



Test Report Serial Number:
 Test Report Date:
 Project Number:

45461385-R2.0
23 June 2017
1369

SAR Test Report - New Certification

Applicant:



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

Maximum Reported 1g SAR			
FCC	Body	1.03	W/kg
ISED	Body	1.03	
General Pop. Limit:		1.60	

FCC ID:

IPH-03321

Product Model Number / HVIN

A03321

ISED Registration Number

1792A-03321

Product Name / PMN

A03321

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.
 Kelowna, BC, V1X 7R8
 Canada



Test Lab Certificate: 2470.01



**Industry
 Canada**

IC Registration 3874A-1



FCC Registration: 714830

This report shall not be reproduced in any form without the expressed written consent of Celltech Labs Inc.

Table of Contents

1.0 DOCUMENT CONTROL.....	3
2.0 NORMATIVE REFERENCES.....	3
3.0 CLIENT AND DEVICE INFORMATION.....	4
4.0 STATEMENT OF COMPLIANCE.....	5
5.0 SAR MEASUREMENT SYSTEM.....	6
6.0 RF CONDUCTED POWER MEASUREMENT.....	7
7.0 NUMBER OF TEST CHANNELS (N_c).....	9
8.0 ACCESSORIES EVALUATED.....	9
9.0 SAR MEASUREMENT SUMMARY.....	10
10.0 SCALING OF MAXIMUM MEASURE SAR.....	11
11.0 SAR EXPOSURE LIMITS.....	13
12.0 DETAILS OF SAR EVALUATION.....	14
13.0 MEASUREMENT UNCERTAINTIES.....	15
14.0 FLUID DIELECTRIC PARAMETERS.....	17
15.0 SYSTEM VERIFICATION TEST RESULTS.....	21
16.0 MEASUREMENT SYSTEM SPECIFICATIONS.....	22
17.0 TEST EQUIPMENT LIST.....	24
18.0 FLUID COMPOSITION.....	25
APPENDIX A – SYSTEM VERIFICATION PLOTS.....	26
APPENDIX B – MEASUREMENT PLOTS OF MAXIMUMUM MEASURED SAR.....	30
APPENDIX C - SETUP PHOTOS.....	36
APPENDIX D – DUT AND ACCESSORY PHOTOS.....	39
APPENDIX E – PROBE CALIBRATION.....	44
APPENDIX F – DIPOLE CALIBRATION.....	45
APPENDIX G - PHANTOM.....	46

1.0 DOCUMENT CONTROL

Prepared By:	Trevor Whillock		
Reviewed By:	Ben Hewson		
Issue Number	Description	By	Issue Date
1.0	Initial Release	Trevor Whillock	27 April 2017
1.1	Corrected Report	Art Voss	17 May 2017
2.0	Corrections per TCB	Art Voss	23 June 2017

2.0 NORMATIVE REFERENCES

Normative References*	
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.

3.0 CLIENT AND DEVICE INFORMATION

Client Information	
Applicant Name	Garmin International Inc.
Applicant Address	1200 East 151 St
	Olathe, KS, 66062
	USA
DUT Information	
Device Identifier(s):	FCC ID: IPH-03321
	ISED: 1792A-03321
Type of Equipment:	Personal Navigation device
Device Model(s) / HVIN:	A03321
Device Marketing Name / PMN:	A03321
Test Sample Serial No.:	T/A Sample - Identical Prototype
Transmit Frequency Range:	BLE: 2402-2480 MHz
	WiFi: 2412-2462 MHz
Number of Channels:	n/a
Manuf. Max. Rated Output Power:	BLE/ANT: 4dBm, WiFi: 20.0dBm
Modulation:	DSSS, OFDM, MCS 0-7
Duty Cycle:	100%
DUT Power Source:	5V USB, Internal Li-ion battery
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

4.0 STATEMENT OF COMPLIANCE

This measurement report demonstrates that the:

Applicant: Garmin International Inc.	Model / HVIN: A03321
--	--------------------------------

complies with the SAR (Specific Absorption Rate) RF exposure requirements and limits specified in the following:

Standard(s): FCC 47 CFR §2.1093 Health Canada's Safety Code 6	Measurement Procedure(s): FCC KDB 865664, FCC KDB 447498, FCC KDB 643646 Industry Canada RSS-102 Issue 5 IEEE Standard 1528-2013, IEC 62209-2
---	---

Use Group: <input type="checkbox"/> Occupational / Controlled	<input checked="" type="checkbox"/> General Population / Uncontrolled
---	--

Reason for Issue: New Certification

A description of the device, operating configuration, detailed summary of the test results, methodology and procedures used during this evaluation, equipment used and the various provisions of the rules are included within this test report.

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 DASY4 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 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, a command decoder and a 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.



DASY 4 SAR System with SAM Phantom



DASY 4 Measurement Controller

6.0 RF CONDUCTED POWER MEASUREMENT

Table 6.0

Conducted Power Measurements (CW)						
Channel	Frequency (MHz)	Measured Power (dBm)	Rated Power* (dBm)	Max Rated Power (W)	Delta (dBm)	SAR Test Channel (Y/N)
1	2412	20.54	18.0 +/- 2.0	0.10	0.54	y
6	2437	20.82			0.82	y
11	2462	20.74			0.74	y
Notes:						
The Conducted Power of the DUT was measured at the antenna port, the unit was tested at 100% duty cycle transmit.						

*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. Continuous Wave (CW) mode is a test mode not typical with normal transmission modes and may produce higher 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 CW mode at the Maximum output power level setting and produced the most conservative SAR. The reported SAR was not scaled down.

Table 6.1

Conduced Power Measurements (DSSS)								
Channel	Data Rate (Mbps)	Measured Power (dBm)	Channel	Data Rate (Mbps)	Measured Power (dBm)	Channel	Data Rate (Mbps)	Measured Power (dBm)
1	DSSS 1Mbps	17.47	6	DSSS 1Mbps	18.09	11	DSSS 1Mbps	17.45
	DSSS 2Mbps	17.44		DSSS 2Mbps	18.11		DSSS 2Mbps	17.45
	DSSS 5.5Mbps	16.79		DSSS 5.5Mbps	18.12		DSSS 5.5Mbps	17.68
	DSSS 11Mbps	17.48		DSSS 11Mbps	18.01		DSSS 11Mbps	17.60
2	DSSS 1Mbps	18.10	7	DSSS 1Mbps	17.65			
	DSSS 2Mbps	18.09		DSSS 2Mbps	17.65			
	DSSS 5.5Mbps	18.09		DSSS 5.5Mbps	18.06			
	DSSS 11Mbps	18.15		DSSS 11Mbps	17.73			
3	DSSS 1Mbps	18.20	8	DSSS 1Mbps	17.96			
	DSSS 2Mbps	18.21		DSSS 2Mbps	17.78			
	DSSS 5.5Mbps	18.18		DSSS 5.5Mbps	17.83			
	DSSS 11Mbps	18.25		DSSS 11Mbps	17.69			
4	DSSS 1Mbps	17.87	9	DSSS 1Mbps	17.89			
	DSSS 2Mbps	17.89		DSSS 2Mbps	17.71			
	DSSS 5.5Mbps	18.08		DSSS 5.5Mbps	17.90			
	DSSS 11Mbps	17.96		DSSS 11Mbps	17.84			
5	DSSS 1Mbps	17.93	10	DSSS 1Mbps	17.95			
	DSSS 2Mbps	17.93		DSSS 2Mbps	17.97			
	DSSS 5.5Mbps	17.13		DSSS 5.5Mbps	17.98			
	DSSS 11Mbps	17.02		DSSS 11Mbps	17.88			

Table 6.2

Conducted Power Measurements (OFDM)								
Channel	Data Rate (Mbps)	Measured Power (dBm)	Channel	Data Rate (Mbps)	Measured Power (dBm)	Channel	Data Rate (Mbps)	Measured Power (dBm)
1	OFDM 6Mbps	12.47	6	OFDM 6Mbps	17.29	11	OFDM 6Mbps	12.91
	OFDM 9Mbps	12.50		OFDM 9Mbps	17.23		OFDM 9Mbps	12.91
	OFDM 12Mbps	12.55		OFDM 12Mbps	17.29		OFDM 12Mbps	12.74
	OFDM 18Mbps	12.39		OFDM 18Mbps	17.35		OFDM 18Mbps	12.77
	OFDM 24Mbps	12.44		OFDM 24Mbps	17.42		OFDM 24Mbps	12.83
	OFDM 36Mbps	12.61		OFDM 36Mbps	17.67		OFDM 36Mbps	12.95
	OFDM 48Mbps	12.43		OFDM 48Mbps	17.67		OFDM 48Mbps	12.84
	OFDM 54Mbps	12.67		OFDM 54Mbps	17.80		OFDM 54Mbps	12.85
2	OFDM 6Mbps	17.08	7	OFDM 6Mbps	17.41			
	OFDM 9Mbps	17.08		OFDM 9Mbps	17.41			
	OFDM 12Mbps	17.11		OFDM 12Mbps	17.28			
	OFDM 18Mbps	17.18		OFDM 18Mbps	17.34			
	OFDM 24Mbps	17.05		OFDM 24Mbps	17.42			
	OFDM 36Mbps	17.46		OFDM 36Mbps	17.80			
	OFDM 48Mbps	17.45		OFDM 48Mbps	17.84			
	OFDM 54Mbps	17.45		OFDM 54Mbps	17.84			
3	OFDM 6Mbps	17.25	8	OFDM 6Mbps	17.40			
	OFDM 9Mbps	17.26		OFDM 9Mbps	17.41			
	OFDM 12Mbps	17.11		OFDM 12Mbps	17.43			
	OFDM 18Mbps	17.18		OFDM 18Mbps	17.27			
	OFDM 24Mbps	17.48		OFDM 24Mbps	17.60			
	OFDM 36Mbps	17.56		OFDM 36Mbps	17.99			
	OFDM 48Mbps	17.40		OFDM 48Mbps	17.89			
	OFDM 54Mbps	17.65		OFDM 54Mbps	17.81			
4	OFDM 6Mbps	17.29	9	OFDM 6Mbps	17.32			
	OFDM 9Mbps	17.26		OFDM 9Mbps	17.55			
	OFDM 12Mbps	17.67		OFDM 12Mbps	17.37			
	OFDM 18Mbps	17.15		OFDM 18Mbps	17.42			
	OFDM 24Mbps	17.19		OFDM 24Mbps	17.48			
	OFDM 36Mbps	17.49		OFDM 36Mbps	17.83			
	OFDM 48Mbps	17.58		OFDM 48Mbps	17.95			
	OFDM 54Mbps	17.57		OFDM 54Mbps	17.89			
5	OFDM 6Mbps	17.23	10	OFDM 6Mbps	17.59			
	OFDM 9Mbps	17.25		OFDM 9Mbps	17.66			
	OFDM 12Mbps	17.31		OFDM 12Mbps	17.46			
	OFDM 18Mbps	17.34		OFDM 18Mbps	17.51			
	OFDM 24Mbps	17.21		OFDM 24Mbps	17.51			
	OFDM 36Mbps	17.64		OFDM 36Mbps	17.93			
	OFDM 48Mbps	17.68		OFDM 48Mbps	18.11			
	OFDM 54Mbps	17.67		OFDM 54Mbps	17.99			

See Section 12.0 for Details

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 ACCESSORIES EVALUATED

Table
8.0

Manufacturer's Accessory List

Test Report ID Number	Manufacturer's Par Number	Description	UDC Group ⁽¹⁾	Type II Group ⁽²⁾	SAR ⁽³⁾ Evaluated	SAR ⁽⁴⁾ Tested
T1	362.00086-01	Ca-Assy. Mini B to A style USB, 0.5m	n/a	n/a	N	N
T2	320-00541-01	AC Adapter, 5.0V, 2.0A, USB-A RECEIPT	n/a	n/a	N	N

9.0 SAR MEASUREMENT SUMMARY

Table 9.0

2450 Band Wifi - A03321 BODY SAR Evaluation Results (FCC/IC)										
Date	Model		Plot #	Freq (MHz)	Accessories		DUT Spacing		Measured SAR 1g (W/kg)	SAR Drift (dB)
	M/N	Type			Body	Audio	DUT	ANT	Duty Cycle	
							(mm)	(mm)	100%	
05 Apr 2017	011-04455-19	n/a	B1	2412	n/a	n/a	0	0	0.993	1.340
05 Apr 2017	011-04455-19	n/a	B2	2437	n/a	n/a	0	0	0.658	-0.398
05 Apr 2017	011-04455-19	n/a	B3	2462	n/a	n/a	0	0	0.542	3.780
SAR 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	

Table 9.1

2450 Band Wifi- A03321 BODY/SIDE SAR Evaluation Results (FCC/IC)										
Date	Model		Plot #	Freq (MHz)	Accessories		DUT Spacing		Measured SAR 1g (W/kg)	SAR Drift (dB)
	M/N	Type			Body	Audio	DUT	ANT	Duty Cycle	
							(mm)	(mm)	100%	
11 Apr 2017	011-04455-19	n/a	B4	2412	n/a	n/a	0	0	0.067	-0.356
11 Apr 2017	011-04455-19	n/a	B5	2412	n/a	n/a	0	0	0.056	-0.029
SAR 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	

10.0 SCALING OF MAXIMUM MEASURE SAR

Table 10.0								
Scaling of Maximum Measured SAR ⁽¹⁾								
Plot ID	Configuration	Freq	Measured Fluid Deviation		Measured Conducted Power	Measured Drift	Measured SAR (1g)	
		(MHz)	Permittivity	Conductivity	(dBm)	(dB)	(W/kg)	
B1	Body	2412	-5.54%	5.65%	20.5	1.340	0.993	
Step 1								
Fluid Sensitivity Adjustment								
Plot ID	Scale Factor		X	Measured SAR		=	Step 1 Adjusted SAR (1g)	
	(%)			(W/kg)			(W/kg)	
B1	4.010%		X	0.993		=	1.030	
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)
B1	20.5	20.0		0.5	+	0.000	=	1.030
Step 3								
Simultaneous Transmission - Bluetooth and/or WiFi								
Plot ID	Rated Output Power (Pmax)	Freq	Separation Distance	Estimated SAR	+	Step 2 Adjusted SAR	=	Step 3 Adjusted SAR (1g)
	(mW)	(MHz)	(mm)	(W/kg)		(W/kg)		(W/kg)
B1	2.5	2437	0	0.000	+	1.030	=	1.030
Step 4								
Drift Adjustment								
Plot ID	Measured Drift		+	Step 3 Adjusted SAR		=	Step 4 Adjusted SAR (1g)	
	(dB)			(W/kg)			(W/kg)	
B1	1.340		+	1.030		=	1.030	
Step 5								
Reported SAR								
Plot ID	FCC				IC			
	From Steps 1 through 3				From Steps 1 through 4			
	1g SAR (W/kg)				1g SAR (W/kg)			
B1	1.030				1.030			

The Bluetooth transmitter does not simultaneously transmit with the WiFi transmitter since they 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:

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

$$[(2.51)/(5)] * [(\pm 2.480)] = 0.8 \leq 3.0$$

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:

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

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

NOTES to Table 10.0	
<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.</p> <p>NOTE: Some of the scaling factors in Steps 1 through 4 may not apply and are identified by light gray text.</p>	
Step 1	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 (+).
Step 2	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.
Step 3	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.
Step 4	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.
Step 5	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 10.1

Fluid Sensitivity Calculation (1g)	
Delta SAR = Ce * Delta Er + C(sigma)*Delta Sigma	
Frequency (GHz)	Plot ID
2.412	B3
Ce	-0.2251
Cσ	0.4885
Δ E	-5.54%
Δσ	5.65%
ΔSAR	4.01%
Scale Factor Is Positive. Scaling Required	

<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>27 April 2017 Date</p>

11.0 SAR EXPOSURE LIMITS

Table 11.0

SAR RF EXPOSURE LIMITS			
FCC 47 CFR§2.1093	Health Canada Safety Code 6	General Population / Uncontrolled Exposure⁽⁴⁾	Occupational / Controlled Exposure⁽⁵⁾
Spatial Average⁽¹⁾ (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak⁽²⁾ (Head and Trunk averaged over any 1 g of tissue)		1.6 W/kg	8.0 W/kg
Spatial Peak⁽³⁾ (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.			

12.0 DETAILS OF SAR EVALUATION

EVALUATION DETAILS

1	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. Reference Appendix D, Figures 8 & 9
2	The Device was capable of transmitting in Continuous Wave CW) and the Conducted Power was higher in CW mode 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 an unmodulated continuous transmit mode at 100% duty cycle.
3	<p style="text-align: center;">2.4GHz 802.11g/n OFDM SAR Test Exclusion</p> <p>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 ≤ 1.2 W/kg.</p> <p>Maximum 802.11g/n OFDM specified power (P_{OFDM}) = 18.4dBm Maximum 802.11b DSSS specified power (P_{DSSS}) = 18.99dBm Ratio OFDM/DSSS power = -0.59dBm (87%) Highest <u>reported</u>* SAR(SAR_{MAX}) = 1.03/kg</p> <p>$(P_{\text{OFDM}}/P_{\text{DSSS}}) \times SAR_{\text{MAX}} = 0.899\text{W/kg}$</p> <p>Since the ratio of the OFDM/DSSS specified power is less than one (0dB), the <u>reported</u> SAR would not exceed 1.2W/kg</p> <p>*The <u>reported</u> SAR in this case is the measured SAR adjusted for fluid sensitivity.</p>
4	Each SAR evaluation was performed with a fully charged battery.
5	The fluid temperature remained within +/-2°C from the time of the fluid dielectric parameter measurement to the completion of the SAR evaluation.
6	The fluid temperature remained within +/-0.5°C throughout the test day.

SCAN PROCEDURE

Maximum distance from the closest measurement point to phantom surface.	4 ± 1mm
Maximum probe angle normal to phantom surface.	5° ± 1°
Area Scan Spatial Resolution $\Delta X, \Delta Y$	12mm
Zoom Scan Spatial Resolution $\Delta X, \Delta Y$	5mm
Zoom Scan Spatial Resolution ΔZ	5mm
Zoom Scan Volume X, Y, Z	30mm x 30mm x 30mm
Phantom	ELI
Fluid Depth	150mm
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	

13.0 MEASUREMENT UNCERTAINTIES

Table 13.0

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 _i or V _{eff}
Measurement System									
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	∞
Test Sample Related									
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	∞
Phantom and Tissue Parameters									
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	∞
Effective Degrees of Freedom⁽¹⁾								V_{eff} =	873.2
Combined Standard Uncertainty			RSS				12.59	12.40	
Expanded Uncertainty (95% Confidence Interval)			k=2				25.18	24.80	

(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 13.1

Calculation of the Degrees and Effective Degrees of Freedom

$v_i = n - 1$	$v_{\text{eff}} = \frac{u_c^4}{m \sum_{i=1} \frac{c_i^4 u_i^4}{v_i}}$
---------------	---

14.0 FLUID DIELECTRIC PARAMETERS

Aprel Laboratory
 Test Result for UIM Dielectric Parameter
 Tue 04/Apr/2017 13:31:03
 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	50.17	1.94
2.3600	52.82	1.86	49.94	1.96
2.3700	52.81	1.87	49.96	1.96
2.3800	52.79	1.88	49.86	1.98
2.3900	52.78	1.89	49.71	1.98
2.4000	52.77	1.90	49.58	1.98
2.4100	52.75	1.91	49.87	2.01
2.4200	52.74	1.92	49.66	2.06
2.4300	52.73	1.93	49.60	2.06
2.4400	52.71	1.94	49.95	2.09
2.4500	52.70	1.95	49.77	2.09
2.4600	52.69	1.96	49.85	2.12
2.4700	52.67	1.98	49.81	2.12
2.4800	52.66	1.99	49.61	2.12
2.4900	52.65	2.01	49.60	2.13
2.5000	52.64	2.02	49.59	2.15
2.5100	52.62	2.04	49.29	2.14
2.5200	52.61	2.05	49.30	2.17
2.5300	52.60	2.06	49.43	2.19
2.5400	52.59	2.08	49.27	2.20
2.5500	52.57	2.09	49.27	2.24

Table 14.0

FLUID DIELECTRIC PARAMETERS							
Date:	4 Apr 2017	Fluid Temp:	21.2	Frequency:	2450MHz	Tissue:	Body
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2350.0000		50.1700	1.9400	52.8300	1.85	-5.04%	4.86%
2360.0000		49.9400	1.9600	52.8200	1.86	-5.45%	5.38%
2370.0000		49.9600	1.9600	52.8100	1.87	-5.40%	4.81%
2380.0000		49.8600	1.9800	52.7900	1.88	-5.55%	5.32%
2390.0000		49.7100	1.9800	52.7800	1.89	-5.82%	4.76%
2400.0000		49.5800	1.9800	52.7700	1.90	-6.05%	4.21%
2410.0000		49.8700	2.0100	52.7500	1.91	-5.46%	5.24%
2412.0000	*	49.8280	2.0200	52.7480	1.91	-5.54%	5.65%
2420.0000		49.6600	2.0600	52.7400	1.92	-5.84%	7.29%
2430.0000		49.6000	2.0600	52.7300	1.93	-5.94%	6.74%
2437.0000	*	49.8450	2.0810	52.7160	1.94	-5.45%	7.43%
2440.0000		49.9500	2.0900	52.7100	1.94	-5.24%	7.73%
2450.0000		49.7700	2.0900	52.7000	1.95	-5.56%	7.18%
2460.0000		49.8500	2.1200	52.6900	1.96	-5.39%	8.16%
2462.0000	*	49.8420	2.1200	52.6860	1.96	-5.40%	7.94%
2470.0000		49.8100	2.1200	52.6700	1.98	-5.43%	7.07%
2472.0000	*	49.7700	2.1200	52.6680	1.98	-5.50%	6.96%
2480.0000		49.6100	2.1200	52.6600	1.99	-5.79%	6.53%
2490.0000		49.6000	2.1300	52.6500	2.01	-5.79%	5.97%
2500.0000		49.5900	2.1500	52.6400	2.02	-5.79%	6.44%
2510.0000		49.2900	2.1400	52.6200	2.04	-6.33%	4.90%
2520.0000		49.3000	2.1700	52.6100	2.05	-6.29%	5.85%
2530.0000		49.4300	2.1900	52.6000	2.06	-6.03%	6.31%
2540.0000		49.2700	2.2000	52.5900	2.08	-6.31%	5.77%
2550.0000		49.2700	2.2400	52.5700	2.09	-6.28%	7.18%

*Channel Frequency Tested

Aprel Laboratory
 Test Result for UIM Dielectric Parameter
 Tue 11/Apr/2017 15:01:54
 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_eBFCC Limits for Body Epsilon
 FCC_sBFCC 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	50.11	1.87
2.3600	52.82	1.86	50.00	1.91
2.3700	52.81	1.87	49.73	1.90
2.3800	52.79	1.88	49.92	1.90
2.3900	52.78	1.89	49.94	1.95
2.4000	52.77	1.90	49.78	1.95
2.4100	52.75	1.91	49.81	1.96
2.4200	52.74	1.92	49.84	2.01
2.4300	52.73	1.93	49.58	2.00
2.4400	52.71	1.94	49.77	2.00
2.4500	52.70	1.95	49.53	2.01
2.4600	52.69	1.96	49.81	2.03
2.4700	52.67	1.98	49.45	2.04
2.4800	52.66	1.99	49.49	2.06
2.4900	52.65	2.01	49.54	2.08
2.5000	52.64	2.02	49.50	2.10
2.5100	52.62	2.04	49.50	2.10
2.5200	52.61	2.05	49.38	2.12
2.5300	52.60	2.06	49.46	2.12
2.5400	52.59	2.08	49.32	2.12
2.5500	52.57	2.09	49.21	2.17

Table 14.1

FLUID DIELECTRIC PARAMETERS							
Date:	11 Apr 2017	Fluid Temp:	22.2	Frequency:	2450MHz	Tissue:	Body
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	
2350.0000		50.1100	1.8700	52.8300	1.85	-5.15%	1.08%
2360.0000		50.0000	1.9100	52.8200	1.86	-5.34%	2.69%
2370.0000		49.7300	1.9000	52.8100	1.87	-5.83%	1.60%
2380.0000		49.9200	1.9000	52.7900	1.88	-5.44%	1.06%
2390.0000		49.9400	1.9500	52.7800	1.89	-5.38%	3.17%
2400.0000		49.7800	1.9500	52.7700	1.90	-5.67%	2.63%
2410.0000		49.8100	1.9600	52.7500	1.91	-5.57%	2.62%
2412.0000	*	49.8160	1.9700	52.7480	1.91	-5.56%	3.03%
2420.0000		49.8400	2.0100	52.7400	1.92	-5.50%	4.69%
2430.0000		49.5800	2.0000	52.7300	1.93	-5.97%	3.63%
2437.0000	*	49.7130	2.0000	52.7160	1.94	-5.70%	3.25%
2440.0000		49.7700	2.0000	52.7100	1.94	-5.58%	3.09%
2450.0000		49.5300	2.0100	52.7000	1.95	-6.02%	3.08%
2460.0000		49.8100	2.0300	52.6900	1.96	-5.47%	3.57%
2462.0000	*	49.7380	2.0320	52.6860	1.96	-5.60%	3.46%
2470.0000		49.4500	2.0400	52.6700	1.98	-6.11%	3.03%
2472.0000	*	49.4580	2.0440	52.6680	1.98	-6.09%	3.13%
2480.0000		49.4900	2.0600	52.6600	1.99	-6.02%	3.52%
2490.0000		49.5400	2.0800	52.6500	2.01	-5.91%	3.48%
2500.0000		49.5000	2.1000	52.6400	2.02	-5.97%	3.96%
2510.0000		49.5000	2.1000	52.6200	2.04	-5.93%	2.94%
2520.0000		49.3800	2.1200	52.6100	2.05	-6.14%	3.41%
2530.0000		49.4600	2.1200	52.6000	2.06	-5.97%	2.91%
2540.0000		49.3200	2.1200	52.5900	2.08	-6.22%	1.92%
2550.0000		49.2100	2.1700	52.5700	2.09	-6.39%	3.83%

*Channel Frequency Tested

15.0 SYSTEM VERIFICATION TEST RESULTS

Table 15.0

System Verification Test Results											
Date	Frequency (MHz)	Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Dipole Spacing (mm)	Validation Source			
								P/N		S/N	
04-Apr-17	2450	Body	21.2	20	15%	250	10	D2450V2		825	
SAR						Fluid Parameters					
1 gram			10 gram			Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation	Measured	Target	Deviation	Measured	Target	Deviation
13	13	0.00%	5.98	6.05	-1.16%	49.8	52.7	-5.56%	2.12	1.95	7.18%
<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 865664 and IEC 62209-1. 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>											

Table 15.1

System Verification Test Results											
Date	Frequency (MHz)	Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Dipole Spacing (mm)	Validation Source			
								P/N		S/N	
11-Apr-17	2450	Body	22.2	23	16%	250	10	D2450V2		825	
SAR						Fluid Parameters					
1 gram			10 gram			Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation	Measured	Target	Deviation	Measured	Target	Deviation
13.7	13	5.38%	6.27	6.05	3.64%	49.5	52.7	-6.02%	2.01	1.95	3.08%
<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 865664 and IEC 62209-1. 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>											

16.0 MEASUREMENT SYSTEM SPECIFICATIONS

Table 16.0

Measurement System Specification

Specifications

Positioner	Stäubli Unimation Corp. Robot Model: RX60L
Repeatability	0.02 mm
No. of axis	6

Data Acquisition Electronic (DAE) System

Cell Controller

Processor	AMD Athlon XP 2400+
Clock Speed	2.0 GHz
Operating System	Windows XP Professional

Data Converter

Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY4, V4.7 Build 80
	Postprocessing Software: SEMCAD, V1.8 Build 186
Connecting Lines	Optical downlink for data and status info., Optical uplink for commands and clock

DASY4 Measurement Server

Function	Real-time data evaluation for field measurements and surface detection
Hardware	PC/104 166MHz Pentium CPU; 32 MB chipdisk; 64 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface

E-Field Probe

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)

Phantom

Type	ELI
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	> 30 Liter

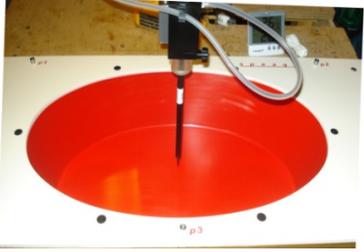
Table 16.1

Measurement System Specification (Continued)

Probe Specification

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: ± 0.2 dB (30 MHz to 3 GHz)	
Directivity:	± 0.2 dB in head tissue (rotation around probe axis) ± 0.4 dB in head tissue (rotation normal to probe axis)	
Dynamic Range:	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB	
Surface Detect:	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces	
Dimensions:	Overall length: 330 mm; Tip length: 16 mm; Body diameter: 12 mm; Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm	
Application:	General dosimetry up to 3 GHz; Compliance tests of mobile phone	EX3DV4 E-Field Probe

Phantom Specification

<p>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.</p>	
	ELI Phantom

Device Positioner Specification

<p>The DASY4 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°. 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.</p>	
	Device Positioner

17.0 TEST EQUIPMENT LIST

Table 17.0

Test Equipment List

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	20 April 2016	Annual
-EX3DV6 E-Field Probe	00213	3600	27 April 2016	Annual
-D2450V2 Validation Dipole	00219	825	22 April 2015	Triennial
ELI Phantom	00247	-	CNR	CNR
HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
Gigatronics 8652A Power Meter	00110	1835801	29 Feb 2016	Triennial
Gigatronics 80701A Power Sensor	00248	1833687	29 Feb 2016	Triennial
HP 8753ET Network Analyzer	00134	US39170292	22 Oct 2014	Triennial
Rohde & Schwarz SMR20 Signal Generator	00006	100104	8 May 2014	Triennial
Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR

CNR = Calibration Not Required

18.0 FLUID COMPOSITION

Table 18.0		2450MHz Body		
Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Glycol	Salt ⁽¹⁾	HEC ⁽²⁾	Bacteriacide ⁽³⁾
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: 04/04/2017 1:03:50 PM

Test Laboratory: Celltech Labs

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 825; Calibrated: 22/04/2015
Program Name: 2450MHz Body SPC

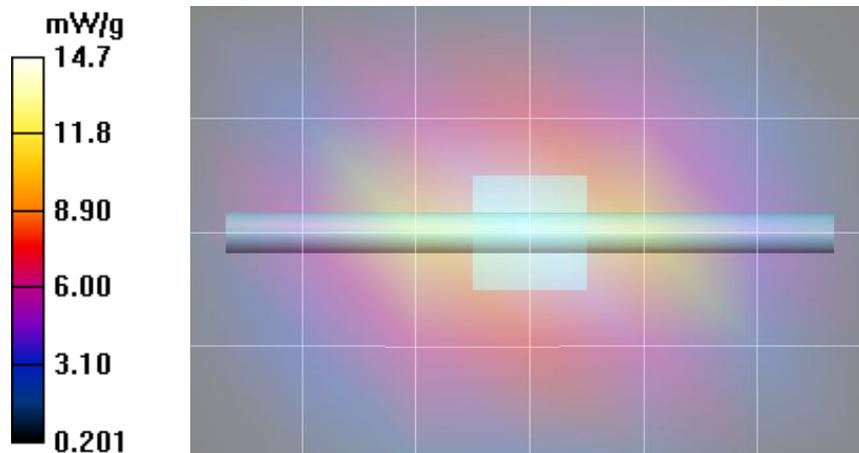
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 2.09$ mho/m; $\epsilon_r = 49.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

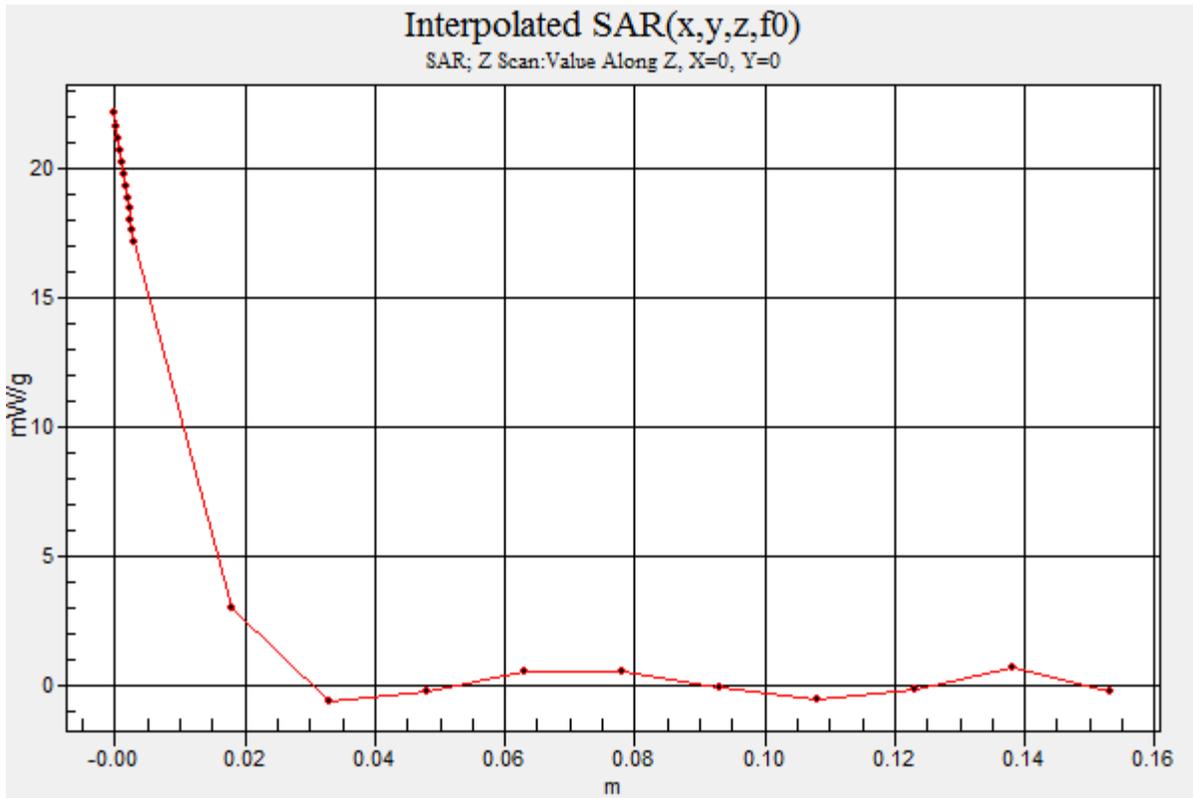
DASY4 Configuration:

- Probe: EX3DV4 - SN3600 2016; ConvF(6.55, 6.55, 6.55); Calibrated: 27/04/2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353 2016; Calibrated: 20/04/2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

2450MHz Body Dipole d=10mm P=250mW TS=[11.7][13.0][14.3]/Area Scan (5x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 14.7 mW/g

2450MHz Body Dipole d=10mm P=250mW TS=[11.7][13.0][14.3]/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 92.4 V/m; Power Drift = 0.017 dB
Peak SAR (extrapolated) = 27.2 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 5.98 mW/g





Date/Time: 11/04/2017 2:03:30 PM

Test Laboratory: Celltech Labs

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 825; Calibrated: 22/04/2015
Program Name: 2450MHz Body SPC

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: $f = 2450$ MHz; $\sigma = 2.01$ mho/m; $\epsilon_r = 49.5$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3600 2016; ConvF(6.55, 6.55, 6.55); Calibrated: 27/04/2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353 2016; Calibrated: 20/04/2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

2450MHz Body Dipole d=10mm P=250mW TS=[11.7][13.0][14.3]/Area Scan (5x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 14.8 mW/g

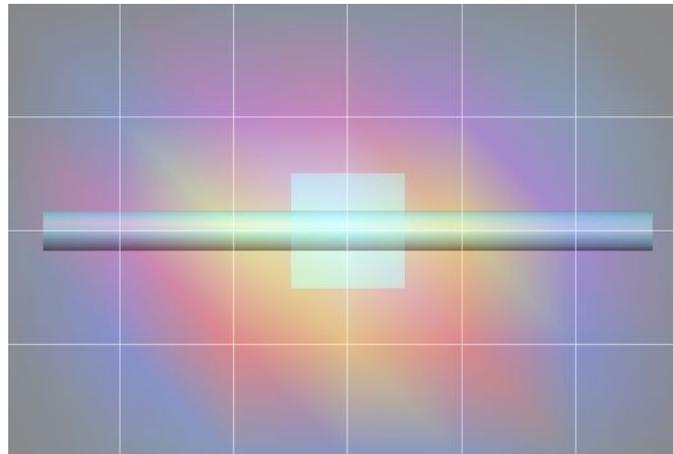
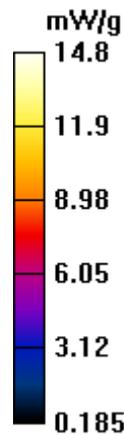
2450MHz Body Dipole d=10mm P=250mW TS=[11.7][13.0][14.3]/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

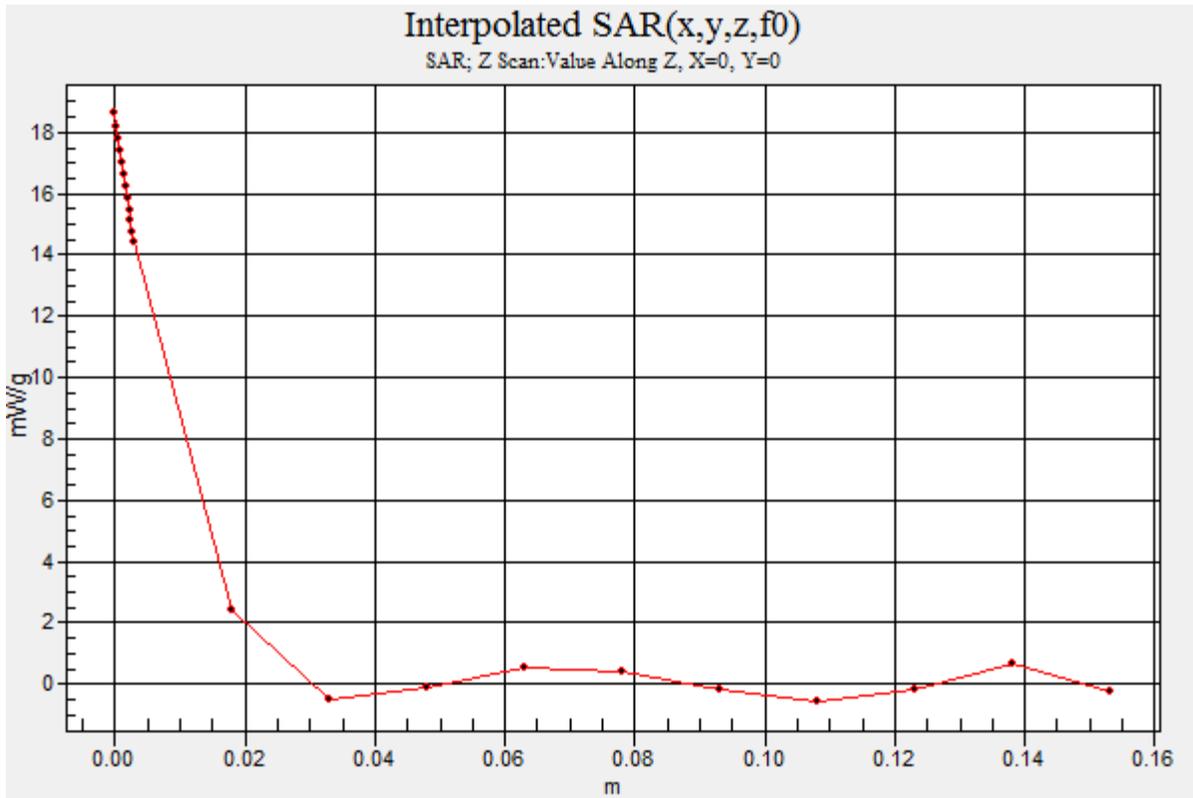
Reference Value = 92.1 V/m; Power Drift = 0.040 dB

Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.27 mW/g

Maximum value of SAR (measured) = 15.6 mW/g





APPENDIX B – MEASUREMENT PLOTS OF MAXIMUMUM MEASURED SAR

Plot B1

Date/Time: 05/04/2017 2:26:46 PM

Test Laboratory: Celltech Labs

DUT: A03321; Type:Serial:
Program Name: 2450MHz Body

Communication System: CW; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 2.02$ mho/m; $\epsilon_r = 49.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3600 2016; ConvF(6.55, 6.55, 6.55); Calibrated: 27/04/2016
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353 2016; Calibrated: 20/04/2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

B1 A03321, 2412 MHz Body Back Side/Area Scan (19x13x1): Measurement grid: dx=10mm, dy=10mm

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

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

B1 A03321, 2412 MHz Body Back Side/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

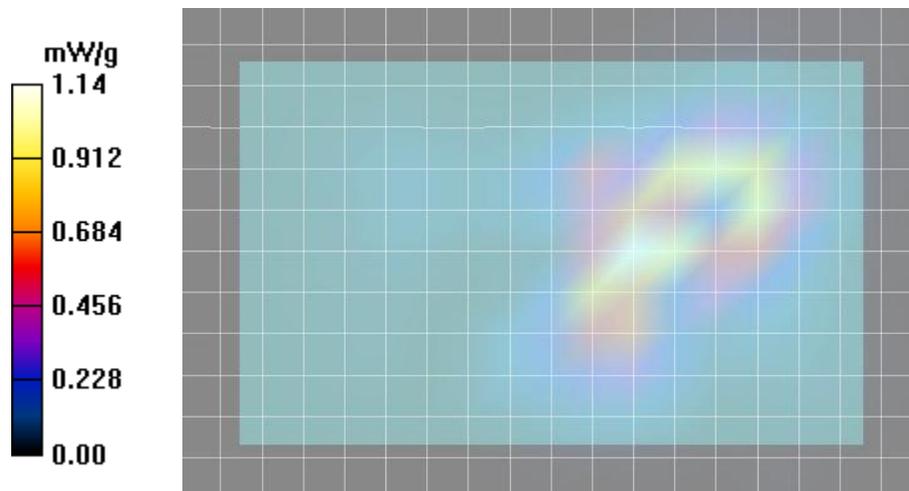
Reference Value = 3.38 V/m; Power Drift = 1.34 dB

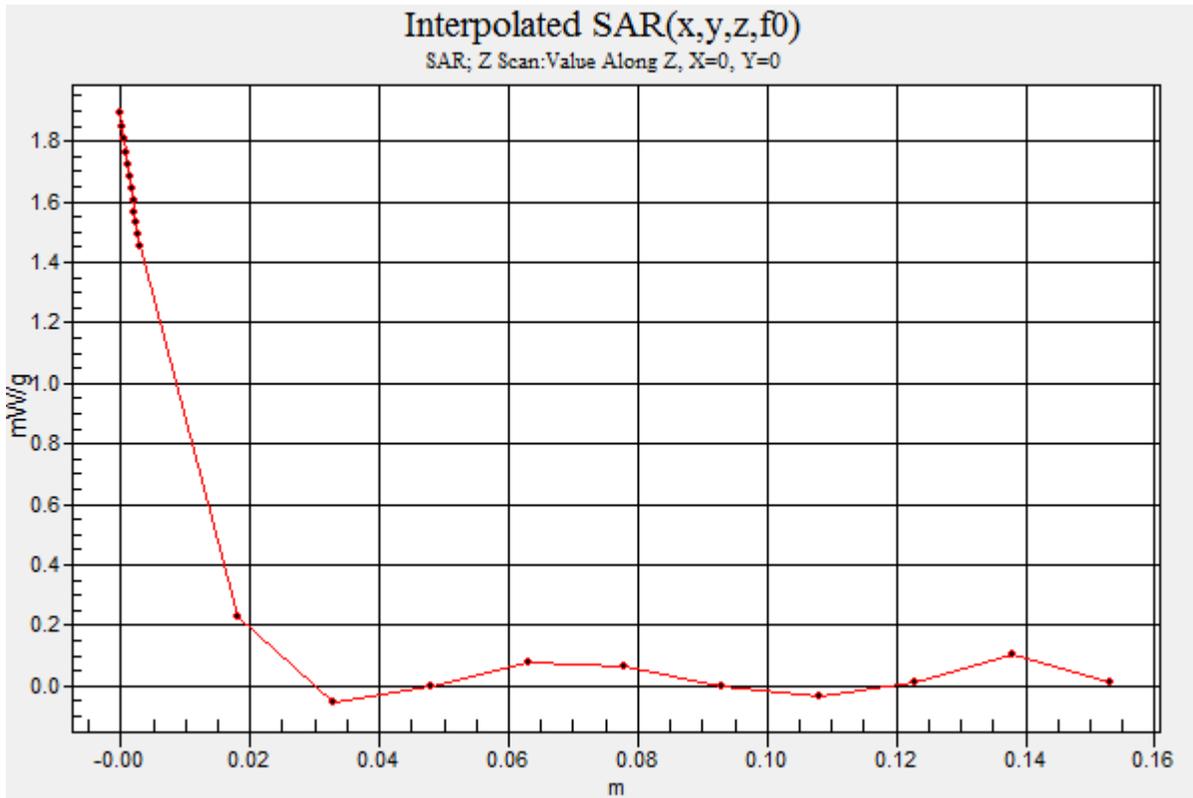
Peak SAR (extrapolated) = 2.49 W/kg

SAR(1 g) = 0.993 mW/g; SAR(10 g) = 0.373 mW/g

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

Maximum value of SAR (measured) = 1.28 mW/g





Plot B2

Date/Time: 05/04/2017 3:29:57 PM

Test Laboratory: Celltech Labs

DUT: A03321; Type:Serial:
Program Name: 2450MHz Body

Communication System: CW; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 2.08$ mho/m; $\epsilon_r = 49.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3600 2016; ConvF(6.55, 6.55, 6.55); Calibrated: 27/04/2016
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353 2016; Calibrated: 20/04/2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

B2 A03321, 2437 MHz Body Back Side/Area Scan (19x13x1): Measurement grid: dx=10mm, dy=10mm

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

Maximum value of SAR (measured) = 0.858 mW/g

B2 A03321, 2437 MHz Body Back Side/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

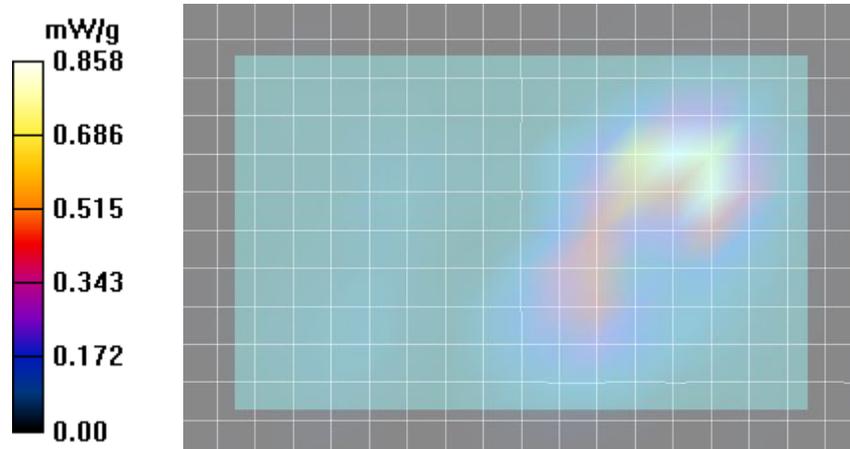
Reference Value = 3.93 V/m; Power Drift = -0.398 dB

Peak SAR (extrapolated) = 1.46 W/kg

SAR(1 g) = 0.658 mW/g; SAR(10 g) = 0.312 mW/g

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

Maximum value of SAR (measured) = 0.778 mW/g



Plot B3

Date/Time: 05/04/2017 4:43:03 PM

Test Laboratory: Celltech Labs

DUT: A03321; Type:Serial:
Program Name: 2450MHz Body

Communication System: CW; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2462$ MHz; $\sigma = 2.12$ mho/m; $\epsilon_r = 49.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3600 2016; ConvF(6.55, 6.55, 6.55); Calibrated: 27/04/2016
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353 2016; Calibrated: 20/04/2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

B3 A03321, 2462 MHz Body Back Side/Area Scan (19x13x1): Measurement grid: dx=10mm, dy=10mm

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

Maximum value of SAR (measured) = 0.796 mW/g

B3 A03321, 2462 MHz Body Back Side/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

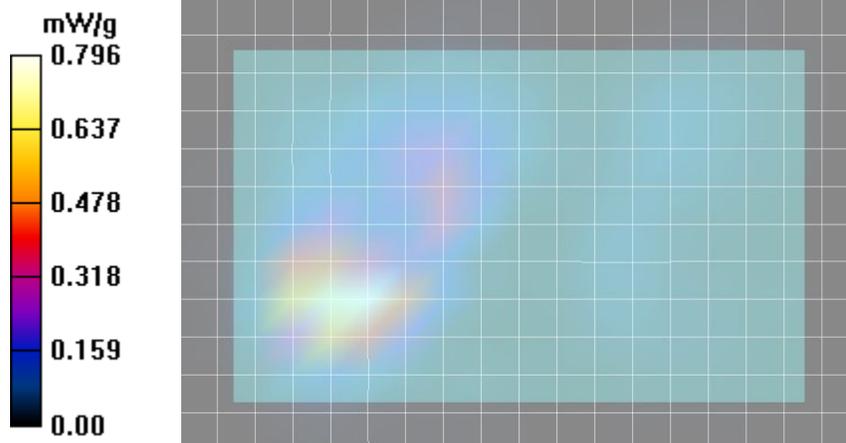
Reference Value = 1.83 V/m; Power Drift = 3.78 dB

Peak SAR (extrapolated) = 1.14 W/kg

SAR(1 g) = 0.542 mW/g; SAR(10 g) = 0.266 mW/g

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

Maximum value of SAR (measured) = 0.613 mW/g



Plot B4

Date/Time: 11/04/2017 3:06:00 PM

Test Laboratory: Celltech Labs

DUT: A03321; Type:Serial:
Program Name: 2450MHz Body

Communication System: CW; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 2.02$ mho/m; $\epsilon_r = 49.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3600 2016; ConvF(6.55, 6.55, 6.55); Calibrated: 27/04/2016
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353 2016; Calibrated: 20/04/2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

B4 A03321, 2412 MHz Body,Top Edge/Area Scan (6x19x1): Measurement grid: dx=10mm, dy=10mm

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

Maximum value of SAR (measured) = 0.072 mW/g

B4 A03321, 2412 MHz Body,Top Edge/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

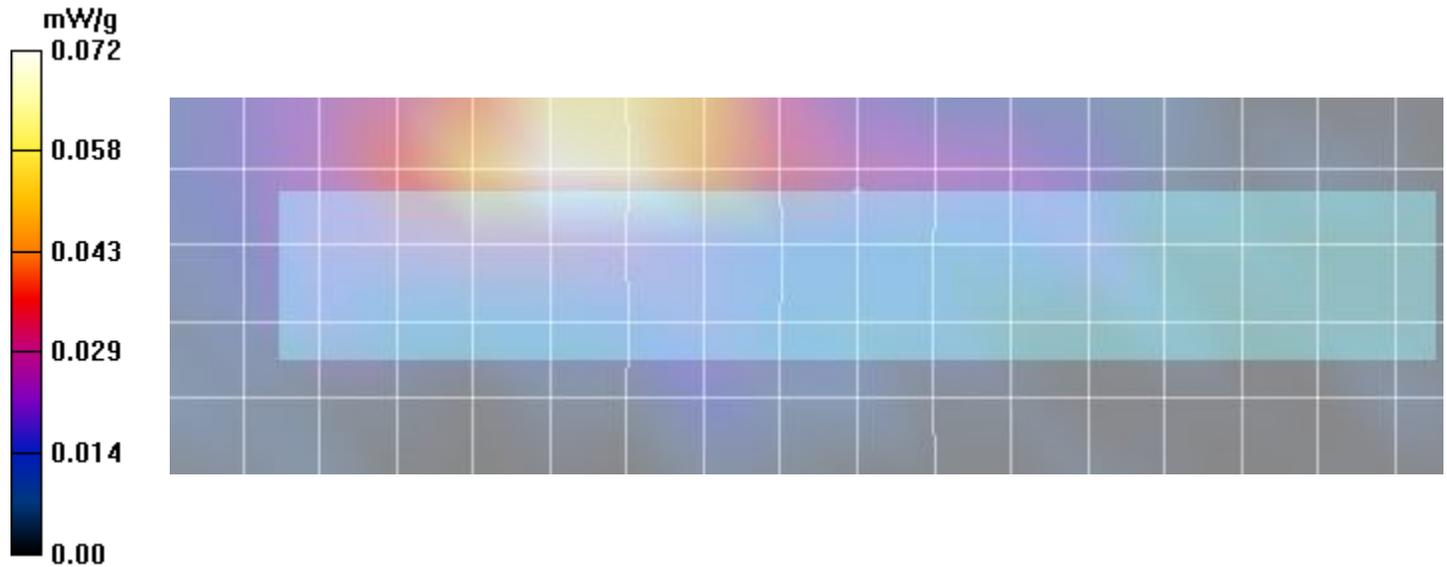
Reference Value = 3.08 V/m; Power Drift = -0.356 dB

Peak SAR (extrapolated) = 0.121 W/kg

SAR(1 g) = 0.067 mW/g; SAR(10 g) = 0.034 mW/g

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

Maximum value of SAR (measured) = 0.074 mW/g



Plot B5

Date/Time: 11/04/2017 1:31:55 PM

Test Laboratory: Celltech Labs

DUT: A03321 Right Edge; Type:Serial:
Program Name: 2450MHz Body

Communication System: CW; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): $f = 2412$ MHz; $\sigma = 2.02$ mho/m; $\epsilon_r = 49.8$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: EX3DV4 - SN3600 2016; ConvF(6.55, 6.55, 6.55); Calibrated: 27/04/2016
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used))Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353 2016; Calibrated: 20/04/2016
- Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP:xxxx
- Measurement SW: DASY4, V4.5 Build 19; Postprocessing SW: SEMCAD, V1.8 Build 145

B5 A03321, 2412 MHz Body Left Edge/Area Scan (6x13x1): Measurement grid: dx=10mm, dy=10mm

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

Maximum value of SAR (measured) = 0.064 mW/g

B5 A03321, 2412 MHz Body Left Edge/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.60 V/m; Power Drift = -0.904 dB

Peak SAR (extrapolated) = 0.108 W/kg

SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.029 mW/g

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

Maximum value of SAR (measured) = 0.060 mW/g

