





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	  Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	


## SAR TEST REPORT (FCC/IC)

RF EXPOSURE EVALUATION		SPECIFIC ABSORPTION RATE		
APPLICANT / MANUFACTURER	THALES COMMUNICATIONS INC.			
DEVICE UNDER TEST (DUT)	PORTABLE MULTIBAND LAND MOBILE PTT RADIO TRANSCEIVER			
	MODES	ANALOG (FM) / DIGITAL (P25)		
FREQUENCY RANGE UNDER TEST	UHF	406.1 - 512.0 MHz		
DEVICE MODEL(S)	NAME	LIBERTY	NO.	4102023-501
DEVICE IDENTIFIER(S)	FCC ID:	OKC-4102023501	IC:	473C-4102023501
APPLICATION TYPE	FCC/IC Certification			
STANDARD(S) APPLIED	FCC 47 CFR §2.1093			
	Health Canada Safety Code 6			
PROCEDURE(S) APPLIED	FCC OET Bulletin 65, Supplement C (01-01)			
	FCC Mobile & Portable RF Exposure Proc. (KDB 447498 D01 v03r03)			
	Industry Canada RSS-102 Issue 2			
	IEEE 1528-2003		IEC 62209-1:2005	
FCC DEVICE CLASSIFICATION	Licensed Non-Broadcast Transmitter Held to Face (TNF)			
IC DEVICE CLASSIFICATION	Land Mobile Radio Transmitter/Receiver (27.41-960 MHz)			
RF EXPOSURE CATEGORY	Occupational / Controlled			
RF EXPOSURE EVALUATION(S)	Face-held & Body-worn			
DATE(S) OF EVALUATION	March 10 & April 06, 2009			
TEST REPORT SERIAL NO.	030409OKC-T954-S90U			
TEST REPORT REVISION NO.	Revision 1.1	Response to FCC		April 09, 2009
	Revision 1.0	Initial Release		March 12, 2009
TEST REPORT SIGNATORIES	Testing Performed By		Test Report Prepared By	
	Sean Johnston Celltech Labs Inc.		Jonathan Hughes Celltech Labs Inc.	
TEST LAB AND LOCATION	Celltech Compliance Testing and Engineering Lab			
	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada			
TEST LAB CONTACT INFO.	Tel.: 250-765-7650		Fax: 250-765-7645	
	info@celltechlabs.com		www.celltechlabs.com	
TEST LAB ACCREDITATION(S)	<div></div> <div>Test Lab Certificate No. 2470.01</div>			

Applicant:		Thales Communications Inc.		FCC ID:	OKC-4102023501	IC:	473C-4102023501	THALES
Model:	Liberty 4102023-501		Portable Multiband Land Mobile Radio Transceiver		UHF:	406.1 - 512.0 MHz		
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.						Page 1 of 45

	Date(s) of Evaluation March 10 & April 06, 2009	Test Report Serial No. 030409OKC-T954-S90U	Test Report Revision No. Rev. 1.1 (2nd Release)	
	Test Report Issue Date April 09, 2009	Description of Test(s) Specific Absorption Rate	RF Exposure Category Occupational (Controlled)	

## DECLARATION OF COMPLIANCE SAR RF EXPOSURE EVALUATION

<b>Test Lab Information</b>	<b>Name</b>	CELLTECH LABS INC.			
	<b>Address</b>	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada			
<b>Applicant Information</b>	<b>Name</b>	THALES COMMUNICATIONS INC.			
	<b>Address</b>	22605 Gateway Center Drive, Clarksburg, MD 20871 United States			
<b>Standard(s) Applied</b>	<b>FCC</b>	47 CFR §2.1093	<b>IC</b>	Health Canada Safety Code 6	
<b>Procedure(s) Applied</b>	<b>FCC</b>	OET Bulletin 65, Supplement C (Edition 01-01)			
	<b>FCC</b>	Mobile & Portable RF Exposure Procedures (KDB 447498 D01 v03r03)			
	<b>IC</b>	RSS-102 Issue 2	<b>IEEE</b>	1528-2003	<b>IEC</b>
<b>Application Type(s)</b>	<b>FCC/IC</b>	New Certification			
<b>Device Classification(s)</b>	<b>FCC</b>	Licensed Non-Broadcast Transmitter Held to Face (TNF)			
	<b>IC</b>	Land Mobile Radio Transmitter/Receiver (27.41-960 MHz)			
<b>Device RF Exposure Category</b>	<b>Portable</b>	Occupational / Controlled Environment			
<b>Device Identifier(s)</b>	<b>FCC ID:</b>	OKC-4102023501			
	<b>IC:</b>	473C-4102023501			
<b>Device Model (Name / No.)</b>	Liberty 4102023-501				
<b>Test Sample Serial No.</b>	10007 (Identical Prototype)				
<b>Device-Under-Test Description</b>	Portable Multiband Push-To-Talk (PTT) Radio Transceiver				
<b>Device Modes of Operation</b>	Analog (FM) / Digital (P25)				
<b>Frequency Range Under Test</b>	<b>UHF Band</b>	406.1 - 512.0 MHz			
<b>Max. RF Output Power Tested</b>	5.3 Watts	37.24 dBm	Conducted	406.1 MHz	
	5.3 Watts	37.24 dBm	Conducted	450.0 MHz	
	5.3 Watts	37.24 dBm	Conducted	512.0 MHz	
<b>Antenna Type(s) Tested</b>	Detachable	Multiband Flex	P/N: 1600678-1	Length: 216 mm	
<b>Battery Type(s) Tested</b>	Lithium-ion	10.8 V	4.8 Ah	P/N: 1600691-2	
<b>Body-worn Accessories Tested</b>	Belt-Clip	Contains Metal Components			P/N: 40508
	Belt-Holster	Contains Metal Components			P/N: 1600702-1
<b>Audio Accessories Tested</b>	Speaker-Microphone (P/N: 1600696-01)				
<b>Max. SAR Level(s) Evaluated</b>	Face-held	1.16 W/kg	1g	50% duty cycle	Occupational / Controlled Exposure
	Body-worn	1.94 W/kg	1g	50% duty cycle	Occupational / Controlled Exposure
<b>FCC/IC Spatial Peak SAR Limit</b>	Head/Body	8.0 W/kg	1g	50% duty cycle	Occupational / Controlled Exposure
<p>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 for the Occupational / Controlled Exposure environment. The device was tested in accordance with the measurement procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 2, IEEE Standard 1528-2003 and IEC International Standard 62209-1:2005. All measurements were performed in accordance with the SAR system manufacturer recommendations.</p> <p>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.</p> <p>The results and statements contained in this report pertain only to the device(s) evaluated.</p> <p>This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.</p>					
<b>Test Report Approved By</b>			<b>Sean Johnston</b>	<b>Celltech Labs Inc.</b>	



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 2 of 45





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

TABLE OF CONTENTS	
1.0 INTRODUCTION	4
2.0 SAR MEASUREMENT SYSTEM	4
3.0 MEASUREMENT SUMMARY	5
4.0 DETAILS OF SAR EVALUATION	6
5.0 EVALUATION PROCEDURES	6
6.0 SAR EVALUATION POWER THRESHOLDS FOR PTT DEVICES	7
7.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES	7
8.0 SYSTEM PERFORMANCE CHECK	8
9.0 SIMULATED EQUIVALENT TISSUES	9
10.0 SAR LIMITS	9
11.0 ROBOT SYSTEM SPECIFICATIONS	10
12.0 PROBE SPECIFICATION (ET3DV6)	11
13.0 SIDE PLANAR PHANTOM	11
14.0 VALIDATION PLANAR PHANTOM	11
15.0 DEVICE HOLDER	11
16.0 TEST EQUIPMENT LIST	12
17.0 MEASUREMENT UNCERTAINTIES	13
18.0 REFERENCES	14
APPENDIX A - SAR MEASUREMENT DATA	15
APPENDIX B - SYSTEM PERFORMANCE CHECK DATA	26
APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS	31
APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS	36
APPENDIX E - DIPOLE CALIBRATION (FCC KDB 250418) & PROBE CALIBRATION	45

<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 3 of 45

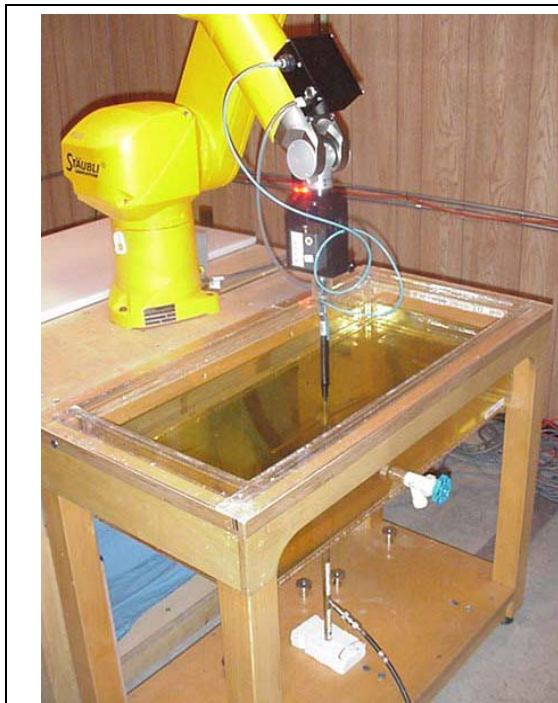
	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## 1.0 INTRODUCTION

This measurement report demonstrates that the Thales Communications Inc. Model: Liberty 4102023-501 Portable Analog/Digital Multiband Land Mobile PTT Radio Transceiver (UHF Band) 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 Occupational / Controlled Exposure environment. The measurement procedures described in FCC OET Bulletin 65, Supplement C (Edition 01-01) (see reference [3]), IC RSS-102 Issue 2 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]) and IEC International Standard 62209-1:2005 (see reference [6]) 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 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 head 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 a controller with a built in VME-bus computer.





DASY4 SAR System with Plexiglas validation phantom



DASY4 SAR System with Plexiglas side planar phantom

<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 4 of 45





	Date(s) of Evaluation March 10 & April 06, 2009	Test Report Serial No. 030409OKC-T954-S90U	Test Report Revision No. Rev. 1.1 (2nd Release)	
	Test Report Issue Date April 09, 2009	Description of Test(s) Specific Absorption Rate	RF Exposure Category Occupational (Controlled)	

Test Lab Certificate No. 2470.01

### 3.0 MEASUREMENT SUMMARY

#### SAR EVALUATION RESULTS

Test Type	Freq.	Ch.	Batt. Type	Antenna Position	Accessory Type(s)		Device Distance to Planar Phantom		Cond. Power Before Test	Measured SAR 1g (W/kg)			SAR Drift During Test	Scaled SAR with droop 1g (W/kg)			
	Duty Cycle									Duty Cycle							
	MHz				Body-worn	Audio	DUT	Antenna	Watts	100%	50%	dB	100%	50%			
Face	450.0	Mid	Li-ion	Fixed	n/a	n/a	2.5 cm	5.5 cm	5.3	2.27	1.14	-0.095	2.32	1.16			
Body	406.1	Low	Li-ion	Fixed	Belt-Clip	Spkr-Mic	1.6 cm	2.0 cm	5.3	P	3.40	1.70	-0.166	P	3.53	1.77	
										S	2.86	1.43		S	2.97	1.49	
Body	406.1	Low	Li-ion	Fixed	Belt-Holster	Spkr-Mic	2.0 cm	2.2 cm	5.3	P	3.37	1.69	-0.127	P	3.47	1.74	
										S	3.29	1.65		S	3.39	1.70	
Body	450.0	Mid	Li-ion	Fixed	Belt-Clip	Spkr-Mic	1.6 cm	2.0 cm	5.3	P	3.74	1.87	-0.016	P	3.75	1.88	
										S	3.86	1.93		S	3.87	1.94	
Body	450.0	Mid	Li-ion	Fixed	Belt-Holster	Spkr-Mic	2.0 cm	2.2 cm	5.3	P	3.72	1.86	-0.003	P	3.72	1.86	
										S	2.76	1.38		S	2.76	1.38	
Body	512.0	High	Li-ion	Fixed	Belt-Clip	Spkr-Mic	1.6 cm	2.0 cm	5.3	P	3.22	1.61	-0.177	P	3.35	1.68	
										S	2.85	1.43		S	2.97	1.49	
Body	512.0	High	Li-ion	Fixed	Belt-Holster	Spkr-Mic	2.0 cm	2.2 cm	5.3	P	3.61	1.81	-0.193	P	3.77	1.89	
										S	2.89	1.45		S	3.02	1.51	
SAR LIMIT(S)						HEAD & BODY			SPATIAL PEAK			RF EXPOSURE CATEGORY					
FCC 47 CFR 2.1093			Health Canada Safety Code 6			8.0 W/kg			averaged over 1 gram			Occupational / Controlled					
Date of Measurement		March 10, 2009				March 10, 2009			April 06, 2009			April 06, 2009					
Measured Fluid Type		450 Head		450 MHz Meas.		450 Body		450 MHz Meas.		450 Body		410 MHz Meas.		450 Body		510 MHz Meas.	
Dielectric Constant $\epsilon_r$		IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.
		43.5	±5%	44.3	+1.8%	56.7	±5%	58.6	+3.4%	56.7	±5%	58.6	+3.4%	56.7	±5%	57.8	+2.0%
Conductivity $\sigma$ (mho/m)		IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.
		0.87	±5%	0.85	-2.3%	0.94	±5%	0.92	-2.1%	0.94	±5%	0.90	-4.3%	0.94	±5%	0.96	+2.2%
Test Date		Fluid Type		Ambient Temp.		Fluid Temp.		Fluid Depth		Atmospheric Pressure			Relative Humidity		ρ (Kg/m³)		
March 10, 2009		Head		24.0 °C		21.5 °C		≥ 15 cm		101 kPa			35%		1000		
March 10, 2009		Body		24.0 °C		21.5 °C		≥ 15 cm		101 kPa			35%		1000		
April 06, 2009		Body		22.5 °C		21.5 °C		≥ 15 cm		101 kPa			35%		1000		

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## 4.0 DETAILS OF SAR EVALUATION

The Thales Communications Inc. Model: Liberty 4102023-501 Portable Analog/Digital Multiband Land Mobile PTT Radio Transceiver (UHF Band) described in this report was compliant for localized Specific Absorption Rate (Occupational / Controlled 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 evaluated in a face-held configuration with the front of the radio placed parallel to the outer surface of the planar phantom. A 2.5 cm spacing was maintained between the front side of the DUT and the outer surface of the planar phantom.
2. The DUT was evaluated in a body-worn configuration with the back of the radio facing the outer surface of the planar phantom and the attached belt-clip accessory placed parallel to and touching the planar phantom. The belt-clip accessory provided a 1.6 cm spacing from the back of the DUT to the planar phantom. The DUT was evaluated for body-worn SAR with the customer-supplied speaker-microphone accessory connected to the input connector.
3. The DUT was evaluated in a body-worn configuration with the radio placed inside the belt-holster accessory. The back of the radio was facing the outer surface of the planar phantom and the belt-holster accessory was touching the planar phantom. The belt-holster accessory provided a 2.0 cm spacing from the back of the DUT to the planar phantom. The DUT was evaluated for body-worn SAR with the customer-supplied speaker-microphone accessory connected to the input connector.
4. The conducted output power levels referenced in this report were measured prior to the SAR evaluations at the antenna connector of the DUT using a Gigatronics 8652A Universal Power Meter in accordance with FCC 47 CFR §2.1046 and IC RSS-Gen.
5. The area scan evaluation was performed with a fully charged battery. After the area scan was completed the radio was cooled down and the battery was replaced with a fully charged battery prior to the zoom scan evaluation.
6. The fluid temperature was measured prior to and after the SAR evaluations to ensure the temperature remained within  $\pm 2^{\circ}\text{C}$  of the fluid temperature reported during the dielectric parameter measurements.
7. The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR evaluations using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).

## 5.0 EVALUATION PROCEDURES

- (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.
- 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:
- 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.
- 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:
- 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 E). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.
- 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).
- 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  $\geq 800$  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.

<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	THALES
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 6 of 45

<b>Applicant:</b>	<b>Thales Communications Inc.</b>	<b>FCC ID:</b>	<b>OKC-4102023501</b>	<b>IC:</b>	<b>473C-4102023501</b>	<b>THALES</b>
<b>Model:</b>	<b>Liberty 4102023-501</b>	<b>Portable Multiband Land Mobile Radio Transceiver</b>		<b>UHF:</b>	<b>406.1 - 512.0 MHz</b>	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 7 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## 8.0 SYSTEM PERFORMANCE CHECK

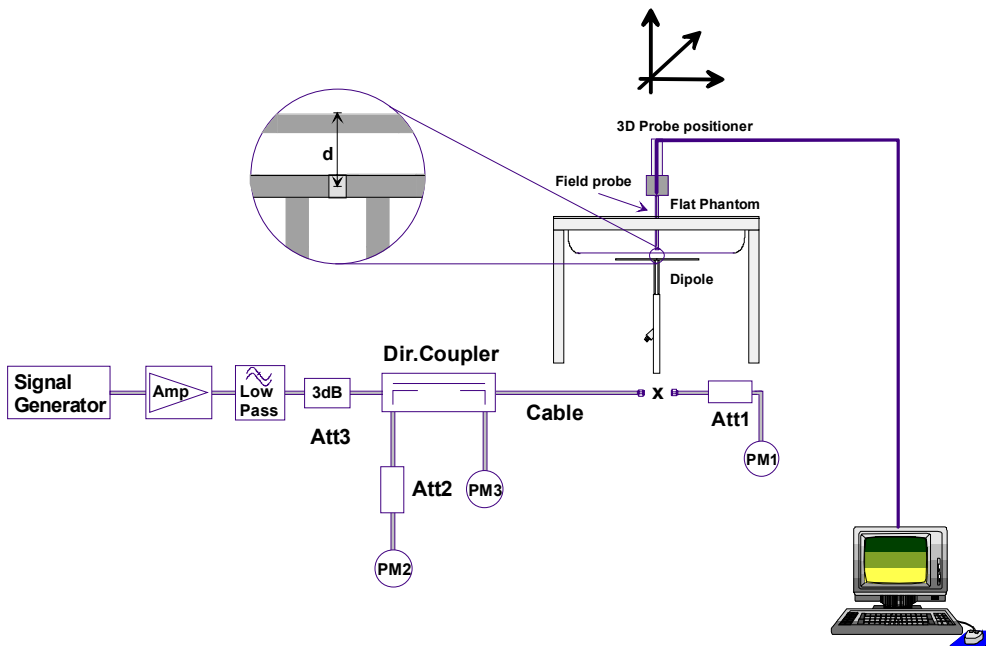
Prior to the SAR evaluations a daily system check was performed using a Plexiglas planar phantom and 450 MHz dipole (see Appendix B for system performance check test plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]) and IEC International Standard 62209-1:2005 (see reference [6]). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C for measured fluid dielectric parameters). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of  $\pm 10\%$  from the system validation target SAR value (see Appendix E for system validation target SAR value listed on page 10 of the dipole calibration report).

### SYSTEM PERFORMANCE CHECK EVALUATION

System Performance Check Evaluation																
Test Date	Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant $\epsilon_r$			Conductivity $\sigma$ (mho/m)			$\rho$ (Kg/m <sup>3</sup> )	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
	Freq. (MHz)	Sys. Val. Target	Meas.	Dev.	Sys. Val. Target	Meas.	Dev.	Sys. Val. Target	Meas.	Dev.						
Mar 10	Head 450	1.22 ±10%	1.19	-2.5%	43.8 ±5%	44.3	+1.1%	0.86 ±5%	0.85	-1.2%	1000	24.0	21.5	≥ 15	35	101.1
Apr 06	Head 450	1.22 ±10%	1.22	0.0%	43.8 ±5%	44.2	+1.0%	0.86 ±5%	0.87	+1.1%	1000	22.5	21.5	≥ 15	35	101.1

#### Notes

- The target SAR value is referenced from the System Validation performed by Celltech Labs Inc. (see Appendix E).
- The target dielectric parameters are referenced from the System Validation performed by Celltech Labs Inc. (see Appendix E).
- The fluid temperature was measured prior to and after the system performance check to ensure the temperature remained within  $\pm 2^\circ\text{C}$  of the fluid temperature reported during the dielectric parameter measurements.
- The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).






System Performance Check Measurement Setup Diagram



450 MHz Validation Dipole Setup

Applicant:	Thales Communications Inc.		FCC ID:	OKC-4102023501	IC:	473C-4102023501	THALES
Model:	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver			UHF:	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.					Page 8 of 45



	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	
Test Lab Certificate No. 2470.01				

## 9.0 SIMULATED EQUIVALENT TISSUES



The simulated tissue mixtures consisted of a viscous gel using hydroxethylcellulose (HEC) gelling agent and saline solution. Preservation with a bactericide was added and visual inspection made to ensure air bubbles were 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	Water	450 MHz Head Tissue Mixture	38.56 %	450 MHz Body Tissue Mixture	52.00 %
	Sugar		56.32 %		45.65 %
	Salt		3.95 %		1.75 %
	HEC		0.98 %		0.50 %
	Bactericide		0.19 %		0.10 %

## 10.0 SAR LIMITS

SAR RF EXPOSURE LIMITS			
FCC 47 CFR 2.1093	Health Canada Safety Code 6	(General Population / Uncontrolled Exposure)	(Occupational / Controlled Exposure)
Spatial Average (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak (averaged over any 1 g of tissue)		1.6 W/kg	8.0 W/kg
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)		4.0 W/kg	20.0 W/kg
The Spatial Average value of the SAR averaged over the whole body.			
The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.			
The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.			
Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.			
Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.			



Applicant:	Thales Communications Inc.	FCC ID:	OKC-4102023501	IC:	473C-4102023501	THALES
Model:	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		UHF:	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 9 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	


## 11.0 ROBOT SYSTEM SPECIFICATIONS

<u>Specifications</u>	
Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6
<u>Data Acquisition Electronic (DAE) System</u>	
<u>Cell Controller</u>	
Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional
<u>Data Converter</u>	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY4, V4.7 Build 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
Connecting Lines	Optical downlink for data and status info., Optical uplink for commands and clock
<u>DASY4 Measurement Server</u>	
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
<u>E-Field Probe</u>	
Model	ET3DV6
Serial No.	1590
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
<u>Evaluation Phantom</u>	
Type	Side Planar Phantom
Shell Material	Plexiglas
Bottom Thickness	2.0 mm ± 0.1 mm
Inner Dimensions	72.6 cm (L) x 20.3 cm (W) x 20.3 cm (H)
<u>Validation Phantom (≤ 450MHz)</u>	
Type	Planar Phantom
Shell Material	Plexiglas
Bottom Thickness	6 mm ± 0.1 mm
Inner Dimensions	83.5 cm (L) x 36.9 cm (W) x 21.8 cm (H)

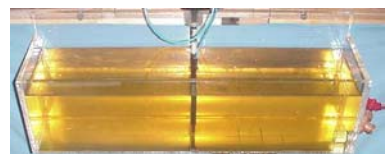
Applicant:	Thales Communications Inc.	FCC ID:	OKC-4102023501	IC:	473C-4102023501	THALES
Model:	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		UHF:	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 10 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	
Test Lab Certificate No. 2470.01				


## 12.0 PROBE SPECIFICATION (ET3DV6)

<p><b>Construction:</b> Symmetrical design with triangular core; Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, glycol)</p> <p><b>Calibration:</b> In air from 10 MHz to 2.5 GHz In head simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy <math>\pm 8\%</math>)</p> <p><b>Frequency:</b> 10 MHz to &gt; 6 GHz; Linearity: <math>\pm 0.2</math> dB (30 MHz to 3 GHz)</p> <p><b>Directivity:</b> <math>\pm 0.2</math> dB in head tissue (rotation around probe axis) <math>\pm 0.4</math> dB in head tissue (rotation normal to probe axis)</p> <p><b>Dynamic Range:</b> 5 <math>\mu</math>W/g to &gt; 100 mW/g; Linearity: <math>\pm 0.2</math> dB</p> <p><b>Surface Detect:</b> <math>\pm 0.2</math> mm repeatability in air and clear liquids over diffuse reflecting surfaces</p> <p><b>Dimensions:</b> 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</p> <p><b>Application:</b> General dosimetry up to 3 GHz; Compliance tests of mobile phone</p>	
<b>ET3DV6 E-Field Probe</b>	


## 13.0 SIDE PLANAR PHANTOM

<p>The side planar phantom is constructed of Plexiglas material with a 2.0 mm shell thickness for face-held and body-worn SAR evaluations of portable radio transceivers. The side planar phantom is mounted on the side of the DASY4 compact system table.</p>	
<b>Plexiglas Side Planar Phantom</b>	



## 14.0 VALIDATION PLANAR PHANTOM

<p>The validation planar phantom is constructed of Plexiglas material with a 6.0 mm shell thickness for system validations at 450MHz and below. The validation planar phantom is mounted to the table of the DASY4 compact system.</p>	
<b>Plexiglas Validation Planar Phantom</b>	

## 15.0 DEVICE HOLDER

<p>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.</p>	
<b>Device Holder</b>	

<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 11 of 45




	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## 16.0 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	CNR	CNR
x	-Robot	00046	599396-01	CNR	CNR
x	-DAE4	00019	353	22Apr08	22Apr09
x	-ET3DV6 E-Field Probe	00017	1590	21Jul08	21Jul09
x	-Celltech 450 MHz Validation Dipole	00024	136	19Jan09	19Jan10
x	-Plexiglas Side Planar Phantom	00156	161	CNR	CNR
x	-Plexiglas Validation Planar Phantom	00157	137	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	US39240170	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	23Apr08	23Apr09
x	Gigatronics 80701A Power Sensor	00014	1833699	23Apr08	23Apr09
x	HP 8753ET Network Analyzer	00134	US39170292	28Apr08	28Apr09
x	HP 8648D Signal Generator	00005	3847A00611	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

<b>Applicant:</b>	<b>Thales Communications Inc.</b>	<b>FCC ID:</b>	<b>OKC-4102023501</b>	<b>IC:</b>	<b>473C-4102023501</b>	<b>THALES</b>
<b>Model:</b>	<b>Liberty 4102023-501</b>	<b>Portable Multiband Land Mobile Radio Transceiver</b>		<b>UHF:</b>	<b>406.1 - 512.0 MHz</b>	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 12 of 45



	Date(s) of Evaluation March 10 & April 06, 2009	Test Report Serial No. 030409OKC-T954-S90U	Test Report Revision No. Rev. 1.1 (2nd Release)	 
	Test Report Issue Date April 09, 2009	Description of Test(s) Specific Absorption Rate	RF Exposure Category Occupational (Controlled)	



Test Lab Certificate No. 2470.01

## 17.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION									
Uncertainty Component	IEEE 1528 Section	Uncertainty Value ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value ±% (1g)	Uncertainty Value ±% (10g)	V <sub>i</sub> or V <sub>eff</sub>
<b>Measurement System</b>									
Probe Calibration (450 MHz)	E.2.1	6.65	Normal	1	1	1	6.65	6.65	∞
Axial Isotropy	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	∞
Boundary Effect	E.2.3	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Linearity	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	Rectangular	1.732050808	1	1	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3	Rectangular	1.732050808	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Extrapolation, interpolation & integration algorithms for max. SAR evaluation	E.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
<b>Test Sample Related</b>									
Test Sample Positioning	E.4.2	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	E.4.1	3.6	Normal	1	1	1	3.6	3.6	8
SAR Drift Measurement	6.6.2	5	Rectangular	1.732050808	1	1	2.9	2.9	∞
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty	E.3.1	4	Rectangular	1.732050808	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5	Rectangular	1.732050808	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measured)	E.3.3	4.3	Normal	1	0.64	0.43	2.8	1.8	∞
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measured)	E.3.3	3.4	Normal	1	0.6	0.49	2.0	1.7	∞
<b>Combined Standard Uncertainty</b>			<b>RSS</b>				<b>11.53</b>	<b>11.15</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>			<b>k=2</b>				<b>23.05</b>	<b>22.31</b>	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 and IEC International Standard 62209-1:2005



Applicant:	Thales Communications Inc.		FCC ID:	OKC-4102023501	IC:	473C-4102023501	THALES
Model:	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver			UHF:	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.					Page 13 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	
Test Lab Certificate No. 2470.01				

## 18.0 REFERENCES



- [1] Federal Communications Commission - "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093.
- [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] IEC International Standard 62209-1:2005 - "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures."
- [7] Federal Communications Commission, Office of Engineering and Technology - "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies"; KDB 447498 D01 v03r03: January 2009.
- [8] Federal Communications Commission, Office of Engineering and Technology - "Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz"; KDB 450824 D01 v01r01: January 2007.

<b>Applicant:</b>	<b>Thales Communications Inc.</b>	<b>FCC ID:</b>	<b>OKC-4102023501</b>	<b>IC:</b>	<b>473C-4102023501</b>	<b>THALES</b>
<b>Model:</b>	<b>Liberty 4102023-501</b>	<b>Portable Multiband Land Mobile Radio Transceiver</b>		<b>UHF:</b>	<b>406.1 - 512.0 MHz</b>	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 14 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## APPENDIX A - SAR MEASUREMENT DATA

<b>Applicant:</b>	<b>Thales Communications Inc.</b>	<b>FCC ID:</b>	<b>OKC-4102023501</b>	<b>IC:</b>	<b>473C-4102023501</b>	<b>THALES</b>
<b>Model:</b>	<b>Liberty 4102023-501</b>	<b>Portable Multiband Land Mobile Radio Transceiver</b>		<b>UHF:</b>	<b>406.1 - 512.0 MHz</b>	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 15 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	
Test Lab Certificate No. 2470.01				

Date Tested: 03/10/2009

## Face-held SAR - UHF Band - Mid Channel - 450.0 MHz

**DUT: Kenwood Liberty 4102023-501; Type: Portable Multiband Land Mobile PTT Radio Transceiver; Serial: 10007**

Ambient Temp: 24.0°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF (CW)

Frequency: 450.0 MHz; Duty Cycle: 1:1

10.8 V Li-ion Battery (P/N: 1600691-2)

Medium: HSL450 Medium parameters used:  $f = 450.0 \text{ MHz}$ ;  $\sigma = 0.85 \text{ mho/m}$ ;  $\epsilon_r = 44.3$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### Face-held SAR - 2.5 cm Spacing from Front Side of DUT to Planar Phantom

**Area Scan (8x27x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 2.37 mW/g

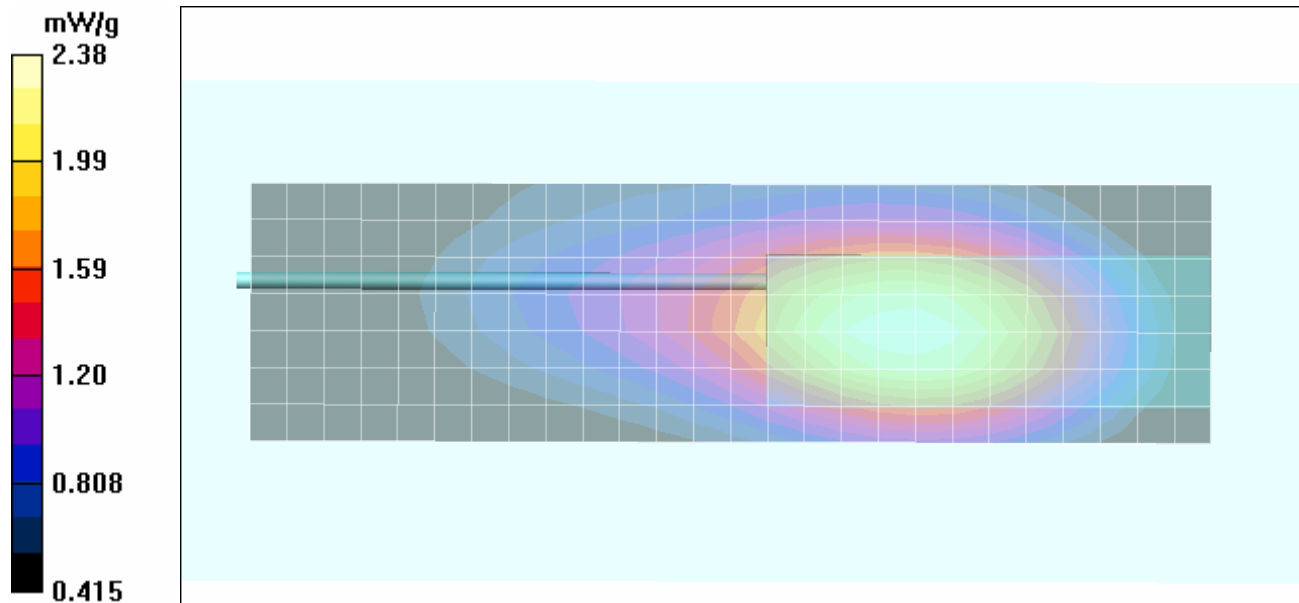
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 47.8 V/m; Power Drift = -0.095 dB

Peak SAR (extrapolated) = 3.08 W/kg



**SAR(1 g) = 2.27 mW/g; SAR(10 g) = 1.71 mW/g**

Maximum value of SAR (measured) = 2.38 mW/g

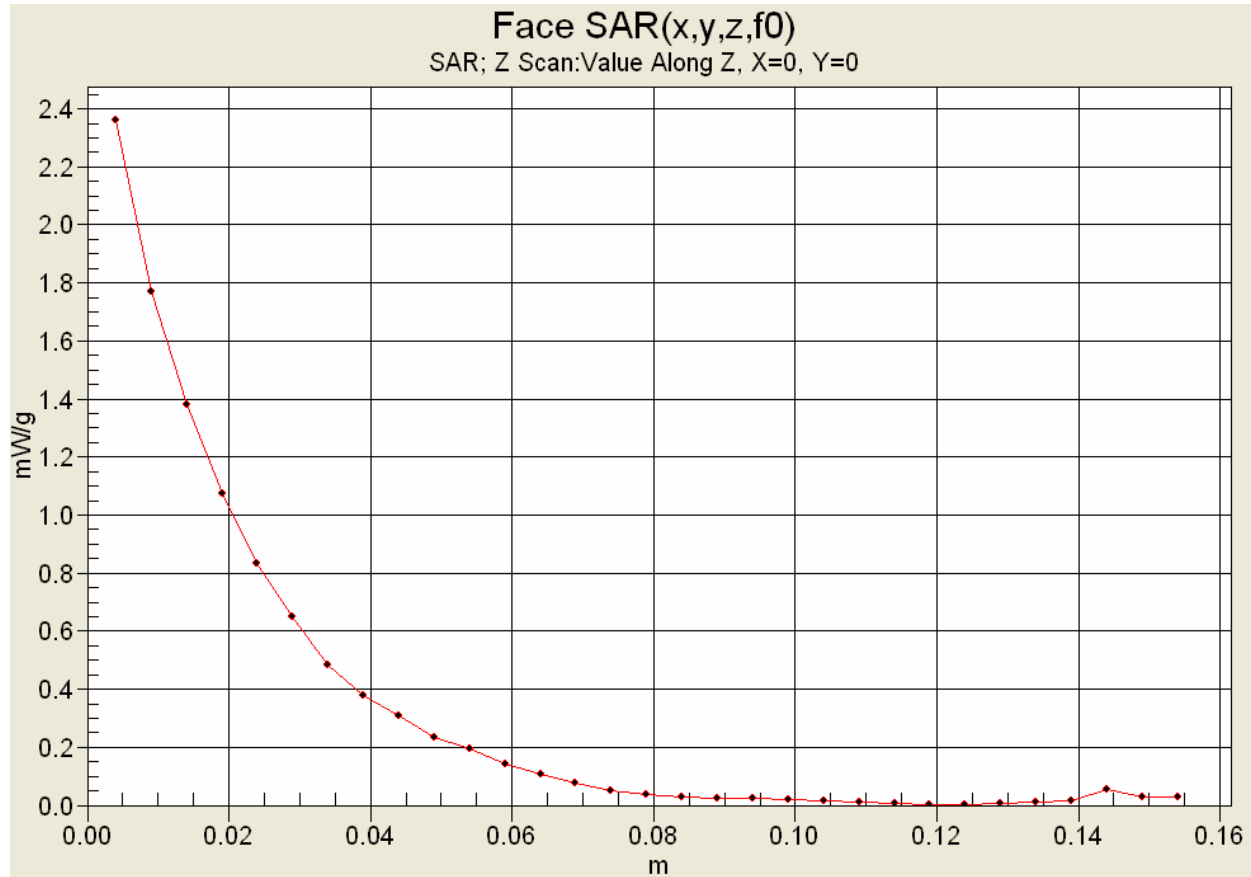


<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 16 of 45





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## Z-Axis Scan



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 17 of 45

	Date(s) of Evaluation March 10 & April 06, 2009	Test Report Serial No. 030409OKC-T954-S90U	Test Report Revision No. Rev. 1.1 (2nd Release)	
	Test Report Issue Date April 09, 2009	Description of Test(s) Specific Absorption Rate	RF Exposure Category Occupational (Controlled)	

Date Tested: 04/06/2009

## Body-worn SAR - DUT with Belt-Clip Accessory - UHF Band - Low Channel - 406.1 MHz

**DUT: Kenwood Liberty 4102023-501; Type: Portable Multiband Land Mobile PTT Radio Transceiver; Serial: 10007**

**Body-worn Accessory: Belt-Clip (P/N: 40508); Audio Accessory: Speaker-Microphone (P/N: 1600696-01)**

Ambient Temp: 22.5°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF (CW)

Frequency: 406.1 MHz; Duty Cycle: 1:1

10.8 V Li-ion Battery (P/N: 1600691-2)

Medium: M450 Medium parameters used:  $f = 406.1$  MHz;  $0.9$  mho/m;  $\epsilon_r = 58.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

- Probe: ET3DV6 – SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### Body-worn SAR - 1.6 cm Belt-Clip Spacing from Back Side of DUT to Planar Phantom

**Area Scan (8x27x1):** Measurement grid:  $dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (measured) = 4.00 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5$ mm,  $dy=7.5$ mm,  $dz=5$ mm

Reference Value = 62.3 V/m; Power Drift = -0.166 dB

Peak SAR (extrapolated) = 4.89 W/kg

**SAR(1 g) = 3.4 mW/g; SAR(10 g) = 2.49 mW/g**

Maximum value of SAR (measured) = 3.55 mW/g

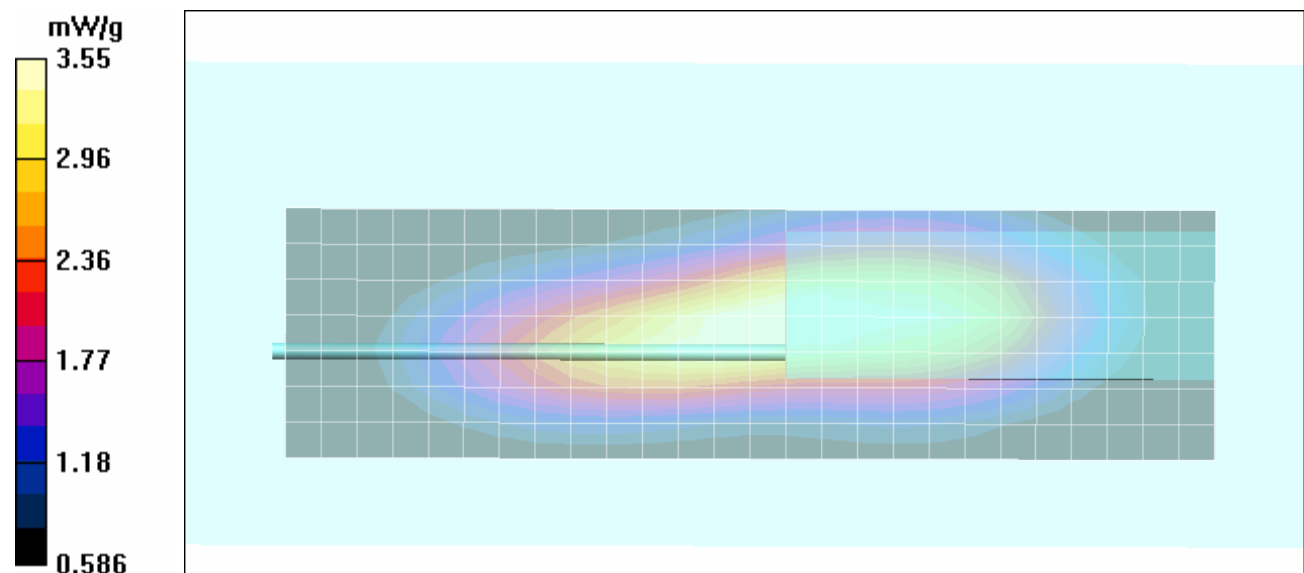
**Zoom Scan (5x5x7)/Cube 1:** Measurement grid:  $dx=7.5$ mm,  $dy=7.5$ mm,  $dz=5$ mm

Reference Value = 62.3 V/m; Power Drift = -0.166 dB



Peak SAR (extrapolated) = 3.76 W/kg

**SAR(1 g) = 2.86 mW/g; SAR(10 g) = 2.19 mW/g**

Maximum value of SAR (measured) = 2.98 mW/g



Applicant:	Thales Communications Inc.	FCC ID:	OKC-4102023501	IC:	473C-4102023501	THALES
Model:	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		UHF:	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 18 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Date Tested: 04/06/2009

## Body-worn SAR - DUT with Belt-Holster Accessory - UHF Band - Low Channel - 406.1 MHz

**DUT: Kenwood Liberty 4102023-501; Type: Portable Multiband Land Mobile PTT Radio Transceiver; Serial: 10007**

**Body-worn Accessory: Belt-Holster (P/N: 40508); Audio Accessory: Speaker-Microphone (P/N: 1600696-01)**

Ambient Temp: 22.5°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF (CW)

Frequency: 406.1 MHz; Duty Cycle: 1:1

10.8 V Li-ion Battery (P/N: 1600691-2)

Medium: M450 Medium parameters used:  $f = 406.1$  MHz;  $0.9$  mho/m;  $\epsilon_r = 58.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

- Probe: ET3DV6 – SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### Body-worn SAR - 2.0 cm Belt-Holster Spacing from Back Side of DUT to Planar Phantom

**Area Scan (8x27x1):** Measurement grid:  $dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (measured) = 2.97 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5$ mm,  $dy=7.5$ mm,  $dz=5$ mm

Reference Value = 62.5 V/m; Power Drift = -0.127 dB

Peak SAR (extrapolated) = 4.68 W/kg

**SAR(1 g) = 3.37 mW/g; SAR(10 g) = 2.53 mW/g**

Maximum value of SAR (measured) = 3.52 mW/g

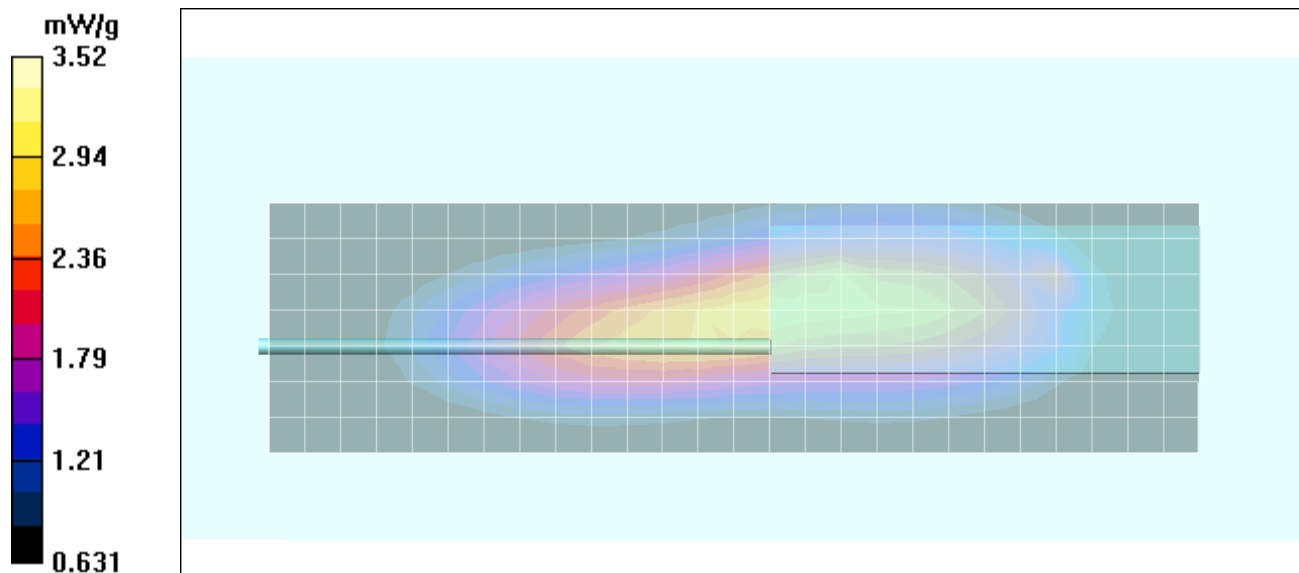
**Zoom Scan (5x5x7)/Cube 1:** Measurement grid:  $dx=7.5$ mm,  $dy=7.5$ mm,  $dz=5$ mm

Reference Value = 62.5 V/m; Power Drift = -0.127 dB



Peak SAR (extrapolated) = 4.42 W/kg

**SAR(1 g) = 3.29 mW/g; SAR(10 g) = 2.52 mW/g**

Maximum value of SAR (measured) = 3.45 mW/g



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 19 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Date Tested: 03/10/2009

## Body-worn SAR - DUT with Belt-Clip Accessory - UHF Band - Mid Channel - 450.0 MHz

**DUT: Kenwood Liberty 4102023-501; Type: Portable Multiband Land Mobile PTT Radio Transceiver; Serial: 10007**

**Body-worn Accessory: Belt-Clip (P/N: 40508); Audio Accessory: Speaker-Microphone (P/N: 1600696-01)**

Ambient Temp: 24.0°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF (CW)

Frequency: 450.0 MHz; Duty Cycle: 1:1

10.8 V Li-ion Battery (P/N: 1600691-2)

Medium: M450 Medium parameters used:  $f = 450.0$  MHz;  $0.92$  mho/m;  $\epsilon_r = 58.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

- Probe: ET3DV6 – SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### Body-worn SAR - 1.6 cm Belt-Clip Spacing from Back Side of DUT to Planar Phantom

**Area Scan (8x27x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 4.42 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 62.0 V/m; Power Drift = -0.016 dB

Peak SAR (extrapolated) = 4.96 W/kg

**SAR(1 g) = 3.74 mW/g; SAR(10 g) = 2.81 mW/g**

Maximum value of SAR (measured) = 3.92 mW/g

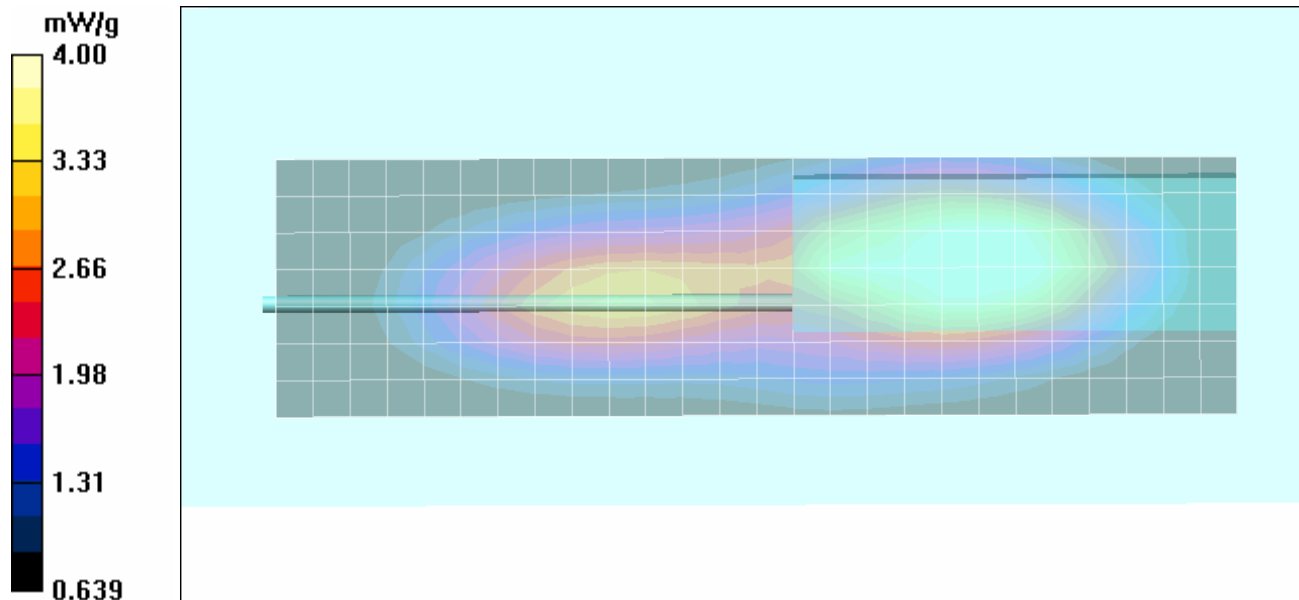
**Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 62.0 V/m; Power Drift = -0.016 dB

Peak SAR (extrapolated) = 5.99 W/kg



**SAR(1 g) = 3.86 mW/g; SAR(10 g) = 2.77 mW/g**

Maximum value of SAR (measured) = 4.00 mW/g

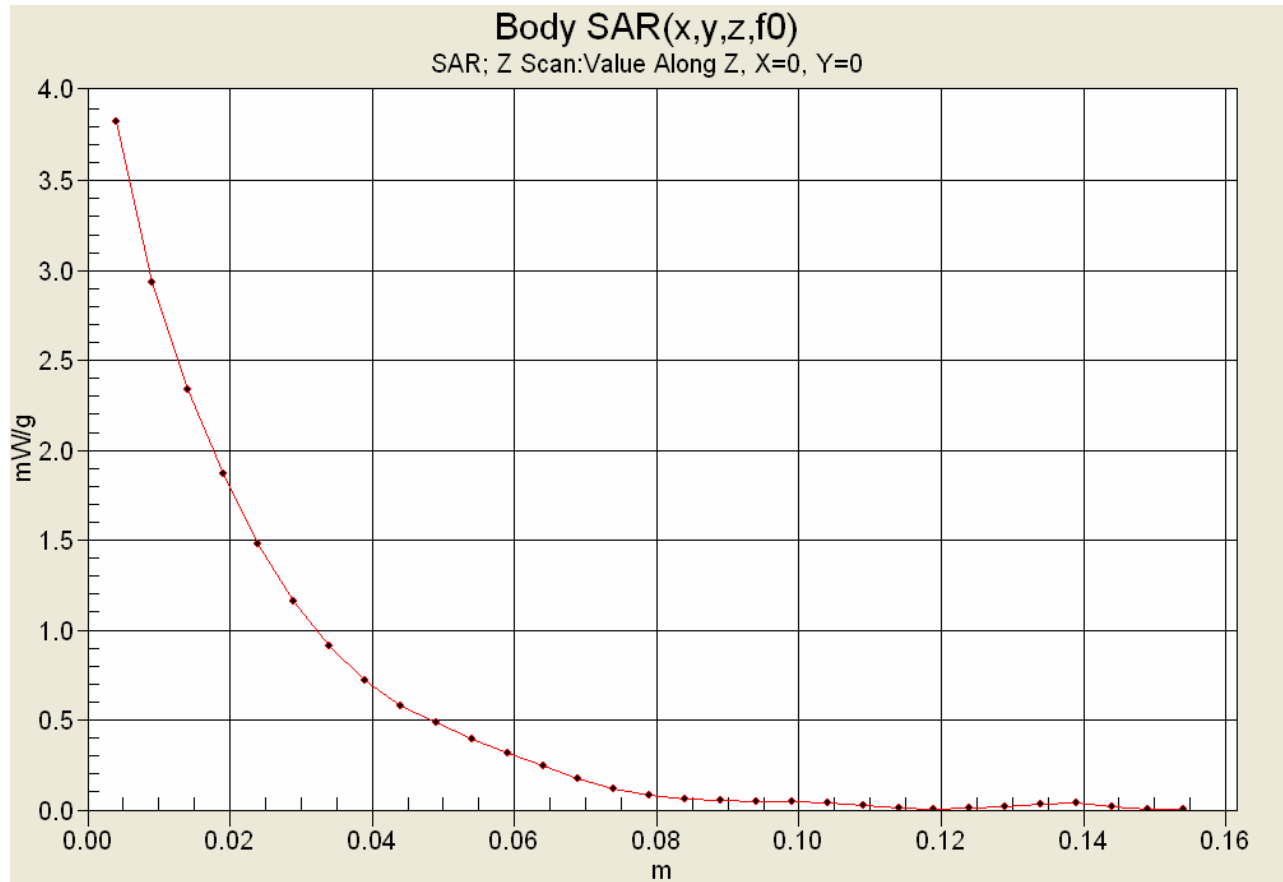


<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 20 of 45





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## Z-Axis Scan



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 21 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Date Tested: 03/10/2009

## Body-worn SAR - DUT with Belt-Holster Accessory - UHF Band - Mid Channel - 450.0 MHz

**DUT: Kenwood Liberty 4102023-501; Type: Portable Multiband Land Mobile PTT Radio Transceiver; Serial: 10007**

**Body-worn Accessory: Belt-Holster (P/N: 1600702-1); Audio Accessory: Speaker-Microphone (P/N: 1600696-01)**

Ambient Temp: 24.0°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF (CW)

Frequency: 450.0 MHz; Duty Cycle: 1:1

10.8 V Li-ion Battery (P/N: 1600691-2)

Medium: M450 Medium parameters used:  $f = 450.0$  MHz;  $0.92$  mho/m;  $\epsilon_r = 58.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

- Probe: ET3DV6 – SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### Body-worn SAR - 2.0 cm Belt-Holster Spacing from Back Side of DUT to Planar Phantom

**Area Scan (8x27x1):** Measurement grid:  $dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (measured) = 3.90 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5$ mm,  $dy=7.5$ mm,  $dz=5$ mm

Reference Value = 53.5 V/m; Power Drift = -0.003 dB

Peak SAR (extrapolated) = 5.38 W/kg

**SAR(1 g) = 3.72 mW/g; SAR(10 g) = 2.61 mW/g**

Maximum value of SAR (measured) = 3.92 mW/g

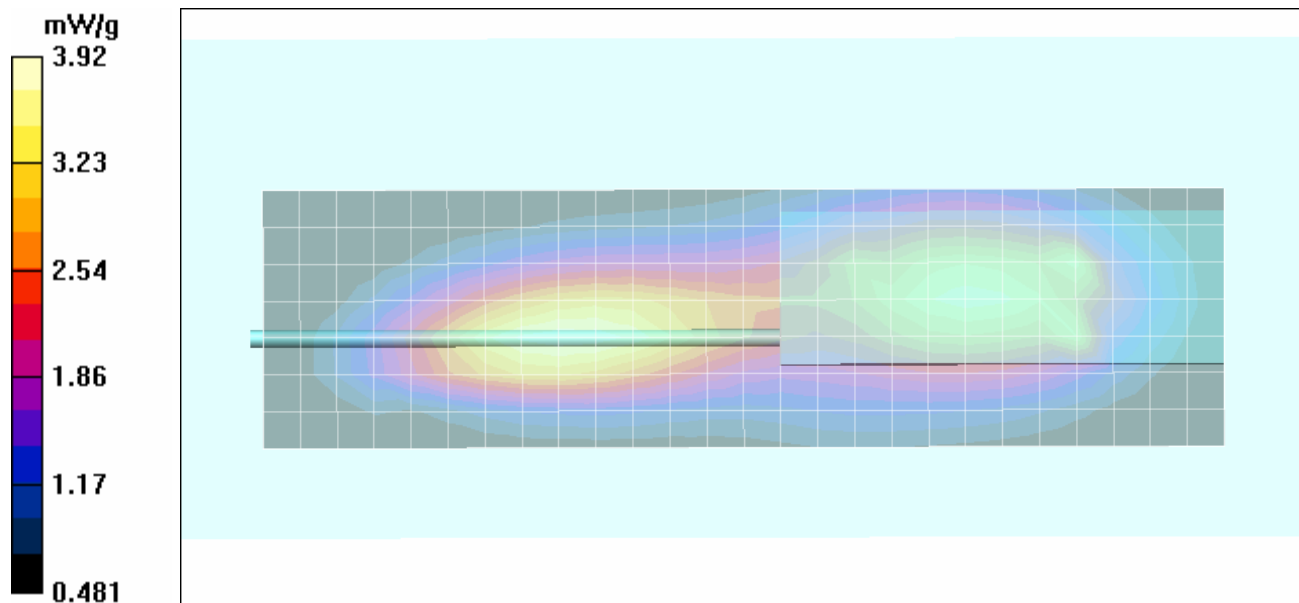
**Zoom Scan (5x5x7)/Cube 1:** Measurement grid:  $dx=7.5$ mm,  $dy=7.5$ mm,  $dz=5$ mm

Reference Value = 53.5 V/m; Power Drift = -0.003 dB



Peak SAR (extrapolated) = 3.68 W/kg

**SAR(1 g) = 2.76 mW/g; SAR(10 g) = 2.11 mW/g**

Maximum value of SAR (measured) = 2.88 mW/g



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 22 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Date Tested: 04/06/2009

## Body-worn SAR - DUT with Belt-Clip Accessory - UHF Band - High Channel - 512.0 MHz

**DUT: Kenwood Liberty 4102023-501; Type: Portable Multiband Land Mobile PTT Radio Transceiver; Serial: 10007**

**Body-worn Accessory: Belt-Clip (P/N: 40508); Audio Accessory: Speaker-Microphone (P/N: 1600696-01)**

Ambient Temp: 22.5°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF (CW)

Frequency: 512.0 MHz; Duty Cycle: 1:1

10.8 V Li-ion Battery (P/N: 1600691-2)

Medium: M450 Medium parameters used:  $f = 512.0$  MHz;  $0.9$  mho/m;  $\epsilon_r = 58.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

- Probe: ET3DV6 – SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### Body-worn SAR - 1.6 cm Belt-Clip Spacing from Back Side of DUT to Planar Phantom

**Area Scan (8x27x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 3.81 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 47.6 V/m; Power Drift = -0.177 dB

Peak SAR (extrapolated) = 4.35 W/kg

**SAR(1 g) = 3.22 mW/g; SAR(10 g) = 2.36 mW/g**

Maximum value of SAR (measured) = 3.36 mW/g

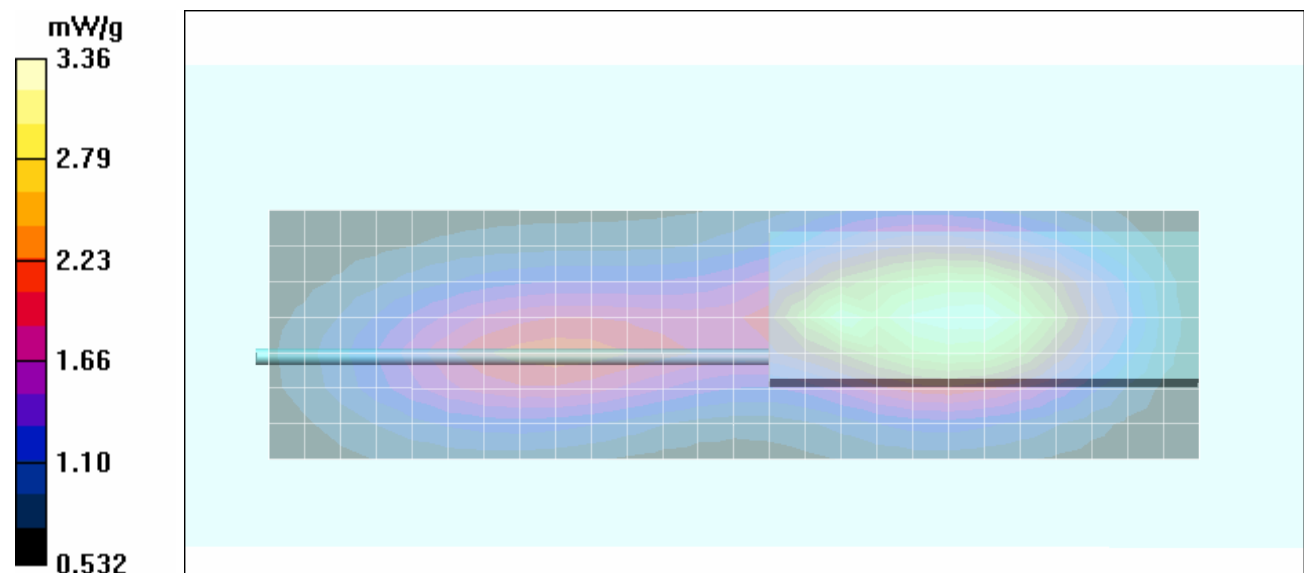
**Zoom Scan (5x5x7)/Cube 1:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 47.6 V/m; Power Drift = -0.177 dB



Peak SAR (extrapolated) = 4.75 W/kg

**SAR(1 g) = 2.85 mW/g; SAR(10 g) = 2.1 mW/g**

Maximum value of SAR (measured) = 3.08 mW/g



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 23 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Date Tested: 04/06/2009

## Body-worn SAR - DUT with Belt-Holster Accessory - UHF Band - High Channel - 512.0 MHz

**DUT: Kenwood Liberty 4102023-501; Type: Portable Multiband Land Mobile PTT Radio Transceiver; Serial: 10007**

**Body-worn Accessory: Belt-Holster (P/N: 40508); Audio Accessory: Speaker-Microphone (P/N: 1600696-01)**

Ambient Temp: 22.5°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF (CW)

Frequency: 512.0 MHz; Duty Cycle: 1:1

10.8 V Li-ion Battery (P/N: 1600691-2)

Medium: M450 Medium parameters used:  $f = 512.0$  MHz;  $0.9$  mho/m;  $\epsilon_r = 58.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

- Probe: ET3DV6 – SN1590; ConvF(8.27, 8.27, 8.27); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### Body-worn SAR - 2.0 cm Belt-Holster Spacing from Back Side of DUT to Planar Phantom

**Area Scan (8x27x1):** Measurement grid:  $dx=15$ mm,  $dy=15$ mm

Maximum value of SAR (measured) = 3.44 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5$ mm,  $dy=7.5$ mm,  $dz=5$ mm

Reference Value = 49.0 V/m; Power Drift = -0.193 dB

Peak SAR (extrapolated) = 4.86 W/kg

**SAR(1 g) = 3.61 mW/g; SAR(10 g) = 2.74 mW/g**

Maximum value of SAR (measured) = 3.76 mW/g

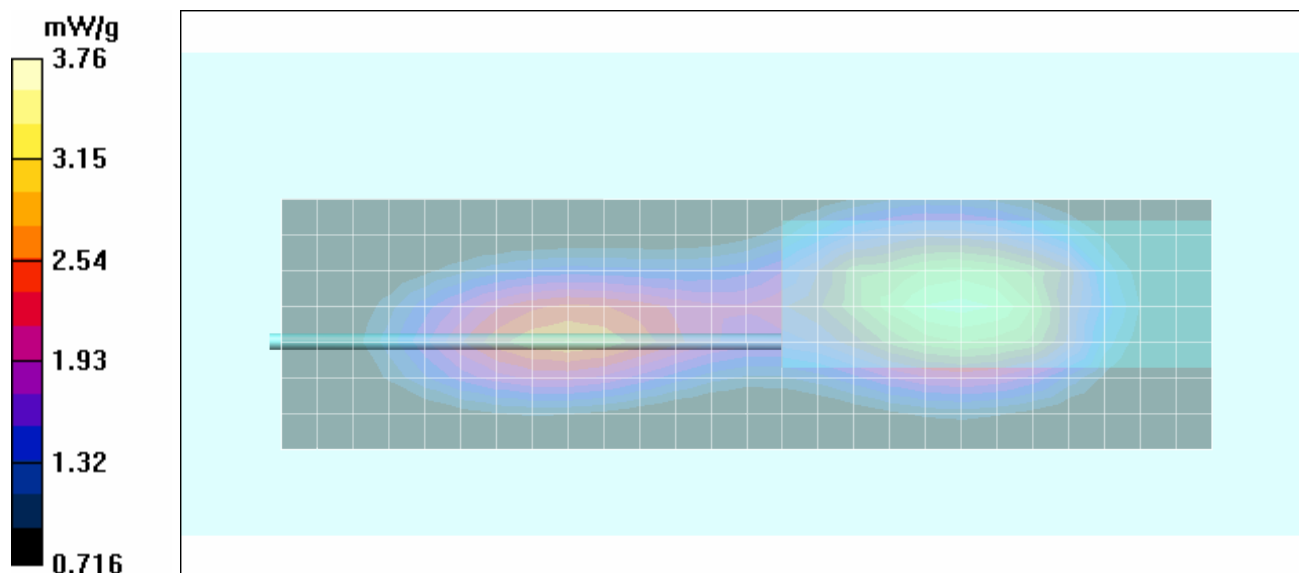
**Zoom Scan (5x5x7)/Cube 1:** Measurement grid:  $dx=7.5$ mm,  $dy=7.5$ mm,  $dz=5$ mm

Reference Value = 49.0 V/m; Power Drift = -0.193 dB

Peak SAR (extrapolated) = 4.14 W/kg



**SAR(1 g) = 2.89 mW/g; SAR(10 g) = 2.08 mW/g**

Maximum value of SAR (measured) = 3.06 mW/g

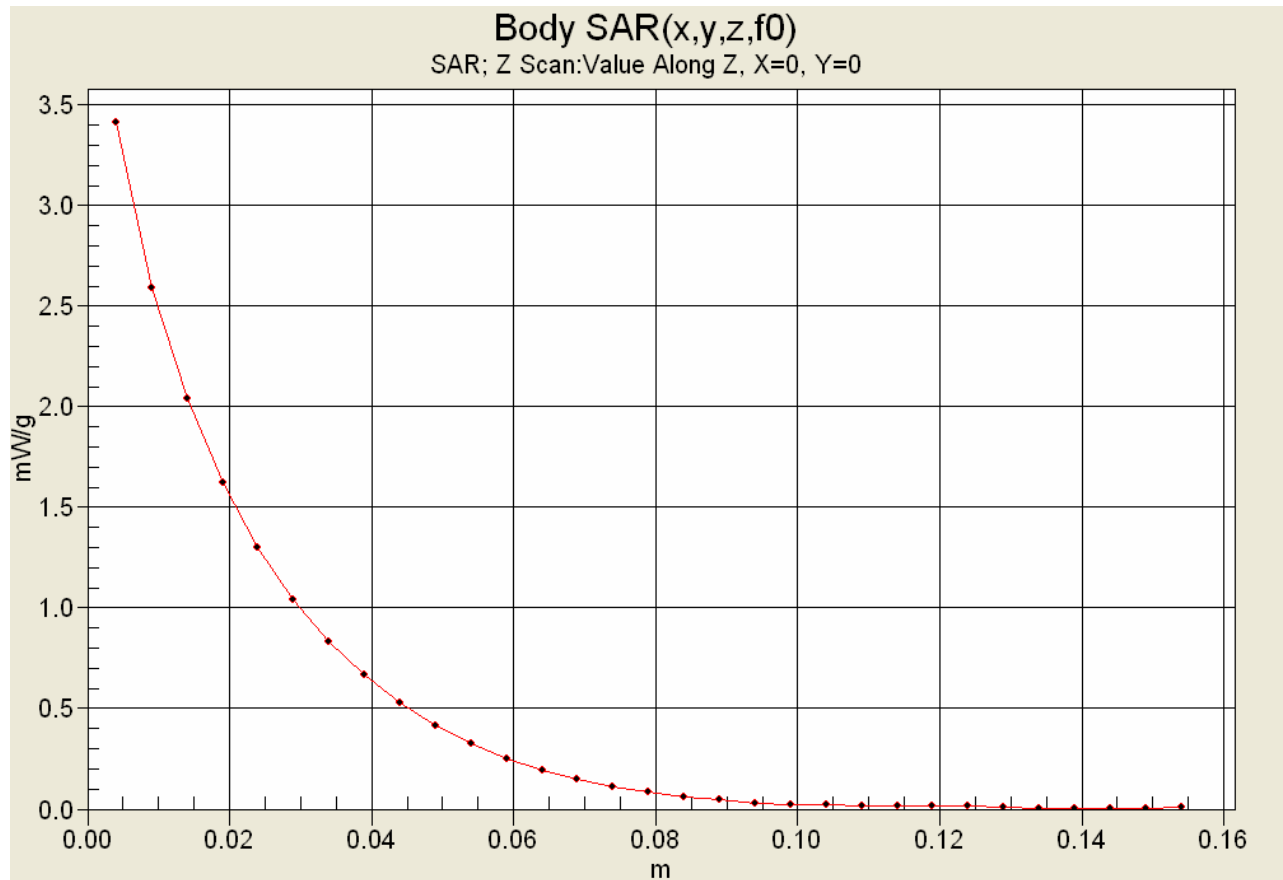


Applicant:	Thales Communications Inc.	FCC ID:	OKC-4102023501	IC:	473C-4102023501	THALES
Model:	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		UHF:	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 24 of 45





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## Z-Axis Scan





<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 25 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

<b>Applicant:</b>	<b>Thales Communications Inc.</b>	<b>FCC ID:</b>	<b>OKC-4102023501</b>	<b>IC:</b>	<b>473C-4102023501</b>	<b>THALES</b>
<b>Model:</b>	<b>Liberty 4102023-501</b>	<b>Portable Multiband Land Mobile Radio Transceiver</b>		<b>UHF:</b>	<b>406.1 - 512.0 MHz</b>	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 26 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	
Test Lab Certificate No. 2470.01				

Date Tested: 03/10/2009

## System Performance Check - 450 MHz Dipole - HSL

**DUT: Dipole 450 MHz; Asset: 00024; Serial: 136; Calibration: 01/19/2009**

Ambient Temp: 24.0°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW

Forward Conducted Power: 250 mW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.85 \text{ mho/m}$ ;  $\epsilon_r = 44.3$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Validation Planar; Type: Plexiglas; Serial: TE#137
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### System Performance Check - 450 MHz Dipole

**Area Scan (6x11x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 1.16 mW/g

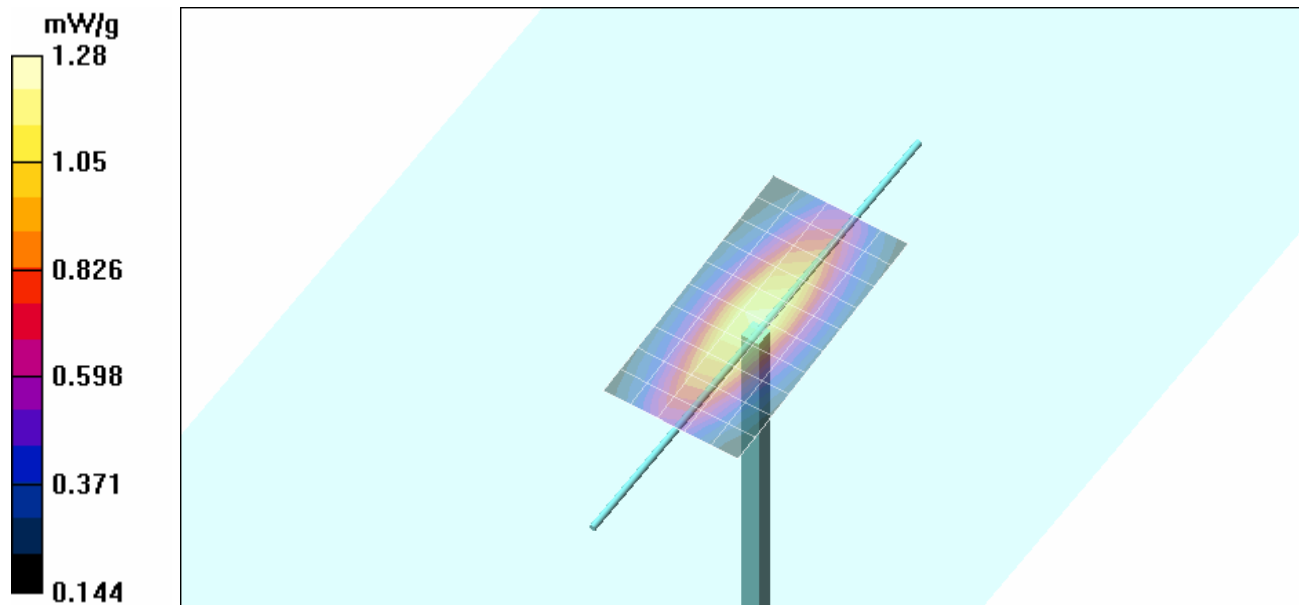
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.1 V/m; Power Drift = -0.004 dB



Peak SAR (extrapolated) = 1.87 W/kg

**SAR(1 g) = 1.19 mW/g; SAR(10 g) = 0.794 mW/g**

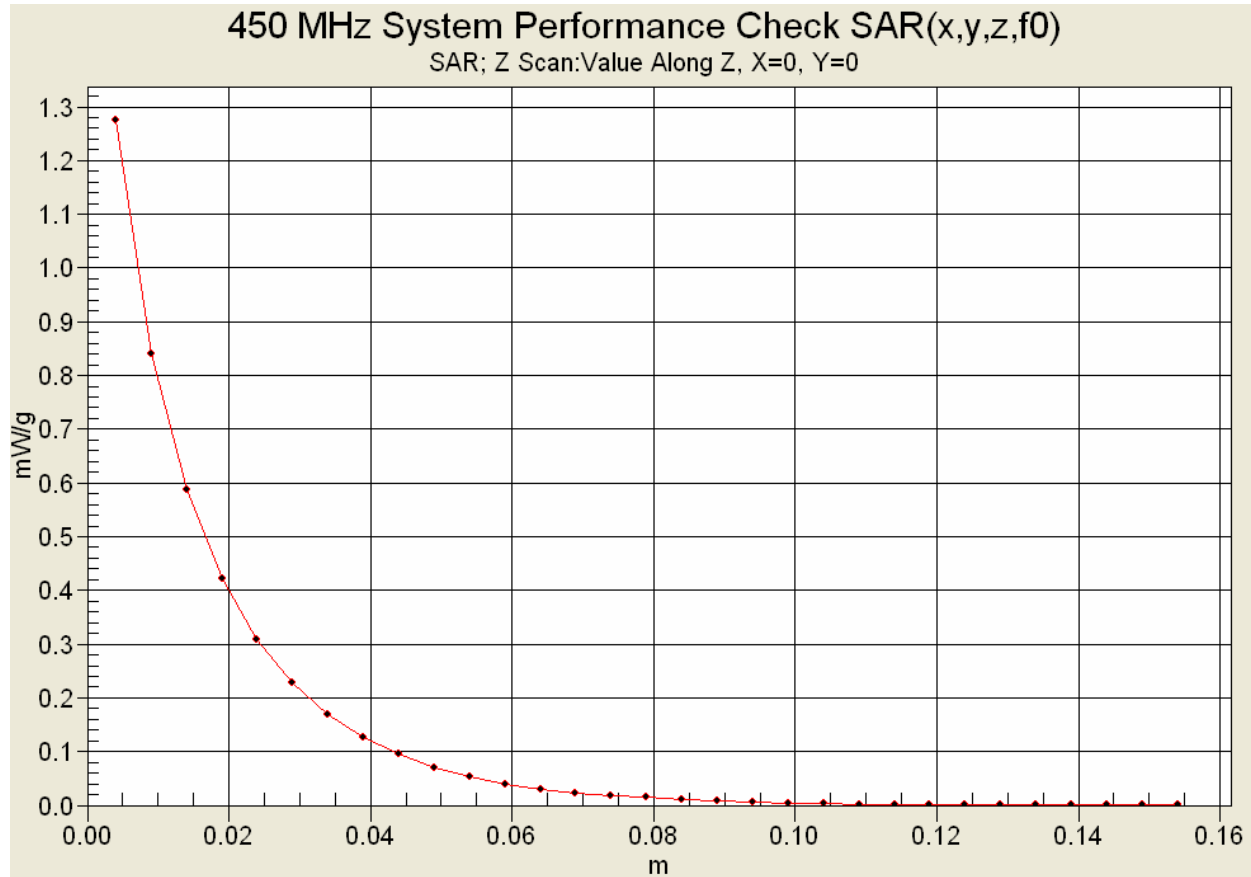
Maximum value of SAR (measured) = 1.28 mW/g





<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	THALES
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 27 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## Z-Axis Scan



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 28 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Date Tested: 04/06/2009

## System Performance Check - 450 MHz Dipole - HSL

**DUT: Dipole 450 MHz; Asset: 00024; Serial: 136; Calibration: 01/19/2009**

Ambient Temp: 22.5°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW

Forward Conducted Power: 250 mW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.87 \text{ mho/m}$ ;  $\epsilon_r = 44.2$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: Validation Planar; Type: Plexiglas; Serial: TE#137
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

### System Performance Check - 450 MHz Dipole

**Area Scan (6x11x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 1.24 mW/g

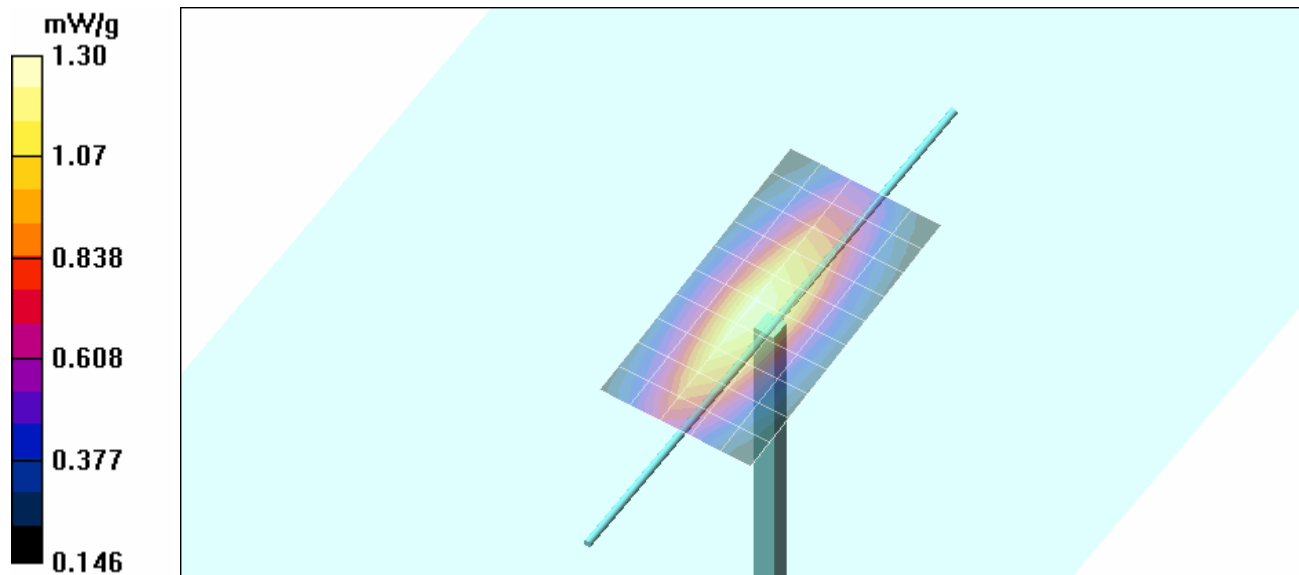
**/Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.2 V/m; Power Drift = -0.051 dB



Peak SAR (extrapolated) = 1.92 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.810 mW/g**

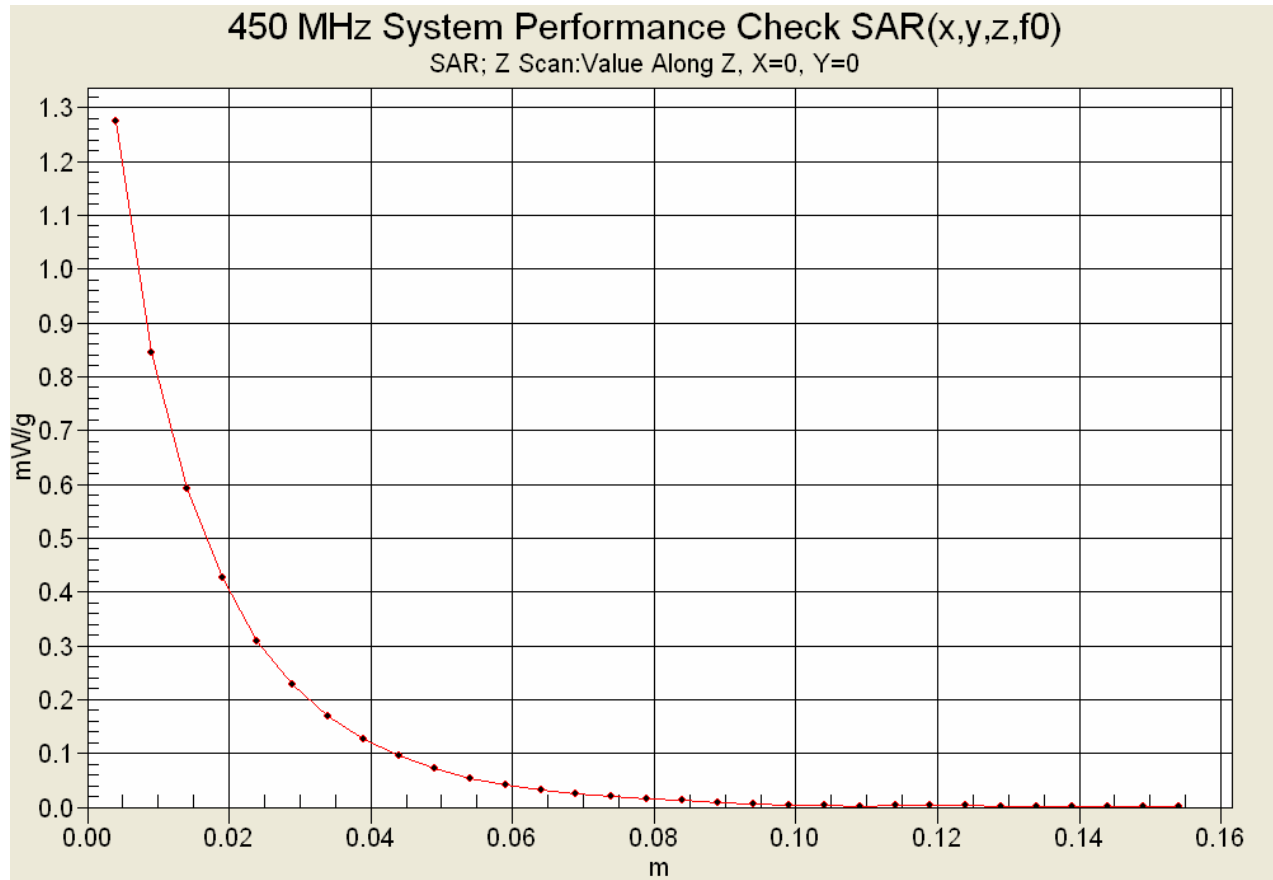
Maximum value of SAR (measured) = 1.30 mW/g



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 29 of 45



	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## Z-Axis Scan





<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 30 of 45



	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 31 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## 450 MHz System Performance Check & DUT Evaluation (Head)



\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
10/Mar/2009  
Frequency (GHz)  
FCC\_eHFCC OET 65 Supplement C (June 2001) Limits for Head Epsilon  
FCC\_sHFCC OET 65 Supplement C (June 2001) Limits for Head Sigma  
Test\_e Epsilon of UIM  
Test\_s Sigma of UIM

\*\*\*\*\*

Freq	FCC_eHF	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	46.73	0.77
0.3600	44.58	0.87	46.81	0.77
0.3700	44.46	0.87	46.12	0.79
0.3800	44.34	0.87	46.55	0.80
0.3900	44.22	0.87	45.47	0.80
0.4000	44.10	0.87	45.73	0.80
0.4100	43.98	0.87	45.11	0.81
0.4200	43.86	0.87	45.09	0.81
0.4300	43.74	0.87	44.75	0.82
0.4400	43.62	0.87	44.87	0.83
0.4500	43.50	0.87	44.34	0.85
0.4600	43.45	0.87	44.15	0.86
0.4700	43.40	0.87	44.44	0.87
0.4800	43.34	0.87	44.38	0.88
0.4900	43.29	0.87	44.14	0.88
0.5000	43.24	0.87	43.25	0.90
0.5100	43.19	0.87	42.97	0.90
0.5200	43.14	0.88	43.04	0.91
0.5300	43.08	0.88	42.69	0.93
0.5400	43.03	0.88	42.45	0.92
0.5500	42.98	0.88	42.65	0.93

<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver			UHF: 406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 32 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Test Lab Certificate No. 2470.01

### 450 MHz DUT Evaluation (Body)



\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
10/Mar/2009  
Frequency (GHz)  
FCC\_eHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon  
FCC\_sHFCC 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
0.3500	57.70	0.93	59.69	0.84
0.3600	57.60	0.93	59.80	0.84
0.3700	57.50	0.93	59.64	0.85
0.3800	57.40	0.93	59.31	0.85
0.3900	57.30	0.93	59.32	0.86
0.4000	57.20	0.93	58.67	0.86
0.4100	57.10	0.93	58.33	0.88
0.4200	57.00	0.94	58.25	0.87
0.4300	56.90	0.94	58.82	0.88
0.4400	56.80	0.94	59.02	0.90
0.4500	56.70	0.94	58.56	0.92
0.4600	56.66	0.94	58.00	0.92
0.4700	56.62	0.94	58.40	0.93
0.4800	56.58	0.94	57.84	0.92
0.4900	56.54	0.94	57.43	0.92
0.5000	56.51	0.94	57.67	0.96
0.5100	56.47	0.94	57.47	0.96
0.5200	56.43	0.95	57.61	0.96
0.5300	56.39	0.95	57.11	0.98
0.5400	56.35	0.95	57.34	0.98
0.5500	56.31	0.95	57.29	0.99

<b>Applicant:</b>	Thales Communications Inc.		<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	THALES
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver			<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.					Page 33 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Test Lab Certificate No. 2470.01

### 450 MHz System Performance Check (Head)

\*\*\*\*\*

Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

6/Apr/2009

Frequency (GHz)

FCC\_eHFCC OET 65 Supplement C (June 2001) Limits for Head Epsilon

FCC\_sHFCC OET 65 Supplement C (June 2001) Limits for Head Sigma



Test\_e Epsilon of UIM

Test\_s Sigma of UIM

\*\*\*\*\*

Freq	FCC_eHF	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	46.93	0.77
0.3600	44.58	0.87	46.16	0.79
0.3700	44.46	0.87	46.05	0.80
0.3800	44.34	0.87	46.28	0.81
0.3900	44.22	0.87	46.19	0.82
0.4000	44.10	0.87	45.92	0.82
0.4100	43.98	0.87	45.63	0.83
0.4200	43.86	0.87	44.76	0.84
0.4300	43.74	0.87	45.20	0.87
0.4400	43.62	0.87	44.97	0.85
0.4500	43.50	0.87	44.21	0.87
0.4600	43.45	0.87	44.20	0.88
0.4700	43.40	0.87	44.30	0.88
0.4800	43.34	0.87	43.83	0.89
0.4900	43.29	0.87	43.89	0.90
0.5000	43.24	0.87	43.24	0.91
0.5100	43.19	0.87	43.24	0.92
0.5200	43.14	0.88	43.21	0.94
0.5300	43.08	0.88	43.20	0.94
0.5400	43.03	0.88	42.99	0.95
0.5500	42.98	0.88	42.65	0.95

<b>Applicant:</b>	Thales Communications Inc.		<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	THALES
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver			<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.					Page 34 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

### 410 MHz & 510 MHz DUT Evaluation (Body)



\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
6/Apr/2009  
Frequency (GHz)  
FCC\_eHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon  
FCC\_sHFCC 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
0.3500	57.70	0.93	60.12	0.84
0.3600	57.60	0.93	58.85	0.86
0.3700	57.50	0.93	59.02	0.86
0.3800	57.40	0.93	59.14	0.87
0.3900	57.30	0.93	59.35	0.89
0.4000	57.20	0.93	58.89	0.87
0.4100	57.10	0.93	58.56	0.90
0.4200	57.00	0.94	58.45	0.90
0.4300	56.90	0.94	58.39	0.92
0.4400	56.80	0.94	59.01	0.92
0.4500	56.70	0.94	57.64	0.92
0.4600	56.66	0.94	58.31	0.94
0.4700	56.62	0.94	58.36	0.94
0.4800	56.58	0.94	57.73	0.95
0.4900	56.54	0.94	58.38	0.97
0.5000	56.51	0.94	57.26	0.96
0.5100	56.47	0.94	57.79	0.96
0.5200	56.43	0.95	57.57	0.98
0.5300	56.39	0.95	57.46	0.99
0.5400	56.35	0.95	57.27	0.99
0.5500	56.31	0.95	57.38	0.99



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 35 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

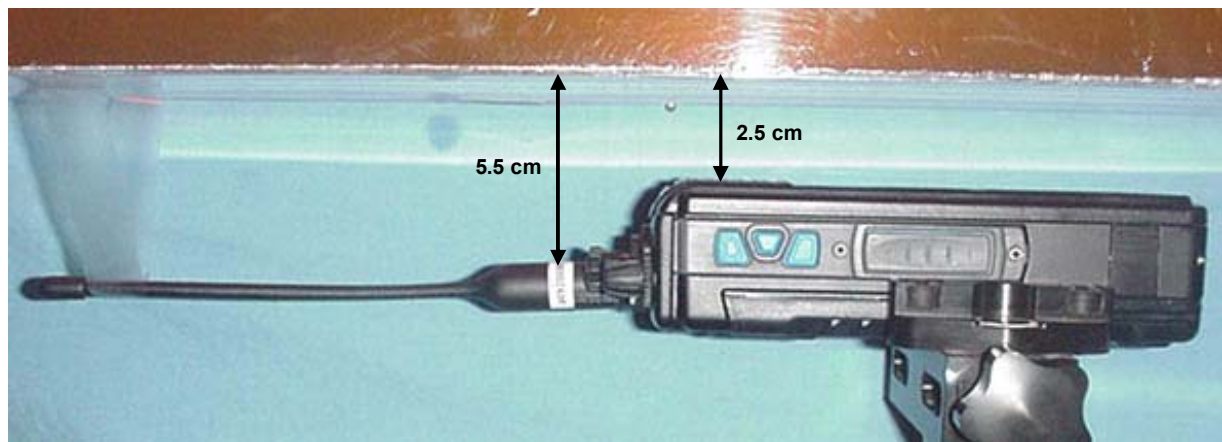
<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 36 of 45





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## FACE-HELD SAR TEST SETUP PHOTOGRAPHS

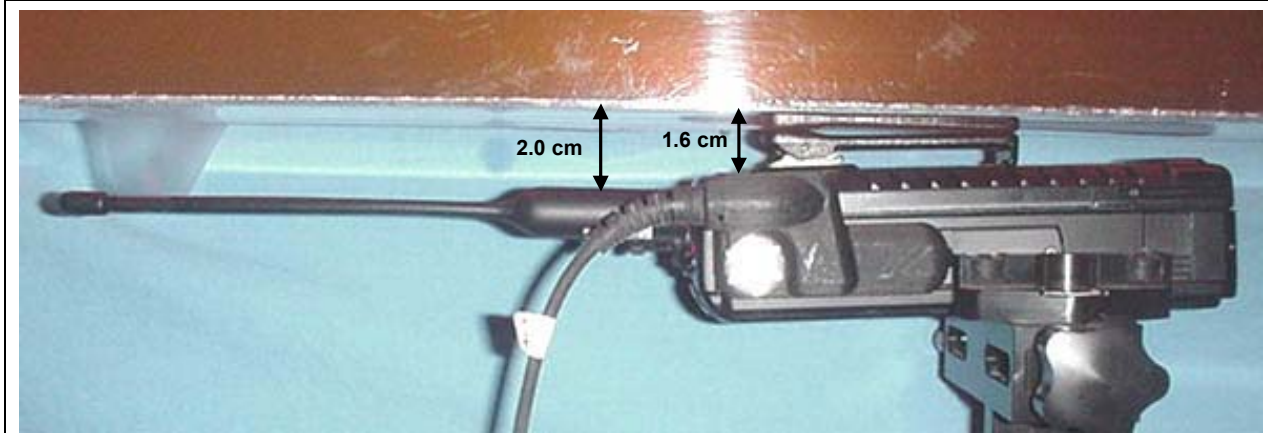
### 2.5 cm Spacing from Front of DUT to Planar Phantom



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 37 of 45



	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

**BODY-WORN SAR TEST SETUP PHOTOGRAPHS**  
**1.6 cm Belt-Clip Spacing from Back of DUT to Planar Phantom**  
**DUT with Belt-Clip and Speaker-Microphone Audio Accessory**

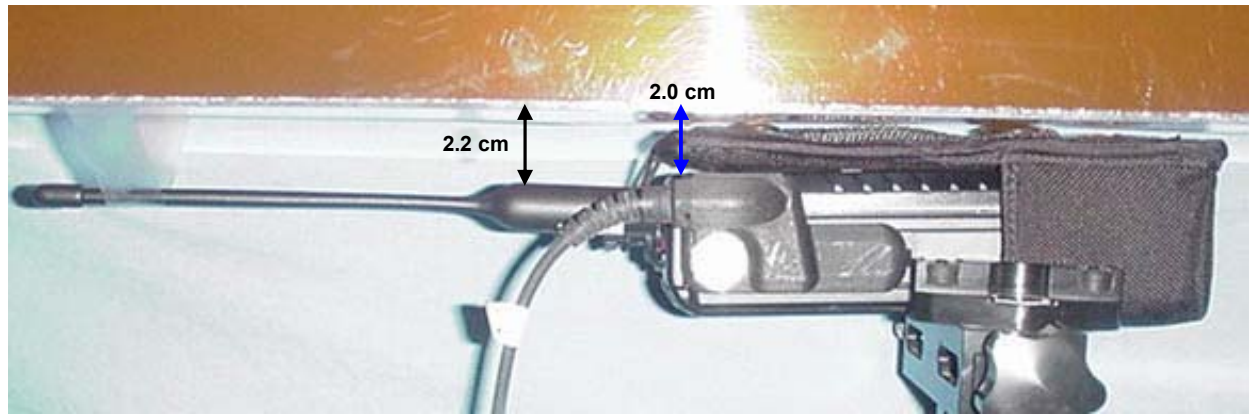


<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 38 of 45





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

**BODY-WORN SAR TEST SETUP PHOTOGRAPHS**  
2.0 cm Belt-Holster Spacing from Back of DUT to Planar Phantom  
DUT with Belt-Holster and Speaker-Microphone Audio Accessory



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 39 of 45



	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## DUT PHOTOGRAPHS



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 40 of 45





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## DUT PHOTOGRAPHS

					
					
Left & Right Sides of DUT with Belt-Clip accessory (P/N: 40508)		Belt-Clip accessory (P/N: 40508)			
					
Bottom end of DUT with Belt-Clip		Top end of DUT with Belt-Clip		Belt-Clip accessory (P/N: 40508)	





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## DUT PHOTOGRAPHS

		
		
Left & Right Sides of DUT with <b>Belt-Holster</b> accessory (P/N: 1600702-1)		Back of <b>Belt-Holster</b> accessory
		
Bottom end of DUT with <b>Belt-Holster</b>	Top end of DUT with <b>Belt-Holster</b>	Front of <b>Belt-Holster</b> accessory

<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	THALES
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 42 of 45





	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

Test Lab Certificate No. 2470.01

## DUT PHOTOGRAPHS

		
DUT Battery Housing	10.8 V 4.8 Ah Lithium-ion Battery (P/N: 1600691-2)	



<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 43 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## DUT PHOTOGRAPHS

	
DUT with Belt-Clip & Speaker-Microphone (P/N: 1600696-01)	DUT with Belt-Holster & Speaker-Microphone (P/N: 1600696-01)

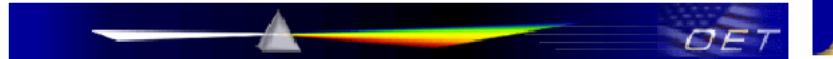
<b>Applicant:</b>	Thales Communications Inc.	<b>FCC ID:</b>	OKC-4102023501	<b>IC:</b>	473C-4102023501	<b>THALES</b>
<b>Model:</b>	Liberty 4102023-501	Portable Multiband Land Mobile Radio Transceiver		<b>UHF:</b>	406.1 - 512.0 MHz	
2009 Celltech Labs Inc.		This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.				Page 44 of 45

	<u>Date(s) of Evaluation</u> March 10 & April 06, 2009	<u>Test Report Serial No.</u> 030409OKC-T954-S90U	<u>Test Report Revision No.</u> Rev. 1.1 (2nd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> April 09, 2009	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Occupational (Controlled)	

## APPENDIX E - DIPOLE CALIBRATION (FCC KDB 250418) & PROBE CALIBRATION



FCC Home | Search | Updates | E-Filing | Initiatives | For Consumers | Find People



### Office of Engineering and Technology

#### Inquiry:

Uploading 300 MHz and 450 MHz Dipole Calibration Reports

#### Response:

FCC confirmation attached for Celltech Labs Dipoles with following identifications:

Serial #: 136 / 450 MHz / Head Tissue-Equivalent Medium / Expires 02/28/2010

Serial #: 135 / 300 MHz / Head Tissue-Equivalent Medium / Expires 02/28/2010

A copy of the confirmation and corresponding Dipole Report(s) are required to be included in SAR reports of applicable equipment certification filings. Each filing must have KDB tracking number 250418 included on 731 Form.



The dipoles listed below have prior coordination with the FCC Lab for use in SAR system validation and verification by Celltech Labs through February 2010. The SAR target values, specific operating parameters and identifications are indicated below. SAR measurements using these dipoles must be in accordance with the parameters specified below; for example, phantom shell and tissue dielectric requirements etc. These will be verified during each equipment certification by the FCC or TCB, according to measurement protocols required for testing the specific device and wireless technology, to support the test methodologies and measurement results.

This confirmation and copies of the dipole calibration reports are required to be included in SAR reports for equipment certification containing SAR system verification results involving these dipoles. The information is available and can be verified through the KDB inquiry tracking number provided to Celltech Labs. The same tracking number must also be included on the 731 Form of the corresponding equipment certifications.

Dipole Serial Number	136	135
Calibration Document No.	DC450H-021209-R1.2	DC300H-021209-R1.2
Frequency	450 MHz	300 MHz
Dipole Impedance	58.21 + j 5.69 Ohms	46.39 + j 6.25 Ohms
Dipole Return Loss	-20.7 dB	-22.6 dB
Tissue-Equivalent Dielectric Type	Head	
Tissue Dielectric Constant	43.5	45.3
Tissue Conductivity	0.87 S/m	0.87 S/m
Phantom Shell Thickness	6.0 mm Plexiglas	
Phantom Shell Dielectric Constant	2.7	
Dipole Axis to Tissue Medium Separation Distance	15.175 mm	
Numerical Simulation:	FDTD	
1-g SAR Target Value	4.893 W/kg @ 1.0 W	3.019 W/kg @ 1.0 W
10-g SAR Target Value	3.263 W/kg @ 1.0 W	2.051 W/kg @ 1.0 W
SAR at Phantom Surface above Dipole Feed-Point	6.845 W/kg @ 1.0 W	4.046 W/kg @ 1.0 W
SAR at Phantom Surface at 2.0 cm offset from Dipole Feed-Point	3.101 W/kg @ 1.0 W	2.049 W/kg @ 1.0 W
Experimental Verification:	SAR Measurements	
1-g SAR Target Value	1.21 ~ 1.23 W/kg @ 0.25 W	0.753 ~ 0.765 W/kg @ 0.25 W
10-g SAR Target Value	0.787 ~ 0.803 W/kg @ 0.25 W	0.503 ~ 0.509 W/kg @ 0.25 W
SAR at Phantom Surface above Dipole Feed-Point	1.93 W/kg (average) @ 0.25 W	1.20 W/kg (average) @ 0.25 W
SAR at Phantom Surface at 2.0 cm offset from Dipole Feed-Point	0.79 W/kg @ 0.25 W	0.56 W/kg @ 0.25 W

Expires February 2010

Celltech Labs Inc.

February 13, 2009

Applicant:		Thales Communications Inc.		FCC ID:		OKC-4102023501		IC:		473C-4102023501		THALES
Model:		Liberty 4102023-501		Portable Multiband Land Mobile Radio Transceiver				UHF:		406.1 - 512.0 MHz		
2009 Celltech Labs Inc.			This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.									Page 45 of 45

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 450 MHz Dipole Calibration

Type:

**450 MHz Validation Dipole**

Asset Number:

**00024**

Serial Number:

**136**

Place of Calibration:

**Celltech Labs Inc.**

Date(s) of Calibration:

**Jan. 19 & Feb. 09, 2009**

Celltech Labs Inc. certifies that the 450 MHz Dipole Calibration was performed on the date(s) indicated above.

Calibrated by:

**Sean Johnston**

Signature:



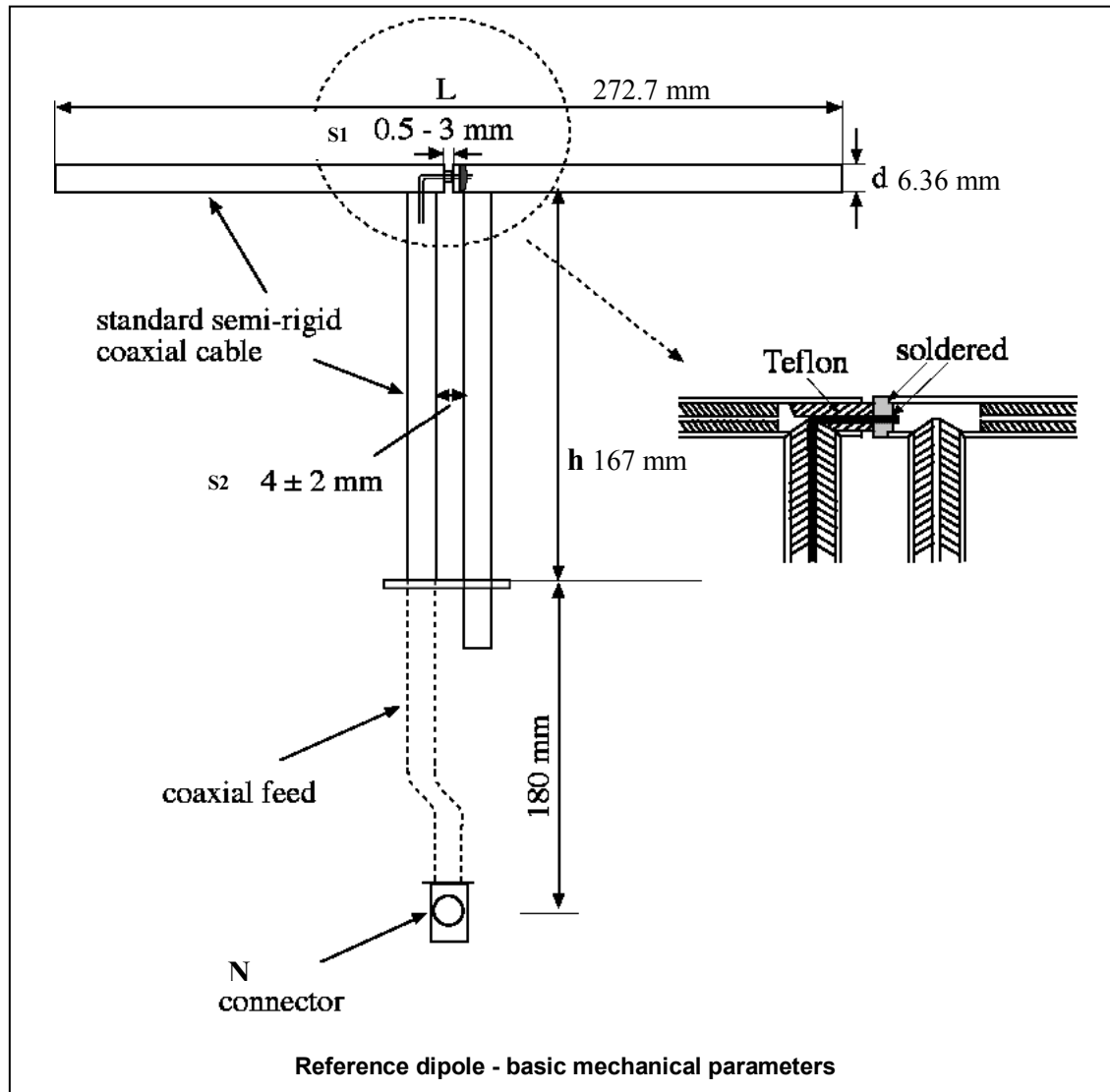
	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 1. Dipole Construction & Electrical Characteristics

The validation dipole was constructed with RG401/U semi-rigid coax in accordance with the requirements specified in IEEE Standard 1528-2003 and International Standard IEC 62209-1:2005. The electrical properties were measured using an HP 8753ET 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 15.1 mm from the simulating fluid using a loss-less dielectric spacer. The measured input impedance is:

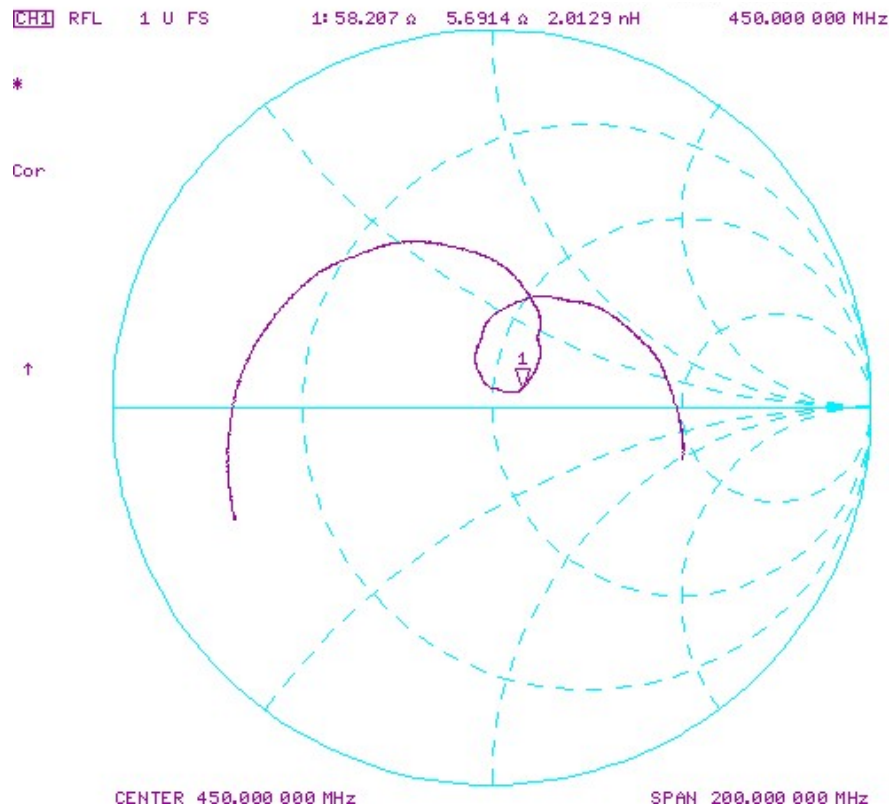
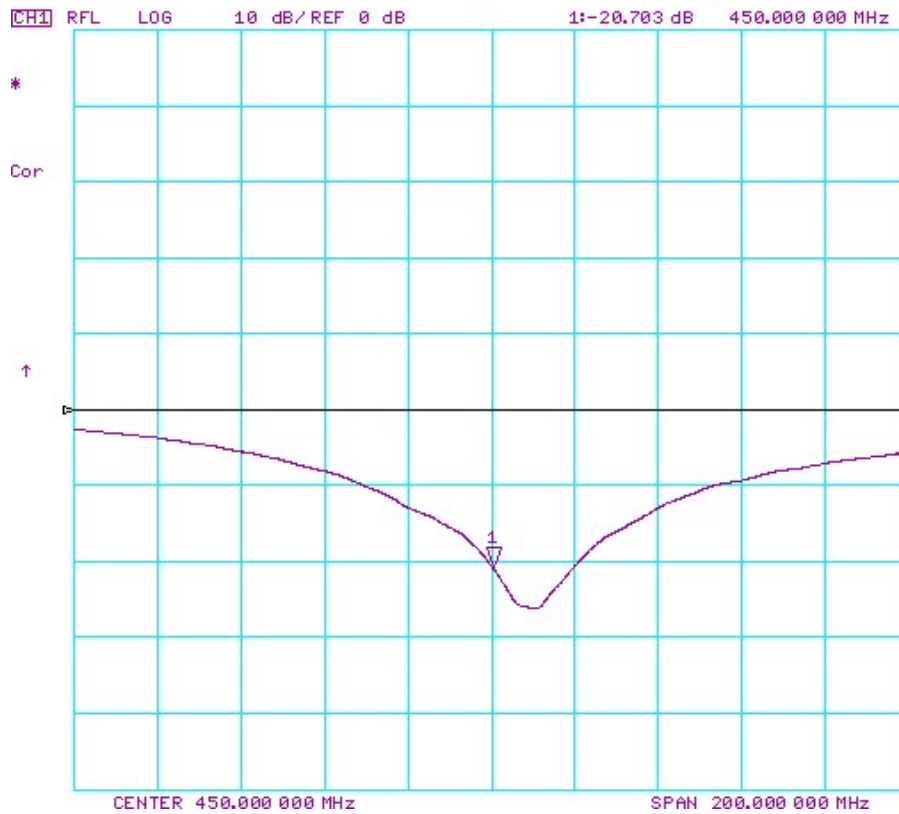
Feed point impedance at 450 MHz       $\text{Re}\{Z\} = 58.207 \, \Omega$   
 $\text{Im}\{Z\} = 5.6914 \, \Omega$

Return Loss at 450 MHz                      -20.703 dB





## 2. Validation Dipole VSWR Data





	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

### 3. Validation Dipole Dimensions

Dimension	IEEE 1528 (mm)	Measured (mm)	Difference (mm)	Tolerance (1528 1%)
L (mm)	270.0	272.7	+2.7	+1%
h (mm)	166.7	167.0	+0.3	+0.2%
d (mm)	6.35	6.36	+0.01	+0.2%

The L, h and d dimensions should be within  $\pm 1\%$  tolerance per 1528-2003.

### 4. Validation Phantom

The validation phantom (planar) was constructed using relatively low-loss tangent Plexiglas material. The dielectric constant used for the numerical analysis was 2.7. The typical range of 2.5 - 3 was selected and the mean of this value was used for the simulation.

The inner dimensions of the validation phantom are as follows:

Length: 83.5 cm  
Width: 36.9 cm  
Height: 21.8 cm

The bottom section of the validation phantom is constructed of  $6.0 \pm 0.1\text{mm}$  Plexiglas.

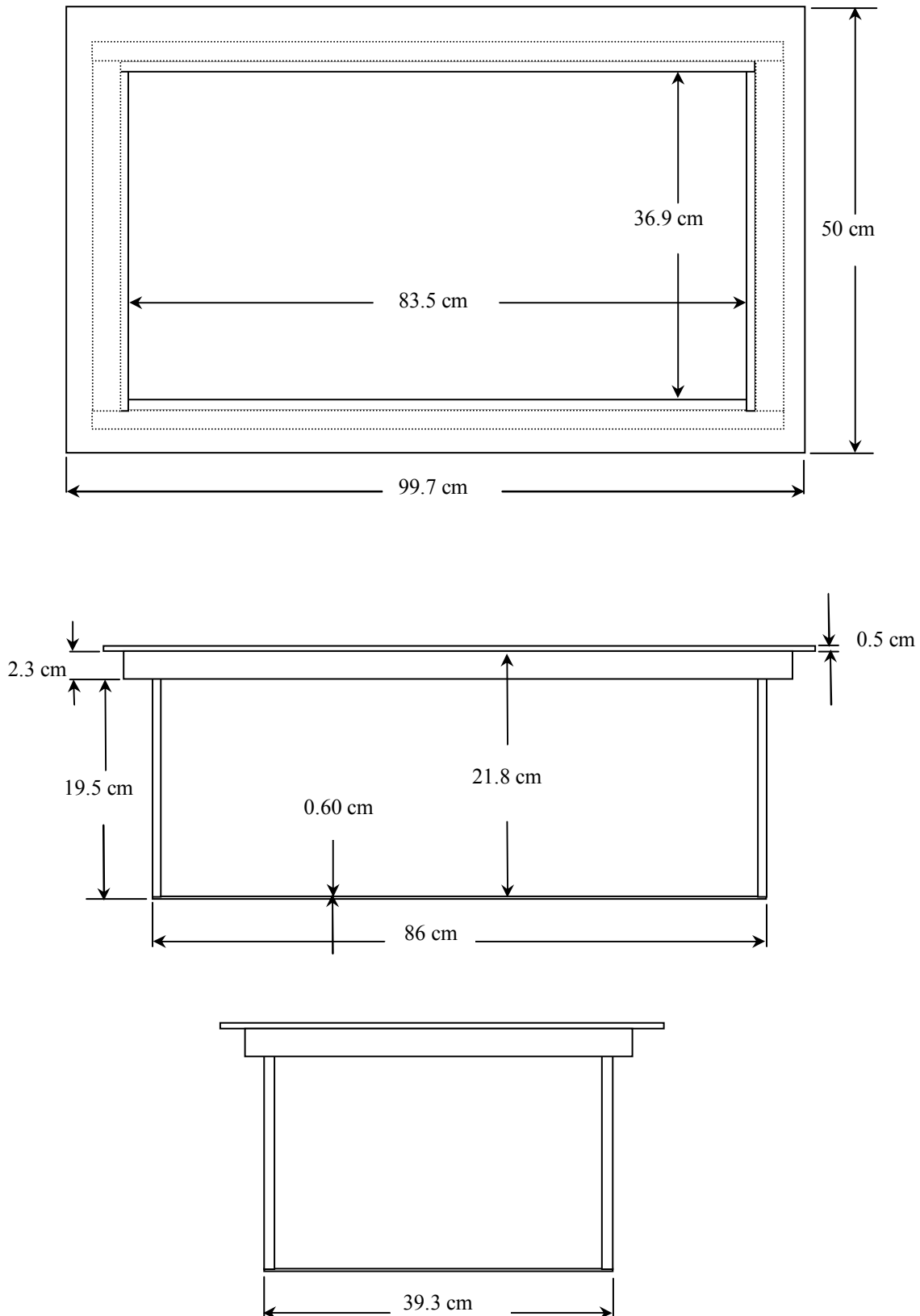
$$s = 3.175\text{mm}(d/2) + 6.0\text{mm}(\text{phantom}) + 6.0\text{mm}(\text{spacer}) = 15.175\text{mm}$$

### 5. Test Equipment List

TEST EQUIPMENT	ASSET NO.	SERIAL NO.	DATE OF CAL.	CAL. DUE DATE
SPEAG DASY4 Measurement Server	00158	1078	CNR	CNR
SPEAG Robot	00046	599396-01	CNR	CNR
SPEAG DAE4	00019	353	22Apr08	22Apr09
SPEAG ET3DV6 E-Field Probe	00017	1590	21Jul08	21Jul09
Plexiglas Validation Planar Phantom	00157	137	CNR	CNR
HP 85070C Dielectric Probe Kit	00033	US39240170	CNR	CNR
Gigatronics 8652A Power Meter	00007	1835272	23Apr08	23Apr09
Gigatronics 80701A Power Sensor	00014	1833699	23Apr08	23Apr09
HP 8753ET Network Analyzer	00134	US39170292	28Apr08	28Apr09
HP 8648D Signal Generator	00005	3847A00611	CNR	CNR
Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
CNR = Calibration Not Required				

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 6. Dimensions of Plexiglas Planar Validation Phantom



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 7. Plexiglas Planar Validation Phantom



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 8. 450 MHz Validation Dipole



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 9. SAR Target Validation

Parameter																	Result				
SEMCAD Simulation	Frequency (MHz)	Shell thickness (mm)	Shell permittivity	Shell permeability	Shell Conductivity (σ) (S/m)	Phantom dimensions (mm) [x, y, z]	Liquid Relative permittivity	Liquid Conductivity (σ) (S/m)	Liquid permeability	Reference dipole distances from the liquid (mm)	Spacer (mm)	Dipole L (mm)	Dipole h (mm)	Dipole d (mm)	Distance between dipole feedpoint gap S1 (mm)	Distance between dipole balun elements S2 (mm)	1 g SAR (1 Watt)	10 g SAR (1 Watt)	Local SAR at surface (above feed-point)	Local SAR at surface (y = 2 cm offset from feed-point)	
	450	6	2.7	1	0	700, 600, 170	43.5	0.87	1	15.175	6	270	166.7	6.35	1	4	4.893	3.263	6.845	3.101	
																	CELLTECH TARGET				
																	1.223 W/kg		1g	0.25 W	
																	0.816 W/kg		10g	0.25 W	

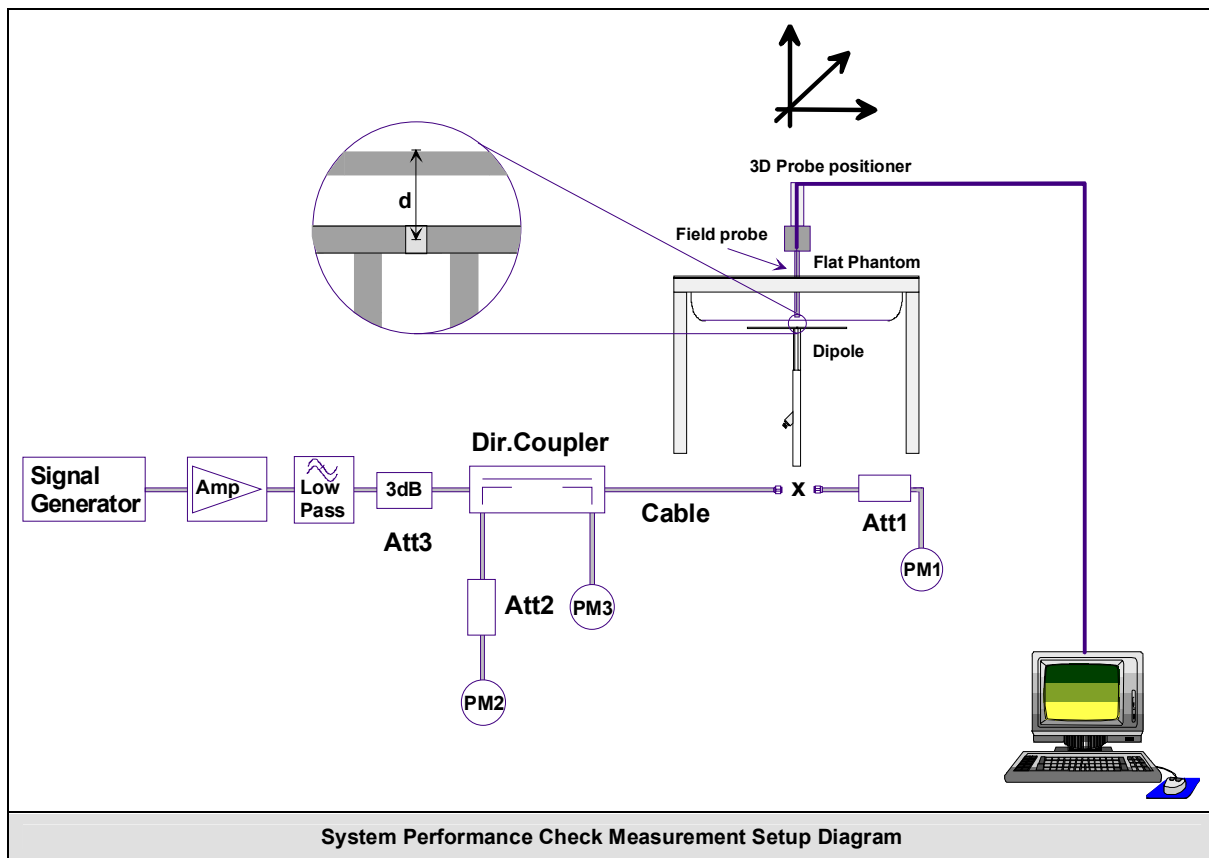
- Standard dipole dimensions used in simulation per 1528-2003 mechanical dimensions of the reference dipole.
- Reference distance from liquid is actual measured distance.

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 10. SAR Measurement

Measurements were made using a dosimetric E-field probe ET3DV6 (S/N: 1590, Conversion Factor 7.66). 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 procedures described below.

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.



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 11. Measurement Conditions

The validation phantom was filled with 450 MHz Head tissue simulant.

Relative Permittivity: 43.8 (+0.7% deviation from target)  
Conductivity: 0.86 mho/m (-1.1% deviation from target)  
Fluid Temperature: 22.1°C (Start of Test) / 22.3°C (End of Test)  
Fluid Depth:  $\geq 15.0$  cm

Environmental Conditions:

Ambient Temperature: 23.1°C  
Barometric Pressure: 101.1 kPa  
Humidity: 35%

The 450 MHz Head tissue simulant consisted of the following ingredients:

Ingredient	Percentage by weight	
Water	38.56%	
Sugar	56.32%	
Salt	3.95%	
HEC	0.98%	
Dowicil 75	0.19%	
IEEE/IEC Target Dielectric Parameters (450 MHz):	$\epsilon_r = 43.5$ (+/- 5%)	$\sigma = 0.87$ S/m (+/- 5%)

## 12. System Performance Check SAR Results

SAR @ 0.25W Input averaged over 1g (W/kg)				SAR @ 1W Input averaged over 1g (W/kg)			
Validation Target (450)	Measured	Deviation		Validation Target (450)	Measured	Deviation	
1.223	+/- 10%	1.216	-0.57%	4.892	+/- 10%	4.864	-0.57%
SAR @ 0.25W Input averaged over 10g (W/kg)				SAR @ 1W Input averaged over 10g (W/kg)			
Validation Target (450)	Measured	Deviation		Validation Target (450)	Measured	Deviation	
0.816	+/- 10%	0.799	-2.08%	3.264	+/- 10%	3.196	-2.08%



### 450 MHz System Performance Check @ 250mW (1g)

	SAR 1g (mW/g)	Deviation From 450 MHz Numerical Simulation (1.223 mW/g)	STDEV	Mean	Coefficient of Variation
Test 1	1.21	-1.06%	0.008	1.216	0.007
Test 2	1.22	-0.25%			
Test 3	1.22	-0.25%			
Test 4	1.21	-1.06%			
Test 5	1.22	-0.25%			
Test 6	1.20	-1.88%			
Test 7	1.22	-0.25%			
Test 8	1.22	-0.25%			
Test 9	1.23	0.57%			
Test 10	1.21	-1.06%			
	1.216	-0.57%			

### 450 MHz System Performance Check @ 250mW (10g)

	SAR 10g (mW/g)	Deviation From 450 MHz Numerical Simulation (0.816 mW/g)	STDEV	Mean	Coefficient of Variation
Test 1	0.799	-2.08%	0.006	0.799	0.007
Test 2	0.800	-1.96%			
Test 3	0.803	-1.59%			
Test 4	0.796	-2.45%			
Test 5	0.801	-1.84%			
Test 6	0.793	-2.82%			
Test 7	0.802	-1.72%			
Test 8	0.802	-1.72%			
Test 9	0.807	-1.10%			
Test 10	0.787	-3.55%			
	0.799	-2.08%			

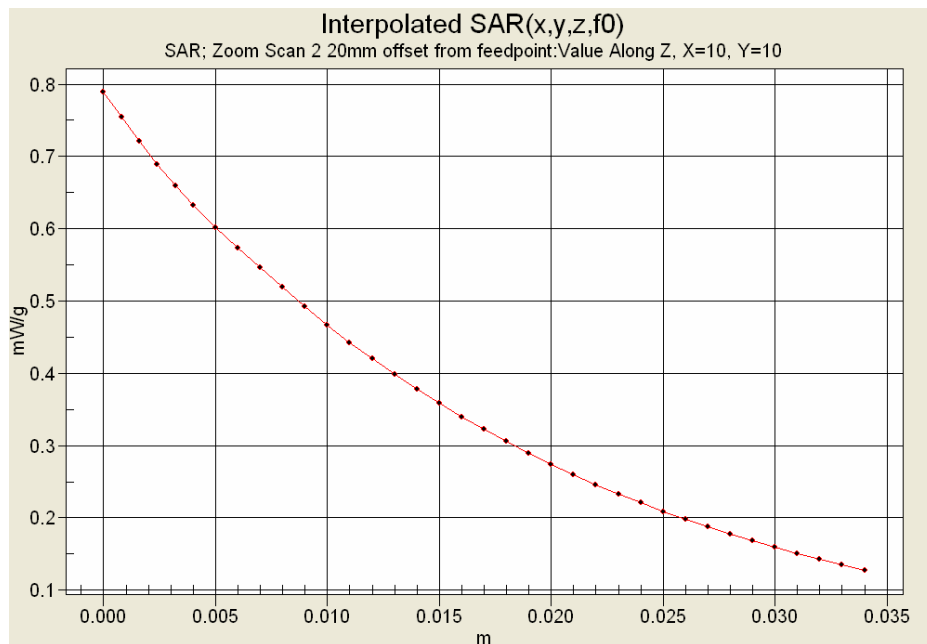
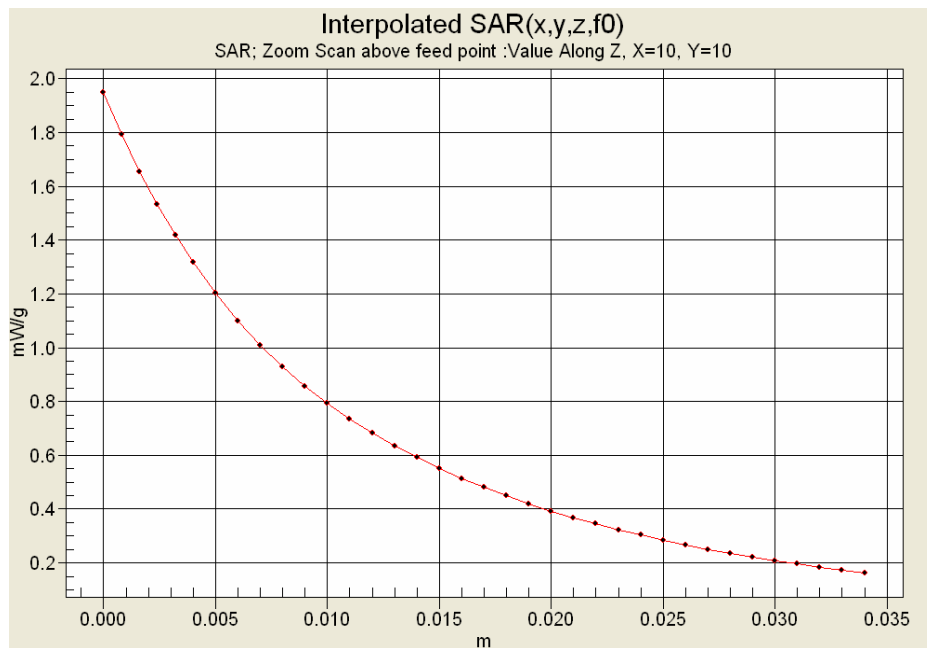
	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

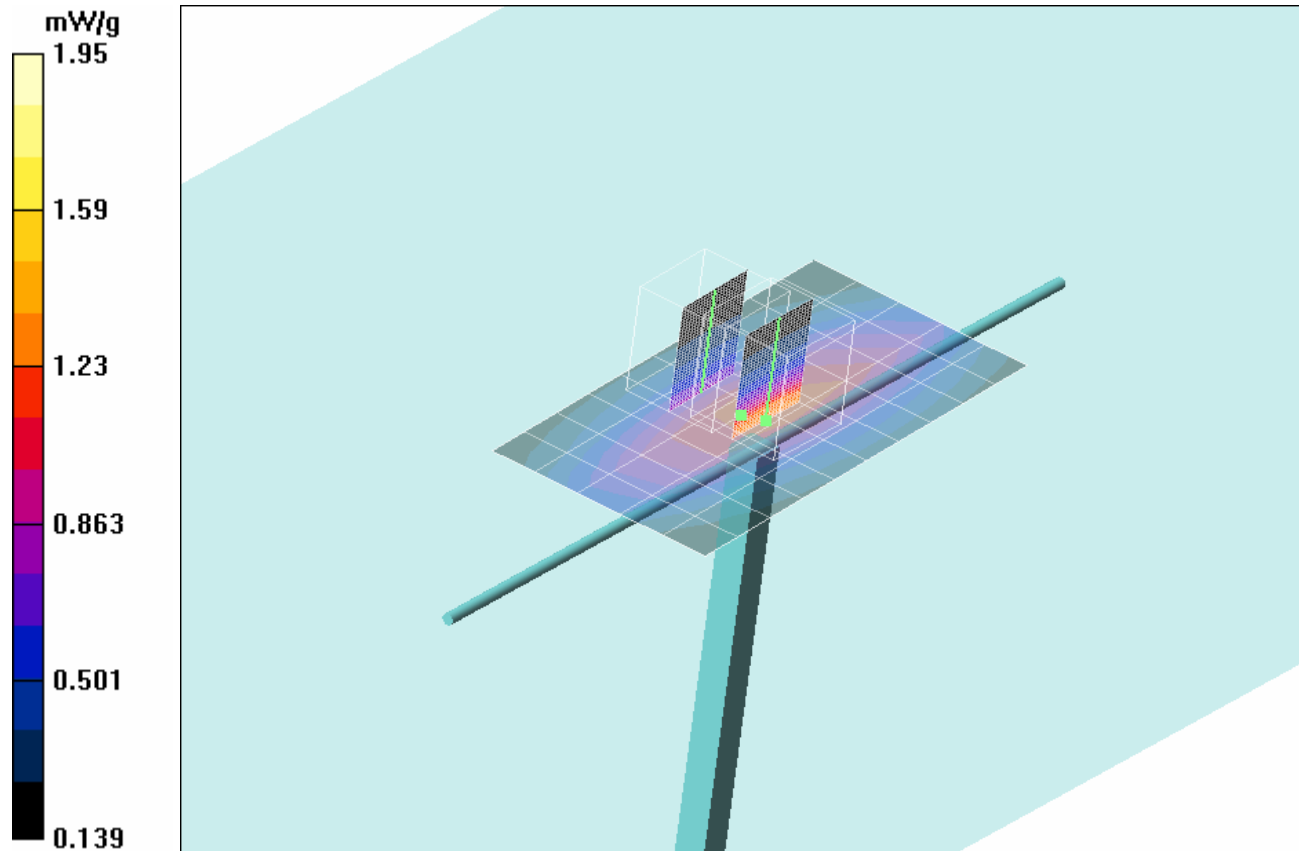
## b) Extrapolation Routine:

The zoom scan routine was used to extrapolate the peak SAR above the feed point and offset at 20mm. Two zoom scans were used, the first centered above the feedpoint and the second offset 20mm. The interpolated SAR at these points are shown in the table below. Note: Center point of zoom scan located at  $x=10$ ,  $y=10$ .

Measurement Location	Measured SAR mW/g	SAR 1W Normalized	Peak Target mW/g	Deviation	System Performance Check Expanded Uncertainty +/-%
Feed Point	1.93*	7.72	6.85	12.7%	17.86
2 cm Offset	0.79	3.16	3.10	1.9%	17.86

\*Note: measured SAR level is the average from the 10 evaluations





	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:	DC450H-021209-R1.2		
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## System Performance Check - 450 MHz Dipole - HSL

**DUT: Dipole 450 MHz; Asset: 00024; Serial: 136**

Ambient Temp: 23.1°C; Fluid Temp: 22.1°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.86 \text{ mho/m}$ ;  $\epsilon_r = 43.8$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.66, 7.66, 7.66); Calibrated: 21/07/2008

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn353; Calibrated: 22/04/2008

- Phantom: Validation Planar; Type: Plexiglas; Serial: TE#137

- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

**450 MHz Area Scan (6x11x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 1.20 mW/g

**450 MHz Zoom Scan 1 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.6 V/m; Power Drift = -0.035 dB

Peak SAR (extrapolated) = 1.92 W/kg

**SAR(1 g) = 1.21 mW/g; SAR(10 g) = 0.799 mW/g**

Maximum value of SAR (measured) = 1.30 mW/g

**450 MHz Zoom Scan 2 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.5 V/m; Power Drift = -0.022 dB

Peak SAR (extrapolated) = 1.93 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.800 mW/g**

Maximum value of SAR (measured) = 1.30 mW/g

**450 MHz Zoom Scan 3 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.4 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 1.92 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.803 mW/g**

Maximum value of SAR (measured) = 1.30 mW/g

**450 MHz Zoom Scan 4 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.3 V/m; Power Drift = 0.001 dB

Peak SAR (extrapolated) = 1.92 W/kg

**SAR(1 g) = 1.21 mW/g; SAR(10 g) = 0.796 mW/g**

Maximum value of SAR (measured) = 1.29 mW/g

**450 MHz Zoom Scan 5 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.5 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 1.94 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.801 mW/g**

Maximum value of SAR (measured) = 1.32 mW/g

**450 MHz Zoom Scan 6 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.3 V/m; Power Drift = -0.017 dB

Peak SAR (extrapolated) = 1.90 W/kg

**SAR(1 g) = 1.20 mW/g; SAR(10 g) = 0.793 mW/g**

Maximum value of SAR (measured) = 1.29 mW/g

**450 MHz Zoom Scan 7 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.4 V/m; Power Drift = 0.006 dB

Peak SAR (extrapolated) = 1.94 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.802 mW/g**

Maximum value of SAR (measured) = 1.31 mW/g

**450 MHz Zoom Scan 8 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.7 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 1.93 W/kg

**SAR(1 g) = 1.22 mW/g; SAR(10 g) = 0.802 mW/g**

Maximum value of SAR (measured) = 1.30 mW/g

**450 MHz Zoom Scan 9 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.6 V/m; Power Drift = -0.009 dB

Peak SAR (extrapolated) = 1.95 W/kg

**SAR(1 g) = 1.23 mW/g; SAR(10 g) = 0.807 mW/g**

Maximum value of SAR (measured) = 1.32 mW/g

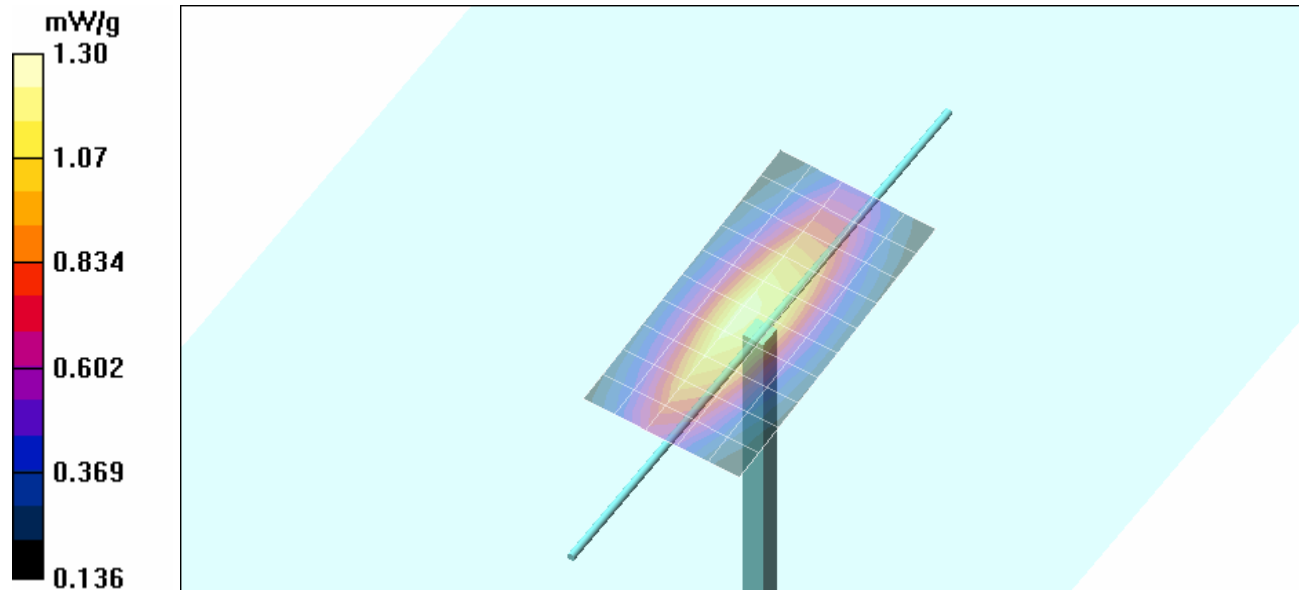
**450 MHz Zoom Scan 10 (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 39.3 V/m; Power Drift = 0.007 dB

Peak SAR (extrapolated) = 1.92 W/kg

**SAR(1 g) = 1.21 mW/g; SAR(10 g) = 0.787 mW/g**

Maximum value of SAR (measured) = 1.29 mW/g



### 13. Measured Fluid Dielectric Parameters

#### 450 MHz (Head)

\*\*\*\*\*

Celltech Labs Inc.

Test Result for UIM Dielectric Parameter

19/Jan/2009

Frequency (GHz)

IEEE\_eH IEEE 1528-2003 Limits for Head Epsilon

IEEE\_sH IEEE 1528-2003 Limits for Head Sigma

Test\_e Epsilon of UIM

Test\_s Sigma of UIM

\*\*\*\*\*

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	44.61	0.78
0.3600	44.58	0.87	46.57	0.79
0.3700	44.46	0.87	45.58	0.79
0.3800	44.34	0.87	44.52	0.80
0.3900	44.22	0.87	44.68	0.82
0.4000	44.10	0.87	44.30	0.83
0.4100	43.98	0.87	43.79	0.84
0.4200	43.86	0.87	44.67	0.85
0.4300	43.74	0.87	43.93	0.86
0.4400	43.62	0.87	43.86	0.86
0.4500	43.50	0.87	43.79	0.86
0.4600	43.45	0.87	43.00	0.86
0.4700	43.40	0.87	42.82	0.88
0.4800	43.34	0.87	42.69	0.89
0.4900	43.29	0.87	42.38	0.91
0.5000	43.24	0.87	42.02	0.90
0.5100	43.19	0.87	42.04	0.92
0.5200	43.14	0.88	42.26	0.95
0.5300	43.08	0.88	41.66	0.94
0.5400	43.03	0.88	41.84	0.95
0.5500	42.98	0.88	41.33	0.96

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 14. Measurement Uncertainties

UNCERTAINTY BUDGET FOR SYSTEM PERFORMANCE CHECK									
Uncertainty Component	IEEE 1528 Section	Uncertainty Value $\pm\%$	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value $\pm\%$ (1g)	Uncertainty Value $\pm\%$ (10g)	$V_i$ or $V_{eff}$
<b>Measurement System</b>									
Probe Calibration (450 MHz)	E.2.1	6.65	Normal	1	1	1	6.65	6.65	$\infty$
Axial Isotropy	E.2.2	4.7	Rectangular	1.732050808	1	1	2.7	2.7	$\infty$
Hemispherical Isotropy	E.2.2	0	Rectangular	1.732050808	1	1	0.0	0.0	$\infty$
Boundary Effect	E.2.3	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
Linearity	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	$\infty$
System Detection Limits	E.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
Readout Electronics	E.2.6	0.3	Normal	1	1	1	0.3	0.3	$\infty$
Response Time	E.2.7	0	Rectangular	1.732050808	1	1	0.0	0.0	$\infty$
Integration Time	E.2.8	0	Rectangular	1.732050808	1	1	0.0	0.0	$\infty$
RF Ambient Conditions	E.6.1	3	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Probe Positioner Mechanical Tolerance	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	$\infty$
Probe Positioning wrt Phantom Shell	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Extrapolation, interpolation & integration algorithms for max. SAR evaluation	E.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
<b>Dipole</b>									
Dipole Positioning	E.4.2	2	Normal	1.732050808	1	1	1.2	1.2	$\infty$
SAR Drift Measurement	6.6.2	0.5	Normal	1.732050808	1	1	0.3	0.3	$\infty$
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty	E.3.1	4	Rectangular	1.732050808	1	1	2.3	2.3	$\infty$
Liquid Conductivity (target)	E.3.2	5	Rectangular	1.732050808	0.64	0.43	1.8	1.2	$\infty$
Liquid Conductivity (measured)	E.3.3	1.1	Normal	1	0.64	0.43	0.7	0.5	$\infty$
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	$\infty$
Liquid Permittivity (measured)	E.3.3	0.7	Normal	1	0.6	0.49	0.4	0.3	$\infty$
<b>Combined Standard Uncertainty</b>			<b>RSS</b>				<b>8.93</b>	<b>8.75</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>			<b>k=2</b>				<b>17.86</b>	<b>17.50</b>	
Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003 and IEC International Standard 62209-1:2005									

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## 15. Dipole Calibration History

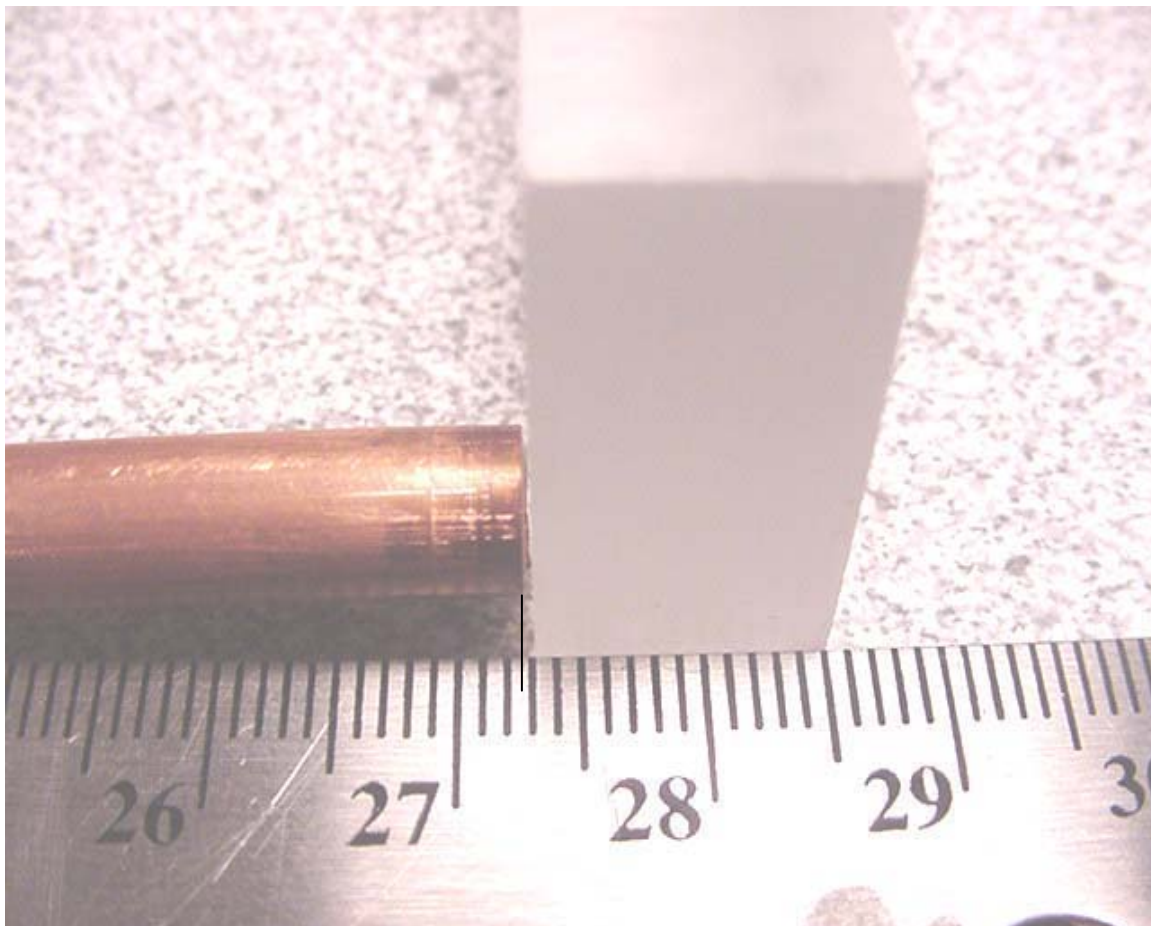
450 MHz Dipole Calibration History										
Dipole Calibration Date	SAR Probe Information			Celltech Measured Data						
				SAR (W/kg) Measured at 250 mW	% Deviation from IEEE 1528 Target (4.9 W/kg @ 1 W)	% Deviation from Target validated by Celltech (4.893 W/kg @ 1 W)	Dielectric Parameters		RL (dB)	Impedance
	Serial Number	Calibration Factor	Calibration Procedure				$\epsilon_r$	$\sigma$		
2003	1387	7.50	Numerical	1.30	6.12		43.70	0.88	-22.60	49.98
2004	1387	7.50	Numerical	1.23	0.41		42.90	0.85	-23.74	54.04
2005	1387	7.50	Numerical	1.24	1.22		43.20	0.84	-20.40	58.50
2006	1387	7.40	Numerical	1.27	3.67		44.70	0.90	-21.60	56.17
2007	1387	7.00	Numerical	1.29	5.31		43.10	0.85	-22.20	55.20
2008	1387	7.32	Measured	1.19		-2.72	43.60	0.86	-23.10	55.60
2008	1590	7.66	Measured	1.18		-3.53	43.44	0.89	-20.70	58.20
2008	1590	7.66	Measured	1.22		-0.26	43.80	0.86	-20.70	58.20
Target Dielectric Parameters: $\epsilon_r = 43.5$ , $\sigma = 0.87$ s/m										



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

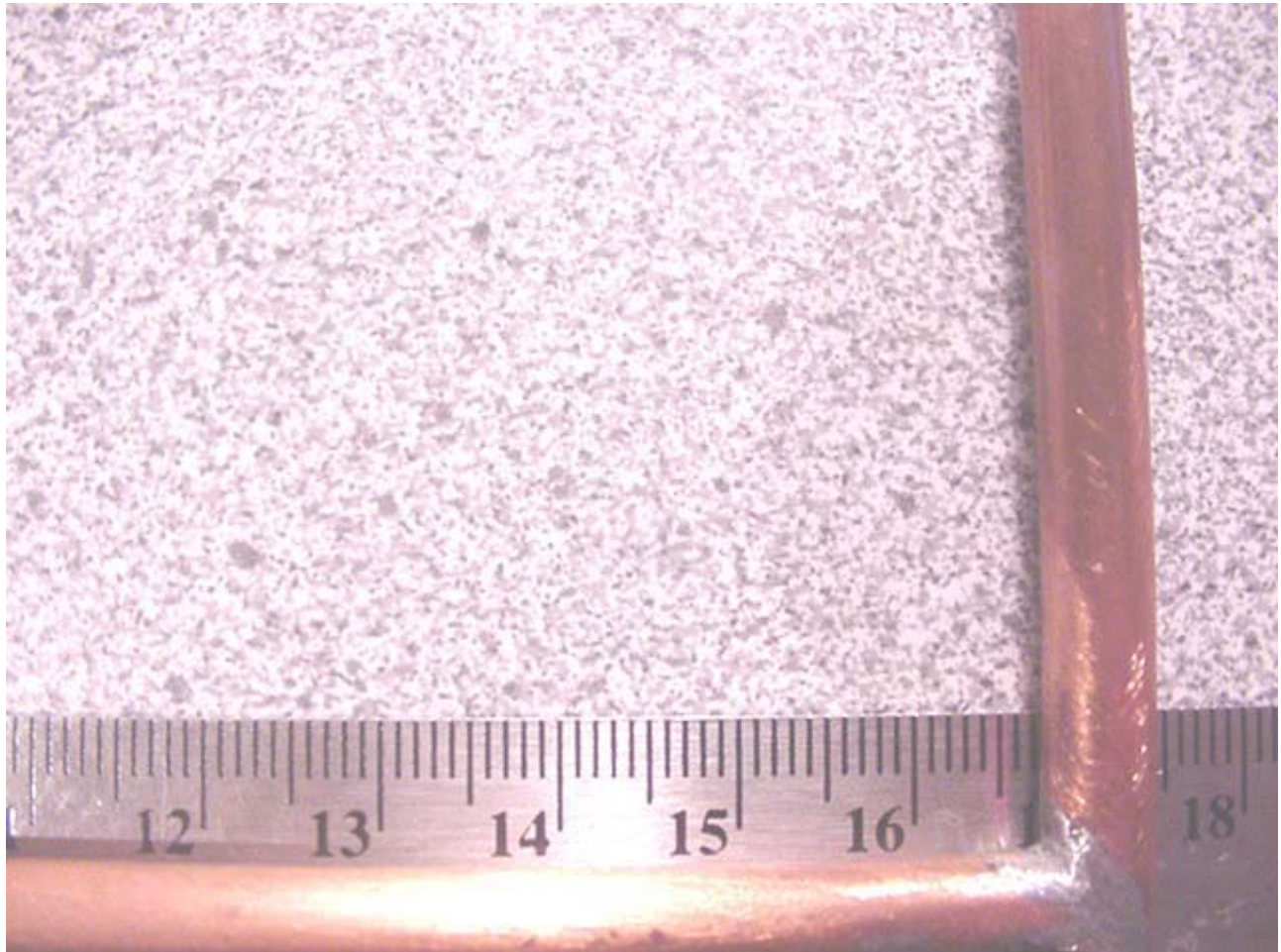
## APPENDIX A - PHOTOGRAPHS

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head



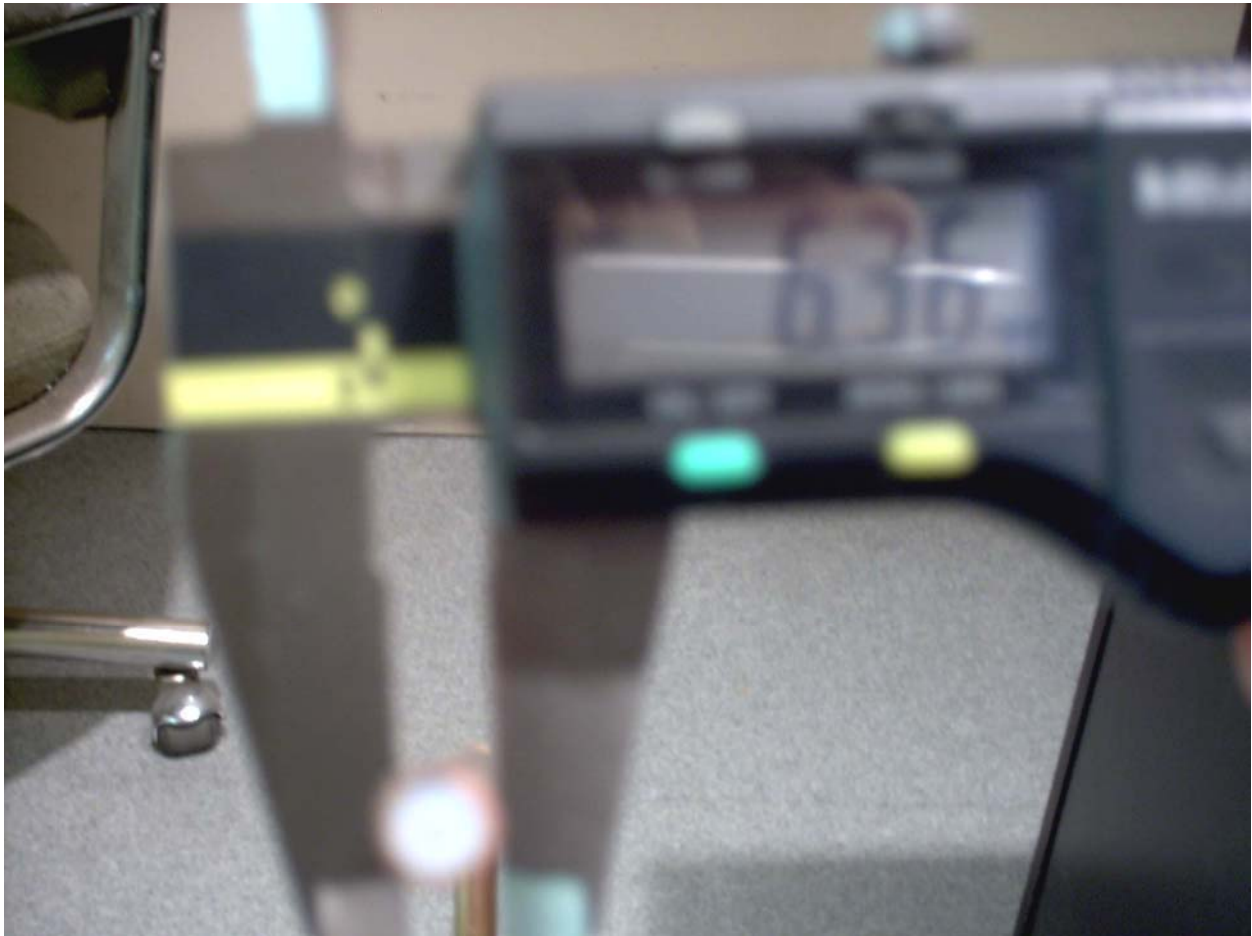
**Dipole Dimension  $L = 272.7\text{mm}$**

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head



**Dipole Dimension  $h = 167\text{mm}$**

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head



**Dipole Dimension  $d = 6.36\text{mm}$**



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head



**Dipole Spacer Dimension = 6.0mm**

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## **APPENDIX B - SEMCAD SIMULATION LOG FILE**

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

iSolve X, Version 13.4, Build 34, 64Bit Windows, Single Precision  
Simulation name 'Dielec Const = 2.7, Low Conduct'  
Maxwell Solver started the 2009-Feb-09 10:40:20.  
Initializing FDTD (x1 CFL) Harmonic Simulation at 450 MHz

Overall discretization:

Smallest number of cells per wavelength = 20.202, largest = 422.988, average = 113.419  
Simulation time-step = 9.781e-013 s  
Simulation time-step / minimum of CFL criteria = 0.999938  
Maximum of CFL criteria / minimum of CFL criteria = 64.6059  
Average of CFL criteria / minimum of CFL criteria = 9.92029

Discretization by solids:

Background: epsr = 1, mur = 1, sigma = 0, sigma\* = 0 - smallest number of cells per wavelength = 133.241, largest = 422.988, average = 145.219  
Phantom/Shell: epsr = 2.7, mur = 1, sigma = 0, sigma\* = 0 - smallest number of cells per wavelength = 81.0879, largest = 237.738, average = 120.104  
Phantom/Liquid: epsr = 43.5, mur = 1, sigma = 0.87, sigma\* = 0 - smallest number of cells per wavelength = 20.202, largest = 55.4378, average = 23.1303

Boundary conditions:

Side X-: U-PML(8)  
Side X+: U-PML(8)  
Side Y-: U-PML(8)  
Side Y+: U-PML(8)  
Side Z-: U-PML(8)  
Side Z+: U-PML(8)

Grid:

Number of nodes=285x233x175, number of voxels=11464512

Excitations:

Initializing (Voltage) edge source Quelle  
Overall duration : 3.33333e-008 s or 34080 iterations

Probes & Sensors:

Initializing near-field sensor 1g  
Initializing near-field sensor 10g  
Initializing near to far field transformation  
Initializing near-field sensor Overall Field  
Initializing near-field sensor Unnamed  
Initializing port sensor Sensor of Quelle  
Initializing port sensor TDSensor  
Initializing port sensor FDSensor  
Initializing port sensor ObererSensor

Enable monitoring:

Sensor of Quelle, V(t)  
Sensor of Quelle, I(t)  
TDSensor, V(t)  
TDSensor, I(t)  
FDSensor, V(t)  
FDSensor, I(t)  
ObererSensor, V(t)  
ObererSensor, I(t)

Checking out the license feature ISOLVEX\_SOLVER\_FDTD, expiring the 1-mar-2009, version 10.0, (1).

Calculating update coefficients:

Created thread pool with 2 thread(s).  
Calculating update coefficients: completed. Time: 17.8 seconds.

Hardware acceleration not used, please contact SPEAG for more information.

Yee (explicit) iterations starting using U-PML Boundary Condition.

0% - iterations: 8 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:34:02  
0% - iterations: 16 / 34079 - [7.64 MCells/s] - Estimated time to completion: 14:11:34  
0% - iterations: 24 / 34079 - [8.34 MCells/s] - Estimated time to completion: 13:00:25  
0% - iterations: 32 / 34079 - [7.64 MCells/s] - Estimated time to completion: 14:11:10  
0% - iterations: 43 / 34079 - [11.5 MCells/s] - Estimated time to completion: 09:27:16  
0% - iterations: 53 / 34079 - [10.4 MCells/s] - Estimated time to completion: 10:23:48  
0% - iterations: 62 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:32:56



	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

0% - iterations: 70 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:59:22  
 0% - iterations: 77 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:50:31  
 0% - iterations: 84 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:11:17  
 0% - iterations: 91 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:50:09  
 0% - iterations: 100 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:32:09  
 0% - iterations: 110 / 34079 - [10.4 MCells/s] - Estimated time to completion: 10:22:45  
 0% - iterations: 118 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:58:16  
 0% - iterations: 126 / 34079 - [7.64 MCells/s] - Estimated time to completion: 14:08:49  
 0% - iterations: 133 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:49:03  
 0% - iterations: 140 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:48:52  
 0% - iterations: 147 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:48:41  
 0% - iterations: 154 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:48:30  
 0% - iterations: 161 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:48:19  
 0% - iterations: 170 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:30:44  
 1% - iterations: 179 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:30:33  
 1% - iterations: 186 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:47:40  
 1% - iterations: 191 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:42:33  
 1% - iterations: 198 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:08:01  
 1% - iterations: 203 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:35:02  
 1% - iterations: 208 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:34:50  
 1% - iterations: 214 / 34079 - [6.25 MCells/s] - Estimated time to completion: 17:14:45  
 1% - iterations: 221 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:07:22  
 1% - iterations: 228 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:46:34  
 1% - iterations: 235 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:06:58  
 1% - iterations: 243 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:55:24  
 1% - iterations: 252 / 34079 - [7.94 MCells/s] - Estimated time to completion: 13:34:21  
 1% - iterations: 257 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:40:08  
 1% - iterations: 262 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:39:57  
 1% - iterations: 269 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:45:30  
 1% - iterations: 277 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:54:37  
 1% - iterations: 286 / 34079 - [8.6 MCells/s] - Estimated time to completion: 12:30:57  
 1% - iterations: 290 / 34079 - [3.82 MCells/s] - Estimated time to completion: 28:09:27  
 1% - iterations: 295 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:31:21  
 1% - iterations: 300 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:31:09  
 1% - iterations: 305 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:38:22  
 1% - iterations: 313 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:53:48  
 1% - iterations: 320 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:44:09  
 1% - iterations: 327 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:43:58  
 1% - iterations: 339 / 34079 - [12.5 MCells/s] - Estimated time to completion: 08:35:28  
 1% - iterations: 347 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:53:01  
 1% - iterations: 355 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:52:50  
 1% - iterations: 362 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:03:20  
 1% - iterations: 369 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:42:52  
 1% - iterations: 376 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:02:56  
 1% - iterations: 383 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:42:30  
 1% - iterations: 391 / 34079 - [7.64 MCells/s] - Estimated time to completion: 14:02:12  
 1% - iterations: 400 / 34079 - [8.6 MCells/s] - Estimated time to completion: 12:28:25  
 1% - iterations: 407 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:41:53  
 1% - iterations: 415 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:51:28  
 1% - iterations: 424 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:25:33  
 1% - iterations: 433 / 34079 - [8.6 MCells/s] - Estimated time to completion: 12:27:41  
 1% - iterations: 442 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:25:11  
 1% - iterations: 449 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:40:47  
 1% - iterations: 456 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:00:39  
 1% - iterations: 461 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:32:39  
 1% - iterations: 468 / 34079 - [6.69 MCells/s] - Estimated time to completion: 16:00:18  
 1% - iterations: 475 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:40:06  
 1% - iterations: 481 / 34079 - [6.25 MCells/s] - Estimated time to completion: 17:06:36  
 1% - iterations: 486 / 34079 - [4.78 MCells/s] - Estimated time to completion: 22:23:43  
 1% - iterations: 491 / 34079 - [5.21 MCells/s] - Estimated time to completion: 20:31:33  
 1% - iterations: 498 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:39:30  
 1% - iterations: 504 / 34079 - [5.73 MCells/s] - Estimated time to completion: 18:39:10  
 1% - iterations: 510 / 34079 - [5.29 MCells/s] - Estimated time to completion: 20:12:12  
 2% - iterations: 516 / 34079 - [5.73 MCells/s] - Estimated time to completion: 18:38:46  
 2% - iterations: 523 / 34079 - [7.3 MCells/s] - Estimated time to completion: 14:38:50  
 2% - iterations: 531 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:48:48  
 2% - iterations: 539 / 34079 - [8.34 MCells/s] - Estimated time to completion: 12:48:37  
 2% - iterations: 548 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:23:02  
 2% - iterations: 557 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:22:51  
 2% - iterations: 566 / 34079 - [8.6 MCells/s] - Estimated time to completion: 12:24:44  
 2% - iterations: 575 / 34079 - [9.38 MCells/s] - Estimated time to completion: 11:22:29

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

62% - iterations: 21213 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:22:05  
62% - iterations: 21221 / 34079 - [7.64 MCells/s] - Estimated time to completion: 05:21:27  
62% - iterations: 21229 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:54:28  
62% - iterations: 21238 / 34079 - [8.6 MCells/s] - Estimated time to completion: 04:45:21  
62% - iterations: 21246 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:54:05  
62% - iterations: 21254 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:53:54  
62% - iterations: 21263 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:21:03  
62% - iterations: 21271 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:53:31  
62% - iterations: 21280 / 34079 - [8.6 MCells/s] - Estimated time to completion: 04:44:25  
62% - iterations: 21289 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:20:32  
62% - iterations: 21298 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:20:21  
63% - iterations: 21307 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:20:10  
63% - iterations: 21316 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:19:59  
63% - iterations: 21329 / 34079 - [13.5 MCells/s] - Estimated time to completion: 02:59:48  
63% - iterations: 21340 / 34079 - [10.5 MCells/s] - Estimated time to completion: 03:51:37  
63% - iterations: 21349 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:19:18  
63% - iterations: 21358 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:19:07  
63% - iterations: 21367 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:18:56  
63% - iterations: 21376 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:18:45  
63% - iterations: 21383 / 34079 - [7.3 MCells/s] - Estimated time to completion: 05:32:30  
63% - iterations: 21390 / 34079 - [6.69 MCells/s] - Estimated time to completion: 06:02:32  
63% - iterations: 21397 / 34079 - [6.69 MCells/s] - Estimated time to completion: 06:02:20  
63% - iterations: 21404 / 34079 - [6.69 MCells/s] - Estimated time to completion: 06:02:08  
63% - iterations: 21411 / 34079 - [7.3 MCells/s] - Estimated time to completion: 05:31:46  
63% - iterations: 21418 / 34079 - [7.3 MCells/s] - Estimated time to completion: 05:31:35  
63% - iterations: 21425 / 34079 - [7.3 MCells/s] - Estimated time to completion: 05:31:24  
63% - iterations: 21433 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:49:48  
63% - iterations: 21442 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:17:25  
63% - iterations: 21451 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:17:14  
63% - iterations: 21457 / 34079 - [6.25 MCells/s] - Estimated time to completion: 06:25:40  
63% - iterations: 21462 / 34079 - [5.21 MCells/s] - Estimated time to completion: 07:42:37  
63% - iterations: 21467 / 34079 - [5.21 MCells/s] - Estimated time to completion: 07:42:26  
63% - iterations: 21473 / 34079 - [5.29 MCells/s] - Estimated time to completion: 07:35:13  
63% - iterations: 21482 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:16:36  
63% - iterations: 21491 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:16:25  
63% - iterations: 21499 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:48:17  
63% - iterations: 21508 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:16:04  
63% - iterations: 21516 / 34079 - [8.34 MCells/s] - Estimated time to completion: 04:47:54  
63% - iterations: 21525 / 34079 - [8.6 MCells/s] - Estimated time to completion: 04:38:58  
63% - iterations: 21534 / 34079 - [9.38 MCells/s] - Estimated time to completion: 04:15:32  
63% - iterations: 21546 / 34079 - [12.5 MCells/s] - Estimated time to completion: 03:11:28  
63% - iterations: 21557 / 34079 - [11.5 MCells/s] - Estimated time to completion: 03:28:42  
63% - iterations: 21569 / 34079 - [12.5 MCells/s] - Estimated time to completion: 03:11:07  
63% - iterations: 21581 / 34079 - [12.5 MCells/s] - Estimated time to completion: 03:10:56

Steady state detected at iteration: 21585 - the simulation will end shortly.

Please wait ... saving the sensor 'Overall Field' (E-fields) on disk.

Please wait ... saving the sensor 'Overall Field' (H-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (E-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (H-fields) on disk.

97% - iterations: 21585 / 22153 - [0.0356 MCells/s] - Estimated time to completion: 50:45:54  
97% - iterations: 21592 / 22153 - [6.69 MCells/s] - Estimated time to completion: 00:16:01  
98% - iterations: 21600 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:12:40  
98% - iterations: 21609 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:11:04  
98% - iterations: 21618 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:53  
98% - iterations: 21627 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:42  
98% - iterations: 21636 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:31  
98% - iterations: 21644 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:11:39  
98% - iterations: 21653 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:11  
98% - iterations: 21662 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:10:00  
98% - iterations: 21671 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:10:42  
98% - iterations: 21680 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:09:38  
98% - iterations: 21689 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:09:27  
98% - iterations: 21698 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:09:16  
98% - iterations: 21706 / 22153 - [7.64 MCells/s] - Estimated time to completion: 00:11:10  
98% - iterations: 21713 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:11:31  
98% - iterations: 21720 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:11:20  
98% - iterations: 21727 / 22153 - [6.69 MCells/s] - Estimated time to completion: 00:12:10

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

98% - iterations: 21735 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:09:34  
 98% - iterations: 21743 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:09:23  
 98% - iterations: 21751 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:09:12  
 98% - iterations: 21760 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:08:44  
 98% - iterations: 21769 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:08:32  
 98% - iterations: 21778 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:08:20  
 98% - iterations: 21786 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:08:24  
 98% - iterations: 21794 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:08:13  
 98% - iterations: 21802 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:08:02  
 98% - iterations: 21810 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:07:51  
 98% - iterations: 21818 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:07:40  
 99% - iterations: 21826 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:07:29  
 99% - iterations: 21834 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:07:18  
 99% - iterations: 21841 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:08:10  
 99% - iterations: 21849 / 22153 - [7.64 MCells/s] - Estimated time to completion: 00:07:36  
 99% - iterations: 21857 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:06:47  
 99% - iterations: 21865 / 22153 - [7.64 MCells/s] - Estimated time to completion: 00:07:12  
 99% - iterations: 21873 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:06:25  
 99% - iterations: 21881 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:06:14  
 99% - iterations: 21889 / 22153 - [7.64 MCells/s] - Estimated time to completion: 00:06:36  
 99% - iterations: 21897 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:52  
 99% - iterations: 21905 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:41  
 99% - iterations: 21913 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:30  
 99% - iterations: 21921 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:19  
 99% - iterations: 21929 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:05:08  
 99% - iterations: 21938 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:04:46  
 99% - iterations: 21947 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:04:11  
 99% - iterations: 21956 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:04:22  
 99% - iterations: 21965 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:03:49  
 99% - iterations: 21972 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:04:44  
 99% - iterations: 21981 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:03:30  
 99% - iterations: 21990 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:03:19  
 99% - iterations: 22001 / 22153 - [11.5 MCells/s] - Estimated time to completion: 00:02:32  
 99% - iterations: 22012 / 22153 - [11.5 MCells/s] - Estimated time to completion: 00:02:21  
 99% - iterations: 22021 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:02:41  
 99% - iterations: 22030 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:02:44  
 99% - iterations: 22039 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:02:19  
 100% - iterations: 22048 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:02:08  
 100% - iterations: 22056 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:02:13  
 100% - iterations: 22065 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:01:47  
 100% - iterations: 22072 / 22153 - [7.3 MCells/s] - Estimated time to completion: 00:02:07  
 100% - iterations: 22078 / 22153 - [6.25 MCells/s] - Estimated time to completion: 00:02:17  
 100% - iterations: 22084 / 22153 - [6.25 MCells/s] - Estimated time to completion: 00:02:06  
 100% - iterations: 22092 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:01:23  
 100% - iterations: 22101 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:01:03  
 100% - iterations: 22109 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:01:00  
 100% - iterations: 22118 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:00:42  
 100% - iterations: 22126 / 22153 - [8.34 MCells/s] - Estimated time to completion: 00:00:37  
 100% - iterations: 22135 / 22153 - [9.38 MCells/s] - Estimated time to completion: 00:00:22  
 100% - iterations: 22144 / 22153 - [8.6 MCells/s] - Estimated time to completion: 00:00:12  
 Please wait ... saving the sensor 'Overall Field' (E-fields) on disk.

Please wait ... saving the sensor 'Overall Field' (H-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (E-fields) on disk.

Please wait ... saving the sensor 'Unnamed' (H-fields) on disk.

100% - iterations: 22153 / 22153 - [0.0834 MCells/s] - Estimated time to completion: 00:00:00

Convert time-domain data to frequency-domain data.

Maxwell Solver run ended the 2009-Feb-09 21:12:38. Total simulation time was 10:32:18 (hh:mm:ss, wall-clock time).

	Date(s) of Evaluations:	Jan. 19 & Feb. 09, 2009	Calibration Document Serial No.:		DC450H-021209-R1.2	
	Type of Evaluation:	Dipole Calibration	Dipole Frequency:	450 MHz	Fluid Type:	Head

## **APPENDIX C - PROBE CALIBRATION REPORT**



Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Celltech**

Certificate No: **ET3-1590\_Jul08**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1590**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v5 and QA CAL-23.v3  
 Calibration procedure for dosimetric E-field probes**

Calibration date: **July 21, 2008**

Condition of the calibrated item **In Tolerance**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature  $(22 \pm 3)^\circ\text{C}$  and humidity  $< 70\%$ .

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	3-Sep-07 (No. DAE4-660_Sep07)	Sep-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

	Name	Function	Signature
Calibrated by:	<b>Katja Pokovic</b>	<b>Technical Manager</b>	
Approved by:	<b>Niels Kuster</b>	<b>Quality Manager</b>	

Issued: July 21, 2008

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



Accredited by the Swiss Accreditation Service (SAS)  
 The Swiss Accreditation Service is one of the signatories to the EA  
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

### Glossary:

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\phi$	$\phi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.



# Probe ET3DV6

## SN:1590

Manufactured:	March 19, 2001
Last calibrated:	May 20, 2005
Recalibrated:	July 21, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

**DASY - Parameters of Probe: ET3DV6 SN:1590****Sensitivity in Free Space<sup>A</sup>****Diode Compression<sup>B</sup>**

NormX	<b>1.81</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	<b>87</b> mV
NormY	<b>2.00</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	<b>92</b> mV
NormZ	<b>1.72</b> ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	<b>85</b> mV

**Sensitivity in Tissue Simulating Liquid (Conversion Factors)**

Please see Page 8.

**Boundary Effect****TSL                      835 MHz      Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		<b>3.7 mm</b>	<b>4.7 mm</b>
SAR <sub>be</sub> [%]	Without Correction Algorithm	10.7	7.2
SAR <sub>be</sub> [%]	With Correction Algorithm	0.8	0.5

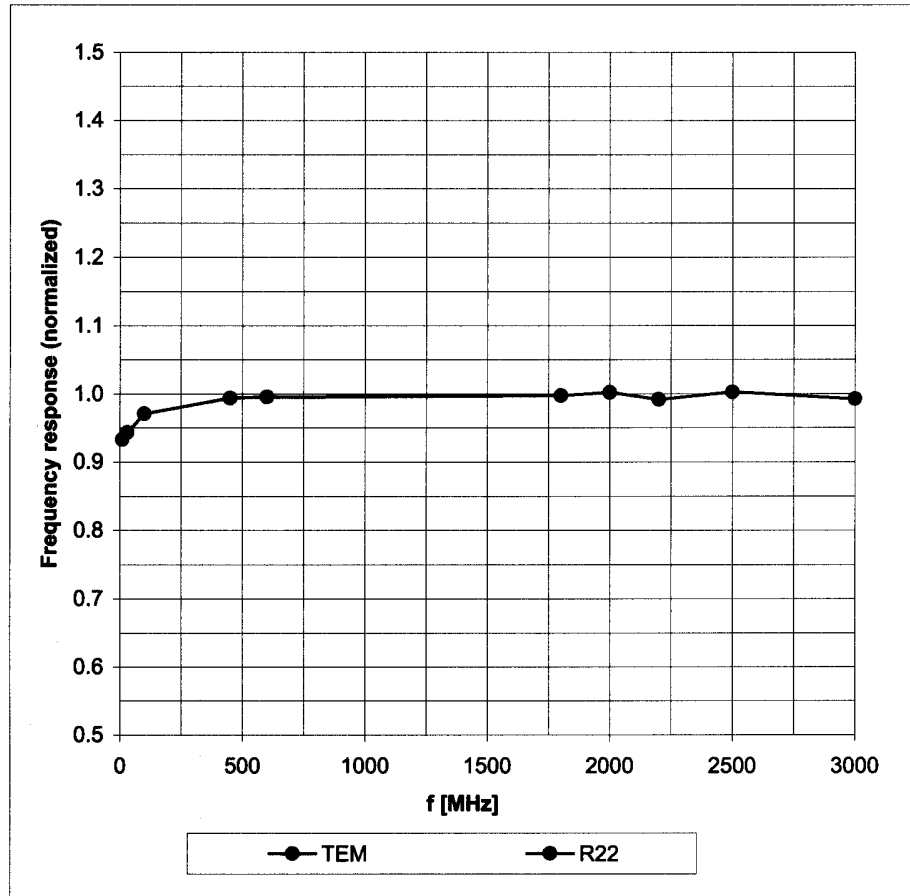
**Sensor Offset**Probe Tip to Sensor Center                      **2.7 mm**

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

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).<sup>B</sup> Numerical linearization parameter: uncertainty not required.

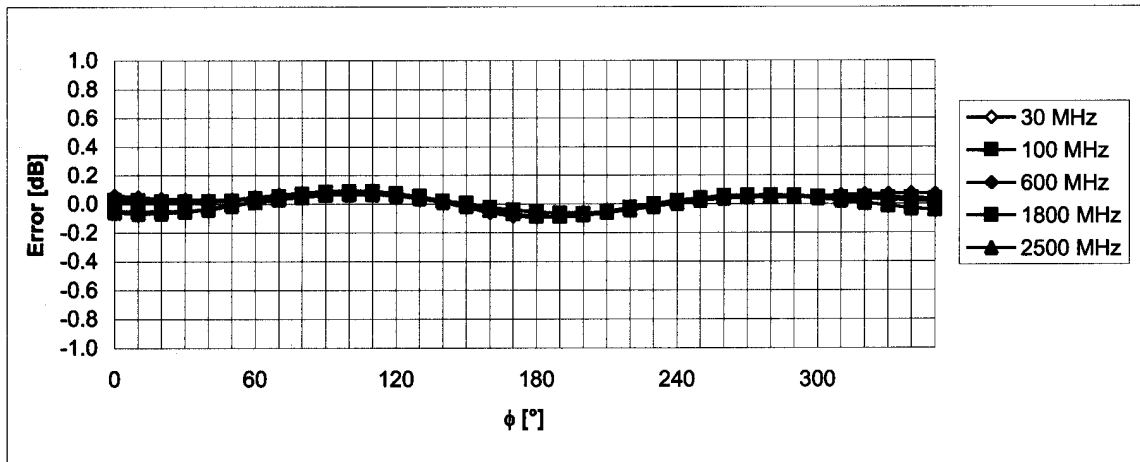
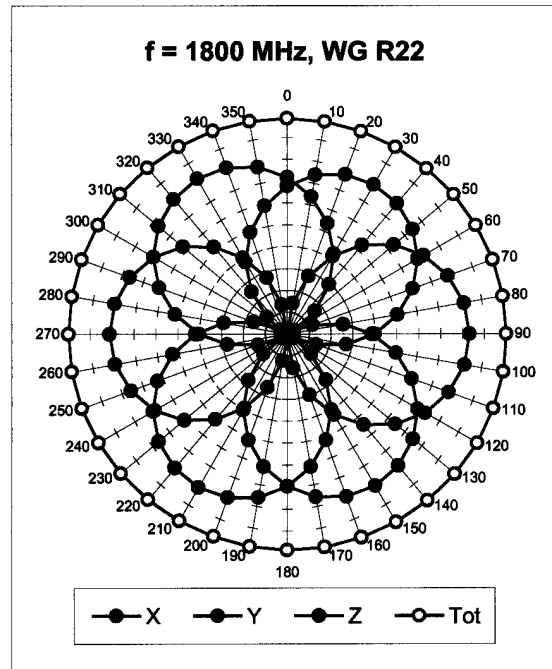
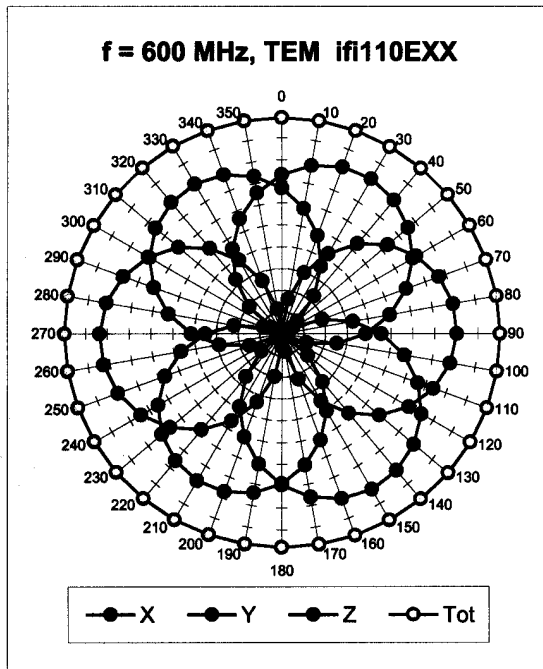
## Frequency Response of E-Field

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



Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

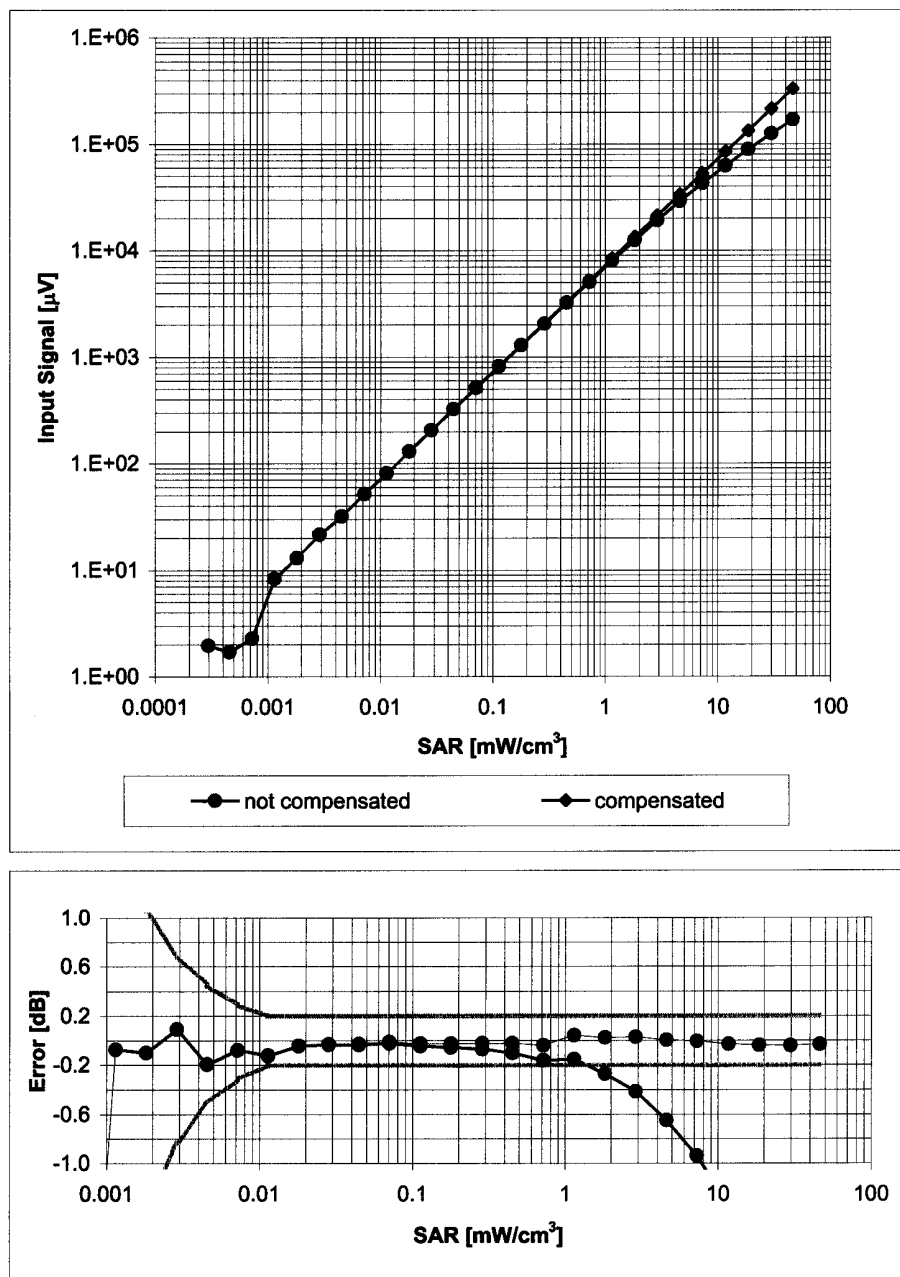
## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

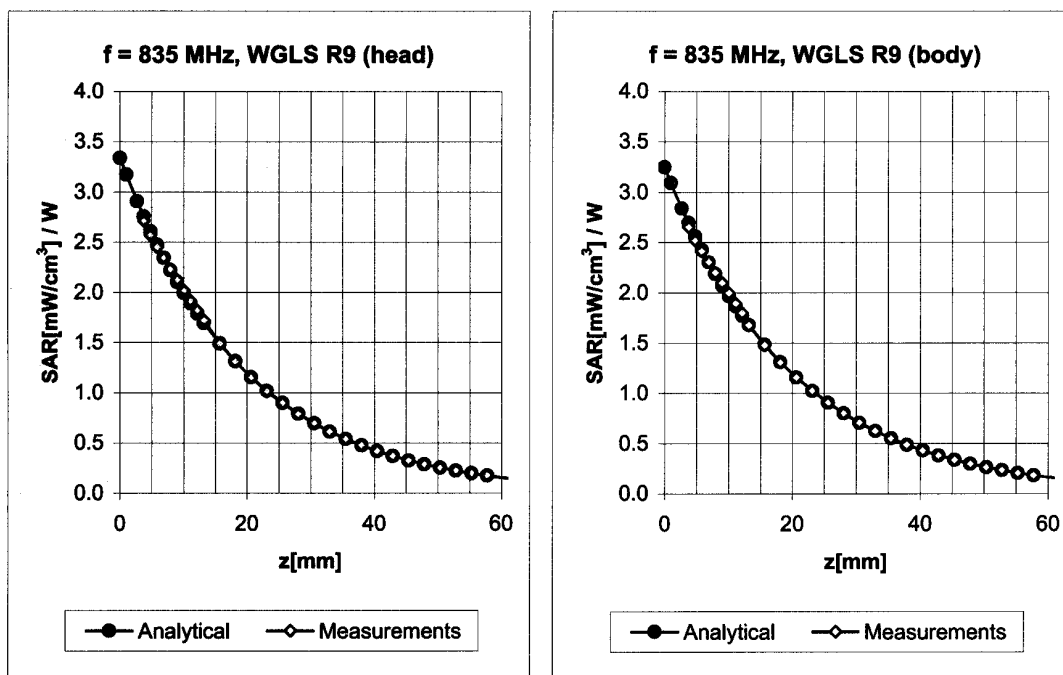
# Dynamic Range f(SAR<sub>head</sub>)

(Waveguide R22, f = 1800 MHz)



Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

## Conversion Factor Assessment

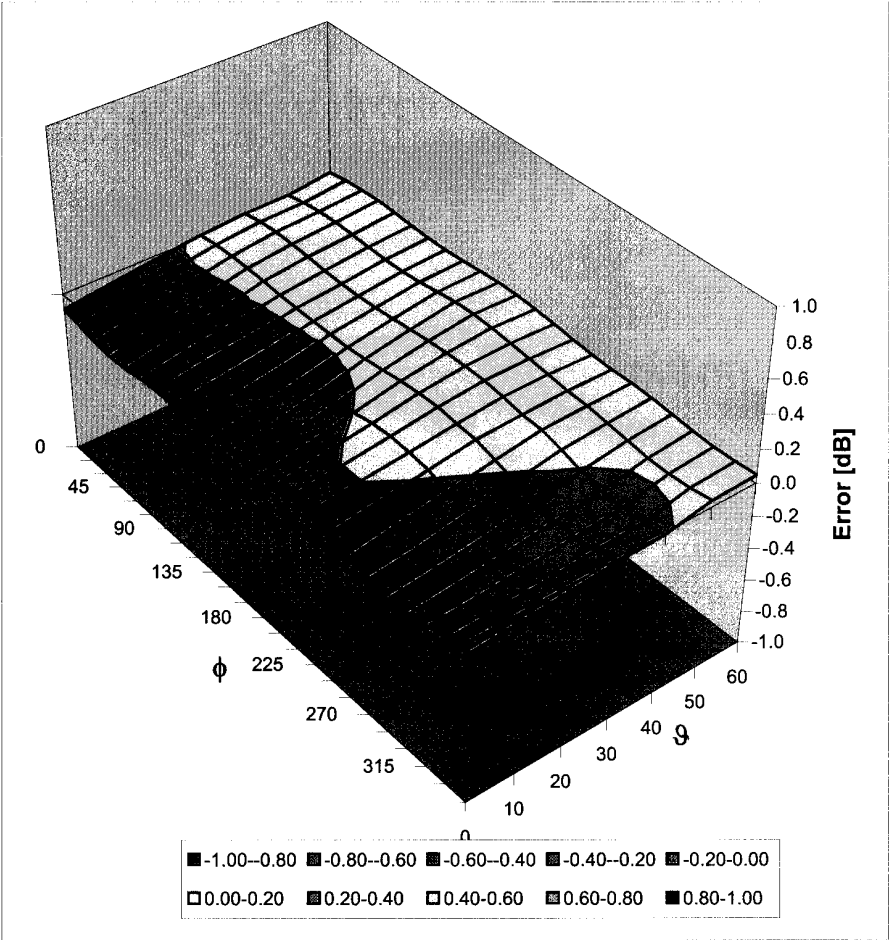


f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.34	1.75	7.66 ± 13.3% (k=2)
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.32	3.52	6.54 ± 11.0% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.28	1.77	8.27 ± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.36	3.31	6.39 ± 11.0% (k=2)

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



Deviation from Isotropy in HSL  
Error ( $\phi, \vartheta$ ),  $f = 900 \text{ MHz}$



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  ( $k=2$ )