SAR TEST REPORT

HCT CO., LTD

EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
FCC ID:	BEJP990
Model:	LG-P990
Additional Model:	P990
Date of Issue:	Dec.9, 2010
Test report No.:	HCTA1012FS02
Test Laboratory:	**HCT CO., LTD.** SAN 136-1, AMI-RI, BUBAL-EUP, ICHEON-SI, KYOUNGKI-DO, 467-701, KOREA TEL: +82 31 639 8565 FAX: +82 31 639 8525
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Testing has been carried out in accordance with:	RSS-102 Issue 4; Health Canada Safety Code 6 47CFR §2.1093 FCC OET Bulletin 65(Edition 97-01), Supplement C (Edition 01-01) ANSI/ IEEE C95.1 – 1992 IEEE 1528-2003
Test result:	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 except in full, without written approval of the laboratory.
Signature	Report prepared by : Young-Soo Jang Test Engineer of SAR Part Approved by : Jae-Sang So Manager of SAR Part

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1. 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 devices.

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-2005 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave 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 (NCRP) in Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814. 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 of the incremental electromagnetic energy (d*W*) absorbed by (dissipated in) an incremental mass (d*m*) contained in a volume element (d*V*) of a given density (*r*). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body.

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

Figure 2. 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)

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

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

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

2. DESCRIPTION OF DEVICE

Environmental evaluation measurements of specific absorption rate (SAR) distributions in emulated human head and body tissues exposed to radio frequency (RF) radiation from wireless portable devices for compliance with the rules and regulations of the U.S. Federal Communications Commission (FCC).

EUT Type	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)		
FCC ID:	BEJP990		
Model:	LG-P990		
Additional Model:	P990		
Trade Name	LG	Serial Number(s)	#1
Application Type	Certification		
Mode(s) of Operation	GSM850/GSM1900/ WCDMA1900/802.11b/g/n		
Tx Frequency	824.20 - 848.80 MHz (GSM850) 1 850.20 – 1 909.80 MHz (GSM1900) 1 852.4 – 1 907.6 MHz (WCDMA1900) 2 412- 2 462 MHz (DSSS/ OFDM)		
Rx Frequency	869.20 - 893.80 MHz (GSM850) 1 930.20 – 1 989.80 MHz (GSM1900) 1 932.4 – 1 987.6 MHz (WCDMA1900) 2 412- 2 462 MHz (DSSS/ OFDM)		
FCC Classification	Licensed Portable Transmitter Held to Ear (PCE)		
Production Unit or Identical Prototype	Prototype		
Max SAR	0.213 W/kg GSM850 Head SAR / 0.616 W/kg GSM850 Body SAR 0.249 W/kg GSM1900 Head SAR / 0.314 W/kg GSM1900 Body SAR 0.274 W/kg WCDMA1900 Head SAR / 0.170 W/kg WCDMA1900 Body SAR 0.366 W/kg Wi-Fi 802.11b Head SAR/ 0.047 W/kg Wi-Fi 802.11b Body SAR		
Date(s) of Tests	Dec.6, 2010 ~ Dec.7, 2010		
Antenna Type	Intenna		

3. DESCRIPTION OF TEST EQUIPMENT

3.1 SAR MEASUREMENT SETUP

These measurements are performed using the DASY4 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic 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 Figure.3.1).

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The PC consists of the HP Pentium IV 3.0 GHz computer with Windows XP system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. 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.

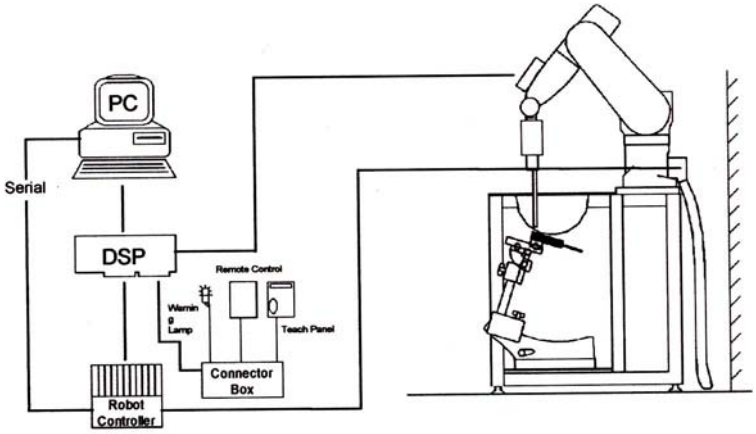

Figure 3.1 HCT SAR Lab. Test Measurement Set-up

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in.

3.2 DASY4 E-FIELD PROBE SYSTEM

3.2.1 ET3DV6 Probe Specification

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

Figure 3.2 Photograph of the probe and the Phantom

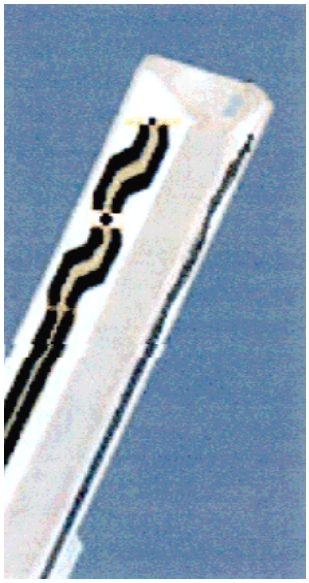

Figure 3.3 ET3DV6 E-field Probe

The SAR measurements were conducted with the dosimetric probe ET3DV6, designed in the classical triangular configuration 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 on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.

3.3 PROBE CALIBRATION PROCESS

3.3.1 E-Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with an accuracy better than ± 10 %. The spherical isotropy was evaluated with the proper procedure and found to be better than ± 0.25 dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

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

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

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

where:

Δt = exposure time (30 seconds),

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

ΔT = temperature increase due to RF exposure.

SAR is proportional to $\Delta T / \Delta t$, the initial rate of tissue heating, before thermal diffusion takes place. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

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

where:

σ = simulated tissue conductivity,

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

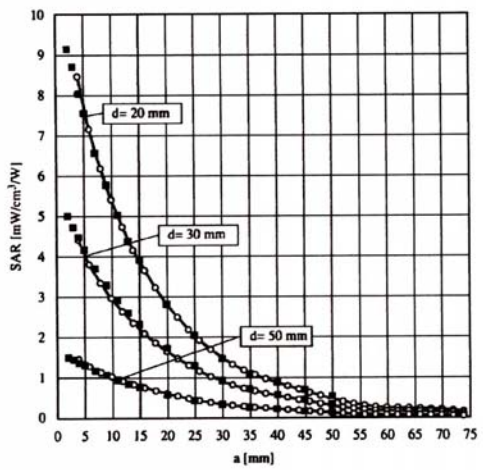

Figure 3.4 E-Field and Temperature measurements at 900 MHz

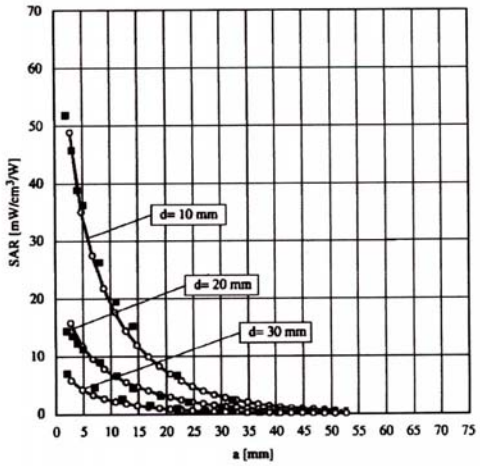

Figure 3.5 E-Field and temperature measurements at 1.8 GHz

3.3.2 Data Extrapolation

The DASY4 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given like below;

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

with
V_i = compensated signal of channel i (i=x,y,z)
U_i = input signal of channel i (i=x,y,z)
cf = crest factor of exciting field (DASY parameter)
dcp_i = diode compression point (DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

E-field probes:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

with
V_i = compensated signal of channel i (i = x,y,z)
$Norm_i$ = sensor sensitivity of channel i (i = x,y,z) $\mu V/(V/m)^2$ for E-field probes
ConvF = sensitivity of enhancement in solution
E_i = electric field strength of channel i in V/m

The RSS value of the field components gives the total field strength (Hermetian magnitude):

$$E_{tot} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with
SAR = local specific absorption rate in W/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770}$$

with
P_{pwe} = equivalent power density of a plane wave in W/cm^2
E_{tot} = total electric field strength in V/m

3.4 SAM Phantom

The SAM Phantom is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90 % of all users. 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.

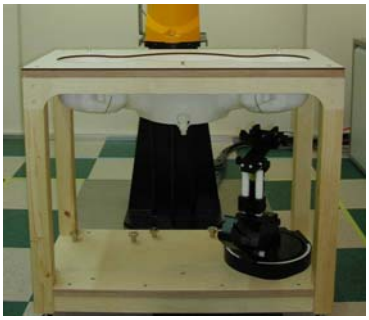

Figure 3.6 SAM Phantom

Shell Thickness	2.0 mm
Filling Volume	about 30 L
Dimensions	810 mm x 1 000 mm x 500 mm (H x L x W)

3.5 Device Holder for Transmitters

In combination with the SAM Phantom V 4.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatable positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

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

Figure 3.7 Device Holder

3.6 Brain & Muscle Simulating Mixture Characterization

The brain and muscle mixtures consist of a viscous gel using hydrox-ethyl cellulose (HEC) gelling agent and saline solution (see Table 3.1). Preservation with a bacteriacide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Hartsgrove.

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1 900		2 450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7

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

Table 3.1 Composition of the Tissue Equivalent Matter

3.7 SAR TEST EQUIPMENT

Manufacturer	Type / Model	S/N	Calib. Date	Calib.Interval	Calib.Due
SPEAG	SAM Phantom	-	N/A	N/A	N/A
Staubli	Robot RX90L	F01/5K09A1/A/01	N/A	N/A	N/A
Staubli	Robot ControllerCS7MB	F99/5A82A1/C/01	N/A	N/A	N/A
HP	Pavilion t000_puffer	KRJ51201TV	N/A	N/A	N/A
SPEAG	Light Alignment Sensor	265	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	D221340.01	N/A	N/A	N/A
SPEAG	DAE3	446	Sep. 21, 2010	Annual	Sep. 21, 2011
SPEAG	E-Field Probe ET3DV6	1630	May 25, 2010	Annual	May 25, 2011
SPEAG	Validation Dipole D450V2	1007	July 15, 2010	Biennial	July 15, 2012
SPEAG	Validation Dipole D835V2	441	May 21, 2010	Annual	May 21, 2011
SPEAG	Validation Dipole D1800V2	2d006	Apr. 20, 2010	Biennial	Apr. 20, 2012
SPEAG	Validation Dipole D1900V2	5d032	July 16, 2010	Annual	July 16, 2011
SPEAG	Validation Dipole D2450V2	743	Aug. 25, 2010	Biennial	Aug. 27, 2012
\Agilent	Power Meter(F) E4419B	MY41291386	Nov. 05, 2010	Annual	Nov. 05, 2011
Agilent	Power Sensor(G) 8481	MY41090870	Nov. 05, 2010	Annual	Nov. 05, 2011
HP	Dielectric Probe Kit 85070C	00721521	N/A	N/A	N/A
HP	Dual Directional Coupler	16072	Nov. 05, 2010	Annual	Nov. 05, 2011
R&S	Base Station CMU200	110740	July 26, 2010	Annual	July 26, 2011
Agilent	Base Station E5515C	GB44400269	Feb. 10, 2010	Annual	Feb. 10, 2011
HP	Signal Generator E4438C	MY42082646	Dec. 24, 2009	Annual	Dec. 24, 2010
HP	Network Analyzer 8753ES	MY4000025	Sep. 02, 2010	Annual	Sep. 02, 2011

NOTE:

The E-field probe was calibrated by SPEAG, by the waveguide technique procedure. Dipole Validation measurement is performed by HCT Lab. before each test. The brain simulating material is calibrated by HCT using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain-equivalent material.

4. SAR MEASUREMENT PROCEDURE

The evaluation was performed with the following procedure:

1. The SAR value at a fixed location above the ear point was measured and was used as a reference value for assessing the power drop.

2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 20 mm x 20 mm. Based on this data, the area of the maximum absorption was determined by spline interpolation.

3. Around this point, a volume of 32 mm x 32 mm x 30 mm was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

   a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
   b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

4. The SAR value, at the same location as procedure #1, was re-measured. If the value changed by more than 5 %, the evaluation is repeated.

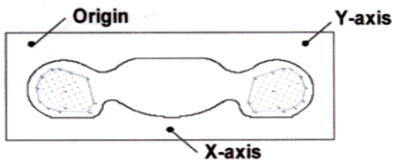

Figure 4.1 SAR Measurement Point in Area Scan

5. DESCRIPTION OF TEST POSITION

5.1 HEAD POSITION

The device was placed in a normal operating position with the Point A on the device, as illustrated in following drawing, aligned with the location of the RE(ERP) on the phantom. With the ear-piece pressed against the head, the vertical center line of the body of the handset was aligned with an imaginary plane consisting of the RE, LE and M. While maintaining these alignments, the body of the handset was gradually moved towards the cheek until any point on the mouth-piece or keypad contacted the cheek. This is a cheek/touch position. For ear/tilt position, while maintain the device aligned with the BM and FN lines, the device was pivot against ERP back for 15º or until the device antenna touch the phantom. Please refer to IEEE 1528-2003 illustration below.

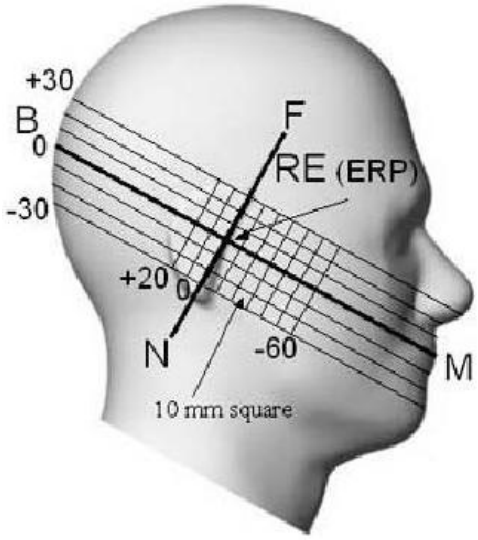

Figure 5.1 Side view of the phantom

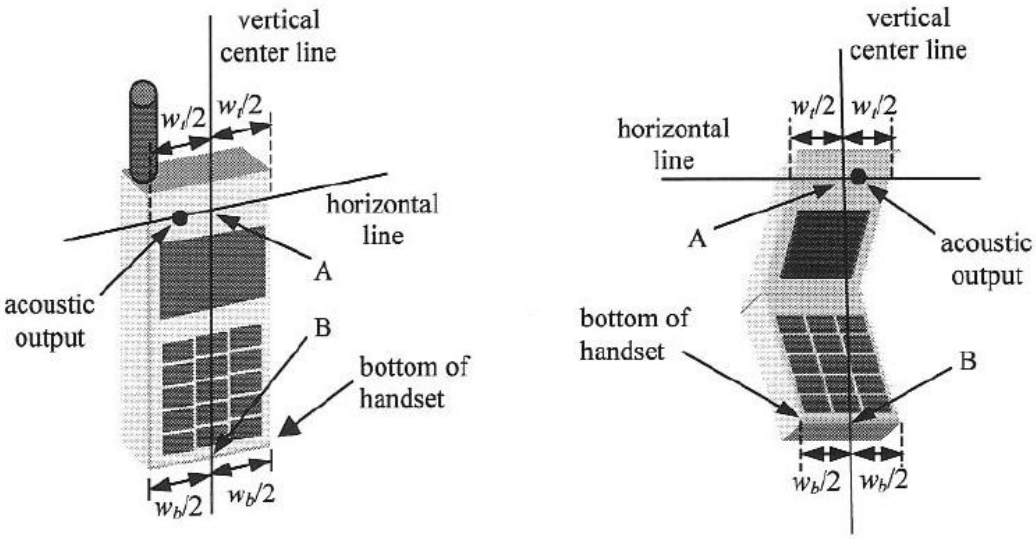

Figure 5.2 Handset vertical and horizontal reference lines

5.2 Body Holster/Belt Clip Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration. A device with a headset output is tested with a headset 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 contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with each accessory. If multiple accessory share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Body-worn accessories may not always be supplied or available as options for some Devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used.

Since this EUT does not supply any body worn accessory to the end user a distance of 2.0 cm from the EUT back surface to the liquid interface is configured for the generic test.

"See the Test SET-UP Photo"

Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, 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 cases SAR measurements are performed to investigate the worst-case positioning. Worstcase positioning is then documented and used to perform Body SAR testing.

6. MEASUREMENT UNCERTAINTY

Error Description	Tol (± %)	Prob. dist.	Div.	c_i	Standard Uncertainty (± %)	v_{eff}
1. Measurement System						
Probe Calibration	5.50	N	1	1	5.50	∞
Axial Isotropy	4.70	R	1.73	0.7	1.90	∞
Hemispherical Isotropy	9.60	R	1.73	0.7	3.88	∞
Boundary Effects	1.00	R	1.73	1	0.58	∞
Linearity	4.70	R	1.73	1	2.71	∞
System Detection Limits	1.00	R	1.73	1	0.58	∞
Readout Electronics	0.30	N	1.00	1	0.30	∞
Response Time	0.8	R	1.73	1	0.46	∞
Integration Time	2.6	R	1.73	1	1.50	∞
RF Ambient Noise	3.00	R	1.73	1	1.73	∞
RF Ambient Reflection	3.00	R	1.73	1	1.73	∞
Probe Positioner	0.40	R	1.73	1	0.23	∞
Probe Positioning	2.90	R	1.73	1	1.67	∞
Max SAR Eval	1.00	R	1.73	1	0.58	∞
2.Test Sample Related						
Device Positioning	1.80	N	1.00	1	1.80	9
Device Holder	3.60	N	1.00	1	3.60	5
Power Drift	5.00	R	1.73	1	2.89	∞
3.Phantom and Setup						
Phantom Uncertainty	4.00	R	1.73	1	2.31	∞
Liquid Conductivity(target)	5.00	R	1.73	0.64	1.85	∞
Liquid Conductivity(meas.)	2.07	N	1	0.64	1.32	9
Liquid Permitivity(target)	5.00	R	1.73	0.6	1.73	∞
Liquid Permitivity(meas.)	5.02	N	1	0.6	3.01	9
Combind Standard Uncertainty					10.76	
Coverage Factor for 95 %					k=2	
Expanded STD Uncertainty					21.53	

Table 6.1 Uncertainty (800 MHz- 2450 MHz)

7. ANSI/ IEEE C95.1 - 1992 RF EXPOSURE LIMITS

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

Table 7.1 Safety Limits for Partial Body Exposure

NOTES:

* The Spatial Peak value of the SAR averaged over any 1 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

** The Spatial Average value of the SAR averaged over the whole-body.

******* The Spatial Peak value of the SAR averaged over any 10 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e.as a result of employment or occupation).

8. SYSTEM VERIFICATION

8.1 Tissue Verification

Freq. [MHz]	Date	Liquid	Liquid Temp.[°C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
835	Dec.6, 2010	Head	21.1	ε r	41.5	42.8	+ 3.13	± 5
				σ	0.90	0.867	- 3.67	± 5
835	Dec.6, 2010	Body	21.1	ε r	55.2	56.83	+ 2.95	± 5
				σ	0.97	0.97	0.00	± 5
1 900	Dec. 7, 2010	Head	21.1	ε r	40.0	40.9	+ 2.25	± 5
				σ	1.40	1.4	0.00	± 5
1 900	Dec. 7, 2010	Body	21.1	ε r	53.3	53.6	+ 0.56	± 5
				σ	1.52	1.49	- 1.97	± 5
2450	Dec. 7, 2010	Head	21.1	ε r	39.2	38.4	- 2.04	± 5
				σ	1.80	1.85	+ 2.78	± 5
2 450	Dec. 7, 2010	Body	21.1	ε r	52.7	51.58	- 2.13	± 5
				σ	1.95	1.95	0.00	± 5

8.2 System Validation

Prior to assessment, the system is verified to the ± 10 % of the specifications at 835 MHz / 1 900 MHz/ 2 450 MHz by using the system validation kit. (Graphic Plots Attached)

* Input Power: 100 m W

Freq. [MHz]	Date	Liquid	Liquid Temp. [°C]	SAR Average	Target Value (SPEAG) (mW/g)	*Measured Value (mW/g)	Deviation [%]	Limit [%]
835	Dec.6, 2010	Head	21.1	1 g	9.66	0.999	+ 3.42	± 10
1 900	Dec. 7, 2010	Head	21.1	1 g	39.9	3.84	- 3.76	± 10
2 450	Dec. 7, 2010	Head	21.1	1 g	54	5.45	0.93	± 10

9. TEST CONFIGURATIONS

SAR Testing with IEEE 802.11 a/b/g Transmitters

Normal Network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable.

9.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

9.2 Frequency Channel Configurations

80.11 a/b/g and 4.9 GHz operating modes are tested independently according to the service requirements in each frequency band. 80.211 b/g modes are tested on channels 1, 6 and 11.802.11a is tested for UNII operations on channels 36 and 48 in the 5.15-5.25 GHz band; channels 52 and 64 in the 5.25-5.35 GHz band; Channels 104, 116, 124 and 136 in the 5.470-5.725 GHz band; and channels 149 and 161 in the 5.8 GHz band. When 5.8 GHz § 15.247 is also available, channels 149, 157 and 165 should be tested instead of the UNII channels. 4.9 GHz is tested on channels 1, 10 and 5 or 6, whichever has the higher output power, for 5 MHz channels; channels 11,15 and 19 for 10 MHz channels; and channels 21 and 25 for 20 MHz channels.

These are referred to as the “default test channels”. 802.11g mode was evaluated only if the output power was 0.25 dB higher than the 802.11b mode.

Mode		GHz	Channel	Turbo Channel	“Default Test Channels”			
					§15.247		UNII	
					802.11b	802.11g		
802.11 b/g		2.412	1		√	∇		
		2.437	6	6	√	∇		
		2.462	11		√	∇		
802.11a	UNII	5.18	36				√	
		5.20	40	42 (5.21 GHz)				*
		5.22	44					*
		5.24	48	50 (5.25 GHz)			√	
		5.26	52				√	
		5.28	56	58 (5.29 GHz)				*
		5.30	60					*
		5.32	64				√	
		5.500	100	Unknown				*
		5.520	104				√	
		5.540	108					*
		5.560	112					*
		5.580	116				√	
		5.600	120					*
		5.620	124				√	
		5.640	128					*
		5.660	132					*
		5.680	136				√	
		5.700	140					*
	UNII or §15.247	5.745	149		√		√	
		5.765	153	152 (5.76 GHz)		*		*
		5.785	157		√			*
		5.805	161	160 (5.80 GHz)		*	√	
	§15.247	5.825	165		√			

802.11 Test Channels per FCC Requirements

10. RF CONDUCTED POWER

Power measurements were performed using a base station simulator under digital average power

10.1 Procedures Used to Establish RF Signal for SAR

The handset was placed into a simulated call using a base station simulator in a shielded chamber. Such test signals offer a consistent means for testing SAR and are recommended for evaluation SAR[4] SAR measurements were taken with a fully charged battery. In order to verify that the device was tested and maintained at full power, this was configured with the base station simulator. The SAR measurement Software calculates a reference point at the start and end of the test to check for power drifts. If conducted Power deviations of more then 5 % occurred, the tests were repeated.

10.2 SAR Measurement Conditions for UMTS

Body SAR is not required for handsets with HSDPA capabilities when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise, SAR is Measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that results in the highest SAR in 12.2 kbps RMC for that RF channel.

10.2.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3 GPP TS 34.121, using the appropriate RMC or AMR with TPC(transmit power control) set to all “1s”

10.2.2 Head SAR Measurements

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than ¼ dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that results in the highest SAR for that RF channel in 12.2 RMC.

10.2.3 Body SAR Measurement

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all “1s”.

10.2.4 Handsets with Release 5 HSDPA

Body SAR is not required for handsets with HSDPA capabilities when the maximum average output of each RF channel with HSDPA active is less than ¼ dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Otherwise, SAR is Measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that results in the highest SAR in 12.2 kbps RMC for that RF channel.

Sub-Test 1 Setup for Release 5 HSDPA

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	CM (dB)(2)
1	2/15	15/15	64	2/15	4/15	0.0
2	12/15(3)	15/15(3)	64	12/15(3)	24/15	1.0
3	15/15	8/15	64	15/8	30/15	1.5
4	15/15	4/15	64	15/4	30/15	1.5

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15.
Note 3: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 11/15 and β_d = 15/15.

10.2.5 Handsets with Release 6 HSPA (HSDPA/HSUPA)

Body SAR is not required for handsets with HSPA capabilities when the maximum average output of each RF channel with HSUPA/HSDPA active is less than ¼ dB higher than that measured without HSUPA/HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is ≤ 75 % of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.1 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than ¼ dB higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurement should be used to test for head exposure.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{hs} (1)	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM (2) (dB)	MPR (dB)	AG (4) Index	E-TFCI
1	11/15 (3)	15/15 (3)	64	11/15 (3)	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1}: 47/15 β_{ed2}: 47/15	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 (4)	15/15 (4)	64	15/15 (4)	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Band	Channel	Voice	GPRS Data				EDGE Data			
		GSM (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)	EDGE 1 TX Slot (dBm)	EDGE 2 TX Slot (dBm)	EDGE 3 TX Slot (dBm)	EDGE 4 TX Slot (dBm)
GSM 850	128	32.65	32.65	32.65	31.95	30.91	27.20	27.20	26.34	25.15
	190	32.70	32.70	32.70	31.93	30.88	27.11	27.11	26.28	25.07
	251	32.70	32.68	32.68	31.95	30.91	27.18	27.18	26.35	25.12
GSM 1900	512	29.96	29.96	29.96	29.16	28.12	26.20	26.19	25.30	24.34
	661	29.97	29.97	29.97	29.19	28.13	26.24	26.21	25.33	24.29
	810	30.00	30.00	30.00	29.29	28.14	26.23	26.21	25.34	24.26

Table 1. GSM Conducted output powers

3GPP Release Version	Mode	3GPP 34.121	PCS Band [dBm]			MPR
		Subtest	UL 9262 (1852.4)	UL 9400 (1880.0)	UL 9538 (1907.6)	
99	WCDMA	12.2kbps (RMC)	22.82	22.80	22.63	-
5	HSDPA	Subtest1	22.77	22.73	22.65	0
5		Subtest2	22.93	22.82	22.70	0
5		Subtest3	22.77	22.66	22.46	0.5
5		Subtest4	22.56	22.43	22.28	0.5
5	HSUPA	Subtest1	22.36	22.30	22.33	0
5		Subtest2	20.81	20.76	20.75	2
5		Subtest3	21.46	21.38	21.39	1
5		Subtest4	20.77	21.03	20.91	2
5		Subtest5	22.28	22.53	22.12	0

Table 2. WCDMA Conducted output powers

Band	Channel	Mbps			
		1	2	5.5	11
IEEE 802.11b	1	17.71	17.27	17.10	17.13
	6	17.58	17.55	17.48	17.39
	11	17.96	17.88	17.79	17.61

Table 10.3 IEEE 802.11b Conducted output power

Band	Channel	Mbps							
		6	9	12	18	24	36	48	54
IEEE 802.11g	1	13.92	13.73	13.62	13.64	13.88	13.62	12.84	12.35
	6	13.70	12.59	12.34	12.18	11.50	11.18	10.49	10.28
	11	13.86	12.97	12.52	12.24	11.74	11.13	10.72	10.80

Table 10.4 IEEE 802.11g Conducted output power

Band	Channel	Mbps							
		6.5	13	20	26	39	52	58	65
IEEE 802.11n (HT-20)	1	12.56	12.38	12.39	12.40	12.04	11.50	11.39	11.02
	6	12.66	12.58	12.49	12.58	12.11	11.62	11.40	11.36
	11	12.98	12.97	12.81	12.89	121.28	11.85	11.38	11.56

Table 10.5 IEEE 802.11n Conducted output power

11. SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas

11.1 SAR Evaluation Considerations

These procedures were followed according to FCC "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas", May 2008. The procedures are applicable to phones with built-in unlicensed transmitters, such as 802.11 a/b/g and Bluetooth devices.

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

Table. 11.1 Output Power Thresholds for Unlicensed Transmitters

	Individual Transmitter	Simultaneous Transmission
Licensed Transmitters	Routine evaluation required	SAR not required: Unlicensed only ○ when stand-alone 1-g SAR is not required and antenna is ≥ 5 cm from other antennas Licensed & Unlicensed ○ when the sum of the 1-g SAR is < 1.6 W/kg for all simultaneous transmitting antennas ○ when SAR to peak location separation ratio of simultaneous transmitting antenna pair is < 0.3 SAR required: Licensed & Unlicensed antenna pairs with SAR to peak location separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in stand-alone configuration for each wireless mode and exposure condition Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply
Unlicensed Transmitters	When there is no simultaneous transmission – ○ output ≤ 60/f: SAR not required ○ output > 60/f: stand-alone SAR required When there is simultaneous transmission – Stand-alone SAR not required when ○ output ≤ 2·P_{Ref} and antenna is ≥ 5.0 cm from other antennas ○ output ≤ P_{Ref} and antenna is ≥ 2.5 cm from other antennas ○ output ≤ P_{Ref} and antenna is < 2.5 cm from other antennas, each with either output power ≤ P_{Ref} or 1-g SAR < 1.2 W/kg Otherwise stand-alone SAR is required When stand-alone SAR is required ○ test SAR on highest output channel for each wireless mode and exposure condition ○ if SAR for highest output channel is > 50% of SAR limit, evaluate all channels according to normal procedures	
Jaw, Mouth and Nose	Flat phantom SAR required ○ when measurement is required in tight regions of SAM and it is not feasible or the results can be questionable due to probe tilt, calibration, positioning and orientation issues ○ position rectangular and clam-shell phones according to flat phantom procedures and conduct SAR measurements for these specific locations	When simultaneous transmission SAR testing is required, contact the FCC Laboratory for interim guidance.

Table. 11.2 SAR Evaluation Requirements for Cellphones with Multiple Transmitters

FCC ID: BEJP990

BT Max. RF output power: 8.04 dBm (6.37 mW)

Antenna separation distance between Main and BT/ WLAN: 95.5 mm

WLAN Max. RF output power: Wi-Fi 802.11b (17.96 dBm) / Wi-Fi 802.11g (13.92 dBm) / Wi-Fi 802.11n (12.98 dBm)

Because the conducted output power level of the BT transmitter is less than 2*P_{ref}, and the BT antenna is more than 5 cm from the Main antenna, neither simultaneous SAR nor stand-alone BT SAR are required for the EUT. Based on the output power and antenna separation distance, a stand-slone WLAN SAR test is required.

12. SAR TEST DATA SUMMARY

12.1 Measurement Results (GSM850 Head SAR Touch)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
836.6	190 (Mid)	GSM850	32.70	32.67	Standard	Left Ear	Intenna	0.213
836.6	190 (Mid)	GSM850	32.70	32.64	Standard	Right Ear	Intenna	0.152
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Head 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

12.2 Measurement Results (GSM850 Head SAR Tilt)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
836.6	190 (Mid)	GSM850	32.70	32.68	Standard	Left Tilt 15°	Intenna	0.091
836.6	190 (Mid)	GSM850	32.70	32.70	Standard	Right Tilt 15°	Intenna	0.105
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Head 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

12.3 Measurement Results (GSM1900 Head SAR Touch)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 880.0	661 (Mid)	GSM1900	29.97	29.99	Standard	Left Ear	Intenna	0.189
1 880.0	661 (Mid)	GSM1900	29.97	30.02	Standard	Right Ear	Intenna	0.249
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Head 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

12.4 Measurement Results (GSM1900 Head SAR Tilt)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 880.0	661 (Mid)	GSM1900	29.97	30.00	Standard	Left Tilt 15°	Intenna	0.09
1 880.0	661 (Mid)	GSM1900	29.97	29.96	Standard	Right Tilt 15°	Intenna	0.10
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Head 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

12.5 Measurement Results (WCDMA1900 Head SAR Touch)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 880.0	9400 (Mid)	WCDMA1900	22.80	22.76	Standard	Left Ear	Intenna	0.209
1 880.0	9400 (Mid)	WCDMA1900	22.80	22.98	Standard	Right Ear	Intenna	0.274
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Head 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 WCDMA Mode was tested under RMC 12.2 kbps and HSPA Inactive.

12.6 Measurement Results (WCDMA1900 Head SAR Tilt)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 880.0	9400 (Mid)	WCDMA1900	22.80	22.76	Standard	Left Tilt 15°	Intenna	0.116
1 880.0	9400 (Mid)	WCDMA1900	22.80	22.76	Standard	Right Tilt 15°	Intenna	0.133
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Head 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
8 WCDMA Mode was tested under RMC 12.2 kbps and HSPA Inactive.

12.7 Measurement Results (802.11b/g/n Module Head SAR Touch)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Data Rate	SAR(mW/g)
MHz	Channel		Begin	End				
2462	11 (High)	802.11b	17.96	17.91	Standard	Left Ear	1 Mbps	0.264
2462	11 (High)	802.11b	17.96	18.07	Standard	Right Ear	1 Mbps	0.366
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Head 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☒ Manual Test cord ☐ Base Station Simulator

12.8 Measurement Results (802.11b/g/n Module Head SAR Tilt)

Frequency		Modulation	Conducted Power (dBm)		Battery	Phantom Position	Data Rate	SAR(mW/g)
MHz	Channel		Begin	End				
2462	11 (High)	802.11b	17.96	18.00	Standard	Left Tilt 15°	1 Mbps	0.219
2462	11 (High)	802.11b	17.96	17.98	Standard	Right Tilt 15°	1 Mbps	0.286
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Head 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☒ Manual Test cord ☐ Base Station Simulator

12.9 Measurement Results (GSM850 Body SAR)

Frequency		Modulation	Conducted Power (dBm)		Configuration	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
836.6	190 (Mid)	GPRS 4Tx	30.88	30.79	Rear	2.0 cm without Holster	Intenna	0.616
836.6	190 (Mid)	GPRS 3Tx	31.93	31.84	Rear	2.0 cm without Holster	Intenna	0.525
836.6	190 (Mid)	GPRS 2Tx	32.70	32.73	Rear	2.0 cm without Holster	Intenna	0.414
836.6	190 (Mid)	GPRS 1Tx	32.70	32.88	Rear	2.0 cm without Holster	Intenna	0.205
836.6	190 (Mid)	GSM850	32.70	32.78	Rear	2.0 cm without Holster	Intenna	0.216
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Body 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Both side of the phone were tested and the worst-case side is reported.
8 Test Configuration ☐ With Holster ☒ Without Holster
9 HEADSET was connected.
10 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

12.10 Measurement Results (GSM1900 Body SAR)

Frequency		Modulation	Conducted Power (dBm)		Configuration	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 880.0	661 (Mid)	GPRS 4Tx	28.13	28.18	Rear	2.0 cm without Holster	Intenna	0.314
1 880.0	661 (Mid)	GPRS 3Tx	29.19	29.22	Rear	2.0 cm without Holster	Intenna	0.307
1 880.0	661 (Mid)	GPRS 2Tx	29.97	30.14	Rear	2.0 cm without Holster	Intenna	0.242
1 880.0	661 (Mid)	GPRS 1Tx	29.97	29.93	Rear	2.0 cm without Holster	Intenna	0.121
1 880.0	661 (Mid)	GSM1900	29.97	30.05	Rear	2.0 cm without Holster	Intenna	0.116
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Body 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Both side of the phone were tested and the worst-case side is reported.
8 Test Configuration ☐ With Holster ☒ Without Holster
9 HEADSET was connected.
10 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

12.11 Measurement Results (WCDMA1900 Body SAR)

Frequency		Modulation	Conducted Power (dBm)		Configuration	Phantom Position	Antenna Type	SAR(mW/g)
MHz	Channel		Begin	End				
1 880.0	9400 (Mid)	WCDMA1900	22.80	22.80	Rear	2.0 cm without Holster	Intenna	0.170
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Body 1.6 W/kg (mW/g)** Averaged over 1 gram		

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
7 Both side of the phone were tested and the worst-case side is reported.
8 HEADSET was connected.
9 Test Configuration ☐ With Holster ☒ Without Holster
10 Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
11 WCDMA Mode was tested under RMC 12.2 kbps and HSDPA Inactive.

12.12 Measurement Results (802.11b/g/n Module Body SAR)

Frequency		Modulation	Conducted Power (dBm)		Configuration	Separation Distance	Data Rate	SAR(mW/g)
MHz	Channel		Begin	End				
2412	1 (Low)	802.11b	17.71	17.68	Rear	2.0 cm	1 Mbps	0.047
2437	6 (Mid)	802.11b	17.58	17.48	Rear	2.0 cm	1 Mbps	0.045
2462	11 (High)	802.11b	17.96	17.95	Rear	2.0 cm	1 Mbps	0.039
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						**Body 1.6 W/kg (mW/g)** Averaged over 1 gram		

NOTES:

1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
2 All modes of operation were investigated and the worst-case are reported.
3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
4 Tissue parameters and temperatures are listed on the SAR plot.
5 Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
6 Test Signal Call Mode ☒ Manual Test code ☐ Base Station Simulator

13. CONCLUSION

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the ANSI/ IEEE C95.1 1992.

These measurements are taken to simulate the RF effects exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests.

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Attachment 1. – SAR Test Plots

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.869 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

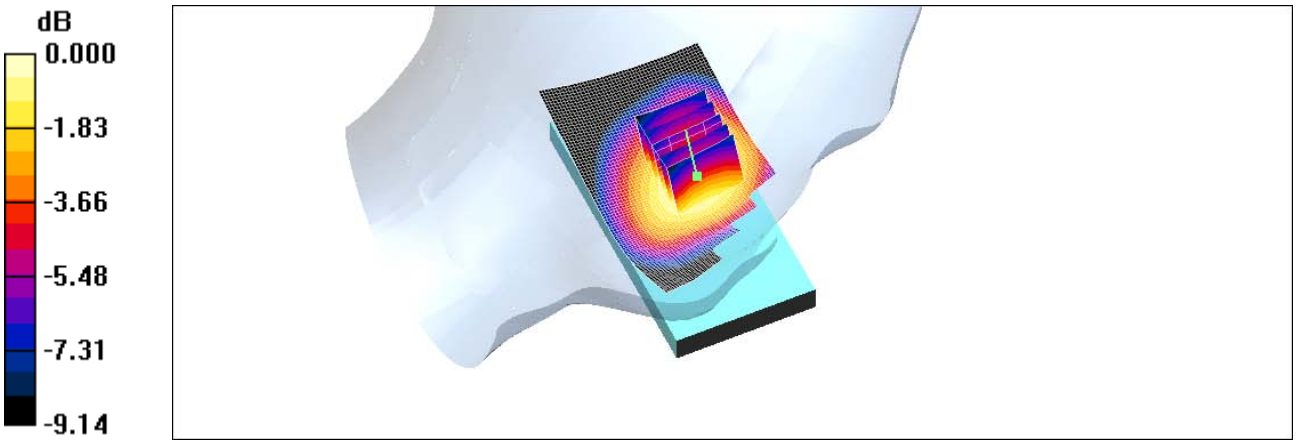
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.25, 6.25, 6.25); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Left touch 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.226 mW/g

Left touch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.03 V/m; Power Drift = -0.033 dB
Peak SAR (extrapolated) = 0.255 W/kg
SAR(1 g) = 0.213 mW/g; SAR(10 g) = 0.161 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.227 mW/g



0 dB = 0.227mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.869 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

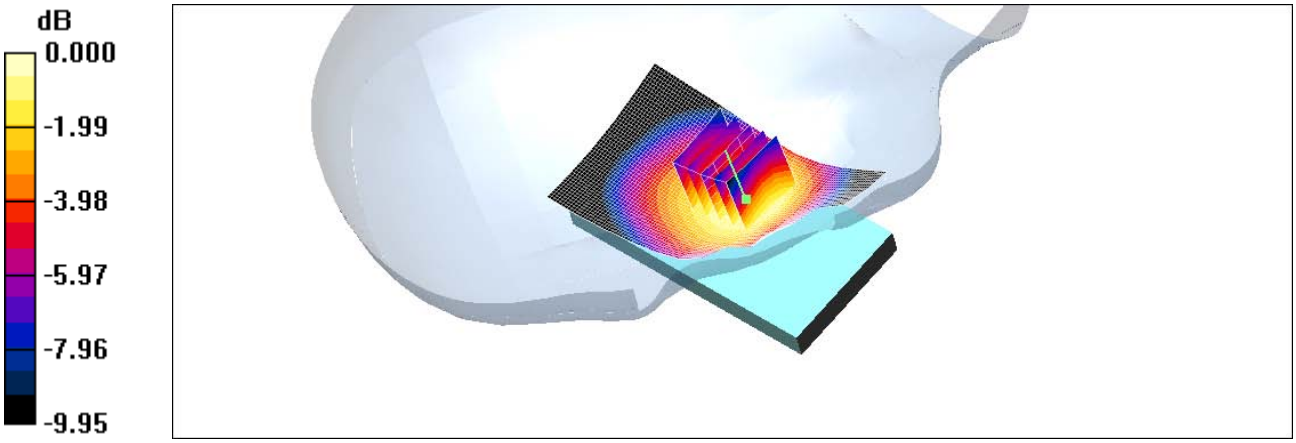
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.25, 6.25, 6.25); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Right touch 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.161 mW/g

Right touch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.64 V/m; Power Drift = -0.064 dB
Peak SAR (extrapolated) = 0.184 W/kg
SAR(1 g) = 0.152 mW/g; SAR(10 g) = 0.116 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.160 mW/g



0 dB = 0.160mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.869 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

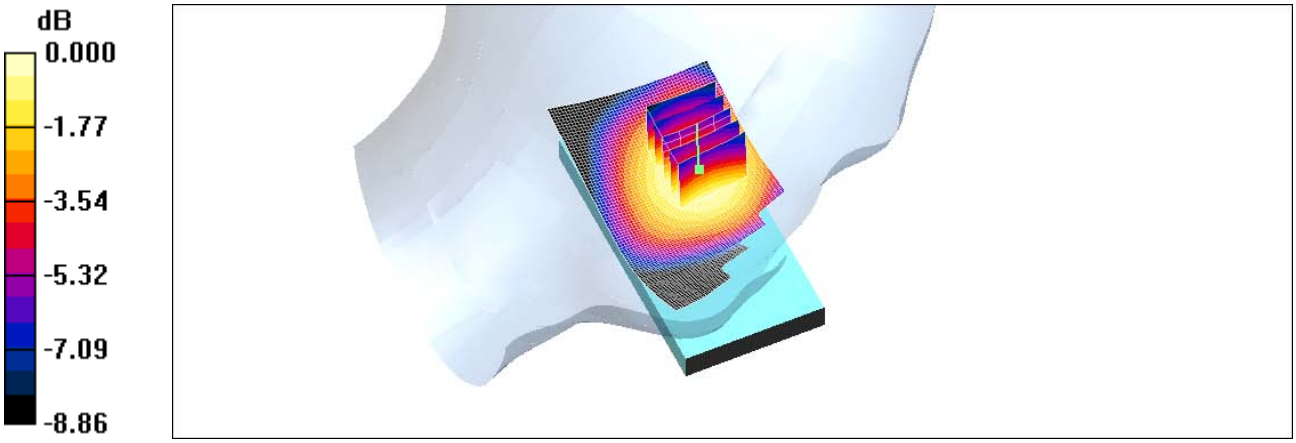
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.25, 6.25, 6.25); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Left tilt 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.096 mW/g

Left tilt 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.08 V/m; Power Drift = -0.021 dB
Peak SAR (extrapolated) = 0.108 W/kg
SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.070 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.096 mW/g



0 dB = 0.096mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.869 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

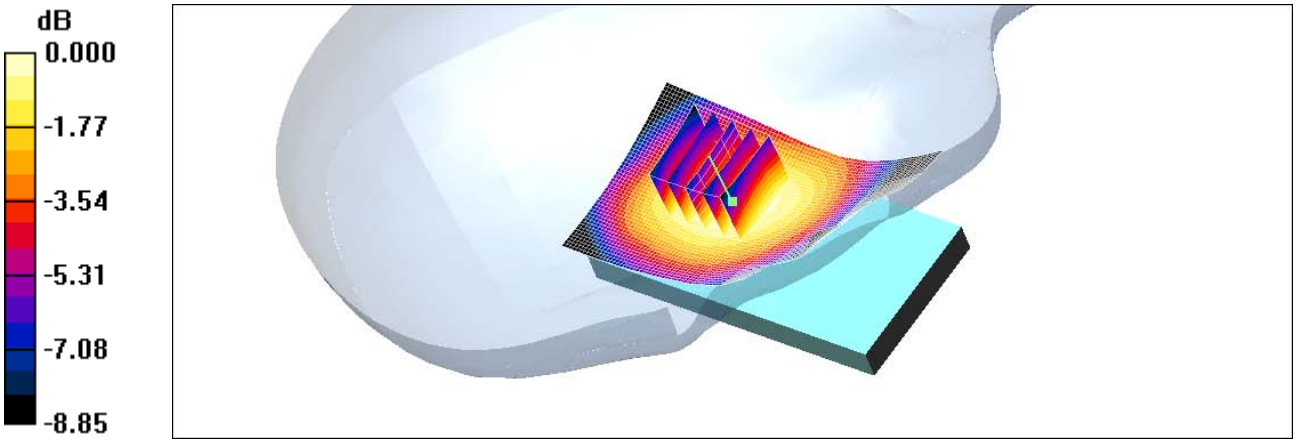
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.25, 6.25, 6.25); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Right tilt 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.111 mW/g

Right tilt 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.40 V/m; Power Drift = 0.004 dB
Peak SAR (extrapolated) = 0.127 W/kg
SAR(1 g) = 0.105 mW/g; SAR(10 g) = 0.080 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.111 mW/g



0 dB = 0.111mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

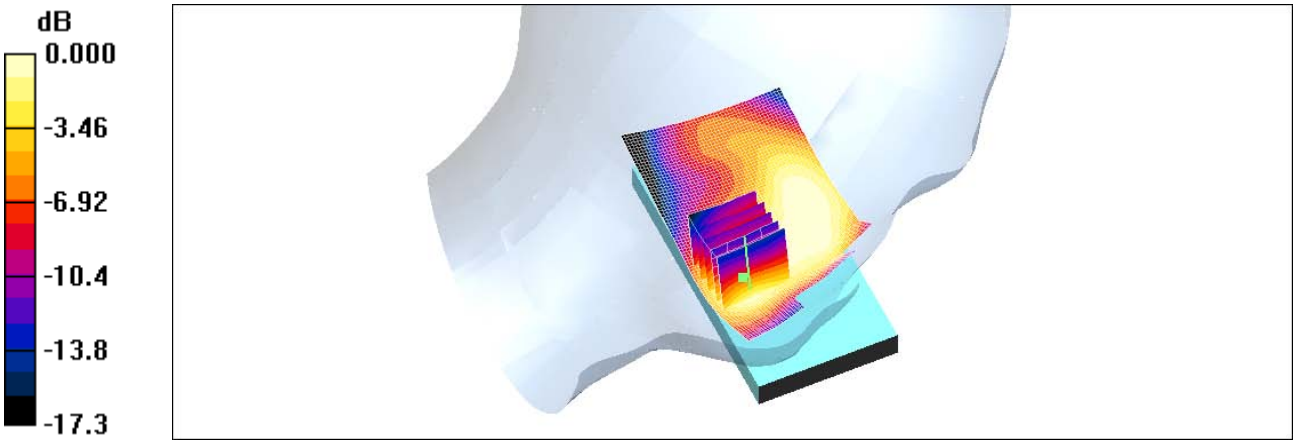
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Left touch 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.210 mW/g

Left touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.50 V/m; Power Drift = 0.020 dB
Peak SAR (extrapolated) = 0.297 W/kg
SAR(1 g) = 0.189 mW/g; SAR(10 g) = 0.118 mW/g
Maximum value of SAR (measured) = 0.203 mW/g



0 dB = 0.203mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

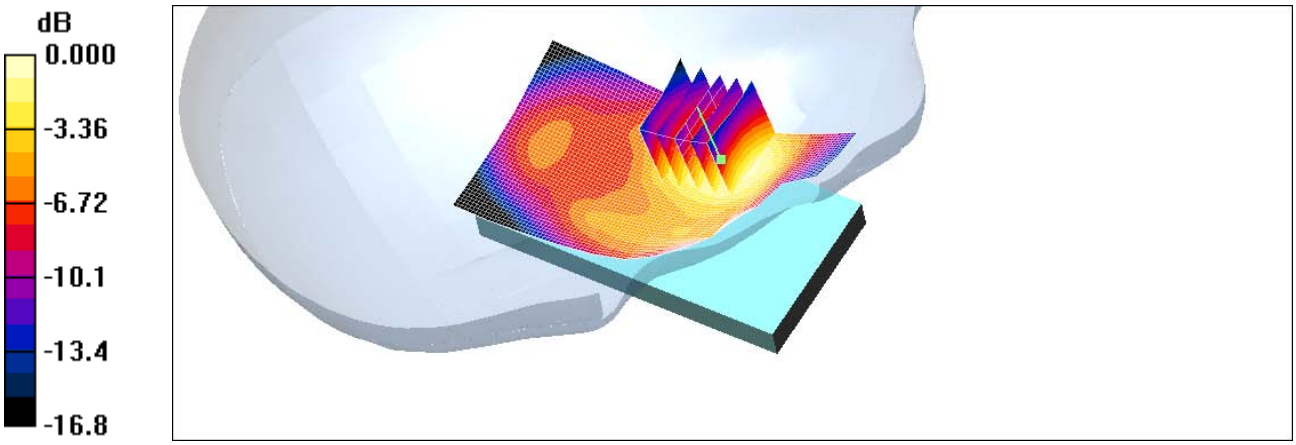
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Right touch 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.283 mW/g

Right touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.76 V/m; Power Drift = 0.054 dB
Peak SAR (extrapolated) = 0.371 W/kg
SAR(1 g) = 0.249 mW/g; SAR(10 g) = 0.156 mW/g
Maximum value of SAR (measured) = 0.270 mW/g



0 dB = 0.270mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

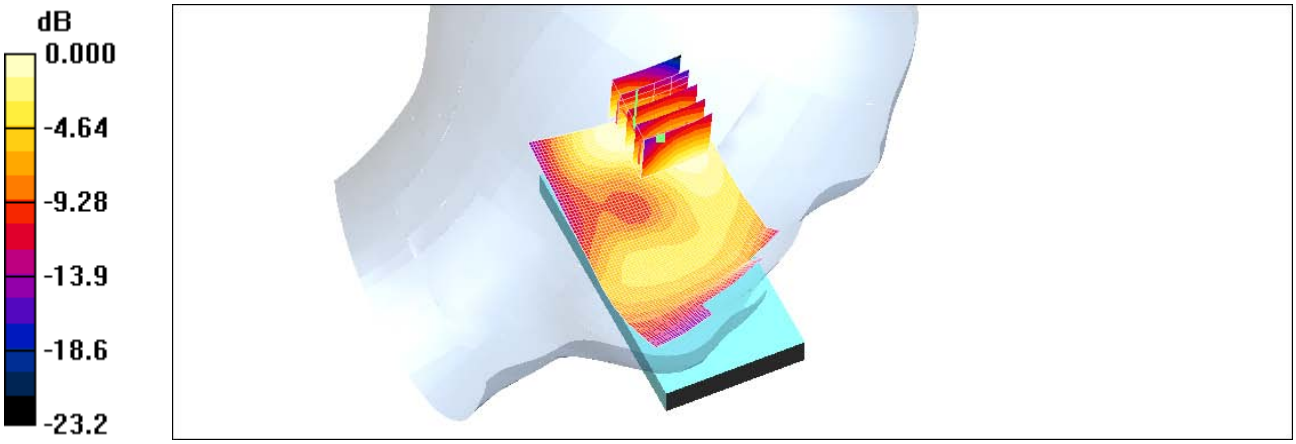
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Left tilt 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.103 mW/g

Left tilt 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.40 V/m; Power Drift = 0.034 dB
Peak SAR (extrapolated) = 0.145 W/kg
SAR(1 g) = 0.090 mW/g; SAR(10 g) = 0.055 mW/g
Maximum value of SAR (measured) = 0.098 mW/g



0 dB = 0.098mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

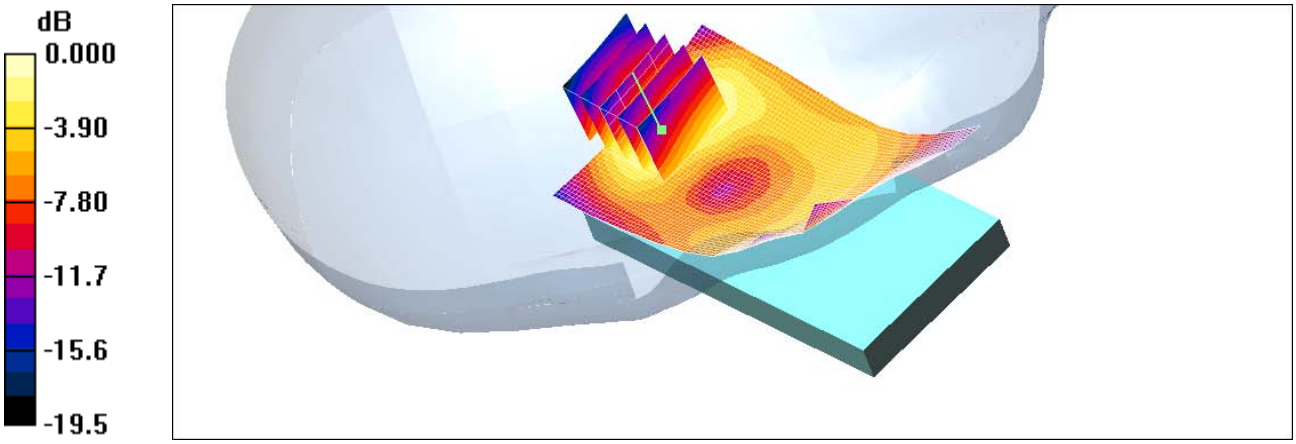
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Right tilt 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.110 mW/g

Right tilt 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.33 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 0.155 W/kg
SAR(1 g) = 0.100 mW/g; SAR(10 g) = 0.058 mW/g
Maximum value of SAR (measured) = 0.110 mW/g



0 dB = 0.110mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

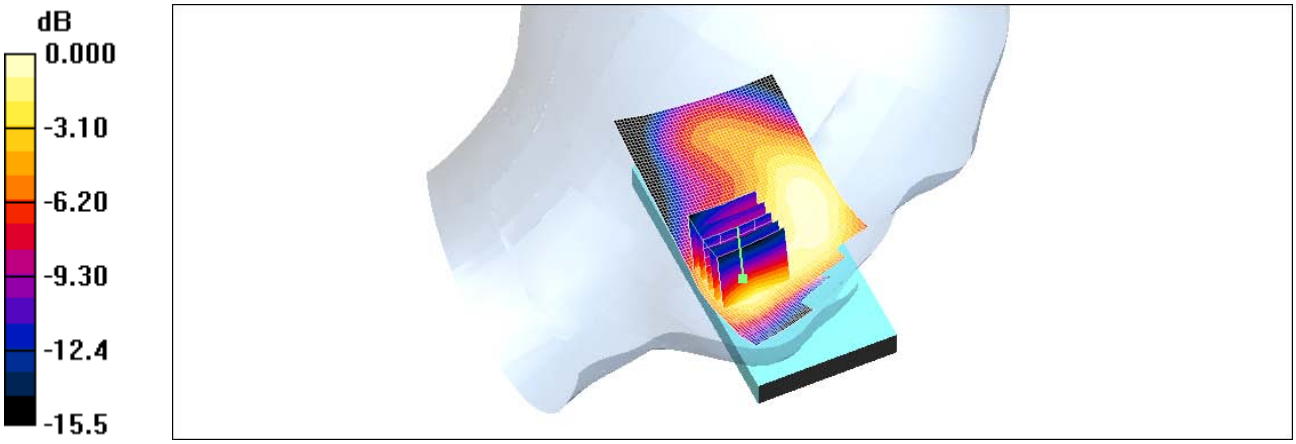
DUT: LG-P990; Type: bar; Serial: #1

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Left touch 9400/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.230 mW/g

Left touch 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.43 V/m; Power Drift = -0.045 dB
Peak SAR (extrapolated) = 0.323 W/kg
SAR(1 g) = 0.209 mW/g; SAR(10 g) = 0.130 mW/g
Maximum value of SAR (measured) = 0.223 mW/g



0 dB = 0.223mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

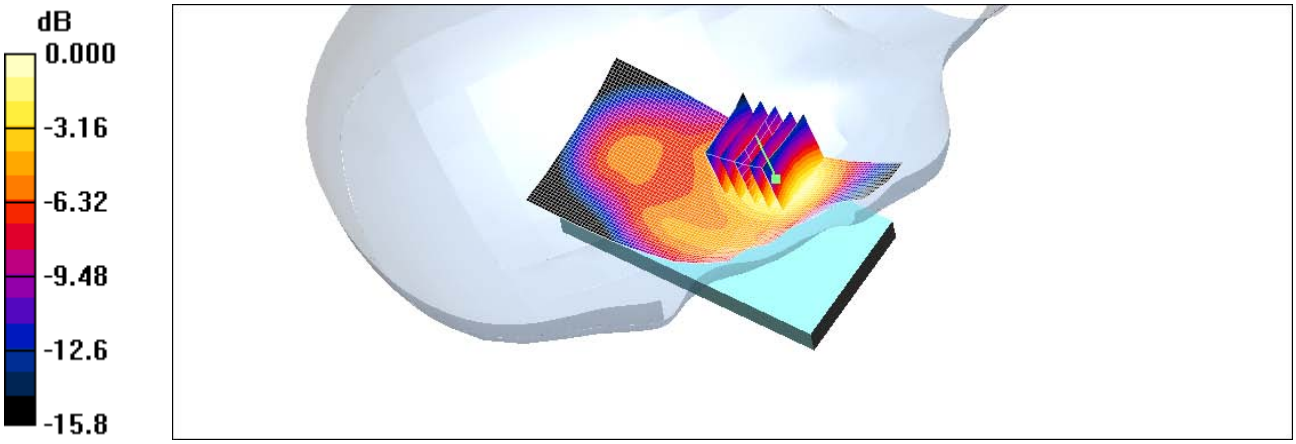
DUT: LG-P990; Type: bar; Serial: #1

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Right touch 9400/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.298 mW/g

Right touch 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.26 V/m; Power Drift = 0.189 dB
Peak SAR (extrapolated) = 0.410 W/kg
SAR(1 g) = 0.274 mW/g; SAR(10 g) = 0.170 mW/g
Maximum value of SAR (measured) = 0.297 mW/g



0 dB = 0.297mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

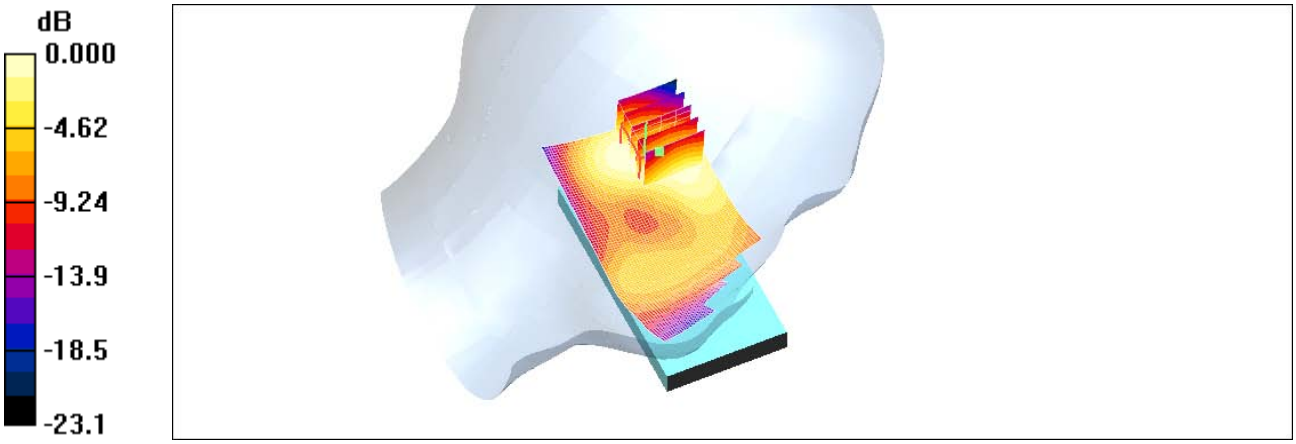
DUT: LG-P990; Type: bar; Serial: #1

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Left tilt 9400/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.134 mW/g

Left tilt 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.66 V/m; Power Drift = -0.031 dB
Peak SAR (extrapolated) = 0.183 W/kg
SAR(1 g) = 0.116 mW/g; SAR(10 g) = 0.071 mW/g
Maximum value of SAR (measured) = 0.121 mW/g



0 dB = 0.121mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

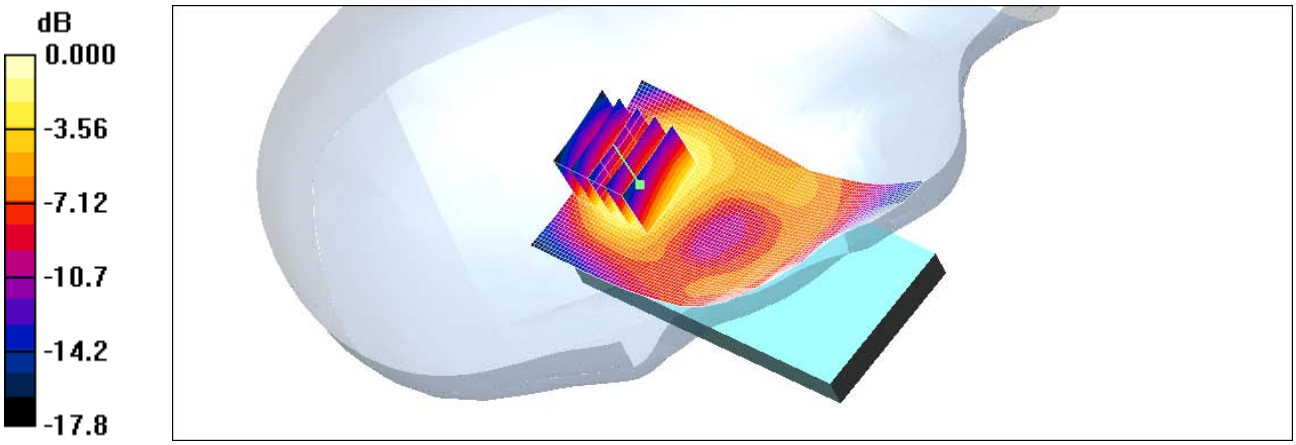
DUT: LG-P990; Type: bar; Serial: #1

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Right tilt 9400/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.156 mW/g

Right tilt 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.5 V/m; Power Drift = 0.030 dB
Peak SAR (extrapolated) = 0.203 W/kg
SAR(1 g) = 0.133 mW/g; SAR(10 g) = 0.078 mW/g
Maximum value of SAR (measured) = 0.148 mW/g



0 dB = 0.148mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.86 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

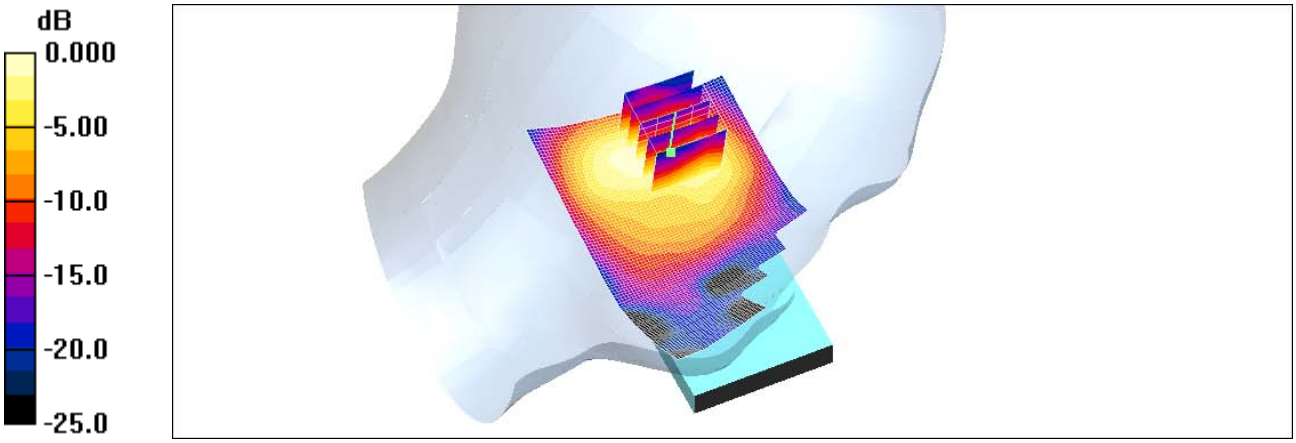
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.58, 4.58, 4.58); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Left touch 11/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.289 mW/g

Left touch 11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.0 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 0.563 W/kg
SAR(1 g) = 0.264 mW/g; SAR(10 g) = 0.134 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.280 mW/g



0 dB = 0.280mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.86 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

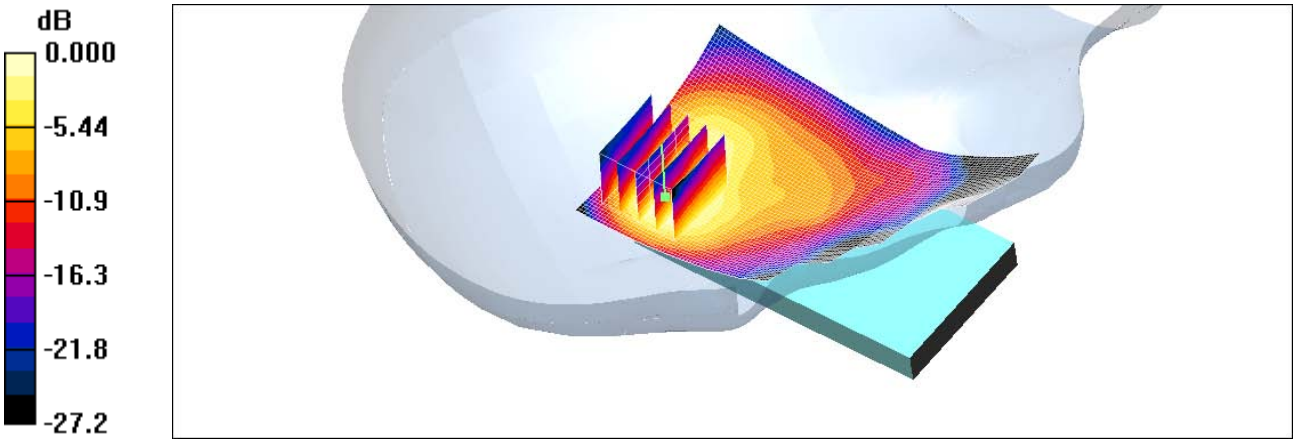
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.58, 4.58, 4.58); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Right touch 11/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.453 mW/g

Right touch 11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.5 V/m; Power Drift = 0.107 dB
Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.177 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.370 mW/g



0 dB = 0.370mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.86 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

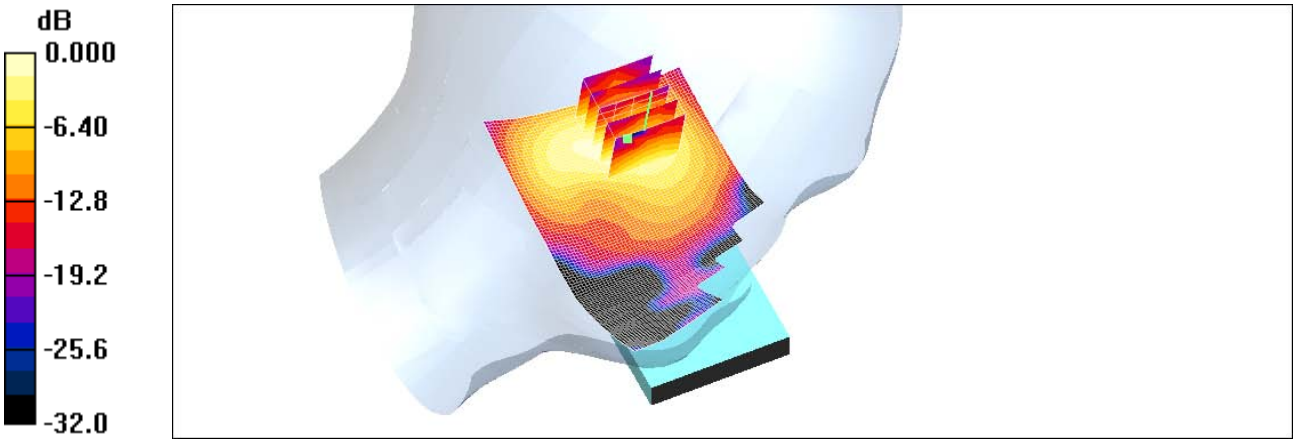
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.58, 4.58, 4.58); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Left tilt 11/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.244 mW/g

Left tilt 11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.46 V/m; Power Drift = 0.036 dB
Peak SAR (extrapolated) = 0.495 W/kg
SAR(1 g) = 0.219 mW/g; SAR(10 g) = 0.107 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.216 mW/g



0 dB = 0.216mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.86 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

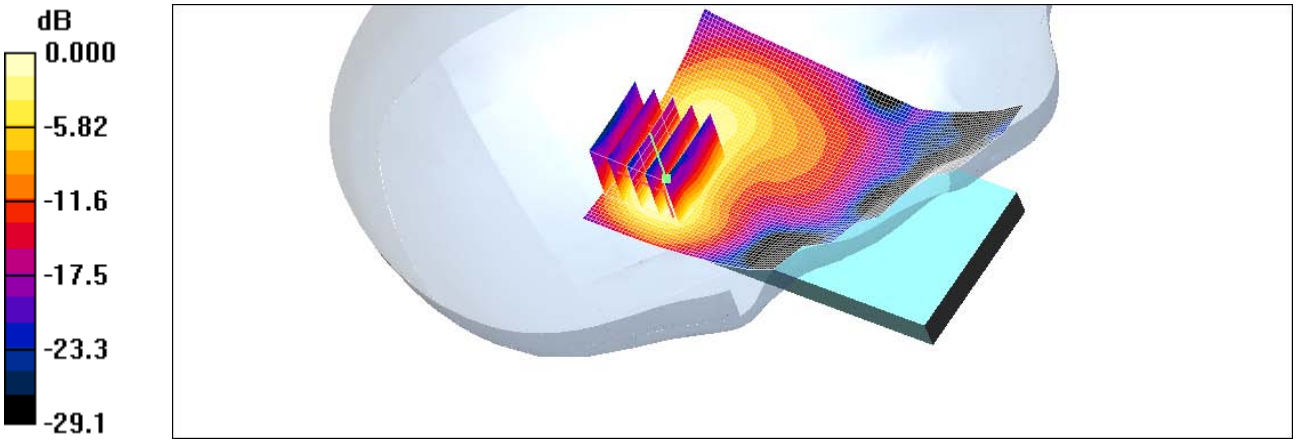
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.58, 4.58, 4.58); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Right tilt 11/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.353 mW/g

Right tilt 11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.91 V/m; Power Drift = 0.016 dB
Peak SAR (extrapolated) = 0.780 W/kg
SAR(1 g) = 0.286 mW/g; SAR(10 g) = 0.123 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.314 mW/g



0 dB = 0.314mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:2.075
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.981 mho/m; ε_r = 56.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

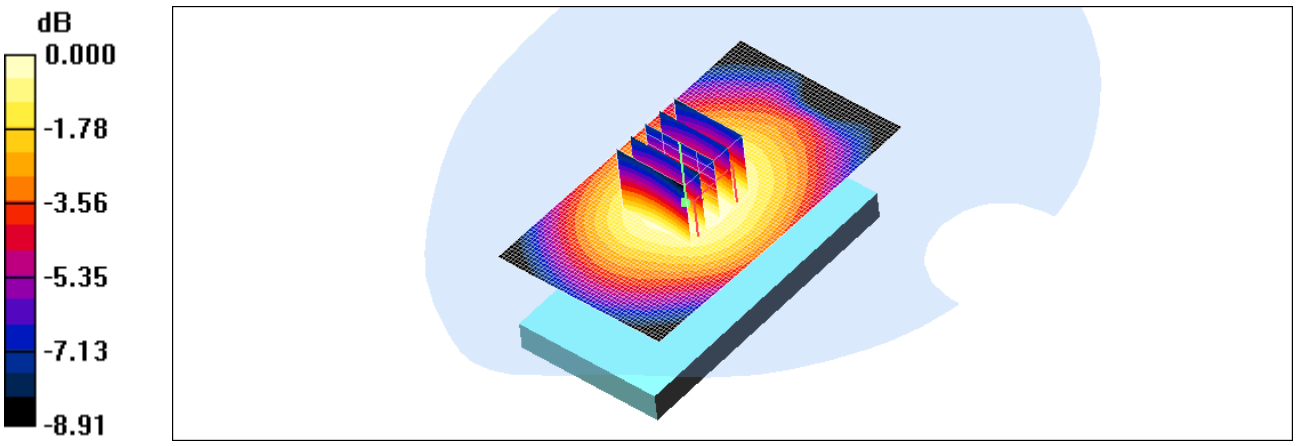
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.17, 6.17, 6.17); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.641 mW/g

Body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.9 V/m; Power Drift = -0.085 dB
Peak SAR (extrapolated) = 0.770 W/kg
SAR(1 g) = 0.616 mW/g; SAR(10 g) = 0.458 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.645 mW/g



0 dB = 0.645mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:2.77
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.981 mho/m; ε_r = 56.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

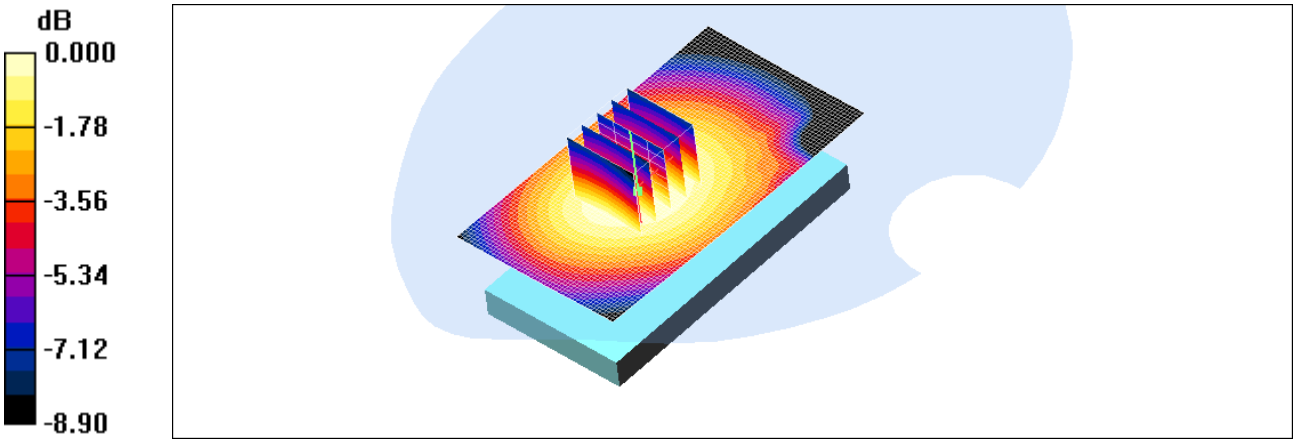
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.17, 6.17, 6.17); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.565 mW/g

Body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.1 V/m; Power Drift = -0.019 dB
Peak SAR (extrapolated) = 0.646 W/kg
SAR(1 g) = 0.525 mW/g; SAR(10 g) = 0.392 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.550 mW/g



0 dB = 0.550mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.981 mho/m; ε_r = 56.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

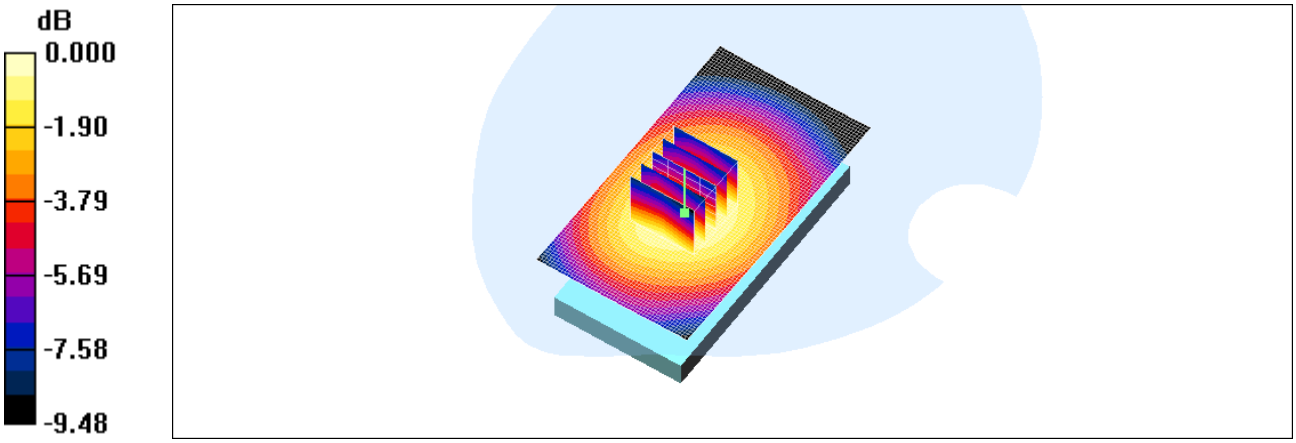
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.17, 6.17, 6.17); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.402 mW/g

Body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.5 V/m; Power Drift = 0.032 dB
Peak SAR (extrapolated) = 0.507 W/kg
SAR(1 g) = 0.414 mW/g; SAR(10 g) = 0.302 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.443 mW/g



0 dB = 0.443mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.981 mho/m; ε_r = 56.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

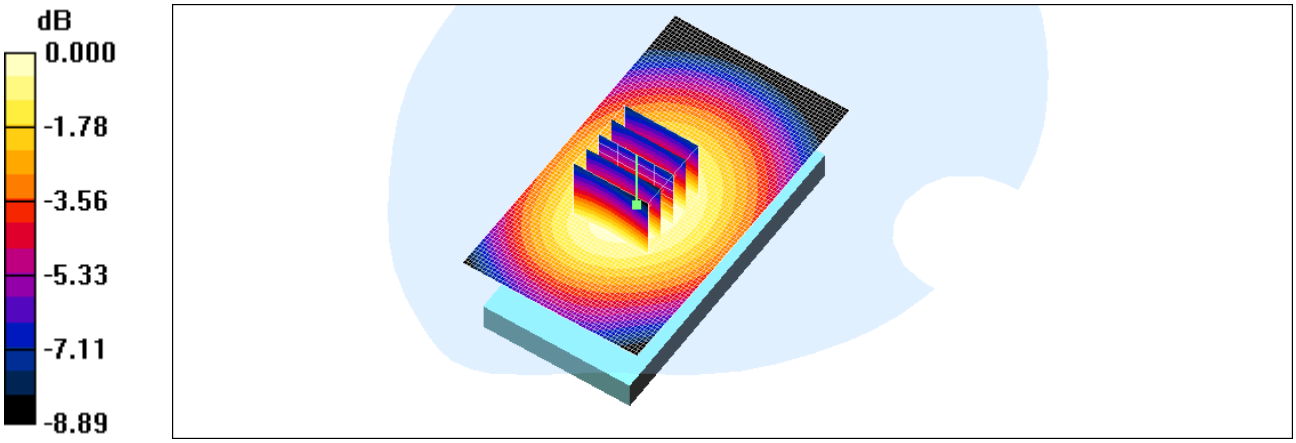
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.17, 6.17, 6.17); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.215 mW/g

Body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.59 V/m; Power Drift = 0.182 dB
Peak SAR (extrapolated) = 0.256 W/kg
SAR(1 g) = 0.205 mW/g; SAR(10 g) = 0.153 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.216 mW/g



0 dB = 0.216mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

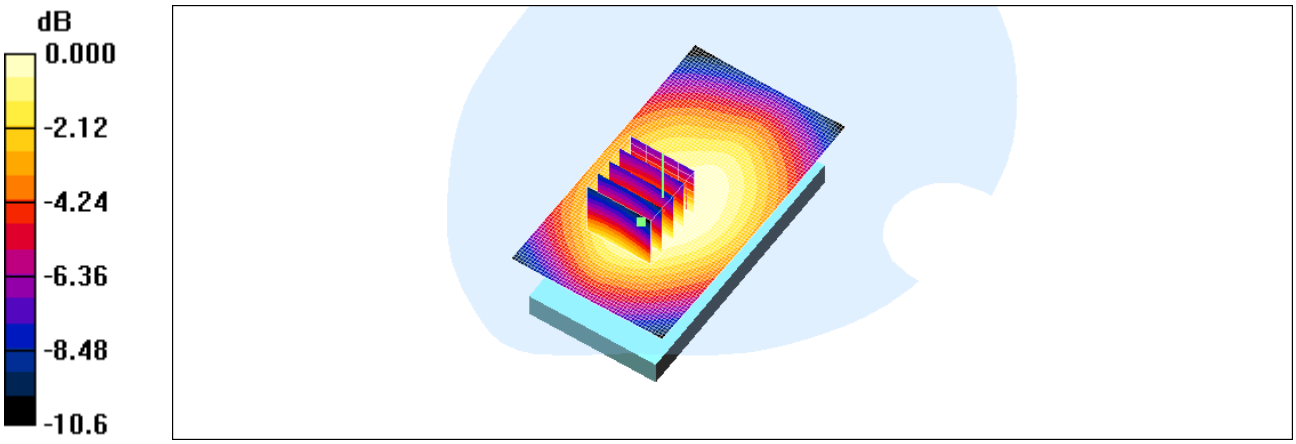
Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.981 mho/m; ε_r = 56.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.17, 6.17, 6.17); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.256 mW/g

Body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.58 V/m; Power Drift = 0.081 dB
Peak SAR (extrapolated) = 0.272 W/kg
SAR(1 g) = 0.216 mW/g; SAR(10 g) = 0.156 mW/g
Maximum value of SAR (measured) = 0.230 mW/g



0 dB = 0.230mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

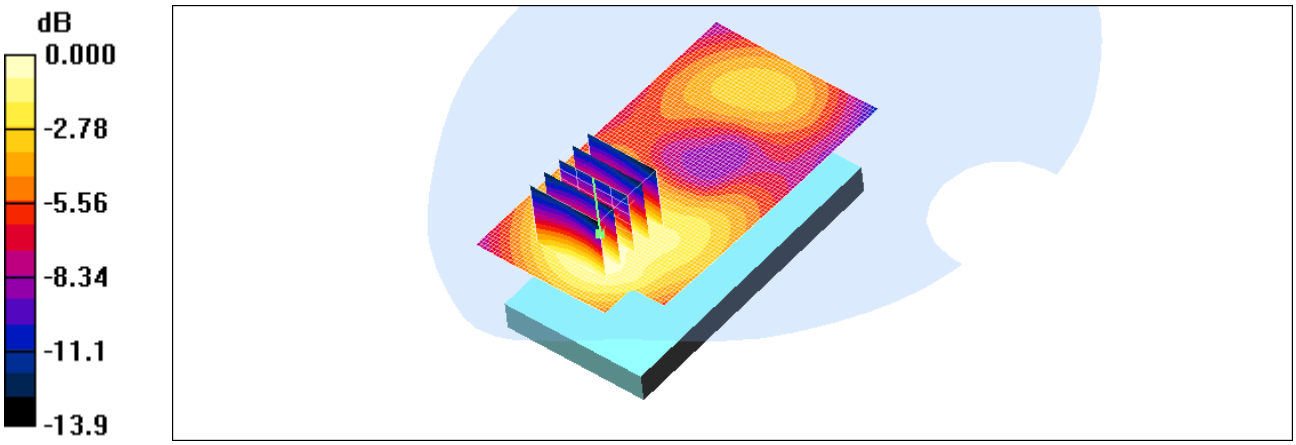
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:2.075
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.338 mW/g

Body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.5 V/m; Power Drift = 0.049 dB
Peak SAR (extrapolated) = 0.438 W/kg
SAR(1 g) = 0.314 mW/g; SAR(10 g) = 0.203 mW/g
Maximum value of SAR (measured) = 0.339 mW/g



0 dB = 0.339mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

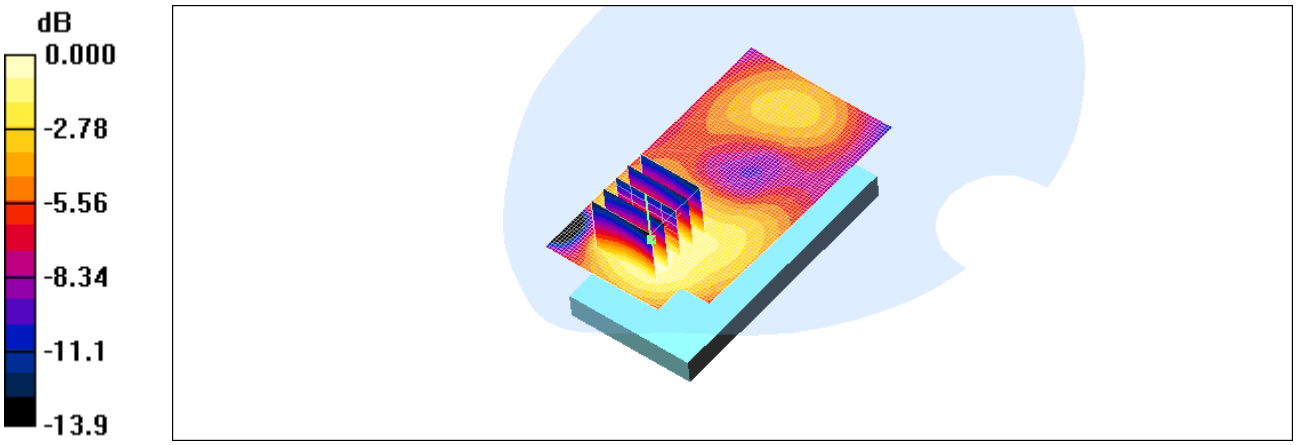
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:2.77
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.330 mW/g

Body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.4 V/m; Power Drift = 0.029 dB
Peak SAR (extrapolated) = 0.436 W/kg
SAR(1 g) = 0.307 mW/g; SAR(10 g) = 0.197 mW/g
Maximum value of SAR (measured) = 0.335 mW/g



0 dB = 0.335mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

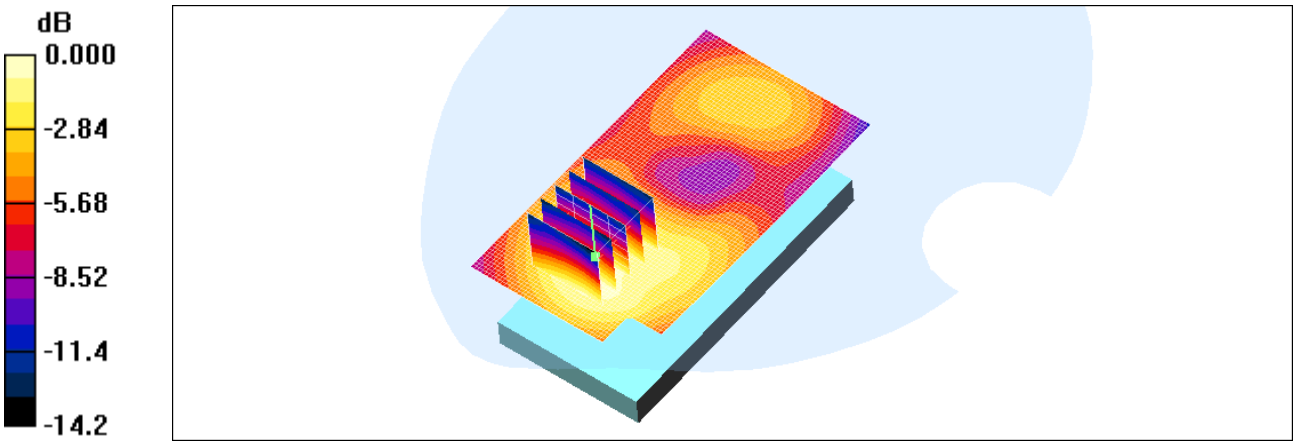
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.259 mW/g

Body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.1 V/m; Power Drift = 0.170 dB
Peak SAR (extrapolated) = 0.346 W/kg
SAR(1 g) = 0.242 mW/g; SAR(10 g) = 0.155 mW/g
Maximum value of SAR (measured) = 0.260 mW/g



0 dB = 0.260mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

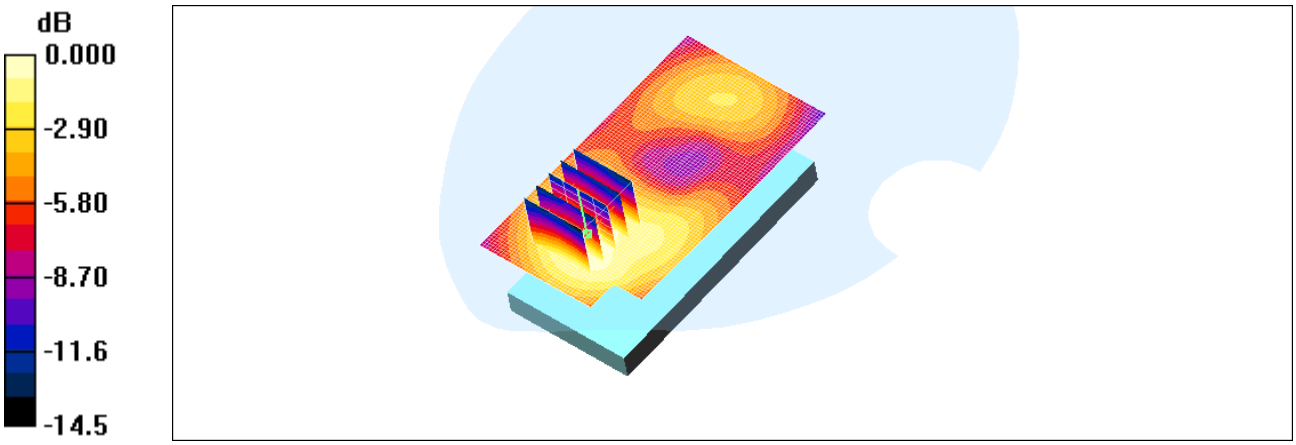
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.130 mW/g

Body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.28 V/m; Power Drift = -0.037 dB
Peak SAR (extrapolated) = 0.172 W/kg
SAR(1 g) = 0.121 mW/g; SAR(10 g) = 0.078 mW/g
Maximum value of SAR (measured) = 0.131 mW/g



0 dB = 0.131mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

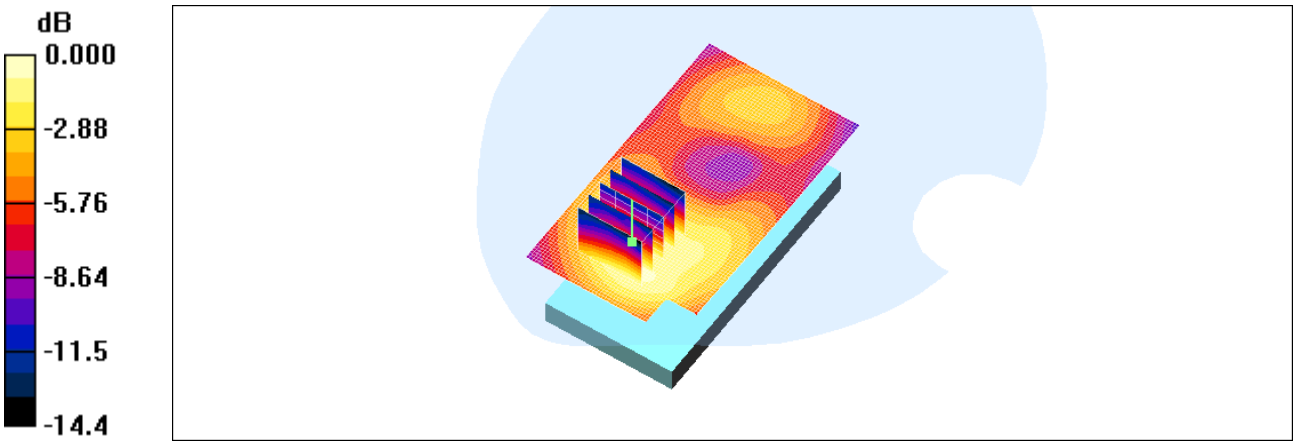
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.124 mW/g

Body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.94 V/m; Power Drift = 0.080 dB
Peak SAR (extrapolated) = 0.166 W/kg
SAR(1 g) = 0.116 mW/g; SAR(10 g) = 0.074 mW/g
Maximum value of SAR (measured) = 0.127 mW/g



0 dB = 0.127mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

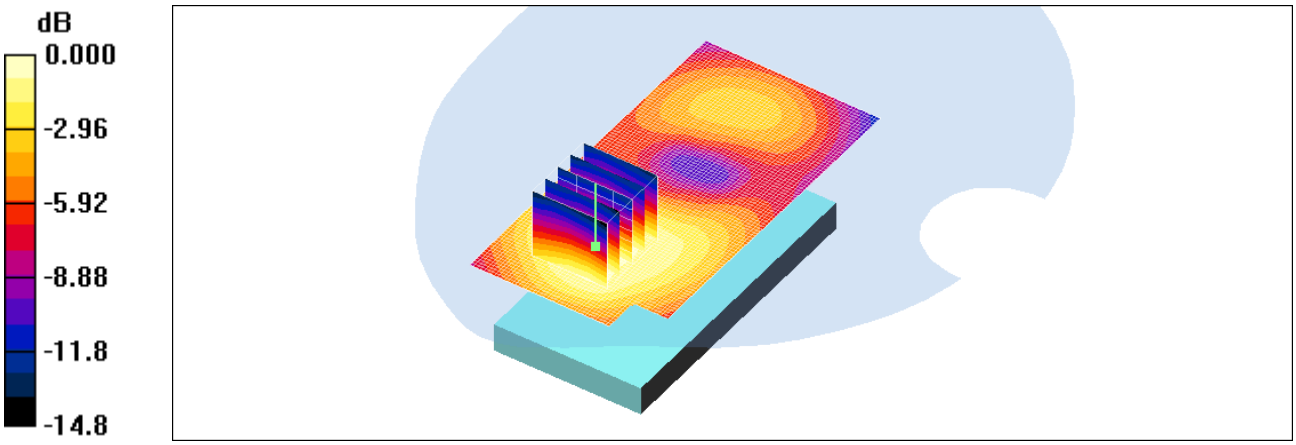
DUT: LG-P990; Type: bar; Serial: #1

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Body 9400/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.182 mW/g

Body 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.13 V/m; Power Drift = 0.002 dB
Peak SAR (extrapolated) = 0.241 W/kg
SAR(1 g) = 0.170 mW/g; SAR(10 g) = 0.108 mW/g
Maximum value of SAR (measured) = 0.184 mW/g



0 dB = 0.184mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.9 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

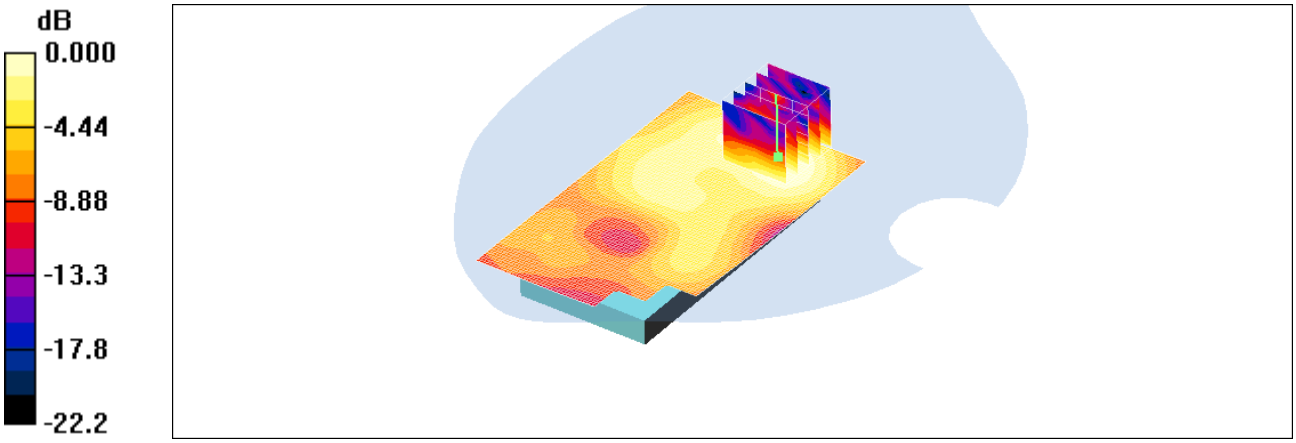
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.15, 4.15, 4.15); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 1/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.052 mW/g

Body 1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.97 V/m; Power Drift = 0.018 dB
Peak SAR (extrapolated) = 0.095 W/kg
SAR(1 g) = 0.047 mW/g; SAR(10 g) = 0.026 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.050 mW/g



0 dB = 0.050mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

DUT: LG-P990; Type: bar; Serial: #1

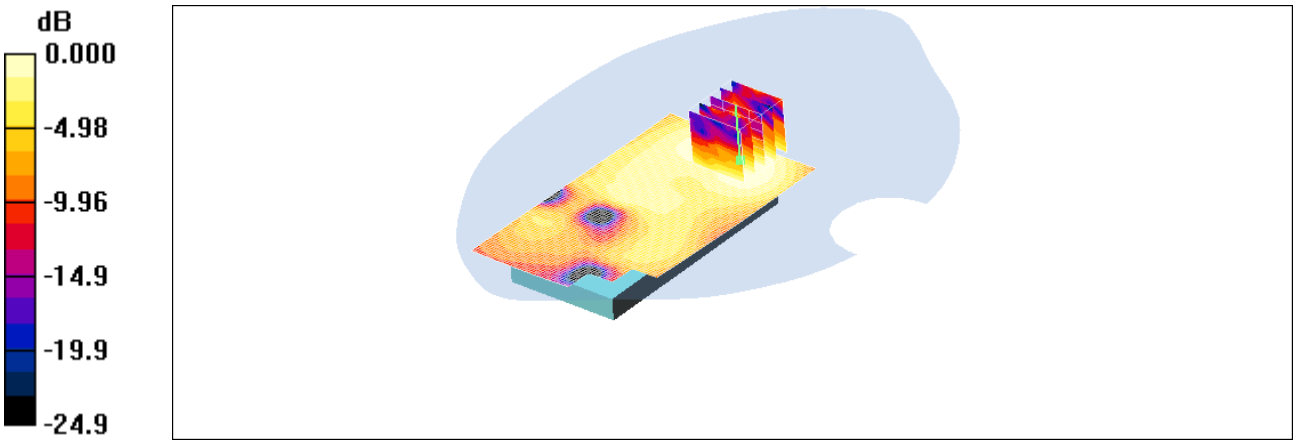
Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.94 mho/m; ε_r = 51.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.15, 4.15, 4.15); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 6/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.052 mW/g

Body 6/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.95 V/m; Power Drift = -0.104 dB
Peak SAR (extrapolated) = 0.086 W/kg
SAR(1 g) = 0.045 mW/g; SAR(10 g) = 0.025 mW/g
Maximum value of SAR (measured) = 0.048 mW/g



0 dB = 0.048mW/g

Test Laboratory: HCT CO., LTD

EUT Type: Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN

GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)

Liquid Temperature: 21.1 ℃

Ambient Temperature: 21.3 ℃

Test Date: Dec. 7, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.97 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

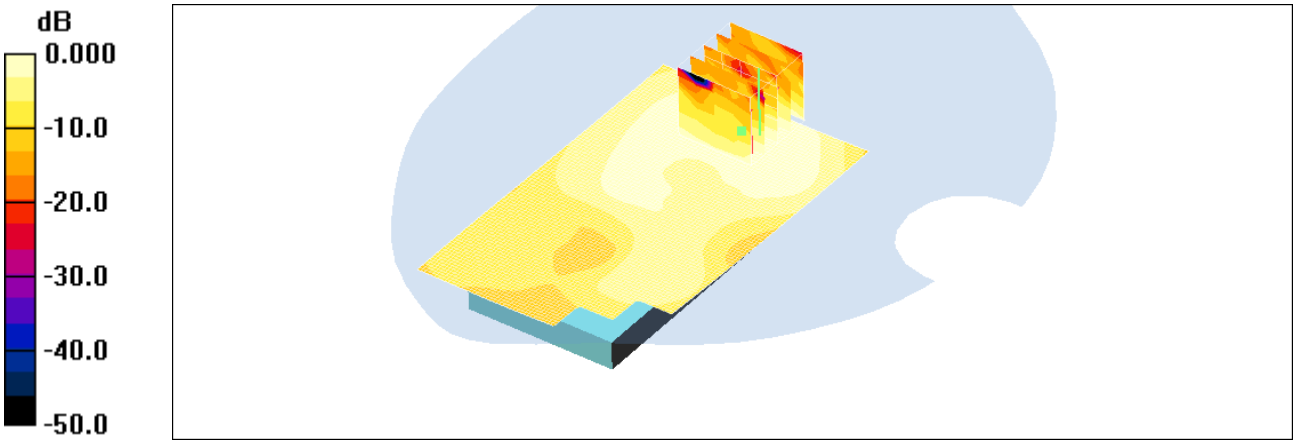
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.15, 4.15, 4.15); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 11/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.041 mW/g

Body 11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.78 V/m; Power Drift = -0.011 dB
Peak SAR (extrapolated) = 0.077 W/kg
SAR(1 g) = 0.039 mW/g; SAR(10 g) = 0.022 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.042 mW/g



0 dB = 0.042mW/g

Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.869 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

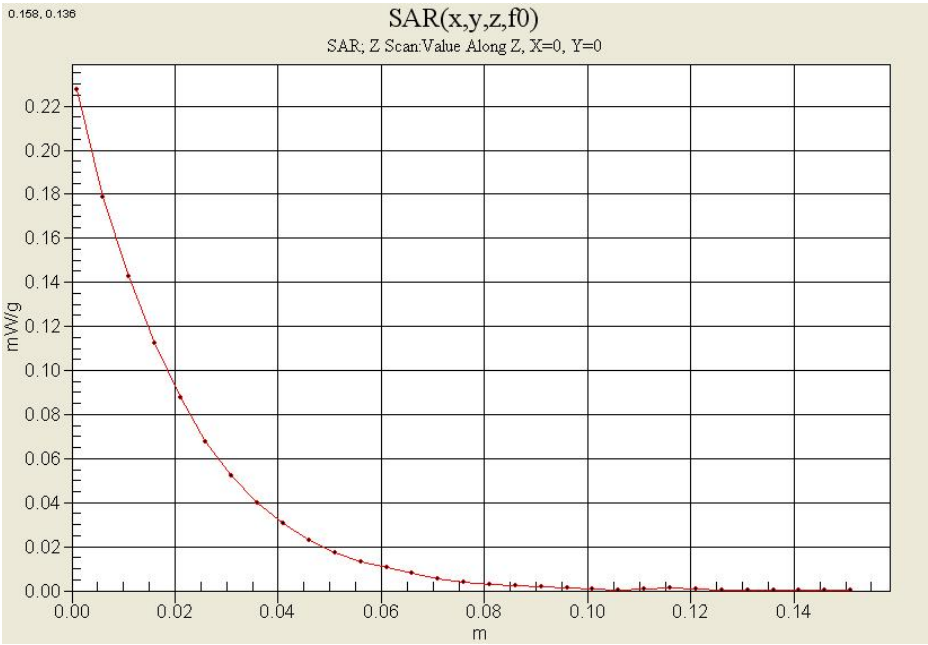
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.25, 6.25, 6.25); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Left touch 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.226 mW/g

Left touch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.03 V/m; Power Drift = -0.033 dB
Peak SAR (extrapolated) = 0.255 W/kg
SAR(1 g) = 0.213 mW/g; SAR(10 g) = 0.161 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.227 mW/g



Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 6, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:2.075
Medium parameters used (interpolated): f = 836.6 MHz; σ = 0.981 mho/m; ε_r = 56.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

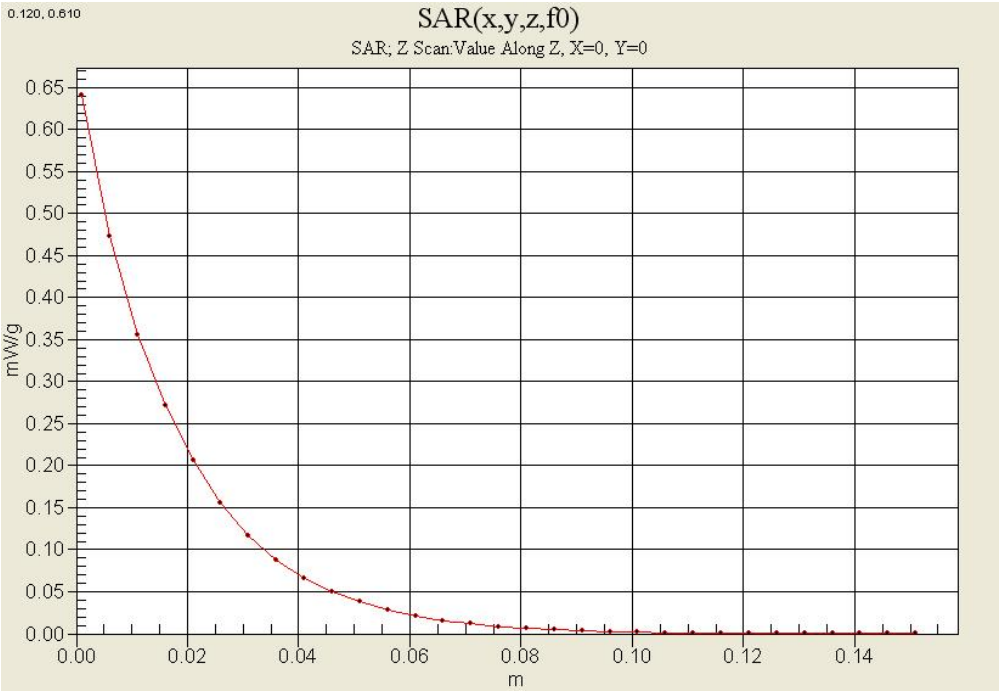
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.17, 6.17, 6.17); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 190/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.641 mW/g

Body 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.9 V/m; Power Drift = -0.085 dB
Peak SAR (extrapolated) = 0.770 W/kg
SAR(1 g) = 0.616 mW/g; SAR(10 g) = 0.458 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.645 mW/g



Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

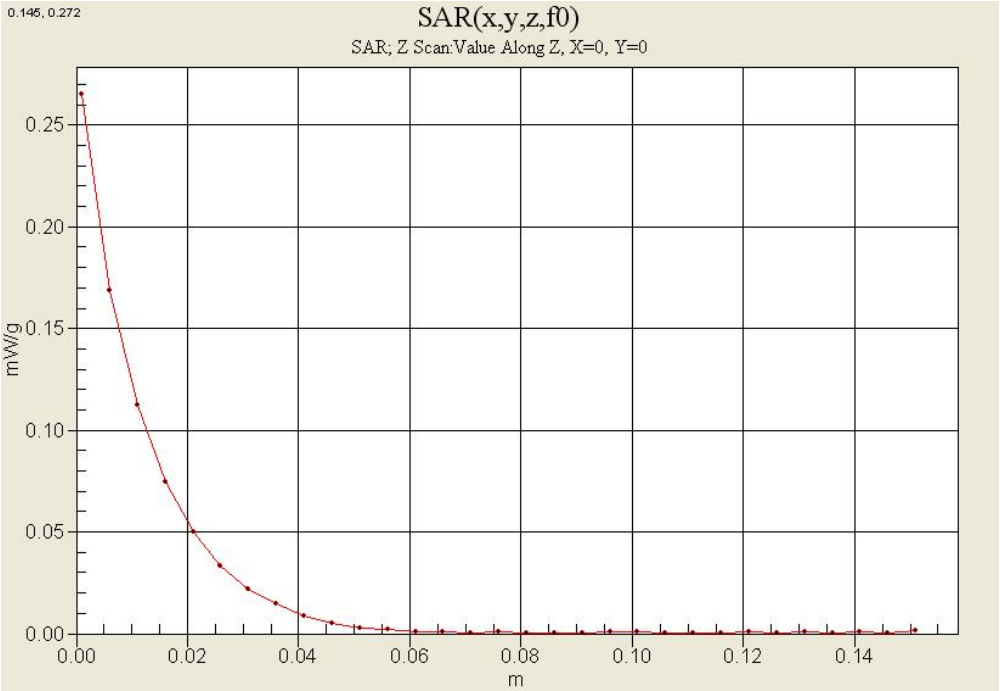
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Right touch 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.283 mW/g

Right touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.76 V/m; Power Drift = 0.054 dB
Peak SAR (extrapolated) = 0.371 W/kg
SAR(1 g) = 0.249 mW/g; SAR(10 g) = 0.156 mW/g
Maximum value of SAR (measured) = 0.270 mW/g



Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

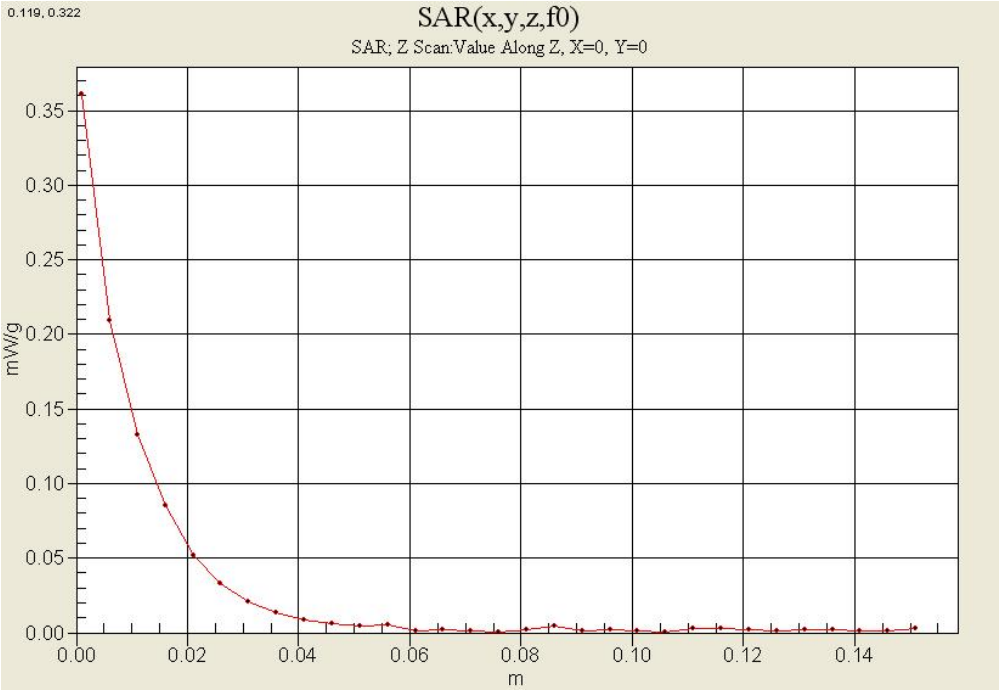
DUT: LG-P990; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:2.075
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 661/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.338 mW/g

Body 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.5 V/m; Power Drift = 0.049 dB
Peak SAR (extrapolated) = 0.438 W/kg
SAR(1 g) = 0.314 mW/g; SAR(10 g) = 0.203 mW/g



Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

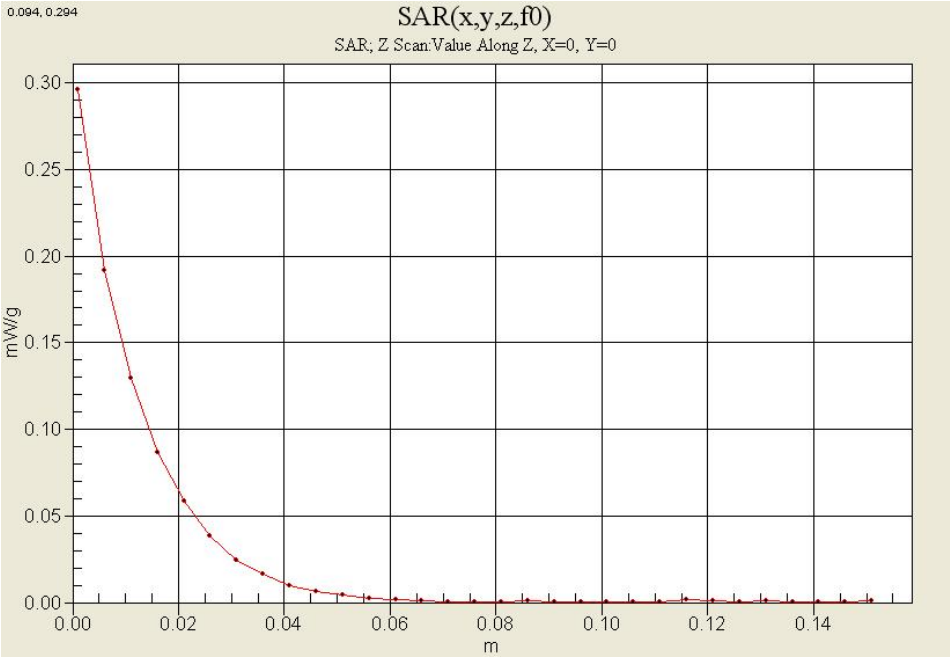
DUT: LG-P990; Type: bar; Serial: #1

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.38 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Right touch 9400/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.298 mW/g

Right touch 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.26 V/m; Power Drift = 0.189 dB
Peak SAR (extrapolated) = 0.410 W/kg
SAR(1 g) = 0.274 mW/g; SAR(10 g) = 0.170 mW/g
Maximum value of SAR (measured) = 0.297 mW/g



Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

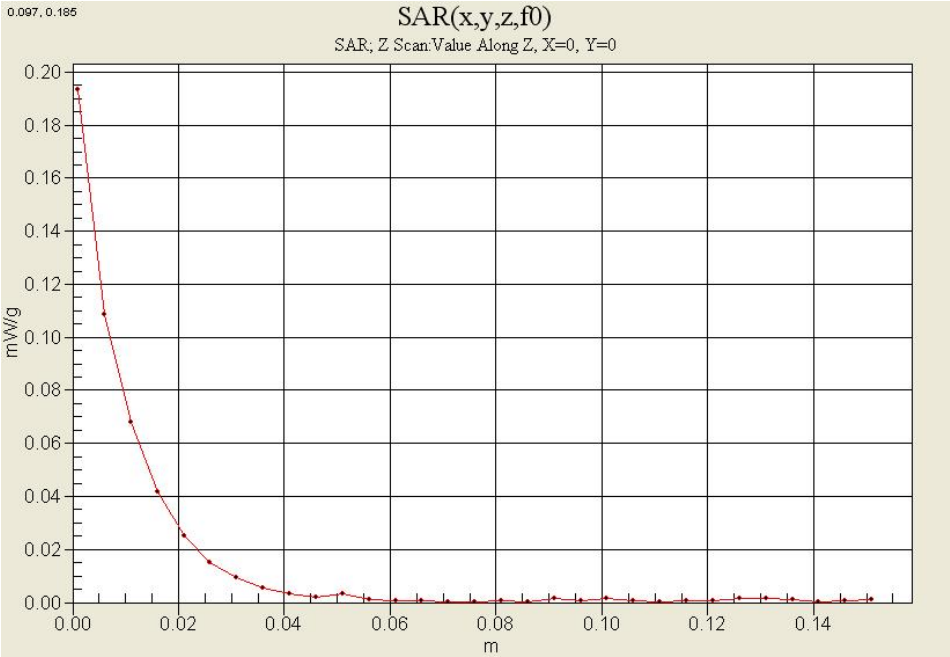
DUT: LG-P990; Type: bar; Serial: #1

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.47 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 835/900 MHz; Type: SAM

Body 9400/Area Scan (51x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.182 mW/g

Body 9400/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.13 V/m; Power Drift = 0.002 dB
Peak SAR (extrapolated) = 0.241 W/kg
SAR(1 g) = 0.170 mW/g; SAR(10 g) = 0.108 mW/g
Maximum value of SAR (measured) = 0.184 mW/g



Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.86 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

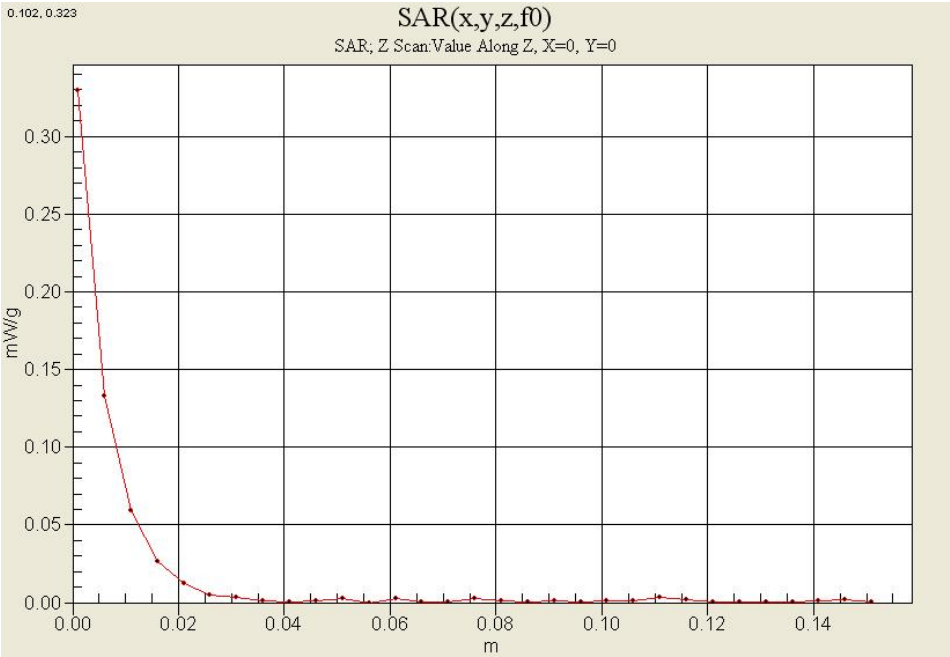
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.58, 4.58, 4.58); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Right touch 11/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.453 mW/g

Right touch 11/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.5 V/m; Power Drift = 0.107 dB
Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.177 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.370 mW/g



Test Laboratory:	HCT CO., LTD
EUT Type:	Cellular/PCS GSM/EDGE/PCS WCDMA Phone with Bluetooth & WLAN
	GPRS Class12 and GPRS mode class B(GPRS and GSM, but not simultaneously)
Liquid Temperature:	21.1 ℃
Ambient Temperature:	21.3 ℃
Test Date:	Dec. 7, 2010

DUT: LG-P990; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.9 mho/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

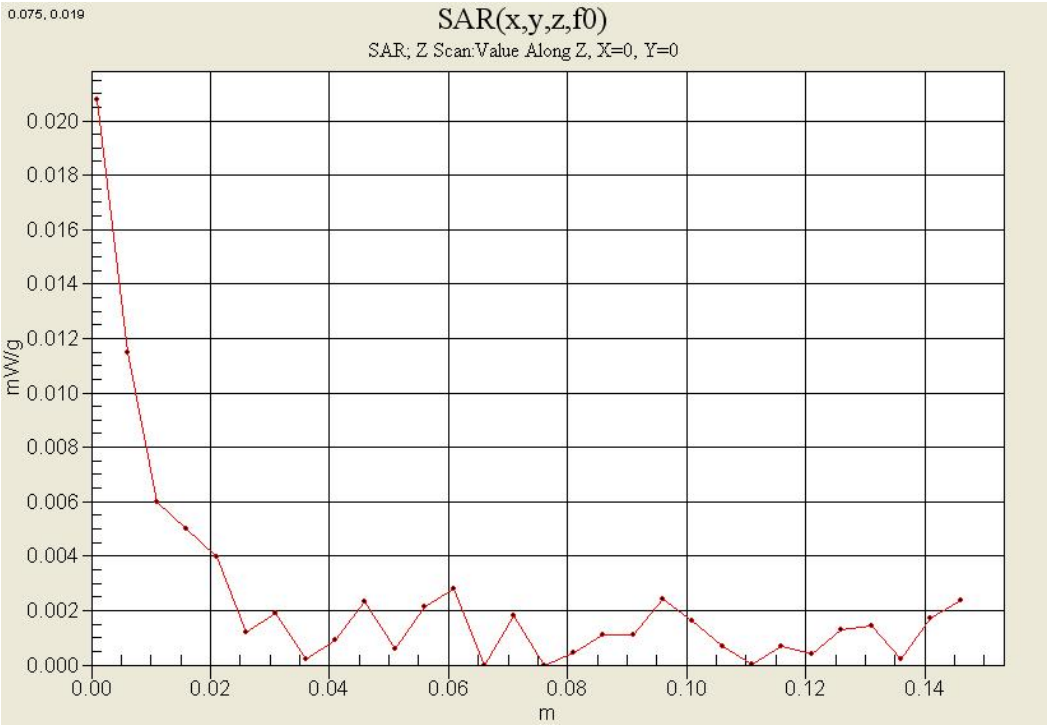
DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.15, 4.15, 4.15); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Body 1/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (interpolated) = 0.052 mW/g

Body 1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.97 V/m; Power Drift = 0.018 dB
Peak SAR (extrapolated) = 0.095 W/kg
SAR(1 g) = 0.047 mW/g; SAR(10 g) = 0.026 mW/g

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.050 mW/g



Attachment 2. – Dipole Validation Plots

■ Validation Data (835 MHz Head)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.1 ℃

Test Date: Dec. 6, 2010

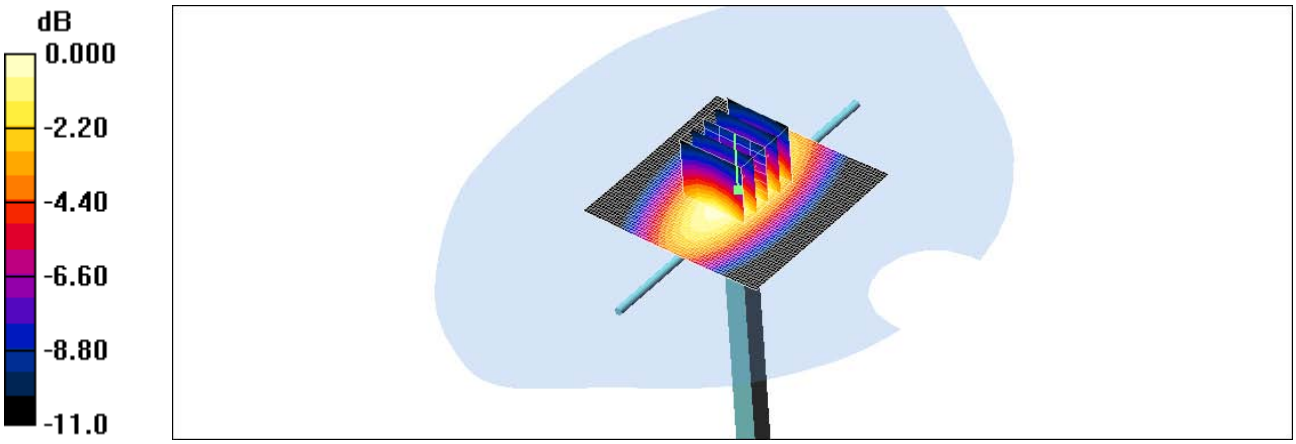
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 – SN:441

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.867 mho/m; ε_r = 42.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(6.25, 6.25, 6.25); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 835MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.08 mW/g

Validation 835MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 36.6 V/m; Power Drift = -0.006 dB
Peak SAR (extrapolated) = 1.49 W/kg
SAR(1 g) = 0.999 mW/g; SAR(10 g) = 0.640 mW/g
Maximum value of SAR (measured) = 1.08 mW/g



0 dB = 1.08mW/g

■ Validation Data (1900 MHz Head)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.1 ℃

Test Date: Dec. 7, 2010

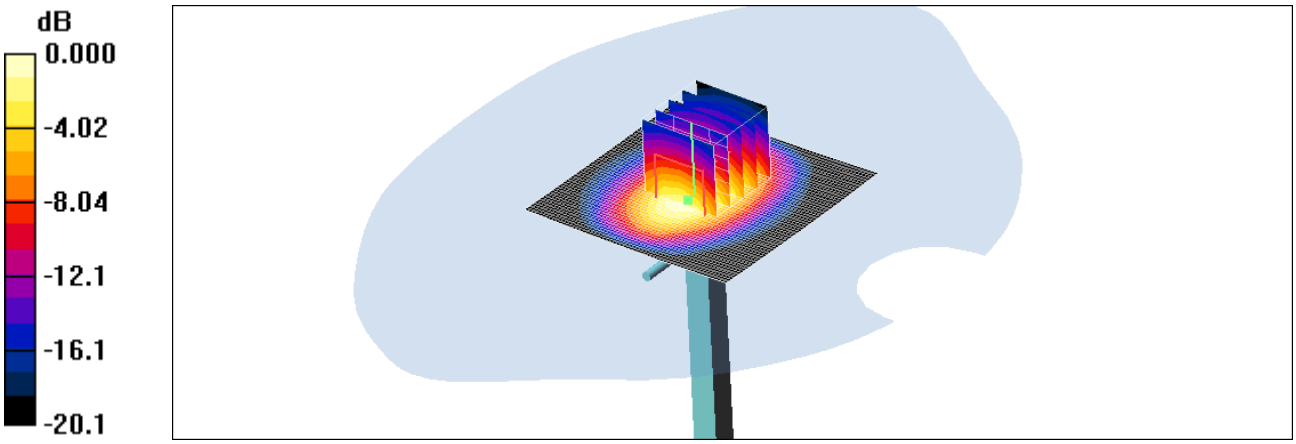
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 – SN:5d032

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.4 mho/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 – SN1630; ConvF(5.12, 5.12, 5.12); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Dipole 1900MHz Validation/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.49 mW/g

Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 59.7 V/m; Power Drift = -0.193 dB
Peak SAR (extrapolated) = 6.81 W/kg
SAR(1 g) = 3.84 mW/g; SAR(10 g) = 1.99 mW/g
Maximum value of SAR (measured) = 4.31 mW/g



0 dB = 4.31mW/g

■ Validation Data (2450 MHz Head)

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.1 ℃

Test Date: Dec. 7, 2010

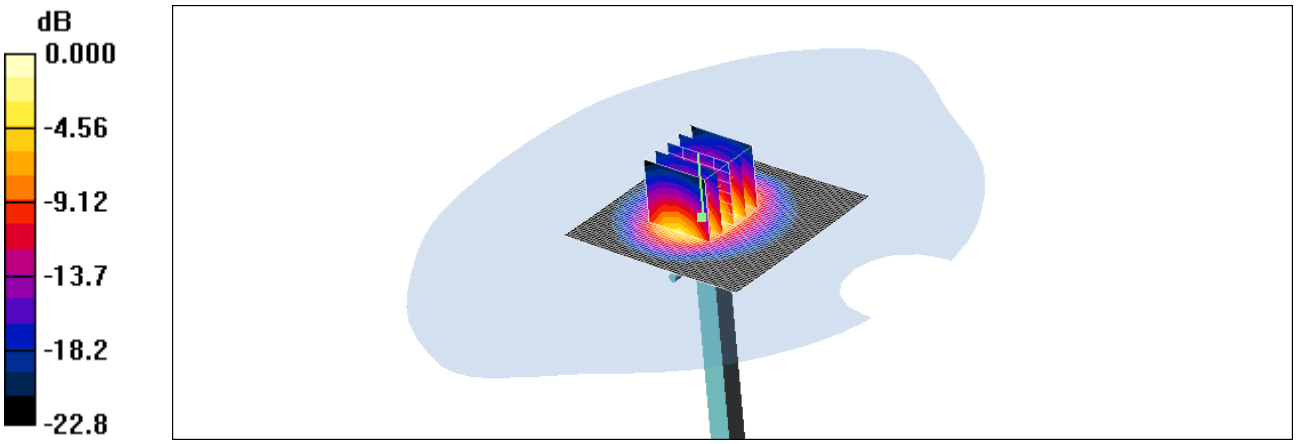
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 – SN:743

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.85 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.58, 4.58, 4.58); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.56 mW/g

Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 60.2 V/m; Power Drift = -0.035 dB
Peak SAR (extrapolated) = 12.7 W/kg
SAR(1 g) = 5.45 mW/g; SAR(10 g) = 2.48 mW/g
Maximum value of SAR (measured) = 6.01 mW/g



0 dB = 6.01mW/g

Test Laboratory: HCT CO., LTD

Input Power 100 mW (20 dBm)

Liquid Temp: 21.1 ℃

Test Date: Dec. 7, 2010

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:743

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.85 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:
- Probe: ET3DV6 - SN1630; ConvF(4.58, 4.58, 4.58); Calibrated: 2010-05-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2010-09-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.56 mW/g

Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 60.2 V/m; Power Drift = -0.035 dB
Peak SAR (extrapolated) = 12.7 W/kg
SAR(1 g) = 5.45 mW/g; SAR(10 g) = 2.48 mW/g
Maximum value of SAR (measured) = 6.01 mW/g

■ Dielectric Parameter (835 MHz Head)

Title LG-P990

SubTitle GSM850(Head)

Test Date Dec. 6, 2010

Frequency	e'	e''
800000000.0000	43.3400	18.6688
805000000.0000	43.3096	18.6526
810000000.0000	43.2264	18.6569
815000000.0000	43.1615	18.6455
820000000.0000	43.0815	18.6333
825000000.0000	43.0056	18.6310
830000000.0000	42.9071	18.6196
835000000.0000	42.7977	18.6748
840000000.0000	42.7897	18.6586
845000000.0000	42.6434	18.6307
850000000.0000	42.5713	18.6027
855000000.0000	42.4939	18.6231
860000000.0000	42.4348	18.5971
865000000.0000	42.3085	18.6170
870000000.0000	42.2568	18.5743
875000000.0000	42.1807	18.6001
880000000.0000	42.0767	18.5286
885000000.0000	42.0236	18.5730
890000000.0000	41.8996	18.5439
895000000.0000	41.8143	18.4739
900000000.0000	41.7847	18.4868

■ Dielectric Parameter (835 MHz Body)

Title LG-P990

SubTitle GSM850(Body)

Test Date Dec. 6, 2010

Frequency	e'	e''
800000000.0000	57.0015	21.2796
805000000.0000	56.9770	21.2466
810000000.0000	56.9150	21.2617
815000000.0000	56.9540	21.2223
820000000.0000	56.9720	21.1850
825000000.0000	56.8653	21.1520
830000000.0000	56.8508	21.1510
835000000.0000	56.8273	21.0824
840000000.0000	56.7546	21.0779
845000000.0000	56.7153	21.0417
850000000.0000	56.6868	20.9908
855000000.0000	56.6181	20.9856
860000000.0000	56.4951	20.9136
865000000.0000	56.4514	20.9310
870000000.0000	56.3371	20.8386
875000000.0000	56.3539	20.7953
880000000.0000	56.2623	20.8065
885000000.0000	56.1437	20.7460
890000000.0000	56.1101	20.7683
895000000.0000	56.0598	20.7744
900000000.0000	56.0481	20.7404

■ Dielectric Parameter (1900 MHz Head)

Title LG-P990

SubTitle WCDMA1900(Head)

Test Date Dec. 7, 2010

Frequency	e'	e''
1800000000.0000	41.3544	12.9701
1810000000.0000	41.3153	12.9986
1820000000.0000	41.3183	13.0523
1830000000.0000	41.2900	13.1075
1840000000.0000	41.2427	13.1595
1850000000.0000	41.2154	13.1741
1860000000.0000	41.1360	13.1772
1870000000.0000	41.1019	13.2148
1880000000.0000	41.0058	13.2208
1890000000.0000	40.9710	13.2259
1900000000.0000	40.9044	13.2315
1910000000.0000	40.8505	13.2138
1920000000.0000	40.8268	13.2484
1930000000.0000	40.8122	13.2858
1940000000.0000	40.7709	13.3084
1950000000.0000	40.7813	13.3525
1960000000.0000	40.8203	13.3797
1970000000.0000	40.8019	13.4521
1980000000.0000	40.7865	13.4535
1990000000.0000	40.7460	13.5114
2000000000.0000	40.6930	13.5155

■ Dielectric Parameter (1900 MHz Body)

Title LG-P990

SubTitle WCDMA1900(Body)

Test Date Dec. 7, 2010

Frequency	e'	e''
1850000000.0000	53.8721	14.0068
1855000000.0000	53.8602	14.0108
1860000000.0000	53.8695	14.0202
1865000000.0000	53.8496	14.0535
1870000000.0000	53.8291	14.0423
1875000000.0000	53.7949	14.0815
1880000000.0000	53.7615	14.0909
1885000000.0000	53.7345	14.1284
1890000000.0000	53.6964	14.1420
1895000000.0000	53.6410	14.1492
1900000000.0000	53.6277	14.1671
1905000000.0000	53.6091	14.1812
1910000000.0000	53.5780	14.2110
1915000000.0000	53.5296	14.2347
1920000000.0000	53.5360	14.2740
1925000000.0000	53.5320	14.2795
1930000000.0000	53.5031	14.3036
1935000000.0000	53.5196	14.3451
1940000000.0000	53.5115	14.3413
1945000000.0000	53.4798	14.3755
1950000000.0000	53.5293	14.3907

■ Dielectric Parameter (2450 MHz Head)

Title LG-P990

SubTitle WCDMA1900(Body)

Test Date Dec. 7, 2010

Frequency	e'	e''
2400000000.0000	38.5785	13.3589
2405000000.0000	38.5296	13.3869
2410000000.0000	38.5166	13.4131
2415000000.0000	38.4382	13.4268
2420000000.0000	38.3970	13.4692
2425000000.0000	38.3863	13.4668
2430000000.0000	38.3432	13.4481
2435000000.0000	38.3391	13.5050
2440000000.0000	38.3163	13.5041
2445000000.0000	38.3565	13.5041
2450000000.0000	38.3569	13.5411
2455000000.0000	38.3769	13.5409
2460000000.0000	38.3845	13.5512
2465000000.0000	38.3778	13.5773
2470000000.0000	38.3993	13.5753
2475000000.0000	38.4223	13.5831
2480000000.0000	38.4134	13.5800
2485000000.0000	38.3804	13.6031
2490000000.0000	38.3945	13.6348
2495000000.0000	38.3540	13.6296
2500000000.0000	38.3340	13.6240

■ Dielectric Parameter (2450 MHz Body)

Title LG-P990

SubTitle WCDMA1900(Body)

Test Date Dec. 7, 2010

Frequency	e'	e''
2400000000.0000	51.8899	14.1012
2405000000.0000	51.8656	14.1238
2410000000.0000	51.8102	14.1331
2415000000.0000	51.7606	14.1316
2420000000.0000	51.7447	14.1630
2425000000.0000	51.7080	14.1833
2430000000.0000	51.6884	14.2348
2435000000.0000	51.6376	14.2582
2440000000.0000	51.6295	14.3180
2445000000.0000	51.5797	14.3445
2450000000.0000	51.5811	14.3815
2455000000.0000	51.5772	14.3992
2460000000.0000	51.5426	14.3924
2465000000.0000	51.5449	14.4437
2470000000.0000	51.5182	14.4985
2475000000.0000	51.4838	14.4881
2480000000.0000	51.5073	14.5167
2485000000.0000	51.4815	14.5447
2490000000.0000	51.5126	14.5522
2495000000.0000	51.4613	14.5570
2500000000.0000	51.4896	14.5645