ELECTRONIC TECHNOLOGY SYSTEMS
DR. GENZ GMBH

TEST - REPORT

SAR Compliance Test Report

Test report no.:

G0M20606-0530-S-1

SAR

TABLE OF CONTENTS

1 General Information

1.1 Notes

The purpose of conformity testing is to increase the probability of adherence to the essential requirements or conformity specifications, as appropriate.
The complexity of the technical specifications, however, means that full and thorough testing is impractical for both technical and economic reasons.
Furthermore, there is no guarantee that a test sample which has passed all the relevant tests conforms to a specification.
The existence of the tests nevertheless provides the confidence that the test sample possesses the qualities as maintained and that is performance generally conforms to representative cases of communications equipment.

The test results of this test report relate exclusively to the item tested as specified in 1.5.
The test report may only be reproduced or published in full.
Reproduction or publication of extracts from the report requires the prior written approval of the ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualification of all persons taking them.

Tester:

14.06.2006		K. Damm	Kurt D...
Date	ETS-Lab.	Name	Signature

Technical responsibility for area of testing:

14.06.2006		N. Kaspar	Norbert Kaspar
Date	ETS	Name	Signature

1.2 Testing laboratory

1.2.1 Location

ELECTRONIC TECHNOLOGY SYSTEM DR. GENZ GMBH (ETS)
Storkower Straße 38c
D-15526 Reichenwalde b. Berlin
Germany
Telephone : +49 33631 888 00
Fax : +49 33631 888 660

1.2.2 Details of accreditation status

ACCREDITED TESTING LABORATORY
DAR-REGISTRATION NUMBER: TTI-P-G 126/96

FCC FILED TEST LABORATORY REG. NO. 96970

BLUETOOTH QUALIFICATION TEST FACILITY (BQTF)
ACCREDITED BY BLUETOOTH QUALIFICATION REVIEW BOARD

INDUSTRY CANADA FILED TEST LABORATORY REG. NO. IC 3470

A2LA ACCREDITED Certificate Number 1983-01

Statement: The tests documented within this report are carried out in accordance with the scope of accreditation of the test laboratory ETS Dr. Genz GmbH.

1.3 Details of approval holder

Name	: Ingenico Barcelona
Street	: Av. Via Augusta 71-73
Town	: 08174 Sant Cugat del Vallés Barcelona
Country	: Spain
Telephone	: +34 93 580 22 27
Fax	: +34 93 580 27 68
Contact	: Mr. Pere Mogas
E-Mail	: pere.mogas@ingenico.com

1.4 Manufacturer: (if applicable)

Name	:
Street	:
Town	:
Country	:

1.5 Application details

Date of receipt of application	: 01.06.2006
Date of receipt of test item	: 01.06.2006
Date of test	: 08.06.2006

1.6 Test item

FCC ID	: T8D-I7910
Description of test item	: Payment terminal
Type identification	: I7910 US
Serial number	: without; Identical prototype
Device category	: PCB (Licensed Base Station)

Technical data

	GSM850	PCS 1900
TX Frequency range	: 824,2 - 848,8 MHz	1850,2 - 1909,8 MHz
RX Frequency range	: 869,2 - 893,8 MHz	1930,2 - 1989,8 MHz
Max. Conducted RF output power	: 32,93 dBm / (1,96 W)	30,34 dBm / (1,08 W)
Power supply	: 3,7 V DC rechargeable battery	
Antenna Tx	: integral	
Antenna RX	: integral	
Additional information	: Tx and Rx. antenna are the same.	

1.7 Test Results

Max. SAR Measurement : 0,167 W/kg (averaged over 1 gram)

This EUT has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in Radio Protection Standard – Series No. 3 and ANSI/IEEE Std. C95.1-1992 and had been tested in accordance with the measurement procedures specified in Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2003, FCC/OET Bulletin 65 Supplement C (2001) and IEEE Std. 1528-2003, December 2003.

1.8 Test standards

Standards : - Radiocommunications (Electromagnetic Radiations – Human Exposure) Standard 2003
- IEEE Std. 1528-2003, December 2003

FCC Rule Part(s) : - FCC OET Bulletin 65, Supplement C, Edition 01-01

2 Technical test

2.1 Summary of test results

Handset (Head)	
Handset (Body)	
Headset (Head)	
Body Worn Equipment	X

EUT complies with the RF radiation exposure limits of the FCC as shown by the SAR measurement results. These measurements are taken to simulate the RF effects exposure under worst-case conditions. The EUT complies with the requirements in respect to all parameters subject to the test. The test results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [1]

In case of multiple hotspots the secondary hotspots within 2 dB of the maximum SAR value will be recorded and displayed in the measurement plots. The secondary hotspots with a peak SAR value below 0.5 W/kg will not be measured by the system, due to the high margin to the limits.

2.2 Test environment

Room temperature	: 22,1 - 22,7 ° C
Liquid temperature	: 22,2 - 22,4 ° C
Relative humidity content	: 20 ... 75 %
Air pressure	: 86 ... 103 kPa
Details of power supply	: 3,7 V DC

2.3 Test equipment utilized

No.	Measurement device:	Type:	Manufacturer:
ETS 0449	Stäubli Robot	RX90B L	Stäubli
ETS 0450	Stäubli Robot Controller	CS/MBs&p	Stäubli
ETS 0451	DASY 4 Measurement Server		Schmid & Partner
ETS 0452	Control Pendant		Stäubli
ETS 0453	Compaq Computer	Pentium IV, 2 GHz,	Schmid & Partner
ETS 0454	Dabu Acquisition Electronics	DAE3V1	Schmid & Partner
ETS 0455	Dummy Probe		Schmid & Partner
ETS 0456	Dosimetric E-Field Probe	ET3DV6	Schmid & Partner
ETS 0457	Dosimetric E-Field Probe	ET3DV6	Schmid & Partner
ETS 0458	Dosimetric H-Field Probe	H3DV6	Schmid & Partner
ETS 0479	System Validation Kit	D300V3	Schmid & Partner
ETS 0480	System Validation Kit	D450V3	Schmid & Partner
ETS 0459	System Validation Kit	D900V2	Schmid & Partner
ETS 0460	System Validation Kit	D1800V2	Schmid & Partner
ETS 0461	System Validation Kit	D1900V2	Schmid & Partner
ETS 0462	System Validation Kit	D2450V2	Schmid & Partner
ETS 0463	Probe Alignment Unit	LBV2	Schmid & Partner
ETS 0464	SAM Twin phantom	V 4.0	Schmid & Partner
ETS 0513	Flat phantom	V 4.4	Schmid & Partner
ETS 0465	Mounting Device	V 3.1	Schmid & Partner
ETS 0224a	Millivoltmeter	URV 5	Rohde & Schwarz
ETS 0219	Power sensor	NRV-Z2	Rohde & Schwarz
ETS 0268	RF signal generator	SMP 02	Rohde & Schwarz
ETS 0322	Insertion unit	URV5-Z4	Rohde & Schwarz
ETS 0466	Directional Coupler	HP 87300B	HP
ETS0231	Radio Communication Tester	CMD65	Rohde & Schwarz
ETS 0467	Universal Radio Communication Tester	CMU 200	Rohde & Schwarz
ETS 0468	Network Analyzer 300 kHz to 3 GHz	8753C	Agilent
ETS 0469	Dielectric Probe Kit	85070C	Agilent

2.4 Definitions

2.4.1 SAR

The specific absorption rate (SAR) is defined as the time derivative of the incremental energy (*dW*) absorbed by (dissipated in) an incremental mass (*dm*) contained in a volume element *(dV)* of a given density (ρ_t), expressed in watts per kilogram (W/kg)

$$\text{SAR} = \frac{d}{dt}\left(\frac{dW}{dm}\right) = \frac{d}{dt}\left(\frac{dW}{\rho_t dV}\right) = \frac{\sigma}{\rho_t}\left|E_t\right|^2$$

where:

$$\frac{dW}{dt} = \int_v E \cdot J\, dV = \int_v \sigma E^2 dV$$

2.4.2 Uncontrolled Exposure

The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category, and the general population/uncontrolled exposure limits apply to these devices. [2]

2.4.3 Controlled Exposure

In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means. Awareness of the potential for RF exposure in a workplace or similar environment can be provided through specific training as part of a RF safety program. If appropriate, warning signs and labels can also be used to establish such awareness by providing prominent information on the risk of potential exposure and instructions on the risk of potential exposure and instructions on methods to minimize such exposure risks. [2]

2.5 Measurement System Description

2.5.1 System Setup

Measurements are performed using the DASY4 automated dosimetric assessment system (figure 1) made by Schmid & Partner Engineering AG (SPEAG)in Zurich, Switzerland.

Figure 1

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

- A standard high precision 6-axis robot (Stäubli RX family) with controller, teach pendant and software. An arm extension for accommodating 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.
- An unit to operate the optical surface detector which is connected to the EOC.
- The Electro-optical converter (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the measurement server.
- The functions of the measurement server is to perform the time critical task such as signal filtering, surveillance of the robot operation, fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows NT.
- 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 and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes (see Application Notes).
- System validation dipoles allowing to validate the proper functioning of the system.

2.5.2 Phantom Description

Figure 2

The SAM twin phantom V4.0 (figure 2) is a fiberglass shell phantom with 2 mm shell thickness. It has three measurement areas:

- Left hand
- Right hand
- Flat phantom

The phantom is integrated in a wooden table.

The bottom plate of the table contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. Only one device holder is necessary if two phantoms are used (e.g., for different liquids).

A 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 positions with respect to the robot.

2.5.3 Tissue Simulating Liquids

The parameters of the tissue simulating liquid strongly influence the SAR. The parameters for the different frequencies are defined in the corresponding compliance standards (e.g., EN 50361, IEEE P1528-2003, Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2003).

Tissue dielectric properties

	Head		Body	
Frequency (MHz)	**Relative Dielectric Constant (ε_r)**	**Conductivity (σ) (S/m)**	**Relative Dielectric Constant (ε_r)**	**Conductivity (σ) (S/m)**
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
1450	40.5	1.20	54.0	1.30
1800	40.0	1.40	53.3	1.52
1900	40.0	1.40	53.3	1.52
2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73

2.5.4 Device Holder

The DASY device holder (figure 3.1 and 3.2) 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 openings). The rotation centers for both scales is the ear opening. Thus the device needs no repositioning when changing the angles.

Figure 3.1

Figure 3.2

The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\varepsilon = 3$ and loss tangent $\delta = 0.02$. 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.

2.5.5 Probes

The SAR measurements were conducted with the dosimetric probe ET3DV6 (figure 4), designed in the classical triangular configuration and optimized for dosimetric evaluation. [3] The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multifiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.

Figure 4

Probe Specifications

Calibration:	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at Frequencies of 835 MHz, 900 MHz, 1800 MHz, 1900 MHz and 2450 MHz Calibration certificates please find attached.
Frequency:	10 MHz to > 3 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity:	± 0.2 dB in HSL (rotation around probe axis) ± 0.4 dB in HSL (rotation normal probe axis)
Dynamic Range:	5 µW/g to > 100 mW/g;
Linearity:	± 0.2 dB
Dimensions:	Overall length: 330 m Tip length: 16 mm Body diameter: 12 mm Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

2.6 Test System Specification

Positioner

Robot:	Stäubli Animation Corp. Robot Model: RX90B L
Repeatability:	0.02 mm
No. of axis:	6

Data Acquisition Electronic (DAE) System

Cell Controller

Processor:	Pentium IV
Clock Speed:	2.0 GHz
Operating System:	Windows 2000
Data Card:	DASY4 PC-Board
Data Converter	
Features:	Signal Amplifier, multiplexer, A/D converter, & control logic
Software:	DASY4 software
Connecting Lines:	Optical downlink for data and status info. Optical uplink for commands and clock

PC Interface Card

Function:	24 bit (64 MHz) DSP for real time processing Link to DAE3 16 bit A/D converter for surface detection system serial link to robot direct emergency stop output for robot

E-Field Probes

Model:	ET3DV6 SN1711
Construction:	Triangular core fiber optic detection system
Frequency:	10 MHz to 6 GHz
Linearity:	± 0.2 dB (30MHz to 3 GHz)

Phantom

Phantom 1:	Flat Phantom (V4.4)
Shell Material:	Fiberglass
Thickness:	6.0 ± 0.2 mm
Phantom 2:	SAM Twin Phantom (V4.0)
Shell Material:	Fiberglass
Thickness:	2.0 ± 0.2 mm

2.7 Measurement Procedure

The evaluation was performed using the following procedure:

1. The SAR measurement was taken at a selected spatial reference point to monitor power variations during testing. This fixed location point was measured and used as a reference value.
2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 10 mm x 10 mm.
3. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation. Around this point, a volume of 30 mm x 30 mm x 30 mm (fine resolution volume scan, zoom scan) was assessed by measuring 5 x 5 x 5 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:
   a. The data at the surface was extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm [4]. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.
   b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions) [4] [5]. The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as procedure # 1, was re-measured. If the value changed by more than 5 %, the evaluation is repeated.

2.8 Reference Points

2.8.1 Ear Reference Points

Figure 5.1 shows the front, back and side vies of SAM. The point "M" is the reference point for the center of mouth, "LE" is the left ear reference point (ERP), and "RE" is the right ERP. The ERPs are 15 mm posterior to the entrance to ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5.2. The plane passing through the two ear reference points and M is defined as the Reference Plane. The line N-F (Neck-Front) perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 5.3). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines should be marked on the external phantom shell to facilitate handset positioning. Posterior to the N-F line, the thickness of the N-F line, the ear is truncated as illustrated in Figure 5.2. The ear truncation is introduced to avoid the handset from touching the ear lobe, which can cause unstable handset positioning at the cheek. [6]

Figure 5.1

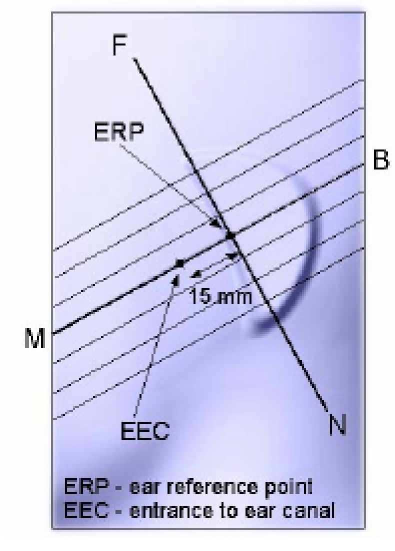


Figure 5.2

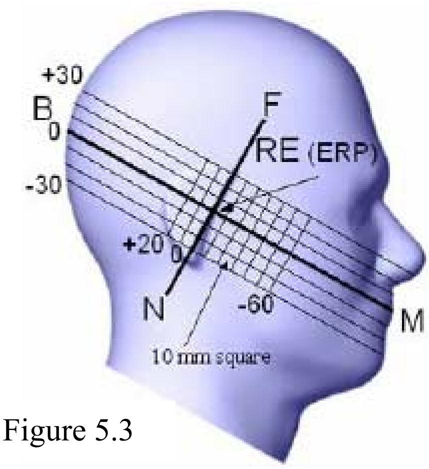


Figure 5.3

2.8.2 Handset Reference Points

Two imaginary lines on the handset were defined: the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset: the midpoint of the width *wt* of the handset at the level of the acoustic output (point A on Figures 6.1 and 6.2), and the midpoint of the width *wb* of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 6.1). The two lines intersect at point A. For many handsets, point A coincides with the center of the acoustic output. However, the acoustic output may be located elsewhere on the horizontal line. The vertical centerline is not necessarily parallel to the front face of the handset (see Figure 6.2), especially for clamshell handsets, handsets with flip pieces, and other irregularly-shaped handsets. [6]

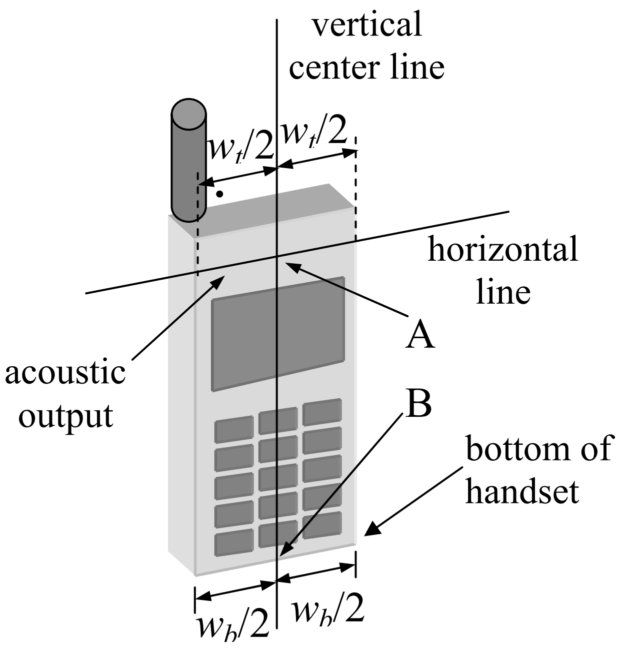


Figure 6.1

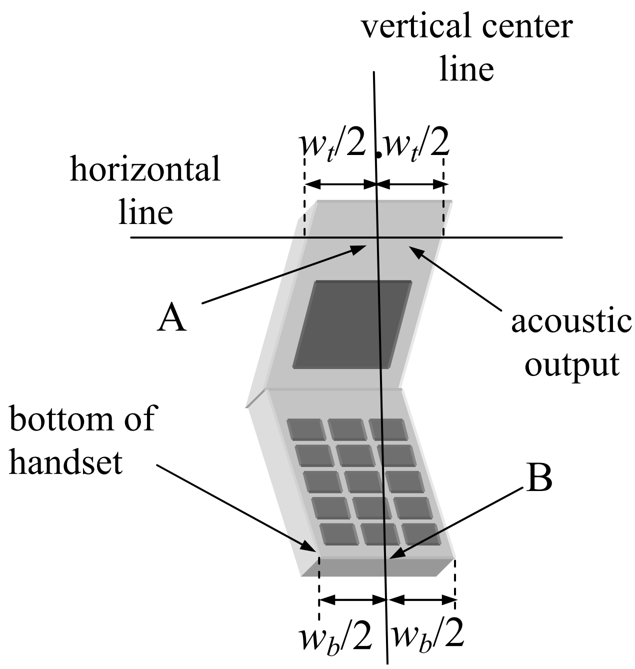


Figure 6.2

2.9 Test Positions

2.9.1 "Cheek" / "Touch" Position

The EUT was positioned close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 7), such that the plane defined by the vertical center line and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
The EUT was translated towards the phantom along the line passing through RE and LE until the handset touches the pinna.
While maintaining the handset in this plane, the EUT was rotated it around the LE-RE line until the vertical centerline was in the plane normal to MB-NF including the line MB (called the reference plane).
The EUT was rotated around the vertical centerline until the handset (horizontal line) was symmetrical with respect to the line NF.
While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE and maintaining the handset contact with the pinna, the EUT was rotated about the line NF until any point on the handset was in contact with a phantom point below the pinna (cheek). [6] See Figure 7.

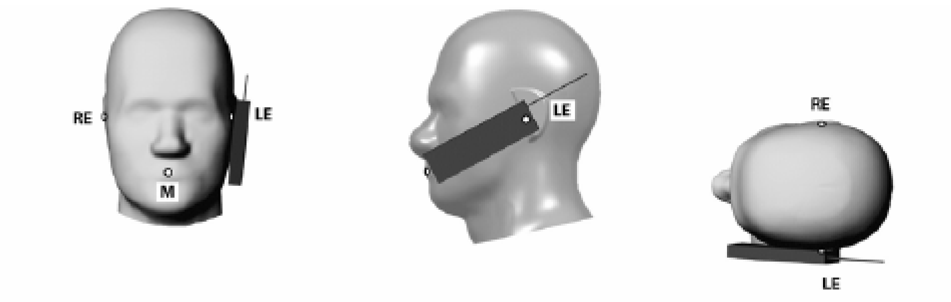


Figure 7

2.9.2 "Tilted" Position

The EUT was in "cheek position".
While maintaining the orientation of the handset move the handset away from the pinna along the line passing through RE and LE in order to enable a rotation of the handset by 15 degrees.
The EUT was rotated around the horizontal line by 15 degrees.
While maintaining the orientation of the handset, the EUT was moved towards the phantom on a line passing through RE and LE until any part of the handset touched the ear. The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna (e.g., the antenna with the back of the phantom head), the angle of the handset would be reduced. In this case, the tilted position is obtained if any part of the handset was in contact with the pinna as well as a second part of the handset was in contact with the phantom (e.g., the antenna with the back of the head). [6] See Figure 8.

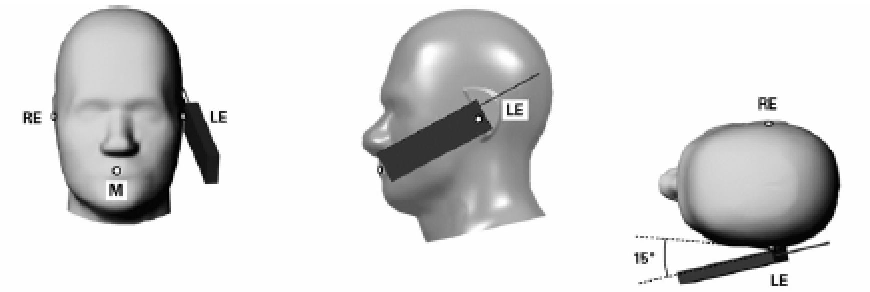


Figure 8

2.9.3 Belt Clip/Holster Configuration

Test configurations for body-worn operated EUTs are carried out while the belt-clip and/or holster is attached to the EUT and placed against a flat phantom in a regular configuration (see Figure 9). An EUT with a headset output is tested with a headset connected to the device.

Body dielectric parameters are used.

There are two categories for accessories for body-worn operation configurations:

1. accessories not containing metallic components
2. accessories containing metallic components.

When the EUT is equipped with accessories not containing metallic components the tests are done with the accessory that dictates the closest spacing to the body. For accessories containing metallic parts a test with each one is implemented. If the multiple accessories share an identical metallic component (e.g. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that has the closest spacing to the body is tested.

In case that a EUT authorized to be body-worn is not supplied or has no options to be operated with any accessories, a test configuration where a separation distance between the back of the device and the flat phantom is used. All test position spacings are documented.

Transmitters operating in front of a person's face (e.g. push-to-talk configurations) are tested for SAR compliance with the front of the device positioned to face the flat platform. SAR Compliance tests for shoulder, waist or chest-worn transmitters are carried out with the accessories including headsets and microphones attached to the device and placed against a flat phantom in a regular configuration.

The SAR measurements are performed to investigate the worst-case positioning. This is documented and used to perform Body SAR testing. [2].

Figure 9

2.9.4 Headset Configuration

Headsets which have their radiating structure in close proximity to the head are measured according to the following conditions.

- Head tissue liquid is used.
- The EUT is positioned on the surface of the head of phantom according the picture below. Right and left position is tested according to the normal use (see figure 10).
- Additional metallic parts like clips or others are subject of testing, too.

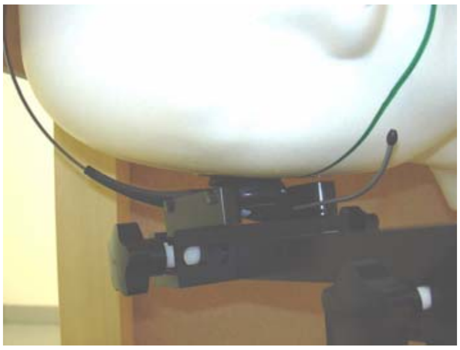


Figure 10

Headsets which have their radiating structure in close proximity to the body are tested as body worn equipment.

2.10 Measurement uncertainty

The uncertainty budget has been determined for the DASY4 system performance check according to IEEE Std. 1528-2003, December 2003.

	Tol.	Prob.	Div.	$(c_i)^1$	Std. unc.	$(v_i)^2$
Error Description	(± %)	dist.		(1 g)	(1 g) (± %)	
Measurement System						
Probe Calibration	4.8	N	1	1	4.8	∞
Axial Isotropy	4.7	R	√3	0.7	1.9	∞
Hemispherical Isotropy	9.6	R	√3	0.7	3.9	∞
Boundary Effects	1.0	R	√3	1	0.6	∞
Linearity	4.7	R	√3	1	2.7	∞
System Detection Limit	1.0	R	√3	1	0.6	∞
Readout Electronics	1.0	N	1	1	1.0	∞
Response Time	0.8	R	√3	1	0.5	∞
Integration Time	2.6	R	√3	1	1.5	∞
RF Ambient Conditions	3.0	R	√3	1	1.7	∞
Probe Positioner	0.4	R	√3	1	0.2	∞
Probe Positioning	2.9	R	√3	1	1.7	∞
Algorithms for Max. SAR Eval.	1.0	R	√3	1	0.6	∞
Test Sample Related						
Device Positioning	2.9	N	1	1	2.9	*145*
Device Holder	3.6	N	1	1	3.6	*5*
Power Drift	5.0	R	√3	1	2.9	∞
Phantom and Setup						
Phantom Uncertainty	4.0	R	√3	1	2.3	∞
Liquid Conductivity (target)	5.0	R.	√3	0.64	1.8	∞
Liquid Conductivity (meas.)	2.6	N	1	0.64	1.7	∞
Liquid Permittivity (target)	5.0	R	√3	0.6	1.7	∞
Liquid Permittivity (meas.)	3.8	N	1	0.6	2.3	∞
Combined Standard Uncertainty					**10.4**	*330*
Expanded Uncertainty kp = 2						
Coverage Factor for 95 %					**20.8**	

The budget is valid for the frequency range 300 MHz - 3 GHz and represent a worst case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

3 Tissue and System Verification

3.1 Tissue Verification

Dielectric parameters of the simulating liquids were verified using a Dielectric Probe Kit Agilent 85070D to a tolerance of ± 5 %.

Room Temperature: **22,1 - 22,7 ° C**

	Measured Tissue Parameters			
	900 MHz Muscle		1900 MHz Muscle	
	Target	Measured 08.06.2006	Target	Measured 08.06.2006
Room Temperature: ° C		**22,1**		**22,1**
Liquid Temperature: ° C		**22,1**		**22,1**
Dielectric Constant: ε	55,0	54,4	53,3	51,9
Conductivity: σ	1,05	1,04	1,52	1,58

3.2 System Verification

Prior to the assessment, the system was verified by using a 900 MHz / 1900 MHz validation dipole. Power level of 250 mW was supplied to the dipole antenna placed under the flat section of SAM Phantom. This system validation is valid for a frequency range of 900 ± 100 MHz.

The system was verified to a tolerance of ± 10 %.

Liquid Temperature: **22,2 - 22,4 ° C**
Room Temperature: **22,1 - 22,7 ° C**
Liquid Depth: **>15.5 cm**

System Dipole Validation Target & Measurement					
Date	**System Validation Kit:**	**Liquid**	**Targeted SAR 1g (mW/g)**	**Measured SAR 1g (mW/g)**	**Deviation (%)**
07.04.2006	D900V2 SN164	900 MHz Muscle	11,2	11,72	4,64
24.04.2003	D1900V2 SN5d025	1900 MHz Muscle	45,6	45,6	0,00

Comment: Please find attached the measurement plot.

4 Test Results

Procedures Used To Establish Test Signal

The EUT was placed into simulated call mode (e.g. AMPS, Cellular CDMA & PCS CDMA modes) using manufacturers test codes. Such test signals offer a consistent means for testing SAR and are recommended for evaluating SAR [2]. The actual transmission is activated through a base station simulator or similar when test modes are not available or inappropriate for testing the EUT.

The EUT is rechargeable battery operated. The battery used for the SAR measurements was completely charged. The device was tested at full power verified by implementing conducted output power measurements. For confirming of the output power it was tested before and after each SAR measurement. The test was repeated if a conducted power deviation of more than 5 % occurred.

Mixture Type: **850 Muscle**
Date: **07.04.2006**
Liquid Temperature: **22,2 - 22,4 ° C** **Room Temperature: 22,1 - 22,7 ° C**

Frequency			**Power Drift dBm**	**Antenna Pos.**	**Phantom Section**	**Test Position**	**SAR (W/kg)**
MHz	**Channel**	**Modulation**					
824,2	128	GSM	-	Integral	Flat	Front	-
824,2	128	GSM	0,017	Integral	Flat	Back	0,125
836,4	189	GSM	-	Integral	Flat	Front	-
836,4	189	GSM	0,009	Integral	Flat	Back	0,133
848,8	251	GSM	-	Integral	Flat	Front	-
848,8	251	GSM	0,002	Integral	Flat	Back	0,142

Limits:

Exposure Limits	SAR (W/kg)	
	Uncontrolled Exposure/General Population Environment	**Controlled Exposure/Occupational Environment**
Spatial Average SAR (averaged over the whole body)	0.08	0.40
Spatial Peak SAR (averaged over any 1g of tissue)	1.60	8.00
Spatial Peak SAR (Hands, Feet, Ankles, Wrist) (averaged over any 10g of tissue)	4.00	20.00

Notes:

1. Test data represent the worst case SAR value and test procedure used are according to OET Bulletin 65, Supplement C (01-01).
2. All modes of operation were investigated.

Mixture Type: **1900 MHz Muscle**
Date: **04.04.2006**
Liquid Temperature: **22,2 - 22,4 ° C** **Room Temperature: 22,1 - 22,7 ° C**

Frequency			Power Drift dBm	Antenna Pos.	Phantom Section	Test Position -15 mm	SAR (W/kg)
MHz	Channel	Modulation					
1850,2	512	GSM	-	Integral	Flat	Front	-
1850,2	512	GSM	-0,003	Integral	Flat	Back	0,134
1880,0	661	GSM	-	Integral	Flat	Front	-
1880,0	661	GSM	0,052	Integral	Flat	Back	0,152
1909,8	810	GSM	-	Integral	Flat	Front	-
1909,8	810	GSM	0,011	Integral	Flat	Back	**0,167**

Note: Device positioning: spacing from flat phantom was adjusted at 1.5 cm.

Limits:

Exposure Limits	SAR (W/kg)	
	Uncontrolled Exposure/General Population Environment	Controlled Exposure/Occupational Environment
Spatial Average SAR (averaged over the whole body)	0.08	0.40
Spatial Peak SAR (averaged over any 1g of tissue)	1.60	8.00
Spatial Peak SAR (Hands, Feet, Ankles, Wrist) (averaged over any 10g of tissue)	4.00	20.00

Notes:

3. Test data represent the worst case SAR value and test procedure used are according to OET Bulletin 65, Supplement C (01-01).
4. All modes of operation were investigated.

5 References

[1] ANSI/IEEE C95.3 – 1991, *IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic fields, 300 kHz to 100 GHz,* New York: IEEE, Aug. 1992

[2] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), *Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields,* July 2001.

[3] T. Schmid, O. Egger, N. Kuster, *Automated E-field scanning system for dosimetric assessments,* IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[4] W. Gander, *Computermathematics*, Birkhaeuser, Basel, 1992.

[5] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery*, Numerical Recipes in C,* The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[6] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, December 2003 *Recommended Practice for Determining the Peak Spatial-Average Absorption Rate (SAR in the Human Body Due to Wireless Communications Devices: Experimental Techniques*.

[7] DASY4 *Dosimetric Assessment System Manual*; Draft; September 6, 2002; Schmid & Partner Engineering AG

[8] Radiation Protection Standard – Series No. 3

[9] Radiocommunications (Electromagnetic Radiation – Human Exposure) Standard 2003

6 Appendix

1.	Appendix A	Calibration Certificate	D900V2 SN164 D1900V2 SN5d025 ET3DV6 SN1711 DAE3V1-522
2.	Appendix B	Measurement Plots	
3.	Appendix C	Pictures	

Appendix A

Calibration Certificate

Note:

ETS Dr. Genz GmbH has extended the calibration interval for SPEAG System Validation Dipoles up to two years above the two years recommended by manufacturer. The determination of individual calibrations interval is covered and defined by ETS internal quality management procedures according EN 17025. This QM procedures are acknowledged by accreditation bodies mentioned on page 3 of this test report.

Schmid & Partner
Engineering AG

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

Calibration Certificate

900 MHz System Validation Dipole

Type:	**D900V2**
Serial Number:	**164**
Place of Calibration:	**Zurich**
Date of Calibration:	**September 5, 2002**
Calibration Interval:	**24 months**

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:	N. Vetter
Approved by:	[signature]

Schmid & Partner
Engineering AG

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

DASY

Dipole Validation Kit

Type: D900V2

Serial: 164

Manufactured: April 30, 2002
Calibrated: September 5, 2002

1. Measurement Conditions

The measurements were performed in the flat section of the new SAM twin phantom filled with head simulating solution of the following electrical parameters at 900 MHz:

Relative Dielectricity	**40.6**	± 5%
Conductivity	**0.95 mho/m**	± 5%

The DASY System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.5 at 900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 15mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 20mm was aligned with the dipole. The 5x5x7 fine cube was chosen for cube integration. Probe isotropy errors were cancelled by measuring the SAR with normal and 90° turned probe orientations and averaging.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2 SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**10.2 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**6.56 mW/g**

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.408 ns**	(one direction)
Transmission factor:	**0.990**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 900 MHz:	Re{Z} = **50.7 Ω**
	Im {Z} = **-5.2 Ω**
Return Loss at 900 MHz	**-25.7 dB**

4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

5. Design

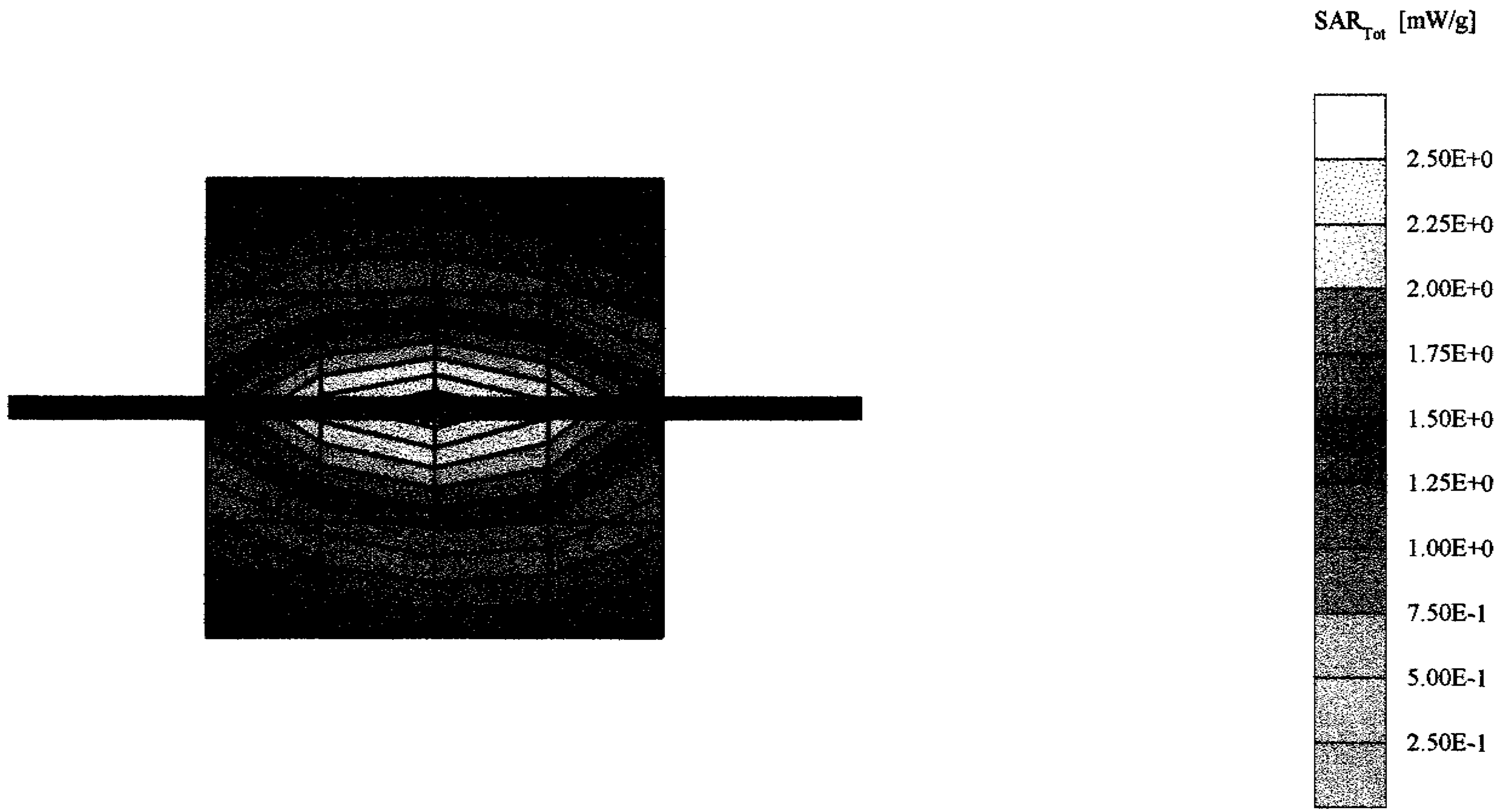
The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

6. Power Test

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

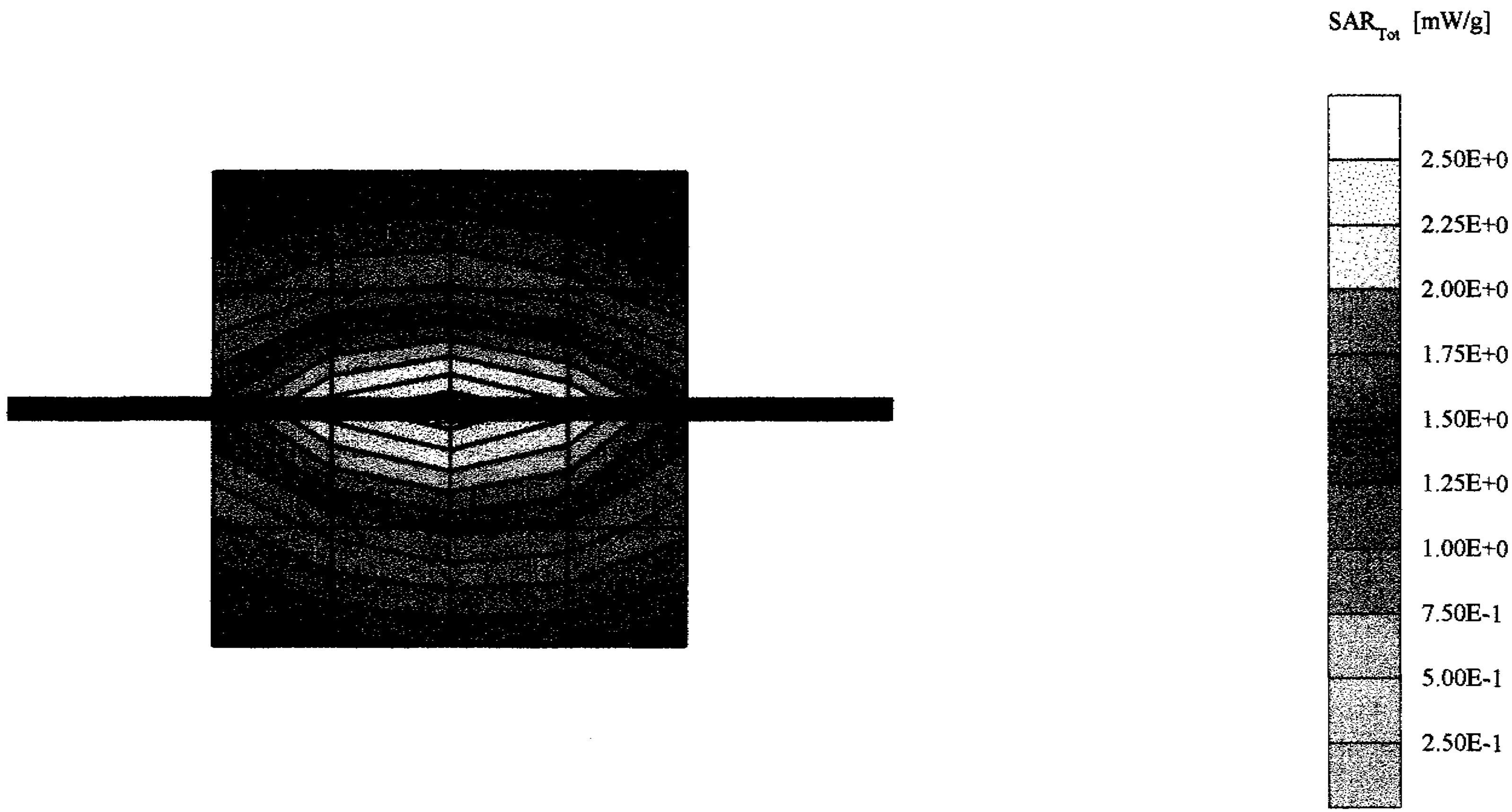
Validation Dipole D900V2 SN:164, d=15 mm

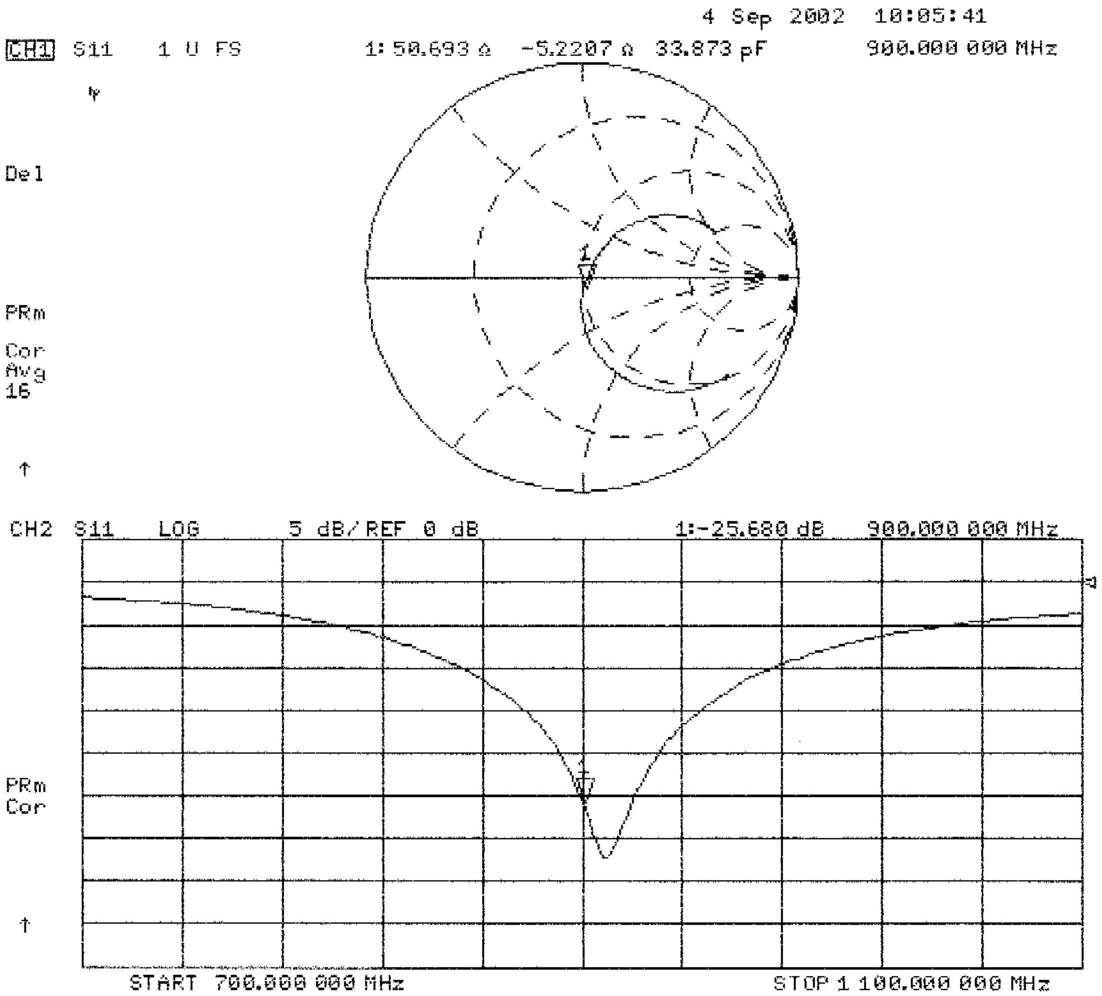
Frequency: 900 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(6.50,6.50,6.50) at 900 MHz; IEEE 1528 900 MHz: $\sigma = 0.95$ mho/m $\varepsilon_r = 40.6$ $\rho = 1.00$ g/cm^3
Cubes (2): Peak: 3.80 mW/g ± 0.03 dB, SAR (1g): 2.54 mW/g ± 0.03 dB, SAR (10g): 1.64 mW/g ± 0.02 dB, (Advanced extrapolation)
Penetration depth: 12.5 (12.3, 13.0) [mm]
Powerdrift: -0.01 dB



Validation Dipole D900V2 SN:164, d=15 mm

Frequency: 900 MHz; Antenna Input Power: 250 [mW]
SAM Phantom; Flat Section; Grid Spacing: Dx = 20.0, Dy = 20.0, Dz = 10.0
Probe: ET3DV6 - SN1507; ConvF(6.50,6.50,6.50) at 900 MHz; IEEE 1528 900 MHz: $\sigma = 0.95$ mho/m $\varepsilon_r = 40.6$ $\rho = 1.00$ g/cm^3
Cubes (2): Peak: 4.29 mW/g ± 0.03 dB, SAR (1g): 2.71 mW/g ± 0.03 dB, SAR (10g): 1.72 mW/g ± 0.02 dB, (Worst-case extrapolation)
Penetration depth: 11.6 (10.7, 12.8) [mm]
Powerdrift: -0.01 dB





4 Sep 2002 10:05:41
CH1 S11 1 U FS
1: 50.693 Ω -5.2207 Ω 33.873 pF 900.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF 0 dB 1:-25.680 dB 900.000 000 MHz
PRm
Cor
START 700.000 000 MHz
STOP 1 100.000 000 MHz

Schmid & Partner Engineering AG

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

Calibration Certificate

1900 MHz System Validation Dipole

Type:	**D1900V2**
Serial Number:	**5d025**
Place of Calibration:	**Zurich**
Date of Calibration:	**October 14, 2002**
Calibration Interval:	**24 months**

Schmid & Partner Engineering AG hereby certifies, that this device has been calibrated on the date indicated above. The calibration was performed in accordance with specifications and procedures of Schmid & Partner Engineering AG.

Wherever applicable, the standards used in the calibration process are traceable to international standards. In all other cases the standards of the Laboratory for EMF and Microwave Electronics at the Swiss Federal Institute of Technology (ETH) in Zurich, Switzerland have been applied.

Calibrated by:	D. Vetter
Approved by:	[signature]

Schmid & Partner
Engineering AG

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

DASY

Dipole Validation Kit

Type: D1900V2

Serial: 5d025

Manufactured: July 29, 2002
Calibrated: October 14, 2002

1. Measurement Conditions

The measurements were performed in the flat section of the new SAM twin phantom filled with head simulating glycol solution of the following electrical parameters at 1900 MHz:

Relative Dielectricity	**38.7**	± 5%
Conductivity	**1.45 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 5.2 at 1900 MHz) was used for the measurements.

The dipole was mounted on the small tripod so that the dipole feedpoint was positioned below the center marking of the flat phantom section and the dipole was oriented parallel to the body axis (the long side of the phantom). The standard measuring distance was 10mm from dipole center to the solution surface. The included distance holder was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 15mm was aligned with the dipole. The 7x7x7 fine cube was chosen for cube integration.
The dipole input power (forward power) was 250mW ± 3 %. The results are normalized to 1W input power.

2 SAR Measurement with DASY4 System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figure supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured with the dosimetric probe ET3DV6 SN:1507 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue:	**40.4 mW/g**
averaged over 10 cm^3 (10 g) of tissue:	**20.6 mW/g**

3. Dipole Impedance and Return Loss

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint. The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1.196 ns**	(one direction)
Transmission factor:	**0.997**	(voltage transmission, one direction)

The dipole was positioned at the flat phantom sections according to section 1 and the distance holder was in place during impedance measurements.

Feedpoint impedance at 1900 MHz:	Re{Z} = **51.6 Ω**
	Im {Z} = **4.7 Ω**
Return Loss at 1900 MHz	**-26.3 dB**

4. Handling

Do not apply excessive force to the dipole arms, because they might bend. Bending of the dipole arms stresses the soldered connections near the feedpoint leading to a damage of the dipole.

5. Design

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.

6. Power Test

After long term use with 40W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

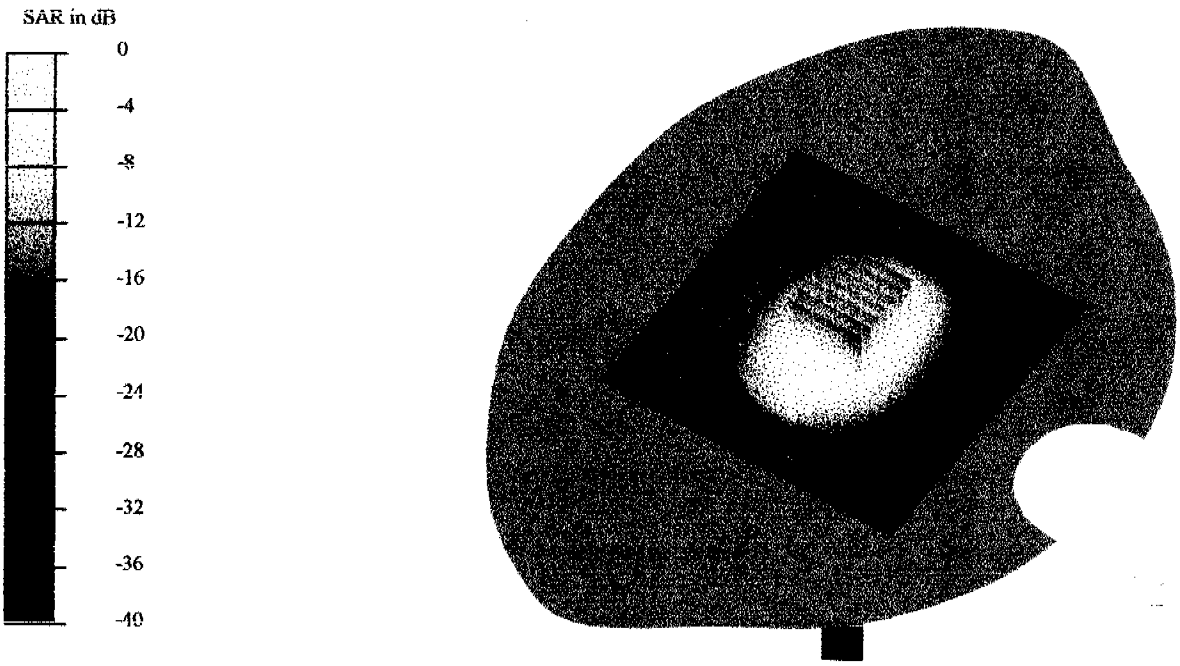
Test Laboratory: SPEAG, Zurich, Switzerland
File Name: SN5d025_SN1507_HSL1900_141002.da4

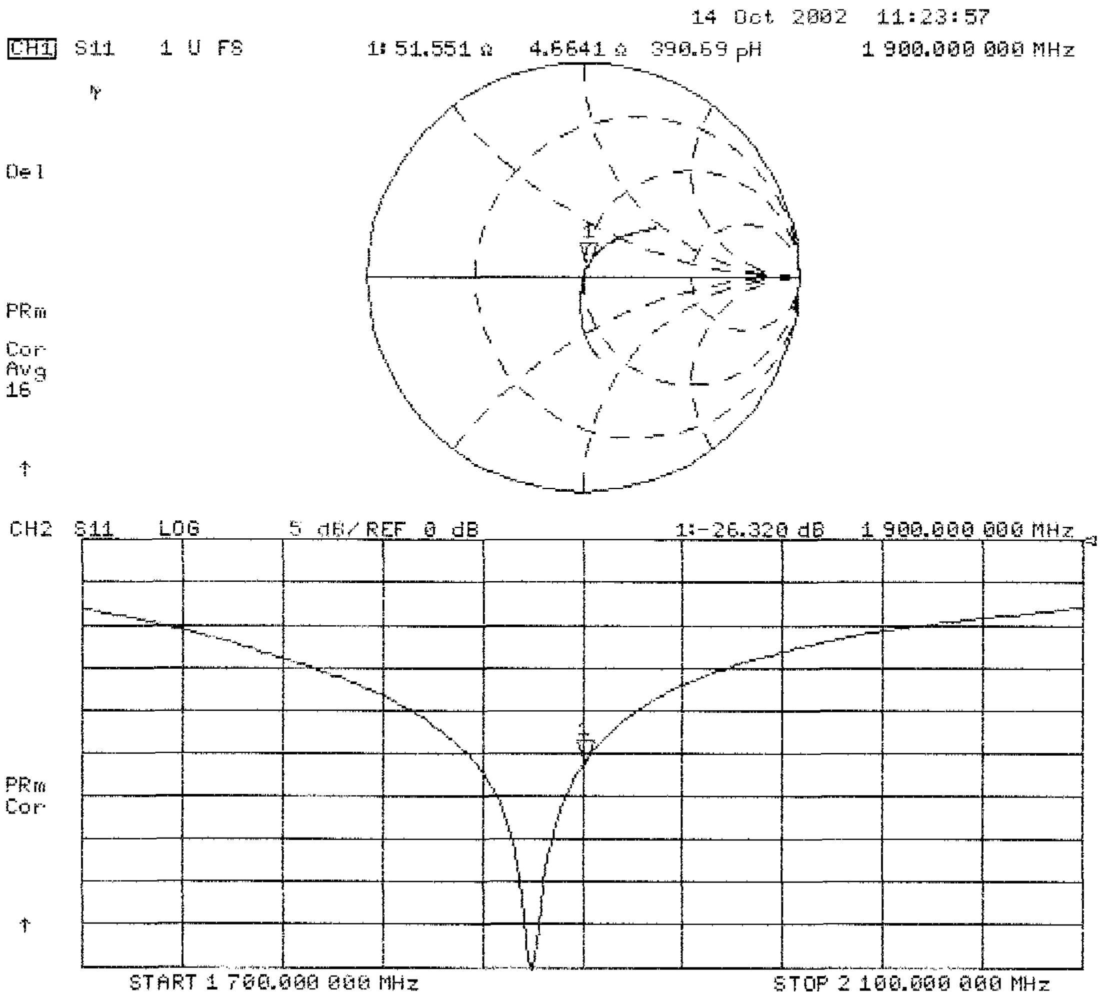
DUT: Dipole 1900 MHz Type & Serial Number: D1900V2 - SN5d025
Program: Dipole Calibration; Pin = 250 mW; d = 10 mm

Communication System: CW-1900; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL 1900 MHz (σ = 1.45 mho/m, ε = 38.7, ρ = 1000 kg/m3)
Phantom section: FlatSection

DASY4 Configuration:
- Probe: ET3DV6 - SN1507; ConvF(5.2, 5.2, 5.2); Calibrated: 1/24/2002
- *Sensor-Surface: 4mm (Mechanical Surface Detection)*
- Electronics: DAE3 - SN410; Calibrated: 7/18/2002
- Phantom: SAM 4.0 - TP:1006
- Software: DASY4, V4.0 Build 35

Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm
Reference Value = 93 V/m
Peak SAR = 18.3 mW/g
SAR(*1* g) = *10.1* mW/g; SAR(*10* g) = *5.16* mW/g
Power Drift = -0.0005 dB




14 Oct 2002 11:23:57
CH1 S11 1 U FS
1: 51.551 Ω 4.6641 Ω 390.69 pH 1 900.000 000 MHz
Del
PRm
Cor
Avg
16
CH2 S11 LOG 5 dB/ REF 0 dB 1:-26.320 dB 1 900.000 000 MHz
PRm
Cor
START 1 700.000 000 MHz
STOP 2 100.000 000 MHz

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

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

Accredited by the Swiss Federal Office of Metrology and Accreditation
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 **ETS Dr. Genz**

Certificate No: ET3-1711_Nov05

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1711
Calibration procedure(s)	QA CAL-01.v5 and QA CAL-12.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	November 21, 2005
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	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
Reference 3 dB Attenuator	SN: S5054 (3c)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
Reference 30 dB Attenuator	SN: S5129 (30b)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	7-Jan-05 (SPEAG, No. ES3-3013_Jan05)	Jan-06
DAE4	SN: 654	27-Oct-05 (SPEAG, No. DAE4-654_Oct05)	Oct-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Dec-03)	In house check: Dec-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-04)	In house check: Nov 05

	Name	Function	Signature
Calibrated by:	Nico Vetterli	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: November 21, 2005

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 ET3DV6

SN:1711

Manufactured:	August 7, 2002
Last calibrated:	December 16, 2003
Recalibrated:	November 21, 2005

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1711

Sensitivity in Free Space[A]

NormX	**1.45** ± 10.1%	$\mu V/(V/m)^2$
NormY	**1.68** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**1.59** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**95** mV
DCP Y	**95** mV
DCP Z	**95** 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		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	8.2	4.4
SAR_{be} [%]	With Correction Algorithm	0.0	0.2

TSL 1810 MHz Typical SAR gradient: 10 % per mm

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	14.6	10.0
SAR_{be} [%]	With Correction Algorithm	0.6	0.1

Sensor Offset

Probe Tip to Sensor Center **2.7** mm

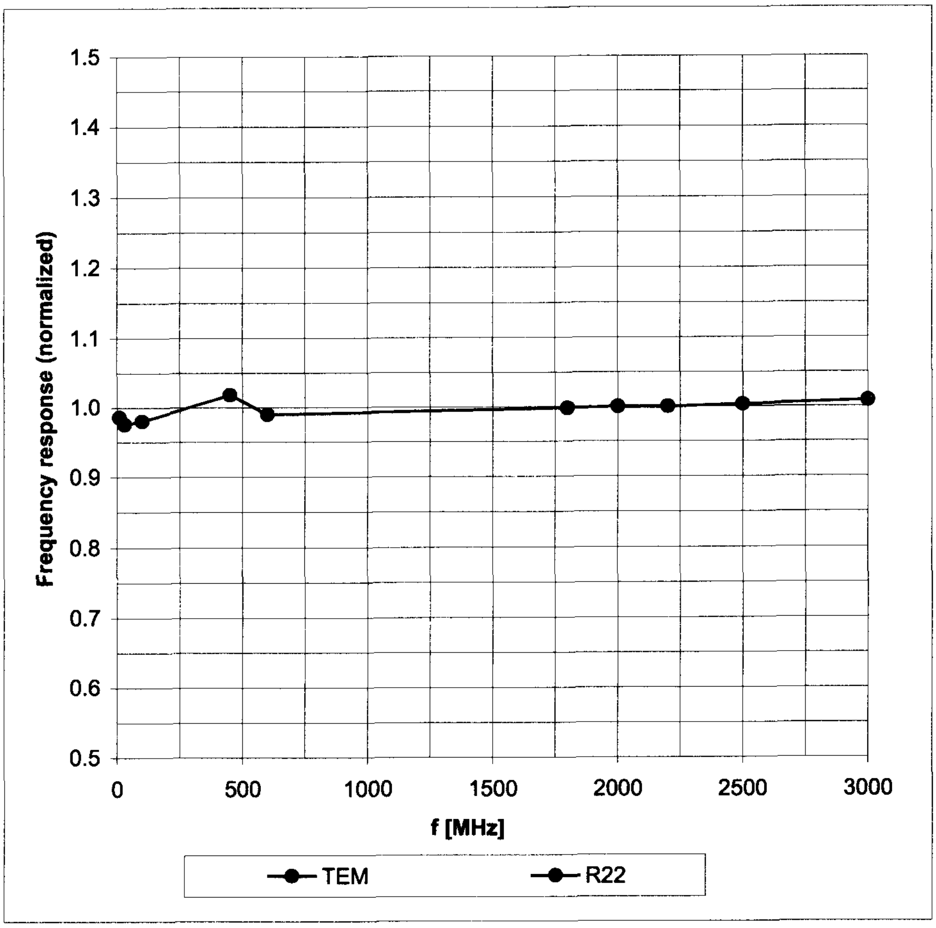
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[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.

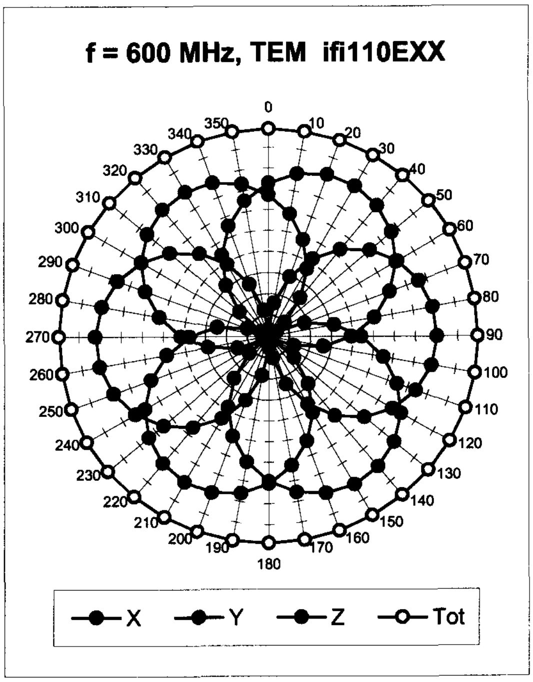
Frequency Response of E-Field

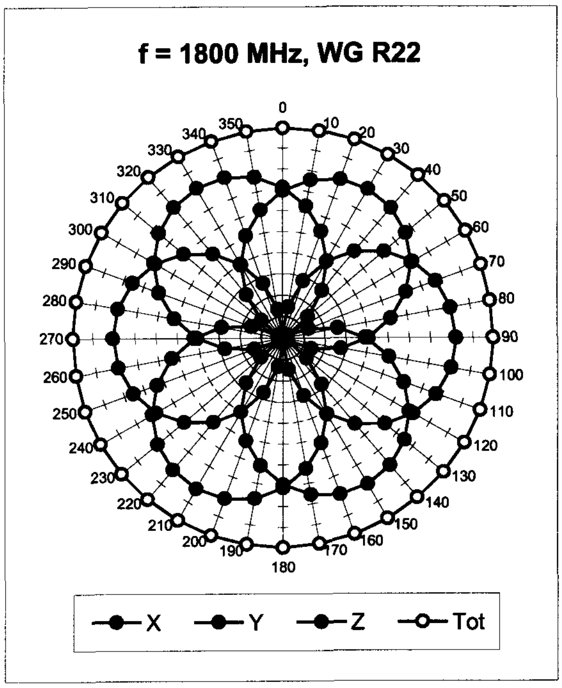
(TEM-Cell:ifi110 EXX, Waveguide: R22)

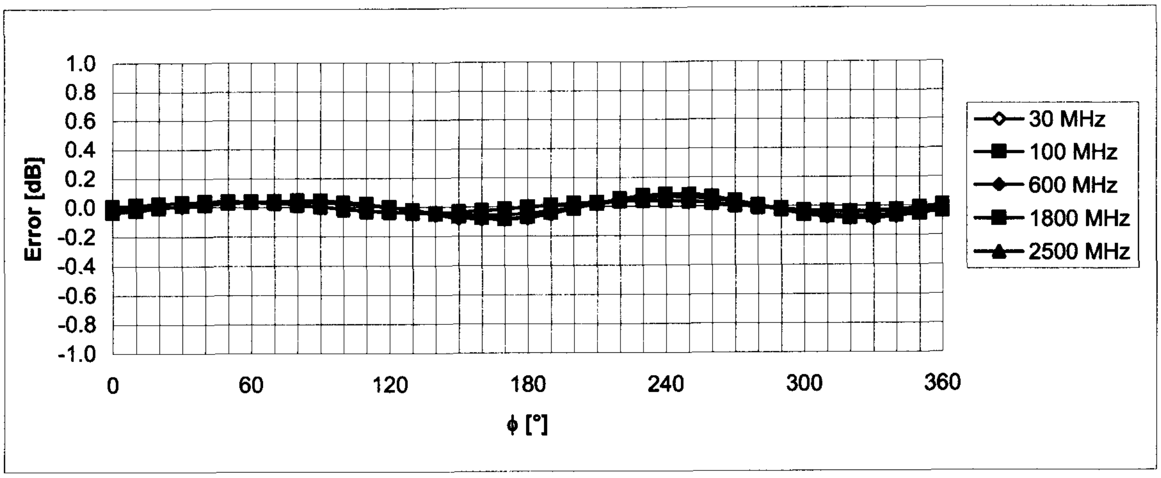


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



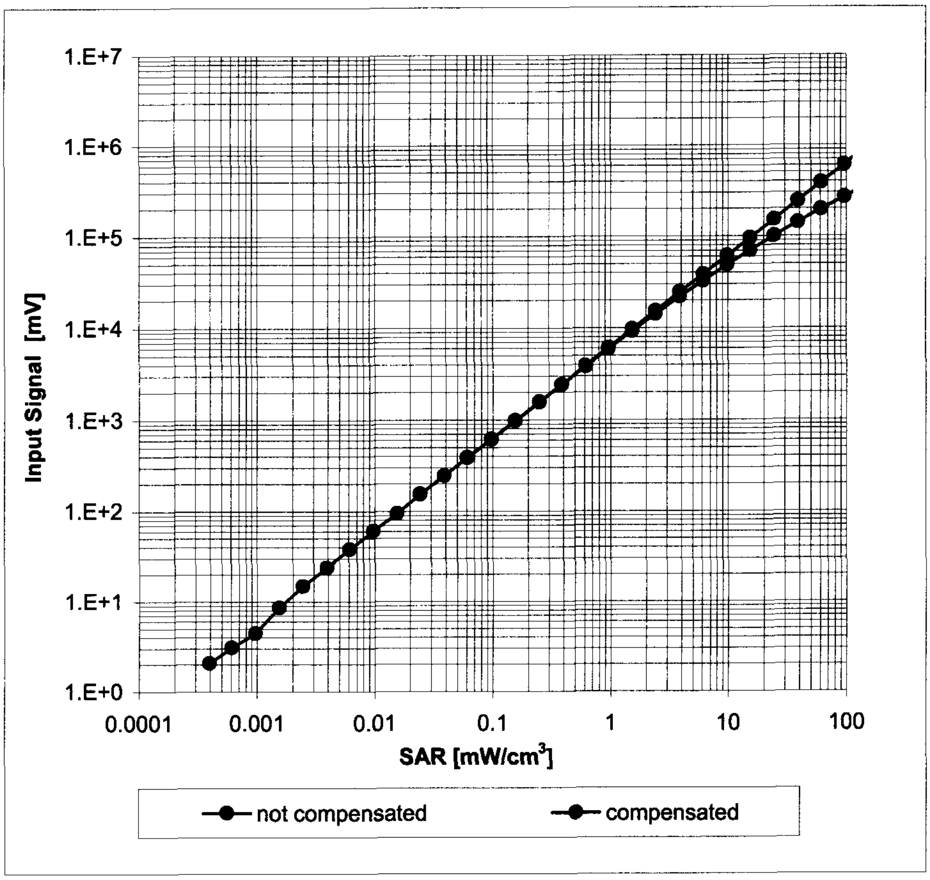


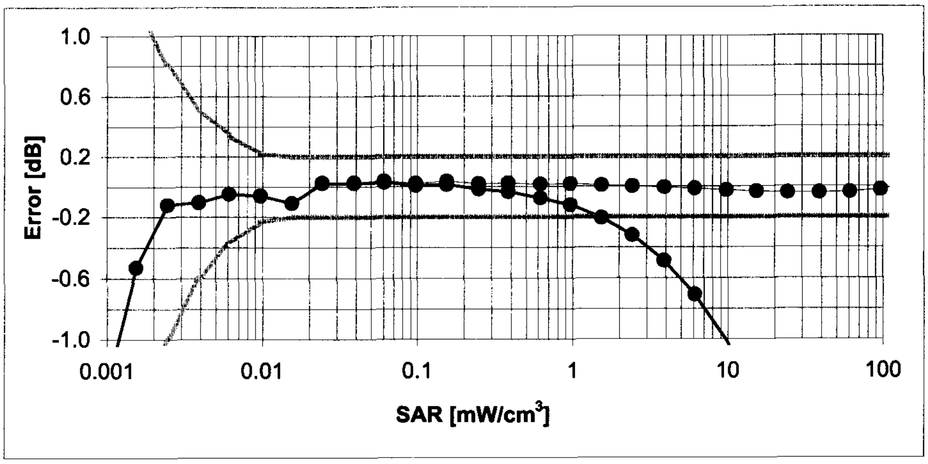


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

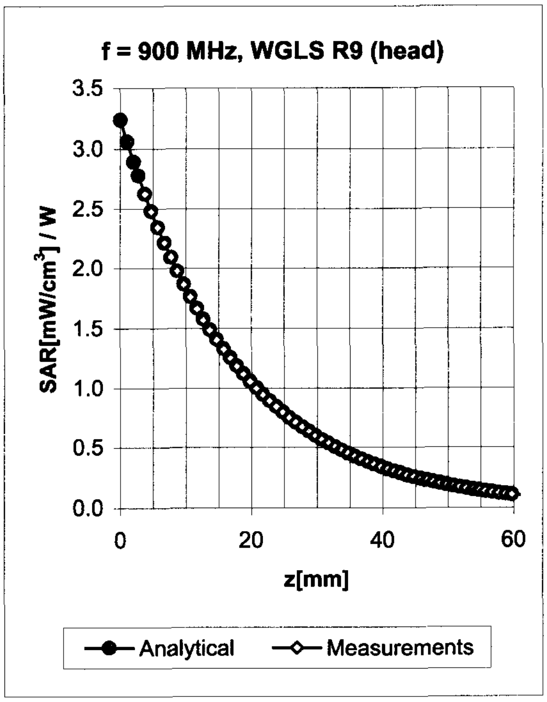
(Waveguide R22, f = 1800 MHz)

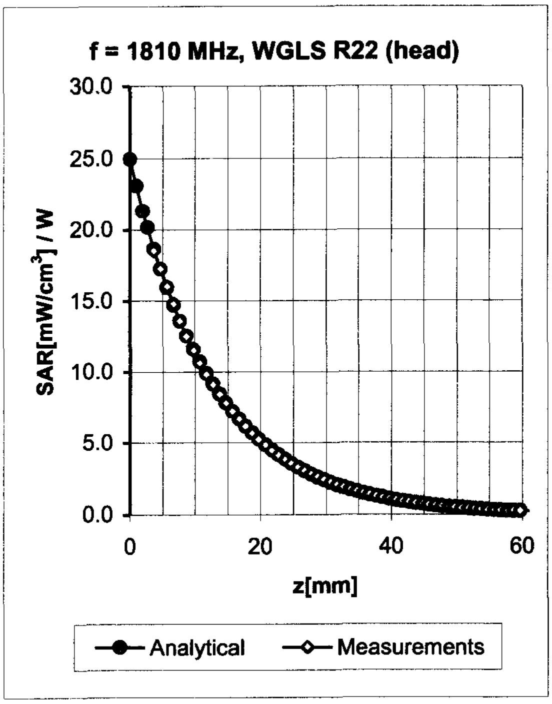




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



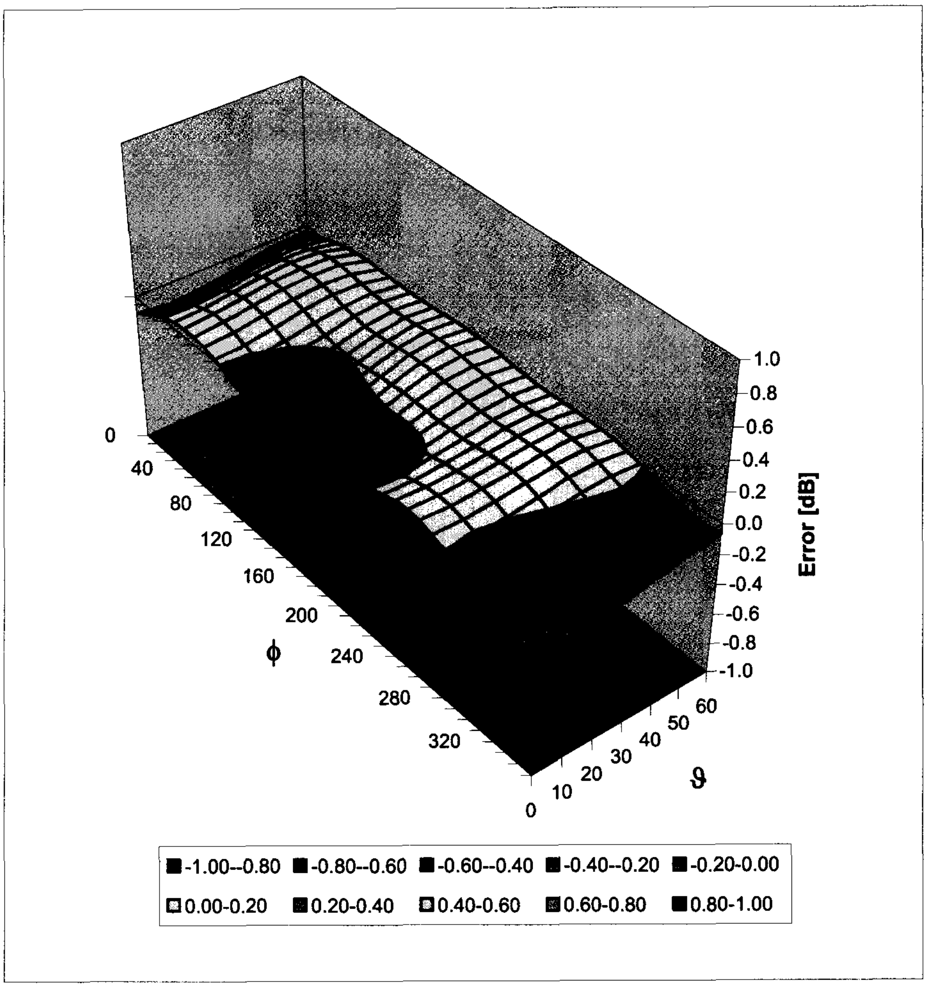


f [MHz]	Validity [MHz][c]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.02	2.48	6.52	± 13.3% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.55	1.87	5.99	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.57	2.55	4.84	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.56	2.59	4.54	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.70	2.28	4.27	± 11.8% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.02	2.36	6.96	± 13.3% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.49	2.11	5.73	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.56	2.77	4.31	± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.57	2.61	4.13	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.79	1.67	4.11	± 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)

Schmid & Partner Engineering AG
s p e a g
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

IMPORTANT NOTICE

USAGE OF PROBES IN ORGANIC SOLVENTS

Diethylene Gycol Monobuthy Ether (the basis for liquids above 1 GHz), as many other organic solvents, is a very effective softener for synthetic materials. These solvents can cause irreparable damage to certain SPEAG products, except those which are explicitly declared as compliant with organic solvents.

Compatible Probes:
- ET3DV6
- ET3DV6R
- ES3DVx
- EX3DVx
- ER3DV6
- H3DV6

Important Note for ET3DV6 Probes:
The ET3DV6 probes shall not be exposed to solvents longer than necessary for the measurements and shall be cleaned daily after use with warm water and stored dry.

s p e a g
Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Schmid & Partner Engineering AG

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1711**
Place of Assessment:	**Zurich**
Date of Assessment:	**November 23, 2005**
Probe Calibration Date:	**November 21, 2005**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. The evaluation is coupled with measured conversion factors (probe calibration date indicated above). The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1810 MHz.

Assessed by:

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Dosimetric E-Field Probe ET3DV6 SN:1711

Conversion factor (± standard deviation)

150 ± 50 MHz	*ConvF*	**8.1 ± 10%**	**ε_r = 52.3 ± 5%** **σ = 0.76 ± 5% mho/m** (head tissue)
150 ± 50 MHz	*ConvF*	**7.8 ± 10%**	**ε_r = 61.9 ± 5%** **σ = 0.80 ± 5% mho/m** (body tissue)
300 ± 50 MHz	*ConvF*	**7.3 ± 9%**	**ε_r = 45.3 ± 5%** **σ = 0.87 ± 5% mho/m** (head tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also Section 4.7 of the DASY4 Manual.

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

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

Accredited by the Swiss Federal Office of Metrology and Accreditation
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 ETS Dr. Genz

Certificate No: DAE3-522_Nov05

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 522
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	November 23, 2005
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	7-Oct-05 (Sintrel, No.E-050073)	Oct-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1002	29-Jun-05 (SPEAG, in house check)	In house check Jun-06

	Name	Function	Signature
Calibrated by:	Eric Hainfeld	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: November 23, 2005

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	404.289 ± 0.1% (k=2)	403.958 ± 0.1% (k=2)	404.788 ± 0.1% (k=2)
Low Range	3.95603 ± 0.7% (k=2)	3.93852 ± 0.7% (k=2)	3.96295 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	60 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	200000	199999.5	0.00
Channel X	+ Input	20000	20004.13	0.02
Channel X	- Input	20000	-19999.46	0.00
Channel Y	+ Input	200000	200000.3	0.00
Channel Y	+ Input	20000	20003.71	0.02
Channel Y	- Input	20000	-20000.98	0.00
Channel Z	+ Input	200000	199999.5	0.00
Channel Z	+ Input	20000	20001.35	0.01
Channel Z	- Input	20000	-20001.38	0.01

Low Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	2000	2000	0.00
Channel X	+ Input	200	200.74	0.37
Channel X	- Input	200	-200.66	0.33
Channel Y	+ Input	2000	2000	0.00
Channel Y	+ Input	200	199.67	-0.17
Channel Y	- Input	200	-200.19	0.09
Channel Z	+ Input	2000	2000.1	0.00
Channel Z	+ Input	200	199.46	-0.27
Channel Z	- Input	200	-200.78	0.39

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	-4.69	-5.13
	- 200	5.48	5.55
Channel Y	200	-0.70	-0.94
	- 200	0.03	0.01
Channel Z	200	16.03	15.52
	- 200	-17.34	-18.11

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	-	2.29	0.70
Channel Y	200	1.28	-	2.45
Channel Z	200	-2.82	-0.11	-

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	15727	15989
Channel Y	15754	16141
Channel Z	16032	16721

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	0.86	-1.08	2.33	0.61
Channel Y	-1.73	-3.15	0.41	0.60
Channel Z	-1.20	-2.72	0.46	0.55

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2000	199.2
Channel Y	0.2000	200.1
Channel Z	0.2001	197.2

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

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

IMPORTANT NOTICE

USAGE OF THE DAE 3

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE3 unit is connected to a fragile 3-pin battery connector. Customer is responsible to apply outmost caution not to bend or damage the connector when changing batteries.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration Customer shall remove the batteries and pack the DAE in an antistatic bag. The packaging shall protect the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, Customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

Important Note:
Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:
Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Schmid & Partner Engineering

Appendix B

Measurement Plots

Date/Time: 6/8/2006 11:41:50

Test Laboratory: ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH

Dipol Valid.900 (m)_250mW 08.06.2006

DUT: Dipole 900 MHz; Type: D900V2; Serial: 164

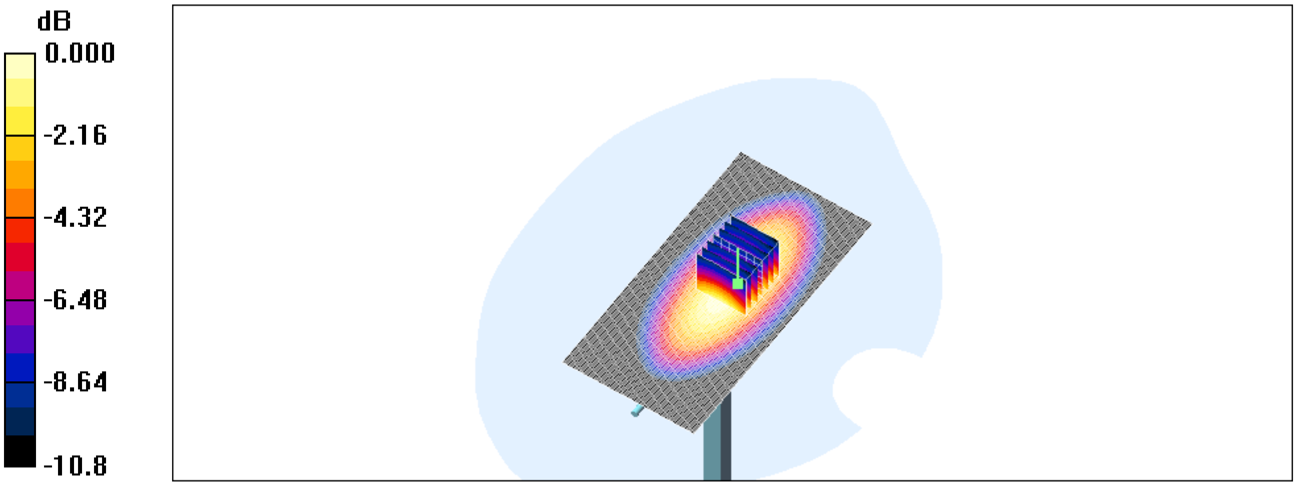
Communication System: CW; Frequency: 900 MHz;Duty Cycle: 1:1
Medium: Muscle 900 MHz Medium parameters used: f = 900 MHz; σ = 1.04 mho/m; ε_r = 54.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1711; ConvF(5.73, 5.73, 5.73); Calibrated: 11/21/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn522; Calibrated: 11/23/2005
- Phantom: SAM 12; Type: TP-1217; Serial: QD000P40CA
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Dipol 900 (250mW)/Area Scan (81x161x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 3.21 mW/g

Dipol 900 (250mW)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.0 V/m; Power Drift = 0.002 dB
Peak SAR (extrapolated) = 4.31 W/kg
SAR(1 g) = 2.93 mW/g; SAR(10 g) = 1.9 mW/g
Maximum value of SAR (measured) = 3.17 mW/g



0 dB = 3.17mW/g

Date/Time: 6/8/2006 10:57:14

Test Laboratory: ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH

Dipol Valid.1900(m)_250mW 8.6.2006

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d025

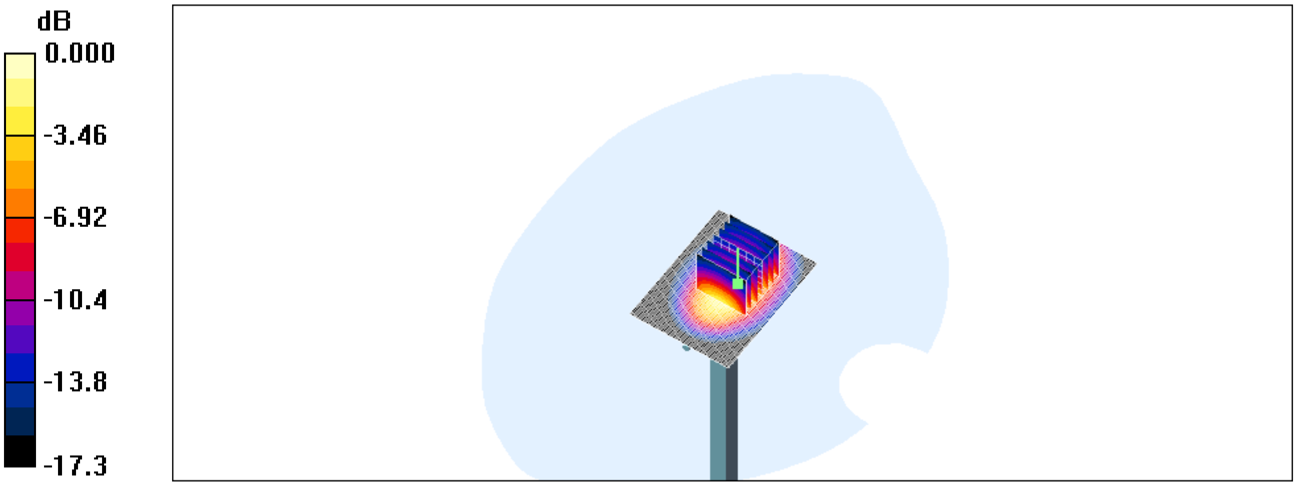
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: Muscle 1900 MHz Medium parameters used: f = 1900 MHz; σ = 1.58 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1711; ConvF(4.31, 4.31, 4.31); Calibrated: 11/21/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn522; Calibrated: 11/23/2005
- Phantom: SAM 12; Type: TP-1217; Serial: QD000P40CA
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

Dipol 1900 (250mW)/Area Scan (61x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 13.6 mW/g

Dipol 1900 (250mW)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.1 V/m; Power Drift = -0.001 dB
Peak SAR (extrapolated) = 19.8 W/kg
SAR(1 g) = 11.4 mW/g; SAR(10 g) = 5.93 mW/g
Maximum value of SAR (measured) = 13.0 mW/g



0 dB = 13.0mW/g

Date/Time: 6/8/2006 14:03:15

Test Laboratory: ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH

850_flat_back_ch128_dist 0mm

DUT: payment terminal; Type: I7910 US; Serial: MER609D

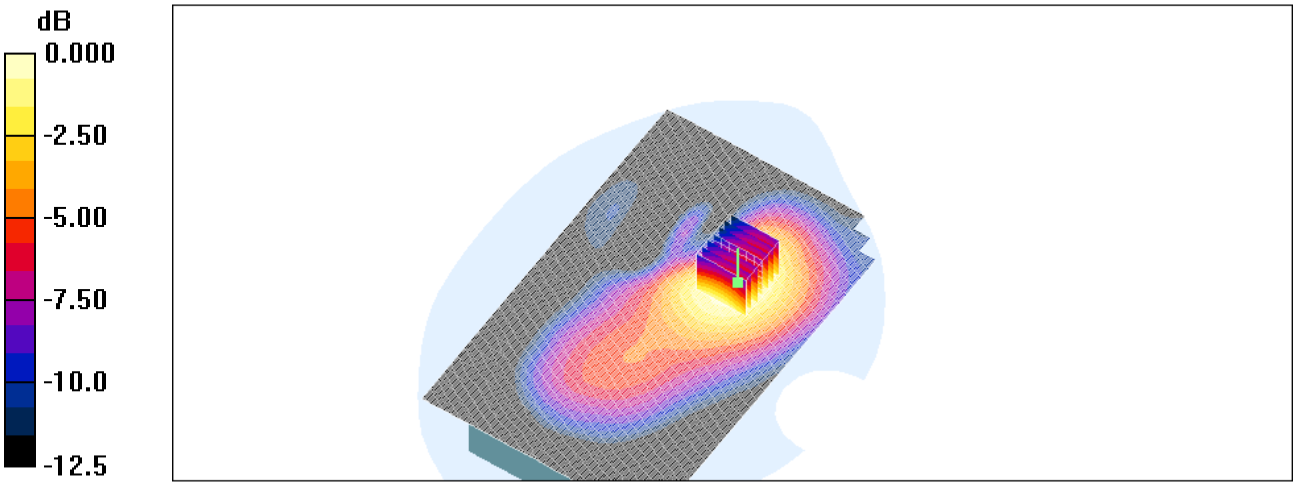
Communication System: GSM 850; Frequency: 824.2 MHz;Duty Cycle: 1:8.3
Medium: Muscle 900 MHz Medium parameters used: f = 824.2 MHz; σ = 0.962 mho/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1711; ConvF(5.73, 5.73, 5.73); Calibrated: 11/21/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn522; Calibrated: 11/23/2005
- Phantom: SAM 12; Type: TP-1217; Serial: QD000P40CA
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

I7910 US/Area Scan (141x221x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.135 mW/g

I7910 US/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.53 V/m; Power Drift = 0.017 dB
Peak SAR (extrapolated) = 0.166 W/kg
SAR(1 g) = 0.125 mW/g; SAR(10 g) = 0.087 mW/g
Maximum value of SAR (measured) = 0.137 mW/g



0 dB = 0.137mW/g

Date/Time: 6/8/2006 13:23:04

Test Laboratory: ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH

850_flat_back_ch189_dist 0mm

DUT: payment terminal; Type: I7910 US; Serial: MER609D

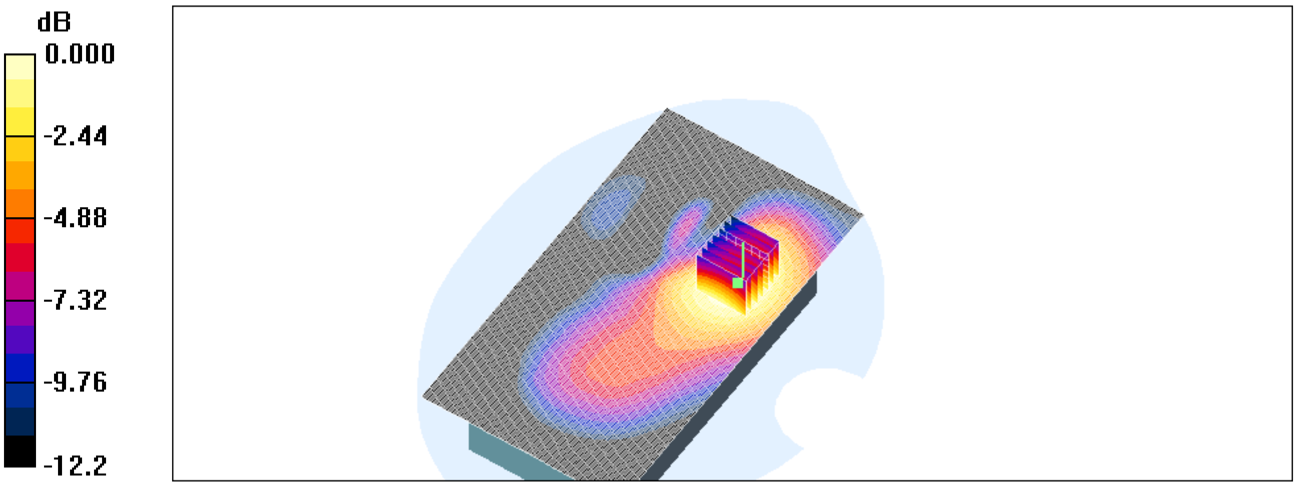
Communication System: GSM 850; Frequency: 836.4 MHz;Duty Cycle: 1:8.3
Medium: Muscle 900 MHz Medium parameters used: f = 836.4 MHz; σ = 0.972 mho/m; ε_r = 55.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1711; ConvF(5.73, 5.73, 5.73); Calibrated: 11/21/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn522; Calibrated: 11/23/2005
- Phantom: SAM 12; Type: TP-1217; Serial: QD000P40CA
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

I7910 US/Area Scan (121x221x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.145 mW/g

I7910 US/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.50 V/m; Power Drift = 0.009 dB
Peak SAR (extrapolated) = 0.176 W/kg
SAR(1 g) = 0.133 mW/g; SAR(10 g) = 0.094 mW/g
Maximum value of SAR (measured) = 0.142 mW/g



0 dB = 0.142mW/g

Date/Time: 6/8/2006 14:45:28

Test Laboratory: ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH

850_flat_back_ch251_dist 0mm

DUT: payment terminal; Type: I7910 US; Serial: MER609D

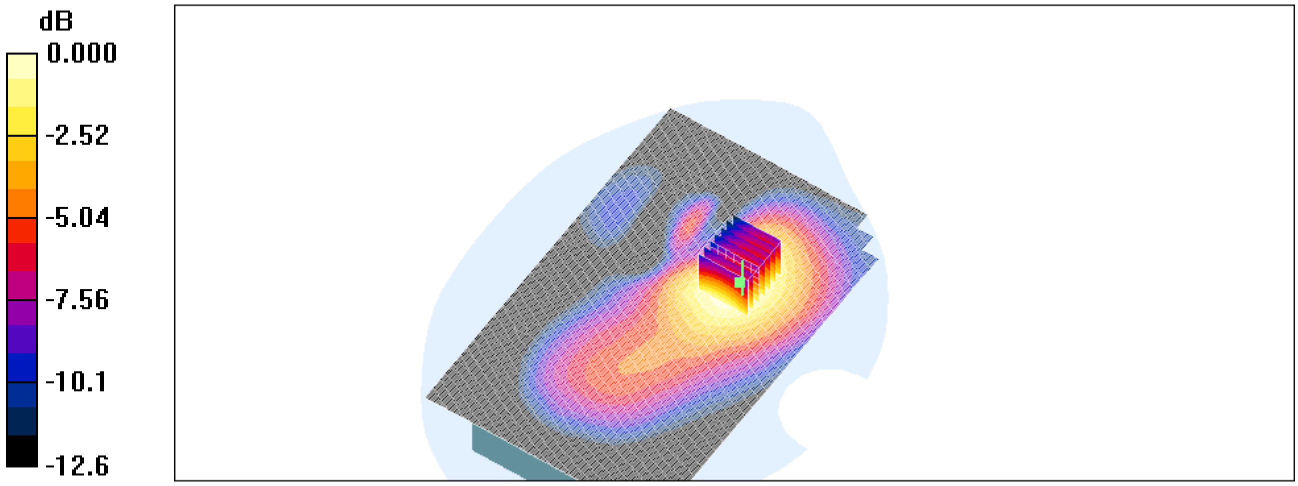
Communication System: GSM 850; Frequency: 848.8 MHz;Duty Cycle: 1:8.3
Medium: Muscle 900 MHz Medium parameters used: f = 848.8 MHz; σ = 0.981 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1711; ConvF(5.73, 5.73, 5.73); Calibrated: 11/21/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn522; Calibrated: 11/23/2005
- Phantom: SAM 12; Type: TP-1217; Serial: QD000P40CA
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

I7910 US/Area Scan (141x221x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.150 mW/g

I7910 US/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.55 V/m; Power Drift = 0.002 dB
Peak SAR (extrapolated) = 0.196 W/kg
SAR(1 g) = 0.142 mW/g; SAR(10 g) = 0.098 mW/g
Maximum value of SAR (measured) = 0.150 mW/g



0 dB = 0.150mW/g

Date/Time: 6/8/2006 09:16:46

Test Laboratory: ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH

1900_flat_back_ch512_dist 0mm

DUT: payment terminal; Type: I7910 US; Serial: MER609D

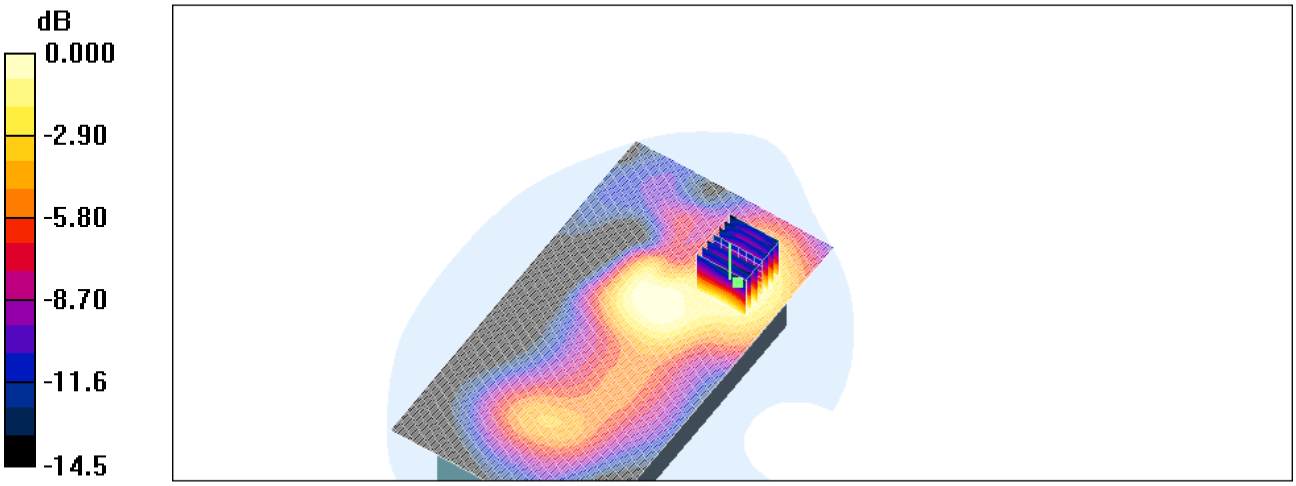
Communication System: GSM 1900; Frequency: 1850.2 MHz;Duty Cycle: 1:8.3
Medium: Muscle 1900 MHz Medium parameters used: f = 1850.2 MHz; σ = 1.51 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1711; ConvF(4.31, 4.31, 4.31); Calibrated: 11/21/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn522; Calibrated: 11/23/2005
- Phantom: SAM 12; Type: TP-1217; Serial: QD000P40CA
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

I7910 US/Area Scan (121x221x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.148 mW/g

I7910 US/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.89 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 0.211 W/kg
SAR(1 g) = 0.134 mW/g; SAR(10 g) = 0.083 mW/g
Maximum value of SAR (measured) = 0.145 mW/g



0 dB = 0.145mW/g

Date/Time: 6/8/2006 08:36:49

Test Laboratory: ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH

1900_flat_back_ch661_dist 0mm

DUT: payment terminal; Type: I7910 US; Serial: MER609D

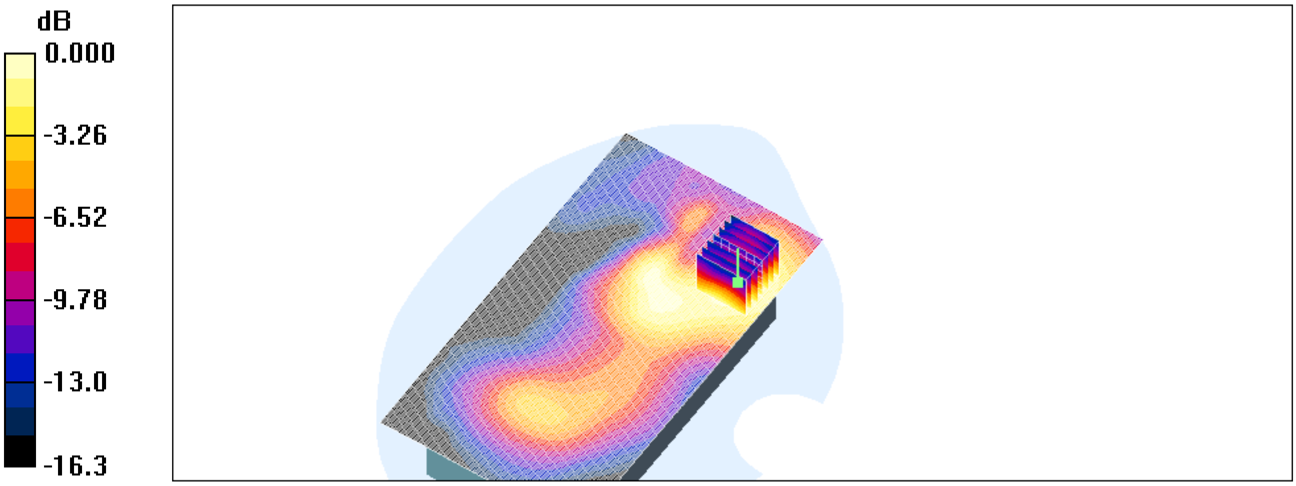
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: Muscle 1900 MHz Medium parameters used: f = 1880 MHz; σ = 1.55 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1711; ConvF(4.31, 4.31, 4.31); Calibrated: 11/21/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn522; Calibrated: 11/23/2005
- Phantom: SAM 12; Type: TP-1217; Serial: QD000P40CA
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

I7910 US/Area Scan (121x221x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.165 mW/g

I7910 US/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.93 V/m; Power Drift = 0.052 dB
Peak SAR (extrapolated) = 0.241 W/kg
SAR(1 g) = 0.152 mW/g; SAR(10 g) = 0.094 mW/g
Maximum value of SAR (measured) = 0.162 mW/g



0 dB = 0.162mW/g

Date/Time: 6/8/2006 10:13:26

Test Laboratory: ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH

1900_flat_back_ch810_dist 0mm

DUT: payment terminal; Type: I7910 US; Serial: MER609D

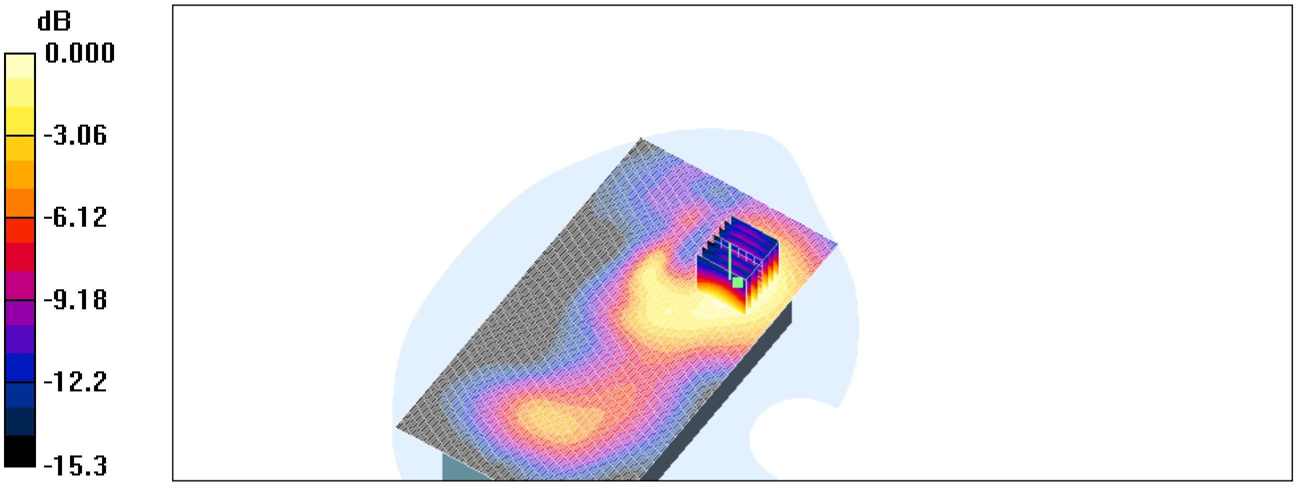
Communication System: GSM 1900; Frequency: 1909.8 MHz;Duty Cycle: 1:8.3
Medium: Muscle 1900 MHz Medium parameters used: f = 1909.8 MHz; σ = 1.59 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1711; ConvF(4.31, 4.31, 4.31); Calibrated: 11/21/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn522; Calibrated: 11/23/2005
- Phantom: SAM 12; Type: TP-1217; Serial: QD000P40CA
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

I7910 US/Area Scan (121x221x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.184 mW/g

I7910 US/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.15 V/m; Power Drift = 0.011 dB
Peak SAR (extrapolated) = 0.272 W/kg
SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.103 mW/g
Maximum value of SAR (measured) = 0.179 mW/g



0 dB = 0.179mW/g

Date/Time: 6/8/2006 10:13:26

Test Laboratory: ELECTRONIC TECHNOLOGY SYSTEMS DR. GENZ GMBH

1900_flat_back_ch810_z-axis-scan

DUT: payment terminal; Type: I7910 US; Serial: MER609D

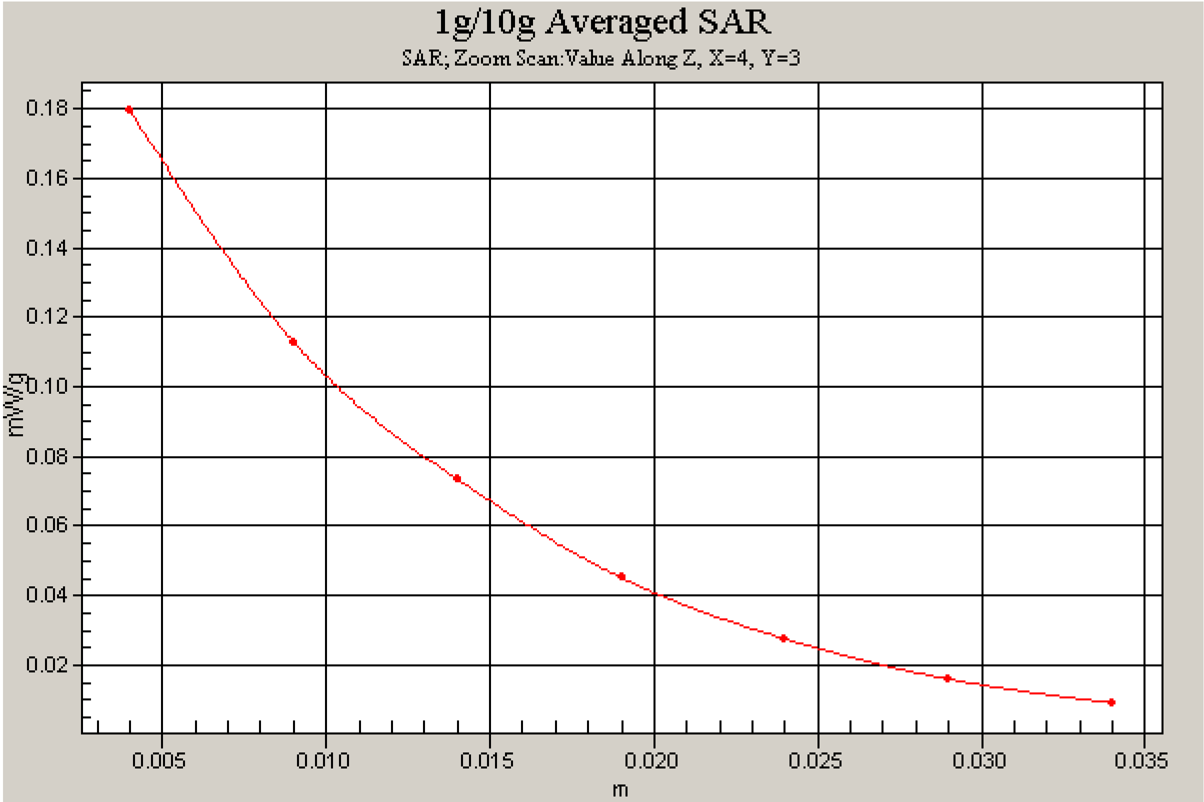
Communication System: GSM 1900; Frequency: 1909.8 MHz;Duty Cycle: 1:8.3
Medium: Muscle 1900 MHz Medium parameters used: f = 1909.8 MHz; σ = 1.59 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ET3DV6 - SN1711; ConvF(4.31, 4.31, 4.31); Calibrated: 11/21/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn522; Calibrated: 11/23/2005
- Phantom: SAM 12; Type: TP-1217; Serial: QD000P40CA
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 160

I7910 US/Area Scan (121x221x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.184 mW/g

I7910 US/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.15 V/m; Power Drift = 0.011 dB
Peak SAR (extrapolated) = 0.272 W/kg
SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.103 mW/g
Maximum value of SAR (measured) = 0.179 mW/g



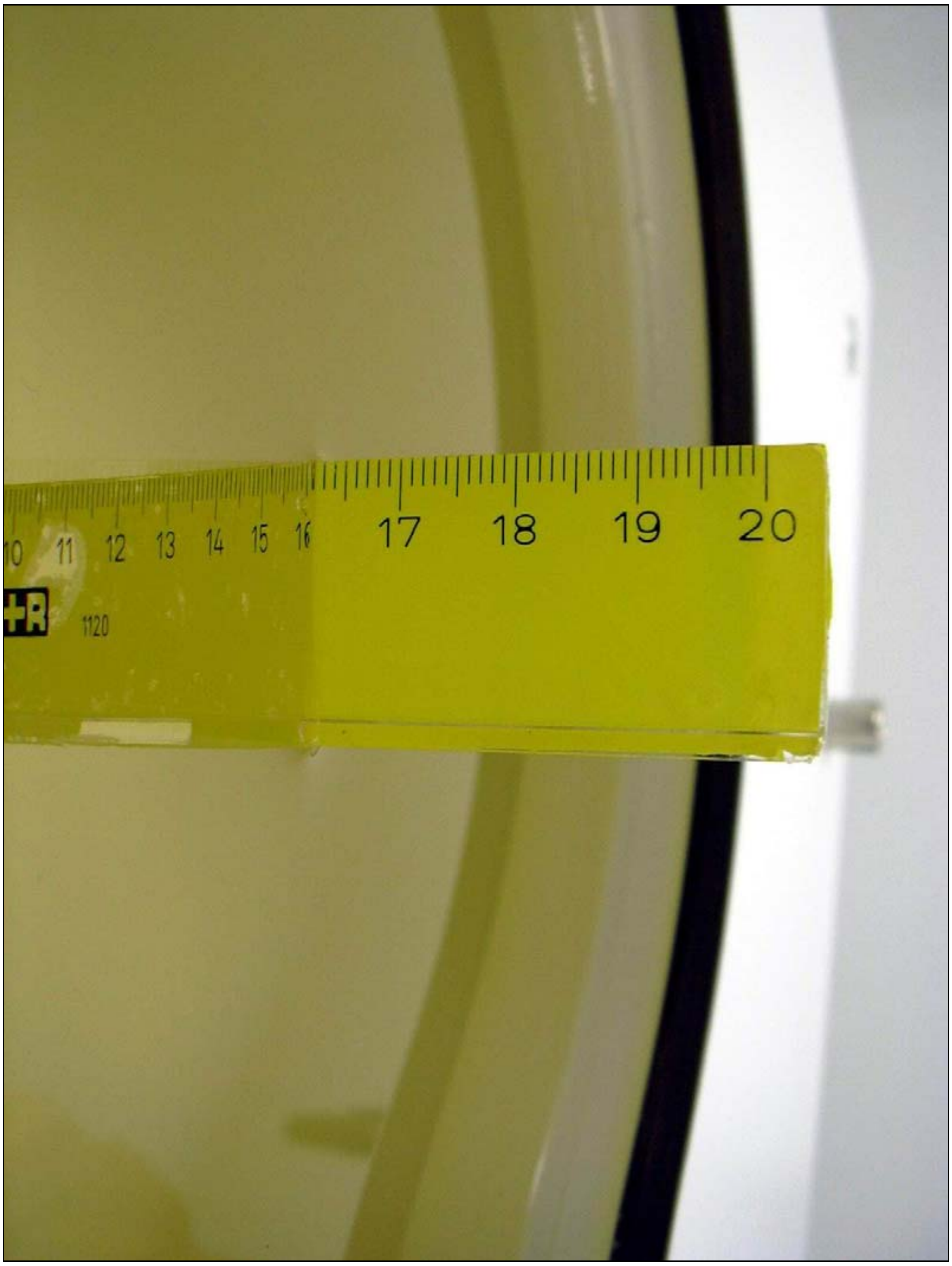
Appendix C

Pictures

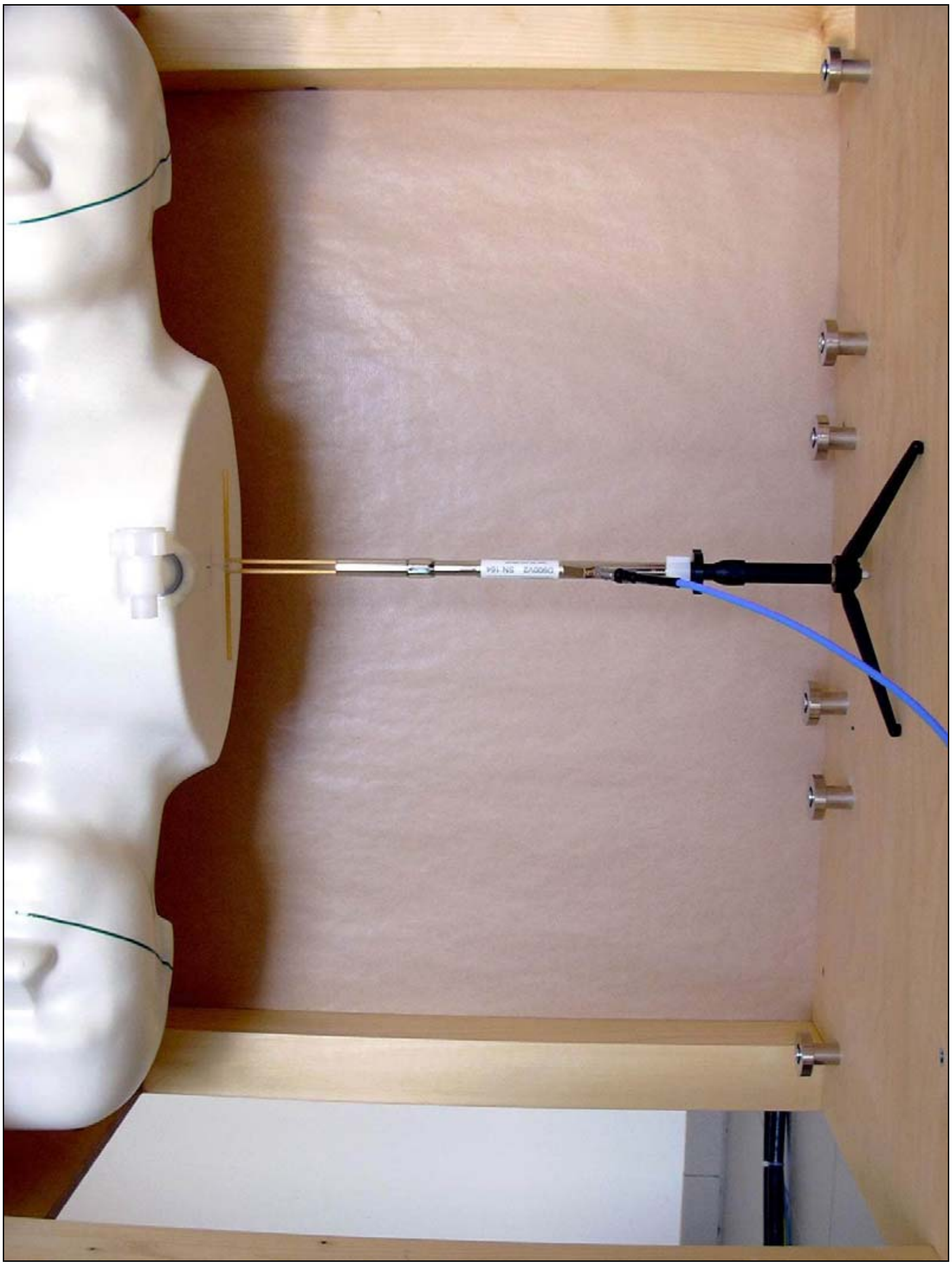
Appendix

C. Pictures

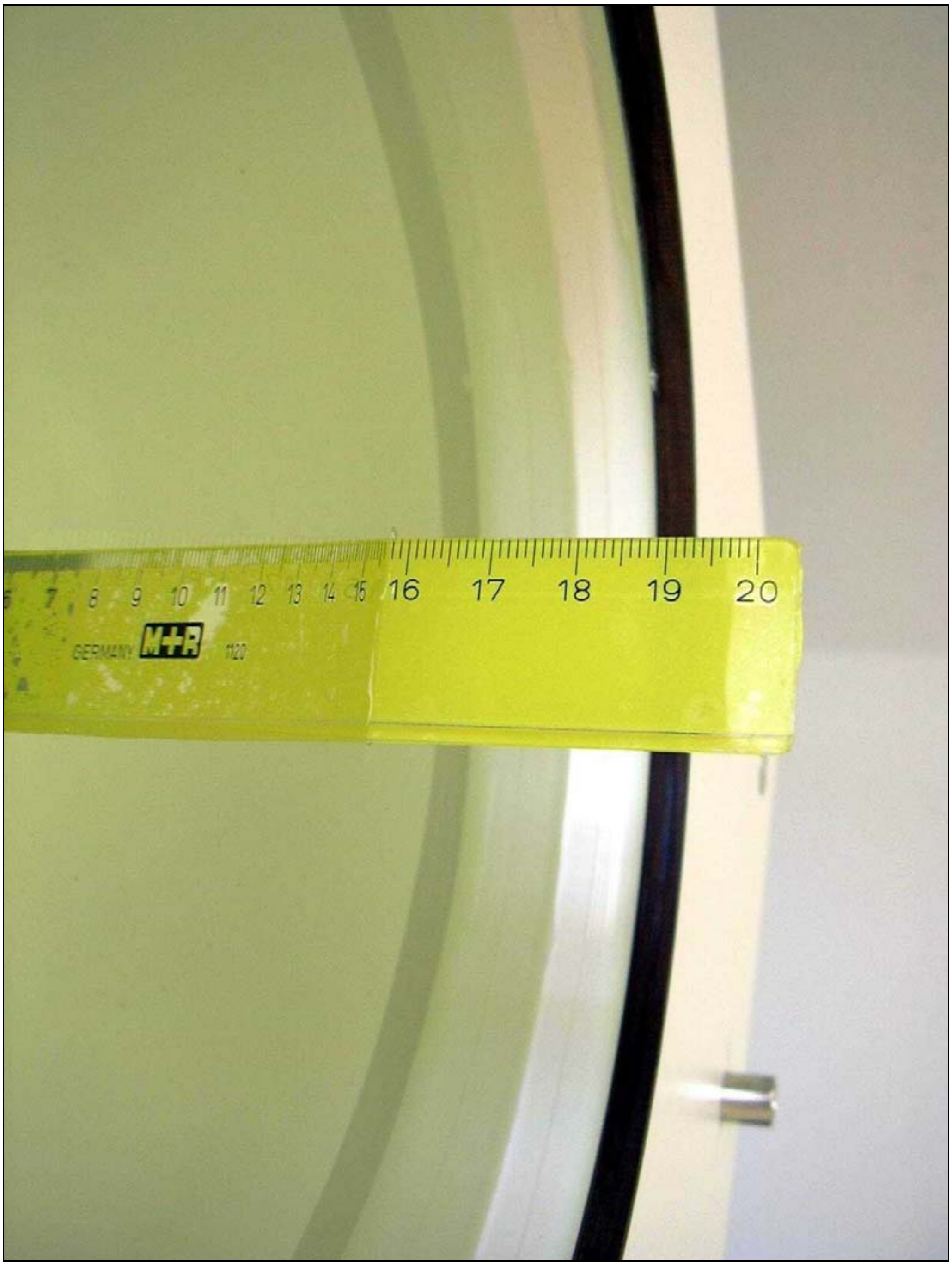
Liquid Depth – 850 MHz



Dipole Validation – 850 MHz



Liquid Depth – 1900 MHz



Dipole Validation – 1900 MHz