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 Compliace 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 : 2005 10/10 ~ 10/20
Test Site : ESTECH Co., Ltd. Korea

Test Device :

Models : LSI-120R , LSI-120T

FCC ID : BEJLSI120R

TYPE : Single - Mode WLL Phone (CDMA)

Test report no :	ESTSAR0510-004	Number of page :	22
Contact person :	Cheol-Goo Lee	Responsible test Engineer :	K.H.Kang
Testing has been Carried out in Accordance with :	IEEE P1528-200X Draft 6.4 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)		
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 recept in full, without written approval of the laboratory.		

Date and Signatures : 2005/10/20
Report Prepared By : Engineer/ K.H.Kang
(Signature)
Manager Engineer/ Jay Kim
(Signature)

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 ---------- 22
APPENDIX A : Validation Test Data of Tissue
APPENDIX B : Validation Test Data
APPENDIX C : SAR Test Setup Photographs
APPENDIX D : SAR Test Data
APPENDIX E : Calibration Certificates

1. SUMMARY FOR TEST REPORT

FCC ID	BEJLSI120R
Date of test	2005/10/10 ~ 2005/10/20
Responsible test engineer	Jay Kim
Measurement performed by	K.H.Kang
EUT Type	Single - Mode WLL Phone (CDMA)
Tx Frequency	824.70 ~ 848.31 MHz (CDMA)
Rx Frequency	869.70 ~ 893.31 MHz (CDMA)
Max. RF Output Power	CDMA (24.5 dBm)

Maximum Results Found During SAR Evaluation

1.1 Head Configuration

Max. SAR Measurement

FREQUENCY		Modulation	Conducted Power(dBm)		Device test position	Antenna position	SAR (W/kg)
MHz	Ch		dBm	Battery			
824.70	1013	CDMA	24.5	Standard	Left Touch	-	1.29

1.2 Body Worn Configuration

Max. SAR Measurement

FREQUENCY		Modulation	Conducted Power(dBm)		Separation test position	Antenna position	SAR (W/kg)
MHz	Ch		dBm	Battery			
848.31	777	CDMA	24.5	Standard	1.5cm [w/o Holster]	-	0.949

1.3 Measurement Uncertainty

Combine Standard Uncertainty	± 10.81 (k=1)
Extended Standard Uncertainty	± 21.62 (k=2, 95% CONFIDENCE LEVEL)

2. INTRODUCATION

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 azards of RF emissions due to FCC-regulated portable device.[1]

The safety limits used for the environmental evaluation measurements arethe 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/ANSIC95.3-1992 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 radiationexposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields," NCRP Report No. 86 (c) NCRP, 1986, Bethesda, MD20814.[6] SAR is ameasure 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. 3.1.).

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

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/㎥)
ρ = Total RMS electric field strength (V/m)

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 sevices 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. The EUT is a identical prototype, and the all techniques of it are identical with production unit.

2.1 Antenna Description

Type	Helical
Location	the right top of the device
Radiator Material	P-Carbonate

2.2 Device Description

FCC ID	FCC ID : BEJLSI120R
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 (CDMA)
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)	21
Tissue simulating liquid temperature (°C)	21
Humidity (%)	45

4.2 RF Characteristics of The Test Site

Tests were performed in a fully enclosed RF Shielded environment

4.3 Test Signal, Frequencies, And Output Power

The handset was placed into simulated call mode (800MHz CDMA modes) using manufacturers test codes.

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. date
DAE	DAE3	551	2004-04-28
E-Field Probe	ET3DV6	1748	2005-01-21
Dipole validation kit	D835V2	475	2005-02-24
Network analyzer	8753ES	NONE	2005-10-17
Signal generator	E4432B	GB40050840	2005-03-03
RF Power meter	EPM-442A	GB37170412	2005-10-05
Power Sensor	8481A	3318A90368	2005-10-05
RF Power meter	E4418A	GB38272722	2005-03-03
Power Sensor	8481A	3318A96478	2005-03-03
Dielectric Probe	85070D	US01440154	-

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 Windows2000 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.

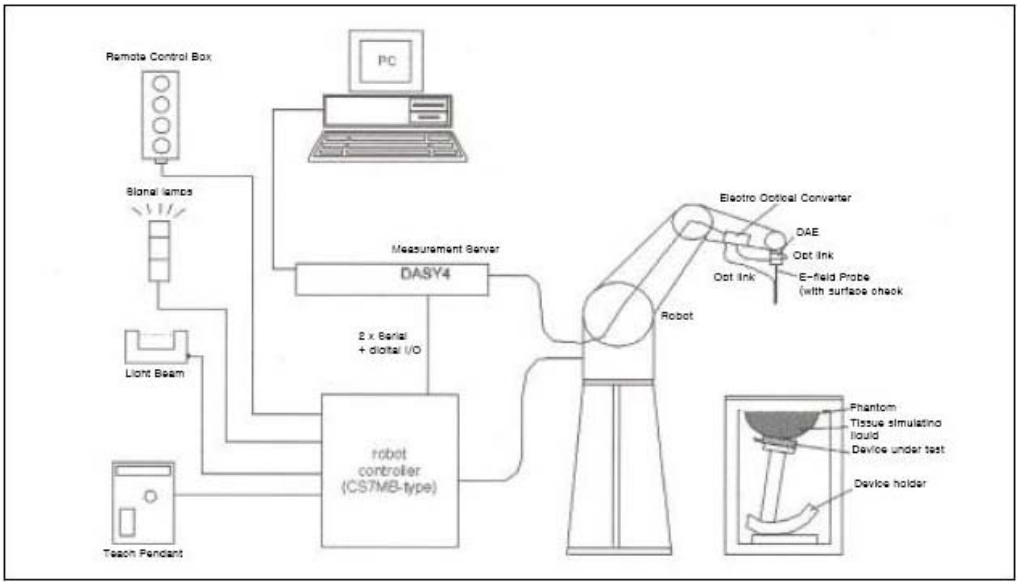


Fig. 5.1 SAR Measurement System Setup

The DAE3 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 PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in [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 Table. 5.2). The approach is stopped at reaching the maximum.

	Isotropic E-Field Probe for Dosimetric Measurements	
Isotropic E-Field Probe	**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 ± 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 µW/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 hydroxethlcellullose(HEC) gelling agent and saline solution (see Table 5.1). 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 P1528 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. Hartagrove [13]. (see Fig. 5.3)

Frequency	Head		Body	
(MHz)	εr	σ (S/m)	εr	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(diethyene Glycol butyl 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 (hydroxyethyl cellulose)	0.24%				
Preventol	0.24%	0.10%			
ε	41.0±5%	55.2±5%	ε	40.0±5%	53.3±5%
σ	0.89±10%	0.97±10%	σ	1.45±10%	1.52±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].

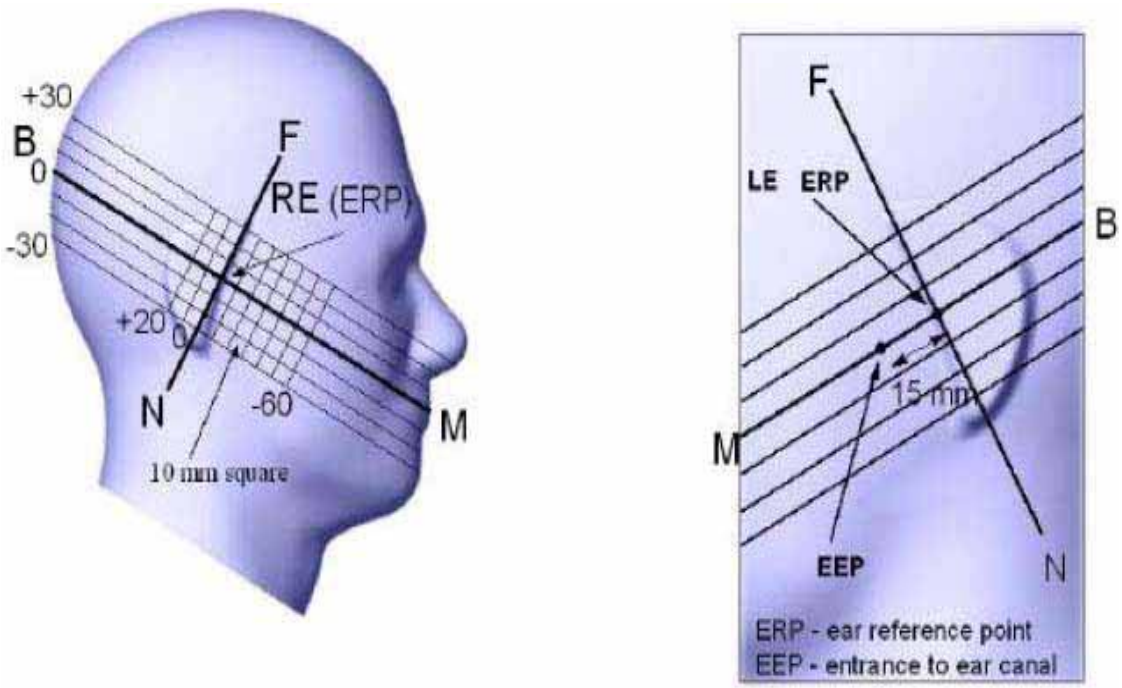


Figure 6.1 Close-up side view of ERP

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 than 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)

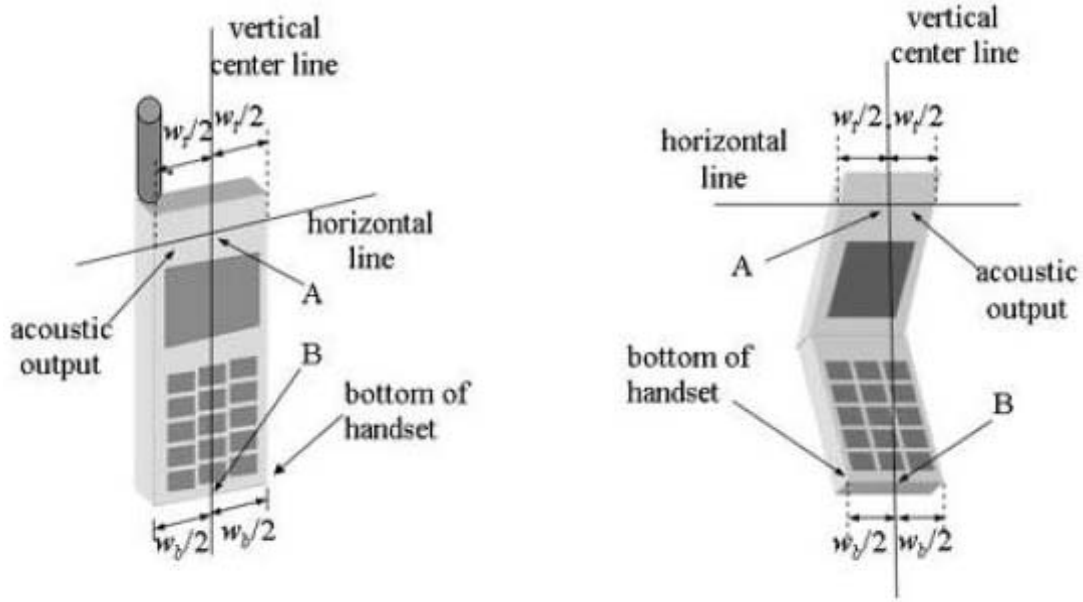


Figure 6.2 Handset Vertical Center & Horizontal Line Reference Points

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 wt of the handset at the level of the acoustic output (point A on Figures 6.2), and the midpoint of the width wb 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 ecessarily 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

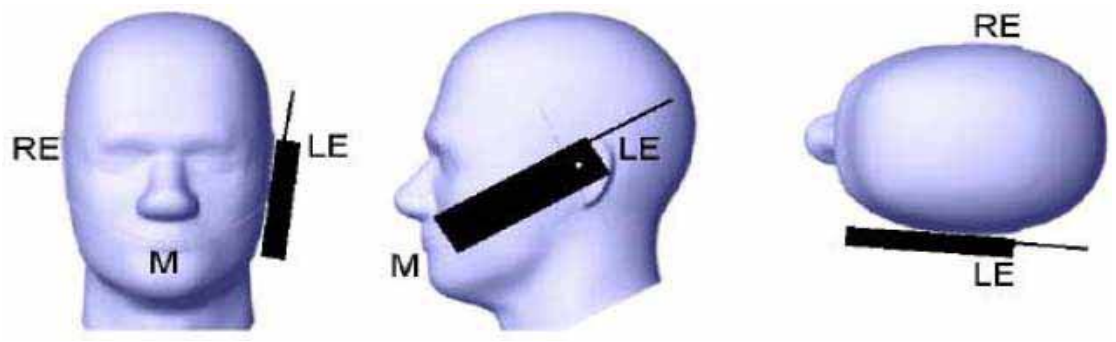


Figure 6.3 “Cheek” or “Touch” Position.

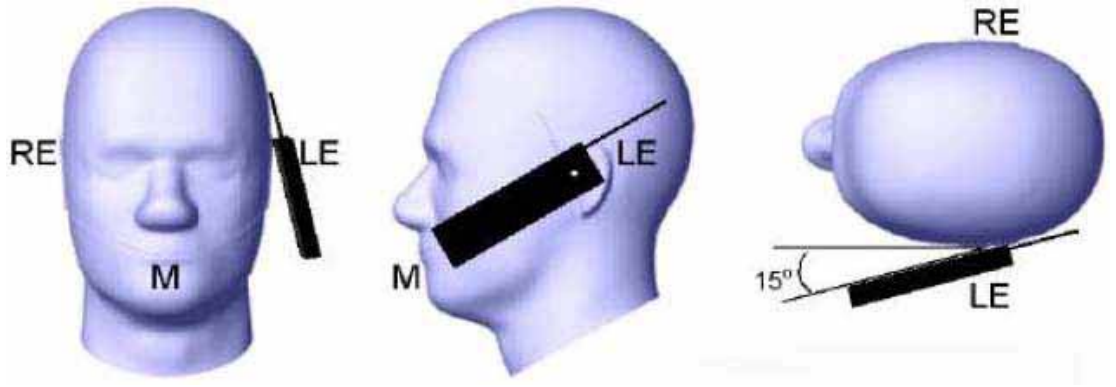


Figure 6.4 “Tilted” Position.

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, 7x7x7 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 value ±%	Probability Distribution	Divisor	ci 1 1g	Standard unc. (1g)	vi or 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	± 2.5	normal	1	0.64	± 1.6%	∞
Liquid permittivity Target - tolerance	± 5.0	rectangular	√3	0.6	± 1.7%	∞
Liquid Permittivity - measurement uncertainty	± 2.5	normal	1	0.6	± 1.5%	∞
Combined Standard Uncertainty					±11.32 %	330
Coverage Factor for 95%				K = 2		
Expanded Standard Uncertainty					± 22.64 %	

8. SYSTEM VERIFICATION

Tissue Verification

Table 8.1 Simulated Tissue Verification [5]

MEASURED TISSUE PARAMETERS										
Liquid Temperature (°C)			21		Liquid Depth(mm)		150			
Date	2005-10-19		2005-10-19				/ /			
Tissue	835MHz Brain		835MHz Muscle							
	Target	Measured	Target	Measured						
Dielectric Constant: ε	41.5	40.4	55.2	54.2						
Conductivity: σ	0.9	0.888	0.97	0.959						
Deviation (%)	ε : -2.65% σ : -1.33%		ε : -1.81% σ : -1.13%							

Test System Validation

- Prior to assessment, the system is verified to the ±10% of the specifications at 835MHz (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
835MHz Brain	D835V2(S/N :475)	1.0	9.5	9.4	1.05%	2005-10-19

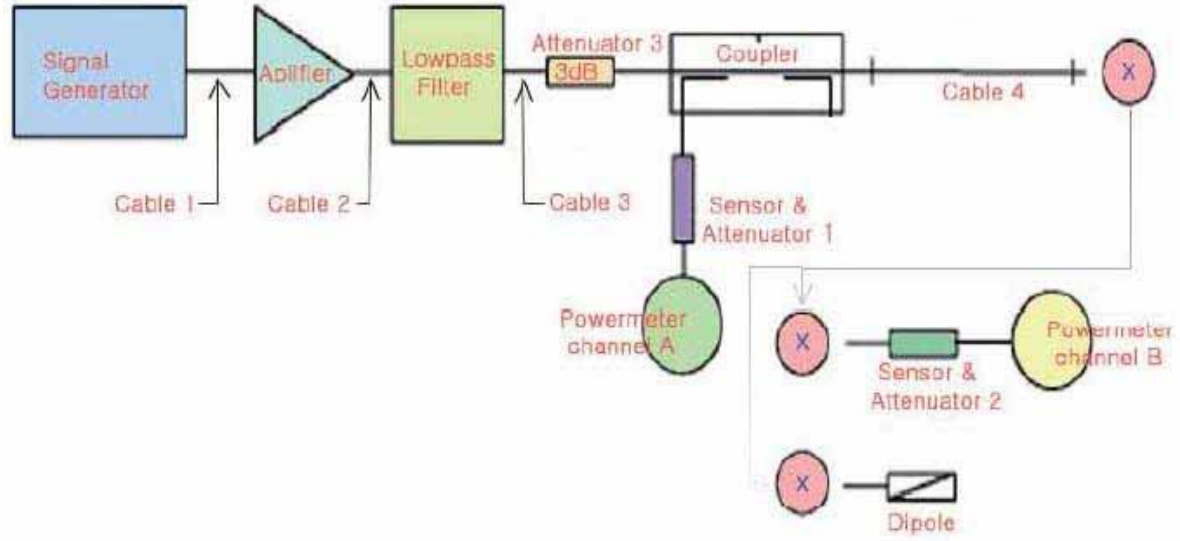


Figure 12.1 Dipole Validation Test Setup

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) : 21.0
Relative HUMIDITY (%) : 45
Mixture Type : 835MHz Brain
Dielectric Constant : 40.4
Conductivity: 0.888

Measurement Results (CDMA Head SAR-Touch)

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 Left Head SAR – Touch)

Frequency		Moudulation	Conducted Power(dBm)		battery	Device Test position	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End				
824.70	1013	CDMA	24.50	24.53	Standard	Cheek Touch	–	1.290
835.89	363	CDMA	24.50	24.47	Standard	Cheek Touch	–	1.270
848.31	777	CDMA	24.50	24.66	Standard	Cheek Touch	–	1.290

MEASUREMENT RESULTS (CDMA Right Head SAR – Touch)

Frequency		Moudulation	Conducted Power(dBm)		battery	Device Test position	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End				
824.70	1013	CDMA	24.50	24.57	Standard	Cheek Touch	–	1.260
835.89	363	CDMA	24.50	24.58	Standard	Cheek Touch	–	1.230
848.31	777	CDMA	24.50	24.56	Standard	Cheek Touch	–	1.100

NOTES:
1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration.
2. All modes of operation were investigated and the worst-case are reported.
3. Battery Type : Standard
Radiated measurements indicate that the Extended-life battery produces lower ERP and EIRP, therefore the Standard-life battery is used in SAR testing.
4. Power Measured : Conducted
5. SAR Measurement System : SPEAG
6. SAR Configuration : Head

Engineer K.H.Kang
(Signature)

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) : 21.0
Relative HUMIDITY (%) : 45
Mixture Type : 835MHz Brain
Dielectric Constant : 40.4
Conductivity: 0.888

Measurement Results (CDMA Head SAR-Tilt)

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 Left Head SAR – Tlit – Slide IN)								
Frequency		Moudulation	Conducted Power(dBm)		battery	Device Test position	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End				
835.89	363	CDMA	24.50	24.38	Standard	Tilt	–	0.578

MEASUREMENT RESULTS (CDMA Right Head SAR – Tilt)								
Frequency		Moudulation	Conducted Power(dBm)		battery	Device Test position	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End				
835.89	363	CDMA	24.50	24.55	Standard	Tilt	–	0.641

NOTES:
1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration.
2. All modes of operation were investigated and the worst-case are reported.
3. Battery Type : Standard
Radiated measurements indicate that the Extended-life battery produces lower ERP and EIRP, therefore the Standard-life battery is used in SAR testing.
4. Power Measured : Conducted
5. SAR Measurement System : SPEAG
6. SAR Configuration : Head

Engineer K.H.Kang
(Signature)

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) : 20
Relative HUMIDITY (%) : 46
Mixture Type : 835MHz Body
Dielectric Constant : 54.2
Conductivity: 0.959

Measurement Results (CDMA BODY SAR with 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 (CDMA Body SAR With Holster)

Frequency		Moudulation	Conducted Power(dBm)		battery	Device Test position	Antenna Position	SAR (W/kg)
MHz	Ch.		Begin	End				
824.70	1013	CDMA	24.50	24.59	Standard	1.5[w/o Holster]	–	0.919
835.89	363	CDMA	24.50	24.44	Standard	1.5[w/o Holster]	–	0.813
848.31	777	CDMA	24.50	24.37	Standard	1.5[w/o Holster]	–	0.949

NOTES:
1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration.
2. All modes of operation were investigated and the worst-case are reported.
3. Battery Type : Standard
Radiated measurements indicate that the Extended-life battery produces lower ERP and EIRP, therefore the Standard-life battery is used in SAR testing.
4. Power Measured : Conducted
5. SAR Measurement System : SPEAG
6. SAR Configuration : Body

Engineer K.H.Kang
(Signature)

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. Pokovi æ , 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. Hartsgrove, 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 Recepies 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.

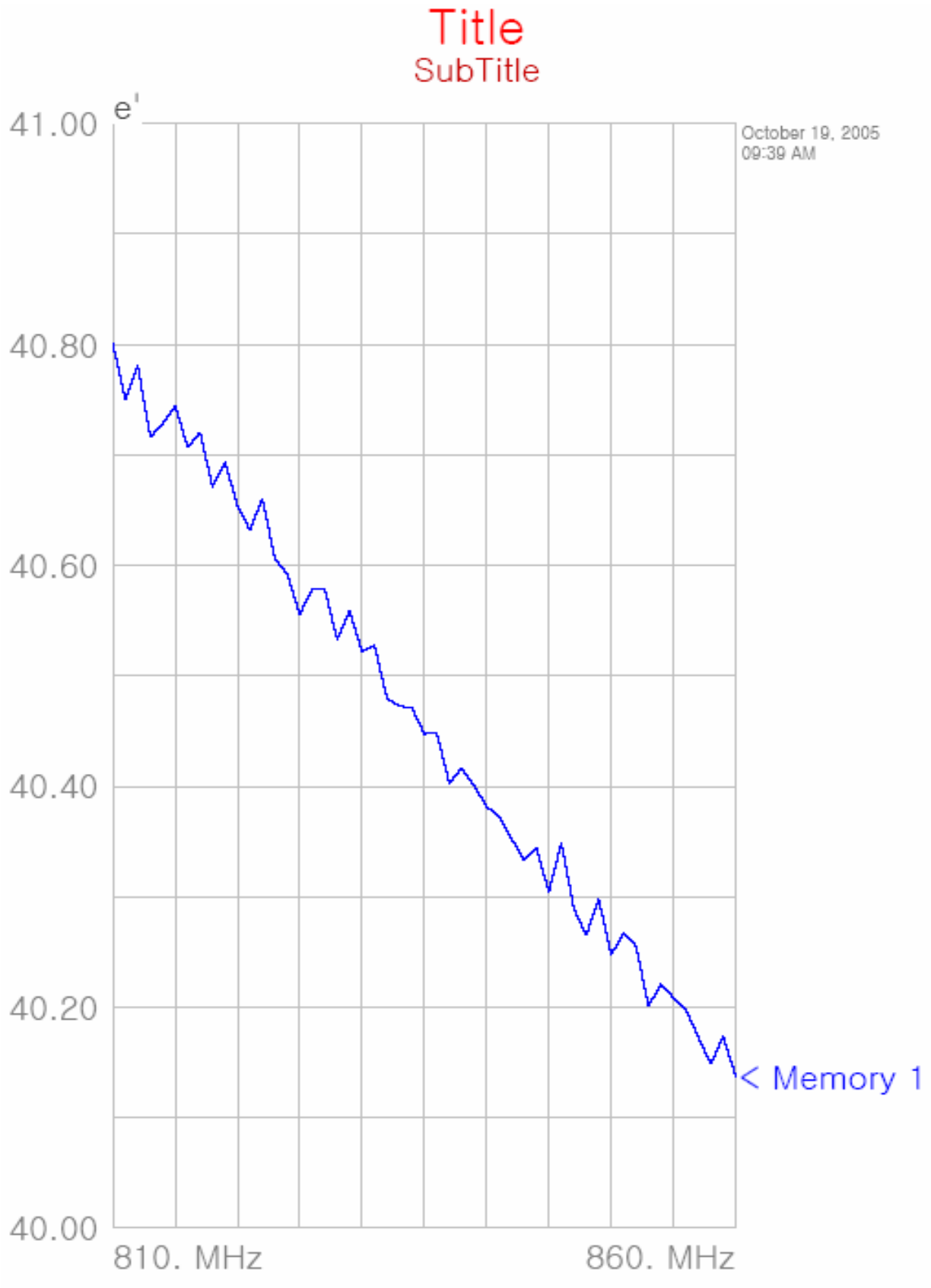
[18] Prof. Dr. Niels Kuster, ETH, Eidgen o ssische Technische Hoschschule Z u rich, Dosimetric Evaluation of the Cellular Phone.

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

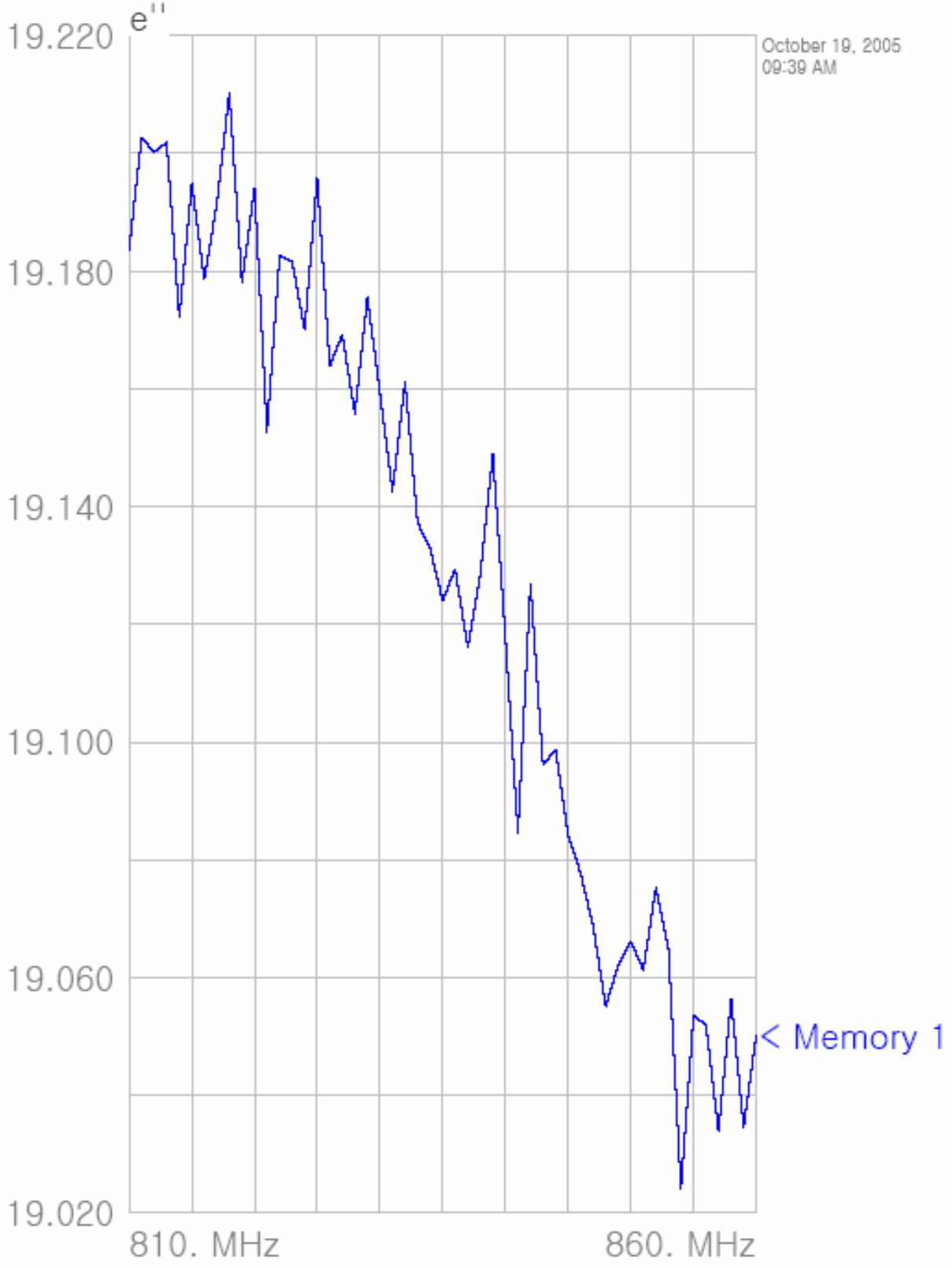
ESTECH Co., Ltd.
Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea
TEL: 82-2-867-3201
FAX: 82-2-867-3204

– Head Tissue



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

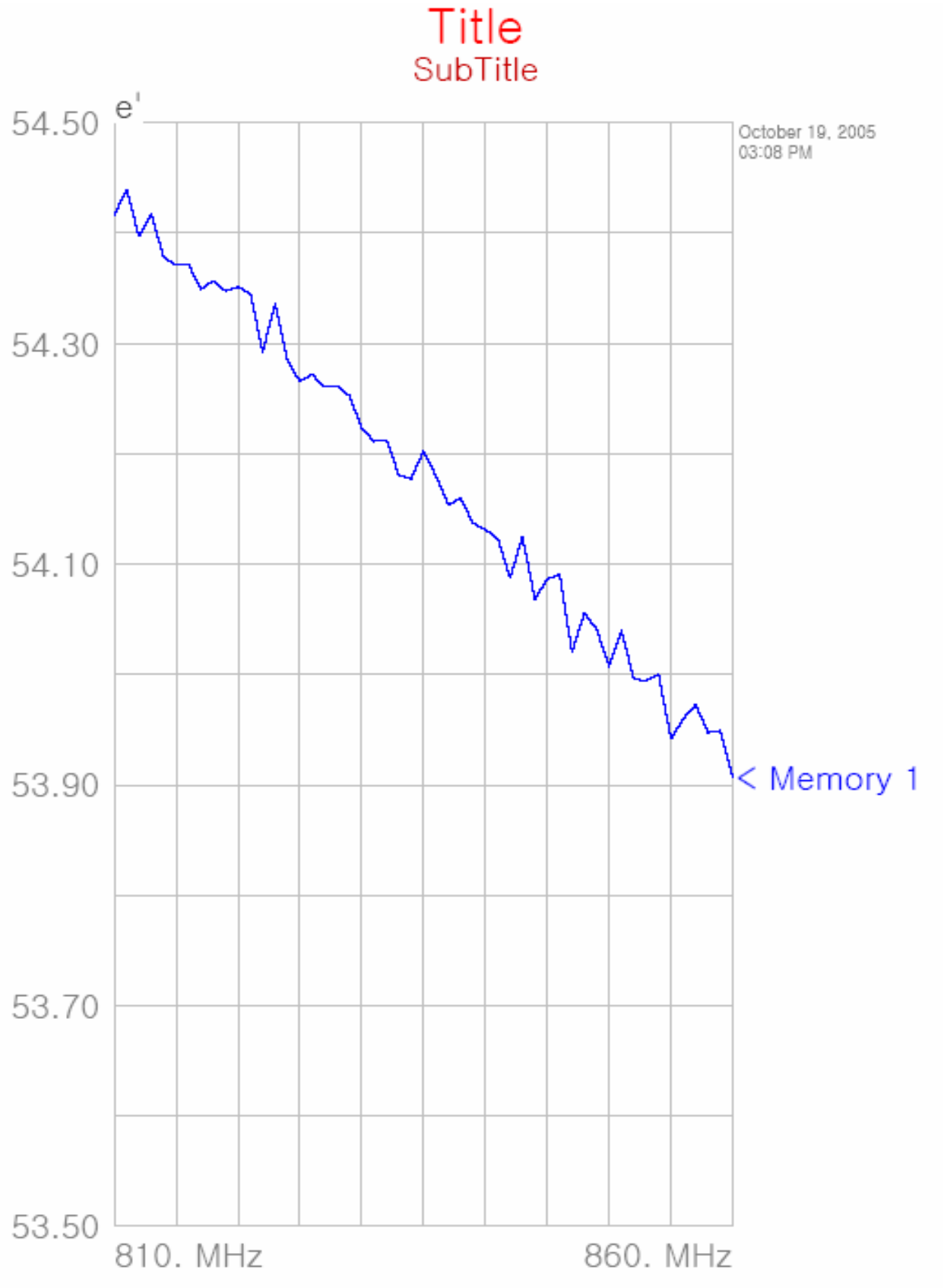
SubTitle

October 10, 2006 09:30 AM

Frequency	e'	e''
810.000000 MHz	40.8002	19.1837
811.000000 MHz	40.7505	19.2026
812.000000 MHz	40.7809	19.2002
813.000000 MHz	40.7160	19.2018
814.000000 MHz	40.7285	19.1721
815.000000 MHz	40.7443	19.1949
816.000000 MHz	40.7070	19.1786
817.000000 MHz	40.7201	19.1914
818.000000 MHz	40.6710	19.2103
819.000000 MHz	40.6934	19.1780
820.000000 MHz	40.6544	19.1941
821.000000 MHz	40.6318	19.1527
822.000000 MHz	40.6603	19.1826
823.000000 MHz	40.6063	19.1816
824.000000 MHz	40.5919	19.1700
825.000000 MHz	40.5559	19.1959
826.000000 MHz	40.5783	19.1638
827.000000 MHz	40.5792	19.1692
828.000000 MHz	40.5327	19.1558
829.000000 MHz	40.5586	19.1755
830.000000 MHz	40.5222	19.1594
831.000000 MHz	40.5276	19.1426
832.000000 MHz	40.4797	19.1612
833.000000 MHz	40.4727	19.1373
834.000000 MHz	40.4711	19.1329
835.000000 MHz	40.4474	19.1240
836.000000 MHz	40.4485	19.1294
837.000000 MHz	40.4028	19.1161
838.000000 MHz	40.4163	19.1285
839.000000 MHz	40.4008	19.1489
840.000000 MHz	40.3817	19.1180
841.000000 MHz	40.3723	19.0846
842.000000 MHz	40.3525	19.1269
843.000000 MHz	40.3336	19.0961
844.000000 MHz	40.3446	19.0987
845.000000 MHz	40.3042	19.0843
846.000000 MHz	40.3490	19.0777
847.000000 MHz	40.2895	19.0687
848.000000 MHz	40.2651	19.0552
849.000000 MHz	40.2980	19.0621
850.000000 MHz	40.2475	19.0662
851.000000 MHz	40.2669	19.0613
852.000000 MHz	40.2554	19.0753
853.000000 MHz	40.2012	19.0650
854.000000 MHz	40.2209	19.0241
855.000000 MHz	40.2087	19.0536
856.000000 MHz	40.1981	19.0519
857.000000 MHz	40.1728	19.0338
858.000000 MHz	40.1486	19.0564
859.000000 MHz	40.1736	19.0346
860.000000 MHz	40.1373	19.0503

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

– Body 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

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

October 10, 2006 03:08 PM

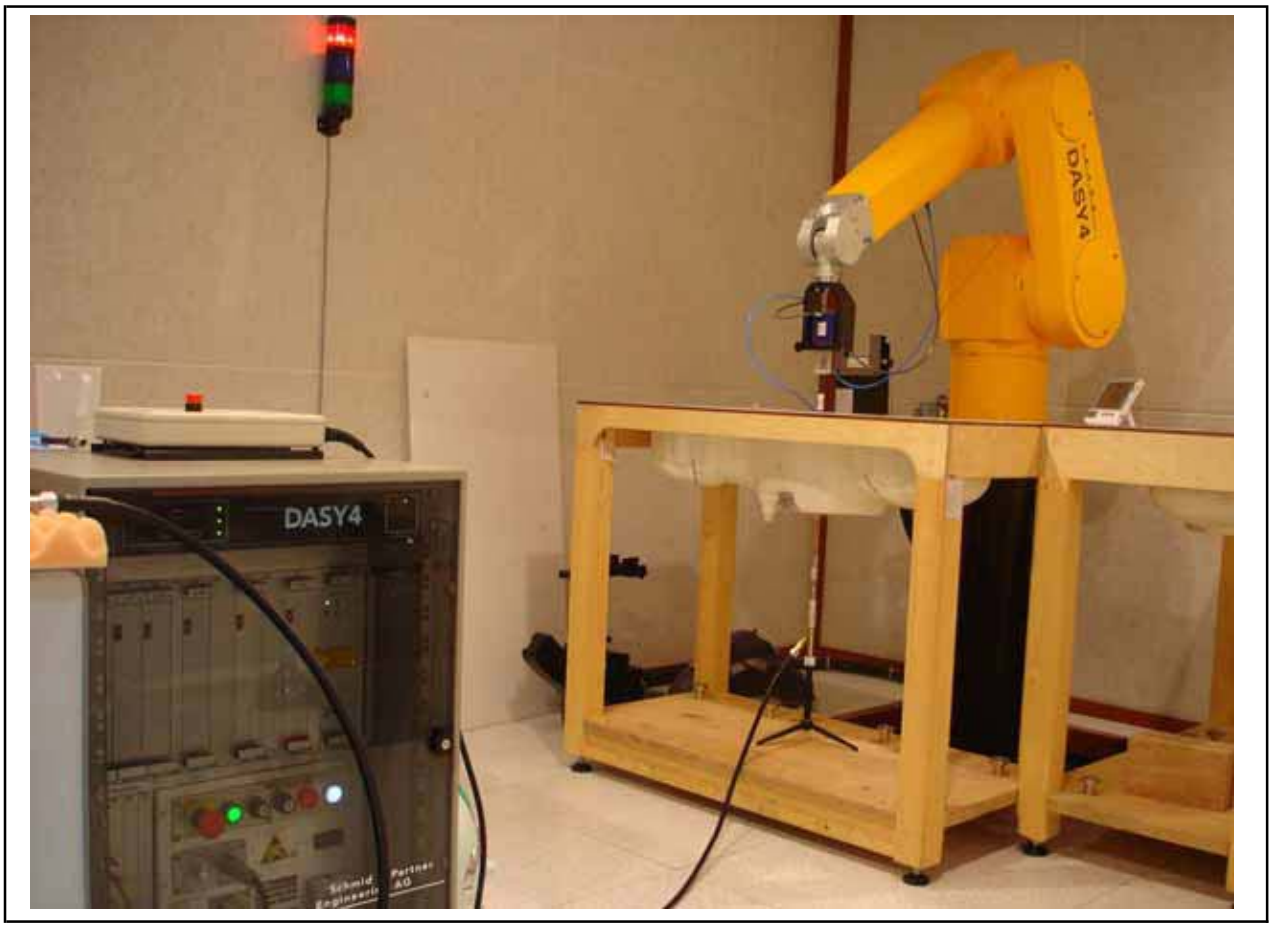
Frequency	e'	e''
810.000000 MHz	54.4158	20.5512
811.000000 MHz	54.4396	20.5604
812.000000 MHz	54.3967	20.5712
813.000000 MHz	54.4170	20.5703
814.000000 MHz	54.3777	20.5910
815.000000 MHz	54.3711	20.5774
816.000000 MHz	54.3717	20.5837
817.000000 MHz	54.3489	20.5871
818.000000 MHz	54.3567	20.6131
819.000000 MHz	54.3475	20.6228
820.000000 MHz	54.3509	20.6057
821.000000 MHz	54.3453	20.6252
822.000000 MHz	54.2924	20.6062
823.000000 MHz	54.3361	20.6078
824.000000 MHz	54.2843	20.6219
825.000000 MHz	54.2656	20.6350
826.000000 MHz	54.2718	20.5947
827.000000 MHz	54.2603	20.6273
828.000000 MHz	54.2613	20.6333
829.000000 MHz	54.2526	20.6427
830.000000 MHz	54.2234	20.6265
831.000000 MHz	54.2112	20.6262
832.000000 MHz	54.2123	20.6320
833.000000 MHz	54.1808	20.6388
834.000000 MHz	54.1774	20.6022
835.000000 MHz	54.2026	20.6432
836.000000 MHz	54.1799	20.6138
837.000000 MHz	54.1537	20.5747
838.000000 MHz	54.1596	20.6226
839.000000 MHz	54.1371	20.5933
840.000000 MHz	54.1313	20.5797
841.000000 MHz	54.1231	20.5889
842.000000 MHz	54.0875	20.5536
843.000000 MHz	54.1249	20.5678
844.000000 MHz	54.0683	20.5786
845.000000 MHz	54.0862	20.5400
846.000000 MHz	54.0906	20.5826
847.000000 MHz	54.0200	20.5552
848.000000 MHz	54.0558	20.5208
849.000000 MHz	54.0407	20.5543
850.000000 MHz	54.0073	20.5241
851.000000 MHz	54.0400	20.4963
852.000000 MHz	53.9954	20.5517
853.000000 MHz	53.9948	20.4930
854.000000 MHz	54.0002	20.5080
855.000000 MHz	53.9416	20.5253
856.000000 MHz	53.9600	20.4596
857.000000 MHz	53.9726	20.4934
858.000000 MHz	53.9473	20.4552
859.000000 MHz	53.9493	20.4605
860.000000 MHz	53.9065	20.4613

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

835MHz 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

Date/Time: 10/19/05 10:19:57

Test Laboratory: ESTECH

validation-1019

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN475

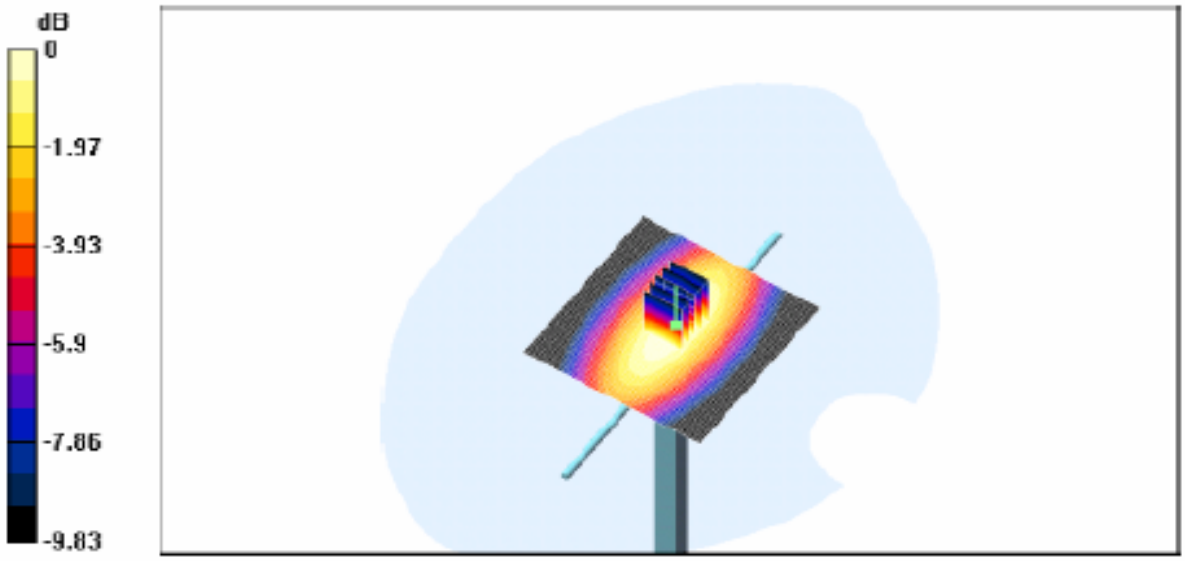
Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used: f = 835 MHz; σ = 0.888 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 45%

Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 2.53 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.2 V/m; Power Drift = 0.002 dB
Peak SAR (extrapolated) = 3.48 W/kg
SAR(1 g) = 2.35 mW/g
Maximum value of SAR (measured) = 2.54 mW/g

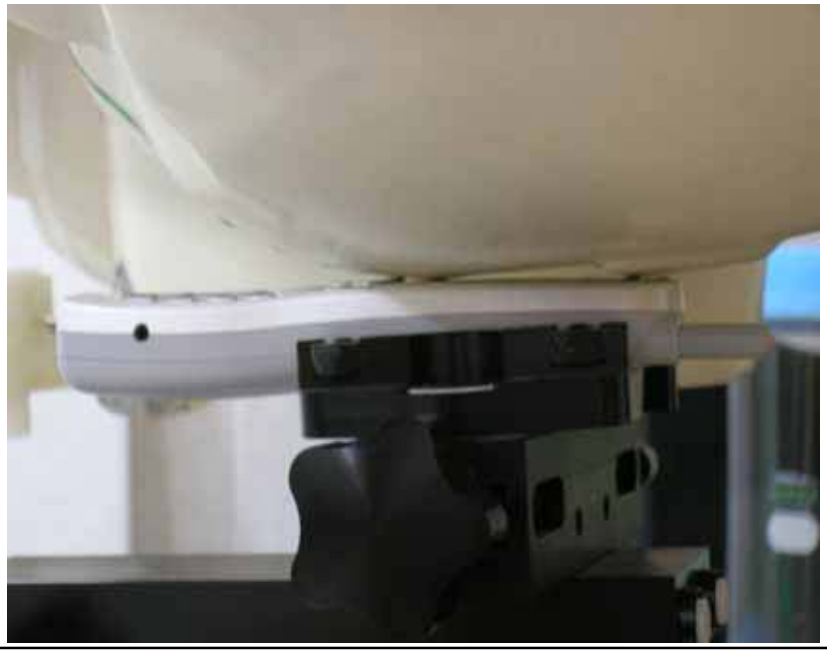


0 dB = 2.54mW/g

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 Setup Photographs

Left Hand –Touch Position



Right Hand –Touch Position

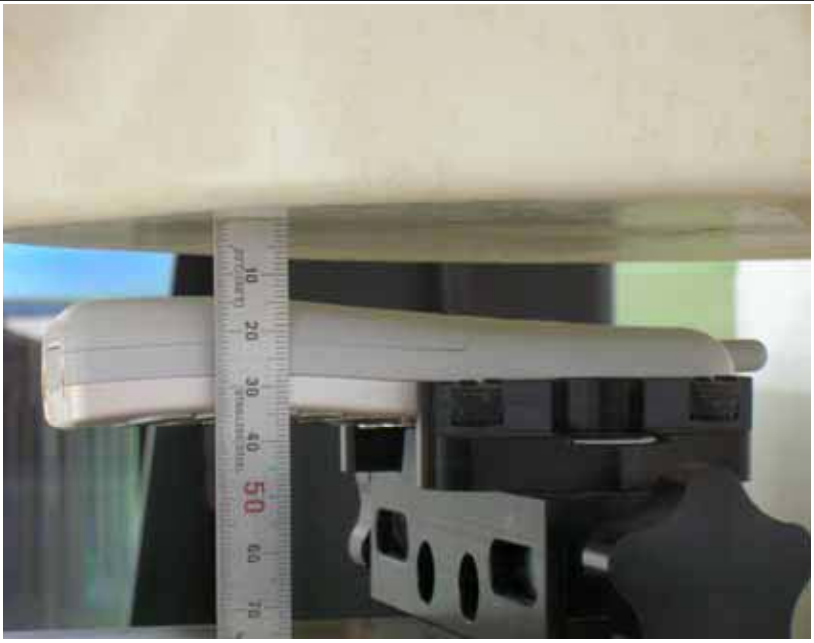
ESTECH Co., Ltd.
Rm.1015, World Venture Center II,
426-5, Gasan-dong, Geumcheon-gu,
Seoul, 153-803, Korea
TEL: 82-2-867-3201
FAX: 82-2-867-3204

Left Hand –Tlit Position

Right Hand –Tilt Position

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

Flat – Body Side Configuration (With Holster)



APPENDIX D : 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

Date/Time: 10/19/05 12:31:27

Test Laboratory: ESTECH

CH1013 LEFT TOUCH

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

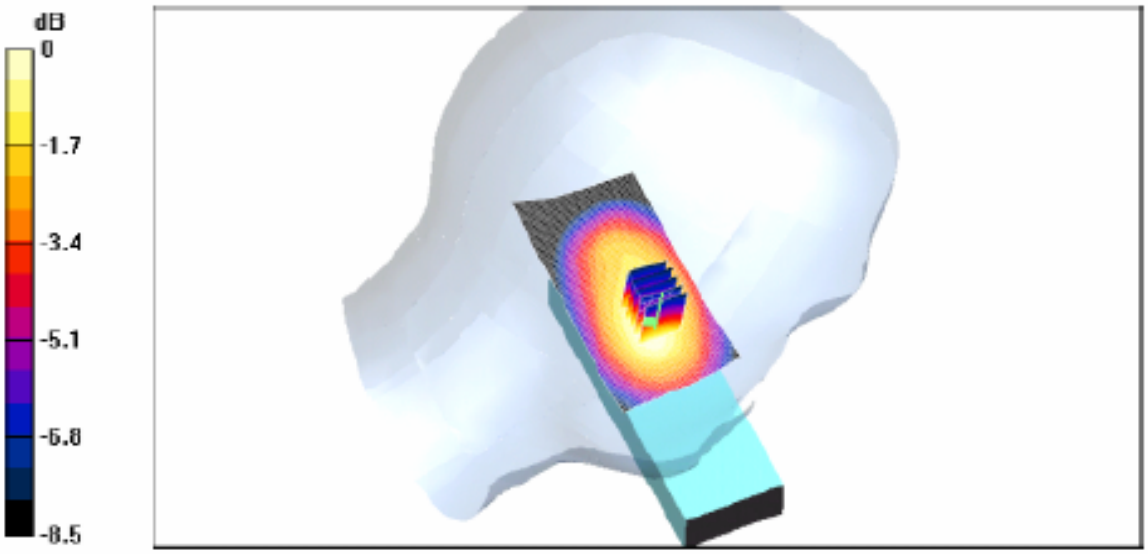
Communication System: CDMA FCC; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used (interpolated): f = 824.7 MHz; σ = 0.88 mho/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 43%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.36 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 32.2 V/m; Power Drift = 0.0 dB
Peak SAR (extrapolated) = 1.72 W/kg
SAR(1 g) = 1.29 mW/g
Maximum value of SAR (measured) = 1.37 mW/g



0 dB = 1.37mW/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/Time: 10/19/05 10:44:57

Test Laboratory: ESTECH

CH363 LEFT TOUCH

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

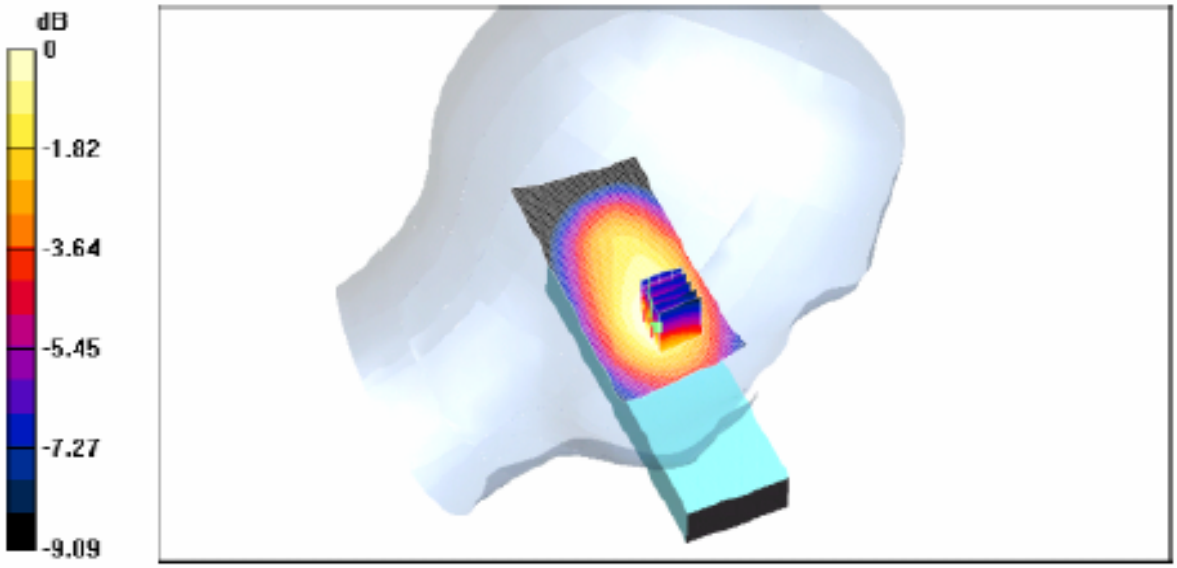
Communication System: CDMA FCC; Frequency: 835.89 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used (interpolated): f = 835.89 MHz; σ = 0.89 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 44%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.37 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 32.5 V/m; Power Drift = -0.0 dB
Peak SAR (extrapolated) = 1.7 W/kg
SAR(1 g) = 1.27 mW/g
Maximum value of SAR (measured) = 1.35 mW/g



0 dB = 1.35mW/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/Time: 10/19/05 13:50:26

Test Laboratory: ESTECH

CH777 LEFT TOUCH

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

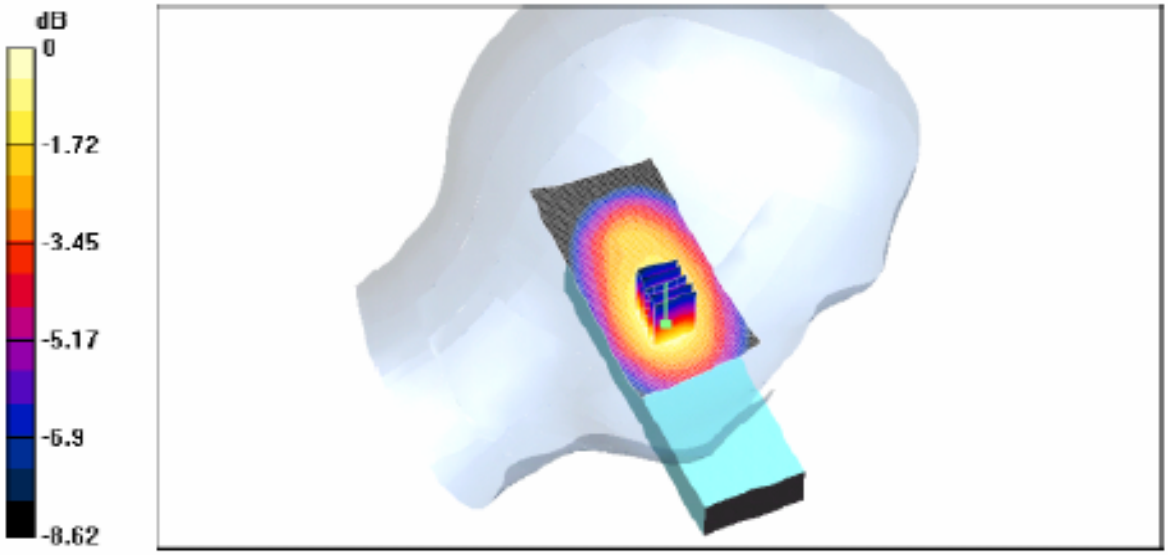
Communication System: CDMA FCC; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used (interpolated): f = 848.31 MHz; σ = 0.9 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 22℃, Humidity : 45%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.32 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.9 V/m; Power Drift = 0.2 dB
Peak SAR (extrapolated) = 1.74 W/kg
SAR(1 g) = 1.29 mW/g
Maximum value of SAR (measured) = 1.37 mW/g



0 dB = 1.37mW/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/Time: 10/19/05 12:54:09

Test Laboratory: ESTECH

CH1013 RIGHT TOUCH

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

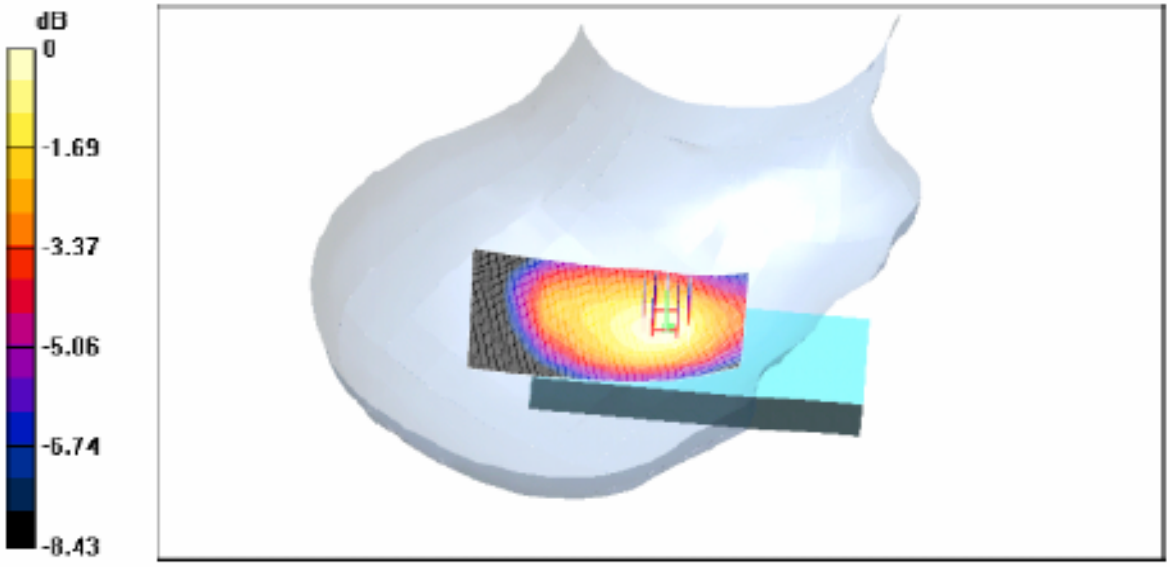
Communication System: CDMA FCC; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used (interpolated): f = 824.7 MHz; σ = 0.88 mho/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 43%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.34 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 31.6 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 1.72 W/kg
SAR(1 g) = 1.26 mW/g
Maximum value of SAR (measured) = 1.35 mW/g



0 dB = 1.35mW/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/Time: 10/19/05 11:15:14

Test Laboratory: ESTECH

CH363 RIGHT TOUCH

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

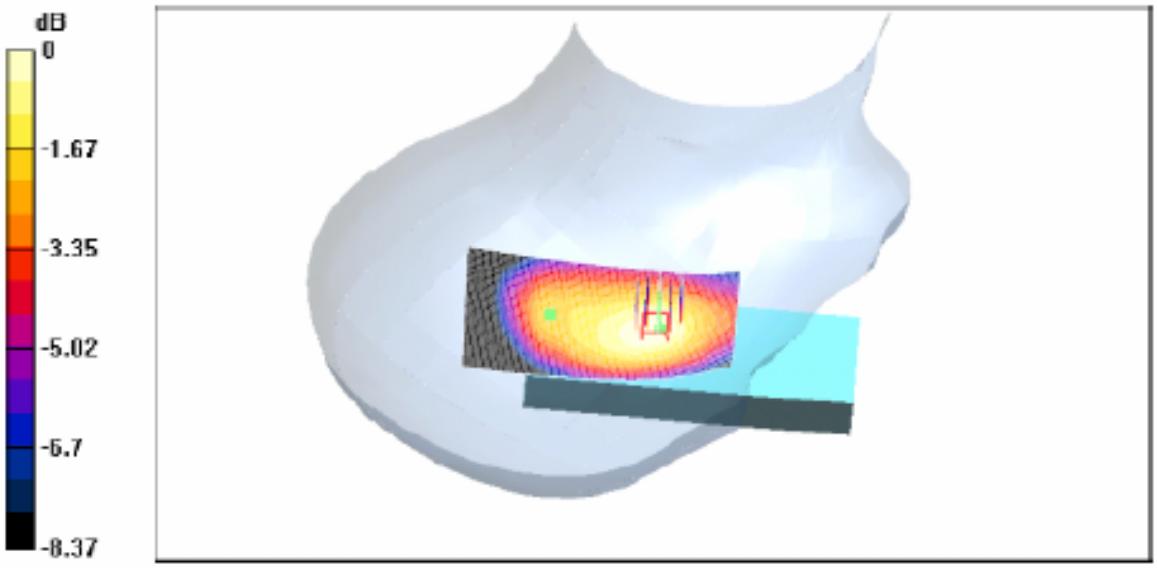
Communication System: CDMA FCC; Frequency: 835.89 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used (interpolated): f = 835.89 MHz; σ = 0.89 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 49%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.3 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 32.7 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 1.67 W/kg
SAR(1 g) = 1.23 mW/g
Maximum value of SAR (measured) = 1.32 mW/g



0 dB = 1.32mW/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/Time: 10/19/05 14:29:54

Test Laboratory: ESTECH

CH777 RIGHT TOUCH

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

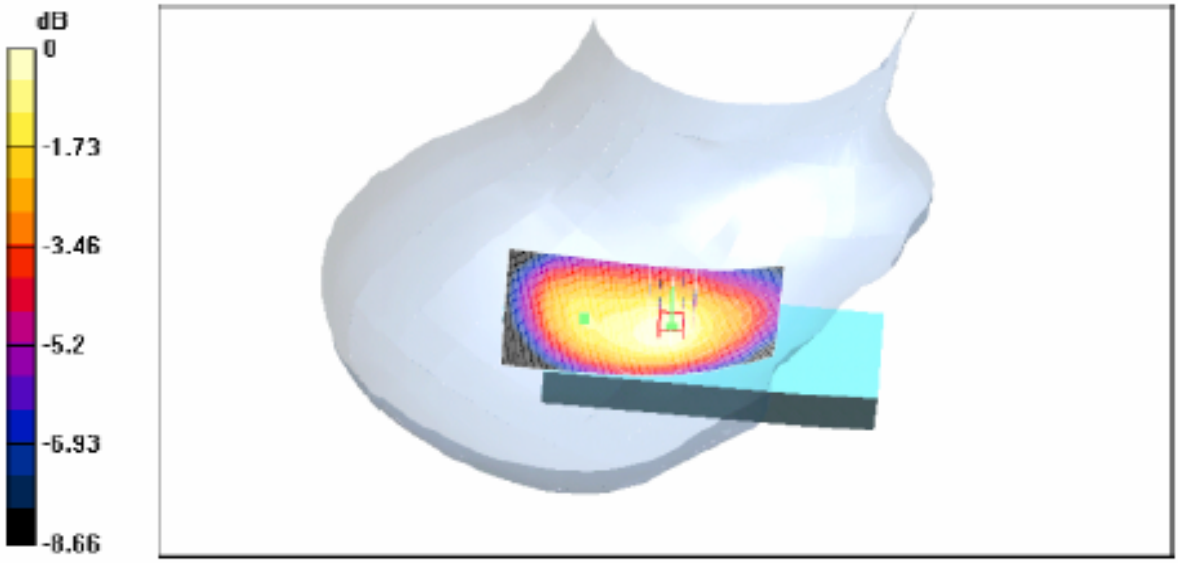
Communication System: CDMA FCC; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used (interpolated): f = 848.31 MHz; σ = 0.9 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 22℃, Humidity : 43%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.19 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 32 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 1.1 mW/g
Maximum value of SAR (measured) = 1.19 mW/g



0 dB = 1.19mW/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/Time: 10/19/05 11:42:58

Test Laboratory: ESTECH

CH363 LEFT TILT

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

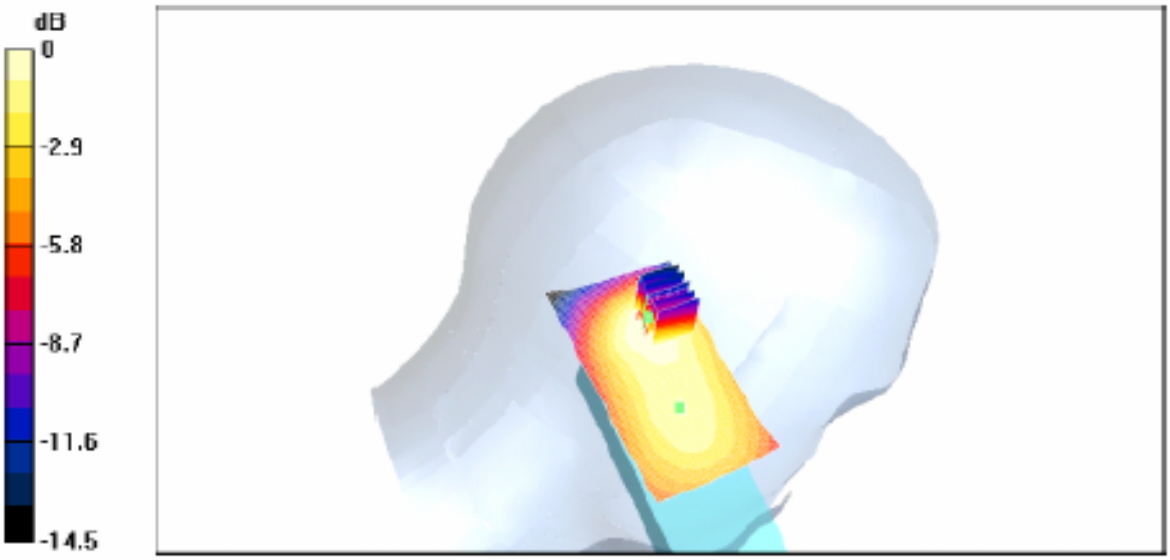
Communication System: CDMA FCC; Frequency: 835.89 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used (interpolated): f = 835.89 MHz; σ = 0.89 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 48%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.677 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 26.1 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 1.04 W/kg
SAR(1 g) = 0.578 mW/g
Maximum value of SAR (measured) = 0.633 mW/g



0 dB = 0.633mW/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/Time: 10/19/05 12:06:33

Test Laboratory: ESTECH

CH363 RIGHT TILT

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

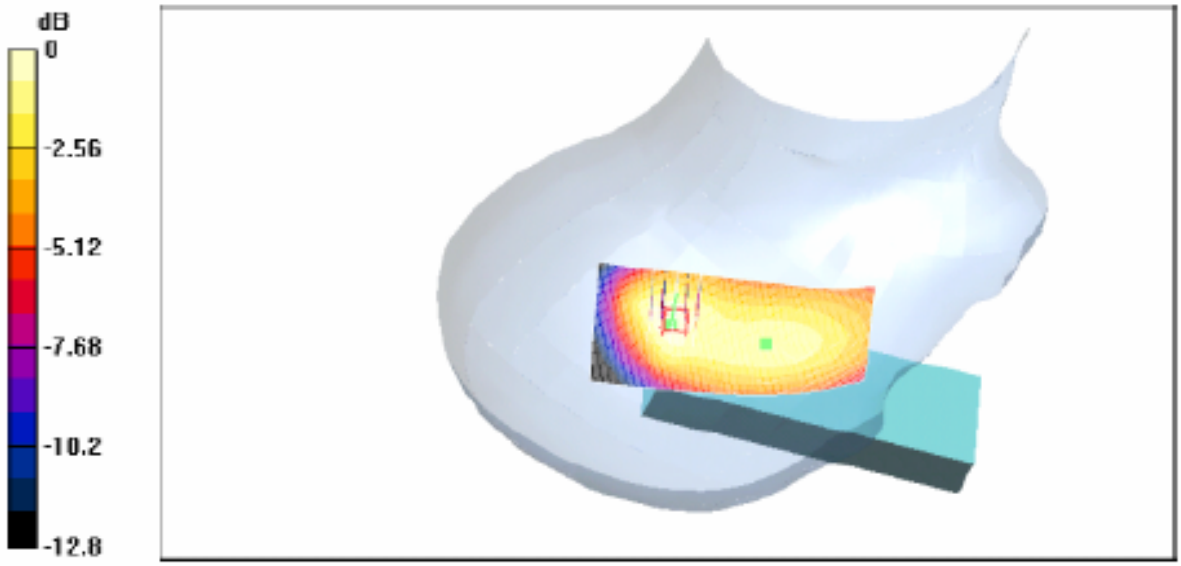
Communication System: CDMA FCC; Frequency: 835.89 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used (interpolated): f = 835.89 MHz; σ = 0.89 mho/m; ε_r = 40.4; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 51%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.700 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 27.4 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 1.06 W/kg
SAR(1 g) = 0.641 mW/g
Maximum value of SAR (measured) = 0.695 mW/g



0 dB = 0.695mW/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/Time: 10/19/05 12:31:27

Test Laboratory: ESTECH

CH1013 LEFT TOUCH-ZSCAN

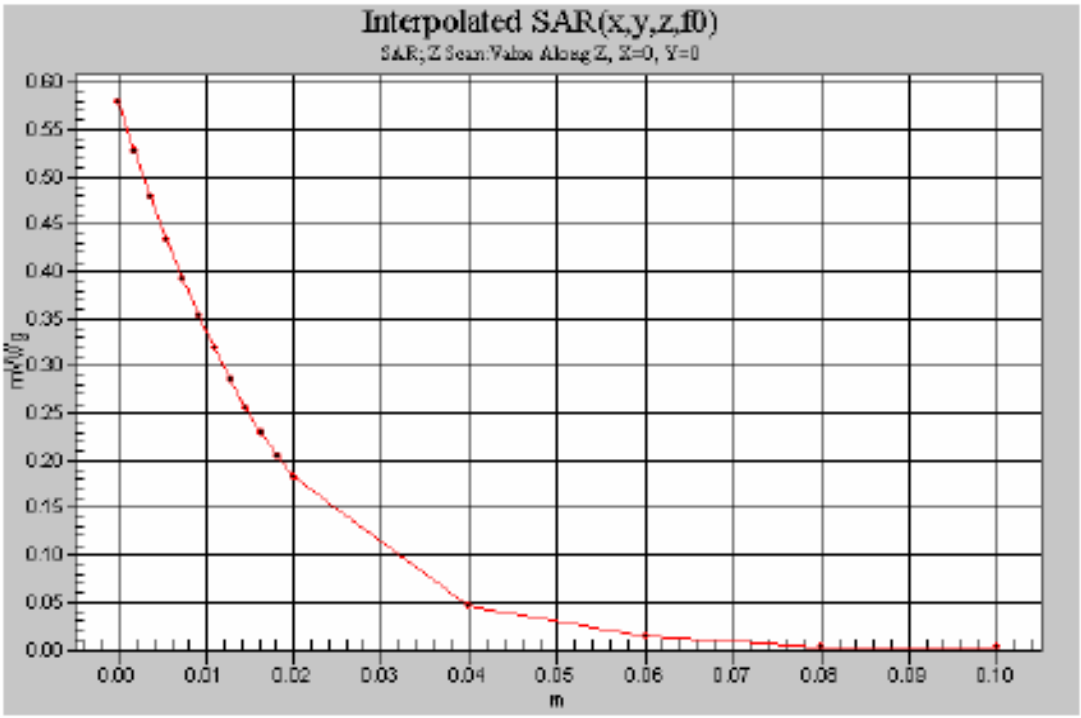
DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

Communication System: CDMA FCC; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: HSL 835MHz Medium parameters used (interpolated): f = 824.7 MHz; σ = 0.88 mho/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.57, 6.57, 6.57); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 22℃, Humidity : 43%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.36 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/Time: 10/19/05 16:38:46

Test Laboratory: ESTECH

CH1013 BODY

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

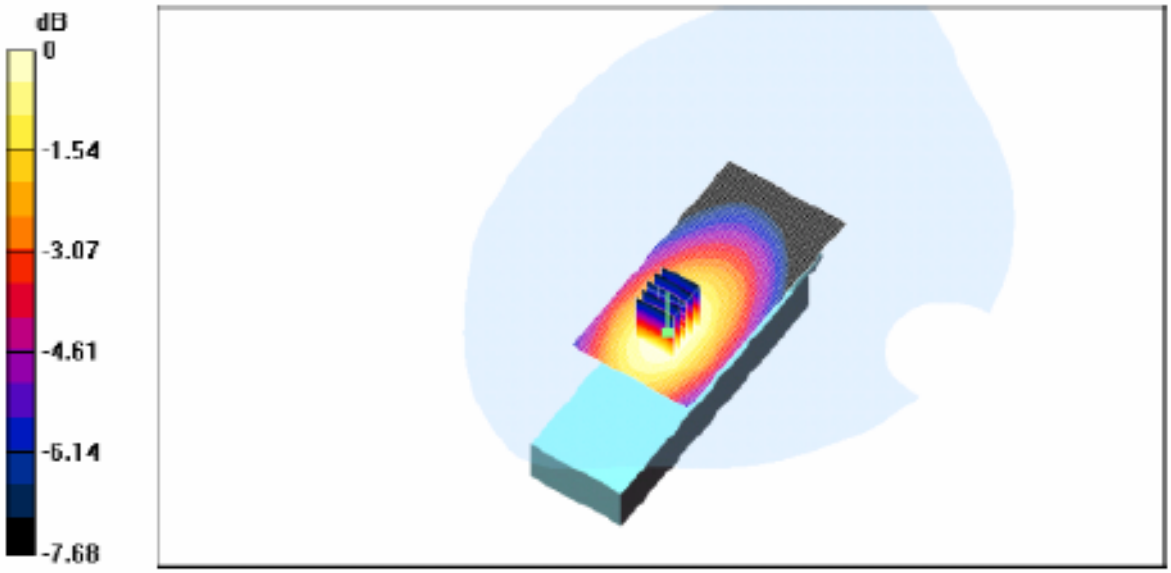
Communication System: CDMA FCC; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: M900 Medium parameters used (interpolated): f = 824.7 MHz; σ = 0.947 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.03, 6.03, 6.03); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 50%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.978 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.8 V/m; Power Drift = 0.1 dB
Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.919 mW/g
Maximum value of SAR (measured) = 0.975 mW/g



0 dB = 0.975mW/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/Time: 10/19/05 15:51:44

Test Laboratory: ESTECH

CH363 BODY

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

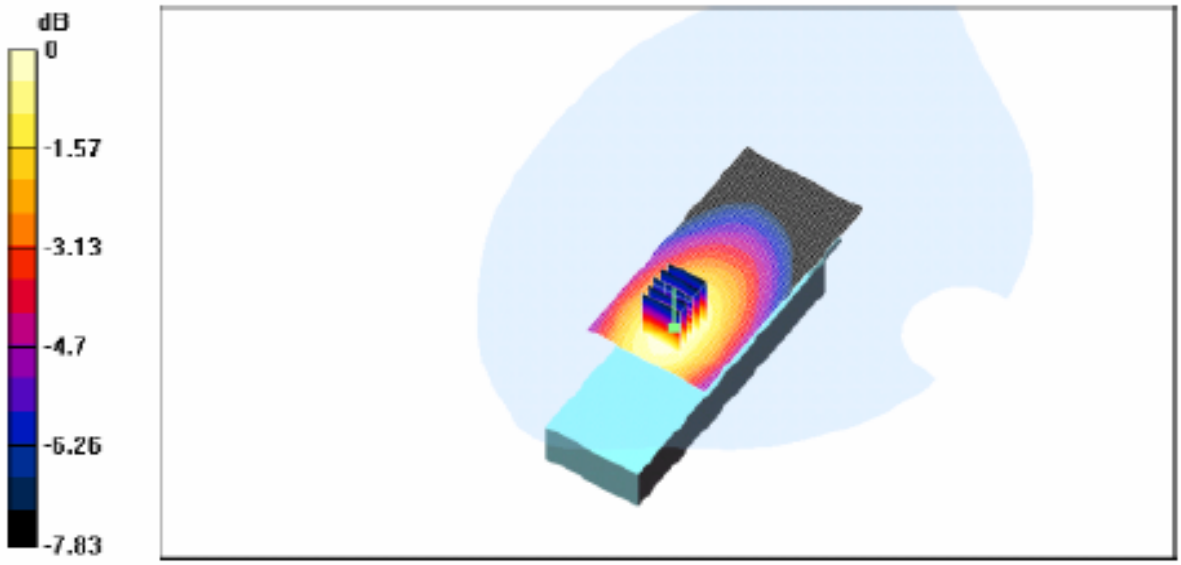
Communication System: CDMA FCC; Frequency: 835.89 MHz;Duty Cycle: 1:1
Medium: M900 Medium parameters used (interpolated): f = 835.89 MHz; σ = 0.959 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.03, 6.03, 6.03); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 20℃, Humidity : 46%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.839 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.3 V/m; Power Drift = -0.1 dB
Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.813 mW/g
Maximum value of SAR (measured) = 0.868 mW/g



0 dB = 0.868mW/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/Time: 10/19/05 17:14:02

Test Laboratory: ESTECH

CH777 BODY

DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

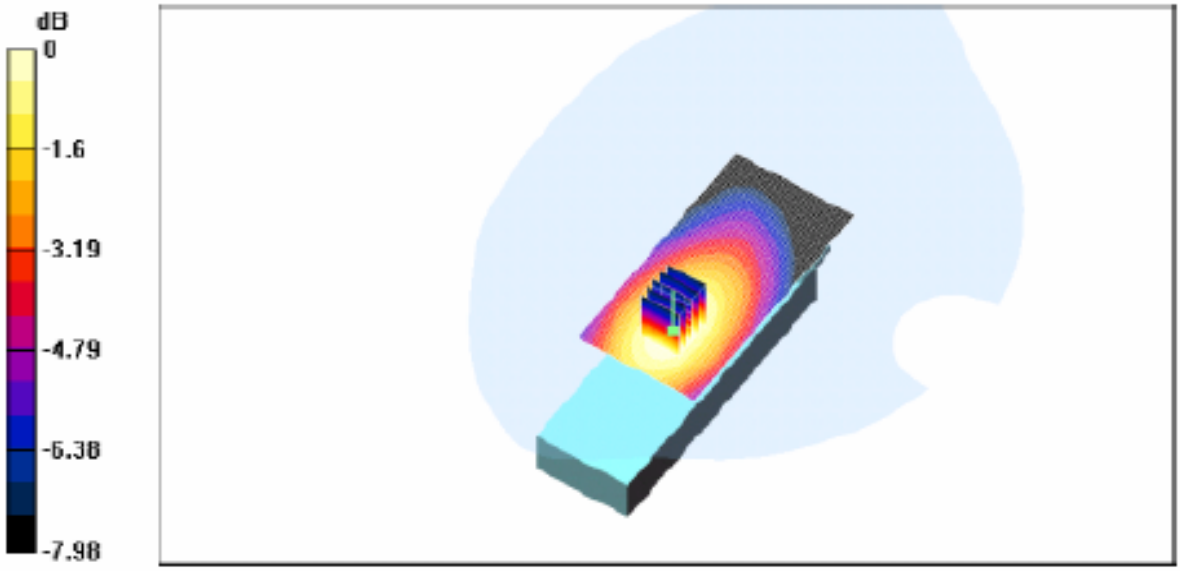
Communication System: CDMA FCC; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: M900 Medium parameters used (interpolated): f = 848.31 MHz; σ = 0.97 mho/m; ε_r = 54;
ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.03, 6.03, 6.03); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 43%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1 mW/g

Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.1 V/m; Power Drift = 0.2 dB
Peak SAR (extrapolated) = 1.24 W/kg
SAR(1 g) = 0.949 mW/g
Maximum value of SAR (measured) = 1 mW/g



0 dB = 1mW/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/Time: 10/19/05 17:14:02

Test Laboratory: ESTECH

CH777 BODY-ZSCAN

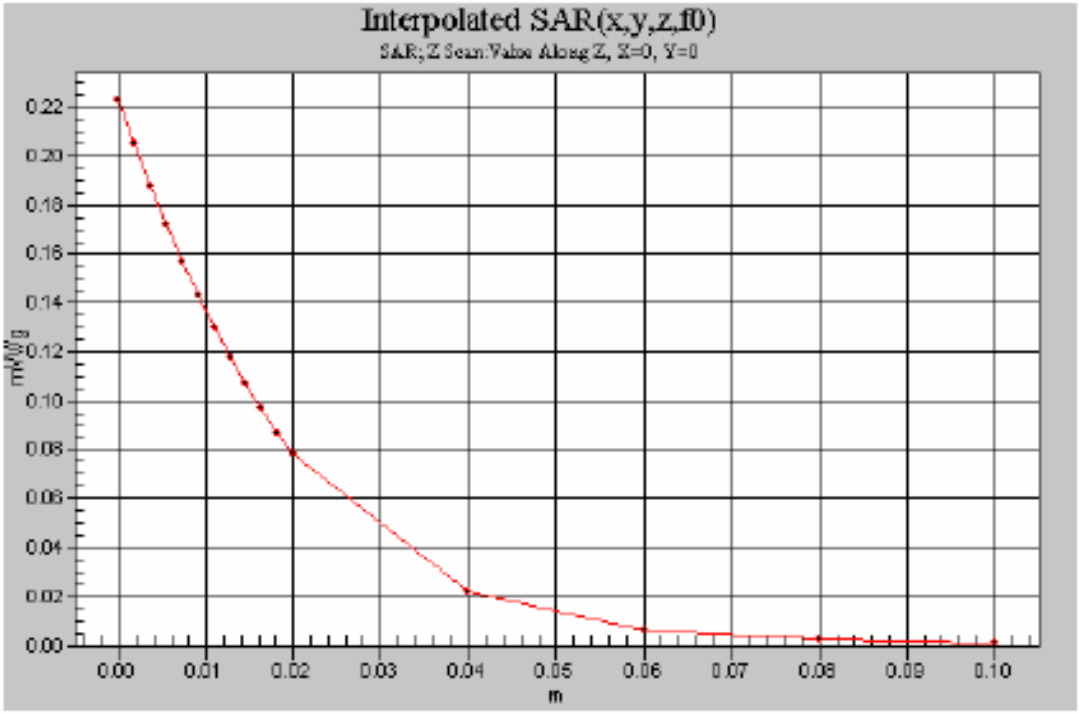
DUT: LSI-120R,LSI-120T; Type: BAR TYPE; Serial: XXXX

Communication System: CDMA FCC; Frequency: 848.31 MHz;Duty Cycle: 1:1
Medium: M900 Medium parameters used (interpolated): f = 848.31 MHz; σ = 0.97 mho/m; ε_r = 54;
ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1748; ConvF(6.03, 6.03, 6.03); Calibrated: 2005-01-21
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE3 Sn551; Calibrated: 2004-04-28
- Phantom: SAM 835MHz; Type: SAM 835MHz; Serial: TP-1262
- Measurement SW: DASY4, V4.4 Build 3; Postprocessing SW: SEMCAD, V1.8 Build 130
- Temperature : 21℃, Humidity : 43%

Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1 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 E : Calibration Certificates

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

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

Accredited by the Swiss 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_Feb05

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 475
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	February 24, 2005
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 E442	GB37480704	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Power sensor HP 8481A	US37292783	12-Oct-04 (METAS, No. 251-00412)	Oct-05
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-04 (METAS, No 251-00402)	Aug-05
Reference Probe ET3DV6	SN 1507	26-Oct-04 (SPEAG, No. ET3-1507_Oct04)	Oct-05
DAE4	SN 601	07-Jan-05 (SPEAG, No. DAE4-601_Jan05)	Jan-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-03)	In house check: Oct-05
RF generator R&S SML-03	100698	27-Mar-02 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov-05

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

Issued: February 25, 2005

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

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) 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
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 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	V4.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan resolution	dx, dy = 15 mm	
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.2 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 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	2.25 mW / g
SAR normalized	normalized to 1W	9.00 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**9.02 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.48 mW / g
SAR normalized	normalized to 1W	5.92 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**5.93 mW / g ± 16.5 % (k=2)**

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