

SAR TEST REPORT

HCT CO., LTD



EUT Type:	PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)	
FCC ID:	ZNFL06D	
Model:	L-06D	
Date of Issue:	Jun.13, 2012	
Test report No.:	HCTA1206FS02	
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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/m³)
 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	PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)			
FCC ID:	ZNFL06D			
Model:	L-06D			
Trade Name	LG Electronics, MobileComm U.S.A., Inc.			
Application Type	Certification			
Mode(s) of Operation	GSM1900 / 802.11a/b/g/n			
Tx Frequency	1 850.20 – 1 909.80 MHz (GSM1900) 2 412- 2 462 MHz (802.11b/g/n) 802.11a/n: 5180-5240MHz/ 5260-5320 MHz/ 5500-5700 MHz/ 5745-5825 MHz			
Rx Frequency	1 930.20 – 1 989.80 MHz (GSM1900) 2 412- 2 462 MHz (802.11b/g/n) 802.11a/n: 5180-5240MHz/ 5260-5320 MHz/ 5500-5700 MHz/ 5745-5825 MHz			
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	Hotspot
	GSM1900	0.339	0.636	0.636
	802.11b/g/n	0.457	0.064	0.064
	802.11a/n	0.123	0.061	-
Simultaneous SAR per KDB 690783 D01		0.744	0.700	0.700
Date(s) of Tests	Jun.10, 2012~ Jun.11, 2012			
Antenna Type	Integral Antenna			
GPRS	Multislot Class: 12, Mode Class: B			
Key Feature(s)	This device support Mobile Hotspot.			

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.

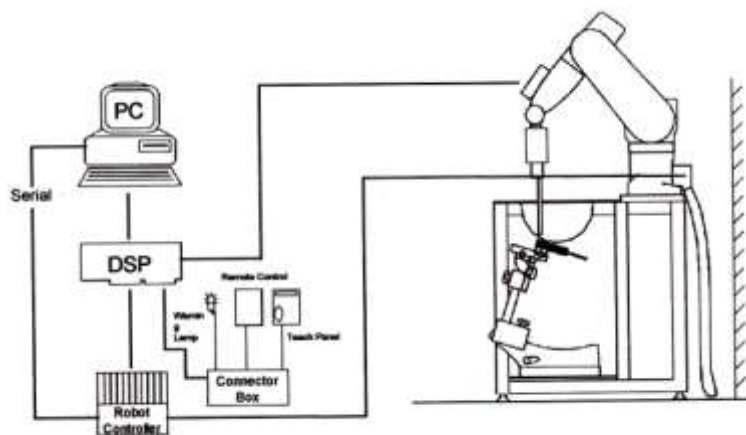


Figure 3.1 HCT SAR Lab. Test Measurement Set-up

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 EX3DV4 Probe Specification

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL 900 and HSL 1810 Additional CF for other liquids and frequencies upon request
Frequency	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones



Figure 3.1 Photograph of the probe and the Phantom



Figure 3.2 EX3DV4 E-field

The SAR measurements were conducted with the dosimetric probe EX3DV4, 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)

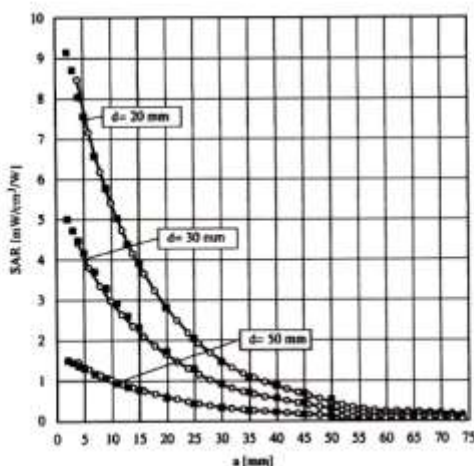


Figure 3.4 E-Field and Temperature measurements at 900 MHz

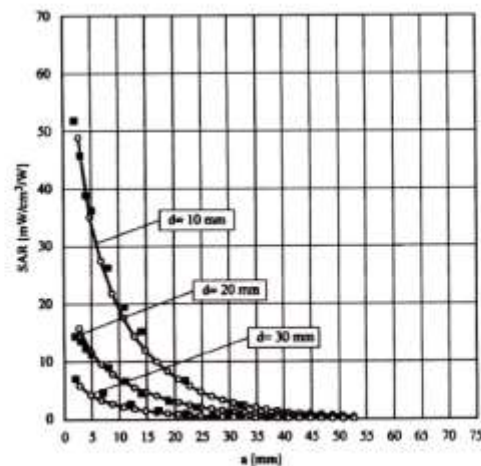


Figure 3.5 E-Field and temperature measurements at 1.8 GHz

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.

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

with P_{pwr} = 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 produce an 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)											
	750		835		915		1 900		2 450		5200-5800	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	41.2	51.7	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2	65.52	78.66
Salt (NaCl)	1.4	1.0	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04	0.0	0.0
Sugar	57	47.2	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0	0.0	0.0
HEC	0.2	0.0	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0	0.0	0.0
Bactericide	0.2	0.1	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0	0.0	0.0
Triton X-100	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0	17.24	10.67
DGBE	0.00	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7	0.0	0.0
Diethylene glycol hexyl ether											17.24	10.67

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	DAE4	869	Sep 22, 2011	Annual	Sep 22, 2012
SPEAG	DAE3	466	Feb. 21, 2012	Annual	Feb. 21, 2013
SPEAG	E-Field Probe ET3DV6	1630	Nov. 18, 2011	Annual	Nov. 18, 2012
SPEAG	E-Field Probe EX3DV4	3797	July 25, 2011	Annual	July 25, 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
SPEAG	Validation Dipole D5GHzV2	1107	Nov. 15, 2011	Annual	Nov. 15, 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

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.
5. Per KDB pub. 865664 FCC SAR Measurement requirement, a minimum volume of 24 mm x 24 mm x 20 mm was assessed by measuring 7 x 7 x 11 points for 5GHz testing.

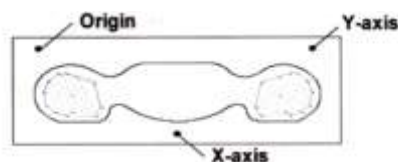


Figure 4.1 SAR Measurement Point in Area Scan

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.

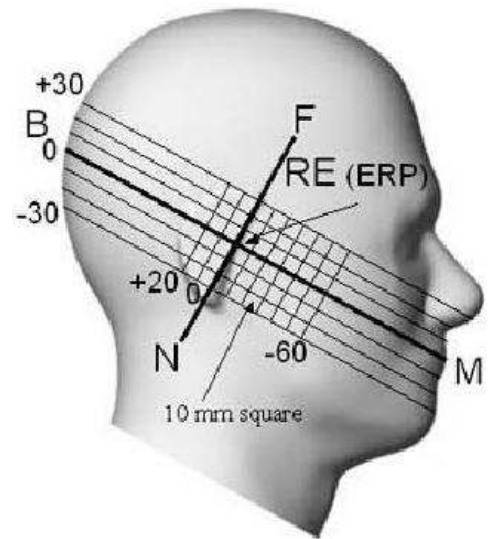


Figure 5.1 Side view of the phantom

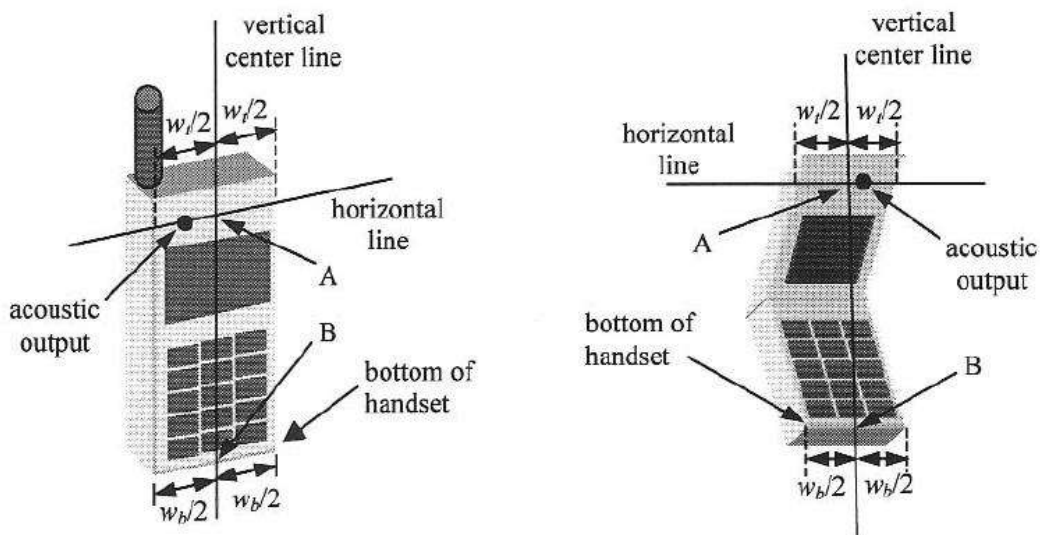


Figure 5.2 Handset vertical and horizontal reference lines

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 1.0 cm from the EUT back surface to the liquid interface is configured for the generic test.

"See the Test SET-UP Photo"

Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessory(ies), including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worstcase positioning is then documented and used to perform Body SAR testing.

6. MEASUREMENT UNCERTAINTY

Error Description	Tol (± %)	Prob. dist.	Div.	C_i	Standard Uncertainty (± %)	V_{eff}
1. Measurement System						
Probe Calibration	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)

Error Description	Tol (± %)	Prob. dist.	Div.	c_i	Standard Uncertainty (± %)	V_{eff}
1. Measurement System						
Probe Calibration	6.55	N	1	1	6.55	∞
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					11.43	
Coverage Factor for 95 %					$k = 2$	
Expanded STD Uncertainty					22.86	

Table 6.2 Uncertainty (5000-5900 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 [%]
1 900	Jun.10, 2012	Head	21.3	ϵ_r	40.0	39.8	- 0.05	± 5
				σ	1.40	1.4	0.00	± 5
Body		ϵ_r		53.3	53.7	+ 0.75	± 5	
		σ		1.52	1.5	- 1.32	± 5	
2 450	Jun.10, 2012	Head	21.3	ϵ_r	39.2	38.5	- 1.79	± 5
				σ	1.80	1.87	+ 3.89	± 5
Body		ϵ_r		52.7	51.7	- 1.90	± 5	
		σ		1.95	1.89	- 3.08	± 5	
5 200	Jun.11, 2012	Head	21.3	ϵ_r	36.0	36.6	+ 1.67	± 5
				σ	4.66	4.56	- 2.15	± 5
Body		ϵ_r		49.0	47.3	- 3.47	± 5	
		σ		5.3	5.18	- 2.26	± 5	
5 500		Head		ϵ_r	35.6	35.8	+ 0.56	± 5
				σ	4.96	4.93	- 0.60	± 5
5 500		Body		ϵ_r	48.6	46.4	- 4.53	± 5
				σ	5.65	5.51	- 2.48	± 5
5 800		Head		ϵ_r	35.3	35	- 0.85	± 5
				σ	5.27	5.33	+ 1.14	± 5
5 800		Body		ϵ_r	48.2	46	- 4.56	± 5
				σ	6.00	6.06	+ 1.00	± 5

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

8.2 System Validation

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 [%]
1 900	Jun.10, 2012	1630	Head	21.5	21.3	39.9	4.08	40.8	+ 2.26	± 10
			Body			40.9	4.13	41.3	+ 0.98	± 10
2 450	Jun.10, 2012		Head	21.5	21.3	53.8	5.34	53.4	- 0.74	± 10
			Body			51.7	5.03	50.3	- 2.71	± 10
5 200	Jun.11, 2012	3797	Head	21.5	21.3	80.3	8.08	80.8	+ 0.62	± 10
Body			21.5	21.3	77.2	7.8	78	+ 1.04	± 10	
5 500			Head	21.5	21.3	87.8	8.6	86	- 2.05	± 10
			Body	21.5	21.3	81.6	8.04	80.4	- 1.47	± 10
5 800			Head	21.5	21.3	78.9	7.98	79.8	+ 1.14	± 10
			Body	21.5	21.3	76.9	7.7	77	+ 0.13	± 10

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

8.3 System Validation Procedure

SAR measurement was prior to assessment, the system is verified to the ± 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.

9.1 GSM

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. Please refer to the below worst case SAR operation setup.

- GSM voice: Head SAR
- GPRS Multi-slots : Body SAR with GPRS Multi-slot Class12 CS 1 (GMSK)

Note;

CS1 coding scheme was used in GPRS output power measurements and SAR Testing, as a condition where GMSK modulation was ensured. Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels in the GPRS modes.

GSM Conducted output powers (Burst-Average)

Band	Channel	Voice	GPRS(GMSK) Data – CS1			
		GSM (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)
GSM 1900	512	30.18	30.16	27.84	25.78	24.84
	661	30.08	30.06	27.65	25.73	24.60
	810	29.97	29.96	27.61	25.49	24.46

GSM Conducted output powers (Frame-Average)

Band	Channel	Voice	GPRS(GMSK) Data – CS1			
		GSM (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)
GSM 1900	512	21.15	21.13	21.82	21.52	21.83
	661	21.05	21.03	21.63	21.47	21.59
	810	20.94	20.93	21.59	21.23	21.45

Note:

Time slot average factor is as follows:

1 Tx slot = 9.03 dB, Frame-Average output power = Burst-Average output power – 9.03 dB

2 Tx slot = 6.02 dB, Frame-Average output power = Burst-Average output power – 6.02 dB

3 Tx slot = 4.26 dB, Frame-Average output power = Burst-Average output power – 4.26 dB

4 Tx slot = 3.01 dB, Frame-Average output power = Burst-Average output power – 3.01 dB

9.2 WiFi

9.2.1 SAR Testing for 802.11a/b/g/n modes

General Device Setup

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

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

Frequency Channel Configurations

80.11 a/b/g and 4.9 GHz operating modes are tested independently according to the service requirements in each frequency band. 80.211 b/g modes are tested on channels 1, 6 and 11. 802.11a is tested for UNII operations on channels 36 and 48 in the 5.15-5.25 GHz band; channels 52 and 64 in the 5.25-5.35 GHz band; Channels 104, 116, 124 and 136 in the 5.470-5.725 GHz band; and channels 149 and 161 in the 5.8 GHz band. When 5.8 GHz § 15.247 is also available, channels 149, 157 and 165 should be tested instead of the UNII channels. 4.9 GHz is tested on channels 1, 10 and 5 or 6, whichever has the higher output power, for 5 MHz channels; channels 11,15 and 19 for 10 MHz channels; and channels 21 and 25 for 20 MHz channels.

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

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

Band	Channel	Conducted Power (dBm)			
		Data Rate (Mbps)			
		1	2	5.5	11
IEEE 802.11b	1	14.66	14.68	14.85	14.52
	6	14.73	14.76	14.88	14.64
	11	14.65	14.61	14.72	14.53

Average IEEE 802.11b Conducted output power

Band	Channel	Conducted Power (dBm)							
		Data Rate (Mbps)							
		6	9	12	18	24	36	48	54
IEEE 802.11g	1	11.58	11.44	11.37	11.19	10.97	10.68	10.43	10.25
	6	11.63	11.50	11.38	11.26	11.01	10.66	10.36	10.24
	11	11.55	11.45	11.32	11.18	10.84	10.56	10.27	10.15

Average IEEE 802.11g Conducted output power

Band	Channel	Conducted Power (dBm)							
		Data Rate (Mbps)							
		6.5	13	20	26	39	52	58	65
IEEE 802.11n (HT-20)	1	10.32	10.01	9.70	9.54	9.26	9.00	8.83	8.72
	6	10.22	10.02	9.92	9.66	9.40	9.10	9.02	8.82
	11	10.25	10.00	9.76	9.72	9.27	9.12	8.92	9.26

Average IEEE 802.11n Conducted output power

WLAN 5GHz Conducted Powers

802.11 a

Mode	Freq [MHz]	Channel	conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36	12.11	11.91	11.78	11.66	11.53	11.20	10.82	10.68
802.11a	5200	40	11.97	11.87	11.78	11.61	11.48	11.22	10.86	10.79
802.11a	5220	44	12.15	12.04	11.90	11.83	11.71	11.45	11.04	11.01
802.11a	5240	48	11.89	11.65	11.51	11.30	11.05	10.66	10.47	10.37
802.11a	5260	52	11.92	11.54	11.33	11.18	11.05	10.81	10.49	10.37
802.11a	5280	56	11.99	11.82	11.68	11.52	11.39	11.31	10.98	10.92
802.11a	5300	60	11.94	11.53	11.48	11.29	11.16	10.90	10.61	10.36
802.11a	5320	64	11.78	11.55	11.40	11.18	11.10	10.80	10.50	10.45
802.11a	5500	100	11.69	11.48	11.27	11.09	10.92	10.66	10.35	10.14
802.11a	5520	104	11.70	11.62	11.50	11.37	11.29	11.10	10.81	10.72
802.11a	5540	108	11.92	11.80	11.66	11.54	11.42	11.19	10.97	10.85
802.11a	5560	112	11.83	11.73	11.58	11.49	11.38	11.11	10.92	10.79
802.11a	5580	116	11.54	11.44	11.30	11.18	11.09	10.88	10.70	10.55
802.11a	5600	120	11.34	11.05	10.89	10.76	10.61	10.32	10.05	9.94
802.11a	5620	124	11.4	11.28	11.11	10.99	10.89	10.73	10.51	10.42
802.11a	5640	128	11.42	11.33	11.15	10.99	10.91	10.78	10.55	10.49
802.11a	5660	132	11.19	11.07	10.96	10.82	10.78	10.51	10.29	10.11
802.11a	5680	136	11.17	11.04	10.89	10.80	10.69	10.58	10.31	10.15
802.11a	5700	140	11.21	10.80	10.55	10.46	10.30	9.95	9.63	9.50
802.11a	5745	149	11.00	10.88	10.85	10.65	10.50	10.19	9.88	9.76
802.11a	5765	153	10.57	10.5	10.45	10.14	10.03	9.90	9.57	9.51
802.11a	5785	157	10.94	10.90	10.77	10.56	10.34	10.12	9.82	9.72
802.11a	5805	161	10.47	10.36	10.41	10.22	10.02	9.76	9.39	9.26
802.11a	5825	165	10.90	10.90	10.79	10.60	10.51	10.20	9.95	9.83

802.11 n

Mode	Freq [MHz]	Channe l	conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	20	26	39	52	58	65
802.11n	5180	36	11.10	10.76	10.70	10.54	10.26	9.98	9.65	9.57
802.11n	5200	40	10.76	10.56	1.038	10.15	9.96	9.72	9.65	9.43
802.11n	5220	44	11.25	11.09	10.78	10.58	10.36	10.09	9.99	9.90
802.11n	5240	48	10.70	10.44	10.24	9.98	9.69	9.40	9.41	9.33
802.11n	5260	52	10.9	10.79	10.26	10.13	9.75	9.51	9.31	9.31
802.11n	5280	56	10.95	10.81	10.75	10.63	10.54	10.11	9.97	9.88
802.11n	5300	60	10.79	10.69	10.19	10.05	9.82	9.49	9.38	9.14
802.11n	5320	64	10.73	10.46	10.13	9.92	9.55	9.26	9.18	9.10
802.11n	5500	100	10.77	10.48	10.29	10.17	9.86	9.68	9.55	9.29
802.11n	5520	104	10.70	10.62	10.50	10.37	10.22	10.08	9.91	9.78
802.11n	5540	108	10.84	10.71	10.59	10.45	10.33	10.18	10.04	9.95
802.11n	5560	112	10.41	10.27	10.19	10.08	9.99	9.88	9.81	9.69
802.11n	5580	116	10.28	10.14	10.01	9.89	9.77	9.63	9.50	9.38
802.11n	5600	120	10.30	10.14	9.99	9.74	9.44	9.16	9.05	8.97
802.11n	5620	124	10.13	10.02	9.87	9.79	9.64	9.57	9.41	9.29
802.11n	5640	128	10.29	10.16	10.03	9.90	9.77	9.68	9.55	9.48
802.11n	5660	132	10.04	9.91	9.77	9.71	9.54	9.39	9.32	9.20
802.11n	5680	136	10.08	9.99	9.90	9.79	9.57	9.50	9.44	9.32
802.11n	5700	140	10.11	9.89	9.80	9.64	9.26	8.90	8.84	8.72
802.11n	5745	149	9.96	9.76	9.53	9.32	9.04	8.82	8.67	8.61
802.11n	5765	153	9.62	9.45	9.28	9.16	8.84	8.56	8.43	8.31
802.11n	5785	157	9.78	9.63	9.42	9.26	9.06	8.78	8.67	8.59
802.11n	5805	161	9.30	9.12	8.99	8.80	8.58	8.37	8.24	8.05
802.11n	5825	165	9.89	9.78	9.55	9.29	8.99	8.74	8.60	8.51

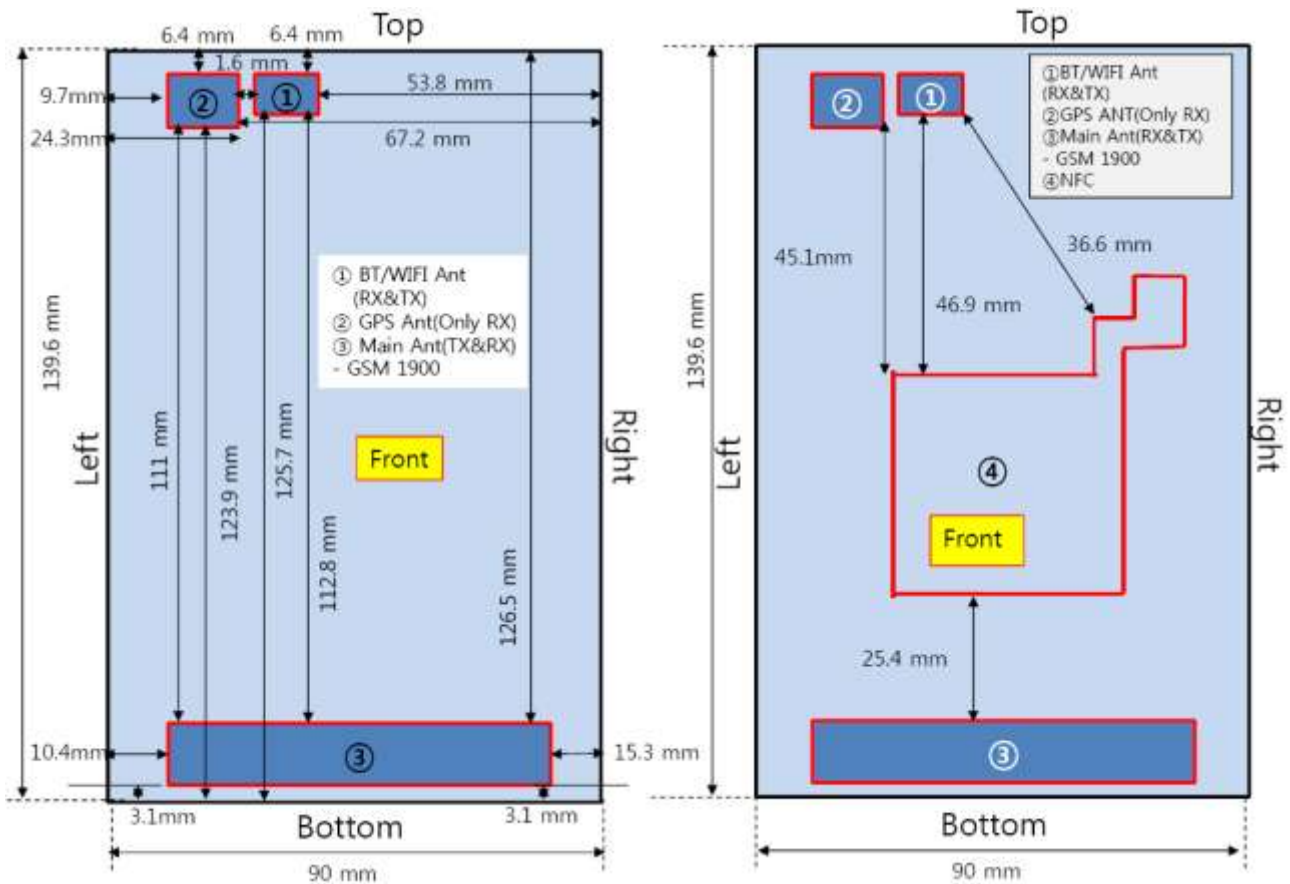
Note;
SAR testing was performed according to the FCC KDB 248227.

10. SAR Test configuration & Antenna Information

10.1 SAR Test configurations

Mode	Back	Front	Left	Right	Bottom	Top
1900 GPRS	Yes	Yes	Yes	Yes	Yes	No
2.4 GHz	Yes	Yes	Yes	No	No	Yes

10.2 Antenna and Device Information



[Front side View]

Note;

Per FCC KDB Publication 941225 D06, we performed the SAR testing at 1 cm from the top & bottom surfaces and also from side edges with a transmitting antenna ≤ 2.5 cm from an edge.

10.3 SAR Test configurations

Head Operation			
Mode	Tx(MHz)	Main ANT	BT/WLAN ANT
GSM Voice	1900	Yes	No
Wi-Fi 2.4/ 5 GHz	2400/5000	No	Yes
BT	2400	No	No

Body-worn Operation			
Mode	Tx(MHz)	Main ANT	BT/WLAN ANT
GPRS Data	1900	Yes	No
Wi-Fi 2.4/ 5 GHz	2400/5000	No	Yes
BT	2400	No	No

Wireless Router/ Hotspot Operation			
Separation Distance = 1 cm			
Mode	Tx(MHz)	Main ANT	BT/WLAN ANT
GPRS Data+Wi-Fi 2.4 GHz	1900/2400	Yes	Yes

11. SAR Considerations for Multiple Transmitters and Antennas

11.1 SAR Evaluation Considerations

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

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

Table. 11.1 Output Power Thresholds for Unlicensed Transmitters

	Individual Transmitter	Simultaneous Transmission
Licensed Transmitters	<u>Routine evaluation required</u>	SAR not required: <u>Unlicensed only</u>
Unlicensed Transmitters	<p><u>When there is no simultaneous transmission –</u></p> <ul style="list-style-type: none"> o output $\leq 60/f$: SAR not required o output $> 60/f$: stand-alone SAR required <p><u>When there is simultaneous transmission –</u></p> <p><u>Stand-alone SAR not required when</u></p> <ul style="list-style-type: none"> o output $\leq 2 \cdot P_{Ref}$ and antenna is ≥ 5.0 cm from other antennas o output $\leq P_{Ref}$ and antenna is ≥ 2.5 cm from other antennas o 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 <p><u>Otherwise stand-alone SAR is required</u></p> <p><u>When stand-alone SAR is required</u></p> <ul style="list-style-type: none"> o test SAR on highest output channel for each wireless mode and exposure condition o if SAR for highest output channel is $> 50\%$ of SAR limit, evaluate all channels according to normal procedures 	<ul style="list-style-type: none"> o when stand-alone 1-g SAR is not required and antenna is ≥ 5 cm from other antennas <p><u>Licensed & Unlicensed</u></p> <ul style="list-style-type: none"> o when the sum of the 1-g SAR is < 1.6 W/kg for all simultaneous transmitting antennas o when SAR to peak location separation ratio of simultaneous transmitting antenna pair is < 0.3 <p>SAR required:</p> <p><u>Licensed & Unlicensed</u></p> <p>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</p> <p>Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply</p>
Jaw, Mouth and Nose	<p><u>Flat phantom SAR required</u></p> <ul style="list-style-type: none"> o 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 o 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: ZNFL06D

BT Max. RF output power: 3.43 dBm (2.20 mW)

11.2 SAR Summation Scenario

All Simultaneous case

No.	Capable TX Configuration	Head SAR	Body-worn SAR	Hotspot SAR	Power Reduction	Note
1	GSM1900 Voice	O	O	x	x	Stand-alone GSM1900 Voice
2	Wi-Fi 2.4 GHz	O	O	x	x	Stand-alone Wi-Fi 2.4 GHz
3	Wi-Fi 5 GHz	O	O	x	x	Stand-alone Wi-Fi 5 GHz
4	BT	x	x	x	x	N/A
5	GPRS1900 Data + Wi-Fi 2.4 GHz data	x	O	O	x	Wi-Fi Hotspot 2.4GHz
6	GPRS1900 Data + Wi-Fi 5 GHz data	x	O	x	x	Wi-Fi 5 GHz

* BT and WLAN are not simultaneous transmission.
* Hotspot support (GPRS).

Simultaneous Transmission Summation for Held to Ear

Simultaneous TX	configuration	1900 GSM SAR(W/kg)	WIFI SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Left Cheek	0.339	0.405	0.744
	Left Tilt	0.093	0.339	0.432
	Right Cheek	0.183	0.457	0.640
	Right Tilt	0.137	0.394	0.531

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

Simultaneous TX	configuration	1900 GSM SAR(W/kg)	5G WIFI SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Left Cheek	0.339	0.107	0.446
	Left Tilt	0.093	0.073	0.166
	Right Cheek	0.183	0.123	0.306
	Right Tilt	0.137	0.122	0.259

The above tables represent a held to ear voice call with 5 GHz WLAN.

Simultaneous TX	configuration	1900 GPRS SAR(W/kg)	2.4 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.636	0.064	0.700

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

Simultaneous TX	configuration	1900 GPRS SAR(W/kg)	5 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.636	0.061	0.697

The above tables represent a body-worn call with 5 GHz WLAN.

Simultaneous TX	configuration	1900 GPRS SAR(W/kg)	2.4GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.636	0.064	0.700
	Front	0.508	0.056	0.564
	Left	0.327	0.0462	0.373
	Right	0.109	-	0.109
	Bottom	0.61	-	0.610
	Top	-	0.041	0.041

The above tables represent a portable hotspot condition.

Note;

Body-Worn SAR : The Rear side hotspot SAR test configurations can be considered for body-worn accessory SAR. Although body-worn accessory conditions are typically for voice configurations, the GPRS slot frame averaged output power was more conservative and was included for the body-worn accessory SAR assessment.

11.3 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 less than $2 \cdot P_{ref}$, the BT antenna is more than 5 cm from the other antenna, therefore, a stand-alone BT SAR evaluation is not required.

12. SAR TEST DATA SUMMARY

12.1 Measurement Results (GSM1900 Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	SAR(mW/g)
MHz	Channel						
1 880.0	661 (Mid)	GSM1900	30.08	0.077	Standard	Left Ear	0.339
			30.08	0.041	Standard	Left Tilt 15°	0.093
			30.08	-0.079	Standard	Right Ear	0.183
			30.08	-0.068	Standard	Right Tilt 15°	0.137
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg (mW/g) Averaged over 1 gram	

NOTES:

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

12.2 Measurement Results (802.11b/g/n Head)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Data Rate	SAR(mW/g)
MHz	Channel							
2437	6 (Mid)	802.11b	14.73	0.073	Standard	Left Ear	1 Mbps	0.405
2437	6 (Mid)	802.11b	14.73	-0.038	Standard	Left Tilt 15°	1 Mbps	0.339
2437	6 (Mid)	802.11b	14.73	0.096	Standard	Right Ear	1 Mbps	0.457
2437	6 (Mid)	802.11b	14.73	0.043	Standard	Right Tilt 15	1 Mbps	0.394
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg (mW/g) Averaged over 1 gram		

NOTES:

- 1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- 2 All modes of operation were investigated and the worst-case are reported.
- 3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- 4 Tissue parameters and temperatures are listed on the SAR plot.
- 5 Battery Type Standard Extended Slim
Batteries are fully charged for all readings.
- 6 Test Signal Call Mode Manual Test cord Base Station Simulator
- 7 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.
- 8 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.

12.3 Measurement Results (802.11a/n 5GHz Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Data Rate	SAR(mW/g)
MHz	Channel							
5 180	36	802.11a	12.11	0.002	Standard	Left Ear	6Mbps	0.107
5 180	36	802.11a	12.11	0.119	Standard	Left Tilt 15°	6Mbps	0.065
5 180	36	802.11a	12.11	-0.09	Standard	Right Ear	6Mbps	0.102
5 180	36	802.11a	12.11	0.037	Standard	Right Tilt 15	6Mbps	0.096
5 300	60	802.11a	11.94	0.080	Standard	Left Ear	6Mbps	0.082
5 300	60	802.11a	11.94	0.094	Standard	Left Tilt 15°	6Mbps	0.048
5 300	60	802.11a	11.94	-0.068	Standard	Right Ear	6Mbps	0.123
5 300	60	802.11a	11.94	-0.082	Standard	Right Tilt 15	6Mbps	0.122
5 500	100	802.11a	11.69	0.083	Standard	Left Ear	6Mbps	0.048
5 500	100	802.11a	11.69	0.076	Standard	Left Tilt 15°	6Mbps	0.073
5 500	100	802.11a	11.69	-0.068	Standard	Right Ear	6Mbps	0.073
5 500	100	802.11a	11.69	0.164	Standard	Right Tilt 15	6Mbps	0.064
5 745	149	802.11a	11.00	-0.021	Standard	Left Ear	6Mbps	0.063
5 745	149	802.11a	11.00	0.092	Standard	Left Tilt 15°	6Mbps	0.063
5 745	149	802.11a	11.00	0.068	Standard	Right Ear	6Mbps	0.094
5 745	149	802.11a	11.00	0.055	Standard	Right Tilt 15	6Mbps	0.067
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg (mW/g) <small>Averaged over 1 gram</small>		

NOTES:

- 1 The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- 2 All modes of operation were investigated and the worst-case are reported.
- 3 Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- 4 Tissue parameters and temperatures are listed on the SAR plot.
- 5 Battery Type Standard Extended Slim
Batteries are fully charged for all readings.
- 6 Test Signal Call Mode Manual Test cord Base Station Simulator
- 7 Highest average RF output power channel for the lowest data rate were selected for SAR testing. IEEE 802.11(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 802.11a.
- 8 When Hotspot is enabled, 5 GHz Bands are disabled

12.4 Measurement Results (GSM1900 Hotspot SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
1 880.0	661 (Mid)	GPRS 4Tx	24.60	-0.024	Rear	1.0 cm	0.636
1 880.0	661 (Mid)	GPRS 4Tx	24.60	-0.014	Front	1.0 cm	0.508
1 880.0	661 (Mid)	GPRS 4Tx	24.60	0.023	Left	1.0 cm	0.327
1 880.0	661 (Mid)	GPRS 4Tx	24.60	-0.023	Right	1.0 cm	0.109
1 880.0	661 (Mid)	GPRS 4Tx	24.60	-0.018	Bottom	1.0 cm	0.610
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 ± 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).
- For body SAR testing, the EUT was set in GPRS multi-slot class12 with 4uplink slots for GSM1900 due to maximum source-based time-averaged output power.
According to the KDB 941225 D03 SAR test reduction GSM/GPRS/EDGE, the maximum output power configuration were chosen for Body SAR testing.

12.5 Measurement Results (802.11b/g/n Hotspot SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	Data Rate	SAR(mW/g)
MHz	Channel							
2437	6 (Mid)	802.11b	14.73	0.059	Rear	1.0 cm	1 Mbps	0.064
2437	6 (Mid)	802.11b	14.73	0.117	Front	1.0 cm	1 Mbps	0.056
2437	6 (Mid)	802.11b	14.73	-0.42	Left	1.0 cm	1 Mbps	0.00462
2437	6 (Mid)	802.11b	14.73	-0.058	Top	1.0 cm	1 Mbps	0.041
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Body 1.6 W/kg (mW/g) <small>Averaged over 1 gram</small>		

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 ± 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
- 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.

12.6 Measurement Results (802.11a/n 5GHz Body-Worn)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	Data Rate	SAR(mW/g)
MHz	Channel							
5 180	36	802.11a	12.11	-0.076	Rear	1.0 cm	6Mbps	0.044
5 300	60	802.11a	11.94	-0.024	Rear	1.0 cm	6Mbps	0.061
5 500	100	802.11a	11.69	-0.094	Rear	1.0 cm	6Mbps	0.021
5 745	149	802.11a	11.00	-0.06	Rear	1.0 cm	6Mbps	0.025
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-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
- Highest average RF output power channel for the lowest data rate were selected for SAR testing. IEEE 802.11(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 802.11a.
- When Hotspot is enabled, 5 GHz Bands are disabled

13. CONCLUSION

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

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

14. REFERENCE

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Attachment 1. – SAR Test Plots

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

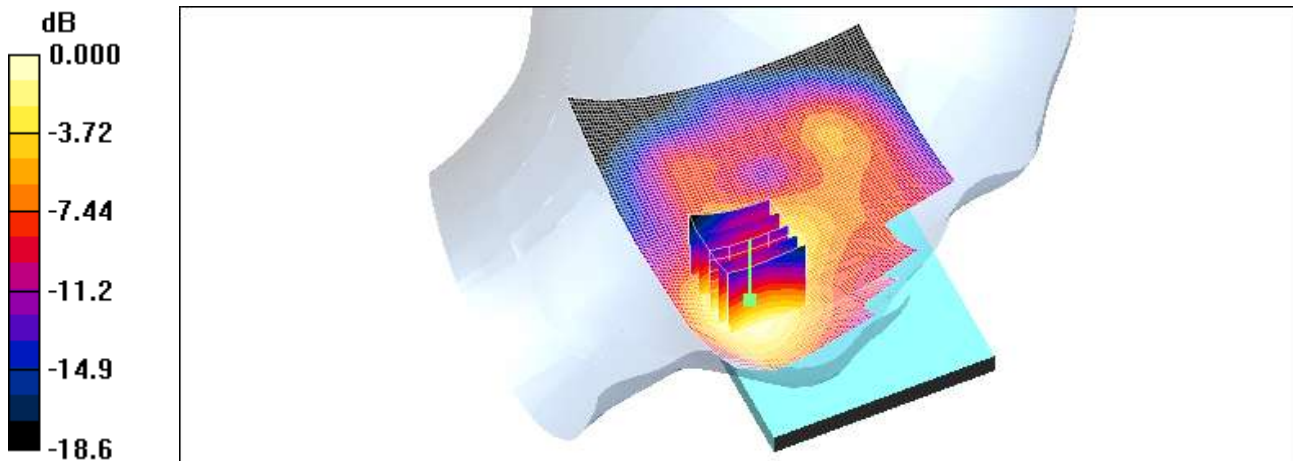
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 39.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

Left touch 661/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.367 mW/g

Left touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.58 V/m; Power Drift = 0.077 dB
Peak SAR (extrapolated) = 0.535 W/kg
SAR(1 g) = 0.339 mW/g; SAR(10 g) = 0.205 mW/g
Maximum value of SAR (measured) = 0.359 mW/g



0 dB = 0.359mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

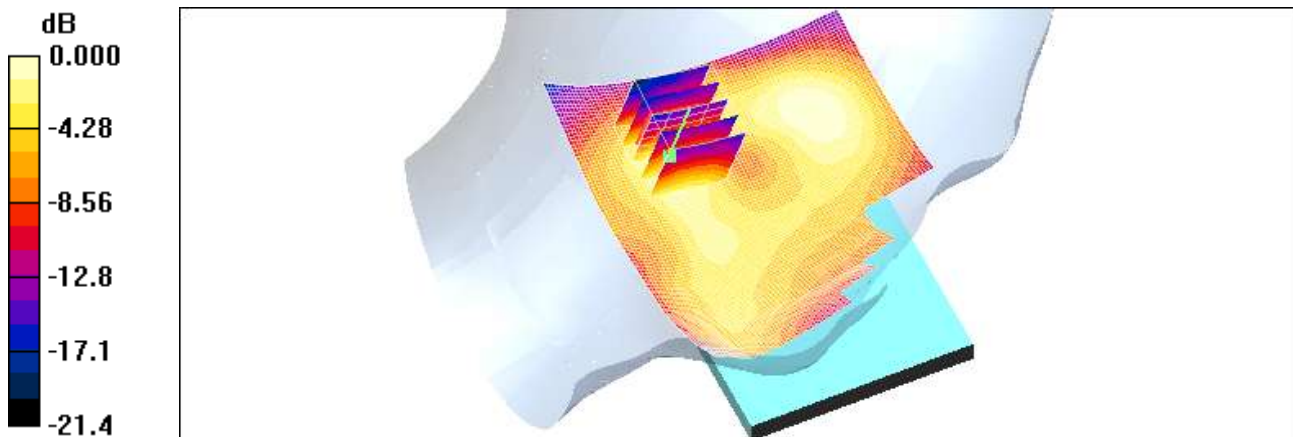
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 39.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

Left tilt 661/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.107 mW/g

Left tilt 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.65 V/m; Power Drift = 0.041 dB
Peak SAR (extrapolated) = 0.165 W/kg
SAR(1 g) = 0.093 mW/g; SAR(10 g) = 0.050 mW/g
Maximum value of SAR (measured) = 0.104 mW/g



0 dB = 0.104mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

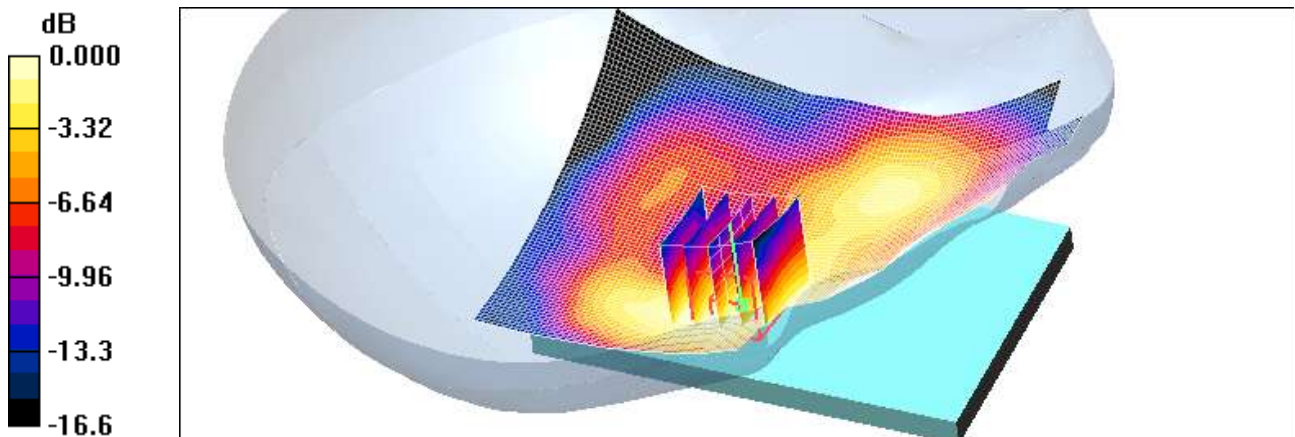
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 39.9$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

Right touch 661/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.197 mW/g

Right touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.73 V/m; Power Drift = -0.079 dB
Peak SAR (extrapolated) = 0.279 W/kg
SAR(1 g) = 0.183 mW/g; SAR(10 g) = 0.115 mW/g
Maximum value of SAR (measured) = 0.195 mW/g



0 dB = 0.195mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

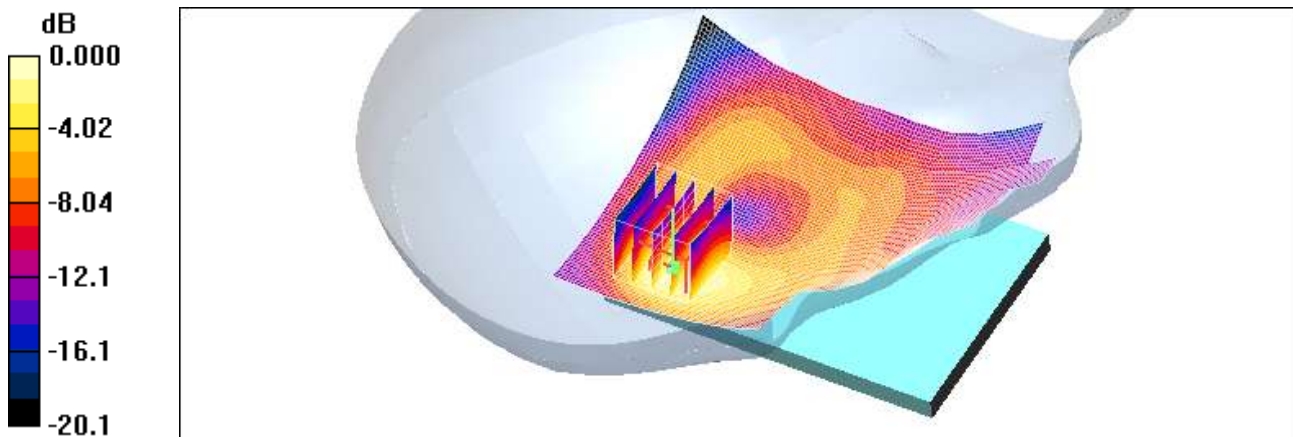
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 39.9$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

Right tilt 661/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.163 mW/g

Right tilt 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.79 V/m; Power Drift = -0.068 dB
Peak SAR (extrapolated) = 0.231 W/kg
SAR(1 g) = 0.137 mW/g; SAR(10 g) = 0.075 mW/g
Maximum value of SAR (measured) = 0.152 mW/g



0 dB = 0.152mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.86$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 1800/1900 Phantom; Type: SAM

Left touch 6ch 1Mbps/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.428 mW/g

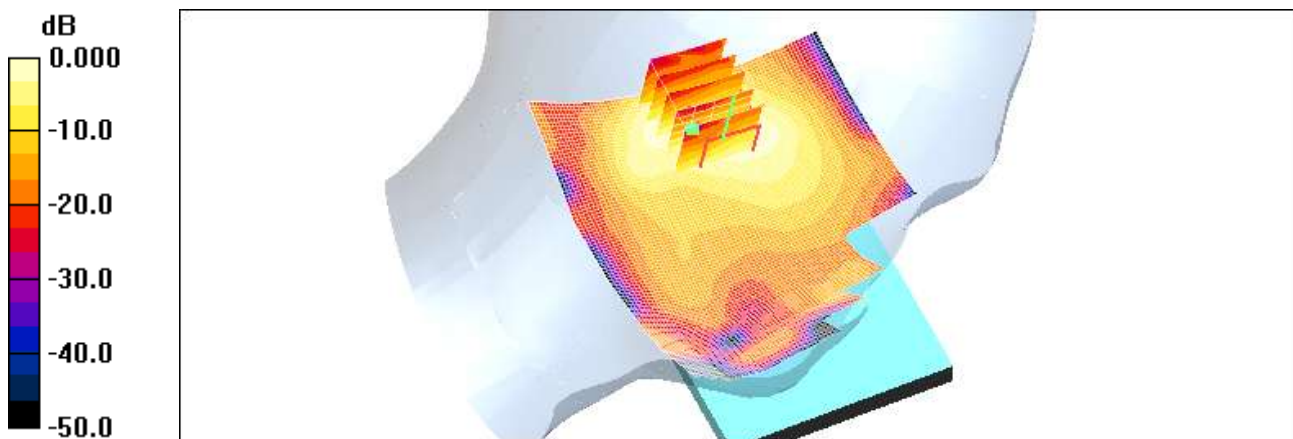
Left touch 6ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.2 V/m; Power Drift = 0.073 dB

Peak SAR (extrapolated) = 0.891 W/kg

SAR(1 g) = 0.405 mW/g; SAR(10 g) = 0.195 mW/g

Maximum value of SAR (measured) = 0.430 mW/g



0 dB = 0.430mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.86$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 1800/1900 Phantom; Type: SAM

Left tilt 6ch 1Mbps/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.369 mW/g

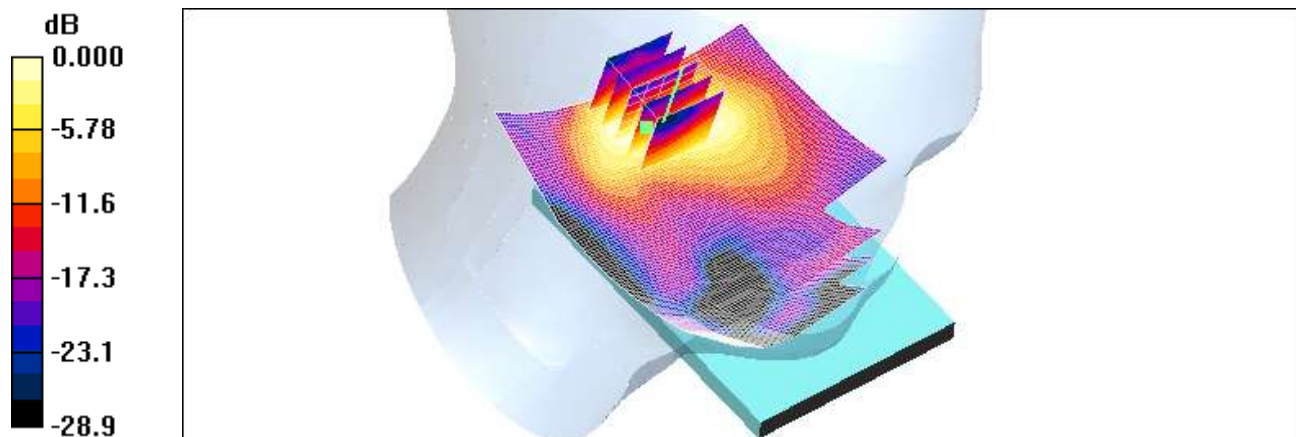
Left tilt 6ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.1 V/m; Power Drift = -0.038 dB

Peak SAR (extrapolated) = 0.758 W/kg

SAR(1 g) = 0.339 mW/g; SAR(10 g) = 0.163 mW/g

Maximum value of SAR (measured) = 0.362 mW/g



0 dB = 0.362mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.86$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 1800/1900 Phantom; Type: SAM

Right touch 6ch 1Mbps/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.504 mW/g

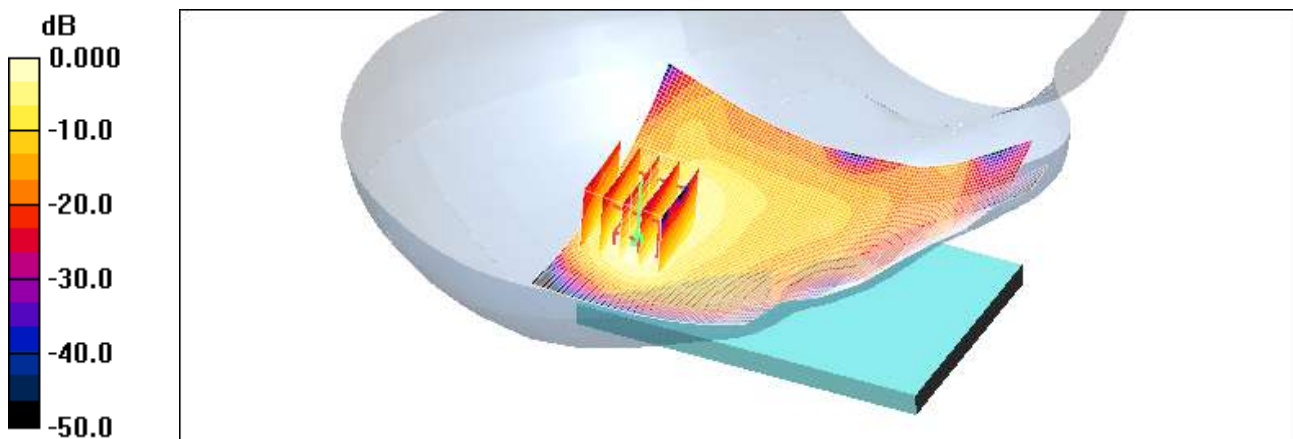
Right touch 6ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.3 V/m; Power Drift = 0.096 dB

Peak SAR (extrapolated) = 1.27 W/kg

SAR(1 g) = 0.457 mW/g; SAR(10 g) = 0.196 mW/g

Maximum value of SAR (measured) = 0.497 mW/g



0 dB = 0.497mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.86$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 1800/1900 Phantom; Type: SAM

Right tilt 6ch 1Mbps/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.504 mW/g

Right tilt 6ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

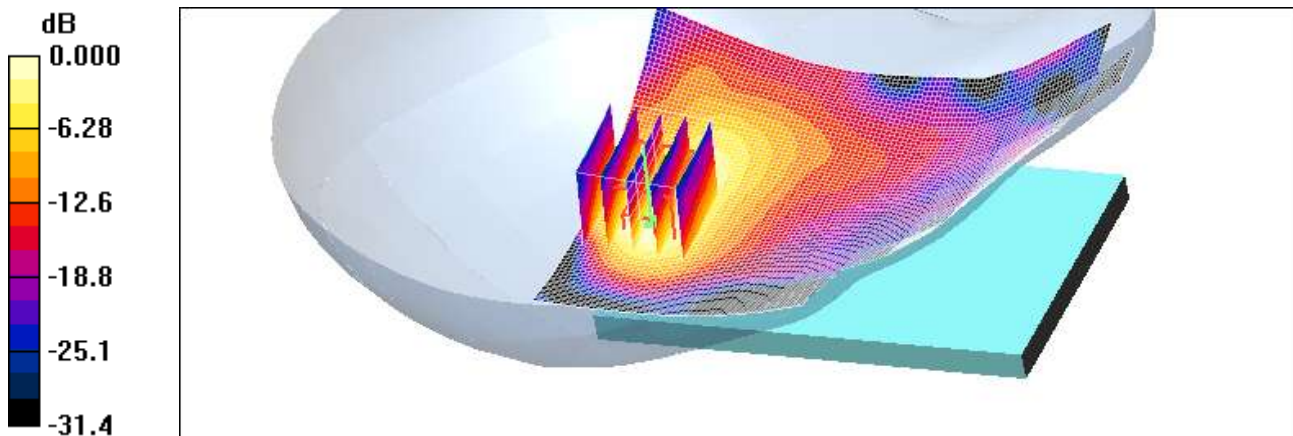
Reference Value = 14.1 V/m; Power Drift = 0.043 dB

Peak SAR (extrapolated) = 1.04 W/kg

SAR(1 g) = 0.394 mW/g; SAR(10 g) = 0.173 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.430 mW/g



0 dB = 0.430mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5180 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5180$ MHz; $\sigma = 4.55$ mho/m; $\epsilon_r = 36.5$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.73, 4.73, 4.73); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Left touch 36ch 6Mbps/Area Scan (101x161x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.158 mW/g

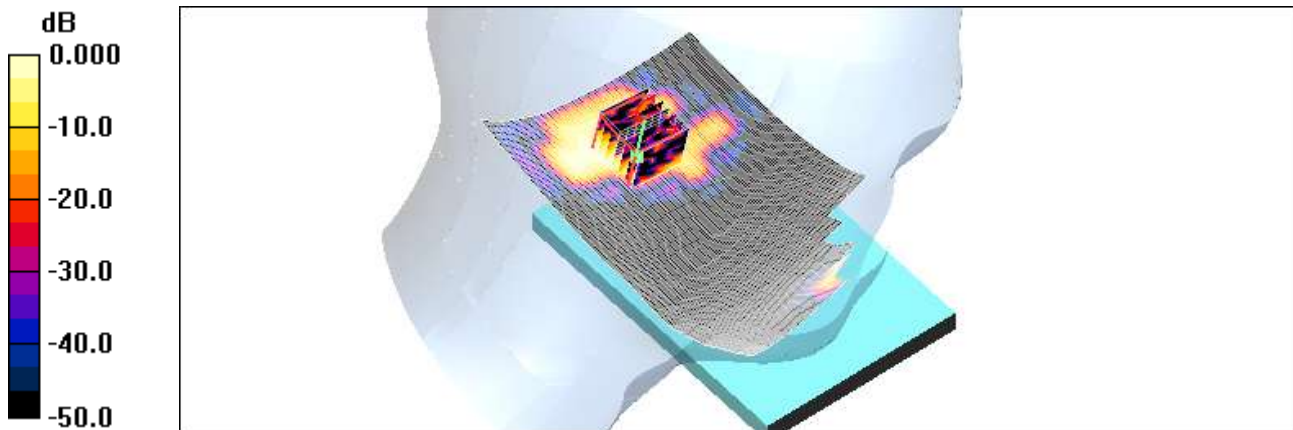
802.11a Left touch 36ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 5.10 V/m; Power Drift = 0.002 dB

Peak SAR (extrapolated) = 0.350 W/kg

SAR(1 g) = 0.107 mW/g; SAR(10 g) = 0.029 mW/g

Maximum value of SAR (measured) = 0.126 mW/g



0 dB = 0.126mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5180 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5180$ MHz; $\sigma = 4.55$ mho/m; $\epsilon_r = 36.5$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.73, 4.73, 4.73); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Left tilt 36ch 6Mbps/Area Scan (101x161x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.138 mW/g

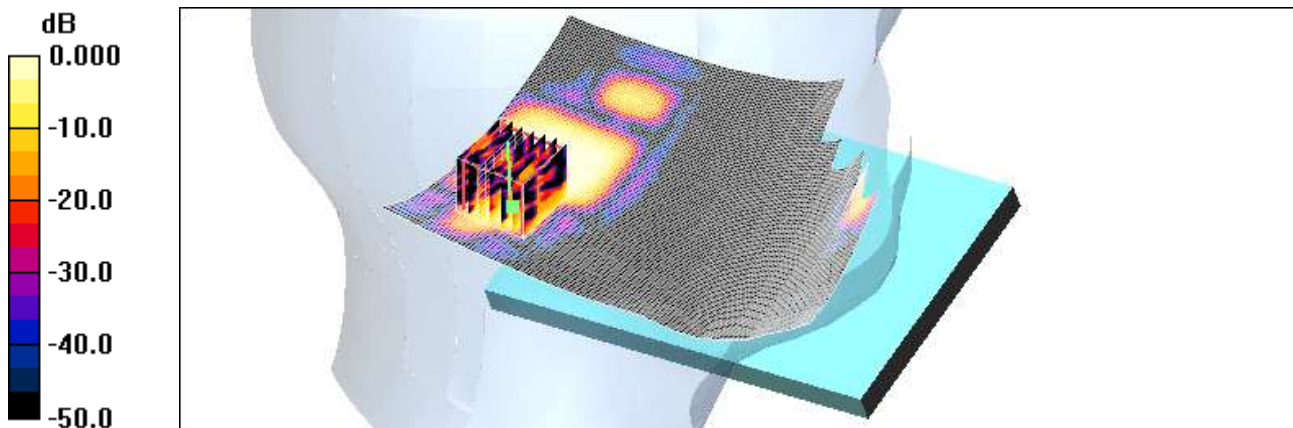
802.11a Left tilt 36ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 4.36 V/m; Power Drift = 0.119 dB

Peak SAR (extrapolated) = 0.198 W/kg

SAR(1 g) = 0.065 mW/g; SAR(10 g) = 0.021 mW/g

Maximum value of SAR (measured) = 0.081 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5180 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5180$ MHz; $\sigma = 4.55$ mho/m; $\epsilon_r = 36.5$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.73, 4.73, 4.73); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Right touch 36ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.254 mW/g

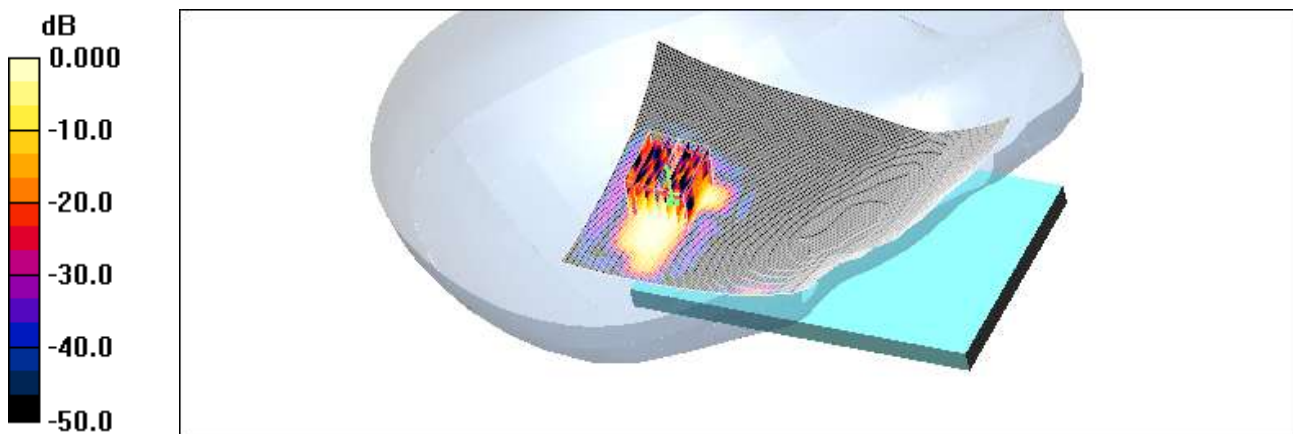
802.11a Right touch 36ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 4.09 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.315 W/kg

SAR(1 g) = 0.102 mW/g; SAR(10 g) = 0.030 mW/g

Maximum value of SAR (measured) = 0.119 mW/g



0 dB = 0.119mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5180 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5180$ MHz; $\sigma = 4.55$ mho/m; $\epsilon_r = 36.5$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.73, 4.73, 4.73); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Right tilt 36ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.146 mW/g

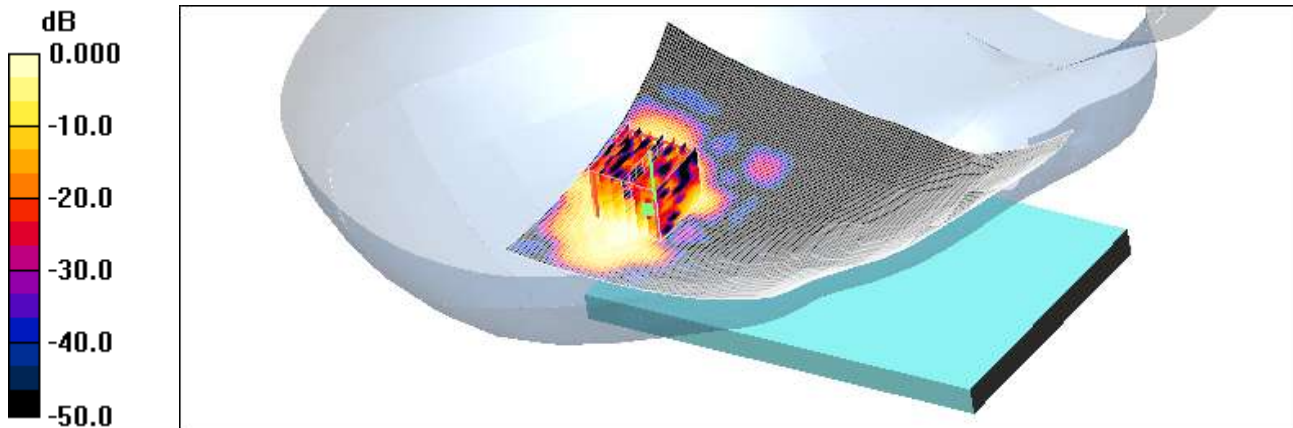
802.11a Right tilt 36ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 3.55 V/m; Power Drift = 0.037 dB

Peak SAR (extrapolated) = 0.319 W/kg

SAR(1 g) = 0.096 mW/g; SAR(10 g) = 0.030 mW/g

Maximum value of SAR (measured) = 0.119 mW/g



0 dB = 0.119mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

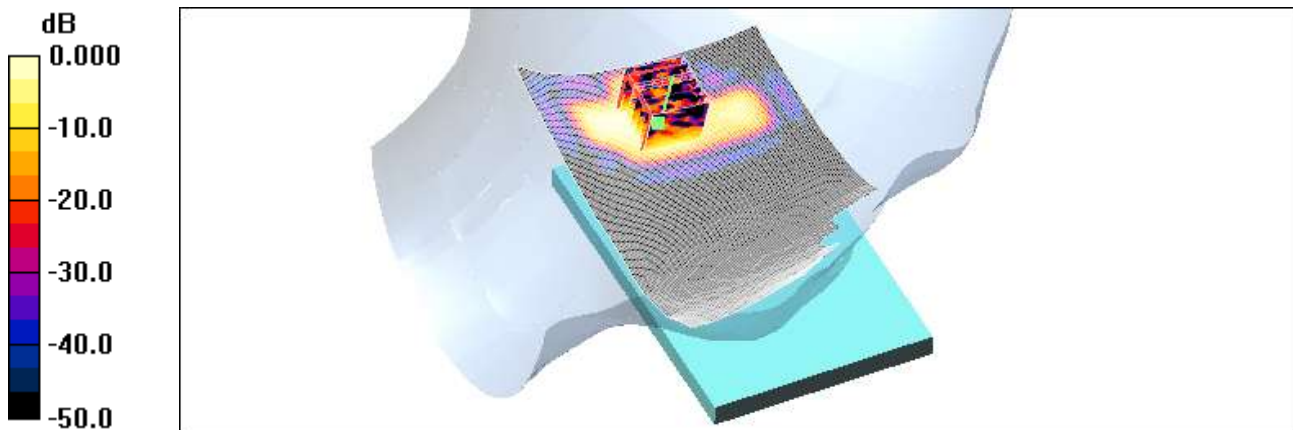
Communication System: WIFI 5GHz; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5300 \text{ MHz}$; $\sigma = 4.71 \text{ mho/m}$; $\epsilon_r = 36.3$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.44, 4.44, 4.44); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Left touch 60ch 6Mbps/Area Scan (101x151x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$
Maximum value of SAR (interpolated) = 0.098 mW/g

802.11a Left touch 60ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2\text{mm}$
Reference Value = 3.30 V/m; Power Drift = 0.080 dB
Peak SAR (extrapolated) = 0.677 W/kg
SAR(1 g) = 0.082 mW/g; SAR(10 g) = 0.030 mW/g
Maximum value of SAR (measured) = 0.098 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

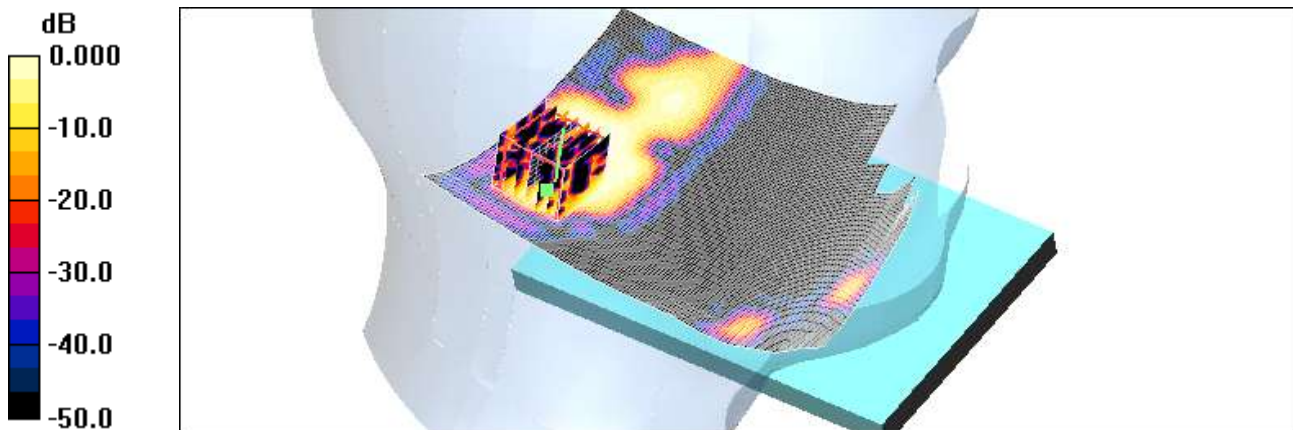
Communication System: WIFI 5GHz; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium parameters used: $f = 5300$ MHz; $\sigma = 4.71$ mho/m; $\epsilon_r = 36.3$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.44, 4.44, 4.44); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Left tilt 60ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.143 mW/g

802.11a Left tilt 60ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.37 V/m; Power Drift = 0.094 dB
Peak SAR (extrapolated) = 0.197 W/kg
SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.016 mW/g
Maximum value of SAR (measured) = 0.061 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

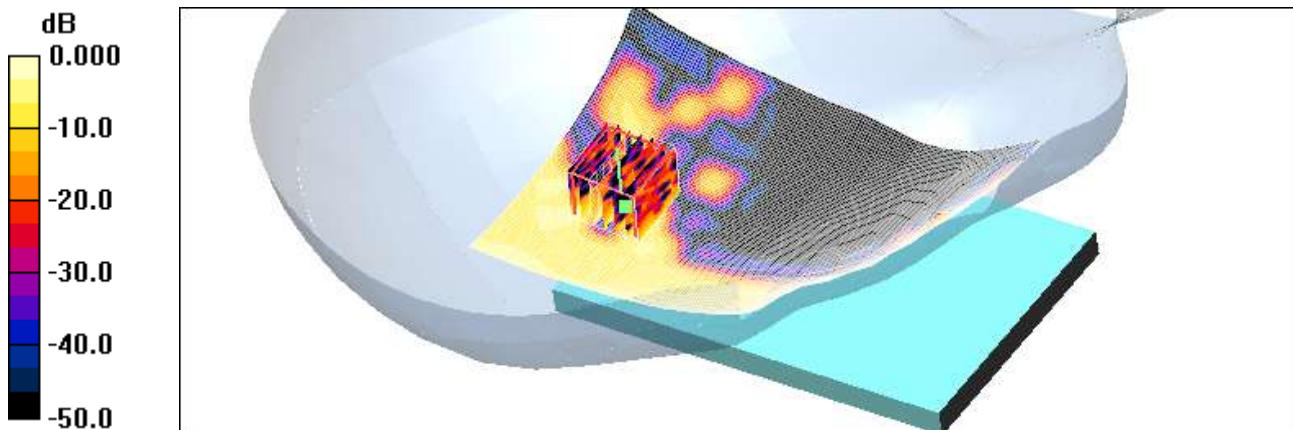
Communication System: WIFI 5GHz; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5300 \text{ MHz}$; $\sigma = 4.71 \text{ mho/m}$; $\epsilon_r = 36.3$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section ; Measurement SW: DAS4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DAS4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.44, 4.44, 4.44); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Right touch 60ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.158 mW/g

802.11a Right touch 60ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 5.07 V/m; Power Drift = -0.068 dB
Peak SAR (extrapolated) = 0.385 W/kg
SAR(1 g) = 0.123 mW/g; SAR(10 g) = 0.036 mW/g
Maximum value of SAR (measured) = 0.154 mW/g



0 dB = 0.154mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5300$ MHz; $\sigma = 4.71$ mho/m; $\epsilon_r = 36.3$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

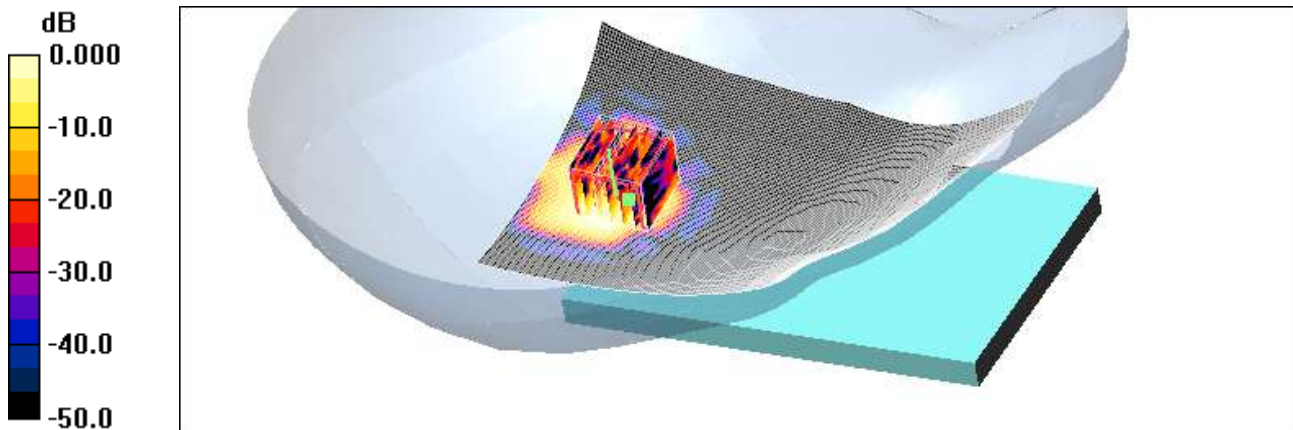
DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.44, 4.44, 4.44); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Right tilt 60ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.178 mW/g

802.11a Right tilt 60ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.77 V/m; Power Drift = -0.082 dB
Peak SAR (extrapolated) = 0.394 W/kg
SAR(1 g) = 0.122 mW/g; SAR(10 g) = 0.035 mW/g

Maximum value of SAR (measured) = 0.150 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

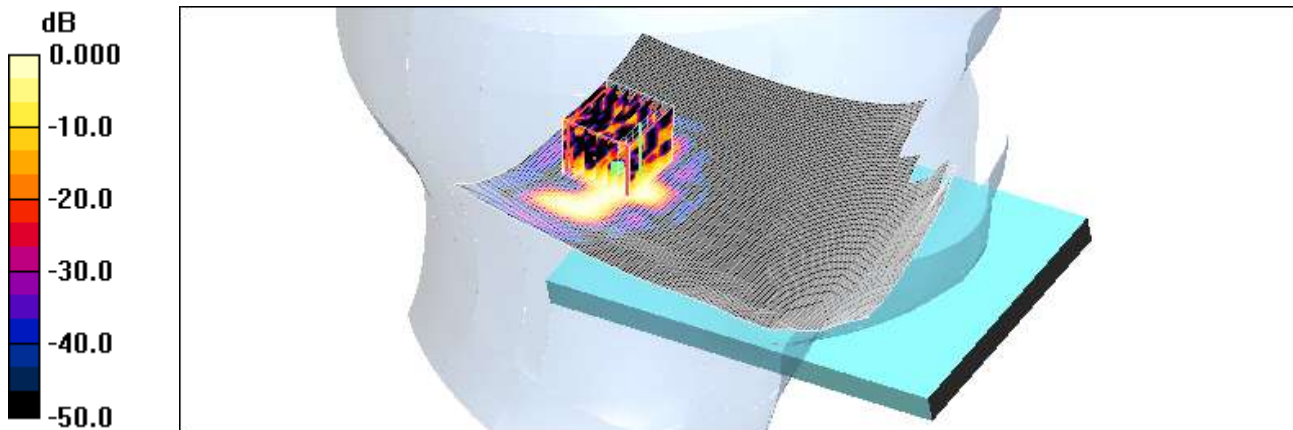
Communication System: WIFI 5GHz; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5500$ MHz; $\sigma = 4.93$ mho/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.48, 4.48, 4.48); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Left touch 100ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.115 mW/g

802.11a Left touch 100ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.14 V/m; Power Drift = 0.083 dB
Peak SAR (extrapolated) = 0.439 W/kg
SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.017 mW/g
Maximum value of SAR (measured) = 0.043 mW/g



0 dB = 0.043mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

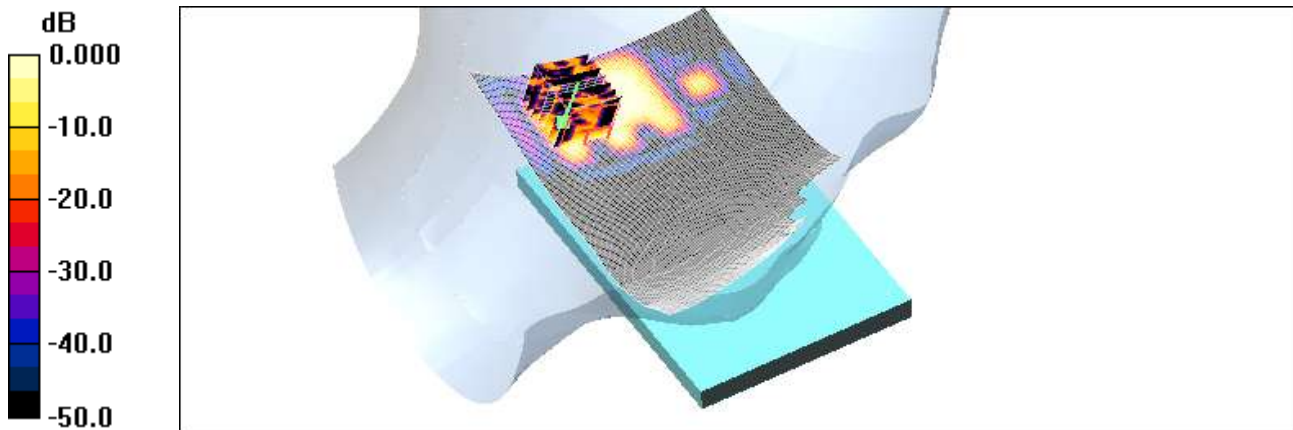
Communication System: WIFI 5GHz; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5500$ MHz; $\sigma = 4.93$ mho/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.48, 4.48, 4.48); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Left tilt 100ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.130 mW/g

802.11a Left tilt 100ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.18 V/m; Power Drift = 0.076 dB
Peak SAR (extrapolated) = 0.612 W/kg
SAR(1 g) = 0.073 mW/g; SAR(10 g) = 0.017 mW/g
Maximum value of SAR (measured) = 0.051 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

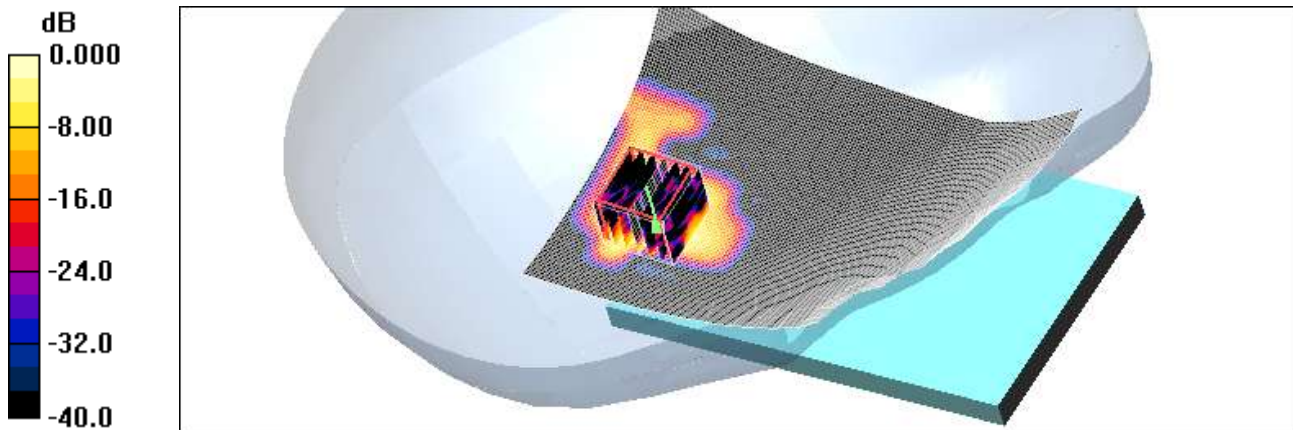
Communication System: WIFI 5GHz; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5500$ MHz; $\sigma = 4.93$ mho/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.48, 4.48, 4.48); Calibrated: 2011-07-25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

Right touch 802.11a 100ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.189 mW/g

Right touch 802.11a 100ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.47 V/m; Power Drift = -0.068 dB
Peak SAR (extrapolated) = 0.349 W/kg
SAR(1 g) = 0.073 mW/g; SAR(10 g) = 0.020 mW/g
Maximum value of SAR (measured) = 0.173 mW/g



0 dB = 0.173mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

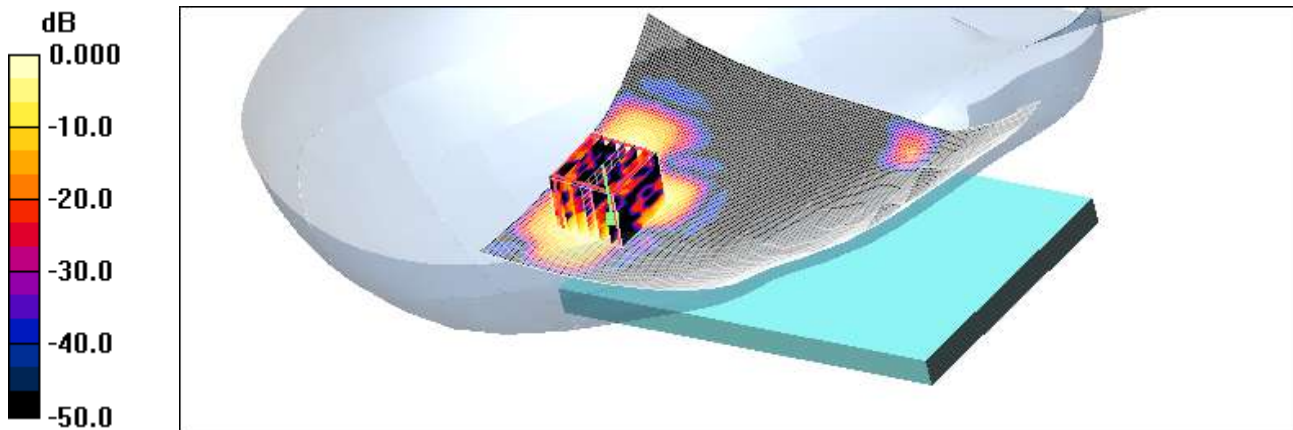
Communication System: WIFI 5GHz; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5500$ MHz; $\sigma = 4.93$ mho/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.48, 4.48, 4.48); Calibrated: 2011-07-25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

Right tilt 802.11a 100ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.183 mW/g

Right tilt 802.11a 100ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.27 V/m; Power Drift = 0.164 dB
Peak SAR (extrapolated) = 0.299 W/kg
SAR(1 g) = 0.064 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.154 mW/g



0 dB = 0.154mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5745 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5745$ MHz; $\sigma = 5.28$ mho/m; $\epsilon_r = 35.2$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.26, 4.26, 4.26); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

Left touch 802.11a 149ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.069 mW/g

Left touch 802.11a 149ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

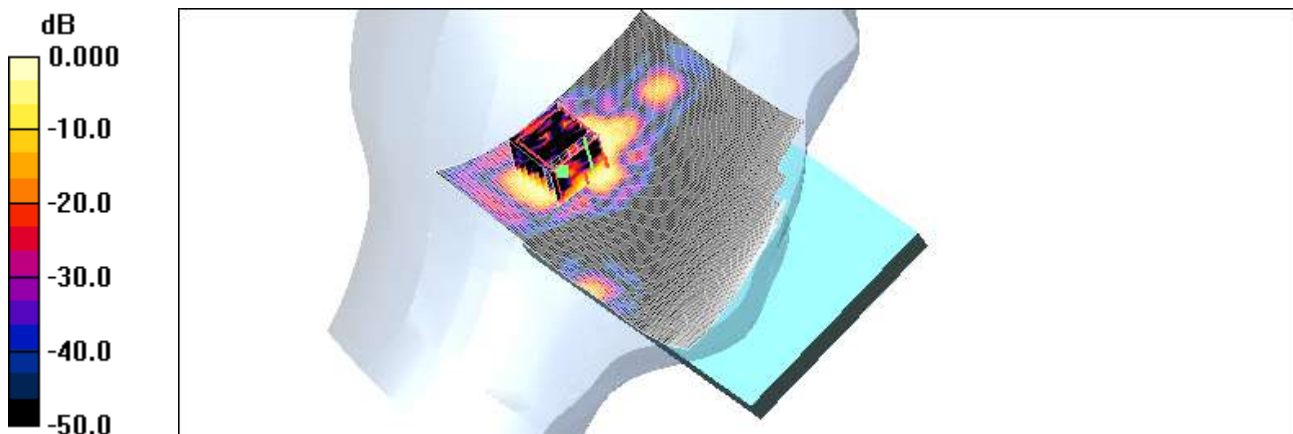
Reference Value = 4.41 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 0.277 W/kg

SAR(1 g) = 0.063 mW/g; SAR(10 g) = 0.019 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.150 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5745 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5745$ MHz; $\sigma = 5.28$ mho/m; $\epsilon_r = 35.2$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.26, 4.26, 4.26); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

Left tilt 802.11a 149ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.188 mW/g

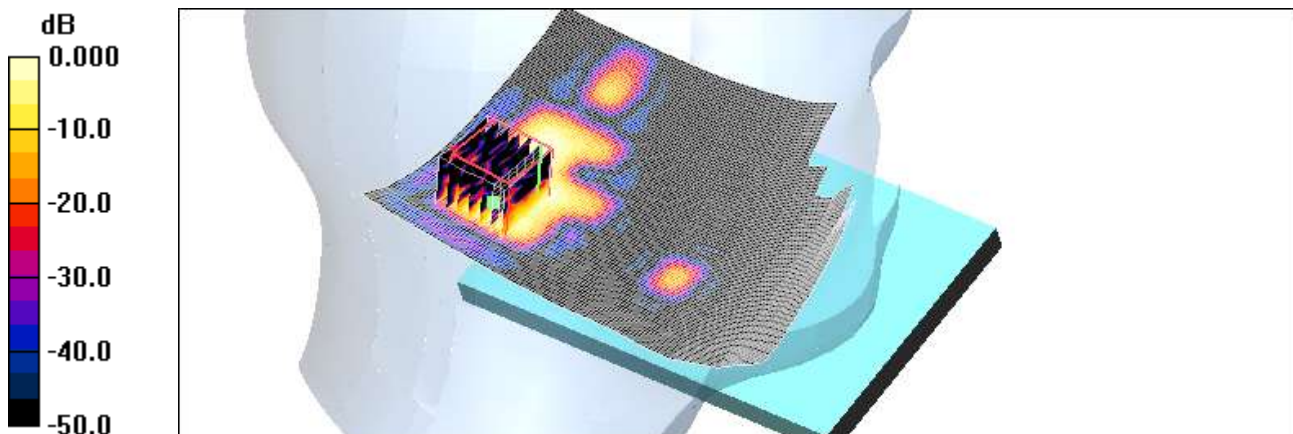
Left tilt 802.11a 149ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 4.00 V/m; Power Drift = 0.092 dB

Peak SAR (extrapolated) = 0.236 W/kg

SAR(1 g) = 0.063 mW/g; SAR(10 g) = 0.020 mW/g

Maximum value of SAR (measured) = 0.130 mW/g



0 dB = 0.130mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5745 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5745$ MHz; $\sigma = 5.28$ mho/m; $\epsilon_r = 35.2$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.26, 4.26, 4.26); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

Right touch 802.11a 149ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.152 mW/g

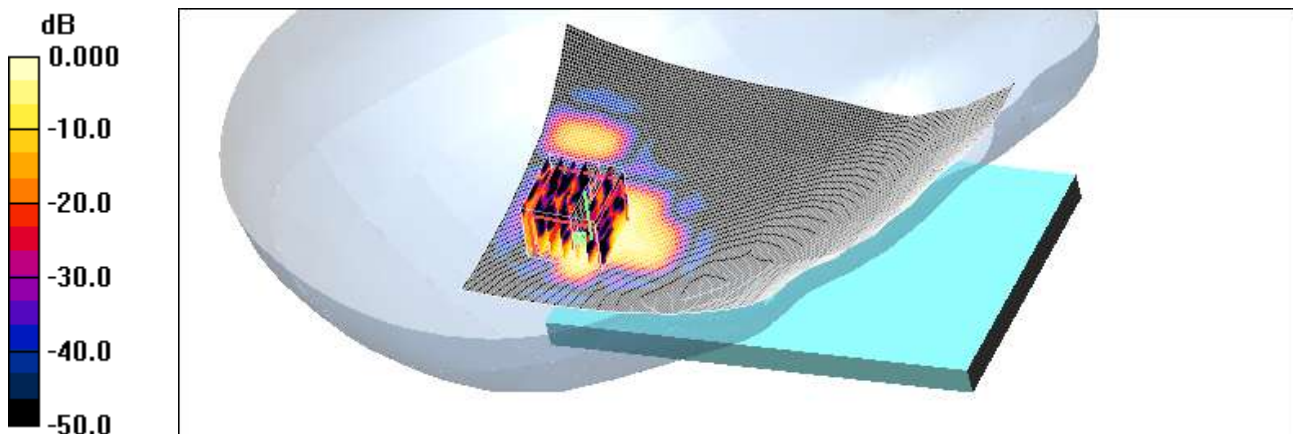
Right touch 802.11a 149ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.74 V/m; Power Drift = 0.068 dB

Peak SAR (extrapolated) = 0.459 W/kg

SAR(1 g) = 0.094 mW/g; SAR(10 g) = 0.027 mW/g

Maximum value of SAR (measured) = 0.131 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5745 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5745$ MHz; $\sigma = 5.28$ mho/m; $\epsilon_r = 35.2$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.26, 4.26, 4.26); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

Right tilt 802.11a 149ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.257 mW/g

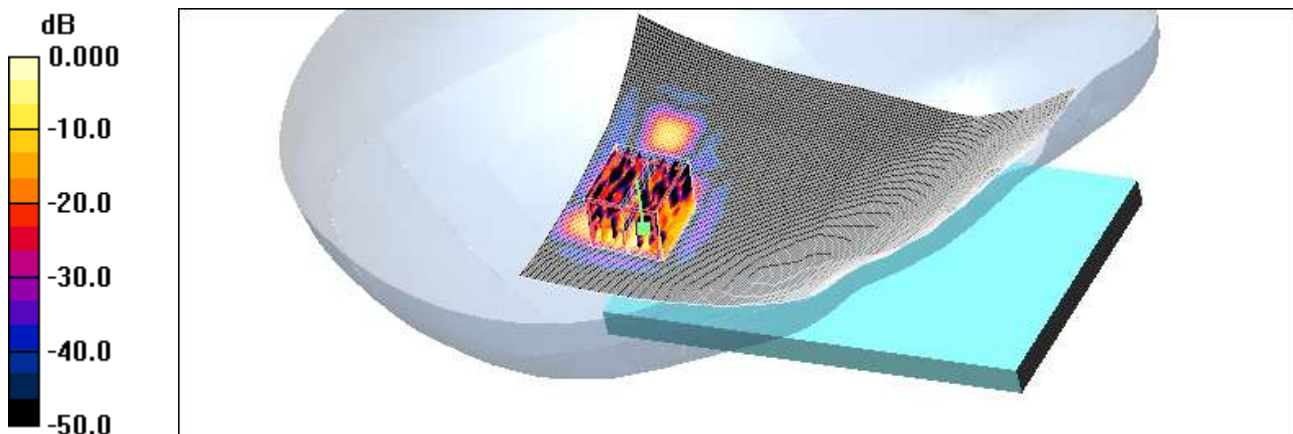
Right tilt 802.11a 149ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.38 V/m; Power Drift = 0.055 dB

Peak SAR (extrapolated) = 0.614 W/kg

SAR(1 g) = 0.067 mW/g; SAR(10 g) = 0.023 mW/g

Maximum value of SAR (measured) = 0.098 mW/g



0 dB = 0.098mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012
Separation Distance: 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

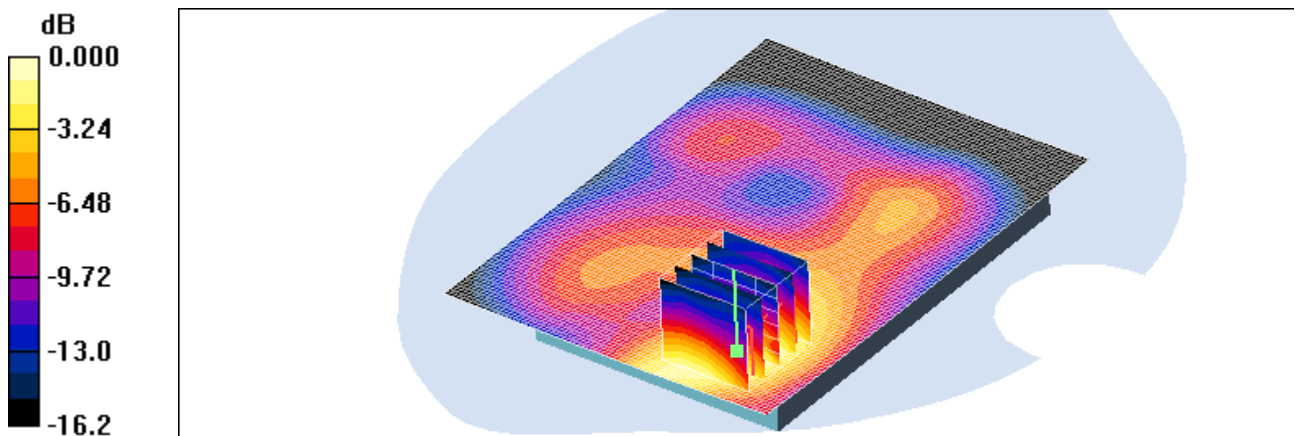
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

Body rear 661 4TX/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.680 mW/g

Body rear 661 4TX/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.73 V/m; Power Drift = -0.024 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.636 mW/g; SAR(10 g) = 0.370 mW/g
Maximum value of SAR (measured) = 0.678 mW/g



0 dB = 0.678mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012
Separation Distance: 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

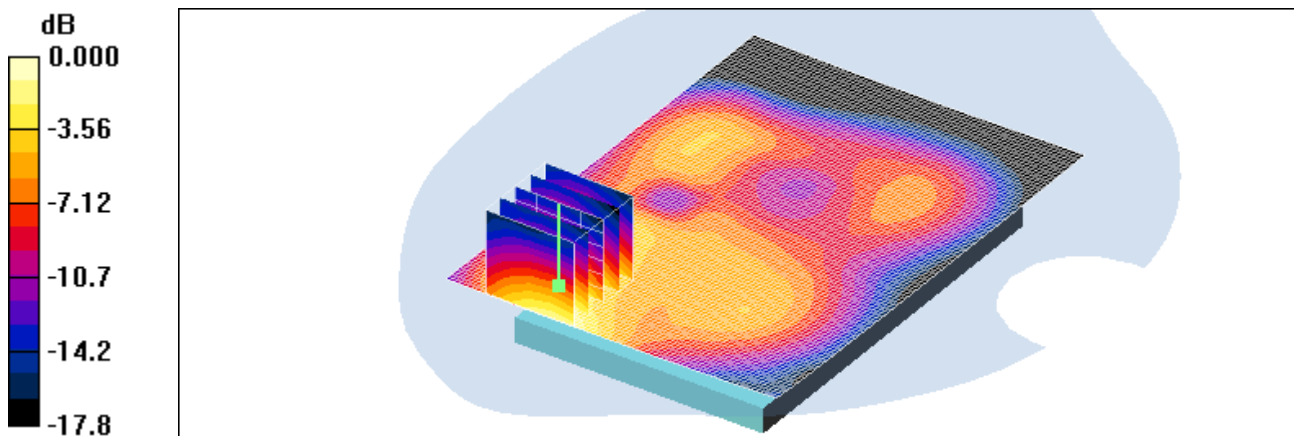
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

Body front 661 4TX/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.555 mW/g

Body front 661 4TX/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.90 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 0.889 W/kg
SAR(1 g) = 0.508 mW/g; SAR(10 g) = 0.281 mW/g
Maximum value of SAR (measured) = 0.555 mW/g



0 dB = 0.555mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012
Separation Distance: 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

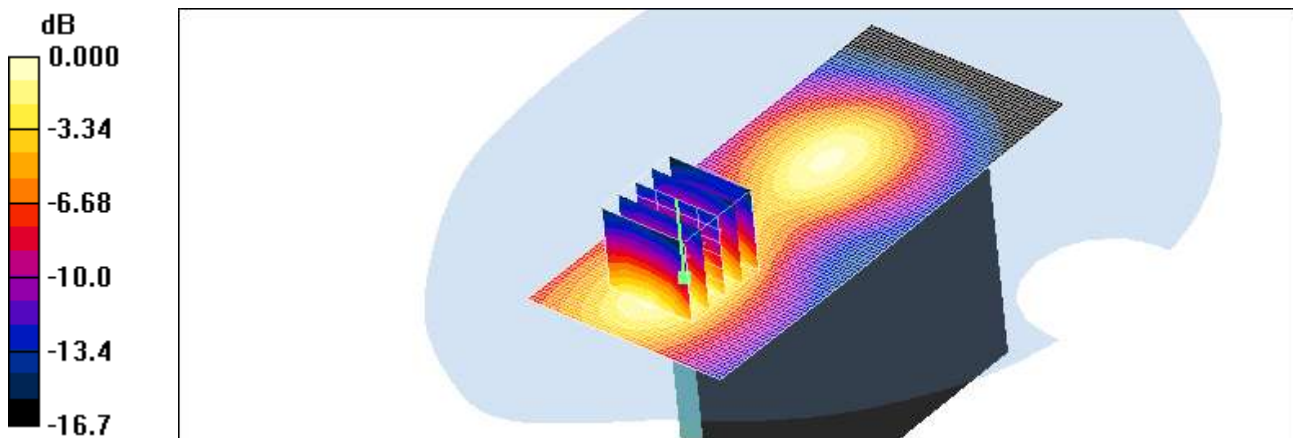
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

Body left 661 4TX/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.361 mW/g

Body left 661 4TX/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.0 V/m; Power Drift = 0.023 dB
Peak SAR (extrapolated) = 0.543 W/kg
SAR(1 g) = 0.327 mW/g; SAR(10 g) = 0.189 mW/g
Maximum value of SAR (measured) = 0.358 mW/g



0 dB = 0.358mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012
Separation Distance: 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

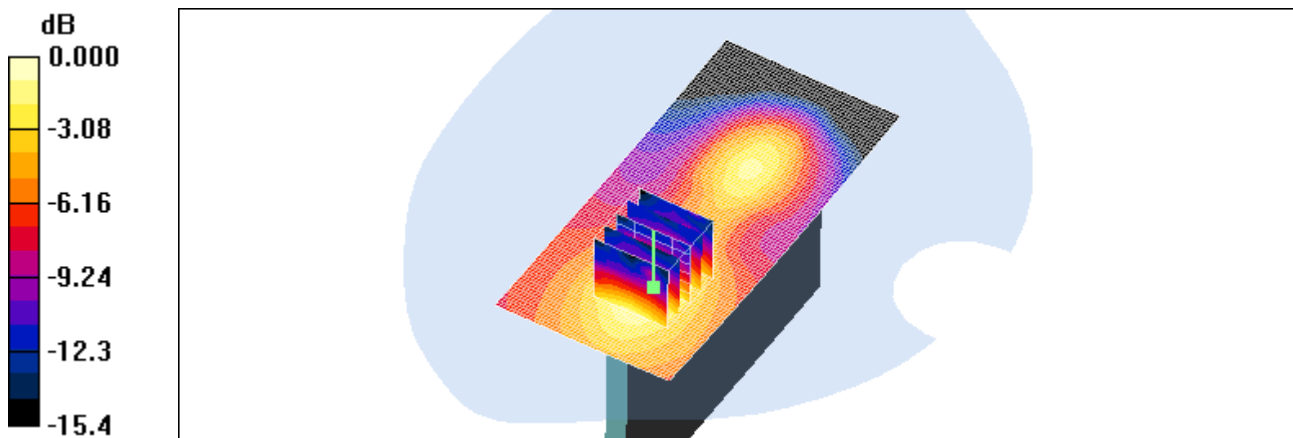
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 835/900 MHz; Type: SAM

Body right 661 4TX/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.123 mW/g

Body right 661 4TX/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.10 V/m; Power Drift = -0.023 dB
Peak SAR (extrapolated) = 0.178 W/kg
SAR(1 g) = 0.109 mW/g; SAR(10 g) = 0.063 mW/g
Maximum value of SAR (measured) = 0.121 mW/g



0 dB = 0.121mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012
Separation Distance 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

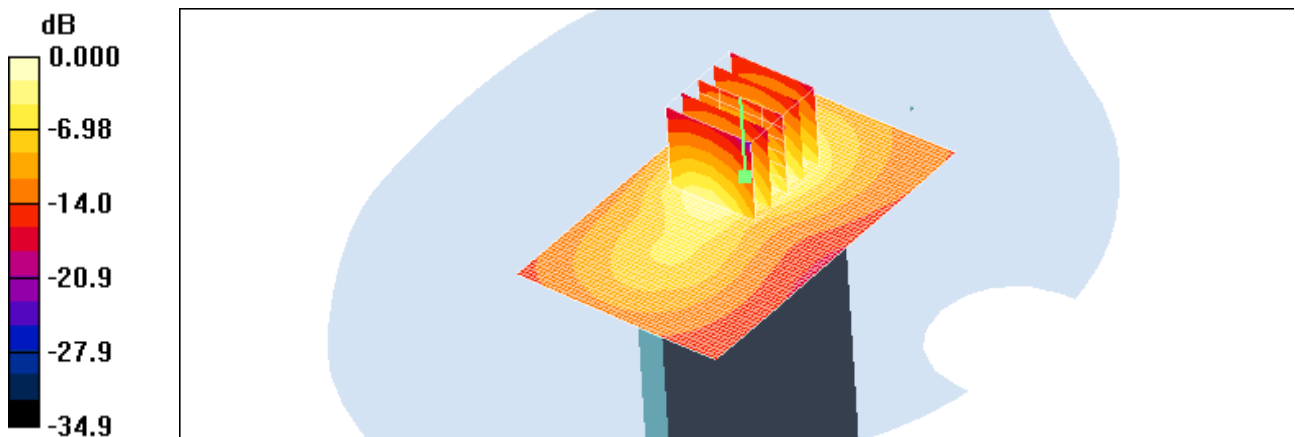
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

Body bottom 661 4TX/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.695 mW/g

Body bottom 661 4TX/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.6 V/m; Power Drift = -0.018 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.610 mW/g; SAR(10 g) = 0.312 mW/g
Maximum value of SAR (measured) = 0.693 mW/g



0 dB = 0.693mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012
Separation Distance 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.87$ mho/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

Body rear 6ch 1Mbps/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.073 mW/g

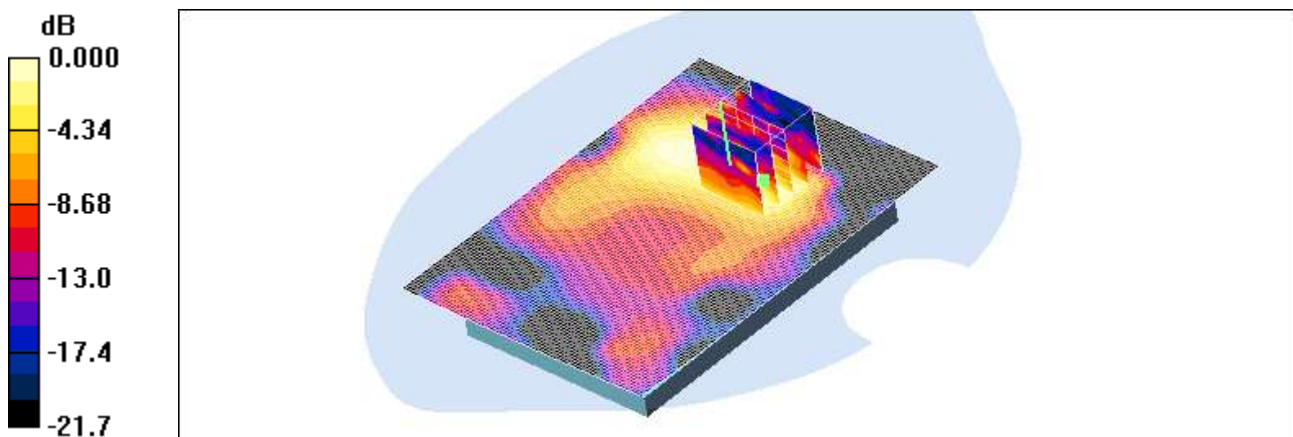
Body rear 6ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.95 V/m; Power Drift = 0.059 dB

Peak SAR (extrapolated) = 0.226 W/kg

SAR(1 g) = 0.064 mW/g; SAR(10 g) = 0.028 mW/g

Maximum value of SAR (measured) = 0.069 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012
Separation Distance: 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.87$ mho/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

Body front 6ch 1Mbps/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.056 mW/g

Body front 6ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

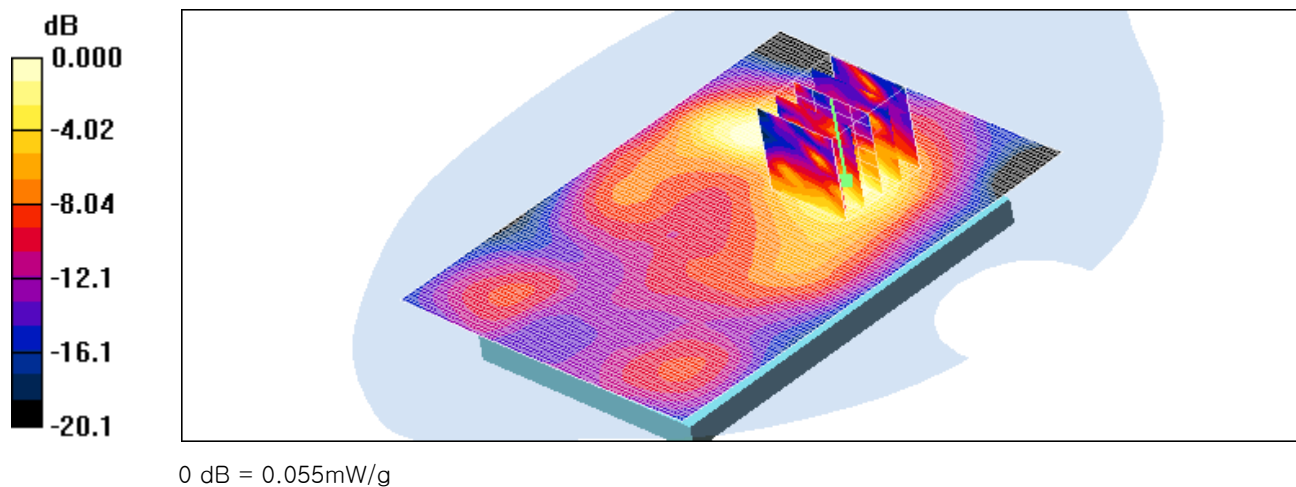
Reference Value = 2.97 V/m; Power Drift = 0.117 dB

Peak SAR (extrapolated) = 0.177 W/kg

SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.023 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.055 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012
Separation Distance 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.87$ mho/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

Body left 6ch 1Mbps/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.011 mW/g

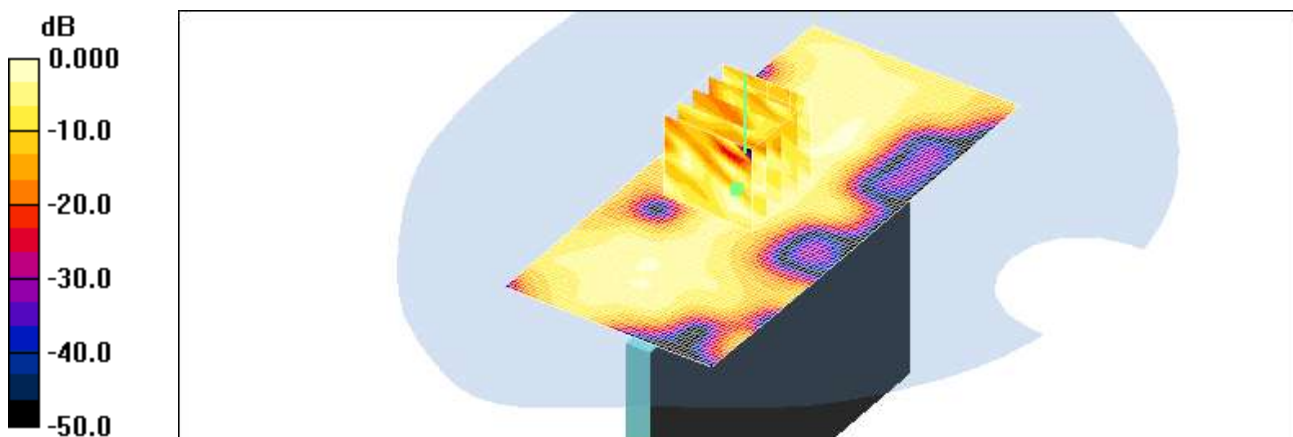
Body left 6ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.93 V/m; Power Drift = -0.042 dB

Peak SAR (extrapolated) = 0.020 W/kg

SAR(1 g) = 0.00462 mW/g; SAR(10 g) = 0.000999 mW/g

Maximum value of SAR (measured) = 0.016 mW/g



0 dB = 0.016mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012
Separation Distance: 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.87$ mho/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

Body top 6ch 1Mbps/Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.044 mW/g

Body top 6ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

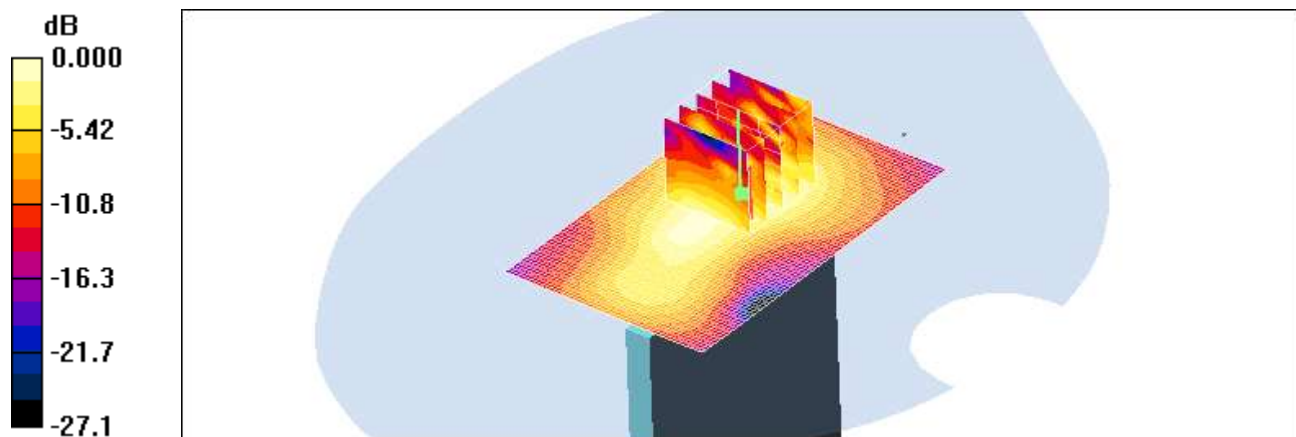
Reference Value = 4.08 V/m; Power Drift = -0.058 dB

Peak SAR (extrapolated) = 0.102 W/kg

SAR(1 g) = 0.041 mW/g; SAR(10 g) = 0.021 mW/g

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.044 mW/g



0 dB = 0.044mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012
Separation Distance 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5180 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5180$ MHz; $\sigma = 5.16$ mho/m; $\epsilon_r = 47.4$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.1, 4.1, 4.1); Calibrated: 2011-07-25
- Sensor-Surface: 2.5mm (Mechanical Surface Detection) Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

WIFI 5GHz Body Rear 36ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.081 mW/g

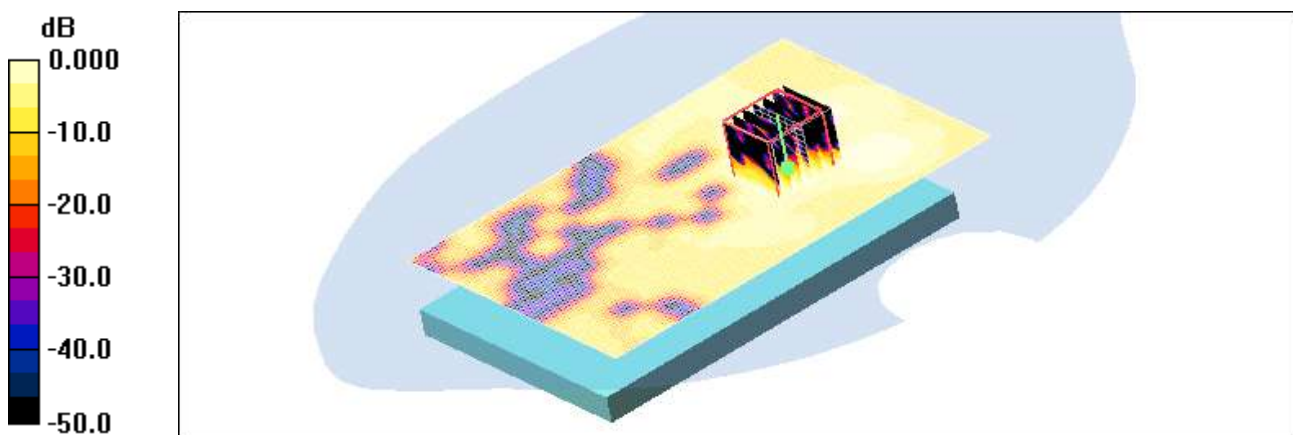
WIFI 5GHz Body Rear 36ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.89 V/m; Power Drift = -0.076 dB

Peak SAR (extrapolated) = 0.186 W/kg

SAR(1 g) = 0.044 mW/g; SAR(10 g) = 0.015 mW/g

Maximum value of SAR (measured) = 0.085 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012
Separation Distance 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

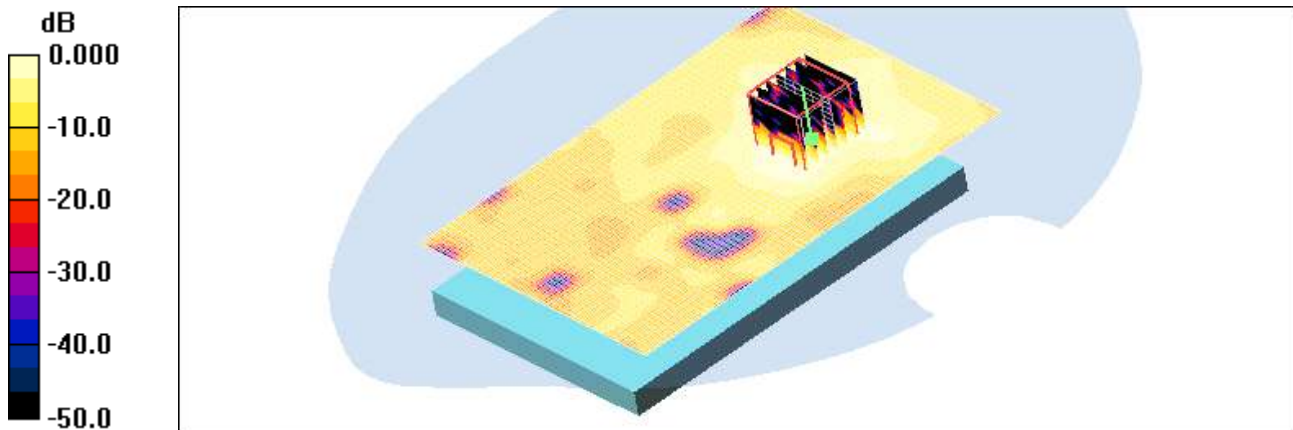
Communication System: WIFI 5GHz; Frequency: 5300 MHz;Duty Cycle: 1:1
Medium parameters used: $f = 5300$ MHz; $\sigma = 5.33$ mho/m; $\epsilon_r = 46.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(3.83, 3.83, 3.83); Calibrated: 2011-07-25
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

WIFI 5GHz Body Rear 60ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.111 mW/g

WIFI 5GHz Body Rear 60ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.04 V/m; Power Drift = -0.024 dB
Peak SAR (extrapolated) = 0.233 W/kg
SAR(1 g) = 0.061 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.119 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012
Separation Distance 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5680 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5680$ MHz; $\sigma = 5.87$ mho/m; $\epsilon_r = 46.2$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(3.6, 3.6, 3.6); Calibrated: 2011-07-25
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

WIFI 5GHz Body Rear 136ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.094 mW/g

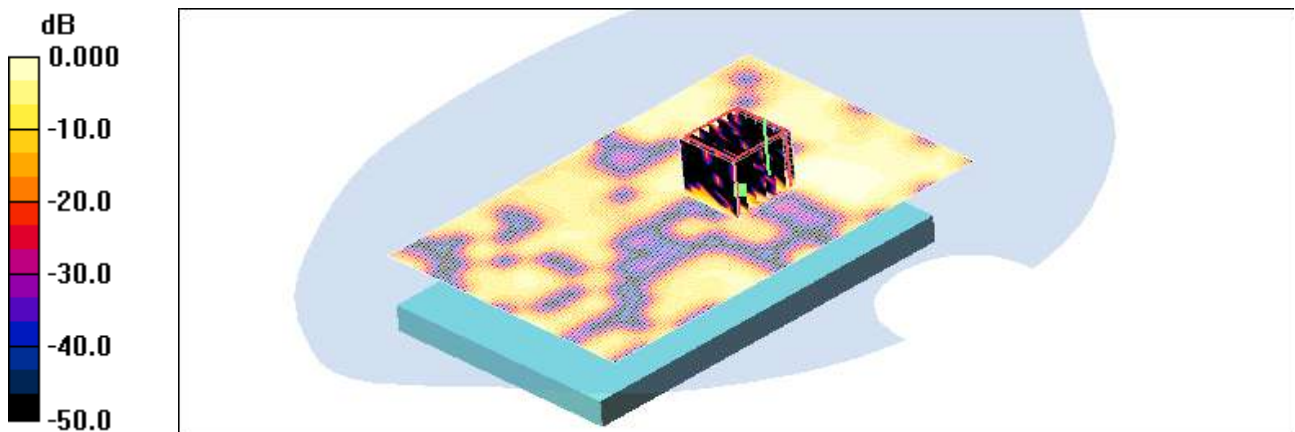
WIFI 5GHz Body Rear 136ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 2.16 V/m; Power Drift = -0.094 dB

Peak SAR (extrapolated) = 0.213 W/kg

SAR(1 g) = 0.021 mW/g; SAR(10 g) = 0.0078 mW/g

Maximum value of SAR (measured) = 0.055 mW/g



0 dB = 0.055mW/g

Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012
Separation Distance 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

Communication System: WIFI 5GHz; Frequency: 5745 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 5745$ MHz; $\sigma = 6.06$ mho/m; $\epsilon_r = 46.2$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(3.75, 3.75, 3.75); Calibrated: 2011-07-25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

WIFI 5GHz Body Rear 149ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (interpolated) = 0.076 mW/g

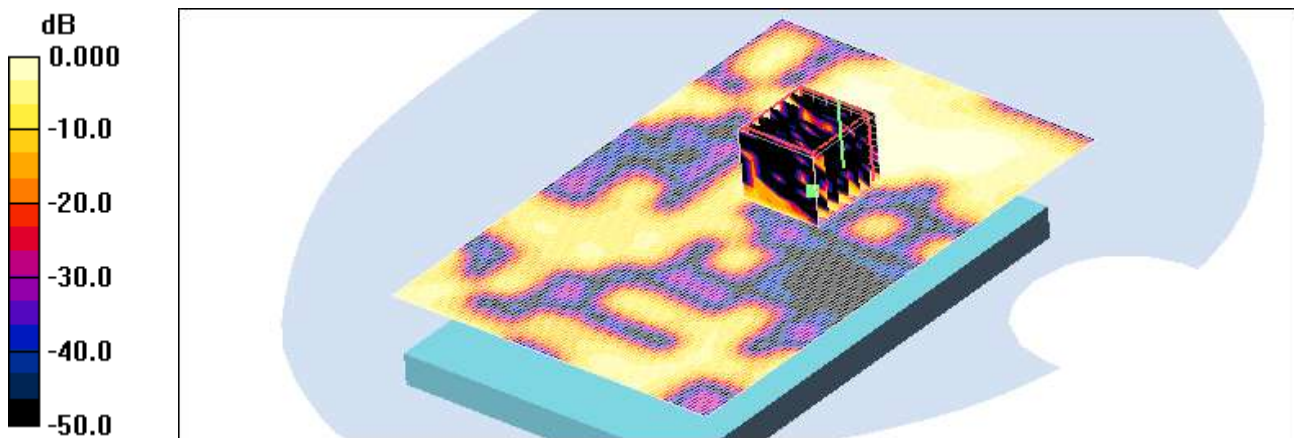
WIFI 5GHz Body Rear 149ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 1.62 V/m; Power Drift = -0.060 dB

Peak SAR (extrapolated) = 0.346 W/kg

SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.00775 mW/g

Maximum value of SAR (measured) = 0.043 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 39.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 800/900 Phantom; Type: SAM

Left touch 661/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.367 mW/g

Left touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.58 V/m; Power Drift = 0.077 dB
Peak SAR (extrapolated) = 0.535 W/kg
SAR(1 g) = 0.339 mW/g; SAR(10 g) = 0.205 mW/g
Maximum value of SAR (measured) = 0.359 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.48$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 835/900 Phantom ; Type: SAM

Body rear 661 4TX/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.680 mW/g

Body rear 661 4TX/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.73 V/m; Power Drift = -0.024 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.636 mW/g; SAR(10 g) = 0.370 mW/g
Maximum value of SAR (measured) = 0.678 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.10, 2012

DUT: L-06D; Type: bar; Serial: #1

Communication System: 2450MHz FCC; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.86$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: 1800/1900 Phantom; Type: SAM

Right touch 6ch 1Mbps/Area Scan (81x111x1): Measurement grid: dx=15mm, dy=15mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (interpolated) = 0.504 mW/g

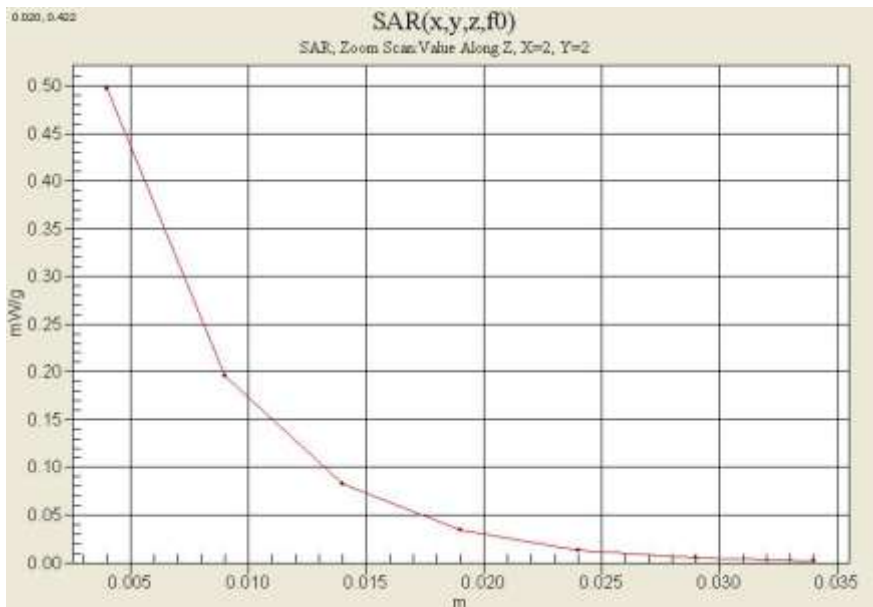
Right touch 6ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.3 V/m; Power Drift = 0.096 dB

Peak SAR (extrapolated) = 1.27 W/kg

SAR(1 g) = 0.457 mW/g; SAR(10 g) = 0.196 mW/g

Maximum value of SAR (measured) = 0.497 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012

DUT: L-06D; Type: bar; Serial: #1

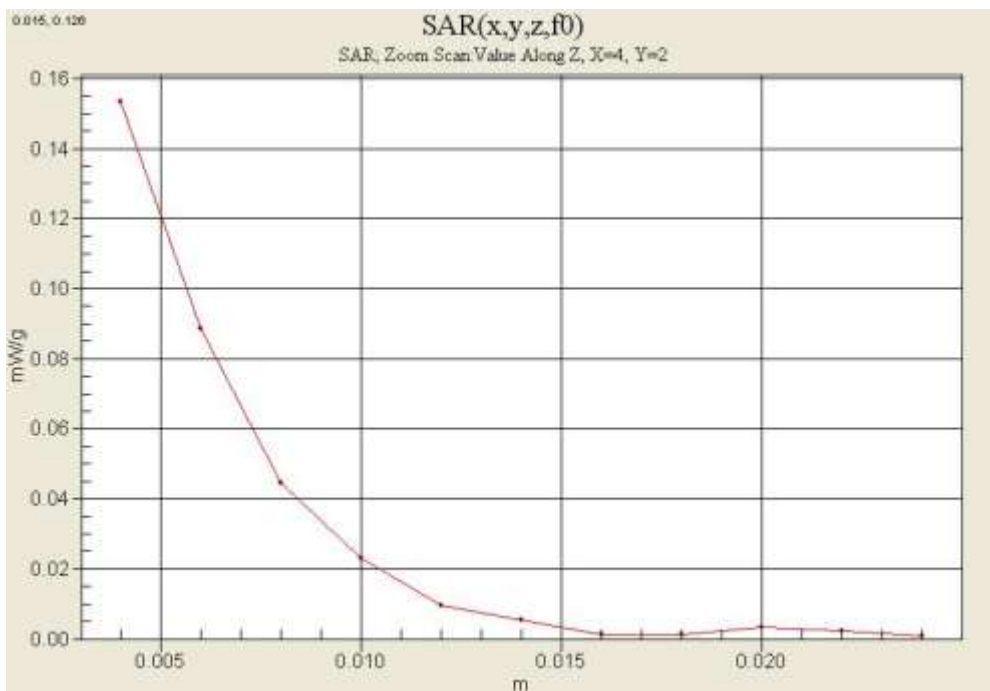
Communication System: WIFI 5GHz; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5300$ MHz; $\sigma = 4.71$ mho/m; $\epsilon_r = 36.3$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.44, 4.44, 4.44); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

802.11a Right touch 60ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.158 mW/g

802.11a Right touch 60ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 5.07 V/m; Power Drift = -0.068 dB
Peak SAR (extrapolated) = 0.385 W/kg
SAR(1 g) = 0.123 mW/g; SAR(10 g) = 0.036 mW/g
Maximum value of SAR (measured) = 0.154 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: PCS GSM/GPRS Phone with Bluetooth, WLAN and NFC(Felica)
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Jun.11, 2012
Separation Distance 1.0 cm

DUT: L-06D; Type: bar; Serial: #1

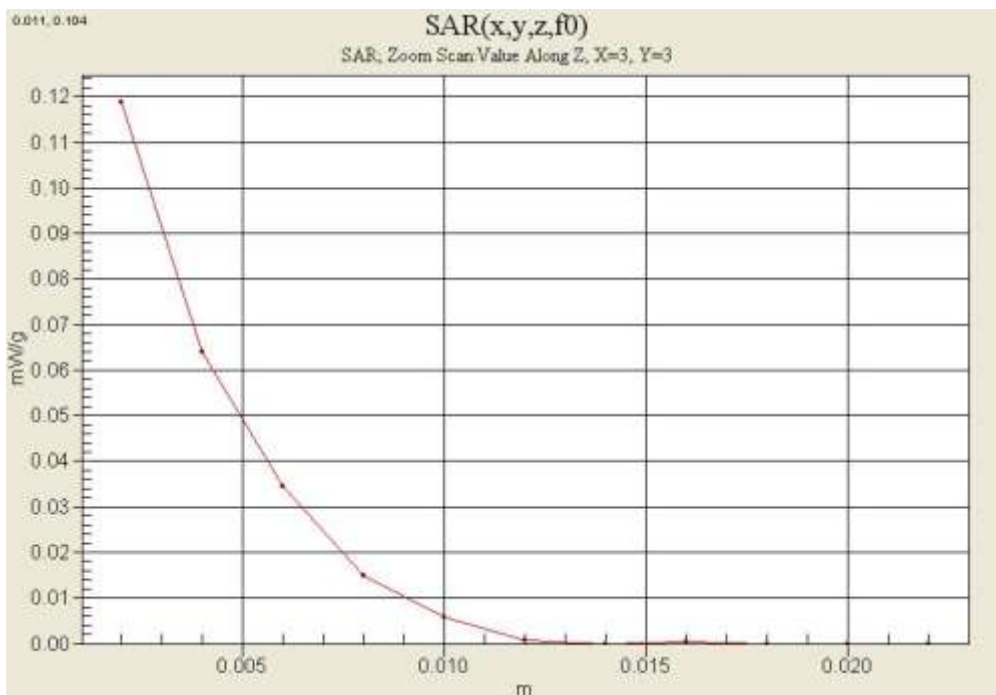
Communication System: WIFI 5GHz; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5300$ MHz; $\sigma = 5.33$ mho/m; $\epsilon_r = 46.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(3.83, 3.83, 3.83); Calibrated: 2011-07-25
- Sensor-Surface: 2.5mm (Mechanical Surface Detection) Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

WIFI 5GHz Body Rear 60ch 6Mbps/Area Scan (101x151x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.111 mW/g

WIFI 5GHz Body Rear 60ch 6Mbps/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.04 V/m; Power Drift = -0.024 dB
Peak SAR (extrapolated) = 0.233 W/kg
SAR(1 g) = 0.061 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.119 mW/g



Attachment 2. – Dipole Validation Plots

■ Validation Data (1 900 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Jun.10, 2012

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

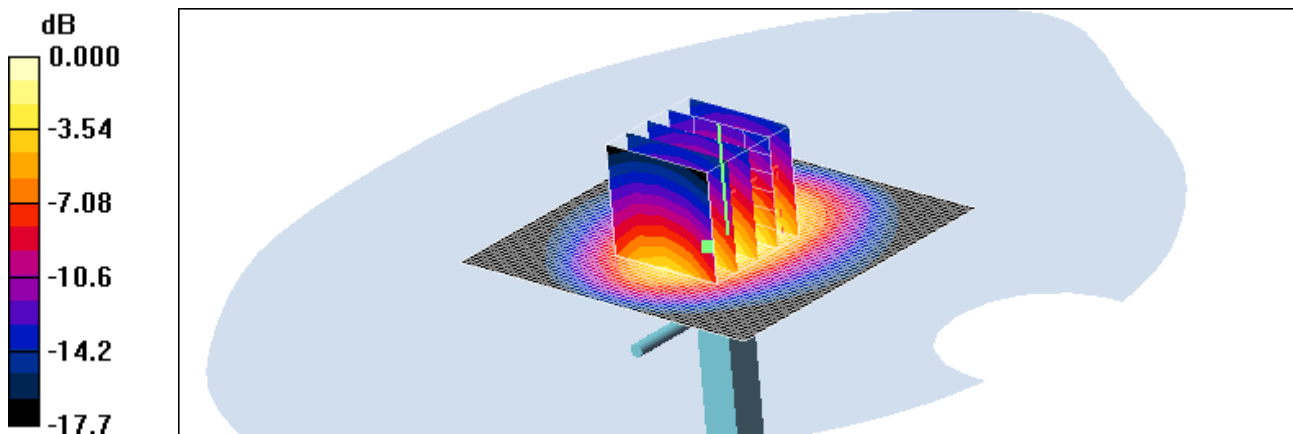
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1900$ MHz; $\sigma = 1.4$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1630; ConvF(5.17, 5.17, 5.17); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 835/900 MHz; Type: SAM

Dipole 1900MHz Validation/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.57 mW/g

Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 59.4 V/m; Power Drift = -0.027 dB
Peak SAR (extrapolated) = 6.96 W/kg
SAR(1 g) = 4.08 mW/g; SAR(10 g) = 2.27 mW/g
Maximum value of SAR (measured) = 4.50 mW/g



0 dB = 4.50mW/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: Jun.10, 2012

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

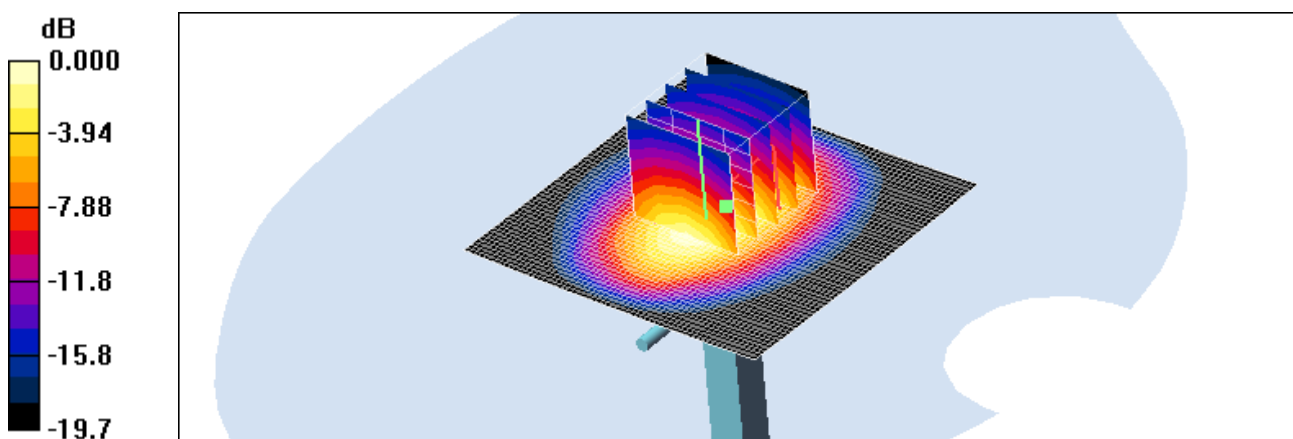
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1900$ MHz; $\sigma = 1.5$ mho/m; $\epsilon_r = 53.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1630; ConvF(4.75, 4.75, 4.75); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

Dipole 1900MHz Validation/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 4.79 mW/g

Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 57.7 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 7.13 W/kg
SAR(1 g) = 4.13 mW/g; SAR(10 g) = 2.14 mW/g
Maximum value of SAR (measured) = 4.65 mW/g



■ Validation Data (2 450 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Jun.10, 2012

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

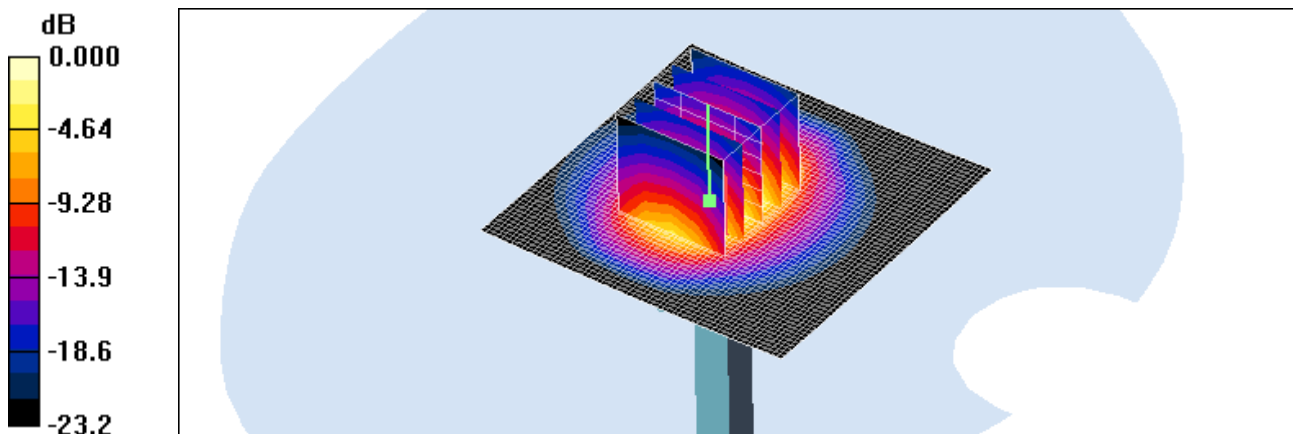
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 1.87$ mho/m; $\epsilon_r = 38.5$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1630; ConvF(4.57, 4.57, 4.57); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.44 mW/g

Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 58.6 V/m; Power Drift = -0.037 dB
Peak SAR (extrapolated) = 12.6 W/kg
SAR(1 g) = 5.34 mW/g; SAR(10 g) = 2.43 mW/g
Maximum value of SAR (measured) = 5.82 mW/g



0 dB = 5.82mW/g

■ Validation Data (2 450 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Jun.10, 2012

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

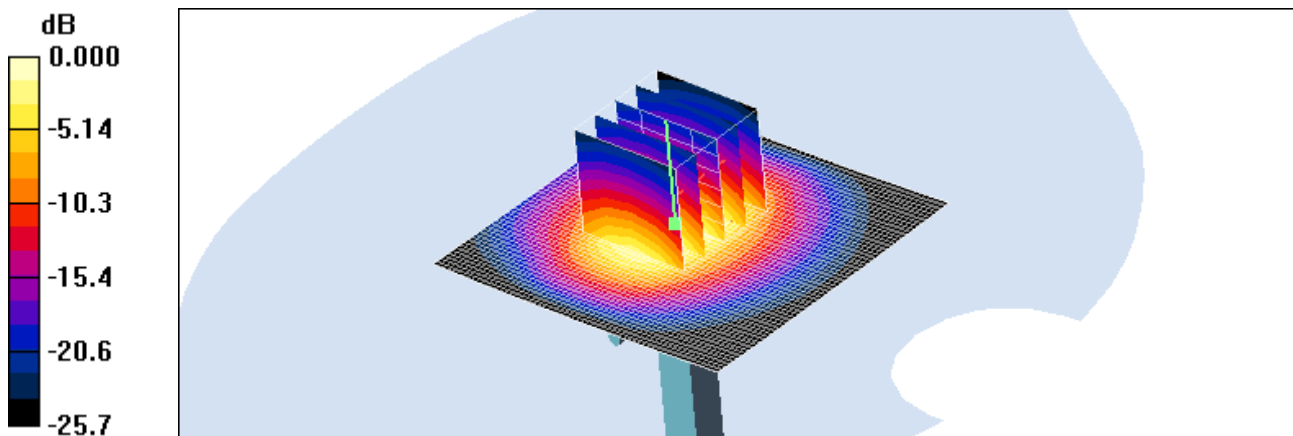
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 1.89$ mho/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.02 mW/g

Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 54.7 V/m; Power Drift = 0.004 dB
Peak SAR (extrapolated) = 12.1 W/kg
SAR(1 g) = 5.03 mW/g; SAR(10 g) = 2.24 mW/g
Maximum value of SAR (measured) = 5.53 mW/g



0 dB = 5.53mW/g

Validation Data (2 450 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Jun.10, 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; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1630; ConvF(4.3, 4.3, 4.3); Calibrated: 2011-11-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn869; Calibrated: 2011-09-22
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 6.02 mW/g

Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 54.7 V/m; Power Drift = 0.004 dB
Peak SAR (extrapolated) = 12.1 W/kg
SAR(1 g) = 5.03 mW/g; SAR(10 g) = 2.24 mW/g
Maximum value of SAR (measured) = 5.53 mW/g



■ Validation Data (5GHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Jun.11, 2012

DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 – SN:1107

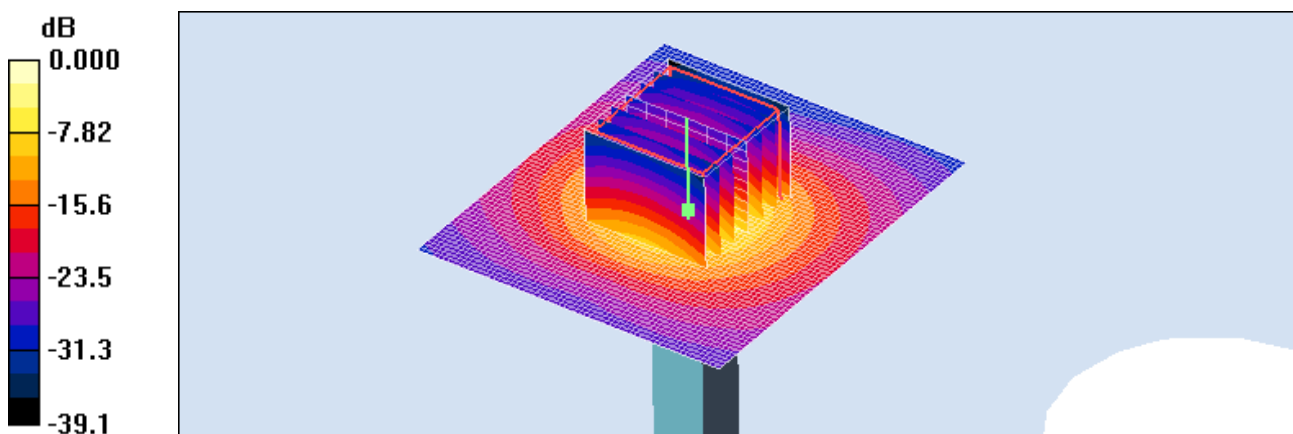
Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5200$ MHz; $\sigma = 4.56$ mho/m; $\epsilon_r = 36.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 – SN3797; ConvF(4.73, 4.73, 4.73); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

Validation 5200MHz/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.56 mW/g

Validation 5200MHz/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 44.8 V/m; Power Drift = 0.050 dB
Peak SAR (extrapolated) = 33.0 W/kg
SAR(1 g) = 8.08 mW/g; SAR(10 g) = 2.29 mW/g
Maximum value of SAR (measured) = 16.6 mW/g



0 dB = 16.6mW/g

■ Validation Data (5GHz Head)

Test Laboratory: HCT CO., LTD
 Input Power 100 mW (20 dBm)
 Liquid Temp: 21.3 °C
 Test Date: Jun.11, 2012

DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 – SN:1107

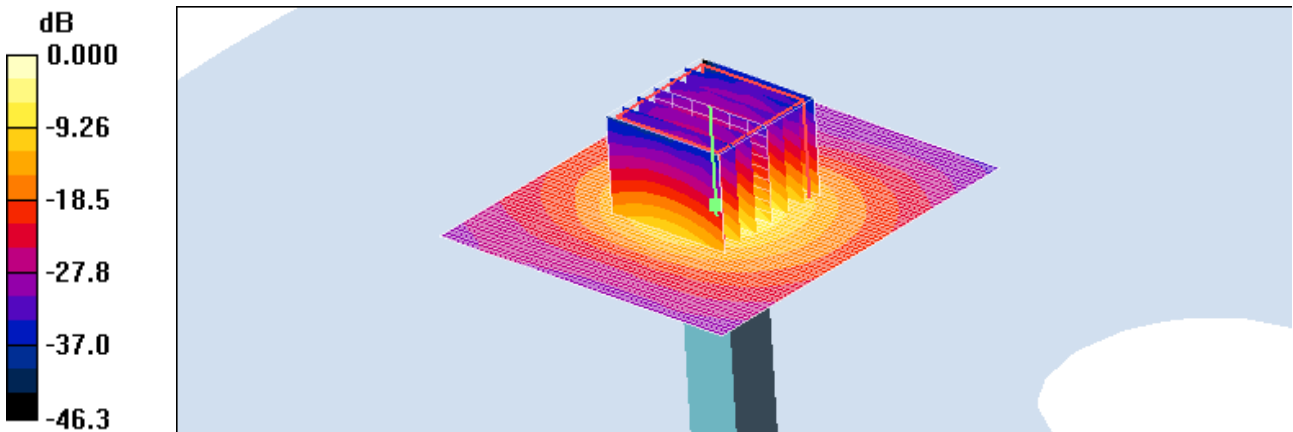
Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1
 Medium parameters used: $f = 5500$ MHz; $\sigma = 4.93$ mho/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m³
 Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 – SN3797; ConvF(4.48, 4.48, 4.48); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

Validation 5500MHz/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (interpolated) = 9.95 mW/g

Validation 5500MHz/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
 Reference Value = 44.5 V/m; Power Drift = -0.033 dB
 Peak SAR (extrapolated) = 38.4 W/kg
SAR(1 g) = 8.6 mW/g; SAR(10 g) = 2.39 mW/g
 Maximum value of SAR (measured) = 17.8 mW/g



0 dB = 17.8mW/g

■ Validation Data (5GHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Jun.11, 2012

DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2- SN:1107

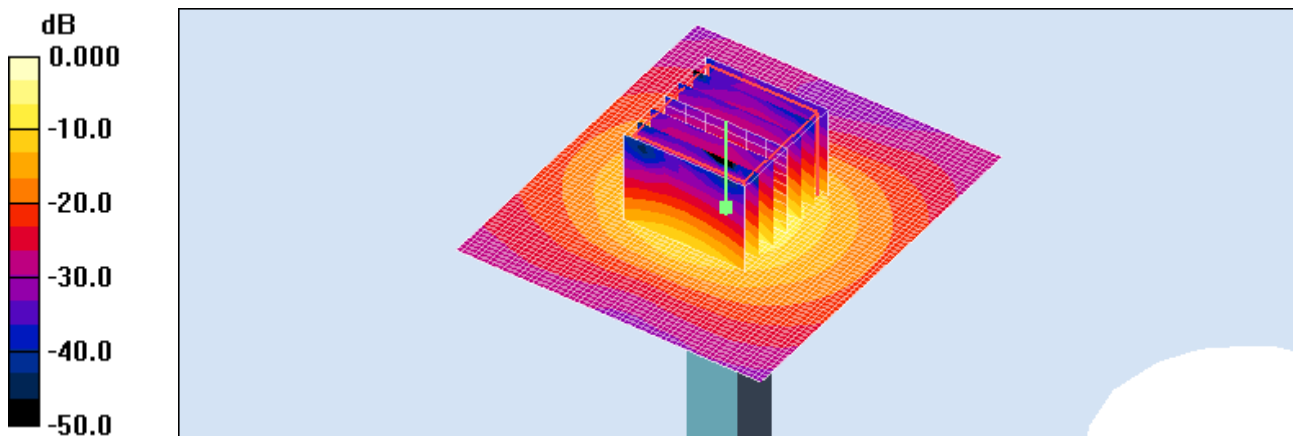
Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5800$ MHz; $\sigma = 5.33$ mho/m; $\epsilon_r = 35$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 - SN3797; ConvF(4.26, 4.26, 4.26); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 1800/1900 Phantom; Type: SAM

Validation 5800MHz/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.09 mW/g

Validation 5800MHz/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 40.0 V/m; Power Drift = -0.001 dB
Peak SAR (extrapolated) = 36.6 W/kg
SAR(1 g) = 7.98 mW/g; SAR(10 g) = 2.22 mW/g
Maximum value of SAR (measured) = 16.7 mW/g



■ Validation Data (5GHzBody)

Test Laboratory: HCT CO., LTD
Input Power: 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Jun.11, 2012

DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 – SN:1107

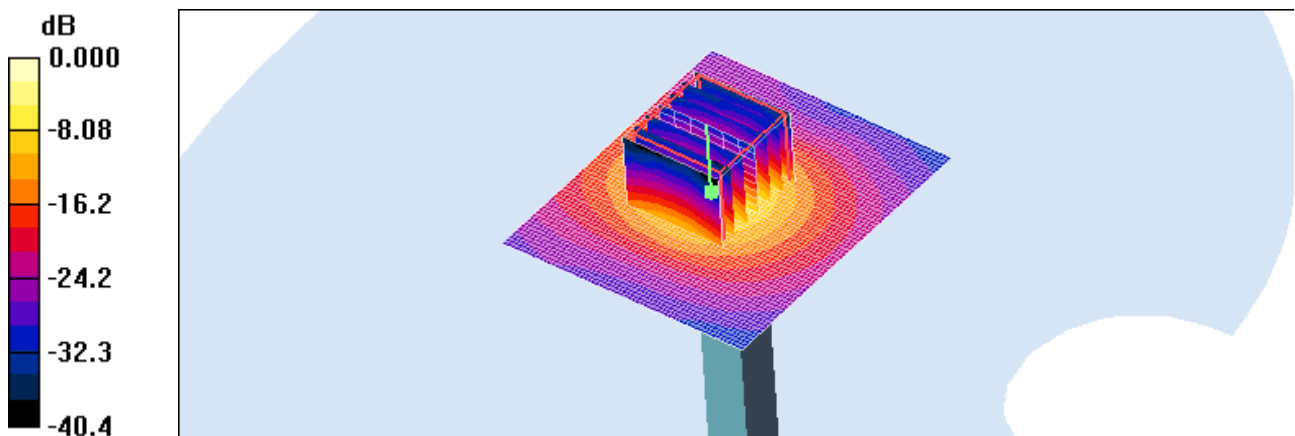
Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5200$ MHz; $\sigma = 5.18$ mho/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 – SN3797; ConvF(4.1, 4.1, 4.1); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

Validation 5200MHz/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.73 mW/g

Validation 5200MHz/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 37.6 V/m; Power Drift = 0.037 dB
Peak SAR (extrapolated) = 34.7 W/kg
SAR(1 g) = 7.8 mW/g; SAR(10 g) = 2.13 mW/g
Maximum value of SAR (measured) = 16.5 mW/g



0 dB = 16.5mW/g

■ Validation Data (5GHzBody)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Jun.11, 2012

DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 – SN:1107

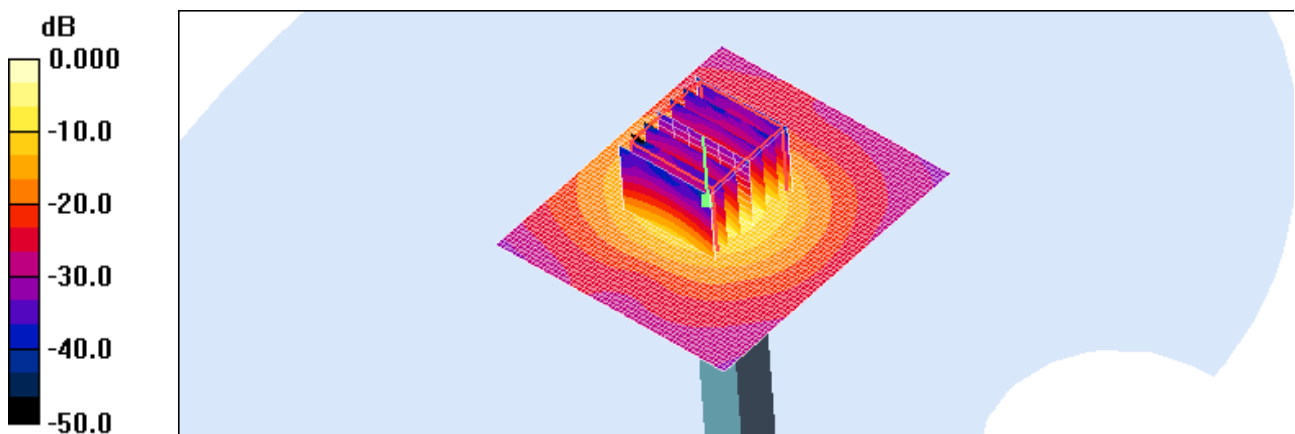
Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5500$ MHz; $\sigma = 5.51$ mho/m; $\epsilon_r = 46.4$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 – SN3797; ConvF(3.72, 3.72, 3.72); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

Validation 5500MHz/Area Scan (61x71x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 9.90 mW/g

Validation 5500MHz/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 36.8 V/m; Power Drift = 0.037 dB
Peak SAR (extrapolated) = 37.3 W/kg
SAR(1 g) = 8.04 mW/g; SAR(10 g) = 2.18 mW/g
Maximum value of SAR (measured) = 17.4 mW/g



■ Validation Data (5GHzBody)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Jun.11, 2012

DUT: Dipole 5GHz; Type: D5000V2; Serial: D5000V2 – SN:1107

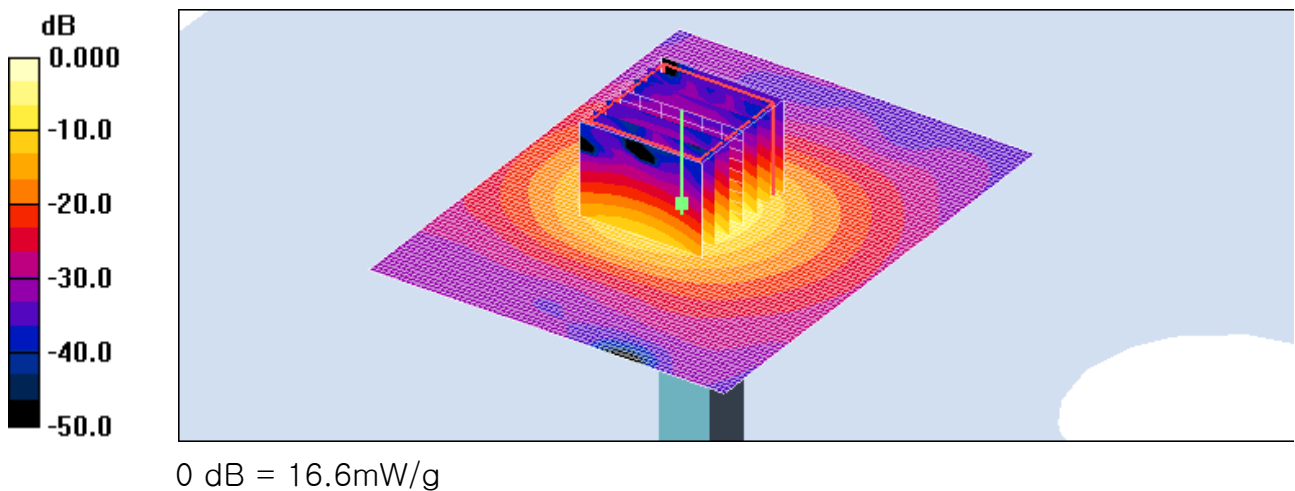
Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 5800$ MHz; $\sigma = 6.06$ mho/m; $\epsilon_r = 46$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: EX3DV4 – SN3797; ConvF(3.75, 3.75, 3.75); Calibrated: 2011-07-25
- Sensor-Surface: 4mm (Mechanical Surface Detection) Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn466; Calibrated: 2012-02-21
- Phantom: 800/900 Phantom; Type: SAM

Validation 5800MHz/Area Scan (71x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 8.72 mW/g

Validation 5800MHz/Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 35.6 V/m; Power Drift = -0.042 dB
Peak SAR (extrapolated) = 34.7 W/kg
SAR(1 g) = 7.7 mW/g; SAR(10 g) = 2.14 mW/g
Maximum value of SAR (measured) = 16.6 mW/g



■ Dielectric Parameter (1 900 MHz Head)

Title L-06D
SubTitle 1 900MHz
Test Date Jun.10, 2012

Frequency	e'	e''
1800000000.0000	40.2180	12.9879
1810000000.0000	40.1912	13.0236
1820000000.0000	40.1534	13.0699
1830000000.0000	40.1192	13.0879
1840000000.0000	40.0830	13.1141
1850000000.0000	40.0465	13.1382
1860000000.0000	39.9997	13.1557
1870000000.0000	39.9706	13.2078
1880000000.0000	39.9231	13.2272
1890000000.0000	39.8908	13.2693
1900000000.0000	39.8472	13.2807
1910000000.0000	39.8001	13.3187
1920000000.0000	39.7628	13.3364
1930000000.0000	39.7225	13.3436
1940000000.0000	39.6902	13.3577
1950000000.0000	39.6447	13.4024
1960000000.0000	39.6032	13.4155
1970000000.0000	39.5684	13.4452
1980000000.0000	39.5166	13.4927
1990000000.0000	39.4880	13.5032
2000000000.0000	39.4282	13.5095

■ Dielectric Parameter (1 900 MHz Body)

Title L-06D
SubTitle 1 900MHz
Test Date Jun.10, 2012

Frequency	e'	e''
1850000000.0000	53.9584	14.0509
1855000000.0000	53.9807	14.0362
1860000000.0000	53.9966	14.0771
1865000000.0000	53.9333	14.0927
1870000000.0000	53.9388	14.0791
1875000000.0000	53.8431	14.0998
1880000000.0000	53.8682	14.1444
1885000000.0000	53.7888	14.1370
1890000000.0000	53.7394	14.1592
1895000000.0000	53.7069	14.1812
1900000000.0000	53.6619	14.1895
1905000000.0000	53.6115	14.2152
1910000000.0000	53.5703	14.2438
1915000000.0000	53.5214	14.2725
1920000000.0000	53.5188	14.3302
1925000000.0000	53.5155	14.3388
1930000000.0000	53.4700	14.3682
1935000000.0000	53.4809	14.4061
1940000000.0000	53.4916	14.3981
1945000000.0000	53.4767	14.4481
1950000000.0000	53.5311	14.4557

■ Dielectric Parameter (2 450 MHz Head)

Title L-06D
SubTitle 2 450MHz
Test Date Jun.10, 2012

Frequency	e'	e''
240000000.0000	38.7763	13.5694
240500000.0000	38.7209	13.5878
241000000.0000	38.6997	13.6186
241500000.0000	38.6348	13.6085
242000000.0000	38.5822	13.6830
242500000.0000	38.5836	13.6942
243000000.0000	38.5409	13.6801
243500000.0000	38.5310	13.7093
244000000.0000	38.5112	13.7308
244500000.0000	38.5493	13.7306
245000000.0000	38.5372	13.7485
245500000.0000	38.5446	13.7765
246000000.0000	38.5663	13.7653
246500000.0000	38.5960	13.8119
247000000.0000	38.6121	13.8050
247500000.0000	38.5951	13.8540
248000000.0000	38.6100	13.8188
248500000.0000	38.5670	13.8431
249000000.0000	38.5995	13.8655
249500000.0000	38.5657	13.8718
250000000.0000	38.5547	13.8746

■ Dielectric Parameter (2 450 MHz Body)

Title L-06D
SubTitle 2 450MHz
Test Date Jun.10, 2012

Frequency	e'	e''
2400000000.0000	51.8484	13.5885
2405000000.0000	51.8801	13.5854
2410000000.0000	51.8063	13.6106
2415000000.0000	51.7874	13.6228
2420000000.0000	51.7732	13.6739
2425000000.0000	51.7533	13.6730
2430000000.0000	51.7159	13.7315
2435000000.0000	51.7099	13.7468
2440000000.0000	51.6875	13.8017
2445000000.0000	51.6576	13.8328
2450000000.0000	51.6771	13.8758
2455000000.0000	51.6350	13.8968
2460000000.0000	51.6418	13.9115
2465000000.0000	51.6425	13.9679
2470000000.0000	51.5963	13.9497
2475000000.0000	51.5978	13.9680
2480000000.0000	51.5990	14.0092
2485000000.0000	51.5574	14.0083
2490000000.0000	51.5650	14.0189
2495000000.0000	51.5485	14.0310
2500000000.0000	51.5727	14.0653

■ Dielectric Parameter (5GHz Head)

Title L-06D
 SubTitle 5GHz
 Test Date Jun.11, 2012

Frequency	e'	e''
5000000000.0000	36.8042	15.4095
5050000000.0000	36.8019	15.6553
5100000000.0000	36.7329	15.5025
5150000000.0000	36.4830	15.8173
5200000000.0000	36.5812	15.7740
5250000000.0000	36.3099	15.7919
5300000000.0000	36.2877	15.9726
5350000000.0000	36.2579	15.8450
5400000000.0000	36.0312	16.0242
5450000000.0000	36.0564	16.0276
5500000000.0000	35.8432	16.1069
5550000000.0000	35.7274	16.1670
5600000000.0000	35.6434	16.2233
5650000000.0000	35.4498	16.3048
5700000000.0000	35.3263	16.3711
5750000000.0000	35.1635	16.5261
5800000000.0000	34.9942	16.5325
5850000000.0000	34.8725	16.7198
5900000000.0000	34.7300	16.7752
5950000000.0000	34.6084	16.8461
6000000000.0000	34.4709	16.9768

■ Dielectric Parameter (5GHz Body)

Title L-06D
SubTitle 5GHz
Test Date Jun.11, 2012

Frequency	e'	e''
5000000000.0000	47.6694	17.5867
5050000000.0000	47.8185	17.6316
5100000000.0000	47.5175	17.6225
5150000000.0000	47.5162	17.8836
5200000000.0000	47.2663	17.9185
5250000000.0000	47.3640	17.8710
5300000000.0000	46.8085	18.0871
5350000000.0000	47.3635	18.0158
5400000000.0000	46.4907	18.0135
5450000000.0000	47.1118	18.4276
5500000000.0000	46.3917	17.9976
5550000000.0000	46.6622	18.7315
5600000000.0000	46.4173	18.1286
5650000000.0000	46.2172	18.8526
5700000000.0000	46.2030	18.3998
5750000000.0000	46.1786	19.0190
5800000000.0000	46.0033	18.7904
5850000000.0000	45.4855	19.0803
5900000000.0000	45.7925	19.2318
5950000000.0000	45.1930	19.2349
6000000000.0000	45.6057	19.5698

Attachment 3. – Probe Calibration Data

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



SCS
Schweizerischer Kalibrierdienst
Service suisse d'étalonnage
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: **ET3-1630_Nov11**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1630**

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: **November 18, 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	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 ES30V2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8645C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8733E	US37390565	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

Calibrated by:	Names Jeton Kashtali	Function Laboratory Technician	Signature
Approved by:	Names Katja Pokovic	Function Technical Manager	Signature

Issued: November 16, 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
S Service suisse d'étalonnage
S Servizio svizzero di taratura
S 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

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., $\theta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) 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 $\theta = 0$ ($f \leq 900$ 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 E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}: DCP are numerical linearization parameters assessed based on the data of power sweep 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:1630

November 18, 2011

Probe ET3DV6

SN:1630

Manufactured: October 12, 2001
Calibrated: November 18, 2011

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

ET3DV6- SN:1630

November 18, 2011

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1630

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V/m})^2$) ^A	1.71	1.62	1.60	$\pm 10.1 \%$
DCP (mV) ^B	100.3	99.5	101.7	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^C (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	98.2	$\pm 2.7 \%$
			Y	0.00	0.00	1.00	101.9	
			Z	0.00	0.00	1.00	98.0	

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.

^C 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:1630

November 18, 2011

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1630

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^e	Conductivity (S/m) ^e	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
300	45.3	0.87	8.13	8.13	8.13	0.31	1.60	± 13.4 %
450	43.5	0.87	7.40	7.40	7.40	0.22	2.27	± 13.4 %
750	41.9	0.89	6.61	6.61	6.61	0.82	1.68	± 12.0 %
835	41.5	0.90	6.27	6.27	6.27	0.72	1.84	± 12.0 %
900	41.5	0.97	6.16	6.16	6.16	0.68	1.92	± 12.0 %
1450	40.5	1.20	5.57	5.57	5.57	0.54	2.48	± 12.0 %
1750	40.1	1.37	5.43	5.43	5.43	0.60	2.26	± 12.0 %
1900	40.0	1.40	5.17	5.17	5.17	0.63	2.15	± 12.0 %
1950	40.0	1.40	5.05	5.05	5.05	0.63	2.13	± 12.0 %
2450	39.2	1.80	4.57	4.57	4.57	0.81	1.74	± 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.

^e 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:1630

November 18, 2011

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1630

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^①	Relative Permittivity ^②	Conductivity (S/m) ^③	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
300	58.2	0.92	7.96	7.96	7.96	0.29	2.29	± 13.4 %
450	56.7	0.94	7.74	7.74	7.74	0.16	2.25	± 13.4 %
750	55.5	0.96	6.36	6.36	6.36	0.75	1.84	± 12.0 %
835	55.2	0.97	6.27	6.27	6.27	0.72	1.88	± 12.0 %
1450	54.0	1.30	5.46	5.46	5.46	0.70	1.97	± 12.0 %
1750	53.4	1.49	4.95	4.95	4.95	0.59	2.72	± 12.0 %
1900	53.3	1.52	4.75	4.75	4.75	0.60	2.56	± 12.0 %
2450	52.7	1.95	4.30	4.30	4.30	1.00	1.29	± 12.0 %

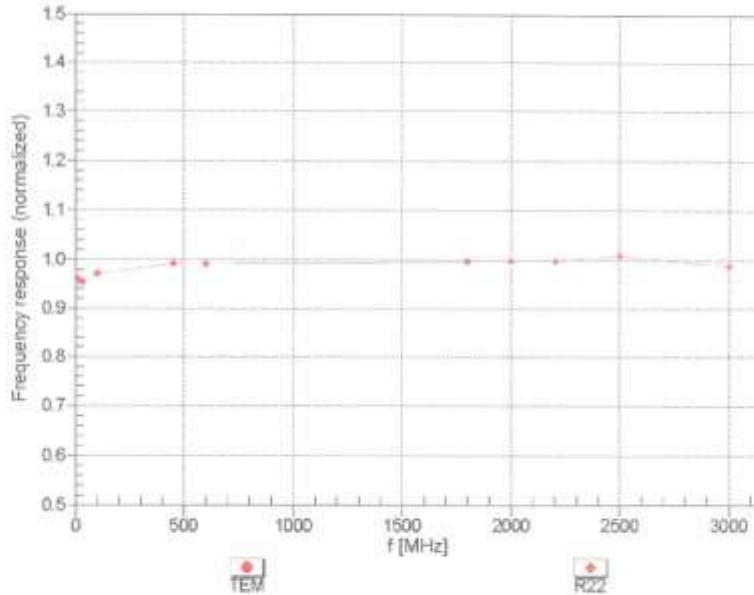
^① Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^② 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:1630

November 18, 2011

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

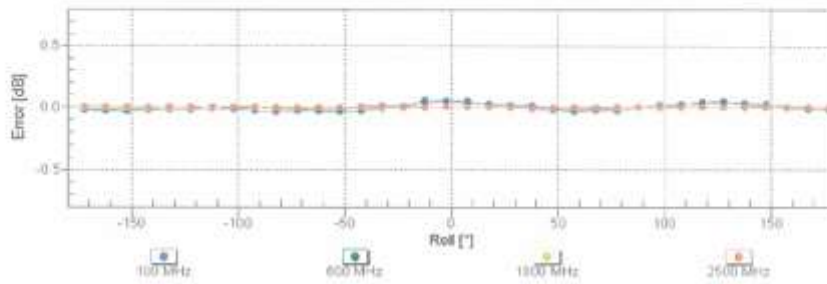
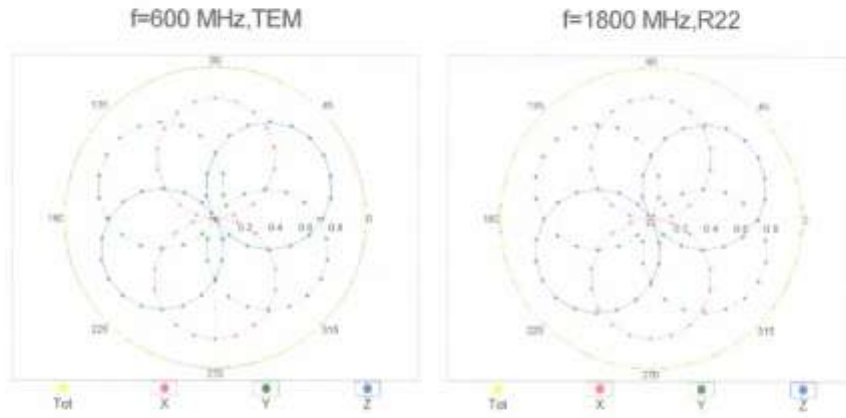


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

ET3DV6-SN:1630

November 18, 2011

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

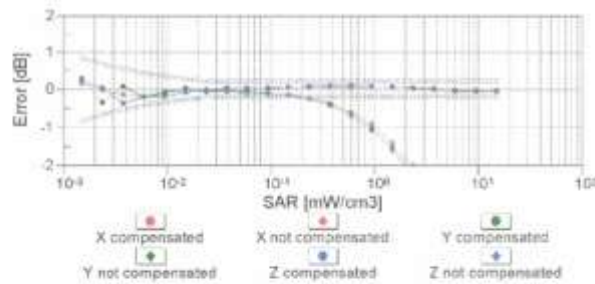
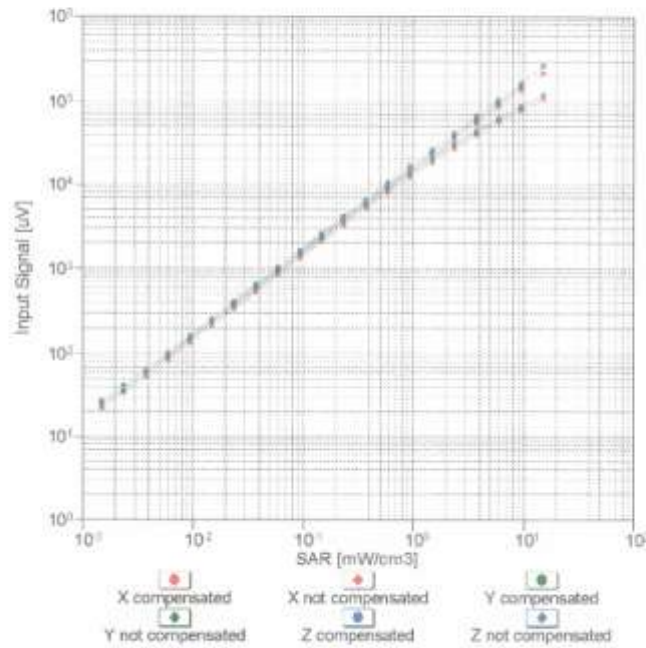


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

ET3DV6- SN:1630

November 18, 2011

Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell, $f = 900 \text{ MHz}$)

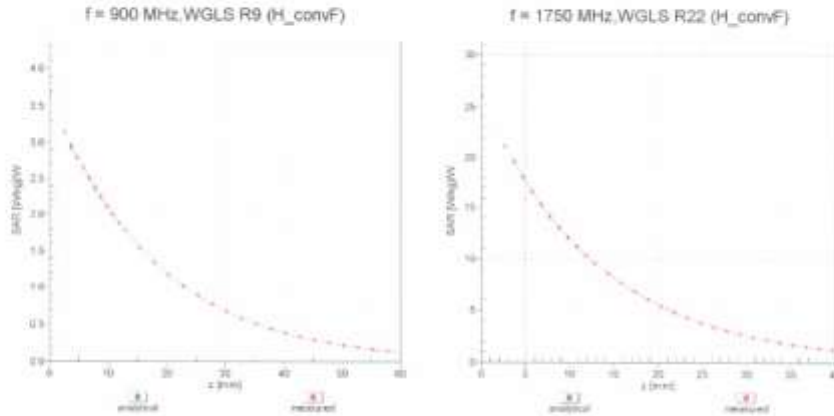


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ET3DV6- SN:1630

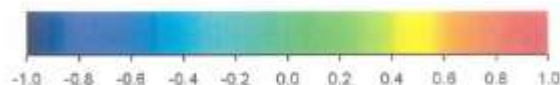
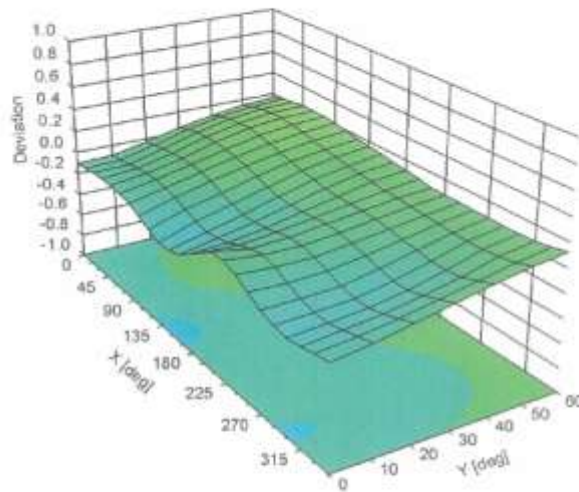
November 18, 2011

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:1630

November 18, 2011

DASY/EASY - Parameters of Probe: ET3DV6 - SN:1630**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

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info@speag.com, http://www.speag.com

Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1630

Place of Assessment:

Zurich

Date of Assessment:

November 21, 2011

Probe Calibration Date:

November 18, 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 450, 900 MHz or at 1750 MHz.

Assessed by:



ET3DV6-SN:1630

Page 1 of 2

November 21, 2011

Schmid & Partner Engineering AG

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Dosimetric E-Field Probe ET3DV6 - SN:1630

Conversion factor (\pm standard deviation)

150 \pm 50 MHz *ConvF* 8.03 \pm 10%

$\epsilon_r = 52.3 \pm 5\%$
 $\sigma = 0.76 \pm 5\%$ mho/m
(head tissue)

150 \pm 50 MHz *ConvF* 8.29 \pm 10%

$\epsilon_r = 61.9 \pm 5\%$
 $\sigma = 0.80 \pm 5\%$ 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.

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USAGE OF ORGANIC SOLVENTS WITH SPEAG PRODUCTS

INTRODUCTION

SPEAG offers a wide range of simulating liquids. These liquids are based on various ingredients depending on their frequency range. The below compatibility table shows compatibility of SPEAG products used in conjunction with tissue simulating liquids. Proper treatment and maintenance of all SPEAG products is essential regardless of its compliance status.

COMPATIBILITY TABLE

- Y**= fully compatible with the tissue simulating liquid. Long time exposure is not critical.
- P**= partially compatible. It is essential to keep the exposure time to a minimum and to rinse and clean the item after exposure to the respective tissue simulating liquid. Continuous exposure will reduce the item life-time drastically and will therefore void any warranty. 100 hours per 7 days maximum exposure.
- R**= restricted compatibility with the respective tissue simulating liquid. Short time exposure of less than 4 hours is possible given that the item is thoroughly rinsed and dried after each exposure.
- N**= not compatible with the respective tissue simulating liquid. Short time exposure will cause irreparable damage to the item exposed.

SPEAG MSDS	772-SLAAxHy						772-SLAAxJz		772-SLAAxBy		772-SLAAxBy		772-SLAAxBy		3rd Party Liquids	
	in 900	HSL 175 to HSL 900	MSL 650 to MSL 900	HSL 1450 to HSL 2450	MSL 1450 to MSL 2450	HSL 3500 - 5000 Broadband	MSL 3500 - 5000 Broadband	HSL 3500 - 5000 Broadband	MSL 3500 - 5000 Broadband	HSL 5000 Broadband	MSL 5000 Broadband	HSL BB 1.5 to HSL BB 1.9	MSL BB 1.5 to MSL BB 1.9			
Probes & Phantoms	Liquid Type															
	in 900	HSL 175 to HSL 900	MSL 650 to MSL 900	HSL 1450 to HSL 2450	MSL 1450 to MSL 2450	HSL 3500 - 5000 Broadband	MSL 3500 - 5000 Broadband	HSL 3500 - 5000 Broadband	MSL 3500 - 5000 Broadband	HSL 5000 Broadband	MSL 5000 Broadband	HSL BB 1.5 to HSL BB 1.9	MSL BB 1.5 to MSL BB 1.9	Tissue Simulating Liquids	Acids	Solvents
Twin SAM Phantom V4.0	Y	Y	Y	P	P	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
ELI Oval Phantom V4.0	Y	Y	Y	P	P	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Flat Phantom V4.x / V5.x	Y	Y	Y	P	P	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Whole Body Mannequin	Y	Y	Y	R	R	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
SAM HEAD V4.5	Y	Y	Y	P	P	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
SAM HEAD V4.5 CTIA	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
SAM HEAD V4.5 BS																
SAM HEAD V6.0 / 6.1	Y	Y	Y	R	R	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Probe EK3DV6 / ET3DV6R	Y	Y	Y	P	P	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Probe ES3DVx / EX3DVx	Y	Y	Y	P	P	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Probe HD3DV6 and higher	Y	Y	Y	P	P	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Probe EU2DVx / HU2DVx	Y	Y	Y	P	P	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Probe ET1DVx	Y	Y	Y	R	R	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Probe T1V3 / T1V5 Lab	Y	Y	Y	R	R	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
PEX 150 / 300 Probe Extension	Y	Y	Y	P	P	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
Probes in PMMA enclosures	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
ASTM Phantom	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N
ELIT 1.5 / 1.8T Phantom	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	N

IMPORTANT NOTE FOR PROBES: The probe shall not be exposed to solvents longer than necessary for the measurements and shall be cleaned daily after use with warm water and stored dry.

IMPORTANT NOTE FOR PHANTOMS: Phantoms shall not be exposed to solvents longer than necessary for the measurement. After use, they shall be washed in the inside with clean water and stored dry. Any damaging of the inner surface must be avoided. Once a week, also the outside of the phantom shell shall be washed with clean water and dried.

Schmid & Partner Engineering AG

771-TN-BR-100621-7A

BR

June 2010

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



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C Servizio svizzero di taratura
S 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: EX3-3797_Jul11

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3797**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes**

Calibration date: **July 25, 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	GB41293674	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41499067	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: S5066 (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	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-09 (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:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: July 25, 2011

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

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

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 β	β rotation around an axis that is in the plane normal to probe axis (at measurement center). i.e., $\beta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) 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 $\beta = 0$ ($f \leq 900$ 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 E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}: DCP are numerical linearization parameters assessed based on the data of power sweep 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
- Ax,y,z; Bx,y,z; Cx,y,z, VRx,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.

EX3DV4 – SN:3797

July 25, 2011

Probe EX3DV4

SN:3797

Manufactured: April 5, 2011
Calibrated: July 25, 2011

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

EX3DV4-- SN:3797

July 25, 2011

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^a	0.63	0.59	0.57	± 10.1 %
DCP (mV) ^b	94.6	95.3	96.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^c (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	96.0	±2.5 %
			Y	0.00	0.00	1.00	126.8	
			Z	0.00	0.00	1.00	126.7	

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.

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

EX3DV4- SN 3797

July 25, 2011

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^①	Relative Permittivity ^②	Conductivity (S/m) ^③	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	9.29	9.29	9.29	0.80	0.68	± 12.0 %
835	41.5	0.90	8.93	8.93	8.93	0.80	0.67	± 12.0 %
900	41.5	0.97	8.83	8.83	8.83	0.80	0.66	± 12.0 %
1450	40.5	1.20	8.30	8.30	8.30	0.59	0.78	± 12.0 %
1750	40.1	1.37	7.88	7.88	7.88	0.77	0.62	± 12.0 %
1900	40.0	1.40	7.60	7.60	7.60	0.80	0.60	± 12.0 %
1950	40.0	1.40	7.44	7.44	7.44	0.78	0.61	± 12.0 %
2300	39.5	1.67	7.30	7.30	7.30	0.75	0.62	± 12.0 %
2450	39.2	1.80	6.94	6.94	6.94	0.74	0.62	± 12.0 %
2600	39.0	1.96	7.16	7.16	7.16	0.59	0.72	± 12.0 %
5200	36.0	4.66	4.73	4.73	4.73	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.44	4.44	4.44	0.42	1.80	± 13.1 %
5500	35.6	4.96	4.48	4.48	4.48	0.42	1.80	± 13.1 %
5600	35.5	5.07	4.16	4.16	4.16	0.42	1.80	± 13.1 %
5800	35.3	5.27	4.26	4.26	4.26	0.45	1.80	± 13.1 %

^① 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^② uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^② 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^② uncertainty for indicated target tissue parameters.

EX3DV4- SN:3797

July 25, 2011

DASY/EASY - Parameters of Probe: EX3DV4- SN:3797

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^d	Conductivity (S/m) ^e	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.22	9.22	9.22	0.80	0.70	± 12.0 %
835	55.2	0.97	9.14	9.14	9.14	0.80	0.69	± 12.0 %
1750	53.4	1.49	7.69	7.69	7.69	0.80	0.66	± 12.0 %
1900	53.3	1.52	7.26	7.26	7.26	0.80	0.64	± 12.0 %
2300	52.9	1.81	7.18	7.18	7.18	0.80	0.62	± 12.0 %
2450	52.7	1.95	6.96	6.96	6.96	0.80	0.50	± 12.0 %
2600	52.5	2.16	6.90	6.90	6.90	0.80	0.50	± 12.0 %
5200	49.0	5.30	4.10	4.10	4.10	0.50	1.90	± 13.1 %
5300	48.9	5.42	3.83	3.83	3.83	0.55	1.90	± 13.1 %
5500	48.6	5.65	3.72	3.72	3.72	0.55	1.90	± 13.1 %
5600	48.5	5.77	3.60	3.60	3.60	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.75	3.75	3.75	0.60	1.90	± 13.1 %

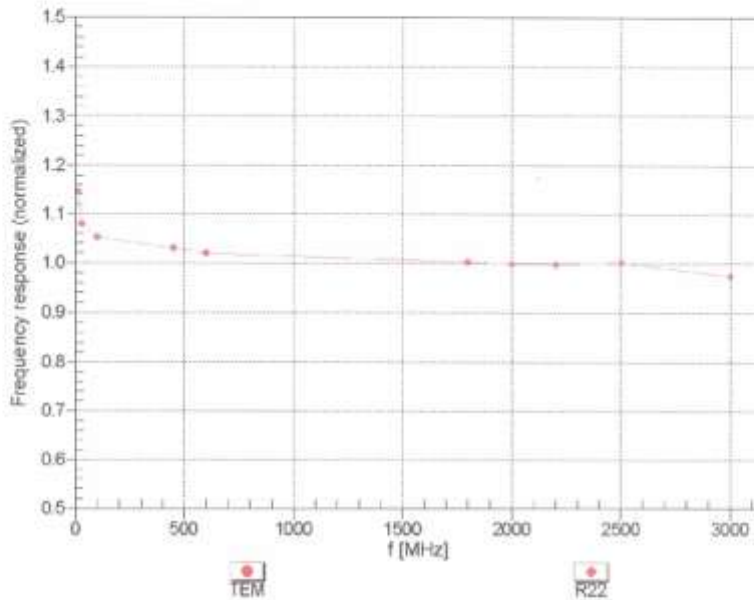
^b Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^c At frequencies below 3 GHz, the validity of tissue parameters (μ and α) 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 (μ and α) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

EX3DV4- SN-3797

July 25, 2011

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

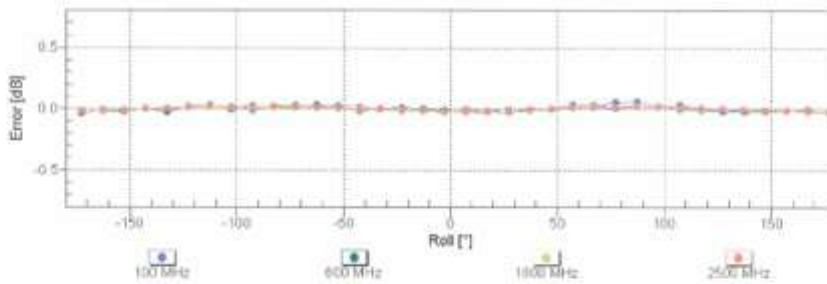
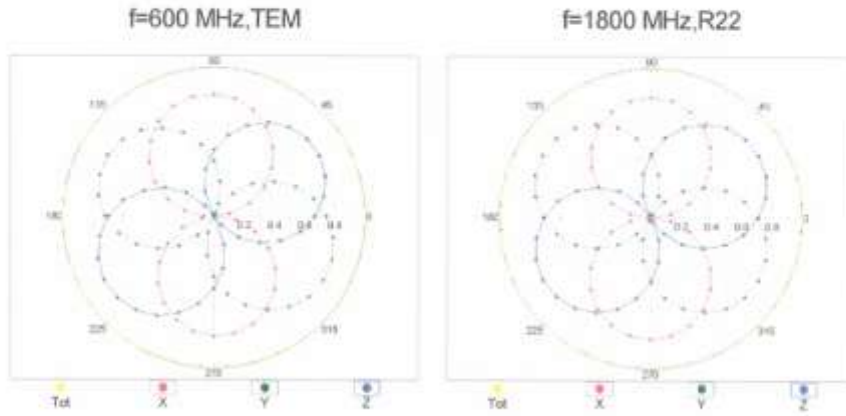


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

EX3DV4-SN:3797

July 25, 2011

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

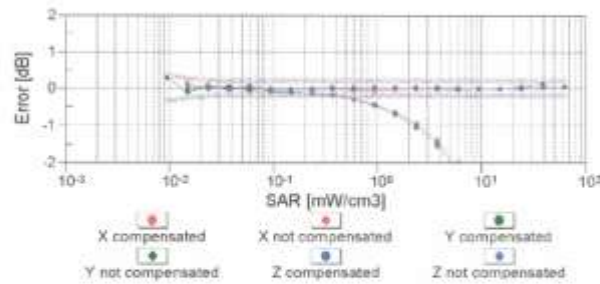
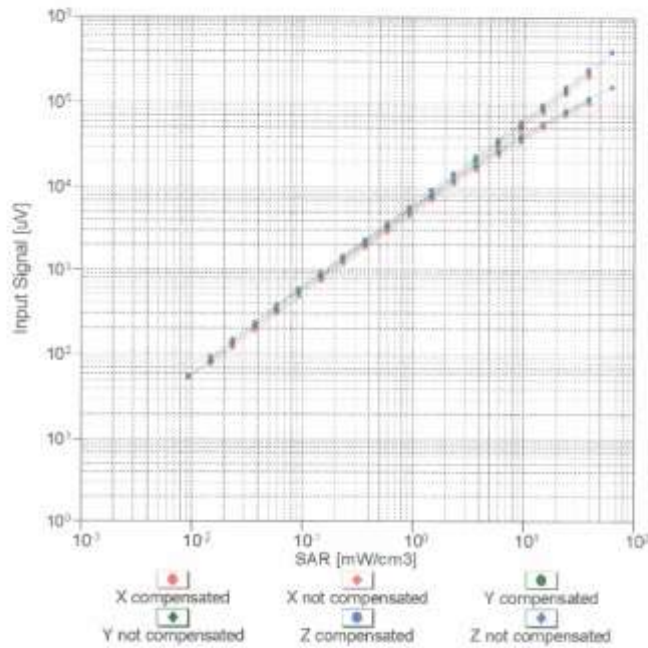


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

EX3DV4- SN-3797

July 25, 2011

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

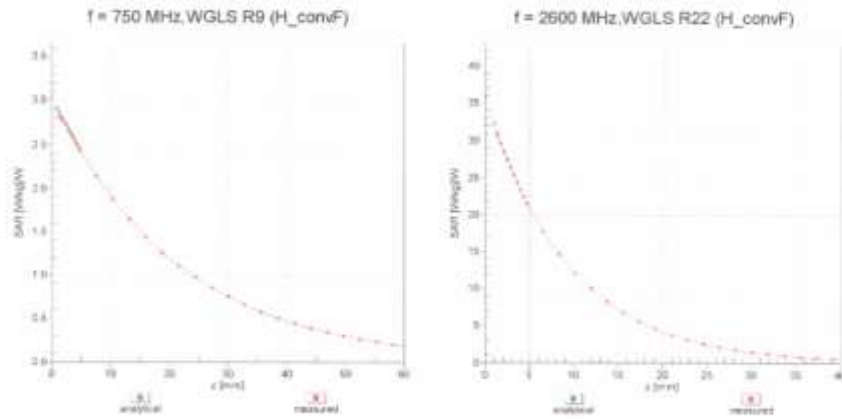


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

EX3DV4- SN:3797

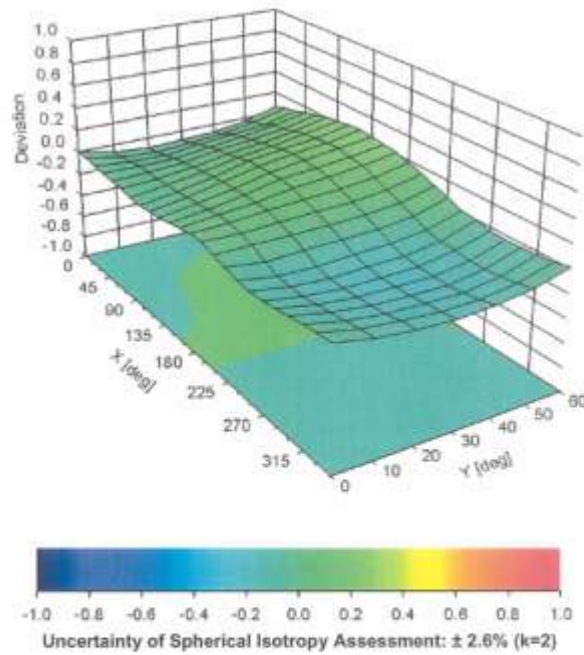
July 25, 2011

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), f = 900 MHz



EX3DV4- SN:3797

July 25, 2011

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3797**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	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Attachment 4. – Dipole Calibration Data

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



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Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **D1900V2-5d032_Jul11**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d032**

Calibration procedure(s) **QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **July 22, 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 EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 55086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by:	Name	Function	Signature
	Dimce Iliev	Laboratory Technician	
Approved by:	Name	Function	Signature
	Katja Pokovic	Technical Manager	

Issued: August 2, 2011

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

Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	39.1 \pm 6 %	1.42 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	39.9 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.29 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	21.0 mW / g \pm 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 \pm 0.2) °C	52.3 \pm 6 %	1.53 mho/m \pm 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	40.9 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.39 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.5 mW / g \pm 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.6 Ω + 6.5 j Ω
Return Loss	- 23.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6 Ω + 6.0 j Ω
Return Loss	- 22.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.190 ns
----------------------------------	----------

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 17, 2003

DASY5 Validation Report for Head TSL

Date: 20.07.2011

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

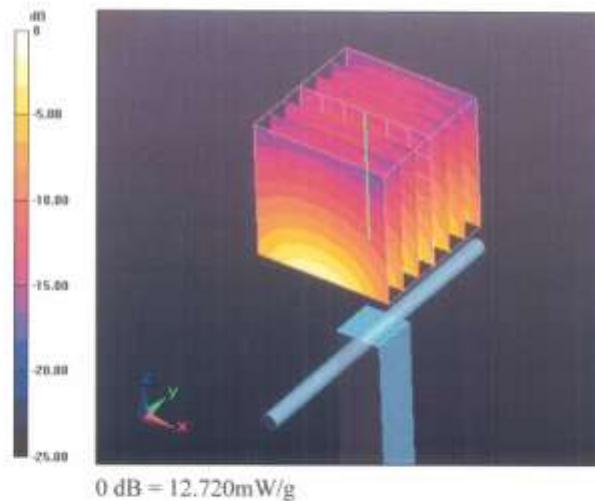
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.253 V/m; Power Drift = 0.03 dB

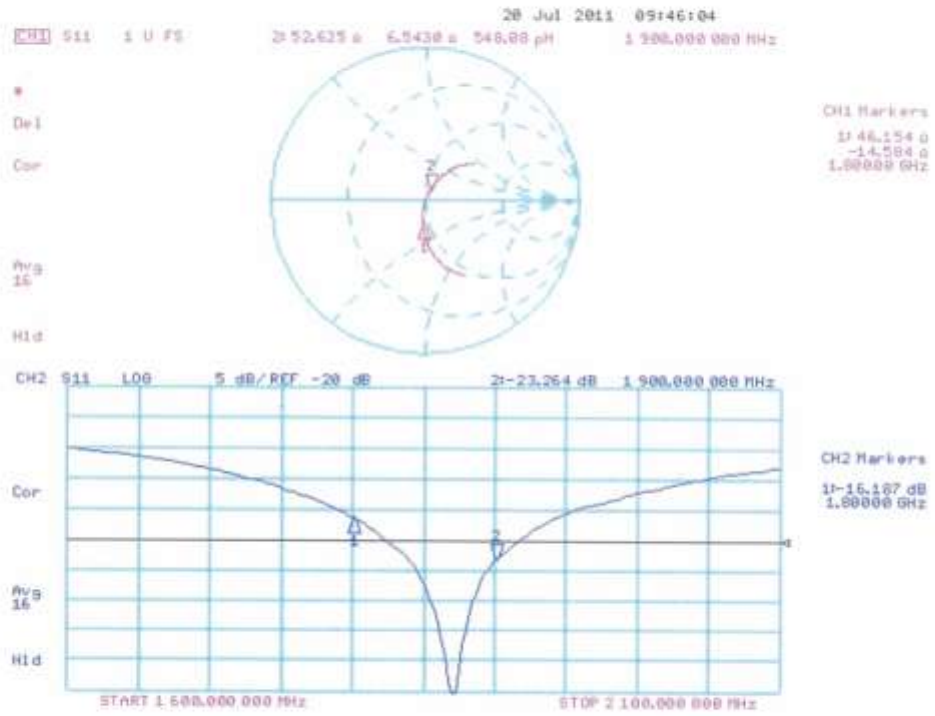
Peak SAR (extrapolated) = 18.469 W/kg

SAR(1 g) = 10.1 mW/g; SAR(10 g) = 5.29 mW/g

Maximum value of SAR (measured) = 12.721 mW/g



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.07.2011

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

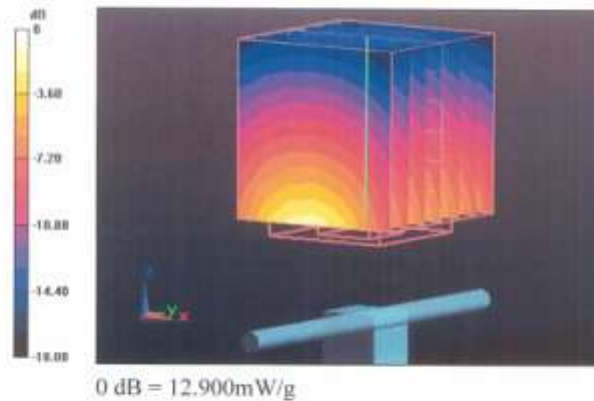
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.827 V/m; Power Drift = 0.0078 dB

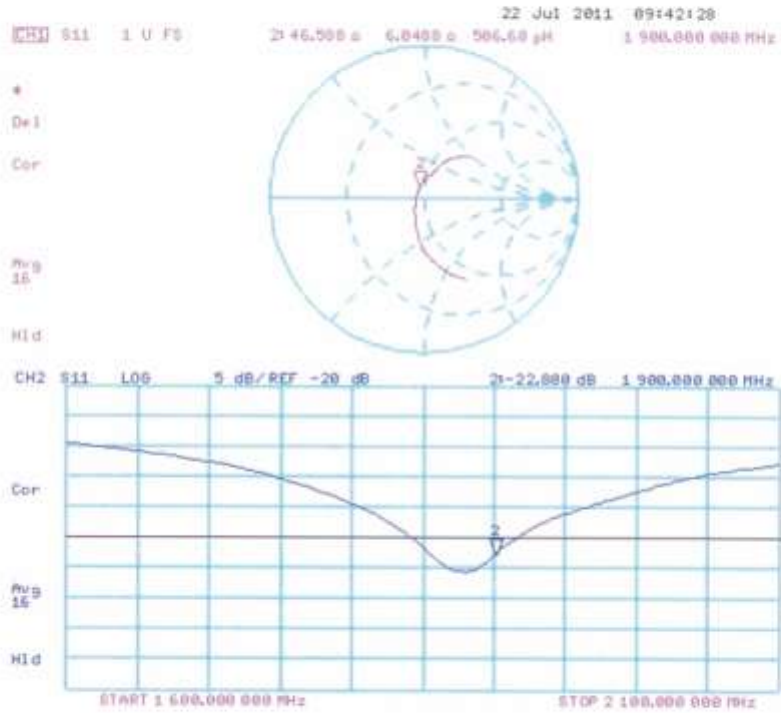
Peak SAR (extrapolated) = 18.111 W/kg

SAR(1 g) = 10.3 mW/g; SAR(10 g) = 5.39 mW/g

Maximum value of SAR (measured) = 12.898 mW/g



Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **D2450V2-743_Aug11**

CALIBRATION CERTIFICATE

Object: **D2450V2 - SN: 743**

Calibration procedure(s): **QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **August 29, 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 EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by:	Name: Dimco Iliev	Function: Laboratory Technician	Signature:
Approved by:	Name: Katja Pokovic	Function: Technical Manager	Signature:

Issued: August 29, 2011

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	38.4 \pm 6 %	1.85 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.7 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	53.8 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.40 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	25.4 mW / g \pm 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 \pm 0.2) °C	51.8 \pm 6 %	2.02 mho/m \pm 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.7 mW / g \pm 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.11 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.2 mW / g \pm 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.0 Ω + 4.8 jΩ
Return Loss	- 23.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.3 Ω + 5.8 jΩ
Return Loss	- 24.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 ns
----------------------------------	----------

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

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 01, 2003

DASY5 Validation Report for Head TSL

Date: 29.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.85$ mho/m; $\epsilon_r = 38.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

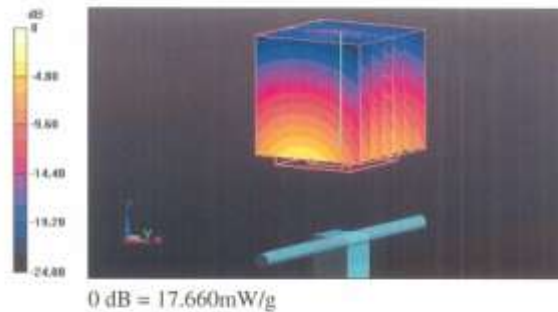
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 101.2 V/m; Power Drift = 0.03 dB

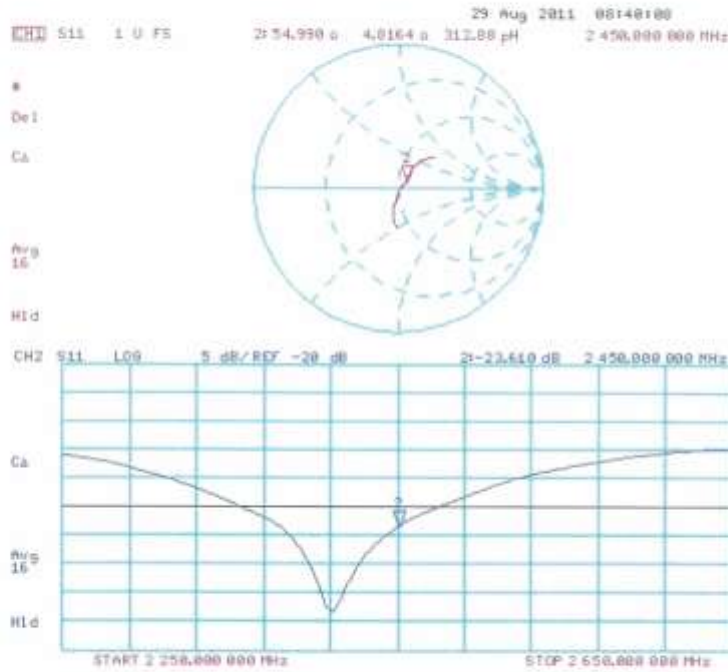
Peak SAR (extrapolated) = 28.291 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.4 mW/g

Maximum value of SAR (measured) = 17.657 mW/g



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 29.08.2011

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.02$ mho/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

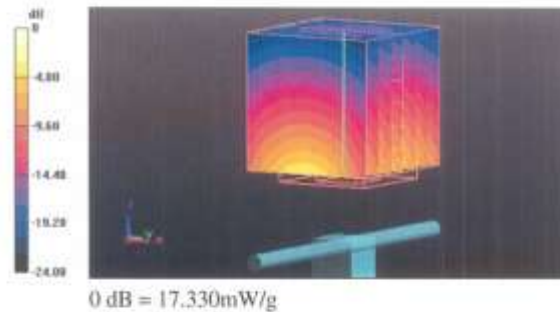
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 95.903 V/m; Power Drift = -0.0051 dB

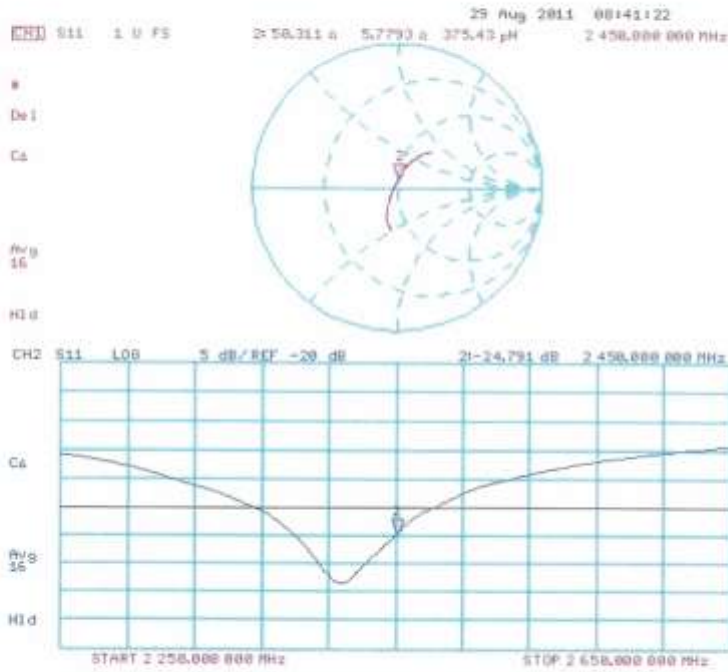
Peak SAR (extrapolated) = 27.107 W/kg

SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.11 mW/g

Maximum value of SAR (measured) = 17.329 mW/g



Impedance Measurement Plot for Body TSL



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Accreditation No.: **SCS 108**

Client **HCT (Dymstec)**

Certificate No: **D5GHzV2-1107_Nov11**

CALIBRATION CERTIFICATE

Object: **D5GHzV2 - SN: 1107**

Calibration procedure(s): **QA CAL-22.v1
Calibration procedure for dipole validation kits between 3-6 GHz**

Calibration date: **November 15, 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 EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe EX3DV4	SN: 3503	04-Mar-11 (No. EX3-3503_Mar11)	Mar-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4208	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

Calibrated by:	Name: Dimce Iliev	Function: Laboratory Technician	Signature:
Approved by:	Name: Katja Pokovic	Function: Technical Manager	Signature:

Issued: November 16, 2011

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz ± 1 MHz 5500 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	4.48 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.10 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	80.3 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	22.9 mW / g ± 16.5 % (k=2)

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	4.75 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.87 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	87.8 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.52 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.9 mW / g ± 16.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.7 ± 6 %	5.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.98 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	78.9 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.27 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	22.4 mW / g ± 16.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.7 ± 6 %	5.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.76 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	77.2 mW / g ± 18.1 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.16 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.5 mW / g ± 17.6 % (k=2)

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.66 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.87 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.20 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	81.5 mW / g ± 18.1 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.27 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	22.6 mW / g ± 17.6 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	6.26 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.73 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	76.9 mW / g ± 18.1 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.2 mW / g ± 17.6 % (k=2)

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	51.4 Ω - 9.9 j Ω
Return Loss	- 20.2 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	53.5 Ω - 6.8 j Ω
Return Loss	- 22.6 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	54.3 Ω - 7.3 j Ω
Return Loss	- 21.8 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	48.9 Ω - 8.9 j Ω
Return Loss	- 20.9 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	52.8 Ω - 4.6 j Ω
Return Loss	- 25.6 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	56.8 Ω - 4.6 j Ω
Return Loss	- 22.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.196 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 15.11.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1107

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: $f = 5200$ MHz; $\sigma = 4.46$ mho/m; $\epsilon_r = 34.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 4.75$ mho/m; $\epsilon_r = 34.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.03$ mho/m; $\epsilon_r = 33.7$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

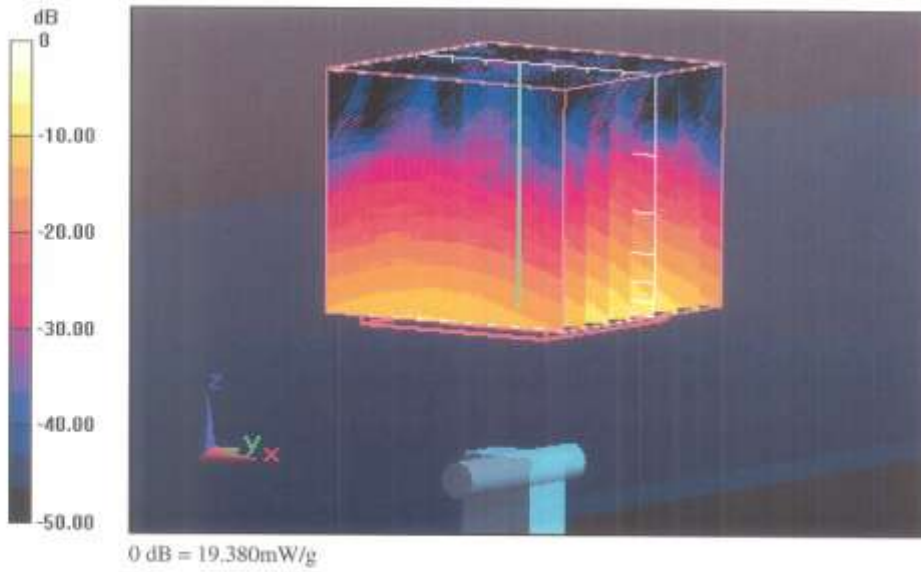
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41), ConvF(4.91, 4.91, 4.91), ConvF(4.81, 4.81, 4.81); Calibrated: 04.03.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

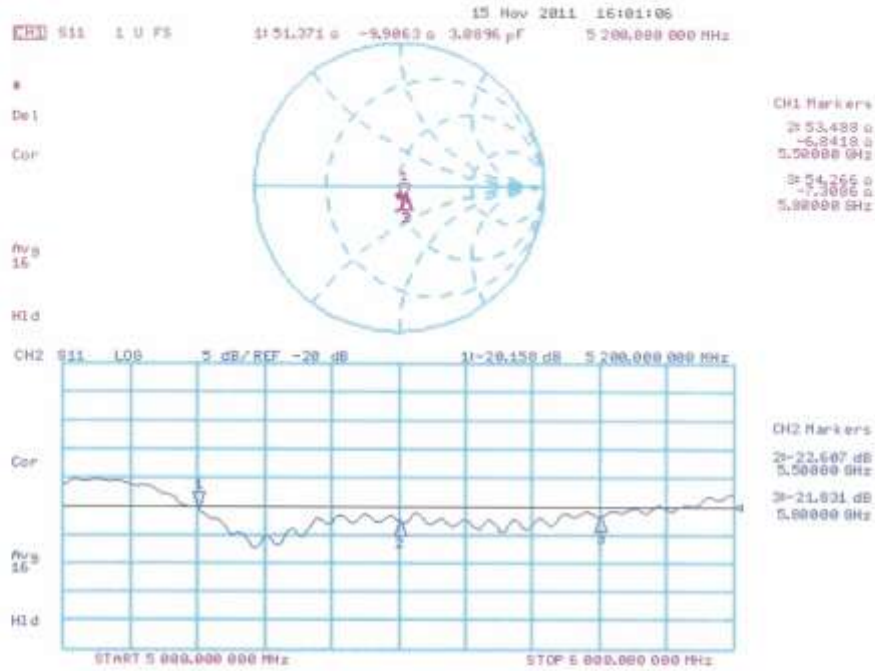
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.489 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 30.049 W/kg
SAR(1 g) = 8.1 mW/g; SAR(10 g) = 2.32 mW/g
Maximum value of SAR (measured) = 18.742 mW/g

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.044 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 35.139 W/kg
SAR(1 g) = 8.87 mW/g; SAR(10 g) = 2.52 mW/g
Maximum value of SAR (measured) = 21.234 mW/g

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 62.486 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 33.340 W/kg
SAR(1 g) = 7.98 mW/g; SAR(10 g) = 2.27 mW/g
Maximum value of SAR (measured) = 19.378 mW/g



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.11.2011

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1107

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz
Medium parameters used: $f = 5200$ MHz; $\sigma = 5.48$ mho/m; $\epsilon_r = 47.7$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 5.87$ mho/m; $\epsilon_r = 47.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.26$ mho/m; $\epsilon_r = 46.6$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

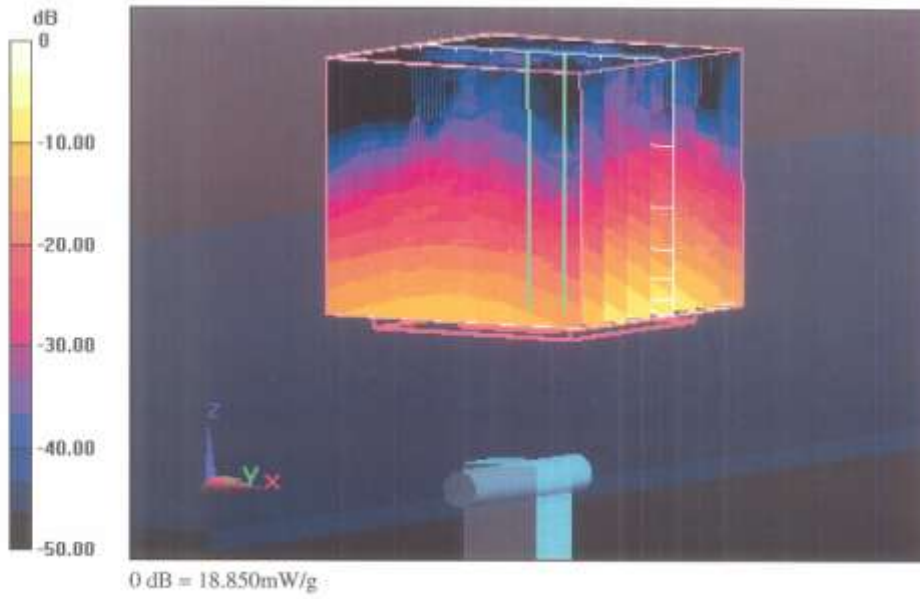
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91), ConvF(4.43, 4.43, 4.43), ConvF(4.38, 4.38, 4.38); Calibrated: 04.03.2011
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 59.430 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 30.431 W/kg
SAR(1 g) = 7.76 mW/g; SAR(10 g) = 2.16 mW/g
Maximum value of SAR (measured) = 17.928 mW/g

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 58.998 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 35.235 W/kg
SAR(1 g) = 8.2 mW/g; SAR(10 g) = 2.27 mW/g
Maximum value of SAR (measured) = 19.488 mW/g

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 55.860 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 35.929 W/kg
SAR(1 g) = 7.73 mW/g; SAR(10 g) = 2.14 mW/g
Maximum value of SAR (measured) = 18.853 mW/g



Impedance Measurement Plot for Body TSL

