RF EXPOSURE EVALUATION

SPECIFIC ABSORPTION RATE

SAR TEST REPORT

FOR

ASIA PACIFIC SATELLITE INDUSTRIES CO., LTD.

THURAYA SAT/GSM DUAL MODE HAND HELD TERMINAL WITH BLUETOOTH

MODEL: SG-2520

FCC ID: TZ5SG-2520

TEST STANDARD(S) & PROCEDURE(S) APPLIED
FCC OET Bulletin 65, Supplement C (01-01)
IEEE 1528-2003

Test Report Serial No.

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Test Lab and Location

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DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

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FCC IDENTIFIER:	**TZ5SG-2520**
Model Name:	**Thuraya**
Model No.:	**SG-2520**
SAR Test Requirement(s):	**FCC 47 CFR §2.1093**
SAR Test Procedure(s):	**FCC OET Bulletin 65, Supplement C (Edition 01-01)** **IEEE 1528-2003**
FCC Device Classification(s):	**Licensed Non-Broadcast Transmitter held to ear (TNE) - SAT** **PCS Licensed Transmitter held to ear (PCE) - GSM**
Device Description:	**Portable SAT/GSM Dual Mode Hand Held Terminal with Bluetooth**
Transmit Frequency Range(s):	**1626.0 - 1660.0 MHz (Satellite Band)** **1850.2 - 1909.8 MHz (PCS GSM Band)** **2402 - 2480 MHz (Bluetooth)**
Max. RF Output Power Tested:	**SAT: 32.4 dBm (1.74 Watts) Conducted (Average)** **GSM/GPRS: 30.0 dBm (1 Watt) Conducted (Peak)** **Bluetooth: 4 dBm (2.5 mW) Conducted (Class 2)**
Max. Duty Cycle Tested:	**SAT: 12% (Source-Based Time-Averaged)** **GSM: 12% (Source-Based Time-Averaged)** **GPRS: 24% (Source-Based Time-Averaged)**
Max. SBTA RF Output Power Tested:	**SAT: 23.2 dBm (0.209 Watts) Conducted** **GSM: 20.8 dBm (0.120 Watts) Conducted** **GPRS: 23.8 dBm (0.240 Watts) Conducted**
Operating Mode(s) Tested:	**SAT, PCS GSM, PCS GPRS**
Antenna Type(s) Tested:	**External Retractable (SAT)** **Internal (PCS GSM/GPRS)** **Internal (Bluetooth)**
Battery Type(s) Tested:	**Lithium-Polymer 3.7 V (SG-2520)**
Body-Worn Accessories Tested:	**None (1.5 cm air-gap spacing - front and back sides) - GSM/GPRS only**
Audio Accessories Tested:	**Generic Ear-Microphone - GSM/GPRS only**
Max. SAR Level(s) Evaluated:	**SAT Head: 0.314 W/kg (1g average); GSM Head: 0.120 W/kg (1 g average)** **GSM Body: 0.418 W/kg (1g average); GPRS Body: 0.649 W/kg (1g average)**

Celltech Labs Inc. declares under its sole responsibility that this wireless device was compliant with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01) and IEEE-1528-2003 for the General Population / Uncontrolled Exposure environment. All measurements were performed in accordance with the SAR system manufacturer recommendations.

I attest to the accuracy of data. All measurements 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 qualifications of all persons taking them.

Test Report Approved By:
Sean Johnston
SAR Lab Manager
Celltech Labs Inc.

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1.0 INTRODUCTION

This measurement report demonstrates that the Asia Pacific Satellite Industries Co., Ltd. Model: SG-2520 Thuraya Portable SAT/GSM Dual Mode Hand Held Terminal with Bluetooth FCC ID: TZ5SG-2520 complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [2]) and IEEE 1528-2003 (see reference [3]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 DESCRIPTION of DEVICE UNDER TEST (DUT)

SAR Test Requirement(s)	FCC Rule Part 47 CFR §2.1093						
SAR Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)			IEEE 1528-2003			
FCC Device Classification	Licensed Non-Broadcast Transmitter held to ear			TNE	Rule Part 25	SAT Band	
	PCS Licensed Transmitter held to ear			PCE	Rule Part 24E	GSM Band	
Device Description	Portable SAT/GSM Dual Mode Hand Held Terminal with Bluetooth						
Co-Transmit Operation	GSM/GPRS and Bluetooth (body-worn operation)						
RF Exposure Category	General Population / Uncontrolled Environment						
FCC IDENTIFIER	TZ5SG-2520						
Model Name/No.	Thuraya			SG-2520			
Test Sample Serial No.(s)	35601300-060304-6			Identical Prototype			
Transmit Frequency Range(s)	1626.0 - 1660.0 MHz			Satellite Band			
	1850.2 - 1909.8 MHz			PCS Band			
	2402 - 2480 MHz			Bluetooth			
Mode(s) of Operation	GSM/GPRS (PCS 1900)			SAT			
GSM/GPRS Transmit Class	Class B	can be connected to both GPRS and GSM services using one service at a time					
GPRS Multislot Class	10			**GSM/GPRS Power Class**		1	PCS 1900
Max. RF Conducted Output Power Measured	SAT (Average)	32.3 dBm	1.70 Watts	1626.0 MHz	**SBTA**	23.1 dBm	0.204 Watts
		32.4 dBm	1.74 Watts	1643.0 MHz	**SBTA**	23.2 dBm	0.209 Watts
		32.3 dBm	1.70 Watts	1660.0 MHz	**SBTA**	23.1 dBm	0.204 Watts
	GSM (Peak)	30.1 dBm	1.02 Watts	1850.2 MHz	**SBTA**	20.9 dBm	0.122 Watts
		30.0 dBm	1.00 Watts	1880.0 MHz	**SBTA**	20.8 dBm	0.120 Watts
		29.7 dBm	0.933 Watts	1909.8 MHz	**SBTA**	20.5 dBm	0.112 Watts
	GPRS (Peak)	30.1 dBm	1.02 Watts	1850.2 MHz	**SBTA**	23.9 dBm	0.245 Watts
		30.0 dBm	1.00 Watts	1880.0 MHz	**SBTA**	23.8 dBm	0.240 Watts
		29.7 dBm	0.933 Watts	1909.8 MHz	**SBTA**	23.5 dBm	0.224 Watts
Max. Duty Cycle Tested	SAT	12 %	Source-Based Time-Averaged			Crest Factor 1:8.3	
	GSM	12 %	Source-Based Time-Averaged			Crest Factor 1:8.3	
	GPRS	24 %	Source-Based Time-Averaged			Crest Factor 1:4.16	
Antenna Type(s) Tested	SAT: External Retractable		GSM/GPRS: Internal		Bluetooth: Internal		
Battery Type(s) Tested	Lithium-Polymer		3.7 V		SG-2520		
Body-Worn Accessories Tested	None		1.5 cm Air-Gap Spacing		Front and Back Sides		
	(Note: DUT does not support body-worn operations for SAT mode)						
Audio Accessories Tested	Generic Ear-Microphone (Note: DUT does not support body-worn operations for SAT mode)						

3.0 SAR MEASUREMENT SYSTEM

Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for brain and/or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server. The DAE4 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the DASY4 measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer.

DASY4 Measurement System with SAM Phantom and device holder

DASY4 Measurement System with SAM Phantom and validation dipole

4.0 MEASUREMENT SUMMARY

HEAD SAR EVALUATION RESULTS - PCS GSM

Test Mode	Freq. (MHz)	Chan.	Duty Cycle	Crest Factor	Antenna Position	Battery Type	Phantom Section	Test Position	Conducted Power Before Test (dBm)	SAR Drift During Test (dB)	Measured SAR 1g (W/kg)
PCS GSM	1880.0	661	12 %	1:8.3	Internal	Li-Poly	Right Ear	Cheek/Touch	30.0	-0.159	0.0863
PCS GSM	1880.0	661	12 %	1:8.3	Internal	Li-Poly	Right Ear	Ear/Tilt (15°)	30.0	-0.188	**0.120**
PCS GSM	1880.0	661	12 %	1:8.3	Internal	Li-Poly	Left Ear	Cheek/Touch	30.0	-0.169	0.0842
PCS GSM	1880.0	661	12 %	1:8.3	Internal	Li-Poly	Left Ear	Ear/Tilt (15°)	30.0	-0.108	0.109
ANSI / IEEE C95.1 1999 SAFETY LIMIT				**BRAIN: 1.6 W/kg (averaged over 1 gram)**				**Spatial Peak Uncontrolled Exposure / General Population**			

Test Date(s)	August 17, 2006				**Relative Humidity**	32	%
Measured Fluid Type	**1880 MHz Brain**				**Atmospheric Pressure**	101.1	kPa
Dielectric Constant ε_r	**IEEE Target**		**Measured**	**Deviation**	**Ambient Temperature**	23.8	°C
	40.0	**± 5%**	38.6	-3.5%	**Fluid Temperature**	23.2	°C
Conductivity σ (mho/m)	**IEEE Target**		**Measured**	**Deviation**	**Fluid Depth**	≥ 15	cm
	1.40	**± 5%**	1.41	+0.7%	**ρ (Kg/m³)**	1000	

Note(s)	1.	The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
	2.	If the measured SAR levels evaluated at the mid channel were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]).
	3.	The DUT was placed in test mode using an over-the-air signal with the Anritsu MT8820A communications test set for maximum power and duty cycle.
	4.	The power drift of the DUT measured by the DASY4 system during the SAR evaluations was <5% from the start power.
	5.	The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter checks and the SAR evaluation. The temperatures reported were consistent for all measurement periods.
	6.	The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).
	7.	The SAR evaluations were performed within 24 hours of the system performance check.

MEASUREMENT SUMMARY (Cont.)

HEAD SAR EVALUATION RESULTS - SAT

Test Date	Freq. (MHz)	Chan.	Duty Cycle	Crest Factor	Antenna Position	Battery Type	Phantom Section	Test Position	Conducted Power Before Test (dBm)	SAR Drift During Test (dB)	Measured SAR 1g (W/kg)
Aug 17	1643.0	0544	12 %	1:8.3	Extended	Li-Poly	Right Ear	Cheek/Touch	32.4	0.0267	0.0710
Aug 17	1643.0	0544	12 %	1:8.3	Retracted	Li-Poly	Right Ear	Cheek/Touch	32.4	-0.0846	0.106
Aug 17	1643.0	0544	12 %	1:8.3	Extended	Li-Poly	Right Ear	Ear/Tilt (15°)	32.4	-0.119	0.135
Aug 17	1643.0	0544	12 %	1:8.3	Retracted	Li-Poly	Right Ear	Ear/Tilt (15°)	32.4	0.0114	0.117
Aug 16	1643.0	0544	12 %	1:8.3	Extended	Li-Poly	Left Ear	Cheek/Touch	32.4	-0.0737	0.106
Aug 16	1643.0	0544	12 %	1:8.3	Retracted	Li-Poly	Left Ear	Cheek/Touch	32.4	0.0120	0.135
Aug 16	1643.0	0544	12 %	1:8.3	Extended	Li-Poly	Left Ear	Ear/Tilt (15°)	32.4	-0.189	**0.314**
Aug 16	1643.0	0544	12 %	1:8.3	Retracted	Li-Poly	Left Ear	Ear/Tilt (15°)	32.4	0.0159	0.138

ANSI / IEEE C95.1 1999 SAFETY LIMIT	BRAIN: 1.6 W/kg (averaged over 1 gram)	Spatial Peak Uncontrolled Exposure / General Population

Test Date(s)	August 16, 2006	August 17, 2006
Measured Fluid Type	1640 MHz Brain	
	IEEE Target	Date / Measured / Deviation
Dielectric Constant ε_r	40.3 ± 5%	Aug 16: 42.2, +4.7% / Aug 17: 41.3, +2.5%
Conductivity σ (mho/m)	1.31 ± 5%	Aug 16: 1.34, +2.3% / Aug 17: 1.35, +3.1%

Test Date(s)	Aug. 16	Aug. 17	Unit
Relative Humidity	32	32	%
Atmospheric Pressure	101.1	101.1	kPa
Ambient Temperature	23.7	23.7	°C
Fluid Temperature	23.0	23.0	°C
Fluid Depth	≥ 15	≥ 15	cm
ρ (Kg/m^3)	1000		

Note(s)

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. If the measured SAR levels evaluated at the mid channel were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]).
3. The DUT was placed in test mode via internal software controlled by the keypad for maximum power and duty cycle.
4. The power drift of the DUT measured by the DASY4 system during the SAR evaluations was <5% from the start power.
5. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter checks and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
6. The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).
7. The SAR evaluations were performed within 24 hours of the system performance check.

MEASUREMENT SUMMARY (Cont.)

BODY-WORN SAR EVALUATION RESULTS - PCS GSM/GPRS

Test Date	Test Mode	Freq. (MHz)	Chan.	Duty Cycle	Crest Factor	Antenna Position	Battery Type	Access. Type / Audio	DUT Position to Planar Phantom	Separation Distance to Planar Phantom (cm)	Cond. Power Before Test (dBm)	SAR Drift During Test (dB)	Measured SAR 1g (W/kg)
Aug 18	PCS GPRS	1880.0	661	24 %	1:4.16	Internal	Li-Poly	Ear-Mic	Front Side	1.5 air-gap	30.0	-0.0938	0.00997
Aug 18	PCS GPRS	1880.0	661	24 %	1:4.16	Internal	Li-Poly	Ear-Mic	Back Side	1.5 air-gap	30.0	-0.133	**0.649**
Aug 18	PCS GSM	1880.0	661	12 %	1:8.3	Internal	Li-Poly	Ear-Mic	Back Side	1.5 air-gap	30.0	-0.0630	0.418
Sep 25	PCS GPRS	1880.0	661	24 %	1:4.16	Internal	Li-Poly	Ear-Mic	Back Side	1.5 air-gap	30.0	-0.0970	0.599
	Bluetooth co-transmit	2441	39	Modulated Fixed Frequency		Internal					4.0		

ANSI / IEEE C95.1 1999 - SAFETY LIMIT	BODY: 1.6 W/kg (averaged over 1 gram)	Spatial Peak Uncontrolled Exposure / General Population

Test Date(s)	August 18, 2006			September 25, 2006		Test Date	Aug 18	Sep 25	Unit
Measured Fluid Type	1880 MHz Body					Relative Humidity	32	31	%
	IEEE Target		Date	Measured	Deviation	Atmospheric Pressure	101.1	102.9	KPa
Dielectric Constant ε_r	53.3	± 5%	Aug 18	50.9	-4.5%	Ambient Temperature	24.4	24.3	°C
			Sep 25	51.2	-3.9%	Fluid Temperature	23.8	23.7	°C
Conductivity σ (mho/m)	1.52	± 5%	Aug 18	1.51	-0.7%	Fluid Depth	≥ 15	≥ 15	cm
			Sep 25	1.46	-3.9%	ρ (Kg/m^3)	1000		

Note(s)		
	1.	The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
	2.	If the measured SAR levels evaluated at the mid channel were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]).
	3.	The DUT was placed in test mode using an over-the-air signal with the Anritsu MT8820A communications test set for maximum power and duty cycle.
	4.	The DUT was initially evaluated for body-worn SAR in GPRS mode (24% duty cycle). The worst-case configuration was also tested in GSM mode (12% duty cycle).
	5	The power drift of the DUT measured by the DASY4 system during the SAR evaluations was <5% from the start power.
	6.	Simultaneous transmit operation for GPRS and co-located Bluetooth was evaluated in the maximum body SAR configuration with the Bluetooth at maximum power on a fixed frequency (frequency hopping disabled).
	7.	The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter checks and the SAR evaluation. The temperatures reported were consistent for all measurement periods.
	8.	The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).
	9.	The SAR evaluations were performed within 24 hours of the system performance check.

5.0 DETAILS OF SAR EVALUATION

The Asia Pacific Satellite Industries Co., Ltd. Model: SG-2520 Thuraya Portable SAT/GSM Dual Mode Hand Held Terminal FCC ID: TZ5SG-2520 has demonstrated compliance for localized Specific Absorption Rate (Uncontrolled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix D.

Ear-held Configuration

1) The DUT was tested in an ear-held configuration on both the left and right sections of the SAM phantom at the mid channel of the operating band. If the SAR level at the mid channel of the frequency band for each test configuration (left ear, right ear, cheek/touch, ear/tilt) was ≥ 3dB below the SAR limit, measurements at the low and high channels were optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [2]). The handset was placed in the device holder in a normal operating position with the test device reference point located along the vertical centerline on the front of the device aligned to the ear reference point, with the center of the earpiece touching the center of the ear spacer of the SAM phantom.

a) With the handset positioned parallel to the cheek, the test device reference point was aligned to the ear reference point on the head phantom, and the vertical centerline was aligned to the phantom reference plane (initial ear position).

b) While maintaining the three alignments, the body of the handset was gradually adjusted to each of the following test positions:

- Cheek/Touch Position: the handset was brought toward the mouth of the head phantom by pivoting against the ear reference point until any point of the mouthpiece or keypad touched the phantom.

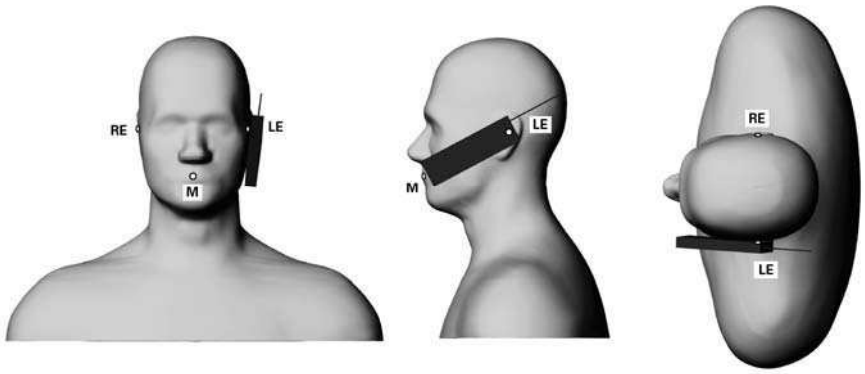


Figure 1. Phone position 1 - "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated (Shoulders are shown for illustration only).

- Ear/Tilt Position: With the phone aligned in the Cheek/Touch position, the handset was tilted away from the mouth with respect to the test device reference point by 15 degrees.

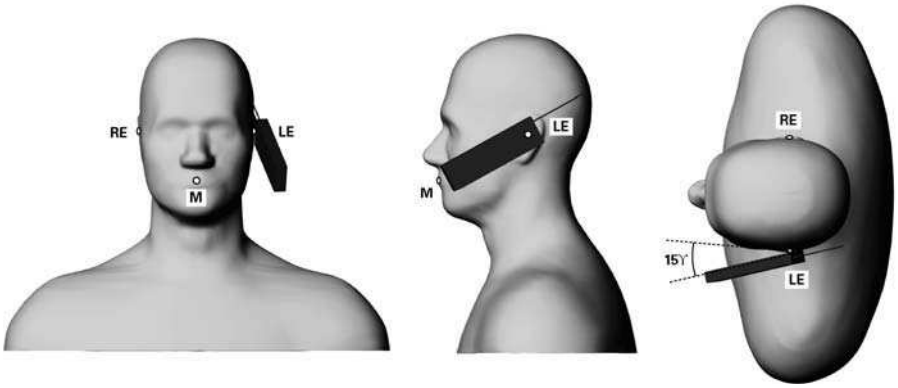


Figure 2. Phone position 2 - "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for phone positioning, are indicated (Shoulders are shown for illustration only).

DETAILS OF SAR EVALUATION (Cont.)

Body-worn Configuration

2) The DUT was tested in a body-worn configuration with an "air-gap" spacing of 1.5 cm between the front side (keypad side) and the outer surface of the SAM phantom (planar section). The DUT was also tested with an "air-gap" spacing of 1.5 cm between the back side (battery side) and the outer surface of the SAM phantom (planar section). No body-worn accessories were utilized with the DUT in the "air-gap" test configurations for the purpose of allowing for after-market body-worn accessories that do not contain any metallic components and provide a minimum separation distance of 1.5 cm between the front or back side of the phone and the user's body. A generic ear-microphone accessory was connected to the audio port of the DUT for the duration of the tests.
3) The maximum SAR configuration for body-worn operation was re-evaluated with co-located Bluetooth transmitting simultaneously.

DUT Test Modes & Power Settings

4) The GSM/GPRS peak conducted power levels were measured prior to the SAR evaluations using a spectrum analyzer according to the procedures described in FCC 47 CFR §2.1046 (spectrum analyzer settings: RBW - 3 MHz, VBW - 3 MHz, Detector - Peak, Trace - Max Hold, Span - 25 MHz).
5) The SAT average conducted power levels were measured prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter according to the procedures described in FCC 47 CFR §2.1046.
6) SAR evaluations were performed with the DUT transmitting continuously at maximum power and duty cycle in SAT (Crest Factor 8.3), GSM (Crest Factor 8.3) and GPRS (Crest Factor 4.16) modes.
7) For the GPRS and Bluetooth co-transmit SAR evaluation the Bluetooth was placed in test mode via internal software controlled by the keypad at maximum power with a modulated signal on a fixed frequency (frequency hopping disabled).
8) The DUT battery was fully charged prior to the SAR evaluations.

Test Conditions

9) The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter checks and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
10) The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).

6.0 EVALUATION PROCEDURES

a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
(ii) For body-worn and face-held devices a planar phantom was used.
b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.
An area scan was determined as follows:
c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.
d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.
A 1g and 10g spatial peak SAR was determined as follows:
e. Extrapolation is used to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, 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 1.4 mm (see probe calibration document in Appendix F). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.
f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).
g. A zoom scan volume of 32 mm x 32 mm x 30 mm (5 x 5 x 7 points) centered at the peak SAR location determined from the area scan is used for all zoom scans for devices with a transmit frequency < 800 MHz. Zoom scans for frequencies ≥ 800 MHz are determined with a scan volume of 30 mm x 30 mm x 30 mm (7 x 7 x 7) to ensure complete capture of the peak spatial-average SAR.

EVALUATION PROCEDURES (Cont.)

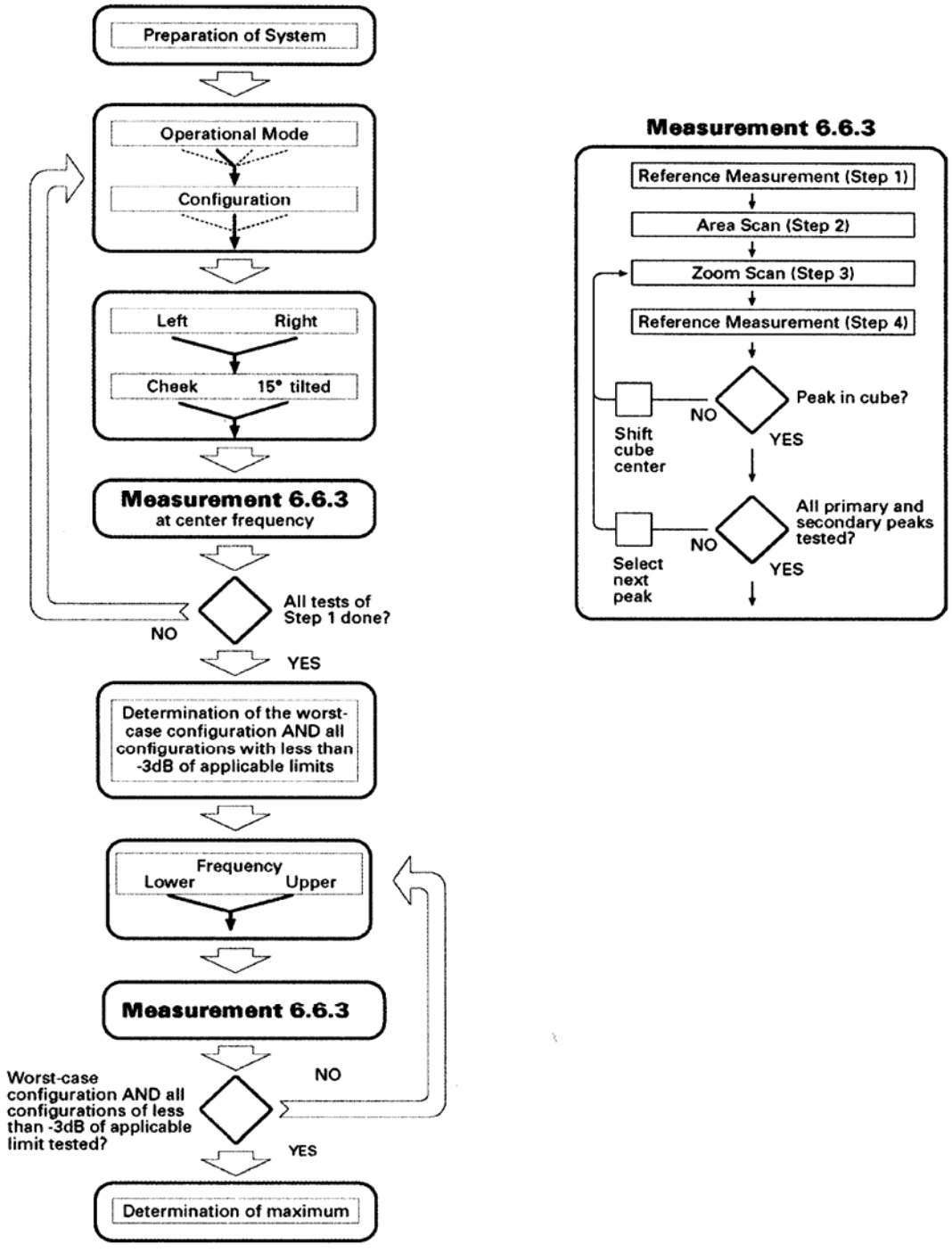


Figure 3. Flow Chart for determining the largest peak spatial-average SAR from all device configurations per IEEE Standard 1528-2003 (see reference [3]).

7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations a system check was performed using a planar phantom with a 1640MHz dipole and a 1900MHz dipole (see Appendix E for system validation procedures). The dielectric parameters of the simulated tissue mixtures were measured prior to the system performance checks using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±10% (see Appendix B for system performance check test plots). See Table 1 below for the SAR system manufacturer's reference body SAR values from the DASY4 Operation Manual (see reference [4]).

SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	Equiv. Tissue Freq. MHz	SAR 1g (W/kg) Target	SAR 1g (W/kg) Meas.	SAR 1g (W/kg) Dev.	Dielectric Constant ε_r Target	Dielectric Constant ε_r Meas.	Dielectric Constant ε_r Dev.	Conductivity σ (mho/m) Target	Conductivity σ (mho/m) Meas.	Conductivity σ (mho/m) Dev.	ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
Aug 16	Brain 1640	8.60 ±10%	9.20	+7.0%	40.3 ±5%	42.2	+4.7%	1.31 ±5%	1.34	+2.3%	1000	23.7	23.0	≥ 15	32	101.1
Aug 17	Brain 1900	9.93 ±10%	10.7	+7.8%	40.0 ±5%	38.4	-4.0%	1.40 ±5%	1.43	+2.1%	1000	24.0	23.2	≥ 15	32	101.1
Sep 25	Body 1900	9.95±10%	10.4	+4.5%	53.3±5%	51.1	-4.1%	1.52±5%	1.47	-3.3%	1000	24.3	23.7	≥ 15	31	102.9

Note(s)

1. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the system performance check. The temperatures listed in the table above were consistent for all measurement periods.
2. The SAR evaluations were performed within 24 hours of the system performance check.

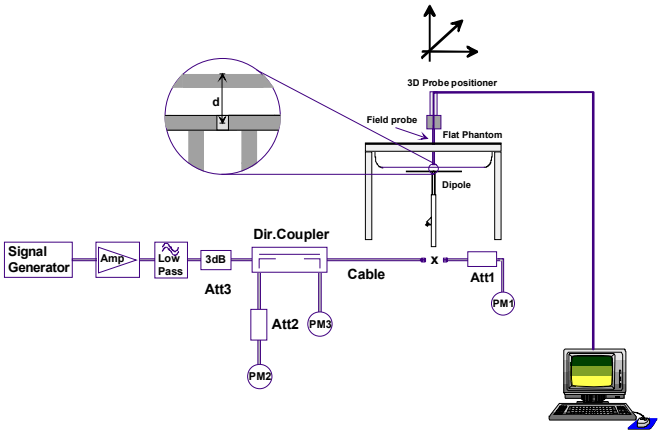


Figure 1. System Performance Check Measurement Setup

1640 MHz Dipole Setup

Dipole Type	Distance [mm]	Frequency [MHz]	SAR (1g) [W/kg]	SAR (10g) [W/kg]	SAR (peak) [W/kg]
D300V2	15	300	3.02	2.06	4.36
D450V2	15	450	5.01	3.36	7.22
D835V2	15	835	9.71	6.38	14.1
D900V2	15	900	11.1	7.17	16.3
D1450V2	10	1450	29.6	16.6	49.8
D1500V2	10	1500	30.8	17.1	52.1
D1640V2	10	1640	34.4	18.7	59.4
D1800V2	10	1800	38.5	20.3	67.5
D1900V2	10	1900	39.8	20.8	69.6
D2000V2	10	2000	40.9	21.2	71.5
D2450V2	10	2450	51.2	23.7	97.6
D3000V2	10	3000	61.9	24.8	136.7

Table 32.1: Numerical reference SAR values for SPEAG dipoles and flat phantom filled with body-tissue simulating liquid. Note: All SAR values normalized to 1 W forward power.

Table 1. SAR system manufacturer's reference body SAR values

1900 MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

The 1640/1880/1900MHz simulated equivalent tissue mixtures consisted of Glycol-monobutyl, water, and salt. The fluids were prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

1640/1880/1900MHz TISSUE MIXTURES			
INGREDIENT	**1640 MHz Brain**	**1880/1900 MHz Brain**	**1880 MHz Body**
	System Performance Check	System Performance Check	System Performance Check
	DUT Evaluation	DUT Evaluation	DUT Evaluation
Water	55.5 %	55.85 %	69.85 %
Glycol Monobutyl	44.0 %	44.00 %	29.89 %
Salt	0.5 %	0.15 %	0.26 %

9.0 SAR SAFETY LIMITS

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	**(Occupational / Controlled Exposure Environment)**
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak (averaged over any 1 g of tissue)	1.60	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0
Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.		
Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.		

10.0 ROBOT SYSTEM SPECIFICATIONS

Specifications	
Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6
Data Acquisition Electronic (DAE) System	
Cell Controller	
Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional
Data Converter	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY4, V4.7 Build 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
Connecting Lines	Optical downlink for data and status info.; Optical uplink for commands and clock
DASY4 Measurement Server	
Function	Real-time data evaluation for field measurements and surface detection
Hardware	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface
E-Field Probe(s)	
SAT Band	
Model	ET3DV6
Serial No.	1387
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
PCS Band	
Model	EX3DV4
Serial No.	3547
Construction	Symmetrical design with triangular core
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
Phantom(s)	
Type	SAM V4.0C
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 25 liters

11.0 PROBE SPECIFICATION (ET3DV6 & EX3DV4)

ET3DV6 E-Field Probe

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In brain simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy ± 8%)
Frequency:	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity:	± 0.2 dB in brain tissue (rotation around probe axis) ± 0.4 dB in brain tissue (rotation normal to probe axis)
Dynamic Range:	5 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Surface Detect:	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm 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 phone

ET3DV6 E-Field Probe

EX3DV4 E-Field Probe

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. DGBE)
Calibration:	Basic Broadband Calibration in air: 10-3000 MHz Conversion Factors (CF) for HSL 900 and HSL 1750
Frequency:	10 MHz to >6 GHz; 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 to probe axis)
Dynamic Range:	10 μW/g to >100 mW/g; Linearity: ±0.2 dB (noise: typically < 1 μW/g)
Dimensions:	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1.0 mm
Application:	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better than 30%

EX3DV4 E-Field Probe

12.0 SAM PHANTOM V4.0C

The SAM phantom V4.0C is a fiberglass shell phantom with a 2.0 mm (+/-0.2 mm) shell thickness for left and right head and flat planar area integrated in a wooden table. The shape of the fiberglass shell corresponds to the phantom defined by SCC34-SC2. The device holder positions are adjusted to the standard measurement positions in the three sections (see Appendix G for specifications of the SAM phantom V4.0C).

SAM Phantom V4.0C

13.0 DEVICE HOLDER

The DASY4 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate 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.

Device Holder

14.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED		CALIBRATION DUE DATE
USED	DESCRIPTION					
x	Schmid & Partner DASY4 System	-	-	-		-
x	-DASY4 Measurement Server	00158	1078	N/A		N/A
x	-Robot	00046	599396-01	N/A		N/A
x	-DAE4	00019	353	21Jun06		21Jun07
	-DAE3	00018	370	08Feb06		08Feb07
x	-ET3DV6 E-Field Probe	00016	1387	16Mar06		16Mar07
x	-EX3DV4 E-Field Probe	00125	3547	14Feb06		14Feb07
	-300MHz Validation Dipole	00023	135	25Oct05		25Oct06
	-450MHz Validation Dipole	00024	136	25Oct05		25Oct06
	-835MHz Validation Dipole	00022	411	**Brain**	28Mar06	28Mar07
				Body	27Mar06	27Mar07
	-900MHz Validation Dipole	00020	054	**Brain**	06Jun06	06Jun07
				Body	06Jun06	06Jun07
x	-1640MHz Validation Dipole	00211	0180	**Brain**	14Aug06	14Aug07
	-1800MHz Validation Dipole	00021	247	**Brain**	08Jun06	08Jun07
				Body	09Jun06	09Jun07
x	-1900MHz Validation Dipole	00032	151	**Brain**	09Jun06	09Jun07
x				**Body**	12Jun06	12Jun07
	-2450MHz Validation Dipole	00025	150	**Body**	24Apr06	24Apr07
	-5800MHz Validation Dipole	00126	1031	**Brain**	15Mar06	15Mar07
x	-SAM Phantom V4.0C	00154	1033	N/A		N/A
	-Barski Planar Phantom	00155	03-01	N/A		N/A
x	ALS-PR-DIEL Dielectric Probe Kit	00160	260-00953	N/A		N/A
	Gigatronics 8652A Power Meter	00110	1835801	12Apr06		12Apr07
x	Gigatronics 8652A Power Meter	00007	1835272	03Feb06		03Feb07
	Gigatronics 80701A Power Sensor	00011	1833542	03Feb06		03Feb07
x	Gigatronics 80701A Power Sensor	00013	1833713	03Feb06		03Feb07
x	Gigatronics 80701A Power Sensor	00014	1833699	07Sep05		07Sep06
x	HP 8753ET Network Analyzer	00134	US39170292	18Apr06		18Apr07
x	HP 8648D Signal Generator	00005	3847A00611	N/A		N/A
	Rohde & Schwarz SMR40 Signal Generator	00006	100104	06Apr06		06Apr07
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	N/A		N/A
x	Anritsu Radio Communication Analyzer	00208	6200241241	06Jun06		06Jun07

15.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (PCS Band)						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**ci 1g**	**Uncertainty Value ±% (1g)**	**V_i or V_{eff}**
Measurement System						
Probe calibration	5.5	Normal	1	1	5.5	∞
Axial isotropy of the probe	4.7	Rectangular	1.732050808	0.7	1.9	∞
Spherical isotropy of the probe	9.6	Rectangular	1.732050808	0.7	3.9	∞
Spatial resolution	0	Rectangular	1.732050808	1	0.0	∞
Boundary effects	1	Rectangular	1.732050808	1	0.6	∞
Probe linearity	4.7	Rectangular	1.732050808	1	2.7	∞
Detection limit	1	Rectangular	1.732050808	1	0.6	∞
Readout electronics	0.3	Normal	1	1	0.3	∞
Response time	0.8	Rectangular	1.732050808	1	0.5	∞
Integration time	2.6	Rectangular	1.732050808	1	1.5	∞
RF ambient conditions	3	Rectangular	1.732050808	1	1.7	∞
Mech. constraints of robot	0.4	Rectangular	1.732050808	1	0.2	∞
Probe positioning	2.9	Rectangular	1.732050808	1	1.7	∞
Extrapolation & integration	1	Rectangular	1.732050808	1	0.6	∞
Test Sample Related						
Device positioning	2.9	Normal	1	1	2.9	12
Device holder uncertainty	3.6	Normal	1	1	3.6	8
Power drift	5	Rectangular	1.732050808	1	2.9	∞
Phantom and Setup						
Phantom uncertainty	4	Rectangular	1.732050808	1	2.3	∞
Liquid conductivity (target)	5	Rectangular	1.732050808	0.64	1.8	∞
Liquid conductivity (measured)	2.5	Normal	1	0.64	1.6	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	2.5	Normal	1	0.6	1.5	∞
Combined Standard Uncertainty					**10.58**	
Expanded Uncertainty (k=2)					**21.16**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [3])

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION (PCS Band)						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**ci 1g**	**Uncertainty Value ±% (1g)**	**V_i or V_{eff}**
Measurement System						
Probe calibration	5.5	Normal	1	1	5.5	∞
Axial isotropy of the probe	4.7	Rectangular	1.732050808	1	2.7	∞
Spherical isotropy of the probe	0	Rectangular	1.732050808	1	0.0	∞
Spatial resolution	0	Rectangular	1.732050808	1	0.0	∞
Boundary effects	1	Rectangular	1.732050808	1	0.6	∞
Probe linearity	4.7	Rectangular	1.732050808	1	2.7	∞
Detection limit	1	Rectangular	1.732050808	1	0.6	∞
Readout electronics	0.3	Normal	1	1	0.3	∞
Response time	0	Rectangular	1.732050808	1	0.0	∞
Integration time	0	Rectangular	1.732050808	1	0.0	∞
RF ambient conditions	3	Rectangular	1.732050808	1	1.7	∞
Mech. constraints of robot	0.4	Rectangular	1.732050808	1	0.2	∞
Probe positioning	2.9	Rectangular	1.732050808	1	1.7	∞
Extrapolation & integration	1	Rectangular	1.732050808	1	0.6	∞
Test Sample Related						
Dipole Positioning	2	Normal	1.732050808	1	1.2	∞
Power & Power Drift	4.7	Normal	1.732050808	1	2.7	∞
Phantom and Setup						
Phantom uncertainty	4	Rectangular	1.732050808	1	2.3	∞
Liquid conductivity (target)	5	Rectangular	1.732050808	0.64	1.8	∞
Liquid conductivity (measured)	2.5	Normal	1	0.64	1.6	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	2.5	Normal	1	0.6	1.5	∞
Combined Standard Uncertainty					**8.79**	
Expanded Uncertainty (k=2)					**17.57**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [3])

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (SAT Band)						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**ci 1g**	**Uncertainty Value ±% (1g)**	**V_i or V_{eff}**
Measurement System						
Probe calibration	3.5	Normal	1	1	3.5	∞
Axial isotropy of the probe	4.7	Rectangular	1.732050808	0.7	1.9	∞
Spherical isotropy of the probe	9.6	Rectangular	1.732050808	0.7	3.9	∞
Spatial resolution	0	Rectangular	1.732050808	1	0.0	∞
Boundary effects	1	Rectangular	1.732050808	1	0.6	∞
Probe linearity	4.7	Rectangular	1.732050808	1	2.7	∞
Detection limit	1	Rectangular	1.732050808	1	0.6	∞
Readout electronics	0.3	Normal	1	1	0.3	∞
Response time	0.8	Rectangular	1.732050808	1	0.5	∞
Integration time	2.6	Rectangular	1.732050808	1	1.5	∞
RF ambient conditions	3	Rectangular	1.732050808	1	1.7	∞
Mech. constraints of robot	0.4	Rectangular	1.732050808	1	0.2	∞
Probe positioning	2.9	Rectangular	1.732050808	1	1.7	∞
Extrapolation & integration	1	Rectangular	1.732050808	1	0.6	∞
Test Sample Related						
Device positioning	2.9	Normal	1	1	2.9	12
Device holder uncertainty	3.6	Normal	1	1	3.6	8
Power drift	5	Rectangular	1.732050808	1	2.9	∞
Phantom and Setup						
Phantom uncertainty	4	Rectangular	1.732050808	1	2.3	∞
Liquid conductivity (target)	5	Rectangular	1.732050808	0.64	1.8	∞
Liquid conductivity (measured)	2.5	Normal	1	0.64	1.6	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	2.5	Normal	1	0.6	1.5	∞
Combined Standard Uncertainty					**9.69**	
Expanded Uncertainty (k=2)					**19.39**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [3])

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION (SAT Band)						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**ci 1g**	**Uncertainty Value ±% (1g)**	**V_i or V_{eff}**
Measurement System						
Probe calibration	3.5	Normal	1	1	3.5	∞
Axial isotropy of the probe	4.7	Rectangular	1.732050808	1	2.7	∞
Spherical isotropy of the probe	0	Rectangular	1.732050808	1	0.0	∞
Spatial resolution	0	Rectangular	1.732050808	1	0.0	∞
Boundary effects	1	Rectangular	1.732050808	1	0.6	∞
Probe linearity	4.7	Rectangular	1.732050808	1	2.7	∞
Detection limit	1	Rectangular	1.732050808	1	0.6	∞
Readout electronics	0.3	Normal	1	1	0.3	∞
Response time	0	Rectangular	1.732050808	1	0.0	∞
Integration time	0	Rectangular	1.732050808	1	0.0	∞
RF ambient conditions	3	Rectangular	1.732050808	1	1.7	∞
Mech. constraints of robot	0.4	Rectangular	1.732050808	1	0.2	∞
Probe positioning	2.9	Rectangular	1.732050808	1	1.7	∞
Extrapolation & integration	1	Rectangular	1.732050808	1	0.6	∞
Dipole						
Dipole Positioning	2	Normal	1.732050808	1	1.2	∞
Power & Power Drift	4.7	Normal	1.732050808	1	2.7	∞
Phantom and Setup						
Phantom uncertainty	4	Rectangular	1.732050808	1	2.3	∞
Liquid conductivity (target)	5	Rectangular	1.732050808	0.64	1.8	∞
Liquid conductivity (measured)	2.5	Normal	1	0.64	1.6	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	2.5	Normal	1	0.6	1.5	∞
Combined Standard Uncertainty					**7.69**	
Expanded Uncertainty (k=2)					**15.39**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [3])

16.0 REFERENCES

[1] Federal Communications Commission, “Radiofrequency radiation exposure evaluation: portable devices”, Rule Part 47 CFR §2.1093: 1999.

[2] Federal Communications Commission, “Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields”, OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.

[3] IEEE Standard 1528-2003, “Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”: December 2003.

[4] Schmid & Partner Engineering AG - “DASY4 Manual”, V4.5: March 2005.

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 08/17/2006

Head SAR - PCS GSM - Right Ear - Cheek/Touch Position - Internal Antenna - Ch. 661 - 1880.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

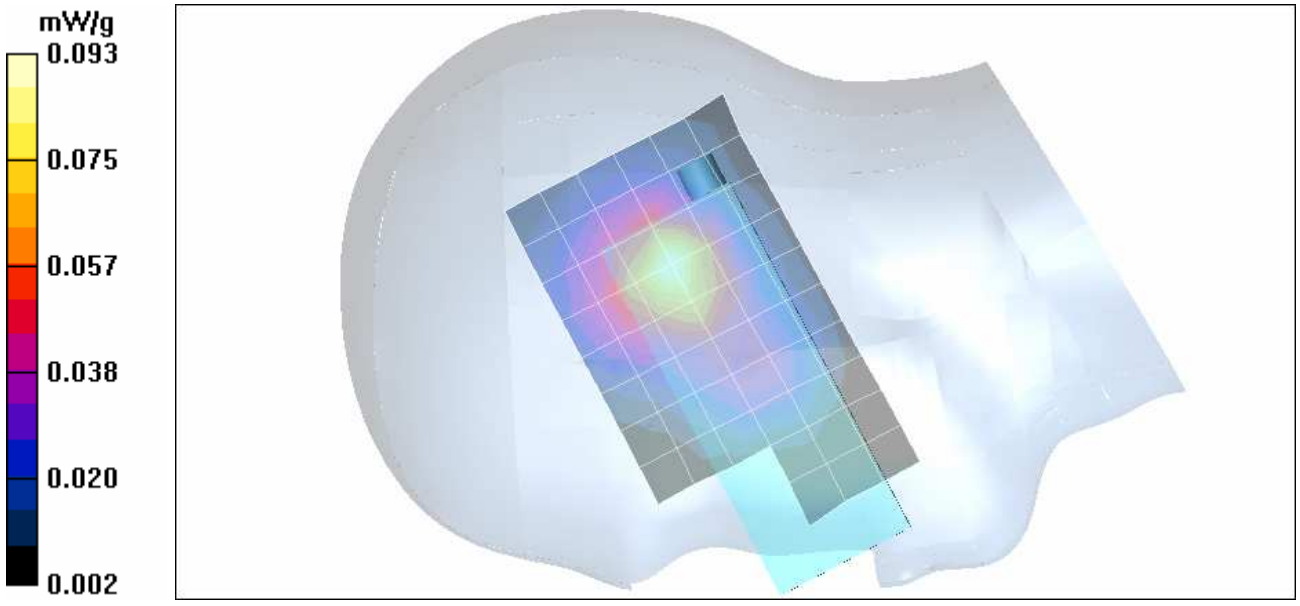
Ambient Temp: 23.8ºC; Fluid Temp: 23.2ºC; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: GSM 1900
RF Output Power: 30.0 dBm (Peak Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Frequency: 1880.0 MHz; Duty Cycle: 1:8.3
Medium: HSL1880 (σ = 1.41 mho/m; ε_r = 38.6; ρ = 1000 kg/m^3)

- Probe: EX3DV4 - SN3547; ConvF(8.2, 8.2, 8.2); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - PCS GSM - Right Ear - Cheek/Touch - Mid Channel
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - PCS GSM - Right Ear - Cheek/Touch - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.34 V/m; Power Drift = -0.159 dB
Peak SAR (extrapolated) = 0.140 W/kg
SAR(1 g) = 0.0863 mW/g; SAR(10 g) = 0.051 mW/g



Date Tested: 08/17/2006

Head SAR - PCS GSM - Right Ear - Tilt Position (15º) - Internal Antenna - Ch. 661 - 1880.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

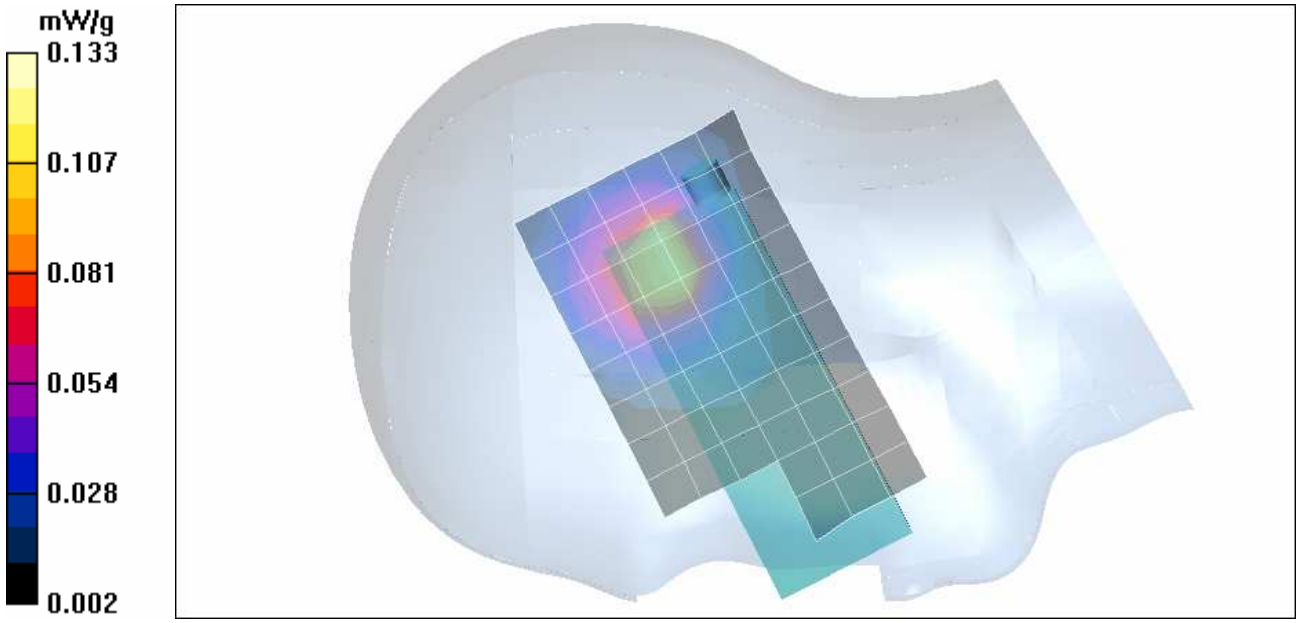
Ambient Temp: 23.8ºC; Fluid Temp: 23.2ºC; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: GSM 1900
RF Output Power: 30.0 dBm (Peak Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Frequency: 1880.0 MHz; Duty Cycle: 1:8.3
Medium: HSL1880 (σ = 1.41 mho/m; ε_r = 38.6; ρ = 1000 kg/m^3)

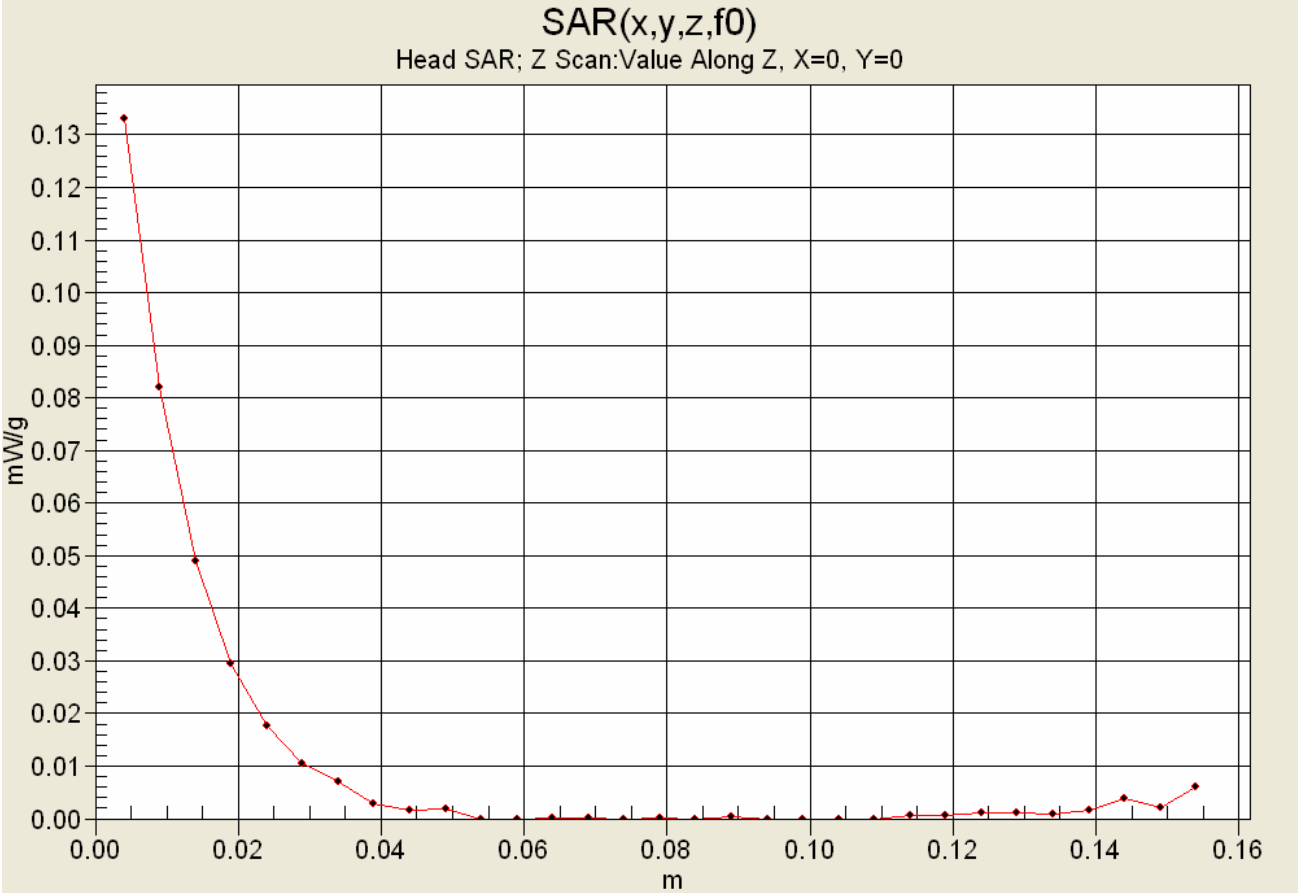
- Probe: EX3DV4 - SN3547; ConvF(8.2, 8.2, 8.2); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

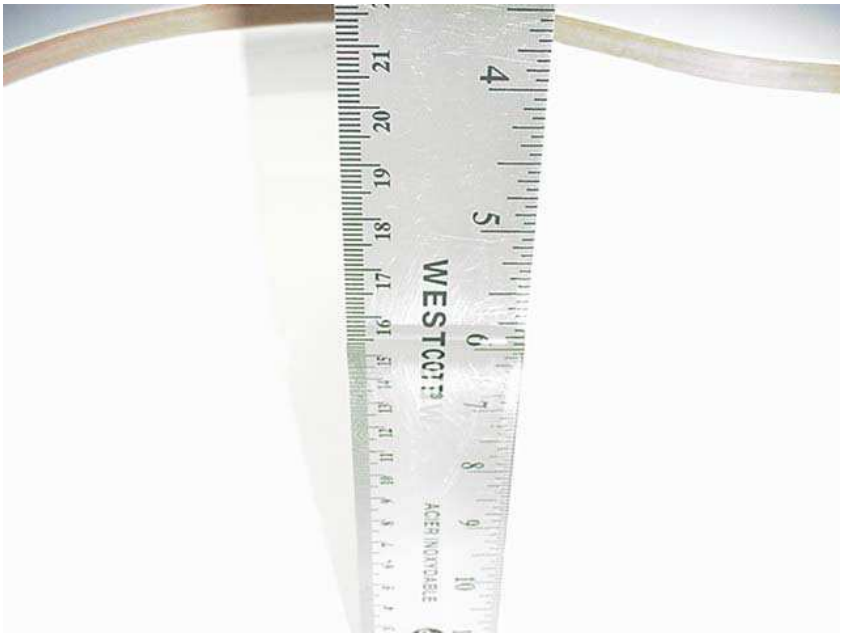
Head SAR - PCS GSM - Right Ear - Tilt Position (15º) - Mid Channel
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - PCS GSM - Right Ear - Tilt Position (15º) - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.99 V/m; Power Drift = -0.188 dB
Peak SAR (extrapolated) = 0.200 W/kg
SAR(1 g) = 0.120 mW/g; SAR(10 g) = 0.068 mW/g



Z-Axis Scan





Fluid Depth (≥ 15 cm)

Date Tested: 08/17/2006

Head SAR - PCS GSM - Left Ear - Cheek/Touch Position - Internal Antenna - Ch. 661 - 1880.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

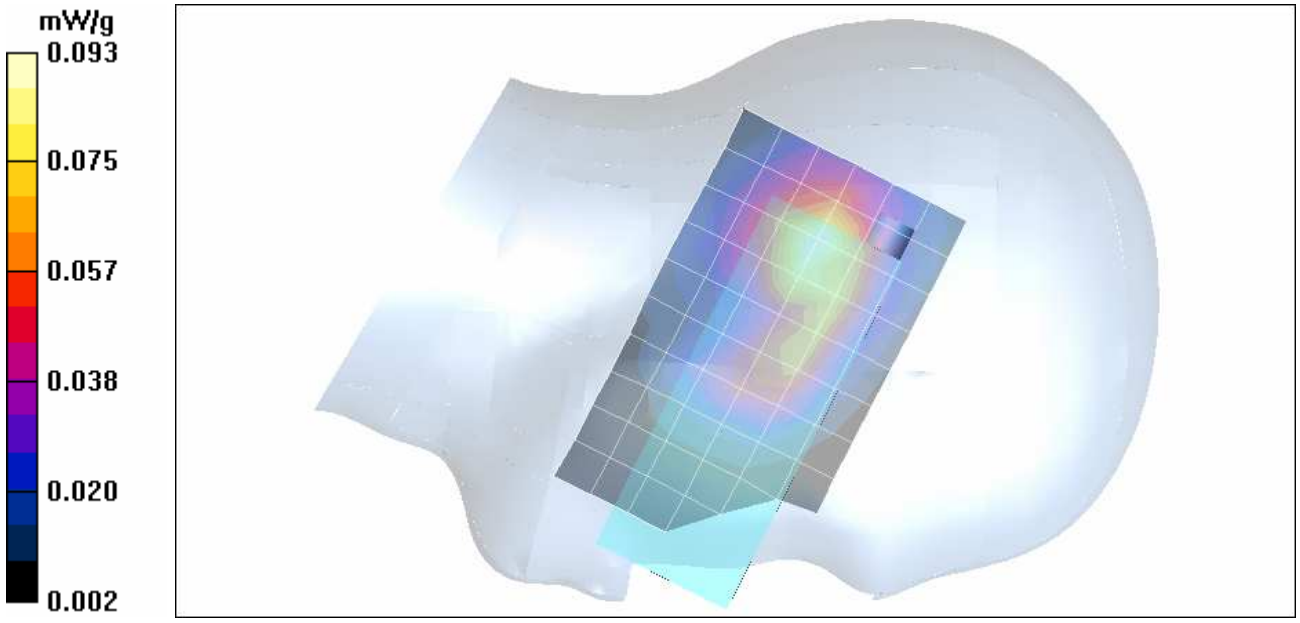
Ambient Temp: 23.8ºC; Fluid Temp: 23.2ºC; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: GSM 1900
RF Output Power: 30.0 dBm (Peak Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Frequency: 1880.0 MHz; Duty Cycle: 1:8.3
Medium: HSL1880 (σ = 1.41 mho/m; ε_r = 38.6; ρ = 1000 kg/m^3)

- Probe: EX3DV4 - SN3547; ConvF(8.2, 8.2, 8.2); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - PCS GSM - Left Ear - Cheek/Touch - Mid Channel
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - PCS GSM - Left Ear - Cheek/Touch - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.31 V/m; Power Drift = -0.169 dB
Peak SAR (extrapolated) = 0.131 W/kg
SAR(1 g) = 0.0842 mW/g; SAR(10 g) = 0.050 mW/g



Date Tested: 08/17/2006

Head SAR - PCS GSM - Left Ear - Tilt Position (15º) - Internal Antenna - Ch. 661 - 1880.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

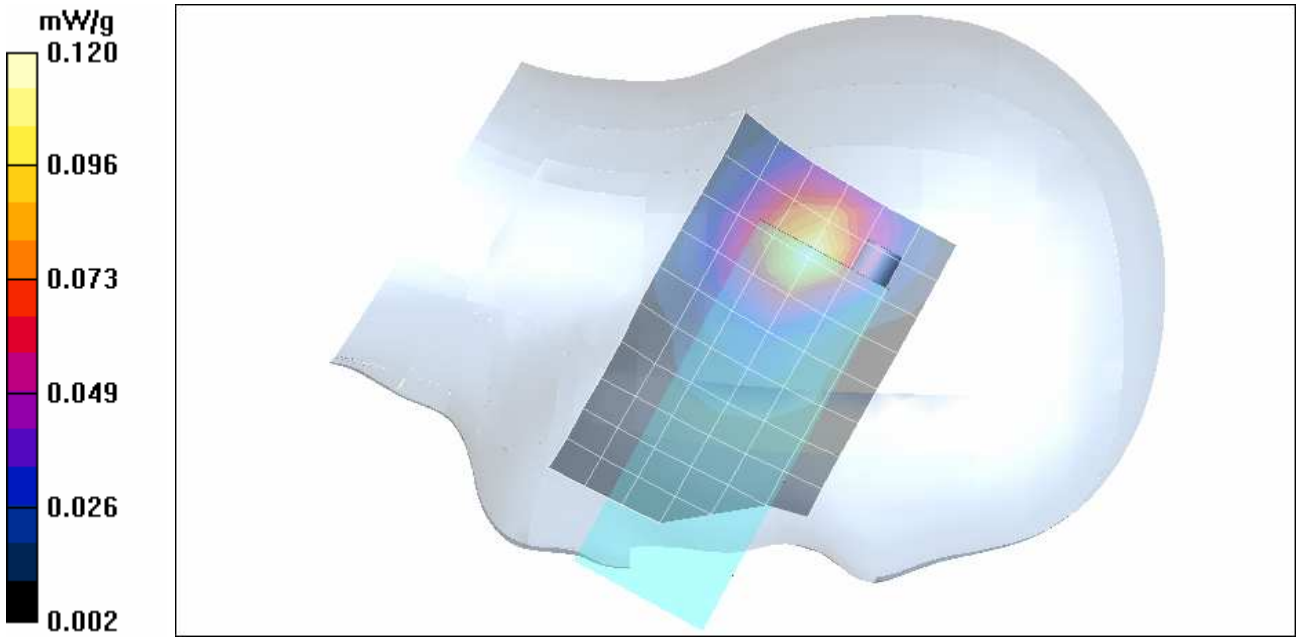
Ambient Temp: 23.8ºC; Fluid Temp: 23.2ºC; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: GSM 1900
RF Output Power: 30.0 dBm (Peak Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Frequency: 1880.0 MHz; Duty Cycle: 1:8.3
Medium: HSL1880 (σ = 1.41 mho/m; ε_r = 38.6; ρ = 1000 kg/m^3)

- Probe: EX3DV4 - SN3547; ConvF(8.2, 8.2, 8.2); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - PCS GSM - Left Ear - Tilt Position (15º) - Mid Channel
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - PCS GSM - Left Ear - Tilt Position (15º) - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.29 V/m; Power Drift = -0.108 dB
Peak SAR (extrapolated) = 0.188 W/kg
SAR(1 g) = 0.109 mW/g; SAR(10 g) = 0.063 mW/g



Date Tested: 08/17/2006

Head SAR - SAT Mode - Right Ear - Cheek/Touch Position - Antenna Extended - Ch. 544 - 1643.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

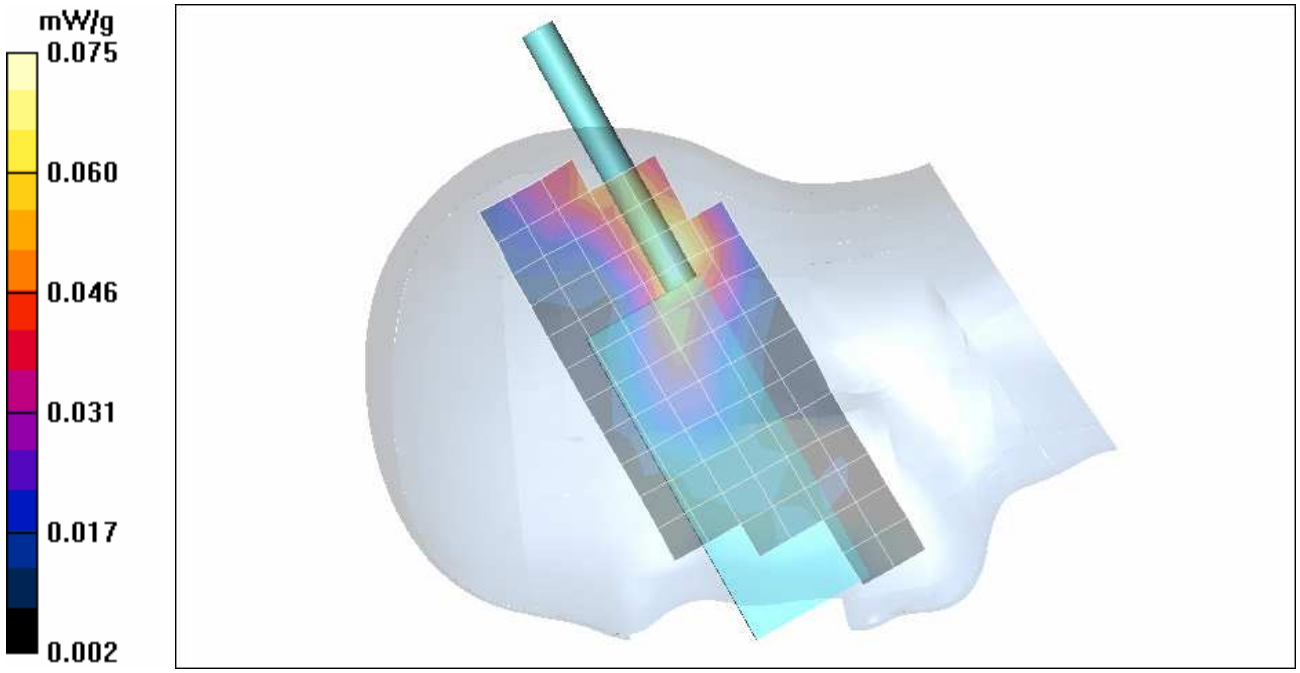
Ambient Temp: 23.7 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: SAT 1640
RF Output Power: 32.4 dBm (Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Frequency: 1643.0 MHz; Duty Cycle: 1:8.3
Medium: HSL1610 (σ = 1.35 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(5.4, 5.4, 5.4); Calibrated: 26/03/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - SAT Mode - Right Ear - Cheek/Touch Position - Antenna Extended - Mid Channel
Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - SAT Mode - Right Ear - Cheek/Touch Position - Antenna Extended - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.32 V/m; Power Drift = 0.0267 dB
Peak SAR (extrapolated) = 0.131 W/kg
SAR(1 g) = 0.0710 mW/g; SAR(10 g) = 0.044 mW/g



Date Tested: 08/17/2006

Head SAR - SAT Mode - Right Ear - Cheek/Touch Position - Antenna Retracted - Ch. 544 - 1643.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

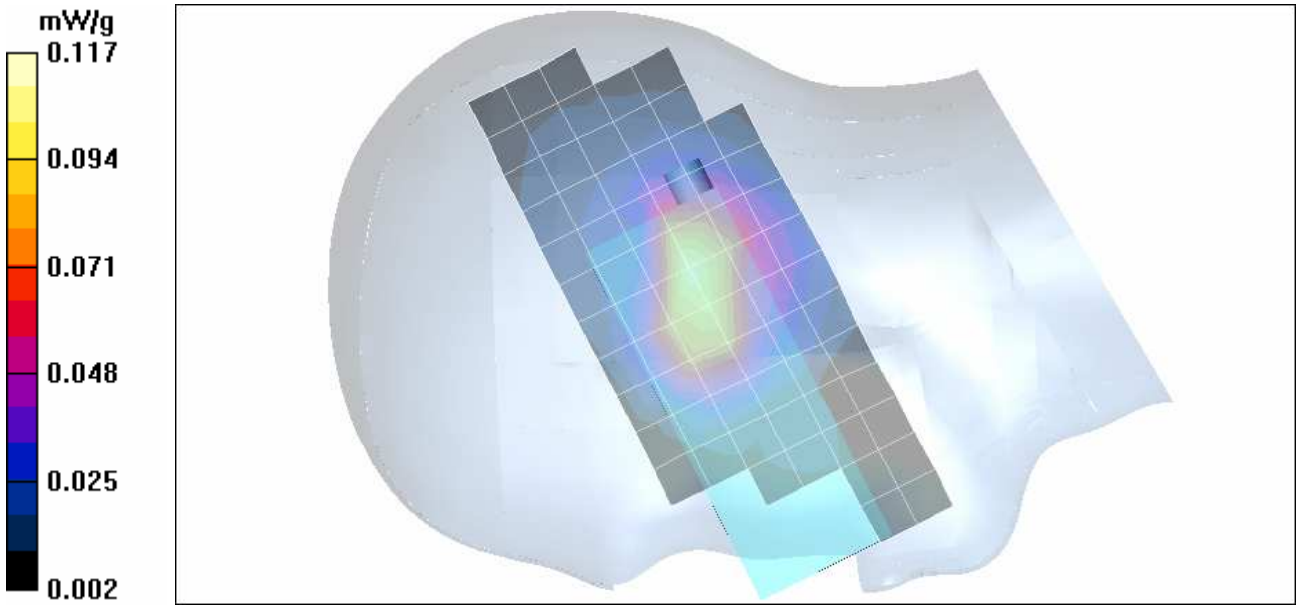
Ambient Temp: 23.7 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: SAT 1640
Frequency: 1643.0 MHz; Duty Cycle: 1:8.3
RF Output Power: 32.4 dBm (Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Medium: HSL1610 (σ = 1.35 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1387; ConvF(5.4, 5.4, 5.4); Calibrated: 26/03/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - SAT Mode - Right Ear - Cheek/Touch Position - Antenna Retracted - Mid Channel
Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - SAT Mode - Right Ear - Cheek/Touch Position - Antenna Retracted - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.09 V/m; Power Drift = -0.0846 dB
Peak SAR (extrapolated) = 0.172 W/kg
SAR(1 g) = 0.106 mW/g; SAR(10 g) = 0.064 mW/g



Date Tested: 08/17/2006

Head SAR - SAT Mode - Right Ear - Tilt Position (15°) - Antenna Extended - Ch. 544 - 1643.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

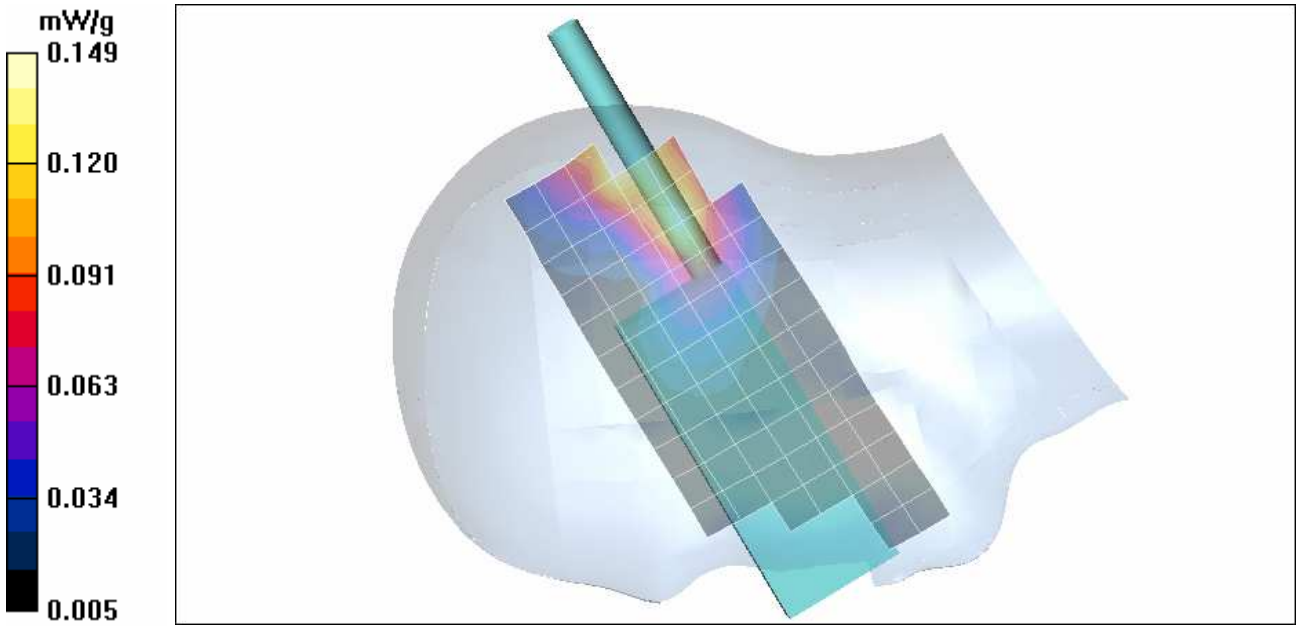
Ambient Temp: 23.7 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: SAT 1640
Frequency: 1643.0 MHz; Duty Cycle: 1:8.3
RF Output Power: 32.4 dBm (Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Medium: HSL1610 (σ = 1.35 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3

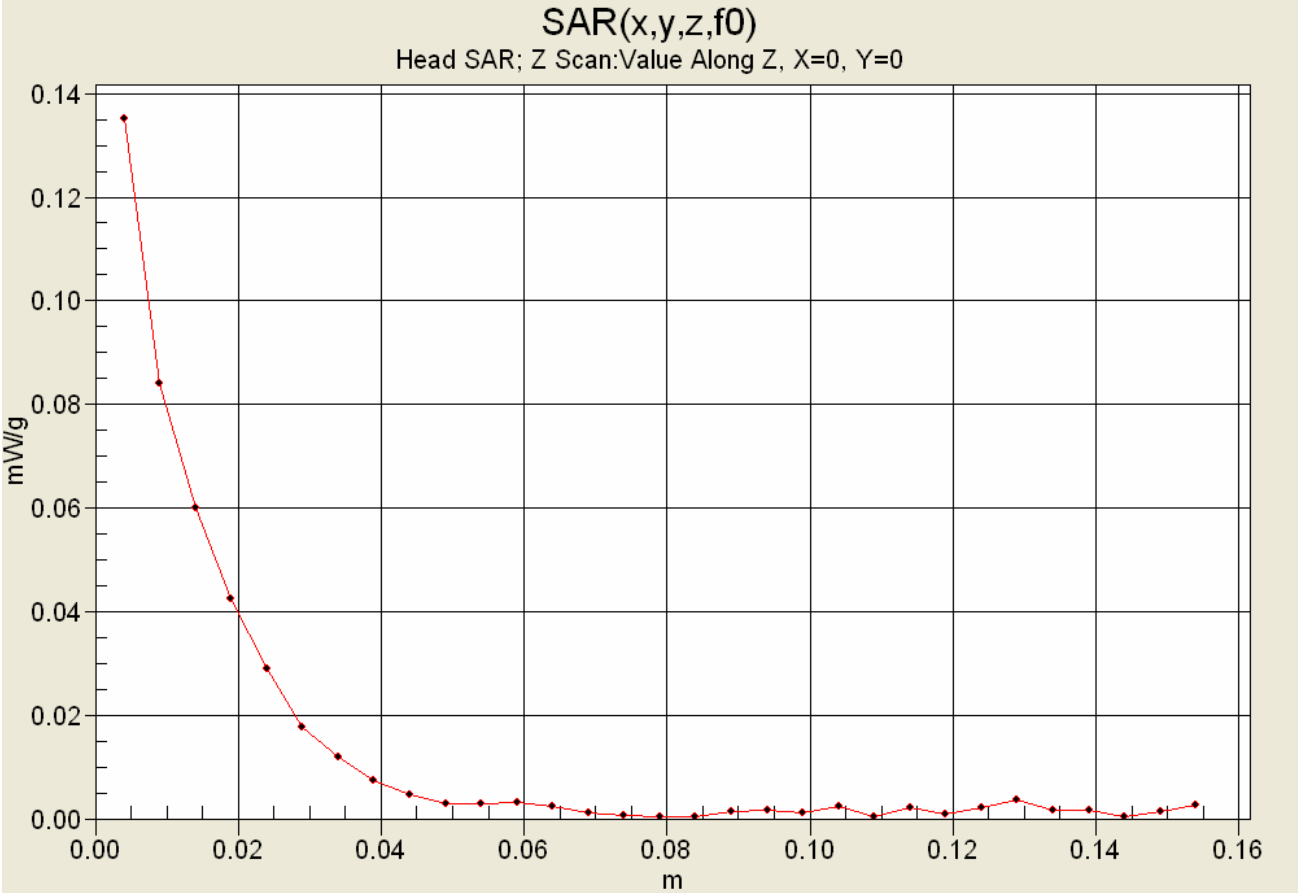
- Probe: ET3DV6 - SN1387; ConvF(5.4, 5.4, 5.4); Calibrated: 26/03/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

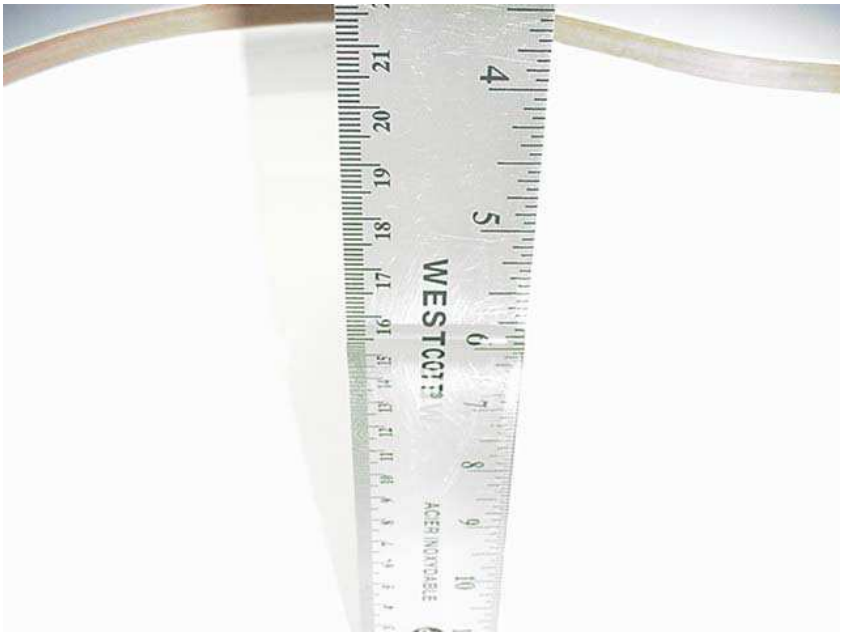
Head SAR - SAT Mode - Right Ear - Tilt Position (15°) - Antenna Extended - Mid Channel
Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - SAT Mode - Right Ear - Tilt Position (15°) - Antenna Extended - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.3 V/m; Power Drift = -0.119 dB
Peak SAR (extrapolated) = 0.276 W/kg
SAR(1 g) = 0.135 mW/g; SAR(10 g) = 0.085 mW/g



Z-Axis Scan





Fluid Depth (≥ 15 cm)

Date Tested: 08/17/2006

Head SAR - SAT Mode - Right Ear - Tilt Position (15°) - Antenna Retracted - Ch. 544 - 1643.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

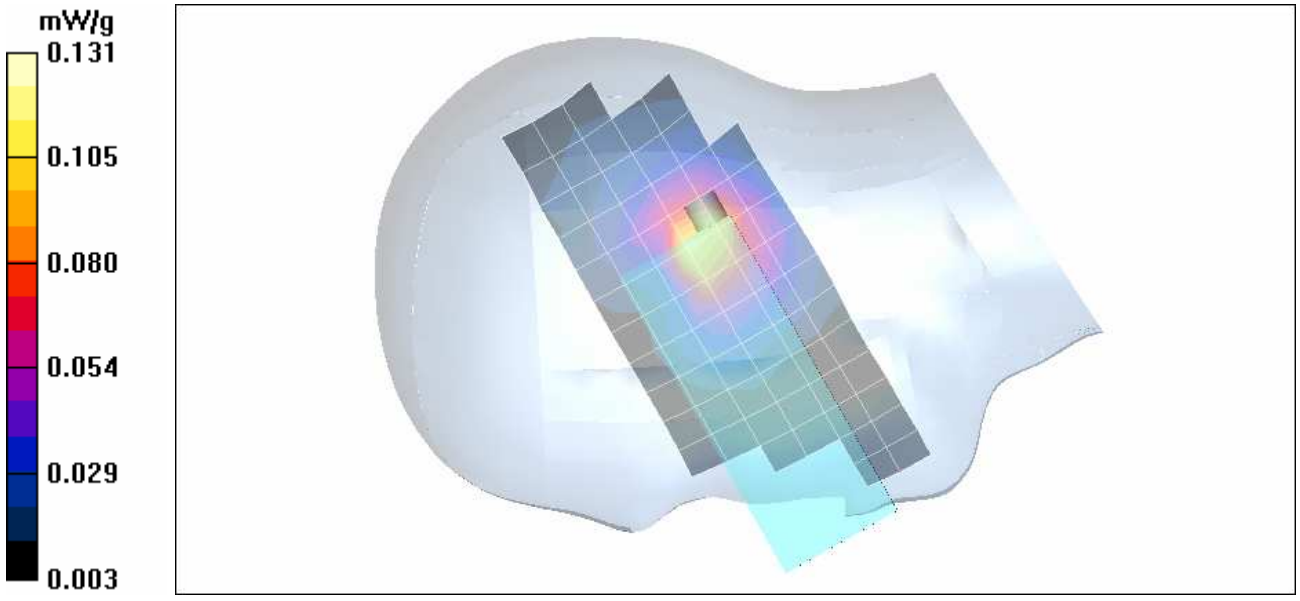
Ambient Temp: 23.7 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: SAT 1640
Frequency: 1643.0 MHz; Duty Cycle: 1:8.3
RF Output Power: 32.4 dBm (Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Medium: HSL1610 (σ = 1.35 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(5.4, 5.4, 5.4); Calibrated: 26/03/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - SAT Mode - Right Ear - Tilt Position (15°) - Antenna Retracted - Mid Channel
Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - SAT Mode - Right Ear - Tilt Position (15°) - Antenna Retracted - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.82 V/m; Power Drift = 0.0114 dB
Peak SAR (extrapolated) = 0.213 W/kg
SAR(1 g) = 0.117 mW/g; SAR(10 g) = 0.067 mW/g



Date Tested: 08/16/2006

Head SAR - SAT Mode - Left Ear - Cheek/Touch Position - Antenna Extended - Ch. 544 - 1643.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

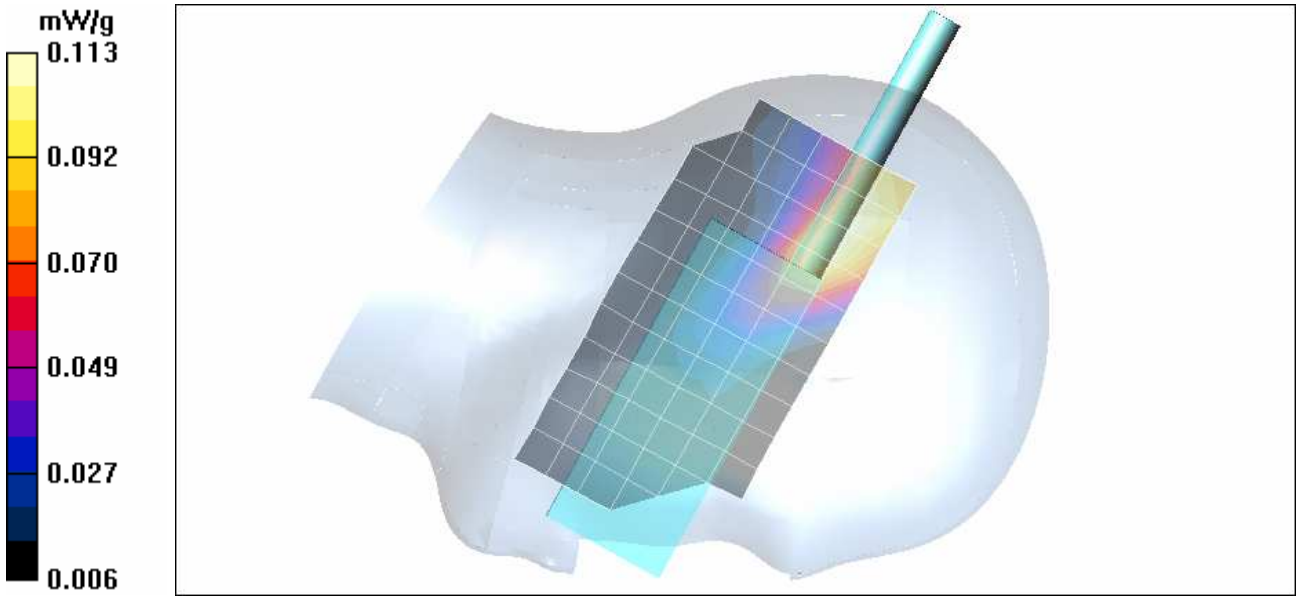
Ambient Temp: 23.7 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: SAT 1640
Frequency: 1643.0 MHz; Duty Cycle: 1:8.3
RF Output Power: 32.4 dBm (Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Medium: HSL1610 (σ = 1.34 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(5.4, 5.4, 5.4); Calibrated: 26/03/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - SAT Mode - Left Ear - Cheek/Touch Position - Antenna Extended - Mid Channel
Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - SAT Mode - Left Ear - Cheek/Touch Position - Antenna Extended - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.38 V/m; Power Drift = -0.0737 dB
Peak SAR (extrapolated) = 0.200 W/kg
SAR(1 g) = 0.106 mW/g; SAR(10 g) = 0.067 mW/g



Date Tested: 08/16/2006

Head SAR - SAT Mode - Left Ear - Cheek/Touch Position - Antenna Retracted - Ch. 544 - 1643.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

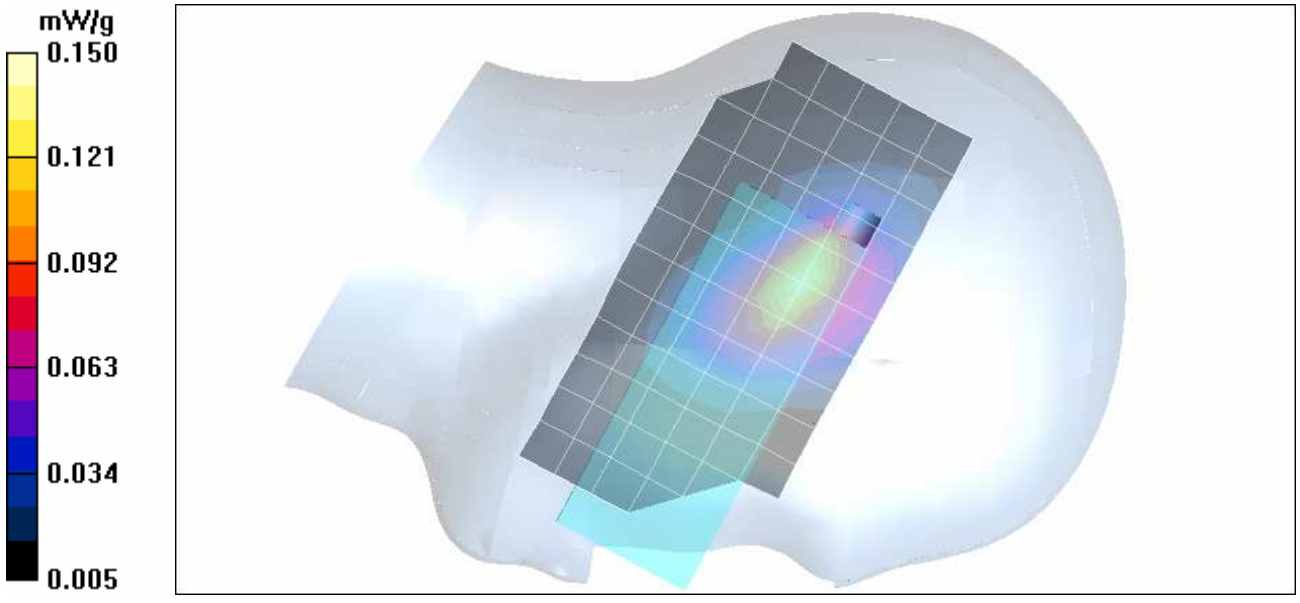
Ambient Temp: 23.7 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: SAT 1640
Frequency: 1643.0 MHz; Duty Cycle: 1:8.3
RF Output Power: 32.4 dBm (Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Medium: HSL1610 (σ = 1.34 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(5.4, 5.4, 5.4); Calibrated: 26/03/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - SAT Mode - Left Ear - Cheek/Touch Position - Antenna Retracted - Mid Channel
Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - SAT Mode - Left Ear - Cheek/Touch Position - Antenna Retracted - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.1 V/m; Power Drift = 0.0120 dB
Peak SAR (extrapolated) = 0.252 W/kg
SAR(1 g) = 0.135 mW/g; SAR(10 g) = 0.082 mW/g



Date Tested: 08/16/2006

Head SAR - SAT Mode - Left Ear - Tilt Position (15°) - Antenna Extended - Ch. 544 - 1643.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

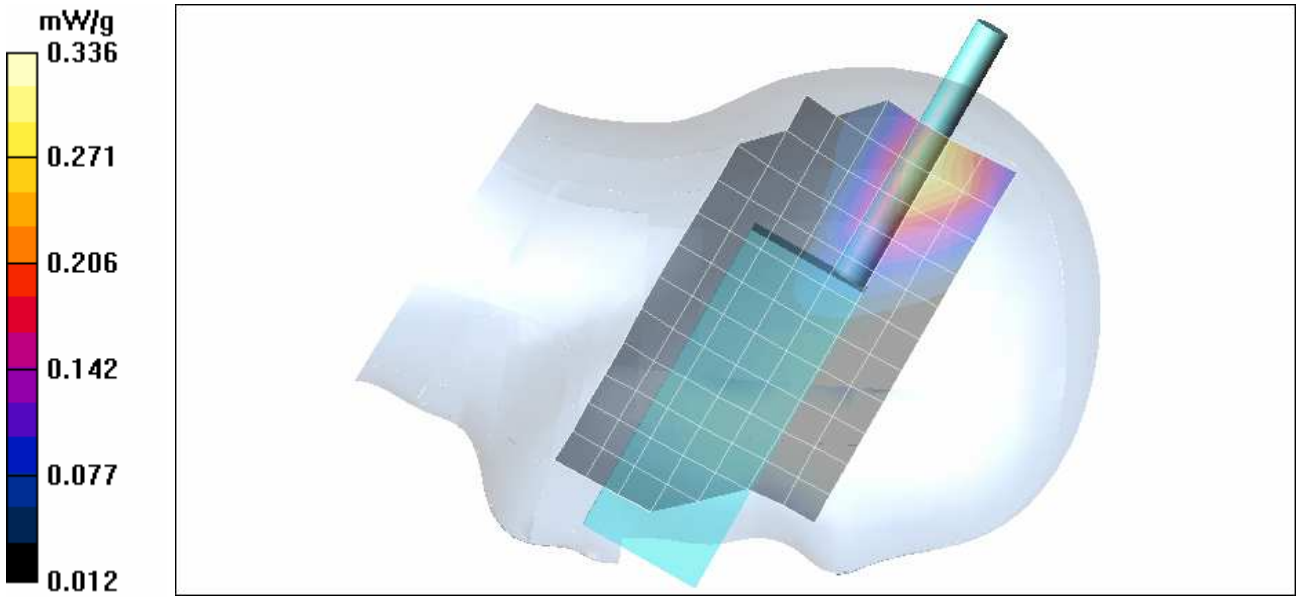
Ambient Temp: 23.7 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: SAT 1640
Frequency: 1643.0 MHz; Duty Cycle: 1:8.3
RF Output Power: 32.4 dBm (Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Medium: HSL1610 (σ = 1.34 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3)

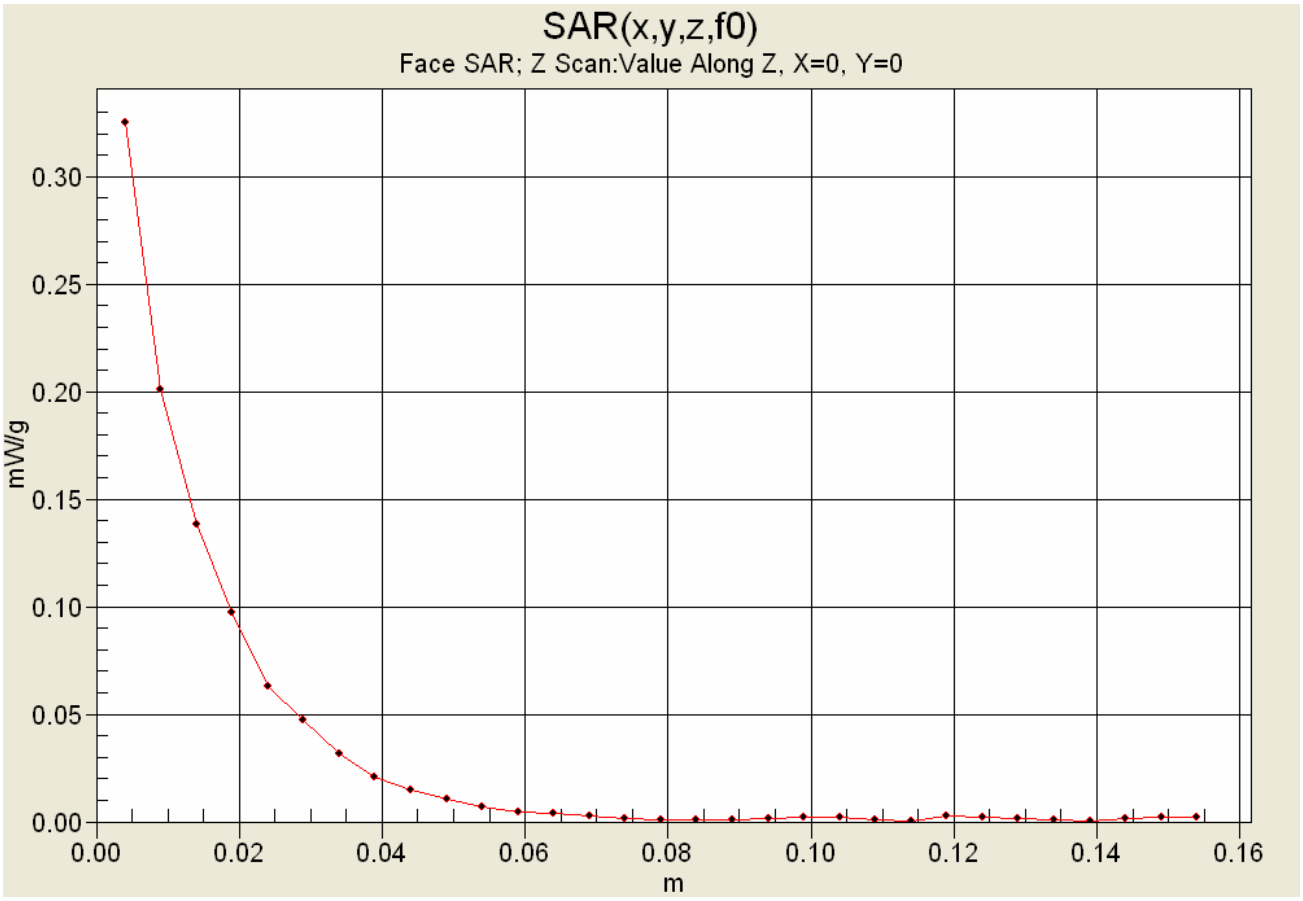
- Probe: ET3DV6 - SN1387; ConvF(5.4, 5.4, 5.4); Calibrated: 26/03/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - SAT Mode - Left Ear - Tilt Position (15°) - Antenna Extended - Mid Channel
Area Scan (8x15x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - SAT Mode - Left Ear - Tilt Position (15°) - Antenna Extended - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.53 V/m; Power Drift = -0.189 dB
Peak SAR (extrapolated) = 0.608 W/kg
SAR(1 g) = 0.314 mW/g; SAR(10 g) = 0.193 mW/g



Z-Axis Scan



Fluid Depth (≥ 15 cm)

Date Tested: 08/16/2006

Head SAR - SAT Mode - Left Ear - Tilt Position (15°) - Antenna Retracted - Ch. 544 - 1643.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

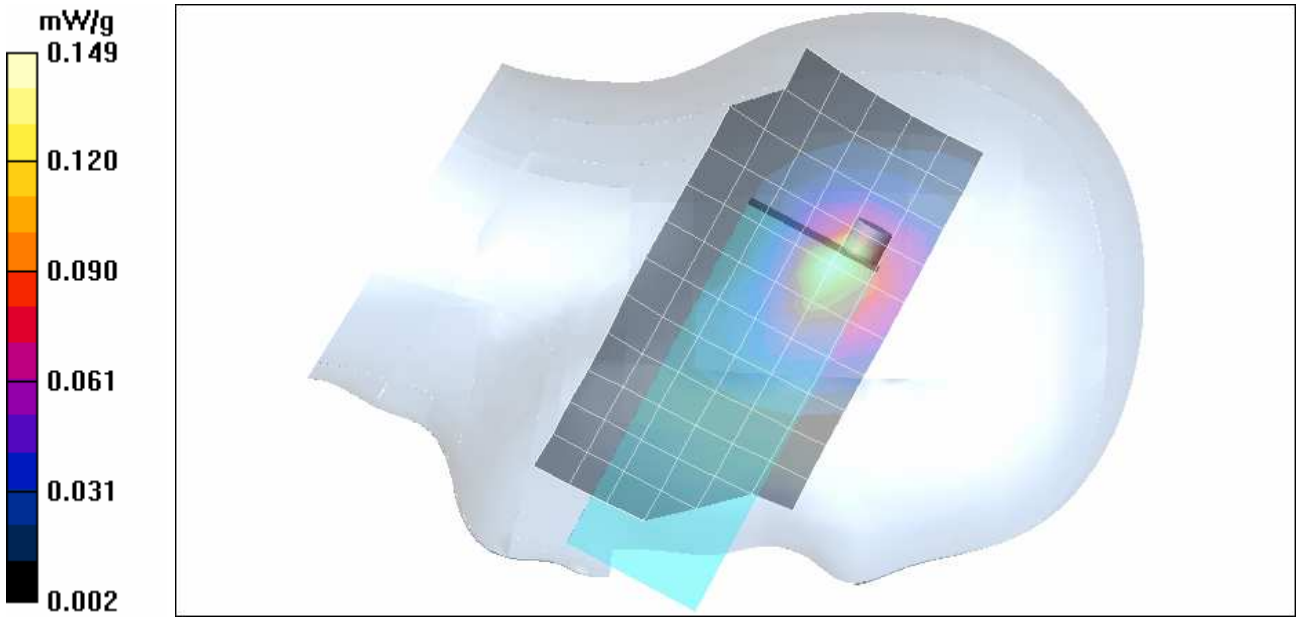
Ambient Temp: 23.7 °C; Fluid Temp: 23.0 °C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: SAT 1640
Frequency: 1643.0 MHz; Duty Cycle: 1:8.3
RF Output Power: 32.4 dBm (Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Medium: HSL1610 (σ = 1.34 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(5.4, 5.4, 5.4); Calibrated: 26/03/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - SAT Mode - Left Ear - Tilt Position (15°) - Antenna Retracted - Mid Channel
Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

Head SAR - SAT Mode - Left Ear - Tilt Position (15°) - Antenna Retracted - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.03 V/m; Power Drift = 0.0159 dB
Peak SAR (extrapolated) = 0.256 W/kg
SAR(1 g) = 0.138 mW/g; SAR(10 g) = 0.079 mW/g



Date Tested: 08/18/2006

Body-Worn SAR - PCS GPRS - Front Side of DUT (1.5 cm) - Internal Antenna - Ch. 661 - 1880.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

Body-Worn Accessory: None (1.5 cm air-gap spacing); Audio Accessory: Generic Ear-Microphone

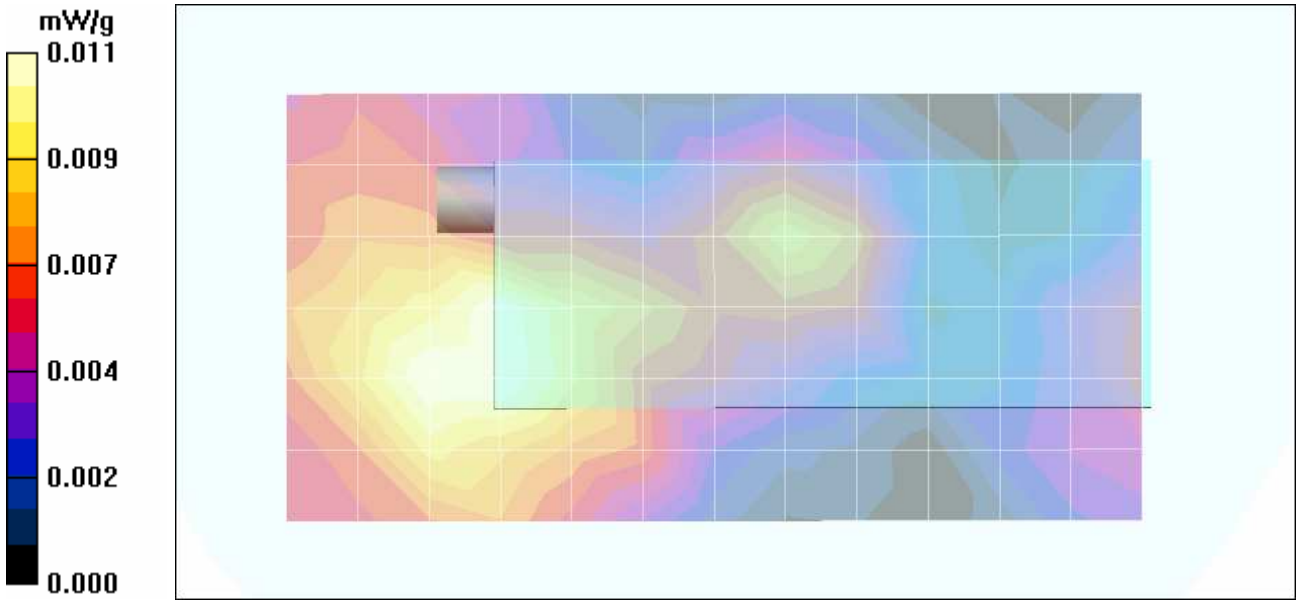
Ambient Temp: 24.4°C; Fluid Temp: 23.8°C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: GPRS 1900
RF Output Power: 30.0 dBm (Peak Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Frequency: 1880.0 MHz; Duty Cycle: 1:4.16
Medium: M1880 (σ = 1.51 mho/m; ε_r = 50.9; ρ = 1000 kg/m^3)

- Probe: EX3DV4 - SN3547; ConvF(7.84, 7.84, 7.84); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-Worn SAR - PCS GPRS - 1.5 cm Air-Gap Spacing from Front of DUT to Planar Phantom - Mid Channel
Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

Body-Worn SAR - PCS GPRS - 1.5 cm Air-Gap Spacing from Front of DUT to Planar Phantom - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.28 V/m; Power Drift = -0.0938 dB
Peak SAR (extrapolated) = 0.018 W/kg
SAR(1 g) = 0.00997 mW/g; SAR(10 g) = 0.00598 mW/g



Date Tested: 08/18/2006

Body-Worn SAR - PCS GPRS - Back Side of DUT (1.5 cm) - Internal Antenna - Ch. 661 - 1880.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

Body-Worn Accessory: None (1.5 cm air-gap spacing); Audio Accessory: Generic Ear-Microphone

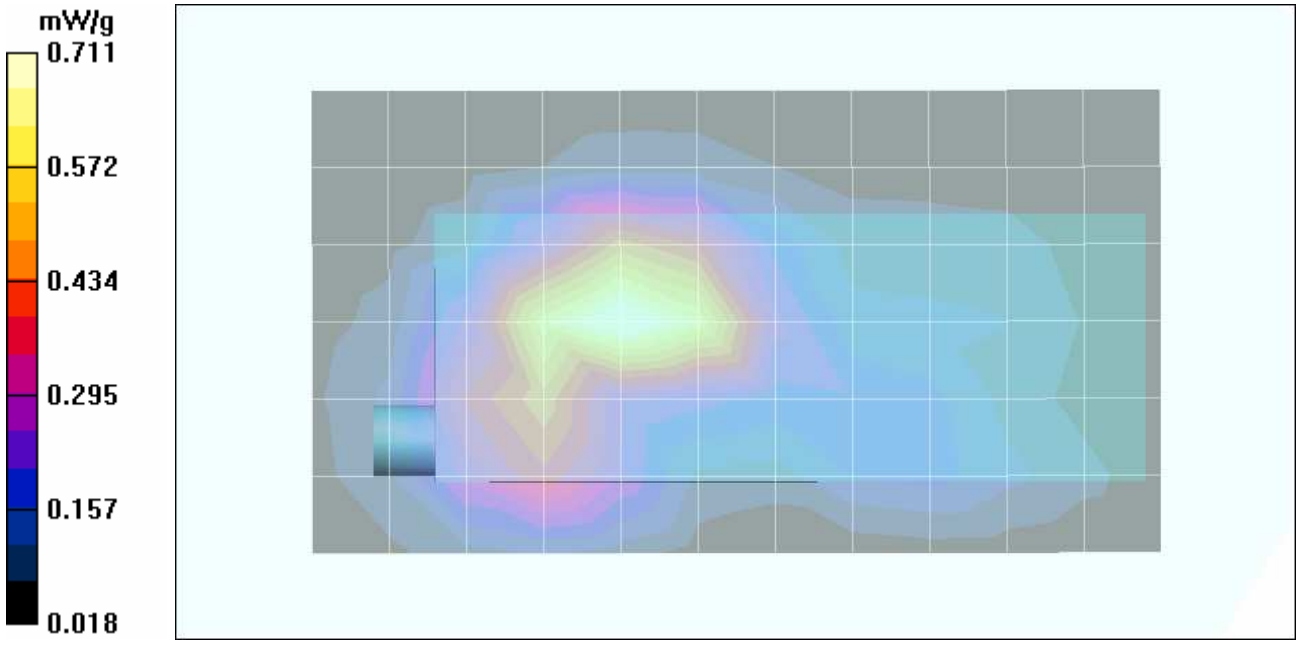
Ambient Temp: 24.4°C; Fluid Temp: 23.8°C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: GPRS 1900
RF Output Power: 30.0 dBm (Peak Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Frequency: 1880.0 MHz; Duty Cycle: 1:4.16
Medium: M1880 (σ = 1.51 mho/m; ε_r = 50.9; ρ = 1000 kg/m^3)

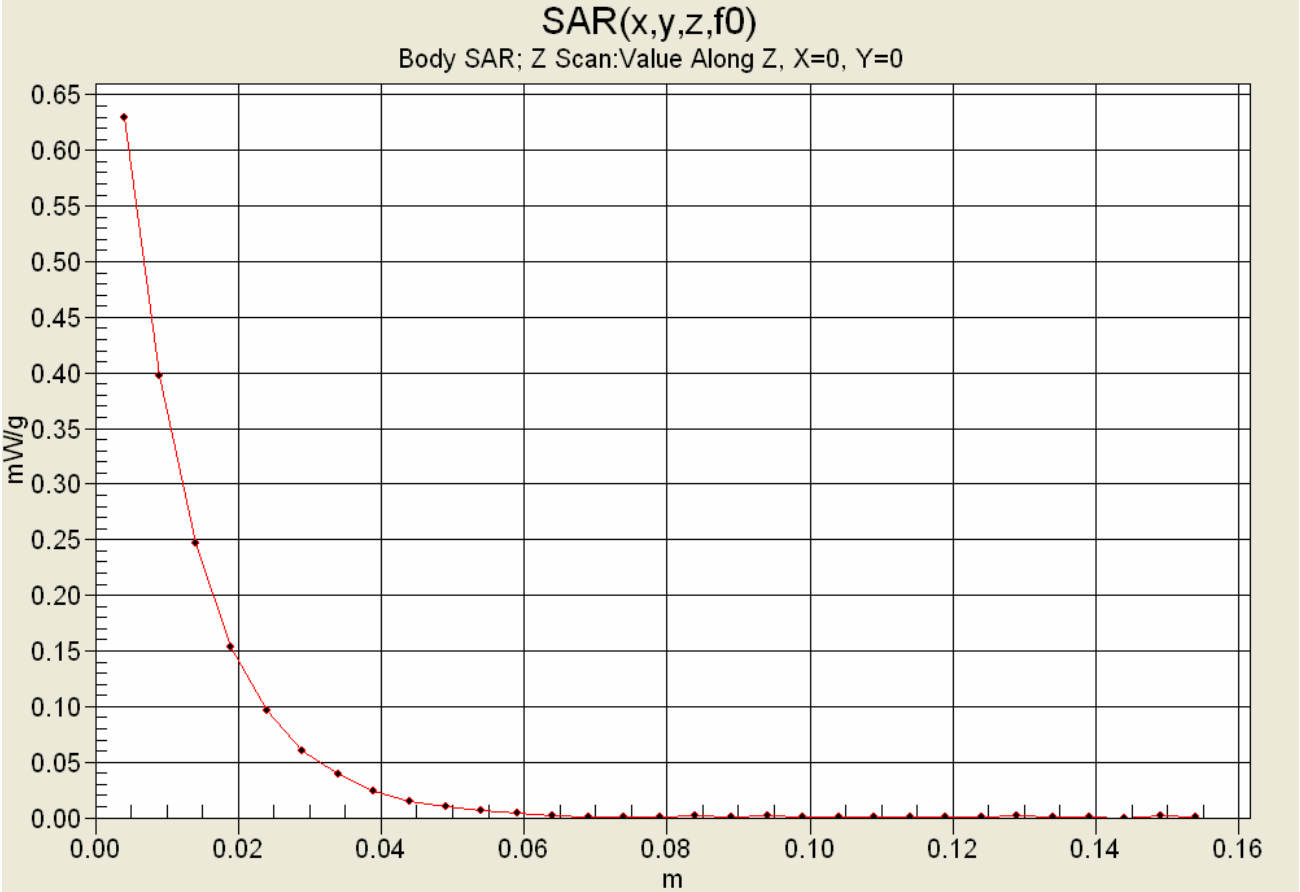
- Probe: EX3DV4 - SN3547; ConvF(7.84, 7.84, 7.84); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-Worn SAR - PCS GPRS - 1.5 cm Air-Gap Spacing from Back of DUT to Planar Phantom - Mid Channel
Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

Body-Worn SAR - PCS GPRS - 1.5 cm Air-Gap Spacing from Back of DUT to Planar Phantom - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.6 V/m; Power Drift = -0.133 dB
Peak SAR (extrapolated) = 1.06 W/kg
SAR(1 g) = 0.649 mW/g; SAR(10 g) = 0.369 mW/g



Z-Axis Scan



Date Tested: 08/18/2006

Body-Worn SAR - PCS GSM - Back Side of DUT (1.5 cm) - Internal Antenna - Ch. 661 - 1880.0 MHz

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

Body-Worn Accessory: None (1.5 cm air-gap spacing); Audio Accessory: Generic Ear-Microphone

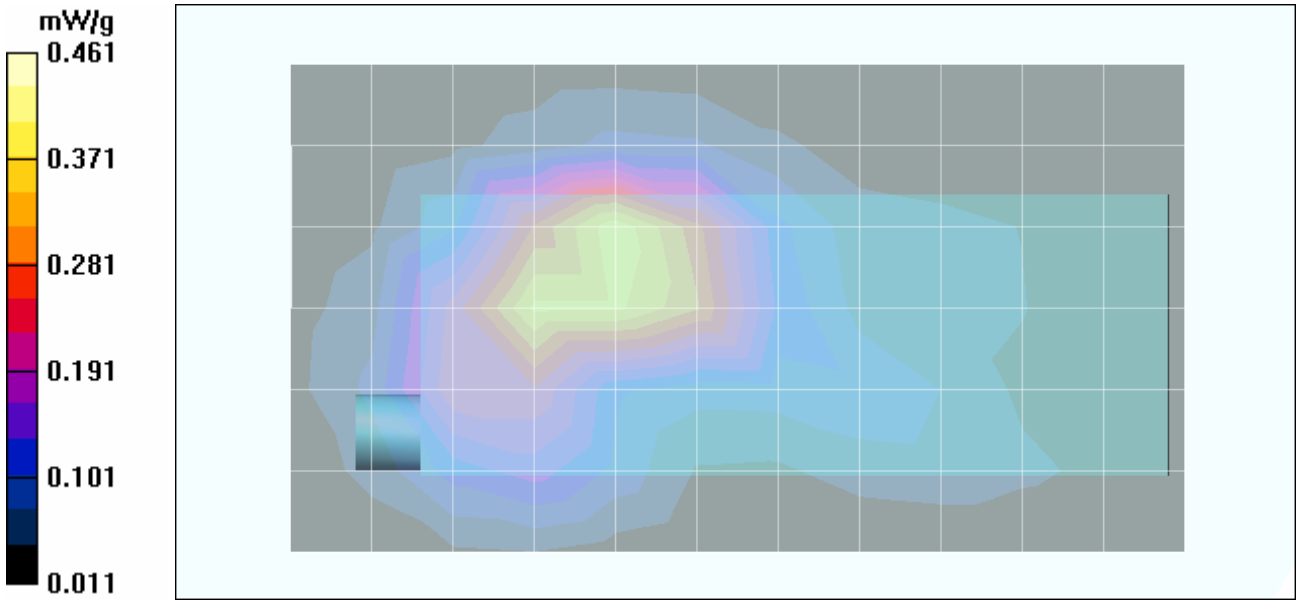
Ambient Temp: 24.4°C; Fluid Temp: 23.8°C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: GSM 1900
RF Output Power: 30.0 dBm (Peak Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Frequency: 1880.0 MHz; Duty Cycle: 1:8.3
Medium: M1880 (σ = 1.51 mho/m; ε_r = 50.9; ρ = 1000 kg/m^3)

- Probe: EX3DV4 - SN3547; ConvF(7.84, 7.84, 7.84); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-Worn SAR - PCS GSM - 1.5 cm Air-Gap Spacing from Back of DUT to Planar Phantom - Mid Channel
Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

Body-Worn SAR - PCS GSM - 1.5 cm Air-Gap Spacing from Back of DUT to Planar Phantom - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.6 V/m; Power Drift = -0.0630 dB
Peak SAR (extrapolated) = 0.679 W/kg
SAR(1 g) = 0.418 mW/g; SAR(10 g) = 0.238 mW/g



Date Tested: 09/25/2006

Body-Worn SAR - PCS GPRS - Back Side of DUT (1.5 cm) - Internal Antenna - Ch. 661 - 1880.0 MHz Simultaneous Transmit with Co-located Bluetooth

DUT: APSI Thuraya; Model: SG-2520; Type: Portable SAT/GSM Dual Mode Hand Held Terminal; Serial: 35601300-060304-6

Body-Worn Accessory: None (1.5 cm air-gap spacing); Audio Accessory: Generic Ear-Microphone

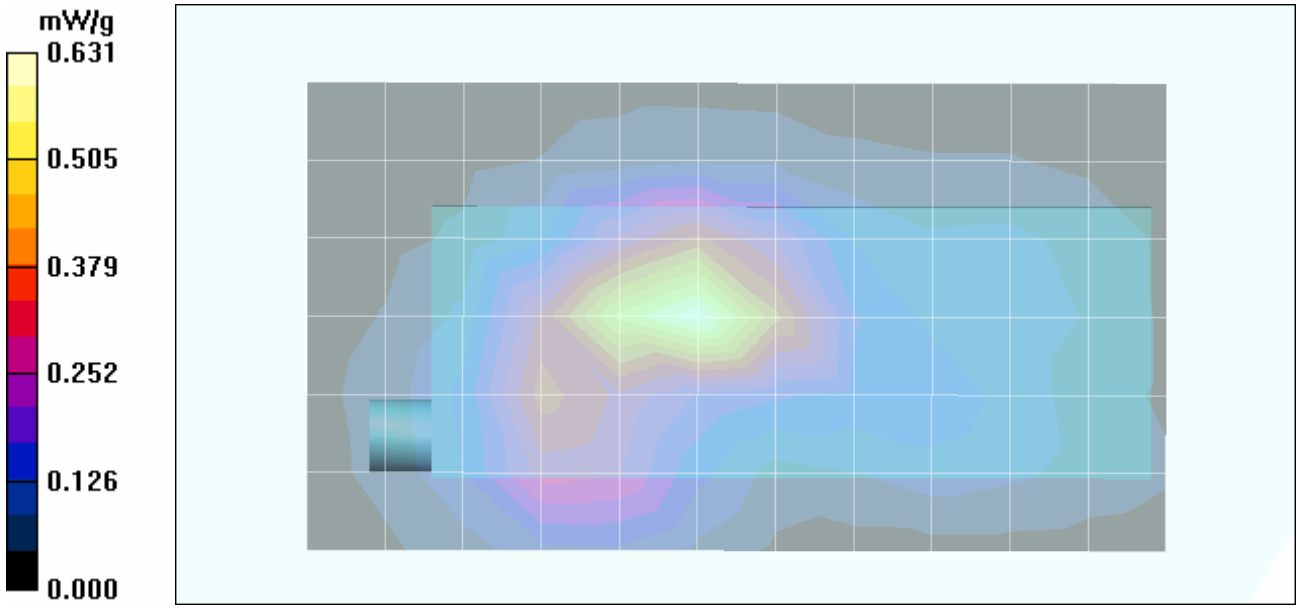
Ambient Temp: 24.3°C; Fluid Temp: 23.7°C; Barometric Pressure: 102.9 kPa; Humidity: 31%

Communication System: GPRS 1900
RF Output Power: 30.0 dBm (Peak Conducted)
3.7V Lithium-Polymer Battery Pack (SG-2520)
Frequency: 1880.0 MHz; Duty Cycle: 1:4.16
RF Output Power: 4 dBm (Conducted) Bluetooth
Communication System: Modulated Fixed Frequency (Bluetooth)
Frequency: 2441 MHz; Duty Cycle: 1:1 (Bluetooth)
Medium: M1880 (σ = 1.46 mho/m; ε_r = 51.2; ρ = 1000 kg/m^3)

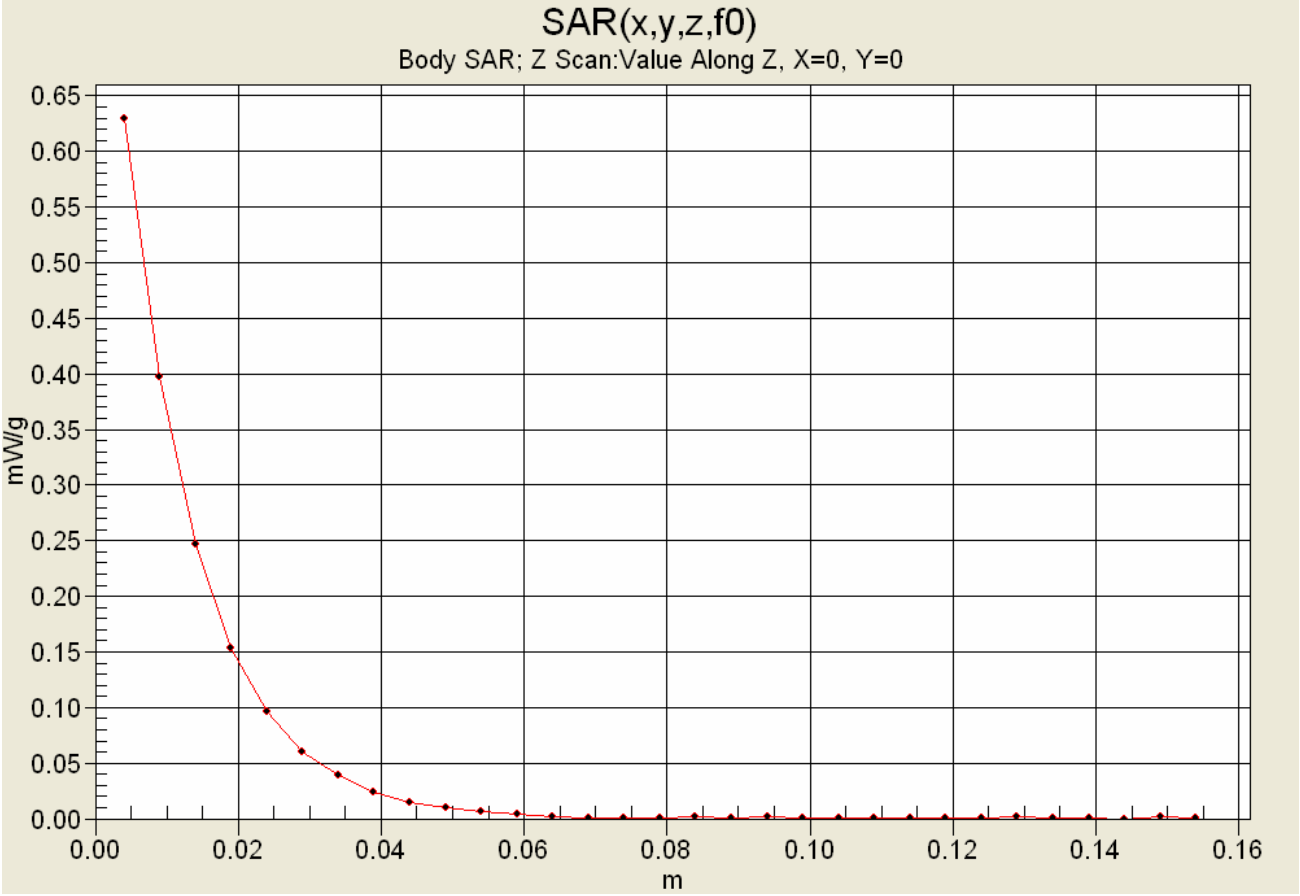
- Probe: EX3DV4 - SN3547; ConvF(7.84, 7.84, 7.84); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-Worn SAR - PCS GPRS & Bluetooth - 1.5 cm Air-Gap Spacing from Back of DUT to Planar Phantom - Mid Channel
Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm

Body-Worn SAR - PCS GPRS & Bluetooth - 1.5 cm Air-Gap Spacing from Back of DUT to Planar Phantom - Mid Channel
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 18.4 V/m; Power Drift = -0.0970 dB
Peak SAR (extrapolated) = 1.20 W/kg
SAR(1 g) = 0.599 mW/g; SAR(10 g) = 0.337 mW/g



Z-Axis Scan



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 08/16/2006

System Performance Check (Brain) - 1640 MHz Dipole

DUT: Dipole 1640 MHz; Model: IXD-164; Serial: 0175; Validation: 08/14/2006

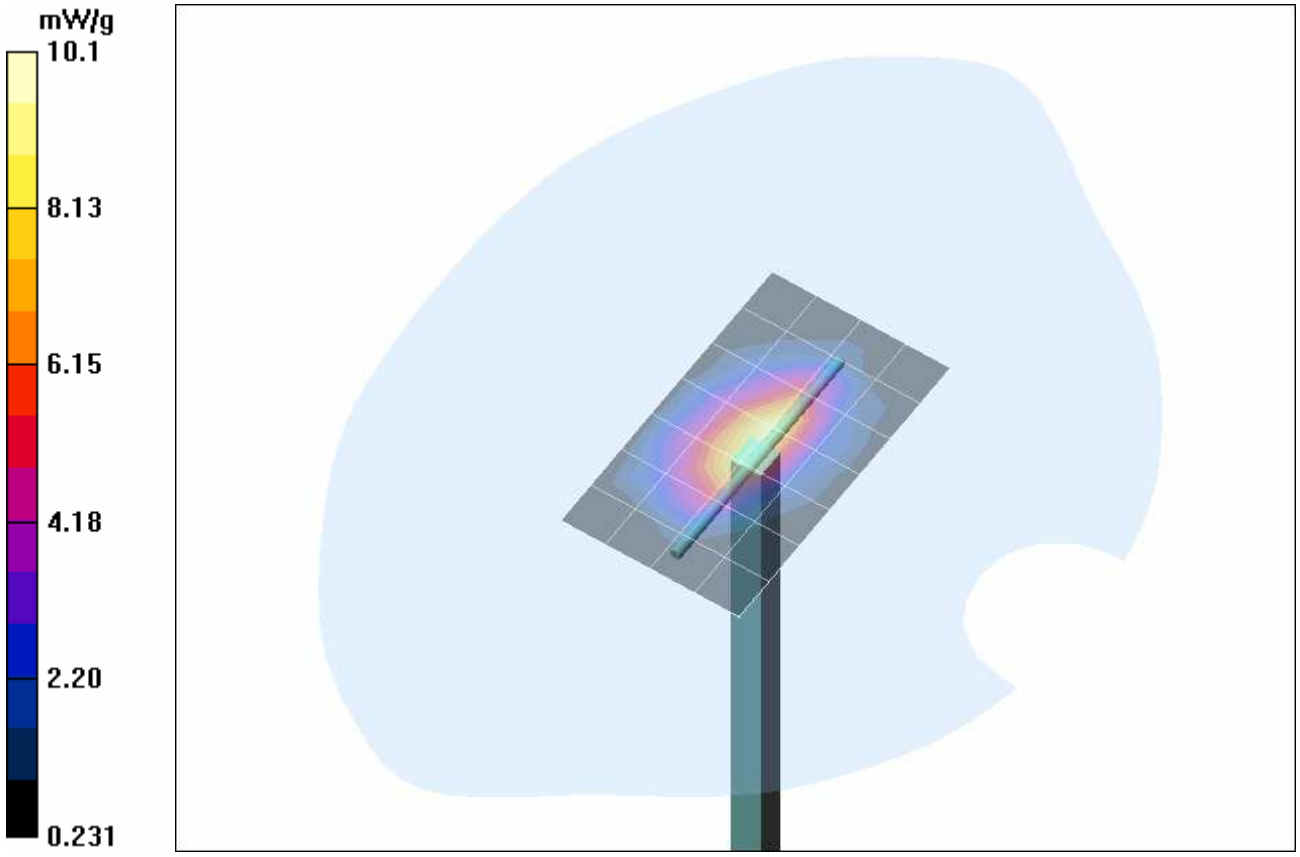
Ambient Temp: 23.7°C; Fluid Temp: 23.0°C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1640 MHz; Duty Cycle: 1:1
Medium: HSL1640 (σ = 1.34 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3)

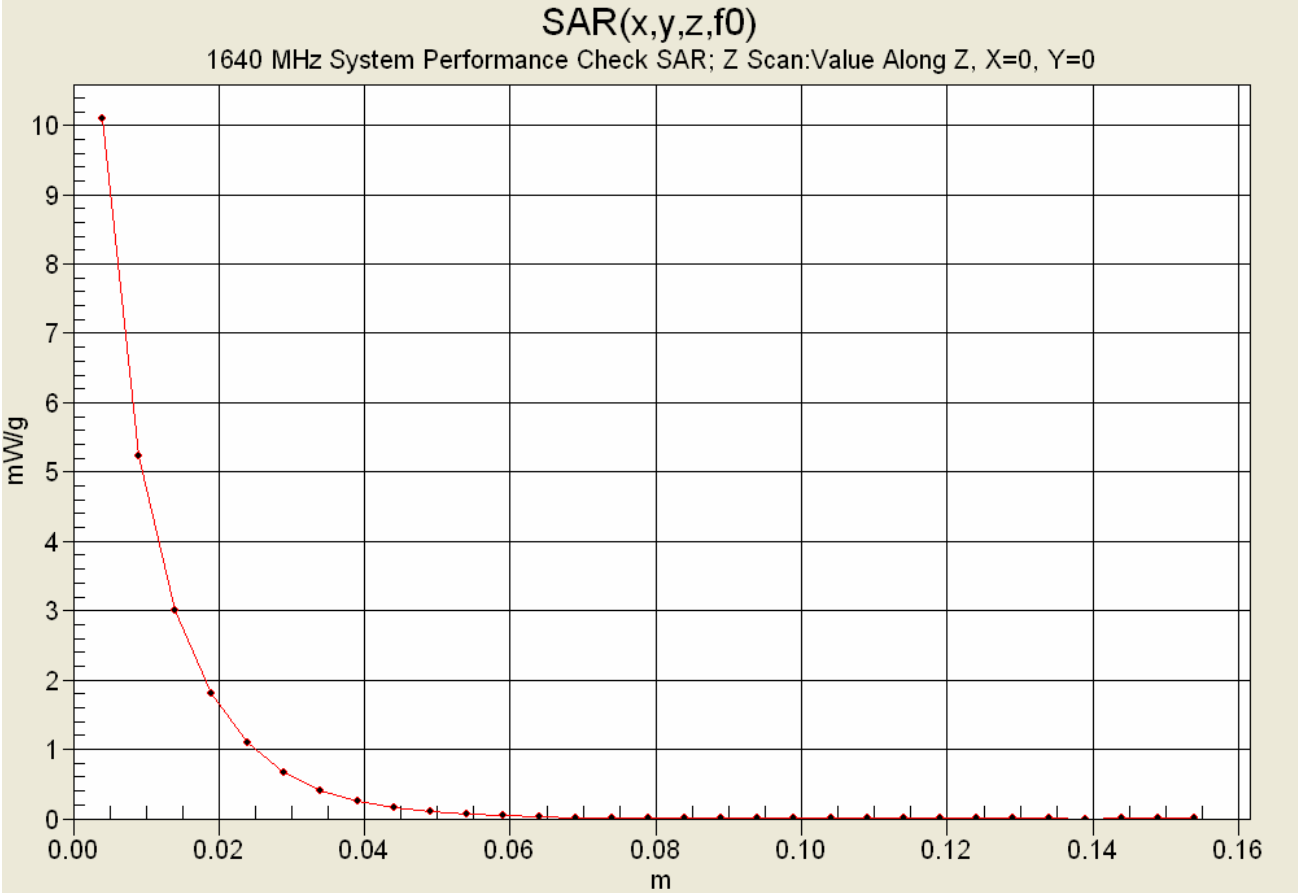
- Probe: ET3DV6 - SN1387; ConvF(5.4, 5.4, 5.4); Calibrated: 16/03/2006
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

1640 MHz Dipole - System Performance Check/Area Scan (5x8x1):
Measurement grid: dx=15mm, dy=15mm

1640 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 85.9 V/m; Power Drift = -0.082 dB
Peak SAR (extrapolated) = 19.6 W/kg
SAR(1 g) = 9.20 mW/g; SAR(10 g) = 4.8 mW/g



Z-Axis Scan



Date Tested: 08/17/2006

System Performance Check (Brain) - 1900 MHz Dipole

DUT: Dipole 1900 MHz; Model: D1900V2; Serial: 151; Validation: 06/09/2006

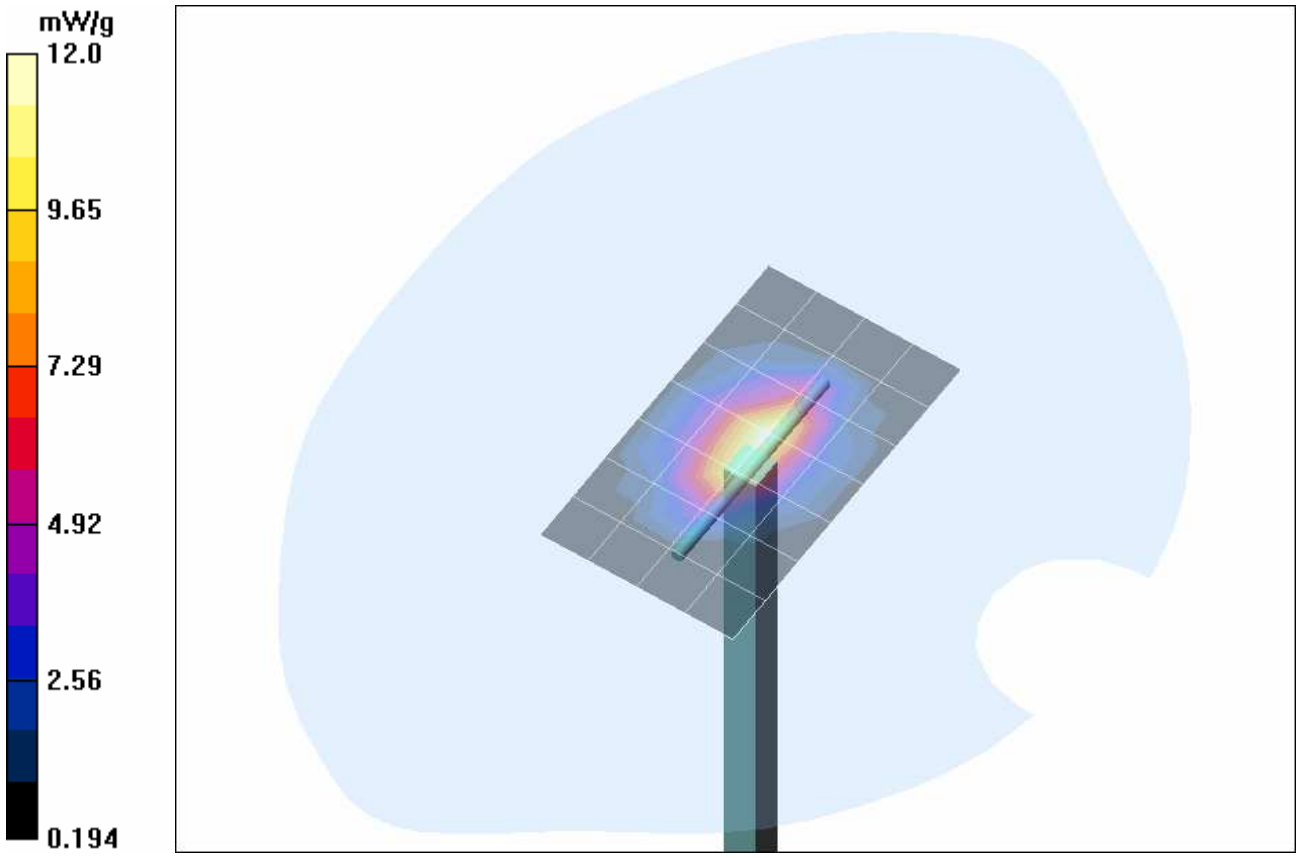
Ambient Temp: 24.0ºC; Fluid Temp: 23.2ºC; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 (σ = 1.43 mho/m; ε_r = 38.4; ρ = 1000 kg/m^3)

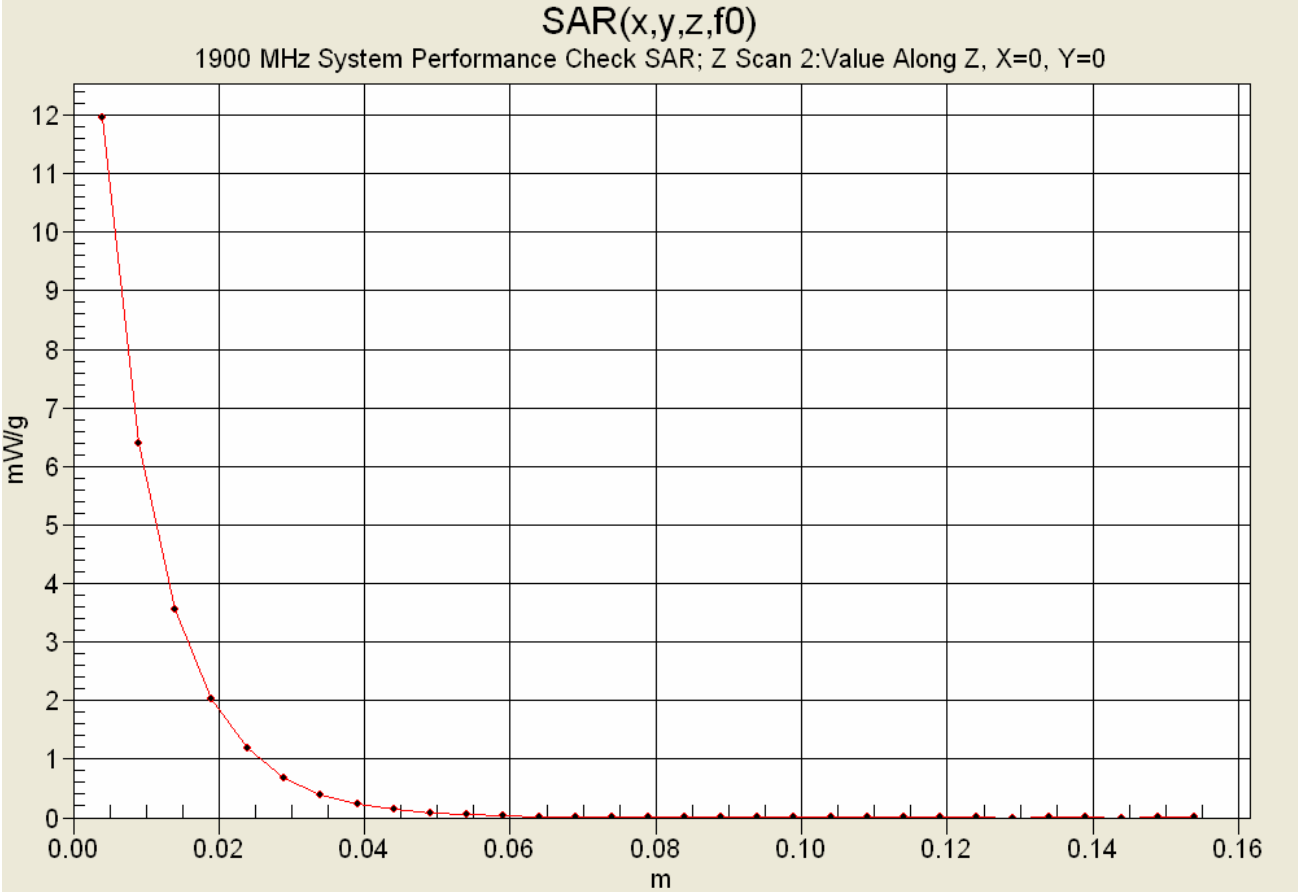
- Probe: EX3DV4 - SN3547; ConvF(8.2, 8.2, 8.2); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

1900 MHz Dipole - System Performance Check/Area Scan (5x8x1):
Measurement grid: dx=15mm, dy=15mm

1900 MHz Dipole - System Performance Check/Zoom Scan 2 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.0 V/m; Power Drift = -0.089 dB
Peak SAR (extrapolated) = 20.4 W/kg
SAR(1 g) = 10.7 mW/g; SAR(10 g) = 5.49 mW/g



Z-Axis Scan



Date Tested: 09/25/2006

System Performance Check (Body) - 1900 MHz Dipole

DUT: Dipole 1900 MHz; Model: D1900V2; Serial: 151; Validation: 06/12/2006

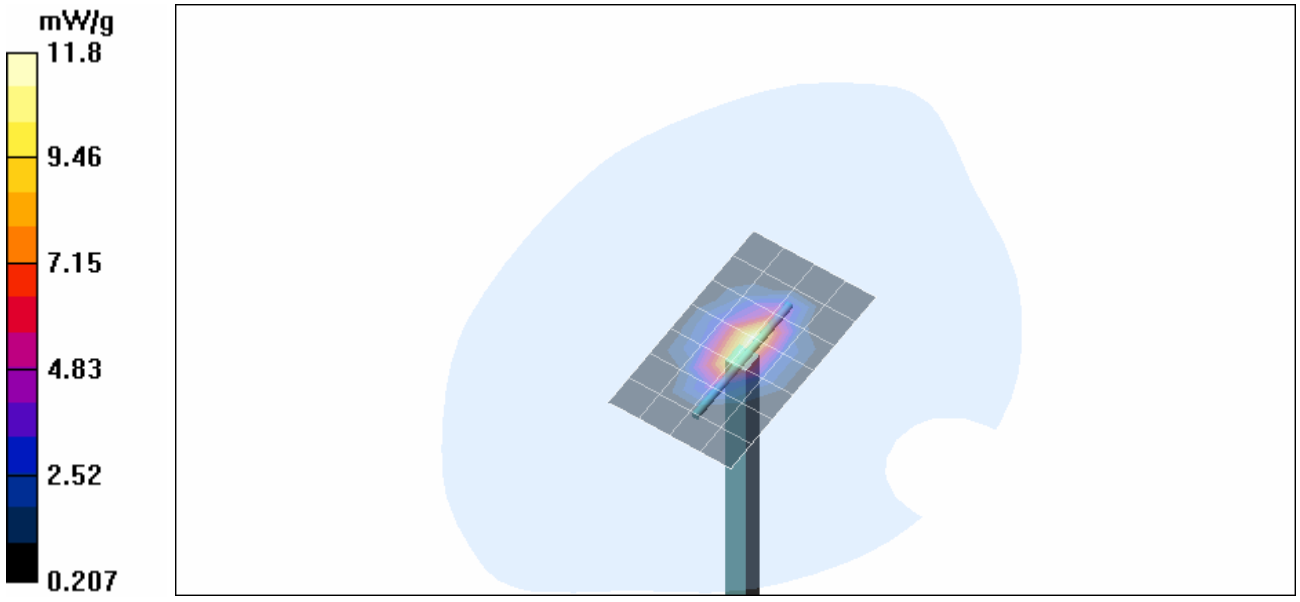
Ambient Temp: 24.3°C; Fluid Temp: 23.7°C; Barometric Pressure: 102.9 kPa; Humidity: 31%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: M1900 (σ = 1.47 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3)

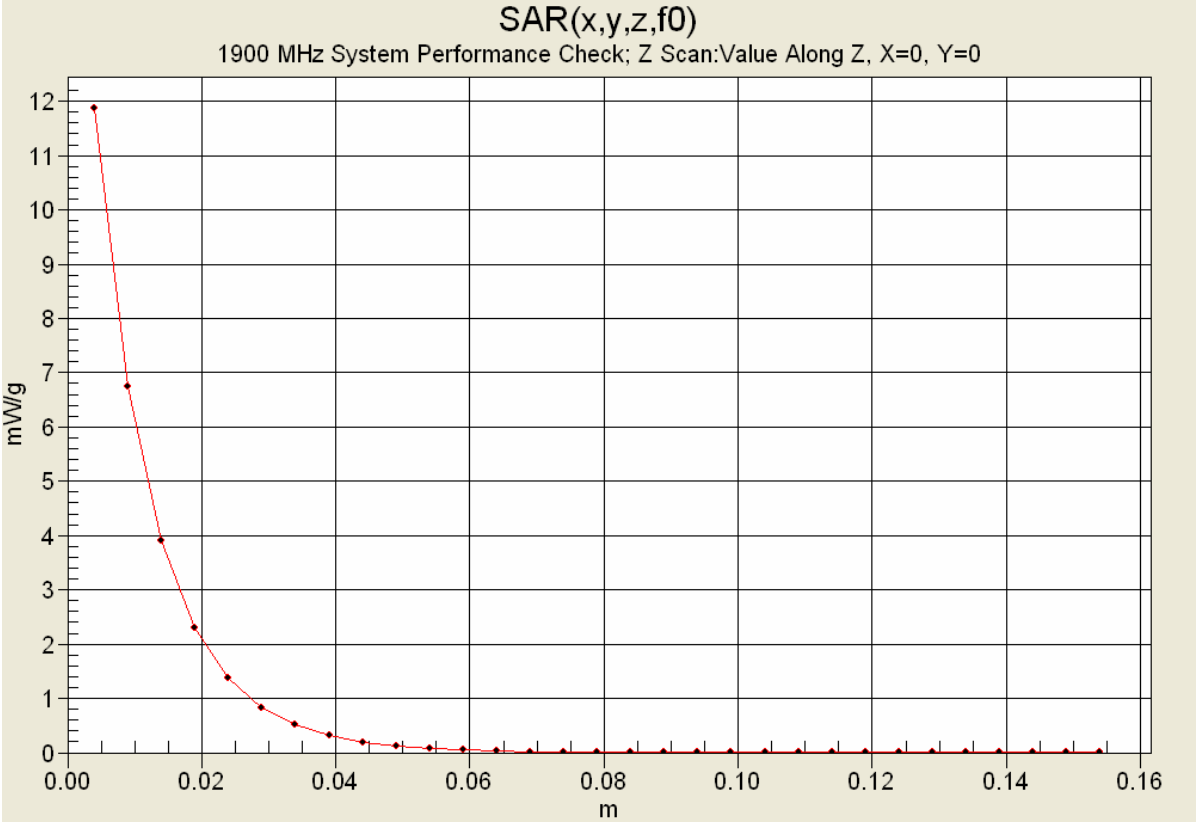
- Probe: EX3DV4 - SN3547; ConvF(7.84, 7.84, 7.84); Calibrated: 14/02/2006
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 21/06/2006
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 23; Postprocessing SW: SEMCAD, V1.8 Build 171

1900 MHz Dipole System Performance Check/Area Scan (5x8x1):
Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 11.4 mW/g

1900 MHz Dipole System Performance Check/Zoom Scan 3 (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.5 V/m; Power Drift = -0.011 dB
Peak SAR (extrapolated) = 18.8 W/kg
SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.37 mW/g
Maximum value of SAR (measured) = 11.8 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

1640 MHz System Performance Check & DUT Evaluation (Head)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Wed 16/Aug/2006
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
1.5100	40.42	1.23	42.74	1.21
1.5200	40.41	1.24	42.71	1.21
1.5300	40.40	1.25	42.72	1.23
1.5400	40.39	1.25	42.64	1.24
1.5500	40.38	1.26	42.51	1.25
1.5600	40.36	1.26	42.62	1.26
1.5700	40.35	1.27	42.49	1.27
1.5800	40.34	1.27	42.46	1.27
1.5900	40.33	1.28	42.32	1.29
1.6000	40.31	1.28	42.32	1.30
1.6100	40.30	1.29	42.29	1.31
1.6200	40.28	1.30	42.28	1.32
1.6300	40.27	1.30	42.12	1.33
1.6400	40.25	1.31	42.24	1.34
1.6500	40.24	1.31	42.11	1.35
1.6600	40.22	1.32	42.06	1.36
1.6700	40.21	1.32	41.97	1.36
1.6800	40.19	1.33	42.05	1.37
1.6900	40.17	1.34	42.08	1.38
1.7000	40.16	1.34	42.13	1.40
1.7100	40.14	1.35	41.99	1.41

1640 MHz DUT Evaluation (Head)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Thu 17/Aug/2006
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
1.5100	40.42	1.23	42.09	1.22
1.5200	40.41	1.24	42.00	1.22
1.5300	40.40	1.25	42.00	1.24
1.5400	40.39	1.25	41.95	1.25
1.5500	40.38	1.26	41.79	1.26
1.5600	40.36	1.26	41.86	1.27
1.5700	40.35	1.27	41.74	1.27
1.5800	40.34	1.27	41.61	1.28
1.5900	40.33	1.28	41.55	1.29
1.6000	40.31	1.28	41.52	1.30
1.6100	40.30	1.29	41.48	1.31
1.6200	40.28	1.30	41.40	1.33
1.6300	40.27	1.30	41.36	1.34
1.6400	40.25	1.31	41.32	1.35
1.6500	40.24	1.31	41.25	1.35
1.6600	40.22	1.32	41.25	1.36
1.6700	40.21	1.32	41.11	1.36
1.6800	40.19	1.33	41.19	1.37
1.6900	40.17	1.34	41.18	1.38
1.7000	40.16	1.34	41.11	1.40
1.7100	40.14	1.35	41.13	1.40

1900 MHz System Performance Check & 1880 MHz DUT Evaluation (Head)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Thu 17/Aug/2006
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
1.8000	40.00	1.40	39.11	1.34
1.8100	40.00	1.40	39.04	1.35
1.8200	40.00	1.40	39.02	1.35
1.8300	40.00	1.40	38.96	1.36
1.8400	40.00	1.40	38.81	1.38
1.8500	40.00	1.40	38.84	1.38
1.8600	40.00	1.40	38.72	1.39
1.8700	40.00	1.40	38.69	1.39
1.8800	40.00	1.40	38.59	1.41
1.8900	40.00	1.40	38.47	1.42
1.9000	40.00	1.40	38.41	1.43
1.9100	40.00	1.40	38.46	1.44
1.9200	40.00	1.40	38.41	1.45
1.9300	40.00	1.40	38.34	1.46
1.9400	40.00	1.40	38.29	1.47
1.9500	40.00	1.40	38.22	1.47
1.9600	40.00	1.40	38.26	1.48
1.9700	40.00	1.40	38.23	1.50
1.9800	40.00	1.40	38.15	1.51
1.9900	40.00	1.40	38.14	1.52
2.0000	40.00	1.40	38.03	1.53

1880 MHz DUT Evaluation (Body)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Fri 18/Aug/2006
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
1.8000	53.30	1.52	51.30	1.44
1.8100	53.30	1.52	51.20	1.45
1.8200	53.30	1.52	51.19	1.47
1.8300	53.30	1.52	51.13	1.47
1.8400	53.30	1.52	51.02	1.48
1.8500	53.30	1.52	50.99	1.50
1.8600	53.30	1.52	50.98	1.51
1.8700	53.30	1.52	50.97	1.51
1.8800	53.30	1.52	50.93	1.51
1.8900	53.30	1.52	50.80	1.52
1.9000	53.30	1.52	50.75	1.54
1.9100	53.30	1.52	50.77	1.55
1.9200	53.30	1.52	50.76	1.55
1.9300	53.30	1.52	50.80	1.56
1.9400	53.30	1.52	50.54	1.58
1.9500	53.30	1.52	50.73	1.58
1.9600	53.30	1.52	50.64	1.60
1.9700	53.30	1.52	50.54	1.61
1.9800	53.30	1.52	50.65	1.61
1.9900	53.30	1.52	50.54	1.64
2.0000	53.30	1.52	50.66	1.64

1900 MHz System Performance Check & 1880 MHz DUT Evaluation (Body)

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Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Mon 25/Sept/2006
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
1.8000	53.30	1.52	51.51	1.38
1.8100	53.30	1.52	51.53	1.39
1.8200	53.30	1.52	51.37	1.39
1.8300	53.30	1.52	51.40	1.41
1.8400	53.30	1.52	51.24	1.41
1.8500	53.30	1.52	51.29	1.43
1.8600	53.30	1.52	51.34	1.43
1.8700	53.30	1.52	51.24	1.44
1.8800	53.30	1.52	51.21	1.46
1.8900	53.30	1.52	51.25	1.46
1.9000	53.30	1.52	51.13	1.47
1.9100	53.30	1.52	51.08	1.48
1.9200	53.30	1.52	51.19	1.49
1.9300	53.30	1.52	51.06	1.50
1.9400	53.30	1.52	51.01	1.51
1.9500	53.30	1.52	51.09	1.53
1.9600	53.30	1.52	51.08	1.53
1.9700	53.30	1.52	51.02	1.54
1.9800	53.30	1.52	50.95	1.56
1.9900	53.30	1.52	50.95	1.57
2.0000	53.30	1.52	50.90	1.58

APPENDIX D - SAR TEST SETUP PHOTOGRAPHS

APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY

Schmid & Partner
Engineering AG

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

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

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

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

Standards

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

Conformity

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

Date 18.11.2001

Signature / Stamp Schmid & Partner Engineering AG
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Tel. +41 1 245 97 00, Fax +41 1 245 97 79