TEST REPORT

Equipment Under Test:	Connected Portable Navigation Device
Market name:	TeleNav Shotgun 101
Hardware Version:	V7.03
Software Version:	ADI R16.0
Applicant:	YF INTERNATIONAL LIMITED
Address of Applicant:	R308, incubator building, China Academy of Science and Technology Development, High Tech South Street 1, Shenzhen, China 518057
Date of Receipt:	2008.10.6
Date of Test:	2008.10.10 ~2008.10.12
Date of Issue:	2008.10.13

检 测
CNAS L1486

CTIA Authorized Test Lab

LAB CODE 20050309-01

GCF Global Certification Forum

Tested by :	Will Ni	Date :	2008.10.13
Approved by :	Zhiang Yuan	Date :	2008.10.13

SHGSM

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Change History

Version	Change contents	Author	Date
V1.0	First edition	Will Ni	2008-10-13

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Standards:

The Equipment under Test (EUT) has been tested at SGS's (own or subcontracted) laboratories. The following table summarizes the specific reference documents such as harmonized standards or test specifications which were used for testing as SGS's (own or subcontracted) laboratories.

Identity	Document Title	Version
FCC OET Bulletin 65 supplement C	Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields	June 2001
IEEE1528	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques	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.

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1. General Information

1.1 Test Laboratory

GSM Laboratory
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Zip code: 200233

Telephone:	+86 (0) 21 6495 1616
Fax:	+86 (0) 21 5450 0149
Internet:	http://www.cn.sgs.com

1.2 Details of Applicant

Name:	YF INTERNATIONAL LIMITED
Address:	R308, incubator building, China Academy of Science and Technology Development, High Tech South Street 1, Shenzhen, China 518057
Contact Person:	Shine He
Contact Telephone	(86)755 26995276

1.3 Description of EUT(s)

Brand name	TeleNav	
Market Name	TeleNav Shotgun 101	
Status of Product	Production	
Hardware Version	V7.03	
Software Version	ADI R16.0	
Serial No.	IMEI: 359585016944495	
Battery Type	Li-on(embedded)	
Antenna Type	Inner Antenna	
Operation Mode	GPRS	
Modulation Mode	GMSK	
Frequency range	GSM850	Tx: 824~849 MHz
		Rx: 869~894 MHz
	PCS1900	Tx: 1850~1910 MHz

		Rx: 1930~1990 MHz
Nominal Maximum RF Conducted Power/MS Power Class	GSM850:GMSK/33.0dBm PCS1900: GMSK/30.0dBm	

1.4 Test Environment

Ambient temperature: 22.0° C

Tissue Simulating Liquid: 22.0° C

Relative Humidity: 45%~55%

1.5 Operation Configuration

Configuration 1: GSM 850, BodyWorn P1&P2&P3&P4 1.5cm

Configuration 2: PCS 1900, BodyWorn P1&P2&P3&P4 1.5cm

Note: P1&P2&P3&P4 are defined based on the location of the internal antenna; refer to page 38-41 for details

For SS

The device was put into operation by using CMU200 radio tester through air link.

The device output power was set to maximum power level for each test.

The measurements were performed on lowest, middle and highest channels.

In GPRS mode

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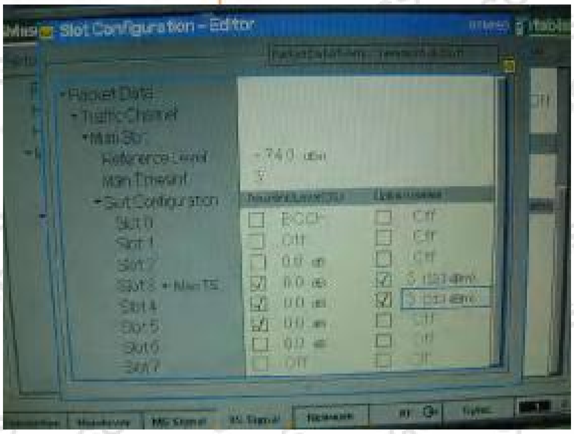

1.6 SAM Twin Phantom

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.

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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 Description of Test Position

1.8.1 SAM Phantom Shape

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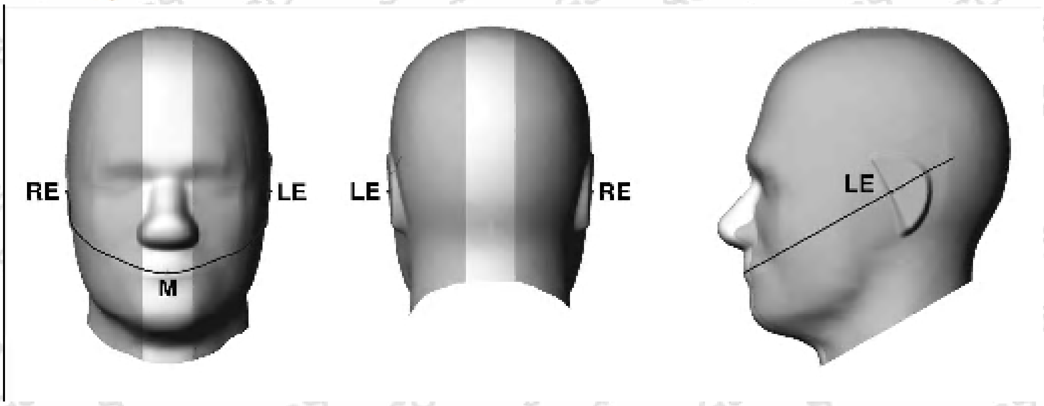

Figure1—front, back, and side views of SAM (model for the phantom shell). Full-head model is for illustration purposes only—procedures in this recommended practice are intended primarily for the phantom setup of Figure 2. Note: The center strip including the nose region has a different thickness tolerance.

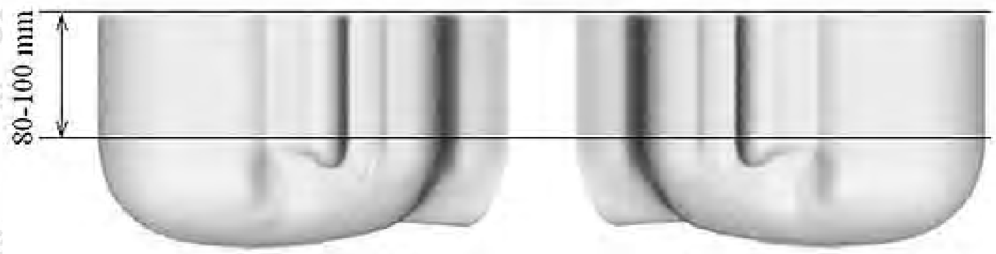

Figure 2—Sagittally bisected phantom with extended perimeter (shown placed on its side as used for SAR measurements)

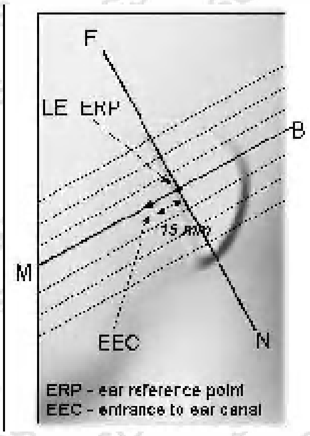

Figure 3—Close-up side view of phantom showing ear region, N-F and B-M lines, and seven cross-sectional plane locations

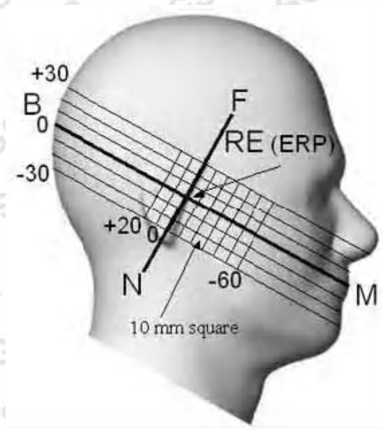

Figure 4—Side view of the phantom showing relevant markings and seven cross-sectional plane locations

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1.8.2 The following pictures present the different DUT constructions.

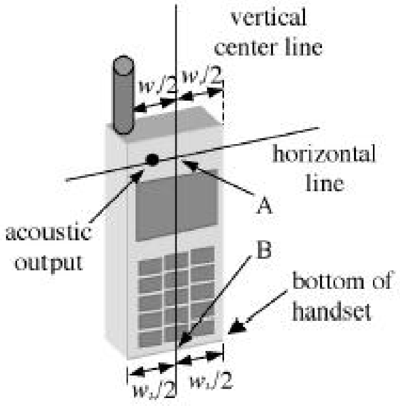

Figure 5a—Handset vertical and horizontal reference lines—"fixed case"

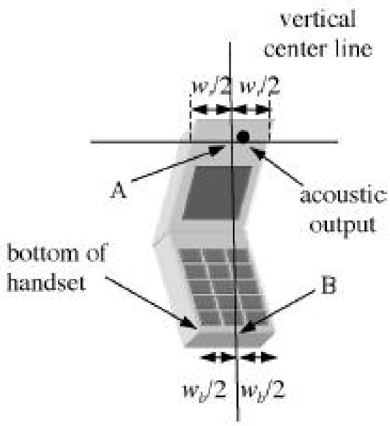

Figure 5b—Handset vertical and horizontal reference lines—"clam-shell case"

1.8.3 Definition of the "cheek" position:

a) Position the device with the vertical centre line of the body of the device and the horizontal line crossing the centre of the ear piece in a plane parallel to the sagittal plane of the phantom ("initial position" see Figure 6). While maintaining the device in this plane, align the vertical centre line with the reference plane containing the three ear and mouth reference points (M, RE and LE) and align the centre of the ear piece with the line RE-LE;

b) Translate the mobile phone box towards the phantom with the ear piece aligned with the line LE-RE until the phone touches the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the box until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost.

1.8.4 Definition of the "tilted" position:

a) Position the device in the "cheek" position described above;

b) While maintaining the device in the reference plane described above and pivoting against the ear, move it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost.

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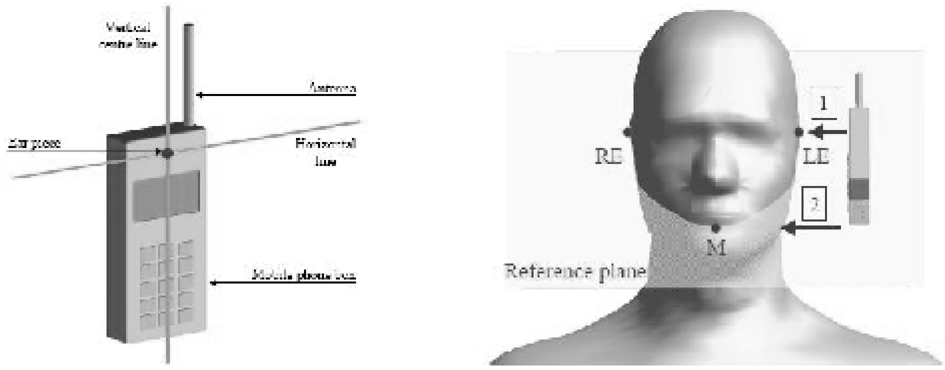

Figure 6 - Definition of the reference lines and points, on the phone and on the phantom and initial position

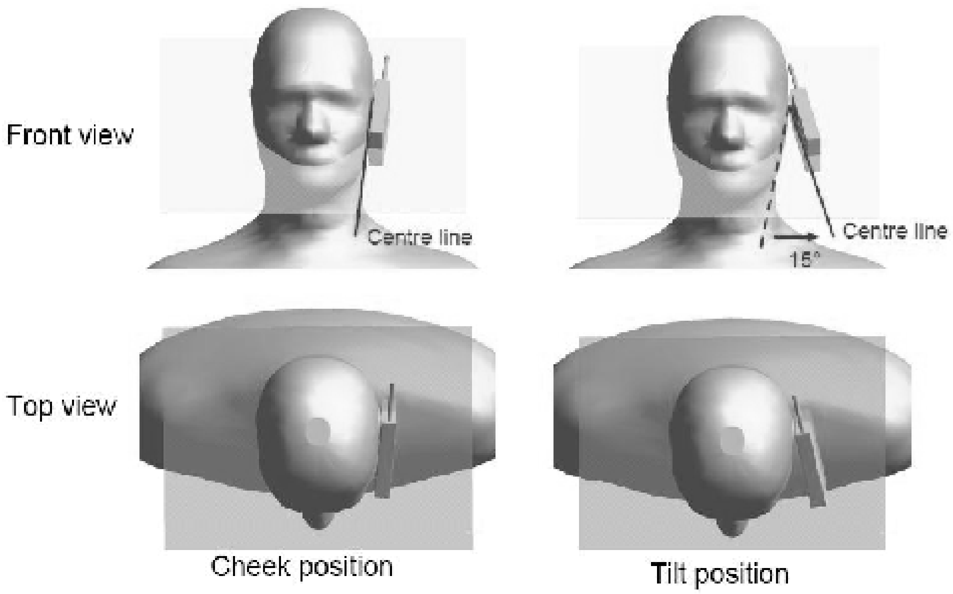

Figure 7 -"Cheek" and "tilt" positions of the mobile phone on the left side

1.9 Recipes for Tissue Simulating Liquid

The following tables give the recipes for tissue simulating liquids to be used in different frequency bands.

Ingredient	850MHz	1900MHz
Water	40.29%	55.24%
Sugar	57.90%	-

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Salt (NaCl)	1.38%	0.31%
DGBE	-	44.45%
Preventol	0.18%	-
HEC	0.24%	-
Relative Permittivity	41.5	40.0
Conductivity (S/m)	0.90	1.40

Table 1: Composition of the Brain Tissue Equivalent Matter

Ingredient	850MHz	1900MHz
Water	50.75%	70.17%
Sugar	48.21%	-
Salt (NaCl)	0.94%	0.39%
DGBE	-	29.44%
Preventol	0.10%	-
HEC	0.00	-
Relative Permittivity	55.2	53.3
Conductivity (S/m)	0.97	1.52

Table 2: Composition of the Body Tissue Equivalent Matter

1.10 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 evaluate the points between the surface and the probe tip. The maximum interpolated value was searched with a straight-forward algorithm. Around this

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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.)

1.11 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 ES3DV3 3088 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.

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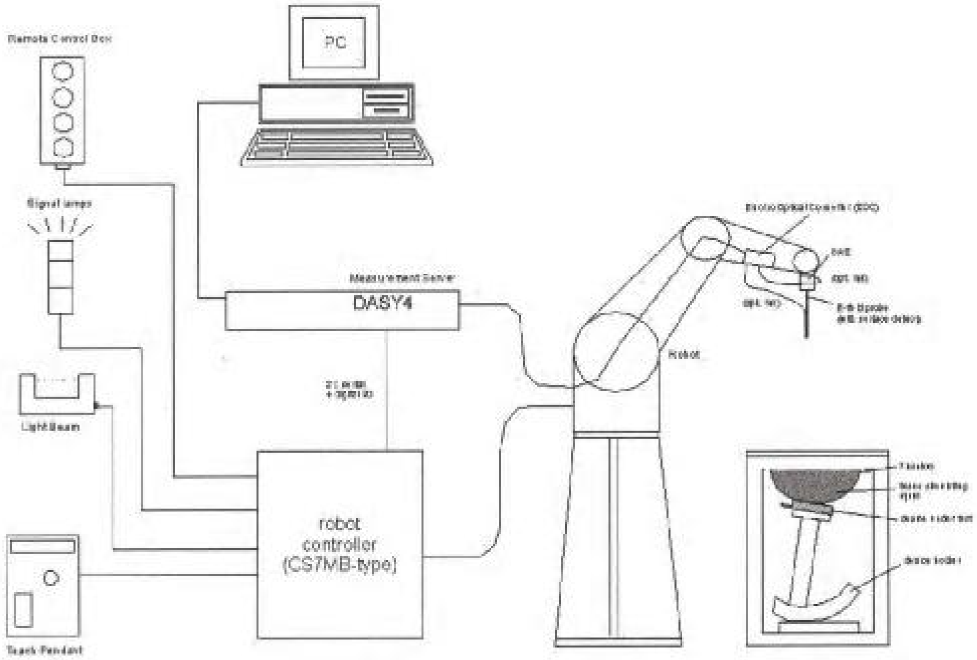

Fig. a SAR System Configuration

- 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 to validating the proper functioning of the system.

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1.12 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 900&1900MHz. 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.

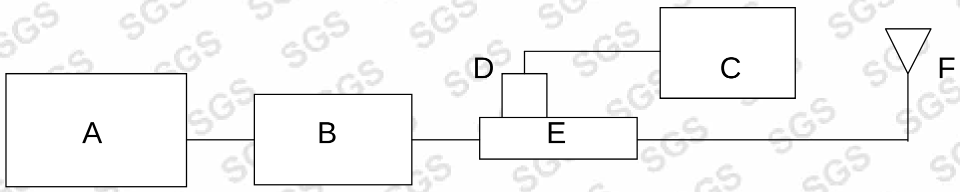

Fig. b the microwave circuit arrangement used for SAR system verification

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)	10% Limit Range	Measured SAR 1g	Measured Date
D900V2 184	900 Body	2.9	2.61~3.19	2.65	2008-10-10
D900V2 184	900 Body	2.9	2.61~3.19	2.74	2008-10-12
D1900V2 5d028	1900 Body	9.34	8.41~10.27	9.65	2008-10-10

Table 1. Result System Validation

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1.13 Tissue Simulant Fluid for the Frequency Band 850MHZ and 1900MHz

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 1.For the SAR measurement given in this report. The temperature variation of the Tissue Simulant Fluid was 22°C.

Frequency (MHz)	Tissue Type	Limit/Measured	Permittivity (ρ)	Conductivity (σ)	Simulated Tissue Temp (°C)
850	Body	**Recommended Limit**	**55.2±5%**	**0.97±5%**	**20-24**
		Measured, 2008-10-10	54.3	1.02	21.6
		Measured, 2008-10-12	53.8	1.01	21.8
1900	Body	**Recommended Limit**	**53.3±5%**	**1.52±5%**	**20-24**
		Measured, 2008-10-10	52.8	1.58	22.4

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

1.14 Test Standards and Limits

Standards:

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 specific 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 (Brain)	1.60 mW/g (averaged over a mass of 1g)

Table 3. 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.

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2. Summary of Results

Conducted Power

Power(dBm)		Lowest Channel	Middle Channel	Highest Channel
GSM850	GPRS	31.58	31.69	31.9
PCS1900	GPRS	29.09	28.97	28.97

GSM850

850	Test Configuration		SAR, Averaged over 1g(W/kg)			Temperature	Verdict
	Channel		Low	Middle	High	(℃)	
Body	P1	GPRS	--	0.617	--	22	Pass
	P2	GPRS	0.915	0.918	0.844	22	Pass
	P3	GPRS	--	0.429	--	22	Pass
	P4	GPRS	--	0.146	--	22	Pass

PCS1900

1900	Test Configuration		SAR, Averaged over 1g(W/kg)			Temperature	Verdict
	Channel		Low	Middle	High	(℃)	
Body	P1	GPRS	--	0.211	--	22	Pass
	P2	GPRS	1.01	1.34	1.24	22	Pass
	P3	GPRS	--	0.441	--	22	Pass
	P4	GPRS	--	0.177	--	22	Pass

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Maximum Values

Frequency Band(MHz)	EUT position	Output Power (dBm)	1g Average (W/Kg)	Power Drift (dB)	Temperature (℃)	Verdict
GSM850	Body Worn, GPRS, Mid Channel, 1.5cm, P2	31.6	0.918	0.018	22	PASS
PCS1900	Body Worn, GPRS, Mid Channel, 1.5cm, P2	28.9	1.34	-0.084	22	PASS

Note:

1. In GSM850 band, the low, middle and high channels are CH128/824.2MHz, CH189/836.4MHz and CH251/848.8MHz separately.
2. In PCS1900 band, the low, middle and high channels are CH512/1805.2MHz, CH661/1880.0MHz and CH810/1909.8MHz separately.
3. For all the tests, the maximum absolute value of the power drift which is under the GSM850-Body-Worn-GPRS-High-P2 configuration is -0.236dB.

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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	2008.1.18
DAE	DAE3	569	GSM-SAR-023	2007.11.19
900MHz system validation dipole	D900V2	184	GSM-SAR-017	2007.12.21
1900MHz system validation dipole	D1900V2	5d028	GSM-SAR-020	2007.12.21
Phantom	SAM 12	TP-1283	GSM-SAR-005	N/A
Robot	RX90L	F03/5V32A1/A01	GSM-SAR-006	N/A
Dielectric probe kit	85070D	US01440168	GSM-SAR-016	2007.12.18
Agilent network analyzer	E5071B	MY42100549	GSM-SAR-007	2007.12.18
Agilent signal generator	E4438	14438CATO-19719	GSM-SAR-008	2007.12.18
Mini-Circuits preamplifier	ZHL-42	D041905	GSM-SAR-033	2007.12.18
Agilent power meter	E4416A	GB41292095	GSM-SAR-010	2007.12.18
Agilent power sensor	8481H	MY41091234	GSM-SAR-011	2007.12.18
HT CP6100 20N Coupling	6100	SCP301480120	GSM-SAR-012	2007.12.18
R&S Universal radio communication tester	CMU200	103633	GSM-AUD-002	2007.12.18

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4. Measurements

GSM850

4.1 GSM850-Body-Worn-GPRS-Middle-P1

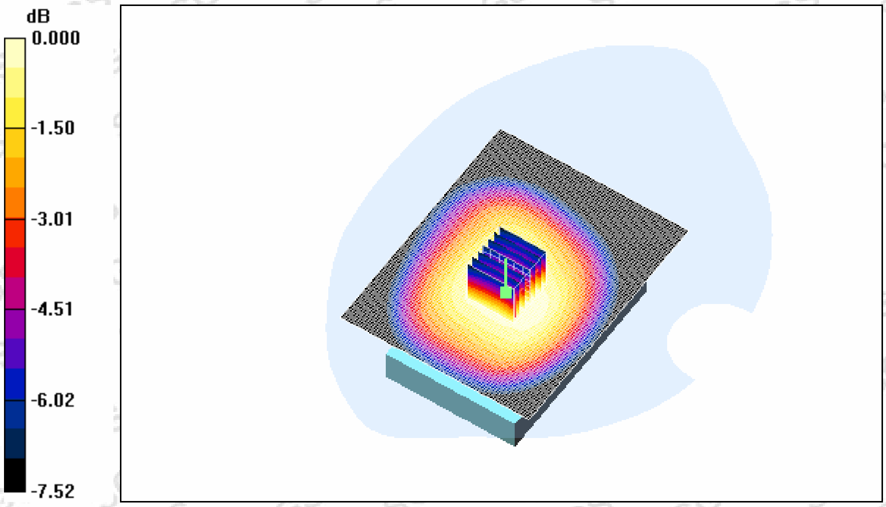
Date/Time: 2008-10-10 18:57:50

Test Laboratory: SGS-GSM
GSM850-Body-Worn-GPRS-Mid-P1
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: GSM850-GPRS Mode; Frequency: 836.4 MHz;Duty Cycle: 1:4
Medium: HSL900-Body Medium parameters used: f = 836.4 MHz; σ = 0.955 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(5.81, 5.81, 5.81); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p1 -1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 0.656 mW/g

Body Worn - Middle p1 -1.5cm/Zoom Scan (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 21.5 V/m; Power Drift = -0.190 dB
Peak SAR (extrapolated) = 0.776 W/kg
SAR(1 g) = 0.617 mW/g; SAR(10 g) = 0.476 mW/g
Maximum value of SAR (measured) = 0.646 mW/g



0 dB = 0.646mW/g

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4.2 GSM850-Body-Worn-GPRS-Middle-P2

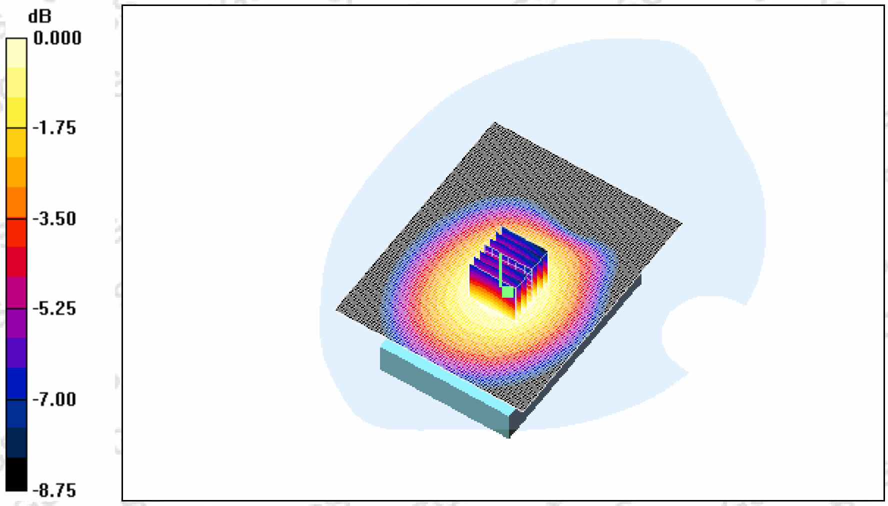
Date/Time: 2008-10-10 19:19:43

Test Laboratory: SGS-GSM
GSM850-Body-Worn-GPRS-Mid-P2
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: GSM850-GPRS Mode; Frequency: 836.4 MHz;Duty Cycle: 1:4
Medium: HSL900-Body Medium parameters used: f = 836.4 MHz; σ = 0.955 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(5.81, 5.81, 5.81); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p2 -1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 0.958 mW/g

Body Worn - Middle p2 -1.5cm/Zoom Scan (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 23.9 V/m; Power Drift = 0.018 dB
Peak SAR (extrapolated) = 1.18 W/kg
SAR(1 g) = 0.918 mW/g; SAR(10 g) = 0.693 mW/g
Maximum value of SAR (measured) = 0.964 mW/g



0 dB = 0.964mW/g

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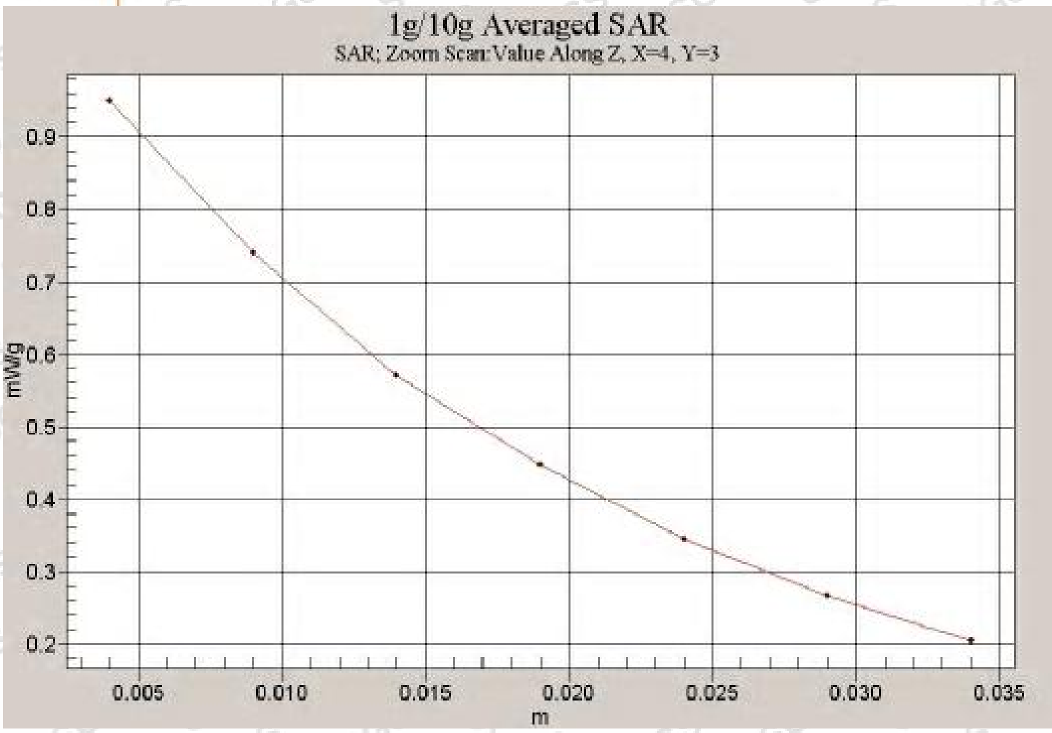

4.3 GSM850-Body-Worn- GPRS -Middle-P3

Date/Time: 2008-10-12 11:09:35

Test Laboratory: SGS-GSM
GSM850-Body-Worn-GPRS-Mid-P3
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: GSM850-GPRS Mode; Frequency: 836.4 MHz;Duty Cycle: 1:4
Medium: HSL900-Body Medium parameters used: f = 836.4 MHz; σ = 0.955 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(5.81, 5.81, 5.81); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p3-1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 0.460 mW/g

Body Worn - Middle p3-1.5cm/Zoom Scan (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 12.5 V/m; Power Drift = -0.006 dB
Peak SAR (extrapolated) = 0.566 W/kg
SAR(1 g) = 0.429 mW/g; SAR(10 g) = 0.309 mW/g
Maximum value of SAR (measured) = 0.456 mW/g

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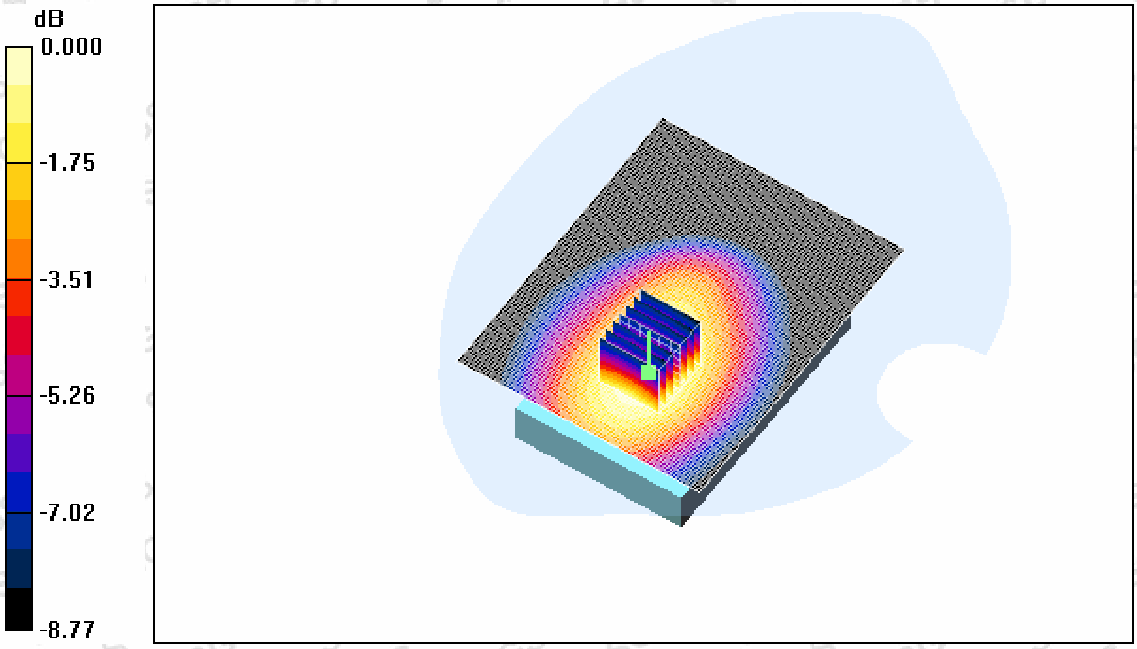

0 dB = 0.456mW/g

4.4 GSM850-Body-Worn- GPRS -Middle-P4

Date/Time: 2008-10-12 12:12:26

Test Laboratory: SGS-GSM
GSM850-Body-Worn-GPRS-Mid-P4
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: GSM850-GPRS Mode; Frequency: 836.4 MHz;Duty Cycle: 1:4
Medium: HSL900-Body Medium parameters used: f = 836.4 MHz; σ = 0.955 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(5.81, 5.81, 5.81); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p4-1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 0.156 mW/g

Body Worn - Middle p4-1.5cm/Zoom Scan (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 10.9 V/m; Power Drift = -0.053 dB
Peak SAR (extrapolated) = 0.208 W/kg
SAR(1 g) = 0.146 mW/g; SAR(10 g) = 0.100 mW/g
Maximum value of SAR (measured) = 0.156 mW/g

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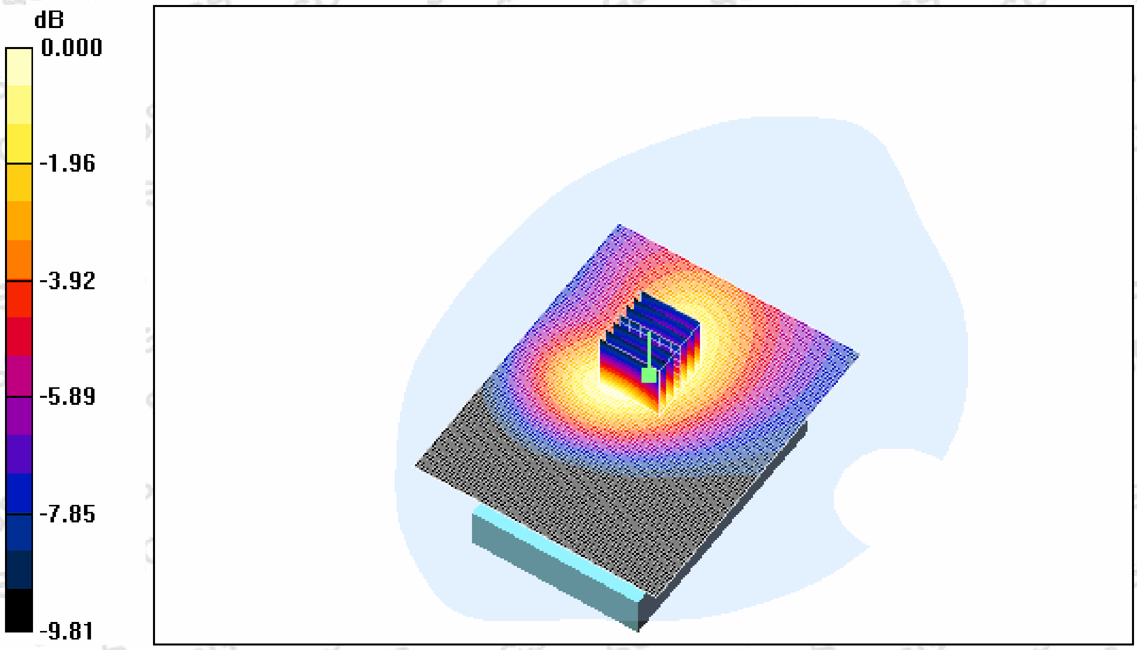


0 dB = 0.156mW/g

4.5 GSM850-Body-Worn-GPRS-Worstcase-Low

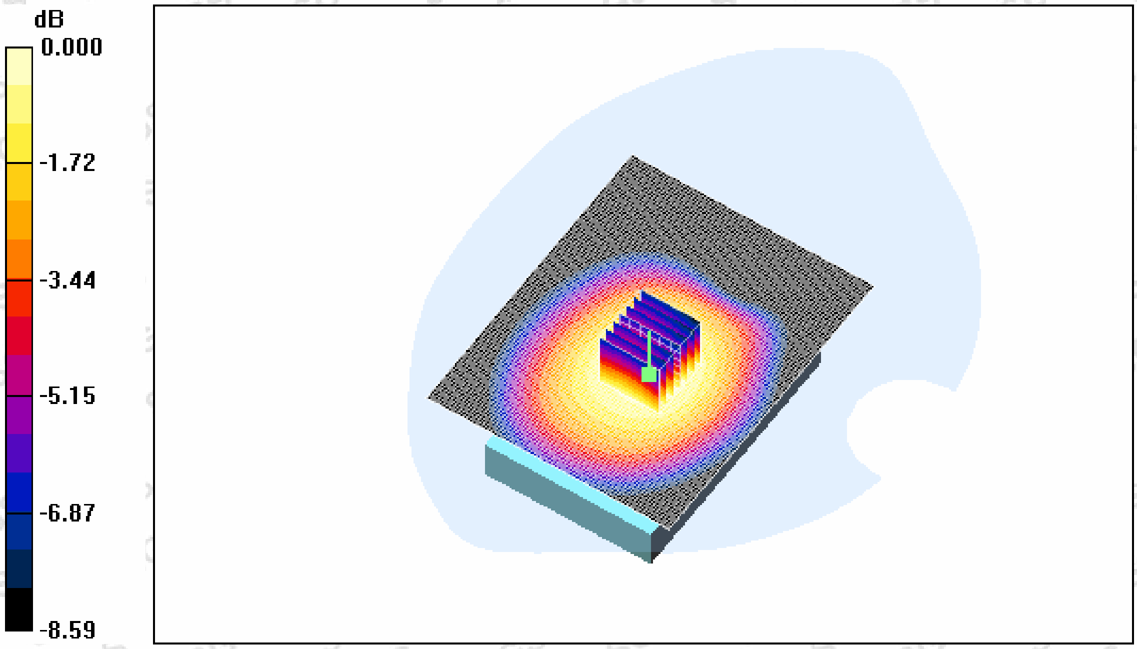
Date/Time: 2008-10-10 19:43:37

Test Laboratory: SGS-GSM
GSM850-Body-Worn-GPRS-Low-P2
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: GSM850-GPRS Mode; Frequency: 824.2 MHz;Duty Cycle: 1:4
Medium: HSL900-Body Medium parameters used: f = 824.2 MHz; σ = 0.941 mho/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(5.81, 5.81, 5.81); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p2 -1.5cm 2/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 0.957 mW/g

Body Worn - Low p2 -1.5cm 2/Zoom Scan (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 24.4 V/m; Power Drift = -0.042 dB
Peak SAR (extrapolated) = 1.18 W/kg
SAR(1 g) = 0.915 mW/g; SAR(10 g) = 0.690 mW/g
Maximum value of SAR (measured) = 0.962 mW/g



0 dB = 0.962mW/g

4.6 GSM850-Body-Worn- GPRS-Worstcase-High

Date/Time: 2008-10-12 10:47:01

Test Laboratory: SGS-GSM
GSM900-Body-Worn-GPRS-High-P2
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: GSM850-GPRS Mode; Frequency: 848.8 MHz;Duty Cycle: 1:4
Medium: HSL900-Body Medium parameters used: f = 848.8 MHz; σ = 0.967 mho/m; ε_r = 54.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(5.81, 5.81, 5.81); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p2-1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 0.917 mW/g

Body Worn - High p2-1.5cm/Zoom Scan (7x7x7) (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 9.30 V/m; Power Drift = -0.236 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR(1 g) = 0.844 mW/g; SAR(10 g) = 0.635 mW/g
Maximum value of SAR (measured) = 0.887 mW/g

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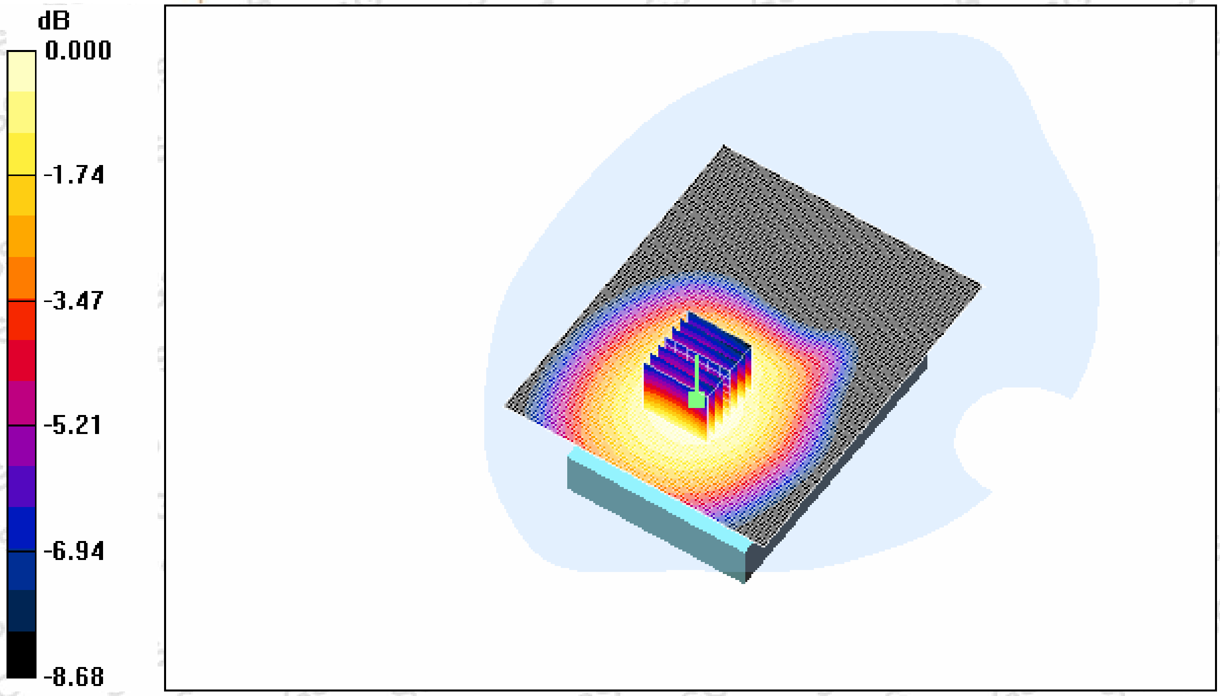

0 dB = 0.887mW/g

GSM1900

4.7 GSM1900-Body-Worn-GPRS-Middle-P1

Date/Time: 2008-10-10 13:12:40

Test Laboratory: SGS-GSM
GSM1900Body-Worn--GPRS-Mid-P1
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: PCS1900-GPRS Mode; Frequency: 1880 MHz;Duty Cycle: 1:4
Medium: HSL1900-Body Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 53; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.6, 4.6, 4.6); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p1 -1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 0.226 mW/g

Body Worn - Middle p1 -1.5cm/Zoom Scan (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 7.83 V/m; Power Drift = -0.084 dB
Peak SAR (extrapolated) = 0.341 W/kg

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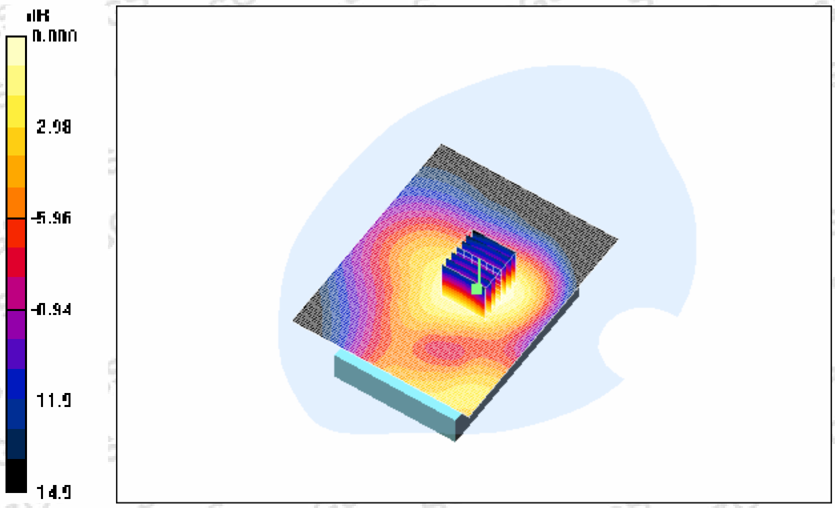
SAR(1 g) = 0.211 mW/g; SAR(10 g) = 0.131 mW/g
Maximum value of SAR (measured) = 0.224 mW/g



0 dB = 0.224mW/g

4.8 GSM1900-Body-Worn-GPRS-Middle-P2

Date/Time: 2008-10-10 11:07:36

Test Laboratory: SGS-GSM
GSM1900Body-Worn--GPRS-Mid-P2
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: PCS1900-GPRS Mode; Frequency: 1880 MHz;Duty Cycle: 1:4
Medium: HSL1900-Body Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 53; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.6, 4.6, 4.6); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p2 -1.5cm/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.70 mW/g

Body Worn - Middle p2 -1.5cm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.4 V/m; Power Drift = -0.084 dB
Peak SAR (extrapolated) = 2.50 W/kg
SAR(1 g) = 1.34 mW/g; SAR(10 g) = 0.701 mW/g
Maximum value of SAR (measured) = 1.47 mW/g

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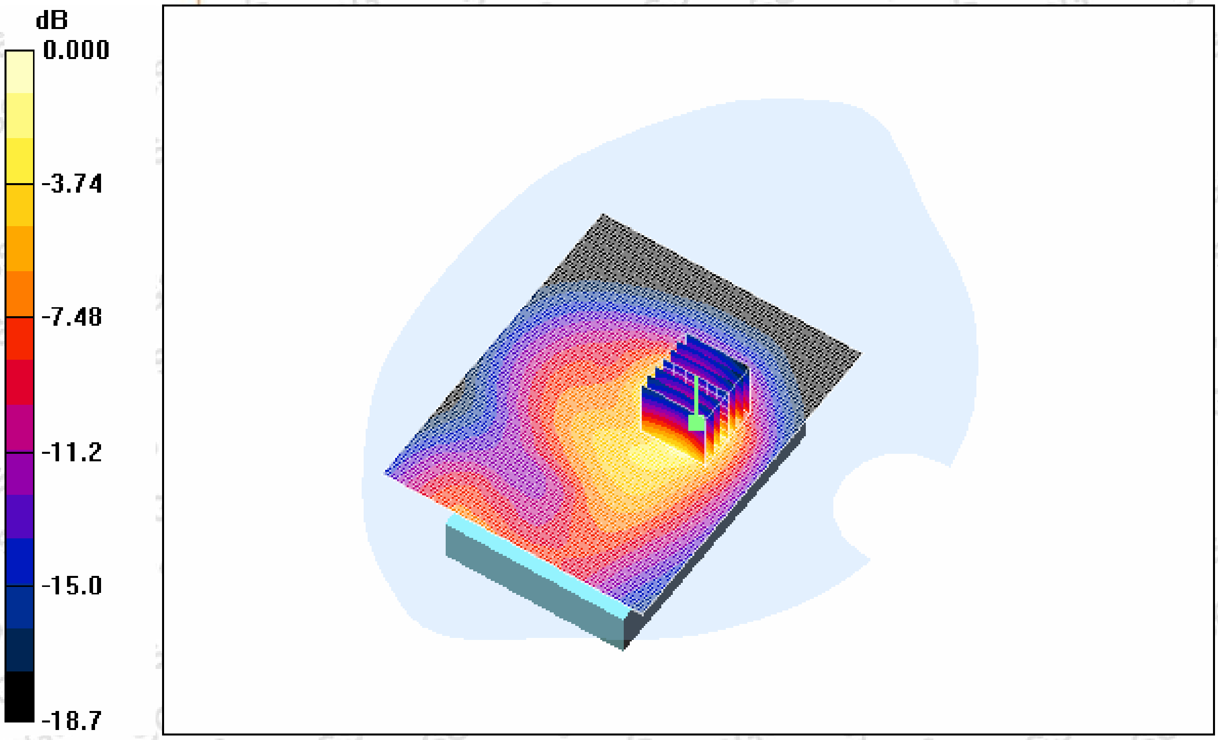
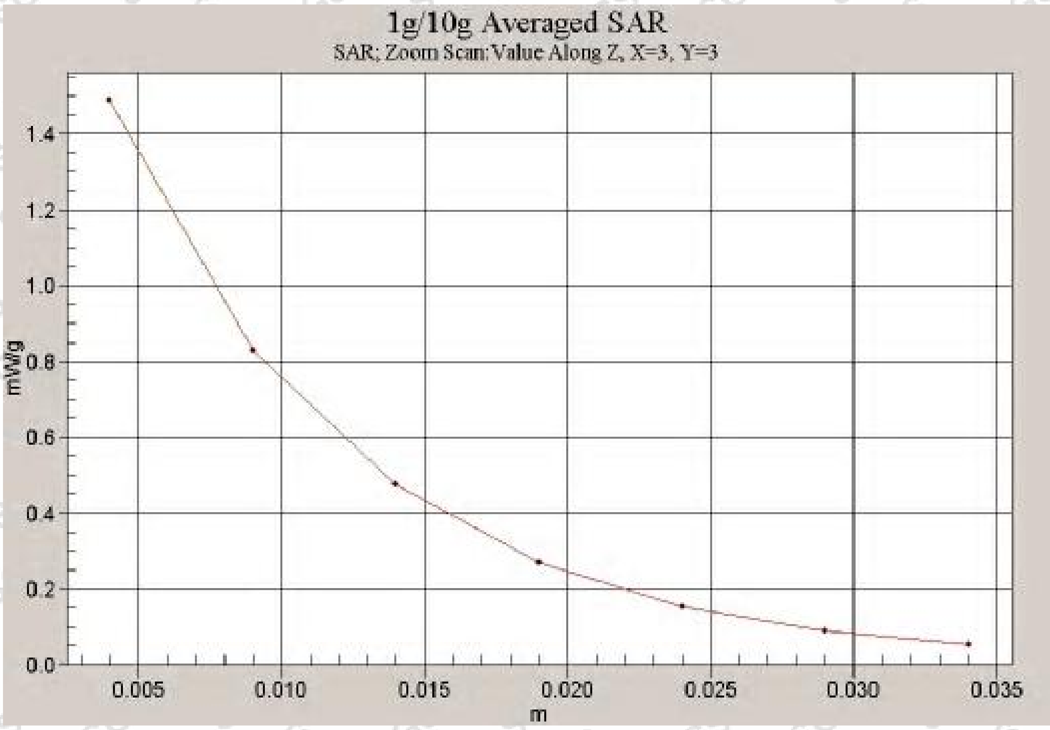

dB
0.000
-3.74
-7.48
-11.2
-15.0
-18.7

0 dB = 1.47mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=3, Y=3
mW/g
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

4.9 GSM1900-Body-Worn-GPRS-Middle-P3

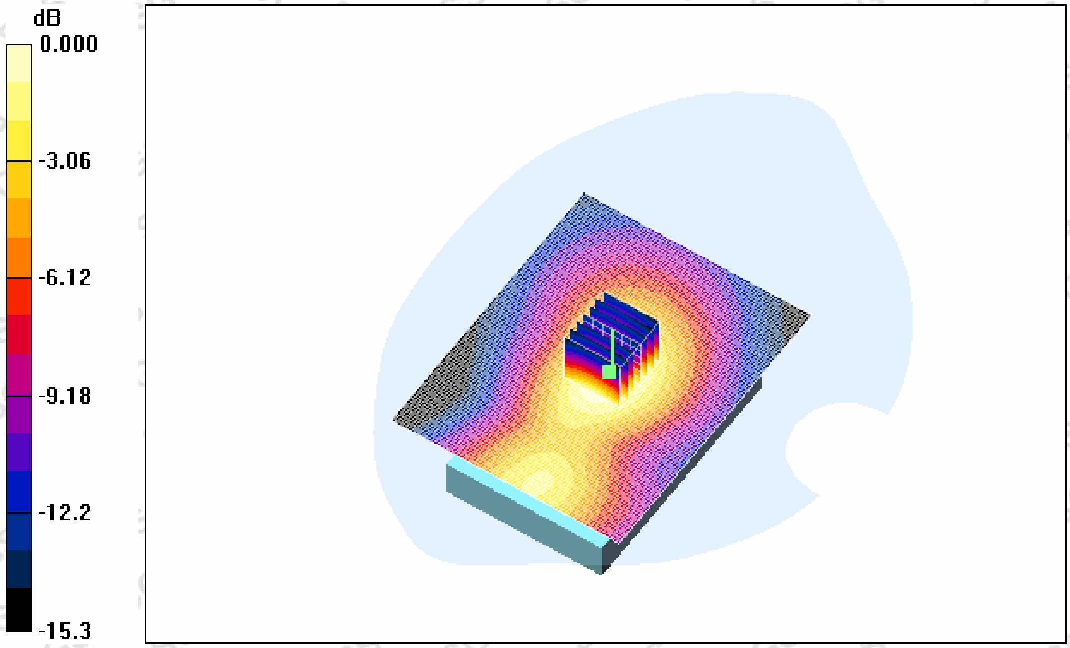
Date/Time: 2008-10-10 13:38:34

Test Laboratory: SGS-GSM
GSM1900Body-Worn--GPRS-Mid-P3
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: PCS1900-GPRS Mode; Frequency: 1880 MHz;Duty Cycle: 1:4
Medium: HSL1900-Body Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 53; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.6, 4.6, 4.6); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p3-1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 0.492 mW/g

Body Worn - Middle p3-1.5cm/Zoom Scan (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 13.6 V/m; Power Drift = -0.069 dB
Peak SAR (extrapolated) = 0.738 W/kg
SAR(1 g) = 0.441 mW/g; SAR(10 g) = 0.265 mW/g
Maximum value of SAR (measured) = 0.475 mW/g



0 dB = 0.475mW/g

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4.10 GSM1900-Body-Worn-GPRS-Middle-P4

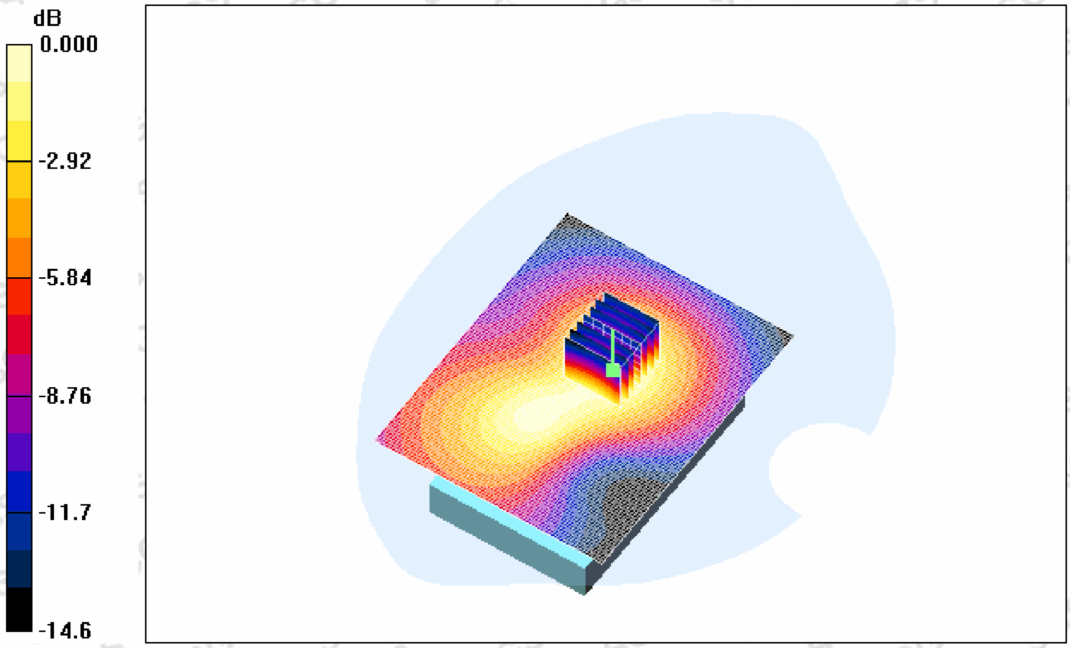
Date/Time: 2008-10-10 14:59:10

Test Laboratory: SGS-GSM
GSM1900Body-Worn--GPRS-Mid-P4
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: PCS1900-GPRS Mode; Frequency: 1880 MHz;Duty Cycle: 1:4
Medium: HSL1900-Body Medium parameters used: f = 1880 MHz; σ = 1.56 mho/m; ε_r = 53; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.6, 4.6, 4.6); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p4-1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 0.195 mW/g

Body Worn - Middle p4-1.5cm/Zoom Scan (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 10.6 V/m; Power Drift = -0.225 dB
Peak SAR (extrapolated) = 0.287 W/kg
SAR(1 g) = 0.177 mW/g; SAR(10 g) = 0.107 mW/g
Maximum value of SAR (measured) = 0.192 mW/g



0 dB = 0.192mW/g

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4.11 GSM1900-Body-Worn-GPRS-Worstcase-Low

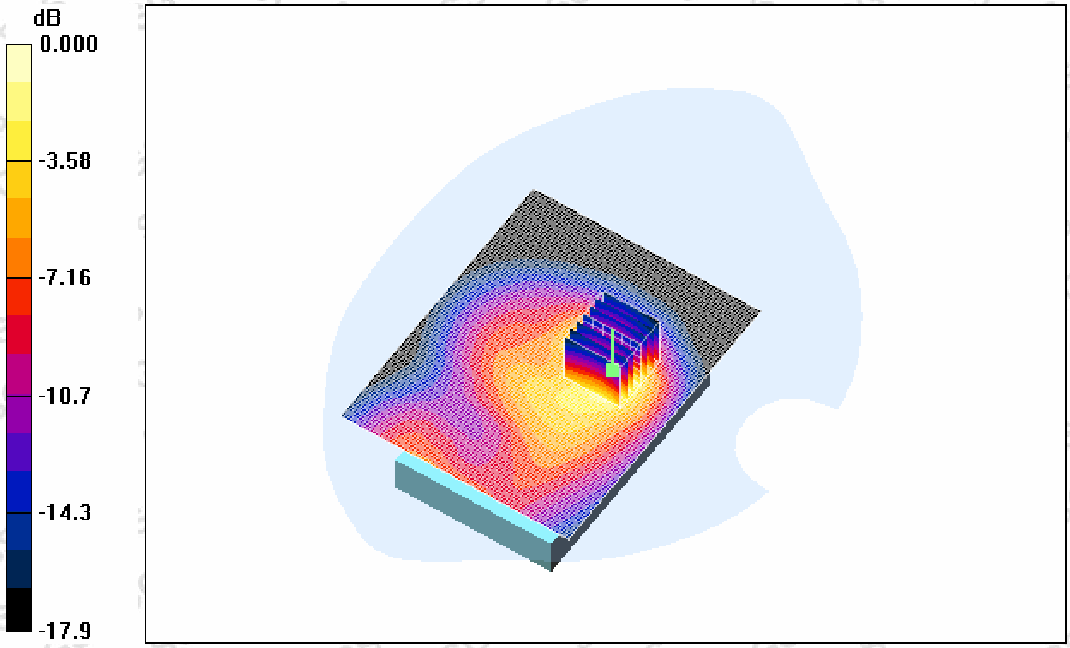
Date/Time: 2008-10-10 15:23:33

Test Laboratory: SGS-GSM
GSM1900Body-Worn--GPRS-Low-P2
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: PCS1900-GPRS Mode; Frequency: 1850.2 MHz;Duty Cycle: 1:4
Medium: HSL1900-Body Medium parameters used: f = 1850.2 MHz; σ = 1.53 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.6, 4.6, 4.6); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p2-1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 1.24 mW/g

Body Worn - Low p2-1.5cm/Zoom Scan (7x7x7) (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 17.8 V/m; Power Drift = -0.075 dB
Peak SAR (extrapolated) = 1.85 W/kg
SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.537 mW/g
Maximum value of SAR (measured) = 1.11 mW/g



0 dB = 1.11mW/g

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4.12 GSM1900-Body-Worn- GPRS- Worstcase-High

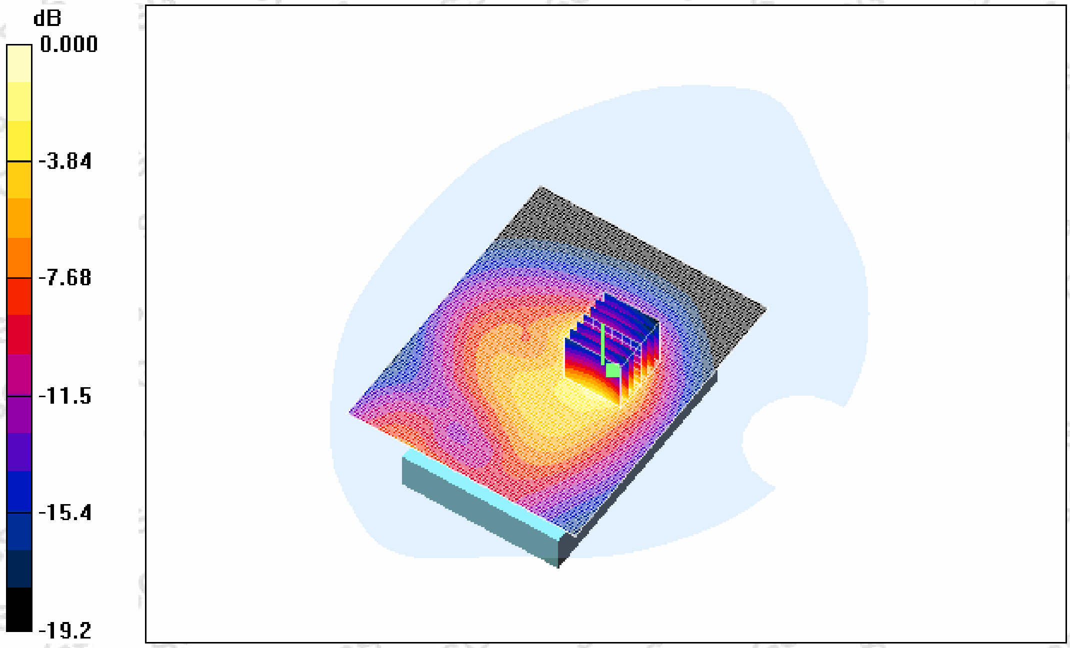
Date/Time: 2008-10-10 16:10:37

Test Laboratory: SGS-GSM
GSM1900Body-Worn--GPRS-High-P2
DUT: L8001; Type: Body; Serial: 359585016944495
Communication System: PCS1900-GPRS Mode; Frequency: 1909.8 MHz;Duty Cycle: 1:4
Medium: HSL1900-Body Medium parameters used: f = 1909.8 MHz; σ = 1.59 mho/m; ε_r = 52.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.6, 4.6, 4.6); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- 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 p2-1.5cm/Area Scan (81x101x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 1.41 mW/g

Body Worn - High p2-1.5cm/Zoom Scan (7x7x7) (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 17.5 V/m; Power Drift = -0.138 dB
Peak SAR (extrapolated) = 2.29 W/kg
SAR(1 g) = 1.24 mW/g; SAR(10 g) = 0.655 mW/g
Maximum value of SAR (measured) = 1.37 mW/g



0 dB = 1.37mW/g

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System Performance Check

System Validation for 900MHz-Body-Worn-1

Date/Time: 2008-10-10 18:27:55

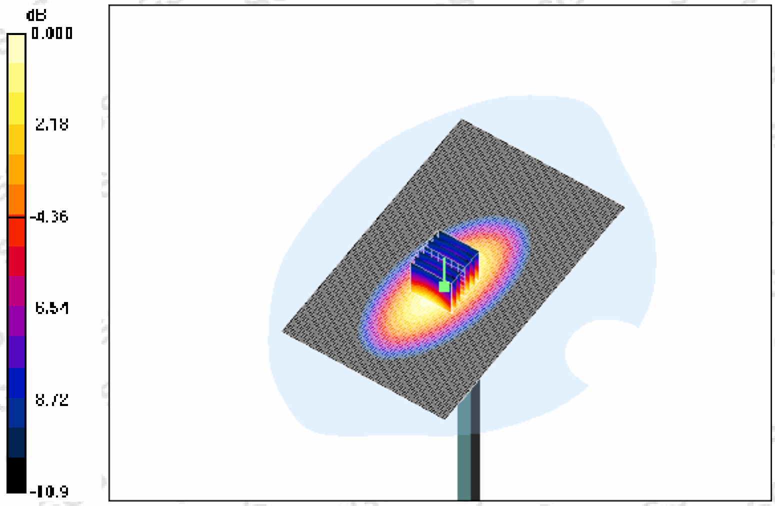
Test Laboratory: SGS-GSM
SystemPerformanceCheck-D900-Body-1010
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:184
Communication System: CW; Frequency: 900 MHz;Duty Cycle: 1:1
Medium: HSL900-Body Medium parameters used (extrapolated): f = 900 MHz; σ = 1.02 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(5.81, 5.81, 5.81); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

d=10mm, Pin=250mW /Area Scan (81x131x1): **Measurement grid: dx=15mm, dy=15mm**

Maximum value of SAR (interpolated) = 2.84 mW/g

d=10mm, Pin=250mW /Zoom Scan (7x7x7) (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 49.6 V/m; Power Drift = 0.000 dB
Peak SAR (extrapolated) = 4.01 W/kg
SAR(1 g) = 2.65 mW/g; SAR(10 g) = 1.7 mW/g
Maximum value of SAR (measured) = 2.87 mW/g



0 dB = 2.87mW/g

System Validation for 900MHz-Body-Worn-2

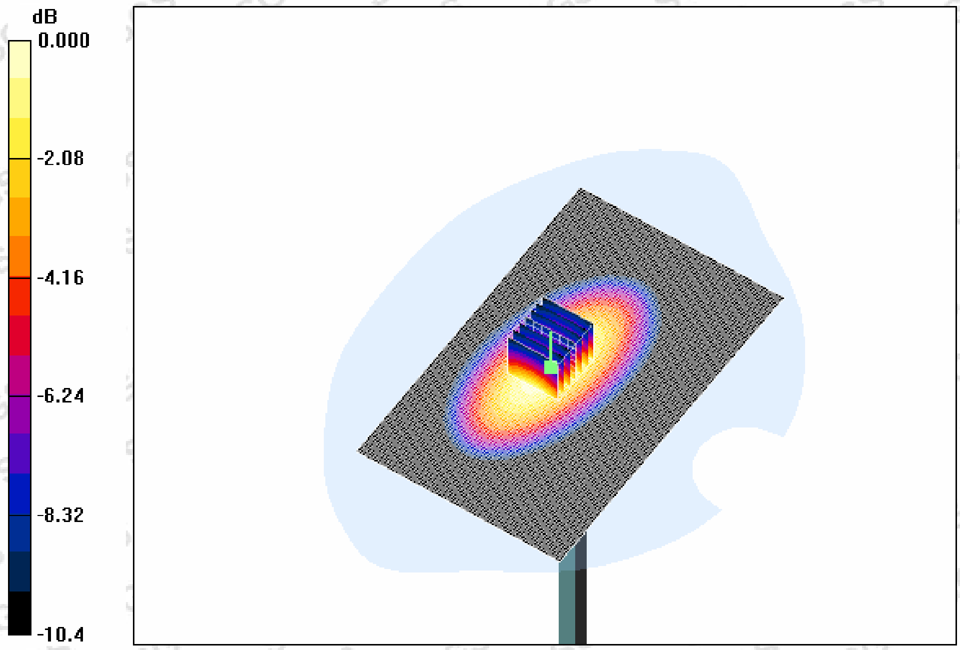
Date/Time: 2008-10-12 11:05:08

Test Laboratory: SGS-GSM
SystemPerformanceCheck-D900-Body-1012
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:184
Communication System: CW; Frequency: 900 MHz;Duty Cycle: 1:1
Medium: HSL 900_Body Medium parameters used: f = 900 MHz; σ = 1.01 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(5.81, 5.81, 5.81); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

d=15mm, Pin=250mW/Area Scan (81x131x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 2.93 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 49.3 V/m; Power Drift = 0.004 dB
Peak SAR (extrapolated) = 4.01 W/kg
SAR(1 g) = 2.74 mW/g; SAR(10 g) = 1.81 mW/g
Maximum value of SAR (measured) = 2.95 mW/g



0 dB = 2.95mW/g

System Validation for 1900MHz-Body-Worn

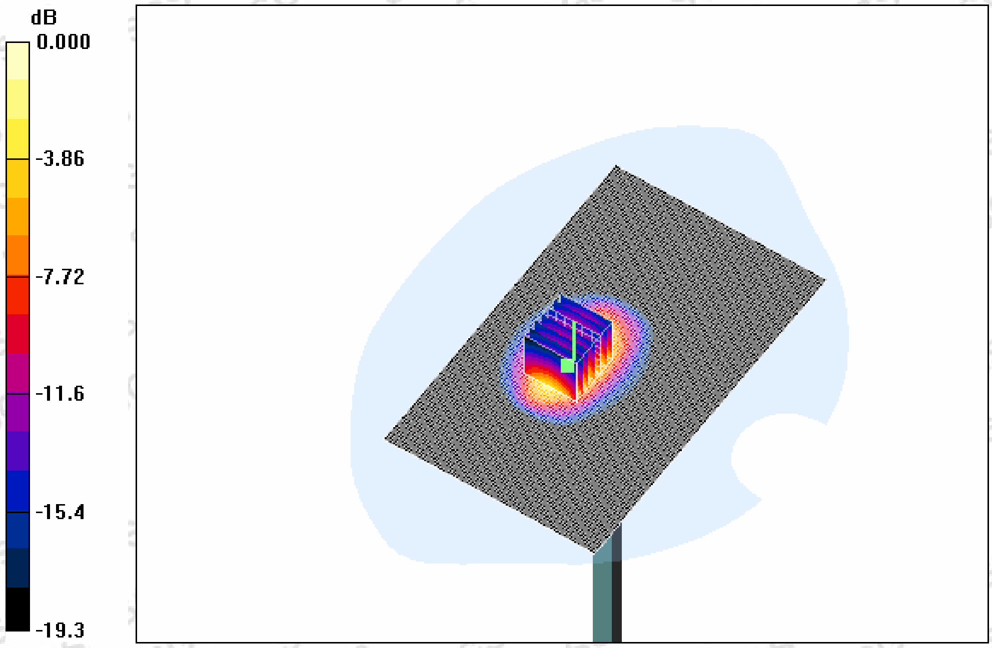
Date/Time: 2008-10-10 10:14:53

Test Laboratory: SGS-GSM
SystemPerformanceCheck-D1900-Body-1010
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d028
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: HSL1900-Body Medium parameters used: f = 1900 MHz; σ = 1.58 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
DASY4 Configuration:

- Probe: ES3DV3 - SN3088; ConvF(4.6, 4.6, 4.6); Calibrated: 2008-1-18
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn569; Calibrated: 2007-11-19
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP-1283
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

d=10mm, Pin=250mW/Area Scan (81x131x1): **Measurement grid: dx=15mm, dy=15mm**
Maximum value of SAR (interpolated) = 11.1 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: **Measurement grid: dx=5mm, dy=5mm, dz=5mm**
Reference Value = 47.2 V/m; Power Drift = 0.102 dB
Peak SAR (extrapolated) = 18.8 W/kg
SAR(1 g) = 9.65 mW/g; SAR(10 g) = 4.77 mW/g
Maximum value of SAR (measured) = 11.1 mW/g



0 dB = 11.1mW/g

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Appendix

1. Photographs of Test Setup

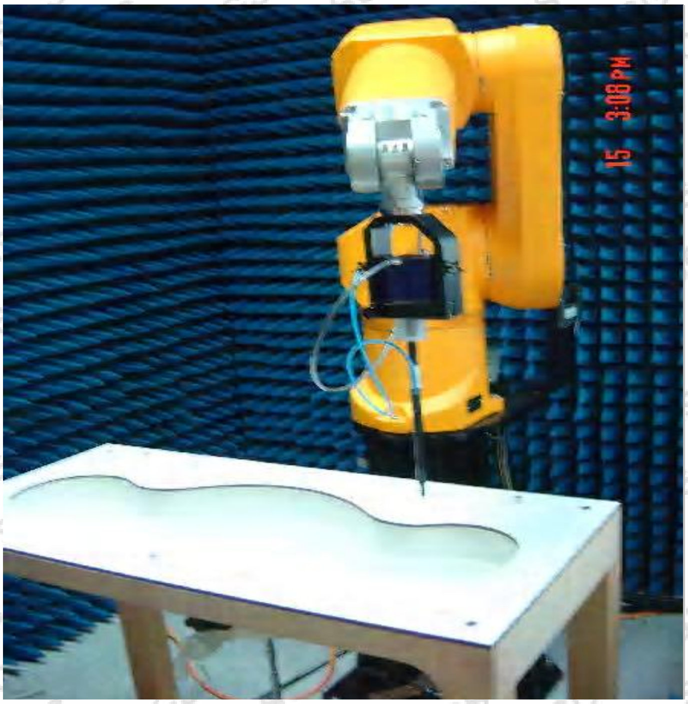


Fig.1 Photograph of the SAR measurement System

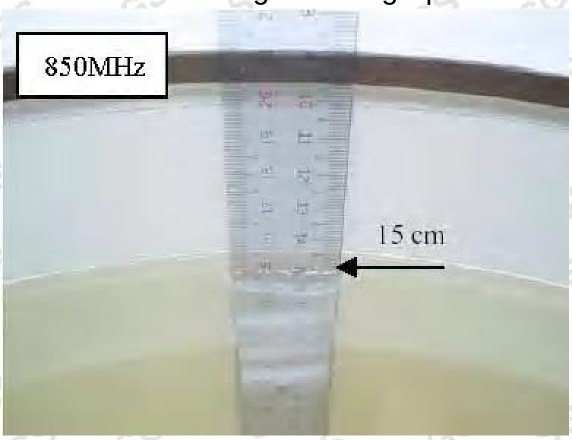


Fig.2 Photograph of the Tissue Simulant Liquid depth 15cm for Body Worn

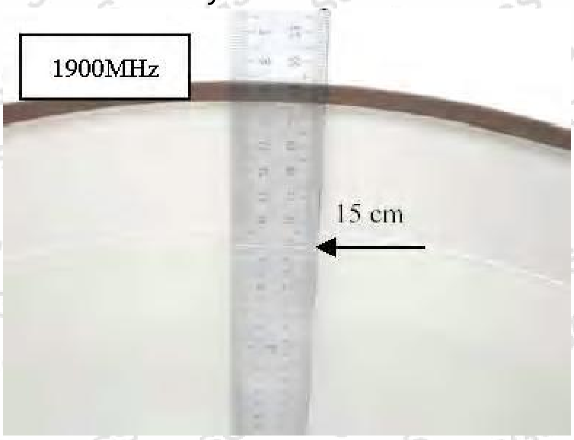
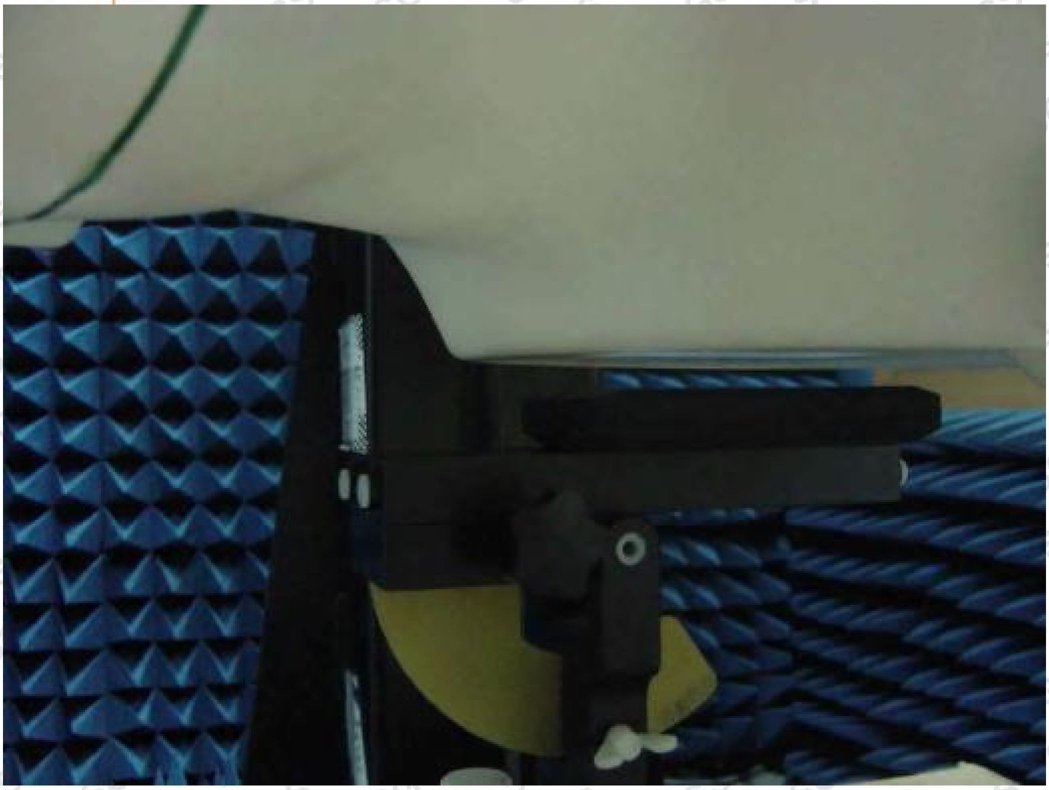


Fig.3 Photograph of the Tissue Simulant Fluid Fluid Liquid depth 15cm for Body Worn



P1

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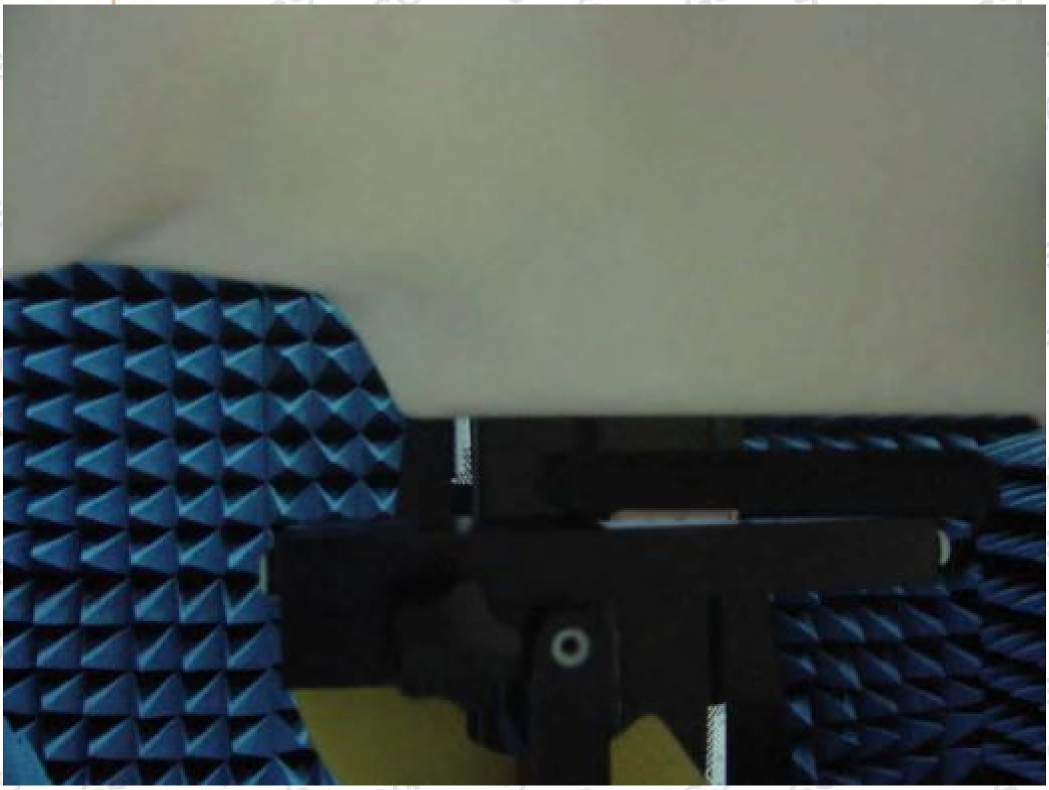

P2

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P3

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P4

Fig.4 Photograph of the BodyWorn status(P1~P4)

2. *Photographs of the EUT*

Fig.5 Front View

Fig.6 Back View

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3. *Photographs of charger*

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4. Probe Calibration certificate

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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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 SGS China (Auden)

Certificate No: ES3-3088_Jan08

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3088
Calibration procedure(s)	QA CAL-01.v6 Calibration procedure for dosimetric E-field probes
Calibration date:	January 18, 2008
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	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41495277	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Power sensor E4412A	MY41498087	29-Mar-07 (METAS, No. 217-00670)	Mar-08
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (METAS, No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-07 (METAS, No. 217-00671)	Mar-08
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (METAS, No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (SPEAG, No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 654	20-Apr-07 (SPEAG, No. DAE4-654_Apr07)	Apr-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

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

Issued: January 18, 2008

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

Certificate No: ES3-3088_Jan08 Page 1 of 9

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Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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S Swiss Calibration Service

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

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
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) 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 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.

Certificate No: ES3-3068_Jan08 Page 2 of 9

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Probe ES3DV3

SN:3088

Manufactured:	July 20, 2005
Last calibrated:	December 12, 2006
Recalibrated:	January 18, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

SHGSM

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ES3DV3 SN:3088 January 18, 2008

DASY - Parameters of Probe: ES3DV3 SN:3088

Sensitivity in Free Space[A]

NormX	1.31 ± 10.1%	$\mu V/(V/m)^2$
NormY	1.26 ± 10.1%	$\mu V/(V/m)^2$
NormZ	1.24 ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	92 mV
DCP Y	93 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	11.0	6.8
SAR_{be} [%]	With Correction Algorithm	0.9	0.4

TSL 1750 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR_{be} [%]	Without Correction Algorithm	9.6	5.1
SAR_{be} [%]	With Correction Algorithm	0.7	0.9

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.

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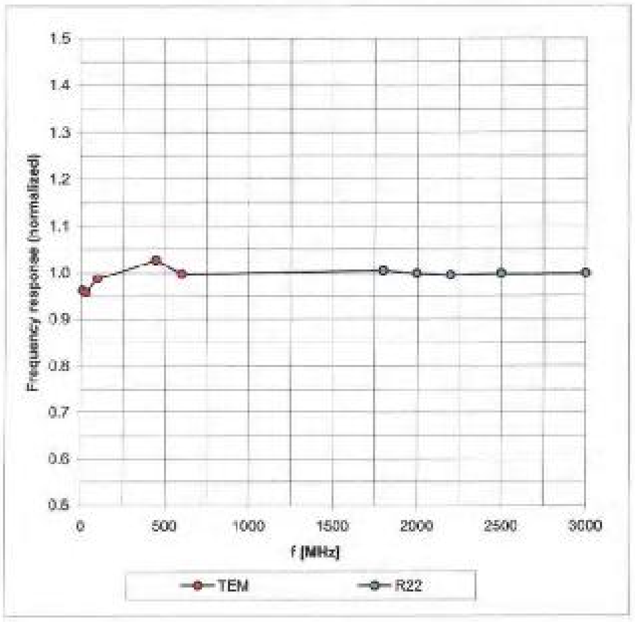
ES3DV3 SN:3088 January 18, 2008

Frequency Response of E-Field

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



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

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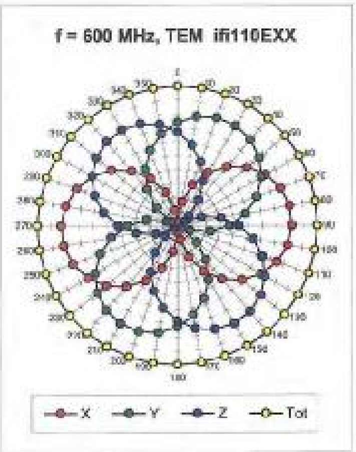
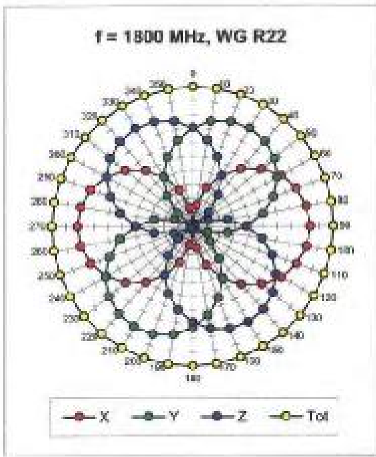
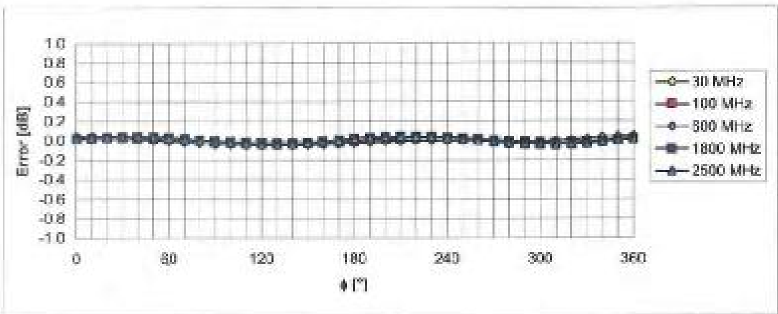
Receiving Pattern (φ), $\vartheta = 0°$







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

Certificate No: ES3-3088_Jan08 Page 6 of 9

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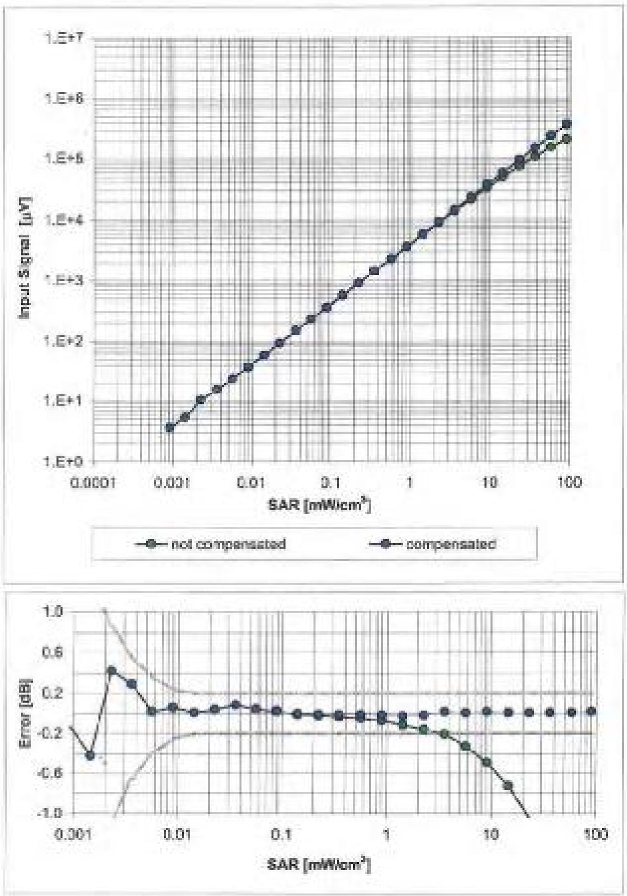
ES3DV3 SN:3088 January 18, 2008

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)

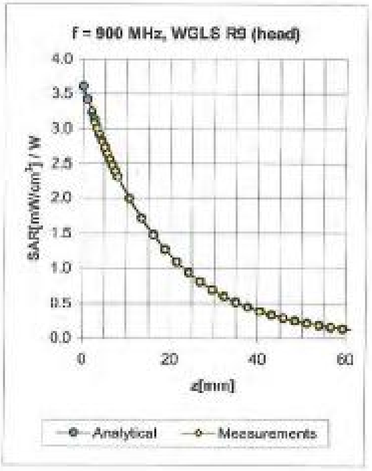


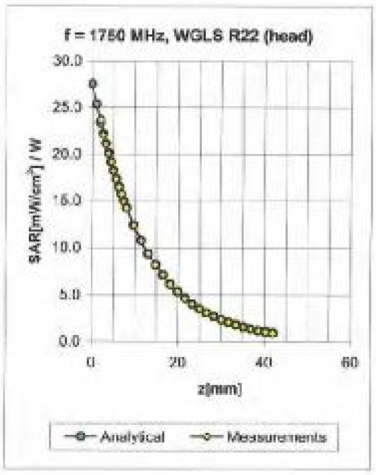
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Certificate No: ES3-3088_Jan08 Page 7 of 9

ES3DV3 SN:3088 January 18, 2008

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%	0.90	1.23	6.15	± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.93	1.18	5.04	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.73	1.35	4.84	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.70	1.39	4.53	± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.95	1.14	5.81	± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.90	1.17	4.92	± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.84	1.23	4.60	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.84	1.17	4.13	± 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.

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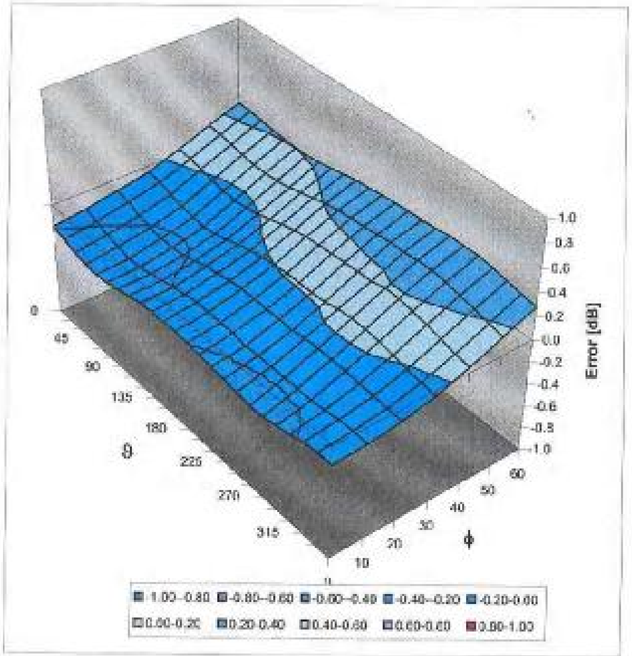
Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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5. 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_Nov07**

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:	November 19, 2007
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	04-Oct-07 (Elcal AG, No: 6467)	Oct-08
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-07 (Elcal AG, No: 6465)	Oct-08
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	25-Jun-07 (SPEAG, in house check)	In house check Jun-08

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: November 19, 2007

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Certificate No: DAE3-569_Nov07 Page 1 of 5

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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 as documented in the Appendix 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.

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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	404.776 ± 0.1% (k=2)	404.362 ± 0.1% (k=2)	404.137 ± 0.1% (k=2)
Low Range	3.94862 ± 0.7% (k=2)	3.94274 ± 0.7% (k=2)	3.94290 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	265 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	200000	199999.4	0.00
Channel X	+ Input	20000	20003.10	0.02
Channel X	- Input	20000	-19998.40	-0.01
Channel Y	+ Input	200000	199999.8	0.00
Channel Y	+ Input	20000	20000.56	0.00
Channel Y	- Input	20000	-20003.76	0.02
Channel Z	+ Input	200000	199999.7	0.00
Channel Z	+ Input	20000	19999.91	0.00
Channel Z	- Input	20000	-20001.93	0.01

Low Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	2000	2000	0.00
Channel X	+ Input	200	199.91	-0.05
Channel X	- Input	200	-200.13	0.06
Channel Y	+ Input	2000	2000	0.00
Channel Y	+ Input	200	198.90	-0.55
Channel Y	- Input	200	-200.33	0.17
Channel Z	+ Input	2000	2000	0.00
Channel Z	+ Input	200	198.87	-0.56
Channel Z	- Input	200	-200.97	0.48

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	-5.51	-5.11
	- 200	9.14	5.16
Channel Y	200	7.38	7.24
	- 200	-8.13	-8.74
Channel Z	200	-5.41	-5.65
	- 200	4.80	4.15

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	-	1.82	0.97
Channel Y	200	3.44	-	3.38
Channel Z	200	-0.57	-0.43	-

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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	16395	15475
Channel Y	15747	15647
Channel Z	16314	16212

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	-0.02	-0.85	1.22	0.32
Channel Y	-0.62	-1.53	0.45	0.30
Channel Z	-0.95	-2.89	-0.14	0.35

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	199.3
Channel Y	0.2000	203.2
Channel Z	0.2001	204.8

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

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7. Dipole Calibration certification

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Accreditation No.: **SCS 108**

Client **SGS China (Auden)**

Certificate No: **D900V2-184_Dec07**

CALIBRATION CERTIFICATE

Object	D900V2 - SN: 184
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	December 21, 2007
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	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6 (HF)	SN 1507	26-Oct-07 (SPEAG, No. ET3-1507_Oct07)	Oct-08
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 21, 2007

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Certificate No: D900V2-184_Dec07   Page 1 of 9

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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) 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
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.

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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 V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.97 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.5 ± 6 %	0.98 mho/m ± 6 %
Head TSL temperature during test	(22.1 ± 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	2.73 mW / g
SAR normalized	normalized to 1W	10.9 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**11.0 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.75 mW / g
SAR normalized	normalized to 1W	7.00 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**7.05 mW /g ± 16.5 % (k=2)**

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

Certificate No: D900V2-184_Dec07 Page 3 of 9

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Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.0	1.05 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.2 ± 6 %	1.06 mho/m ± 6 %
Body TSL temperature during test	(22.6 ± 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	2.90 mW / g
SAR normalized	normalized to 1W	11.6 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**11.4 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.87 mW / g
SAR normalized	normalized to 1W	7.48 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**7.40 mW /g ± 16.5 % (k=2)**

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

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.8 Ω - 7.5 jΩ
Return Loss	- 22.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.3 Ω - 9.4 jΩ
Return Loss	- 19.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.411 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	April 1, 2003

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DASY4 Validation Report for Head TSL

Date/Time: 21.12.2007 14:51:24

Test Laboratory: SPEAG, Zurich, Switzerland

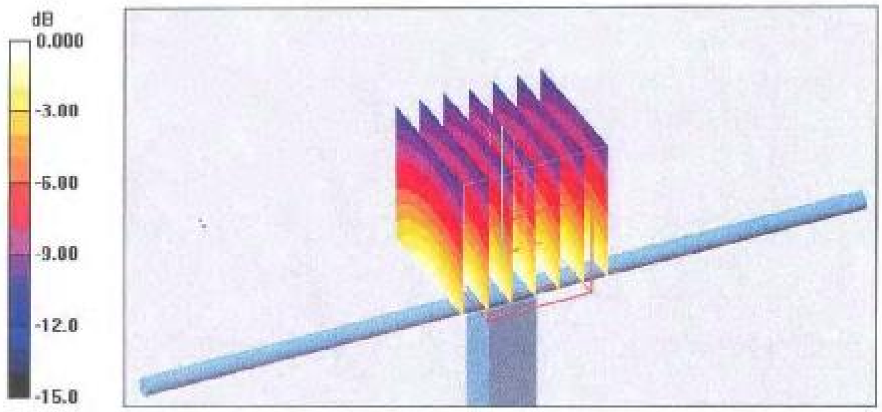
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:184

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz;
Medium parameters used: f = 900 MHz; σ = 0.98 mho/m; ε_r = 42.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.93, 5.93, 5.93); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.9 V/m; Power Drift = -0.012 dB
Peak SAR (extrapolated) = 4.06 W/kg
SAR(1 g) = 2.73 mW/g; SAR(10 g) = 1.75 mW/g
Maximum value of SAR (measured) = 2.95 mW/g



0 dB = 2.95mW/g

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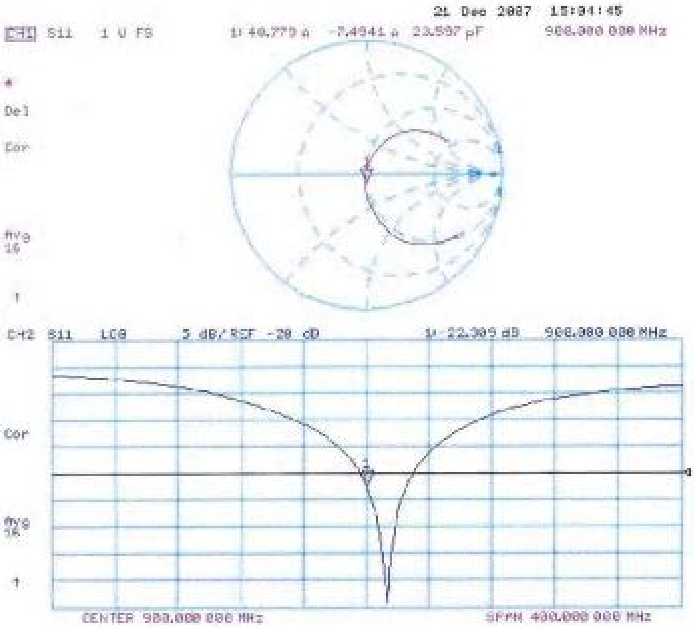
Impedance Measurement Plot for Head TSL



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DASY4 Validation Report for Body TSL

Date/Time: 21.12.2007 15:46:31

Test Laboratory: SPEAG, Zurich, Switzerland

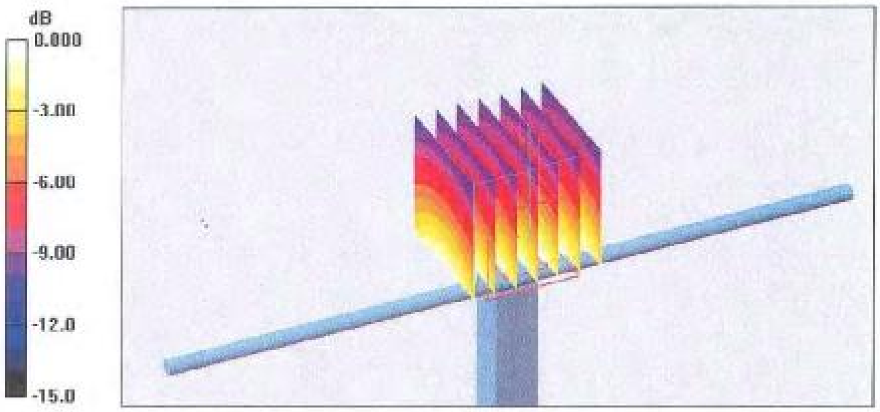
DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN:184

Communication System: CW; Frequency: 900 MHz; Duty Cycle: 1:1
Medium: MSL900;
Medium parameters used: f = 900 MHz; σ = 1.06 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(5.57, 5.57, 5.57); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin=250mW/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.9 V/m; Power Drift = 0.008 dB
Peak SAR (extrapolated) = 4.23 W/kg
SAR(1 g) = 2.9 mW/g; SAR(10 g) = 1.87 mW/g
Maximum value of SAR (measured) = 3.16 mW/g



0 dB = 3.16mW/g

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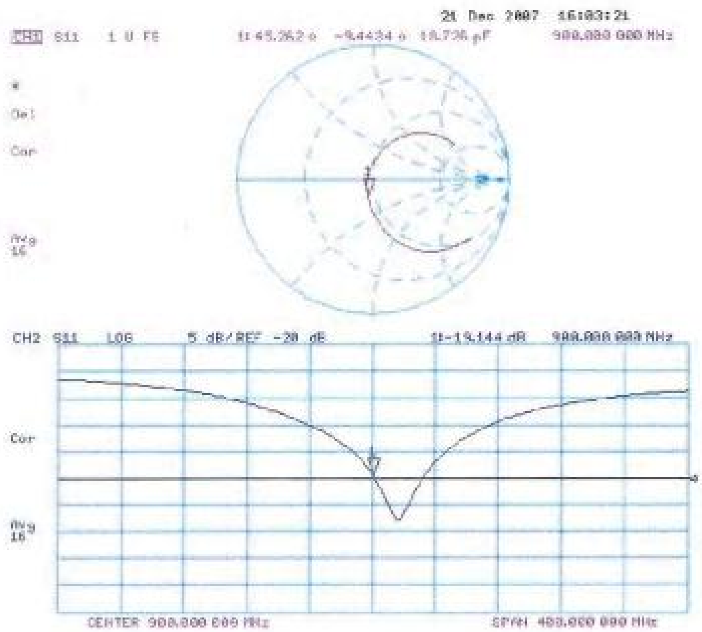
Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 108

Client SGS China (Auden)

Certificate No: D1900V2-5d028_Dec07

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d028
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	December 21, 2007
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	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (METAS, No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference 10 dB Attenuator	SN: 5047.2 (10r)	07-Aug-07 (METAS, No 217-00718)	Aug-08
Reference Probe ET3DV6 (HF)	SN: 1507	26-Oct-07 (SPEAG, No. ET3-1507_Oct07)	Oct-08
DAE4	SN 601	30-Jan-07 (SPEAG, No. DAE4-601_Jan07)	Jan-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-07)	In house check: Oct-08
RF generator R&S SMT-06	100005	4-Aug-99 (SPEAG, in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 31, 2007

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

Certificate No: D1900V2-5d028_Dec07 Page 1 of 9

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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
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.

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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	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.46 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 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	9.82 mW / g
SAR normalized	normalized to 1W	39.3 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**37.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.14 mW / g
SAR normalized	normalized to 1W	20.6 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**20.2 mW / g ± 16.5 % (k=2)**

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

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Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.5 ± 6 %	1.54 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 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	9.34 mW / g
SAR normalized	normalized to 1W	37.4 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**37.2 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.97 mW / g
SAR normalized	normalized to 1W	19.9 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**19.8 mW / g ± 16.5 % (k=2)**

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

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Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω + 5.2 jΩ
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.5 Ω + 3.4 jΩ
Return Loss	- 29.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.198 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 17, 2002

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DASY4 Validation Report for Head TSL

Date/Time: 21.12.2007 09:54:50

Test Laboratory: SPEAG, Zurich, Switzerland

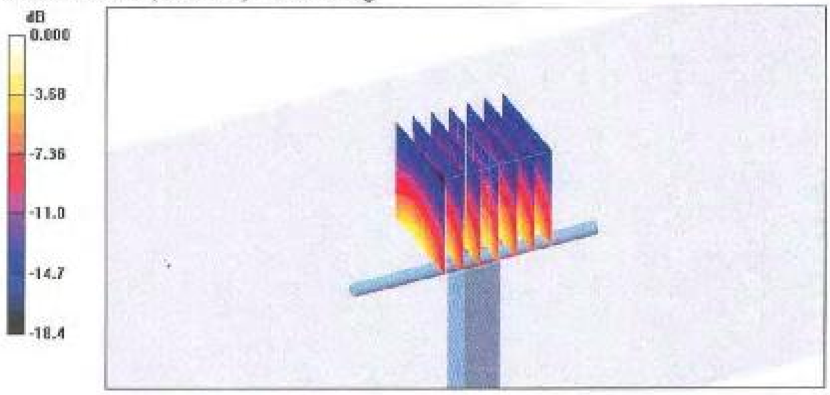
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d028

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB;
Medium parameters used: f = 1900 MHz; $\sigma = 1.46$ mho/m; $\varepsilon_r = 39$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.86, 4.86, 4.86); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.9 V/m; Power Drift = 0.010 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.82 mW/g; SAR(10 g) = 5.14 mW/g
Maximum value of SAR (measured) = 10.9 mW/g



0 dB = 10.9mW/g

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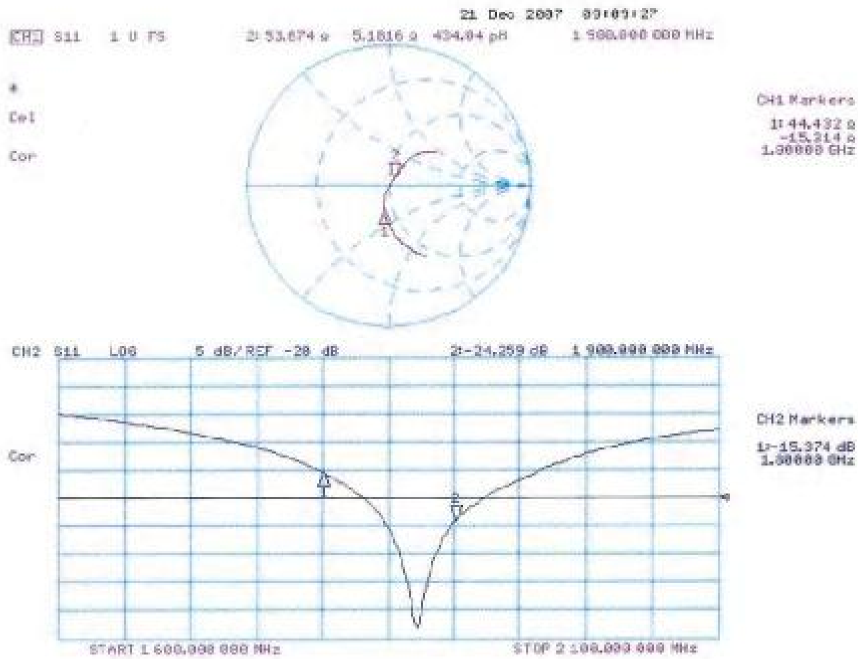
Impedance Measurement Plot for Head TSL



Certificate No: D1900V2-5d028_Dec07 Page 7 of 9

DASY4 Validation Report for Body TSL

Date/Time: 21.12.2007 11:05:06

Test Laboratory: SPEAG, Zurich, Switzerland

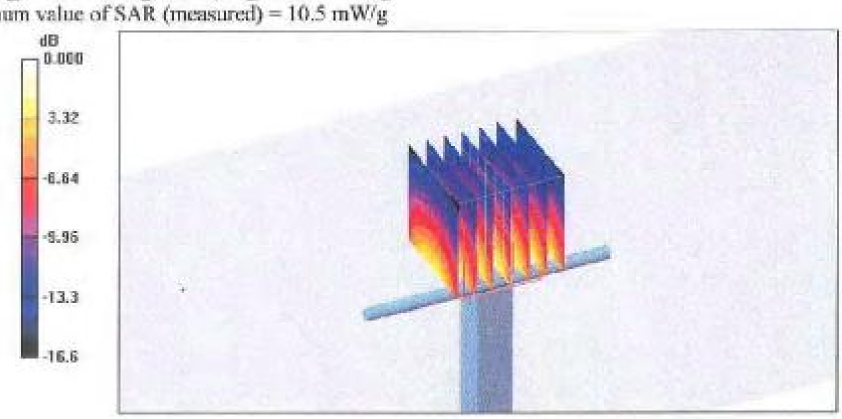
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d028

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB;
Medium parameters used: f = 1900 MHz; σ = 1.54 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507 (HF); ConvF(4.48, 4.48, 4.48); Calibrated: 26.10.2007
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.01.2007
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.3 V/m; Power Drift = -0.044 dB
Peak SAR (extrapolated) = 16.0 W/kg
SAR(1 g) = 9.34 mW/g; SAR(10 g) = 4.97 mW/g
Maximum value of SAR (measured) = 10.5 mW/g



0 dB = 10.5mW/g

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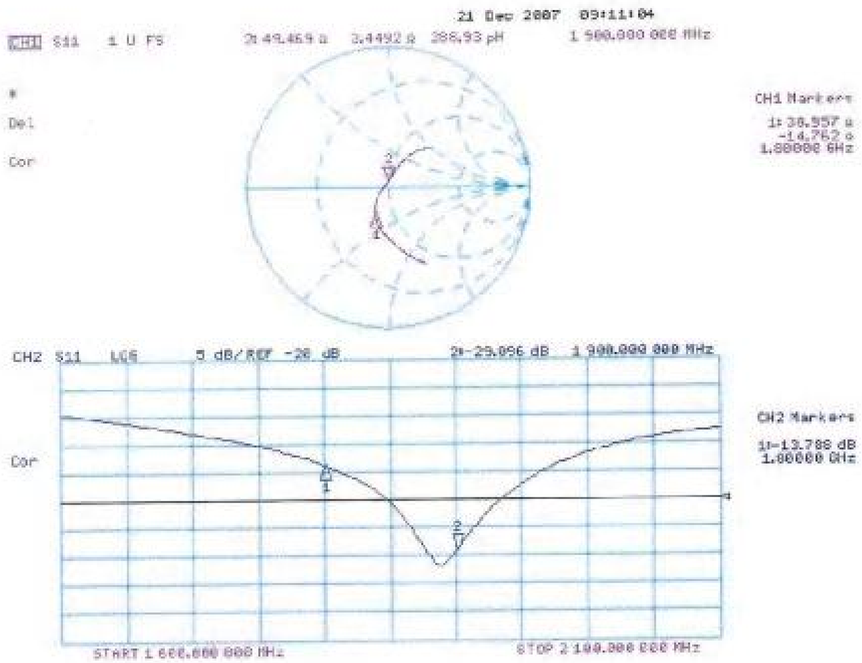
Impedance Measurement Plot for Body TSL



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8. Uncertainty analysis

Error Description	Tol. (± %)	Prob. dist.	Div.	(c_i) (1g)	(c_i) (10g)	Std. unc. (± %) (1g)	(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

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9. 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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10. CNAS Certificate

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(No. CNAS L1486)

China National Accreditation Service for Conformity Assessment has accredited

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to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

The scope of accreditation is detailed in the attached schedule bearing the same accreditation number as above. The schedule forms an integral part of this certificate.

Date of Issue: 2007-06-28

Date of Expiry: 2009-06-14

Date of Initial Accreditation: 2004-06-15

Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment(CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation systems for conformity assessment. CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA), and the signatory to Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).

End of Report

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