



Test Report Serial Number:

45461408 R3.0

Test Report Date:

13 June 2018

Project Number:

1389

## SAR Test Report - New Certification

Applicant:



**Garmin International Inc.**  
1200 East 151 St.  
Olathe, KS, 66062  
USA

Maximum Reported 1g SAR			
FCC	Body	0.94	W/kg
ISED	Body	0.88	
General Pop. Limit:		1.60	

FCC ID:

**IPH-03341**

Product Model Number / HVIN

**A03341**

ISED Registration Number

**1792A-03341**

Product Name / PMN

**A03341**

In Accordance With:

### FCC 47 CFR §2.1093

Radiofrequency Radiation Exposure Evaluation: Portable Devices

### IC RSS-102 Issue 5

Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

Approved By:

**Ben Hewson, President**

Celltech Labs Inc.  
21-364 Lougheed Rd.  
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Canada



Test Lab Certificate: 2470.01



Industry  
Canada

IC Registration 3874A-1



FCC Registration: 714830

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## 1.0 DOCUMENT CONTROL

<b>Samples Tested By:</b>	Trevor Whillock
<b>Report Prepared By:</b>	Art Voss
<b>Report Reviewed By:</b>	Ben Hewson

Report Issue Number	Description	By	Report Issue Date
R1.0	Initial Release	Art Voss	4 December 2017
R2.0	Removed Reference to NII and DSS FCC Part 15 Section 2.0 Revised Max Rated Output Power Section 2.0 and 6.0. Adjusted Scaling Section 9.0 Added Reference to DXX Part 15 Low Power Communication Device Transmitter Section 2.0 New Section Added- System Validation Summary Section 15.0 Extended Dipole Calibration Added to Appendix F Change to Reported Max SAR Values on Cover Page	Art Voss	16 April 2018
R3.0	Change to Rated Power Section 2.0,6.0,9.0. Change to Reported Max SAR Values Table 9.0 and Cover Page	Trevor Whillock	13 June 2018

## 2.0 CLIENT AND DEVICE INFORMATION

Client Information	
<b>Applicant Name</b>	<b>Garmin International Inc.</b>
<b>Applicant Address</b>	1200 East 151 St.
	Olathe, KS,66062
	USA
DUT Information	
<b>Device Identifier(s):</b>	<b>FCC ID:</b> IPH-03341
	<b>IC:</b> 1792A-03341
<b>Type of Equipment:</b>	Digital Transmission System (DTS) FCC Part 15, RSS 247
	DXX- Part 15 Low Power Communication Device Transmitter
<b>Device Model(s) / HVIN:</b>	A03341
<b>Device Marketing Name / PMN:</b>	A03341
<b>Test Sample Serial No.:</b>	T/A Sample - Identical Prototype
<b>Transmit Frequency Range:</b>	BLE: 2402 - 2480 MHz
	WiFi: 2412 - 2462 MHz
<b>Number of Channels:</b>	n/a
<b>Manuf. Max. Rated Output Power:</b>	BLE/ANT: 4 dBm
	WiFi:14 dBm
<b>Modulation:</b>	DSSS, OFDM, MCS 0-7
<b>Duty Cycle:</b>	100%
<b>DUT Power Source:</b>	5V USB, Internal Li-ion battery
<b>Deviation(s) from standard/procedure:</b>	None
<b>Modification of DUT:</b>	None

### 3.0 NORMATIVE REFERENCES

<b>Normative References*</b>	
ANSI / ISO 17025:2005	General Requirements for competence of testing and calibration laboratories
FCC CFR Title 47 Part 2 Title 47: Part 2.1093:	Code of Federal Regulations Telecommunication Radiofrequency Radiation Exposure Evaluation: Portable Devices
Health Canada Safety Code 6 (2015)	Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3kHz to 300GHz
Industry Canada Spectrum Management & Telecommunications Policy RSS-102 Issue 5:	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
IEEE International Committee on Electromagnetic Safety IEEE 1528-2013:	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
IEC International Standard IEC 62209-2 2010	Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 2
FCC KDB KDB 865664 D01v01r04	SAR Measurement Requirements for 100MHz to 6GHz
FCC KDB KDB 447498 D01v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
FCC KDB KDB 248227 D01v02r02	SAR Test Guidance for IEEE 802.11 (WiFi) Transmitters
* When the issue number or issue date is omitted, the latest version is assumed.	

## 4.0 STATEMENT OF COMPLIANCE

This measurement report demonstrates that samples of the product model(s) were evaluated for Specific Absorption Rate (SAR) on the date(s) shown, in accordance with the Measurement Procedures cited and were found to comply with the Standard(s) Applied based on the Exposure Limits of the Use Group indicated for which the product is intended to be used.

<b>Applicant:</b> Garmin International Inc.	<b>Model / HVIN:</b> A03341	
<b>Standard(s) Applied:</b> FCC 47 CFR §2.1093 Health Canada's Safety Code 6	<b>Measurement Procedure(s):</b> FCC KDB 865664, FCC KDB 447498, FCC KDB 248227 Industry Canada RSS-102 Issue 5 IEEE Standard 1528-2013, IEC 62209-2	
<b>Reason For Issue:</b> <input checked="" type="checkbox"/> New Certification <input type="checkbox"/> Class I Permissive Change <input type="checkbox"/> Class II Permissive Change	<b>Use Group:</b> <input checked="" type="checkbox"/> General Population / Uncontrolled <input type="checkbox"/> Occupational / Controlled	<b>Limits Applied:</b> <input checked="" type="checkbox"/> 1.6W/kg - 1g Volume <input type="checkbox"/> 8.0W/kg - 1g Volume <input type="checkbox"/> 4.0W/kg - 10g Volume
<b>Reason for Change:</b> Original Filing	<b>Date(s) Evaluated:</b> Nov. 15 & Dec. 01, 2017	

The results of this investigation are based solely on the test sample(s) provided by the applicant which was not adjusted, modified or altered in any manner whatsoever except as required to carry out specific tests or measurements. A description of the device, operating configuration, detailed summary of the test results, methodologies and procedures used during this evaluation, the equipment used and the various provisions of the rules are included in this test report.

I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025.



Art Voss, P.Eng.  
Technical Manager  
Celltech Labs Inc.

13 June 2018

Date



## 5.0 SAR MEASUREMENT SYSTEM

### SAR Measurement System

Celltech Labs Inc. SAR measurement facility employs a Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY6 measurement system is comprised of the measurement server, a robot controller, a computer, a near-field probe, a probe alignment sensor, an Elliptical Planar Phantom (ELI) phantom and a specific anthropomorphic mannequin (SAM) phantom 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 and a teach pendant (Joystick) to control the robot's servo 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 form the DAE to digital electronic signal and transfers data to the DASY6 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, a command decoder and a control logic unit. Transmission to the DASY6 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 VMbus computer.



**DASY 6 SAR System with SAM Phantom**



**DASY 6 Measurement Controller**

## 6.0 RF CONDUCTED POWER MEASUREMENT

**Table 6.0 Conducted Power Measurements (DSS 1Mbps)**

<b>Conducted Power Measurements</b>								
Channel	Modulation	Data Rate	Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Measured Power (W)	Delta (dBm)	SAR Test Channel (Y/N)
1	DSS	1Mbps	2412.0000	13.88	14.00	0.025	-0.12	Y
2	DSS	1Mbps	2417.0000	13.88	14.00	0.025	-0.12	N
3	DSS	1Mbps	2422.0000	13.79	14.00	0.025	-0.21	N
4	DSS	1Mbps	2427.0000	13.82	14.00	0.025	-0.18	N
5	DSS	1Mbps	2432.0000	13.85	14.00	0.025	-0.15	N
6	DSS	1Mbps	2437.0000	13.81	14.00	0.025	-0.19	Y
7	DSS	1Mbps	2442.0000	13.81	14.00	0.025	-0.19	Y
8	DSS	1Mbps	2447.0000	13.81	14.00	0.025	-0.19	N
9	DSS	1Mbps	2452.0000	13.76	14.00	0.024	-0.24	N
10	DSS	1Mbps	2457.0000	13.89	14.00	0.025	-0.11	N
11	DSS	1Mbps	2462.0000	13.89	14.00	0.025	-0.11	Y

\*The rated power and tolerance are stated for typical transmission modes and data rates. Some modes and data rates may produce lower than rated conducted power levels. Power measurements taken across the various channels, modes and data rates did not produce levels in excess of the Rated Power plus Tolerance. SAR was evaluated using DSS mode at 1Mbps at the Maximum output power level setting and produced the most conservative SAR. The reported SAR was not scaled down.

**7.0 NUMBER OF TEST CHANNELS ( $N_c$ )**

As per FCC KDB 248277, the required 802.11 test channels are Ch1, Ch6 and Ch 11.

## 8.0 SAR MEASUREMENT SUMMARY

**Table 8.0: Measured Results – BODY**

Measured SAR Results (1g) - BODY Configuration (FCC/ISED)																
Date	Plot ID #	DUT Model	Test Type	Test Freq. (MHz)	Modulation	Accessories				DUT Spacing		Meas. Cond. Power (dBm)	Measured SAR (1g) 100% DC (W/kg)	SAR Drift (dB)		
						Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)					
<b>BODY 2.G WIFI</b>																
15 Nov 2017	B1	A03341	Body-Touch/Front	2462	DSS 1Mbps	n/a	n/a	n/a	n/a	0	0	13.89	<b>0.126</b>	-0.210		
15 Nov 2017	B2	A03341	Body-Touch/Back	2462	DSS 1Mbps	n/a	n/a	n/a	n/a	0	0	13.89	<b>0.064</b>	0.450		
15 Nov 2017	B3	A03341	Body-Touch Left	2462	DSS 1Mbps	n/a	n/a	n/a	n/a	0	0	13.89	<b>0.049</b>	0.130		
15 Nov 2017	B4	A03341	Body-Touch Right	2462	DSS 1Mbps	n/a	n/a	n/a	n/a	0	0	13.89	<b>0.790</b>	-0.170		
15 Nov 2017	B5	A03341	Body-Touch Top	2462	DSS 1Mbps	n/a	n/a	n/a	n/a	0	0	13.89	<b>0.139</b>	0.280		
15 Nov 2017	B6	A03341	Body-Touch Bottom	2462	DSS 1Mbps	n/a	n/a	n/a	n/a	0	0	13.89	<b>0.095</b>	-0.290		
15 Nov 2017	B7	A03341	Body-Touch Right	2442	DSS 1Mbps	n/a	n/a	n/a	n/a	0	0	13.81	<b>0.730</b>	-0.140		
29 Nov 2017	B8	A03341	Body-Touch Right	2412	DSS 1Mbps	n/a	n/a	n/a	n/a	0	0	13.88	<b>0.525</b>	-0.270		
29 Nov 2017	B9	A03341	Body-Touch Right	2437	DSS 1Mbps	n/a	n/a	n/a	n/a	0	0	13.81	<b>0.526</b>	-0.260		
<b>SAR Limit</b>						<b>Spatial Peak</b>				<b>BODY</b>		<b>RF Exposure Category</b>				
FCC 47 CFR 2.1093						Health Canada Safety Code 6				1 Gram Average		1.6 W/kg		General Population		

## 9.0 SCALING OF MAXIMUM MEASURE SAR

**Table 9.0 SAR Scaling**

Scaling of Maximum Measured SAR <sup>(1)</sup>							
Plot ID	Configuration	Freq	Measured Fluid Deviation		Measured Conducted Power	Measured Drift	Measured SAR (1g)
		(MHz)	Permittivity	Conductivity	(dBm)	(dB)	(W/kg)
B4	Body	2472	-6.70%	6.01%	13.9	-0.170	0.790
Step 1							
Fluid Sensitivity Adjustment							
Plot ID	Scale Factor		X	Measured SAR		=	Step 1 Adjusted SAR (1g)
	(%)			(W/kg)	(W/kg)		
B4	4.380%		X	0.790	=		0.825
Step 2							
Manufacturer's Tune-Up Tolerance							
Plot ID	Measured Conducted Power	Rated Power		Delta	+	Step 1 Adjusted SAR	Step 2 Adjusted SAR (1g)
	(dBm)	(dBm)	(dB)	(W/kg)		(W/kg)	
B4	13.9	14.0	-0.1	+	0.825	=	0.844
Step 3 (ISED)							
Drift Adjustment							
Plot ID	Measured Drift		+	Step 2 Adjusted SAR		=	Step 3 Adjusted SAR (1g)
	(dB)			(W/kg)	(W/kg)		
B4	-0.170		+	0.844	=		0.878
Step 4 (FCC)							
Simultaneous Transmission - Bluetooth and/or WiFi							
Plot ID	Rated Output Power (Pmax)	Freq	Separation Distance	Estimated SAR	+	Step 2 Adjusted SAR	Step 4 Adjusted SAR (1g)
	(mW)	(MHz)	(mm)	(W/kg)		(W/kg)	(W/kg)
B4	2.5	2480	0	0.100	+	0.844	0.944
Step 5							
Reported SAR							
Plot ID	FCC			ISED			
	From Steps 1,2 and 4			From Steps 1 through 3			
B4	<b>0.944</b>			<b>0.878</b>			

The BlueTooth transmitter simultaneously transmits with the WiFi transmitter since they do not share the same antenna. Test Exclusion of the BlueTooth transmitter is evaluated using Max Power = 4dBm (2.52mW), Separation Distance = 5mm, Transmit Frequency = 2.480GHz.

Per KDB 447498 D01v06 [4.3.1(a)], SAR Test Exclusion is given by:

$$[(\text{Max Power, mW}) / (\text{Separation Distance, mm})] * [\sqrt{f, \text{GHz}}] \leq 3.0 \text{ for 1g SAR}$$

$$[(2.51)/(5)] * [\sqrt{2.480}] = 0.8 \leq 3.0$$

Therefore the BlueTooth transmitter meets the SAR Test Exclusion criteria.

For reference only, per KDB 447498 D01v06 [4.3.2(b)], the estimated BlueTooth SAR is given by:

$$[(\text{Max Power, mW}) / (\text{Separation Distance, mm})] * [(\sqrt{f, \text{GHz}}) / (x)], \text{ where } x = 7.5 \text{ for 1g SAR}$$

$$[(2.51)/(5)] * [(\sqrt{2.480}) / (7.5)] = 0.107\text{W/kg}$$

NOTES to Table 9.0	
<p>(1) Scaling of the Maximum Measured SAR is based on the highest, 100% duty cycle, Face, Body and/or Head SAR measured of ALL test channels, configurations and accessories used during THIS evaluation. The Measured Fluid Deviation parameters apply only to deviation of the tissue equivalent fluids used at the frequencies which produced the highest measured SAR. The Measured Conducted Power applies to the Conducted Power measured at the frequencies producing the highest Face and Body SAR. The Measured Drift is the SAR drift associated with that specific SAR measurement. The Reported SAR is the accumulation of all SAR Adjustments from the applicable Steps 1 through 4. The Plot ID is for identification of the SAR Measurement Plots in Annex A of this report.            NOTE: Some of the scaling factors in Steps 1 through 4 may not apply and are identified by light gray text.</p>	
<b>Step 1</b>	Per IEC 62209-1 and FCC KDB 865664. Scaling required only when Measured Fluid Deviation is greater than 5%. If the Measured Fluid Deviation is greater than 5%, Table 10.1 will be shown and will indicate the SAR scaling factor in percent (%). SAR is MULTIPLIED by this scaling factor only when the scaling factor is positive (+).
<b>Step 2</b>	Per KDB 447498. Scaling required only when the difference (Delta) between the Measured Conducted Power and the Manufacturer's Rated Conducted Power is (-) Negative. The absolute value of Delta is ADDED to the SAR.
<b>Step 3</b>	Per IEC 62209-1. Scaling required only when Measured Drift is (-) Negative. The absolute value of Measured Drift is added to Reported or Simultaneous Reported SAR.
<b>Step 4</b>	Per KDB 447498 4.3.2. The SAR, either measured or calculated, of ANY and ALL simultaneous transmitters must be added together and includes all contributors.
<b>Step 5</b>	The Reported SAR is the Maximum Final Adjusted Cumulative SAR from the applicable Steps 1 through 4 and are reported on Page 1 of this report.

**Table 9.1 Fluid Sensitivity Calculation (1g)**

Fluid Sensitivity Calculation (1g)	
Delta SAR = Ce * Delta Er + C(sigma)*Delta Sigma	
Frequency (GHz)	Plot ID
<b>2.462</b>	<b>B4</b>
Ce	-0.2248
Cσ	0.4776
Δ E	-6.70%
Δσ	6.01%
<b>ΔSAR</b>	<b>4.38%</b>
<b>Scale Factor Is Positive. Scaling Required</b>	

<p>I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025.</p>	
	<p>Trevor Whillock            Test Lab Engineer            Celltech Labs Inc.</p>
	<p>13 June 2018            Date</p>

## 10.0 SAR EXPOSURE LIMITS

Table 10.0 Exposure Limits

SAR RF EXPOSURE LIMITS			
FCC 47 CFR§2.1093	Health Canada Safety Code 6	General Population / Uncontrolled Exposure <sup>(4)</sup>	Occupational / Controlled Exposure <sup>(5)</sup>
Spatial Average <sup>(1)</sup> (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak <sup>(2)</sup> (Head and Trunk averaged over any 1 g of tissue)		<b>1.6 W/kg</b>	8.0 W/kg
Spatial Peak <sup>(3)</sup> (Hands/Wrists/Feet/Ankles averaged over 10 g)		4.0 W/kg	20.0 W/kg
(1) The Spatial Average value of the SAR averaged over the whole body.			
(2) 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.			
(3) 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.			
(4) Uncontrolled environments are defined as locations where there is potential exposure to individuals who have no knowledge or control of their potential exposure.			
(5) Controlled environments are defined as locations where there is potential exposure to individuals who have knowledge of their potential exposure and can exercise control over their exposure.			

## 11.0 DETAILS OF SAR EVALUATION

### 11.0 Day Log

DAY LOG					Fluid Dielectric	SPC	Test
Date	Ambient Temp °C	Fluid Temp °C	Humidity	TSL			
14 Nov 2017	27	21.8	35%	2450B	X	X	
15 Nov 2017	27	21.3	36%	2450B			X
28 Nov 2017	28	23.2	36%	2450B	X	X	
29 Nov 2017	28	23.4	36%	2450B			X
30 Nov 2017	28	24.3	36%	2450B	X	X	X
01 Dec 2017	27	23.5	36%	2450B			X

## 11.1 DUT Setup and Configuration

### DUT Setup and Configuration

#### Overview

The DUT was evaluated for SAR in accordance with the procedures described in IEEE 1528, FCC KDB 865646 and RSS-102. Since the overall diagonal dimension of the display is < 20cm the device was evaluated at a phantom separation distance of less than 5mm on all surfaces and edges where the transmitter was located less than 25mm from that edge or surface.

The Device was capable of transmitting at various modulations and data rates. The Conducted Power was higher when measured in DSS mode at 1 Mbps than any other configuration. The DUT was evaluated for SAR at the maximum conducted output power level, preset by the manufacturer. The device was tested in a DSS modulated transmit mode at a data rate of 1 Mbps.

#### 2.4GHz 802.11g/n OFDM SAR Test Exclusion

As Per KDB 248277 D01v02r02 - 5.2.2,

b) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is  $\leq 1.2$  W/kg.

Maximum 802.11g/n OFDM specified power (POFDM) = 13.5dBm

Maximum 802.11b DSSS specified power (PDSSS) = 14.5dBm

Ratio OFDM/DSSS power = -1.0dBm (79%)

Highest reported\* SAR(SARMAX) = 0.825 W/kg

$(POFDM/PDSSS) \times SARMAX = 0.652W/kg$

Since the ratio of the OFDM/DSSS specified power is less than one (0dB), the reported SAR would not exceed 1.2W/kg

\*The reported SAR in this case is the measured SAR adjusted for fluid sensitivity.

Each SAR evaluation was performed with a fully charged battery.

## 11.2 DUT Positioning

DUT Positioning	
<b>Positioning</b>	The DUT Positioner was securely fastened to the Phantom Platform. Registration marks were placed on the DUT and the Positioner to ensure consistent positioning of the DUT for each test evaluation.
<b>FACE Configuration</b>	This device is not intended to be held to the face and was not tested in the FACE configuration.
<b>BODY Configuration</b>	The DUT was securely clamped into the device holder with the surface of the DUT normally in contact with the body in direct contact with the bottom of the phantom, or 0mm separation from the DUT's accessory to the phantom.
<b>HEAD Configuration</b>	This device is not intended to be held to the ear and was not tested in the HEAD configuration.

## 11.3 General Procedures and Report

General Procedures and Reporting	
<b>General Procedures</b>	<p>The fluid dielectric parameters of the Active Tissue Simulating Liquid (TSL) were measured as described in this Section, recorded and entered into the DASY Measurement Server. Active meaning the TSL used during the SAR evaluation of the DUT. The temperature of the Active TSL was measured and recorded prior to performing a System Performance Check (SPC). An SPC was performed with the Active TSL prior to the start of the test series. The temperature of the Active TSL was measured throughout the day and the Active TSL temperature was maintained to <math>\pm 0.5^{\circ}\text{C}</math>. The Active TSL temperature was maintained to within <math>\pm 1.0^{\circ}\text{C}</math> throughout the test series. TSL analysis and SPC were repeated when the Active TSL use exceeded 84 hours.</p> <p>An Area Scan exceeding the length and width of the DUT projection was performed and the locations of all maximas within 2dB of the Peak SAR recorded. A Zoom Scan centered over the Peak SAR location(s) was performed and the 1g and 10g SAR values recorded. The resolutions of the Area Scan and Zoom Scan are described in the Scan Resolution table(s) in this Section. A Power Reference Measurement was taken at the phantom reference point immediately prior to the Area Scan. A Power Drift measurement was taken at the phantom reference point immediately following the Zoom Scan to determine the power drift. A Z-Scan from the <u>Maximum Distance to Phantom Surface</u> to the fluid surface was performed following the power drift measurement.</p>
<b>Reporting</b>	<p>The 1g SAR, 10g SAR and power drift measurements are recorded in the SAR Measurement Summary tables in the SAR Measurement Summary Section of this report. The SAR values shown in the 100% DC (Duty Cycle) column are the SAR values reported by the SAR Measurement Server with the DUT operating at 100% transmit duty cycle. These tables also include other information such as transmit channel and frequency, modulation, accessories tested and DUT-phantom separation distance.</p> <p>In the Scaling of Maximum Measured SAR Section of this report, the highest measured SAR in the BODY configuration, within the entire scope of this assessment, are, when applicable, scaled for Fluid Sensitivity, Manufacturer's Tune-Up Tolerance, Simultaneous Transmission and Drift. With the exception of Duty Cycle correction/compensation, SAR values are <u>ONLY</u> scaled up, not down. The final results of this scaling is the <u>reported SAR</u> which appears on the Cover Page of this report.</p>

### 11.4 Fluid Dielectric and Systems Performance Check

Fluid Dielectric and Systems Performance Check	
<b>Fluid Dielectric Measurement Procedure</b>	
<p>The fluid dielectric parameters of the Tissue Simulating Liquid (TSL) are measured using the Open-Ended Coax Method connected to an Agilent 8753ET Network Analyzer connected to a measurement server running Aprel Dielectric Property Measurement System. A frequency range of <math>\pm 100\text{MHz}</math> for frequencies <math>&gt; 300\text{MHz}</math> and <math>\pm 50\text{MHz}</math> for frequencies <math>\leq 300\text{MHz}</math> with frequency step size of <math>10\text{MHz}</math> is used. The center frequency is centered around the SAR measurement probe's calibration point for that TSL frequency range. A calibration of the setup is performed using a short-open-deionized water (at <math>23^\circ\text{C}</math> in a <math>300\text{ml}</math> beaker) method. A sample of the TSL is placed in a <math>300\text{ml}</math> beaker and the open-ended coax is submerged approximately <math>8\text{mm}</math> below the fluid surface in the approximate center of the beaker. A check of the setup is made to ensure no air is trapped under the open-ended coax. The sample of TSL is measured and compared to the FCC OET Bulletin 65 Supplement C targets for HEAD or BODY for the entire fluid measurement range. Fluid adjustment are made if the dielectric parameters are <math>&gt; 5\%</math> in range that the DUT is to be tested. If the adjustments fail to bring the parameters to <math>\leq 5\%</math> but are <math>&lt; 10\%</math>, the SAR Fluid Sensitivity as per IEC 62201-1 and FCC KDB 865664 are applied to the highest measured SAR. A TSL with dielectric parameters <math>&gt; 10\%</math> in the DUT test frequency range are not used.</p>	
<b>Systems Performance Check</b>	
<p>The fluid dielectric parameters of the Active TSL are entered into the DASY Measurement Server at each of the <math>10\text{MHz}</math> step size intervals. Active meaning the TSL used during the SAR evaluation of the DUT. The DASY Measurement System will automatically interpolate the dielectric parameters for DUT test frequencies that fall between the <math>10\text{MHz}</math> step intervals.</p> <p>A Systems Performance Check (SPC) is performed in accordance with IEEE 1528 "System Check" and FCC KDB 865664 "System Verification". A validation source, dipole or Confined Loop Antenna (CLA), is placed under the geometric center of the phantom and separated from the phantom in accordance to the validation source's Calibration Certificate data. A CW signal set to the frequency of the validate source's and SAR measurement probe's calibration frequency with a forward power set to the validation source's Calibration Certificate data power setting is applied to the validation source. An Area Scan is centered over the projection of the validation source's feed point and an Area Scan is taken. A Zoom Scan centered over the Peak SAR measurement of the Area Scan and the <math>1\text{g}</math> and <math>10\text{g}</math> SAR is measured. The measured <math>1\text{g}</math> and <math>10\text{g}</math> SAR is compared to the <math>1\text{g}</math> and <math>10\text{g}</math> SAR measurements from the validation source's Calibration Certificate. When required, the measured SAR is normalized to <math>1.0\text{W}</math> and compared to the normalized SAR indicated on the validation source's Calibration Certificate. The SPC is considered valid when the measured and normalized SAR is <math>\leq 10\%</math> of the measured and normalize SAR of the validation source's Calibration Certificate.</p> <p>The fluid dielectric parameters of the Active TSL and SPC are repeated when the Active TSL has been in use for greater than <math>84</math> hours or if the Active TSL temperature has exceed <math>\pm 1^\circ\text{C}</math> of the initial fluid analysis.</p>	

### 11.5 Scan Resolution 100MHz to 2GHz

Scan Resolution 100MHz to 2GHz	
Maximum distance from the closest measurement point to phantom surface: (Geometric Center of Probe Center)	<b><math>4 \pm 1 \text{ mm}</math></b>
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	<b><math>5^\circ \pm 1^\circ</math></b>
Area Scan Spatial Resolution $\Delta X, \Delta Y$	<b><math>15 \text{ mm}</math></b>
Zoom Scan Spatial Resolution $\Delta X, \Delta Y$	<b><math>7.5 \text{ mm}</math></b>
Zoom Scan Spatial Resolution $\Delta Z$ (Uniform Grid)	<b><math>5 \text{ mm}</math></b>
Zoom Scan Volume X, Y, Z	<b><math>30 \text{ mm}</math></b>
Phantom	<b>ELI</b>
Fluid Depth	<b><math>150 \pm 5 \text{ mm}</math></b>
An Area Scan with an area extending beyond the device was used to locate the candidate maximas within $2\text{dB}$ of the global maxima.	
A Zoom Scan centered over the peak SAR location(s) determined by the Area Scan was used to determine the $1\text{-gram}$ and $10\text{-gram}$ peak spatial-average SAR	

### 11.6 Scan Resolution 2GHz to 3GHz

<b>Scan Resolution 2GHz to 3GHz</b>	
Maximum distance from the closest measurement point to phantom surface: (Geometric Center of Probe Center)	<b>4 ± 1 mm</b>
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	<b>5° ± 1°</b>
Area Scan Spatial Resolution $\Delta X, \Delta Y$	<b>12 mm</b>
Zoom Scan Spatial Resolution $\Delta X, \Delta Y$	<b>5 mm</b>
Zoom Scan Spatial Resolution $\Delta Z$ (Uniform Grid)	<b>5 mm</b>
Zoom Scan Volume X, Y, Z	<b>30 mm</b>
Phantom	<b>ELI</b>
Fluid Depth	<b>150 ± 5 mm</b>
An Area Scan with an area extending beyond the device was used to locate the candidate maximas within 2dB of the global maxima.	
A Zoom Scan centered over the peak SAR location(s) determined by the Area Scan was used to determine the 1-gram and 10-gram peak spatial-average SAR	

### 11.7 Scan Resolution 5GHz to 6GHz

<b>Scan Resolution 5GHz to 6GHz</b>	
Maximum distance from the closest measurement point to phantom surface: (Geometric Center of Probe Center)	<b>4 ± 1 mm</b>
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	<b>5° ± 1°</b>
Area Scan Spatial Resolution $\Delta X, \Delta Y$	<b>10 mm</b>
Zoom Scan Spatial Resolution $\Delta X, \Delta Y$	<b>4 mm</b>
Zoom Scan Spatial Resolution $\Delta Z$ (Uniform Grid)	<b>2 mm</b>
Zoom Scan Volume X, Y, Z	<b>22 mm</b>
Phantom	<b>ELI</b>
Fluid Depth	<b>100 ± 5 mm</b>
An Area Scan with an area extending beyond the device was used to locate the candidate maximas within 2dB of the global maxima.	
A Zoom Scan centered over the peak SAR location(s) determined by the Area Scan was used to determine the 1-gram and 10-gram peak spatial-average SAR	

## 12.0 MEASUREMENT UNCERTAINTIES

**Table 12.0 Measurement Uncertainty**

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEEE 1528-2013 Table 9)									
Uncertainty Component	IEEE 1528 Section	Uncertainty Value ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value ±% (1g)	Uncertainty Value ±% (10g)	V <sub>i</sub> or V <sub>eff</sub>
<b>Measurement System</b>									
Probe Calibration*	E.2.1	6.6	Normal	1	1	1	6.60	6.60	∞
Axial Isotropy*	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy*	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	∞
Boundary Effect*	E.2.3	8.3	Rectangular	1.732050808	1	1	4.8	4.8	∞
Linearity*	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
System Detection Limits*	E.2.4	1.0	Rectangular	1.732050808	1	1	0.6	0.6	∞
Modulation Response	E.2.5	4.0	Rectangular	1.732050808	1	1	2.3	2.3	∞
Readout Electronics*	E.2.6	1.0	Normal	1	1	1	1.0	1.0	∞
Response Time*	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time*	E.2.8	1.4	Rectangular	1.732050808	1	1	0.8	0.8	∞
RF Ambient Conditions - Noise	E.6.1	0.0	Rectangular	1.732050808	1	1	0.0	0.0	∞
RF Ambient Conditions - Reflection	E.6.1	0.0	Rectangular	1.732050808	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance*	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell*	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Extrapolation, interpolation & integration algorithms for max. SAR evaluation*	E.5	3.9	Rectangular	1.732050808	1	1	2.3	2.3	∞
<b>Test Sample Related</b>									
Test Sample Positioning	E.4.2	0.3	Normal	1	1	1	0.3	0.3	5
Device Holder Uncertainty*	E.4.1	3.6	Normal	1	1	1	3.6	3.6	∞
SAR Drift Measurement**	E.2.9	0.0	Rectangular	1.732050808	1	1	0.0	0.0	∞
SAR Scaling***	E.6.5	2.0	Rectangular	1.732050808	1	1	1.2	1.2	∞
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty*	E.3.1	4.0	Rectangular	1.732050808	1	1	2.3	2.3	∞
SAR Correction Uncertainty	E.3.2	1.2	Normal	1	1	0.84	1.2	1.0	∞
Liquid Conductivity (measurement)	E.3.3	6.8	Normal	1	0.78	0.71	5.3	4.8	10
Liquid Permittivity (measurement)	E.3.3	5.3	Normal	1	0.23	0.26	1.2	1.4	10
Liquid Conductivity (Temperature)	E.3.2	0.1	Rectangular	1.732050808	0.78	0.71	0.1	0.0	∞
Liquid Permittivity Temperature)	E.3.2	0.0	Rectangular	1.732050808	0.23	0.26	0.0	0.0	∞
<b>Effective Degrees of Freedom<sup>(1)</sup></b>								<b>V<sub>eff</sub> =</b>	<b>873.2</b>
<b>Combined Standard Uncertainty</b>			<b>RSS</b>				<b>12.59</b>	<b>12.40</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>			<b>k=2</b>				<b>25.18</b>	<b>24.80</b>	
<b>Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003</b>									

(1) The Effective Degrees of Freedom is > 30 therefore a coverage factor of k=2 represents an approximate confidence level of 95%.

\* Provided by SPEAG

**Table 12.1 Calculation of Degrees of Freedom**

Calculation of the Degrees and Effective Degrees of Freedom	
$v_i = n - 1$	$v_{\text{eff}} = \frac{u_c^4}{m \sum_{i=1}^m \frac{c_i^4 u_i^4}{v_i}}$

### 13.0 FLUID DIELECTRIC PARAMETERS

**Table 13.0 Fluid Dielectric Parameters 2450MHz BODY TSL**

\*\*\*\*\*  
 Aprel Laboratory  
 Test Result for UIM Dielectric Parameter  
 Tue 14/Nov/2017 09:55:09  
 Freq Frequency(GHz)  
 FCC\_eH FCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon  
 FCC\_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma  
 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	49.54	1.92
2.3600	52.82	1.86	49.69	1.97
2.3700	52.81	1.87	49.59	1.95
2.3800	52.79	1.88	49.58	1.96
2.3900	52.78	1.89	49.62	1.98
2.4000	52.77	1.90	49.56	2.00
2.4100	52.75	1.91	49.34	1.98
2.4200	52.74	1.92	49.15	2.01
2.4300	52.73	1.93	49.36	2.03
2.4400	52.71	1.94	49.26	2.04
2.4500	52.70	1.95	49.21	2.06
2.4600	52.69	1.96	49.15	2.08
2.4700	52.67	1.98	49.18	2.09
2.4800	52.66	1.99	49.24	2.07
2.4900	52.65	2.01	49.06	2.10
2.5000	52.64	2.02	49.27	2.13
2.5100	52.62	2.04	48.99	2.13
2.5200	52.61	2.05	49.07	2.16
2.5300	52.60	2.06	48.99	2.17
2.5400	52.59	2.08	48.76	2.21
2.5500	52.57	2.09	48.89	2.20

FLUID DIELECTRIC PARAMETERS								
Date:	14 Nov 2017	Fluid Temp:		21.8	Frequency:	2450MHz	Tissue:	Body
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity		
2350.0000		49.5400	1.9200	52.8300	1.85	-6.23%	3.78%	
2360.0000		49.6900	1.9700	52.8200	1.86	-5.93%	5.91%	
2370.0000		49.5900	1.9500	52.8100	1.87	-6.10%	4.28%	
2380.0000		49.5800	1.9600	52.7900	1.88	-6.08%	4.26%	
2390.0000		49.6200	1.9800	52.7800	1.89	-5.99%	4.76%	
2400.0000		49.5600	2.0000	52.7700	1.90	-6.08%	5.26%	
2410.0000		49.3400	1.9800	52.7500	1.91	-6.46%	3.66%	
2412.0000	*	49.3020	1.9860	52.7480	1.91	-6.53%	3.87%	
2420.0000		49.1500	2.0100	52.7400	1.92	-6.81%	4.69%	
2430.0000		49.3600	2.0300	52.7300	1.93	-6.39%	5.18%	
2437.0000	*	49.2900	2.0370	52.7160	1.94	-6.50%	5.16%	
2440.0000		49.2600	2.0400	52.7100	1.94	-6.55%	5.15%	
2442.0000	*	49.2500	2.0440	52.7080	1.94	-6.56%	5.25%	
2450.0000		49.2100	2.0600	52.7000	1.95	-6.62%	5.64%	
2460.0000		49.1500	2.0800	52.6900	1.96	-6.72%	6.12%	
2462.0000	*	49.1560	2.0820	52.6860	1.96	-6.70%	6.01%	
2470.0000		49.1800	2.0900	52.6700	1.98	-6.63%	5.56%	
2480.0000		49.2400	2.0700	52.6600	1.99	-6.49%	4.02%	
2490.0000		49.0600	2.1000	52.6500	2.01	-6.82%	4.48%	
2500.0000		49.2700	2.1300	52.6400	2.02	-6.40%	5.45%	
2510.0000		48.9900	2.1300	52.6200	2.04	-6.90%	4.41%	
2520.0000		49.0700	2.1600	52.6100	2.05	-6.73%	5.37%	
2530.0000		48.9900	2.1700	52.6000	2.06	-6.86%	5.34%	
2540.0000		48.7600	2.2100	52.5900	2.08	-7.28%	6.25%	
2550.0000		48.8900	2.2000	52.5700	2.09	-7.00%	5.26%	

\*Channel Frequency Tested

**Table 13.2 Fluid Dielectric Parameters 2450MHz BODY TSL**

```

*****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Tue 28/Nov/2017 12:33:27
Freq      Frequency(GHz)
FCC_eHFCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon
FCC_sHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
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	49.55	1.86
2.3600	52.82	1.86	49.38	1.89
2.3700	52.81	1.87	49.29	1.90
2.3800	52.79	1.88	49.24	1.89
2.3900	52.78	1.89	49.18	1.92
2.4000	52.77	1.90	49.10	1.94
2.4100	52.75	1.91	49.26	1.95
2.4200	52.74	1.92	49.23	1.97
2.4300	52.73	1.93	49.17	1.98
2.4400	52.71	1.94	49.00	2.00
2.4500	52.70	1.95	49.34	1.99
2.4600	52.69	1.96	49.19	2.03
2.4700	52.67	1.98	48.91	2.02
2.4800	52.66	1.99	49.05	2.06
2.4900	52.65	2.01	48.88	2.06
2.5000	52.64	2.02	49.04	2.07
2.5100	52.62	2.04	48.99	2.08
2.5200	52.61	2.05	48.67	2.09
2.5300	52.60	2.06	48.89	2.12
2.5400	52.59	2.08	48.78	2.11
2.5500	52.57	2.09	48.90	2.15

### FLUID DIELECTRIC PARAMETERS

Date:	28 Nov 2017	Fluid Temp:	23.2	Frequency:	2450MHz	Tissue:	Body
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	
2350.0000		49.5500	1.8600	52.8300	1.85	-6.21%	0.54%
2360.0000		49.3800	1.8900	52.8200	1.86	-6.51%	1.61%
2370.0000		49.2900	1.9000	52.8100	1.87	-6.67%	1.60%
2380.0000		49.2400	1.8900	52.7900	1.88	-6.72%	0.53%
2390.0000		49.1800	1.9200	52.7800	1.89	-6.82%	1.59%
2400.0000		49.1000	1.9400	52.7700	1.90	-6.95%	2.11%
2410.0000		49.2600	1.9500	52.7500	1.91	-6.62%	2.09%
2412.0000	*	49.2540	1.9540	52.7480	1.91	-6.62%	2.20%
2420.0000		49.2300	1.9700	52.7400	1.92	-6.66%	2.60%
2430.0000		49.1700	1.9800	52.7300	1.93	-6.75%	2.59%
2437.0000	*	49.0510	1.9940	52.7160	1.94	-6.95%	2.94%
2440.0000		49.0000	2.0000	52.7100	1.94	-7.04%	3.09%
2442.0000	*	49.0680	1.9980	52.7080	1.94	-6.91%	2.88%
2450.0000		49.3400	1.9900	52.7000	1.95	-6.38%	2.05%
2460.0000		49.1900	2.0300	52.6900	1.96	-6.64%	3.57%
2462.0000	*	49.1340	2.0280	52.6860	1.96	-6.74%	3.26%
2470.0000		48.9100	2.0200	52.6700	1.98	-7.14%	2.02%
2480.0000		49.0500	2.0600	52.6600	1.99	-6.86%	3.52%
2490.0000		48.8800	2.0600	52.6500	2.01	-7.16%	2.49%
2500.0000		49.0400	2.0700	52.6400	2.02	-6.84%	2.48%
2510.0000		48.9900	2.0800	52.6200	2.04	-6.90%	1.96%
2520.0000		48.6700	2.0900	52.6100	2.05	-7.49%	1.95%
2530.0000		48.8900	2.1200	52.6000	2.06	-7.05%	2.91%
2540.0000		48.7800	2.1100	52.5900	2.08	-7.24%	1.44%
2550.0000		48.9000	2.1500	52.5700	2.09	-6.98%	2.87%

\*Channel Frequency Tested

## 14.0 SYSTEM VERIFICATION TEST RESULTS

**Table 14.0 System Verification Results 2450MHz BODY TSL**

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
14 Nov 2017		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Body	21.8	27	35%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
49.21	52.70	-6.62%	2.06	1.95	5.64%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
13.9	13.00	6.92%	6.32	6.05	4.46%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
55.60	50.70	9.66%	25.28	23.80	6.22%
<p>Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEEE 1528-2013, FCC KDB 846224 and IEC 62209-1.</p> <p>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.</p> <p>The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.</p> <p>The forward power applied was same forward power applied by the calibration lab during the calibration of this validation source.</p>					

**Table 14.1 System Verification Results 2450MHz BODY TSL**

<b>System Verification Test Results</b>					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
28 Nov 2017		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Body	23.2	28	36%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
49.34	52.70	-6.38%	1.99	1.95	2.05%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
12.9	13.00	-0.77%	5.88	6.05	-2.81%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
51.60	50.70	1.78%	23.52	23.80	-1.18%
<p>Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEEE 1528-2013, FCC KDB 846224 and IEC 62209-1.</p> <p>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.</p> <p>The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.</p> <p>The forward power applied was same forward power applied by the calibration lab during the calibration of this validation source.</p>					

## 15.0 SYSTEM VALIDATION SUMMARY

Table 15.0 System Validation Summary

System Validation Summary											
Frequency (MHz)	Validation Date	Probe Model	Probe S/N	Validation Source	Source S/N	Tissue	Tissue Dielectrics		Validation Results		
							Permittivity	Conductivity	Sensitivity	Linearity	Isotropy
30		EX3DV4	3600	CLA-30	1005	Head					
150	03-May-17	EX3DV4	3600	CLA-150	4007	Body	66.48	0.79	Pass	Pass	Pass
150	04-May-17	EX3DV4	3600	CLA-150	4007	Head	51.51	0.81	Pass	Pass	Pass
450	08-May-17	EX3DV4	3600	D450V3	1068	Body	54.65	0.95	Pass	Pass	Pass
450	16-May-17	EX3DV4	3600	D450V3	1068	Head	43.70	0.83	Pass	Pass	Pass
835	17-May-17	EX3DV4	3600	D835V2	4d075	Body	54.39	0.95	Pass	Pass	Pass
835	19-May-14	EX3DV4	3600	D835V2	4d075	Head	42.01	0.89	Pass	Pass	Pass
900	01-Aug-17	EX3DV4	3600	D900V2	045	Body	51.30	1.01	Pass	Pass	Pass
900	02-Aug-17	EX3DV4	3600	D900V2	045	Head	39.10	0.93	Pass	Pass	Pass
1640	06-Feb-18	EX3DV4	3600	1620-S-2	207-00102	Body	39.87	1.27	Pass	Pass	Pass
1640	07-Feb-18	EX3DV4	3600	1620-S-2	207-00102	Head	39.87	1.27	Pass	Pass	Pass
1800	21-Jul-17	EX3DV4	3600	D1800V2	247	Body	54.77	1.53	Pass	Pass	Pass
1800	18-Jul-17	EX3DV4	3600	D1800V2	247	Head	40.70	1.33	Pass	Pass	Pass
2450	24-Jul-17	EX3DV4	3600	D2450V2	825	Body	49.51	1.92	Pass	Pass	Pass
2450	24-Jul-17	EX3DV4	3600	D2450V2	825	Head	37.95	1.87	Pass	Pass	Pass
5250	24-Jul-17	EX3DV4	3600	D5GHzV2	1031	Body	46.42	5.69	Pass	Pass	Pass
5250	24-Jul-17	EX3DV4	3600	D5GHzV2	1031	Head	35.96	4.99	Pass	Pass	Pass

## 16.0 MEASUREMENT SYSTEM SPECIFICATIONS

Table 16.0 Measurement System Specifications

Measurement System Specification	
<b>Specifications</b>	
Positioner	Stäubli Unimation Corp. Robot Model: TX90XL
Repeatability	+/- 0.035 mm
No. of axis	6.0
<b>Data Acquisition Electronic (DAE) System</b>	
<b>Cell Controller</b>	
Processor	Intel(R) Core(TM) i7-7700
Clock Speed	3.60 GHz
Operating System	Windows 10 Professional
<b>Data Converter</b>	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY6, V 6.4.0.12171 / DASY52 V52.10.0.1446 Postprocessing Software: SEMCAD X, V14.6.10( Deployment Build )
Connecting Lines	Optical downlink for data and status info., Optical uplink for commands and clock
<b>DASY Measurement Server</b>	
Function	Real-time data evaluation for field measurements and surface detection
Hardware	Intel ULV Celeron CPU 400 MHz; 128 MB chip disk; 128 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface
<b>E-Field Probe</b>	
Model	EX3DV4
Serial No.	3600
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
<b>Phantom</b>	
Type	ELI Elliptical Planar Phantom
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	> 30 Liter

<b>Measurement System Specification</b>	
<b>Probe Specification</b>	
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
	
<b>EX3DV4 E-Field Probe</b>	
<b>Phantom Specification</b>	
The ELI V5.0 phantom is an elliptical planar fiberglass shell phantom with a shell thickness of 2.0mm +/- .2mm at the planar area. This phantom conforms to OET Bulletin 65, Supplement C, IEEE 1528-2013, IEC 62209-1 and IEC 62209-2.	
	
<b>ELI Phantom</b>	
<b>Device Positioner Specification</b>	
The DASY device positioner 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 $65^{\circ}$ . 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.	
	
<b>Device Positioner</b>	

## 17.0 TEST EQUIPMENT LIST

Table 17.0 Equipment List and Calibration

Test Equipment List				
DESCRIPTION	ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION INTERVAL
Schmid & Partner DASY System	-	-	-	-
-DASY Measurement Server	294	1078	CNR	CNR
-Robot	-	599396-01	CNR	CNR
-DAE4	19	353	24-Apr-17	Annual
-EX3DV4 E-Field Probe	213	3600	27-Apr-17	Annual
-CLA150 Validation Source	251	4007	27-Apr-17	Triennial
-D835V2 Validation Dipole	217	4D075	23-Apr-15	Triennial
-D450V3 Validation Dipole	221	1068	21-Apr-15	Triennial
-D2450V2 Validation Dipole	219	825	23-Apr-15	Triennial
-D5GHzV2 Validation Dipole	126	1031	20-Apr-15	Triennial
ELI Phantom	247	-	CNR	CNR
HP 85070C Dielectric Probe Kit	33	none	CNR	CNR
Gigatronics 8652A Power Meter	110	1835801	29-Feb-16	Triennial
Gigatronics 80701A Power Sensor	248	1833687	29-Feb-16	Triennial
HP 8753ET Network Analyzer	134	US39170292	Extended	Triennial
Rohde & Schwarz SMR20 Signal Generator	6	100104	29-May-17	Triennial
Amplifier Research 5S1G4 Power Amplifier	106	26235	CNR	CNR

CNR = Calibration Not Required

## 18.0 FLUID COMPOSITION

Table 18.0 Fluid Composition 2450MHz BODY TSL

Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Glycol	Salt <sup>(1)</sup>	HEC <sup>(2)</sup>	Bacteriacide <sup>(3)</sup>
69.98	30.0	0.02	0.0	0.0

(1) Non-Iodinized

(2) HydroxyEthyl-Cellulose: Sigma-Aldrich P/N 54290-500g

(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

## APPENDIX A – SYSTEM VERIFICATION PLOTS

Date/Time: 11/14/2017 11:37:45 AM

Test Laboratory: Celltech Labs

**SPC-2450B Nov 14 2017**

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

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 2450 MHz; Communication System PAR: 0 dB; PMF: 1

Medium: TSL\_2450B[14NV17]

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 2.06$  S/m;  $\epsilon_r = 49.21$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.0(1446);

**Frequency: 2450 MHz**

**SPC/SPC 2450B Input=250mw, Target=13.0W/kg/Area Scan (4x9x1):** Measurement grid:  $dx=12$ mm,  $dy=12$ mm

Maximum value of SAR (measured) = 15.1 W/kg

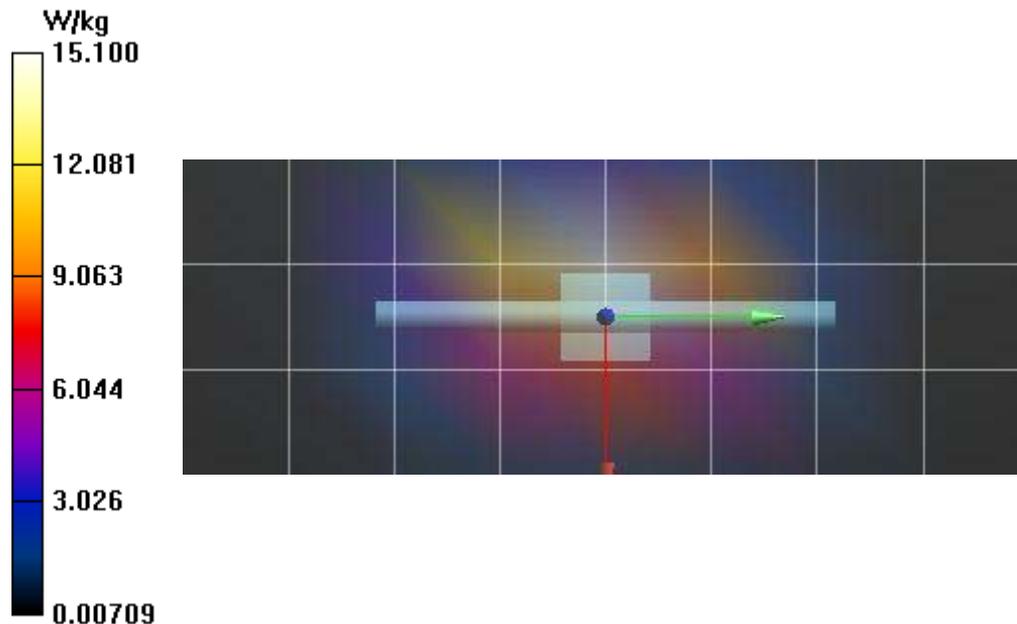
**SPC/SPC 2450B Input=250mw, Target=13.0W/kg/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

Reference Value = 84.63 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 29.5 W/kg

**SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.32 W/kg**

Maximum value of SAR (measured) = 15.6 W/kg



Date/Time: 11/28/2017 3:23:08 PM

Test Laboratory: Celltech Labs

**SPC-2450B Nov 28 2017**

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

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 2450 MHz; Communication System PAR: 0 dB; PMF: 1

Medium: TSL\_2450B[28NV17]  
 Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.99$  S/m;  $\epsilon_r = 49.34$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Flat Section  
 Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

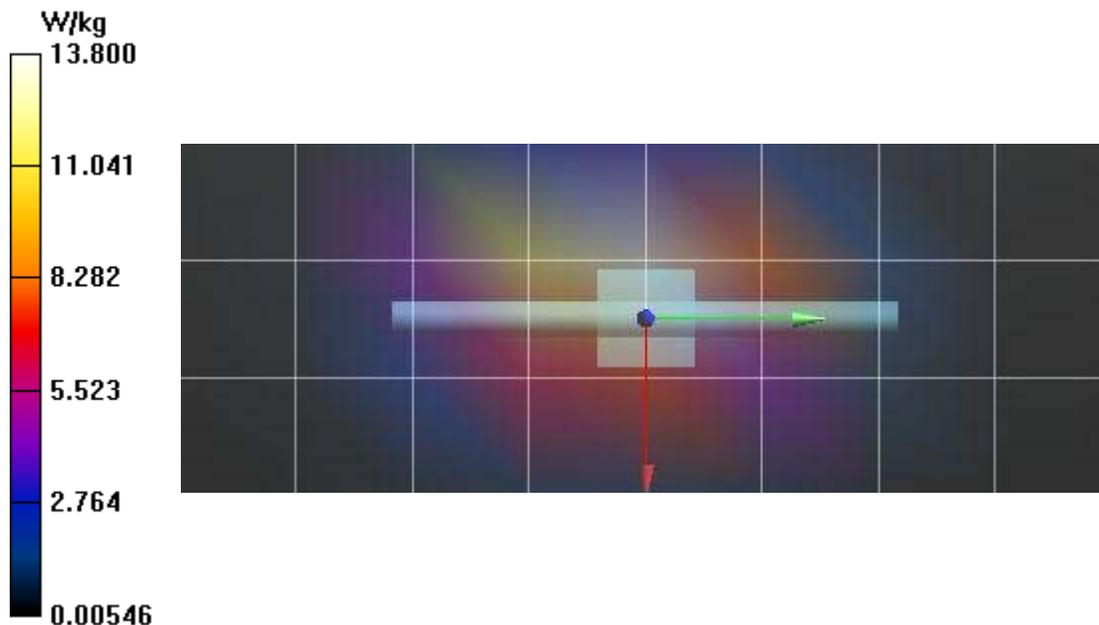
- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0, -99.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.0(1446);

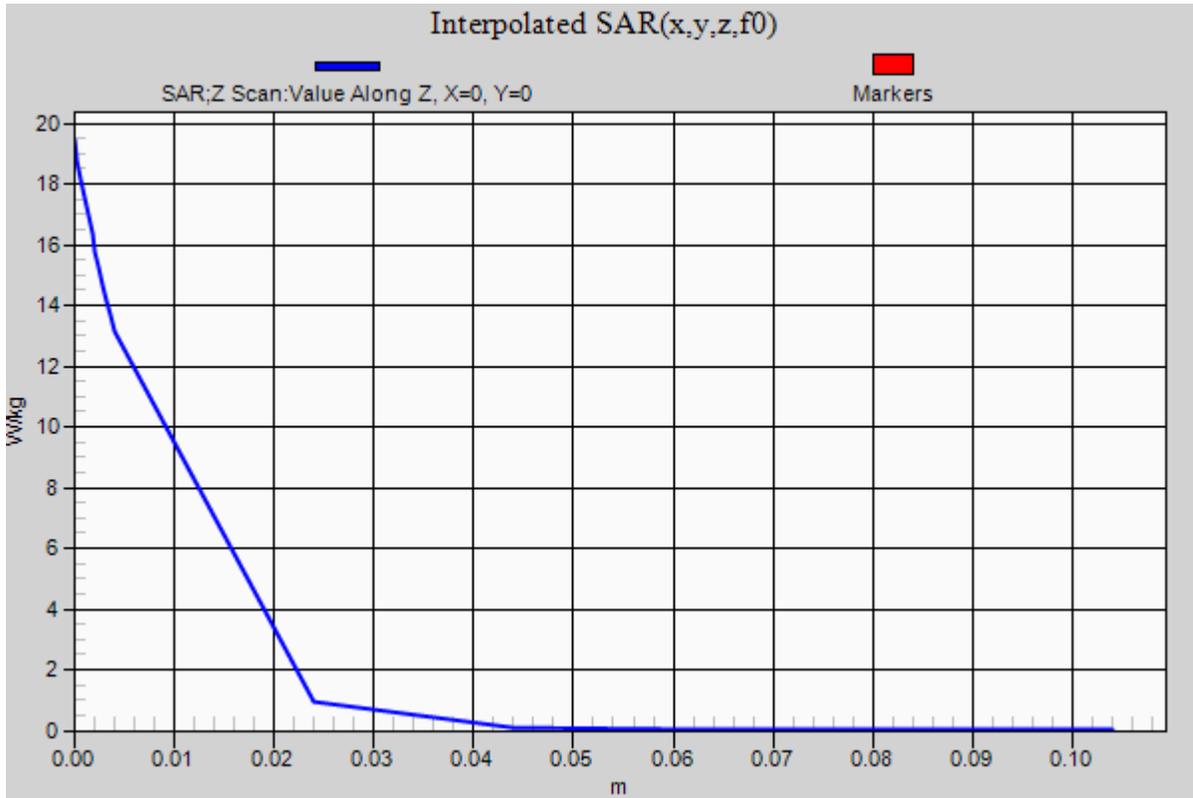
**Frequency: 2450 MHz**

**SPC/SPC 2450B Input=250mw, Target=13.0W/kg/Area Scan (4x9x1):** Measurement grid: dx=12mm, dy=12mm  
 Maximum value of SAR (measured) = 13.8 W/kg

**SPC/SPC 2450B Input=250mw, Target=13.0W/kg/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
 Reference Value = 81.41 V/m; Power Drift = 0.06 dB  
 Peak SAR (extrapolated) = 27.1 W/kg  
**SAR(1 g) = 12.9 W/kg; SAR(10 g) = 5.88 W/kg**  
 Maximum value of SAR (measured) = 14.7 W/kg

**SPC/SPC 2450B Input=250mw, Target=13.0W/kg/Z Scan (1x1x17):** Measurement grid: dx=20mm, dy=20mm, dz=20mm  
 Penetration depth = n/a (n/a, 7.515) [mm]  
 Maximum value of SAR (interpolated) = 19.4 W/kg





## APPENDIX B – MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

### Plot B1

Date/Time: 11/15/2017 12:35:41 PM

Test Laboratory: Celltech Labs

**Garmin-2450B Nov 15-3 2017**  
**DUT: A03341; Type: Sample; Serial: Identical Prototype**

**Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2462 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833**

**Medium: TSL\_2450B[14NV17]**

**Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 2.082$  S/m;  $\epsilon_r = 49.156$ ;  $\rho = 1000$  kg/m<sup>3</sup>**

**Phantom section: Flat Section**

**Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)**

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/27/2017
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.0(1446);

**Frequency: 2462 MHz**

**2450B/B1- A03341 2462 MHz, Body-Touch/Front/Area Scan (8x7x1):** Measurement grid:  $dx=12$ mm,  $dy=12$ mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.147 W/kg

**2450B/B1- A03341 2462 MHz, Body-Touch/Front/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

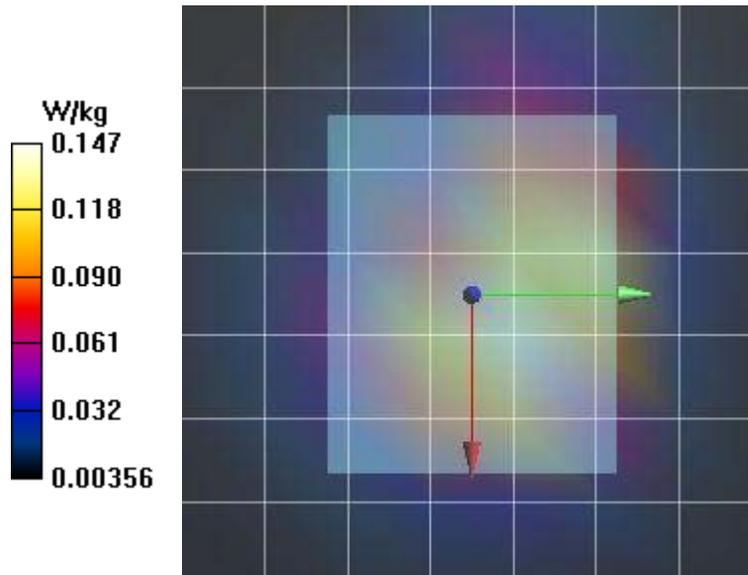
Reference Value = 7.845 V/m; Power Drift = -0.21 dB

Peak SAR (extrapolated) = 0.246 W/kg

**SAR(1 g) = 0.126 W/kg; SAR(10 g) = 0.066 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.139 W/kg



**Plot B2**

Date/Time: 11/15/2017 1:05:32 PM

Test Laboratory: Celltech Labs

**Garmin-2450B Nov 15-3 2017**  
**DUT: A03341; Type: Sample; Serial: Identical Prototype**

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2462 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833

Medium: TSL\_2450B[14NV17]  
 Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 2.082$  S/m;  $\epsilon_r = 49.156$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
 Phantom section: Flat Section  
 Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/27/2017
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.0(1446);

**Frequency: 2462 MHz**

**2450B/B2- A03341 2462 MHz, Body-Touch/Back/Area Scan (8x7x1):** Measurement grid:  $dx=12$ mm,  $dy=12$ mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0733 W/kg

**2450B/B2- A03341 2462 MHz, Body-Touch/Back/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

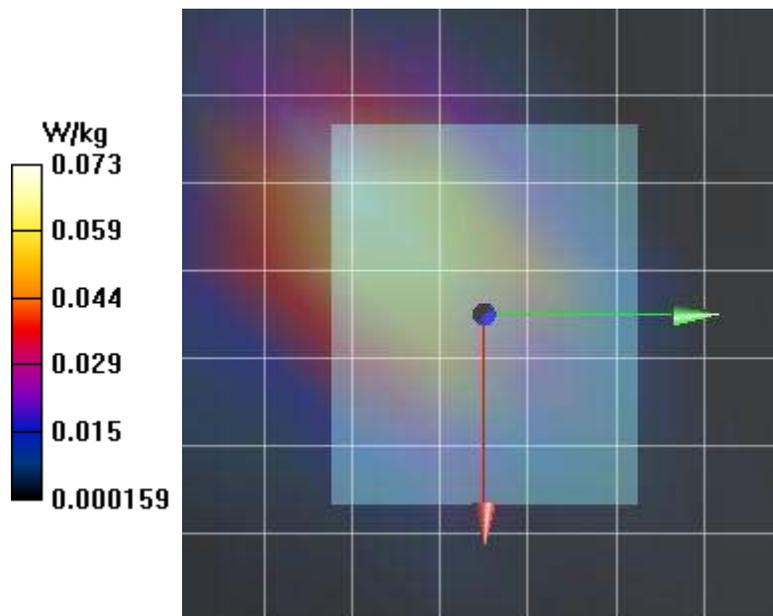
Reference Value = 3.654 V/m; Power Drift = 0.45 dB

Peak SAR (extrapolated) = 0.142 W/kg

**SAR(1 g) = 0.064 W/kg; SAR(10 g) = 0.029 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0707 W/kg



Date/Time: 11/15/2017 1:37:58 PM

Test Laboratory: Celltech Labs

**Garmin-2450B Nov 15-3 2017**

**DUT: A03341; Type: Sample; Serial: Identical Prototype**

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2462 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833

Medium: TSL\_2450B[14NV17]

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 2.082$  S/m;  $\epsilon_r = 49.156$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/27/2017
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS5 52.10.0(1446);

**Frequency: 2462 MHz**

**2450B/B3- A03341 2462 MHz, Body-Touch/Left/Area Scan (8x7x1):** Measurement grid:  $dx=12$ mm,  $dy=12$ mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0475 W/kg

**2450B/B3- A03341 2462 MHz, Body-Touch/Left/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

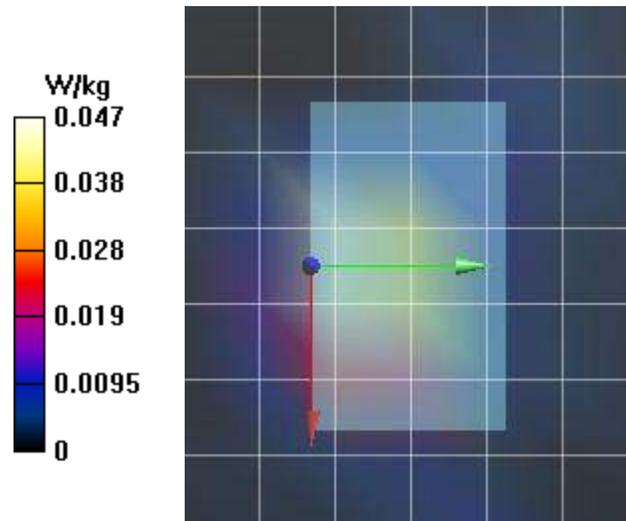
Reference Value = 4.587 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.102 W/kg

**SAR(1 g) = 0.049 W/kg; SAR(10 g) = 0.022 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.0547 W/kg



**Plot B4**

Date/Time: 11/15/2017 2:11:13 PM

Test Laboratory: Celltech Labs

**Garmin-2450B Nov 15-3 2017**

**DUT: A03341; Type: Sample; Serial: Identical Prototype**

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2462 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833

Medium: TSL\_2450B[14NV17]

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 2.082$  S/m;  $\epsilon_r = 49.156$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/27/2017
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS2 52.10.0(1446);

**Frequency: 2462 MHz**

**2450B/B4- A03341 2462 MHz, Body-Touch/Right/Area Scan (8x7x1):** Measurement grid: dx=12mm, dy=12mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.921 W/kg

**2450B/B4- A03341 2462 MHz, Body-Touch/Right/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

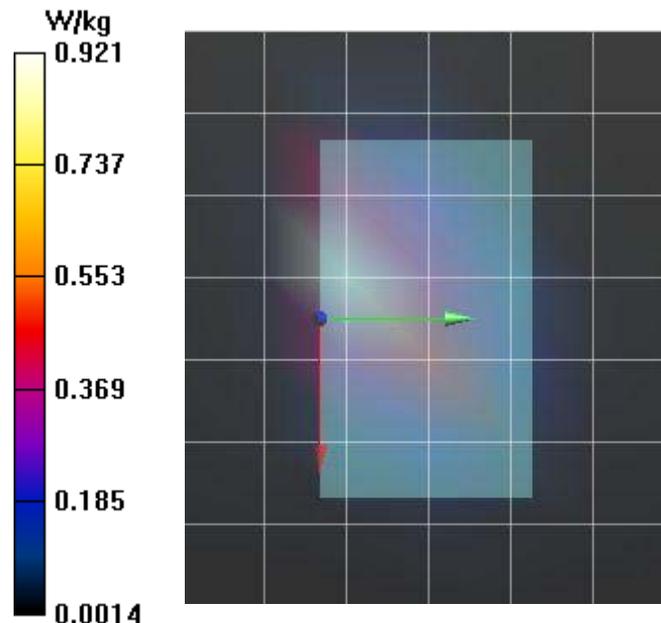
Reference Value = 12.61 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 2.01 W/kg

**SAR(1 g) = 0.790 W/kg; SAR(10 g) = 0.298 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 1.01 W/kg



**Plot B5**

Date/Time: 11/15/2017 2:51:36 PM

Test Laboratory: Celltech Labs

**Garmin-2450B Nov 15-3 2017**

**DUT: A03341; Type: Sample; Serial: Identical Prototype**

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2462 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833

Medium: TSL\_2450B[14NV17]

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 2.082$  S/m;  $\epsilon_r = 49.156$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/27/2017
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS52 52.10.0(1446);

**Frequency: 2462 MHz**

**2450B/B5- A03341 2462 MHz, Body-Touch/Top/Area Scan (6x7x1):** Measurement grid:  $dx=12$ mm,  $dy=12$ mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.131 W/kg

**2450B/B5- A03341 2462 MHz, Body-Touch/Top/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

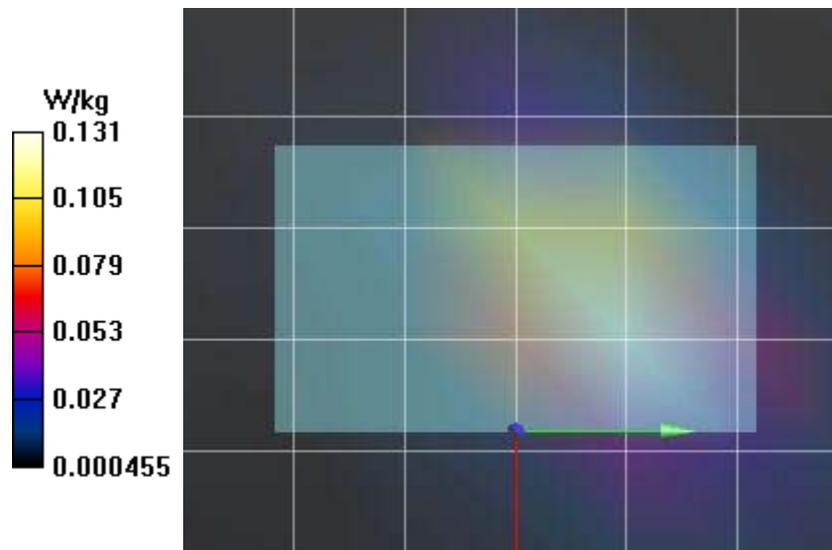
Reference Value = 2.998 V/m; Power Drift = 0.28 dB

Peak SAR (extrapolated) = 0.358 W/kg

**SAR(1 g) = 0.139 W/kg; SAR(10 g) = 0.055 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.165 W/kg



**Plot B6**

Date/Time: 11/15/2017 3:36:26 PM

Test Laboratory: Celltech Labs

**Garmin-2450B Nov 15-3 2017**

**DUT: A03341; Type: Sample; Serial: Identical Prototype**

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2462 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833

Medium: TSL\_2450B[14NV17]

Medium parameters used (interpolated):  $f = 2462$  MHz;  $\sigma = 2.082$  S/m;  $\epsilon_r = 49.156$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/27/2017
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.0(1446);

**Frequency: 2462 MHz**

**2450B/B6- A03341 2462 MHz, Body-Touch/Bottom/Area Scan (6x7x1):** Measurement grid: dx=12mm, dy=12mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.111 W/kg

**2450B/B6- A03341 2462 MHz, Body-Touch/Bottom/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

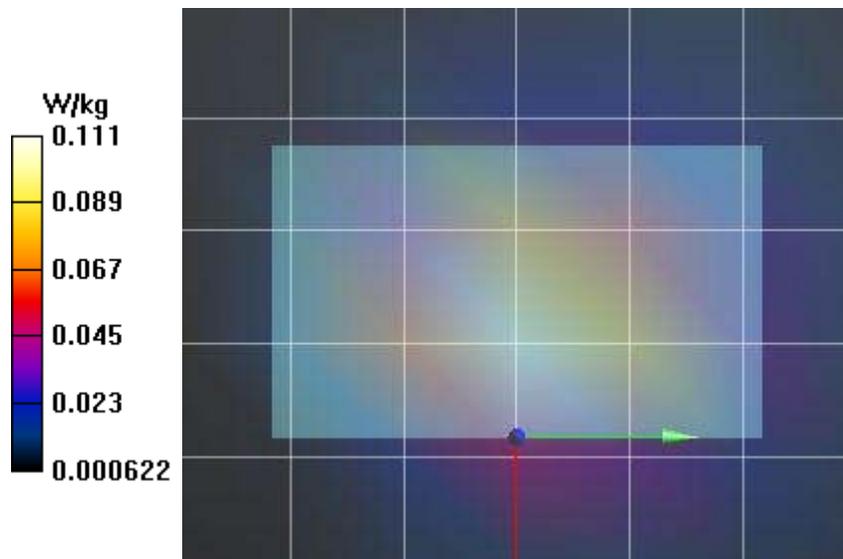
Reference Value = 5.140 V/m; Power Drift = -0.29 dB

Peak SAR (extrapolated) = 0.184 W/kg

**SAR(1 g) = 0.094 W/kg; SAR(10 g) = 0.045 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.106 W/kg



**Plot B7**

Date/Time: 11/15/2017 4:29:43 PM

Test Laboratory: Celltech Labs

**Garmin-2450B Nov 15-3 2017**

**DUT: A03341; Type: Sample; Serial: Identical Prototype**

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2442 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833

Medium: TSL\_2450B[14NV17]

Medium parameters used (interpolated):  $f = 2442$  MHz;  $\sigma = 2.044$  S/m;  $\epsilon_r = 49.25$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/27/2017
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS52 52.10.0(1446);

**Frequency: 2442 MHz**

**2450B/B7- A03341 2442 MHz, w/c config Body-Touch/Right/Area Scan (8x7x1):** Measurement grid:  $dx=12$ mm,  $dy=12$ mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.953 W/kg

**2450B/B7- A03341 2442 MHz, w/c config Body-Touch/Right/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

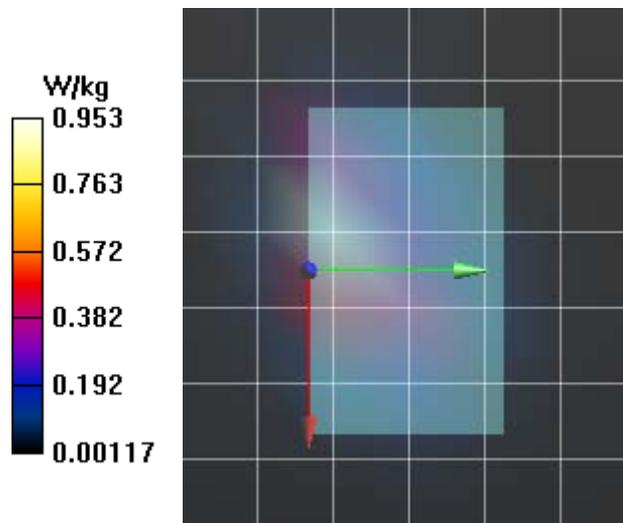
Reference Value = 16.21 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 1.87 W/kg

**SAR(1 g) = 0.730 W/kg; SAR(10 g) = 0.277 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.842 W/kg



**Plot B8**

Date/Time: 11/29/2017 10:06:30 AM

Test Laboratory: Celltech Labs

**Garmin-2450B Nov 29 2017**

**DUT: A03341; Type: Sample; Serial: Identical Prototype**

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2412 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833

Medium: TSL\_2450B[28NV17]

Medium parameters used (interpolated):  $f = 2412$  MHz;  $\sigma = 1.954$  S/m;  $\epsilon_r = 49.254$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/27/2017
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0, 101.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS52 52.10.0(1446);

**Frequency: 2412 MHz**

**2450B/B8- A03341 2412 MHz, w/c config Body-Touch/Right/Area Scan (8x7x1):** Measurement grid:  $dx=12$ mm,  $dy=12$ mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.662 W/kg

**2450B/B8- A03341 2412 MHz, w/c config Body-Touch/Right/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5$ mm,  $dy=5$ mm,  $dz=5$ mm

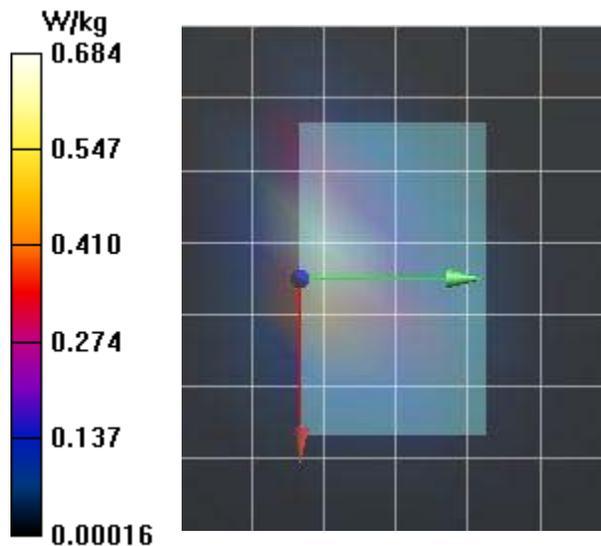
Reference Value = 16.00 V/m; Power Drift = -0.27 dB

Peak SAR (extrapolated) = 1.30 W/kg

**SAR(1 g) = 0.525 W/kg; SAR(10 g) = 0.208 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.599 W/kg



Date/Time: 11/29/2017 10:42:21 AM

Test Laboratory: Celltech Labs

**Garmin-2450B Nov 29 2017**

**DUT: A03341; Type: Sample;**

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Communication System Band: WLAN 2.4GHz (2412.0 - 2484.0 MHz); Frequency: 2437 MHz; Communication System PAR: 1.87 dB; PMF: 1.04833

Medium: TSL\_2450B[28NV17]

Medium parameters used (interpolated):  $f = 2437$  MHz;  $\sigma = 1.994$  S/m;  $\epsilon_r = 49.051$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.56, 6.56, 6.56); Calibrated: 4/27/2017;
  - Modulation Compensation: PMR for UID 10012 - CAB, Calibrated: 4/27/2017
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0, 101.0$
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS2 52.10.0(1446);

**Frequency: 2437 MHz**

**2450B/B9- A03341 2437 MHz, w/c config Body-Touch/Right/Area Scan (8x7x1):** Measurement grid: dx=12mm, dy=12mm

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.587 W/kg

**2450B/B9- A03341 2437 MHz, w/c config Body-Touch/Right/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.06 V/m; Power Drift = -0.26 dB

Peak SAR (extrapolated) = 1.33 W/kg

**SAR(1 g) = 0.526 W/kg; SAR(10 g) = 0.205 W/kg**

[Info: Interpolated medium parameters used for SAR evaluation.](#)

Maximum value of SAR (measured) = 0.600 W/kg

