


	<u>Date(s) of Evaluation</u> January 17, 2012	<u>Test Report Serial No.</u> 011612K66-T1146-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

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	VERTEX STANDARD CO., LTD.		
	Address	4-8-8 Nakameguro, Meguro-Ku, Tokyo, Japan 153-8644		
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	IC	RSS-102 Issue 4
	IEEE	1528-2003	IEC	62209-2:2010
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:	K6630493X20		
	IC:	511B-30493X20		
Device Model(s)	Model(s)	HX300		
Test Sample Hardware Revision No.	S8150001			
Test Sample Firmware Revision No.	017			
Test Sample Serial No.	1M000011 (Identical Prototype)			
Date of Sample Receipt	Jan. 16, 2012			
Date(s) of Evaluations	Jan. 17, 2012			
Device-Under-Test Description (DUT)	Portable FM VHF Push-To-Talk (PTT) Marine Radio Transceiver			
VHF Transmit Frequency Range(s)	156.025 - 157.425 MHz (VHF Marine Band)			
Manuf. Rated Output Power and Tolerance Specification	5.0 Watts	± 0.1 W	Hi Power setting	Li-ion Battery
	1.0 Watts	± 0.1 W	Lo Power setting	Alkaline Battery
	Note: The alkaline battery was not evaluated for SAR based on the lower output power level			
Measured RF Output Power	5.1 Watts	37.08 dBm	Conducted	156.7 MHz (Ch. 14)
Battery Type Tested	Li-ion	3.7 V	1560 mAh	Model: FNB-122LI
Antenna Type Tested	Flexible Whip (external detachable)			Part No.: CAT460
Body-worn Accessories	Belt-clip (For carrying purpose only - radio does not contain external audio connector)			
Max. SAR Level(s) Evaluated	Face-held	0.421 W/kg	1g	50% PTT duty factor
FCC/IC Spatial Peak SAR Limit	HEAD	1.6 W/kg	1g	50% PTT duty factor
General Population / Uncontrolled				
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			Sean Johnston	Lab Manager
				Celltech Labs Inc.

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	 Vertex Standard
Model(s):	HX300	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	Jon Hughes	January 26, 2012

TEST REPORT SIGN-OFF			
DEVICE TESTED BY	REPORT PREPARED BY	QA REVIEW BY	REPORT APPROVED BY
Mike Meaker	Mike Meaker	Jon Hughes	Sean Johnston

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	 Vertex Standard
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1.0 INTRODUCTION

This measurement report demonstrates that the Vertex Standard Co., Ltd. Model: HX300 Portable 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]) 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 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 Plexiglas side planar phantom



DASY4 SAR System with Barski Fiberglass Planar Phantom

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

FCC SAR Evaluation Power Thresholds for PTT Devices, $f \leq 0.5$ GHz *		
Exposure Conditions	P mW (General Population)	P mW (Occupational)
Held to face, $d \geq 2.5$ cm	250	1250
Body-worn, $d \geq 1.5$ cm	200	1000
Body-worn, $d \geq 1.0$ cm	150	750

1. The time-averaged output power, corresponding to the required PTT duty factor, is compared with these thresholds.
2. The closest distance between the user and the device or its antenna is used to determine the power thresholds.
* Per FCC KDB 447498 D01v04 Section 5)b)i) (see reference [7]).

4.0 RF OUTPUT POWER MEASUREMENT

Band	Frequency	Channel	Mode	Power Setting	Measured Power Level		Method
					dBm	Watts	
VHF	156.7 MHz	14	CW	Hi	37.08	5.1	Average Conducted

Notes

1. The test channel was selected in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (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 connector of the DUT in accordance with FCC 47 CFR §2.1046 (see reference [11]) and IC RSS-Gen (see reference [12]).

5.0 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 Section 6) c) (see reference [7]).



6.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES

The following procedures are recommended for measurements at 150 MHz - 3 GHz to minimize probe calibration and tissue dielectric parameter discrepancies. In general, SAR measurements below 300 MHz should be within ± 50 MHz of the probe calibration frequency. At 300 MHz to 3 GHz, measurements should be within ± 100 MHz of the probe calibration frequency. Measurements exceeding 50% of these intervals, ± 25 MHz < 300 MHz and ± 50 MHz ≥ 300 MHz, require additional steps (per FCC KDB 450824 D01 v01r01, SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz - see reference [8]).

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	± 25 MHz ≤ 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.

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7.0 MANUFACTURER'S DISCLOSED ACCESSORY LISTING

Part No.	Accessory Description	Accessory Type
CAT460	Detachable Whip	Antenna
FNB-122LI	Lithium Ion, 3.7 V, 1560 mAh	Battery
FBA-44	Alkaline Case (3 x AAA)	
CLIP-22	Belt-Clip (for carrying purpose only)	Body-worn

Notes:

1. Manufacturer's disclosed accessory listing information provided by Vertex Standard Co., Ltd.

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8.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS						
Date: 01/17/2012		Frequency: 300 MHz			Tissue: Head	
Freq	Test e	Test s	Target e	Target s	Deviation Permittivity	Deviation Conductivity
0.200	51.34	0.75	45.3	0.87	13.33%	-13.79%
0.210	51.06	0.75	45.3	0.87	12.72%	-13.79%
0.220	49.57	0.77	45.3	0.87	9.43%	-11.49%
0.230	49.2	0.76	45.3	0.87	8.61%	-12.64%
0.240	48.26	0.78	45.3	0.87	6.53%	-10.34%
0.250	48.22	0.78	45.3	0.87	6.45%	-10.34%
0.260	47.65	0.81	45.3	0.87	5.19%	-6.90%
0.270	47.27	0.81	45.3	0.87	4.35%	-6.90%
0.280	47.9	0.82	45.3	0.87	5.74%	-5.75%
0.290	47.13	0.83	45.3	0.87	4.04%	-4.60%
0.300	46.43	0.83	45.3	0.87	2.49%	-4.60%
0.310	45.76	0.87	45.3	0.87	1.02%	0.00%
0.320	45.74	0.86	45.3	0.87	0.97%	-1.15%
0.330	45.17	0.86	45.3	0.87	-0.29%	-1.15%
0.340	45	0.88	45.3	0.87	-0.66%	1.15%
0.350	44.51	0.88	45.3	0.87	-1.74%	1.15%
0.360	43.99	0.9	45.3	0.87	-2.89%	3.45%
0.370	44.28	0.89	45.3	0.87	-2.25%	2.30%
0.380	44.01	0.89	45.3	0.87	-2.85%	2.30%
0.390	43.78	0.92	45.3	0.87	-3.36%	5.75%
0.400	42.8	0.92	45.3	0.87	-5.52%	5.75%

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m ³)
Jan 17	300 Head	21.0 °C	20.9 °C	≥ 15 cm	101.1 kPa	30%	1000

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FLUID DIELECTRIC PARAMETERS						
Date: 01/17/2012		Frequency: 150 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.050	74.96	0.71	52.3	0.76	43.33%	-6.58%
0.060	70.64	0.72	52.3	0.76	35.07%	-5.26%
0.070	60	0.68	52.3	0.76	14.72%	-10.53%
0.080	61.7	0.68	52.3	0.76	17.97%	-10.53%
0.090	66.05	0.69	52.3	0.76	26.29%	-9.21%
0.100	62.37	0.7	52.3	0.76	19.25%	-7.89%
0.110	55	0.72	52.3	0.76	5.16%	-5.26%
0.120	53.28	0.72	52.3	0.76	1.87%	-5.26%
0.130	55.94	0.72	52.3	0.76	6.96%	-5.26%
0.140	55.2	0.75	52.3	0.76	5.54%	-1.32%
0.150	54.77	0.73	52.3	0.76	4.72%	-3.95%
0.1567*	53.2	0.75	52.3	0.76	1.72%	-1.32%
0.160	52.49	0.76	52.3	0.76	0.36%	0.00%
0.170	51.6	0.75	52.3	0.76	-1.34%	-1.32%
0.180	51.79	0.77	52.3	0.76	-0.98%	1.32%
0.190	51.78	0.78	52.3	0.76	-0.99%	2.63%
0.200	50.09	0.79	52.3	0.76	-4.23%	3.95%
0.210	51.1	0.8	52.3	0.76	-2.29%	5.26%
0.220	49.39	0.79	52.3	0.76	-5.56%	3.95%
0.230	49.47	0.82	52.3	0.76	-5.41%	7.89%
0.240	48.91	0.81	52.3	0.76	-6.48%	6.58%
0.250	48.85	0.84	52.3	0.76	-6.60%	10.53%

*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	ρ (Kg/m ³)
Jan 17	150 Head	21.0 °C	20.7 °C	≥ 15 cm	101.1 kPa	30%	1000

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11.0 SAR LEVEL CORRECTION FOR FLUID DEVIATION (IC RSS-102 / IEC 62209-2)

The SAR levels are corrected for deviation of complex permittivity in accordance with Section 6.1.1 of IEC 62209-2:2010 (see reference [6]) as shown below.

Test Freq.	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	Measured SAR Level 50% (W/kg)	Corrected SAR Level 50% (W/kg)
0.1567	53.2	0.75	52.3	0.76	1.72%	-1.32%	0.421	N/A

SAR Correction Formula (IEC 62209-2:2010 Section 6.1.1)

$$\Delta \text{SAR} = c_e \Delta \epsilon_r + c_\sigma \Delta \sigma \quad (\text{F.1})$$

where

$c_e = \partial(\Delta \text{SAR}) / \partial(\Delta \epsilon)$ is the coefficients representing the sensitivity of SAR to permittivity where SAR is normalized to output power;

$c_\sigma = \partial(\Delta \text{SAR}) / \partial(\Delta \sigma)$ is the coefficients representing the sensitivity of SAR to conductivity, where SAR is normalized to output power.

The values of c_e and c_σ have a simple relationship with frequency that can be described using polynomial equations. For the 1 g averaged SAR c_e and c_σ are given by

$$c_e = -7,854 \times 10^{-4} f^3 + 9,402 \times 10^{-3} f^2 - 2,742 \times 10^{-2} f - 0,2026 \quad (\text{F.2})$$

$$c_\sigma = 9,804 \times 10^{-3} f^3 - 8,661 \times 10^{-2} f^2 + 2,981 \times 10^{-2} f + 0,7829 \quad (\text{F.3})$$

where


f is the frequency in GHz.



SAR Correction Calculation

Frequency (GHz)	0.1567
Ce	-0.2067
Cσ	0.7855
Δ E	0.0172
Δσ	-0.0132
ΔSAR	-0.0139

Conclusion

The correction ΔSAR has a negative sign; therefore correction is not applied to the measured SAR level.


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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 20mm x 20mm.
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.

Applicant:	Vertex Standard Co., Ltd.	FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	Test Report Issue Date January 26, 2012	Description of Test(s) Specific Absorption Rate	RF Exposure Category Gen. Pop. / Uncontrolled	

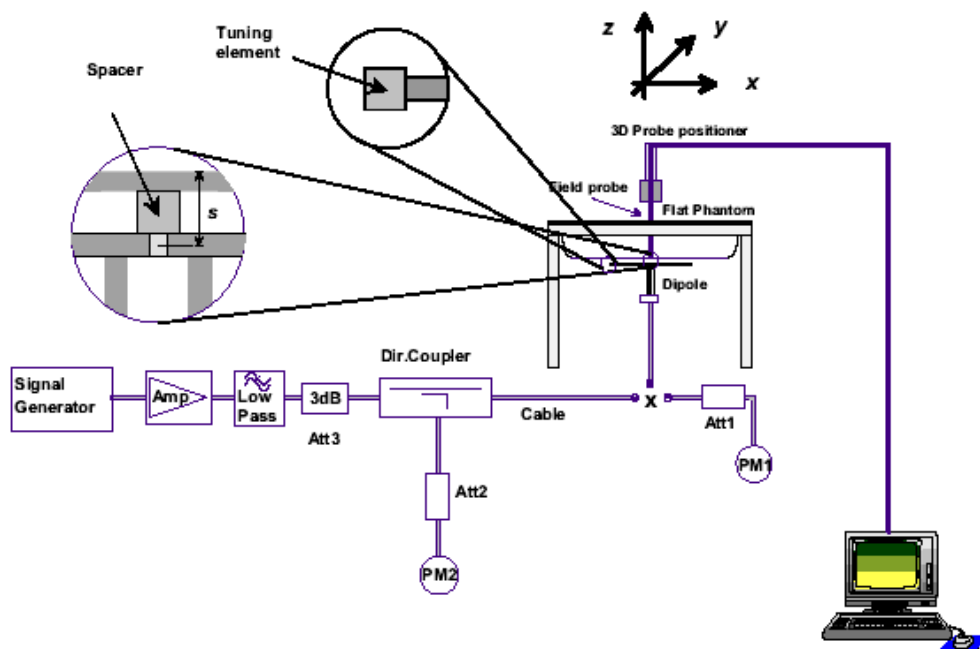
Test Lab Certificate No. 2470.01

13.0 SYSTEM PERFORMANCE CHECK

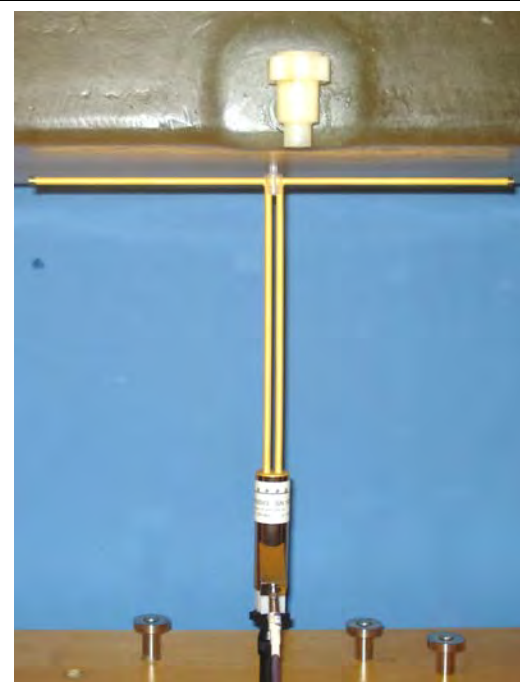
Prior to the SAR evaluation a daily system check was performed with a planar phantom and 300 MHz SPEAG validation dipole (see Appendix B for system performance check evaluation plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]). The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C for measured fluid dielectric parameters). A forward power of 398 mW was applied to the dipole and the system was verified to a tolerance of $\pm 10\%$ from the system manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

SYSTEM PERFORMANCE CHECK EVALUATION


Test Date	Equiv. Tissue 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.						
Jan 17	Head 300	1.14 $\pm 10\%$	1.18	+3.5%	45.3 $\pm 5\%$	46.4	+2.5%	0.87 $\pm 5\%$	0.83	-4.6%	1000	21.0	20.3	≥ 15	30	101.1
Notes	1.	The target SAR value is the measured value specified in the SAR system manufacturer's dipole calibration (see Appendix E).														
	2.	The target fluid dielectric parameters are the nominal values specified in the SAR system manufacturer's dipole calibration (see Appendix E) and IC RSS-102.														
	3.	The fluid temperature remained within $\pm 2^\circ\text{C}$ from the fluid dielectric parameter measurement to the completion of the system performance check.														
	4.	The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).														





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



SPEAG 300 MHz Validation Dipole Setup

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
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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 reference [9]) in accordance with the procedures and requirements specified in IEEE Standard 1528-2003 (see reference [5]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

SIMULATED TISSUE MIXTURES					
INGREDIENT	Water	300 MHz Head Tissue Mixture	37.56 %	150 MHz Head Tissue Mixture	38.35 %
	Sugar		55.32 %		55.5%
	Salt		5.95 %		5.15%
	HEC		0.98 %		0.9%
	Bactericide		0.19 %		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:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	 Vertex Standard
Model(s):	HX300	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 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
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>Evaluation Phantom</u>	
Type	Side Planar Phantom
Shell Material	Plexiglas
Bottom Thickness	2.0 mm ± 0.1 mm
Outer Dimensions	75.0 cm (L) x 22.5 cm (W) x 20.5 cm (H); Back Plane: 25.7 cm (H)
<u>Validation Phantom</u>	
Type	Barski Planar Phantom
Shell Material	Fiberglass
Thickness	2.0 ±0.1 mm
Volume	Approx. 70 liters

Applicant:	Vertex Standard Co., Ltd.	FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz	
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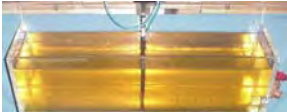
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17.0 PROBE SPECIFICATION (ET3DV6)

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 SIDE PLANAR PHANTOM

The side planar phantom is constructed of Plexiglas material with a 2.0 mm shell thickness for face-held and body-worn SAR evaluations of portable radio transceivers. The side planar phantom is mounted on the side of the DASY4 compact system table.	
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Plexiglas Side Planar Phantom

19.0 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

20.0 DEVICE HOLDER

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

Device Holder

Applicant:	Vertex Standard Co., Ltd.	FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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21.0 TEST EQUIPMENT LIST



TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
USED	DESCRIPTION				
x	Schmid & Partner DASY4 System	-	-	-	-
x	-DASY4 Measurement Server	00158	1078	CNR	CNR
x	-Robot	00046	599396-01	CNR	CNR
x	-DAE4	00019	353	27Apr10	Biennial
x	-ET3DV6 E-Field Probe	00017	1590	22Jun11	Annual
x	-SPEAG D300V3 Validation Dipole	000216	1009	18Jan10	Triennial
x	Side Planar Phantom	00156	161	CNR	CNR
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	04May10	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833699	04May10	Biennial
x	Gigatronics 80701A Power Sensor	00011	1833542	04May10	Biennial
x	Narda 3020A Directional Coupler	00064	none	CNR	CNR
x	10dB Attenuator	00102	none	CNR	CNR
x	HP 8753ET Network Analyzer	00134	US39170292	04May10	Biennial
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

22.0 JUSTIFICATION FOR EXTENDED DIPOLE CALIBRATION

SAR dipoles calibrated less than two years ago but more than one year ago were confirmed by maintaining return loss (< -20 dB, within 20% of prior calibration) and impedance (within 5 Ω from prior calibration) requirements per extended calibrations in FCC KDB Publication 450824 (see reference [8]).

SPEAG D300V3 SN: 1009						
Date of Measurement	Frequency	Fluid Type	Return Loss (dB)	Δ %	Impedance (Ω)	Δ Ω
Jan. 18, 2010 (SPEAG)	300 MHz	Head	-20.1	-	56.3	-
Jun. 06, 2011 (Celltech)			-21.2	-5.5%	50.3	5

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	 Vertex Standard
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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23.0 MEASUREMENT UNCERTAINTY (IEEE 1528-2003)

UNCERTAINTY BUDGET FOR DEVICE EVALUATION									
Uncertainty Component	IEEE 1528 Section	Uncertainty Value $\pm\%$	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value $\pm\%$ (1g)	Uncertainty Value $\pm\%$ (10g)	V_i or V_{eff}
Measurement System									
Probe Calibration (150 MHz)	E.2.1	10.0	Normal	1	1	1	10.0	10.0	∞
Axial Isotropy	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	∞
Boundary Effect	E.2.3	2.5	Rectangular	1.732050808	1	1	1.4	1.4	∞
Linearity	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
System Detection Limits	E.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Readout Electronics	E.2.6	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	Rectangular	1.732050808	1	1	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3	Rectangular	1.732050808	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Extrapolation, interpolation & integration algorithms for max. SAR evaluation	E.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	E.4.1	3.6	Normal	1	1	1	3.6	3.6	8
SAR Drift Measurement	6.6.2	5	Rectangular	1.732050808	1	1	2.9	2.9	∞
Phantom and Tissue Parameters									
Phantom Uncertainty	E.3.1	4	Rectangular	1.732050808	1	1	2.3	2.3	∞
Liquid Conductivity (target)	E.3.2	5	Rectangular	1.732050808	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measured)	E.3.3	1.32	Normal	1	0.64	0.43	0.8	0.6	∞
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measured)	E.3.3	1.72	Normal	1	0.6	0.49	1.0	0.8	∞
Combined Standard Uncertainty			RSS				13.43	13.30	
Expanded Uncertainty (95% Confidence Interval)			k=2				26.86	26.59	

Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003

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


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24.0 REFERENCES



- [1] Federal Communications Commission - "Radiofrequency radiation exposure evaluation: portable devices"; Rule Part 47 CFR §2.1093.
- [2] Health Canada - "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz", Safety Code 6: 1999.
- [3] Federal Communications Commission - "Evaluating Compliance with FCC Guidelines for Human Exposure to Radio frequency Electromagnetic Fields", OET Bulletin 65, Supplement C (Edition 01-01), FCC, Washington, D.C.: June 2001.
- [4] Industry Canada - "Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)", Radio Standards Specification RSS-102 Issue 4: March 2010.
- [5] IEEE Standard 1528-2003 - "Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques": December 2003.
- [6] International Standard IEC 62209-2 Edition 1.0 2010-03 - "Human exposure to radio frequency fields from hand-held & body-mounted wireless communication devices - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)".
- [7] Federal Communications Commission, Office of Engineering and Technology - "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies"; KDB 447498 D01v04: November 2009.
- [8] Federal Communications Commission, Office of Engineering and Technology - "Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz"; KDB 450824 D01 v01r01: January 2007.
- [9] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 16 Application Note, Head Tissue Recipe: Sept. 2005.
- [10] ISO/IEC 17025 - "General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025:2005)."
- [11] Federal Communications Commission - "Measurements Required: RF Power Output"; Rule Part 47 CFR §2.1046.
- [12] Industry Canada - "General Requirements and Information for the Certification of Radiocommunication Equipment", Radio Standards Specification RSS-Gen Issue 3: December 2010.

Applicant:	Vertex Standard Co., Ltd.	FCC ID:	K6630493X20	IC:	511B-30493X20	
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APPENDIX A - SAR MEASUREMENT PLOT

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
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Date Tested: 01/17/2012

Face-held SAR - Channel 14 - 156.7 MHz - Li-ion Battery

DUT: Vertex HX300; Type: VHF PTT Radio Transceiver; Serial: 1M000011

Ambient Temp: 21C; Fluid Temp: 20.7C; Barometric Pressure: 101.1 kPa; Humidity: 30%

Communication System: VHF (CW)

Frequency: 156.7 MHz; Duty Cycle: 1:1

Medium: HSL150 Medium parameters used (interpolated): $f = 156.7 \text{ MHz}$; $\sigma = 0.75 \text{ mho/m}$; $\epsilon_r = 53.2$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(8.9, 8.9, 8.9); Calibrated: 22/06/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face - Ch.14 - Li-ion/Area Scan (6x15x1): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.839 mW/g

Face - Ch.14 - Li-ion/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=7.5\text{mm}$, $dy=7.5\text{mm}$, $dz=5\text{mm}$

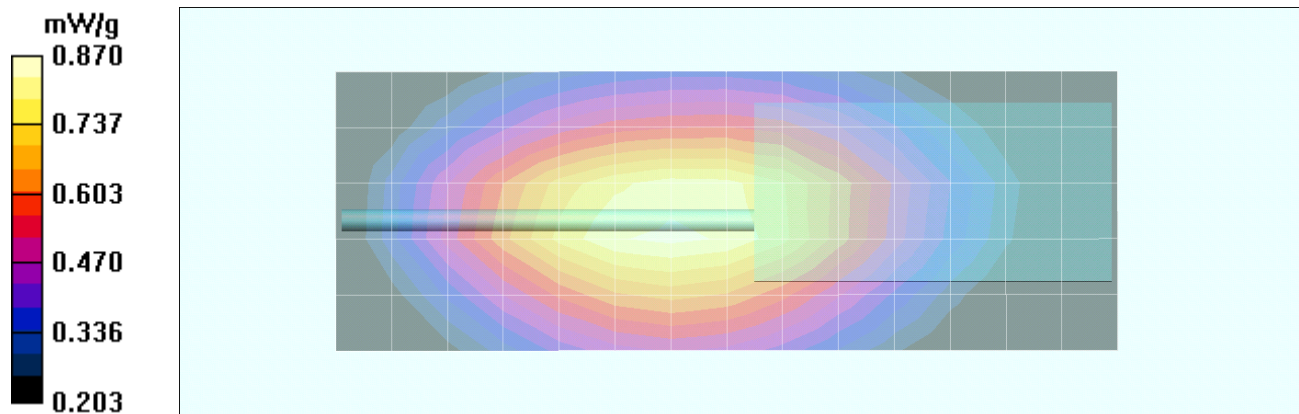
Reference Value = 33.1 V/m; Power Drift = -0.219 dB


Peak SAR (extrapolated) = 1.22 W/kg

SAR(1 g) = 0.841 mW/g; SAR(10 g) = 0.639 mW/g

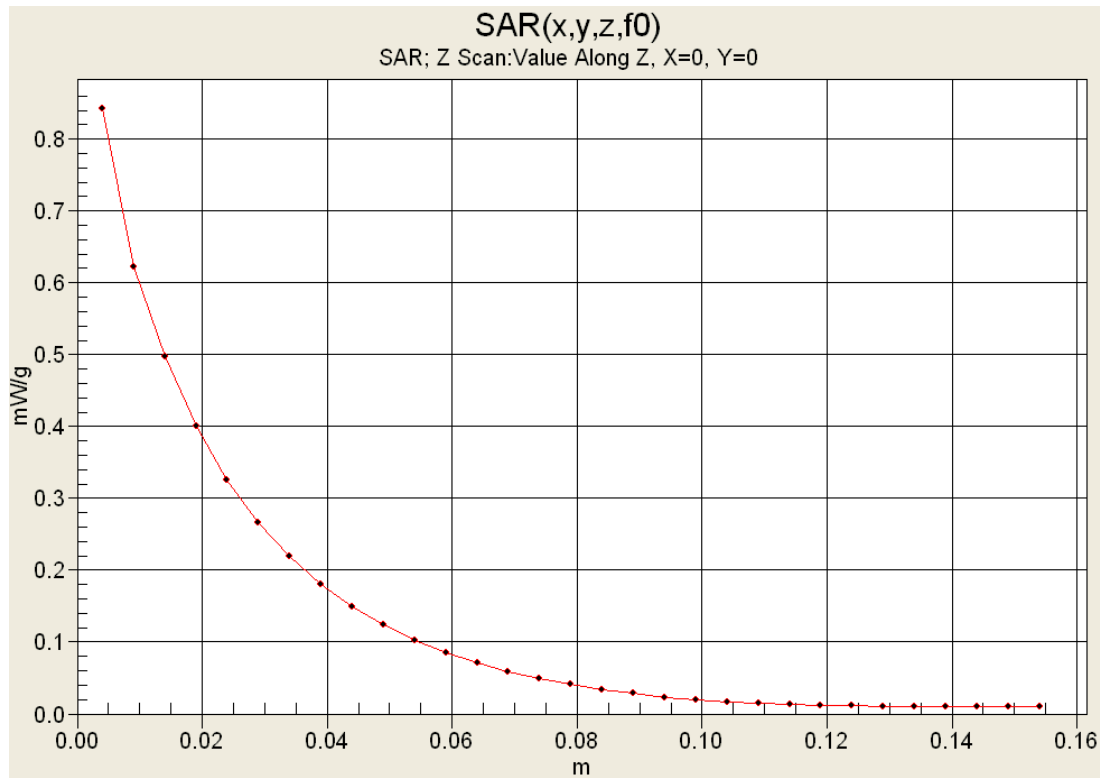
Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.870 mW/g

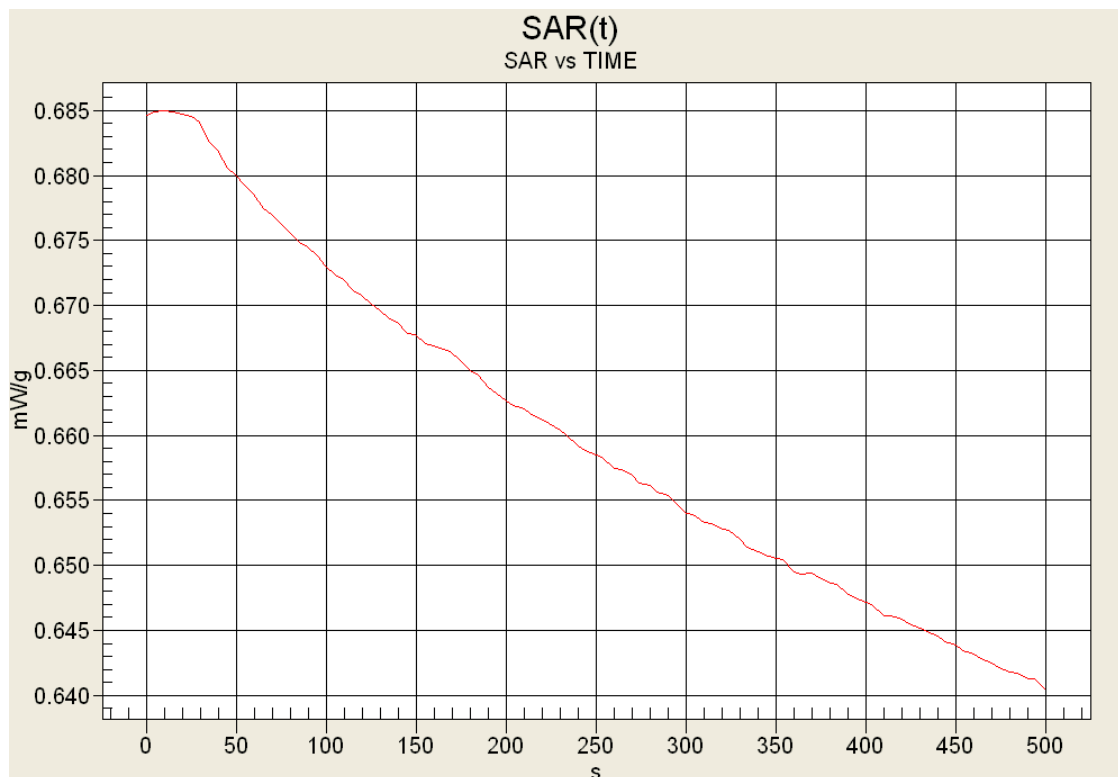




Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
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Z-Axis Scan






SAR vs. Time Power Droop



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	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

APPENDIX B - SYSTEM PERFORMANCE CHECK PLOT

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> January 17, 2012	<u>Test Report Serial No.</u> 011612K66-T1146-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

Date Tested: 01/17/2012

System Performance Check - 300 MHz Dipole - Head

DUT: Dipole 300 MHz; Type: D300V3; Serial: 1009; Calibrated: 18/01/2010

Ambient Temp: 21C; Fluid Temp: 20.9C; Barometric Pressure: 101.1 kPa; Humidity: 30%

Communication System: CW

Frequency: 300 MHz; Duty Cycle: 1:1

Medium: 300 HSL Medium parameters used: $f = 300 \text{ MHz}$; $\sigma = 0.83 \text{ mho/m}$; $\epsilon_r = 46.4$; $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(8, 8, 8); Calibrated: 22/06/2011
- Sensor-Surface: 5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Barski Industries; Type: Fiberglass Planar; Serial: 03-01
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Head d=15mm, Pin = 398mW/Area Scan (6x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 1.09 mW/g

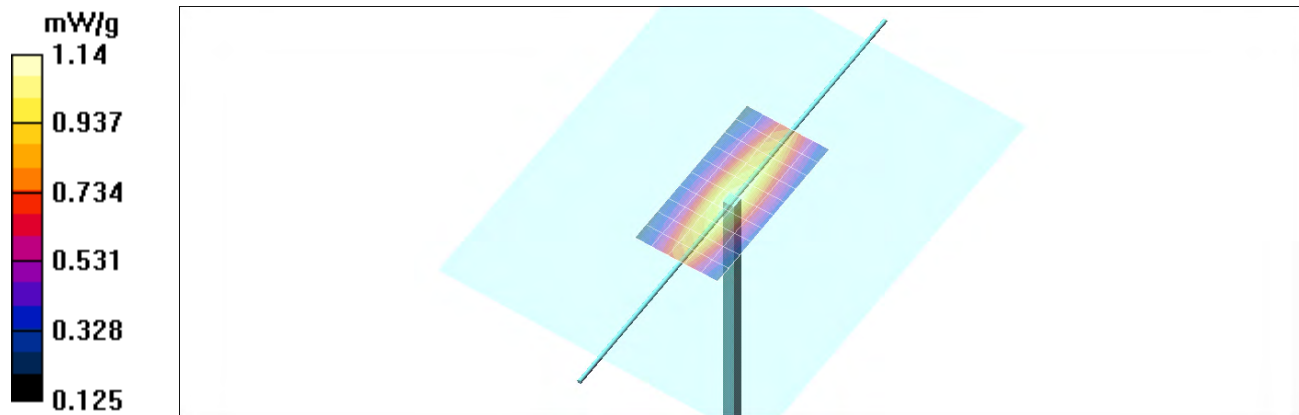
Head d=15mm, Pin = 398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$


Reference Value = 36.8 V/m; Power Drift = -0.073 dB



Peak SAR (extrapolated) = 1.88 W/kg

SAR(1 g) = 1.18 mW/g; SAR(10 g) = 0.781 mW/g

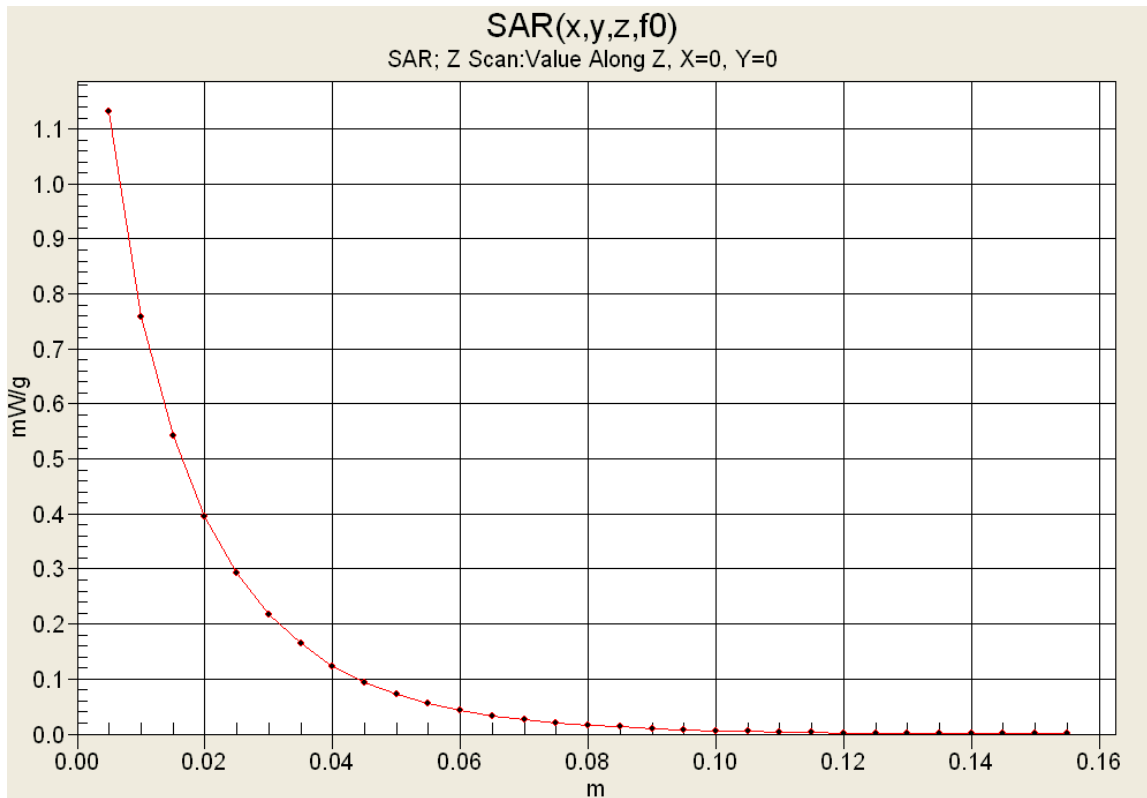
Maximum value of SAR (measured) = 1.14 mW/g






Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Z-Axis Scan






Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	 Vertex Standard
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

Applicant:	Vertex Standard Co., Ltd.	FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver	156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

300 MHz Head

Celltech Labs
Test Result for UIM Dielectric Parameter
17/Jan/2012
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_eH	FCC_sH	Test_e	Test_s
0.2000	49.97	0.80	51.34	0.75
0.2100	49.50	0.80	51.06	0.75
0.2200	49.03	0.81	49.57	0.77
0.2300	48.57	0.82	49.20	0.76
0.2400	48.10	0.83	48.26	0.78
0.2500	47.63	0.83	48.22	0.78
0.2600	47.17	0.84	47.65	0.81
0.2700	46.70	0.85	47.27	0.81
0.2800	46.23	0.86	47.90	0.82
0.2900	45.77	0.86	47.13	0.83
0.3000	45.30	0.87	46.43	0.83
0.3100	45.18	0.87	45.76	0.87
0.3200	45.06	0.87	45.74	0.86
0.3300	44.94	0.87	45.17	0.86
0.3400	44.82	0.87	45.00	0.88
0.3500	44.70	0.87	44.51	0.88
0.3600	44.58	0.87	43.99	0.90
0.3700	44.46	0.87	44.28	0.89
0.3800	44.34	0.87	44.01	0.89
0.3900	44.22	0.87	43.78	0.92
0.4000	44.10	0.87	42.80	0.92

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	 Vertex Standard
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

150 MHz Head

Celltech Labs
Test Result for UIM Dielectric Parameter

17/Jan/2012

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
0.0500	56.97	0.69	74.96	0.71
0.0600	56.50	0.69	70.64	0.72
0.0700	56.03	0.70	60.00	0.68
0.0800	55.57	0.71	61.70	0.68
0.0900	55.10	0.72	66.05	0.69
0.1000	54.63	0.72	62.37	0.70
0.1100	54.17	0.73	55.00	0.72
0.1200	53.70	0.74	53.28	0.72
0.1300	53.23	0.75	55.94	0.72
0.1400	52.77	0.75	55.20	0.75
0.1500	52.30	0.76	54.77	0.73
0.1600	51.83	0.77	52.49	0.76
0.1700	51.37	0.77	51.60	0.75
0.1800	50.90	0.78	51.79	0.77
0.1900	50.43	0.79	51.78	0.78
0.2000	49.97	0.80	50.09	0.79
0.2100	49.50	0.80	51.10	0.80
0.2200	49.03	0.81	49.39	0.79
0.2300	48.57	0.82	49.47	0.82
0.2400	48.10	0.83	48.91	0.81
0.2500	47.63	0.83	48.85	0.84

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> January 26, 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:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

FACE-HELD SAR TEST SETUP PHOTOGRAPHS

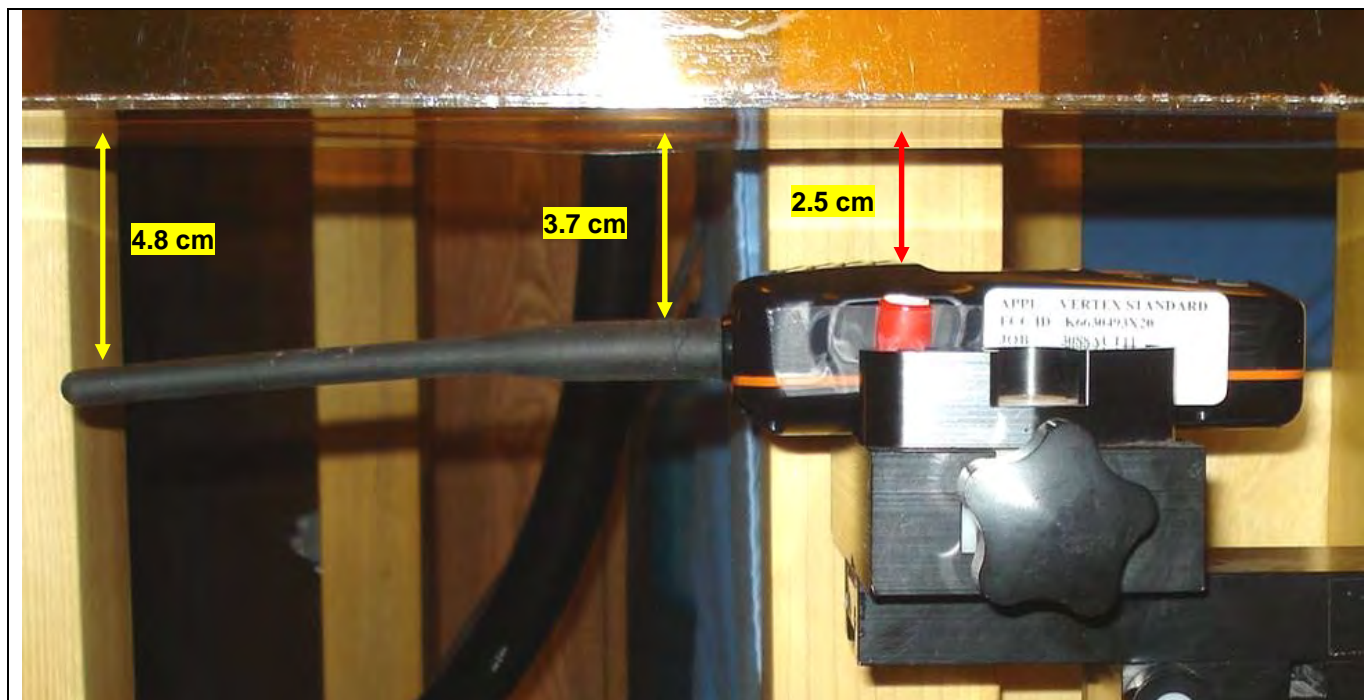


Face-held Test Setup Configuration


Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

FACE-HELD SAR TEST SETUP PHOTOGRAPHS




DUT Spacing to Planar Phantom



Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	 Vertex Standard
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver			156.025-157.425 MHz	
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	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

DUT PHOTOGRAPHS



Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> January 17, 2012	<u>Test Report Serial No.</u> 011612K66-T1146-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01



DUT Front side



DUT Left side



DUT Back side




DUT Right side





DUT Top end (showing antenna connector)




DUT Bottom end



Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	 Vertex Standard
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	



Antenna (Part No. CAT460)

Applicant:	Vertex Standard Co., Ltd.	FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz	
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	Test Report Issue Date January 26, 2012	Description of Test(s) Specific Absorption Rate	RF Exposure Category Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01



Front of Li-ion Battery




Back of Li-ion Battery





Back of DUT - Belt-clip removed




Back of DUT - Battery removed

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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	<u>Date(s) of Evaluation</u> January 17, 2012	<u>Test Report Serial No.</u> 011612K66-T1146-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
	<u>Test Report Issue Date</u> January 26, 2012	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Lab Certificate No. 2470.01

APPENDIX E - DIPOLE CALIBRATION

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Client **Celitech**

Certificate No: **D300V3-1009_Jan10**

CALIBRATION CERTIFICATE

Object **D300V3 - SN: 1009**

Calibration procedure(s) **QA CAL-15.v5**
Calibration Procedure for dipole validation kits below 800 MHz

Calibration date: **January 18, 2010**

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ET3DV6 (LF)	SN: 1507	03-Jul-09 (No. ET3-1507_Jul09)	Jul-10
DAE4	SN: 654	04-May-09 (No. DAE4-654_May09)	May-10
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	04-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-09)	In house check: Oct-10

Calibrated by: **Jeton Kastrati** **Laboratory Technician**

Signature

Jeton Kastrati

Approved by: **Katja Pokovic** **Technical Manager**

Katja Pokovic

Issued: January 20, 2010

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
Conf	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 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	ELI4 Flat Phantom	Shell thickness: 2 ± 0.2 mm
Distance Dipole Center - TSL	15 mm	with Spacer
Area Scan Resolution	dx, dy = 15 mm	
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	45.8 \pm 6 %	0.84 mho/m \pm 6 %
Head TSL temperature during test	(22.0 \pm 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	398 mW input power	1.14 mW / g
SAR normalized	normalized to 1W	2.86 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	2.95 mW / g \pm 18.1 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	398 mW input power	0.76 mW / g
SAR normalized	normalized to 1W	1.92 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	1.97 mW / g \pm 17.6 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	56.3 Ω - 8.5 j Ω
Return Loss	- 20.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.747 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 26, 2009

DASY5 Validation Report for Head TSL

Date/Time: 1/18/2010 2:57:54 PM

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

Communication System: CW; Frequency: 300 MHz; Duty Cycle: 1:1

Medium: HSL300

Medium parameters used: $f = 300 \text{ MHz}$; $\sigma = 0.84 \text{ mho/m}$; $\epsilon_r = 45.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ET3DV6 - SN1507 (LF); ConvF(7.5, 7.5, 7.5); Calibrated: 7/3/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn654; Calibrated: 5/4/2009
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: 1003
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 57

Head/d=15mm, Pin=398mW/Area Scan (41x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 1.2 mW/g

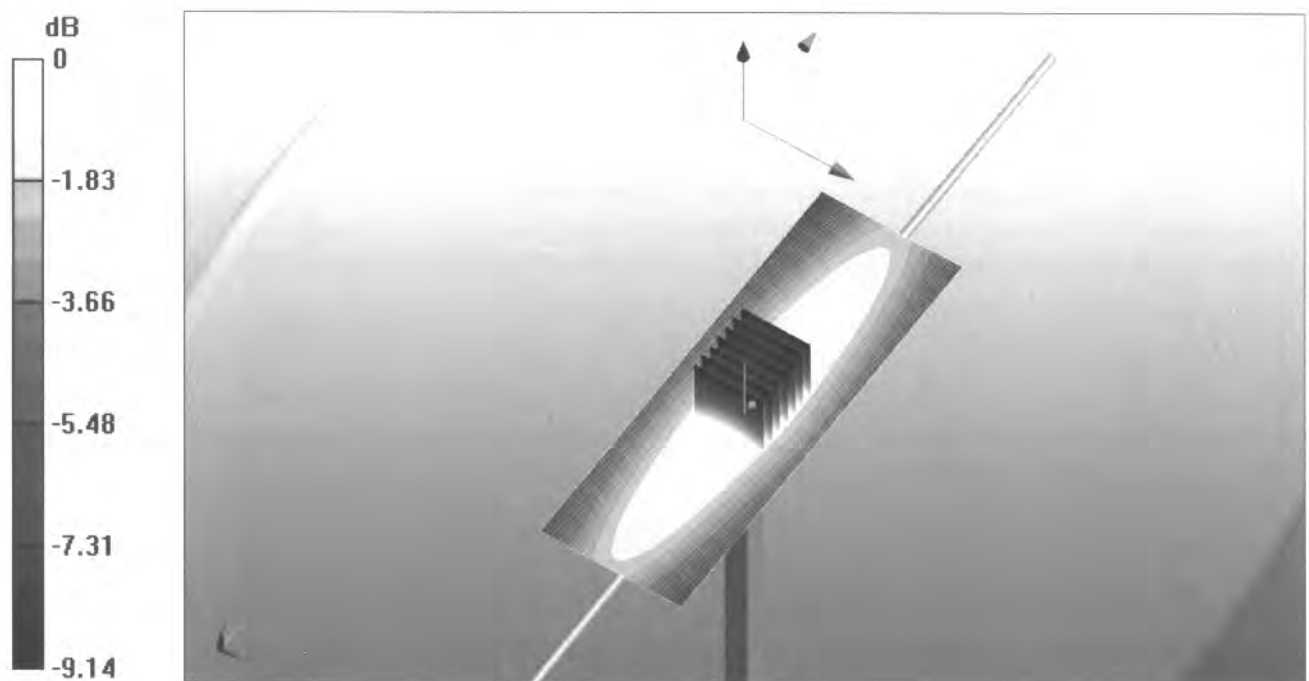
Head/d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 38.7 V/m ; Power Drift = 0.00736 dB

Peak SAR (extrapolated) = 1.85 W/kg

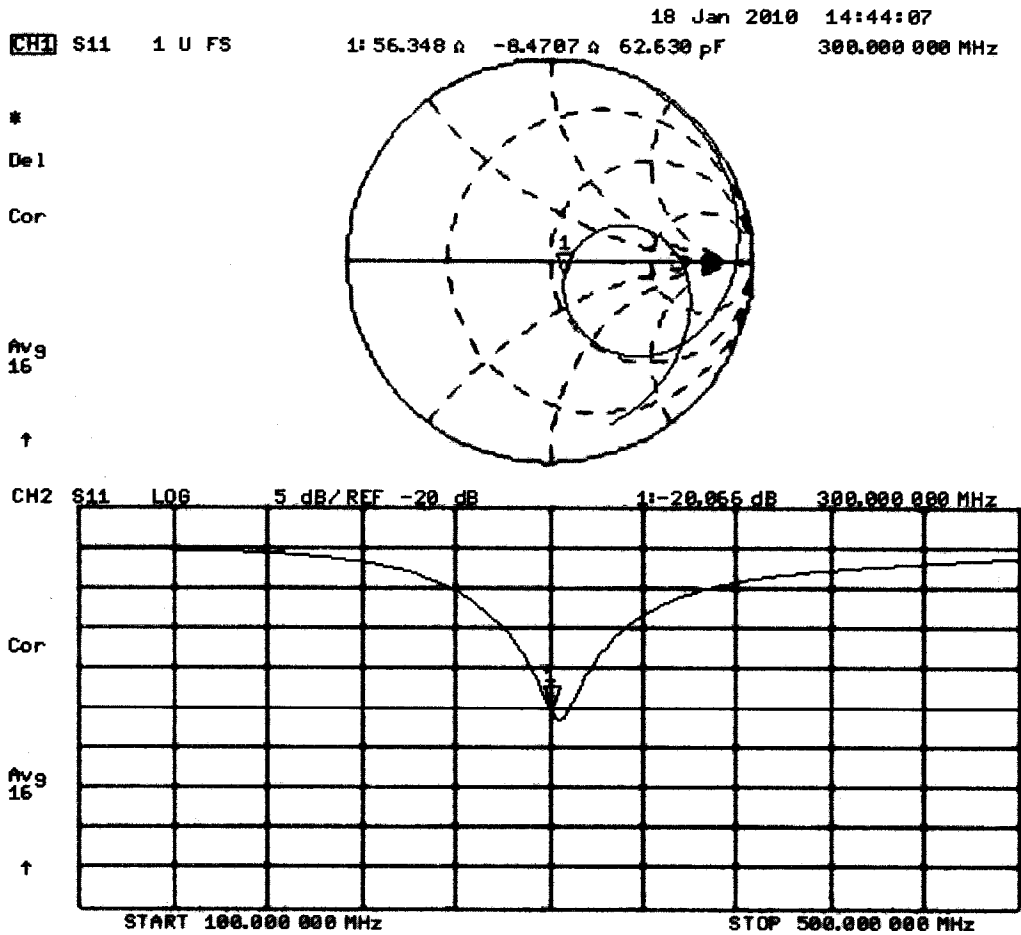
SAR(1 g) = 1.14 mW/g ; SAR(10 g) = 0.763 mW/g



Maximum value of SAR (measured) = 1.21 mW/g



0 dB = 1.21 mW/g


Impedance Measurement Plot for Head TSL



	<u>Date(s) of Evaluation</u> January 17, 2012	<u>Test Report Serial No.</u> 011612K66-T1146-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	
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Test Lab Certificate No. 2470.01

APPENDIX F - PROBE CALIBRATION

Applicant:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Client **Celltech**

Certificate No: **ET3-1590_Jun11**

CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1590**

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



Calibration date: **June 22, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature 
Approved by:	Katja Pokovic	Technical Manager	
Issued: June 23, 2011			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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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 E^2 -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: June 22, 2011

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

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

Basic Calibration Parameters

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

Modulation Calibration Parameters

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

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

^A The uncertainties of NormX,Y,Z do not affect the 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	7.30	7.30	7.30	0.18	2.10	± 13.4 %
835	41.5	0.90	6.50	6.50	6.50	0.38	2.55	± 12.0 %
900	41.5	0.97	6.39	6.39	6.39	0.39	2.47	± 12.0 %

^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

Calibration Parameter Determined in Body Tissue Simulating Media

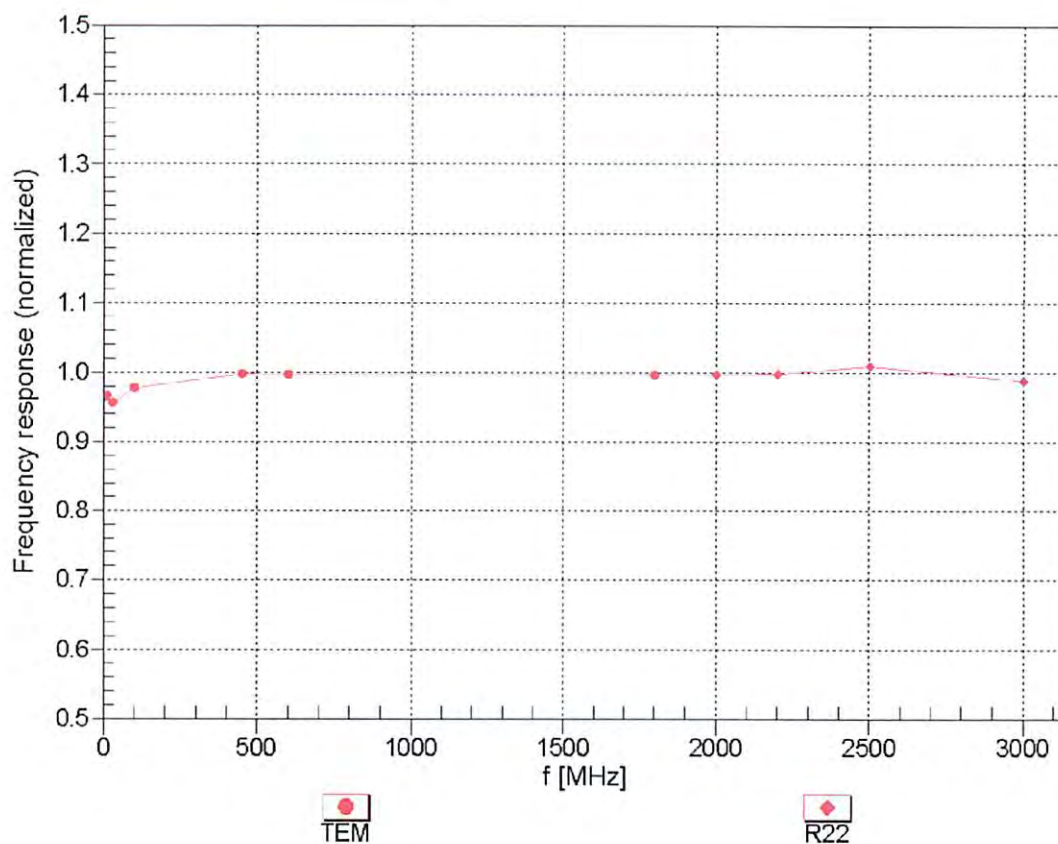
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
450	56.7	0.94	7.82	7.82	7.82	0.12	2.04	± 13.4 %
835	55.2	0.97	6.37	6.37	6.37	0.42	2.33	± 12.0 %
900	55.0	1.05	6.27	6.27	6.27	0.40	2.45	± 12.0 %

^C Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

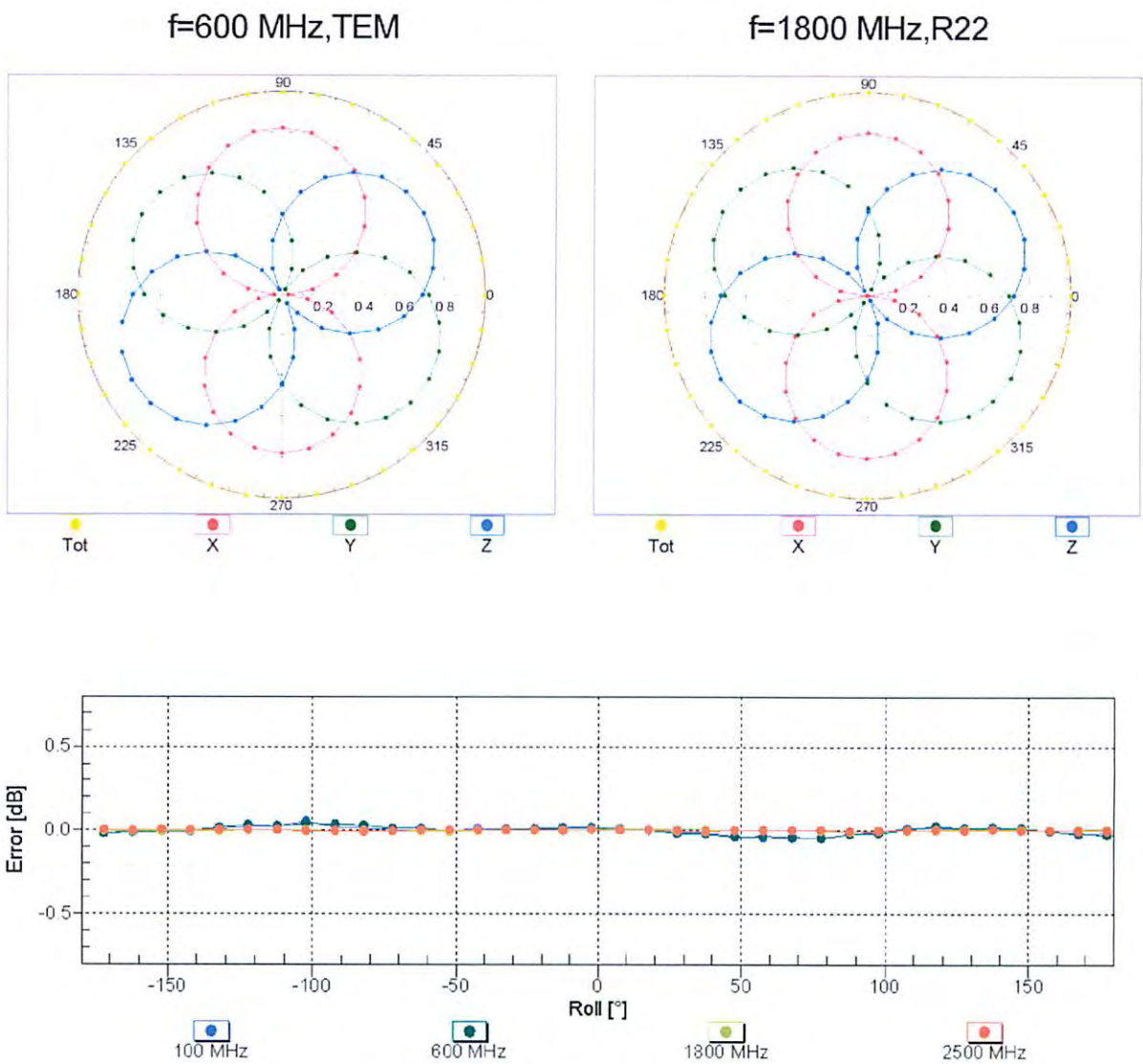
Frequency Response of E-Field

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



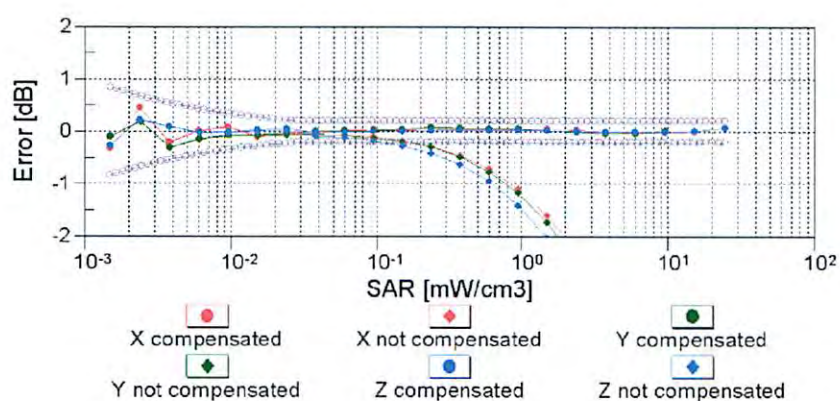
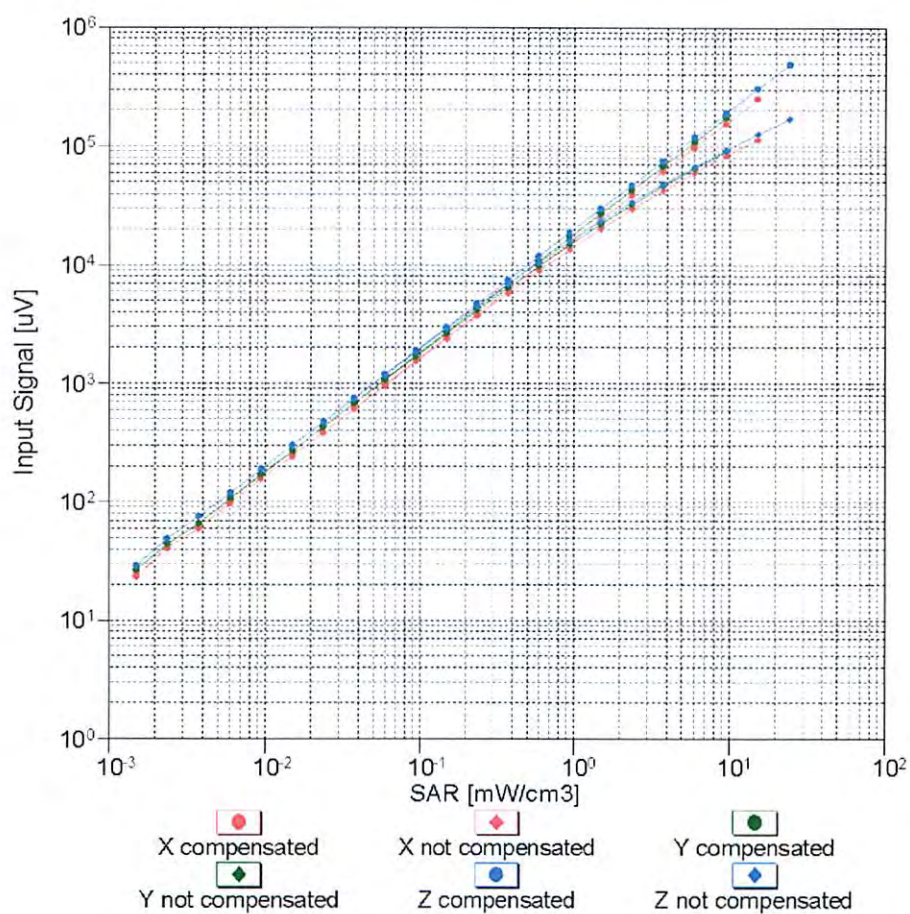
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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



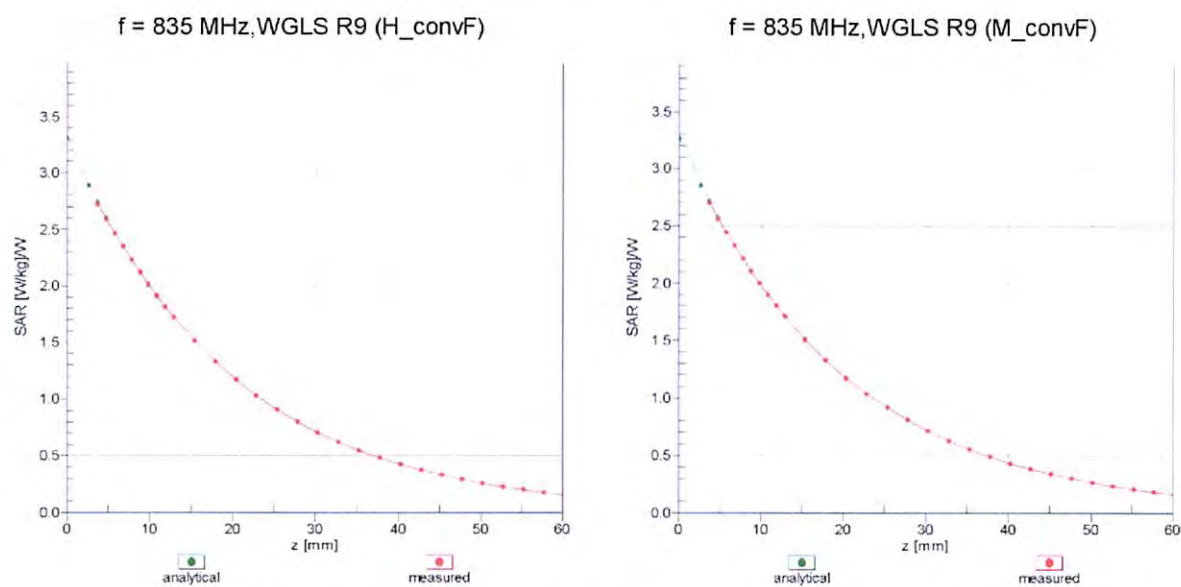
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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

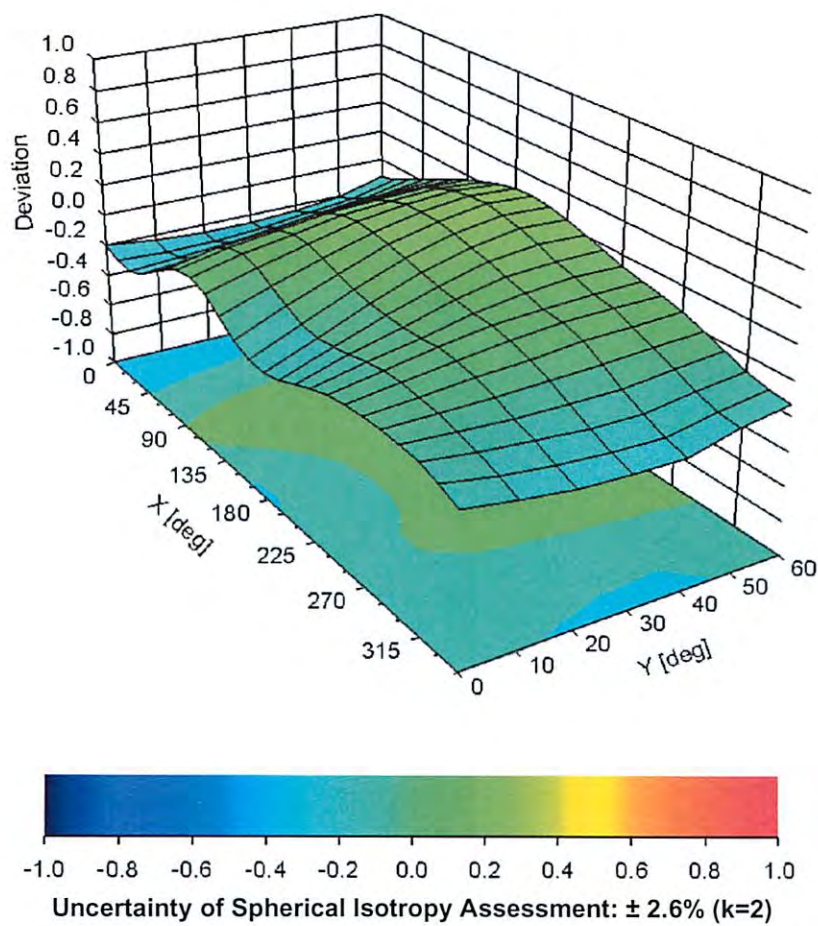


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

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

Additional Conversion Factors

for Dosimetric E-Field Probe

Type:

ET3DV6

Serial Number:

1590

Place of Assessment:

Zurich

Date of Assessment:

June 24, 2011

Probe Calibration Date:

June 22, 2011

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* **8.9 \pm 10%**

$\epsilon_r = 52.3$
 $\sigma = 0.76$ mho/m
(head tissue)

300 \pm 50 MHz *ConvF* **8.0 \pm 9%**

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



150 \pm 50 MHz *ConvF* **8.3 \pm 10%**

$\epsilon_r = 61.9$
 $\sigma = 0.80$ 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> January 17, 2012	<u>Test Report Serial No.</u> 011612K66-T1146-S80V	<u>Test Report Revision No.</u> Rev. 1.0 (1st Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> January 26, 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:	Vertex Standard Co., Ltd.		FCC ID:	K6630493X20	IC:	511B-30493X20	
Model(s):	HX300	DUT Type:	Portable VHF PTT Marine Radio Transceiver		156.025-157.425 MHz		
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E-mail: barskiind@shaw.ca
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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 Chailler', is written over a horizontal line.

Daniel Chailler



Fiberglass Planar Phantom - Top View



Fiberglass Planar Phantom - Front View



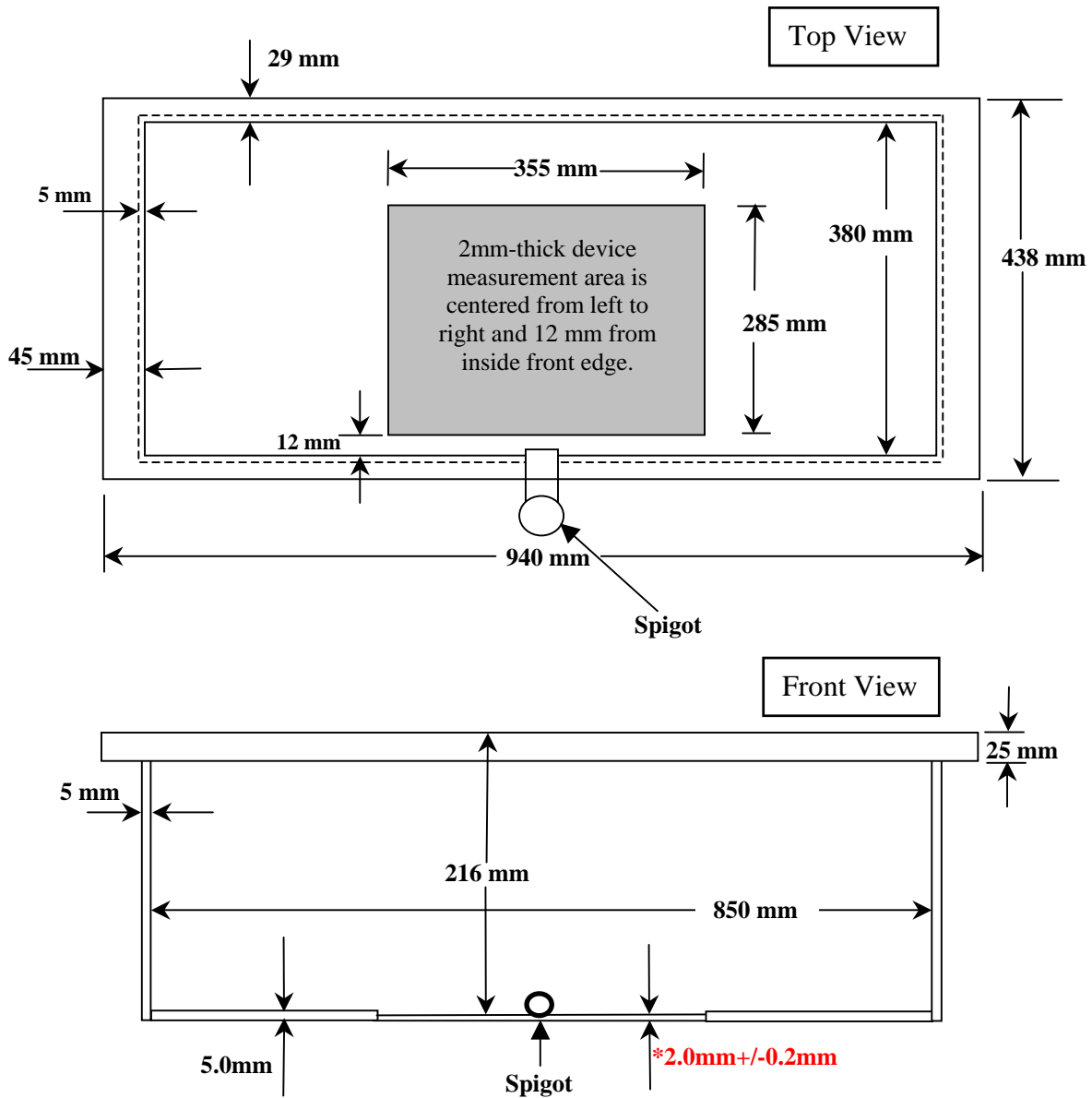
Fiberglass Planar Phantom - Back View



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.**