SAR TEST REPORT

Eequipment Under Test :	54Mbps Wireless USB Adapter
Model No. :	TL-WN322G
Market name:	TL-WN322G
FCC ID:	TE7WN322GV1
Applicant :	TP-LINK Technologies CO.,LTD
Address of Applicant :	Building 7,Section 2, Honghualing Industrial Park, Xili, Nanshan District
Date of Receipt :	2007.03.06
Date of Test :	2007.03.13 – 2007.03.14
Date of Issue :	2007.03.22

Standards

FCC OET Bulletin 65 supplement C,
ANSI/IEEE C95.1, C95.3, IEEE 1528-2003

In the configuration tested, the EUT complied with the standards specified above.

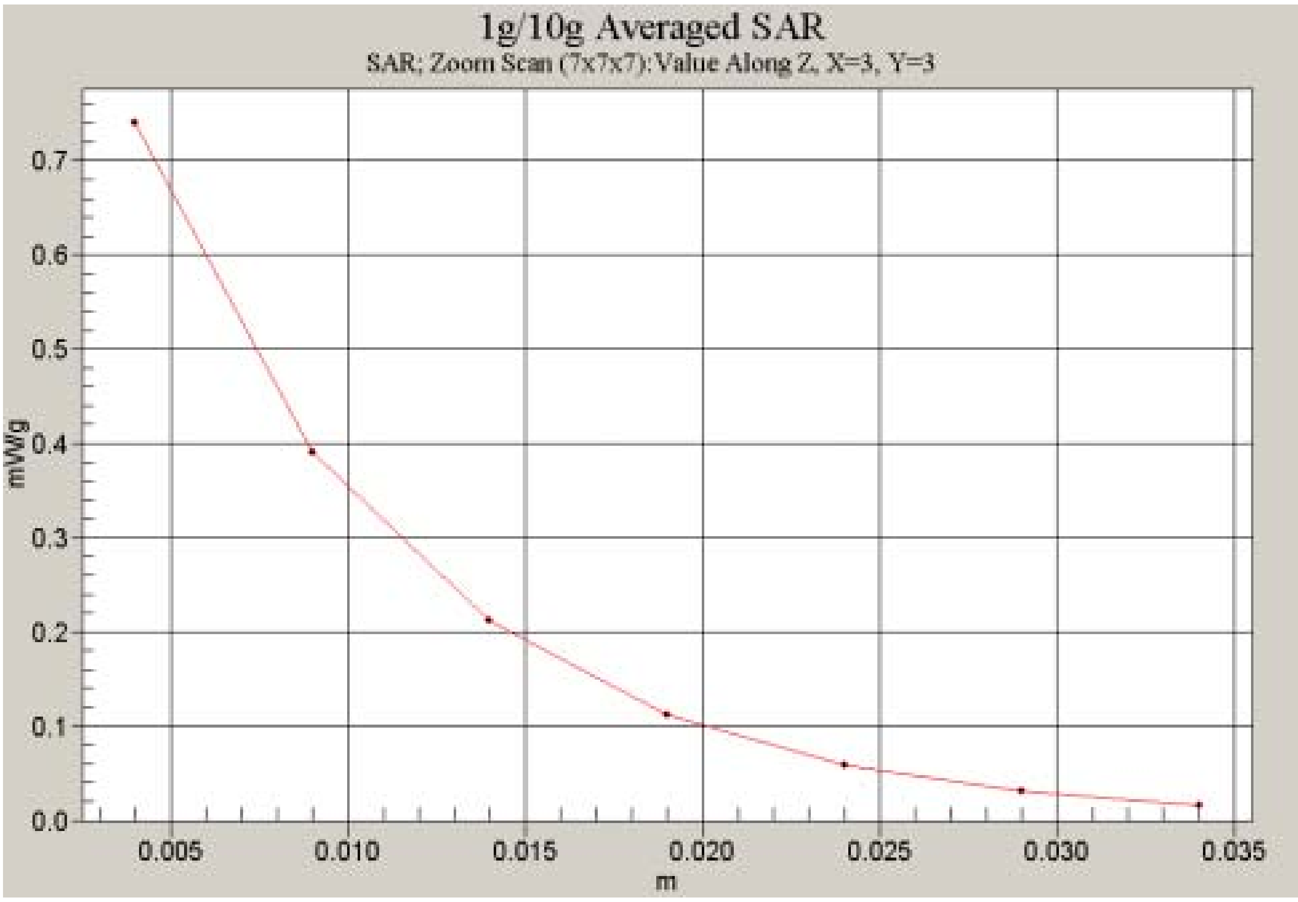
Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

This report may only be reproduced and distributed in full. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS-CSTC Shanghai GSM Lab or testing done by SGS-CSTC Shanghai GSM Lab must approve SGS Shanghai GSM Lab in connection with distribution or use of the product described in this report in writing.

Tested by :	Zenger Zhang	Date :	2007.03.22
Approved by :	Zhiang Yuan	Date :	2007.03.22

Contents


1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=3
mW/g
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

1. General Information

1.1 Test Laboratory

GSM Lab
SGS-CSTC Standards Technical Services Co.Ltd Shanghai Branch
9F,the 3rd Building, No.889, Yishan Rd, Xuhui District, Shanghai, China
Zip code: 200233
Telephone: +86 (0) 21 6495 1616
Fax: +86 (0) 21 6495 3679
Internet: http://www.cn.sgs.com

1.2 Details of Applicant

Name: TP-LINK Technologies CO.,LTD
Address: Building 7,Section 2, Honghualing Industrial Park, Xili, Nanshan District

1.3 Description of EUT(s)

Brand name	TP-LINK
Model No.	TL-WN322G
Serial No.	070200262RF
MAC	KT99CTQC-236
Antenna Type	Inner Antenna
Operation Mode	802.11b/802.11g
Modulation Mode	CCK/OFDM
Frequency range	2.4-2.4835GHz
Maximum RF Conducted Power	802.11b:16.7 dBm, 802.11g:17.2 dBm

1.4 Test Environment

Ambient temperature: 22.0° C

Tissue Simulating Liquid: 22° C

Relative Humidity: 45%~55%

1.5 Operation Configuration

Configuration 1: 802.11b, BodyWorn Vertical & Horizontal Position

Configuration 2: 802.11g, BodyWorn Vertical & Horizontal Position

1.6 SAM Twin Phantom

The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

- Left hand
- Right hand
- Flat phantom

A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. Free space scans of devices on the cover are possible.

On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

Phantom specification:

Construction: The shell corresponds to the specifications of Specific Anthropomorphic Mannequin(SAM) Phantom defined in IEEE 1528-2003,EN 50361:2001 and IEC 62209.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±0.2mm
Filling Volume	Approx.25 liters
Dimensions	Height: 850mm Length: 1000mm Width: 500mm

1.7 Device Holder for Transmitters

The SAR in the phantom is approximately inversely proportional to the square of the distance between the source and the liquid surface. For a source in 5mm distance, a positioning uncertainty of ±0.5mm would produce a SAR uncertainty of ±20%. An accurate device positioning is therefore crucial for accurate and repeatable measurements. The positions, in which the devices must be measured, are defined by the standards.

The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centers for both scales are the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.

The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity "=3 and loss tangent _=0.02. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered.

1.8 Recipes for Tissue Simulating Liquid

The following tables give the recipes for tissue simulating liquids to be used in testing.

Ingredient	WiFi802.11b/g(Body)
Water	69.83%
DGBE	30.17%
Relative Permittivity	52.7
Conductivity (S/m)	1.95

1.9 Measurement procedure

Step 1: Power reference measurement

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: *Area scan*

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*20mm.Based on the area scan data, the area of the maximum absorption was determined by spline interpolation.

Step 3: *Zoom scan*

Around this point, a volume of 30mm*30mm*34mm (fine resolution volume scan, zoom scan) was assessed by measuring 7*7*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 2.1mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. (This can be variable. Refer to the probe specification) 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 volume was integrated with the trapezoidal algorithm. One thousand points (10*10*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: Power reference measurement (drift)

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.)

1.10 The SAR Measurement System

A photograph of the SAR measurement System is given in Fig.a.

This SAR Measurement System uses a Computer-controlled 3-D stepper motor system (Speag Dasy 4 professional system). A Model ET3DV6 1705 E-field probe is used to determine the internal electric fields. The SAR can be obtained from the equation SAR= σ ($|Ei|^2$)/ ρ where σ and ρ are the conductivity and mass density of the tissue-simulant.

The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stabile RX family) with controller, teach pendant and software. An arm extension for accommodation the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.

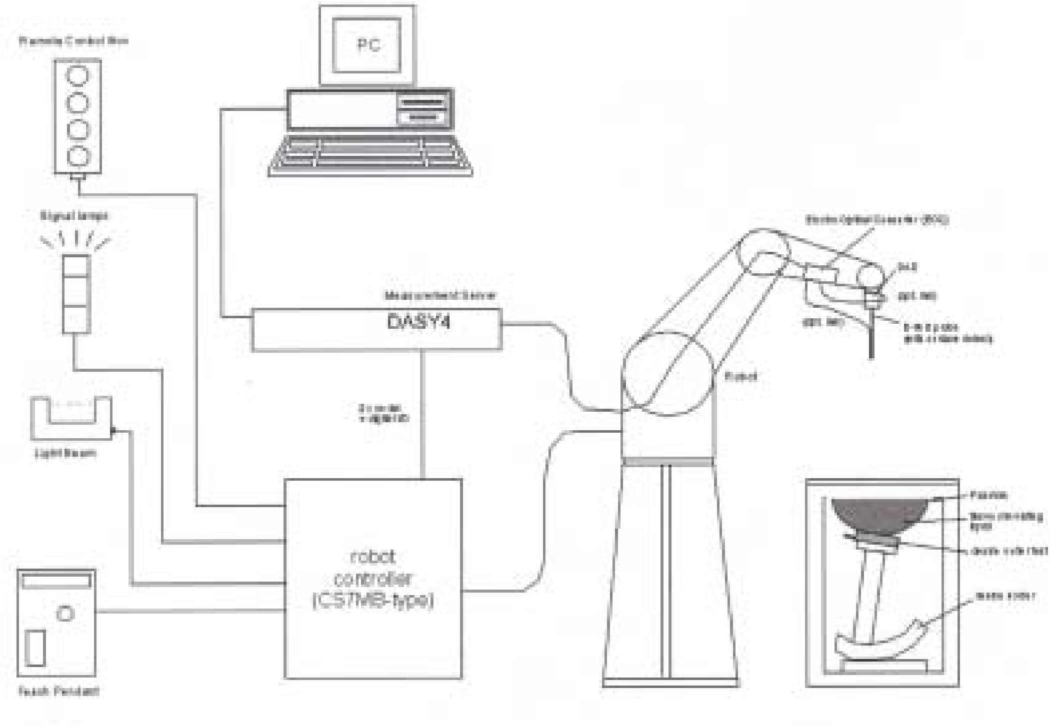


Fig. a SAR System Configuration

- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000.
- DASY4 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand, right-hand and body-worn usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing validating the proper functioning of the system.

1.11 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within +/- 10% from the target SAR values. These tests were done at 2450MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was in the range 22°C, the relative humidity was in the range 60% and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

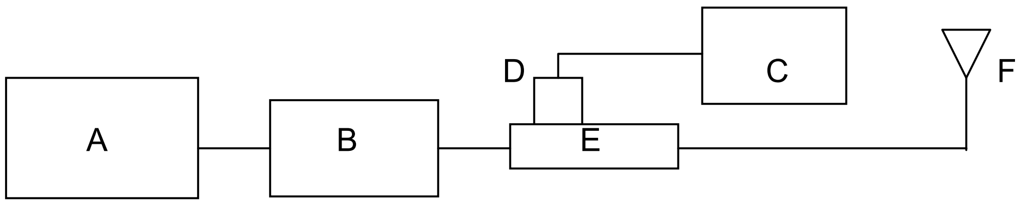


Fig. b the microwave circuit arrangement used for SAR system verification

A. Agilent Model E4438C Signal Generator

B. Mini-Circuit Model ZHL-42 Preamplifier

C. Agilent Model E4416A Power Meter

D. Agilent Model 8481H Power Sensor

E. HT CP6100 20N Dual directional coupler

F. Reference dipole antenna

Validation Kit	Frequency MHz	Target SAR 1g (250mW)	Target SAR 10g (250mW)	Measured SAR 1g	Measured SAR 10g	Measured Date
D2450V2 SN:733	2450	13.5	6.25	13.33	6.17	2007-03-13
D2450V2 SN:733	2450	13.5	6.25	13.37	6.23	2007-03-14

Table1. Result System Validation

1.12 Tissue Simulant Fluid for the WLan 802.11b/g

The dielectric properties for this body-simulant fluid were measured by using the HP Model 85070D Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with Agilent E5071B Network Analyzer (300 KHz-8500 MHz). The Conductivity (σ) and Permittivity (ρ) are listed in Table 2.For the SAR measurement given in this report. The temperature variation of the Tissue Simulant Fluid was 22°C.

Wireless Lan	Tissue Type	Limit/Measured	Permittivity (ρ)	Conductivity (σ)	Simulated Tissue Temp (°C)
802.11b/g	Body	Recommended Limit	52.7±5%	1.95±5%	20-24
		Measured, 2007-03-13	51.94	1.971	22.1
		Measured, 2007-03-14	51.92	1.982	21.6

Table 2. Dielectric parameters for the Frequency Band 850MHz&1900MHZ

1.13 Test Standards and Limits

According to FCC 47 CFR §2.1093(d) the limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specifics absorption rate (SAR) in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3KHz to 300GHz," ANSI/IEEE C95.1-1992, Copyright 1992 by the Institute of Electrical & Electronics Engineers, Inc., New York, New York 10071.

Human Exposure	**Uncontrolled Environment General Population**
Spatial Peak SAR	1.60 mW/g (averaged over a mass of 1g)

Table3. RF Exposure Limits

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.

2. Summary of Results

802.11b SAR

Mode	Test Configuration		SAR, Averaged over 1g (W/kg)			Temperature	Verdict
	Channel/Power(dBm)		Low/16.4	Middle/16.2	High/16.7	(℃)	
802.11b Body	Vertical	Rate:11M	0.037	0.046	0.054	22	Pass
		Rate:5.5M	-	-	0.050	22	Pass
	Horizontal	Rate:11M	1.04	1.03	0.797	22	Pass
		Rate:5.5M	0.761	-	-	22	Pass

802.11g SAR

Mode	Test Configuration		SAR, Averaged over 1g (W/kg)			Temperature	Verdict
	Channel/Power(dBm)		Low/16.6	Middle/17.2	High/16.7	(℃)	
802.11g Body	Vertical	Rate:54M	0.018	0.019	0.024	22	Pass
		Rate:36M	-	-	0.027	22	Pass
		Rate:24M	-	-	0.055	22	Pass
	Horizontal	Rate:54M	0.389	0.527	0.395	22	Pass
		Rate:36M	-	0.628	-	22	Pass
		Rate:24M	-	0.677	-	22	Pass

Maximum Values

Frequency Band(MHz)	EUT position	Conducted Output Power (dBm)	1g Average (W/Kg)	Power Drift (dB)	Amb. Temp (℃)	Verdict
802.11b	Body-Worn-Vertical-High-Channel(11M)	16.7	0.054	0.206	22	PASS
	Body-Worn-Horizontal-Low-Channel(11M)	16.4	1.04	-0.032	22	PASS

802.11g	**Body-Worn-Vertical-High-Channel(24M)**	**16.7**	0.055	0.354	**22**	**PASS**
	Body-Worn-Horizontal-Middle-Channel(24M)	**17.2**	0.677	0.208	**22**	**PASS**

Note:

1. The low, middle and high channels are CH1/2412MHz, CH6/2437MHz and CH11/2462MHz separately.

2. For the Bodyworn measurements, in the horizontal position the notebook computer pressed close to the phantom; in the vertical position the distance from the sample to the phantom is 1.5 cm.

3. For all the tests, the maximum absolute value of the power drift which is under the Body-Worn-802.11g-Vertical-High(Rate 54M) configuration is 0.379dB.

3. Instruments List

Instrument	Model	Serial number	NO.	Date of last Calibration
Desktop PC	COMPAQ EVO	N/A	GSM-SAR-025	N/A
Dasy 4 software	V 4.7 build 44	N/A	GSM-SAR-001	N/A
Probe	ES3DV3	3088	GSM-SAR-034	2006.12.12
DAE	DAE3	569	GSM-SAR-023	2006.12.08
2450MHz system validation dipole	D2450V2	733	GSM-SAR-019	2006.12.12
Phantom	SAM 12	TP-1283	GSM-SAR-005	N/A
Robot	RX90L	F03/5V32A1/A01	GSM-SAR-028	N/A
Dielectric probe kit	85070D	US01440168	GSM-SAR-016	2006.12.19
Agilent network analyzer	E5071B	MY42100549	GSM-SAR-007	2006.12.19
Agilent signal generator	E4438	14438CATO-19719	GSM-SAR-008	2006.12.19
Mini-Circuits preamplifier	ZHL-42	D041905	GSM-SAR-033	2006.04.19
Agilent power meter	E4416A	GB41292095	GSM-SAR-010	2006.12.19
Agilent power sensor	8481H	MY41091234	GSM-SAR-011	2006.12.19
HT CP6100 20N Coupling	6100	SCP301480120	GSM-SAR-012	2006.12.19
R&S Universal radio communication tester	CMU200	103633	GSM-AUD-002	2006.12.19

4. Measurements

4.1 Body-Worn-802.11b-Vertical-Low(Rate 11M)

Date/Time: 2007-3-13 20:35:30

Test Laboratory: SGS-GSM

802.11b-Body-Worn-Vertical-Low(11M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

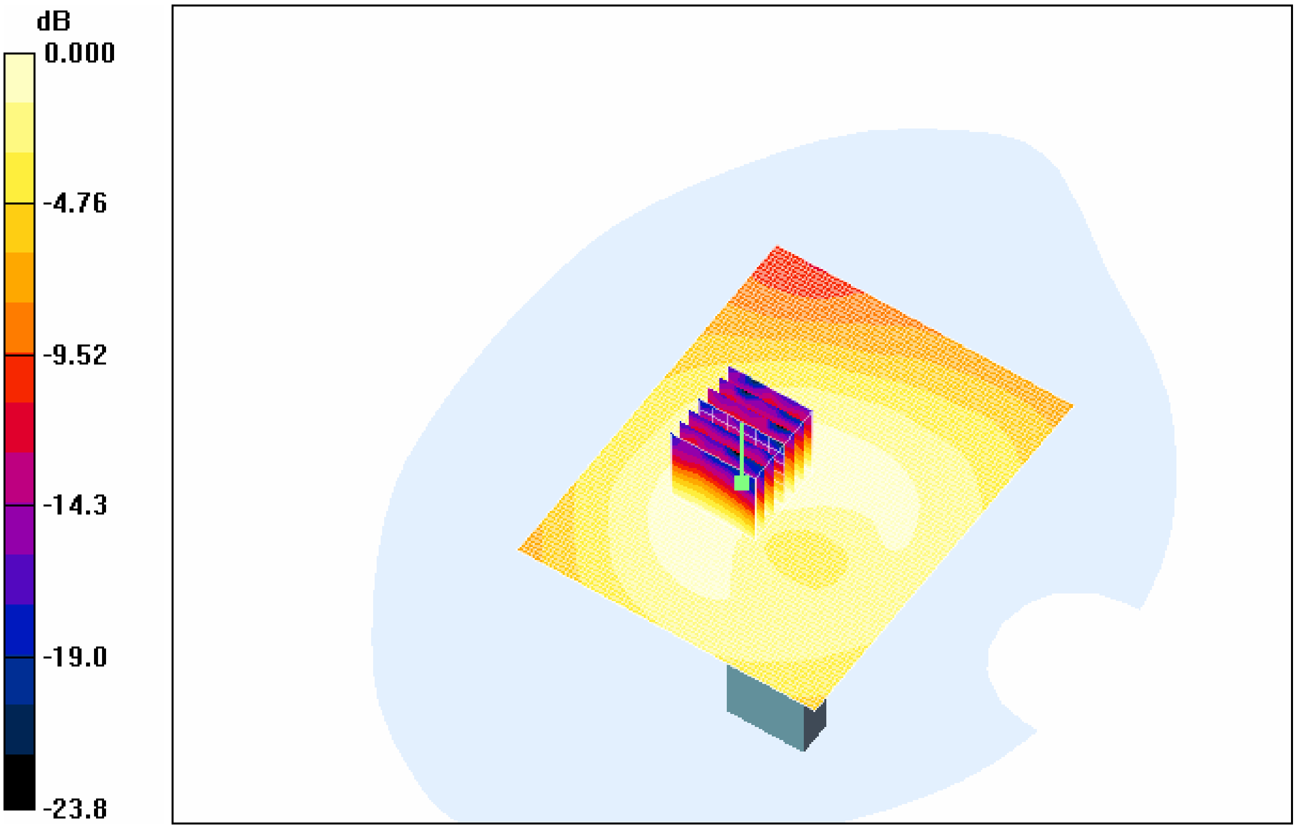
Communication System: WiFi(2450); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2412 MHz; σ = 1.92 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Low(11M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.041 mW/g

Body Worn - Low(11M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.23 V/m; Power Drift = -0.110 dB
Peak SAR (extrapolated) = 0.070 W/kg
SAR(1 g) = 0.037 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.039 mW/g



0 dB = 0.039mW/g

4.2 Body-Worn-802.11b-Vertical-Middle(Rate 11M)

Date/Time: 2007-3-13 21:10:07

Test Laboratory: SGS-GSM

802.11b-Body-Worn-Vertical-Middle(11M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

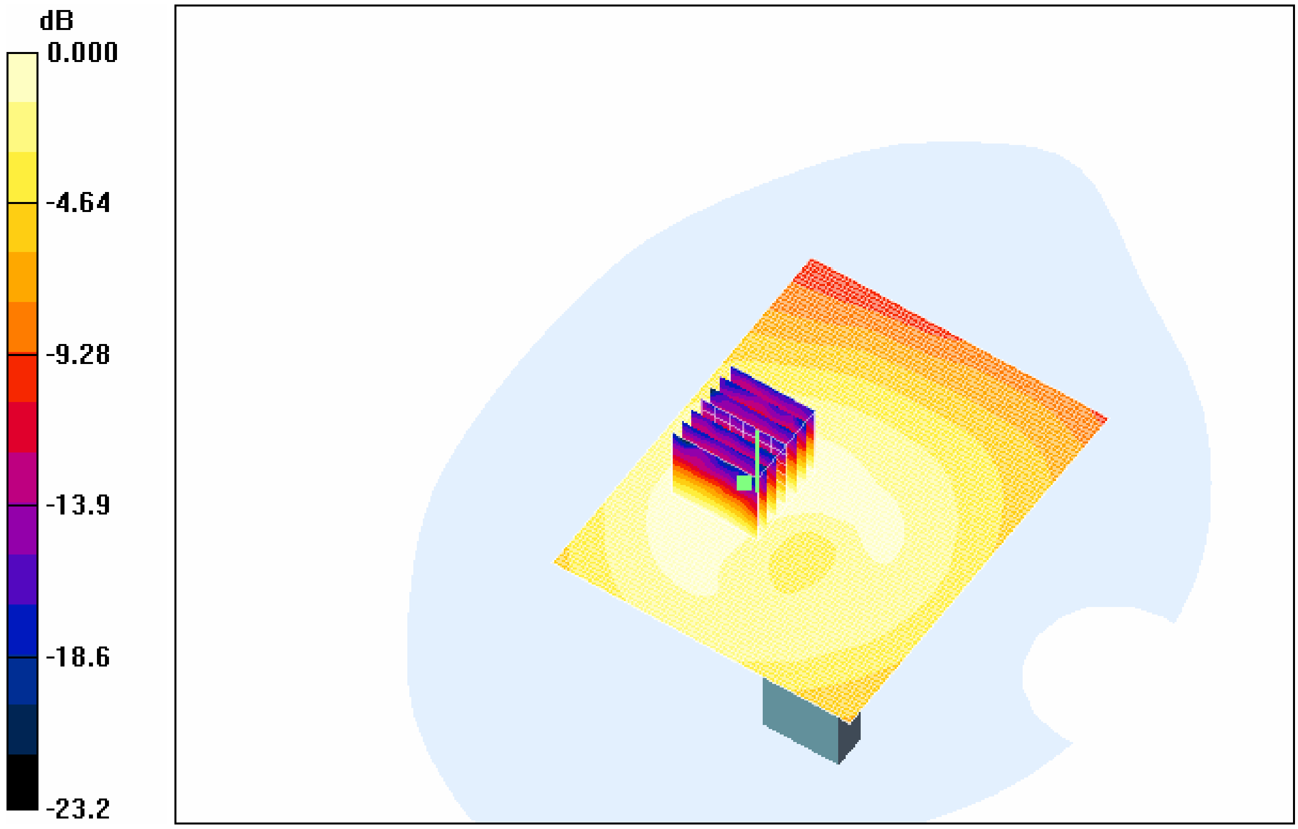
Communication System: WiFi(2450); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Middle(11M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.049 mW/g

Body Worn - Middle(11M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.37 V/m; Power Drift = 0.130 dB
Peak SAR (extrapolated) = 0.087 W/kg
SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.027 mW/g
Maximum value of SAR (measured) = 0.049 mW/g



0 dB = 0.049mW/g

4.3 Body-Worn-802.11b-Vertical-High(Rate 11M)

Date/Time: 2007-3-13 21:35:50

Test Laboratory: SGS-GSM

802.11b-Body-Worn-Vertical-High(11M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

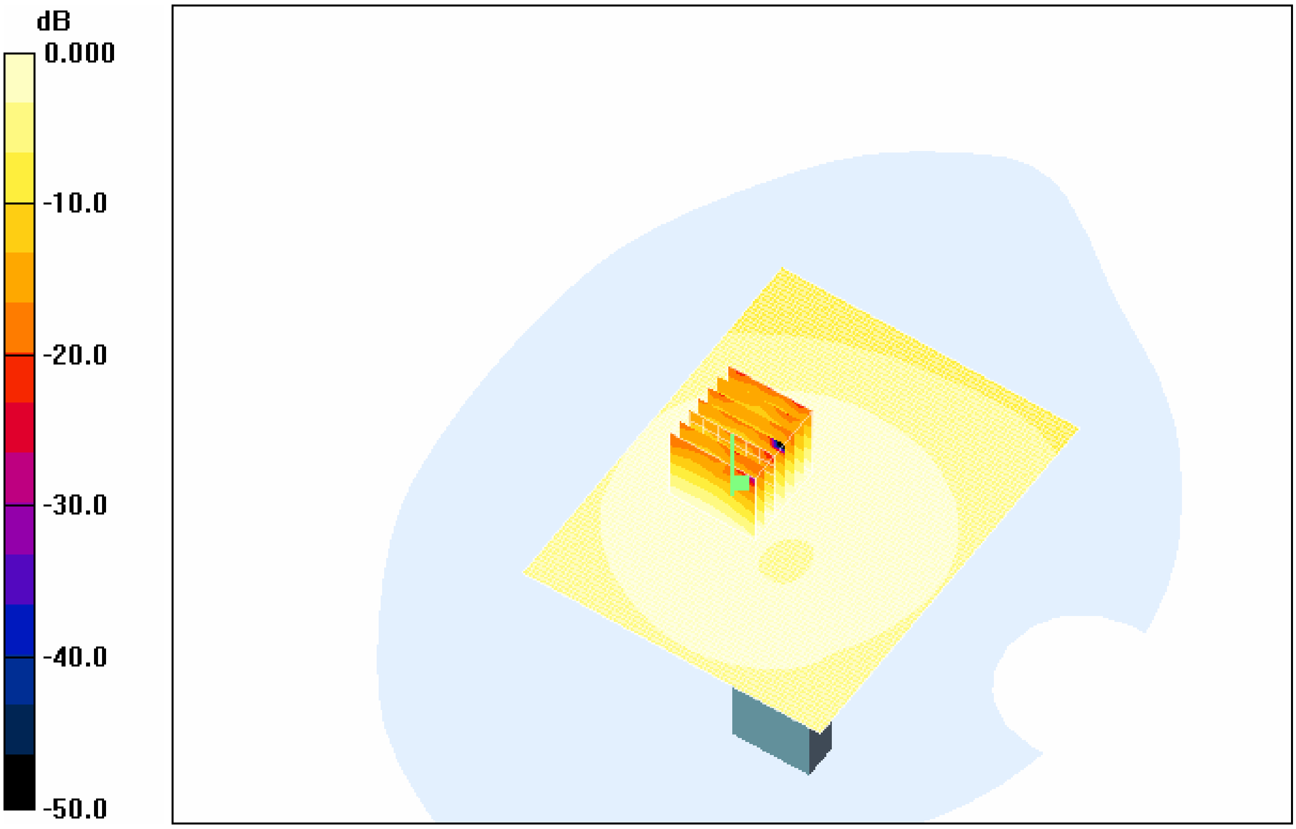
Communication System: WiFi(2450); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

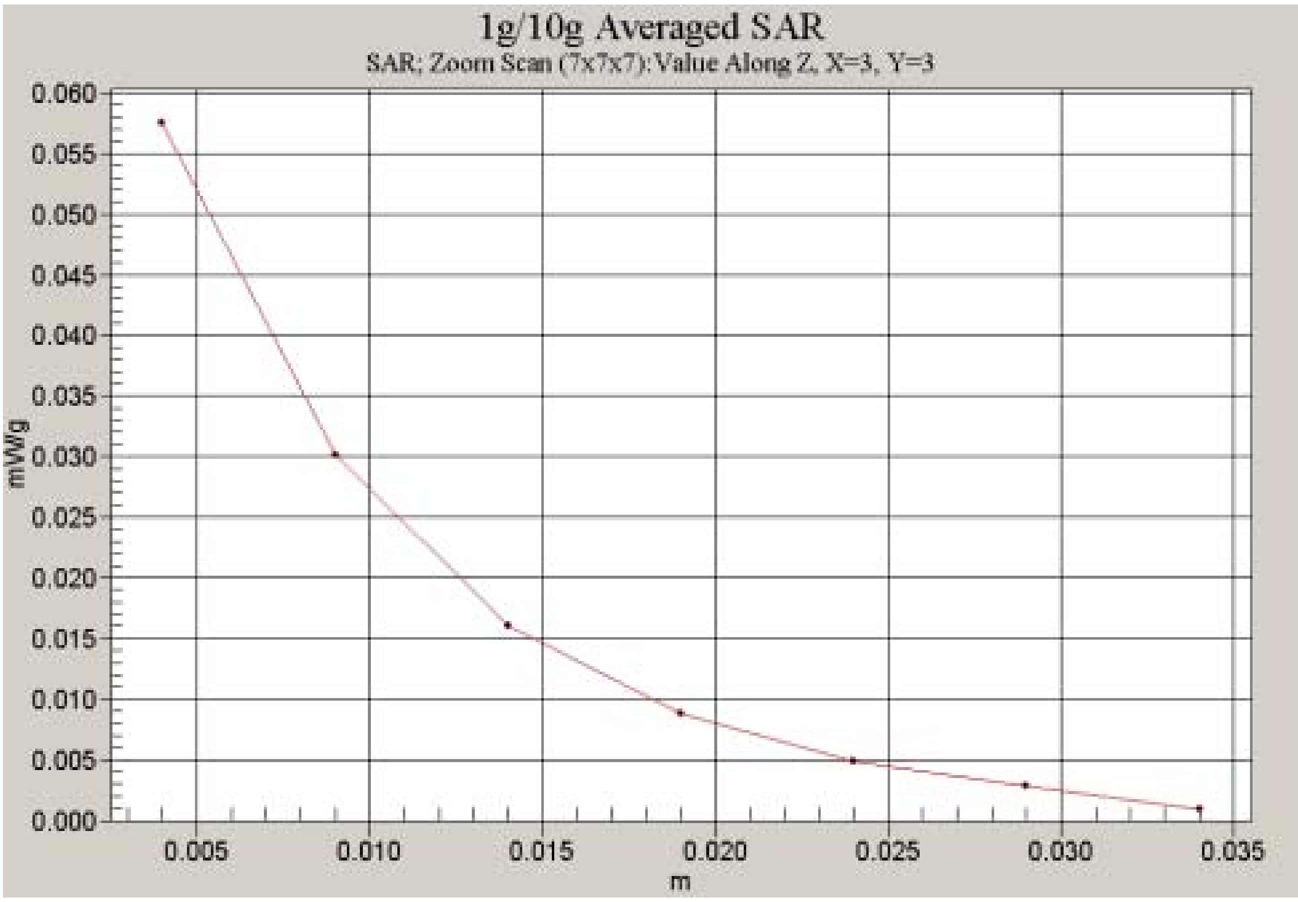
- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - High(11M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.057 mW/g

Body Worn - High(11M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.17 V/m; Power Drift = 0.206 dB
Peak SAR (extrapolated) = 0.103 W/kg
SAR(1 g) = 0.054 mW/g; SAR(10 g) = 0.031 mW/g
Maximum value of SAR (measured) = 0.058 mW/g



0 dB = 0.058mW/g



4.4 Body-Worn-802.11b-Vertical-High(Rate 5.5M)

Date/Time: 2007-3-13 22:03:09

Test Laboratory: SGS-GSM

802.11b-Body-Worn-Vertical-High(5.5M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

Communication System: WiFi(2450); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

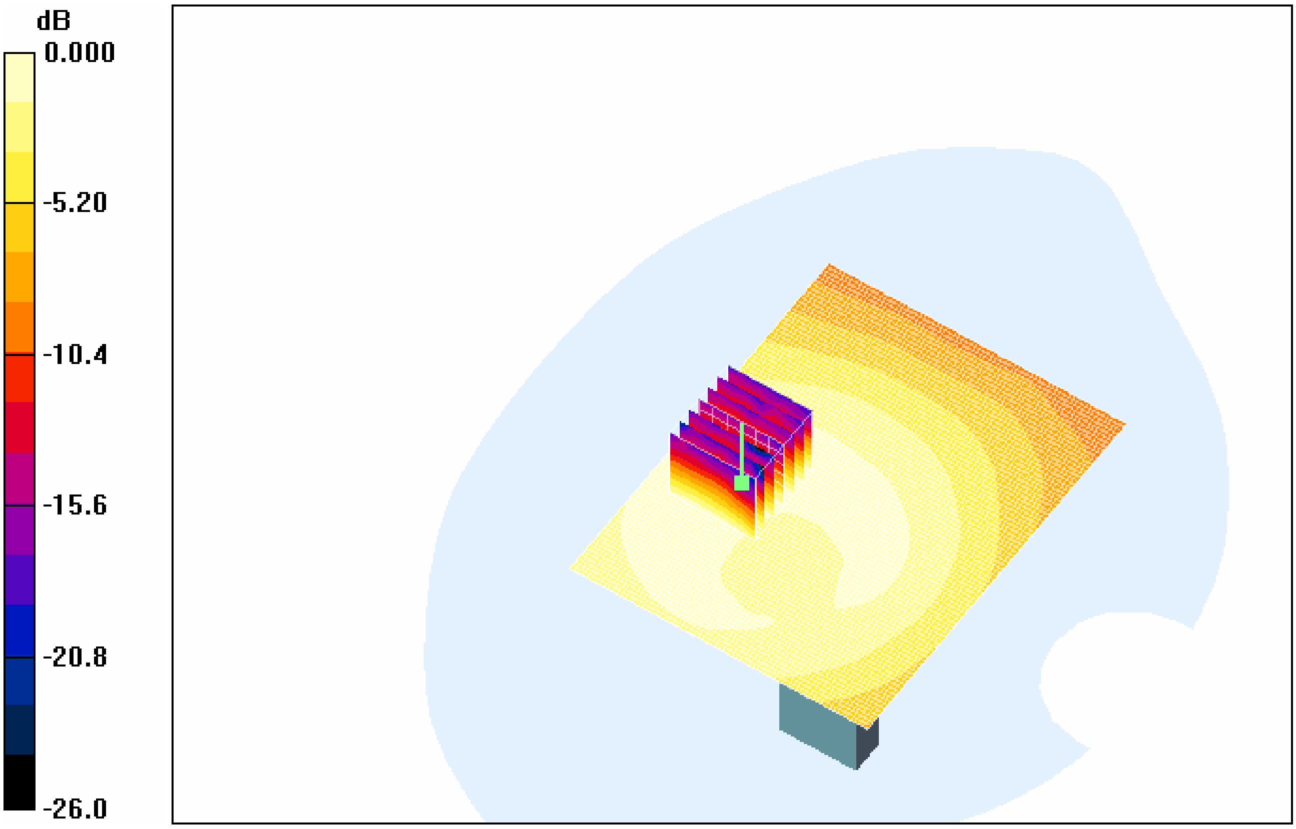
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - High(5.5M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.051 mW/g

Body Worn - High(5.5M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.66 V/m; Power Drift = 0.041 dB
Peak SAR (extrapolated) = 0.094 W/kg
SAR(1 g) = 0.050 mW/g; SAR(10 g) = 0.028 mW/g
Maximum value of SAR (measured) = 0.053 mW/g



0 dB = 0.053mW/g

4.5 Body-Worn-802.11b-Horizontal-Low(Rate 11M)

Date/Time: 2007-3-14 18:40:36

Test Laboratory: SGS-GSM

802.11b-Body-Worn-Horizontal-Low(11M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

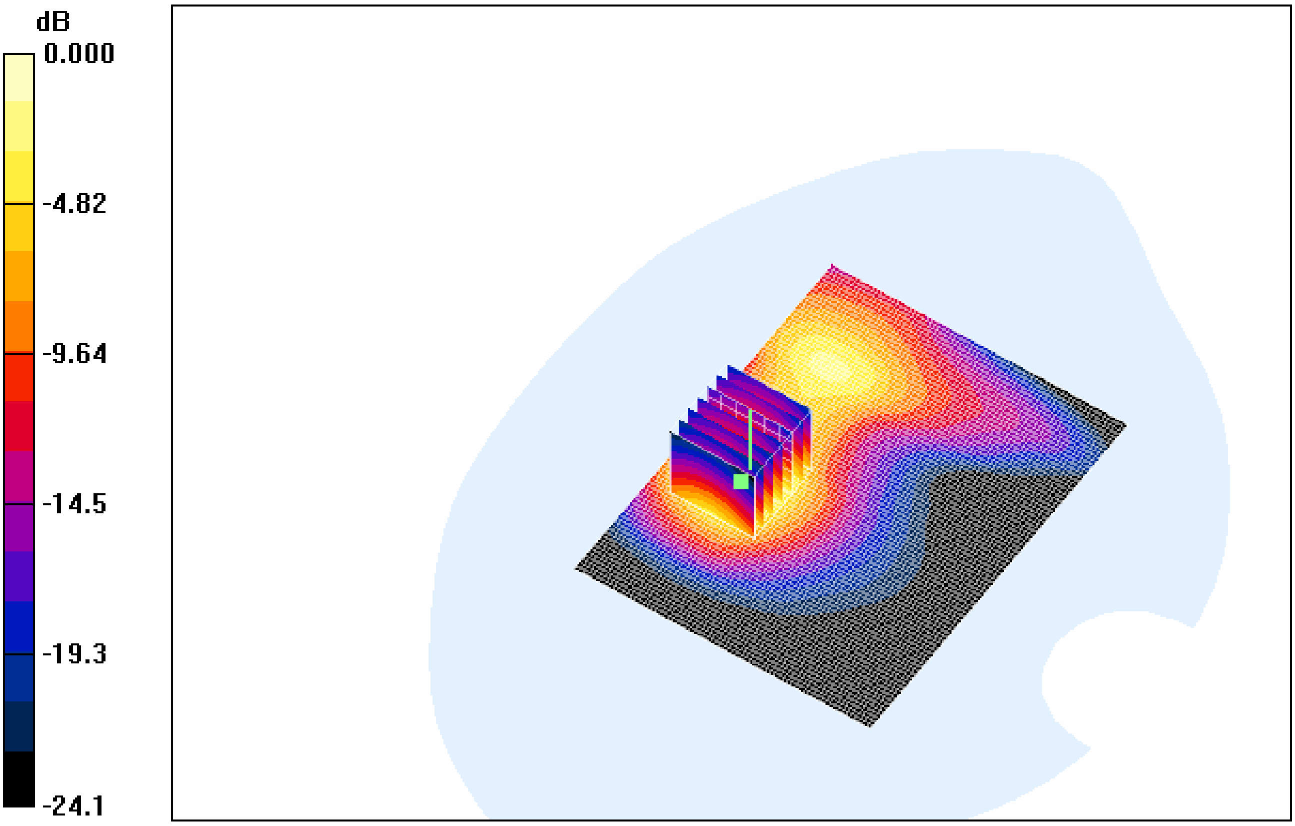
Communication System: WiFi(2450); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2412 MHz; σ = 1.92 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

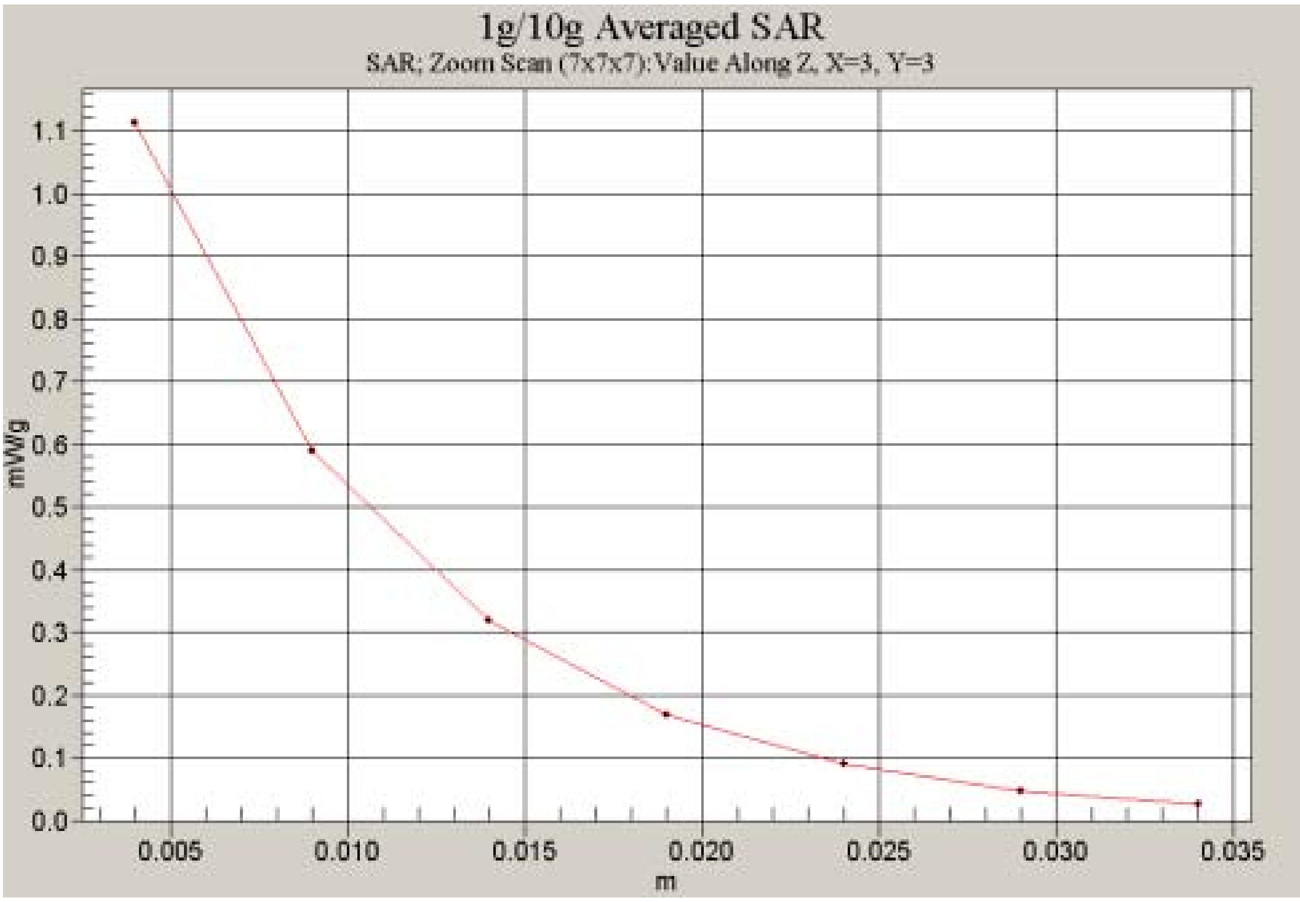
- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Low(11M) 2/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.25 mW/g

Body Worn - Low(11M) 2/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.98 V/m; Power Drift = -0.032 dB
Peak SAR (extrapolated) = 1.99 W/kg
SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.516 mW/g
Maximum value of SAR (measured) = 1.14 mW/g



0 dB = 1.14mW/g



4.6 Body-Worn-802.11b-Horizontal-Middle(Rate 11M)

Date/Time: 2007-3-13 10:41:40

Test Laboratory: SGS-GSM

802.11b-Body-Worn-Horizontal-Middle(11M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

Communication System: WiFi(2450); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

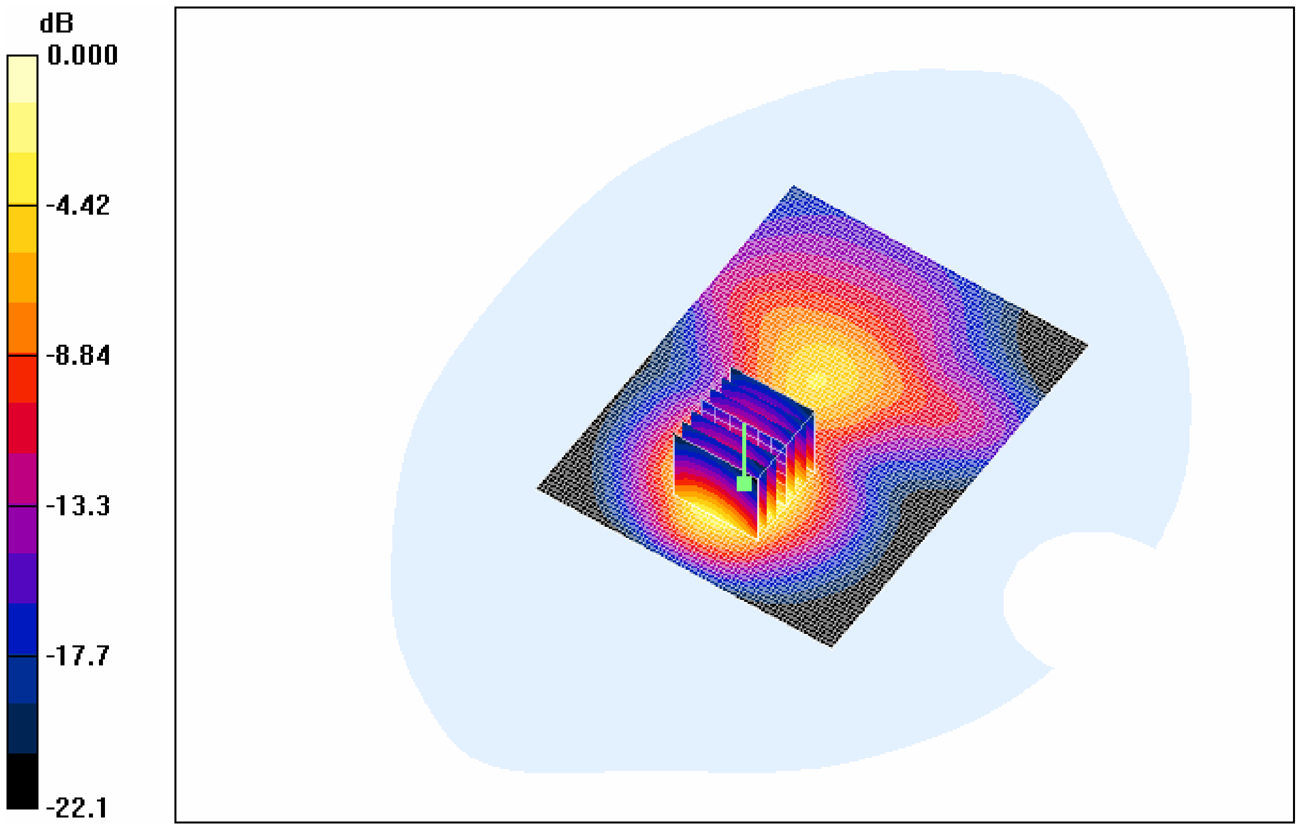
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Middle(11M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.34 mW/g

Body Worn - Middle(11M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.32 V/m; Power Drift = 0.049 dB
Peak SAR (extrapolated) = 1.96 W/kg
SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.518 mW/g
Maximum value of SAR (measured) = 1.14 mW/g



0 dB = 1.14mW/g

4.7 Body-Worn-802.11b-Horizontal-High(Rate 11M)

Date/Time: 2007-3-14 19:41:50

Test Laboratory: SGS-GSM

802.11b-Body-Worn-Horizontal-High(11M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

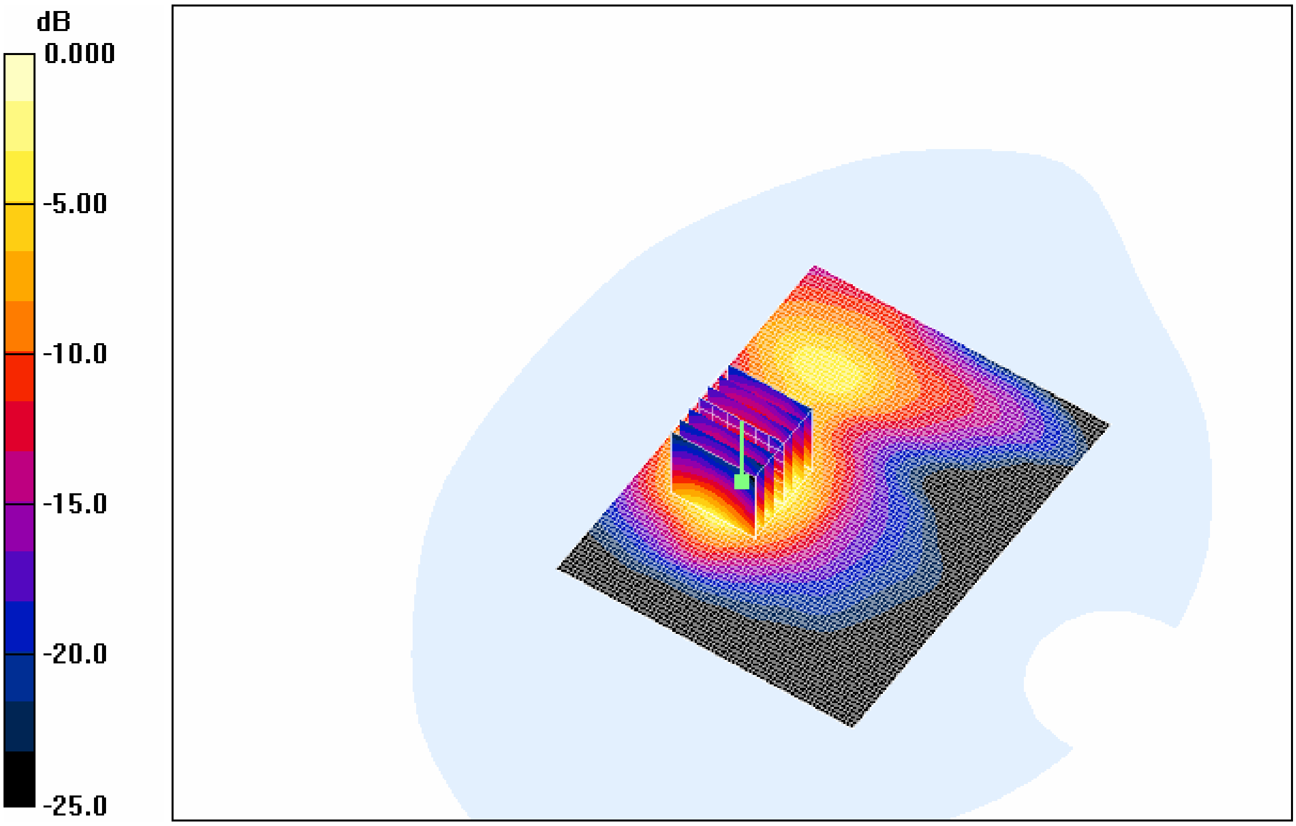
Communication System: WiFi(2450); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - High(11M)3/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.992 mW/g

Body Worn - High(11M)3/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.57 V/m; Power Drift = 0.260 dB
Peak SAR (extrapolated) = 1.67 W/kg
SAR(1 g) = 0.797 mW/g; SAR(10 g) = 0.398 mW/g
Maximum value of SAR (measured) = 0.861 mW/g



0 dB = 0.861mW/g

4.8 Body-Worn-802.11b-Horizontal-Low(Rate 5.5M)

Date/Time: 2007-3-14 16:59:00

Test Laboratory: SGS-GSM

802.11b-Body-Worn-Horizontal-Low(5.5M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

Communication System: WiFi(2450); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2412 MHz; σ = 1.92 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

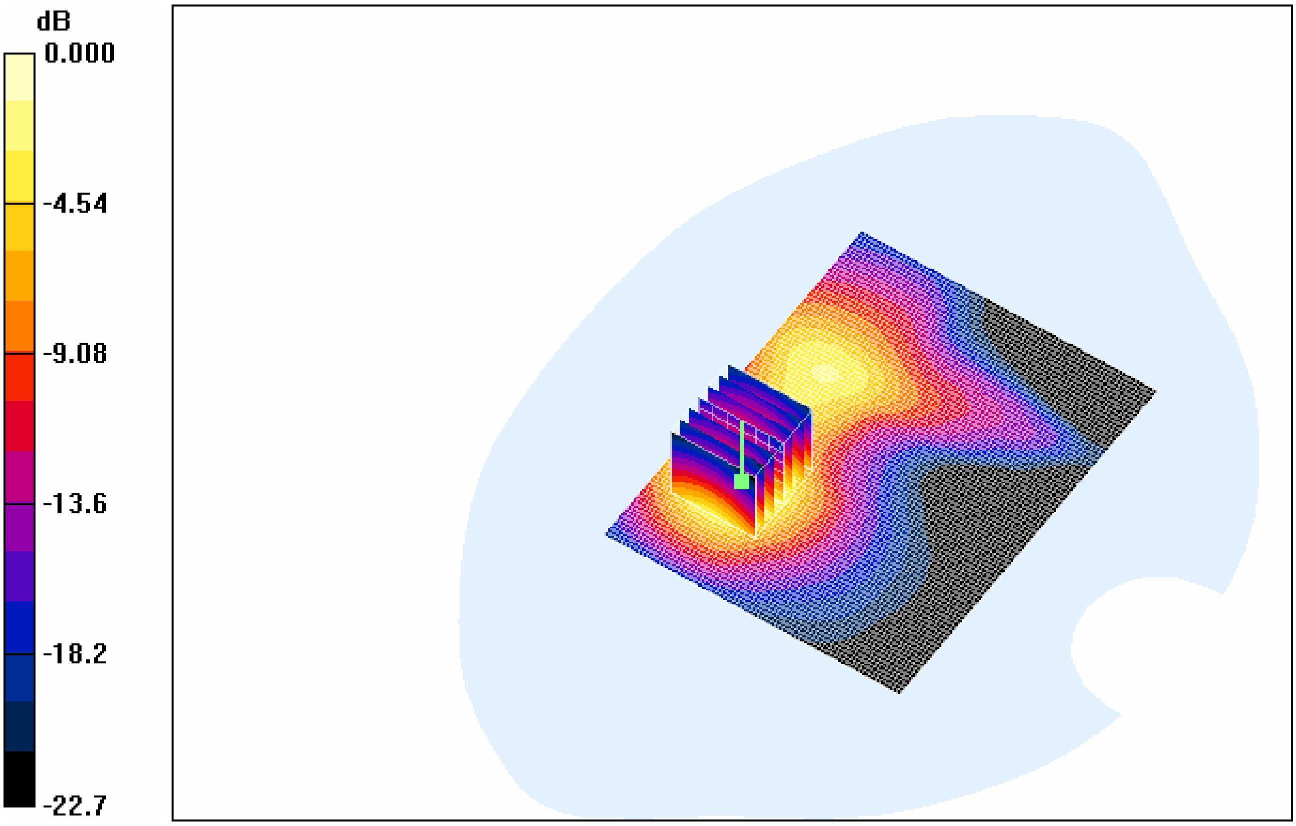
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Low(5.5M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.898 mW/g

Body Worn - Low(5.5M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.43 V/m; Power Drift = 0.103 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.761 mW/g; SAR(10 g) = 0.383 mW/g
Maximum value of SAR (measured) = 0.842 mW/g



0 dB = 0.842mW/g

4.9 Body-Worn-802.11g-Vertical-Low(Rate 54M)

Date/Time: 2007-3-13 22:52:46

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Vertical-Low(54M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

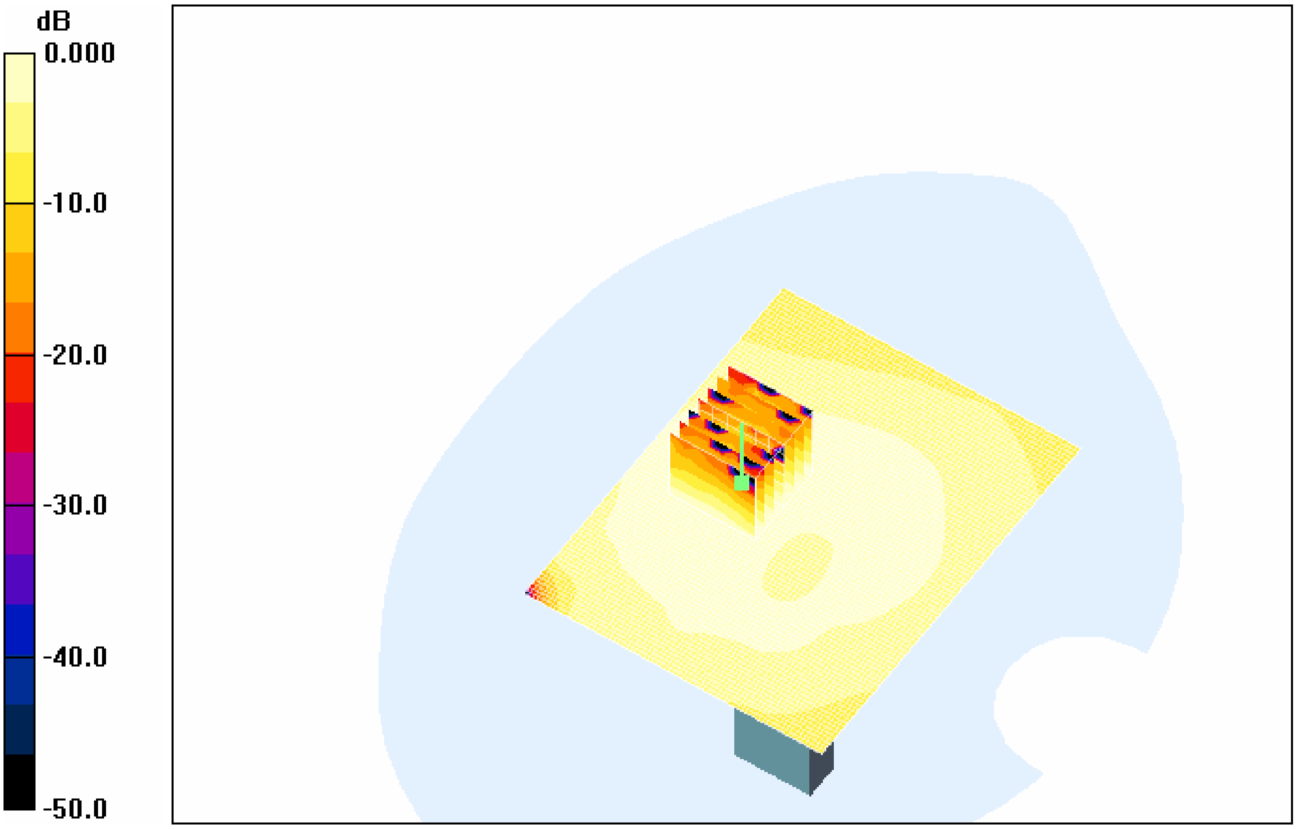
Communication System: WiFi(2450); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2412 MHz; σ = 1.92 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Low(54M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.020 mW/g

Body Worn - Low(54M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.05 V/m; Power Drift = 0.179 dB
Peak SAR (extrapolated) = 0.036 W/kg
SAR(1 g) = 0.018 mW/g; SAR(10 g) = 0.010 mW/g
Maximum value of SAR (measured) = 0.020 mW/g



0 dB = 0.020mW/g

4.10 Body-Worn-802.11g-Vertical-Middle(Rate 54M)

Date/Time: 2007-3-13 23:16:13

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Vertical-Middle(54M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

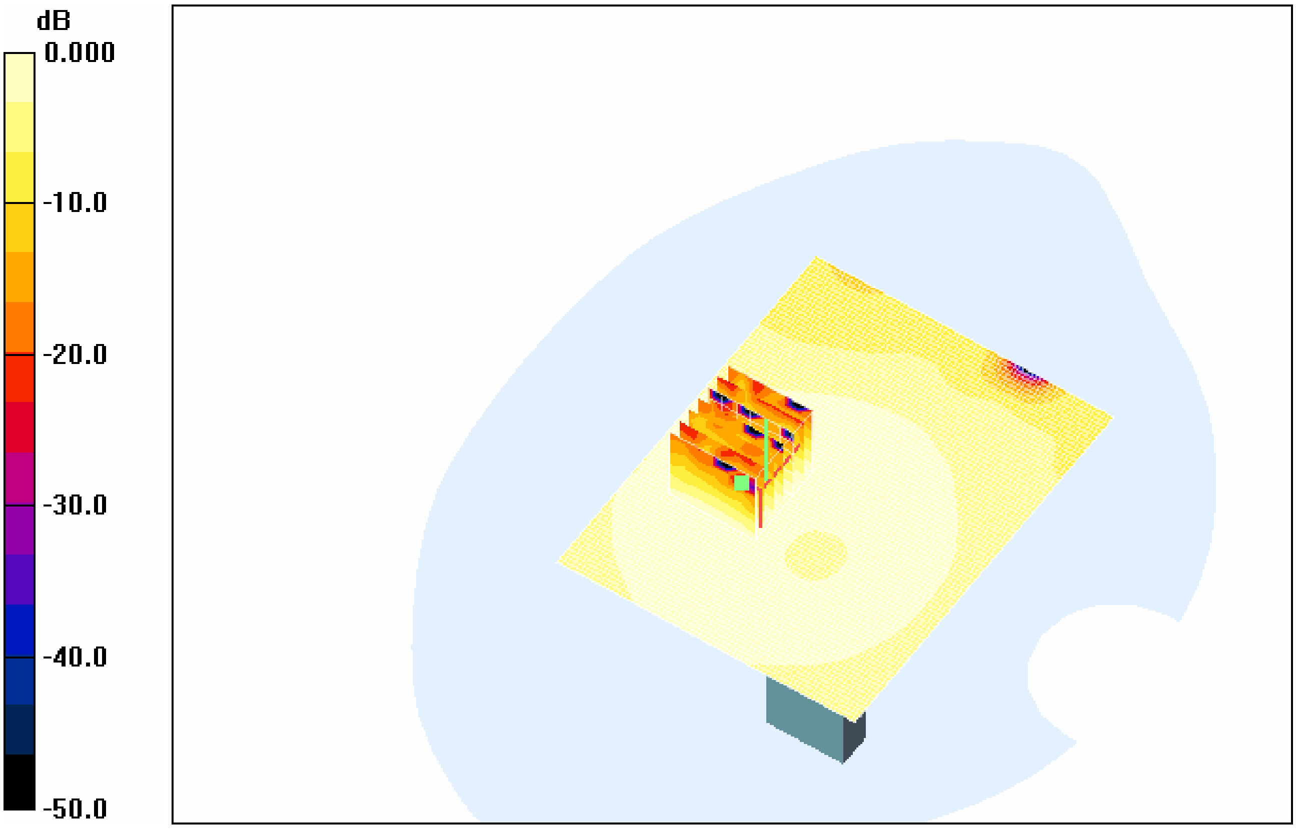
Communication System: WiFi(2450); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Middle(54M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.020 mW/g

Body Worn - Middle(54M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.48 V/m; Power Drift = 0.093 dB
Peak SAR (extrapolated) = 0.037 W/kg
SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.011 mW/g
Maximum value of SAR (measured) = 0.021 mW/g



0 dB = 0.021mW/g

4.11 Body-Worn-802.11g-Vertical-High(Rate 54M)

Date/Time: 2007-3-14 8:55:28

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Vertical-High(54M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

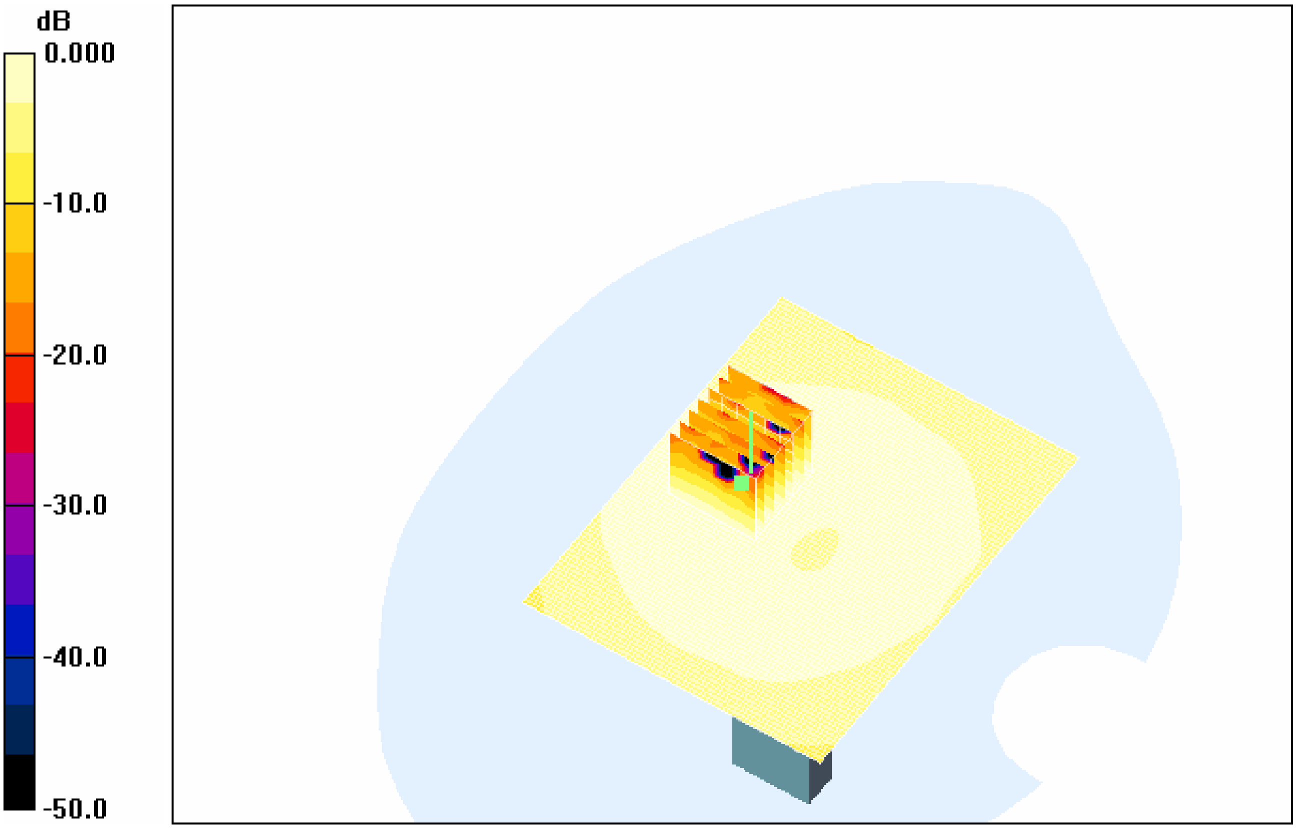
Communication System: WiFi(2450); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - High(54M) 2/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.026 mW/g

Body Worn - High(54M) 2/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.36 V/m; Power Drift = 0.379 dB
Peak SAR (extrapolated) = 0.045 W/kg
SAR(1 g) = 0.024 mW/g; SAR(10 g) = 0.014 mW/g
Maximum value of SAR (measured) = 0.026 mW/g



0 dB = 0.026mW/g

4.12 Body-Worn-802.11g-Vertical-High(Rate 36M)

Date/Time: 2007-3-14 10:35:23

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Vertical-High(36M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

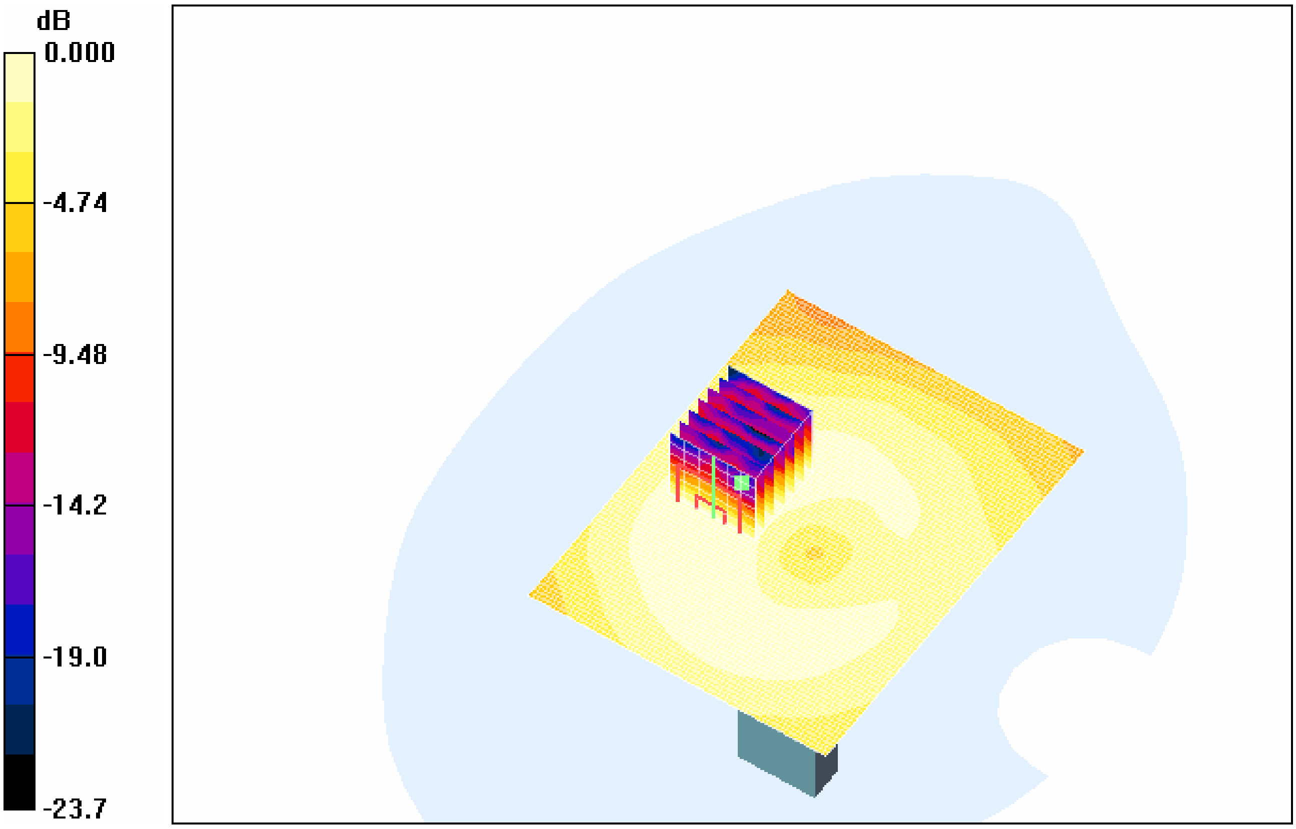
Communication System: WiFi(2450); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - High(36M) 3/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.029 mW/g

Body Worn - High(36M) 3/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.43 V/m; Power Drift = 0.368 dB
Peak SAR (extrapolated) = 0.052 W/kg
SAR(1 g) = 0.027 mW/g; SAR(10 g) = 0.016 mW/g
Maximum value of SAR (measured) = 0.030 mW/g



0 dB = 0.030mW/g

4.13 Body-Worn-802.11g-Vertical-High(Rate 24M)

Date/Time: 2007-3-14 21:39:19

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Vertical-High(24M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

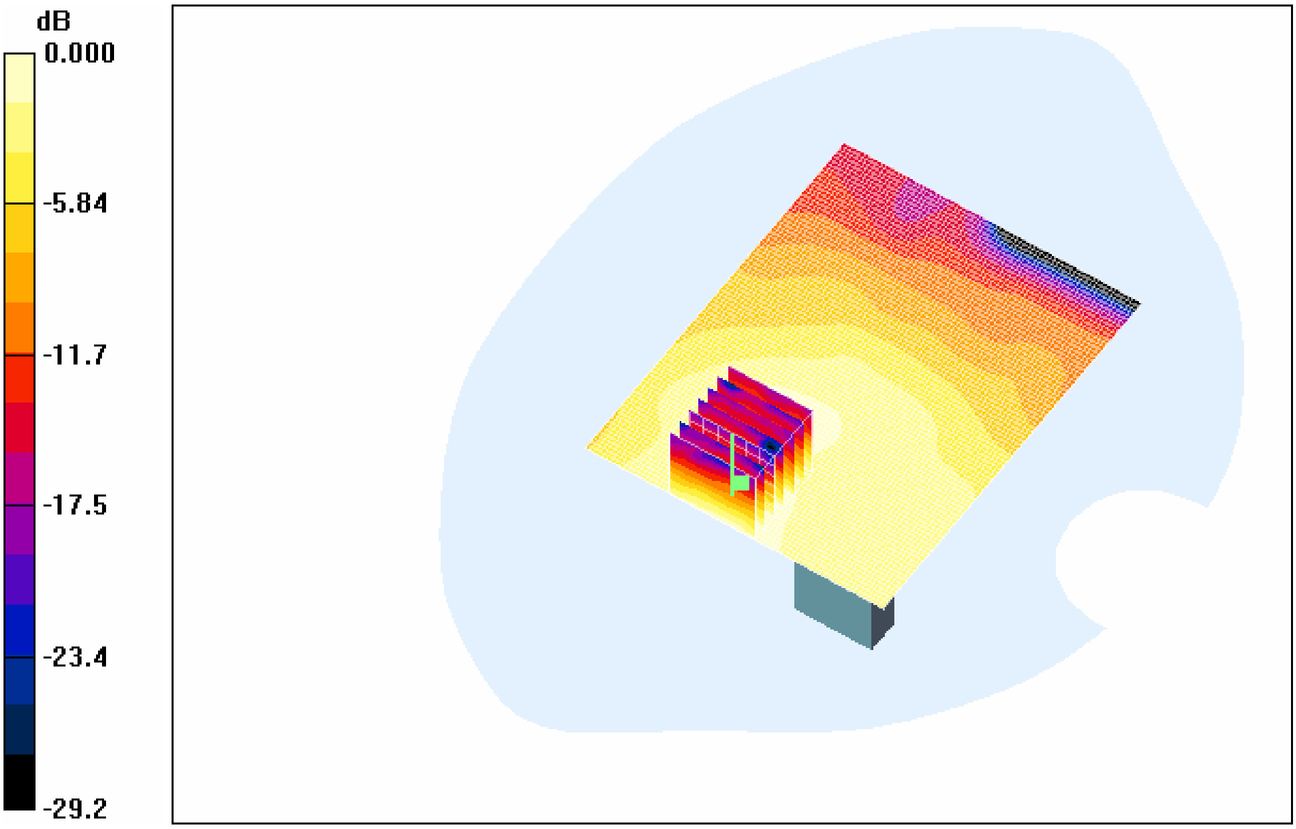
Communication System: WiFi(2450); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

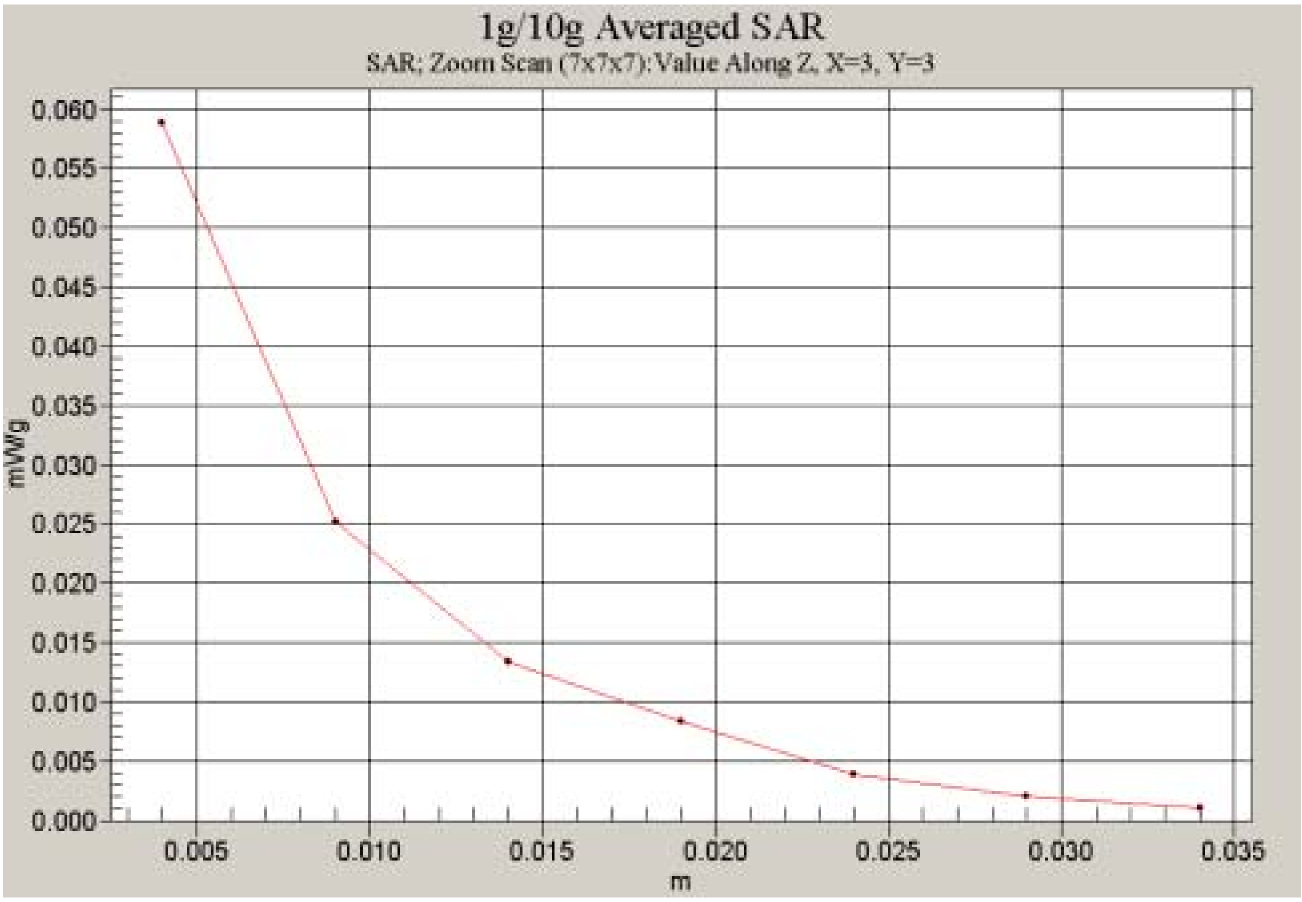
- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - High(24M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.059 mW/g

Body Worn - High(24M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.14 V/m; Power Drift = 0.354 dB
Peak SAR (extrapolated) = 0.114 W/kg
SAR(1 g) = 0.055 mW/g; SAR(10 g) = 0.030 mW/g
Maximum value of SAR (measured) = 0.060 mW/g



0 dB = 0.060mW/g



4.14 Body-Worn-802.11g-Horizontal-Low(Rate 54M)

Date/Time: 2007-3-14 12:49:54

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Horizontal-Low(54M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

Communication System: WiFi(2450); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2412 MHz; σ = 1.92 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

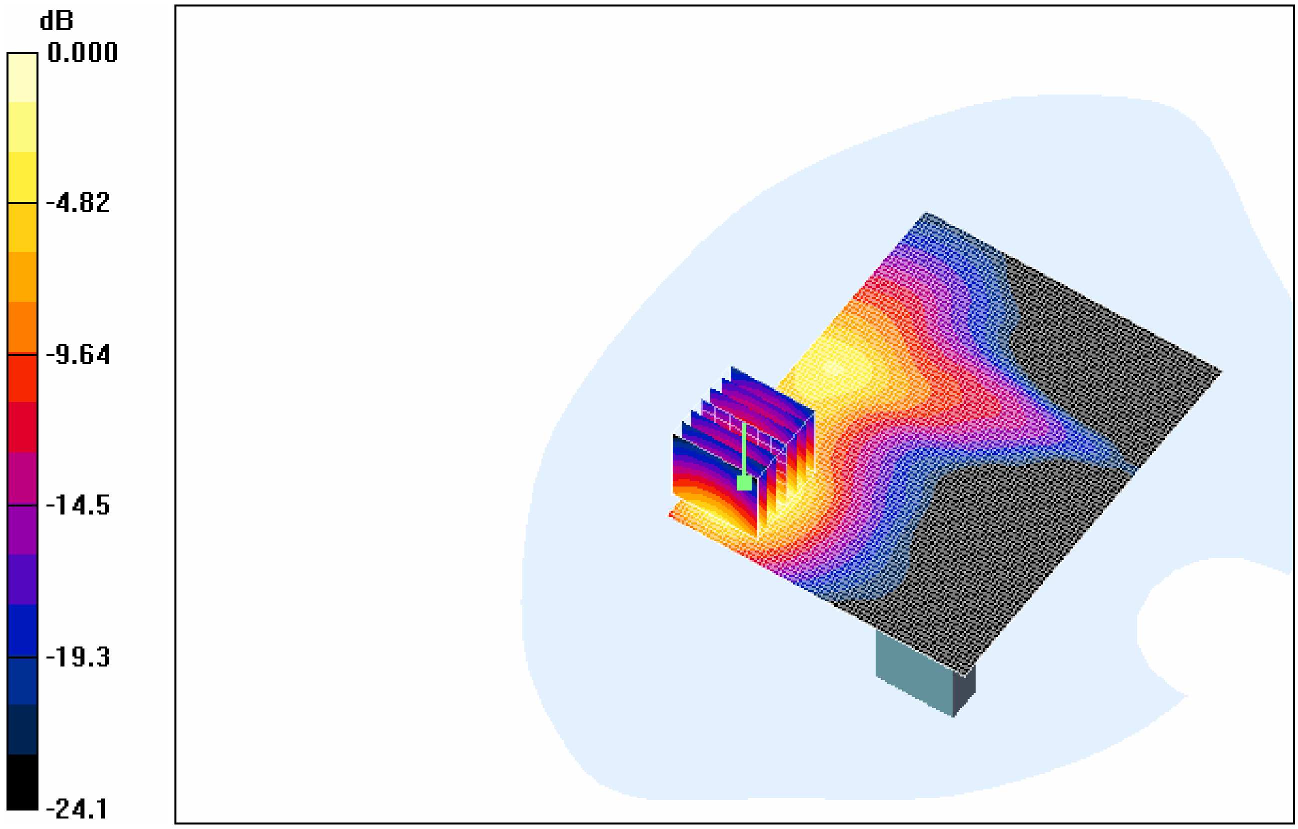
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12

- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Low(54M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.472 mW/g

Body Worn - Low(54M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.44 V/m; Power Drift = 0.178 dB
Peak SAR (extrapolated) = 0.761 W/kg
SAR(1 g) = 0.389 mW/g; SAR(10 g) = 0.193 mW/g
Maximum value of SAR (measured) = 0.430 mW/g



0 dB = 0.430mW/g

4.15 Body-Worn-802.11g-Horizontal-Middle(Rate 54M)

Date/Time: 2007-3-14 11:50:51

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Horizontal-Middle(54M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

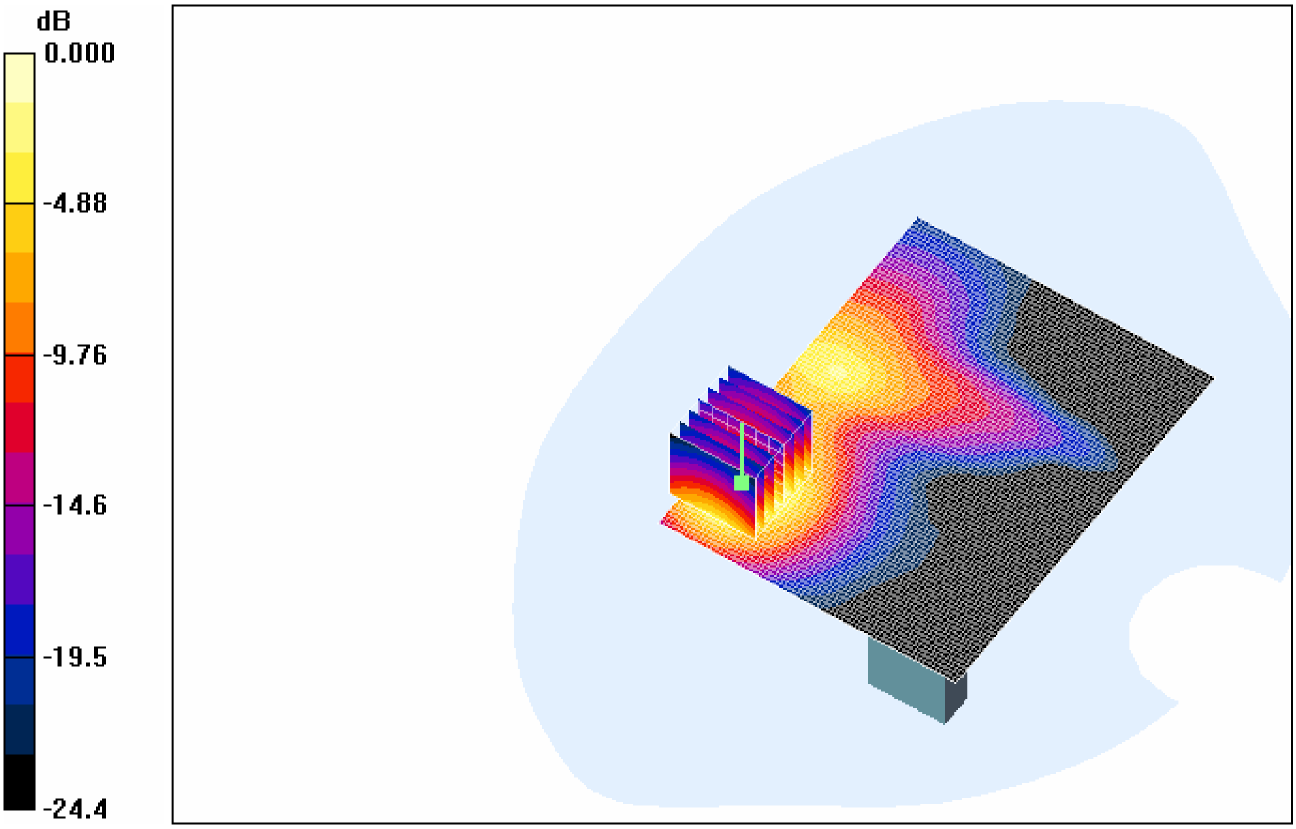
Communication System: WiFi(2450); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Middle(54M) 2/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.613 mW/g

Body Worn - Middle(54M) 2/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.56 V/m; Power Drift = 0.209 dB
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.527 mW/g; SAR(10 g) = 0.261 mW/g
Maximum value of SAR (measured) = 0.578 mW/g



0 dB = 0.578mW/g

4.16 Body-Worn-802.11g-Horizontal-High(Rate 54M)

Date/Time: 2007-3-14 13:19:01

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Horizontal-High(54M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

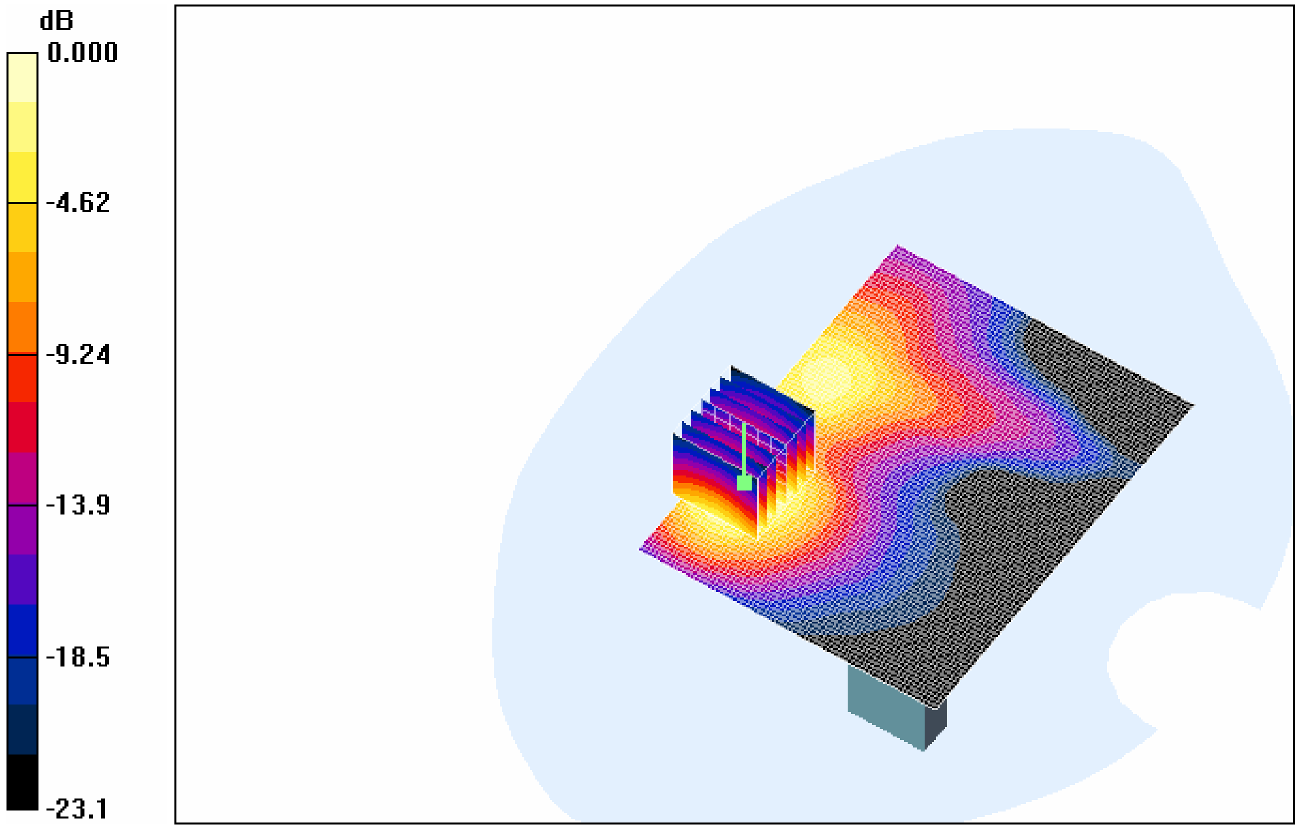
Communication System: WiFi(2450); Frequency: 2462 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2462 MHz; σ = 1.99 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - High(54M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.461 mW/g

Body Worn - High(54M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.00 V/m; Power Drift = 0.199 dB
Peak SAR (extrapolated) = 0.774 W/kg
SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.198 mW/g
Maximum value of SAR (measured) = 0.434 mW/g



0 dB = 0.434mW/g

4.17 Body-Worn-802.11g-Horizontal-Middle(Rate 36M)

Date/Time: 2007-3-14 15:09:49

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Horizontal-Middle(36M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

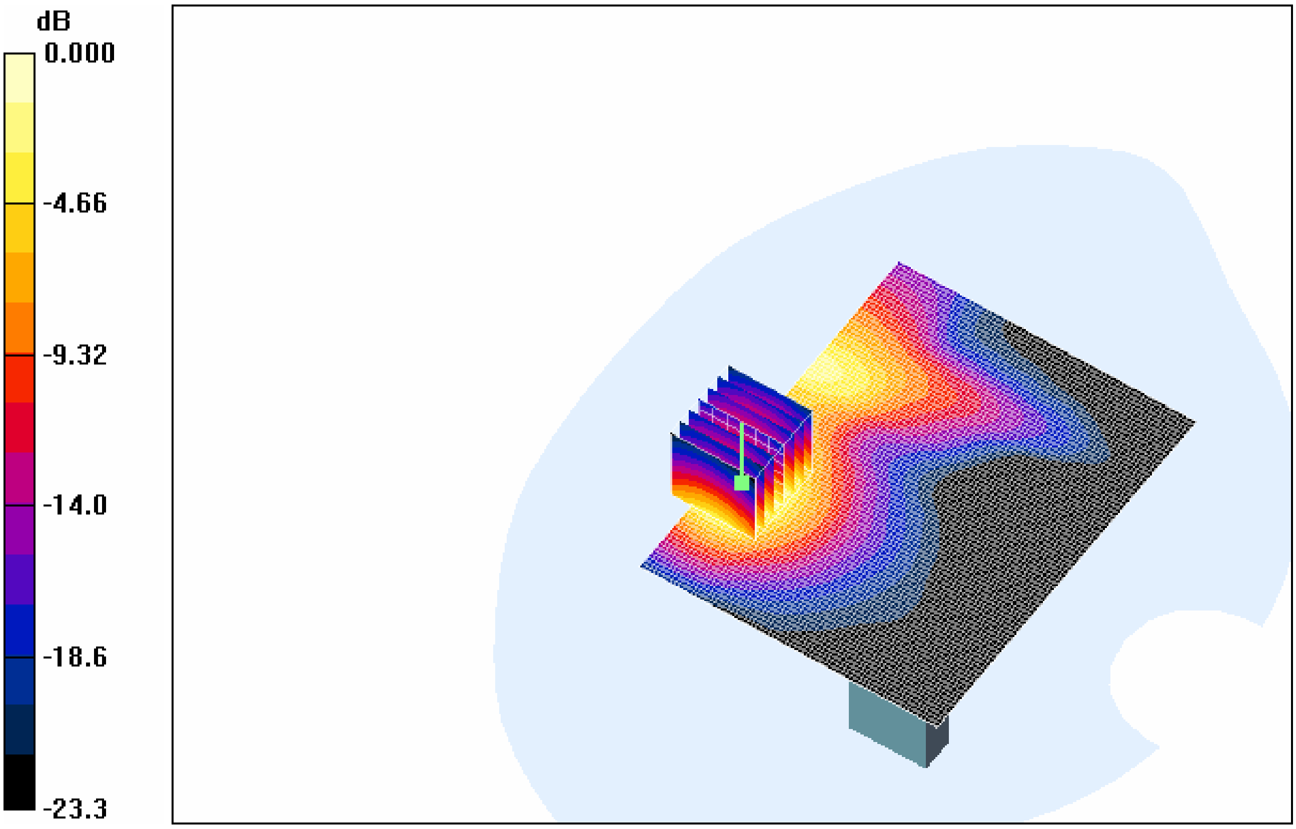
Communication System: WiFi(2450); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Middle (36M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.730 mW/g

Body Worn - Middle (36M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.19 V/m; Power Drift = -0.114 dB
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.628 mW/g; SAR(10 g) = 0.315 mW/g
Maximum value of SAR (measured) = 0.689 mW/g



0 dB = 0.689mW/g

4.18 Body-Worn-802.11g-Horizontal-Middle(Rate 24M)

Date/Time: 2007-3-14 16:23:11

Test Laboratory: SGS-GSM

802.11g-Body-Worn-Horizontal-Middle(24M)

DUT: TL-WM322G; Type: Body; Serial: KT99CTQC-236

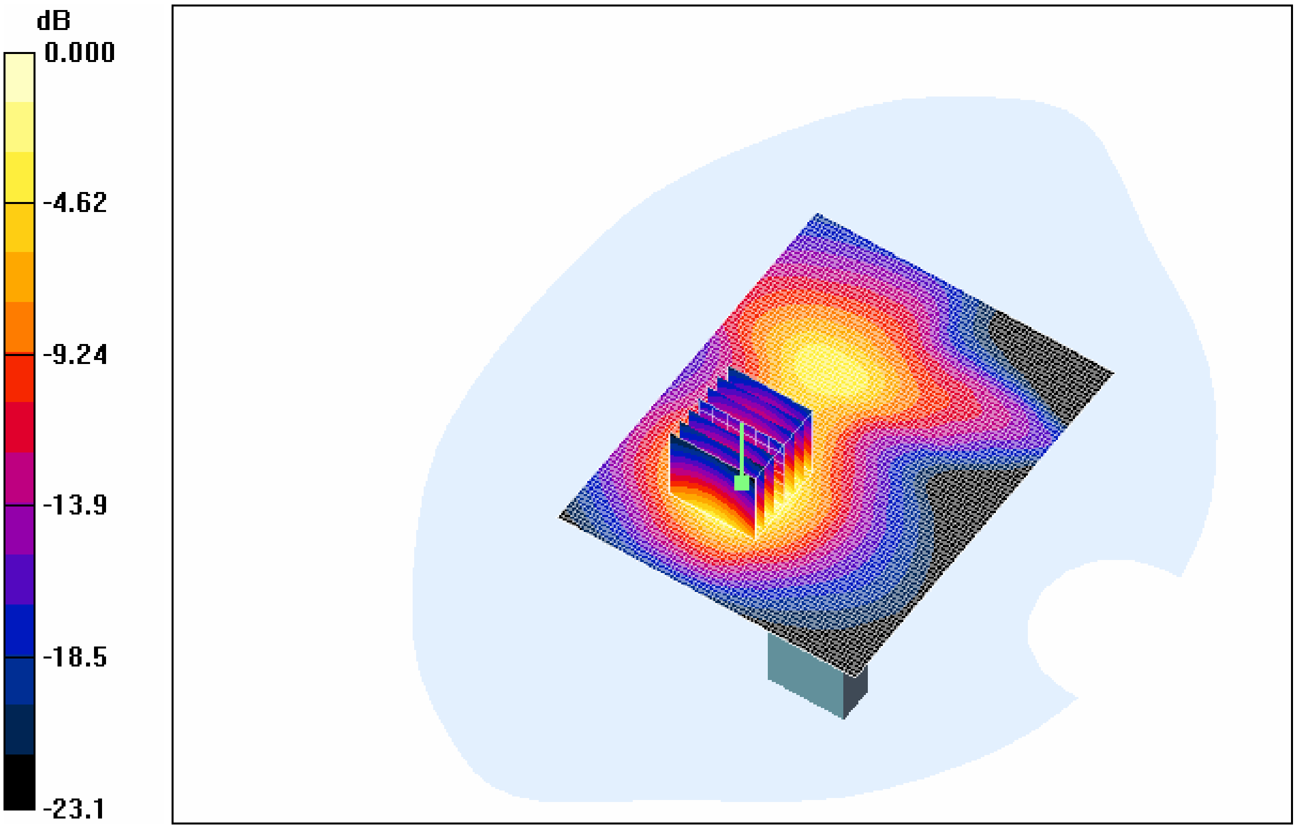
Communication System: WiFi(2450); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: MSL2450-Body Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

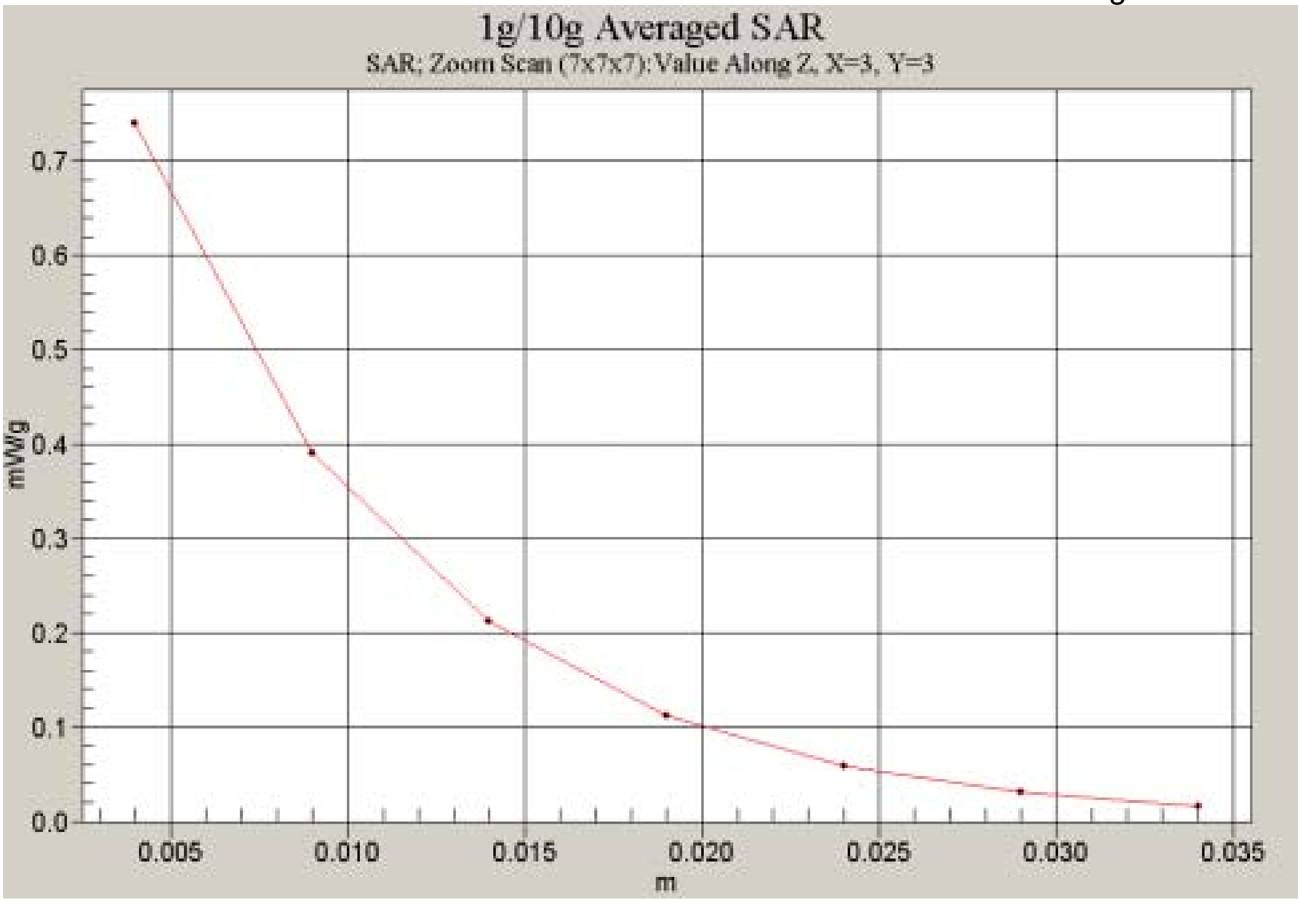
- Probe: ES3DV3 - SN3088; ConvF(4.33, 4.33, 4.33); Calibrated: 2006-12-12
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2006-12-8
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body Worn - Middle(24M)/Area Scan (71x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.805 mW/g

Body Worn - Middle(24M)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.40 V/m; Power Drift = 0.208 dB
Peak SAR (extrapolated) = 1.34 W/kg
SAR(1 g) = 0.677 mW/g; SAR(10 g) = 0.337 mW/g
Maximum value of SAR (measured) = 0.741 mW/g



0 dB = 0.741mW/g


1g/10g Averaged SAR
SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=3
mW/g
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Appendix

1. Photographs of Test Setup

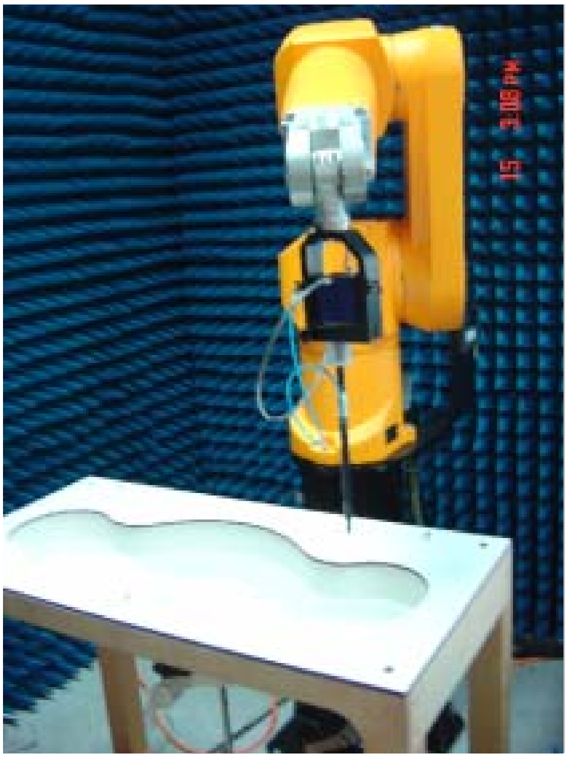


Fig.1 Photograph of the SAR measurement System

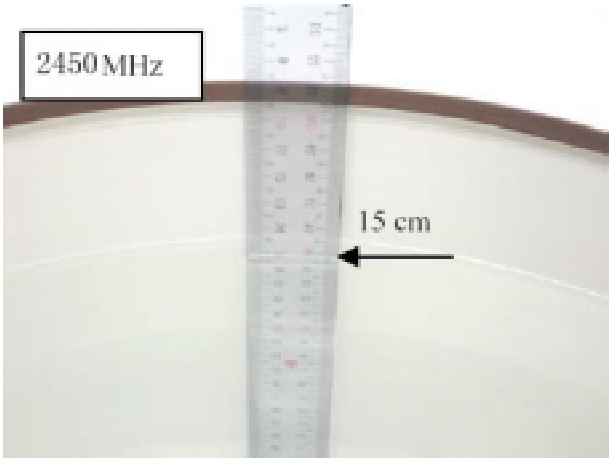


Fig.2 Photograph of the Tissue Simulant
Liquid depth 15cm for Body-Worn

Fig.3 Photograph of the Body Vertical & Horizontal status

2. *Photographs of the EUT*

Fig.4 Front View

Fig.5 Back View

Fig.6 Side View

3. *Probe Calibration certification*

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Accreditation No.: SCS 108

Client **SGS-CSTC (MTT)**

Certificate No: ES3-3088_Dec06

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3088
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	December 12, 2006
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: December 13, 2006

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

Certificate No: ES3-3088_Dec06 Page 1 of 9

Calibration Laboratory of
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Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
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., ϑ = 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) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 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 (no uncertainty required). DCP does not depend on frequency nor media.
- *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:3088

Manufactured: July 20, 2005
Last calibrated: September 13, 2005
Recalibrated: December 12, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ES3DV3 SN:3088

Sensitivity in Free Space[A]

NormX	**1.31** ± 10.1%	$\mu V/(V/m)^2$
NormY	**1.23** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**1.27** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**94** mV
DCP Y	**94** mV
DCP Z	**93** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL **900 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	2.4	0.6
SAR_{be} [%]	With Correction Algorithm	1.0	0.0

TSL **1810 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**3.0 mm**	**4.0 mm**
SAR_{be} [%]	Without Correction Algorithm	7.6	4.5
SAR_{be} [%]	With Correction Algorithm	0.1	0.2

Sensor Offset

Probe Tip to Sensor Center **2.0** mm

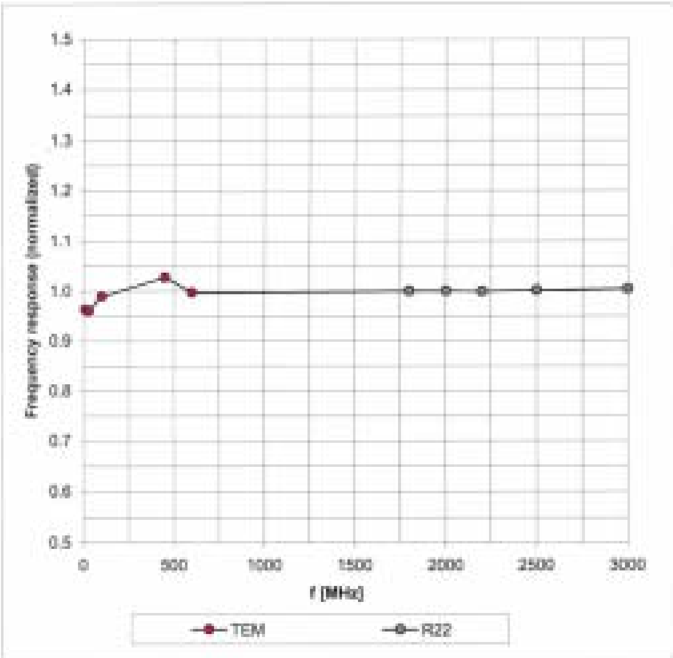
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

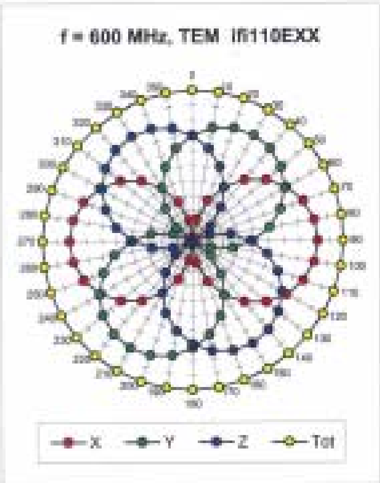
Frequency Response of E-Field

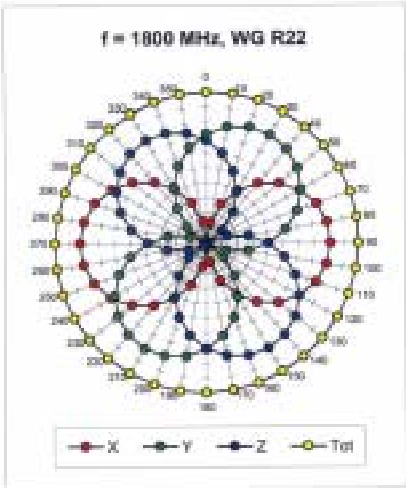
(TEM-Cell:ifi110 EXX, Waveguide: R22)

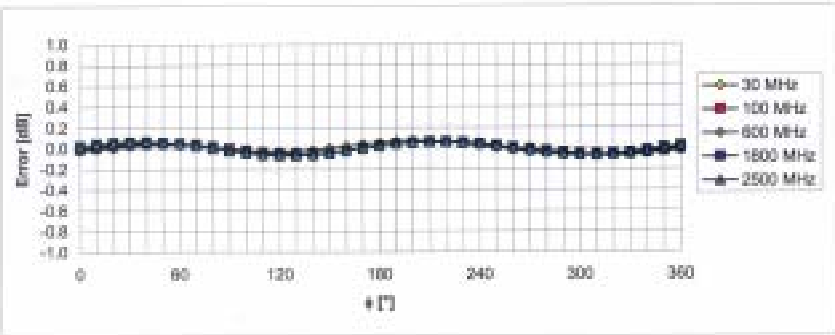


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$



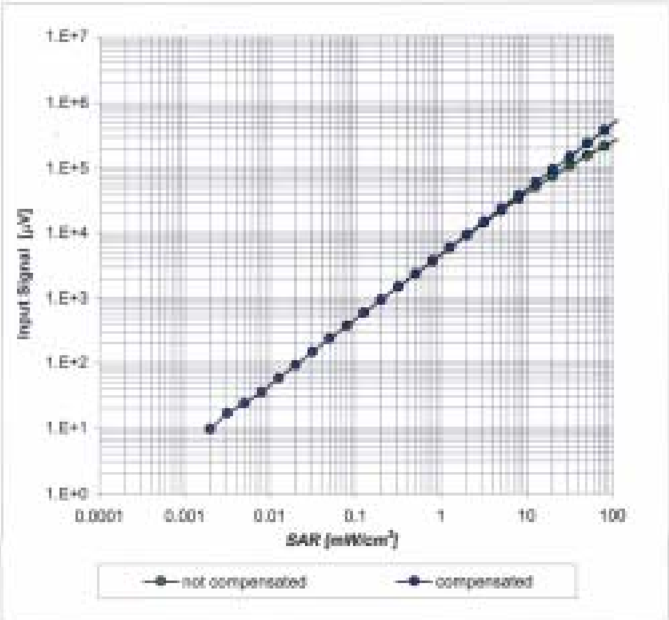


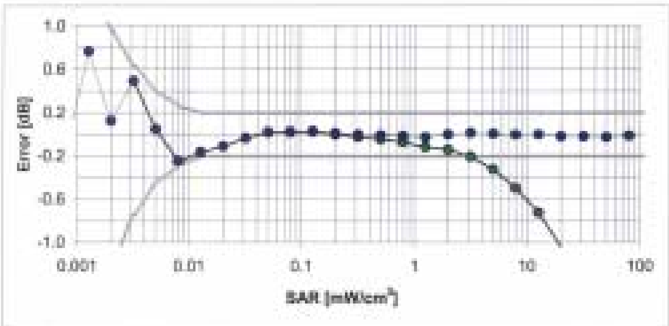


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

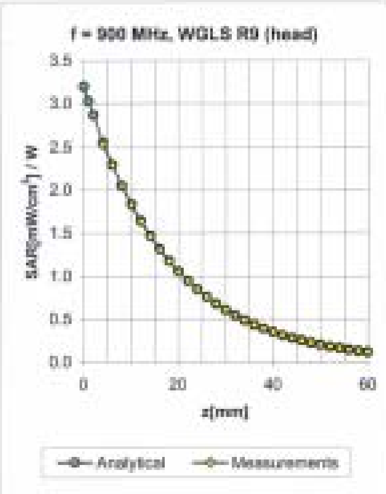
(Waveguide R22, f = 1800 MHz)

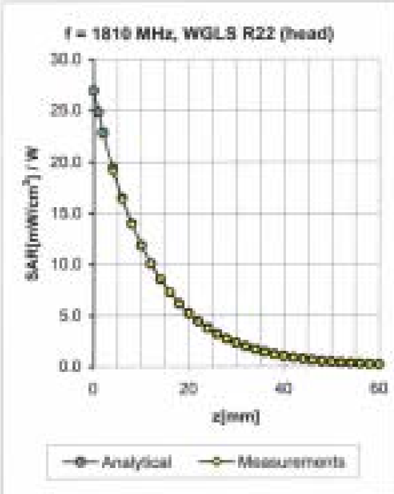




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



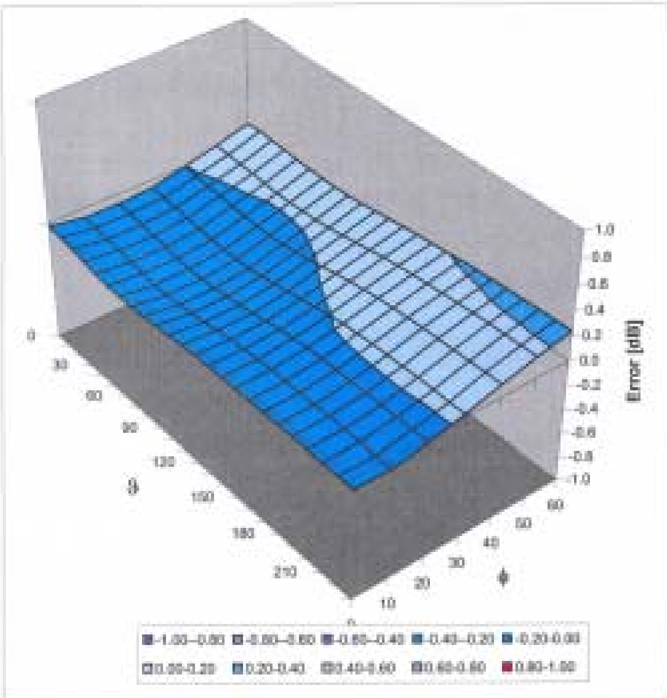


f [MHz]	Validity [MHz][c]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	1.00	1.18	6.00	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.73	1.39	5.07	± 11.0% (k=2)
2000	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.73	1.38	4.97	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.74	1.36	4.69	± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	1.00	1.17	5.92	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	1.00	1.18	4.68	± 11.0% (k=2)
2000	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.89	1.27	4.51	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.80	1.12	4.33	± 11.8% (k=2)

[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.

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

4. *DAE Calibration certification*

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **SGS – CSTC (MTT)**

Certificate No: **DAE3-569_Dec06**

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 569
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	December 8, 2006
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	13-Oct-06 (Elcal AG, No: 5492)	Oct-07
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-06 (Elcal AG, No: 5478)	Oct-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1002	15-Jun-06 (SPEAG, in house check)	In house check Jun-07

	Name	Function	Signature
Calibrated by:	Stefano Giannotta	Technician	
Approved by:	Fin Bomholt	R&D Director	F. Bomholt

Issued: December 8, 2006

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Accreditation No.: **SCS 108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle:* The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters contain technical information as a result from the performance test and require no uncertainty.
- *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
- *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
- *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
- *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
- *Input Offset Measurement:* Output voltage and statistical results over a large number of zero voltage measurements.
- *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
- *Input resistance:* DAE input resistance at the connector, during internal auto-zeroing and during measurement.
- *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
- *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range:	1LSB =	6.1μV ,	full range =	-100...+300 mV
Low Range:	1LSB =	61nV ,	full range =	-1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.742 ± 0.1% (k=2)	404.327 ± 0.1% (k=2)	404.103 ± 0.1% (k=2)
Low Range	3.93547 ± 0.7% (k=2)	3.93513 ± 0.7% (k=2)	3.93385 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	80 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	200000	199999.9	0.00
Channel X	+ Input	20000	20002.27	0.01
Channel X	- Input	20000	-19998.87	-0.01
Channel Y	+ Input	200000	200000.1	0.00
Channel Y	+ Input	20000	19999.20	0.00
Channel Y	- Input	20000	-20003.47	0.02
Channel Z	+ Input	200000	200000.0	0.00
Channel Z	+ Input	20000	20001.01	0.01
Channel Z	- Input	20000	-20001.46	0.01

Low Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	2000	1999.9	0.00
Channel X	+ Input	200	199.91	-0.05
Channel X	- Input	200	-200.86	0.43
Channel Y	+ Input	2000	1999.9	0.00
Channel Y	+ Input	200	199.35	-0.32
Channel Y	- Input	200	-200.57	0.28
Channel Z	+ Input	2000	2000.1	0.00
Channel Z	+ Input	200	200.37	0.19
Channel Z	- Input	200	-201.04	0.52

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	-6.08	-11.00
	- 200	8.46	12.92
Channel Y	200	6.85	6.78
	- 200	-8.07	-8.07
Channel Z	200	-5.10	-5.59
	- 200	4.40	3.64

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	0.47	0.37
Channel Y	200	1.04	-	3.88
Channel Z	200	-1.66	0.07	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16396	15608
Channel Y	15744	16385
Channel Z	16312	16061

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.16	-0.70	1.24	0.30
Channel Y	-1.80	-2.48	-0.86	0.32
Channel Z	-0.29	-1.19	0.92	0.39

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	200.2	0.2001
Channel Y	204.0	0.2001
Channel Z	205.8	0.2000

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9

5. Dipole Calibration certification

DASY4 Validation Report for Body TSL

Date/Time: 13.12.2006 15:14:05

Test Laboratory: SPEAG, Zurich, Switzerland

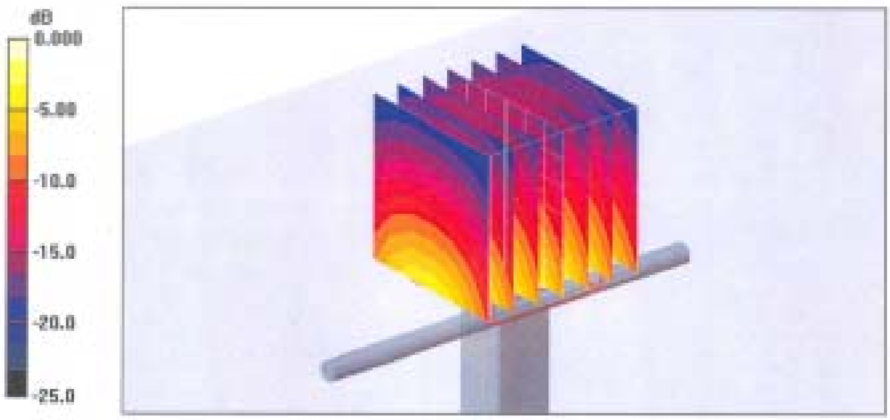
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN733

Communication System: CW-2450; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: MSL U10;
Medium parameters used: f = 2450 MHz; σ = 1.96 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025 (HF); ConvF(4.16, 4.16, 4.16); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.1 V/m; Power Drift = -0.036 dB
Peak SAR (extrapolated) = 28.2 W/kg
SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.25 mW/g
Maximum value of SAR (measured) = 15.3 mW/g



0 dB = 15.3mW/g

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Accreditation No.: SCS 108

Client **SGS-CSTC (MTT)**

Certificate No: **D2450V2-733_Dec06**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 733
Calibration procedure(s)	QA CAL-05.v6 Calibration procedure for dipole validation kits
Calibration date:	December 13, 2006
Condition of the calibrated item	In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Power sensor HP 8481A	US37292783	03-Oct-06 (METAS, No. 217-00608)	Oct-07
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ES3DV2	SN 3025	19-Oct-06 (SPEAG, No. ES3-3025_Oct06)	Oct-07
DAE4	SN 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 54206	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 14, 2006

Calibration Laboratory of
Schmid & Partner
Engineering AG
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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.7 ± 6 %	1.77 mho/m ± 6 %
Head TSL temperature during test	(21.8 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	250 mW input power	13.4 mW / g
SAR normalized	normalized to 1W	53.6 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**52.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.18 mW / g
SAR normalized	normalized to 1W	24.7 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**24.4 mW / g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.3 ± 6 %	1.96 mho/m ± 6 %
Body TSL temperature during test	(22.3 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	250 mW input power	13.5 mW / g
SAR normalized	normalized to 1W	54.0 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**53.1 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.25 mW / g
SAR normalized	normalized to 1W	25.0 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**24.7 mW / g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.8 Ω + 3.1 jΩ
Return Loss	− 27.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.4 Ω + 4.4 jΩ
Return Loss	− 26.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 07, 2003

DASY4 Validation Report for Head TSL

Date/Time: 13.12.2006 13:02:35

Test Laboratory: SPEAG, Zurich, Switzerland

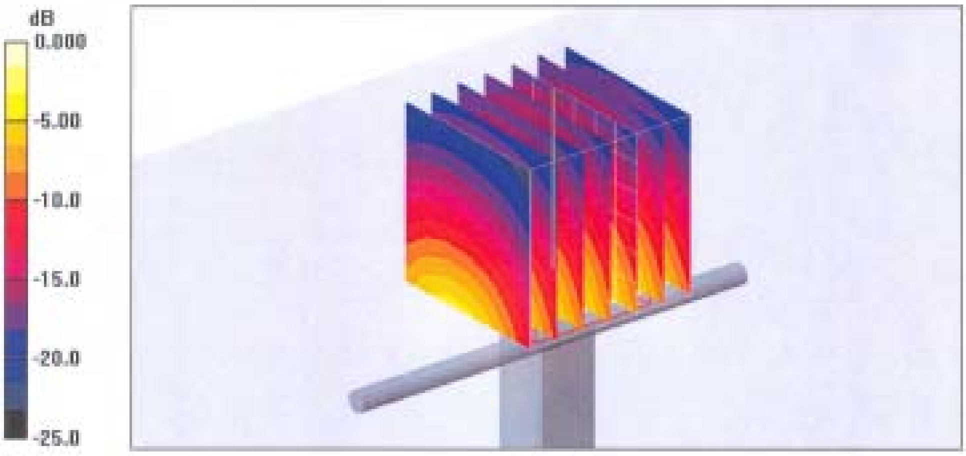
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN733

Communication System: CW-2450; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: HSL U10 BB_060425;
Medium parameters used: f = 2450 MHz; σ = 1.77 mho/m; ε_r = 37.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

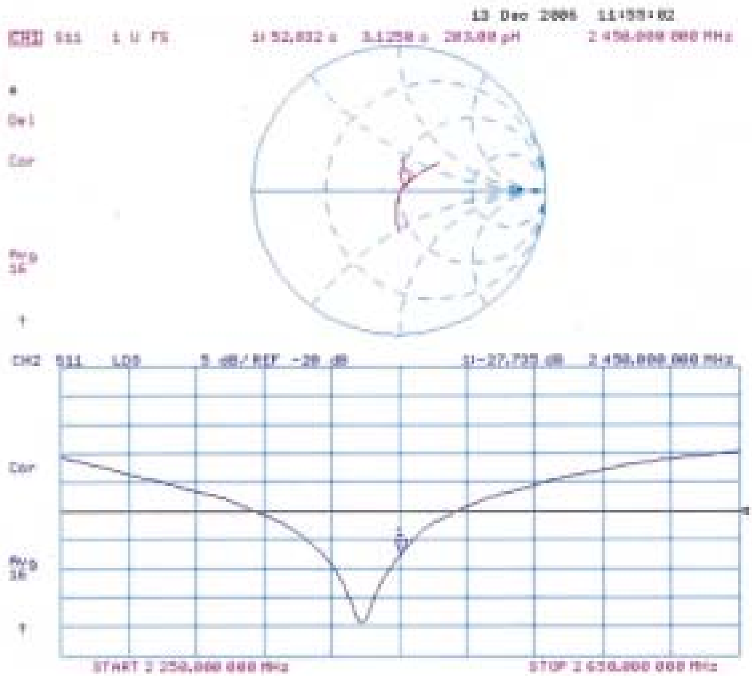
- Probe: ES3DV2 - SN3025 (HF); ConvF(4.5, 4.5, 4.5); Calibrated: 19.10.2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2006
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.8 V/m; Power Drift = 0.091 dB
Peak SAR (extrapolated) = 28.3 W/kg
SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.18 mW/g
Maximum value of SAR (measured) = 14.9 mW/g

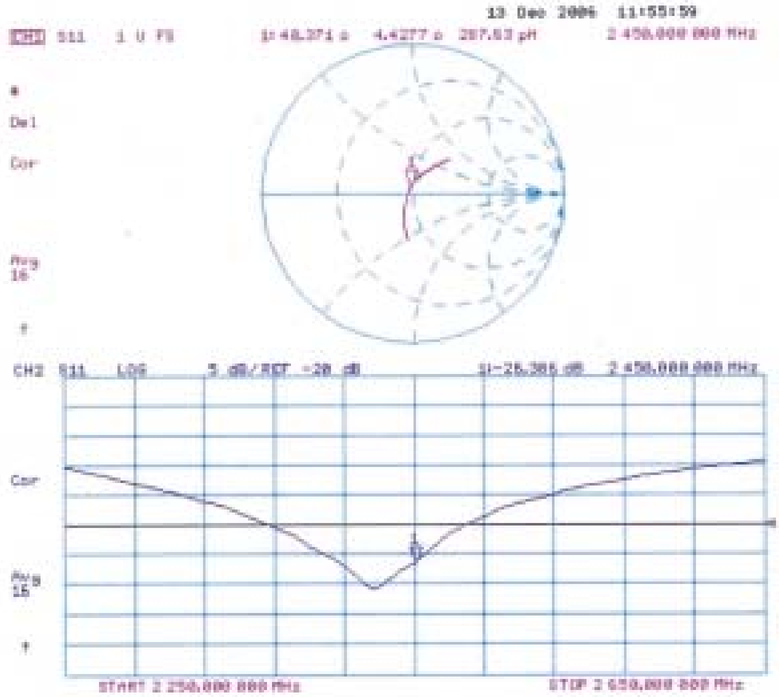


0 dB = 14.9mW/g

Impedance Measurement Plot for Head TSL



Impedance Measurement Plot for Body TSL



6. Uncertainty analysis

Error Description	Tol. (± %)	Prob. dist.	Div.	(c_i) (1g)	(c_i) (10g)	Std. unc. (± %) (1g)	Std. unc. (± %) (10g)	(v_i)
Measurement System								
Probe Calibration	4.8	N	1	1	1	4.8	4.8	∞
Axial Isotropy	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
Hemispherical Isotropy	0	R	$\sqrt{3}$	1	1	0	0	∞
Boundary Effects	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
System Detection Limit	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Readout Electronics	1.0	N	1	1	1	1.0	1.0	∞
Response Time	0	R	$\sqrt{3}$	1	1	0	0	∞
Integration Time	0	R	$\sqrt{3}$	1	1	0	0	∞
RF Ambient Conditions	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
Probe Positioner	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
Probe Positioning	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
Algorithms for Max. SAR Eval.	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
Dipole								
Dipole Axis to Liquid Distance	2.0	R	$\sqrt{3}$	1	1	1.2	1.2	∞
Input power and SAR drift meas.	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
Phantom and Tissue Param.								
Phantom Uncertainty	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5.0	R.	$\sqrt{3}$	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (meas.)	2.5	N	1	0.64	0.43	1.6	1.1	∞
Liquid Permittivity (target)	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (meas.)	2.5	N	1	0.6	0.49	1.5	1.2	∞
Combined Stdandard Uncertainty						8.4	8.1	∞
Coverage Factor for 95%		kp=2						
Expanded Uncertainty						16.8	16.2	

Dasy4 Uncertainty Budget

7. Phantom description

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 CA
Series No	TP-1150 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 28.02.2002

Signature / Stamp

F. Bomholt

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Doc No 881 – QD 000 P40 CA – B Page 1 (1)

The end