SAR TEST REPORT (FCC/IC)

RF EXPOSURE EVALUATION | SPECIFIC ABSORPTION RATE

APPLICANT / MANUFACTURER	UNIDEN AMERICA CORPORATION			
DEVICE UNDER TEST (DUT)	PORTABLE UPCS/LE-PCS 1.9 GHz DECT 6.0 CORDLESS HANDSET			
DEVICE FREQUENCY RANGE	1921.536 - 1928.448 MHz			
DEVICE MODEL(S)	D1680			
DEVICE IDENTIFIER(S)	FCC ID:	AMWUN175R	IC:	513C-UN175
APPLICATION TYPE(S)	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 KDB 447498 D01v04			
	Industry Canada RSS-102 Issue 4			
	IEEE 1528-2003			
	IEC 62209-1:2005			
FCC DEVICE CLASSIFICATION	Part 15 Unlicensed PCS Portable Transmitter held to ear (PUE)		47 CFR §15(D)	
IC DEVICE CLASSIFICATION	2 GHz Licence Exempt Personal Communications Service Device (PCS)		RSS-213 Issue 2	
RF EXPOSURE CATEGORY	General Population / Uncontrolled			
RF EXPOSURE EVALUATION(S)	Held-to-Ear			
DATE OF SAMPLE RECEIPT	June 08, 2010			
DATE(S) OF EVALUATION(S)	June 08, 2010			
TEST REPORT SERIAL NO.	060810AMW-T1031-S15D			
TEST REPORT REVISION NO.	Revision 1.0	Initial Release	July 28, 2010	
TEST REPORT SIGNATORIES	Testing Performed By		Test Report Prepared By	
	Sean Johnston - Celltech Labs		Jon Hughes - Celltech Labs	
TEST LAB AND LOCATION	Celltech Compliance Testing and Engineering Laboratory			
	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)	ilac-MRA A2LA ACCREDITED Test Lab Certificate No. 2470.01			

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

DECLARATION OF COMPLIANCE - SAR RF EXPOSURE EVALUATION (FCC/IC)

Test Lab Information	**Name**	**CELLTECH LABS INC.**		
	Address	21-364 Lougheed Road, Kelowna, British Columbia V1X 7R8 Canada		
Applicant Information	**Name**	**UNIDEN AMERICA CORPORATION**		
	Address	4700 Amon Carter Boulevard, Fort Worth, Texas 76155 United States		
Standard(s) Applied	**FCC**	47 CFR §2.1093		
	IC	Health Canada Safety Code 6		
Procedure(s) Applied	**FCC**	OET Bulletin 65, Supplement C (01-01)		
	FCC	KDB 447498 D01v04		
	IC	RSS-102 Issue 4		
	IEEE	1528-2003		
	IEC	62209-1:2005		
Device RF Exposure Category	**FCC/IC**	General Population / Uncontrolled Environment		
Device Classification(s)	**FCC**	Part 15 Unlicensed PCS portable Transmitter held to ear (PUE)		47 CFR §15(D)
	IC	2 GHz Licence Exempt Personal Communications Service Device (PCS)		RSS-213 Issue 2
Device Identifier(s)	**FCC ID:**	AMWUN175R		
	IC:	513C-UN175		
	Model(s)	D1680		
	Serial No.	SET-A2 (Identical Prototype)		
Device Description	Portable UPCS/LE-PCS 1.9 GHz DECT 6.0 Cordless Handset			
Mode(s) of Operation	TDMA/TDD (12 Uplink / 12 Downlink slots)			
Modulation Type(s)	FSK			
Transmit Frequency Range(s)	1921.536 - 1928.448 MHz			
Reference RF Output Power	20.4 dBm	110 mW	EIRP	1924.992 MHz
	7.4 dBm	5.5 mW	Source-Based Time-Averaged	1924.992 MHz
Maximum Duty Cycle Tested	5 %	Crest Factor: 1:20	Source-Based Time-Averaged	TDMA/TDD
Antenna Type(s) Tested	Internal			
Battery Type(s) Tested	Ni-MH	2.4V	500mAh	Model: BT-1016
Body-worn Accessories Tested	None (n/a - DUT does not support body-worn transmit operations)			
Audio Accessories Tested	None (n/a - DUT does not support body-worn transmit operations)			

Max. SAR Level(s) Evaluated	**HEAD**	**0.033 W/kg**	**1g average**	**FCC/IC SAR Limit**	1.6 W/kg	1g average

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device was compliant with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6 for the General Population / Uncontrolled 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 4, IEEE Standard 1528-2003 and IEC International Standard 62209-1:2005. All measurements were performed in accordance with the SAR system manufacturer recommendations.

I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

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

This test report shall not be reproduced partially, or in full, without the prior written approval of Celltech Labs Inc.

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

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

TABLE OF CONTENTS

1.0 INTRODUCTION ____ 5

2.0 SAR MEASUREMENT SYSTEM ____ 5

3.0 SAR MEASUREMENT SUMMARY ____ 6

4.0 DETAILS OF SAR EVALUATION ____ 7

DETAILS OF SAR EVALUATION (CONT.) ____ 8

5.0 TIMING PLOT ____ 8

6.0 SAR EVALUATION PROCEDURES ____ 9

7.0 SYSTEM PERFORMANCE CHECK ____ 10

8.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES ____ 11

9.0 SIMULATED EQUIVALENT TISSUES ____ 11

10.0 SAR LIMITS ____ 11

11.0 ROBOT SYSTEM SPECIFICATIONS ____ 12

12.0 PROBE SPECIFICATION (EX3DV4) ____ 13

13.0 SAM TWIN PHANTOM V4.0C ____ 13

14.0 DEVICE HOLDER ____ 13

15.0 TEST EQUIPMENT LIST ____ 14

16.0 MEASUREMENT UNCERTAINTIES ____ 15

17.0 REFERENCES ____ 16

APPENDIX A - SAR MEASUREMENT DATA ____ 17

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA ____ 24

APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS ____ 27

APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS ____ 29

APPENDIX E - DIPOLE CALIBRATION ____ 35

APPENDIX F - PROBE CALIBRATION ____ 36

APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY ____ 37

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

REVISION HISTORY			
REVISION NO.	**DESCRIPTION**	**IMPLEMENTED BY**	**RELEASE DATE**
1.0	Initial Release	Jon Hughes	July 28, 2010

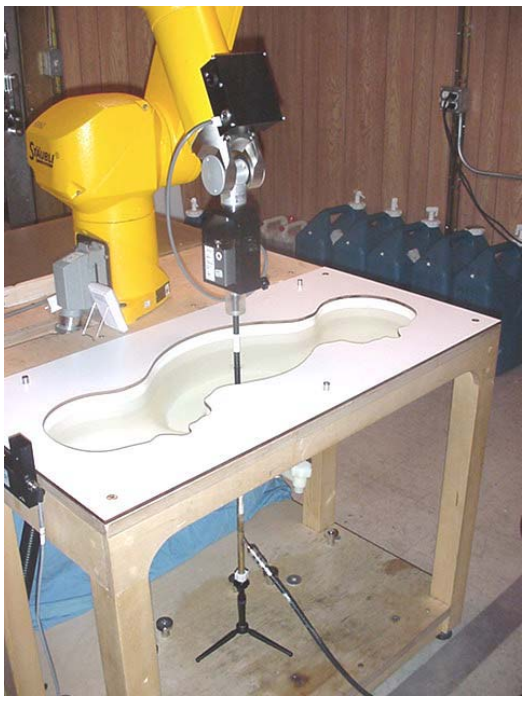
2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

1.0 INTRODUCTION

This measurement report demonstrates that the Uniden America Corporation Model: D1680 Portable 1.9 GHz UPCS/LE-PCS DECT 6.0 Cordless Handset complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]), IC RSS-102 Issue 4 (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 product, 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 utilizes a controller with built in VME-bus computer.



DASY4 System with SAM Twin Phantom V4.0C

DASY4 Measurement Server

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

3.0 SAR MEASUREMENT SUMMARY

SAR EVALUATION SUMMARY

Test Config.	Freq.	Ch.	Test Mode	Duty Cycle	Crest Factor	Phantom Section	Test Position	Reference RF Output Power (mW)		SAR Drift During Test	Measured SAR (1g)
	MHz							EIRP	SBTA*	dB	W/kg
HEAD	1924.992	3	Modulated TDMA/TDD	5%	1:20	Left Ear	Cheek/Touch	110	5.5	0.115	0.031
	1924.992	3	Modulated TDMA/TDD	5%	1:20	Left Ear	Ear/Tilt (15°)	110	5.5	0.195	0.028
	1924.992	3	Modulated TDMA/TDD	5%	1:20	Right Ear	Cheek/Touch	110	5.5	-0.097	**0.033**
	1924.992	3	Modulated TDMA/TDD	5%	1:20	Right Ear	Ear/Tilt (15°)	110	5.5	-0.209	0.025

SAR SAFETY LIMIT(S)		HEAD	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	Health Canada Safety Code 6	1.6 W/kg	1g average	General Population / Uncontrolled

Date(s) of Evaluation	June 08, 2010					Atmospheric Pressure	101.1	kPa
Measured Fluid Type	1900 MHz HEAD					Ambient Temperature	24.0	°C
Dielectric Constant ε_r	IEEE Target		Frequency	Meas.	Deviation	Fluid Temperature	22.5	°C
	40.0	± 5%	1920 MHz	39.3	-1.8%	Relative Humidity	35	%
Conductivity σ (mho/m)	IEEE Target		Frequency	Meas.	Deviation	Fluid Depth	≥ 15	cm
	1.40	± 5%	1920 MHz	1.42	+1.4%	ρ (Kg/m^3)	1000	

Notes

1. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. The transmission band of the DUT is less than 10 MHz; therefore mid channel data only is reported (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
3. The SAR drift of the DUT was measured by the DASY4 system for the duration of the SAR evaluations.
4. The Ni-MH battery installed in the DUT was fully charged prior to the SAR evaluations.
5. The fluid temperature was measured prior to and after the SAR evaluations to ensure the temperature remained within +/- 2°C of the fluid temperature reported during the dielectric parameter measurements.
6. The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).
7. * SBTA = Source-Based Time-Averaged

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

4.0 DETAILS OF SAR EVALUATION

The Uniden America Corporation Model: D1680 Portable UPCS/LE-PCS 1.9 GHz DECT 6.0 Cordless Handset was compliant for localized Specific Absorption Rate (Uncontrolled Exposure) based on the test provisions and conditions described below. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A. The detailed test setup photographs are shown in Appendix D.

Ear-held Configuration(s)

1) The DUT was tested in an ear-held configuration on both the left and right head sections of the SAM phantom at the mid channel of the operating band. If the transmission band of the DUT is less than 10 MHz then mid channel data only was reported (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).

a) The handset was placed in the device holder in a normal operating position with the test device reference point located along the vertical centerline on the front of the device aligned to the ear reference point, with the center of the earpiece touching the center of the ear spacer of the SAM phantom.

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

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

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

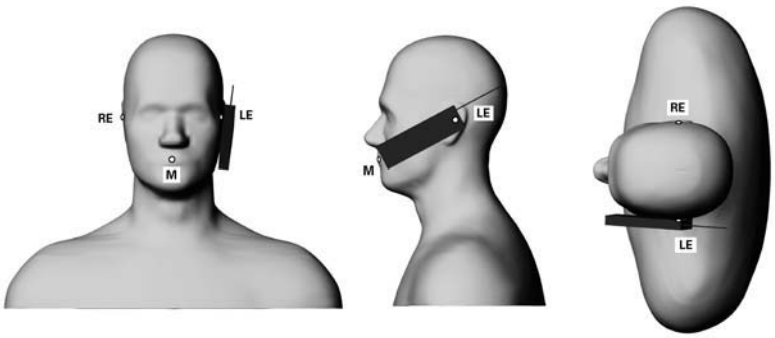


Figure 1. Position 1, "cheek" or "touch" position. The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for device positioning, are indicated (Shoulders are shown for illustration only).

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

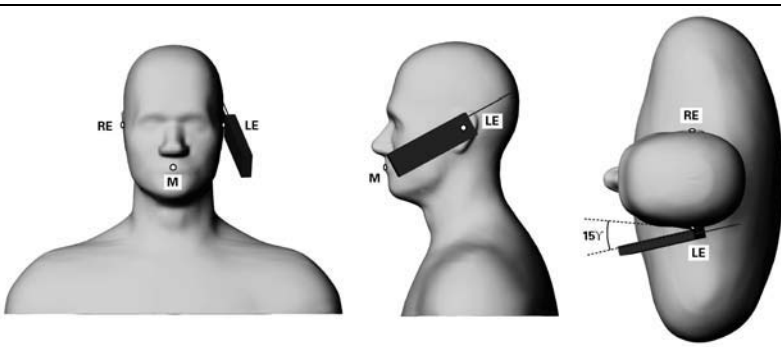


Figure 2. Position 2, "tilted position." The reference points for the right ear (RE), left ear (LE) and mouth (M), which define the reference plane for device positioning, are indicated (Shoulders are shown for illustration only).

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

DETAILS OF SAR EVALUATION (Cont.)

Body-worn Configuration(s)

2) Not applicable. The DUT does not support body-worn transmit operations.

Test Mode(s)

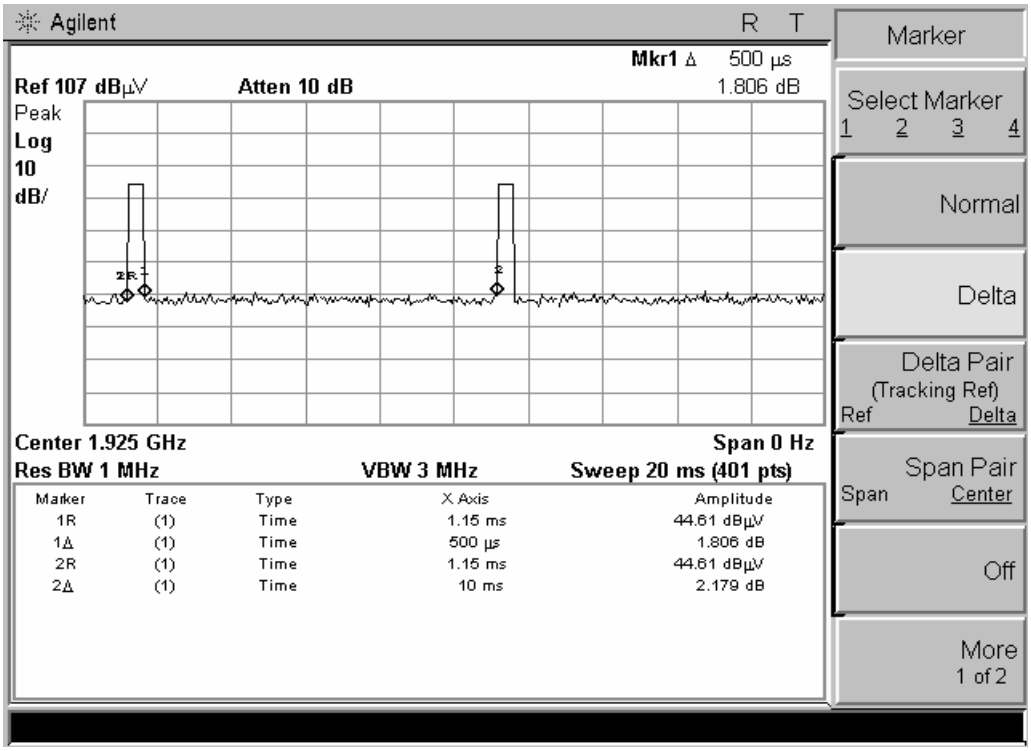
3) The DUT was placed in test mode using internal test software provided by Uniden and programmed via the handset keypad.

4) The DUT was tested with a modulated TDMA signal and a source-based time-averaged duty cycle of 5% (crest factor = 1:20).

Output Power

5) The RF conducted output power of the test sample could not be measured by Celltech Labs Inc. due to the internal antenna type. The RF conducted output power level of the DUT was preset by the manufacturer. The EIRP power level referenced in this report was measured by Timco Engineering Inc. using the same test sample.

5.0 TIMING PLOT



0.500 ms / 10.0 ms
= 5 % Duty Cycle

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

6.0 SAR EVALUATION PROCEDURES

a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
(ii) For body-worn and face-held devices a planar phantom was used.

b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.
An area scan was determined as follows:

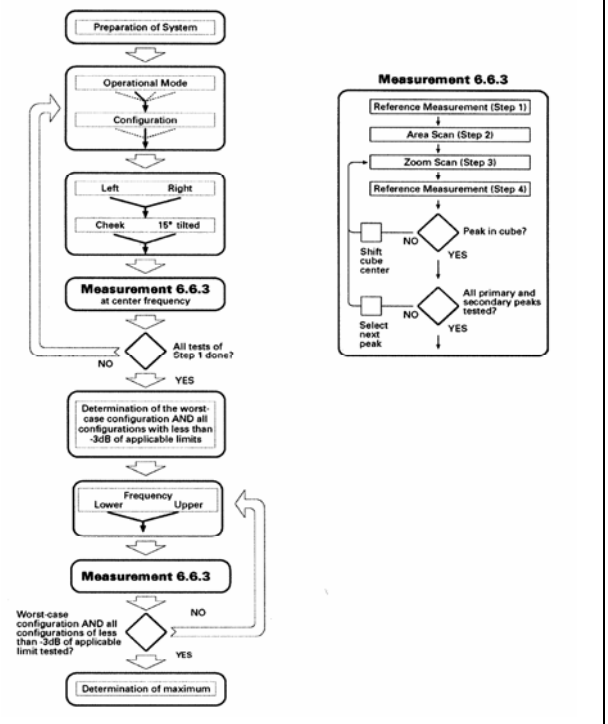
c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.

d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.
A 1g and 10g spatial peak SAR was determined as follows:

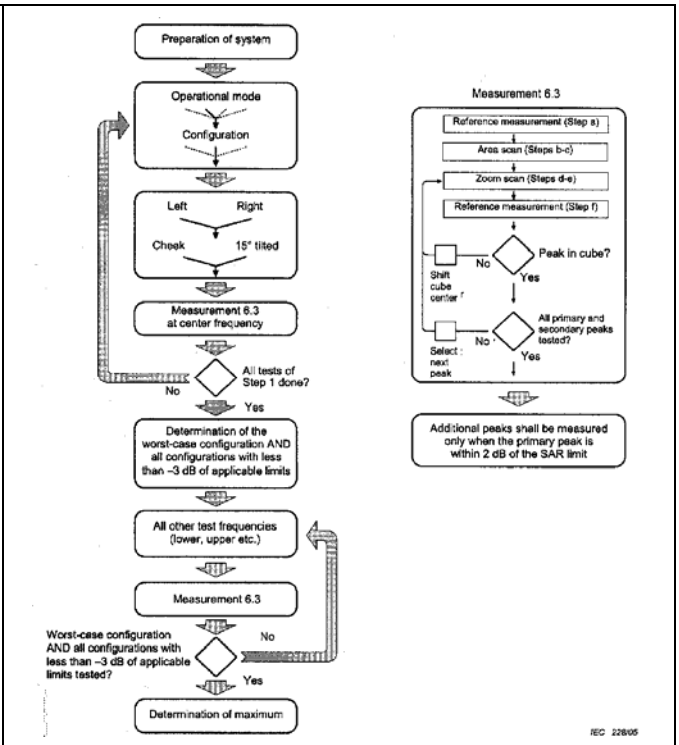
e. Extrapolation is used to determine the values between the dipole center of the probe and the surface of the phantom. This data cannot be measured because the center of the dipole sensors is 1.0 mm away from the probe tip and the distance between the probe and the boundary must be larger than 25% of the probe diameter. The probe diameter is 2.4 mm. In the DASY4 software, the distance between the sensor center and phantom surface is set to 2.0 mm. This provides a distance of 1.0 mm between the probe tip and the surface. The extrapolation of the values between the dipole center and the surface of the phantom was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.

f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).

g. A zoom scan volume of 32 mm x 32 mm x 30 mm (5x5x7 points) centered at the peak SAR location determined from the area scan is used for all zoom scans for devices with a transmit frequency < 800 MHz. Zoom scans for frequencies ≥ 800 MHz are determined with a scan volume of 30 mm x 30 mm x 30 mm (7x7x7 points) to ensure complete capture of the peak spatial-average SAR.



Flow Chart for determining the largest peak spatial-average SAR from all device configurations per IEEE Standard 1528-2003 (see reference [5]).



Block diagram of the tests to be performed per IEC International Standard 62209-1:2005 (see reference [6]).

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

7.0 SYSTEM PERFORMANCE CHECK

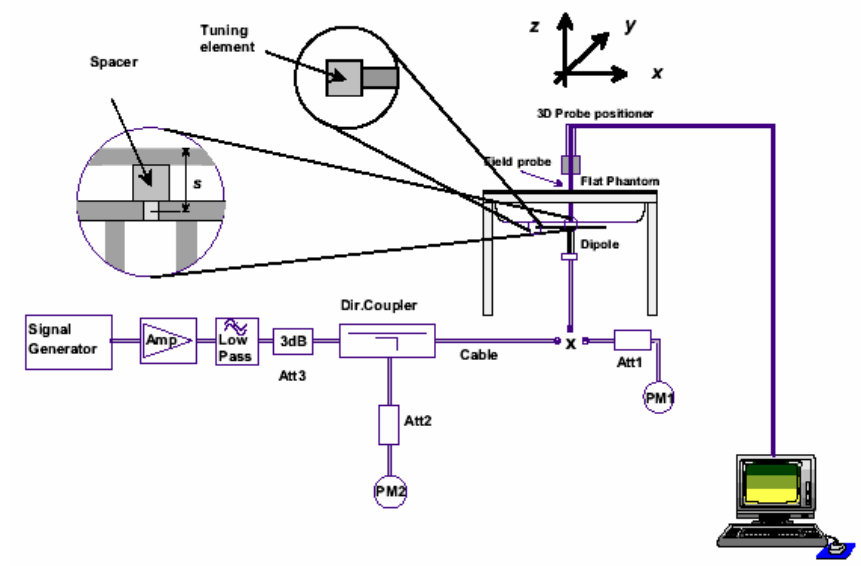
Prior to the SAR evaluations, a daily system check was performed at the planar section of the SAM phantom with a 1900MHz SPEAG dipole (see Appendix B for system performance check test plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±10% from the system manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ε_r			Conductivity σ (mho/m)			ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
	Freq. (MHz)	SPEAG Target	Meas.	Dev.	SPEAG Target	Meas.	Dev.	SPEAG Target	Meas.	Dev.						
Jun- 08	HEAD 1900	10.6 ±10%	10.2	-3.8%	40.0 ±5%	39.2	-2.0%	1.40 ±5%	1.40	0.0%	1000	24.0	22.2	≥ 15	35	101.1

Note(s)

1. The target SAR value is the measured value from the dipole calibration performed by SPEAG (see Appendix E).
2. The target dielectric parameters are the nominal values from the dipole calibration performed by SPEAG (see Appendix E).
3. The fluid temperature was measured prior to and after the system performance check to ensure the temperature remained within +/-2°C of the fluid temperature reported during the dielectric parameter measurements.
4. 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 (IEEE 1528-2003)

1900 MHz Validation Dipole Setup

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

8.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES

The following procedures are recommended for measurements at 150 MHz - 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies. In general, SAR measurements below 300 MHz should be within ±50 MHz of the probe calibration frequency. At 300 MHz to 3 GHz, measurements should be within ±100 MHz of the probe calibration frequency. Measurements exceeding 50% of these intervals, ±25 MHz < 300 MHz and ±50 MHz ≥300 MHz, require additional steps (per FCC KDB 450824 D01 v01r01, SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz - see reference [8]).

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	±50 MHz ≥ 300 MHz
1950 MHz	1924.992	25.008 MHz	< 50 MHz

The probe calibration and measurement frequency interval is < 50 MHz; therefore the additional steps are not required for this evaluation.

9.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipe listed in the table below is derived from the SAR system manufacturer's suggested recipe in the DASY4 manual (see reference [9]) in accordance with the procedures and requirements specified in IEEE Standard 1528-2003 (see reference [5]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

1900 MHz SIMULATED TISSUE MIXTURES	
INGREDIENT	**1900 MHz Head**
Water	55.85 %
Glycol Monobutyl	44.00 %
Salt	0.15 %

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.			

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

11.0 ROBOT SYSTEM SPECIFICATIONS

Specifications	
Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6
Data Acquisition Electronic (DAE) System	
Cell Controller	
Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional
Data Converter	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY4, V4.7 Build 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
Connecting Lines	Optical downlink for data and status info.; Optical uplink for commands and clock
DASY4 Measurement Server	
Function	Real-time data evaluation for field measurements and surface detection
Hardware	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface
E-Field Probe	
Model	EX3DV4
Serial No.	3600
Construction	Symmetrical design with triangular core
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
Phantom(s)	
Type	SAM V4.0C
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 25 liters

2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

12.0 PROBE SPECIFICATION (EX3DV4)

Construction:	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g. DGBE)
Calibration:	Basic Broadband Calibration in air: 10-3000 MHz Conversion Factors (CF) for HSL 900 and HSL 1750
Frequency:	10 MHz to >6 GHz; Linearity: ±0.2 dB (30 MHz to 3 GHz)
Directivity:	±0.3 dB in HSL (rotation around probe axis) ±0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range:	10 μW/g to >100 mW/g; Linearity: ±0.2 dB (noise: typically < 1 μW/g)
Dimensions:	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1.0 mm
Application:	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better than 30%.

EX3DV4 E-Field Probe

13.0 SAM TWIN PHANTOM V4.0C

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

SAM Twin Phantom V4.0C

14.0 DEVICE HOLDER

The DASY4 device holder has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65°. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

Device Holder

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

15.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
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	27Apr10	Annual
x	-EX3DV4 E-Field Probe	00213	3600	29Apr10	Annual
x	-D1900V2 Validation Dipole	00218	5d107	21Apr09	Biennial
x	-SAM Twin Phantom V4.0C	00154	1033	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	04May10	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833699	04May10	Biennial
x	HP 8753ET Network Analyzer	00134	US39170292	04May10	Biennial
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required; N/A = Not Applicable				

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

16.0 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_i or V_{eff}
Measurement System									
Probe Calibration (1950 MHz)	E.2.1	5.5	Normal	1	1	1	5.5	5.5	∞
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	∞
Test Sample Related									
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	∞
Phantom and Tissue Parameters									
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	1.4	Normal	1	0.64	0.43	0.9	0.6	∞
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measured)	E.3.3	1.8	Normal	1	0.6	0.49	1.1	0.9	∞
Combined Standard Uncertainty			**RSS**				**10.45**	**10.27**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**				**20.89**	**20.53**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

17.0 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 4: March 2010.

[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] International Standard IEC 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 D01v04: November 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.

[9] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 17 Application Note, Head Tissue Recipe: Sept. 2005.

[10] International Standard ISO/IEC 17025:2005 - “General requirements for the competence of testing and calibration laboratories”.

2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

APPENDIX A - SAR MEASUREMENT DATA

2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

Test Date: 06/08/2010

Head SAR - Left Ear - Cheek-Touch Position - Mid Channel - 1924.99 MHz

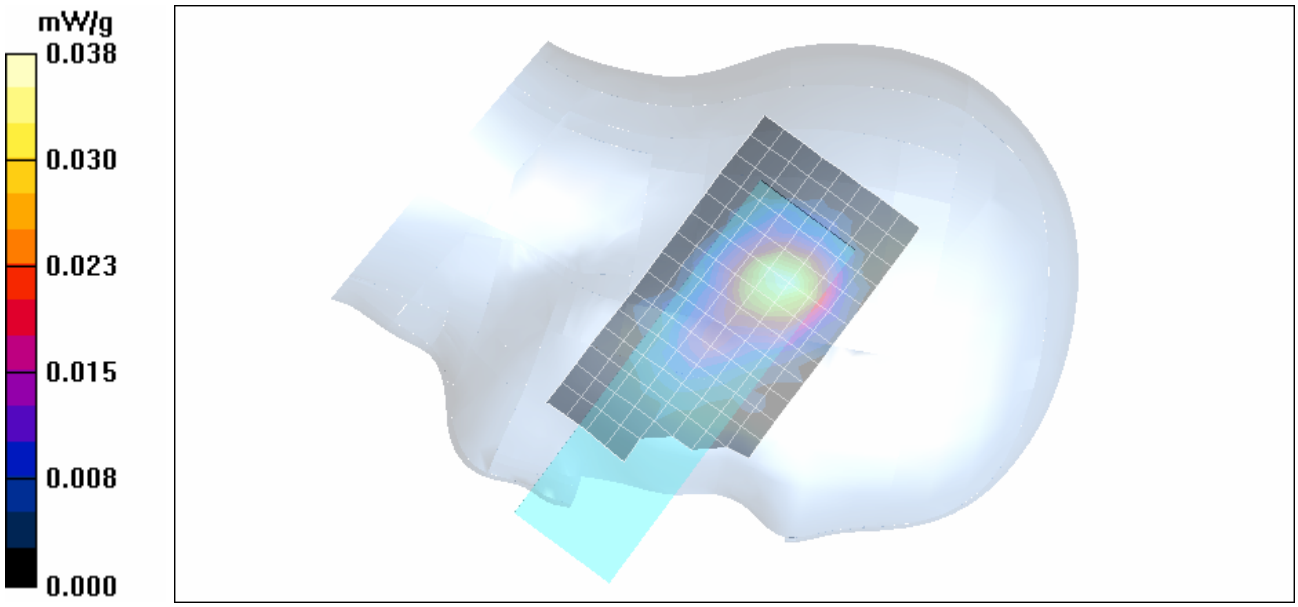
DUT: Uniden Model: D1680; Type: 1.9GHz UPCS/LE-PCS DECT 6.0 Handset; Serial: SET-A2

Ambient Temp: 24.0°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: TDMA/TDD 1900
Frequency: 1924.99 MHz; Duty Cycle: 1:20
Medium: HSL1900 Medium parameters used: f = 1924.99 MHz; σ = 1.42 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.46, 6.46, 6.46); Calibrated: 29/04/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - Left Ear - Cheek-Touch Position - Mid Channel
Area Scan (9x16x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.039 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.00 V/m; Power Drift = 0.115 dB
Peak SAR (extrapolated) = 0.059 W/kg
SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.018 mW/g



2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

Test Date: 06/08/2010

Head SAR - Left Ear - Tilt Position (15°) - Mid Channel - 1924.99 MHz

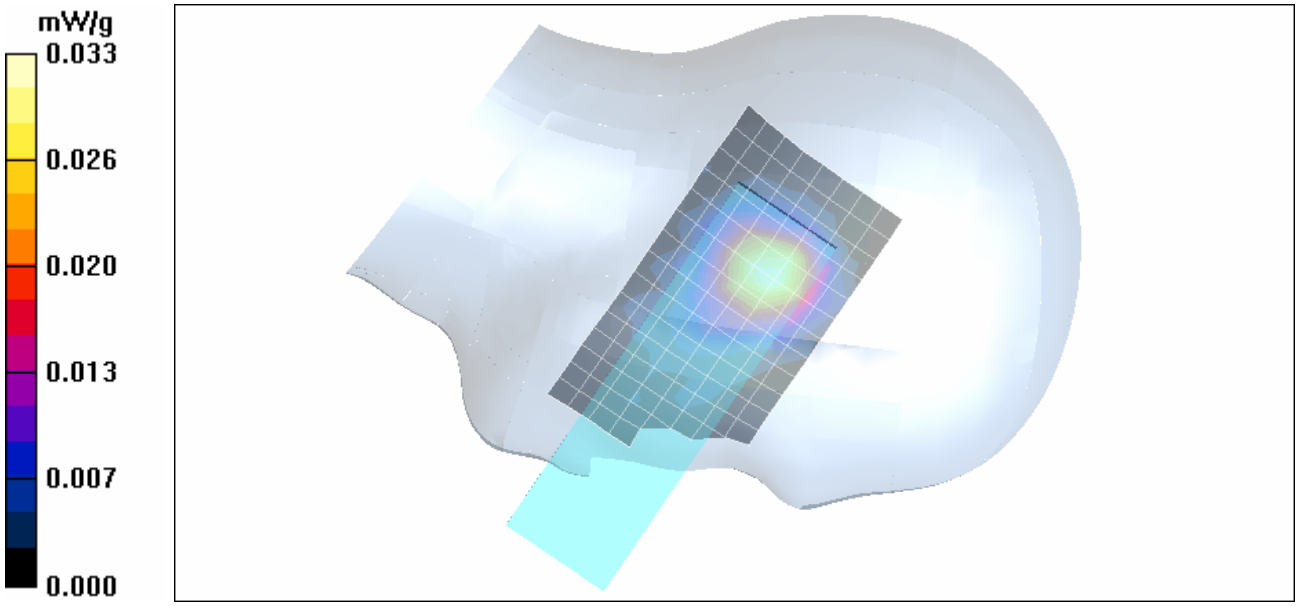
DUT: Uniden Model: D1680; Type: 1.9GHz UPCS/LE-PCS DECT 6.0 Handset; Serial: SET-A2

Ambient Temp: 24.0°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: TDMA/TDD 1900
Frequency: 1924.99 MHz; Duty Cycle: 1:20
Medium: HSL1900 Medium parameters used: f = 1924.99 MHz; σ = 1.42 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.46, 6.46, 6.46); Calibrated: 29/04/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - Left Ear - Tilt Position (15°) - Mid Channel
Area Scan (9x16x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.034 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.88 V/m; Power Drift = 0.195 dB
Peak SAR (extrapolated) = 0.047 W/kg
SAR(1 g) = 0.028 mW/g; SAR(10 g) = 0.016 mW/g



2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

Test Date: 06/08/2010

Head SAR - Right Ear - Cheek-Touch Position - Mid Channel - 1924.99 MHz

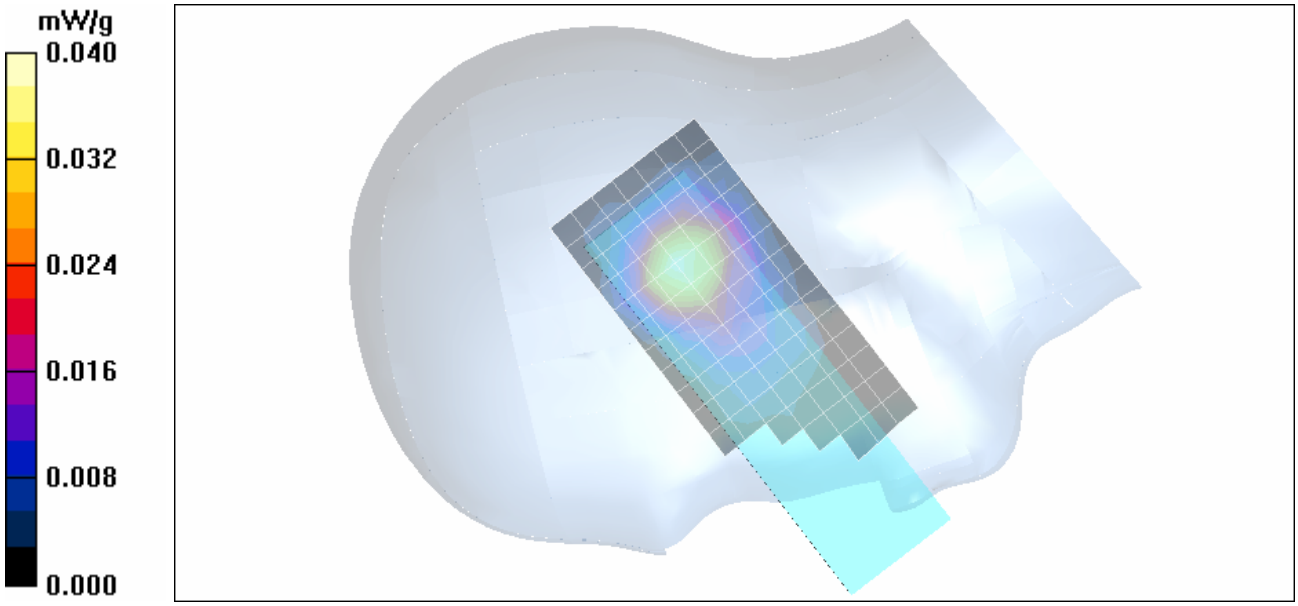
DUT: Uniden Model: D1680; Type: 1.9GHz UPCS/LE-PCS DECT 6.0 Handset; Serial: SET-A2

Ambient Temp: 24.0°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

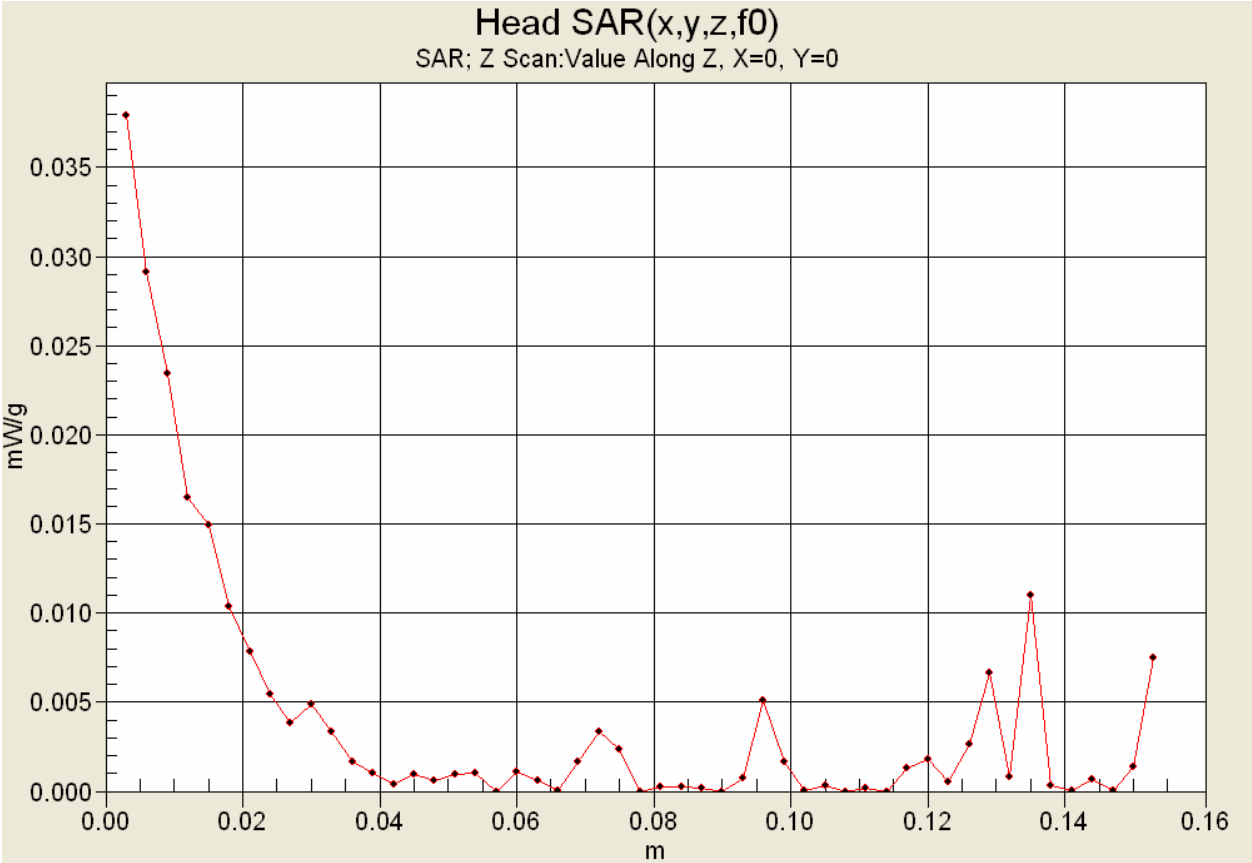
Communication System: TDMA/TDD 1900
Frequency: 1924.99 MHz; Duty Cycle: 1:20
Medium: HSL1900 Medium parameters used: f = 1924.99 MHz; σ = 1.42 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.46, 6.46, 6.46); Calibrated: 29/04/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - Right Ear - Cheek-Touch Position - Mid Channel
Area Scan (8x15x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.040 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.31 V/m; Power Drift = -0.097 dB
Peak SAR (extrapolated) = 0.056 W/kg
SAR(1 g) = 0.033 mW/g; SAR(10 g) = 0.020 mW/g



Z-Axis Scan



Due to the very low SAR level measured, the Z-axis scan is only reporting noise. The DASY4 software adjusts the scale according to the measured SAR level, which for this evaluation is close to the measurement noise floor.

2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

Test Date: 06/08/2010

Head SAR - Right Ear - Tilt Position (15°) - Mid Channel - 1924.99 MHz

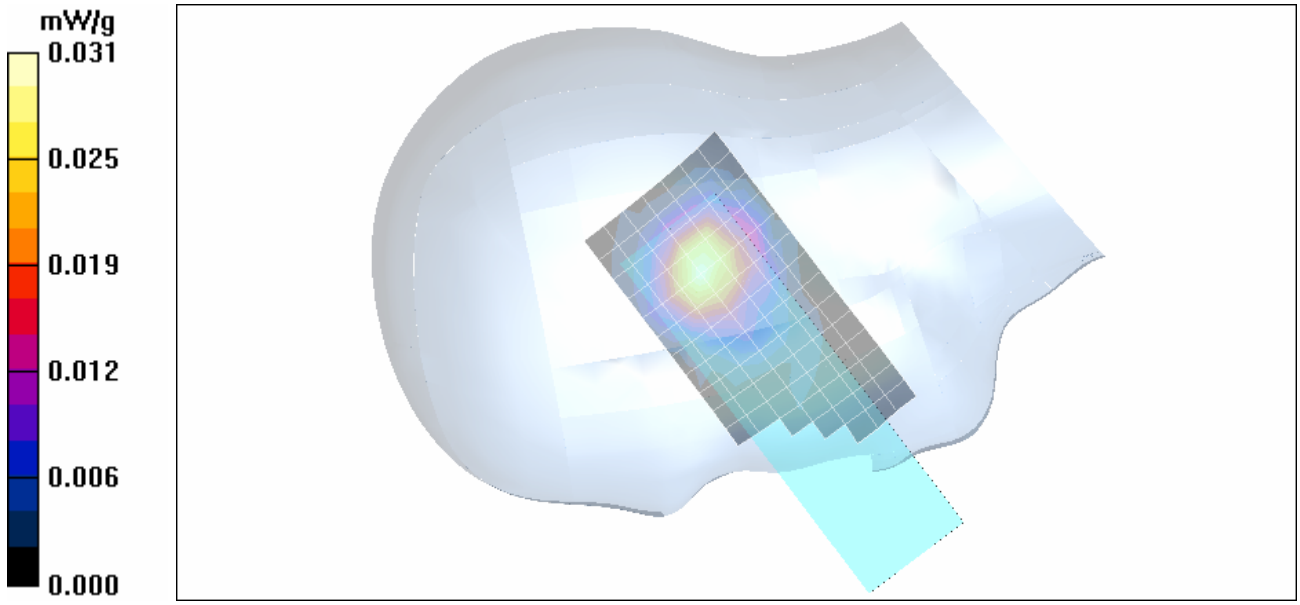
DUT: Uniden Model: D1680; Type: 1.9GHz UPCS/LE-PCS DECT 6.0 Handset; Serial: SET-A2

Ambient Temp: 24.0°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: TDMA/TDD 1900
Frequency: 1924.99 MHz; Duty Cycle: 1:20
Medium: HSL1900 Medium parameters used: f = 1924.99 MHz; σ = 1.42 mho/m; ε_r = 39.3; ρ = 1000 kg/m^3

- Probe: EX3DV4 - SN3600; ConvF(6.46, 6.46, 6.46); Calibrated: 29/04/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head SAR - Right Ear - Tilt Position (15°) - Mid Channel
Area Scan (8x15x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.031 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.64 V/m; Power Drift = -0.209 dB
Peak SAR (extrapolated) = 0.044 W/kg
SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.014 mW/g



2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

Fluid Depth (>15cm)

Left Head Section

Right Head Section

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

Date/Time: 06/08/2010

System Performance Check - 1900 MHz Validation Dipole - HSL

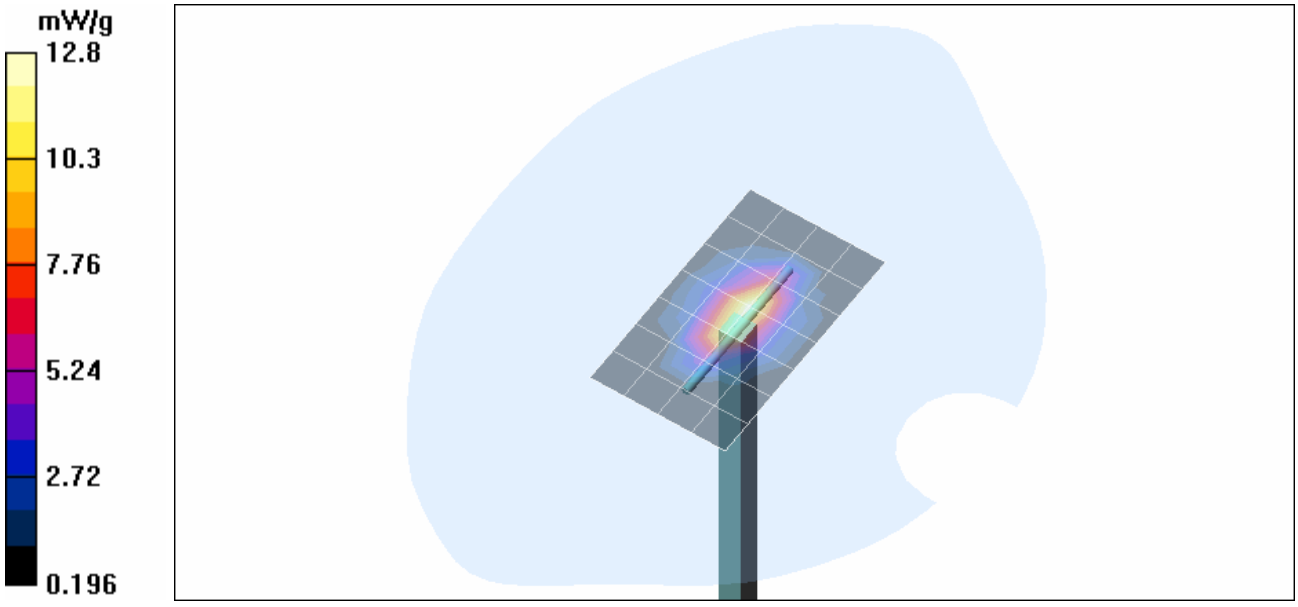
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d107; Calibrated: 21/04/2009

Ambient Temp: 24.0°C; Fluid Temp: 22.2°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL1900 Medium parameters used: f = 1900 MHz; σ = 1.4 mho/m; ε_r = 39.2; ρ = 1000 kg/m^3

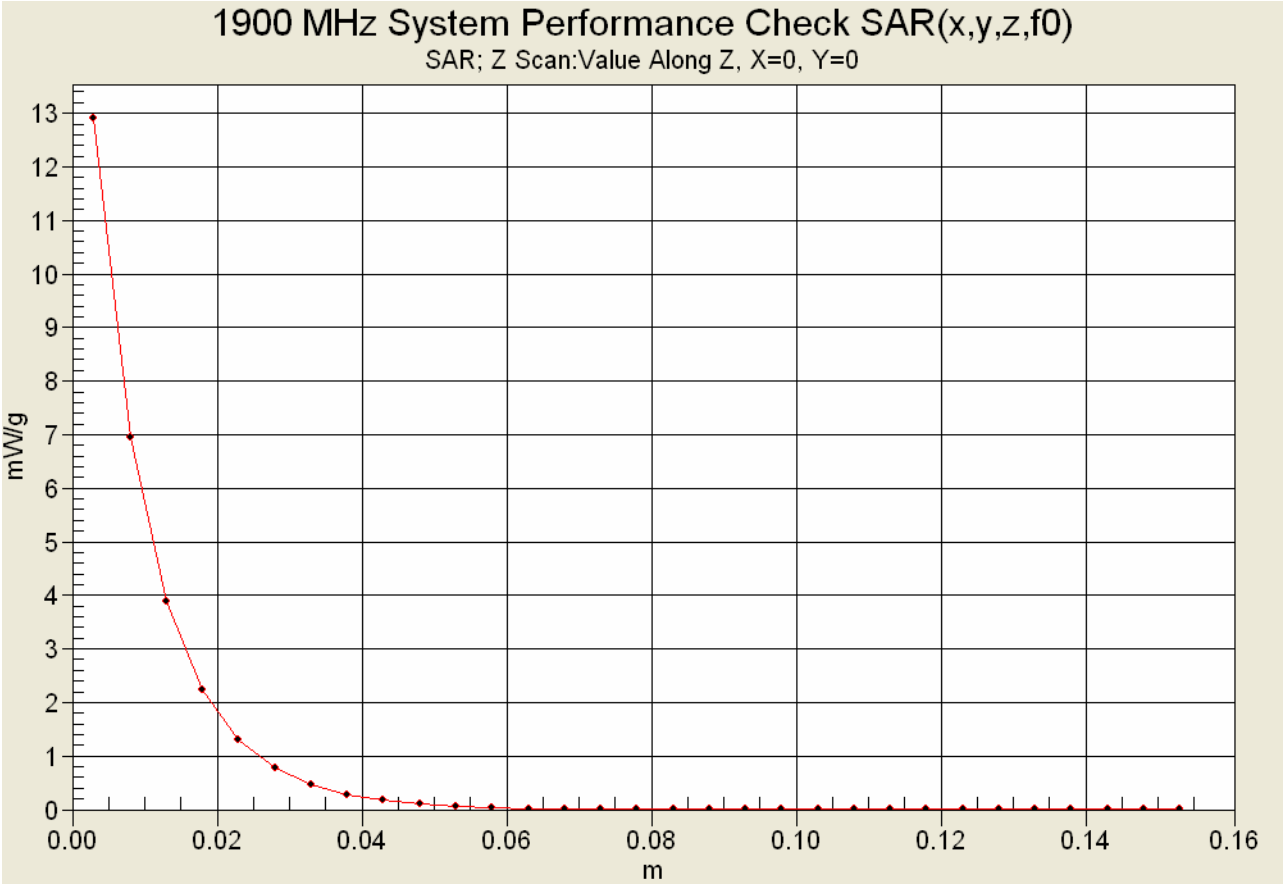
- Probe: EX3DV4 - SN3600; ConvF(6.46, 6.46, 6.46); Calibrated: 29/04/2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

1900 MHz Dipole - System Performance Check
Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 12.6 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.2 V/m; Power Drift = -0.093 dB
Peak SAR (extrapolated) = 19.4 W/kg
SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.2 mW/g
Maximum value of SAR (measured) = 12.8 mW/g



2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

Z-Axis Scan


1900 MHz System Performance Check SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
m
0
1
2
3
4
5
6
7
8
9
10
11
12
13
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16

APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

1900 MHz System Performance Check & 1920 MHz DUT Evaluation (Head)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
08/Jun/2010
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
1.8000	40.00	1.40	39.22	1.30
1.8100	40.00	1.40	39.08	1.31
1.8200	40.00	1.40	39.22	1.32
1.8300	40.00	1.40	39.21	1.32
1.8400	40.00	1.40	39.20	1.33
1.8500	40.00	1.40	39.19	1.34
1.8600	40.00	1.40	39.17	1.36
1.8700	40.00	1.40	39.32	1.36
1.8800	40.00	1.40	39.26	1.38
1.8900	40.00	1.40	39.33	1.39
1.9000	40.00	1.40	39.20	1.40
1.9100	40.00	1.40	39.23	1.41
1.9200	40.00	1.40	39.33	1.42
1.9300	40.00	1.40	39.21	1.41
1.9400	40.00	1.40	39.32	1.46
1.9500	40.00	1.40	39.36	1.44
1.9600	40.00	1.40	39.03	1.46
1.9700	40.00	1.40	39.12	1.48
1.9800	40.00	1.40	39.16	1.49
1.9900	40.00	1.40	39.21	1.51
2.0000	40.00	1.40	39.27	1.52

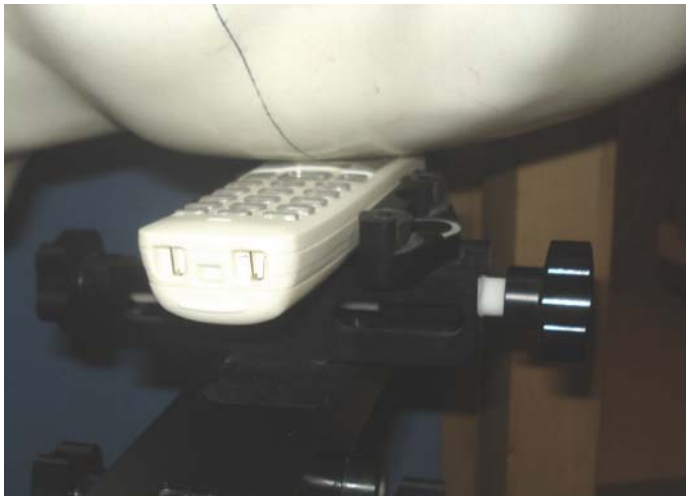
2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

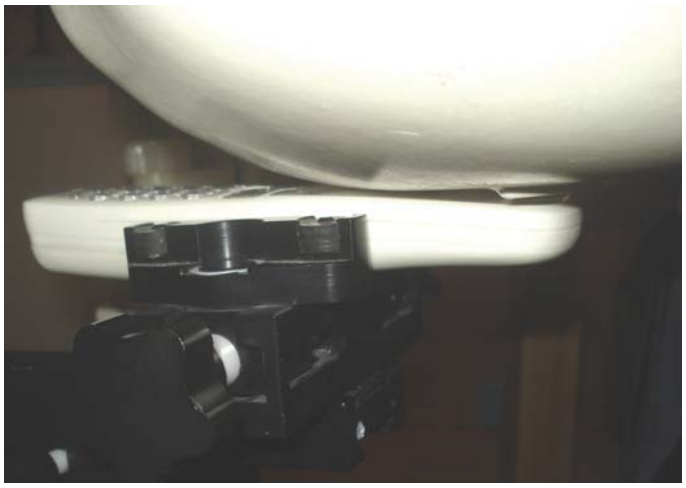
APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

HEAD SAR TEST SETUP PHOTOGRAPHS

Left Head Section / Cheek-Touch Position





2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

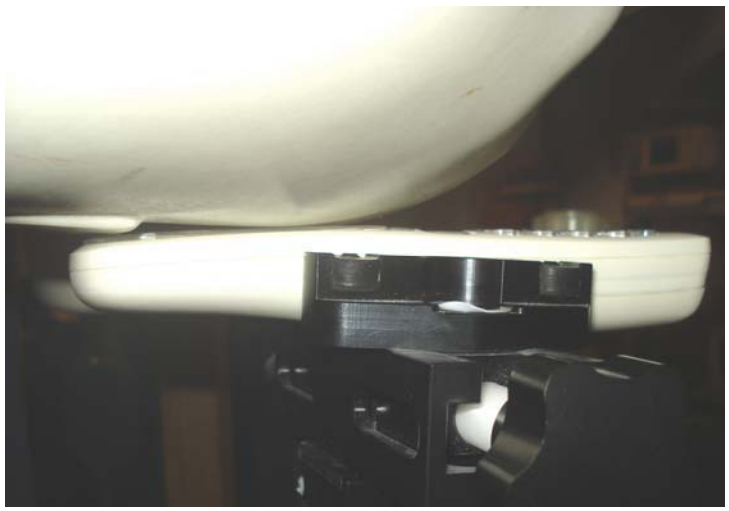
HEAD SAR TEST SETUP PHOTOGRAPHS

Left Head Section / Ear-Tilt Position (15°)

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

HEAD SAR TEST SETUP PHOTOGRAPHS

Right Head Section / Cheek-Touch Position



2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

HEAD SAR TEST SETUP PHOTOGRAPHS

Right Head Section / Ear-Tilt Position (15°)

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

DUT PHOTOGRAPHS

Front Side of DUT

Back Side of DUT

Left and Right Sides of DUT

Bottom end of DUT

Top end of DUT

Ni-MH Battery

2010 Celltech Labs Inc. This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

APPENDIX E - DIPOLE CALIBRATION

2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

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

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

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: D1900V2-5d107-Apr09

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d107
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	April 21, 2009
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 24, 2009

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

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters: The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.6 ± 6 %	1.47 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	10.6 mW / g
SAR normalized	normalized to 1W	42.4 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**40.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	5.45 mW / g
SAR normalized	normalized to 1W	21.8 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**21.4 mW / g ± 16.5 % (k=2)**

[1] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.9 ± 6 %	1.56 mho/m ± 6 %
Body TSL temperature during test	(21.3 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.6 mW / g
SAR normalized	normalized to 1W	42.4 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**42.1 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.62 mW / g
SAR normalized	normalized to 1W	22.5 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**22.4 mW / g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.0 Ω + 5.5 jΩ
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.9 Ω + 6.3 jΩ
Return Loss	- 22.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 28, 2008

DASY5 Validation Report for Head TSL

Date/Time: 15.04.2009 15:01:47

Test Laboratory: SPEAG, Zurich, Switzerland

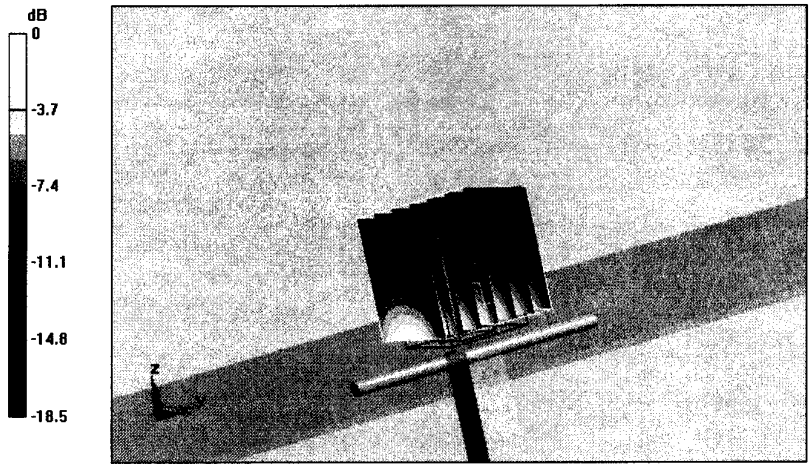
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d107

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: HSL U10 BB
Medium parameters used: f = 1900 MHz; σ = 1.47 mho/m; ε_r = 38.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

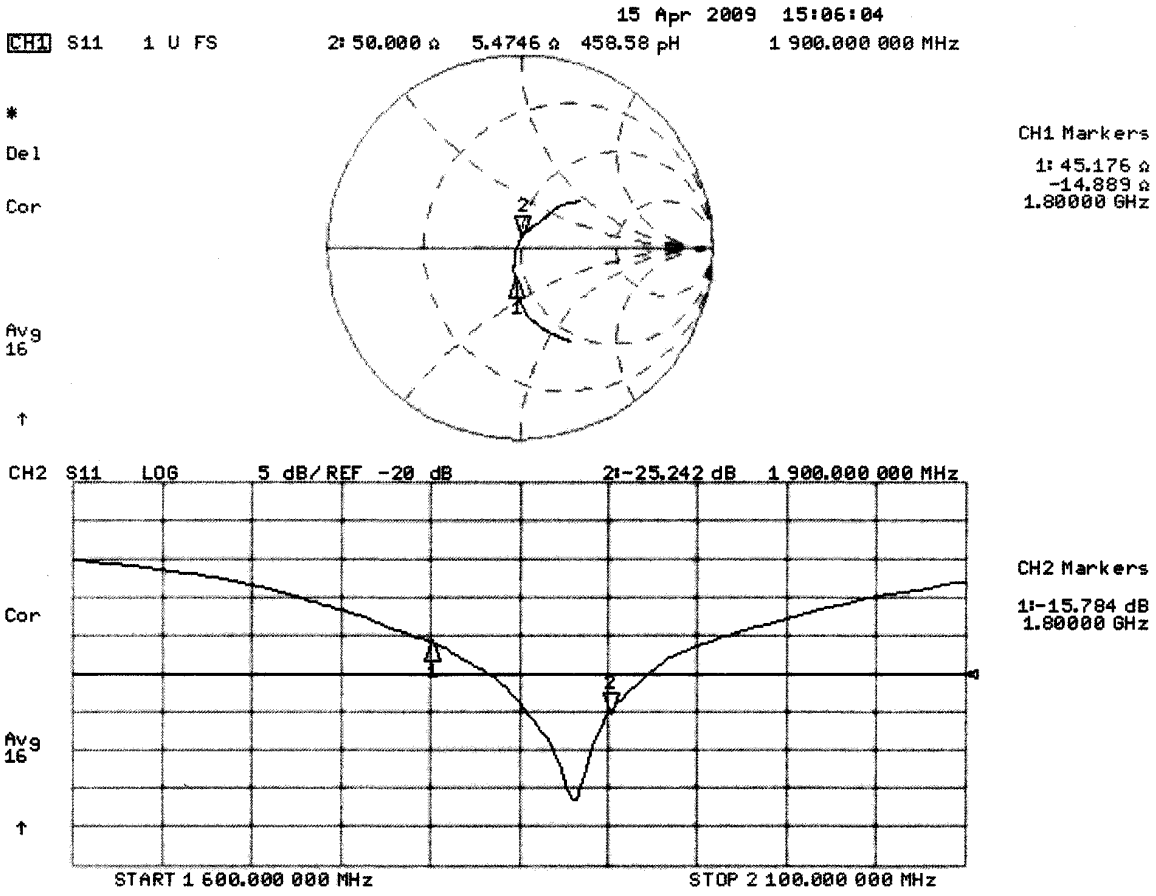
- Probe: ES3DV2 - SN3025; ConvF(4.9, 4.9, 4.9); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; dip = 10 mm, scan at 3.0 mm/Zoom Scan (dist=3.0 mm, probe 0deg) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.7 V/m; Power Drift = 0.031 dB
Peak SAR (extrapolated) = 20 W/kg
SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.45 mW/g
Maximum value of SAR (measured) = 13.2 mW/g



0 dB = 13.2mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 21.04.2009 15:29:55

Test Laboratory: SPEAG, Zurich, Switzerland

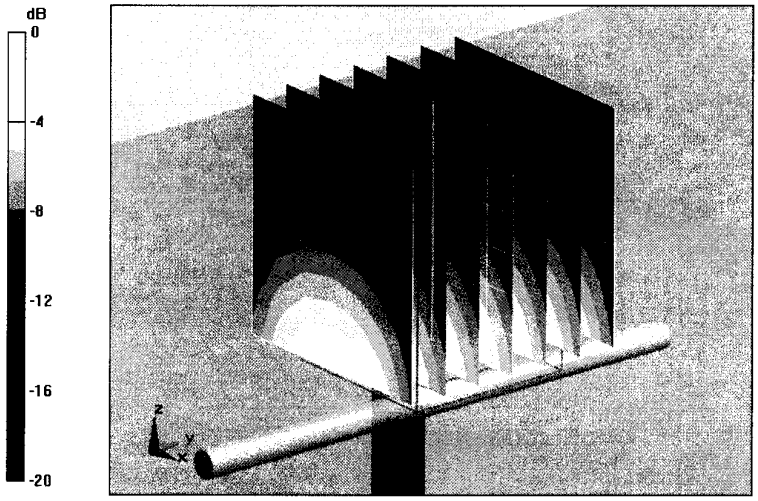
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d107

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB
Medium parameters used: f = 1900 MHz; σ = 1.56 mho/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

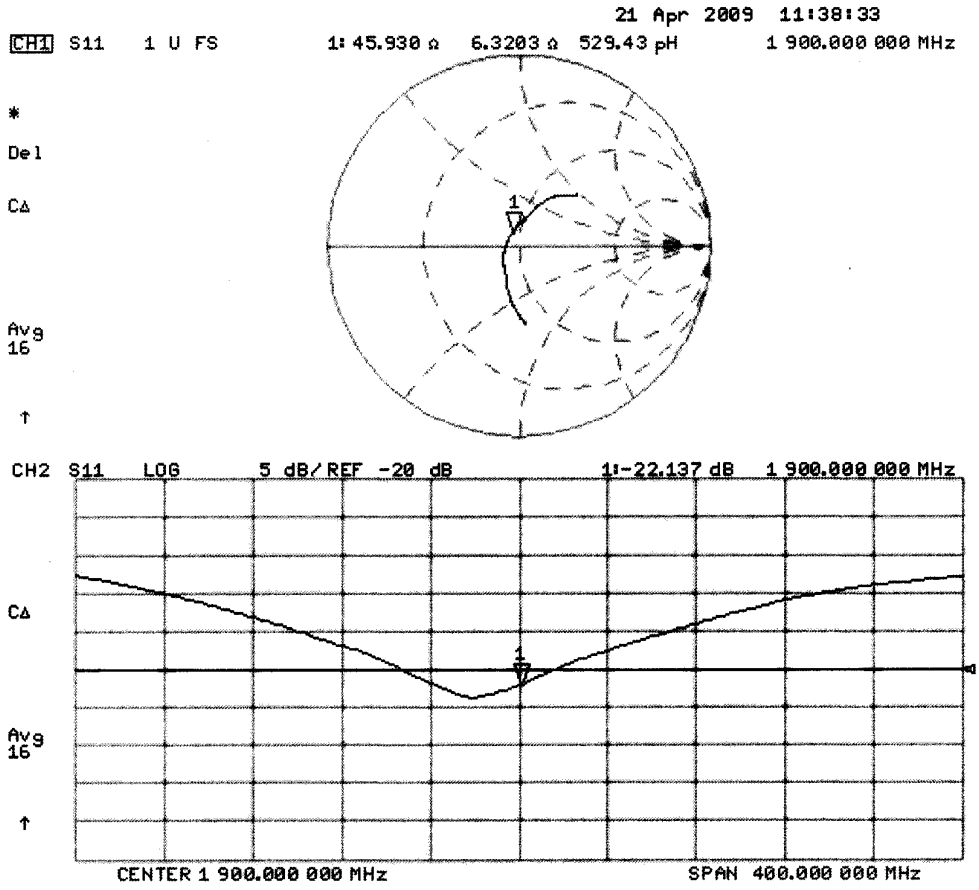
- Probe: ES3DV2 - SN3025; ConvF(4.5, 4.5, 4.5); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; dip = 10 mm, scan at 3.0mm/Zoom Scan (dist=3.4mm, probe 0deg) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.6 V/m; Power Drift = -0.00425 dB
Peak SAR (extrapolated) = 18.7 W/kg
SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.62 mW/g
Maximum value of SAR (measured) = 13.5 mW/g



0 dB = 13.5mW/g

Impedance Measurement Plot for Body TSL



APPENDIX F - PROBE CALIBRATION

2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

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

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

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: EX3-3600_Apr10

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3600
Calibration procedure(s)	QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	April 29, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

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

Issued: April 29, 2010

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) 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:

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

Probe EX3DV4

SN:3600

Manufactured:	January 10, 2007
Last calibrated:	April 28, 2009
Recalibrated:	April 29, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV4 SN:3600

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.51	0.51	0.40	± 10.1%
DCP (mV)[B]	90.5	88.5	85.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5%
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).

[B] Numerical linearization parameter: uncertainty not required.

[E] Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

DASY - Parameters of Probe: EX3DV4 SN:3600

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	7.79	7.79	7.79	0.74	0.61 ± 11.0%
1810	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	6.79	6.79	6.79	0.59	0.70 ± 11.0%
1950	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	6.46	6.46	6.46	0.57	0.72 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	6.15	6.15	6.15	0.34	0.89 ± 11.0%

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

DASY - Parameters of Probe: EX3DV4 SN:3600

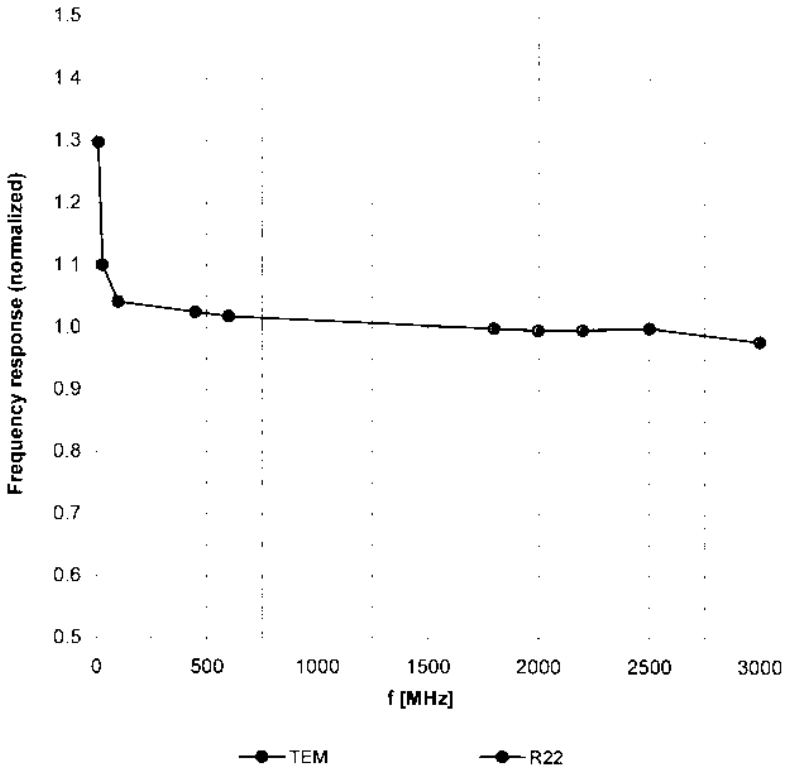
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	7.92	7.92	7.92	0.50	0.77 ± 11.0%
1810	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	6.47	6.47	6.47	0.70	0.64 ± 11.0%
1950	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	6.53	6.53	6.53	0.64	0.67 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	6.24	6.24	6.24	0.43	0.87 ± 11.0%
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	3.73	3.73	3.73	0.52	1.95 ± 13.1%
5500	± 50 / ± 100	48.6 ± 5%	5.65 ± 5%	3.30	3.30	3.30	0.58	1.95 ± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	3.44	3.44	3.44	0.63	1.95 ± 13.1%

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

Frequency Response of E-Field

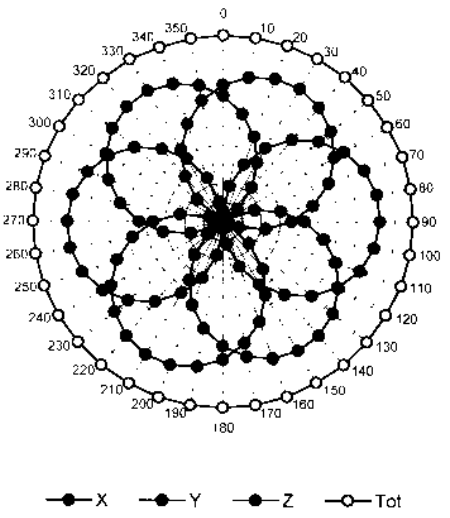
(TEM-Cell:ifi110 EXX, Waveguide: R22)



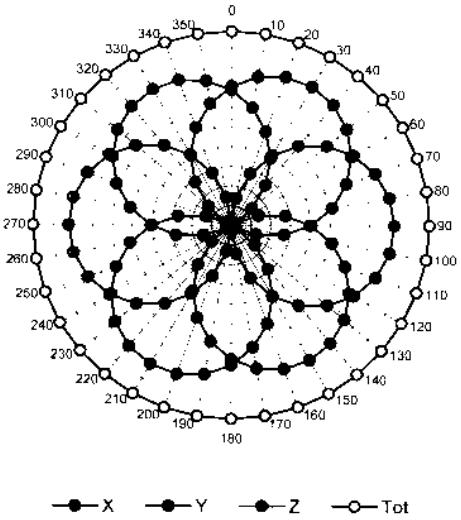
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

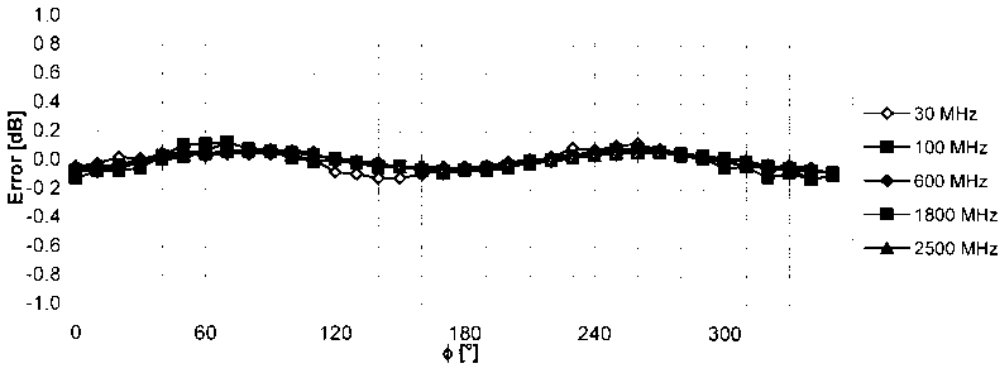
Receiving Pattern (ϕ), ϑ = 0°

f = 600 MHz, TEM ifi110EXX



f = 1800 MHz, WG R22

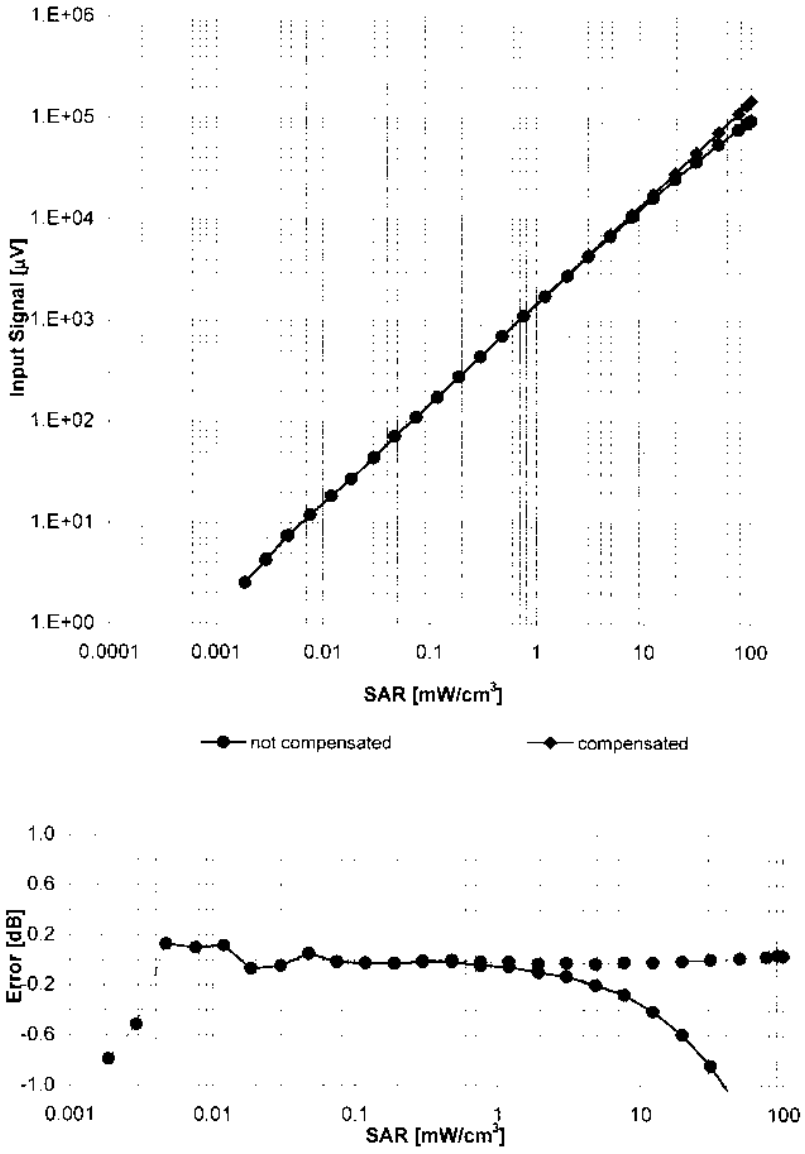




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

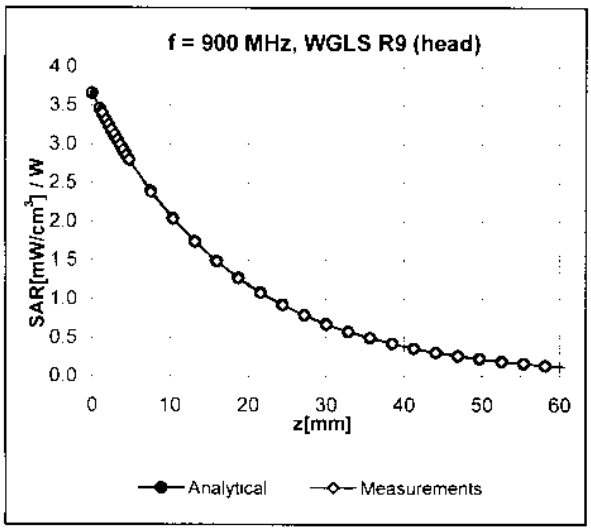
Dynamic Range f(SAR_{head})

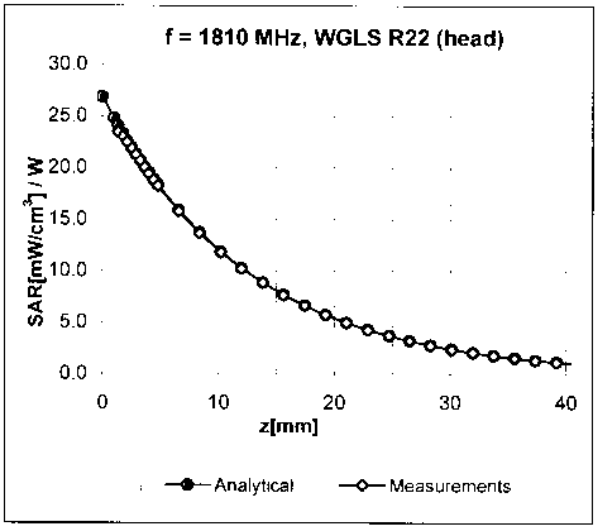
(Waveguide R22, f = 1800 MHz)



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

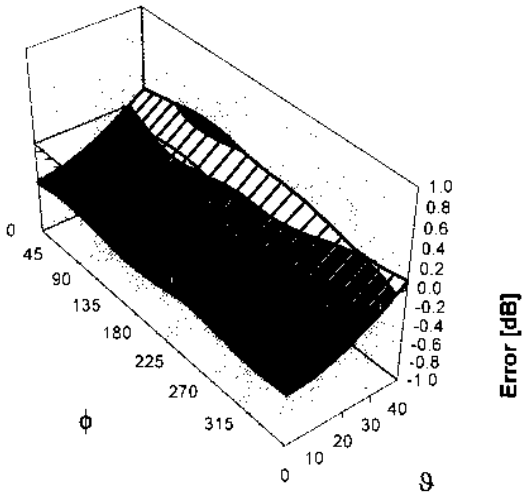
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



■-1.00--0.80 ■-0.80--0.60 ■-0.60--0.40 ■-0.40--0.20 ■-0.20-0.00
□0.00-0.20 ■0.20-0.40 □0.40-0.60 ■0.60-0.80 ■0.80-1.00

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY

2010 Celltech Labs Inc. | This document is not to be reproduced in whole or in part without the prior written permission of Celltech Labs Inc.

Schmid & Partner
Engineering AG

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

Certificate of conformity / First Article Inspection

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

Tests

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

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

Standards

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

Conformity

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

Date 18.11.2001

Signature / Stamp Schmid & Partner Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79