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

Test Lab Information	**Name**	**CELLTECH LABS INC.**				
	Address	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada				
Test Lab Accreditation(s)	**A2LA**	ISO/IEC 17025:2005 (A2LA Test Lab Certificate No. 2470.01)				
Applicant Information	**Name**	**KENWOOD USA CORPORATION**				
	Address	3970 Johns Creek Court, Suite 100, Suwanee, GA 30024 United States				
Application Type(s)	**FCC**	TCB Certification		**IC**	CB Certification	
Standard(s) Applied	**FCC**	47 CFR §2.1093		**IC**	Health Canada Safety Code 6	
Procedure(s) Applied	**FCC**	OET Bulletin 65, Supplement C		**FCC**	KDB 447498 D01v04	
	FCC	KDB 643646 D01v01 - SAR Test Reduction Considerations for Occupational PTT Radios				
	IC	RSS-102 Issue 4	**IEEE**	1528-2003	**IEC**	62209-1:2005
Device Classification(s)	**FCC**	Licensed Non-Broadcast Transmitter Held to Face (TNF) - FCC Part 90				
	IC	Land Mobile Radio Transmitter/Receiver (27.41-960 MHz) - RSS-119 Issue 10				
Device Identifier(s)	**FCC ID:**	ALH431001		**IC**	282D-431001	
Device Model(s) Tested	NX-320-K4 (No LCD)	NX-320-K5 (LCD & 4 Control keys)		NX-320-K6 (LCD, 4 CTRL keys & DTMF keys)		
Test Sample Serial No.(s)	0320K411 (K4)	0320K507 (K5)	No. 11 (K6)	all (3) test samples are identical prototypes		
Test Sample Revision No.s	**Hardware**	Revision 1.0		**Firmware**	Revision 1.0	
Date of Sample Receipt	December 15, 2010					
Date(s) of SAR Evaluations	January 06-07, 21 & March 04, 2011					
Device Description	Portable FM UHF-L Push-To-Talk (PTT) Radio Transceiver					
Transmit Frequency Range(s)	**FCC**	406.1-470.0 MHz				
	IC	406.1-430.0 MHz; 450.0-470.0 MHz				
Manuf. Rated Output Power	5 Watts (Conducted)		**Manuf. Tolerance Specification**	+/- 0 dB		
Antenna Type(s) Tested	Detachable Stub	440.0-470.0 MHz	Length = 80 mm	P/N: KRA-23M	A	
	Detachable Stub	406.1-450.0 MHz	Length = 80 mm	P/N: KRA-23M3	B	
	Detachable Whip	440.0-470.0 MHz	Length = 149 mm	P/N: KRA-27M	C	
	Detachable Whip	406.1-450.0 MHz	Length = 170 mm	P/N: KRA-27M3	D	
Battery Type(s) Tested	Lithium-Ion	7.4 V	2000 mAh	P/N: KNB-57L	a	
	Lithium-Ion	7.4 V	1480 mAh	P/N: KNB-55L	b	
	Nickel-Metal Hydride	7.2 V	1400 mAh	P/N: KNB-56N	c	
	Alkaline Case	9 V	6 x AA	P/N: KBP-5	d	
Body-worn Accessories Tested	Belt-Clip (contains metal)			P/N: KBH-12	1	
	Swivel Belt-Loop (contains metal)			P/N: KBH-13DS	2	
Audio Accessories Tested	Noise Reduction Headset - Behind-the-Head (default audio accessory)			P/N: KHS-10-BH		
	D-Ring Ear Hanger w/ PTT & Mic (default Earpiece audio accessory)			P/N: KHS-27		
	3-Wire Lapel Microphone (default Palm-Mic Wire Kit audio accessory)			P/N: KHS-9BL		
	Heavy Duty Speaker-Microphone (default Spkr-Mic audio accessory)			P/N: KMC-45		

Max. SAR Level(s) Evaluated	Face-held	**3.49 W/kg**	1g	50% PTT duty cycle	Occupational / Controlled Exposure
	Body-worn	**5.31 W/kg**	1g	50% PTT duty cycle	Occupational / Controlled Exposure
FCC/IC Spatial Peak SAR Limit	Head/Body	8.0 W/kg	1g	50% PTT duty cycle	Occupational / Controlled Exposure

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 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 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(s) evaluated.

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

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REVISION HISTORY			
REVISION NO.	**DESCRIPTION**	**IMPLEMENTED BY**	**RELEASE DATE**
1.0	Initial Release	Jon Hughes	January 31, 2011
1.1	Model Listing Corrections (per customer instruction)	Jon Hughes	February 09, 2011
1.2	**Add test data for radio models NX-320-K4 and NX-320-K5**	**Jon Hughes**	**March 04, 2011**

TEST REPORT SIGN-OFF			
DEVICE TESTED BY	**REPORT PREPARED BY**	**QA REVIEW BY**	**REPORT APPROVED BY**
Scott Kulifaj	Scott Kulifaj	Jon Hughes	Sean Johnston

1.0 INTRODUCTION

This measurement report demonstrates that the Kenwood USA Corporation Models: NX-320-K4, NX-320-K5, NX-320-K6 Portable FM UHF-L PTT Radio Transceiver complies with the SAR (Specific Absorption Rate) RF exposure requirements 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 01-01 (see reference [3]), IC RSS-102 Issue 4 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]) and IEC 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.

3.0 RF CONDUCTED OUTPUT POWER MEASUREMENTS

MEASURED RF CONDUCTED OUTPUT POWER LEVELS

Radio Model	Test Frequency	Mode	dBm	Watts	Method
NX-320-K6	406.1 MHz	CW	36.9	4.9	Average Conducted
	420.7 MHz	CW	37.0	5.0	Average Conducted
	435.4 MHz	CW	37.1	5.1	Average Conducted
	440.0 MHz	CW	37.1	5.1	Average Conducted
	450.0 MHz	CW	37.1	5.1	Average Conducted
	455.0 MHz	CW	37.1	5.1	Average Conducted
NX-320-K4	455.0 MHz	CW	37.0	5.0	Average Conducted
NX-320-K5	455.0 MHz	CW	37.1	5.1	Average Conducted
NX-320-K6	470.0 MHz	CW	37.1	5.1	Average Conducted

Notes

1. The test channels were selected in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [7]).

2. The RF conducted output power levels of the DUT were measured by Celltech prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter at the external antenna connector of the radio in accordance with FCC 47 CFR §2.1046 (see reference [13]) and IC RSS-Gen (see reference [14]).

4.0 FCC POWER THRESHOLDS FOR PTT DEVICES ($f \leq 0.5$ GHz)

FCC SAR Evaluation Power Thresholds for PTT Devices, $f \leq 0.5$ GHz*			Manufacturer's Rated RF Output Power	
Exposure Conditions	***P* mW (General Population)**	***P* mW (Occupational)**	**100% PTT Duty Cycle**	**50% PTT Duty Cycle**
Held to face, $d \geq 2.5$ cm	250	**1250**	5 Watts	**2.5 Watts**
Body-worn, $d \geq 1.5$ cm	200	**1000**		
Body-worn, $d \geq 1.0$ cm	150	**750**		
1. The time-averaged output power, corresponding to the required PTT duty factor, is compared with these thresholds. 2. The closest distance between the user and the device or its antenna is used to determine the power thresholds. * Per FCC KDB 447498 D01v04 Section 5)b)i) (see reference [7]).			1. The conducted output power level of the DUT exceeds the FCC threshold for SAR evaluation requirement.	

5.0 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 [9]).

Probe Calibration Frequency	Device Measurement Frequency	Frequency Interval	±50 MHz (≥ 300 MHz)
450 MHz	406.1 MHz	43.9 MHz	< 50 MHz[1]
	420.7 MHz	29.3 MHz	< 50 MHz[1]
	435.4 MHz	14.6 MHz	< 50 MHz[1]
	440.0 MHz	10 MHz	< 50 MHz[1]
	450.0 MHz	0 MHz	< 50 MHz[1]
	455.0 MHz	5 MHz	< 50 MHz[1]
	470.0 MHz	20 MHz	< 50 MHz[1]
1. The probe calibration and measurement frequency interval is < 50 MHz; therefore the additional steps were not required.			

6.0 NO. OF TEST CHANNELS (N_c)

Antenna Part No.		Antenna Freq. Range	Test Freq. Range	N_c	Test Frequencies
A	KRA-23M	440.0 - 490.0 MHz	440.0 - 470.0 MHz	3	440.0, 455.0, 470.0 MHz
B	KRA-23M3	400.0 - 450.0 MHz	406.1 - 450.0 MHz	4	406.1, 420.7, 435.4,450.0 MHz
C	KRA-27M	440.0 - 490.0 MHz	440.0 - 470.0 MHz	3	440.0, 455.0, 470.0 MHz
D	KRA-27M3	400.0 - 450.0 MHz	406.1 - 450.0 MHz	4	406.1, 420.7, 435.4,450.0 MHz
Note: The number of test channels (*Nc*) were calculated in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [7]).					

7.0 MANUFACTURER'S DISCLOSED ACCESSORY LISTING

Part No.	Description		Accessory Type
KRA-23M	Detachable Stub (440-490 MHz)		Antenna
KRA-23M3	Detachable Stub (400-450 MHz)		
KRA-27M	Detachable Whip (440-490 MHz)		
KRA-27M3	Detachable Whip (400-450 MHz)		
KNB-57L	Lithium-ion, 2000 mAh, 7.4 V		Battery
KNB-55L	Lithium-ion, 1480 mAh, 7.4 V		
KNB-56N	Nickel-Metal Hydride, 1400 mAh, 7.2 V		
KBP-5	Alkaline Battery Case, 6xAA, 9 V		
KBH-12	Belt-Clip (contains metal)		Body-worn
KBH-13DS	Swivel Belt-Loop (contains metal)		
KHS-10-BH	Noise Reduction Headset (Behind the head)	Headset (Audio Accessory Category 1)	Audio
KHS-10-OH	Noise Reduction Headset (Over the head)		
KHS-21	Lightweight Headset – no VOX or PTT controls		
KHS-22	Behind-the-Head Headset w/ Boom Mic & PTT		
KHS-7	Single Muff Headset w/ Boom Mic		
KHS-7A	Single Muff Headset w/ Boom Mic & PTT		
KHS-23	2-Wire Ear-Bud w/ mic/PTT - Vox Ready	Earpiece (Audio Accessory Category 2)	
KHS-25	Earhook w/ Mini Boom Mic		
KHS-26	Clip Mic w/ Earphone		
KHS-27	D-Ring Ear Hanger w/ PTT & Mic		
KEP-2	Earphone Kit (for use w/ KMC-21 & KMC-45)		
KHS-8BE/BL	2-Wire Palm Mic w/ Earphone	Palm-Microphone Kit (Audio Accessory Category 3)	
KHS-9BE/BL	3-Wire Lapel Microphone w/ Earpiece		
KMC-21	Slim-Line Speaker-Microphone	Speaker-Microphone (Audio Accessory Category 4)	
KMC-45	Heavy Duty Speaker-Microphone		
KMC-48GPS	Speaker-Microphone with Integral GPS Unit		

Notes:

1. Manufacturer's disclosed accessory listing information was provided by Kenwood USA Corporation.

8.0 SAR MEASUREMENT SUMMARY

FACE-HELD SAR EVALUATION RESULTS

C	Test Date(s): 1/6/11 & 3/4/11*			1	2	3	4	5	6	7	8
R	Antenna Part No. & Test Freq. Range (MHz)	Test Freq. (MHz)	Cond. Pwr (W)	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g
				Battery KNB-57L (a)		Battery KNB-55L (b)		Battery KNB-56N (c)		Battery KBP-5 (d)	
				100% ptt d/f	50% ptt d/f	100% ptt d/f	50% ptt d/f	100% ptt d/f	50% ptt d/f	100% ptt d/f	50% ptt d/f
				Drift (dB)	50%+droop	Drift dB	50%+droop	Drift dB	50%+droop	Drift dB	50%+droop
1	ANT. A KRA-23M (440-470)	440.0	5.1	N/A		N/A		N/A		N/A	
2		455.0	5.1	F1 5.53	2.77	N/A		N/A		N/A	
3				-0.211	2.91						
4		470.0	5.1	N/A		N/A		N/A		N/A	
5	ANT. B KRA-23M3 (406.1-450)	406.1	4.9	N/A		N/A		N/A		N/A	
6		420.7	5.0	N/A		N/A		N/A		N/A	
7		435.4	5.1	F2 4.39	2.20	N/A		N/A		N/A	
8				0.087	-						
9		450.0	5.1	N/A		N/A		N/A		N/A	
10	ANT. C KRA-27M (440-470)	440.0	5.1	N/A		N/A		N/A		N/A	
11		455.0	5.1	F3 6.26	3.13	F4 6.71	3.36	F5 5.98	2.99	F6 5.11	2.56
12				-0.243	3.31	-0.170	**3.49**	-0.571	3.41	-1.29	3.44
13		455.0 (K4)*	5.0	N/A		F7 6.25	3.13	N/A		N/A	
14						-0.236	3.30				
15		455.0 (K5)*	5.1	N/A		F8 5.77	2.89	N/A		N/A	
16						-0.275	3.08				
17		470.0	5.1	N/A		N/A		N/A		N/A	
18	ANT. D KRA-27M3 (406.1-450)	406.1	4.9	N/A		N/A		N/A		N/A	
19		420.7	5.0	N/A		N/A		N/A		N/A	
20		435.4	5.1	F9 5.39	2.70	N/A		N/A		N/A	
21				-0.078	2.75						
22		450.0	5.1	N/A		N/A		N/A		N/A	

SAR LIMITS		HEAD	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	Health Canada Safety Code 6	8.0 W/kg	1g averaging	Occupational / Controlled

Notes

* All SAR levels are for Model NX-320-K6 except as indicated. Models NX-320-K4 and NX-320-K5 were evaluated at the maximum SAR level configuration previously measured with Model NX-320-K6. The rationale for re-evaluating the maximum SAR level configuration only was based on FCC KDB Inquiry Tracking No. 743809: "for (Model y) and (Model z) please include held-to-face/head SAR for antenna & battery that gave highest SAR for (Model x) - if SAR for (Model y) or (Model z) is more than 15 % higher than (Model x) for that antenna & battery, please contact FCC Lab for other guidance". The SAR levels reported for Models NX-320-K4 and NX-320-K5 in the above table are not more than 15 % higher than Model NX-320-K6; therefore no further testing was performed for Models NX-320-K4 and NX-320-K5.

Test Mode = CW (Unmodulated Continuous Wave) | Phantom = Side Planar Phantom

DUT Spacing to Planar Phantom per Battery (see Appendix D)				Antenna Distance to Planar Phantom per Battery (see Appendix D)			
KNB-57L (a)	KNB-55L (b)	KNB-56N (c)	KBP-5 (d)	KNB-57L (a)	KNB-55L (b)	KNB-56N (c)	KBP-5 (d)
2.5 cm	2.5 cm	2.5 cm	2.5 cm	3.7 cm	3.7 cm	3.7 cm	3.7 cm

F1-F9 (F = Face) denotes the corresponding Face SAR Plot # as shown in Appendix A

Test Procedures applied in accordance with FCC KDB 643646 D01v01 (see reference [8])

1. For face-held configuration, the highest capacity battery was selected as the default battery (battery "a").

2. The SAR evaluations commenced at the highest output power channel per antenna and frequency range.

3. When the head SAR of an antenna tested on the highest output power channel using the default battery is ≤ 4.0 W/kg (50% PTT duty factor), testing of the required immediately adjacent channel(s) is not necessary. When the head SAR of an antenna tested on the highest output power channel using the default battery is ≤ 3.5 W/kg (50% PTT duty factor), testing of all other required channels is not necessary.

4. When the SAR for all antennas tested using the default battery is ≤ 4.0 W/kg (50% PTT duty factor), test additional batteries using the antenna and channel configuration that resulted in the highest SAR (C4R12, C6R12, C8R12).

5. When test reduction applies, the slots for such configurations are denoted with N/A (Not Applicable).

SAR MEASUREMENT SUMMARY (CONT.)

BODY-WORN SAR EVALUATION RESULTS (Belt-Clip with Default Audio Accessory P/N: KHS-10-BH)

C	Test Date(s): Jan. 7 & 21, 2011			1	2	3	4	5	6	7	8
R	Antenna Part No. & Test Freq. Range (MHz)	Test Freq. (MHz)	Cond. Pwr (W)	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g
				Battery KNB-57L (a)		Battery KNB-55L (b)		Battery KNB-56N (c)		Battery KBP-5 (d)	
				Belt-Clip KBH-12 (1)		Belt-Clip KBH-12 (1)		Belt-Clip KBH-12 (1)		Belt-Clip KBH-12 (1)	
				Audio KHS-10-BH (default)		Audio KHS-10-BH (default)		Audio KHS-10-BH (default)		Audio KHS-10-BH (default)	
				100% ptt d/f	50% ptt d/f	100% ptt d/f	50% ptt d/f	100% ptt d/f	50% ptt d/f	100% ptt d/f	50% ptt d/f
				Drift dB	50%+droop	Drift dB	50%+droop	Drift dB	50%+droop	Drift dB	50%+droop
1	ANT. A KRA-23M (440-470)	440.0	5.1	N/A		B1 8.33	4.17	N/A		N/A	
2						-0.207	4.37				
3		455.0	5.1	N/A		B2 8.41	4.21	N/A		N/A	
4						-0.411	4.62				
5		470.0	5.1	N/A		B3 9.21	4.61	N/A		N/A	
6						-0.214	4.84				
7	ANT. B KRA-23M3 (406.1-450)	406.1	4.9	N/A		N/A		N/A		N/A	
8		420.7	5.0	N/A		N/A		N/A		N/A	
9		435.4	5.1	N/A		B4 6.43	3.22	N/A		N/A	
10						-0.080	3.28				
11		450.0	5.1	N/A		N/A		N/A		N/A	
12	ANT. C KRA-27M (440-470)	440.0	5.1	B8 9.53	4.77	B5 9.77	4.89	B9 8.67	4.34	B10 7.39	3.70
13				-0.271	5.07	-0.363	**5.31**	-0.441	4.80	-1.28	4.96
14		455.0	5.1	N/A		B6 9.13	4.57	N/A		N/A	
15						-0.377	4.98				
16		470.0	5.1	N/A		B7 9.03	4.52	N/A		N/A	
17						-0.191	4.72				
18	ANT. D KRA-27M3 (406.1-450)	406.1	4.9	N/A		B12 9.17	4.59	N/A		N/A	
19						-0.109	4.70				
20		420.7	5.0	N/A		B13 8.52	4.26				
21						-0.196	4.46				
22		435.4	5.1	N/A		B11 7.45	3.73	N/A		N/A	
23						-0.052	3.77				
24		450.0	5.1	N/A		N/A		N/A		N/A	

All SAR measurements reported above were performed with Model NX-320-K6 only. Models NX-320-K4 and NX-320-K5 were not evaluated for body-worn SAR based on the following rationale per FCC KDB Inquiry Tracking No. 743809: "for (Model y) and (Model z) please include body "without audio accessories and body "default audio by categ" SAR for combinations / configurations that gave SAR > 6 W/kg for (Model x)." The maximum SAR level reported for Model NX-320-K6 was < 6 W/kg; therefore Models NX-320-K4 and NX-320-K5 were not evaluated.

Test Mode = CW (Unmodulated Continuous Wave)				Phantom = Side Planar Phantom			
DUT Spacing to Planar Phantom per Battery (see Appendix D)				**Antenna Distance to Planar Phantom per Battery (see Appendix D)**			
KNB-57L (a)	**KNB-55L (b)**	**KNB-56N (c)**	**KBP-5 (d)**	**KNB-57L (a)**	**KNB-55L (b)**	**KNB-56N (c)**	**KBP-5 (d)**
1.6 cm	1.5 cm	1.7 cm	1.7 cm	2.7 cm	2.6 cm	2.8 cm	2.8 cm

B1-B13 (B = Body) denotes the corresponding Body SAR Plot # as shown in Appendix A

Test Procedures applied in accordance with FCC KDB 643646 D01v01 (see reference [8])

1. For body-worn configuration, the thinnest standard battery was selected as the default battery (battery "b").

2. The SAR evaluations commenced at the highest output power channel per antenna and frequency range.

3. When the body SAR of an antenna tested on the highest output power channel using the default battery is ≤ 3.5 W/kg (50% PTT duty factor), testing of all other required channels is not necessary (C4R10).

4. When the body SAR of an antenna tested on the highest output channel using the default battery is > 3.5 W/kg and ≤ 4.0 W/kg (50% PTT duty factor), testing of the immediately adjacent channel(s) is not necessary, but testing of other required channels may still be required (C4R23, C4R19).

5. When the body SAR of an antenna tested on the highest output power channel using the default battery is > 4.0 W/kg and ≤ 6.0 W/kg (50% PTT duty factor), testing of the required immediately adjacent channel(s) is necessary (C4R2, C4R4, C4R13, C4R15). For the remaining channels that cannot be excluded, this rule may be applied recursively with respect to the highest output power channel among the remaining channels (C4R6, C4R17, C4R21).

6. When the highest SAR for all antennas tested using the default battery is > 4.0 W/kg and ≤ 6.0 W/kg (50% PTT duty factor), test additional batteries using the antenna and channel configuration that resulted in the highest SAR (C2R13, C6R13, C8R13).

7. The Noise Reduction Headset (Behind-the-Head) P/N: KHS-10-BH was selected as the default audio accessory based on preliminary evaluations resulting in the most conservative SAR of all the disclosed audio accessories.

8. When test reduction applies, the slots for such configurations are denoted with N/A (Not Applicable).

SAR MEASUREMENT SUMMARY (CONT.)

BODY-WORN SAR EVALUATION RESULTS (Belt-Loop with Default Audio Accessory P/N: KHS-10-BH)

C	Test Date(s): Jan. 7, 2011			1	2	3	4	5	6	7	8
R	Antenna Part No. & Test Freq. Range (MHz)	Test Freq. (MHz)	Cond. Pwr (W)	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g	SAR W/kg 1g
				Battery KNB-57L (a)		Battery KNB-55L (b)		Battery KNB-56N (c)		Battery KBP-5 (d)	
				Belt-Loop KBH-13DS (2)		Belt-Loop KBH-13DS (2)		Belt-Loop KBH-13DS (2)		Belt-Loop KBH-13DS (2)	
				Audio KHS-10-BH (default)		Audio KHS-10-BH (default)		Audio KHS-10-BH (default)		Audio KHS-10-BH (default)	
				100% ptt d/f	50% ptt d/f	100% ptt d/f	50% ptt d/f	100% ptt d/f	50% ptt d/f	100% ptt d/f	50% ptt d/f
				Drift dB	50%+droop	Drift dB	50%+droop	Drift dB	50%+droop	Drift dB	50%+droop
25	ANT. A KRA-23M (440-470)	440.0	5.1	N/A		N/A		N/A		N/A	
26		455.0	5.1	N/A		B14	2.27	1.14	N/A		N/A
27							-0.492	1.27			
28		470.0	5.1	N/A		N/A		N/A		N/A	
29	ANT. B KRA-23M3 (406.1-450)	406.1	4.9	N/A		N/A		N/A		N/A	
30		420.7	5.0	N/A		N/A		N/A		N/A	
31		435.4	5.1	N/A		B15	2.31	1.16	N/A		N/A
32							-0.215	1.21			
33		450.0	5.1	N/A		N/A		N/A		N/A	
34	ANT. C KRA-27M (440-470)	440.0	5.1	N/A		N/A		N/A		N/A	
35		455.0	5.1	B17	3.11	1.56	B16	3.02	1.51	B18	3.01	1.51	B19	2.57	1.29
36					-0.272	1.66		-0.219	1.59		-0.479	1.68		-1.20	1.69
37		470.0	5.1	N/A		N/A		N/A		N/A	
38	ANT. D KRA-27M3 (406.1-450)	406.1	4.9	N/A		N/A		N/A		N/A	
39		420.7	5.0	N/A		N/A					
40		435.4	5.1	N/A		B20	2.41	1.21	N/A		N/A
41							-0.145	1.25			
42		450.0	5.1	N/A		N/A		N/A		N/A	

SAR LIMITS		BODY	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	Health Canada Safety Code 6	8.0 W/kg	1g averaging	Occupational / Controlled

Notes

All SAR measurements reported above were performed with Model NX-320-K6 only. Models NX-320-K4 and NX-320-K5 were not evaluated for body-worn SAR based on the following rationale per FCC KDB Inquiry Tracking No. 743809: "for (Model y) and (Model z) please include body "without audio accessories and body "default audio by categ" SAR for combinations / configurations that gave SAR > 6 W/kg for (Model x)." The maximum SAR level reported for Model NX-320-K6 was < 6 W/kg; therefore Models NX-320-K4 and NX-320-K5 were not evaluated.

Test Mode = CW (Unmodulated Continuous Wave) | Phantom = Side Planar Phantom

DUT Spacing to Planar Phantom per Battery (see Appendix D)				Antenna Distance to Planar Phantom per Battery (see Appendix D)			
KNB-57L (a)	KNB-55L (b)	KNB-56N (c)	KBP-5 (d)	KNB-57L (a)	KNB-55L (b)	KNB-56N (c)	KBP-5 (d)
4.7 cm	4.7 cm	4.7 cm	4.7 cm	5.7 cm	5.7 cm	5.7 cm	5.7 cm

B14-B20 (B = Body) denotes the corresponding Body SAR Plot # as shown in Appendix A

Test Procedures applied in accordance with FCC KDB 643646 D01v01 (see reference [8])

1. For body-worn configuration, the thinnest standard battery was selected as the default battery (battery "b").
2. The SAR evaluations commenced at the highest output power channel per antenna and frequency range.
3. When the body SAR of an antenna tested on the highest output power channel using the default battery is ≤ 3.5 W/kg (50% PTT duty factor), testing of all other required channels is not necessary (C4R27, C4R32, C4R36, C4R41).
4. When the SAR for all antennas tested using the default battery is ≤ 4.0 W/kg (50% PTT duty factor), test additional batteries using the antenna and channel configuration that resulted in the highest SAR (C2R36, C6R36, C8R36).
5. The Noise Reduction Headset (Behind-the-Head) P/N: KHS-10-BH was selected as the default audio accessory based on preliminary evaluations resulting in the most conservative SAR of all the disclosed audio accessories.
6. When test reduction applies, the slots for such configurations are denoted with N/A (Not Applicable).

SAR MEASUREMENT SUMMARY (CONT.)

BODY-WORN SAR EVALUATION RESULTS (with Remaining Default Audio Acc's by Category)

C	Test Date(s): Jan. 21, 2011			1		2		3		4		5		6	
R	Antenna Part No. & Test Freq. Range (MHz)	Test Freq. (MHz)	Cond. Power (W)	1g SAR (W/kg)		1g SAR (W/kg)		1g SAR (W/kg)		1g SAR (W/kg)		1g SAR (W/kg)		1g SAR (W/kg)	
				Li-ion Battery KNB-55L (b)				Li-ion Battery KNB-55L (b)				Li-ion Battery KNB-55L (b)			
				Belt-Clip KBH-12 (1)				Belt-Clip KBH-12 (1)				Belt-Clip KBH-12 (1)			
				AUDIO ACC. CATEGORY 2				AUDIO ACC. CATEGORY 3				AUDIO ACC. CATEGORY 4			
				Earpiece P/N: KHS-27				Palm-Mic Kit P/N: KHS-9BL				Speaker-Mic P/N: KMC-48GPS			
				100% ptt d/f		50% ptt d/f		100% ptt d/f		50% ptt d/f		100% ptt d/f		50% ptt d/f	
				SAR Drift dB		50%+droop		SAR Drift dB		50%+droop		SAR Drift dB		50%+droop	
43	ANT. A KRA-23M (440-470)	440.0	5.1	N/A				N/A				N/A			
44		455.0	5.1	N/A				N/A				N/A			
45		470.0	5.1	A1	9.65	4.83		A2	9.28	4.64		A3	9.26	4.63	
46					-0.231	5.09			-0.375	5.06			-0.351	5.02	
47	ANT. C KRA-27M (440-470)	440.0	5.1	A4	9.55	4.78		A5	9.47	4.74		A6	9.14	4.57	
48					-0.256	5.06			-0.294	5.07			-0.347	4.95	
49		455.0	5.1	N/A				N/A				N/A			
50		470.0	5.1	N/A				N/A				N/A			
51	ANT. D KRA-27M3 (406.1-450)	406.1	4.9	A7	9.64	4.82		A8	9.10	4.55		A9	8.95	4.48	
52					-0.066	4.89			-0.016	4.57			-0.092	4.57	
53		420.7	5.0	N/A				N/A				N/A			
54		435.4	5.1	N/A				N/A				N/A			
55		450.0	5.1	N/A				N/A				N/A			

SAR LIMITS		BODY	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	HC Safety Code 6	8.0 W/kg	1g averaging	Occupational / Controlled

Notes

	DUT Distance to Phantom		Antenna Distance to Phantom	
Test Mode = CW (Unmodulated Continuous Wave)	1.5 cm	Back of radio to phantom	2.6 cm	Antenna base to phantom
Phantom = Side Planar Phantom				
Audio accessories do not contain any built-in radiating element				

A1-A9 (A = Audio) denotes the corresponding Audio Accessory SAR Plot # as shown in Appendix A

Test Procedures applied in accordance with FCC KDB 643646 D01v01 (see reference [8])

1. The SAR evaluations commenced at the highest output power channel (highlighted in yellow) per antenna band.

2. Preliminary evaluations were performed in order to select the default accessory (per audio accessory category) expected to result in the highest SAR, with respect to changes in RF characteristics and exposure conditions, based on similar construction and operating requirements (see Appendix D for photographs of the manufacturer's disclosed accessory options).

3. Based on the SAR measured in the body-worn test sequence with default audio accessory, if the SAR for the antenna, body-worn accessory and battery combination(s) applicable to an audio accessory is/are > 4.0 W/kg and < 6.0 W/kg, test that audio accessory using the highest body-worn SAR combination (antenna, battery and body-worn accessory) and channel configuration previously identified (see test data on page 8) that is applicable to the audio accessory (C2R46, C4R46, C6R46, C2R48, C4R48, C6R48, C2R52, C4R52, C6R52).

4. The required immediately adjacent channels were not evaluated based on the measured SAR levels were < 6.0 W/kg.

5. The remaining required channels were not evaluated based on the immediately adjacent channels were not required and all SAR levels were < 7.0 W/kg.

6. When test reduction applies, the slots for such configurations are denoted with N/A (Not Applicable).

9.0 SAR SCALING (TUNE-UP TOLERANCE)

SAR LEVELS SCALED TO KENWOOD MAXIMUM TOLERANCE SPECIFICATION

Test Config.	Freq. (MHz)	Antenna Part No.	Battery Part No.	Conducted Power (W)	SAR Level (inc. droop) 1g (W/kg)	Scale to 5.0 W (5 W + 0 dB)	Scaled SAR 1g (W/kg)	
Body-worn	406.1	KRA-27M3 (D)	KNB-55L (b)	4.9	4.70	+0.088 dB	4.80	B12
Body-worn	406.1	KRA-27M3 (D)	KNB-55L (b)	4.9	4.89	+0.088 dB	4.99	A7
Body-worn	406.1	KRA-27M3 (D)	KNB-55L (b)	4.9	4.57	+0.088 dB	4.66	A8
Body-worn	406.1	KRA-27M3 (D)	KNB-55L (b)	4.9	4.57	+0.088 dB	4.66	A9

Notes:

1. The SAR levels reported are based on 50% PTT duty factor including SAR droop.
2. The far right-side column denotes the corresponding SAR Plot # (see Appendix A).
3. The scaled SAR levels are below the FCC/IC Occupational SAR Limit of 8.0 W/kg.

10.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS

Date: 01/06/2011		Frequency: 450 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	48.20	0.81	43.5	0.87	10.80%	-6.90%
0.360	48.37	0.82	43.5	0.87	11.20%	-5.75%
0.370	47.65	0.82	43.5	0.87	9.54%	-5.75%
0.380	47.19	0.84	43.5	0.87	8.48%	-3.45%
0.390	47.20	0.84	43.5	0.87	8.51%	-3.45%
0.400	47.25	0.86	43.5	0.87	8.62%	-1.15%
0.410	46.40	0.86	43.5	0.87	6.67%	-1.15%
0.420	45.95	0.86	43.5	0.87	5.63%	-1.15%
0.430	45.60	0.87	43.5	0.87	4.83%	0.00%
0.4354*	45.50	0.87	43.5	0.87	4.60%	0.00%
0.440	45.47	0.87	43.5	0.87	4.53%	0.00%
0.450	45.61	0.88	43.5	0.87	4.85%	1.15%
0.455*	45.60	0.88	43.5	0.87	4.83%	1.15%
0.460	45.56	0.88	43.5	0.87	4.74%	1.15%
0.470	45.31	0.88	43.5	0.87	4.16%	1.15%
0.480	44.72	0.89	43.5	0.87	2.80%	2.30%
0.490	44.84	0.90	43.5	0.87	3.08%	3.45%
0.500	44.86	0.90	43.5	0.87	3.13%	3.45%
0.510	44.68	0.91	43.5	0.87	2.71%	4.60%
0.520	44.37	0.91	43.5	0.87	2.00%	4.60%
0.530	44.00	0.93	43.5	0.87	1.15%	6.90%
0.540	44.05	0.95	43.5	0.87	1.26%	9.20%
0.550	43.95	0.96	43.5	0.87	1.03%	10.34%

*interpolated using DASY4 software

FLUID DIELECTRIC PARAMETERS (CONT.)

FLUID DIELECTRIC PARAMETERS

Date: 03/04/2011		Frequency: 450 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	45.58	0.77	43.5	0.87	4.78%	-11.49%
0.360	45.52	0.78	43.5	0.87	4.64%	-10.34%
0.370	45.05	0.79	43.5	0.87	3.56%	-9.20%
0.380	45.54	0.8	43.5	0.87	4.69%	-8.05%
0.390	44.64	0.81	43.5	0.87	2.62%	-6.90%
0.400	44.61	0.82	43.5	0.87	2.55%	-5.75%
0.410	44.33	0.83	43.5	0.87	1.91%	-4.60%
0.420	44.54	0.83	43.5	0.87	2.39%	-4.60%
0.430	44.63	0.84	43.5	0.87	2.60%	-3.45%
0.440	43.84	0.84	43.5	0.87	0.78%	-3.45%
0.450	43.43	0.86	43.5	0.87	-0.16%	-1.15%
0.455*	43.4	0.86	43.5	0.87	-0.23%	-1.15%
0.460	43.36	0.86	43.5	0.87	-0.32%	-1.15%
0.470	43.37	0.87	43.5	0.87	-0.30%	0.00%
0.480	43.42	0.88	43.5	0.87	-0.18%	1.15%
0.490	42.75	0.88	43.5	0.87	-1.72%	1.15%
0.500	42.43	0.88	43.5	0.87	-2.46%	1.15%
0.510	42.6	0.9	43.5	0.87	-2.07%	3.45%
0.520	42.34	0.91	43.5	0.87	-2.67%	4.60%
0.530	42.06	0.91	43.5	0.87	-3.31%	4.60%
0.540	41.91	0.92	43.5	0.87	-3.66%	5.75%
0.550	41.62	0.93	43.5	0.87	-4.32%	6.90%

FLUID DIELECTRIC PARAMETERS (CONT.)

FLUID DIELECTRIC PARAMETERS

Date: 01/07/2011		Frequency: 450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	58.96	0.79	56.7	0.94	3.99%	-15.96%
0.360	60.09	0.81	56.7	0.94	5.98%	-13.83%
0.370	59.00	0.80	56.7	0.94	4.06%	-14.89%
0.380	59.12	0.81	56.7	0.94	4.27%	-13.83%
0.390	58.83	0.82	56.7	0.94	3.76%	-12.77%
0.400	58.85	0.85	56.7	0.94	3.79%	-9.57%
0.410	58.56	0.88	56.7	0.94	3.28%	-6.38%
0.420	58.91	0.90	56.7	0.94	3.90%	-4.26%
0.430	59.19	0.90	56.7	0.94	4.39%	-4.26%
0.4354*	59.10	0.905	56.7	0.94	4.23%	-3.72%
0.440	59.06	0.91	56.7	0.94	4.16%	-3.19%
0.450	58.75	0.91	56.7	0.94	3.62%	-3.19%
0.455*	58.60	0.915	56.7	0.94	3.35%	-2.66%
0.460	58.36	0.92	56.7	0.94	2.93%	-2.13%
0.470	58.47	0.90	56.7	0.94	3.12%	-4.26%
0.480	58.24	0.93	56.7	0.94	2.72%	-1.06%
0.490	58.61	0.93	56.7	0.94	3.37%	-1.06%
0.500	58.32	0.96	56.7	0.94	2.86%	2.13%
0.510	58.30	0.95	56.7	0.94	2.82%	1.06%
0.520	58.05	0.97	56.7	0.94	2.38%	3.19%
0.530	57.99	0.97	56.7	0.94	2.28%	3.19%
0.540	57.83	0.98	56.7	0.94	1.99%	4.26%
0.550	58.02	1.00	56.7	0.94	2.33%	6.38%

*interpolated using DASY4 software

FLUID DIELECTRIC PARAMETERS (CONT.)

FLUID DIELECTRIC PARAMETERS

Date: 01/21/2011		Frequency: 450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	57.99	0.85	56.7	0.94	2.28%	-9.57%
0.360	58.86	0.86	56.7	0.94	3.81%	-8.51%
0.370	58.31	0.86	56.7	0.94	2.84%	-8.51%
0.380	58.42	0.87	56.7	0.94	3.03%	-7.45%
0.390	58.27	0.88	56.7	0.94	2.77%	-6.38%
0.400	58.55	0.90	56.7	0.94	3.26%	-4.26%
0.4061*	58.10	0.906	56.7	0.94	2.47%	-3.62%
0.410	57.77	0.91	56.7	0.94	1.89%	-3.19%
0.420	57.60	0.90	56.7	0.94	1.59%	-4.26%
0.4207*	57.60	0.901	56.7	0.94	1.59%	-4.15%
0.430	57.70	0.92	56.7	0.94	1.76%	-2.13%
0.440	57.57	0.92	56.7	0.94	1.53%	-2.13%
0.450	57.22	0.91	56.7	0.94	0.92%	-3.19%
0.455*	57.40	0.935	56.7	0.94	1.23%	-0.53%
0.460	57.49	0.94	56.7	0.94	1.39%	0.00%
0.470	57.52	0.94	56.7	0.94	1.45%	0.00%
0.480	56.85	0.94	56.7	0.94	0.26%	0.00%
0.490	56.85	0.95	56.7	0.94	0.26%	1.06%
0.500	57.34	0.97	56.7	0.94	1.13%	3.19%
0.510	56.49	0.97	56.7	0.94	-0.37%	3.19%
0.520	56.85	0.98	56.7	0.94	0.26%	4.26%
0.530	56.49	0.99	56.7	0.94	-0.37%	5.32%
0.540	56.54	0.99	56.7	0.94	-0.28%	5.32%
0.550	56.90	1.02	56.7	0.94	0.35%	8.51%

*interpolated using DASY4 software

FLUID DIELECTRIC PARAMETERS (CONT.)

Test Date	Fluid Type	Ambient Temp.	Fluid Temp.	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Jan 06	450 Head	23.5°C	22.5°C	≥ 15 cm	101.1 kPa	40%	1000
Jan 07	450 Body	23.0°C	22.4°C	≥ 15 cm	101.1 kPa	35%	1000
Jan 21	450 Body	23.4°C	22.6°C	≥ 15 cm	101.1 kPa	35%	1000
Mar 04	450 Head	22.8°C	21.9°C	≥ 15 cm	101.1 kPa	34%	1000

11.0 DETAILS OF SAR EVALUATION

1. The number of test frequencies and the test channels evaluated for SAR were selected in accordance with the procedures described in FCC KDB 447498 Section 6) c) (see reference [7]).
2. The DUT was evaluated for SAR in accordance with the procedures described in FCC KDB 643646 D01v01 (see reference [8]).
3. All SAR evaluations were performed with Model NX-320-6 (base model) except as denoted on page 7 (Face-held). The rationale for test reduction/exclusion for the additional model variants NX-320-K4 and NX-320-K5 (difference of front keypad and LCD display only) was based on the guidance provided in FCC KDB Inquiry Tracking No. 743809.
4. 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.
5. The SAR droop of the DUT was measured by the DASY4 system for the duration of the SAR evaluations. The measured SAR droop was added to the measured SAR levels to report scaled SAR levels as shown in the SAR test data tables. A SAR-versus-Time power droop evaluation was performed in the test configuration that reported the maximum measured SAR level. See Appendix A (SAR Test Plots) for SAR-versus-Time power droop evaluation plot.
6. The fluid temperature was measured prior to and after the SAR evaluations. The fluid temperature remained within +/-2°C during the SAR evaluations.
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).
8. The DUT was tested at the maximum conducted output power level preset by the manufacturer in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key constantly depressed. For a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.

12.0 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 find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.4 mm (see probe calibration document in Appendix F). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.

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

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

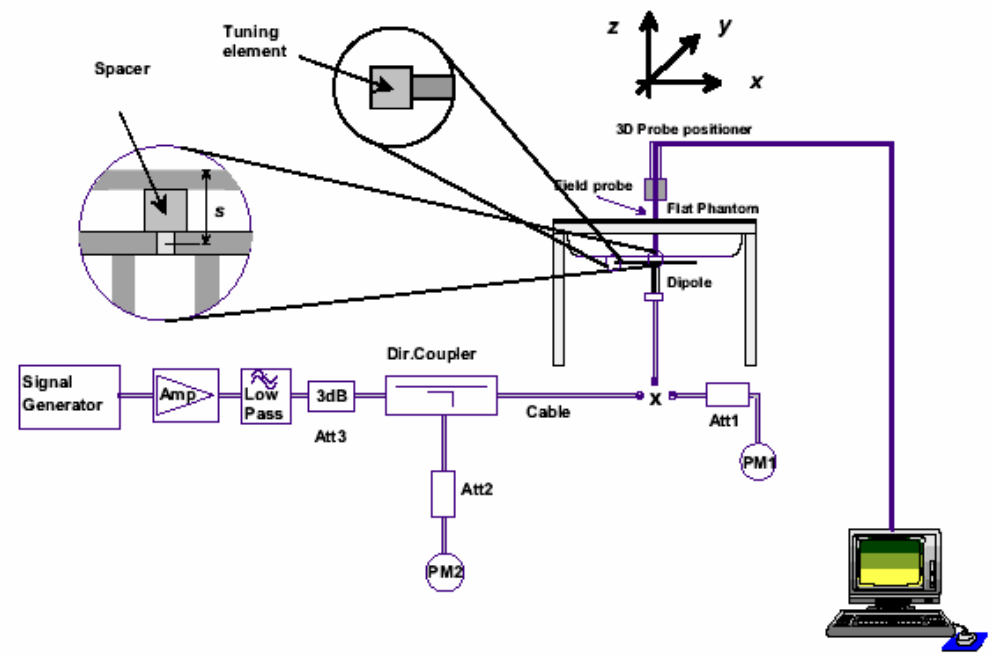
13.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations, daily system checks were performed with the Barski planar phantom and SPEAG 450 MHz dipole (see Appendix B) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]). 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 398 mW was applied to the dipole and the system was verified to a tolerance of ±10% from the SAR system manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

SYSTEM PERFORMANCE CHECK EVALUATIONS

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.						
Jan 06	Head 450	1.87 ±10%	1.93	+3.2%	43.5 ±5%	45.6	+4.8%	0.87 ±5%	0.88	+1.1%	1000	23.5	22.5	≥ 15	40	101.1
Jan 07	Body 450	1.78 ±10%	1.83	+2.8%	56.7 ±5%	58.8	+3.7%	0.94 ±5%	0.91	-3.2%	1000	23.0	22.4	≥ 15	35	101.1
Jan 21	Body 450	1.78 ±10%	1.79	+0.6%	56.7 ±5%	57.2	+0.9%	0.94 ±5%	0.91	-3.2%	1000	23.4	22.6	≥ 15	35	101.1
Mar 04	Head 450	1.87 ±10%	1.88	+0.5%	43.5 ±5%	43.4	-0.2%	0.87 ±5%	0.86	-1.2%	1000	22.8	21.9	≥ 15	34	101.1

Notes		
	1.	The target SAR values are the measured values from the SAR system manufacturer's dipole calibration (see Appendix E).
	2.	The target dielectric parameters are the nominal values from the SAR system manufacturer's dipole calibration (see Appendix E).
	3.	The fluid temperature was measured prior to and after the system performance check evaluations. The fluid temperature remained within +/-2°C during the system performance check evaluations.
	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 (IEEE Standard 1528-2003)

SPEAG 450 MHz Validation Dipole Setup

14.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipes in the table below are derived from the SAR system manufacturer's suggested recipes in the DASY4 manual (see references [10] and [11]) 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.

SIMULATED TISSUE MIXTURES		
INGREDIENT	**450 MHz HEAD**	**450 MHz BODY**
Water	38.56 %	52.00 %
Sugar	56.32 %	45.65 %
Salt	3.95 %	1.75 %
HEC	0.98 %	0.50 %
Bactericide	0.19 %	0.10 %

15.0 SAR LIMITS

SAR RF EXPOSURE LIMITS		
FCC 47 CFR 2.1093	**General Population**	**Occupational**
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.		

16.0 ROBOT SYSTEM SPECIFICATIONS

Specifications	
Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6
Data Acquisition Electronic (DAE) System	
Cell Controller	
Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional
Data Converter	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY4, V4.7 Build 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
Connecting Lines	Optical downlink for data and status info., Optical uplink for commands and clock
DASY4 Measurement Server	
Function	Real-time data evaluation for field measurements and surface detection
Hardware	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface
E-Field Probe	
Model	ET3DV6
Serial No.	1590
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
Evaluation Phantom	
Type	Side Planar Phantom
Shell Material	Plexiglas
Thickness	2.0 mm ± 0.1 mm
Volume	72.6 cm (L) x 20.3 cm (W) x 20.3 cm (H)
Validation Phantom	
Type	Barski Planar Phantom
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 70 liters

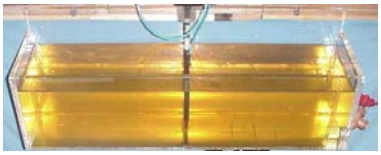
17.0 PROBE SPECIFICATION (ET3DV6)

Construction:	Symmetrical design with triangular core; Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In head simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy ± 8%)
Frequency:	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity:	± 0.2 dB in head tissue (rotation around probe axis) ± 0.4 dB in head tissue (rotation normal to probe axis)
Dynamic Range:	5 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Surface Detect:	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm; Tip length: 16 mm; Body diameter: 12 mm; Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz; Compliance tests of mobile phone

ET3DV6 E-Field Probe

18.0 SIDE PLANAR PHANTOM

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.



Plexiglas Side Planar Phantom

19.0 BARSKI PLANAR PHANTOM

The Barski planar phantom is a fiberglass shell phantom with a 2.0 mm (+/-0.2mm) thick device measurement area at the center of the phantom for SAR evaluations of devices with a larger surface area than the planar section of the SAM phantom. The planar phantom is integrated in a wooden table. The planar phantom was used for the DUT SAR evaluations and the system performance check evaluations. See Appendix G for dimensions and specifications of the Barski planar phantom.

Barski Planar Phantom

20.0 DEVICE HOLDER

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

Device Holder

21.0 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	-ET3DV6 E-Field Probe	00017	1590	15Jul10	Annual
x	-SPEAG D450V3 Validation Dipole	00217	1068	18Jan10	Biennial
x	-Side Planar Phantom	00156	161	CNR	CNR
x	-Barski Planar Phantom	00155	03-01	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				

22.0 JUSTIFICATION FOR EXTENDED SAR DIPOLE CALIBRATION

SAR dipoles calibrated less than two years ago but more than one year ago were confirmed by maintaining return loss (< -20dB, within 20% of prior calibration) and impedance (within 5Ω from prior calibration) requirements per extended calibrations in FCC KDB 450824 (see reference [9]).

SPEAG VALIDATION DIPOLE D450V3 - SN: 1068						
Measurement Date	Freq.	TSL	Return Loss (dB)	Δ %	Impedance (Ω)	Δ Ω
January 18, 2010	450 MHz	Head	-21.0		57.5	
February 7, 2011			-21.3	1.5%	53.8	3.7
January 18, 2010	450 MHz	Body	-20.0		54.8	
February 7, 2011			-20.5	2.5%	50.4	4.4

23.0 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 (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	∞
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	4.2	Normal	1	0.64	0.43	2.7	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	4.8	Normal	1	0.6	0.49	2.9	2.4	∞
Combined Standard Uncertainty			**RSS**				**11.69**	**11.27**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**				**23.37**	**22.54**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2

24.0 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 (RF) 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] 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 v04: November 2009.

[8] Federal Communications Commission, Office of Engineering and Technology - “SAR Test Reduction Considerations for Occupational PTT Radios”, KDB 643646 D01v01: December 2010..

[9] 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.

[10] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 16 Application Note, Head Tissue Recipe: Sept. 2005.

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

[12] ISO/IEC 17025 - “General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005).”

[13] Federal Communications Commission - “Measurements Required: RF Power Output”; Rule Part 47 CFR §2.1046.

[14] Industry Canada - “General Requirements and Information for the Certification of Radiocommunication Equipment”, Radio Standards Specification RSS-Gen Issue 2: June 2007.

APPENDIX B - SYSTEM PERFORMANCE CHECK PLOTS

Date Tested: 01/06/2011

System Performance Check - 450 MHz Dipole - Head

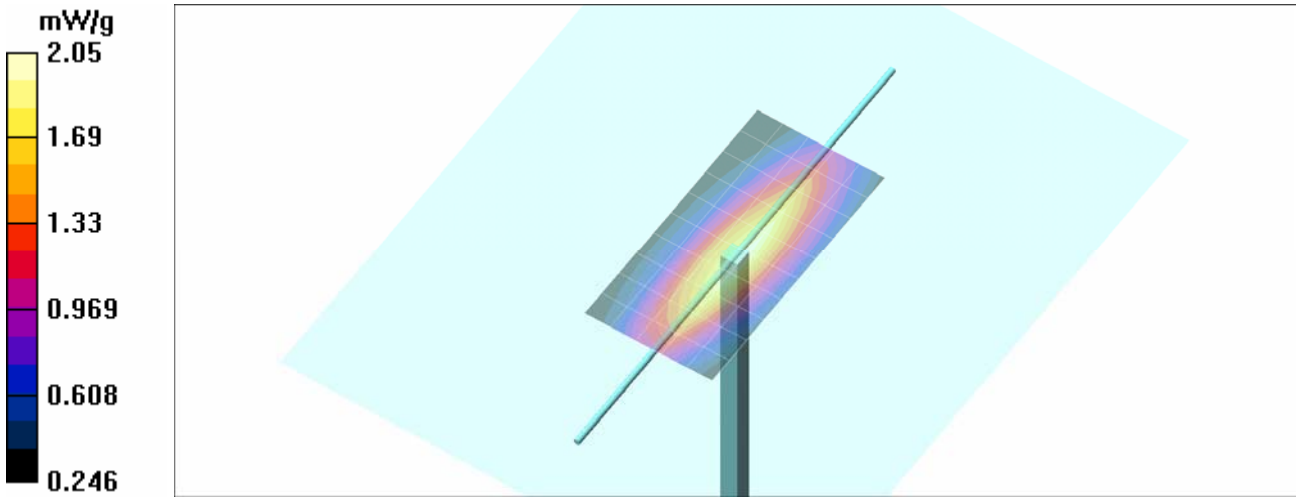
DUT: Dipole D450V3; Asset: 00217; Serial: 1068; Calibration: 01/18/2010

Ambient Temp: 23.5°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 40%

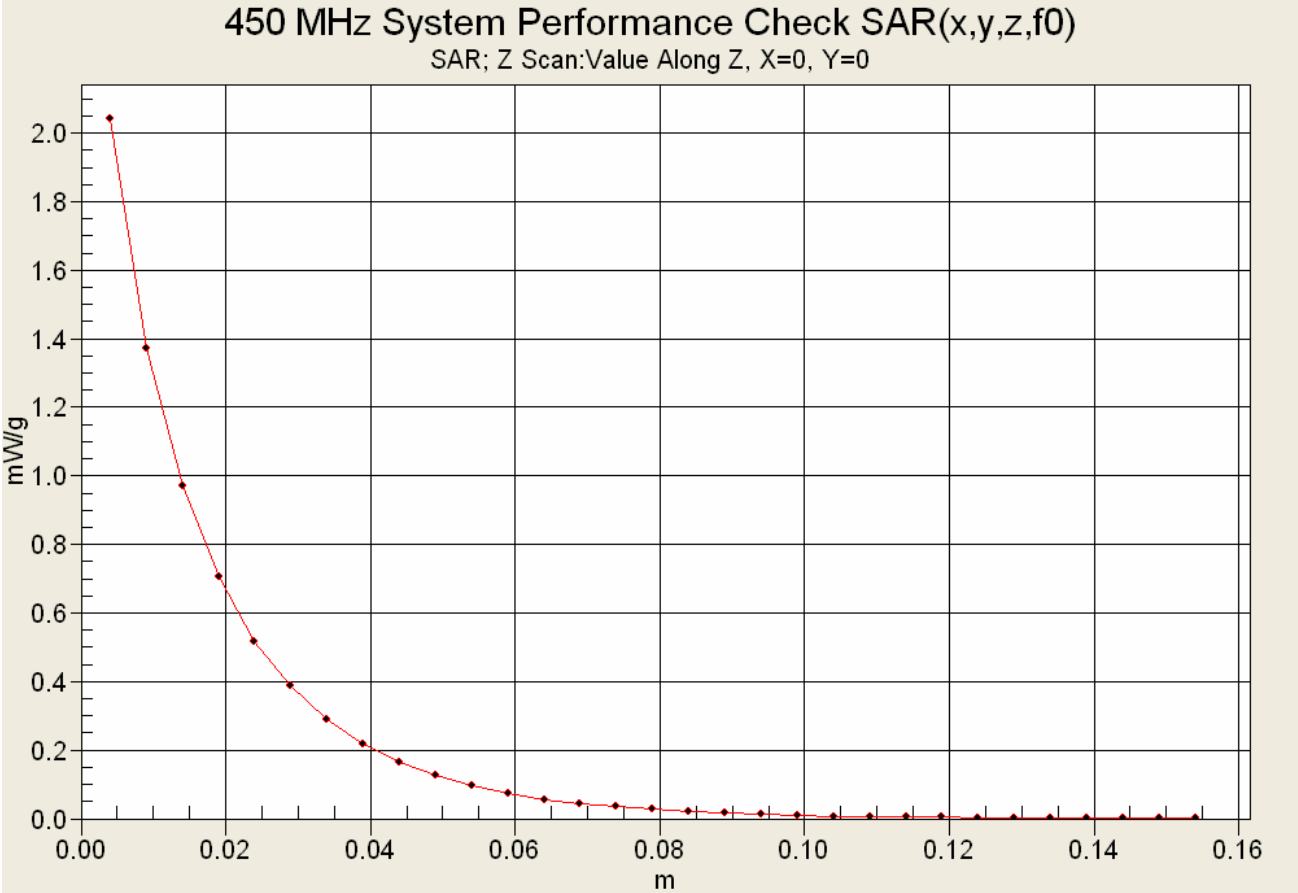
Communication System: CW
Forward Conducted Power: 398 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used: f = 450 MHz; σ = 0.88 mho/m; ε_r = 45.6; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.25, 7.25, 7.25); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

System Performance Check - 450 MHz Dipole
Head d=15mm Pin=398mW 2/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.02 mW/g
Head d=15mm Pin=398mW 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 47.2 V/m; Power Drift = -0.002 dB
Peak SAR (extrapolated) = 2.99 W/kg
SAR(1 g) = 1.93 mW/g; SAR(10 g) = 1.29 mW/g
Maximum value of SAR (measured) = 2.05 mW/g



Z-Axis Scan



Date Tested: 01/07/2010

System Performance Check - 450 MHz Dipole - Body

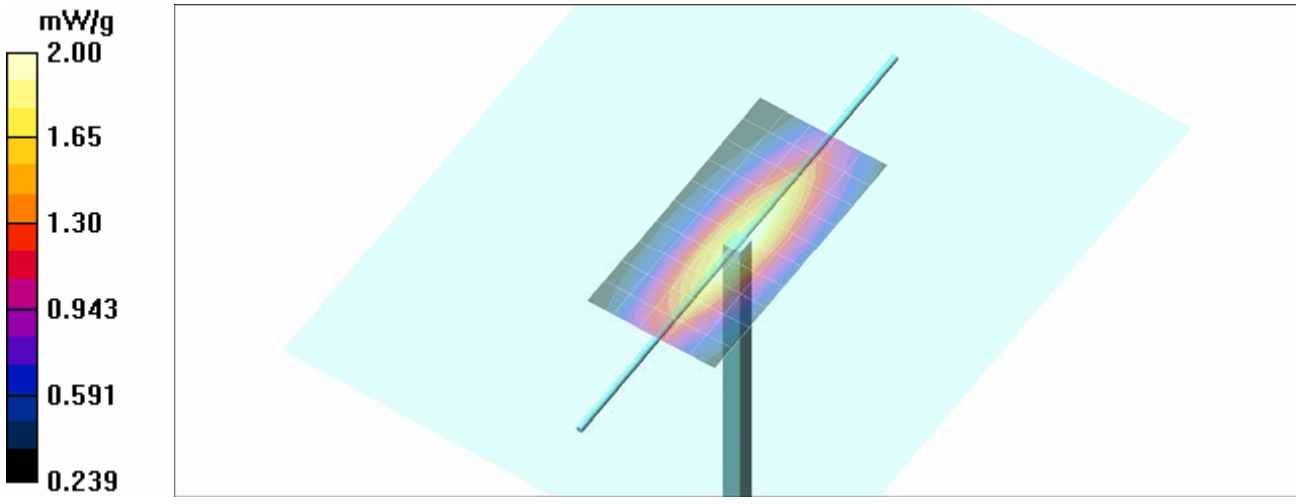
DUT: Dipole D450V3; Asset: 00217; Serial: 1068; Calibration: 01/18/2010

Ambient Temp: 23.0°C; Fluid Temp: 22.4°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

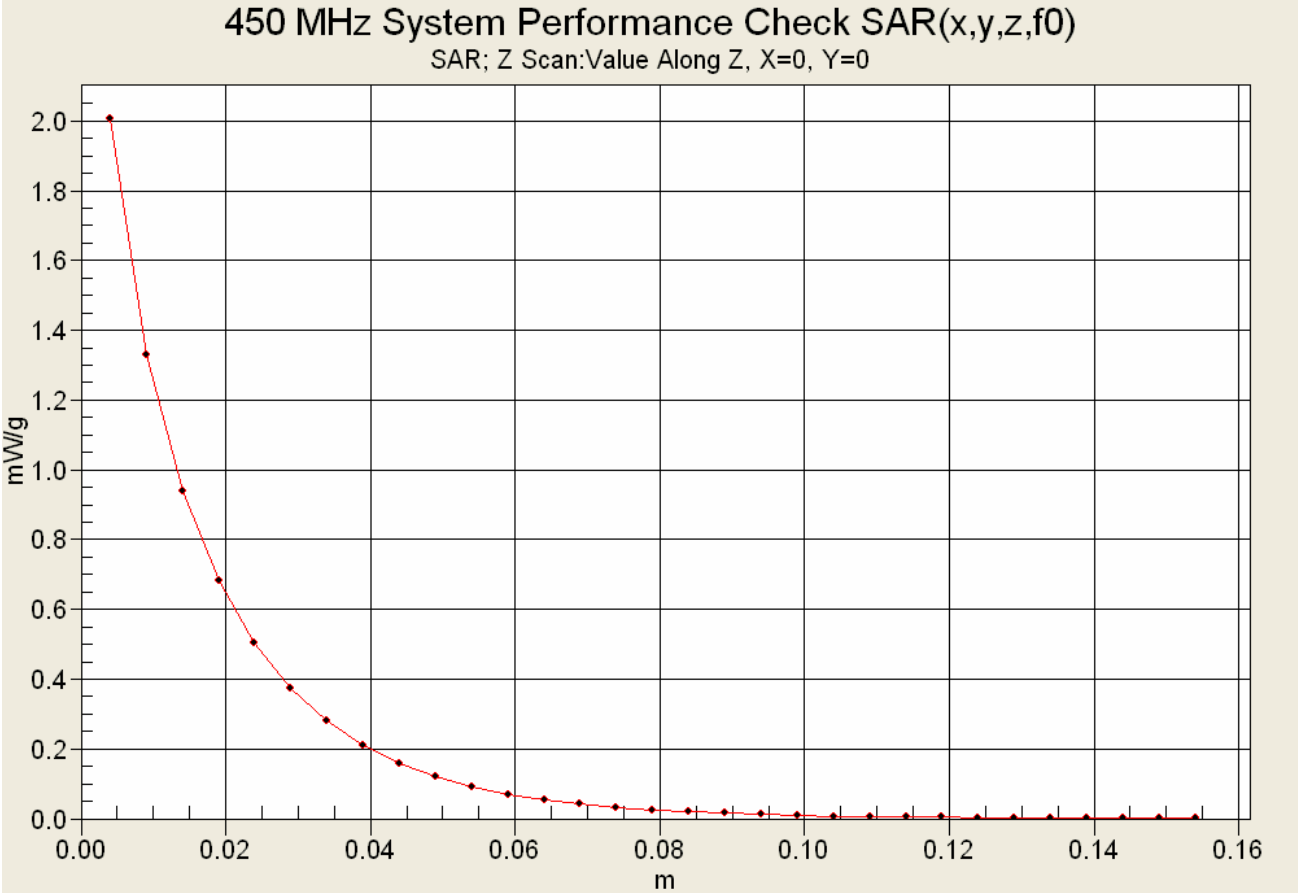
Communication System: CW
Forward Conducted Power: 398 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.91 mho/m; ε_r = 58.8; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

System Performance Check - 450 MHz Dipole
Body d=15mm Pin=398mW 2/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.95 mW/g
Body d=15mm Pin=398mW 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 45.0 V/m; Power Drift = -0.001 dB
Peak SAR (extrapolated) = 3.00 W/kg
SAR(1 g) = 1.83 mW/g; SAR(10 g) = 1.24 mW/g
Maximum value of SAR (measured) = 2.00 mW/g



Z-Axis Scan



Date Tested: 01/21/2010

System Performance Check - 450 MHz Dipole - Body

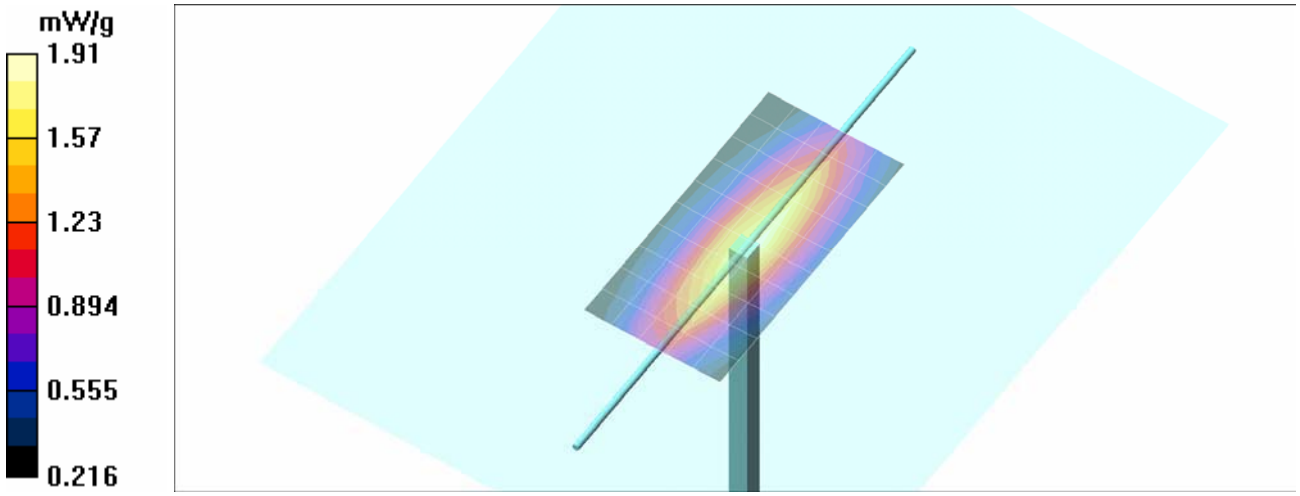
DUT: Dipole D450V3; Asset: 00217; Serial: 1068; Calibration: 01/18/2010

Ambient Temp: 23.4°C; Fluid Temp: 22.6°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

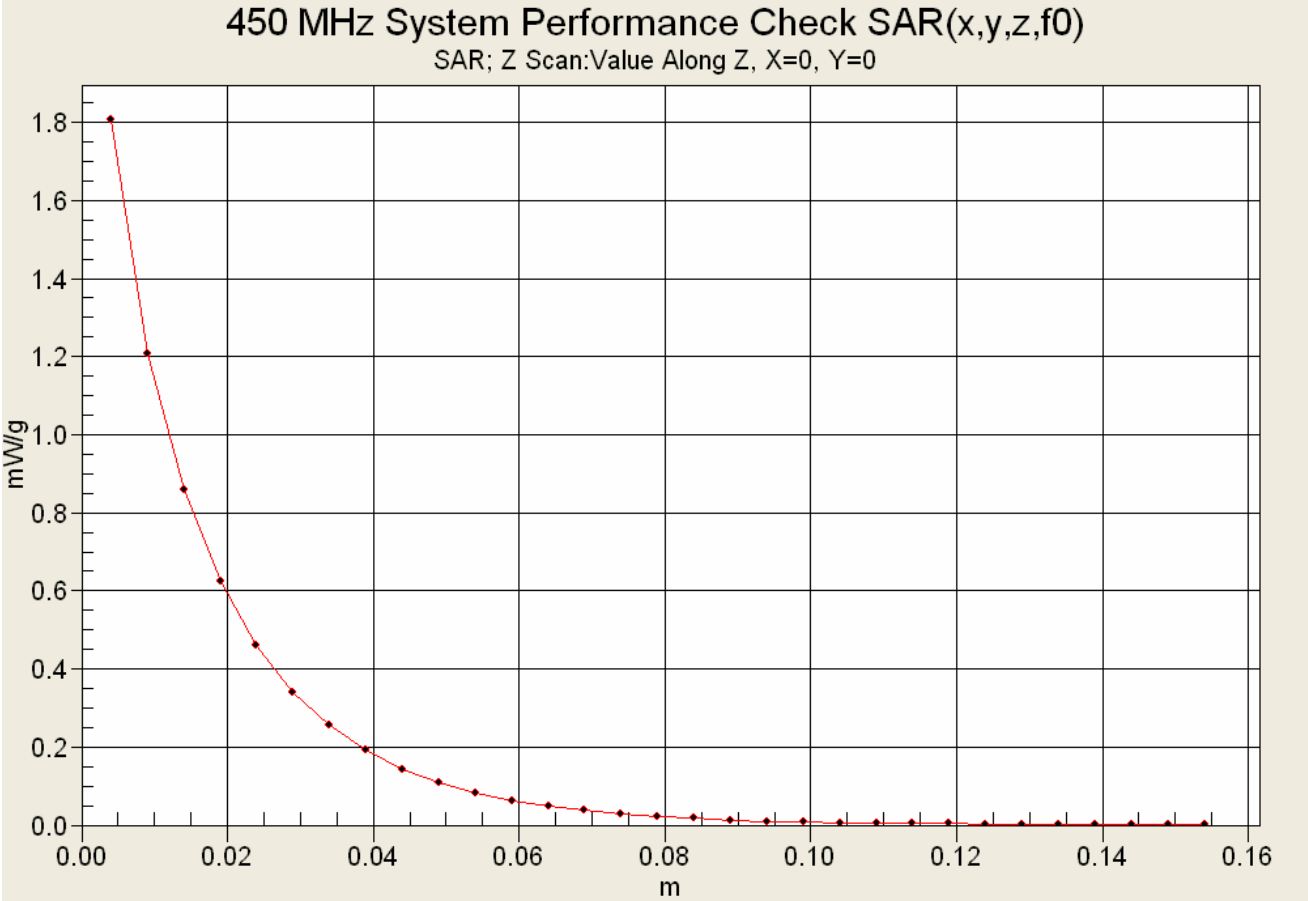
Communication System: CW
Forward Conducted Power: 398 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: M450 Medium parameters used: f = 450 MHz; σ = 0.91 mho/m; ε_r = 57.2; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

System Performance Check - 450 MHz Dipole
Head d=15mm Pin=398mW 2/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.87 mW/g
Head d=15mm Pin=398mW 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 44.4 V/m; Power Drift = 0.046 dB
Peak SAR (extrapolated) = 2.90 W/kg
SAR(1 g) = 1.79 mW/g; SAR(10 g) = 1.19 mW/g
Maximum value of SAR (measured) = 1.91 mW/g



Z-Axis Scan



Date Tested: 03/04/2011

System Performance Check - 450 MHz Dipole - Head

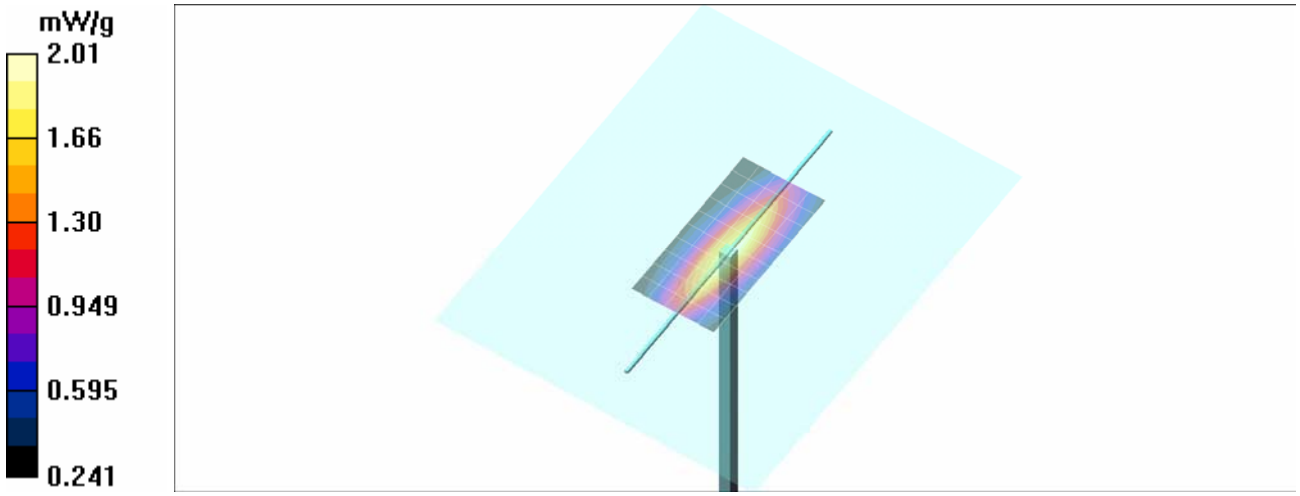
DUT: Dipole D450V3; Asset: 00217; Serial: 1068; Calibration: 01/18/2010

Ambient Temp: 22.8°C; Fluid Temp: 21.9°C; Barometric Pressure: 101.1 kPa; Humidity: 34%

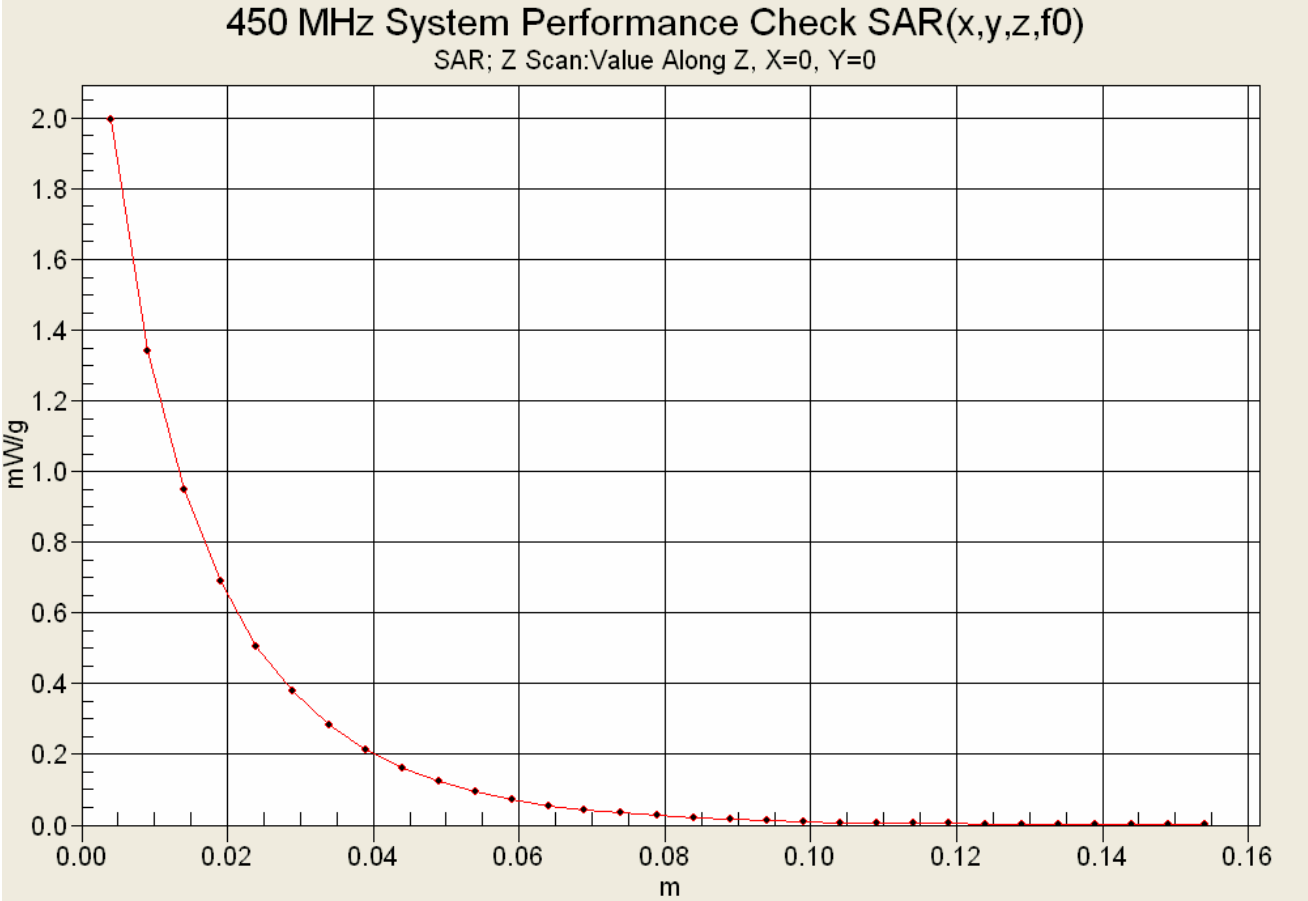
Communication System: CW
Forward Conducted Power: 398 mW
Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used: f = 450 MHz; σ = 0.86 mho/m; ε_r = 43.4; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.25, 7.25, 7.25); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglas Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

System Performance Check - 450 MHz Dipole
Head d=15mm Pin=398mW/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.98 mW/g
Head d=15mm Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 47.2 V/m; Power Drift = -0.002 dB
Peak SAR (extrapolated) = 2.92 W/kg
SAR(1 g) = 1.88 mW/g; SAR(10 g) = 1.26 mW/g
Maximum value of SAR (measured) = 2.01 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

450 MHz Head

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
06/Jan/2011
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	48.20	0.81
0.3600	44.58	0.87	48.37	0.82
0.3700	44.46	0.87	47.65	0.82
0.3800	44.34	0.87	47.19	0.84
0.3900	44.22	0.87	47.20	0.84
0.4000	44.10	0.87	47.25	0.86
0.4100	43.98	0.87	46.40	0.86
0.4200	43.86	0.87	45.95	0.86
0.4300	43.74	0.87	45.60	0.87
0.4400	43.62	0.87	45.47	0.87
0.4500	43.50	0.87	45.61	0.88
0.4600	43.45	0.87	45.56	0.88
0.4700	43.40	0.87	45.31	0.88
0.4800	43.34	0.87	44.72	0.89
0.4900	43.29	0.87	44.84	0.90
0.5000	43.24	0.87	44.86	0.90
0.5100	43.19	0.87	44.68	0.91
0.5200	43.14	0.88	44.37	0.91
0.5300	43.08	0.88	44.00	0.93
0.5400	43.03	0.88	44.05	0.95
0.5500	42.98	0.88	43.95	0.96

450 MHz Body

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
07/Jan/2011
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	57.70	0.93	58.96	0.79
0.3600	57.60	0.93	60.09	0.81
0.3700	57.50	0.93	59.00	0.80
0.3800	57.40	0.93	59.12	0.81
0.3900	57.30	0.93	58.83	0.82
0.4000	57.20	0.93	58.85	0.85
0.4100	57.10	0.93	58.56	0.88
0.4200	57.00	0.94	58.91	0.90
0.4300	56.90	0.94	59.19	0.90
0.4400	56.80	0.94	59.06	0.91
0.4500	56.70	0.94	58.75	0.91
0.4600	56.66	0.94	58.36	0.92
0.4700	56.62	0.94	58.47	0.90
0.4800	56.58	0.94	58.24	0.93
0.4900	56.54	0.94	58.61	0.93
0.5000	56.51	0.94	58.32	0.96
0.5100	56.47	0.94	58.30	0.95
0.5200	56.43	0.95	58.05	0.97
0.5300	56.39	0.95	57.99	0.97
0.5400	56.35	0.95	57.83	0.98
0.5500	56.31	0.95	58.02	1.00

450 MHz Body

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
21/Jan/2011
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	57.70	0.93	57.99	0.85
0.3600	57.60	0.93	58.86	0.86
0.3700	57.50	0.93	58.31	0.86
0.3800	57.40	0.93	58.42	0.87
0.3900	57.30	0.93	58.27	0.88
0.4000	57.20	0.93	58.55	0.90
0.4100	57.10	0.93	57.77	0.91
0.4200	57.00	0.94	57.60	0.90
0.4300	56.90	0.94	57.70	0.92
0.4400	56.80	0.94	57.57	0.92
0.4500	56.70	0.94	57.22	0.91
0.4600	56.66	0.94	57.49	0.94
0.4700	56.62	0.94	57.52	0.94
0.4800	56.58	0.94	56.85	0.94
0.4900	56.54	0.94	56.85	0.95
0.5000	56.51	0.94	57.34	0.97
0.5100	56.47	0.94	56.49	0.97
0.5200	56.43	0.95	56.85	0.98
0.5300	56.39	0.95	56.49	0.99
0.5400	56.35	0.95	56.54	0.99
0.5500	56.31	0.95	56.90	1.02

450 MHz Head

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
04/Mar/2011
Frequency (GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.3500	44.70	0.87	45.58	0.77
0.3600	44.58	0.87	45.52	0.78
0.3700	44.46	0.87	45.05	0.79
0.3800	44.34	0.87	45.54	0.80
0.3900	44.22	0.87	44.64	0.81
0.4000	44.10	0.87	44.61	0.82
0.4100	43.98	0.87	44.33	0.83
0.4200	43.86	0.87	44.54	0.83
0.4300	43.74	0.87	44.63	0.84
0.4400	43.62	0.87	43.84	0.84
0.4500	43.50	0.87	43.43	0.86
0.4600	43.45	0.87	43.36	0.86
0.4700	43.40	0.87	43.37	0.87
0.4800	43.34	0.87	43.42	0.88
0.4900	43.29	0.87	42.75	0.88
0.5000	43.24	0.87	42.43	0.88
0.5100	43.19	0.87	42.60	0.90
0.5200	43.14	0.88	42.34	0.91
0.5300	43.08	0.88	42.06	0.91
0.5400	43.03	0.88	41.91	0.92
0.5500	42.98	0.88	41.62	0.93

APPENDIX E - DIPOLE CALIBRATION

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: D450V3-1068_Jan10

CALIBRATION CERTIFICATE

Object: D450V3 - SN: 1068

Calibration procedure(s): QA CAL-15.v5
Calibration Procedure for dipole validation kits below 800 MHz

Calibration date: January 18, 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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ET3DV6 (LF)	SN: 1507	03-Jul-09 (No. ET3-1507_Jul09)	Jul-10
DAE4	SN: 654	04-May-09 (No. DAE4-654_May09)	May-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	i.V.
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 20, 2010

Glossary:

TSL	tissue simulating liquid
ConF	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) 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
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 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	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan Resolution	dx, dy = 15 mm	
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	43.5	0.87 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	44.2 ± 6 %	0.86 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	398 mW input power	1.87 mW / g
SAR normalized	normalized to 1W	4.70 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**4.76 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	398 mW input power	1.25 mW / g
SAR normalized	normalized to 1W	3.14 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**3.17 mW / g ± 17.6 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	56.7	0.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.1 ± 6 %	0.90 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	398 mW input power	1.78 mW / g
SAR normalized	normalized to 1W	4.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**4.58 mW / g ± 18.1 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	398 mW input power	1.19 mW / g
SAR normalized	normalized to 1W	2.99 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**3.06 mW / g ± 17.6 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.5 Ω - 5.9 jΩ
Return Loss	- 21.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	54.8 Ω - 9.3 jΩ
Return Loss	- 20.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.350 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	July 16, 2009

Date/Time: 1/18/2010 10:59:37 AM

DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1068

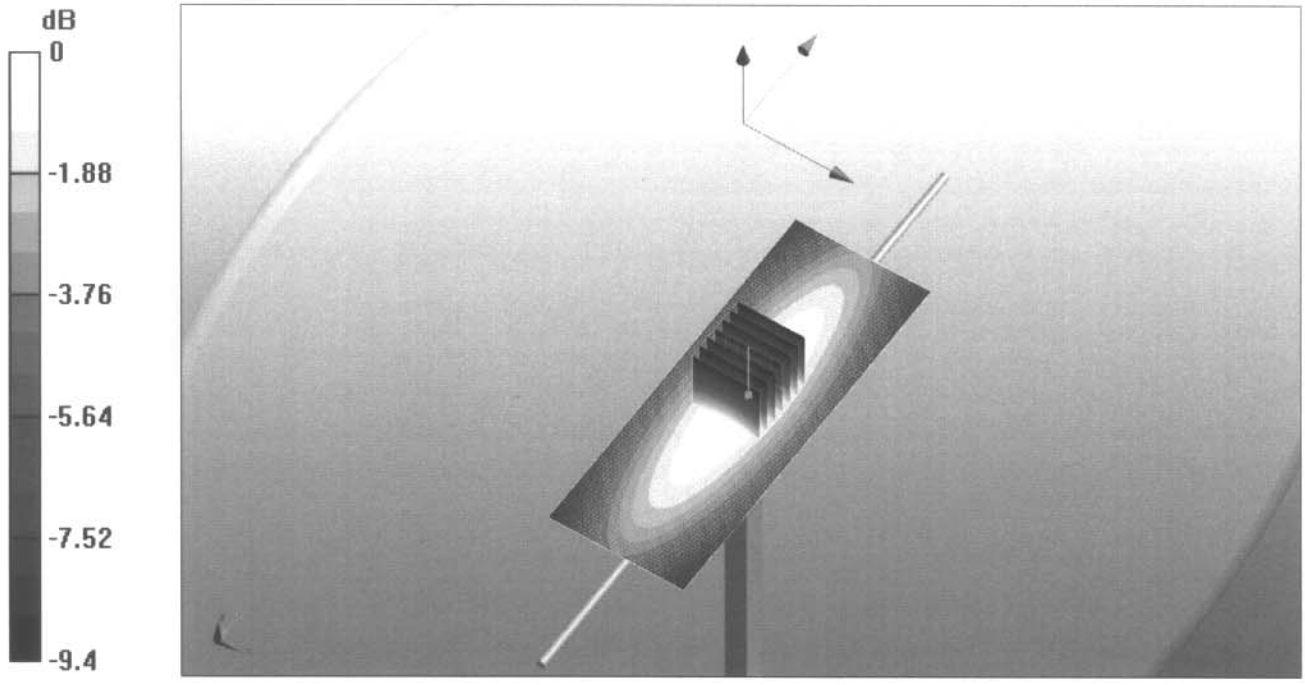
Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium: HSL450
Medium parameters used: f = 450 MHz; σ = 0.86 mho/m; ε_r = 44.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1507 (LF); ConvF(6.66, 6.66, 6.66); Calibrated: 7/3/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 5/4/2009
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 57

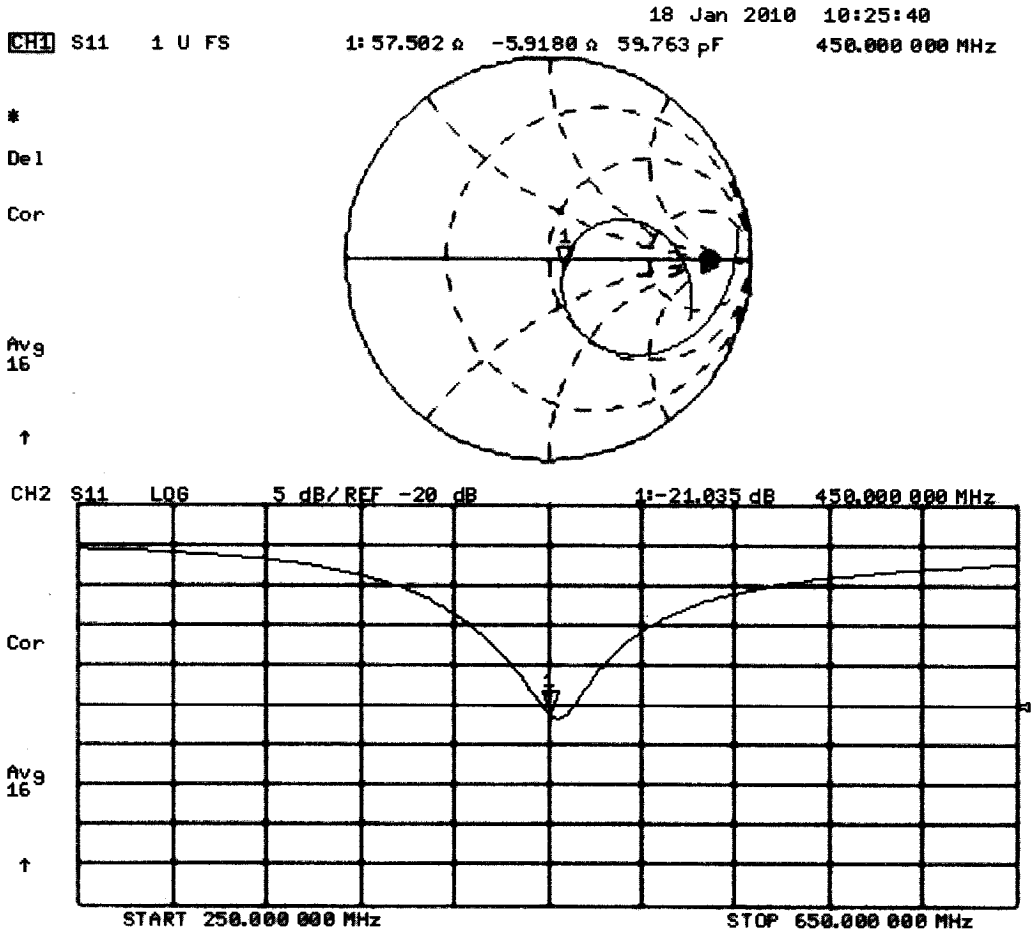
Head/d=15mm, Pin=398mW/Area Scan (41x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.99 mW/g

Head/d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 50.2 V/m; Power Drift = -0.020 dB
Peak SAR (extrapolated) = 2.78 W/kg
SAR(1 g) = 1.87 mW/g; SAR(10 g) = 1.25 mW/g
Maximum value of SAR (measured) = 2 mW/g



0 dB = 2mW/g

Impedance Measurement Plot for Head TSL



Date/Time: 1/18/2010 1:24:11 PM

DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1068

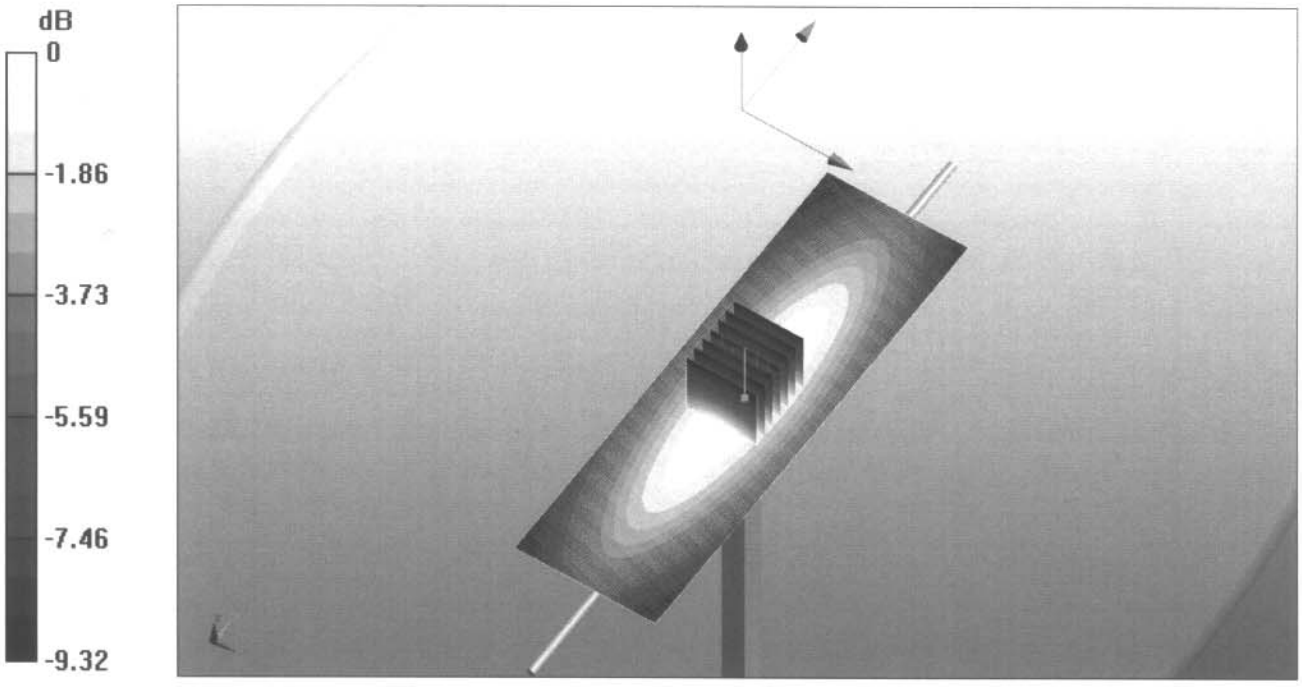
Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1
Medium: MSL450
Medium parameters used: f = 450 MHz; σ = 0.9 mho/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ET3DV6 - SN1507 (LF); ConvF(7.11, 7.11, 7.11); Calibrated: 7/3/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 5/4/2009
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 57

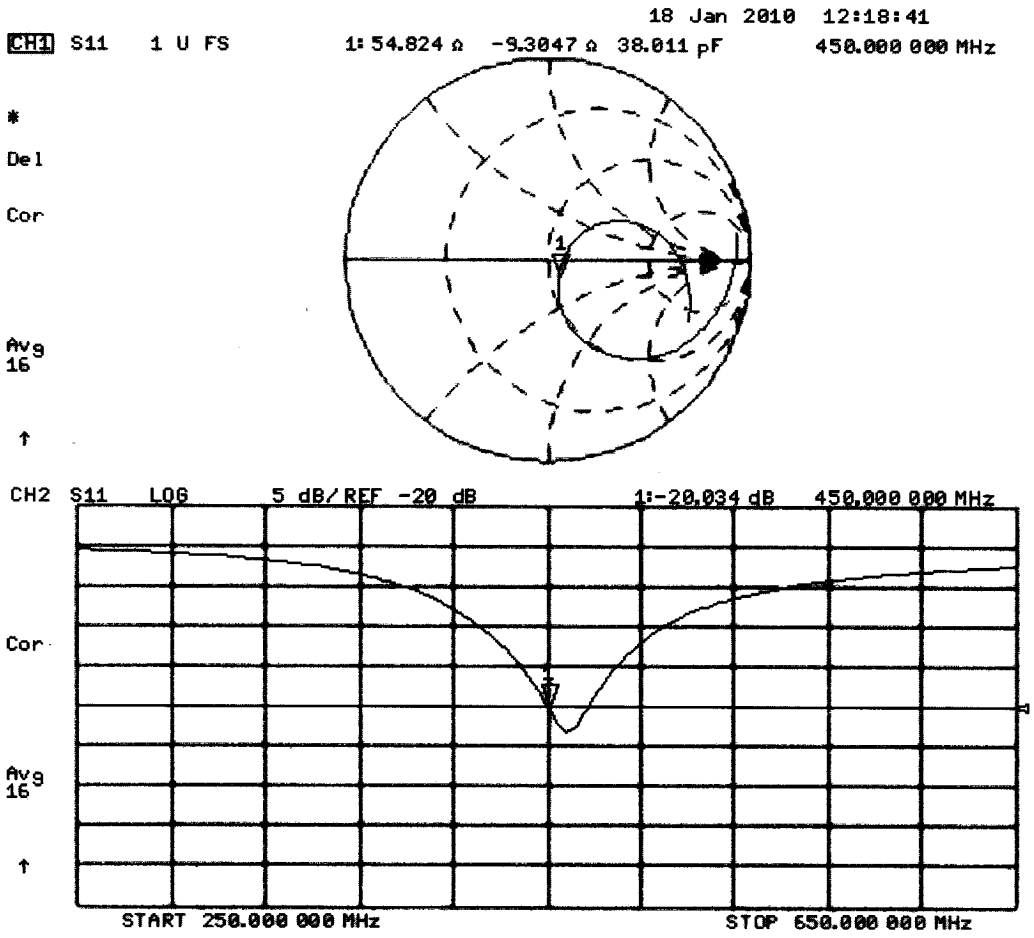
Body/d=15mm, Pin=398mW/Area Scan (61x201x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 1.9 mW/g

Body/d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 47.4 V/m; Power Drift = -0.034 dB
Peak SAR (extrapolated) = 2.71 W/kg
SAR(1 g) = 1.78 mW/g; SAR(10 g) = 1.19 mW/g
Maximum value of SAR (measured) = 1.9 mW/g



0 dB = 1.9mW/g

Impedance Measurement Plot for Body TSL



APPENDIX F - PROBE CALIBRATION

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: ET3-1590_Jul10

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1590**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v6, QA CAL-23.v3 and QA CAL-25.v2**
Calibration procedure for dosimetric E-field probes

Calibration date: **July 15, 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	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11

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	**Jeton Kastrati**	**Laboratory Technician**	
Approved by:	**Katja Pokovic**	**Technical Manager**	

Issued: July 15, 2010

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

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 ET3DV6

SN:1590

Manufactured:	March 19, 2001
Last calibrated:	July 16, 2009
Recalibrated:	July 15, 2010

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ET3DV6 SN:1590

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.86	2.06	1.77	± 10.1%
DCP (mV)[B]	91.4	92.4	83.5	

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	300.0	± 1.5%
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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 rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ET3DV6 SN:1590

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)
450	± 50 / ± 100	43.5 ± 5%	0.87 ± 5%	7.25	7.25	7.25	0.20	2.19 ± 13.3%
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	6.27	6.27	6.27	0.32	2.49 ± 11.0%
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	6.12	6.12	6.12	0.27	2.86 ± 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/EASY - Parameters of Probe: ET3DV6 SN:1590

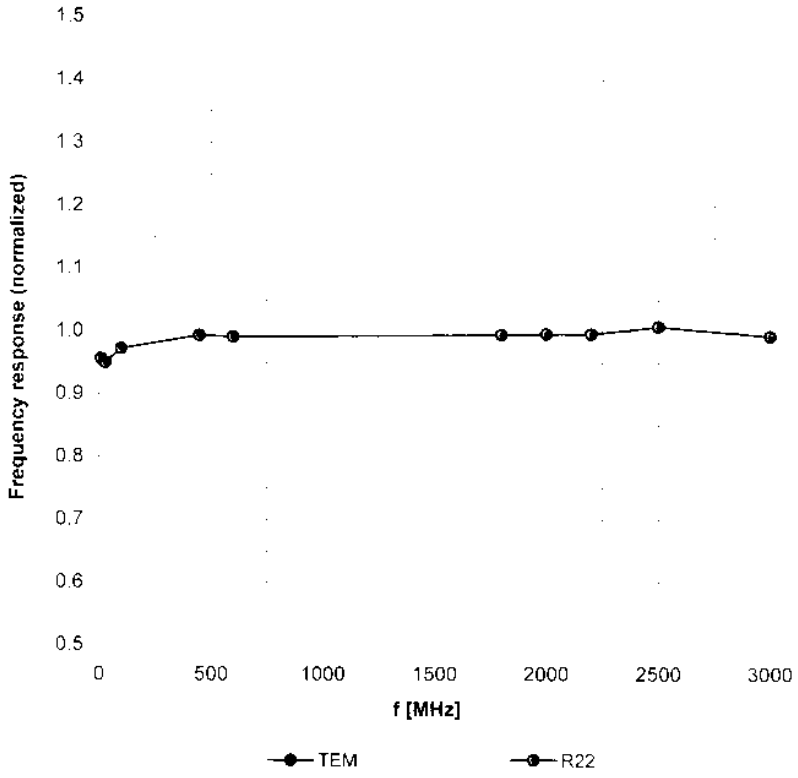
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	56.7 ± 5%	0.94 ± 5%	7.73	7.73	7.73	0.13	2.06 ± 13.3%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	6.33	6.33	6.33	0.22	3.60 ± 11.0%
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	6.15	6.15	6.15	0.28	2.94 ± 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.

Frequency Response of E-Field

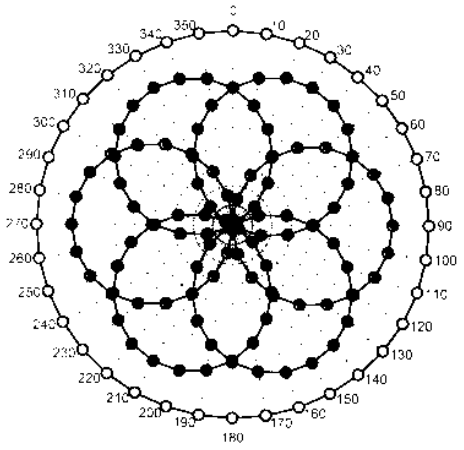
(TEM-Cell:ifi110 EXX, Waveguide: R22)



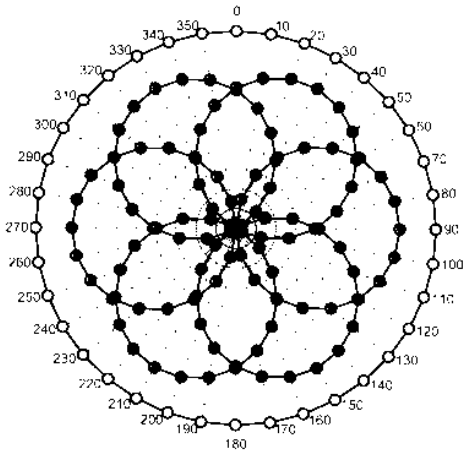
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

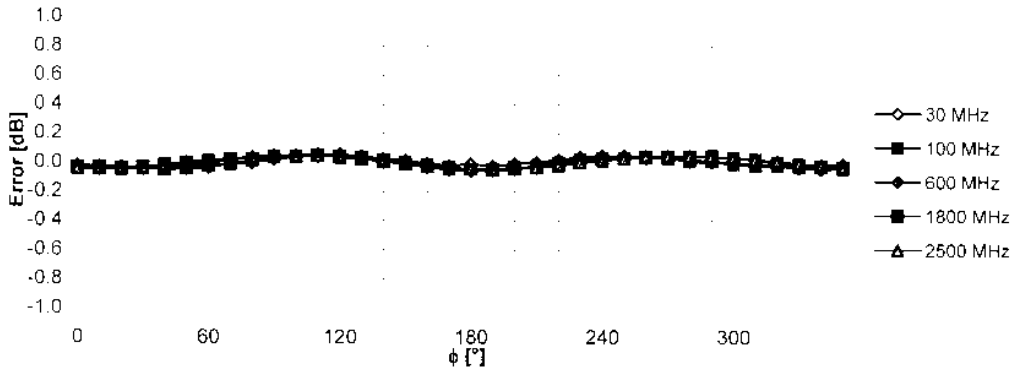
Receiving Pattern (ϕ), ϑ = 0°

f = 600 MHz, TEM ifi110EXX



f = 1800 MHz, WG R22

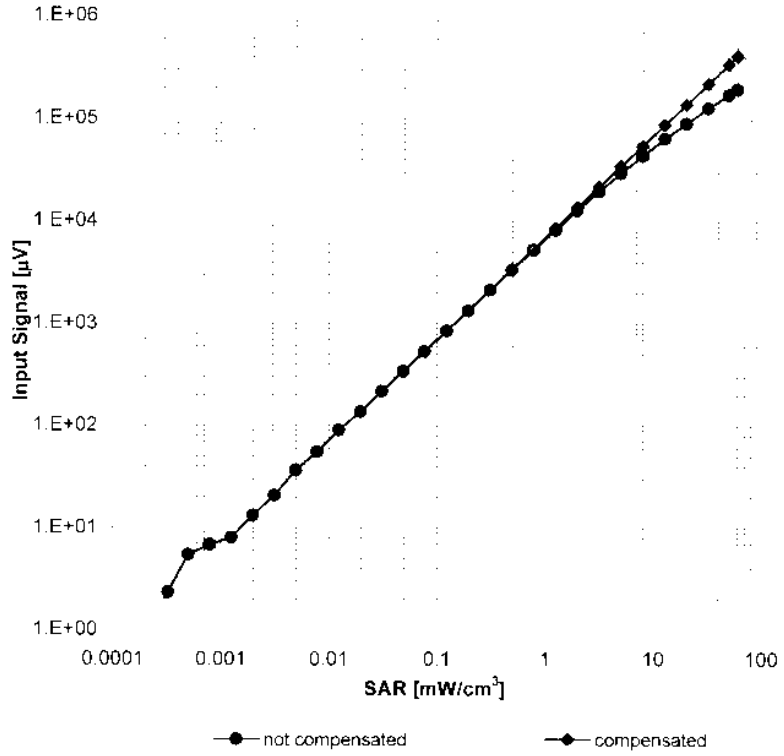


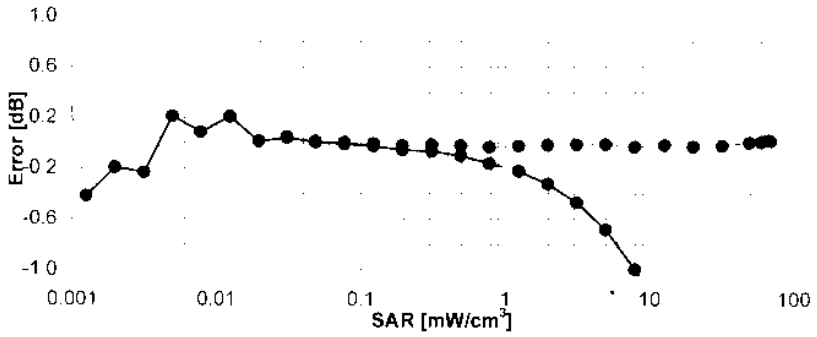


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

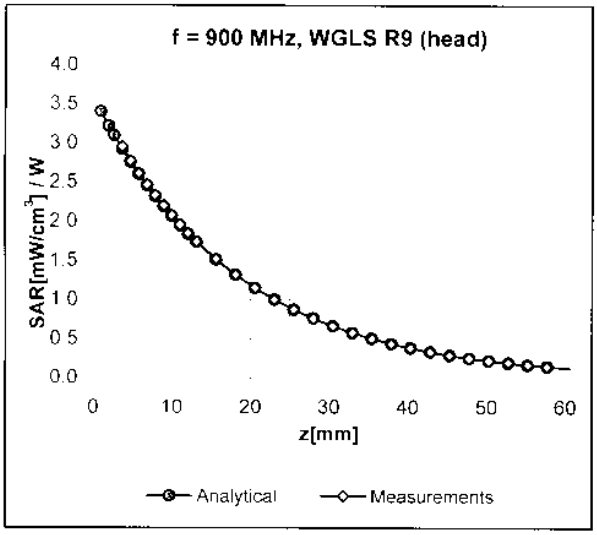
(Waveguide R22, f = 1800 MHz)

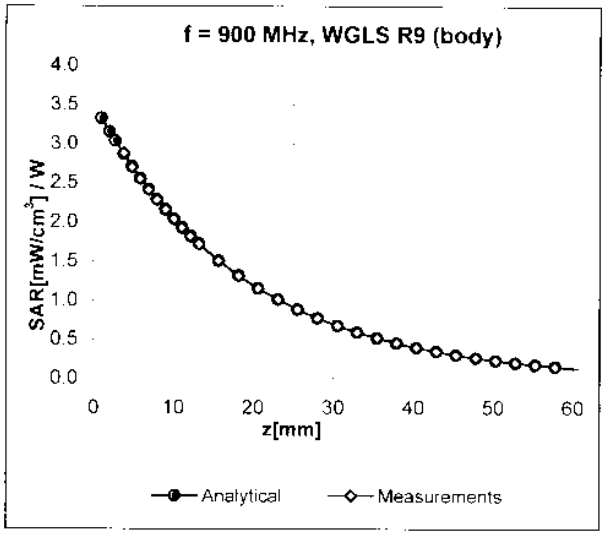




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

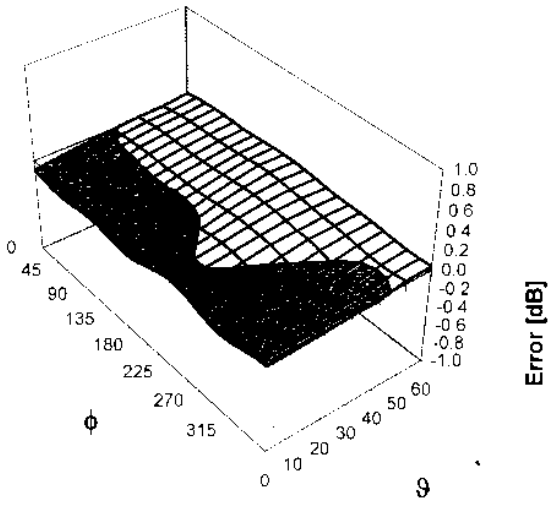
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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	enabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

APPENDIX G - BARSKI PLANAR PHANTOM CERTIFICATE OF CONFORMITY

2378 Westlake Road
Kelowna, B.C. Canada
V1Z-2V2

BARSKI INDUSTRIES (1985) LTD.

Ph. # 250-769-6848
Fax # 250-769-6334
E-mail: barskiind@shaw.ca
Web: www.bcfiberglass.com

FIBERGLASS FABRICATORS

Certificate of Conformity

Item : Flat Planar Phantom Unit # 03-01
Date: June 16, 2003
Manufacturer: Barski Industries (1985 Ltd)

Test	Requirement	Details
Shape	Compliance to geometry according to drawing	Supplied CAD drawing
Material Thickness	Compliant with the requirements	2mm +/- 0.2mm in measurement area
Material Parameters	Dielectric parameters for required frequencies Based on Dow Chemical technical data	100 MHz-5 GHz Relative permittivity<5 Loss Tangent<0.05

Conformity

Based on the above information, we certify this product to be compliant to the requirements specified.

Signature: _____

Daniel Chailler

Fiberglass Planar Phantom - Top View

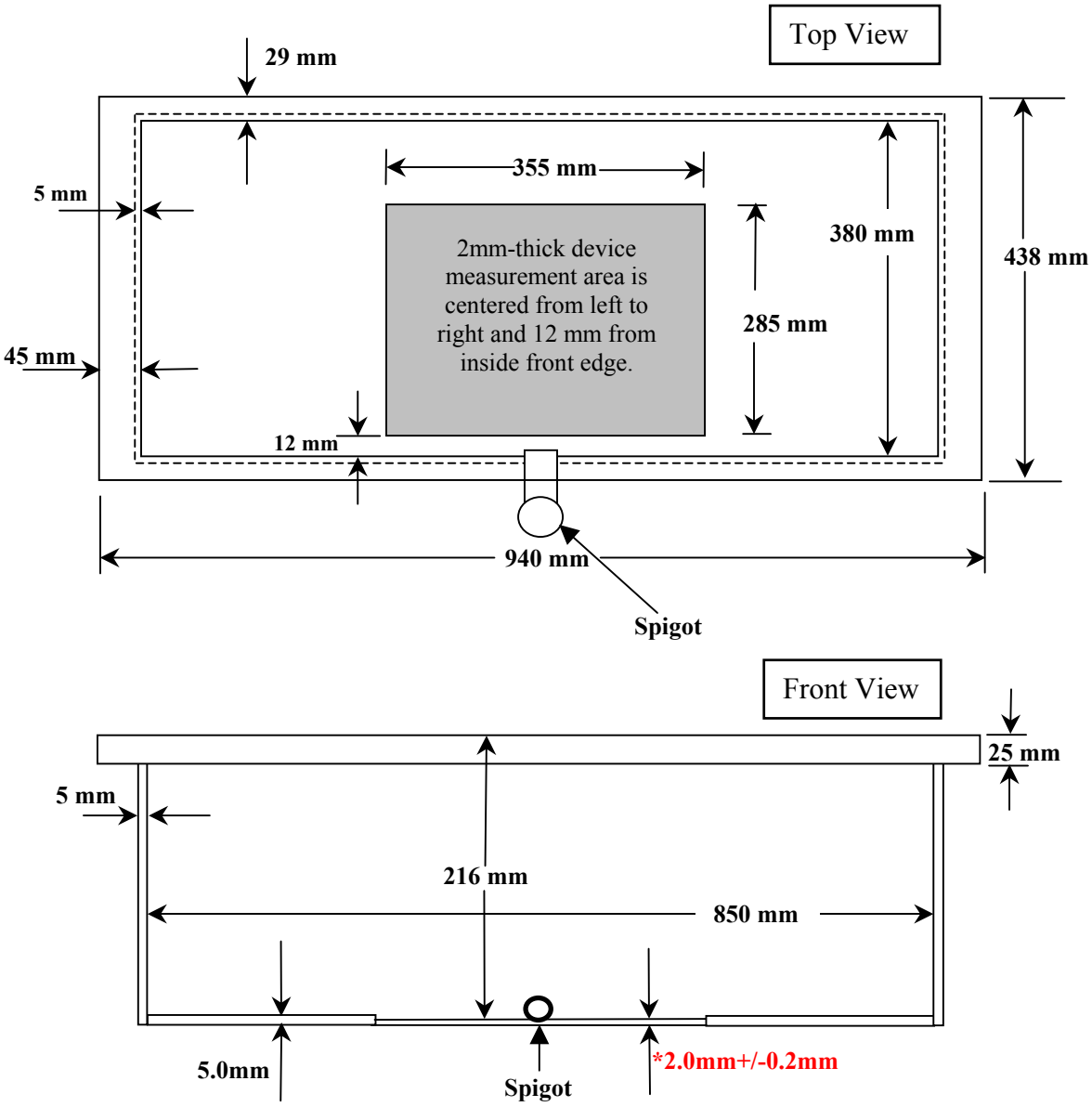
Fiberglass Planar Phantom - Front View

Fiberglass Planar Phantom - Back View

Fiberglass Planar Phantom - Bottom View

Dimensions of Fiberglass Planar Phantom

(Manufactured by Barski Industries Ltd. - Unit# 03-01)



Note: Measurements that aren't repeated for the opposite sides are the same as the side measured. This drawing is not to scale.