SAR TEST REPORT

Test Report No. : 26CE0011-HO-5a

Applicant	:	**Panasonic Communications Co., Ltd.**
Type of Equipment	:	**Cordless Telephone**
Model No.	:	**KX-TGA560**
FCC ID	:	**ACJ96NKX-TG5631**
Test standard	:	**FCC47CFR 2.1093** **FCC OET Bulletin 65, Supplement C**
Test Result	:	**Complied**
Max. SAR Measured	:	**Head 0.395W/kg (5759.70240MHz)** **Body 0.412W/kg (5798.05084MHz)**

1. This test report shall not be reproduced except full or partial, without the written approval of UL Apex Co., Ltd.
2. The results in this report apply only to the sample tested.
3. This equipment is in compliance with the above standard. We hereby certify that the data contain a true representation of the SAR profile.
4. The test results in this test report are traceable to the national or international standards.

Date of test : October 24-25 ,2005

Tested by :

Miyo Ikuta
EMC Services

Approved by :

Tetsuo Maeno
Site Manager of EMC Services

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SECTION 1 : Client information

Company Name	Panasonic Communications Co., Ltd.
Brand name	Panasonic
Address	1-62, 4-chome, Minoshima, Hakata-ku, Fukuoka, 812-8531 Japan
Telephone Number	+81-92-477-1405
Facsimile Number	+81-92-477-1487
Contact Person	Kunihiko Nawata

SECTION 2 : Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment		Cordless Telephone
Model No.		KX-TGA560
Serial No.		1
Country of Manufacture		Japan
Battery	Model Name :	HHR-P104
	Rating :	DC3.6V/830mAh
	Manufacture	Panasonic
Option Battery		N/A
Accessories		Belt-clip and Headset (Refer to Appendix1 (Photo))
Condition of EUT		Engineering prototype (Not for sale: This sample is equivalent to mass-produced items.)
Operation Clock		Main clock : 13.824 MHz
Receipt Date of Sample		October 22, 2005
Category Identified		Portable device

2.2 Product Description

Radio Specification

Equipment Type	Transceiver
Frequency band	Lower limit = 5725MHz、Upper limit = 5850MHz
Bandwidth & Channel spacing	Bandwidth:79MHz Channel spacing:891.87kHz
Type of Modulation	FHSS
Antenna Type	5/8 λ Pattern-Antenna
Antenna Connector Type	N/A
Antenna Gain	4dBi Typ.
Antenna location	Refer to Appendix 1
Max.Transmit Power tested (EIRP)	21.1dBm
Mode of Operation	Duplex
ITU code	F1E
Power Supply	DC 3.6V
Method of Frequency Generation	Synthesizer

SECTION 3 : Test standard information

3.1 Requirements for compliance testing defined by the FCC

The US Federal Communications Commission has released the report and order “Guidelines for Evaluating the Environmental Effects of RF Radiation", ET Docket No. 93-62 in August 1996. The order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. For consumer products, the applicable limit is 1.6 mW/g for an uncontrolled environment and 8.0 mW/g for an occupational/controlled environment as recommended by the ANSI/IEEE standard C95.1-1992. According to the Supplement C of OET Bulletin 65 “Evaluating Compliance with FCC Guide-lines for Human Exposure to Radio frequency Electromagnetic Fields", released on Jun 29, 2001 by the FCC, the device should be evaluated at maximum output power (radiated from the antenna) under “worst-case” conditions for normal or intended use, incorporating normal antenna operating positions, device peak performance frequencies and positions for maximum RF energy coupling.

1 Specific Absorption Rate (SAR) is a measure of the rate of energy absorption due to exposure to an RF transmitting source (wireless portable device).
2 IEEE/ANSI Std. C95.1-1992 limits are used to determine compliance with FCC ET Docket 93-62.

3.2 Exposure limit

(A) Limits for Occupational/Controlled Exposure (W/kg)

Spatial Average (averaged over the whole body)	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.4	8.0	20.0

(B) Limits for General population/Uncontrolled Exposure (W/kg)

Spatial Average (averaged over the whole body	Spatial Peak (averaged over any 1g of tissue)	Spatial Peak (hands/wrists/feet/ankles averaged over 10g)
0.08	1.6	4.0

Occupational/Controlled Environments: are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure, (i.e. as a result of employment or occupation).

General Population/Uncontrolled Environments: are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

NOTE:GENERAL POPULATION/UNCONTROLLED EXPOSURE
SPATIAL PEAK(averaged over any 1g of tissue) LIMIT
1.6 W/kg

SECTION 4 : Test result

4.1 Result of Max. SAR value

Max. SAR Measured : Head 0.395W/kg (5759.70240MHz)
Body 0.412 W/kg(5798.05084MHz)

4.2 Test Location

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Telephone : +81 596 24 8116
Facsimile : +81 596 24 8124

SECTION 5 : Operation of E.U.T. during testing

5.1 Operating modes

	The frequency band and the modulation used in this test are shown as a following. 1. IEEE 802.11b mode Frequency band : 5725-5750MHz Channel : 1ch(5759.70240MHz) 44ch(5798.05084MHz) 89ch(5838.18697MHz) Modulation : FHSS Crest factor : 5 * Remark* : Crest factor decision The EUT transmits 2slots (0.97ms*2) of on time (0.97ms) for 10ms. Therefore, Duty Cycle becomes 20% on an averaged and Crest factor becomes "5".

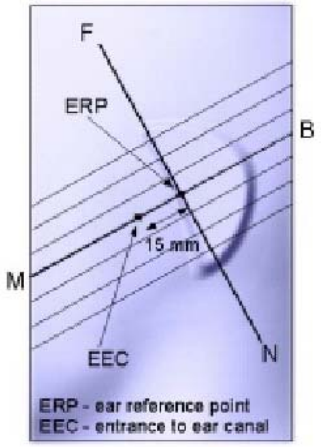
5.2 Description of the head test setup

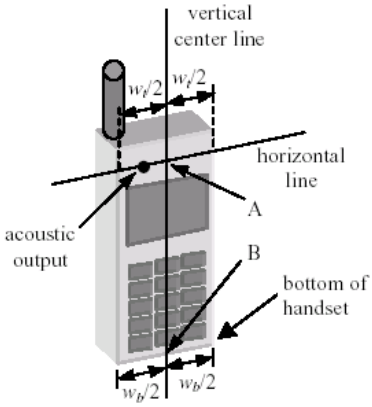
According to the OET 65 and IEEE1528, this EUT was tested on the "Cheek/Touch" and "Ear/Tilt" positions at the left head and right head section of the SAM phantom.

5.2.1 Initial ear position

A handset should be initially positioned with the earpiece region pressed against the ear spacerof a head phantom.

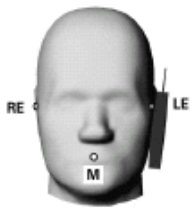
The device should be positioned parallel to the "N-F" line defined along the base of the ear spacer that contains the "ear reference point". The "test device reference point" is aligned to the "ear reference point" on the head phantom and the "vertical centerline" is aligned to the "phantom reference plane".

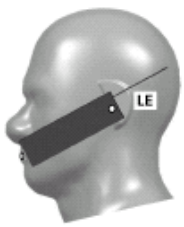


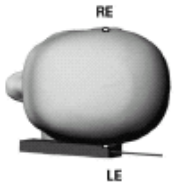


5.2.2 Cheek position

The device is brought toward the mouth of the head phantom by pivoting against the "ear reference point" or along the "N-F" line.
This test position is established:
i) When any point on the display, keypad or mouthpiece portions of the handset is in contact with the phantom.
ii) (or) When any portion of a foldout, sliding or similar keypad cover opened to its intended self-adjusting normal use position is in contact with the cheek or mouth of the phantom.

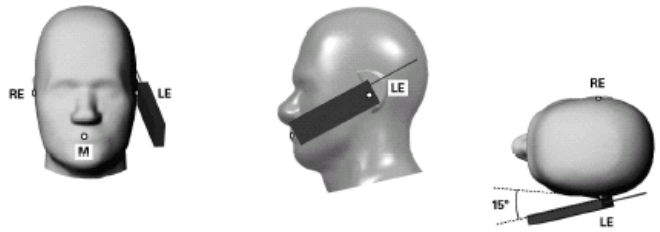






5.2.3 Tilt position

If the earpiece of the handset is not in full contact with the phantom's ear spacer and the peak SAR location for the "Cheek/Touch" position is located at the ear spacer region or corresponds to the earpiece region of the handset, the device should be returned to the "initial ear position" by rotating it away from the mouth until the earpiece is in full contact with the ear spacer.Otherwise the handset should be moved away from the cheek perpendicular to the line passes through both "ear reference points" for approximate 2-3 cm. While it is in this position, the handset is tilted away from the mouth with respect to the "test device reference point" by 15°. After the tilt, it is then moved back toward the head perpendicular to the line passes through both "ear reference points" until the device touches the phantom or the ear spacer. If the antenna touches the head first, the positioning process should be repeated with a tilt angle less than 15° so that the device and its antenna would touch the phantom simultaneously.



5.2.4 Antenna position

The antenna of this EUT was built-in antenna.

5.3 Method of measurement (Head SAR)

Step1. The searching for the worst position
This test was performed at the worst position.

Step2. The changing to the Low and High channels
The test was performed at the worst conditions of Step1.

5.4 Description of the Body-worn test setup and Method

This EUT was tested on the " Back" position at the flat section of SAM phantom.
The tested channel was performed in each Low, Mid and High channels.
The tests were performed in the EUT with the belt-clip and headset.(Refer to the Appendix1)

SECTION 6 : Test surrounding

6.1 Measurement uncertainty

The uncertainty budget has been determined for the DASY4 measurement system according to the SPEAG documents[6][7] and is given in the following Table.

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±6.8	Normal	1	1	±6.8	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	$(1-c_p)^{1/2}$	±1.9	∞
Spherical isotropy of the probe	±9.6	Rectangular	√3	$(c_p)^{1/2}$	±3.9	∞
Boundary effects	±2.0	Rectangular	√3	1	±1.2	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±1.0	Normal	1	1	±1.0	∞
Response time	±0.8	Rectangular	√3	1	±0.5	∞
Integration time	±2.6	Rectangular	√3	1	±1.5	∞
RF ambient conditions	±3.0	Rectangular	√3	1	±1.7	∞
Mech. constraints of robot	±0.8	Rectangular	√3	1	±0.5	∞
Probe positioning	±5.7	Rectangular	1	1	±5.7	∞
Extrap. and integration	±4.0	Rectangular	√3	1	±2.3	∞
Test Sample Related						
Device positioning	±2.9	Rectangular	√3	1	±2.9	8
Device holder uncertainty	±3.6	Rectangular	√3	1	±3.6	4
Power drift	±5.0	Rectangular	√3	1	±2.9	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
Liquid conductivity (target)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid conductivity (meas.)	±5.0	Rectangular	1	0.64	±3.2	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (meas.)	±5.0	Rectangular	1	0.6	±3.0	∞
Combined Standard Uncertainty					**±13.398**	
Expanded Uncertainty (k=2)					**±26.8**	

SECTION 7 : Confirmation before testing

7.1 Output Power Measurement results

Output power measurement method

1) EUT was placed on a platform of nominal size, 0.5m by 1.0m, raised 1.5m above the conducting ground plane. Test was made with the antenna positioned in both the horizontal and vertical planes of polarization. The Radiated Electric Field Strength intensity has been measured in semi anechoic chamber with absorbent materials lined (Type VHP 12) on a ground plane and at a distance of 3m.
The measuring antenna height was varied between 1 to 4m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field intensity.
The measurements were performed for both vertical and horizontal antenna polarization.

2) Exchanged the EUT to the Substitution Antenna, the measurement was set for the same height 1.5m as the EUT. The frequency below 1GHz of the Substitution Antenna was used as the Half wave dipole Antenna, which is harmonized with the measured frequency in 1).
The frequency above 1GHz of the Substitution Antenna was used with Horn Antenna.
The Substitution Antenna was connected with the Signal Generator, and the polarized electromagnetic radiation of the Substitution Antenna was matched with the one of the measuring Antenna, which was set with the Signal Generator to the measured frequency in 1). Then, we set with the Output power (CW) of the Signal Generator where the measuring electromagnetic field is equal to the measured value in 1).
The measuring antenna height was varied between 1 to 4m to obtain the maximum receiving level.
Its Output power of Signal Generator was recorded.

3) Effective radiated power was calculated by subtracting the cable loss and the attenuator loss connected between the Signal Generator and the Substitution Antenna from the Output power of the Signal Generator recorded in 2).
For the usage of the Antenna (Horn Antenna) except for the Half wave dipole Antenna (2.15dBi) for the Substitution Antenna, the Effective radiated power was calculated by compensating the finite difference in the Antenna gain of the Half wave dipole Antenna, and Substitution Antenna.

Spectrum Analyzer setting

Resolution bandwidth set to 1MHz and Video bandwidth to 3MHz.

EIRP			
Ch	Freq. [MHz]	E-field [dBμV/m]	EIRP [dBm]
Low	5759.70240	125.110	21.1
Mid.	5798.05084	124.561	20.5
High	5838.18697	124.668	20.6

SECTION 8 : Measurement results

8.1 Head 5800MHz SAR

Liquid Depth (cm)	:	**15.0**	Model	:	**KX-TGA560**
Parameters	:	ε_r =**36.3**, σ =**5.51**	Serial No.	:	**1**
Ambient temperature (deg.c.)	:	**24.8**	Modulation	:	**FHSS**
Relative Humidity (%)	:	**36**	Crest factor	:	**5**
Date	:	**October 25,2005**	Measured By	:	**Miyo Ikuta**

HEAD SAR MEASUREMENT RESULTS								
Frequency		Modulation (Duty 20%)	Phantom Section	EUT Set-up Conditions		Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Before	After	Maximum value of multi-peak
Step1. Position search								
Mid	5798.05084	FHSS	Left head	Fixed	Cheek	24.8	24.8	**0.235**
Mid	5798.05084	FHSS	Left head	Fixed	Tilt	24.8	24.8	**0.279**
Mid	5798.05084	FHSS	Right head	Fixed	Cheek	24.5	24.5	**0.301**
Mid	5798.05084	FHSS	Right head	Fixed	Tilt	24.8	24.8	**0.332**
Step2. Frequency Change								
Low	5759.70240	FHSS	Right head	Fixed	Tilt	24.8	24.9	**0.395**
High	5838.18697	FHSS	Right head	Fixed	Tilt	24.9	24.9	**0.320**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population						**Body SAR: 1.6 W/kg (averaged over 1 gram)**		

*See Appendix 3 for measurement data plots.

8.2 Body-worn 5800MHz SAR

Liquid Depth (cm)	:	**15.0**	Model	:	**KX-TGA560**
Parameters	:	ε_r =**45.9**, σ =**6.3**	Serial No.	:	**1**
Ambient temperature (deg.c.)	:	**24.8**	Modulation	:	**FHSS**
Relative Humidity (%)	:	**45**	Crest factor	:	**5**
Date	:	**October 24,2005**	Measured By	:	**Miyo Ikuta**

BODY-WORN SAR MEASUREMENT RESULTS									
Frequency		Modulation Duty 20%	Phantom Section	EUT Set-up Conditions			Liquid Temp.[deg.c]		SAR(1g) [W/kg]
Channel	[MHz]			Antenna	Position	Separation [mm]	Before	After	Maximum value of multi-peak
Low	5759.70240	FHSS	Flat	Fixed	Back	0	24.5	24.5	**0.366**
Mid	5798.05084	FHSS	Flat	Fixed	Back	0	24.3	24.3	**0.412**
High	5838.18697	FHSS	Flat	Fixed	Back	0	24.8	24.8	**0.342**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure / General Population							**Body SAR: 1.6 W/kg (averaged over 1 gram)**		

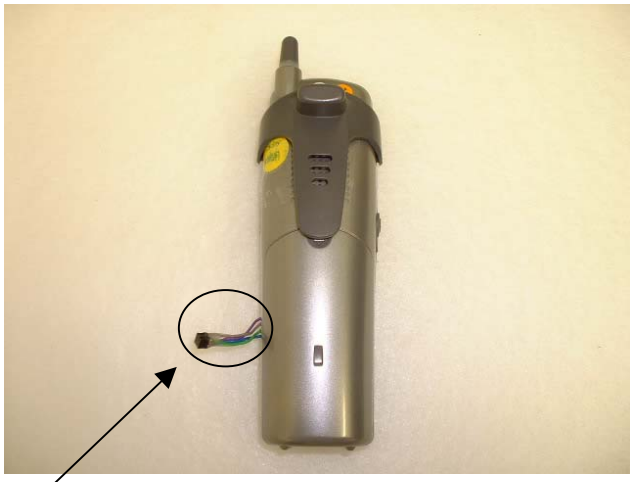
* See Appendix 3 for measurement data plots.

APPENDIX 1 : Photographs of test setup

Photograph EUT

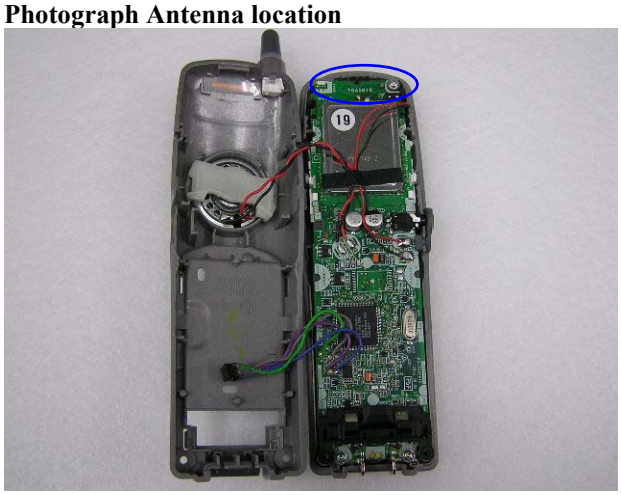
Front

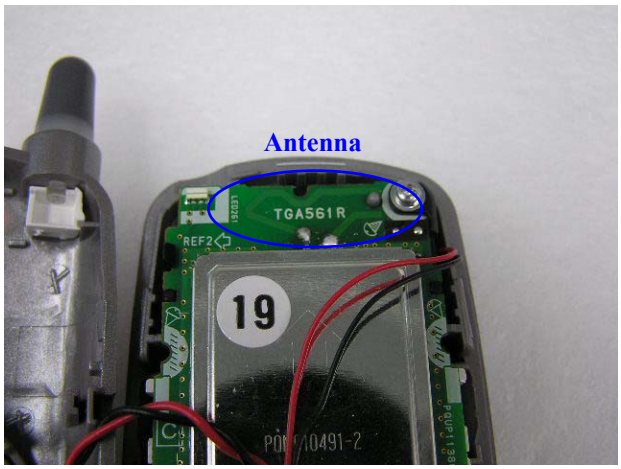
Back



The cable is attached to the EUT just for testing.
It is connected with PC in order to make the EUT test operation mode first, but is disconnected from the PC during test.
The cable is not attached to the production model.

Photograph Antenna location





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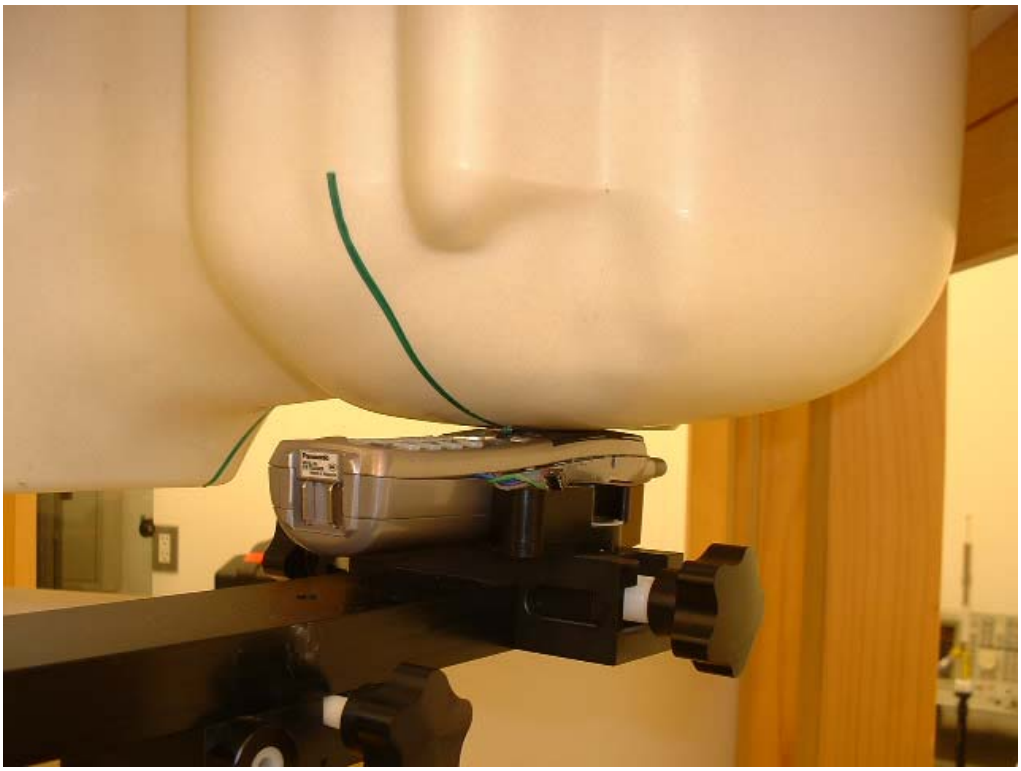
Photograph Accessary

Belt Clip

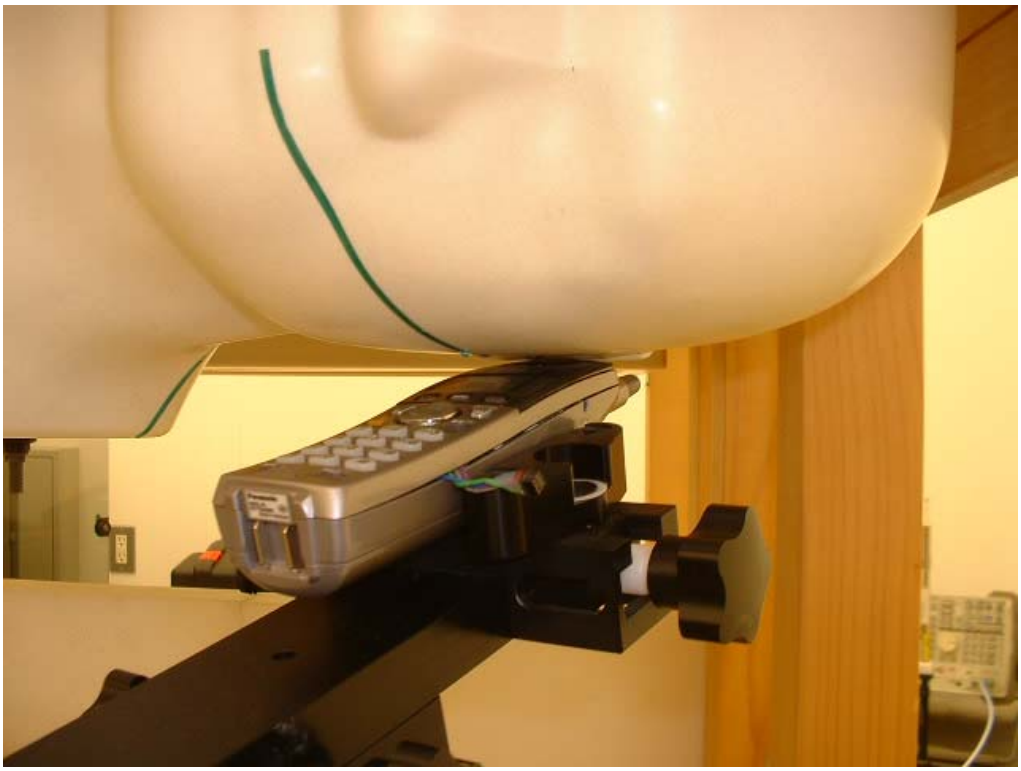
Headphone

Photograph EUT with accessories(Body-worn setup)

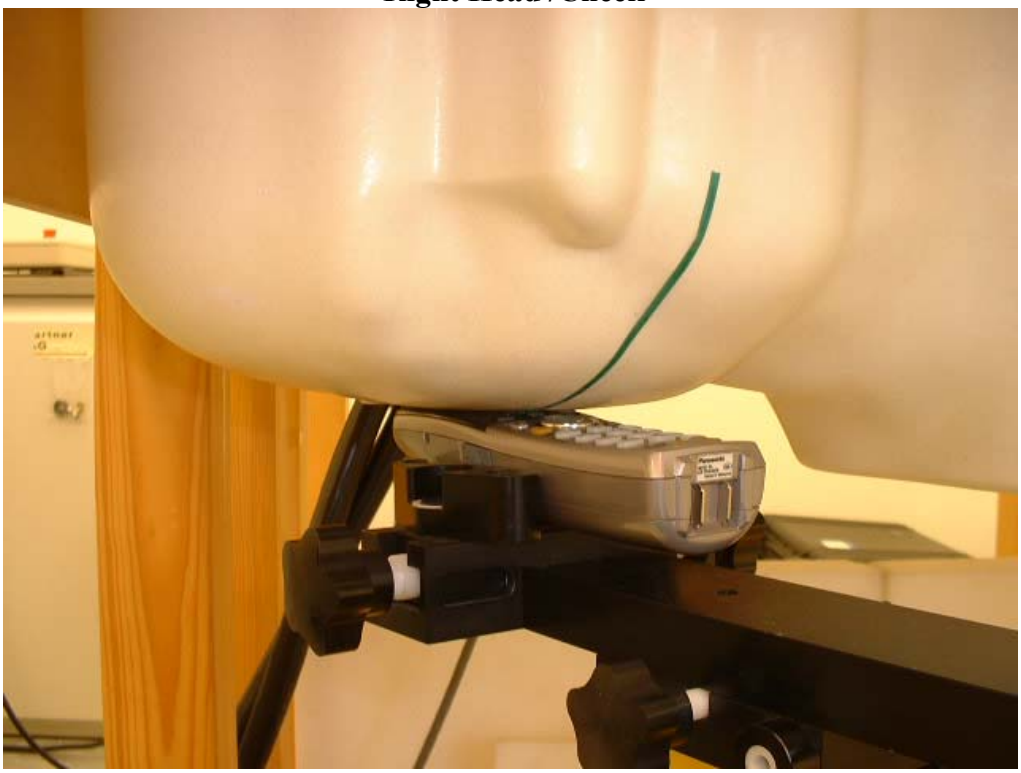
Left Head / Cheek



Left Head / Tilt

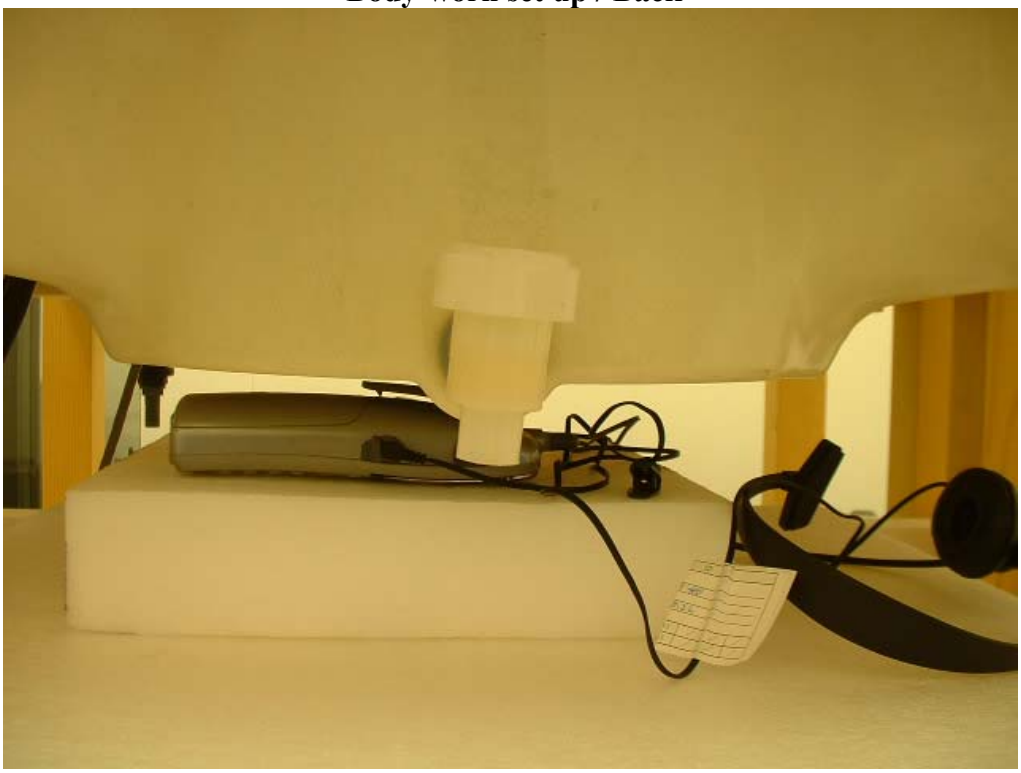


Right Head /Cheek



Right head / Tilt

Body-worn set up / Back



APPENDIX 2 : Test instruments

Equipment & calibration information

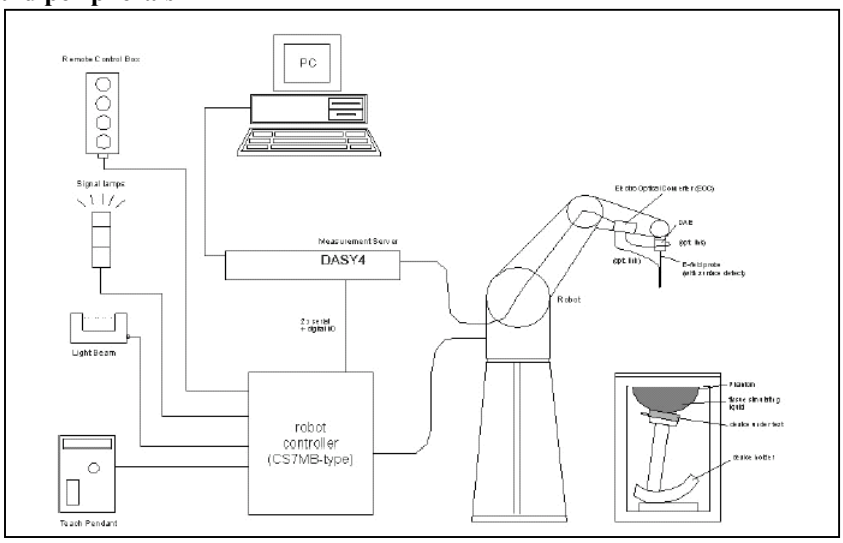
1. Equipment used

Name of Equipment	Manufacture	Model number	Serial number	Calibration	
				Last Cal	due date
Microwave Cable	Storm	SUCOFLEX104	222238/4	2005/08/30	2006/08/29
Horn Antenna	Schwarzbeck	BBHA9120D	258	2005/01/10	2006/01/09
Spectrum Analyzer	Agilent	E4448A	US44300523	2005/05/19	2006/05/18
Power Sensor	Agilent	E9300B	US40010300	2004/11/15	2005/11/14
Power Sensor	Agilent	E9327A	US40440545	2004/11/23	2005/11/22
Attenuator	Agilent	US40010300	08498-60012	2004/12/16	2005/12/15
Spectrum Analyzer	Agilent	E4448A	MY44020357	2005/09/16	2006/09/15
S-Parameter Network Analyzer	Agilent	8753ES	US39174808	2003/10/23	2006/10/22
Signal Generator	Rohde&Schwarz	SML40	100023	2005/01/05	2006/01/04
RF Amplifier	TSJ	TCBP0206	-	2005/02/24	2006/02/23
Dosimetric E-Field Probe	Schmid&Partner Engineering AG	EX3DV3	3507	2005/04/12	2006/04/11
Data Acquisition Electronics	Schmid&Partner Engineering AG	DAE3	509	2005/05/26	2006/05/25
Robot,SAM Phantom	Schmid&Partner Engineering AG	DASY4	I021834	N/A	N/A
5GHz System Validation Dipole	Schmid&Partner Engineering AG	D5GHzV2	1020	2004/02/23	2006/02/23
Dual Directional Coupler	N/A	Narda	03702	N/A	N/A
Head 5GHz	N/A	N/A	N/A	N/A	N/A
Body 5GHz	N/A	N/A	N/A	N/A	N/A
Ambient Noise <0.012W/kg	SAR room	-	-	2005/10/24,25	-

2. Dosimetry assessment setup

These measurements were performed with the automated near-field scanning system DASY4 from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision robot (working range greater than 0.9 m), which positions the probes with a positional repeatability of better than +/- 0.02 mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines to the data acquisition unit. The SAR measurements were conducted with the dosimetry probe ET3DV6, SN: 1684 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the procedure described in [2] with accuracy of better than +/-10%. The spherical isotropy was evaluated with the procedure described in [3] and found to be better than +/-0.25 dB. The phantom used was the
SAM Twin Phantom as described in FCC supplement C, IEEE P1528 and CENELEC EN50361.

3. Configuration and peripherals



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

1. A standard high precision 6-axis robot (Stäubli RX family) with controller and software.
   An arm extension for accommodating the data acquisition electronics (DAE).

2. 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.

3. A data acquisition electronic (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.

4. The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.

5. 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.

6. A probe alignment unit which improves the (absolute) accuracy of the probe positioning.

7. A computer operating Windows 2000.

8. DASY4 software.

9. Remote control with teaches pendant and additional circuitry for robot safety such as warning lamps, etc.

10. The SAM twin phantom enabling testing left-hand and right-hand usage.

11. The device holder for handheld mobile phones.

12. Tissue simulating liquid mixed according to the given recipes.

13. Validation dipole kits allowing to validate the proper functioning of the system.

4. System components

4.2.1 EX3DV4 Probe Specification26

Construction:
Symmetrical design with triangular core
Built-in shielding against static charges
PEEK enclosure material (resistant to organic solvents, e.g., glycol ether)
Calibration:
Basic Broad Band calibration in air : 10-3000 MHz
Frequencies of 900 MHz, 1.8 GHz ,2.45GHz,5.2GHz and 5.8GHz(Head and Body)

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

Directivity:
+/-0.3 dB in HSL (rotation around probe axis)
+/-0.5 dB in tissue material (rotation normal probe axis)

Dynamic Range:
10uW/g to > 100 mW/g;Linearity: +/-0.2 dB(noise: typically < 1uW/g)

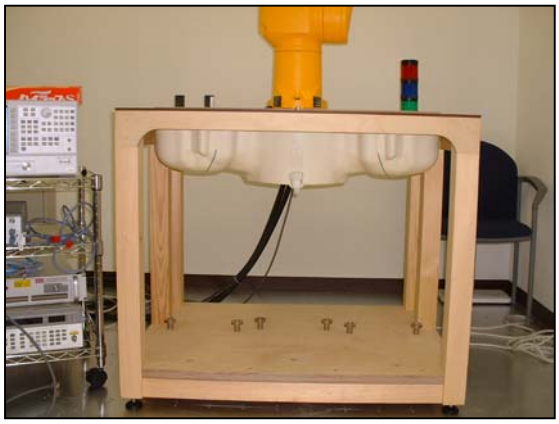
Dimensions:
Overall length: 330 mm (Tip: 20 mm)
Tip diameter: 2.5mm (Body: 12 mm)
Typical distance from probe tip to dipole centers: 1 mm

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

EX3DV4 E-field Probe

SAM Twin Phantom

Construction:
The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC EN 50361 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. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
Shell Thickness:
2 +/-0.2 mm
Filling Volume:
Approx. 25 liters
Dimensions:
(H x L x W): 810 x 1000 x 500 mm



SAM Twin Phantom

Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0, the Mounting Device enables the rotation of the mounted transmitter
in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeatedly positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head,flat phantom).
* Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produced infinite number of configurations.
To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Device holder couldn't be used at this SAR measurement.

Device Holder

5. Test system specifications

Robot RX60L

Number of Axes	:	6
Payload	:	1.6 kg
Reach	:	800mm
Repeatability	:	+/-0.025mm
Control Unit	:	CS7M
Programming Language	:	V+
Manuafacture	:	Stäubli Unimation Corp. Robot Model: RX60

DASY4 Measurement server

Features	:	166MHz low power Pentium MMX 32MB chipdisk and 64MB RAM Serial link to DAE (with watchdog supervision) 16 Bit A/D converter for surface detection system Two serial links to robot (one for real-time communication which is supervised by watchdog) Ethernet link to PC (with watchdog supervision) Emergency stop relay for robot safety chainTwo expansion slots for future applications
Manufacture	:	Schimid & Partner Engineering AG

Data Acquisition Electronic (DAE)

Features	:	Signal amplifier, multiplexer, A/D converter and control logic Serial optical link for communication with DASY4 embedded system (fully remote controlled) 2 step probe touch detector for mechanical surface detection and emergency robot stop (not in -R version)
Measurement Range	:	1 µV to > 200 mV (16 bit resolution and two range settings: 4mV, 400mV)
Input Offset voltage	:	< 1 µV (with auto zero)
Input Resistance	:	200 MΩ
Battery Power	:	> 10 h of operation (with two 9 V battery)
Dimension	:	60 x 60 x 68 mm
Manufacture	:	Schimid & Partner Engineering AG

Software

Item	:	Dosimetric Assesment System DASY4
Type No.	:	SD 000 401A, SD 000 402A
Software version No.	:	4.5
Manufacture / Origin	:	Schimid & Partner Engineering AG

E-Field Probe

Model	:	EX3DV3
Serial No.	:	3507
Construction	:	Symmetrical design with triangular core
Frequency	:	10 MHz to 6 GHz
Linearity	:	+/-0.2 dB (30 MHz to 3 GHz)
Manufacture	:	Schimid & Partner Engineering AG

Phantom

Type	:	SAM Twin Phantom V4.0
Shell Material	:	Fiberglass
Thickness	:	2.0 +/-0.2 mm
Volume	:	Approx. 25 liters
Manufacture	:	Schimid & Partner Engineering AG

6. Simulated Tissues Composition of 5GHz

Ingredient	MIXTURE(%)	
	Head 5GHz	Muscle 5GHz
Water	64.0	78.0
Mineral Oil	18.0	11.0
Emulsifiers	15.0	9.0
Additives and salt	3.0	2.0

7. Validation Measurement

Simulated tissue liquid parameter

7-a Simulated Tissue Liquid Parameter confirmation

The dielectric parameters were checked prior to assessment using the HP85070D dielectric probe kit.
The dielectric parameters measurement are reported in each correspondent section.

7-b Head 5GHz

Type of liquid : **Head 5GHz**
Ambient temperature (deg.c.) : **24.8**
Relative Humidity (%) : **45(24-Oct),36(25-Oct)**
Liquid depth (cm) : **15.0**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency [MHz]	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
		Before	After					
24-Oct	5800	25.0	25.0	Relative Permittivity εr	35.3	35.6	0.8	+/-5
				Coductivity σ [mho/m]	5.27	5.51	4.6	+/-5
25-Oct	5800	25.0	25.0	Relative Permittivity εr	35.3	36.3	2.8	+/-5
				Coductivity σ [mho/m]	5.27	5.51	4.6	+/-5

7-c Muscle 5GHz

Type of liquid : **Muscle 5GHz**
Ambient temperature (deg.c.) : **24.8**
Relative Humidity (%) : **36(25-Oct)**
Liquid depth (cm) : **15.0**

DIELECTRIC PARAMETERS MEASUREMENT RESULTS								
Date	Frequency [MHz]	Liquid Temp [deg.c]		Parameters	Target Value	Measured	Deviation [%]	Limit [%]
		Before	After					
24-Oct	5800	25.0	25.0	Relative Permittivity εr	48.2	45.9	-4.8	+/-5
				Coductivity σ [mho/m]	6.00	6.3	5.0	+/-5

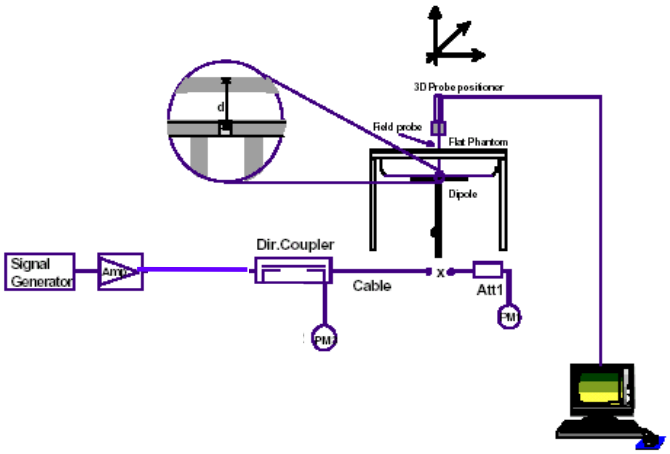
8. System validation data

The target values of 5GHz were not defied by IEEE 1528. So, the target values were made into the calibration values of SPEAG. And the validation results of 5800MHz checked (Evaluation of head) that it was within +/-10% as compared with the calibration values of SPEAG. The validation results are in the table below.

Type of liquid	:	**Muscle 5GHz**
Ambient temperature (deg.c.)	:	**24.8**
Relative Humidity (%)	:	**45(24-Oct),36(25-Oct)**
Dipole	:	**D5GHzV2 SN:1020**
Power	:	**250mW**

SYSTEM PERFORMANCE CHECK											
Liquid (Muscle 5100-5800 MHz)								System dipole validation target & measured			
		Liquid Temp [deg.c.]		Relative Permittivity εr		Conductivity σ [mho/m]		SAR 1g [W/kg]		Deviation [%]	Limit [%]
Date	Frequency	Before	After	Target	Measured	Target	Measured	Target	Measured		
24-Oct	5800	24.8	24.8	35.3	35.6	5.27	5.51	21.5	23.2	7.9	+/-10
25-Oct	5800	25.0	24.9	35.3	36.3	5.27	5.51	21.5	22.6	5.1	+/-10

Note: Please refer to Attachment for the result representation in plot forma



5100-5800MHz
Systemperformance check setup

Test system for the system performance check setup diagram

9. Validation uncertainty

The uncertainty budget has been determined for the DASY4 measurement system according to the SPEAG documents[6][7] and is given in the following Table.

Error Description	Uncertainty value ± %	Probability distribution	divisor	(ci) 1g	Standard Uncertainty (1g)	vi or veff
Measurement System						
Probe calibration	±6.8	Normal	1	1	±6.8	∞
Axial isotropy of the probe	±4.7	Rectangular	√3	1	±2.7	∞
Spherical isotropy of the probe	±0	Rectangular	√3	1	0	∞
Boundary effects	2.0	Rectangular	√3	1	±1.2	∞
Probe linearity	±4.7	Rectangular	√3	1	±2.7	∞
Detection limit	±1.0	Rectangular	√3	1	±0.6	∞
Readout electronics	±0.3	Normal	1	1	±0.3	∞
Response time	0	Rectangular	√3	1	0	∞
Integration time	0	Rectangular	√3	1	0	∞
RF ambient conditions	±3.0	Rectangular	√3	1	±1.7	∞
Mech. constraints of robot	±0.8	Rectangular	√3	1	±0.5	∞
Probe positioning	±5.7	Rectangular	1	1	±5.7	∞
Extrap. and integration	±4.0	Rectangular	√3	1	±2.3	∞
Dipole						
Dipole Axis to Liquid Distance	±2.0	Rectangular	√3	1	±1.2	∞
Input power and SAR drift meas.	±4.7	Rectangular	√3	1	±2.7	∞
Phantom and Setup						
Phantom uncertainty	±4.0	Rectangular	√3	1	±2.3	∞
Liquid conductivity (target)	±5.0	Rectangular	√3	0.64	±1.8	∞
Liquid conductivity (meas.)	±5.0	Rectangular	1	0.64	±3.2	∞
Liquid permittivity (target)	±5.0	Rectangular	√3	0.6	±1.7	∞
Liquid permittivity (meas.)	±5.0	Rectangular	1	0.6	±3.0	∞
Combined Standard Uncertainty					**±11.959**	
Expanded Uncertainty (k=2)					**±23.9**	

10. Validation Measurement data

5800MHz System Validation / Dipole 5GHz / Forward Conducted Power : 250mW

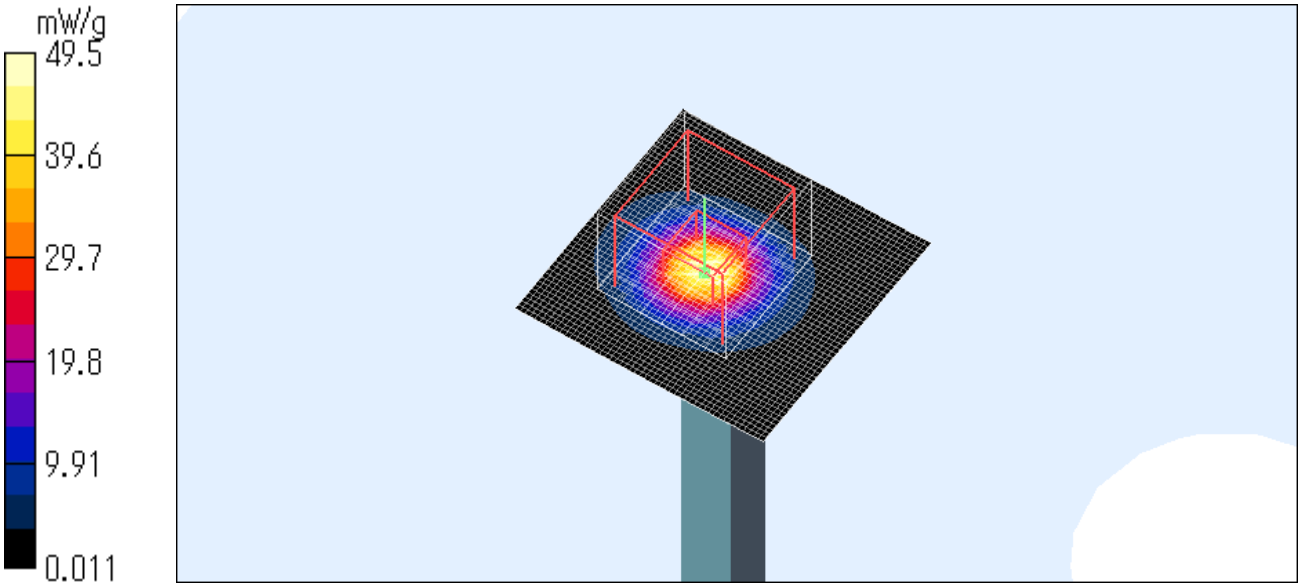
Dipole 5800 MHz; Type: D5GHzV2; Serial: 1020
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 5.51 mho/m; ε_r = 35.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.67, 4.67, 4.67); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (51x51x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 55.3 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 96.4 V/m; Power Drift = -0.070 dB
Peak SAR (extrapolated) = 95.1 W/kg
SAR(1 g) = 23.2 mW/g; SAR(10 g) = 6.55 mW/g
Maximum value of SAR (measured) = 49.5 mW/g

Test Date = 10/24/05
Ambient Temperature = 24.8 degree.C.
Liquid Temperature = Before 24.8 degree.C. , After 24.8 degree.C.



5800MHz System Validation / Dipole 5GHz / Forward Conducted Power : 250mW

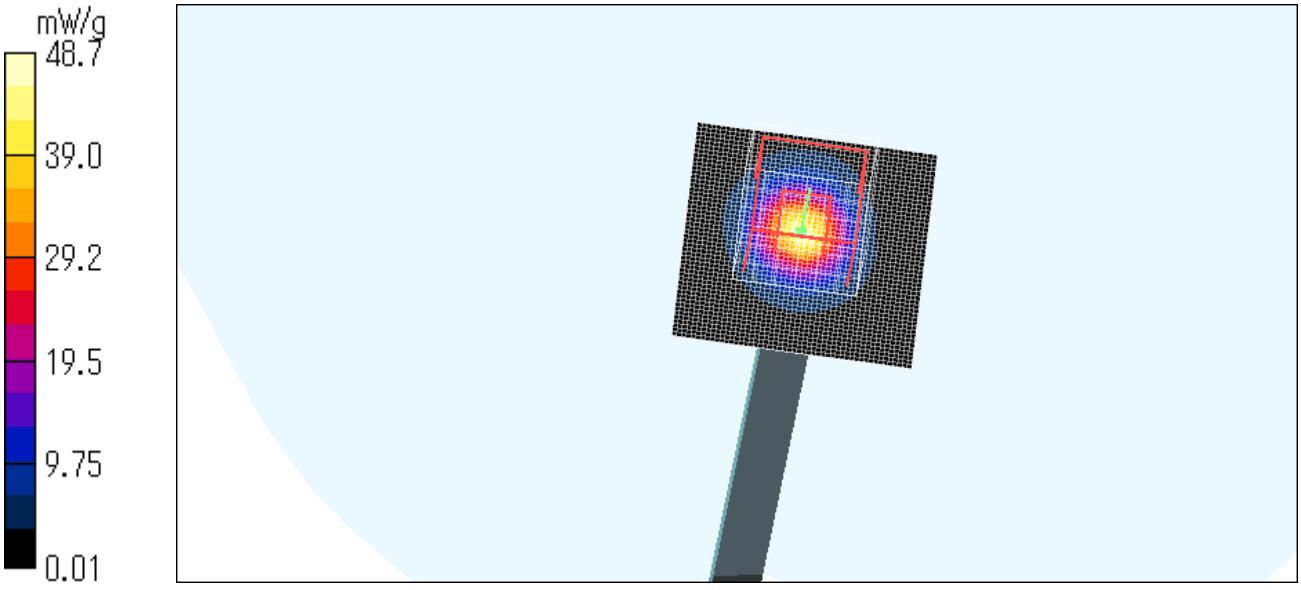
Dipole 5800 MHz; Type: D5GHzV2; Serial: 1020
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5800 MHz; σ = 5.51 mho/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.67, 4.67, 4.67); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (51x51x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 52.7 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 93.2 V/m; Power Drift = 0.085 dB
Peak SAR (extrapolated) = 92.3 W/kg
SAR(1 g) = 22.6 mW/g; SAR(10 g) = 6.46 mW/g
Maximum value of SAR (measured) = 48.7 mW/g

Test Date = 10/25/05
Ambient Temperature = 24.8 degree.C.
Liquid Temperature = Before 25.0 degree.C. , After 24.9 degree.C.



11. System Validation Dipole (D5GHzV2,S/N: 1020)

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

Client UL A-Pex (MTT)

CALIBRATION CERTIFICATE

Object(s)	D5GHzV2 - SN:1020
Calibration procedure(s)	QA CAL-05 v2 Calibration procedure for dipole validation kits
Calibration date:	February 23, 2004
Condition of the calibrated item	In Tolerance (according to the specific calibration document)

This calibration statement documents traceability of M&TE used in the calibration procedures and conformity of the procedures with the ISO/IEC 17025 international standard.

All calibrations have been conducted in the closed laboratory facility: environment temperature 22 +/- 2 degrees Celsius and humidity < 75%.

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E4419B	GB41293874	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor E4412A	MY41495277	2-Apr-03 (METAS, No 252-0250)	Apr-04
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
RF generator R&S SMT06	100058	23-May-01 (SPEAG, in house check May-03)	In house check: May-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Laboratory Director	
Approved by:	Fin Bomholt	R&D Director	

Date issued: February 26, 2004

This calibration certificate is issued as an intermediate solution until the accreditation process (based on ISO/IEC 17025 International Standard) for Calibration Laboratory of Schmid & Partner Engineering AG is completed.

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Schmid & Partner Engineering AG

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info@speag.com, http://www.speag.com

DASY

Dipole Validation Kit

Type: D5GHzV2

Serial: 1020

Manufactured: February 5, 2004
Calibrated: February 23, 2004

1. Measurement Conditions

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

Frequency:	**5200 MHz**	
Relative Dielectricity	**36.3**	± 5%
Conductivity	**4.57 mho/m**	± 5%
Frequency:	**5800 MHz**	
Relative Dielectricity	**35.4**	± 5%
Conductivity	**5.20 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe EX3DV3 - SN:3503 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. Lossless spacer was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 10mm was aligned with the dipole. Special 8x8x8 fine cube was chosen for cube integration (dx=dy=4.3mm, dz=3mm). Distance between probe sensors and phantom surface was set to 2.5 mm. The dipole input power (forward power) was 250 mW ± 3 %. The results are normalized to 1W input power.

2. SAR Measurement with DASY System

Standard SAR-measurements were performed according to the measurement conditions described in section 1. The results (see figures supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured at **5200 MHz (Head Tissue)** with the dosimetric probe EX3DV3 SN:3503 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **87.6 mW/g** ± 20.3 % (k=2)[1]

averaged over 10 cm^3 (10 g) of tissue: **24.5 mW/g** ± 19.8 % (k=2)[1]

The resulting averaged SAR-values measured **at 5800 MHz (Head Tissue)** with the dosimetric probe EX3DV3 SN:3503 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **86.8 mW/g** ± 20.3 % (k=2)[2]

averaged over 10 cm^3 (10 g) of tissue: **24.2 mW/g** ± 19.8 % (k=2)[2]

[1] Target dipole values determined by FDTD (feedpoint impedance set to 50 Ohm). The values are SAR_1g=76.5 mW/g, SAR_10g=21.6 mW/g and SAR_peak=310.3 mW/g.

[2] Target dipole values determined by FDTD (feedpoint impedance set to 50 Ohm). The values are SAR_1g=78.0 mW/g, SAR_10g=21.9 mW/g and SAR_peak=340.9 mW/g.

3. Dipole Transformation Parameters

The impedance was measured at the SMA-connector with a network analyzer and numerically transformed to the dipole feedpoint (please refer to the graphics attached to this document). The transformation parameters from the SMA-connector to the dipole feedpoint are:

Electrical delay:	**1. 200 ns**	(one direction)
Transmission factor:	**0.974**	(voltage transmission, one direction)

4. Measurement Conditions

The measurements were performed in the flat section of the SAM twin phantom filled with **body simulating solution** of the following electrical parameters:

Frequency:	**5200 MHz**	
Relative Dielectricity	**49.7**	± 5%
Conductivity	**5.18 mho/m**	± 5%
Frequency:	**5800 MHz**	
Relative Dielectricity	**48.5**	± 5%
Conductivity	**6.01 mho/m**	± 5%

The DASY3 System with a dosimetric E-field probe EX3DV3 - SN:3503 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. Lossless spacer was used during measurements for accurate distance positioning.

The coarse grid with a grid spacing of 10mm was aligned with the dipole. The 8x8x8 fine cube was chosen for cube integration (dx=dy=4.3mm, dz=3mm). Distance between probe sensors and phantom surface was set to 2.5 mm. The dipole input power (forward power) was 250 mW ± 3 %. The results are normalized to 1W input power.

5. SAR Measurement with DASY System

Standard SAR-measurements were performed according to the measurement conditions described in section 4. The results (see figures supplied) have been normalized to a dipole input power of 1W (forward power). The resulting averaged SAR-values measured at **5200 MHz (Body Tissue)** with the dosimetric probe EX3DV3 SN:3503 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **82.0 mW/g** ± 20.3 % (k=2)[3]

averaged over 10 cm^3 (10 g) of tissue: **23.0 mW/g** ± 19.8 % (k=2)[3]

The resulting averaged SAR-values measured **at 5800 MHz (Body Tissue)** with the dosimetric probe EX3DV3 SN:3503 and applying the advanced extrapolation are:

averaged over 1 cm^3 (1 g) of tissue: **78.4 mW/g** ± 20.3 % (k=2)[4]

averaged over 10 cm^3 (10 g) of tissue: **21.5 mW/g** ± 19.8 % (k=2)[4]

6. 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.

7. 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.

Small end caps have been added to the dipole arms in order to increase frequency bandwidth at the position as explained in Sections 1and 4.

8. Power Test

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

[3] Target dipole values determined by FDTD (feedpoint impedance set to 50 Ohm). The values are SAR_1g=71.8 mW/g, SAR_10g=20.1 mW/g and SAR_peak=284.7 mW/g.

[4] Target dipole values determined by FDTD (feedpoint impedance set to 50 Ohm). The values are SAR_1g=74.1 mW/g, SAR_10g=20.5 mW/g and SAR_peak=324.7 mW/g.

Date/Time: 02/20/04 17:12:14

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Serial: D5GHzV2 - SN:1020

Communication System: CW-5GHz;Duty Cycle: 1:1;Medium: HSL5800
Medium parameters used: f = 5200 MHz; σ = 4.57 mho/m; ε_r = 36.3; ρ = 1000 kg/m^3
Medium parameters used: f = 5800 MHz; σ = 5.2 mho/m; ε_r = 35.4; ρ = 1000 kg/m^3

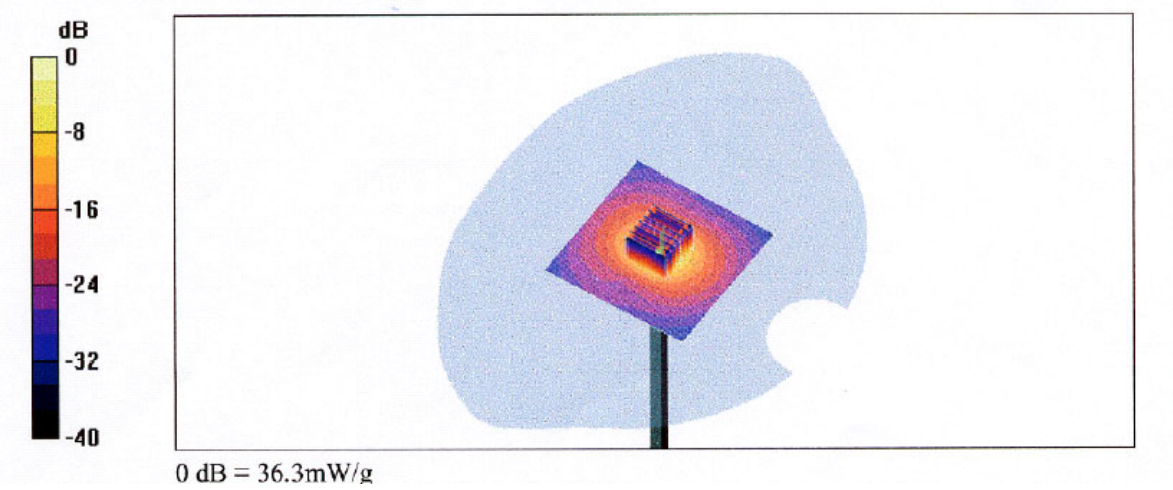
DASY4 Configuration:

- Probe: EX3DV3 - SN3503; ConvF(5.7, 5.7, 5.7)
  ConvF(5, 5, 5); Calibrated: 6/27/2003
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 600; Calibrated: 9/30/2003
- Phantom: SAM with CRP - TP:1312; Phantom section: Flat Section
- Measurement SW: DASY4, V4.2 Build 30; Postprocessing SW: SEMCAD, V1.8 Build 98

d=10mm, Pin=250mW, f=5200 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 97.3 V/m
Power Drift = 0.0 dB
Maximum value of SAR = 40.4 mW/g

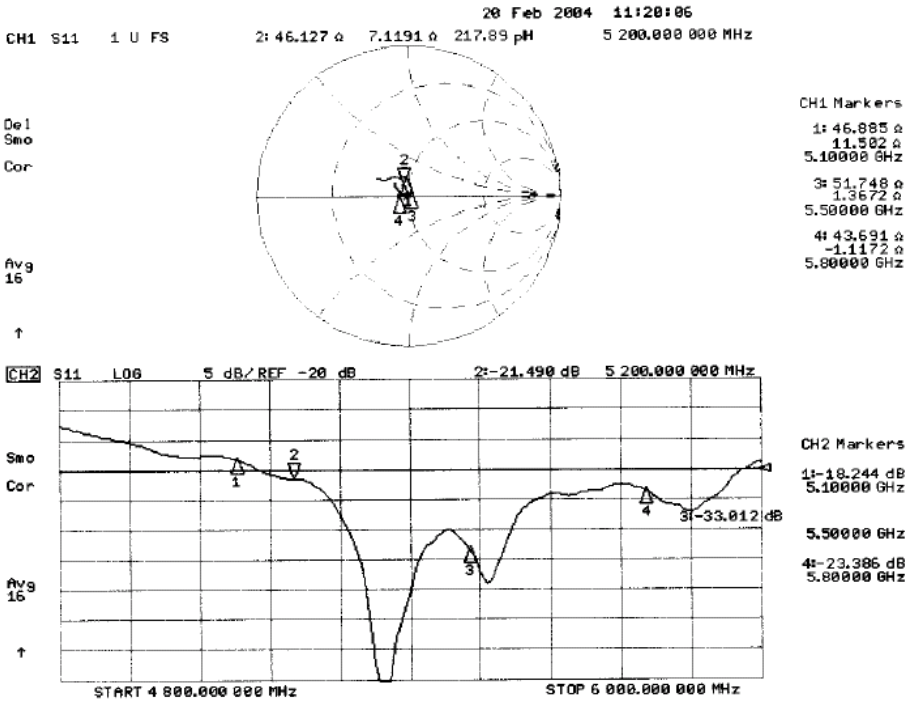
d=10mm, Pin=250mW, f=5800 MHz 2/Zoom Scan (8x8x8), dist=2.5mm (7x7x8)/Cube 0:
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Peak SAR (extrapolated) = 89.6 W/kg
SAR(1 g) = 21.5 mW/g; SAR(10 g) = 6.05 mW/g

d=10mm, Pin=250mW, f=5200 MHz/Zoom Scan (8x8x8), dist=2.5mm (7x7x8)/Cube 0:
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Peak SAR (extrapolated) = 85 W/kg
SAR(1 g) = 21.9 mW/g; SAR(10 g) = 6.12 mW/g



0 dB = 36.3mW/g

Head


20 Feb 2004 11:20:06
CH1 S11 1 U FS
2: 46.127 Ω 7.1191 Ω 217.89 pH
5 200.000 000 MHz
Del
Smo
Cor
Avg
16
CH1 Markers
1: 46.885 Ω
11.502 Ω
5.10000 GHz
3: 51.748 Ω
1.3672 Ω
5.50000 GHz
4: 43.691 Ω
-1.1172 Ω
5.80000 GHz
CH2 S11 LOG 5 dB/ REF -20 dB
2:-21.490 dB 5 200.000 000 MHz
Smo
Cor
Avg
16
CH2 Markers
1:-18.244 dB
5.10000 GHz
3:-33.012 dB
5.50000 GHz
4:-23.386 dB
5.80000 GHz
START 4 800.000 000 MHz
STOP 6 000.000 000 MHz

Date/Time: 02/23/04 19:20:57

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Serial: D5GHzV2 - SN:1020

Communication System: CW-5GHz;Duty Cycle: 1:1;Medium: MSL5800
Medium parameters used: f = 5200 MHz; σ = 5.18 mho/m; ε_r = 49.7; ρ = 1000 kg/m^3
Medium parameters used: f = 5800 MHz; σ = 6.01 mho/m; ε_r = 48.5; ρ = 1000 kg/m^3

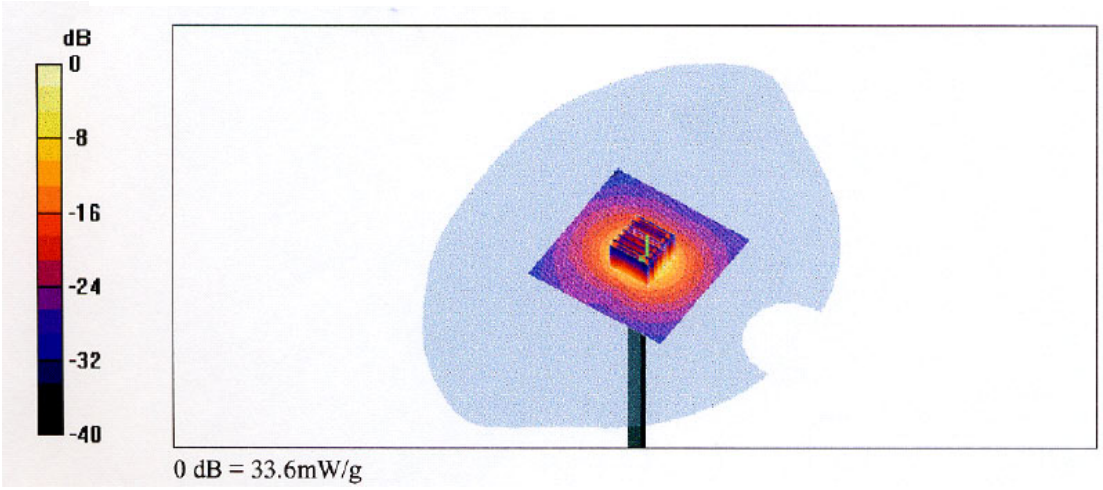
DASY4 Configuration:

- Probe: EX3DV3 - SN3503; ConvF(5, 5, 5)
  ConvF(4.6, 4.6, 4.6); Calibrated: 6/27/2003
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE4 600; Calibrated: 9/30/2003
- Phantom: SAM with CRP - TP:1312; Phantom section: Flat Section
- Measurement SW: DASY4, V4.2 Build 34; Postprocessing SW: SEMCAD, V1.8 Build 105

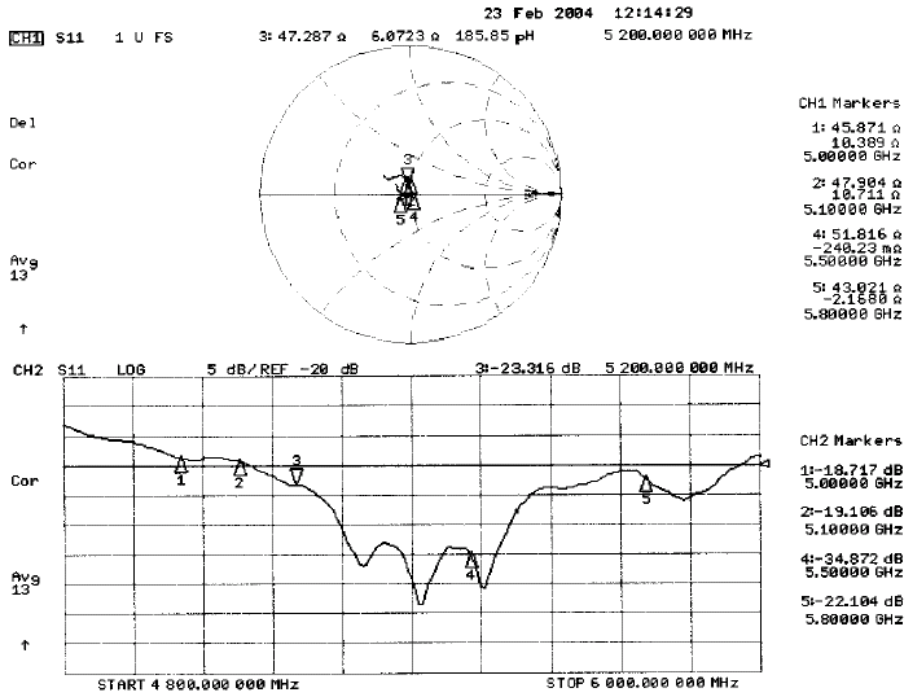
d=10mm, Pin=250mW, f=5200 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Reference Value = 80.3 V/m; Power Drift = 0.0 dB
Maximum value of SAR (interpolated) = 37.5 mW/g

d=10mm, Pin=250mW, f=5800 MHz/Zoom Scan (8x8x8), dist=2.5mm (7x7x8)/Cube 0:
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Peak SAR (extrapolated) = 80.6 W/kg
SAR(1 g) = 19.6 mW/g; SAR(10 g) = 5.38 mW/g

d=10mm, Pin=250mW, f=5200 MHz/Zoom Scan (8x8x8), dist=2.5mm (7x7x8)/Cube 0:
Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Peak SAR (extrapolated) = 71.6 W/kg
SAR(1 g) = 20.5 mW/g; SAR(10 g) = 5.74 mW/g



Body


23 Feb 2004 12:14:29
CH1 S11 1 U FS
3: 47.287 Ω 6.0723 Ω 185.85 pH
5 200.000 000 MHz
Del
Cor
Avg 13
CH1 Markers
1: 45.871 Ω
10.389 Ω
5.00000 GHz
2: 47.904 Ω
10.711 Ω
5.10000 GHz
4: 51.816 Ω
-240.23 mΩ
5.50000 GHz
5: 43.021 Ω
-2.1680 Ω
5.80000 GHz
CH2 S11 LOG 5 dB/REF -20 dB
3: -23.316 dB 5 200.000 000 MHz
Cor
Avg 13
CH2 Markers
1: -18.717 dB
5.00000 GHz
2: -19.106 dB
5.10000 GHz
4: -34.872 dB
5.50000 GHz
5: -22.104 dB
5.80000 GHz
START 4 800.000 000 MHz
STOP 6 000.000 000 MHz

12. Dosimetric E-Field Probe Calibration (EX3DV3,S/N: 3507)

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
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 UL-Apex (MTT) **Certificate No: EX3-3507_Apr05**

CALIBRATION CERTIFICATE

Object EX3DV3 - SN:3507

Calibration procedure(s) QA CAL-01.v5 and QA CAL-14.v2
Calibration procedure for dosimetric E-field probes

Calibration date: April 12, 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	5-May-04 (METAS, No. 251-00388)	May-05
Power sensor E4412A	MY41495277	5-May-04 (METAS, No. 251-00388)	May-05
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-04 (METAS, No. 251-00403)	Aug-05
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-04 (METAS, No. 251-00389)	May-05
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-04 (METAS, No. 251-00404)	Aug-05
Reference Probe ES3DV2	SN: 3013	7-Jan-05 (SPEAG, No. ES3-3013_Jan05)	Jan-06
DAE4	SN: 617	19-Jan-05 (SPEAG, No. DAE4-617_Jan05)	Jan-06

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092180	18-Sep-02 (SPEAG, in house check Oct-03)	In house check: Oct 05
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 Vollard	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 12, 2005

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

Certificate No: EX3-3507_Apr05 Page 1 of 10

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
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

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 EX3DV3

SN:3507

Manufactured: December 15, 2003
Last calibrated: February 20, 2004
Recalibrated: April 12, 2005

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

UL Apex Co., Ltd.
Head Office EMC Lab.
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Facsimile: +81 596 24 8124

EX3DV3 SN:3507 **April 12, 2005**

DASY - Parameters of Probe: EX3DV3 SN:3507

Sensitivity in Free Space[A] Diode Compression[B]

NormX	**0.71** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**96** mV
NormY	**0.74** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**96** mV
NormZ	**0.73** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**96** 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		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	3.4	1.2
SAR_{be} [%]	With Correction Algorithm	0.2	0.4

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

Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	3.3	1.8
SAR_{be} [%]	With Correction Algorithm	0.6	0.7

Sensor Offset

Probe Tip to Sensor Center	**1.0** 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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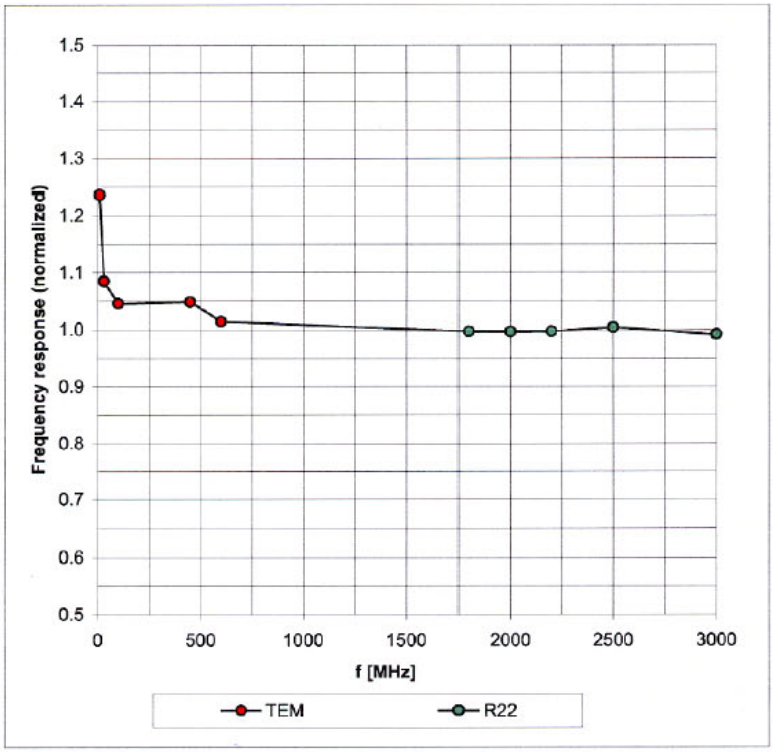
EX3DV3 SN:3507 **April 12, 2005**

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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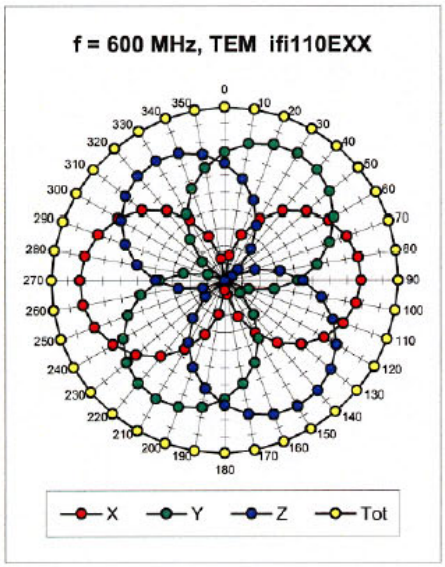
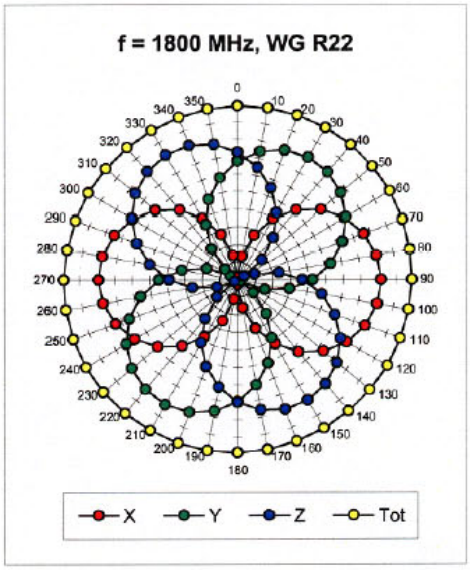
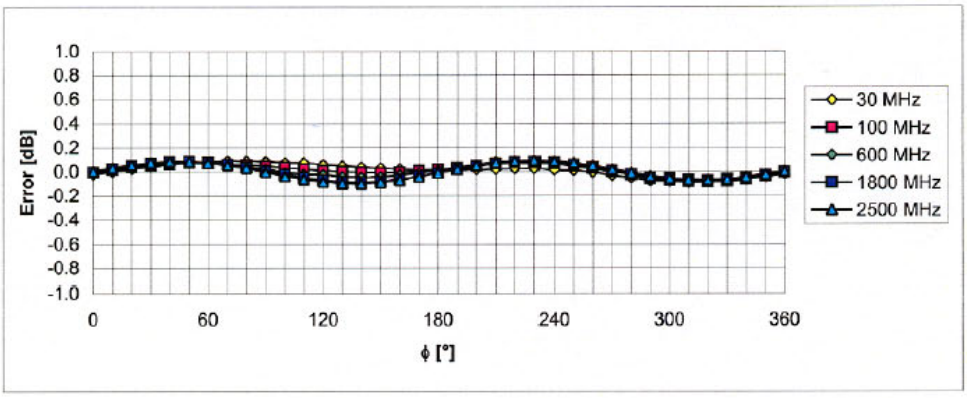
EX3DV3 SN:3507 April 12, 2005

Receiving Pattern (ϕ), ϑ = 0°







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

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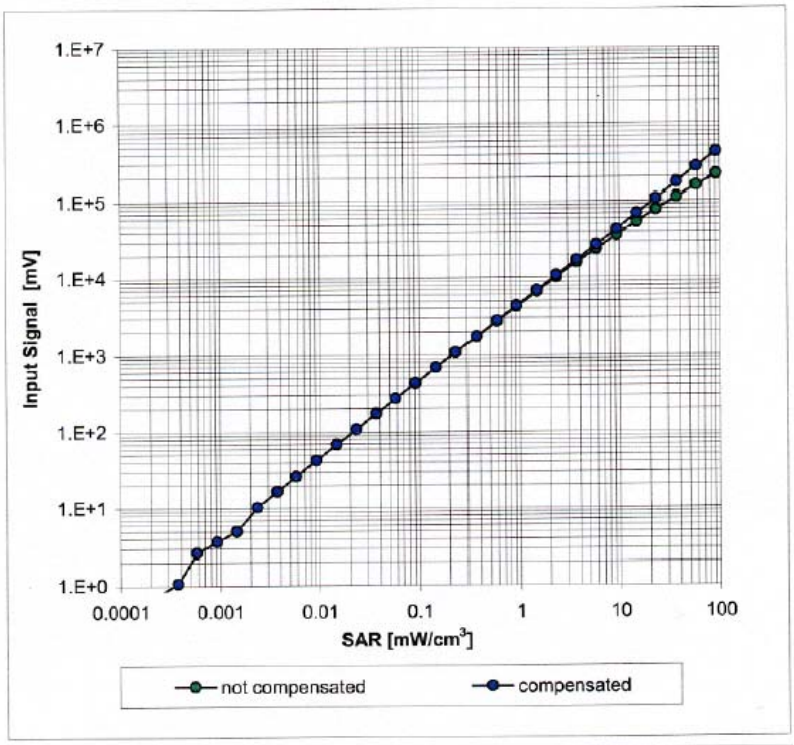
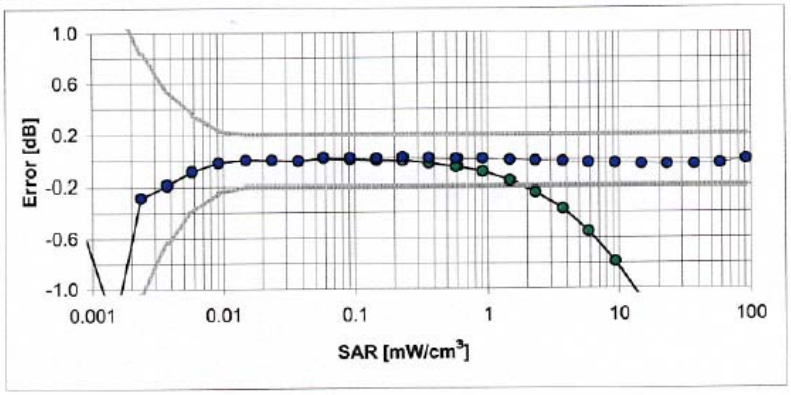
EX3DV3 SN:3507 April 12, 2005

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)





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

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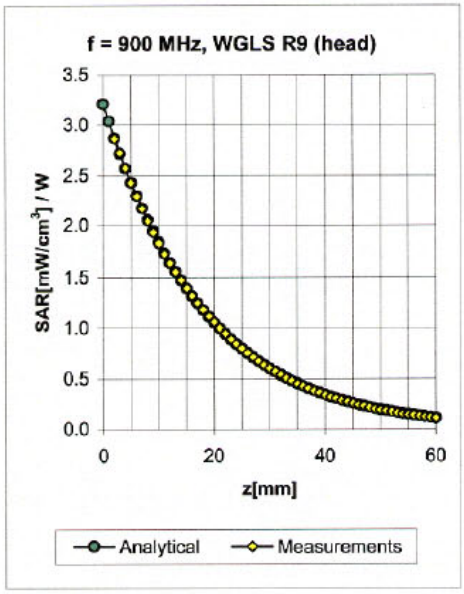
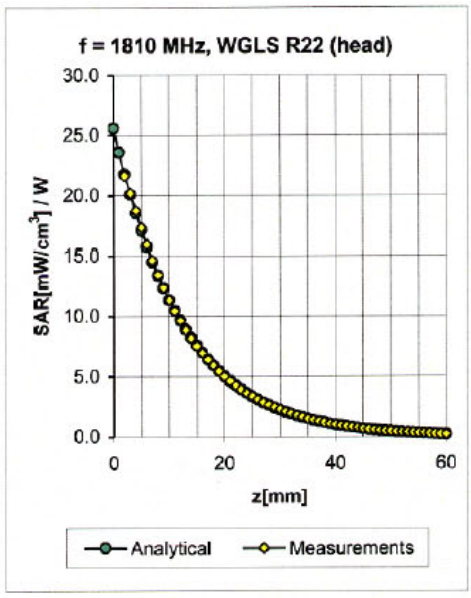
EX3DV3 SN:3507 April 12, 2005

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%	0.74	0.66	10.48 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.51	0.77	9.10 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.46	0.81	8.25 ± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.79	0.62	10.42 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.30	1.78	8.70 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.33	1.59	7.72 ± 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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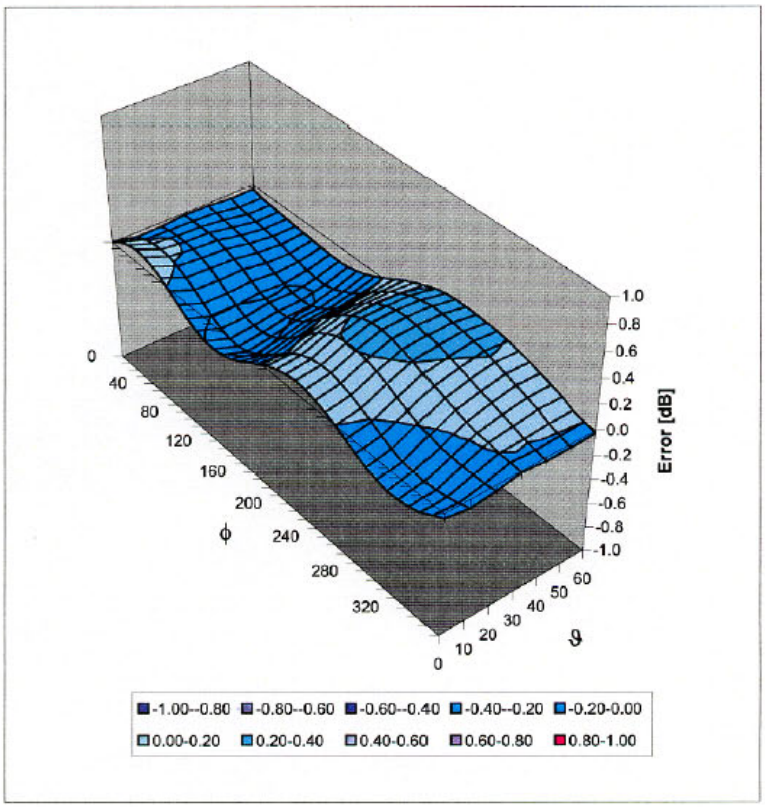
EX3DV3 SN:3507 April 12, 2005

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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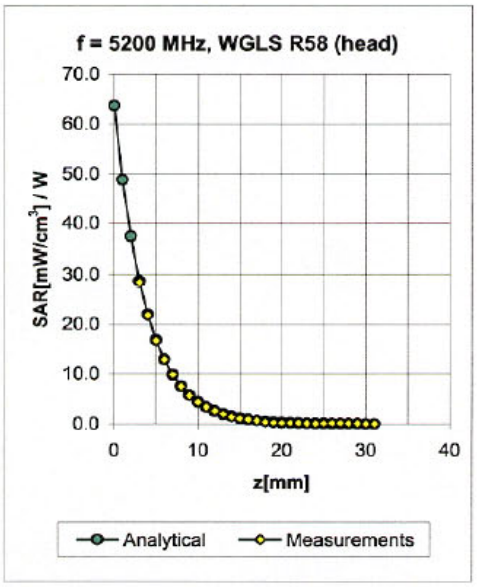
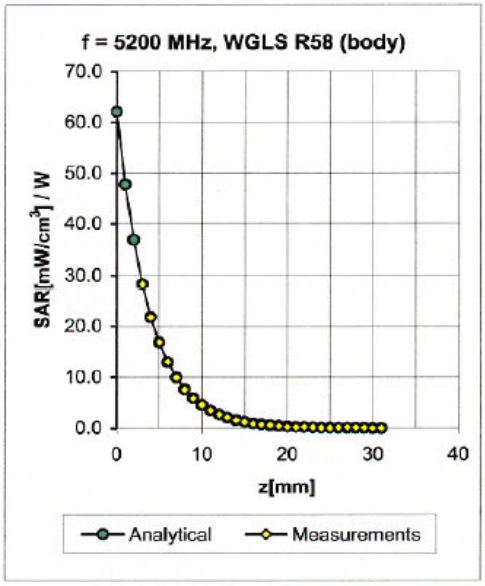
EX3DV3 SN:3507 **April 12, 2005**

Appendix[D]





f [MHz][D]	Validity [MHz]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
5200	± 50	Head	36.0 ± 5%	4.76 ± 5%	0.41	1.80	5.37 ± 13.6% (k=2)
5800	± 50	Head	35.3 ± 5%	5.27 ± 5%	0.45	1.80	4.67 ± 13.6% (k=2)
5200	± 50	Body	49.0 ± 5%	5.30 ± 5%	0.45	1.90	4.86 ± 13.6% (k=2)
5800	± 50	Body	48.2 ± 5%	6.00 ± 5%	0.45	1.90	4.32 ± 13.6% (k=2)

[D] Accreditation for ConvF assessment above 3000 MHz is currently applied for. Accreditation is expected in spring 2005.

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13. References

[1]ANSI, ANSI/IEEE C95.1-1992: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz, The Institute of Electrical and Electronics Engineers, Inc., New York, NY 10017, 1992.
[2] Katja Pokovic, Thomas Schmid, and Niels Kuster, "Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies", in ICECOM '97, Dubrovnik, October 15-17, 1997, pp. 120-124.
[3] Katja Pokovic, Thomas Schmid, and Niels Kuster, "E-_field probe with improved isotropy in brain simulating liquids", in Proceedings of the ELMAR, Zadar, Croatia, 23-25 June, 1996, pp.172-175.
[4] W. Gander, Computermathematik, Birkhaeuser, Basel, 1992.
[5] W. H. Press, S. A. Teukolsky,W. T. Vetterling, and B. P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second Edition, Cambridge University Press, 1992.
[6]SPEAG uncertainty document for DASY 4 System from SPEAG (Shimid & Partner Engineering AG).
[7]SPEAG uncertainty document for "the 5-6GHz Extension" from SPEAG (Shimid & Partner Engineering AG).

APPENDIX 3 : SAR Measurement data

1. Evaluation procedure

The evaluation was performed with the following procedure:

Step 1: Measurement of the E-field at a fixed location above the ear point or central position of flat phantom was used as a reference value for assessing the power drop.

Step 2: The SAR distribution at the exposed side of head or body position was measured at a distance of each device from the inner surface of the shell. The area covered the entire dimension of the antenna of EUT and the horizontal grid spacing was 10 mm x 10 mm . Based on these data, the area of the maximum absorption was determined by spline interpolation.

Step 3: Around this point found in the Step 2 (area scan) , a volume of 25.8mm x 25.8mm x 21mm was assessed by measuring 7 x 7 x 8 points. And for any secondary peaks found in the Step2 which are within 2dB of maximum peak and not with this Step3 (Zoom scan) is repeated. On the basis of this data set, the spatial peak SAR value was evaluated under the following procedure:

(1). The data at the surface were extrapolated, since the center of the dipoles is 1mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.3 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.

(2). The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed by 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.

(3). All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement of the E-field at the same location as in Step 1.

2. Measurement data

KX-TGA560 / Left Head /Cheek / 44ch(5798.05084MHz)

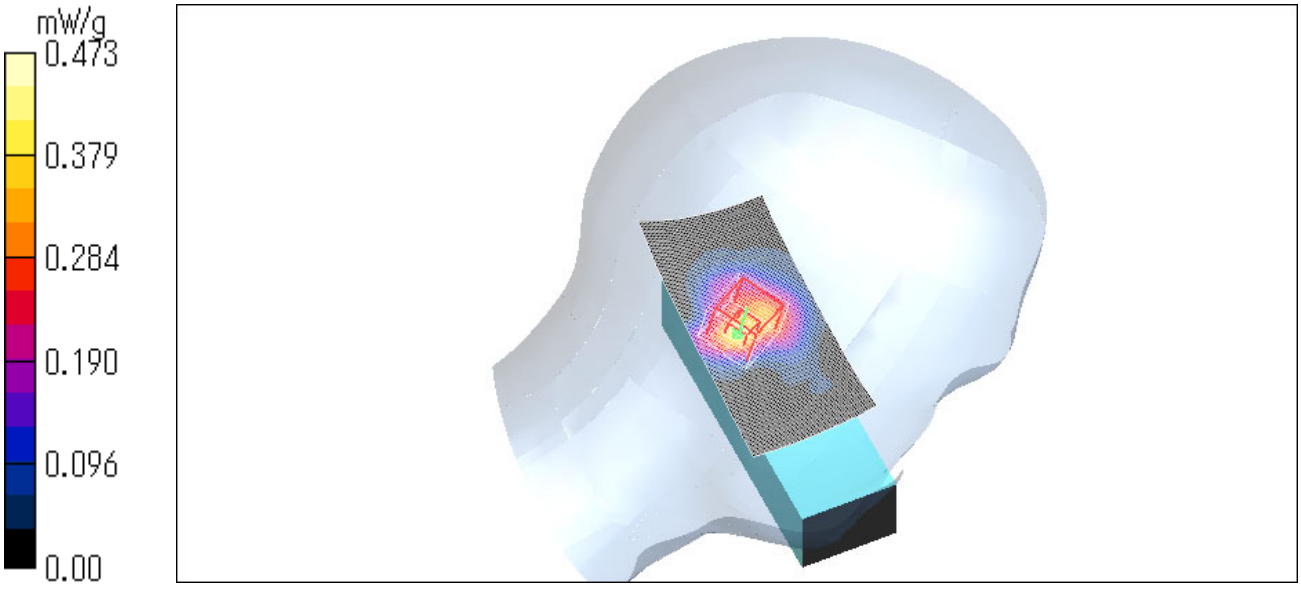
Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 5.51 mho/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.67, 4.67, 4.67); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.443 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 5.89 V/m; Power Drift = -0.218 dB
Peak SAR (extrapolated) = 0.864 W/kg
SAR(1 g) = 0.235 mW/g; SAR(10 g) = 0.085 mW/g
Maximum value of SAR (measured) = 0.473 mW/g

Test Date = 10/25/05
Ambient Temperature = 24.8degree.C.
Liquid Temperature = Before 24.8 degree.C. , After 24.8 degree.C.



KX-TGA560 / Left Head /Tilt / 44ch(5798.05084MHz)

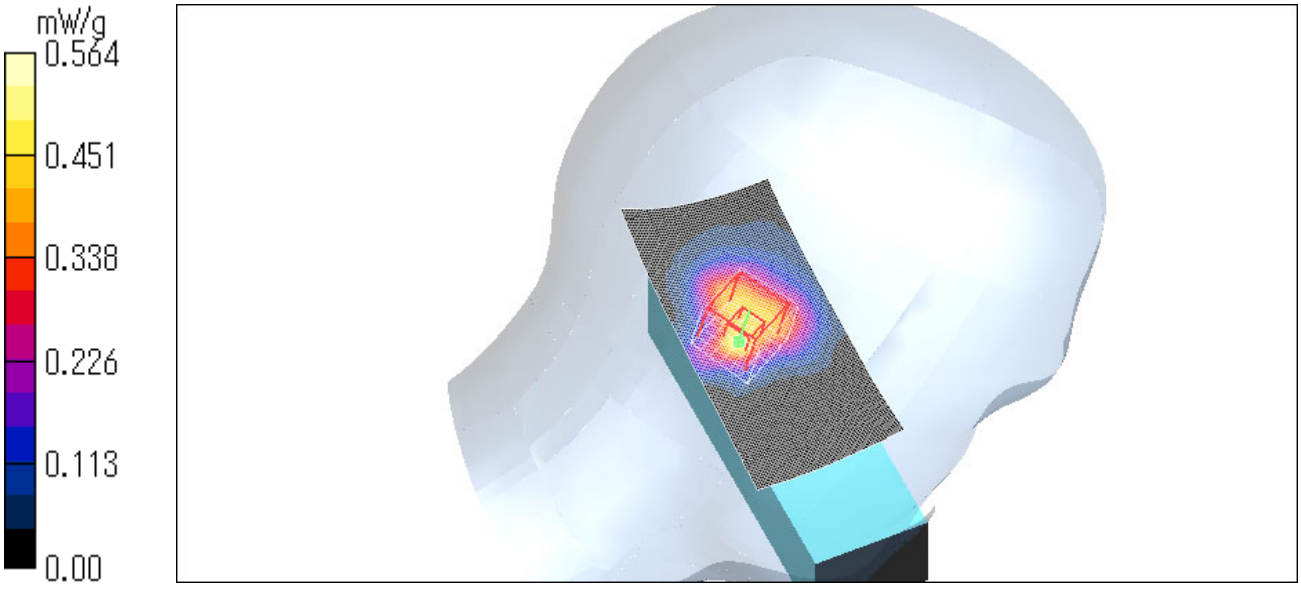
Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 5.51 mho/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Left Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.67, 4.67, 4.67); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.533 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 6.00 V/m; Power Drift = -0.163 dB
Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.279 mW/g; SAR(10 g) = 0.106 mW/g
Maximum value of SAR (measured) = 0.564 mW/g

Test Date = 10/25/05
Ambient Temperature = 24.8degree.C.
Liquid Temperature = Before 24.8 degree.C. , After 24.8 degree.C.



KX-TGA560 / Right Head / Cheek / 44ch(5798.05084MHz)

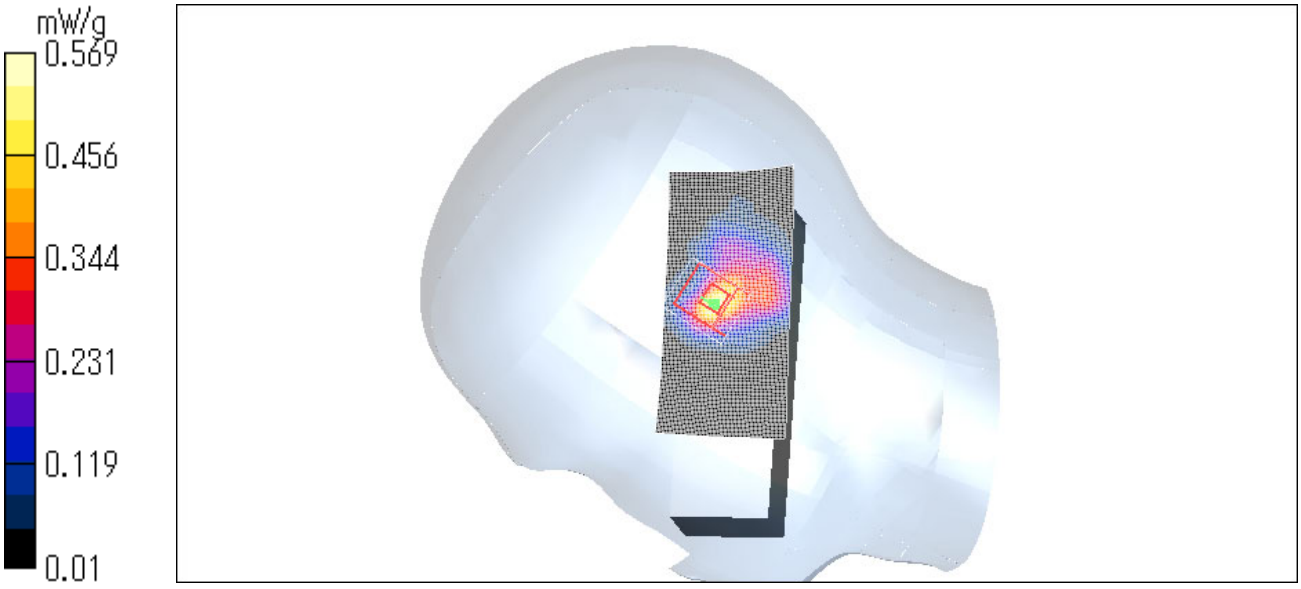
Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 5.51 mho/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.67, 4.67, 4.67); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.566 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 6.91 V/m; Power Drift = 0.120 dB
Peak SAR (extrapolated) = 2.28 W/kg
SAR(1 g) = 0.301 mW/g; SAR(10 g) = 0.111 mW/g
Maximum value of SAR (measured) = 0.569 mW/g

Test Date = 10/25/05
Ambient Temperature = 24.8degree.C.
Liquid Temperature = Before 24.5 degree.C. , After 24.5 degree.C.



KX-TGA560 / Right Head / Tilt / 44ch(5798.05084MHz)

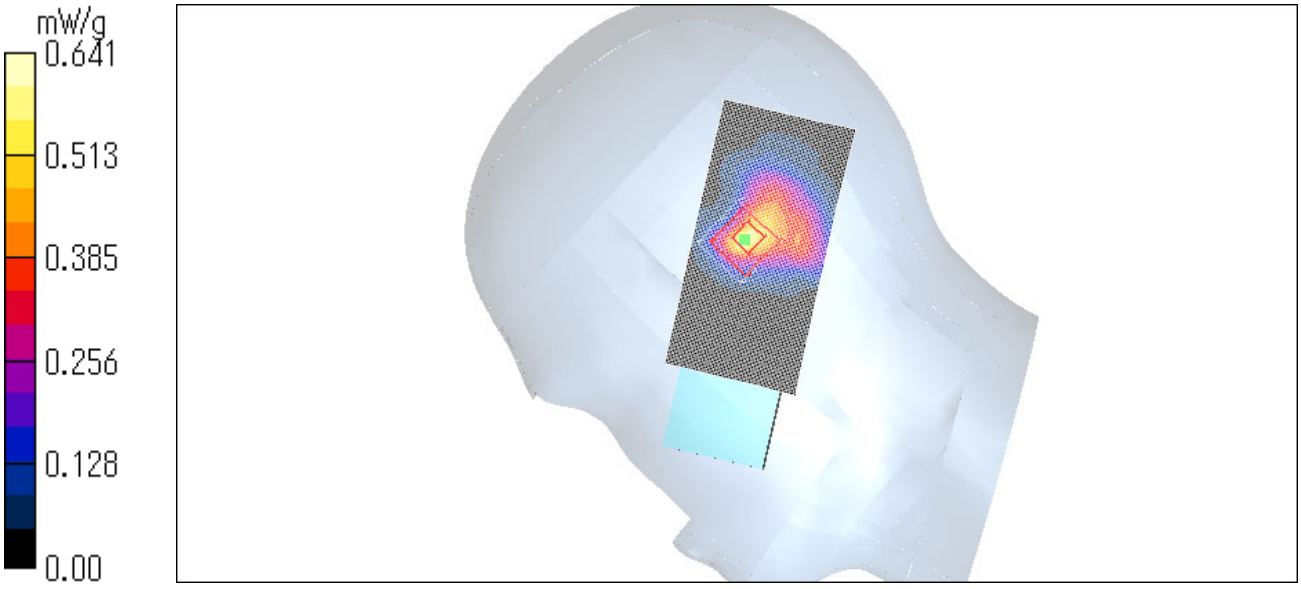
Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 5.51 mho/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.67, 4.67, 4.67); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.625 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 6.98 V/m; Power Drift = -0.131 dB
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.332 mW/g; SAR(10 g) = 0.123 mW/g
Maximum value of SAR (measured) = 0.641 mW/g

Test Date = 10/25/05
Ambient Temperature = 24.8degree.C.
Liquid Temperature = Before 24.8 degree.C. , After 24.8 degree.C.



KX-TGA560 / Right Head / Tilt / 1ch(5759.70240MHz)

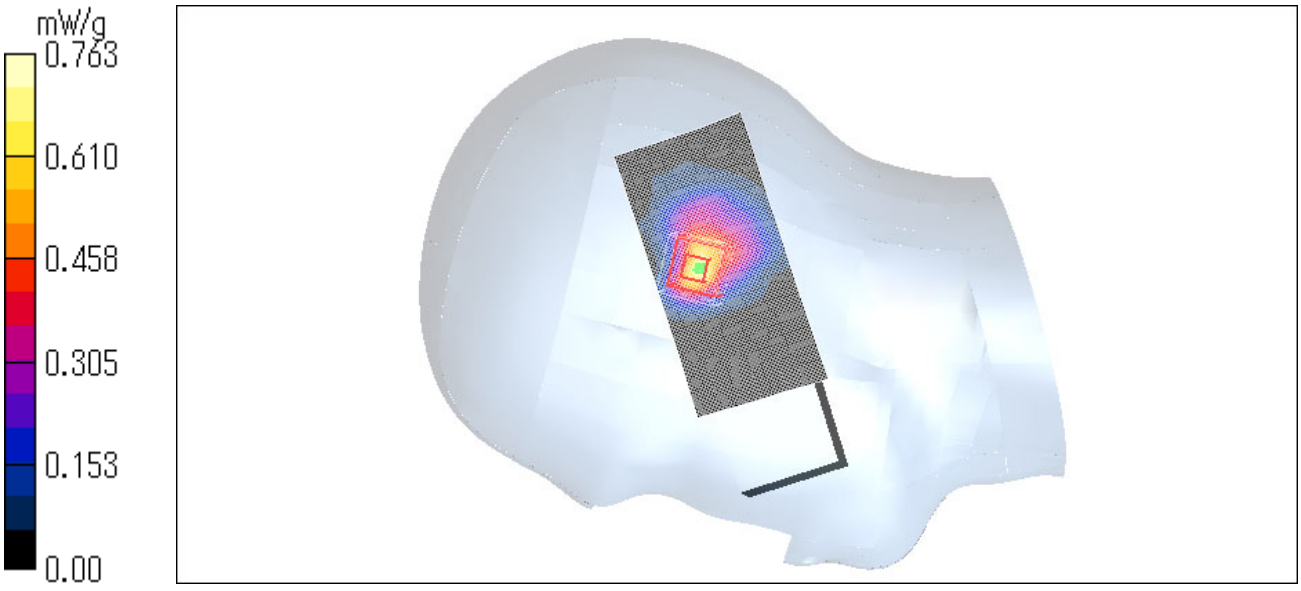
Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 5.51 mho/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.67, 4.67, 4.67); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.725 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 6.81 V/m; Power Drift = -0.098 dB
Peak SAR (extrapolated) = 1.40 W/kg
SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.151 mW/g
Maximum value of SAR (measured) = 0.763 mW/g

Test Date = 10/25/05
Ambient Temperature = 24.8degree.C.
Liquid Temperature = Before 24.8 degree.C. , After 24.9 degree.C.



KX-TGA560 / Right Head / Tilt / 89ch(5838.18697MHz)

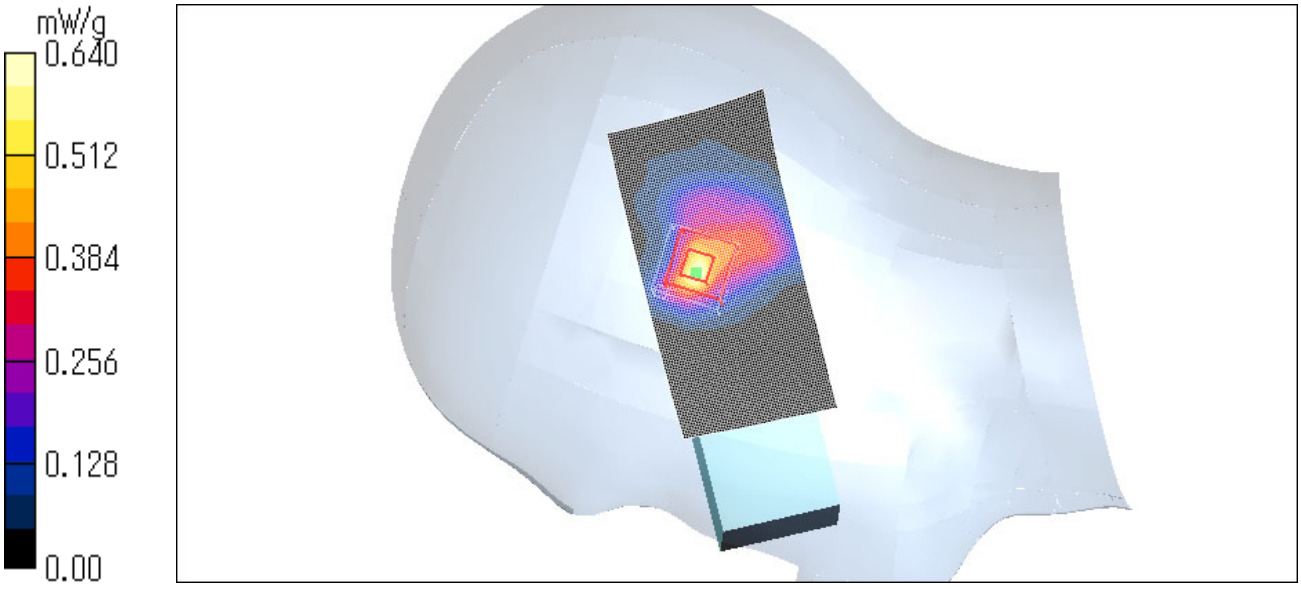
Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 5.51 mho/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Right Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.67, 4.67, 4.67); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.648 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 6.13 V/m; Power Drift = -0.200 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.320 mW/g; SAR(10 g) = 0.117 mW/g
Maximum value of SAR (measured) = 0.640 mW/g

Test Date = 10/25/05
Ambient Temperature = 24.8degree.C.
Liquid Temperature = Before 24.9 degree.C. , After 24.9 degree.C.



KX-TGA560 / Body / Back / 1ch(5759.70240MHz)

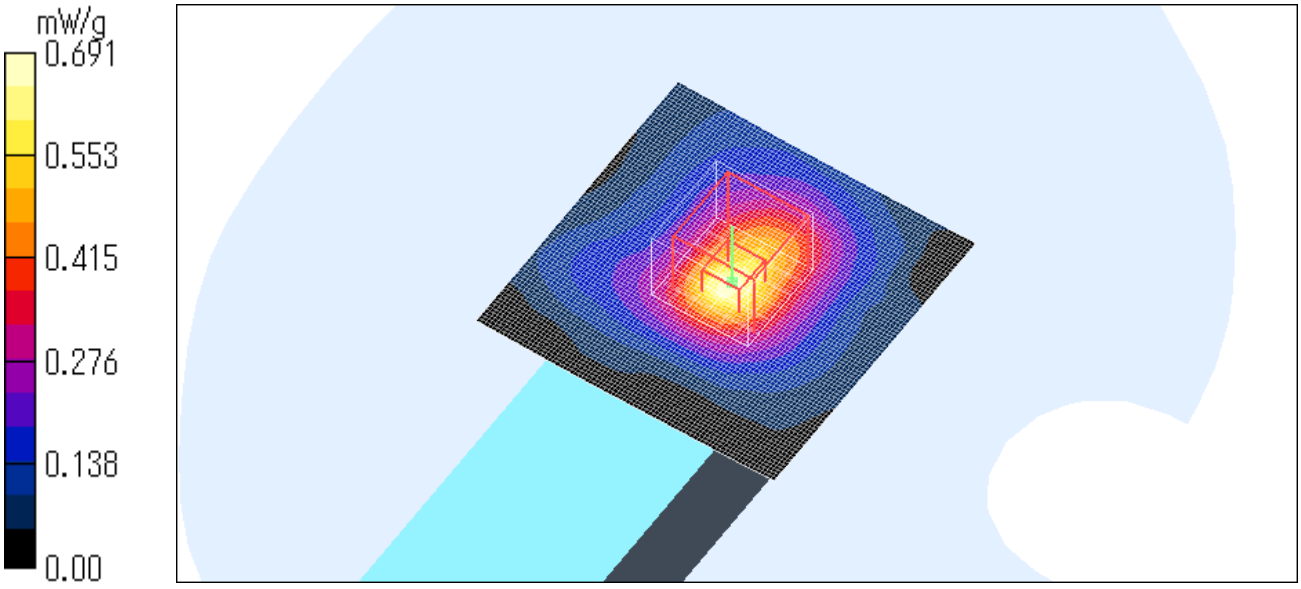
Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 6.3 mho/m; ε_r = 45.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.32, 4.32, 4.32); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (81x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.676 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 11.3 V/m; Power Drift = 0.154 dB
Peak SAR (extrapolated) = 1.25 W/kg
SAR(1 g) = 0.366 mW/g; SAR(10 g) = 0.145 mW/g
Maximum value of SAR (measured) = 0.691 mW/g

Test Date = 10/24/05
Ambient Temperature = 24.8degree.C.
Liquid Temperature = Before 24.5degree.C. , After 24.5degree.C.



KX-TGA560 / Body / Back / 44ch(5798.05084MHz)

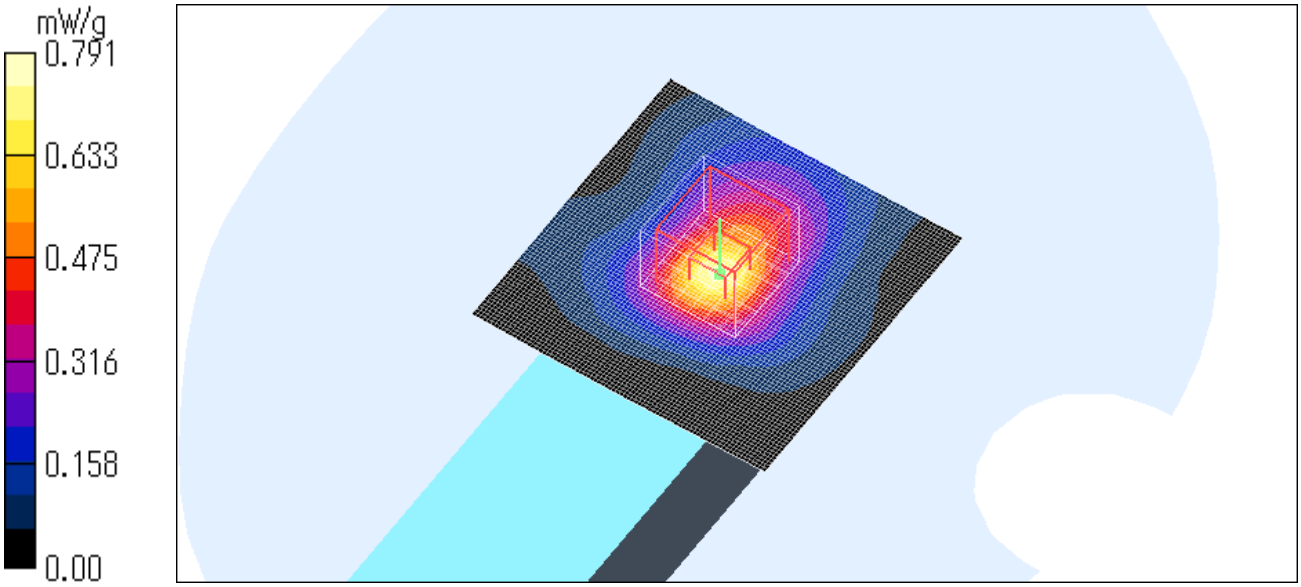
Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 6.3 mho/m; ε_r = 45.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.32, 4.32, 4.32); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (81x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.811 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 12.3 V/m; Power Drift = 0.154 dB
Peak SAR (extrapolated) = 1.40 W/kg
SAR(1 g) = 0.412 mW/g; SAR(10 g) = 0.157 mW/g
Maximum value of SAR (measured) = 0.791 mW/g

Test Date = 10/24/05
Ambient Temperature = 24.8degree.C.
Liquid Temperature = Before 24.3 degree.C. , After 24.3 degree.C.

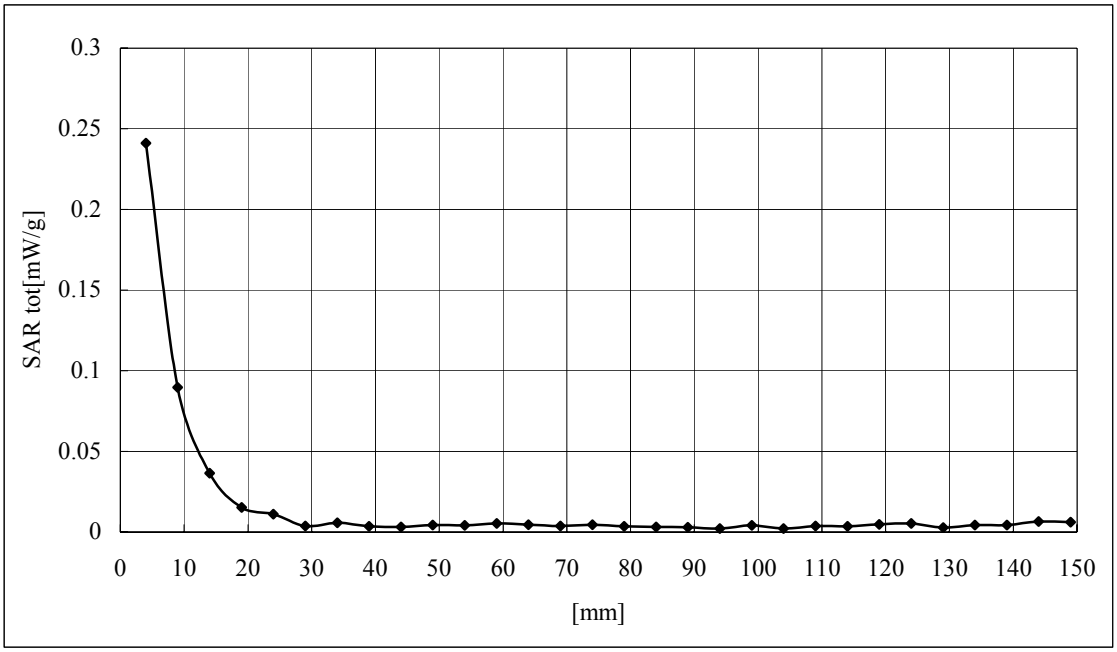


Z-axis scan at max SAR location

KX-TGA560 / Body / Back / 44ch(5798.05084MHz)

Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 6.3 mho/m; ε_r = 45.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.32, 4.32, 4.32); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

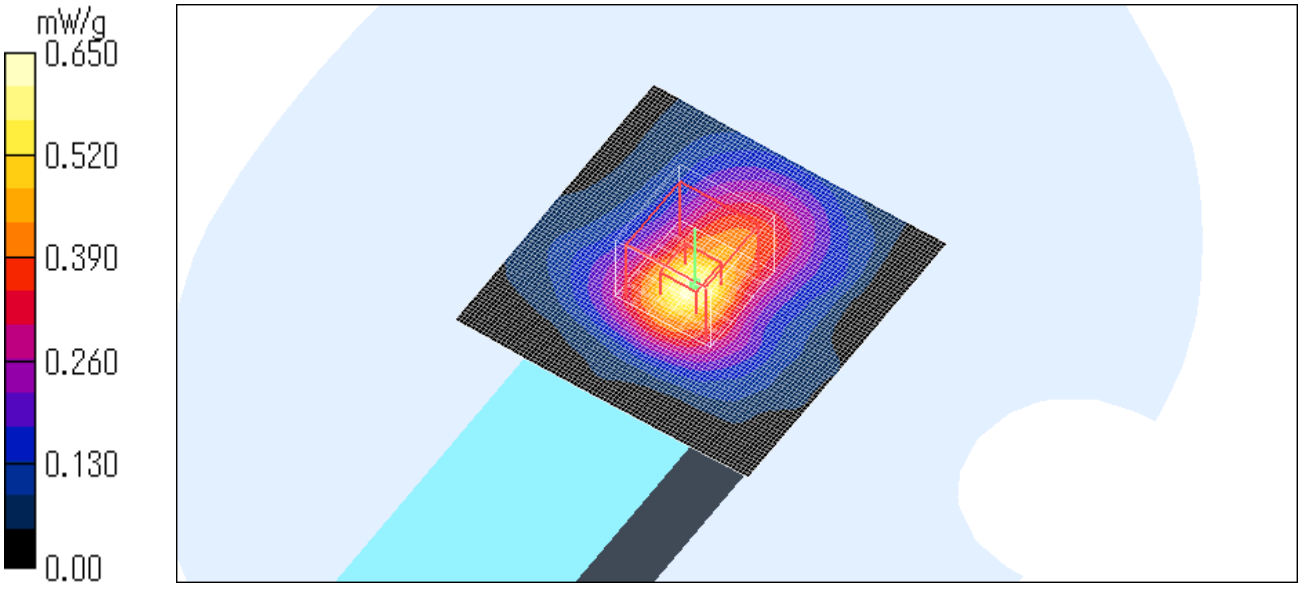


KX-TGA560 / Body / Back / 89ch(5838.18697MHz)

Duty Cycle: 1:5
Medium parameters used: f = 5800 MHz; σ = 6.3 mho/m; ε_r = 45.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:
Probe: EX3DV3 - SN3507; ConvF(4.32, 4.32, 4.32); Calibrated: 2005/04/12
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE3 Sn509; Calibrated: 2005/05/26
Phantom: SAM 1196
Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

Area Scan (81x81x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.630 mW/g

Zoom Scan (7x7x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 10.8 V/m; Power Drift = -0.109 dB
Peak SAR (extrapolated) = 1.20 W/kg
SAR(1 g) = 0.342 mW/g; SAR(10 g) = 0.131 mW/g
Maximum value of SAR (measured) = 0.650 mW/g

Test Date = 10/24/05
Ambient Temperature = 24.8degree.C.
Liquid Temperature = Before 24.8 degree.C. , After 24.8 degree.C.