SAR TEST REPORT (FCC/IC)

RF EXPOSURE EVALUATION | SPECIFIC ABSORPTION RATE

APPLICANT / MANUFACTURER	KENWOOD USA CORPORATION			
DEVICE UNDER TEST (DUT)	PORTABLE DUAL-BAND PUSH-TO-TALK RADIO TRANSCEIVER			
MANUF. RATED OUTPUT POWER	2.5 Watts (Conducted)			
TRANSMIT FREQUENCY BAND(S)	896 - 901 MHz (Low Band)		935 - 940 MHz (High Band)	
DEVICE MODEL(S)	TK-481-3 (without DTMF)		TK-481-4 (with DTMF)	
DEVICE IDENTIFIER(S)	FCC ID:	ALH229900	IC:	282D-229900
APPLICATION TYPE	FCC/IC Certification			
STANDARD(S) APPLIED	FCC 47 CFR §2.1093			
	Health Canada Safety Code 6			
PROCEDURE(S) APPLIED	FCC OET Bulletin 65, Supplement C (01-01)			
	FCC KDB 447498 D01v04			
	Industry Canada RSS-102 Issue 3			
	IEEE 1528-2003			
	IEC 62209-1:2005			
	IEC 62209-2 (Draft)			
FCC DEVICE CLASSIFICATION	Licensed Non-Broadcast Transmitter Held to Face (TNF)			
IC DEVICE CLASSIFICATION	Land Mobile Radio Transmitter/Receiver (27.41-960 MHz)			
RF EXPOSURE CATEGORY	Occupational / Controlled			
RF EXPOSURE EVALUATION(S)	Face-held & Body-worn			
DATE(S) OF EVALUATION	December 23, 2009 & January 04, 2010			
TEST REPORT SERIAL NO.	121509ALH-T999-S90F			
TEST REPORT REVISION NO.	Revision 1.0	Initial Release	January 15, 2010	
TEST REPORT SIGNATORIES	Testing Performed By		Test Report Prepared By	
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TEST LAB ACCREDITATION(S)	ISO/IEC 17025:2005 (A2LA Test Lab Certificate No. 2470.01)			

DECLARATION OF COMPLIANCE
SAR RF EXPOSURE EVALUATION

Test Lab Information	**Name**	**CELLTECH LABS INC.**					
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Applicant Information	**Name**	**KENWOOD USA CORPORATION**					
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Standard(s) Applied	**FCC**	47 CFR §2.1093		**IC**	Health Canada Safety Code 6		
Procedure(s) Applied	**FCC**	OET Bulletin 65, Supplement C (Edition 01-01)					
	FCC	KDB 447498 D01v04 (Mobile and Portable RF Exposure Procedures)					
	IC	RSS-102 Issue 3	**IEEE**	1528-2003	**IEC**	62209-1:2005	62209-2 (Draft)
Device Classification(s)	**FCC**	Licensed Non-Broadcast Transmitter Held to Face (TNF)					
	IC	Land Mobile Radio Transmitter/Receiver (27.41-960 MHz)					
Device RF Exposure Category	**FCC/IC**	Occupational / Controlled Environment					
Device Identifier(s)	**FCC ID:**	ALH229900					
	IC:	282D-229900					
Device Model(s)	TK-481-3 (without DTMF)			TK-481-4 (with DTMF)			
	Note: the two models are electrically and mechanically identical except for DTMF function per manuf.						
Test Sample Model	TK-481-4 (with DTMF)		**Test Sample Serial No.**	2S-02 (Identical Prototype)			
Description of Device-Under-Test	Portable Dual-Band Push-To-Talk (PTT) FM Radio Transceiver						
Manufacturer's Rated Output Power	2.5 Watts						
DUT Mode(s) of Operation	Analog FM						
Transmit Frequency Band(s)	896 - 901 MHz (Low Band)			935 - 940 MHz (High Band)			
RF Conducted Output Power Tested	34.2 dBm	2.63 Watts	898.95 MHz	34.2 dBm	2.63 Watts	935.05 MHz	
Antenna Type(s) Tested	Detachable	Whip		P/N: T90-0640-25	Length: 151 mm		
Battery Type(s) Tested	Ni-Cd IS Battery Pack	7.2 V		1500 mAh	P/N: KNB-17B		
	Ni-MH Battery Pack	7.2 V		1400 mAh	P/N: KNB-52N		
	Ni-MH Battery Pack	7.2 V		1600 mAh	P/N: KNB-21N		
	Ni-MH Battery Pack	7.2 V		2100 mAh	P/N: KNB-22N		
	Ni-MH IS Battery Pack	7.2 V		2100 mAh	P/N: KNB-22NC		
	Alkaline Battery Case	18 V (12x AA)		Energizer Industrial	P/N: KBP-4		
Body-worn Accessories Tested	Belt-Clip	Contains Metal Components			P/N: KBH-10		
Audio Accessories Tested	Speaker-Microphone				P/N: KMC-25		
Max. SAR Level(s) Evaluated	Face-held	**0.950 W/kg**	1g	50% PTT duty cycle	Occupational / Controlled Exposure		
	Body-worn	**3.58 W/kg**	1g	50% PTT duty cycle	Occupational / Controlled Exposure		
FCC/IC Spatial Peak SAR Limit	Head/Body	8.0 W/kg	1g	50% PTT duty cycle	Occupational / Controlled Exposure		

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6 for the Occupational / Controlled Exposure environment. The device was tested in accordance with the measurement procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 3, IEEE Standard 1528-2003, IEC International Standard 62209-1:2005 and IEC International Standard 62209-2 (Draft). 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 approval of Celltech Labs Inc.

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

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1.0 INTRODUCTION

This measurement report demonstrates that the Kenwood USA Corporation Models: TK-481-3 and TK-481-4 Portable FM 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 measurement procedures described in FCC OET Bulletin 65, Supplement C 01-01 (see reference [3]), IC RSS-102 Issue 3 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]), IEC Standard 62209-1:2005 (see reference [6]) and Draft Standard IEC 62209-2 (see reference [7]) were employed. A description of the device, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used and the various provisions of the rules are included within this test report.

2.0 SAR MEASUREMENT SYSTEM

Celltech Labs Inc. SAR measurement facility utilizes the Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY4 measurement system is comprised of the measurement server, robot controller, computer, near-field probe, probe alignment sensor, specific anthropomorphic mannequin (SAM) phantom, and various planar phantoms for head and/or body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the DASY4 measurement server. The DAE4 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter and a command decoder and control logic unit. Transmission to the DASY4 measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot uses a controller with a built in VME-bus computer.

3.0 RF CONDUCTED OUTPUT POWER MEASUREMENTS

MEASURED RF CONDUCTED AVERAGE OUTPUT POWER LEVELS

Frequency (MHz)	Band	Channel	Mode	dBm	Watts
898.95	Low	Mid	CW	34.2	2.63
935.05	High	Low	CW	34.2	2.63

Notes

1. The RF conducted output power levels of the DUT were measured by Celltech prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter at the antenna connector.

4.0 MEASUREMENT SUMMARY

SAR EVALUATION RESULTS

Test Type	Test Date	Freq.	Battery Part No.	Accessory Type(s)		Device Distance to Planar Phantom		Cond. Power Before Test	Measured SAR 1g (W/kg)			SAR Drift During Test	Scaled SAR with droop 1g (W/kg)	
									P/S	PTT Duty Cycle			PTT Duty Cycle	
		MHz		Body-worn	Audio	DUT	Antenna	Watts		100%	50%	dB	100%	50%
Face	Jan 4	898.95 Low Band	KNB-17B	n/a	n/a	2.5 cm	4.3 cm	2.63	P	1.71	0.855	-0.414	1.88	0.940
									S	1.42	0.710		1.56	0.781
Face	Jan 4		KNB-22NC	n/a	n/a	2.5 cm	4.3 cm	2.63	P	1.48	0.740	-0.139	1.53	0.764
									S	1.29	0.645		1.46	0.730
Face	Jan 4		KBP-4	n/a	n/a	2.5 cm	4.3 cm	2.63	-	1.55	0.775	-0.543	1.76	0.878
Face	Jan 4	935.05 High Band	KNB-17B	n/a	n/a	2.5 cm	4.3 cm	2.63	P	1.54	0.770	-0.668	1.80	0.900
									S	1.16	0.580		1.35	0.675
Face	Jan 4		KNB-22NC	n/a	n/a	2.5 cm	4.3 cm	2.63	P	1.82	0.910	-0.192	1.90	**0.950**
									S	1.53	0.765		1.60	0.800
Face	Jan 4		KBP-4	n/a	n/a	2.5 cm	4.3 cm	2.63	-	1.26	0.630	-0.690	1.48	0.740
Body	Dec 23	898.95 Low Band	KNB-17B	Belt-Clip	Speaker-Mic	0.8 cm	1.8 cm	2.63	P	4.80	2.40	0.458	-	-
									S	3.71	1.86		-	-
Body	Dec 23		KNB-21N	Belt-Clip	Speaker-Mic	1.1 cm	1.8 cm	2.63	P	5.07	2.54	-0.191	5.30	2.65
									S	4.07	2.04	-0.122	4.19	2.10
Body	Dec 23		KNB-22N	Belt-Clip	Speaker-Mic	0.9 cm	1.8 cm	2.63	P	4.73	2.37	0.034	-	-
									S	3.26	1.63	-0.066	3.31	1.66
Body	Dec 23		KNB-22NC	Belt-Clip	Speaker-Mic	0.9 cm	1.8 cm	2.63	P	3.58	1.79	-0.379	3.91	1.96
									S	5.42	2.71	-0.027	5.45	2.73
Body	Dec 23		KNB-52N	Belt-Clip	Speaker-Mic	1.1 cm	1.8 cm	2.63	P	3.98	1.99	-0.363	4.33	2.17
									S	4.88	2.44	-0.450	5.41	2.71
Body	Dec 23		KBP-4	Belt-Clip	Speaker-Mic	1.0 cm	1.8 cm	2.63	-	6.34	3.17	-0.529	7.16	**3.58**
Body	Dec 23	935.05 High Band	KNB-17B	Belt-Clip	Speaker-Mic	0.8 cm	1.8 cm	2.63	-	4.21	2.11	-0.606	4.84	2.42
Body	Dec 23		KNB-21N	Belt-Clip	Speaker-Mic	1.1 cm	1.8 cm	2.63	P	4.86	2.43	-0.640	5.63	2.82
									S	3.19	1.60	-0.724	3.77	1.89
Body	Dec 23		KNB-22N	Belt-Clip	Speaker-Mic	0.9 cm	1.8 cm	2.63	-	4.67	2.34	-0.529	5.27	2.64
Body	Dec 23		KNB-22NC	Belt-Clip	Speaker-Mic	0.9 cm	1.8 cm	2.63	P	5.25	2.63	-0.579	6.00	3.00
									S	3.38	1.69	-0.616	3.90	1.95
Body	Dec 23		KNB-52N	Belt-Clip	Speaker-Mic	1.1 cm	1.8 cm	2.63	P	4.44	2.22	-0.431	4.90	2.45
									S	3.41	1.71	-0.027	3.43	1.72
Body	Dec 23		KBP-4	Belt-Clip	Speaker-Mic	1.0 cm	1.8 cm	2.63	-	5.57	2.79	-0.910	6.87	3.44

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

Notes

1. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. Secondary peak SAR levels measured within 2 dB of the primary are reported (P = Primary, S = Secondary).
3. The SAR droop of the DUT measured by the DASY4 system during each SAR measurement was added to the measured SAR level.
4. The transmit frequency bands of the DUT are < 10 MHz; therefore mid-channel data only is required to be reported per FCC OET 65, Supplement C (01-01). Due to the SAR system manufacturer's specified probe conversion factor validity of +/- 100 MHz for 835 MHz (see probe calibration - Appendix F), the 935.05 MHz frequency was selected in place of the mid channel frequency.

5.0 DETAILS OF SAR EVALUATION

The Kenwood USA Corporation Models: TK-481-3 and TK-481-4 Portable PTT FM Radio Transceiver described in this report was compliant for localized Specific Absorption Rate (Occupational / Controlled Exposure) based on the test provisions and conditions described below. Detailed photographs of the test setup are shown in Appendix D.

1. The DUT was evaluated in a face-held configuration with the front of the radio placed parallel to the outer surface of the planar phantom. A 2.5 cm spacing was maintained between the front side of the DUT and the outer surface of the planar phantom.
2. The face-held SAR evaluations with the Ni-MH Intrinsically Safe battery (P/N: KNB-22NC) were selected based on the maximum SAR level measured between the Ni-MH battery options during the body-worn SAR evaluations (100% PTT duty factor).
3. The DUT was evaluated in a body-worn configuration with the back of the radio facing the outer surface of the planar phantom and the attached belt-clip accessory placed parallel to and touching the planar phantom. The belt-clip separation distances listed in the test data table (page 5) were determined by the thickness of the battery and measured from the battery housing to the outer surface of the planar phantom. The body-worn SAR evaluations were performed with the customer-supplied speaker-microphone accessory connected to the audio input connector.
4. The DUT was tested at the power level preset by the manufacturer in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key constantly depressed. For a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
5. The conducted output power levels of the DUT referenced in this report were measured prior to the SAR evaluations at the antenna connector of the DUT using a Gigatronics 8652A Universal Power Meter in accordance with the procedures prescribed in FCC 47 CFR §2.1046 and IC RSS-Gen.
6. The area scan evaluation was performed with a fully charged battery. After the area scan was completed the radio was cooled down and the battery was replaced with a fully charged battery prior to the zoom scan evaluation.
7. 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.
8. The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR evaluations using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).

6.0 EVALUATION PROCEDURES

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

(ii) For body-worn and face-held devices a planar phantom was used.

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

An area scan was determined as follows:

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

d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.

A 1g and 10g spatial peak SAR was determined as follows:

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

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

g. A zoom scan volume of 32 mm x 32 mm x 30 mm (5 x 5 x 7 points) centered at the peak SAR location determined from the area scan was used for all zoom scans.

7.0 MEASURED FLUID DIELECTRIC PARAMETERS

MEASURED FLUID PARAMETERS

Test Date	January 04, 2010				January 04, 2010				December 23, 2009				December 23, 2009			
Fluid Type	835 Head		895 MHz Meas.		835 Head		935 MHz Meas.		835 Body		895 MHz Meas.		835 Body		935 MHz Meas.	
Dielectric Constant ε_r	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.
	41.5	±5%	39.5	-4.8%	41.5	±5%	39.6	-4.6%	55.2	±5%	53.1	-3.8%	55.2	±5%	52.8	-4.3%
Conductivity σ (mho/m)	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.	IEEE Target		Meas.	Dev.
	0.90	±5%	0.92	+2.2%	0.90	±5%	0.94	+4.4%	0.97	±5%	1.00	+3.1%	0.97	±5%	1.02	+5.0%

Test Date	Fluid Type	Ambient Temp.	Fluid Temp.	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Jan 04, 2010	Head	22.5°C	21.3°C	≥ 15	101.1 kPa	35%	1000
Dec 23, 2009	Body	22.8°C	21.5°C	≥ 15	101.1 kPa	35%	1000

Notes

1. The measured fluid parameters for each test frequency satisfy the dielectric parameter requirements of the probe calibration and routine measurements in accordance with FCC KDB 450824 D01 v01r01 (see reference [9]).

8.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES

The following procedures are recommended for measurements at 150 MHz - 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies. In general, SAR measurements below 300 MHz should be within ±50 MHz of the probe calibration frequency. At 300 MHz to 3 GHz, measurements should be within ±100 MHz of the probe calibration frequency. Measurements exceeding 50% of these intervals, ±25 MHz < 300 MHz and ±50 MHz ≥300 MHz, require additional steps (per FCC KDB 450824 D01 v01r01, SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz - see reference [9]).

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	±50 MHz ≥ 300 MHz
835 MHz	898.95 MHz	63.95 MHz	> 50 MHz[1]
	935.05 MHz	100.5 MHz	> 50 MHz[1]

1. 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 ε_r and -5% tolerances in σ, computed according to valid SAR sensitivity data, to reduce SAR underestimation and maintain conservativeness.* SAR sensitivity data is per SPEAG DASY4 Manual (see reference [10]).

Probe Calibration Frequency = 835 MHz				Target Parameters:		Head 41.5 ε_r / 0.9 σ		Body 55.2 ε_r / 0.97 σ	
Test Freq.	Tissue	σ	Sensitivity	ε_r	Sensitivity	% Change	Compensated Max. SAR Level		
898.95 MHz	Head	+2.2%	-	-4.8%	-	-	n/a	-	-
	Body	+3.1%	-	-3.8%	-	-	n/a	-	-
935.05 MHz	Head	+4.4%	-	-4.6%	-	-	n/a	-	-
	Body	+5.0%	-	-4.3%	-	-	n/a	-	-

Parameter	ϵ	σ	ρ
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

Note: Per SPEAG, the above sensitivity data (Head) from the DASY4 manual (see reference [10]) can be applied to Body tissue parameters provided the approximation is for <5% deviation of liquid parameters.

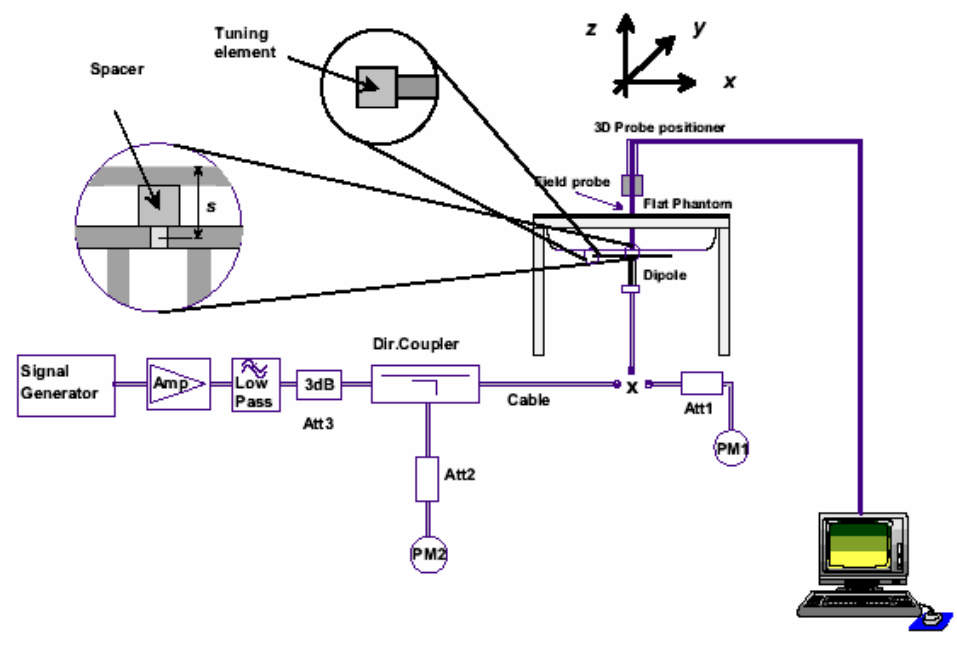
9.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations, daily system checks were performed at the planar section of the SAM phantom with an 835MHz SPEAG 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 International Standard IEC 62209-1:2005 (see reference [6]). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of ±10% from the system manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ε_r			Conductivity σ (mho/m)			ρ (Kg/m³)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
	Freq. (MHz)	SPEAG Target	Meas.	Dev.	SPEAG Target	Meas.	Dev.	SPEAG Target	Meas.	Dev.						
Dec-23 2009	Body 835	2.49 ±10%	2.26	-9.2%	55.2 ±5%	53.0	-4.0%	0.97 ±5%	0.94	-3.0%	1000	22.8	21.5	≥ 15	35	101.1
Jan-04 2010	Head 835	2.35 ±10%	2.26	-3.8%	41.5 ±5%	40.3	-2.9%	0.90 ±5%	0.86	-4.5%	1000	22.5	21.3	≥ 15	35	101.1

Notes		
	1.	The target SAR values are the measured values from the SAR system manufacturer's dipole calibration (see Appendix E).
	2.	The target dielectric parameters are the nominal values from the SAR system manufacturer's dipole calibration (see Appendix E).
	3.	The fluid temperature was measured prior to and after the system performance check to ensure the temperature remained within +/-2°C of the fluid temperature reported during the dielectric parameter measurements.
	4.	The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).



System Performance Check Measurement Setup (IEEE 1528-2003)

835 MHz Validation Dipole Setup

10.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipes in the table below are derived from the SAR system manufacturer's suggested recipes in the DASY4 manual (see references [11] and [12]) in accordance with the procedures and requirements specified in IEEE Standard 1528-2003 (see reference [5]) and IEC Standard 62209-1:2005 (see reference [6]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

SIMULATED TISSUE MIXTURES					
INGREDIENT	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 %

11.0 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.			

12.0 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

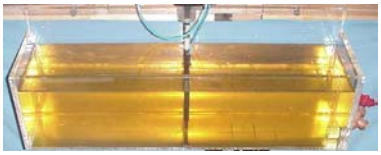
13.0 PROBE SPECIFICATION (ET3DV6)

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

14.0 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

15.0 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.

SAM Twin Phantom V4.0C

16.0 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

17.0 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	28Apr09	28Apr10
x	-ET3DV6 E-Field Probe	00017	1590	16Jul09	16Jul10
x	-D835V2 Validation Dipole	00217	4d075	20Apr09	20Apr10
x	-SAM Phantom V4.0C	00154	1033	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	US39240170	CNR	CNR
x	HP E4408B Spectrum Analyzer	00015	US39240170	23Apr08	28Apr10
x	Gigatronics 8652A Power Meter	00007	1835272	23Apr08	28Apr10
x	Gigatronics 80701A Power Sensor	00014	1833699	23Apr08	28Apr10
x	HP 8753ET Network Analyzer	00134	US39170292	28Apr08	28Apr10
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

18.0 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	4.8	Normal	1	0.6	0.49	2.9	2.4	∞
Combined Standard Uncertainty			**RSS**				**11.21**	**10.70**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**				**22.42**	**21.39**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003

19.0 REFERENCES

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

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

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

[4] Industry Canada - “Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)”, Radio Standards Specification RSS-102 Issue 3: June 2009.

[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] International Standard IEC 62209-2 Draft (106-62209-2-CDV_090323) - “Human exposure to radio frequency fields from hand-held & body-mounted wireless comm. devices - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (30 MHz to 6 GHz)”.

[8] Federal Communications Commission, Office of Engineering and Technology - “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”; KDB 447498 D01 v04: November 2009.

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

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

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

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

APPENDIX A - SAR MEASUREMENT DATA

Date Tested: 01/04/2010

Face-held SAR - Low Band - 898.95 MHz - Ni-Cd 1500mAh Battery P/N: KNB-17B

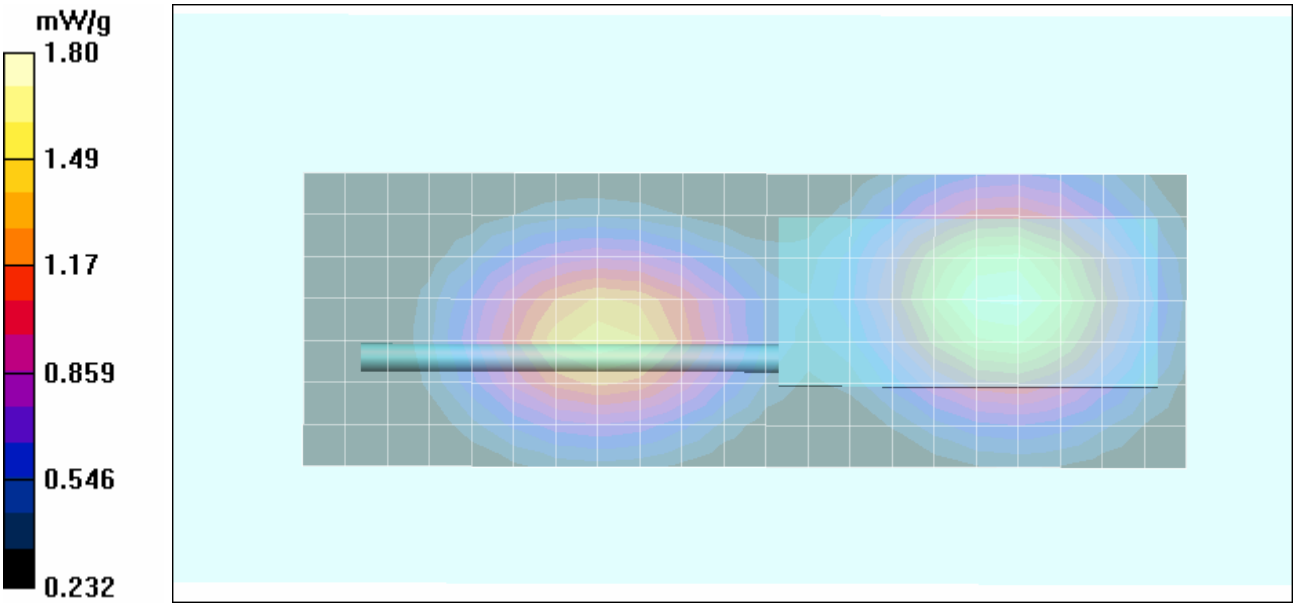
DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

Ambient Temp: 22.5°C; Fluid Temp: 21.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 898.95 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 898.95 MHz; σ = 0.92 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.59, 6.59, 6.59); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front Side of DUT to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.72 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.0 V/m; Power Drift = -0.414 dB
Peak SAR (extrapolated) = 2.23 W/kg
SAR(1 g) = 1.71 mW/g; SAR(10 g) = 1.23 mW/g
Maximum value of SAR (measured) = 1.80 mW/g
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.0 V/m; Power Drift = -0.414 dB
Peak SAR (extrapolated) = 1.88 W/kg
SAR(1 g) = 1.42 mW/g; SAR(10 g) = 1.02 mW/g
Maximum value of SAR (measured) = 1.50 mW/g



Date Tested: 01/04/2010

Face-held SAR - Low Band - 898.95 MHz - Ni-MH IS 2100mAh Battery P/N: KNB-22NC

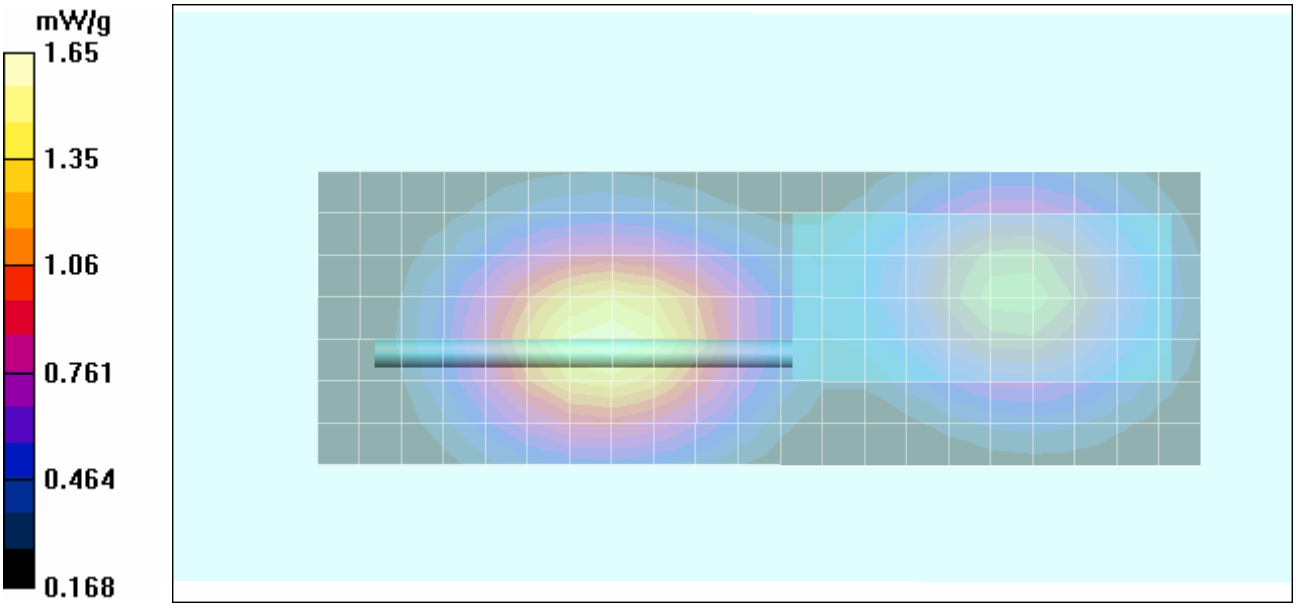
DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

Ambient Temp: 22.5°C; Fluid Temp: 21.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 898.95 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 898.95 MHz; σ = 0.92 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.59, 6.59, 6.59); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front Side of DUT to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.55 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.6 V/m; Power Drift = -0.139 dB
Peak SAR (extrapolated) = 2.06 W/kg
SAR(1 g) = 1.48 mW/g; SAR(10 g) = 1.01 mW/g
Maximum value of SAR (measured) = 1.65 mW/g
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 22.6 V/m; Power Drift = -0.139 dB
Peak SAR (extrapolated) = 1.70 W/kg
SAR(1 g) = 1.29 mW/g; SAR(10 g) = 0.927 mW/g
Maximum value of SAR (measured) = 1.37 mW/g



Date Tested: 01/04/2010

Face-held SAR - Low Band - 898.95 MHz - Alkaline Battery Case P/N: KBP-4

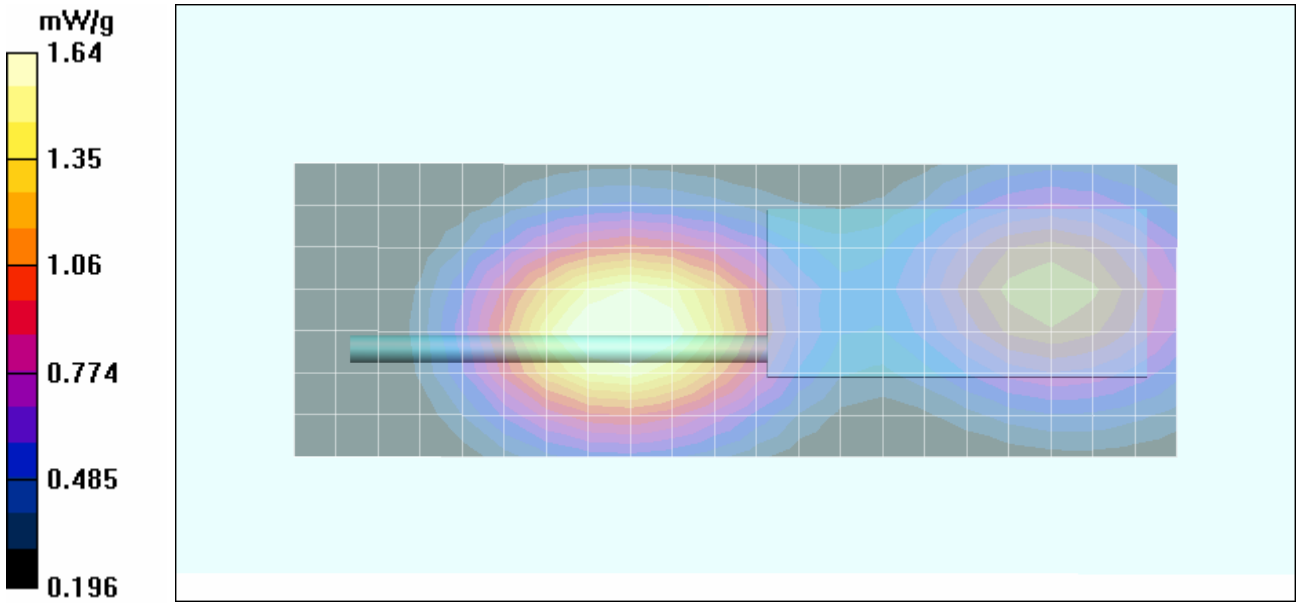
DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

Ambient Temp: 22.5°C; Fluid Temp: 21.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 898.95 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 898.95 MHz; σ = 0.92 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.59, 6.59, 6.59); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front Side of DUT to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.77 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 29.9 V/m; Power Drift = -0.543 dB
Peak SAR (extrapolated) = 2.04 W/kg
SAR(1 g) = 1.55 mW/g; SAR(10 g) = 1.11 mW/g
Maximum value of SAR (measured) = 1.64 mW/g



Date Tested: 01/04/2010

Face-held SAR - High Band - 935.05 MHz - Ni-Cd 1500mAh Battery P/N: KNB-17B

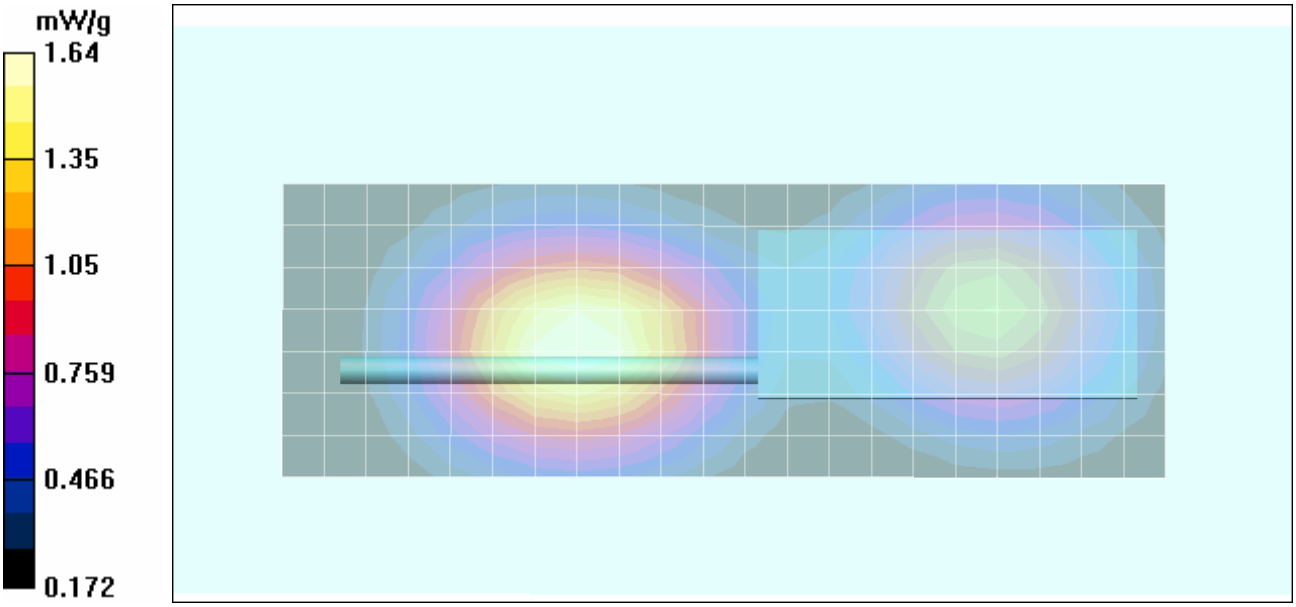
DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

Ambient Temp: 22.5°C; Fluid Temp: 21.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 935.05 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 935.05 MHz; σ = 0.94 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.59, 6.59, 6.59); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front Side of DUT to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.69 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.8 V/m; Power Drift = -0.668 dB
Peak SAR (extrapolated) = 2.06 W/kg
SAR(1 g) = 1.54 mW/g; SAR(10 g) = 1.1 mW/g
Maximum value of SAR (measured) = 1.64 mW/g
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.8 V/m; Power Drift = -0.668 dB
Peak SAR (extrapolated) = 1.54 W/kg
SAR(1 g) = 1.16 mW/g; SAR(10 g) = 0.829 mW/g
Maximum value of SAR (measured) = 1.23 mW/g



Date Tested: 01/04/2010

Face-held SAR - High Band - 935.05 MHz - Ni-MH IS 2100mAh Battery P/N: KNB-22NC

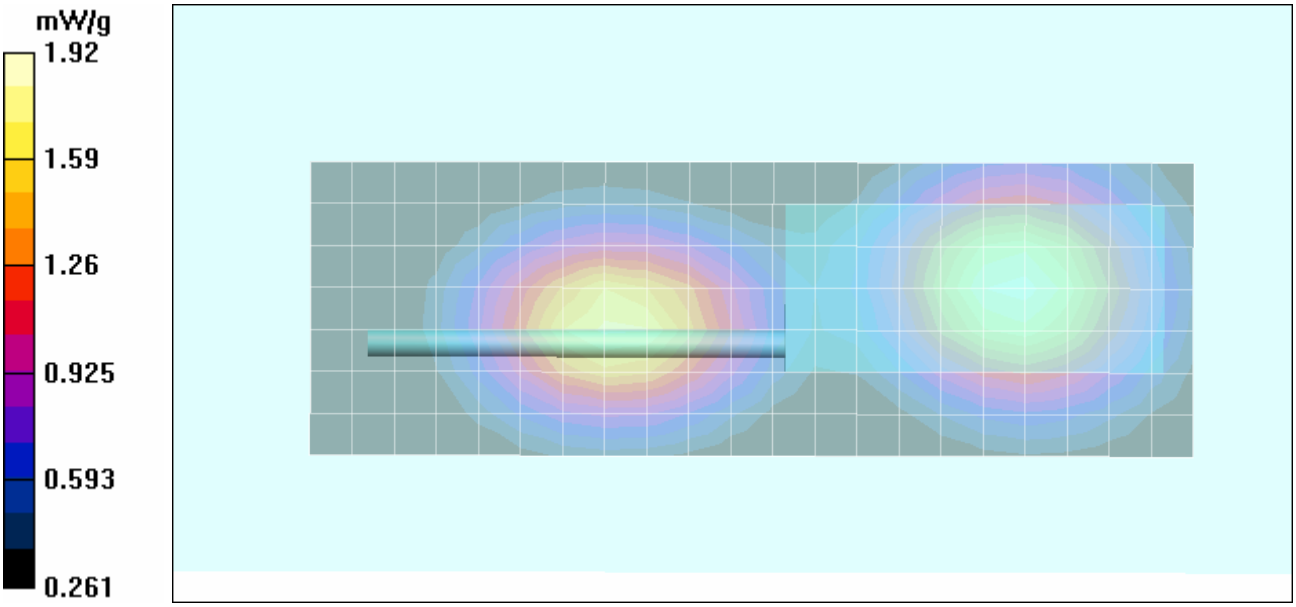
DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

Ambient Temp: 22.5°C; Fluid Temp: 21.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

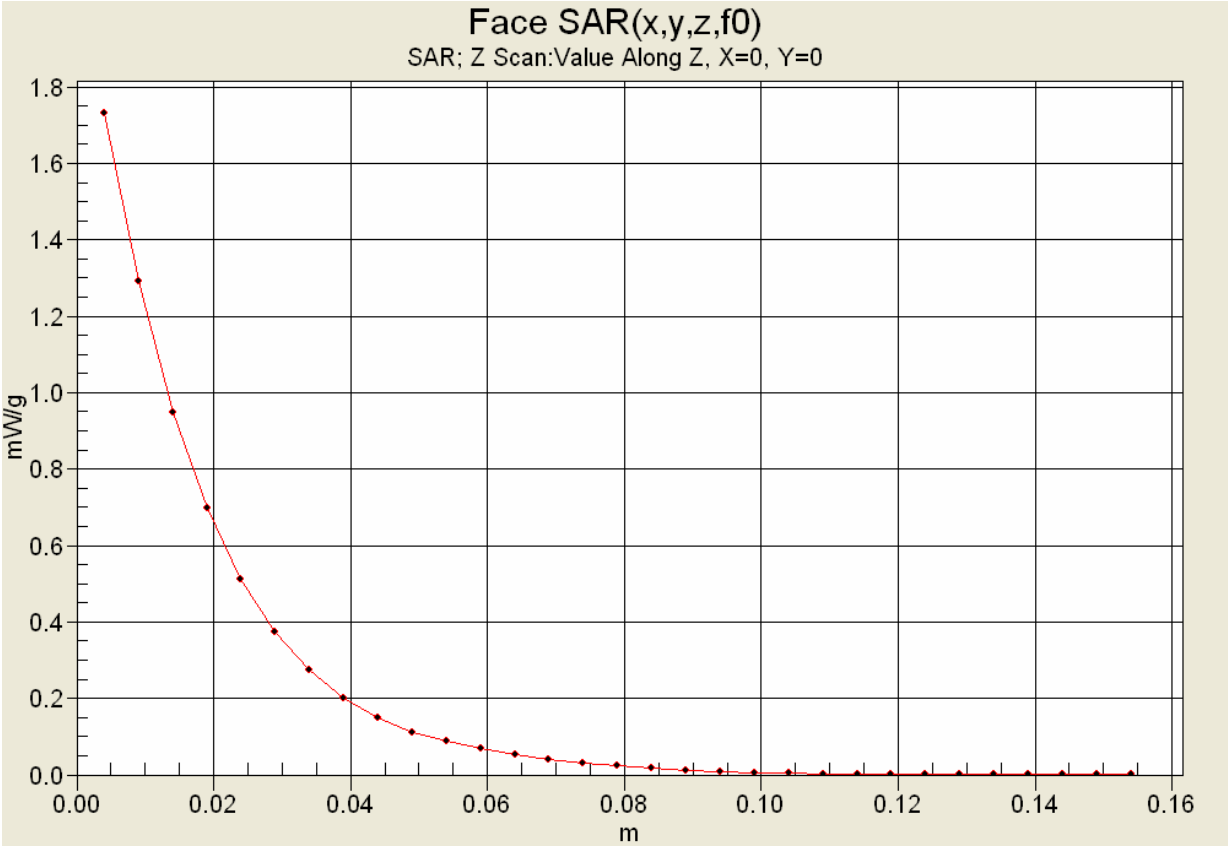
Communication System: CW
Frequency: 935.05 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 935.05 MHz; σ = 0.94 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.59, 6.59, 6.59); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front Side of DUT to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.87 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.0 V/m; Power Drift = -0.192 dB
Peak SAR (extrapolated) = 2.37 W/kg
SAR(1 g) = 1.82 mW/g; SAR(10 g) = 1.32 mW/g
Maximum value of SAR (measured) = 1.92 mW/g
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 23.0 V/m; Power Drift = -0.192 dB
Peak SAR (extrapolated) = 2.03 W/kg
SAR(1 g) = 1.53 mW/g; SAR(10 g) = 1.09 mW/g
Maximum value of SAR (measured) = 1.63 mW/g



Z-Axis Scan



Date Tested: 01/04/2010

Face-held SAR - High Band - 935.05 MHz - Alkaline Battery Case P/N: KBP-4

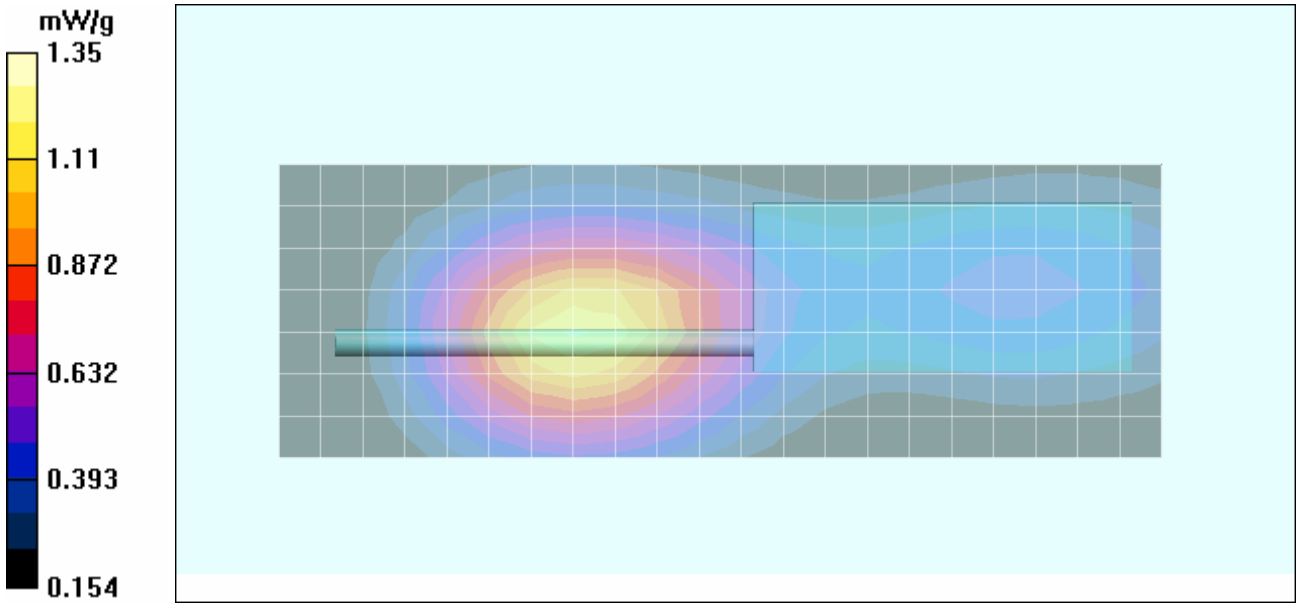
DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

Ambient Temp: 22.5°C; Fluid Temp: 21.3°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 935.05 MHz; Duty Cycle: 1:1
Medium: HSL835 Medium parameters used: f = 935.05 MHz; σ = 0.94 mho/m; ε_r = 39.6; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.59, 6.59, 6.59); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front Side of DUT to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.21 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 26.7 V/m; Power Drift = -0.690 dB
Peak SAR (extrapolated) = 1.71 W/kg
SAR(1 g) = 1.26 mW/g; SAR(10 g) = 0.899 mW/g
Maximum value of SAR (measured) = 1.35 mW/g



Date Tested: 12/23/2009

Body-worn SAR - Low Band - 898.95 MHz - Ni-Cd IS 1500mAh Battery P/N: KNB-17B

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

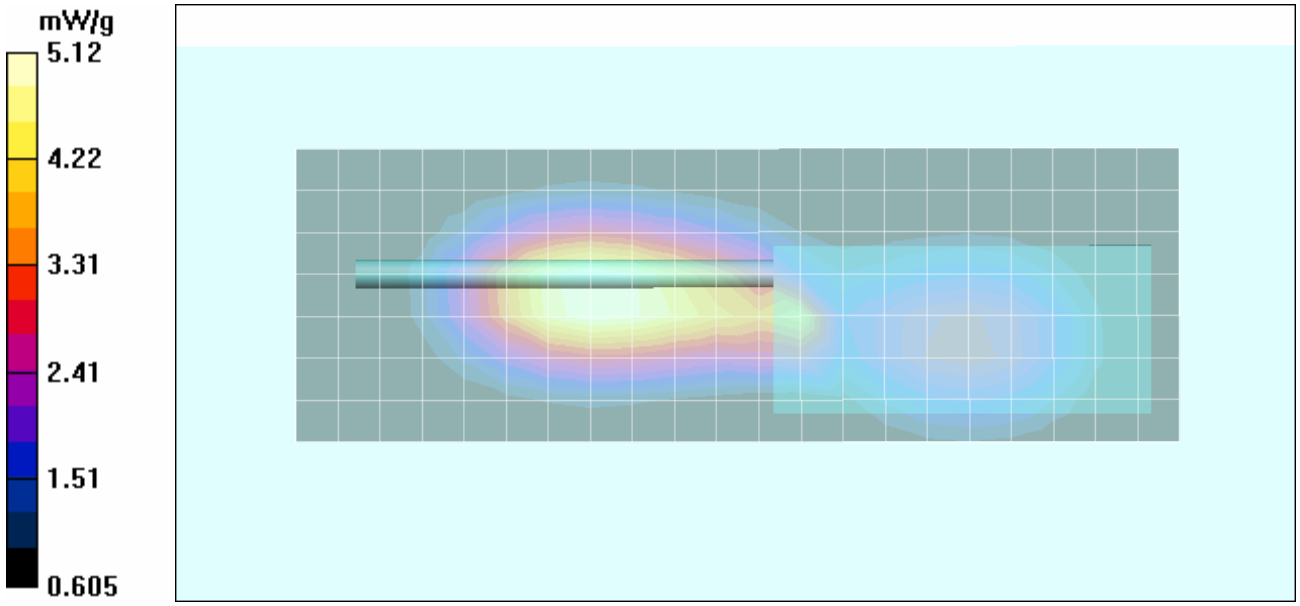
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 898.95 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 898.95 MHz; σ = 1 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 0.8 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.16 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.2 V/m; Power Drift = 0.458 dB
Peak SAR (extrapolated) = 6.37 W/kg
SAR(1 g) = 4.8 mW/g; SAR(10 g) = 3.37 mW/g
Maximum value of SAR (measured) = 5.12 mW/g
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.2 V/m; Power Drift = 0.458 dB
Peak SAR (extrapolated) = 8.25 W/kg
SAR(1 g) = 3.71 mW/g; SAR(10 g) = 2.2 mW/g
Maximum value of SAR (measured) = 4.06 mW/g



Date Tested: 12/23/2009

Body-worn SAR - Low Band - 898.95 MHz - Ni-MH 1600mAh Battery P/N: KNB-21N

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

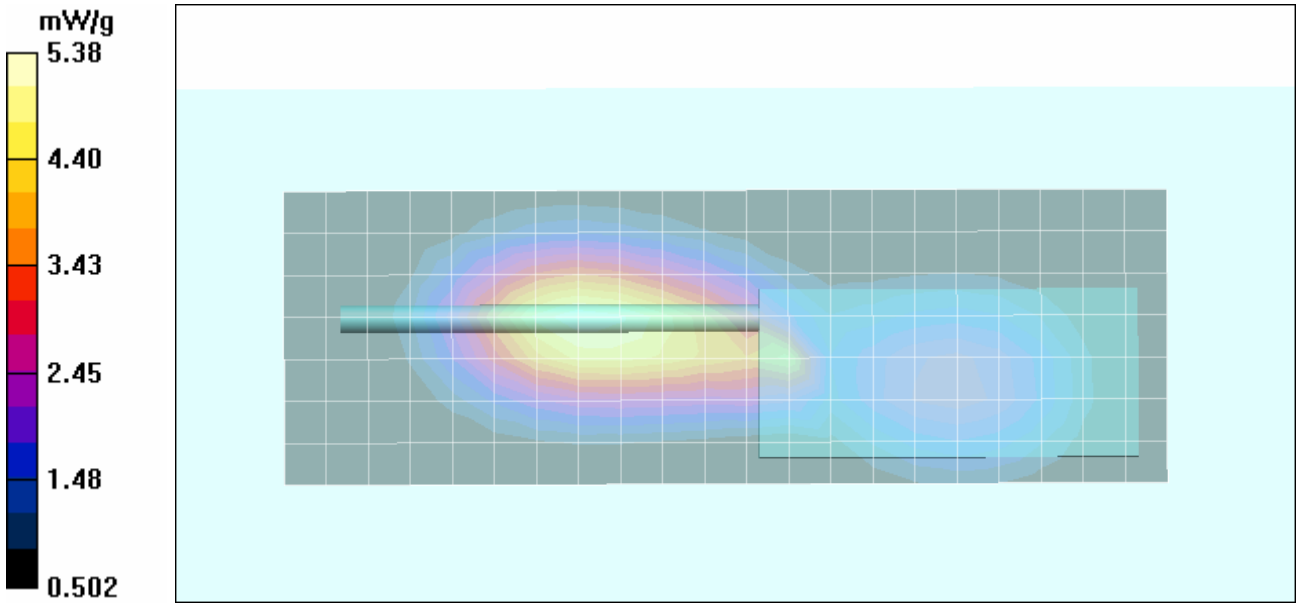
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 898.95 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 898.95 MHz; σ = 1 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 1.1 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.37 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 66.0 V/m; Power Drift = -0.191 dB
Peak SAR (extrapolated) = 6.73 W/kg
SAR(1 g) = 5.07 mW/g; SAR(10 g) = 3.52 mW/g
Maximum value of SAR (measured) = 5.38 mW/g
Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 64.3 V/m; Power Drift = -0.122 dB
Peak SAR (extrapolated) = 9.75 W/kg
SAR(1 g) = 4.07 mW/g; SAR(10 g) = 2.29 mW/g
Maximum value of SAR (measured) = 4.51 mW/g



Date Tested: 12/23/2009

Body-worn SAR - Low Band - 898.95 MHz - Ni-MH 2100mAh Battery P/N: KNB-22N

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

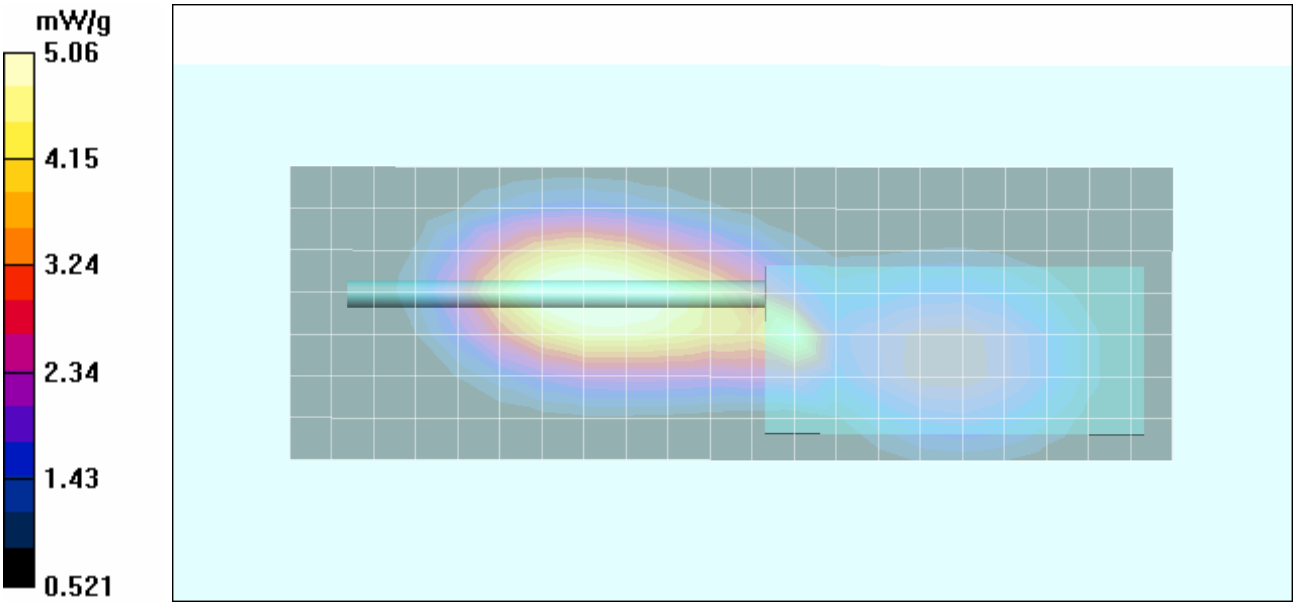
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 898.95 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 898.95 MHz; σ = 1 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 0.9 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.89 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.4 V/m; Power Drift = 0.034 dB
Peak SAR (extrapolated) = 6.35 W/kg
SAR(1 g) = 4.73 mW/g; SAR(10 g) = 3.3 mW/g
Maximum value of SAR (measured) = 5.06 mW/g
Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.5 V/m; Power Drift = -0.066 dB
Peak SAR (extrapolated) = 6.93 W/kg
SAR(1 g) = 3.26 mW/g; SAR(10 g) = 1.93 mW/g
Maximum value of SAR (measured) = 3.49 mW/g



Date Tested: 12/23/2009

Body-worn SAR - Low Band - 898.95 MHz - Ni-MH IS 2100mAh Battery P/N: KNB-22NC

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

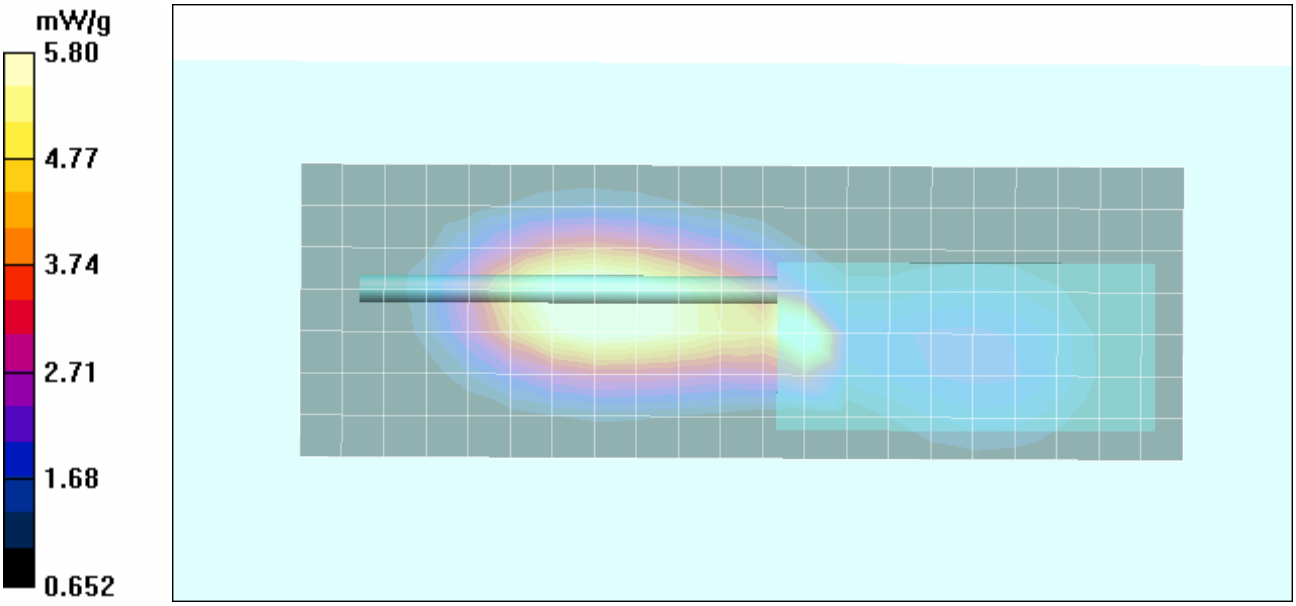
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 898.95 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 898.95 MHz; σ = 1 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 0.9 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 7.19 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.4 V/m; Power Drift = -0.379 dB
Peak SAR (extrapolated) = 7.95 W/kg
SAR(1 g) = 3.58 mW/g; SAR(10 g) = 2.09 mW/g
Maximum value of SAR (measured) = 3.80 mW/g
Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.0 V/m; Power Drift = -0.027 dB
Peak SAR (extrapolated) = 7.25 W/kg
SAR(1 g) = 5.42 mW/g; SAR(10 g) = 3.78 mW/g
Maximum value of SAR (measured) = 5.80 mW/g



Date Tested: 12/23/2009

Body-worn SAR - Low Band - 898.95 MHz - Ni-MH 1400mAh Battery P/N: KNB-52N

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

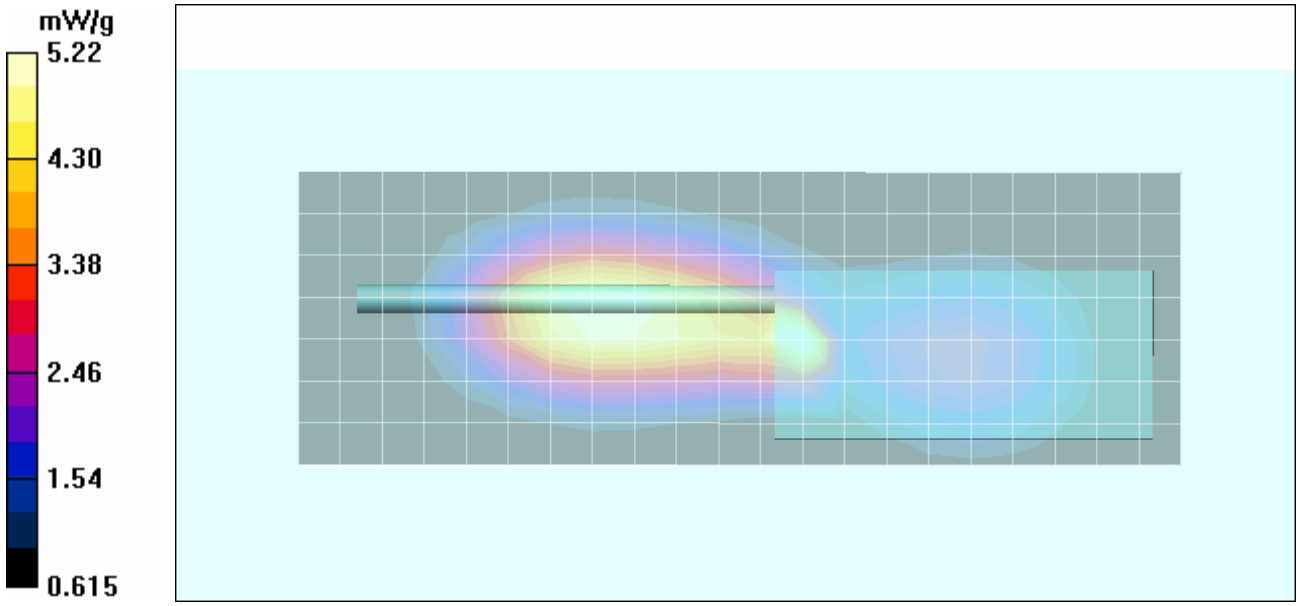
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 898.95 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 898.95 MHz; σ = 1 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 1.1 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.88 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 67.6 V/m; Power Drift = -0.363 dB
Peak SAR (extrapolated) = 9.27 W/kg
SAR(1 g) = 3.98 mW/g; SAR(10 g) = 2.2 mW/g
Maximum value of SAR (measured) = 4.30 mW/g
Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 66.0 V/m; Power Drift = -0.450 dB
Peak SAR (extrapolated) = 6.48 W/kg
SAR(1 g) = 4.88 mW/g; SAR(10 g) = 3.43 mW/g
Maximum value of SAR (measured) = 5.22 mW/g



Date Tested: 12/23/2009

Body-worn SAR - Low Band - 898.95 MHz - Alkaline Battery Case P/N: KBP-4

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

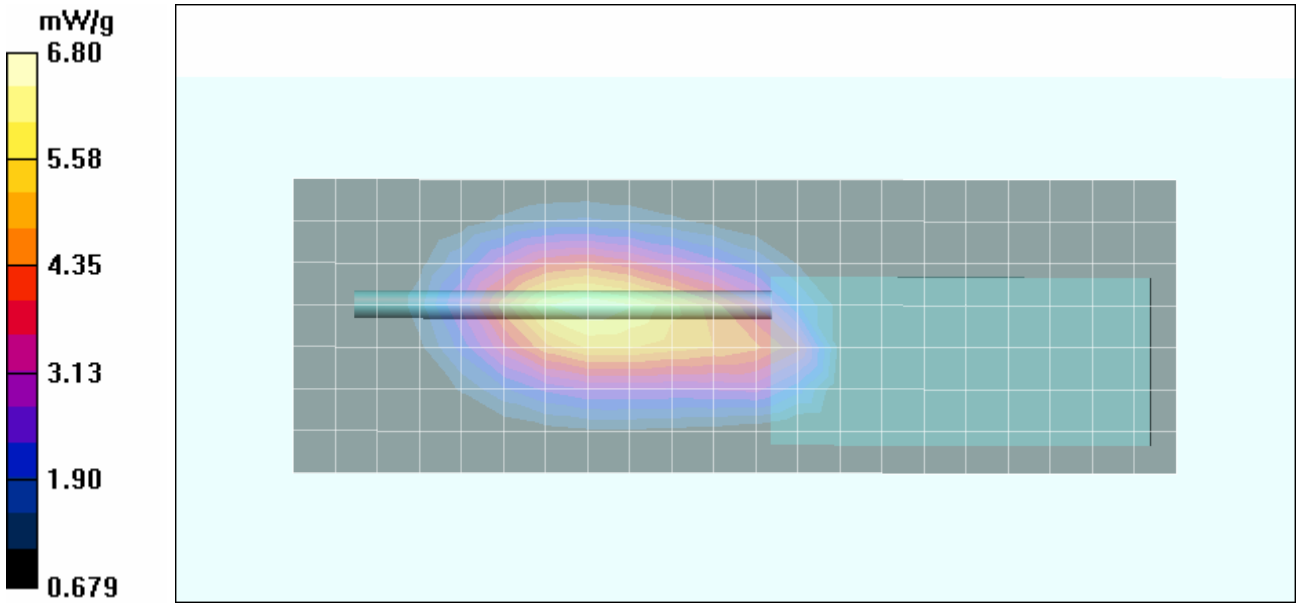
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

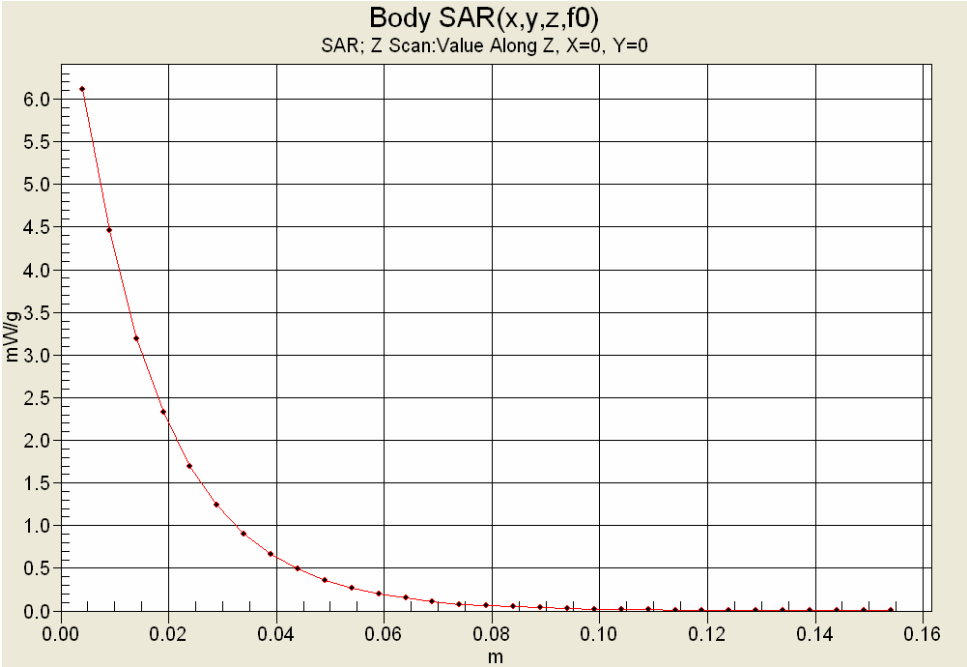
Communication System: CW
Frequency: 898.95 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 898.95 MHz; σ = 1 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 1.0 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 6.42 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 71.0 V/m; Power Drift = -0.529 dB
Peak SAR (extrapolated) = 8.47 W/kg
SAR(1 g) = 6.34 mW/g; SAR(10 g) = 4.45 mW/g
Maximum value of SAR (measured) = 6.80 mW/g

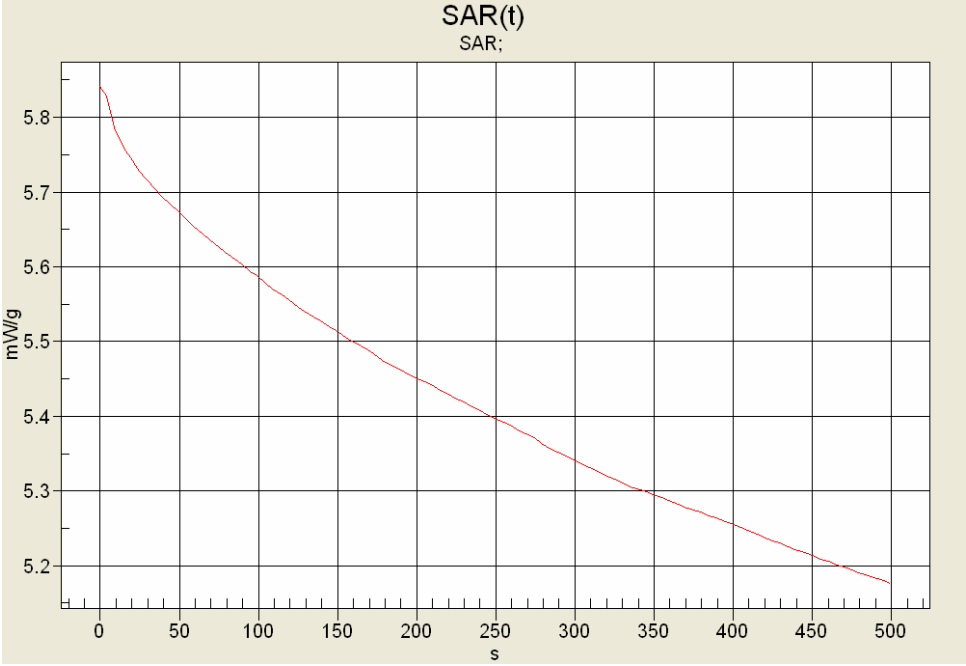


Z-Axis Scan



SAR-versus-Time Power Droop Evaluation

Body-worn - Low Band - 898.95 MHz
Alkaline Battery Case P/N: KBP-4
Belt-Clip & Speaker-Microphone



SAR 0s: 5.841 mW/g
SAR 340s: 5.303 mW/g (-0.420 dB)
(340s = Zoom Scan Duration)
(500s = Area Scan Duration)

Date Tested: 12/23/2009

Body-worn SAR - High Band - 935.05 MHz - Ni-Cd IS 1500mAh Battery P/N: KNB-17B

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

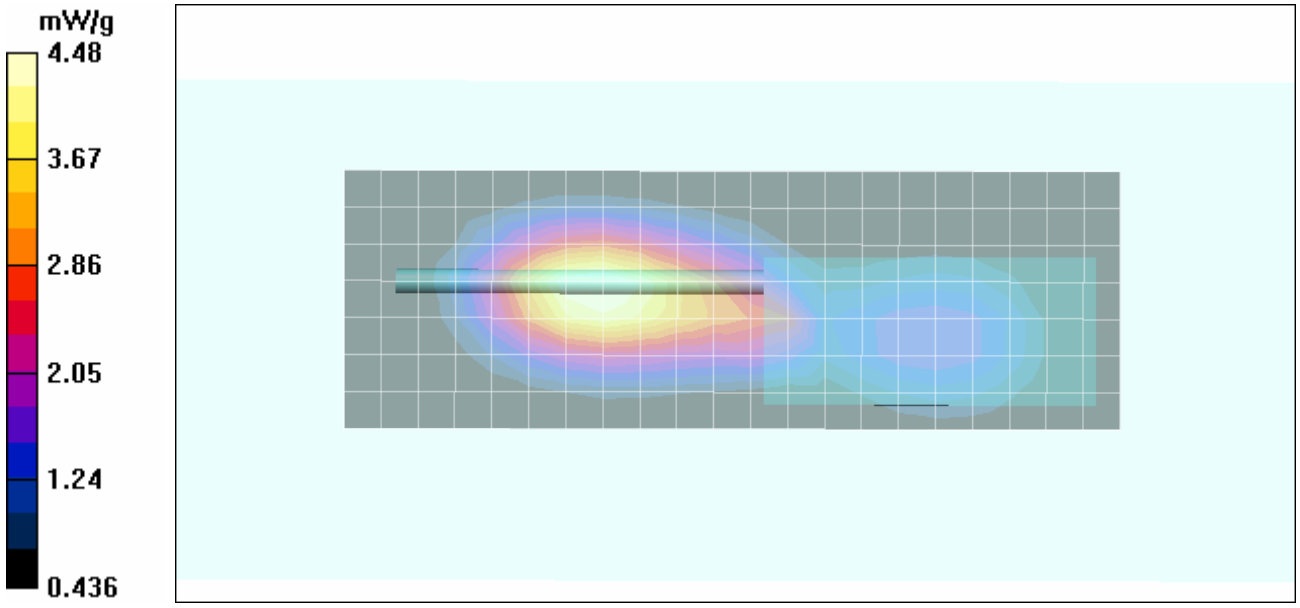
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 935.05 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 935.05 MHz; σ = 1.02 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 0.8 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 4.71 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.0 V/m; Power Drift = -0.606 dB
Peak SAR (extrapolated) = 5.65 W/kg
SAR(1 g) = 4.21 mW/g; SAR(10 g) = 2.9 mW/g
Maximum value of SAR (measured) = 4.48 mW/g



Date Tested: 12/23/2009

Body-worn SAR - High Band - 935.05 MHz - Ni-MH 1600mAh Battery P/N: KNB-21N

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

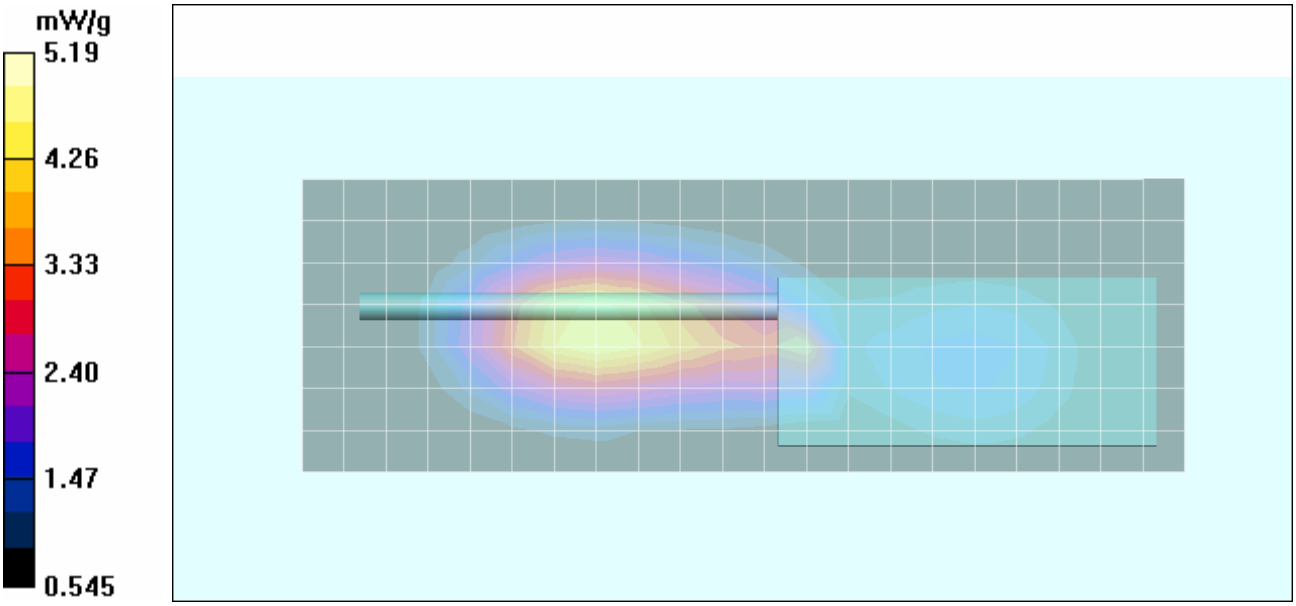
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 935.05 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 935.05 MHz; σ = 1.02 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 1.1 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 4.60 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.9 V/m; Power Drift = -0.640 dB
Peak SAR (extrapolated) = 6.50 W/kg
SAR(1 g) = 4.86 mW/g; SAR(10 g) = 3.37 mW/g
Maximum value of SAR (measured) = 5.19 mW/g
Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.1 V/m; Power Drift = -0.724 dB
Peak SAR (extrapolated) = 7.36 W/kg
SAR(1 g) = 3.19 mW/g; SAR(10 g) = 1.97 mW/g
Maximum value of SAR (measured) = 3.39 mW/g



Date Tested: 12/23/2009

Body-worn SAR - High Band - 935.05 MHz - Ni-MH 2100mAh Battery P/N: KNB-22N

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

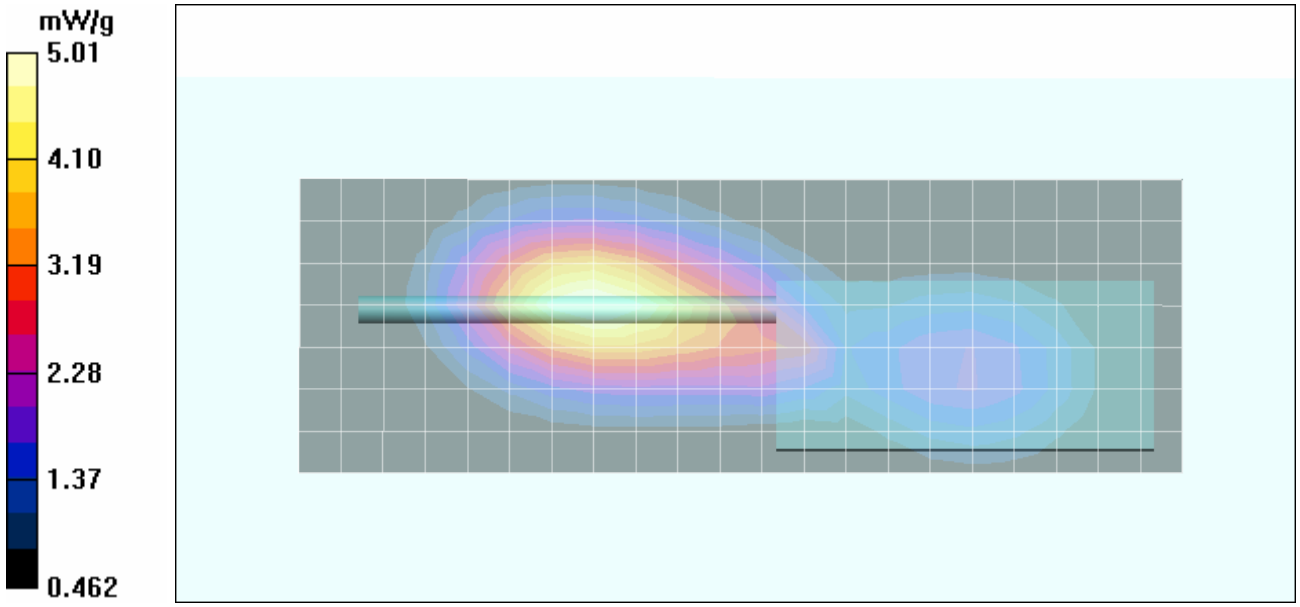
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 935.05 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 935.05 MHz; σ = 1.02 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 0.9 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.26 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.6 V/m; Power Drift = -0.529 dB
Peak SAR (extrapolated) = 6.28 W/kg
SAR(1 g) = 4.67 mW/g; SAR(10 g) = 3.25 mW/g
Maximum value of SAR (measured) = 5.01 mW/g



Date Tested: 12/23/2009

Body-worn SAR - High Band - 935.05 MHz - Ni-MH IS 2100mAh Battery P/N: KNB-22NC

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

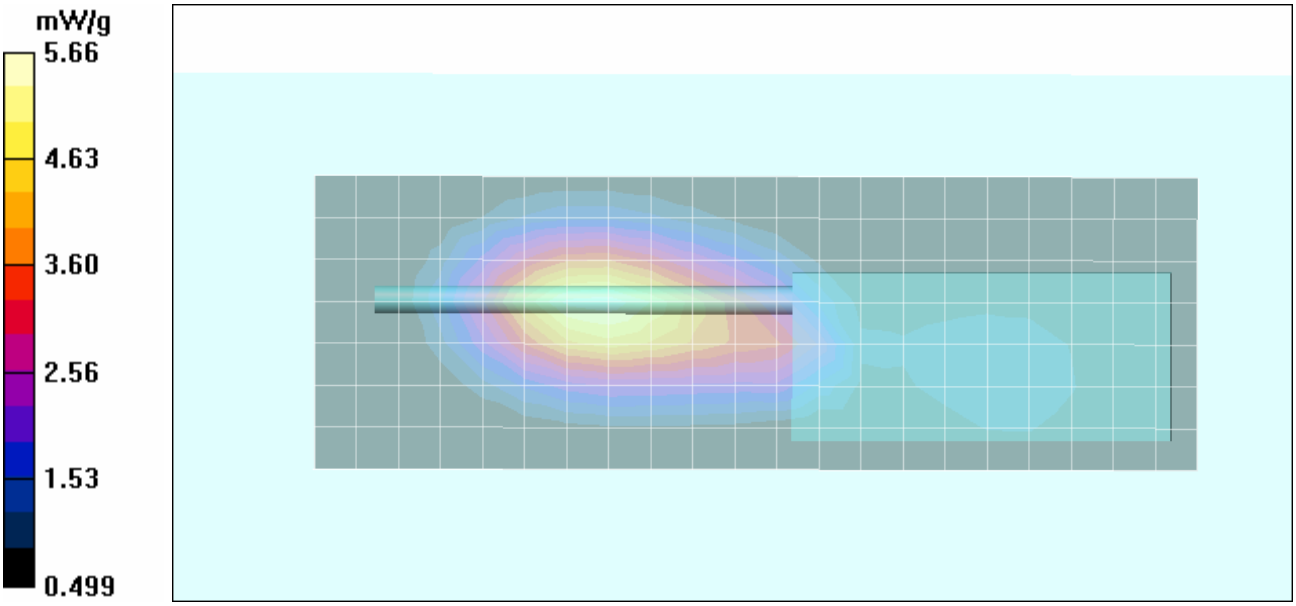
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 935.05 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 935.05 MHz; σ = 1.02 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 0.9 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.58 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.6 V/m; Power Drift = -0.579 dB
Peak SAR (extrapolated) = 7.14 W/kg
SAR(1 g) = 5.25 mW/g; SAR(10 g) = 3.62 mW/g
Maximum value of SAR (measured) = 5.66 mW/g
Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.3 V/m; Power Drift = -0.616 dB
Peak SAR (extrapolated) = 5.06 W/kg
SAR(1 g) = 3.38 mW/g; SAR(10 g) = 2.27 mW/g
Maximum value of SAR (measured) = 3.72 mW/g



Date Tested: 12/23/2009

Body-worn SAR - High Band - 935.05 MHz - Ni-MH 1400mAh Battery P/N: KNB-52N

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

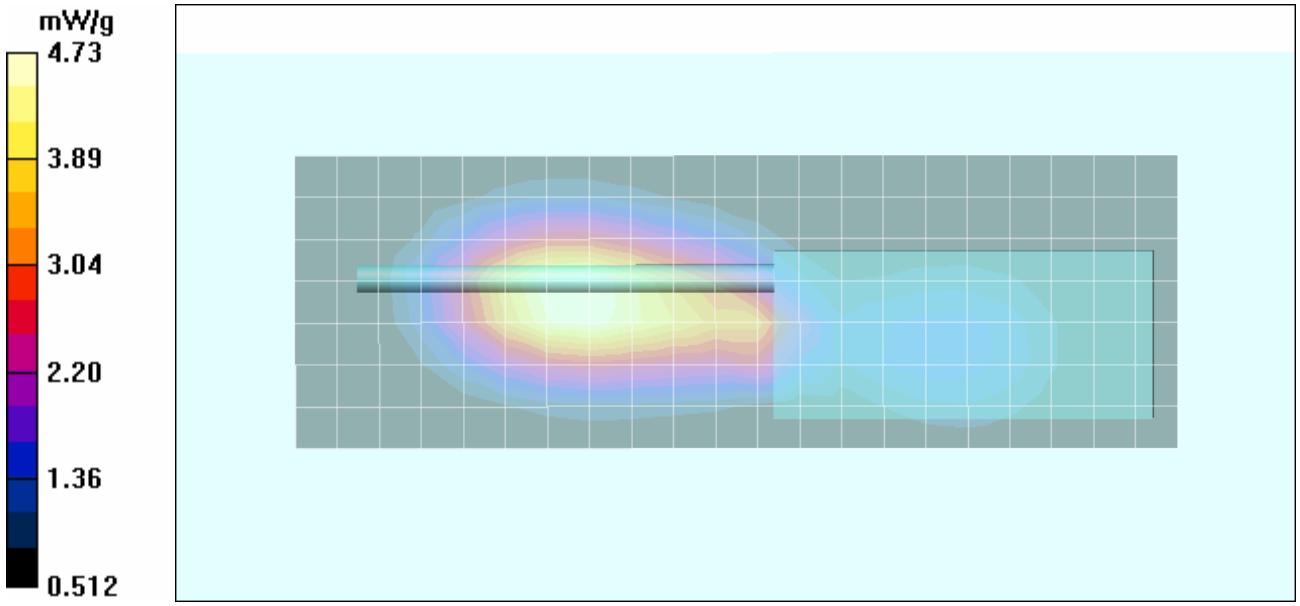
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 935.05 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 935.05 MHz; σ = 1.02 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 1.1 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 4.77 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.9 V/m; Power Drift = -0.431 dB
Peak SAR (extrapolated) = 5.95 W/kg
SAR(1 g) = 4.44 mW/g; SAR(10 g) = 3.09 mW/g
Maximum value of SAR (measured) = 4.73 mW/g
Zoom Scan 2 (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.3 V/m; Power Drift = -0.027 dB
Peak SAR (extrapolated) = 7.93 W/kg
SAR(1 g) = 3.41 mW/g; SAR(10 g) = 2.26 mW/g
Maximum value of SAR (measured) = 3.81 mW/g



Date Tested: 12/23/2009

Body-worn SAR - High Band - 935.05 MHz - Alkaline Battery Case P/N: KBP-4

DUT: Kenwood TK-481-4; Type: Portable 900 MHz PTT FM Radio Transceiver; Serial: 2S-02

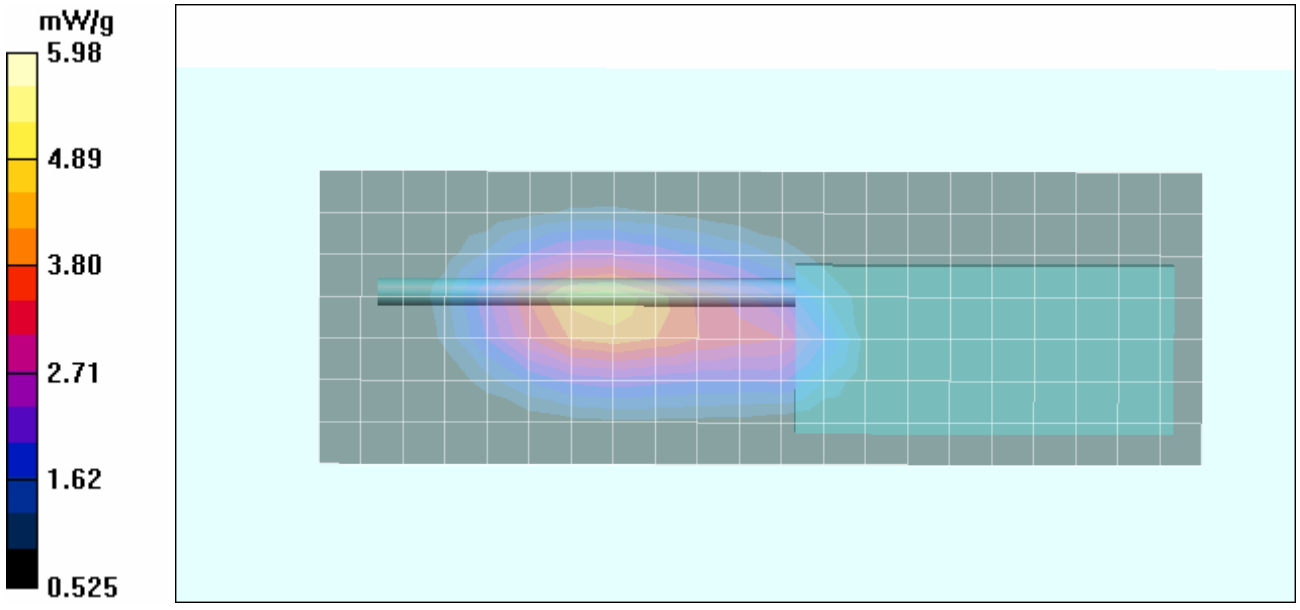
Body-worn Accessory: Belt-Clip (P/N: KBH-10); Audio Accessory: Speaker-Microphone (P/N: KMC-25)

Ambient Temp: 22.8°C; Fluid Temp: 21.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: CW
Frequency: 935.05 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 935.05 MHz; σ = 1.02 mho/m; ε_r = 52.8; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 28/04/2009
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 1.0 cm Belt-Clip Spacing from Back Side of DUT (Battery Housing) to Planar Phantom
Area Scan (8x22x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 4.45 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 67.8 V/m; Power Drift = -0.910 dB
Peak SAR (extrapolated) = 7.54 W/kg
SAR(1 g) = 5.57 mW/g; SAR(10 g) = 3.85 mW/g
Maximum value of SAR (measured) = 5.98 mW/g



APPENDIX B - SYSTEM PERFORMANCE CHECK DATA

Date Tested: 12/23/2009

System Performance Check - 835 MHz Dipole - Body

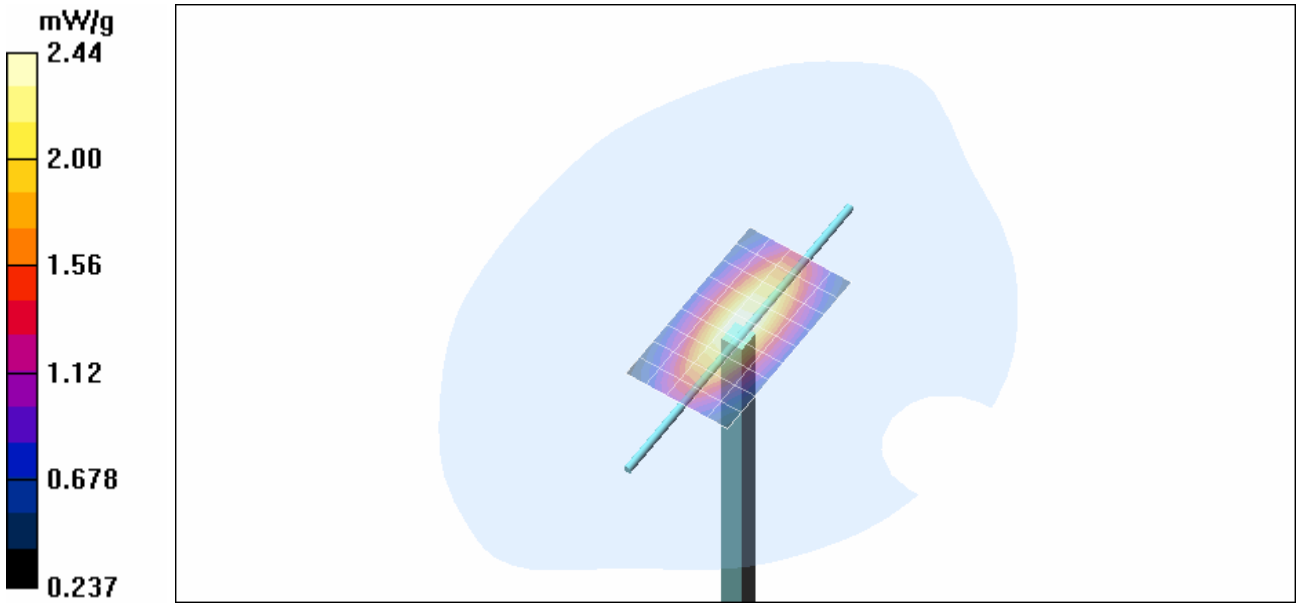
DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d075; Calibration: 04/20/2009

Ambient Temp: 22.8ºC; Fluid Temp: 21.5ºC; Barometric Pressure: 101.1 kPa; Humidity: 35%

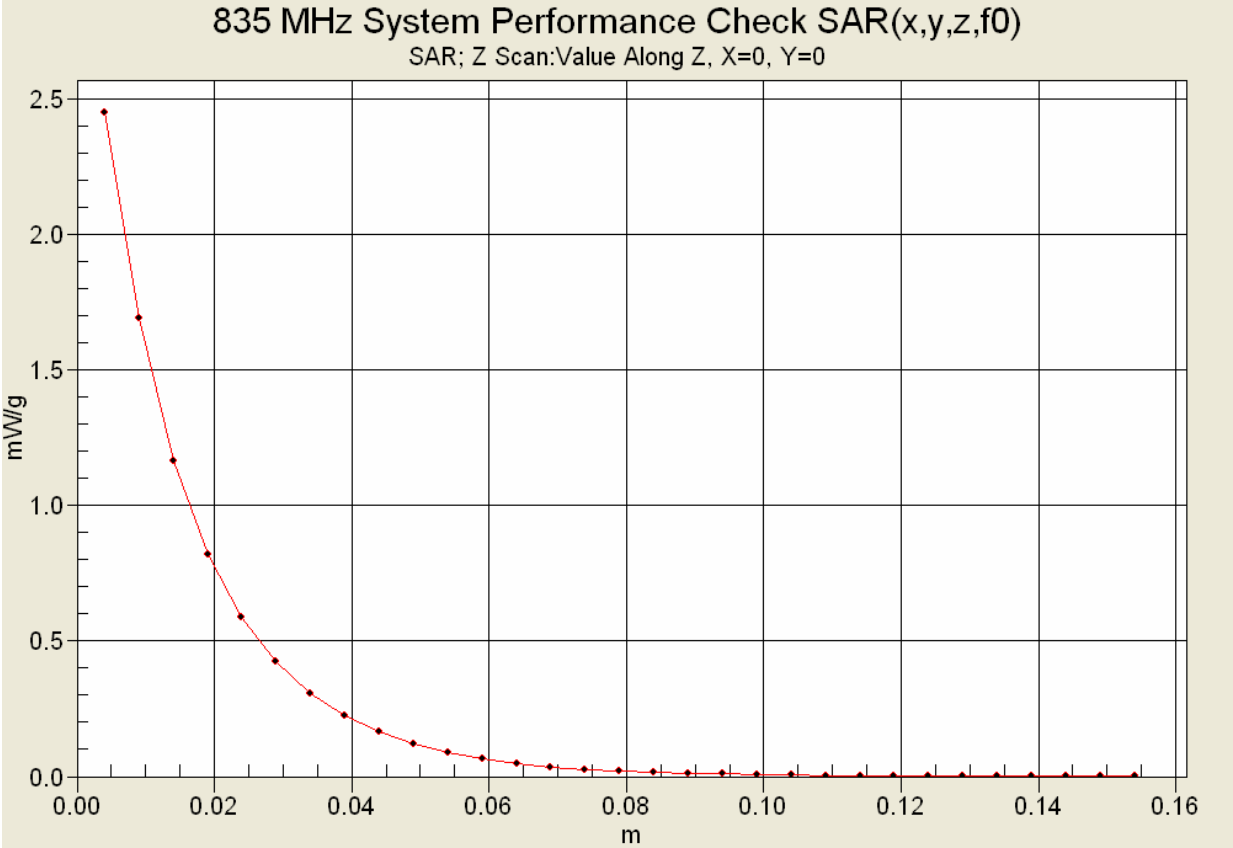
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: M835 Medium parameters used: f = 835 MHz; σ = 0.94 mho/m; ε_r = 53; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.34, 6.34, 6.34); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical 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

System Performance Check - 835 MHz Dipole
Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.38 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.0 V/m; Power Drift = -0.082 dB
Peak SAR (extrapolated) = 3.23 W/kg
SAR(1 g) = 2.26 mW/g; SAR(10 g) = 1.5 mW/g
Maximum value of SAR (measured) = 2.44 mW/g



Z-Axis Scan



Date Tested: 01/04/2010

System Performance Check - 835 MHz Dipole - Head

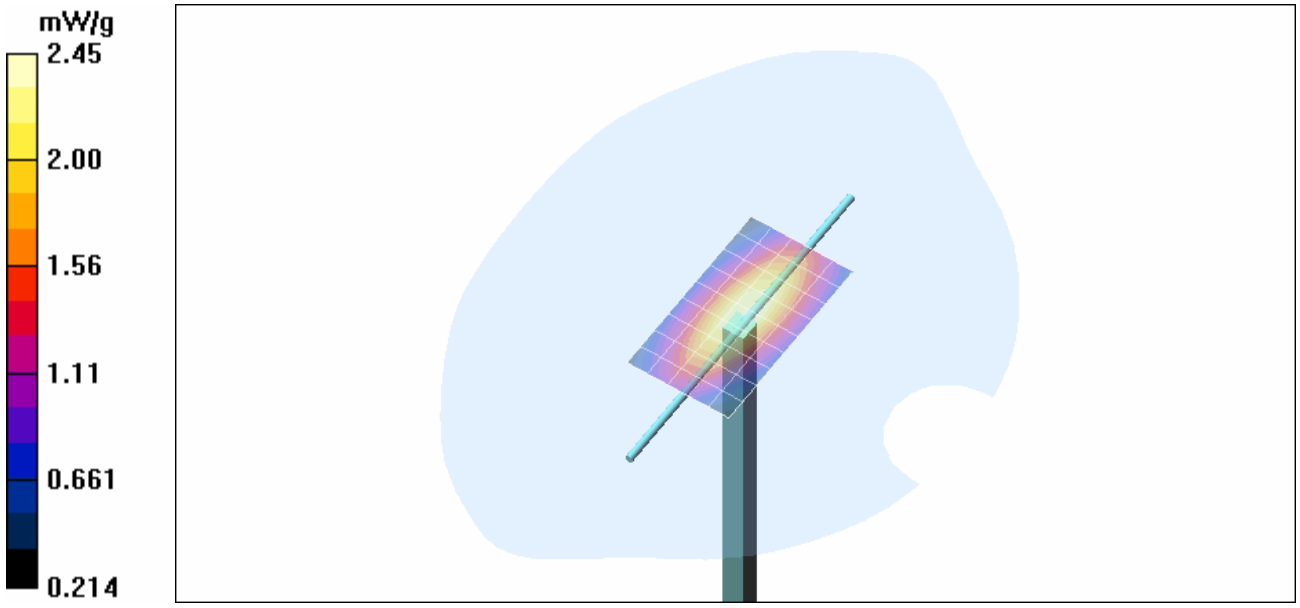
DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d075; Calibration: 04/20/2009

Ambient Temp: 22.5ºC; Fluid Temp: 21.3ºC; Barometric Pressure: 101.1 kPa; Humidity: 35%

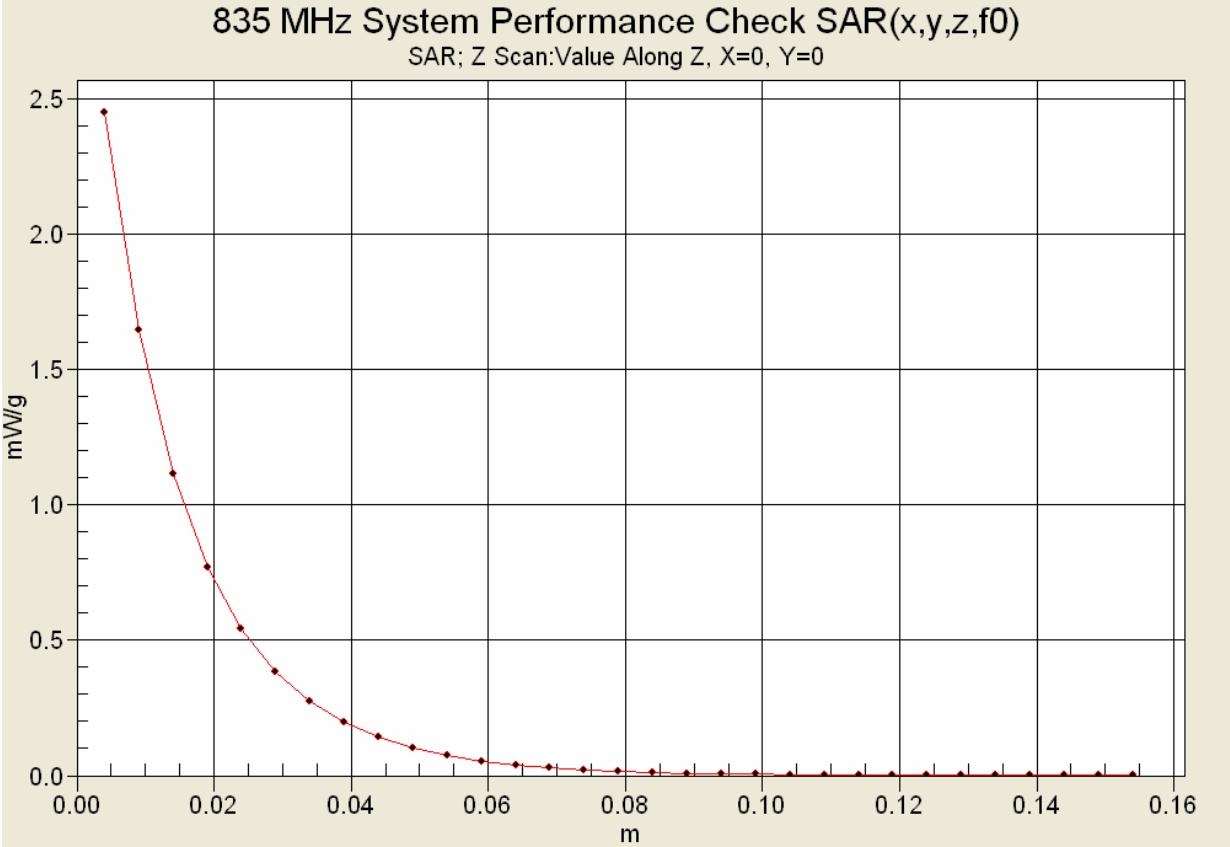
Communication System: CW
Forward Conducted Power: 250 mW
Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835HSL Medium parameters used: f = 835 MHz; σ = 0.86 mho/m; ε_r = 40.3; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.59, 6.59, 6.59); Calibrated: 16/07/2009
- Sensor-Surface: 4mm (Mechanical 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

System Performance Check - 835 MHz Dipole
Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 2.36 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.6 V/m; Power Drift = 0.108 dB
Peak SAR (extrapolated) = 3.35 W/kg
SAR(1 g) = 2.26 mW/g; SAR(10 g) = 1.47 mW/g
Maximum value of SAR (measured) = 2.45 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

835 MHz System Performance Check & 895/935 MHz DUT Evaluation (Body)

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
23/Dec/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	54.74	0.84
0.7450	55.55	0.96	54.38	0.84
0.7550	55.51	0.96	54.51	0.85
0.7650	55.47	0.96	54.75	0.86
0.7750	55.43	0.97	54.30	0.86
0.7850	55.39	0.97	54.45	0.89
0.7950	55.36	0.97	54.39	0.90
0.8050	55.32	0.97	54.11	0.91
0.8150	55.28	0.97	54.00	0.92
0.8250	55.24	0.97	53.72	0.93
0.8350	55.20	0.97	53.04	0.94
0.8450	55.17	0.98	53.63	0.94
0.8550	55.14	0.99	53.66	0.96
0.8650	55.11	1.01	53.46	0.96
0.8750	55.08	1.02	53.09	0.97
0.8850	55.05	1.03	53.37	0.99
0.8950	55.02	1.04	53.10	1.00
0.9050	55.00	1.05	53.19	1.00
0.9150	55.00	1.06	53.17	1.01
0.9250	54.98	1.06	53.09	1.01
0.9350	54.96	1.07	52.75	1.02

835 MHz System Performance Check & 895/935 MHz DUT Evaluation (Head)

****

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

****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.7350	42.02	0.89	41.33	0.76
0.7450	41.97	0.89	41.26	0.78
0.7550	41.92	0.89	40.92	0.77
0.7650	41.86	0.89	41.05	0.80
0.7750	41.81	0.90	40.78	0.80
0.7850	41.76	0.90	40.91	0.80
0.7950	41.71	0.90	40.84	0.82
0.8050	41.66	0.90	40.53	0.82
0.8150	41.60	0.90	40.39	0.83
0.8250	41.55	0.90	40.44	0.84
0.8350	41.50	0.90	40.33	0.86
0.8450	41.50	0.91	40.12	0.86
0.8550	41.50	0.92	40.05	0.88
0.8650	41.50	0.93	40.12	0.89
0.8750	41.50	0.94	40.05	0.91
0.8850	41.50	0.95	39.56	0.91
0.8950	41.50	0.96	39.49	0.92
0.9050	41.50	0.97	39.71	0.92
0.9150	41.50	0.98	39.60	0.93
0.9250	41.48	0.98	39.54	0.94
0.9350	41.46	0.99	39.57	0.94

APPENDIX E - DIPOLE CALIBRATION

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

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

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

Accreditation No.: SCS 108

Client Celltech

Certificate No: D835V2-4d075_Apr09

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d075
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	April 20, 2009
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

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

Issued: April 22, 2009

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.1 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature during test	(22.1 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 mW / g
SAR normalized	normalized to 1W	9.40 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**9.46 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 mW / g
SAR normalized	normalized to 1W	6.16 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**6.19 mW /g ± 16.5 % (k=2)**

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

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.9 ± 6 %	1.01 mho/m ± 6 %
Body TSL temperature during test	(22.1 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.49 mW / g
SAR normalized	normalized to 1W	9.96 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**9.61 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.64 mW / g
SAR normalized	normalized to 1W	6.56 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**6.39 mW / g ± 16.5 % (k=2)**

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω - 3.1 jΩ
Return Loss	- 29.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.0 Ω - 4.1 jΩ
Return Loss	- 26.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.401 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 09, 2007

DASY5 Validation Report for Head TSL

Date/Time: 14.04.2009 11:20:38

Test Laboratory: SPEAG, Zurich, Switzerland

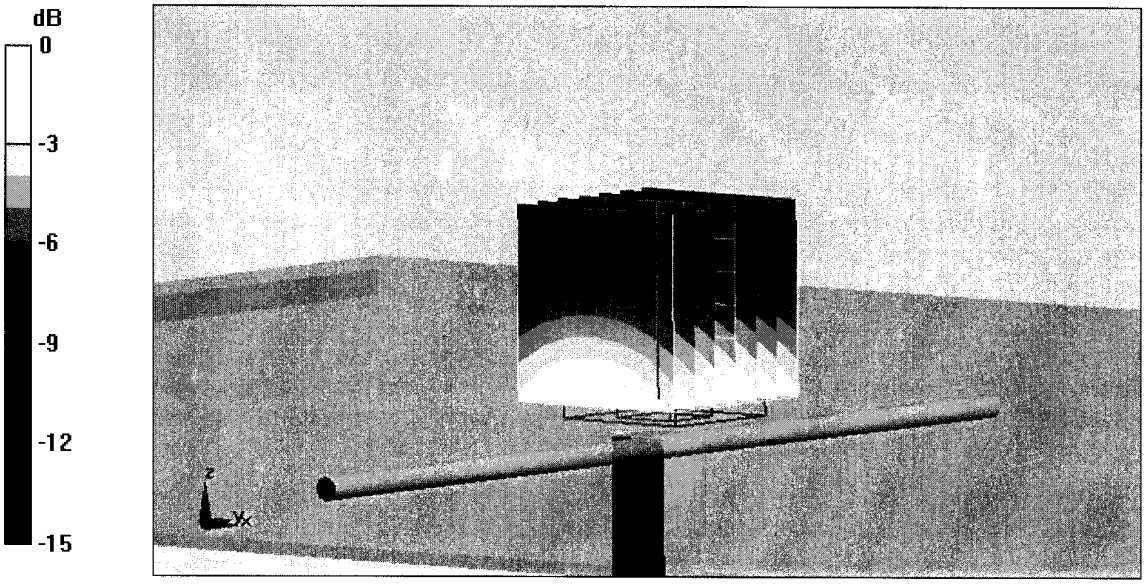
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d075

Communication System: CW-835; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: HSL 900 MHz
Medium parameters used: f = 835 MHz; σ = 0.89 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

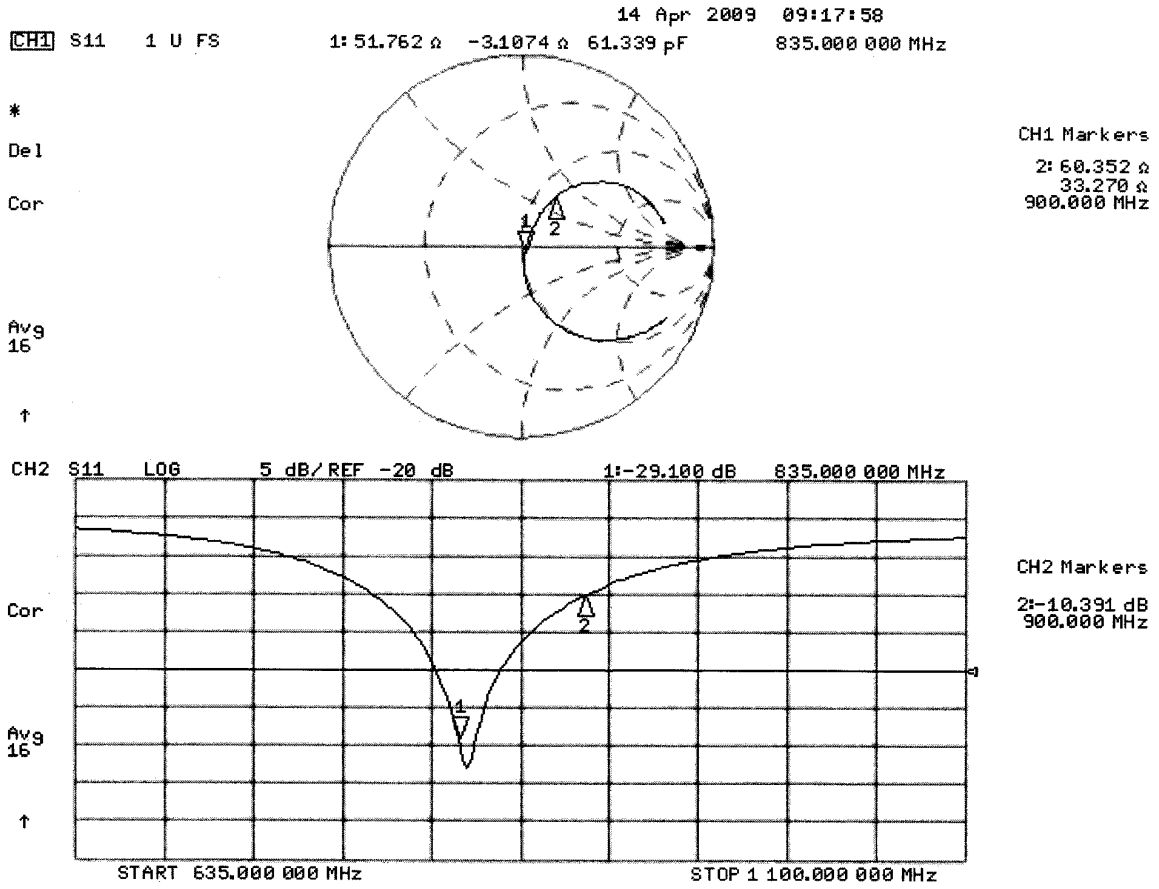
- Probe: ES3DV2 - SN3025; ConvF(5.97, 5.97, 5.97); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin=250mW; dip=15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57 V/m; Power Drift = 0.011 dB
Peak SAR (extrapolated) = 3.47 W/kg
SAR(1 g) = 2.35 mW/g; SAR(10 g) = 1.54 mW/g
Maximum value of SAR (measured) = 2.74 mW/g



0 dB = 2.74mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 20.04.2009 09:57:39

Test Laboratory: SPEAG, Zurich, Switzerland

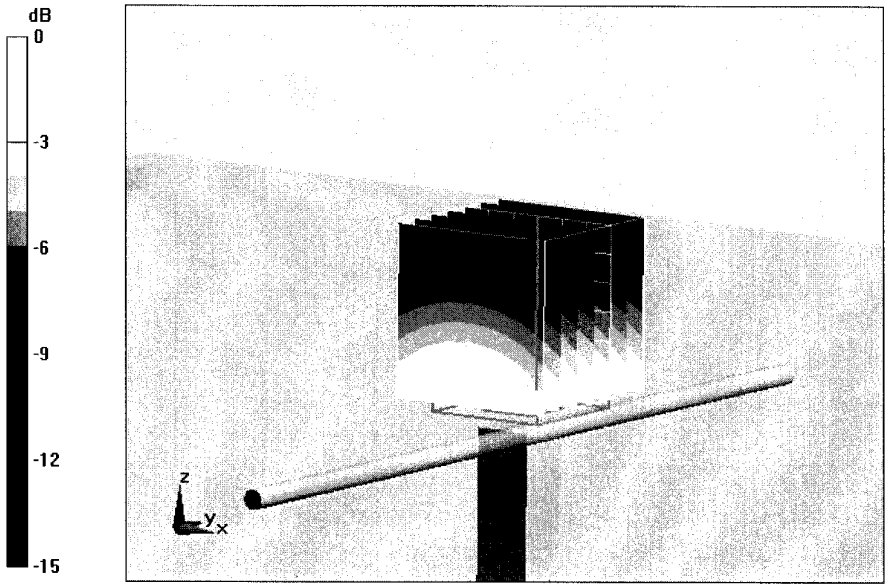
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d075

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: MSL900
Medium parameters used: f = 835 MHz; σ = 1.01 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

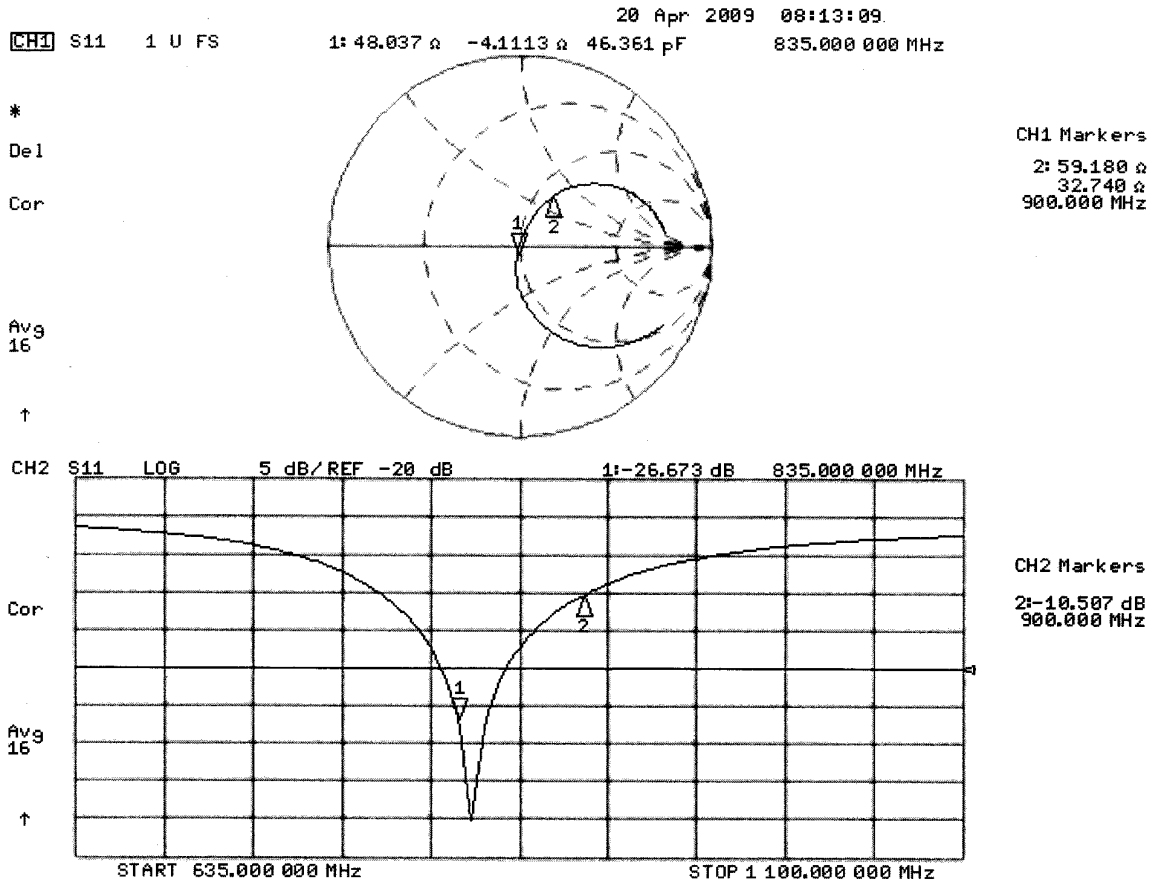
- Probe: ES3DV2 - SN3025; ConvF(5.9, 5.9, 5.9); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250mW, d = 15mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.4 V/m; Power Drift = -0.00173 dB
Peak SAR (extrapolated) = 3.61 W/kg
SAR(1 g) = 2.49 mW/g; SAR(10 g) = 1.64 mW/g
Maximum value of SAR (measured) = 2.9 mW/g



0 dB = 2.9mW/g

Impedance Measurement Plot for Body TSL



APPENDIX F - PROBE CALIBRATION

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

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

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

Accreditation No.: SCS 108

Client **Celltech**

Certificate No: ET3-1590_Jul09

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1590
Calibration procedure(s)	QA CAL-01.v6, QA CAL-12.v5, QA CAL-23.v3 and QA CAL-25.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	July 16, 2009
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

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-08)	In house check: Oct-09

	Name	Function	Signature
Calibrated by:	Marcel Fehr	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 16, 2009

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

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

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

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
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:	July 21, 2008
Recalibrated:	July 16, 2009

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	**1.83** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**90** mV
NormY	**2.02** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**95** mV
NormZ	**1.73** ± 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	9.9	6.3
SAR_{be} [%]	With Correction Algorithm	0.9	0.6

Sensor Offset

Probe Tip to Sensor Center	**2.7** mm

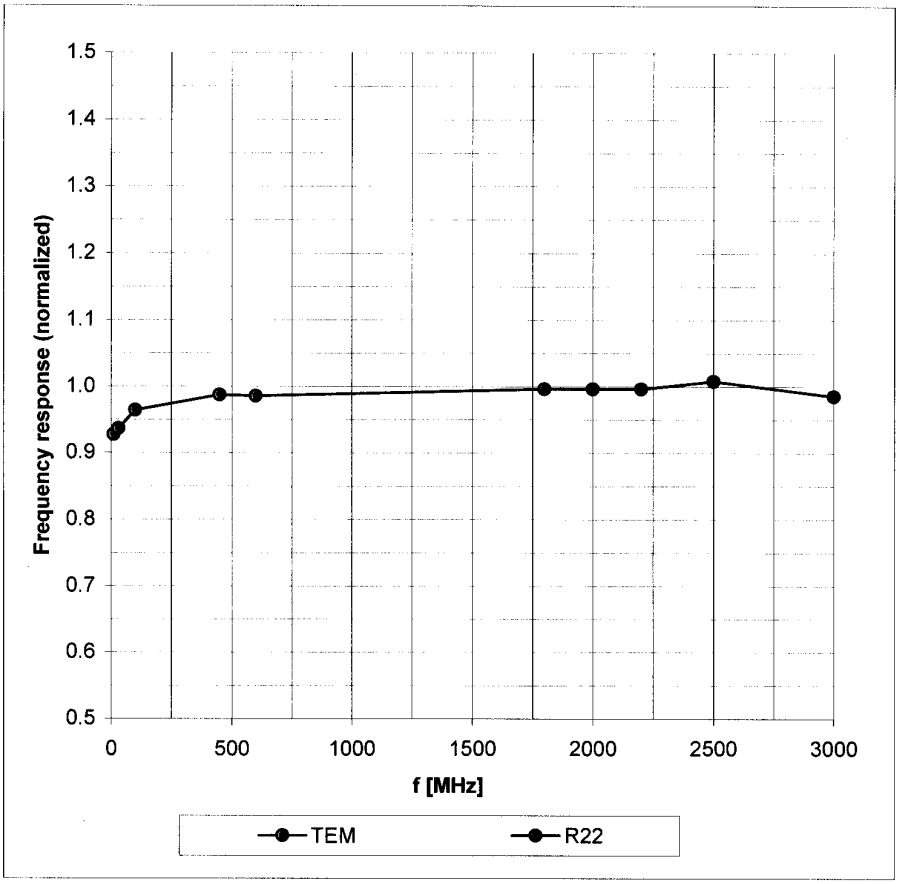
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[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.

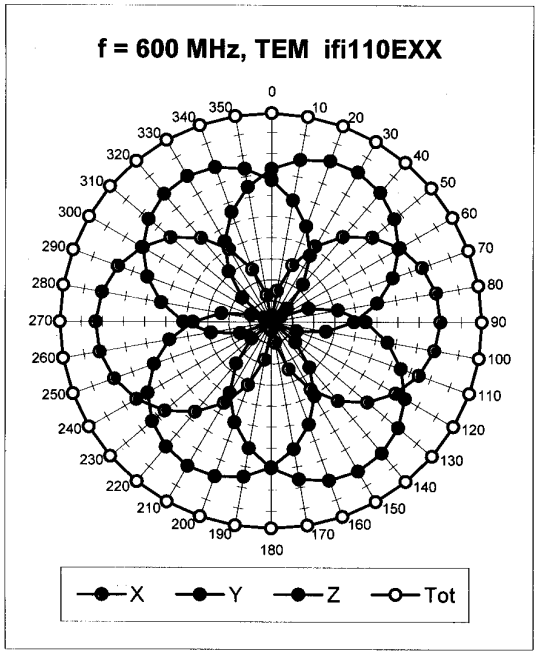
Frequency Response of E-Field

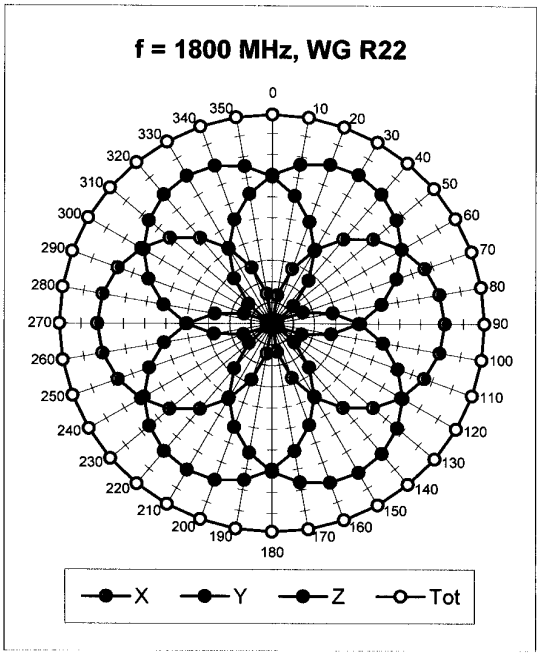
(TEM-Cell:ifi110 EXX, Waveguide: R22)

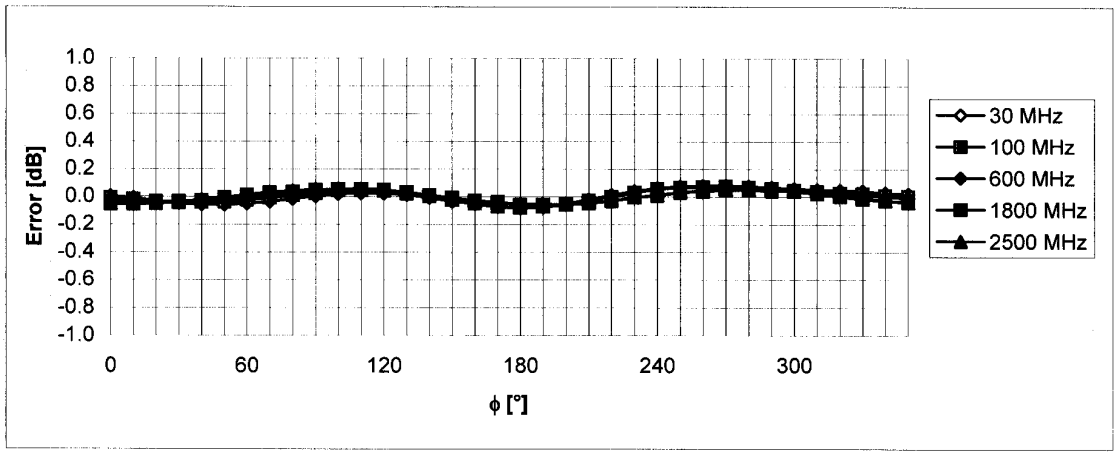


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



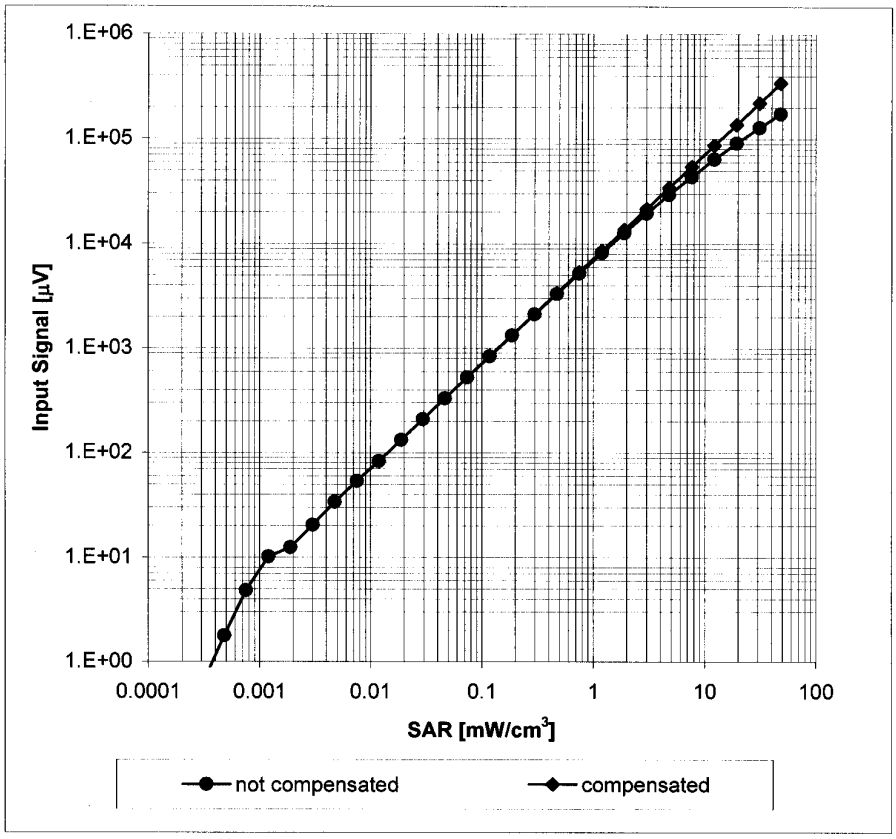


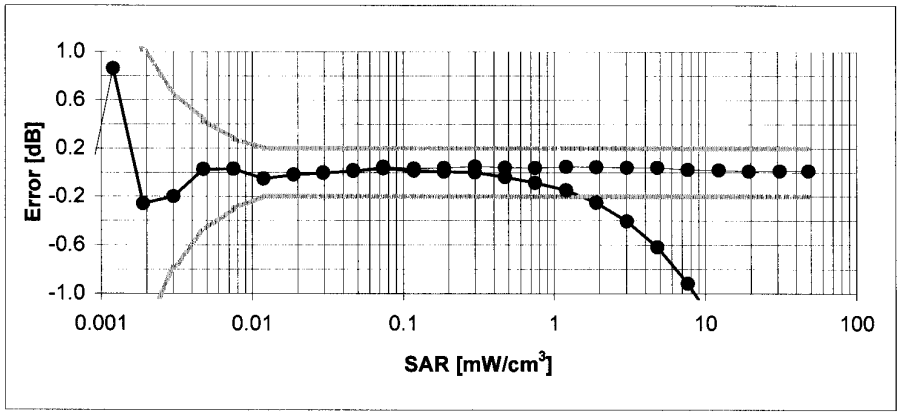


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

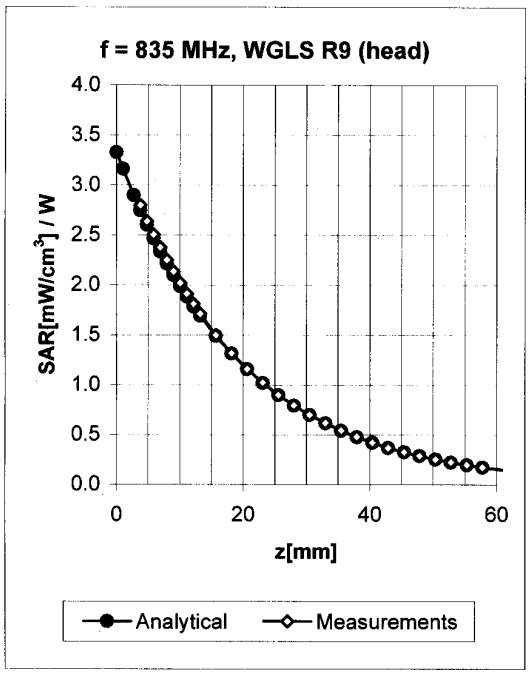
(Waveguide R22, f = 1800 MHz)

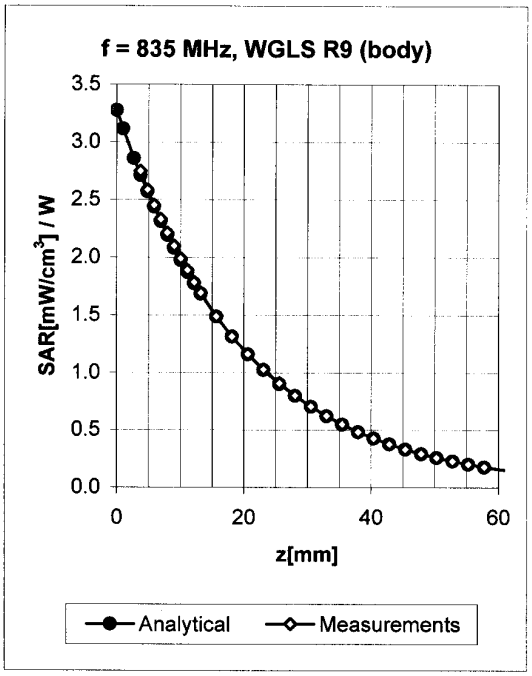




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



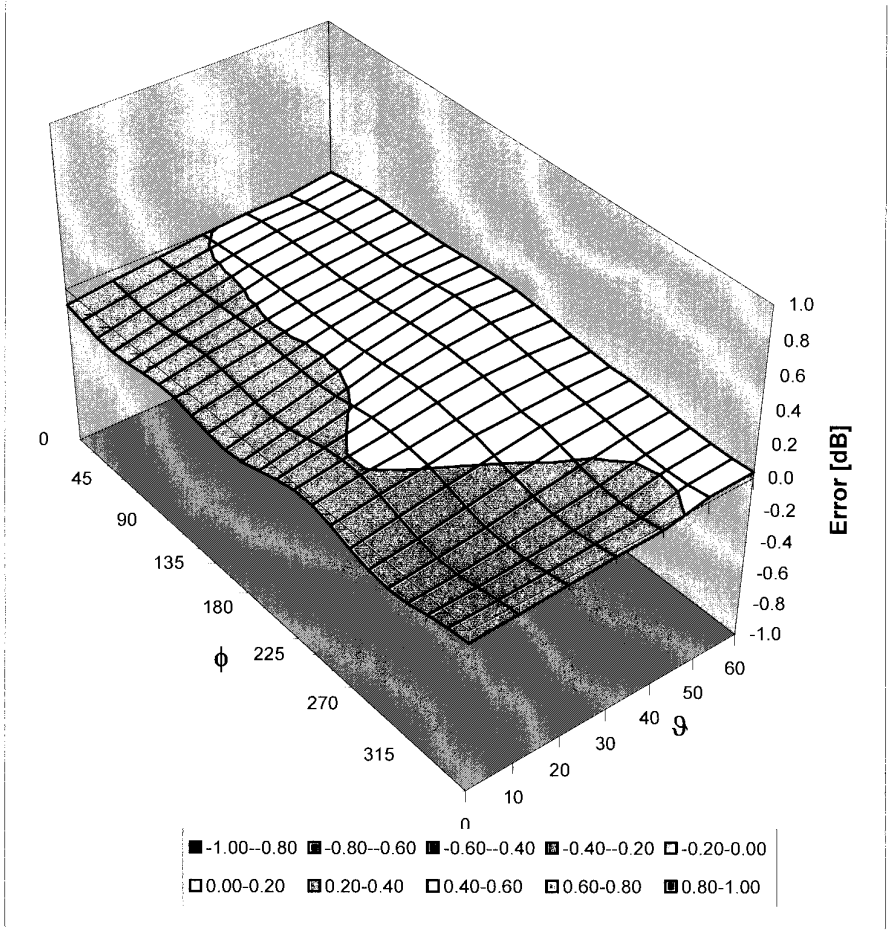


f [MHz]	Validity [MHz][c]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.29	1.90	7.34 ± 13.3% (k=2)
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.37	2.32	6.59 ± 11.0% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.22	1.91	7.34 ± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.30	2.77	6.34 ± 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)