

SAR TEST REPORT

HCT CO., LTD

EUT Type:	850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN		
FCC ID:	A3LGTS5301		
Model:	GT-S5301		
Date of Issue:	Sep.24, 2012		
Test report No.:	HCTA1209FS06		
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Applicant :	SAMSUNG Electronics Co., Ltd. 416 Maetan3-Dong, YeongTong-Gu, Suwon-Si, Gyeonggi-Do, Korea, 443-742		
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.		
Max SAR	Band	1g SAR (W/kg)	
		Head	Body-worn
	GSM850	0.413	0.509
	GSM1900	0.530	0.274
	802.11b	0.595	0.316
Simultaneous SAR per KDB 690783 D01		1.125	0.825
Signature	 Report prepared by : Young-Soo Jang Test Engineer of SAR Part  Approved by : Jae-Sang So Manager of SAR Part		

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1. INTRODUCTION

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices.

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 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).

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

where:

σ	=	conductivity of the tissue-simulant material (S/m)
ρ	=	mass density of the tissue-simulant material (kg/m ³)
E	=	Total RMS electric field strength (V/m)

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

2. DESCRIPTION OF DEVICE

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

EUT Type:	850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
FCC ID:	A3LGTS5301
Model:	GT-S5301
Trade Name	SAMSUNG Electronics Co., Ltd.
Application Type	Certification
Mode(s) of Operation	GSM850/ GSM1900/ 802.11b/g/n
Tx Frequency	824.20 - 848.80 MHz (GSM850) 1 850.20 – 1 909.80 MHz (GSM1900) 2 412 – 2462 MHz (WLAN)
Rx Frequency	869.20 - 893.80 MHz (GSM850) 1 930.20 – 1 989.80 MHz (GSM1900) 2 412 – 2462 MHz (WLAN)
FCC Classification	Licensed Portable Transmitter Held to Ear (PCE)
Production Unit or Identical Prototype	Prototype
Date(s) of Tests	Sep.19, 2012 ~ Sep.21, 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.

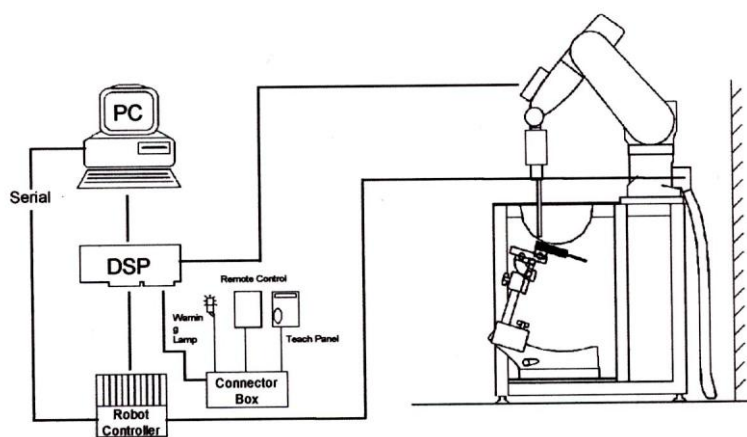


Figure 3.1 HCT SAR Lab. Test Measurement Set-up

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 DASY E-FIELD PROBE SYSTEM

3.2.1 ET3DV6 Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System Built-in shielding against static charges
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at Frequencies of 450 MHz, 900 MHz and 1.8 GHz (accuracy: 8 %)
Frequency	10 MHz to > 3 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity	± 0.2 dB in brain tissue (rotation around probe axis) ± 0.4 dB in brain tissue (rotation normal probe axis)
Dynamic	5 μ W/g to > 100 mW/g;
Range Linearity:	± 0.2 dB
Surface Detection	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces.
Dimensions	Overall length: 337 mm Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application	General dissymmetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

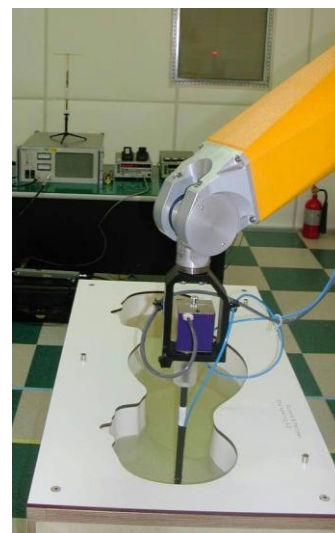


Figure 3.2 Photograph of the probe and the Phantom



Figure 3.3 ET3DV6 E-field Probe

The SAR measurements were conducted with the dosimetric probe ET3DV6, designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches a maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.

3.3 PROBE CALIBRATION PROCESS

3.3.1 E-Probe Calibration

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

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

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

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

where:

Δt = exposure time (30 seconds),

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

ΔT = temperature increase due to RF exposure.

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

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

where:

σ = simulated tissue conductivity,

ρ = Tissue density (1.25 g/cm³ for brain tissue)

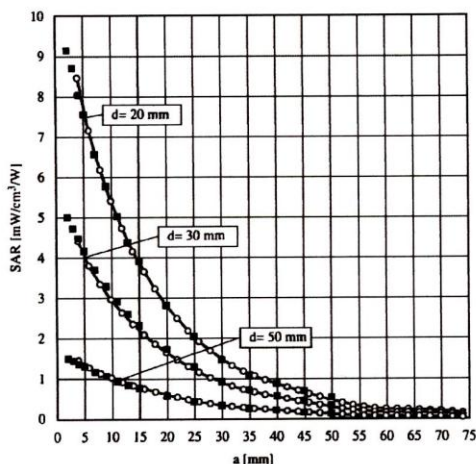


Figure 3.4 E-Field and Temperature measurements at 900 MHz

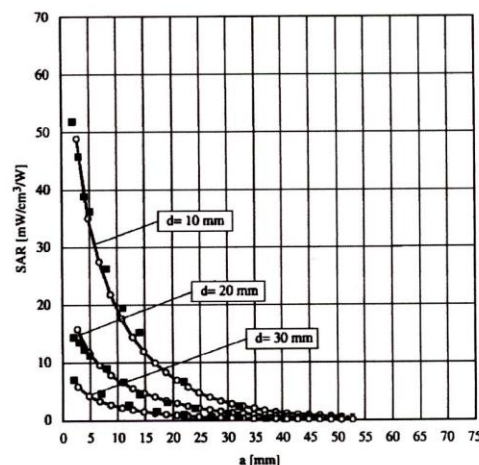


Figure 3.5 E-Field and temperature measurements at 1.8 GHz

3.3.2 Data Extrapolation

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

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

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

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

E-field probes:

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

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

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

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

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

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

with SAR = local specific absorption rate in W/g
 E_{tot} = total field strength in V/m
 σ = conductivity in [mho/m] or [Siemens/m]
 ρ = equivalent tissue density in g/cm³

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

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

with P_{pwe} = equivalent power density of a plane wave in W/cm²
 E_{tot} = total electric field strength in V/m

3.4 SAM Phantom

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.



Figure 3.6 SAM Phantom

Shell Thickness	2.0 mm $\pm$ 0.2 mm (6 $\pm$ 0.2 mm at ear point)
Filling Volume	about 25 L
Dimensions	810 mm x 1 000 mm x 500 mm (H x L x W)

3.5 Device Holder for Transmitters

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

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



Figure 3.7 Device Holder

3.6 Brain & Muscle Simulating Mixture Characterization

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

Ingredients (% by weight)	Frequency (MHz)											
	450		750		835		915		1 900		2 450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.2	51.7	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (NaCl)	3.95	1.49	1.4	1.0	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	57	47.2	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	0.2	0.0	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.2	0.1	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton X-100	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.00	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7

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

Table 3.1 Composition of the Tissue Equivalent Matter

3.7 SAR TEST EQUIPMENT

Manufacturer	Type / Model	S/N	Calib. Date	Calib.Interval	Calib.Due
SPEAG	SAM Phantom	-	N/A	N/A	N/A
Staubli	Robot RX90L	F01/5K09A1/A/01	N/A	N/A	N/A
Staubli	Robot ControllerCS7MB	F99/5A82A1/C/01	N/A	N/A	N/A
HP	Pavilion t000_puffer	KRJ51201TV	N/A	N/A	N/A
SPEAG	Light Alignment Sensor	265	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	D221340.01	N/A	N/A	N/A
SPEAG	DAE4	648	Apr. 27, 2012	Annual	Apr. 27, 2013
SPEAG	E-Field Probe ET3DV6	1609	Mar. 09, 2012	Annual	Mar. 09, 2013
SPEAG	Validation Dipole D835V2	441	May 16, 2012	Annual	May 16, 2013
SPEAG	Validation Dipole D1900V2	5d032	July 20, 2012	Annual	July 20, 2013
SPEAG	Validation Dipole D2450V2	743	Aug. 23, 2012	Annual	Aug. 23, 2013
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 778D	16072	Nov. 04, 2011	Annual	Nov. 04, 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.

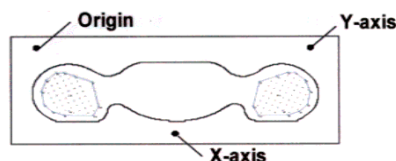


Figure 4.1 SAR Measurement Point in Area Scan

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.

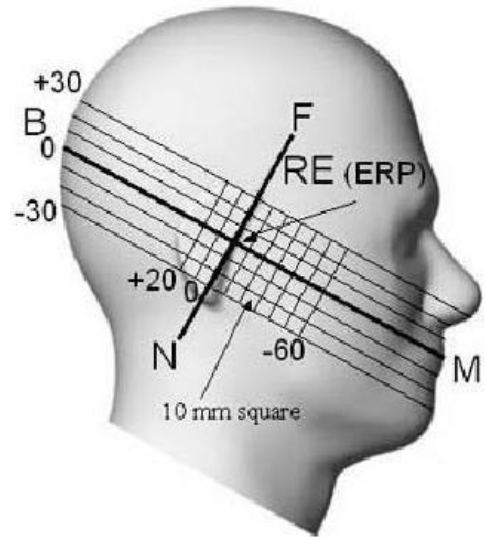


Figure 5.1 Side view of the phantom

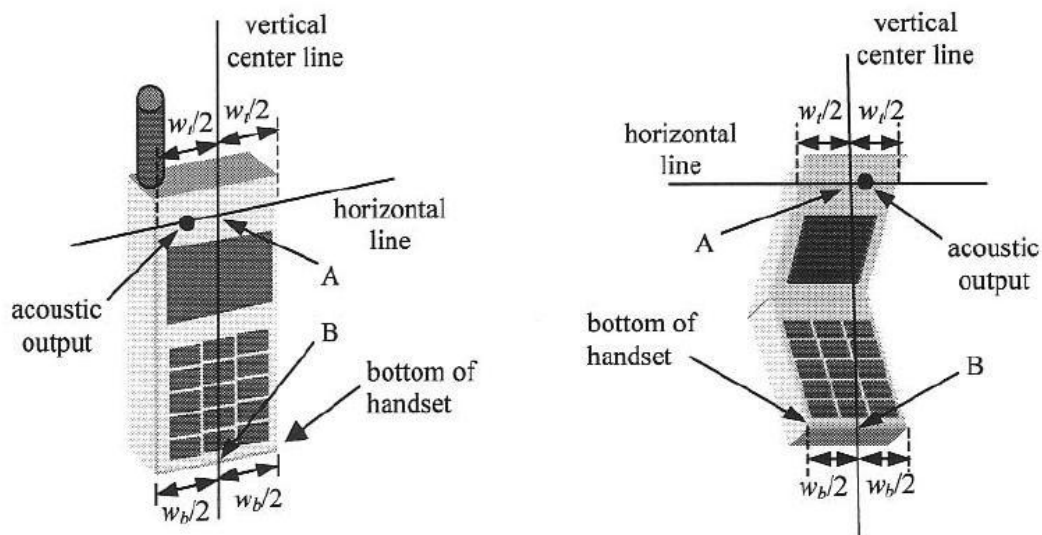


Figure 5.2 Handset vertical and horizontal reference lines

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)

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

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

Table 7.1 Safety Limits for Partial Body Exposure

NOTES:

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

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

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

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

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

8. SYSTEM VERIFICATION

8.1 Tissue Verification

Freq. [MHz]	Date	Liquid	Liquid Temp.[°C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
835	Sep. 19, 2012	Head	21.3	ϵ_r	41.5	40.4	- 2.65	± 5
σ				0.90	0.917	+ 1.89	± 5	
835		Body		ϵ_r	55.2	54.3	- 1.63	± 5
				σ	0.97	1.01	+ 4.12	± 5
1 900	Sep. 20, 2012	Head	21.2	ϵ_r	40.0	40.8	+ 2.00	± 5
σ				1.40	1.37	- 2.14	± 5	
1 900		Body		ϵ_r	53.3	51.4	- 3.56	± 5
				σ	1.52	1.56	+ 2.63	± 5
2 450	Sep. 21, 2012	Head	21.3	ϵ_r	39.2	39.0	- 0.51	± 5
σ				1.80	1.79	- 0.56	± 5	
2 450		Body		ϵ_r	52.7	53.0	+ 0.57	± 5
				σ	1.95	1.98	+ 1.54	± 5

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

8.2 System Validation

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

Freq. [MHz]	Date	Probe (SN)	Liquid	Amb. Temp. [°C]	Liquid Temp. [°C]	1 W Target SAR _{1g} (SPEAG) (mW/g)	Measured SAR _{1g} (mW/g)	1 W Normalized SAR _{1g} (mW/g)	Deviation [%]	Limit [%]
835	Sep. 19, 2012	1609	Head	21.5	21.3	9.43	0.94	9.4	- 0.32	± 10
835			Body			9.50	0.982	9.82	+ 3.37	± 10
1 900	Sep. 20, 2012		Head	21.4	21.2	39.0	3.74	37.4	- 4.10	± 10
1 900			Body			39.9	4.01	40.1	+ 0.50	± 10
2 450	Sep. 21, 2012		Head	21.5	21.3	52.7	5.26	52.6	- 0.19	± 10
2 450			Body			51.2	4.87	48.7	- 4.88	± 10

8.3 System Validation Procedure

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

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

Note;

SAR Verification was performed according to the FCC KDB 450824.

9. RF CONDUCTED POWER MEASUREMENT

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

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 : GPRS850/1900 Body SAR with GPRS Multi-slot Class12, 4Tx with CS 1 (GMSK)

Note;

CS1/MCS7 coding scheme was used in GPRS/EDGE output power measurements and SAR Testing, as a condition where GMSK/8PSK modulation was ensured. Investigation has shown that CS1 - CS4/ MCS5 – MCS9 settings do not have any impact on the output levels in the GPRS/EDGE modes.

GSM Conducted output powers (Burst-Average)

Band	Channel	GSM	GPRS(GMSK) Data – CS1			
		Voice (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)
GSM 850	128	32.35	32.33	30.00	27.96	26.98
	190	32.46	32.44	30.15	28.13	27.15
	251	32.37	32.35	30.06	28.05	27.08
GSM 1900	512	29.54	29.54	27.31	25.30	24.29
	661	29.43	29.42	27.21	25.21	24.20
	810	29.70	29.68	27.47	25.49	24.50

GSM Conducted output powers (Frame-Average)

Band	Channel	GSM	GPRS Data			
		Voice (dBm)	GPRS 1 TX Slot (dBm)	GPRS 2 TX Slot (dBm)	GPRS 3 TX Slot (dBm)	GPRS 4 TX Slot (dBm)
GSM 850	128	23.32	23.30	23.98	23.70	23.97
	190	23.43	23.41	24.13	23.87	24.14
	251	23.34	23.32	24.04	23.79	24.07
GSM 1900	512	20.51	20.51	21.29	21.04	21.28
	661	20.40	20.39	21.19	20.95	21.19
	810	20.67	20.65	21.45	21.23	21.49

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 802.11b/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					*
	5.745	149		✓		✓	
	5.765	153	152 (5.76 GHz)		*		*
	5.785	157		✓			*
	5.805	161	160 (5.80 GHz)		*	✓	
§15.247	5.825	165		✓			

802.11 Test Channels per FCC Requirements

Band	Channel	Conducted Power (dBm)			
		Data Rate (Mbps)			
		1	2	5.5	11
IEEE 802.11b	1	14.88	14.98	14.76	14.53
	6	15.13	15.02	14.94	14.66
	11	15.24	15.22	15.05	14.83

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	11.67	11.45	11.34	11.14	10.89	10.56	10.25	10.05
	6	11.79	11.68	11.58	11.22	11.01	10.69	10.35	10.22
	11	11.83	11.74	11.60	11.39	12.22	10.83	10.53	10.40

Average IEEE 802.11g Conducted output power

Band	Channel	Conducted Power (dBm)							
		Data Rate (Mbps)							
		6.5	13	19.5	26	39	52	58.5	65
IEEE 802.11n (HT-20)	1	10.48	10.21	9.95	10.59	9.64	10.31	10.65	10.66
	6	10.55	10.44	10.35	10.55	10.15	10.99	10.19	10.93
	11	10.78	10.45	10.32	10.53	10.20	10.65	10.26	10.99

Average IEEE 802.11n Conducted output power

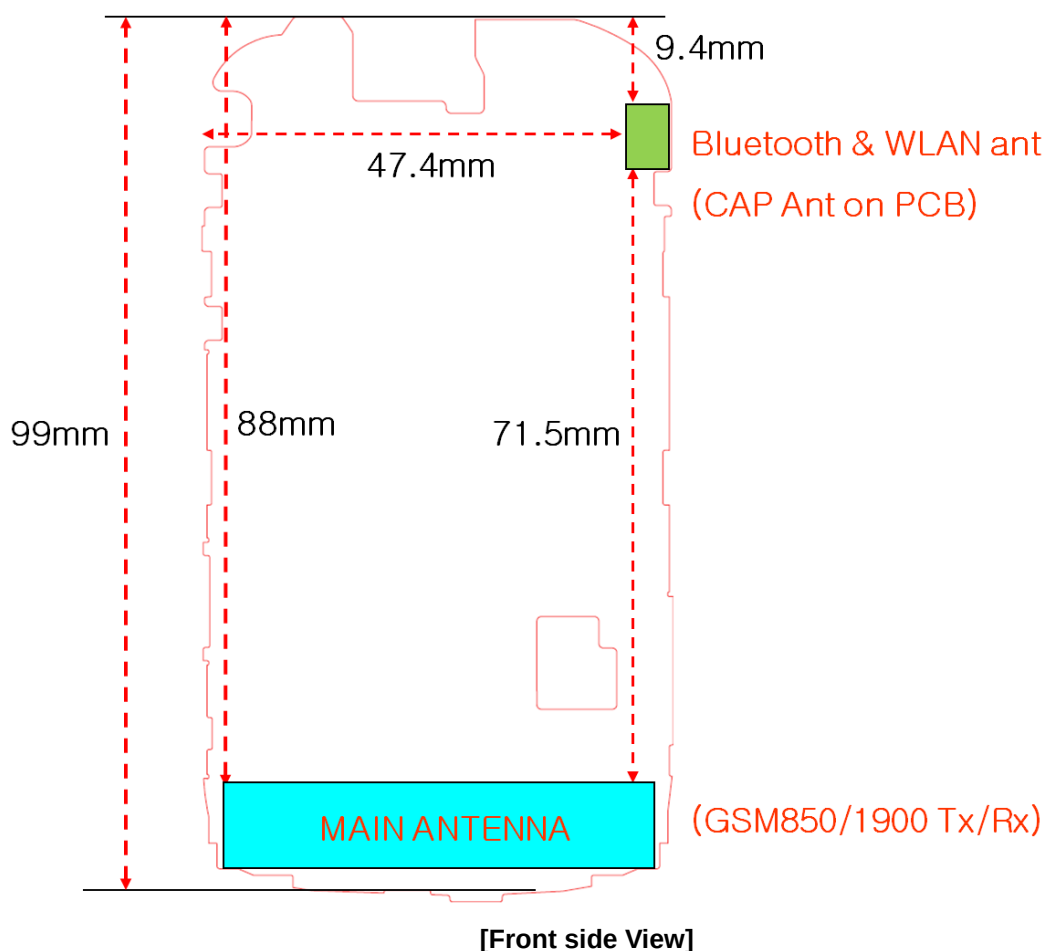
Note;
SAR testing was performed according to the FCC KDB 248227.

10. SAR Test configuration & Antenna Information

10.1 SAR Test configurations

Mode	Back	Front	Left	Right	Bottom	Top
850 GPRS	Yes	Yes	Yes	Yes	Yes	No
1900 GPRS	Yes	Yes	Yes	Yes	Yes	No
WLAN	Yes	Yes	No	Yes	No	Yes

10.2 Antenna and Device Information



Note;

Please see the separate Antenna distance document.

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

SAR Evaluation Requirements for Multiple Transmitters Handsets

FCC ID: A3LGTS5301

BT Max. RF output power: 4.14 mW

11.2 SAR Summation Scenario

Simultaneous Transmission Summation for Held to Ear

Simultaneous TX	configuration	850 GSM SAR(W/kg)	2.4GHz WIFI SAR (W/kg)	Σ SAR (W/kg)	Simultaneous TX	configuration	1900 GSM SAR(W/kg)	2.4GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Left Cheek	0.413	0.595	1.008	Head SAR	Left Cheek	0.530	0.595	1.125
	Left Tilt	0.152	0.281	0.433		Left Tilt	0.153	0.281	0.434
	Right Cheek	0.346	0.263	0.609		Right Cheek	0.397	0.263	0.660
	Right Tilt	0.159	0.142	0.301		Right Tilt	0.149	0.142	0.291

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

Simultaneous Transmission Summation for Body-Worn (1.0cm)

Simultaneous TX	configuration	850 GPRS SAR(W/kg)	2.4GHz WIFI SAR (W/kg)	Σ SAR (W/kg)	Simultaneous TX	configuration	1900 GPRS SAR(W/kg)	2.4GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.509	0.316	0.825	Body SAR	Back	0.274	0.316	0.590
	Front	0.316	0.310	0.626		Front	0.217	0.310	0.527

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

Simultaneous Transmission Summation for Hotspot (1.0cm)

Simultaneous TX	configuration	850 GPRS SAR(W/kg)	2.4GHz WIFI SAR (W/kg)	Σ SAR (W/kg)	Simultaneous TX	configuration	1900 GPRS SAR(W/kg)	2.4GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.509	0.316	0.825	Body SAR	Back	0.274	0.316	0.590
	Front	0.316	0.310	0.626		Front	0.217	0.310	0.527
	Left	0.180	-	0.180		Left	0.082	-	0.082
	Right	0.126	0.352	0.478		Right	0.048	0.352	0.400
	Bottom	0.062	-	0.062		Bottom	0.196	-	0.196
	Top	-	0.144	0.144		Top	-	0.144	0.144

The above tables represent a portable hotspot condition.

Note;

- **Body-Worn 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.
- The EUT front body-worn configuration is provided to cover any potential accessory that will position the EUT in this manner.

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 (GSM850 Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	SAR(mW/g)
MHz	Channel						
836.6	190 (Mid)	GSM850	32.46	-0.160	Standard	Left Ear	0.413
			32.46	-0.021	Standard	Left Tilt 15°	0.152
			32.46	-0.070	Standard	Right Ear	0.346
			32.46	-0.055	Standard	Right Tilt 15°	0.159
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg (mW/g) Averaged over 1 gram	

NOTES:

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

12.2 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	29.43	0.078	Standard	Left Ear	0.530
			29.43	-0.021	Standard	Left Tilt 15°	0.153
			29.43	0.055	Standard	Right Ear	0.397
			29.43	0.027	Standard	Right Tilt 15°	0.149
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg (mW/g) Averaged over 1 gram	

NOTES:

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

12.3 Measurement Results (802.11b Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Data Rate (Mbps)	SAR(mW/g)
MHz	Channel							
2 462	11 (High)	802.11b	15.24	-0.057	Standard	Left Ear	1	0.595
			15.24	-0.172	Standard	Left Tilt 15°	1	0.281
			15.24	0.102	Standard	Right Ear	1	0.263
			15.24	-0.088	Standard	Right Tilt 15	1	0.142
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg (mW/g) Averaged over 1 gram		

NOTES:

- The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm ± 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☒ Manual Test cord ☐ Base Station Simulator
- IEEE 802.11g(including 802.11n) SAR testing is required when the conducted powers are equal to or greater than 0.25 dB Than the conducted powers in IEEE 802.11b.
- For 2.4GHz WLAN, Highest average power channel for the lowest data rate was selected for SAR evaluation based on KDB 248227. Other channels are not necessary because 1g-average SAR < 0.8 W/Kg and peak SAR < 1.6W/Kg per KDB 248227.

12.4 Measurement Results (GSM850 Hotspot SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	SAR(mW/g)
MHz	Channel						
836.6	190 (Mid)	GPRS 4Tx	27.15	0.164	Rear	1.0 cm	0.509
836.6	190 (Mid)	GPRS 4Tx	27.15	-0.063	Front	1.0 cm	0.316
836.6	190 (Mid)	GPRS 4Tx	27.15	-0.038	Left	1.0 cm	0.180
836.6	190 (Mid)	GPRS 4Tx	27.15	-0.016	Right	1.0 cm	0.126
836.6	190 (Mid)	GPRS 4Tx	27.15	-0.080	bottom	1.0 cm	0.062
ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Body 1.6 W/kg (mW/g) Averaged over 1 gram	

NOTES:

- The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supplement C [July 2001].
- All modes of operation were investigated and the worst-case are reported.
- Measured Depth of Simulating Tissue is 15.0 cm $\pm$ 0.2 cm.
- Tissue parameters and temperatures are listed on the SAR plot.
- Battery Type ☒ Standard ☐ Extended ☐ Slim
Batteries are fully charged for all readings.
- Test Signal Call Mode ☐ Manual Test cord ☒ Base Station Simulator
- Test Configuration ☐ With Holster ☒ Without Holster
- Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
- For body SAR testing, the EUT was set in GPRS multi-slot class12 with 4uplink slots for GSM850 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 (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	24.20	-0.182	Rear	1.0 cm	0.274
1 880.0	661 (Mid)	GPRS 4Tx	24.20	0.016	Front	1.0 cm	0.217
1 880.0	661 (Mid)	GPRS 4Tx	24.20	-0.185	Left	1.0 cm	0.082
1 880.0	661 (Mid)	GPRS 4Tx	24.20	0.090	Right	1.0 cm	0.048
1 880.0	661 (Mid)	GPRS 4Tx	24.20	-0.037	bottom	1.0 cm	0.196
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.

12.6 Measurement Results (802.11b Hotspot SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	Data Rate	SAR(mW/g)
MHz	Channel							
2 462	11 (High)	802.11b	15.24	0.064	Rear	1.0 cm	1 Mbps	0.316
		802.11b	15.24	-0.047	Front	1.0 cm	1 Mbps	0.310
		802.11b	15.24	-0.104	Right	1.0 cm	1 Mbps	0.352
		802.11b	15.24	0.043	Top	1.0 cm	1 Mbps	0.144
ANSI/ IEEE C95.1 1992 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Body 1.6 W/kg (mW/g) Averaged over 1 gram		

NOTES:

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

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. REFERENCES

- [1] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields, July 2001.
- [2] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices.
- [3] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio frequency Radiation, Aug. 1996.
- [4] ANSI/IEEE C95.1 - 1991, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 kHz to 100 GHz, New York: IEEE, Aug. 1992
- [5] ANSI/IEEE C95.3 - 1991, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, 1992.
- [6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.
- [7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.
- [8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 120-124.
- [9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.
- [10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.
- [11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Head Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.
- [12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300 MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.
- [13] G. Hartsgrrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.
- [14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.
- [15] W. Gander, Computer mathematic, Birkhaeuser, Basel, 1992.
- [16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.
- [17] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.
- [18] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.
- [19] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10 kHz-300 GHz, Jan. 1995.
- [20] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hochschule Zürich, Dosimetric Evaluation of the Cellular Phone.
- [21] SAR Evaluation of Handsets with Multiple Transmitters and Antennas #648474.
- [22] SAR Measurement Procedure for 802.11 a/b/g Transmitters #KDB 248227.

Attachment 1. – SAR Test Plots

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.919$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.36, 6.36, 6.36); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Left Touch 190/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.451 mW/g

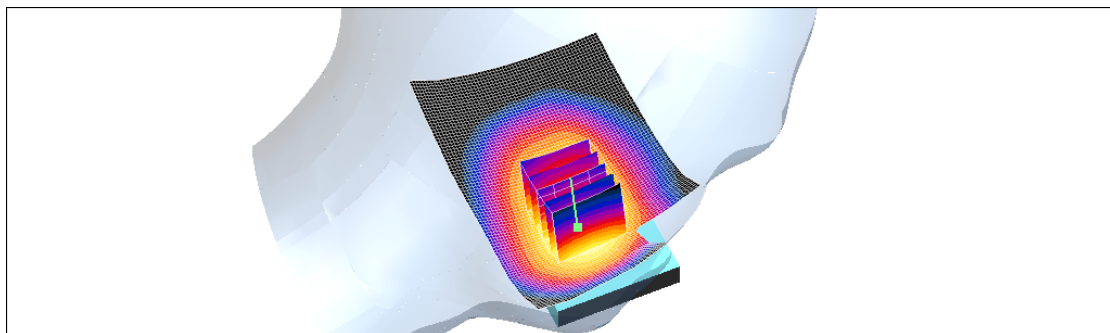
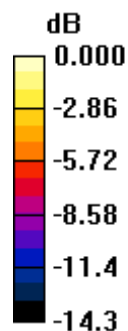
Left Touch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.7 V/m; Power Drift = -0.160 dB

Peak SAR (extrapolated) = 0.657 W/kg

SAR(1 g) = 0.413 mW/g; SAR(10 g) = 0.263 mW/g

Maximum value of SAR (measured) = 0.446 mW/g



0 dB = 0.446mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.919$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.36, 6.36, 6.36); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Left tilt 190/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.162 mW/g

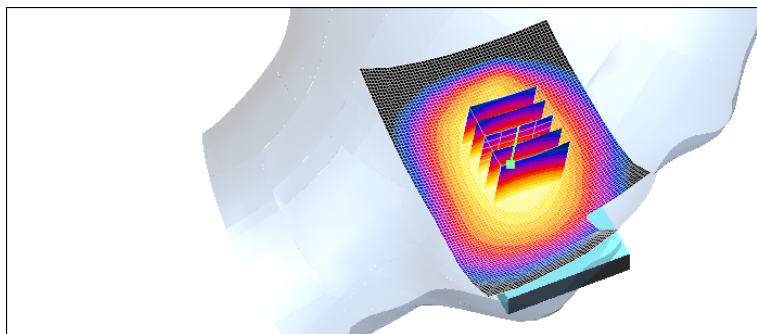
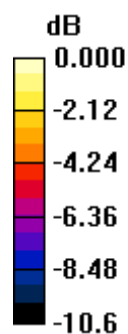
Left tilt 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.6 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 0.193 W/kg

SAR(1 g) = 0.152 mW/g; SAR(10 g) = 0.109 mW/g

Maximum value of SAR (measured) = 0.162 mW/g



0 dB = 0.162mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.919$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.36, 6.36, 6.36); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Right Touch 190/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.391 mW/g

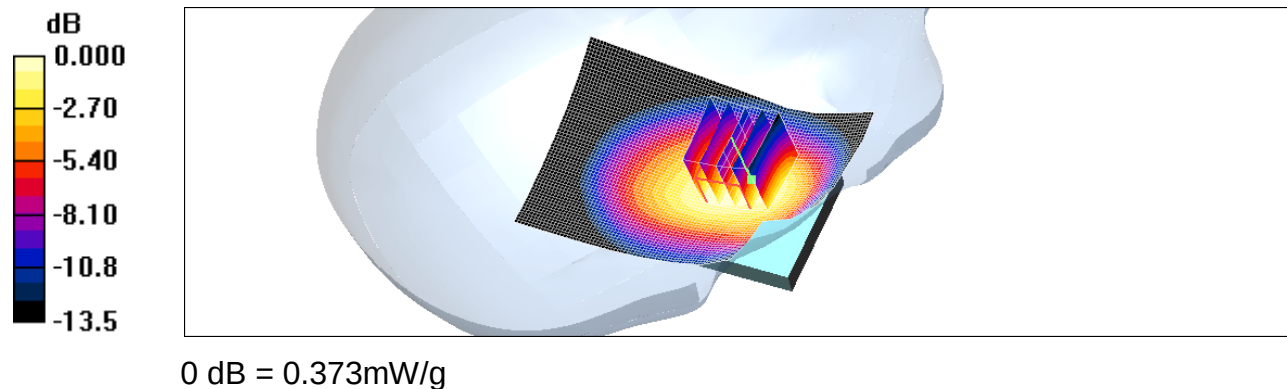
Right Touch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.6 V/m; Power Drift = -0.070 dB

Peak SAR (extrapolated) = 0.515 W/kg

SAR(1 g) = 0.346 mW/g; SAR(10 g) = 0.226 mW/g

Maximum value of SAR (measured) = 0.373 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.919$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.36, 6.36, 6.36); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Right tilt 190/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.171 mW/g

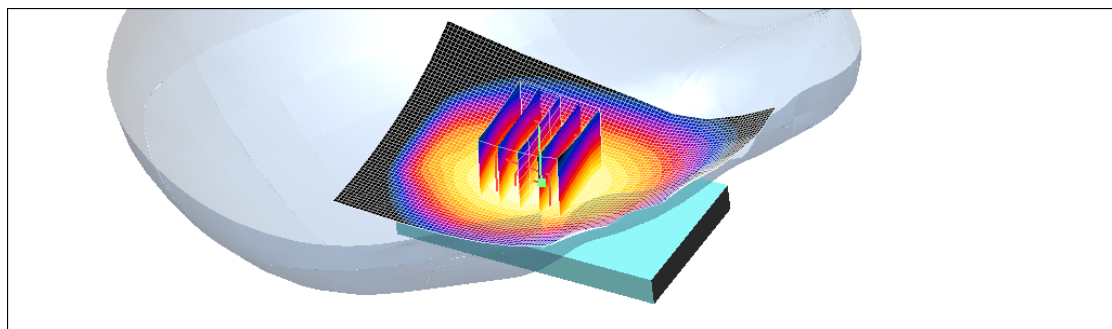
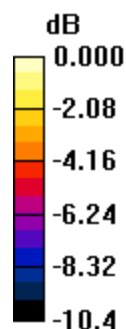
Right tilt 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.9 V/m; Power Drift = -0.055 dB

Peak SAR (extrapolated) = 0.200 W/kg

SAR(1 g) = 0.159 mW/g; SAR(10 g) = 0.114 mW/g

Maximum value of SAR (measured) = 0.168 mW/g



0 dB = 0.168mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 835/900 Phantom ; Type: SAM

Left Touch 661/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.630 mW/g

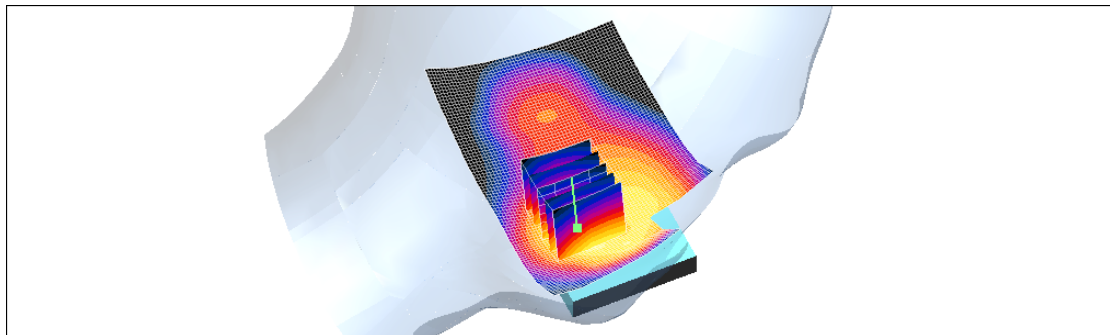
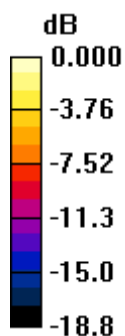
Left Touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.6 V/m; Power Drift = 0.078 dB

Peak SAR (extrapolated) = 0.918 W/kg

SAR(1 g) = 0.530 mW/g; SAR(10 g) = 0.269 mW/g

Maximum value of SAR (measured) = 0.613 mW/g



0 dB = 0.613mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 835/900 Phantom ; Type: SAM

Left tilt 661/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.171 mW/g

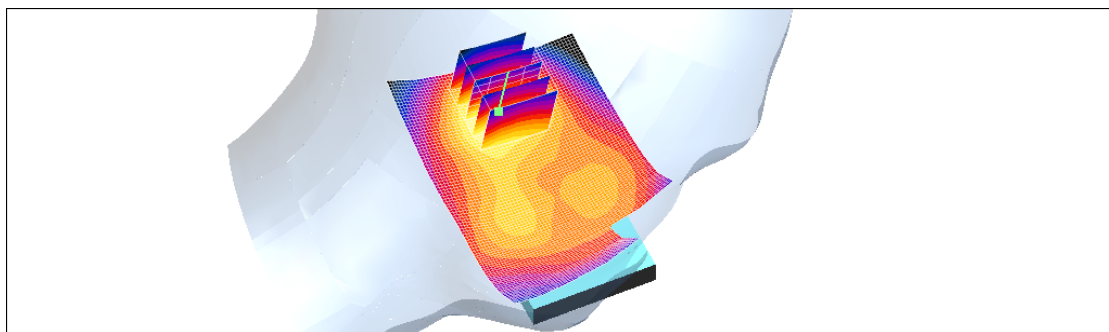
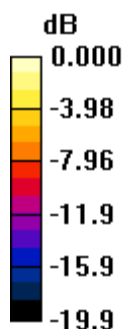
Left tilt 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.44 V/m; Power Drift = -0.021 dB

Peak SAR (extrapolated) = 0.242 W/kg

SAR(1 g) = 0.153 mW/g; SAR(10 g) = 0.084 mW/g

Maximum value of SAR (measured) = 0.172 mW/g



0 dB = 0.172mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³

Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 835/900 Phantom ; Type: SAM

Right Touch 661/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.436 mW/g

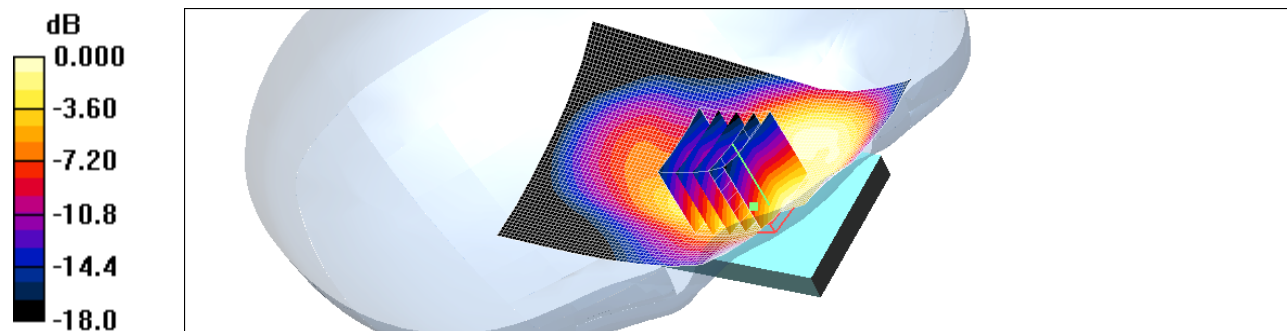
Right Touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.2 V/m; Power Drift = 0.055 dB

Peak SAR (extrapolated) = 0.653 W/kg

SAR(1 g) = 0.397 mW/g; SAR(10 g) = 0.219 mW/g

Maximum value of SAR (measured) = 0.442 mW/g



0 dB = 0.442mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 835/900 Phantom ; Type: SAM

Right tilt 661/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.173 mW/g

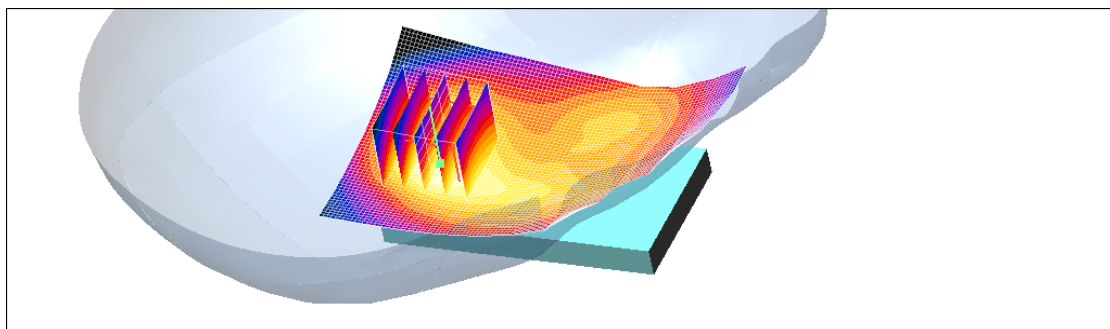
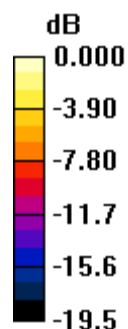
Right tilt 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.02 V/m; Power Drift = 0.027 dB

Peak SAR (extrapolated) = 0.232 W/kg

SAR(1 g) = 0.149 mW/g; SAR(10 g) = 0.085 mW/g

Maximum value of SAR (measured) = 0.159 mW/g



0 dB = 0.159mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Left Touch 11ch 1Mbps/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.839 mW/g

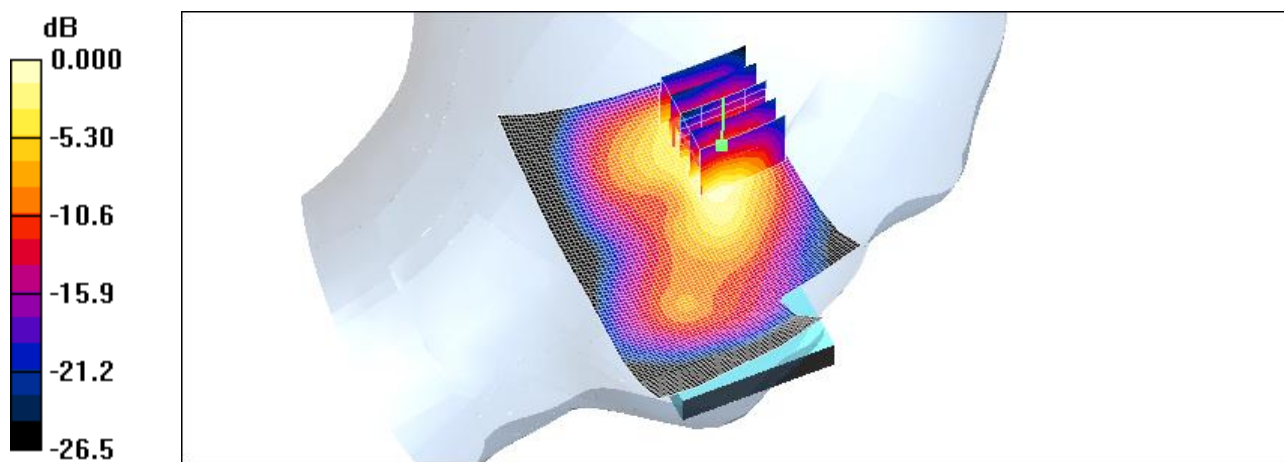
Left Touch 11ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.93 V/m; Power Drift = -0.057 dB

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.595 mW/g; SAR(10 g) = 0.268 mW/g

Maximum value of SAR (measured) = 0.700 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Left Tilt 11ch 1Mbps/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.344 mW/g

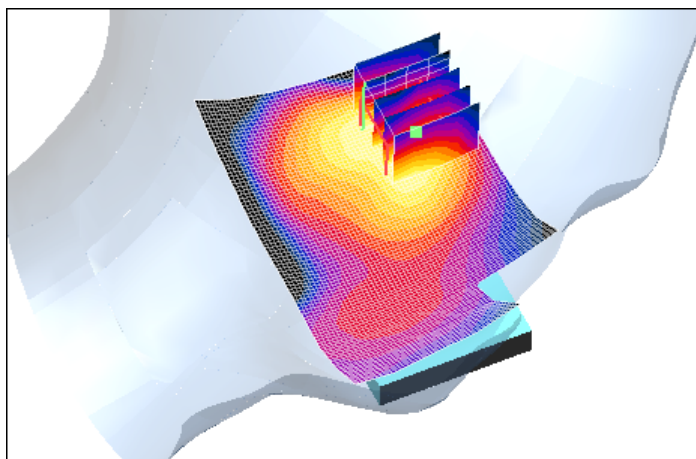
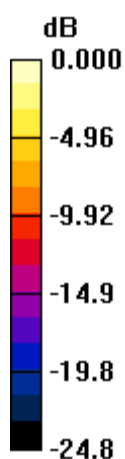
Left Tilt 11ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.60 V/m; Power Drift = -0.172 dB

Peak SAR (extrapolated) = 0.746 W/kg

SAR(1 g) = 0.281 mW/g; SAR(10 g) = 0.137 mW/g

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



0 dB = 0.361mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Right Touch 11ch 1Mbps /Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.249 mW/g

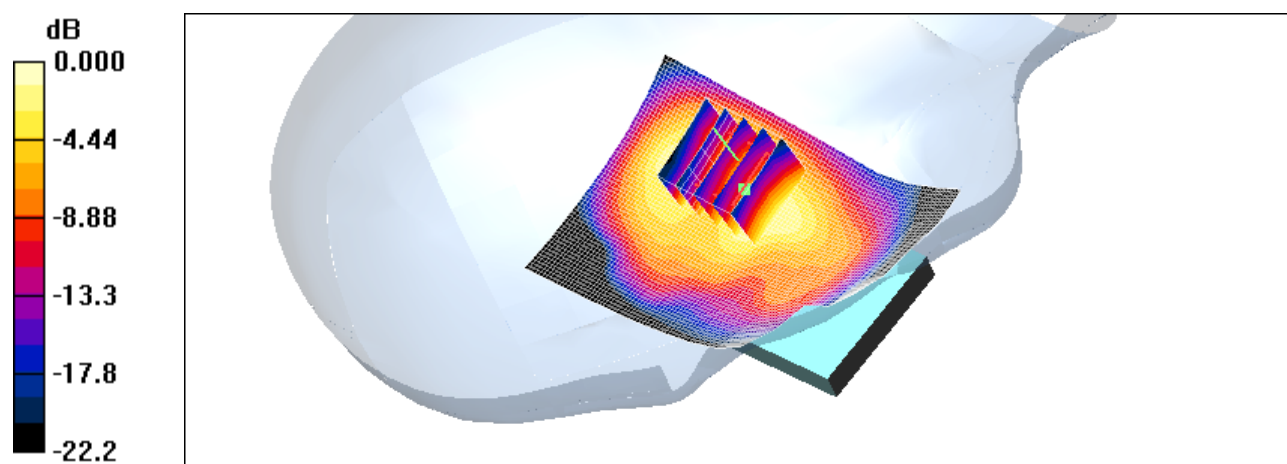
Right Touch 11ch 1Mbps /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.39 V/m; Power Drift = 0.102 dB

Peak SAR (extrapolated) = 0.579 W/kg

SAR(1 g) = 0.263 mW/g; SAR(10 g) = 0.130 mW/g

Maximum value of SAR (measured) = 0.280 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Right Tilt 11ch 1Mbps /Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.142 mW/g

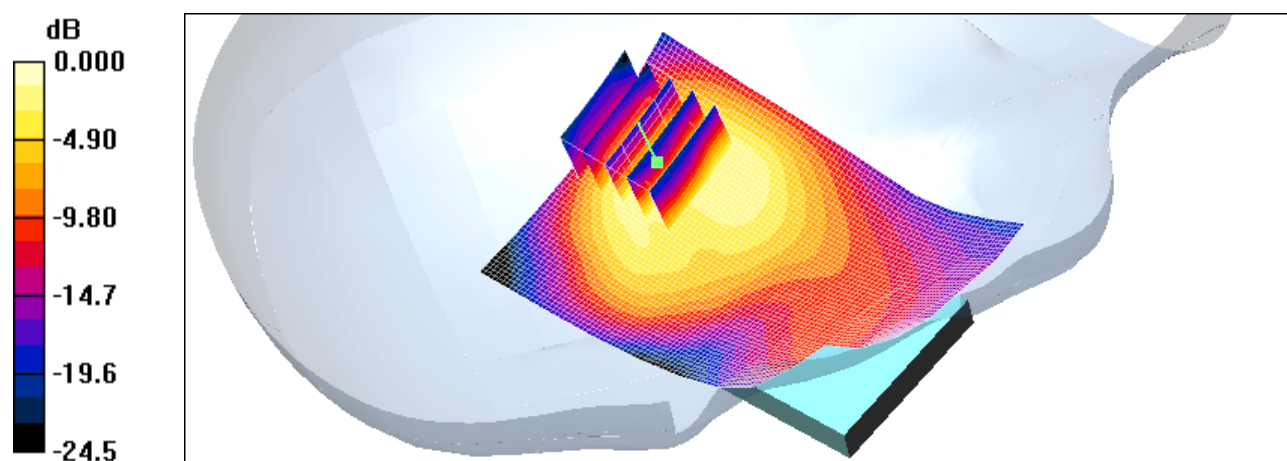
Right Tilt 11ch 1Mbps /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.01 V/m; Power Drift = -0.088 dB

Peak SAR (extrapolated) = 0.325 W/kg

SAR(1 g) = 0.142 mW/g; SAR(10 g) = 0.066 mW/g

Maximum value of SAR (measured) = 0.168 mW/g



0 dB = 0.168mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.075
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body rear 190 4Tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.547 mW/g

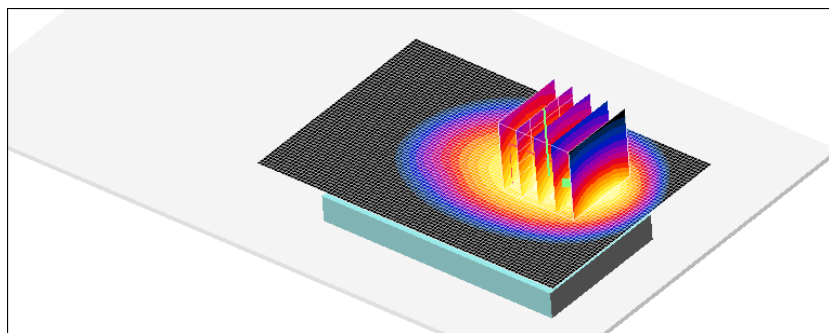
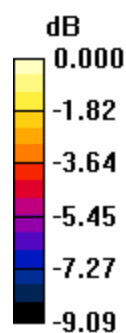
Body rear 190 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.99 V/m; Power Drift = 0.164 dB

Peak SAR (extrapolated) = 0.662 W/kg

SAR(1 g) = 0.509 mW/g; SAR(10 g) = 0.393 mW/g

Maximum value of SAR (measured) = 0.532 mW/g



0 dB = 0.532mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.075
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body front 190 4Tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.340 mW/g

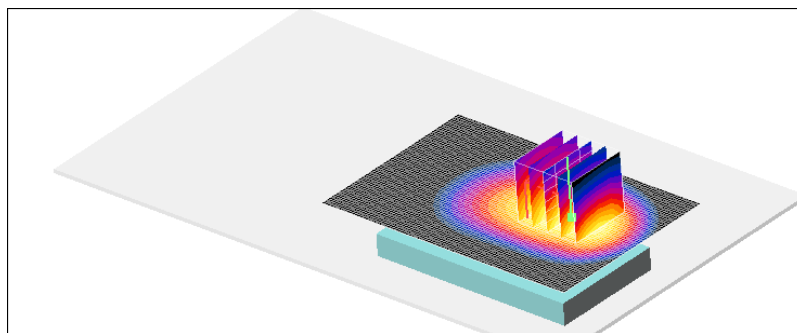
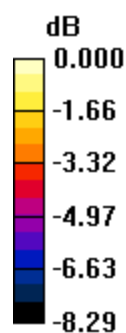
Body front 190 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.34 V/m; Power Drift = -0.063 dB

Peak SAR (extrapolated) = 0.384 W/kg

SAR(1 g) = 0.316 mW/g; SAR(10 g) = 0.239 mW/g

Maximum value of SAR (measured) = 0.336 mW/g



0 dB = 0.336mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.075
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body left 190 4Tx/Area Scan (91x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.190 mW/g

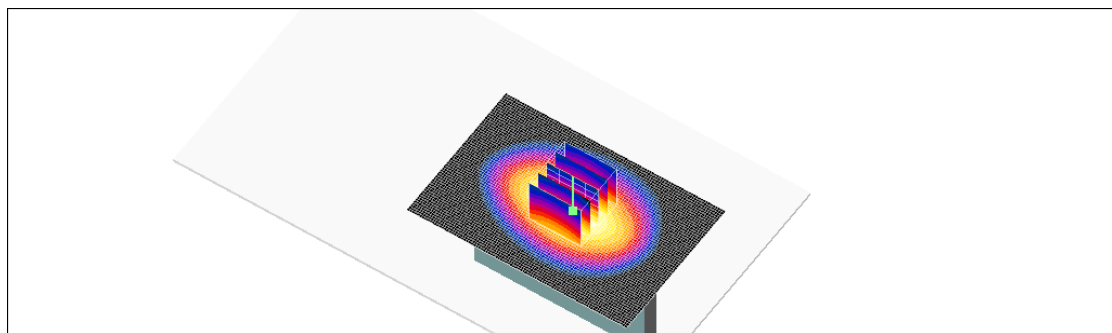
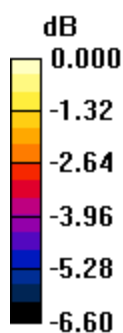
Body left 190 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.38 V/m; Power Drift = -0.038 dB

Peak SAR (extrapolated) = 0.213 W/kg

SAR(1 g) = 0.180 mW/g; SAR(10 g) = 0.139 mW/g

Maximum value of SAR (measured) = 0.189 mW/g



0 dB = 0.189mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.075
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body right 190 4Tx/Area Scan (91x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.133 mW/g

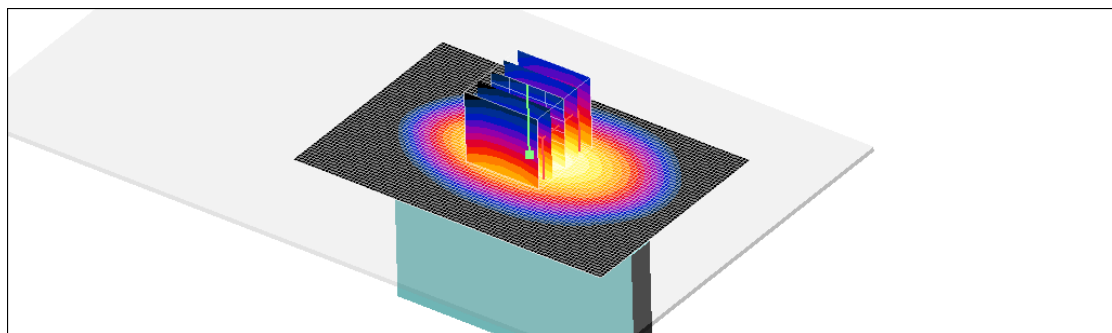
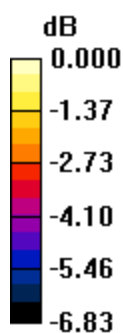
Body right 190 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.73 V/m; Power Drift = -0.016 dB

Peak SAR (extrapolated) = 0.149 W/kg

SAR(1 g) = 0.126 mW/g; SAR(10 g) = 0.096 mW/g

Maximum value of SAR (measured) = 0.134 mW/g



0 dB = 0.134mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.075
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body bottom 190 4Tx/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.062 mW/g

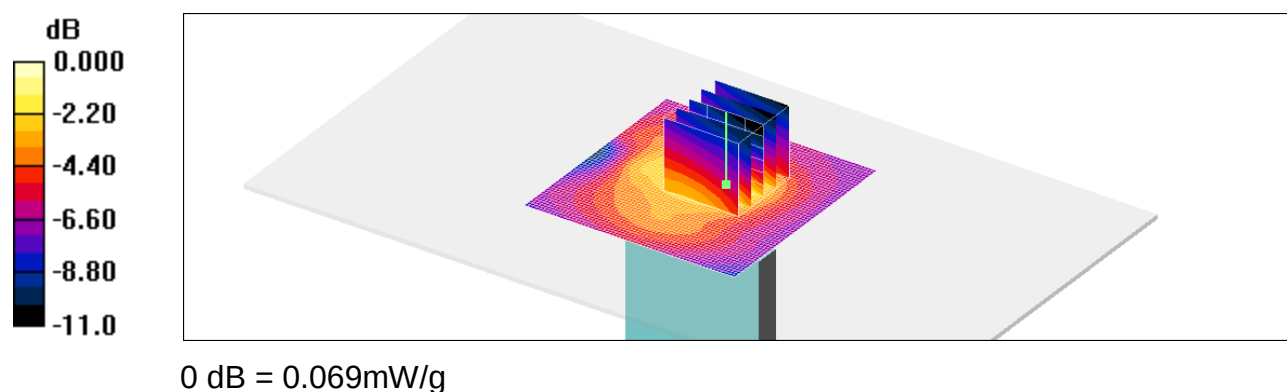
Body bottom 190 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.60 V/m; Power Drift = -0.080 dB

Peak SAR (extrapolated) = 0.124 W/kg

SAR(1 g) = 0.062 mW/g; SAR(10 g) = 0.036 mW/g

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



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body rear 661 4Tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.302 mW/g

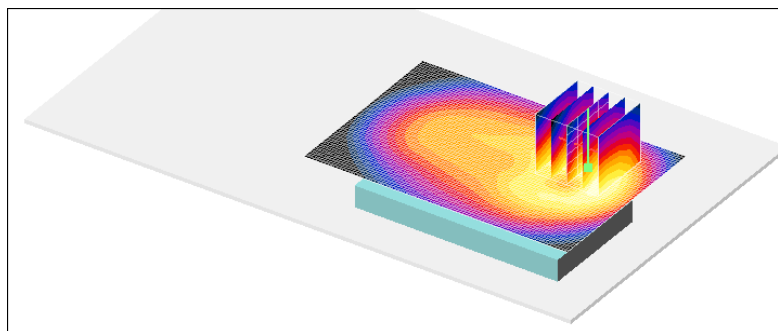
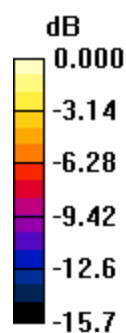
Body rear 661 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.30 V/m; Power Drift = -0.182 dB

Peak SAR (extrapolated) = 0.411 W/kg

SAR(1 g) = 0.274 mW/g; SAR(10 g) = 0.161 mW/g

Maximum value of SAR (measured) = 0.302 mW/g



0 dB = 0.302mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body front 661 4Tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.264 mW/g

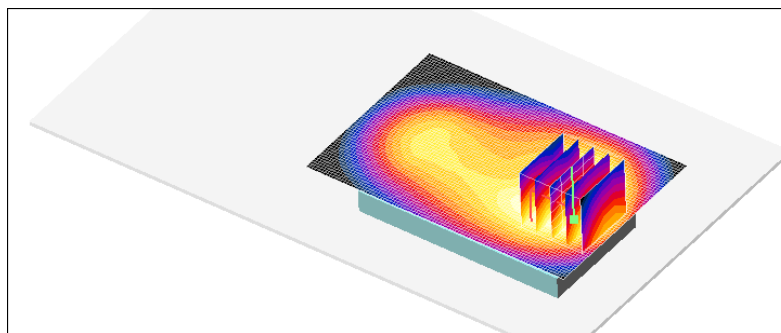
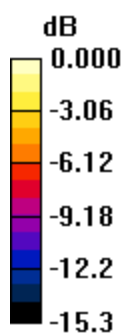
Body front 661 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.54 V/m; Power Drift = 0.016 dB

Peak SAR (extrapolated) = 0.355 W/kg

SAR(1 g) = 0.217 mW/g; SAR(10 g) = 0.135 mW/g

Maximum value of SAR (measured) = 0.241 mW/g



0 dB = 0.241mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body left 661 4Tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.088 mW/g

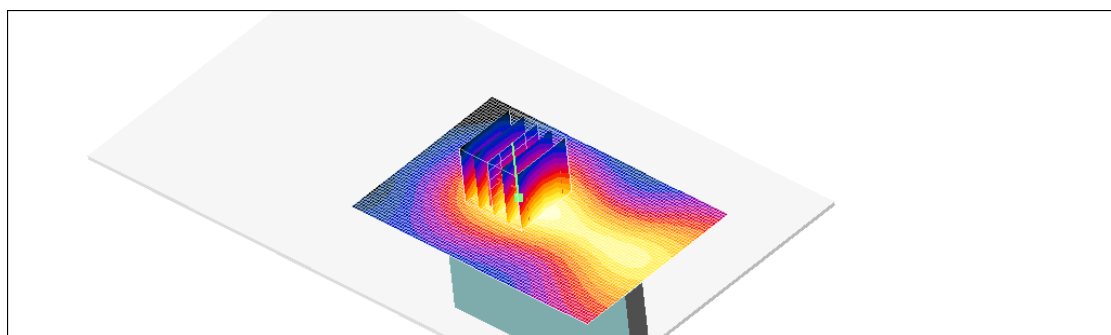
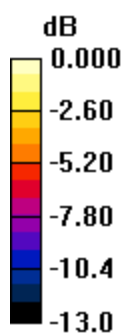
Body left 661 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.04 V/m; Power Drift = -0.185 dB

Peak SAR (extrapolated) = 0.117 W/kg

SAR(1 g) = 0.082 mW/g; SAR(10 g) = 0.052 mW/g

Maximum value of SAR (measured) = 0.087 mW/g



0 dB = 0.087mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body right 661 4Tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.053 mW/g

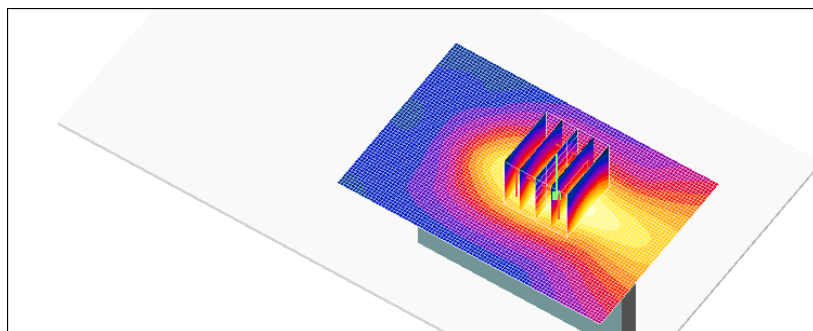
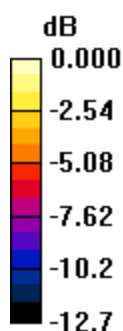
Body right 661 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.30 V/m; Power Drift = 0.090 dB

Peak SAR (extrapolated) = 0.070 W/kg

SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.031 mW/g

Maximum value of SAR (measured) = 0.052 mW/g



0 dB = 0.052mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

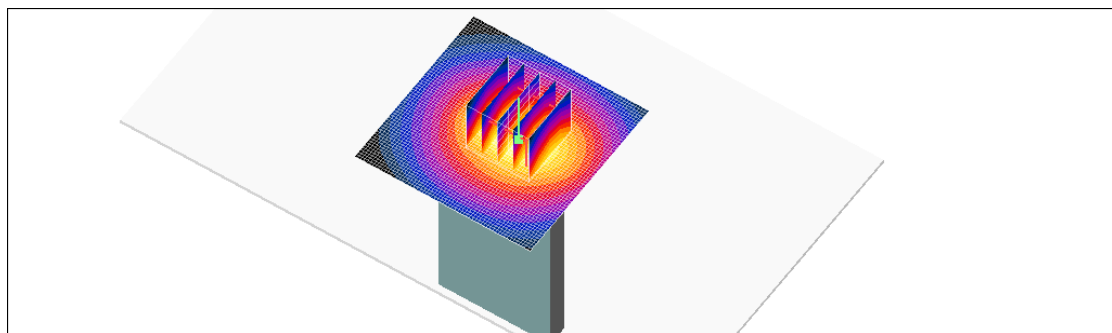
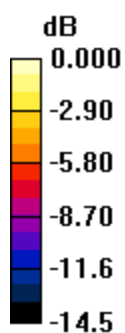
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body Bottom 661 4Tx/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.213 mW/g

Body Bottom 661 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.3 V/m; Power Drift = -0.037 dB
Peak SAR (extrapolated) = 0.289 W/kg
SAR(1 g) = 0.196 mW/g; SAR(10 g) = 0.117 mW/g
Maximum value of SAR (measured) = 0.218 mW/g



0 dB = 0.218mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

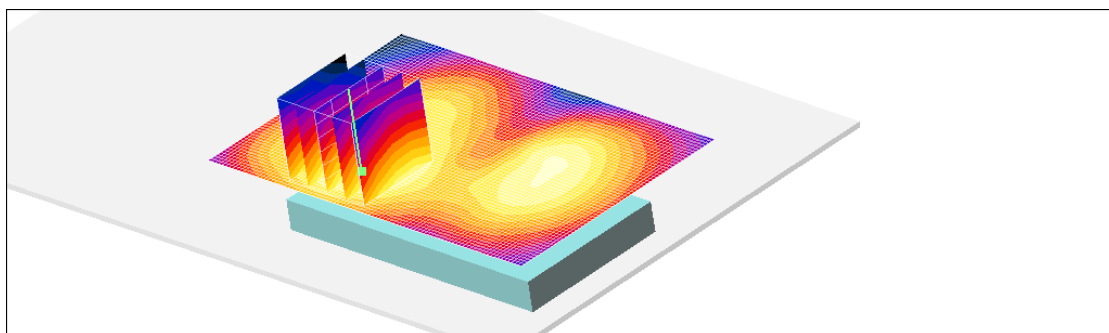
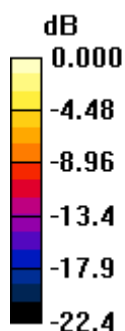
Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.98$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.01, 4.01, 4.01); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body rear 11ch 1Mbps/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.329 mW/g

Body rear 11ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.15 V/m; Power Drift = 0.064 dB
Peak SAR (extrapolated) = 0.707 W/kg
SAR(1 g) = 0.316 mW/g; SAR(10 g) = 0.164 mW/g
Maximum value of SAR (measured) = 0.337 mW/g



0 dB = 0.337mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

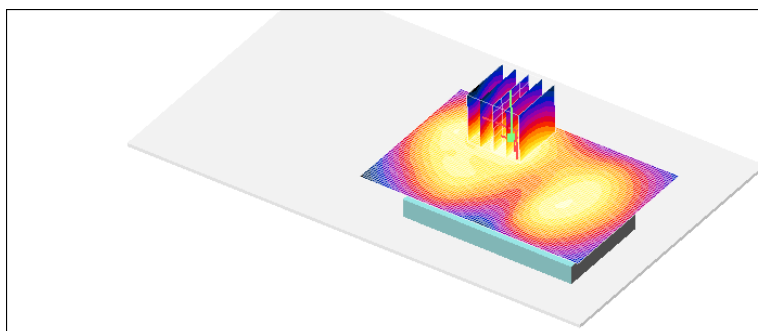
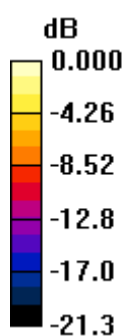
Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.98$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.01, 4.01, 4.01); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body front 11ch 1Mbps/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.329 mW/g

Body front 11ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.2 V/m; Power Drift = -0.047 dB
Peak SAR (extrapolated) = 0.778 W/kg
SAR(1 g) = 0.310 mW/g; SAR(10 g) = 0.157 mW/g
Maximum value of SAR (measured) = 0.322 mW/g



0 dB = 0.322mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

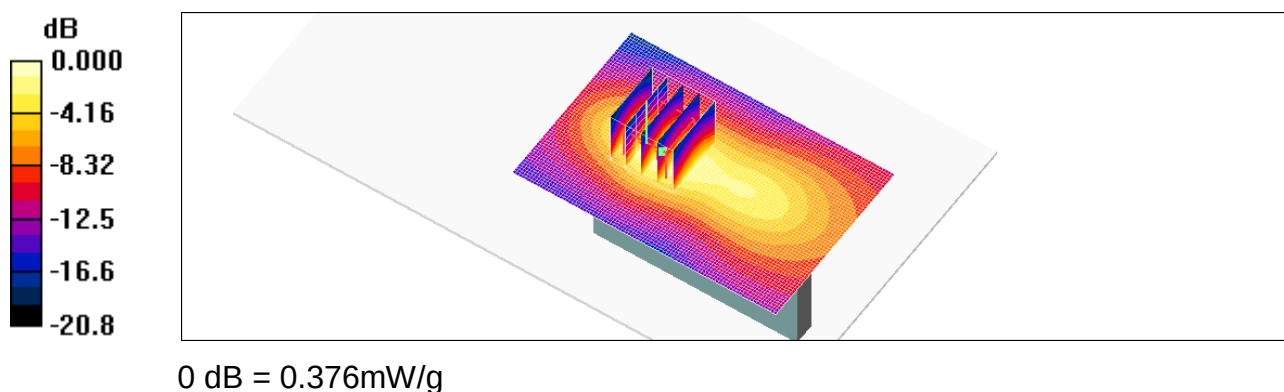
Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.98$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.01, 4.01, 4.01); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body right 11ch 1Mbps/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.379 mW/g

Body right 11ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.48 V/m; Power Drift = -0.104 dB
Peak SAR (extrapolated) = 0.876 W/kg
SAR(1 g) = 0.352 mW/g; SAR(10 g) = 0.172 mW/g
Maximum value of SAR (measured) = 0.376 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

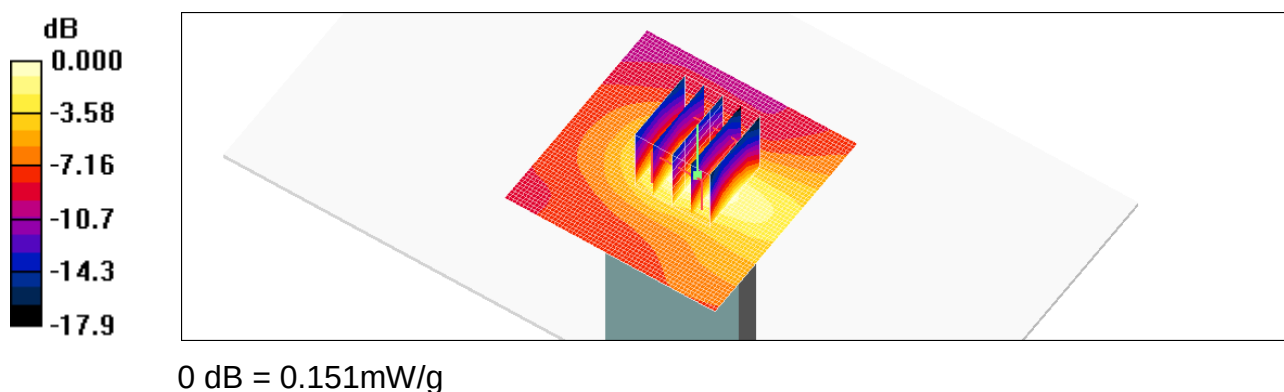
Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.98$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.01, 4.01, 4.01); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body Top 11ch 1Mbps/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.155 mW/g

Body Top 11ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.29 V/m; Power Drift = 0.043 dB
Peak SAR (extrapolated) = 0.337 W/kg
SAR(1 g) = 0.144 mW/g; SAR(10 g) = 0.074 mW/g
Maximum value of SAR (measured) = 0.151 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.919$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.36, 6.36, 6.36); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Left Touch 190/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.451 mW/g

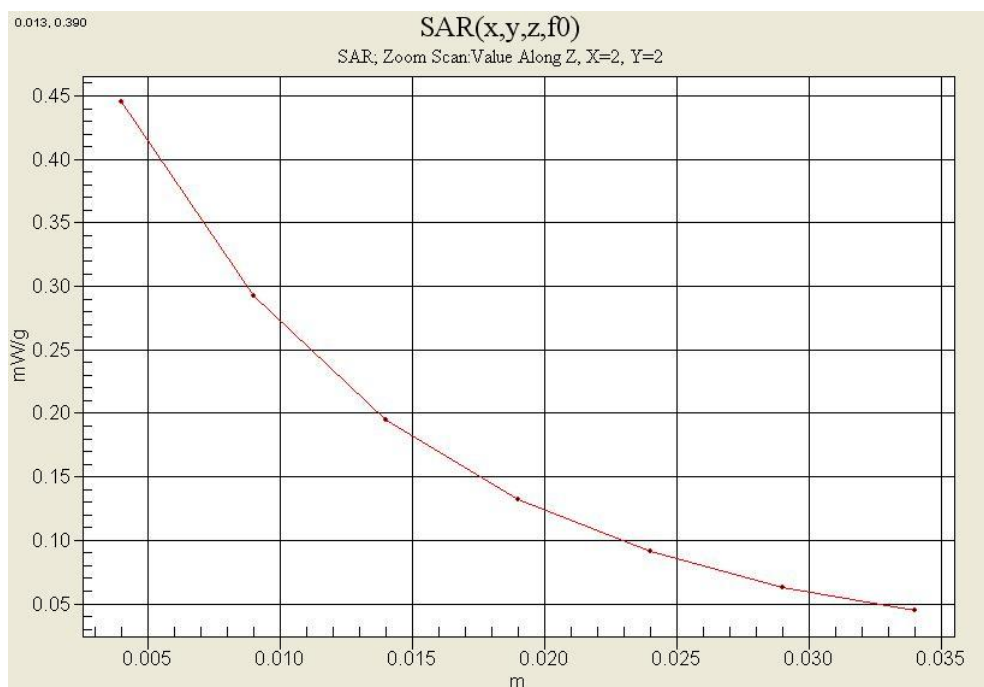
Left Touch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.7 V/m; Power Drift = -0.160 dB

Peak SAR (extrapolated) = 0.657 W/kg

SAR(1 g) = 0.413 mW/g; SAR(10 g) = 0.263 mW/g

Maximum value of SAR (measured) = 0.446 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 19, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:2.075
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 54.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body rear 190 4Tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.547 mW/g

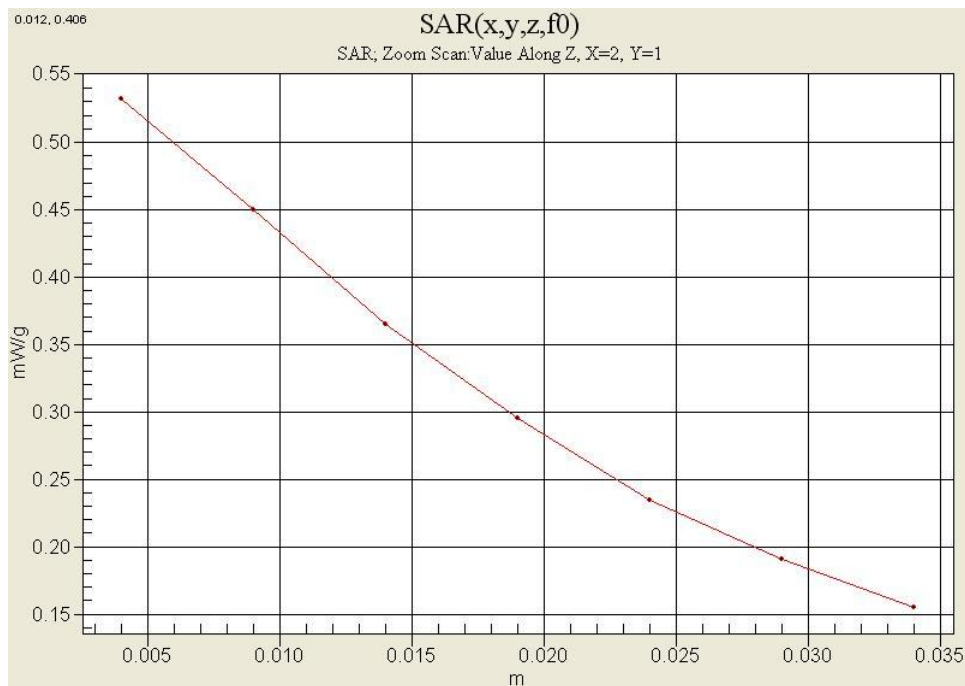
Body rear 190 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.99 V/m; Power Drift = 0.164 dB

Peak SAR (extrapolated) = 0.662 W/kg

SAR(1 g) = 0.509 mW/g; SAR(10 g) = 0.393 mW/g

Maximum value of SAR (measured) = 0.532 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 835/900 Phantom ; Type: SAM

Left Touch 661/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.630 mW/g

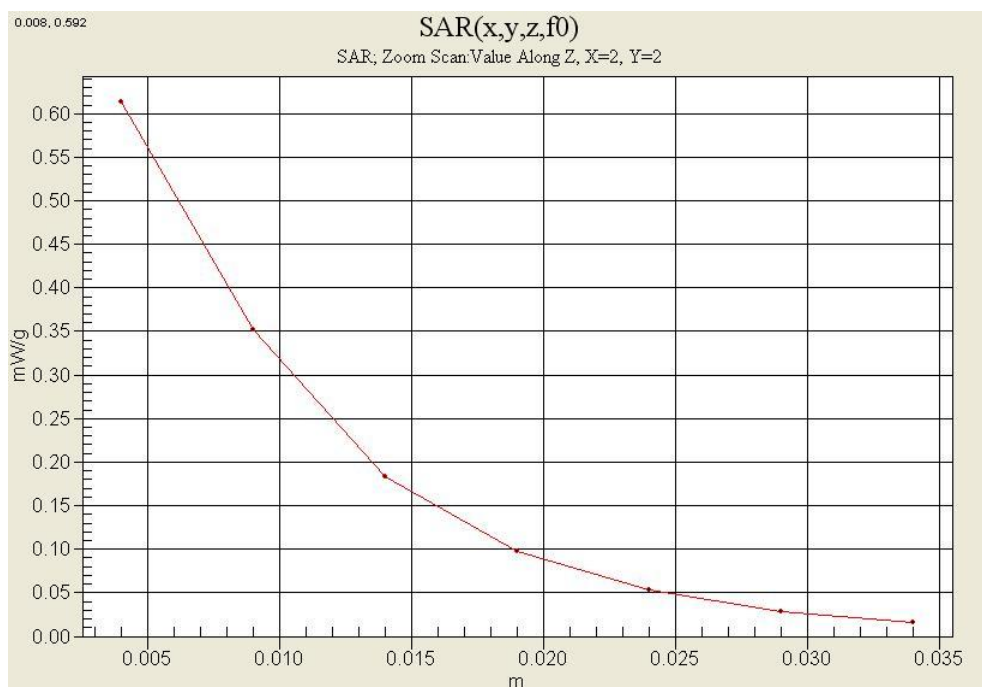
Left Touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 14.6 V/m; Power Drift = 0.078 dB

Peak SAR (extrapolated) = 0.918 W/kg

SAR(1 g) = 0.530 mW/g; SAR(10 g) = 0.269 mW/g

Maximum value of SAR (measured) = 0.613 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.2 °C
Ambient Temperature: 21.4 °C
Test Date: Sep. 20, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.5$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body rear 661 4Tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.302 mW/g

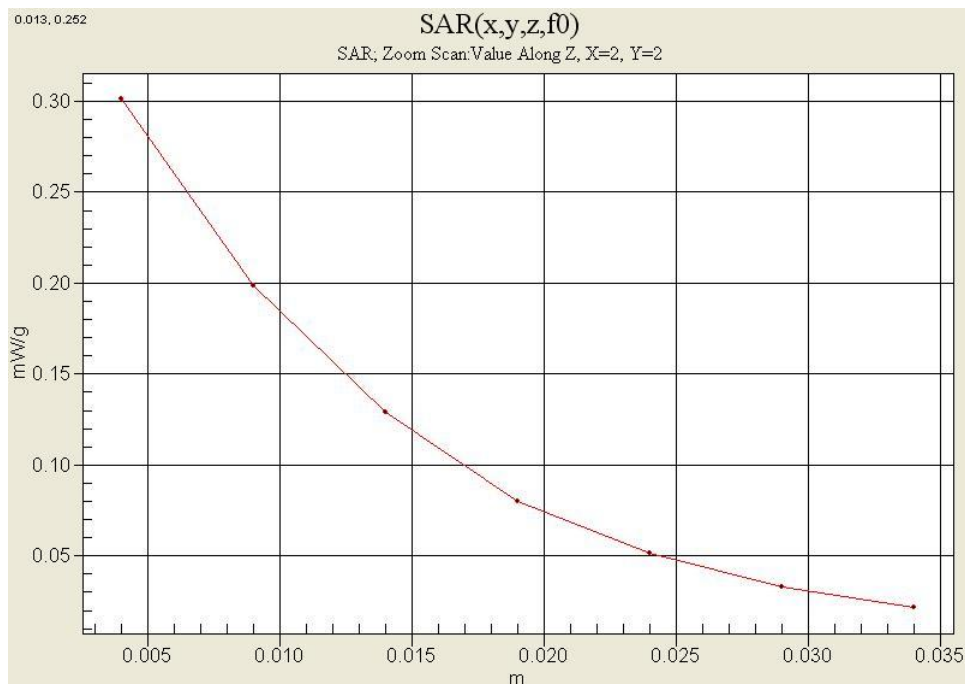
Body rear 661 4Tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.30 V/m; Power Drift = -0.182 dB

Peak SAR (extrapolated) = 0.411 W/kg

SAR(1 g) = 0.274 mW/g; SAR(10 g) = 0.161 mW/g

Maximum value of SAR (measured) = 0.302 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: 1800/1900 Phantom; Type: SAM

Left Touch 11ch 1Mbps/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.839 mW/g

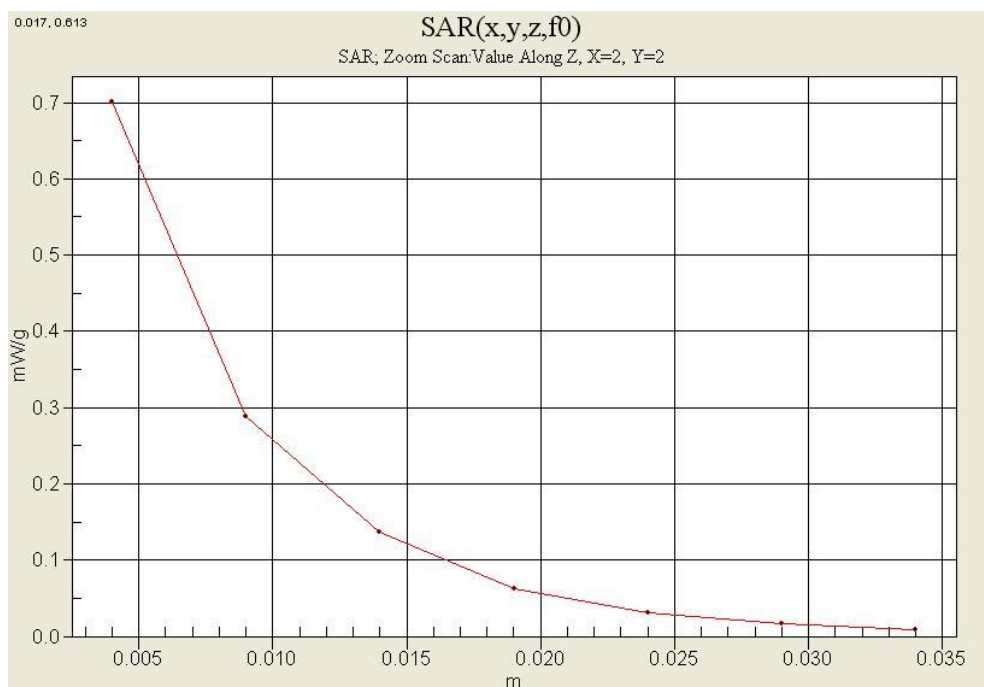
Left Touch 11ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.93 V/m; Power Drift = -0.057 dB

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.595 mW/g; SAR(10 g) = 0.268 mW/g

Maximum value of SAR (measured) = 0.700 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth, EDGE Rx only and WLAN
Liquid Temperature: 21.3 °C
Ambient Temperature: 21.5 °C
Test Date: Sep. 21, 2012
Separation Distance: 1.0 cm

DUT: GT-S5301; Type: Bar; Serial: FJ-251-A

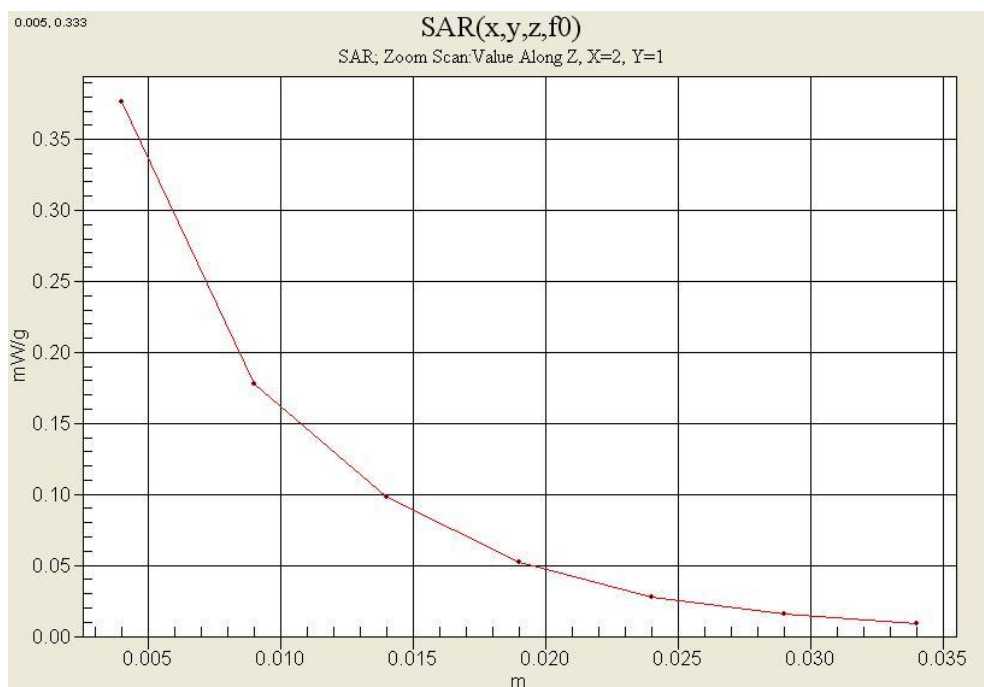
Communication System: 2450MHz FCC; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 1.98$ mho/m; $\epsilon_r = 53.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.01, 4.01, 4.01); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body right 11ch 1Mbps/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.379 mW/g

Body right 11ch 1Mbps/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.48 V/m; Power Drift = -0.104 dB
Peak SAR (extrapolated) = 0.876 W/kg
SAR(1 g) = 0.352 mW/g; SAR(10 g) = 0.172 mW/g
Maximum value of SAR (measured) = 0.376 mW/g



Attachment 2. – Dipole Validation Plots

■ Validation Data (835 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Sep. 19, 2012

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.917 \text{ mho/m}$; $\epsilon_r = 40.4$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.36, 6.36, 6.36); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: SAM 835/900 MHz; Type: SAM

Validation 835MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

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

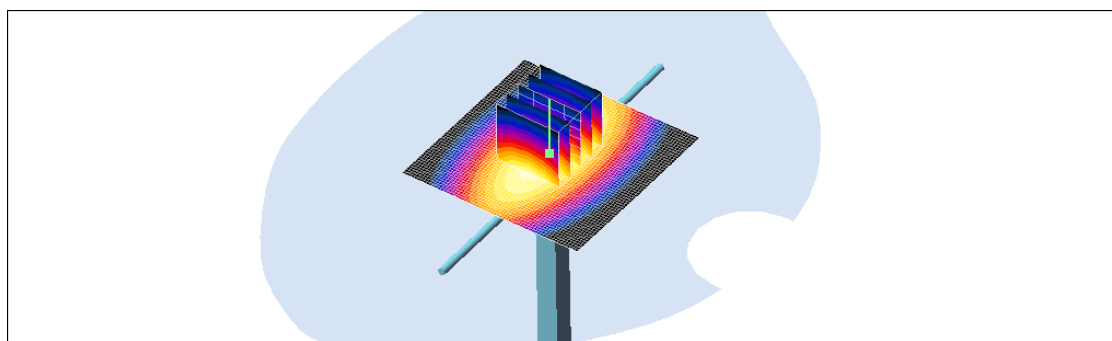
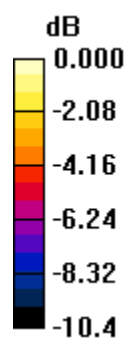
Validation 835MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 34.6 V/m; Power Drift = -0.033 dB

Peak SAR (extrapolated) = 1.35 W/kg

SAR(1 g) = 0.940 mW/g; SAR(10 g) = 0.621 mW/g

Maximum value of SAR (measured) = 1.02 mW/g



0 dB = 1.02mW/g

■ Validation Data (835 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.3 °C
Test Date: Sep. 19, 2012

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ mho/m}$; $\epsilon_r = 54.3$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Validation 835 MHz/Area Scan (111x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 1.06 mW/g

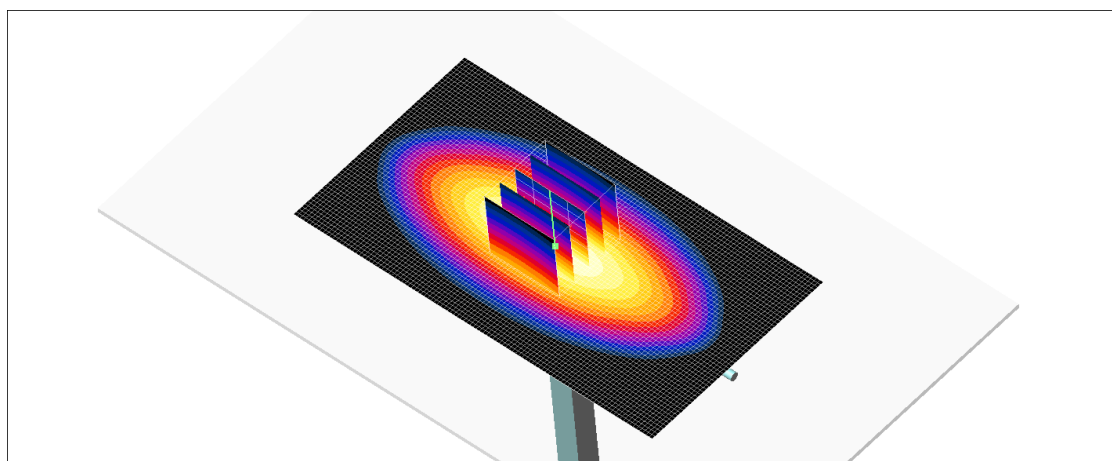
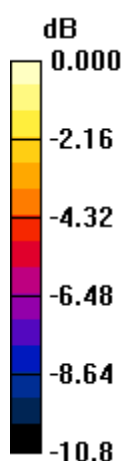
Validation 835 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 34.0 V/m; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 1.43 W/kg

SAR(1 g) = 0.982 mW/g; SAR(10 g) = 0.638 mW/g

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



0 dB = 1.07mW/g

■ Validation Data (1 900 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.2 °C
Test Date: Sep. 20, 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; $\sigma = 1.37$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Dipole 1900MHz Validation/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 4.48 mW/g

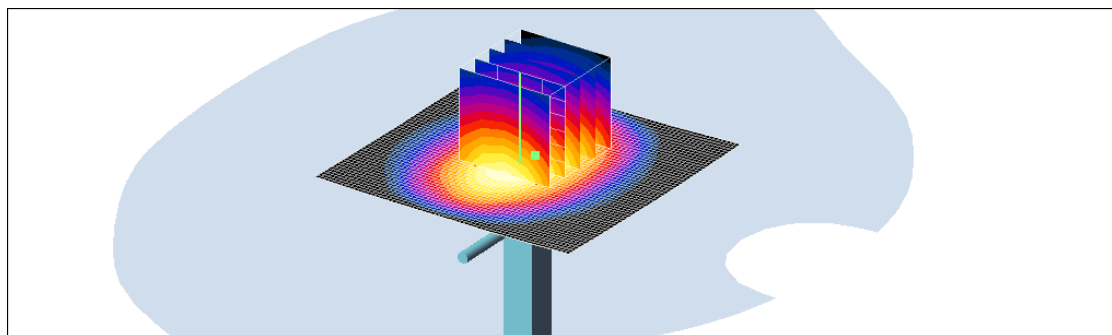
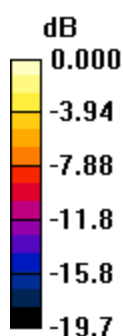
Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 59.3 V/m; Power Drift = 0.008 dB

Peak SAR (extrapolated) = 6.34 W/kg

SAR(1 g) = 3.74 mW/g; SAR(10 g) = 1.96 mW/g

Maximum value of SAR (measured) = 4.20 mW/g



0 dB = 4.20mW/g

■ Validation Data (1 900 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 21.2 °C
Test Date: Sep. 20, 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; $\sigma = 1.56$ mho/m; $\epsilon_r = 51.4$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

Validation1900 MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 4.67 mW/g

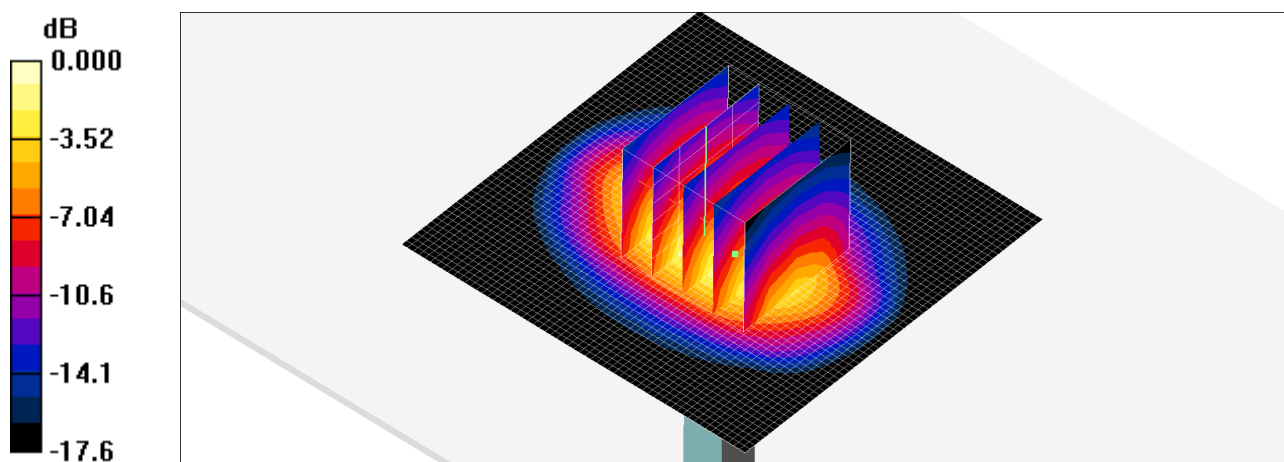
Validation1900 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 57.7 V/m; Power Drift = -0.031 dB

Peak SAR (extrapolated) = 6.37 W/kg

SAR(1 g) = 4.01 mW/g; SAR(10 g) = 2.19 mW/g

Maximum value of SAR (measured) = 4.50 mW/g



0 dB = 4.50mW/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: Sep. 21, 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; $\sigma = 1.79$ mho/m; $\epsilon_r = 39$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: SAM 1800/1900 MHz; Type: SAM

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 6.38 mW/g

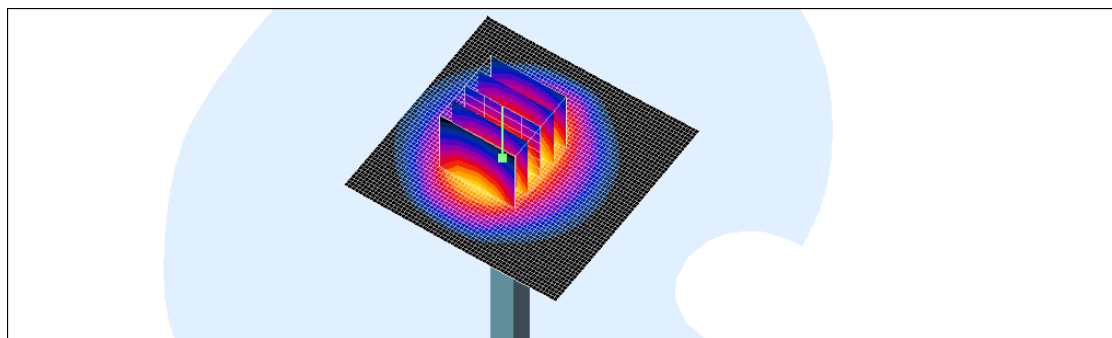
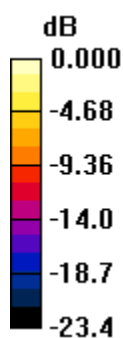
Validation 2450MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 60.2 V/m; Power Drift = -0.004 dB

Peak SAR (extrapolated) = 12.1 W/kg

SAR(1 g) = 5.26 mW/g; SAR(10 g) = 2.4 mW/g

Maximum value of SAR (measured) = 5.78 mW/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: Sep. 21, 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; $\sigma = 1.98$ mho/m; $\epsilon_r = 53$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.01, 4.01, 4.01); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn648; Calibrated: 2012-04-27
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

Validation 2450MHz/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 5.89 mW/g

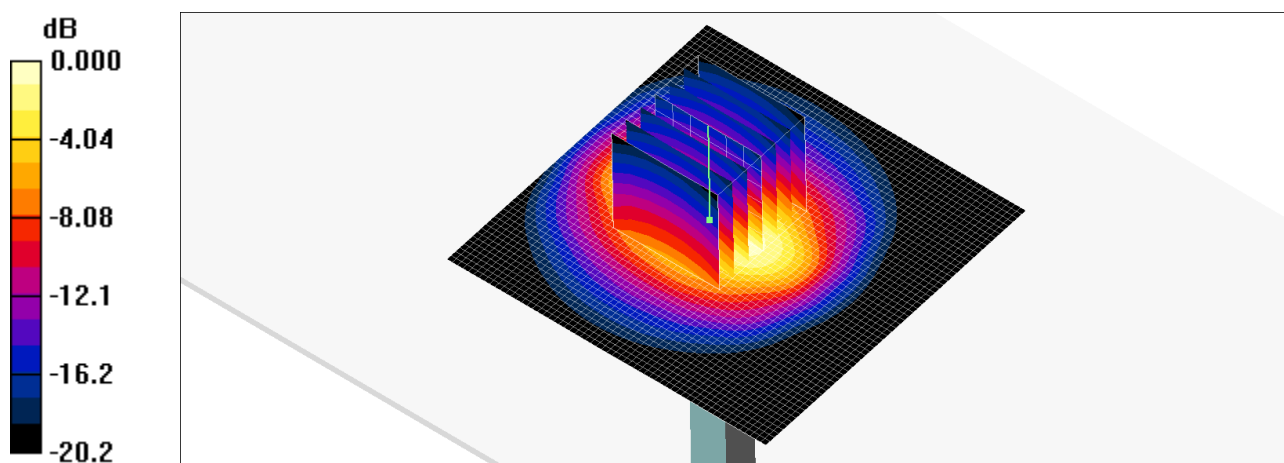
Validation 2450MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 52.0 V/m; Power Drift = -0.011 dB

Peak SAR (extrapolated) = 12.0 W/kg

SAR(1 g) = 4.87 mW/g; SAR(10 g) = 2.33 mW/g

Maximum value of SAR (measured) = 5.21 mW/g



0 dB = 5.21mW/g

■ Dielectric Parameter (835 MHz Head)

Title GT-S5301
SubTitle 835MHz
Test Date Sep. 19, 2012

Frequency	e'	e''
800000000.0000	40.7175	19.8972
805000000.0000	40.6582	19.8520
810000000.0000	40.6105	19.8474
815000000.0000	40.5711	19.8301
820000000.0000	40.5338	19.8178
825000000.0000	40.4784	19.7946
830000000.0000	40.4400	19.7724
835000000.0000	40.4184	19.7512
840000000.0000	40.3606	19.7296
845000000.0000	40.3274	19.6807
850000000.0000	40.2477	19.6867
855000000.0000	40.2091	19.6505
860000000.0000	40.1955	19.6284
865000000.0000	40.0786	19.5637
870000000.0000	40.0542	19.5707
875000000.0000	39.9963	19.5466
880000000.0000	39.9208	19.4926
885000000.0000	39.8329	19.4980
890000000.0000	39.7799	19.4639
895000000.0000	39.7263	19.4253
900000000.0000	39.6788	19.4053

■ Dielectric Parameter (835 MHz Body)

Title GT-S5301
SubTitle 835MHz
Test Date Sep. 19, 2012

Frequency	e'	e''
800000000.0000	54.4558	21.6998
805000000.0000	54.4270	21.6702
810000000.0000	54.4478	21.6343
815000000.0000	54.3927	21.6370
820000000.0000	54.4045	21.6659
825000000.0000	54.3890	21.6483
830000000.0000	54.3552	21.6541
835000000.0000	54.3418	21.6523
840000000.0000	54.3031	21.6541
845000000.0000	54.2147	21.6525
850000000.0000	54.1836	21.6681
855000000.0000	54.0841	21.6438
860000000.0000	53.9938	21.6112
865000000.0000	53.9380	21.5663
870000000.0000	53.8567	21.5369
875000000.0000	53.7931	21.5228
880000000.0000	53.7057	21.4435
885000000.0000	53.7069	21.4265
890000000.0000	53.6725	21.3705
895000000.0000	53.6244	21.2781
900000000.0000	53.6057	21.2327

■ Dielectric Parameter (1 900 MHz Head)

Title GT-S5301
SubTitle 1 900MHz
Test Date Sep. 20, 2012

Frequency	e'	e''
1800000000.0000	41.1902	12.6395
1810000000.0000	41.1510	12.6761
1820000000.0000	41.1192	12.6918
1830000000.0000	41.0577	12.7225
1840000000.0000	41.0309	12.7545
1850000000.0000	41.0010	12.7757
1860000000.0000	40.9706	12.8180
1870000000.0000	40.9357	12.8424
1880000000.0000	40.8962	12.8834
1890000000.0000	40.8635	12.8952
1900000000.0000	40.8320	12.9236
1910000000.0000	40.7860	12.9588
1920000000.0000	40.7409	12.9735
1930000000.0000	40.6988	13.0233
1940000000.0000	40.6744	13.0354
1950000000.0000	40.6319	13.0841
1960000000.0000	40.6209	13.1006
1970000000.0000	40.5686	13.1148
1980000000.0000	40.5492	13.1614
1990000000.0000	40.5029	13.1648
2000000000.0000	40.4578	13.2140

■ Dielectric Parameter (1 900 MHz Body)

Title GT-S5301
SubTitle 1 900MHz
Test Date Sep. 20, 2012

Frequency	e'	e''
1850000000.0000	51.5685	14.6478
1855000000.0000	51.5525	14.6581
1860000000.0000	51.5305	14.6693
1865000000.0000	51.5225	14.6845
1870000000.0000	51.4986	14.6990
1875000000.0000	51.4993	14.7028
1880000000.0000	51.4878	14.7085
1885000000.0000	51.4766	14.7140
1890000000.0000	51.4605	14.7267
1895000000.0000	51.4437	14.7329
1900000000.0000	51.4158	14.7473
1905000000.0000	51.4199	14.7674
1910000000.0000	51.3944	14.7635
1915000000.0000	51.3857	14.7791
1920000000.0000	51.3612	14.7861
1925000000.0000	51.3521	14.7951
1930000000.0000	51.3213	14.8159
1935000000.0000	51.3246	14.8272
1940000000.0000	51.3197	14.8270
1945000000.0000	51.2889	14.8412
1950000000.0000	51.2698	14.8466

■ Dielectric Parameter (2 450 MHz Head)

Title GT-S5301
SubTitle 2 450MHz
Test Date Sep. 21, 2012

Frequency	e'	e''
2400000000.0000	39.2793	13.0438
2405000000.0000	39.2656	13.0577
2410000000.0000	39.2419	13.0662
2415000000.0000	39.2168	13.0759
2420000000.0000	39.2026	13.0654
2425000000.0000	39.1855	13.0741
2430000000.0000	39.1372	13.0788
2435000000.0000	39.1148	13.1005
2440000000.0000	39.0756	13.1087
2445000000.0000	39.0297	13.1284
2450000000.0000	38.9910	13.1366
2455000000.0000	38.9671	13.1488
2460000000.0000	38.9539	13.1798
2465000000.0000	38.9144	13.2057
2470000000.0000	38.9084	13.2251
2475000000.0000	38.8962	13.2499
2480000000.0000	38.9135	13.2797
2485000000.0000	38.8955	13.3068
2490000000.0000	38.9082	13.3434
2495000000.0000	38.9077	13.3388
2500000000.0000	38.8972	13.3512

■ Dielectric Parameter (2 450 MHz Body)

Title GT-S5301
SubTitle 2 450MHz
Test Date Sep. 21, 2012

Frequency	e'	e''
2400000000.0000	53.0857	13.4896
2405000000.0000	52.9664	13.5848
2410000000.0000	52.8630	13.6906
2415000000.0000	52.7696	13.8274
2420000000.0000	52.7156	13.9737
2425000000.0000	52.6950	14.0838
2430000000.0000	52.7144	14.1921
2435000000.0000	52.7340	14.2958
2440000000.0000	52.8058	14.4069
2445000000.0000	52.9116	14.4811
2450000000.0000	53.0231	14.4975
2455000000.0000	53.1367	14.5093
2460000000.0000	53.2639	14.4981
2465000000.0000	53.4141	14.4629
2470000000.0000	53.5364	14.3751
2475000000.0000	53.6457	14.3019
2480000000.0000	53.7029	14.2088
2485000000.0000	53.7407	14.1058
2490000000.0000	53.7387	13.9997
2495000000.0000	53.7191	13.8984
2500000000.0000	53.6462	13.7961

Attachment 3. – Probe Calibration Data

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



S Schweizerischer Kalibrierdienst
S Service suisse d'étalonnage
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: ET3-1609_Mar12

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1609
Calibration procedure(s)	QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	March 19, 2012
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI). The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate. All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%. Calibration Equipment used (M&TE critical for calibration)	

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

Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature 
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature 
			Issued: March 19, 2012
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			

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



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

Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

ET3DV6 – SN:1609

March 19, 2012

Probe ET3DV6

SN:1609

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

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

ET3DV6- SN:1609

March 19, 2012

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

Basic Calibration Parameters

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

Modulation Calibration Parameters

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

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

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

^B Numerical linearization parameter; uncertainty not required.

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

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

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

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

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

Calibration Parameter Determined in Body Tissue Simulating Media

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

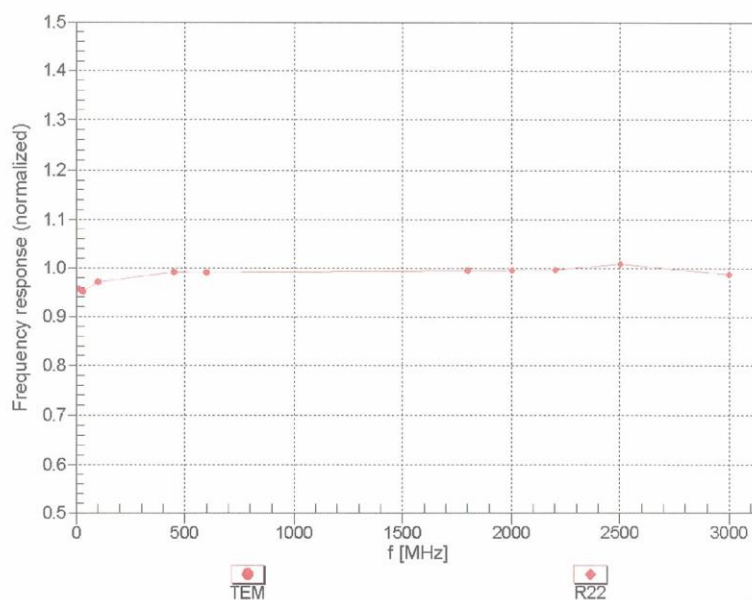
^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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

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



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

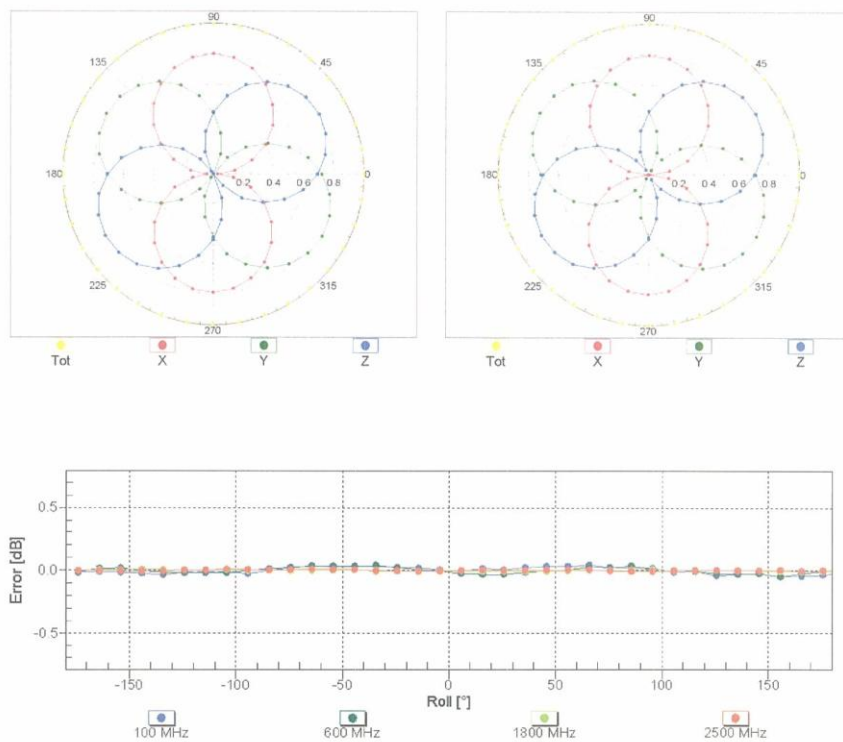
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Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz, TEM

f=1800 MHz, R22

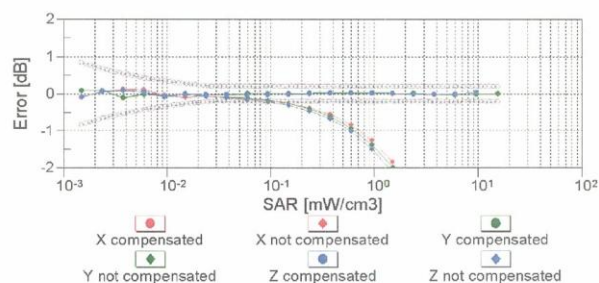
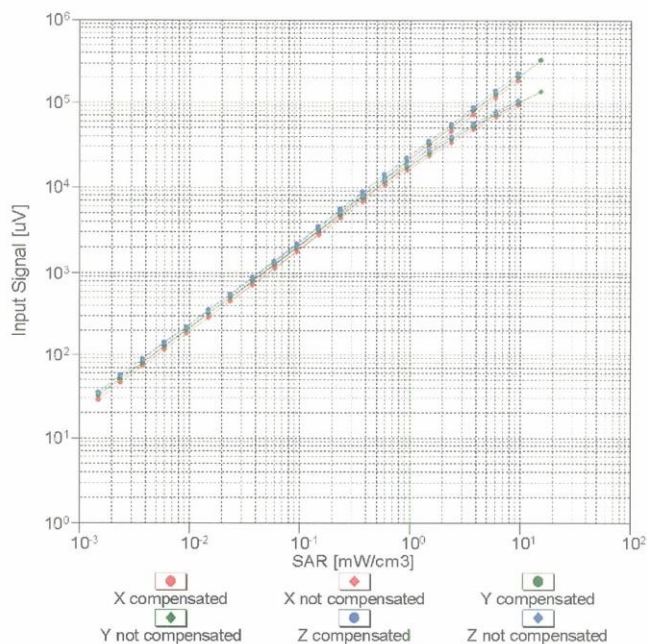


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

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

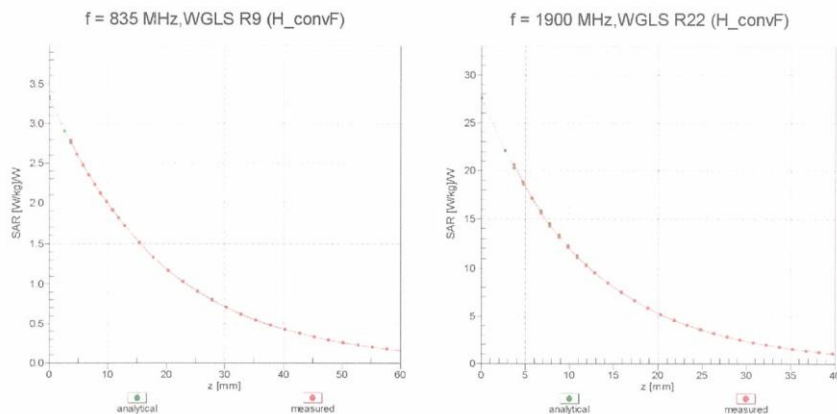


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

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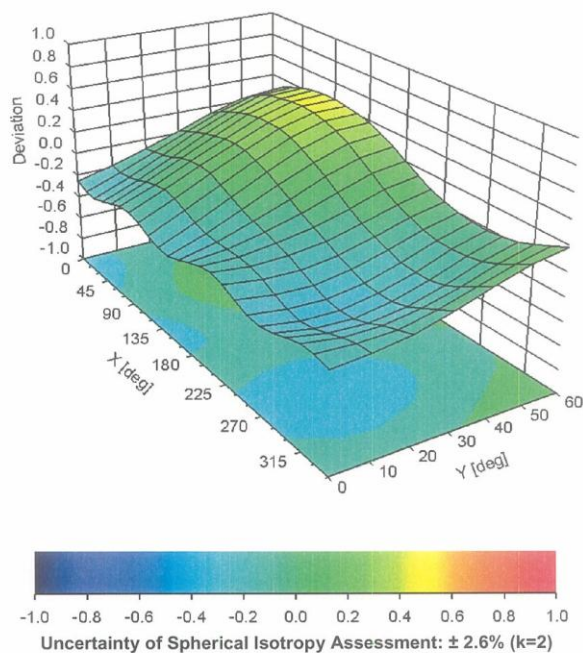
March 19, 2012

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



ET3DV6- SN:1609

March 19, 2012

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

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