DECLARATION OF COMPLIANCE | SAR RF EXPOSURE EVALUATION | FCC & IC

Test Lab Information	**Name**	**CELLTECH LABS INC.**			
	Address	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada			
Test Lab Accreditation(s)	**A2LA**	ISO/IEC 17025:2005 (A2LA Test Lab Certificate No. 2470.01)			
Applicant Information	**Name**	**KENWOOD USA CORPORATION**			
	Address	3970 Johns Creek Court, Suite 100, Suwanee, GA 30024 United States			
Standard(s) Applied	**FCC**	47 CFR §2.1093	**IC**	Health Canada Safety Code 6	
Procedure(s) Applied	**FCC**	OET Bulletin 65, Supplement C	**FCC**	KDB 447498 D01v04	
	FCC	KDB 643646 D01v01r01 (SAR Test Reduction Considerations for Occ. PTT Radios)			
	IC	RSS-102 Issue 4			
	IEEE	1528-2003			
	IEC	62209-2:2010			
Device Classification(s)	**FCC**	Licensed Non-Broadcast Transmitter Held to Face (TNF) - FCC Part 90, 24D			
	IC	Land Mobile Radio Transmitter/Receiver (27.41-960 MHz) - RSS-119, RSS-134			
Device Identifier(s)	**FCC ID:**	ALH409001	**FCC App. Type**	TCB New Certification	
	IC:	282D-409001	**IC App. Type**	CB New Certification	
Date of Sample Receipt	September 28, 2011				
Date(s) of Evaluation	October 06-07, 2011				
Device Description	Portable 900-Band Push-To-Talk (PTT) Digital Radio Transceiver				
Device Model(s)	NX-411-K2				
Test Sample Serial No.	00232058 (Identical Prototype)				
Test Sample Revision No.s	**Hardware**	Revision 0	**Firmware**	Revision 0	
DUT Transmit Frequency Range(s)	**FCC/IC**	896-901 MHz (Part 90, RSS-119)	901-902 MHz (Part 24D, RSS-134)		
		935-940 MHz (Part 90, RSS-119)	940-941 MHz (Part 24D, RSS-134)		
Manufacturer's Rated Output Power	2.5 Watts (Conducted)		**Manuf. Tolerance Spec.**	+/- 0 dB	
RF Output Power Levels Measured	33.98 dBm	2.5 Watts	896.05 MHz	Average Conducted	
	33.98 dBm	2.5 Watts	935.05 MHz	Average Conducted	
Antenna Type(s) Tested	Whip Antenna	P/N: KRA-38	896-940 MHz	Length: 182 mm	
Battery Type(s) Tested	Li-Ion	7.4V	1700 mAh	P/N: KNB-33L	
	Ni-MH	7.2V	2500 mAh	P/N: KNB-32N	
	Alkaline Battery Case	9 V	6x AA	P/N: KBP-6	
Body-worn Accessories Tested	Belt-Clip (contains metal)			P/N: KBH-11	
Audio Accessories Tested	Speaker-Microphone			P/N: KMC-41	

Max. SAR Level(s) Evaluated	Face-held	**0.560 W/kg**	1g	50% PTT duty factor	Occupational / Controlled Exp.
	Body-worn	**1.35 W/kg**	1g	50% PTT duty factor	Occupational / Controlled Exp.
FCC/IC Spatial Peak SAR Limit	Head/Body	8.0 W/kg	1g	50% PTT duty factor	Occupational / Controlled Exp.

Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada Safety Code 6 for the Occupational / Controlled Exposure environment. The device was tested in accordance with the measurement procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 4, IEEE Standard 1528-2003 and International Standard IEC 62209-2:2010. 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.

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

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

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

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REVISION HISTORY			
REVISION NO.	**DESCRIPTION**	**IMPLEMENTED BY**	**RELEASE DATE**
1.0	1st Release	Jon Hughes	October 20, 2011

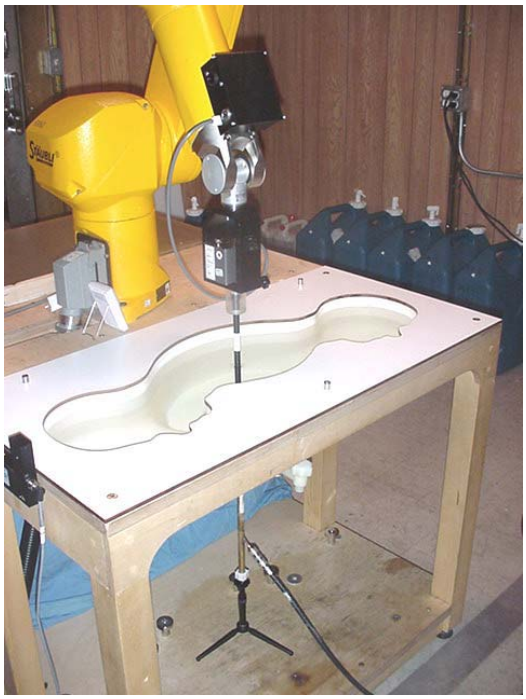
TEST REPORT SIGN-OFF			
DEVICE TESTED BY	**REPORT PREPARED BY**	**QA REVIEW BY**	**REPORT APPROVED BY**
Sean Johnston	Cheri Frangiadakis	Jon Hughes	Sean Johnston

1.0 INTRODUCTION

This measurement report demonstrates that the Kenwood USA Corporation Model: NX-411-K2 Portable 900-Band PTT Digital 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 4 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]) and International Standard IEC 62209-2:2010 (see reference [6]) were employed. A description of the device, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used and the various provisions of the rules are included within this test report.

2.0 SAR MEASUREMENT SYSTEM

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



DASY4 System with SAM Twin Phantom V4.0C

DASY4 Measurement Server

3.0 RF CONDUCTED OUTPUT POWER MEASUREMENTS

MEASURED RF CONDUCTED OUTPUT POWER LEVELS					
Test Frequency	**Freq. Range**	**Mode**	**dBm**	**Watts**	**Method**
896.05 MHz	896-902 MHz	CW	33.98	2.5	Average Conducted
935.05 MHz	935-941 MHz	CW	33.98	2.5	Average Conducted
Notes					
1. The test channels were selected in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [7]).					
2. The RF conducted output power levels of the DUT were measured by Celltech prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter at the external antenna connector of the radio in accordance with FCC 47 CFR §2.1046 (see reference [14]) and IC RSS-Gen (see reference [15]).					

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

FCC SAR Evaluation Power Thresholds for PTT Devices, $f \leq 0.5$ GHz*		
Exposure Conditions	***P* mW (General Population)**	***P* mW (Occupational)**
Held to face, $d \geq 2.5$ cm	250	1250
Body-worn, $d \geq 1.5$ cm	200	1000
Body-worn, $d \geq 1.0$ cm	150	750
1. The time-averaged output power, corresponding to the required PTT duty factor, is compared with these thresholds. 2. The closest distance between the user and the device or its antenna is used to determine the power thresholds. * Per FCC KDB 447498 D01v04 Section 5)b)i) (see reference [8]).		

Note: The thresholds specified in the above table do not apply to this 900 MHz band PTT radio transceiver ($f \geq 0.5$ GHz). The output power threshold of $\geq 60/f_{(GHz)}$ mW specified in FCC KDB 447498 was applied (see reference [7]).

5.0 NO. OF TEST CHANNELS (N_c)

Antenna Part No.	Antenna Freq. Range	Test Freq. Range	Band	N_c	Test Frequencies
KRA-38	896 -940 MHz	896 - 902 MHz	FCC/IC	1	896.05 MHz
		935 - 941 MHz	FCC/IC	1	935.05 MHz
Note: The number of test channels (*Nc*) were calculated in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [7]).					

6.0 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	896.05 MHz	61 MHz	> 50 MHz[1]
	935.05 MHz	100 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. (MHz)	Date	Tissue	σ	Sensitivity	ε_r	Sensitivity	% Change	Compensated SAR Level W/kg	
896.05	Oct 7	Head	3.33%	n/a[2]	1.69%	-0.57	0.96%	0.565	1g 50% ptt d/f
935.05	Oct 7	Head	5.56%[3]	n/a[2]	0.72%	-0.57	0.41%	0.419	1g 50% ptt d/f
896.05	Oct 6	Body	1.24%	n/a[2]	0.54%	-0.57	0.31%	1.15	1g 50% ptt d/f
935.05	Oct 6	Body	4.12%	n/a[2]	0.36%	-0.57	0.21%	1.35	1g 50% ptt d/f

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

Notes

1. The above sensitivity formula (Head) from the DASY4 manual (see reference [10]) can be applied to Body tissue parameters (per SPEAG).

2. SAR sensitivity to positive tolerances in σ are not considered as the SAR measurement is already overcompensated.

3. FCC KDB 450824 refers to probe calibrations with fluid parameter tolerances +/- 5%; SPEAG's current probe calibration is valid for fluid parameter tolerances of +/- 10% (See Appendix F). We have accounted for the > 5% measured fluid parameter tolerance in the measurement uncertainty table (see Section 23) and have still applied the same sensitivity calculation adjustment to the SAR levels as shown in the above table.

7.0 MANUFACTURER'S DISCLOSED ACCESSORY LISTING

Accessory ID # for Test Report	ACCESSORY CATEGORY: ANTENNA		
	Part Number	**Description**	**Evaluated for SAR**
1	KRA-38	900 MHz Band Whip Antenna	Yes
Accessory ID # for Test Report	**ACCESSORY CATEGORY: BATTERY**		
	Part Number	**Description**	**Evaluated for SAR**
a	KNB-33L	Li-Ion, 7.4V, 1700mAh	Yes
b	KNB-32N	Ni-MH, 7.2V, 2500mAh	Yes
c	KBP-6	Alkaline battery case, 9V (6 x AA)	Yes
Accessory ID # for Test Report	**ACCESSORY CATEGORY: BODY-WORN**		
	Part Number	**Description**	**Evaluated for SAR**
1	KBH-11	Belt-Clip (contains metal)	Yes
Accessory ID # for Test Report	**ACCESSORY CATEGORY: AUDIO**		
	Part Number	**Description**	**Evaluated for SAR**
1	KMC-41	Heavy Duty Speaker Microphone	Yes
2	KMC-47GPS	Heavy Duty GPS Speaker Microphone	No

8.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS

Date: 10/06/2011		Frequency: 835 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.800	56.59	0.9	55.2	0.97	2.52%	-7.22%
0.810	56.34	0.89	55.2	0.97	2.07%	-8.25%
0.820	56.46	0.9	55.2	0.97	2.28%	-7.22%
0.830	56.21	0.93	55.2	0.97	1.83%	-4.12%
0.835*	56.2	0.935	55.2	0.97	1.81%	-3.61%
0.840	56.15	0.93	55.2	0.97	1.72%	-4.12%
0.850	55.77	0.94	55.2	0.97	1.03%	-3.09%
0.860	55.9	0.95	55.2	0.97	1.27%	-2.06%
0.870	55.69	0.97	55.2	0.97	0.89%	0.00%
0.880	55.57	0.97	55.2	0.97	0.67%	0.00%
0.890	55.52	0.97	55.2	0.97	0.58%	0.00%
0.896*	55.5	0.982	55.2	0.97	0.54%	1.24%
0.900	55.52	0.99	55.2	0.97	0.58%	2.06%
0.910	55.35	1	55.2	0.97	0.27%	3.09%
0.920	55.45	1	55.2	0.97	0.45%	3.09%
0.930	55.47	1	55.2	0.97	0.49%	3.09%
0.935*	55.4	1.01	55.2	0.97	0.36%	4.12%
0.940	55.15	1.01	55.2	0.97	-0.09%	4.12%
0.950	55.3	1.03	55.2	0.97	0.18%	6.19%
0.960	55.16	1.04	55.2	0.97	-0.07%	7.22%
0.970	55.05	1.05	55.2	0.97	-0.27%	8.25%
0.980	54.9	1.07	55.2	0.97	-0.54%	10.31%
0.990	54.94	1.07	55.2	0.97	-0.47%	10.31%
1.000	54.75	1.09	55.2	0.97	-0.82%	12.37%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Oct 6	835 Body	23.5°C	22.7°C	≥ 15 cm	101.1 kPa	37%	1000

FLUID DIELECTRIC PARAMETERS

Date: 10/07/2011		Frequency: 835 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.800	43.42	0.84	41.5	0.9	4.63%	-6.67%
0.810	43.15	0.86	41.5	0.9	3.98%	-4.44%
0.820	43.16	0.86	41.5	0.9	4.00%	-4.44%
0.830	42.88	0.86	41.5	0.9	3.33%	-4.44%
0.835*	42.7	0.865	41.5	0.9	2.89%	-3.89%
0.840	42.46	0.87	41.5	0.9	2.31%	-3.33%
0.850	42.74	0.88	41.5	0.9	2.99%	-2.22%
0.860	42.28	0.9	41.5	0.9	1.88%	0.00%
0.870	42.24	0.91	41.5	0.9	1.78%	1.11%
0.880	42.19	0.92	41.5	0.9	1.66%	2.22%
0.890	42.26	0.93	41.5	0.9	1.83%	3.33%
0.896*	42.2	0.93	41.5	0.9	1.69%	3.33%
0.900	42.19	0.93	41.5	0.9	1.66%	3.33%
0.910	42.28	0.94	41.5	0.9	1.88%	4.44%
0.920	41.85	0.94	41.5	0.9	0.84%	4.44%
0.930	42.06	0.95	41.5	0.9	1.35%	5.56%
0.935*	41.8	0.95	41.5	0.9	0.72%	5.56%
0.940	41.45	0.95	41.5	0.9	-0.12%	5.56%
0.950	41.62	0.97	41.5	0.9	0.29%	7.78%
0.960	41.36	0.99	41.5	0.9	-0.34%	10.00%
0.970	41.36	1	41.5	0.9	-0.34%	11.11%
0.980	41.22	1.02	41.5	0.9	-0.67%	13.33%
0.990	41.02	1.04	41.5	0.9	-1.16%	15.56%
1.000	41.01	1.07	41.5	0.9	-1.18%	18.89%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Oct 7	835 Head	22.0°C	21.4°C	≥ 15 cm	101.1 kPa	37%	1000

9.0 TEST REDUCTION PROCEDURES (FCC KDB 643646 D01v01r01)

a. Face-held Configuration - Default Battery Selection - per FCC KDB 643646, Page 2, Section 1) A): *"When multiple standard batteries are supplied with a radio, the battery with the highest capacity is considered the default battery for making head SAR measurements."*

b. Body-worn Configuration - Default Battery Selection - per FCC KDB 643646, Page 5, Section 1) A):*"Start by testing a PTT radio with the thinnest battery and a standard (default) Body-worn accessory that are both supplied with the radio and, if applicable, a default audio accessory……..."*

c. Body-worn Configuration - Default Body-worn Accessory Selection - the belt-clip was selected as the default Body-worn accessory based on the smaller separation distance it provides between the radio and the user in comparison to the remaining accessories. Per FCC KDB 643646, Page 5, Section 1) A): *"When multiple default Body-worn accessories are supplied with a radio, the standard Body-worn accessory expected to result in the highest SAR based on its construction and exposure conditions is considered the default Body-worn accessory for making Body-worn measurements."*

d. Body-worn Configuration - Additional Body-worn Accessories - the remaining Body-worn accessories were evaluated based on the *"additional Body-worn accessory"* guidance provided in FCC KDB 643646, Page 7, Section 4). The remaining Body-worn accessories can be utilized with all the audio accessory options.

e. Body-worn Configuration - Default Audio Accessory Selection - According to the manufacturer, the radio is not supplied to the end user with a standard default audio accessory (as referenced in FCC KDB 643646, Page 4, Section "Body SAR Test Considerations for Body-worn Accessories"); therefore the procedures described in note (j) below were applied in order to establish the default audio accessory.

f. Body-worn Configuration - Selection of Remaining Default Audio Accessories by Category - the Remaining Default Audio Accessories by Category were selected based on the guidance provided in FCC KDB 643646, Section "Body SAR Test Considerations for Audio Accessories without Built-in Antenna", Page 10: *"For audio accessories with similar construction and operating requirements, test only the audio accessory within the group that is expected to result in the highest SAR, with respect to changes in RF characteristics and exposure conditions for the combination. If it is unclear which audio accessory within a group of similar accessories is expected to result in the highest SAR, good engineering judgment and preliminary testing should be applied to select the accessory that is expected to result in the highest SAR."* Please refer to note (i) below for the procedure implemented to establish the Default Audio Accessory by Category (Grouping). The Remaining Default Audio Accessories by Category were evaluated on the highest SAR channel and antenna combination from the Default Audio Accessory evaluations (see note e.) based on the guidance provided in FCC KDB 643646, Page 10, Section 1) A) thru D).

g. Body-worn Configuration - Selection of Additional Audio Accessories by Category - the Additional Audio Accessories by Category were selected based on the guidance provided in FCC KDB 643646, Section "Body SAR Test Considerations for Audio Accessories without Built-in Antenna", Page 10.

h. According to the manufacturer, all the optional audio accessories can be used with any accessory combination (antenna, battery & Body-worn accessory) - see Appendix H (Audio Accessory Combinations). Therefore, in order to establish the overall default audio accessory, preliminary SAR evaluations were performed with all optional audio accessories connected to the radio consecutively.

10.0 SAR MEASUREMENT SUMMARY

SAR EVALUATION RESULTS

Test Type	Freq. Band	Test Freq.	Antenna	Battery	Accessories		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)	
										PTT Duty Factor			PTT Duty Factor	
Test Plot #		MHz	Acc. ID #	Acc. ID #	Body-worn Acc. ID #	Audio Acc. ID #	DUT	Antenna	Watts	100%	50%	dB	100%	50%
Face F1	1	896.05	1	b	n/a	n/a	2.5 cm	4.3 cm	2.5	1.12	**0.560**	-0.328	1.21	0.604
Face F2	2	935.05			n/a	n/a	2.5 cm	4.3 cm	2.5	0.834	0.417	-0.406	0.916	0.458
Face F3	1	896.05	1	a	n/a	n/a	2.5 cm	4.3 cm	2.5	1.08	0.540	0.534	1.08	0.540
Face F4	1	896.05	1	c	n/a	n/a	2.5 cm	4.3 cm	2.5	1.01	0.505	-0.084	1.03	0.515
Body B1	1	896.05	1	a	1	1	1.9 cm	2.9 cm	2.5	2.30	1.15	0.001	2.30	1.15
Body B2	2	935.05			1	1	1.9 cm	2.9 cm	2.5	2.26	1.13	-0.520	2.55	1.27
Body B3	2	935.05	1	b	1	1	1.9 cm	2.9 cm	2.5	2.70	**1.35**	-0.699	3.17	1.59
Body B4	2	935.05	1	c	1	1	1.9 cm	2.9 cm	2.5	2.38	1.19	-0.320	2.56	1.28

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. Device Test Mode = CW (Continuous Wave)
2. Phantom(s) used = SAM Planar Section (SAR evaluations); Side Planar (preliminary area scans)
3. n/a = not applicable
4. Test Date(s): Face = Oct. 07, 2011; Body = Oct. 06, 2011
5. Freq. Band 1 = 896-902 MHz; Freq. Band 2 = 935-941 MHz

Test Procedures applied in accordance with FCC KDB 643646 (see reference [8])
1. For face-held configuration, battery “b” was selected as the default battery (highest mAh).
2. When the head SAR of an antenna tested on the highest output power channel with the default battery is ≤ 3.5 W/kg (F1-F2), testing of all other required channels is not necessary.
3. When the head SAR for all antennas tested using the default battery is ≤ 4.0 W/kg (F1-F2), test additional batteries using the antenna and channel configuration that resulted in the highest SAR among all antennas (F3-F4).
4. For body-worn configuration, battery “a” was selected as the default battery (thinnest battery).
5. When the body SAR of an antenna tested on the highest output power channel with the default battery is ≤ 3.5 W/kg (B1-B2), testing of all other required channels is not necessary for that antenna.
6. When the body SAR for all antennas tested using the thinnest battery is ≤ 4.0 W/kg (B1-B2), test additional batteries using the antenna and channel configuration that resulted in the highest SAR among all antennas (B3-B4).
7. Audio accessory #1 was selected as the default audio accessory based on preliminary evaluations resulting in the most conservative SAR of all the disclosed audio accessory options.
8. Audio accessory #2 was not required to be evaluated for SAR based on the following provision: 1) For the audio accessories that have not been tested in the body-worn accessories test sequences in the previous section, , the highest SAR for an antenna, body-worn accessory and battery combination tested in the body-worn accessories sequences applicable to an audio accessory is used to determine SAR test requirements according to the following: A) ≤ 4.0 W/kg, SAR tests for that audio accessory is not necessary

11.0 SAR SCALING (TUNE-UP TOLERANCE)

SAR scaling is not required based on testing was performed at the manufacturer's maximum rated power of 2.5 W +/- 0 dB.

12.0 DETAILS OF SAR EVALUATION

1. The number of test frequencies and the test channels evaluated for SAR were selected in accordance with the procedures described in FCC KDB 447498 Section 6) c) (see reference [7]).
2. The DUT was evaluated for SAR in accordance with the procedures described in FCC KDB 643646 (see reference [8]).
3. A preliminary area scan (face-held and body-worn) was performed in the side planar phantom in order to show there were no peak SAR locations outside of the measurement area of the SAM phantom planar section. The preliminary area scans are shown in Appendix A.
4. The SAR droop of the DUT was measured by the DASY4 system for the duration of the SAR evaluations. The measured SAR droop was added to the measured SAR levels to report scaled SAR levels as shown in the SAR test data tables. A SAR-versus-Time power droop evaluation was also performed (see Appendix A).
5. The fluid temperature remained within +/-2°C from the dielectric parameter measurement to the completion of each SAR test.
6. 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).
7. The DUT was tested at the maximum conducted output power level preset by the manufacturer in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty factor) with the transmit key constantly depressed. For a push-to-talk device the 50% duty factor compensation reported assumes a transmit/receive cycle of equal time base.
8. The SAR evaluations were performed with a fully charged DUT battery.

13.0 SAR EVALUATION PROCEDURES

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

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

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

An area scan was determined as follows:

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

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

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

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

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

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

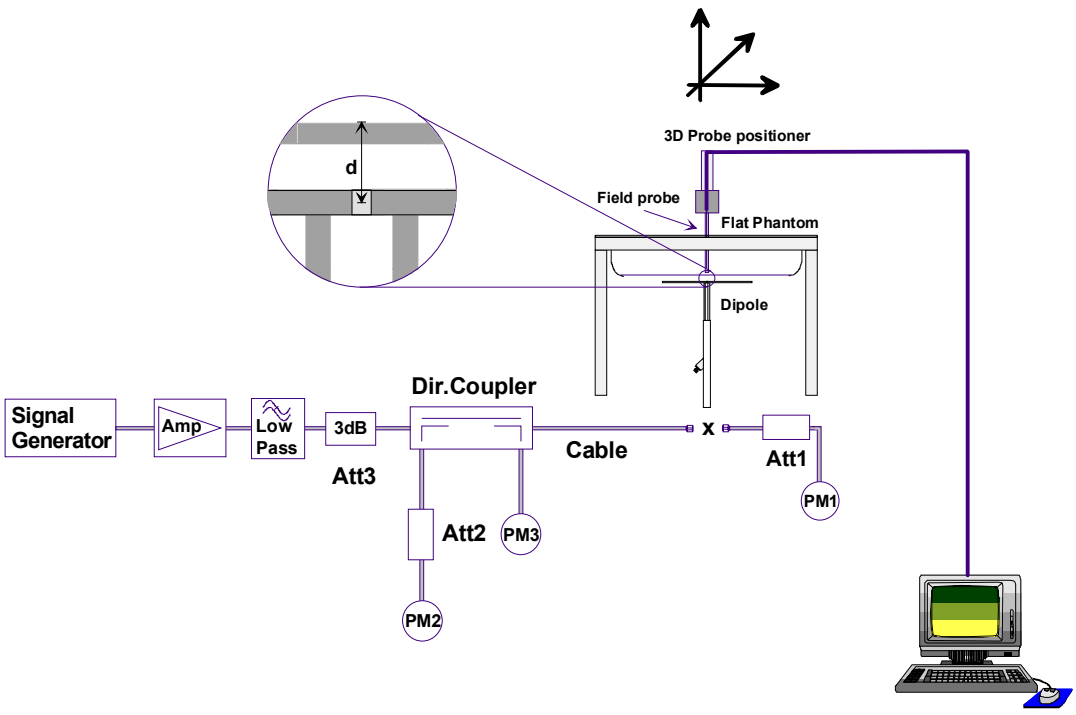
14.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations a daily system check was performed with a planar phantom and 835 MHz 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]). 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 manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

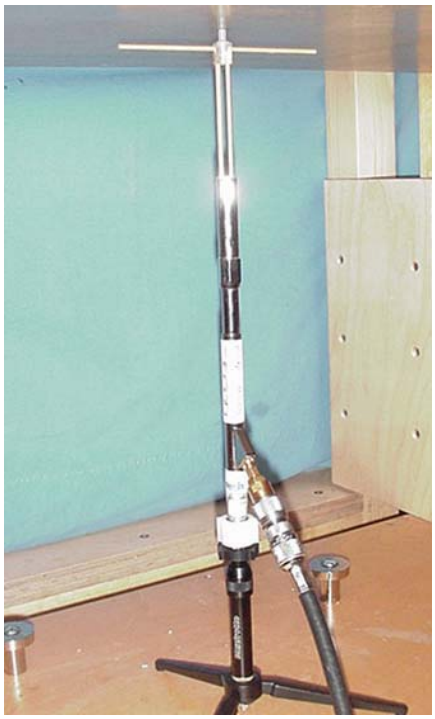
SYSTEM PERFORMANCE CHECK EVALUATIONS

Test Date	Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ε_r			Conductivity σ (mho/m)			ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
	Freq. (MHz)	Target	Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.	Dev.						
Oct 6	Body 835	2.49 ±10%	2.25	-9.6%	55.2 ±5%	56.2	+1.8%	0.97 ±5%	0.935	-3.6%	1000	23.5	22.7	≥ 15	37	101.1
Oct 7	Head 835	2.35 ±10%	2.20	-6.4%	41.5 ±5%	42.7	+2.9%	0.90 ±5%	0.865	-3.9%	1000	22.0	21.4	≥ 15	37	101.1

Notes		
	1.	The target SAR values are the measured values from the dipole calibration performed by SPEAG (see Appendix E).
	2.	The target dielectric parameters are the nominal values from the dipole calibration performed by SPEAG (see Appendix E).
	3.	The fluid temperature remained within +/-2°C from the fluid dielectric parameter measurement to the completion of the system performance check.
	4.	The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).



System Performance Check Measurement Setup Diagram (IEEE Standard 1528-2003)



835 MHz SPEAG Validation Dipole Setup

15.0 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]). 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 %

16.0 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.			

17.0 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)
Phantom	
Type	SAM V4.0C
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 25 liters
Validation Phantom	
Type	Side Planar Phantom
Shell Material	Plexiglass
Bottom Thickness	2.0 mm ± 0.1 mm
Inner Dimensions	72.6 cm (L) x 20.3 cm (W) x 20.3 cm (H)

18.0 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

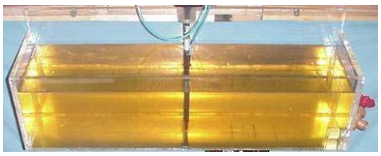
ET3DV6 E-Field Probe

19.0 PHANTOM(S)

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

SAM Twin Phantom V4.0C

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

20.0 DEVICE HOLDER

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

Device Holder

21.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
USED	DESCRIPTION				
x	Schmid & Partner DASY4 System	-	-	-	-
x	-DASY4 Measurement Server	00158	1078	CNR	CNR
x	-Robot	00046	599396-01	CNR	CNR
x	-DAE4	00019	353	27Apr10	Biennial
x	-ET3DV6 E-Field Probe	00017	1590	22Jun11	Annual
x	-D835V2 Validation Dipole	00217	4d075	20Apr09	Triennial
x	SPEAG SAM Twin Phantom V4.0C	00154	1033	CNR	CNR
x	Side Planar Phantom	00156	161	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	04May10	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833699	04May10	Biennial
x	HP 8753ET Network Analyzer	00134	US39170292	04May10	Biennial
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

22.0 JUSTIFICATION FOR EXTENDED SAR DIPOLE CALIBRATION

SAR dipoles calibrated less than two years ago but more than one year ago were confirmed by maintaining return loss (< -20dB, within 20% of prior calibration) and impedance (within 5Ω from prior calibration) requirements per extended calibrations in FCC KDB 450824 (see reference [10]).

SPEAG D835V3 SN: 4d075						
Date of Measurement	Frequency	Fluid Type	Return Loss (dB)	Δ %	Impedance (Ω)	Δ Ω
Apr. 20, 2009	835 MHz	Head	-29.1	-	51.8	-
Jun. 29, 2011			-27.3	-6.2%	48.6	-3.2
Apr. 20, 2009	835 MHz	Body	-26.7	-	48.0	-
Apr. 20, 2011			-24.0	10.1%	51.3	3.3

23.0 MEASUREMENT UNCERTAINTIES

UNCERTAINTY BUDGET FOR DEVICE EVALUATION

Uncertainty Component	IEEE 1528 Section	Uncertainty Value ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value ±% (1g)	Uncertainty Value ±% (10g)	V_i or V_{eff}
Measurement System									
Probe Calibration (835 MHz)	E.2.1	6.0	Normal	1	1	1	6.0	6.0	∞
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	5.56	Normal	1	0.64	0.43	3.6	2.4	∞
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measured)	E.3.3	1.69	Normal	1	0.6	0.49	1.0	0.8	∞
Combined Standard Uncertainty			**RSS**				**11.25**	**10.79**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**				**22.50**	**21.58**	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003

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

24.0 REFERENCES

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

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

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

[4] Industry Canada - “Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)”, Radio Standards Specification RSS-102 Issue 4: March 2010.

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

[6] International Standard IEC 62209-2 Edition 1.0 2010-03 - “Human exposure to radio frequency fields from hand-held & body-mounted wireless communication devices - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)”.

[7] Federal Communications Commission, Office of Engineering and Technology - “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”; KDB 447498 D01v04: November 2009.

[8] Federal Communications Commission, Office of Engineering and Technology - “SAR Test Reduction Considerations for Occupational PTT Radios”, KDB 643646 D01v01r01: April 2011.

[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 22 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.

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

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

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

APPENDIX A - SAR MEASUREMENT PLOTS

Preliminary Area Scan - Face (Side Planar Phantom)

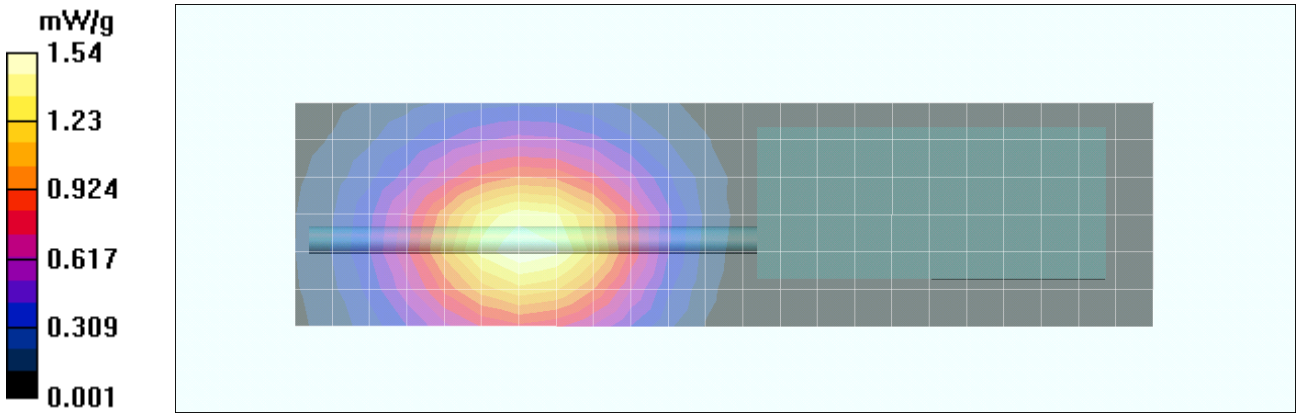
DUT: Kenwood NX-411-K2; Type: 800 PTT Radio Transceiver; Serial: 00232058

The area scan shows that the only peak SAR location is over the antenna of the DUT

Communication System: CW
Frequency: 896.05 MHz; Duty factor: 1:1
Medium: HSL835 Medium parameters used (interpolated): f = 896.05 MHz; σ = 0.93 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.5, 6.5, 6.5); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Area Scan (7x24x1): Measurement grid: dx=15mm, dy=15mm



Face SAR Plot F1

Date Tested: 10/07/2011

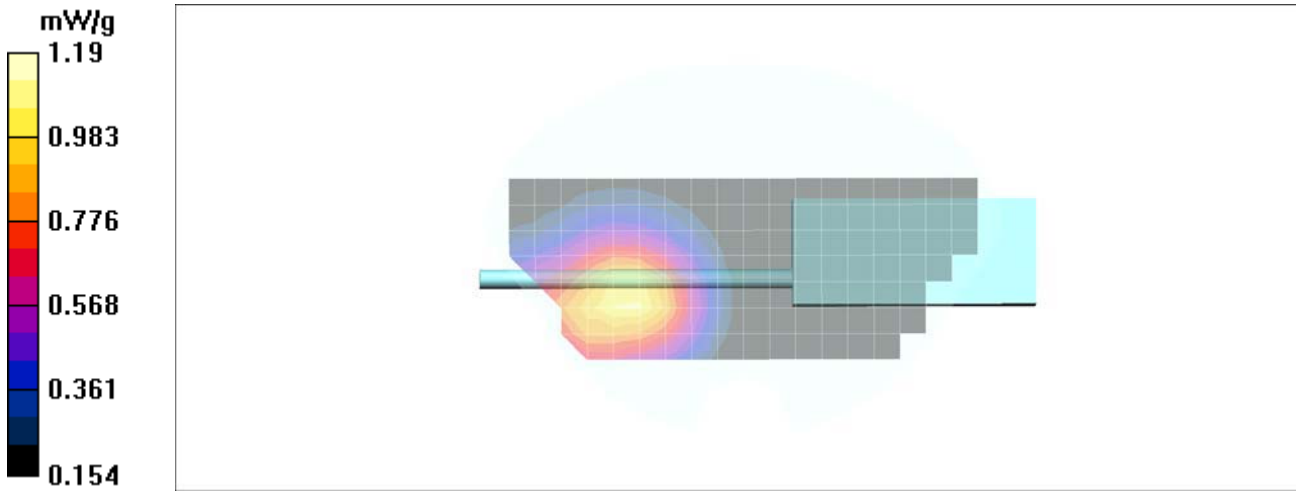
DUT: Kenwood NX-411-K2; Type: Portable 900-Band PTT Radio Transceiver; Serial: 00232058

Ambient Temp: 22C; Fluid Temp: 21.4C; Barometric Pressure: 101.1 kPa; Humidity: 37%

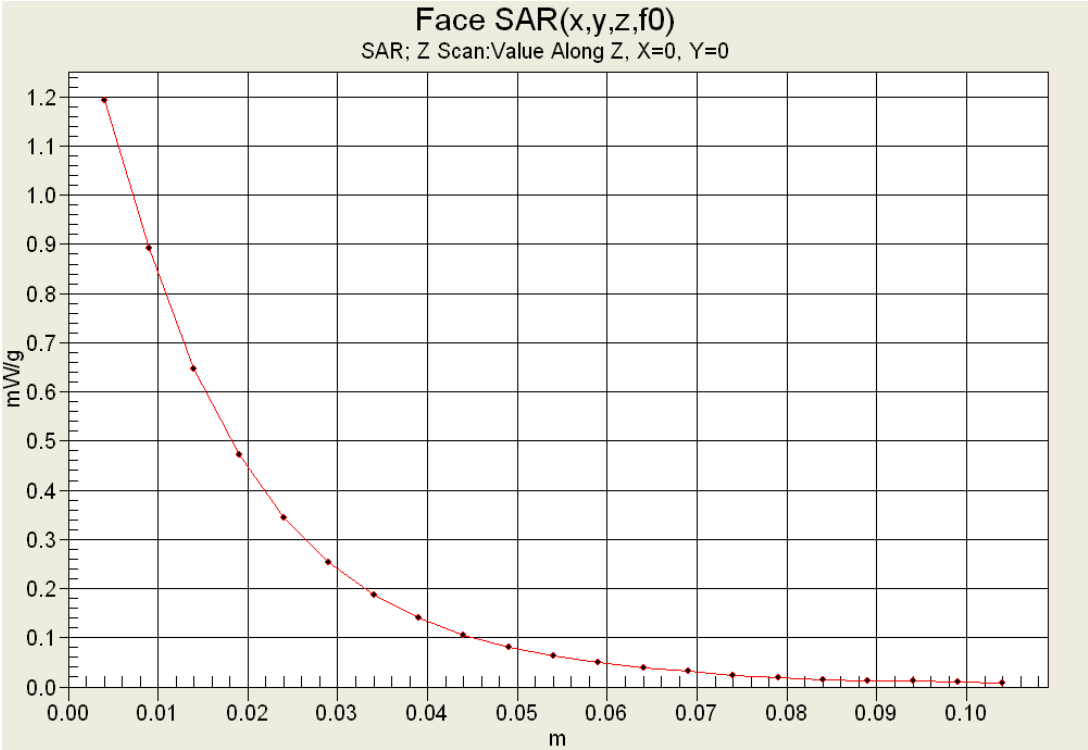
Communication System: CW
Frequency: 896.05 MHz; Duty factor: 1:1
Medium: HSL835 Medium parameters used (interpolated): f = 896.05 MHz; σ = 0.93 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.5, 6.5, 6.5); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

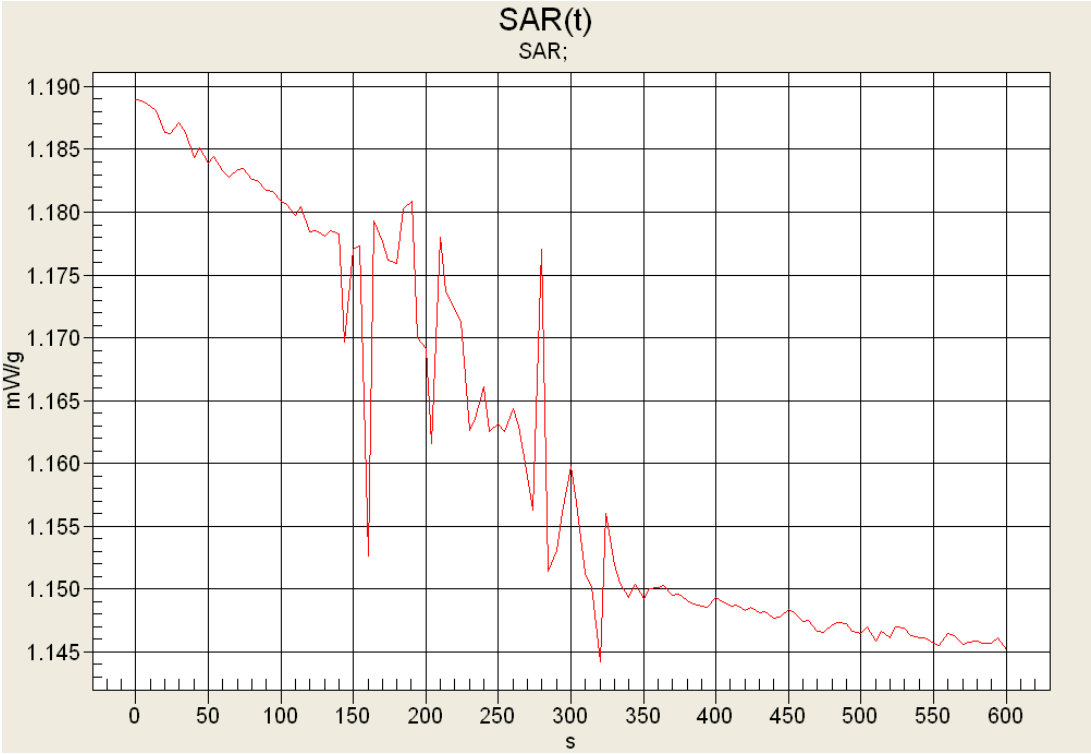
Area Scan (8x21x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.06 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.2 V/m; Power Drift = -0.328 dB
Peak SAR (extrapolated) = 1.42 W/kg
SAR(1 g) = 1.12 mW/g; SAR(10 g) = 0.815 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.19 mW/g



Z-Axis Scan



SAR-Versus-Time



Face SAR Plot F2

Date Tested: 10/07/2011

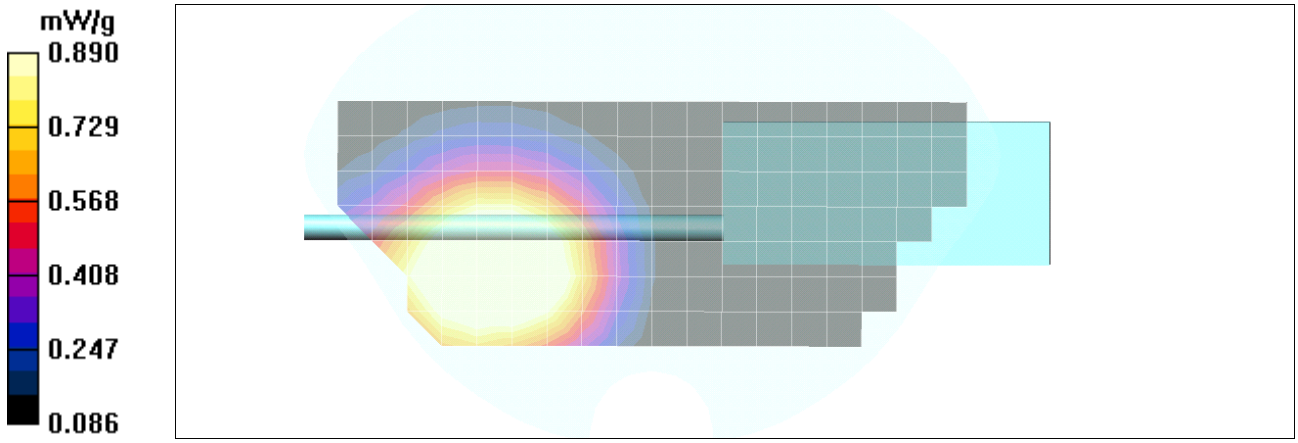
DUT: Kenwood NX-411-K2; Type: Portable 900-Band PTT Radio Transceiver; Serial: 00232058

Ambient Temp: 22C; Fluid Temp: 21.4C; Barometric Pressure: 101.1 kPa; Humidity: 37%

Communication System: CW
Frequency: 935 MHz; Duty factor: 1:1
Medium: HSL835 Medium parameters used (interpolated): f = 935 MHz; σ = 0.95 mho/m; ε_r = 41.8; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.5, 6.5, 6.5); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Area Scan (8x21x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.27 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.9 V/m; Power Drift = -0.406 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.834 mW/g; SAR(10 g) = 0.590 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.890 mW/g



Face SAR Plot F3

Date Tested: 10/07/2011

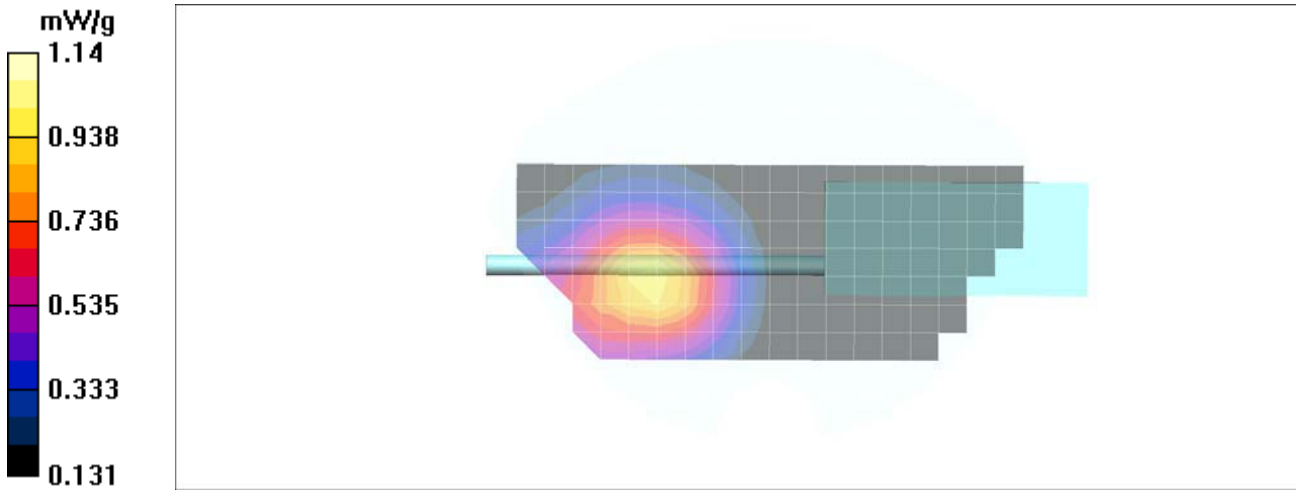
DUT: Kenwood NX-411-K2; Type: Portable 900-Band PTT Radio Transceiver; Serial: 00232058

Ambient Temp: 22C; Fluid Temp: 21.4C; Barometric Pressure: 101.1 kPa; Humidity: 37%

Communication System: CW
Frequency: 896.05 MHz; Duty factor: 1:1
Medium: HSL835 Medium parameters used (interpolated): f = 896.05 MHz; σ = 0.93 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.5, 6.5, 6.5); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Area Scan (8x21x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.986 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.6 V/m; Power Drift = 0.534 dB
Peak SAR (extrapolated) = 1.36 W/kg
SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.778 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.14 mW/g



Face SAR Plot F4

Date Tested: 10/07/2011

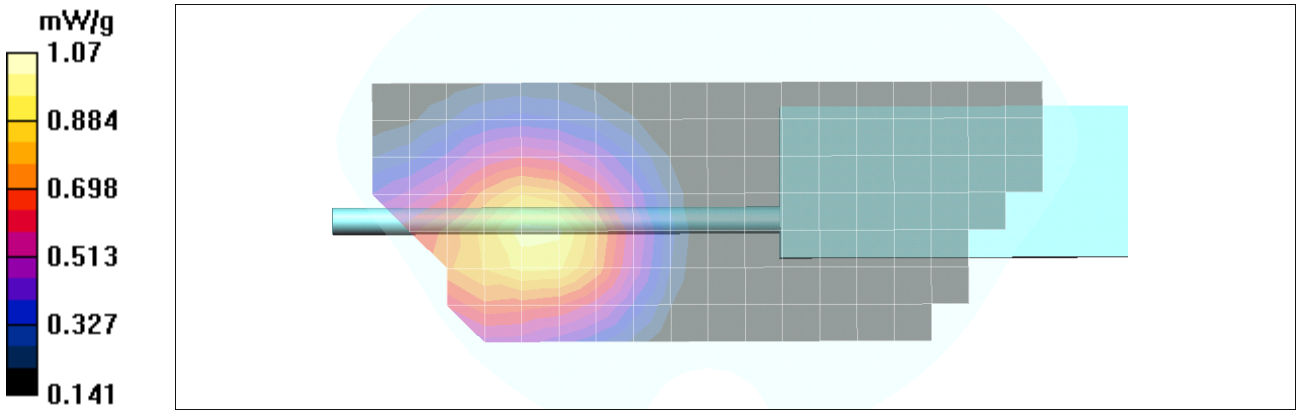
DUT: Kenwood NX-411-K2; Type: Portable 900-Band PTT Radio Transceiver; Serial: 00232058

Ambient Temp: 22C; Fluid Temp: 21.4C; Barometric Pressure: 101.1 kPa; Humidity: 37%

Communication System: CW
Frequency: 896.05 MHz; Duty factor: 1:1
Medium: HSL835 Medium parameters used (interpolated): f = 896.05 MHz; σ = 0.93 mho/m; ε_r = 42.2; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.5, 6.5, 6.5); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Area Scan (8x21x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.976 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.2 V/m; Power Drift = -0.084 dB
Peak SAR (extrapolated) = 1.29 W/kg
SAR(1 g) = 1.01 mW/g; SAR(10 g) = 0.733 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.07 mW/g



Preliminary Area Scan - Body (Side Planar Phantom)

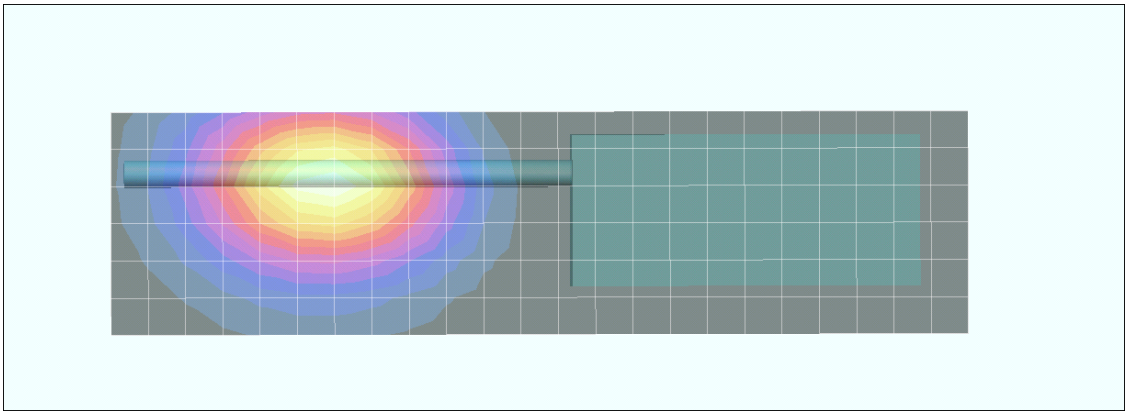
DUT: Kenwood NX-411-K2; Type: 800 PTT Radio Transceiver; Serial: 00232058

The area scan shows that the only peak SAR location is over the antenna of the DUT

Communication System: CW
Frequency: 896.05 MHz; Duty factor: 1:1
Medium: M835 Medium parameters used (interpolated): f = 896.05 MHz; σ = 0.982 mho/m; ε_r = 55.5; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.37, 6.37, 6.37); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Area Scan (7x24x1): Measurement grid: dx=15mm, dy=15mm



Body SAR Plot B1

Date Tested: 10/06/2011

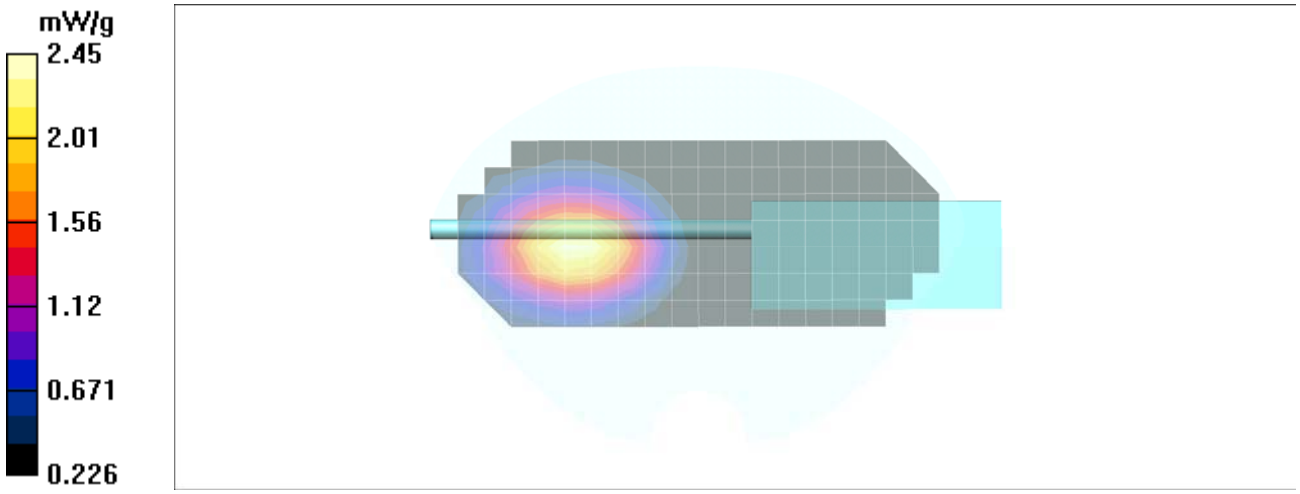
DUT: Kenwood NX-411-K2; Type: Portable 900-Band PTT Radio Transceiver; Serial: 00232058

Ambient Temp: 23.5C; Fluid Temp: 22.7C; Barometric Pressure: 101.1 kPa; Humidity: 37%

Communication System: CW
Frequency: 896.05 MHz; Duty factor: 1:1
Medium: M835 Medium parameters used (interpolated): f = 896.05 MHz; σ = 0.982 mho/m; ε_r = 55.5; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.37, 6.37, 6.37); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Area Scan (8x21x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.37 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.8 V/m; Power Drift = 0.001 dB
Peak SAR (extrapolated) = 2.98 W/kg
SAR(1 g) = 2.3 mW/g; SAR(10 g) = 1.57 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.45 mW/g



Body SAR Plot B2

Date Tested: 10/06/2011

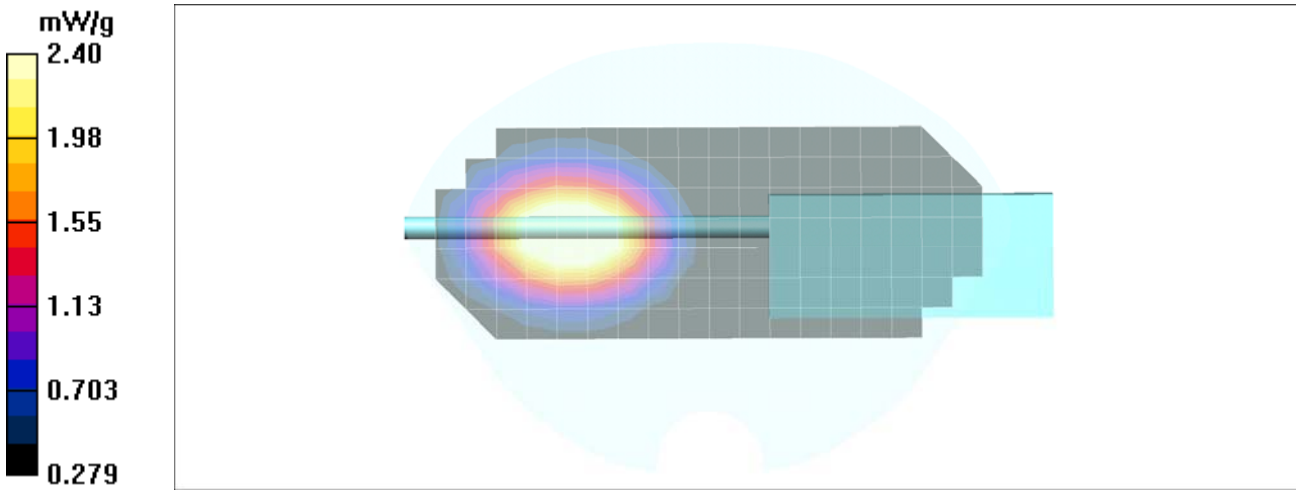
DUT: Kenwood NX-411-K2; Type: Portable 900-Band PTT Radio Transceiver; Serial: 00232058

Ambient Temp: 23.5C; Fluid Temp: 22.7C; Barometric Pressure: 101.1 kPa; Humidity: 37%

Communication System: CW
Frequency: 935 MHz; Duty factor: 1:1
Medium: M835 Medium parameters used (interpolated): f = 935 MHz; σ = 1.01 mho/m; ε_r = 55.4; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.37, 6.37, 6.37); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Area Scan (8x21x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.82 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.7 V/m; Power Drift = -0.52 dB
Peak SAR (extrapolated) = 2.90 W/kg
SAR(1 g) = 2.26 mW/g; SAR(10 g) = 1.63 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.40 mW/g



Body SAR Plot B3

Date Tested: 10/06/2011

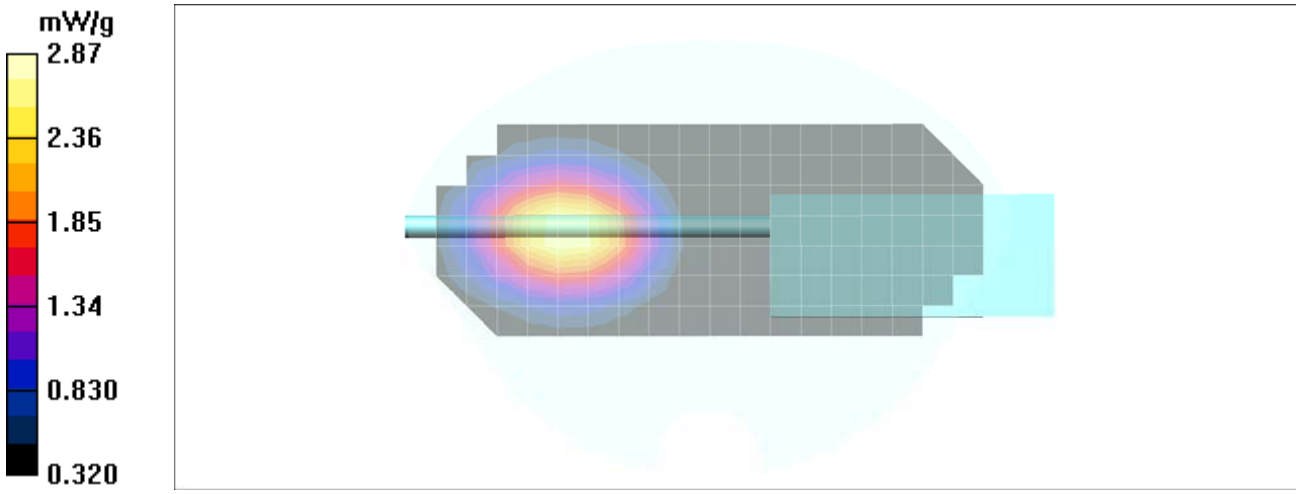
DUT: Kenwood NX-411-K2; Type: Portable 900-Band PTT Radio Transceiver; Serial: 00232058

Ambient Temp: 23.5C; Fluid Temp: 22.7C; Barometric Pressure: 101.1 kPa; Humidity: 37%

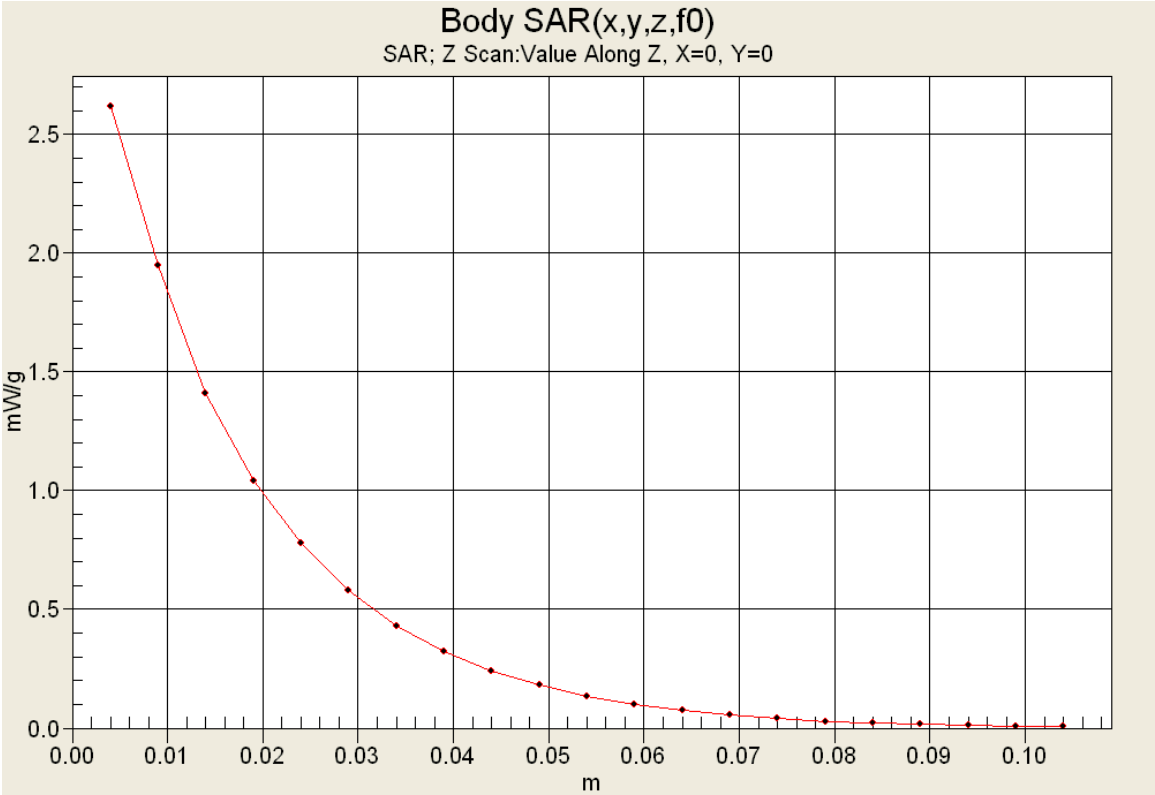
Communication System: CW
Frequency: 935 MHz; Duty factor: 1:1
Medium: M835 Medium parameters used (interpolated): f = 935 MHz; σ = 1.01 mho/m; ε_r = 55.4; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.37, 6.37, 6.37); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Area Scan (8x21x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.68 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.0 V/m; Power Drift = -0.699 dB
Peak SAR (extrapolated) = 3.47 W/kg
SAR(1 g) = 2.7 mW/g; SAR(10 g) = 1.94 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.87 mW/g



Z-Axis Scan



Body SAR Plot B4

Date Tested: 10/06/2011

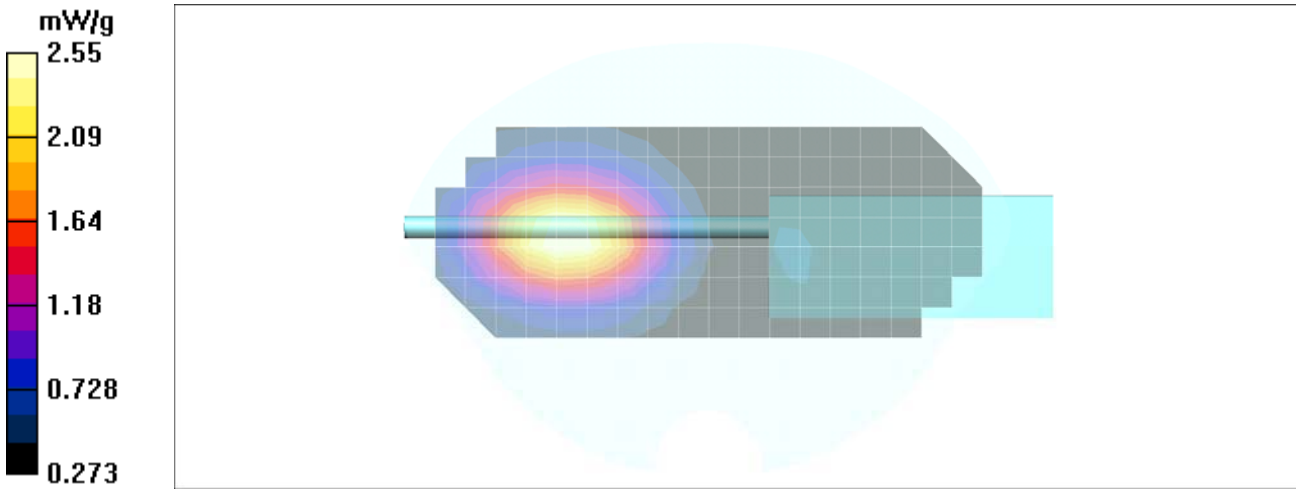
DUT: Kenwood NX-411-K2; Type: Portable 900-Band PTT Radio Transceiver; Serial: 00232058

Ambient Temp: 23.5C; Fluid Temp: 22.7C; Barometric Pressure: 101.1 kPa; Humidity: 37%

Communication System: CW
Frequency: 935 MHz; Duty factor: 1:1
Medium: M835 Medium parameters used (interpolated): f = 935 MHz; σ = 1.01 mho/m; ε_r = 55.4; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(6.37, 6.37, 6.37); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical And Optical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Area Scan (8x21x1): Measurement grid: dx=15mm, dy=15mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 3.38 mW/g
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.6 V/m; Power Drift = -0.32 dB
Peak SAR (extrapolated) = 3.06 W/kg
SAR(1 g) = 2.38 mW/g; SAR(10 g) = 1.71 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.55 mW/g



APPENDIX B - SYSTEM PERFORMANCE CHECK PLOTS

Date Tested: 10/06/2011

System Performance Check - 835 MHz Dipole - Body

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

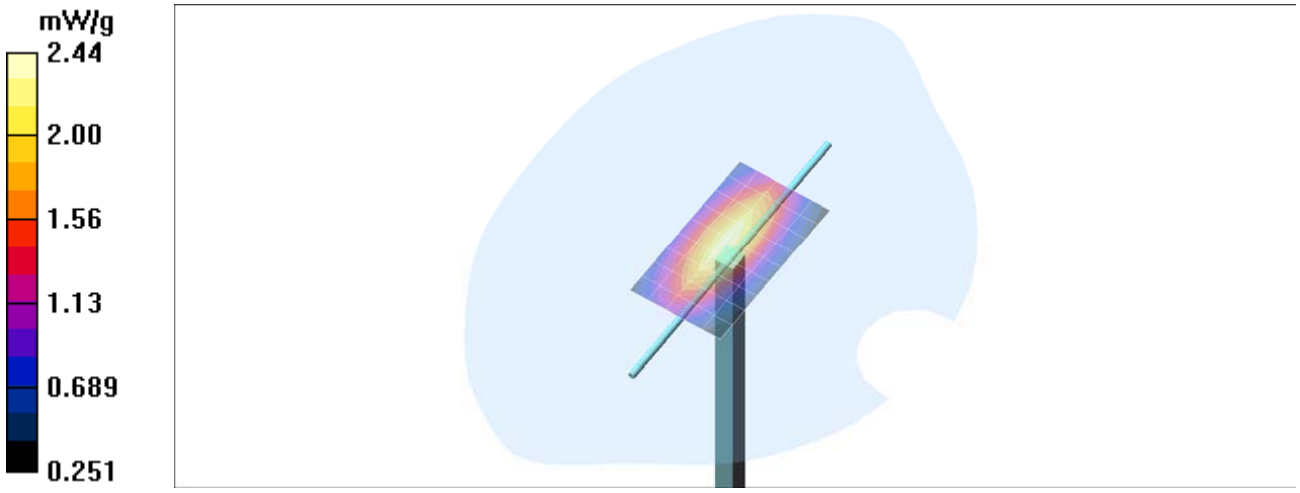
Ambient Temp: 23.5C; Fluid Temp: 22.7C; Barometric Pressure: 101.1 kPa; Humidity: 37%

Communication System: CW
Frequency: 835 MHz; Duty factor: 1:1
Medium: M835 Medium parameters used (interpolated): f = 835 MHz; σ = 0.935 mho/m; ε_r = 56.2; ρ = 1000 kg/m^3

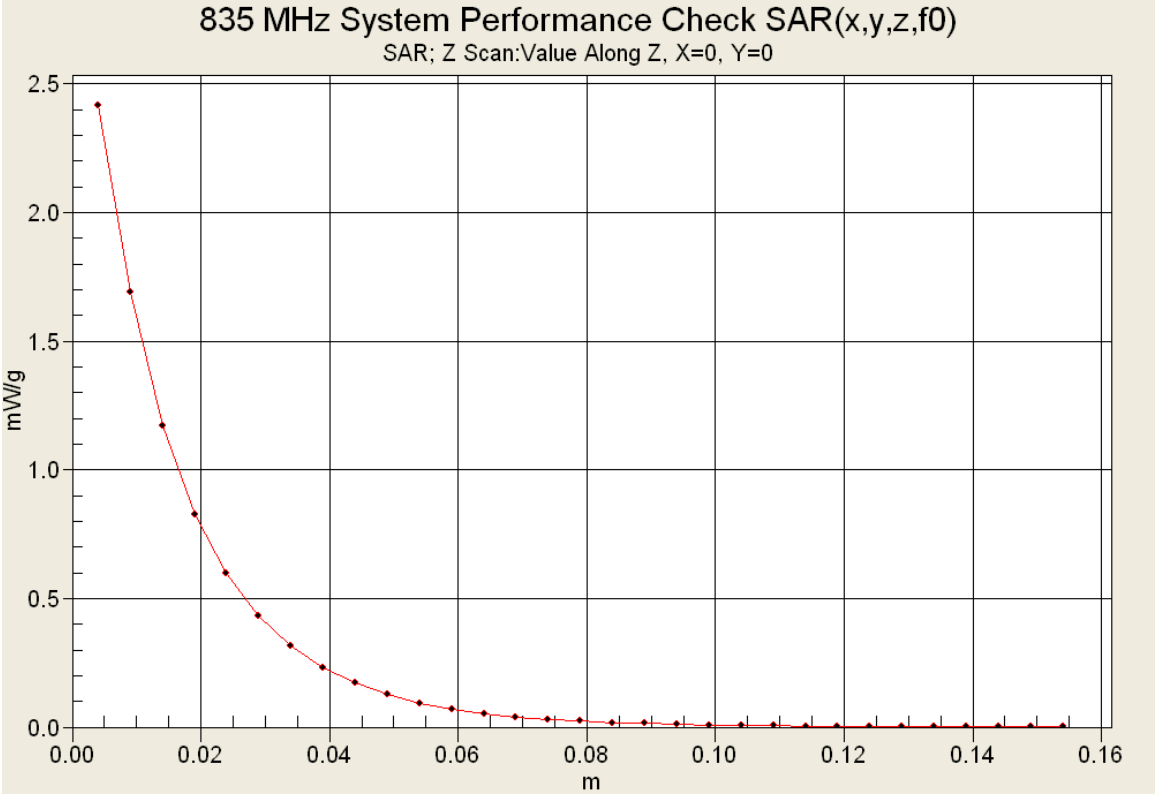
- Probe: ET3DV6 - SN1590; ConvF(6.37, 6.37, 6.37); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body d=15mm Pin=250mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.34 mW/g

Body d=15mm Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 52.6 V/m; Power Drift = 0.000 dB
Peak SAR (extrapolated) = 3.18 W/kg
SAR(1 g) = 2.25 mW/g; SAR(10 g) = 1.5 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.44 mW/g



Z-Axis Scan



Date Tested: 10/07/2011

System Performance Check - 835 MHz Dipole - Head

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

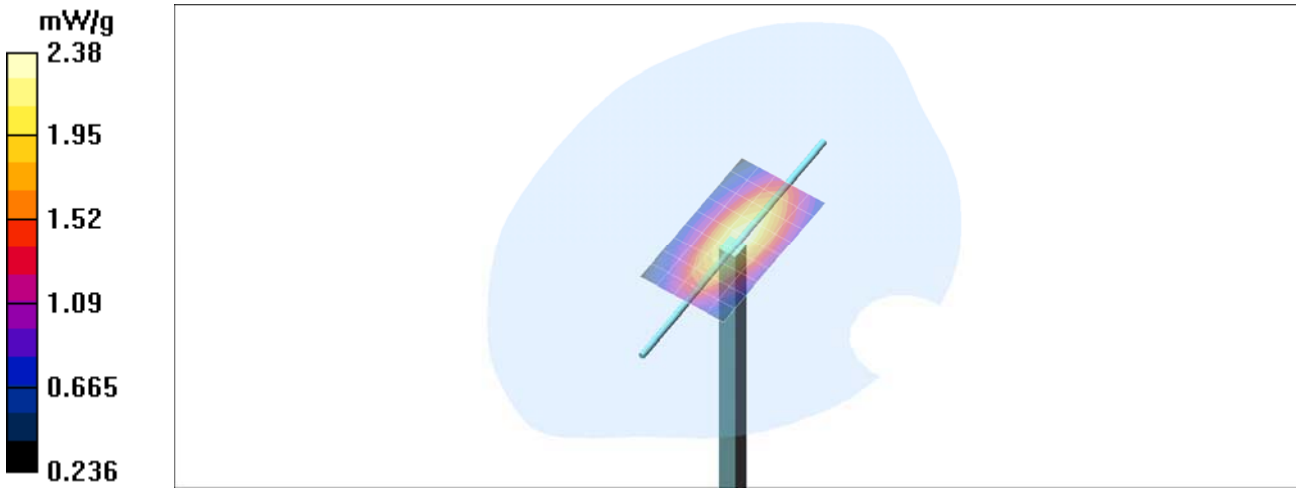
Ambient Temp: 22C; Fluid Temp: 21.4C; Barometric Pressure: 101.1 kPa; Humidity: 37%

Communication System: CW
Frequency: 835 MHz; Duty factor: 1:1
Medium: HSL835 Medium parameters used (interpolated): f = 835 MHz; σ = 0.865 mho/m; ε_r = 42.7; ρ = 1000 kg/m^3

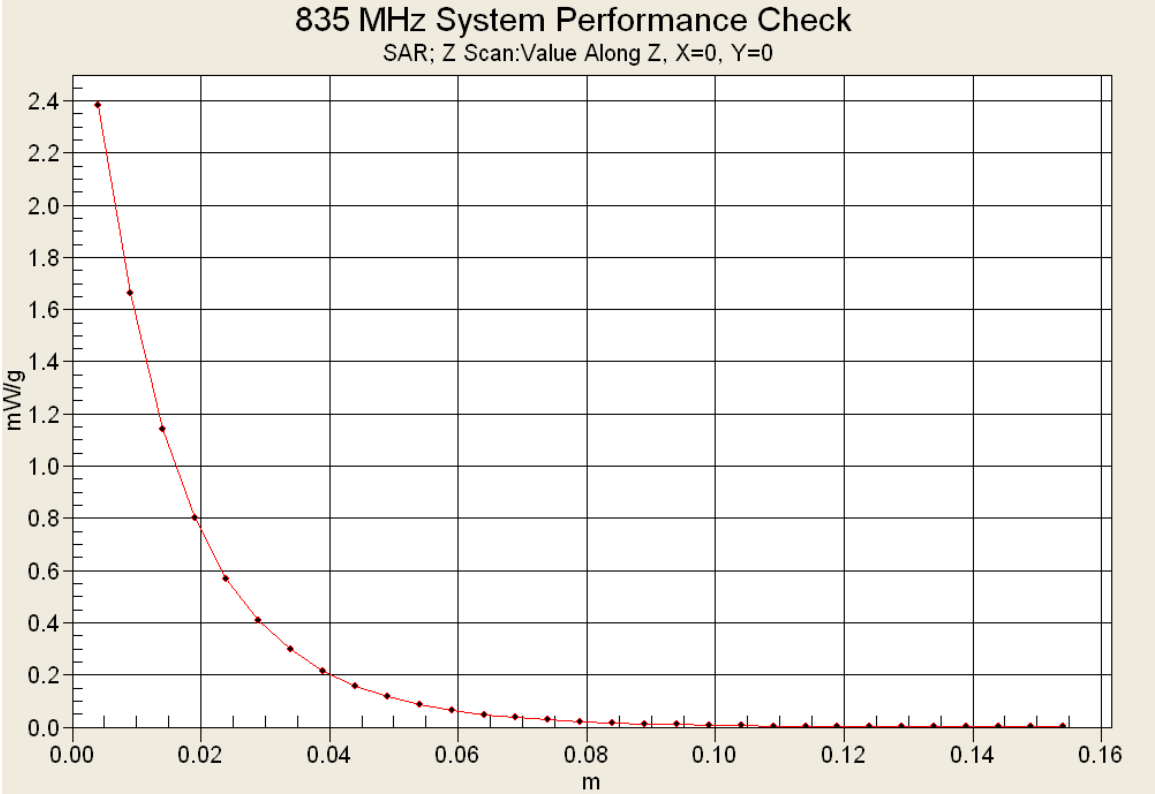
- Probe: ET3DV6 - SN1590; ConvF(6.5, 6.5, 6.5); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: SAM 4.0; Type: Fiberglas; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face d=15mm Pin=250mW/Area Scan (6x10x1): Measurement grid: dx=10mm, dy=10mm
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.36 mW/g

Face d=15mm Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.9 V/m; Power Drift = -0.004 dB
Peak SAR (extrapolated) = 3.07 W/kg
SAR(1 g) = 2.2 mW/g; SAR(10 g) = 1.46 mW/g
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.38 mW/g



Z-Axis Scan



APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

835 MHz Body

****

Celltech Labs Inc.
Test Result for UIM Dielectric Parameter
06/Oct/2011
Frequency (GHz)
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
0.8000	55.34	0.97	56.59	0.90
0.8100	55.30	0.97	56.34	0.89
0.8200	55.26	0.97	56.46	0.90
0.8300	55.22	0.97	56.21	0.93
0.8400	55.18	0.98	56.15	0.93
0.8500	55.15	0.99	55.77	0.94
0.8600	55.12	1.00	55.90	0.95
0.8700	55.09	1.01	55.69	0.97
0.8800	55.06	1.03	55.57	0.97
0.8900	55.03	1.04	55.52	0.97
0.9000	55.00	1.05	55.52	0.99
0.9100	55.00	1.06	55.35	1.00
0.9200	54.99	1.06	55.45	1.00
0.9300	54.97	1.07	55.47	1.00
0.9400	54.95	1.07	55.15	1.01
0.9500	54.93	1.08	55.30	1.03
0.9600	54.92	1.08	55.16	1.04
0.9700	54.90	1.08	55.05	1.05
0.9800	54.88	1.09	54.90	1.07
0.9900	54.86	1.09	54.94	1.07
1.0000	54.84	1.10	54.75	1.09

835 MHz Head

****

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

****

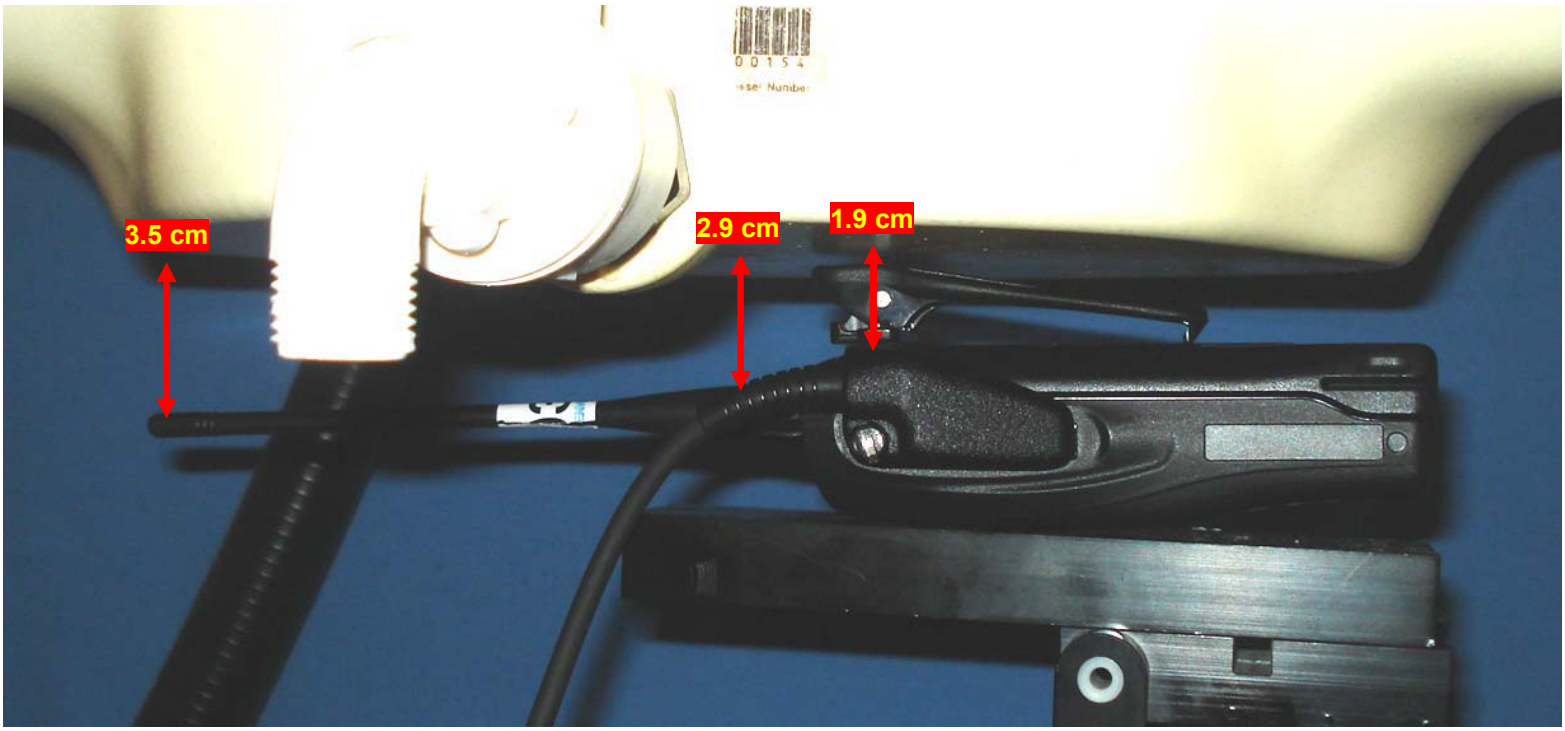
Freq	FCC_eH	FCC_sH	Test_e	Test_s
0.8000	41.68	0.90	43.42	0.84
0.8100	41.63	0.90	43.15	0.86
0.8200	41.58	0.90	43.16	0.86
0.8300	41.53	0.90	42.88	0.86
0.8400	41.50	0.91	42.46	0.87
0.8500	41.50	0.92	42.74	0.88
0.8600	41.50	0.93	42.28	0.90
0.8700	41.50	0.94	42.24	0.91
0.8800	41.50	0.95	42.19	0.92
0.8900	41.50	0.96	42.26	0.93
0.9000	41.50	0.97	42.19	0.93
0.9100	41.50	0.98	42.28	0.94
0.9200	41.49	0.98	41.85	0.94
0.9300	41.47	0.99	42.06	0.95
0.9400	41.45	0.99	41.45	0.95
0.9500	41.43	0.99	41.62	0.97
0.9600	41.42	1.00	41.36	0.99
0.9700	41.40	1.00	41.36	1.00
0.9800	41.38	1.01	41.22	1.02
0.9900	41.36	1.01	41.02	1.04
1.0000	41.34	1.01	41.01	1.07

APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

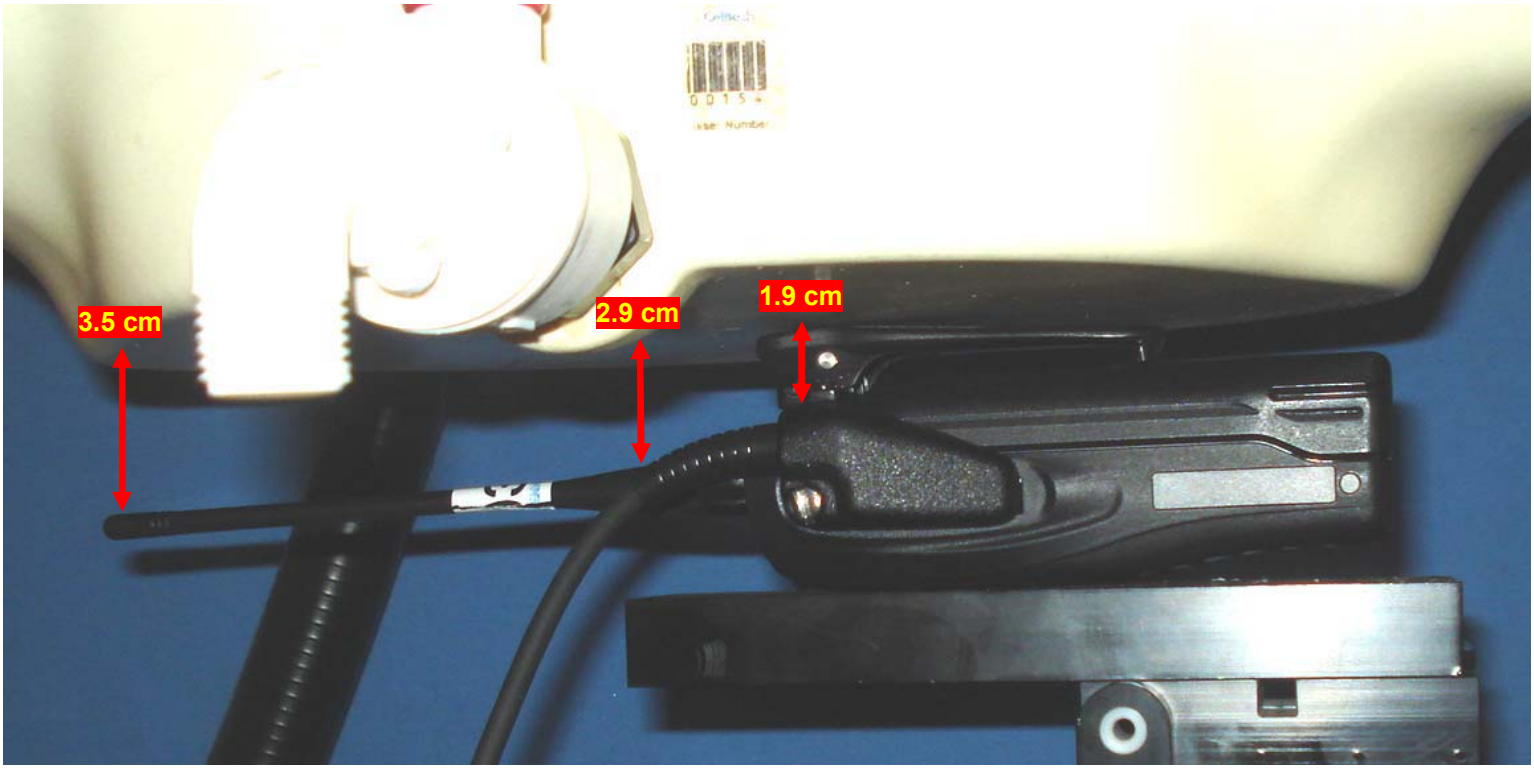
BODY-WORN SAR TEST SETUP PHOTOGRAPHS

Preliminary Area Scan evaluation – Side Planar Phantom

BODY-WORN SAR TEST SETUP PHOTOGRAPHS

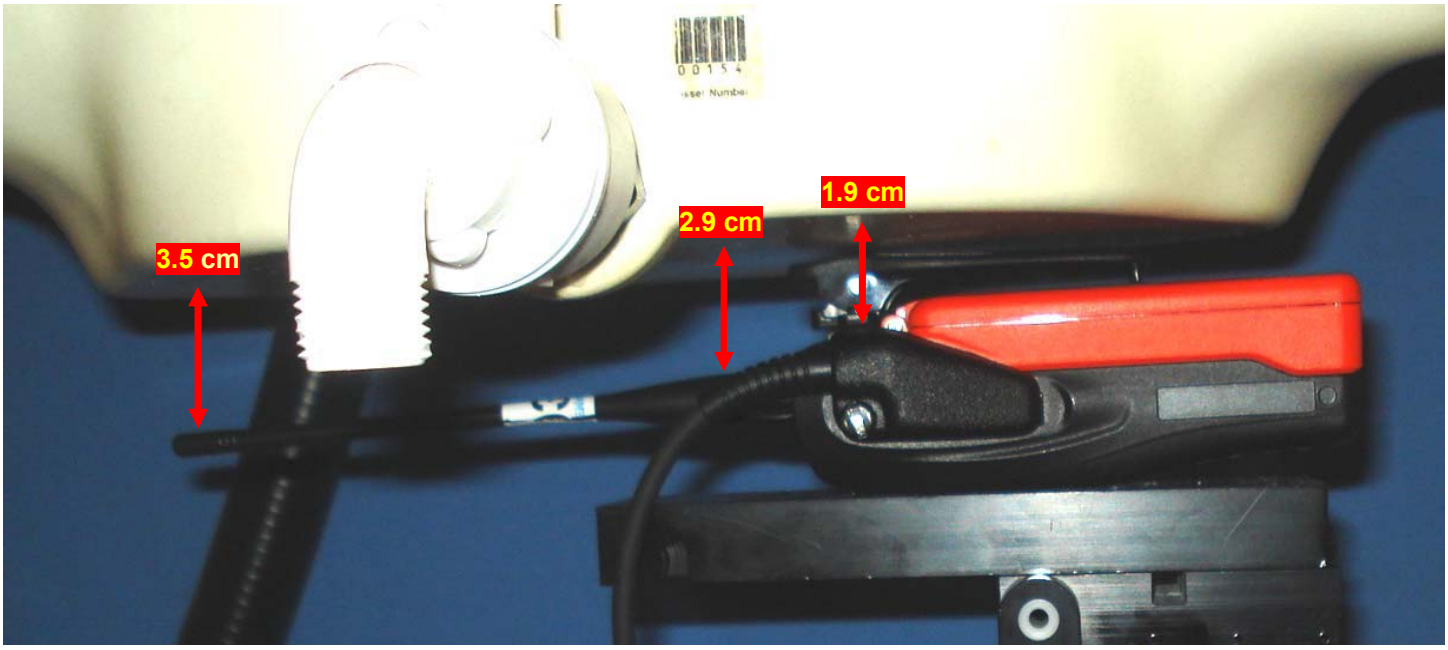


Antenna #1, Body-worn Accessory #1, Audio Accessory #1, Battery "a" (Battery Parallel to SAM Planar Phantom Section)



Antenna #1, Body-worn Accessory #1, Audio Accessory #1, Battery "b" (Battery Parallel to SAM Planar Phantom Section)

BODY-WORN SAR TEST SETUP PHOTOGRAPHS

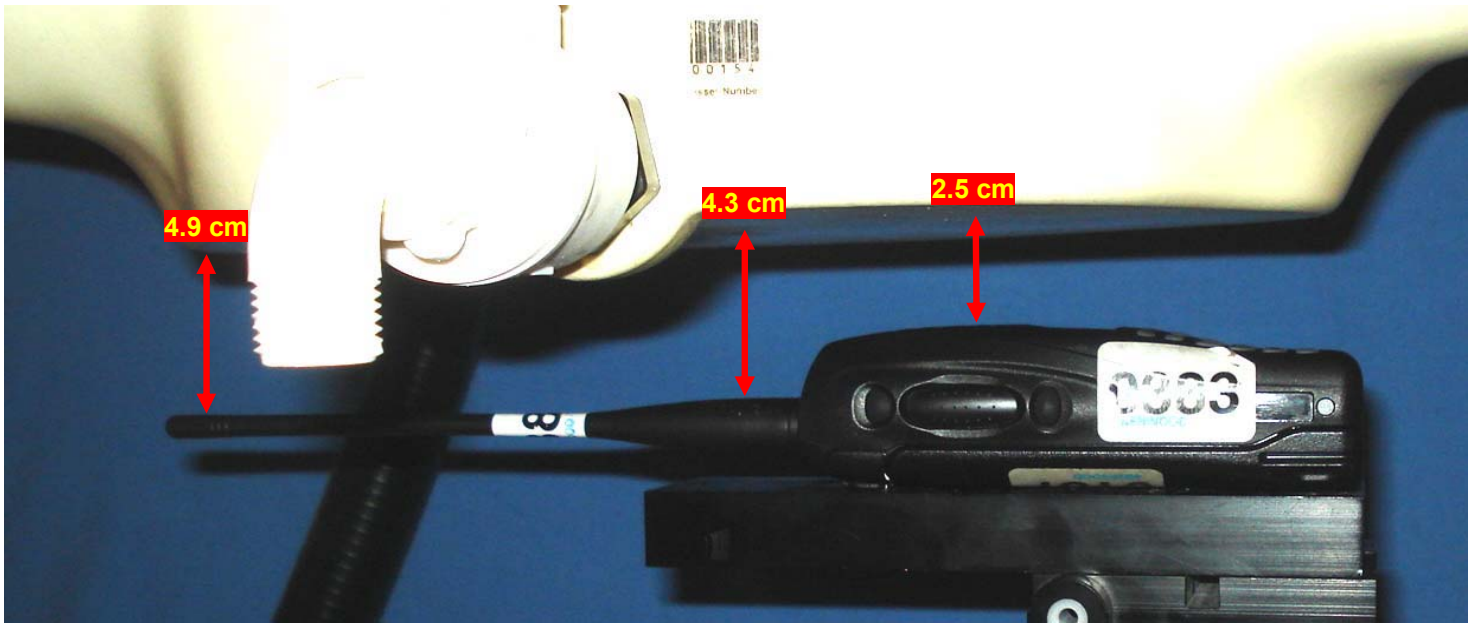


Antenna #1, Body-worn Accessory #1, Audio Accessory #1, Battery "c" (Battery Parallel to SAM Planar Phantom Section)

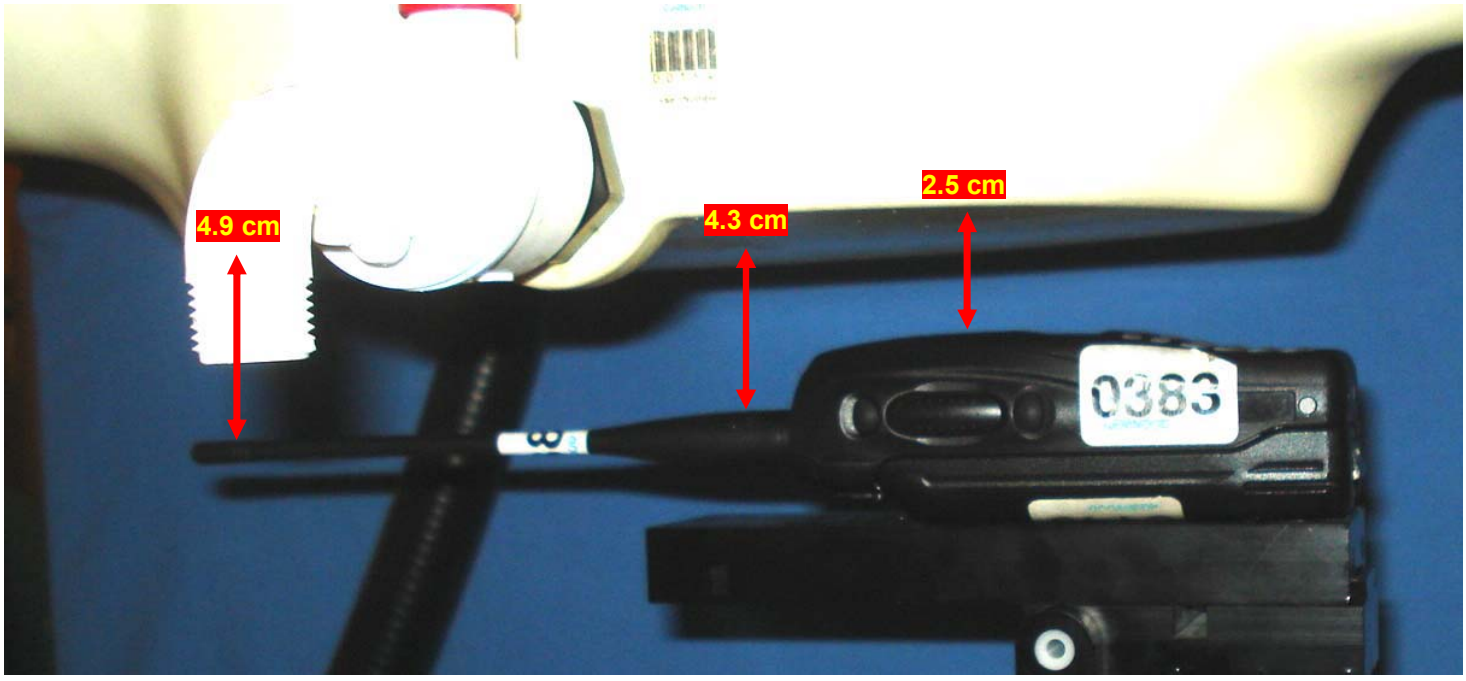
FACE-HELD SAR TEST SETUP PHOTOGRAPHS

Preliminary Area Scan evaluation – Side Planar Phantom

FACE-HELD SAR TEST SETUP PHOTOGRAPHS

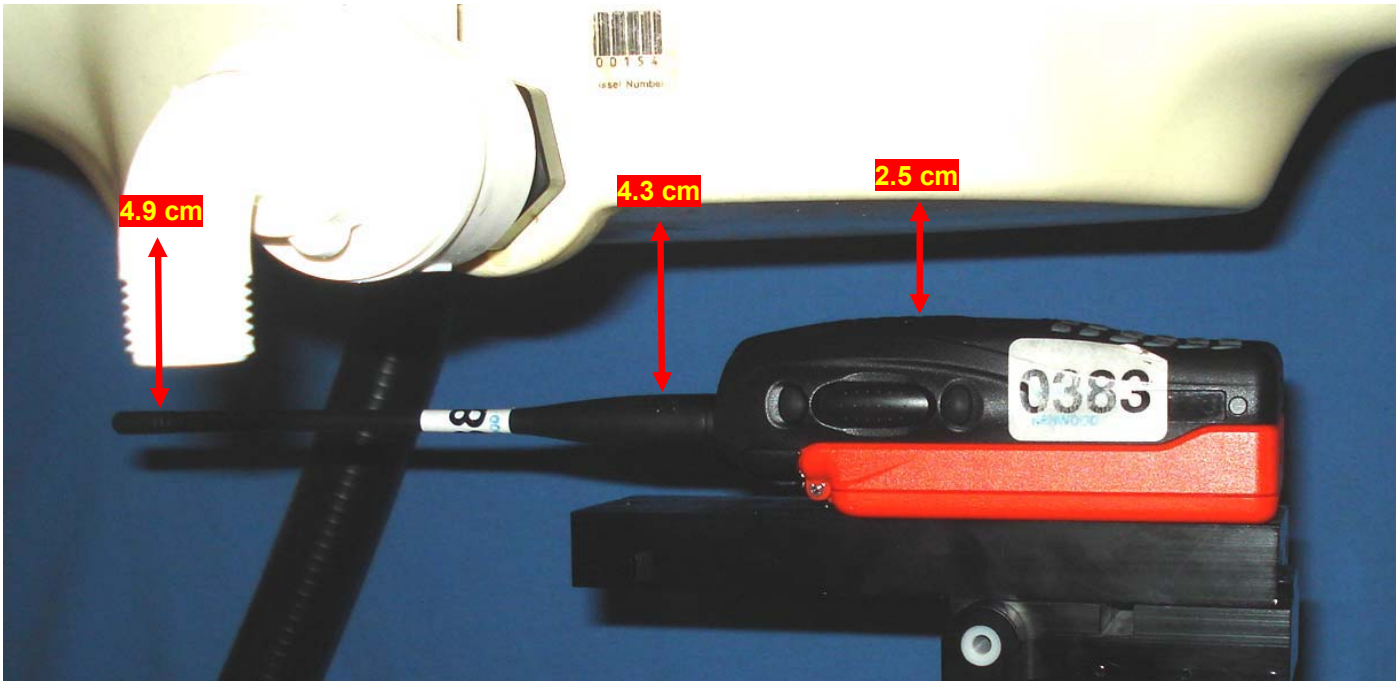


Face held test setup - Antenna #1, Battery "a" (Antenna Parallel to Planar Phantom Section)



Face held test setup - Antenna #1, Battery "b" (Antenna Parallel to Planar Phantom Section)

FACE-HELD SAR TEST SETUP PHOTOGRAPHS



Face held test setup - Antenna #1, Battery "c" (Antenna Parallel to Planar Phantom Section)

DUT PHOTOGRAPHS

Front of DUT

Left Side of DUT

Back of DUT

Right Side of DUT

Top end of DUT

Bottom end of DUT

Back of DUT (battery removed)

Antenna #1 (P/N: KRA-38)

Back of DUT with battery "b" and Body-worn Accessory #1

Side of DUT with battery "b" and Body-worn Accessory #1

Side of DUT with battery "a" and Body-worn Accessory #1

Side of DUT with battery "c" and Body-worn Accessory #1

Front of Li-Ion Battery "a"

Front of Ni-MH Battery "b"

Front of Alkaline Battery Case "c"

Back of Li-Ion Battery "a"

Back of Ni-MH Battery "b"

Back of Alkaline Battery Case "c"

Body-worn Accessory #1 (Belt-Clip P/N: KBH-11)

Audio Accessory #1 (Tested)

Heavy-Duty Speaker-Microphone (P/N: KMC-41)

Audio Accessory #2 (Not Tested)

Heavy-Duty GPS Speaker-Microphone (P/N: KMC-47GPS)

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

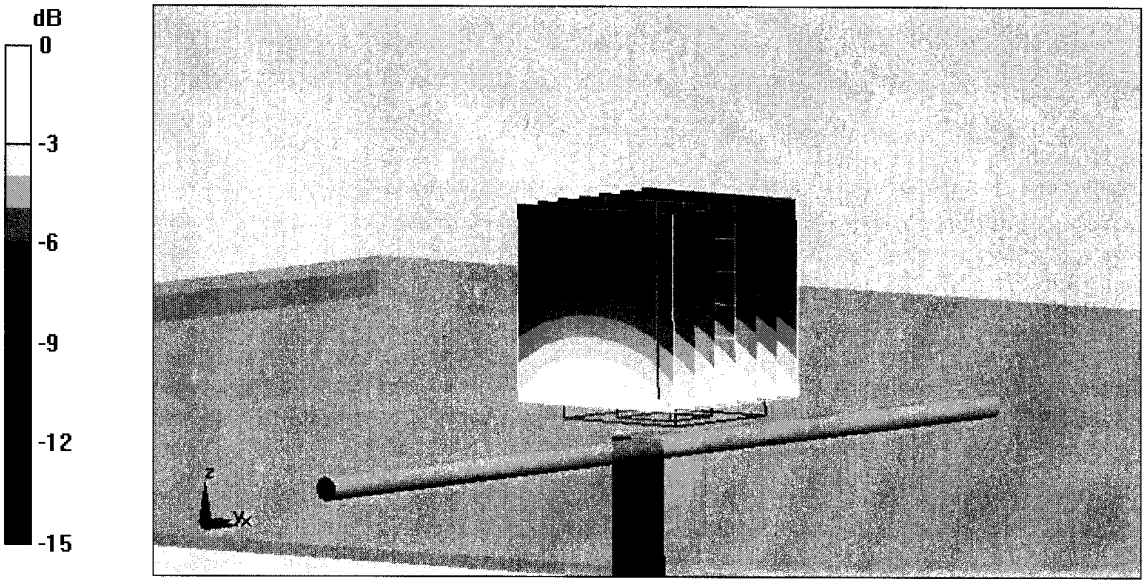
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d075

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:

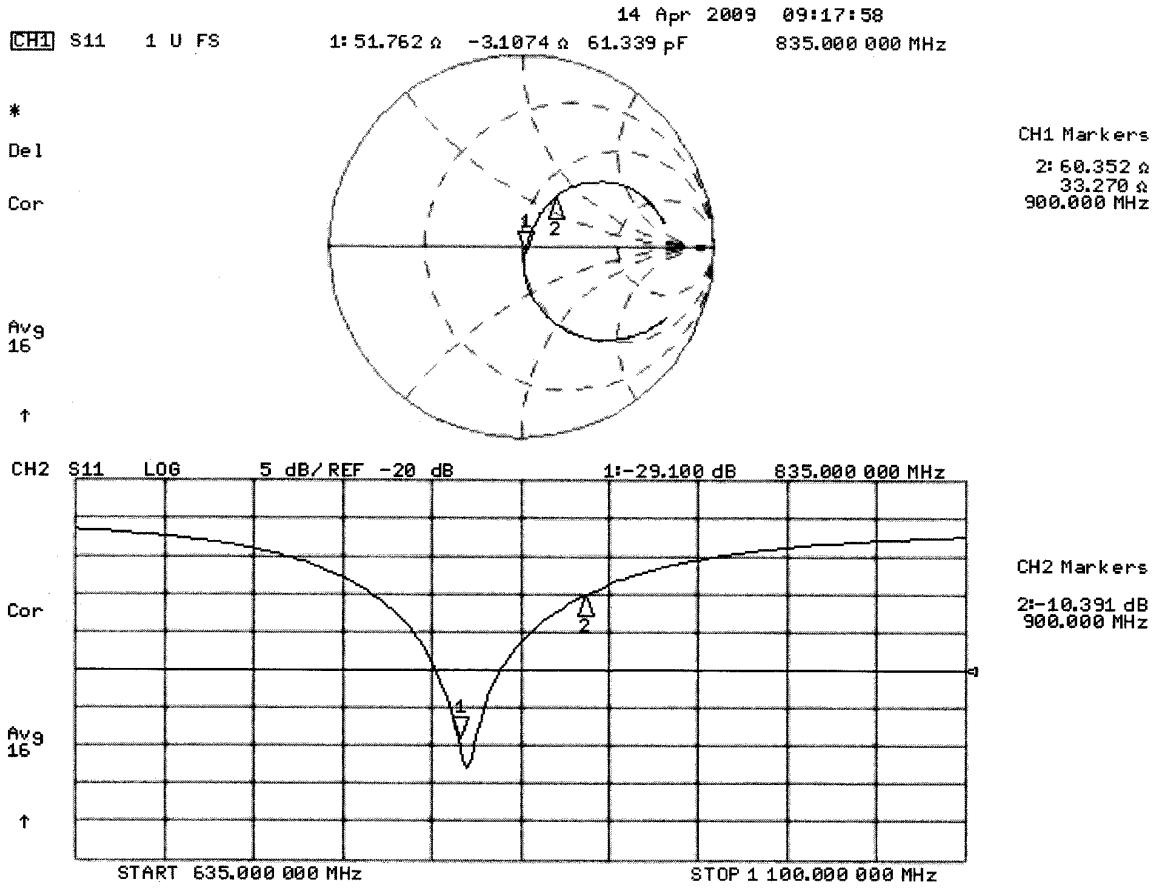
- Probe: ES3DV2 - SN3025; ConvF(5.97, 5.97, 5.97); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4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

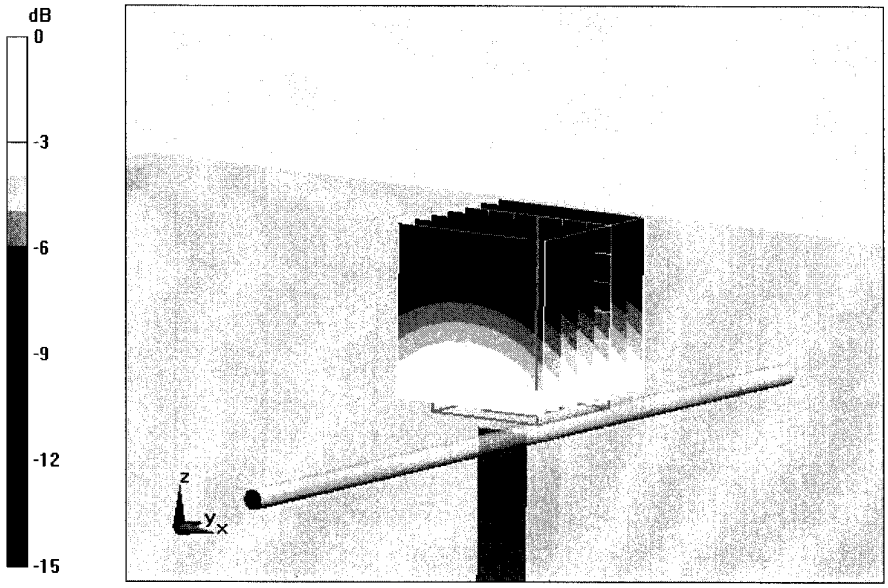
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d075

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:

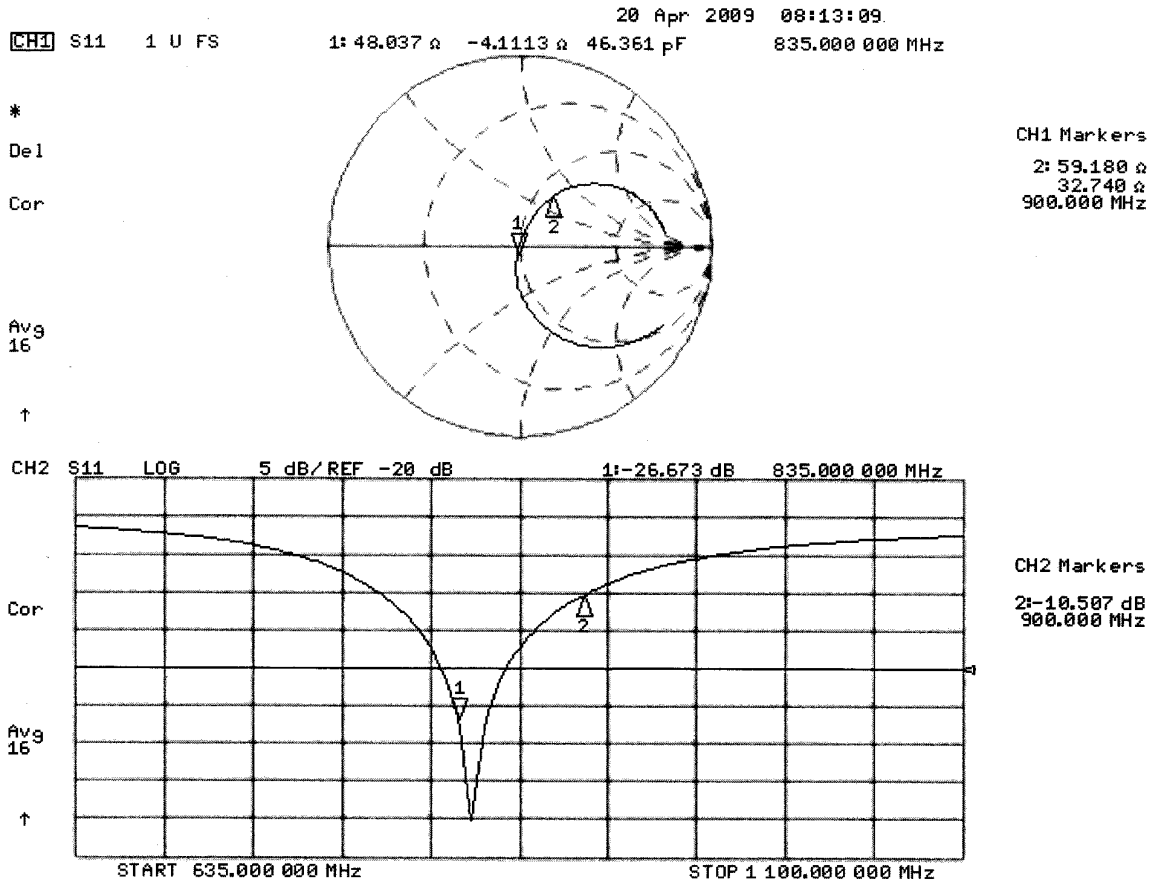
- Probe: ES3DV2 - SN3025; ConvF(5.9, 5.9, 5.9); Calibrated: 28.04.2008
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 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
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_Jun11

CALIBRATION CERTIFICATE

Object: ET3DV6 - SN:1590

Calibration procedure(s): QA CAL-01.v8, QA CAL-12.v7, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: June 22, 2011

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	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: June 23, 2011

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

S Schweizerischer Kalibrierdienst
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S Servizio svizzero di taratura
S Swiss Calibration Service

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

Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe ET3DV6

SN:1590

Manufactured: March 19, 2001
Calibrated: June 22, 2011

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.93	2.00	1.66	± 10.1 %
DCP (mV)[B]	96.0	98.7	88.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	104.2	±2.7 %
			Y	0.00	0.00	1.00	117.7	
			Z	0.00	0.00	1.00	129.9	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	43.5	0.87	7.30	7.30	7.30	0.18	2.10	± 13.4 %
835	41.5	0.90	6.50	6.50	6.50	0.38	2.55	± 12.0 %
900	41.5	0.97	6.39	6.39	6.39	0.39	2.47	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

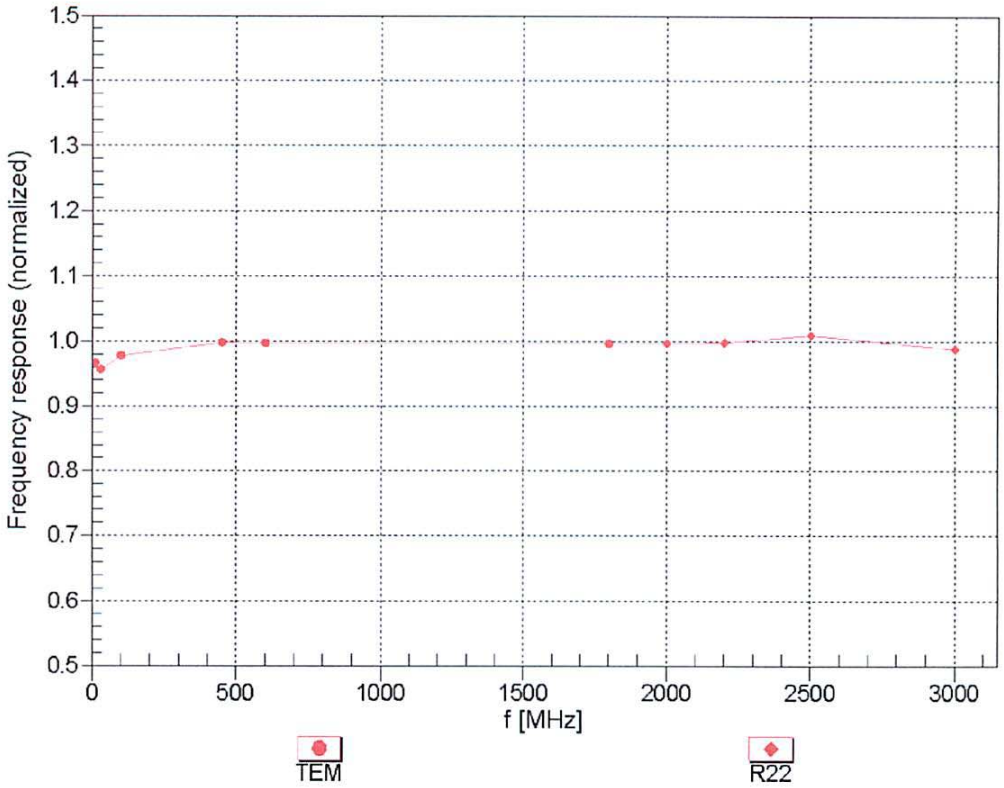
DASY/EASY - Parameters of Probe: ET3DV6- SN:1590

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.82	7.82	7.82	0.12	2.04	± 13.4 %
835	55.2	0.97	6.37	6.37	6.37	0.42	2.33	± 12.0 %
900	55.0	1.05	6.27	6.27	6.27	0.40	2.45	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

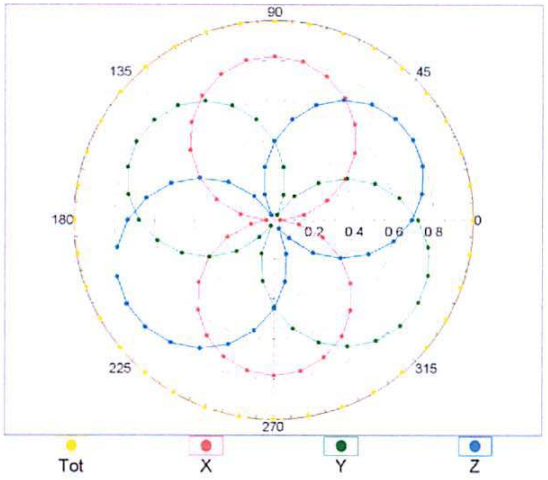
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



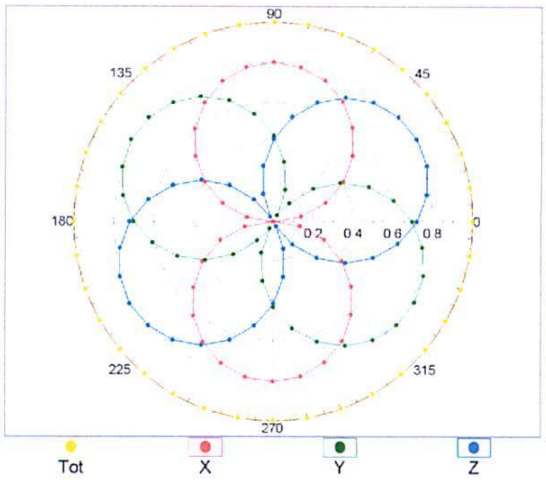
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

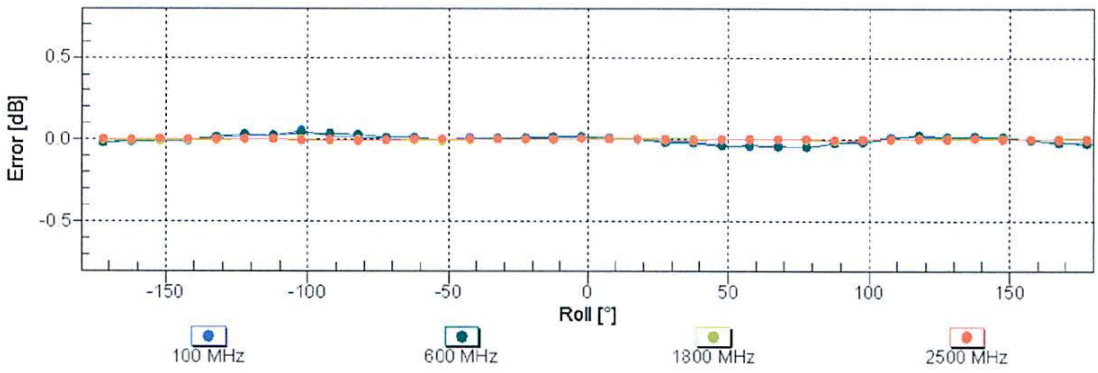
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



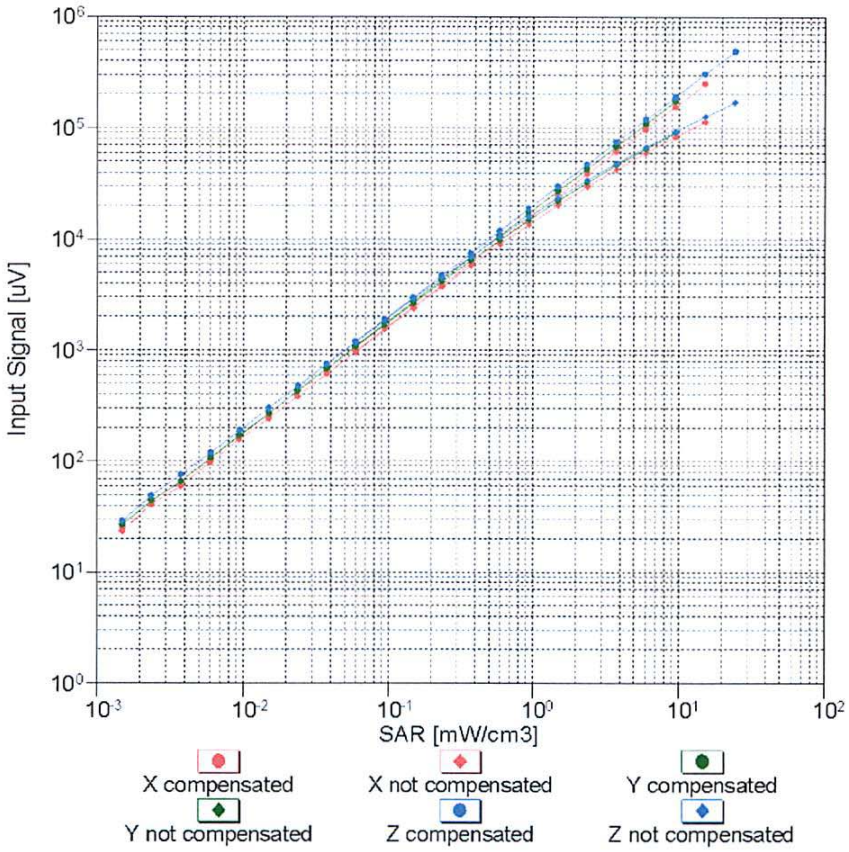
f=1800 MHz,R22

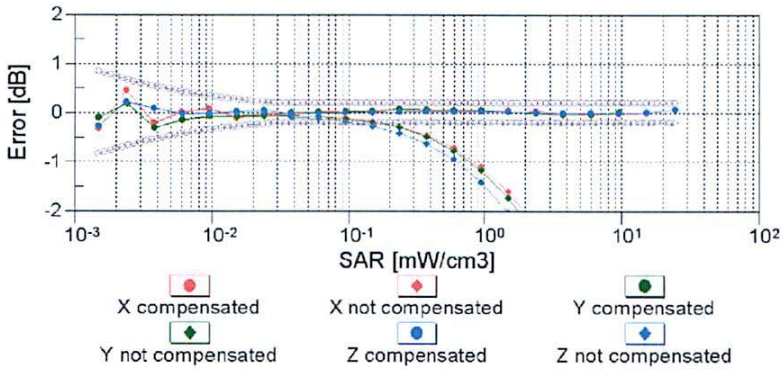




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

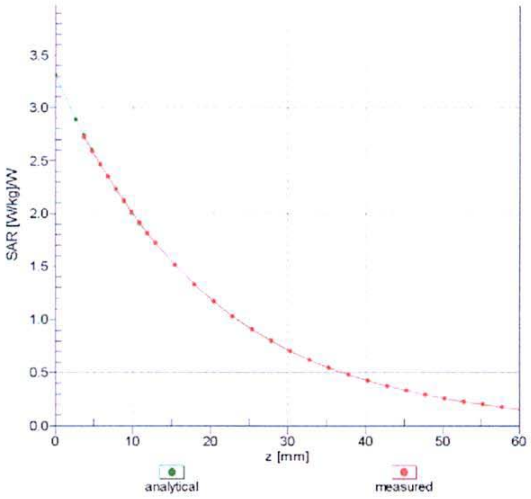




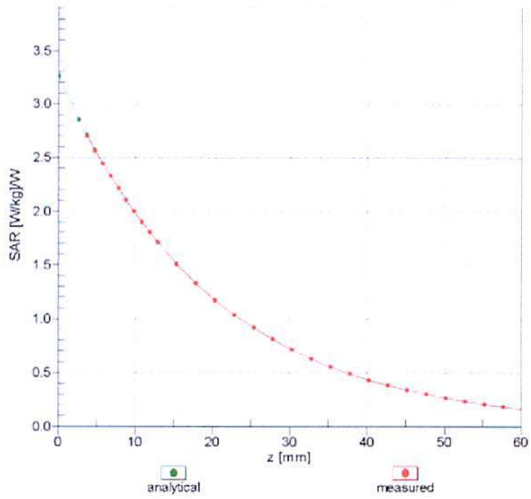
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

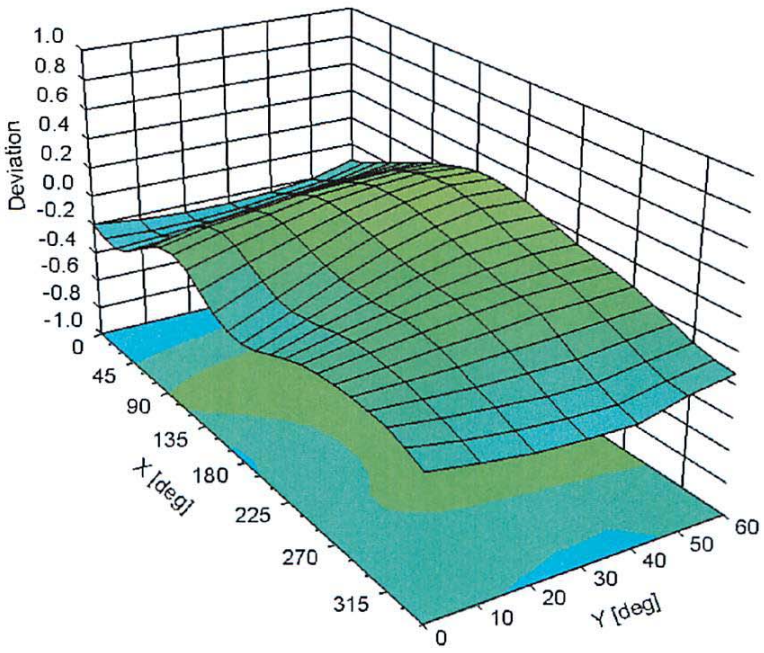


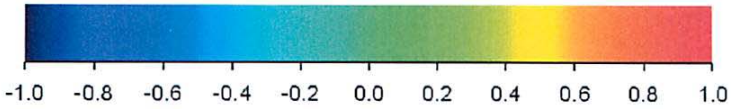
f = 835 MHz,WGLS R9 (M_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	enabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	6.8 mm
Probe Tip to Sensor X Calibration Point	2.7 mm
Probe Tip to Sensor Y Calibration Point	2.7 mm
Probe Tip to Sensor Z Calibration Point	2.7 mm
Recommended Measurement Distance from Surface	4 mm

APPENDIX G - SAM TWIN PHANTOM CERTIFICATE OF CONFORMITY

Schmid & Partner Engineering AG

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

Certificate of conformity / First Article Inspection

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

Tests

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

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

Standards

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

Conformity

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

Date 18.11.2001

Signature / Stamp

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APPENDIX H - AUDIO ACCESSORY COMBINATIONS (FCC KDB 643646 D01v01r01)

Body SAR Test Considerations for Audio Accessories without Built-in Antenna - Audio Accessory Combinations (FCC KDB 643646 D01v01r01 Page 9)			
Audio Accessory ID #	Battery a	Battery b	Battery c
	Antenna #1	Antenna #1	Antenna #1
	Body-worn #1	Body-worn #1	Body-worn #1
1	1	1	1
2	1	1	1

Notes:

1. All audio accessory options can be utilized with an antenna, battery and body-worn combination.
2. The accessory combinations evaluated for SAR are highlighted in yellow.
3. Please refer to Section 7.0 of the SAR report for description of accessory ID #.