RF EXPOSURE EVALUATION

SPECIFIC ABSORPTION RATE

SAR TEST REPORT

FOR

TELEX COMMUNICATIONS INC.

PORTABLE UHF BELTPACK TRANSMITTER

MODEL: REV-BP

FCC ID: B5DB118

IC: 1321A-REVBP

TEST STANDARD(S) & PROCEDURE(S) APPLIED
FCC OET Bulletin 65, Supplement C (01-01)
FCC OET Application Note (11-06)
Industry Canada RSS-102 Issue 2

Test Report Serial No.

091206B5D-T775-S74U

Test Report Revision No.

Revision 1.3 - 4th Release

Response to FCC Comments

(Retested according to FCC Application Note "SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz", November 2006)

Test Lab and Location

Celltech Compliance Testing & Engineering Lab
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Test Report Prepared By:	Test Report Reviewed By:
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DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab and Location

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Company Information

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FCC IDENTIFIER:	**B5DB118**
IC IDENTIFIER:	**1321A-REVBP**
DEVICE MODEL:	**REV-BP**
Test Requirement(s):	**FCC 47 CFR §2.1093; Health Canada Safety Code 6**
Test Procedure(s) Applied:	**FCC OET Bulletin 65, Supplement C (Edition 01-01)** **FCC OET Application Note - SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz** **Industry Canada RSS-102 Issue 2**
FCC Device Classification:	**Licensed Non-Broadcast Transmitter Worn on Body (TNT)**
IC Device Classification:	**Land Mobile and Fixed Radio Transmitter and Receiver (RSS-119)**
Device Description:	**Portable UHF Beltpack Transmitter**
Transmit Frequency Range(s):	**614 - 746 MHz**
Max. RF Output Power Tested:	**18.4 dBm (69.18 mW) ERP (614 MHz)** **18.2 dBm (66.06 mW) ERP (680 MHz)** **18.7 dBm (74.13 mW) ERP (746 MHz)**
Antenna Type(s) Tested:	**Detachable Whip**
Battery Type(s) Tested:	**9V Alkaline (Duracell Procell)**
Body-Worn Accessories Tested:	**Plastic Swivel Belt-Clip with Metal Spring (P/N: 879518-1)**
Audio Accessories Tested:	**RE90TX Microphone (P/N: 17153318)**
Max. SAR Level(s) Evaluated:	**Body-worn: 0.0479 W/kg (1g average)**

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6. The device was tested in accordance with the measurement procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), FCC Application Note - SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz and Industry Canada RSS-102 Issue 2 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.

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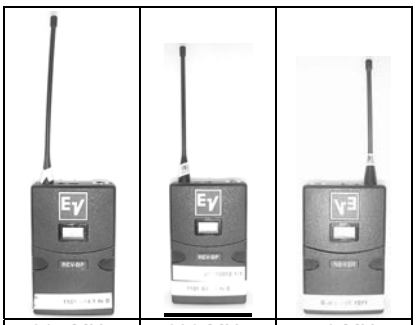
The results and statements contained in this report pertain only to the device(s) evaluated.

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



614 MHz | 680 MHz | 746 MHz

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1.0 INTRODUCTION

This measurement report demonstrates that the TELEX COMMUNICATIONS INC. Model: REV-BP Portable UHF Beltpack Transmitter FCC ID: B5DB118 complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]) and IC RSS-102 Issue 2 (see reference [4]) were employed. A description of the device, 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)

Test Requirement(s)	FCC	47 CFR §2.1093		
	IC	Health Canada Safety Code 6		
Test Procedure(s)	FCC	OET Bulletin 65, Supplement C (01-01)		
		OET Application Note - SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz		
	IC	RSS-102 Issue 2		
Device Classification	Licensed Non-Broadcast Transmitter Worn on Body (TNT)			FCC §74.861
	Land Mobile and Fixed Radio Transmitter and Receiver (27.41 to 960 MHz)			RSS-119
Device Description	Portable UHF Beltpack Transmitter			
RF Exposure Category	General Population / Uncontrolled Environment			
FCC IDENTIFIER	B5DB118			
IC IDENTIFIER	1321A-REVBP			
Device Model(s)	REV-BP			
Test Sample Serial No.(s) Tested	00001	614 MHz (C1)	Production Unit	
	00001	680 MHz (C3)	Production Unit	
	00008	746 MHz (C5)	Production Unit	
Transmit Frequency Range(s)	614 - 746 MHz			
Max. RF Output Power Tested	18.4 dBm	69.18 mW	ERP	614 MHz
	18.2 dBm	66.06 mW	ERP	680 MHz
	18.7 dBm	74.13 mW	ERP	746 MHz
Antenna Type(s) Tested	Detachable Whip	614 MHz (C1)	Length: 126 mm	
	Detachable Whip	680 MHz (C3)	Length: 112 mm	
	Detachable Whip	746 MHz (C5)	Length: 100 mm	
Battery Type(s) Tested	9V Alkaline		Duracell Procell	
Body-Worn Accessories Tested	Plastic Swivel Belt-Clip with Metal Spring		P/N: 879518-1	
Audio Accessories Tested	RE90TX Microphone		P/N: 17153318	

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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 SAR Measurement System with SAM phantom & validation dipole

4.0 SAR MEASUREMENT SUMMARY

BODY-WORN SAR EVALUATION RESULTS

Freq. (MHz)	Chan.	Test Mode	Battery Type	Antenna Type	Accessories		DUT Position to Planar Phantom	Belt-Clip Spacing to Planar Phantom	Output Power Before Test (ERP)	SAR Drift During Test (dB)	Measured SAR 1g (W/kg)
					Body-Worn	Audio					
614	Low	CW	Alkaline	Whip	Belt-Clip	Microphone	Back Side	2.1 cm	18.4 dBm	-0.146	0.0375
680	Mid	CW	Alkaline	Whip	Belt-Clip	Microphone	Back Side	2.1 cm	18.2 dBm	-0.164	0.0267
746	High	CW	Alkaline	Whip	Belt-Clip	Microphone	Back Side	2.1 cm	18.7 dBm	-0.171	**0.0479**
ANSI / IEEE C95.1 1999 - SAFETY LIMIT				**BODY: 1.6 W/kg (averaged over 1 gram)**				**Spatial Peak Uncontrolled Exposure / General Population**			

Date(s) of Evaluation	November 23, 2006				November 23, 2006				November 22, 2006			
Measured Fluid	620 MHz Body				680 MHz Body				750 MHz Body			
	Interpolated Target [6]		Meas.	Dev.	Interpolated Target [6]		Meas.	Dev.	Interpolated Target [6]		Meas.	Dev.
Dielectric Constant ε_r	**56.0**	±5%	54.9	-2.0%	**55.8**	±5%	54.3	-2.7%	**55.5**	±5%	54.5	-1.8%
Conductivity σ (mho/m)	**0.95**	±5%	0.95	0.0%	**0.96**	±5%	1.00	+4.2%	**0.96**	±5%	0.97	+1.0%
System Manufacturer's Probe Conversion Factors (Body):					6.70	Freq.: 650 MHz ± 50 MHz			6.40	Freq.: 750 MHz ± 50 MHz		

Test Date	ρ (Kg/m^3)	Ambient Temperature	Fluid Temperature	Fluid Depth	Relative Humidity	Atmospheric Pressure
22-Nov-06	1000	22.3 °C	22.0 °C	≥ 15	32	101.1
23-Nov-06	1000	21.6 °C	21.2 °C	≥ 15	33	103.4

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.	The power drift of the DUT measured by the DASY4 system during the SAR evaluations was less than 5% from the start power.
	3.	The DUT battery was fully charged prior to the SAR evaluations.
	4.	The ambient and fluid temperatures were measured prior to and after each of the SAR evaluations to ensure the temperatures remained within +/-2°C of the temperatures reported during the dielectric property measurements.
	5.	The dielectric properties 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).
	6.	The dielectric properties listed in FCC OET Bulletin 65, Supplement C are specified within the frequency range of 150 MHz and 5800 MHz at certain frequencies. In the dielectric property measurement software program (Aprel Labs) the related dielectric properties have been derived by interpolation using linear model.
	7.	The SAR evaluations were performed within 24 hours of the system performance check.

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5.0 DETAILS OF SAR EVALUATION

The TELEX COMMUNICATIONS INC. Model: REV-BP Portable UHF Beltpack Transmitter FCC ID: B5DB118 was compliant for localized Specific Absorption Rate (General Population / Uncontrolled Exposure) based on the test provisions and conditions described below. Detailed photographs of the test setup are shown in Appendix D.

Test Configuration(s)

1. The DUT was tested in a body-worn configuration with the back side facing the outer surface of the SAM phantom (planar section). The attached swivel belt-clip accessory was touching the outer surface of the SAM phantom (planar section) and provided a 2.1 cm separation distance from the back of the DUT to the outer surface of the SAM phantom (planar section). The DUT was evaluated for body-worn SAR with the microphone audio accessory connected to the audio port.

Test Mode(s) & Power Setting(s)

2. The DUT was evaluated for SAR at the maximum ERP levels measured at Flom Test Lab prior to the SAR evaluations.
3. The DUT was tested at maximum power in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle).

Test Conditions

4. The ambient and fluid temperatures were measured prior to and after each of the SAR evaluations to ensure the temperatures remained within +/-2°C of the temperatures reported during the dielectric property measurements.
5. The dielectric properties of the simulated tissue mixtures were measured prior to the SAR evaluation 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 1 g and 10 g 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 form 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 E). 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 1 g and 10 g 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. Depending on the device type under evaluation, zoom scans for frequencies ≥ 800 MHz are typically 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.

7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations system checks were performed at the planar section of the SAM phantom with an 835MHz dipole (see Appendix B for procedure and plots). Prior to the system performance checks the dielectric parameters of the simulated tissue mixture were measured 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 Table 1 below for the SAR system manufacturer's reference body SAR values from the DASY4 Operation Manual (see reference [6]).

SYSTEM PERFORMANCE CHECK EVALUATIONS

Test Date	Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ε_r			Conductivity σ (mho/m)			ρ (Kg/m³)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
	Body (Freq.)	SPEAG 835 MHz Target	Avg. Value Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.	Dev.						
Nov22	750 MHz	2.43±15%	2.60	+7.0%	55.5 ±5%	54.5	-1.8%	0.96 ±5%	0.97	+1.0%	1000	22.3	22.0	≥ 15	32	101.1
Nov23	650 MHz	2.43±15%	2.42	-0.4%	55.9 ±5%	54.7	-2.1%	0.96 ±5%	0.97	+1.0%	1000	21.6	21.2	≥ 15	33	103.4

Note(s)

1. The system performance check evaluations were performed according to the procedure referred to as alternative system verification method B of FCC Application Note - SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz (see reference [7]).
2. The ambient and fluid temperatures were measured prior to and after each of the SAR evaluations to ensure the temperatures remained within +/-2°C of the temperatures reported during the dielectric property measurements.
3. The dielectric properties listed in FCC OET Bulletin 65, Supplement C are specified within the frequency range of 150 MHz and 5800 MHz at certain frequencies. In the dielectric property measurement software program (Aprel Labs) the related dielectric properties have been derived by interpolation using linear model.

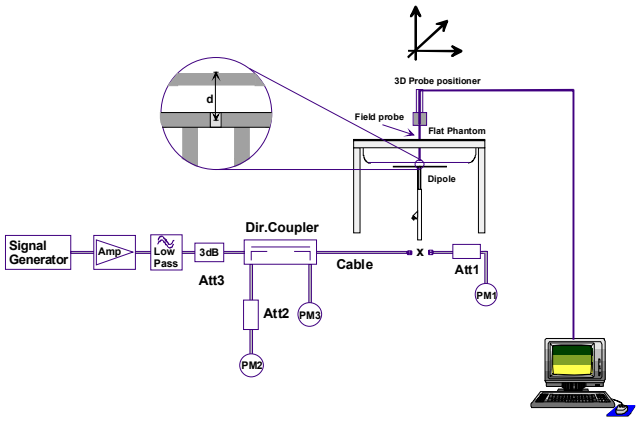

Figure 1. System Performance Check Measurement Setup

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

835MHz Dipole Setup

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8.0 SIMULATED EQUIVALENT TISSUES

The simulated tissue mixture consisted of a viscous gel using saline solution. Preservation with a bactericide is added and visual inspection is made to ensure air bubbles are not trapped during the mixing process. The fluid was prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

SIMULATED TISSUE MIXTURE		
Body Tissue Simulant		
INGREDIENT	650/750 MHz System Performance Check	620/680/750 MHz DUT Evaluation
Water	53.79 %	53.79 %
Sugar	45.13 %	45.13 %
Salt	0.98 %	0.98 %
Bactericide	0.10 %	0.10 %

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.		

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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	
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)
Phantom(s)	
Type	SAM V4.0C
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 25 liters

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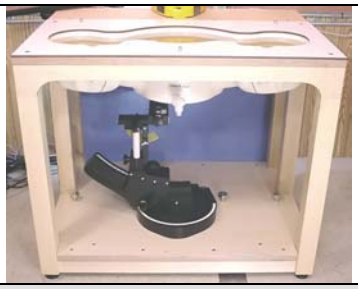
11.0 PROBE SPECIFICATION (ET3DV6)

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

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 F for specifications of the SAM phantom V4.0C.



SAM Phantom

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

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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
	-EX3DV4 E-Field Probe	00125	3547	14Feb06		14Feb07
	-835MHz Validation Dipole	00022	411	**Brain**	28Mar06	28Mar07
x				**Body**	27Mar06	27Mar07
	-900MHz Validation Dipole	00020	054	**Brain**	06Jun06	06Jun07
				Body	06Jun06	06Jun07
	-1640MHz Validation Dipole	00212	0175	**Brain**	14Aug06	14Aug07
	-1800MHz Validation Dipole	00021	247	**Brain**	08Jun06	08Jun07
				Body	09Jun06	09Jun07
	-1900MHz Validation Dipole	00032	151	**Brain**	09Jun06	09Jun07
				Body	12Jun06	12Jun07
	-2450MHz Validation Dipole	00025	150	**Body**	24Apr06	24Apr07
	-5800MHz Validation Dipole	00126	1031	**Brain**	15Mar06	15Mar07
				Body	18Jul06	18Jul07
x	-SAM Phantom V4.0C	00154	1033	N/A		N/A
	-Barski Planar Phantom	00155	03-01	N/A		N/A
	-Plexiglas Side Planar Phantom	00156	161	N/A		N/A
	-Plexiglas Validation Planar Phantom	00157	137	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	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

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15.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**ci 1g**	**Uncertainty Value ±% (1g)**	**V_i or V_{eff}**
Measurement System						
Probe calibration (650/750 MHz)	7.0	Normal	1	1	7.0	∞
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)	5	Normal	1	0.64	3.2	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	5	Normal	1	0.6	3.0	∞
Combined Standard Uncertainty					**12.05**	
Expanded Uncertainty (k=2)					**24.09**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])

MEASUREMENT UNCERTAINTIES (Cont.)

UNCERTAINTY BUDGET FOR SYSTEM VALIDATION						
Error Description	**Uncertainty Value ±%**	**Probability Distribution**	**Divisor**	**ci 1g**	**Uncertainty Value ±% (1g)**	**V_i or V_{eff}**
Measurement System						
Probe calibration (650/750 MHz)	7.0	Normal	1	1	7.0	∞
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)	5	Normal	1	0.64	3.2	∞
Liquid permittivity (target)	5	Rectangular	1.732050808	0.6	1.7	∞
Liquid permittivity (measured)	5	Normal	1	0.6	3.0	∞
Combined Standard Uncertainty					**10.51**	
Expanded Uncertainty (k=2)					**21.01**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 (see reference [5])

16.0 REFERENCES

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

[2] Health Canada - “Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz”, Safety Code 6: 1999.

[3] 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.

[4] Industry Canada - “Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)”, Radio Standards Specification RSS-102 Issue 2: November 2005.

[5] 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.

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

[7] Federal Communications Commission - “Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz”: November 2006.

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 11/23/2006

Body-Worn SAR - Back Side of DUT with Belt-Clip and Microphone accessories - Low Channel

DUT: Telex Communications Inc.; Model: REV-BP; Type: Portable UHF Beltpack Transmitter; Serial: 00001

Body-worn Accessory: Plastic Swivel Belt-Clip with metal spring (P/N: 879518-1)

Audio Accessory: RE90TX Microphone (P/N: 17153318)

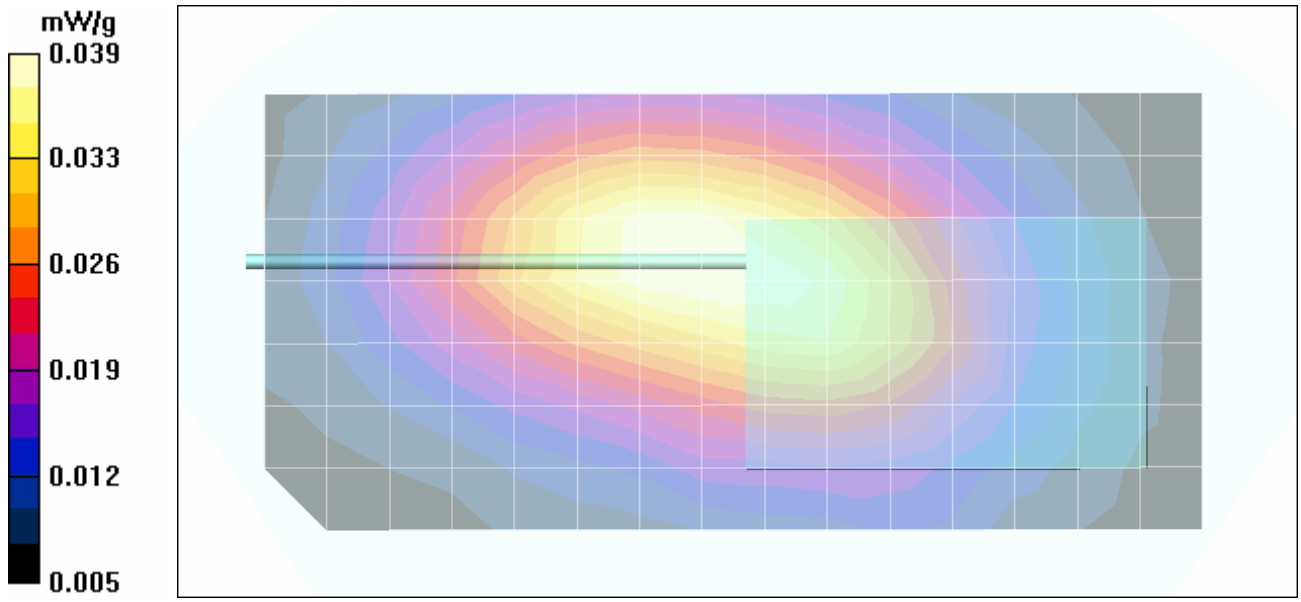
Ambient Temp: 21.6°C; Fluid Temp: 21.2°C; Barometric Pressure: 103.4 kPa; Humidity: 33%

9V Alkaline Battery (Duracell Procell)
Communication System: FM UHF
RF Output Power: 18.4 dBm (ERP)
Frequency: 614 MHz; Duty Cycle: 1:1
Medium: M620 Medium parameters used: σ = 0.95 mho/m; ε_r = 54.9; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1387; ConvF(6.7, 6.7, 6.7); 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

Body-Worn SAR - 2.1 cm Belt-Clip Spacing from Back of DUT to Planar Phantom - Low Channel - 614 MHz
Area Scan (8x16x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.040 mW/g

Body-Worn SAR - 2.1 cm Belt-Clip Spacing from Back of DUT to Planar Phantom - Low Channel - 614 MHz
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.77 V/m; Power Drift = -0.146 dB
Peak SAR (extrapolated) = 0.058 W/kg
SAR(1 g) = 0.0375 mW/g; SAR(10 g) = 0.026 mW/g
Maximum value of SAR (measured) = 0.039 mW/g



Date Tested: 11/23/2006

Body-Worn SAR - Back Side of DUT with Belt-Clip and Microphone accessories - Mid Channel

DUT: Telex Communications Inc.; Model: REV-BP; Type: Portable UHF Beltpack Transmitter; Serial: 00001

Body-worn Accessory: Plastic Swivel Belt-Clip with metal spring (P/N: 879518-1)

Audio Accessory: RE90TX Microphone (P/N: 17153318)

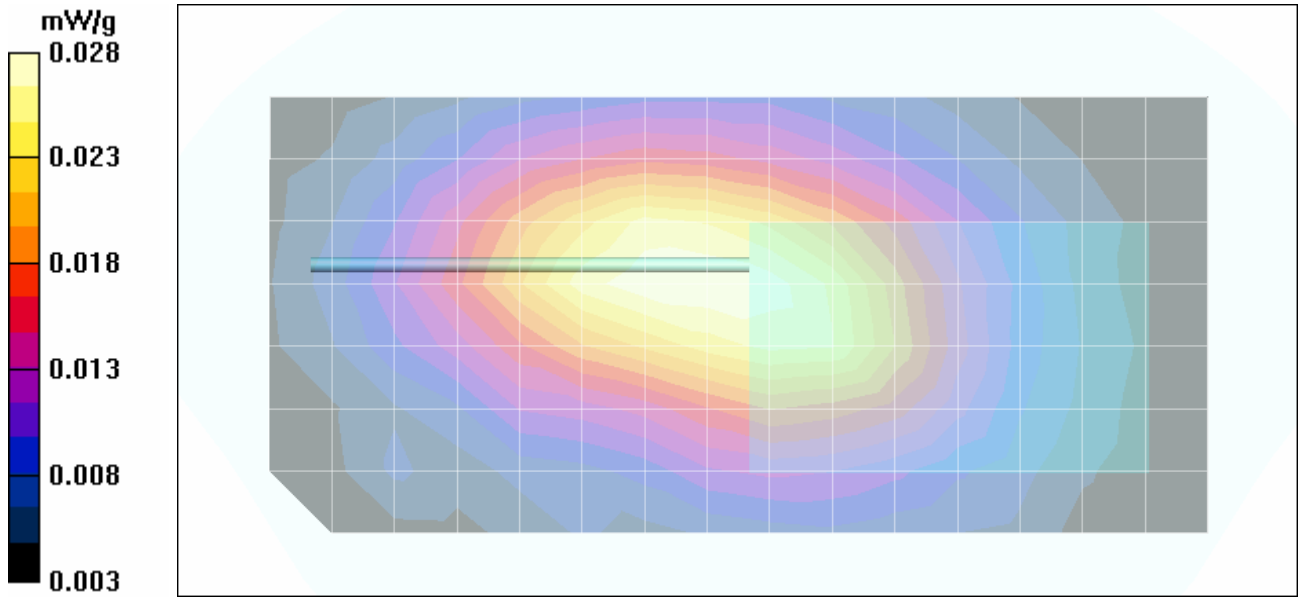
Ambient Temp: 21.6°C; Fluid Temp: 21.2°C; Barometric Pressure: 103.4 kPa; Humidity: 33%

9V Alkaline Battery (Duracell Procell)
Communication System: FM UHF
RF Output Power: 18.2 dBm (ERP)
Frequency: 680 MHz; Duty Cycle: 1:1
Medium: M680 Medium parameters used: σ = 1.00 mho/m; ε_r = 54.3; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1387; ConvF(6.7, 6.7, 6.7); 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

Body-Worn SAR - 2.1 cm Belt-Clip Spacing from Back of DUT to Planar Phantom - Mid Channel - 680 MHz
Area Scan (8x16x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.029 mW/g

Body-Worn SAR - 2.1 cm Belt-Clip Spacing from Back of DUT to Planar Phantom - Mid Channel - 680 MHz
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.98 V/m; Power Drift = -0.164 dB
Peak SAR (extrapolated) = 0.042 W/kg
SAR(1 g) = 0.0267 mW/g; SAR(10 g) = 0.019 mW/g
Maximum value of SAR (measured) = 0.028 mW/g



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Date Tested: 11/22/2006

Body-Worn SAR - Back Side of DUT with Belt-Clip and Microphone accessories - High Channel

DUT: Telex Communications Inc.; Model: REV-BP; Type: Portable UHF Beltpack Transmitter; Serial: 00008

Body-worn Accessory: Plastic Swivel Belt-Clip with metal spring (P/N: 879518-1)

Audio Accessory: RE90TX Microphone (P/N: 17153318)

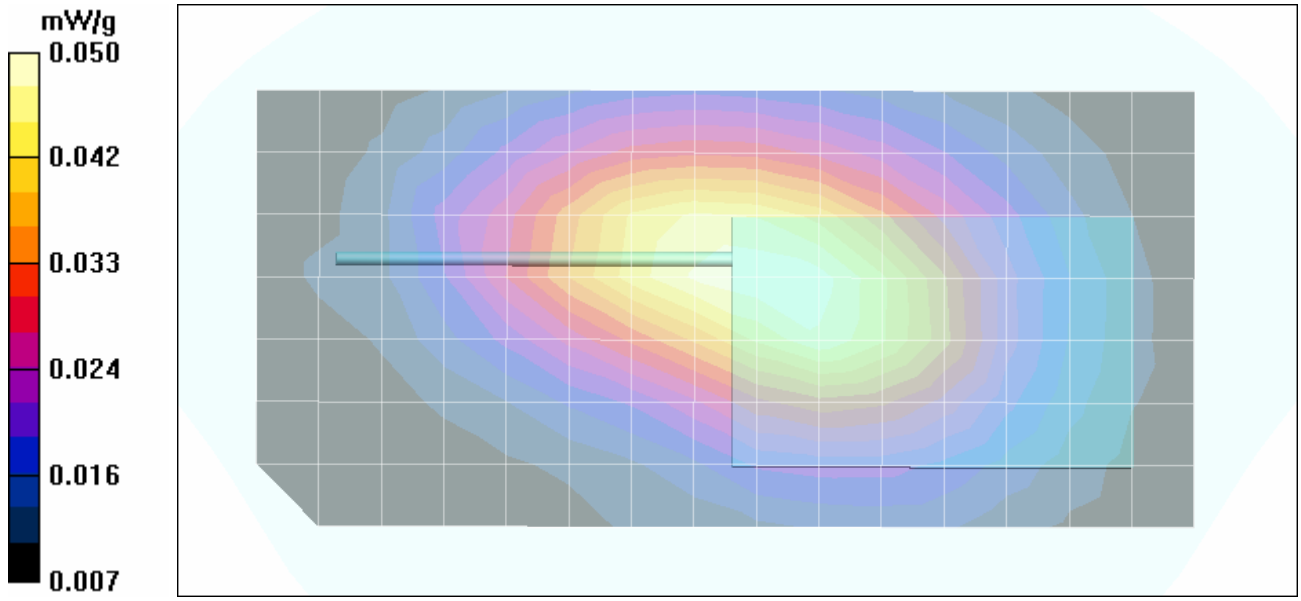
Ambient Temp: 22.3°C; Fluid Temp: 22.0°C; Barometric Pressure: 101.1 kPa; Humidity: 32%

9V Alkaline Battery (Duracell Procell)
Communication System: FM UHF
RF Output Power: 18.7 dBm (ERP)
Frequency: 746 MHz; Duty Cycle: 1:1
Medium: M750 Medium parameters used: σ = 0.97 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1387; ConvF(6.4, 6.4, 6.4); 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

Body-Worn SAR - 2.1 cm Belt-Clip Spacing from Back of DUT to Planar Phantom - High Channel - 746 MHz
Area Scan (8x16x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.053 mW/g

Body-Worn SAR - 2.1 cm Belt-Clip Spacing from Back of DUT to Planar Phantom - High Channel - 746 MHz
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.37 V/m; Power Drift = -0.171 dB
Peak SAR (extrapolated) = 0.071 W/kg
SAR(1 g) = 0.0479 mW/g; SAR(10 g) = 0.034 mW/g
Maximum value of SAR (measured) = 0.050 mW/g



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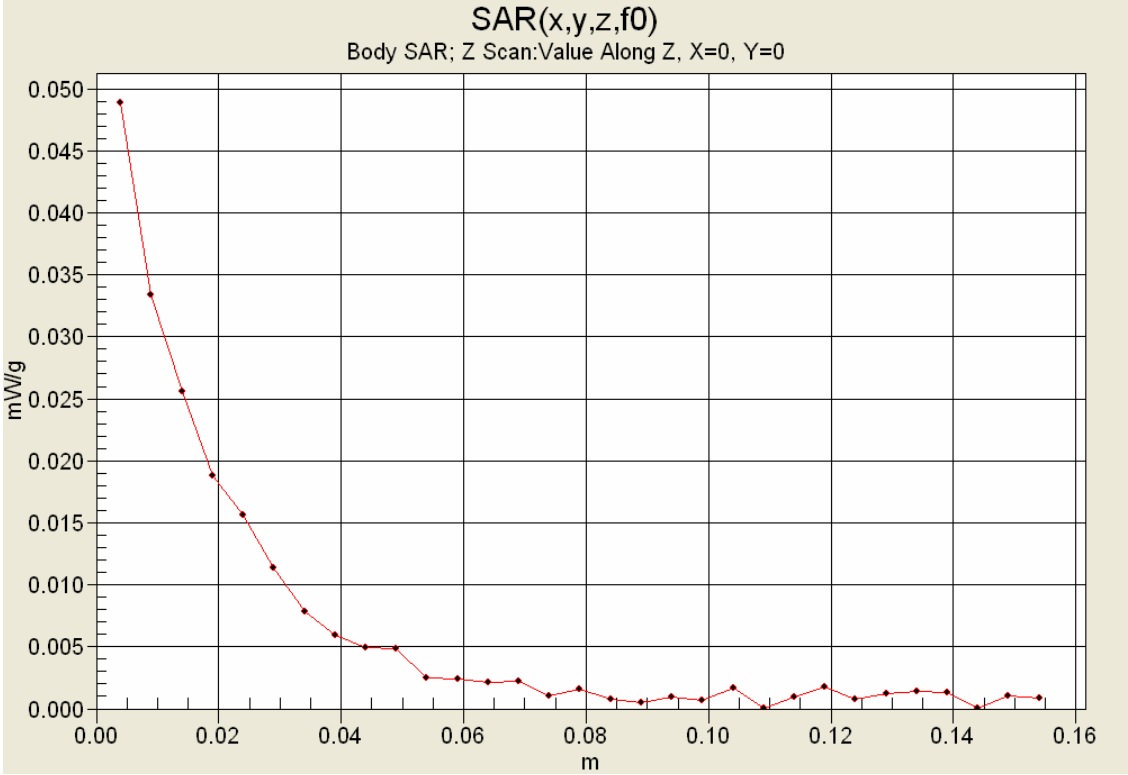
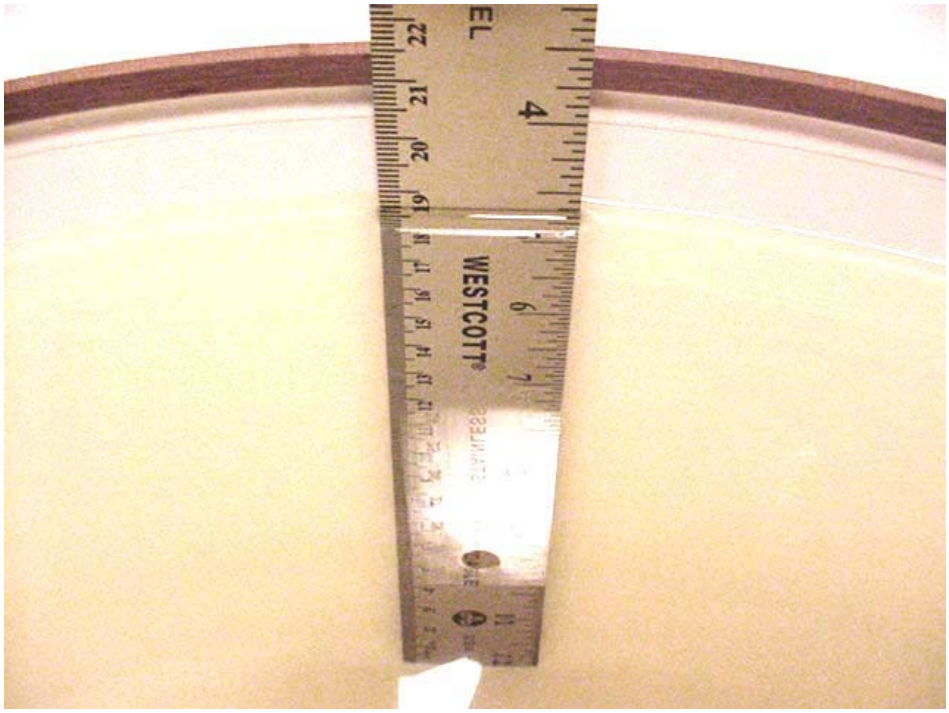
Z-Axis Scan



Fluid Depth (≥15 cm)



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APPENDIX B - SYSTEM VALIDATION DATA

Date Tested: 11/22/2006

System Validation - 750MHz (835 MHz Dipole) - Body

DUT: Dipole 835 MHz; Model: D835V2; Serial: 411

Ambient Temp: 22.3°C; Fluid Temp: 22.0°C; Barometric Pressure: 101.1 kPa; Humidity: 32%
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 750 MHz; Duty Cycle: 1:1
Medium: M750 Medium parameters used: σ = 0.97 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
- Probe: ET3DV6 - SN1387; ConvF(6.4, 6.4, 6.4); 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

750 MHz System Validation/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.62 mW/g
750 MHz System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.4 V/m; Power Drift = 0.012 dB
Peak SAR (extrapolated) = 4.44 W/kg
SAR(1 g) = 2.58 mW/g; SAR(10 g) = 1.61 mW/g
Maximum value of SAR (measured) = 2.75 mW/g
750 MHz System Validation/Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.3 V/m; Power Drift = 0.017 dB
Peak SAR (extrapolated) = 4.49 W/kg
SAR(1 g) = 2.58 mW/g; SAR(10 g) = 1.61 mW/g
Maximum value of SAR (measured) = 2.77 mW/g
750 MHz System Validation/Zoom Scan 3 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.5 V/m; Power Drift = 0.054 dB
Peak SAR (extrapolated) = 4.56 W/kg
SAR(1 g) = 2.62 mW/g; SAR(10 g) = 1.63 mW/g
Maximum value of SAR (measured) = 2.81 mW/g
750 MHz System Validation/Zoom Scan 4 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.9 V/m; Power Drift = 0.068 dB
Peak SAR (extrapolated) = 4.69 W/kg
SAR(1 g) = 2.68 mW/g; SAR(10 g) = 1.66 mW/g
Maximum value of SAR (measured) = 2.86 mW/g
750 MHz System Validation/Zoom Scan 5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.6 V/m; Power Drift = -0.003 dB
Peak SAR (extrapolated) = 4.44 W/kg
SAR(1 g) = 2.55 mW/g; SAR(10 g) = 1.59 mW/g

750 MHz System Validation						
	SAR (mW/g)	835 MHz Target	Deviation %	STDEV	Avg. SAR (Target)	Coefficient of Variation
Test 1	2.58	2.43	+6.17	0.050	2.602 mW/g	**0.019**
Test 2	2.58	2.43	+6.17			
Test 3	2.62	2.43	+7.82			
Test 4	2.68	2.43	+10.29			
Test 5	2.55	2.43	+4.94			

According to FCC Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150MHz - 3 GHz, the coefficient of variation must be < 0.02.

SAR Variations:
ConF for 835 MHz evaluation: 6.04
ConF for 750 MHz evaluation: 6.40

Evaluating SAR changes using the equations converting field values to SAR values from the DASY4 manual: 3.74%

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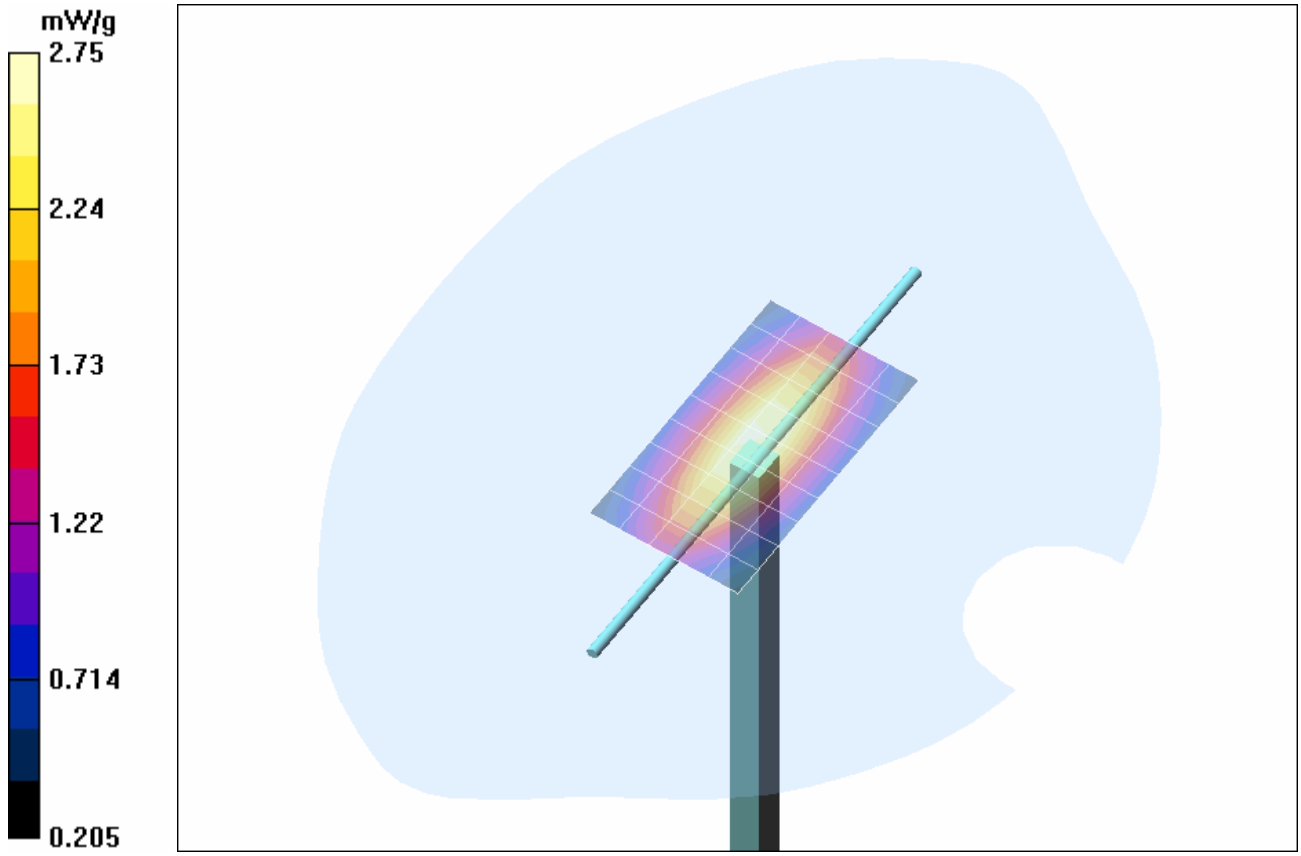

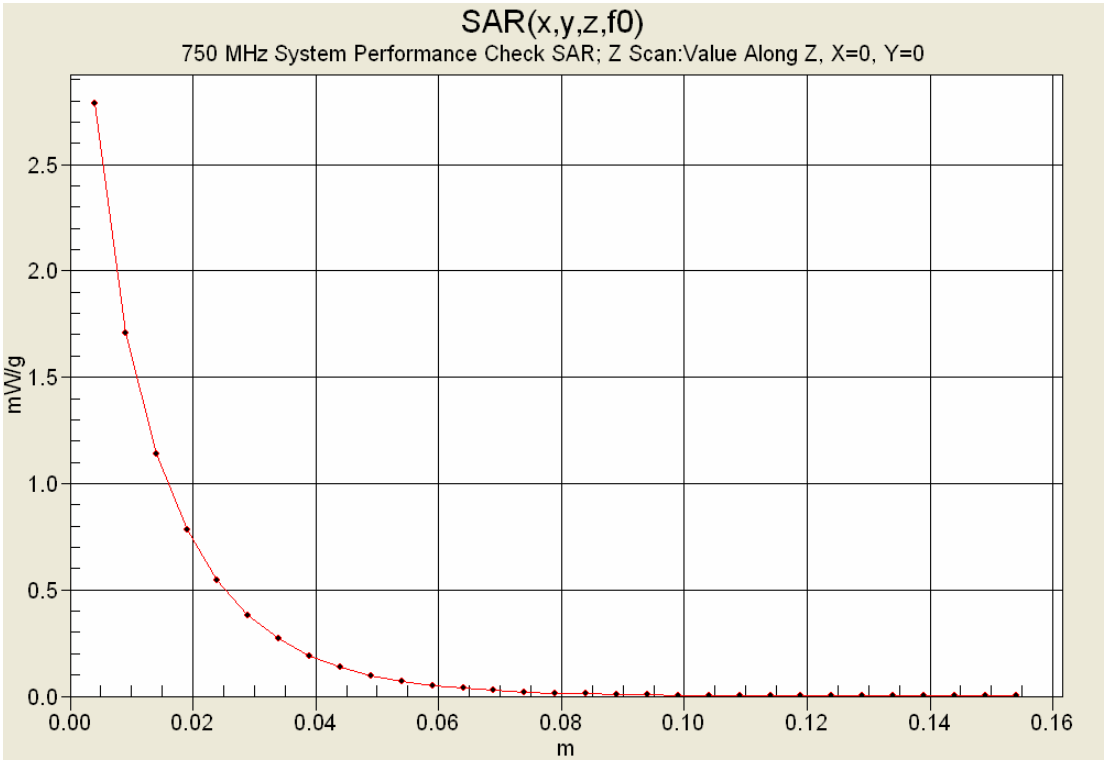

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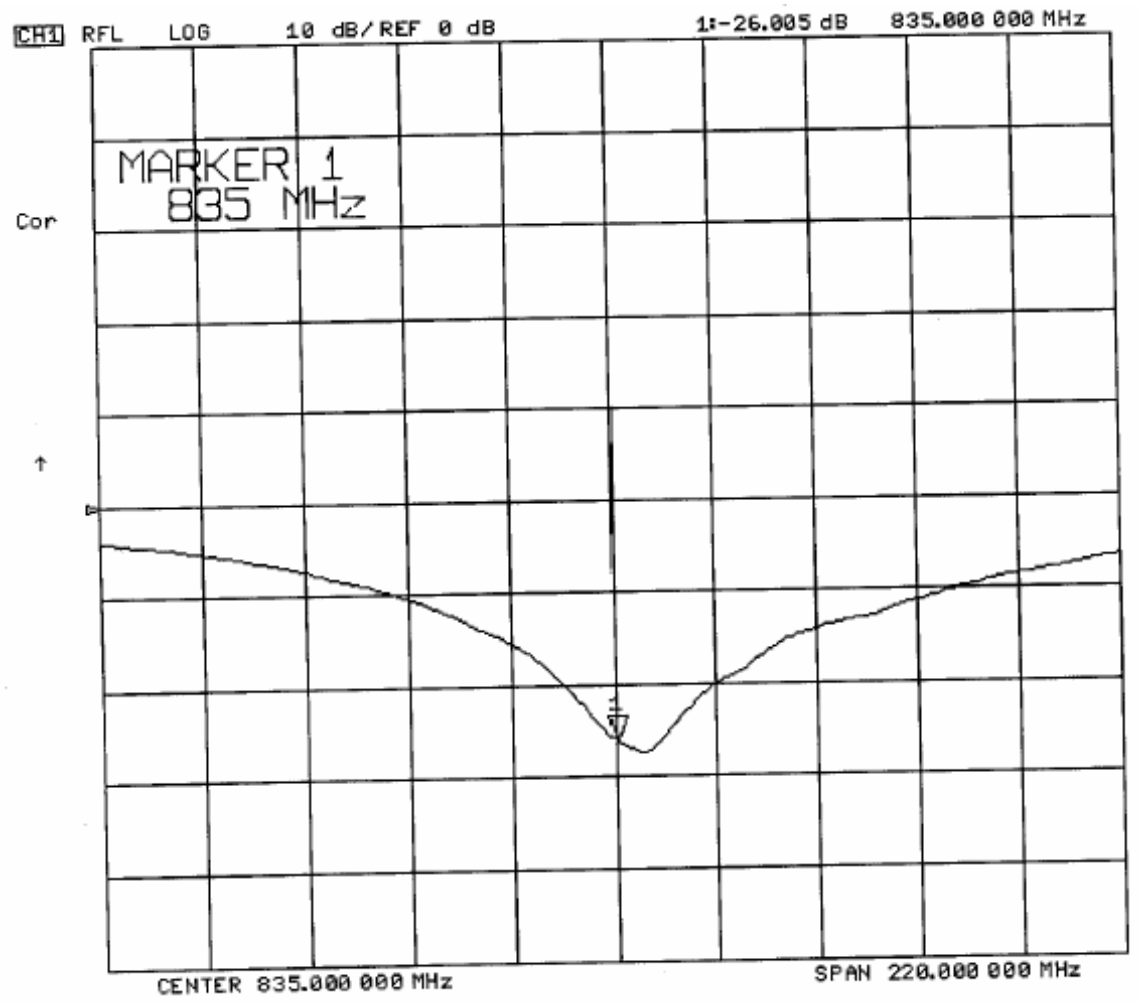
Test Date: Nov. 22, 2006

Dipole Return Loss - 835 MHz dipole with 750 MHz fluid

The dipole return loss was better than -15 dB



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Date Tested: 11/23/2006

System Validation - 650MHz (835 MHz Dipole) - Body

DUT: Dipole 835 MHz; Model: D835V2; Serial: 411

Ambient Temp: 21.6°C; Fluid Temp: 21.2°C; Barometric Pressure: 103.4 kPa; Humidity: 33%
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 650 MHz; Duty Cycle: 1:1
Medium: M650 Medium parameters used: σ = 0.97 mho/m; ε_r = 54.7; ρ = 1000 kg/m^3
- Probe: ET3DV6 - SN1387; ConvF(6.7, 6.7, 6.7); 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

650 MHz System Validation/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.46 mW/g
650 MHz System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.2 V/m; Power Drift = -0.007 dB
Peak SAR (extrapolated) = 4.30 W/kg
SAR(1 g) = 2.38 mW/g; SAR(10 g) = 1.45 mW/g
Maximum value of SAR (measured) = 2.55 mW/g
650 MHz System Validation/Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.6 V/m; Power Drift = 0.022 dB
Peak SAR (extrapolated) = 4.37 W/kg
SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.48 mW/g
Maximum value of SAR (measured) = 2.56 mW/g
650 MHz System Validation/Zoom Scan 3 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.6 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 4.38 W/kg
SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.47 mW/g
650 MHz System Validation/Zoom Scan 4 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 50.8 V/m; Power Drift = 0.023 dB
Peak SAR (extrapolated) = 4.39 W/kg
SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.47 mW/g
Maximum value of SAR (measured) = 2.57 mW/g
650 MHz System Validation/Zoom Scan 5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.4 V/m; Power Drift = 0.024 dB
Peak SAR (extrapolated) = 4.38 W/kg
SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.47 mW/g
Maximum value of SAR (measured) = 2.56 mW/g

650 MHz System Validation						
	SAR (mW/g)	835 MHz Target	Deviation %	STDEV	Avg. SAR (Target)	Coefficient of Variation
Test 1	2.38	2.43	-2.06	0.020736	2.416 mW/g	**0.008582964**
Test 2	2.42	2.43	-0.41			
Test 3	2.43	2.43	0.00			
Test 4	2.42	2.43	-0.41			
Test 5	2.43	2.43	0.00			

According to FCC Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150MHz - 3 GHz, the coefficient of variation must be < 0.02.

SAR Variations:
ConF for 835 MHz evaluation: 6.04
ConF for 650 MHz evaluation: 6.70

Evaluating SAR changes using the equations converting field values to SAR values from the DASY4 manual: 5.32%

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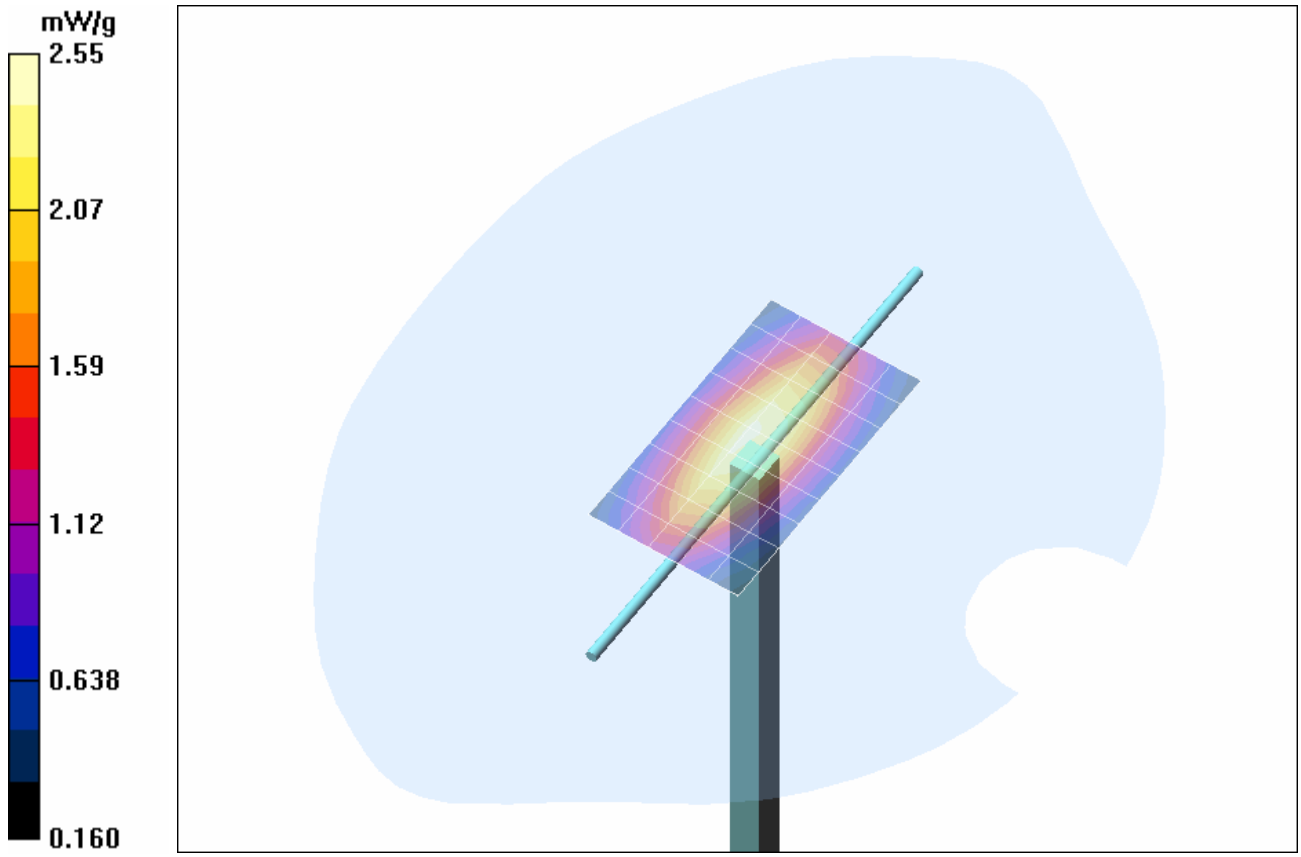

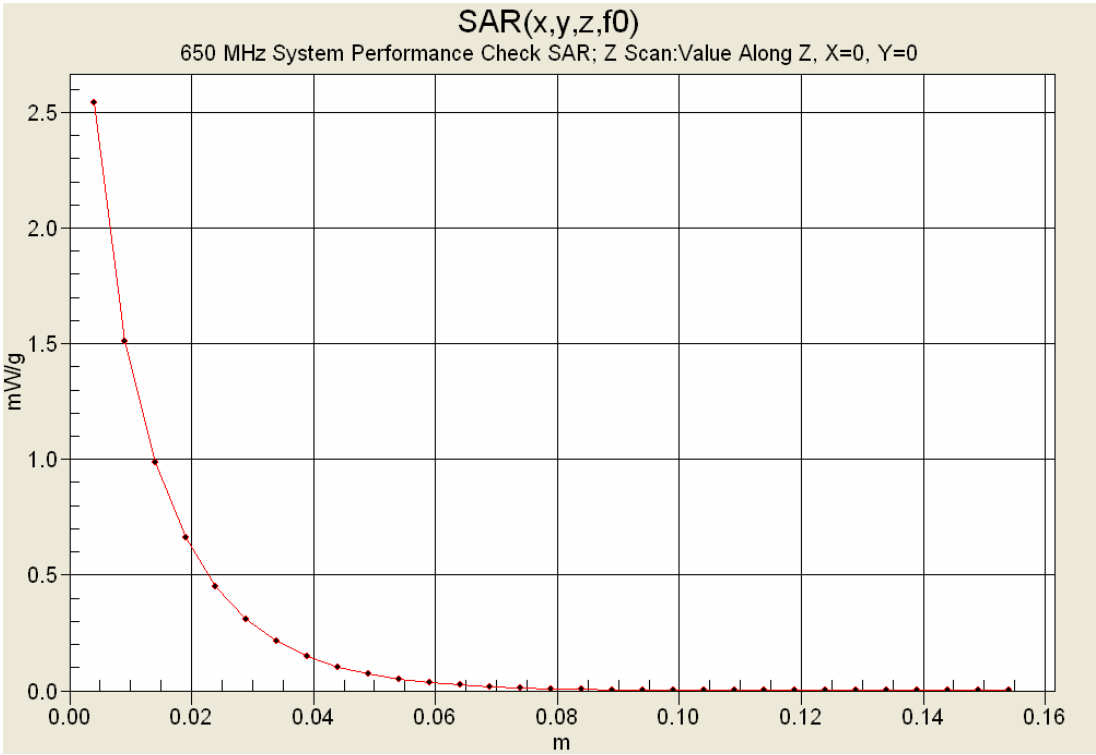

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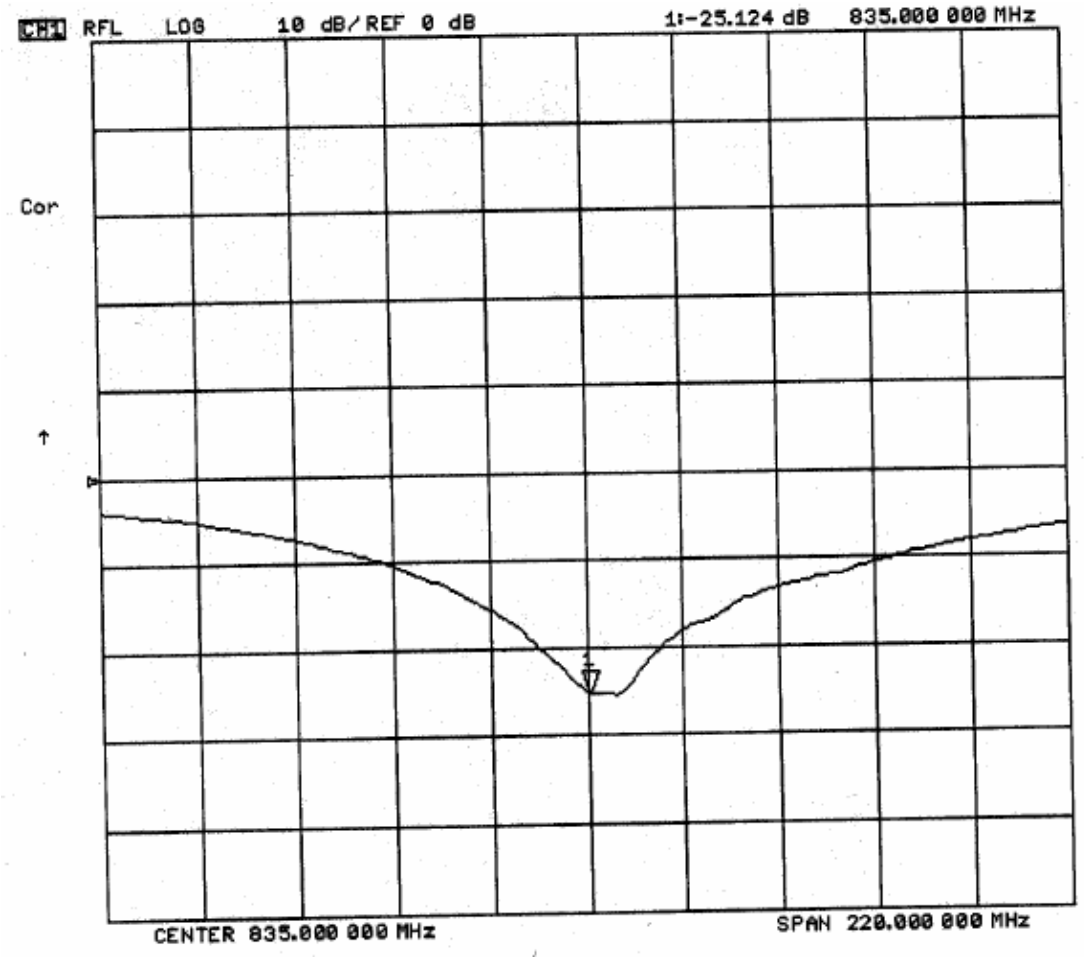
Test Date: Nov. 23, 2006

Dipole Return Loss - 835 MHz dipole with 650 MHz fluid

The dipole return loss was better than -15 dB



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APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

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750 MHz System Performance Check & DUT Evaluation (Body)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Wed 22/Nov/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
0.6000	56.12	0.95	56.03	0.81
0.6100	56.08	0.95	55.86	0.82
0.6200	56.04	0.95	55.43	0.83
0.6300	56.00	0.95	55.78	0.85
0.6400	55.96	0.95	55.43	0.86
0.6500	55.92	0.96	55.45	0.86
0.6600	55.88	0.96	55.12	0.87
0.6700	55.84	0.96	55.36	0.88
0.6800	55.80	0.96	55.34	0.88
0.6900	55.76	0.96	54.36	0.91
0.7000	55.73	0.96	54.66	0.90
0.7100	55.69	0.96	54.96	0.92
0.7200	55.65	0.96	54.85	0.91
0.7300	55.61	0.96	54.78	0.93
0.7400	55.57	0.96	54.70	0.94
0.7500	55.53	0.96	54.53	0.97
0.7600	55.49	0.96	54.34	0.95
0.7700	55.45	0.96	54.52	0.98
0.7800	55.41	0.97	53.73	0.96
0.7900	55.38	0.97	53.82	0.98
0.8000	55.34	0.97	53.76	1.00

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650 MHz System Performance Check and 620 MHz, 680 MHz DUT Evaluation (Body)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Thu 23/Nov/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
0.6000	56.12	0.95	54.94	0.93
0.6100	56.08	0.95	55.20	0.94
0.6200	56.04	0.95	54.92	0.95
0.6300	56.00	0.95	55.03	0.95
0.6400	55.96	0.95	54.59	0.96
0.6500	55.92	0.96	54.68	0.97
0.6600	55.88	0.96	54.41	0.98
0.6700	55.84	0.96	54.24	0.98
0.6800	55.80	0.96	54.25	1.00
0.6900	55.76	0.96	54.46	1.01
0.7000	55.73	0.96	54.01	1.02

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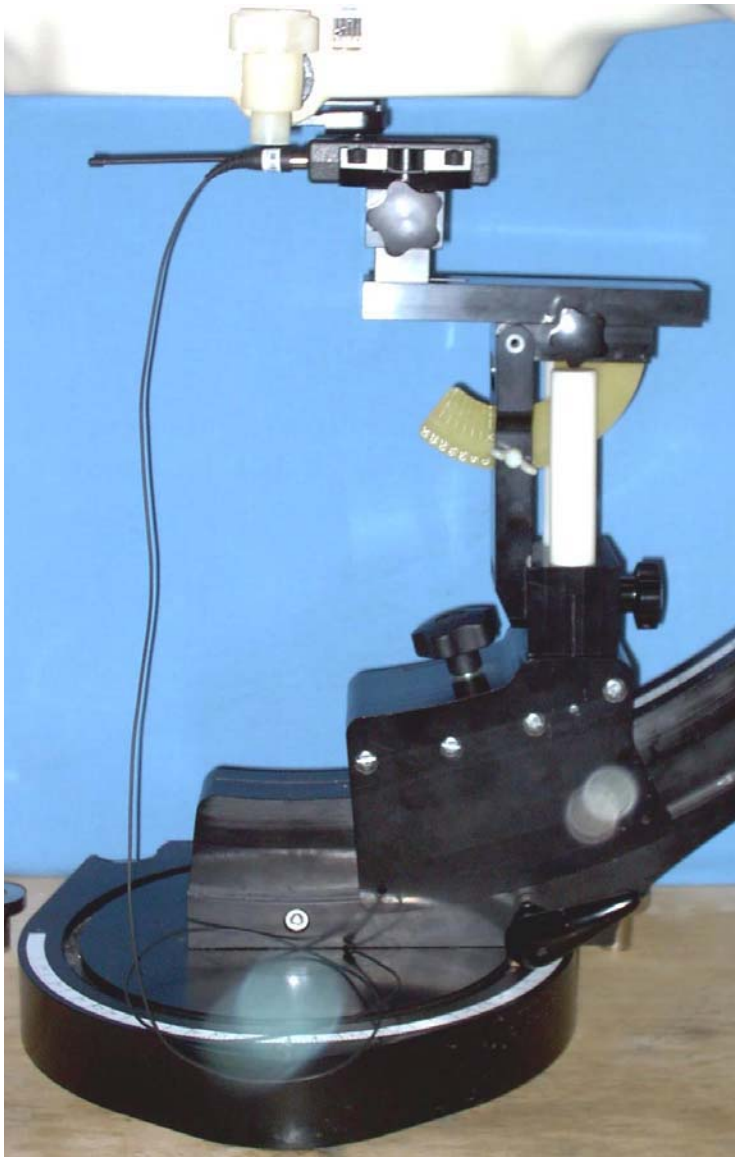
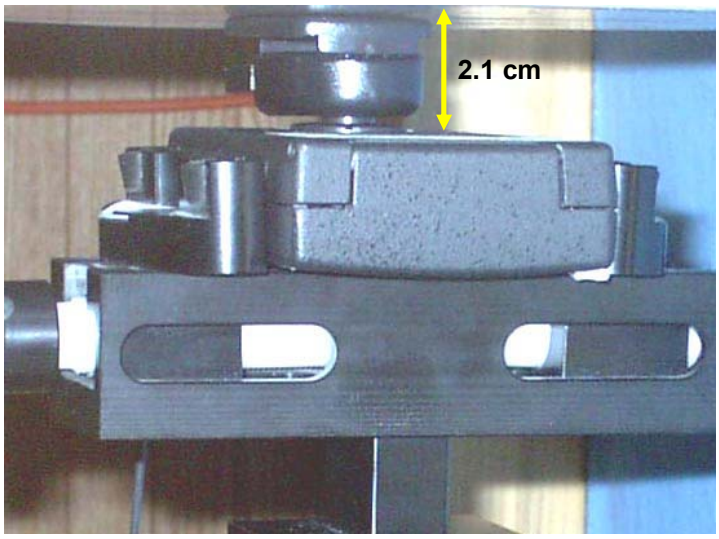
APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

BODY-WORN SAR TEST SETUP PHOTOGRAPHS

2.1 cm Belt-Clip Spacing from Back of DUT to Planar Phantom
With RE90TX Microphone Audio Accessory





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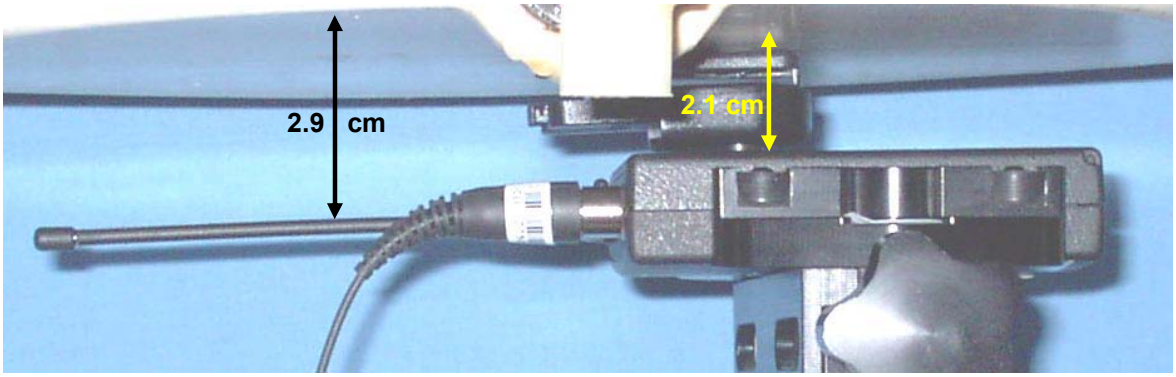
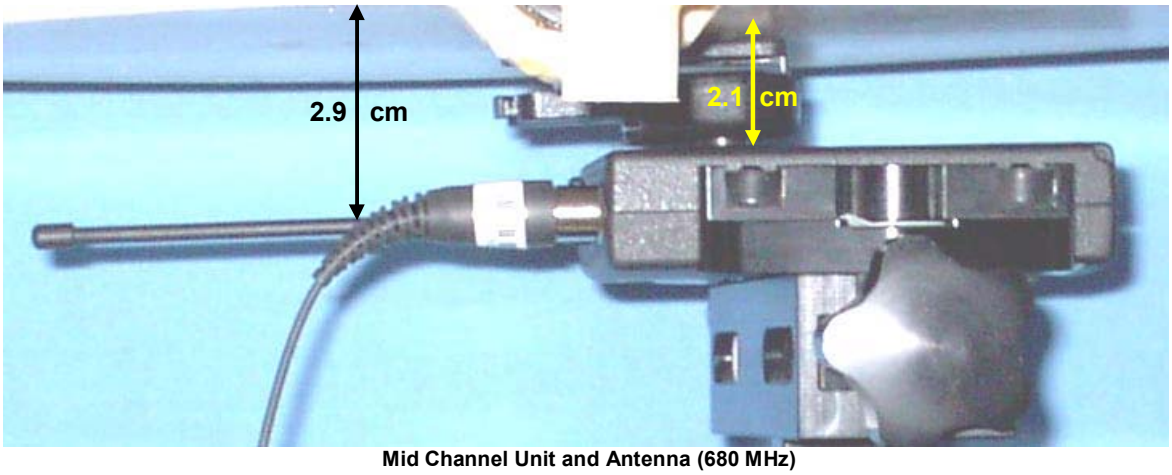
BODY-WORN SAR TEST SETUP PHOTOGRAPHS

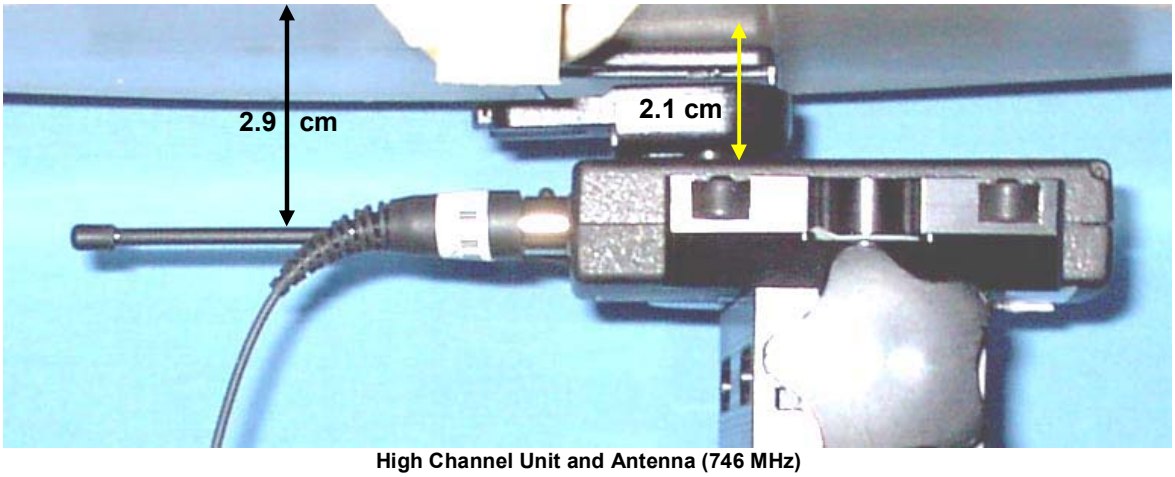
2.1 cm Belt-Clip Spacing from Back of DUT to Planar Phantom With RE90TX Microphone Audio Accessory



Low Channel Unit and Antenna (614 MHz)



Mid Channel Unit and Antenna (680 MHz)



High Channel Unit and Antenna (746 MHz)

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DUT PHOTOGRAPHS

Front of DUT
Low Channel Unit (614 MHz)

Front of DUT
Mid Channel Unit (680 MHz)

Front of DUT
High Channel Unit (746 MHz)

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DUT PHOTOGRAPHS

Back of DUT

Back of DUT with Swivel Belt-Clip

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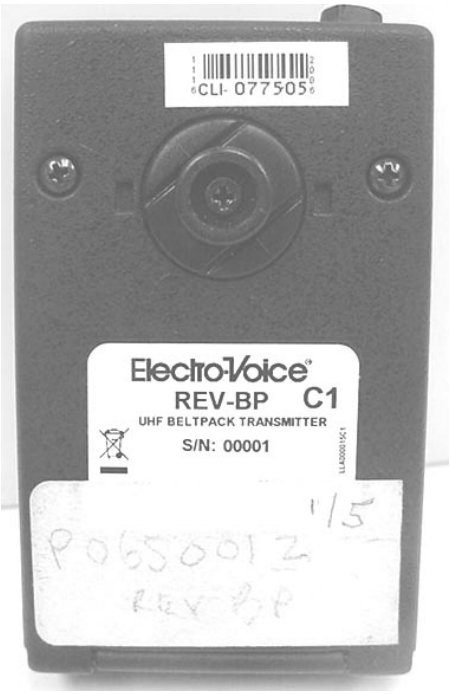
DUT PHOTOGRAPHS



Back of DUT
Low Channel Unit (614 MHz)

Back of DUT
Mid Channel Unit (680 MHz)

Back of DUT
High Channel Unit (746 MHz)

Top end of DUT

Bottom end of DUT

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DUT PHOTOGRAPHS

Left Side of DUT with Swivel Belt-Clip

Right Side of DUT with Swivel Belt-Clip

DUT Battery Compartment and Control Buttons

9V Alkaline Battery

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DUT PHOTOGRAPHS

Whip Antenna - Low Frequency (614 MHz)

Whip Antenna - Mid Frequency (680 MHz)

Whip Antenna - Upper Frequency (746 MHz)

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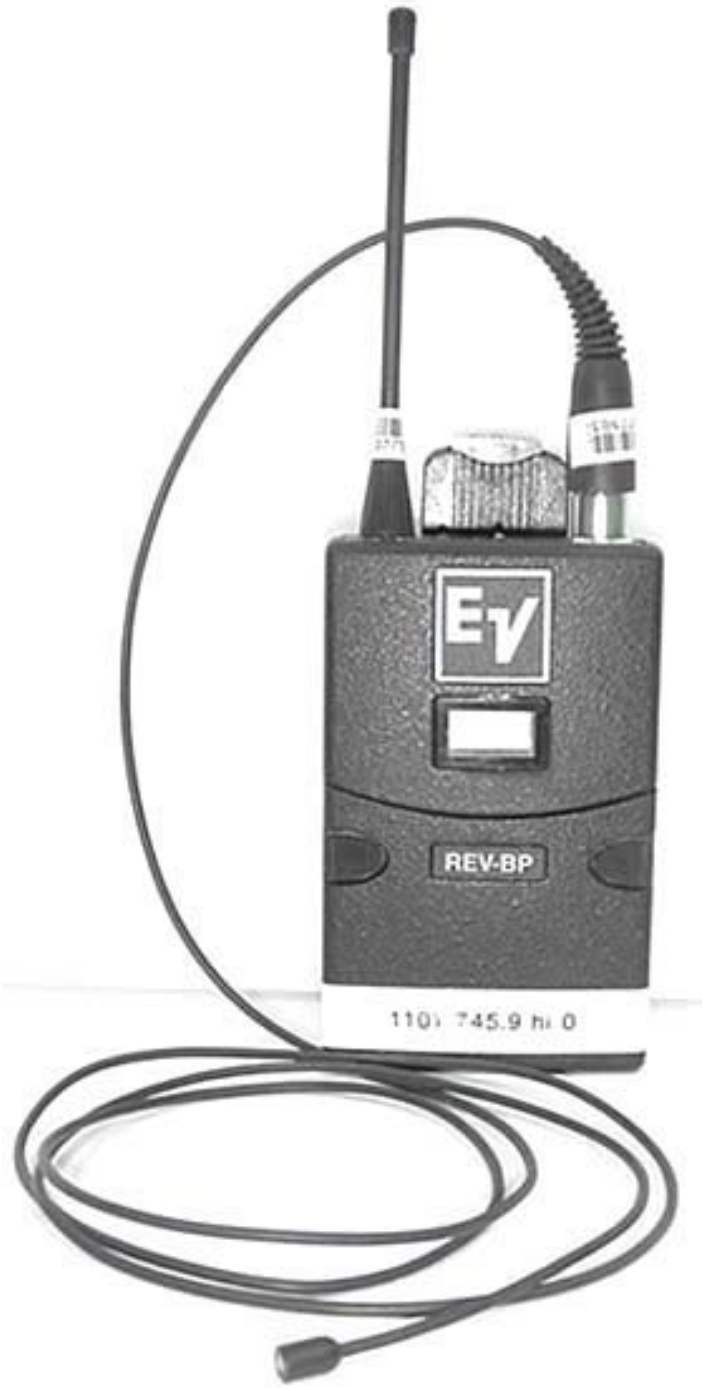
DUT PHOTOGRAPHS



DUT with RE90TX Microphone Audio Accessory (P/N: 17153318)

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APPENDIX E - PROBE CALIBRATION

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

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

Accredited by the Swiss Federal Office of Metrology and Accreditation
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **Celltech Labs**

Certificate No: ET3-1387_Mar06

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1387
Calibration procedure(s)	QA CAL-01.v5 Calibration procedure for dosimetric E-field probes
Calibration date:	March 16, 2006
Condition of the calibrated item	In Tolerance

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41495277	3-May-05 (METAS, No. 251-00466)	May-06
Power sensor E4412A	MY41498087	3-May-05 (METAS, No. 251-00466)	May-06
Reference 3 dB Attenuator	SN: S5054 (3c)	11-Aug-05 (METAS, No. 251-00499)	Aug-06
Reference 20 dB Attenuator	SN: S5086 (20b)	3-May-05 (METAS, No. 251-00467)	May-06
Reference 30 dB Attenuator	SN: S5129 (30b)	11-Aug-05 (METAS, No. 251-00500)	Aug-06
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	2-Feb-06 (SPEAG, No. DAE4-654_Feb06)	Feb-07

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

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

Issued: March 16, 2006

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

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., $\vartheta = 0$ 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 $\vartheta = 0$ ($f \leq 900$ 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 $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ET3DV6

SN:1387

Manufactured:	September 21, 1999
Last calibrated:	March 18, 2005
Recalibrated:	March 16, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1387

Sensitivity in Free Space[A]

NormX	**1.62** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**92** mV
NormY	**1.72** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**92** mV
NormZ	**1.72** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**92** mV

Diode Compression[B]

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

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

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	9.3	5.0
SAR_{be} [%]	With Correction Algorithm	0.1	0.2

Sensor Offset

Probe Tip to Sensor Center **2.7** mm

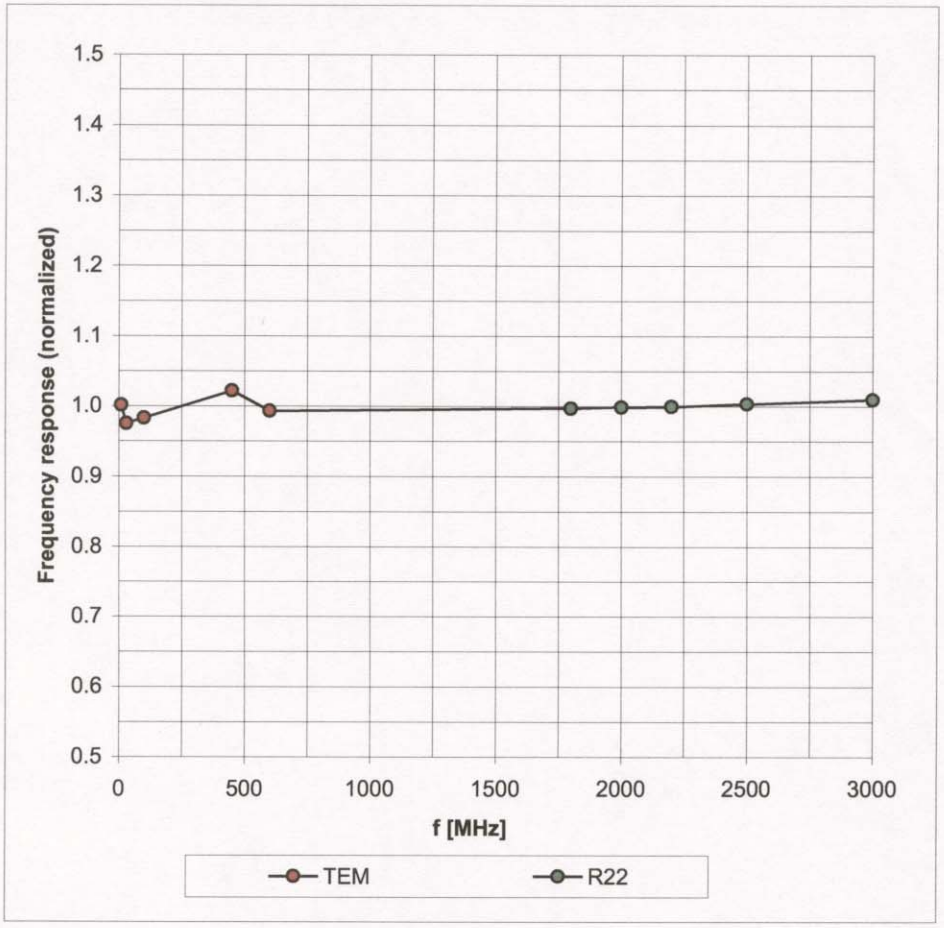
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

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

[B] Numerical linearization parameter: uncertainty not required.

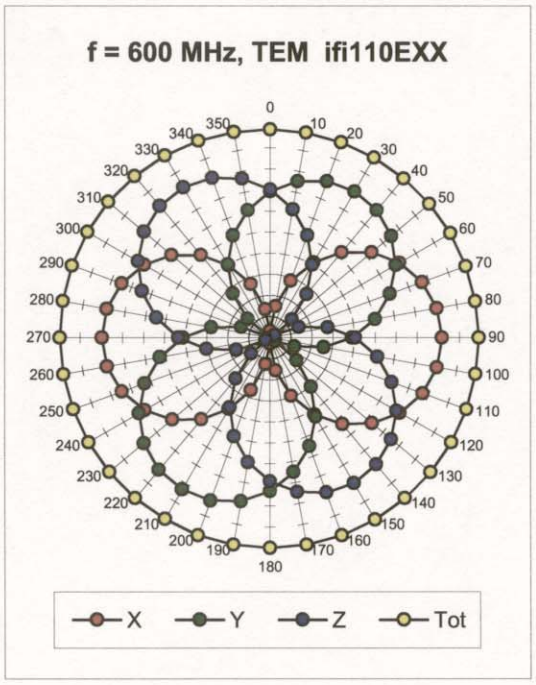
Frequency Response of E-Field

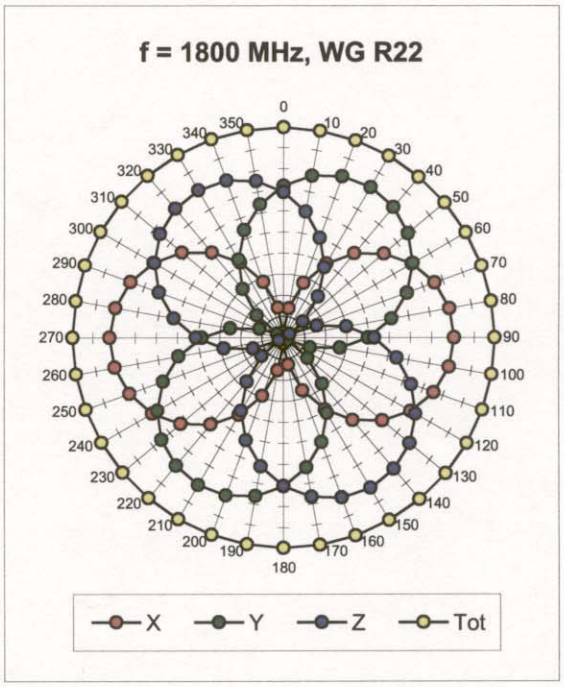
(TEM-Cell:ifi110 EXX, Waveguide: R22)

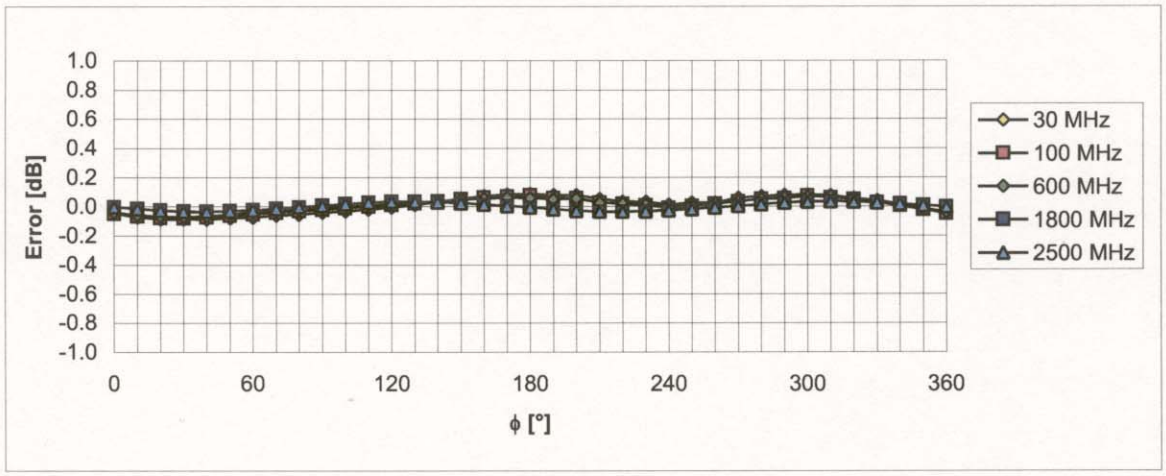


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



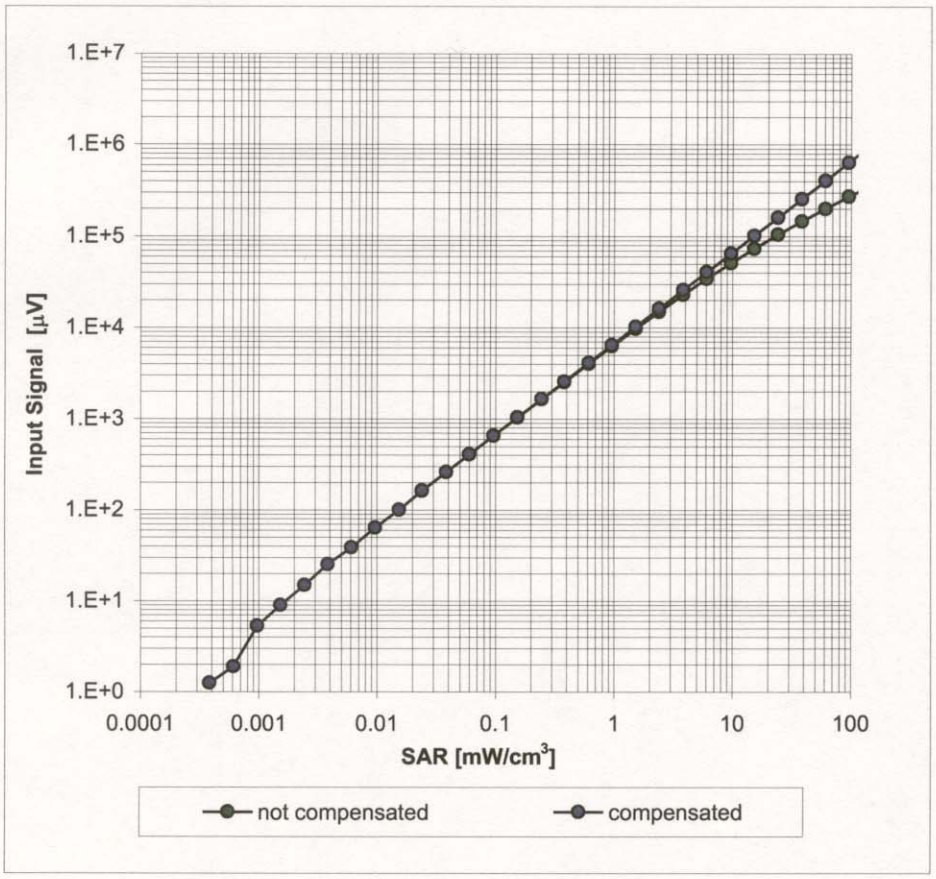


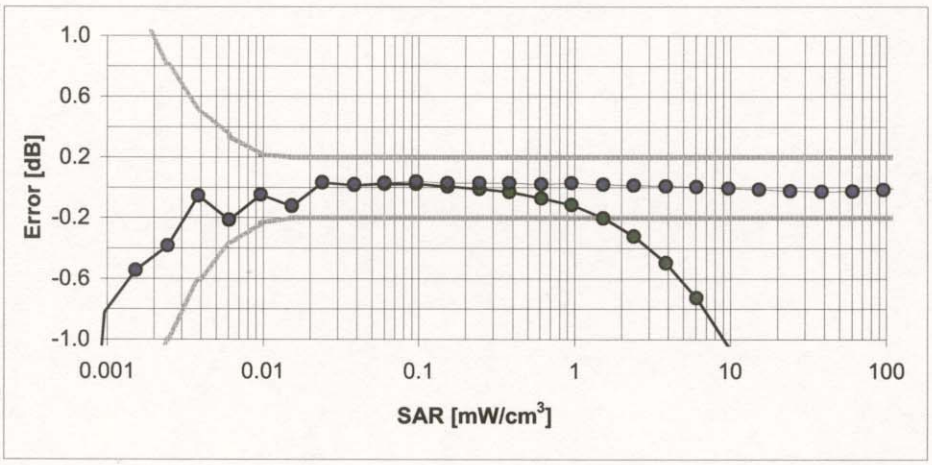


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

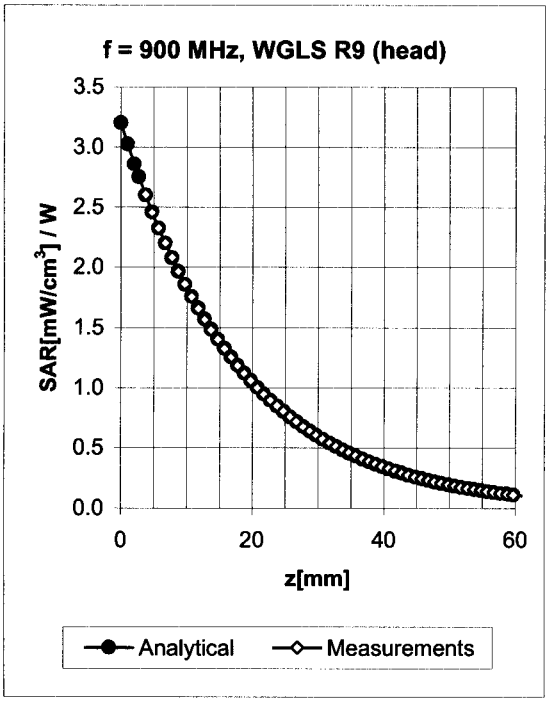
(Waveguide R22, f = 1800 MHz)

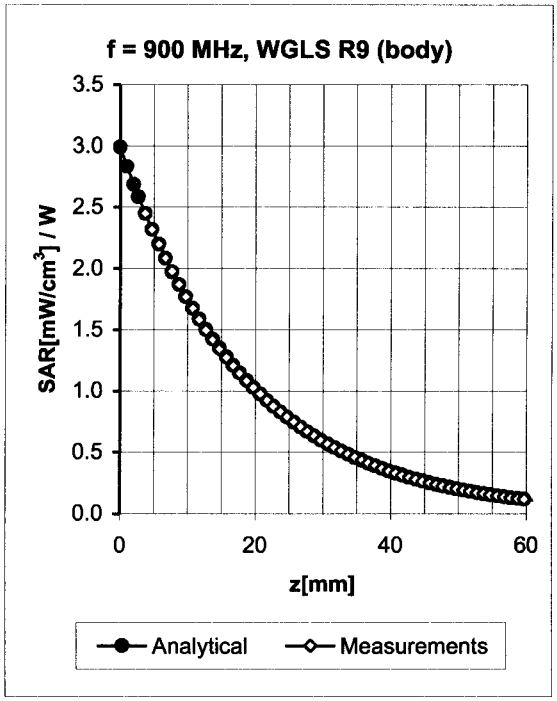




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



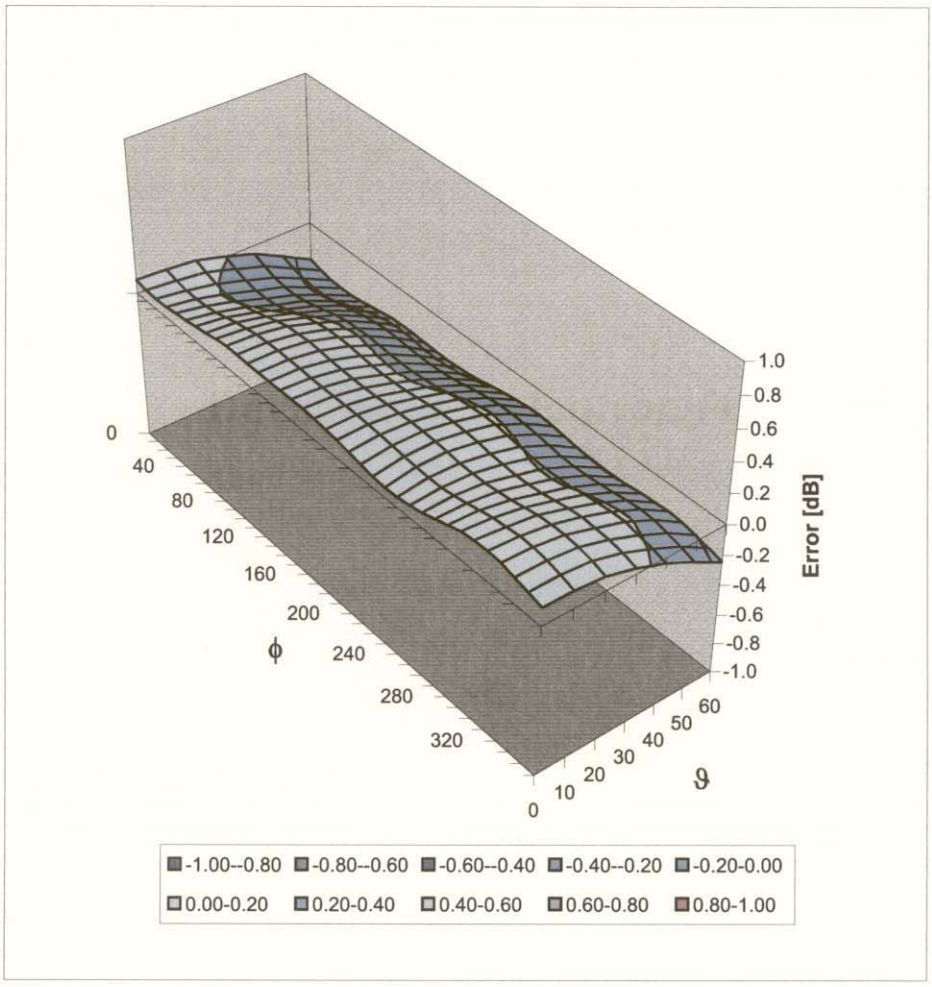


f [MHz]	Validity [MHz][c]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.62	1.86	6.35 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.59	1.97	6.04 ± 11.0% (k=2)

[c] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1387**
Place of Assessment:	**Zurich**
Date of Assessment:	**March 18, 2006**
Probe Calibration Date:	**March 16, 2006**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:

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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor (± standard deviation)

150 ± 50 MHz	ConvF	**8.6 ± 10%**	ε_r = **52.3 ± 5%** σ = **0.76 ± 5% mho/m** (head tissue)
150 ± 50 MHz	ConvF	**8.2 ± 10%**	ε_r = **61.9 ± 5%** σ = **0.80 ± 5% mho/m** (body tissue)
300 ± 50 MHz	ConvF	**7.8 ± 9%**	ε_r = **45.3 ± 5%** σ = **0.87 ± 5% mho/m** (head tissue)
450 ± 50 MHz	ConvF	**7.4 ± 8%**	ε_r = **43.5 ± 5%** σ = **0.87 ± 5% mho/m** (head tissue)
450 ± 50 MHz	ConvF	**7.3 ± 8%**	ε_r = **56.7 ± 5%** σ = **0.94 ± 5% mho/m** (body tissue)
750 ± 50 MHz	ConvF	**6.6± 7%**	ε_r = **41.8 ± 5%** σ = **0.89 ± 5% mho/m** (head tissue)
750 ± 50 MHz	ConvF	**6.4 ± 7%**	ε_r = **55.4 ± 5%** σ = **0.96 ± 5% mho/m** (body tissue)
1925 ± 50 MHz	ConvF	**5.0 ± 7%**	ε_r = **39.8 ± 5%** σ = **1.48 ± 5% mho/m** (head tissue)
1925 ± 50 MHz	ConvF	**4.7 ± 7%**	ε_r = **53.2 ± 5%** σ = **1.60 ± 5% mho/m** (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.
Please see also Section 4.7 of the DASY4 Manual.

Schmid & Partner Engineering AG

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Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1387**
Place of Assessment:	**Zurich**
Date of Assessment:	**July 14, 2005**
Probe Calibration Date:	**March 18, 2005**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:

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

Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor (± standard deviation)

f = 750 MHz	ConvF	**6.8 ± 7%**	**σ_r = 41.8 ± 5%** **σ = 0.89 ± 5% mho/m** (head tissue)
f = 750 MHz	ConvF	**6.5 ± 7%**	**σ_r = 55.4 ± 5%** **σ = 0.96 ± 5% mho/m** (body tissue)
f = 1925 MHz	ConvF	**5.0 ± 7%**	**σ_r = 39.8 ± 5%** **σ = 1.48 ± 5% mho/m** (head tissue)
f = 1925 MHz	ConvF	**4.6 ± 7%**	**σ_r = 53.2 ± 5%** **σ = 1.60 ± 5% mho/m** (body tissue)

Important Note:

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

Please see also Section 4.7 of the DASY4 Manual.

Schmid & Partner Engineering AG

s p e a g

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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:	**ET3DV6**
Serial Number:	**1387**
Place of Assessment:	**Zurich**
Date of Assessment:	**November 21, 2006**
Probe Calibration Date:	**March 16, 2006**

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 900 MHz or at 1800 MHz.

Assessed by:

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Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Dosimetric E-Field Probe ET3DV6 SN:1387

Conversion factor (± standard deviation)

650 ± 50 MHz	ConvF	**6.70 ± 7%**	σ_r **= 55.9 ± 5%** σ **= 0.95 ± 5% mho/m** (body tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.
Please see also Section 4.7 of the DASY4 Manual.

APPENDIX F - 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

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