

SAR TEST REPORT

HCT CO., LTD

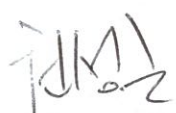
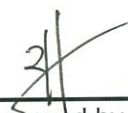
EUT Type:	850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only		
FCC ID:	A3LGTS6812		
Model:	GT-S6812		
Date of Issue:	Mar. 11, 2013		
Test report No.:	HCTA1302FS04		
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Applicant :	SAMSUNG Electronics Co., Ltd. 129, Samsung-ro, Yeongtong-gu, Suwon-City, Gyeonggi-do, 443-742 Republic of Korea		
Testing has been carried out in accordance with:	RSS-102 Issue 4; Health Canada Safety Code 6 47CFR §2.1093 FCC OET Bulletin 65(Edition 97-01), Supplement C (Edition 01-01) ANSI/ IEEE C95.1 – 1992 IEEE 1528-2003		
Test result:	The tested device complies with the requirements in respect of all parameters subject to the test. The test results and statements relate only to the items tested. The test report shall not be reproduced except in full, without written approval of the laboratory.		
Signature	 Report prepared by : Sung-Kun Kwon Test Engineer of SAR Part  Approved by : Jae-Sang So Manager of SAR Part		

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Version

TEST REPORT NO.	DATE	DESCRIPTION
HCTA1302FS04	Mar. 11, 2013	First Approval Report

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. TEST METHODOLOGY

The tests documented in this report were performed in accordance with FCC OET Bulletin 65 Supplement C 01-01, IEEE Standard 1528-2003 & IEEE 1528a-2005 and the following published KDB procedures.

- . 447498 D01 General RF Exposure Guidance v05
- . 450824 D01 SAR Prob Cal and Ver Meas v01r01
- . 450824 D02 Dipole SAR Validation Verification v01
- . 648474 D04 SAR Handsets Multi Xmitter and Ant v01
- . 865664 D01 SAR measurement 100 MHz to 6 GHz v01
- . 865664 D02 SAR Reporting v01
- . 941225 D01 SAR test for 3G devices v02

3. 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 v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only					
FCC ID:	A3LGTS6812					
Model:	GT-S6812					
Trade Name	SAMSUNG Electronics Co., Ltd.					
Application Type	Certification					
Mode(s) of Operation	GSM850/ GSM1900/ 802.11b/g/n/BT v4.0(LE)					
Tx Frequency	824.20 - 848.80 MHz (GSM850) 1 850.20 – 1 909.80 MHz (GSM1900) 2 412- 2 462 MHz (802.11b/g/n) 2402 MHz ~ 2480 MHz(BT 4.0 (LE))					
Rx Frequency	869.20 - 893.80 MHz (GSM850) 1 930.20 – 1 989.80 MHz (GSM1900) 2 412- 2 462 MHz (802.11b/g/n) 2402 MHz ~ 2480 MHz(BT 4.0(LE))					
Production Unit or Identical Prototype	Prototype					
Max SAR	Band	Tx Frequency (MHz)	Equipment Class	Reported 1g SAR (W/kg)		
				Head	Body-Worn	Hotspot
	GSM850	824.20 - 848.80	PCE	0.50	0.86	0.86
	GSM1900	1 850.20 - 1 909.80	PCE	0.93	0.80	0.80
	802.11b	2 412- 2 462	DTS	0.42	0.15	0.15
	Bluetooth	2 402 - 2 480	DSS	-	-	-
Simultaneous SAR per KDB 690783 D01				1.35	1.02	1.02
Date(s) of Tests	Feb. 18, 2013 ~ Feb. 19 2013					
Antenna Type	Integral Antenna					
GPRS	Multislot Class: 12, Mode Class: B					

4. DESCRIPTION OF TEST EQUIPMENT

4.1 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.

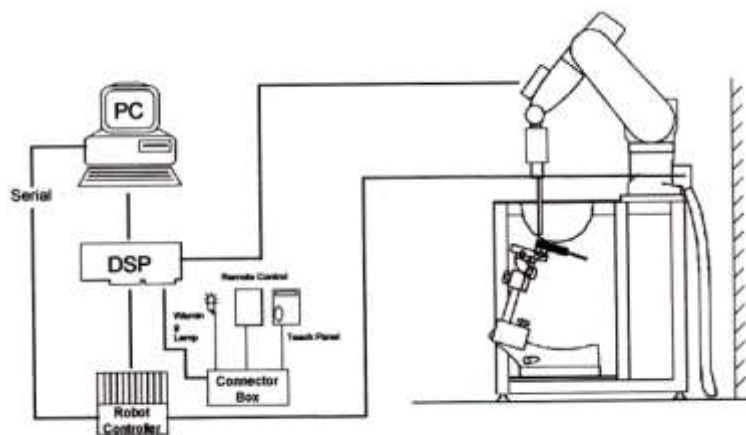


Figure 4.1 HCT SAR Lab. Test Measurement Set-up

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.

4.2 DASY E-FIELD PROBE SYSTEM

4.2.1 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 4.2 Photograph of the probe and the Phantom

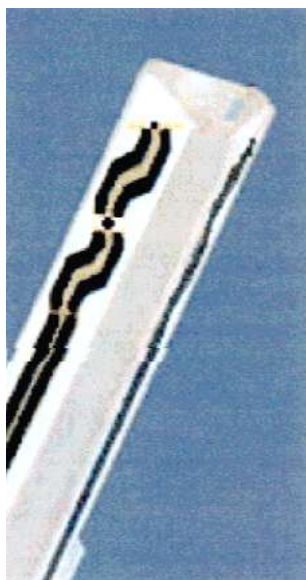


Figure 4.3 ET3DV6 E-field Probe

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.

4.3 PROBE CALIBRATION PROCESS

4.3.1 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)

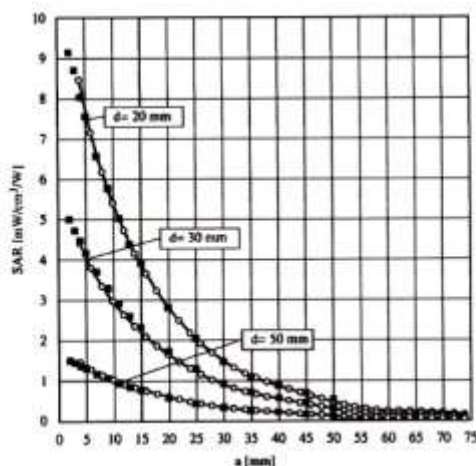


Figure 4.4 E-Field and Temperature measurements at 900 MHz

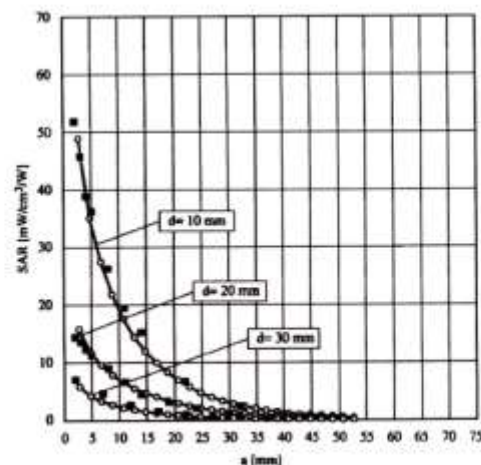


Figure 4.5 E-Field and temperature measurements at 1.8 GHz

4.3.2 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.

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

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

4.4 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)

Triple Modular Phantom consists of three identical modules which can be installed and removed separately without emptying the liquid. It includes three reference points for phantom installation. Covers prevent evaporation of the liquid. Phantom material is resistant to DGBE based tissue simulating liquids. The MFP V5.1 will be delivered including wooden support only (**non**-standard SPEAG support).

Applicable for system performance check from 700 MHz to 6 GHz (MFP V5.1C) or 800 MHz - 6 GHz (MFP V5.1A) as well as dosimetric evaluations for body-worn operation.

Shell Thickness	2.0 mm $\pm$ 0.2 mm
Filling Volume	approx. 9.2 L
Dimensions	830 mm x 500 mm (L x W)



Figure 4.6 MFP V5.1 Triple Modular Phantom

4.5 Device Holder for Transmitters

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

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



Figure 4.7 Device Holder

4.6 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

4.7 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	614	Sep 20, 2012	Annual	Sep 20, 2013
SPEAG	E-Field Probe ET3DV6	1609	Mar 19, 2012	Annual	Mar 19, 2013
SPEAG	Verification Dipole D835V2	441	May 16, 2012	Annual	May 16, 2013
SPEAG	Verification Dipole D1900V2	5d032	July 20, 2012	Annual	July 20, 2013
SPEAG	Verification Dipole D2450V2	743	Aug. 23, 2012	Annual	Aug. 23, 2013
Agilent	Power Meter(F) E4419B	MY41291386	Nov. 02, 2012	Annual	Nov. 02, 2013
Agilent	Power Sensor(G) 8481	MY41090870	Nov. 02, 2012	Annual	Nov. 02, 2013
HP	Dielectric Probe Kit 85070C	00721521	CBT		
HP	Dual Directional Coupler 778D	16072	Nov. 02, 2012	Annual	Nov. 02, 2013
Agilent	Base Station CMU200	110740	July 23, 2012	Annual	July 23, 2013
Agilent	Base Station E5515C	GB44400269	Feb. 14, 2013	Annual	Feb. 14, 2014
HP	Signal Generator 8664A	3744A02069	Nov. 02, 2012	Annual	Nov. 02, 2013
Hewlett Packard	11636B/Power Divider	11377	Nov. 11. 2012	Annual	Nov. 11. 2013
Agilent	N9020A/ SIGNAL ANALYZER	MY51110020	Jul. 31.2012	Annual	Jul. 31.2013
TESCOM	TC-3000C / BLUETOOTH	3000C000276	Jul. 11, 2012	Annual	Jul. 11, 2013

NOTE:

1. The E-field probe was calibrated by SPEAG, by the waveguide technique procedure. Dipole Verification measurement is performed by HCT Lab. before each test. The brain/body 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/body-equivalent material.

2. CBT(Calibrating Before Testing). Prior to testing, the dielectric probe kit was calibrated via the network analyzer, with the specified procedure(calibrated in pure water) and calibration kit(standard) short circuit, before the dielectric measurement. The specific procedure and calibration kit are provided by Agilent

5. 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.

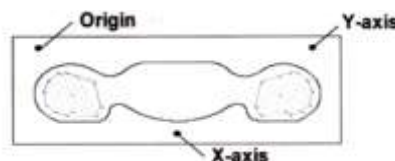


Figure 5.1 SAR Measurement Point in Area Scan

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extend, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan is performed around the highest E-field value to determine the averaged SASR-distribution over 10g.

Area scan and zoom scan resolution setting follow KDB 865664 D01v01 quoted below

		≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface		5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location		$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	≤ 2 GHz: ≤ 15 mm $2 - 3$ GHz: ≤ 12 mm		$3 - 4$ GHz: ≤ 12 mm $4 - 6$ GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be $\leq$ the corresponding x or y dimension of the test device with at least one measurement point on the test device.		
Maximum zoom scan spatial resolution: Δx_{Zoom} , Δy_{Zoom}		≤ 2 GHz: ≤ 8 mm $2 - 3$ GHz: ≤ 5 mm*	$3 - 4$ GHz: ≤ 5 mm* $4 - 6$ GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		$3 - 4$ GHz: ≤ 4 mm $4 - 5$ GHz: ≤ 3 mm $5 - 6$ GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	$3 - 4$ GHz: ≤ 3 mm $4 - 5$ GHz: ≤ 2.5 mm $5 - 6$ GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$
Minimum zoom scan volume	x, y, z	≥ 30 mm	$3 - 4$ GHz: ≥ 28 mm $4 - 5$ GHz: ≥ 25 mm $5 - 6$ GHz: ≥ 22 mm
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.			
* When zoom scan is required and the <u>reported</u> SAR from the area scan based <i>1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.			

6. DESCRIPTION OF TEST POSITION

6.1 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.

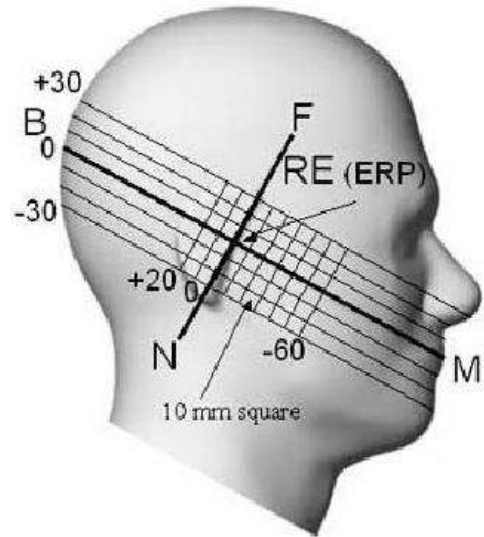


Figure 6.1 Side view of the phantom

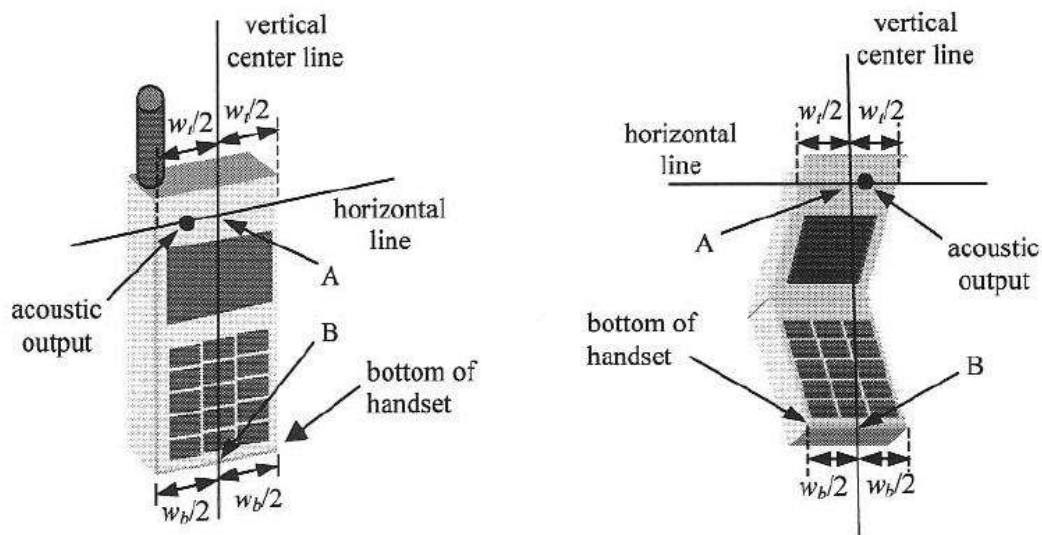


Figure 6.2 Handset vertical and horizontal reference lines

6.2 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.

7. 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 7.1 Uncertainty (800 MHz- 2450 MHz)

8. 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 8.1 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).

9. SAR SYSTEM VALIDATION

Per FCC KCB 865664 D02v01, SAR system validation status should be document to confirm measurement accuracy. The SAR systems (including SAR probes, system components and software versions) used for this device were validated against its performance specifications prior to the SAR measurements. Reference dipoles were used with the required tissue- equivalent media for system validation, according to the procedures outlined in IEEE 1528-2003 and FCC KDB 865664 D01 v01. Since SAR probe calibrations are frequency dependent, each probe calibration point was validated at a frequency within the valid frequency range of the probe calibration point, using the system that normally operates with the probe for routine SAR measurements and according to the required tissue-equivalent media.

A tabulated summary of the system validation status including the validation date(s), measurement frequencies, SAR probes and tissue dielectric parameters has been included.

SAR System Validation Summary

SAR Dasy System 2												
Probe	Tissue Type	Freq. [MHz]	Dipole	CW Validation				Modulated Validations				
				Date	Dielectric Parameters			Data	Mod. Type	Dielectric Parameters		
					Measured (ϵ_r)	Measured (σ)	Result			Measured (ϵ_r)	Measured (σ)	Result
1609	Head	835	441	Dec.20,2012	40.4	0.92	Pass	Dec.20,2012	GMSK	40.4	0.92	Pass
1609	Head	1900	5d032	Dec.20,2012	39.8	1.40	Pass	Dec.20,2012	GMSK	39.8	1.40	Pass
1609	Head	2450	743	Dec.20,2012	38.1	1.83	Pass	Dec.20,2012	OFDM	38.1	1.83	Pass
1609	Body	835	441	Dec.21,2012	56.9	0.98	Pass	Dec.21,2012	GMSK	56.9	0.98	Pass
1609	Body	1900	5d032	Dec.21,2012	51.8	1.54	Pass	Dec.21,2012	GMSK	51.8	1.54	Pass
1609	Body	2450	743	Dec.21,2012	52.9	1.96	Pass	Dec.21,2012	OFDM	52.9	1.96	Pass

10. SYSTEM VERIFICATION

10.1 Tissue Verification

Freq. [MHz]	Date	Probe	Dipole	Liquid	Liquid Temp.[°C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
835	Feb.18 2013	1609	441	Head	20.8	ϵ_r	41.5	40.4	- 2.65	± 5
				σ		0.90	0.919	+ 2.11	± 5	
835				Body		ϵ_r	55.2	56.9	+ 3.08	± 5
						σ	0.97	0.985	+ 1.55	± 5
1 900	Feb.19 2013		5d032	Head	20.9	ϵ_r	40.0	40.9	+ 2.25	± 5
				σ		1.40	1.37	- 2.14	± 5	
1 900				Body		ϵ_r	53.3	52.2	- 2.06	± 5
						σ	1.52	1.55	+ 1.97	± 5
2 450	Feb.19. 2013		743	Head	20.9	ϵ_r	39.2	38.1	- 2.81	± 5
	σ			1.80		1.83	+ 1.67	± 5		
2 450	Feb.19 2013			Body	20.9	ϵ_r	52.7	52.7	0.00	± 5
						σ	1.95	1.96	+ 0.51	± 5

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

10.2 System Verification

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 Verification 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	Feb. 18 2013	1609	Head	21.0	20.8	9.43	0.967	9.67	+ 2.55	± 10
835			Body			9.50	0.981	9.81	+ 3.26	± 10
1 900	Feb. 19 2013		Head	21.1	20.9	39.0	3.81	38.1	- 2.31	± 10
1 900			Body			39.9	3.88	38.8	- 2.76	± 10
2 450	Feb. 19, 2013		Head	21.1	20.9	52.7	5.37	53.7	+ 1.90	± 10
2 450	Feb.19, 2013		Body	21.1	20.9	51.2	5.29	52.9	+ 3.32	± 10

10.3 System Verification 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 Verification kit. (Graphic Plots Attached)

- Cabling the system, using the Verification 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.

11. 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.

11.1 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.

GSM850

Target Power : 32.0 dBm

Tune-up Tolerance : -1.5 dB/ +0.5 dB

GSM1900

Target Power : 28.7 dBm

Tune-up Tolerance : -1.5 dB/ +0.5 dB

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	32.38	32.36	29.87	27.85	26.82
	190	32.28	32.25	29.79	27.77	26.75
	251	32.20	32.17	29.71	27.70	26.69
GSM 1900	512	28.71	28.72	26.14	24.09	23.09
	661	28.88	28.86	26.34	24.33	23.38
	810	28.95	28.92	26.45	24.46	23.50

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	23.35	23.33	23.85	23.59	23.81
	190	23.25	23.22	23.77	23.51	23.74
	251	23.17	23.14	23.69	23.44	23.68
GSM 1900	512	19.68	19.69	20.12	19.83	20.08
	661	19.85	19.83	20.32	20.07	20.37
	810	19.92	19.89	20.43	20.2	20.49

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

11.2 WiFi

11.2.1 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

802.11 a/b/g and 4.9 GHz operating modes are tested independently according to the service requirements in each frequency band. 802.11 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"		
				§15.247 802.11b	802.11g	UNII
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				+
	5.520	104				√
	5.540	108				+
	5.560	112				+
	5.580	116				√
	5.600	120	Unknown			+
	5.620	124				√
	5.640	128				+
	5.660	132				+
	5.680	136				√
	5.700	140				+
	5.745	149		√		√
UNII or §15.247	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

2.4GHz

802.11b : 16 dBm

802.11g : 14 dBm

802.11n : 12.1 dBm

Tune-up Tolerance : -1.5dB/ +0.5dB

■ TEST RESULTS-Average

Conducted Output Power Measurements (802.11b Mode)

802.11b Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	1 Mbps	15.79	30
		2 Mbps	15.77	30
		5.5 Mbps	15.62	30
		11 Mbps	15.40	30
2437	6	1 Mbps	15.61	30
		2 Mbps	15.55	30
		5.5 Mbps	15.52	30
		11 Mbps	15.21	30
2462	11	1 Mbps	15.46	30
		2 Mbps	15.47	30
		5.5 Mbps	15.34	30
		11 Mbps	15.25	30

Conducted Output Power Measurements (802.11g Mode)

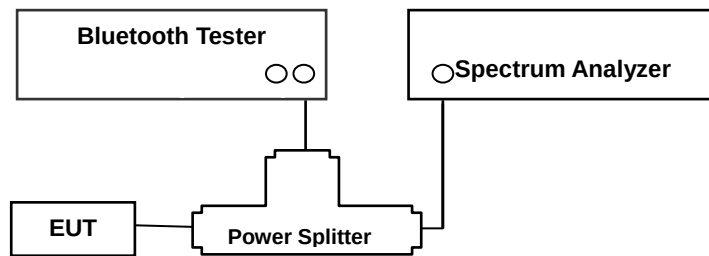
802.11g Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	6 Mbps	13.72	30
		9 Mbps	13.33	30
		12 Mbps	13.36	30
		18 Mbps	13.13	30
		24 Mbps	13.00	30
		36 Mbps	12.61	30
		48 Mbps	12.31	30
		54 Mbps	12.10	30
2437	6	6 Mbps	13.53	30
		9 Mbps	13.34	30
		12 Mbps	13.34	30
		18 Mbps	12.97	30
		24 Mbps	12.83	30
		36 Mbps	12.40	30
		48 Mbps	11.99	30
		54 Mbps	11.90	30
2462	11	6 Mbps	13.31	30
		9 Mbps	13.17	30
		12 Mbps	13.05	30
		18 Mbps	12.81	30
		24 Mbps	12.61	30
		36 Mbps	12.19	30
		48 Mbps	11.90	30
		54 Mbps	11.79	30

Conducted Output Power Measurements (802.11n Mode)

802.11n Mode		Rate (Mbps)	Measured Power(dBm)	Limit (dBm)
Frequency[MHz]	Channel No.			
2412	1	6.5 Mbps	12.52	30
		13 Mbps	12.25	30
		19.5 Mbps	11.97	30
		26 Mbps	11.86	30
		39 Mbps	11.39	30
		52 Mbps	11.10	30
		58.5 Mbps	11.00	30
		65 Mbps	10.77	30
2437	6	6.5 Mbps	12.26	30
		13 Mbps	12.03	30
		19.5 Mbps	11.79	30
		26 Mbps	11.58	30
		39 Mbps	11.28	30
		52 Mbps	10.88	30
		58.5 Mbps	10.79	30
		65 Mbps	10.67	30
2462	11	6.5 Mbps	12.25	30
		13 Mbps	11.95	30
		19.5 Mbps	11.75	30
		26 Mbps	11.52	30
		39 Mbps	11.14	30
		52 Mbps	10.71	30
		58.5 Mbps	10.68	30
		65 Mbps	10.57	30

11. 3 Bluetooth Average Power

Test Configuration



TEST PROCEDURE

The transmitter output is connected to the Spectrum Analyzer. The Spectrum Analyzer is set to the average detector mode. This test is performed with hopping off.

1. Span = 2 MHz (GFSK) / 5 MHz ($\pi/4$ DQPSK and 8DPSK)
2. RBW = auto (GFSK) / auto ($\pi/4$ DQPSK and 8DPSK)
3. VBW = auto (GFSK) / auto ($\pi/4$ DQPSK and 8DPSK)
4. Sweep = 1 s
5. Packet type= DH5 (GFSK) / 2-DH5 ($\pi/4$ DQPSK) / 3-DH5 (8DPSK)

Model	Channel	Frequency (MHz)	Output Power (dBm)		
			GFSK	8DPSK	$\pi/4$ DQPSK
GT-S6812	0	2402	9.78	6.54	6.53
	39	2440	9.73	6.54	6.54
	78	2480	8.81	5.51	5.5

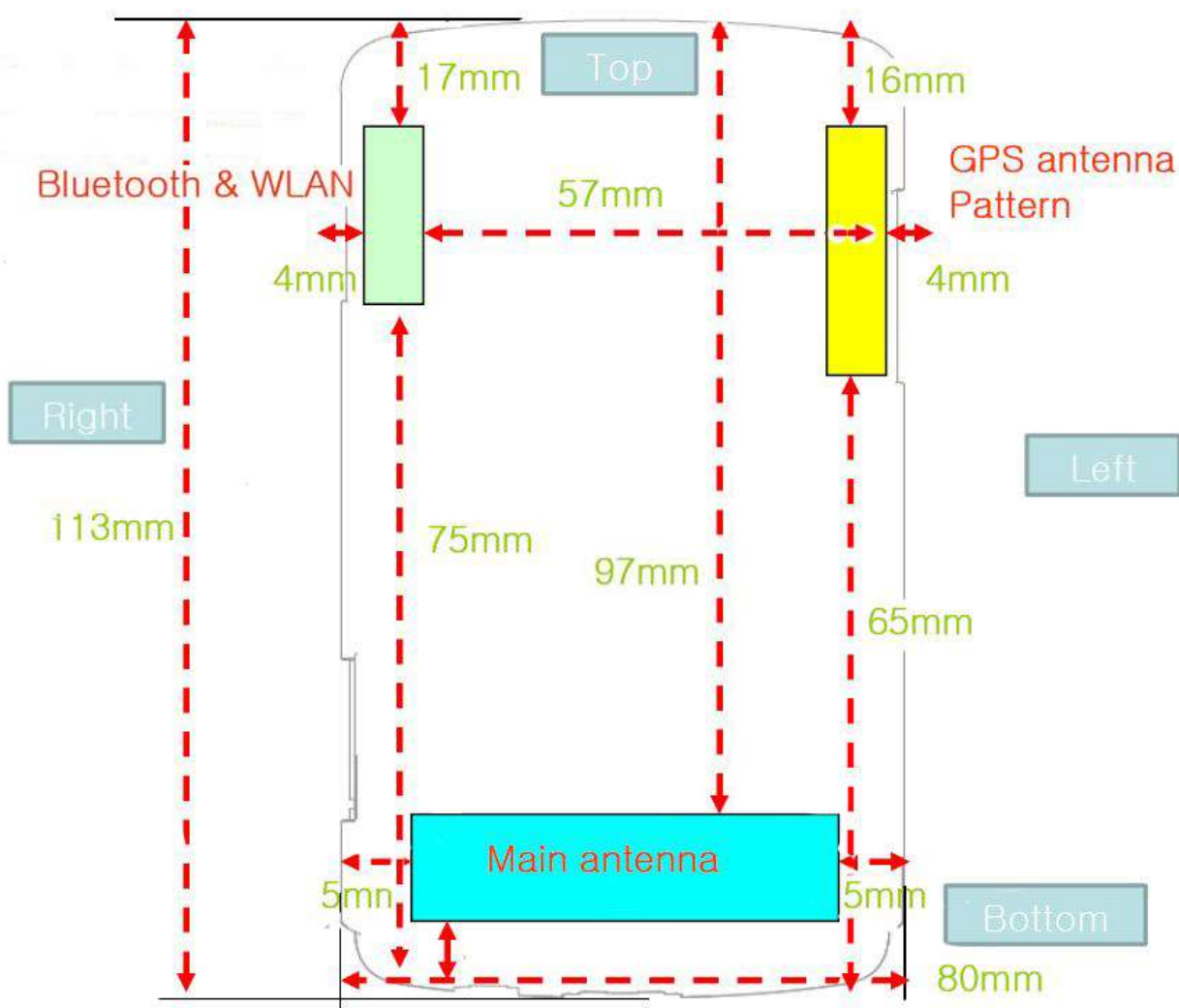
10 dBm

Power Tolerance: - 1.5dB/ + 0.5dB

12. SAR Test configuration & Antenna Information

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

12.1 Antenna and Device Information



[Rear side View]

13. SAR TEST DATA SUMMARY

13.1 Measurement Results (GSM850 Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Measured SAR(mW/g)	Scaled SAR(mW/g)	Plot No
MHz	Channel								
836.6	190 (Mid)	GSM850	32.28	0.156	Standard	Left Ear	0.475	0.500	1
			32.28	-0.060	Standard	Left Tilt 15°	0.26	0.274	2
			32.28	-0.144	Standard	Right Ear	0.306	0.322	3
			32.28	-0.101	Standard	Right Tilt 15°	0.192	0.202	4
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
- According to KDB 447498, Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz.

13.2 Measurement Results (GSM1900 Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Measured SAR(mW/g)	Scaled SAR(mW/g)	Plot No.
MHz	Channel								
1850.2	512 (Low)	GSM1900	28.71	0.003	Standard	Left Ear	0.726	0.813	5
1 880.0	661 (Mid)		28.88	-0.184	Standard	Left Ear	0.86	0.926	6
1909.8	810 (High)		28.95	-0.062	Standard	Left Ear	0.533	0.565	7
1 880.0	661 (Mid)		28.88	-0.040	Standard	Left Tilt 15°	0.223	0.240	8
			28.88	-0.102	Standard	Right Ear	0.647	0.696	9
			28.88	-0.175	Standard	Right Tilt 15°	0.222	0.239	10
			ANSI/ IEEE C95.1 - 1992– Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg (mW/g) Averaged over 1 gram

NOTES:

- 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
- According to KDB 447498, Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz.

13.3 Measurement Results (802.11b/g/n Head SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Battery	Phantom Position	Data Rate	Measured SAR(mW/g)	Scaled SAR(mW/g)	Plot No.
MHz	Channel									
2 412	1 (Low)	802.11b	15.79	-0.073	Standard	Left Ear	1Mbps	0.359	0.423	11
			15.79	-0.125	Standard	Left Tilt 15°	1Mbps	0.121	0.142	12
			15.79	0.048	Standard	Right Ear	1Mbps	0.112	0.132	13
			15.79	-0.020	Standard	Right Tilt 15	1Mbps	0.127	0.150	14
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.

13.4 Measurement Results (GSM850 Hotspot SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	Measured SAR(mW/g)	Scaled SAR(mW/g)	Plot No.
MHz	Channel								
824.2	128 (Low)	GPRS 2Tx	29.87	-0.138	Rear	1 cm	0.746	0.862	15
836.6	190 (Mid)		29.79	0.045	Rear	1 cm	0.708	0.834	16
848.8	251(High)		29.71	0.019	Rear	1 cm	0.633	0.759	17
836.6	190 (Mid)		29.79	0.045	Front	1 cm	0.43	0.506	18
			29.79	-0.008	Left	1 cm	0.44	0.518	19
			29.79	-0.028	Right	1 cm	0.276	0.325	20
			29.79	0.036	Bottom	1 cm	0.154	0.181	21
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
- According to KDB 447498, Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is $\leq$ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is $\leq$ 100 MHz.

13.5 Measurement Results (GSM1900 Hotspot SAR)

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Separation Distance	Measured SAR(mW/g)	Scaled SAR(mW/g)	Plot No.
MHz	Channel								
1 880.0	661 (Mid)	GPRS 4Tx	23.38	-0.068	Rear	1 cm	0.534	0.691	22
			23.38	-0.075	Front	1 cm	0.614	0.795	23
			23.38	-0.098	Left	1 cm	0.191	0.247	24
			23.38	-0.004	Right	1 cm	0.118	0.153	25
			23.38	-0.037	Bottom	1 cm	0.434	0.562	26
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
- According to KDB 447498, Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid-band or highest output power channel is ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz.

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

Frequency		Modulation	Conducted Power (dBm)	Power Drift (dB)	Configuration	Data Rate	Separation Distance	Measured SAR(mW/g)	Scaled SAR(mW/g)	Plot No.
MHz	Channel									
2 412	1 (Low)	802.11b	15.79	-0.169	Rear	1Mbps	1 cm	0.13	0.153	27
			15.79	-0.016	Front	1Mbps	1 cm	0.080	0.094	28
			15.79	0.183	Right	1Mbps	1 cm	0.126	0.148	29
			15.79	-0.138	Top	1Mbps	1 cm	0.056	0.066	30
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.

14. SAR Summation Scenario

	Position	Applicable Combination
Simultaneous Transmission	Head	GSM850 Voice + 2.4 GHz WiFi
		GSM1900 Voice + 2.4 GHz WiFi
	Body-worn	GSM850 Voice + 2.4 GHz WiFi
		GSM1900 Voice + 2.4 GHz WiFi
		GSM850 Voice + 2.4 GHz Bluetooth
		GSM1900 Voice + 2.4 GHz Bluetooth
	Hotspot	GSM850 GPRS + 2.4 GHz WiFi
		GSM1900 GPRS + 2.4 GHz WiFi
* BT and WLAN are not simultaneous transmission.		

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05 IV.C.1iii, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is $\leq 1.6\text{W/kg}$. when standalone SAR is not required to be measured per FCC KDB 447498 D01v05 4.3.22, the following equation must be used to estimate the standalone 1-g SAR for simultaneous transmission assessment involving that transmitter

$$\text{Estimated SAR} = \frac{\sqrt{f(\text{GHz})}}{7.5} * \frac{(\text{Max Power of channel,mW})}{\text{Min.Separation Distance}}$$

Mode	Frequency	Maximum Allowed Power	Separatuin Distance	Estimated SAR
	[MHz]	[mW]	[mm]	[W/kg]
Bluetooth(Body)	2402	11	10	0.23

Note: Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission.

Simultaneous Transmission Summation for Held to Ear

Simultaneous TX	configuration	GSM850 Scaled SAR(W/kg)	2.4 GHz WIFI Scaled SAR (W/kg)	Σ SAR (W/kg)	Simultaneous TX	configuration	GSM1900 Scaled SAR(W/kg)	2.4 GHz WIFI Scaled SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Left Cheek	0.500	0.423	0.923	Head SAR	Left Cheek	0.926	0.423	1.349
	Left Tilt	0.274	0.142	0.416		Left Tilt	0.240	0.142	0.382
	Right Cheek	0.322	0.132	0.454		Right Cheek	0.696	0.132	0.828
	Right Tilt	0.202	0.150	0.352		Right Tilt	0.239	0.150	0.389

Simultaneous Transmission Summation for Body-Worn (1.0 cm)

Simultaneous TX	configuration	GSM850 Scaled SAR(W/kg)	2.4 GHz WIFI Scaled SAR (W/kg)	Σ SAR (W/kg)	Simultaneous TX	configuration	GSM1900 Scaled SAR(W/kg)	2.4 GHz WIFI Scaled SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Rear	0.862	0.153	1.015	Body SAR	Rear	0.691	0.153	0.844
Body SAR	Front	0.506	0.094	0.6	Body SAR	Front	0.795	0.094	0.889
Simultaneous TX	configuration	GSM850 Scaled SAR(W/kg)	BT SAR (W/kg)	Σ SAR (W/kg)	Simultaneous TX	configuration	GSM1900 Scaled SAR(W/kg)	BT SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Rear	0.862	0.23	1.092	Body SAR	Rear	0.691	0.23	0.921
Body SAR	Front	0.506	0.23	0.736	Body SAR	Front	0.795	0.23	1.025

Simultaneous Transmission Summation for Hotspot (1.0 cm)

Simultaneous TX	configuration	GSM850 Scaled SAR(W/kg)	2.4GHz WIFI Scaled SAR (W/kg)	Σ SAR (W/kg)	Simultaneous TX	configuration	GSM1900 Scaled SAR(W/kg)	2.4GHz WIFI Scaled SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Rear	0.862	0.153	1.015	Body SAR	Rear	0.691	0.153	0.844
	Front	0.506	0.094	0.6		Front	0.795	0.094	0.889
	Left	0.518	-	0.518		Left	0.247	-	0.247
	Right	0.325	0.148	0.473		Right	0.153	0.148	0.301
	Bottom	0.181	-	0.181		Bottom	0.562	-	0.562
	Top	-	0.066	0.066		Top	-	0.066	0.066

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.

14.1 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.

Per FCC KDB 447498 D01v05, Bluetooth SAR were not required based on the maximum conducted power and the Bluetooth antenna to user separation distance.

$$\frac{\text{Max Power of Channel(mW)}}{\text{Test Separation Dist(mm)}} * \sqrt{\text{Frequency(GHz)}} \leq 3.0$$

. Mode	Frequency	Maximum Allowed Power	Separatuin Distance	≤ 3.0
	[MHz]	[mW]	[mm]	
Bluetooth(Body)	2402	11	10	1.74

15. SAR Measurement Variability and Uncertainty

In accordance with published RF Exposure KDB procedure 865664 D01 SAR measurement 100 MHz to 6 GHz v01.

These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

- 1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg; steps 2) through 4) do not apply.
- 2) When the original highest measured SAR is ≥ 0.80 W/kg, repeat that measurement once.
- 3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg (~ 10% from the 1-g SAR limit).
- 4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Frequency		Modulation	Battery	Phantom Position	Original SAR(mW/g)	Repeated SAR(mW/g)	Largest to Smallest SAR Ratio	Plot No.
MHz	Channel							
1880	810 (Mid)	GSM1900	Standard	Left Ear (Touch)	0.86	0.787	1.093	31

Note(s):

1. Second Repeated Measurement is not required since the ratio of the largest to smallest SAR for the original and first repeated measurement is not > 1.20.
2. Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg.

16. CONCLUSION

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

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

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Attachment 1. – SAR Test Plots

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0 °C
Test Date: Feb. 18 2013
Plot No.: 1

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.921$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: 835/900 Phantom ; Type: SAM

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

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

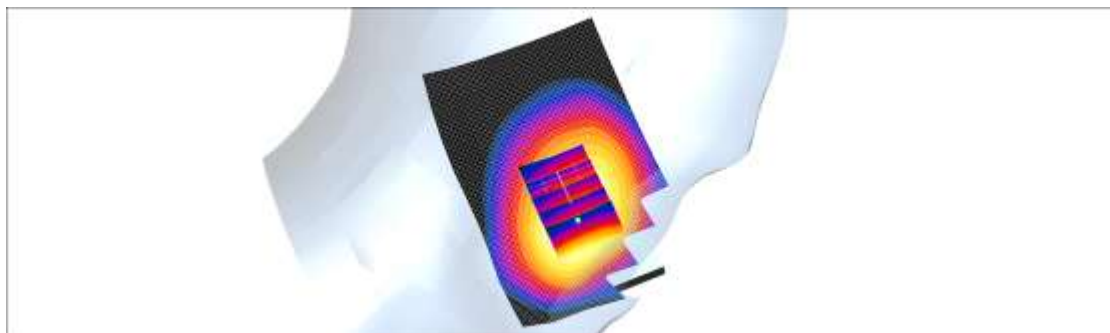
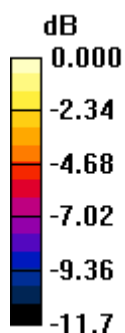
Left Touch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.76 V/m; Power Drift = 0.156 dB

Peak SAR (extrapolated) = 0.643 W/kg

SAR(1 g) = 0.475 mW/g; SAR(10 g) = 0.330 mW/g

Maximum value of SAR (measured) = 0.499 mW/g



0 dB = 0.499mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0 °C
Test Date: Feb. 18 2013
Plot No.: 2

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.921$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: 835/900 Phantom ; Type: SAM

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

Maximum value of SAR (interpolated) = 0.272 mW/g

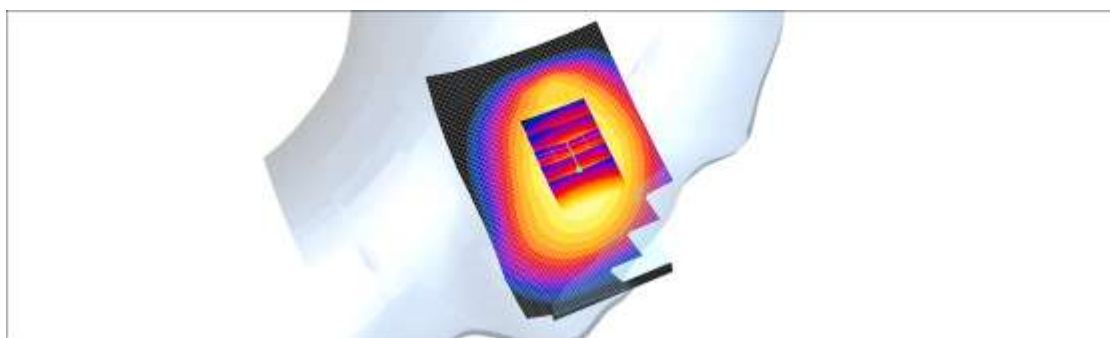
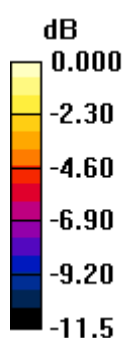
Left Tilt 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.42 V/m; Power Drift = -0.060 dB

Peak SAR (extrapolated) = 0.335 W/kg

SAR(1 g) = 0.260 mW/g; SAR(10 g) = 0.186 mW/g

Maximum value of SAR (measured) = 0.284 mW/g



0 dB = 0.284mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0°C
Test Date: Feb. 18 2013
Plot No.: 3

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.921$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: 835/900 Phantom ; Type: SAM

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

Maximum value of SAR (interpolated) = 0.325 mW/g

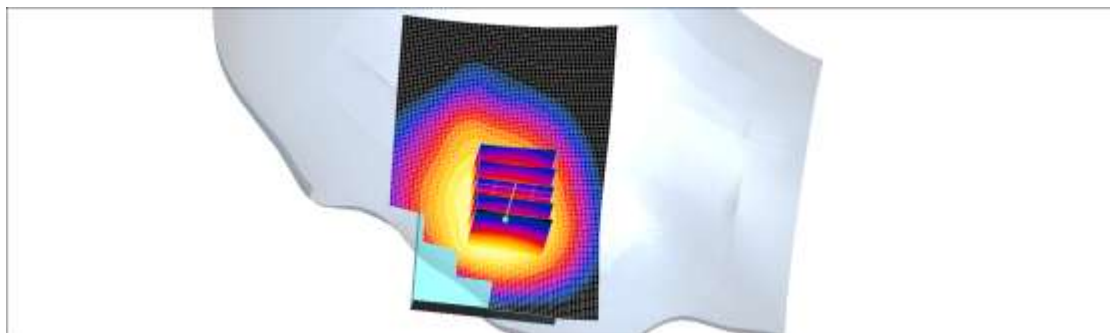
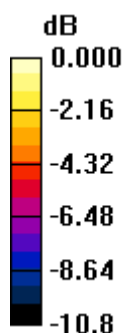
Right Touch 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.14 V/m; Power Drift = -0.144 dB

Peak SAR (extrapolated) = 0.388 W/kg

SAR(1 g) = 0.306 mW/g; SAR(10 g) = 0.218 mW/g

Maximum value of SAR (measured) = 0.326 mW/g



0 dB = 0.326mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0 °C
Test Date: Feb. 18 2013
Plot No.: 4

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.921$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: 835/900 Phantom ; Type: SAM

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

Maximum value of SAR (interpolated) = 0.197 mW/g

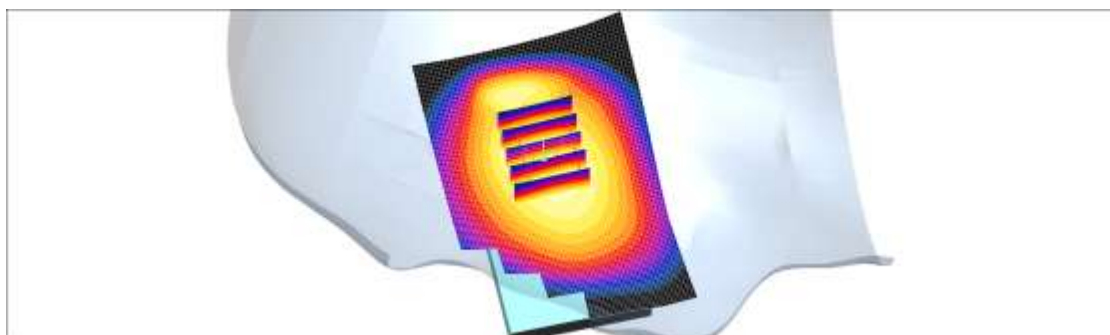
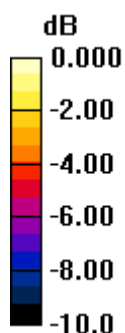
Right Tilt 190/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.7 V/m; Power Drift = -0.101 dB

Peak SAR (extrapolated) = 0.252 W/kg

SAR(1 g) = 0.192 mW/g; SAR(10 g) = 0.138 mW/g

Maximum value of SAR (measured) = 0.205 mW/g



0 dB = 0.205mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 5

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3
Medium parameters used (interpolated): $f = 1850.2$ MHz; $\sigma = 1.32$ mho/m; $\epsilon_r = 41$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; 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 Sn614; Calibrated: 2012-09-20
- Phantom: 800/900 Phantom; Type: SAM

Left Touch 512/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.678 mW/g

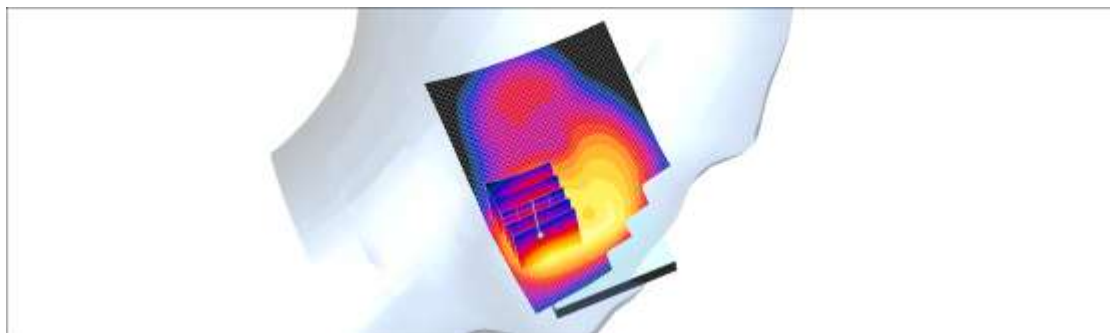
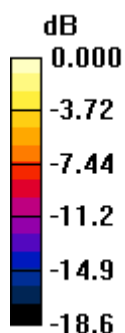
Left Touch 512/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.03 V/m; Power Drift = 0.003 dB

Peak SAR (extrapolated) = 1.20 W/kg

SAR(1 g) = 0.726 mW/g; SAR(10 g) = 0.388 mW/g

Maximum value of SAR (measured) = 0.776 mW/g



0 dB = 0.776mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 6

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.35 \text{ mho/m}$; $\epsilon_r = 40.9$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

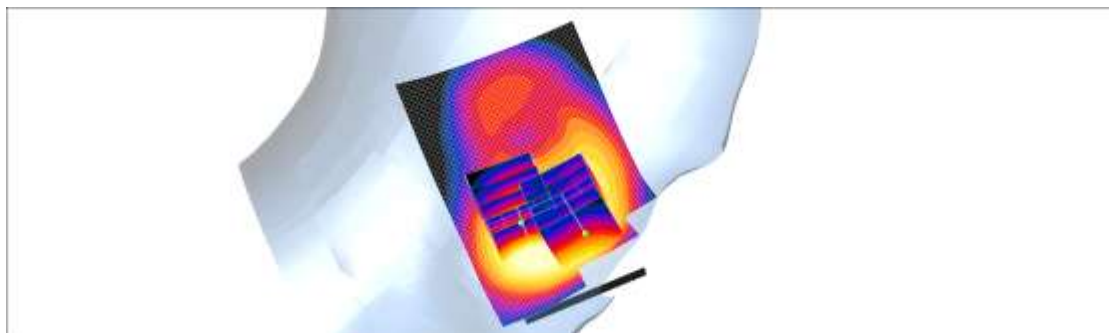
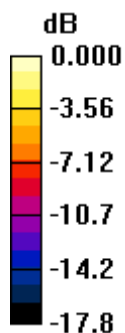
DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: SAM 1800/1900 MHz; Type: SAM

Left Touch 661/Area Scan (61x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.928 mW/g

Left Touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 9.88 V/m; Power Drift = -0.184 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.860 mW/g; SAR(10 g) = 0.431 mW/g
Maximum value of SAR (measured) = 0.994 mW/g

Left Touch 661/Zoom Scan (5x5x7)/Cube 1: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 9.88 V/m; Power Drift = -0.184 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.603 mW/g; SAR(10 g) = 0.330 mW/g
Maximum value of SAR (measured) = 0.676 mW/g



0 dB = 0.676mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 7

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1910$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8
Build 184

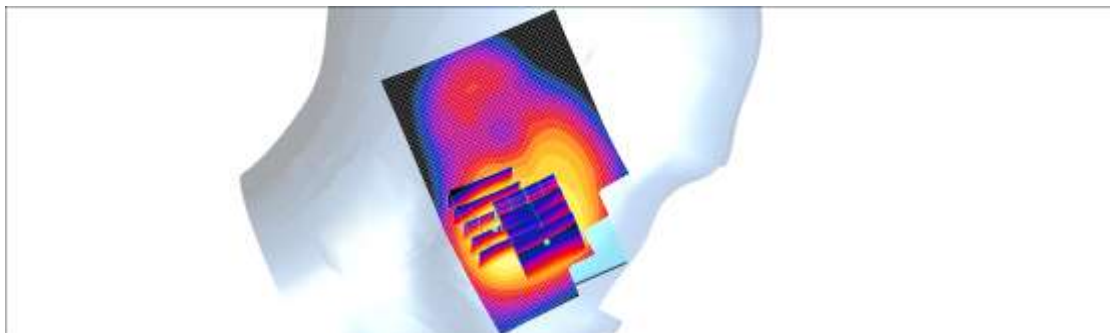
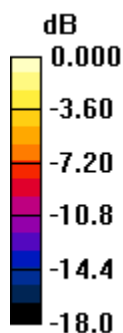
DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: 800/900 Phantom; Type: SAM

Left Touch 810/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.757 mW/g

Left Touch 810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.86 V/m; Power Drift = -0.062 dB
Peak SAR (extrapolated) = 1.36 W/kg
SAR(1 g) = 0.791 mW/g; SAR(10 g) = 0.420 mW/g
Maximum value of SAR (measured) = 0.877 mW/g

Left Touch 810/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.86 V/m; Power Drift = -0.062 dB
Peak SAR (extrapolated) = 1.34 W/kg
SAR(1 g) = 0.533 mW/g; SAR(10 g) = 0.286 mW/g



0 dB = 0.877mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 8

DUT: GT-S6812; Type: bar; Serial: FK-034-C

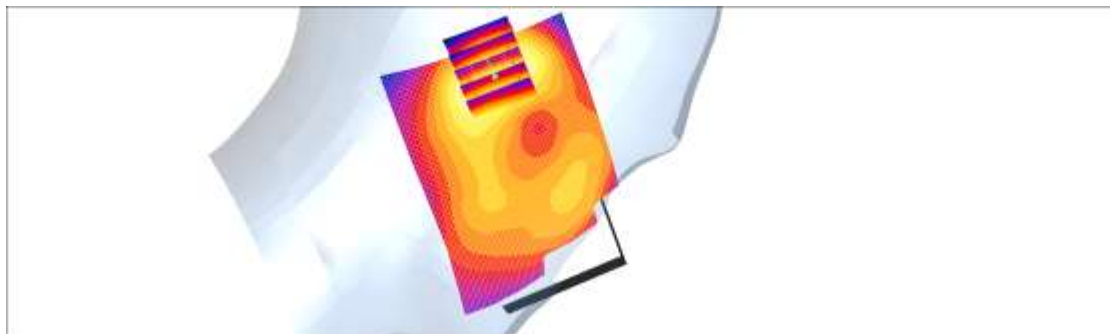
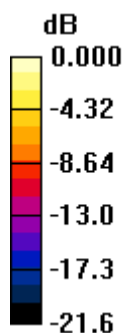
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8
Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: SAM 1800/1900 MHz; Type: SAM

Left Tilt 661/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.262 mW/g

Left Tilt 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.4 V/m; Power Drift = -0.040 dB
Peak SAR (extrapolated) = 0.353 W/kg
SAR(1 g) = 0.223 mW/g; SAR(10 g) = 0.123 mW/g
Maximum value of SAR (measured) = 0.251 mW/g



0 dB = 0.251mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 9

DUT: GT-S6812; Type: bar; Serial: FK-034-C

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 Sn614; Calibrated: 2012-09-20
- Phantom: SAM 1800/1900 MHz; Type: SAM

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

Maximum value of SAR (interpolated) = 0.715 mW/g

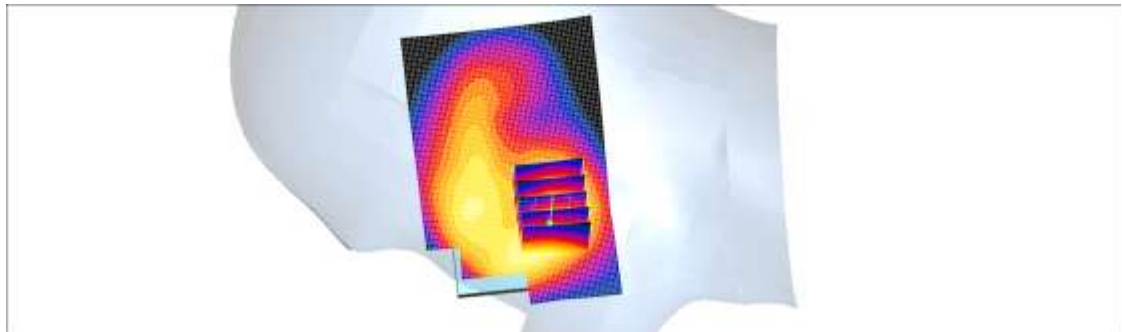
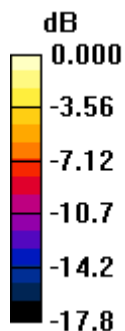
Right Touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.81 V/m; Power Drift = -0.102 dB

Peak SAR (extrapolated) = 0.944 W/kg

SAR(1 g) = 0.647 mW/g; SAR(10 g) = 0.369 mW/g

Maximum value of SAR (measured) = 0.714 mW/g



0 dB = 0.714mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 10

DUT: GT-S6812; Type: bar; Serial: FK-034-C

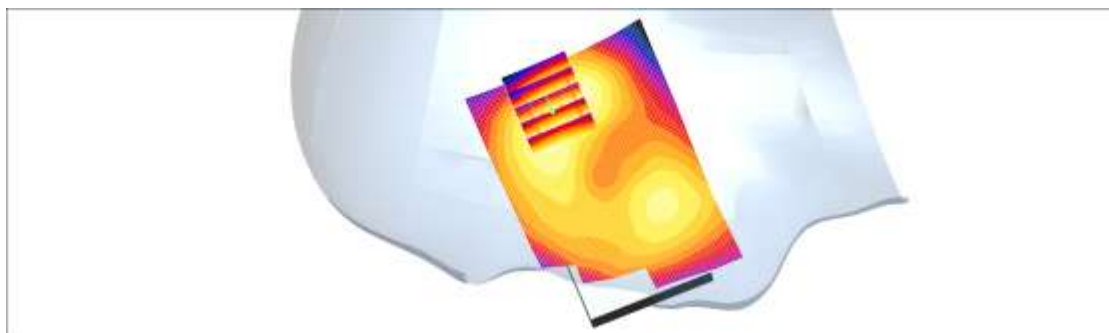
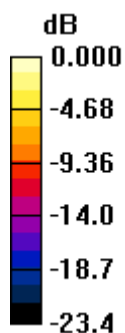
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.35$ mho/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8
Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: SAM 1800/1900 MHz; Type: SAM

Right Tilt 661/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.302 mW/g

Right Tilt 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.7 V/m; Power Drift = -0.175 dB
Peak SAR (extrapolated) = 0.396 W/kg
SAR(1 g) = 0.222 mW/g; SAR(10 g) = 0.127 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 v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient: 21.1 °C
Temperature:
Test Date: Feb. 19 2013
Plot No.: 11

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.8$ mho/m; $\epsilon_r = 38.2$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: 1800/1900 Phantom; Type: SAM

Left Touch 1CH 1M/Area Scan (71x111x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.427 mW/g

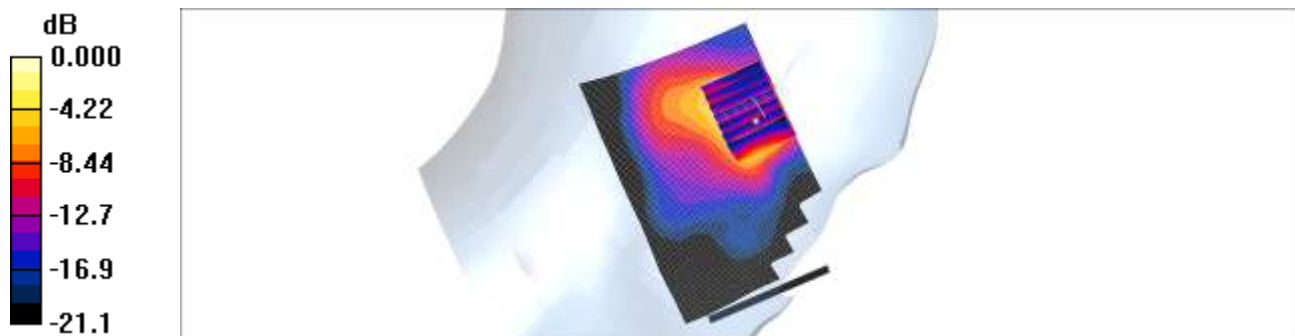
Left Touch 1CH 1M/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.99 V/m; Power Drift = -0.073 dB

Peak SAR (extrapolated) = 0.894 W/kg

SAR(1 g) = 0.359 mW/g; SAR(10 g) = 0.164 mW/g

Maximum value of SAR (measured) = 0.409 mW/g



0 dB = 0.409mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 12

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.8$ mho/m; $\epsilon_r = 38.2$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8
Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: 1800/1900 Phantom; Type: SAM

Left TILT 1CH 1M/Area Scan (81x111x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.140 mW/g

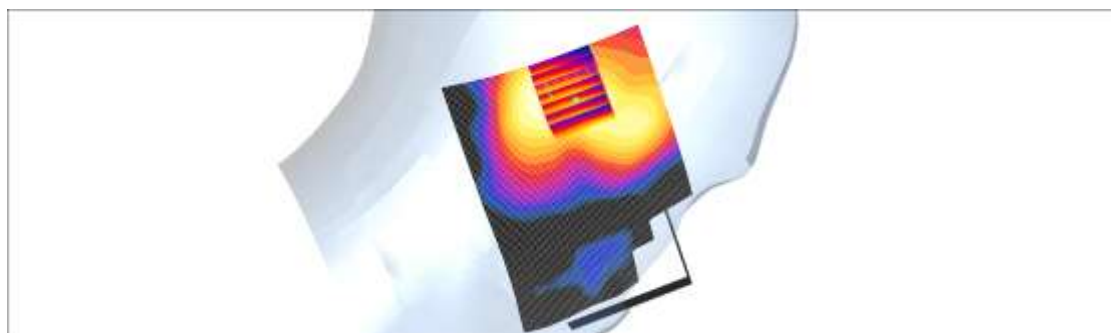
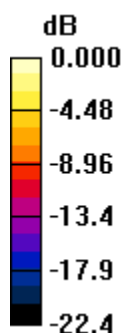
Left TILT 1CH 1M/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.96 V/m; Power Drift = -0.125 dB

Peak SAR (extrapolated) = 0.215 W/kg

SAR(1 g) = 0.121 mW/g; SAR(10 g) = 0.070 mW/g

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



0 dB = 0.131mW/g

Test Laboratory: HCT CO., LTD
 EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
 Liquid Temperature: 20.9 °C
 Ambient Temperature: 21.1 °C
 Test Date: Feb. 19 2013
 Plot No.: 13

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 2412 \text{ MHz}$; $\sigma = 1.8 \text{ mho/m}$; $\epsilon_r = 38.2$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-03-19
- Phantom: 1800/1900 Phantom; Type: SAM

Right Touch 1CH 1M/Area Scan (81x111x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.125 mW/g

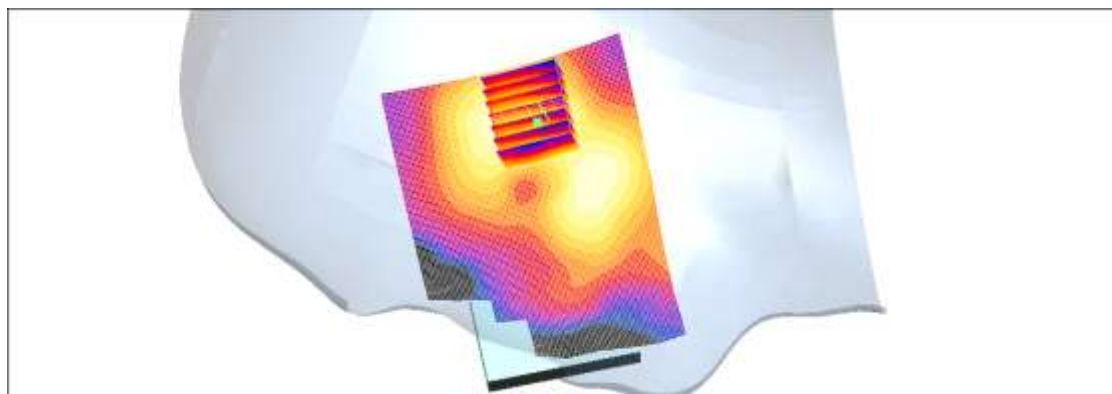
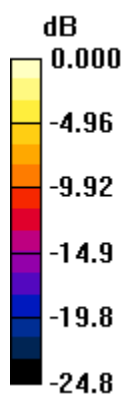
Right Touch 1CH 1M/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.43 V/m; Power Drift = 0.048 dB

Peak SAR (extrapolated) = 0.191 W/kg

SAR(1 g) = 0.112 mW/g; SAR(10 g) = 0.062 mW/g

Maximum value of SAR (measured) = 0.124 mW/g



0 dB = 0.124mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 14

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.8$ mho/m; $\epsilon_r = 38.2$; $\rho = 1000$ kg/m³
Phantom section: Right Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: 1800/1900 Phantom; Type: SAM

Right tilt 1CH 1M/Area Scan (81x111x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.141 mW/g

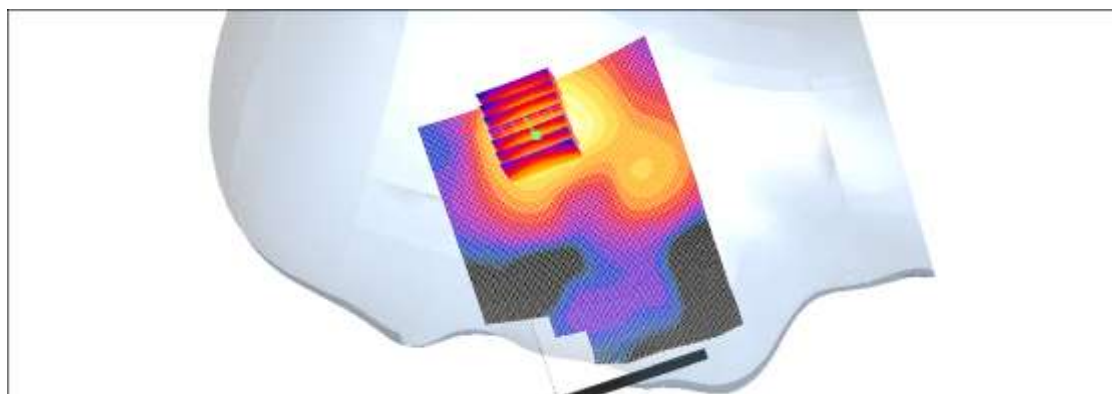
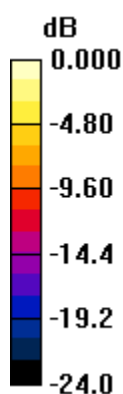
Right tilt 1CH 1M/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.16 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 0.226 W/kg

SAR(1 g) = 0.127 mW/g; SAR(10 g) = 0.069 mW/g

Maximum value of SAR (measured) = 0.137 mW/g



0 dB = 0.137mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0°C
Test Date: Feb. 18 2013
Plot No.: 15

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 824.2 MHz; Duty Cycle: 1:4.15
Medium parameters used: $f = 825$ MHz; $\sigma = 0.978$ mho/m; $\epsilon_r = 57$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

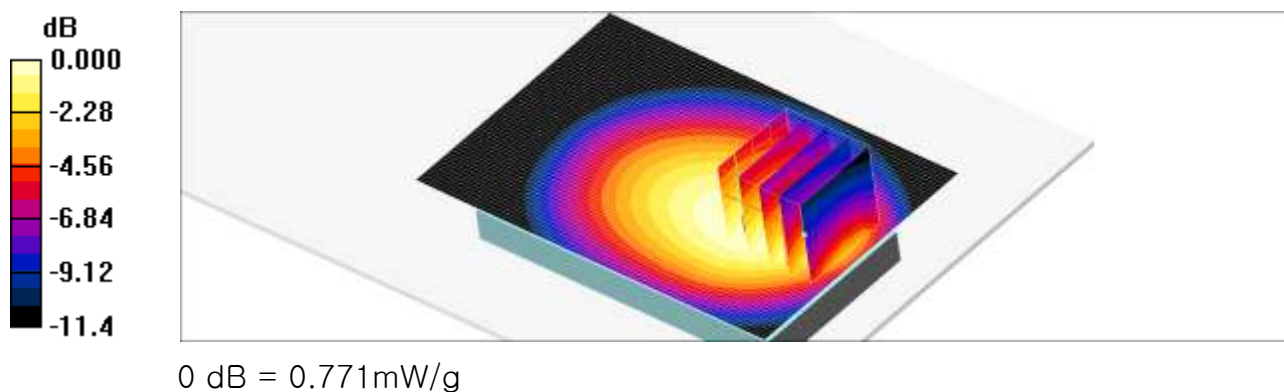
DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

Body Rear 128 GPRS 2tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.823 mW/g

Body Rear 128 GPRS 2tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.54 V/m; Power Drift = -0.138 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.746 mW/g; SAR(10 g) = 0.547 mW/g

Maximum value of SAR (measured) = 0.771 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0°C
Test Date: Feb. 18 2013
Plot No.: 16

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.987$ mho/m; $\epsilon_r = 56.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body Rear 190 GPRS 2tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.754 mW/g

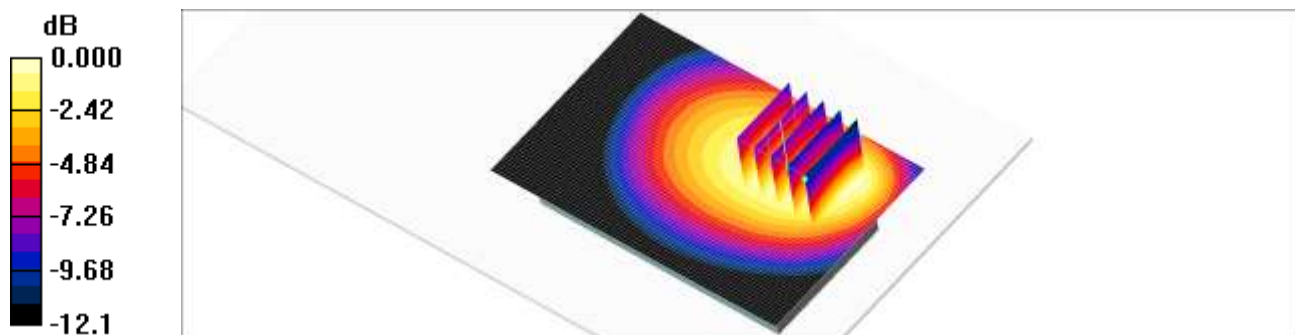
Body Rear 190 GPRS 2tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.83 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 0.973 W/kg

SAR(1 g) = 0.708 mW/g; SAR(10 g) = 0.504 mW/g

Maximum value of SAR (measured) = 0.754 mW/g



0 dB = 0.754mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0°C
Test Date: Feb. 18 2013
Plot No.: 17

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 848.8 MHz; Duty Cycle: 1:4.15
Medium parameters used (interpolated): $f = 848.8$ MHz; $\sigma = 0.997$ mho/m; $\epsilon_r = 56.8$; $\rho = 1000$ 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(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

Body Rear 251 GPRS 2tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.690 mW/g

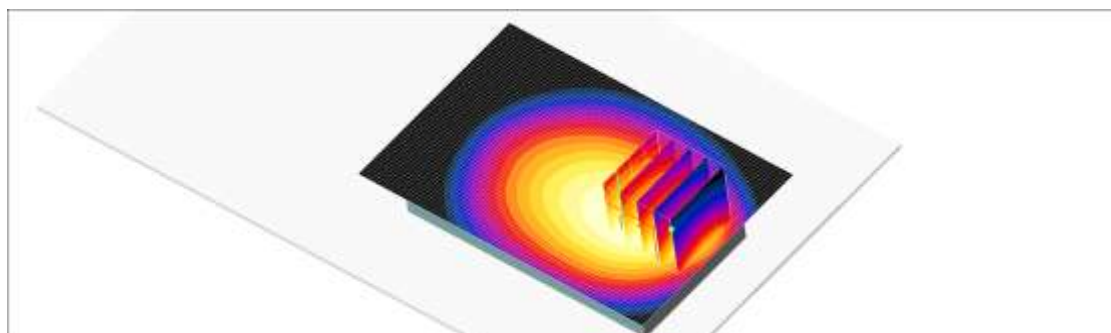
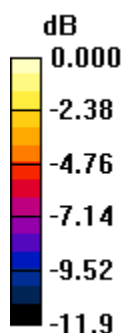
Body Rear 251 GPRS 2tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.77 V/m; Power Drift = 0.019 dB

Peak SAR (extrapolated) = 0.872 W/kg

SAR(1 g) = 0.633 mW/g; SAR(10 g) = 0.462 mW/g

Maximum value of SAR (measured) = 0.661 mW/g



0 dB = 0.661mW/g

Test Laboratory: HCT CO., LTD

EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only

Liquid Temperature: 20.8 °C

Ambient Temperature: 21.0 °C

Test Date: Feb. 18 2013

Plot No.: 18

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.987$ mho/m; $\epsilon_r = 56.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body Front 190 GPRS 2tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.451 mW/g

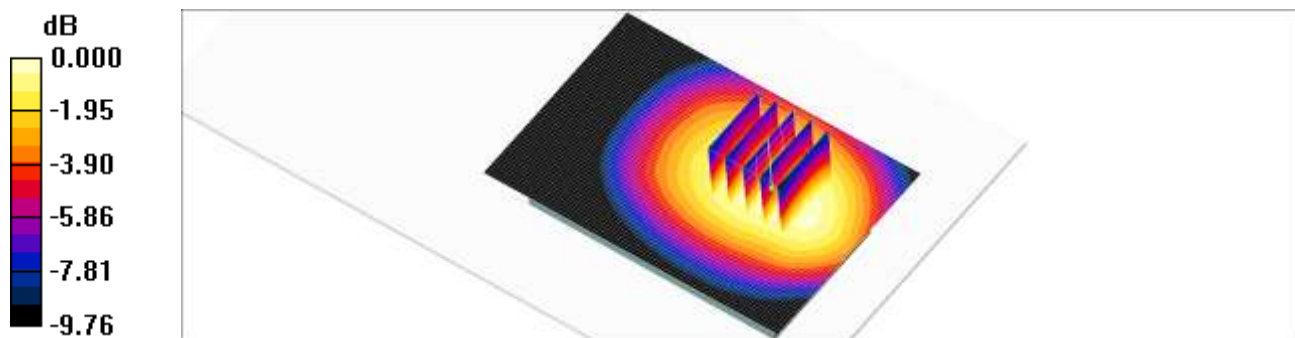
Body Front 190 GPRS 2tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.64 V/m; Power Drift = 0.045 dB

Peak SAR (extrapolated) = 0.539 W/kg

SAR(1 g) = 0.430 mW/g; SAR(10 g) = 0.316 mW/g

Maximum value of SAR (measured) = 0.456 mW/g



0 dB = 0.456mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0°C
Test Date: Feb. 18 2013
Plot No.: 19

DUT: GT-S6812 left; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.987$ mho/m; $\epsilon_r = 56.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body_left side 190 GPRS 2tx/Area Scan (41x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.473 mW/g

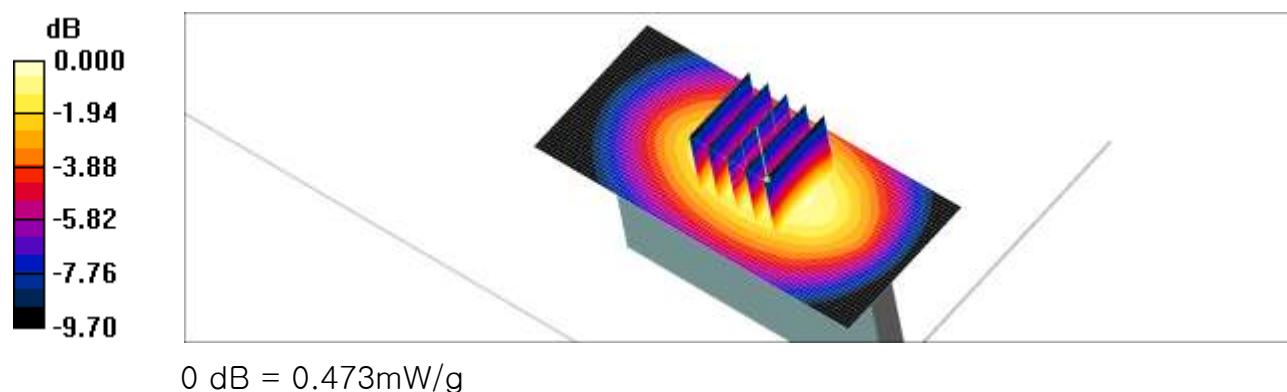
Body_left side 190 GPRS 2tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 10.2 V/m; Power Drift = -0.008 dB

Peak SAR (extrapolated) = 0.605 W/kg

SAR(1 g) = 0.440 mW/g; SAR(10 g) = 0.300 mW/g

Maximum value of SAR (measured) = 0.473 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0°C
Test Date: Feb. 18 2013
Plot No.: 20

DUT: GT-S6812 left; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15
Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.987$ mho/m; $\epsilon_r = 56.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body_right side 190 GPRS 2tx/Area Scan (41x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.294 mW/g

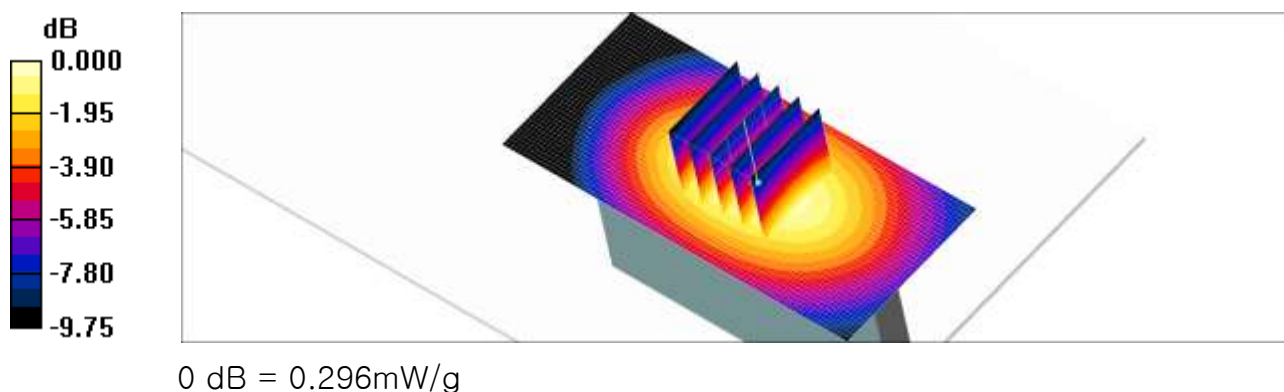
Body_right side 190 GPRS 2tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.32 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 0.390 W/kg

SAR(1 g) = 0.276 mW/g; SAR(10 g) = 0.187 mW/g

Maximum value of SAR (measured) = 0.296 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0°C
Test Date: Feb. 18 2013
Plot No.: 21

DUT: GT-S6812 bottom; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.987$ mho/m; $\epsilon_r = 56.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body_left side 190 GPRS 2tx/Area Scan (61x41x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.184 mW/g

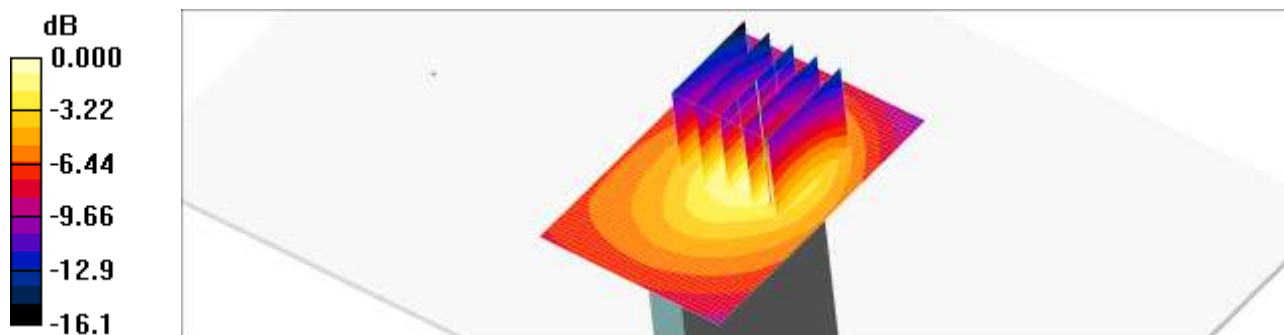
Body_left side 190 GPRS 2tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 11.9 V/m; Power Drift = 0.036 dB

Peak SAR (extrapolated) = 0.308 W/kg

SAR(1 g) = 0.154 mW/g; SAR(10 g) = 0.087 mW/g

Maximum value of SAR (measured) = 0.170 mW/g



0 dB = 0.170mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 22

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ 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(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- 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) = 0.611 mW/g

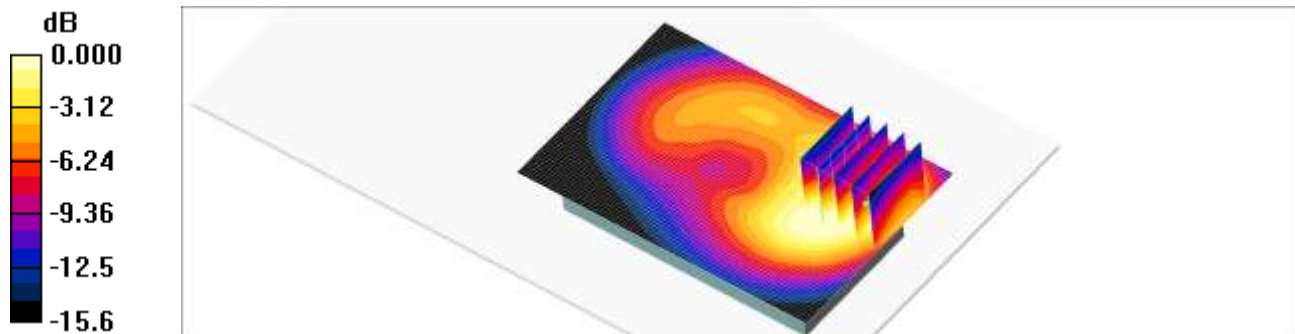
Body Rear 661 4tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.39 V/m; Power Drift = -0.068 dB

Peak SAR (extrapolated) = 0.820 W/kg

SAR(1 g) = 0.534 mW/g; SAR(10 g) = 0.313 mW/g

Maximum value of SAR (measured) = 0.588 mW/g



0 dB = 0.588mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 23

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ 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(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- 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) = 0.696 mW/g

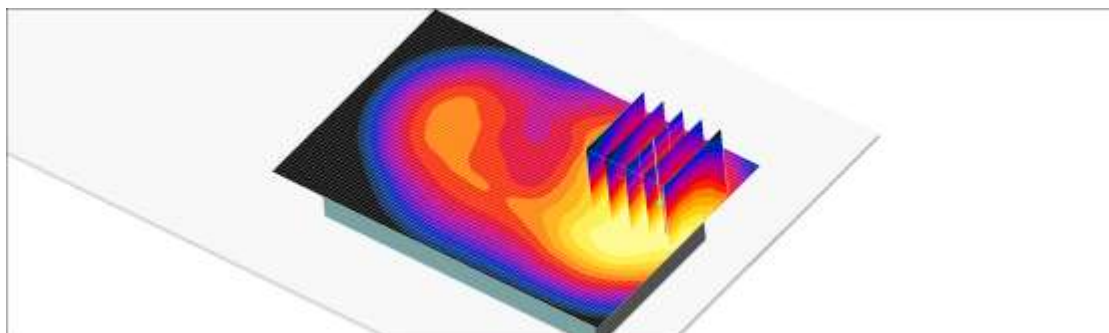
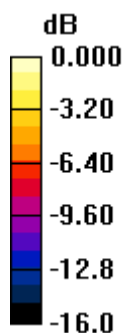
Body front 661 4tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 7.09 V/m; Power Drift = -0.075 dB

Peak SAR (extrapolated) = 0.879 W/kg

SAR(1 g) = 0.614 mW/g; SAR(10 g) = 0.375 mW/g

Maximum value of SAR (measured) = 0.671 mW/g



0 dB = 0.671mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 24

DUT: GT-S6812 left; Type: bar; Serial: FK-034-C

Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ 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(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body_left side 661 GPRS 4tx/Area Scan (41x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.215 mW/g

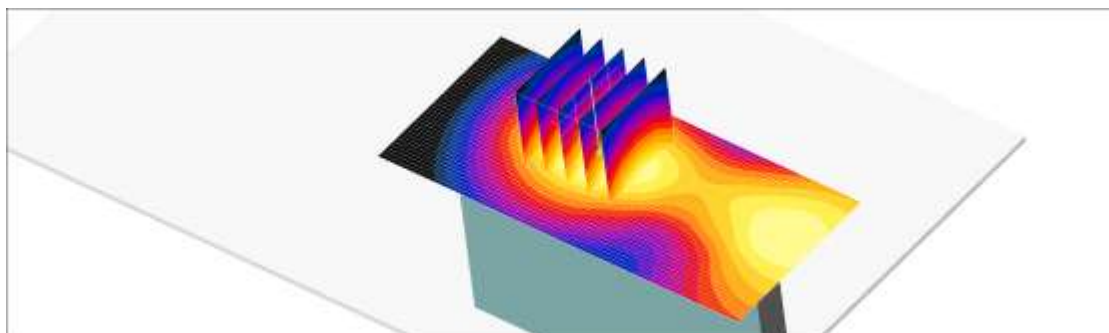
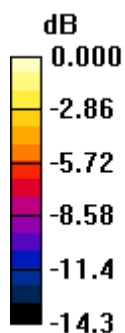
Body_left side 661 GPRS 4tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 4.09 V/m; Power Drift = -0.098 dB

Peak SAR (extrapolated) = 0.279 W/kg

SAR(1 g) = 0.191 mW/g; SAR(10 g) = 0.117 mW/g

Maximum value of SAR (measured) = 0.210 mW/g



0 dB = 0.210mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 25

DUT: GT-S6812 left; Type: bar; Serial: FK-034-C

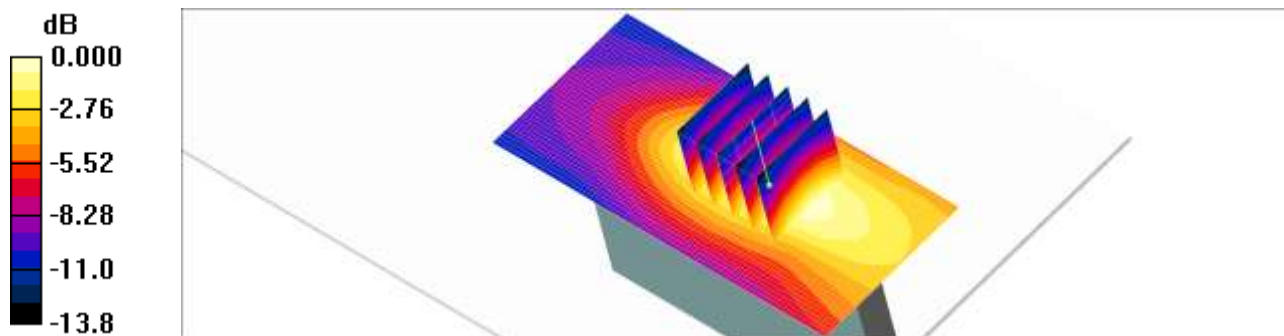
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body_right side 661 GPRS 4tx/Area Scan (41x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.130 mW/g

Body_right side 661 GPRS 4tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.93 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 0.172 W/kg
SAR(1 g) = 0.118 mW/g; SAR(10 g) = 0.074 mW/g
Maximum value of SAR (measured) = 0.129 mW/g



0 dB = 0.129mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 26

DUT: GT-S6812 bottom; Type: bar; Serial: FK-034-C

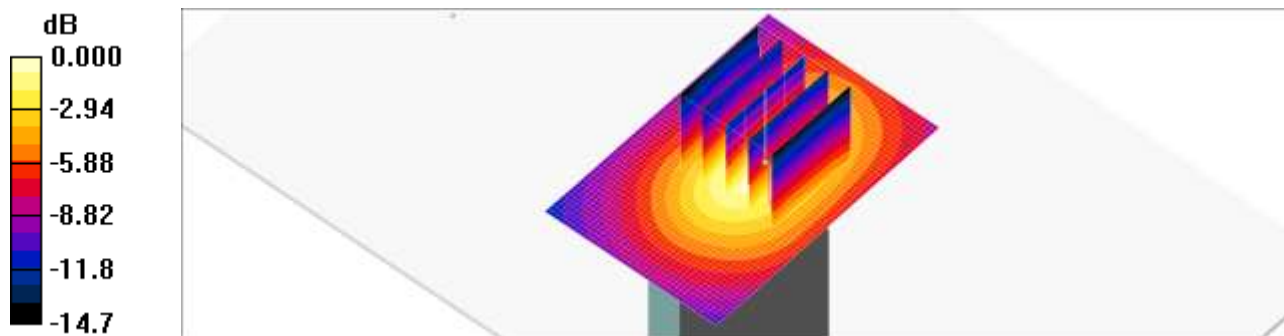
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.53$ mho/m; $\epsilon_r = 52.3$; $\rho = 1000$ kg/m³
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.55, 4.55, 4.55); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body_bottom 661 GPRS 4tx/Area Scan (61x41x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.477 mW/g

Body_bottom 661 GPRS 4tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.4 V/m; Power Drift = -0.037 dB
Peak SAR (extrapolated) = 0.661 W/kg
SAR(1 g) = 0.434 mW/g; SAR(10 g) = 0.253 mW/g
Maximum value of SAR (measured) = 0.486 mW/g



0 dB = 0.486mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 27

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.91$ mho/m; $\epsilon_r = 52.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body Rear ch1 1mbps/Area Scan (71x111x1): Measurement grid: dx=12mm, dy=12mm

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

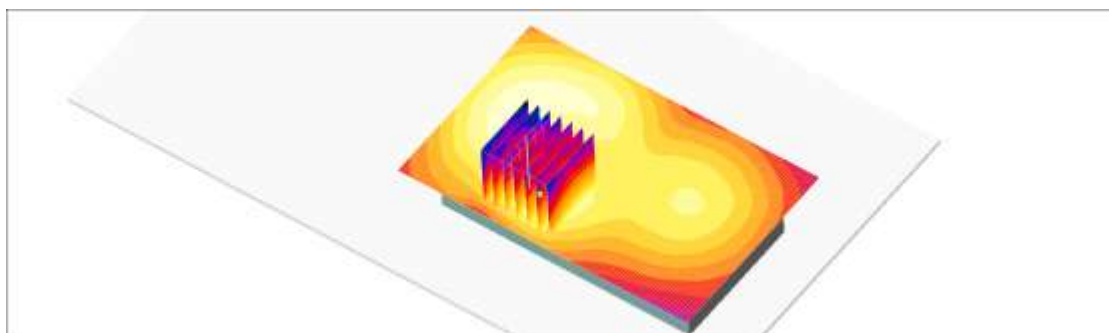
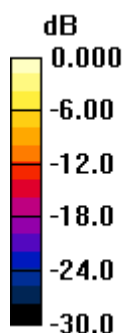
Body Rear ch1 1mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.70 V/m; Power Drift = -0.169 dB

Peak SAR (extrapolated) = 0.352 W/kg

SAR(1 g) = 0.130 mW/g; SAR(10 g) = 0.058 mW/g

Maximum value of SAR (measured) = 0.140 mW/g



0 dB = 0.140mW/g

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 28

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.91$ mho/m; $\epsilon_r = 52.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body front ch1 1Mbps/Area Scan (71x111x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.086 mW/g

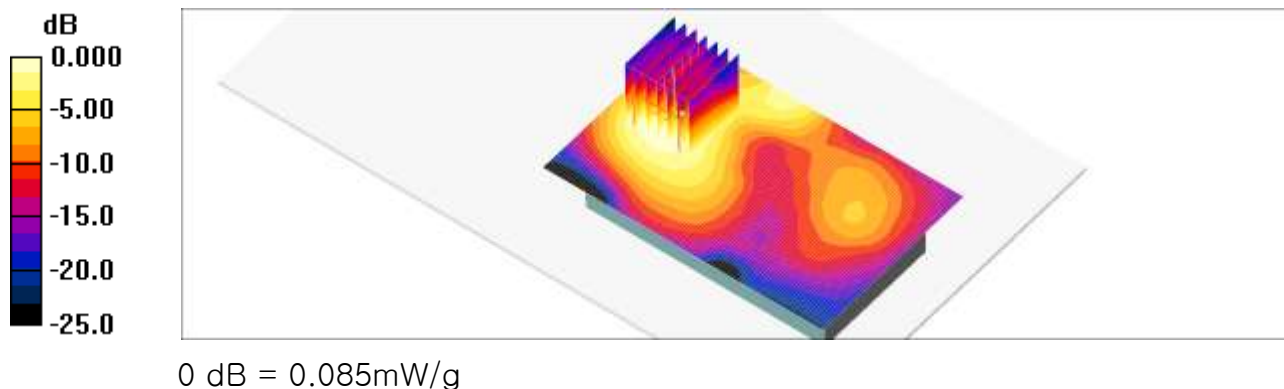
Body front ch1 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.47 V/m; Power Drift = -0.016 dB

Peak SAR (extrapolated) = 0.172 W/kg

SAR(1 g) = 0.080 mW/g; SAR(10 g) = 0.043 mW/g

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



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 29

DUT: GT-S6812 left; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.91$ mho/m; $\epsilon_r = 52.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body_right side 1ch 1Mbps/Area Scan (51x111x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.136 mW/g

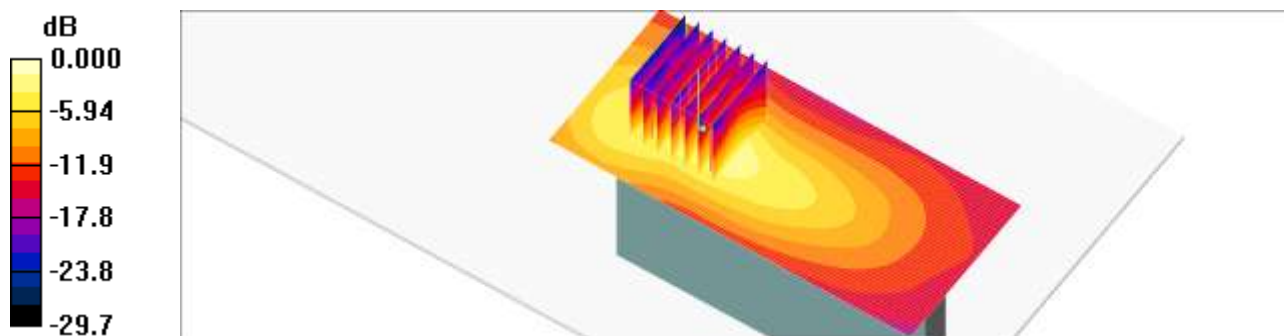
Body_right side 1ch 1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.99 V/m; Power Drift = 0.183 dB

Peak SAR (extrapolated) = 0.343 W/kg

SAR(1 g) = 0.126 mW/g; SAR(10 g) = 0.054 mW/g

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



0 dB = 0.138mW/g

Test Laboratory: HCT CO., LTD

EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only

Liquid Temperature: 20.9 °C

Ambient Temperature: 21.1 °C

Test Date: Feb. 19 2013

Plot No.: 30

DUT: GT-S6812 bottom; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.91$ mho/m; $\epsilon_r = 52.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

Body_top ch1/Area Scan (71x51x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.061 mW/g

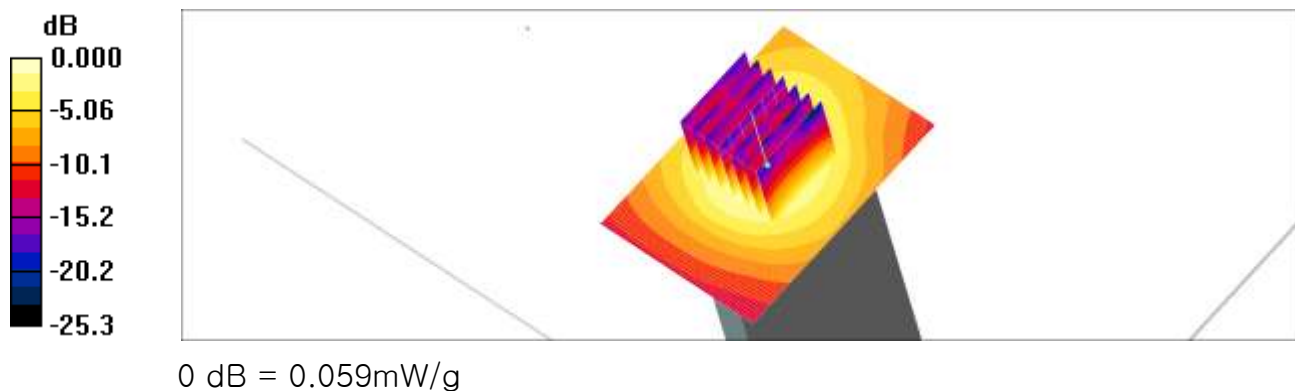
Body_top ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.63 V/m; Power Drift = -0.138 dB

Peak SAR (extrapolated) = 0.136 W/kg

SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.029 mW/g

Maximum value of SAR (measured) = 0.059 mW/g



Test Laboratory: HCT CO., LTD

Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013
Plot No.: 31

DUT: GT-S6812; Type: bar; Serial: FK-034-C

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 80; Postprocessing SW: SEMCAD, V1.8 Build 184

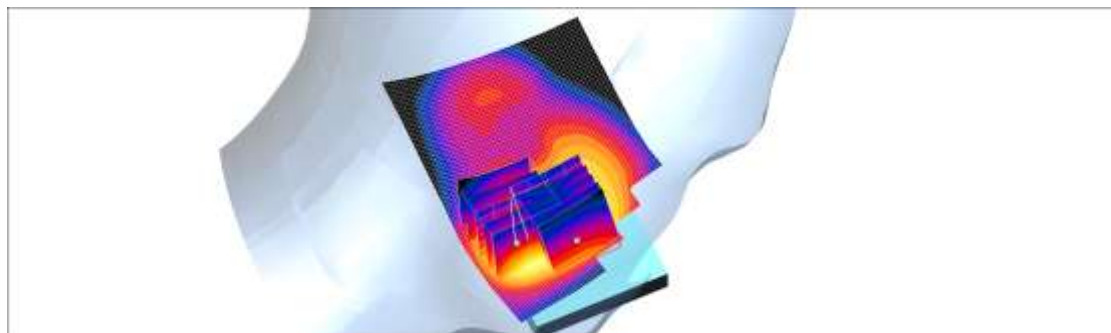
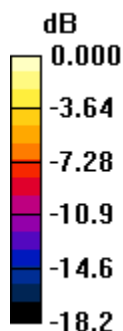
DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(5.26, 5.26, 5.26); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: 800/900 Phantom; Type: SAM

Left Touch 661/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.748 mW/g

Left Touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.0 V/m; Power Drift = -0.124 dB
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.787 mW/g; SAR(10 g) = 0.420 mW/g
Maximum value of SAR (measured) = 0.851 mW/g

Left Touch 661/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.0 V/m; Power Drift = -0.124 dB
Peak SAR (extrapolated) = 1.28 W/kg
SAR(1 g) = 0.497 mW/g; SAR(10 g) = 0.284 mW/g
Maximum value of SAR (measured) = 0.842 mW/g



0 dB = 0.842mW/g

Test Laboratory: HCT CO., LTD
 EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
 Liquid Temperature: 20.8 °C
 Ambient Temperature: 21.0 °C
 Test Date: Feb. 18 2013

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
 Medium parameters used (interpolated): $f = 836.6 \text{ MHz}$; $\sigma = 0.921 \text{ mho/m}$; $\epsilon_r = 40.4$; $\rho = 1000 \text{ kg/m}^3$
 Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(6.36, 6.36, 6.36); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: 835/900 Phantom ; Type: SAM

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

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

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

Reference Value = 4.76 V/m; Power Drift = 0.156 dB

Peak SAR (extrapolated) = 0.643 W/kg

SAR(1 g) = 0.475 mW/g; SAR(10 g) = 0.330 mW/g

Maximum value of SAR (measured) = 0.499 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.8 °C
Ambient Temperature: 21.0 °C
Test Date: Feb. 18 2013

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: GSM 850; Frequency: 824.2 MHz; Duty Cycle: 1:4.15

Medium parameters used: $f = 825$ MHz; $\sigma = 0.978$ mho/m; $\epsilon_r = 57$; $\rho = 1000$ 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(6.24, 6.24, 6.24); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C_20120905; Type: QD 000 P51 CA

Body Rear 128 GPRS 2tx/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.823 mW/g

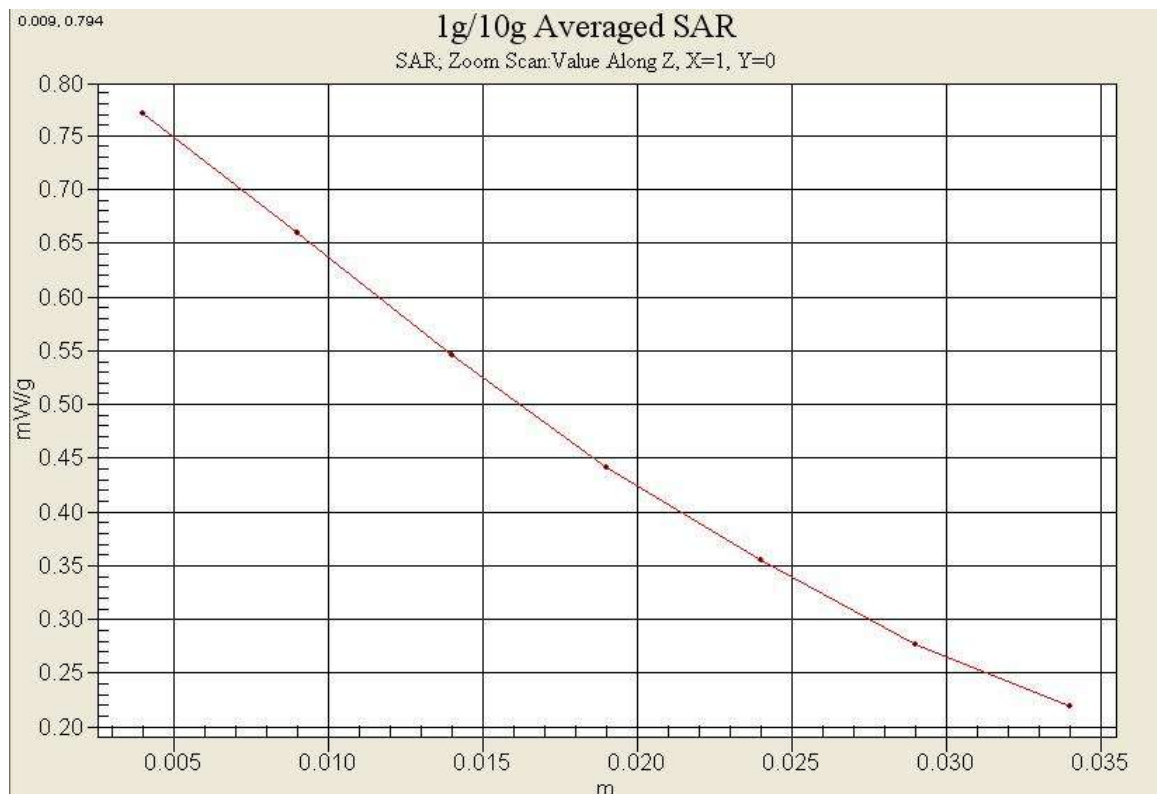
Body Rear 128 GPRS 2tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.54 V/m; Power Drift = -0.138 dB

Peak SAR (extrapolated) = 1.02 W/kg

SAR(1 g) = 0.746 mW/g; SAR(10 g) = 0.547 mW/g

Maximum value of SAR (measured) = 0.771 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz
and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013

DUT: GT-S6812; Type: bar; Serial: FK-034-C

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 Sn614; Calibrated: 2012-09-20
- Phantom: SAM 1800/1900 MHz; Type: SAM

Left Touch 661/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.928 mW/g

Left Touch 661/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.88 V/m; Power Drift = -0.184 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.860 mW/g; SAR(10 g) = 0.431 mW/g
Maximum value of SAR (measured) = 0.994 mW/g

Left Touch 661/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.88 V/m; Power Drift = -0.184 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.603 mW/g; SAR(10 g) = 0.330 mW/g
Maximum value of SAR (measured) = 0.676 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013

DUT: GT-S6812; Type: bar; Serial: FK-034-C

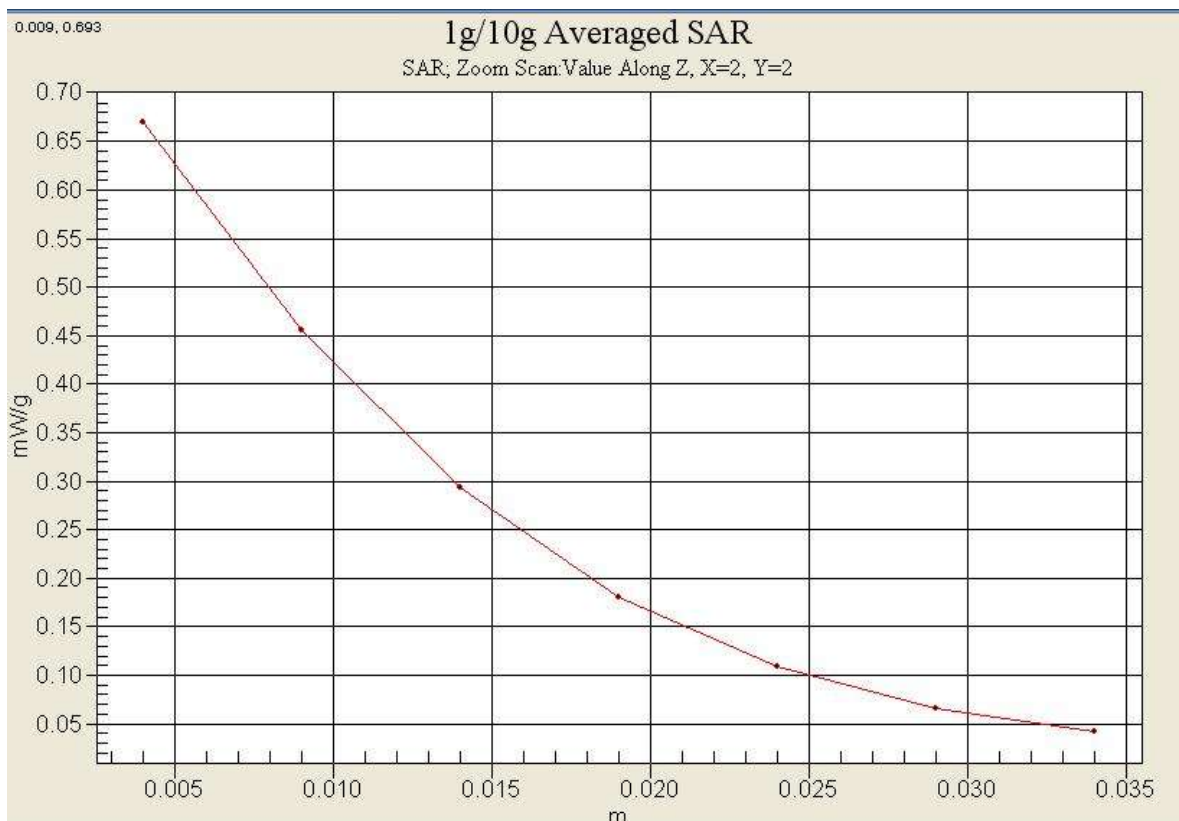
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:2.075
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.53 \text{ mho/m}$; $\epsilon_r = 52.3$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Center Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 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 Sn614; Calibrated: 2012-09-20
- 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) = 0.696 mW/g

Body front 661 4tx/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.09 V/m; Power Drift = -0.075 dB
Peak SAR (extrapolated) = 0.879 W/kg
SAR(1 g) = 0.614 mW/g; SAR(10 g) = 0.375 mW/g
Maximum value of SAR (measured) = 0.671 mW/g



Test Laboratory: HCT CO., LTD
EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
Liquid Temperature: 20.9 °C
Ambient Temperature: 21.1 °C
Test Date: Feb. 19 2013

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 1.8$ mho/m; $\epsilon_r = 38.2$; $\rho = 1000$ kg/m³
Phantom section: Left Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 - SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: 1800/1900 Phantom; Type: SAM

Left Touch 1CH 1M/Area Scan (71x111x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 0.427 mW/g

Left Touch 1CH 1M/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.99 V/m; Power Drift = -0.073 dB

Peak SAR (extrapolated) = 0.894 W/kg

SAR(1 g) = 0.359 mW/g; SAR(10 g) = 0.164 mW/g

Maximum value of SAR (measured) = 0.409 mW/g



Test Laboratory: HCT CO., LTD
 EUT Type: 850/1900 GSM/GPRS Phone with Bluetooth v4.0(LE), WLAN 2.4GHz and Hotspot and EDGE Rx Only
 Liquid Temperature: 20.9 °C
 Ambient Temperature: 21.1 °C
 Test Date: Feb. 19 2013

DUT: GT-S6812; Type: bar; Serial: FK-034-C

Communication System: 2450MHz FCC; Frequency: 2412 MHz; Duty Cycle: 1:1
 Medium parameters used (interpolated): $f = 2412 \text{ MHz}$; $\sigma = 1.91 \text{ mho/m}$; $\epsilon_r = 52.9$; $\rho = 1000 \text{ kg/m}^3$
 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Body Rear ch1 1mbps/Area Scan (71x111x1): Measurement grid: dx=12mm, dy=12mm

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

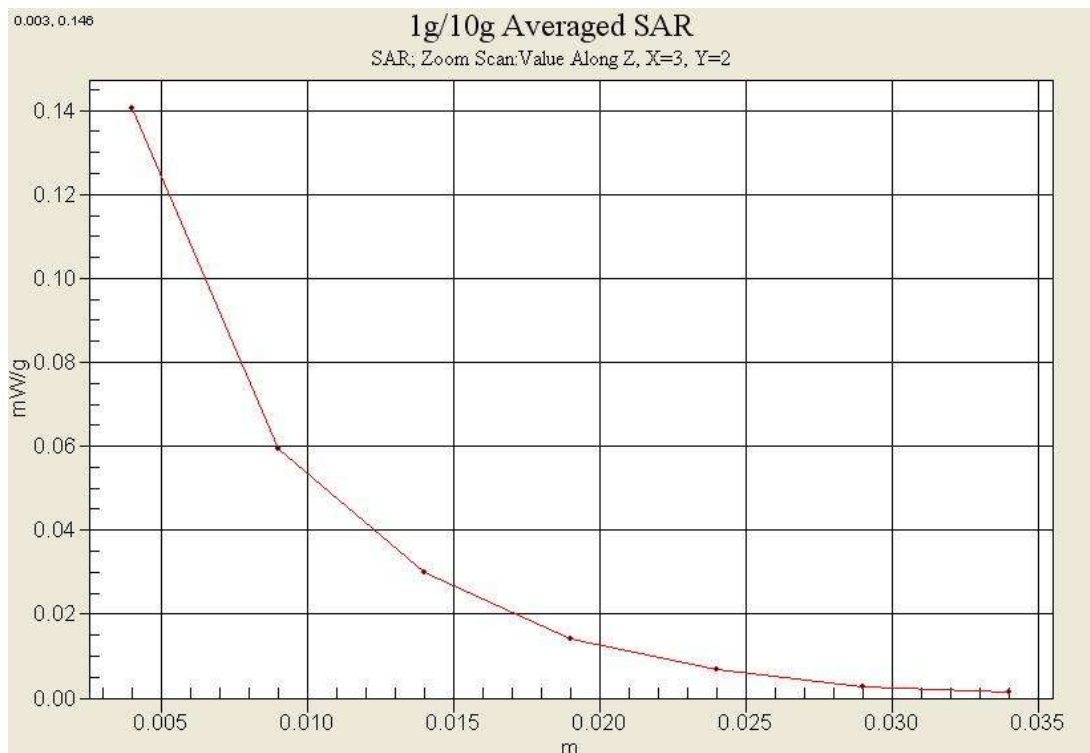
Body Rear ch1 1mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.70 V/m; Power Drift = -0.169 dB

Peak SAR (extrapolated) = 0.352 W/kg

SAR(1 g) = 0.130 mW/g; SAR(10 g) = 0.058 mW/g

Maximum value of SAR (measured) = 0.140 mW/g



Attachment 2. – Dipole Verification Plots

■ Verification Data (835 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.8 °C
Test Date: Feb. 18, 2013

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835$ MHz; $\sigma = 0.919$ mho/m; $\epsilon_r = 40.4$; $\rho = 1000$ kg/m³

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

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(6.36, 6.36, 6.36); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: 1800/1900 Phantom; Type: SAM

Validation 835 MHz/Area Scan (61x81x1): Measurement grid: dx=15mm, dy=15mm

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

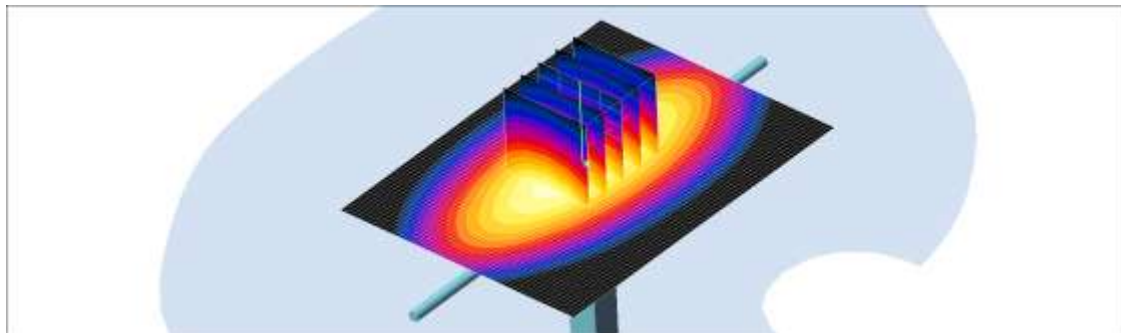
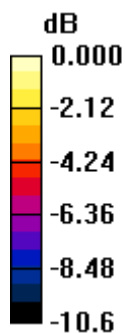
Validation 835 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 35.1 V/m; Power Drift = -0.012 dB

Peak SAR (extrapolated) = 1.40 W/kg

SAR(1 g) = 0.967 mW/g; SAR(10 g) = 0.635 mW/g

Maximum value of SAR (measured) = 1.05 mW/g



0 dB = 1.05mW/g

■ Verification Data (835 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.8 °C
Test Date: Feb. 18, 2013

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

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835$ MHz; $\sigma = 0.985$ mho/m; $\epsilon_r = 56.9$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Validation 835 MHz/Area Scan (111x61x1): Measurement grid: dx=15mm, dy=15mm

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

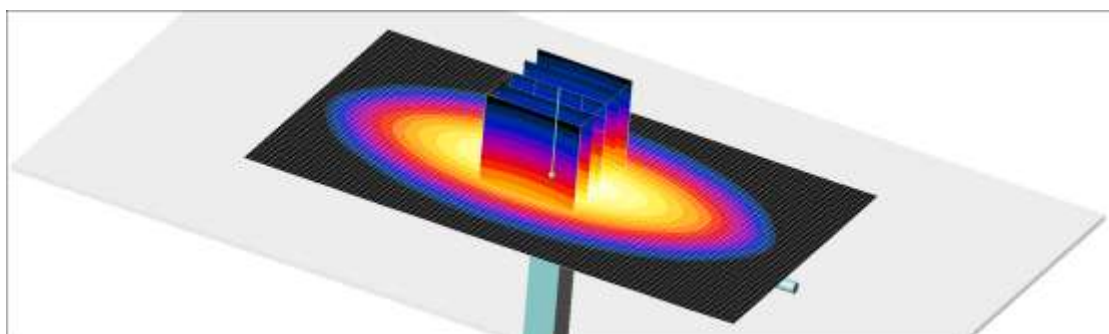
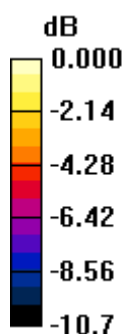
Validation 835 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 34.3 V/m; Power Drift = -0.002 dB

Peak SAR (extrapolated) = 1.42 W/kg

SAR(1 g) = 0.981 mW/g; SAR(10 g) = 0.638 mW/g

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



0 dB = 1.07mW/g

■ Verification Data (1 900 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.9 °C
Test Date: Feb. 19, 2013

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 – SN:xxx

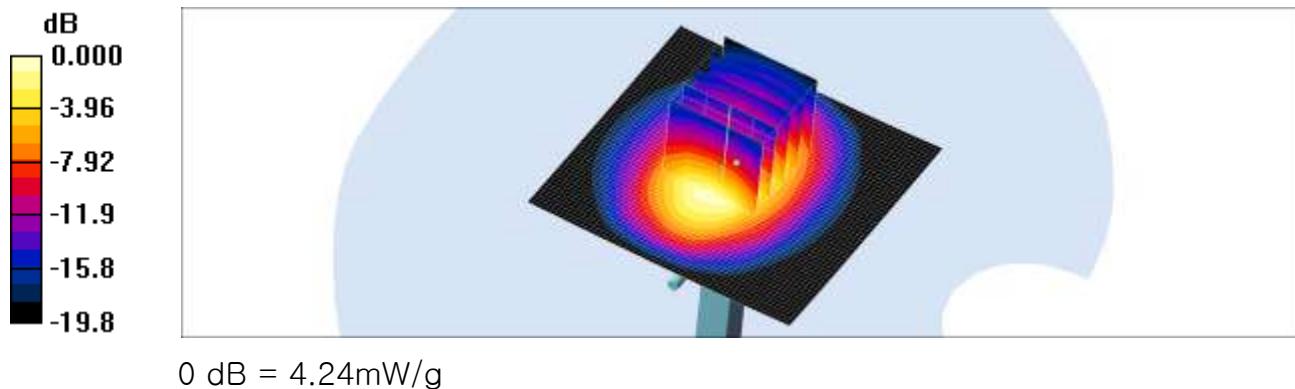
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1900 \text{ MHz}$; $\sigma = 1.37 \text{ mho/m}$; $\epsilon_r = 40.9$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(5.12, 5.12, 5.12); Calibrated: 2009-03-17
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: SAM 1800/1900 MHz; Type: SAM

Dipole 1900MHz Validation/Area Scan (61x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 4.48 mW/g

Dipole 1900MHz Validation/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 58.2 V/m; Power Drift = 0.018 dB
Peak SAR (extrapolated) = 6.62 W/kg
SAR(1 g) = 3.81 mW/g; SAR(10 g) = 1.97 mW/g
Maximum value of SAR (measured) = 4.24 mW/g



■ Verification Data (1 900 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.9 °C
Test Date: Feb. 19, 2013

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 – SN:xxx

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 1900$ MHz; $\sigma = 1.55$ mho/m; $\epsilon_r = 52.2$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- 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) = 4.81 mW/g

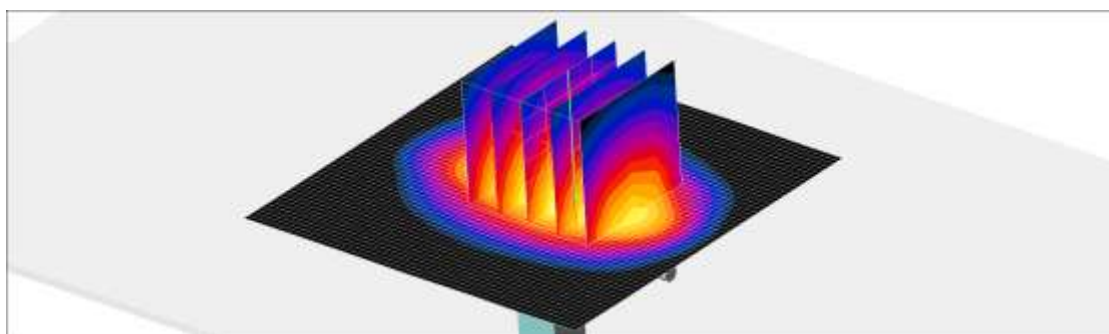
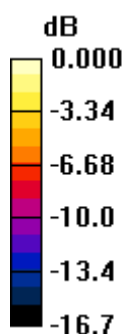
Validation1900 MHz/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.9 V/m; Power Drift = -0.033 dB

Peak SAR (extrapolated) = 6.18 W/kg

SAR(1 g) = 3.88 mW/g; SAR(10 g) = 2.12 mW/g

Maximum value of SAR (measured) = 4.35 mW/g



0 dB = 4.35mW/g

■ Verification Data (2 450 MHz Head)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.9 °C
Test Date: Feb. 19, 2013

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

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 1.83$ mho/m; $\epsilon_r = 38.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

DASY4 Configuration:

- Probe: ET3DV6 – SN1609; ConvF(4.52, 4.52, 4.52); Calibrated: 2012-03-19
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn614; Calibrated: 2012-09-20
- Phantom: 835/900 Phantom ; Type: SAM

Validation 2450MHz/Area Scan (81x81x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 6.05 mW/g

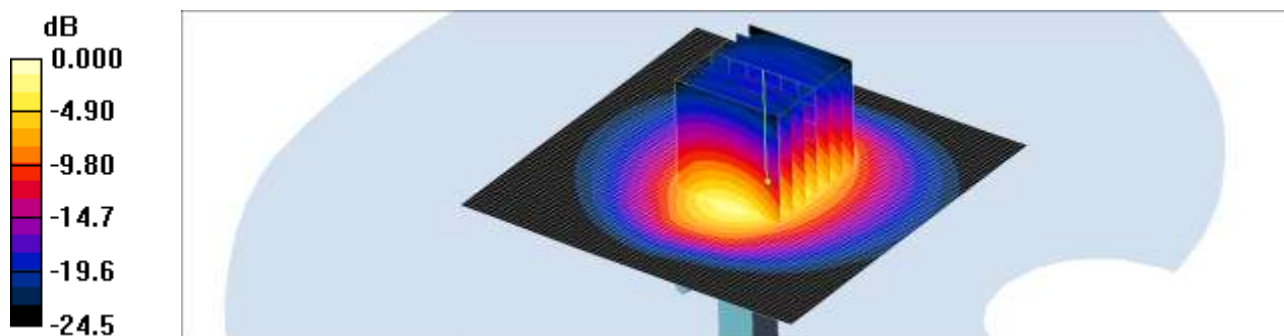
Validation 2450MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.0 V/m; Power Drift = -0.070 dB

Peak SAR (extrapolated) = 12.5 W/kg

SAR(1 g) = 5.37 mW/g; SAR(10 g) = 2.4 mW/g

Maximum value of SAR (measured) = 6.00 mW/g



0 dB = 6.00mW/g

■ Verification Data (2 450 MHz Body)

Test Laboratory: HCT CO., LTD
Input Power 100 mW (20 dBm)
Liquid Temp: 20.9 °C
Test Date: Feb. 19, 2013

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

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.96$ mho/m; $\epsilon_r = 52.7$; $\rho = 1000$ 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 Sn614; Calibrated: 2012-09-20
- Phantom: Triple Flat Phantom 5.1C; Type: QD 000 P51 CA

Validation 2450MHz/Area Scan (81x81x1): Measurement grid: dx=12mm, dy=12mm

Maximum value of SAR (interpolated) = 5.90 mW/g

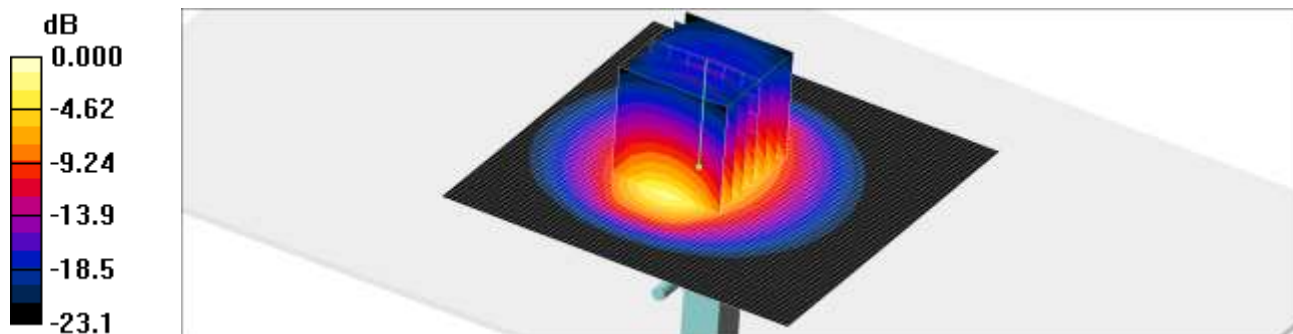
Validation 2450MHz/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 48.5 V/m; Power Drift = 0.046 dB

Peak SAR (extrapolated) = 13.9 W/kg

SAR(1 g) = 5.29 mW/g; SAR(10 g) = 2.35 mW/g

Maximum value of SAR (measured) = 5.74 mW/g



0 dB = 5.74mW/g

■ Dielectric Parameter (835 MHz Head)

Title GT-S6812
SubTitle 835MHz
Test Date Feb. 18, 2013

Frequency	e'	e''
800000000.0000	40.7437	19.9557
805000000.0000	40.6715	19.9027
810000000.0000	40.6387	19.8723
815000000.0000	40.5871	19.8902
820000000.0000	40.5531	19.8500
825000000.0000	40.5092	19.8500
830000000.0000	40.4802	19.8038
835000000.0000	40.4192	19.7930
840000000.0000	40.3978	19.7508
845000000.0000	40.3477	19.7168
850000000.0000	40.2749	19.7103
855000000.0000	40.2293	19.6862
860000000.0000	40.2008	19.6474
865000000.0000	40.1029	19.5773
870000000.0000	40.0796	19.5890
875000000.0000	40.0190	19.5554
880000000.0000	39.9314	19.5299
885000000.0000	39.8627	19.5147
890000000.0000	39.7878	19.4916
895000000.0000	39.7552	19.4568
900000000.0000	39.6873	19.4523

■ Dielectric Parameter (835 MHz Body)

Title GT-S6812
SubTitle 835MHz
Test Date Feb. 18, 2013

Frequency	e'	e''
800000000.0000	57.2405	21.5967
805000000.0000	57.2068	21.5588
810000000.0000	57.1465	21.5084
815000000.0000	57.1175	21.4182
820000000.0000	57.0504	21.3603
825000000.0000	56.9864	21.3075
830000000.0000	56.9534	21.2601
835000000.0000	56.8980	21.2107
840000000.0000	56.8560	21.1787
845000000.0000	56.8130	21.1419
850000000.0000	56.7986	21.1052
855000000.0000	56.7249	21.1249
860000000.0000	56.6883	21.1244
865000000.0000	56.6687	21.1226
870000000.0000	56.6163	21.1177
875000000.0000	56.6022	21.1513
880000000.0000	56.5778	21.1565
885000000.0000	56.5412	21.1557
890000000.0000	56.5185	21.1600
895000000.0000	56.5072	21.1381
900000000.0000	56.4626	21.1618

■ Dielectric Parameter (1 900 MHz Head)

Title GT-S6812
SubTitle 1 900MHz
Test Date Feb. 19, 2013

Frequency	e'	e''
1800000000.0000	41.2223	12.6490
1810000000.0000	41.1717	12.6677
1820000000.0000	41.1367	12.6920
1830000000.0000	41.0810	12.7228
1840000000.0000	41.0411	12.7532
1850000000.0000	41.0211	12.7903
1860000000.0000	40.9763	12.8239
1870000000.0000	40.9587	12.8713
1880000000.0000	40.9163	12.8921
1890000000.0000	40.8894	12.9152
1900000000.0000	40.8521	12.9321
1910000000.0000	40.8146	12.9729
1920000000.0000	40.7695	12.9903
1930000000.0000	40.7386	13.0228
1940000000.0000	40.6973	13.0464
1950000000.0000	40.6798	13.0748
1960000000.0000	40.6355	13.1201
1970000000.0000	40.5831	13.1342
1980000000.0000	40.5562	13.1626
1990000000.0000	40.5191	13.1910
2000000000.0000	40.4747	13.2191

■ Dielectric Parameter (1 900 MHz Body)

Title GT-S6812
SubTitle 1 900MHz
Test Date Feb. 19, 2013

Frequency	e'	e''
1850000000.0000	52.3275	14.6175
1855000000.0000	52.3234	14.6244
1860000000.0000	52.2994	14.6281
1865000000.0000	52.2967	14.6573
1870000000.0000	52.2697	14.6580
1875000000.0000	52.2718	14.6730
1880000000.0000	52.2557	14.6748
1885000000.0000	52.2536	14.6804
1890000000.0000	52.2431	14.6907
1895000000.0000	52.2221	14.7044
1900000000.0000	52.2042	14.7060
1905000000.0000	52.2003	14.7195
1910000000.0000	52.1698	14.7282
1915000000.0000	52.1610	14.7456
1920000000.0000	52.1451	14.7416
1925000000.0000	52.1339	14.7592
1930000000.0000	52.1036	14.7853
1935000000.0000	52.0913	14.7851
1940000000.0000	52.0855	14.7997
1945000000.0000	52.0602	14.8116
1950000000.0000	52.0663	14.8170

■ Dielectric Parameter (2 450 MHz Head)

Title GT-S6812
SubTitle 2450MHz
Test Date Feb. 19, 2013

Frequency	e'	e''
2400000000.0000	38.2887	13.3541
2405000000.0000	38.2643	13.3675
2410000000.0000	38.2435	13.3780
2415000000.0000	38.2327	13.3804
2420000000.0000	38.2038	13.3839
2425000000.0000	38.1911	13.3935
2430000000.0000	38.1609	13.3983
2435000000.0000	38.1430	13.4178
2440000000.0000	38.1112	13.4268
2445000000.0000	38.0882	13.4396
2450000000.0000	38.0628	13.4490
2455000000.0000	38.0461	13.4623
2460000000.0000	38.0166	13.4862
2465000000.0000	38.0057	13.5058
2470000000.0000	37.9890	13.5248
2475000000.0000	37.9746	13.5528
2480000000.0000	37.9485	13.5796
2485000000.0000	37.9371	13.6107
2490000000.0000	37.9187	13.6231
2495000000.0000	37.9109	13.6513
2500000000.0000	37.8904	13.6574

■ Dielectric Parameter (2 450 MHz Body)

Title GT-S6812
SubTitle 2450MHz
Test Date Feb. 19, 2013

Frequency	e'	e''
2400000000.0000	52.9409	14.1695
2405000000.0000	52.9217	14.1835
2410000000.0000	52.8991	14.2096
2415000000.0000	52.8987	14.2227
2420000000.0000	52.8693	14.2427
2425000000.0000	52.8689	14.2522
2430000000.0000	52.8410	14.2669
2435000000.0000	52.8113	14.2917
2440000000.0000	52.7904	14.3053
2445000000.0000	52.7753	14.3347
2450000000.0000	52.7464	14.3592
2455000000.0000	52.7272	14.3789
2460000000.0000	52.7045	14.3957
2465000000.0000	52.6829	14.4190
2470000000.0000	52.6793	14.4496
2475000000.0000	52.6480	14.4708
2480000000.0000	52.6352	14.5025
2485000000.0000	52.6184	14.5280
2490000000.0000	52.6023	14.5567
2495000000.0000	52.5990	14.5917
2500000000.0000	52.5802	14.6090

Attachment 3. – Probe Calibration Data

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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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	G641293874	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 6648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kasirali	Laboratory Technician	
Approved by:	Katja Pokorsic	Technical Manager	
Issued: March 19, 2012			

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

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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1526-2003, "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 $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}:** DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR:** PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}:** A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters:** Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

ET3DV6 – SN: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 ($\mu V/(V/m)^2$) ^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 ^C (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.

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

ET3DV6- SN:1609

March 19, 2012

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^d	Conductivity (S/m) ^e	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.

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

ET3DV6-SN:1609

March 19, 2012

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

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^e	Conductivity (S/m) ^e	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
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 %

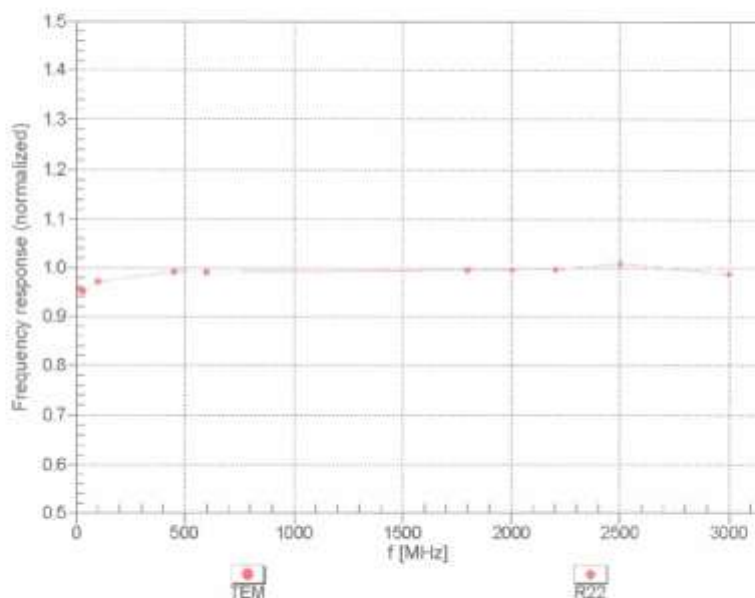
^c Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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

ET3DV6-SN:1609

March 19, 2012

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

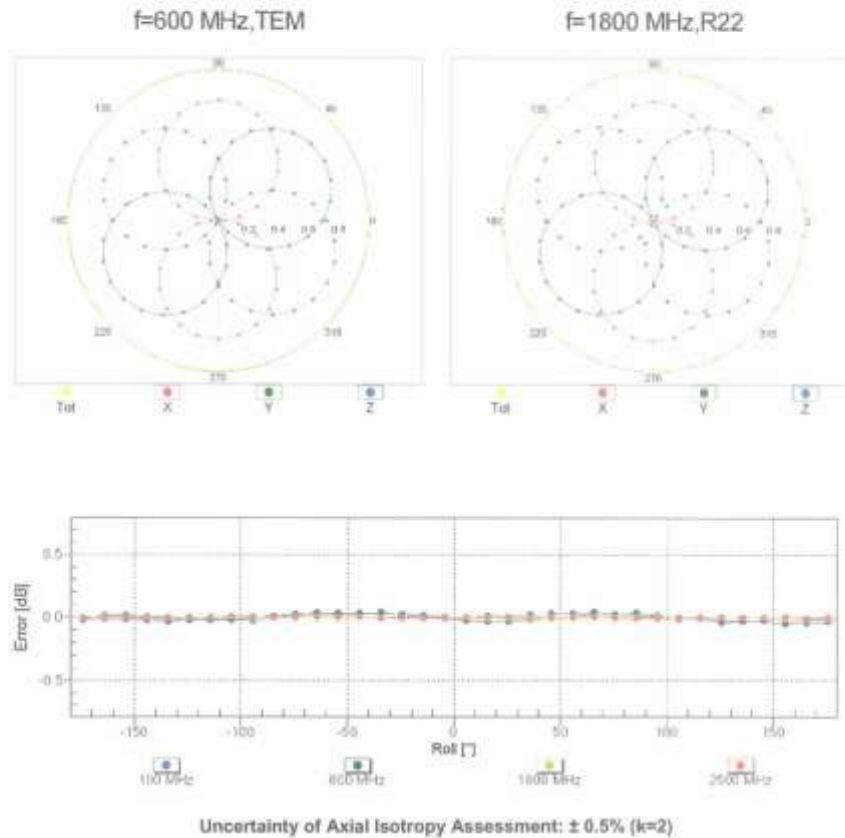


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

ET3DV5-SN:1809

March 19, 2012

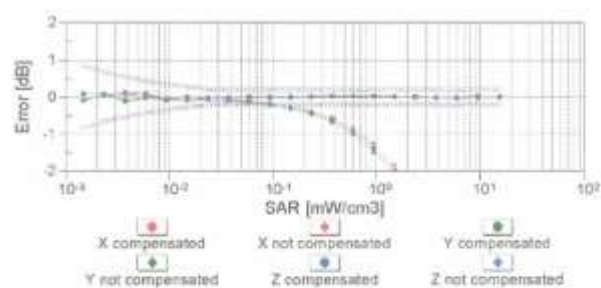
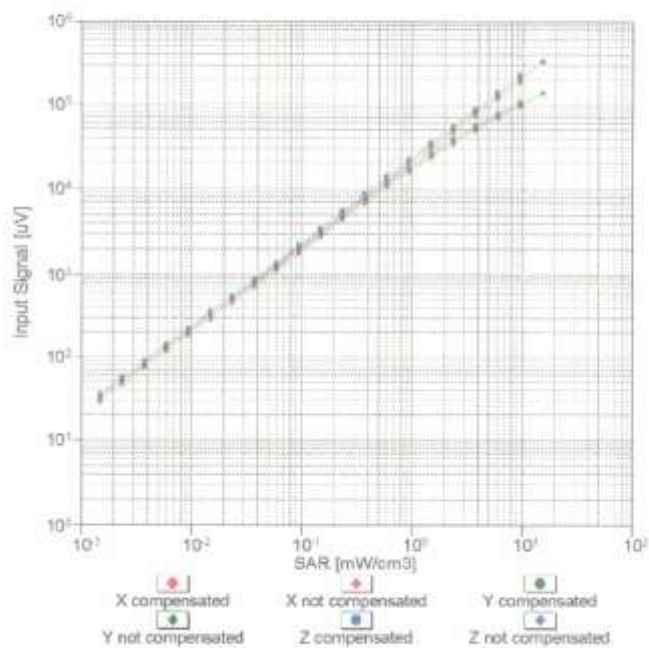
Receiving Pattern (ϕ), $\theta = 0^\circ$



ET3DV6-SN:1609

March 19, 2012

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

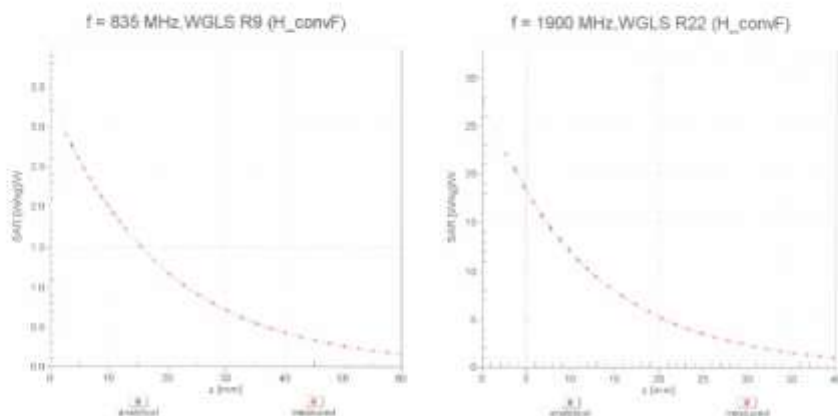


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

ET30VB-SN:1609

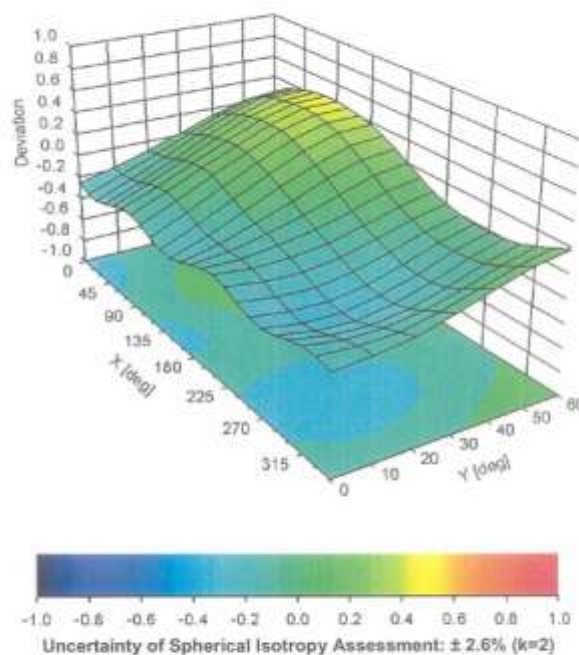
March 19, 2012

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ , θ), $f = 900$ MHz



ET3DV6- SN:1609

March 19, 2012

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

Other Probe Parameters

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

Attachment 4. – Dipole Calibration Data

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Accreditation No.: SCS 108

Client **HCT (Dymstec)**

Certificate No: D835V2-441_May12

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 441**

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

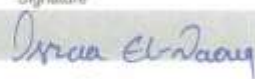
Calibration date: **May 16, 2012**

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 EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5056 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	in house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	in house check: Oct-13
Network Analyzer HP 8753E	US37390586 S4206	18-Oct-01 (in house check Oct-11)	in house check: Oct-12

	Name	Function	Signature
Calibrated by:	Isaac El-Naouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 16, 2012

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Certificate No: D835V2-441_May12

Page 1 of 8

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.6 $\pm$ 6 %	0.89 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.43 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.18 mW / g $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.3 $\pm$ 6 %	1.00 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.44 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.50 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.27 mW / g $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 Ω - 5.8 j Ω
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.0 Ω - 8.1 j Ω
Return Loss	- 21.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.372 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 09, 2001

DASY5 Validation Report for Head TSL

Date: 16.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.89$ mho/m; $\epsilon_r = 40.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm 2/Zoom Scan (7x7x7)/Cube 0:

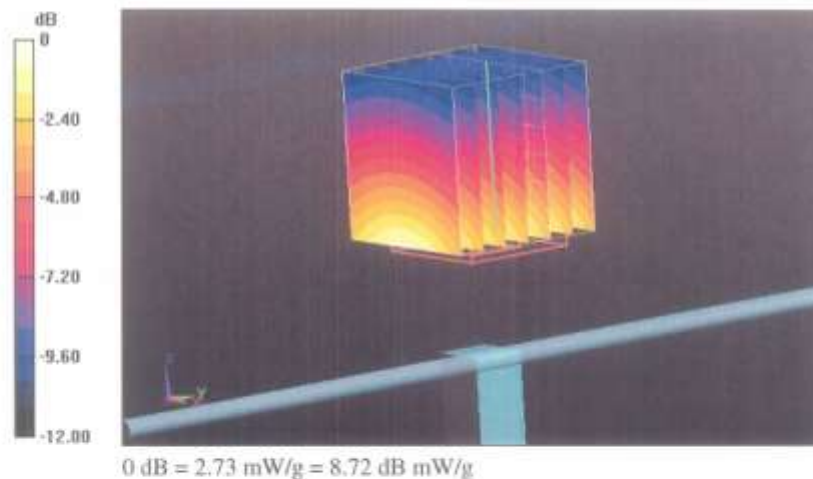
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.129 V/m; Power Drift = 0.00 dB

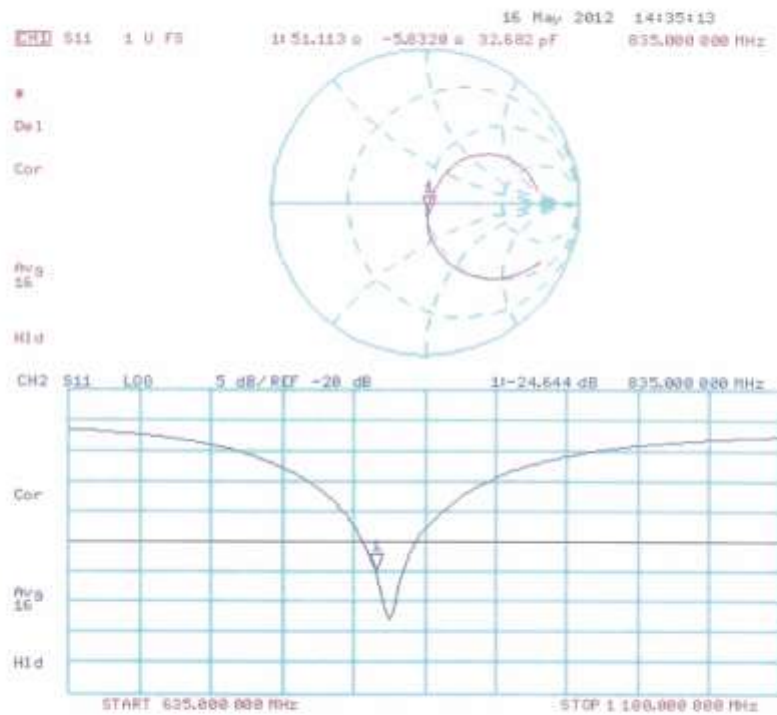
Peak SAR (extrapolated) = 3.474 mW/g

SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.54 mW/g

Maximum value of SAR (measured) = 2.73 mW/g



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.05.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1 \text{ mho/m}$; $\epsilon_r = 54.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Body Tissue/Pin=250 mW, $d=15\text{mm}$ /Zoom Scan (7x7x7)/Cube 0:

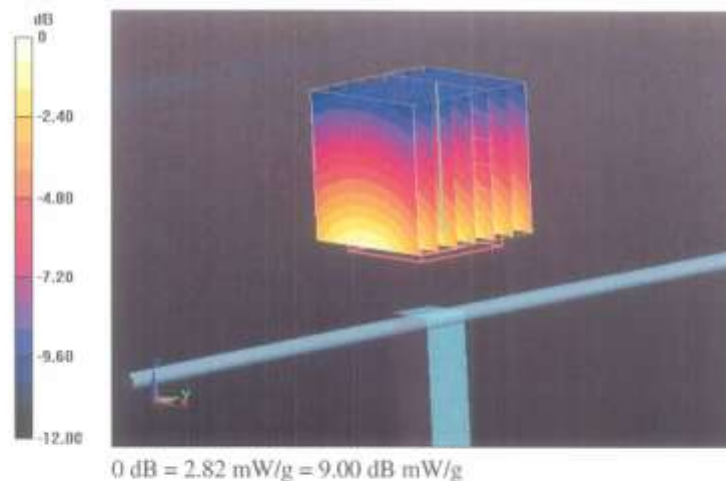
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.054 V/m; Power Drift = 0.03 dB

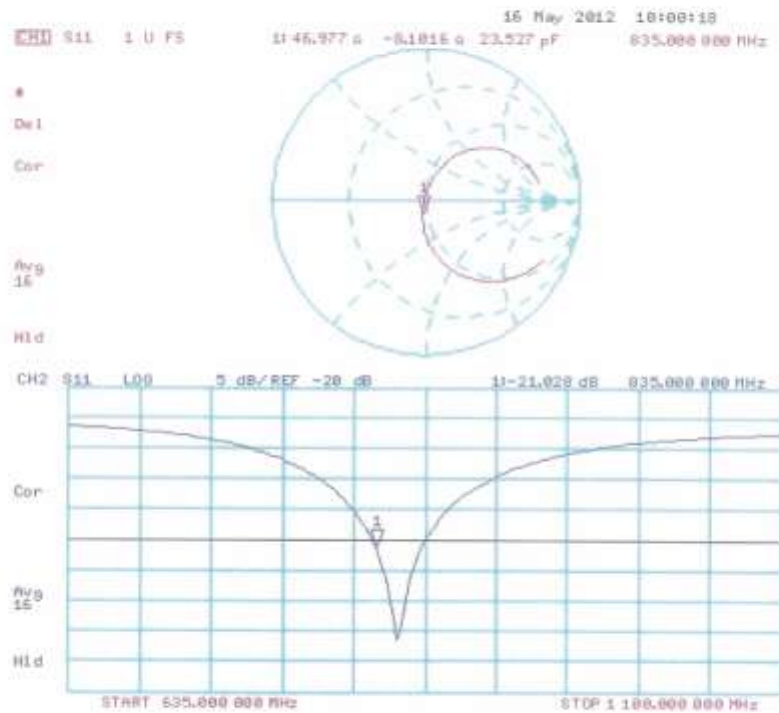
Peak SAR (extrapolated) = 3.533 mW/g

SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 2.82 mW/g



Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client **HCT (Dymstec)**

Certificate No: D1900V2-5d032_Jul12

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d032**

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

Calibration date: **July 20, 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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	QB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES30V3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

Calibrated by: **Dimitri Iliev** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

Issued: July 20, 2012

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

Certificate No: D1900V2-5d032_Jul12

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.9 $\pm$ 6 %	1.38 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.68 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	39.0 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.11 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.5 mW / g $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.6 $\pm$ 6 %	1.52 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	39.9 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.30 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.2 mW / g $\pm$ 16.5 % (k=2)

Appendix**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	50.0 Ω + 3.1 j Ω
Return Loss	- 30.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.2 Ω + 3.7 j Ω
Return Loss	- 25.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 17, 2003

DASY5 Validation Report for Head TSL

Date: 20.07.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.38$ mho/m; $\epsilon_r = 39.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

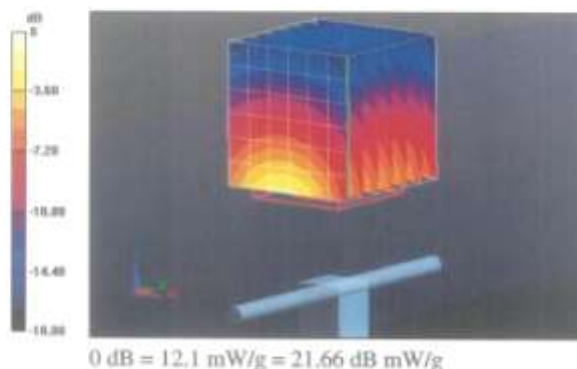
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.864 V/m; Power Drift = 0.03 dB

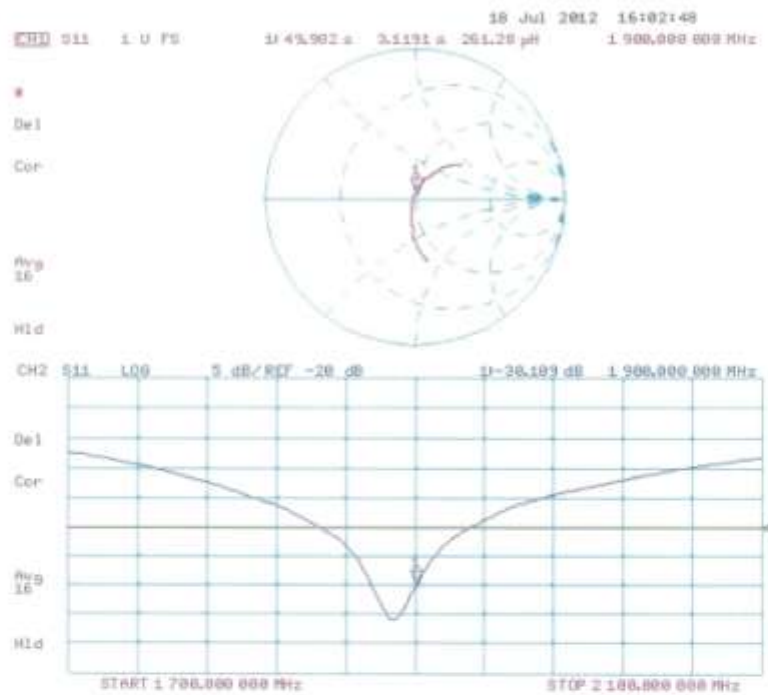
Peak SAR (extrapolated) = 17.209 mW/g

SAR(1 g) = 9.68 mW/g; SAR(10 g) = 5.11 mW/g

Maximum value of SAR (measured) = 12.1 mW/g



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.07.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.52$ mho/m; $\epsilon_r = 52.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

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

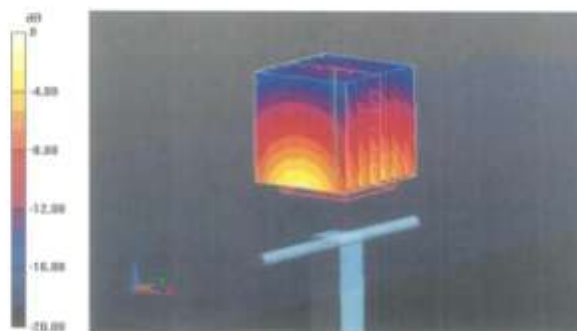
Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 95.470 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 17.332 mW/g

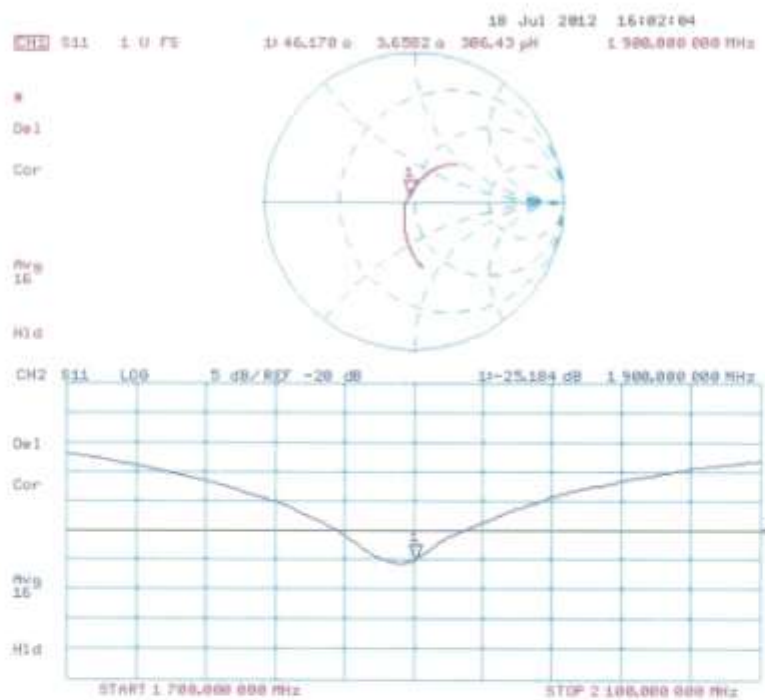
SAR(1 g) = 10 mW/g; SAR(10 g) = 5.3 mW/g

Maximum value of SAR (measured) = 12.6 mW/g



0 dB = 12.6 mW/g = 22.01 dB mW/g

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client **HCT (Dymstec)**

Certificate No: D2450V2-743_Aug12

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 743**

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

Calibration date: **August 23, 2012**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainty 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 ($22 \pm 3^\circ\text{C}$) and humidity $< 70\%$.

Calibration Equipment used (M&E critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 54206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

Calibrated by: **Isma El-Nasouj** Name: **Isma El-Nasouj** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager**

Signature
Isma El-Nasouj
Katja Pokovic

Issued: August 23, 2012

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Certificate No: D2450V2-743_Aug12

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices; Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.2 $\pm$ 6 %	1.81 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	52.7 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.18 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.7 mW / g $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.3 $\pm$ 6 %	1.99 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	51.2 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	24.2 mW / g $\pm$ 16.5 % (k=2)

Appendix**Antenna Parameters with Head TSL**

Impedance, transformed to feed point	$54.0 \Omega + 4.7 j\Omega$
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$50.9 \Omega + 8.5 j\Omega$
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.158 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 01, 2003

DASY5 Validation Report for Head TSL

Date: 23.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.81$ mho/m; $\epsilon_r = 39.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

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

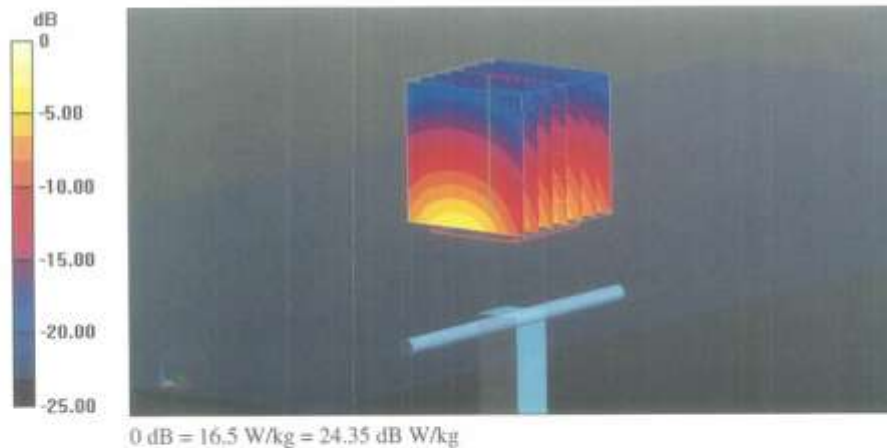
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.554 V/m; Power Drift = 0.01 dB

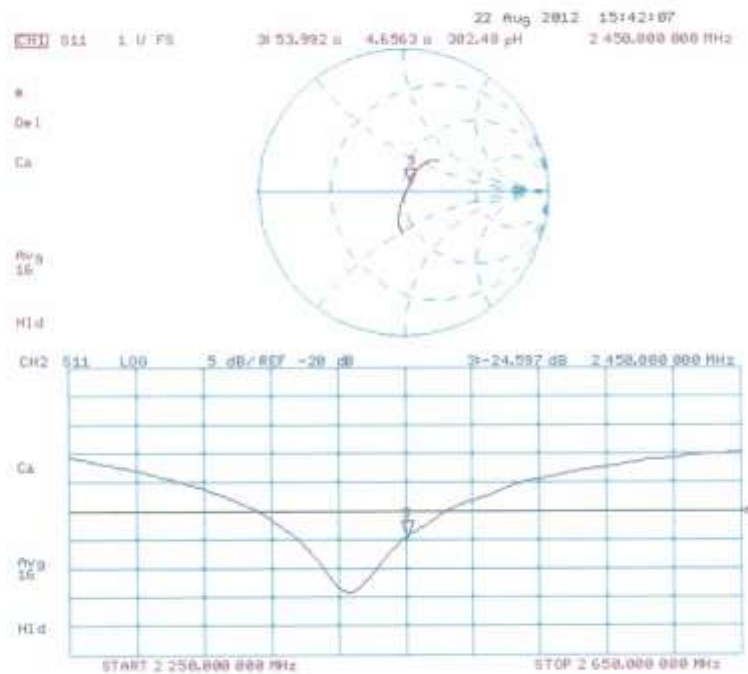
Peak SAR (extrapolated) = 26.584 mW/g

SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.18 mW/g

Maximum value of SAR (measured) = 16.5 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: C'W; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.99$ mho/m; $\epsilon_r = 51.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

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

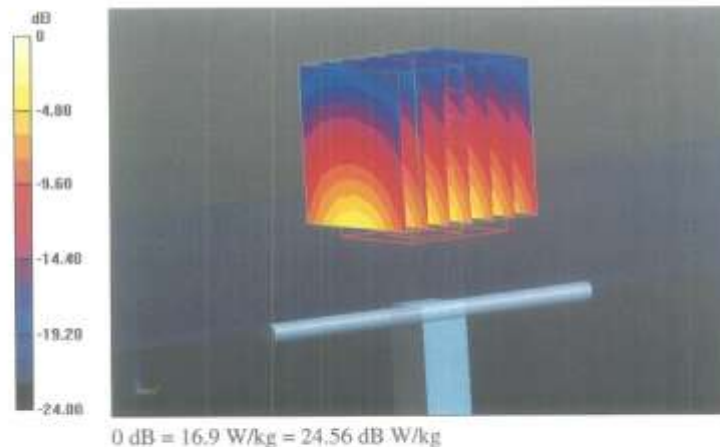
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.699 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 26.489 mW/g

SAR(1 g) = 13 mW/g; SAR(10 g) = 6.1 mW/g

Maximum value of SAR (measured) = 16.9 W/kg



Impedance Measurement Plot for Body TSL

