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Regulatory Compliance Group
IT R&D Center

416, Maetan-3dong,
Yeongtong-gu, Suwon-si,
Gyeonggi-do, Korea 443-742

TEST REPORT ON SAR

Model Tested: **GT-I9003**

FCC ID (Requested): **A3LGTI9003**

Job No: **FH-230**

Report No: **FH-230-S1**

- Abstract –

This document reports on SAR Tests carried out in accordance with FCC/OET Bulletin 65, Supplement C(July 2001).

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1. GENERAL INFORMATION

Test Dates :	Oct.19, 2010 ~ Oct.21, 2010
Manufacturer :	SAMSUNG ELECTRONICS Co., Ltd.
Address :	416 Maetan3-Dong, Suwon City, Korea
Test Standard :	§2.1093; FCC/OET Bulletin 65, Supplement C(July 2001)
FCC Classification :	Licensed Portable Transmitter Held to Ear (PCE)
Tested for :	FCC/TCB Certification

2. DESCRIPTION OF DEVICE

Test Sample :	Dual-Band GSM/GPRS/EDGE 850/1900 and Single-Band WCDMA1900 Phone with Bluetooth and WLAN
Model Number :	GT-I9003
Serial Number :	Identical prototype (S/N : # FH-230-B)
Tx Freq.Range :	824.2 ~ 848.8 MHz (GSM850) 1850.20 ~ 1909.80 MHz (GSM1900) 1852.4 ~ 1907.6 MHz (WCDMA1900) 2412 ~ 2462 MHz (WLAN)
Rx Freq.Range :	869.2 ~ 893.8 MHz (GSM850) 1930.20 ~ 1989.80 MHz (GSM1900) 1932.4 ~ 1987.6 MHz (WCDMA1900) 2412 ~ 2462 MHz (WLAN)
Antenna Manufacturer :	Galtronics Model No.: GT-I9003
GPRS	Class 12
Antenna Dimensions :	46.83 * 13.53 * 8.32 (mm)
Separation distance between Main and Bluetooth antenna :	81 (mm)
GSM Device Class:	B

3. DESCRIPTION OF TEST EQUIPMENT

3.1 SAR Measurement Setup

Robotic System

Measurements are performed using the DASY4 (or DASY5) automated dosimetric assessment system. Which is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Stäubli), robot controller, measurement server, Samsung computer, near-field probe, probe alignment sensor, and the SAM 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 Fig. 3.1).

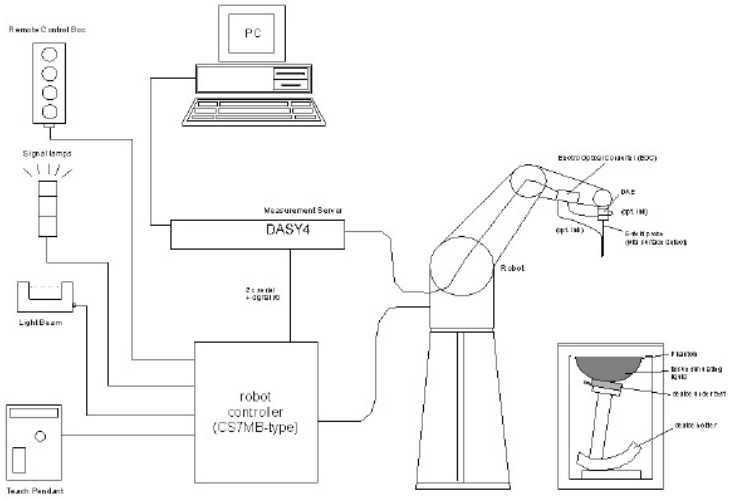


Figure 3.1 SAR Measurement System Setup

System Hardware

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and a remote control is used to drive the robot motors. The PC consists of the Samsung computer with Windows XP system and SAR Measurement Software DASY4 (or DASY5), LCD monitor, mouse and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that 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 measurement server.

System Electronics

The DAE4(or DAE3) 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 measurement server 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.

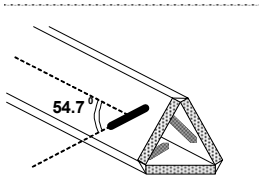
3.2 E-field Probe

Figure 3.2 DAE System

The SAR measurement were conducted with the dosimetric probe ES3DV2, ES3DV3, EX3DV4 and ET3DV6, designed in the classical triangular configuration (see Fig.3.3) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. 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 (see Fig.3.2). The approach is stopped at reaching the maximum.

Probe Specifications

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	Basic Broad Band Calibration in air: 10-3000 MHz Conversion Factors (CF) for HSL 900 and HSL 1800



Δ - BEAM

Figure 3.3 Triangular Probe Configuration

Additional CF for other liquids and frequencies upon request

Frequency 10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)

Directivity **[ES3DV3], [ET3DV6]**

± 0.2 dB in HSL (rotation around probe axis)

± 0.3 dB in tissue material (rotation normal to probe axis)

[EX3DV4]

± 0.3 dB in HSL (rotation around probe axis)

± 0.5 dB in tissue material (rotation normal to probe axis)

Dynamic Range **[ES3DV3], [ET3DV6]**

5μW/g to > 100mW/g; Linearity: ± 0.2dB

[EX3DV4]

10 μW/g to > 100 mW/g; Linearity: ± 0.2 dB

Dimensions **[ES3DV3], [ES3DV2]**

Overall length: 330 mm (Tip: 20 mm)

Tip diameter: 3.9 mm (Body: 12 mm)

Distance from probe tip to dipole centers: 2.1 mm

[ES3DV3] ,[ES3DV2]

[EX3DV4]

Overall length: 330 mm (Tip: 20 mm)

Tip diameter: 2.5 mm (Body: 12 mm)

Typical distance from probe tip to dipole centers: 1 mm

[ET3DV6]

Overall length: 330mm

Tip length: 16mm

Body diameter: 12mm

Tip diameter: 6.8mm

Distance from probe tip to dipole centers: 2.7mm

[EX3DV4]

Application **[ES3DV3], [ES3DV2]**

General dosimetry up to 5 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones

[ET3DV6]

[EX3DV4]

High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields).Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30 %.

[ET3DV6]

General dosimetry up to 3 GHz

Compliance tests of mobile phones

Fast automatic scanning in arbitrary phantoms

Optical Surface Detection	**[ET3DV6]** ± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces

3.3 Phantom

SAM Twin Phantom

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a wooden table. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid.

Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. (See Figure 3.5)

Figure3.5 SAM Twin Phantom

SAM Twin Phantom Specification

Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, EN 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.
Shell Thickness	2 ± 0.2 mm
Filling Volume	Approx. 25 liters
Dimensions	Height: 810 mm; Length: 1000 mm; Width: 500 mm

Modular Flat Phantom

The Modular Flat Phantom V5.1 is constructed of a fiberglass shell integrated in a wooden table. Also It consists of three identical flat phantoms (modules) which can be installed and removed separately without emptying the liquid, as well as a wooden support.. It enables the dosimetric evaluation of body mounted usage at the flat phantom region. A cover prevents the evaporation of the liquid.

Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot. (See Figure 3.6)

Figure 3.6 Modular Flat Phantom

Modular Flat Phantom Specification

Construction	The shell corresponds to the specifications of IEEE 1528-2003. It enables the dosimetric evaluation of body mounted usage above 800 MHz at the flat phantom region. A cover prevents evaporation of the liquid
Shell Thickness	2 ± 0.2 mm
Filling Volume	Approx. 10 liters
Dimension	Wooden support - Height: 810 mm; Length: 830 mm; Width: 500 mm Each Module - Height:190 mm; Length: 200 mm; width: 300 mm

3.4 Brain Simulating Mixture Characterization

The brain mixtures consist of a viscous gel using hydroxethylcellullose (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.

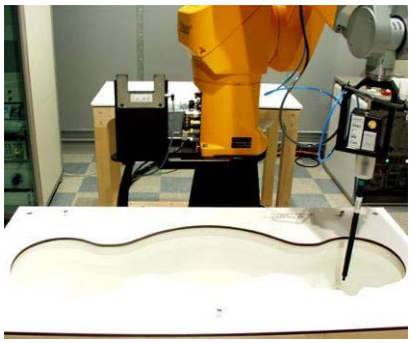


Figure 3.7 Simulated Tissue

Table 3.1 Composition of the Brain Tissue Equivalent Matter

INGREDIENTS	835MHz Brain	835MHz Muscle	1800MHz Brain	1800MHz Muscle	1900MHz Brain	1900MHz Muscle	2450MHz Brain	2450MHz Muscle
WATER	40.19%	50.75%	55.24%	69.04%	55.24%	70.23%	71.88%	73.4%
SUGAR	57.90%	48.21%	-	-	-	-	-	-
SALT	1.48%	0.94%	0.31%	2.72%	0.31%	0.29%	0.16%	0.06%
DGBE	-	-	44.45%	28.24%	44.45%	29.48%	7.99%	26.54%
Triton X-100	-	-	-	-	-	-	19.97%	-
BACTERIACIDE	0.18%	0.10%	-	-	-	-	-	-
HEC	0.25%	-	-	-	-	-	-	-
Dielectric Constant Target	41.5	55.2	40	53.3	40	53.3	39.2	52.7
Conductivity Target (S/m)	0.9	0.97	1.4	1.52	1.4	1.52	1.8	1.95

3.5 Device Holder for Transmitters

In combination with the Twin SAM Phantom V4.0, the Mounting Device (see Fig. 3.7) 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 repeatedly be positioned according to the EN 50360:2001 and FCC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Figure 3.8 Device Holder

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

3.6 Validation Dipole

The reference dipole should have a return loss better than –20 dB (measured in the setup) at the resonant frequency to reduce the uncertainty in the power measurement.

Frequency	835, 1900, 2450 MHz
Return Loss	< -20 dB at specified validation position
Dimensions	D835V2: dipole length: 161 mm; overall height: 330 mm D1900V2: dipole length: 68 mm; overall height: 300 mm D2450V2: dipole length: 51.8 mm; overall height: 300 mm

Note:

Usage of SAR dipoles calibrated less than 2 years ago but more than 1 year ago were confirmed in maintaining return loss (< -20dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibration in KDB 450824

D835V2 S/N:4d050	Paramaters			
Date of Cal	Return loss (dB)	Deviation (%)	Impedance (Ω)	Deviation (Ω)
2009.03.16	-26.7	0	51.5	0
2010.10.19	-25.8	3.3	51.6	0.1

D1900V2 S/N:5d082	Paramaters			
Date of Cal	Return loss (dB)	Deviation (%)	Impedance (Ω)	Deviation (Ω)
2009.03.17	-25.7	0	52.9	0
2010.10.28	-25.7	0	50.5	-2.4

D2450V2 S/N:807	Paramaters			
Date of Cal	Return loss (dB)	Deviation (%)	Impedance (Ω)	Deviation (Ω)
2008.06.09	-27.3	0	53.4	0
2010.02.04	-26.8	1.8	54.4	1

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3.7 Equipment Calibration

Table 3.2 Test Equipment Calibration

Type	Calibration Due Date	Serial No.
SPEAG E-Field Probe ES3DV3	Jan.27, 2011	3080
SPEAG DAE4	Sep.22, 2011	533
SPEAG Validation Dipole D835V2	Mar.16, 2011	4d050
SPEAG Validation Dipole D1900V2	Mar.17, 2011	5d082
SPEAG Validation Dipole D2450V2	Feb.04, 2012	807
Stäubli Robot RX90BL	Not Required	F01/5N19A1/A/01
SPEAG SAM Twin Phantom V4.0	Not Required	TP-1141
SPEAG SAM Twin Phantom V4.0	Not Required	TP-1143
E4421B Signal Generator	Oct.23, 2010	MY41000654
BBS3Q7ECK Power Amp	Dec.11, 2010	1024
E4419B Power meter	May.14, 2011	MY45101765
E9300B Power sensor	Jun.09, 2011	MY41495872
HP-8753ES Network Analyzer	Apr.23, 2011	US39173712
HP85070C Dielectric Probe Kit	Not Required	US99360087
NRVD Power Meter	Mar.23, 2011	836416/030
NRV-Z55 Power Sensor	Mar.23, 2011	834558/012
NRV-Z55 Power Sensor	Mar.23, 2011	834558/014
DASY4 S/W (ver 4.7)	Not Required	-
Directional Coupler	Mar.26, 2011	20412
Base Station Simulator	Feb.08, 2011	GB43460148
Modular Phantom	Not Required	MP-1001

NOTE:
The E-field probe was calibrated by SPEAG, by temperature measurement procedure. Dipole Validation measurement is performed by Samsung Lab. before each test. (see § 7.2) The brain simulating material is calibrated by Samsung using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain-equivalent material. (see § 7.1)

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4. SAR MEASUREMENT PROCEDURE

The evaluation was performed using the following procedure.

STEP 1

The SAR measurement was taken at a selected spatial reference point to monitor power variations during testing. This fixed location point was measured and used as a reference value.

STEP 2

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

STEP 3

Around this point, a volume of 32mm x 32mm x 30mm (fine resolution volume scan, zoom scan) 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:

The data at the surface was extrapolated, since the center of the dipoles is 2.7mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. 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 evaluated the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) 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. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

STEP 4

The SAR value at the same location as in step 1 was again measured.

(If the value changed by more than 5%, the evaluation is repeated.)

5. DESCRIPTION OF TEST POSITION

5.1 SAM Phantom Shape

Figure 5.1 shows the front, back and side views of SAM. The point “M” is the reference point for the center of mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERPs are 15 mm posterior to the entrance to ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5.2.

Figure 5.1 Front, back and side view of SAM

The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 5.3). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines should be marked on the external phantom shell to facilitate handset positioning. Posterior to the N-F line, the thickness of the phantom shell with the shape of an ear is a flat surface 6 mm thick at the ERPs.

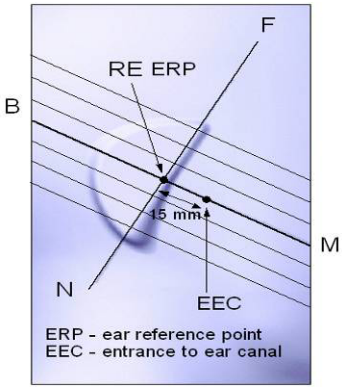

Figure 5.2 Close up side view

5.2 “cheek” Position

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (see Fig. 5.4). The “test device reference point” was than located at the same level as the center of the eat reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at it’s tip and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head

phantoms on the ear reference point

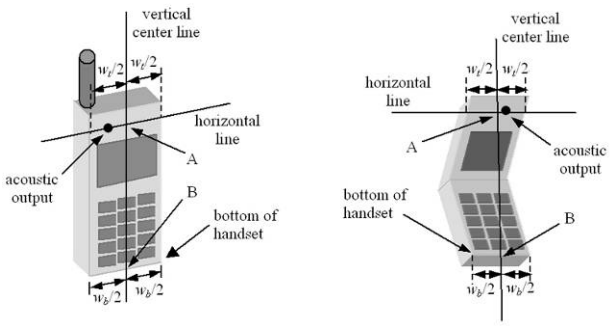

Figure 5.4 Handset vertical and horizontal reference lines

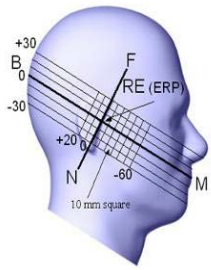

Figure 5.3 Side view of the phantom showing relevant markings

Step 1

The test device was positioned with the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 5.5), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom

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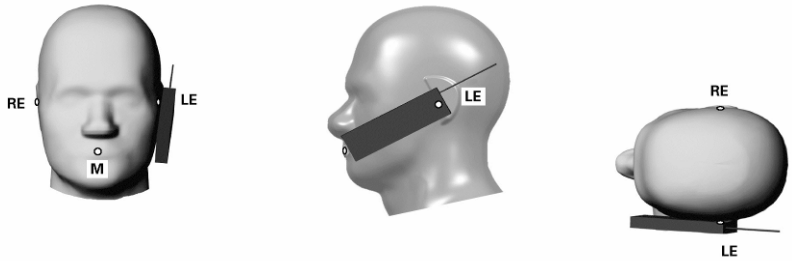

Figure 5.5 Front, Side and Top View of Cheek/Touch Position

Step 2

The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.

Step 3

While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the plane normal to MB-NF including the line MB (reference plane).

Step 4

Rotate the handset around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.

Step 5

While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, the handset was rotated about the line NF until any point on the handset made contact with a phantom point below the ear (cheek). See Figure 5.2.

5.3 “tilted” Position

With the test device aligned in the “cheek” position :

Step 1

Repeat steps 1 to 5 of 5.2 to place the device in the “Cheek/Touch Position”

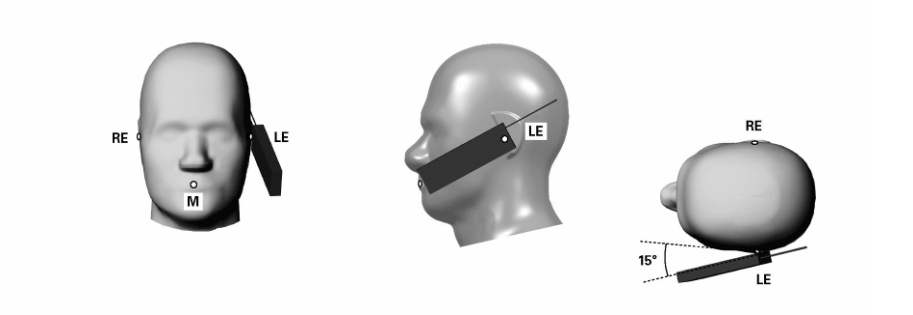

Figure 5.6 Front, side and Top View of Ear/Tilt 15° Position

Step 2

While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degree.

Step 3

The phone was then rotated around the horizontal line by 15 degree.

Step 4

While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head. (In this position, point A was located on the

line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head.

5.4 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 (see Figure 5.7). A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

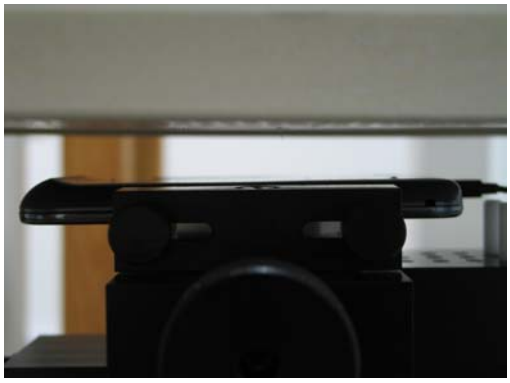

Figure 5.7 Body Belt Clip and Holster Configurations

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 supplied with the device, the device is tested with each accessory that contains unique metallic component. 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 where a separation distance between the back of the device and the flat phantom is used.

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. Worst-case positioning is then documented and used to perform Body SAR testing.

In order for users to be aware of the body-worn operating requirements for meeting RF exposure compliance, operating instructions and cautions statements must be included in the user's manual.

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6. MEASUREMENT UNCERTAINTY

Table 6.1 Uncertainty Budget at 835MHz (June 2009)

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	c_i	Standard uncertainty (±%)	v_i^2 or v_{eff}
Measurement System						
Probe Calibration	11.00	normal	2.000	1	5.50	∞
Axial Isotropy	4.70	rectangular	1.732	0.7	1.90	∞
Hemispherical Isotropy	9.60	rectangular	1.732	0.7	3.88	∞
Linearity	4.70	rectangular	1.732	1	2.71	∞
System Detection Limits	0.25	rectangular	1.732	1	0.14	∞
Boundary effects	1.00	rectangular	1.732	1	0.58	∞
Readout electronics	0.30	normal	1.000	1	0.30	∞
Response time	0.80	rectangular	1.732	1	0.46	∞
RF ambient conditions	3.00	rectangular	1.732	1	1.73	∞
Integration time	1.73	rectangular	1.732	1	1.00	∞
Mechanical constrains of robot	1.50	rectangular	1.732	1	0.87	∞
Probe positioning	2.90	rectangular	1.732	1	1.67	∞
Extrapolation and integration	1.00	rectangular	1.732	1	0.58	∞
Test Sample Related						
Test Sample positioning	1.12	normal	1.000	1	1.12	14
Device holded uncertainty	3.44	normal	1.000	1	3.44	∞
Power Drift	5.00	rectangular	1.732	1	2.89	∞
Phantom and Setup						
Modular Phantom uncertainty	5.62	normal	1.000	1	5.62	2
Phantom uncertainty	4.00	rectangular	1.732	1	2.31	∞
Liquid conductivity (deviation from target)	5.00	rectangular	1.732	0.64	1.85	∞
Liquid conductivity (measurement error)	0.38	normal	1.000	0.64	0.24	∞
Liquid permittivity (deviation from target)	5.00	rectangular	1.732	0.6	1.73	∞
Liquid permittivity (measurement error)	5.44	normal	1.000	0.6	3.26	∞
Combined Standard Uncertainty		Normal	-	-	**11.84**	**172776**
Extended Standard Uncertainty(K=2.00)					**23.69**	**172776**

Table 6.2 Uncertainty Budget at 1900MHz (June 2009)

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	c_i	Standard uncertainty (±%)	v_i^2 or v_{eff}
Measurement System						
Probe Calibration	11.00	normal	2.000	1	5.50	∞
Axial Isotropy	4.70	rectangular	1.732	0.7	1.90	∞
Hemispherical Isotropy	9.60	rectangular	1.732	0.7	3.88	∞
Linearity	4.70	rectangular	1.732	1	2.71	∞
System Detection Limits	0.25	rectangular	1.732	1	0.14	∞
Boundary effects	1.00	rectangular	1.732	1	0.58	∞
Readout electronics	0.30	normal	1.000	1	0.30	∞
Response time	0.80	rectangular	1.732	1	0.46	∞
RF ambient conditions	3.00	rectangular	1.732	1	1.73	∞
Integration time	0.00	rectangular	1.732	1	0.00	∞
Mechanical constrains of robot	1.50	rectangular	1.732	1	0.87	∞
Probe positioning	2.90	rectangular	1.732	1	1.67	∞
Extrapolation and integration	1.00	rectangular	1.732	1	0.58	∞
Test Sample Related						
Test Sample positioning	1.50	normal	1.000	1	1.50	14
Device holded uncertainty	3.44	normal	1.000	1	3.44	∞
Power Drift	5.00	rectangular	1.732	1	2.89	∞
Phantom and Setup						
Modular Phantom uncertainty	6.02	normal	1.000	1	6.02	2
Phantom uncertainty	4.00	rectangular	1.732	1	2.31	∞
Liquid conductivity (deviation from target)	5.00	rectangular	1.732	0.64	1.85	∞
Liquid conductivity (measurement error)	1.84	normal	1.000	0.64	1.18	∞
Liquid permittivity (deviation from target)	5.00	rectangular	1.732	0.6	1.73	∞
Liquid permittivity (measurement error)	4.54	normal	1.000	0.6	2.73	∞
Combined Standard Uncertainty		Normal	-	-	**12.00**	**60176**
Extended Standard Uncertainty(K=2.00)					**24.00**	**60176**

Table 6.3 Uncertainty Budget at 2450MHz (June 2009)

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	c_i	Standard uncertainty (±%)	v_i^2 or v_{eff}
Measurement System						
Probe Calibration	11.00	normal	2.000	1	5.00	∞
Axial Isotropy	4.70	rectangular	1.732	0.7	1.90	∞
Hemispherical Isotropy	9.60	rectangular	1.732	0.7	3.88	∞
Linearity	4.70	rectangular	1.732	1	2.71	∞
System Detection Limits	0.25	rectangular	1.732	1	0.14	∞
Boundary effects	1.00	rectangular	1.732	1	0.58	∞
Readout electronics	0.30	normal	1.000	1	0.30	∞
Response time	0.80	rectangular	1.732	1	0.46	∞
RF ambient conditions	3.00	rectangular	1.732	1	1.73	∞
Integration time	0.00	rectangular	1.732	1	0.00	∞
Mechanical constrains of robot	1.50	rectangular	1.732	1	0.87	∞
Probe positioning	2.90	rectangular	1.732	1	1.67	∞
Extrapolation and integration	1.00	rectangular	1.732	1	0.58	∞
Test Sample Related						
Test Sample positioning	4.22	normal	1.000	1	4.22	14
Device holded uncertainty	3.44	normal	1.000	1	3.44	∞
Power Drift	5.00	rectangular	1.732	1	2.89	∞
Phantom and Setup						
Modular Phantom uncertainty	2.32	Normal	1.0001	1	2.32	2
Phantom uncertainty	4.00	rectangular	1.732	1	2.31	∞
Liquid conductivity (deviation from target)	5.00	rectangular	1.732	0.64	1.85	∞
Liquid conductivity (measurement error)	2.04	normal	1.000	0.64	1.30	∞
Liquid permittivity (deviation from target)	5.00	rectangular	1.732	0.6	1.73	∞
Liquid permittivity (measurement error)	4.27	normal	1.000	0.6	2.56	∞
Combined Standard Uncertainty		Normal	-	-	**11.32**	**728**
Extended Standard Uncertainty(K=2.00)					**22.64**	**728**

7. SYSTEM VERIFICATION

7.1 Tissue Verification

Table 7.1 MEASURED TISSUE PARAMETERS

	835MHz Head		835MHz Body		1900MHz Head		1900MHz Body		2450MHz Head		2450MHz Body	
	Target	Measured	Target	Measured	Target	Measured	Target	Measured	Target	Measured	Target	Measured
Date	Oct.20,2010		Oct.20,2010		Oct.21,2010		Oct.21,2010		Oct.19,2010		Oct.19,2010	
Liquid Temperature(°C)	22.3		22.3		21.9		22.0		22.2		21.9	
Dielectric Constant: å'	41.5	41.4	55.2	53.6	40	39	53.3	54.2	39.2	38.2	52.7	52.8
Conductivity:	0.9	0.91	0.97	0.96	1.4	1.43	1.52	1.56	1.8	1.83	1.95	1.98
Tissue Batch Number	835DF1001O		835B1001K		1900F1001X		1900B2002B		2450MF1001Q		2450B1001F	

The measured value must be within ±5% of the target value.

7.2 Test System Validation

Prior to assessment, the system is verified to the ±10% of the specification at 835MHz, 1900MHz and 2450MHz by using the system validation kit(s). (see Appendix D, Graphic Plot Attached)

Table 7.2 System Validation Results

System Validation Kit	Tissue	Targeted SAR_{1g} (mW/g)	Measured SAR_{1g} (mW/g)	Deviation (%)	Input Power (mW)	Date	Liquid Temperature(°C)	Ambient Temperature(°C)
4d050	835MHz Brain	9.49	9.88	4.11	250	Oct.20, 2010	22.3	22.6
5d082	1900MHz Brain	39.4	39.84	1.12	250	Oct.21, 2010	21.9	22.3
807	2450MHz Brain	54.4	56.30	3.49	100	Oct.19, 2010	22.2	22.8

*Validation was normalized to 1W.

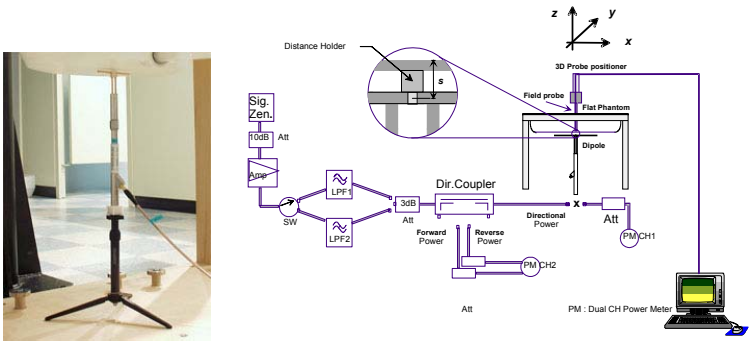

Figure 7.1 Dipole Validation Test Setup

8. SAR MEASUREMENT RESULTS

Procedures Used To Establish Test Signal

The handset was placed into simulated call mode using base station simulator and manufacturers test codes. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR. When test modes are not available or inappropriate for testing a handset, the actual transmission is activated through a base station simulator or similar equipment. See data pages for actual procedure used in measurement.

SAR Measurement Conditions for WCDMA

These procedures were followed according to FCC "SAR Measurement Procedures for 3G Devices", May 2006.

Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the ge neral descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR wit h TPC (transmit power control) set to all “1s”. Results for all applicable physical channel co nfigurations (DPCCH, DPDCHn and spreading codes) should be tabulated in the test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations should be clearly identified.

Head SAR Measurements

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

Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits configured to all “1s”. SAR for other spreading codes and multiple DPDCHn, when supported by the DUT, are not required when the maximum average outputs of each RF channel, for each spreading code and DPDCHn configuration, are less than ¼ dB higher than those measured in

12.2 RMC. Otherwise, SAR is measured on the maximum output channel with an applicable RMC configuration for the corresponding spreading code or DPDCHn using the exposure configuration that results in the highest SAR with 12.2 RMC. When more than 2 DPDCHn are supported by the DUT, it may be necessary to configure the additional DPDCHn for the DUT using FTM(Factory Test Mode) with parameters similar to those used in 384 kbps and 768 kbps RMC.

Table 8.1 Max Power Output Table for GT-I9003

Operation Band Channel	Channel	HSDPA Inactive		HSDPA Active
		12.2 Kbps RMC	12.2 Kbps AMR	12.2 Kbps RMC
PCS WCDMA	9262	22.65	22.77	22.01
	9400	22.93	22.91	22.19
	9538	22.85	22.82	22.15

Table 8.2 HSPA Conducted Output Power Table for GT-I9003

3GPP Release Version	Mode	3GPP 34.121 Subtest	PCS Band [dBm]			MPR
			9662	9800	9938	
6	HSDPA	Subtest1	22.27	22.43	22.36	0
6		Subtest2	21.76	21.93	21.78	0
6		Subtest3	21.61	21.86	21.59	0.5
6		Subtest4	21.35	21.55	21.38	0.5
6	HSUPA	Subtest1	21.02	21.39	21.14	0
6		Subtest2	19.43	19.70	19.64	2
6		Subtest3	20.33	20.63	20.65	1
6		Subtest4	19.82	19.89	19.69	2
6		Subtest5	20.88	21.11	22.14	0

Device Test Conditions

The handset is battery operated. Each SAR measurement was taken with a fully charged battery. In order to verify that the device was tested at full power, conducted output power measurements were performed before and after each SAR measurement to confirm the output power. If a conducted power deviation of more than 5% occurred, the test was repeated. And all Tx(1~4Tx) conducted power were also investigated for Body-Worn SAR Measurement

Table 8.3 GPRS Power Table for GT-I9003

Band	Channel	Voice	1Tx	2Tx	3Tx	4Tx
850	128	32.09	32.06	31.15	29.87	28.78
	190	32.02	31.98	31.08	29.85	28.76
	251	32.00	31.97	31.09	29.87	28.70
1900	512	29.75	29.79	28.77	27.53	26.36
	661	29.95	29.98	29.02	27.77	26.50
	810	30.00	30.02	29.04	27.79	26.53

Table 8.4 EDGE850 Conduction Power Table for GT-I9003

Test Item	Limit (unit)	Channel	Result	
			Data	Pass or Fail
Transmit Power	GSM Power Class (dBm)	128	27.26	PASS
		190	27.34	PASS
		251	27.42	PASS

Table 8.5 EDGE1900 Conduction Power Table for GT-I9003

Test Item	Limit (unit)	Channel	Result	
			Data	Pass or Fail
Transmit Power	GSM Power Class (dBm)	512	26.48	PASS
		661	26.94	PASS
		810	26.71	PASS

Simultaneous Transmission

Refer to the FCC OET document, 'SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas' (Feb 2008)

Table 8.6 Output Power Thresholds for Unlicensed Transmitters

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

Table 8.7 Summary of SAR Evaluation Requirements for Cell phones with Multiple Transmitters

	Individual Transmitter	Simultaneous Transmission
Licensed Transmitters	**Routine evaluation required**	**SAR not required:** **Unlicensed only** o when stand-alone 1-g SAR is not required and antenna is > 5 cm from other antennas **Licensed & Unlicensed** o when the sum of the 1-g SAR is <1.6 W/kg for all simultaneous transmitting antennas o when SAR to antenna separation ratio of simultaneous transmitting antenna pair is < 0.3 **SAR required:** **Licensed & Unlicensed** antenna pairs with SAR to antenna separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in standalone configuration for each wireless mode and exposure condition Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply
Unlicensed Transmitters	**When there is no simultaneous transmission –** o output < 60/f: SAR not required o output ≥ 60/f: stand-alone SAR required **When there is simultaneous transmission –** **Stand-alone SAR not required when** O output ≤ 2.P_{Ref} and antenna is > 5.0 cm from other antennas O output ≤ P_{Ref} and antenna is > 2.5 cm from other antennas, each either output power output ≤ P_{Ref} or 1-g SAR < 1.2 W/Kg **Otherwise stand-alone SAR is required** **When stand-alone SAR is required** o test SAR on highest output channel for each wireless mode and exposure condition o if SAR for highest output channel is > 50% of SAR limit, evaluate all channels according to normal procedures	

Conclusion

Based on the output power, antenna separation distance, and Body SAR, a stand-alone BT SAR test is not required while for WLAN it is required. Therefore, a simultaneous SAR evaluation is not required.

The summation of WLAN SAR and Licensed Transmitter SAR is 0.499 + 0.030 = 0.529, which is less than 1.6 W/Kg, Therefore, a simultaneous SAR evaluation is not required.

8.1 GSM850 Head SAR Results

Frequency		Mode	Conducted		Side	Test Position	Antenna Type	Battery	SAR Level (W/kg)
MHz	Ch		Start	End					
836.6	190	GSM850	32.10	32.05	Right	Cheek/Touch	Intenna	Standard	**0.091**
836.6	190	GSM850	32.10	31.94	Right	Ear/Tilt 15°	Intenna	Standard	0.067
836.6	190	GSM850	32.09	31.93	Left	Cheek/Touch	Intenna	Standard	0.084
836.6	190	GSM850	31.97	32.00	Left	Ear/Tilt 15°	Intenna	Standard	0.068
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram			

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plot.
4. Liquid tissue depth is 15.2 ± 0.2cm
5. Battery is fully charged for all readings.
6. Test Configuration ☐ Manu. Test Codes ☒ Base Station Simulator
7. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

8.2 GPRS850 Body SAR Results(Without Holster)

Frequency		Mode	Conducted		Test Position	Slots	Antenna Type	Battery	Bar	SAR Level (W/kg)
MHz	Ch		Start	End						
824.2	128	GSM850	31.22	31.19	1.5 cm [w/o Holster]	2	Intenna	Standard	Body	0.193
836.6	190	GSM850	31.15	30.99	1.5 cm [w/o Holster]	2	Intenna	Standard	Body	0.236
848.8	251	GSM850	31.12	31.07	1.5 cm [w/o Holster]	2	Intenna	Standard	Body	**0.284**
836.6	190	GSM850	29.85	29.82	1.5 cm [w/o Holster]	3	Intenna	Standard	Body	0.207
836.6	190	GSM850	28.75	28.77	1.5 cm [w/o Holster]	4	Intenna	Standard	Body	0.230
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population					**1.6W/kg (mW/g)** averaged over 1 gram					

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plot.
4. Liquid tissue depth is 15.2 ± 0.2cm
5. Battery is fully charged for all readings.
6. Test Configuration ☐ With Holster ☒ Without Holster
7. Justification for reduced test configurations: This model supports GPRS CLASS 12(max 4Tx) and EDGE. The burst power and timing period is more than 2dB higher in GPRS mode than in GSM1900and EDGE mode. Hence, the GSM1900 and EDGE mode was not reported. And all Tx(1~4Tx) cases were also investigated and the worst-case results are reported.(2Tx)

8.3 GSM1900 Head SAR Results

Frequency		Mode	Conducted		Side	Test Position	Antenna Type	Battery	SAR Level (W/kg)
MHz	Ch		Start	End					
1880	661	GSM1900	29.94	29.98	Right	Cheek/Touch	Intenna	Standard	0.187
1880	661	GSM1900	30.02	29.97	Right	Ear/Tilt 15°	Intenna	Standard	0.091
1880	661	GSM1900	30.00	30.04	Left	Cheek/Touch	Intenna	Standard	**0.208**
1880	661	GSM1900	29.90	29.97	Left	Ear/Tilt 15°	Intenna	Standard	0.106
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram			

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plot.
4. Liquid tissue depth is 15.2 ± 0.2cm
5. Battery is fully charged for all readings.
6. Test Configuration ☐ Manu. Test Codes ☒ Base Station Simulator
7. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

8.4 GPRS1900 Body SAR Results(Without Holster)

Frequency		Mode	Conducted		Test Position	Slots	Antenna Type	Battery	Bar	SAR Level (W/kg)
MHz	Ch		Start	End						
1850.2	512	GSM1900	26.39	26.42	1.5 cm [w/o Holster]	4	Intenna	Standard	Body	0.375
1880	661	GSM1900	26.52	26.56	1.5 cm [w/o Holster]	4	Intenna	Standard	Body	**0.396**
1909.8	810	GSM1900	26.47	26.50	1.5 cm [w/o Holster]	4	Intenna	Standard	Body	0.386
1880	661	GSM1900	29.03	29.09	1.5 cm [w/o Holster]	2	Intenna	Standard	Body	0.361
1880	661	GSM1900	27.73	27.79	1.5 cm [w/o Holster]	3	Intenna	Standard	Body	0.393
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population					**1.6W/kg (mW/g)** averaged over 1 gram					

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].

2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plot.
4. Liquid tissue depth is 15.2 ± 0.2cm
5. Battery is fully charged for all readings.
6. Test Configuration ☐ With Holster ☒ Without Holster
7. Justification for reduced test configurations: This model supports GPRS CLASS 12(max 4Tx) and EDGE. The burst power and timing period is more than 2dB higher in GPRS mode than in GSM1900and EDGE mode. Hence, the GSM1900 and EDGE mode was not reported. And all Tx(1~4Tx) cases were also investigated and the worst-case results are reported.(4Tx)

8.5 WCDMA1900 Head SAR Results

Frequency		Mode	Conducted		Side	Test Position	Antenna Type	Battery	SAR Level (W/kg)
MHz	Ch		Start	End					
1880	9400	WCDMA1900	22.84	22.95	Right	Cheek/Touch	Intenna	Standard	0.293
1880	9400	WCDMA1900	22.90	22.83	Right	Ear/Tilt 15°	Intenna	Standard	0.169
1880	9400	WCDMA1900	22.92	22.87	Left	Cheek/Touch	Intenna	Standard	**0.366**
1880	9400	WCDMA1900	22.98	22.90	Left	Ear/Tilt 15°	Intenna	Standard	0.175
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram			

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plot.
4. Liquid tissue depth is 15.2 ± 0.2cm
5. Battery is fully charged for all readings.
6. Test Configuration ☐ Manu. Test Codes ☒ Base Station Simulator
7. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
8. WCDMA mode was tested under RMC 12.2kbps with HSDPA and HSUPA Inactive

8.6 WCDMA1900 Body SAR Results(Without Holster)

Frequency		Mode	Conducted		Test Position	Antenna Type	Battery	Bar	SAR Level (W/kg)
MHz	Ch		Start	End					
1852.4	9262	WCDMA1900	22.61	22.68	1.5 cm [w/o Holster]	Intenna	Standard	Body	0.482
1880	9400	WCDMA1900	22.89	22.95	1.5 cm [w/o Holster]	Intenna	Standard	Body	**0.499**
1907.6	9538	WCDMA1900	22.83	22.91	1.5 cm [w/o Holster]	Intenna	Standard	Body	0.462
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population					**1.6W/kg (mW/g)** averaged over 1 gram				

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plot.
4. Liquid tissue depth is 15.2 ± 0.2cm
5. Battery is fully charged for all readings.
6. Test Configuration ☐ With Holster ☒ Without Holster
7. WCDMA mode was tested under RMC 12.2kbps with HSDPA and HSUPA Inactive

8.7 WLAN Head SAR Results

Frequency		Mode	Conducted		Side	Test Position	Antenna Type	Battery	SAR Level (W/kg)
MHz	Ch		Start	End					
2437	6	WLAN	19.92	19.99	Right	Cheek/Touch	Intenna	Standard	0.066
2437	6	WLAN	19.87	19.95	Right	Ear/Tilt 15°	Intenna	Standard	0.064
2437	6	WLAN	19.93	19.89	Left	Cheek/Touch	Intenna	Standard	**0.094**
2437	6	WLAN	19.91	19.96	Left	Ear/Tilt 15°	Intenna	Standard	0.078
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**1.6W/kg (mW/g)** averaged over 1 gram			

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plot.
4. Liquid tissue depth is 15.2 ± 0.2cm
5. Battery is fully charged for all readings.
6. Test Configuration ☒ Manu. Test Codes ☐ Base Station Simulator
7. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
8. SAR is not required for 802.11.g/n channels per April 2010 TCB Workshop when the maximum average out power is less than 1/4 dB higher than that measured on the corresponding 802.11.b channels.
9. Data rate for WLAN(802.11.b) testing was 1Mbps.

8.8 WLAN Body SAR Results(Without Holster)

Frequency		Mode	Conducted Power		Test Position	Antenna Type	Battery	Bar	SAR Level (W/kg)
MHz	Ch		Start	End					
2412	1	WLAN	19.59	19.65	1.5 cm [w/o Holster]	Intenna	Standard	Body	0.016
2437	6	WLAN	19.87	19.94	1.5 cm [w/o Holster]	Intenna	Standard	Body	0.029
2462	11	WLAN	20.35	20.29	1.5 cm [w/o Holster]	Intenna	Standard	Body	**0.030**
ANSI / IEEE C95.1 1992 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population					**1.6W/kg (mW/g)** averaged over 1 gram				

NOTES:

1. The test data reported are the worst-case SAR value with the antenna-head position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and the worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plot.
4. Liquid tissue depth is 15.2 ± 0.2cm
5. Battery is fully charged for all readings.
6. Test Configuration ☐ With Holster ☒ Without Holster
7. SAR is not required for 802.11.g/n channels per April 2010 TCB Workshop when the maximum average out power is less than 1/4 dB higher than that measured on the corresponding 802.11.b channels.
8. Data rate for WLAN(802.11.b) testing was 1Mbps.

9. CONCLUSION

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC. 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. The test results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

The highest reported SAR values are as follows:
GSM850: Head: 0.091W/Kg : Body-worn: 0.284W/Kg
GSM1900: Head: 0.208W/Kg : Body-worn: 0.396W/Kg
WCDMA1900: Head: 0.366W/Kg : Body-worn: 0.499W/Kg
WLAN: Head: 0.094W/Kg : Body-worn: 0.03W/Kg

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APPENDIX A

SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (p). It is also defined as the rate of RF energy absorption pet unit mass at a point in an absorbing body (see Fig. A.1) .

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

Figure A.1 SAR Mathematical Equation

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

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

Where :

σ = conductivity of the tissue-simulant material (S/m)
p = 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 or 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.

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APPENDIX B

Probe Calibration Process

Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure described in **K. Pokovic, T.Schmid, N. Kuster, *Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies*, ICECOM97, Oct. 1997, pp. 120-124** with an accuracy better than +/-10%. The spherical isotropy was evaluated with the procedure described in **K. Pokovic, T.Schmid, N. Kuster, *E-field Probe with improved isotropy in brain simulating liquids*, Proceedings of the ELMAR, Zadar, June 23-25, 1996, pp. 172-175** and found to be better than +/-0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe is tested.

Free Space Assessment

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz (see Fig. B.1), 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.

Temperature Assessment

E-field temperature correlation calibration is performed in a flat phantom 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 (see Fig. B.2).

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

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 ΔT/ Δt, 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;

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

where:

σ = simulated tissue conductivity

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

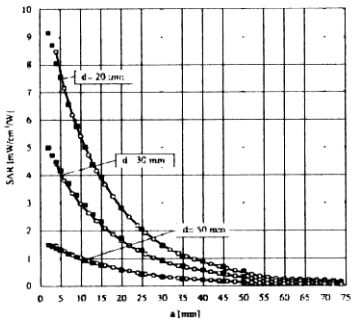


Figure B.1. E-Field and Temperature measurements at 900MHz

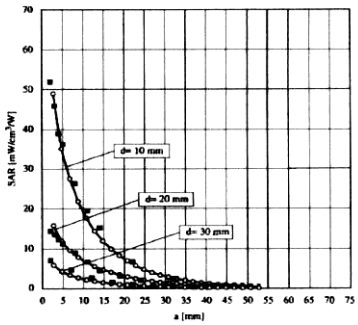


Figure B.2. E-Field and temperature measurements at 1.9GHz

APPENDIX C

ANSI/IEEE C95.1 – 1992 RF EXPOSURE LIMITS

Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is the exposure that may be incurred by persons who are aware of the potential for exposure,(i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table C.1 Safety Limits for Partial Body Exposure

	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)
SPATIAL PEAK SAR[1] Brain	1.60	8.00
SPATIAL PEAK SAR[2] Whole Body	0.08	0.40
SPATIAL PEAK SAR[3] Hands,Feet,Ankles, Wrists	4.00	20.00

[1] The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as tissue volume in the shape of a cube) and over the appropriate averaging time.
[2] The Spatial Average value of the SAR averaged over the whole body.
[3] The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

APPENDIX D

The Validation Measurements

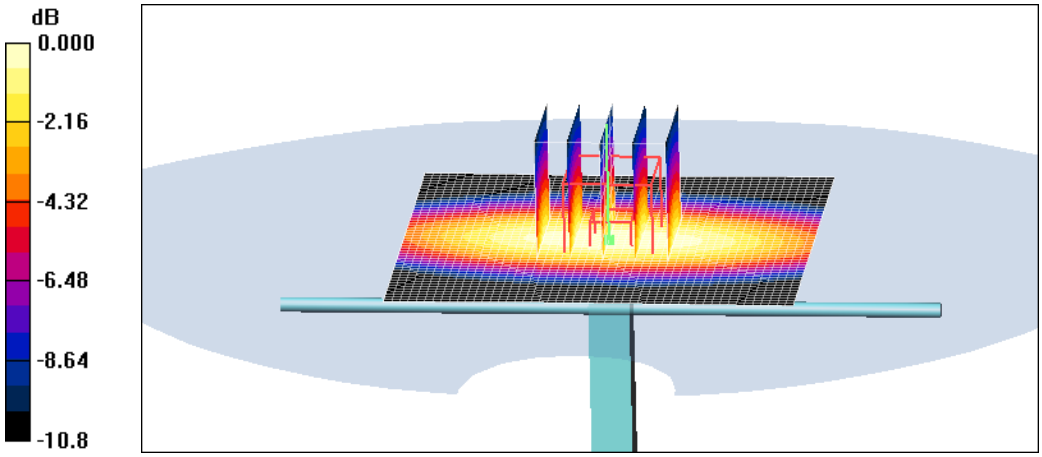
DUT: Dipole 835 MHz; Serial: 4d050
Program Name: 835MHz Dipole Validation 2010.10.20
Procedure Name: 835MHz @ 250mW
Meas. Ambient Temp(celsius)-22.6,Tissue Temp(celsius)-22.3;Test Date-20/Oct/2010

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.91 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(5.77, 5.77, 5.77); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

835MHz @ 250mW/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 2.65 mW/g

835MHz @ 250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 54.8 V/m; Power Drift = 0.040 dB
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.6 mW/g
Maximum value of SAR (measured) = 2.68 mW/g



0 dB = 2.68mW/g

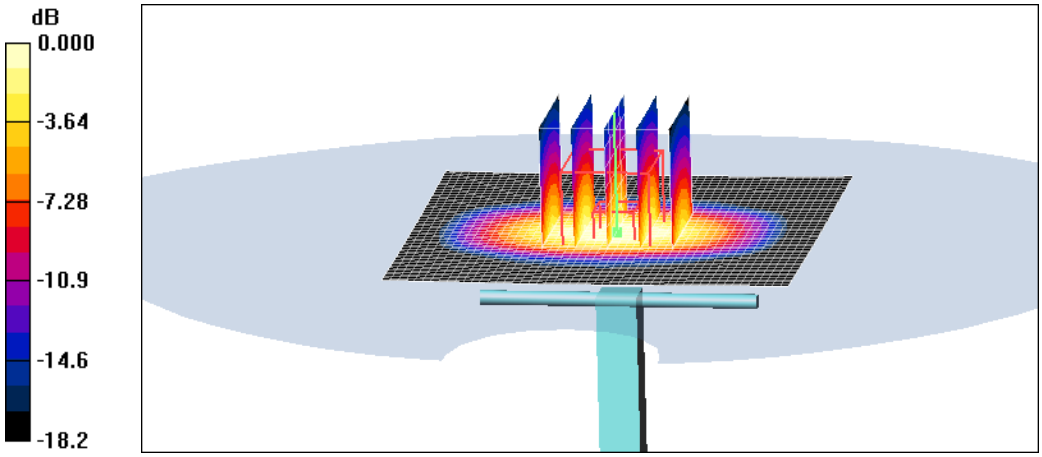
DUT: Dipole 1900 MHz; Serial: 5d082
Program Name: 1900MHz Dipole Validation 2010.10.21
Procedure Name: 1900MHz @ 250mW
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #1; Type: SAM; Serial: TP-1143
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

1900MHz @ 250mW/Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 16.0 mW/g

1900MHz @ 250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 90.3 V/m; Power Drift = 0.016 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 9.96 mW/g; SAR(10 g) = 5.13 mW/g
Maximum value of SAR (measured) = 11.2 mW/g



0 dB = 11.2mW/g

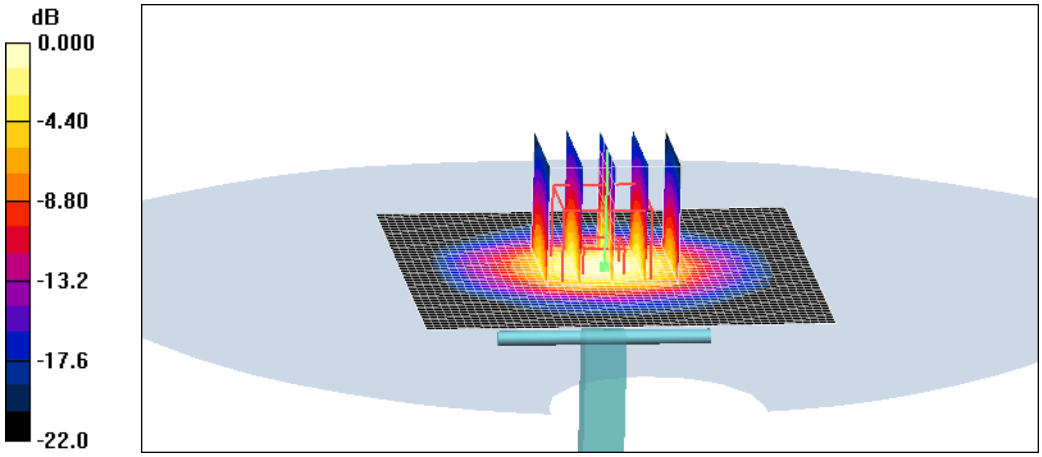
DUT: Dipole 2450 MHz; Serial: 807
Program Name: 2450MHz Dipole Validation 2010.10.19
Procedure Name: 2450MHz @ 100mW
Meas. Ambient Temp(celsius)-22.8,Tissue Temp(celsius)-22.2;Test Date-19/Oct/2010

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.83 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.38, 4.38, 4.38); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #1; Type: SAM; Serial: TP-1143
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

2450MHz @ 100mW /Area Scan (51x51x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 6.14 mW/g

2450MHz @ 100mW /Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 59.6 V/m; Power Drift = 0.078 dB
Peak SAR (extrapolated) = 11.7 W/kg
SAR(1 g) = 5.63 mW/g; SAR(10 g) = 2.62 mW/g
Maximum value of SAR (measured) = 6.40 mW/g



0 dB = 6.40mW/g

APPENDIX E

Plots of The SAR Measurements

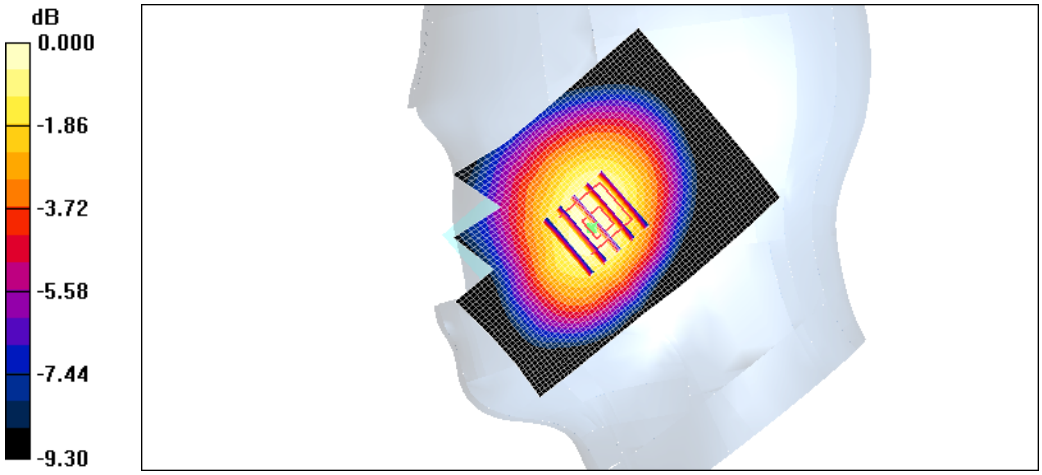
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM850 Right (Job No. : FH-230)
Procedure Name: Cheek/Touch, Ch.190, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.6,Tissue Temp(celsius)-22.3;Test Date-20/Oct/2010

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 836.6 MHz; σ = 0.91 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(5.77, 5.77, 5.77); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek/Touch, Ch.190, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.098 mW/g

Cheek/Touch, Ch.190, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.85 V/m; Power Drift = 0.135 dB
Peak SAR (extrapolated) = 0.116 W/kg
SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.068 mW/g
Maximum value of SAR (measured) = 0.095 mW/g



0 dB = 0.095mW/g

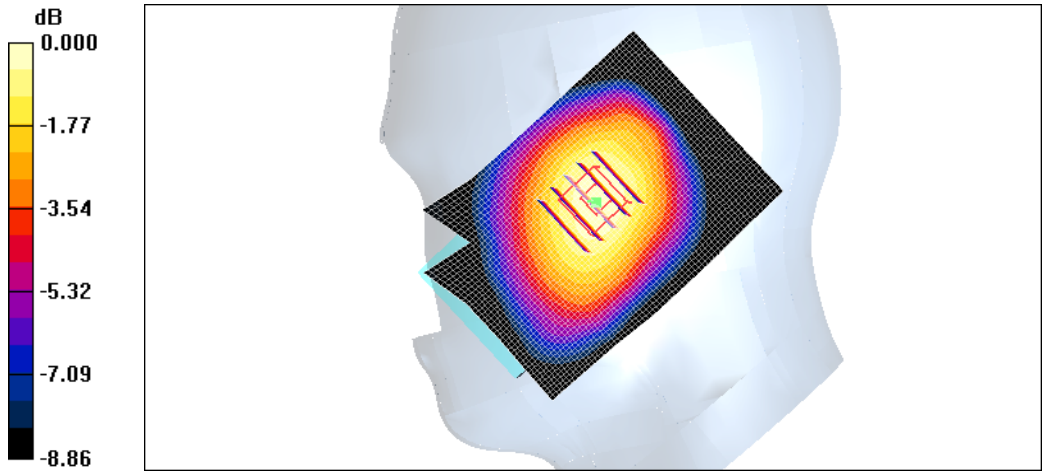
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM850 Right (Job No. : FH-230)
Procedure Name: Ear/Tilt, Ch.190, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.6,Tissue Temp(celsius)-22.3;Test Date-20/Oct/2010

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 836.6 MHz; σ = 0.91 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(5.77, 5.77, 5.77); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Ear/Tilt, Ch.190, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.070 mW/g

Ear/Tilt, Ch.190, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.88 V/m; Power Drift = 0.097 dB
Peak SAR (extrapolated) = 0.084 W/kg
SAR(1 g) = 0.067 mW/g; SAR(10 g) = 0.050 mW/g
Maximum value of SAR (measured) = 0.071 mW/g



0 dB = 0.071mW/g

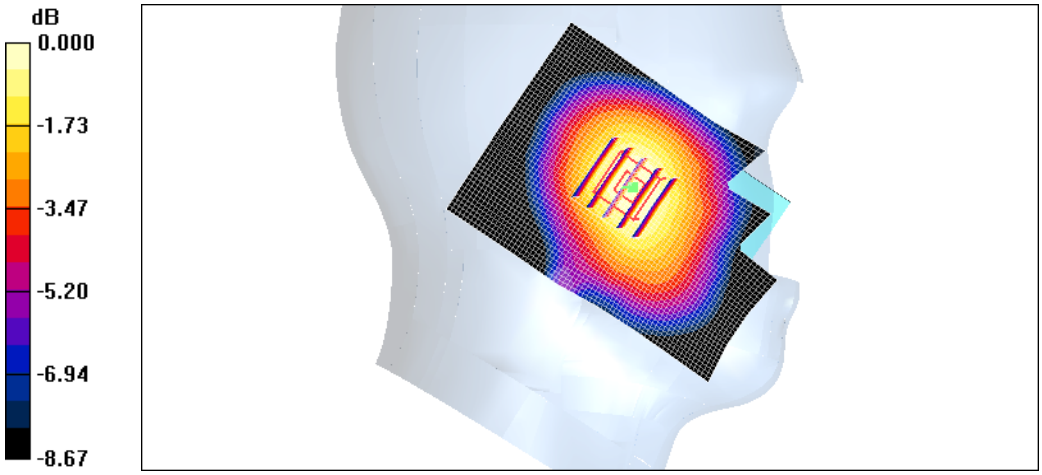
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM850 Left (Job No. : FH-230)
Procedure Name: Cheek/Touch, Ch.190, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.6,Tissue Temp(celsius)-22.3;Test Date-20/Oct/2010

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 836.6 MHz; σ = 0.91 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(5.77, 5.77, 5.77); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek/Touch, Ch.190, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.091 mW/g

Cheek/Touch, Ch.190, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.47 V/m; Power Drift = 0.042 dB
Peak SAR (extrapolated) = 0.107 W/kg
SAR(1 g) = 0.084 mW/g; SAR(10 g) = 0.063 mW/g
Maximum value of SAR (measured) = 0.089 mW/g



0 dB = 0.089mW/g

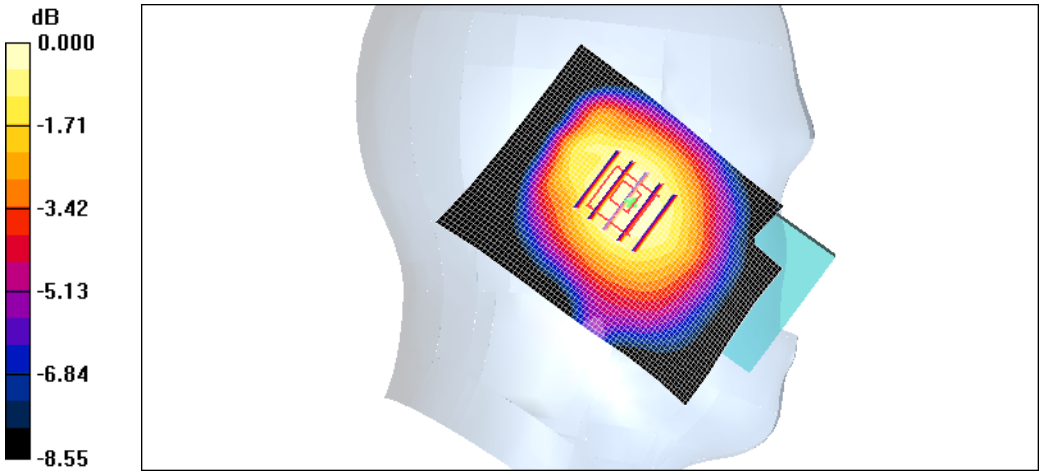
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM850 Left (Job No. : FH-230)
Procedure Name: Ear/Tilt, Ch.190, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.6,Tissue Temp(celsius)-22.3;Test Date-20/Oct/2010

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 836.6 MHz; σ = 0.91 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(5.77, 5.77, 5.77); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Ear/Tilt, Ch.190, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.072 mW/g

Ear/Tilt, Ch.190, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.46 V/m; Power Drift = -0.026 dB
Peak SAR (extrapolated) = 0.087 W/kg
SAR(1 g) = 0.068 mW/g; SAR(10 g) = 0.052 mW/g
Maximum value of SAR (measured) = 0.071 mW/g



0 dB = 0.071mW/g

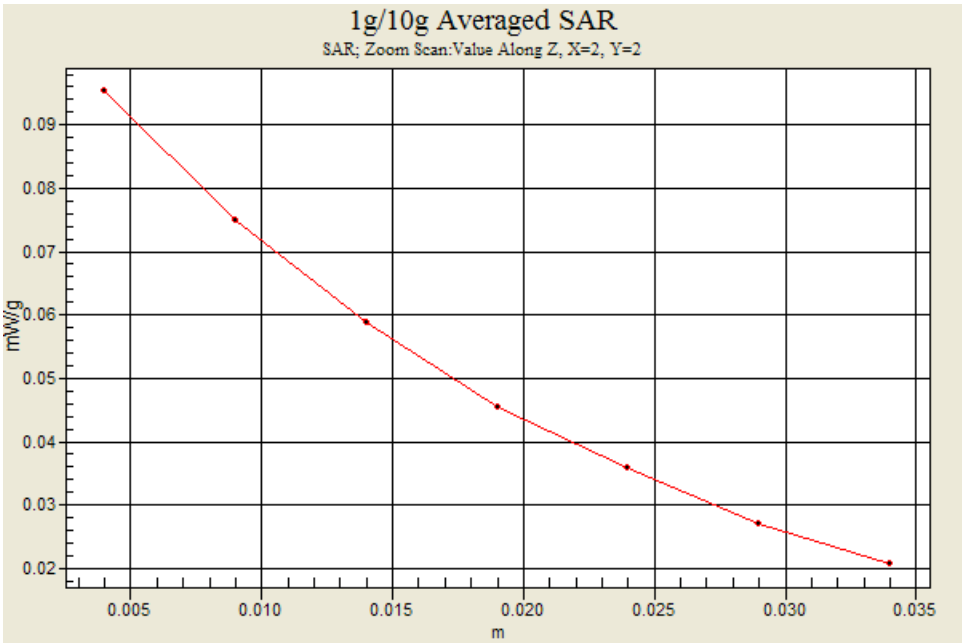
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM850 Right (Job No. : FH-230)
Procedure Name: Cheek/Touch, Ch.190, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.6,Tissue Temp(celsius)-22.3;Test Date-20/Oct/2010

Communication System: GSM 850; Frequency: 836.6 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 836.6 MHz; σ = 0.91 mho/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(5.77, 5.77, 5.77); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek/Touch, Ch.190, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.098 mW/g

Cheek/Touch, Ch.190, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.85 V/m; Power Drift = 0.135 dB
Peak SAR (extrapolated) = 0.116 W/kg
SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.068 mW/g
Maximum value of SAR (measured) = 0.095 mW/g



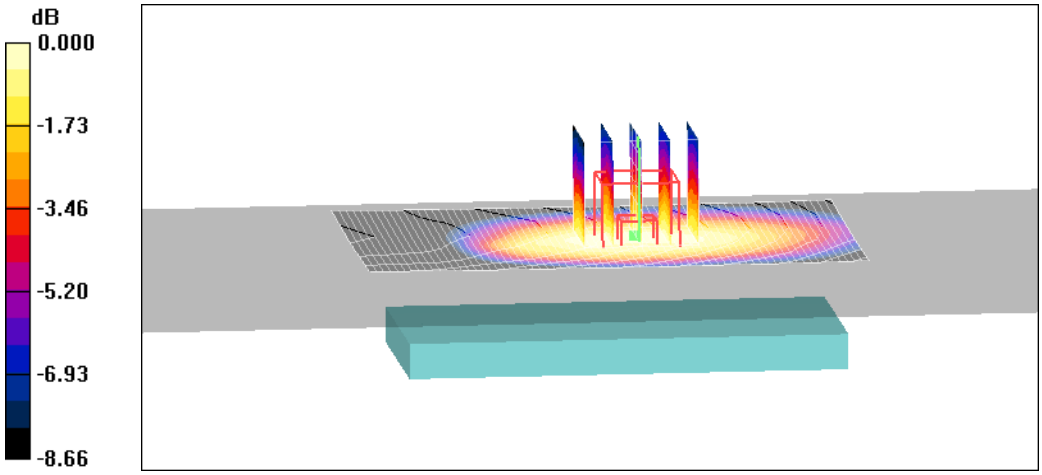
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GPRS850 Body (Job No. : FH-230)
Procedure Name: Body, Ch. 251, Ant. Intenna, Bat. Standard
Meas. Ambient Temp(celsius)-22.6,Tissue Temp(celsius)-22.3;Test Date-20/Oct/2010

Communication System: GPRS 850; Frequency: 848.8 MHz;Duty Cycle: 1:2.075
Medium parameters used: f = 848.8 MHz; σ = 0.96 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(5.7, 5.7, 5.7); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: Triple Flat Phantom 5.1; Type: Triple Flat Phantom 5.1; Serial: 1001
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Body, Ch. 251, Ant. Intenna, Bat. Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.282 mW/g

Body, Ch. 251, Ant. Intenna, Bat. Standard/Zoom Scan 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.5 V/m; Power Drift = -0.018 dB
Peak SAR (extrapolated) = 0.391 W/kg
SAR(1 g) = 0.284 mW/g; SAR(10 g) = 0.210 mW/g
Maximum value of SAR (measured) = 0.296 mW/g



0 dB = 0.296mW/g

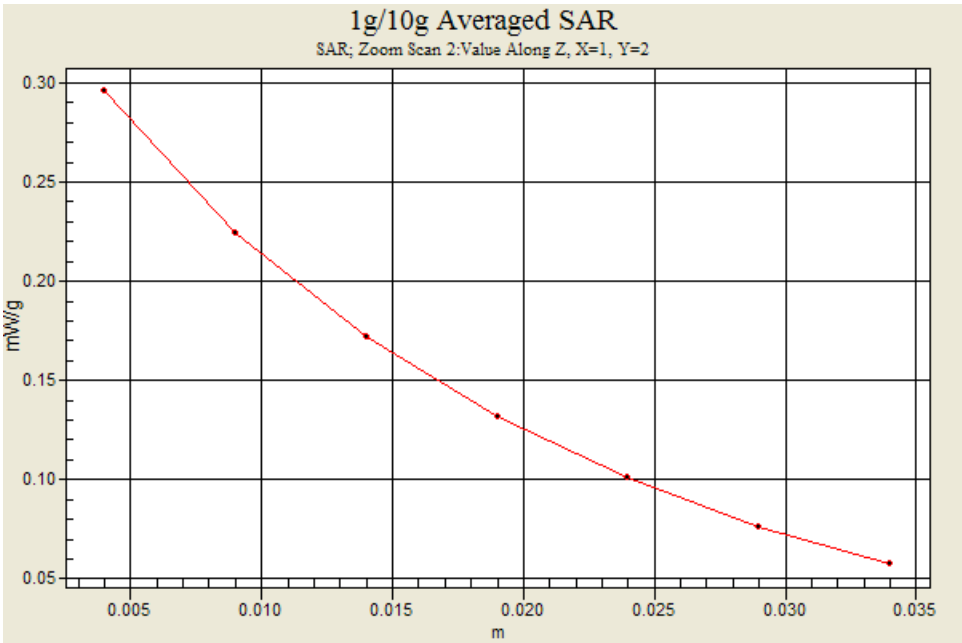
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GPRS850 Body (Job No. : FH-230)
Procedure Name: Body, Ch. 251, Ant. Intenna, Bat. Standard
Meas. Ambient Temp(celsius)-22.6,Tissue Temp(celsius)-22.3;Test Date-20/Oct/2010

Communication System: GPRS 850; Frequency: 848.8 MHz;Duty Cycle: 1:2.075
Medium parameters used: f = 848.8 MHz; σ = 0.96 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(5.7, 5.7, 5.7); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: Triple Flat Phantom 5.1; Type: Triple Flat Phantom 5.1; Serial: 1001
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Body, Ch. 251, Ant. Intenna, Bat. Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.282 mW/g

Body, Ch. 251, Ant. Intenna, Bat. Standard/Zoom Scan 2 (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.5 V/m; Power Drift = -0.018 dB
Peak SAR (extrapolated) = 0.391 W/kg
SAR(1 g) = 0.284 mW/g; SAR(10 g) = 0.210 mW/g
Maximum value of SAR (measured) = 0.296 mW/g



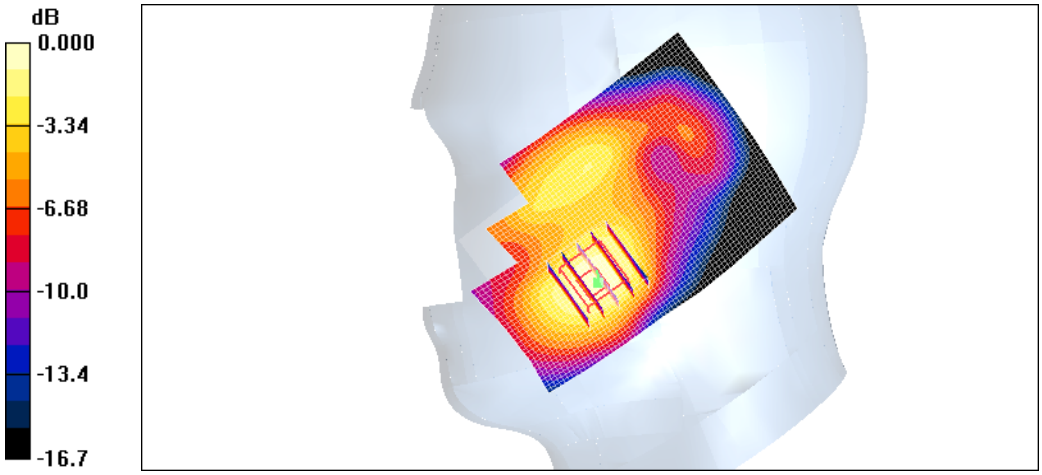
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM1900 Right (Job No. : FH-230)
Procedure Name: Cheek/Touch, Ch.661, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek/Touch, Ch.661, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.188 mW/g

Cheek/Touch, Ch.661, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.76 V/m; Power Drift = 0.046 dB
Peak SAR (extrapolated) = 0.292 W/kg
SAR(1 g) = 0.187 mW/g; SAR(10 g) = 0.113 mW/g
Maximum value of SAR (measured) = 0.204 mW/g



0 dB = 0.204mW/g

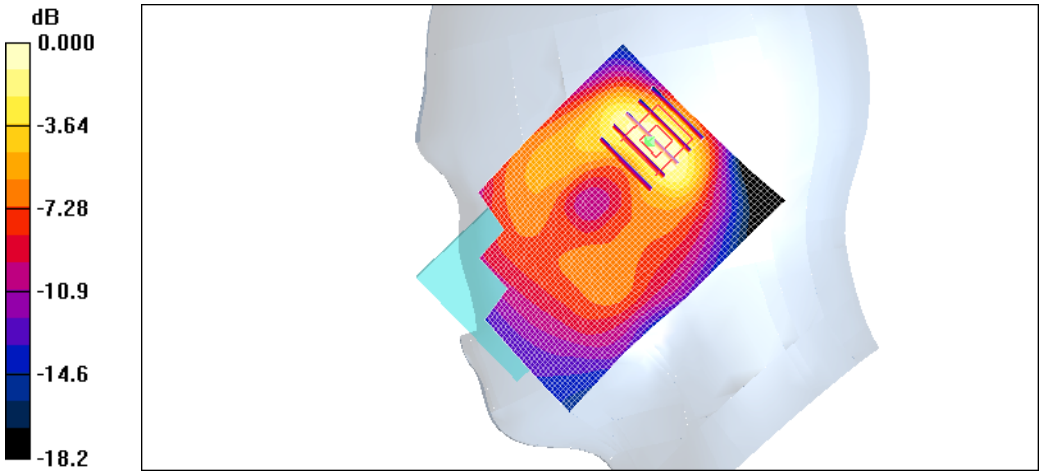
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM1900 Right (Job No. : FH-230)
Procedure Name: Ear/Tilt, Ch.661, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Ear/Tilt, Ch.661, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.102 mW/g

Ear/Tilt, Ch.661, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.52 V/m; Power Drift = 0.070 dB
Peak SAR (extrapolated) = 0.152 W/kg
SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.051 mW/g
Maximum value of SAR (measured) = 0.101 mW/g



0 dB = 0.101mW/g

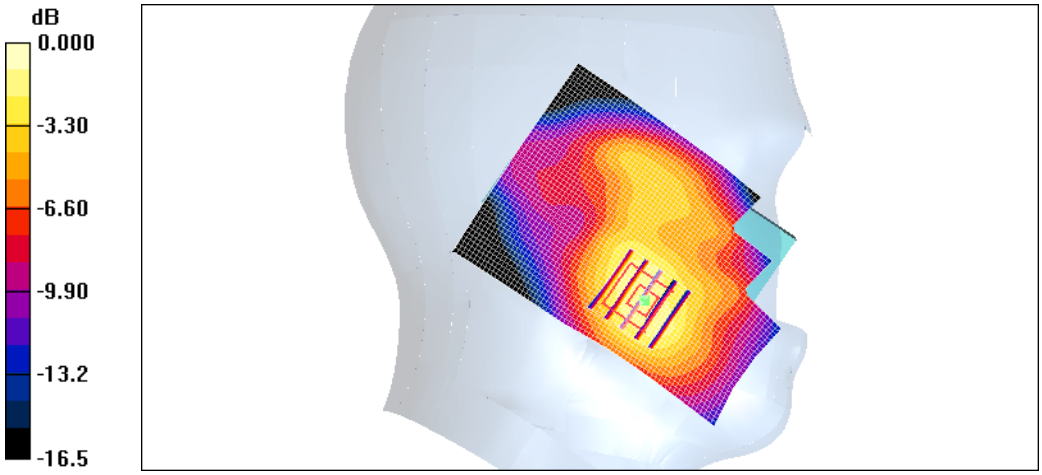
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM1900 Left (Job No. : FH-230)
Procedure Name: Cheek/Touch, Ch.661, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek/Touch, Ch.661, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.175 mW/g

Cheek/Touch, Ch.661, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.51 V/m; Power Drift = -0.036 dB
Peak SAR (extrapolated) = 0.326 W/kg
SAR(1 g) = 0.208 mW/g; SAR(10 g) = 0.123 mW/g
Maximum value of SAR (measured) = 0.231 mW/g



0 dB = 0.231mW/g

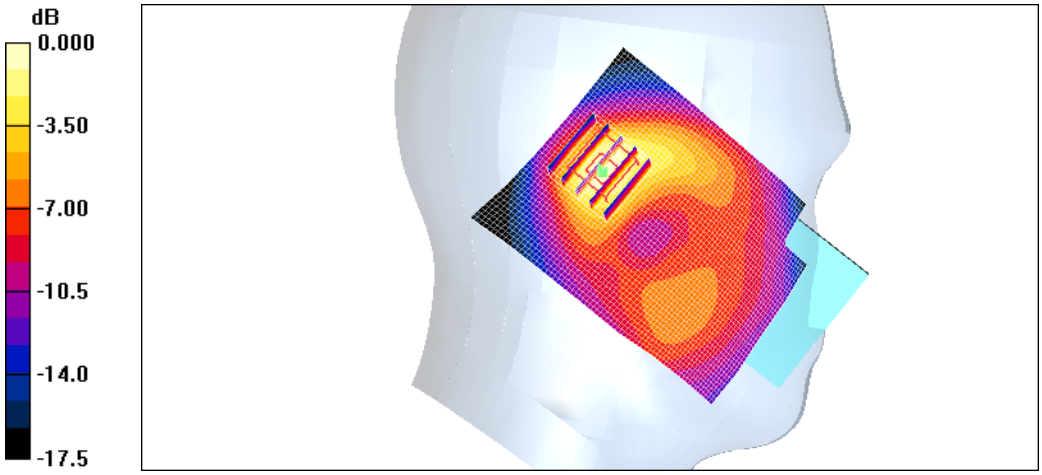
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM1900 Left (Job No. : FH-230)
Procedure Name: Ear/Tilt, Ch.661, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Ear/Tilt, Ch.661, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.116 mW/g

Ear/Tilt, Ch.661, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.04 V/m; Power Drift = -0.073 dB
Peak SAR (extrapolated) = 0.179 W/kg
SAR(1 g) = 0.106 mW/g; SAR(10 g) = 0.059 mW/g
Maximum value of SAR (measured) = 0.120 mW/g



0 dB = 0.120mW/g

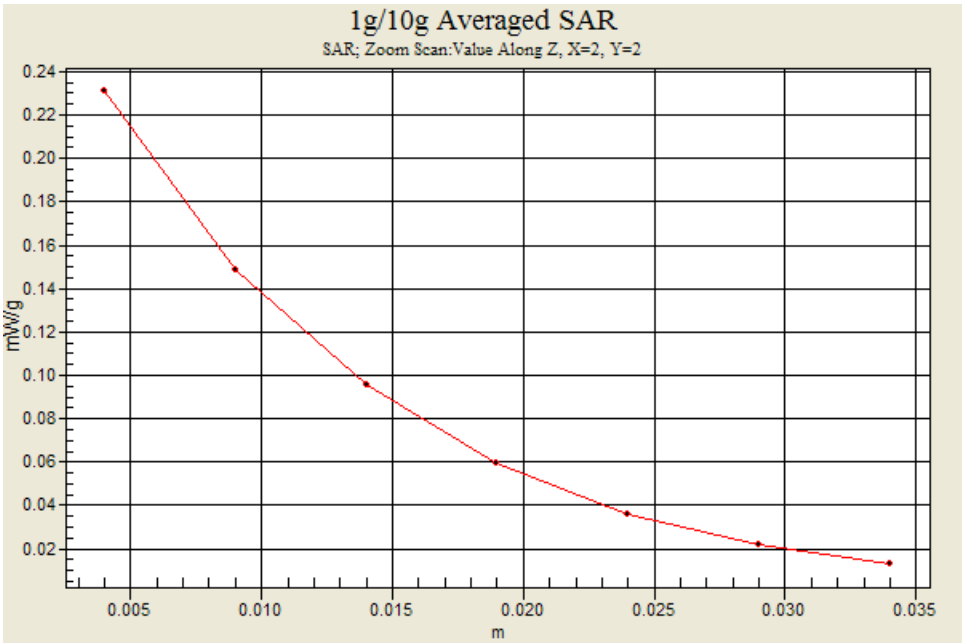
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GSM1900 Left (Job No. : FH-230)
Procedure Name: Cheek/Touch, Ch.661, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek/Touch, Ch.661, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.175 mW/g

Cheek/Touch, Ch.661, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.51 V/m; Power Drift = -0.036 dB
Peak SAR (extrapolated) = 0.326 W/kg
SAR(1 g) = 0.208 mW/g; SAR(10 g) = 0.123 mW/g
Maximum value of SAR (measured) = 0.231 mW/g



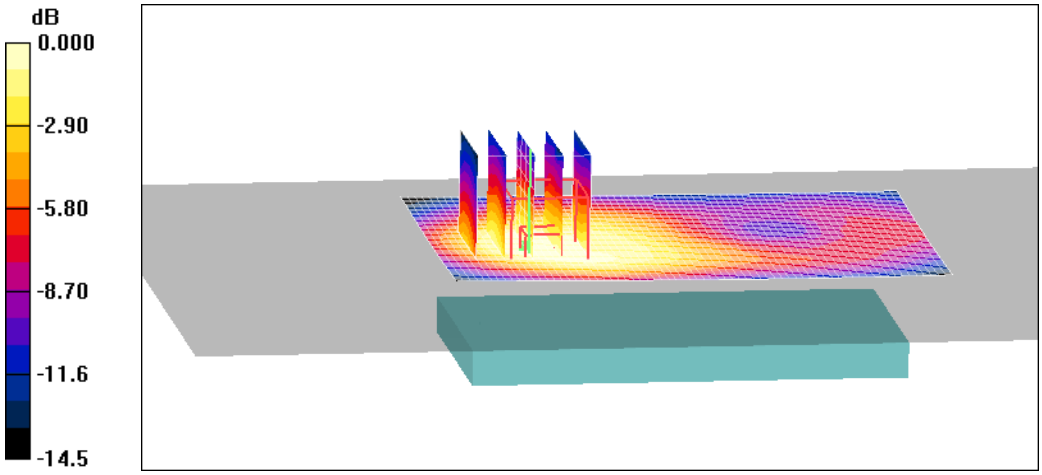
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GPRS1900 Body (Job No. : FH-230)
Procedure Name: Body, Ch.661, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.4,Tissue Temp(celsius)-22.0;Test Date-21/Oct/2010

Communication System: GPRS 1900; Frequency: 1880 MHz;Duty Cycle: 1:2.075
Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: Triple Flat Phantom 5.1; Type: Triple Flat Phantom 5.1; Serial: 1001
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Body, Ch.661, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.473 mW/g

Body, Ch.661, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.8 V/m; Power Drift = 0.061 dB
Peak SAR (extrapolated) = 0.589 W/kg
SAR(1 g) = 0.396 mW/g; SAR(10 g) = 0.252 mW/g
Maximum value of SAR (measured) = 0.427 mW/g



0 dB = 0.427mW/g

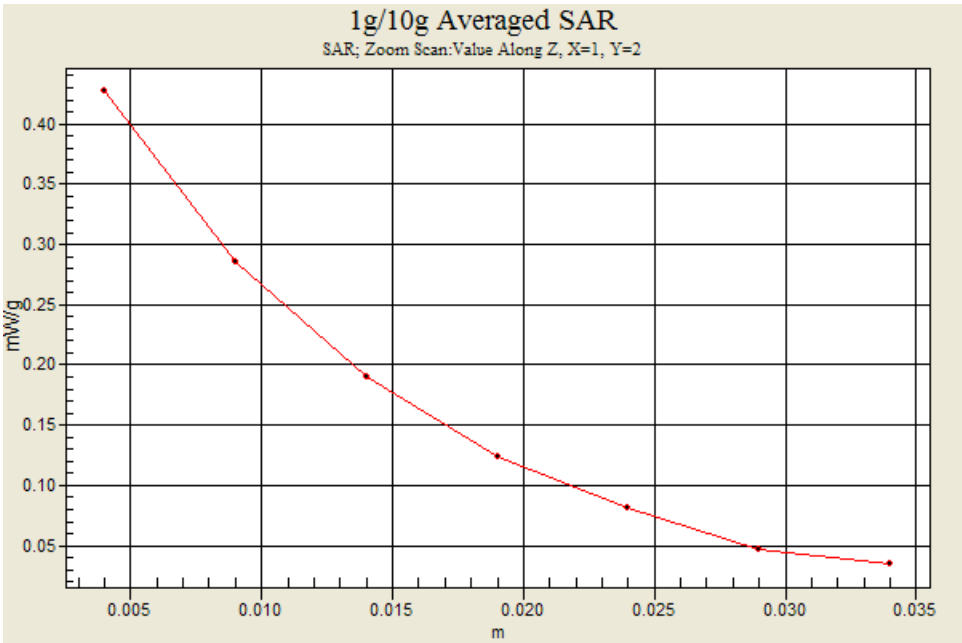
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 GPRS1900 Body (Job No. : FH-230)
Procedure Name: Body, Ch.661, Ant.Intenna, Bat.Standard 4TX
Meas. Ambient Temp(celsius)-22.4,Tissue Temp(celsius)-22.0;Test Date-21/Oct/2010

Communication System: GPRS 1900; Frequency: 1880 MHz;Duty Cycle: 1:2.075
Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: Triple Flat Phantom 5.1; Type: Triple Flat Phantom 5.1; Serial: 1001
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Body, Ch.661, Ant.Intenna, Bat.Standard 4TX/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.473 mW/g

Body, Ch.661, Ant.Intenna, Bat.Standard 4TX/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.8 V/m; Power Drift = 0.061 dB
Peak SAR (extrapolated) = 0.589 W/kg
SAR(1 g) = 0.396 mW/g; SAR(10 g) = 0.252 mW/g
Maximum value of SAR (measured) = 0.427 mW/g



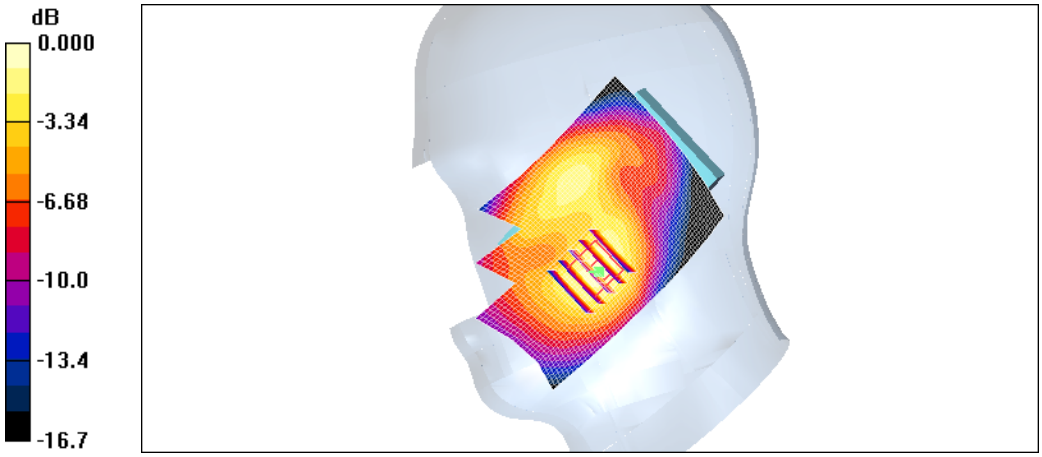
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WCDMA1900 Right (Job No.: FH-230)
Procedure Name: Cheek/Touch, Ch.9400, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek/Touch, Ch.9400, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.280 mW/g

Cheek/Touch, Ch.9400, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.86 V/m; Power Drift = 0.031 dB
Peak SAR (extrapolated) = 0.461 W/kg
SAR(1 g) = 0.293 mW/g; SAR(10 g) = 0.179 mW/g
Maximum value of SAR (measured) = 0.317 mW/g



0 dB = 0.317mW/g

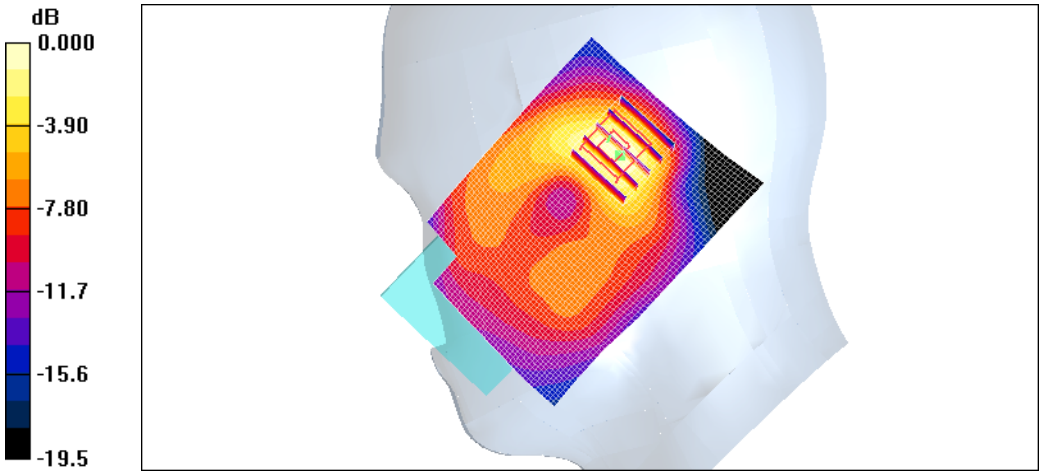
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WCDMA1900 Right (Job No.: FH-230)
Procedure Name: Ear/Tilt, Ch.9400, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Ear/Tilt, Ch.9400, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.185 mW/g

Ear/Tilt, Ch.9400, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.8 V/m; Power Drift = -0.189 dB
Peak SAR (extrapolated) = 0.282 W/kg
SAR(1 g) = 0.169 mW/g; SAR(10 g) = 0.094 mW/g
Maximum value of SAR (measured) = 0.187 mW/g



0 dB = 0.187mW/g

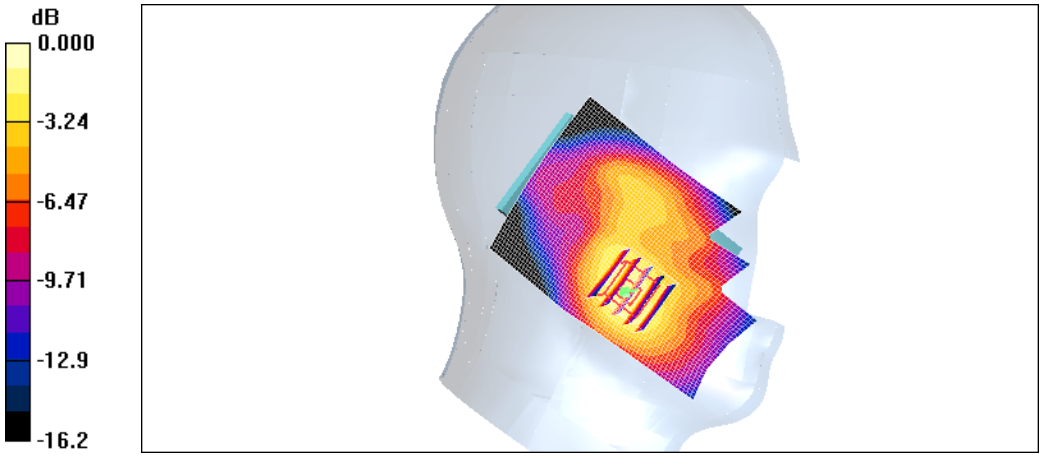
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WCDMA1900 Left (Job No.:FH-230)
Procedure Name: Cheek/Touch, Ch.9400, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek/Touch, Ch.9400, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.312 mW/g

Cheek/Touch, Ch.9400, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.82 V/m; Power Drift = 0.074 dB
Peak SAR (extrapolated) = 0.570 W/kg
SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.218 mW/g
Maximum value of SAR (measured) = 0.403 mW/g



0 dB = 0.403mW/g

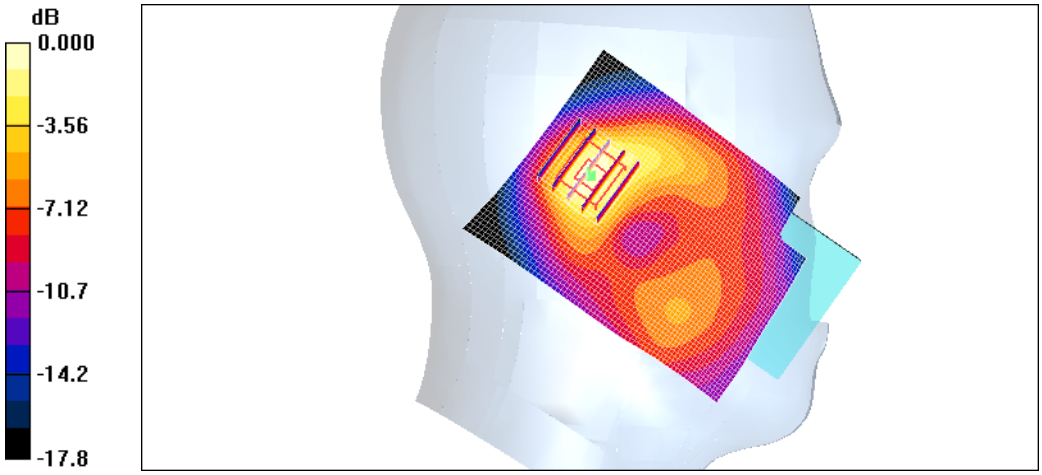
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WCDMA1900 Left (Job No.:FH-230)
Procedure Name: Ear/Tilt, Ch.9400, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Ear/Tilt, Ch.9400, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.190 mW/g

Ear/Tilt, Ch.9400, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.6 V/m; Power Drift = 0.061 dB
Peak SAR (extrapolated) = 0.290 W/kg
SAR(1 g) = 0.175 mW/g; SAR(10 g) = 0.098 mW/g
Maximum value of SAR (measured) = 0.196 mW/g



0 dB = 0.196mW/g

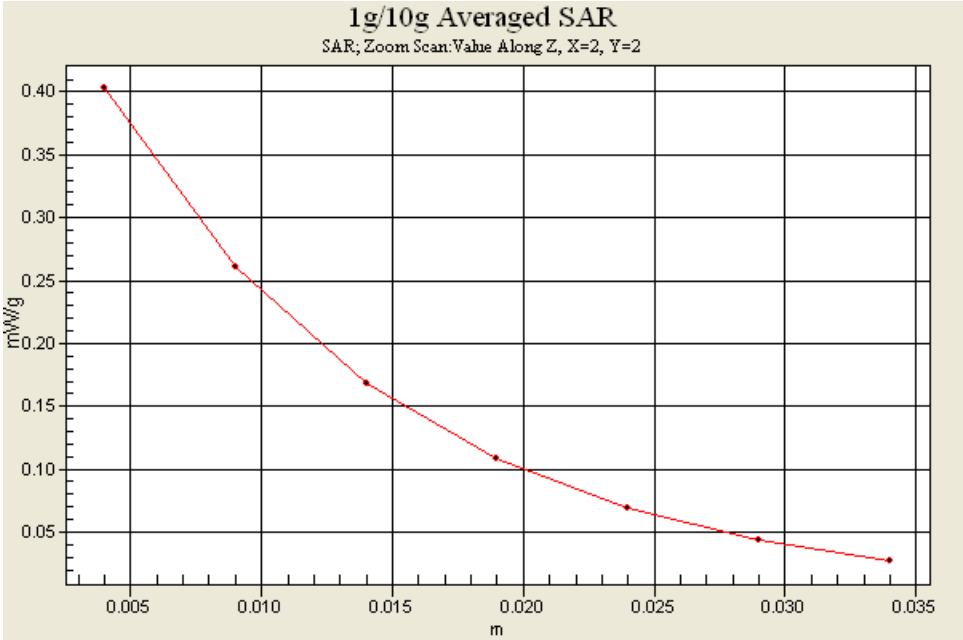
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WCDMA1900 Left (Job No.:FH-230)
Procedure Name: Cheek/Touch, Ch.9400, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-21/Oct/2010

Communication System: WCDMA1900; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.43 mho/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.87, 4.87, 4.87); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #2; Type: SAM; Serial: TP-1141
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek/Touch, Ch.9400, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.312 mW/g

Cheek/Touch, Ch.9400, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.82 V/m; Power Drift = 0.074 dB
Peak SAR (extrapolated) = 0.570 W/kg
SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.218 mW/g
Maximum value of SAR (measured) = 0.403 mW/g



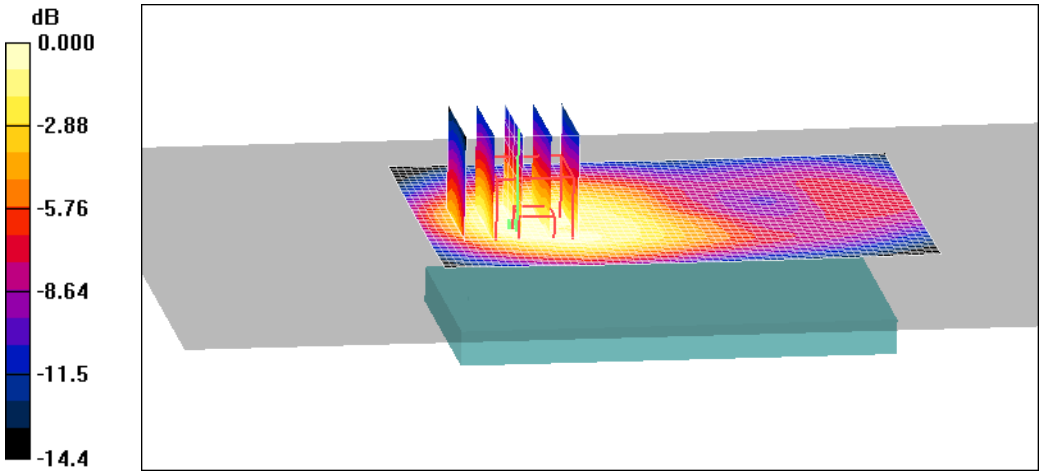
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WCDMA1900 Body (Job No. : FH-230)
Procedure Name: Body, Ch.9400, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.4,Tissue Temp(celsius)-22.0;Test Date-21/Oct/2010

Communication System: WCDMA; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: Triple Flat Phantom 5.1; Type: Triple Flat Phantom 5.1; Serial: 1001
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Body, Ch.9400, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.623 mW/g

Body, Ch.9400, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.9 V/m; Power Drift = 0.111 dB
Peak SAR (extrapolated) = 0.764 W/kg
SAR(1 g) = 0.499 mW/g; SAR(10 g) = 0.311 mW/g
Maximum value of SAR (measured) = 0.539 mW/g



0 dB = 0.539mW/g

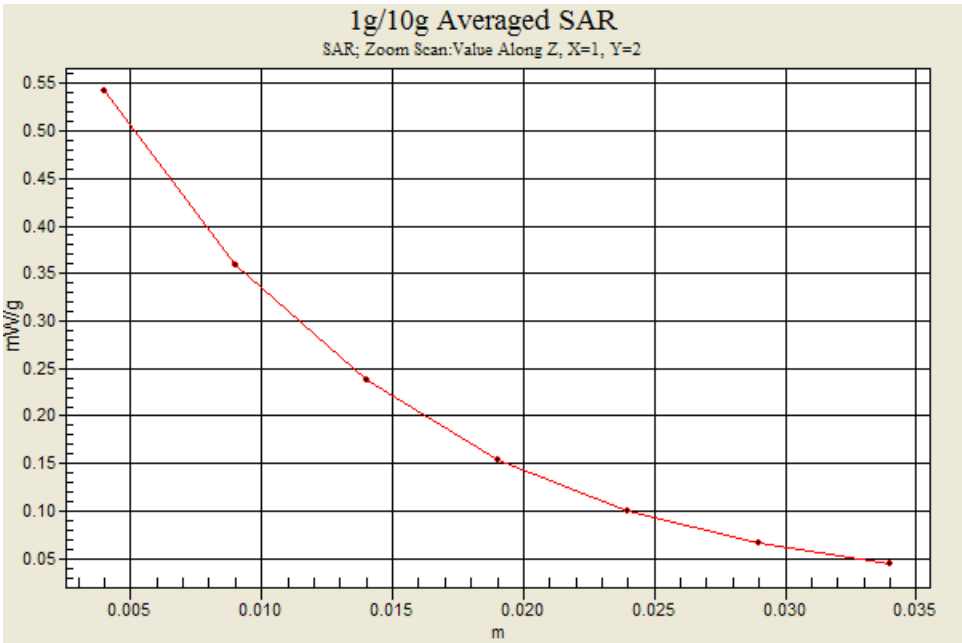
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WCDMA1900 Body (Job No. : FH-230)
Procedure Name: Body, Ch.9400, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.4,Tissue Temp(celsius)-22.0;Test Date-21/Oct/2010

Communication System: WCDMA; Frequency: 1880 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.55, 4.55, 4.55); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: Triple Flat Phantom 5.1; Type: Triple Flat Phantom 5.1; Serial: 1001
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Body, Ch.9400, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.623 mW/g

Body, Ch.9400, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.9 V/m; Power Drift = 0.111 dB
Peak SAR (extrapolated) = 0.764 W/kg
SAR(1 g) = 0.499 mW/g; SAR(10 g) = 0.311 mW/g
Maximum value of SAR (measured) = 0.539 mW/g



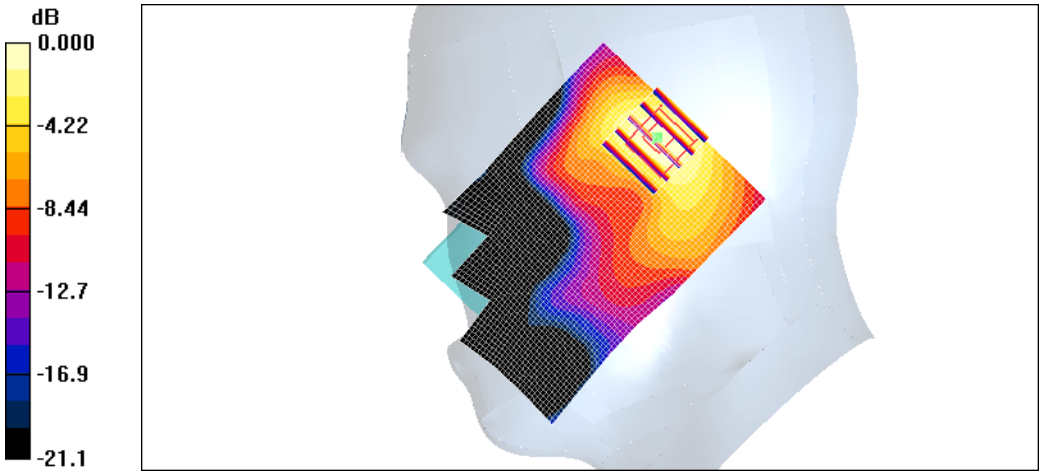
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WLAN Right(Job No. : FH-230)
Procedure Name: Cheek, Ch.06, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.8,Tissue Temp(celsius)-22.2;Test Date-19/Oct/2010

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.83 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.38, 4.38, 4.38); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #1; Type: SAM; Serial: TP-1143
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek, Ch.06, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.070 mW/g

Cheek, Ch.06, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.923 V/m; Power Drift = 0.010 dB
Peak SAR (extrapolated) = 0.120 W/kg
SAR(1 g) = 0.066 mW/g; SAR(10 g) = 0.036 mW/g
Maximum value of SAR (measured) = 0.074 mW/g



0 dB = 0.074mW/g

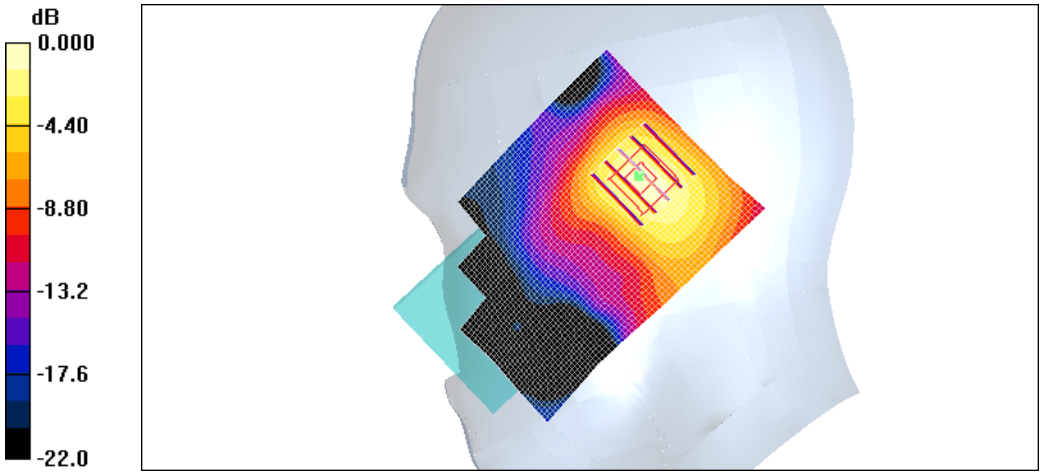
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WLAN Right(Job No. : FH-230)
Procedure Name: Tilted, Ch.06, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.8,Tissue Temp(celsius)-22.2;Test Date-19/Oct/2010

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.83 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Right Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.38, 4.38, 4.38); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #1; Type: SAM; Serial: TP-1143
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Tilted, Ch.06, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.059 mW/g

Tilted, Ch.06, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.28 V/m; Power Drift = 0.097 dB
Peak SAR (extrapolated) = 0.121 W/kg
SAR(1 g) = 0.064 mW/g; SAR(10 g) = 0.034 mW/g
Maximum value of SAR (measured) = 0.072 mW/g



0 dB = 0.072mW/g

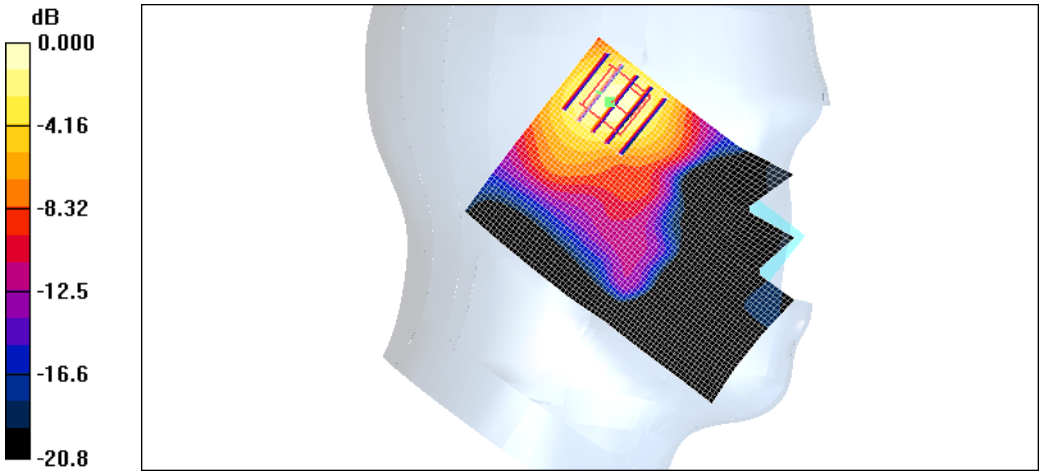
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WLAN Left(Job No. : FH-230)
Procedure Name: Cheek, Ch.06, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.8,Tissue Temp(celsius)-22.2;Test Date-19/Oct/2010

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.83 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.38, 4.38, 4.38); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #1; Type: SAM; Serial: TP-1143
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek, Ch.06, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.100 mW/g

Cheek, Ch.06, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.56 V/m; Power Drift = -0.110 dB
Peak SAR (extrapolated) = 0.208 W/kg
SAR(1 g) = 0.094 mW/g; SAR(10 g) = 0.048 mW/g
Maximum value of SAR (measured) = 0.110 mW/g



0 dB = 0.110mW/g

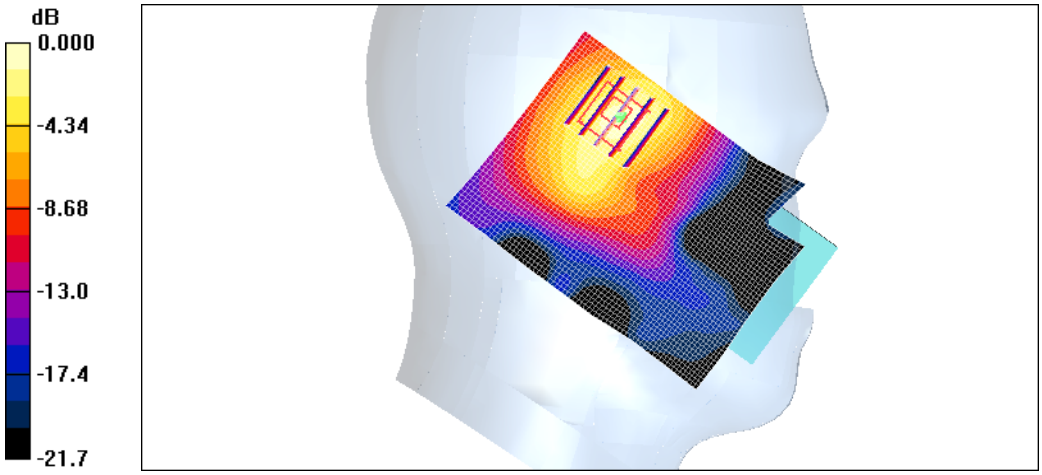
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WLAN Left(Job No. : FH-230)
Procedure Name: Tilted, Ch.06, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.8,Tissue Temp(celsius)-22.2;Test Date-19/Oct/2010

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.83 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.38, 4.38, 4.38); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #1; Type: SAM; Serial: TP-1143
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Tilted, Ch.06, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.076 mW/g

Tilted, Ch.06, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.54 V/m; Power Drift = 0.108 dB
Peak SAR (extrapolated) = 0.164 W/kg
SAR(1 g) = 0.078 mW/g; SAR(10 g) = 0.038 mW/g
Maximum value of SAR (measured) = 0.085 mW/g



0 dB = 0.085mW/g

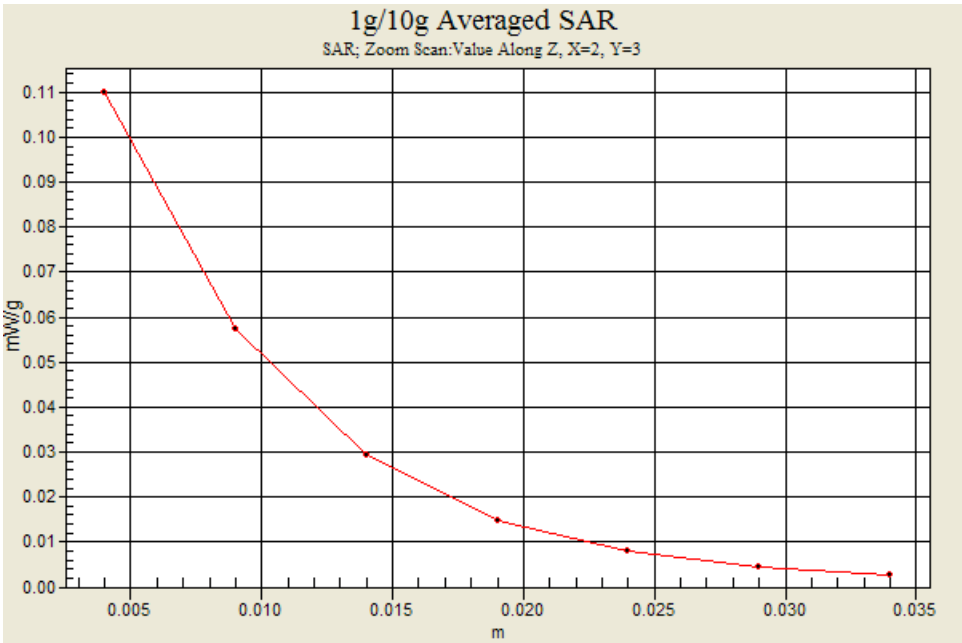
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WLAN Left(Job No. : FH-230)
Procedure Name: Cheek, Ch.06, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.8,Tissue Temp(celsius)-22.2;Test Date-19/Oct/2010

Communication System: WLAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.83 mho/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.38, 4.38, 4.38); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: PHANTOM #1; Type: SAM; Serial: TP-1143
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Cheek, Ch.06, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.100 mW/g

Cheek, Ch.06, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.56 V/m; Power Drift = -0.110 dB
Peak SAR (extrapolated) = 0.208 W/kg
SAR(1 g) = 0.094 mW/g; SAR(10 g) = 0.048 mW/g
Maximum value of SAR (measured) = 0.110 mW/g



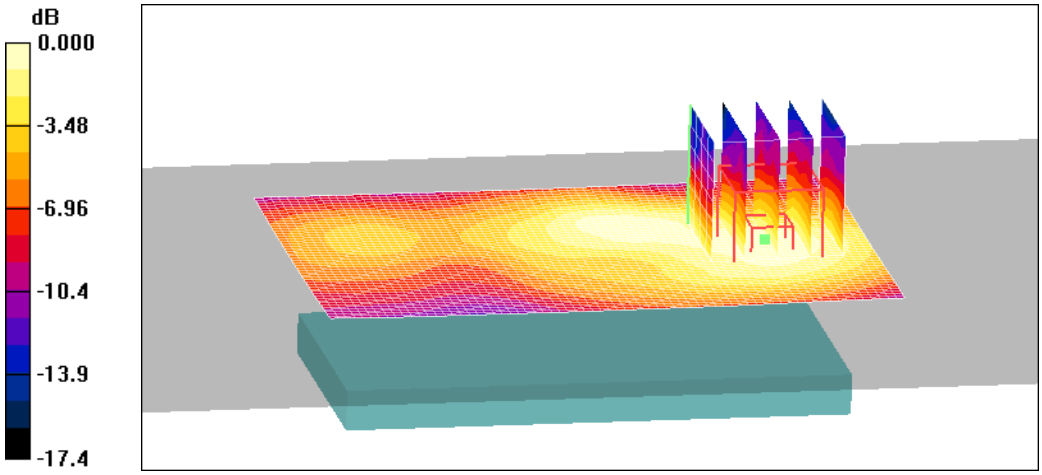
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WLAN Body (Job No. : FH-230)
Procedure Name: Body, Ch.11, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-19/Oct/2010

Communication System: WLAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.98 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.2, 4.2, 4.2); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: Triple Flat Phantom 5.1; Type: Triple Flat Phantom 5.1; Serial: 1001
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Body, Ch.11, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.033 mW/g

Body, Ch.11, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.40 V/m; Power Drift = 0.010 dB
Peak SAR (extrapolated) = 0.056 W/kg
SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.033 mW/g



0 dB = 0.033mW/g

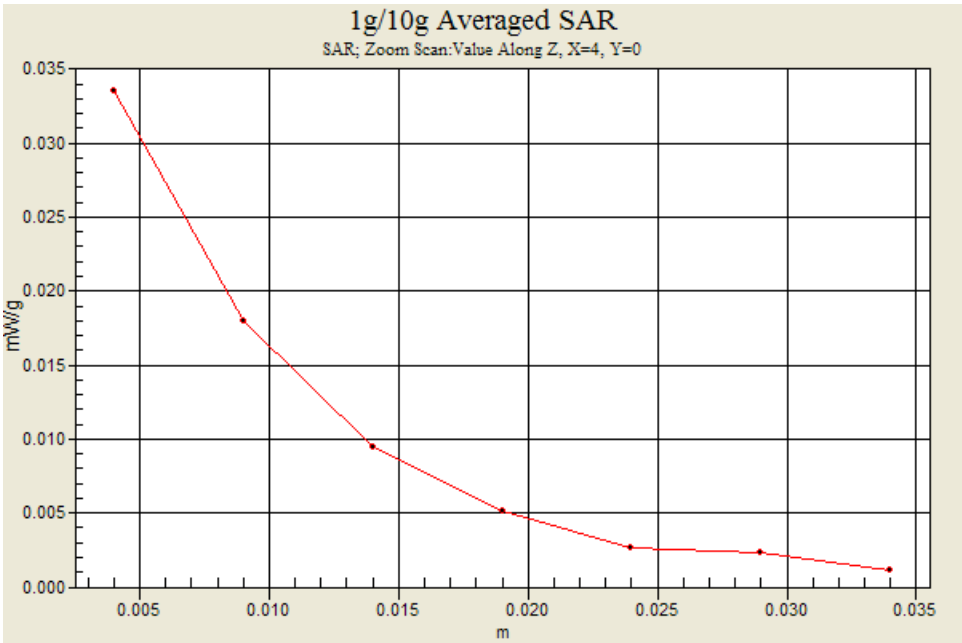
DUT: GT-I9003; Serial: FH-230-B
Program Name: GT-I9003 WLAN Body (Job No. : FH-230)
Procedure Name: Body, Ch.11, Ant.Intenna, Bat.Standard
Meas. Ambient Temp(celsius)-22.3,Tissue Temp(celsius)-21.9;Test Date-19/Oct/2010

Communication System: WLAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.98 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3
Phantom section: Left Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3080; ConvF(4.2, 4.2, 4.2); Calibrated: 2010-01-27
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn533; Calibrated: 2010-09-22
- Phantom: Triple Flat Phantom 5.1; Type: Triple Flat Phantom 5.1; Serial: 1001
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 184

Body, Ch.11, Ant.Intenna, Bat.Standard/Area Scan (51x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.033 mW/g

Body, Ch.11, Ant.Intenna, Bat.Standard/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.40 V/m; Power Drift = 0.010 dB
Peak SAR (extrapolated) = 0.056 W/kg
SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.033 mW/g



APPENDIX F

Probe Calibration

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

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

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

Accreditation No.: SCS 108

Client **Samsung (Dymstec)**

Certificate No: ES3-3080_Jan10

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3080
Calibration procedure(s)	QA CAL-01.v6, QA CAL-23.v3 and QA CAL-25.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	January 27, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

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

Issued: January 27, 2010

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

O.K to use
2010.2.18

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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 *NORMx,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.

Probe ES3DV3

SN:3080

Manufactured:	March 14, 2005
Last calibrated:	January 20, 2009
Recalibrated:	January 27, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3080

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.24	1.13	1.18	± 10.1%
DCP (mV)[B]	93.7	92.4	96.5	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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

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

[B] Numerical linearization parameter: uncertainty not required.

[E] Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

DASY - Parameters of Probe: ES3DV3 SN:3080

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
850	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	5.77	5.77	5.77	0.99	1.10 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	5.04	5.04	5.04	0.84	1.18 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	4.87	4.87	4.87	0.52	1.50 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	4.38	4.38	4.38	0.60	1.47 ± 11.0%

[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

DASY - Parameters of Probe: ES3DV3 SN:3080

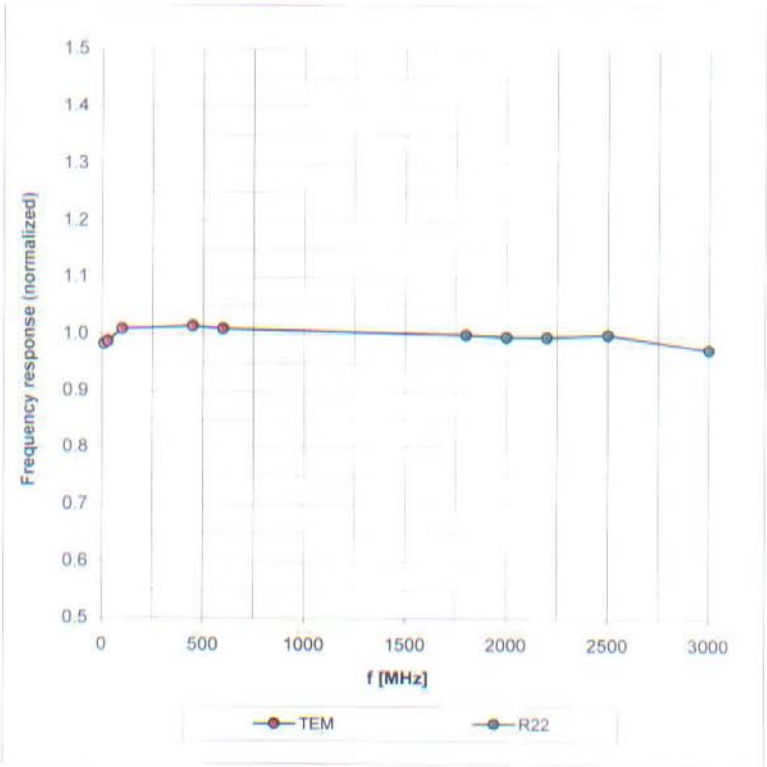
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
850	± 50 / ± 100	55.2 ± 5%	0.99 ± 5%	5.70	5.70	5.70	0.99	1.12 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	4.85	4.85	4.85	0.60	1.50 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	4.55	4.55	4.55	0.42	1.96 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	4.20	4.20	4.20	0.99	1.12 ± 11.0%

[C] The validity of ± 100 MHz only applies for DASY v4 4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

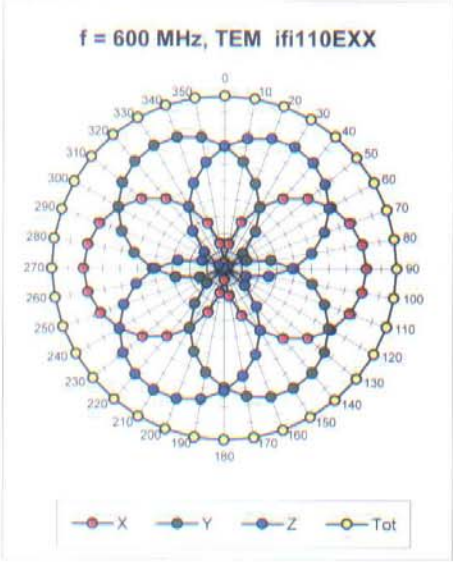
Frequency Response of E-Field

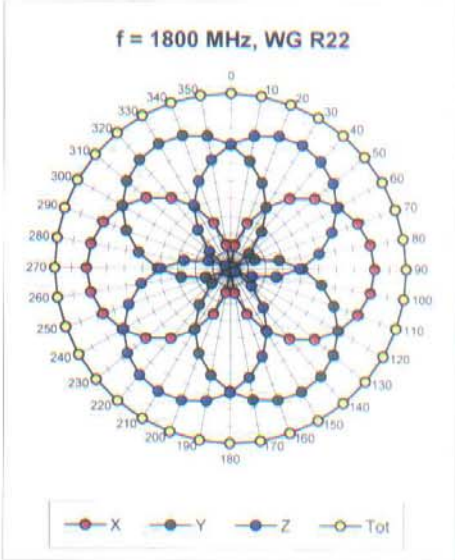
(TEM-Cell:ifi110 EXX, Waveguide: R22)

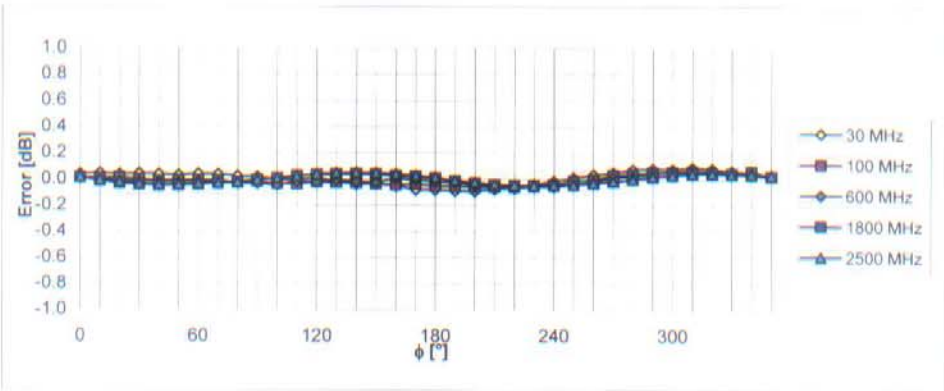


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



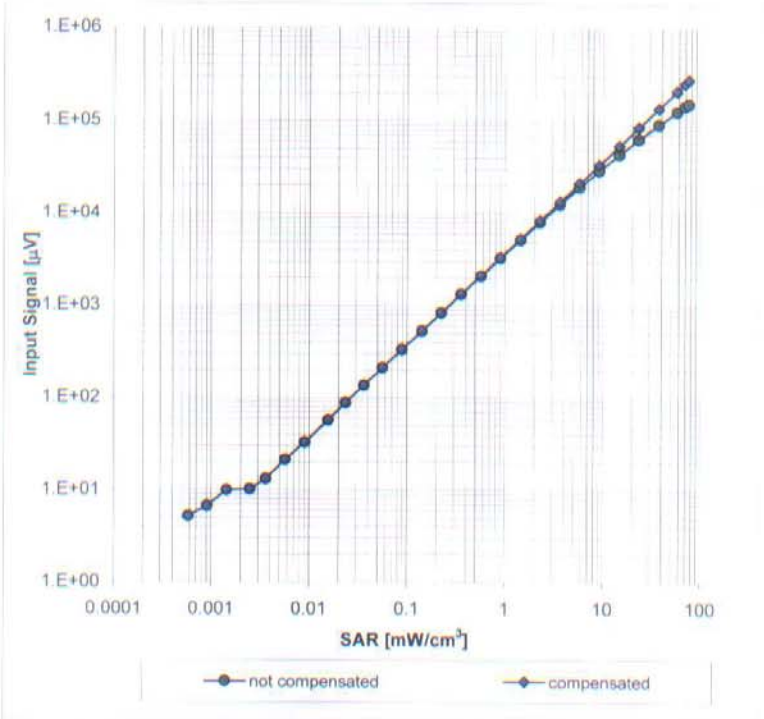


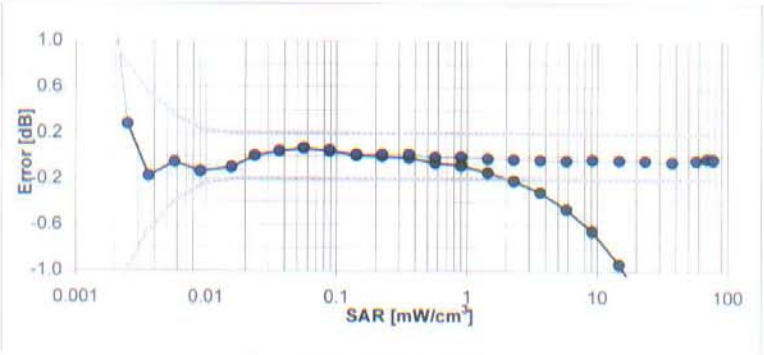


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

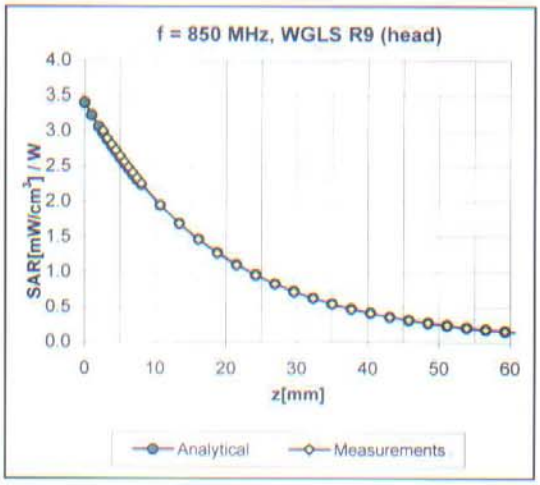
(Waveguide R22, f = 1800 MHz)

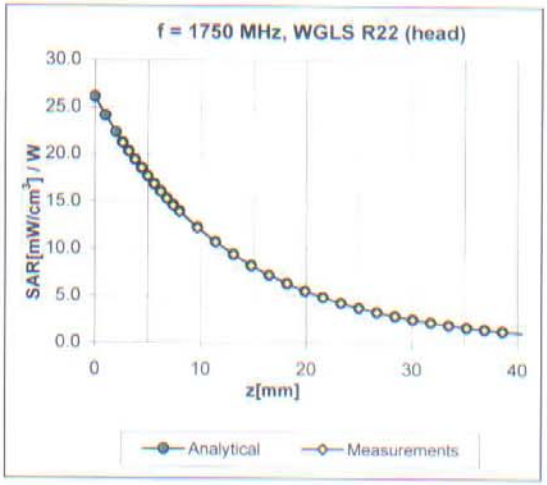




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

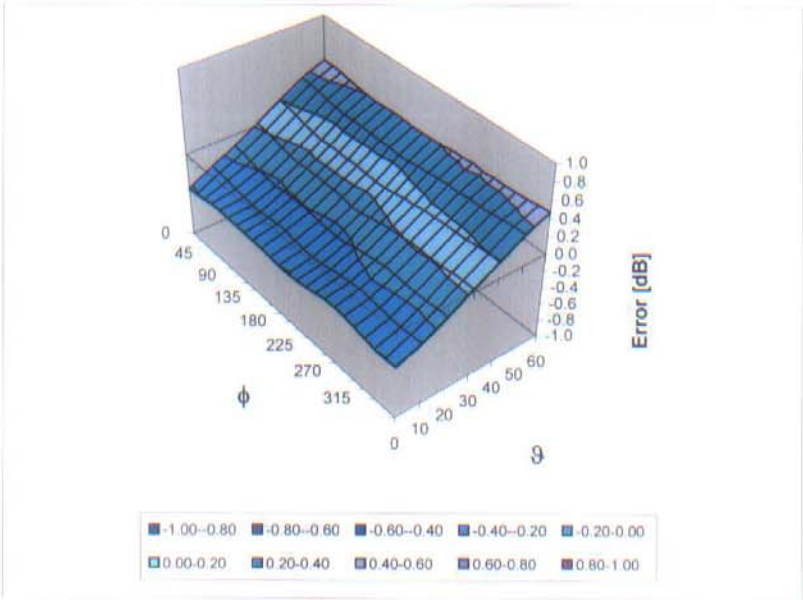
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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	4.0 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm