


	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

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)	ISO 17025	A2LA Test Lab Certificate No. 2470.01			
Applicant Information	Name	COBRA ELECTRONICS CORPORATION			
	Address	6500 West Cortlan Street, Chicago, IL 60707 United States			
Application Type(s)	FCC	TCB Certification	IC	CB Certification	
Standard(s) Applied	FCC	47 CFR §2.1093	IC	Health Canada Safety Code 6	
Procedure(s) Applied	FCC	OET 65, Supplement C	FCC	KDB 447498 D01v05	
	IC	RSS-102 Issue 4	IEEE	Standard 1528-2003	
Device Classification(s)	FCC	Licensed Non-Broadcast Transmitter Held to Face (TNF)			
	IC	Maritime Radio Transmitter and Receiver (RSS-182)			
Device RF Exposure Category	FCC/IC	General Population / Uncontrolled Environment			
Device Identifier(s)	FCC ID:	BBOMRHH500			
	IC:	906A-MRHH500			
Device Model(s)	Model(s)	MR HH500	MR HH350 (not tested)		
	Note: Only model difference is that the MR HH350 does not have Bluetooth or voice recording. Models are mechanically and electrically identical.				
Co-located Transmitters	Bluetooth (7mW) - not able to transmit simultaneously with radio.				
Test Sample Serial No.	#8 (Identical Prototype)				
Date of Sample Receipt	Dec. 11, 2012	Date(s) of Evaluations		Dec. 17, 2012	
Test Sample Hardware Rev. No.	n/a	Test Sample Firmware Rev. No.		B6CD	
Device-Under-Test Description (DUT)	Portable FM VHF Push-To-Talk (PTT) Marine Radio Transceiver with Bluetooth				
VHF Transmit Frequency Range(s)	156.025 - 157.425 MHz (VHF Marine Band)				
Manuf. Rated Output Power	5.0 W +/- 0.8 W (average conducted) (Hi power setting)				
Measured RF Output Power	5.2 W	37.2 dBm	Conducted	156.7 MHz (Ch. 14)	
Battery Type Tested	Lithium-Ion	7.4 V	1000 mAh	P/N: 110-350	
Antenna Type Tested	Removable Stubby			P/N: N/A	
Body-worn Accessory Tested	Belt-Clip (contains metal)			P/N: 240-003	
Audio Accessory Tested	Speaker-Microphone			P/N: CM330-001	
Max. SAR Level(s) Evaluated	Face-held	0.299 W/kg	1g	50% PTT duty factor	General Population / Uncontrolled
	Body-worn	0.630 W/kg	1g	50% PTT duty factor	
FCC/IC Spatial Peak SAR Limit	Head/Body	1.6 W/kg	1g	50% PTT duty factor	
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 General Population / Uncontrolled Exposure environment. The device was tested in accordance with the measurement procedures specified in FCC OET Bulletin 65, Supplement C (Edition 01-01), Industry Canada RSS-102 Issue 4, IEEE Standard 1528-2003 and IEC International Standard 62209-2:2010. 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.					
The results and statements contained in this report pertain only to the device(s) evaluated.					
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Test Report Approved By		Mike Meaker	Engineering Technologist	Celltech Labs Inc.	

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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REVISION HISTORY

REVISION NO.	DESCRIPTION	IMPLEMENTED BY	RELEASE DATE
1.0	1st Release	Mike Meaker	Dec. 19, 2012

TEST REPORT SIGN-OFF

DEVICE TESTED BY	REPORT PREPARED BY	QA REVIEW BY	REPORT APPROVED BY
Mike Meaker	Mike Meaker	Glen Westwell	Mike Meaker

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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1.0 INTRODUCTION

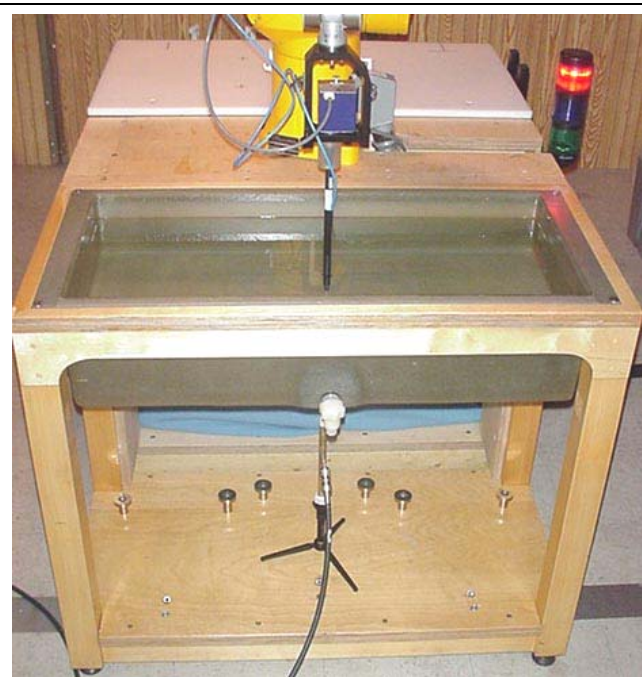
This measurement report demonstrates that the Cobra Electronics Corporation Models: MR HH500 and MR HH350 Portable VHF PTT Marine Radio Transceivers comply with the SAR (Specific Absorption Rate) RF exposure requirements specified in FCC 47 CFR §2.1093 (see reference [1]) and Health Canada's Safety Code 6 (see reference [2]) for the General Population / Uncontrolled Exposure environment. The measurement procedures described in FCC OET Bulletin 65, Supplement C 01-01 (see reference [3]), IC RSS-102 Issue 4 (see reference [4]), IEEE Standard 1528-2003 (see reference [5]) and IEC Standard 62209-2:2010 (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 predecoder 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 Plexiglas side planar phantom



DASY4 SAR System with Barski Fiberglass Planar Phantom

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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3.0 RF CONDUCTED OUTPUT POWER MEASUREMENT

Band	Frequency	Channel	Mode	Power Setting	Measured Power Level		Method
					dBm	Watts	
VHF	156.7 MHz	14	CW	Hi	37.2	5.2	Average Conducted
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 level of the DUT was measured by Celltech prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter at the antenna of the DUT in accordance with FCC 47 CFR §2.1046 (see reference [13]) and IC RSS-Gen (see reference [14]).							


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	156.7 MHz
Note: The number of test channels (N_c) was calculated in accordance with the procedures specified in FCC KDB 447498 (see reference [7]).			

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 \geq 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	± 25 MHz \leq 300 MHz
150 MHz	156.7 MHz	6.7 MHz	$<$ 25 MHz
Note: The probe calibration and measurement frequency interval is $<$ 25 MHz; therefore additional steps were not required.			

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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6.0 ACCESSORY LISTING



Accessory ID # for Test Report	ACCESSORY CATEGORY: ANTENNA		
	Part Number	Description	SAR Evaluation
1	N/A	Detachable Stubby Antenna	Yes
Accessory ID # for Test Report	ACCESSORY CATEGORY: BATTERY		
	Part Number	Description	SAR Evaluation
a	110-350	Li-ion Battery 7.4V, 1000mAh	Yes
b	110-012	Alkaline Battery case	No ¹
Accessory ID # for Test Report	ACCESSORY CATEGORY: BODY-WORN		
	Part Number	Description	SAR Evaluation
1	240-003	Belt-clip (contains metal)	Yes
Accessory ID # for Test Report	ACCESSORY CATEGORY: AUDIO		
	Part Number	Description	SAR Evaluation
A	CM330-001	Speaker-Microphone	Yes

Manufacturer's disclosed accessory listing provided by Cobra Electronics Corporation.

Notes:

1. Alkaline battery was not tested based on lower output power capability and inability to sustain hi power mode transmissions.


Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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7.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS						
Date: 12/17/2012		Frequency: 300 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.200	50.91	0.77	45.3	0.87	12.38%	-11.49%
0.210	50.67	0.77	45.3	0.87	11.85%	-11.49%
0.220	49.21	0.77	45.3	0.87	8.63%	-11.49%
0.230	49.54	0.79	45.3	0.87	9.36%	-9.20%
0.240	48.36	0.78	45.3	0.87	6.75%	-10.34%
0.250	46.41	0.81	45.3	0.87	2.45%	-6.90%
0.260	48.23	0.81	45.3	0.87	6.47%	-6.90%
0.270	47.1	0.83	45.3	0.87	3.97%	-4.60%
0.280	47.1	0.84	45.3	0.87	3.97%	-3.45%
0.290	46.52	0.83	45.3	0.87	2.69%	-4.60%
0.300	46.87	0.86	45.3	0.87	3.47%	-1.15%
0.310	45.57	0.85	45.3	0.87	0.60%	-2.30%
0.320	44.99	0.85	45.3	0.87	-0.68%	-2.30%
0.330	45.59	0.86	45.3	0.87	0.64%	-1.15%
0.340	44.67	0.88	45.3	0.87	-1.39%	1.15%
0.350	44.78	0.87	45.3	0.87	-1.15%	0.00%
0.360	44.02	0.9	45.3	0.87	-2.83%	3.45%
0.370	43.95	0.9	45.3	0.87	-2.98%	3.45%
0.380	43.42	0.92	45.3	0.87	-4.15%	5.75%
0.390	43.15	0.91	45.3	0.87	-4.75%	4.60%
0.400	43.5	0.93	45.3	0.87	-3.97%	6.90%



Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m ³)
Dec 17	300 Head	22.0 °C	21.5 °C	≥ 15 cm	98.8 kPa	30%	1000

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500		
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz			
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FLUID DIELECTRIC PARAMETERS						
Date: 12/17/2012		Frequency: 150 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.050	81.71	0.64	52.3	0.76	56.23%	-15.79%
0.060	68.65	0.71	52.3	0.76	31.26%	-6.58%
0.070	66.37	0.7	52.3	0.76	26.90%	-7.89%
0.080	59.8	0.69	52.3	0.76	14.34%	-9.21%
0.090	61.65	0.69	52.3	0.76	17.88%	-9.21%
0.100	62.01	0.71	52.3	0.76	18.57%	-6.58%
0.110	56.21	0.71	52.3	0.76	7.48%	-6.58%
0.120	54.35	0.71	52.3	0.76	3.92%	-6.58%
0.130	55.16	0.74	52.3	0.76	5.47%	-2.63%
0.140	52.76	0.73	52.3	0.76	0.88%	-3.95%
0.150	54.12	0.73	52.3	0.76	3.48%	-3.95%
0.1567*	52.4	0.75	52.3	0.76	0.19%	-1.32%
0.160	51.61	0.76	52.3	0.76	-1.32%	0.00%
0.170	52.39	0.76	52.3	0.76	0.17%	0.00%
0.180	50.76	0.79	52.3	0.76	-2.94%	3.95%
0.190	51.29	0.81	52.3	0.76	-1.93%	6.58%
0.200	50.21	0.79	52.3	0.76	-4.00%	3.95%
0.210	48.62	0.81	52.3	0.76	-7.04%	6.58%
0.220	48.52	0.8	52.3	0.76	-7.23%	5.26%
0.230	46.86	0.81	52.3	0.76	-10.40%	6.58%
0.240	47.09	0.83	52.3	0.76	-9.96%	9.21%
0.250	46.51	0.84	52.3	0.76	-11.07%	10.53%

*interpolated using DASY4 software


Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m ³)
Dec 17	150 Head	22.0 °C	21.5 °C	≥ 15 cm	98.8 kPa	30%	1000



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FLUID DIELECTRIC PARAMETERS						
Date: 12/17/2012		Frequency: 150 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.050	92.67	0.69	61.9	0.8	49.71%	-13.75%
0.060	81.95	0.75	61.9	0.8	32.39%	-6.25%
0.070	78.84	0.74	61.9	0.8	27.37%	-7.50%
0.080	70.25	0.75	61.9	0.8	13.49%	-6.25%
0.090	69.26	0.72	61.9	0.8	11.89%	-10.00%
0.100	71.81	0.74	61.9	0.8	16.01%	-7.50%
0.110	64.07	0.73	61.9	0.8	3.51%	-8.75%
0.120	64.47	0.73	61.9	0.8	4.15%	-8.75%
0.130	66.8	0.77	61.9	0.8	7.92%	-3.75%
0.140	62.32	0.76	61.9	0.8	0.68%	-5.00%
0.150	64.69	0.76	61.9	0.8	4.51%	-5.00%
0.1567*	64.2	0.767	61.9	0.8	3.72%	-4.13%
0.160	63.92	0.77	61.9	0.8	3.26%	-3.75%
0.170	64.51	0.78	61.9	0.8	4.22%	-2.50%
0.180	62.11	0.79	61.9	0.8	0.34%	-1.25%
0.190	62.94	0.8	61.9	0.8	1.68%	0.00%
0.200	61.18	0.81	61.9	0.8	-1.16%	1.25%
0.210	60.48	0.82	61.9	0.8	-2.29%	2.50%
0.220	59.38	0.81	61.9	0.8	-4.07%	1.25%
0.230	58.35	0.82	61.9	0.8	-5.74%	2.50%
0.240	58.64	0.83	61.9	0.8	-5.27%	3.75%
0.250	59.08	0.85	61.9	0.8	-4.56%	6.25%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m ³)
Dec 17	150 Head	22.0 °C	20.8 °C	≥ 15 cm	98.8 kPa	30%	1000

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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8.0 SAR MEASUREMENT SUMMARY

SAR EVALUATION RESULTS														
Test Config.	Test Date	Freq.	Ch.	Battery Type	Cond. Power Before Test	Accessories		Device Distance to Planar Phantom		Measured SAR (before droop) 1g (W/kg)		SAR Drift During Test dB	Scaled SAR (with droop) 1g (W/kg)	
		MHz			Watts	Body-worn	Audio	DUT	Antenna	PTT Duty Factor			PTT Duty Factor	
					100%	50%	100%	50%						
FACE	Dec 17	156.7	14	Li-ion	5.2	-	-	2.5 cm	3.9 cm	0.537	0.269	-0.248	0.569	0.284
BODY	Dec 17	156.7	14	Li-ion	5.2	Belt-clip	Spkr-mic	1.5 cm	3.0 cm	1.13	0.565	0.150	n/a	n/a
SAR LIMIT(S)					HEAD			SPATIAL PEAK		RF EXPOSURE CATEGORY				
FCC 47 CFR 2.1093		Health Canada Safety Code 6			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.	The highest measured SAR test was < 0.8 W/kg. Therefore repeatability measurements were not required according to the procedures of FCC KDB 865664 (see reference [8]).													


9.0 SAR SCALING (MANUFACTURER TOLERANCE)




SAR SCALING TO MANUFACTURER'S MAX. UPPER TOLERANCE SPEC.					
Test Config.	Test Freq. (MHz)	Measured Conducted Power (Watts)	Measured SAR Level 1g (W/kg)*	Scaling to Max. Conducted Power Level (5.8 Watts)	Scaled SAR Level 1g (W/kg)*
Face	156.7	5.2	0.269	+ 0.47 dB	0.299
Body	156.7	5.2	0.565	+ 0.47 dB	0.630

*50% PTT duty-cycle

10.0 CO-LOCATED TRANSMITTERS

The MR HH500 model is equipped with Bluetooth. However, the DUT does not allow simultaneous transmission of the Bluetooth and VHF Transmitters. The Bluetooth (7mW) is also below the 10mW threshold for SAR testing, so no testing is required to show compliance, according to KDB 447498 D01v01 (see reference{7}).

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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11.0 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 evaluation was 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 was performed with the belt-clip body-worn accessory attached to the back of the DUT in a parallel-touch position to the outer surface of the planar phantom.
3. The body-worn SAR evaluation was performed with the customer-supplied speaker-microphone audio accessory connected to the DUT.
4. Each evaluation was performed with a fully charged battery.
5. The DUT was evaluated with the Li-ion battery pack only. The DUT also has a 5x AA Cell Alkaline battery case, but it cannot provide enough voltage to reach the maximum rated power of 5.8W. Additionally, the Alkaline batteries were not able to sustain a transmission at the maximum transmitter power setting for the duration of a SAR evaluation.
6. 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.
7. 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).
8. The fluid temperature remained within +/-2°C from the fluid dielectric parameter measurement to the completion of the SAR evaluation.
9. 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).

12.0 SAR EVALUATION PROCEDURES

- a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.
(ii) For body-worn and face-held devices a planar phantom was used.
- b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 15mm x 15mm.
An area scan was determined as follows:
- c. Based on the defined area scan grid, a more detailed grid is created to increase the points by a factor of 10. The interpolation function then evaluates all field values between corresponding measurement points.
- d. A linear search is applied to find all the candidate maxima. Subsequently, all maxima are removed that are >2 dB from the global maximum. The remaining maxima are then used to position the cube scans.
A 1g and 10g spatial peak SAR was determined as follows:
- e. Extrapolation is used to find the points between the dipole center of the probe and the surface of the phantom. This data cannot be measured, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.4 mm (see probe calibration document in Appendix F). The extrapolation was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.
- f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).
- g. A zoom scan volume of 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.

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13.0 SYSTEM PERFORMANCE CHECK

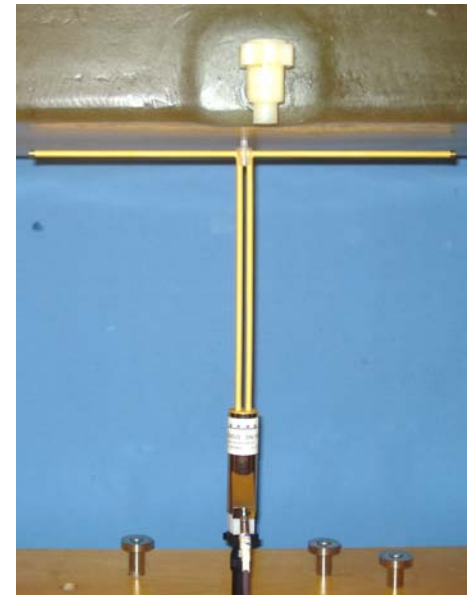
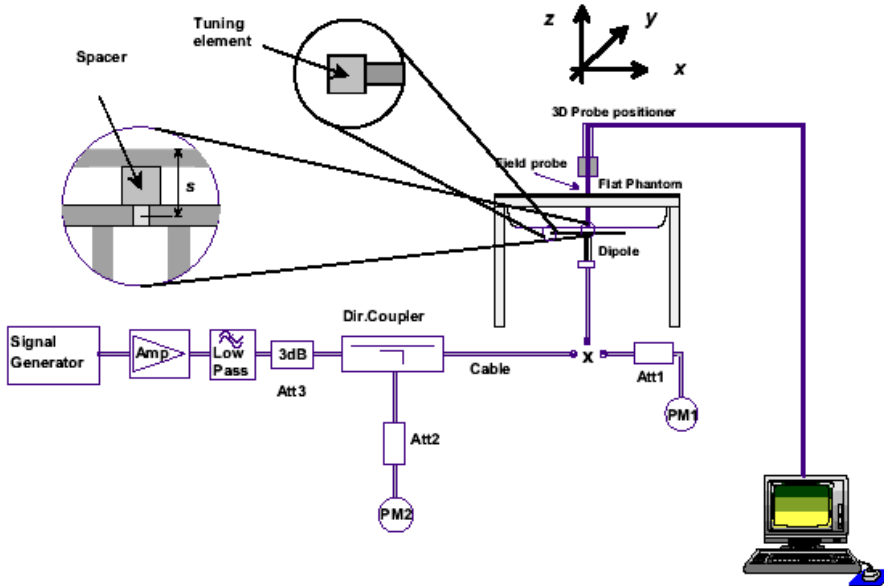
Prior to the SAR evaluations system verifications were performed with a planar phantom and 300 MHz SPEAG validation dipole (see Appendix B) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]). The dielectric parameters of the simulated tissue mixtures were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C). A forward power of 398 mW was applied to the dipole. The system was verified to a tolerance of $\pm 10\%$ from the system manufacturer's dipole calibration target SAR value using 300 MHz tissue-equivalent medium (see Appendix E). Additionally the system was verified to meet the internally generated SAR target using 150MHz tissue-equivalent medium with a 300 MHz SPEAG validation dipole transmitting at 300 MHz according to the procedures of FCC KDB 865664 D01v01 (see reference [8]) (See appendix E).

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)
		Target	Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.	Dev.						
Dec 17	Head 300	1.17 $\pm 10\%$	1.16	-0.9%	45.3 $\pm 5\%$	46.9	+3.5%	0.87 $\pm 5\%$	0.86	-1.1%	1000	22.0	21.5	≥ 15	30	98.8
Dec 17	Head 150	0.910 $\pm 10\%$	0.892	-2.0%	52.3 $\pm 5\%$	54.1	+3.4%	0.76 $\pm 5\%$	0.73	-3.9%	1000	22.0	21.5	≥ 15	30	98.8
Dec 17	Body 150	0.940 $\pm 10\%$	0.933	-0.7%	61.9 $\pm 5\%$	64.7	+4.5%	0.80 $\pm 5\%$	0.76	-5.0%	1000	22.0	21.8	≥ 15	30	98.8



Notes

- The 150MHz SAR values have a coefficient of variation $< 3\%$.
- The target fluid dielectric parameters are the nominal values from the SAR system manufacturer's probe calibration (see Appendix F)
- The fluid temperature remained within $\pm 2^\circ\text{C}$ from the fluid dielectric parameter measurement to the completion of the system performance check.
- The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).



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

SPEAG 300 MHz Validation Dipole Setup

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14.0 SIMULATED EQUIVALENT TISSUES



The simulated equivalent tissue recipes in the table below are derived from the SAR system manufacturer's suggested recipes in the DASY4 manual (see references [10] and [11]) in accordance with the procedures and requirements specified in IEEE Standard 1528-2003 (see reference [5]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

SIMULATED TISSUE MIXTURES			
INGREDIENT	300 MHz HEAD	150 MHz HEAD	150 MHz BODY
Water	37.56 %	38.35 %	46.6 %
Sugar	55.32 %	55.5%	49.7 %
Salt	5.95 %	5.15%	2.6 %
HEC	0.98 %	0.9%	1.0 %
Bactericide	0.19 %	0.1%	0.1 %

15.0 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.			




Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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16.0 ROBOT SYSTEM SPECIFICATIONS

<u>Specifications</u>	
Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6
<u>Data Acquisition Electronic (DAE) System</u>	
<u>Cell Controller</u>	
Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional
<u>Data Converter</u>	
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
<u>DASY4 Measurement Server</u>	
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
<u>E-Field Probe</u>	
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)
<u>Phantom</u>	
Type	Barski Planar Phantom
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 70 liters

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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17.0 PROBE SPECIFICATION (ET3DV6)

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



ET3DV6 E-Field Probe

18.0 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



19.0 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



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20.0 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-12	Annual
x	-SPEAG D300V3 Validation Dipole	000216	1009	17-Apr-12	Triennial
x	Barski Planar Phantom	00155	03-01	CNR	CNR
x	HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
x	Gigatronics 8652A Power Meter	00007	1835272	03-May-12	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833699	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				

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21.0 MEASUREMENT UNCERTAINTIES (IC ONLY)

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEC 62209-2:2010)									
Source of Uncertainty	IEC 62209-2 Section	Tolerance / Uncertainty ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Standard Uncertainty ±% (1g)	Standard Uncertainty ±% (10g)	V _i or V _{eff}
Measurement System									
Probe Calibration (150 MHz)	7.2.2.1	10.0	Normal	1	1	1	10.0	10.0	∞
Isotropy	7.2.2.2	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
Boundary Effect	7.2.2.6	2.5	Rectangular	1.732050808	1	1	1.4	1.4	∞
Linearity	7.2.2.3	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
Detection Limits	7.2.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Readout Electronics	7.2.2.7	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	7.2.2.8	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time	7.2.2.9	2.6	Rectangular	1.732050808	1	1	1.5	1.5	∞
RF Ambient Conditions	7.2.4.5	3	Rectangular	1.732050808	1	1	1.7	1.7	∞
Probe Positioner Mechanical Restrictions	7.2.3.1	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell	7.2.3.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Post-processing	7.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	7.2.3.4.3	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	7.2.3.4.2	3.6	Normal	1	1	1	3.6	3.6	8
Drift of Output Power (meas. SAR drift)	7.2.2.10	5	Rectangular	1.732050808	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	7.2.3.2	4	Rectangular	1.732050808	1	1	2.3	2.3	∞
SAR Correction Algorithm for deviations in permittivity and conductivity	7.2.4.3	1.9	Normal	1	1	0.81	1.9	1.54	∞
Liquid Conductivity (measured)	7.2.4.3	4.13	Normal	1	0.78	0.71	3.2	2.9	∞
Liquid Permittivity (measured)	7.2.4.3	3.72	Normal	1	0.23	0.26	0.9	1.0	∞
Liquid Permittivity - temp. uncertainty	7.2.4.4	1.04	Rectangular	1.732050808	0.78	0.71	0.5	0.4	∞
Liquid Conductivity - temp. uncertainty	7.2.4.4	1.97	Rectangular	1.732050808	0.23	0.26	0.3	0.3	∞
Combined Standard Uncertainty	7.3.1		RSS				13.26	13.16	
Expanded Uncertainty (95% Confidence Interval)	7.3.2		k=2				26.53	26.31	

Measurement Uncertainty Table in accordance with International Standard IEC 62209-2:2010


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



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22.0 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 D01v05: October 2012.
- [8] Federal Communications Commission, Office of Engineering and Technology - "SAR Measurement Requirements for 100 MHz to 6 GHz"; KDB 865664 D01v01: October 2012.
- [9] Federal Communications Commission, Office of Engineering and Technology - "Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz"; KDB 450824 D01 v01r01: January 2007.
- [10] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 16 Application Note, Head Tissue Recipe: Sept. 2005.
- [11] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 17 Application Note, Body Tissue Recipe: Sept. 2005.
- [12] ISO/IEC 17025 - "General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)."
- [13] Federal Communications Commission - "Measurements Required: RF Power Output"; Rule Part 47 CFR §2.1046.
- [14] Industry Canada - "General Requirements and Information for the Certification of Radiocommunication Equipment", Radio Standards Specification RSS-Gen Issue 3: December 2010.

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APPENDIX A - SAR MEASUREMENT PLOTS

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
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Date Tested: 12/17/2012

Face-held SAR - Channel 14 - 156.7 MHz

DUT: Cobra MR HH500; Type: VHF PTT Radio Transceiver; Serial: Not Specified

Program Notes: Ambient Temp: 22C; Fluid Temp: 21.5C; Barometric Pressure: 98.8 kPa; Humidity: 30%

Procedure Notes:

Communication System: VHF Marine

Frequency: 156.7 MHz; Duty Cycle: 1:1

Medium: HSL150 Medium parameters used (interpolated): $f = 156.7 \text{ MHz}$; $\sigma = 0.75 \text{ mho/m}$; $\epsilon_r = 52.4$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(9.3, 9.3, 9.3); Calibrated: 24/04/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)) Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: Barski Industries; Type: Fiberglass Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch.14 - Face/Area Scan (7x19x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.551 mW/g

Ch.14 - Face/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

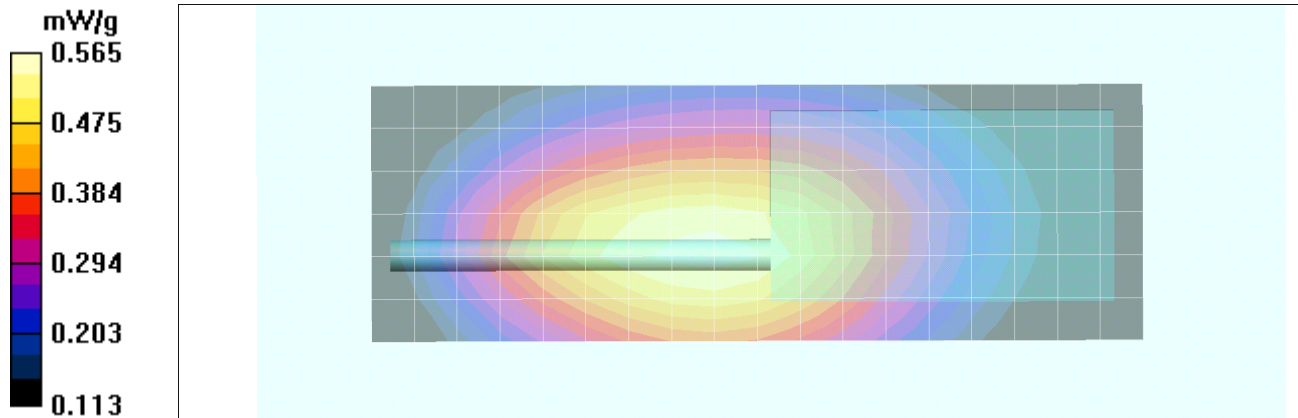
Reference Value = 26.7 V/m; Power Drift = -0.248 dB


Peak SAR (extrapolated) = 0.803 W/kg



SAR(1 g) = 0.537 mW/g; SAR(10 g) = 0.388 mW/g

Info: Interpolated medium parameters used for SAR evaluation.

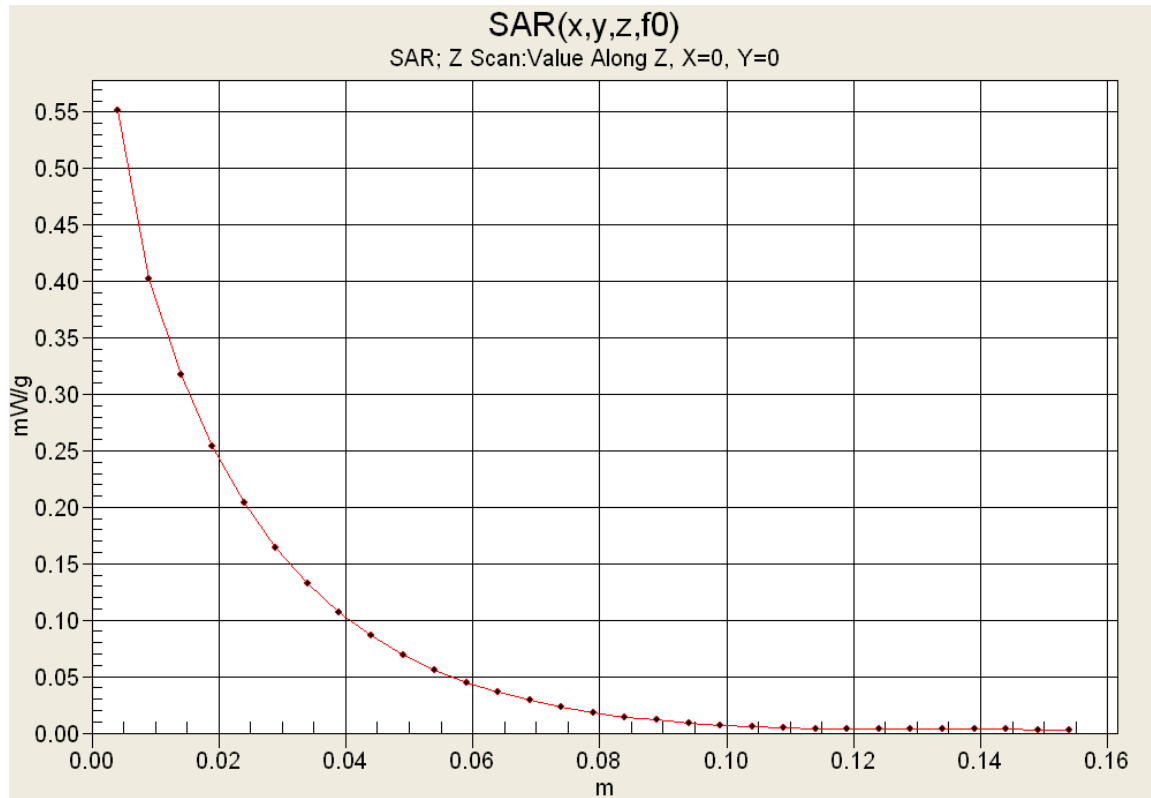
Maximum value of SAR (measured) = 0.565 mW/g






Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Z-Axis Scan



Applicant: Cobra Electronics Corporation	FCC ID: BBOMRHH500	IC: 906A-MRHH500	
Model(s): MR HH500	DUT Type: Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz	
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 12/17/2012

Body-worn SAR - Channel 14 - 156.7 MHz

DUT: Cobra MR HH500; Type: VHF PTT Radio Transceiver; Serial: Not Specified

Program Notes: Ambient Temp: 22C; Fluid Temp: 20.8C; Barometric Pressure: 98.8 kPa; Humidity: 30%

Procedure Notes:

Communication System: VHF Marine

Frequency: 156.7 MHz; Duty Cycle: 1:1

Medium: M150 Medium parameters used (interpolated): $f = 156.7 \text{ MHz}$; $\sigma = 0.767 \text{ mho/m}$; $\epsilon_r = 64.2$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(8.6, 8.6, 8.6); Calibrated: 24/04/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)) Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: Barski Industries; Type: Fiberglass Planar; Serial: 03-01
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch.14 - Body/Area Scan (7x19x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.990 mW/g

Ch.14 - Body/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

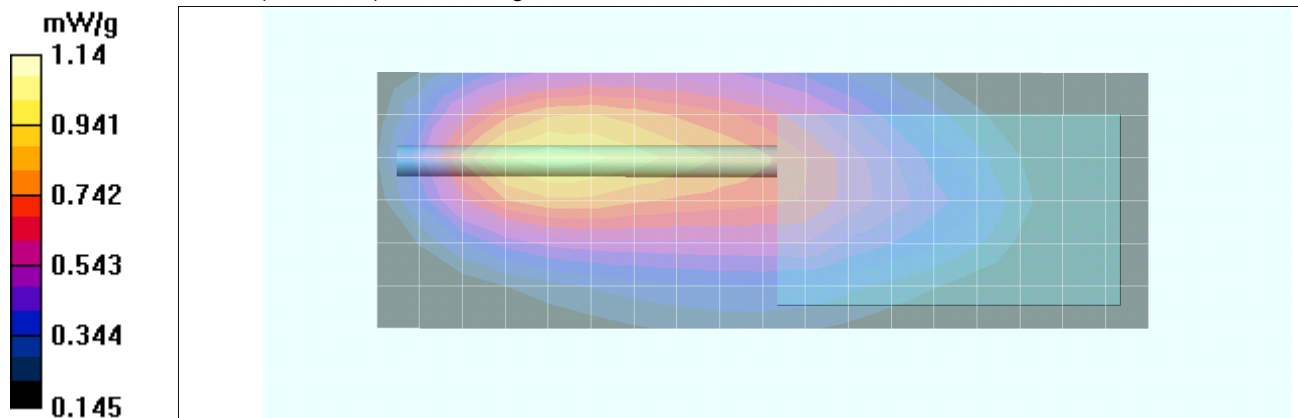
Reference Value = 30.8 V/m; Power Drift = 0.150 dB


Peak SAR (extrapolated) = 2.39 W/kg

SAR(1 g) = 1.13 mW/g; SAR(10 g) = 0.752 mW/g

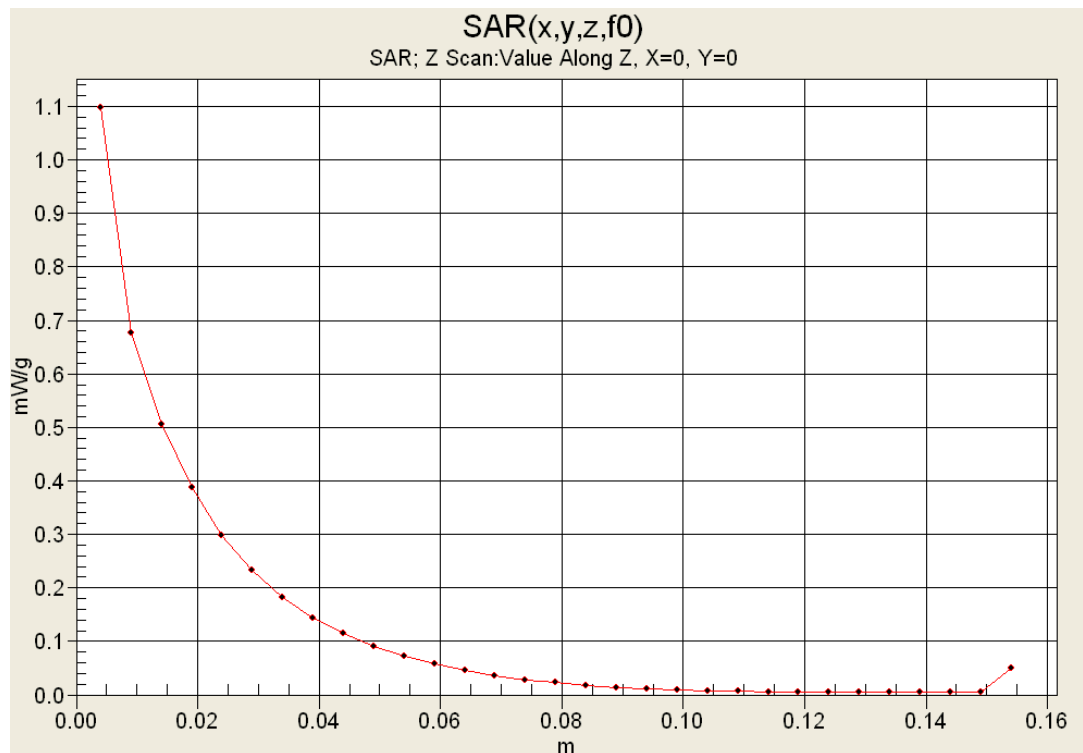
Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.14 mW/g

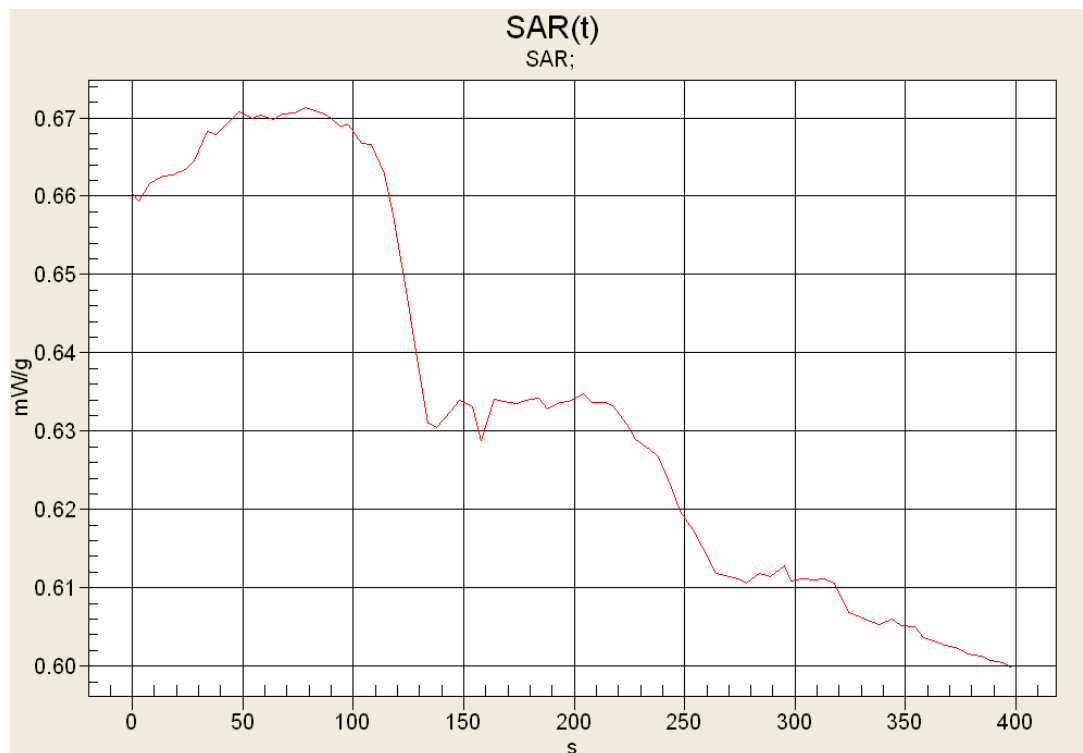




Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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Z-Axis Scan






SAR vs. Time



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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX B - SYSTEM PERFORMANCE CHECK PLOTS

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 12/17/2012

System Performance Check - 300 MHz Dipole - Head

DUT: Dipole 300 MHz; Type: D300V3; Serial: 1009; Calibrated: 17/04/2012

Program Notes: Ambient Temp: 22.0C; Fluid Temp: 21.5C; Barometric Pressure: 98.8 kPa; Humidity: 30%

Procedure Notes:

Communication System: CW

Frequency: 300 MHz; Duty Cycle: 1:1

Medium: 300 HSL Medium parameters used: $f = 300 \text{ MHz}$; $\sigma = 0.86 \text{ mho/m}$; $\epsilon_r = 46.9$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(8.3, 8.3, 8.3); Calibrated: 24/04/2012
- Sensor-Surface: 5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: Barski Industries; Type: Fiberglass Planar; Serial: 03-01
- Measurement SW: DAS4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Head d=15mm, Pin = 398mW/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.03 mW/g

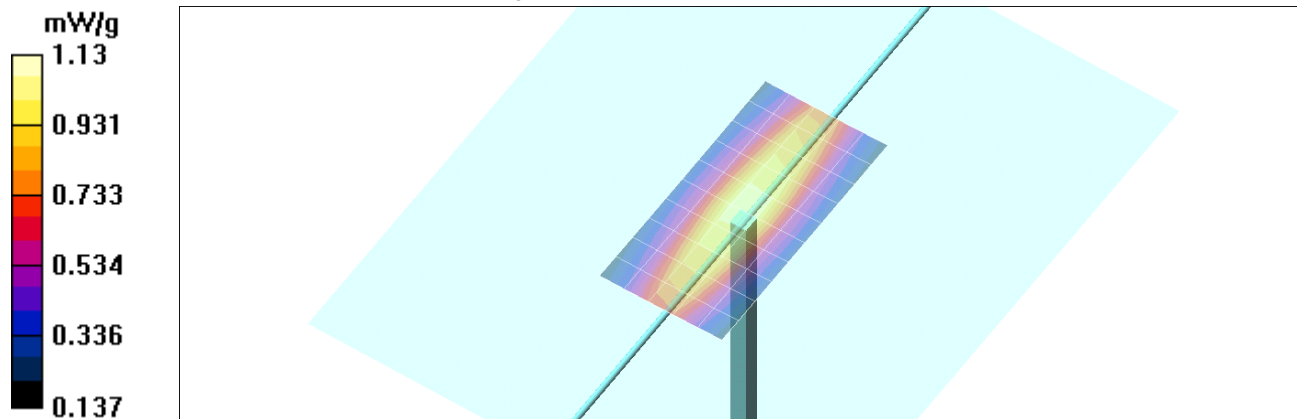
Head d=15mm, Pin = 398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm


Reference Value = 36.1 V/m; Power Drift = -0.009 dB



Peak SAR (extrapolated) = 1.86 W/kg

SAR(1 g) = 1.16 mW/g; SAR(10 g) = 0.777 mW/g

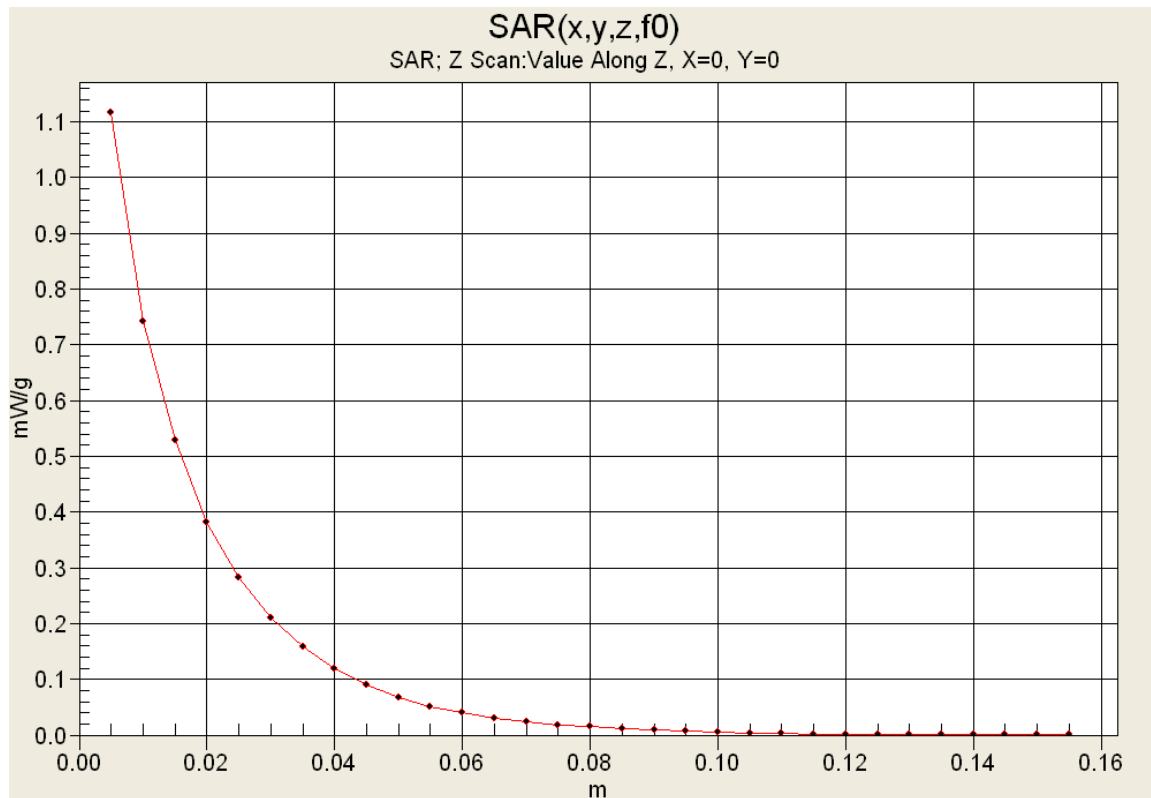
Maximum value of SAR (measured) = 1.13 mW/g






Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Z-axis Scan



Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 12/17/2012

System Performance Check - 300 MHz Dipole - 150 MHz Head Fluid

DUT: Dipole 300 MHz; Type: D300V3; Serial: 1009; Calibrated: 17/04/2012

Program Notes: Ambient Temp: 22C; Fluid Temp: 21.5C; Barometric Pressure: 98.8 kPa; Humidity: 30%

Procedure Notes: 300 MHz Dipole transmitting at 300 MHz using 150 MHz SAR probe calibration and 150 MHz tissue dielectric parameters

Communication System: CW

Frequency: 150 MHz; Duty Cycle: 1:1

Medium: HSL150 Medium parameters used: $f = 150 \text{ MHz}$; $\sigma = 0.73 \text{ mho/m}$; $\epsilon_r = 54.1$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(9.3, 9.3, 9.3); Calibrated: 24/04/2012
- Sensor-Surface: 5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: Barski Industries; Type: Fiberglass Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Head d=15mm, Pin = 398mW/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.831 mW/g

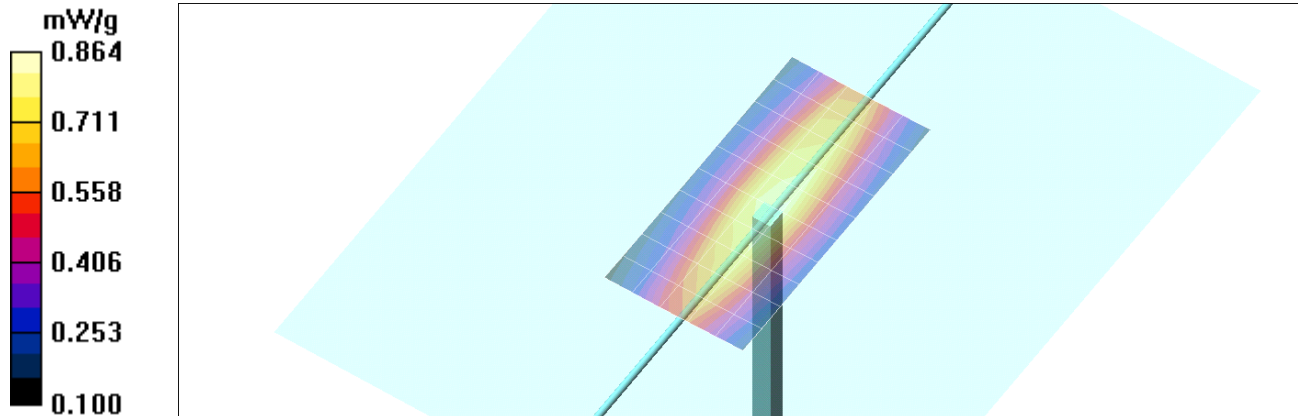
Head d=15mm, Pin = 398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm


Reference Value = 34.6 V/m; Power Drift = -0.067 dB

Peak SAR (extrapolated) = 1.43 W/kg

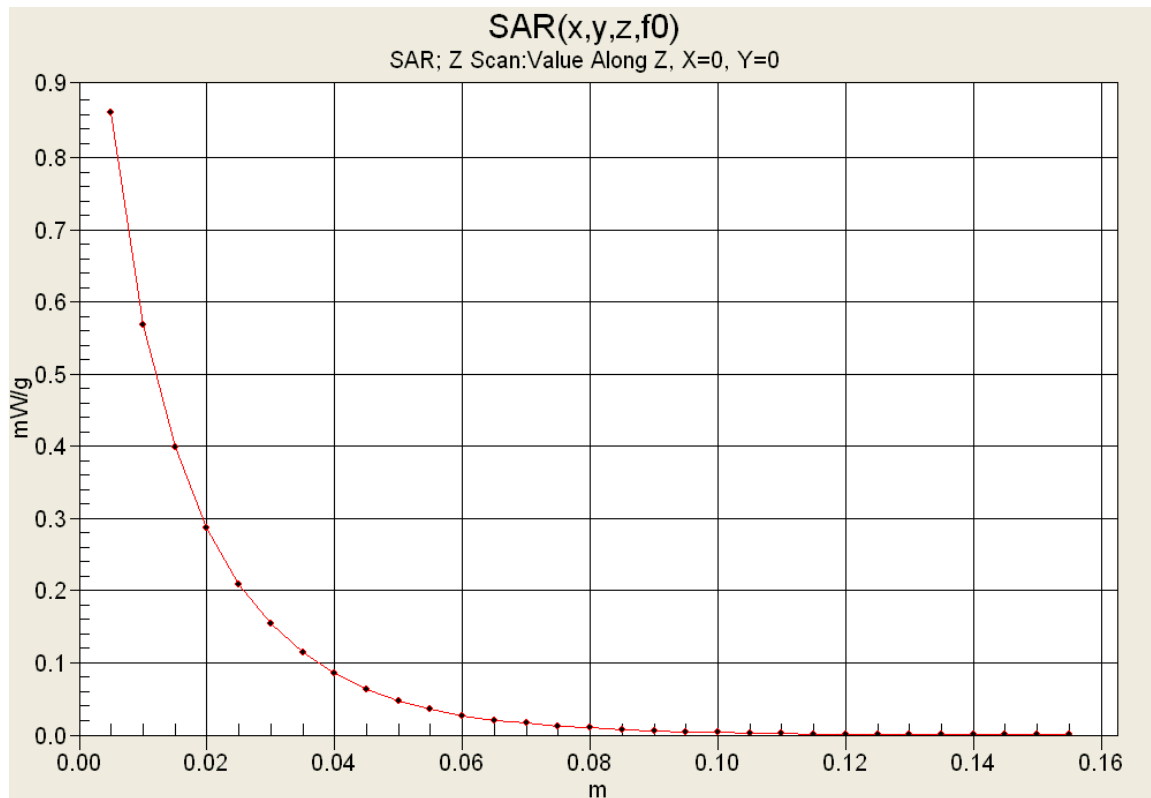
SAR(1 g) = 0.892 mW/g; SAR(10 g) = 0.592 mW/g



Maximum value of SAR (measured) = 0.864 mW/g



Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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Z-axis Scan



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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 12/17/2012

System Performance Check - 300 MHz Dipole - 150 MHz Body Fluid

DUT: Dipole 300 MHz; Type: D300V3; Serial: 1009; Calibrated: 17/04/2012

Program Notes: Ambient Temp: 22C; Fluid Temp: 20.8C; Barometric Pressure: 98.8 kPa; Humidity: 30%

Procedure Notes: 300 MHz Dipole transmitting at 300 MHz using 150 MHz SAR probe calibration and 150 MHz tissue dielectric parameters

Communication System: CW

Frequency: 150 MHz; Duty Cycle: 1:1

Medium: M150 Medium parameters used: $f = 150 \text{ MHz}$; $\sigma = 0.76 \text{ mho/m}$; $\epsilon_r = 64.7$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(8.6, 8.6, 8.6); Calibrated: 24/04/2012
- Sensor-Surface: 5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: Barski Industries; Type: Fiberglass Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Head d=15mm, Pin = 398mW/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.829 mW/g

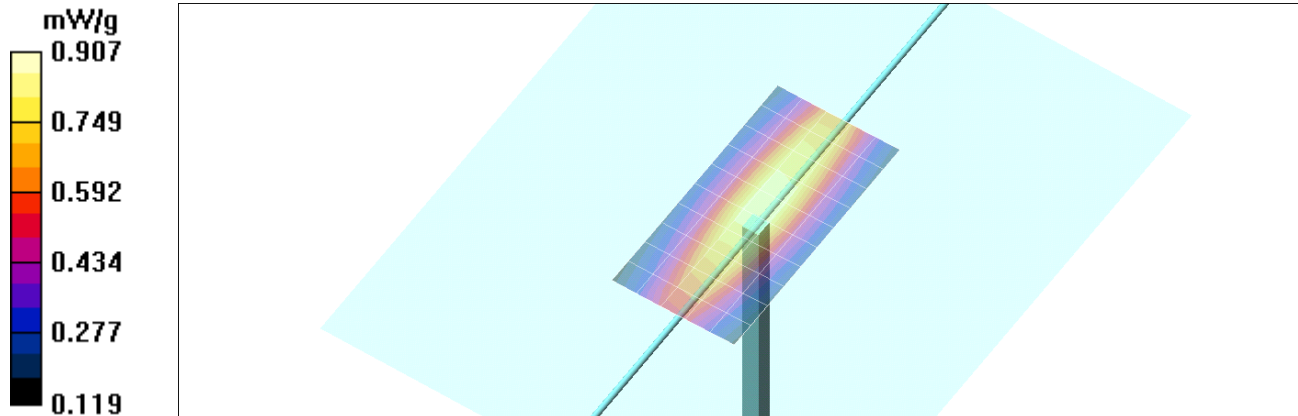
Head d=15mm, Pin = 398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm


Reference Value = 34.4 V/m; Power Drift = 0.011 dB



Peak SAR (extrapolated) = 1.47 W/kg

SAR(1 g) = 0.933 mW/g; SAR(10 g) = 0.632 mW/g

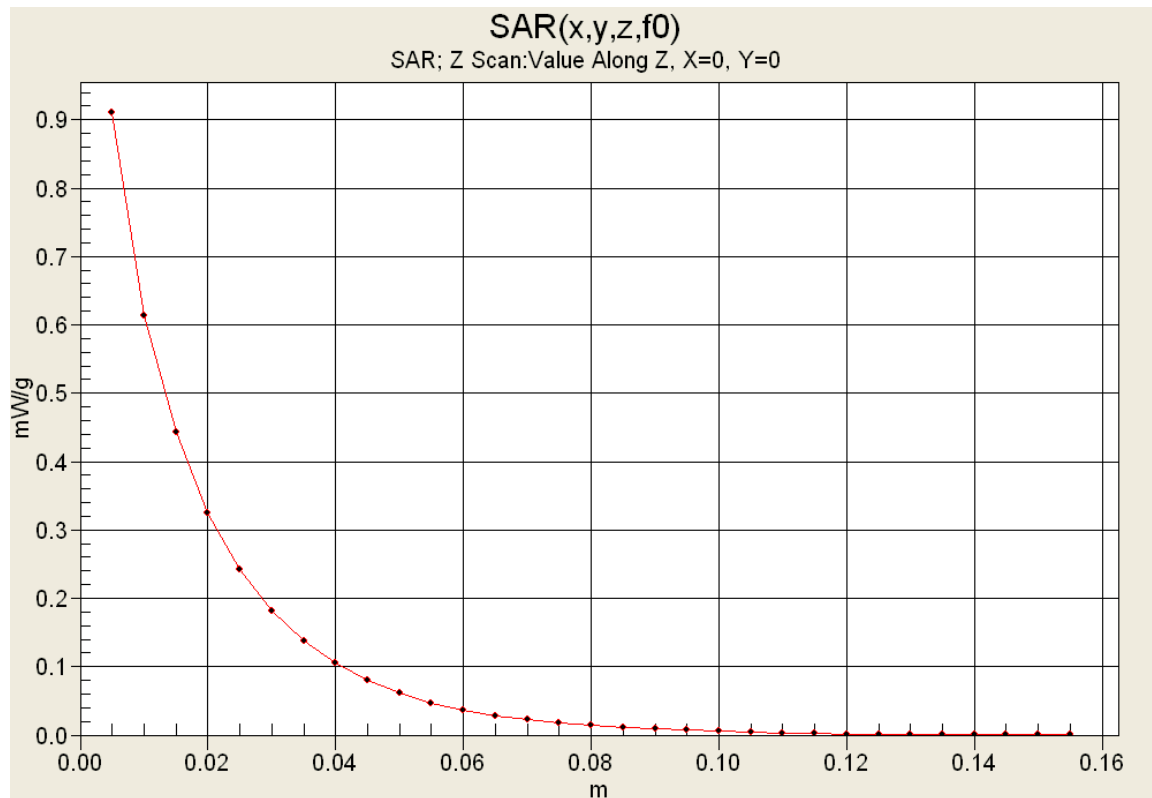
Maximum value of SAR (measured) = 0.907 mW/g






Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	


Z-axis Scan





Applicant: Cobra Electronics Corporation	FCC ID: BBOMRHH500	IC: 906A-MRHH500	
Model(s): MR HH500	DUT Type: Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz	
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS


Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

300 MHz Head

Celltech Labs
Test Result for UIM Dielectric Parameter
17/Dec/2012
Freq Frequency(GHz)
FCC_eHFCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sHFCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM

Freq	FCC_eHF	FCC_sH	Test_e	Test_s
0.2000	49.97	0.80	50.91	0.77
0.2100	49.50	0.80	50.67	0.77
0.2200	49.03	0.81	49.21	0.77
0.2300	48.57	0.82	49.54	0.79
0.2400	48.10	0.83	48.36	0.78
0.2500	47.63	0.83	46.41	0.81
0.2600	47.17	0.84	48.23	0.81
0.2700	46.70	0.85	47.10	0.83
0.2800	46.23	0.86	47.10	0.84
0.2900	45.77	0.86	46.52	0.83
0.3000	45.30	0.87	46.87	0.86
0.3100	45.18	0.87	45.57	0.85
0.3200	45.06	0.87	44.99	0.85
0.3300	44.94	0.87	45.59	0.86
0.3400	44.82	0.87	44.67	0.88
0.3500	44.70	0.87	44.78	0.87
0.3600	44.58	0.87	44.02	0.90
0.3700	44.46	0.87	43.95	0.90
0.3800	44.34	0.87	43.42	0.92
0.3900	44.22	0.87	43.15	0.91
0.4000	44.10	0.87	43.50	0.93


Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz	
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

150 MHz Head

Celltech Labs
 Test Result for UIM Dielectric Parameter
 17/Dec/2012
 Freq Frequency(GHz)
 FCC_eHFCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
 FCC_sHFCC OET 65 Supplement C (June 2001) Limits for Head Sigma
 Test_e Epsilon of UIM
 Test_s Sigma of UIM

Freq	FCC_eHFCC_sH	Test_e	Test_s
0.0500	56.97 0.69	81.71	0.64
0.0600	56.50 0.69	68.65	0.71
0.0700	56.03 0.70	66.37	0.70
0.0800	55.57 0.71	59.80	0.69
0.0900	55.10 0.72	61.65	0.69
0.1000	54.63 0.72	62.01	0.71
0.1100	54.17 0.73	56.21	0.71
0.1200	53.70 0.74	54.35	0.71
0.1300	53.23 0.75	55.16	0.74
0.1400	52.77 0.75	52.76	0.73
0.1500	52.30 0.76	54.12	0.73
0.1600	51.83 0.77	51.61	0.76
0.1700	51.37 0.77	52.39	0.76
0.1800	50.90 0.78	50.76	0.79
0.1900	50.43 0.79	51.29	0.81
0.2000	49.97 0.80	50.21	0.79
0.2100	49.50 0.80	48.62	0.81
0.2200	49.03 0.81	48.52	0.80
0.2300	48.57 0.82	46.86	0.81
0.2400	48.10 0.83	47.09	0.83
0.2500	47.63 0.83	46.51	0.84


Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz	
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	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

150 MHz Body


Celltech Labs
Test Result for UIM Dielectric Parameter
17/Dec/2012
Freq 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
0.0500	64.37	0.72	92.67	0.69
0.0600	64.12	0.73	81.95	0.75
0.0700	63.87	0.74	78.84	0.74
0.0800	63.63	0.74	70.25	0.75
0.0900	63.38	0.75	69.26	0.72
0.1000	63.13	0.76	71.81	0.74
0.1100	62.89	0.77	64.07	0.73
0.1200	62.64	0.78	64.47	0.73
0.1300	62.39	0.78	66.80	0.77
0.1400	62.15	0.79	62.32	0.76
0.1500	61.90	0.80	64.69	0.76
0.1600	61.65	0.81	63.92	0.77
0.1700	61.41	0.82	64.51	0.78
0.1800	61.16	0.82	62.11	0.79
0.1900	60.91	0.83	62.94	0.80
0.2000	60.67	0.84	61.18	0.81
0.2100	60.42	0.85	60.48	0.82
0.2200	60.17	0.86	59.38	0.81
0.2300	59.93	0.86	58.35	0.82
0.2400	59.68	0.87	58.64	0.83
0.2500	59.43	0.88	59.08	0.85

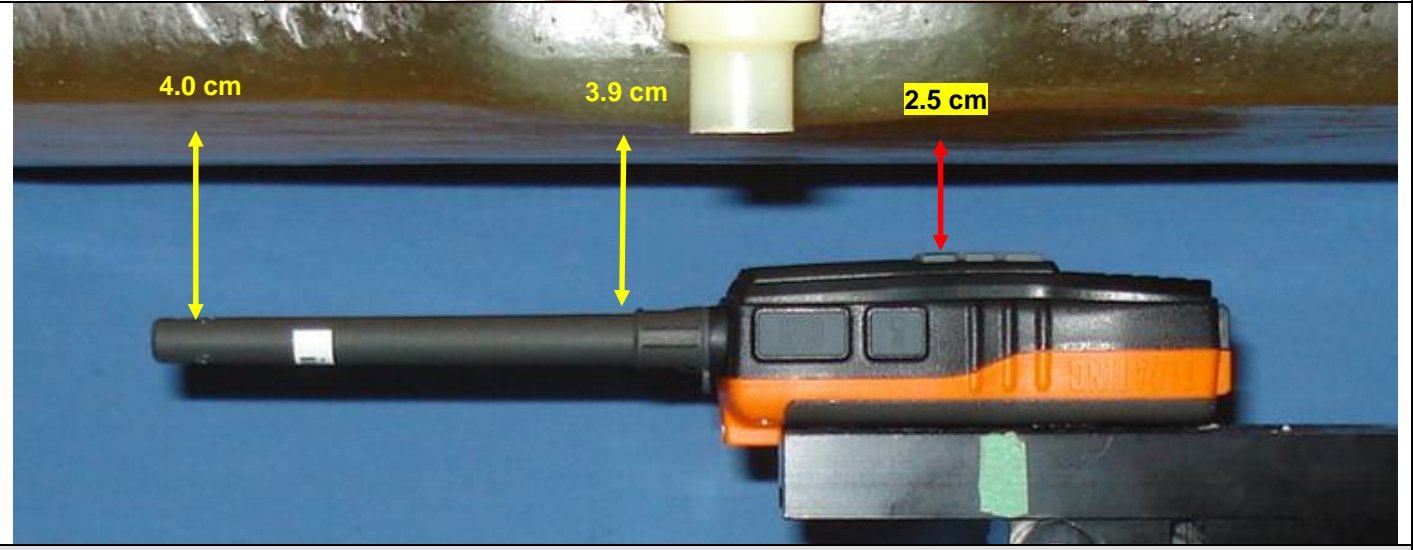
Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	



APPENDIX D - SAR TEST SETUP & DUT PHOTOGRAPHS

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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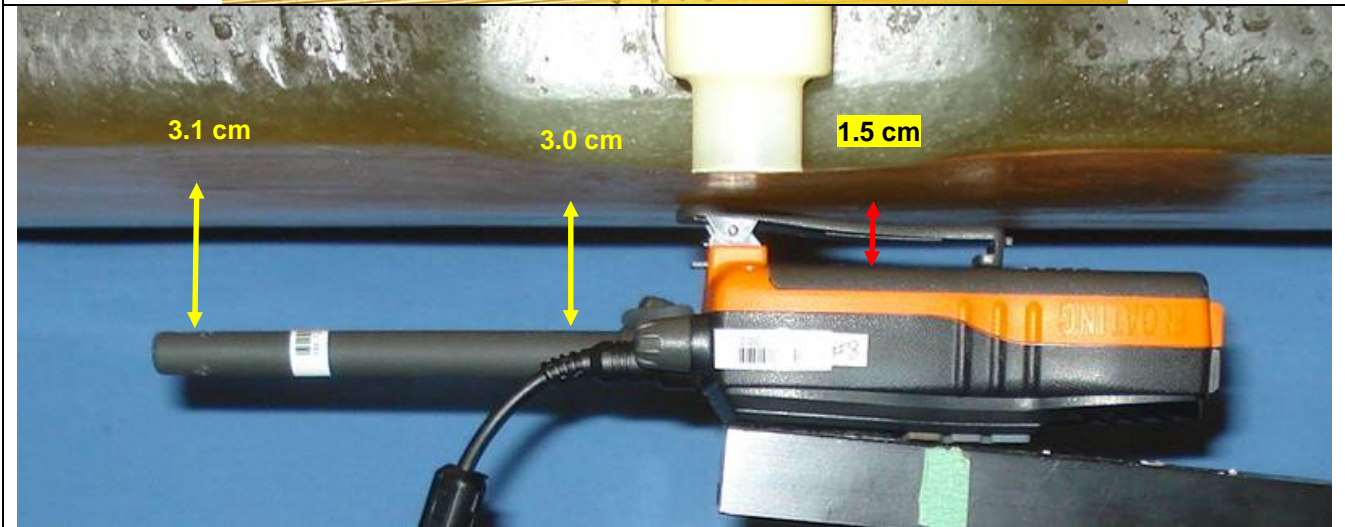
FACE-HELD SAR TEST SETUP PHOTOGRAPHS




Face-held Test Setup



	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

BODY-WORN SAR TEST SETUP PHOTOGRAPHS




Body-worn Test Setup



Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

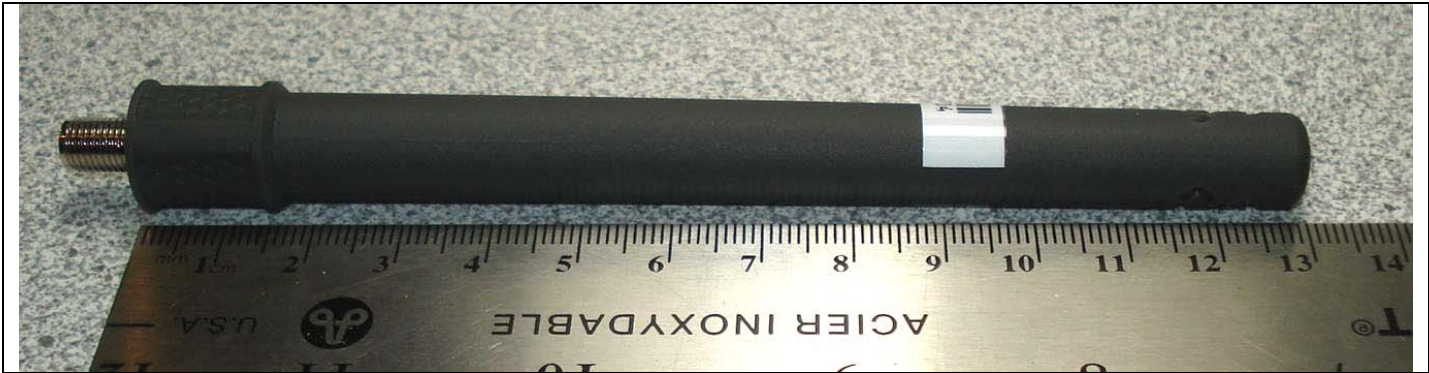
DUT PHOTOGRAPHS



Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	


DUT PHOTOGRAPHS





Antenna




Belt-clip accessory



Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

DUT PHOTOGRAPHS

	
Front of Li-ion Battery	Back of Li-ion Battery
	
Front of Alkaline Battery Case	Back of Alkaline Battery Case (AA's inserted)
	
Back of DUT with Battery removed	


Applicant: Cobra Electronics Corporation	FCC ID: BBOMRHH500	IC: 906A-MRHH500	
Model(s): MR HH500	DUT Type: Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz	
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	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

DUT PHOTOGRAPHS




Speaker-mic Accessory

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX E - DIPOLE CALIBRATION

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Celltech**

Certificate No: **D300V3-1009_Apr12**

CALIBRATION CERTIFICATE

Object **D300V3 - SN: 1009**

Calibration procedure(s) **QA CAL-15.v6
 Calibration procedure for dipole validation kits below 700 MHz**

Calibration date: **April 17, 2012**

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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ET3DV6	SN: 1507	30-Dec-11 (No. ET3-1507_Dec11)	Dec-12
DAE4	SN: 900	11-Apr-12 (No. DAE4-900_Apr12)	Apr-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: April 27, 2012

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Accreditation No.: **SCS 108**

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:

- 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
- 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
- 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:

- 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.

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	300 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	45.3	0.87 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	44.9 \pm 6 %	0.89 mho/m \pm 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	398 mW input power	1.17 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	2.88 mW / g \pm 18.1 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	398 mW input power	0.770 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	1.90 mW / g \pm 17.6 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.8 Ω - 2.9 j Ω
Return Loss	- 22.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.748 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. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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	February 26, 2009

DASY5 Validation Report for Head TSL

Date: 17.04.2012

Test Laboratory: SPEAG

DUT: Dipole 300 MHz; Type: D300V3; Serial: D300V3 - SN: 1009

Communication System: CW; Frequency: 300 MHz

Medium parameters used: $f = 300$ MHz; $\sigma = 0.89$ mho/m; $\epsilon_r = 44.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ET3DV6 - SN1507; ConvF(6.59, 6.59, 6.59); Calibrated: 30.12.2011;
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn900; Calibrated: 11.04.2012
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

Dipole Calibration for Head Tissue/d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0:

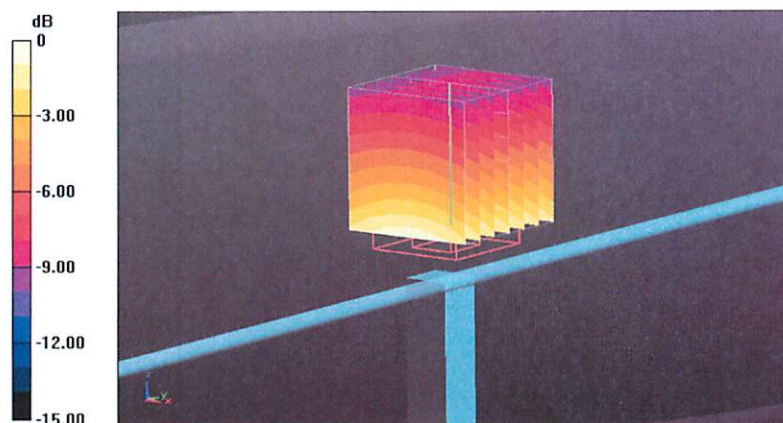
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 37.838 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.974 mW/g

SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.770 mW/g

Maximum value of SAR (measured) = 1.24 mW/g

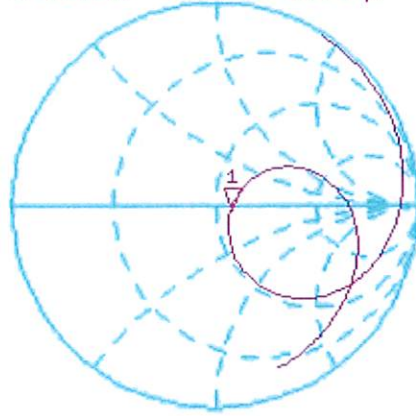


0 dB = 1.24 mW/g = 1.87 dB mW/g

Impedance Measurement Plot for Head TSL

17 Apr 2012 15:12:03
[CH1] S11 1 U FS 1: 57.850 Ω -2.8926 Ω 183.41 pF 300.000 000 MHz

*
De l
Cor



Avg
16

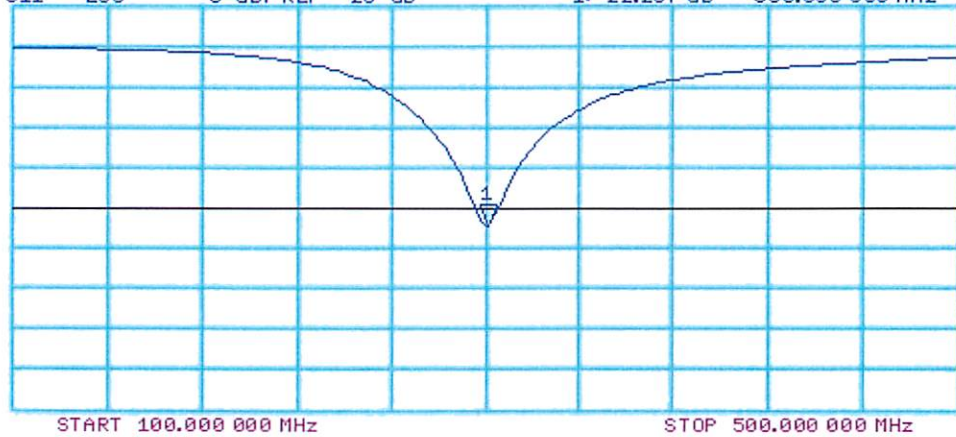
H1 d

CH2 S11 LOG 5 dB/REF -20 dB 1:-22.207 dB 300.000 000 MHz

Cor

Avg
16

H1 d



A 300MHz Head System Verification was performed to support the results.

300 MHZ SYSTEM VERIFICATION																
Test Date	Equiv. Tissue Freq. (MHz)	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)
		Target	Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.	Dev.						
Dec 10	Head 300	1.17 ±10%	1.14	-2.6%	45.3 ±5%	45.8	+1.1%	0.87 ±5%	0.83	-4.6%	1000	22.0	21.2	≥ 15	30	102.5

Five System Verification's were performed with the 300 MHz dipole transmitting at 300 MHz with the Barski Planar phantom filled with 150 MHz Head tissue simulating fluid.

Test #	Test Date	SAR 1g (W/kg)	Dielectric Constant ϵ_r			Conductivity σ (mho/m)			ρ (Kg/m ³)	Amb. Temp. (°C)	Fluid Temp. (°C)	Humid. (%)	Barom. Press. (kPa)
			Target	Meas.	Dev.	Target	Meas.	Dev.					
1	Dec 12	0.916	52.3 ±5%	53.5	+2.3%	0.76 ±5%	0.76	0.0%	1000	21.0	23.5	30	101.0
2	Dec 12	0.917	52.3 ±5%	53.5	+2.3%	0.76 ±5%	0.76	0.0%	1000	21.0	23.5	30	101.0
3	Dec 12	0.892	52.3 ±5%	52.4	+0.2%	0.76 ±5%	0.74	-2.6%	1000	22.0	22.6	30	101.0
4	Dec 12	0.890	52.3 ±5%	52.4	+0.2%	0.76 ±5%	0.74	-2.6%	1000	22.0	22.6	30	101.0
5	Dec 13	0.933	52.3 ±5%	51.2	-2.1%	0.76 ±5%	0.76	0.0%	1000	22.0	21.8	30	101.7

Coefficient of variation for established target

Mean = **0.910 W/kg**

Standard Deviation = 1.64%

Coefficient of Variation = 1.80%

150 MHz SPC Target Coefficient of Variation Calculation			
		calc	
SPC values	0.916		4.096E-05
	0.917		5.476E-05
	0.892		0.00030976
	0.89		0.00038416
	0.933		0.00054756
Sum of SPC's	4.548	Standard deviation	0.016353593
# of SPC's	5	Mean	0.910
		Coefficient	1.80%

A 300MHz System Verification was performed to support the results (Only head is available at this time).

300 MHZ SYSTEM VERIFICATION																
Test Date	Equiv. Tissue Freq. (MHz)	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)
		Target	Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.	Dev.						
Dec 3	Head 300	1.17 ±10%	1.12	-4.3%	45.3 ±5%	46.7	+3.1%	0.87 ±5%	0.85	-2.3%	1000	22.0	21.4	≥ 15	30	101.1

Five System Verification's were performed with the 300 MHz dipole transmitting at 300 MHz with the Barski Planar phantom filled with 150 MHz Body tissue simulating fluid.

Test #	Test Date	SAR 1g (W/kg)	Dielectric Constant ϵ_r			Conductivity σ (mho/m)			ρ (Kg/m ³)	Amb. Temp. (°C)	Fluid Temp. (°C)	Humid. (%)	Barom. Press. (kPa)
			Target	Meas.	Dev.	Target	Meas.	Dev.					
1	Dec 4	0.952	61.9 ±5%	62.4	+0.8%	0.80 ±5%	0.79	-1.3%	1000	22.0	22.9	30	100.4
2	Dec 4	0.951	61.9 ±5%	62.4	+0.8%	0.80 ±5%	0.79	-1.3%	1000	22.0	22.9	30	100.4
3	Dec 4	0.935	61.9 ±5%	61.3	-1.0%	0.80 ±5%	0.78	-2.5%	1000	22.0	22.3	30	100.4
4	Dec 4	0.931	61.9 ±5%	61.3	-1.0%	0.80 ±5%	0.78	-2.5%	1000	22.0	22.3	30	100.4
5	Dec 5	0.929	61.9 ±5%	61.6	-0.5%	0.80 ±5%	0.78	-2.5%	1000	22.0	20.9	30	101.3



Coefficient of variation for established target

Mean = **0.940 W/kg**


Standard Deviation = 0.99%

Coefficient of Variation = 1.05%

150 MHz SPC Target Coefficient of Variation Calculation			
	calc		
SPC values	0.952		0.00015376
	0.951		0.00012996
	0.935		2.116E-05
	0.931		7.396E-05
	0.929		0.00011236
Sum of SPC's	4.698	Standard deviation	0.009911609
# of SPC's	5	Mean	0.940
		Coefficient	1.05%

	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX F - PROBE CALIBRATION

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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Accreditation No.: **SCS 108**

Client **Celltech**

Certificate No: **ET3-1590_Apr12**

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: **April 24, 2012**

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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	10-Jan-12 (No. DAE4-660_Jan12)	Jan-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
			Issued: April 26, 2012
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,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:

- 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
- 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:

- NORM_{x,y,z}:** Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z} = NORM_{x,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*.
- DCP_{x,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
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,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 $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,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: April 24, 2012

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 ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.79	1.92	1.60	± 10.1 %
DCP (mV) ^B	94.8	98.4	88.8	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
0	CW	0.00	X	0.00	0.00	1.00	143.4	±4.6 %
			Y	0.00	0.00	1.00	150.1	
			Z	0.00	0.00	1.00	179.4	

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 E²-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	7.54	7.54	7.54	0.20	2.16	± 13.4 %
750	41.9	0.89	7.11	7.11	7.11	0.29	3.00	± 12.0 %
835	41.5	0.90	6.77	6.77	6.77	0.27	3.00	± 12.0 %
900	41.5	0.97	6.67	6.67	6.67	0.29	3.00	± 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

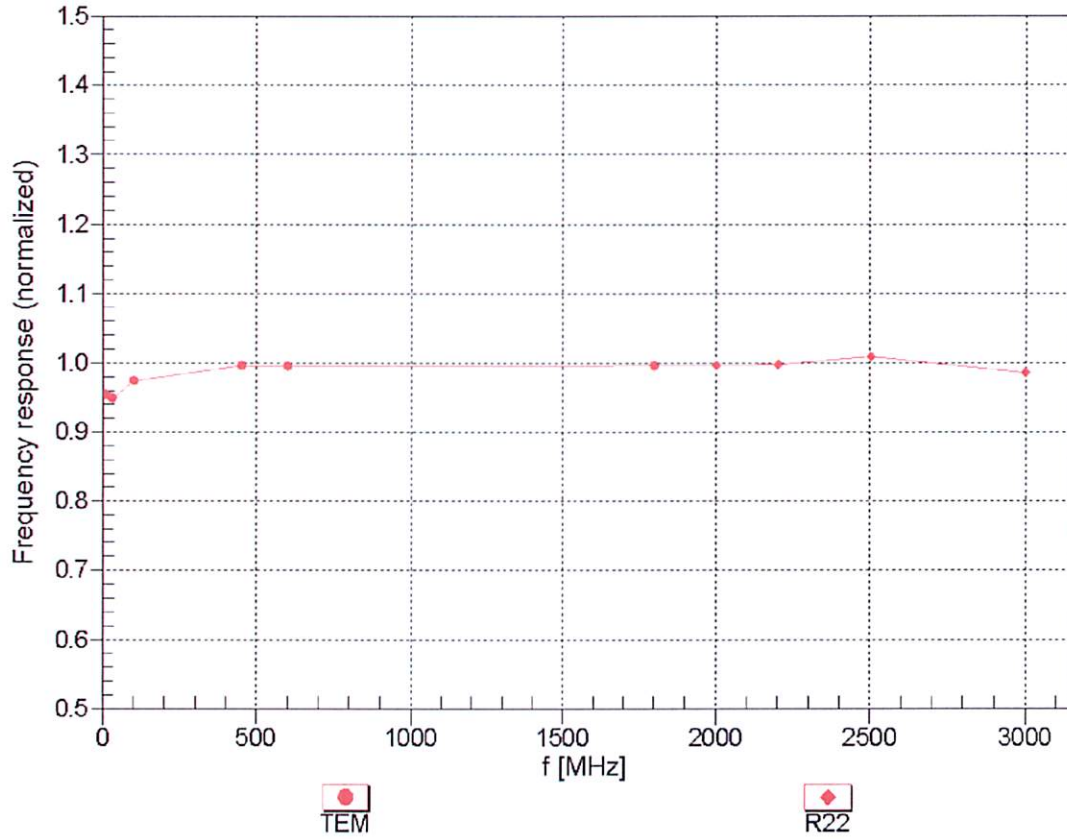
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.93	7.93	7.93	0.12	2.07	± 13.4 %
750	55.5	0.96	6.71	6.71	6.71	0.22	3.00	± 12.0 %
835	55.2	0.97	6.54	6.54	6.54	0.27	3.00	± 12.0 %
900	55.0	1.05	6.51	6.51	6.51	0.29	2.92	± 12.0 %

^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

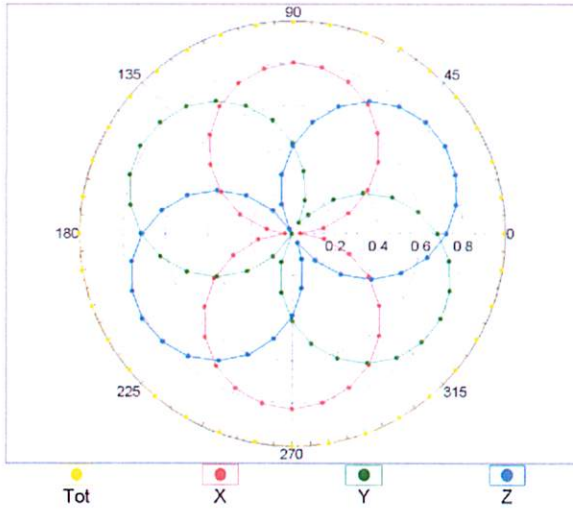
(TEM-Cell:ifi110 EXX, Waveguide: R22)



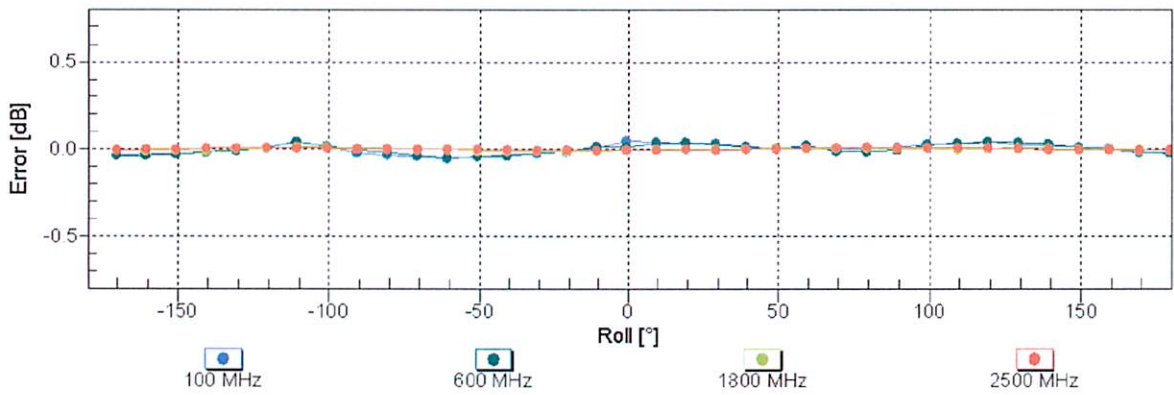
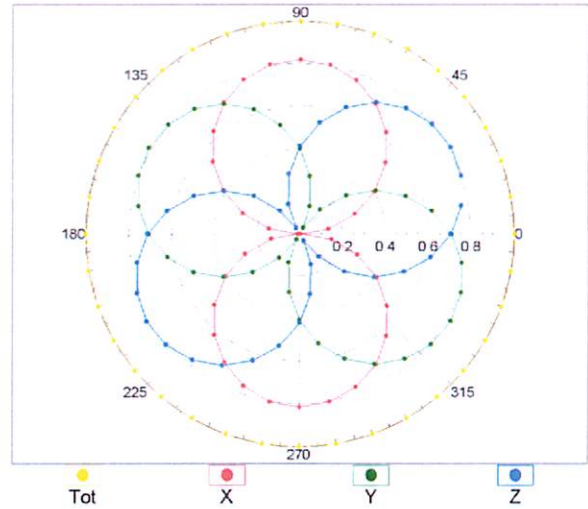
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz,TEM

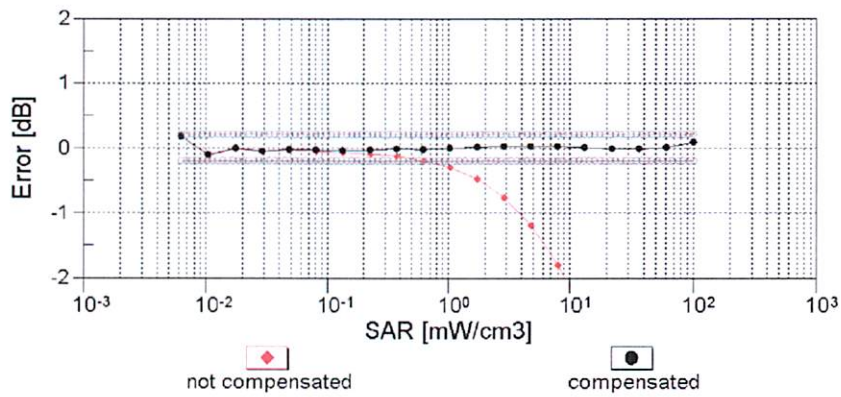
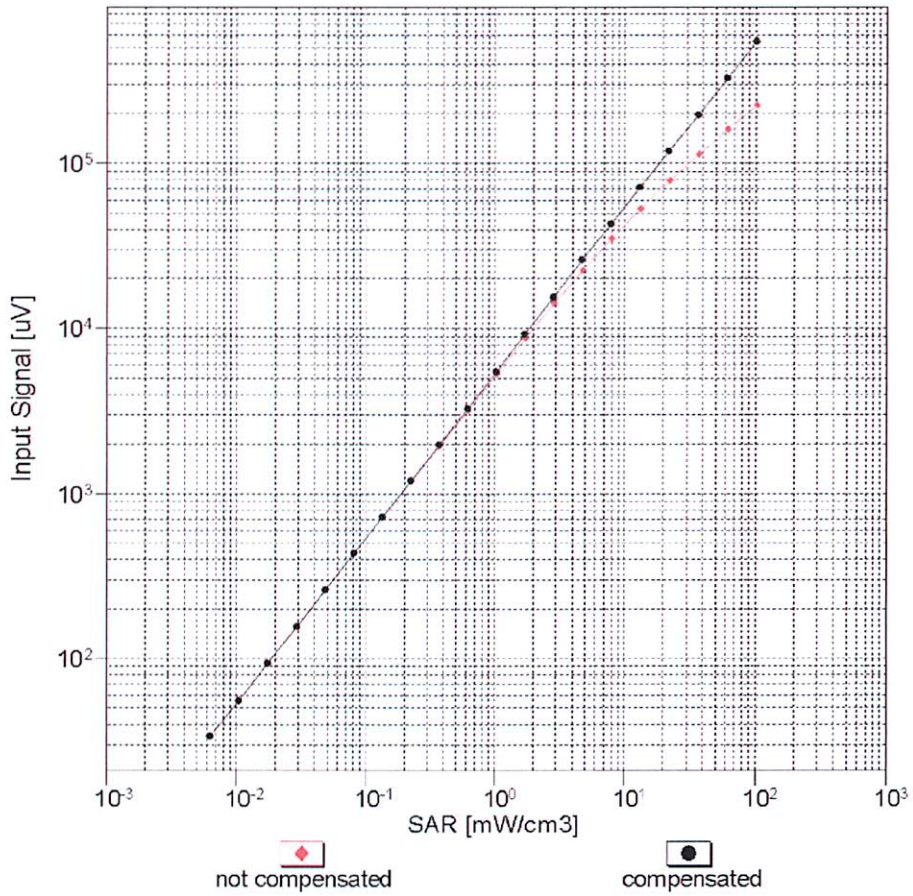


f=1800 MHz,R22



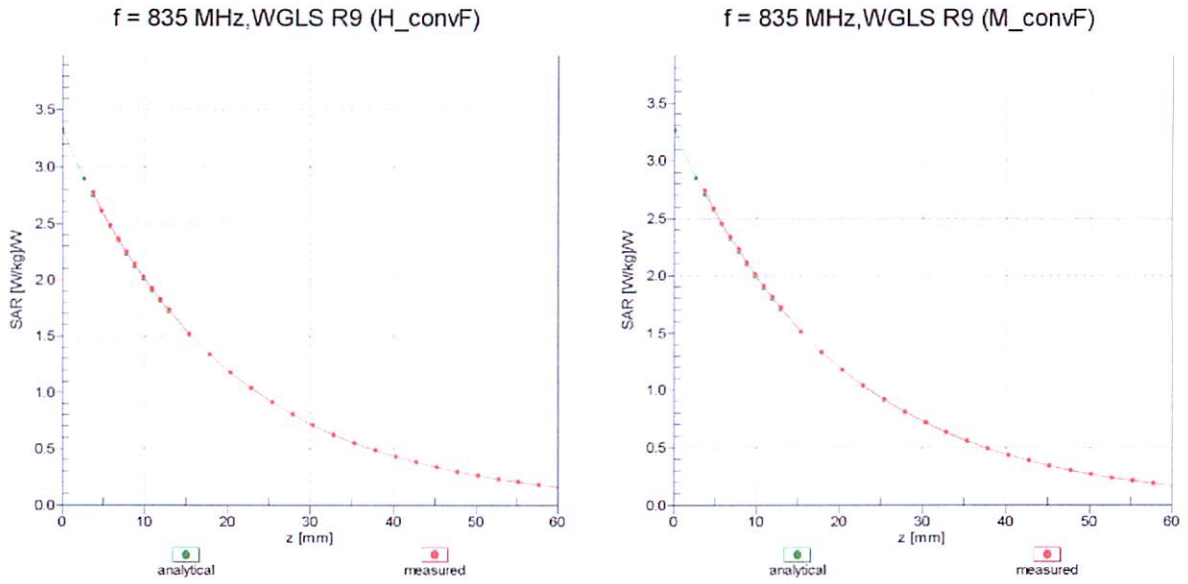
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f = 900 \text{ MHz}$)

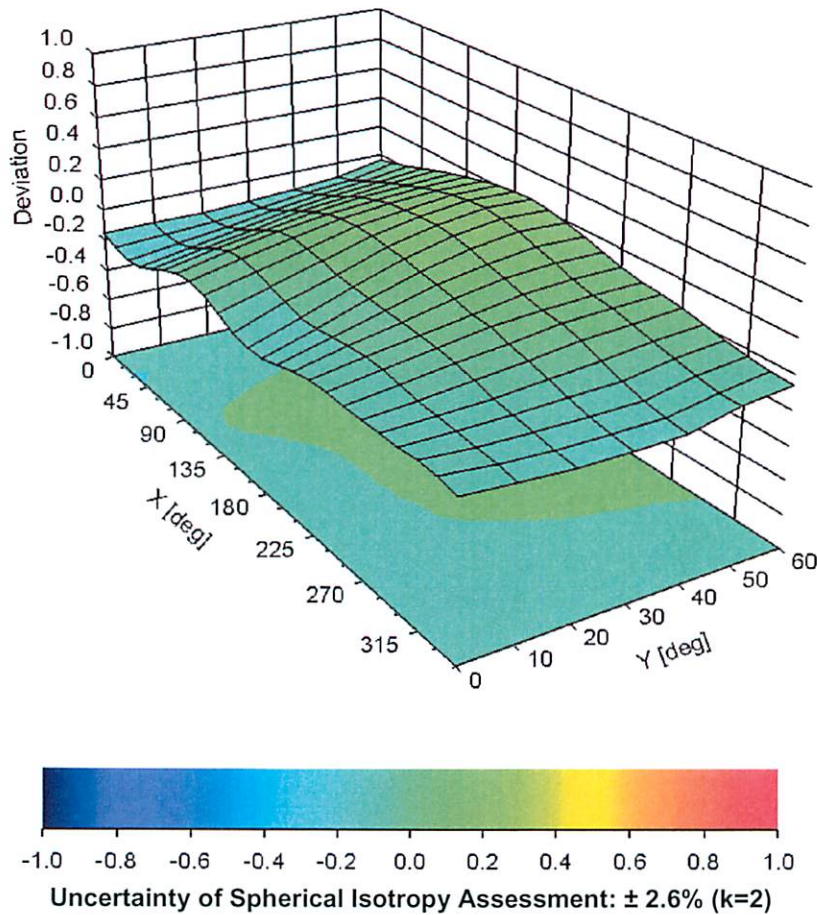


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ, ϑ), f = 900 MHz



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

Sensor Arrangement	Triangular
Connector Angle (°)	-170.8
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

Additional Conversion Factors for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1590

Place of Assessment:

Zurich

Date of Assessment:

May 21, 2012

Probe Calibration Date:

April 24, 2012

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 450, 835 and 900 MHz.

Assessed by:



Dosimetric E-Field Probe ET3DV6 SN:1590

Conversion factor (\pm standard deviation)

300 ± 50 MHz C_{convF} $8.3 \pm 9\%$

$\epsilon_r = 45.3 \pm 5\%$ $\sigma = 0.87 \pm 5\%$ mho/m (head tissue)

Important Note:

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also DASY Manual.

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1590

Place of Assessment:

Zurich

Date of Assessment:

April 27, 2012

Probe Calibration Date:

April 24, 2012

Schmid & Partner Engineering AG hereby certifies that conversion factor(s) of this probe have been evaluated on the date indicated above. The assessment was performed using the FDTD numerical code SEMCAD of Schmid & Partner Engineering AG. Since the evaluation is coupled with measured conversion factors, it has to be recalculated yearly, i.e., following the re-calibration schedule of the probe. The uncertainty of the numerical assessment is based on the extrapolation from measured value at 450, 835 and 900 MHz.



Assessed by:




Dosimetric E-Field Probe ET3DV6 SN:1590Conversion factor (\pm standard deviation)150 \pm 50 MHz *ConvF* 9.3 \pm 10% $\epsilon_r = 52.3 \pm 5\%$
 $\sigma = 0.76 \pm 5\%$ mho/m
(head tissue)150 \pm 50 MHz *ConvF* 8.6 \pm 10% $\epsilon_r = 61.9 \pm 5\%$
 $\sigma = 0.80 \pm 5\%$ mho/m
(body tissue)**Important Note:**

For numerically assessed probe conversion factors, parameters Alpha and Delta in the DASY software must have the following entries: Alpha = 0 and Delta = 1.

Please see also DASY Manual.

	<u>Date(s) of Evaluation</u> Dec. 17, 2012	<u>Test Report Serial No.</u> 121112BBO-T1210-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> Dec. 19, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX G - BARSKI PHANTOM CERTIFICATE OF CONFORMITY

Applicant:	Cobra Electronics Corporation	FCC ID:	BBOMRHH500	IC:	906A-MRHH500	
Model(s):	MR HH500	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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2378 Westlake Road
Kelowna, B.C. Canada
V1Z-2V2



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

FIBERGLASS FABRICATORS

Certificate of Conformity

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

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

Conformity

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

Signature: _____

A handwritten signature in black ink, appearing to read 'Daniel Chailier', is written over a horizontal line.

Daniel Chailier



Fiberglass Planar Phantom - Top View



Fiberglass Planar Phantom - Front View



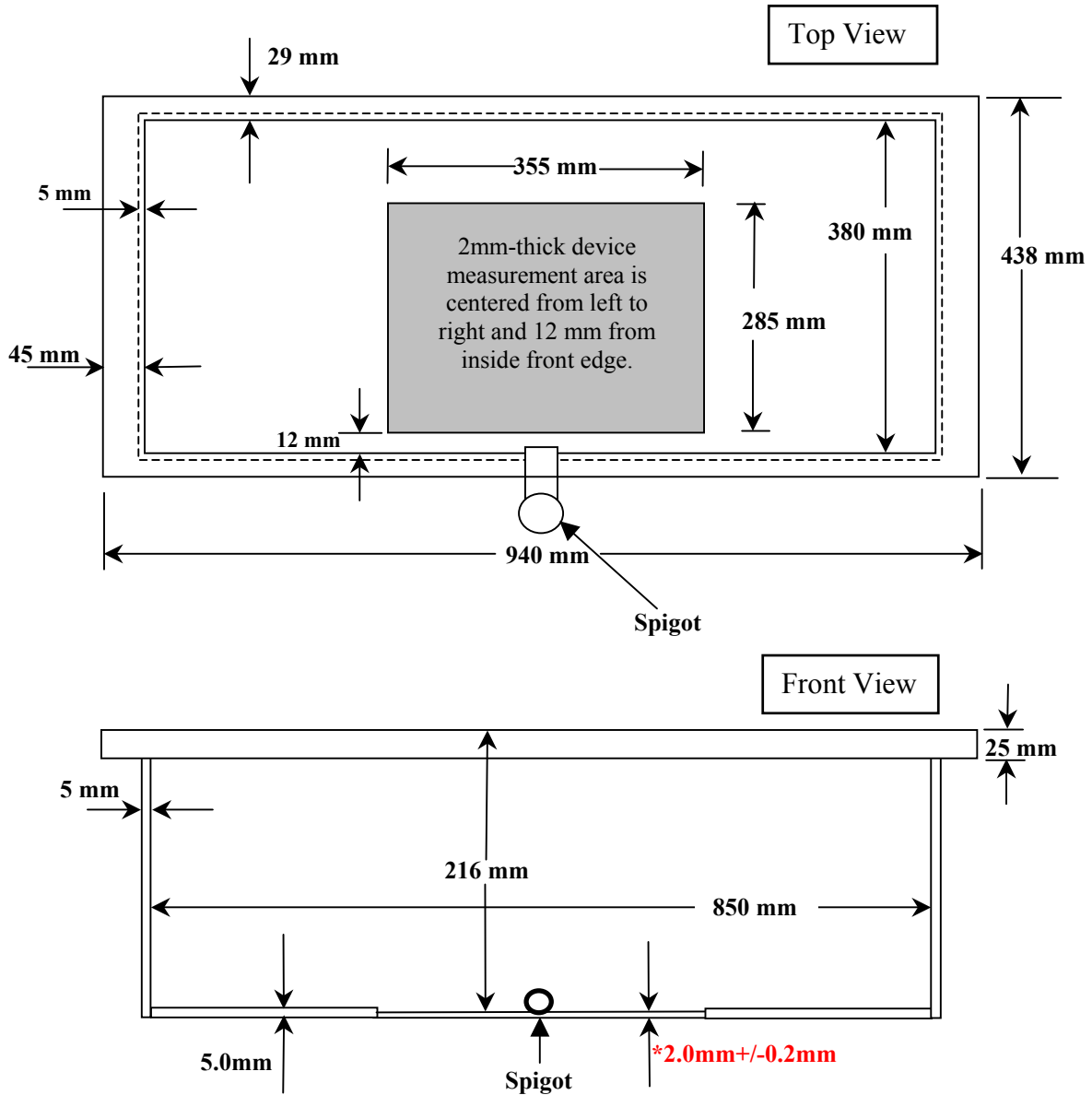
Fiberglass Planar Phantom - Back View



Fiberglass Planar Phantom - Bottom View

Dimensions of Fiberglass Planar Phantom

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



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