DECLARATION OF COMPLIANCE

SAR RF EXPOSURE EVALUATION - FCC / IC C1PC

TEST LAB INFORMATION	Name	CELLTECH LABS INC.			
	Address	21-364 Lougheed Road, Kelowna, B.C. V1X 7R8 Canada			
TEST LAB ACCREDITATION	Type	ISO / IEC 17025	Accreditation	A2LA Test Lab Certificate No. 2470.01	
APPLICANT INFORMATION	Name	COBRA ELECTRONICS CORPORATION			
	Address	6500 West Cortland Street, Chicago, IL 60707 United States			
STANDARDS APPLIED	FCC	47 CFR §2.1093			
PROCEDURES APPLIED	FCC	KDB 447498 D01v05r01, KDB 865664 D01v01r02			
	FCC	KDB 865664 D02v01r01, KDB 643646 D01v01r01	IEC	62209-1:2005	
	IEEE	IEEE 1528-2013	IEC	62209-2:2010	
DEVICE CLASSIFICATION	FCC	Part 95 Family Radio Face Held Transmitter (FRF)			
DEVICE DESCRIPTION	Portable Dual-Band UHF GMRS and VHF Marine PTT Radio Transceiver				
APPLICATION TYPE	New Certification				
DATE(S) OF EVALUATION	Dec 17, 2013 – Jan 15, 2014	SAMPLES RECEIVED			

Devices Tested

FCC ID	Model	Type	Frequency Range	Manufacturer's Rated Output Power
BBOMRHH450	MR HH450	UHF GMRS VHF Marine	462.5500 - 467.7125 MHz 156.025 - 157.425 MHz	2.8 Watts 6.0 Watts +0.2W, -0.5W

Antennas Tested

Type	Description	Length (mm)	Diameter (mm)
Dual-band VHF Marine and UHF GMRS	Detachable helical monopole		

Batteries Tested

Type	Output Voltage	Capacity (mAh)
Lithium Polymer	7.4V	1000 mAh
Alkaline AA (x5)	1.5 V	n/a

Body-Warn Accessories Tested

Part Number	Description
	Detachable Belt-Clip (includes metallic components)

Audio Accessories Tested

Part Number	Description
	Speaker-Microphone

EVALUATION RESULTS

Maximum SAR Level Evaluated FCC	Head	0.452	W/kg	1g	50% PTT Duty Factor	General Population / UnControlled Exposure
	Body	1.36				
FCC Spatial Peak SAR Limit	Head /Body	1.6	W/kg	1g	50% PTT Duty Factor	General Population / UnControlled 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 for the General Population / Uncontrolled Exposure environment. The device was tested in accordance with the measurement procedures specified in IEEE Standard 1528-2013 and International Standard IEC 62209-2:2010. All measurements were performed in accordance with the SAR system manufacturer recommendations.

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

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.

Test Report Approved By		Art Voss, P.Eng.	Senior Engineer	Celltech Labs Inc.

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REVISION HISTORY			
REVISION NO.	**DESCRIPTION**	**IMPLEMENTED BY**	**RELEASE DATE**
1.0	1st Release	Art Voss	23 Jan 2014

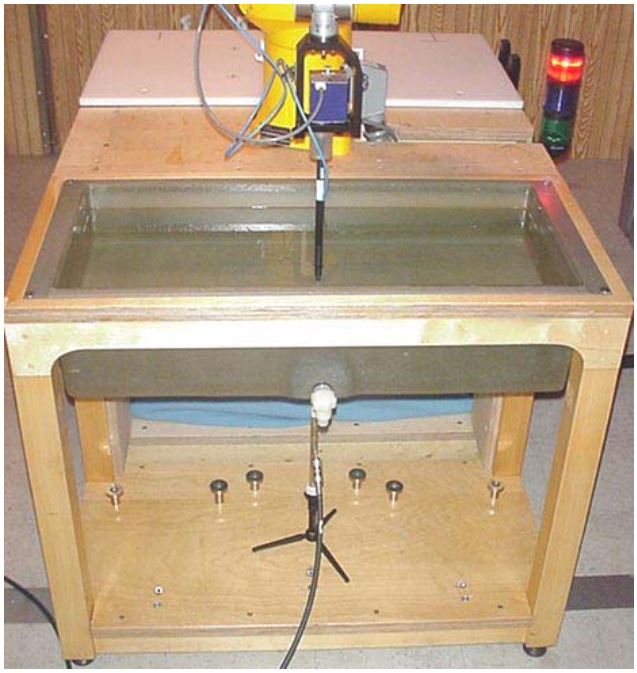
TEST REPORT SIGN-OFF			
DEVICE TESTED BY	**REPORT PREPARED BY**	**QA REVIEW BY**	**REPORT APPROVED BY**
Art Voss	Cheri Frangiadakis	Art Voss	Art Voss

1.0 INTRODUCTION

This measurement report demonstrates that the Cobra Electronics Corporation Model: MR HH450 Portable Dual-Band UHF GMRS and VHF PTT Marine Radio Transceiver complies with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) for the General Population / Uncontrolled Exposure environment. The measurement procedures described in KDB 447498 (see reference [8]), KDB 865664 (see reference [9]), IEEE Standard 1528-2013 (see reference [5]) and IEC Standard 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 utilizes a controller with built in VME-bus computer.



DASY4 SAR System with Barski Fiberglas Planar Phantom

3.0 RF CONDUCTED OUTPUT POWER MEASUREMENT

Band	Frequency MHz	Measured Power Level		Mode	Method
		dBm	Watts		
VHF Marine	156.05	38	6.3	CW	Average Conducted
	156.275	37.9	6.2		
	157.05	37.9	6.2		
	157.425	37.9	6.2		
UHF GMRS	462.5625	34.4	2.8		
	462.7125	34.4	2.8		
	462.5500	34.4	2.8		
	462.7250	34.4	2.8		

Notes

1. The test channel was selected in accordance with the procedures specified in FCC KDB 447498 (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 [15]).

4.0 NO. OF TEST CHANNELS (N_C)

Device Frequency Range	Band	N_c	Test Frequencies (MHz)
156.025 - 157.425 MHz	VHF Marine	1	156.05 MHz
462.5500 - 467.7125 MHz	UHF GMRS	1	462.5625 MHz

Note: The number of test channels (*Nc*) was calculated in accordance with the procedures specified in FCC KDB 447498 (see reference [8]).

5.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES

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

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	
150 MHz	156.05 MHz	6.05 MHz	< 25 MHz[1]
450 MHz	462.5625 MHz	12.5625 MHz	< 50 MHz[2]

Note(s)

1. At 150 MHz the probe calibration and measurement frequency interval is < 25 MHz; therefore additional steps were not required.

2. At 450 MHz The probe calibration and measurement frequency interval is < 50 MHz; therefore the additional steps are not required.

6.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS

Date: 12/17/2013		Frequency: 450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	60.33	0.85	56.7	0.94	6.40%	-9.57%
0.360	59.73	0.87	56.7	0.94	5.34%	-7.45%
0.370	59.8	0.88	56.7	0.94	5.47%	-6.38%
0.380	59.72	0.89	56.7	0.94	5.33%	-5.32%
0.390	58.5	0.91	56.7	0.94	3.17%	-3.19%
0.400	59.3	0.91	56.7	0.94	4.59%	-3.19%
0.410	58.59	0.9	56.7	0.94	3.33%	-4.26%
0.420	58.52	0.93	56.7	0.94	3.21%	-1.06%
0.430	58.83	0.93	56.7	0.94	3.76%	-1.06%
0.440	57.65	0.93	56.7	0.94	1.68%	-1.06%
0.450	58.4	0.94	56.7	0.94	3.00%	0.00%
0.460	57.9	0.95	56.7	0.94	2.12%	1.06%
0.462625*	57.9	0.95	56.7	0.94	2.12%	1.06%
0.470	57.95	0.95	56.7	0.94	2.20%	1.06%
0.480	57.67	0.97	56.7	0.94	1.71%	3.19%
0.490	57.59	0.97	56.7	0.94	1.57%	3.19%
0.500	58.03	0.98	56.7	0.94	2.35%	4.26%
0.510	57.58	0.99	56.7	0.94	1.55%	5.32%
0.520	57.38	0.98	56.7	0.94	1.20%	4.26%
0.530	57.56	1.01	56.7	0.94	1.52%	7.45%
0.540	57.39	1.02	56.7	0.94	1.22%	8.51%
0.550	56.91	1.03	56.7	0.94	0.37%	9.57%

**interpolated using DASY4 software*

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Dec 17	450 Body	26°C	23.0 °C	≥ 15 cm	102.0 kPa	15%	1000

FLUID DIELECTRIC PARAMETERS

Date: 12/18&19/2013		Frequency: 450 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	47.22	0.81	43.5	0.87	8.55%	-6.90%
0.360	45.79	0.82	43.5	0.87	5.26%	-5.75%
0.370	46.5	0.83	43.5	0.87	6.90%	-4.60%
0.380	46.72	0.83	43.5	0.87	7.40%	-4.60%
0.390	45.95	0.83	43.5	0.87	5.63%	-4.60%
0.400	46.19	0.86	43.5	0.87	6.18%	-1.15%
0.410	45.69	0.86	43.5	0.87	5.03%	-1.15%
0.420	45.12	0.88	43.5	0.87	3.72%	1.15%
0.430	45.32	0.89	43.5	0.87	4.18%	2.30%
0.440	45.17	0.9	43.5	0.87	3.84%	3.45%
0.450	44.54	0.9	43.5	0.87	2.39%	3.45%
0.460	44.56	0.91	43.5	0.87	2.44%	4.60%
0.4625625*	44.4	0.91	43.5	0.87	2.07%	4.60%
0.470	43.94	0.91	43.5	0.87	1.01%	4.60%
0.480	44	0.93	43.5	0.87	1.15%	6.90%
0.490	44.54	0.93	43.5	0.87	2.39%	6.90%
0.500	44.18	0.95	43.5	0.87	1.56%	9.20%
0.510	44.09	0.95	43.5	0.87	1.36%	9.20%
0.520	43.91	0.96	43.5	0.87	0.94%	10.34%
0.530	44.02	0.99	43.5	0.87	1.20%	13.79%
0.540	43.09	0.98	43.5	0.87	-0.94%	12.64%
0.550	42.98	0.99	43.5	0.87	-1.20%	13.79%

**interpolated using DASY4 software*

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Dec 18	450 Head	25°C	22.6°C	≥ 15 cm	101.6kPa	15%	1000
Dec 19	450 Head	25°C	23.5°C	≥ 15 cm	101.9kPa	13%	1000

FLUID DIELECTRIC PARAMETERS

Date: 12/20&24/2013		Frequency: 150 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.100	65.53	0.78	61.9	0.8	5.86%	-2.50%
0.110	61.42	0.74	61.9	0.8	-0.78%	-7.50%
0.120	63.97	0.76	61.9	0.8	3.34%	-5.00%
0.130	59.64	0.75	61.9	0.8	-3.65%	-6.25%
0.140	63.56	0.77	61.9	0.8	2.68%	-3.75%
0.150	61.71	0.78	61.9	0.8	-0.31%	-2.50%
0.15605*	61.6	0.78	61.9	0.8	-0.48%	-2.50%
0.160	61.52	0.78	61.9	0.8	-0.61%	-2.50%
0.170	59.76	0.79	61.9	0.8	-3.46%	-1.25%
0.180	60.05	0.79	61.9	0.8	-2.99%	-1.25%
0.190	60.25	0.79	61.9	0.8	-2.67%	-1.25%
0.200	61.03	0.81	61.9	0.8	-1.41%	1.25%

**interpolated using DASY4 software*

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Dec 20	150 Body	25°C	21.8°C	≥ 15 cm	101.5kPa	13%	1000
Dec 14	150 Body	25°C	22.4°C	≥ 15 cm	103.4kPa	18%	1000

FLUID DIELECTRIC PARAMETERS

Date: 01/13/2014		Frequency: 450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	57.96	0.86	56.7	0.94	2.22%	-8.51%
0.360	57.75	0.87	56.7	0.94	1.85%	-7.45%
0.370	57.81	0.86	56.7	0.94	1.96%	-8.51%
0.380	57.84	0.89	56.7	0.94	2.01%	-5.32%
0.390	57.06	0.89	56.7	0.94	0.63%	-5.32%
0.400	57.52	0.89	56.7	0.94	1.45%	-5.32%
0.410	57.14	0.9	56.7	0.94	0.78%	-4.26%
0.420	57.84	0.91	56.7	0.94	2.01%	-3.19%
0.430	57.56	0.92	56.7	0.94	1.52%	-2.13%
0.440	56.9	0.94	56.7	0.94	0.35%	0.00%
0.450	56.95	0.93	56.7	0.94	0.44%	-1.06%
0.460	56.22	0.96	56.7	0.94	-0.85%	2.13%
0.4625625*	56.3	0.963	56.7	0.94	-0.71%	2.45%
0.470	56.46	0.97	56.7	0.94	-0.42%	3.19%
0.480	55.07	0.99	56.7	0.94	-2.87%	5.32%
0.490	55.86	0.99	56.7	0.94	-1.48%	5.32%
0.500	55.6	1.01	56.7	0.94	-1.94%	7.45%
0.510	55.34	1.01	56.7	0.94	-2.40%	7.45%
0.520	55.72	1	56.7	0.94	-1.73%	6.38%
0.530	55.57	1.01	56.7	0.94	-1.99%	7.45%
0.540	55.54	1.02	56.7	0.94	-2.05%	8.51%
0.550	55.65	1.03	56.7	0.94	-1.85%	9.57%

**interpolated using DASY4 software*

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Jan 13	450 Body	25°C	22.7 °C	≥ 15 cm	101.9 kPa	20%	1000

FLUID DIELECTRIC PARAMETERS

Date: 01/15/2014		Frequency: 150 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.100	55.41	0.7	52.3	0.76	5.95%	-7.89%
0.110	50.54	0.7	52.3	0.76	-3.37%	-7.89%
0.120	47.93	0.68	52.3	0.76	-8.36%	-10.53%
0.130	49.2	0.7	52.3	0.76	-5.93%	-7.89%
0.140	52.37	0.7	52.3	0.76	0.13%	-7.89%
0.150	51.26	0.73	52.3	0.76	-1.99%	-3.95%
0.15605*	52.5	0.736	52.3	0.76	0.38%	-3.16%
0.160	53.37	0.74	52.3	0.76	2.05%	-2.63%
0.170	52.31	0.75	52.3	0.76	0.02%	-1.32%
0.180	53.42	0.76	52.3	0.76	2.14%	0.00%
0.190	50.78	0.78	52.3	0.76	-2.91%	2.63%
0.200	50.17	0.76	52.3	0.76	-4.07%	0.00%

**interpolated using DASY4 software*

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m^3)
Jan 15	150 Head	25 °C	23.3 °C	≥ 15 cm	103.4 kPa	20%	1000

7.0 SAR MEASUREMENT SUMMARY

SAR EVALUATION RESULTS

Test Date	Plot	Band	Freq.	Battery Type	Cond. Power Before Test	Body-Worn & Audio Accessories	Device Distance to Planar Phantom		Measured SAR (before droop) 1g (W/kg) PTT Duty Factor		SAR Drift During Test	Scaled SAR (with droop) 1g (W/kg) PTT Duty Factor	
			MHz		dBm		DUT	Antenna	100%	50%	dB	100%	50%
FACE-HELD SAR													
Dec 18	F1	GMRS	462.5625	Li-ion	34.4	N/A	2.5 cm	4.3 cm	0.197	**0.099**	-0.688	0.231	0.115
Dec 19	F2	GMRS	462.5625	Alkaline	34.4	N/A	2.5 cm	4.3 cm	0.182	**0.091**	-0.806	0.219	0.110
Jan 15	F3	Marine	156.05	Li-ion	38	N/A	2.5 cm	4.3 cm	0.903	**0.452**	-0.275	0.962	0.481
Jan 15	F4	Marine	156.05	Alkaline	38	N/A	2.5 cm	4.3 cm	0.787	**0.394**	-0.720	0.929	0.464
BODY-WORN SAR													
Dec 17	B1	GMRS	462.5625	Alkaline	34.4	Belt-Clip Spk-Mic	1.5 cm	3.2 cm	2.35	**1.18**	-0.768	2.81	1.40
Jan 13 Repeat	B4	GMRS	462.5625	Aklaline	34.4	Belt-Clip Spk-Mic	1.5 cm	3.2 cm	2.68	**1.34**	-0.130	2.76	1.38
Jan 13	B5	GMRS	462.5625	Li-ion	34.4	Belt-Clip Spk-Mic	1.5 cm	3.2 cm	2.71	**1.36**	-0.302	2.91	1.45
Jan 14 Repeat	B6	GMRS	462.5625	Li-ion	34.4	Belt-Clip Spk-Mic	1.5 cm	3.2 cm	2.75	**1.38**	-0.125	2.83	1.42
Dec 24	B2	Marine	156.05	Li-ion	38	Belt-Clip Spk-Mic	1.5 cm	3.2 cm	0.575	**0.288**	-1.28	0.772	0.386
Dec 24	B3	Marine	156.05	Alkaline	38	Belt-Clip Spk-Mic	1.5 cm	3.2 cm	0.559	**0.280**	-1.42	0.775	0.388

SAR LIMIT(S)	HEAD / BODY	SPATIAL PEAK	RF EXPOSURE CATEGORY
FCC 47 CFR 2.1093	1.6 W/kg	averaged over 1 gram	General Population / Uncontrolled

Notes

1. Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.
2. The SAR droop measured by the DASY4 system for the duration of the SAR evaluation was added to the measured SAR level to report the scaled SAR result as shown in the above test data table.
3. Per KDB 447498 D01v05r01, a repeatability test is required if SAR is half of the limit.

8.0 SAR SCALING (MANUFACTURER TOLERANCE)

SCALING OF MAXIMUM SAR LEVELS TO MANUFACTURER'S TUNE-UP TOLERANCE SPECIFICATION

Test Config.	Test Freq. (MHz)	Cond. Power	Drift	SAR Level 1g (50% PTT d/f)	Scaling up to Manuf. Upper Tol. Power Spec.	Scaled SAR (50% PTT d/f) 1g (W/kg)
		dBm	dB	W/kg		

Notes:

1. No scaling required. Conducted power equaled or slightly exceeded manufacturer's spec.

9.0 DETAILS OF SAR EVALUATION

The DUT was compliant for localized Specific Absorption Rate (General Population / Uncontrolled Exposure) based on the test provisions and conditions described below. The detailed test setup photographs are shown in Appendix D.

1. The face-held SAR evaluations were performed with the front of the DUT 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 Body-Worn SAR evaluation were performed with the back of the DUT with Belt-Clip placed parallel to the outer surface of the planar phantom with a speaker-microphone audio accessory.
3. The area scan evaluation was performed with a fully charged battery. After the area scan was completed the radio was allowed to cool for 10 minutes prior to the zoom scan evaluation.
4. The DUT was evaluated for SAR in an 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 SAR drift of the DUT was measured by the DASY4 system for the duration of the SAR evaluation and a SAR-versus-Time power droop evaluation was performed (see Appendix A).
6. The fluid temperature remained within +/-2°C from the fluid dielectric parameter measurement to the completion of the SAR evaluation.
7. The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluation using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).

10.0 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.

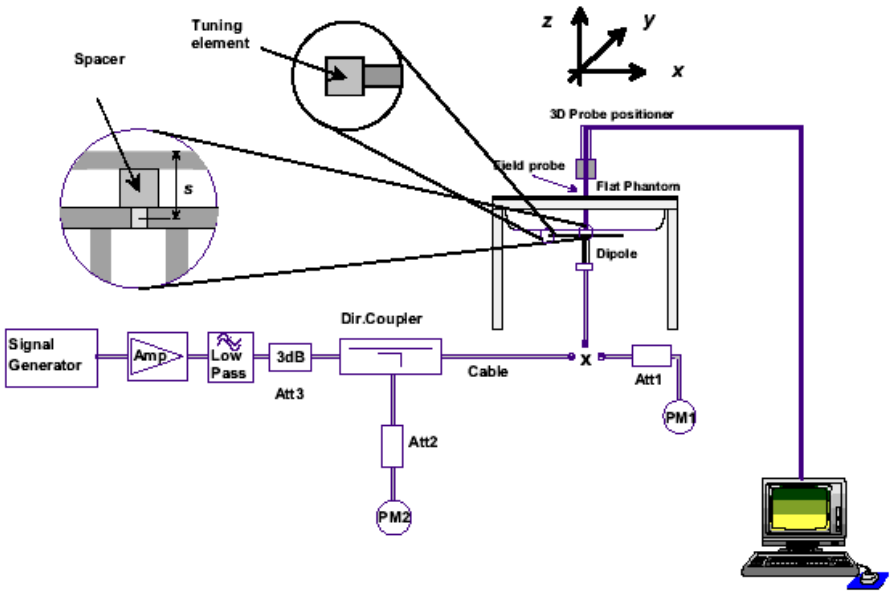
11.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations, system verifications were performed with a planar phantom and SPEAG 450 MHz and SPEAG 300 MHz dipoles (see Appendix B) in accordance with the procedures described in FCC KDB 865664 (see reference [9]). At 150 MHz, the system was verified to meet the internally generated SAR target using 150MHz tissue-equivalent medium with a 300 MHz validation dipole transmitting at 300 MHz (see Appendix E). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C for measured fluid dielectric parameters). A forward power of 398 mW was applied to the dipole for 150 Head and 450 Head and Body. A forward power of 250 mW was applied for 150 Body.

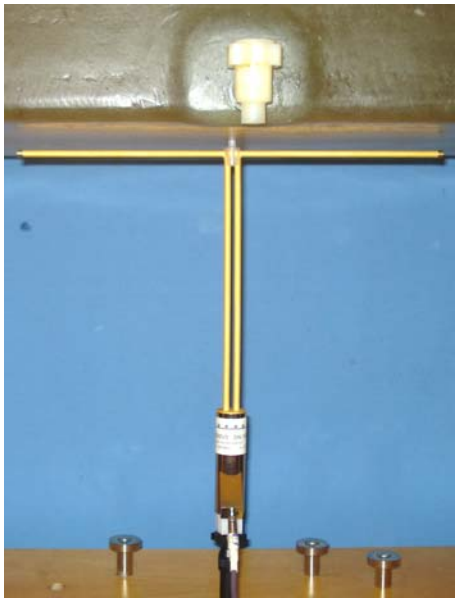
SYSTEM PERFORMANCE CHECK EVALUATION

Test Date	Equiv. Tissue	SAR 1g (W/kg)			Dielectric Constant ε_r			Conductivity σ (mho/m)			ρ (Kg/m^3)	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
	Freq. (MHz)	Target	Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.	Dev.						
Dec 17	Body 450	1.81 ±10%	1.75	-3.3%	56.7 ±5%	58.4	+3.0%	0.94 ±5%	0.94	0.0%	1000	26	23.0	≥ 15	15	102.0
Dec 18	Head 450	1.87 ±10%	1.82	-2.7%	43.5 ±5%	44.5	+2.3%	0.87 ±5%	0.90	-3.4%	1000	25	23.6	≥ 15	15	101.6
Dec 20	Body 150	0.653 ±10%	0.598	-8.4%	61.9 ±5%	61.7	-0.3%	0.80 ±5%	0.78	-2.5%	1000	25	21.8	≥ 15	13	101.5
Jan 13	Body 450	1.81 ±10%	1.80	-0.6%	56.7 ±5%	57.0	+0.5%	0.94 ±5%	0.93	-1.1%	1000	26	22.7	≥ 15	20	101.9
Jan 15	Head 150	0.953 ±10%	0.908	-4.7%	52.3 ±5%	51.3	-1.9%	0.76 ±5%	0.73	-3.9%	1000	22	22.3	≥ 15	32	102.0

Notes		
	1.	The 150MHz SAR values have a coefficient of variation < 3%.
	2.	The target dielectric parameters are the nominal values from the SAR system manufacturer's dipole calibration (see Appendix E).
	3.	The fluid temperature was measured prior to and after the system performance check evaluations. The fluid temperature remained within +/-2°C during the system performance check evaluations.
	4.	The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).



System Performance Check Measurement Setup (IEEE Standard 1528-2013)



SPEAG 300 MHz Validation Dipole Setup

12.0 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 [12] and [13]) in accordance with the procedures and requirements specified in IEEE Standard 1528-2013 (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	**150 MHz HEAD**	**150 MHZ BODY**	**450 MHz HEAD**	**450 MHz BODY**
Water	38.35 %	46.6 %	38.56 %	52.00 %
Sugar	55.5%	49.7%	56.32 %	45.65 %
Salt	5.15%	2.6 %	3.95 %	1.75 %
HEC	0.9%	1.0 %	0.98 %	0.50 %
Bactericide	0.1%	0.1 %	0.19 %	0.10 %

13.0 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.			

14.0 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 80
	Postprocessing Software: SEMCAD, V1.8 Build 186
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	Barski Planar Phantom
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 70 liters
Type	ELI Planar Phantom
Shell Material	
Thickness	
Volume	

15.0 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 Body 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 Body tissue (rotation around probe axis) ± 0.4 dB in Body 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

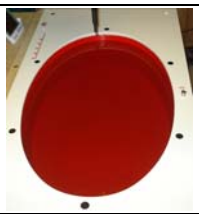
16.0 BARSKI PLANAR PHANTOM

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

Barski Planar Phantom

17.0 ELI PLANAR PHANTOM

The ELI planar phantom is



ELI Planar Phantom

18.0 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. Face-held SAR evaluations (PTT radios) are performed with the device holder in the body axis.

Device Holder

19.0 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	19-Apr-12	Biennial
x	-ET3DV6 E-Field Probe	00017	1590	24-Apr-13	Annual
x	-D300V3 Validation Dipole	00216	1009	17-Apr-12 / 8-Jan-13	Triennial
x	-D450V3 Validation Dipole	00221	1068	27-Apr-12	Triennial
x	-Barski Planar Phantom	00155	03-01	CNR	CNR
x	-ELI Planar Phantom			CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	03-May-12	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833542	03-May-12	Biennial
x	Gigatronics 80334A Power Sensor	-	1837001	03-May-12	Biennial
x	HP 8753ET Network Analyzer	00134	US39170292	26-Apr-12	Biennial
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	02-May-12	Biennial
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

20.0 REFERENCES

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

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

[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 1528-2013 - “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 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)”.

[8] Federal Communications Commission, Office of Engineering and Technology - “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”; KDB 447498 D01 v05: October 2012.

[9] Federal Communications Commission, Office of Engineering and Technology - “SAR Measurement Requirements for 100 MHz to 6 GHz”; KDB 865664 D01v01: October 2012.

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

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

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

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

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

[16] Industry Canada - “General Requirements and Information for the Certification of Radiocommunication Equipment”, Radio Standards Specification RSS-Gen Issue 3: December 2010.