SAR TEST REPORT (FCC/IC)

RF EXPOSURE EVALUATION | SPECIFIC ABSORPTION RATE

APPLICANT / MANUFACTURER	M/A-COM, INC.				
DEVICE UNDER TEST (DUT)	PORTABLE 700/800 PTT RADIO TRANSCEIVER (ANALOG/DIGITAL)				
DEVICE MODEL(S)	P7300				
RATED OUTPUT POWER	3 Watts				
FREQUENCY RANGES TESTED	FCC	769-775 MHz	799-805 MHz	806-824 MHz	851-869 MHz
	IC	764-770 MHz		794-800 MHz	
DEVICE IDENTIFIER(S)	FCC ID:	OWDTR-0054-E	IC:	3636B-0054	
APPLICATION TYPE	Certification				
STANDARD(S) APPLIED	FCC 47 CFR §2.1093				
	Health Canada Safety Code 6				
PROCEDURE(S) APPLIED	FCC OET Bulletin 65, Supplement C (01-01)				
	FCC Mobile & Portable RF Exposure Proc. (KDB 447498 D01 v03r03)				
	Industry Canada RSS-102 Issue 2				
	IEEE 1528-2003				
	IEC 62209-1:2005				
FCC DEVICE CLASSIFICATION	Licensed Non-Broadcast Transmitter Held to Face (TNF)				
IC DEVICE CLASSIFICATION	Land Mobile Radio Transmitter/Receiver (27.41-960 MHz)				
RF EXPOSURE CATEGORY	Occupational / Controlled				
RF EXPOSURE EVALUATIONS	Face-held & Body-worn				
DATE(S) OF EVALUATIONS	March 24 - May 13, 2009				
TEST REPORT SERIAL NO.	032009OWD-T959-S90P				
TEST REPORT REVISION NO.	Revision 1.0	Initial Release	May 22, 2009		
TEST REPORT SIGNATORIES	Testing Performed By		Test Report Prepared By		
	Sean Johnston Celltech Labs Inc.		Jonathan Hughes Celltech Labs Inc.		
TEST LAB AND LOCATION	Celltech Compliance Testing and Engineering Lab				
	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada				
TEST LAB CONTACT INFO.	Tel.: 250-765-7650		Fax: 250-765-7645		
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TEST LAB ACCREDITATION(S)	ilac-MRA / A2LA ACCREDITED Test Lab Certificate No. 2470.01				

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DECLARATION OF COMPLIANCE - SAR RF EXPOSURE EVALUATION

Test Lab Information	**Name**	**CELLTECH LABS INC.**			**Address**	21-364 Lougheed Road, Kelowna B.C. V1X 7R8 Canada					
Company Information	**Name**	**M/A-COM, INC.**			**Address**	221 Jefferson Ridge Parkway Lynchburg, VA 24501 USA					
Device Description	Portable 700/800 MHz PTT Radio Transceiver				**Model(s)**	P7300 700-800	**Mode(s)**	Analog (FM)	Digital (FSK)		
Device Part No.(s) & Serial No.(s) Tested	Scan Radio	P/N: RU-012560-001	S/N: T2-DB-003	Identical Prototype							
	System Radio	P/N: RU-012560-002	S/N: T2-DB-004	Identical Prototype							
Transmit Frequency Range(s)	FCC	769-775 MHz	Low Channel: 769.00625 MHz	Mid Channel: 772.00625 MHz	High Channel: 774.99375 MHz						
		799-805 MHz	Low Channel: 799.00625 MHz	Mid Channel: 802.00625 MHz	High Channel: 804.99375 MHz						
		806-824 MHz	Low Channel: 806.00000 MHz	Mid Channel: 815.00000 MHz	High Channel: 824.00000 MHz						
		851-869 MHz	Low Channel: 851.00000 MHz	Mid Channel: 860.00000 MHz	High Channel: 869.00000 MHz						
	IC	764-770 MHz	Low Channel: 764.00000 MHz	Mid Channel: 767.00000 MHz	High Channel: 770.00625 MHz						
		794-800 MHz	Low Channel: 794.00000 MHz	Mid Channel: 797.00000 MHz	High Channel: 800.00625 MHz						
RF Output Power Measured	System Radio	FCC	Low Channel: 770.00625 MHz	Mid Channel: 772.00625 MHz	High Channel: 774.99375 MHz						
			34.45 dBm	2.79 Watts	34.45 dBm	2.79 Watts	32.70 dBm	1.86 Watts			
			Low Channel: 800.00625 MHz	Mid Channel: 802.00625 MHz	High Channel: 804.99375 MHz						
			34.52 dBm	2.83 Watts	34.52 dBm	2.83 Watts	32.75 dBm	1.88 Watts			
			Low Channel: 806.00000 MHz	Mid Channel: 815.00000 MHz	High Channel: 824.00000 MHz						
			35.00 dBm	3.16 Watts	35.00 dBm	3.16 Watts	35.00 dBm	3.16 Watts			
			Low Channel: 851.00000 MHz	Mid Channel: 860.00000 MHz	High Channel: 869.00000 MHz						
			35.00 dBm	3.16 Watts	34.93 dBm	3.11 Watts	34.90 dBm	3.09 Watts			
		IC	Low Channel: 764.00000 MHz	Mid Channel: 767.00000 MHz	High Channel: 770.00625 MHz						
			34.40 dBm	2.75 Watts	34.40 dBm	2.75 Watts	34.45 dBm	2.78 Watts			
			Low Channel: 794.00000 MHz	Mid Channel: 797.00000 MHz	High Channel: 800.00625 MHz						
			34.50 dBm	2.82 Watts	34.50 dBm	2.82 Watts	34.50 dBm	2.82 Watts			
Rated RF Conducted Power	3 Watts (700/800 Band)	**Manufacturer's Output Power Spec. inc. Tolerance**	2.9 Watts (700 Band)	3.4 Watts (800 Band)							
	Note: The maximum SAR level configurations in the 800 freq. bands were re-evaluated at the max. tolerance power of 3.4 Watts										
Antenna Type(s) Tested	Half-wave Whip	806 - 870 MHz	Length: 175 mm	P/N: KRE 101 1506/1							
	Wideband Whip	764 - 870 MHz	Length: 79 mm	P/N: KRE 101 1506/2							
Battery Type(s) Tested	7.5V	Ni-Cd	immersible	non-IS	P/N: BT-023406-001	7.5V	Ni-Cd	immersible	IS	P/N: BT-023406-002	
	7.5V	Ni-MH	immersible	non-IS	P/N: BT-023406-003	7.5V	Ni-MH	immersible	IS	P/N: BT-023406-004	
	7.5V	Li-ion	immersible	non-IS	P/N: BT-023406-005	7.5V	Li-ion	immersible	IS	P/N: BT-023406-006	
Body-worn Accessories Tested	Metal Belt-Clip P/N: CC23894					Nylon "T"-Strap Holder P/N: KRY1011656/1					
	[BEE] P7300 Black Nylon Case with Belt Loop Kit: Kit containing FM-016199-001 P7300 [BEE] Nylon Case (Black) (with radio retaining strap) & [BEE] Leather Belt Loop (P/N: CC-014527)									P/N: KT-016201-001	
	[BEE] P7300 Leather Case with Belt Loop Kit: Kit containing FM-016199-003 P7300 [BEE] Leather Case (with radio retaining strap) without shoulder strap D-rings, Swivel-Mount (P/N: KRY1011608/2) & [BEE] Leather Belt Loop (P/N: CC-014527)									P/N: KT-016201-003	
	[BEE] P7300 Leather Case with Shoulder Strap Kit: Kit containing FM-016199-004 P7300 [BEE] Leather Case with shoulder strap D-rings (with radio retaining strap), Swivel-Mount (P/N: KRY1011608/2) & [BEE] Shoulder Strap (P/N: CC-014524-001)									P/N: KT-016201-004	
	[BEE] Short Leather Retaining Strap (for use with shoulder strap application)									P/N: CC-014524-002	
Audio Accessories Tested	Speaker-Mic P/N: MC-023933-001	Speaker-Mic w/ Ant. P/N: MC-023933-002	Earphone for speaker-mic P/N: LS103239V1								
Max. SAR Level(s) Evaluated	**Face-held**	**2.70 W/kg**	1g average	50% PTT Duty Cycle	**FCC/IC SAR Limit**	**8.0 W/kg**	1g average				
	Body-worn	**3.31 W/kg**	1g average	50% PTT Duty Cycle	**FCC/IC SAR Limit**	**8.0 W/kg**	1g average				

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6 for the Occupational / Controlled Exposure environment. The device was tested in accordance with the measurement standards and procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 2, IEEE 1528-2003 and IEC 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. This test report shall not be reproduced partially, or in full, without the prior written permission of Celltech Labs Inc.

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

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1.0 INTRODUCTION

This measurement report demonstrates that the M/A-COM Model: P7300 Portable Analog/Digital 700/800 MHz PTT Radio Transceiver complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada's Safety Code 6 (see reference [2]) for the Occupational / Controlled Exposure environment. The test procedures described in FCC OET Bulletin 65, Supplement C, Edition 01-01 (see reference [3]) IC RSS-102 Issue 2 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]) and IEC International Standard 62209-1:2005 (see reference [6]) were employed. A description of the device, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

2.0 ADDITIONAL BODY-WORN AND AUDIO ACCESSORIES

	Accessory Type	Part No.
Additional Body-worn and Audio Accessories*	Kit containing FM-016199-002 P7300 [BEE] Nylon Case (Orange) (with radio retaining strap) & [BEE] Leather Belt Loop (P/N: CC-014527)	KT-016201-002
	Metal Belt Clip (alternate)	CC-011318
	Earphone Kit, Black	EA-009580-001
	Earphone Kit, Beige	EA-009580-002
	2-Wire Kit, Palm mic, Black	EA-009580-003
	2-Wire Kit, Palm mic, Beige	EA-009580-004
	3-Wire Kit, Mini-Lapel Mic, Black	EA-009580-005
	3-Wire Kit, Mini-Lapel Mic, Beige	EA-009580-006
	Explorer Headset w/ PTT	EA-009580-007
	Lightweight headset single speaker w/ PTT	EA-009580-008
	Breeze Headset w/ PTT	EA-009580-009
	Headset, heavy duty, N/C behind the head w/ PTT	EA-009580-010
	Ranger Headset w/ PTT	EA-009580-011
	Skull mic w/ body PTT & earcup	EA-009580-012
	Headset, heavy duty, N/C over the head w/ PTT	EA-009580-013
	Throat mic w/ acoustic tube & body PTT	EA-009580-014
	Throat mic w/ acoustic tube, body PTT, & ring PTT	EA-009580-015
	Breeze headset w/ PTT & pigtail jack	EA-009580-016
	Hurricane headset w/ PTT	EA-009580-017
	Hurricane headset w/ PTT & pigtail jack	EA-009580-018

* Additional testing not performed for the above-listed body-worn accessories based on identical or similar construction with equal or lesser spacing and similar metallic components to the body-worn accessories tested and therefore no change in SAR is expected. Additional testing not performed for the above-listed audio accessories based on identical or similar construction to the audio accessories tested and therefore no change in SAR is expected.

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3.0 SAR MEASUREMENT SYSTEM

Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for 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 its own controller with a built in VME-bus computer.

DASY4 SAR Measurement System with SAM phantom V4.0 (validation)

DASY4 SAR Measurement System with Plexiglas side planar phantom

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4.0 FACE-HELD SAR MEASUREMENT SUMMARY

FACE-HELD SAR EVALUATION RESULTS

Test Date	Freq. Band	Test Freq.	DUT Type	Antenna Part No.	Battery Type	Device Distance to Planar Phantom		Cond. Power Before Test	SAR Drift During Test	Measured SAR 1g (W/kg)		Scaled SAR 1g (W/kg) with Droop	
										PTT Duty Cycle		PTT Duty Cycle	
	MHz	MHz				DUT	Antenna	dBm	dB	100%	50%	100%	50%
Apr 15	806-824	815.00000	System	KRE1011506/1	Ni-Cd NIS	2.5 cm	5.5 cm	35.00	-0.504	1.63	0.815	1.83	0.915
Apr 15	851-869	860.00000						34.93	-0.092	1.08	0.540	1.10	0.552
Apr 15	769-775	770.00625	System	KRE1011506/2	Ni-Cd NIS	2.5 cm	5.5 cm	34.45	-0.039	2.11	1.06	2.13	1.06
Apr 15	799-805	800.00625						34.52	-0.009	3.33	1.67	3.34	1.67
Apr 15	806-824	815.00000						35.00[3]	-0.450	4.00	2.00	4.44	2.22
May 13	806-824	815.00000						35.31[3]	-0.174	5.19	2.60	5.40	**2.70**
Apr 15	851-869	860.00000						34.93	-0.322	3.30	1.65	3.55	1.78
Apr 15	806-824	815.00000	Scan					34.95	-0.187	3.92	1.96	4.09	2.05
Apr 15	806-824	815.00000	Speaker-Mic with Antenna	KRE1011506/1	Ni-Cd NIS	2.5 cm	3.0 cm	35.00	-0.031	3.14	1.57	3.16	1.58
Apr 15	851-869	860.00000						34.93	-0.017	2.27	1.14	2.28	1.14
Apr 15	769-775	770.00625	Speaker-Mic with Antenna	KRE1011506/2	Ni-Cd NIS	2.5 cm	3.0 cm	34.45	0.025	1.91	0.955	1.91	0.955
Apr 15	799-805	800.00625						34.52	0.217	1.87	0.935	1.87	0.935
Apr 15	806-824	815.00000						35.00	-0.099	1.86	0.930	1.90	0.951
Apr 15	851-869	860.00000						34.93	-0.176	1.82	0.910	1.90	0.948

SAR SAFETY LIMIT(S)		HEAD	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	Health Canada Safety Code 6	8.0 W/kg	averaged over 1 gram	Occupational / Controlled

Test Date(s)	April 15, 2009				April 15, 2009				April 15, 2009				April 15, 2009			
Measured Fluid Freq.	775 MHz Head				805 MHz Head				815 MHz Head				865 MHz Head			
Dielectric Constant ε_r	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	41.5	± 5%	43.1	+3.8%	41.5	± 5%	42.5	+2.4%	41.5	± 5%	42.8	+3.1%	41.5	± 5%	41.9	+1.0%
May 13, 2009									41.5	± 5%	42.3	+2.0%				
Conductivity σ (mho/m)	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	0.90	± 5%	0.86	-4.5%	0.90	± 5%	0.88	-2.2%	0.90	± 5%	0.90	0.0%	0.90	± 5%	0.94	+4.5%
May 13, 2009									0.90	± 5%	0.89	-1.1%				

Test Date	Fluid Type	Ambient Temp.	Fluid Temp.	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
April 15, 2009	835 MHz Head	24.0 °C	22.6 °C	≥ 15 cm	101.5 kPa	35 %	1000
May 13, 2009	835 MHz Head	23.0 °C	22.4 °C	≥ 15 cm	101.5 kPa	35 %	1000

Notes

1. The Ni-Cd NIS battery was selected for the face-held SAR evaluations based on the max. measured SAR level configuration from the body-worn evaluations.
2. The SAR evaluations were perfomed with the System Radio based on the maximum measured conducted output power levels. The maximum SAR level configuration measured with the System Radio was also re-evaluated with the Scan Radio to report a comparison.
3. The DUT was evaluated for SAR at the conducted output power level preset by the manufacturer. The maximum measured SAR level configuration was also re-evaluated at the manufacturer's specified maximum output power level including tolerance (3.4 Watts 800 band only) to report a worst-case max. SAR level.
4. If the scaled SAR levels evaluated at the mid channel (50% duty cycle) were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
5. The SAR droop measured by the DASY4 system for the duration of the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the above test data table.
6. The area scan evaluation was performed with a fully charged battery. After the area scan evaluation was completed the battery was replaced with a fully charged battery prior to the zoom scan evaluation.
7. The DUT was evaluated for SAR 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.

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5.0 BODY-WORN SAR MEASUREMENT SUMMARY

BODY-WORN SAR EVALUATION RESULTS (SYSTEM RADIO)

Test Date	Freq. Band	Test Freq.	Antenna Part No.	Battery Type	Device Accessories and Distance to Planar Phantom			Cond. Power Before Test	SAR Drift During Test	Measured SAR 1g (W/kg)		Scaled SAR 1g (W/kg) with Droop	
										PTT Duty Cycle		PTT Duty Cycle	
	MHz	MHz			Accessory	DUT	Antenna	dB	dB	100%	50%	100%	50%
Mar 24	769-775	770.00625	KRE1011506/2	NiCd NIS	Belt-Clip & Speaker-Mic	1.1 cm	2.5 cm	34.45	-0.033	5.12	2.56	5.16	2.58
Mar 24				NiCd IS				34.45	-0.069	5.09	2.55	5.17	2.59
Mar 24				NiMH NIS				34.45	0.015	4.50	2.25	4.50	2.25
Mar 24				NiMH IS				34.45	-0.015	4.88	2.44	4.90	2.45
Mar 24				Li-ion NIS				34.45	-0.100	4.71	2.36	4.82	2.41
Mar 24				Li-ion IS				34.45	-0.035	4.45	2.23	4.49	2.24
Mar 24	799-805	800.00625	KRE1011506/2	NiCd NIS	Belt-Clip & Speaker-Mic	1.1 cm	2.5 cm	34.52	-0.340	P 4.02	2.01	P 4.35	2.17
										S 2.80	1.40	S 3.03	1.51
Mar 24				NiCd IS				34.52	-0.212	4.24	2.12	4.45	2.23
Mar 24				NiMH NIS				34.52	-0.085	P 3.76	1.88	P 3.83	1.92
										S 2.59	1.30	S 2.64	1.32
Mar 24				NiMH IS				34.52	-0.159	4.41	2.21	4.57	2.29
Mar 24				Li-ion NIS				34.52	-0.201	4.34	2.17	4.55	2.27
Mar 24				Li-ion IS				34.52	-0.112	4.43	2.22	4.55	2.27
Mar 25	806-824	815.00000	KRE1011506/1	NiCd NIS	Belt-Clip & Speaker-Mic	1.1 cm	2.5 cm	35.00	0.369	4.18	2.09	4.18	2.09
Mar 25				NiCd IS				35.00	-0.235	3.17	1.59	3.35	1.67
Mar 25				NiMH NIS				35.00	-0.674	4.73	2.37	5.52	2.76
Mar 25				NiMH IS				35.00	-0.016	4.33	2.17	4.35	2.17
Mar 25				Li-ion NIS				35.00	-0.072	3.71	1.86	3.77	1.89
Mar 25				Li-ion IS				35.00	-0.017	4.59	2.30	4.61	2.30
Mar 25			KRE1011506/2	NiCd NIS	Belt-Clip & Speaker-Mic	1.1 cm	2.5 cm	35.00	-0.045	4.64	2.32	4.69	2.34
Mar 25				NiCd IS				35.00	-0.018	3.89	1.95	3.91	1.95
Mar 25				NiMH NIS				35.00	-0.011	4.18	2.09	4.19	2.10
Mar 25				NiMH IS				35.00	0.052	P 3.82	1.91	P 3.82	1.91
										S 2.86	1.43	S 2.86	1.43
Mar 25				Li-ion NIS				35.00	-0.044	P 3.36	1.68	P 3.39	1.70
										S 2.74	1.37	S 2.77	1.38
Mar 25				Li-ion IS				35.00	-0.087	4.26	2.13	4.35	2.17
Mar 26	851-869	860.00000	KRE1011506/1	NiCd NIS	Belt-Clip & Speaker-Mic	1.1 cm	2.5 cm	34.93	-0.026	2.68	1.34	2.70	1.35
Mar 26				NiCd IS				34.93	-0.075	2.89	1.45	2.94	1.47
Mar 26				NiMH NIS				34.93	0.029	2.43	1.22	2.43	1.22
Mar 26				NiMH IS				34.93	-0.106	2.81	1.41	2.88	1.44
Mar 26				Li-ion NIS				34.93	-0.099	2.75	1.38	2.81	1.41
Mar 26				Li-ion IS				34.93	-0.094	3.12	1.56	3.19	1.59
Mar 26			KRE1011506/2	NiCd NIS	Belt-Clip & Speaker-Mic	1.1 cm	2.5 cm	34.93	-0.110	P 3.47	1.74	P 3.56	1.78
										S 3.61	1.81	S 3.70	1.85
Mar 26				NiCd IS				34.93	-0.093	P 3.74	1.87	P 3.82	1.91
										S 3.53	1.77	S 3.61	1.80
Mar 26				NiMH NIS				34.93	-0.107	P 3.84	1.92	P 3.94	1.97
										S 3.50	1.75	S 3.59	1.79
Mar 26				NiMH IS				34.93	-0.228	P 3.80	1.90	P 4.00	2.00
										S 3.65	1.83	S 3.85	1.92
Mar 26				Li-ion NIS				34.93	-0.246	P 3.83	1.92	P 4.05	2.03
										S 3.76	1.88	S 3.98	1.99
Mar 26				Li-ion IS				34.93	-0.257	P 3.68	1.84	P 3.90	1.95
										S 3.59	1.80	S 3.81	1.90

SAR SAFETY LIMIT(S)		BODY	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	Health Canada Safety Code 6	8.0 W/kg	averaged over 1 gram	Occupational / Controlled

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BODY-WORN SAR EVALUATION RESULTS (CONT.)

Test Date	Freq. Band	Test Freq.	DUT Type	Antenna Part No.	Device Accessories and Distance to Planar Phantom System Radio with Speaker-Microphone Speaker-Mic-Antenna with Earphone			Cond. Power Before Test	SAR Drift During Test	Measured SAR 1g (W/kg) PTT Duty Cycle		Scaled SAR 1g (W/kg) with Droop PTT Duty Cycle	
	MHz	MHz			Accessory	DUT	Antenna	Watts	dB	100%	50%	100%	50%
Mar 27	769-775	770.00625	System Radio	KRE1011506/2	T-Strap	2.0 cm	2.2 cm	34.45	0.008	P 3.15	1.58	P 3.15	1.58
										S 2.21	1.11	S 2.21	1.11
Mar 27					NC & LBL	4.0 cm	4.5 cm	34.45	0.187	1.33	0.665	1.33	0.665
Mar 27					LC & LBL	5.0 cm	5.3 cm	34.45	0.010	1.13	0.565	1.13	0.565
Mar 27					LC & SS	3.5 cm	3.8 cm	34.45	-0.164	P 2.75	1.38	P 2.86	1.43
										S 2.68	1.34	S 2.78	1.39
Apr 14			SMA		Lapel-Clip	1.5 cm	2.8 cm	34.45	-0.075	2.67	1.34	2.72	1.36
Mar 27	799-805	800.00625	System Radio	KRE1011506/2	T-Strap	2.0 cm	2.2 cm	34.52	-0.528	P 2.60	1.30	P 2.94	1.47
										S 2.46	1.23	S 2.78	1.39
Mar 27					NC & LBL	4.0 cm	4.5 cm	34.52	-0.286	1.28	0.640	1.37	0.684
Mar 27					LC & LBL	5.0 cm	5.3 cm	34.52	0.407	1.09	0.545	1.09	0.545
Mar 27					LC & SS	3.5 cm	3.8 cm	34.52	-0.309	P 2.81	1.41	P 3.02	1.51
										S 2.39	1.20	S 2.57	1.28
										S 1.83	0.915	S 1.96	0.982
Apr 14			SMA		Lapel-Clip	1.5 cm	2.8 cm	34.52	-0.025	3.38	1.69	3.40	1.70
Mar 30	806-824	815.00000	System Radio	KRE1011506/1	T-Strap	2.0 cm	2.2 cm	35.00	-0.317	5.41	2.71	5.82	2.91
Mar 30					NC & LBL	4.0 cm	4.5 cm	35.00	0.215	1.01	0.505	1.01	0.505
Mar 30					LC & LBL	5.0 cm	5.3 cm	35.00	-0.339	0.650	0.325	0.703	0.351
Mar 30					LC & SS	3.5 cm	3.8 cm	35.00	-0.374	1.62	0.810	1.77	0.883
Apr 14			SMA		Lapel-Clip	1.5 cm	2.8 cm	35.00	0.067	0.841	0.421	0.841	0.421
Mar 30		815.00000	System Radio	KRE1011506/2	T-Strap	2.0 cm	2.2 cm	35.00	-0.250	P 2.46	1.23	P 2.61	1.30
										S 2.47	1.24	S 2.62	1.31
Mar 30					NC & LBL	4.0 cm	4.5 cm	35.00	-0.145	1.57	0.785	1.62	0.812
Mar 30					LC & LBL	5.0 cm	5.3 cm	35.00	-0.144	1.54	0.770	1.59	0.796
Mar 30					LC & SS	3.5 cm	3.8 cm	35.00	-0.187	P 1.96	0.980	P 2.05	1.02
										S 1.66	0.830	S 1.73	0.867
Apr 14			SMA		Lapel-Clip	1.5 cm	2.8 cm	35.00	-0.006	3.55	1.78	3.55	1.78
Mar 30	851-869	860.00000	System Radio	KRE1011506/1	T-Strap	2.0 cm	2.2 cm	34.93	-0.172	2.73	1.37	2.84	1.42
Mar 30					NC & LBL	4.0 cm	4.5 cm	34.93	-0.279	0.775	0.388	0.826	0.413
Mar 30					LC & LBL	5.0 cm	5.3 cm	34.93	-0.046	0.774	0.387	0.782	0.391
Mar 30					LC & SS	3.5 cm	3.8 cm	34.93	0.053	1.06	0.530	1.06	0.530
Apr 14			SMA		Lapel-Clip	1.5 cm	2.8 cm	34.93	0.031	0.606	0.303	0.606	0.303
Mar 30		860.00000	System Radio	KRE1011506/2	T-Strap	2.0 cm	2.2 cm	34.93	-0.369	P 3.21	1.61	P 3.49	1.75
Mar 30										S 2.51	1.26	S 2.73	1.37
Mar 30					NC & LBL	4.0 cm	4.5 cm	34.93	0.070	1.69	0.845	1.69	0.845
Mar 30					LC & LBL	5.0 cm	5.3 cm	34.93	-0.402	1.11	0.555	1.22	0.609
Mar 30					LC & SS	3.5 cm	3.8 cm	34.93	-0.326	P 2.94	1.47	P 3.17	1.58
Mar 30										S 2.17	1.09	S 2.34	1.17
Mar 30										S 1.80	0.900	S 1.94	0.970
Apr 14			SMA		Lapel-Clip	1.5 cm	2.8 cm	34.93	-0.101	3.36	1.68	3.44	1.72
Apr 13	806-824	806.00000	System Radio	KRE1011506/1	T-Strap	2.0 cm	2.2 cm	35.00	0.007	2.06	1.03	2.06	1.03
Apr 13		824.00000				2.0 cm	2.2 cm	35.00	-0.258	1.96	0.980	2.08	1.04
Apr 13		806.00000		KRE1011506/2	T-Strap	2.0 cm	2.2 cm	35.00	-0.431	P 2.86	1.43	P 3.01	1.51
										S 2.82	1.41	S 2.97	1.48
Apr 13		824.00000				2.0 cm	2.2 cm	35.00	-0.225	P 3.12	1.56	P 3.45	1.72
										S 2.71	1.36	S 2.99	1.50
Apr 13	851-869	851.00000	System Radio	KRE1011506/1	T-Strap	2.0 cm	2.2 cm	35.00	-0.462	4.91	2.46	5.46	2.73
Apr 13		869.00000				2.0 cm	2.2 cm	34.90	-0.263	3.71	1.86	3.94	1.97
Apr 13		851.00000		KRE1011506/2	T-Strap	2.0 cm	2.2 cm	35.00	-0.385	P 3.18	1.59	P 3.47	1.74
										S 2.76	1.38	S 3.02	1.51
Apr 13		869.00000				2.0 cm	2.2 cm	34.90	-0.481	P 3.11	1.56	P 3.47	1.74
										S 2.28	1.14	S 2.55	1.27

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ADDITIONAL BODY-WORN SAR EVALUATION RESULTS FOR 3.4 WATTS CONDUCTED OUTPUT POWER

Test Date	Freq. Band	Test Freq.	Battery Type	Antenna Part No.	Accessories	Device Distance to Planar Phantom		Cond. Power Before Test	SAR Drift During Test	Measured SAR 1g (W/kg)		Scaled SAR 1g (W/kg) with Droop	
										PTT Duty Cycle		PTT Duty Cycle	
	MHz	MHz				DUT	Antenna	dBm	dB	100%	50%	100%	50%
May 13	799-805	800.00625	NiMH IS	KRE1011506/2	Belt-Clip	1.1 cm	2.5 cm	35.31	-0.356	P 4.23	2.12	P 4.59	2.30
					Speaker-Mic					S 3.14	1.57	S 3.41	1.70
May 13	806-824	815.00000	NiMH NIS	KRE1011506/1	Belt-Clip	1.1 cm	2.5 cm	35.31	0.072	5.50	2.75	5.50	2.75
					Speaker-Mic								
May 13	806-824	815.00000	NiCd NIS	KRE1011506/1	T-Strap	2.0 cm	2.2 cm	35.31	-0.166	6.37	3.19	6.62	**3.31**
					Speaker-Mic								
May 13	851-869	860.00000	Li-ion NIS	KRE1011506/2	Belt-Clip	1.1 cm	2.5 cm	35.31	-0.240	4.09	2.05	4.32	2.16
					Speaker-Mic								

SAR SAFETY LIMIT(S)		BODY	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	Health Canada Safety Code 6	8.0 W/kg	averaged over 1 gram	Occupational / Controlled

Notes

1.	The DUT was initially tested at the conducted output power level preset by the manufacturer. The maximum measured SAR level configurations were re-evaluated at the manufacturer's specified maximum output power level including tolerance (3.4 Watts) in order to report the worst-case maximum SAR level for the 800 MHz frequency bands. The RF conducted output power level was set to 3.4 Watts by Celltech Labs Inc. using proprietary software provided by MA/-COM and measured using a Gigatronics 8652A Universal Power Meter.
2.	The DUT was not re-evaluated for SAR at 770.00625 MHz because the manufacturer's specified maximum output power level including tolerance for the 700 MHz band is 2.9 Watts which is within 5% of the measured nominal output power of 2.79 Watts and therefore the measured SAR level of 2.58 W/kg (50% duty cycle) is calculated to be approximately 2.68 W/kg by scaling the difference of 3.8% in power.
3.	Secondary peak SAR levels measured within 2 dB of the primary are reported (P = Primary, S = Secondary).
4.	If the scaled SAR levels evaluated at the mid channel (50% duty cycle) were ≥ 3 dB below the SAR limit, SAR evaluation for the low and high channels was optional (per FCC OET Bulletin 65, Supplement C, Edition 01-01 - see reference [3]).
5.	The SAR droop measured by the DASY4 system for the duration of the SAR evaluations were added to the measured SAR levels to report scaled SAR results as shown in the above test data table.
6.	The area scan evaluation was performed with a fully charged battery. After the area scan evaluation was completed the battery was replaced with a fully charged battery prior to the zoom scan evaluation.
7.	The DUT was evaluated for SAR 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.

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6.0 MEASURED FLUID DIELECTRIC PARAMETERS

Date of Measurement	March 24, 2009				March 24, 2009				March 25, 2009				March 26, 2009			
Measured Fluid & Freq.	775 MHz Body				805 MHz Body				815 MHz Body				865 MHz Body			
Dielectric Constant ε_r	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	55.2	± 5%	57.1	+3.5%	55.2	± 5%	56.6	+2.5%	55.2	± 5%	56.6	+2.5%	55.2	± 5%	56.3	+2.0%
Conductivity σ (mho/m)	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	0.97	± 5%	0.93	-4.1%	0.97	± 5%	0.95	-2.1%	0.97	± 5%	0.95	-2.1%	0.97	± 5%	1.01	+4.1%

Date of Measurement	March 27, 2009				March 27, 2009				March 30, 2009				March 30, 2009			
Measured Fluid & Freq.	775 MHz Body				805 MHz Body				815 MHz Body				865 MHz Body			
Dielectric Constant ε_r	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	55.2	± 5%	57.6	+4.4%	55.2	± 5%	57.3	+3.8%	55.2	± 5%	57.7	+4.5%	55.2	± 5%	57.2	+3.6%
Conductivity σ (mho/m)	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	0.97	± 5%	0.92	-5.0%	0.97	± 5%	0.95	-2.1%	0.97	± 5%	0.94	-3.0%	0.97	± 5%	1.00	+3.1%

Date of Measurement	April 13, 2009				April 13, 2009				April 13, 2009				April 13, 2009			
Measured Fluid & Freq.	805 MHz Body				825 MHz Body				855 MHz Body				865 MHz Body			
Dielectric Constant ε_r	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	55.2	± 5%	57.6	+4.4%	55.2	± 5%	57.0	+3.3%	55.2	± 5%	56.9	+3.1%	55.2	± 5%	57.5	+4.2%
Conductivity σ (mho/m)	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	0.97	± 5%	0.94	-3.0%	0.97	± 5%	0.95	-2.1%	0.97	± 5%	0.99	+2.0%	0.97	± 5%	0.99	+2.1%

Date of Measurement	April 14, 2009				April 14, 2009				April 14, 2009				April 14, 2009			
Measured Fluid & Freq.	775 MHz Body				805 MHz Body				815 MHz Body				865 MHz Body			
Dielectric Constant ε_r	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	55.2	± 5%	54.8	-0.7%	55.2	± 5%	54.2	-1.8%	55.2	± 5%	54.4	-1.4%	55.2	± 5%	54.0	-2.2%
Conductivity σ (mho/m)	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.
	0.97	± 5%	0.92	-5.0%	0.97	± 5%	0.94	-3.0%	0.97	± 5%	0.96	-1.1%	0.97	± 5%	1.00	+3.1%

Date of Measurement	May 13, 2009				May 13, 2009				May 13, 2009				n/a
Measured Fluid & Freq.	805 MHz Body				815 MHz Body				865 MHz Body				
Dielectric Constant ε_r	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	
	55.2	± 5%	56.0	+1.4%	55.2	± 5%	56.1	+1.7%	55.2	± 5%	55.6	+0.7%	
Conductivity σ (mho/m)	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	835 Target		Meas.	Dev.	
	0.97	± 5%	0.93	-4.1%	0.97	± 5%	0.93	-4.1%	0.97	± 5%	0.99	+2.0%	

Test Date	Fluid Type	Ambient Temp.	Fluid Temp.	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
March 24	835 MHz Body	24.3 °C	22.9 °C	≥ 15 cm	101.1 kPa	35 %	1000
March 25	835 MHz Body	25.0 °C	23.5 °C	≥ 15 cm	101.1 kPa	35 %	1000
March 26	835 MHz Body	24.5 °C	23.0 °C	≥ 15 cm	101.1 kPa	35 %	1000
March 27	835 MHz Body	25.0 °C	23.5 °C	≥ 15 cm	101.1 kPa	35 %	1000
March 30	835 MHz Body	23.2 °C	22.3 °C	≥ 15 cm	101.1 kPa	35 %	1000
April 13	835 MHz Body	22.5 °C	21.3 °C	≥ 15 cm	101.1 kPa	35 %	1000
April 14	835 MHz Body	22.3 °C	21.8 °C	≥ 15 cm	101.1 kPa	35 %	1000
May 13	835 MHz Body	22.8 °C	22.0 °C	≥ 15 cm	101.1 kPa	35 %	1000

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7.0 DETAILS OF SAR EVALUATION

The M/A-COM Model: P7300 Portable Analog/Digital 700/800 MHz PTT Radio Transceiver was compliant for localized Specific Absorption Rate (Occupational / Controlled Exposure) based on the test provisions and conditions described below. Detailed photographs of the test setup are shown in Appendix D.

Face-held Configuration

1. The Radio was tested in a face-held configuration with the front of the radio placed parallel to the outer surface of the planar phantom. A spacing of 2.5 cm was maintained between the front side of the Radio and the outer surface of the planar phantom.
2. The Speaker-Microphone Antenna Version (P/N: MC-023933-002) was connected to the Radio and tested in a face-held configuration with the front of the speaker-microphone placed parallel to the outer surface of the planar phantom with a spacing of 2.5 cm.

Body-worn Configuration

3. The Speaker-Microphone Antenna Version (P/N: MC-023933-002) was connected to the Radio and tested in a body-worn configuration with the back of the speaker-microphone placed parallel to the outer surface of the planar phantom. The speaker-microphone Lapel Clip (contains metal components) was touching the outer surface of the planar phantom and provided a 1.5 cm spacing between the back of the speaker-microphone and the outer surface of the planar phantom. The SAR evaluations were performed with the Earphone audio accessory (P/N: LS103239V1) connected to the Speaker-Mic.
4. The Radio was tested in a body-worn configuration with the back side placed parallel to the outer surface of the planar phantom. The attached Metal Belt-Clip (P/N: CC23894) was touching the planar phantom and provided a 1.1 cm spacing between the back of the Radio and the planar phantom. The SAR evaluations were performed with the Speaker-Microphone (non-antenna version) audio accessory (P/N: MC-023933-001) connected to the Radio.
5. The Radio was tested in a body-worn configuration with the Nylon "T"-Strap Holder (P/N: KRY1011656/1) attached to the Radio and the back side facing parallel to and touching the outer surface of the planar phantom. The Nylon "T"-Strap Holder (does not contain metal components) provided a 2.0 cm spacing between the back of the Radio and the planar phantom. The SAR evaluations were performed with the Speaker-Microphone (non-antenna version) audio accessory (P/N: MC-023933-001) connected to the Radio.
6. The Radio was tested in a body-worn configuration with the Leather Case and Shoulder Strap Kit (P/N: KT-016201-004). The Radio was placed inside the Leather Case (P/N: FM-016199-004) and the back of the Radio was facing parallel to the outer surface of the planar phantom. The back side of the Leather Case (P/N: FM-016199-004) was touching the planar phantom and provided a 3.5 cm spacing between the back of the Radio and the planar phantom. The Leather Case and Shoulder Strap contain metal components. The SAR evaluations were performed with the Speaker-Microphone (non-antenna version) audio accessory (P/N: MC-023933-001) connected to the Radio.
7. The Radio was tested in a body-worn configuration with the Black Nylon Case and Belt-Loop Kit (P/N: KT-016201-001). The Radio was placed inside the Nylon Case (P/N: FM-016199-001) with the Leather Belt Loop (P/N: CC-014527) attached to the swivel mount on the back of the Nylon Case. The back side of the Leather Belt Loop (P/N: CC-014527) was placed parallel touching the outer surface of the planar phantom and with the Nylon Case (P/N: FM-016199-001) accessory provided a combined spacing of 4.0 cm between the back of the Radio and the planar phantom. The Black Nylon Case and Belt-Loop contain metal components. The SAR evaluations were performed with the Speaker-Microphone (non-antenna version) audio accessory (P/N: MC-023933-001) connected to the Radio.
8. The Radio was tested in a body-worn configuration with the Leather Case and Belt Loop Kit (P/N: KT-016201-003). The Radio was placed inside the Leather Case (P/N: FM-016199-003) with the Leather Belt Loop (P/N: CC-014527) attached to the Swivel Mount on the back of the Leather Case. The back side of the Leather Belt Loop (P/N: CC-014527) was placed parallel touching the outer surface of the planar phantom and with the Leather Case (P/N: FM-016199-003) accessory provided a combined spacing of 5.0 cm between the back of the Radio and the planar phantom. The Leather Case and Belt Loop contain metal components. The SAR evaluations were performed with the Speaker-Microphone (non-antenna version) audio accessory (P/N: MC-023933-001) connected to the Radio.
9. The 806-824 and 851-869 MHz bands were evaluated at the low and high channels in the worst-case mid ch. config.

Output Power

10. The conducted power levels were measured at the radio antenna connector prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter according to the procedures in FCC 47 CFR §2.1046 and IC RSS-Gen.
11. The area scan evaluation was performed with a fully charged battery. After the area scan evaluation was completed the battery was replaced with a fully charged battery prior to the zoom scan evaluation.
12. The SAR drift of the DUT during the SAR evaluations was measured by the DASY4 system. The measured SAR droop was added to the measured SAR level to report scaled SAR results as shown in the test data tables (pgs. 6-9).

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DETAILS OF SAR EVALUATION (CONT.)

RF Conducted Output Power Measurement Results

RF CONDUCTED OUTPUT POWER MEASUREMENT CORRELATION				
Test Frequency	**Celltech SAR Lab**		**Rhein Tech EMC Lab**	
MHz	**dBm**	**Watts**	**dBm**	**Watts**
770.00625	34.45	2.79	34.43	2.773
800.00625	34.52	2.83	34.52	2.831
806.00000	35.00	3.16	35.00	3.162
815.00000	35.00	3.16	35.01	3.170
824.00000	35.00	3.16	35.01	3.170
851.00000	35.00	3.16	34.98	3.148
860.00000	34.93	3.11	34.93	3.112
869.00000	34.90	3.09	34.90	3.090

Test Conditions

13. 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.
14. The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR evaluations using an ALS-PR-DIEL Dielectric Probe Kit and an HP 8753ET Network Analyzer (see Appendix C).

8.0 EVALUATION PROCEDURES

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

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

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

d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.
A 1 g and 10 g 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 form 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 1 g and 10 g 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, except for push-to-talk radios > 800 MHz are evaluated with a zoom scan volume of 32 mm x 32 mm x 30 mm (5 x 5 x 7 points). Depending on the device type under evaluation, zoom scans for frequencies ≥ 800 MHz are typically 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. The SAR evaluations described in this test report for the maximum tolerance output power levels of the DUT were evaluated 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.

9.0 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
835 MHz	770 MHz	65 MHz	> 50 MHz[2]
	800 MHz	35 MHz	< 50 MHz[1]
	806 MHz	29 MHz	
	815 MHz	20 MHz	
	824 MHz	11 MHz	
	851 MHz	16 MHz	
	860 MHz	25 MHz	
	869 MHz	34 MHz	

1. The probe calibration and measurement frequency interval is < 50 MHz; therefore the additional steps were not required.

2. The probe calibration and measurement frequency interval is > 50 MHz; therefore the following additional steps were implemented (per FCC KDB 450824 D01 v01r01): *The measured 1-g SAR may be compensated with respect to +5% tolerances in x and -5% tolerances in x, computed according to valid SAR sensitivity data, to reduce SAR underestimation and maintain conservativeness.* SAR sensitivity data is per SPEAG DASY4 Manual (see reference [9]).

Probe Calibration Frequency = 835 MHz				Target Parameters:		Head 41.5 ε_r / 0.9 σ		Body 55.2 ε_r / 0.97 σ		
Freq	Tissue	σ	Sensitivity	ε_r	Sensitivity	% Change	SAR Level	770 MHz Compensated SAR		
770 MHz	Head	-4.5%	2.66%	+3.8%	2.17%	+4.83%	1.06 W/kg	1.11 W/kg	1g	50% ptt d/c
	Body	-4.1%	2.42%	+3.5%	2.00%	+4.42%	2.59 W/kg	2.70 W/kg	1g	50% ptt d/c

Chapter 21 SAR Sensitivities

21.1 Introduction

The measured SAR-values in homogeneous phantoms depend strongly on the electrical parameters of the liquid. Liquids with exactly matching parameters are difficult to produce; there is always a small error involved in the production or measurement of the liquid parameters. The following sensitivities allow the estimation of the influence of small parameter errors on the measured SAR values. The calculations are based on an approximation formula [1] for the SAR of an electrical dipole near the phantom surface and a adapted plane wave approximation for the penetration depth. The sensitivities are given in percent SAR change per percent change in the controlling parameter:

$$S(x) = \frac{dSAR/SAR}{dx/x} \qquad (21.1)$$

The controlling parameters x are:

ϵ permitivity
σ conductivity
ρ head density (= one over integration volume)

For example: If The liquid permitivity increases by 2 percent and the sensitivity of the SAR to permitivity is -0.6 then the SAR will decrease by 1.2 percent.

21.2 SAR Sensitivity Table

In the following Table, sensitivities are given for surface SAR values and averaged SAR values for 1 g and 10 g cubes and for dipole distances d of 15 mm (for frequencies below 1000 MHz) and 10 mm (for frequencies above 1000 MHz) from the liquid surface. Liquid density was set to ρ=1g/cm^3 as required by the standards.

Liquid parameters are as proposed in the new standards (e.g., IEEE P1528).

f=800 MHz, d=15 mm (ϵ_r=41.5, σ=0.90 S/m)			
SAR Peak	- 0.70	+ 0.86	-
SAR 1 g	- 0.57	+ 0.59	0.10
SAR 10 g	- 0.45	+ 0.35	0.18

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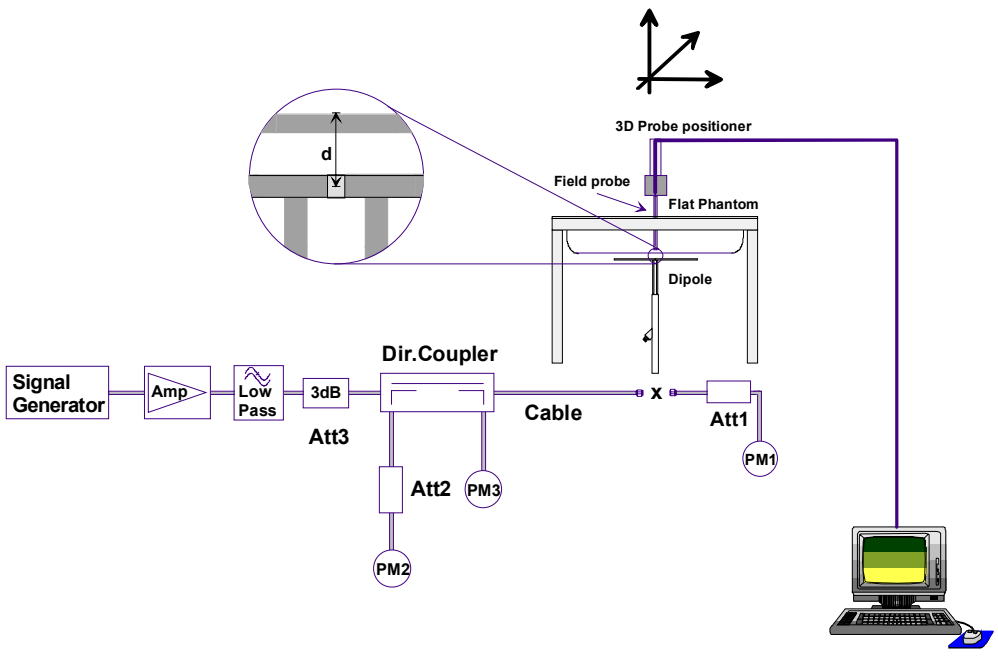
10.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations daily system checks were performed at the planar section of the SAM phantom with an 835 MHz dipole (see Appendix B for system performance check test plots) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]) and IEC International Standard 62209-1:2005 (see reference [6]). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C for measured fluid dielectric parameters). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±10% from the system validation target SAR value.

SYSTEM PERFORMANCE CHECK EVALUATIONS

Test Date	HEAD 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)	Sys. Val. Target	Meas.	Dev.	Sys. Val. Target	Meas.	Dev.	Sys. Val. Target	Meas.	Dev.						
Mar-24	835	2.34 ±10%	2.43	+3.9%	42.7 ±5%	42.0	-1.6%	0.90 ±5%	0.90	0.0%	1000	24.3	22.5	≥ 15	35	101.1
Mar-25			2.40	+2.6%		40.9	-4.2%		0.89	-1.1%	1000	23.8	21.5	≥ 15	35	101.1
Mar-26			2.34	0.0%		41.1	-3.7%		0.88	-2.2%	1000	24.4	22.8	≥ 15	35	101.1
Mar-27			2.42	+3.4%		43.2	+1.2%		0.91	+1.1%	1000	25.0	23.3	≥ 15	35	101.1
Mar-30			2.34	0.0%		42.1	-1.4%		0.89	-1.1%	1000	23.5	22.1	≥ 15	35	101.1
Apr-13			2.37	+1.3%		41.3	-3.3%		0.90	0.0%	1000	22.5	21.5	≥ 15	35	101.1
Apr-14			2.45	+4.7%		42.1	-1.4%		0.92	+2.2%	1000	22.3	21.7	≥ 15	35	101.1
Apr-15			2.45	+4.7%		42.3	-0.9%		0.92	+2.2%	1000	23.6	22.3	≥ 15	35	101.1
May-13			2.40	+2.6%		42.2	-1.2%		0.91	+1.1%	1000	23.0	22.4	≥ 15	35	101.1

Notes		
	1.	The target SAR value and target dielectric parameters are referenced from the system validation performed by Celltech Labs.
	2.	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.
	3.	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

835 MHz Validation Dipole Setup

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11.0 SIMULATED EQUIVALENT TISSUES

The simulated tissue mixtures consisted of a viscous gel using hydroxethylcellulose (HEC) gelling agent (except body) and saline solution. Preservation with a bactericide was added and visual inspection made to ensure air bubbles were not trapped during the mixing process. The fluid was prepared according to standardized procedures and measured for dielectric parameters (permittivity and conductivity).

SIMULATED TISSUE MIXTURES					
INGREDIENT	Water	**835 MHz Head Tissue Mixture**	40.71 %	**835 MHz Body Tissue Mixture**	53.79 %
	Sugar		56.63 %		45.13 %
	Salt		1.48 %		0.98 %
	HEC		0.99 %		--
	Bactericide		0.19 %		0.10 %

12.0 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.			

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13.0 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
Bottom Thickness	2.0 mm ± 0.1 mm
Inner Dimensions	72.6 cm (L) x 20.3 cm (W) x 20.3 cm (H)
Validation Phantom	
Type	SAM V4.0C
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 25 liters

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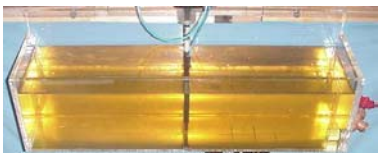
14.0 PROBE SPECIFICATION (ET3DV6)

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

15.0 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

16.0 VALIDATION PHANTOM

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

SAM Twin Phantom V4.0C

17.0 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

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18.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION DUE DATE
USED	DESCRIPTION				
x	Schmid & Partner DASY4 System	-	-	-	-
x	-DASY4 Measurement Server	00158	1078	CNR	CNR
x	-Robot	00046	599396-01	CNR	CNR
x	-DAE4	00019	353	22Apr08	22Apr09
				28Apr09	28Apr10
x	-ET3DV6 E-Field Probe	00017	1590	21Jul08	21Jul09
x	-835 MHz Validation Dipole	00022	411	10Feb09	10Feb10
x	-Plexiglas Side Planar Phantom	00156	161	CNR	CNR
x	-SAM Phantom V4.0C	00154	1033	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	US39240170	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	23Apr08	21Jul09
x	Gigatronics 80701A Power Sensor	00014	1833699	23Apr08	21Jul09
x	HP 8753ET Network Analyzer	00134	US39170292	28Apr08	28Apr10
x	HP 8648D Signal Generator	00005	3847A00611	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

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19.0 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 (835 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	5	Normal	1	0.64	0.43	3.2	2.2	∞
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measured)	E.3.3	4.5	Normal	1	0.6	0.49	2.7	2.2	∞
Combined Standard Uncertainty			**RSS**				**11.17**	**10.67**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**				**22.33**	**21.33**	

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

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20.0 REFERENCES

[1] Federal Communications Commission - "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093.

[2] Health Canada - "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz", Safety Code 6: 1999.

[3] Federal Communications Commission - "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.

[4] Industry Canada - "Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)", Radio Standards Specification RSS-102 Issue 2: November 2005.

[5] IEEE Standard 1528-2003 - "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques": December 2003.

[6] IEC International Standard 62209-1:2005 - "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures."

[7] Federal Communications Commission, Office of Engineering and Technology - "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies"; KDB 447498 D01 v03r03: January 2009.

[8] Federal Communications Commission, Office of Engineering and Technology - "Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz"; KDB 450824 D01 v01r01: January 2007.

[9] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 21 Application Note, SAR Sensitivities: Sept. 2005.

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APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

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Date Tested: 03/24/2009

System Performance Check - 835 MHz Dipole - HSL

DUT: Dipole 835 MHz; Asset: 00022; Serial: 411; Validation: 02/10/2009

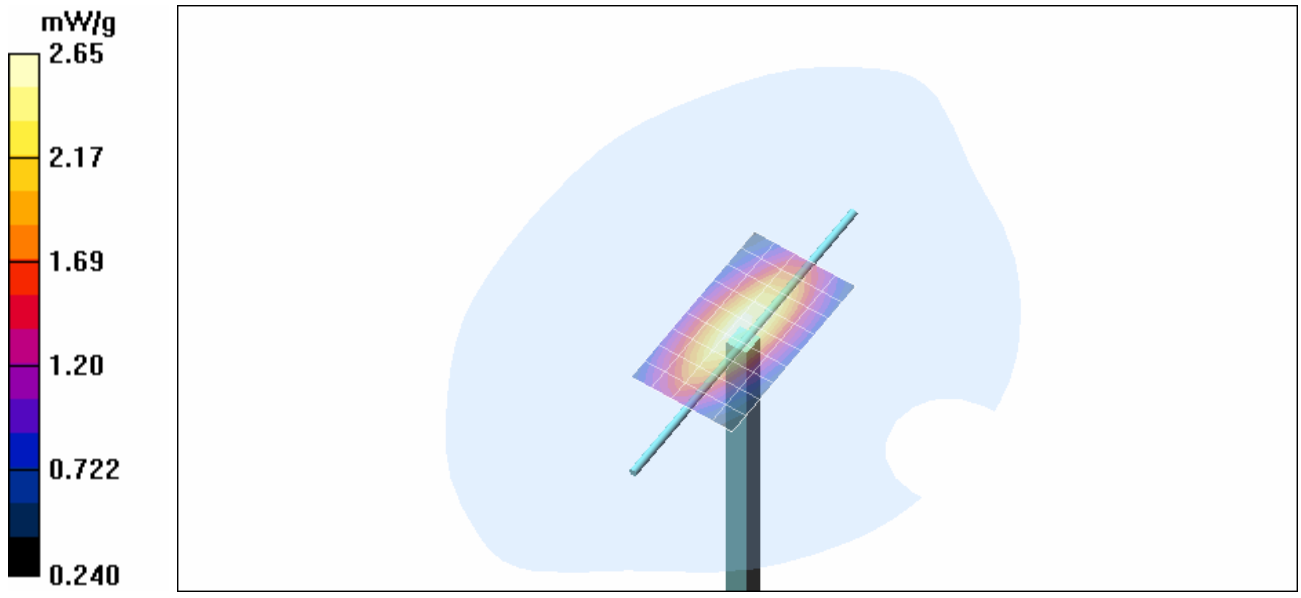
Ambient Temp: 24.3°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.9 mho/m; ε_r = 42; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.54, 6.54, 6.54); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Performance Check

Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.57 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.5 V/m; Power Drift = -0.025 dB
Peak SAR (extrapolated) = 3.34 W/kg
SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.61 mW/g
Maximum value of SAR (measured) = 2.65 mW/g



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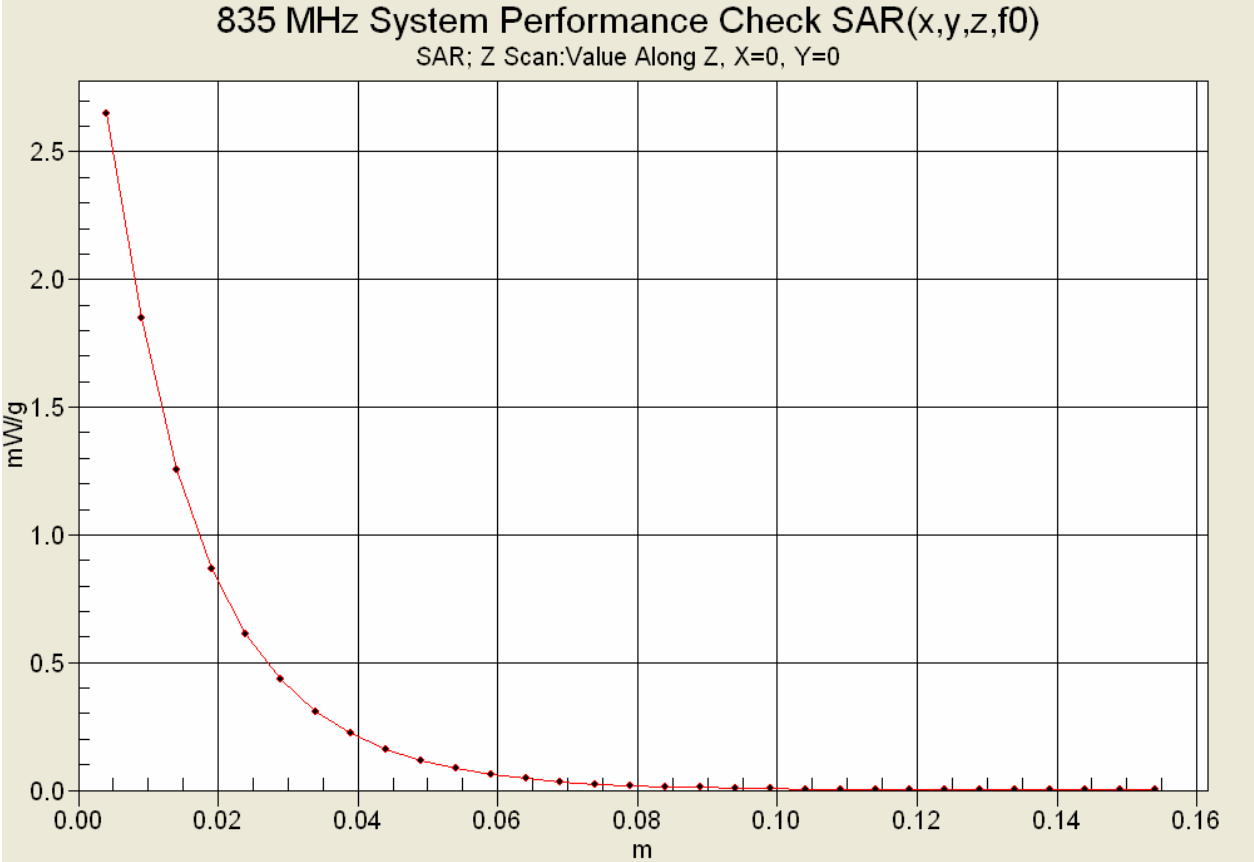
Z-Axis Scan



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Date Tested: 03/25/2009

System Performance Check - 835 MHz Dipole - HSL

DUT: Dipole 835 MHz; Asset: 00022; Serial: 411; Validation: 02/10/2009

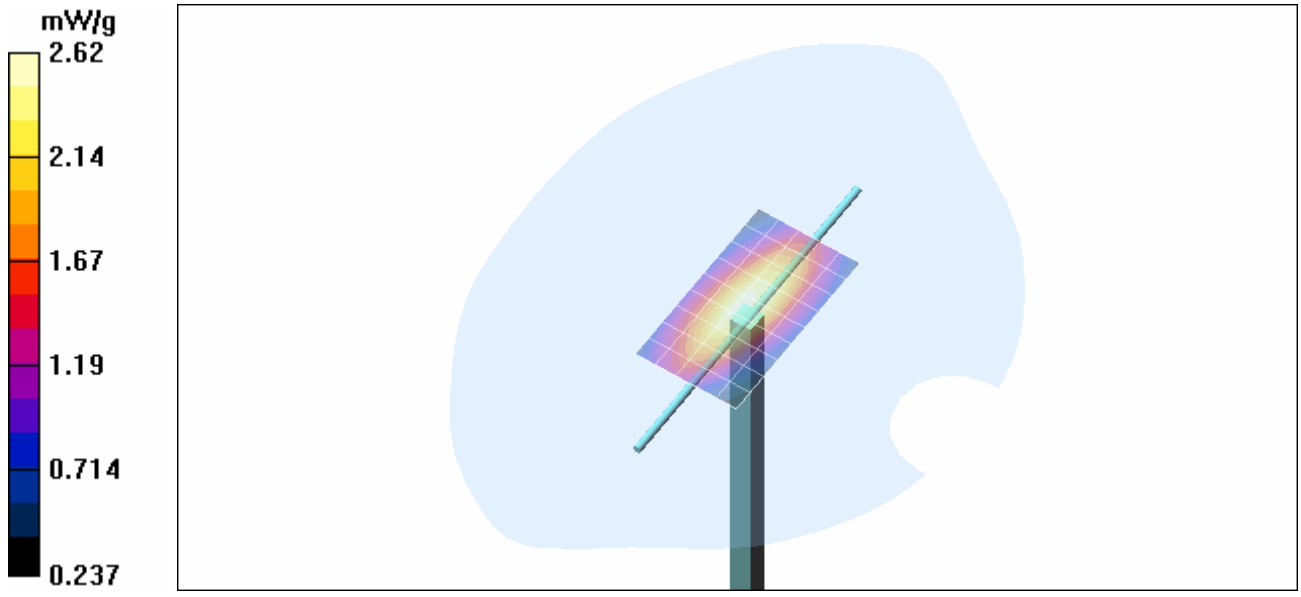
Ambient Temp: 23.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 40.9; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.54, 6.54, 6.54); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Performance Check

Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.54 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.5 V/m; Power Drift = -0.025 dB
Peak SAR (extrapolated) = 3.30 W/kg
SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.59 mW/g
Maximum value of SAR (measured) = 2.62 mW/g



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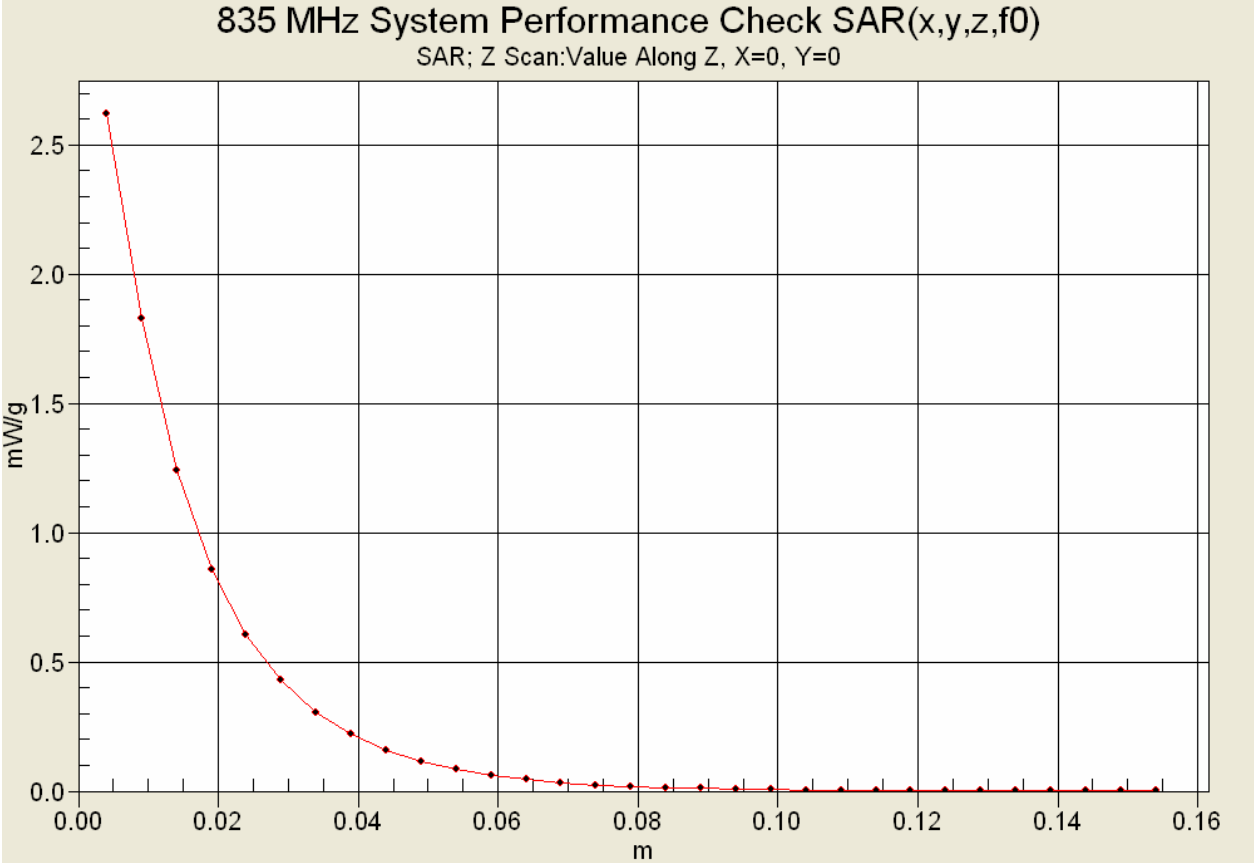
Z-Axis Scan



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Date Tested: 03/26/2009

System Performance Check - 835 MHz Dipole - HSL

DUT: Dipole 835 MHz; Asset: 00022; Serial: 411; Validation: 02/10/2009

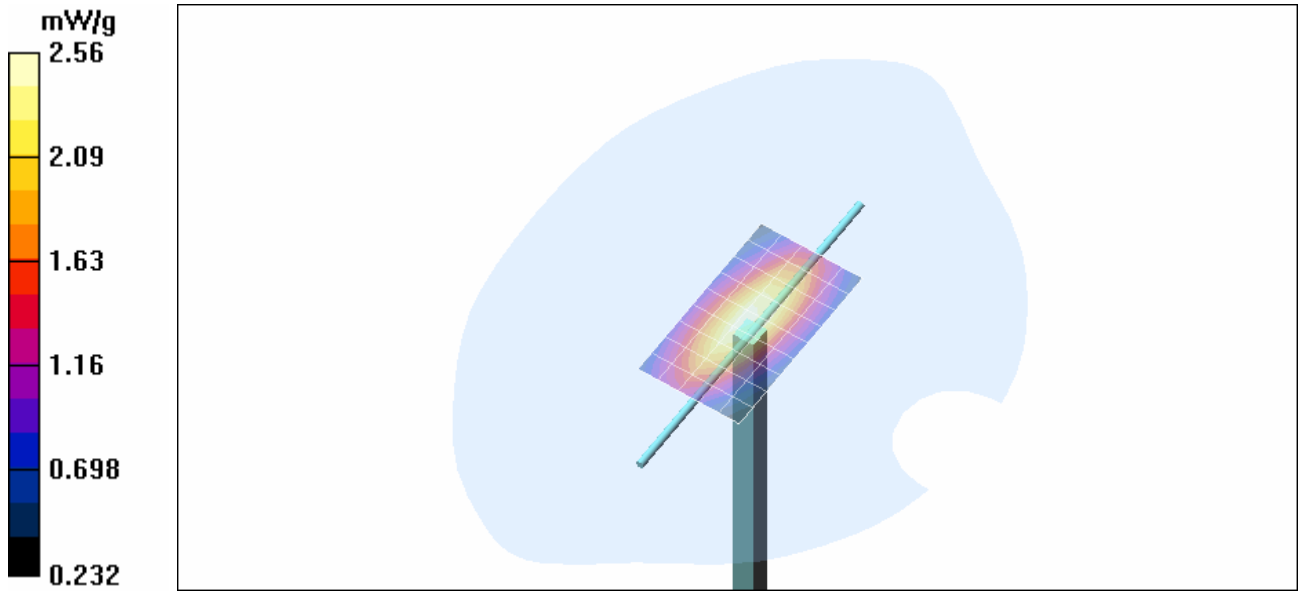
Ambient Temp: 24.4°C; Fluid Temp: 22.8°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.88 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.54, 6.54, 6.54); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Performance Check

Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.47 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.5 V/m; Power Drift = -0.022 dB
Peak SAR (extrapolated) = 3.22 W/kg
SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.56 mW/g



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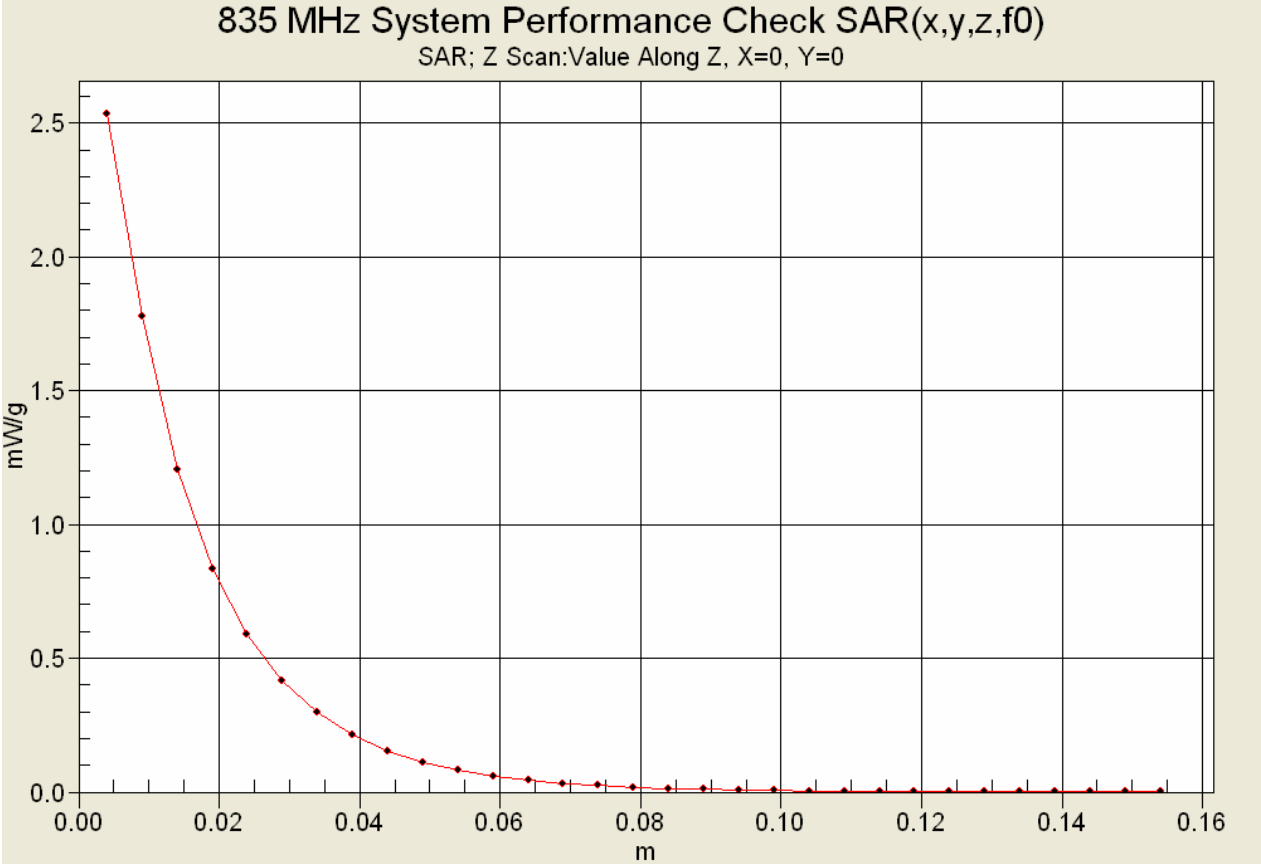
Z-Axis Scan



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Date Tested: 03/27/2009

System Performance Check - 835 MHz Dipole - HSL

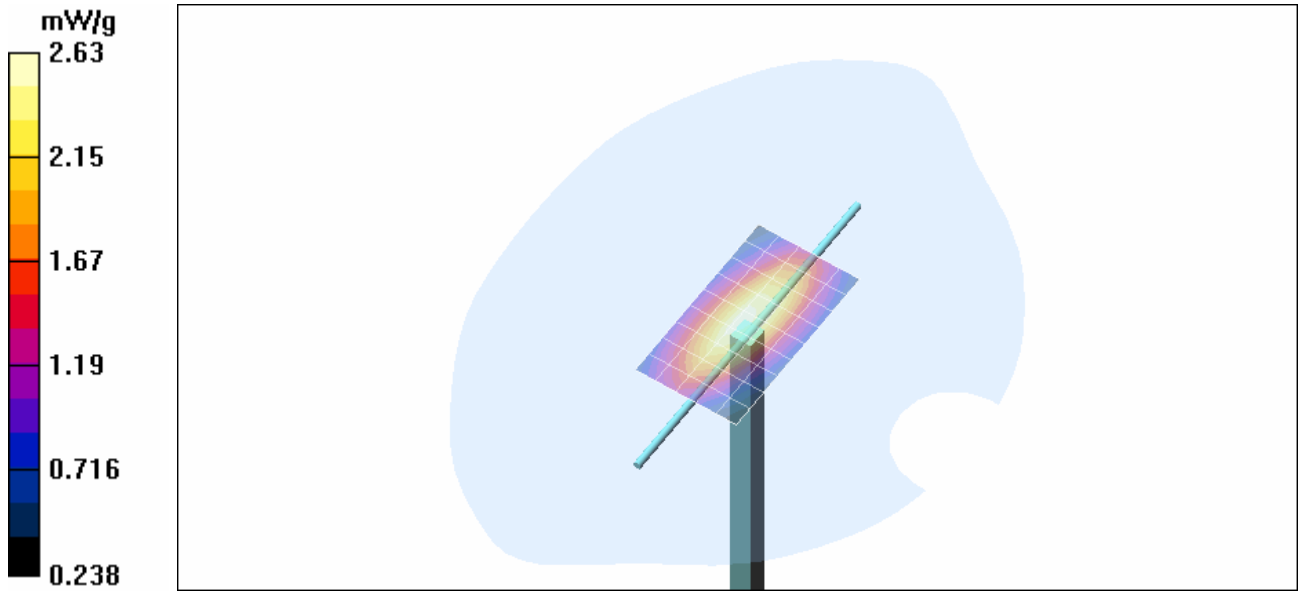
DUT: Dipole 835 MHz; Asset: 00022; Serial: 411; Validation: 02/10/2009

Ambient Temp: 25.0°C; Fluid Temp: 23.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.91 mho/m; ε_r = 43.2; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.54, 6.54, 6.54); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Performance Check
Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.56 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.6 V/m; Power Drift = -0.032 dB
Peak SAR (extrapolated) = 3.29 W/kg
SAR(1 g) = 2.42 mW/g; SAR(10 g) = 1.61 mW/g
Maximum value of SAR (measured) = 2.63 mW/g



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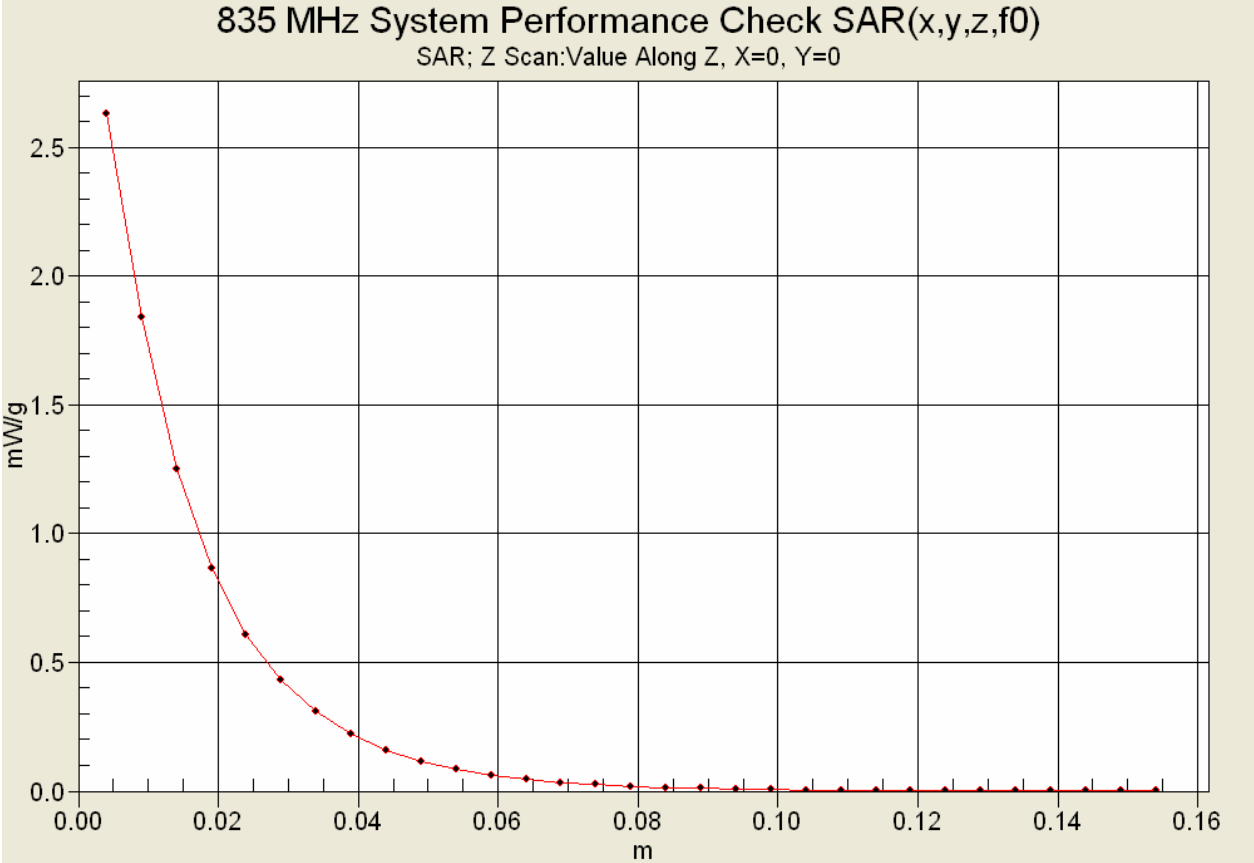
Z-Axis Scan



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Date Tested: 03/30/2009

System Performance Check - 835 MHz Dipole - HSL

DUT: Dipole 835 MHz; Asset: 00022; Serial: 411; Validation: 02/10/2009

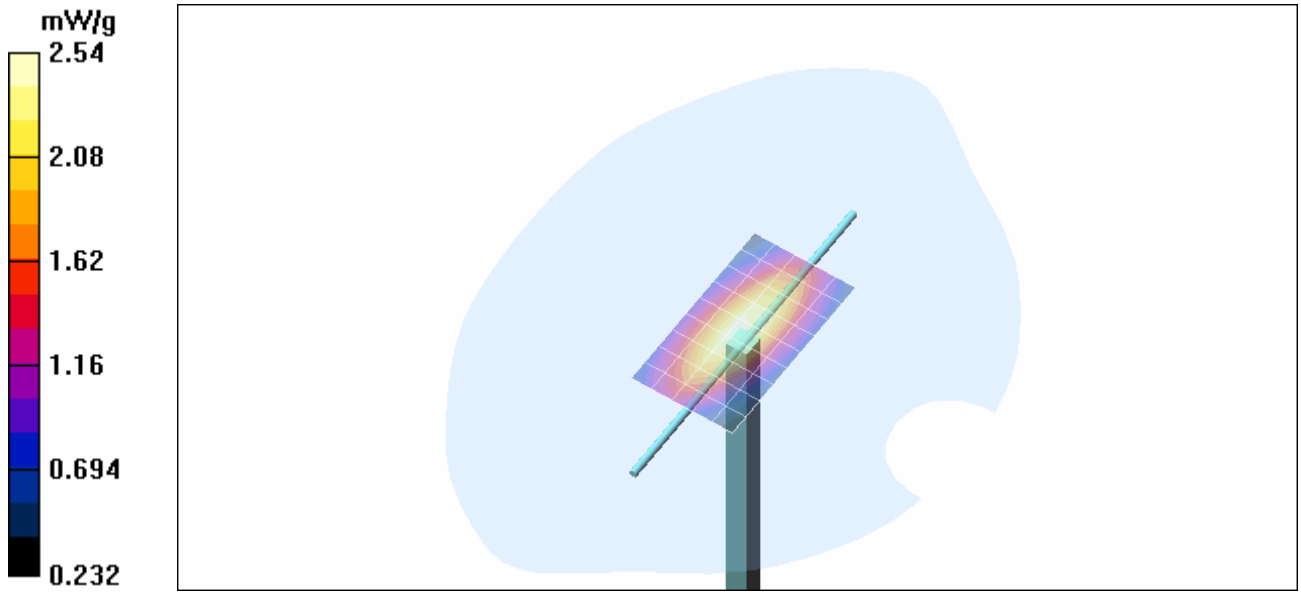
Ambient Temp: 23.5°C; Fluid Temp: 22.1°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 42.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.54, 6.54, 6.54); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Performance Check

Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.45 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.3 V/m; Power Drift = 0.040 dB
Peak SAR (extrapolated) = 3.16 W/kg
SAR(1 g) = 2.34 mW/g; SAR(10 g) = 1.56 mW/g
Maximum value of SAR (measured) = 2.54 mW/g



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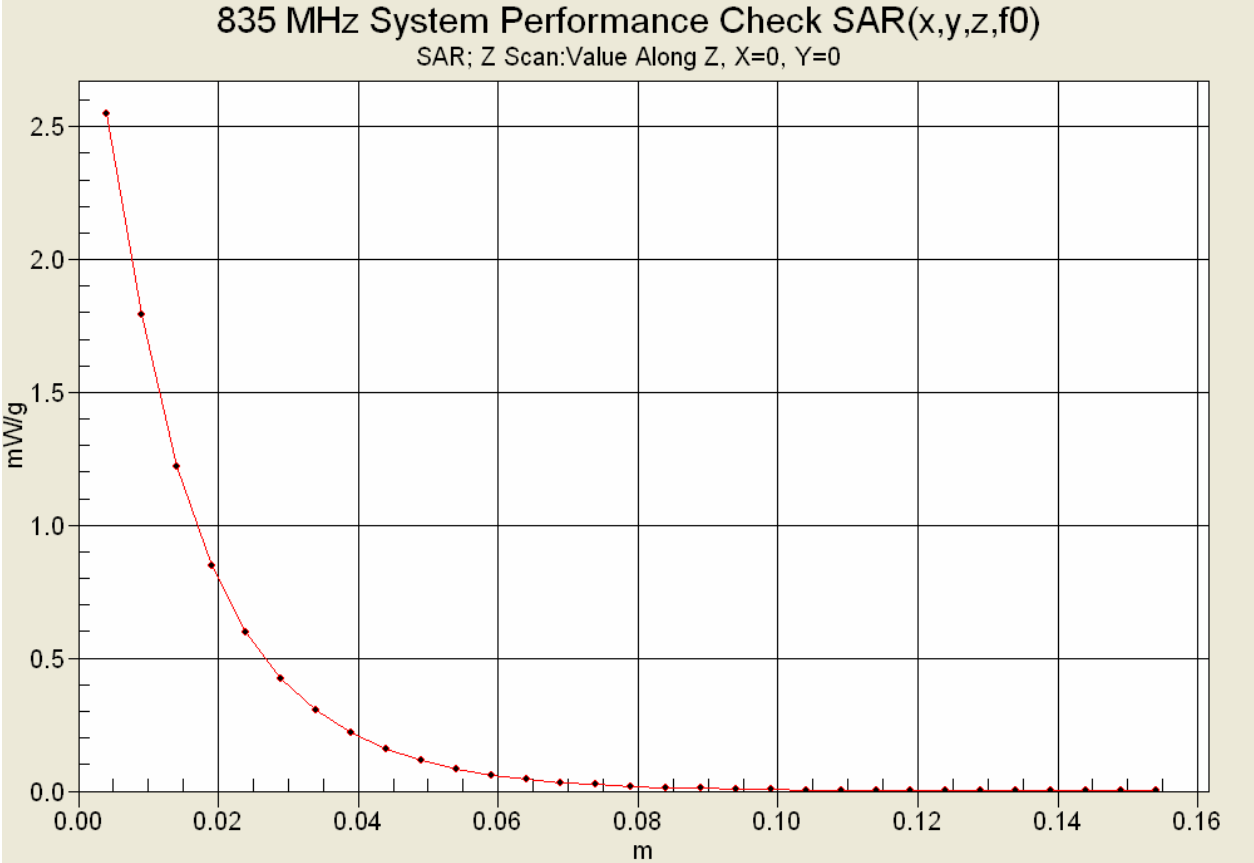
Z-Axis Scan



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Date Tested: 04/13/2009

System Performance Check - 835 MHz Dipole - HSL

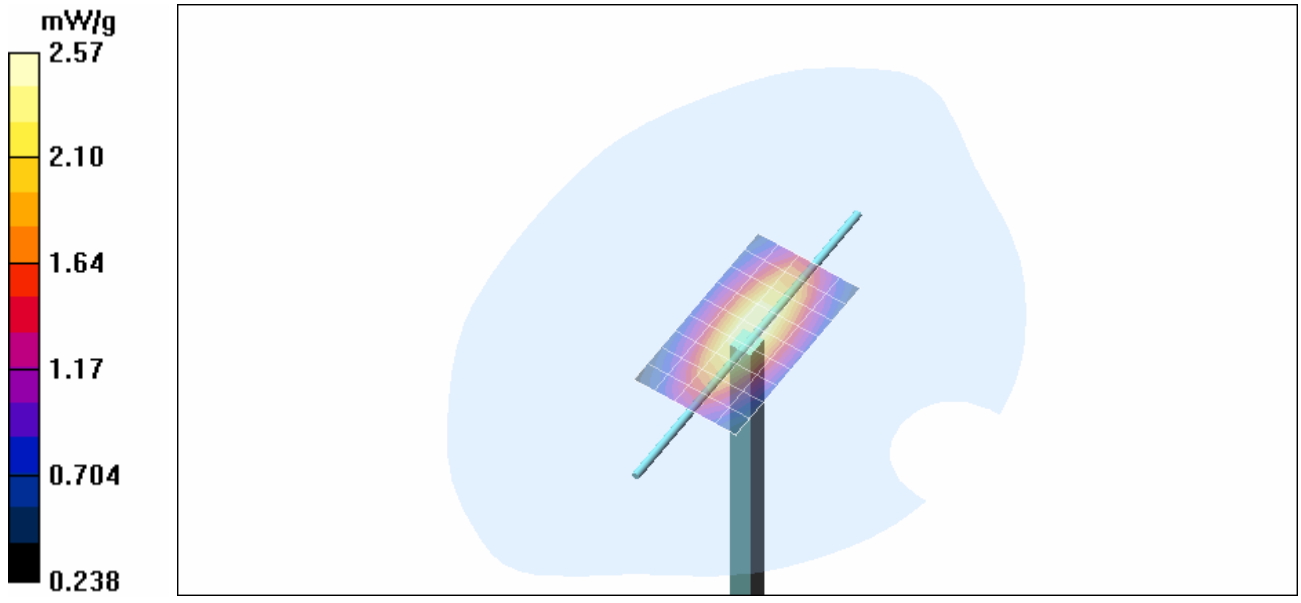
DUT: Dipole 835 MHz; Asset: 00022; Serial: 411; Validation: 02/10/2009

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

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.9 mho/m; ε_r = 41.3; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.54, 6.54, 6.54); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Performance Check
Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.44 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.3 V/m; Power Drift = 0.013 dB
Peak SAR (extrapolated) = 3.26 W/kg
SAR(1 g) = 2.37 mW/g; SAR(10 g) = 1.57 mW/g
Maximum value of SAR (measured) = 2.57 mW/g



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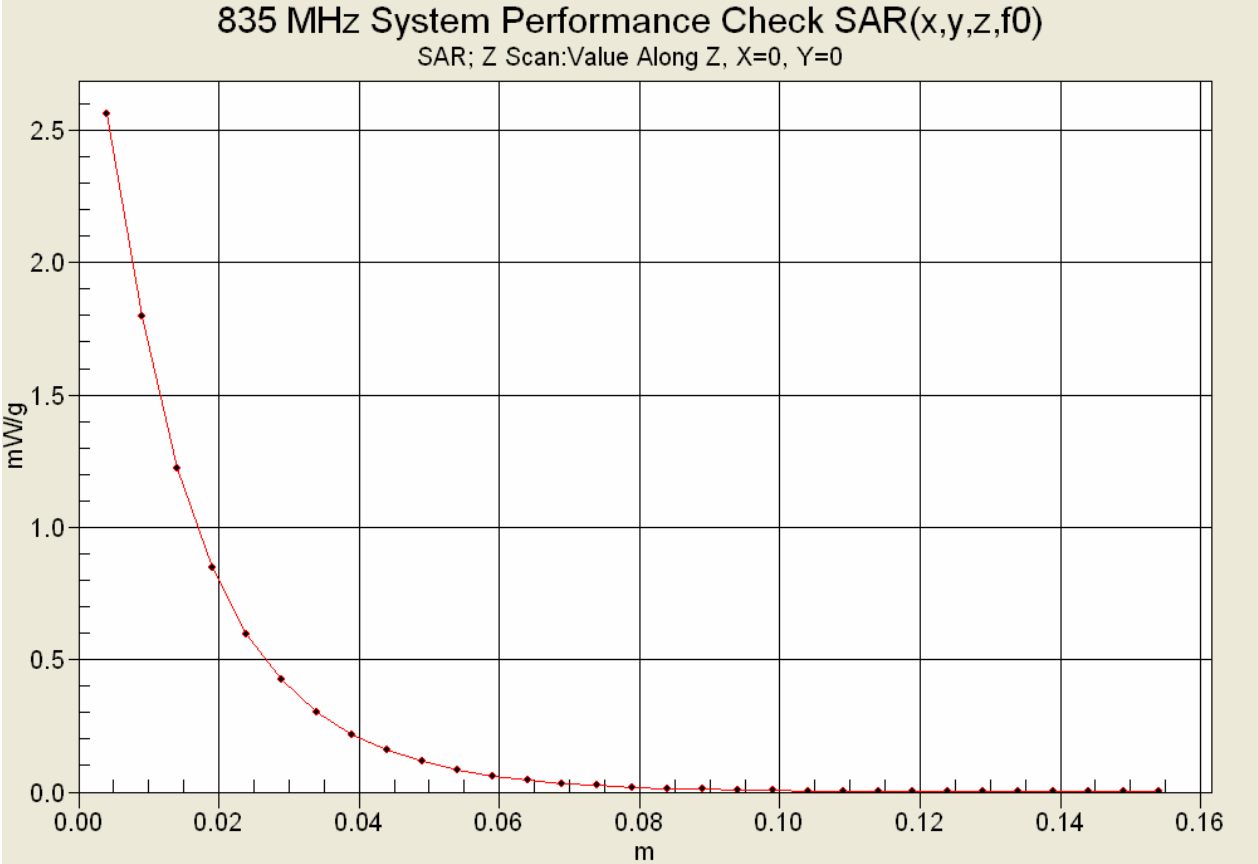
Z-Axis Scan


835 MHz System Performance Check SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

Date Tested: 04/14/2009

System Performance Check - 835 MHz Dipole - HSL

DUT: Dipole 835 MHz; Asset: 00022; Serial: 411; Validation: 02/10/2009

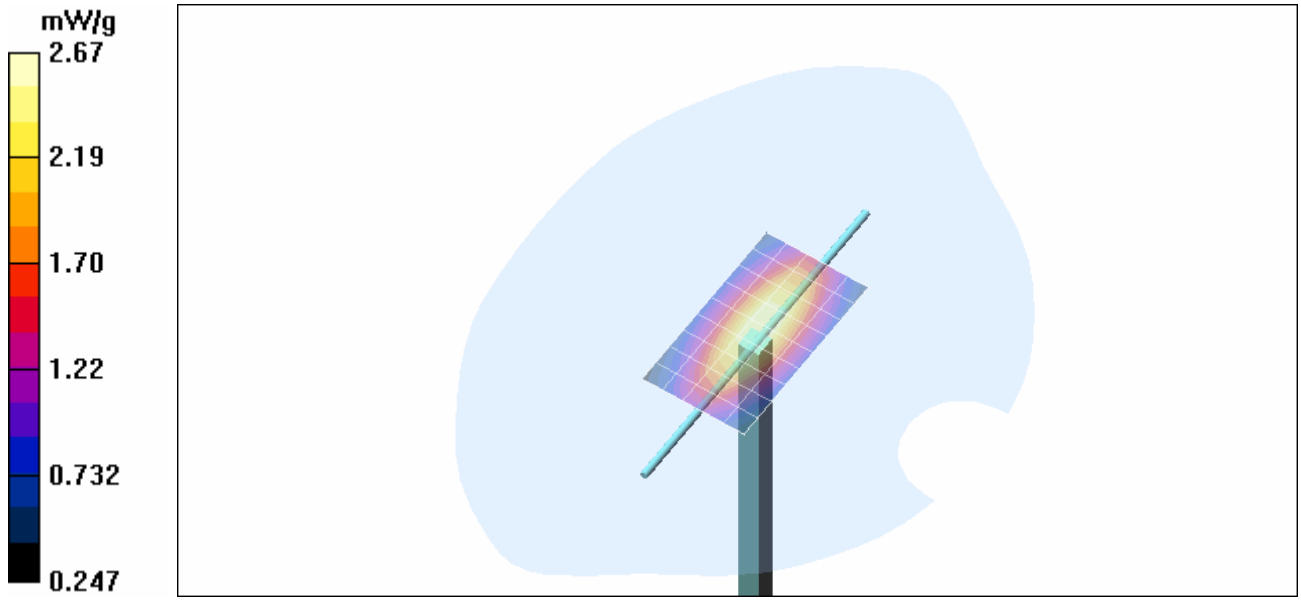
Ambient Temp: 22.3°C; Fluid Temp: 21.7°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.92 mho/m; ε_r = 42.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.54, 6.54, 6.54); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Performance Check

Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.52 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.8 V/m; Power Drift = 0.007 dB
Peak SAR (extrapolated) = 3.38 W/kg
SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.62 mW/g
Maximum value of SAR (measured) = 2.67 mW/g



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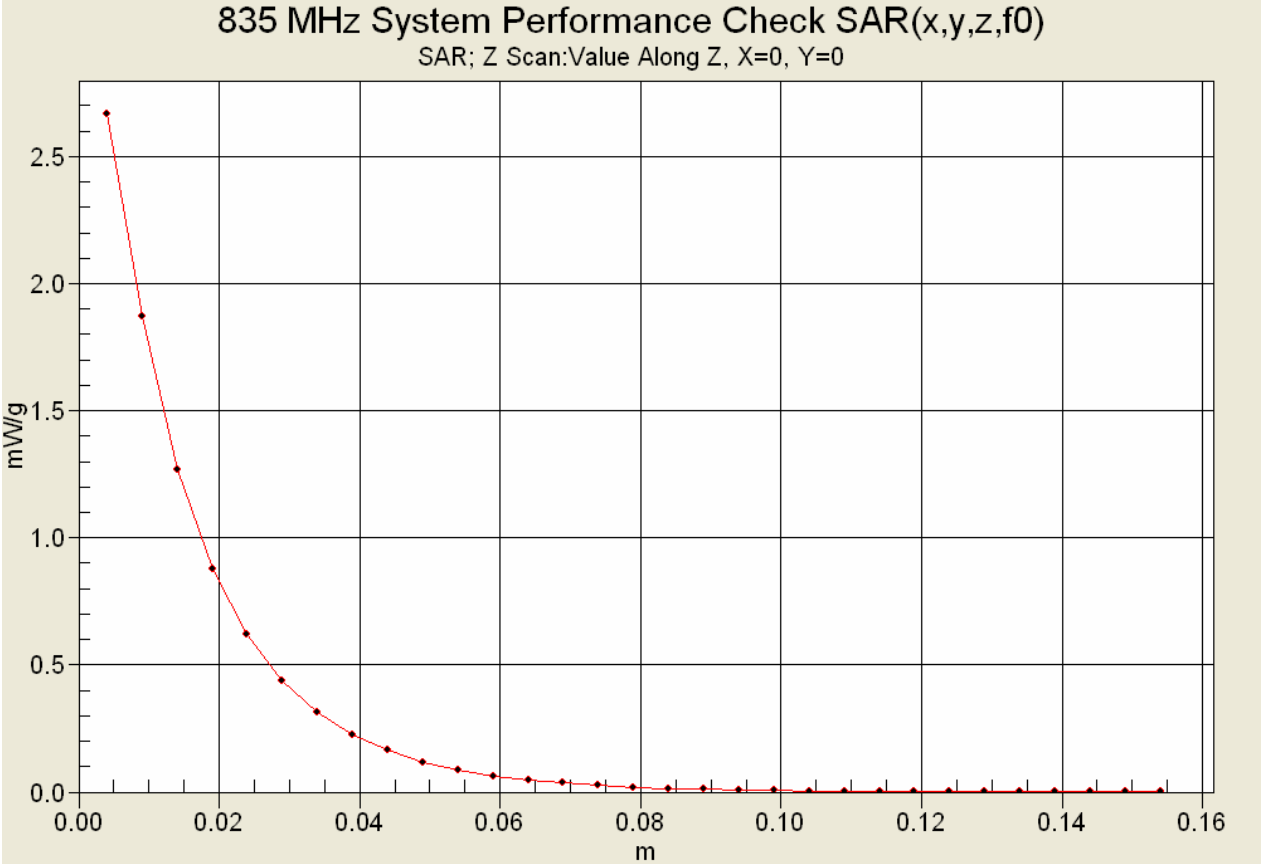
Z-Axis Scan



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Date Tested: 04/15/2009

System Performance Check - 835 MHz Dipole - HSL

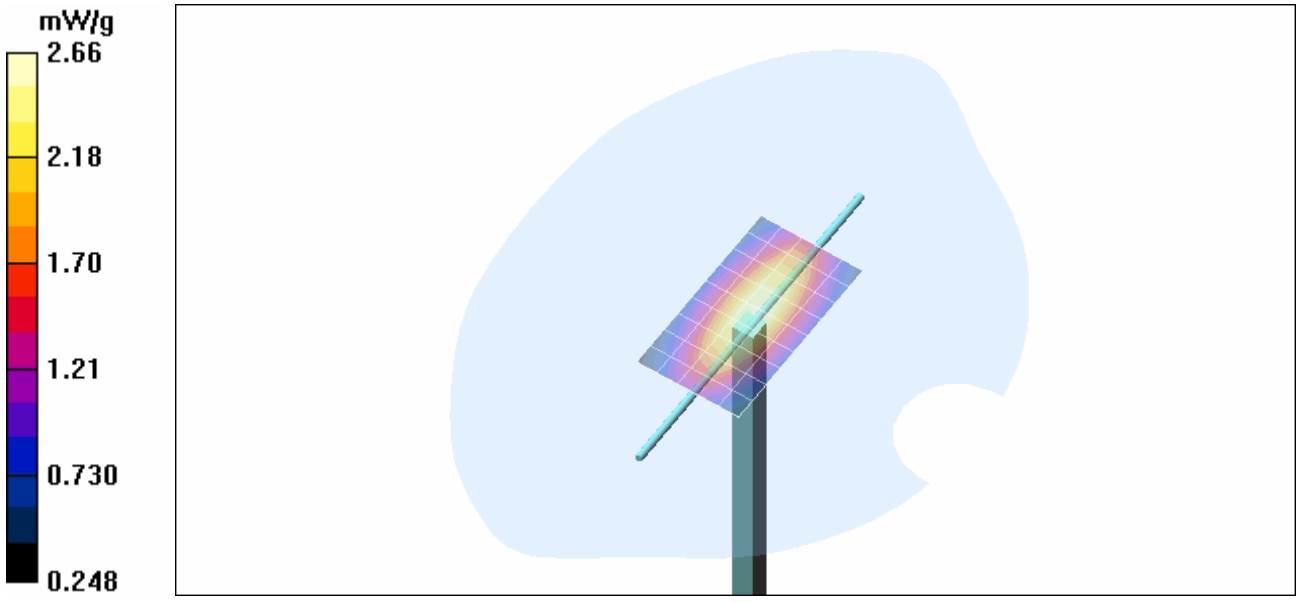
DUT: Dipole 835 MHz; Asset: 00022; Serial: 411; Validation: 02/10/2009

Ambient Temp: 23.6°C; Fluid Temp: 22.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.92 mho/m; ε_r = 42.3; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.54, 6.54, 6.54); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 22/04/2008
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Performance Check
Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.56 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.8 V/m; Power Drift = -0.023 dB
Peak SAR (extrapolated) = 3.34 W/kg
SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.63 mW/g
Maximum value of SAR (measured) = 2.66 mW/g



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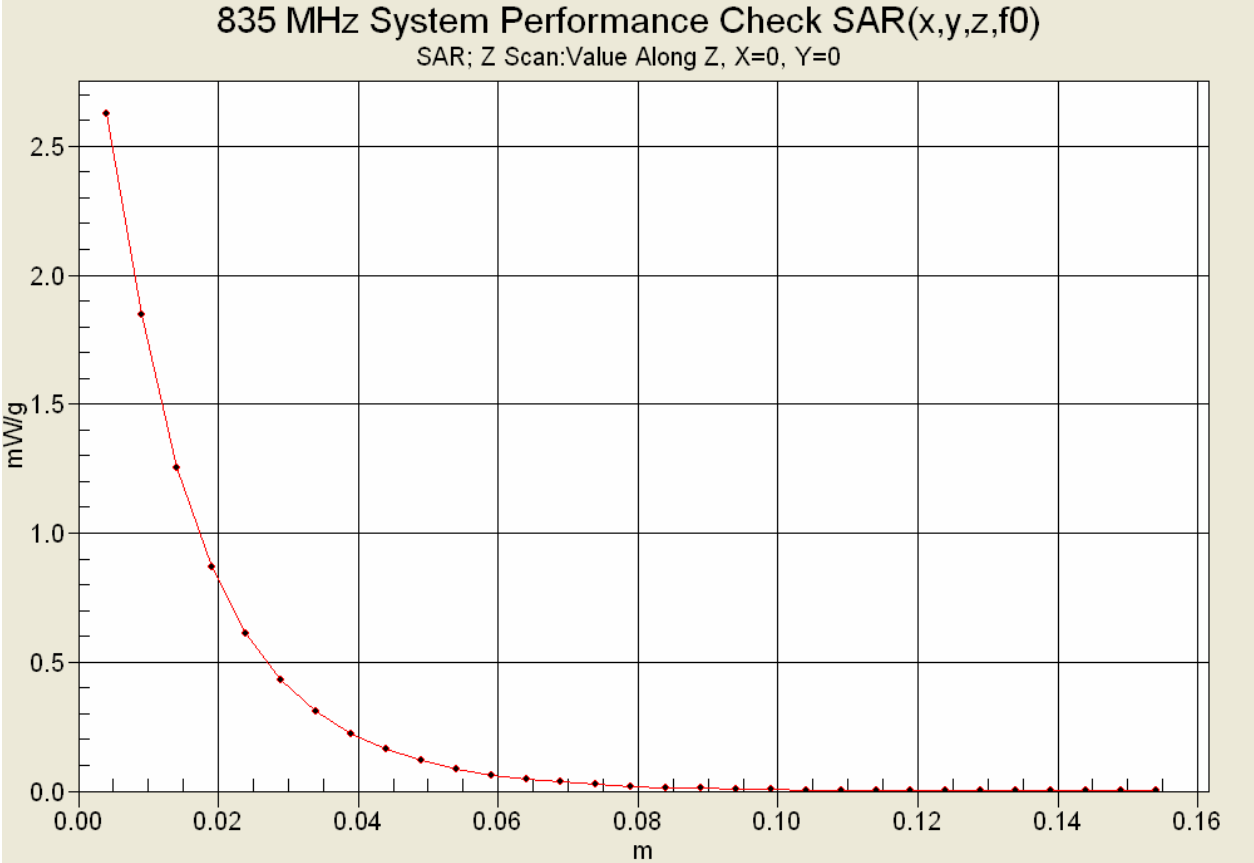
Z-Axis Scan



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Date Tested: 05/13/2009

System Performance Check - 835 MHz Dipole - HSL

DUT: Dipole 835 MHz; Asset: 00022; Serial: 411; Validation: 02/10/2009

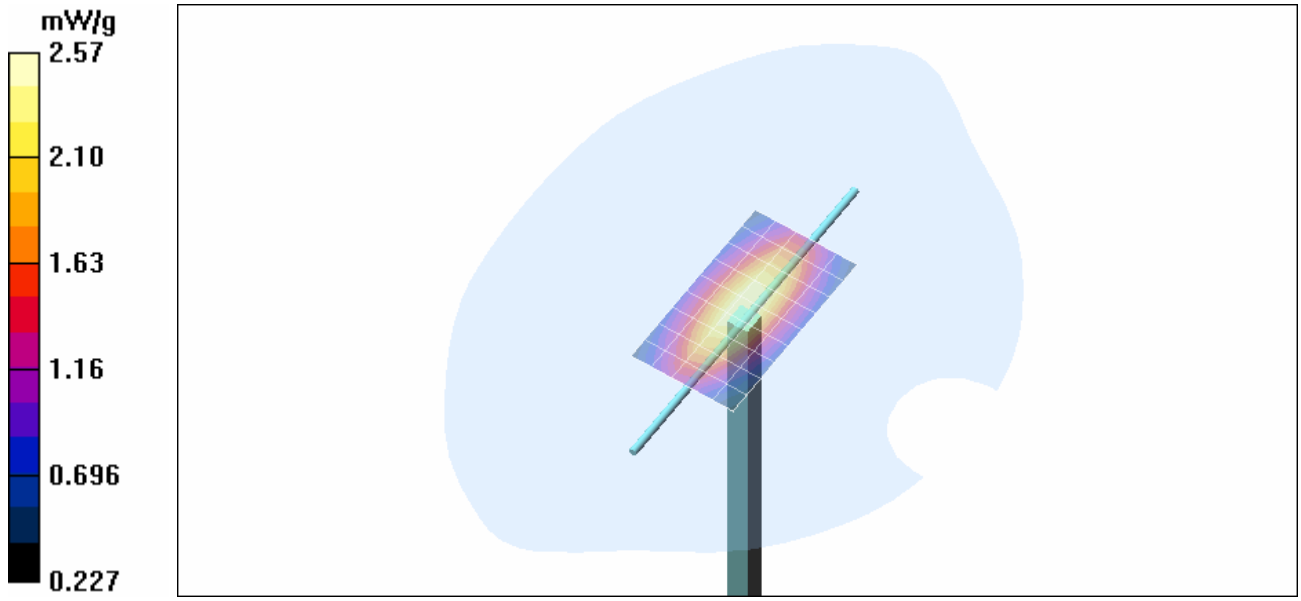
Ambient Temp: 23.0°C; Fluid Temp: 22.4°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 835 MHz; σ = 0.91 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.54, 6.54, 6.54); Calibrated: 21/07/2008
- Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

835 MHz System Performance Check

Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.40 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.1 V/m; Power Drift = -0.030 dB
Peak SAR (extrapolated) = 3.25 W/kg
SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.6 mW/g
Maximum value of SAR (measured) = 2.57 mW/g



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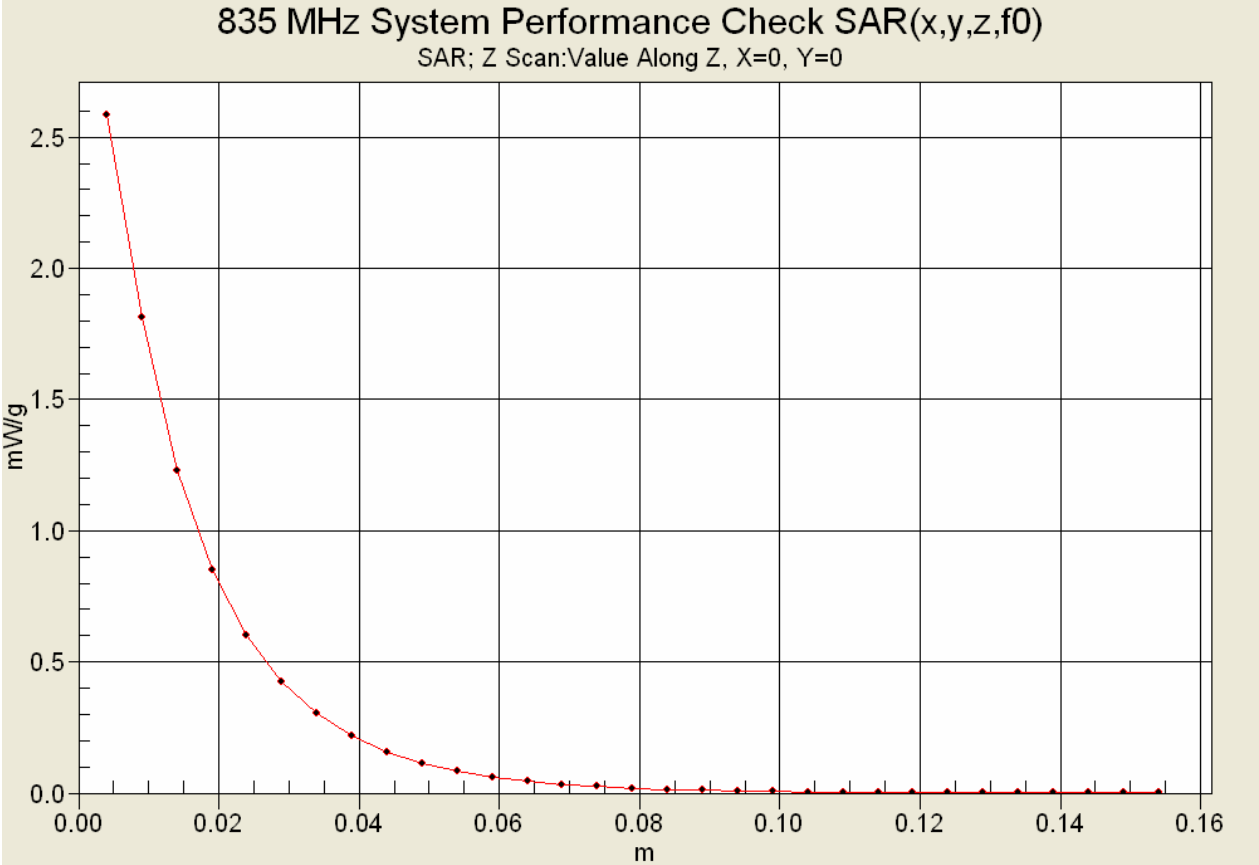
Z-Axis Scan



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APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

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835 MHz System Performance Check (Head)

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Celltech Labs
Test Result for UIM Dielectric Parameter
24/Mar/2009
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
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.7350	42.02	0.89	43.11	0.77
0.7450	41.97	0.89	43.08	0.81
0.7550	41.92	0.89	42.92	0.83
0.7650	41.86	0.89	42.85	0.82
0.7750	41.81	0.90	42.61	0.84
0.7850	41.76	0.90	42.50	0.85
0.7950	41.71	0.90	42.41	0.86
0.8050	41.66	0.90	42.46	0.85
0.8150	41.60	0.90	42.30	0.88
0.8250	41.55	0.90	42.21	0.88
0.8350	41.50	0.90	41.95	0.90
0.8450	41.50	0.91	41.95	0.91
0.8550	41.50	0.92	41.68	0.91
0.8650	41.50	0.93	41.61	0.92
0.8750	41.50	0.94	41.50	0.95
0.8850	41.50	0.95	41.49	0.93
0.8950	41.50	0.96	41.41	0.95
0.9050	41.50	0.97	41.04	0.96
0.9150	41.50	0.98	41.13	0.96
0.9250	41.48	0.98	40.88	0.99
0.9350	41.46	0.99	40.76	0.99

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775/805 MHz DUT Evaluation (Body)

****

Celltech Labs
Test Result for UIM Dielectric Parameter
24/Mar/2009
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7350	55.59	0.96	57.38	0.90
0.7450	55.55	0.96	57.46	0.89
0.7550	55.51	0.96	57.06	0.92
0.7650	55.47	0.96	57.04	0.92
0.7750	55.43	0.97	57.05	0.93
0.7850	55.39	0.97	56.93	0.94
0.7950	55.36	0.97	56.91	0.95
0.8050	55.32	0.97	56.55	0.95
0.8150	55.28	0.97	56.79	0.97
0.8250	55.24	0.97	56.82	0.98
0.8350	55.20	0.97	56.67	0.98
0.8450	55.17	0.98	56.43	0.99
0.8550	55.14	0.99	56.02	1.02
0.8650	55.11	1.01	56.51	1.02
0.8750	55.08	1.02	56.15	1.03
0.8850	55.05	1.03	56.31	1.05
0.8950	55.02	1.04	56.48	1.06
0.9050	55.00	1.05	55.92	1.07
0.9150	55.00	1.06	55.97	1.07
0.9250	54.98	1.06	55.76	1.09
0.9350	54.96	1.07	55.76	1.10

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835 MHz System Performance Check (Head)

****

Celltech Labs
Test Result for UIM Dielectric Parameter
25/Mar/2009
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
0.7350	42.02	0.89	42.17	0.80
0.7450	41.97	0.89	41.86	0.81
0.7550	41.92	0.89	41.80	0.82
0.7650	41.86	0.89	41.96	0.82
0.7750	41.81	0.90	41.51	0.82
0.7850	41.76	0.90	41.60	0.82
0.7950	41.71	0.90	41.51	0.86
0.8050	41.66	0.90	41.17	0.87
0.8150	41.60	0.90	41.19	0.87
0.8250	41.55	0.90	40.86	0.88
0.8350	41.50	0.90	40.90	0.89
0.8450	41.50	0.91	40.38	0.91
0.8550	41.50	0.92	40.38	0.91
0.8650	41.50	0.93	40.73	0.93
0.8750	41.50	0.94	40.54	0.94
0.8850	41.50	0.95	40.21	0.94
0.8950	41.50	0.96	40.04	0.95
0.9050	41.50	0.97	39.89	0.97
0.9150	41.50	0.98	40.15	0.96
0.9250	41.48	0.98	39.88	0.98
0.9350	41.46	0.99	39.66	0.98

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815 MHz DUT Evaluation (Body)

****

Celltech Labs
Test Result for UIM Dielectric Parameter
25/Mar/2009
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7350	55.59	0.96	56.80	0.88
0.7450	55.55	0.96	56.82	0.89
0.7550	55.51	0.96	56.73	0.90
0.7650	55.47	0.96	56.66	0.90
0.7750	55.43	0.97	56.69	0.93
0.7850	55.39	0.97	56.39	0.94
0.7950	55.36	0.97	56.66	0.94
0.8050	55.32	0.97	56.21	0.95
0.8150	55.28	0.97	56.59	0.95
0.8250	55.24	0.97	56.41	0.96
0.8350	55.20	0.97	55.98	0.98
0.8450	55.17	0.98	56.21	0.99
0.8550	55.14	0.99	55.74	1.01
0.8650	55.11	1.01	56.21	1.00
0.8750	55.08	1.02	55.63	1.01
0.8850	55.05	1.03	55.95	1.03
0.8950	55.02	1.04	55.94	1.04
0.9050	55.00	1.05	55.57	1.06
0.9150	55.00	1.06	55.91	1.07
0.9250	54.98	1.06	55.51	1.08
0.9350	54.96	1.07	55.32	1.09

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835 MHz System Performance Check (Head)

****

Celltech Labs
Test Result for UIM Dielectric Parameter
26/Mar/2009
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
0.7350	42.02	0.89	42.75	0.80
0.7450	41.97	0.89	42.36	0.79
0.7550	41.92	0.89	42.69	0.81
0.7650	41.86	0.89	42.26	0.82
0.7750	41.81	0.90	42.11	0.82
0.7850	41.76	0.90	42.01	0.83
0.7950	41.71	0.90	42.03	0.85
0.8050	41.66	0.90	41.79	0.86
0.8150	41.60	0.90	41.61	0.86
0.8250	41.55	0.90	41.44	0.88
0.8350	41.50	0.90	41.14	0.88
0.8450	41.50	0.91	40.86	0.90
0.8550	41.50	0.92	40.92	0.90
0.8650	41.50	0.93	40.90	0.92
0.8750	41.50	0.94	40.90	0.93
0.8850	41.50	0.95	40.74	0.93
0.8950	41.50	0.96	40.58	0.96
0.9050	41.50	0.97	40.55	0.95
0.9150	41.50	0.98	40.43	0.98
0.9250	41.48	0.98	40.28	0.98
0.9350	41.46	0.99	40.24	0.97

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865 MHz DUT Evaluation (Body)

****

Celltech Labs
Test Result for UIM Dielectric Parameter
26/Mar/2009
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7350	55.59	0.96	57.31	0.90
0.7450	55.55	0.96	57.11	0.88
0.7550	55.51	0.96	56.83	0.91
0.7650	55.47	0.96	56.88	0.91
0.7750	55.43	0.97	57.21	0.93
0.7850	55.39	0.97	56.82	0.94
0.7950	55.36	0.97	56.86	0.93
0.8050	55.32	0.97	56.51	0.95
0.8150	55.28	0.97	56.75	0.96
0.8250	55.24	0.97	56.68	0.97
0.8350	55.20	0.97	56.21	0.98
0.8450	55.17	0.98	56.31	1.00
0.8550	55.14	0.99	56.26	1.02
0.8650	55.11	1.01	56.33	1.01
0.8750	55.08	1.02	55.96	1.02
0.8850	55.05	1.03	56.11	1.04
0.8950	55.02	1.04	56.24	1.04
0.9050	55.00	1.05	55.70	1.07
0.9150	55.00	1.06	55.84	1.05
0.9250	54.98	1.06	55.76	1.07
0.9350	54.96	1.07	55.65	1.10

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835 MHz System Performance Check (Head)

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Celltech Labs
Test Result for UIM Dielectric Parameter
27/Mar/2009
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
0.7350	42.02	0.89	44.82	0.81
0.7450	41.97	0.89	44.10	0.82
0.7550	41.92	0.89	44.05	0.83
0.7650	41.86	0.89	44.26	0.85
0.7750	41.81	0.90	43.82	0.84
0.7850	41.76	0.90	43.84	0.85
0.7950	41.71	0.90	43.92	0.88
0.8050	41.66	0.90	43.60	0.88
0.8150	41.60	0.90	43.60	0.88
0.8250	41.55	0.90	43.37	0.90
0.8350	41.50	0.90	43.23	0.91
0.8450	41.50	0.91	42.71	0.92
0.8550	41.50	0.92	42.68	0.92
0.8650	41.50	0.93	42.64	0.94
0.8750	41.50	0.94	42.89	0.96
0.8850	41.50	0.95	42.56	0.95
0.8950	41.50	0.96	42.26	0.97
0.9050	41.50	0.97	42.36	0.98
0.9150	41.50	0.98	42.35	0.98
0.9250	41.48	0.98	42.24	0.99
0.9350	41.46	0.99	42.08	1.01

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775/805 MHz DUT Evaluation (Body)

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Celltech Labs
Test Result for UIM Dielectric Parameter
27/Mar/2009
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7350	55.59	0.96	57.76	0.89
0.7450	55.55	0.96	57.62	0.90
0.7550	55.51	0.96	57.47	0.91
0.7650	55.47	0.96	57.47	0.92
0.7750	55.43	0.97	57.57	0.92
0.7850	55.39	0.97	57.49	0.93
0.7950	55.36	0.97	57.34	0.94
0.8050	55.32	0.97	57.26	0.95
0.8150	55.28	0.97	57.13	0.95
0.8250	55.24	0.97	57.01	0.96
0.8350	55.20	0.97	56.97	0.97
0.8450	55.17	0.98	56.93	0.99
0.8550	55.14	0.99	56.88	1.00
0.8650	55.11	1.01	56.81	1.00
0.8750	55.08	1.02	56.79	1.01
0.8850	55.05	1.03	56.72	1.02
0.8950	55.02	1.04	56.70	1.02
0.9050	55.00	1.05	56.58	1.04
0.9150	55.00	1.06	56.49	1.05
0.9250	54.98	1.06	56.41	1.05
0.9350	54.96	1.07	56.31	1.06

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835 MHz System Performance Check (Head)

****

Celltech Labs
Test Result for UIM Dielectric Parameter
30/Mar/2009
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
0.7350	42.02	0.89	43.40	0.79
0.7450	41.97	0.89	43.19	0.81
0.7550	41.92	0.89	43.46	0.83
0.7650	41.86	0.89	43.42	0.84
0.7750	41.81	0.90	43.03	0.84
0.7850	41.76	0.90	43.12	0.84
0.7950	41.71	0.90	42.89	0.86
0.8050	41.66	0.90	42.70	0.87
0.8150	41.60	0.90	42.55	0.87
0.8250	41.55	0.90	42.41	0.89
0.8350	41.50	0.90	42.05	0.89
0.8450	41.50	0.91	41.97	0.91
0.8550	41.50	0.92	41.92	0.92
0.8650	41.50	0.93	41.86	0.93
0.8750	41.50	0.94	41.74	0.94
0.8850	41.50	0.95	41.59	0.95
0.8950	41.50	0.96	41.42	0.95
0.9050	41.50	0.97	41.73	0.96
0.9150	41.50	0.98	41.59	0.96
0.9250	41.48	0.98	41.48	0.98
0.9350	41.46	0.99	41.39	0.99

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815/865 MHz DUT Evaluation (Body)

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Celltech Labs
Test Result for UIM Dielectric Parameter
30/Mar/2009
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7350	55.59	0.96	58.21	0.87
0.7450	55.55	0.96	58.12	0.87
0.7550	55.51	0.96	57.98	0.90
0.7650	55.47	0.96	58.23	0.90
0.7750	55.43	0.97	58.28	0.91
0.7850	55.39	0.97	57.92	0.92
0.7950	55.36	0.97	57.89	0.93
0.8050	55.32	0.97	57.67	0.93
0.8150	55.28	0.97	57.66	0.94
0.8250	55.24	0.97	57.49	0.94
0.8350	55.20	0.97	57.51	0.96
0.8450	55.17	0.98	56.99	0.97
0.8550	55.14	0.99	57.12	0.99
0.8650	55.11	1.01	57.17	1.00
0.8750	55.08	1.02	56.96	1.01
0.8850	55.05	1.03	57.02	1.02
0.8950	55.02	1.04	57.13	1.03
0.9050	55.00	1.05	56.70	1.03
0.9150	55.00	1.06	56.71	1.06
0.9250	54.98	1.06	56.78	1.06
0.9350	54.96	1.07	56.75	1.07

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835 MHz System Performance Check (Head)

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Celltech Labs
Test Result for UIM Dielectric Parameter
13/Apr/2009
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
0.7350	42.02	0.89	42.81	0.79
0.7450	41.97	0.89	42.39	0.81
0.7550	41.92	0.89	42.37	0.82
0.7650	41.86	0.89	42.45	0.83
0.7750	41.81	0.90	42.05	0.83
0.7850	41.76	0.90	42.22	0.85
0.7950	41.71	0.90	41.77	0.85
0.8050	41.66	0.90	41.69	0.87
0.8150	41.60	0.90	41.53	0.89
0.8250	41.55	0.90	41.30	0.88
0.8350	41.50	0.90	41.26	0.90
0.8450	41.50	0.91	41.31	0.91
0.8550	41.50	0.92	41.09	0.92
0.8650	41.50	0.93	41.18	0.92
0.8750	41.50	0.94	40.73	0.94
0.8850	41.50	0.95	40.71	0.95
0.8950	41.50	0.96	40.57	0.97
0.9050	41.50	0.97	40.41	0.98
0.9150	41.50	0.98	40.26	0.97
0.9250	41.48	0.98	40.19	0.99
0.9350	41.46	0.99	39.77	0.99

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805/825/855/865 MHz DUT Evaluation (Body)

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Celltech Labs
Test Result for UIM Dielectric Parameter
13/Apr/2009
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7350	55.59	0.96	58.33	0.86
0.7450	55.55	0.96	58.08	0.89
0.7550	55.51	0.96	57.92	0.89
0.7650	55.47	0.96	58.22	0.90
0.7750	55.43	0.97	57.72	0.89
0.7850	55.39	0.97	58.17	0.91
0.7950	55.36	0.97	57.50	0.91
0.8050	55.32	0.97	57.59	0.94
0.8150	55.28	0.97	57.54	0.94
0.8250	55.24	0.97	57.04	0.95
0.8350	55.20	0.97	57.29	0.97
0.8450	55.17	0.98	57.46	0.99
0.8550	55.14	0.99	56.93	0.99
0.8650	55.11	1.01	57.46	0.99
0.8750	55.08	1.02	56.91	1.00
0.8850	55.05	1.03	56.83	1.00
0.8950	55.02	1.04	56.75	1.02
0.9050	55.00	1.05	57.02	1.02
0.9150	55.00	1.06	56.76	1.05
0.9250	54.98	1.06	56.65	1.05
0.9350	54.96	1.07	56.43	1.06

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835 MHz System Performance Check (Head)

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Celltech Labs
Test Result for UIM Dielectric Parameter
14/Apr/2009
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
0.7350	42.02	0.89	43.76	0.80
0.7450	41.97	0.89	43.60	0.82
0.7550	41.92	0.89	43.13	0.83
0.7650	41.86	0.89	42.87	0.85
0.7750	41.81	0.90	42.91	0.85
0.7850	41.76	0.90	42.70	0.85
0.7950	41.71	0.90	42.71	0.87
0.8050	41.66	0.90	42.15	0.90
0.8150	41.60	0.90	42.24	0.90
0.8250	41.55	0.90	42.17	0.91
0.8350	41.50	0.90	42.09	0.92
0.8450	41.50	0.91	41.77	0.94
0.8550	41.50	0.92	41.93	0.94
0.8650	41.50	0.93	41.61	0.94
0.8750	41.50	0.94	41.77	0.95
0.8850	41.50	0.95	41.46	0.97
0.8950	41.50	0.96	41.34	0.97
0.9050	41.50	0.97	40.91	0.99
0.9150	41.50	0.98	41.15	1.00
0.9250	41.48	0.98	40.91	1.01
0.9350	41.46	0.99	40.84	1.02

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775/805/815/865 MHz DUT Evaluation (Body)

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Celltech Labs
Test Result for UIM Dielectric Parameter
14/Apr/2009
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7350	55.59	0.96	55.07	0.88
0.7450	55.55	0.96	55.25	0.88
0.7550	55.51	0.96	55.07	0.90
0.7650	55.47	0.96	54.67	0.91
0.7750	55.43	0.97	54.76	0.92
0.7850	55.39	0.97	54.64	0.93
0.7950	55.36	0.97	54.42	0.93
0.8050	55.32	0.97	54.21	0.94
0.8150	55.28	0.97	54.39	0.96
0.8250	55.24	0.97	53.92	0.96
0.8350	55.20	0.97	54.31	0.99
0.8450	55.17	0.98	54.31	0.98
0.8550	55.14	0.99	54.40	0.99
0.8650	55.11	1.01	53.98	1.00
0.8750	55.08	1.02	54.19	1.02
0.8850	55.05	1.03	53.87	1.03
0.8950	55.02	1.04	53.69	1.04
0.9050	55.00	1.05	53.72	1.05
0.9150	55.00	1.06	53.82	1.06
0.9250	54.98	1.06	53.53	1.07
0.9350	54.96	1.07	53.48	1.09

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835 MHz System Performance Check & 775/805/815/865 MHz DUT Evaluation (Head)

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Celltech Labs
Test Result for UIM Dielectric Parameter
15/Apr/2009
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
0.7350	42.02	0.89	43.35	0.81
0.7450	41.97	0.89	43.41	0.83
0.7550	41.92	0.89	43.05	0.83
0.7650	41.86	0.89	43.00	0.85
0.7750	41.81	0.90	43.05	0.86
0.7850	41.76	0.90	43.20	0.88
0.7950	41.71	0.90	43.05	0.87
0.8050	41.66	0.90	42.49	0.88
0.8150	41.60	0.90	42.75	0.90
0.8250	41.55	0.90	42.24	0.91
0.8350	41.50	0.90	42.33	0.92
0.8450	41.50	0.91	42.11	0.95
0.8550	41.50	0.92	41.96	0.94
0.8650	41.50	0.93	41.89	0.94
0.8750	41.50	0.94	41.88	0.95
0.8850	41.50	0.95	41.68	0.96
0.8950	41.50	0.96	41.77	0.97
0.9050	41.50	0.97	41.53	0.99
0.9150	41.50	0.98	41.65	0.99
0.9250	41.48	0.98	41.31	1.00
0.9350	41.46	0.99	41.44	1.02

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835 MHz System Performance Check & 815 MHz DUT Evaluation (Head)

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Celltech Labs
Test Result for UIM Dielectric Parameter
13/May/2009
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
0.7350	42.02	0.89	43.32	0.81
0.7450	41.97	0.89	43.26	0.83
0.7550	41.92	0.89	43.25	0.83
0.7650	41.86	0.89	43.22	0.85
0.7750	41.81	0.90	43.00	0.85
0.7850	41.76	0.90	42.59	0.86
0.7950	41.71	0.90	42.59	0.89
0.8050	41.66	0.90	42.25	0.90
0.8150	41.60	0.90	42.26	0.89
0.8250	41.55	0.90	42.23	0.90
0.8350	41.50	0.90	42.23	0.91
0.8450	41.50	0.91	41.98	0.93
0.8550	41.50	0.92	41.68	0.93
0.8650	41.50	0.93	41.91	0.93
0.8750	41.50	0.94	41.79	0.94
0.8850	41.50	0.95	41.43	0.97
0.8950	41.50	0.96	41.24	0.98
0.9050	41.50	0.97	41.07	0.98
0.9150	41.50	0.98	41.29	0.99
0.9250	41.48	0.98	40.93	1.01
0.9350	41.46	0.99	40.80	1.01

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805/815/865 MHz DUT Evaluation (Body)

****

Celltech Labs
Test Result for UIM Dielectric Parameter
13/May/2009
Frequency (GHz)
FCC_eH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
FCC_eB FCC Limits for Body Epsilon
FCC_sB FCC Limits for Body Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

****

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.7350	55.59	0.96	56.52	0.85
0.7450	55.55	0.96	56.54	0.87
0.7550	55.51	0.96	56.46	0.87
0.7650	55.47	0.96	56.70	0.90
0.7750	55.43	0.97	56.52	0.90
0.7850	55.39	0.97	55.95	0.91
0.7950	55.36	0.97	56.23	0.92
0.8050	55.32	0.97	55.97	0.93
0.8150	55.28	0.97	56.06	0.93
0.8250	55.24	0.97	55.84	0.93
0.8350	55.20	0.97	56.00	0.94
0.8450	55.17	0.98	55.62	0.96
0.8550	55.14	0.99	55.36	0.97
0.8650	55.11	1.01	55.59	0.99
0.8750	55.08	1.02	55.61	1.00
0.8850	55.05	1.03	55.40	1.02
0.8950	55.02	1.04	55.09	1.02
0.9050	55.00	1.05	55.13	1.03
0.9150	55.00	1.06	55.19	1.04
0.9250	54.98	1.06	55.02	1.05
0.9350	54.96	1.07	54.86	1.07

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APPENDIX E - PROBE CALIBRATION

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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_Jul08

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1590
Calibration procedure(s)	QA CAL-01.v6, QA CAL-12.v5 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	July 21, 2008
Condition of the calibrated item	In Tolerance

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

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 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-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	3-Sep-07 (No. DAE4-660_Sep07)	Sep-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

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

Issued: July 21, 2008

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
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 $\vartheta = 0$ ($f \leq 900$ 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 (no uncertainty required). DCP does not depend on frequency nor media.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *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:	May 20, 2005
Recalibrated:	July 21, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1590

Sensitivity in Free Space[A] Diode Compression[B]

NormX	**1.81** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**87** mV
NormY	**2.00** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**92** mV
NormZ	**1.72** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**85** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

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

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	10.7	7.2
SAR_{be} [%]	With Correction Algorithm	0.8	0.5

Sensor Offset

Probe Tip to Sensor Center	**2.7** mm

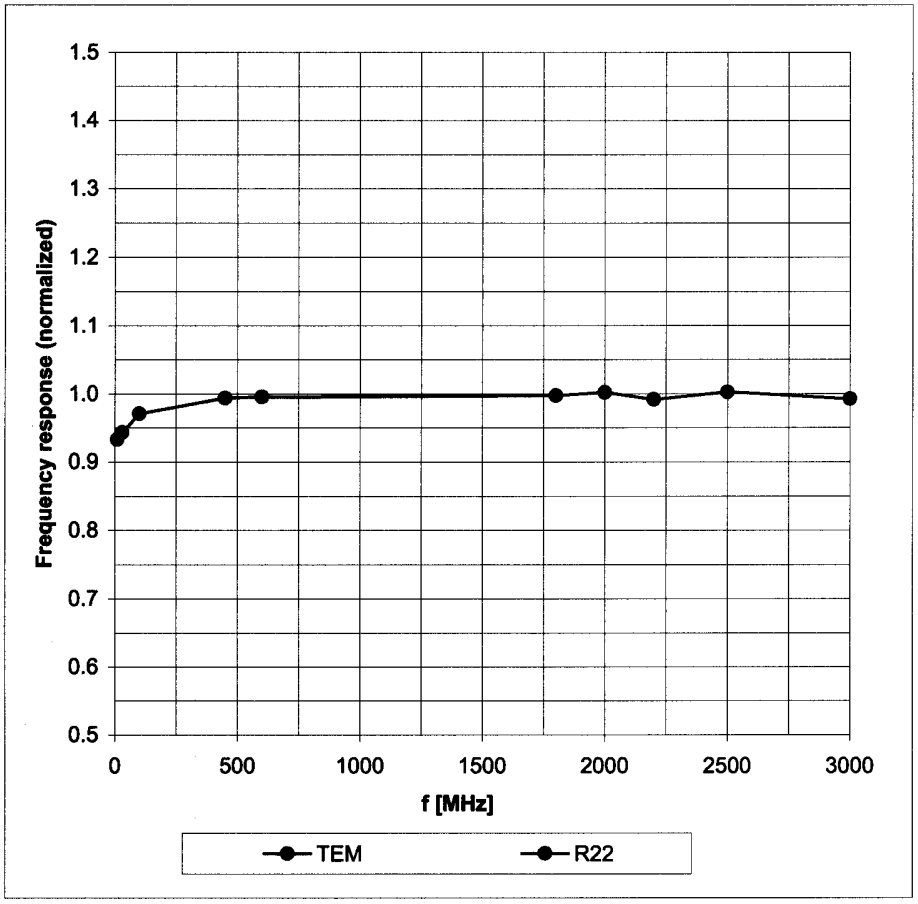
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

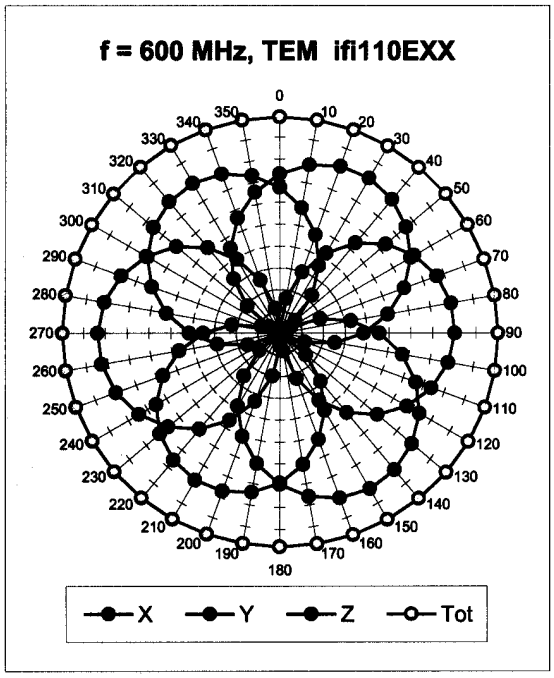
Frequency Response of E-Field

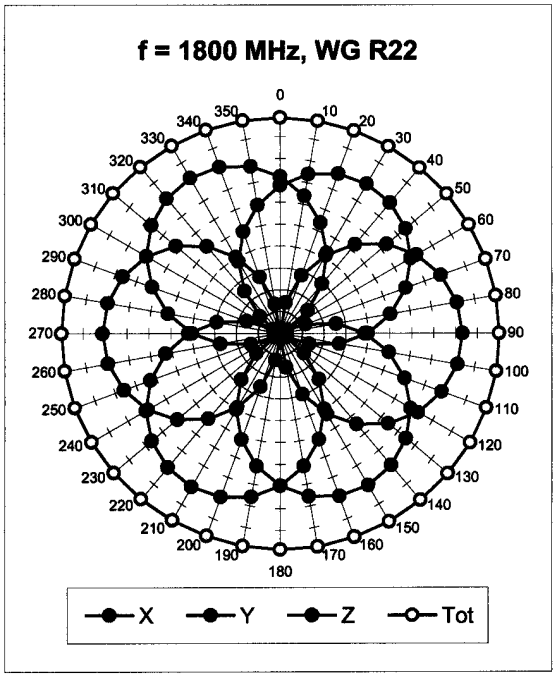
(TEM-Cell:ifi110 EXX, Waveguide: R22)

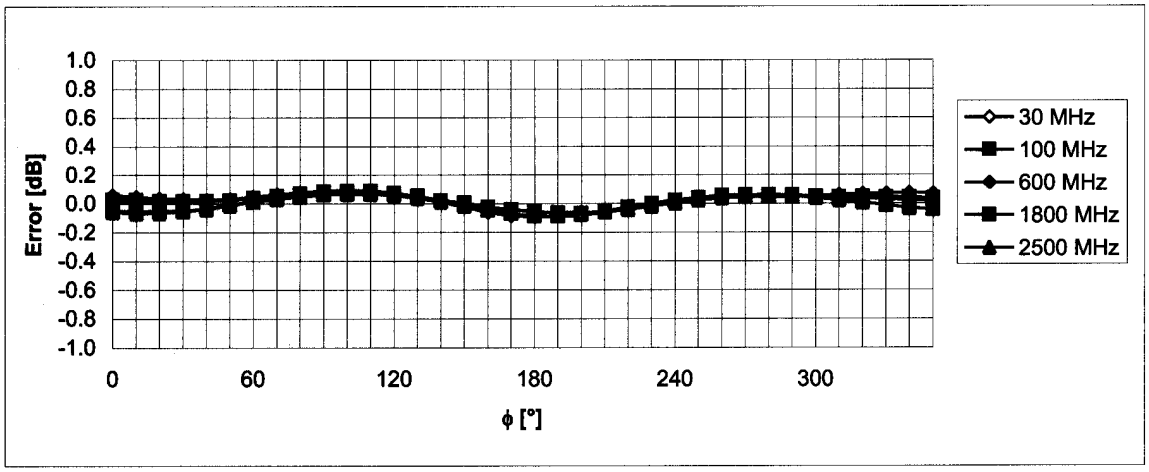


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



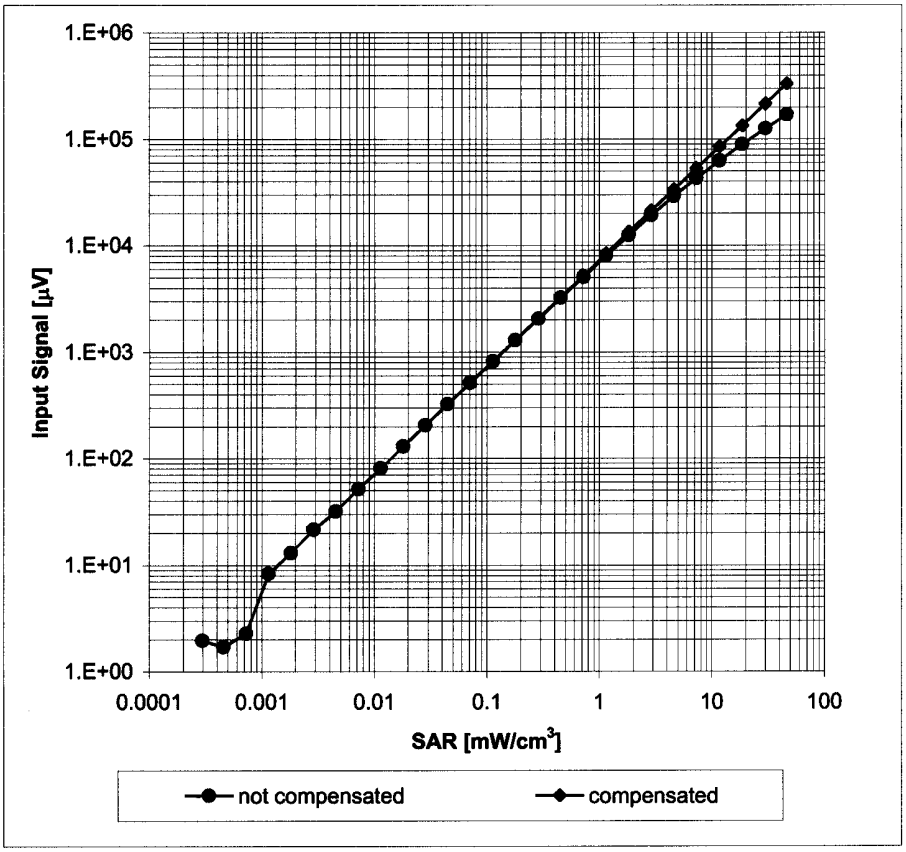


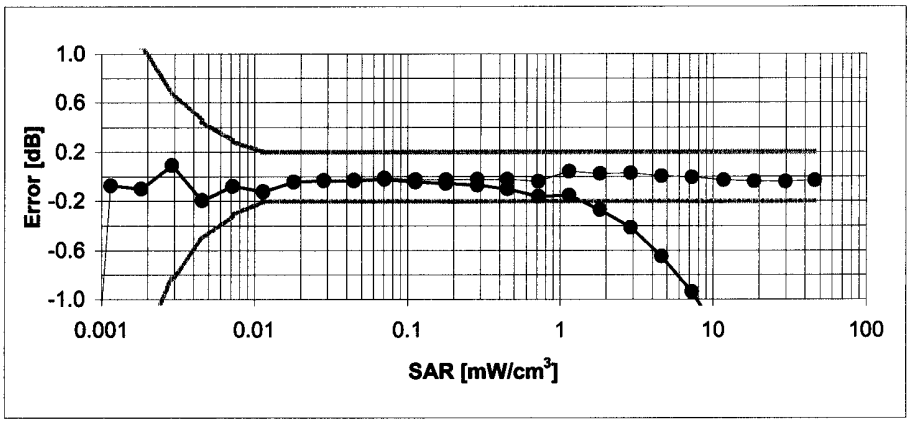


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

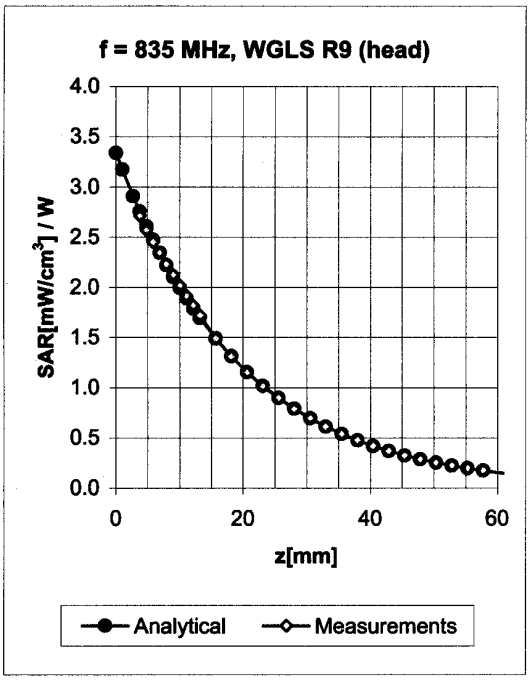
(Waveguide R22, f = 1800 MHz)

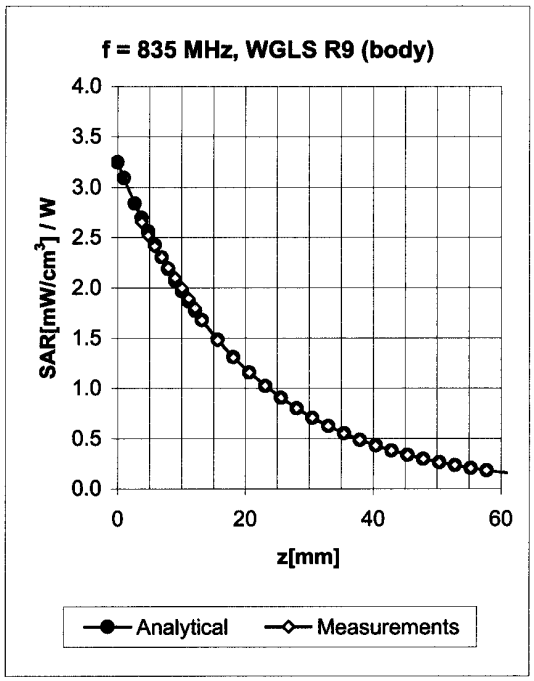




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



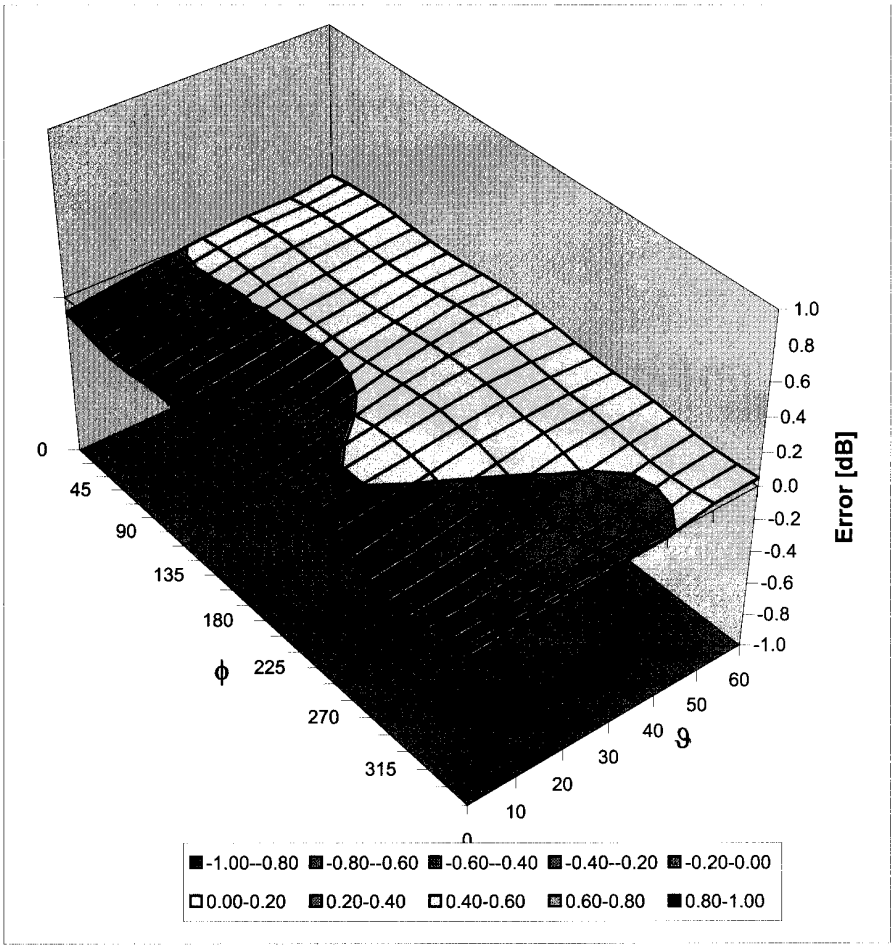


f [MHz]	Validity [MHz][C]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty	
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.34	1.75	7.66	± 13.3% (k=2)
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.32	3.52	6.54	± 11.0% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.28	1.77	8.27	± 13.3% (k=2)
835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

[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.**

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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