

	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	
	<u>Test Report Issue Date</u> July 11, 2011	<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

<b>Test Lab Information</b>	<b>Name</b>	CELLTECH LABS INC.			
	<b>Address</b>	21-364 Lougheed Road, Kelowna, British Columbia V1X 7R8 Canada			
<b>Test Lab Accreditation(s)</b>	<b>A2LA</b>	ISO/IEC 17025:2005 (A2LA Test Lab Certificate No. 2470.01)			
<b>Applicant Information</b>	<b>Name</b>	GARMIN INTERNATIONAL INC.			
	<b>Address</b>	1200, East 151 <sup>st</sup> Street, Olathe, KS, 66062			
<b>Application Type(s)</b>	<b>FCC</b>	TCB Certification	<b>IC</b>	CB Certification	
<b>Standard(s) Applied</b>	<b>FCC</b>	47 CFR §2.1093	<b>IC</b>	Health Canada Safety Code 6	
<b>Procedure(s) Applied</b>	<b>FCC</b>	OET Bulletin 65, Supplement C	<b>FCC</b>	KDB 447498	
	<b>IEEE</b>	1528-2003	<b>IC</b>	RSS-102 Issue 4	
	<b>IEC</b>	62209-1:2005	<b>IEC</b>	62209-2:2010	
<b>Device Classification(s)</b>	<b>FCC</b>	Licensed Non-Broadcast Transmitter Held to Face (TNF) - GMRS			
	<b>IC</b>	Licence-exempt Radio Apparatus: Category I Equipment (RSS-210) - GMRS			
<b>Device Identifier(s)</b>	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>Date of Sample Receipt</b>	April 15, 2011		<b>Date(s) of Evaluation</b>	May 20, 25-26, June 10, 13, 2011	
<b>Device Model Tested</b>	Rino 610				
<b>Test Sample Serial No.</b>	1766382196551000 (Identical Prototype)				
<b>Device-Under-Test Description (DUT)</b>	Portable GMRS/FRS Push-To-Talk (PTT) Radio Transceiver				
<b>Device Mode(s) of Operation</b>	Analog FM				
<b>Transmitter Frequency Range(s)</b>	462.5500 - 462.7250 MHz (GMRS Channels 15-22)				
	462.5625 - 462.7125 MHz (GMRS/FRS Channels 1-7)				
	467.5625 - 467.7125 MHz (FRS Channels 8-14)				
<b>Manufacturer's Rated Output Power</b>	1 Watt Conducted (+0/-0.45 dB)				
<b>RF Output Power Measured</b>	1.0 W	30.0 dBm	Conducted Average	462.5625 MHz	GMRS Ch. 1
<b>Battery Type(s) Tested</b>	Ni-MH Battery Pack		1.2 V (x4)	1600 mAh (x4)	P/N: 011-02526-40
	Alkaline Battery Pack		1.5 V (x4)	Energizer Industrial	P/N: 011-02526-40
<b>Antenna Type Tested</b>	Helix (Internal)	1.5 dBi Gain	Length : 62.3 mm	P/N: 700-00040-00	
<b>Body-worn Accessories Tested</b>	Swivel Belt-Clip (contains metal)				P/N: 013-00063-00
	Carabiner Clip (contains metal)				P/N: 011-01750-20
<b>Audio Accessories Tested</b>	Earbud w/ PTT Mic				P/N: 013-00072-00
	Flexible Ear Receiver				P/N 013-00071-00
	Headset w/ Mic, no PTT				P/N: 013-00392-00
<b>Max. SAR Level(s) Evaluated</b>	<b>Face-held</b>	<b>0.727 W/kg</b>	1g	50% PTT duty cycle	General Population / Uncontrolled
	<b>Body-worn</b>	<b>0.513 W/kg</b>	1g	50% PTT duty cycle	
<b>FCC/IC Spatial Peak SAR Limit</b>	<b>Head/Body</b>	1.6 W/kg	1g	50% PTT duty cycle	
<p>Celltech Labs Inc. declares under its sole responsibility that this wireless portable device has demonstrated compliance with the Specific Absorption Rate (SAR) RF exposure requirements specified in FCC 47 CFR §2.1093 and Health Canada's Safety Code 6 for the 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 and IEEE Standard 1528-2003. All measurements were performed in accordance with the SAR system manufacturer recommendations.</p>					
<p>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.</p>					
<p>The results and statements contained in this report pertain only to the device(s) evaluated.</p>					
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<b>Test Report Approved By</b>			<b>Sean Johnston</b>	<b>Lab Manager</b>	<b>Celltech Labs Inc</b>

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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<b>Applicant:</b> Garmin International Inc.	<b>FCC ID:</b> IPH-01766	<b>IC:</b> 1792A-01766	
<b>DUT Model:</b> Rino 610	<b>DUT Type:</b> Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver		
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### REVISION HISTORY

REVISION NO.	DESCRIPTION	IMPLEMENTED BY	RELEASE DATE
1.0	Initial Release	Jon Hughes	July 11, 2011

### TEST REPORT SIGN-OFF

DEVICE TESTED BY	REPORT PREPARED BY	QA REVIEW BY	REPORT APPROVED BY
Mike Meaker	Mike Meaker	Jon Hughes	Sean Johnston

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## 1.0 INTRODUCTION

This measurement report demonstrates that the Garmin International Inc. Rino610 Portable GMRS/FRS Push-To-Talk Radio Transceiver (FCC ID: IPH-01766 / IC: 1792A-01766) 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 test procedures described in FCC OET Bulletin 65, Supplement C Edition 01-01 (see reference [3]), IC RSS-102 Issue 4 (see reference [4]) and IEEE Standard 1528-2003 (see reference [5]) were employed. A description of the product and operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the 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/face 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.

## 3.0 RF CONDUCTED OUTPUT POWER MEASUREMENT

### MEASURED RF CONDUCTED OUTPUT POWER

DUT	Battery	Test Freq.	Chan.	Band	Mode	dBm	Watts	Method
Rino610	Alkaline	462.5625 MHz	1	GMRS	CW	30.0	1.0	Conducted Average
Rino610	Ni-MH	462.5625 MHz	1	GMRS	CW	30.0	1.0	Conducted Average

#### Notes

- The test channel was selected in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [8]).
- The RF conducted output power levels of the DUT were measured by Celltech prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter at the antenna connector of the radio in accordance with FCC 47 CFR §2.1046 (see reference [13]) and IC RSS-Gen (see reference [14]).

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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#### 4.0 FCC POWER THRESHOLDS FOR PTT DEVICES ( $f \leq 0.5$ GHz)

FCC SAR Evaluation Power Thresholds for PTT Devices, $f \leq 0.5$ GHz*			Manufacturer's Rated RF Output Power	
Exposure Conditions	P mW (General Population)	P mW (Occupational)	100% PTT Duty Cycle	50% PTT Duty Cycle
Held to face, $d \geq 2.5$ cm	250	1250	1.0 Watt	0.5 Watt
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 Section 5)b)i) (see reference [8]).			The conducted output power level of the DUT exceeds the FCC power threshold and therefore SAR evaluation is required.	

#### 5.0 NO. OF TEST CHANNELS ( $N_c$ )

Device Frequency Range	Band	$N_c$	Test Frequencies (MHz)
462.5500 - 462.7250 MHz	UHF GMRS	1	462.5625 MHz

Note: The number of test channels per antenna frequency range was calculated in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [8]).

#### 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  $\pm 50$  MHz of the probe calibration frequency. At 300 MHz to 3 GHz, measurements should be within  $\pm 100$  MHz of the probe calibration frequency. Measurements exceeding 50% of these intervals,  $\pm 25$  MHz  $< 300$  MHz and  $\pm 50$  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	$\pm 50$ MHz $\geq 300$ MHz
450 MHz	462.5625 MHz	12.5625 MHz	$< 50$ MHz

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

#### 7.0 MANUFACTURER'S DISCLOSED ACCESSORY LISTING

Part No.	Description	Accessory Category
011-02526-40	Battery Case (with AA Ni-MH Rechargeable)	Battery
011-02526-40	Battery Case (with AA Alkaline)	
013-00063-00	Swivel Belt-Clip (Contains Metal)	Body-worn
011-01750-20	Carabiner Clip (Contains Metal)	
013-00072-00	Earbud w/ PTT Mic	Audio
013-00071-00	Flexible Ear Receiver	
013-00392-00	Headset w/ mic, no PTT	

Notes:

- Manufacturer's disclosed accessory listing information provided by Garmin International Inc.

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## 8.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS						
Date: 05/20/2011		Frequency: 450 MHz			Tissue: Head	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	46.6	0.75	43.5	0.87	7.13%	-13.79%
0.360	46.51	0.75	43.5	0.87	6.92%	-13.79%
0.370	45.65	0.75	43.5	0.87	4.94%	-13.79%
0.380	45.48	0.77	43.5	0.87	4.55%	-11.49%
0.390	45.71	0.77	43.5	0.87	5.08%	-11.49%
0.400	45.05	0.78	43.5	0.87	3.56%	-10.34%
0.410	45.66	0.79	43.5	0.87	4.97%	-9.20%
0.420	45.19	0.79	43.5	0.87	3.89%	-9.20%
0.430	44.73	0.81	43.5	0.87	2.83%	-6.90%
0.440	43.98	0.83	43.5	0.87	1.10%	-4.60%
0.450	44.02	0.84	43.5	0.87	1.20%	-3.45%
0.460	43.69	0.83	43.5	0.87	0.44%	-4.60%
0.4625625*	43.6	0.833	43.5	0.87	0.23%	-4.25%
0.470	43.22	0.84	43.5	0.87	-0.64%	-3.45%
0.480	43.47	0.85	43.5	0.87	-0.07%	-2.30%
0.490	43.19	0.86	43.5	0.87	-0.71%	-1.15%
0.500	43.1	0.86	43.5	0.87	-0.92%	-1.15%
0.510	42.88	0.87	43.5	0.87	-1.43%	0.00%
0.520	42.13	0.89	43.5	0.87	-3.15%	2.30%
0.530	42.36	0.91	43.5	0.87	-2.62%	4.60%
0.540	42.4	0.91	43.5	0.87	-2.53%	4.60%
0.550	42.46	0.94	43.5	0.87	-2.39%	8.05%

\*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	$\rho$ (Kg/m <sup>3</sup> )
May 20	450 Head	22.0 °C	21.8 °C	≥ 15 cm	101.1 kPa	31%	1000

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
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FLUID DIELECTRIC PARAMETERS						
Date: 05/25/2011		Frequency: 450 MHz			Tissue: Body	
Freq	Test e	Test s	Target e	Target s	Deviation Permittivity	Deviation Conductivity
0.350	59.89	0.86	56.7	0.94	5.63%	-8.51%
0.360	58.9	0.86	56.7	0.94	3.88%	-8.51%
0.370	58.7	0.88	56.7	0.94	3.53%	-6.38%
0.380	58.7	0.88	56.7	0.94	3.53%	-6.38%
0.390	58.85	0.91	56.7	0.94	3.79%	-3.19%
0.400	59.01	0.9	56.7	0.94	4.07%	-4.26%
0.410	59.2	0.91	56.7	0.94	4.41%	-3.19%
0.420	58.15	0.92	56.7	0.94	2.56%	-2.13%
0.430	58.25	0.92	56.7	0.94	2.73%	-2.13%
0.440	58.09	0.94	56.7	0.94	2.45%	0.00%
0.450	58.1	0.94	56.7	0.94	2.47%	0.00%
0.460	57.54	0.93	56.7	0.94	1.48%	-1.06%
0.4625625*	57.5	0.933	56.7	0.94	1.41%	-0.74%
0.470	57.63	0.94	56.7	0.94	1.64%	0.00%
0.480	57.79	0.96	56.7	0.94	1.92%	2.13%
0.490	56.88	0.96	56.7	0.94	0.32%	2.13%
0.500	57	0.97	56.7	0.94	0.53%	3.19%
0.510	57.03	1	56.7	0.94	0.58%	6.38%
0.520	57.24	0.99	56.7	0.94	0.95%	5.32%
0.530	57.01	1	56.7	0.94	0.55%	6.38%
0.540	56.85	1.03	56.7	0.94	0.26%	9.57%
0.550	56.69	1.03	56.7	0.94	-0.02%	9.57%

\*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	$\rho$ (Kg/m <sup>3</sup> )
May 25	450 Body	22.0 °C	22.1 °C	≥ 15 cm	101.1 kPa	35%	1000

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
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FLUID DIELECTRIC PARAMETERS						
Date: 05/26/2011		Frequency: 450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	59.92	0.82	56.7	0.94	5.68%	-12.77%
0.360	59.17	0.83	56.7	0.94	4.36%	-11.70%
0.370	59.59	0.85	56.7	0.94	5.10%	-9.57%
0.380	58.56	0.85	56.7	0.94	3.28%	-9.57%
0.390	58.83	0.86	56.7	0.94	3.76%	-8.51%
0.400	58.78	0.87	56.7	0.94	3.67%	-7.45%
0.410	58.87	0.88	56.7	0.94	3.83%	-6.38%
0.420	58.8	0.87	56.7	0.94	3.70%	-7.45%
0.430	57.98	0.9	56.7	0.94	2.26%	-4.26%
0.440	58.2	0.9	56.7	0.94	2.65%	-4.26%
0.450	57.65	0.9	56.7	0.94	1.68%	-4.26%
0.460	58.03	0.92	56.7	0.94	2.35%	-2.13%
0.4625625*	57.9	0.923	56.7	0.94	2.12%	-1.81%
0.470	57.56	0.93	56.7	0.94	1.52%	-1.06%
0.480	57.36	0.94	56.7	0.94	1.16%	0.00%
0.490	57.24	0.95	56.7	0.94	0.95%	1.06%
0.500	57.39	0.96	56.7	0.94	1.22%	2.13%
0.510	57.56	0.97	56.7	0.94	1.52%	3.19%
0.520	57.11	0.97	56.7	0.94	0.72%	3.19%
0.530	56.6	0.98	56.7	0.94	-0.18%	4.26%
0.540	56.84	0.98	56.7	0.94	0.25%	4.26%
0.550	56.85	1	56.7	0.94	0.26%	6.38%

\*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	$\rho$ (Kg/m <sup>3</sup> )
May 26	450 Body	21.0 °C	21.7 °C	≥ 15 cm	101.1 kPa	39%	1000

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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FLUID DIELECTRIC PARAMETERS						
Date: 06/10/2011		Frequency: 450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	59.04	0.89	56.7	0.94	4.13%	-5.32%
0.360	58.91	0.9	56.7	0.94	3.90%	-4.26%
0.370	58.74	0.92	56.7	0.94	3.60%	-2.13%
0.380	58.62	0.91	56.7	0.94	3.39%	-3.19%
0.390	59.05	0.9	56.7	0.94	4.14%	-4.26%
0.400	58.46	0.92	56.7	0.94	3.10%	-2.13%
0.410	58.22	0.94	56.7	0.94	2.68%	0.00%
0.420	58.54	0.95	56.7	0.94	3.25%	1.06%
0.430	57.74	0.96	56.7	0.94	1.83%	2.13%
0.440	57.84	0.96	56.7	0.94	2.01%	2.13%
0.450	57.9	0.97	56.7	0.94	2.12%	3.19%
0.460	57.75	0.98	56.7	0.94	1.85%	4.26%
0.4625625*	57.7	0.98	56.7	0.94	1.76%	4.26%
0.470	57.71	0.98	56.7	0.94	1.78%	4.26%
0.480	57.07	1	56.7	0.94	0.65%	6.38%
0.490	57.22	1.01	56.7	0.94	0.92%	7.45%
0.500	57.05	1.02	56.7	0.94	0.62%	8.51%
0.510	56.94	1.02	56.7	0.94	0.42%	8.51%
0.520	56.83	1.03	56.7	0.94	0.23%	9.57%
0.530	56.56	1.03	56.7	0.94	-0.25%	9.57%
0.540	57.04	1.03	56.7	0.94	0.60%	9.57%
0.550	56.49	1.04	56.7	0.94	-0.37%	10.64%

\*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	$\rho$ (Kg/m <sup>3</sup> )
Jun 10	450 Body	22.0 °C	22.9 °C	≥ 15 cm	101.1 kPa	34%	1000

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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FLUID DIELECTRIC PARAMETERS						
Date: 06/13/2011		Frequency: 450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
0.350	58.49	0.85	56.7	0.94	3.16%	-9.57%
0.360	57.86	0.86	56.7	0.94	2.05%	-8.51%
0.370	58.2	0.85	56.7	0.94	2.65%	-9.57%
0.380	57.84	0.87	56.7	0.94	2.01%	-7.45%
0.390	57.79	0.87	56.7	0.94	1.92%	-7.45%
0.400	57.42	0.89	56.7	0.94	1.27%	-5.32%
0.410	56.79	0.89	56.7	0.94	0.16%	-5.32%
0.420	57.24	0.89	56.7	0.94	0.95%	-5.32%
0.430	57.07	0.9	56.7	0.94	0.65%	-4.26%
0.440	56.85	0.91	56.7	0.94	0.26%	-3.19%
0.450	57.18	0.93	56.7	0.94	0.85%	-1.06%
0.460	57.12	0.94	56.7	0.94	0.74%	0.00%
0.4625625*	57	0.94	56.7	0.94	0.53%	0.00%
0.470	56.83	0.94	56.7	0.94	0.23%	0.00%
0.480	56.42	0.95	56.7	0.94	-0.49%	1.06%
0.490	56.12	0.97	56.7	0.94	-1.02%	3.19%
0.500	56.04	0.97	56.7	0.94	-1.16%	3.19%
0.510	55.75	0.97	56.7	0.94	-1.68%	3.19%
0.520	55.98	0.98	56.7	0.94	-1.27%	4.26%
0.530	55.9	0.99	56.7	0.94	-1.41%	5.32%
0.540	55.63	0.99	56.7	0.94	-1.89%	5.32%
0.550	55.38	1	56.7	0.94	-2.33%	6.38%

\*interpolated using DASY4 software

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	$\rho$ (Kg/m <sup>3</sup> )
Jun 13	450 Body	23.0 °C	22.8 °C	≥ 15 cm	101.1 kPa	40%	1000

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## 9.0 SAR MEASUREMENT SUMMARY

### SAR EVALUATION RESULTS (GMRS Mode)

Test Type	Test Date	Test Freq. (MHz)	Battery Type	Accessories		DUT Spacing to Planar Phantom		Cond. Power	Measured SAR 1g (W/kg)		SAR Drift During Test	SAR Scaling (with Droop)	
									PTT Duty Cycle			dB	PTT Duty Cycle
				Body-worn	Audio	DUT	Antenna	Watts	100%	50%	100%		50%
FACE	May 20	462.5625	Alkaline	n/a	n/a	2.5 cm	3.5 cm	1.0	1.35	0.675	-0.324	1.45	0.727
	May 20	462.5625	Ni-MH	n/a	n/a	2.5 cm	3.5 cm	1.0	1.17	0.585	-0.484	1.31	0.654
BODY	May 25	462.5625	Alkaline	Belt-Clip	Earbud Mic	2.9 cm	5.3 cm	1.0	0.530	0.265	-0.423	0.584	0.292
	May 25	462.5625	Ni-MH	Belt-Clip	Earbud Mic	2.9 cm	5.3 cm	1.0	0.440	0.220	-0.451	0.488	0.244
	May 25	462.5625	Alkaline	Belt-Clip	Ear Receiver	2.9 cm	5.3 cm	1.0	0.289	0.145	-0.198	0.303	0.151
	May 25	462.5625	Ni-MH	Belt-Clip	Ear Receiver	2.9 cm	5.3 cm	1.0	0.208	0.104	-0.161	0.216	0.108
	Jun 10	462.5625	Alkaline	Belt-Clip	Headset Mic	2.9 cm	5.3 cm	1.0	0.500	0.250	-0.390	0.547	0.274
	Jun 10	462.5625	Ni-MH	Belt-Clip	Headset Mic	2.9 cm	5.3 cm	1.0	0.467	0.234	-0.528	0.527	0.264
	May 26	462.5625	Alkaline	Carabiner Clip	Earbud Mic	1.3 cm	4.5 cm	1.0	0.875	0.438	-0.444	0.969	0.485
	May 26	462.5625	Ni-MH	Carabiner Clip	Earbud Mic	1.3 cm	4.5 cm	1.0	0.742	0.371	-0.701	0.872	0.436
	May 26	462.5625	Alkaline	Carabiner Clip	Ear Receiver	1.3 cm	4.5 cm	1.0	0.899	0.450	-0.575	1.03	0.513
	May 26	462.5625	Ni-MH	Carabiner Clip	Ear Receiver	1.3 cm	4.5 cm	1.0	0.840	0.420	-0.603	0.965	0.483
Jun 13	462.5625	Alkaline	Carabiner Clip	Headset Mic	1.3 cm	4.5 cm	1.0	0.701	0.351	-0.518	0.790	0.395	
Jun 13	462.5625	Ni-MH	Carabiner Clip	Headset Mic	1.3 cm	4.5 cm	1.0	0.494	0.247	-0.477	0.551	0.276	
<b>SAR LIMIT(S)</b>		<b>HEAD / BODY</b>		<b>SPATIAL PEAK</b>				<b>RF EXPOSURE CATEGORY</b>					
FCC 47 CFR 2.1093		1.6 W/kg		averaged over 1 gram				General Population / Uncontrolled					

#### Notes

1.	Detailed measurement plots showing the maximum SAR location of the DUT are reported in Appendix A.
2.	Test Mode: CW (Unmodulated Continuous Wave)
3.	The number of test channels was selected in accordance with the procedures specified in FCC KDB 447498 Section 6) c) (see reference [8]).
4.	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.
5.	The DUT was tested in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key constantly depressed. For a push-to-talk device the 50% duty cycle compensation reported assumes a transmit/receive cycle of equal time base.
6.	The fluid temperature was measured prior to and after the SAR evaluations. The measured fluid remained within +/-2°C.
7.	The dielectric parameters of the simulated tissue mixtures were measured prior to the SAR evaluations using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## 10.0 DETAILS OF SAR EVALUATION

The Garmin International Inc. Rino610 Portable GMRS/FRS PTT Radio Transceiver (FCC ID: IPH-01766 / IC: 1792A-01766) 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 radio placed parallel to the outer surface of the planar phantom. A 2.5 cm spacing was maintained between the front side of the DUT and the outer surface of the planar phantom. The face-held SAR evaluations were performed consecutively with each battery option.
2. The body-worn SAR evaluations were performed with the swivel belt-clip and carabiner clip body-worn accessories consecutively with each audio accessory and battery option.
3. The area scan evaluation was performed with a fully charged battery pack. After the area scan was completed the battery was replaced with a fully charged battery pack prior to the zoom scan evaluation.

## 11.0 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 32 mm x 32 mm x 30 mm (5 x 5 x 7 points) centered at the peak SAR location determined from the area scan 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.

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-01766</b>	<b>IC:</b>	<b>1792A-01766</b>	
<b>DUT Model:</b>	<b>Rino 610</b>	<b>DUT Type:</b>	<b>Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver</b>			
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## 12.0 SYSTEM PERFORMANCE CHECK

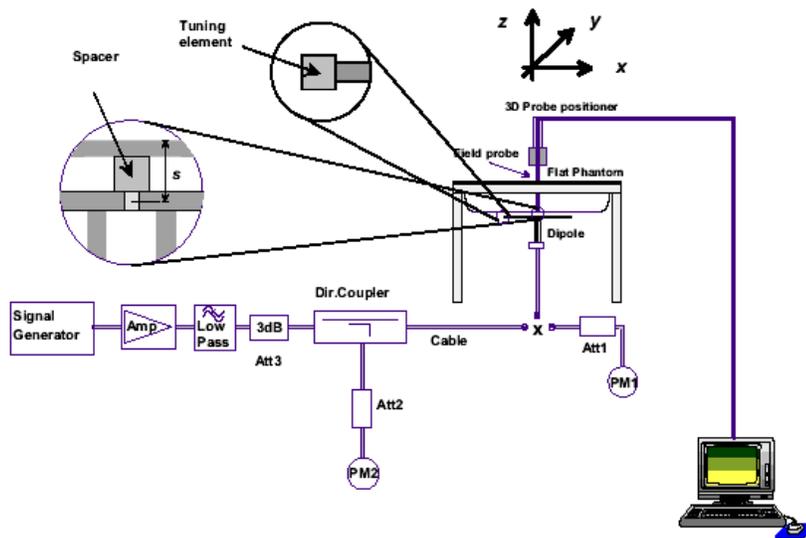
Prior to the SAR evaluations, daily system checks were performed with a planar phantom and 450 MHz SPEAG dipole (see Appendix B for system performance check test plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]). The dielectric parameters of the simulated 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 SAR system manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

### SYSTEM PERFORMANCE CHECK EVALUATIONS

Test Date	Equiv. Tissue	SAR 1g normalized to 1W (W/kg)			Dielectric Constant $\epsilon_r$			Conductivity $\sigma$ (mho/m)			$\rho$ (Kg/m <sup>3</sup> )	Amb. Temp. (°C)	Fluid Temp. (°C)	Fluid Depth (cm)	Humid. (%)	Barom. Press. (kPa)
		Target	Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.	Dev.						
May 20	Head 450	4.76 $\pm 10\%$	5.00	+5.0%	43.5 $\pm 5\%$	44.0	+1.1%	0.87 $\pm 5\%$	0.84	-3.4%	1000	23	21.6	$\geq 15$	32	101.1
May 25	Body 450	4.58 $\pm 10\%$	4.97	+8.5%	56.7 $\pm 5\%$	58.1	+2.5%	0.94 $\pm 5\%$	0.94	0%	1000	23	21.1	$\geq 15$	34	101.1
May 26	Body 450	4.58 $\pm 10\%$	4.85	+5.9%	56.7 $\pm 5\%$	57.7	+1.8%	0.94 $\pm 5\%$	0.90	-4.3%	1000	21	21.7	$\geq 15$	39	101.1
Jun 10	Body 450	4.58 $\pm 10\%$	4.92	+7.4%	56.7 $\pm 5\%$	57.9	+2.1%	0.94 $\pm 5\%$	0.97	+3.2%	1000	22	22.7	$\geq 15$	34	101.1
Jun 13	Body 450	4.58 $\pm 10\%$	4.85	+5.9%	56.7 $\pm 5\%$	57.2	+0.9%	0.94 $\pm 5\%$	0.93	-1.1%	1000	23	22.8	$\geq 15$	40	101.1

#### Notes

- The target SAR value is the measured values from the SAR system manufacturer's dipole calibration (see Appendix E).
- The target dielectric parameters are the normalized values for nominal fluid parameters from the SAR system manufacturer's dipole calibration (see Appendix E).
- The fluid temperature was measured prior to and after the system performance check. The measured fluid remained within  $\pm 2^\circ\text{C}$ .
- 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 450 MHz Validation Dipole Setup

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
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## 13.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipe in the table below is derived from the SAR system manufacturer's suggested recipe 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	450 MHz HEAD	450 MHz BODY
Water	38.56 %	52.00 %
Sugar	56.32 %	45.65 %
Salt	3.95 %	1.75 %
HEC	0.98 %	0.50 %
Bactericide	0.19 %	0.10 %

## 14.0 SAR LIMITS

SAR RF EXPOSURE LIMITS			
FCC 47 CFR 2.1093	Health Canada Safety Code 6	General Population	Occupational
Spatial Average (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak (averaged over any 1 g of tissue)		<b>1.6 W/kg</b>	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.			

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## 15.0 ROBOT SYSTEM SPECIFICATIONS

<u>Specifications</u>	
<b>Positioner</b>	Stäubli Unimation Corp. Robot Model: RX60L
<b>Repeatability</b>	0.02 mm
<b>No. of axis</b>	6
<u>Data Acquisition Electronic (DAE) System</u>	
<u>Cell Controller</u>	
<b>Processor</b>	AMD Athlon XP 2400+
<b>Clock Speed</b>	2.0 GHz
<b>Operating System</b>	Windows XP Professional
<u>Data Converter</u>	
<b>Features</b>	Signal Amplifier, multiplexer, A/D converter, and control logic
<b>Software</b>	Measurement Software: DASY4, V4.7 Build 44
	Postprocessing Software: SEMCAD, V1.8 Build 171
<b>Connecting Lines</b>	Optical downlink for data and status info., Optical uplink for commands and clock
<u>DASY4 Measurement Server</u>	
<b>Function</b>	Real-time data evaluation for field measurements and surface detection
<b>Hardware</b>	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
<b>Connections</b>	COM1, COM2, DAE, Robot, Ethernet, Service Interface
<u>E-Field Probe</u>	
<b>Model</b>	ET3DV6
<b>Serial No.</b>	1590
<b>Construction</b>	Triangular core fiber optic detection system
<b>Frequency</b>	10 MHz to 6 GHz
<b>Linearity</b>	±0.2 dB (30 MHz to 3 GHz)
<u>Phantom</u>	
<b>Type</b>	Barski Planar Phantom
<b>Shell Material</b>	Fiberglass
<b>Thickness</b>	2.0 ±0.1 mm
<b>Volume</b>	Approx. 70 liters

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## 16.0 PROBE SPECIFICATION (ET3DV6)

**Construction:** Symmetrical design with triangular core;  
Built-in shielding against static charges  
PEEK enclosure material (resistant to organic solvents, glycol)

**Calibration:** In air from 10 MHz to 2.5 GHz  
In head simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy  $\pm 8\%$ )

**Frequency:** 10 MHz to > 6 GHz; Linearity:  $\pm 0.2$  dB (30 MHz to 3 GHz)

**Directivity:**  $\pm 0.2$  dB in head tissue (rotation around probe axis)  
 $\pm 0.4$  dB in head tissue (rotation normal to probe axis)

**Dynamic Range:** 5  $\mu$ W/g to > 100 mW/g; Linearity:  $\pm 0.2$  dB

**Surface Detect:**  $\pm 0.2$  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

## 17.0 BARKSI 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

## 18.0 DEVICE HOLDER

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



Device Holder

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## 19.0 TEST EQUIPMENT LIST

TEST EQUIPMENT		ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
USED	DESCRIPTION				
x	Schmid & Partner DASY4 System	-	-	-	-
x	-DASY4 Measurement Server	00158	1078	CNR	CNR
x	-Robot	00046	599396-01	CNR	CNR
x	-DAE4	00019	353	27Apr10	Biennial
x	-ET3DV6 E-Field Probe	00017	1590	15Jul10	Annual
x	-SPEAG D450V3 Validation Dipole	000217	1068	18Jan10	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	04May10	Biennial
x	Gigatronics 80701A Power Sensor	00014	1833699	04May10	Biennial
x	HP 8753ET Network Analyzer	00134	US39170292	04May10	Biennial
x	Rohde & Schwarz SMR20 Signal Generator	00006	100104	CNR	CNR
x	Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Abbr.	CNR = Calibration Not Required				

## 20.0 JUSTIFICATION FOR EXTENDED SAR DIPOLE CALIBRATION

SAR dipoles calibrated less than two years ago but more than one year ago were confirmed by maintaining return loss (< -20dB, within 20% of prior calibration) and impedance (within 5Ω from prior calibration) requirements per extended calibrations in FCC KDB 450824 (see reference [9]).

SPEAG VALIDATION DIPOLE D450V3 - SN: 1068						
Measurement Date	Freq.	TSL	Return Loss (dB)	Δ %	Impedance (Ω)	Δ Ω
January 18, 2010	450 MHz	Body	- 20.0		54.8	
February 7, 2011			-20.5	2.5%	50.4	4.4

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-01766</b>	<b>IC:</b>	<b>1792A-01766</b>	
<b>DUT Model:</b>	<b>Rino 610</b>	<b>DUT Type:</b>	<b>Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver</b>			
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## 21.0 MEASUREMENT UNCERTAINTIES

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)	$V_1$ or $V_{eff}$
<b>Measurement System</b>									
Probe Calibration (450 MHz)	E.2.1	6.65	Normal	1	1	1	6.65	6.65	$\infty$
Axial Isotropy	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	$\infty$
Hemispherical Isotropy	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	$\infty$
Boundary Effect	E.2.3	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
Linearity	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	$\infty$
System Detection Limits	E.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
Readout Electronics	E.2.6	0.3	Normal	1	1	1	0.3	0.3	$\infty$
Response Time	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	$\infty$
Integration Time	E.2.8	2.6	Rectangular	1.732050808	1	1	1.5	1.5	$\infty$
RF Ambient Conditions	E.6.1	3	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Probe Positioner Mechanical Tolerance	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	$\infty$
Probe Positioning wrt Phantom Shell	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	$\infty$
Extrapolation, interpolation & integration algorithms for max. SAR evaluation	E.5	1	Rectangular	1.732050808	1	1	0.6	0.6	$\infty$
<b>Test Sample Related</b>									
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	$\infty$
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty	E.3.1	4	Rectangular	1.732050808	1	1	2.3	2.3	$\infty$
Liquid Conductivity (target)	E.3.2	5	Rectangular	1.732050808	0.64	0.43	1.8	1.2	$\infty$
Liquid Conductivity (measured)	E.3.3	4.26	Normal	1	0.64	0.43	2.7	1.8	$\infty$
Liquid Permittivity (target)	E.3.2	5	Rectangular	1.732050808	0.6	0.49	1.7	1.4	$\infty$
Liquid Permittivity (measured)	E.3.3	2.12	Normal	1	0.6	0.49	1.3	1.0	$\infty$
<b>Combined Standard Uncertainty</b>			<b>RSS</b>				<b>11.41</b>	<b>11.08</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>			<b>k=2</b>				<b>22.82</b>	<b>22.15</b>	
<b>Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003</b>									

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

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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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 62209-1:2005 - "Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures."
- [7] International Standard IEC 62209-2 Edition 1.0 2010-03 - "Human exposure to radio frequency fields from hand-held & body-mounted wireless communication devices - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)".
- [8] Federal Communications Commission, Office of Engineering and Technology - "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies"; KDB 447498 D01v04: November 2009.
- [9] Federal Communications Commission, Office of Engineering and Technology - "Application Note: SAR Probe Calibration and System Verification Considerations for Measurements at 150 MHz - 3 GHz"; KDB 450824 D01 v01r01: January 2007.
- [10] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 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.

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-01766</b>	<b>IC:</b>	<b>1792A-01766</b>	
<b>DUT Model:</b>	<b>Rino 610</b>	<b>DUT Type:</b>	<b>Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver</b>			
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## APPENDIX A - SAR MEASUREMENT DATA

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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Date Tested: 05/20/2011

**Face SAR - 1W - GMRS ch.1 - 462.5625 MHz - Alkaline**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 22°C; Fluid Temp: 21.8°C; Barometric Pressure: 101.1 kPa; Humidity: 31%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.833 \text{ mho/m}$ ;  $\epsilon_r = 43.6$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.25, 7.25, 7.25); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 1.29 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

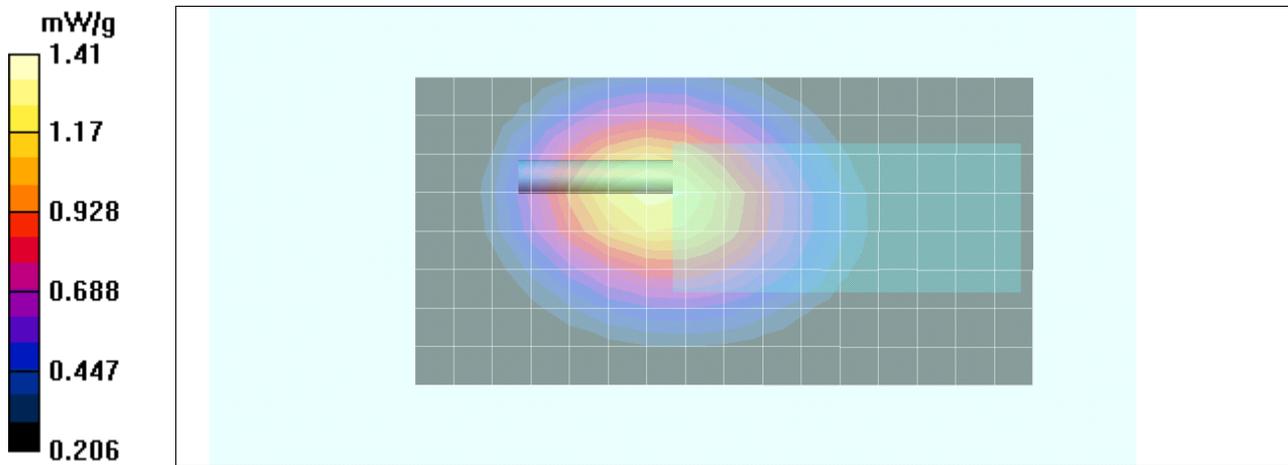
Reference Value = 42.1 V/m; Power Drift = -0.324 dB

Peak SAR (extrapolated) = 1.91 W/kg

**SAR(1 g) = 1.35 mW/g; SAR(10 g) = 0.969 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

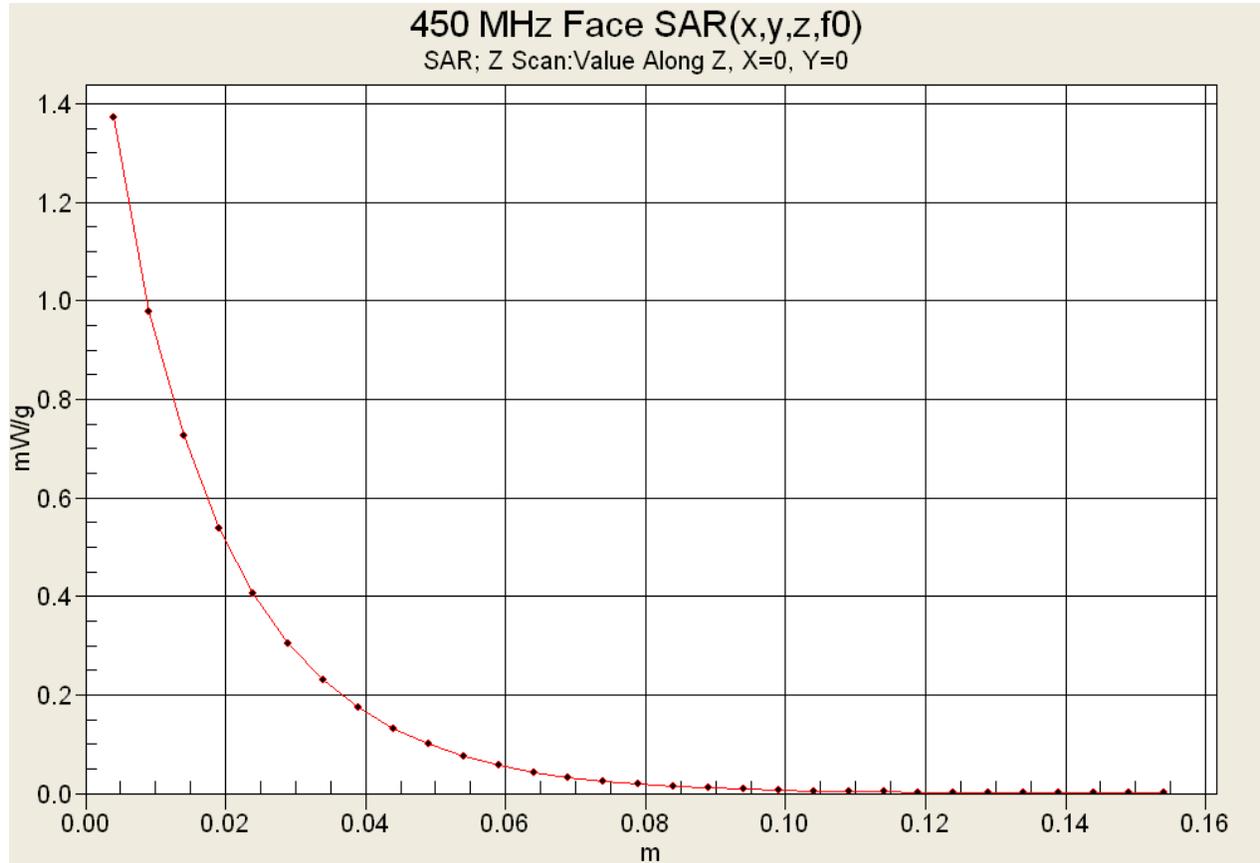
Maximum value of SAR (measured) = 1.41 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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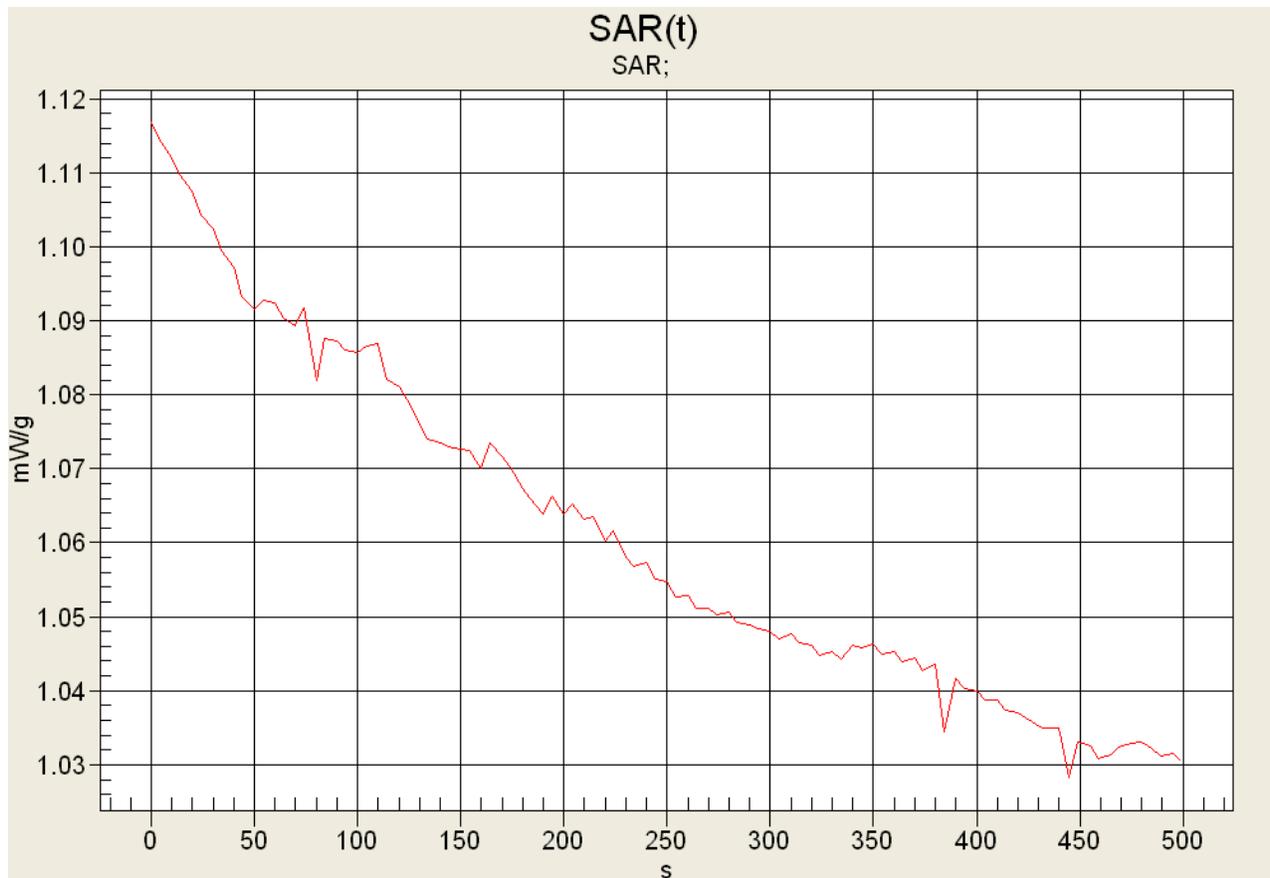
## Z-axis Scan



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## SAR versus Time



Start SAR: 1.117 mW/g

Zoom Scan (after 250s): 1.055 mW/g (-0.248 dB)

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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Date Tested: 05/20/2011

## Face SAR - 1W - GMRS ch.1 - 462.5625 MHz – Ni-MH

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 22°C; Fluid Temp: 21.8°C; Barometric Pressure: 101.1 kPa; Humidity: 31%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.833 \text{ mho/m}$ ;  $\epsilon_r = 43.6$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.25, 7.25, 7.25); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid: dx=15mm, dy=15mm

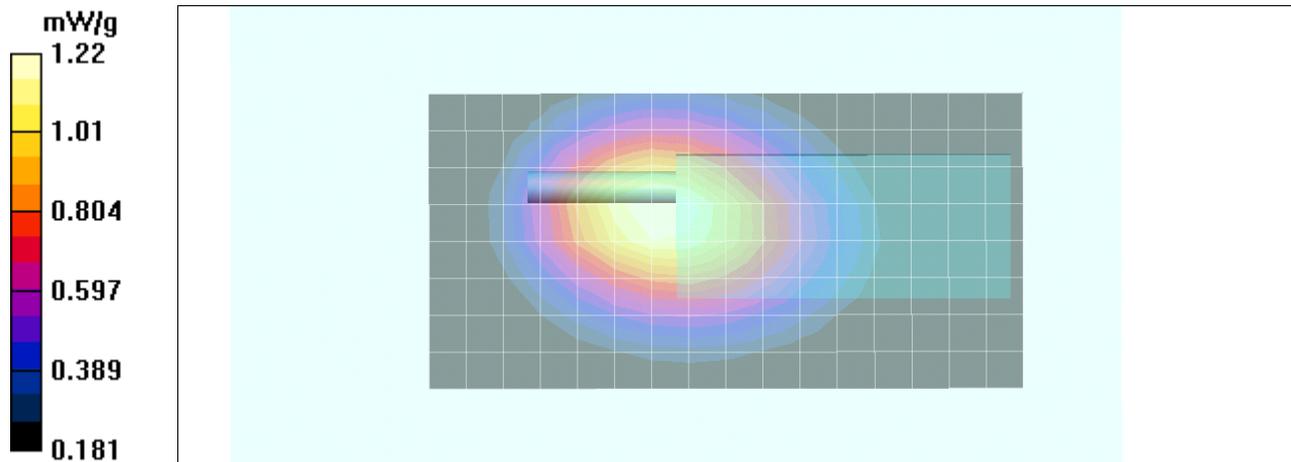
Maximum value of SAR (measured) = 1.22 mW/g

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 39.5 V/m; Power Drift = -0.484 dB

Peak SAR (extrapolated) = 1.65 W/kg

**SAR(1 g) = 1.17 mW/g; SAR(10 g) = 0.842 mW/g**



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/25/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Alkaline - Belt-Clip – Earbud**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 22°C; Fluid Temp: 22.1°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.933 \text{ mho/m}$ ;  $\epsilon_r = 57.5$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.488 mW/g

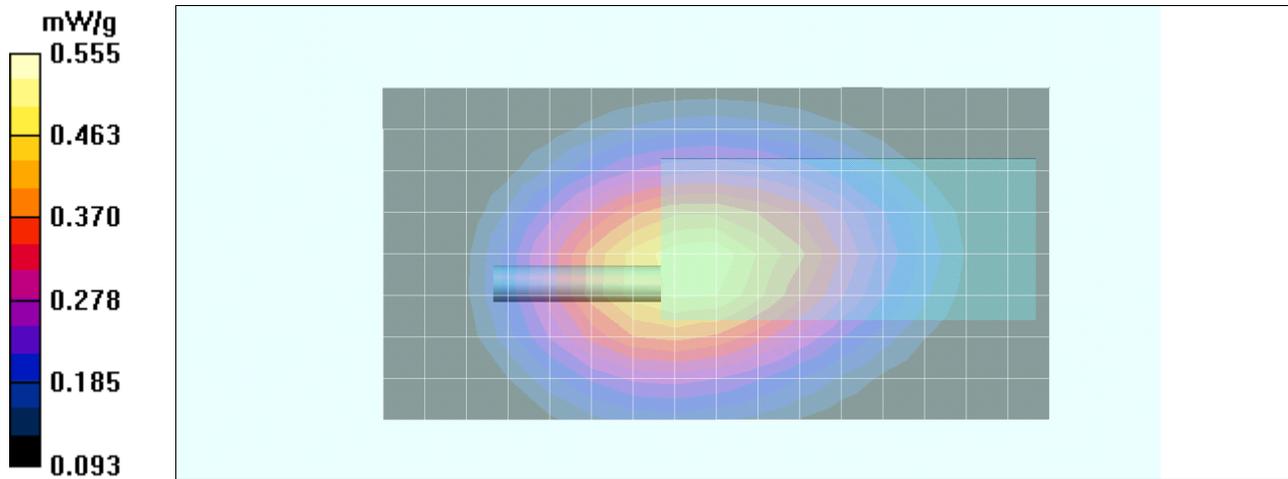
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 24.2 V/m; Power Drift = -0.423 dB

Peak SAR (extrapolated) = 0.760 W/kg

**SAR(1 g) = 0.530 mW/g; SAR(10 g) = 0.387 mW/g**

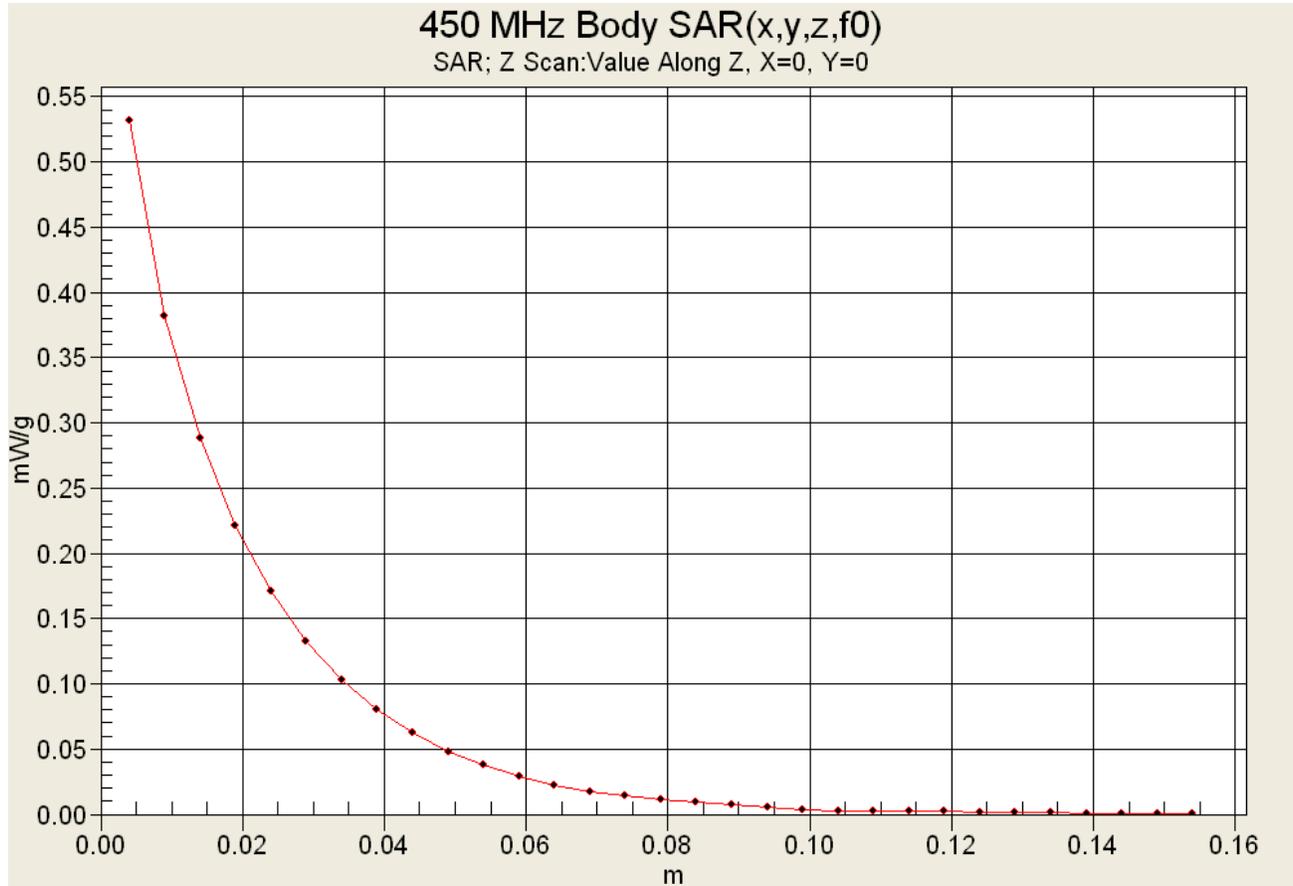
Maximum value of SAR (measured) = 0.555 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## Z-axis Scan



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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Date Tested: 05/25/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Ni-MH - Belt-Clip – Earbud**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 22°C; Fluid Temp: 22.1°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.933 \text{ mho/m}$ ;  $\epsilon_r = 57.5$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.388 mW/g

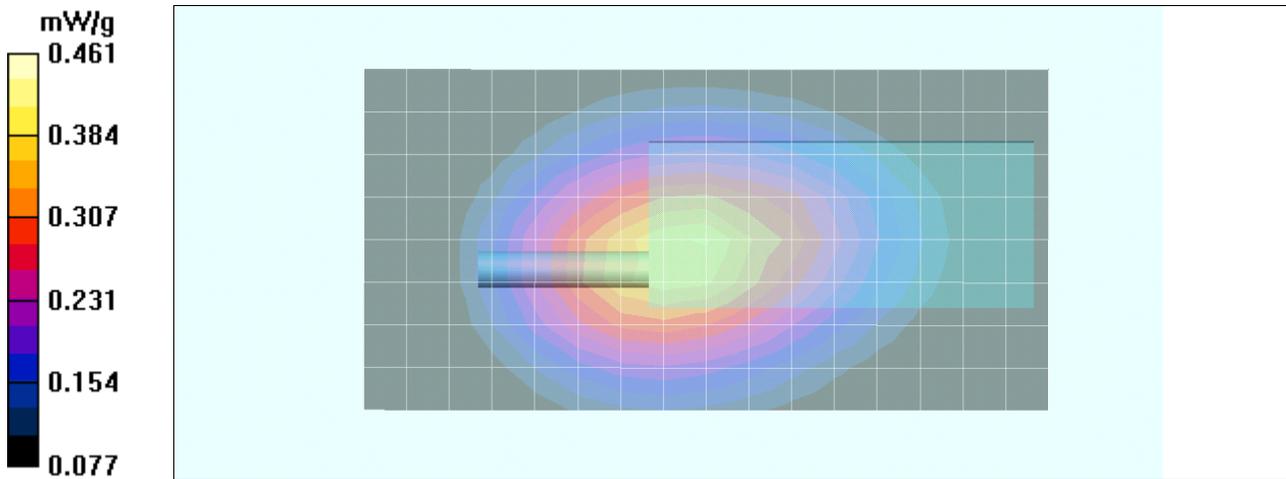
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 22.3 V/m; Power Drift = -0.451 dB

Peak SAR (extrapolated) = 0.634 W/kg

**SAR(1 g) = 0.440 mW/g; SAR(10 g) = 0.321 mW/g**

Maximum value of SAR (measured) = 0.461 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/25/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Alkaline - Belt-Clip – Ear Receiver**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 22°C; Fluid Temp: 22.1°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.933 \text{ mho/m}$ ;  $\epsilon_r = 57.5$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.479 mW/g

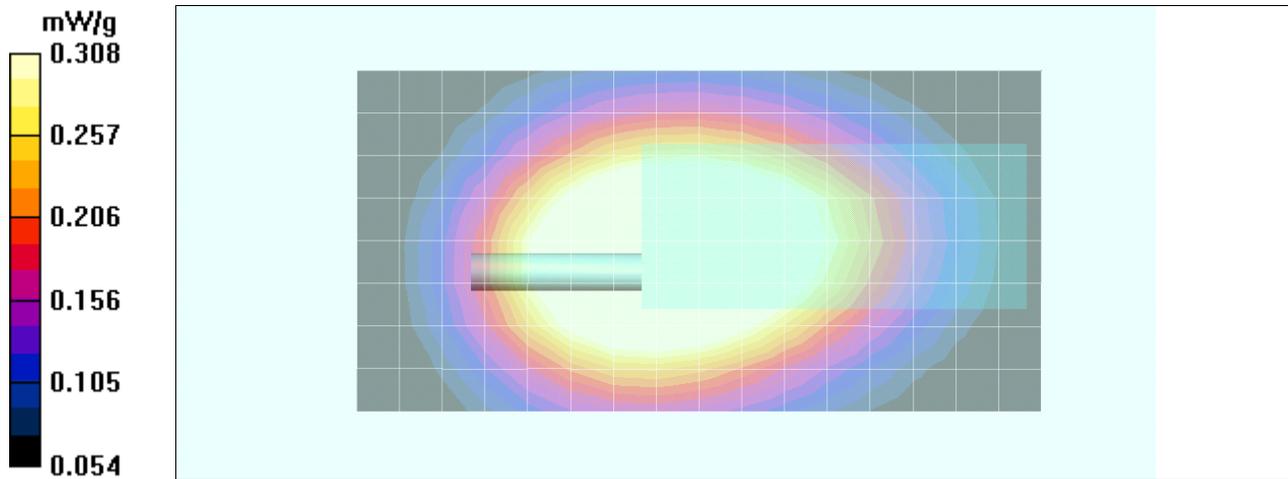
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 18.0 V/m; Power Drift = -0.198 dB

Peak SAR (extrapolated) = 0.416 W/kg

**SAR(1 g) = 0.289 mW/g; SAR(10 g) = 0.210 mW/g**

Maximum value of SAR (measured) = 0.308 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/25/2011

### Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Ni-MH - Belt-Clip – Ear Receiver

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 22°C; Fluid Temp: 22.1°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.933 \text{ mho/m}$ ;  $\epsilon_r = 57.5$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.282 mW/g

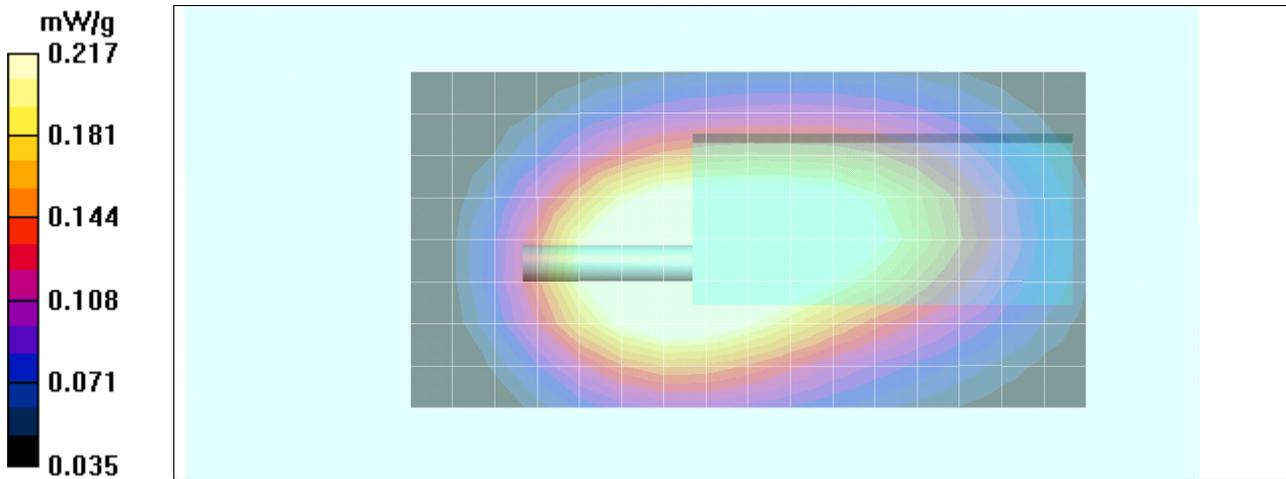
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 14.4 V/m; Power Drift = -0.161 dB

Peak SAR (extrapolated) = 0.290 W/kg

**SAR(1 g) = 0.208 mW/g; SAR(10 g) = 0.154 mW/g**

Maximum value of SAR (measured) = 0.217 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/10/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Alkaline – Belt-Clip – Headset**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 22°C; Fluid Temp: 22.9°C; Barometric Pressure: 101.1 kPa; Humidity: 34%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.98 \text{ mho/m}$ ;  $\epsilon_r = 57.7$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.489 mW/g

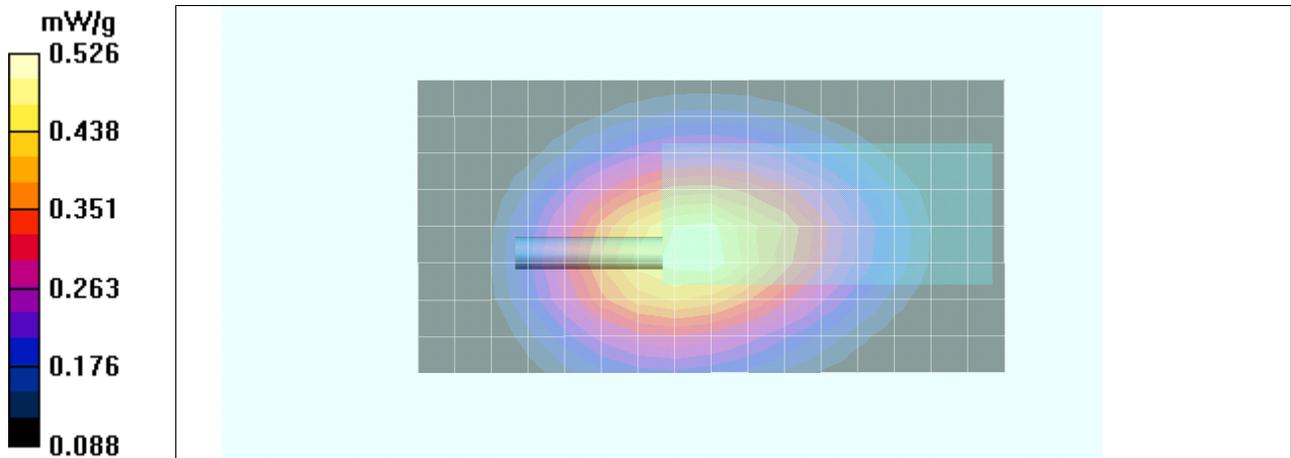
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 21.6 V/m; Power Drift = -0.390 dB

Peak SAR (extrapolated) = 0.725 W/kg

**SAR(1 g) = 0.500 mW/g; SAR(10 g) = 0.363 mW/g**

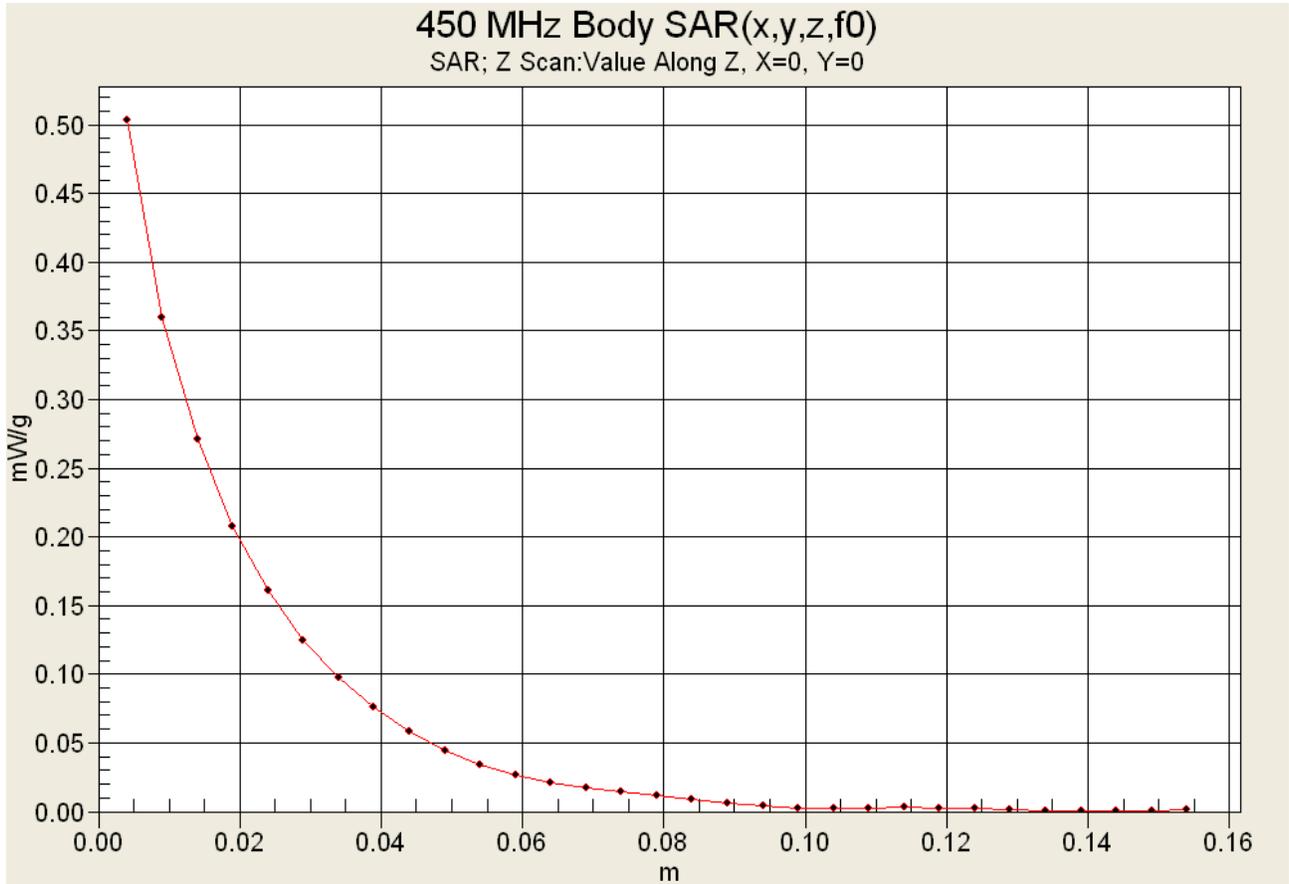
Maximum value of SAR (measured) = 0.526 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-axis Scan



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/10/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Ni-MH – Belt-Clip – Headset**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 22°C; Fluid Temp: 22.9°C; Barometric Pressure: 101.1 kPa; Humidity: 34%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.98 \text{ mho/m}$ ;  $\epsilon_r = 57.7$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.448 mW/g

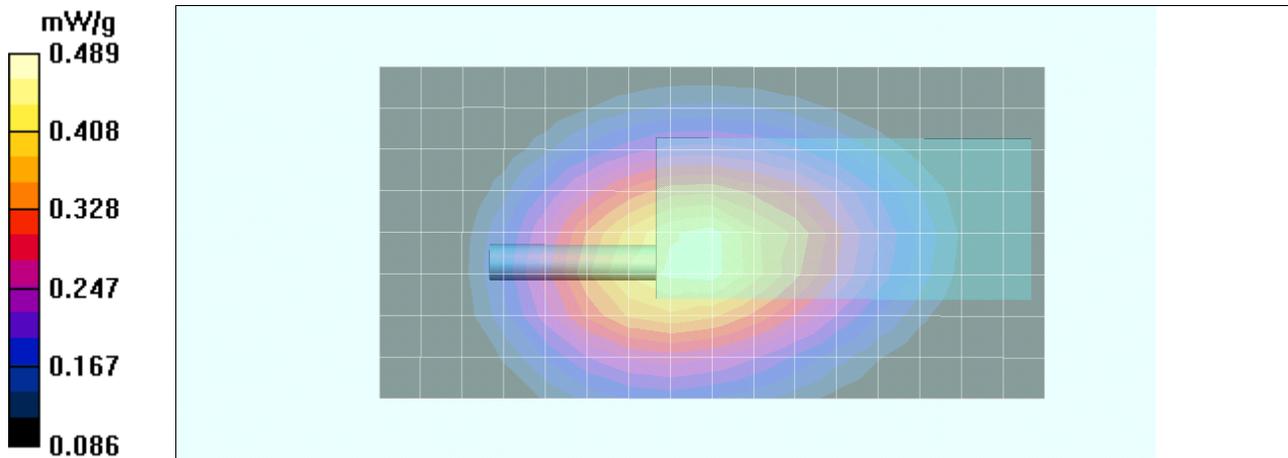
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 22.0 V/m; Power Drift = -0.528 dB

Peak SAR (extrapolated) = 0.665 W/kg

**SAR(1 g) = 0.467 mW/g; SAR(10 g) = 0.344 mW/g**

Maximum value of SAR (measured) = 0.489 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/26/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Alkaline - Carabiner – Earbud**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 21°C; Fluid Temp: 21.7°C; Barometric Pressure: 101.1 kPa; Humidity: 39%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.923 \text{ mho/m}$ ;  $\epsilon_r = 57.9$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

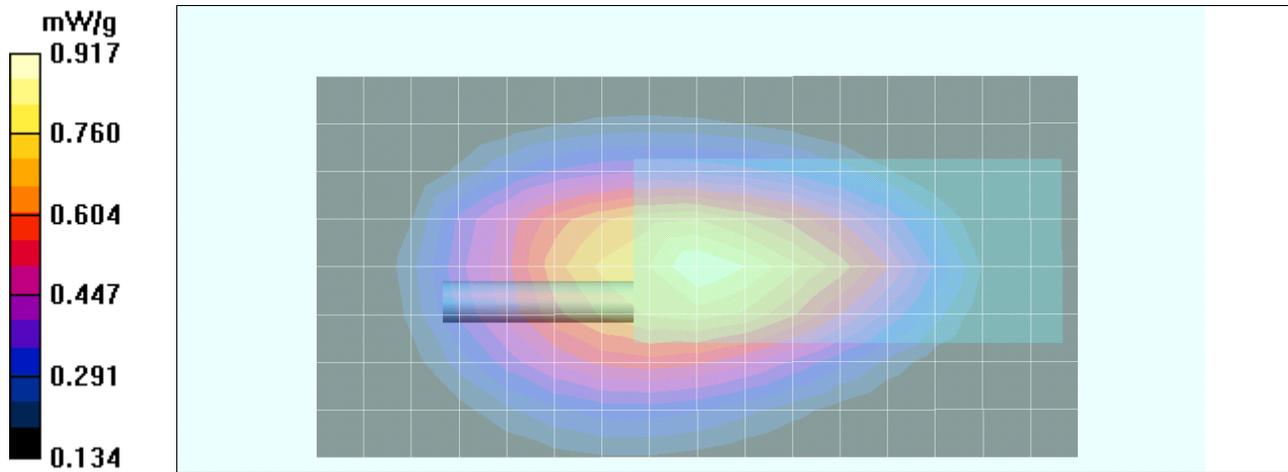
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 30.3 V/m; Power Drift = -0.444 dB

Peak SAR (extrapolated) = 1.28 W/kg

**SAR(1 g) = 0.875 mW/g; SAR(10 g) = 0.628 mW/g**

Maximum value of SAR (measured) = 0.917 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/26/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Ni-MH - Carabiner – Earbud**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 21°C; Fluid Temp: 21.7°C; Barometric Pressure: 101.1 kPa; Humidity: 39%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.923 \text{ mho/m}$ ;  $\epsilon_r = 57.9$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.726 mW/g

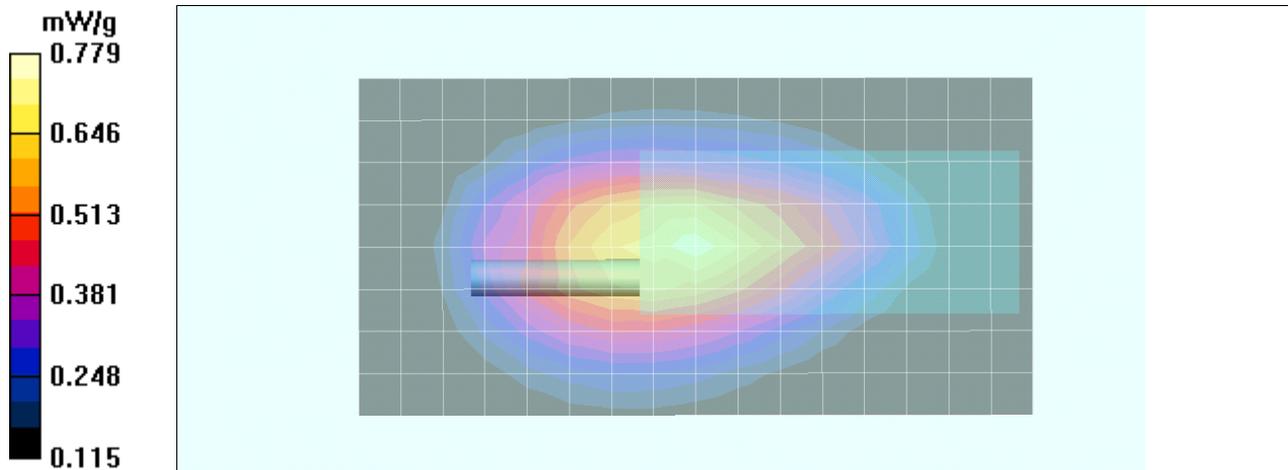
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 29.0 V/m; Power Drift = -0.701 dB

Peak SAR (extrapolated) = 1.11 W/kg

**SAR(1 g) = 0.742 mW/g; SAR(10 g) = 0.535 mW/g**

Maximum value of SAR (measured) = 0.779 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/26/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Alkaline - Carabiner – Ear Receiver**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 21°C; Fluid Temp: 21.7°C; Barometric Pressure: 101.1 kPa; Humidity: 39%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.923 \text{ mho/m}$ ;  $\epsilon_r = 57.9$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.757 mW/g

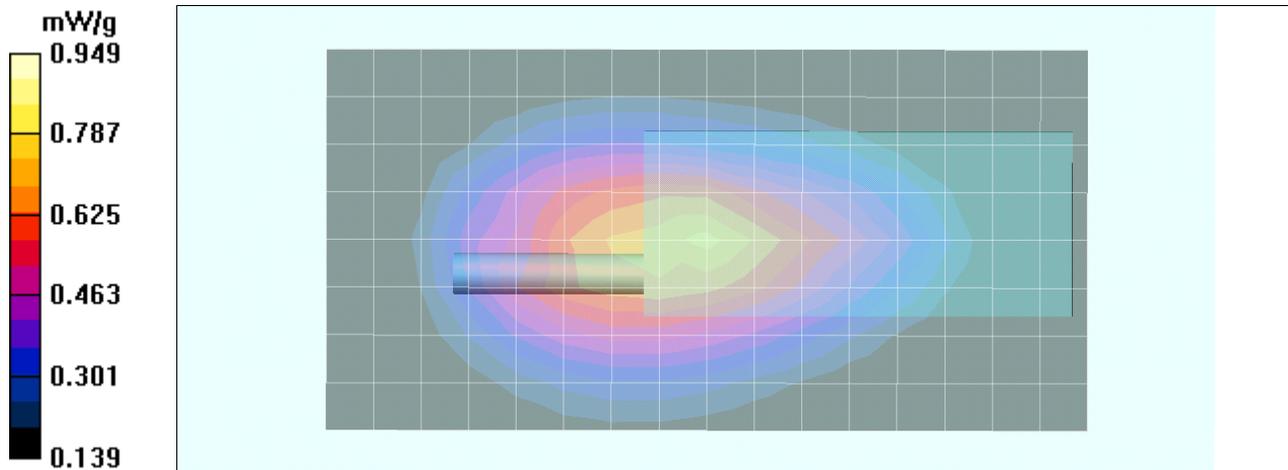
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 31.3 V/m; Power Drift = -0.575 dB

Peak SAR (extrapolated) = 1.34 W/kg

**SAR(1 g) = 0.899 mW/g; SAR(10 g) = 0.639 mW/g**

Maximum value of SAR (measured) = 0.949 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/26/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Ni-MH - Carabiner – Ear Receiver**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 21°C; Fluid Temp: 21.7°C; Barometric Pressure: 101.1 kPa; Humidity: 39%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.923 \text{ mho/m}$ ;  $\epsilon_r = 57.9$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.772 mW/g

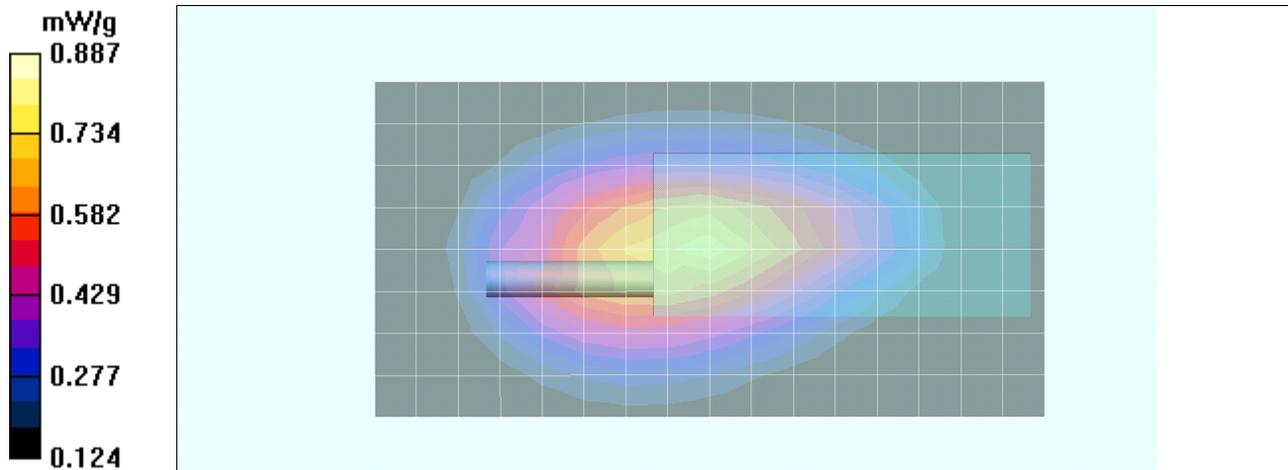
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 30.2 V/m; Power Drift = -0.603 dB

Peak SAR (extrapolated) = 1.26 W/kg

**SAR(1 g) = 0.840 mW/g; SAR(10 g) = 0.603 mW/g**

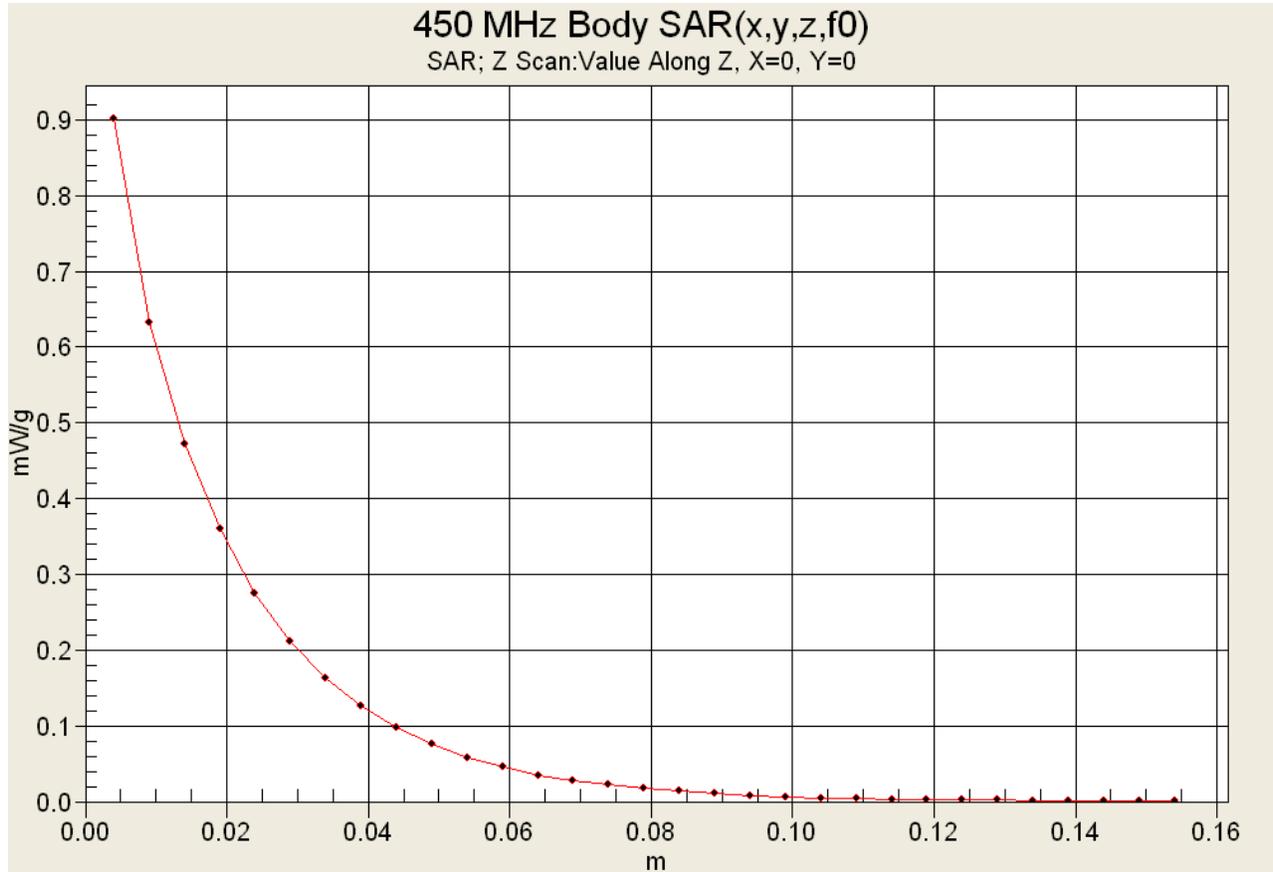
Maximum value of SAR (measured) = 0.887 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-axis Scan



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/13/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Alkaline – Carabiner – Headset**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 23°C; Fluid Temp: 22.8°C; Barometric Pressure: 101.1 kPa; Humidity: 40%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.94 \text{ mho/m}$ ;  $\epsilon_r = 57$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.911 mW/g

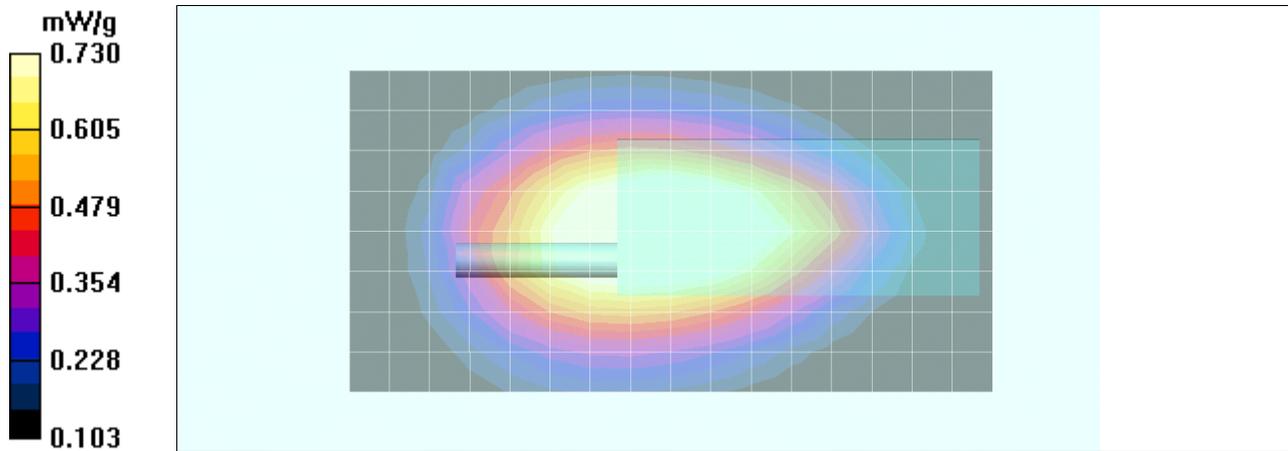
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 27.7 V/m; Power Drift = -0.518 dB

Peak SAR (extrapolated) = 1.01 W/kg

**SAR(1 g) = 0.701 mW/g; SAR(10 g) = 0.515 mW/g**

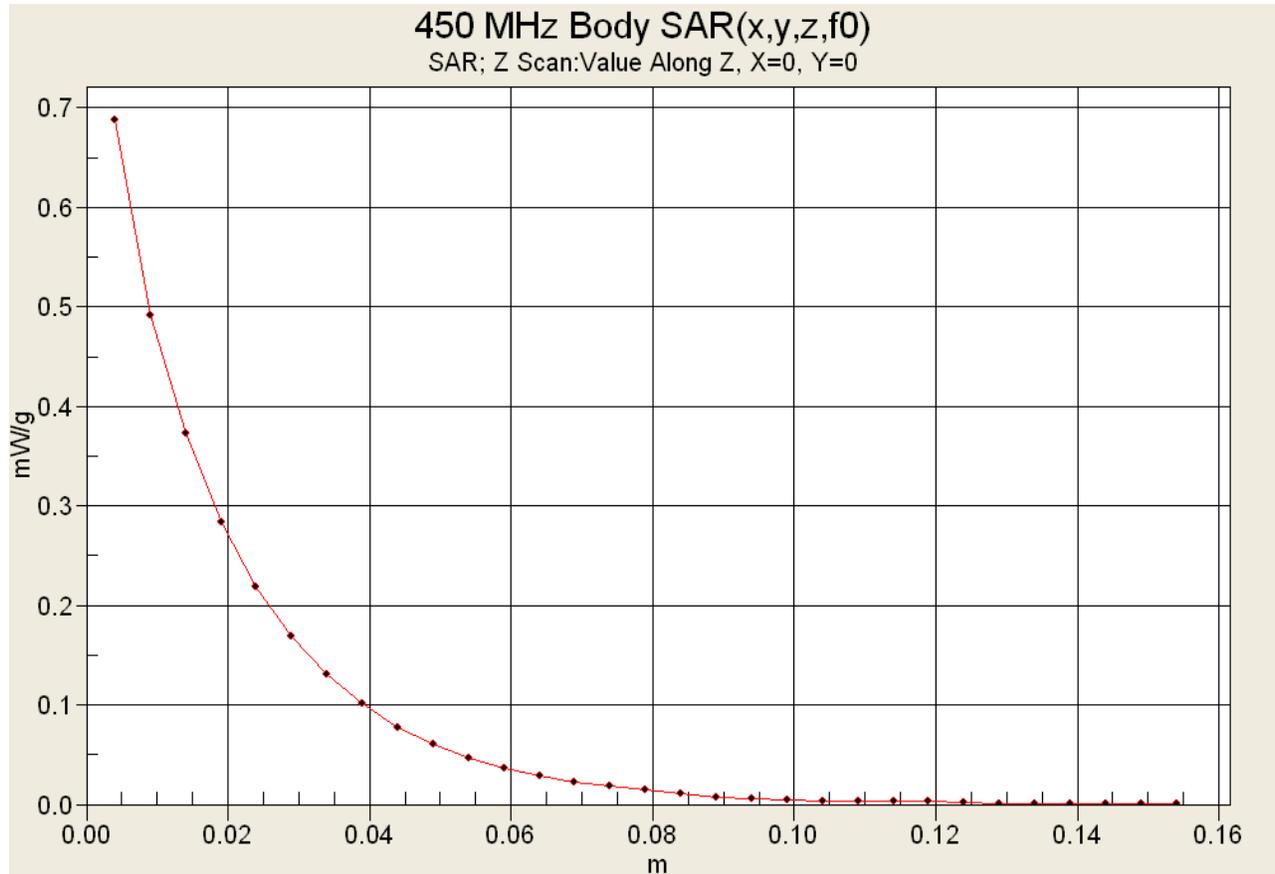
Maximum value of SAR (measured) = 0.730 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-axis Scan



<b>Applicant:</b> Garmin International Inc.	<b>FCC ID:</b> IPH-01766	<b>IC:</b> 1792A-01766	
<b>DUT Model:</b> Rino 610	<b>DUT Type:</b> Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver		
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/13/2011

**Body-worn SAR - 1W - GMRS ch.1 - 462.5625 MHz – Ni-MH – Carabiner – Headset**

**DUT: Garmin Rino610; Type: Portable UHF FRS/GMRS PTT Radio Transceiver; Serial: 1766382196551000**

Ambient Temp: 23°C; Fluid Temp: 22.8°C; Barometric Pressure: 101.1 kPa; Humidity: 40%

Communication System: UHF GMRS

Frequency: 462.563 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used (interpolated):  $f = 462.563 \text{ MHz}$ ;  $\sigma = 0.94 \text{ mho/m}$ ;  $\epsilon_r = 57$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Area Scan (9x17x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.640 mW/g

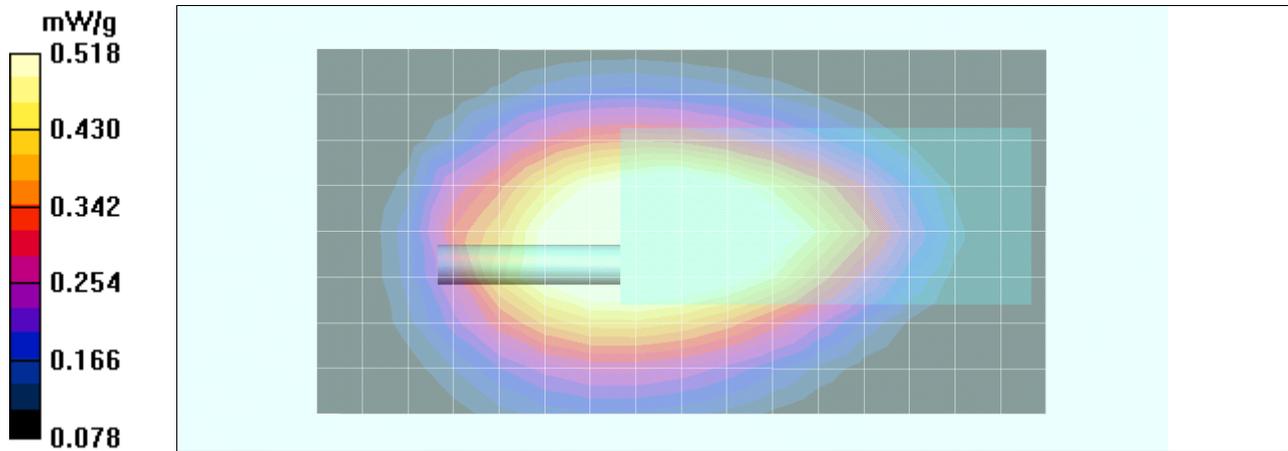
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=7.5\text{mm}$ ,  $dy=7.5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 23.8 V/m; Power Drift = -0.477 dB

Peak SAR (extrapolated) = 0.739 W/kg

**SAR(1 g) = 0.494 mW/g; SAR(10 g) = 0.365 mW/g**

Maximum value of SAR (measured) = 0.518 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX B - SYSTEM PERFORMANCE CHECK DATA**

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-01766</b>	<b>IC:</b>	<b>1792A-01766</b>	
<b>DUT Model:</b>	<b>Rino 610</b>	<b>DUT Type:</b>	<b>Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver</b>			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/20/2011

### System Performance Check - 450 MHz Dipole - Head

**DUT: Dipole 450 MHz; Type: D450V3; Serial: 1068; Calibrated: 01/18/2010**

Ambient Temp: 23.0°C; Fluid Temp: 21.6°C; Barometric Pressure: 101.1 kPa; Humidity: 32%

Communication System: CW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: HSL450 Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.84 \text{ mho/m}$ ;  $\epsilon_r = 44$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.25, 7.25, 7.25); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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=15mm, dy=15mm

Maximum value of SAR (measured) = 2.05 mW/g

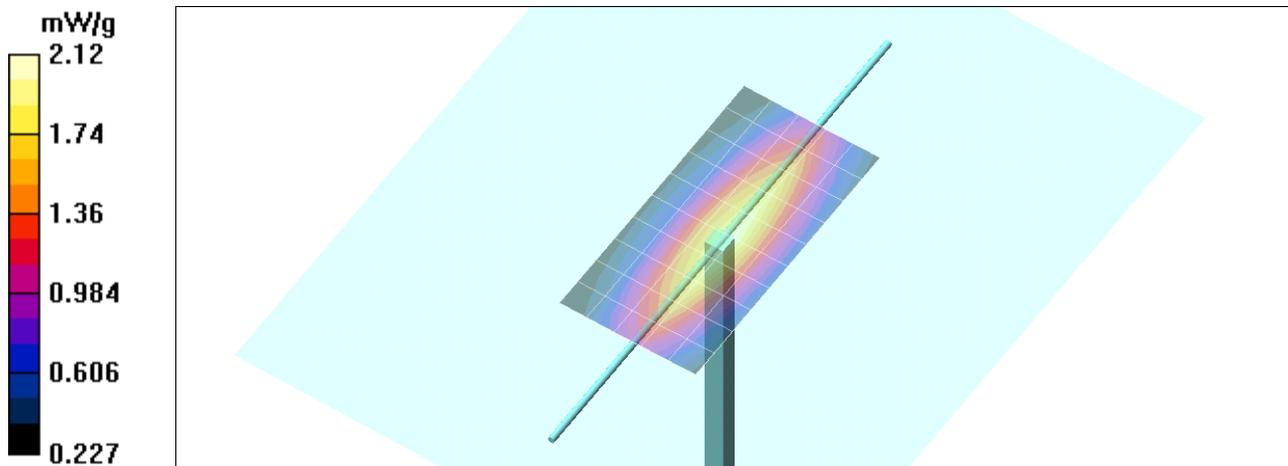
**Head d=15mm Pin=398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 49.1 V/m; Power Drift = 0.037 dB

Peak SAR (extrapolated) = 3.15 W/kg

**SAR(1 g) = 1.99 mW/g; SAR(10 g) = 1.31 mW/g**

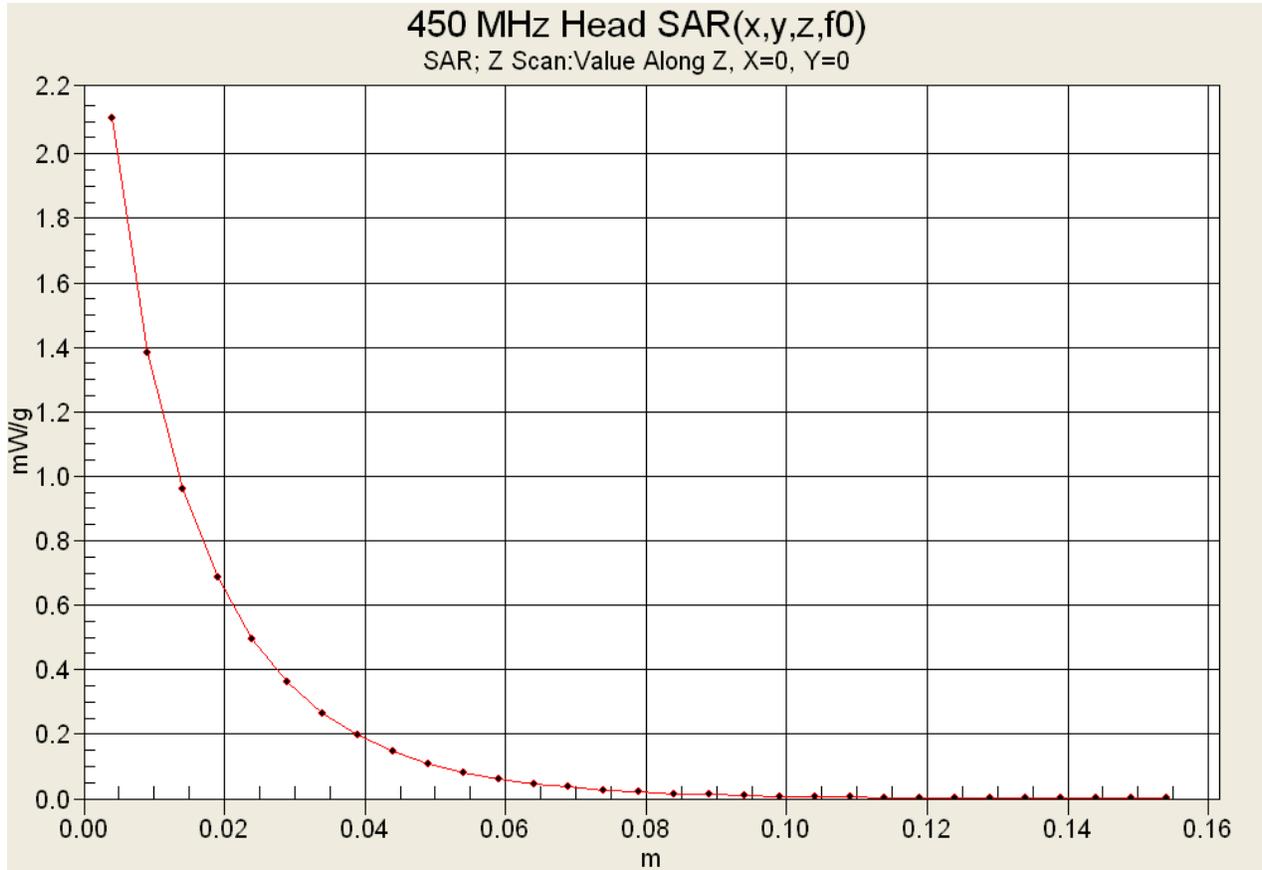
Maximum value of SAR (measured) = 2.12 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-axis Scan



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/25/2011

### System Performance Check - 450 MHz Dipole - Body

**DUT: Dipole 450 MHz; Type: D450V3; Serial: 1068; Calibrated: 01/18/2010**

Ambient Temp: 23.0°C; Fluid Temp: 21.1°C; Barometric Pressure: 101.1 kPa; Humidity: 34%

Communication System: CW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.94 \text{ mho/m}$ ;  $\epsilon_r = 58.1$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Body d=15mm Pin=398mW/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 2.03 mW/g

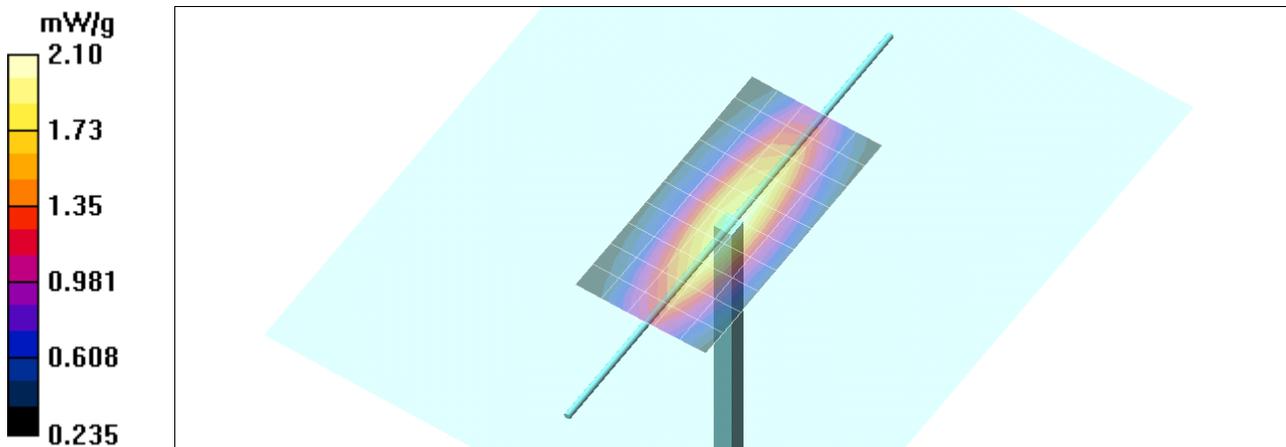
**Body d=15mm Pin=398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 47.0 V/m; Power Drift = 0.015 dB

Peak SAR (extrapolated) = 3.21 W/kg

**SAR(1 g) = 1.98 mW/g; SAR(10 g) = 1.31 mW/g**

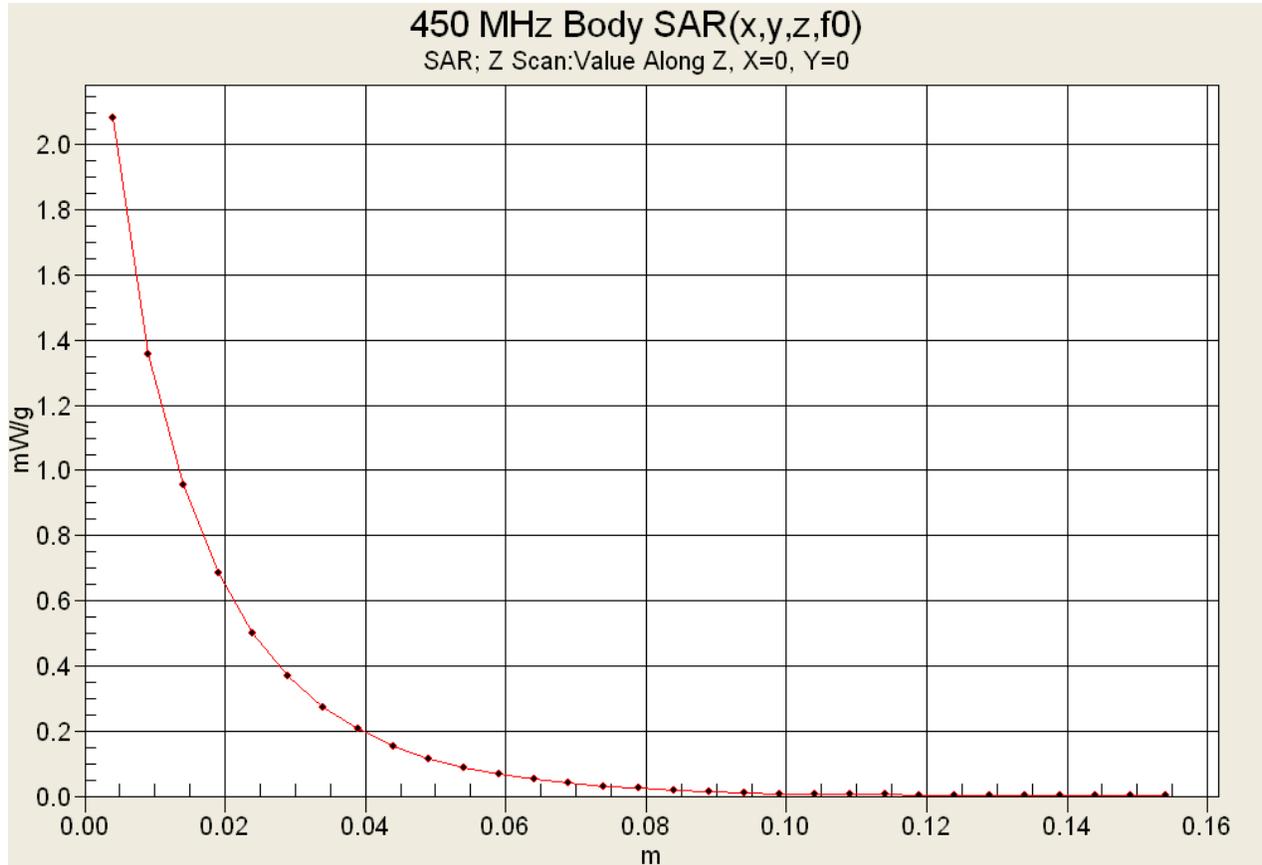
Maximum value of SAR (measured) = 2.10 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-axis Scan



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 05/26/2011

### System Performance Check - 450 MHz Dipole - Body

**DUT: Dipole 450 MHz; Type: D450V3; Serial: 1068; Calibrated: 01/18/2010**

Ambient Temp: 21.0°C; Fluid Temp: 21.7°C; Barometric Pressure: 101.1 kPa; Humidity: 39%

Communication System: CW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.9 \text{ mho/m}$ ;  $\epsilon_r = 57.7$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Body d=15mm Pin=398mW/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.86 mW/g

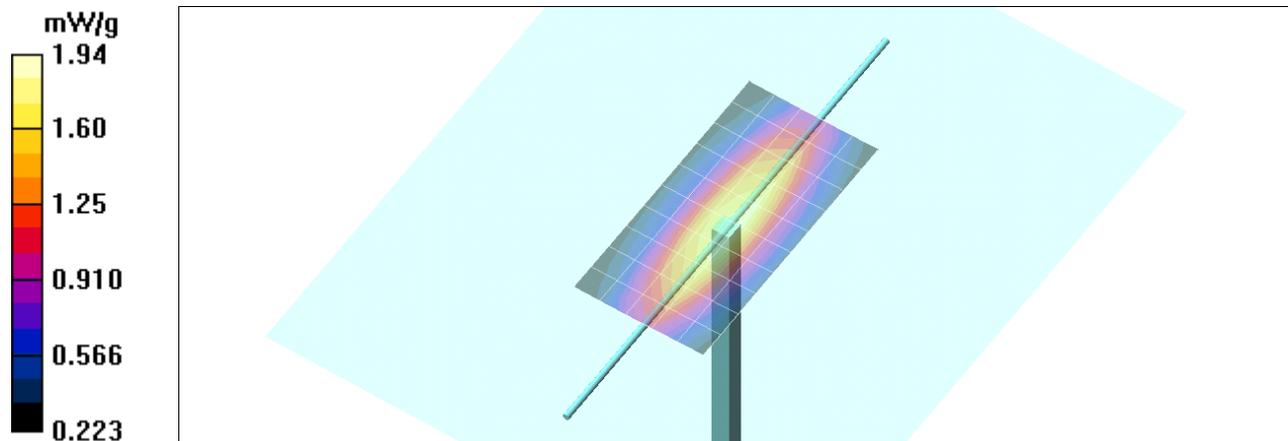
**Body d=15mm Pin=398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 46.2 V/m; Power Drift = 0.039 dB

Peak SAR (extrapolated) = 2.92 W/kg

**SAR(1 g) = 1.83 mW/g; SAR(10 g) = 1.22 mW/g**

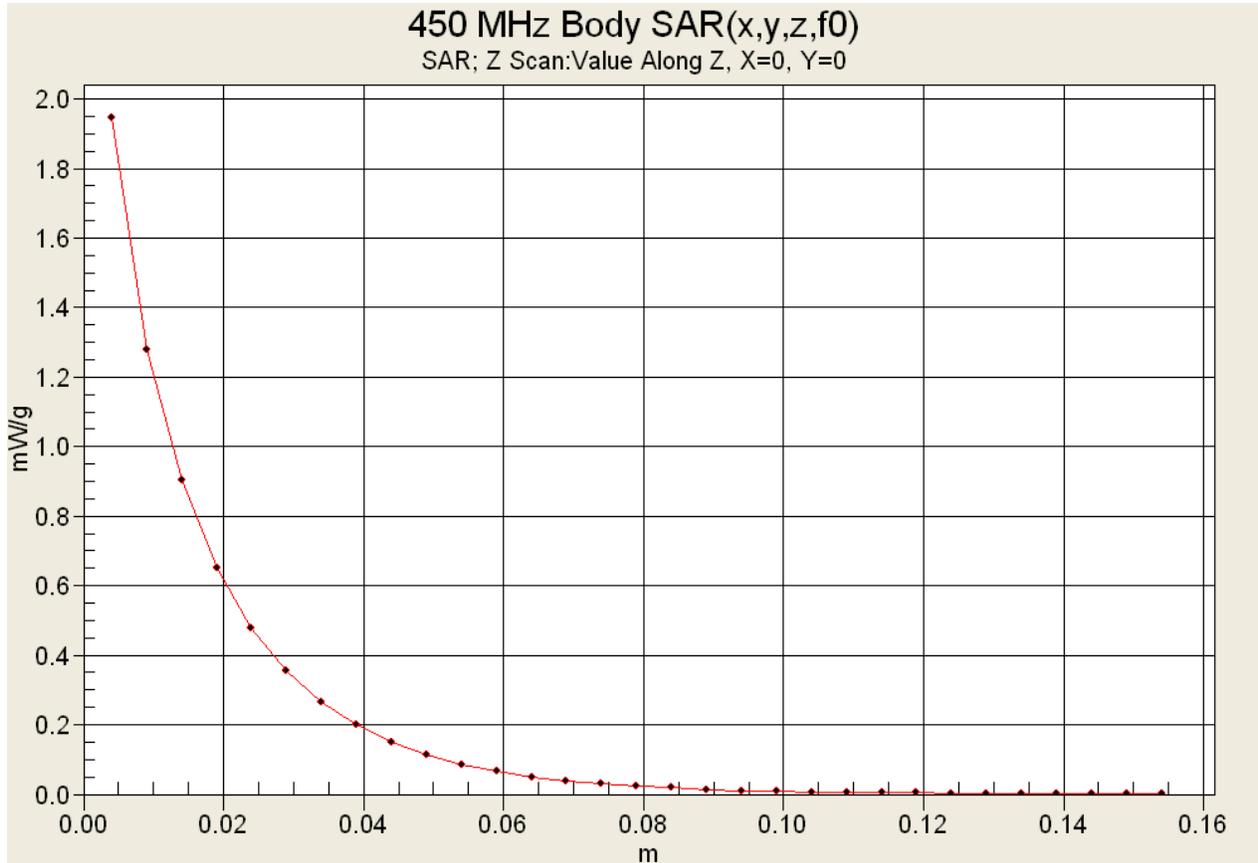
Maximum value of SAR (measured) = 1.94 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-axis Scan



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/10/2011

### System Performance Check - 450 MHz Dipole - Body

**DUT: Dipole 450 MHz; Type: D450V3; Serial: 1068; Calibrated: 01/18/2010**

Ambient Temp: 22.0°C; Fluid Temp: 22.7°C; Barometric Pressure: 101.1 kPa; Humidity: 34%

Communication System: CW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.97 \text{ mho/m}$ ;  $\epsilon_r = 57.9$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Body d=15mm Pin=398mW/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 1.98 mW/g

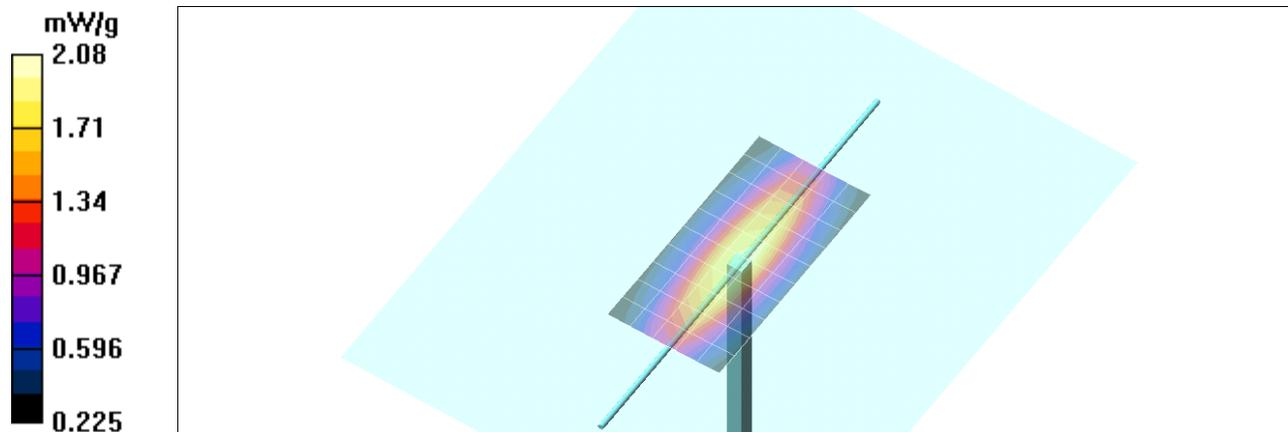
**Body d=15mm Pin=398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 46.4 V/m; Power Drift = 0.008 dB

Peak SAR (extrapolated) = 3.17 W/kg

**SAR(1 g) = 1.96 mW/g; SAR(10 g) = 1.3 mW/g**

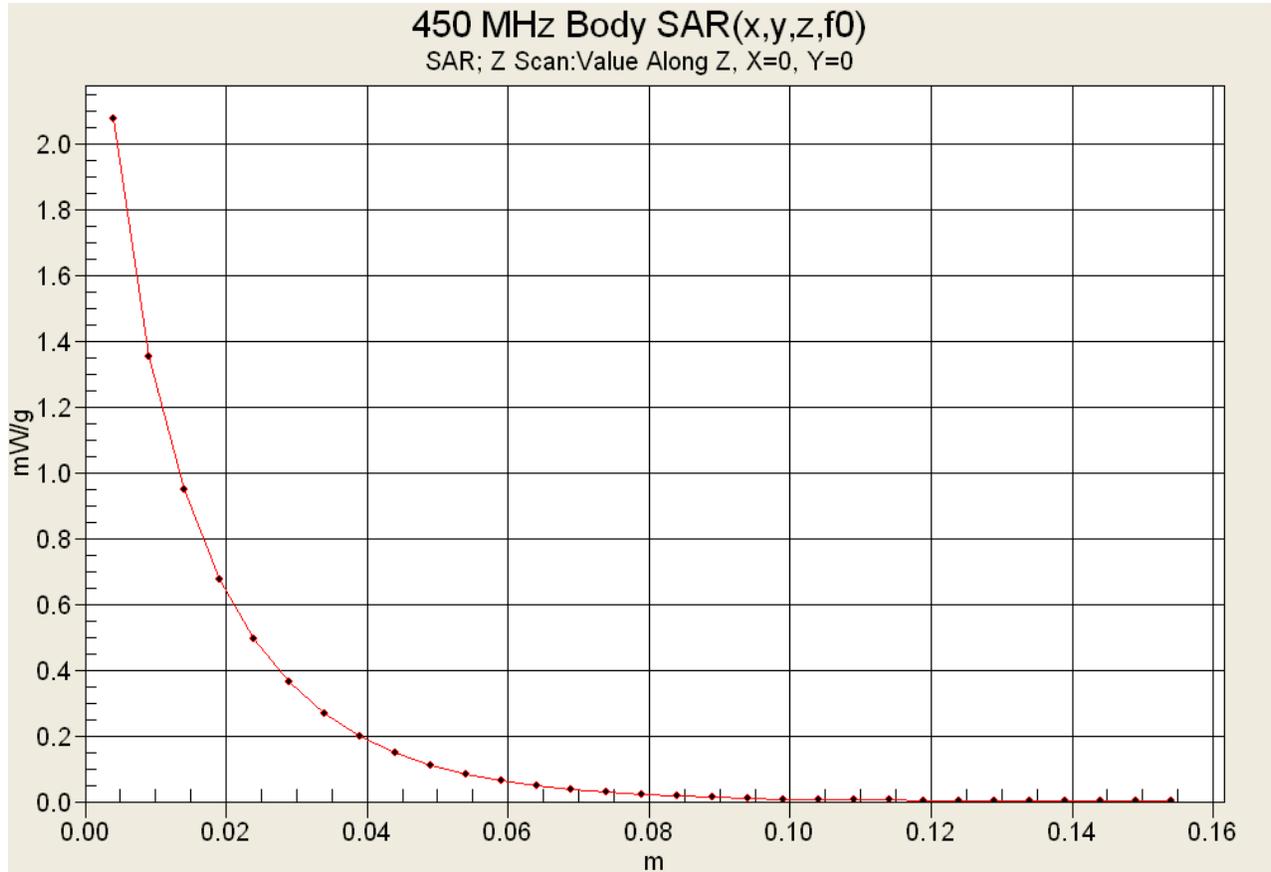
Maximum value of SAR (measured) = 2.08 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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## Z-axis Scan



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Date Tested: 06/13/2011

### System Performance Check - 450 MHz Dipole - Body

**DUT: Dipole 450 MHz; Type: D450V3; Serial: 1068; Calibrated: 01/18/2010**

Ambient Temp: 23.0°C; Fluid Temp: 22.8°C; Barometric Pressure: 101.1 kPa; Humidity: 40%

Communication System: CW

Frequency: 450 MHz; Duty Cycle: 1:1

Medium: M450 Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.93 \text{ mho/m}$ ;  $\epsilon_r = 57.2$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (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

**Body d=15mm Pin=398mW/Area Scan (6x11x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 2.00 mW/g

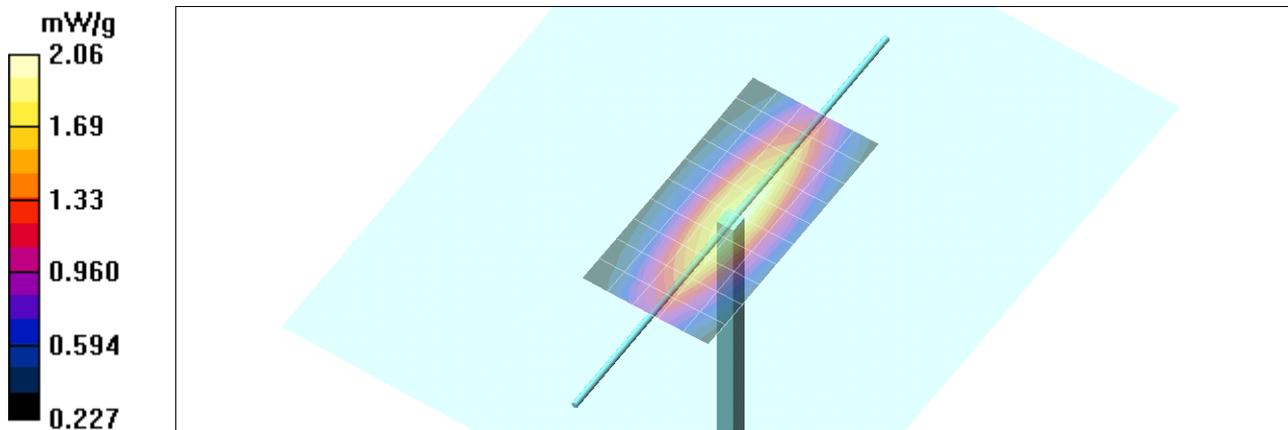
**Body d=15mm Pin=398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 46.2 V/m; Power Drift = 0.020 dB

Peak SAR (extrapolated) = 3.15 W/kg

**SAR(1 g) = 1.93 mW/g; SAR(10 g) = 1.27 mW/g**

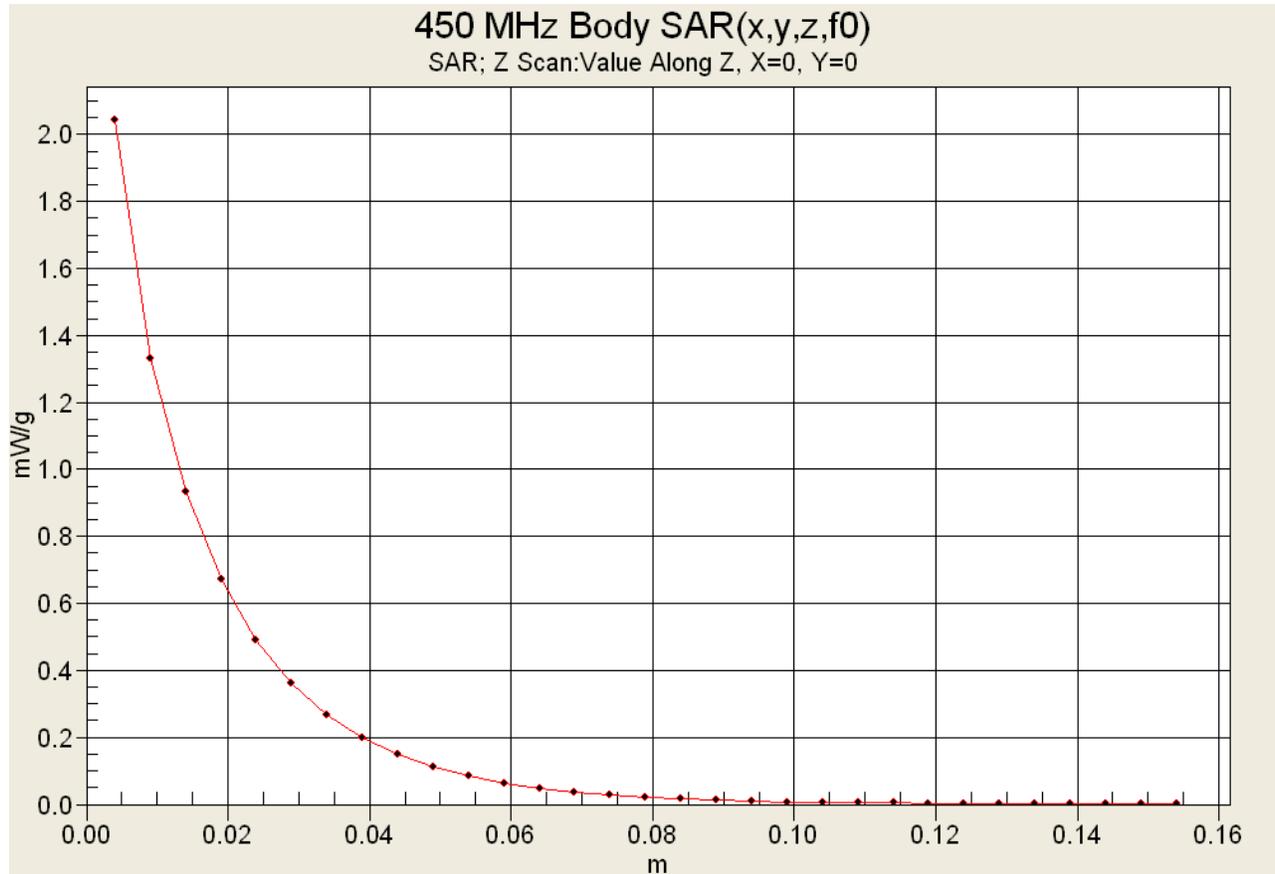
Maximum value of SAR (measured) = 2.06 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## Z-axis Scan



<b>Applicant:</b> Garmin International Inc.	<b>FCC ID:</b> IPH-01766	<b>IC:</b> 1792A-01766	
<b>DUT Model:</b> Rino 610	<b>DUT Type:</b> Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver		
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## APPENDIX C - MEASURED FLUID DIELECTRIC PARAMETERS

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

### 450 MHz Head

\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
20/May/2011  
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
0.3500	44.70	0.87	46.60
0.3600	44.58	0.87	46.51
0.3700	44.46	0.87	45.65
0.3800	44.34	0.87	45.48
0.3900	44.22	0.87	45.71
0.4000	44.10	0.87	45.05
0.4100	43.98	0.87	45.66
0.4200	43.86	0.87	45.19
0.4300	43.74	0.87	44.73
0.4400	43.62	0.87	43.98
0.4500	43.50	0.87	44.02
0.4600	43.45	0.87	43.69
0.4700	43.40	0.87	43.22
0.4800	43.34	0.87	43.47
0.4900	43.29	0.87	43.19
0.5000	43.24	0.87	43.10
0.5100	43.19	0.87	42.88
0.5200	43.14	0.88	42.13
0.5300	43.08	0.88	42.36
0.5400	43.03	0.88	42.40
0.5500	42.98	0.88	42.46

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

### 450 MHz Body

\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
25/May/2011  
Frequency (GHz)  
FCC\_eB FCC Limits for Body Epsilon  
FCC\_sB FCC Limits for Body Sigma  
Test\_e Epsilon of UIM  
Test\_s Sigma of UIM

\*\*\*\*\*

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.3500	57.70	0.93	59.89	0.86
0.3600	57.60	0.93	58.90	0.86
0.3700	57.50	0.93	58.70	0.88
0.3800	57.40	0.93	58.70	0.88
0.3900	57.30	0.93	58.85	0.91
0.4000	57.20	0.93	59.01	0.90
0.4100	57.10	0.93	59.20	0.91
0.4200	57.00	0.94	58.15	0.92
0.4300	56.90	0.94	58.25	0.92
0.4400	56.80	0.94	58.09	0.94
0.4500	56.70	0.94	58.10	0.94
0.4600	56.66	0.94	57.54	0.93
0.4700	56.62	0.94	57.63	0.94
0.4800	56.58	0.94	57.79	0.96
0.4900	56.54	0.94	56.88	0.96
0.5000	56.51	0.94	57.00	0.97
0.5100	56.47	0.94	57.03	1.00
0.5200	56.43	0.95	57.24	0.99
0.5300	56.39	0.95	57.01	1.00
0.5400	56.35	0.95	56.85	1.03
0.5500	56.31	0.95	56.69	1.03

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

### 450 MHz Body

\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
26/May/2011  
Frequency (GHz)  
FCC\_eB FCC Limits for Body Epsilon  
FCC\_sB FCC Limits for Body Sigma  
Test\_e Epsilon of UIM  
Test\_s Sigma of UIM

\*\*\*\*\*

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.3500	57.70	0.93	59.92	0.82
0.3600	57.60	0.93	59.17	0.83
0.3700	57.50	0.93	59.59	0.85
0.3800	57.40	0.93	58.56	0.85
0.3900	57.30	0.93	58.83	0.86
0.4000	57.20	0.93	58.78	0.87
0.4100	57.10	0.93	58.87	0.88
0.4200	57.00	0.94	58.80	0.87
0.4300	56.90	0.94	57.98	0.90
0.4400	56.80	0.94	58.20	0.90
0.4500	56.70	0.94	57.65	0.90
0.4600	56.66	0.94	58.03	0.92
0.4700	56.62	0.94	57.56	0.93
0.4800	56.58	0.94	57.36	0.94
0.4900	56.54	0.94	57.24	0.95
0.5000	56.51	0.94	57.39	0.96
0.5100	56.47	0.94	57.56	0.97
0.5200	56.43	0.95	57.11	0.97
0.5300	56.39	0.95	56.60	0.98
0.5400	56.35	0.95	56.84	0.98
0.5500	56.31	0.95	56.85	1.00

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

### 450 MHz Body

\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
10/Jun/2011  
Frequency (GHz)  
FCC\_eB FCC Limits for Body Epsilon  
FCC\_sB FCC Limits for Body Sigma  
Test\_e Epsilon of UIM  
Test\_s Sigma of UIM

\*\*\*\*\*

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.3500	57.70	0.93	59.04	0.89
0.3600	57.60	0.93	58.91	0.90
0.3700	57.50	0.93	58.74	0.92
0.3800	57.40	0.93	58.62	0.91
0.3900	57.30	0.93	59.05	0.90
0.4000	57.20	0.93	58.46	0.92
0.4100	57.10	0.93	58.22	0.94
0.4200	57.00	0.94	58.54	0.95
0.4300	56.90	0.94	57.74	0.96
0.4400	56.80	0.94	57.84	0.96
0.4500	56.70	0.94	57.90	0.97
0.4600	56.66	0.94	57.75	0.98
0.4700	56.62	0.94	57.71	0.98
0.4800	56.58	0.94	57.07	1.00
0.4900	56.54	0.94	57.22	1.01
0.5000	56.51	0.94	57.05	1.02
0.5100	56.47	0.94	56.94	1.02
0.5200	56.43	0.95	56.83	1.03
0.5300	56.39	0.95	56.56	1.03
0.5400	56.35	0.95	57.04	1.03
0.5500	56.31	0.95	56.49	1.04

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

### 450 MHz Body

\*\*\*\*\*

Celltech Labs Inc.  
Test Result for UIM Dielectric Parameter  
13/Jun/2011  
Frequency (GHz)  
FCC\_eB FCC Limits for Body Epsilon  
FCC\_sB FCC Limits for Body Sigma  
Test\_e Epsilon of UIM  
Test\_s Sigma of UIM

\*\*\*\*\*

Freq	FCC_eB	FCC_sB	Test_e	Test_s
0.3500	57.70	0.93	58.49	0.85
0.3600	57.60	0.93	57.86	0.86
0.3700	57.50	0.93	58.20	0.85
0.3800	57.40	0.93	57.84	0.87
0.3900	57.30	0.93	57.79	0.87
0.4000	57.20	0.93	57.42	0.89
0.4100	57.10	0.93	56.79	0.89
0.4200	57.00	0.94	57.24	0.89
0.4300	56.90	0.94	57.07	0.90
0.4400	56.80	0.94	56.85	0.91
0.4500	56.70	0.94	57.18	0.93
0.4600	56.66	0.94	57.12	0.94
0.4700	56.62	0.94	56.83	0.94
0.4800	56.58	0.94	56.42	0.95
0.4900	56.54	0.94	56.12	0.97
0.5000	56.51	0.94	56.04	0.97
0.5100	56.47	0.94	55.75	0.97
0.5200	56.43	0.95	55.98	0.98
0.5300	56.39	0.95	55.90	0.99
0.5400	56.35	0.95	55.63	0.99
0.5500	56.31	0.95	55.38	1.00

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## APPENDIX E - DIPOLE CALIBRATION

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Celltech**

Certificate No.: **D450V3-1068 Jan10**

## CALIBRATION CERTIFICATE

Object **D450V3 - SN: 1068**

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  $(22 \pm 3)^\circ\text{C}$  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**      Function: **Laboratory Technician**      Signature: *i.v. [Signature]*

Approved by: **Katja Pokovic**      Technical Manager      *[Signature]*

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.

<b>DASY Version</b>	DASY5	V5.2
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	ELI4 Flat Phantom	Shell thickness: $2 \pm 0.2$ mm
<b>Distance Dipole Center - TSL</b>	15 mm	with Spacer
<b>Area Scan Resolution</b>	dx, dy = 15 mm	
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	450 MHz $\pm$ 1 MHz	

## Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	43.5	0.87 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	44.2 $\pm$ 6 %	0.86 mho/m $\pm$ 6 %
<b>Head TSL temperature during test</b>	(22.0 $\pm$ 0.2) °C	----	----

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	condition	
SAR measured	398 mW input power	1.87 mW / g
SAR normalized	normalized to 1W	4.70 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>4.76 mW / g <math>\pm</math> 18.1 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	398 mW input power	1.25 mW / g
SAR normalized	normalized to 1W	3.14 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>3.17 mW / g <math>\pm</math> 17.6 % (k=2)</b>

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	56.7	0.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.1 ± 6 %	0.90 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

## SAR result with Body TSL

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	condition	
SAR measured	398 mW input power	1.78 mW / g
SAR normalized	normalized to 1W	4.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>4.58 mW / g ± 18.1 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	398 mW input power	1.19 mW / g
SAR normalized	normalized to 1W	2.99 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>3.06 mW / g ± 17.6 % (k=2)</b>

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	57.5 $\Omega$ - 5.9 j $\Omega$
Return Loss	- 21.0 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	54.8 $\Omega$ - 9.3 j $\Omega$
Return Loss	- 20.0 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.350 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	July 16, 2009

# DASY5 Validation Report for Head TSL

Date/Time: 1/18/2010 10:59:37 AM

**DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1068**

Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1  
Medium: HSL450

Medium parameters used:  $f = 450$  MHz;  $\sigma = 0.86$  mho/m;  $\epsilon_r = 44.2$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ET3DV6 - SN1507 (LF); ConvF(6.66, 6.66, 6.66); 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 (41x111x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 1.99 mW/g

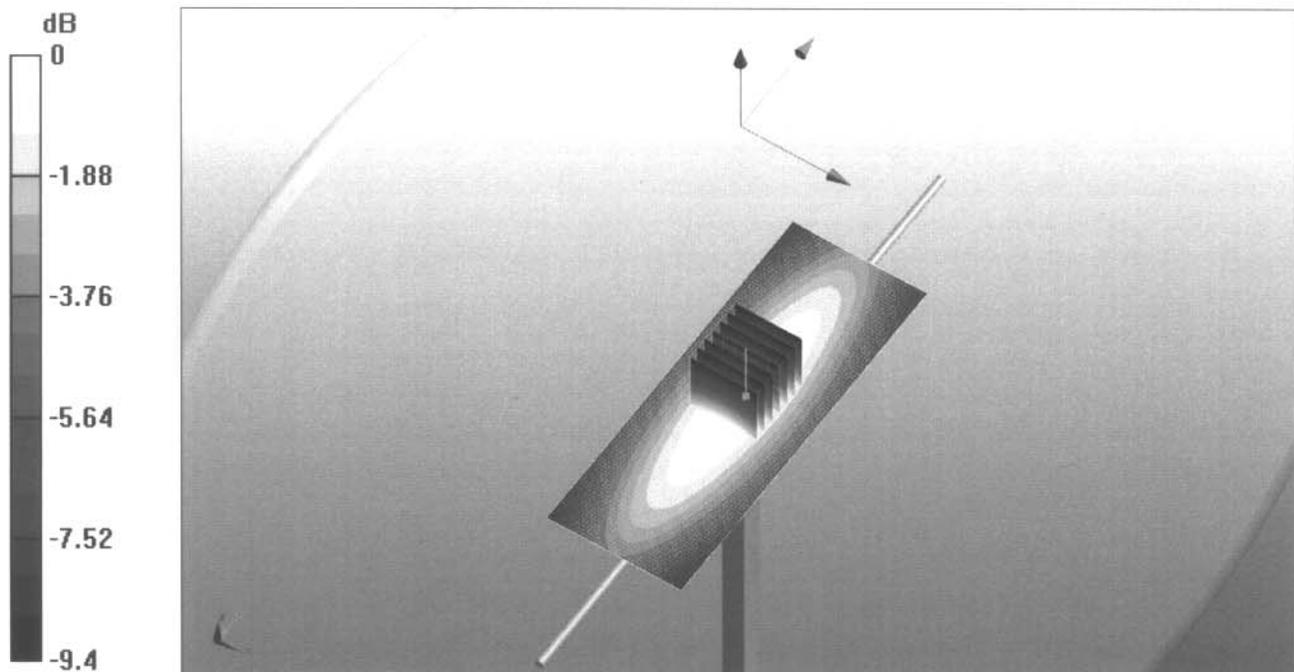
**Head/d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 50.2 V/m; Power Drift = -0.020 dB

Peak SAR (extrapolated) = 2.78 W/kg

**SAR(1 g) = 1.87 mW/g; SAR(10 g) = 1.25 mW/g**

Maximum value of SAR (measured) = 2 mW/g



0 dB = 2mW/g

# Impedance Measurement Plot for Head TSL

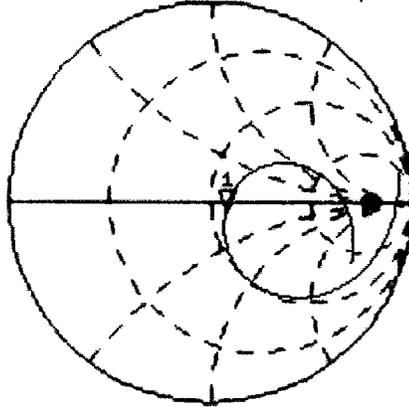
18 Jan 2010 10:25:40

CH1 S11 1 U FS

1: 57.502  $\Omega$  -5.9180  $\Omega$  59.763 pF

450.000 000 MHz

\*  
Del  
Cor



Avg  
16

↑

CH2 S11 LOG

5 dB/REF -20 dB

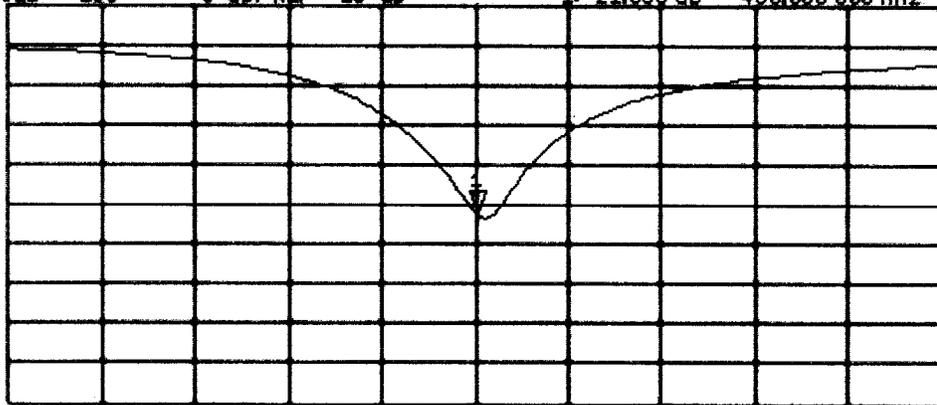
1: -21.035 dB

450.000 000 MHz

Cor

Avg  
16

↑



START 250.000 000 MHz

STOP 650.000 000 MHz

# DASY5 Validation Report for Body TSL

Date/Time: 1/18/2010 1:24:11 PM

**DUT: Dipole 450 MHz; Type: D450V3; Serial: D450V3 - SN:1068**

Communication System: CW; Frequency: 450 MHz; Duty Cycle: 1:1

Medium: MSL450

Medium parameters used:  $f = 450 \text{ MHz}$ ;  $\sigma = 0.9 \text{ mho/m}$ ;  $\epsilon_r = 54.1$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY5 Configuration:

- Probe: ET3DV6 - SN1507 (LF); ConvF(7.11, 7.11, 7.11); 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

**Body/d=15mm, Pin=398mW/Area Scan (61x201x1):** Measurement grid:  $dx=10\text{mm}$ ,  $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 1.9 mW/g

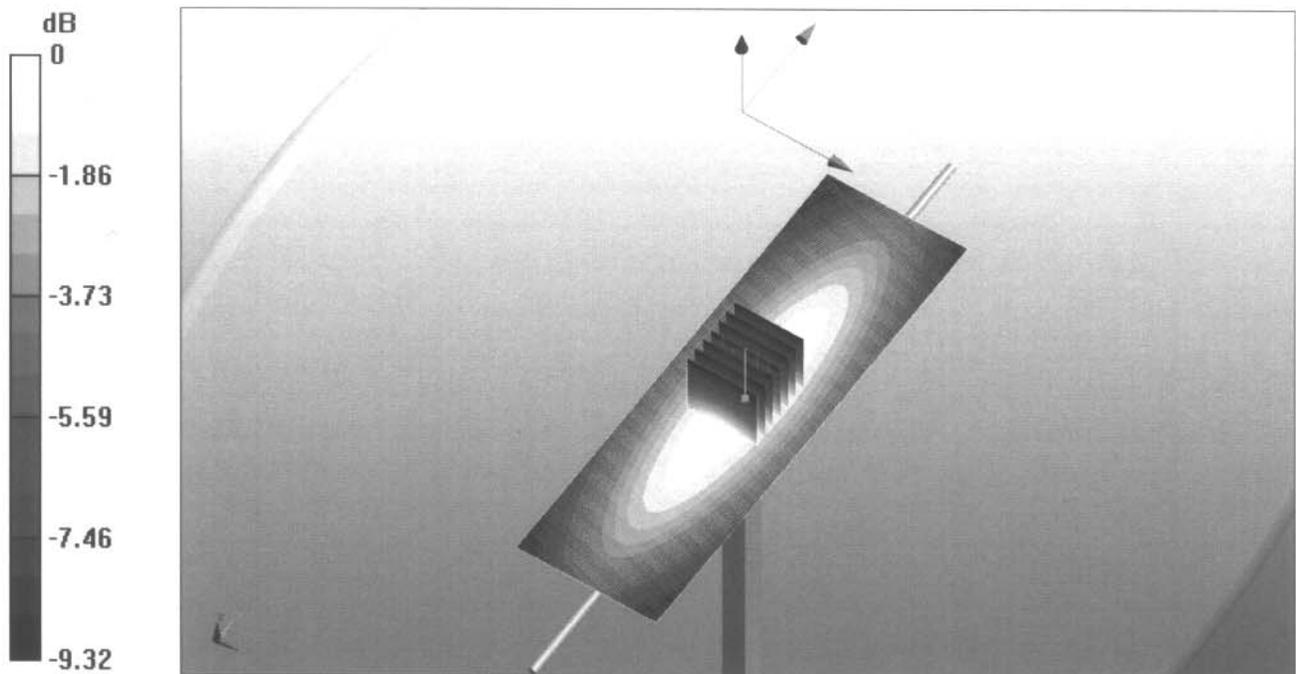
**Body/d=15mm, Pin=398mW/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 47.4 V/m; Power Drift = -0.034 dB

Peak SAR (extrapolated) = 2.71 W/kg

**SAR(1 g) = 1.78 mW/g; SAR(10 g) = 1.19 mW/g**

Maximum value of SAR (measured) = 1.9 mW/g



0 dB = 1.9mW/g

# Impedance Measurement Plot for Body TSL

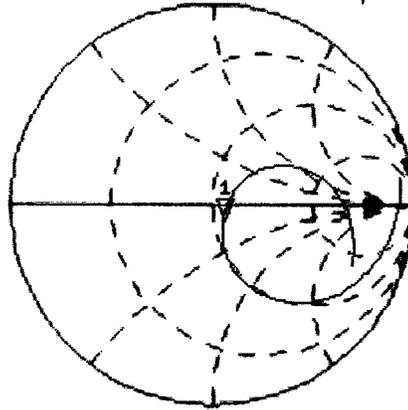
18 Jan 2010 12:18:41

CH1 S11 1 U FS

1: 54.824  $\Omega$  -9.3047  $\Omega$  38.011 pF

450.000 000 MHz

\*  
Del  
Cor



Avg  
16

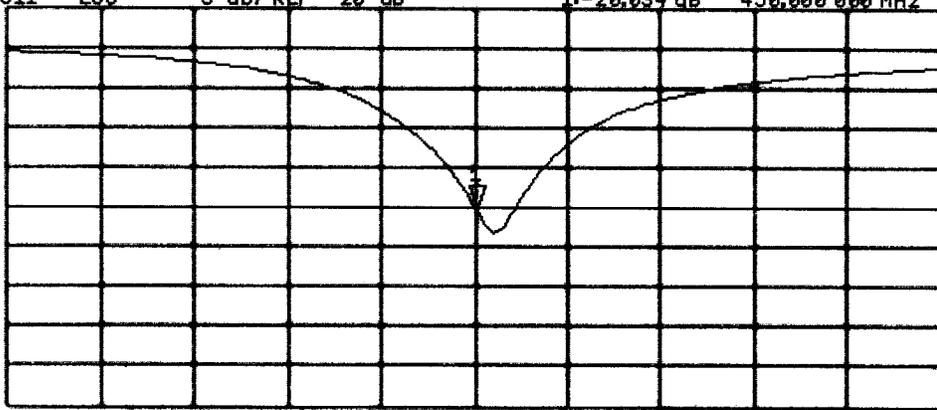
↑

CH2 S11 L06 5 dB/REF -20 dB 1:-20.034 dB 450.000 000 MHz

Cor

Avg  
16

↑



START 250.000 000 MHz

STOP 650.000 000 MHz

	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## APPENDIX F - PROBE CALIBRATION

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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Accredited by the Swiss Accreditation Service (SAS)  
The Swiss Accreditation Service is one of the signatories to the EA  
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Celltech**

Certificate No: **ET3-1590\_Jul10**

## CALIBRATION CERTIFICATE

Object **ET3DV6 - SN:1590**

Calibration procedure(s) **QA CAL-01.v6, QA CAL-12.v6, QA CAL-23.v3 and QA CAL-25.v2  
Calibration procedure for dosimetric E-field probes**

Calibration date: **July 15, 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 (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11

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-09)	In house check: Oct10

Calibrated by	Name <b>Jeton Kastrati</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Technical Manager	

Issued: July 15, 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
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

**Calibration is Performed According to the Following Standards:**

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

**Methods Applied and Interpretation of Parameters:**

- **NORM<sub>x,y,z</sub>:** Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- **NORM(f)<sub>x,y,z</sub> = NORM<sub>x,y,z</sub> \* 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<sub>x,y,z</sub>:** 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.
- **A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; VR<sub>x,y,z</sub>; 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<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  MHz.
- **Spherical isotropy (3D deviation from isotropy):** in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- **Sensor Offset:** The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

# Probe ET3DV6

## SN:1590

Manufactured:	March 19, 2001
Last calibrated:	July 16, 2009
Recalibrated:	July 15, 2010

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 ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	1.86	2.06	1.77	$\pm 10.1\%$
DCP (mV) <sup>B</sup>	91.4	92.4	83.5	

**Modulation Calibration Parameters**

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc <sup>E</sup> (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300.0	$\pm 1.5\%$
			Y	0.00	0.00	1.00	300.0	
			Z	0.00	0.00	1.00	300.0	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 5 and 6)

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the maximum deviation from linear response applying recatangular 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]	Validity [MHz] <sup>c</sup>	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	43.5 ± 5%	0.87 ± 5%	7.25	7.25	7.25	0.20	2.19 ± 13.3%
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	6.27	6.27	6.27	0.32	2.49 ± 11.0%
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	6.12	6.12	6.12	0.27	2.86 ± 11.0%

<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

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

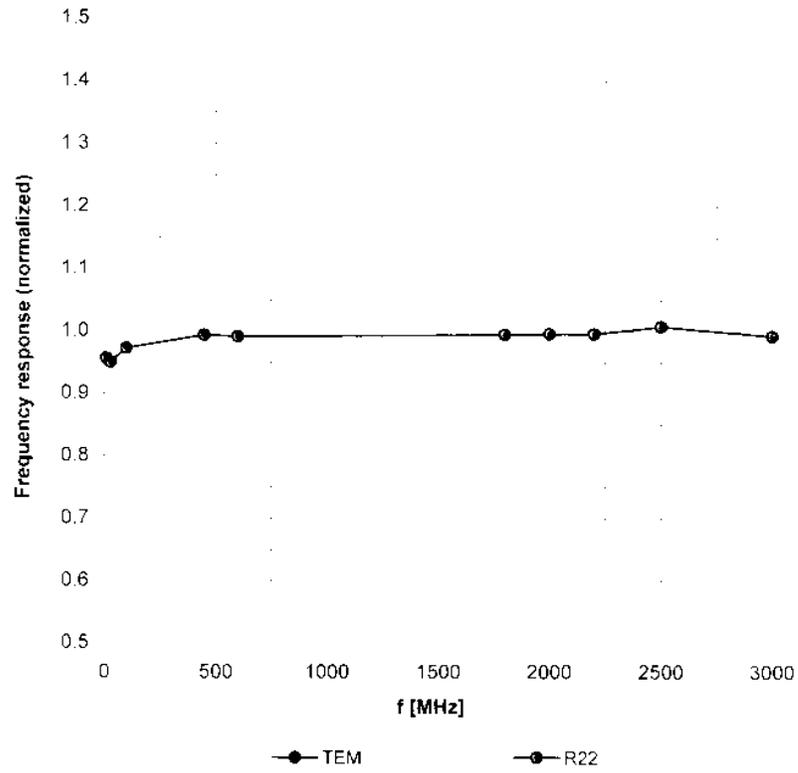
### Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz] <sup>c</sup>	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	56.7 ± 5%	0.94 ± 5%	7.73	7.73	7.73	0.13	2.06 ± 13.3%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	6.33	6.33	6.33	0.22	3.60 ± 11.0%
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	6.15	6.15	6.15	0.28	2.94 ± 11.0%

<sup>c</sup> The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

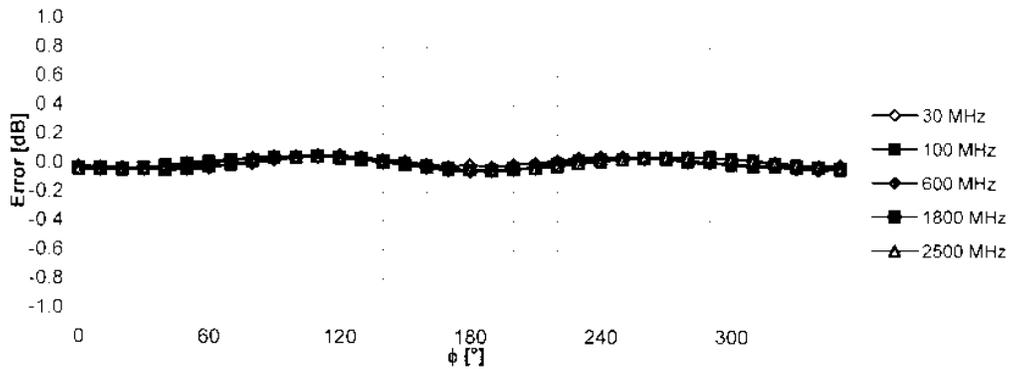
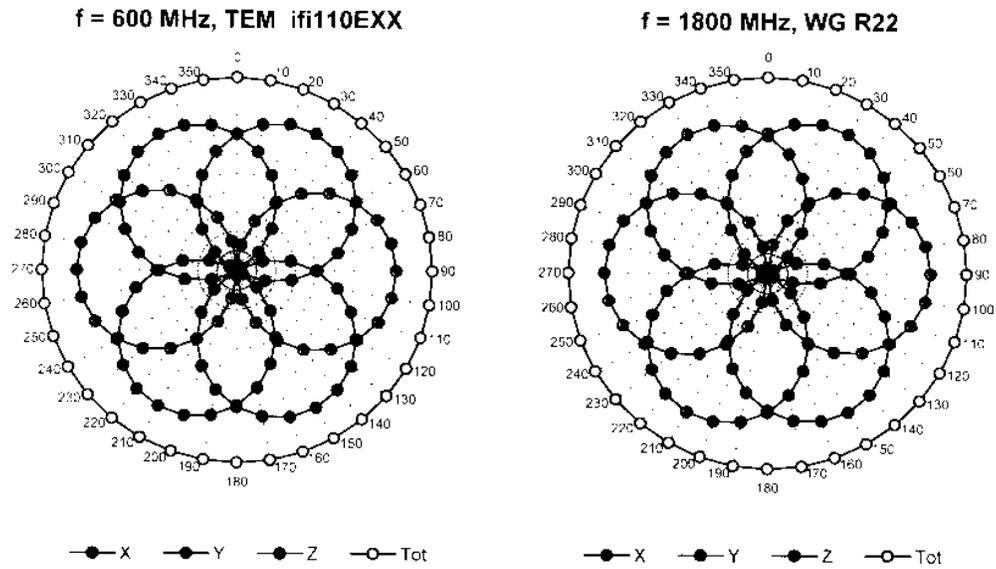
### Frequency Response of E-Field

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



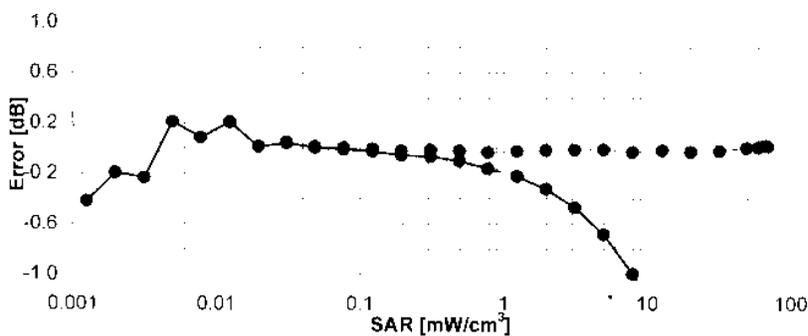
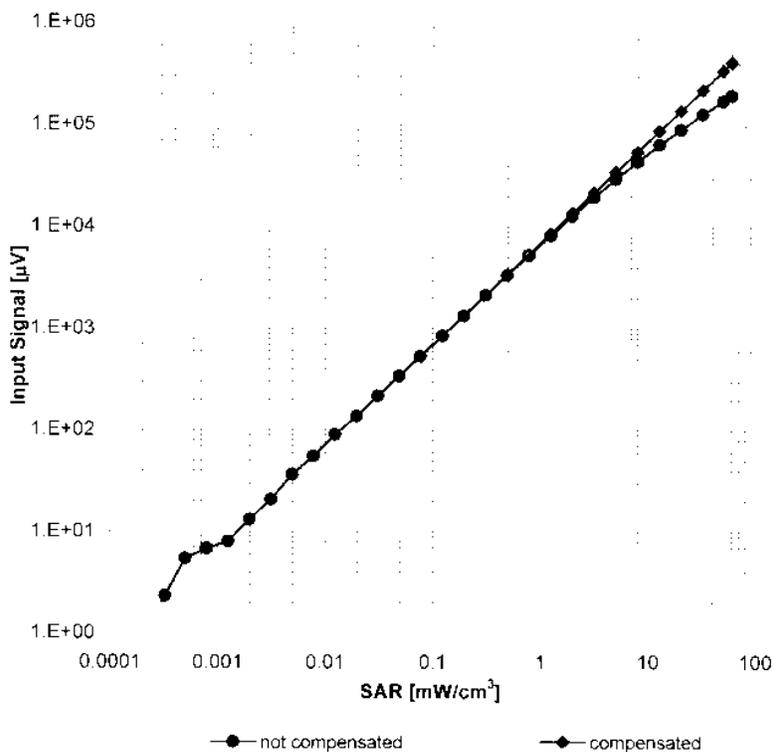
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  ( $k=2$ )

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



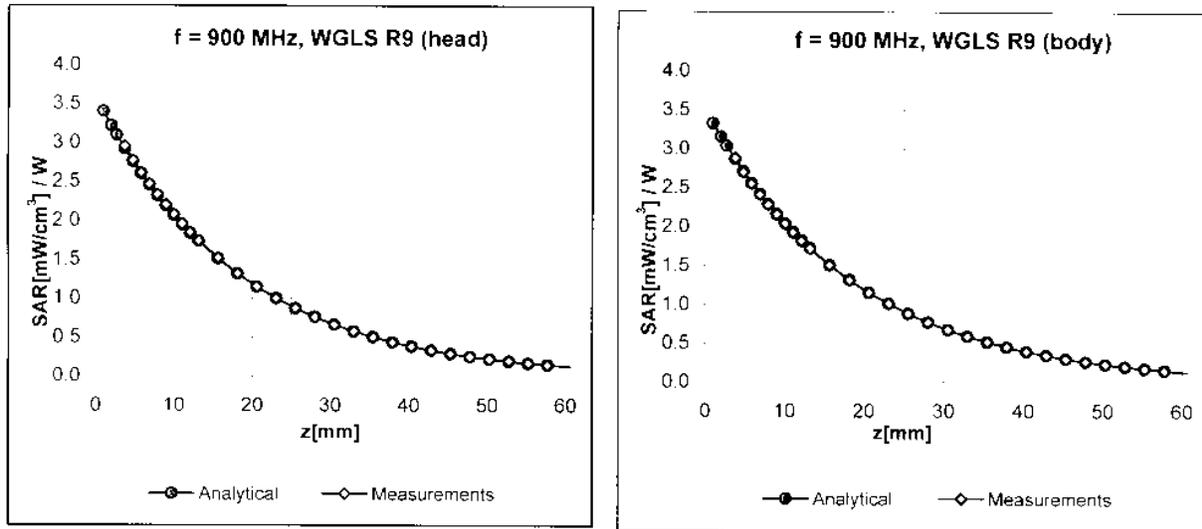
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

### Dynamic Range f(SAR<sub>head</sub>) (Waveguide R22, f = 1800 MHz)



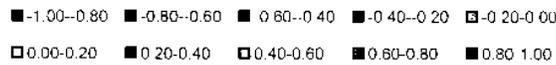
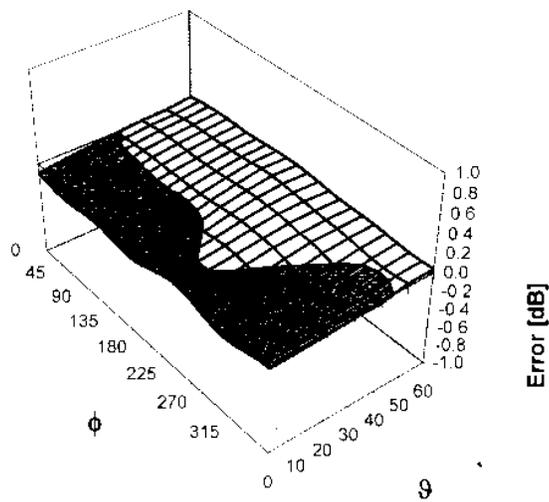
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

### Conversion Factor Assessment



### Deviation from Isotropy in HSL

Error ( $\phi, \theta$ ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment:  $\pm 2.6\%$  (k=2)

## 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

	<u>Date(s) of Evaluation</u> May 20 - Jun 13, 2011	<u>Test Report Serial No.</u> 041511IPH-T1093-S95U	<u>Test Report Revision No.</u> Rev. 1.0 (Initial Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> July 11, 2011	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

## APPENDIX G - BARSKI PLANAR PHANTOM CERTIFICATE OF CONFORMITY

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-01766	<b>IC:</b>	1792A-01766	
<b>DUT Model:</b>	Rino 610	<b>DUT Type:</b>	Portable 1 Watt FM UHF FRS/GMRS PTT Radio Transceiver			
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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](mailto:barskiind@shaw.ca)  
Web: [www.bcfiberglass.com](http://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: 

Daniel Chailier



**Fiberglass Planar Phantom - Top View**



**Fiberglass Planar Phantom - Front View**

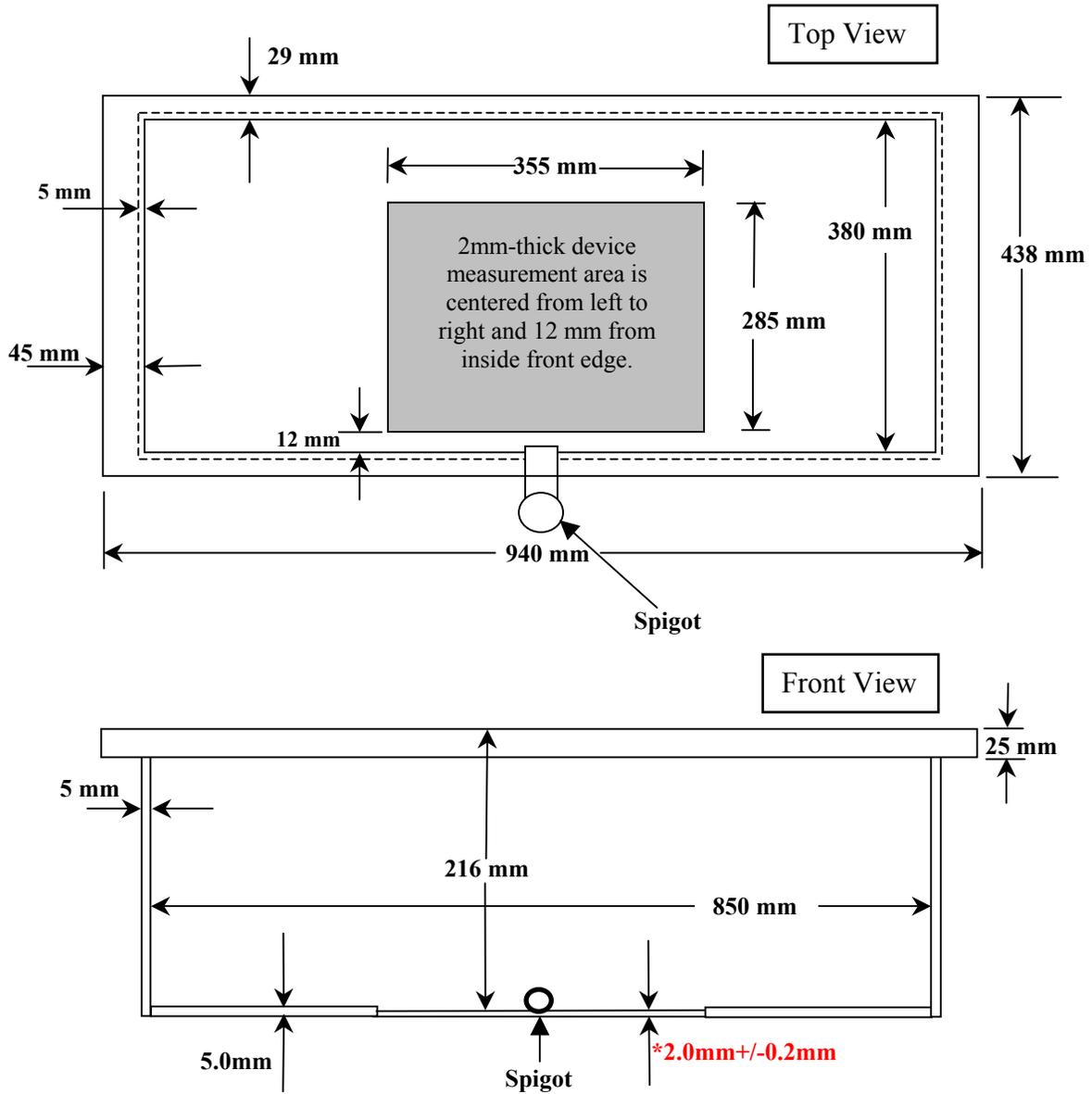


**Fiberglass Planar Phantom - Back View**



**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.**