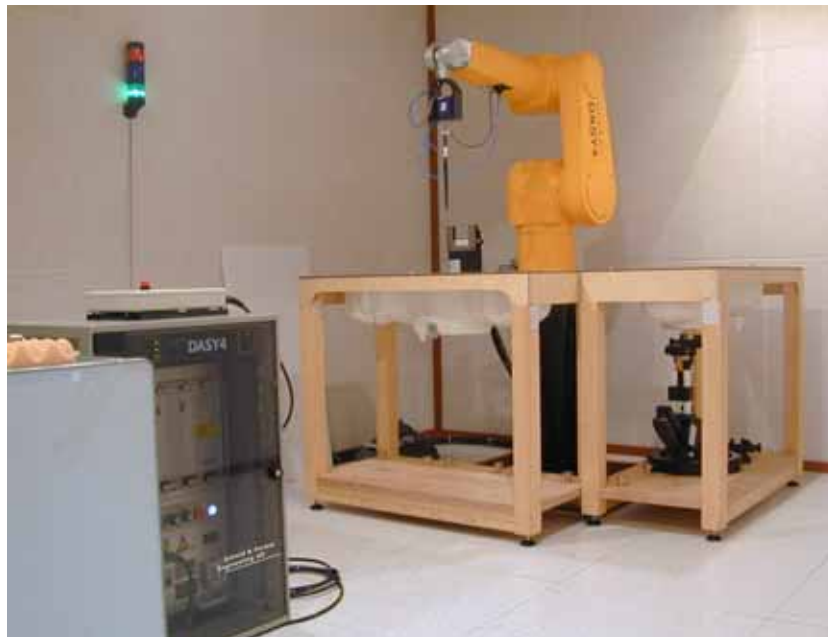


Fig. 4.1 SAR Measurement System



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	2008-02-07

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.

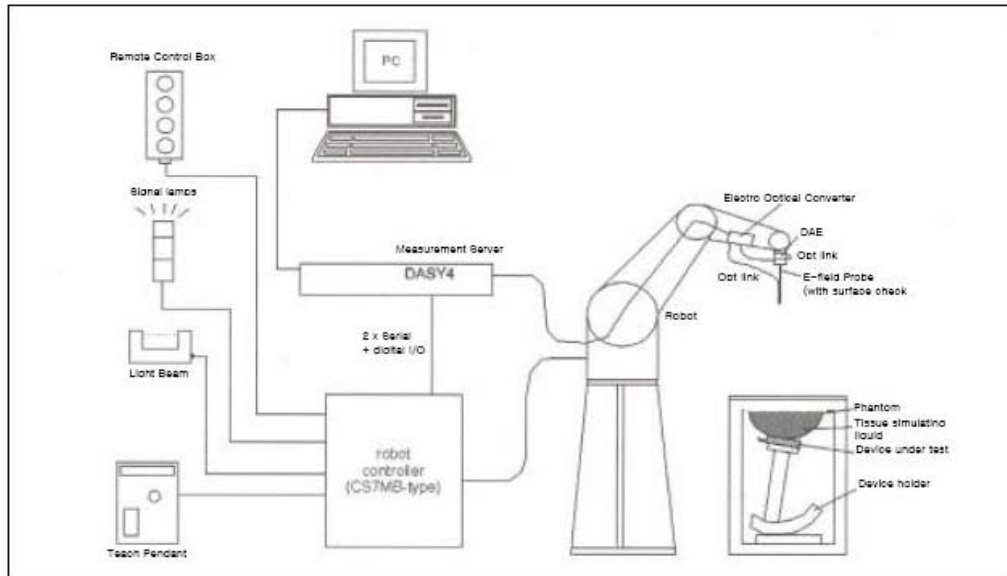


Fig. 5.1 SAR Measurement System Setup

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 (MHz)	Head		Body	
	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].

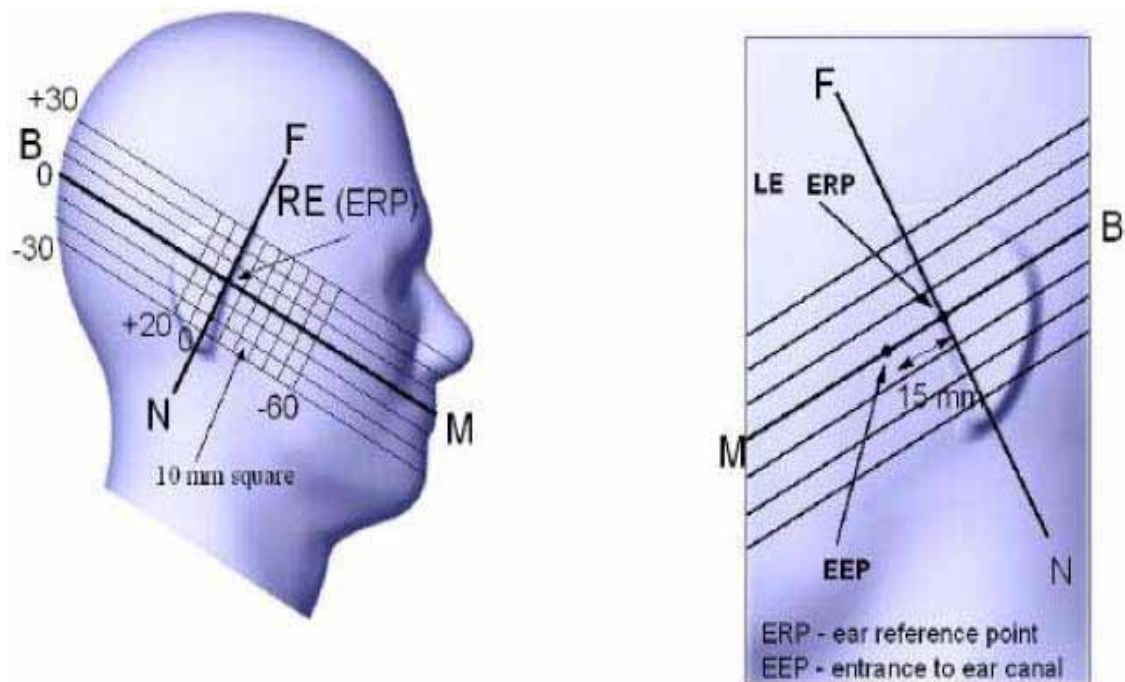


Figure 6.1 Close-up side view of ERP

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 it’s 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” 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)

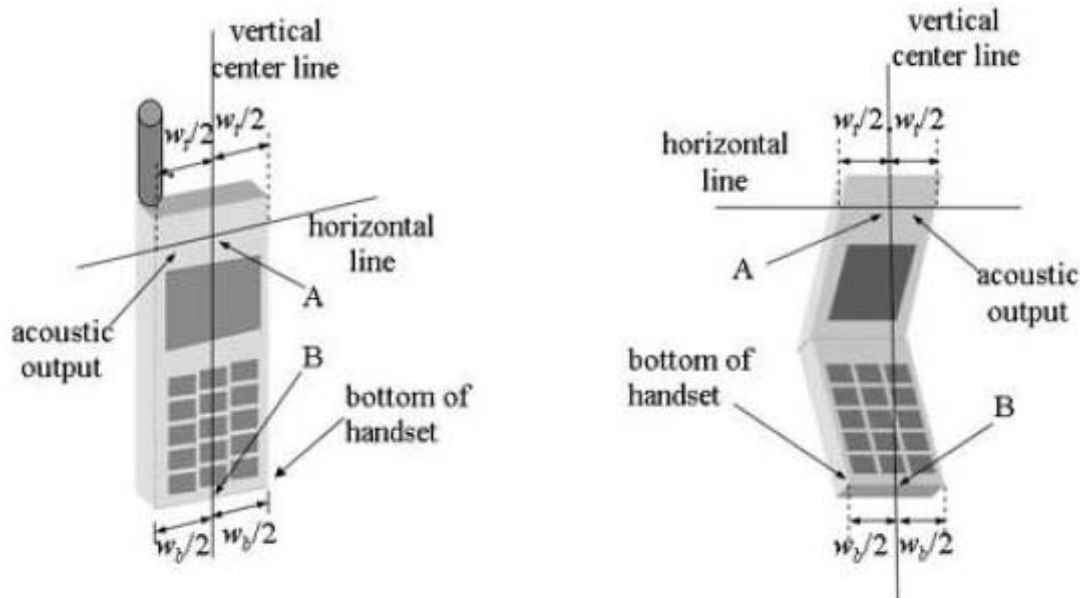


Figure 6.2 Handset Vertical Center & Horizontal Line Reference Points

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

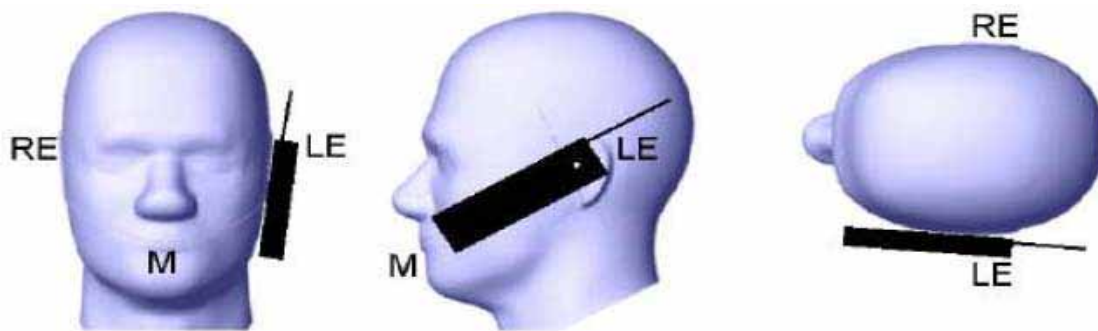


Figure 6.3 "Cheek" or "Touch" Position.

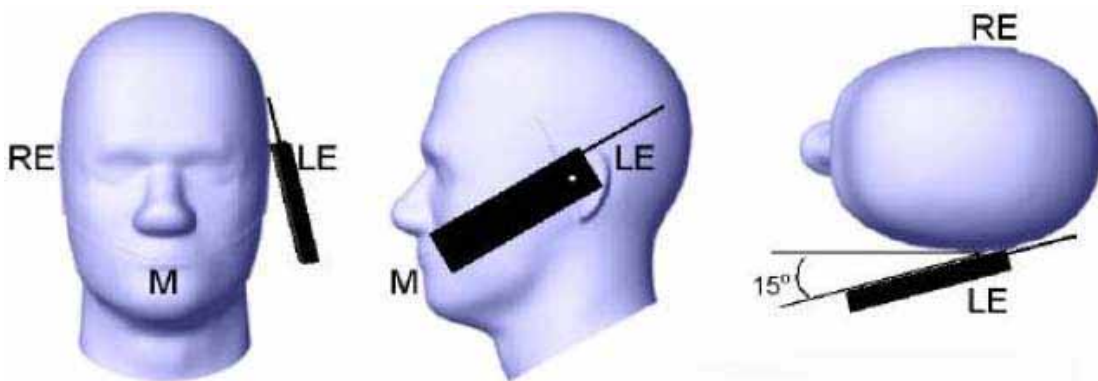


Figure 6.4 "Tilted" Position.



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]

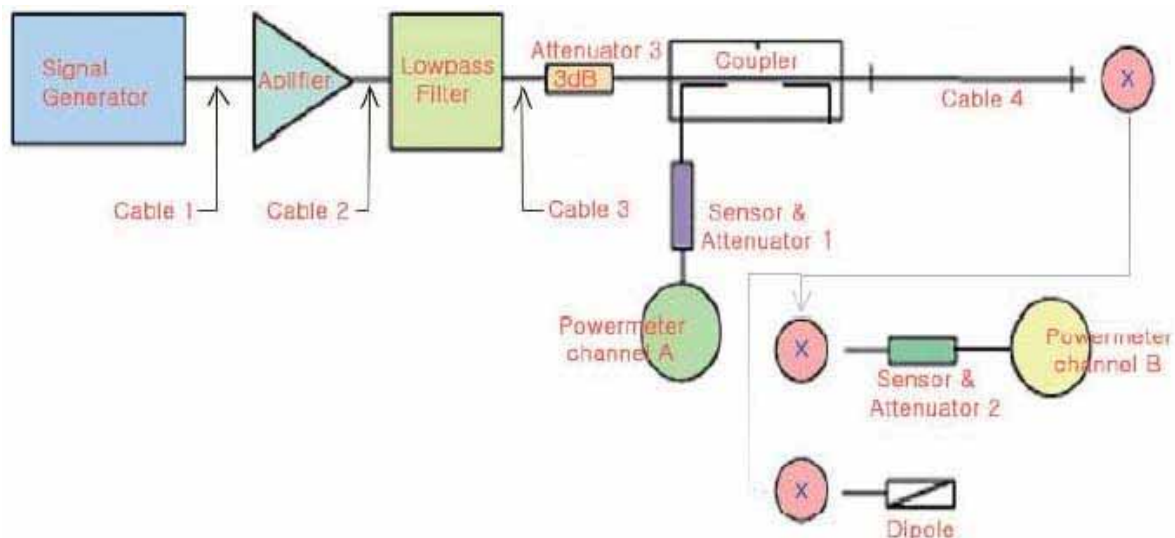
MEASURED TISSUE PARAMETERS										
Liquid Temperature (°C)		22		Liquid Depth(mm)		150				
Date	2007-02-22		2007-02-22		2007-02-22		2007-02-22			
Tissue	1900MHz Brain		1900MHz Muscle		835MHz Brain		835MHz Muscle			
	Target	Measured	Target	Measured	Target	Measured	Target	Measured	Target	Measured
Dielectric Constant: ϵ	40	39.8	53.3	53.52	41.5	40.9	55.2	53.7		
Conductivity: σ	1.4	1.42	1.52	1.52	0.9	0.92	0.97	0.967		
Deviation (%)	ϵ : -0.5% σ : 1.43%		ϵ : 0.41% σ : 0%		ϵ : -1.45% σ : 2.22%		ϵ : -2.71% σ : -0.31%			

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	38.8	-2.27%	2007-02-22
835MHz Brain	D835V2(S/N:475)	1.0	9.5	9.2	-3.16%	2007-02-22





ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

SAR Measurement Conditions for CDMA2000 1x

These procedures were followed according to FCC "SAR Measurement Procedures for 3G Devices", May 2006.

Head SAR Measurement

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option S055. SAR for RC1 is not required when the maximum average output of each channel is less than 1/4dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3

Body SAR Measurement

SAR for body exposure configuration is measured on RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCHn) is not required when the maximum average output of each RF channel is less than 1/4 dB higher than that measured with FCH at full rate and SCH0 enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5dB and lead to higher SAR drifts and SCH dropouts.

Body SAR in RC1 is not required when the maximum average output of each channel is less than 1/4dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option S055, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.



SAR Measurement Conditions for CDMA2000 1x

Handsets with EV-DO

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev.0 is less than 1/4dB higher than that measured in RC3(1xRTT), body SAR for Ev-Do is not required. Otherwise, SAR for Rev.0 is measured on the maximum output channel at 153.6 kbps using the

body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev.A is not required when the maximum average output of each channel is less than that measured in Rev.0 or less than 1/4 dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in slots should be configured in the downlink for both Rev. 0 and Rev. A.

Band	Channel	S02	S02	S055	S055	TDS0S032
		RC1/1	RC3/3	RC1/1	RC3/3	RC3/3
CDMA 850	1013	24.18	24.18	24.20	24.17	24.16
	363	24.00	24.00	24.00	24.01	24.01
	777	23.99	23.92	23.99	23.90	23.92

Band	Channel	S02	S02	S055	S055	TDS0S032
		RC1/1	RC3/3	RC1/1	RC3/3	RC3/3
CDMA 1900	25	24.01	24.01	24.08	23.98	23.97
	600	24.02	23.95	24.02	23.98	23.98
	1175	23.82	23.82	23.78	23.80	23.80

(OUTPUT POWER TABLE)



ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

9. RESULTS(continued)

Ambient TEMPERATURE (C) : 22.0

Relative HUMIDITY (%) : 48

Mixture Type : 835MHz Brain

Dielectric Constant : 40.9

Conductivity: 0.92

Measurement Results (CDMA850 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 (CDMA850 Head SAR)

Frequency		Mod	Conducted Power(dBm)		battery	Device Test position	Slider	BT	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End						
835.89	363	CDMA	24.00	24.00	Standrd	LEFT TOUCH	–	–	Fixed	1.010
835.89	363	CDMA	24.00	24.01	Standrd	RIGHT TOUCH	–	–	Fixed	1.060
835.89	363	CDMA	24.00	24.13	Standrd	LEFT TILT	–	–	Fixed	0.330
835.89	363	CDMA	24.00	24.05	Standrd	RIGHT TILT	–	–	Fixed	0.340
824.70	1013	CDMA	24.00	23.92	Standrd	LEFT TOUCH	–	–	Fixed	0.942
824.70	1013	CDMA	24.00	24.05	Standrd	RIGHT TOUCH	–	–	Fixed	0.986
848.31	777	CDMA	24.00	24.05	Standrd	LEFT TOUCH	–	–	Fixed	1.120
848.31	777	CDMA	24.00	23.96	Standrd	RIGHT TOUCH	–	–	Fixed	1.170

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

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 : ESTSAR0702-002

FCC ID : BEJPW560

Web : www.estech.co.kr

Page 21 of 25

**ESTECH Co., Ltd.**Rm.1015, World Venture Center II,
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) : 22.0Relative HUMIDITY (%) : 48Mixture Type : 835MHz BodyDielectric Constant : 53.7Conductivity: 0.967

Measurement Results (CDMA850 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 (CDMA850 Body SAR Without Holster)

Frequency		Mod	Conducted Power(dBm)		battery	Device Test position	Slider	BT	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End						
835.89	363	CDMA	24.00	24.01	Standard	2[w/o Holster]	–	–	Fixed	0.537

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

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

Engineer I.K.Hong

Test report no : ESTSAR0702-002

FCC ID : BEJPW560

Web : www. estech. co. kr

Page 22 of 25

**ESTECH Co., Ltd.**Rm.1015, World Venture Center II,
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 (%) : **48**Mixture Type : **1900MHz Brain**Dielectric Constant : **39.8**Conductivity: **1.42**

Measurement Results (CDMA 1900 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 (CDMA 1900 Head SAR)

Frequency		Mod	Conducted Power(dBm)		battery	Device Test position	Slider	BT	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End						
1880.00	600	CDMA	24.00	24.00	Standard	LEFT TOUCH	–	–	Fixed	1.420
1880.00	600	CDMA	24.00	23.91	Standard	RIGHT TOUCH	–	–	Fixed	1.120
1880.00	600	CDMA	24.00	24.04	Standard	LEFT TILT	–	–	Fixed	0.382
1880.00	600	CDMA	24.00	23.96	Standard	RIGHT TILT	–	–	Fixed	0.366
1851.25	25	CDMA	24.00	24.00	Standard	LEFT TOUCH	–	–	Fixed	1.370
1851.25	25	CDMA	24.00	23.98	Standard	RIGHT TOUCH	–	–	Fixed	1.140
1908.75	1175	CDMA	24.00	24.02	Standard	LEFT TOUCH	–	–	Fixed	1.380
1908.75	1175	CDMA	24.00	23.97	Standard	RIGHT TOUCH	–	–	Fixed	1.140

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**

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

Test report no : ESTSAR0702-002

FCC ID : BEJPW560

Web : www.estech.co.kr

Page 23 of 25

**ESTECH Co., Ltd.**Rm.1015, World Venture Center II,
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) : 22Relative HUMIDITY (%) : 48Mixture Type : 1900MHz BodyDielectric Constant : 53.5Conductivity: 1.52

Measurement Results (CDMA 1900 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 (CDMA 1900 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	600	CDMA	24.00	24.01	Standard	2[w/o Holster]	-	-	Fixed	0.341

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

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

Engineer I.K.Hong

Test report no : ESTSAR0702-002

FCC ID : BEJPW560

Web : www.estech.co.kr

Page 24 of 25



10. REFERENCE

- [1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio Frequency Radiation, Aug. 1996.
- [2] ANSI/IEEE C95.1 – 1991, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300kHz to 100GHz, New York: IEEE, Aug. 1992
- [3] ANSI/IEEE C95.3 – 1991, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields – RF and Microwave, New York: IEEE, 1992.
- [4] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.
- [5] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.
- [6] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 120-124.
- [7] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.
- [8] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.
- [9] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Head Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.
- [10] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.
- [11] G. Hartsgrrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.
- [12] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.
- [13] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.
- [14] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.
- [15] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to RadioFrequency Electromagnetic Fields. Supplement C, Dec. 1997.
- [16] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.
- [17] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.
- [18] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hochschule Zürich, Dosimetric Evaluation of the Cellular Phone.



ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

APPENDIX A : Validation Test Data of Tissue



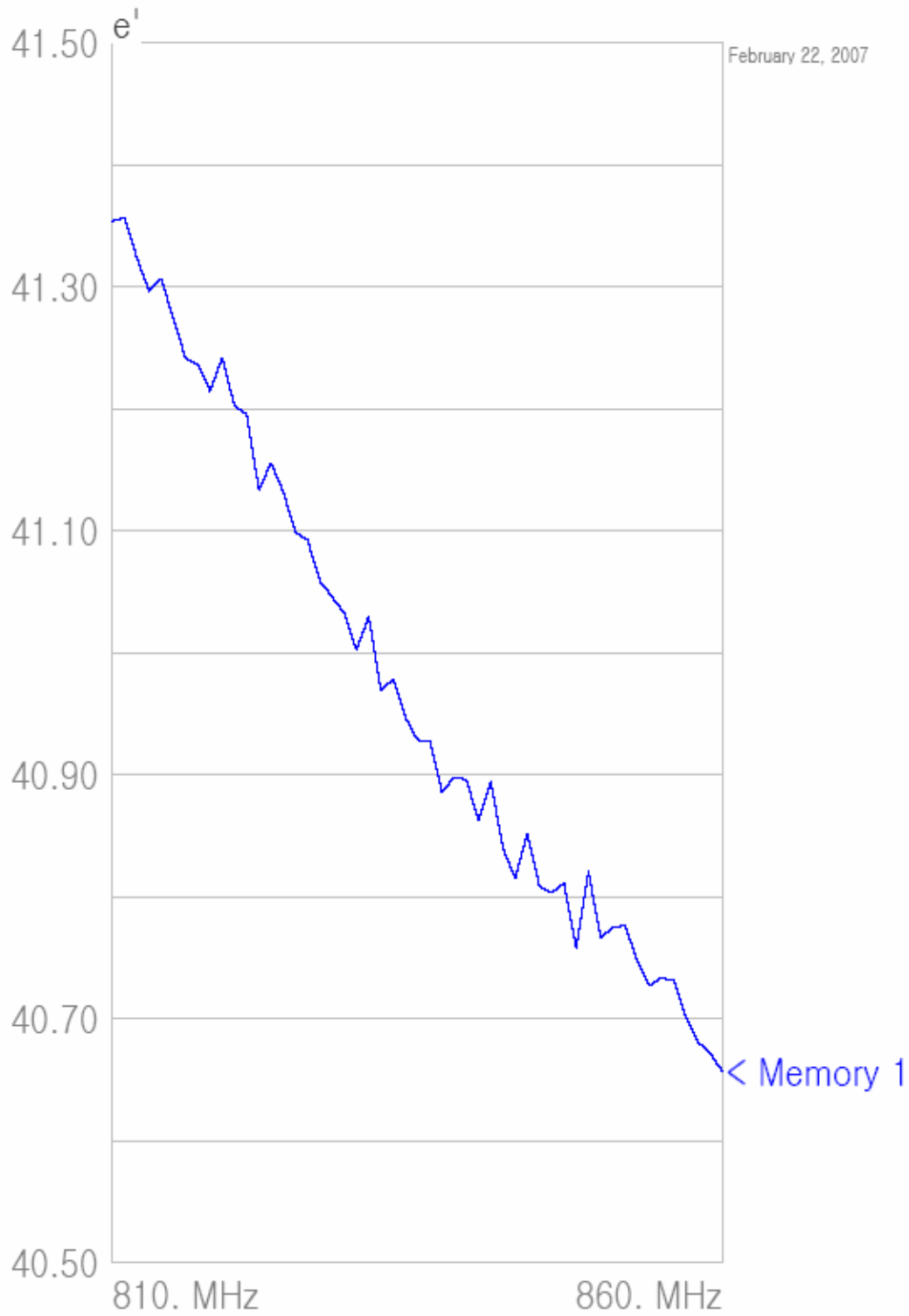
ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

– Head Tissue(CDMA 850)

Title
SubTitle



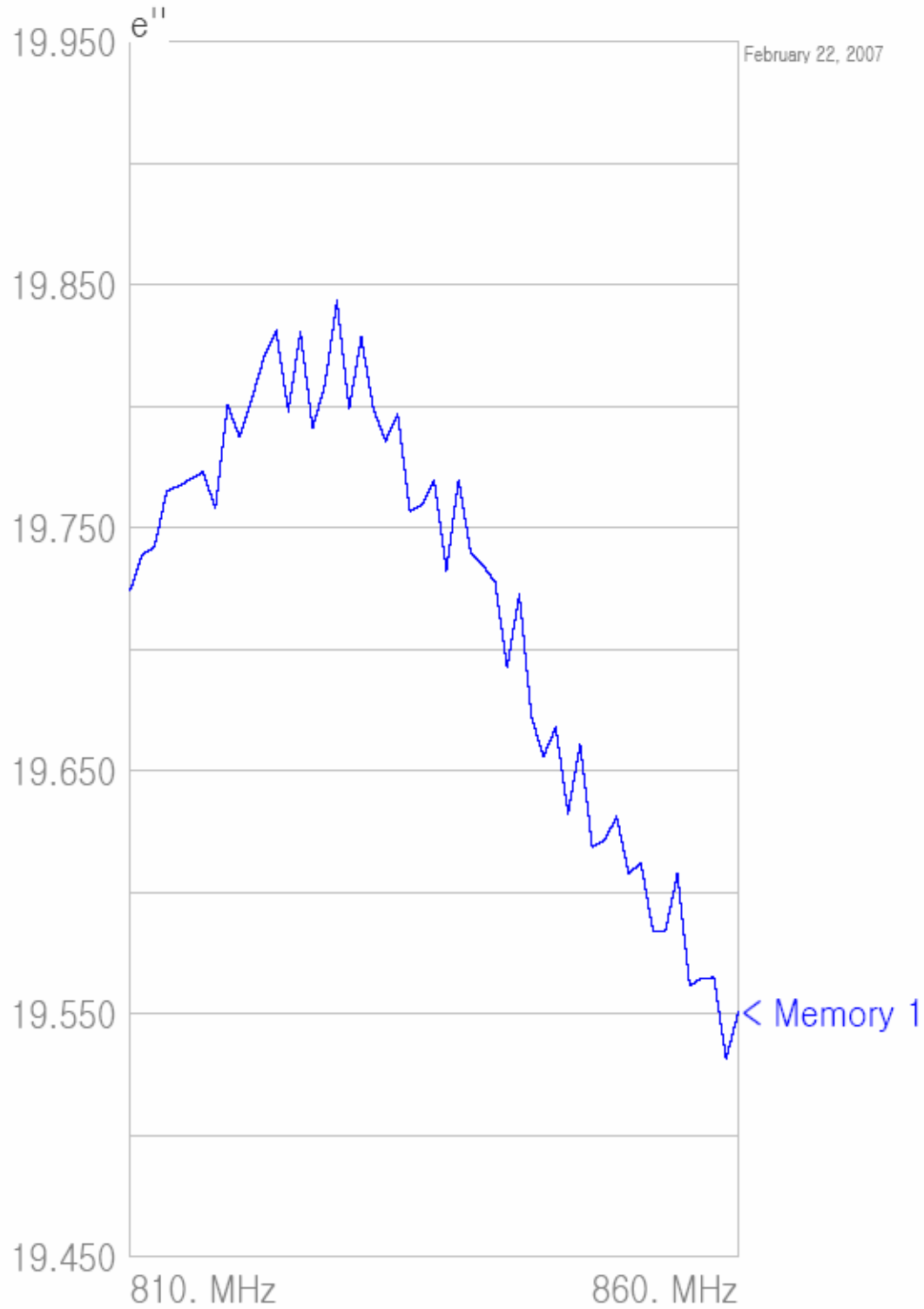


ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Title
SubTitle



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Title

SubTitle

February 22, 2007

Frequency	e'	e''
810.000000 MHz	41.3543	19.7243
810.973262 MHz	41.3569	19.7392
811.946524 MHz	41.3241	19.7422
812.919785 MHz	41.2968	19.7652
813.893047 MHz	41.3069	19.7673
814.866309 MHz	41.2742	19.7702
815.845418 MHz	41.2417	19.7732
816.824527 MHz	41.2365	19.7580
817.803636 MHz	41.2149	19.8008
818.782745 MHz	41.2423	19.7874
819.761854 MHz	41.2028	19.8030
820.740845 MHz	41.1959	19.8203
821.731836 MHz	41.1339	19.8313
822.716828 MHz	41.1560	19.7981
823.701819 MHz	41.1321	19.8307
824.686810 MHz	41.0993	19.7912
825.677719 MHz	41.0926	19.8085
826.668628 MHz	41.0590	19.8437
827.659537 MHz	41.0461	19.7989
828.650446 MHz	41.0324	19.8286
829.641354 MHz	41.0026	19.7992
830.638216 MHz	41.0301	19.7859
831.635078 MHz	40.9691	19.7969
832.631941 MHz	40.9787	19.7568
833.628803 MHz	40.9474	19.7597
834.625665 MHz	40.9286	19.7697
835.628516 MHz	40.9284	19.7324
836.631367 MHz	40.8858	19.7700
837.634218 MHz	40.8982	19.7399
838.637068 MHz	40.8964	19.7348
839.639919 MHz	40.8827	19.7279
840.648795 MHz	40.8945	19.6925
841.657671 MHz	40.8399	19.7230
842.666547 MHz	40.8151	19.6720
843.675423 MHz	40.8522	19.6561
844.684299 MHz	40.8084	19.6680
845.693236 MHz	40.8035	19.6325
846.714173 MHz	40.8114	19.6612
847.729110 MHz	40.7578	19.6186
848.744047 MHz	40.8208	19.6215
849.758984 MHz	40.7663	19.6312
850.780018 MHz	40.7752	19.6077
851.801053 MHz	40.7764	19.6122
852.822087 MHz	40.7477	19.5837
853.843122 MHz	40.7271	19.5840
854.864157 MHz	40.7338	19.6077
855.891325 MHz	40.7312	19.5617
856.918494 MHz	40.7012	19.5647
857.945663 MHz	40.6808	19.5650
858.972831 MHz	40.6714	19.5314
860.000000 MHz	40.6565	19.5508



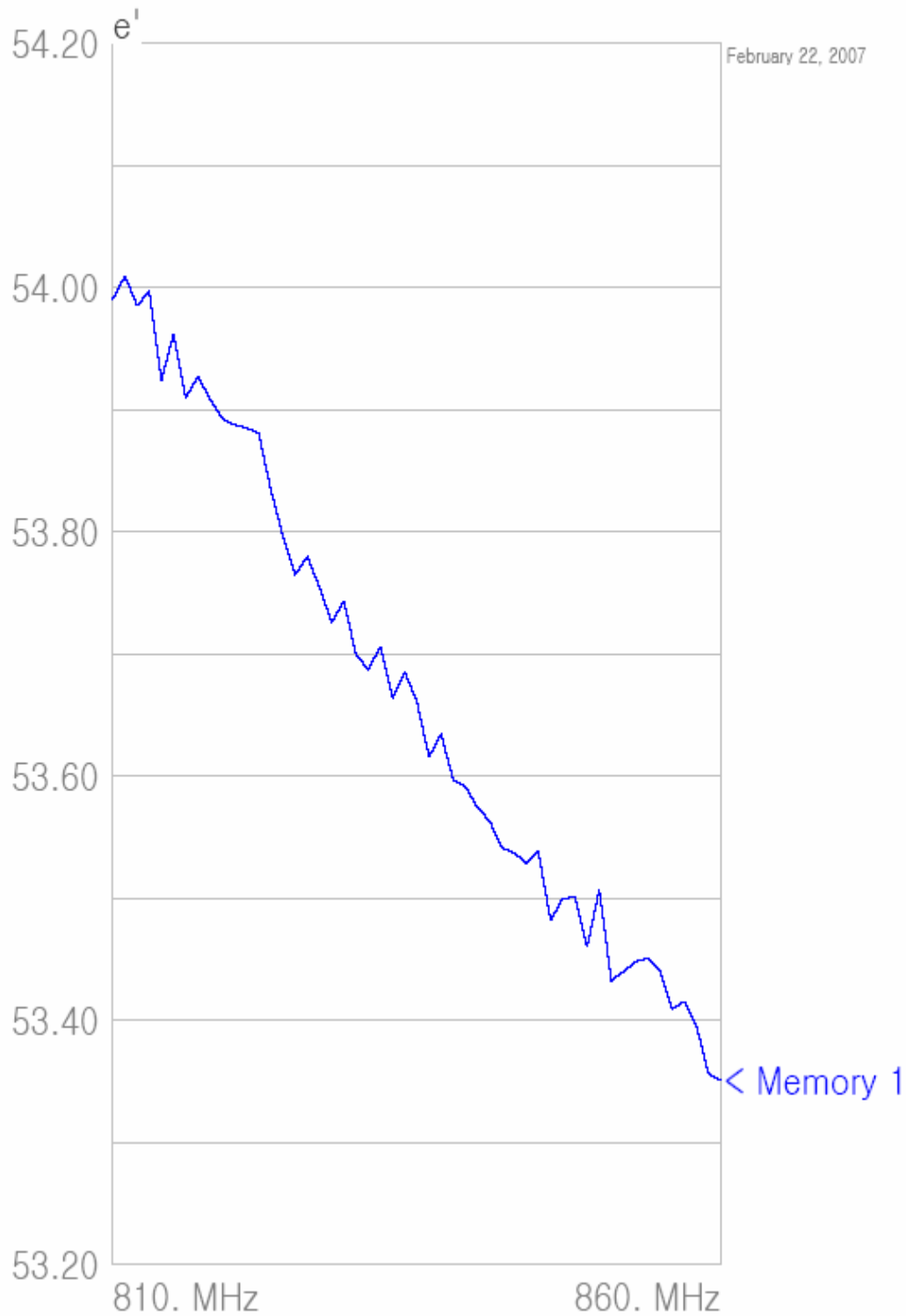
ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

– CDMA 850 Body Tissue

Title
SubTitle



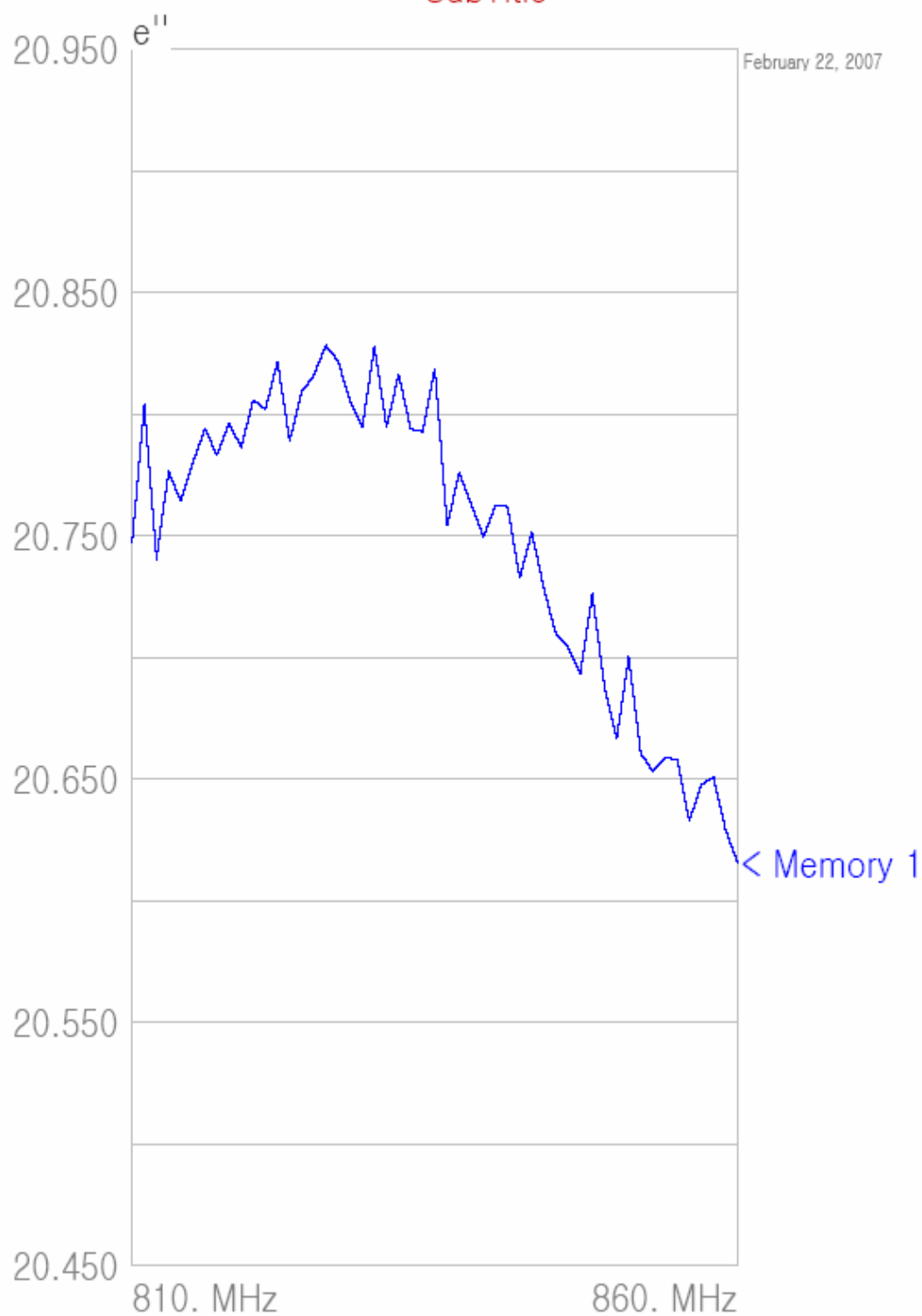


ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Title
SubTitle



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Title
SubTitle
February 02, 2007

Frequency	e'	e''
810.000000 MHz	53.9910	20.7477
810.973262 MHz	54.0096	20.8040
811.946524 MHz	53.9856	20.7405
812.919785 MHz	53.9972	20.7767
813.893047 MHz	53.9243	20.7645
814.866309 MHz	53.9822	20.7800
815.845418 MHz	53.9101	20.7941
816.824527 MHz	53.9275	20.7833
817.803636 MHz	53.9088	20.7965
818.782745 MHz	53.8930	20.7864
819.761854 MHz	53.8879	20.8060
820.746845 MHz	53.8856	20.8022
821.731836 MHz	53.8805	20.8217
822.716828 MHz	53.8346	20.7892
823.701819 MHz	53.7966	20.8093
824.686810 MHz	53.7850	20.8162
825.677719 MHz	53.7799	20.8284
826.668628 MHz	53.7547	20.8219
827.659537 MHz	53.7260	20.8055
828.650446 MHz	53.7436	20.7946
829.641354 MHz	53.6999	20.8280
830.638216 MHz	53.6875	20.7948
831.635078 MHz	53.7060	20.8166
832.631941 MHz	53.6643	20.7941
833.628803 MHz	53.6855	20.7929
834.625665 MHz	53.6617	20.8190
835.628516 MHz	53.6159	20.7543
836.631367 MHz	53.6345	20.7759
837.634218 MHz	53.5967	20.7632
838.637068 MHz	53.5916	20.7497
839.639919 MHz	53.5743	20.7625
840.648795 MHz	53.5631	20.7621
841.657671 MHz	53.5414	20.7328
842.666547 MHz	53.5374	20.7516
843.675423 MHz	53.5289	20.7265
844.684299 MHz	53.5383	20.7096
845.692236 MHz	53.4820	20.7042
846.714173 MHz	53.4998	20.6932
847.729110 MHz	53.5012	20.7262
848.744047 MHz	53.4802	20.6881
849.758984 MHz	53.5067	20.6665
850.780018 MHz	53.4327	20.7003
851.801053 MHz	53.4400	20.6607
852.822087 MHz	53.4483	20.6532
853.843122 MHz	53.4507	20.6587
854.864157 MHz	53.4401	20.6583
855.891325 MHz	53.4095	20.6329
856.918494 MHz	53.4155	20.6478
857.945663 MHz	53.3955	20.6509
858.972831 MHz	53.3556	20.6291
860.000000 MHz	53.3511	20.6156



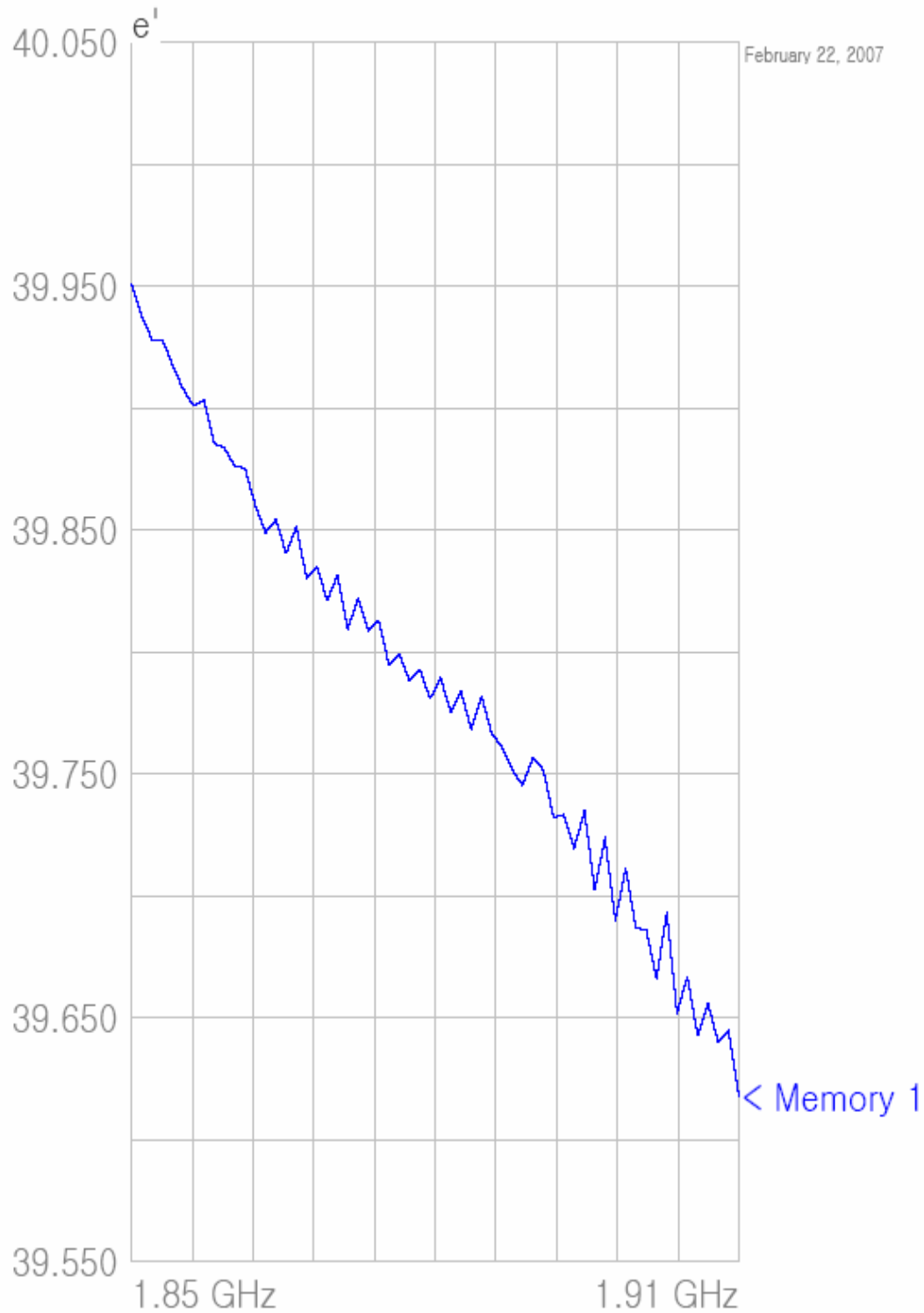
ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

– Head Tissue(CDMA 1900)

Title
SubTitle





ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201

FAX: 82-2-867-3204

Title
SubTitle



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Title

SubTitle

February 22, 2007

Frequency	e ⁱ	e ⁱⁱ
1.850000000 GHz	39.9509	13.5061
1.851016949 GHz	39.9377	13.5080
1.852033898 GHz	39.9281	13.5106
1.853050847 GHz	39.9282	13.4951
1.854067797 GHz	39.9172	13.4955
1.855084746 GHz	39.9080	13.5131
1.856101695 GHz	39.9011	13.5200
1.857118644 GHz	39.9035	13.5272
1.858135593 GHz	39.8857	13.5169
1.859152542 GHz	39.8838	13.5267
1.860169492 GHz	39.8764	13.5280
1.861186441 GHz	39.8756	13.5252
1.862203390 GHz	39.8804	13.5283
1.863220339 GHz	39.8490	13.5231
1.864237288 GHz	39.8544	13.5254
1.865254237 GHz	39.8406	13.5307
1.866271186 GHz	39.8514	13.5415
1.867288136 GHz	39.8303	13.5305
1.868305085 GHz	39.8349	13.5362
1.869322034 GHz	39.8212	13.5415
1.870338983 GHz	39.8317	13.5375
1.871355932 GHz	39.8095	13.5482
1.872372881 GHz	39.8223	13.5337
1.873389831 GHz	39.8086	13.5390
1.874406780 GHz	39.8131	13.5538
1.875423729 GHz	39.7948	13.5471
1.876440678 GHz	39.7995	13.5527
1.877457627 GHz	39.7882	13.5475
1.878474576 GHz	39.7929	13.5532
1.879491525 GHz	39.7809	13.5515
1.880508475 GHz	39.7896	13.5635
1.881525424 GHz	39.7755	13.5632
1.882542373 GHz	39.7841	13.5843
1.883559322 GHz	39.7682	13.5671
1.884576271 GHz	39.7819	13.5820
1.885593220 GHz	39.7666	13.5704
1.886610169 GHz	39.7611	13.5975
1.887627119 GHz	39.7515	13.5853
1.888644068 GHz	39.7455	13.6067
1.889661017 GHz	39.7569	13.5901
1.890677966 GHz	39.7517	13.6080
1.891694915 GHz	39.7321	13.6082
1.892711864 GHz	39.7334	13.6130
1.893728814 GHz	39.7196	13.6035
1.894745763 GHz	39.7349	13.6442
1.895762712 GHz	39.7025	13.6197
1.896779661 GHz	39.7240	13.6325
1.897796610 GHz	39.6998	13.6332
1.898813559 GHz	39.7116	13.6278
1.899830508 GHz	39.6868	13.6523
1.900847458 GHz	39.6862	13.6493
1.901864407 GHz	39.6660	13.6530
1.902881356 GHz	39.6932	13.6560
1.903898305 GHz	39.6519	13.6733
1.904915254 GHz	39.6670	13.6482
1.905932203 GHz	39.6427	13.6546
1.906949153 GHz	39.6560	13.6546
1.907966102 GHz	39.6398	13.6737
1.908983051 GHz	39.6450	13.6610



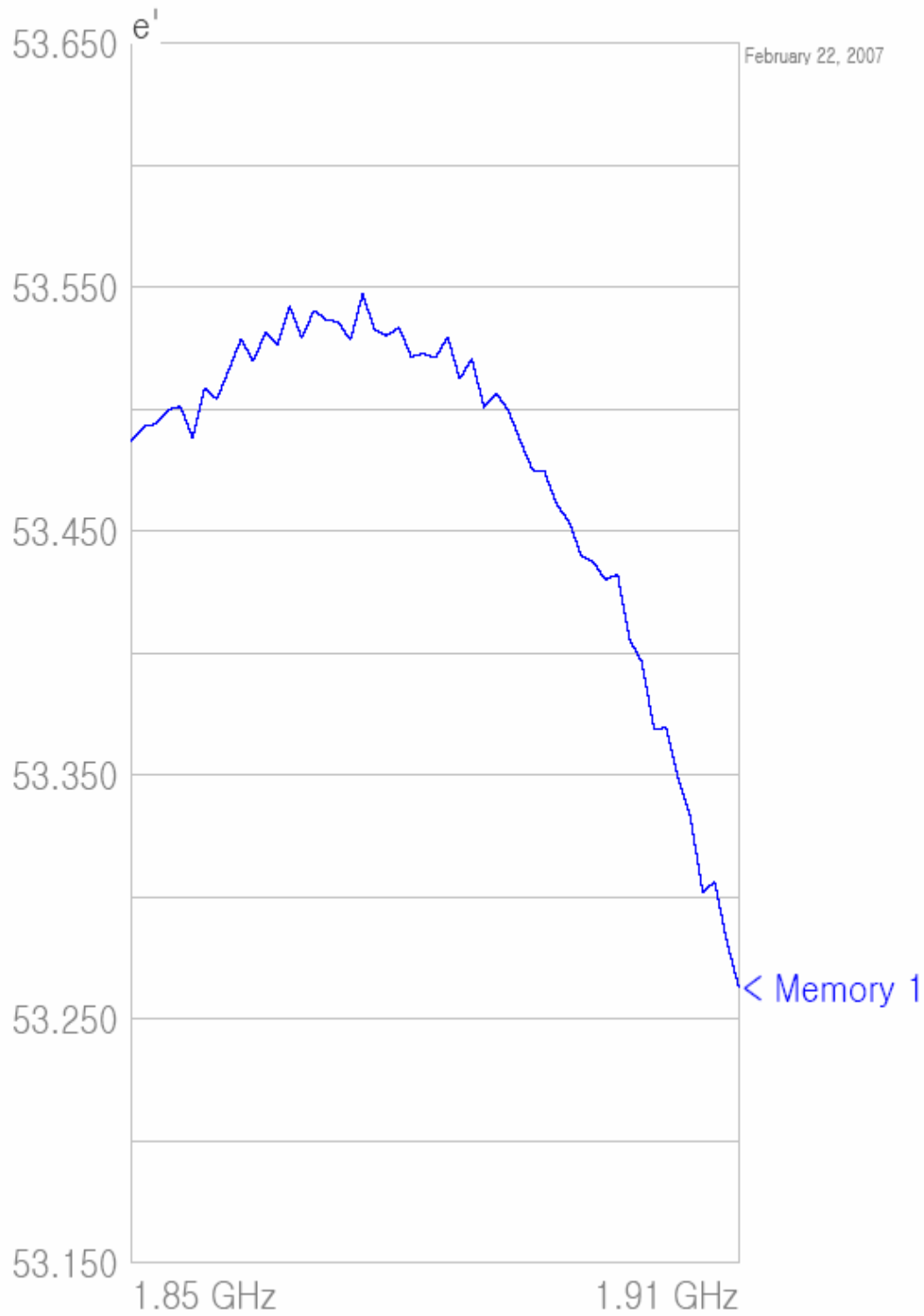
ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

– CDMA 1900 Body Tissue

Title
SubTitle

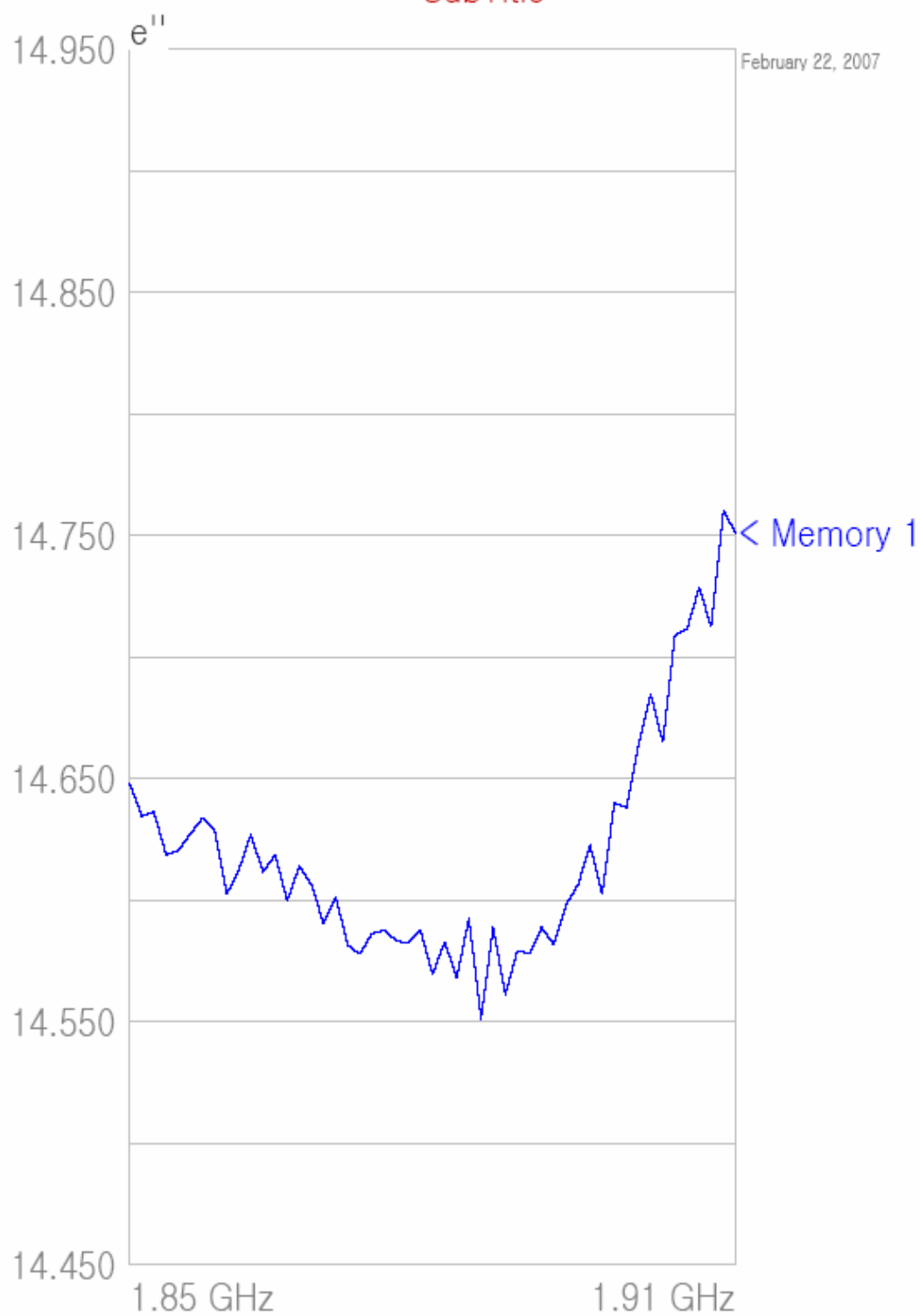


**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Title
SubTitle



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Title

SubTitle

February 22, 2007

Frequency	e ⁱ	e ⁱⁱ
1.850000000 GHz	53.4872	14.6481
1.851182838 GHz	53.4930	14.6346
1.852365676 GHz	53.4941	14.6363
1.853548514 GHz	53.5000	14.6188
1.854731352 GHz	53.5012	14.6205
1.855914190 GHz	53.4885	14.6273
1.857100809 GHz	53.5087	14.6337
1.858287429 GHz	53.5043	14.6293
1.859474048 GHz	53.5165	14.6025
1.860660667 GHz	53.5289	14.6124
1.861847287 GHz	53.5198	14.6270
1.863033906 GHz	53.5314	14.6117
1.864220525 GHz	53.5266	14.6187
1.865407144 GHz	53.5422	14.5998
1.866593763 GHz	53.5294	14.6141
1.867780382 GHz	53.5406	14.6065
1.868967001 GHz	53.5369	14.5905
1.870153620 GHz	53.5358	14.6014
1.871340239 GHz	53.5284	14.5814
1.872526858 GHz	53.5472	14.5779
1.873713477 GHz	53.5328	14.5863
1.874900096 GHz	53.5303	14.5876
1.876086715 GHz	53.5337	14.5834
1.877273334 GHz	53.5217	14.5823
1.878459953 GHz	53.5229	14.5875
1.879646572 GHz	53.5212	14.5696
1.880833191 GHz	53.5298	14.5828
1.882019810 GHz	53.5126	14.5681
1.883206429 GHz	53.5208	14.5927
1.884393048 GHz	53.5009	14.5511
1.885579667 GHz	53.5066	14.5889
1.886766286 GHz	53.4996	14.5612
1.887952905 GHz	53.4870	14.5792
1.889139524 GHz	53.4752	14.5780
1.890326143 GHz	53.4744	14.5888
1.891512762 GHz	53.4809	14.5818
1.892700000 GHz	53.4542	14.5980
1.894217620 GHz	53.4402	14.6063
1.895427183 GHz	53.4374	14.6226
1.896636746 GHz	53.4302	14.6026
1.897846309 GHz	53.4323	14.6400
1.899055872 GHz	53.4054	14.6383
1.900273168 GHz	53.3966	14.6638
1.901486597 GHz	53.3890	14.6849
1.902700027 GHz	53.3895	14.6650
1.903913456 GHz	53.3487	14.7091
1.905130765 GHz	53.3332	14.7116
1.906348074 GHz	53.3020	14.7286
1.907565383 GHz	53.3063	14.7127
1.908782691 GHz	53.2817	14.7604
1.910000000 GHz	53.2629	14.7512



ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

APPENDIX B : Validation Test Data

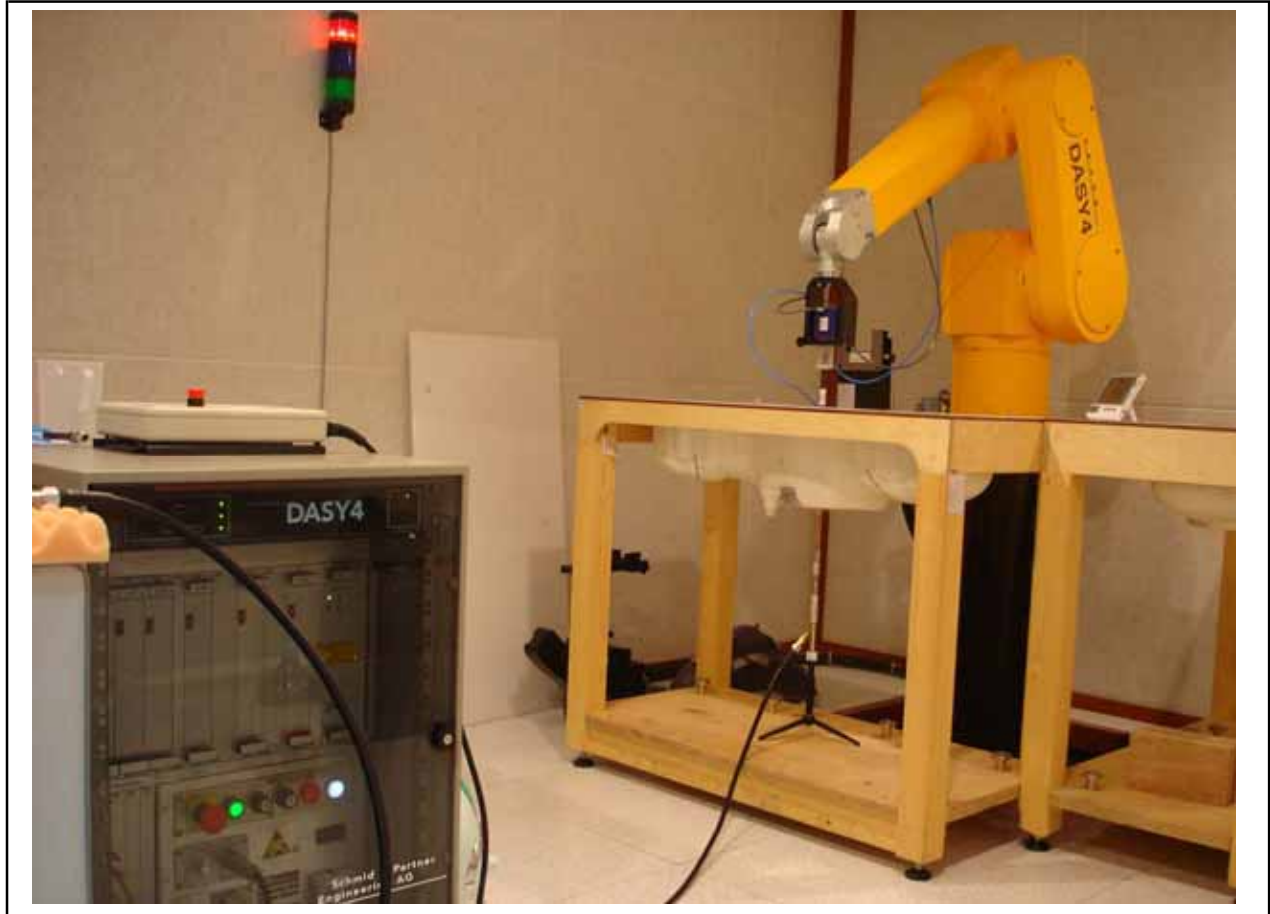


ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Dipole Validation





ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

– CDMA850 Validation

Date: 2007-02-22

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: $f = 835 \text{ MHz}$; $\sigma = 0.018 \text{ mho/m}$; $\epsilon_r = 40.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat 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 : 48%

Area Scan (61x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

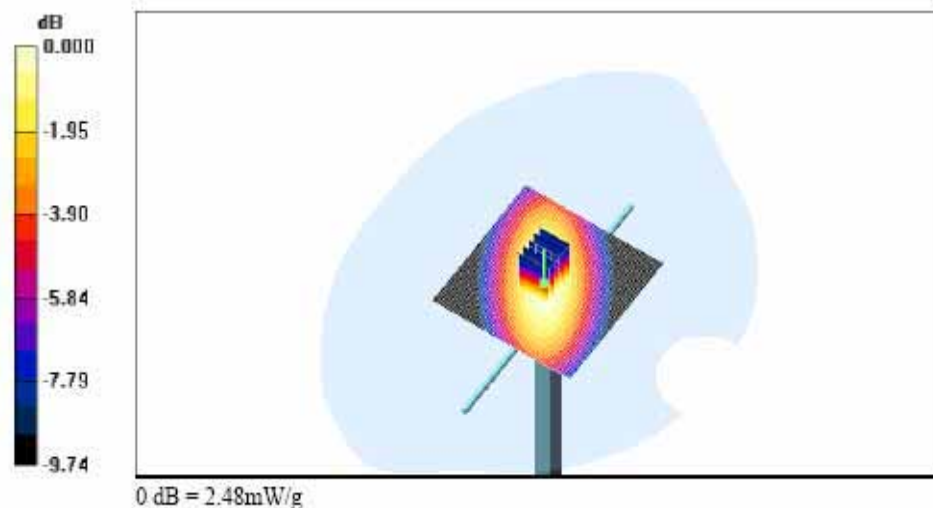
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 52.7 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 3.35 W/kg

SAR(1 g) = 2.3 mW/g

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



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

– CDMA1900 Validation

Date: 2007-02-22

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; $\epsilon_r = 39.7$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 11.3 mW/g

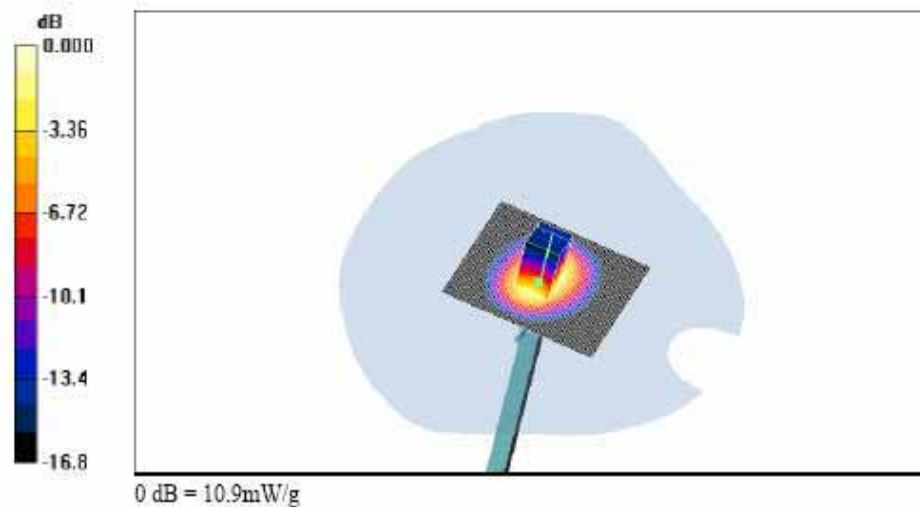
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.9 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 18.3 W/kg

SAR(1 g) = 9.7 mW/g

Maximum value of SAR (measured) = 10.9 mW/g





ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

APPENDIX C : SAR Test Data

**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

– CDMA 850

Date: 2007-02-22

Test Laboratory: ESTECH

LEFT TOUCH 363

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 835.89 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 836$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.11 mW/g

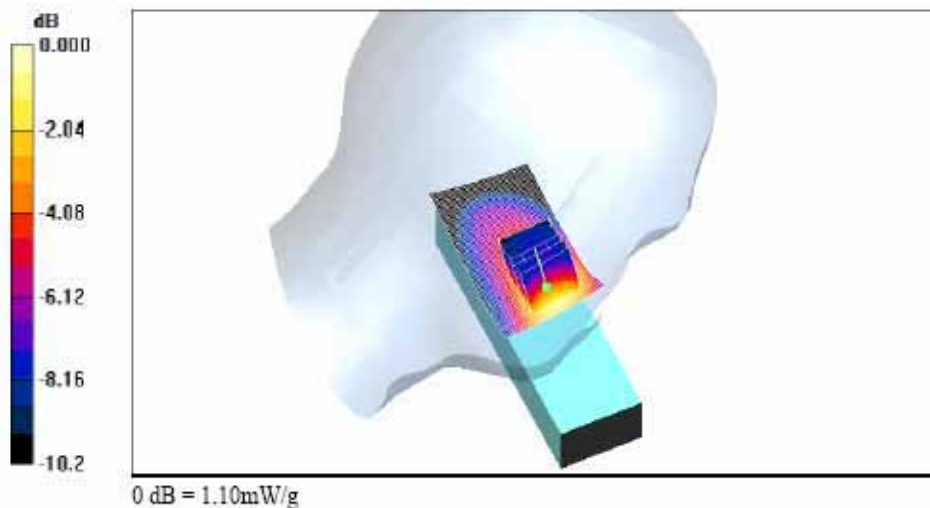
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 13.8 V/m; Power Drift = -0.005 dB

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.672 mW/g

Maximum value of SAR (measured) = 1.10 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

RIGHT TOUCH 363

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 835.89 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 836$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.13 mW/g

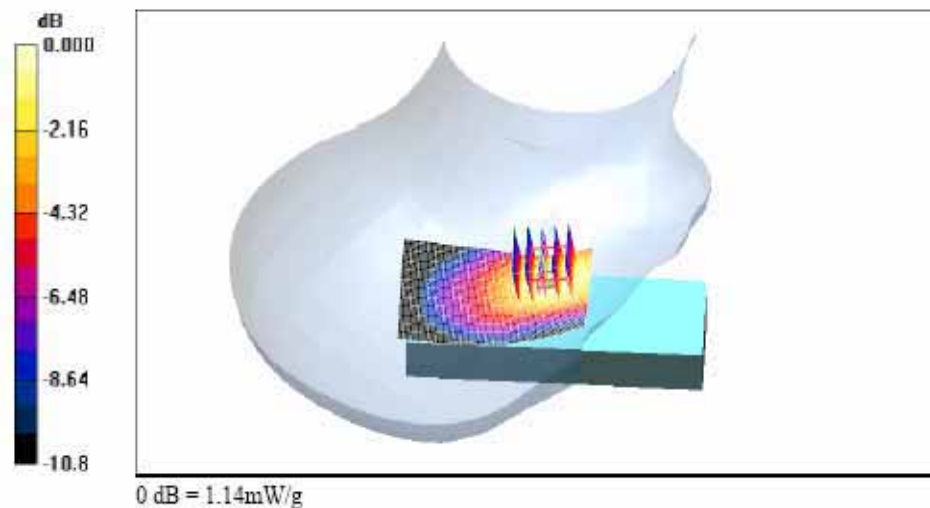
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 13.0 V/m; Power Drift = 0.012 dB

Peak SAR (extrapolated) = 1.61 W/kg

SAR(1 g) = 1.06 mW/g; SAR(10 g) = 0.694 mW/g

Maximum value of SAR (measured) = 1.14 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

LEFT TILT 363

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 835.89 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 836$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 0.347 mW/g

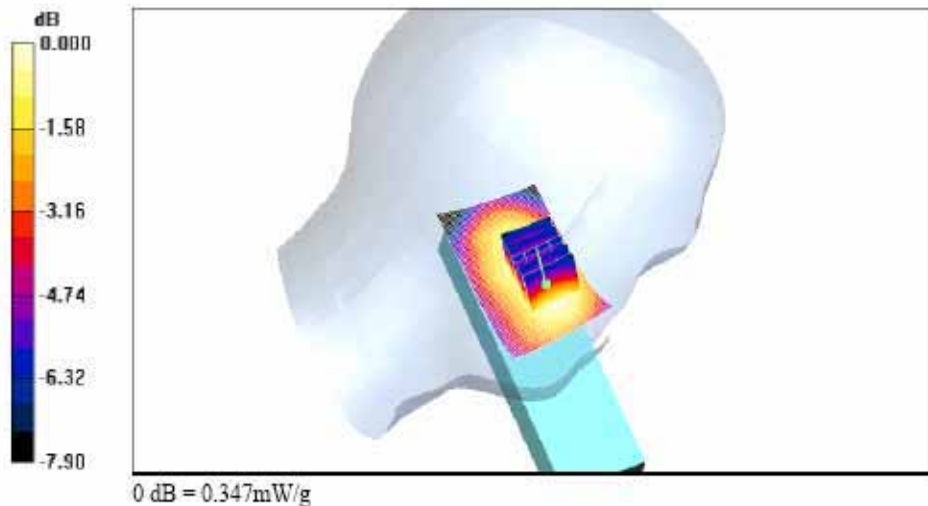
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 15.5 V/m; Power Drift = 0.128 dB

Peak SAR (extrapolated) = 0.416 W/kg

SAR(1 g) = 0.330 mW/g; SAR(10 g) = 0.248 mW/g

Maximum value of SAR (measured) = 0.347 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

RIGHT TILT 363

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 835.89 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 836$ MHz; $\sigma = 0.918$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 0.363 mW/g

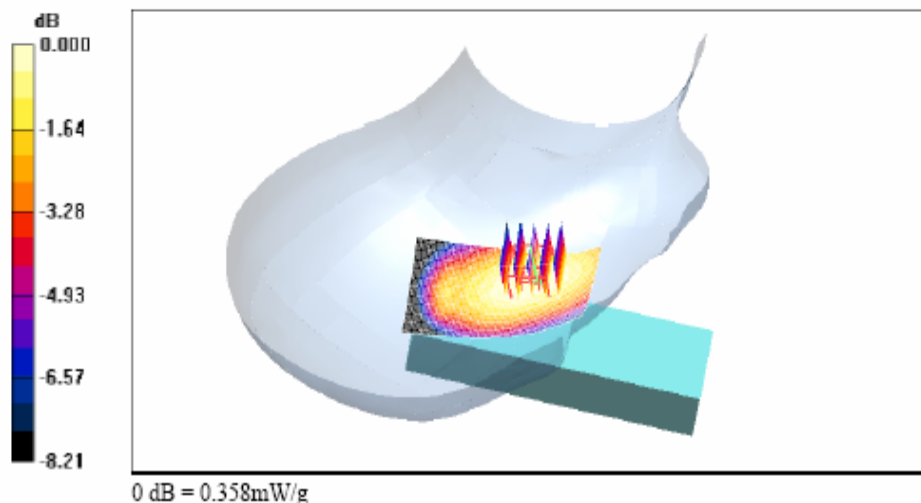
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 14.4 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 0.417 W/kg

SAR(1 g) = 0.340 mW/g; SAR(10 g) = 0.257 mW/g

Maximum value of SAR (measured) = 0.358 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II, TEL: 82-2-867-3201
426-5, Gasan-dong, Geumcheon-gu, FAX: 82-2-867-3204
Seoul, 153-803, Korea

Date: 2007-02-22

Test Laboratory: ESTECH

LEFT TOUCH 1013

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 825$ MHz; $\sigma = 0.908$ mho/m; $\epsilon_r = 41.1$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.03 mW/g

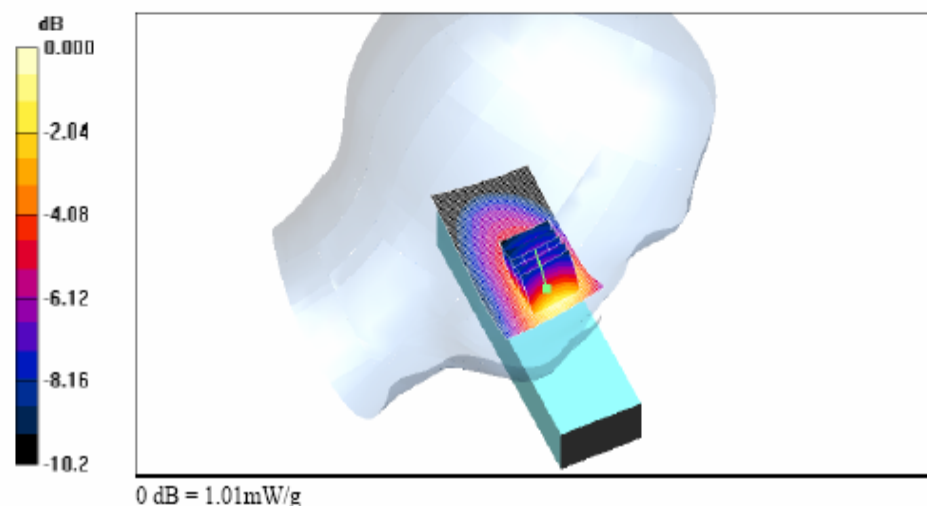
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 13.2 V/m; Power Drift = -0.082 dB

Peak SAR (extrapolated) = 1.39 W/kg

SAR(1 g) = 0.942 mW/g; SAR(10 g) = 0.622 mW/g

Maximum value of SAR (measured) = 1.01 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

RIGHT TOUCH 1013

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 825$ MHz; $\sigma = 0.908$ mho/m; $\epsilon_r = 41.1$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.07 mW/g

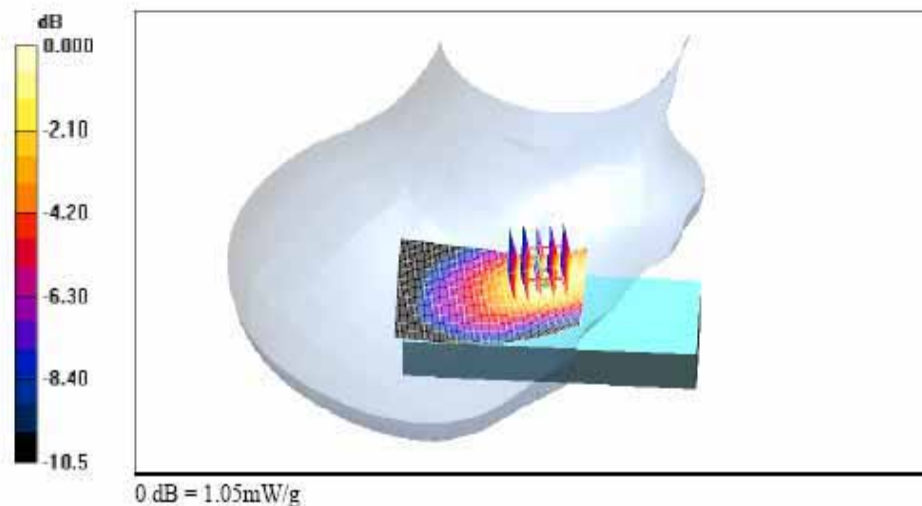
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5$ mm, $dy=7.5$ mm, $dz=5$ mm

Reference Value = 12.8 V/m; Power Drift = 0.050 dB

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 0.986 mW/g; SAR(10 g) = 0.647 mW/g

Maximum value of SAR (measured) = 1.05 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II, TEL: 82-2-867-3201
426-5, Gasan-dong, Geumcheon-gu, FAX: 82-2-867-3204
Seoul, 153-803, Korea

Date: 2007-02-22

Test Laboratory: ESTECH

LEFT TOUCH 777

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 848.31 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 848.31$ MHz; $\sigma = 0.926$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.27 mW/g

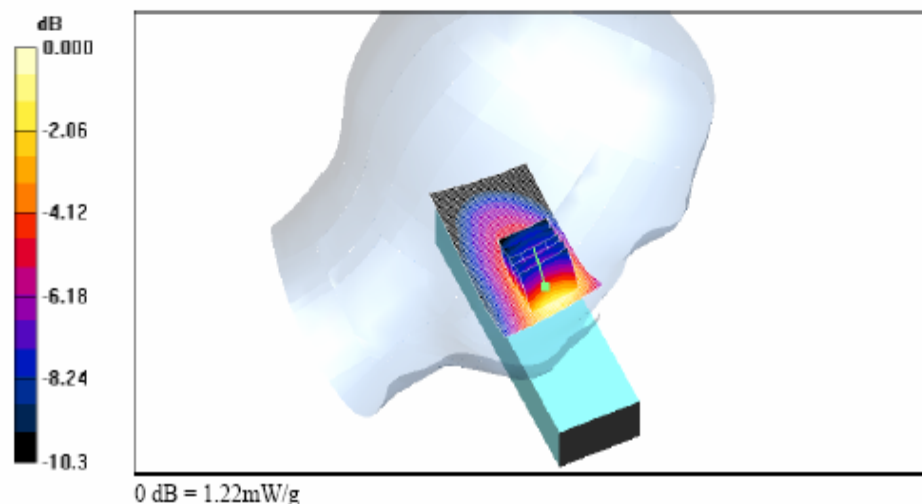
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 14.2 V/m; Power Drift = 0.047 dB

Peak SAR (extrapolated) = 1.65 W/kg

SAR(1 g) = 1.12 mW/g; SAR(10 g) = 0.743 mW/g

Maximum value of SAR (measured) = 1.22 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

RIGHT TOUCH 777

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 848.31$ MHz; $\sigma = 0.926$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.26 mW/g

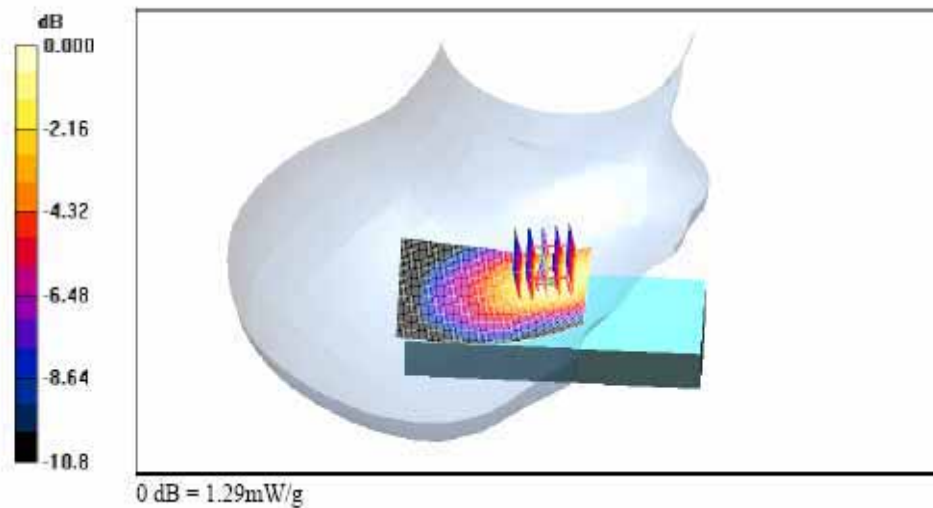
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 13.9 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 1.75 W/kg

SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.760 mW/g

Maximum value of SAR (measured) = 1.29 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II, TEL: 82-2-867-3201
426-5, Gasan-dong, Geumcheon-gu, FAX: 82-2-867-3204
Seoul, 153-803, Korea

Date: 2007-02-22

Test Laboratory: ESTECH

RIGHT TOUCH 777

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 848.31$ MHz; $\sigma = 0.926$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$

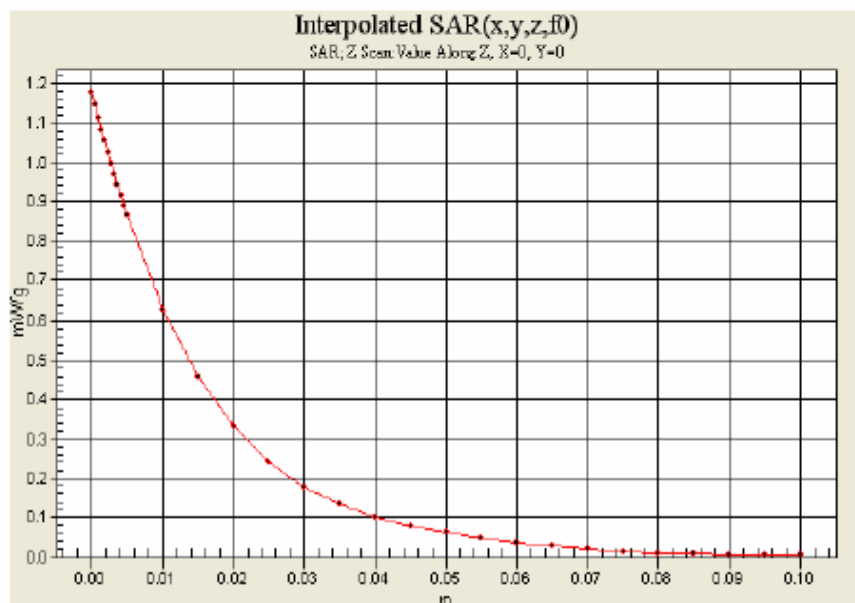
kg/m³

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) 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 : 48%



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

CDMA 850 BODY

Date: 2007-02-22

Test Laboratory: ESTECH

BODY 363

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 835.89 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 836$ MHz; $\sigma = 0.965$ 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 : 48%

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

Maximum value of SAR (interpolated) = 0.581 mW/g

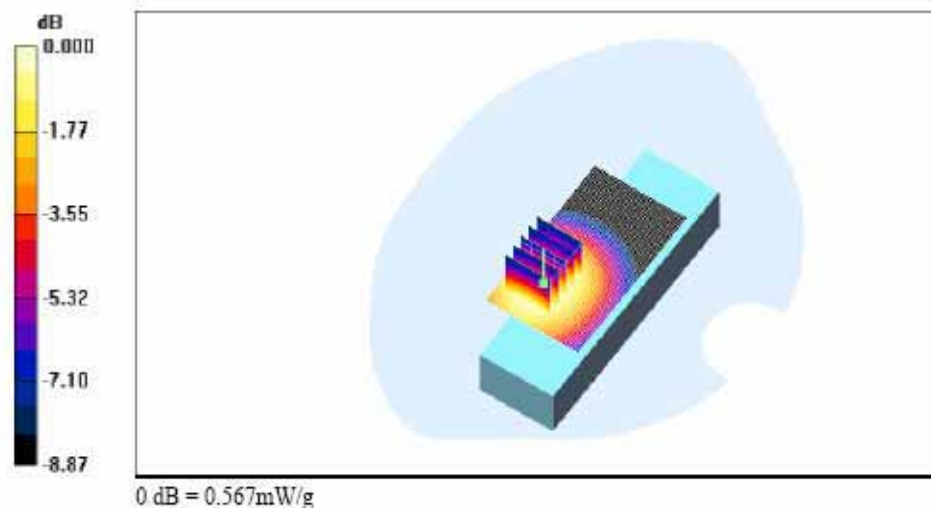
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 15.9 V/m; Power Drift = -0.073 dB

Peak SAR (extrapolated) = 0.692 W/kg

SAR(1 g) = 0.537 mW/g; SAR(10 g) = 0.393 mW/g

Maximum value of SAR (measured) = 0.567 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

BODY 363

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: CDMA FCC; Frequency: 835.89 MHz; Duty Cycle: 1:1

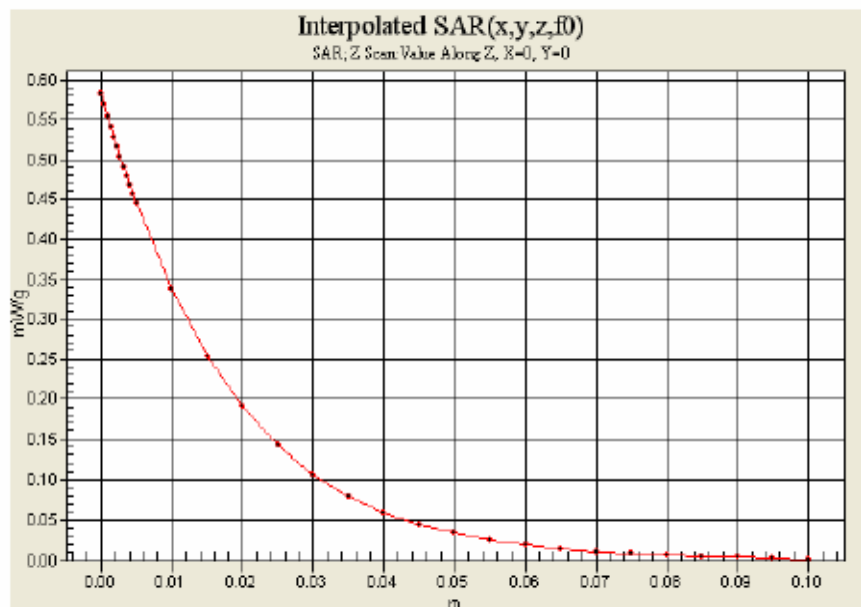
Medium parameters used: $f = 836$ MHz; $\sigma = 0.965$ mho/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³

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 : 48%



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

CDMA 1900 HEAD

Date: 2007-02-22

Test Laboratory: ESTECH

LEFT TOUCH 600

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.52 mW/g

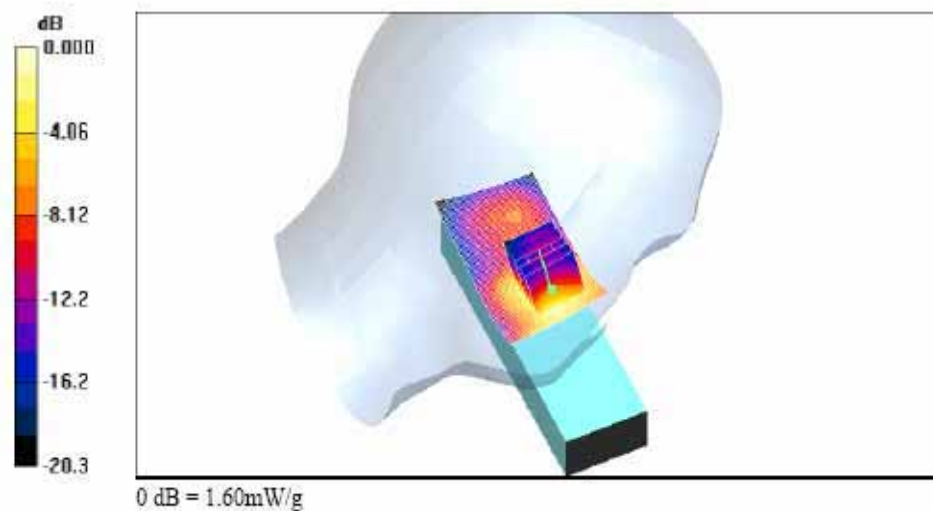
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 11.1 V/m; Power Drift = -0.003 dB

Peak SAR (extrapolated) = 2.43 W/kg

SAR(1 g) = 1.42 mW/g; SAR(10 g) = 0.762 mW/g

Maximum value of SAR (measured) = 1.60 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

LEFT TOUCH 600

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1880 MHz; Duty Cycle: 1:1

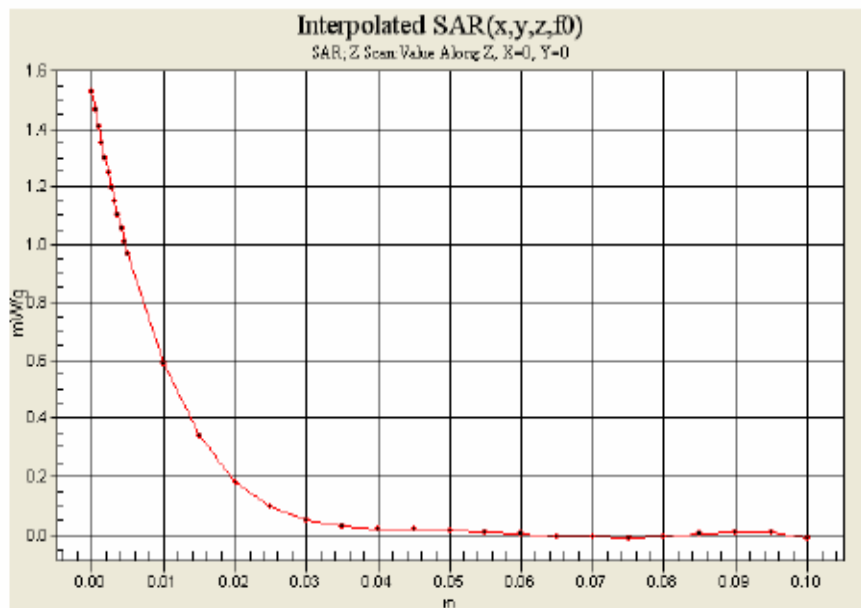
Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

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) 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 : 48%



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201

FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

RIGHT TOUCH 600

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.25 mW/g

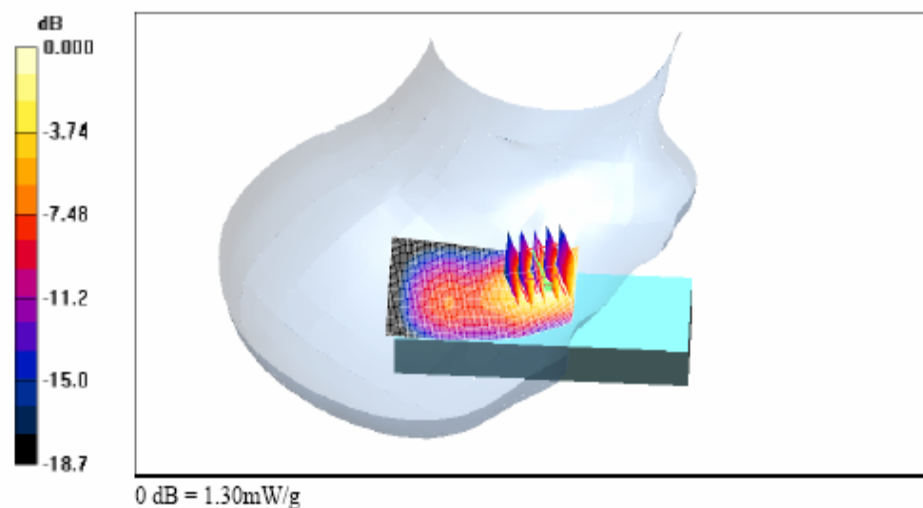
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 8.38 V/m; Power Drift = -0.094 dB

Peak SAR (extrapolated) = 1.85 W/kg

SAR(1 g) = 1.12 mW/g; SAR(10 g) = 0.611 mW/g

Maximum value of SAR (measured) = 1.30 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

LEFT TILT 600

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 0.486 mW/g

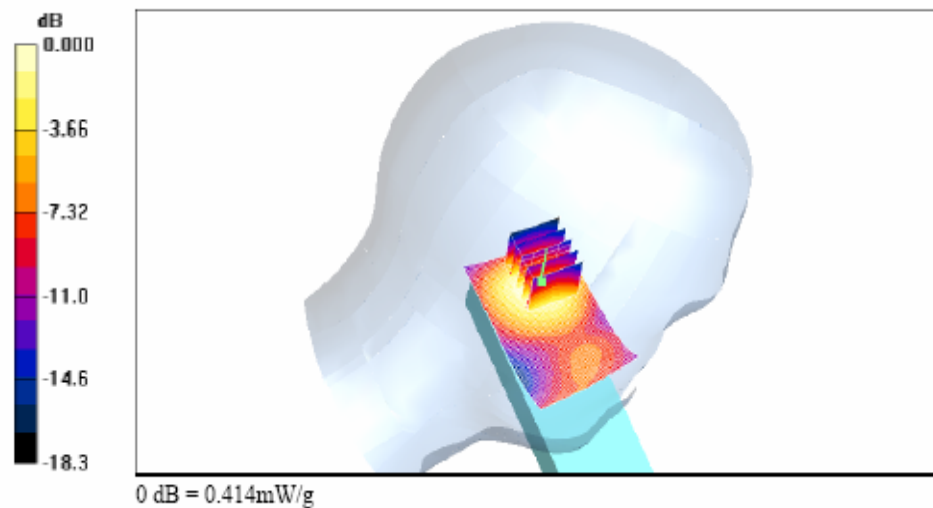
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 14.6 V/m; Power Drift = 0.038 dB

Peak SAR (extrapolated) = 0.577 W/kg

SAR(1 g) = 0.382 mW/g; SAR(10 g) = 0.230 mW/g

Maximum value of SAR (measured) = 0.414 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

RIGHT TILT 600

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ 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 : 48%

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

Maximum value of SAR (interpolated) = 0.437 mW/g

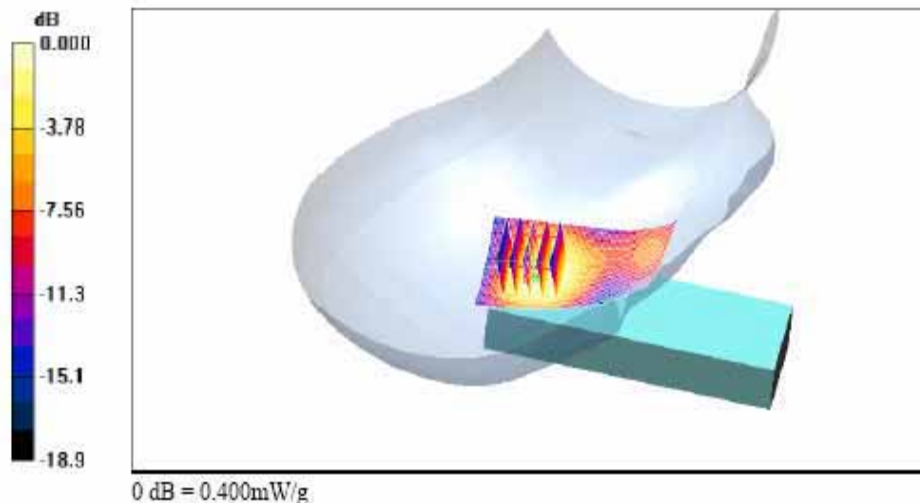
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 12.5 V/m; Power Drift = -0.045 dB

Peak SAR (extrapolated) = 0.575 W/kg

SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.215 mW/g

Maximum value of SAR (measured) = 0.400 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

LEFT TOUCH 25

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1851.25$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 39.9$; $\rho = 1000$

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℃, Humidity : 48%

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

Maximum value of SAR (interpolated) = 1.50 mW/g

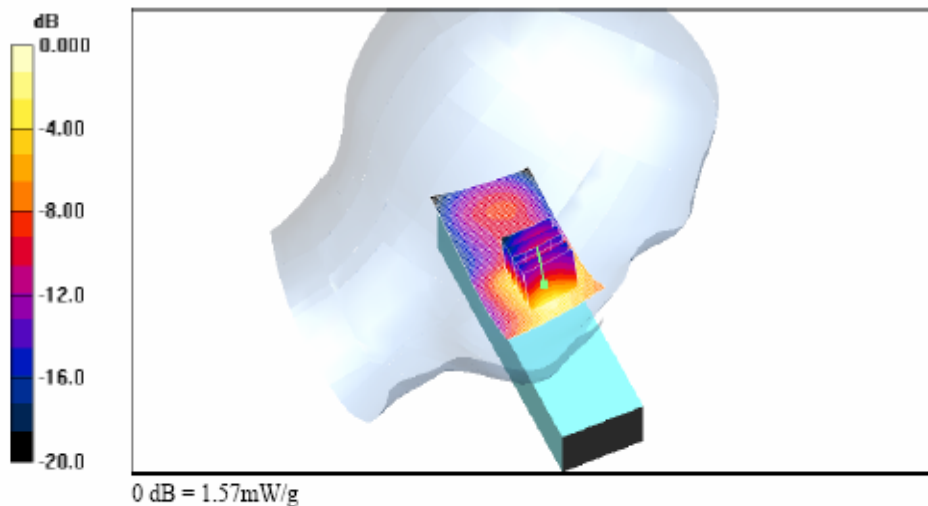
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 11.2 V/m; Power Drift = 0.002 dB

Peak SAR (extrapolated) = 2.27 W/kg

SAR(1 g) = 1.37 mW/g; SAR(10 g) = 0.740 mW/g

Maximum value of SAR (measured) = 1.57 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

RIGHT TOUCH 25

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 1851.25$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 39.9$; $\rho = 1000$

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 : 48%

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

Maximum value of SAR (interpolated) = 1.26 mW/g

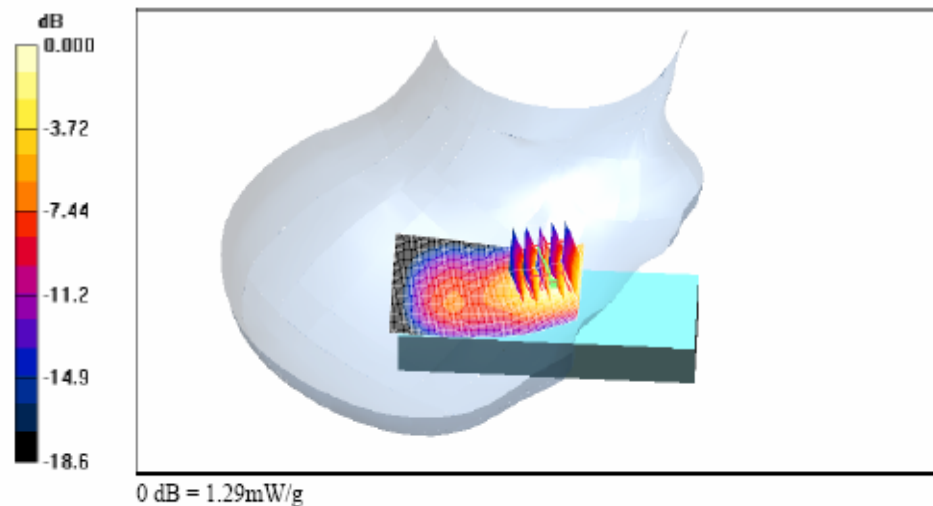
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 8.37 V/m; Power Drift = -0.025 dB

Peak SAR (extrapolated) = 1.81 W/kg

SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.632 mW/g

Maximum value of SAR (measured) = 1.29 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201

FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

LEFT TOUCH 1175

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1908.98$ MHz; $\sigma = 1.45$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.40 mW/g

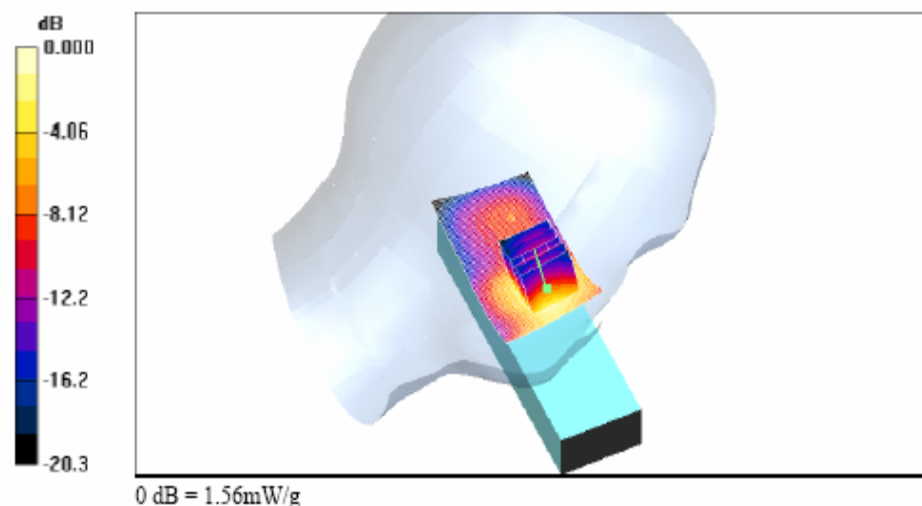
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 10.1 V/m; Power Drift = 0.025 dB

Peak SAR (extrapolated) = 2.37 W/kg

SAR(1 g) = 1.38 mW/g; SAR(10 g) = 0.726 mW/g

Maximum value of SAR (measured) = 1.56 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

RIGHT TOUCH 1175

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1908.98$ MHz; $\sigma = 1.45$ 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 : 48%

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

Maximum value of SAR (interpolated) = 1.24 mW/g

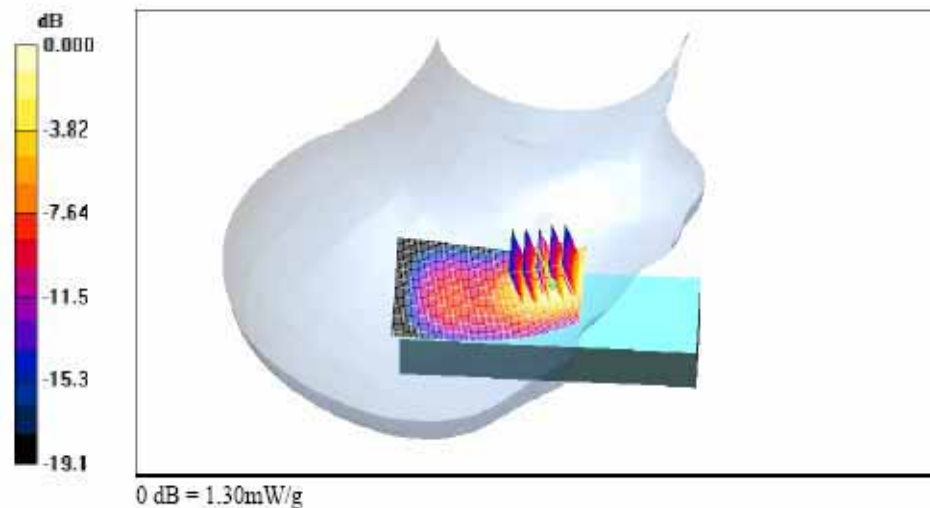
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 8.04 V/m; Power Drift = -0.031 dB

Peak SAR (extrapolated) = 1.85 W/kg

SAR(1 g) = 1.14 mW/g; SAR(10 g) = 0.619 mW/g

Maximum value of SAR (measured) = 1.30 mW/g





ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

CDMA 1900 BODY

Date: 2007-02-22

Test Laboratory: ESTECH

BODY 600

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.52 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$

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 : 48%

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

Maximum value of SAR (interpolated) = 0.361 mW/g

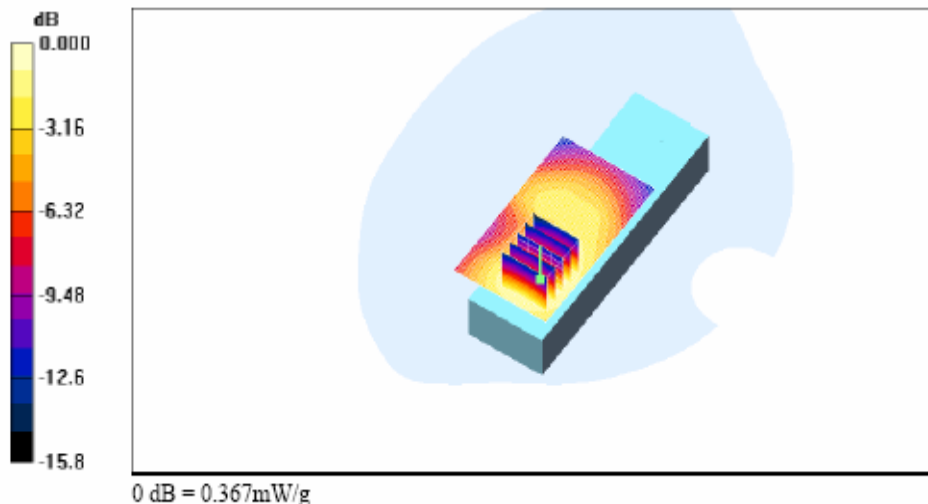
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

Reference Value = 10.7 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 0.544 W/kg

SAR(1 g) = 0.341 mW/g; SAR(10 g) = 0.210 mW/g

Maximum value of SAR (measured) = 0.367 mW/g



**ESTECH Co., Ltd.**

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201

FAX: 82-2-867-3204

Date: 2007-02-22

Test Laboratory: ESTECH

BODY 600

DUT: PW560; Type: POLDER; Serial: XXXX

Communication System: PCS FCC; Frequency: 1880 MHz; Duty Cycle: 1:1

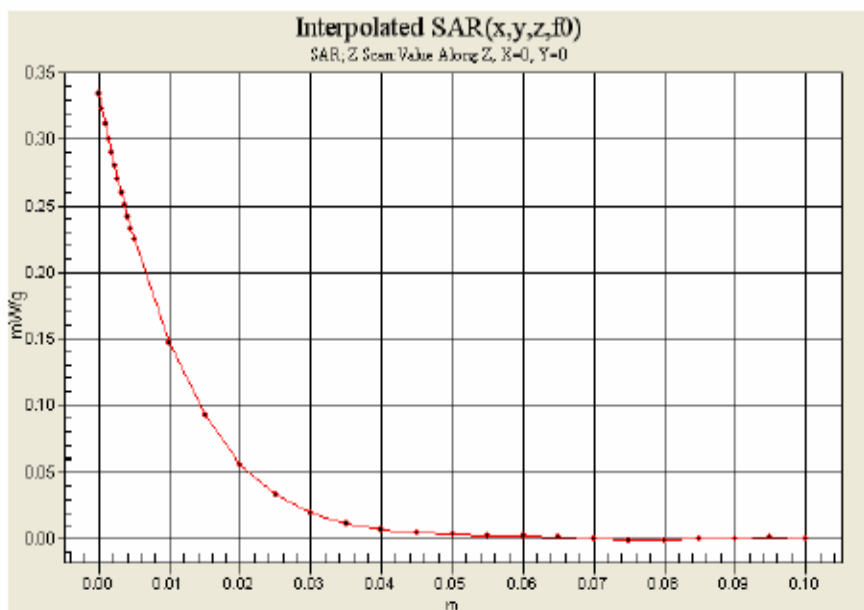
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.52$ mho/m; $\epsilon_r = 53.5$; $\rho = 1000$ kg/m³

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 : 48%





ESTECH Co., Ltd.

Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea

TEL: 82-2-867-3201
FAX: 82-2-867-3204

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.



Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, <http://www.speag.com>

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: **Katja Pokovic** **Technical Manager**

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

Issued: October 17, 2006

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



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**

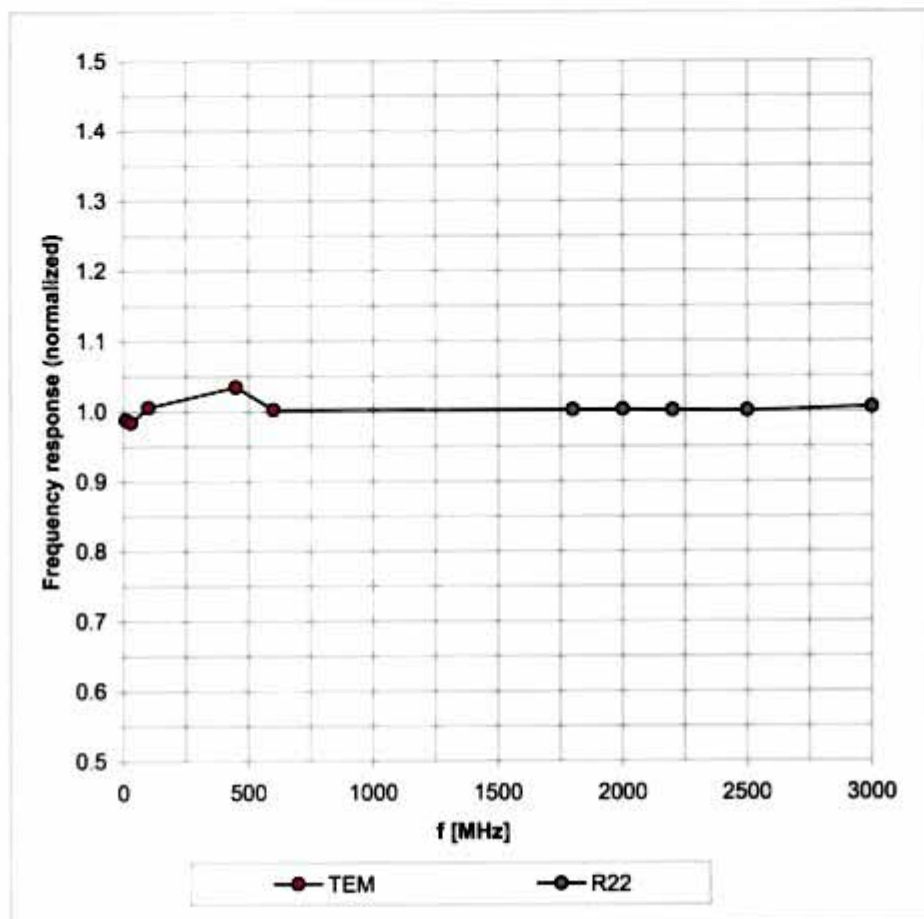
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^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.

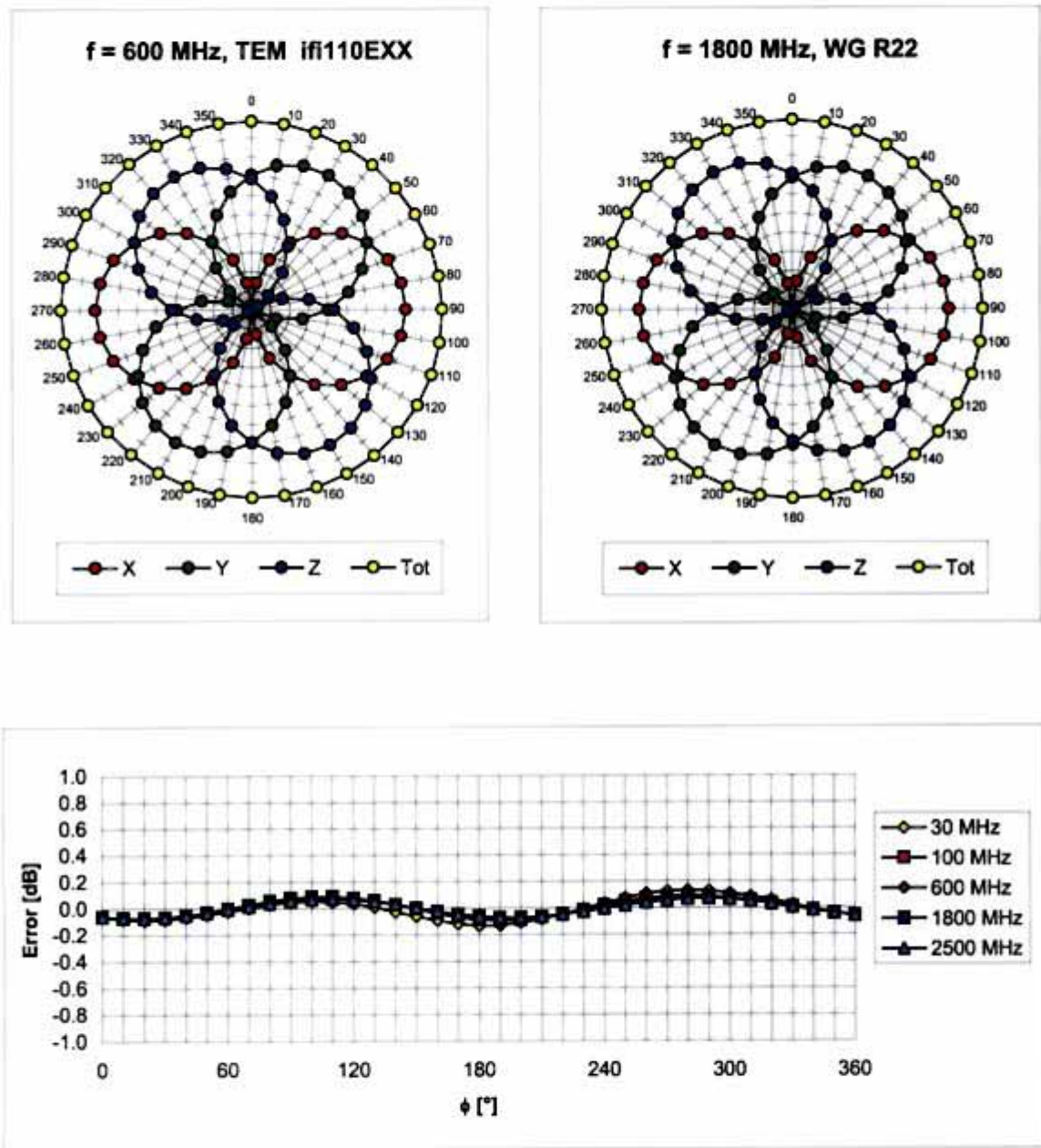
Frequency Response of E-Field

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



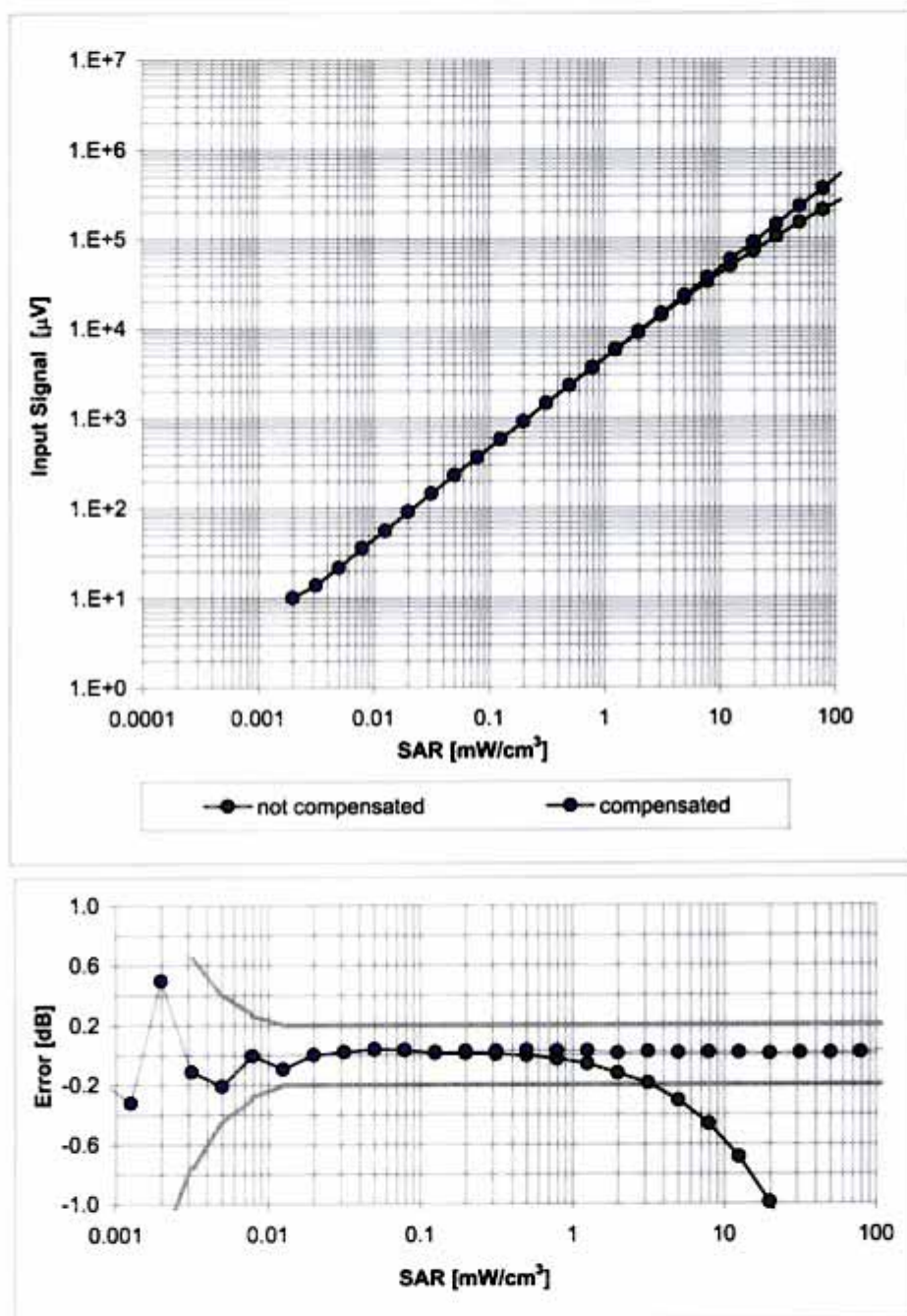
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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



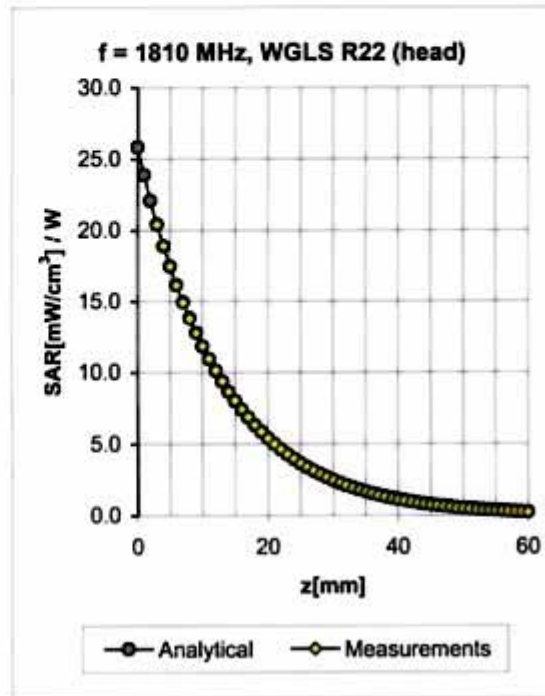
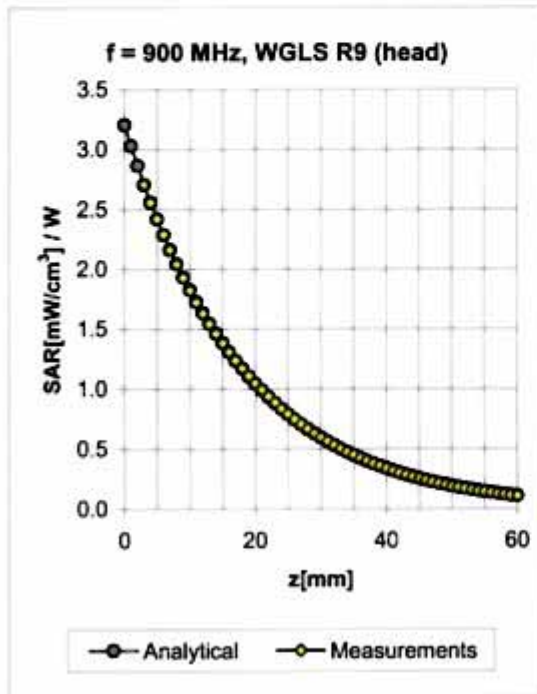
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



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

Conversion Factor Assessment

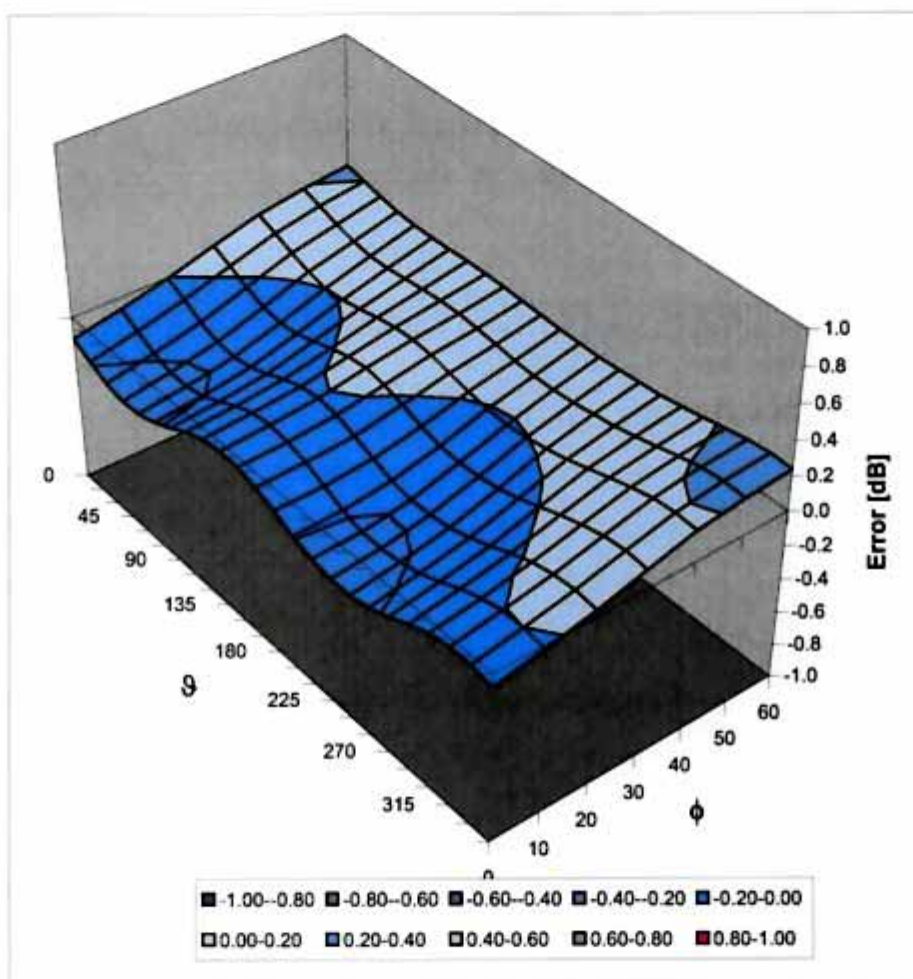


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.00	1.09	6.42 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.92	1.16	5.23 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.79	1.29	5.08 ± 11.0% (k=2)
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: $\pm 2.6\%$ ($k=2$)



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: **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

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



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**

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 Ω - 0.5 j Ω
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: $f = 835 \text{ MHz}$; $\sigma = 0.893 \text{ mho/m}$; $\epsilon_r = 42.3$; $\rho = 1000 \text{ kg/m}^3$

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:

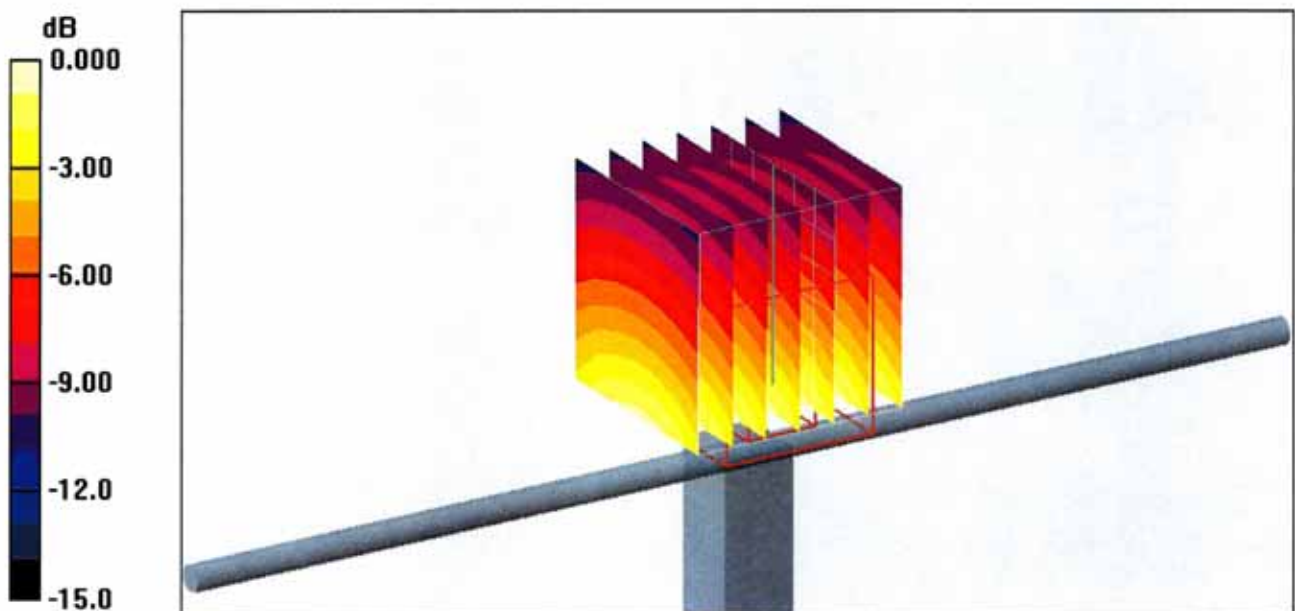
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

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

Peak SAR (extrapolated) = 3.41 W/kg

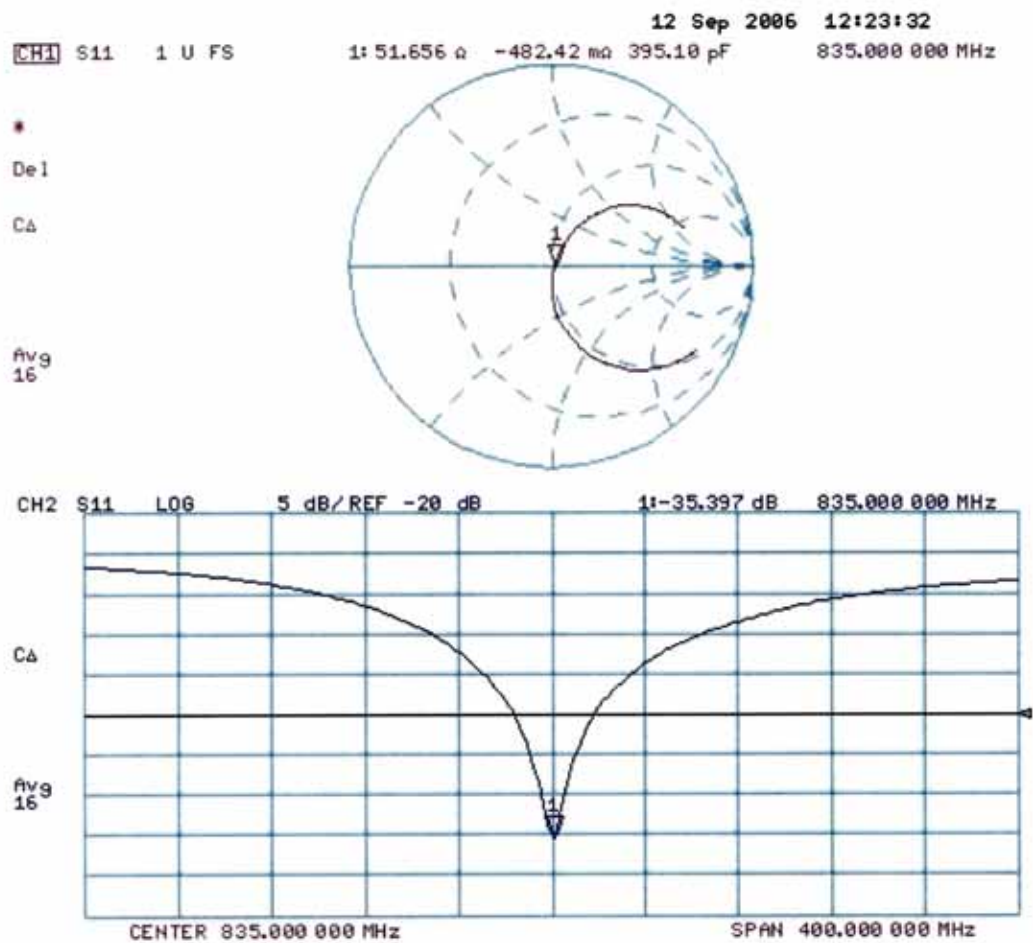
SAR(1 g) = 2.29 mW/g; SAR(10 g) = 1.49 mW/g

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



0 dB = 2.48mW/g

Impedance Measurement Plot for Head TSL





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: **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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	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**

[Signature of Marcel Fehr]
[Signature of Katja Pokovic]

Issued: September 20, 2006

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



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**

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 cm³ (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 cm³ (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:

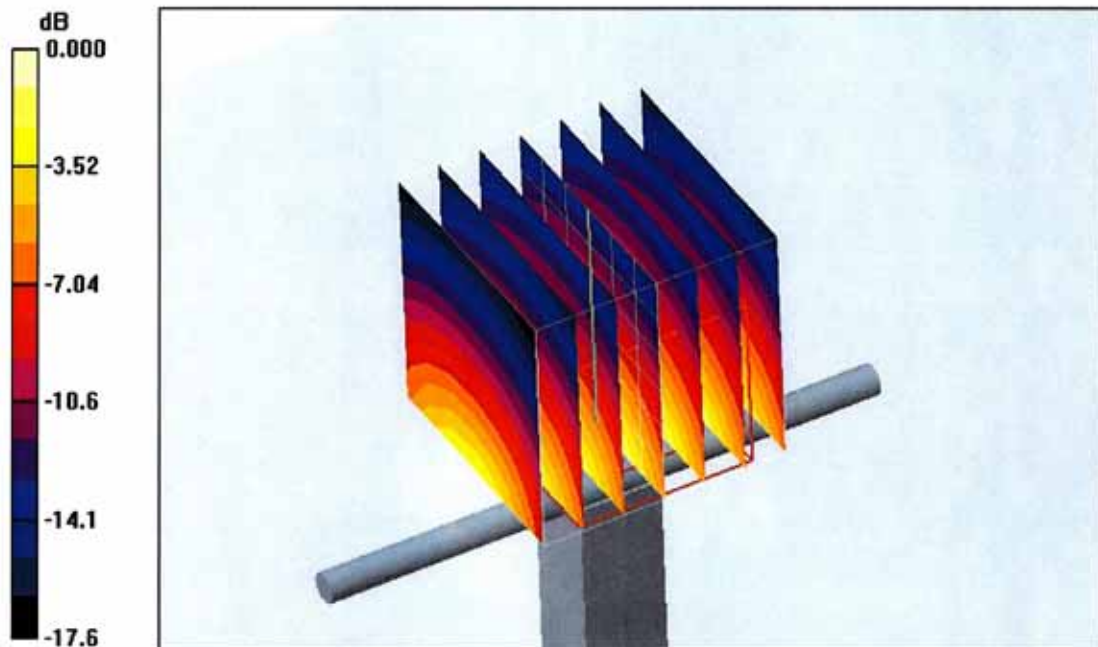
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

