DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab

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Applicant Information

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Canada

FCC IDENTIFIER:	**NJILT10R**
IC IDENTIFIER:	**2971B-LT10R**
Model No.:	**LT10R**
Model Name:	**Location Tag**
Rule Part(s):	**FCC 47 CFR §2.1093; IC RSS-102, Issue 1 (Provisional)**
Test Procedure(s):	**FCC OET Bulletin 65, Supplement C (Edition 01-01)**
FCC Device Classification:	**PCS Licensed Transmitter (PCB)**
Device Description:	**Portable Body-Worn ReFLEX GPS Radio Tracking Device**
Modulation Type:	**FSK**
Tx Frequency Range Tested:	**896 - 902 MHz**
Max. RF Output Power Tested:	**1.23 Watts ERP (899.0 MHz)**
Max. Duty Cycle Tested:	**50 % (Crest Factor: 1:2)**
Antenna Type(s) Tested:	**Internal**
Battery Type(s) Tested:	**Li-ion 3.7 V, 1000 mAh (Model: BAK-NP60)**
Body-Worn Accessories Tested:	**None (tested with 2.0 cm air-gap spacing)**
Max. SAR Level(s) Evaluated:	**Body-worn: 1.45 W/kg (1g average)**
Class II Permissive Change(s):	**Add Body-Worn Operating Configuration**

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device was compliant 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 1 (Provisional) 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.

Tested By:

Spencer Watson

Spencer Watson
Compliance Technologist
Celltech Labs Inc.

Reviewed By:

Russell W. Pipe

Russell W. Pipe
Senior Compliance Technologist
Celltech Labs Inc.

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1.0 INTRODUCTION

This measurement report demonstrates that the CSI Wireless Inc. Model: LT10R Portable Body-Worn ReFLEX GPS Radio Tracking Device FCC ID: NJILT10R 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 1 (Provisional) (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)

FCC Rule Part(s)	47 CFR §2.1093			
IC Rule Part(s)	RSS-102 Issue 1 (Provisional)			
Test Procedure(s)	FCC OET Bulletin 65, Supplement C (Edition 01-01)			
FCC Device Classification	PCS Licensed Transmitter (PCB)			
Device Description	Portable Body-Worn ReFLEX GPS Radio Tracking Device			
Modulation Type	FSK			
FCC IDENTIFIER	NJILT10R			
IC IDENTIFIER	2971B-LT10R			
Model No.	LT10R			
Model Name	Location Tag			
Serial No.(s)	37722823		Identical Prototype	
Tx Frequency Range	896 - 902 MHz			
Max. RF Output Power Measured	1.23 Watts	ERP	899.0 MHz	
Max. Duty Cycle Tested	50 %		Crest Factor: 1:2	
Antenna Type(s) Tested	Internal			
Battery Type(s) Tested	Li-ion	3.7 V	1000 mAh	Model: BAK-NP60
Body-worn Accessories Tested	None	Tested with 2.0 cm air-gap spacing		
Class II Permissive Change(s)	Add Body-Worn Operating Configuration			

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 SAR Measurement System with SAM phantom

DASY4 Measurement System with SAM Phantom

4.0 SAR MEASUREMENT SUMMARY

BODY-WORN SAR MEASUREMENT RESULTS

Freq. (MHz)	Chan.	Test Mode	Duty Cycle	Battery Type	Antenna Position	DUT Position to Planar Phantom	Air-Gap Spacing to Planar Phantom (cm)	ERP Start Power (Watts)	Measured SAR 1g (W/kg)	SAR Drift During Test (dB)	Scaled SAR 1g with Power Droop (to 1.30 W ERP) (W/kg)
899	2	FM Unmodulated	50%	Li-ion	Internal	Front Side	2.0	1.23	1.25	-0.436	1.45
899	2	FM Unmodulated	50%	Li-ion	Internal	Back Side	2.0	1.23	0.850	1.20	0.920

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

Test Date(s)	May 04, 2005				**Relative Humidity**	30	%
Measured Fluid Type	**900 MHz Body**				**Atmospheric Pressure**	101.8	kPa
Dielectric Constant ε_r	**IEEE Target**		**Measured**	**Deviation**	**Ambient Temperature**	24.3	°C
	55.0	**± 5%**	52.4	-4.7%	**Fluid Temperature**	23.3	°C
Conductivity σ (mho/m)	**IEEE Target**		**Measured**	**Deviation**	**Fluid Depth**	≥ 15	cm
	1.05	**± 5%**	1.02	-2.9%	**ρ (Kg/m^3)**	1000	

Note(s):

1. The measurement results were obtained with the DUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. The transmission band of the DUT is less than 10 MHz, therefore mid channel test data only is reported (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
3. The power droop measured by the DASY4 system for the duration of the SAR evaluation (DUT front side) was added to the measured SAR level to report a scaled SAR result as shown in the above test data table. The measured SAR levels were also scaled up to 1.30 Watts based on the max. ERP level reported in the original FCC EMC certification test report.
4. 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.
5. The dielectric parameters of the simulated tissue mixture were measured prior to the evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix C for printout of measured fluid dielectric parameters).
6. SAR measurements were performed within 24 hours of the daily system performance check.

5.0 DETAILS OF SAR EVALUATION

The CSI Wireless Inc. Model: LT10R Portable Body-Worn ReFLEX GPS Radio Tracking Device FCC ID: NJILT10R 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.

1. The DUT was tested in a body-worn configuration with the front side of the DUT facing parallel to the outer surface of the SAM phantom (planar section) with an air-gap spacing of 2.0 cm between the front side of the DUT and the outer surface of the SAM phantom (planar section).
2. The DUT was tested in a body-worn configuration with the back side of the DUT facing parallel to the outer surface of the SAM phantom (planar section) with an air-gap spacing of 2.0 cm between the back side of the DUT and the outer surface of the SAM phantom (planar section).
3. The conducted RF output power of the DUT could not be measured for the SAR evaluation due to an internal antenna. The DUT was evaluated for SAR at the maximum conducted RF output power level preset by the manufacturer.
4. The DUT was evaluated for ERP (reference output power level) prior to the SAR evaluation on a 3-meter Open Area Test Site using the signal substitution method in accordance with ANSI/TIA-603-C-2004 (see reference [6]).
5. The DUT was tested in unmodulated transmit operation at maximum power and 50% duty cycle (Crest Factor 1:2).
6. The DUT was tested with a fully charged battery 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 evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix C for printout of measured fluid dielectric parameters).
9. The SAR evaluations were performed within 24 hours of the system performance check.

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 1.3 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 (5x5x7 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 (7x7x7) 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 900 MHz dipole (see Appendix E for system validation procedures). Prior to the system performance check the dielectric parameters of the simulated tissue mixture were measured using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753E Network Analyzer (see Appendix C for printout of measured fluid dielectric parameters). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±10% (see Appendix B for system performance check test plot).

SYSTEM PERFORMANCE CHECK

Test Date	900MHz 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.						
5/3/05	**Brain**	**2.70 ±10%**	2.60	-3.7%	**41.5 ±5%**	39.8	-4.1%	**0.97 ±5%**	0.95	-2.1%	1000	23.0	22.7	≥ 15	30	101.8

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.

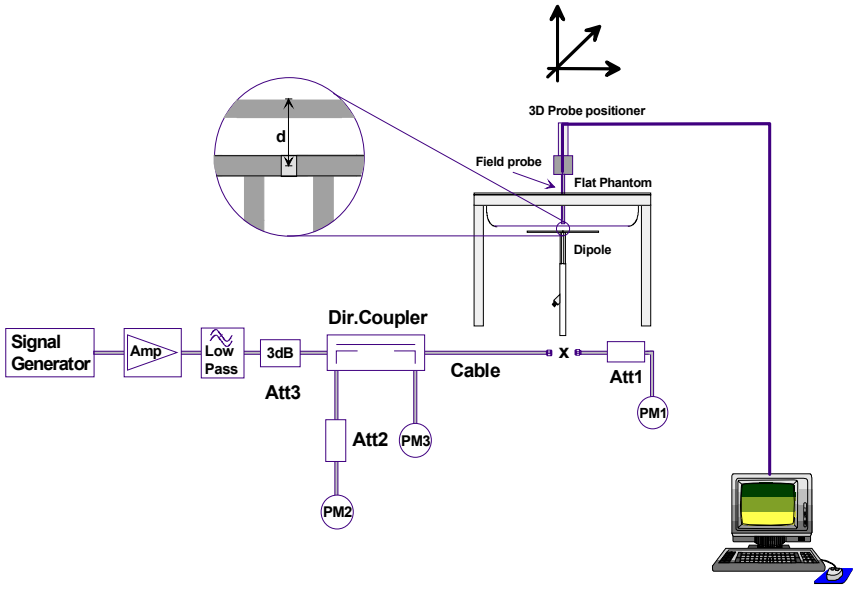


Figure 1. System Performance Check Setup Diagram

900MHz Dipole Setup

8.0 SIMULATED EQUIVALENT TISSUES

The 900MHz simulated tissue mixtures consist of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. The simulated tissue mixtures consist 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 MIXTURES		
INGREDIENT	900 MHz Brain	900 MHz Body
	System Performance Check	DUT Evaluation
Water	40.71 %	53.79 %
Sugar	56.63 %	45.13 %
Salt	1.48 %	0.98 %
HEC	0.99 %	--
Bactericide	0.19 %	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

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 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 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.

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
	-DAE3	00019	353	06Jul04	06Jul05
x	-DAE3	00018	370	25Jan05	25Jan06
x	-ET3DV6 E-Field Probe	00016	1387	18Mar05	18Mar06
	-ET3DV6 E-Field Probe	00017	1590	24May04	24May05
	-EX3DV4 E-Field Probe	00125	3547	21Jan05	21Jan06
	-300MHz Validation Dipole	00023	135	26Oct04	26Oct05
	-450MHz Validation Dipole	00024	136	04Nov04	04Nov05
	-835MHz Validation Dipole	00022	411	30Mar05	30Mar06
x	-900MHz Validation Dipole	00020	054	10Jun04	10Jun05
	-1800MHz Validation Dipole	00021	247	08Jun04	08Jun05
	-1900MHz Validation Dipole	00032	151	18Jun04	18Jun05
	-2450MHz Validation Dipole	00025	150	30Sep04	30Sep05
	-5000MHz Validation Dipole	00126	1031	11Jan05	11Jan06
x	-SAM Phantom V4.0C	00154	1033	N/A	N/A
	-Barski Planar Phantom	00155	03-01	N/A	N/A
	-Plexiglas Planar Phantom	00156	161	N/A	N/A
	-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
	Gigatronics 8652A Power Meter	00008	1835267	29Apr05	29Apr06
	Gigatronics 8652A Power Meter	00007	1835272	18Oct04	18Oct05
x	Gigatronics 80701A Power Sensor	00013	1833713	11Oct04	11Oct05
	Gigatronics 80701A Power Sensor	00011	1833542	08Oct04	08Oct05
x	Gigatronics 80701A Power Sensor	00109	1834366	16Apr05	16Apr06
x	HP 8753E Network Analyzer	80006	US38433271	04Jan05	04Jan06
	HP 8753ET Network Analyzer	00134	US39170292	04May05	04May06
	HP 8648D Signal Generator	00005	3847A00611	29Apr05	29Apr06
x	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**	**c_i 1g**	**Standard Uncertainty ±% (1g)**	**v_i or v_{eff}**
Measurement System						
Probe calibration	± 5.5	Normal	1	1	± 5.5	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 1.4	Rectangular	√3	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	√3	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Test Sample Related						
Device positioning	± 6.0	Normal	√3	1	± 6.7	12
Device holder uncertainty	± 5.0	Normal	√3	1	± 5.9	8
Power drift	± 5.0	Rectangular	√3		± 2.9	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty					**± 13.57**	
Expanded Uncertainty (k=2)					**± 27.14**	

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**	**c_i 1g**	**Standard Uncertainty ±% (1g)**	**v_i or v_{eff}**
Measurement System						
Probe calibration	± 5.5	Normal	1	1	± 5.5	∞
Axial isotropy of the probe	± 4.7	Rectangular	√3	$(1-c_p)$	± 1.9	∞
Spherical isotropy of the probe	± 9.6	Rectangular	√3	(c_p)	± 3.9	∞
Spatial resolution	± 0.0	Rectangular	√3	1	± 0.0	∞
Boundary effects	± 5.5	Rectangular	√3	1	± 3.2	∞
Probe linearity	± 4.7	Rectangular	√3	1	± 2.7	∞
Detection limit	± 1.0	Rectangular	√3	1	± 0.6	∞
Readout electronics	± 1.0	Normal	1	1	± 1.0	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5	∞
Integration time	± 1.4	Rectangular	√3	1	± 0.8	∞
RF ambient conditions	± 3.0	Rectangular	√3	1	± 1.7	∞
Mech. constraints of robot	± 0.4	Rectangular	√3	1	± 0.2	∞
Probe positioning	± 2.9	Rectangular	√3	1	± 1.7	∞
Extrapolation & integration	± 3.9	Rectangular	√3	1	± 2.3	∞
Dipole						
Dipole Axis to Liquid Distance	± 2.0	Rectangular	√3	1	± 1.2	∞
Input Power	± 4.7	Rectangular	√3	1	± 2.7	∞
Phantom and Setup						
Phantom uncertainty	± 4.0	Rectangular	√3	1	± 2.3	∞
Liquid conductivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid conductivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (target)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Liquid permittivity (measured)	± 5.0	Rectangular	√3	0.6	± 1.7	∞
Combined Standard Uncertainty					**± 10.30**	
Expanded Uncertainty (k=2)					**± 20.60**	

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.

[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, “Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada’s Safety Code 6 for Exposure of Humans to Radio Frequency Fields”, Radio Standards Specification RSS-102 Issue 1 (Provisional): September 1999.

[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] ANSI/TIA-603-C, “Land Mobile FM or PM Communications Equipment - Measurement and Performance Standards”: December 2004.

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 05/04/2005

Body-Worn SAR - Front Side of DUT - 2.0 cm Air-Gap Spacing

DUT: CSI Wireless Model: LT10R; Type: Portable Body-Worn ReFLEX GPS Radio Tracking Device; Serial: 37722823

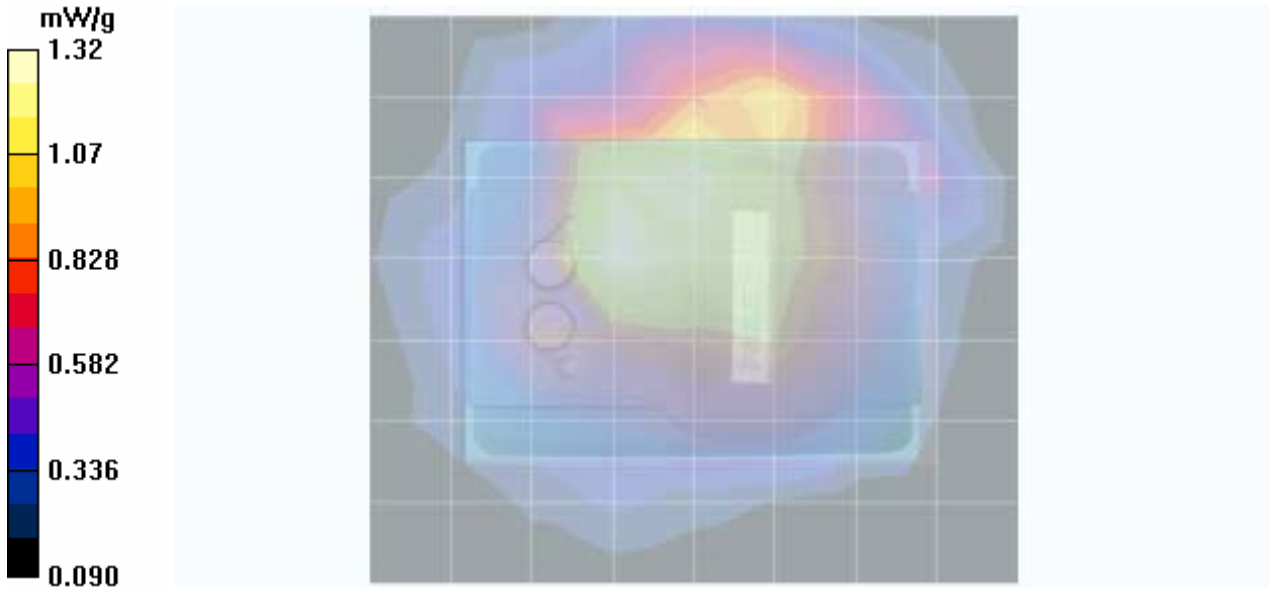
Ambient Temp: 24.3 °C; Fluid Temp: 23.3 °C; Barometric Pressure: 101.2 kPa; Humidity: 30%

Communication System: FSK
RF Output Power: 1.23 Watts (ERP)
Frequency: 899 MHz; Duty Cycle: 1:2
3.6V, 1000mAh Li-ion Battery Pack (Model: BAK-NP60)
Medium: M900 (σ = 1.02 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3)

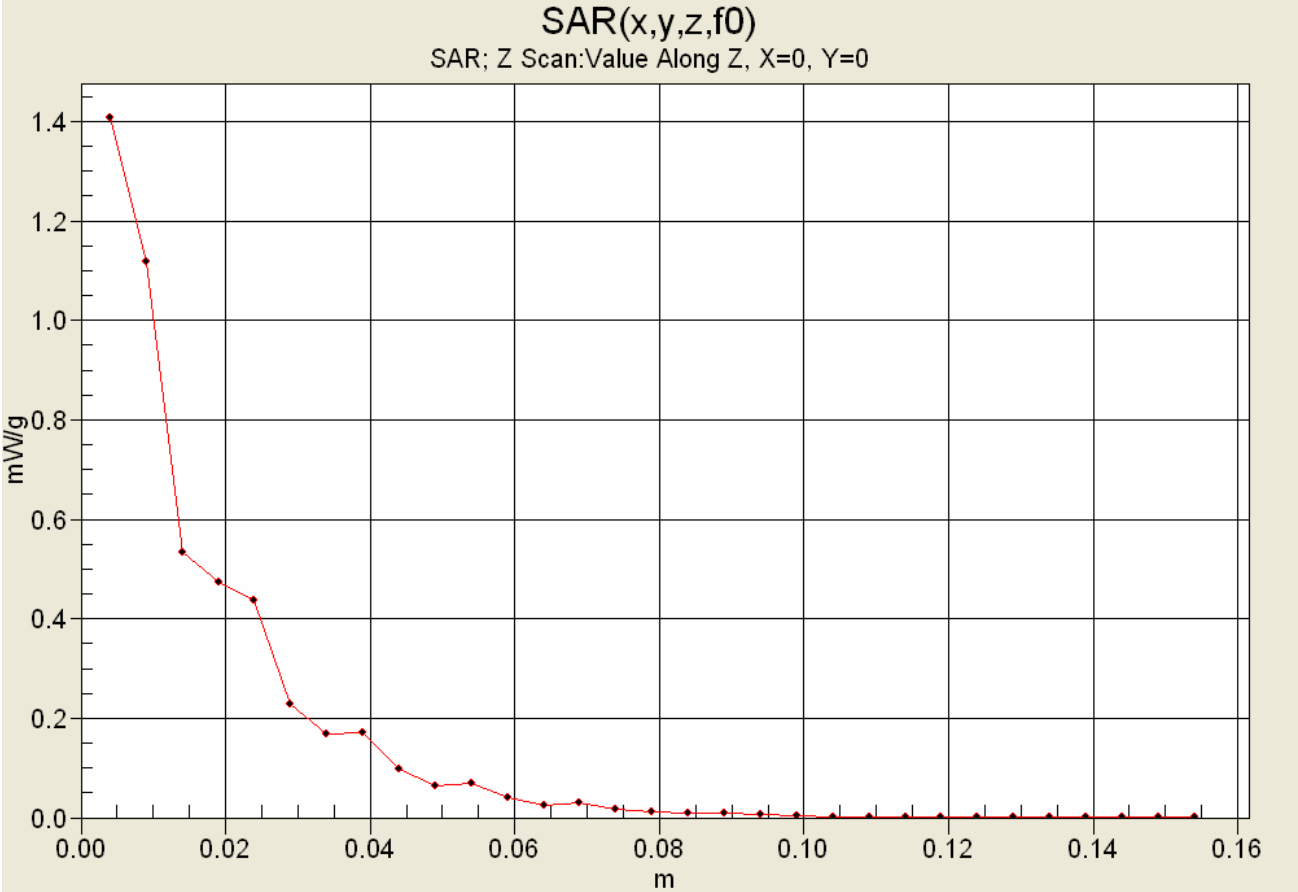
- Probe: ET3DV6 - SN1387; ConvF(6.1, 6.1, 6.1); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 25/01/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Body-Worn - 2.0 cm Air-Gap Spacing from Front Side of DUT to Planar Phantom - Mid Channel
Area Scan (8x9x1): Measurement grid: dx=15mm, dy=15mm

Body-Worn - 2.0 cm Air-Gap Spacing from Front Side of DUT to Planar Phantom - Mid Channel
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.7 V/m; Power Drift = -0.436 dB
Peak SAR (extrapolated) = 3.11 W/kg
SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.767 mW/g



Z-Axis Scan



Date Tested: 05/04/2005

Body-Worn SAR - Back Side of DUT - 2.0 cm Air-Gap Spacing

DUT: CSI Wireless Model: LT10R; Type: Portable Body-Worn ReFLEX GPS Radio Tracking Device; Serial: 37722823

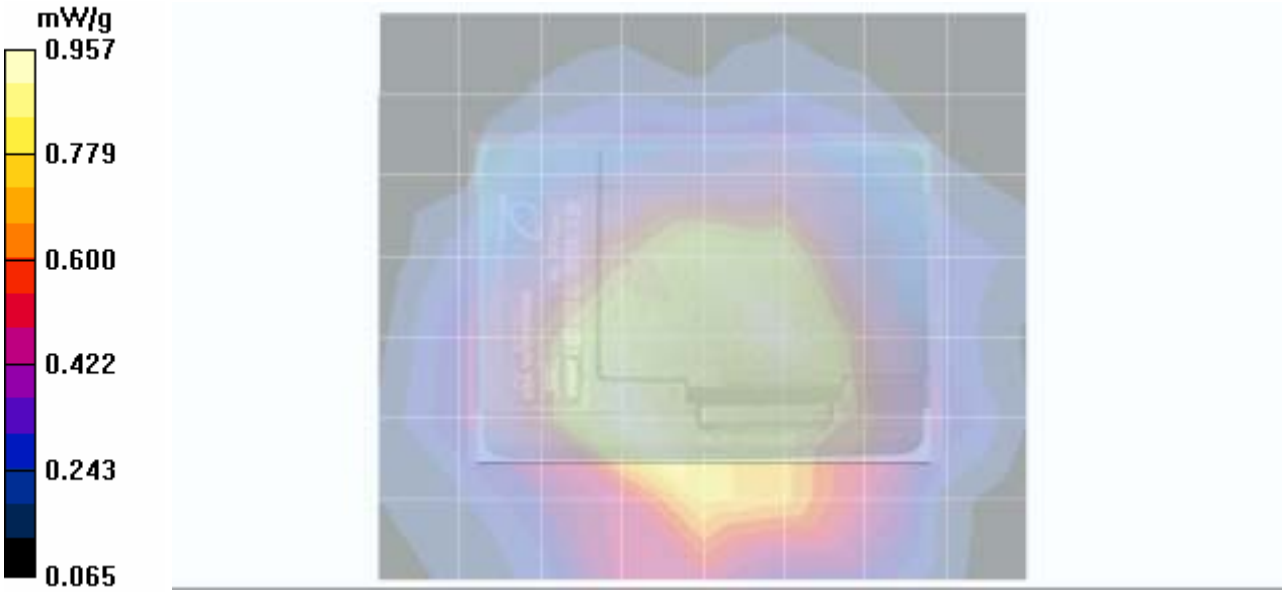
Ambient Temp: 24.3 °C; Fluid Temp: 23.3 °C; Barometric Pressure: 101.2 kPa; Humidity: 30%

Communication System: FSK
RF Output Power: 1.23 Watts (ERP)
Frequency: 899 MHz; Duty Cycle: 1:2
3.6V, 1000mAh Li-ion Battery Pack (Model: BAK-NP60)
Medium: M900 (σ = 1.02 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3)

- Probe: ET3DV6 - SN1387; ConvF(6.1, 6.1, 6.1); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 25/01/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

Body-Worn - 2.0 cm Air-Gap Spacing from Back Side of DUT to Planar Phantom - Mid Channel
Area Scan (8x9x1): Measurement grid: dx=15mm, dy=15mm

Body-Worn - 2.0 cm Air-Gap Spacing from Back Side of DUT to Planar Phantom - Mid Channel
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.0 V/m; Power Drift = 1.20 dB
Peak SAR (extrapolated) = 1.84 W/kg
SAR(1 g) = 0.850 mW/g; SAR(10 g) = 0.569 mW/g



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 05/03/2005

System Performance Check - 900 MHz Dipole

DUT: Dipole 900 MHz; Model: D900V2; Type: System Performance Check; Serial: 054; Calibrated: 06/10/2004

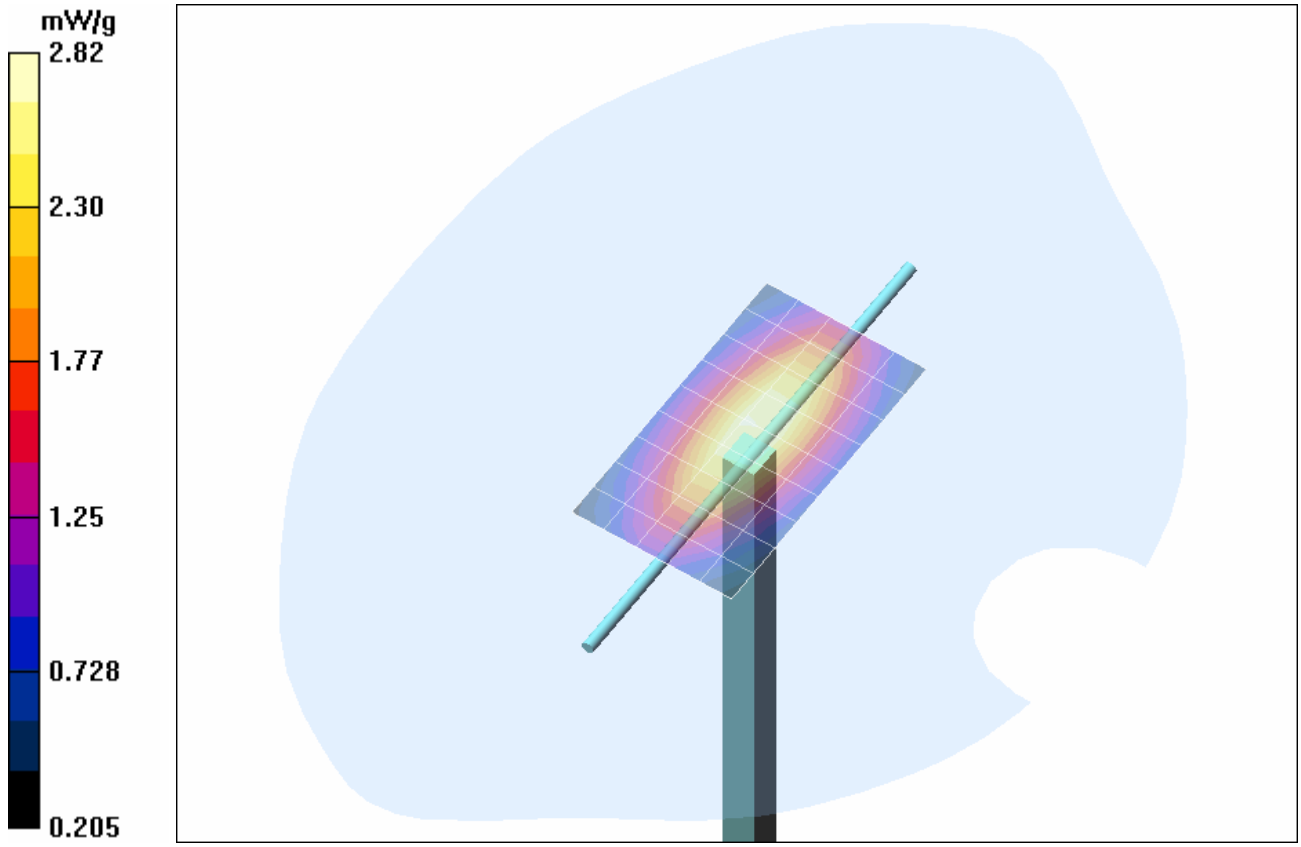
Ambient Temp: 23.0 °C; Fluid Temp: 22.7 °C; Barometric Pressure: 101.8 kPa; Humidity: 30%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 900 MHz; Duty Cycle: 1:1
Medium: HSL900 (σ = 0.95 mho/m; ε_r = 39.8; ρ = 1000 kg/m^3)

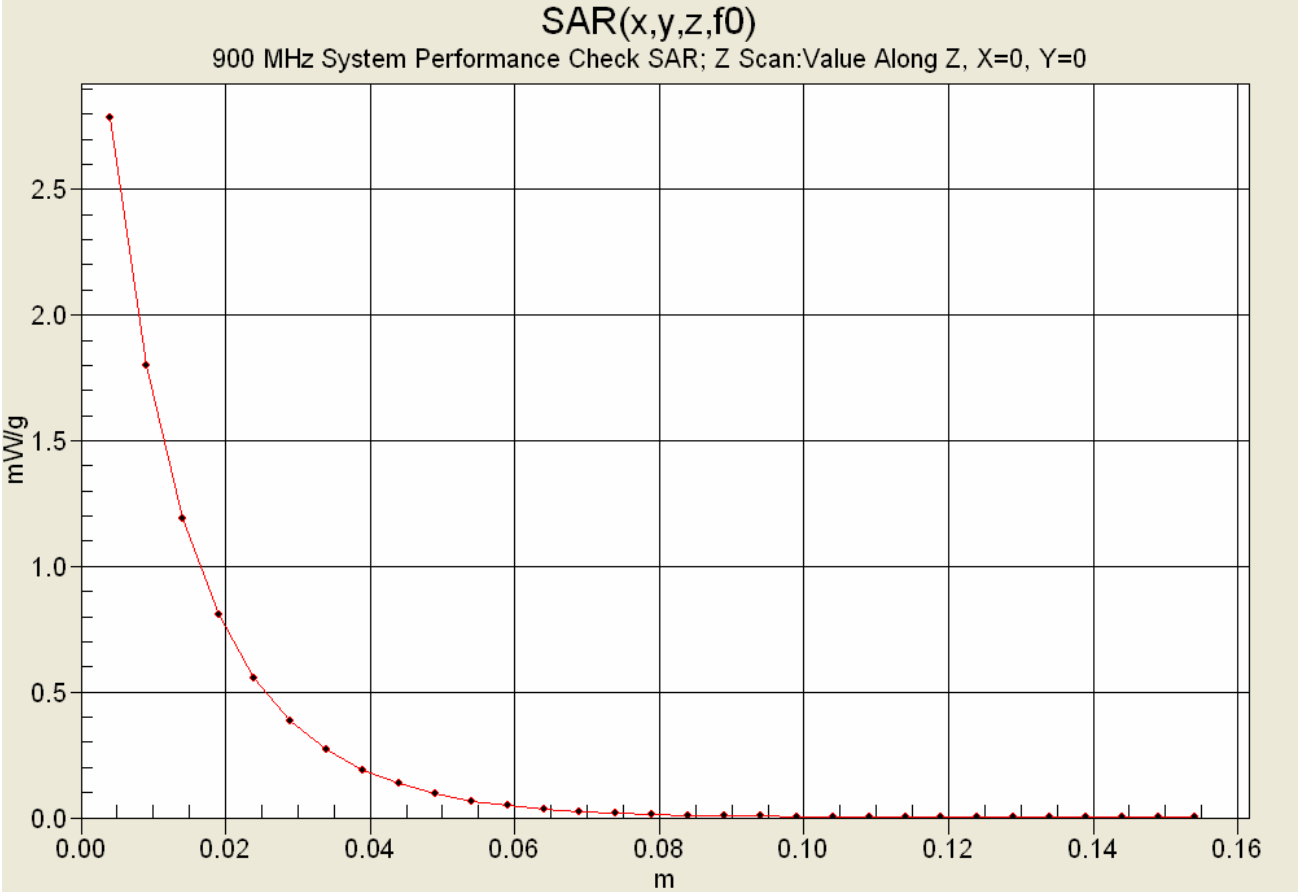
- Probe: ET3DV6 - SN1387; ConvF(6.47, 6.47, 6.47); Calibrated: 18/03/2005
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE3 Sn370; Calibrated: 25/01/2005
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 146

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

900 MHz Dipole - System Performance Check/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.3 V/m; Power Drift = -0.014 dB
Peak SAR (extrapolated) = 4.02 W/kg
SAR(1 g) = 2.60 mW/g; SAR(10 g) = 1.65 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

900 MHz DUT Evaluation (Body)

****
Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Wed 04/May/2005
Freq 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
0.8000	55.34	0.97	53.18	0.93
0.8100	55.30	0.97	53.28	0.93
0.8200	55.26	0.97	53.07	0.94
0.8300	55.22	0.97	53.09	0.95
0.8400	55.18	0.98	52.94	0.97
0.8500	55.15	0.99	52.90	0.98
0.8600	55.12	1.00	52.78	0.98
0.8700	55.09	1.01	52.72	1.00
0.8800	55.06	1.03	52.68	1.00
0.8900	55.03	1.04	52.50	1.01
0.9000	55.00	1.05	52.39	1.02
0.9100	55.00	1.06	52.32	1.03
0.9200	54.99	1.06	52.24	1.04
0.9300	54.97	1.07	52.22	1.05
0.9400	54.95	1.07	52.02	1.06
0.9500	54.93	1.08	51.98	1.07
0.9600	54.92	1.08	51.86	1.08
0.9700	54.90	1.08	51.87	1.09
0.9800	54.88	1.09	51.67	1.10
0.9900	54.86	1.09	51.59	1.11
1.0000	54.84	1.10	51.50	1.12

900 MHz System Performance Check (Brain)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
Tue 03/May/2005
Freq Frequency(GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

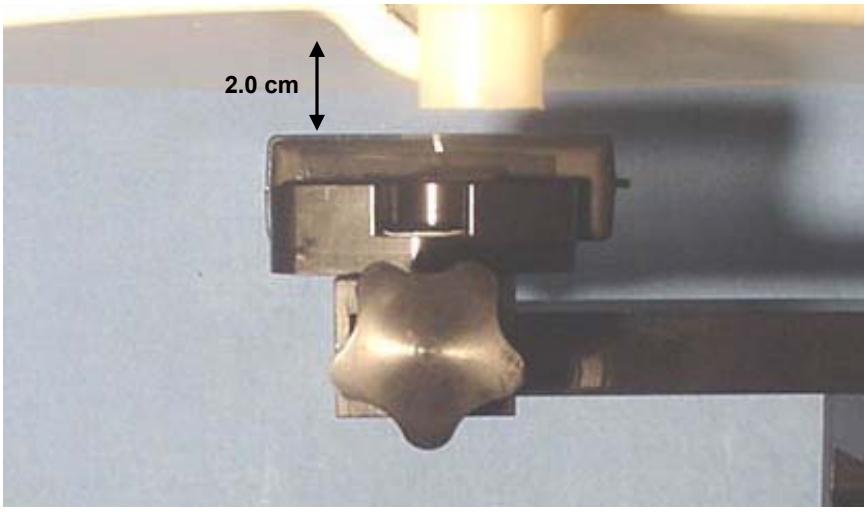
****

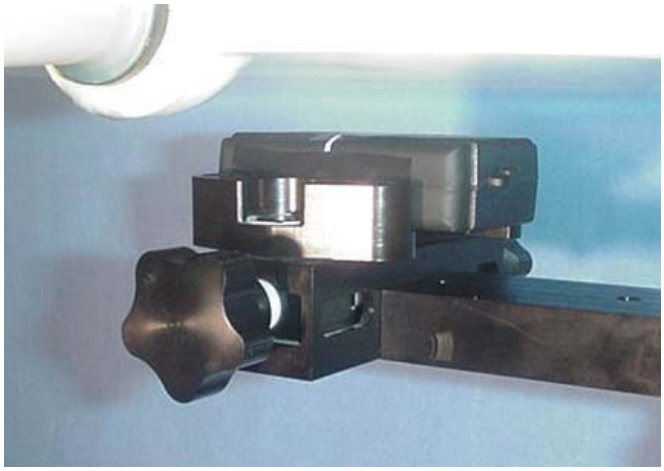
Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.8000	41.68	0.90	41.23	0.87
0.8100	41.63	0.90	41.00	0.87
0.8200	41.58	0.90	40.84	0.88
0.8300	41.53	0.90	40.70	0.89
0.8400	41.50	0.91	40.62	0.90
0.8500	41.50	0.92	40.49	0.92
0.8600	41.50	0.93	40.32	0.92
0.8700	41.50	0.94	40.25	0.93
0.8800	41.50	0.95	40.02	0.93
0.8900	41.50	0.96	39.95	0.95
0.9000	41.50	0.97	39.84	0.95
0.9100	41.50	0.98	39.78	0.96
0.9200	41.49	0.98	39.57	0.97
0.9300	41.47	0.99	39.56	0.98
0.9400	41.45	0.99	39.56	0.99
0.9500	41.43	0.99	39.38	1.00
0.9600	41.42	1.00	39.18	1.01
0.9700	41.40	1.00	39.16	1.02
0.9800	41.38	1.01	39.00	1.03
0.9900	41.36	1.01	38.90	1.03
1.0000	41.34	1.01	38.88	1.05

APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

BODY-WORN SAR TEST SETUP PHOTOGRAPHS

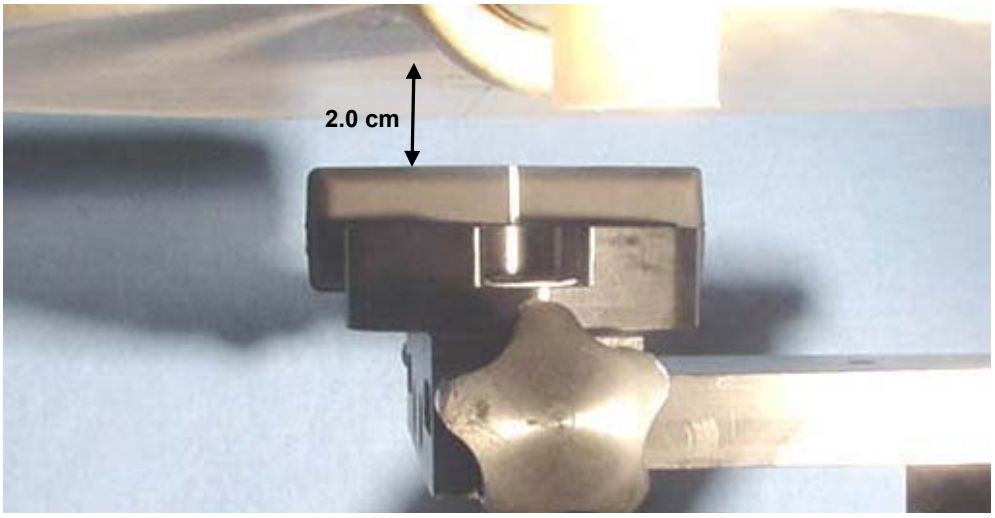
2.0 cm Air-Gap Spacing from Front Side of DUT to Planar Phantom





BODY-WORN SAR TEST SETUP PHOTOGRAPHS

2.0 cm Air-Gap Spacing from Back Side of DUT to Planar Phantom



DUT PHOTOGRAPHS

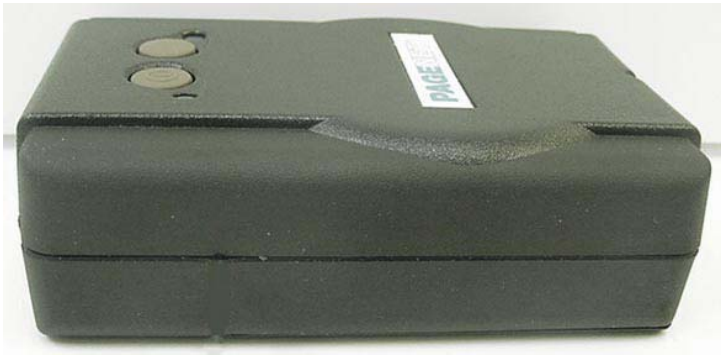
Front of DUT

Back of DUT

Top End of DUT

Bottom End of DUT

DUT PHOTOGRAPHS



Left Side of DUT

Right Side of DUT

DUT Battery Compartment

Lithium-ion Battery (Model: BAK-NP60)

Lithium-ion Battery (Model: BAK-NP60)

APPENDIX E - SYSTEM VALIDATION

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

Client **Celltech Labs**

CALIBRATION CERTIFICATE

Object(s) D900V2 - SN:054

Calibration procedure(s) QA CAL-05.v2
Calibration procedure for dipole validation kits

Calibration date: June 10, 2004

Condition of the calibrated item In Tolerance (according to the specific calibration document)

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

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

Calibration Equipment used (M&TE critical for calibration)

Model Type	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM E442	GB37480704	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Power sensor HP 8481A	US37292783	6-Nov-03 (METAS, No. 252-0254)	Nov-04
Power sensor HP 8481A	MY41092317	18-Oct-02 (Agilent, No. 20021018)	Oct-04
RF generator R&S SML-03	100698	27-Mar-2002 (R&S, No. 20-92389)	In house check: Mar-05
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Nov-03)	In house check: Oct 05

	Name	Function	Signature
Calibrated by:	Judith Mueller	Technician	
Approved by:	Katja Pokovic	Laboratory Director	

Date issued: June 14, 2004

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

Schmid & Partner Engineering AG

s p e a g

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

DASY

Dipole Validation Kit

Type: D900V2

Serial: 054

Manufactured: August 25, 1999
Calibrated: June 10, 2004

1. Measurement Conditions

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

Relative Dielectricity	**42.0**	± 5%
Conductivity	**1.00 mho/m**	± 5%

The DASY4 System with a dosimetric E-field probe ET3DV6 (SN:1507, Conversion factor 6.18 at 900 MHz) was used for the measurements.

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

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

2. SAR Measurement with DASY4 System

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

averaged over 1 cm^3 (1 g) of tissue:	**11.0 mW/g** ± 16.8 % (k=2)[1]
averaged over 10 cm^3 (10 g) of tissue:	**7.00 mW/g** ± 16.2 % (k=2)[1]

[1] validation uncertainty

3. Dipole Impedance and Return Loss

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

Electrical delay:	**1.396 ns**	(one direction)
Transmission factor:	**0.992**	(voltage transmission, one direction)

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

Feedpoint impedance at 900 MHz:	Re{Z} = **49.5 Ω**
	Im {Z} = **-2.6 Ω**
Return Loss at 900 MHz	**-32.5 dB**

4. Handling

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

5. Design

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

6. Power Test

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

Date/Time: 06/10/04 11:48:00

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 900 MHz; Type: D900V2; Serial: D900V2 - SN054

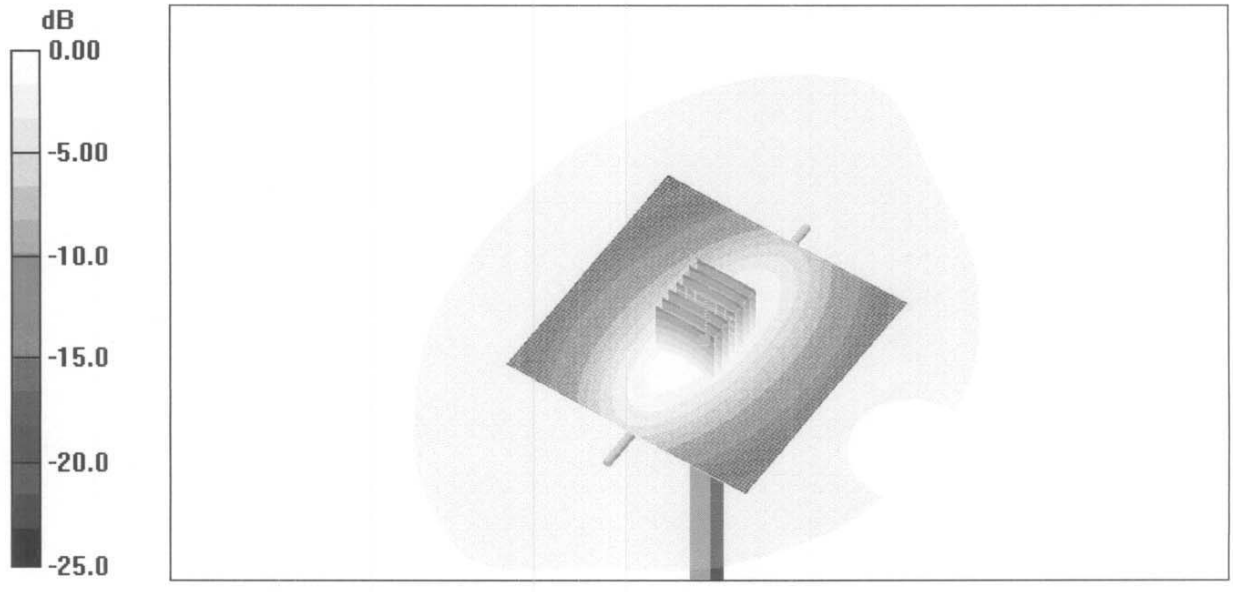
Communication System: CW-900; Frequency: 900 MHz;Duty Cycle: 1:1
Medium: HSL 900 MHz;
Medium parameters used: f = 900 MHz; σ = 1 mho/m; ε_r = 42; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.18, 6.18, 6.18); Calibrated: 1/23/2004
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn411; Calibrated: 11/6/2003
- Phantom: SAM with CRP - TP1006; Type: SAM 4.0; Serial: TP:1006;
- Measurement SW: DASY4, V4.2 Build 56; Postprocessing SW: SEMCAD, V2.0 Build 34

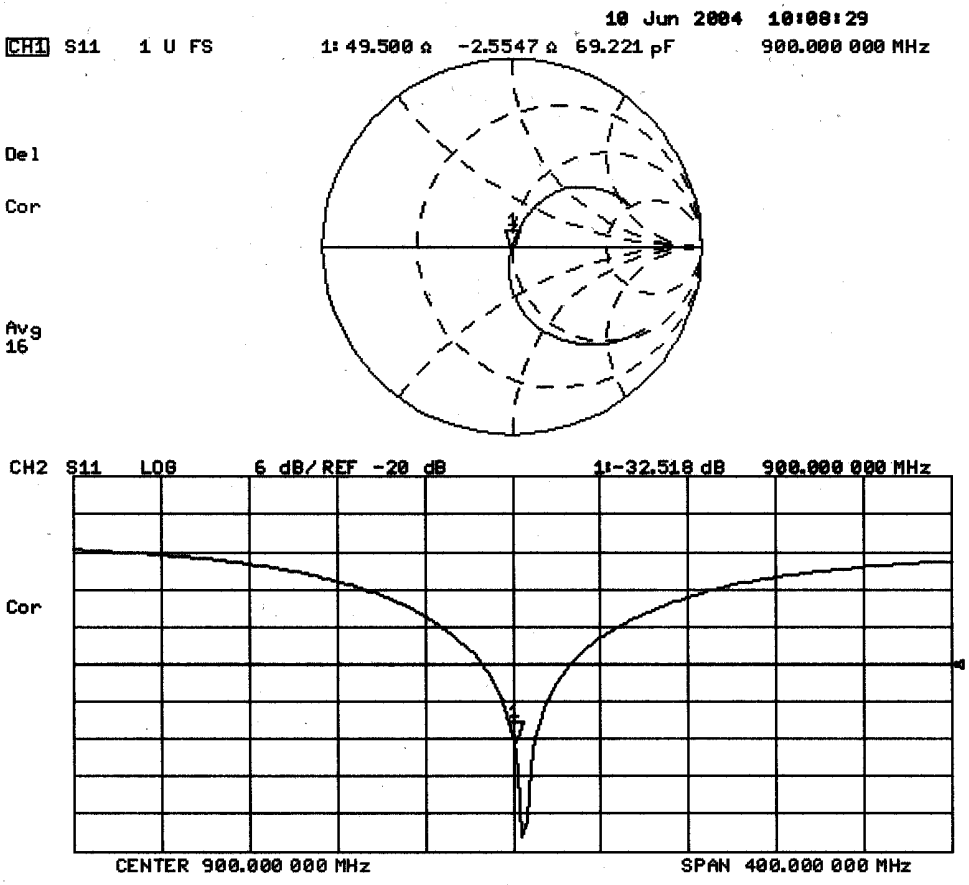
Pin = 250 mW; d = 15 mm/Area Scan (81x81x1): Measurement grid: dx=15mm, dy=15mm
Reference Value = 56.4 V/m; Power Drift = 0.02 dB
Maximum value of SAR (interpolated) = 2.96 mW/g

Pin = 250 mW; d = 15 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.4 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 4.18 W/kg
SAR(1 g) = 2.75 mW/g; SAR(10 g) = 1.75 mW/g
Maximum value of SAR (measured) = 2.96 mW/g



0 dB = 2.96mW/g

Head


10 Jun 2004 10:08:29
CH1 S11 1 U FS
1: 49.500 Ω -2.5547 Ω 69.221 pF
900.000 000 MHz
Del
Cor
Avg
16
CH2 S11 LOG 6 dB/ REF -20 dB
1:-32.518 dB 900.000 000 MHz
Cor
CENTER 900.000 000 MHz
SPAN 400.000 000 MHz

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