

	<u>Date(s) of Evaluation</u> Feb. 28, 2013	<u>Test Report Serial No.</u> 021913MQO-T1205S	<u>Test Report Revision No.</u> Rev. 1.2(3rd Release)	
	<u>Test Report Issue Date</u> Mar. 07, 2013	<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>CELLTECH LABS INC.</b> 21-364 Lougheed Road, Kelowna, BC. V1X 7R8 Canada					
<b>Test Lab Accreditation</b>	A2LA - ISO/IEC 17025:2005 (A2LA TEST LAB CERTIFICATE NO. 2470.01)					
<b>Applicant Information</b>	<b>GARMIN INTERNATIONAL INC.</b> 1200, East 151 <sup>st</sup> Street, Olathe, KS, 66062 USA					
<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 (01-01)				
		KDB 447498 D01v05 - General RF Exposure Procedures				
		KDB 248227 D01v01r02 - SAR Measurement Procedures for 802.11a/b/g Transmitters				
	<b>IC</b>	KDB 941225 D07v01 - SAR for UMPC Mini Tablet Devices				
	<b>IEEE</b>	1528-2003	<b>IEC</b>	62209-2:2010		
<b>Device RF Exposure Category</b>	<b>FCC/IC</b>	General Population / Uncontrolled Environment				
<b>Device Classification(s)</b>	<b>FCC</b>	DTS - Digital Transmission System (Part 15 Subpart C)				
	<b>IC</b>	Low Power License-Exempt Radio-communication Device (RSS-210)				
<b>Device Identifier(s)</b>	<b>FCC ID:</b>	IPH-02104		<b>IC:</b>	1792A-02104	
<b>Device Model No.</b>	O3AHGX00					
<b>Test Sample Serial No.</b>	n/a (Identical Prototype)					
<b>Test Sample Hardware Rev. No.</b>	012-02104-XX			<b>Test Sample Firmware Rev. No.</b>	006-B1716-XX rev 4.0.4 or later	
<b>Measurement Date(s)</b>	Feb. 28, 2013			<b>Date of Sample Receipt</b>	Feb. 19, 2013	
<b>Device Description</b>	Hand-held GPS Navigation Computer					
<b>Internal Transmitter(s) Type</b>	802.11b/g/n		802.15		RFID	
<b>Transmitter Type Tested</b>	802.11b/g/n					
<b>Transmitter Specifications</b>	Frequency Range - 2412 - 2462 MHz					
	802.11b - Modulations [DSSS, CCK] - Data Rates [1, 2, 5.5, 11]					
	802.11g - Modulations [OFDM] - Data Rates [6, 9, 12, 24, 36, 48, 54] 802.11n - MCS [0 - 7]					
<b>Co-located Transmitter(s)</b>	Rated Conducted Output Power = 18.5 dBm (+/- 1dB)					
	802.15	2402 - 2480 MHz	4 dBm	Shared antenna with 802.11 - No simultaneous tx		
<b>Antenna Type(s) Tested</b>	RFID	13.56 MHz	Low Power NFC	Simultaneous tx with 802.11 or 802.15		
	Internal (2.4 GHz)					
<b>Battery Type(s) Tested</b>	Lithium-ion (3.7V, 2000 mAh)			P/N: 361-00053-00		
	Alkaline			AA x3		
<b>Max. SAR Level(s) Evaluated</b>	<b>BODY</b>	<b>802.11b</b>	<b>0.152 W/kg</b>	<b>1g average</b>	<b>FCC/IC SAR Limit</b>	<b>1.6 W/kg</b> <b>1g average</b>
Celltech Labs Inc. declares under its sole responsibility that this wireless portable device was compliant 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, IEEE Standard 1528-2003 and IEC International Standard 62209-2:2010. All measurements were performed in accordance with the SAR system manufacturer recommendations.						
I attest to the accuracy of data. All measurements were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.						
The results and statements contained in this report pertain only to the device evaluated.						
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<b>Test Report Approved By</b>			<b>Mike Meaker</b>	<b>Engineering Technologist</b>	<b>Celltech Labs Inc.</b>	

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-02104</b>	<b>IC:</b>	<b>1792A-02104</b>	
<b>Model:</b>	<b>O3AHGX00</b>	<b>DUT Type:</b>	<b>Hand-held GPS Navigation Computer</b>			
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	<u>Test Report Issue Date</u> Mar. 07, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

REVISION HISTORY			
REVISION NO.	DESCRIPTION	IMPLEMENTED BY	RELEASE DATE
1.0	1st Release	Mike Meaker	Mar. 06, 2013
1.1	Changes to device descriptions per client request	Mike Meaker	Mar. 07, 2013
1.2	Fixed typo in SAR data table pg. 7 Fixed incorrect references [10] and [15] on pg. 16.	Mike Meaker	Jul. 15, 2013

TEST REPORT SIGN-OFF			
DEVICE TESTED BY	REPORT PREPARED BY	QA REVIEW BY	REPORT APPROVED BY
Mike Meaker	Mike Meaker	Glen Westwell	Mike Meaker

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-02104	<b>IC:</b>	1792A-02104	
<b>Model:</b>	O3AHGX00	<b>DUT Type:</b>	Hand-held GPS Navigation Computer			
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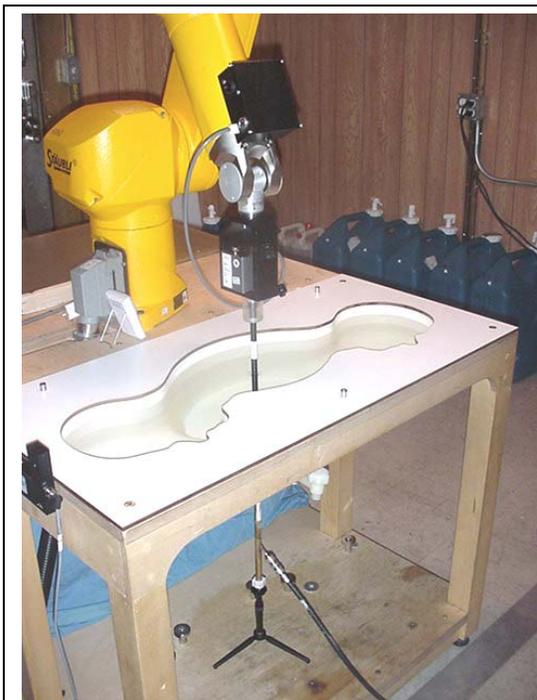
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## 1.0 INTRODUCTION

This measurement report demonstrates that the Garmin International Inc. Model: O3AHGX00 Portable Hand-held GPS Navigation Computer 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]), IEEE Standard 1528-2003 (see reference [5]) and IEC International Standard 62209-2:2010 (see reference [7]) were employed. A description of the product, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used, and the various provisions of the rules are included within this test report.

## 2.0 SAR MEASUREMENT SYSTEM

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



**DASY4 System with SAM Twin Phantom V4.0C**



**DASY4 Measurement Server**

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-02104</b>	<b>IC:</b>	<b>1792A-02104</b>	
<b>Model:</b>	<b>O3AHGX00</b>	<b>DUT Type:</b>	<b>Hand-held GPS Navigation Computer</b>			
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### 3.0 SAR PROBE CALIBRATION & MEASUREMENT FREQUENCIES (150MHz-3GHz)

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 865664 D01v01 - see reference [10]).

Probe Calibration Freq.	Device Measurement Freq.	Frequency Interval	$\pm 50$ MHz $\geq 300$ MHz
2450 MHz	2462 MHz	12 MHz	$< 50$ MHz

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

### 4.0 CONDUCTED OUTPUT POWER MEASUREMENTS

MEASURED RF CONDUCTED OUTPUT POWER LEVELS													
Freq. (MHz)	Channel	Average Conducted RF Output Power Levels (dBm)											
		802.11b Mode		802.11g Mode									
		1 Mbps	2 Mbps	5.5 Mbps	11 Mbps	6 Mbps	9 Mbps	12 Mbps	18 Mbps	24 Mbps	36 Mbps	48 Mbps	54 Mbps
2412	1	18.2	18.3	18.2	18.2	16.9	16.9	16.4	16.3	14.2	14	12.4	12.3
2437	6	18.2	18.4	18.2	18.2	17	16.9	16.5	16.4	14.3	14	12.5	12.4
2462	11	18.4	18.5	18.4	18.3	17.1	17.1	16.5	16.5	14.3	14.14	12.6	12.5

**Notes**

- According to the manufacturer 802.11n conducted power levels are  $> 1$  dB below the equivalent 802.11b power.
- The RF conducted average output power levels of the DUT were measured by Celltech prior to the SAR evaluations using a Gigatronics 8652A Universal Power Meter at the internal connector in accordance with FCC 47 CFR §2.1046 (see reference [14]) and IC RSS-Gen (see reference [15]).

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## 5.0 FLUID DIELECTRIC PARAMETERS

FLUID DIELECTRIC PARAMETERS						
Date: 02/27&28/2013		Frequency: 2450 MHz			Tissue: Body	
Freq	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2.350	52.34	1.82	52.7	1.95	-0.68%	-6.67%
2.360	52.29	1.85	52.7	1.95	-0.78%	-5.13%
2.370	52.33	1.86	52.7	1.95	-0.70%	-4.62%
2.380	52.42	1.84	52.7	1.95	-0.53%	-5.64%
2.390	51.98	1.86	52.7	1.95	-1.37%	-4.62%
2.400	52.18	1.88	52.7	1.95	-0.99%	-3.59%
2.410	52.36	1.88	52.7	1.95	-0.65%	-3.59%
2.420	52.09	1.9	52.7	1.95	-1.16%	-2.56%
2.430	52.06	1.92	52.7	1.95	-1.21%	-1.54%
2.440	51.88	1.93	52.7	1.95	-1.56%	-1.03%
2.450	52.05	1.96	52.7	1.95	-1.23%	0.51%
2.460	51.88	1.96	52.7	1.95	-1.56%	0.51%
2.462*	51.9	1.97	52.7	1.95	-1.52%	1.03%
2.470	51.78	1.99	52.7	1.95	-1.75%	2.05%
2.480	51.98	2.01	52.7	1.95	-1.37%	3.08%
2.490	51.89	2.01	52.7	1.95	-1.54%	3.08%
2.500	51.94	1.98	52.7	1.95	-1.44%	1.54%
2.510	52.04	2.02	52.7	1.95	-1.25%	3.59%
2.520	51.85	2.05	52.7	1.95	-1.61%	5.13%
2.530	51.85	2.04	52.7	1.95	-1.61%	4.62%
2.540	51.73	2.07	52.7	1.95	-1.84%	6.15%
2.550	51.75	2.07	52.7	1.95	-1.80%	6.15%

*\*interpolated using DASY4 software*

Test Date	Fluid Type	Ambient Temperature	Fluid Temperature	Fluid Depth	Atmospheric Pressure	Relative Humidity	$\rho$ (Kg/m <sup>3</sup> )
Feb 27	2450 Body	22.0°C	23.7 °C	≥ 15 cm	102.5 kPa	32%	1000
Feb 28	2450 Body	23.0°C	23.6 °C	≥ 15 cm	102.7 kPa	32%	1000

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## 6.0 SAR MEASUREMENT SUMMARY

BODY SAR EVALUATION RESULTS										
WLAN Mode	Test Mode	Test Freq.	Test Chan.	Data Rate	Battery	DUT Position (Side facing phantom)	DUT Distance to Phantom	Conducted Power Before Test	SAR Drift During Test	Measured SAR (1g)
		MHz		Mbps				dBm	dB	W/kg
802.11b	DSSS	2462	11	1	Li-ion	Front	5mm	18.4	0.508	0.014
802.11b	DSSS	2462	11	1	Li-ion	Back	5mm	18.4	0.311	0.030
802.11b	DSSS	2462	11	1	Li-ion	Side	5mm	18.4	-0.054	0.106
802.11b	DSSS	2462	11	1	Alkaline	Side	5mm	18.4	-0.011	<b>0.118</b>
SAR SAFETY LIMIT(S)					BODY	SPATIAL PEAK	RF EXPOSURE CATEGORY			
FCC 47 CFR 2.1093		Health Canada Safety Code 6			1.6 W/kg	1g average	General Population / Uncontrolled			
<b>Test Date(s):</b>	Feb. 28, 2013									
<b>Notes</b>										
1.	Detailed measurement data and plots showing the maximum SAR location of the DUT are reported in Appendix A.									
2.	The default channel and data rate evaluated for SAR was determined based on the maximum conducted output power level measured prior to the SAR evaluations in accordance with the requirements specified in FCC KDB 248227 D01v01r02 (see reference [9]).									
3.	The DUT was not required to be evaluated in 802.11g/n mode or higher data rates based the highest output power channel was < ¼ dB higher than the corresponding 802.11b channel on the lowest data rate, in accordance with the procedures of FCC KDB 248227 (see reference [9]).									
4.	SAR levels measured at the maximum output channel are ≤ 0.8 W/kg and the peak extrapolated levels are ≤ 1.6 W/kg, therefore, SAR evaluations for the remaining default channels are not required (per FCC KDB 248227 D01v01r02 - see reference [9]).									
5.	The SAR drift of the DUT was measured by the DASY4 system for the duration of the SAR evaluation.									
6.	The DUT battery was fully charged prior to the SAR evaluation.									
7.	The fluid temperature remained within +/-2°C from the dielectric parameter measurement to the completion of the SAR test.									
8.	The dielectric parameters of the simulated tissue mixture were measured prior to the SAR evaluations using a Dielectric Probe Kit and a Network Analyzer (see Section 5.0 and Appendix C).									

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## 7.0 SAR SCALING FOR TUNE-UP TOLERANCE

SCALED SAR							
Test Config.	Freq. (MHz)	Test Ch.	Data Rate	Measured Conducted Power (dBm)	Maximum Rated Conducted Power (dBm)	Measured SAR Level 1g (W/kg)	Scaled SAR 1g (W/kg)
Body	2462	11	1 Mbps	18.4	19.5	0.118	0.152

## 8.0 SIMULTANEOUS TRANSMISSION ASSESSMENT

### 802.11b/g/n + 802.15

These transmitters share an antenna and are not capable of simultaneous transmission. The 802.15 is rated at 4 dBm and is below the threshold for standalone SAR evaluation.

### 802.11b/g/n + RFID

#### 802.15 + RFID

The RFID transmitter is a low power communication device transmitter and does not require standalone SAR evaluation. Simultaneous transmission evaluation with it and the 802.11b/g/n and 802.15 is not required.

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## 9.0 DETAILS OF SAR EVALUATION

1. The DUT was evaluated for body SAR in accordance with the test positions required by FCC KDB 941225 D07v01 (see reference [11]). Based on this 3 sides of the device required testing, front, back and side, at a distance of 5mm to the phantom surface.
2. The front surface (screen side) of the DUT is 1.1cm from the antenna.
3. The back surface (battery side) of the DUT is 2.5cm from the antenna.
4. The side surface (power button side) of the DUT is 0.5cm from the antenna.
5. All other DUT surfaces are > 2.5cm from the antenna.
6. The DUT supports connection of a standard 3.5mm jack headset accessory. No accessory is supplied with the DUT therefore one was not evaluated.
7. The DUT was supplied with test mode software that was able to transmit at any selected channel / data-rate required for SAR testing.
8. The DUT was tested with a modulated DSSS signal in 802.11b mode.
9. The DUT was tested in all required positions and modes with the default Li-ion rechargeable battery pack. The worst case test was then repeated with the AA batteries.

## 10.0 SAR EVALUATION PROCEDURES

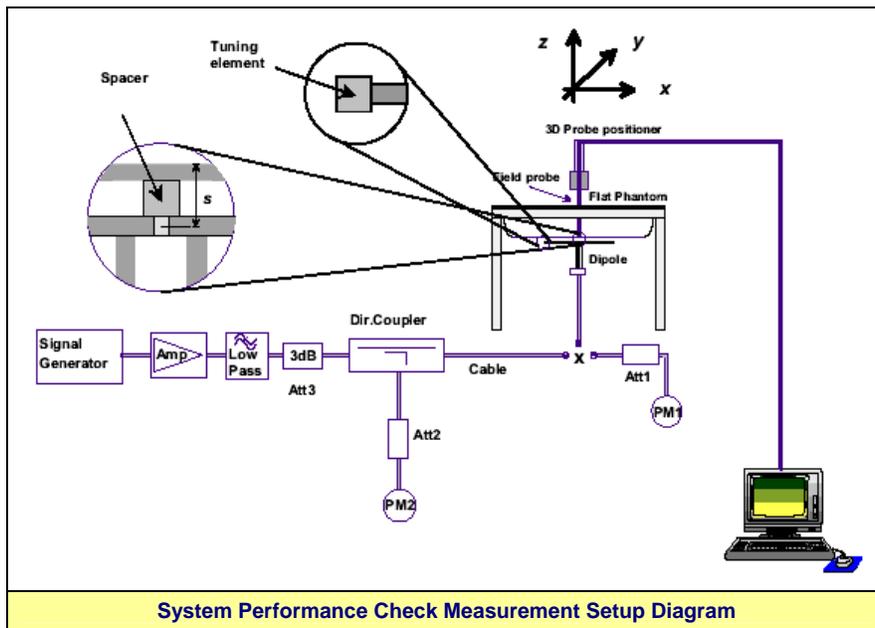
- a. (i) The evaluation was performed in the applicable area of the phantom depending on the type of device being tested. For devices held to the ear during normal operation, both the left and right ear positions were evaluated using the SAM phantom.  
(ii) For body-worn and face-held devices a planar phantom was used.
- b. The SAR was determined by a pre-defined procedure within the DASY4 software. Upon completion of a reference and optical surface check, the exposed region of the phantom was scanned near the inner surface with a grid spacing of 12mm x 12mm.  
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 determine the values between the dipole center of the probe and the surface of the phantom. This data cannot be measured because the center of the dipole sensors is 1.0 mm away from the probe tip and the distance between the probe and the boundary must be larger than 25% of the probe diameter. The probe diameter is 2.4 mm. In the DASY4 software, the distance between the sensor center and phantom surface is set to 2.0 mm. This provides a distance of 1.0 mm between the probe tip and the surface. The extrapolation of the values between the dipole center and the surface of the phantom was based on trivariate quadratics computed from the previously calculated 3D interpolated points nearest the phantom surface.
- f. Interpolated data is used to calculate the average SAR over 1g and 10g cubes by spatially discretizing the entire measured cube. The volume used to determine the averaged SAR is a 1mm grid (42875 interpolated points).
- g. A zoom scan volume of 30 mm x 30 mm x 30 mm (5x5x7 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 (7x7x7 points) to ensure complete capture of the peak spatial-average SAR.

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<b>Model:</b>	<b>O3AHGX00</b>	<b>DUT Type:</b>	<b>Hand-held GPS Navigation Computer</b>			
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## 11.0 SYSTEM PERFORMANCE CHECK

Prior to the SAR evaluations, a system check was performed at the planar section of the SAM phantom with a 2450MHz SPEAG validation dipole (see Appendix B for system performance check test plot) in accordance with the procedures described in IEEE Standard 1528-2003 (see reference [5]) and IEC 62209-2:2010 (see reference [7]). A forward power of 250 mW was applied to the dipole and the system was verified to a tolerance of  $\pm 10\%$  from the system manufacturer's dipole calibration target SAR value (see Appendix E for system manufacturer's dipole calibration procedures).

SYSTEM PERFORMANCE CHECK EVALUATION																
Test Date	Equiv. Tissue	SAR 1g (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)
		Freq. (MHz)	Target	Meas.	Dev.	Target	Meas.	Dev.	Target	Meas.						
Feb 27	BODY 2450	12.7 $\pm 10\%$	14.0	+10%	52.7 $\pm 5\%$	52.0	-1.3%	1.95 $\pm 5\%$	1.96	+0.5%	1000	22.0	23.7	$\geq 15$	32	102.5
Notes	1. The target SAR value is the measured value from the dipole calibration performed by the system manufacturer (see Appendix E). 2. The target dielectric parameters are the nominal values from the dipole calibration performed by SPEAG (see Appendix E) and specified in IC RSS-102 Issue 4 (see reference [4]). 3. The fluid temperature remained within $\pm 2^\circ\text{C}$ from the dielectric parameter measurement to the completion of the system performance check evaluation. 4. The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer (see Appendix C).															



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## 12.0 SIMULATED EQUIVALENT TISSUES

The simulated equivalent tissue recipe listed in the table below is derived from the SAR system manufacturer's suggested recipe in the DASY4 manual (see reference [12]). The ingredient percentage may have been adjusted minimally in order to achieve the appropriate target dielectric parameters within the specified tolerance.

2450 MHz SIMULATED TISSUE MIXTURES	
INGREDIENT	2450 MHz Body
Water	69%
Glycol Monobutyl	31%

## 13.0 SAR LIMITS

SAR RF EXPOSURE LIMITS			
FCC 47 CFR 2.1093	Health Canada Safety Code 6	(General Population / Uncontrolled Exposure)	(Occupational / Controlled Exposure)
Spatial Average (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak (averaged over any 1 g of tissue)		<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-02104	<b>IC:</b>	1792A-02104	
<b>Model:</b>	O3AHGX00	<b>DUT Type:</b>	Hand-held GPS Navigation Computer			
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## 14.0 ROBOT SYSTEM SPECIFICATIONS

<b><u>Specifications</u></b>	
<b>Positioner</b>	Stäubli Unimation Corp. Robot Model: RX60L
<b>Repeatability</b>	0.02 mm
<b>No. of axis</b>	6
<b><u>Data Acquisition Electronic (DAE) System</u></b>	
<b><u>Cell Controller</u></b>	
<b>Processor</b>	AMD Athlon XP 2400+
<b>Clock Speed</b>	2.0 GHz
<b>Operating System</b>	Windows XP Professional
<b><u>Data Converter</u></b>	
<b>Features</b>	Signal Amplifier, multiplexer, A/D converter, and control logic
<b>Software</b>	Measurement Software: DASY4, V4.7 Build 80
	Postprocessing Software: SEMCAD, V1.8 Build 186
<b>Connecting Lines</b>	Optical downlink for data and status info.; Optical uplink for commands and clock
<b><u>DASY4 Measurement Server</u></b>	
<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
<b><u>E-Field Probe</u></b>	
<b>Model</b>	EX3DV4
<b>Serial No.</b>	3600
<b>Construction</b>	Symmetrical design with triangular core
<b>Frequency</b>	10 MHz to 6 GHz
<b>Linearity</b>	±0.2 dB (30 MHz to 3 GHz)
<b><u>Phantom(s)</u></b>	
<b>Type</b>	SAM V4.0C
<b>Shell Material</b>	Fiberglass
<b>Thickness</b>	2.0 ±0.1 mm
<b>Volume</b>	Approx. 25 liters

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-02104	<b>IC:</b>	1792A-02104	
<b>Model:</b>	O3AHGX00	<b>DUT Type:</b>	Hand-held GPS Navigation Computer			
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## 15.0 PROBE SPECIFICATION (EX3DV4)

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

**Calibration:** Basic Broadband Calibration in air: 10-3000 MHz  
 Conversion Factors (CF) for HSL 900 and HSL 1750

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

**Directivity:**  $\pm 0.3$  dB in HSL (rotation around probe axis)  
 $\pm 0.5$  dB in tissue material (rotation normal to probe axis)

**Dynamic Range:** 10  $\mu$ W/g to >100 mW/g; Linearity:  $\pm 0.2$  dB  
 (noise: typically < 1  $\mu$ W/g)

**Dimensions:** Overall length: 330 mm (Tip: 20 mm)  
 Tip diameter: 2.5 mm (Body: 12 mm)  
 Typical distance from probe tip to dipole centers: 1.0 mm

**Application:** High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better than 30%.



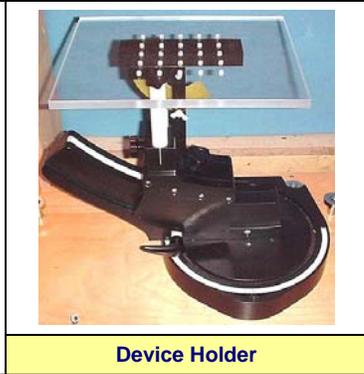
## 16.0 SAM TWIN PHANTOM V4.0C

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



## 17.0 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. For evaluations of larger devices a Plexiglas platform is attached to the device holder.



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<b>Model:</b>	O3AHGX00	<b>DUT Type:</b>	Hand-held GPS Navigation Computer			
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## 18.0 TEST EQUIPMENT LIST

TEST EQUIPMENT DESCRIPTION	ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
Schmid & Partner DASY4 System	-	-	-	-
-DASY4 Measurement Server	00158	1078	CNR	CNR
-Robot	00046	599396-01	CNR	CNR
-DAE4	00019	353	19-Apr-12	Biennial
-EX3DV4 E-Field Probe	00213	3600	27-Apr-12	Annual
-D2450V2 Validation Dipole	00219	825	25-Apr-12	Triennial
-SAM Twin Phantom V4.0C	00154	1033	CNR	CNR
HP 85070C Dielectric Probe Kit	00033	None	CNR	CNR
Gigatronics 8652A Power Meter	00007	1835272	03-May-12	Biennial
Gigatronics 80701A Power Sensor	00014	1833542	03-May-12	Biennial
Gigatronics 80334A Power Sensor	-	1837001	03-May-12	Biennial
HP 8753ET Network Analyzer	00134	US39170292	26-Apr-12	Biennial
Rohde & Schwarz SMR20 Signal Generator	00006	100104	02-May-12	Biennial
Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
CNR = Calibration Not Required				

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## 19.0 MEASUREMENT UNCERTAINTY (IC RSS-102 / IEC 62209-2)

### UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEC 62209-2:2010)

Source of Uncertainty	IEC 62209-2 Section	Tolerance / Uncertainty ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Standard Uncertainty ±% (1g)	Standard Uncertainty ±% (10g)	V <sub>i</sub> or V <sub>eff</sub>
<b>Measurement System</b>									
Probe Calibration (2450 MHz)	7.2.2.1	6.0	Normal	1	1	1	6.0	6.0	∞
Isotropy	7.2.2.2	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
Boundary Effect	7.2.2.6	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Linearity	7.2.2.3	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
Detection Limits	7.2.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
Readout Electronics	7.2.2.7	0.3	Normal	1	1	1	0.3	0.3	∞
Response Time	7.2.2.8	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time	7.2.2.9	2.6	Rectangular	1.732050808	1	1	1.5	1.5	∞
RF Ambient Conditions	7.2.4.5	3	Rectangular	1.732050808	1	1	1.7	1.7	∞
Probe Positioner Mechanical Restrictions	7.2.3.1	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell	7.2.3.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Post-processing	7.2.5	1	Rectangular	1.732050808	1	1	0.6	0.6	∞
<b>Test Sample Related</b>									
Test Sample Positioning	7.2.3.4.3	2.9	Normal	1	1	1	2.9	2.9	12
Device Holder Uncertainty	7.2.3.4.2	3.6	Normal	1	1	1	3.6	3.6	8
Drift of Output Power (meas. SAR drift)	7.2.2.10	0	Rectangular	1.732050808	1	1	0.0	0.0	∞
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty	7.2.3.2	4	Rectangular	1.732050808	1	1	2.3	2.3	∞
SAR Correction Algorithm for deviations in permittivity and conductivity	7.2.4.3	1.9	Normal	1	1	0.81	1.9	1.54	∞
Liquid Conductivity (measured)	7.2.4.3	1.03	Normal	1	0.78	0.71	0.8	0.7	∞
Liquid Permittivity (measured)	7.2.4.3	1.52	Normal	1	0.23	0.26	0.3	0.4	∞
Liquid Permittivity - temp. uncertainty	7.2.4.4	1.23	Rectangular	1.732050808	0.78	0.71	0.6	0.5	∞
Liquid Conductivity - temp. uncertainty	7.2.4.4	0.93	Rectangular	1.732050808	0.23	0.26	0.1	0.1	∞
<b>Combined Standard Uncertainty</b>	<b>7.3.1</b>		<b>RSS</b>				<b>9.57</b>	<b>9.50</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>	<b>7.3.2</b>		<b>k=2</b>				<b>19.14</b>	<b>18.99</b>	

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

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

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<b>Model:</b>	<b>O3AHGX00</b>	<b>DUT Type:</b>	<b>Hand-held GPS Navigation Computer</b>			
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## 20.0 REFERENCES

- [1] Federal Communications Commission - "Radiofrequency radiation exposure evaluation: portable devices", Rule Part 47 CFR §2.1093.
- [2] Health Canada - "Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz", Safety Code 6: 1999.
- [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 Exposure Compliance of Radio Communication 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 Devices RF Exposure Procedures and Equipment Authorization Policies"; KDB 447498 D01 v05: October 2012.
- [9] Federal Communications Commission, Office of Engineering and Technology - "SAR Measurement Procedures for 802.11a/b/g Transmitters"; KDB 248227 D01 v01r02: May 2007.
- [10] Federal Communications Commission, Office of Engineering and Technology - "SAR Measurements Requirements for 100MHz - 6 GHz"; KDB 865664 D01v01: October 2012.
- [11] Federal Communications Commission, Office of Engineering and Technology - "SAR for UMPC Mini Tablet Devices"; KDB 941225 D07v01: April 2011.
- [12] Schmid & Partner Engineering AG - DASY4 Manual V4.6, Chapter 17 Application Note, Body Tissue Recipe: Sept. 2005.
- [13] International Standard ISO/IEC 17025:2005 - "General requirements for the competence of testing and calibration laboratories".
- [14] Federal Communications Commission - "Measurements Required: RF Power Output"; Rule Part 47 CFR §2.1046.
- [15] Industry Canada - "General Requirements and Information for the Certification of Radiocommunication Equipment", Radio Standards Specification RSS-Gen Issue 3: December 2010.

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**APPENDIX A - SAR MEASUREMENT PLOTS**

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-02104</b>	<b>IC:</b>	<b>1792A-02104</b>	
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Test Date: 02/28/2013

**Body - 802.11b - Ch. 11 - 2462 MHz - 1Mbps - Li-ion - Front**

**DUT: Garmin GPS; Type: Hand Held GPS; Serial: Not Specified**

Program Notes: Ambient Temp: 23C; Fluid Temp: 23.6C; Barometric Pressure: 102.7 kPa; Humidity: 32%

Procedure Notes:

Communication System: WLAN

Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used (interpolated):  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.97 \text{ mho/m}$ ;  $\epsilon_r = 51.9$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: EX3DV4 - SN3600; ConvF(6.34, 6.34, 6.34); Calibrated: 27/04/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Front - 802.11b - 2462 - 1Mbps - Li-ion/Area Scan (9x15x1):** Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.014 mW/g

**Front - 802.11b - 2462 - 1Mbps - Li-ion/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

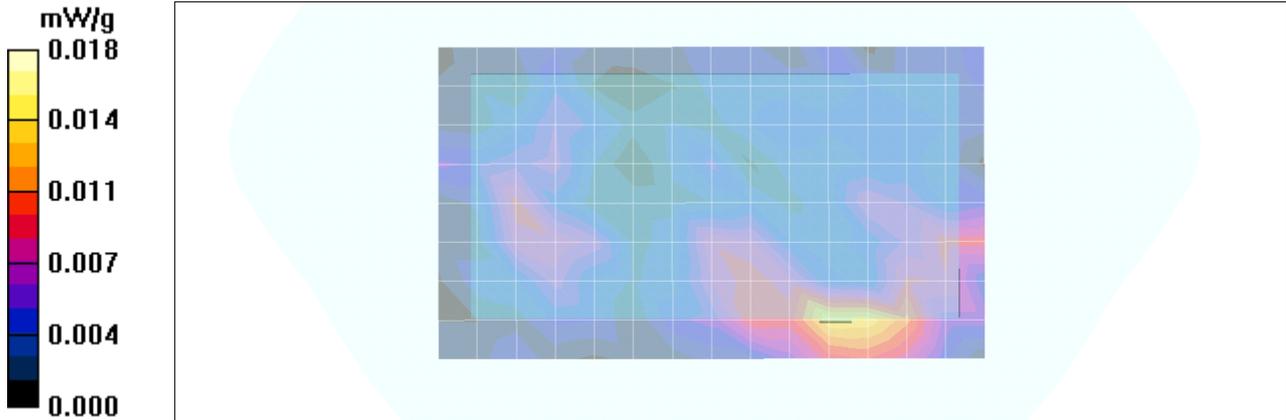
Reference Value = 2.31 V/m; Power Drift = 0.508 dB

Peak SAR (extrapolated) = 0.029 W/kg

**SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00609 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.018 mW/g



DUT orientation: Front (screen side) facing phantom, top edge to the right.

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Test Date: 02/28/2013

**Body - 802.11b - Ch. 11 - 2462 MHz - 1Mbps - Li-ion - Back**

**DUT: Garmin GPS; Type: Hand Held GPS; Serial: Not Specified**

Program Notes: Ambient Temp: 23C; Fluid Temp: 23.6C; Barometric Pressure: 102.7 kPa; Humidity: 32%

Procedure Notes:

Communication System: WLAN

Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used (interpolated):  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.97 \text{ mho/m}$ ;  $\epsilon_r = 51.9$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: EX3DV4 - SN3600; ConvF(6.34, 6.34, 6.34); Calibrated: 27/04/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Back - 802.11b - 2462 - 1Mbps - Li-ion/Area Scan (9x15x1):** Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.032 mW/g

**Back - 802.11b - 2462 - 1Mbps - Li-ion/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

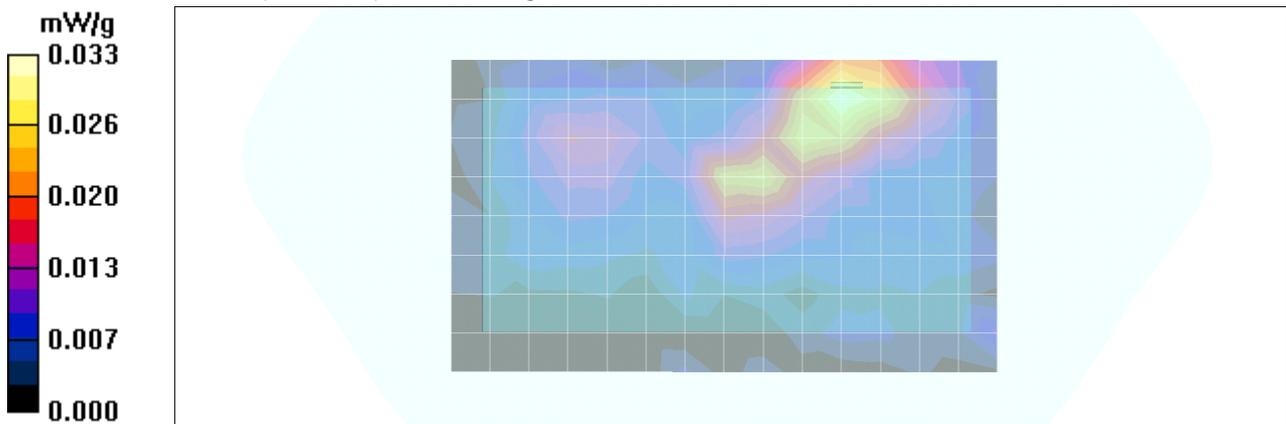
Reference Value = 4.02 V/m; Power Drift = 0.311 dB

Peak SAR (extrapolated) = 0.068 W/kg

**SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.016 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.033 mW/g



DUT orientation: Back (battery side) facing phantom, top edge to the right.

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-02104	<b>IC:</b>	1792A-02104	
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Test Date: 02/28/2013

**Body - 802.11b - Ch. 11 - 2462 MHz - 1Mbps - Li-ion - Side**

**DUT: Garmin GPS; Type: Hand Held GPS; Serial: Not Specified**

Program Notes: Ambient Temp: 23C; Fluid Temp: 23.6C; Barometric Pressure: 102.7 kPa; Humidity: 32%

Procedure Notes:

Communication System: WLAN

Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used (interpolated):  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.97 \text{ mho/m}$ ;  $\epsilon_r = 51.9$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: EX3DV4 - SN3600; ConvF(6.34, 6.34, 6.34); Calibrated: 27/04/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASy4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Side - 802.11b - 2462 - 1Mbps - Li-ion/Area Scan (5x15x1):** Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.119 mW/g

**Side - 802.11b - 2462 - 1Mbps - Li-ion/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

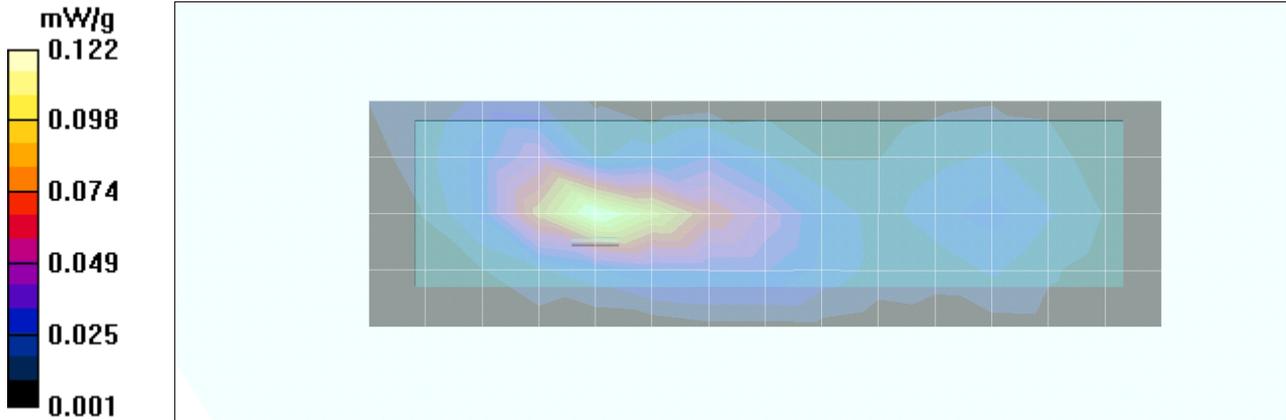
Reference Value = 7.94 V/m; Power Drift = -0.054 dB

Peak SAR (extrapolated) = 0.250 W/kg

**SAR(1 g) = 0.106 mW/g; SAR(10 g) = 0.044 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.122 mW/g



DUT orientation: Side (Power button side) facing phantom, top edge to the left

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-02104	<b>IC:</b>	1792A-02104	
<b>Model:</b>	O3AHGX00	<b>DUT Type:</b>	Hand-held GPS Navigation Computer			
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	<u>Date(s) of Evaluation</u> Feb. 28, 2013	<u>Test Report Serial No.</u> 021913MQO-T1205S	<u>Test Report Revision No.</u> Rev. 1.2(3rd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Mar. 07, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Date: 02/28/2013

**Body - 802.11b - Ch. 11 - 2462 MHz - 1Mbps - Alkaline - Side**

**DUT: Garmin GPS; Type: Hand Held GPS; Serial: Not Specified**

Program Notes: Ambient Temp: 23C; Fluid Temp: 23.6C; Barometric Pressure: 102.7 kPa; Humidity: 32%

Procedure Notes:

Communication System: WLAN

Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used (interpolated):  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.97 \text{ mho/m}$ ;  $\epsilon_r = 51.9$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: EX3DV4 - SN3600; ConvF(6.34, 6.34, 6.34); Calibrated: 27/04/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**Side - 802.11b - 2462 - 1Mbps - Alkaline/Area Scan (5x15x1):** Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.

Maximum value of SAR (measured) = 0.088 mW/g

**Side - 802.11b - 2462 - 1Mbps - Alkaline/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

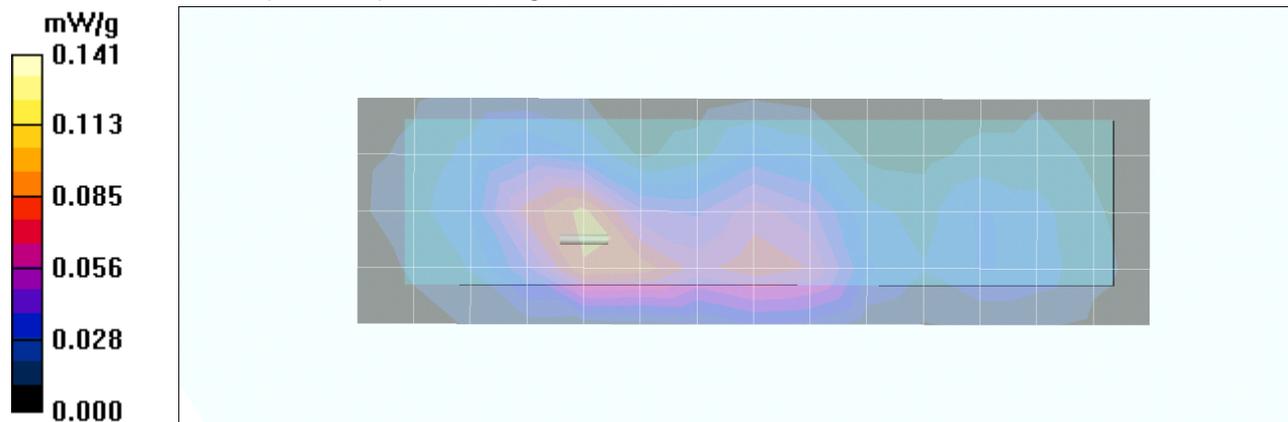
Reference Value = 7.16 V/m; Power Drift = -0.011 dB

Peak SAR (extrapolated) = 0.259 W/kg

**SAR(1 g) = 0.118 mW/g; SAR(10 g) = 0.050 mW/g**

Info: Interpolated medium parameters used for SAR evaluation.

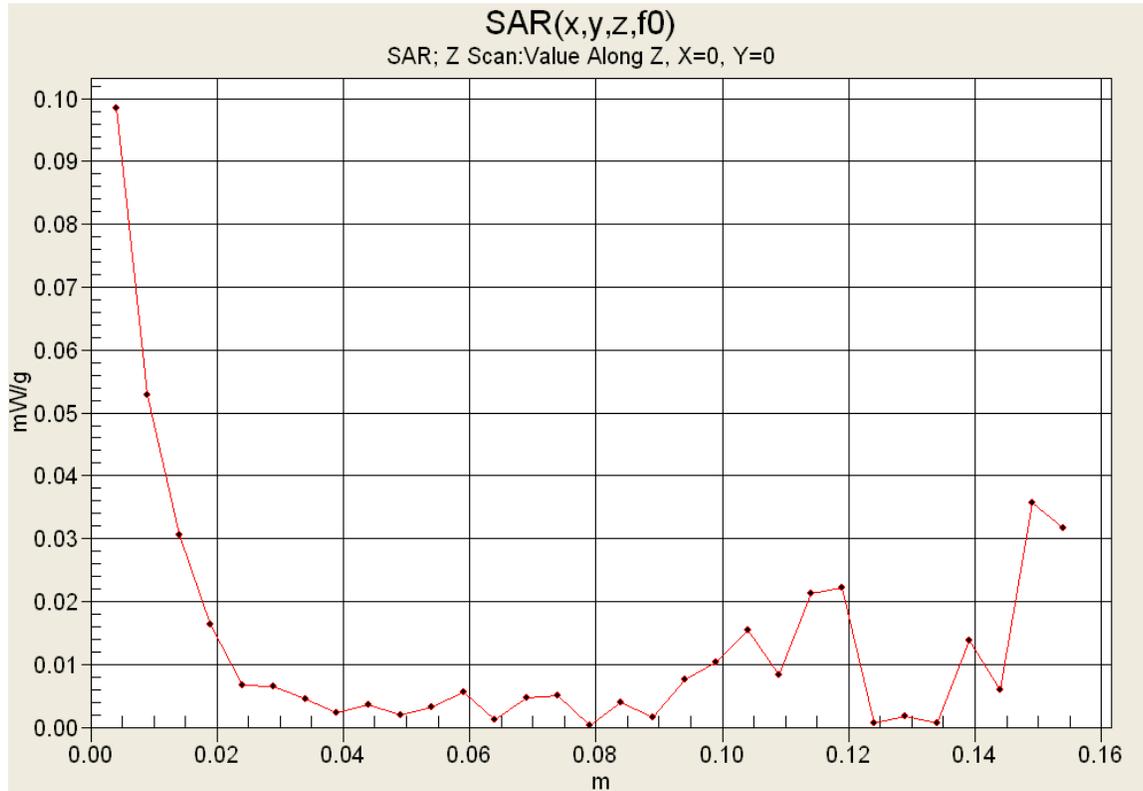
Maximum value of SAR (measured) = 0.141 mW/g



DUT orientation: Side (Power button side) facing phantom, top edge to the left

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-02104	<b>IC:</b>	1792A-02104	
<b>Model:</b>	O3AHGX00	<b>DUT Type:</b>	Hand-held GPS Navigation Computer			
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### Z-axis Scan



	<u>Date(s) of Evaluation</u> Feb. 28, 2013	<u>Test Report Serial No.</u> 021913MQO-T1205S	<u>Test Report Revision No.</u> Rev. 1.2(3rd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Mar. 07, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX B - SYSTEM PERFORMANCE CHECK PLOTS**

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-02104</b>	<b>IC:</b>	<b>1792A-02104</b>	
<b>Model:</b>	<b>O3AHGX00</b>	<b>DUT Type:</b>	<b>Hand-held GPS Navigation Computer</b>			
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	<u>Date(s) of Evaluation</u> Feb. 28, 2013	<u>Test Report Serial No.</u> 021913MQO-T1205S	<u>Test Report Revision No.</u> Rev. 1.2(3rd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Mar. 07, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

Test Date: 02/27/2013

## System Performance Check - 2450 MHz Dipole - Body

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 825; Calibrated: 25/04/2012**

Program Notes: Ambient Temp: 22C; Fluid Temp: 23.7C; Barometric Pressure: 102.5 kPa; Humidity: 32%

Procedure Notes:

Communication System: CW

Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: M2450 Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.96 \text{ mho/m}$ ;  $\epsilon_r = 52$ ;  $\rho = 1000 \text{ kg/m}^3$

- Probe: EX3DV4 - SN3600; ConvF(6.34, 6.34, 6.34); Calibrated: 27/04/2012
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 19/04/2012
- Phantom: SAM 4.0; Type: Fiberglass; Serial: 1033
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

**2450 MHz Dipole d=10mm P=250mW 2 2 2/Area Scan (6x10x1):** Measurement grid: dx=10mm, dy=10mm  
Maximum value of SAR (measured) = 14.9 mW/g

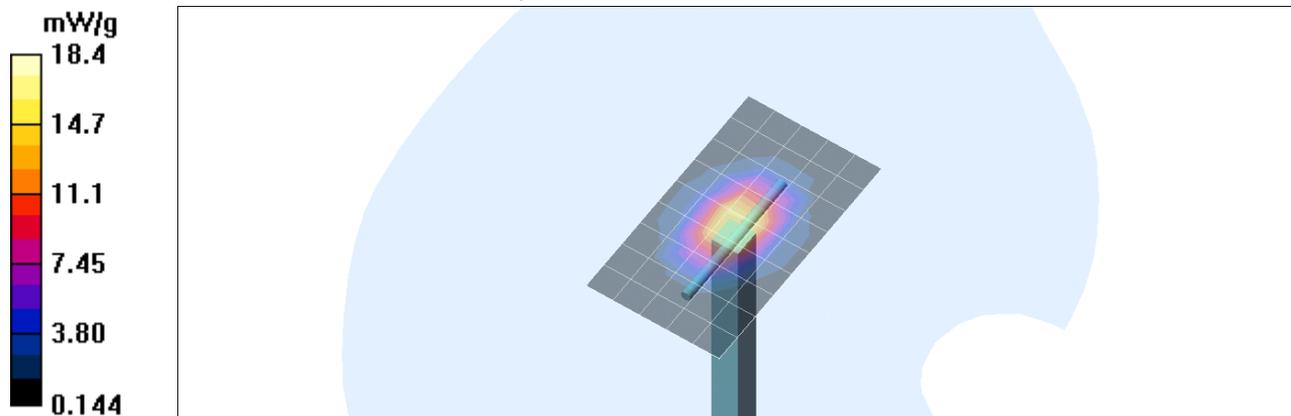
**2450 MHz Dipole d=10mm P=250mW 2 2 2/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.6 V/m; Power Drift = 0.015 dB

Peak SAR (extrapolated) = 28.2 W/kg

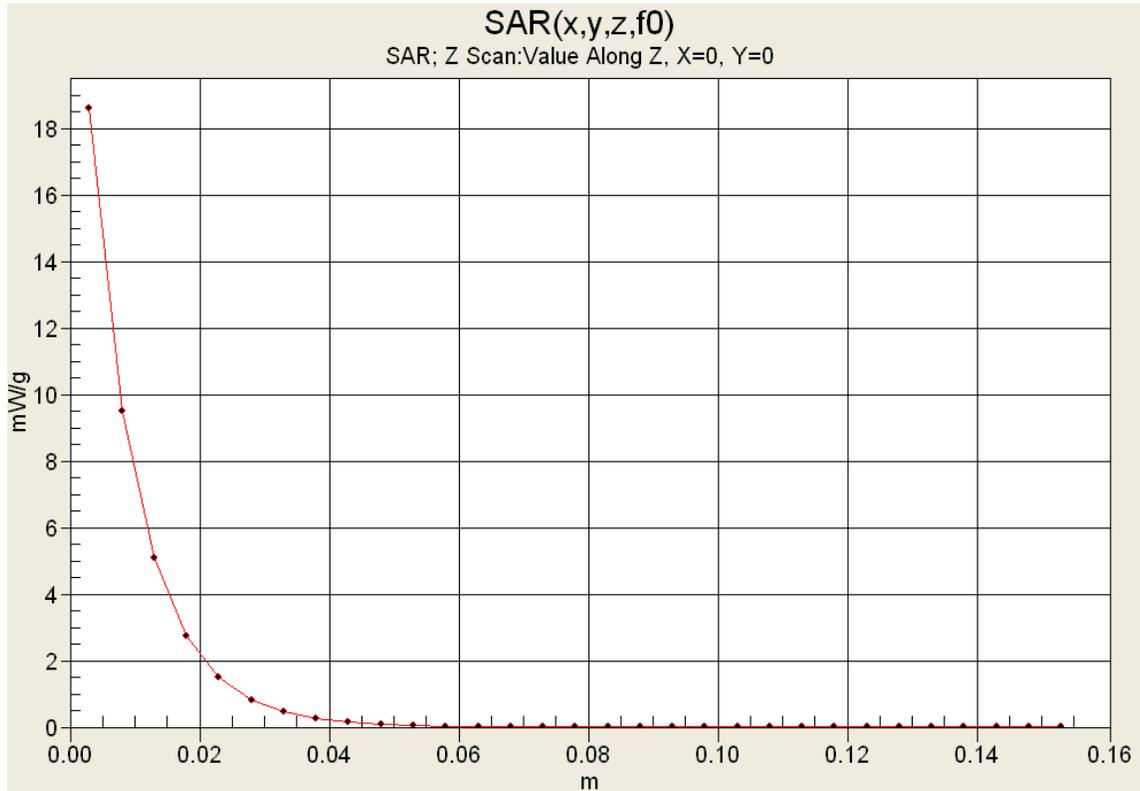
**SAR(1 g) = 14 mW/g; SAR(10 g) = 6.50 mW/g**

Maximum value of SAR (measured) = 18.4 mW/g



<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-02104	<b>IC:</b>	1792A-02104	
<b>Model:</b>	O3AHGX00	<b>DUT Type:</b>	Hand-held GPS Navigation Computer			
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### Z-axis Scan



	<u>Date(s) of Evaluation</u> Feb. 28, 2013	<u>Test Report Serial No.</u> 021913MQO-T1205S	<u>Test Report Revision No.</u> Rev. 1.2(3rd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Mar. 07, 2013	<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>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-02104</b>	<b>IC:</b>	<b>1792A-02104</b>	
<b>Model:</b>	<b>O3AHGX00</b>	<b>DUT Type:</b>	<b>Hand-held GPS Navigation Computer</b>			
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	<u>Date(s) of Evaluation</u> Feb. 28, 2013	<u>Test Report Serial No.</u> 021913MQO-T1205S	<u>Test Report Revision No.</u> Rev. 1.2(3rd Release)	
	<u>Test Report Issue Date</u> Mar. 07, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

### 2450 MHz Body

\*\*\*\*\*

Celltech Labs Inc.  
 Test Result for UIM Dielectric Parameter  
 27/Feb/2013  
 Freq Frequency(GHz)  
 FCC\_eB FCC Limits for Body Epsilon  
 FCC\_sB FCC Limits for Body Sigma  
 Test\_e Epsilon of UIM  
 Test\_s Sigma of UIM

\*\*\*\*\*

Freq	FCC_eB	FCC_sB	Test_e	Test_s
2.3500	52.83	1.85	52.34	1.82
2.3600	52.82	1.86	52.29	1.85
2.3700	52.81	1.87	52.33	1.86
2.3800	52.79	1.88	52.42	1.84
2.3900	52.78	1.89	51.98	1.86
2.4000	52.77	1.90	52.18	1.88
2.4100	52.75	1.91	52.36	1.88
2.4200	52.74	1.92	52.09	1.90
2.4300	52.73	1.93	52.06	1.92
2.4400	52.71	1.94	51.88	1.93
2.4500	52.70	1.95	52.05	1.96
2.4600	52.69	1.96	51.88	1.96
2.4700	52.67	1.98	51.78	1.99
2.4800	52.66	1.99	51.98	2.01
2.4900	52.65	2.01	51.89	2.01
2.5000	52.64	2.02	51.94	1.98
2.5100	52.62	2.04	52.04	2.02
2.5200	52.61	2.05	51.85	2.05
2.5300	52.60	2.06	51.85	2.04
2.5400	52.59	2.08	51.73	2.07
2.5500	52.57	2.09	51.75	2.07

<b>Applicant:</b>	Garmin International Inc.	<b>FCC ID:</b>	IPH-02104	<b>IC:</b>	1792A-02104	
<b>Model:</b>	O3AHGX00	<b>DUT Type:</b>	Hand-held GPS Navigation Computer			
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	<u>Date(s) of Evaluation</u> Feb. 28, 2013	<u>Test Report Serial No.</u> 021913MQO-T1205S	<u>Test Report Revision No.</u> Rev. 1.2(3rd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Mar. 07, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX E - DIPOLE CALIBRATION**

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-02104</b>	<b>IC:</b>	<b>1792A-02104</b>	
<b>Model:</b>	<b>O3AHGX00</b>	<b>DUT Type:</b>	<b>Hand-held GPS Navigation Computer</b>			
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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: **D2450V2-825\_Apr12**

## CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 825**

Calibration procedure(s) **QA CAL-05.v8  
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **April 25, 2012**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Approved by: **Katja Pokovic**      Technical Manager     

Issued: April 25, 2012

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

### Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

### Additional Documentation:

- DASY4/5 System Handbook

### Methods Applied and Interpretation of Parameters:

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

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

## Measurement Conditions

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

<b>DASY Version</b>	DASY5	V52.8.1
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	2450 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	39.2	1.80 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	39.6 $\pm$ 6 %	1.81 mho/m $\pm$ 6 %
<b>Head TSL temperature change during test</b>	< 0.5 °C	----	----

## SAR result with Head TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>50.8 mW / g <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	5.90 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	<b>23.6 mW / g <math>\pm</math> 16.5 % (k=2)</b>

## Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Body TSL parameters</b>	22.0 °C	52.7	1.95 mho/m
<b>Measured Body TSL parameters</b>	(22.0 $\pm$ 0.2) °C	52.4 $\pm$ 6 %	1.98 mho/m $\pm$ 6 %
<b>Body TSL temperature change during test</b>	< 0.5 °C	----	----

## SAR result with Body TSL

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Body TSL</b>	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>50.4 mW / g <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Body TSL</b>	condition	
SAR measured	250 mW input power	5.91 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	<b>23.5 mW / g <math>\pm</math> 16.5 % (k=2)</b>

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.0 $\Omega$ + 5.5 j $\Omega$
Return Loss	- 24.3 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.4 $\Omega$ + 6.1 j $\Omega$
Return Loss	- 24.3 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.159 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

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

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 11, 2008

## DASY5 Validation Report for Head TSL

Date: 25.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 825**

Communication System: CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.81$  mho/m;  $\epsilon_r = 39.6$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

### Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

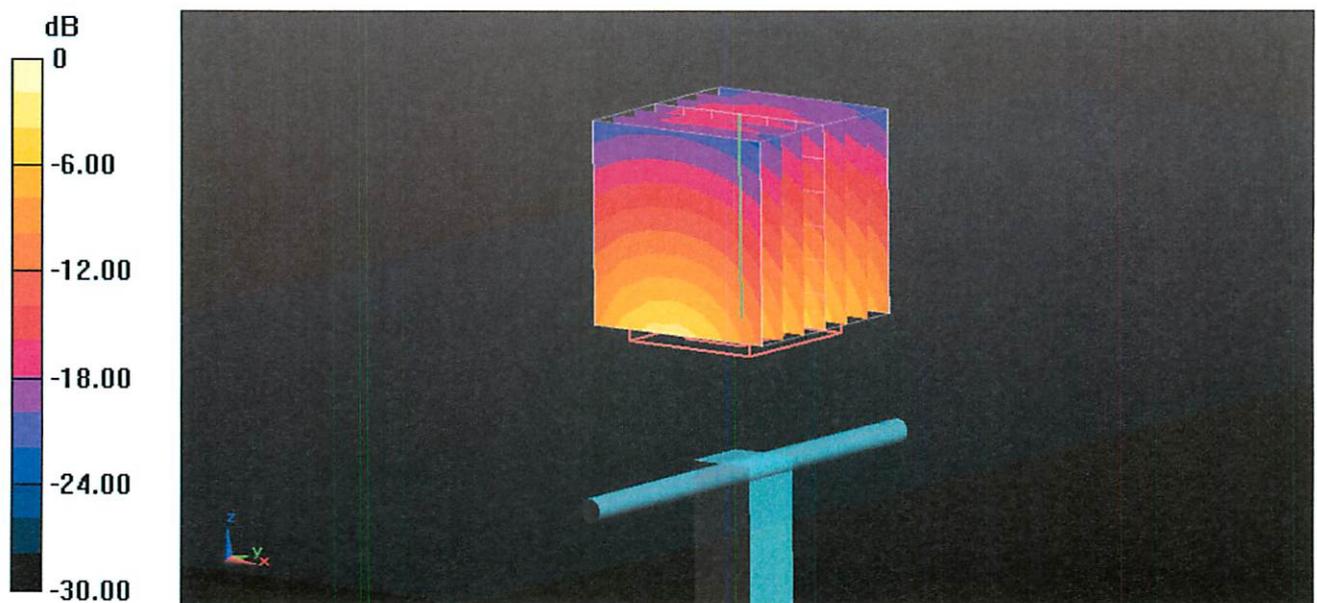
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.271 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 26.216 mW/g

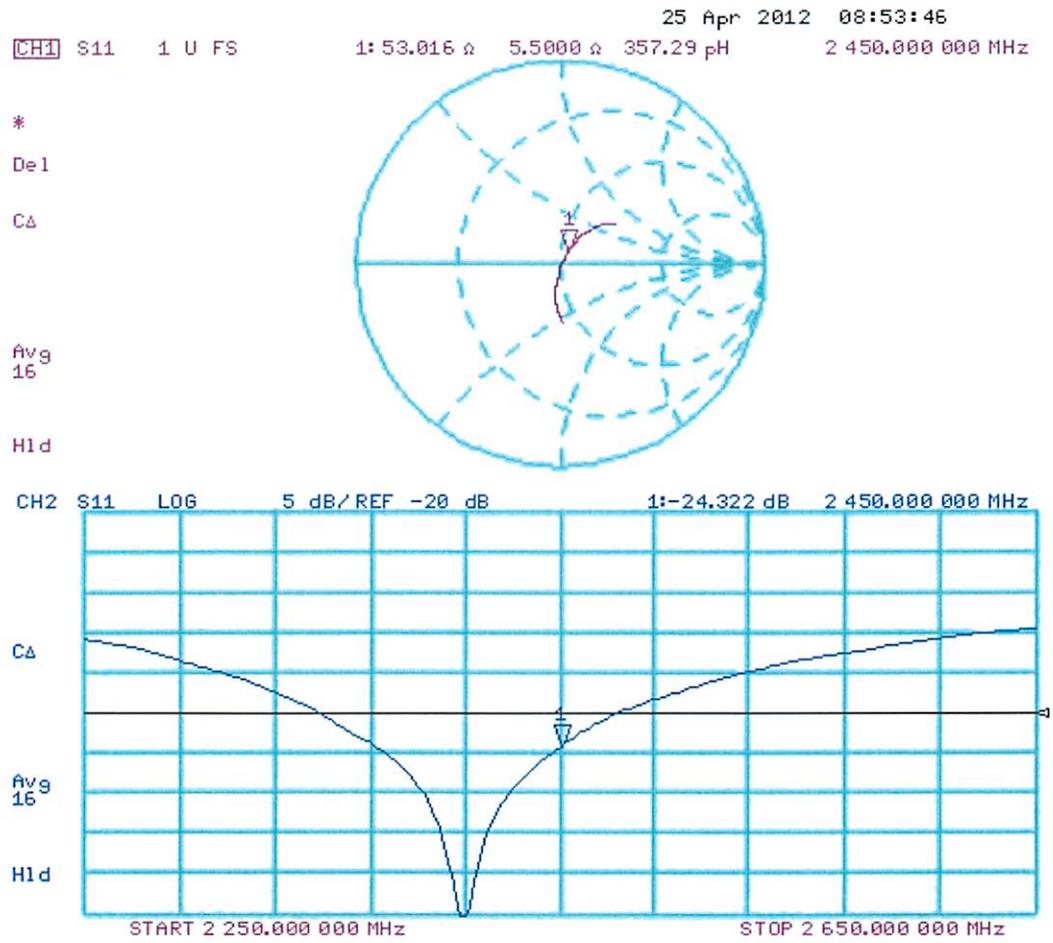
**SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.9 mW/g**

Maximum value of SAR (measured) = 16.5 mW/g



0 dB = 16.5 mW/g = 24.35 dB mW/g

# Impedance Measurement Plot for Head TSL



## DASY5 Validation Report for Body TSL

Date: 25.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 825**

Communication System: CW; Frequency: 2450 MHz

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.98$  mho/m;  $\epsilon_r = 52.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

### Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

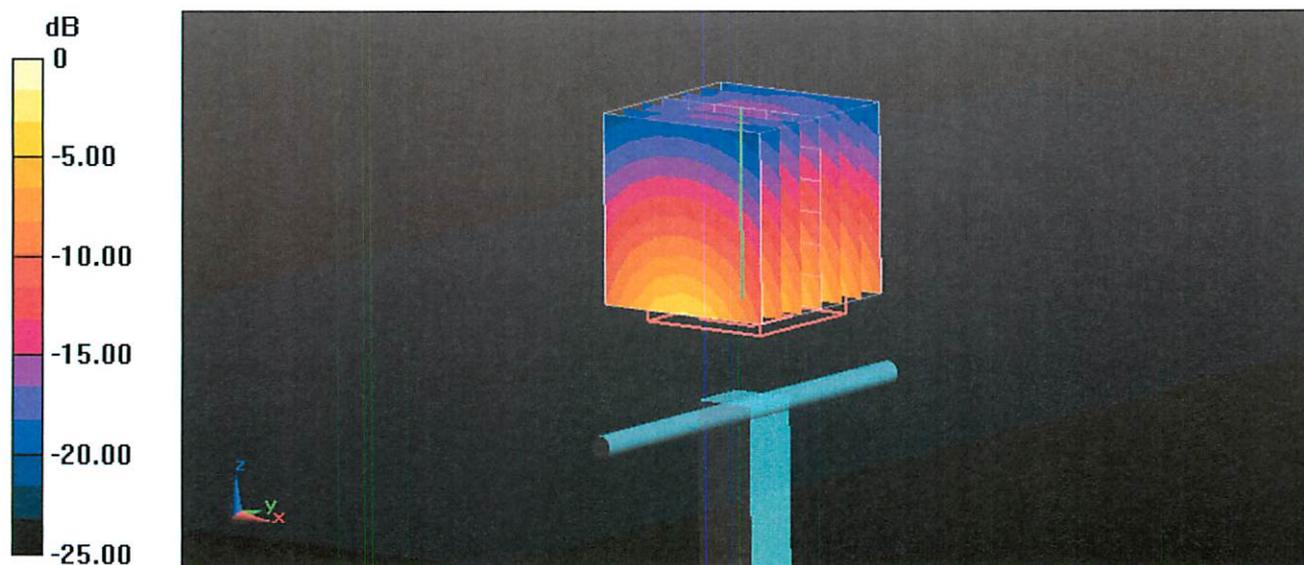
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.157 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 25.807 mW/g

**SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.91 mW/g**

Maximum value of SAR (measured) = 16.7 mW/g



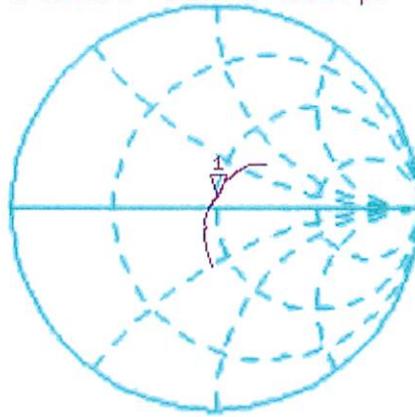
0 dB = 16.7 mW/g = 24.45 dB mW/g

# Impedance Measurement Plot for Body TSL

25 Apr 2012 08:53:21

[CH1] S11 1 U FS 1: 50.408  $\Omega$  6.1094  $\Omega$  396.87 pF 2 450.000 000 MHz

\*  
De1  
CA



Avg  
16

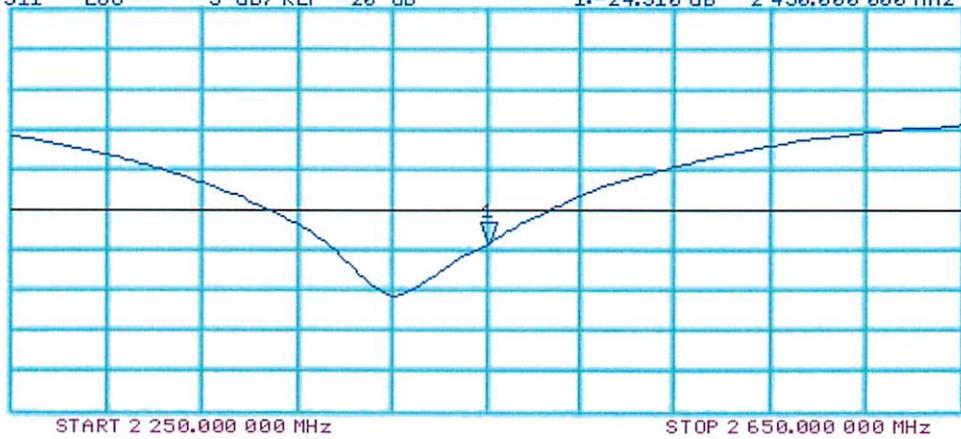
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-24.310 dB 2 450.000 000 MHz

CA

Avg  
16

H1d



	<u>Date(s) of Evaluation</u> Feb. 28, 2013	<u>Test Report Serial No.</u> 021913MQO-T1205S	<u>Test Report Revision No.</u> Rev. 1.2(3rd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Mar. 07, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX F - PROBE CALIBRATION**

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-02104</b>	<b>IC:</b>	<b>1792A-02104</b>	
<b>Model:</b>	<b>O3AHGX00</b>	<b>DUT Type:</b>	<b>Hand-held GPS Navigation Computer</b>			
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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: **EX3-3600\_Apr12**

**CALIBRATION CERTIFICATE**

Object **EX3DV4 - SN:3600**

Calibration procedure(s) **QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4  
Calibration procedure for dosimetric E-field probes**

Calibration date: **April 27, 2012**

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: April 28, 2012

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



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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:

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

### Methods Applied and Interpretation of Parameters:

- NORM<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 affect the  $E^2$ -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.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- 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 EX3DV4

## SN:3600

Manufactured: January 10, 2007  
Calibrated: April 27, 2012

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

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	0.50	0.52	0.38	$\pm 10.1 \%$
DCP (mV) <sup>B</sup>	100.3	99.1	99.9	

### Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	0.00	X	0.00	0.00	1.00	111.1	$\pm 2.5 \%$
			Y	0.00	0.00	1.00	118.1	
			Z	0.00	0.00	1.00	123.5	

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 max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1810	40.0	1.40	7.12	7.12	7.12	0.14	1.52	± 12.0 %
1950	40.0	1.40	6.83	6.83	6.83	0.13	1.69	± 12.0 %
2450	39.2	1.80	6.35	6.35	6.35	0.24	1.29	± 12.0 %

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

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

### Calibration Parameter Determined in Body Tissue Simulating Media

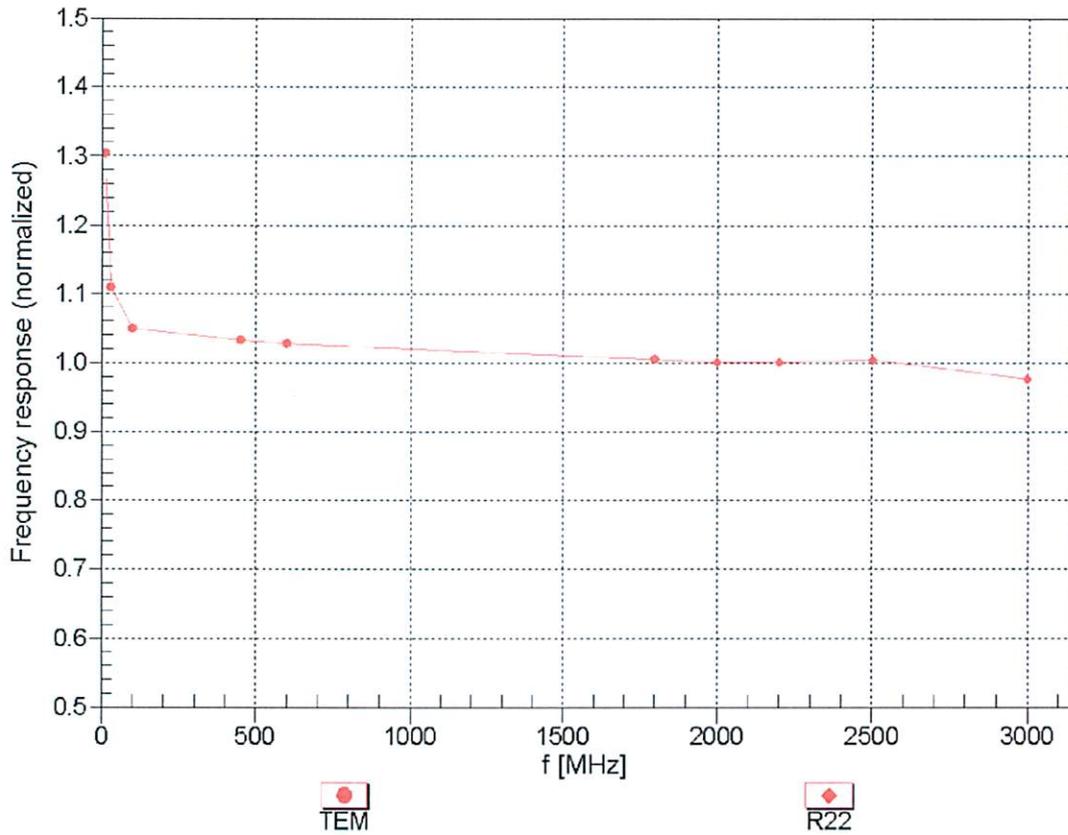
f (MHz) <sup>c</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
1810	53.3	1.52	6.80	6.80	6.80	0.11	3.00	± 12.0 %
1950	53.3	1.52	6.72	6.72	6.72	0.16	1.10	± 12.0 %
2450	52.7	1.95	6.34	6.34	6.34	0.79	0.50	± 12.0 %
5200	49.0	5.30	3.78	3.78	3.78	0.55	1.90	± 13.1 %
5500	48.6	5.65	3.29	3.29	3.29	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.39	3.39	3.39	0.60	1.90	± 13.1 %

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

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

# Frequency Response of E-Field

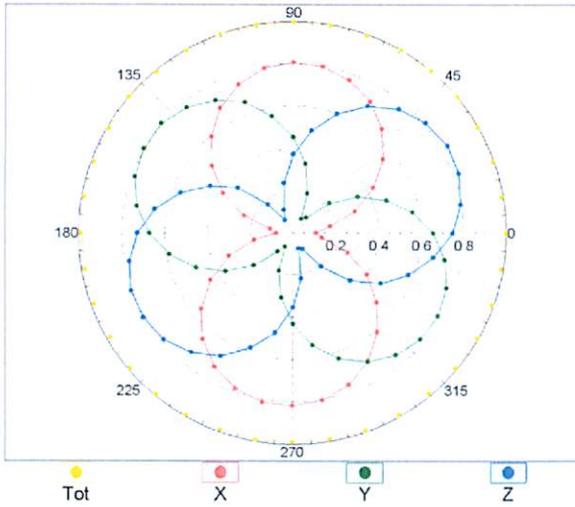
(TEM-Cell:ifi110 EXX, Waveguide: R22)



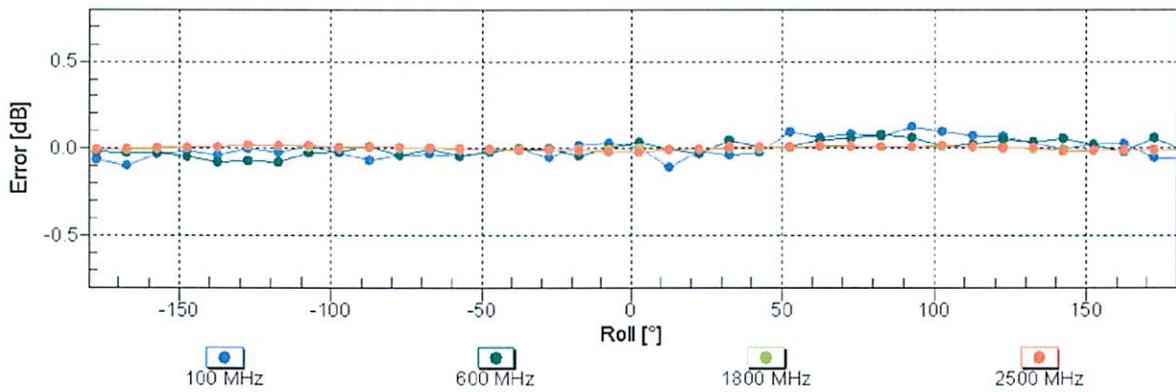
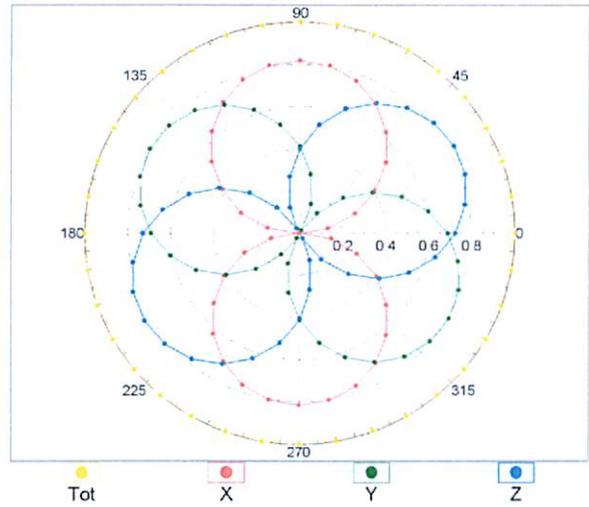
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

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

f=600 MHz, TEM

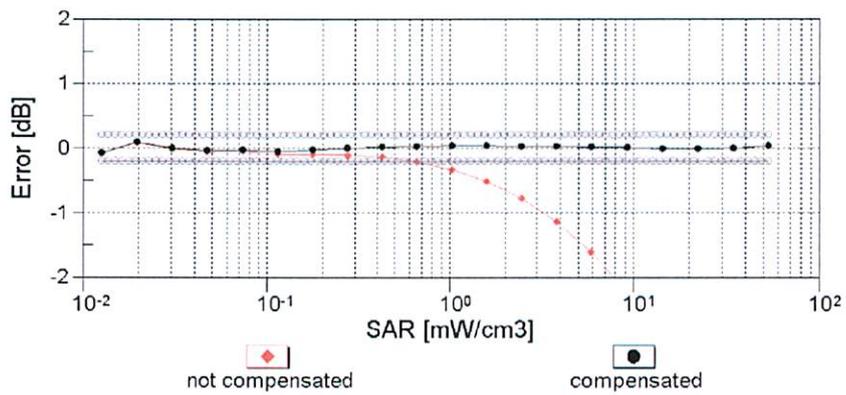
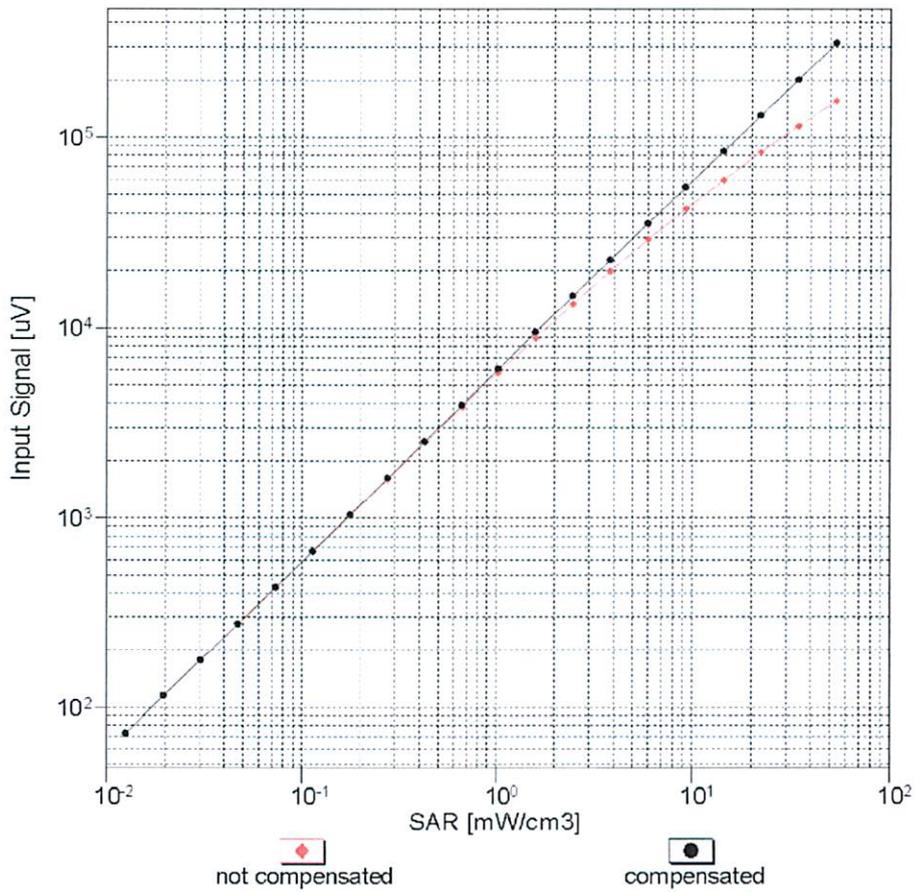


f=1800 MHz, R22



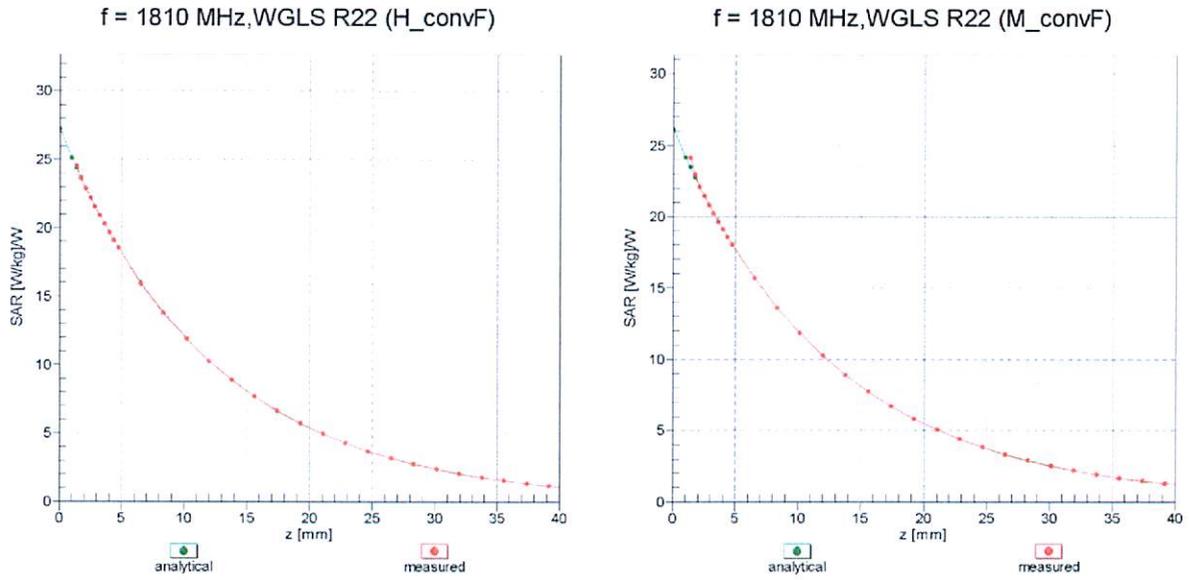
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  ( $k=2$ )

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

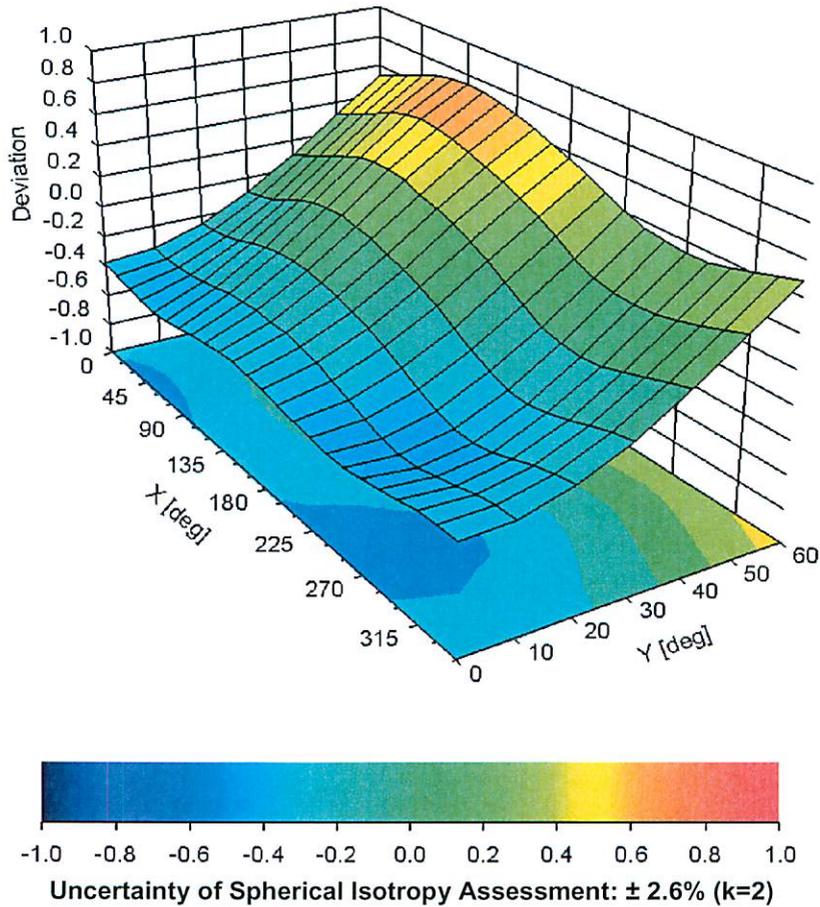


**Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )**

# Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \theta$ ), f = 900 MHz



## DASY/EASY - Parameters of Probe: EX3DV4 - SN:3600

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	32.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

	<u>Date(s) of Evaluation</u> Feb. 28, 2013	<u>Test Report Serial No.</u> 021913MQO-T1205S	<u>Test Report Revision No.</u> Rev. 1.2(3rd Release)	 Test Lab Certificate No. 2470.01
	<u>Test Report Issue Date</u> Mar. 07, 2013	<u>Description of Test(s)</u> Specific Absorption Rate	<u>RF Exposure Category</u> Gen. Pop. / Uncontrolled	

**APPENDIX G - SAM PHANTOM CERTIFICATE OF CONFORMITY**

<b>Applicant:</b>	<b>Garmin International Inc.</b>	<b>FCC ID:</b>	<b>IPH-02104</b>	<b>IC:</b>	<b>1792A-02104</b>	
<b>Model:</b>	<b>O3AHGX00</b>	<b>DUT Type:</b>	<b>Hand-held GPS Navigation Computer</b>			
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# Schmid & Partner Engineering AG

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

## Certificate of conformity / First Article Inspection

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

### Tests

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

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

### Standards

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

### Conformity

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

Date 18.11.2001

Signature / Stamp

**Schmid & Partner  
Engineering AG**

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Tel. +41 1 245 97 00, Fax +41 1 245 97 79