

SAR TEST REPORT

HCT CO., LTD

EUT Type:	Cellular/AWS/PCS CDMA Phone with Bluetooth	
FCC ID:	A3LSCHR270	
Model:	SCH-R270	
Date of Issue:	Apr. 20, 2012	
Test report No.:	HCTA1204FS02	
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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.	
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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 C95.1-1992 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 (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body.

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

Figure 2. SAR Mathematical Equation

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

where:

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

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/AWS/PCS CDMA Phone with Bluetooth		
FCC ID:	A3LSCHR270		
Model:	SCH-R270		
Trade Name	SAMSUNG Electronics Co., Ltd.		
Application Type	Certification		
Mode(s) of Operation	CDMA835/AWS1700/PCS1900		
Tx Frequency	824.70 – 848.31 MHz (CDMA) 1 711.25 – 1 753.75 MHz (AWS CDMA) 1 851.25 – 1 908.75 MHz (PCS CDMA) 2 402 – 2 480 MHz (Bluetooth)		
Rx Frequency	869.70 – 893.31 MHz (CDMA) 2 111.25 – 2 153.75 MHz (AWS CDMA) 1 931.25 – 1 988.75 MHz (PCS CDMA) 2 402 – 2 480 MHz (Bluetooth)		
FCC Classification	Licensed Portable Transmitter Held to Ear (PCE)		
Production Unit or Identical Prototype	Prototype		
Max SAR	Band	1g SAR (W/kg)	
		Head	Body-worn
	CDMA835	0.572	0.477
	AWS1700	0.517	0.495
	PCS1900	0.402	0.625
	Bluetooth	0.00113	0.00274
Simultaneous SAR per KDB 690783 D01		0.573	0.628
Date(s) of Tests	Apr. 04, 2012/ Apr. 09, 2012/ Apr. 20, 2012		
Antenna Type	Integral Antenna		
Key Feature(s)	It doesn't support Mobile Hotspot. Only 1x support.		

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.

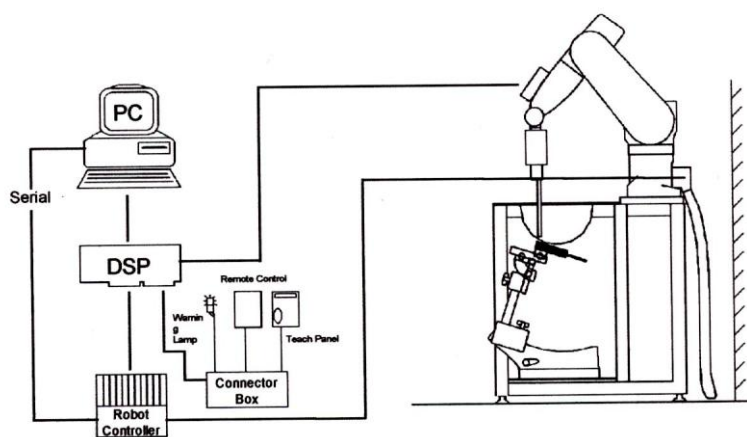


Figure 3.1 HCT SAR Lab. Test Measurement Set-up

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 μ W/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

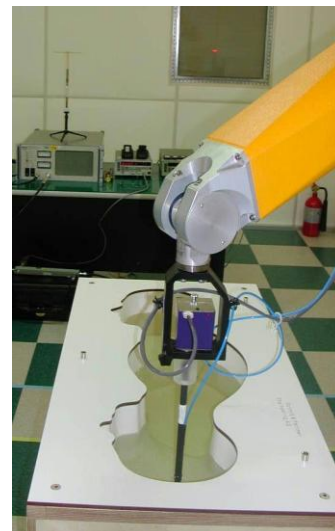


Figure 3.2 Photograph of the probe and the Phantom



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 $\pm 10\%$. 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 below 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/cm³ for brain tissue)

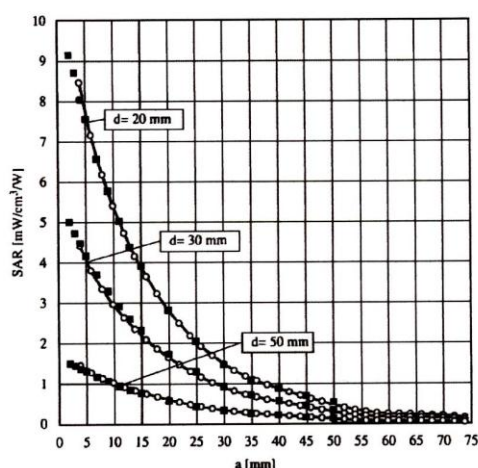


Figure 3.4 E-Field and Temperature measurements at 900 MHz

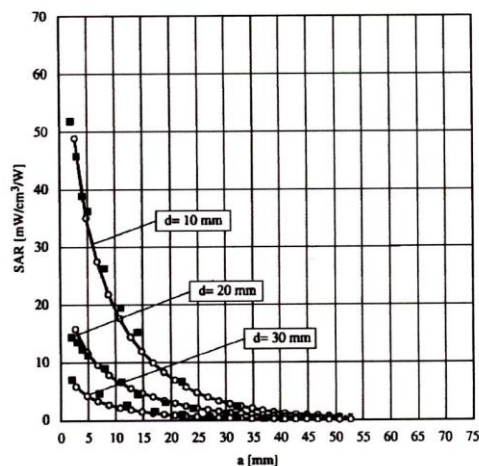


Figure 3.5 E-Field and temperature measurements at 1.8 GHz

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/cm³

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/cm²
 E_{tot} = total electric field strength in V/m

3.4 SAM Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. 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 evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.



Figure 3.6 SAM Phantom

Shell Thickness	2.0 mm $\pm$ 0.2 mm (6 $\pm$ 0.2 mm at ear point)
Filling Volume	about 25 L
Dimensions	1 000 mm x 500 mm (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 repeatably 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 bactericide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The 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		750		835		915		1 900		2 450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.2	51.7	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.4	1.0	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	57	47.2	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	0.2	0.0	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.2	0.1	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.00	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. 27, 2011	Annual	Sep. 27, 2012
SPEAG	DAE3	466	Feb. 12, 2012	Annual	Feb. 12, 2013
SPEAG	E-Field Probe ET3DV6	1798	Apr. 14, 2011	Annual	Apr. 14, 2012
SPEAG	E-Field Probe ET3DV6	1609	Mar. 19, 2012	Annual	Mar. 19, 2013
SPEAG	Validation Dipole D835V2	441	May 16, 2011	Annual	May 16, 2012
SPEAG	Validation Dipole D1800V2	2d007	Apr. 19, 2011	Annual	Apr. 19, 2012
SPEAG	Validation Dipole D1900V2	5d032	July 22, 2011	Annual	July 22, 2012
SPEAG	Validation Dipole D2450V2	743	Aug 29, 2011	Annual	Aug 29, 2012
Agilent	Power Meter(F) E4419B	MY41291386	Nov. 04, 2011	Annual	Nov. 04, 2012
Agilent	Power Sensor(G) 8481	MY41090870	Nov. 04, 2011	Annual	Nov. 04, 2012
HP	Dielectric Probe Kit 85070C	00721521	N/A	N/A	N/A
HP	Dual Directional Coupler	16072	Nov. 04, 2011	Annual	Nov. 04, 2012
R&S	Base Station CMU200	110740	July 26, 2011	Annual	July 26, 2012
Agilent	Base Station E5515C	GB44400269	Feb. 10, 2012	Annual	Feb. 10, 2013
HP	Signal Generator E4438C	MY42082646	Nov. 11, 2011	Annual	Nov. 11, 2012
HP	Network Analyzer 8753ES	JP39240221	Apr. 3, 2012	Annual	Apr. 3, 2013
TESCOM	TC-3000C / BLUETOOTH	3000B670110	Feb. 08, 2012	Annual	Feb. 08, 2013

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 15 mm x 15 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.

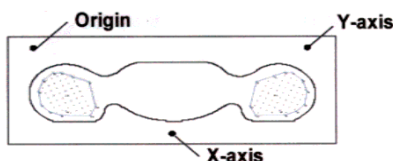


Figure 4.1 SAR Measurement Point in Area Scan

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 15° or until the device antenna touch the phantom. Please refer to IEEE 1528-2003 illustration below.

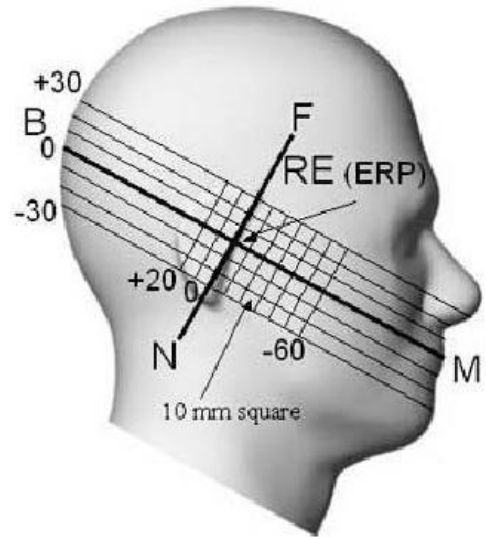


Figure 5.1 Side view of the phantom

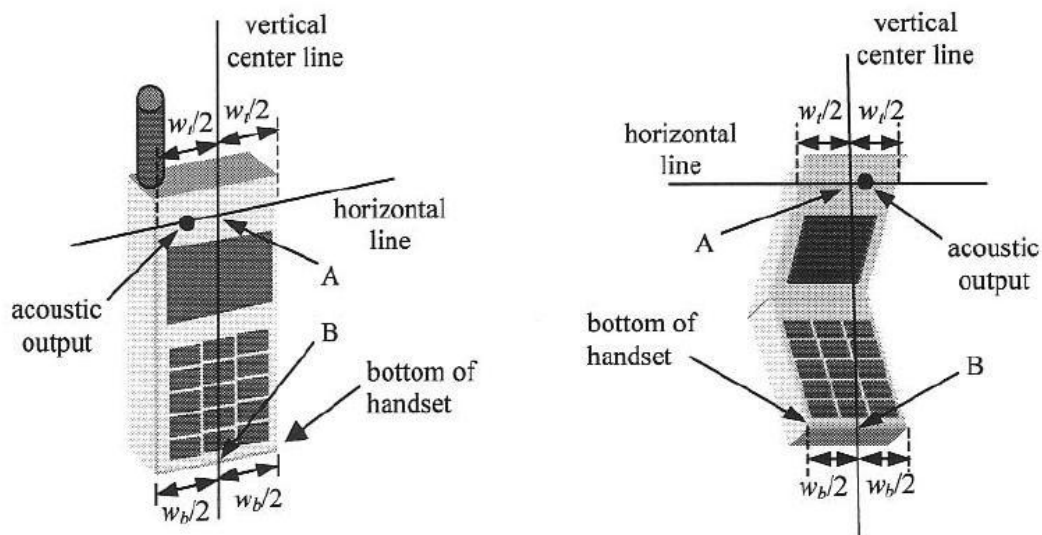


Figure 5.2 Handset vertical and horizontal reference lines

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 1.5 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	6.00	N	1	1	6.00	∞
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 Conditions	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	2.90	N	1.00	1	2.90	145
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 Permittivity(target)	5.00	R	1.73	0.6	1.73	∞
Liquid Permittivity(meas.)	5.02	N	1	0.6	3.01	9
Combine Standard Uncertainty					11.13	
Coverage Factor for 95 %					$k=2$	
Expanded STD Uncertainty					22.25	

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	Apr. 4, 2012	Head	21.3	ϵ_r	41.5	41.7	+ 0.48	± 5
				σ	0.90	0.869	- 3.44	± 5
835		Body	21.3	ϵ_r	55.2	54.9	- 0.54	± 5
				σ	0.97	1.01	+ 4.12	± 5
1 800	Apr. 4, 2012	Head	21.3	ϵ_r	40.0	41.5	+ 3.75	± 5
				σ	1.40	1.42	+ 1.43	± 5
1 800		Body	21.3	ϵ_r	53.3	55.1	+ 3.38	± 5
				σ	1.52	1.5	- 1.32	± 5
1 900	Apr. 4, 2012	Head	21.3	ϵ_r	40.0	39.1	- 2.25	± 5
				σ	1.40	1.39	- 0.71	± 5
1 900		Body	21.3	ϵ_r	53.3	53.5	+ 0.37	± 5
				σ	1.52	1.48	- 2.63	± 5
2 450	Apr. 09, 2012	Body	21.1	ϵ_r	52.7	52.1	- 1.13	± 5
				σ	1.95	1.89	- 3.07	± 5
2 450	Apr. 20, 2012	Head	21.1	ϵ_r	39.2	38.8	-1.02	± 5
				σ	1.80	1.84	2.22	± 5

The Tissue dielectronic parameters were measured prior to the SAR evaluation using an Agilent 85070C Dielectronic Probe Kit and Agilent Network Analyzer.

8.2 System Validation

Prior to assessment, the system is verified to the $\pm 10\%$ of the specifications at 835 MHz /1 800 MHz/1900 MHz /2 450 MHz by using the system validation kit. (Graphic Plots Attached)

Freq. [MHz]	Date	Probe (SN)	Liquid	Amb. Temp. [°C]	Liquid Temp. [°C]	1 W Target SAR _{1g} (SPEAG) (mW/g)	Measured SAR _{1g} (mW/g)	1 W Normalized SAR _{1g} (mW/g)	Deviation [%]	Limit [%]
835	Apr. 4, 2012	1798	Head	21.5	21.3	9.34	0.935	9.35	+ 0.11	± 10
835			Body	21.5	21.3	9.45	0.964	9.64	+ 2.01	± 10
1 800			Head	21.5	21.3	39.8	4.1	41	+ 3.02	± 10
1 800			Body	21.5	21.3	37.3	3.86	38.6	+ 3.49	± 10
1 900			Head	21.5	21.3	39.9	4	40	+ 0.25	± 10
1 900			Body	21.5	21.3	40.9	4.07	40.7	- 0.49	± 10
2 450	Apr. 09, 2012	1609	Body	21.3	21.1	51.7	5.41	54.1	+ 4.64	± 10
2 450	Apr. 20, 2012		Head	21.3	21.1	53.8	5.38	53.8	0	± 10

8.3 System Validation Procedure

SAR measurement was prior to assessment, the system is verified to the $\pm 10\%$ of the specifications at each frequency band by using the system validation kit. (Graphic Plots Attached)

- Cabling the system, using the validation kit equipments.
- Generate about 100 mW Input Level from the Signal generator to the Dipole Antenna.
- Dipole Antenna was placed below the Flat phantom.
- The measured one-gram SAR at the surface of the phantom above the dipole feed-point should be within 10 % of the target reference value.
- The results are normalized to 1 W input power.

Note;

SAR Verification was performed according to the FCC KDB 450824.

9. RF CONDUCTED POWER MEASUREMENT

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

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

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 than 5 % occurred, the tests were repeated.

Conducted output power measurements were performed using a base station simulator under digital average power.



SAR Test for WWAN were performed with a base station simulator Agilent E5515C. Communication between the device and the emulator was established by air link. Set base station emulator to allow DUT to radiate maximum output power during all tests.

9.1 CDMA

9.1.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices", May 2006. MMaximum output power is verified on the High, Middle and Low channels according to procedures defined in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in "All Up" condition.

1. If the mobile station supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9 600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1 (Table 9.1) parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH0 and demodulation of RC 3, 4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9 600 bps Fundamental Channel and 9 600 bps SCH0 data rate Channel and 9 600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2 (Table 9.2) was applied.
5. FCHs were configured at full rate for mMaximum SAR with "All Up" power control bits.

Parameters for Max. Power for RC1

Parameter	Units	Value
I_{or}	dBm/1.23 MHz	-104
$\frac{Pilot E_c}{I_{or}}$	dB	-7
$\frac{Traffic E_c}{I_{or}}$	dB	-7.4

Table. 9.1

Parameters for Max. Power for RC3

Parameter	Units	Value
I_{or}	dBm/1.23 MHz	-86
$\frac{Pilot E_c}{I_{or}}$	dB	-7
$\frac{Traffic E_c}{I_{or}}$	dB	-7.4

Table. 9.2

9.1.2 Head SAR Measurement

SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the mMaximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the mMaximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

9.1.3 Body SAR Measurement

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCHn) is not required when the mMaximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the mMaximum output channel (FCH + SCHn) with FCH at full rate and SCH0 enabled at 9 600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts.

Body SAR in RC1 is not required when the mMaximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the mMaximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

Maximum Average Output Power Measurement for FCC ID: A3LSCHR270

Band	Ch.	SO2 RC1/1	SO2 RC3/3	SO55 RC1/1	SO55 RC3/3	TDSO SO32 RC3/3
CDMA	1013	24.37	24.35	24.24	24.36	24.39
	384	24.25	24.45	24.27	24.48	24.42
	777	24.22	24.34	24.12	24.46	24.32
AWS	25	24.37	24.44	24.26	24.40	24.48
	450	24.46	24.47	24.39	24.49	24.31
	875	24.47	24.48	24.43	24.48	24.49
PCS	25	24.27	24.37	24.23	24.39	24.31
	600	24.23	24.32	24.19	24.38	24.29
	1175	24.29	24.25	24.13	24.33	24.21

CDMA Average Conducted output powers (dBm)

10. SAR Considerations for Multiple Transmitters and

Antennas

10.1 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. 10.1 Output Power Thresholds for Unlicensed Transmitters

	Individual Transmitter	Simultaneous Transmission
Licensed Transmitters	<u>Routine evaluation required</u>	SAR not required: <u>Unlicensed only</u> - when stand-alone 1-g SAR is not required and antenna is ≥ 5 cm from other antennas <u>Licensed & Unlicensed</u> - 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: <u>Licensed & Unlicensed</u> 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	<u>When there is no simultaneous transmission –</u> - output ≤ 60 f: SAR not required - output > 60 f: stand-alone SAR required <u>When there is simultaneous transmission –</u> <u>Stand-alone SAR not required when</u> - output $\leq 2 \cdot P_{Ref}$ and antenna is ≥ 5.0 cm from other antennas - output $\leq P_{Ref}$ and antenna is ≥ 2.5 cm from other antennas - output $\leq P_{Ref}$ and antenna is < 2.5 cm from other antennas, each with either output power $\leq P_{Ref}$ or 1-g SAR < 1.2 W/kg <u>Otherwise stand-alone SAR is required</u> <u>When stand-alone SAR is required</u> - 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	<u>Flat phantom SAR required</u> - 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.

SAR Evaluation Requirements for Multiple Transmitters Handsets

FCC ID: A3LSCHR270

BT Max. RF output power: 12.27 mW

Distance between the Cellular antennas and the BT antenna: 43 mm

Distance between the PCS antennas and the BT antenna: 32 mm

Distance between the AWS antennas and the BT antenna: 44 mm

Please see the separate Antenna distance document.

10.2 SAR Summation Scenario

Simultaneous Transmission Summation for Body-Worn (1.5cm)

Simultaneous TX	configuration	850 CDMA SAR(W/kg)	BT SAR (W/kg)	Σ SAR (W/kg)	Simultaneous TX	configuration	1700 AWS SAR(W/kg)	BT SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.477	0.00274	0.480	Body SAR	Back	0.495	0.00274	0.498
Simultaneous TX	configuration	1900 PCS SAR(W/kg)	BT SAR (W/kg)	Σ SAR (W/kg)					
Body SAR	Back	0.625	0.00274	0.628					

The above tables represent a body-worn call with 2.4 GHz BT.

Simultaneous Transmission Summation for Held to Ear

Simultaneous TX	configuration	850 CDMA SAR(W/kg)	BT SAR (W/kg)	Σ SAR (W/kg)	Simultaneous TX	configuration	1700 AWS SAR(W/kg)	BT SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Mouth-Jaw	0.572	0.00113	0.573	Head SAR	Mouth-Jaw	0.517	0.00113	0.518
	Left Tilt	0.00446	0.000683	0.005		Left Tilt	0.117	0.000683	0.118
	Right Tilt	0.053	0.000683	0.054		Right Tilt	0.113	0.000683	0.114
Simultaneous TX	configuration	1900 PCS SAR(W/kg)	BT SAR (W/kg)	Σ SAR (W/kg)					
Head SAR	Mouth-Jaw	0.402	0.00113	0.403					
	Left Tilt	0.059	0.000683	0.060					
	Right Tilt	0.075	0.000683	0.076					

The above tables represent a held to ear voice call with 2.4 GHz BT

10.3 Simultaneous Transmission Conclusion

The above numerical summed SAR was below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit. No volumetric SAR summation is required per FCC KDB Publication 648474.

The above tables represent the worst-case simultaneous transmission scenarios possibility with this device.

The conducted output power level of the BT transmitter is more than P_{ref} , the BT antenna is less than 5 cm from the other antenna, therefore, a stand-alone BT SAR evaluation is required.

11. SAR TEST DATA SUMMARY

11.1 Measurement Results (CDMA835 Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	SAR(mW/g)
MHz	Channel						
836.52	384 (Mid)	CDMA835	24.48	-0.073	Standard	Mouth-Jaw	*0.572
836.52	384 (Mid)	CDMA835	24.48	-0.002	Standard	Left Tilt 15°	0.00446
836.52	384 (Mid)	CDMA835	24.48	-0.022	Standard	Right Tilt 15°	0.053
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:

- 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].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- 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).
- Near the Mouth-Jaw region SAR were performed in Body Phantom position per the FCC KDB Publication 648474.
- *Separation Distance : 0.8 cm
- Head SAR was tested under RC3/SO55.

11.2 Measurement Results (AWS 1700 Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	SAR(mW/g)
MHz	Channel						
1 732.5	450 (Mid)	AWS 1700	24.49	0.124	Standard	Mouth-Jaw	*0.517
1 732.5	450 (Mid)	AWS 1700	24.49	0.067	Standard	Left Tilt 15°	0.117
1 732.5	450 (Mid)	AWS 1700	24.49	0.047	Standard	Right Tilt 15°	0.113
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:

- 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].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- 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).
- Near the Mouth-Jaw region SAR were performed in Body Phantom position per the FCC KDB Publication 648474.
- *Separation Distance : 0.8 cm
- Head SAR was tested under RC3/SO55.

11.3 Measurement Results (PCS1900 Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	SAR(mW/g)
MHz	Channel						
1 880.00	600 (Mid)	PCS1900	24.38	-0.119	Standard	Mouth-Jaw	*0.402
1 880.00	600 (Mid)	PCS1900	24.38	0.09	Standard	Left Tilt 15°	0.059
1 880.00	600 (Mid)	PCS1900	24.38	0.06	Standard	Right Tilt 15°	0.075
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:

- 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].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☒ Manual Test cord ☐ Base Station Simulator
- IEEE 802.11g(including 802.11n) SAR testing is required when the conducted powers are equal to or greater than 0.25 dB Than the conducted powers in IEEE 802.11b.
- For 2.4GHz WLAN, Highest average power channel for the lowest data rate was selected for SAR evaluation based on KDB 248227. Other channels are not necessary because 1g-average SAR < 0.8 W/Kg and peak SAR < 1.6W/Kg per KDB 248227.
- Near the Mouth-Jaw region SAR were performed in Body Phantom position per the FCC KDB Publication 648474.
- *Separation Distance : 0.8 cm
- Head SAR was tested under RC3/SO55.

11.4 Measurement Results (Bluetooth Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	SAR(mW/g)
MHz	Channel						
2402	0	Bluetooth	10.89	- 0.131	Standard	Mouth-Jaw	*0.00113
2402	0	Bluetooth	10.89	- 0.152	Standard	Mouth-Jaw	**0.000683
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:

- The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm $\pm$ 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test code ☒ Base Station Simulator
- For 2.4GHz BT, Highest power channel was selected for SAR evaluation. Other channels are not necessary because 1g-average SAR < 0.8 W/Kg.
- *Separation Distance : 0.8 cm [Touch]
- **Separation Distance : 3.4 cm [Tilt]

11.5 Measurement Results (CDMA835 Body-worn SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
835	384 (Mid)	CDMA835	24.42	0.030	Rear	1.5 cm	0.477
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:

- The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm $\pm$ 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- 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).
- Body SAR was tested under RC3/SO32 FCH only since FCH+SCH modes are not greater than 0.25 dB of the FCH only mode per KDB Publication 941225 D01.

11.6 Measurement Results (AWS1700 Body-worn SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
1 732.5	450 (Mid)	AWS 1700	24.31	-0.041	Rear	1.5 cm	0.495
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:

- The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm $\pm$ 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- 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).
- Body SAR was tested under RC3/SO32 FCH only since FCH+SCH modes are not greater than 0.25 dB of the FCH only mode per KDB Publication 941225 D01.

11.7 Measurement Results (PCS1900 Body-worn SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
1 880.00	600 (Mid)	PCS1900	24.29	-0.194	Rear	1.5 cm	0.625
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:

- The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm $\pm$ 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- 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).
- Body SAR was tested under RC3/SO32 FCH only since FCH+SCH modes are not greater than 0.25 dB of the FCH only mode per KDB Publication 941225 D01.

11.8 Measurement Results (Bluetooth Body-worn SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
2402	0	Bluetooth	10.89	-0.097	Rear	1.5 cm	0.00274
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:

- The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm $\pm$ 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test code ☒ Base Station Simulator
- For 2.4GHz BT, Highest power channel was selected for SAR evaluation. Other channels are not necessary because 1g-average SAR < 0.8 W/Kg.

12. 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.

13. REFERENCES

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Attachment 1. – SAR Test Plots

Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012
Separation Distance 0.8 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

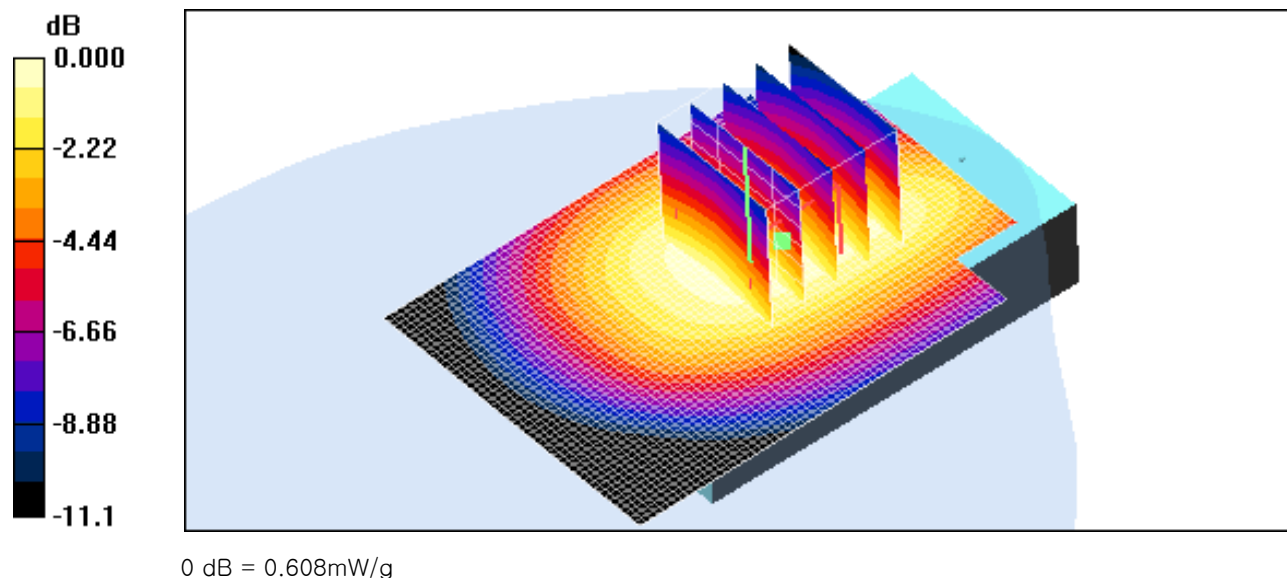
Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 836.52$ MHz; $\sigma = 0.87$ mho/m; $\epsilon_r = 41.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(6.72, 6.72, 6.72); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 835/900 MHz; Type: SAM

Mouth-Jaw Region Head 384/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.622 mW/g

Mouth-Jaw Region Head 384/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.27 V/m; Power Drift = -0.073 dB
Peak SAR (extrapolated) = 0.755 W/kg
SAR(1 g) = 0.572 mW/g; SAR(10 g) = 0.402 mW/g
Maximum value of SAR (measured) = 0.608 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 836.52 \text{ MHz}$; $\sigma = 0.87 \text{ mho/m}$; $\epsilon_r = 41.7$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(6.72, 6.72, 6.72); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 835/900 MHz; Type: SAM

Left tilt 384/Area Scan (51x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.005 mW/g

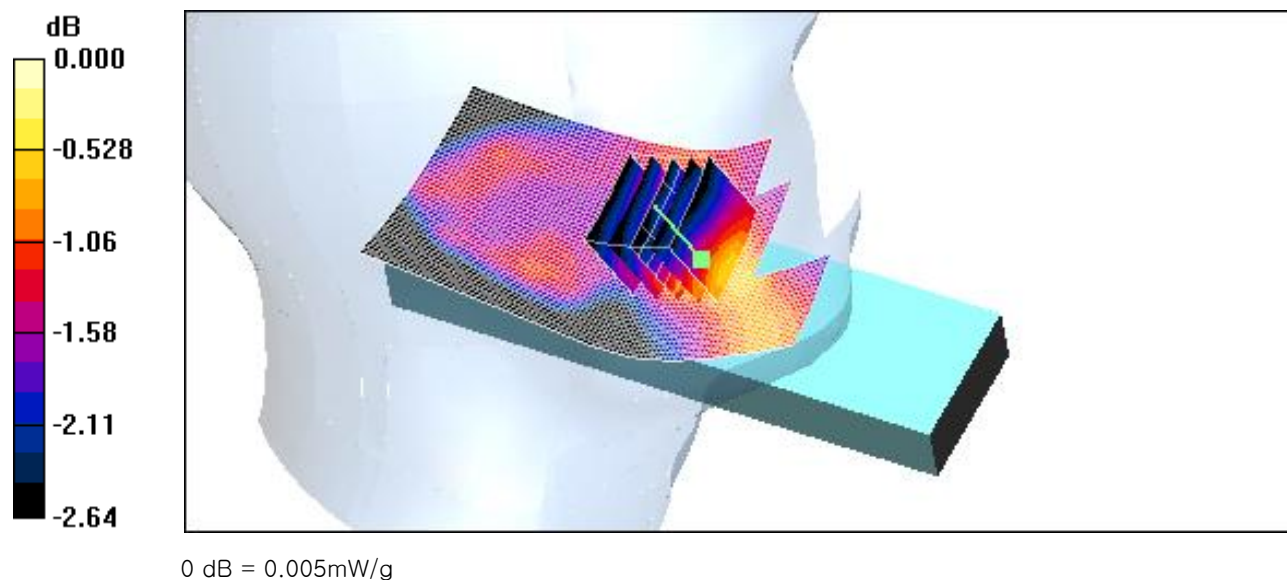
Left tilt 384/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 2.22 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 0.005 W/kg

SAR(1 g) = 0.00446 mW/g; SAR(10 g) = 0.00414 mW/g

Maximum value of SAR (measured) = 0.005 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

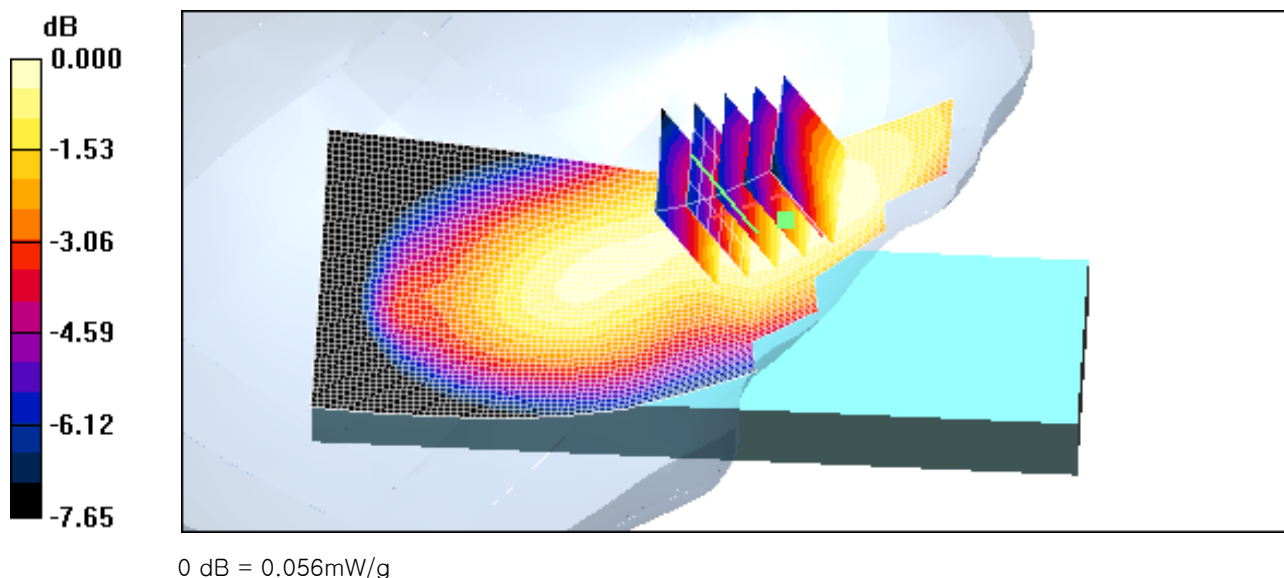
Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 836.52$ MHz; $\sigma = 0.87$ mho/m; $\epsilon_r = 41.7$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(6.72, 6.72, 6.72); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 835/900 MHz; Type: SAM

Right tilt 384/Area Scan (51x121x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.057 mW/g

Right tilt 384/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.91 V/m; Power Drift = -0.022 dB
Peak SAR (extrapolated) = 0.077 W/kg
SAR(1 g) = 0.053 mW/g; SAR(10 g) = 0.041 mW/g
Maximum value of SAR (measured) = 0.056 mW/g



Test Laboratory: HCT CO., LTD
 EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
 Liquid Temperature: 21.3 °C
 Ambient Temperature: 21.5 °C
 Test Date: Apr. 4, 2012
 Separation Distance: 0.8 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 1732.5$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 41.8$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

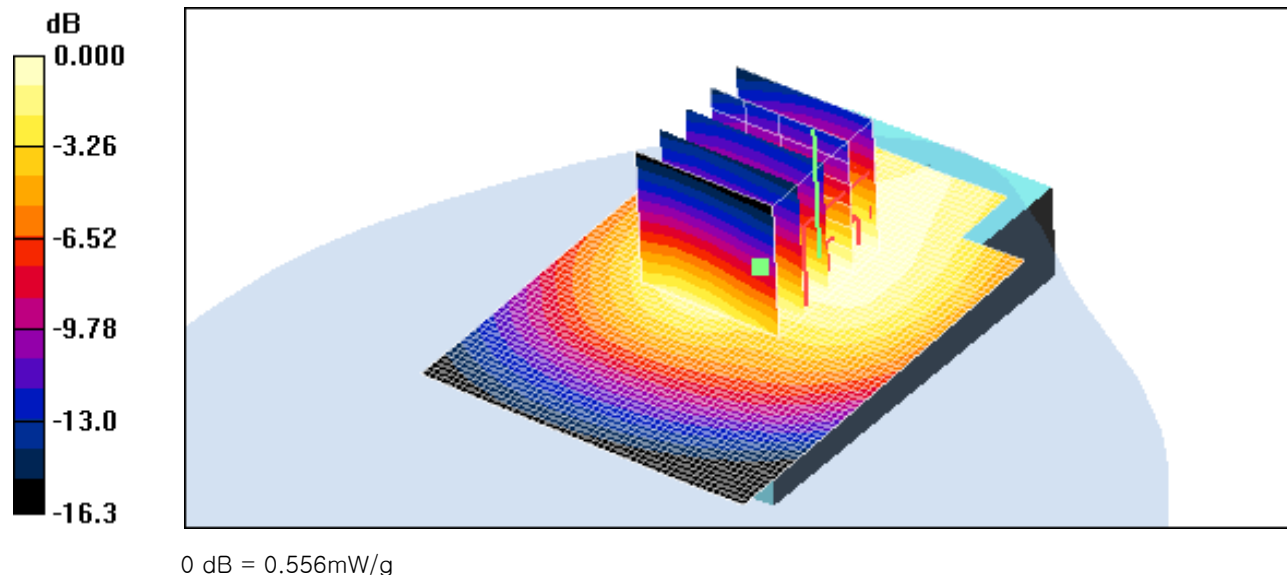
DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(5.46, 5.46, 5.46); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Mouth-Jaw Region Head 450/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (interpolated) = 0.582 mW/g

Mouth-Jaw Region Head 450/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 1.63 V/m; Power Drift = 0.124 dB
 Peak SAR (extrapolated) = 0.812 W/kg
 SAR(1 g) = 0.517 mW/g; SAR(10 g) = 0.329 mW/g

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



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

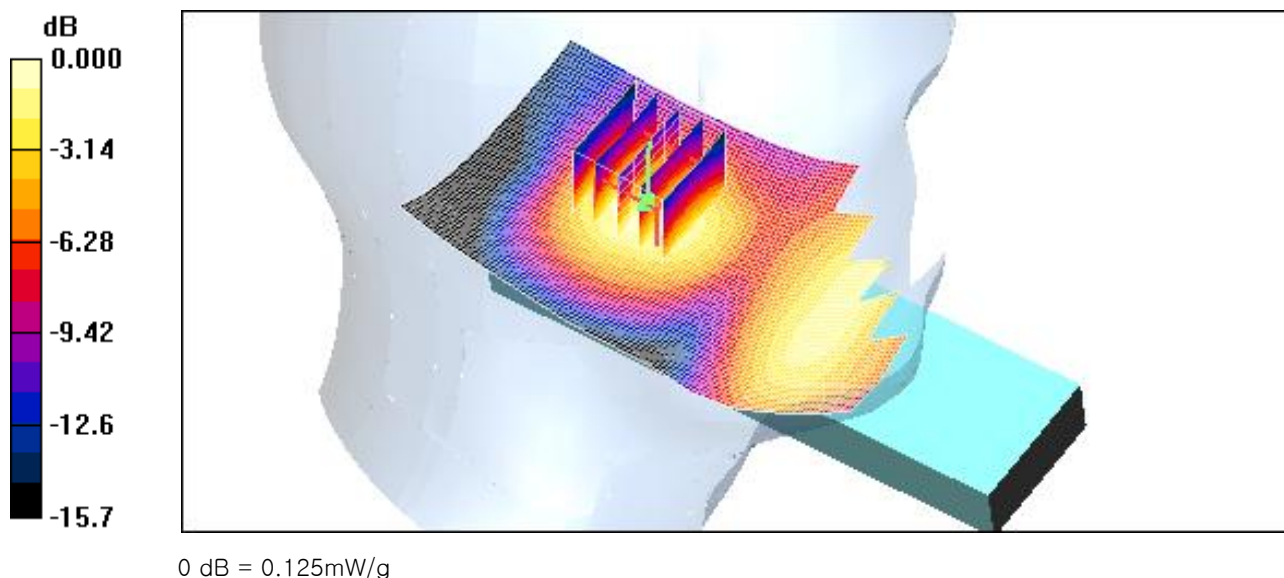
Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.5$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 41.8$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(5.46, 5.46, 5.46); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 1800/1900 Phantom; Type: SAM

Left tilt 450/Area Scan (61x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.132 mW/g

Left tilt 450/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.47 V/m; Power Drift = 0.067 dB
Peak SAR (extrapolated) = 0.163 W/kg
SAR(1 g) = 0.117 mW/g; SAR(10 g) = 0.073 mW/g
Maximum value of SAR (measured) = 0.125 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

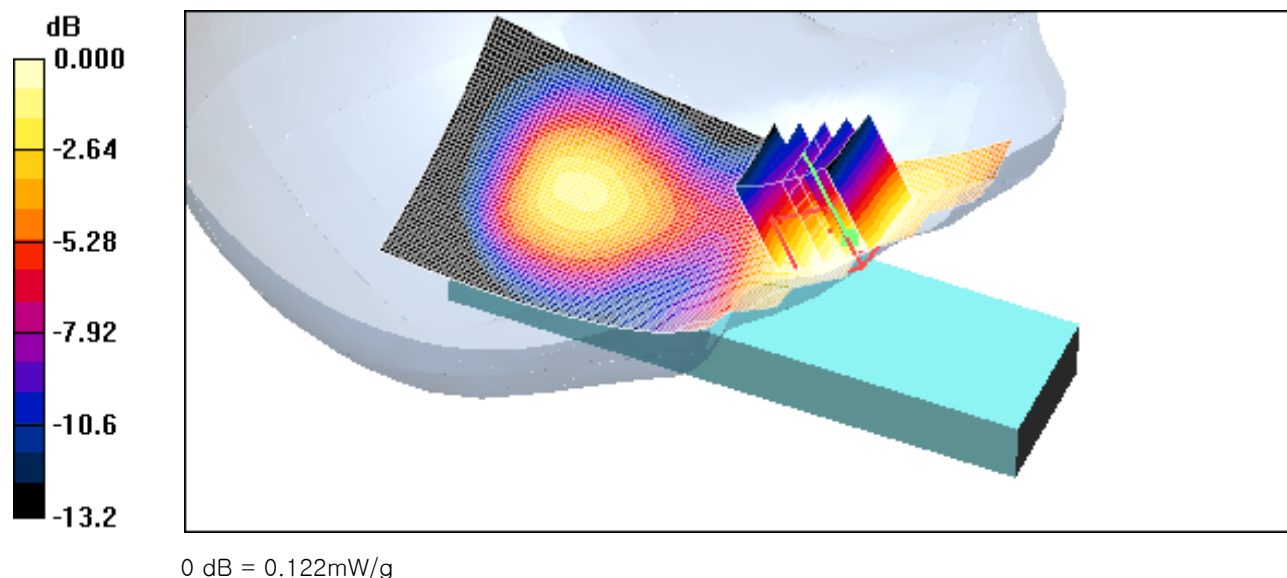
Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.5$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 41.8$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(5.46, 5.46, 5.46); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 1800/1900 Phantom; Type: SAM

Right tilt 450/Area Scan (61x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.123 mW/g

Right tilt 450/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.87 V/m; Power Drift = 0.047 dB
Peak SAR (extrapolated) = 0.151 W/kg
SAR(1 g) = 0.113 mW/g; SAR(10 g) = 0.078 mW/g
Maximum value of SAR (measured) = 0.122 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012
Separation Distance: 0.8 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

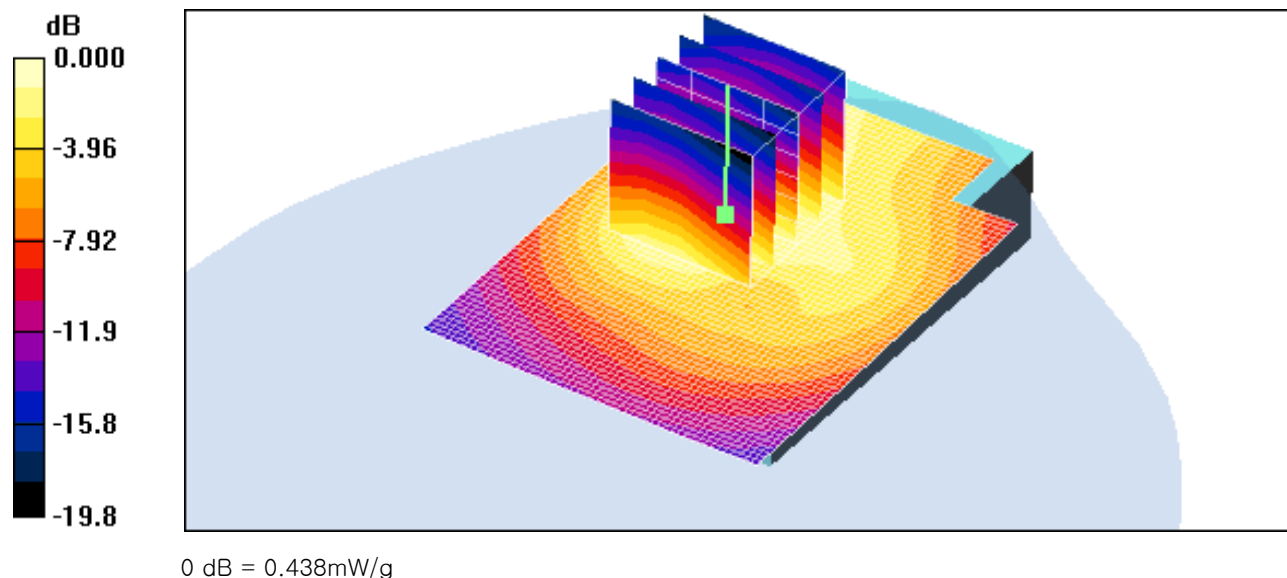
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.37$ mho/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(5.24, 5.24, 5.24); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Mouth-Jaw Region Head 600/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.432 mW/g

Mouth-Jaw Region Head 600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.24 V/m; Power Drift = -0.119 dB
Peak SAR (extrapolated) = 0.701 W/kg
SAR(1 g) = 0.402 mW/g; SAR(10 g) = 0.223 mW/g
Maximum value of SAR (measured) = 0.438 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

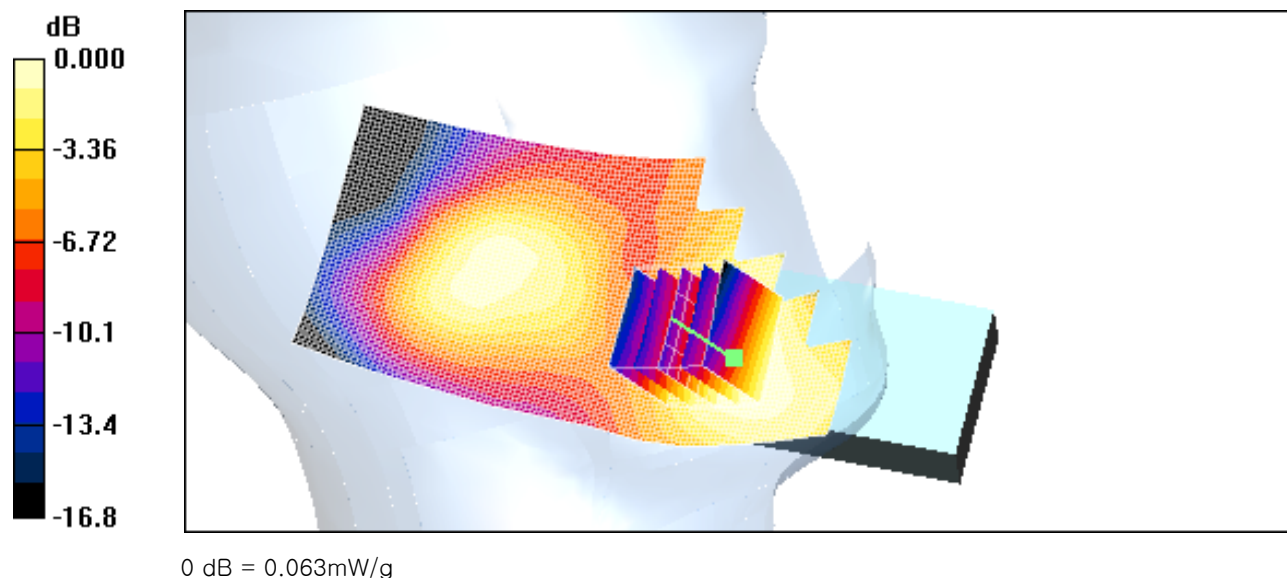
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.37$ mho/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(5.24, 5.24, 5.24); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 1800/1900 Phantom; Type: SAM

Left tilt 600/Area Scan (61x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.064 mW/g

Left tilt 600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.57 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.090 W/kg
SAR(1 g) = 0.059 mW/g; SAR(10 g) = 0.038 mW/g
Maximum value of SAR (measured) = 0.063 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

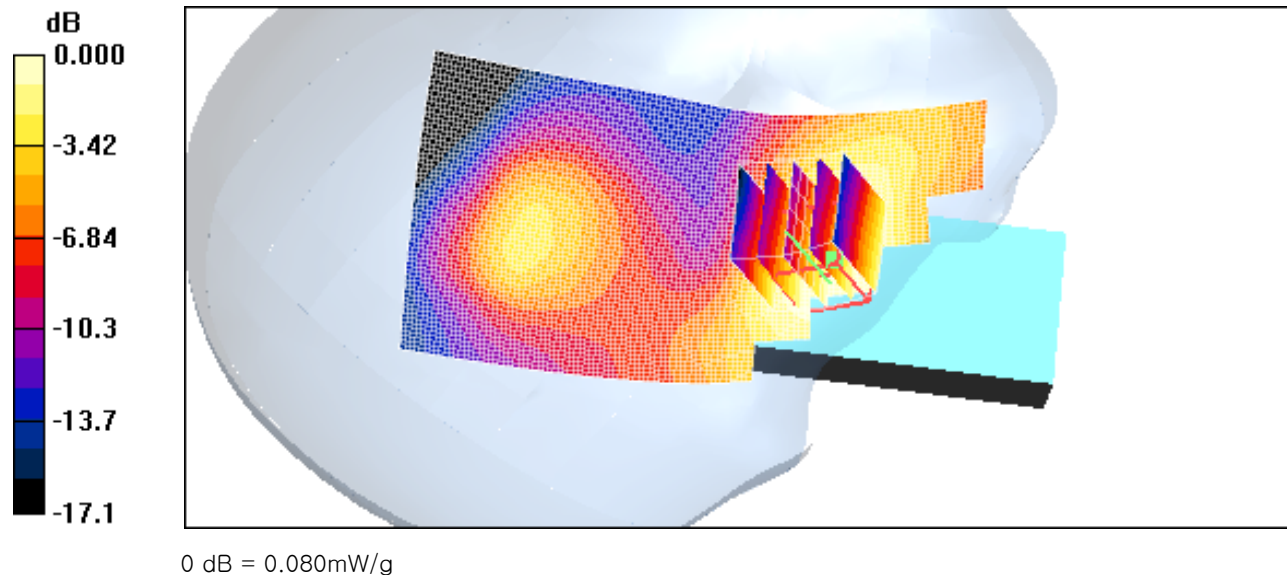
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.37$ mho/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(5.24, 5.24, 5.24); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 1800/1900 Phantom; Type: SAM

Right tilt 600/Area Scan (61x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.084 mW/g

Right tilt 600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.44 V/m; Power Drift = 0.060 dB
Peak SAR (extrapolated) = 0.107 W/kg
SAR(1 g) = 0.075 mW/g; SAR(10 g) = 0.050 mW/g
Maximum value of SAR (measured) = 0.080 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.1 °C
Ambient Temperature: 21.3 °C
Test Date: Apr. 20, 2012
Separation Distance: 3.4 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

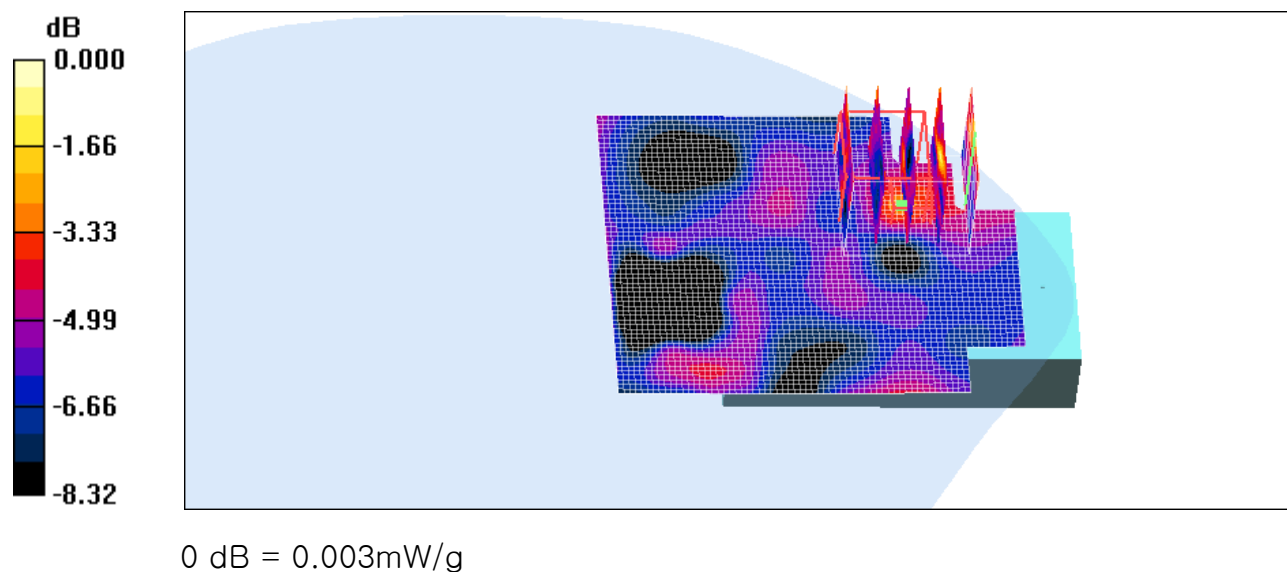
Communication System: Bluetooth; Frequency: 2402 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2402$ MHz; $\sigma = 1.78$ mho/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phantom ; Type: SAM

Mouth-Jaw Region Head 0ch/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.002 mW/g

Mouth-Jaw Region Head 0ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.739 V/m; Power Drift = -0.131 dB
Peak SAR (extrapolated) = 0.004 W/kg
SAR(1 g) = 0.00113 mW/g; SAR(10 g) = 0.000662 mW/g
Maximum value of SAR (measured) = 0.003 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.1 °C
Ambient Temperature: 21.3 °C
Test Date: Apr. 20, 2012
Separation Distance: 3.4 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

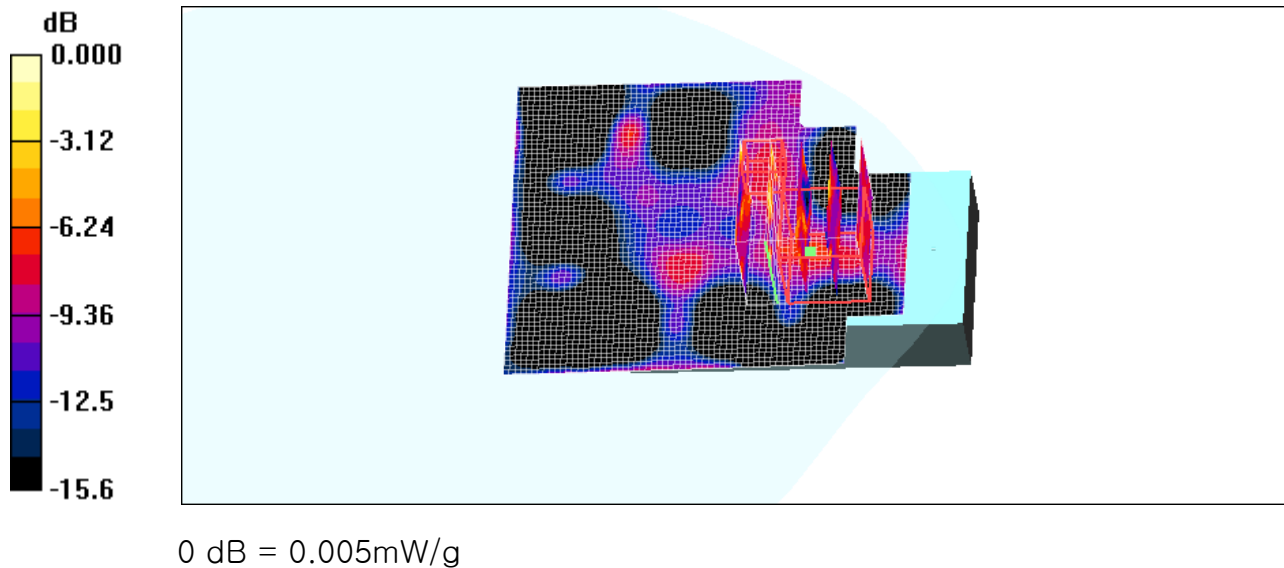
Communication System: Bluetooth; Frequency: 2402 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2402$ MHz; $\sigma = 1.78$ mho/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 835/900 Phantom ; Type: SAM

Mouth-Jaw Region Head 0ch/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm.
Maximum value of SAR (interpolated) = 0.001 mW/g

Mouth-Jaw Region Head 0ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.673 V/m; Power Drift = -0.152 dB
Peak SAR (extrapolated) = 0.005 W/kg
SAR(1 g) = 0.000683 mW/g; SAR(10 g) = 0.000378 mW/g
Maximum value of SAR (measured) = 0.005 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012
Separation Distance: 1.5 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

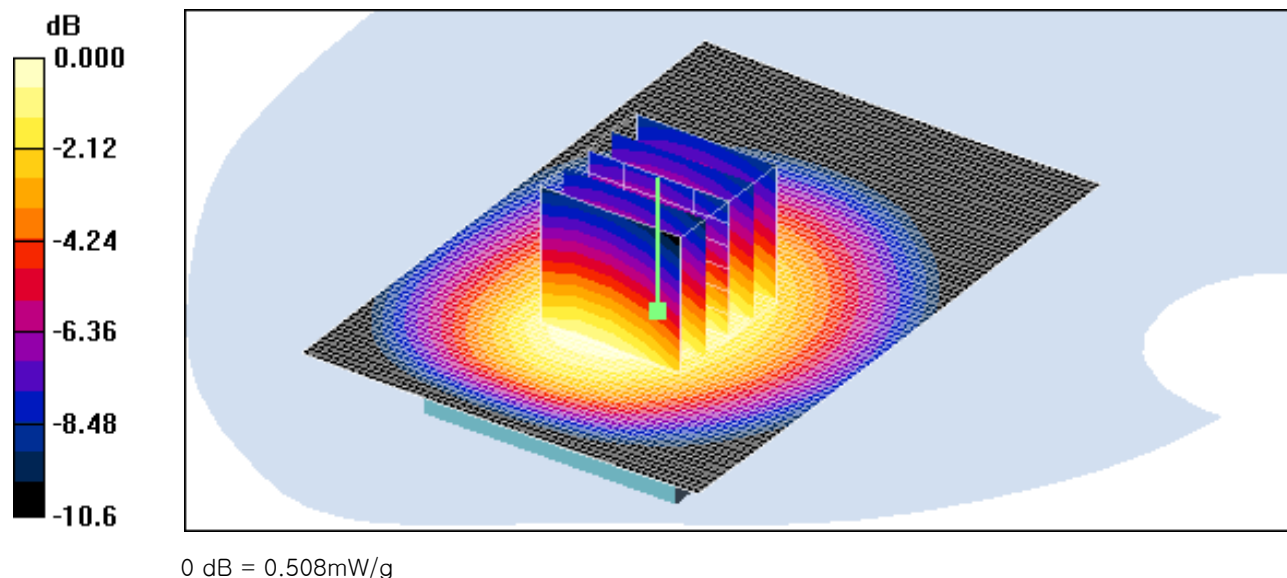
Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 836.52$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(6.5, 6.5, 6.5); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 835/900 Phantom ; Type: SAM

Body rear 384/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.507 mW/g

Body rear 384/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.38 V/m; Power Drift = 0.030 dB
Peak SAR (extrapolated) = 0.620 W/kg
SAR(1 g) = 0.477 mW/g; SAR(10 g) = 0.340 mW/g
Maximum value of SAR (measured) = 0.508 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012
Separation Distance: 1.5 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

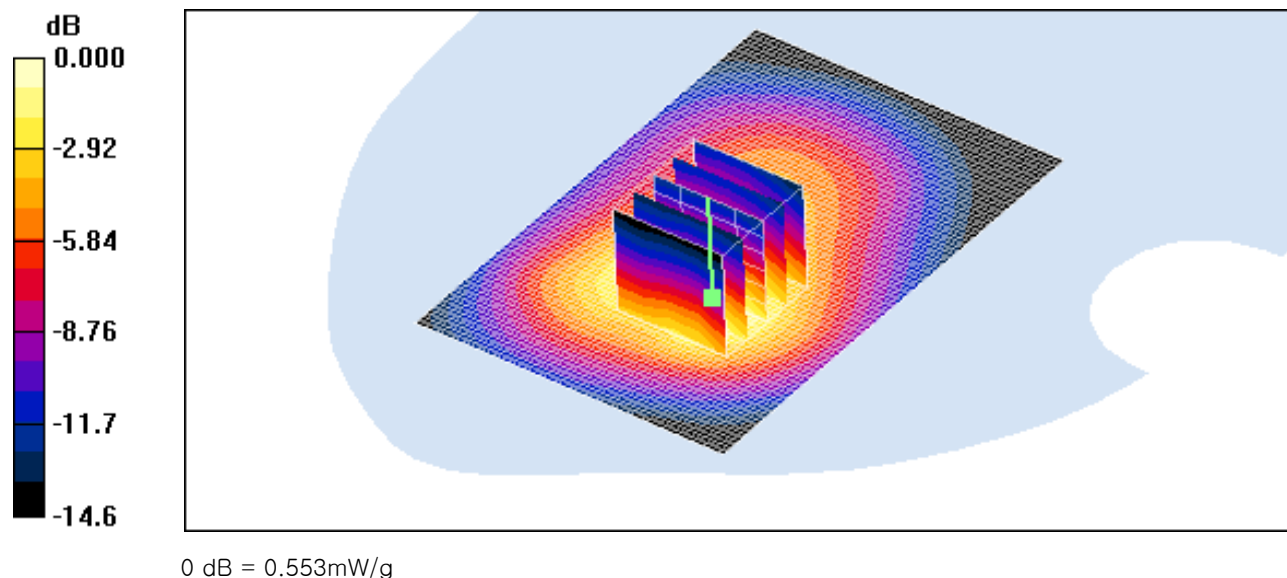
Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.5$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 55.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(4.84, 4.84, 4.84); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 1800/1900 Phantom; Type: SAM

Body rear 450/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.544 mW/g

Body rear 450/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.58 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 0.752 W/kg
SAR(1 g) = 0.495 mW/g; SAR(10 g) = 0.302 mW/g
Maximum value of SAR (measured) = 0.553 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012
Separation Distance: 1.5 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

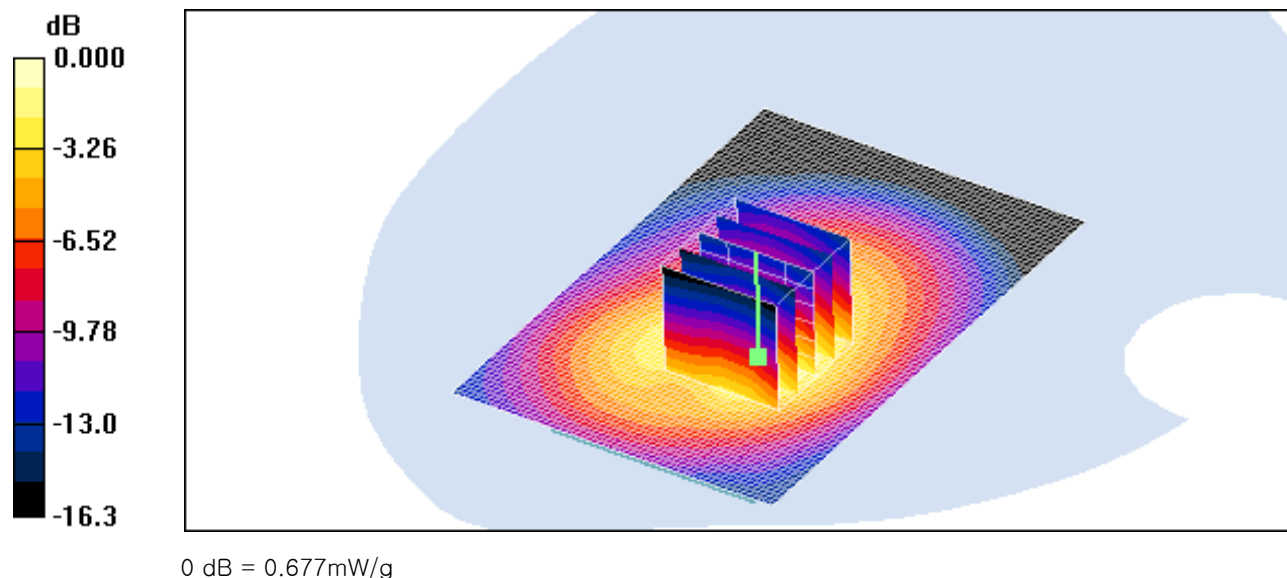
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(4.63, 4.63, 4.63); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 1800/1900 Phantom; Type: SAM

Body rear 600/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.709 mW/g

Body rear 600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.35 V/m; Power Drift = -0.194 dB
Peak SAR (extrapolated) = 1.00 W/kg
SAR(1 g) = 0.625 mW/g; SAR(10 g) = 0.372 mW/g
Maximum value of SAR (measured) = 0.677 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.1 °C
Ambient Temperature: 21.3 °C
Test Date: Apr. 9, 2012
Separation Distance: 1.5 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

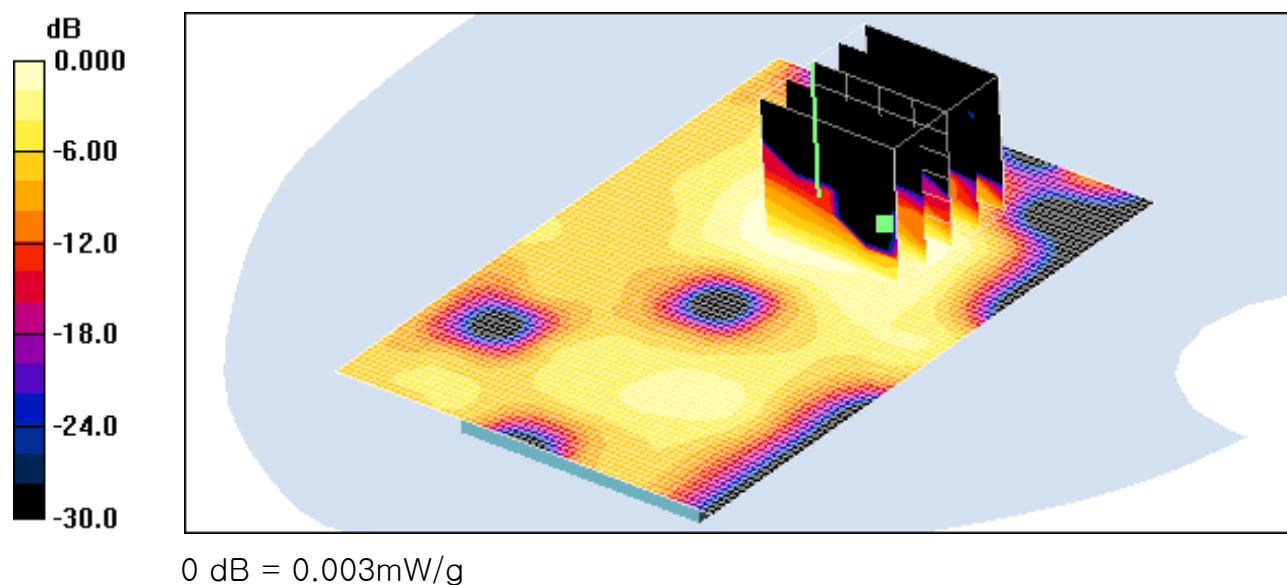
Communication System: Bluetooth; Frequency: 2402 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2402$ MHz; $\sigma = 1.83$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(4.21, 4.21, 4.21); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 1800/1900 Phantom; Type: SAM

BT Body Rear 0ch/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.003 mW/g

BT Body Rear 0ch/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.18 V/m; Power Drift = -0.097 dB
Peak SAR (extrapolated) = 0.011 W/kg
SAR(1 g) = 0.00274 mW/g; SAR(10 g) = 0.00118 mW/g
Maximum value of SAR (measured) = 0.003 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012
Separation Distance: 0.8 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

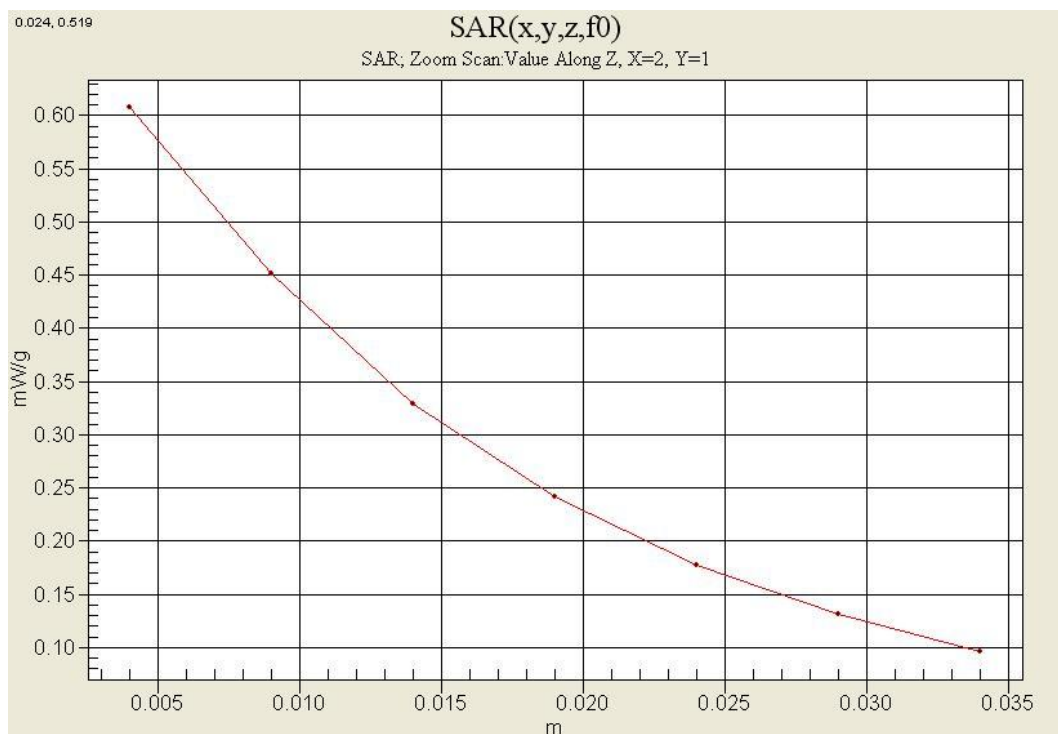
Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 836.52 \text{ MHz}$; $\sigma = 0.87 \text{ mho/m}$; $\epsilon_r = 41.7$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(6.72, 6.72, 6.72); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 835/900 MHz; Type: SAM

Mouth-Jaw Region Head 384/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.622 mW/g

Mouth-Jaw Region Head 384/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.27 V/m; Power Drift = -0.073 dB
Peak SAR (extrapolated) = 0.755 W/kg
SAR(1 g) = 0.572 mW/g; SAR(10 g) = 0.402 mW/g
Maximum value of SAR (measured) = 0.608 mW/g



Test Laboratory: HCT CO., LTD
 EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
 Liquid Temperature: 21.3 °C
 Ambient Temperature: 21.5 °C
 Test Date: Apr. 4, 2012
 Separation Distance: 1.5 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

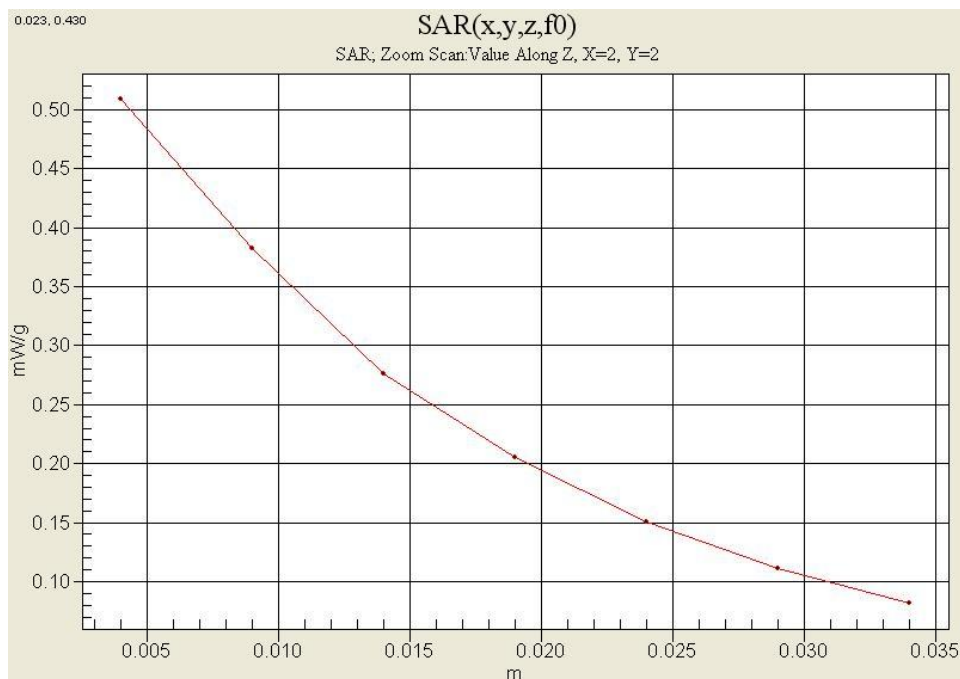
Communication System: CDMA 835MHz FCC; Frequency: 836.52 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 836.52 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 54.9$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(6.5, 6.5, 6.5); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 835/900 Phantom ; Type: SAM

Body rear 384/Area Scan (61x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
 Maximum value of SAR (interpolated) = 0.507 mW/g

Body rear 384/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
 Reference Value = 7.38 V/m; Power Drift = 0.030 dB
 Peak SAR (extrapolated) = 0.620 W/kg
SAR(1 g) = 0.477 mW/g; SAR(10 g) = 0.340 mW/g
 Maximum value of SAR (measured) = 0.508 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012
Separation Distance: 0.8 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.5$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 41.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

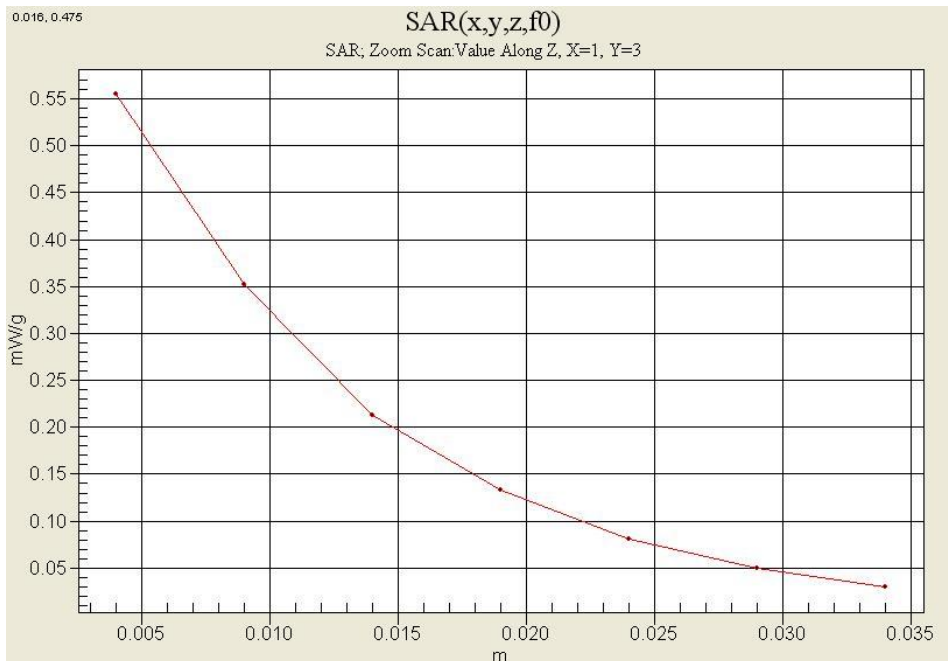
DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(5.46, 5.46, 5.46); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Mouth-Jaw Region Head 450/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.582 mW/g

Mouth-Jaw Region Head 450/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.63 V/m; Power Drift = 0.124 dB
Peak SAR (extrapolated) = 0.812 W/kg
SAR(1 g) = 0.517 mW/g; SAR(10 g) = 0.329 mW/g

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



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012
Separation Distance: 1.5 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

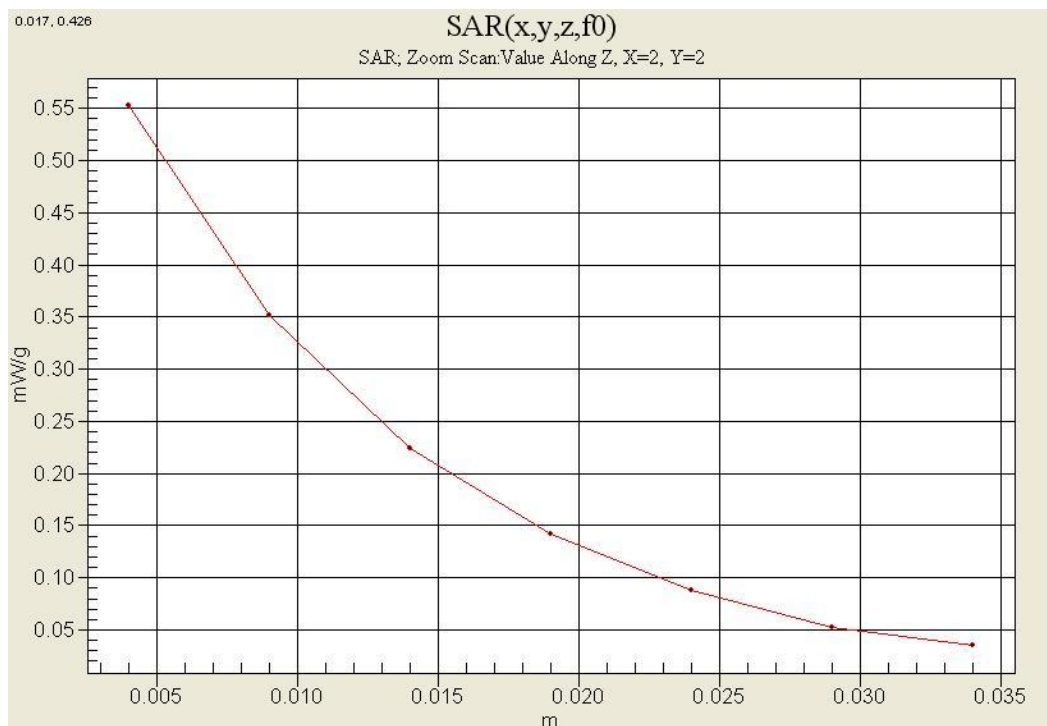
Communication System: AWS 1700 MHz FCC; Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 1732.5$ MHz; $\sigma = 1.45$ mho/m; $\epsilon_r = 55.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(4.84, 4.84, 4.84); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 1800/1900 Phantom; Type: SAM

Body rear 450/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.544 mW/g

Body rear 450/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.58 V/m; Power Drift = -0.041 dB
Peak SAR (extrapolated) = 0.752 W/kg
SAR(1 g) = 0.495 mW/g; SAR(10 g) = 0.302 mW/g
Maximum value of SAR (measured) = 0.553 mW/g



Test Laboratory: HCT CO., LTD
 EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
 Liquid Temperature: 21.3 °C
 Ambient Temperature: 21.5 °C
 Test Date: Apr. 4, 2012
 Separation Distance: 0.8 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

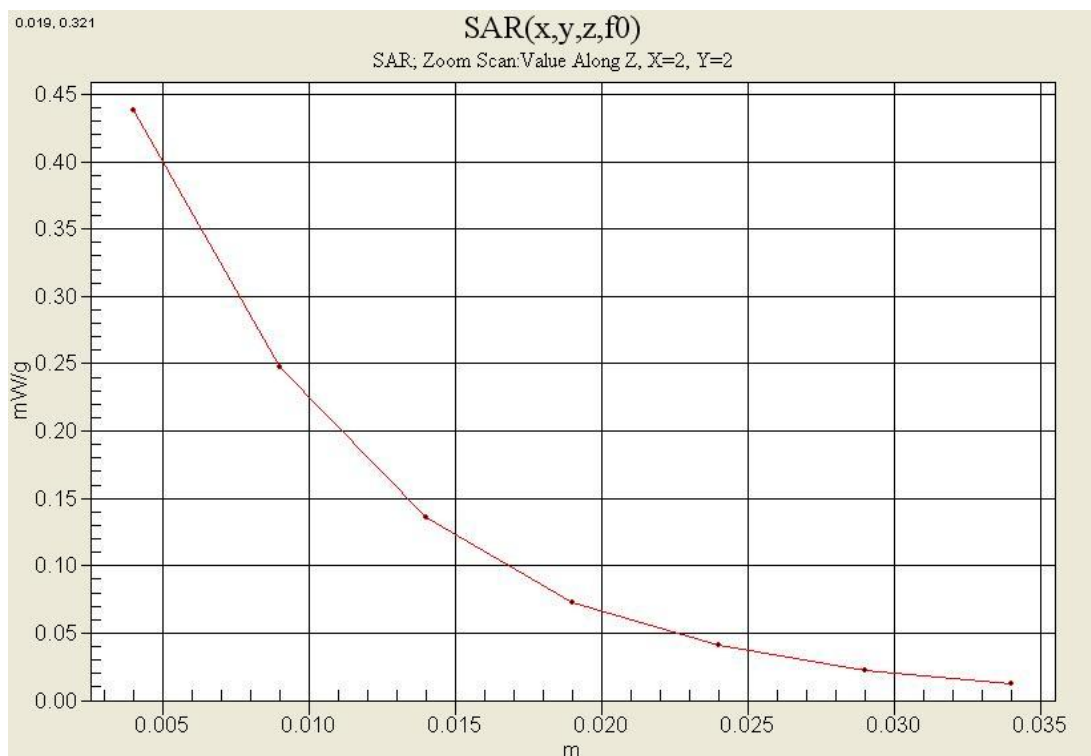
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 1880$ MHz; $\sigma = 1.37$ mho/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(5.24, 5.24, 5.24); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Mouth-Jaw Region Head 600/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
 Maximum value of SAR (interpolated) = 0.432 mW/g

Mouth-Jaw Region Head 600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
 Reference Value = 2.24 V/m; Power Drift = -0.119 dB
 Peak SAR (extrapolated) = 0.701 W/kg
SAR(1 g) = 0.402 mW/g; SAR(10 g) = 0.223 mW/g
 Maximum value of SAR (measured) = 0.438 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: Cellular/AWS/PCS CDMA Phone with Bluetooth
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Apr. 4, 2012
Separation Distance: 1.5 cm

DUT: SCH-R270; Type: bar; Serial: FJ-090-A

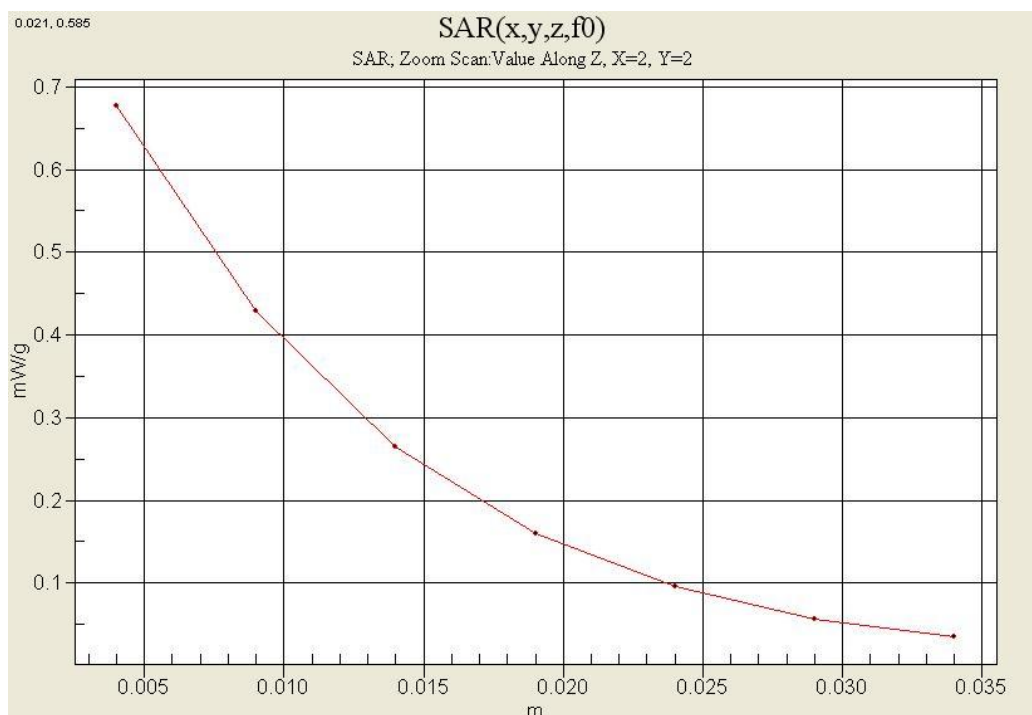
Communication System: PCS 1900MHz FCC; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.46$ mho/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1798; ConvF(4.63, 4.63, 4.63); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: 1800/1900 Phantom; Type: SAM

Body rear 600/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.709 mW/g

Body rear 600/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.35 V/m; Power Drift = -0.194 dB
Peak SAR (extrapolated) = 1.00 W/kg
SAR(1 g) = 0.625 mW/g; SAR(10 g) = 0.372 mW/g
Maximum value of SAR (measured) = 0.677 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: 21.3 °C
Test Date: Apr. 4, 2012

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

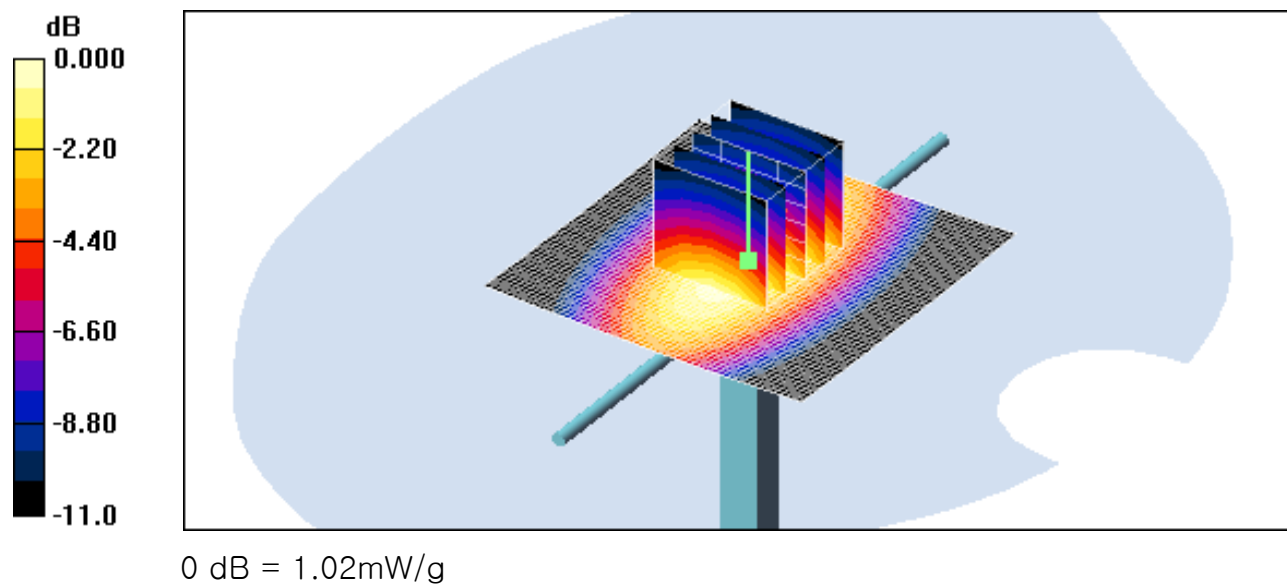
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 835$ MHz; $\sigma = 0.869$ mho/m; $\epsilon_r = 41.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(6.72, 6.72, 6.72); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 835MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.02 mW/g

Validation 835MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.4 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 1.41 W/kg
SAR(1 g) = 0.935 mW/g; SAR(10 g) = 0.598 mW/g
Maximum value of SAR (measured) = 1.02 mW/g



■ Validation Data (835 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Apr. 4, 2012

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

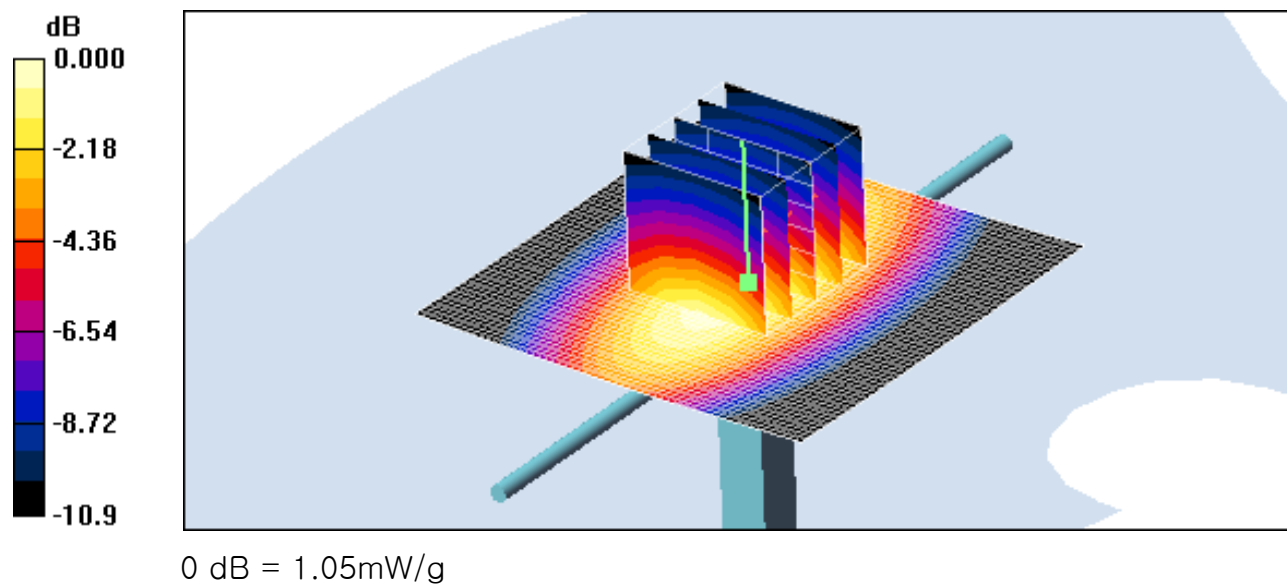
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 54.9$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(6.5, 6.5, 6.5); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 835MHz/Area Scan (61x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 1.05 mW/g

Validation 835MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 33.8 V/m; Power Drift = -0.009 dB
Peak SAR (extrapolated) = 1.40 W/kg
SAR(1 g) = 0.964 mW/g; SAR(10 g) = 0.623 mW/g
Maximum value of SAR (measured) = 1.05 mW/g



■ Validation Data (1 800 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Apr. 4, 2012

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 – SN:2d007

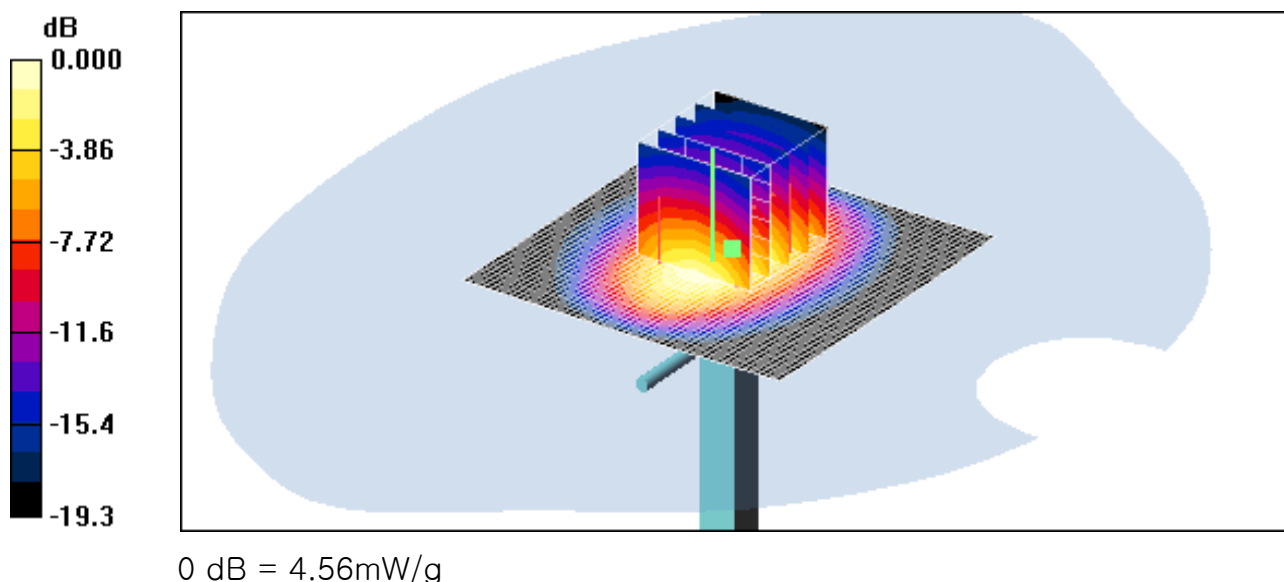
Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1800 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 41.5$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(5.46, 5.46, 5.46); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Dipole 1800MHz Validation/Area Scan (61x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 4.81 mW/g

Dipole 1800MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 59.9 V/m; Power Drift = -0.086 dB
Peak SAR (extrapolated) = 7.13 W/kg
SAR(1 g) = 4.1 mW/g; SAR(10 g) = 2.15 mW/g
Maximum value of SAR (measured) = 4.56 mW/g



■ Validation Data (1 800 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Apr. 4, 2012

DUT: Dipole 1800 MHz; Type: D1800V2; Serial: D1800V2 – SN:2d007

Communication System: CW; Frequency: 1800 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1800$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 55.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(4.84, 4.84, 4.84); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

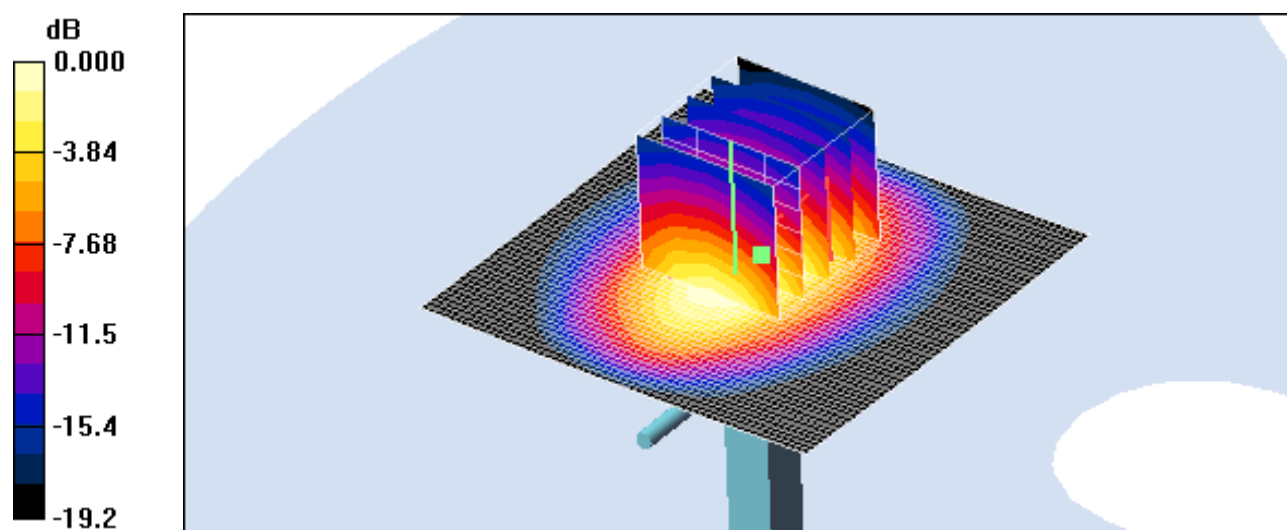
Dipole 1800MHz Validation/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.54 mW/g

Dipole 1800MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 57.3 V/m; Power Drift = -0.039 dB

Peak SAR (extrapolated) = 6.48 W/kg

SAR(1 g) = 3.86 mW/g; SAR(10 g) = 2.04 mW/g

Maximum value of SAR (measured) = 4.32 mW/g



0 dB = 4.32mW/g

Validation Data (1 900 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Apr. 4, 2012

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

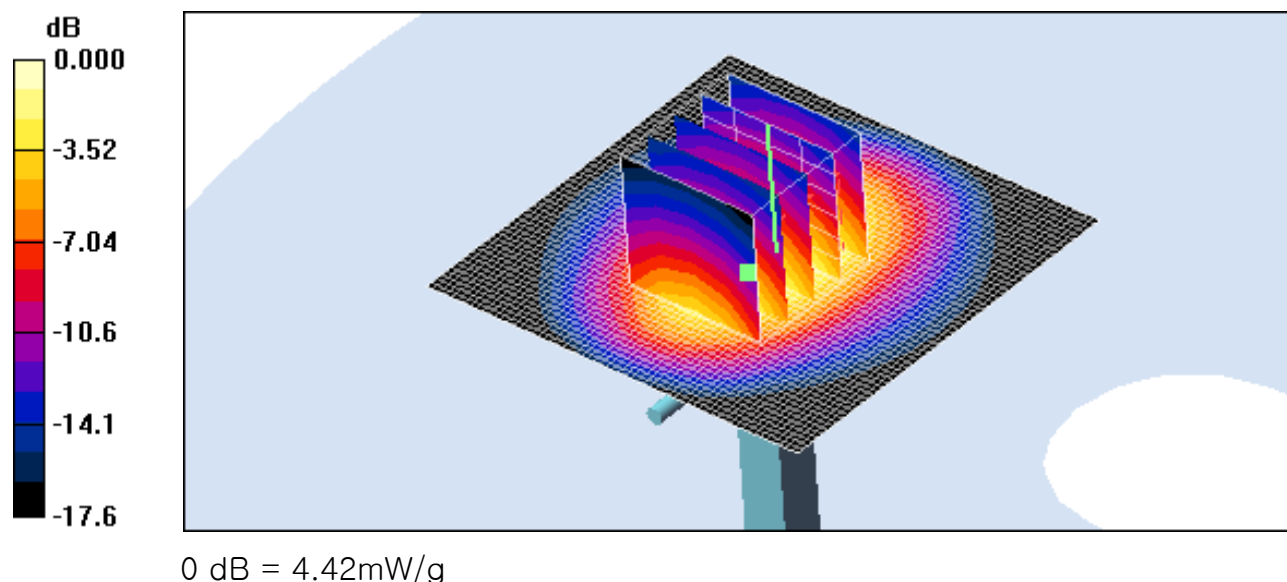
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(5.24, 5.24, 5.24); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 835/900 MHz; Type: SAM

Dipole 1900MHz Validation/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.47 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 = -0.006 dB
Peak SAR (extrapolated) = 6.63 W/kg
SAR(1 g) = 4 mW/g; SAR(10 g) = 2.24 mW/g
Maximum value of SAR (measured) = 4.42 mW/g



■ Validation Data (1 900 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Apr. 4, 2012

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

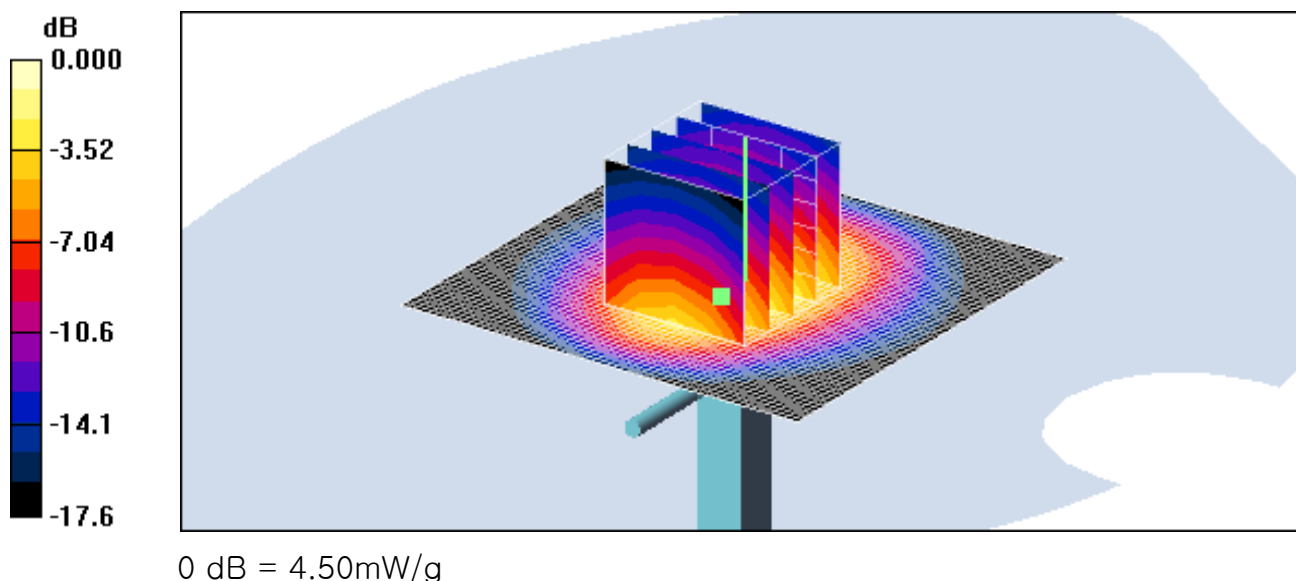
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.48 \text{ mho/m}$; $\epsilon_r = 53.5$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(4.63, 4.63, 4.63); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 835/900 MHz; Type: SAM

Dipole 1900MHz Validation/Area Scan (61x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 4.56 mW/g

Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 58.5 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 6.68 W/kg
SAR(1 g) = 4.07 mW/g; SAR(10 g) = 2.29 mW/g
Maximum value of SAR (measured) = 4.50 mW/g



■ Validation Data (2450 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.1 °C
Test Date: Apr. 20, 2012

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

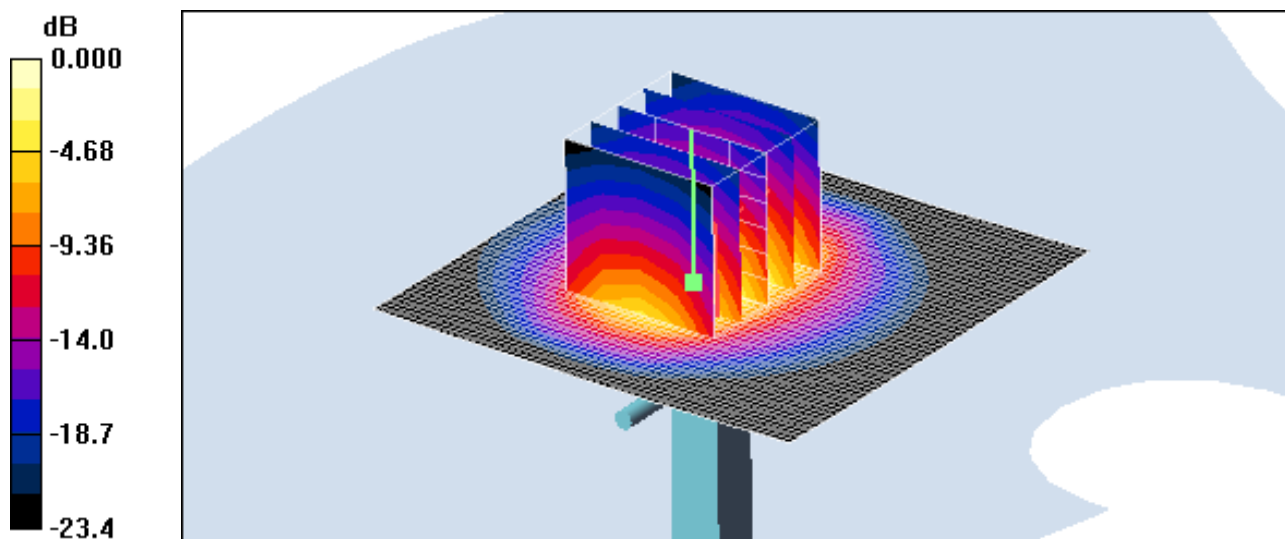
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 1.84$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.53 mW/g

Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 60.1 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 12.4 W/kg
SAR(1 g) = 5.38 mW/g; SAR(10 g) = 2.45 mW/g
Maximum value of SAR (measured) = 5.90 mW/g



0 dB = 5.90mW/g

Validation Data (2450 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.1 °C
Test Date: Apr. 9, 2012

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

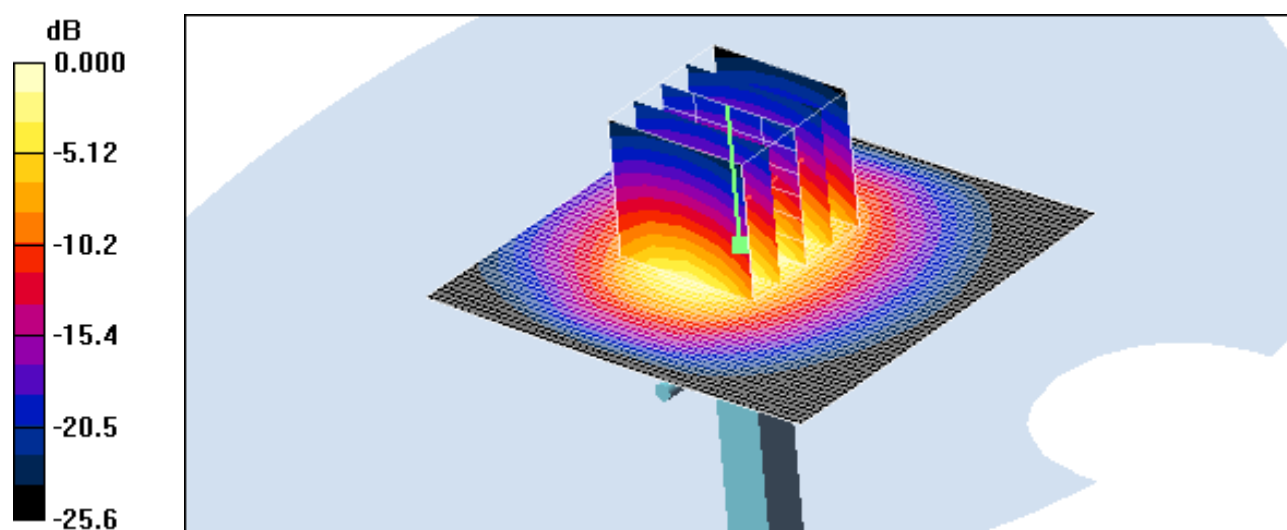
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450 \text{ MHz}$; $\sigma = 1.89 \text{ mho/m}$; $\epsilon_r = 52.1$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(4.21, 4.21, 4.21); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 6.51 mW/g

Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 56.1 V/m; Power Drift = -0.052 dB
Peak SAR (extrapolated) = 13.5 W/kg
SAR(1 g) = 5.41 mW/g; SAR(10 g) = 2.41 mW/g
Maximum value of SAR (measured) = 5.85 mW/g



0 dB = 5.85mW/g

Validation Data (2450 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.1 °C
Test Date: Apr. 20, 2012

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; $\sigma = 1.84$ mho/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.53 mW/g

Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 60.1 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 12.4 W/kg
SAR(1 g) = 5.38 mW/g; SAR(10 g) = 2.45 mW/g
Maximum value of SAR (measured) = 5.90 mW/g



Validation Data (2450 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.1 °C
Test Date: Apr. 9, 2012

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

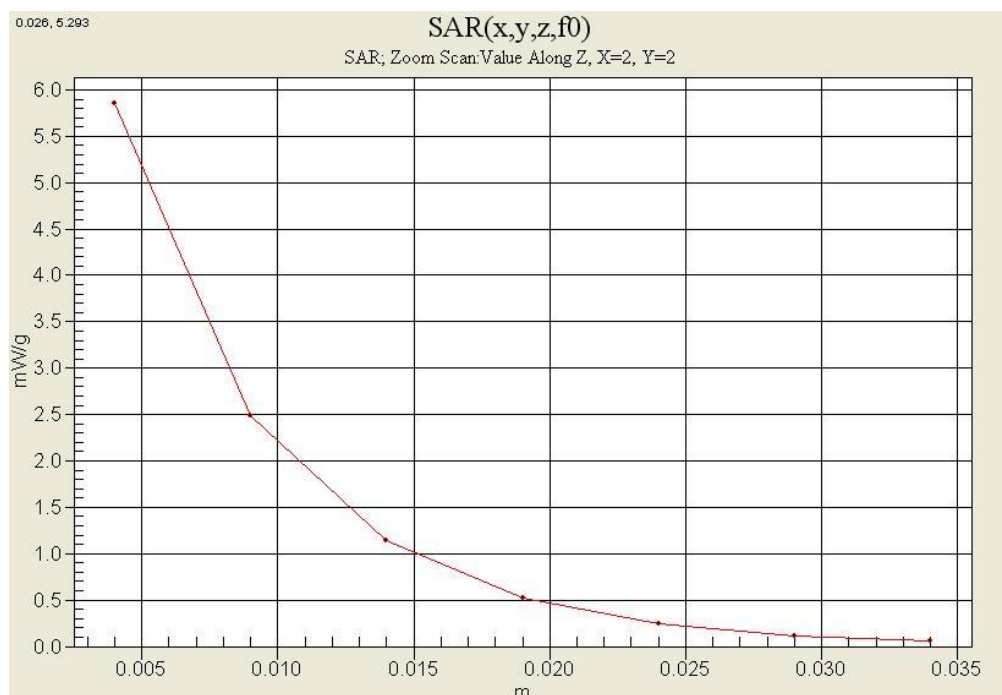
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 1.89$ mho/m; $\epsilon_r = 52.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1798; ConvF(4.21, 4.21, 4.21); Calibrated: 2011-04-14
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn446; Calibrated: 2011-09-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.51 mW/g

Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 56.1 V/m; Power Drift = -0.052 dB
Peak SAR (extrapolated) = 13.5 W/kg
SAR(1 g) = 5.41 mW/g; SAR(10 g) = 2.41 mW/g
Maximum value of SAR (measured) = 5.85 mW/g



■ Dielectric Parameter (835 MHz Head)

Title SCH-R270

SubTitle 835MHz

Test Date Apr. 4, 2012

Frequency	e'	e''
800000000.0000	42.1022	18.9509
805000000.0000	42.0765	18.8275
810000000.0000	41.9877	18.7872
815000000.0000	41.9588	18.8434
820000000.0000	41.9162	18.7698
825000000.0000	41.7750	18.7773
830000000.0000	41.7243	18.7442
835000000.0000	41.7037	18.7031
840000000.0000	41.5912	18.6675
845000000.0000	41.5561	18.6625
850000000.0000	41.5498	18.6649
855000000.0000	41.5446	18.6514
860000000.0000	41.5074	18.6676
865000000.0000	41.4710	18.6835
870000000.0000	41.3758	18.6859
875000000.0000	41.4016	18.6835
880000000.0000	41.3533	18.6675
885000000.0000	41.2942	18.6800
890000000.0000	41.2836	18.6681
895000000.0000	41.2447	18.7093
900000000.0000	41.1850	18.6774

■ Dielectric Parameter (835 MHz Body)

Title SCH-R270

SubTitle 835MHz

Test Date Apr. 4, 2012

Frequency	e'	e''
800000000.0000	54.9966	21.6452
805000000.0000	55.0133	21.6544
810000000.0000	54.9772	21.6255
815000000.0000	54.9674	21.6663
820000000.0000	54.9863	21.6904
825000000.0000	54.9483	21.6788
830000000.0000	54.9360	21.7191
835000000.0000	54.9149	21.7622
840000000.0000	54.8718	21.7577
845000000.0000	54.7880	21.7740
850000000.0000	54.7051	21.7737
855000000.0000	54.6152	21.7655
860000000.0000	54.5145	21.6966
865000000.0000	54.4040	21.6270
870000000.0000	54.3169	21.5873
875000000.0000	54.2031	21.5586
880000000.0000	54.1658	21.4477
885000000.0000	54.1469	21.3837
890000000.0000	54.0882	21.3251
895000000.0000	54.0344	21.2231
900000000.0000	54.0009	21.1980

■ Dielectric Parameter (1 800 MHz Head)

Title SCH-R270

SubTitle 1 900MHz

Test Date Apr. 4, 2012

Frequency	e'	e''
1700000000.0000	41.9886	13.9528
1710000000.0000	41.9209	13.9652
1720000000.0000	41.8526	14.0005
1730000000.0000	41.8130	14.0121
1740000000.0000	41.7262	14.0276
1750000000.0000	41.7110	14.0436
1760000000.0000	41.6435	14.0701
1770000000.0000	41.6367	14.1156
1780000000.0000	41.6065	14.1316
1790000000.0000	41.5803	14.1670
1800000000.0000	41.5426	14.1721
1810000000.0000	41.5249	14.2115
1820000000.0000	41.4471	14.2426
1830000000.0000	41.4135	14.3109
1840000000.0000	41.3074	14.3080
1850000000.0000	41.2365	14.3233
1860000000.0000	41.1713	14.3786
1870000000.0000	41.1101	14.4377
1880000000.0000	41.0670	14.4421
1890000000.0000	41.0384	14.4618
1900000000.0000	40.9709	14.4767

■ Dielectric Parameter (1 800 MHz Body)

Title SCH-R270

SubTitle 1 900MHz

Test Date Apr. 4, 2012

Frequency	e'	e''
1700000000.0000	55.2267	15.0316
1710000000.0000	55.2007	15.0489
1720000000.0000	55.1578	15.0783
1730000000.0000	55.1236	15.0849
1740000000.0000	55.0944	15.1108
1750000000.0000	55.1065	15.1050
1760000000.0000	55.1037	15.0923
1770000000.0000	55.1119	15.0563
1780000000.0000	55.0972	15.0374
1790000000.0000	55.0859	15.0479
1800000000.0000	55.0613	15.0243
1810000000.0000	55.0135	15.0490
1820000000.0000	54.9764	15.0676
1830000000.0000	54.9313	15.1044
1840000000.0000	54.8820	15.1364
1850000000.0000	54.8449	15.1520
1860000000.0000	54.8121	15.1797
1870000000.0000	54.8015	15.1921
1880000000.0000	54.8116	15.1826
1890000000.0000	54.8122	15.1542
1900000000.0000	54.8136	15.1384

■ Dielectric Parameter (1 900 MHz Head)

Title SCH-R270

SubTitle 1 900MHz

Test Date Apr. 4, 2012

Frequency	e'	e''
1800000000.0000	39.4860	12.8551
1810000000.0000	39.4407	12.8869
1820000000.0000	39.4056	12.9185
1830000000.0000	39.3670	12.9523
1840000000.0000	39.3368	12.9779
1850000000.0000	39.2932	13.0089
1860000000.0000	39.2645	13.0188
1870000000.0000	39.2193	13.0480
1880000000.0000	39.1894	13.0854
1890000000.0000	39.1481	13.1122
1900000000.0000	39.1091	13.1407
1910000000.0000	39.0602	13.1609
1920000000.0000	39.0246	13.2139
1930000000.0000	38.9811	13.2250
1940000000.0000	38.9443	13.2583
1950000000.0000	38.9153	13.2750
1960000000.0000	38.8659	13.3167
1970000000.0000	38.8169	13.3438
1980000000.0000	38.7837	13.3577
1990000000.0000	38.7384	13.4088
2000000000.0000	38.7201	13.4421

■ Dielectric Parameter (1 900 MHz Body)

Title SCH-R270

SubTitle 1 900MHz

Test Date Apr. 4, 2012

Frequency	e'	e''
1850000000.0000	53.7453	13.8389
1855000000.0000	53.7516	13.8692
1860000000.0000	53.7625	13.8721
1865000000.0000	53.7285	13.8937
1870000000.0000	53.7194	13.8986
1875000000.0000	53.6849	13.9217
1880000000.0000	53.6459	13.9441
1885000000.0000	53.6249	13.9642
1890000000.0000	53.6043	13.9841
1895000000.0000	53.5564	13.9967
1900000000.0000	53.5430	14.0148
1905000000.0000	53.5137	14.0413
1910000000.0000	53.4840	14.0481
1915000000.0000	53.4670	14.0814
1920000000.0000	53.4440	14.1372
1925000000.0000	53.4275	14.1245
1930000000.0000	53.3846	14.1372
1935000000.0000	53.4170	14.1785
1940000000.0000	53.4153	14.1899
1945000000.0000	53.4107	14.2148
1950000000.0000	53.4197	14.2266

■ Dielectric Parameter (2450 MHz Head)

Title SCH-R270

SubTitle 2 450 MHz

Test Date Apr. 9, 2012

Frequency	e'	e''
2400000000.0000	38.9558	13.3516
2405000000.0000	38.9334	13.3677
2410000000.0000	38.9189	13.3662
2415000000.0000	38.8996	13.3855
2420000000.0000	38.8778	13.4013
2425000000.0000	38.8523	13.4092
2430000000.0000	38.8468	13.4142
2435000000.0000	38.8269	13.4315
2440000000.0000	38.8030	13.4438
2445000000.0000	38.7915	13.4541
2450000000.0000	38.7682	13.4633
2455000000.0000	38.7508	13.4759
2460000000.0000	38.7276	13.4880
2465000000.0000	38.7143	13.4918
2470000000.0000	38.7019	13.5226
2475000000.0000	38.6888	13.5262
2480000000.0000	38.6457	13.5334
2485000000.0000	38.6266	13.5423
2490000000.0000	38.6217	13.5614
2495000000.0000	38.6057	13.5734
2500000000.0000	38.5870	13.5823

■ Dielectric Parameter (2450 MHz Body)

Title SCH-R270

SubTitle 2 450 MHz

Test Date Apr. 9, 2012

Frequency	e'	e''
2400000000.0000	52.2586	13.7052
2405000000.0000	52.2430	13.7233
2410000000.0000	52.2214	13.7155
2415000000.0000	52.1973	13.7410
2420000000.0000	52.1773	13.7577
2425000000.0000	52.1393	13.7864
2430000000.0000	52.1406	13.8102
2435000000.0000	52.1356	13.8346
2440000000.0000	52.1152	13.8526
2445000000.0000	52.0955	13.8737
2450000000.0000	52.0963	13.8987
2455000000.0000	52.0697	13.9139
2460000000.0000	52.0397	13.9261
2465000000.0000	52.0497	13.9397
2470000000.0000	52.0275	13.9574
2475000000.0000	52.0333	13.9613
2480000000.0000	52.0062	13.9631
2485000000.0000	51.9913	13.9565
2490000000.0000	51.9803	13.9526
2495000000.0000	51.9748	13.9642
2500000000.0000	51.9595	13.9510

Attachment 3. – Probe Calibration Data

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



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

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **HCT (Dymstec)**

Certificate No: **ET3-1798_Apr11**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1798**

Calibration procedure(s) **QA CAL-01.v7, QA CAL-23.v4, QA CAL-25.v3**
Calibration procedure for dosimetric E-field probes

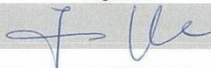
Calibration date: **April 14, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41495277	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
Issued: April 14, 2011			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

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



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

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: SCS 108

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below **ConvF**).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of **ConvF**.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}** are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- VR**: VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for **ConvF**. A frequency dependent **ConvF** is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ET3DV6 – SN:1798

April 14, 2011

Probe ET3DV6

SN:1798

Manufactured: August 14, 2003
Calibrated: April 14, 2011

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

ET3DV6- SN:1798

April 14, 2011

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1798

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	2.02	1.82	2.06	$\pm 10.1 \%$
DCP (mV) ^B	98.8	96.3	98.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	113.1	$\pm 3.0 \%$
			Y	0.00	0.00	1.00	145.9	
			Z	0.00	0.00	1.00	114.8	

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

^A The uncertainties of NormX,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

ET3DV6- SN:1798

April 14, 2011

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1798

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	7.63	7.63	7.63	0.22	2.25	± 13.4 %
835	41.5	0.90	6.72	6.72	6.72	0.78	1.68	± 12.0 %
900	41.5	0.97	6.61	6.61	6.61	0.74	1.74	± 12.0 %
1750	40.1	1.37	5.46	5.46	5.46	0.52	2.60	± 12.0 %
1900	40.0	1.40	5.24	5.24	5.24	0.54	2.52	± 12.0 %
1950	40.0	1.40	5.08	5.08	5.08	0.53	2.57	± 12.0 %
2450	39.2	1.80	4.56	4.56	4.56	0.70	1.97	± 12.0 %

^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

ET3DV6- SN:1798

April 14, 2011

DASY/EASY - Parameters of Probe: ET3DV6- SN:1798

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	8.09	8.09	8.09	0.15	2.17	± 13.4 %
835	55.2	0.97	6.50	6.50	6.50	0.73	1.84	± 12.0 %
900	55.0	1.05	6.40	6.40	6.40	0.71	1.90	± 12.0 %
1750	53.4	1.49	4.84	4.84	4.84	0.55	2.94	± 12.0 %
1900	53.3	1.52	4.63	4.63	4.63	0.57	2.70	± 12.0 %
1950	53.3	1.52	4.76	4.76	4.76	0.59	2.49	± 12.0 %
2450	52.7	1.95	4.21	4.21	4.21	0.97	1.24	± 12.0 %

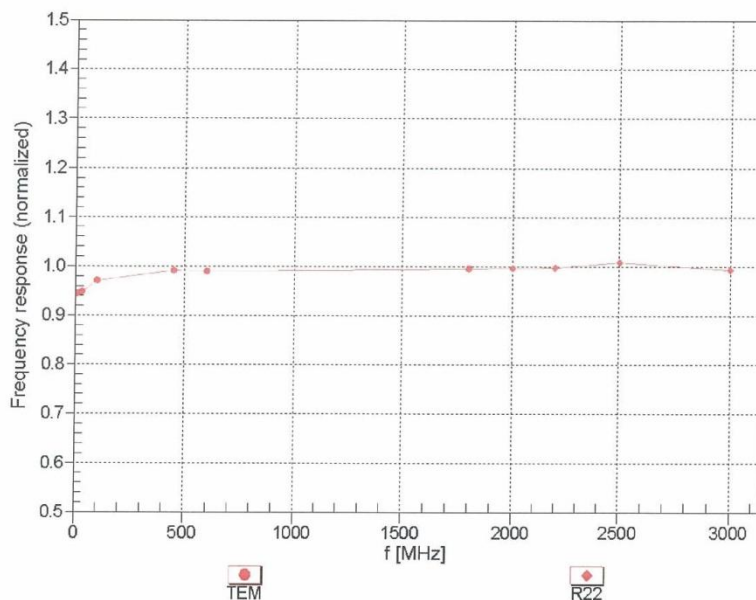
^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

ET3DV6- SN:1798

April 14, 2011

Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



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

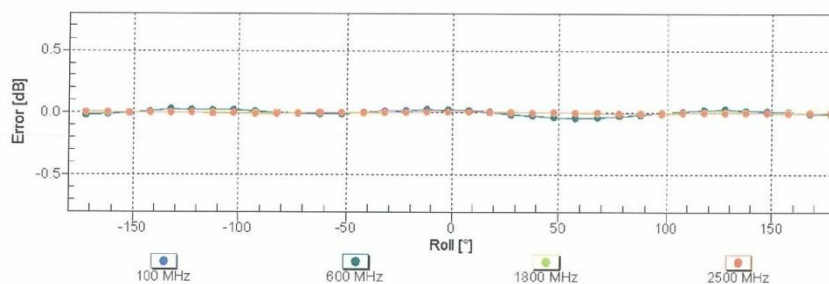
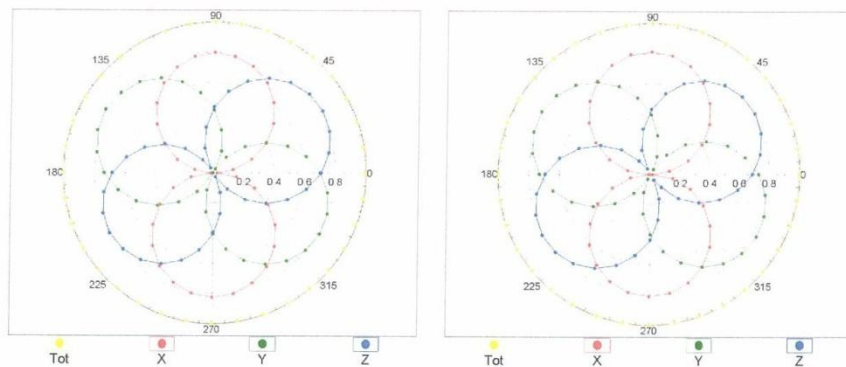
ET3DV6- SN:1798

April 14, 2011

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

f=600 MHz, TEM

f=1800 MHz, R22

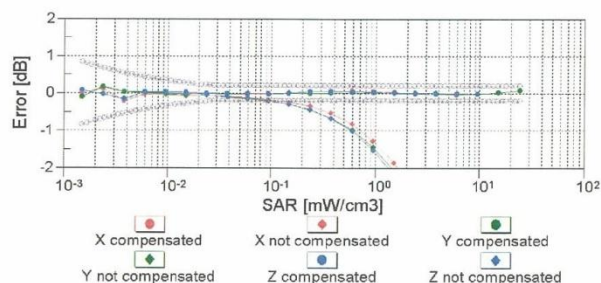
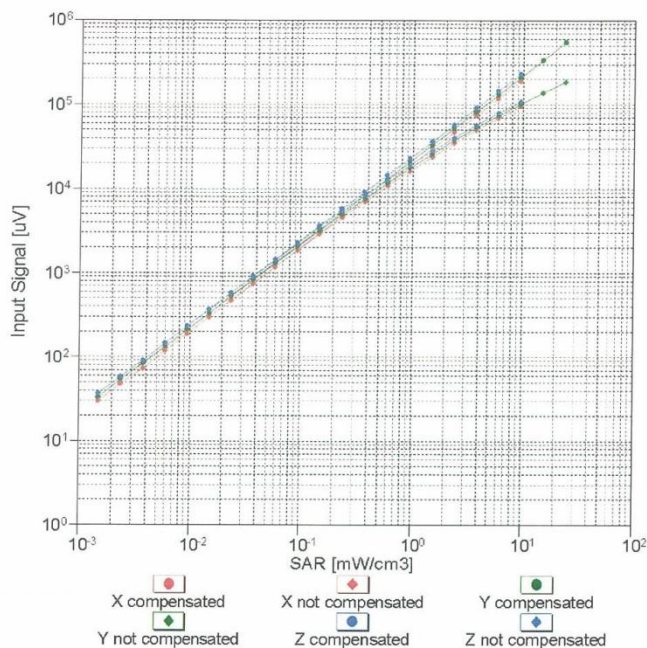


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ET3DV6- SN:1798

April 14, 2011

Dynamic Range f(SAR_{head}) (TEM cell , f = 900 MHz)

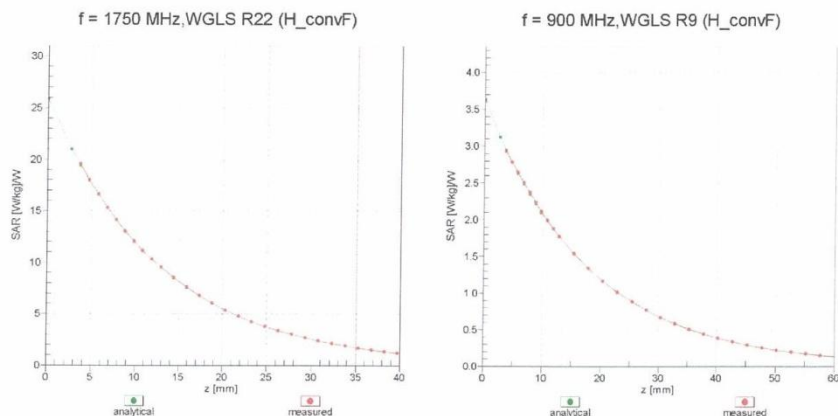


Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

ET3DV6- SN:1798

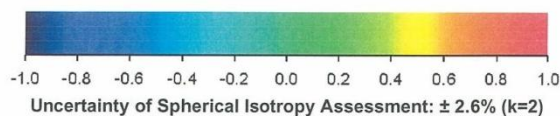
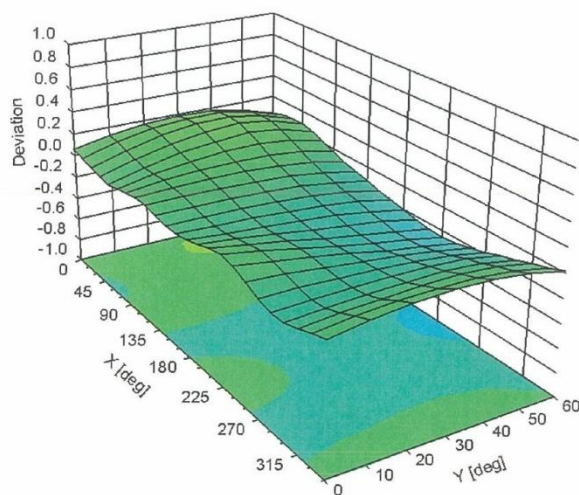
April 14, 2011

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ (k=2)

ET3DV6- SN:1798

April 14, 2011

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1798**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

Schmid & Partner Engineering AG

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Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, <http://www.speag.com>

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1798

Place of Assessment:

Zurich

Date of Assessment:

July 13, 2011

Probe Calibration Date:

April 14, 2011

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the recalibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1750 MHz.

Assessed by:

ET3DV6-SN:1798

Page 1 of 2

July 13, 2011

Schmid & Partner Engineering AG

s p e a g

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Dosimetric E-Field Probe ET3DV6 - SN:1798

Conversion factor ($\pm$ standard deviation)

750 $\pm$ 50 MHz *ConvF* 6.94 $\pm$ 7%

$\epsilon_r = 41.9 \pm 5\%$
 $\sigma = 0.89 \pm 5\%$ mho/m
(head tissue)

750 $\pm$ 50 MHz *ConvF* 6.79 $\pm$ 7%

$\epsilon_r = 55.5 \pm 5\%$
 $\sigma = 0.96 \pm 5\%$ mho/m
(body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also DASY Manual.

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



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **HCT (Dymstec)**

Certificate No: ET3-1609_Mar12

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1609**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4**
Calibration procedure for dosimetric E-field probes

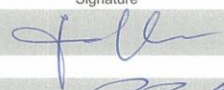
Calibration date: **March 19, 2012**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 19, 2012

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

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



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Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: SCS 108

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization ϕ	ϕ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}:** Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}:** DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR:** PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}, VR_{x,y,z}:** A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ET3DV6 – SN:1609

March 19, 2012

Probe ET3DV6

SN:1609

Manufactured: July 27, 2001
Calibrated: March 19, 2012

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

ET3DV6- SN:1609

March 19, 2012

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1609

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	2.01	1.81	1.82	± 10.1 %
DCP (mV) ^B	97.7	97.4	98.1	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	112.2	±2.2 %
			Y	0.00	0.00	1.00	107.9	
			Z	0.00	0.00	1.00	109.9	

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

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter; uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

ET3DV6- SN:1609

March 19, 2012

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1609

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	7.32	7.32	7.32	0.21	2.26	± 13.4 %
750	41.9	0.89	6.68	6.68	6.68	0.39	2.46	± 12.0 %
835	41.5	0.90	6.36	6.36	6.36	0.32	2.79	± 12.0 %
900	41.5	0.97	6.25	6.25	6.25	0.33	3.00	± 12.0 %
1450	40.5	1.20	5.48	5.48	5.48	0.44	3.00	± 12.0 %
1750	40.1	1.37	5.50	5.50	5.50	0.74	2.42	± 12.0 %
1900	40.0	1.40	5.26	5.26	5.26	0.80	2.18	± 12.0 %
1950	40.0	1.40	5.04	5.04	5.04	0.80	2.09	± 12.0 %
2450	39.2	1.80	4.52	4.52	4.52	0.80	1.90	± 12.0 %

^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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March 19, 2012

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1609

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.73	7.73	7.73	0.15	2.32	± 13.4 %
750	55.5	0.96	6.38	6.38	6.38	0.29	3.00	± 12.0 %
835	55.2	0.97	6.24	6.24	6.24	0.39	2.51	± 12.0 %
1750	53.4	1.49	4.80	4.80	4.80	0.80	2.57	± 12.0 %
1900	53.3	1.52	4.55	4.55	4.55	0.80	2.50	± 12.0 %
2450	52.7	1.95	4.01	4.01	4.01	0.70	1.23	± 12.0 %

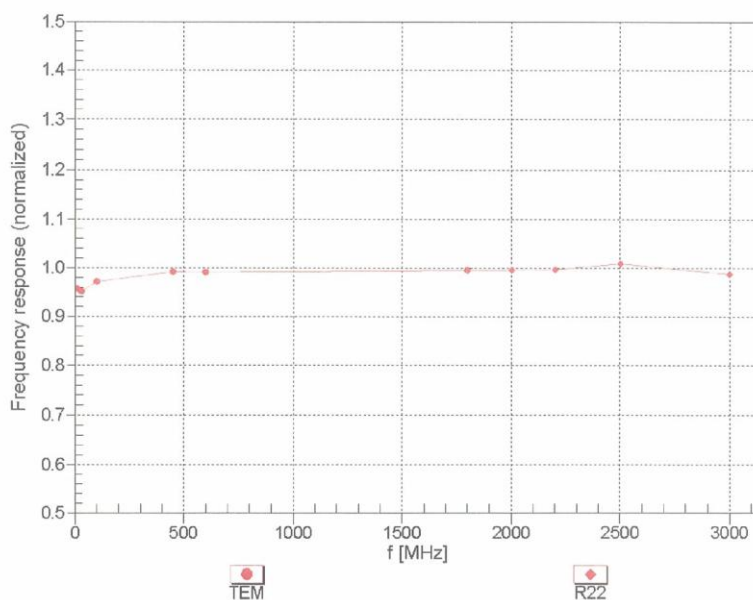
^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

ET3DV6- SN:1609

March 19, 2012

Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



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

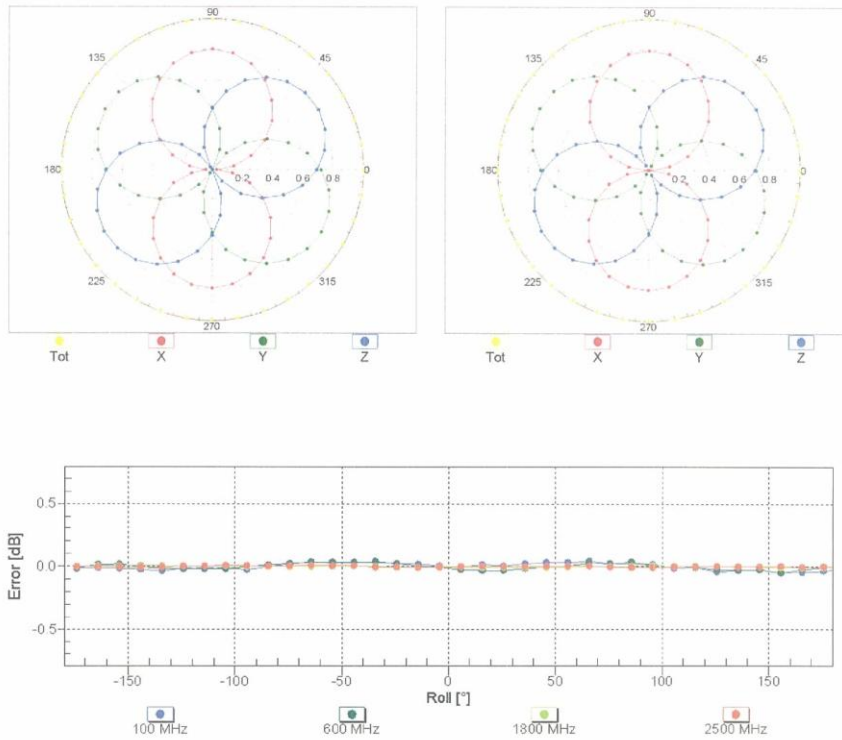
ET3DV6- SN:1609

March 19, 2012

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

f=600 MHz,TEM

f=1800 MHz,R22

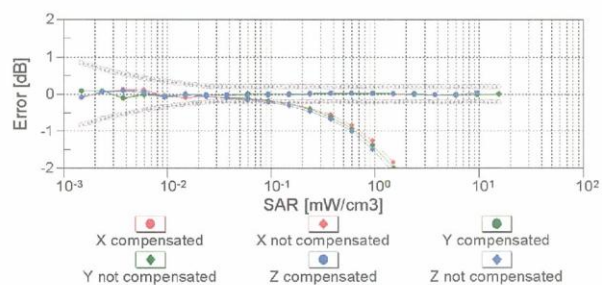
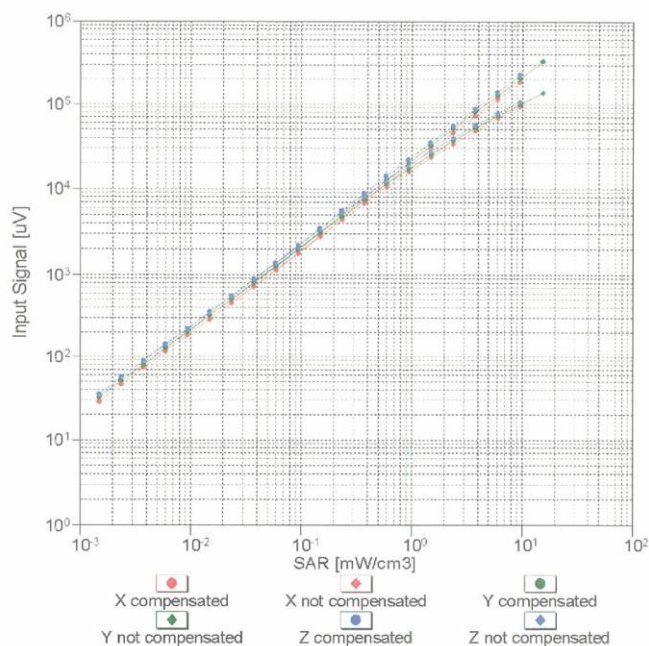


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

ET3DV6-SN:1609

March 19, 2012

Dynamic Range f(SAR_{head}) (TEM cell , f = 900 MHz)

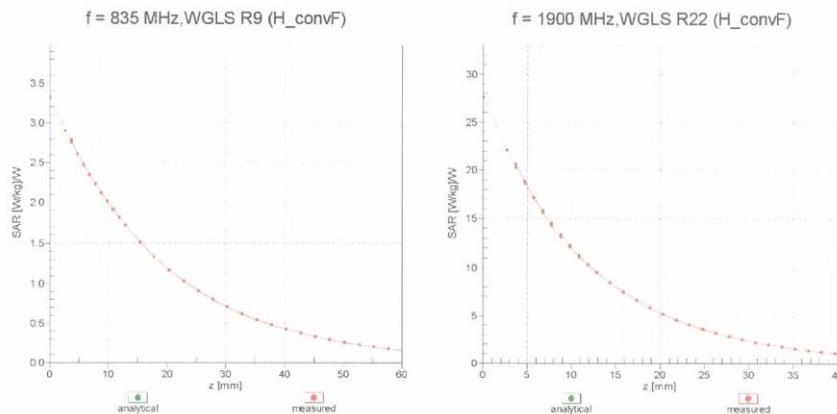


Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

ET3DV6-SN:1609

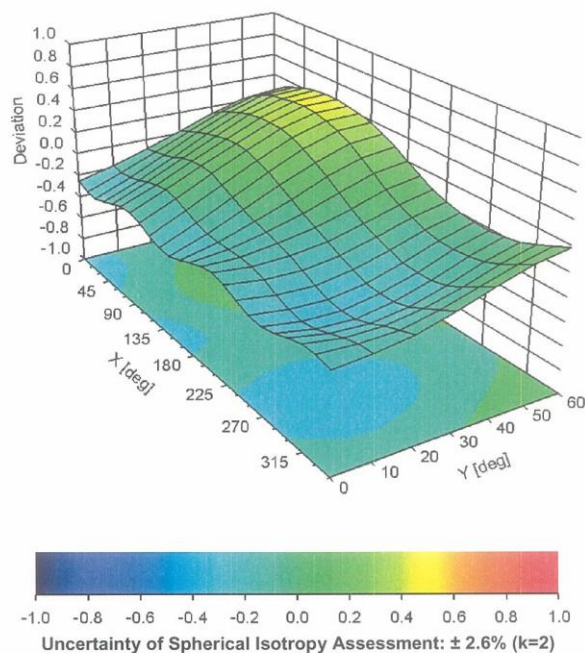
March 19, 2012

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), f = 900 MHz



ET3DV6- SN:1609

March 19, 2012

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1609**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm