RF EXPOSURE EVALUATION

SPECIFIC ABSORPTION RATE

SAR TEST REPORT

FOR

DTC COMMUNICATIONS, INC.

WIRELESS BODY-WORN VIDEO VEST TRANSMITTER

MODEL: PDTX100SBW

FCC ID: H25TPDTX100SBW

Test Report Serial Number

120705H25-F701-S90D
Revision 0

Test Report Issue Date

December 16, 2005

Test Lab

Celltech Compliance Testing & Engineering Lab
(Celltech Labs Inc.)
1955 Moss Court
Kelowna, BC
Canada
V1Y 9L3

Test Report Prepared By:	Test Report Approved By:
Cheri Frangiadakis	
Cheri Frangiadakis Test Report Writer Celltech Labs Inc.	Jonathan Hughes General Manager Celltech Labs Inc.

DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab

CELLTECH LABS INC.
Testing and Engineering Services
1955 Moss Court
Kelowna, B.C.
Canada V1Y 9L3
Phone: 250 - 448-7047
Fax: 250 - 448-7046
e-mail: info@celltechlabs.com
web site: www.celltechlabs.com

Applicant Information

DTC COMMUNICATIONS, INC.
486 Amherst Street
Nashua, NH 03063
United States

FCC IDENTIFIER:	**H25TPDTX100SBW**
Model(s):	**PDTX100SBW**
Rule Part(s):	**FCC §2.1093; IC RSS-102 Issue 2**
Test Procedure(s):	**FCC OET Bulletin 65 Supplement C (01-01)**
Device Classification:	**Licensed Non-Broadcast Transmitter worn on body (TNT)**
Device Description:	**Wireless Body-Worn Video Vest Transmitter**
Transmission System(s):	**Direct Sequence Spread Spectrum (DSSS)**
Transmitter Frequency Range(s):	**2380 - 2480 MHz**
Max. RF Output Power Measured:	**19.5 dBm (89.1 mW) Peak Conducted (2480 MHz)**
Battery Type(s) Tested:	**1.5 V, 3000 mAh AA Energizer Lithium e^2 (x9)**
Antenna Type(s) Tested:	**Dual Microstrip Patch (P/N: 1087816)**
Body-Worn Accessories:	**Cotton Vest**
Audio Accessories:	**Microphone (x2)**
Max. SAR Level(s) Measured:	**Body-worn: 0.681 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 standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01) and Industry Canada RSS-102 Issue 2 for the Occupational / Controlled 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.

Tested By:

Sean Johnston
Compliance Technologist
Celltech Labs Inc.

Reviewed By:

Spencer Watson
Senior Compliance Technologist
Celltech Labs Inc.

TABLE OF CONTENTS

1.0 INTRODUCTION

This measurement report demonstrates that the DTC COMMUNICATIONS, INC. Model: PDTX100SBW Wireless Body-Worn Video Vest Transmitter FCC ID: H25TPDTX100SBW complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada Safety Code 6 (see reference [2]) for the Occupational / Controlled 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 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)

FCC Rule Part(s)	47 CFR §2.1093				
IC Rule Part(s)	RSS-102 Issue 2				
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (01-01)				
FCC Device Classification	Licensed Non-Broadcast Transmitter worn on body (TNT)				Rule Part 90
Device Description	Wireless Body-Worn Video Vest Transmitter				
FCC IDENTIFIER	H25TPDTX100SBW				
Model(s)	PDTX100SBW				
Test Sample Serial No.	None		Identical Prototype		
Transmission System(s)	DSSS		Direct Sequence Spread Spectrum		
Modulation Scheme	QPSK		Quadrature Phase Shift Keying		
Tx Frequency Range(s)	2380 - 2480 MHz				
Max. Peak Conducted RF Output Power Measured	Low	2380 MHz	19.3 dBm		85.1 mW
	Mid	2430 MHz	19.2 dBm		83.2 mW
	High	2480 MHz	19.5 dBm		89.1 mW
Battery Type(s) Tested	Energizer Lithium e^2	AA (x9)	1.5 V	3000 mAh	9V Battery Pack
Antenna Type(s) Tested	Microstrip Patch	Antenna 1	Front Left Side of Vest		P/N: 1087816
	Microstrip Patch	Antenna 2	Back Right Side of Vest		P/N: 1087816
Body-Worn Accessories	Cotton Vest				
Audio Accessories	Microphone (x2)				

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 - right side view

DASY4 Measurement System with SAM Phantom - left side view

4.0 MEASUREMENT SUMMARY

BODY-WORN SAR EVALUATION RESULTS

Freq. (MHz)	Test Chan.	Test Mode	Battery Type	Antenna Tested	Antenna Position to Planar Phantom		Separation Distance to Planar Phantom (cm)	Cond. Power Before Test (dBm)	Measured SAR 1g (W/kg)	SAR Drift During Test (dB)	Scaled SAR 1g with droop (W/kg)
2430	2	DSSS	Lithium-ion	Antenna 1	Back Side	Non-radiating side	0.0	19.2	0.0475	-0.560	0.0540
2430	2	DSSS	Lithium-ion	Antenna 1	Front Side	Radiating Side	0.0	19.2	0.357	-0.601	0.410
2430	2	DSSS	Lithium-ion	Antenna 2	Back Side	Non-radiating side	0.0	19.2	0.0410	-0.532	0.0463
2430	2	DSSS	Lithium-ion	Antenna 2	Front Side	Radiating Side	0.0	19.2	0.276	-0.631	0.319
2380	1	DSSS	Lithium-ion	Antenna 2	Front Side	Radiating Side	0.0	19.3	0.392	-0.583	0.448
2480	3	DSSS	Lithium-ion	Antenna 2	Front Side	Radiating Side	0.0	19.5	0.378	-1.09	0.486
2380	1	DSSS	Lithium-ion	Antenna 1	Front Side	Radiating Side	0.0	19.3	0.605	-0.514	**0.681**
2480	3	DSSS	Lithium-ion	Antenna 1	Front Side	Radiating Side	0.0	19.5	0.462	-0.639	0.535
ANSI / IEEE C95.1 1999 - SAFETY LIMIT			**BODY: 8.0 W/kg (averaged over 1 gram)**				**Spatial Peak - Controlled Exposure / Occupational**				

Test Date(s)	December 8, 2005				Relative Humidity	30	%
Measured Fluid Type	2450 MHz Body				Atmospheric Pressure	103.5	kPa
Dielectric Constant ε_r	IEEE Target		Measured	Deviation	Ambient Temperature	23.2	°C
	52.7	± 5%	51.3	-2.7%	Fluid Temperature	23.8	°C
Conductivity σ (mho/m)	IEEE Target		Measured	Deviation	Fluid Depth	≥ 15	cm
	1.95	± 5%	1.97	+1.0%	ρ (Kg/m^3)	1000	

Note(s):

1. **Antenna 1 = Front Side Upper Left Vest Pouch - Antenna 2 = Back Side Upper Right Vest Pouch**
2. 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.
3. If the SAR measurements performed 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 [3]).
4. The power droops measured by the DASY4 system for the duration of the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the above test data table.
5. A SAR-versus-Time power droop evaluation was performed in the test configuration that reported the worst-case power droop. See Appendix A (SAR Test Plots) for SAR-versus-Time power droop evaluation plot.
6. The DUT was tested with fully charged batteries for all evaluations.
7. The ambient and fluid temperatures were measured prior to, and during, the fluid dielectric parameter check and the SAR evaluations. The temperatures reported were consistent for all measurement periods.
8. The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluation using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).
9. The SAR evaluation was performed within 24 hours of the system performance check.

5.0 DETAILS OF SAR EVALUATION

The DTC COMMUNICATIONS, INC. Model: PDTX100SBW Wireless Body-Worn Video Vest Transmitter FCC ID: H25TPDTX100SBW was determined to be compliant for localized Specific Absorption Rate based on the test provisions and conditions described below. Detailed test setup photographs are shown in Appendix D.

SAR Test Configurations

1. The DUT was tested for body-worn SAR with antenna 1 placed inside the front upper left side pouch of the vest. The back side (non-radiating side) of the antenna was facing parallel to the SAM phantom (planar section) and the inside section of the front vest antenna pouch was touching outer surface of the SAM phantom (planar section).
2. The DUT was tested for body-worn SAR with antenna 1 placed inside the front upper left side pouch of the vest. The front side (radiating side) of the antenna was facing parallel to the SAM phantom (planar section) and the outer section of the front vest antenna pouch was touching the outer surface of the SAM phantom (planar section).
3. The DUT was tested for body-worn SAR with antenna 2 placed inside the back upper right side pouch of the vest. The back side (non-radiating side) of the antenna was facing parallel to the SAM phantom (planar section) and the inside section of the back vest antenna pouch was touching the outer surface of the SAM phantom (planar section).
4. The DUT was tested for body-worn SAR with antenna 2 placed inside the back upper right side pouch of the vest. The front side (radiating side) of the antenna was facing parallel to the SAM phantom (planar section) and the outer section of the back vest antenna pouch was touching the outer surface of the SAM phantom (planar section).

Test Modes & Power Settings

1. The 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.
2. The DUT was controlled in test mode using the transmitter box control buttons and tested at maximum power in modulated DSSS continuous transmit operation at 100% duty cycle.
3. The power drift of the DUT during the SAR evaluations was measured by the DASY4 system.
4. The DUT was tested with fully charged batteries for all evaluations.

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.

7.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations a system check was performed at the planar section of the SAM phantom with a 2450MHz dipole (see Appendix E for system validation procedures). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check 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). 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 EVALUATION

Test Date	2450MHz Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ε_r			Conductivity σ (mho/m)			ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		IEEE Target	Meas.	Dev.	IEEE Target	Meas.	Dev.	IEEE Target	Meas.	Dev.						
12/8/05	**Body**	**12.8 ±10%**	13.9	+8.6%	**52.7 ±5%**	51.3	-2.7%	**1.95 ±5%**	1.97	+1.0%	1000	23.2	23.8	≥ 15	30	103.5

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.

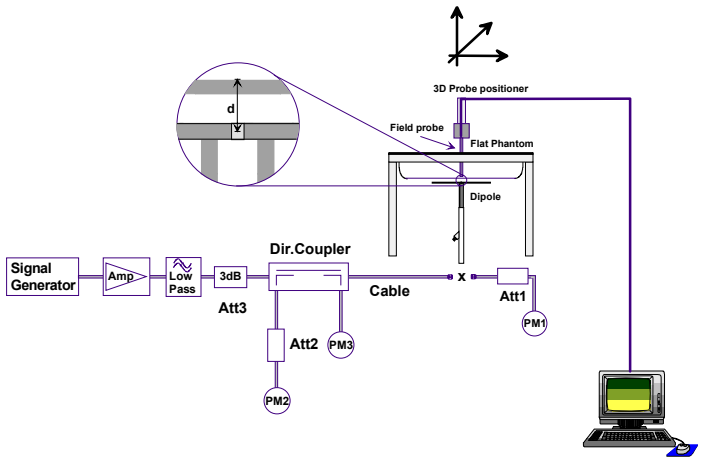


Figure 1. System Performance Check Measurement Setup

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

2450MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

The 2450MHz simulated tissue mixture consists of Glycol-monobutyl, water, and salt. The fluids were prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

SIMULATED TISSUE MIXTURES		
INGREDIENT	2450 MHz Body	2450 MHz Body
	System Performance Check	DUT Evaluation
Water	69.98 %	69.98 %
Glycol Monobutyl	30.00 %	30.00 %
Salt	0.02 %	0.02 %

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

Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. 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: DASY4 software
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

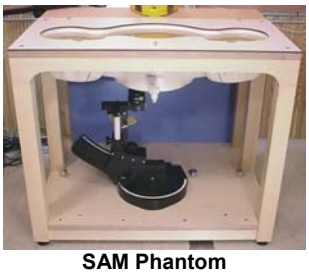
11.0 PROBE SPECIFICATION (ET3DV6)

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. 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 Detection:	±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 portable devices

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 G 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. For evaluations of certain devices, a Plexiglas platform is attached to the device holder.

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	15Jun05		15Jun06
	-DAE3	00018	370	25Jan05		25Jan06
x	-ET3DV6 E-Field Probe	00016	1387	18Mar05		18Mar06
	-ET3DV6 E-Field Probe	00017	1590	20May05		20May06
	-EX3DV4 E-Field Probe	00125	3547	21Jan05		21Jan06
	-300MHz Validation Dipole	00023	135	25Oct05		25Oct06
	-450MHz Validation Dipole	00024	136	25Oct05		25Oct06
	-835MHz Validation Dipole	00022	411	**Brain**	30Mar05	30Mar06
				Body	12Apr05	12Apr06
	-900MHz Validation Dipole	00020	054	**Brain**	10Jun05	10Jun06
				Body	10Jun05	10Jun06
	-1800MHz Validation Dipole	00021	247	**Brain**	14Jun05	14Jun06
				Body	14Jun05	14Jun06
	-1900MHz Validation Dipole	00032	151	**Brain**	17Jun05	17Jun06
				Body	22Apr05	22Apr06
	-2450MHz Validation Dipole	00025	150	**Brain**	20Sep05	20Sep06
x				**Body**	22Apr05	22Apr06
	-5000MHz Validation Dipole	00126	1031	**Brain**	11Jan05	11Jan06
				Body	11Jan05	11Jan06
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
	HP 85070C Dielectric Probe Kit	00033	N/A	N/A		N/A
x	ALS-PR-DIEL Dielectric Probe Kit	00160	260-00953	N/A		N/A
x	Gigatronics 8652A Power Meter	00110	1835801	16Apr05		16Apr06
x	Gigatronics 80701A Power Sensor	00012	1834350	12Sep05		12Sep06
x	Gigatronics 80701A Power Sensor	00014	1833699	07Sep05		07Sep06
	Gigatronics 80701A Power Sensor	00109	1834366	16Apr05		16Apr06
x	HP 8753ET Network Analyzer	00134	US39170292	04May05		04May06
x	HP 8648D Signal Generator	00005	3847A00611	29Apr05		29Apr06
	Rohde & Schwarz SMR40 Signal Generator	00006	100104	12Apr05		12Apr06
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	N/A		N/A

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	5.9	Normal	1	1	5.9	∞
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					**10.79**	
Expanded Uncertainty (k=2)					**21.59**	

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	5.9	Normal	1	1	5.9	∞
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					**9.04**	
Expanded Uncertainty (k=2)					**18.08**	

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.

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 12/08/2005

Body-Worn - Antenna 1 - Back Side (Non-Radiating Side) - Inside of Front Vest Pouch Touching Phantom

DUT: DTC Communications Model: PDTX100SBW; Type: Body-Worn Video Vest Transmitter; Serial: None (Identical Prototype)

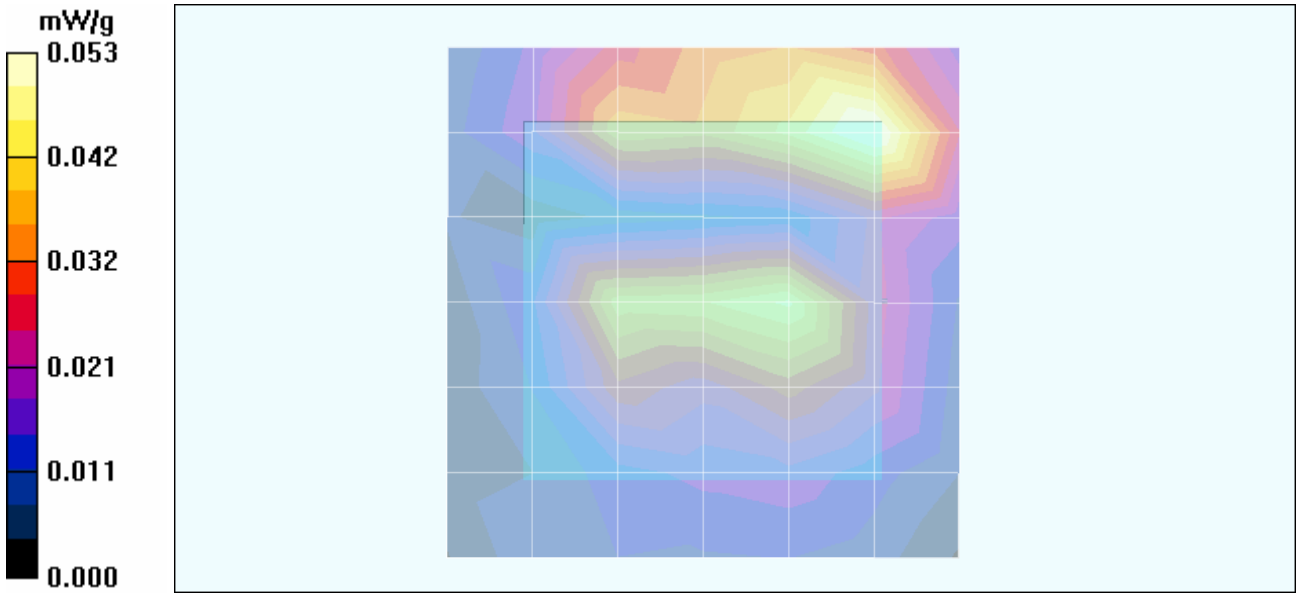
Ambient Temp: 23.2 °C; Fluid Temp: 23.8 °C; Barometric Pressure: 103.5 kPa; Humidity: 30%

Communication System: DSSS
Frequency: 2430 MHz; Duty Cycle: 1:1
RF Output Power: 19.2 dBm (Conducted)
1.5V 3000mAh Energizer E-Squared Lithium AA Battery (x9)
Medium: M2450 (σ = 1.97 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(4.3, 4.3, 4.3); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Mid Channel/Area Scan (7x7x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.48 V/m; Power Drift = -0.560 dB
Peak SAR (extrapolated) = 0.093 W/kg
SAR(1 g) = 0.0475 mW/g; SAR(10 g) = 0.024 mW/g



Date Tested: 12/08/2005

Body-Worn - Antenna 1 - Front Side (Radiating Side) - Outside of Front Vest Pouch Touching Phantom

DUT: DTC Communications: Model PDTX100SBW; Type: Body-Worn Video Vest Transmitter; Serial: None (Identical Prototype)

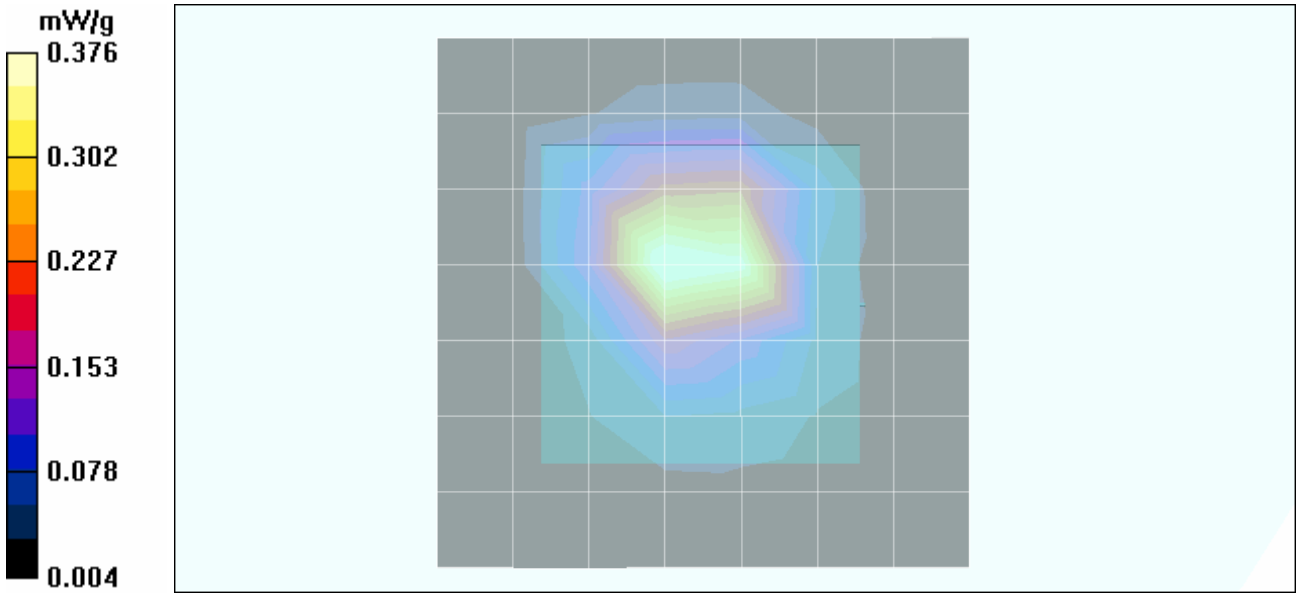
Ambient Temp: 23.2 °C; Fluid Temp: 23.8 °C; Barometric Pressure: 103.5 kPa; Humidity: 30%

Communication System: DSSS
Frequency: 2430 MHz; Duty Cycle: 1:1
RF Output Power: 19.2 dBm (Conducted)
1.5V 3000mAh Energizer E-Squared Lithium AA Battery (x9)
Medium: M2450 (σ = 1.97 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(4.3, 4.3, 4.3); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Mid Channel/Area Scan (8x8x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.8 V/m; Power Drift = -0.601 dB
Peak SAR (extrapolated) = 0.701 W/kg
SAR(1 g) = 0.357 mW/g; SAR(10 g) = 0.193 mW/g



Date Tested: 12/08/2005

Body-Worn - Antenna 2 - Back Side (Non-Radiating Side) - Inside of Back Vest Pouch Touching Phantom

DUT: DTC Communications: Model PDTX100SBW; Type: Body-Worn Video Vest Transmitter; Serial: None (Identical Prototype)

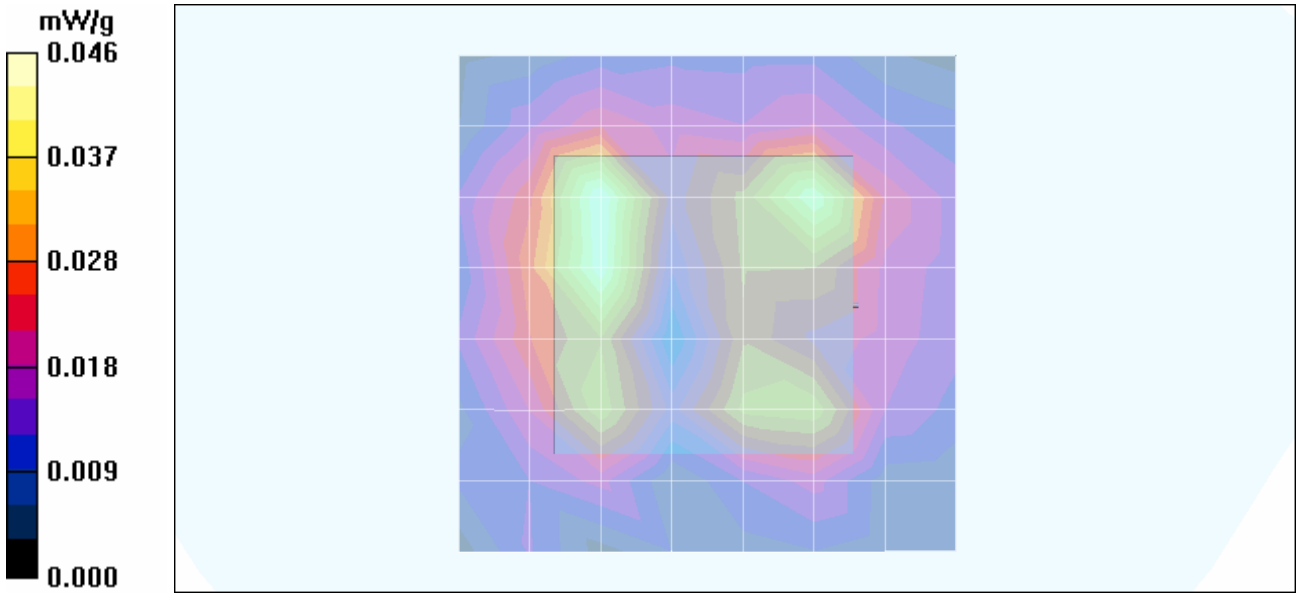
Ambient Temp: 23.2 °C; Fluid Temp: 23.8 °C; Barometric Pressure: 103.5 kPa; Humidity: 30%

Communication System: DSSS
Frequency: 2430 MHz; Duty Cycle: 1:1
RF Output Power: 19.2 dBm (Conducted)
1.5V 3000mAh Energizer E-Squared Lithium AA Battery (x9)
Medium: M2450 (σ = 1.97 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(4.3, 4.3, 4.3); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Mid Channel/Area Scan (8x8x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.62 V/m; Power Drift = -0.532 dB
Peak SAR (extrapolated) = 0.094 W/kg
SAR(1 g) = 0.0410 mW/g; SAR(10 g) = 0.021 mW/g



Date Tested: 12/08/2005

Body-Worn - Antenna 2 - Front Side (Radiating Side) - Outside of Back Vest Pouch Touching Phantom

DUT: DTC Communications: Model PDTX100SBW; Type: Body-Worn Video Vest Transmitter; Serial: None (Identical Prototype)

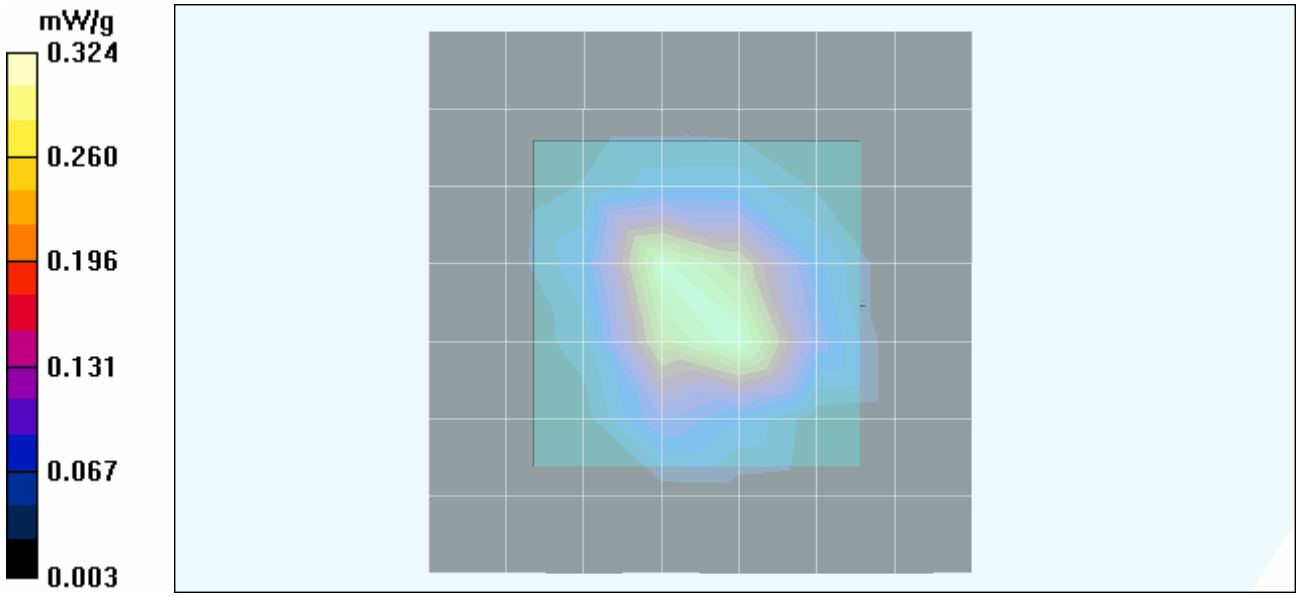
Ambient Temp: 23.2 °C; Fluid Temp: 23.8 °C; Barometric Pressure: 103.5 kPa; Humidity: 30%

Communication System: DSSS
Frequency: 2430 MHz; Duty Cycle: 1:1
RF Output Power: 19.2 dBm (Conducted)
1.5V 3000mAh Energizer E-Squared Lithium AA Battery (x9)
Medium: M2450 (σ = 1.97 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(4.3, 4.3, 4.3); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Mid Channel/Area Scan (8x8x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Mid Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.3 V/m; Power Drift = -0.631 dB
Peak SAR (extrapolated) = 0.705 W/kg
SAR(1 g) = 0.276 mW/g; SAR(10 g) = 0.129 mW/g



Date Tested: 12/08/2005

Body-Worn - Antenna 2 - Front Side (Radiating Side) - Outside of Back Vest Pouch Touching Phantom

DUT: DTC Communications: Model PDTX100SBW; Type: Body-Worn Video Vest Transmitter; Serial: None (Identical Prototype)

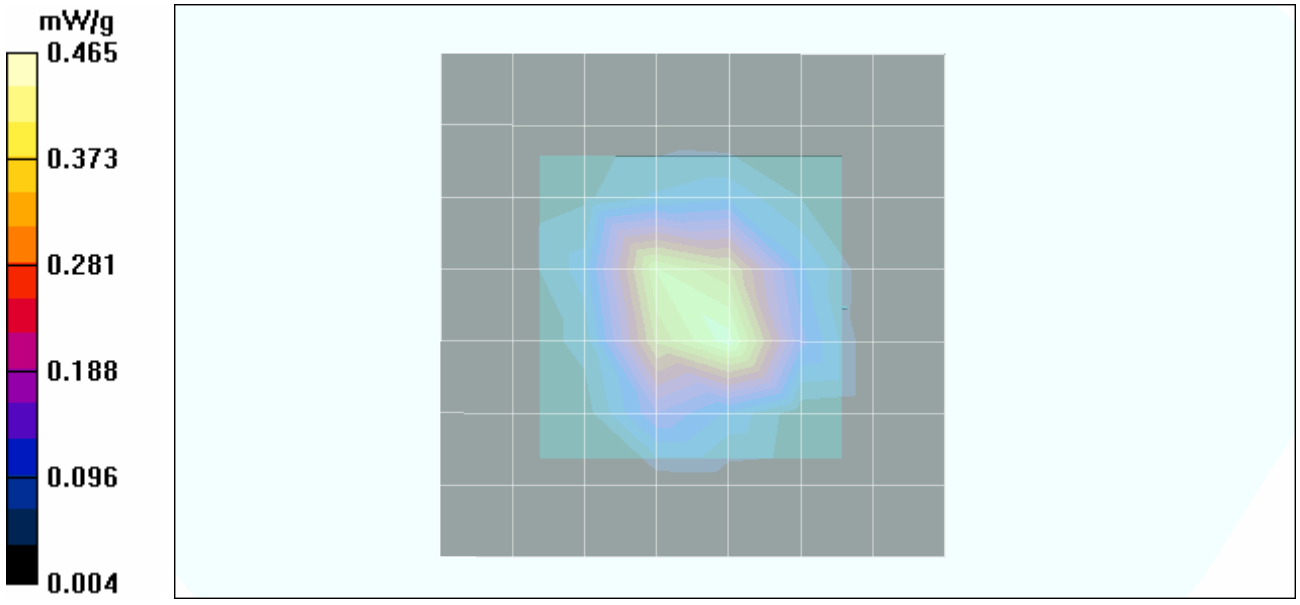
Ambient Temp: 23.2 °C; Fluid Temp: 23.8 °C; Barometric Pressure: 103.5 kPa; Humidity: 30%

Communication System: DSSS
Frequency: 2380 MHz; Duty Cycle: 1:1
RF Output Power: 19.3 dBm (Conducted)
1.5V 3000mAh Energizer E-Squared Lithium AA Battery (x9)
Medium: M2450 (σ = 1.97 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(4.3, 4.3, 4.3); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Low Channel/Area Scan (8x8x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Low Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.7 V/m; Power Drift = -0.583 dB
Peak SAR (extrapolated) = 1.00 W/kg
SAR(1 g) = 0.392 mW/g; SAR(10 g) = 0.184 mW/g



Date Tested: 12/08/2005

Body-Worn - Antenna 2 - Front Side (Radiating Side) - Outside of Back Vest Pouch Touching Phantom

DUT: DTC Communications: Model PDTX100SBW; Type: Body-Worn Video Vest Transmitter; Serial: None (Identical Prototype)

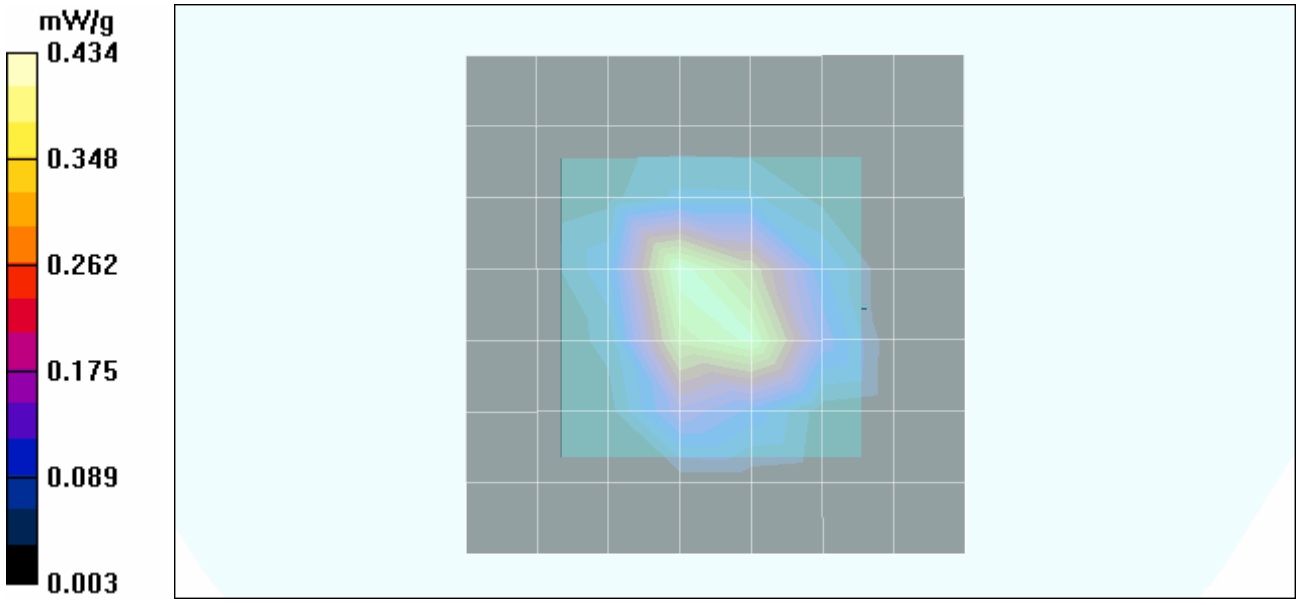
Ambient Temp: 23.2 °C; Fluid Temp: 23.8 °C; Barometric Pressure: 103.5 kPa; Humidity: 30%

Communication System: DSSS
Frequency: 2480 MHz; Duty Cycle: 1:1
RF Output Power: 19.5 dBm (Conducted)
1.5V 3000mAh Energizer E-Squared Lithium AA Battery (x9)
Medium: M2450 (σ = 1.97 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(4.3, 4.3, 4.3); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

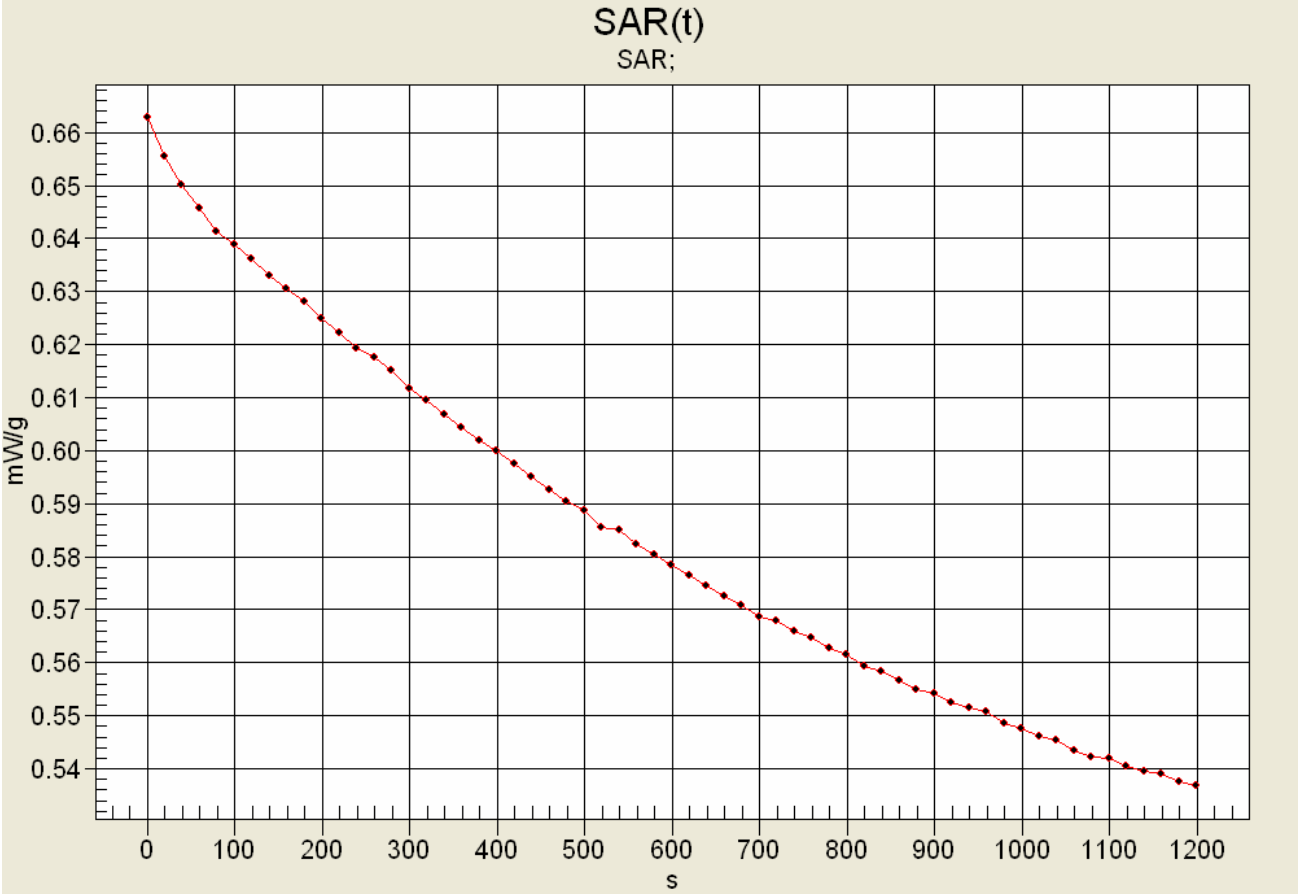
Body-Worn - 0.0 cm Separation Distance to Planar Phantom - High Channel/Area Scan (8x8x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - High Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.6 V/m; Power Drift = -1.09 dB
Peak SAR (extrapolated) = 1.04 W/kg
SAR(1 g) = 0.378 mW/g; SAR(10 g) = 0.177 mW/g



SAR-versus-Time Power Drift Evaluation

Antenna 2 - Front Side (Radiating Side) - Back Vest Pouch
Energizer Lithium Batteries (x9)
High Channel - 2480 MHz



Highest SAR: 0.6628 mW/g
Lowest SAR: 0.5369 mW/g (-0.915 dB)
Test time to end of zoom scan: 1200s

Date Tested: 12/08/2005

Body-Worn - Antenna 1 - Front Side (Radiating Side) - Outside of Front Vest Pouch Touching Phantom

DUT: DTC Communications: Model PDTX100SBW; Type: Body-Worn Video Vest Transmitter; Serial: None (Identical Prototype)

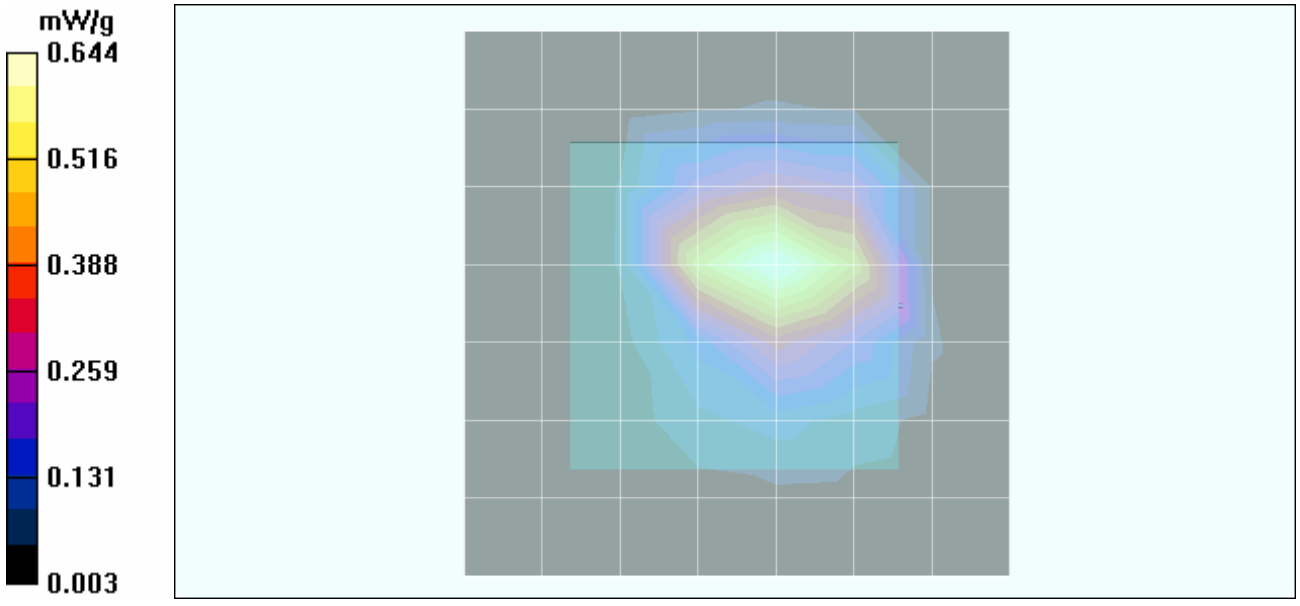
Ambient Temp: 23.2 °C; Fluid Temp: 23.8 °C; Barometric Pressure: 103.5 kPa; Humidity: 30%

Communication System: DSSS
Frequency: 2380 MHz; Duty Cycle: 1:1
RF Output Power: 19.3 dBm (Conducted)
1.5V 3000mAh Energizer E-Squared Lithium AA Battery (x9)
Medium: M2450 (σ = 1.97 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3)

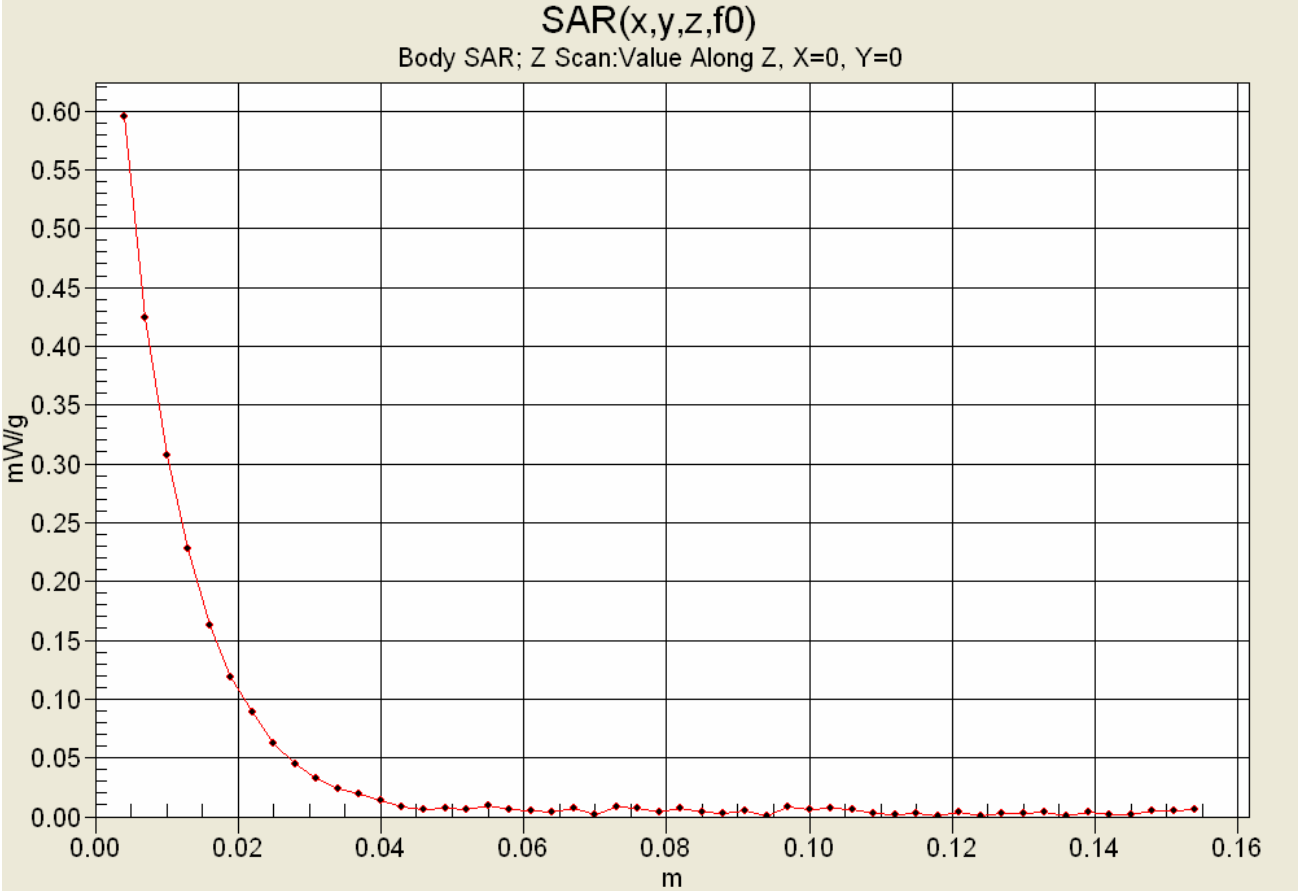
- Probe: ET3DV6 - SN1387; ConvF(4.3, 4.3, 4.3); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Low Channel/Area Scan (8x8x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - Low Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.4 V/m; Power Drift = -0.514 dB
Peak SAR (extrapolated) = 1.23 W/kg
SAR(1 g) = 0.605 mW/g; SAR(10 g) = 0.324 mW/g



Z-Axis Scan



Date Tested: 12/08/2005

Body-Worn - Antenna 1 - Front Side (Radiating Side) - Outside of Front Vest Pouch Touching Phantom

DUT: DTC Communications: Model PDTX100SBW; Type: Body-Worn Video Vest Transmitter; Serial: None (Identical Prototype)

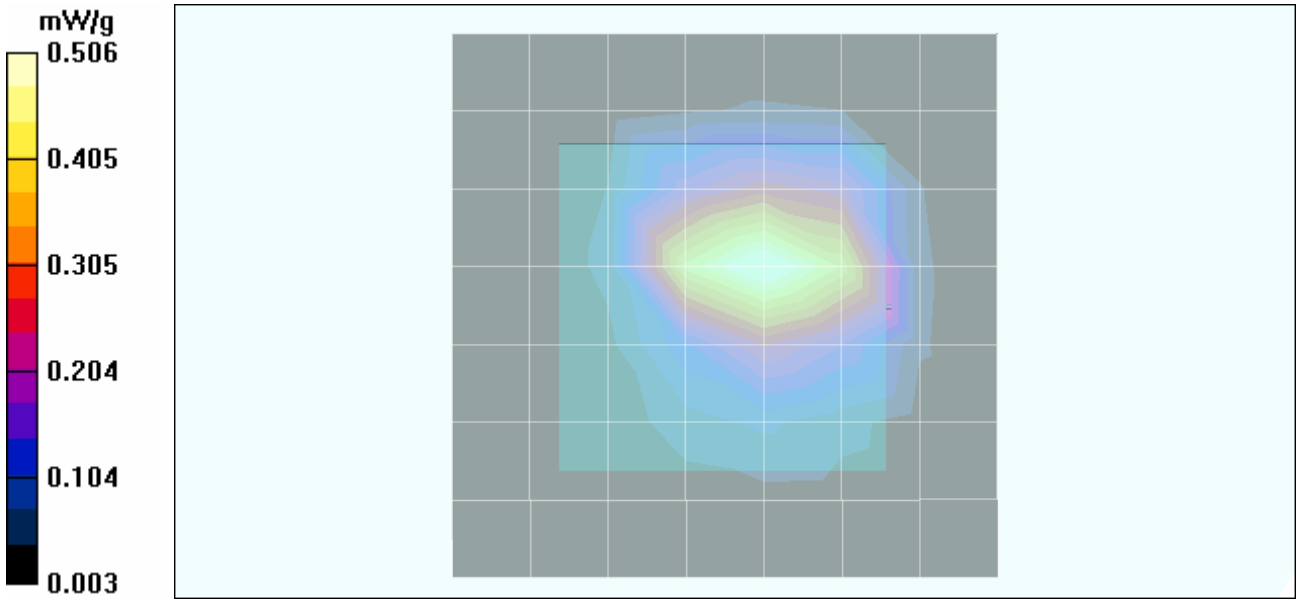
Ambient Temp: 23.2 °C; Fluid Temp: 23.8 °C; Barometric Pressure: 103.5 kPa; Humidity: 30%

Communication System: DSSS
Frequency: 2480 MHz; Duty Cycle: 1:1
RF Output Power: 19.5 dBm (Conducted)
1.5V 3000mAh Energizer E-Squared Lithium AA Battery (x9)
Medium: M2450 (σ = 1.97 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(4.3, 4.3, 4.3); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - High Channel/Area Scan (8x8x1):
Measurement grid: dx=15mm, dy=15mm

Body-Worn - 0.0 cm Separation Distance to Planar Phantom - High Channel/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.8 V/m; Power Drift = -0.639 dB
Peak SAR (extrapolated) = 1.01 W/kg
SAR(1 g) = 0.462 mW/g; SAR(10 g) = 0.251 mW/g



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 12/08/2005

System Performance Check (Body) - 2450 MHz Dipole

DUT: Dipole 2450 MHz; Model: D2450V2; Type: System Performance Check; Serial: 150; Calibrated: 04/22/2005

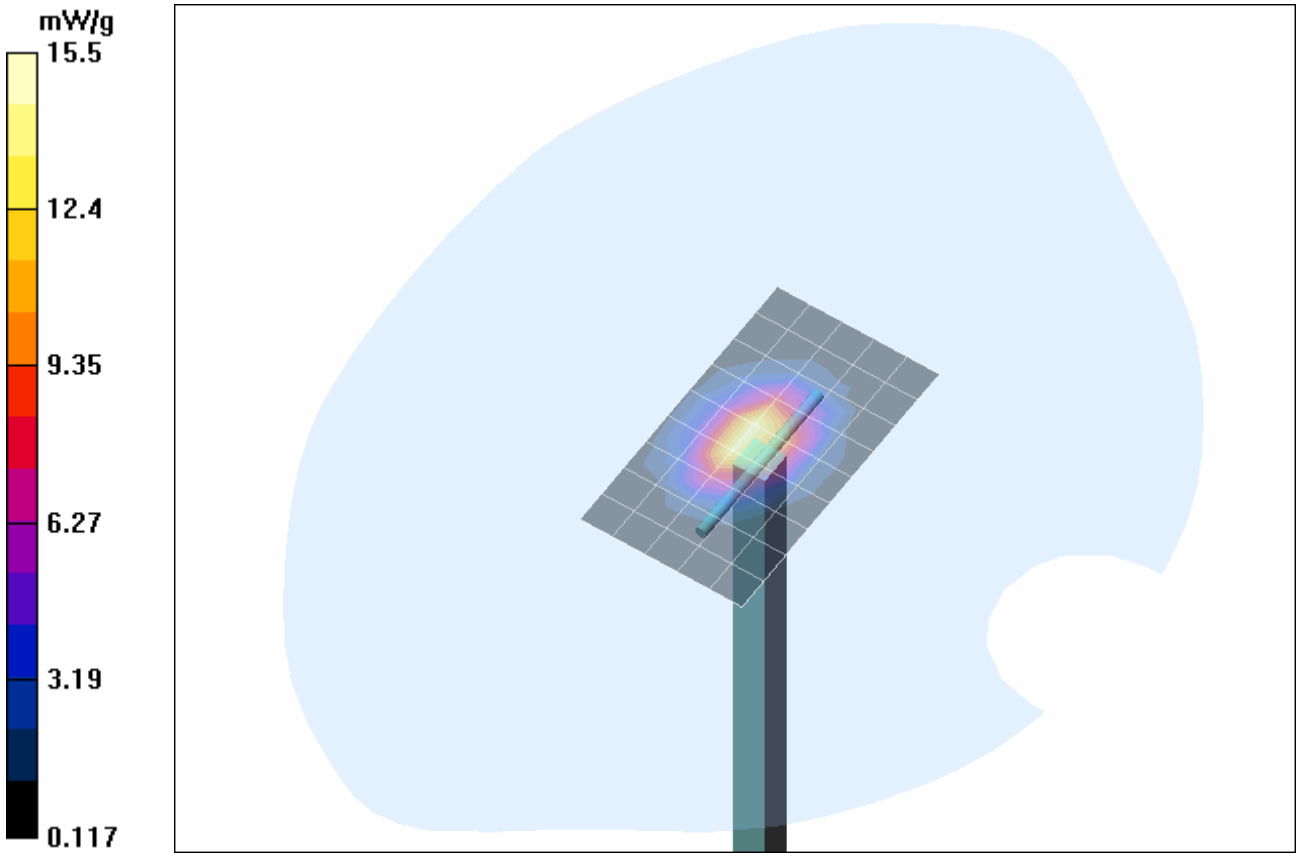
Ambient Temp: 23.2 °C; Fluid Temp: 23.8 °C; Barometric Pressure: 103.5 kPa; Humidity: 30%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: M2450 (σ = 1.97 mho/m; ε_r = 51.3; ρ = 1000 kg/m^3)

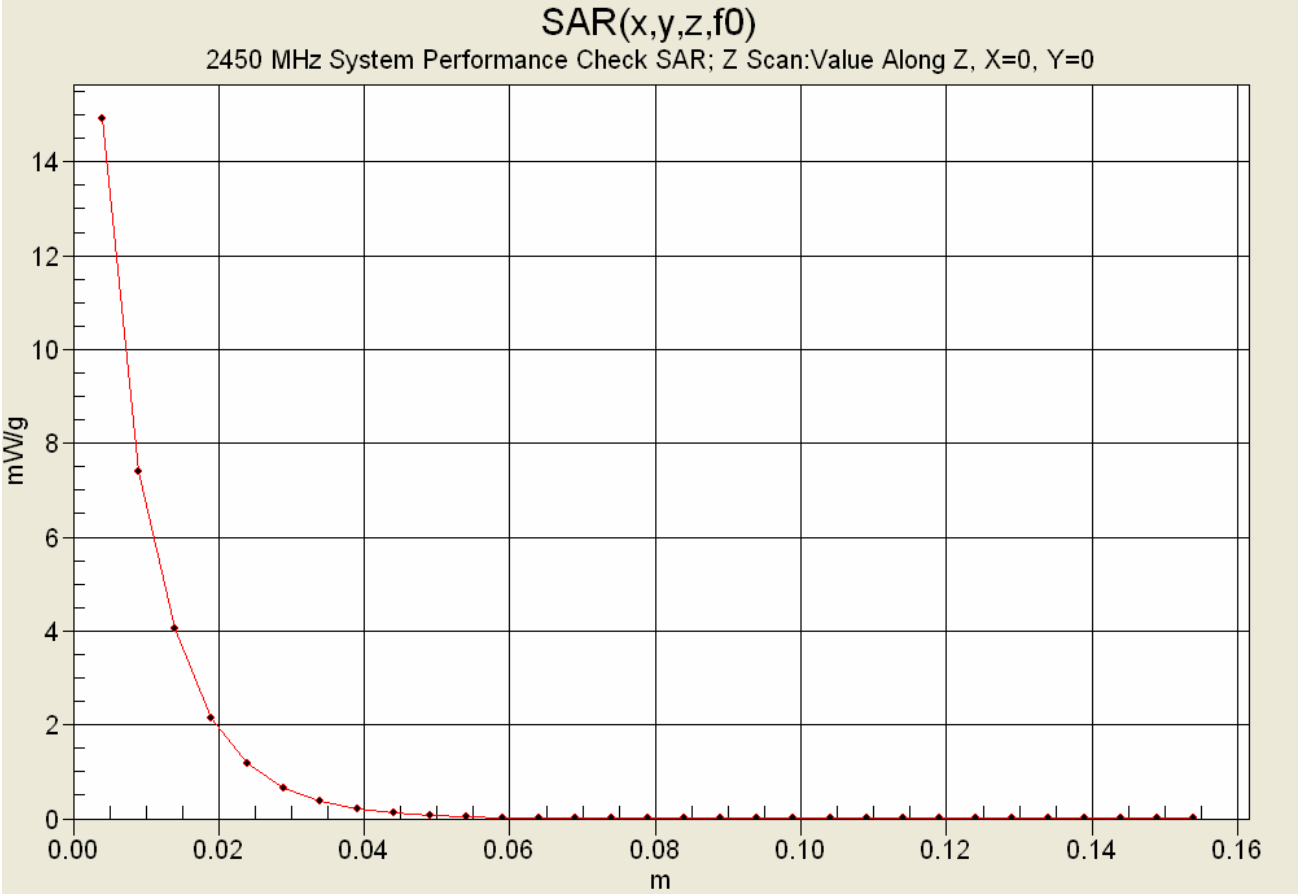
- Probe: ET3DV6 - SN1387; ConvF(4.3, 4.3, 4.3); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 15/06/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.6 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 159

2450 MHz Dipole - System Performance Check/Area Scan (6x10x1):
Measurement grid: dx=10mm, dy=10mm

2450 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.0 V/m; Power Drift = -0.013 dB
Peak SAR (extrapolated) = 31.2 W/kg
SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.44 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

2450 MHz System Performance Check & DUT Evaluation (Body)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Thu 08/Dec/2005
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
2.3500	52.83	1.85	51.74	1.86
2.3600	52.82	1.86	51.66	1.88
2.3700	52.81	1.87	51.65	1.87
2.3800	52.79	1.88	51.52	1.89
2.3900	52.78	1.89	51.45	1.90
2.4000	52.77	1.90	51.39	1.91
2.4100	52.75	1.91	51.48	1.93
2.4200	52.74	1.92	51.40	1.94
2.4300	52.73	1.93	51.46	1.96
2.4400	52.71	1.94	51.42	1.94
2.4500	52.70	1.95	51.27	1.97
2.4600	52.69	1.96	51.34	1.97
2.4700	52.67	1.98	51.45	1.99
2.4800	52.66	1.99	51.24	1.99
2.4900	52.65	2.01	51.27	1.99
2.5000	52.64	2.02	51.17	2.00
2.5100	52.62	2.04	51.13	2.03
2.5200	52.61	2.05	50.93	2.02
2.5300	52.60	2.06	50.98	2.03
2.5400	52.59	2.08	51.06	2.06
2.5500	52.57	2.09	51.05	2.06

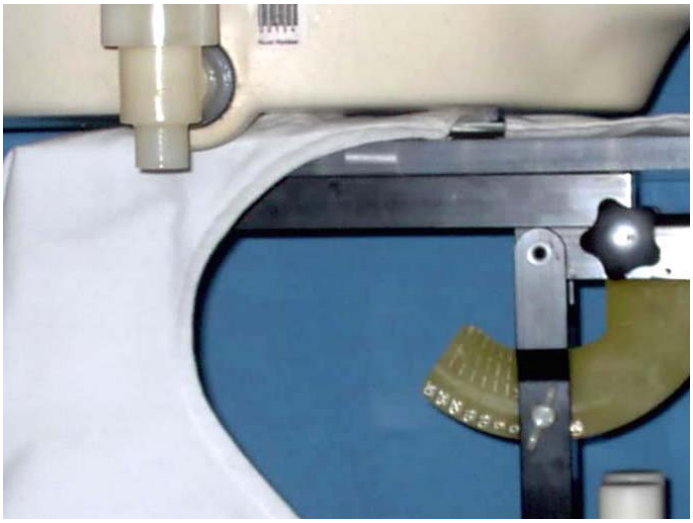
APPENDIX D - SAR TEST SETUP PHOTOGRAPHS

SAR TEST SETUP PHOTOGRAPHS

Antenna 1 - Front Side (Radiating Side)
Outside Front Left Vest Pouch Touching Planar Phantom

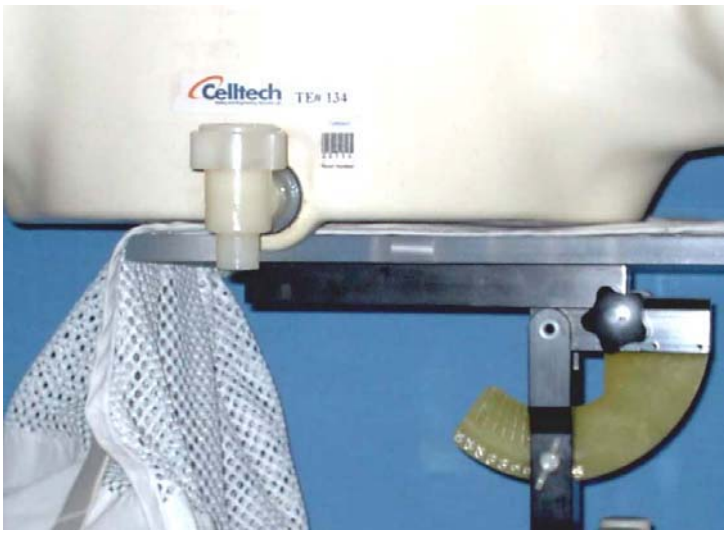
SAR TEST SETUP PHOTOGRAPHS

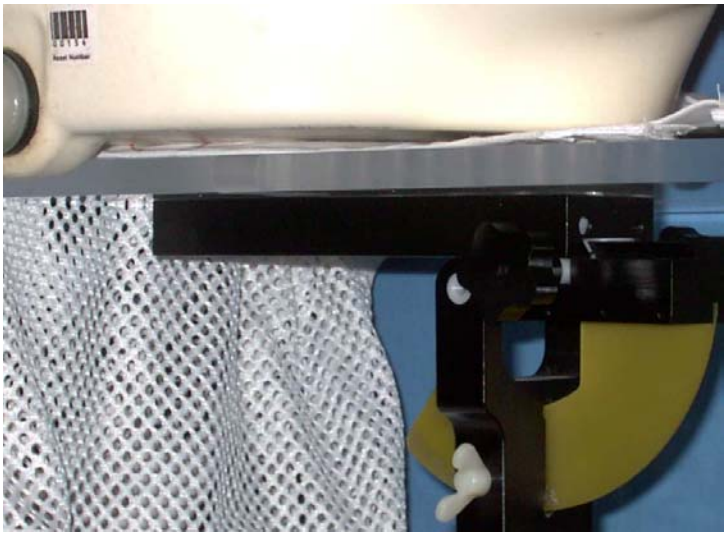
Antenna 1 - Back Side (Non-Radiating Side)
Inside Front Left Vest Pouch Touching Planar Phantom



SAR TEST SETUP PHOTOGRAPHS

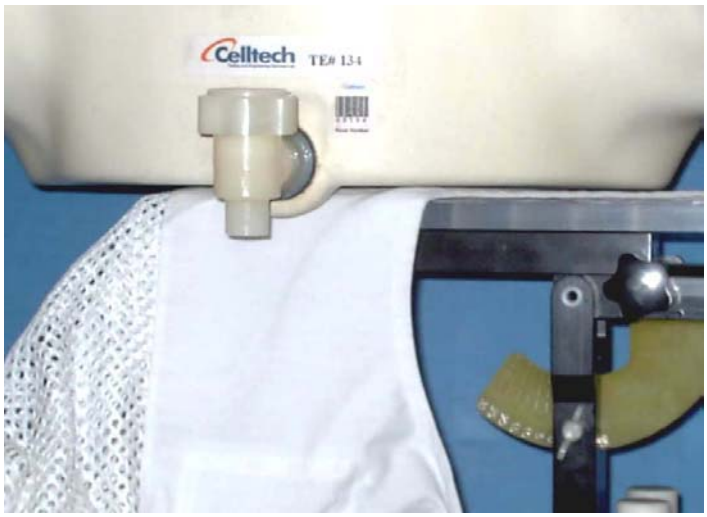
Antenna 2 - Front Side (Radiating Side)
Outside Back Right Vest Pouch Touching Planar Phantom

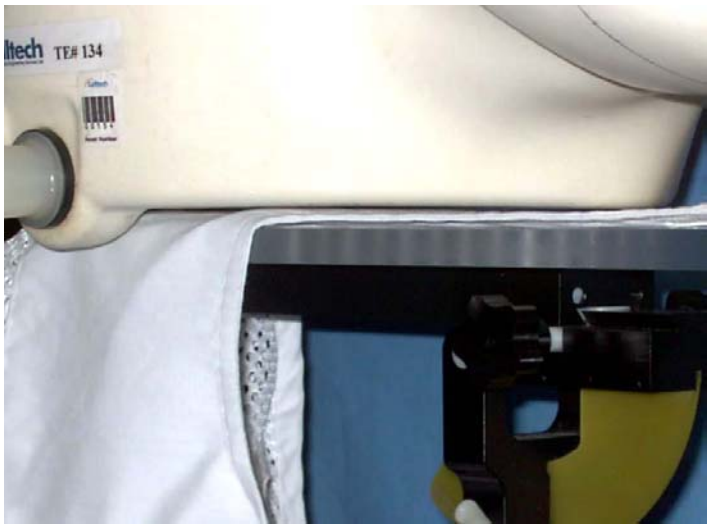




SAR TEST SETUP PHOTOGRAPHS

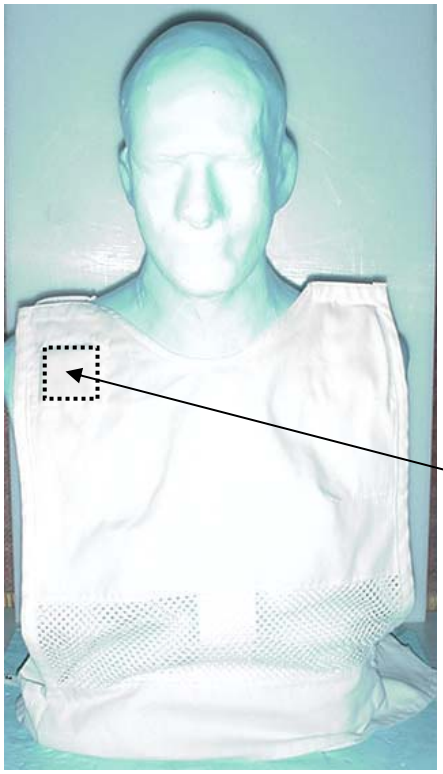
Antenna 2 - Back Side (Non-Radiating Side)
Inside Back Right Vest Pouch Touching Planar Phantom



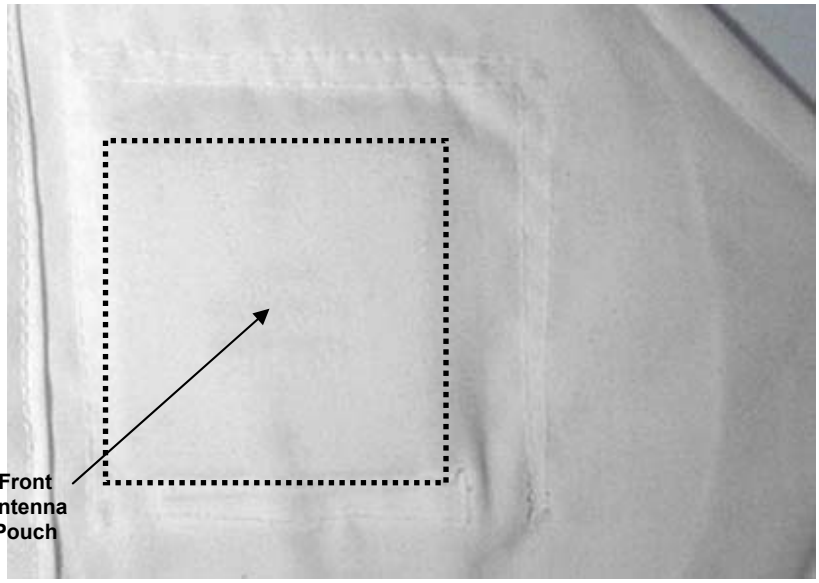


DUT PHOTOGRAPHS

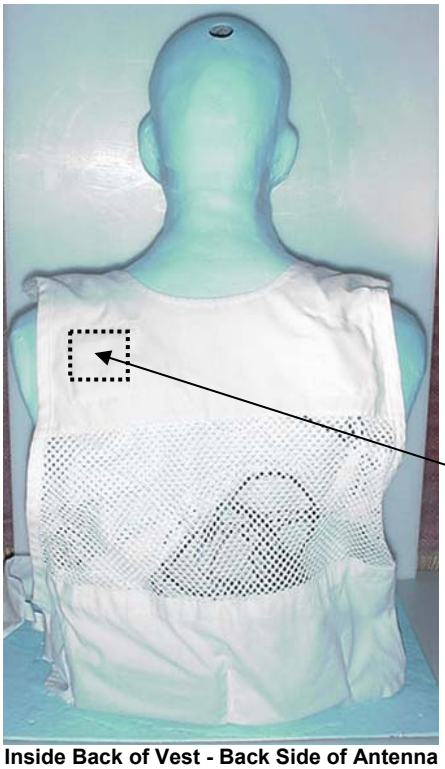
Inside of Vest (Non-Radiating Antenna Side)



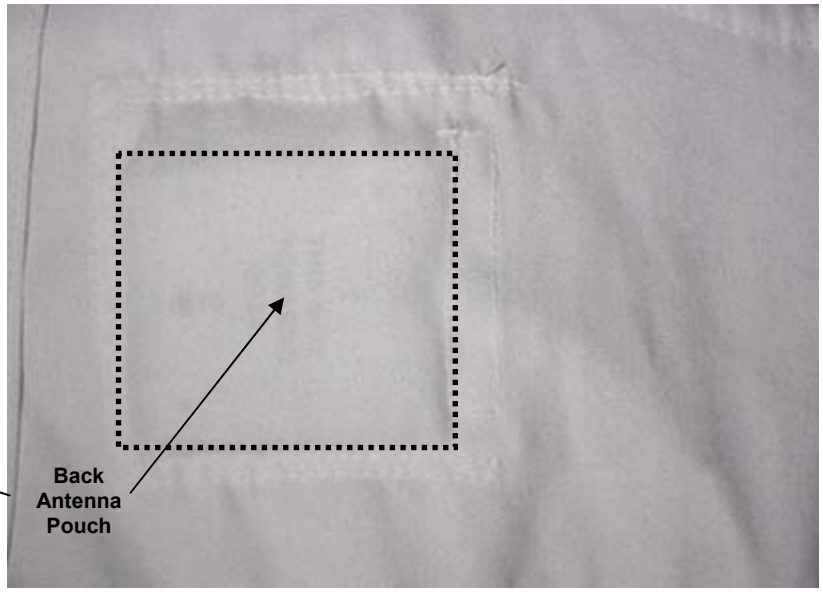
Inside Front of Vest - Back Side of Antenna



Inside of Front Vest Pouch - Back Side of Antenna
(Non-Radiating Side facing body)



Inside Back of Vest - Back Side of Antenna

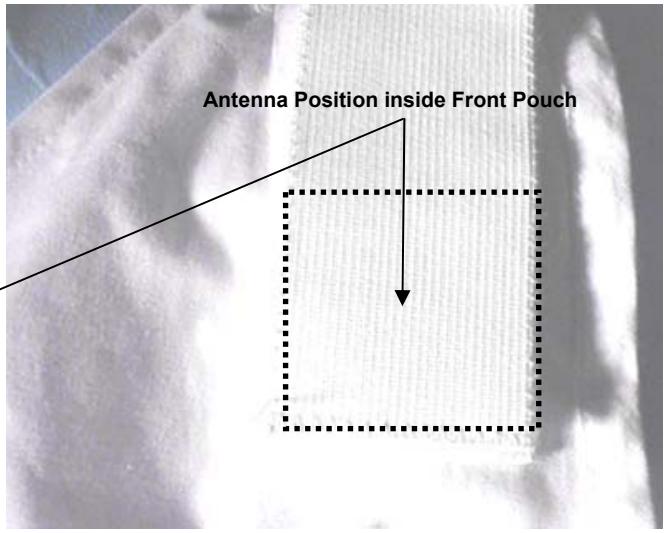


Inside of Back Vest Pouch - Back Side of Antenna
(Non-Radiating Side facing body)

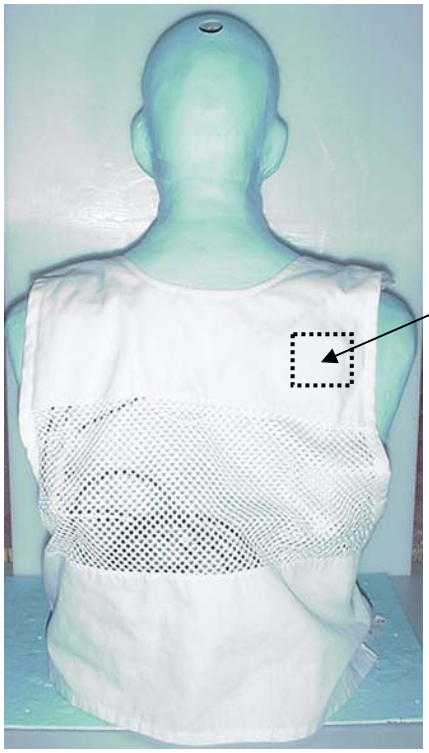
DUT PHOTOGRAPHS

Outside of Vest (Radiating Antenna Side)

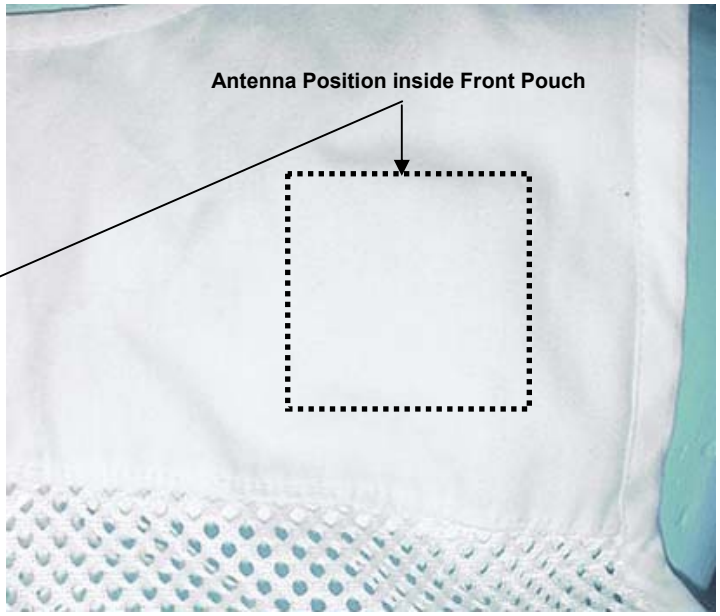
Outside Front of Vest - Front Side of Antenna



Outside of Front Vest Pouch - Front Side of Antenna
(Radiating Side facing away from body)



Outside Back of Vest - Front Side of Antenna



Outside of Back Vest Pouch - Front Side of Antenna
(Radiating Side facing away from body)

DUT PHOTOGRAPHS
Vest & Transmitter

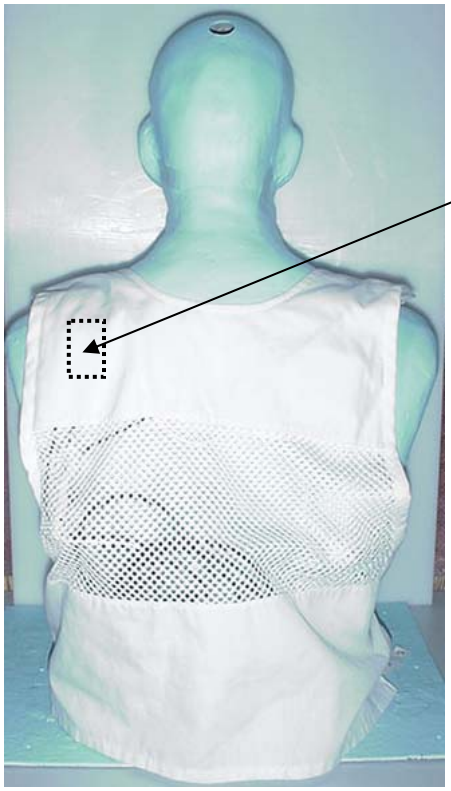
Right Side of Vest

Left Side of Vest

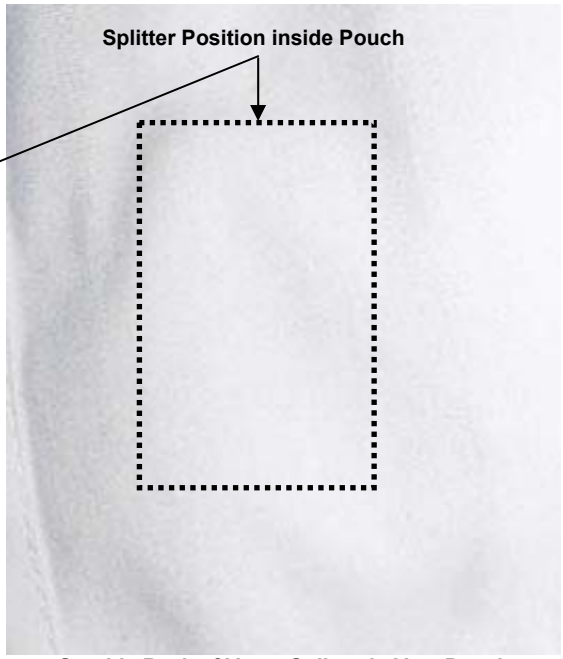
Transmitter & Battery Pack in Vest Pouch (Velcro Open)

Transmitter and Battery Pack in Vest Pouch (Velcro Closed)

DUT PHOTOGRAPHS
Vest & Splitter

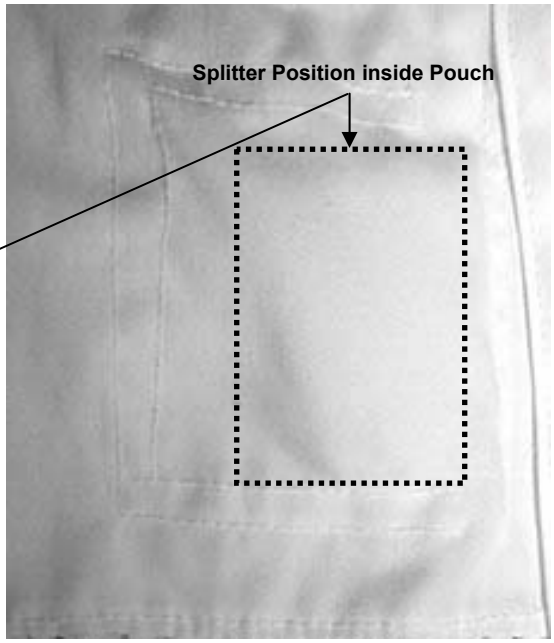


Outside Back of Vest - Splitter in Vest Pouch



Outside Back of Vest - Splitter in Vest Pouch

Inside Back of Vest - Splitter in Vest Pouch

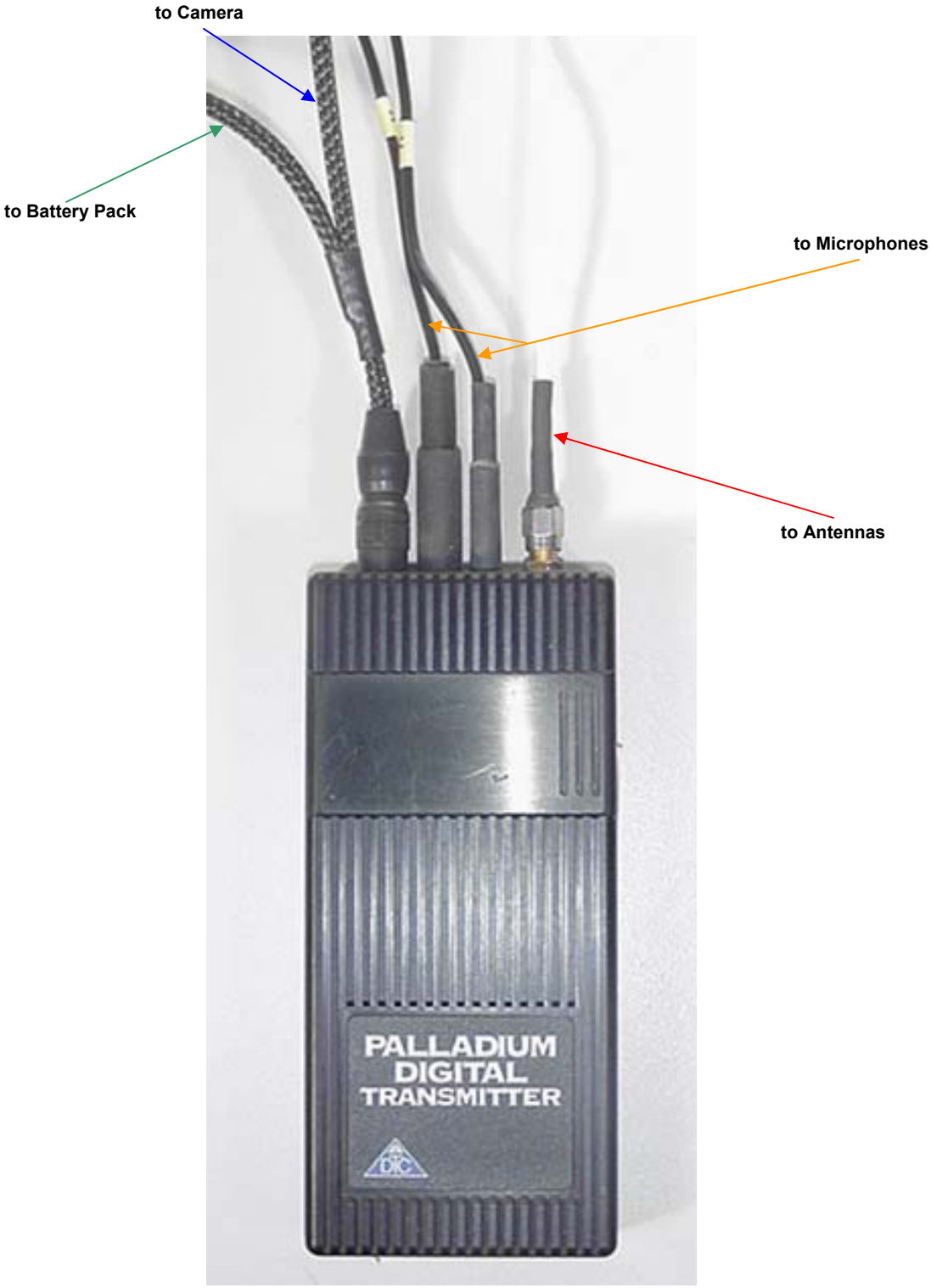


Inside Back of Vest - Splitter in Vest Pouch

DUT PHOTOGRAPHS

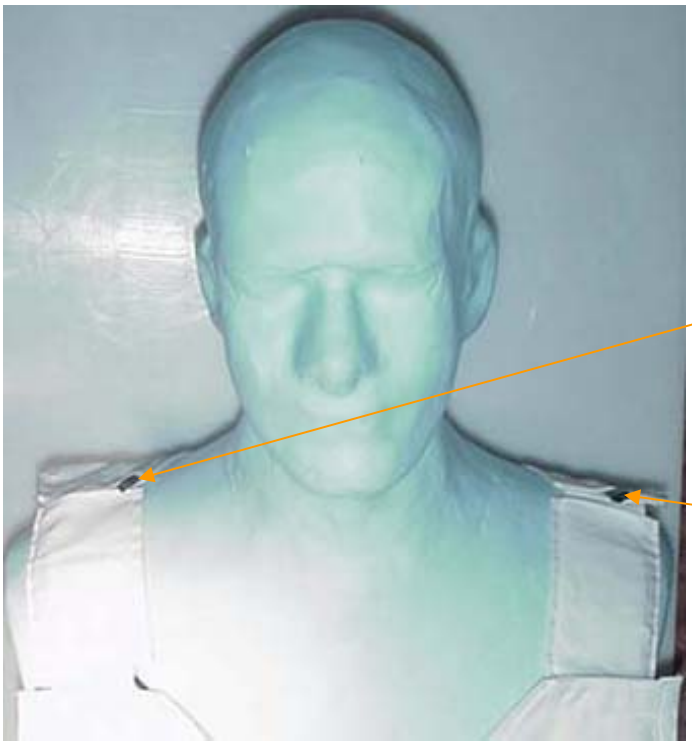
Transmitter and Battery Pack

DUT PHOTOGRAPHS

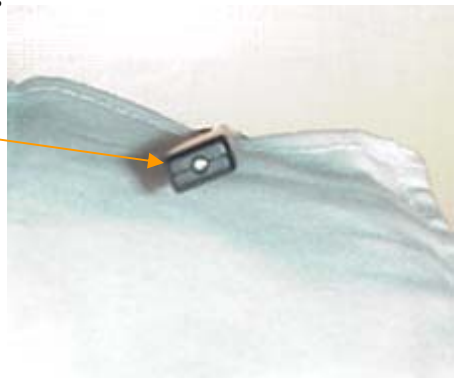


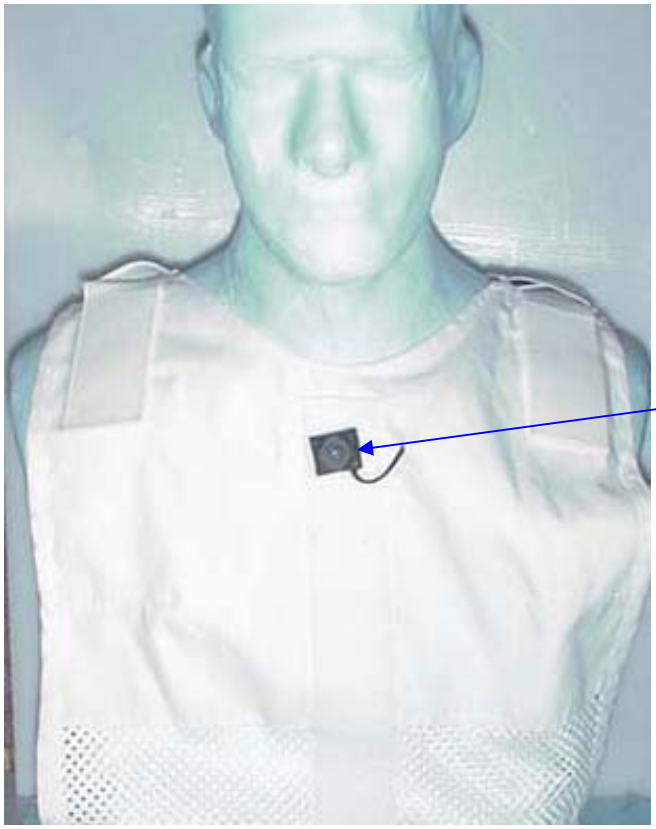
Transmitter

DUT PHOTOGRAPHS



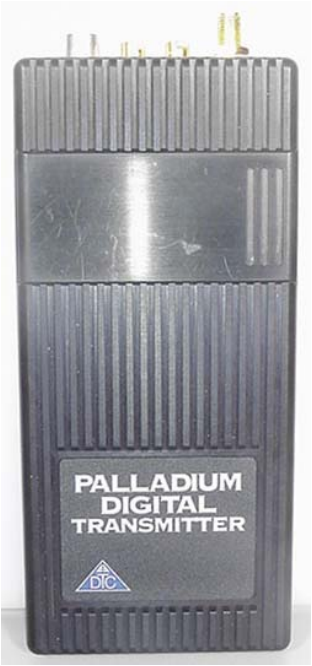
Microphones





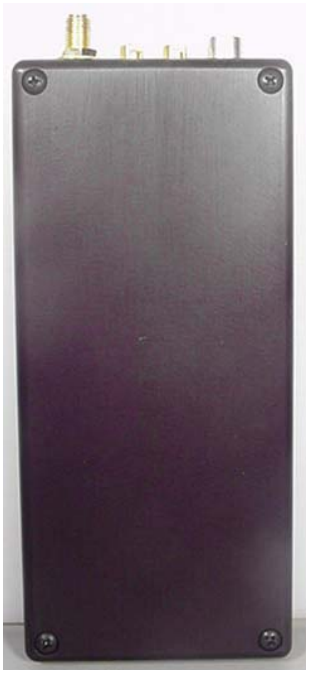
Camera

DUT PHOTOGRAPHS



Front of Transmitter

Front of Transmitter (showing control buttons)



Back of Transmitter

Left Side of Transmitter

Right Side of Transmitter

Top End of Transmitter

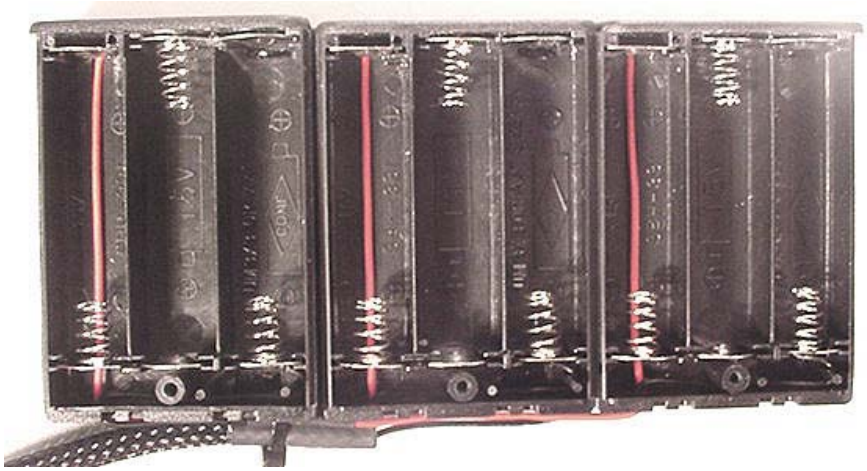
Bottom End of Transmitter

DUT PHOTOGRAPHS

9V AA Battery Pack - Front Side

9V AA Battery Pack - Back Side

Lithium Energizer e^2 Batteries



DUT Battery Compartment

APPENDIX E - SYSTEM VALIDATION

2450 MHz SYSTEM VALIDATION DIPOLE

Type:	**2450 MHz Validation Dipole**
Serial Number:	**150**
Place of Calibration:	**Celltech Labs Inc.**
Date of Calibration:	**April 22, 2005**

Celltech Labs Inc. hereby certifies that this device has been calibrated on the date indicated above.

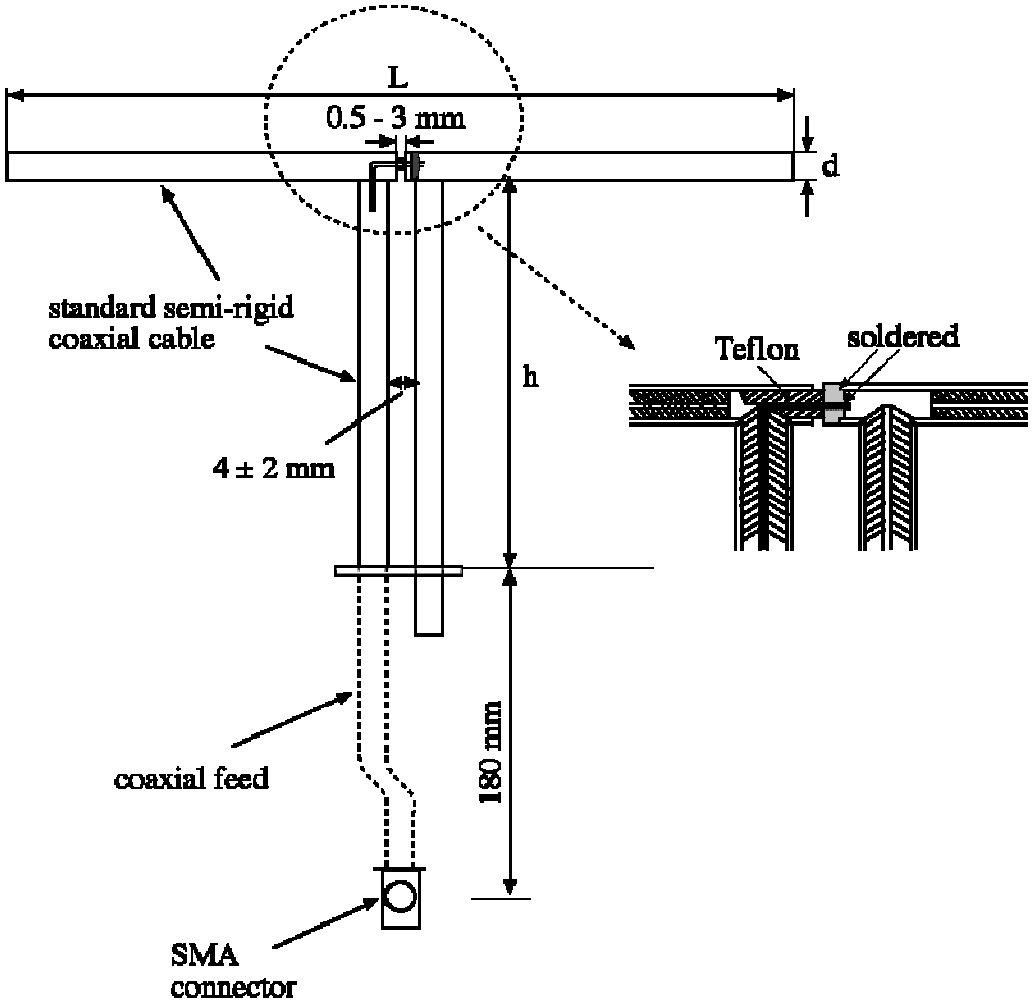
Calibrated by: 

Approved by: 

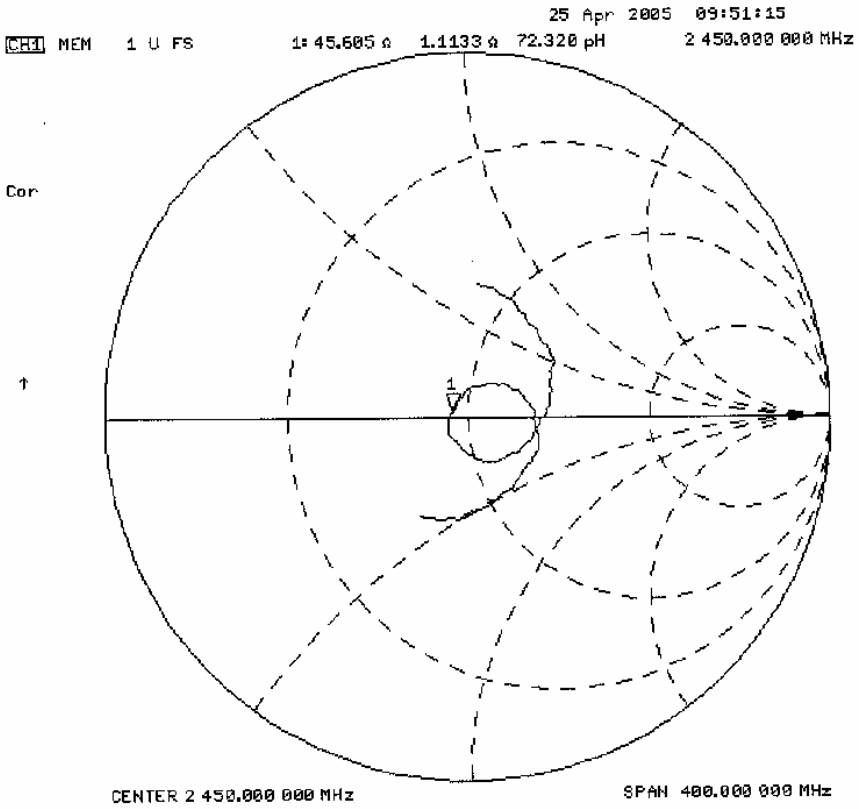
1. Dipole Construction & Electrical Characteristics

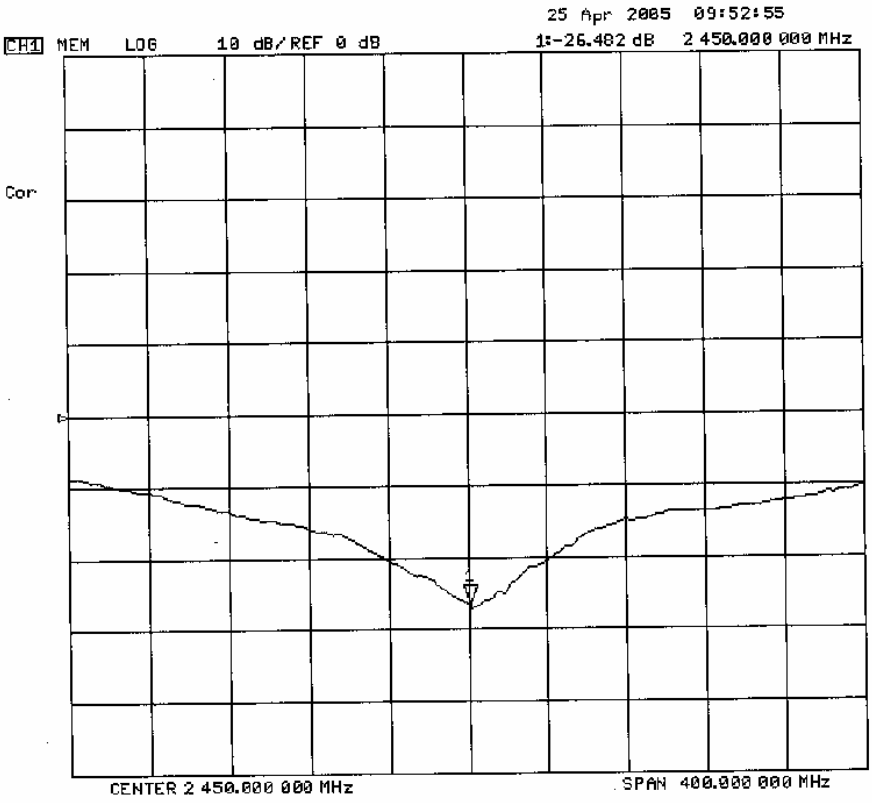
The validation dipole was constructed in accordance with the IEEE Std "Recommended Practice for Determining the Spatial-Peak Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques". The electrical properties were measured using an HP 8753E Network Analyzer. The network analyzer was calibrated to the validation dipole N-type connector feed point using an HP85032E Type N calibration kit. The dipole was placed parallel to a planar phantom at a separation distance of 10.0mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

Feed point impedance at 2450 MHz	Re{Z} = 45.605Ω
	Im{Z} = 1.1133Ω
Return Loss at 2450 MHz	-26.482 dB



2. Validation Dipole VSWR Data





3. Validation Dipole Dimensions

Frequency (MHz)	L (mm)	H (mm)	D (mm)
300	420.0	250.0	6.2
450	288.0	167.0	6.2
835	161.0	89.8	3.6
900	149.0	83.3	3.6
1450	89.1	51.7	3.6
1800	72.0	41.7	3.6
1900	68.0	39.5	3.6
2000	64.5	37.5	3.6
2450	51.8	30.6	3.6
3000	41.5	25.0	3.6

4. Validation Phantom

The validation phantom is a Fiberglass shell planar phantom manufactured by Barski Industries Ltd. The phantom is in conformance with the requirements defined by IEEE SCC34-SC2 for the dosimetric evaluations of body-worn and lap-held operating configurations. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids.

Shell Thickness: 2.0 ± 0.2 mm
Filling Volume: Approx. 55 liters
Dimensions: 44 cm (W) x 94 cm (L)

5. 2450 MHz System Validation Setup

6. 2450 MHz Dipole Setup

7. Measurement Conditions

The phantom was filled with 2450 MHz Body simulating tissue:

Relative Permittivity:	50.2
Conductivity:	1.97 mho/m
Fluid Temperature:	23.9 °C
Fluid Depth:	≥ 15.0 cm

Environmental Conditions:

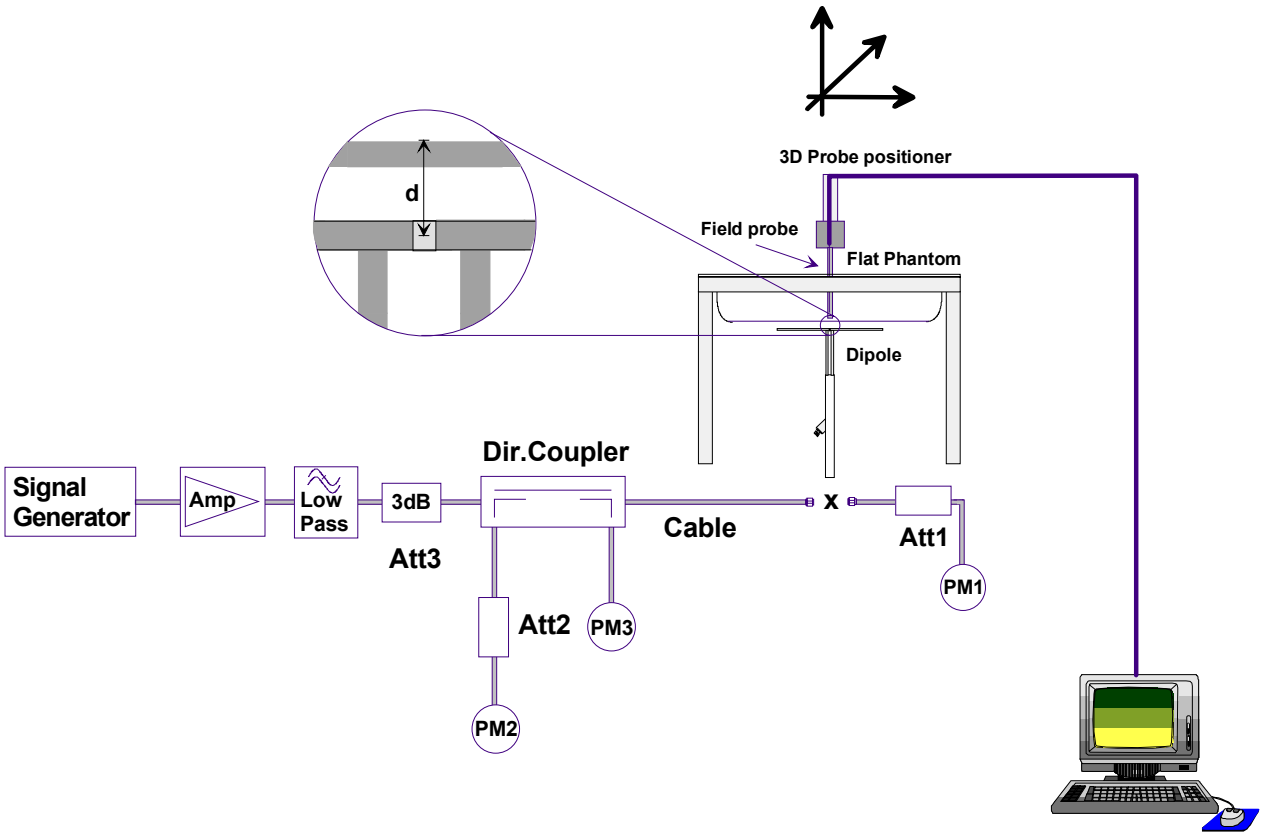
Ambient Temperature:	25.7 °C
Humidity:	30 %
Barometric Pressure:	102.6 kPa

The 2450 MHz simulated Body tissue mixture consists of the following ingredients:

Ingredient	Percentage by weight
Water	69.98%
Glycol Monobutyl	30.00%
Salt	0.02%
Target Dielectric Parameters at 22°C	ε_r = 52.7 (+/-5%) σ = 1.95 S/m (+/-5%)

8. SAR Measurement

The SAR measurement was performed with the E-field probe in mechanical detection mode only. The setup and determination of the forward power into the dipole was performed using the following procedures.



First the power meter PM1 (including attenuator Att1) is connected to the cable to measure the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the attenuation of Att1) as read by power meter PM2. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2. If the signal generator does not allow adjustment in 0.01dB steps, the remaining difference at PM2 must be taken into consideration. PM3 records the reflected power from the dipole to ensure that the value is not changed from the previous value. The reflected power should be 20dB below the forward power.

9. Validation Dipole SAR Test Results

Ten SAR measurements were performed in order to achieve repeatability and to establish an average target value.

Validation Measurement	SAR @ 0.25W Input averaged over 1g	SAR @ 1W Input averaged over 1g	SAR @ 0.25W Input averaged over 10g	SAR @ 1W Input averaged over 10g	Peak SAR @ 0.25W Input
Test 1	12.6	50.4	5.86	23.44	27.7
Test 2	12.6	50.4	5.86	23.44	27.4
Test 3	12.6	50.4	5.87	23.48	27.4
Test 4	12.6	50.4	5.86	23.44	27.3
Test 5	12.6	50.4	5.86	23.44	27.4
Test 6	12.6	50.4	5.87	23.48	27.8
Test 7	12.7	50.8	5.88	23.52	27.7
Test 8	12.7	50.8	5.88	23.52	27.8
Test 9	12.6	50.4	5.87	23.48	27.6
Test10	12.7	50.8	5.88	23.52	27.7
Average Value	12.63	50.52	5.869	23.48	27.58

The results have been normalized to 1W (forward power) into the dipole.

Target SAR @ 1 Watt Input averaged over 1 gram (W/kg)		Measured SAR @ 1 Watt Input averaged over 1 gram (W/kg)	Deviation from Target (%)	Target SAR @ 1 Watt Input averaged over 10 grams (W/kg)		Measured SAR @ 1 Watt Input averaged over 10 grams (W/kg)	Deviation from Target (%)
51.2	+/- 10%	50.52	- 1.3	23.7	+/- 10%	23.48	- 0.93

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.

2450 MHz System Validation - April 22, 2005

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 150; Calibrated: 04/22/2005
Ambient Temp: 25.7 ºC; Fluid Temp: 23.9 ºC; Barometric Pressure: 102.6 kPa; Humidity: 30%
Communication System: CW
Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: M2450 Medium parameters used: f = 2450 MHz; σ = 1.97 mho/m; ε_r = 50.2; ρ = 1000 kg/m^3
- Probe: ET3DV6 - SN1590; ConvF(4.22, 4.22, 4.22); Calibrated: 24/05/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn353; Calibrated: 06/07/2004
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

2450 MHz System Validation/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm

2450 MHz System Validation/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 88.7 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 27.7 W/kg
SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.86 mW/g

2450 MHz System Validation/Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.1 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.86 mW/g

2450 MHz System Validation/Zoom Scan 3 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.0 V/m; Power Drift = 0.015 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.87 mW/g

2450 MHz System Validation/Zoom Scan 4 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.9 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 27.3 W/kg
SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.86 mW/g

2450 MHz System Validation/Zoom Scan 5 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.5 V/m; Power Drift = 0.010 dB
Peak SAR (extrapolated) = 27.4 W/kg
SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.86 mW/g

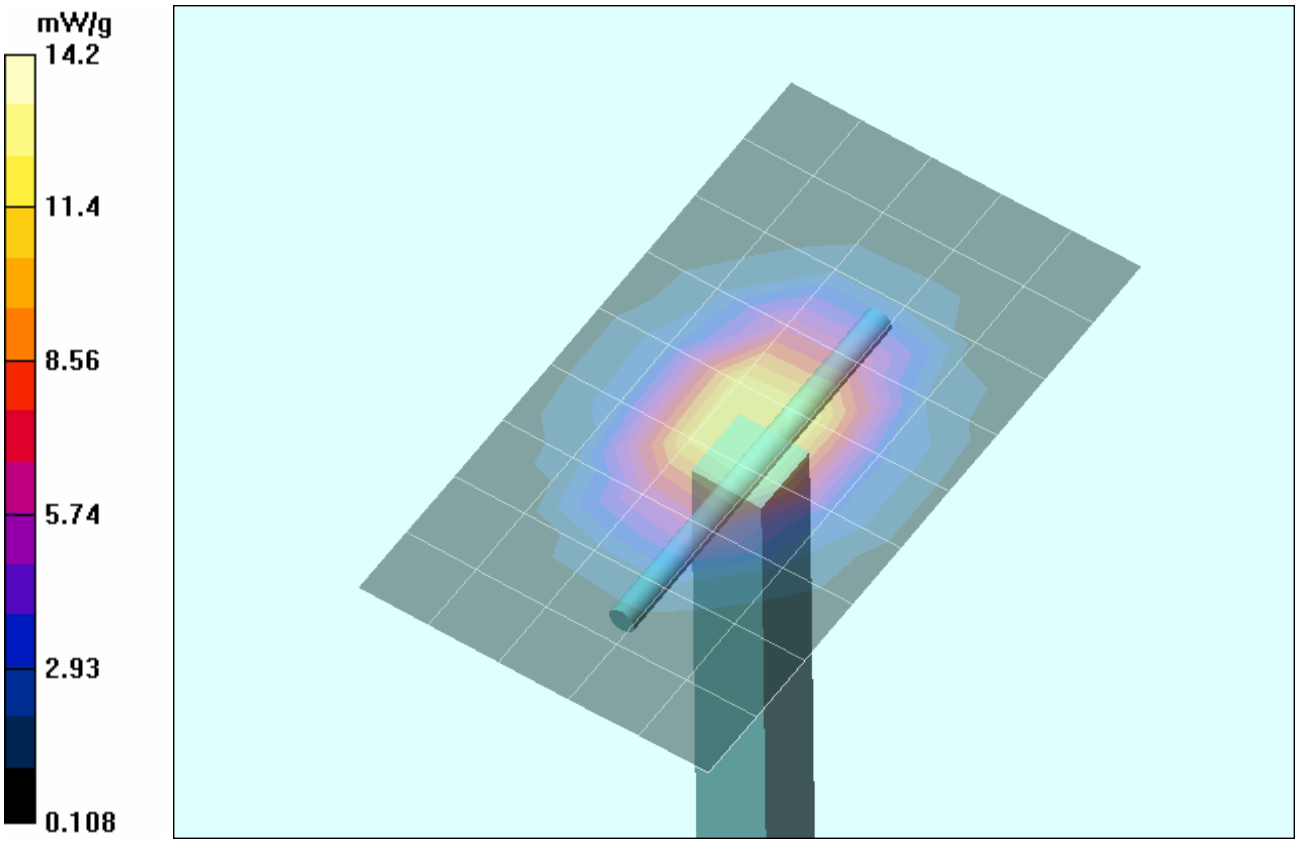
2450 MHz System Validation/Zoom Scan 6 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.0 V/m; Power Drift = -0.042 dB
Peak SAR (extrapolated) = 27.8 W/kg
SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.87 mW/g

2450 MHz System Validation/Zoom Scan 7 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.7 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 27.7 W/kg
SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.88 mW/g

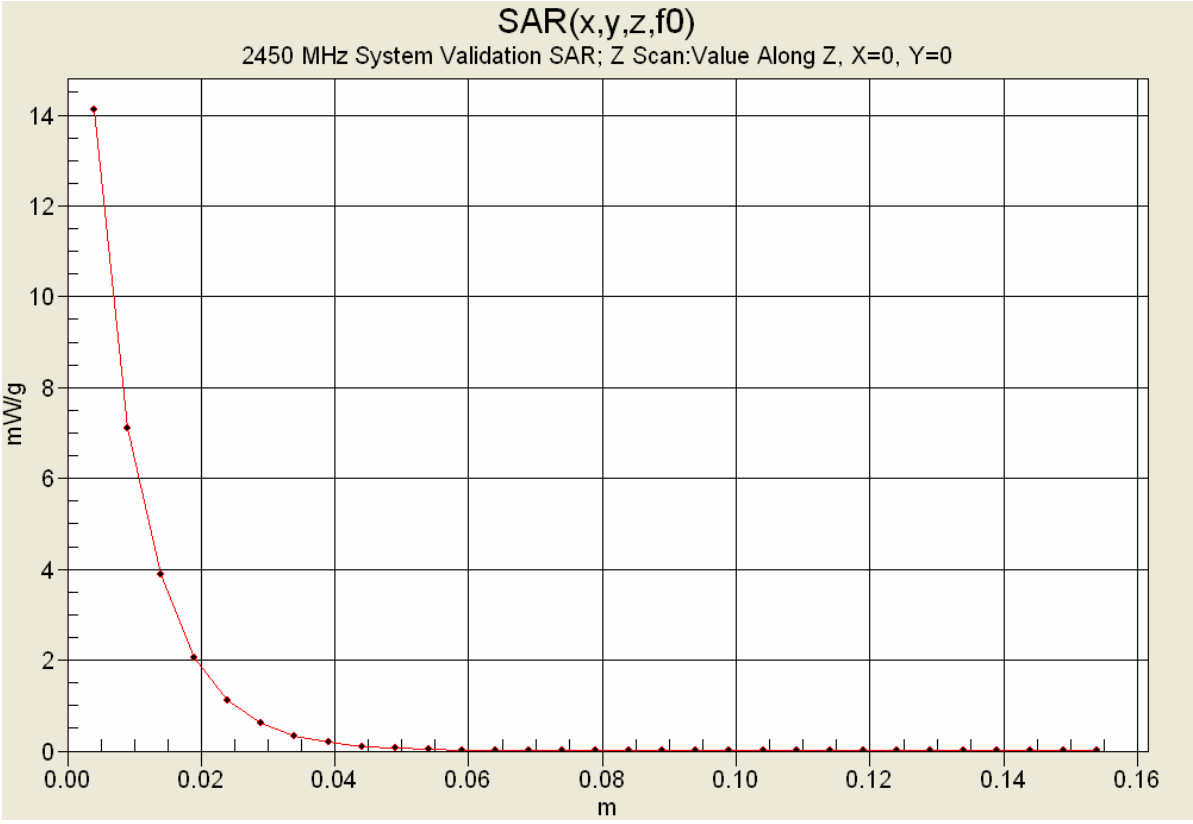
2450 MHz System Validation/Zoom Scan 8 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.4 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 27.8 W/kg
SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.88 mW/g

2450 MHz System Validation/Zoom Scan 9 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.3 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 27.6 W/kg
SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.87 mW/g

2450 MHz System Validation/Zoom Scan 10 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.6 V/m; Power Drift = -0.025 dB
Peak SAR (extrapolated) = 27.7 W/kg
SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.88 mW/g



1 g average of 10 measurements: 12.63 mW/g
10 g average of 10 measurements: 5.869 mW/g



10. Measured Fluid Dielectric Parameters

System Validation - 2450 MHz Dipole

Measured Fluid Dielectric Parameters (Muscle)

April 22, 2005

Frequency	e'	e"
2.350000000 GHz	50.4884	14.1016
2.360000000 GHz	50.4542	14.1475
2.370000000 GHz	50.4295	14.1756
2.380000000 GHz	50.4094	14.2063
2.390000000 GHz	50.3750	14.2541
2.400000000 GHz	50.3395	14.2965
2.410000000 GHz	50.2961	14.3310
2.420000000 GHz	50.2408	14.3481
2.430000000 GHz	50.2047	14.3861
2.440000000 GHz	50.1822	14.4193
2.450000000 GHz	50.1500	14.4611
2.460000000 GHz	50.1035	14.5137
2.470000000 GHz	50.0825	14.5504
2.480000000 GHz	50.0515	14.6073
2.490000000 GHz	50.0191	14.6410
2.500000000 GHz	49.9867	14.6647
2.510000000 GHz	49.9442	14.7231
2.520000000 GHz	49.9042	14.7502
2.530000000 GHz	49.8769	14.7804
2.540000000 GHz	49.8259	14.8081
2.550000000 GHz	49.7900	14.8467

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
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79