

## SAR Test Report - New Application

Applicant:



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

Maximum <i>reported</i> 1g SAR			
FCC	Body (DTS):	<b>0.25</b>	W/kg
	Body (DXX):	<b>0.02</b>	
ISED	Extremity:	<b>n/a</b>	
	Simultaneous:	<b>0.27</b>	
General Pop. Limit:		<b>1.60</b>	

FCC ID:

**IPH-04247**

Product Model Number / HVIN

**A04247**

IC Registration Number

**1792A-04247**

Product Name / PMN

**A04247**

In Accordance With:

**FCC 47 CFR §2.1093**

Radiofrequency Radiation Exposure Evaluation: Portable Devices

**Health Canada Safety Code 6**

Limits of Human Exposure to Radiofrequency Electromagnetic Energy  
in the Frequency Range from 3kHz to 300GHz

Approved By:



**Ben Hewson, President**

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Canada



Test Lab Certificate: 2470.01



**Industry  
Canada**

IC Registration 3874A



FCC Registration: CA3874

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## 1.0 DOCUMENT CONTROL

Revision History					
<b>Samples Tested By:</b>		Trevor Whillock/Ben Hewson	<b>Date(s) of Evaluation:</b>		22 July, 29/30 Sep, 2/3 Dec, 2021
<b>Report Prepared By:</b>		Ben Hewson	<b>Report Reviewed By:</b>		Art Voss
Report Revision	Description of Revision	Revised Section	Revised By	Revision Date	
0.1	Draft	n/a	Art Voss	4 January 2022	
1.0	Initial Release	n/a	Art Voss	25 January 2022	
2.0	Corrections to DUT Info	-	Art Voss	2 February 2022	

## 2.0 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: <b>IPH-04247</b>
	ISED ID: <b>1792A-04247</b>
Device Model(s) / HVIN:	A04247
Device Marketing Name / PMN:	A04247
Test Sample Serial No.:	Conducted: 3383564979, 3383564988 OTA: 3383564975, 3383565083
Device Type:	Radar Device
FCC Equipment Class:	Digital Transmission System (DTS)
ISED Equipment Class:	Wireless Local Area Network Device
Transmit Frequency Range:	WiFi (DTS): 2412-2462MHz
	BLE/ANT: 2402-2480MHz
	Radar: 24.0236GHz - 24.2176GHz
Manuf. Max. Rated Output Power:	WiFi - Digital Transmission System (DTS): 6.42dBm
	ANT - Low Power Communication Device Transmitter (DXX): 6.51dBm
	BLE - Low Power Communication Device Transmitter (DXX): 1.56dBm
	Radar: -11dBm EIRP
Antenna Type and Gain:*	BLE/WiFi: -0.4dBi, ANT: -0.5dBi Max, Radar: 10.5dBi
Modulation:	WiFi: DSSS, OFDM, CCK, MCS0-7
Modulation:	BLE: GMSK
Modulation:	ANT: GFSK
DUT Power Source:	3.8VDC Rechargeable Li-Ion
DUT Dimensions [LxWxH]	L x W x H: 105mm x 40mm x 38mm
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

\* Information on antenna gain provided by applicant.

### 3.0 SCOPE OF EVALUATION

This Certification Report was prepared on behalf of:

**Garmin International Inc.**

The A04247 is a radar and Wi-Fi device operating in the 24 GHz ISM and 2.4GHz WiFi/ BLE / ANT frequency bands. The 24 GHz bands are not evaluated for SAR compliance. The device is capable of simultaneous transmission between the BLE/Wi-Fi and the ANT transmitters. The device is intended for General Population Use. The product operates from an internal proprietary Li-ion rechargeable battery which can be connected to a compliant USB interface port, AC or DC adapter for charging. Test samples provided by the manufacturer were capable of transmitting at select frequencies and modulations preset by the manufacturer. An additional antenna modification was prepared for one sample allowing the ability to connect test equipment for antenna port conducted power analysis. The WiFi + ANT and BLE + ANT transmitters are capable of simultaneous transmission. The WiFi and BLE transmitters are not capable of simultaneous transmission.

**Application:**

This is an application for a new device certification.

**Scope:**

The scope of this evaluation limited to the evaluation of SAR for intended and non-intended applications. It will include evaluation of the 2.4 GHz transmitters for all required RF exposure configurations include Body Configuration. Since the device is capable of simultaneous transmission, the analysis of the Standalone and Simultaneous Transmission SAR is required.

The Test Plan developed for this evaluation is based on the required test channels and configurations which produced the highest worst case SAR and where applicable, SAR test reduction and/or SAR test exclusion may be utilized. The DUT was evaluated for SAR at the maximum tune up tolerance and conducted output power level, preset by the manufacturer and in accordance with the procedures described in IEC/IEEE 62209-1528, IEC 62209-1, IEC 62209-2, FCC KDB 447498 and ISED RSS-102.

## 4.0 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
IEC International Standard /IEEE International Committee on Electromagnetic Safety IEC/IEEE 62209-1528	Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528; Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)
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
* When the issue number or issue date is omitted, the latest version is assumed.	

## 5.0 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> A04247	
<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 IEC/IEEE Standard 62209-1528, 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>		<b>Date(s) Evaluated:</b> January 8th & 9th, 201822 July, 29/30 Sep, 2/3 Dec, 2021

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.



## 6.0 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 VME-bus computer.



**DASY 6 SAR System with SAM Phantom**



**DASY 6 Measurement Controller**

**7.0 RF CONDUCTED POWER MEASUREMENT**

Table 7.0 Conducted Power Measurements, WiFi

A04247 - Conducted Power Measurements								
Channel	Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Rated Power (W)	Delta (dB)	SAR Test Channel (Y/N)	Mode	Modulation
1	2412	5.32	5.71	0.0037	-0.39	Y	WLAN 2.4G	CCK-1Mbps
2	2417	5.39	5.71	0.0037	-0.32	-		CCK-1Mbps
3	2422	5.41	5.71	0.0037	-0.30	-		CCK-1Mbps
6	2437	5.60	5.71	0.0037	-0.11	Y		CCK-1Mbps
10	2457	5.67	5.71	0.0037	-0.04	-		CCK-1Mbps
11	2462	5.69	5.71	0.0037	-0.02	Y		CCK-1Mbps
13	2472	5.71	5.71	0.0037	0.00	Y		CCK-1Mbps
11	2462	3.99	5.16	0.0033	-1.17	-		DSSS-5.5Mbps
		5.16	5.16	0.0033	0.00	-		DSSS-11Mbps
		6.42	6.42	0.0044	0.00	Y		OFDM-6Mbps
		6.28	6.42	0.0044	-0.14			OFDM-9Mbps
		6.09	6.42	0.0044	-0.33			OFDM-12Mbps
		5.37	6.42	0.0044	-1.05	-		OFDM-24Mbps
		4.21	6.42	0.0044	-2.21	-		OFDM-54Mbps
11	2462	5.30	5.32	0.0034	-0.02	-		MCS-0
		3.08	5.32	0.0034	-2.24	-	MCS-4	
		2.50	5.32	0.0034	-2.82	-	MCS-7	
13	2472	5.32	5.32	0.0034	0.00	-	MCS-0	

**Table 7.2 Conducted Power Measurements, ANT**

<b>A04247 - Conducted Power Measurements</b>								
<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Measured Power (dBm)</b>	<b>Rated Power (dBm)</b>	<b>Rated Power (W)</b>	<b>Delta (dB)</b>	<b>SAR Test Channel (Y/N)</b>	<b>Mode</b>	<b>Modulation</b>
2	2402	5.78	6.46	0.0044	-0.68	Y	ANT	GFSK
41	2441	6.46	6.46	0.0044	0.00	Y		
80	2480	6.04	6.46	0.0044	-0.42	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 the power level setting and duty cycle specified by the manufacturer to be the max output power and produce the most conservative SAR. SAR was evaluated at the maximum average tune up tolerance. See section 2.0 Client and Device Information for details. The reported SAR was not scaled down.

## 8.0 NUMBER OF TEST CHANNELS ( $N_c$ )

WiFi SAR Evaluation:

SAR was evaluated in CCK, DSSS and OFDM modes at the DUT's maximum duty cycle. The power level setting selected was specified by the manufacturer to be the max output power and produce the most conservative SAR.

As per FCC KDB 248227, the required 802.11 test channels are Ch 1, Ch 6 and Ch 11.  
When applicable, SAR test reduction methods may be utilized.

802.11b DSSS SAR test reduction is determined according to the following:

- a) When the reported SAR of the highest measured maximum output power channel is  $\leq 0.8$  W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- b) When the reported SAR is  $> 0.8$  W/kg, SAR is required for that exposure configuration using the next highest output power channel. When any reported SAR is  $> 1.2$  W/Kg, SAR is required for the third channel.

While 1-g SAR thresholds are specified in the procedures for SAR test reduction and exclusion, these thresholds should be multiplied by 2.5 when 10-g extremity SAR is considered.

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

- a) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.
- 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.

See 13.1 for details.

BT/BLE/ANT SAR Test Evaluation:

ANT was evaluated for SAR at its maximum duty cycle in the worst-case configuration from the WiFi test evaluation.  
The duty cycle cannot be altered in test mode or by the user.

General SAR Test Reduction Considerations:

As per KDB 447498D01 4.4.1,

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid band or highest output power channel is:

- c)  $\leq 0.4$ W/kg or  $1.0$ W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$ Mh

BLE was not evaluated for SAR.

Per FCC KDB 447498 4.3.1 the BLE transmitter meets the standalone SAR test exclusion criteria. See section 11.0 for details.

NOTE: This device is capable of simultaneous transmission between the BLE/ANT and WiFi/ANT transmitters.

## 9.0 ACCESSORIES EVALUATED

### Table 9.0 Accessories Evaluated

There were no accessories evaluated with this device.

**10.0 SAR MEASUREMENT SUMMARY**

Table 10.1: Measured Results

Measured SAR Results (1g) - BODY Configuration (FCC/ISED)																
Date	Plot ID	DUT		Test Frequency (MHz)	Modulation	Accessories				DUT Spacing		Conducted Power (dBm)	Measured SAR (1g)	SAR Drift (dB)		
		Type	Configuration			Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		100% DC (W/kg)			
22 Jul 2021	B2E	FFP U3	Body - Top Side	2462	DSSS-11Mbps	n/a	n/a	n/a	n/a	0	0	5.16	0.001	5.160		
22 Jul 2021	B3E	FFP U2	Body - Button Side	2462	DSSS-11Mbps	n/a	n/a	n/a	n/a	0	0	5.16	0.000	5.010		
22 Jul 2021	B4E	FFP U1	Body - Non Button Side	2462	DSSS-11Mbps	n/a	n/a	n/a	n/a	0	0	5.16	0.011	2.550		
22 Jul 2021	B5E	FFP U0	Body - Bottom Side	2462	DSSS-11Mbps	n/a	n/a	n/a	n/a	0	0	5.16	0.012	1.670		
22 Jul 2021	B6E	FFP U1	Body - Top Lens Side	2462	DSSS-11Mbps	n/a	n/a	n/a	n/a	0	0	5.16	0.000	4.350		
29 Sep 2021	B1	FFP U2	Front - Top Side	2437	CCK-1mbps	n/a	n/a	n/a	n/a	0	0	5.60	0.007	1.710		
29 Sep 2021	B2	FFP U2	Back - Bottom Side	2437	CCK-1mbps	n/a	n/a	n/a	n/a	0	0	5.60	0.020	1.210		
29 Sep 2021	B3	FFP U2	Side (1)-Button Side	2437	CCK-1mbps	n/a	n/a	n/a	n/a	0	0	5.60	0.009	1.280		
30 Sep 2021	B4	FFP U2	Side 2-Non Button Side	2437	CCK-1mbps	n/a	n/a	n/a	n/a	0	0	5.60	0.014	-1.060		
30 Sep 2021	B5	FFP U2	Side 3 - Top End (light)	2437	CCK-1mbps	n/a	n/a	n/a	n/a	0	0	5.60	0.001	2.260		
30 Sep 2021	B7	FFP U4	Side 4 - Bottom End	2437	CCK-1mbps	n/a	n/a	n/a	n/a	0	0	5.60	0.000	1.670		
30 Sep 2021	B9	FFP U4	Back - Bottom Side	2412	CCK-1mbps	n/a	n/a	n/a	n/a	0	0	5.32	0.017	0.440		
30 Sep 2021	B10	FFP U2	Back - Bottom Side	2462	CCK-1mbps	n/a	n/a	n/a	n/a	0	0	5.69	0.021	0.770		
03 Dec 2021	B28	FFP U2	Back - Bottom Side	2462	OFDM-6mbps	n/a	n/a	n/a	n/a	0	0	6.42	0.018	-0.290		
02 Dec 2021	B20	FFP U2	Front - Top Side	2441	ANT-GFSK	n/a	n/a	n/a	n/a	0	0	6.51	0.102	-0.670		
02 Dec 2021	B21	FFP U2	Back - Bottom Side	2441	ANT-GFSK	n/a	n/a	n/a	n/a	0	0	6.51	0.005	2.060		
02 Dec 2021	B22	FFP U2	Side (1)-Button Side	2441	ANT-GFSK	n/a	n/a	n/a	n/a	0	0	6.51	0.208*	0.360		
02 Dec 2021	B23	FFP U2	Side 2-Non Button Side	2441	ANT-GFSK	n/a	n/a	n/a	n/a	0	0	6.51	0.015	4.380		
02 Dec 2021	B24	FFP U2	Side 3 - Top End (light)	2441	ANT-GFSK	n/a	n/a	n/a	n/a	0	0	6.51	0.002	0.430		
03 Dec 2021	B25	FFP U2	Side 4 - Bottom End	2441	ANT-GFSK	n/a	n/a	n/a	n/a	0	0	6.51	0.010	1.540		
03 Dec 2021	B26	FFP U2	Side (1)-Button Side	2402	ANT-GFSK	n/a	n/a	n/a	n/a	0	0	5.83	0.199	-0.160		
03 Dec 2021	B27	FFP U2	Side (1)-Button Side	2480	ANT-GFSK	n/a	n/a	n/a	n/a	0	0	6.09	0.148	-0.020		
<b>SAR Limit</b>						<b>Spatial Peak</b>				<b>Head/Body</b>		<b>RF Exposure Category</b>				
<b>FCC 47 CFR 2.1093</b>						<b>Health Canada Safety Code 6</b>				<b>1 Gram Average</b>		<b>1.6 W/kg</b>		<b>General Population/User Unaware</b>		

\*Although B22 is the highest measured SAR, the highest reported SAR, after scaling, is B26.

## 11.0 SCALING OF MAXIMUM MEASURE SAR

Table 11.1 SAR Scaling - Extremity

Scaling of Maximum Measured SAR (1g)					
Measured Parameters		Configuration			
		Body WiFi	Body ANT	Head	
Plot ID		B28	B26		
Maximum Measured SAR <sub>M</sub>		0.018	0.199		(W/kg)
Frequency		2462	2402		(MHz)
Power Drift		-0.290 (1)	-0.160		(dB)
Conducted Power		6.420	5.830		(dBm)
Fluid Deviation from Target					
Δe	Permittivity	-9.45%	-8.81%		
Δσ	Conductivity	4.42%	3.18%		

Note(1): Power Drift is Positive, Drift Adjustment not Required.

Fluid Sensitivity Calculation (1g)		IEC 62209-2 Annex F		
$\Delta SAR = C_e * \Delta e + C_\sigma * \Delta \sigma$		(F.1)		
$C_e = (-0.0007854 * f^3) + (0.009402 * f^2) - (0.02742 * f) - 0.2026$		(F.2)		
$C_\sigma = (0.009804 * f^3) - (0.08661 * f^2) + (0.02981 * f) + 0.7829$		(F.3)		
f	Frequency (GHz)	2.462	2.402	
C <sub>e</sub>		-0.225	-0.225	
C <sub>σ</sub>		0.478	0.491	
C <sub>e</sub> * Δe		0.021	0.020	
C <sub>σ</sub> * Δσ		0.021	0.016	
ΔSAR		0.042	0.035	(%)

Manufacturer's Tuneup Tolerance					
Measured Conducted Power		6.420	5.830		(dBm)
Rated Conducted Power		6.420	6.510		(dBm)
ΔP		0.000 (4)	-0.680		(dB)

Note(4): SAR was Evaluated at the Maximum Tuneup Tolerance. SAR Adjustment is not Required.

SAR Adjustment for Fluid Sensitivity					
SAR <sub>1</sub> = SAR <sub>M</sub> * ΔSAR		0.018	0.206		(W/kg)

SAR Adjustment for Tuneup Tolerance					
SAR <sub>2</sub> = SAR <sub>1</sub> + [ΔP]		0.018	0.241		(W/kg)

SAR Adjustment for Drift					
SAR <sub>3</sub> = SAR <sub>2</sub> + Drift		0.020	0.250		(W/kg)

reported SAR					
FCC / ISED		0.02	0.25		(W/kg)

The SAR test exclusion threshold for the BLE transmitter as per FCC KDB 447498 4.3.1 is as follows:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \times [\sqrt{f(\text{GHz})}] \leq 7.5 \text{ for 10-g SAR}$$

$$[1.44]/(5) \times [\sqrt{2.480}] = 0.45 \leq 3.0$$


Where:

max. power of channel, including tune-up tolerance, mW = 1.44 mW  
 min. test separation distance, mm = 5mm  
 f(GHz) = 2.480 GHz

Therefore; the BLE Transmitter meets the SAR test exclusion criteria.

NOTE: This device is not capable of simultaneous transmission between the ANT and (WiFi or BLE) transmitters. WiFi and ANY were evaluated for standalone SAR only.

NOTES to Table 11.0	
(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.	
<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 9.1 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.

<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>	 <hr/> <b>Art Voss, P.Eng.</b> <b>Technical Manager</b> <b>Celltech Labs Inc.</b> <hr/> <b>4 January 2022</b> <hr/> Date
---	--





## 12.0 SAR EXPOSURE LIMITS

Table 12.0 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.			

**13.0 DETAILS OF SAR EVALUATION**

**13.0 Day Log**

DAY LOG					Fluid Dielectric	SPC	Test	Task
Date	Ambient Temp (°C)	Fluid Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)				
21 Jul 2021	26.4	24.2	26%	101.5	X	X		2450H Fluid, SPC
22 Jul 2021	23.4	23.2	28%	101.9			X	2450H SAR Testing
28 Sep 2021	25	24.8	34%	101.7	X	X		2450H Fluid, SPC
29 Sep 2021	24	22.8	32%	101.9			X	2450H SAR Testing
30 Sep 2021	27.6	24.1	28%	102.0			X	2450H SAR Testing
02 Dec 2021	25.7	20.7	24%	101.9	X	X	X	2450H Fluid, SPC, SAR Testing
03 Dec 2021	25.7	20.7	24%	101.9			X	2450H SAR Testing

\*Per IEC/IEEE 62209-1528, test series was started within 24 hours of Fluid Parameter Measurement

### 13.1 DUT Setup and Configuration

<b>DUT Setup and Configuration</b>	
1	This device is capable operating while held in the hand or placed on the body. The device was evaluated at a phantom separation distance of 0mm on ALL surfaces using Head Tissue fluid. The DUT was evaluated for SAR in accordance with the procedures described IEC/IEEE 62209-1528, FCC KDB 447498 and ISED RSS-102.
2	The Device was capable of transmitting at various modulations, data rates and duty cycles. The Conducted Power was highest when measured in DSSS Mode-11 Mbps at 100% Duty cycle than any other configuration in the 2.4GHz Band. The DUT was evaluated for SAR at the maximum conducted output power level, preset by the manufacturer.
3	Each SAR evaluation was performed with a fully charged battery.

### 13.2 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>	The DUT was not evaluated 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.
<b>HEAD Configuration</b>	This device was not evaluated to the Held-To-Ear configuration.

### 13.3 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 2.0^{\circ}\text{C}</math> throughout the test series. The liquid parameters shall be measured within 24 hours before the start of a test series and if it takes longer than 48 hours, the liquid parameters shall also be measured at the end of the test series.</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 <i>Maximum Distance to Phantom Surface</i> 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>

### 13.4 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 300ml beaker) method. A sample of the TSL is placed in a 300ml beaker and the open-ended coax is submerged approximately 8mm 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 KDB 865664 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 1g and 10g SAR is measured. The measured 1g and 10g SAR is compared to the 1g and 10g SAR measurements from the validation source's Calibration Certificate. When required, the measured SAR is normalized to 1.0W 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 84 hours or if the Active TSL temperature has exceed <math>\pm 1^\circ\text{C}</math> of the initial fluid analysis.</p>

### 13.5 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>15 mm</b>
Zoom Scan Spatial Resolution $\Delta X, \Delta Y$	<b>7.5 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><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 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	

### 13.6 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	

### 13.7 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	

## 14.0 MEASUREMENT UNCERTAINTIES

Table 14.0 Measurement Uncertainty

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEC/IEEE 62209-1528, Table 9)									
Source of Uncertainty	IEEE 1528 Section	Toler ±%	Prob Dist	Div	c <sub>i</sub>	c <sub>i</sub>	Stand Unct ±%	Stand Unct ±%	V <sub>i</sub> or V <sub>eff</sub>
<b>Measurement System</b>									
EX3DV4 Probe Calibration** (k=1)	E.2.1	6.7	N	1	1	1	6.7	6.7	∞
Axial Isotropy** (k=1)	E.2.2	0.6	R	√3	0.7	0.7	0.2	0.2	∞
Hemispherical Isotropy** (k=1)	E.2.2	3.2	R	√3	0.7	0.7	1.3	1.3	∞
Boundary Effect*	E.2.3	1.0	R	√3	1	1	0.6	0.6	∞
Linearity** (k=1)	E.2.4	0.5	R	√3	1	1	0.3	0.3	∞
System Detection Limits*	E.2.4	1.0	R	√3	1	1	0.6	0.6	∞
Modulation Response** (k=1)	E.2.5	8.3	R	√3	1	1	4.8	4.8	∞
Readout Electronics*	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time*	E.2.7	0.8	R	√3	1	1	0.5	0.5	∞
Integration Time*	E.2.8	2.6	R	√3	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	0.0	R	√3	1	1	0.0	0.0	10
RF Ambient Conditions - Reflection	E.6.1	0.0	R	√3	1	1	0.0	0.0	10
Probe Positioner Mechanical Tolerance*	E.6.2	0.0	R	√3	1	1	0.0	0.0	∞
Probe Positioning wrt Phantom Shell*	E.6.3	0.4	R	√3	1	1	0.2	0.2	∞
Post-processing*	E.5	2.0	R	√3	1	1	1.2	1.2	∞
<b>Test Sample Related</b>									
Test Sample Positioning	E.4.2	2.2	N	1	1	1	2.2	2.2	5
Device Holder Uncertainty*	E.4.1	3.6	N	1	1	1	3.6	3.6	∞
SAR Drift Measurement <sup>(2)</sup>	E.2.9	0.0	R	√3	1	1	0.0	0.0	∞
SAR Power Scaling <sup>(3)</sup>	E.6.5	0.0	R	√3	1	1	0.0	0.0	∞
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty*	E.3.1	6.1	R	√3	1	1	3.5	3.5	∞
SAR Correction Uncertainty	E.3.2	1.6	N	1	1	0.84	1.6	1.3	∞
Liquid Conductivity (measurement)	E.3.3	5.0	N	1	0.78	0.71	3.9	3.6	10
Liquid Permittivity (measurement)	E.3.3	5.0	N	1	0.23	0.26	1.2	1.3	10
Liquid Conductivity (Temperature)	E.3.2	0.4	R	√3	0.78	0.71	0.2	0.2	10
Liquid Permittivity Temperature)	E.3.2	0.2	R	√3	0.23	0.26	0.0	0.0	10
<b>Effective Degrees of Freedom<sup>(1)</sup></b>								<b>V<sub>eff</sub> =</b>	<b>1141</b>
<b>Combined Standard Uncertainty</b>			<b>RSS</b>				<b>11.1</b>	<b>11.0</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>			<b>k=2</b>				<b>22.2</b>	<b>21.9</b>	
<b>Measurement Uncertainty Table in accordance with IEC/IEEE 62209-1528</b>									

(1) The Effective Degrees of Freedom is > 30

Therefore a coverage factor of k=2 represents an approximate confidence level of 95%.

(2) The SAR Value is compensated for Drift

(3) SAR Power Scaling not Required

\* Provided by SPEAG for DASy

\*\* Standard Uncertainty Calibration Data Provided by SPEAG for EX3DEV4 Probe

**Table 14.1 Calculation of Degrees of Freedom**

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



**15.0 FLUID DIELECTRIC PARAMETERS**

**Table 15.1 Fluid Dielectric Parameters 2450MHz HEAD TSL**

```

*****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Wed 21/Jul/2021 13:15:57
Freq Frequency(GHz)
FCC_eHFCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sHFCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
*****

```

Freq	FCC_eHFCC_sH	Test_e	Test_s
2.3500	39.38 1.71	36.26	1.72
2.3600	39.36 1.72	36.14	1.74
2.3700	39.34 1.73	36.23	1.75
2.3800	39.32 1.74	36.02	1.76
2.3900	39.31 1.75	35.94	1.76
2.4000	39.29 1.76	35.98	1.76
2.4100	39.27 1.76	35.94	1.78
2.4200	39.25 1.77	35.87	1.81
2.4300	39.24 1.78	35.69	1.80
2.4400	39.22 1.79	35.71	1.78
2.4500	39.20 1.80	35.74	1.82
2.4600	39.19 1.81	35.77	1.83
2.4700	39.17 1.82	35.73	1.84
2.4800	39.16 1.83	35.67	1.85
2.4900	39.15 1.84	35.53	1.89
2.5000	39.14 1.85	35.62	1.89
2.5100	39.12 1.87	35.60	1.89
2.5200	39.11 1.88	35.56	1.90
2.5300	39.10 1.89	35.35	1.93
2.5400	39.09 1.90	35.33	1.92
2.5500	39.07 1.91	35.35	1.96

FLUID DIELECTRIC PARAMETERS							
Date:	21 Jul 2021	Fluid Temp:	24.2	Frequency:	2450MHz	Tissue:	Head
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	
2350.0000	36.2600	1.7200	39.3800	1.71	-7.92%	0.58%	
2360.0000	36.1400	1.7400	39.3600	1.72	-8.18%	1.16%	
2370.0000	36.2300	1.7500	39.3400	1.73	-7.91%	1.16%	
2380.0000	36.0200	1.7600	39.3200	1.74	-8.39%	1.15%	
2390.0000	35.9400	1.7600	39.3100	1.75	-8.57%	0.57%	
2400.0000	35.9800	1.7600	39.2900	1.76	-8.42%	0.00%	
2410.0000	35.9400	1.7800	39.2700	1.76	-8.48%	1.14%	
2420.0000	35.8700	1.8100	39.2500	1.77	-8.61%	2.26%	
2430.0000	35.6900	1.8000	39.2400	1.78	-9.05%	1.12%	
2440.0000	35.7100	1.7800	39.2200	1.79	-8.95%	-0.56%	
2450.0000	35.7400	1.8200	39.2000	1.80	-8.83%	1.11%	
2460.0000	35.7700	1.8300	39.1900	1.81	-8.73%	1.10%	
2462.0000	* 35.7620	1.8320	39.1860	1.81	-8.74%	1.22%	
2470.0000	35.7300	1.8400	39.1700	1.82	-8.78%	1.10%	
2480.0000	35.6700	1.8500	39.1600	1.83	-8.91%	1.09%	
2490.0000	35.5300	1.8900	39.1500	1.84	-9.25%	2.72%	
2500.0000	35.6200	1.8900	39.1400	1.85	-8.99%	2.16%	
2510.0000	35.6000	1.8900	39.1200	1.87	-9.00%	1.07%	
2520.0000	35.5600	1.9000	39.1100	1.88	-9.08%	1.06%	
2530.0000	35.3500	1.9300	39.1000	1.89	-9.59%	2.12%	
2540.0000	35.3300	1.9200	39.0900	1.90	-9.62%	1.05%	
2550.0000	35.3500	1.9600	39.0700	1.91	-9.52%	2.62%	

\*Channel Frequency Tested

**Table 15.2 Fluid Dielectric Parameters 2450MHz HEAD TSL**

```

*****
                Aprel Laboratory
                Test Result for UIM Dielectric Parameter
                Tue 28/Sep/2021 17:01:23
                Freq   Frequency(GHz)
                FCC_eHFCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
                FCC_sHFCC OET 65 Supplement C (June 2001) Limits for Head Sigma
                Test_e  Epsilon of UIM
                Test_s  Sigma of UIM
*****

```

Freq	FCC_eHFCC_sH	Test_e	Test_s
2.3000	39.47 1.67	36.73	1.62
2.3100	39.45 1.68	36.58	1.61
2.3200	39.43 1.68	36.51	1.65
2.3300	39.41 1.69	36.56	1.65
2.3400	39.40 1.70	36.53	1.66
2.3500	39.38 1.71	36.57	1.66
2.3600	39.36 1.72	36.49	1.67
2.3700	39.34 1.73	36.51	1.66
2.3800	39.32 1.74	36.28	1.67
2.3900	39.31 1.75	36.39	1.70
2.4000	39.29 1.76	36.42	1.69
2.4100	39.27 1.76	36.37	1.72
2.4200	39.25 1.77	36.44	1.74
2.4300	39.24 1.78	36.43	1.75
2.4400	39.22 1.79	36.41	1.76
2.4500	39.20 1.80	36.29	1.75
2.4600	39.19 1.81	36.11	1.80
2.4700	39.17 1.82	36.30	1.76
2.4800	39.16 1.83	36.12	1.80
2.4900	39.15 1.84	36.22	1.79
2.5000	39.14 1.85	36.05	1.82

### FLUID DIELECTRIC PARAMETERS

Date:	28 Sep 2021	Fluid Temp:	24.8	Frequency:	2450MHz	Tissue:	Head
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	
2300.0000		36.7300	1.6200	39.4700	1.67	-6.94%	-2.99%
2310.0000		36.5800	1.6100	39.4500	1.68	-7.28%	-4.17%
2320.0000		36.5100	1.6500	39.4300	1.68	-7.41%	-1.79%
2330.0000		36.5600	1.6500	39.4100	1.69	-7.23%	-2.37%
2340.0000		36.5300	1.6600	39.4000	1.70	-7.28%	-2.35%
2350.0000		36.5700	1.6600	39.3800	1.71	-7.14%	-2.92%
2360.0000		36.4900	1.6700	39.3600	1.72	-7.29%	-2.91%
2370.0000		36.5100	1.6600	39.3400	1.73	-7.19%	-4.05%
2380.0000		36.2800	1.6700	39.3200	1.74	-7.73%	-4.02%
2390.0000		36.3900	1.7000	39.3100	1.75	-7.43%	-2.86%
2400.0000		36.4200	1.6900	39.2900	1.76	-7.30%	-3.98%
2410.0000		36.3700	1.7200	39.2700	1.76	-7.38%	-2.27%
2412.0000	*	36.3840	1.7240	39.2660	1.76	-7.34%	-2.16%
2420.0000		36.4400	1.7400	39.2500	1.77	-7.16%	-1.69%
2430.0000		36.4300	1.7500	39.2400	1.78	-7.16%	-1.69%
2437.0000	*	36.4160	1.7570	39.2260	1.79	-7.16%	-1.68%
2440.0000		36.4100	1.7600	39.2200	1.79	-7.16%	-1.68%
2450.0000		36.2900	1.7500	39.2000	1.80	-7.42%	-2.78%
2460.0000		36.1100	1.8000	39.1900	1.81	-7.86%	-0.55%
2462.0000	*	36.1480	1.7920	39.1860	1.81	-7.75%	-1.10%
2470.0000		36.3000	1.7600	39.1700	1.82	-7.33%	-3.30%
2472.0000	*	36.2640	1.7680	39.1680	1.82	-7.41%	-2.96%
2480.0000		36.1200	1.8000	39.1600	1.83	-7.76%	-1.64%
2490.0000		36.2200	1.7900	39.1500	1.84	-7.48%	-2.72%
2500.0000		36.0500	1.8200	39.1400	1.85	-7.89%	-1.62%

\*Channel Frequency Tested

**Table 15.3 Fluid Dielectric Parameters 2450MHz HEAD TSL**

```

*****
                Aprel Laboratory
                Test Result for UIM Dielectric Parameter
                Wed 02/Dec/2021 9:02:31
                Freq   Frequency(GHz)
                FCC_eHFCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
                FCC_sHFCC OET 65 Supplement C (June 2001) Limits for Head Sigma
                Test_e  Epsilon of UIM
                Test_s  Sigma of UIM
*****

```

Freq	FCC_eHFCC_sH	Test_e	Test_s
2.3500	39.38 1.71	36.19	1.77
2.3600	39.36 1.72	35.98	1.75
2.3700	39.34 1.73	35.92	1.78
2.3800	39.32 1.74	35.85	1.78
2.3900	39.31 1.75	35.92	1.79
2.4000	39.29 1.76	35.87	1.81
2.4100	39.27 1.76	35.65	1.84
2.4200	39.25 1.77	35.63	1.85
2.4300	39.24 1.78	35.55	1.86
2.4400	39.22 1.79	35.72	1.86
2.4500	39.20 1.80	35.50	1.87
2.4600	39.19 1.81	35.47	1.89
2.4700	39.17 1.82	35.54	1.90
2.4800	39.16 1.83	35.34	1.93
2.4900	39.15 1.84	35.27	1.91
2.5000	39.14 1.85	35.25	1.92
2.5100	39.12 1.87	35.48	1.94
2.5200	39.11 1.88	35.24	1.96
2.5300	39.10 1.89	35.18	1.96
2.5400	39.09 1.90	35.04	1.96
2.5500	39.07 1.91	34.95	1.97

FLUID DIELECTRIC PARAMETERS							
Date:	2 Dec 2021	Fluid Temp:	20.7	Frequency:	2450MHz	Tissue:	Head
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	
2350.0000		36.1900	1.7700	39.3800	1.71	-8.10%	3.51%
2360.0000		35.9800	1.7500	39.3600	1.72	-8.59%	1.74%
2370.0000		35.9200	1.7800	39.3400	1.73	-8.69%	2.89%
2380.0000		35.8500	1.7800	39.3200	1.74	-8.83%	2.30%
2390.0000		35.9200	1.7900	39.3100	1.75	-8.62%	2.29%
2400.0000		35.8700	1.8100	39.2900	1.76	-8.70%	2.84%
2402.0000	*	35.8260	1.8160	39.2860	1.76	-8.81%	3.18%
2410.0000		35.6500	1.8400	39.2700	1.76	-9.22%	4.55%
2420.0000		35.6300	1.8500	39.2500	1.77	-9.22%	4.52%
2430.0000		35.5500	1.8600	39.2400	1.78	-9.40%	4.49%
2440.0000		35.7200	1.8600	39.2200	1.79	-8.92%	3.91%
2441.0000	*	35.6760	1.8620	39.2160	1.79	-9.03%	4.02%
2450.0000		35.5000	1.8700	39.2000	1.80	-9.44%	3.89%
2460.0000		35.4700	1.8900	39.1900	1.81	-9.49%	4.42%
2470.0000		35.5400	1.9000	39.1700	1.82	-9.27%	4.40%
2480.0000	*	35.3400	1.9300	39.1600	1.83	-9.75%	5.46%
2490.0000		35.2700	1.9100	39.1500	1.84	-9.91%	3.80%
2500.0000		35.2500	1.9200	39.1400	1.85	-9.94%	3.78%
2510.0000		35.4800	1.9400	39.1200	1.87	-9.30%	3.74%
2520.0000		35.2400	1.9600	39.1100	1.88	-9.90%	4.26%
2530.0000		35.1800	1.9600	39.1000	1.89	-10.03%	3.70%
2540.0000		35.0400	1.9600	39.0900	1.90	-10.36%	3.16%
2550.0000		34.9500	1.9700	39.0700	1.91	-10.55%	3.14%

\*Channel Frequency Tested

## 16.0 SYSTEM VERIFICATION TEST RESULTS

Table 16.1 System Verification Results 2450MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N	S/N	
21 Jul 2021		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	24.2	26	26%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
35.74	39.20	-8.83%	1.82	1.80	1.11%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
13.60	13.18	3.19%	6.18	6.01	2.91%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
54.40	52.72	3.19%	24.72	24.02	2.94%
<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 16.2 System Verification Results 2450MHz HEAD TSL**

<b>System Verification Test Results</b>					
Date		Frequency (MHz)	Validation Source		
			P/N	S/N	
28 Sep 2021		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	24.8	25	34%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
36.29	39.20	-7.42%	1.75	1.80	-2.78%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
14.00	13.18	6.22%	6.38	6.01	6.24%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
56.00	52.72	6.22%	25.52	24.02	6.27%
<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 16.3 System Verification Results 2450MHz HEAD TSL**

<b>System Verification Test Results</b>					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
02 Dec 2021		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	20.7	26	24%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
35.50	39.20	-9.44%	1.87	1.80	3.89%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
14.40	13.18	9.26%	6.60	6.01	9.91%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
57.60	52.72	9.26%	26.40	24.02	9.93%
<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>					

**17.0 SYSTEM VALIDATION SUMMARY**

Table 17.0 System Validation Summary

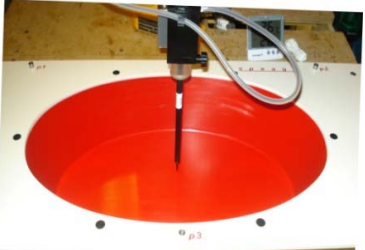

System Validation Summary											
Frequency (MHz)	Validation Date	Probe Model	Probe S/N	Validation Source	Source S/N	Tissue	Tissue Dielectrics		Validation Results		
							Permittivity	Conductivity	Sensitivity	Linearity	Isotropy
30	31-May-19	EX3DV4	3600	CLA-30	1005	Head	52.40	0.75	Pass	Pass	Pass
150	20-May-20	EX3DV4	3600	CLA-150	4007	Head	52.59	0.76	Pass	Pass	Pass
450	12-Aug-20	EX3DV4	3600	D450V3	1068	Head	43.64	0.84	Pass	Pass	Pass
750	20-Jun-19	EX3DV4	3600	D750V3	1061	Head	44.27	0.83	Pass	Pass	Pass
835	17-Aug-20	EX3DV4	3600	D835V2	4d075	Head	40.60	0.87	Pass	Pass	Pass
900	20-Aug-20	EX3DV4	3600	D900V2	045	Head	39.09	0.94	Pass	Pass	Pass
1640	5-Jul-18	EX3DV4	3600	1620-S-2	207-00102	Head	39.87	1.27	Pass	Pass	Pass
1800	18-Jun-19	EX3DV4	3600	D1800V2	247	Head	54.77	1.53	Pass	Pass	Pass
2450	29-Jun-21	EX3DV4	3600	D2450V2	825	Head	38.53	1.85	Pass	Pass	Pass
5250	25-May-21	EX3DV4	3600	D5GHzV2	1031	Head	33.74	4.9	Pass	Pass	Pass
5750	28-May-21	EX3DV4	3600	D5GHzV2	1031	Head	34.99	5.10	Pass	Pass	Pass

## 18.0 MEASUREMENT SYSTEM SPECIFICATIONS

Table 18.0 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 V10.2(1504) Postprocessing Software: SEMCAD X, V14.6.12(7470)
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

**Table 18.1**

<b>Measurement System Specification (Continued)</b>		
<u>Probe Specification</u>		
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>
<u>Phantom Specification</u>		
<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, IEC/IEEE 62209-1528, IEC 62209-1 and IEC 62209-2.</p>		
		<b>ELI Phantom</b>
<u>Device Positioner Specification</u>		
<p>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°. 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>		
		<b>Device Positioner</b>

## 19.0 TEST EQUIPMENT LIST

**Table 19.0 Equipment List and Calibration**

Test Equipment List				
DESCRIPTION	ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION DUE
Schmid & Partner DASY 6 System	-	-	-	-
-DASY Measurement Server	00158	1078	CNR	CNR
-Robot	00046	599396-01	CNR	CNR
-DAE4	00019	353	22-Apr-21	22-Apr-22
-EX3DV4 E-Field Probe	00213	3600	20-Apr-21	20-Apr-22
-CLA 30 Validation Dipole	00300	1005	18-Mar-20	18-Mar-23
-CLA150 Validation Dipole	00251	4007	18-Mar-20	18-Mar-23
-D450V3 Validation Dipole	00221	1068	27-Apr-21	27-Apr-24
-D750V3 Validation Dipole	00238	1061	21-Mar-19	21-Mar-22
-D835V2 Validation Dipole	00217	4D075	27-Apr-21	27-Apr-24
-D900V2 Validation Dipole	00020	54	16-Mar-20	16-Mar-23
ALS-D-01640-S-2	00299	207-00102	15-Dec-20	15-Dec-23
-D1800V2 Validation Dipole	00222	247	16-Mar-20	16-Mar-23
-D1900V2 Validation Dipole	00218	5d107	16-Mar-20	16-Mar-23
ALS-D-2300-S-2	00328	218-00201	26-Feb-19	26-Feb-22
-D2450V2 Validation Dipole	00219	825	24-Apr-21	24-Apr-24
ALS-D-2600-S-2	00327	225-00926	26-Feb-19	26-Feb-22
-D5GHzV2 Validation Dipole	00126	1031	27-Apr-21	27-Apr-24
ELI Phantom	00247	1234	CNR	CNR
SAM Phantom	00154	1033	CNR	CNR
HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
Gigatronics 8652A Power Meter	00007	1835801	26-Mar-19	26-Mar-22
Gigatronics 80701A Power Sensor	00186	1837002	COU	COU
Gigatronics 80334A Power Sensor	00237	1837001	26-Mar-19	26-Mar-22
HP 8753ET Network Analyzer	00134	US39170292	6-Jan-21	6-Jan-24
Rohde & Schwarz SMR20 Signal Generator	00006	100104	11-Aug-20	11-Aug-23
Amplifier Research 10W1000C Power Amplifier	00041	27887	CNR	CNR
Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Narda Directional Coupler 3020A	00064	-	CNR	CNR
Kangaroo VWR Humidity/Thermometer	00334	192385455	5-Aug-19	6-Aug-22
Digital Multi Meter DMR-1800	00250	TE182	23-Jun-20	23-Jun-23
Bipolar Power Supply 6299A	00086	1144A02155	CNR	CNR
DC-18G 10W 30db Attenuator	00102	-	COU	COU
R&S FSP40 Spectrum Analyzer	00241	100500	9-Aug-21	9-Aug-24
HP 8566B Spectrum Analyzer	00051	2747A055100	29-Jun-20	29-Jun-23
RF Cable-SMA	00311	-	CNR	CNR
HP Calibration Kit	00145	-	CNR	CNR

CNR = Calibration Not Required

COU = Calibrate on Use

Note: Per KDB 865664, Dipoles are evaluated annually for return loss and impedance. The dipole's SAR target can only be assessed by the SAR equipment manufacturer and remains the target until the dipole is recalibrated by the manufacturer. The dipole's SAR is evaluated and compared to this target during each and every System Verification which is performed prior to and/or during each DUT SAR evaluation. The results of these verifications are shown in Section 16.0

## 20.0 FLUID COMPOSITION

Table 20.0 Fluid Composition 2450MHz HEAD TSL

Table 20.0				
Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Glycol	Salt <sup>(1)</sup>	HEC <sup>(2)</sup>	Bacteriacide <sup>(3)</sup>
52.0	48.0	0.0	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

**DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:825**  
**Procedure Name: SPC 2450H Input=250mw, Target=[11.86][13.18][14.498]W/kg 2**

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.82$  S/m;  $\epsilon_r = 35.74$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section

Date/Time: 7/21/2021 2:27:54 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.45, 6.45, 6.45) @ 2450 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

**SPC/SPC 2450H Input=250mw, Target=[11.86][13.18][14.498]W/kg 2/Area Scan (4x9x1):** Measurement grid:

dx=12mm, dy=12mm

Maximum value of SAR (measured) = 12.8 W/kg

**SPC/SPC 2450H Input=250mw, Target=[11.86][13.18][14.498]W/kg 2/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:

dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.57 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 29.5 W/kg

**SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.18 W/kg**

Smallest distance from peaks to all points 3 dB below = 10.4 mm

Ratio of SAR at M2 to SAR at M1 = 47.3%

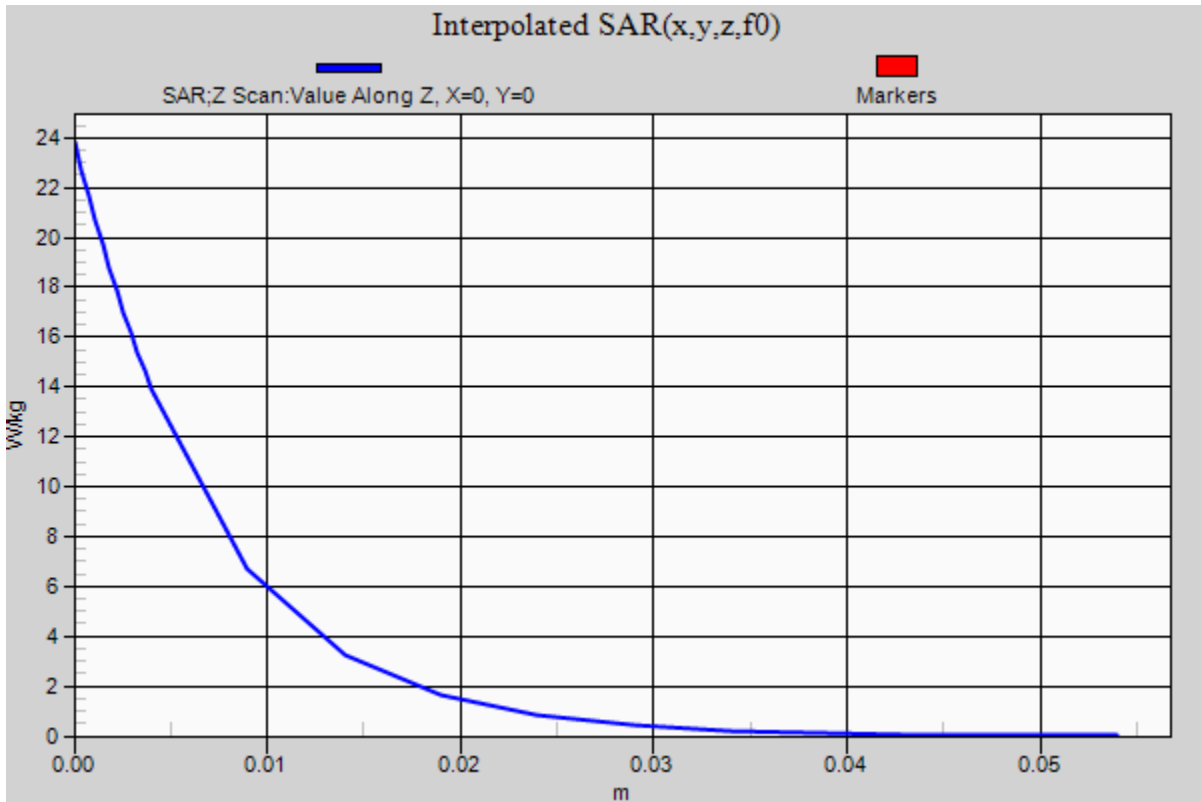
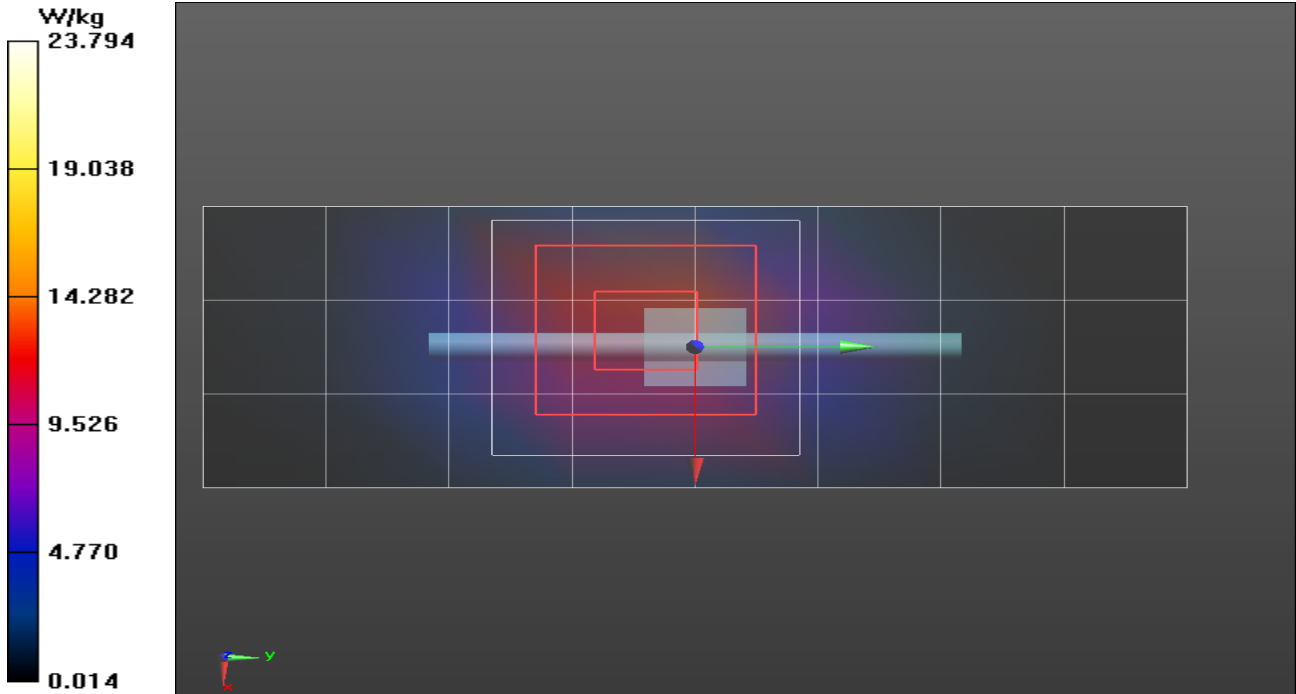
Maximum value of SAR (measured) = 15.3 W/kg

**SPC/SPC 2450H Input=250mw, Target=[11.86][13.18][14.498]W/kg 2/Z Scan (1x1x22):** Measurement grid: dx=20mm,

dy=20mm, dz=5mm

Penetration depth = 6.939 (6.796, 7.151) [mm]

Maximum value of SAR (interpolated) = 23.8 W/kg





**DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:825**  
**Procedure Name: SPC 2450H Input=250mw, Target=[11.86]13.18][14.50]W/kg**

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.75$  S/m;  $\epsilon_r = 36.29$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section

Date/Time: 9/28/2021 5:21:00 PM

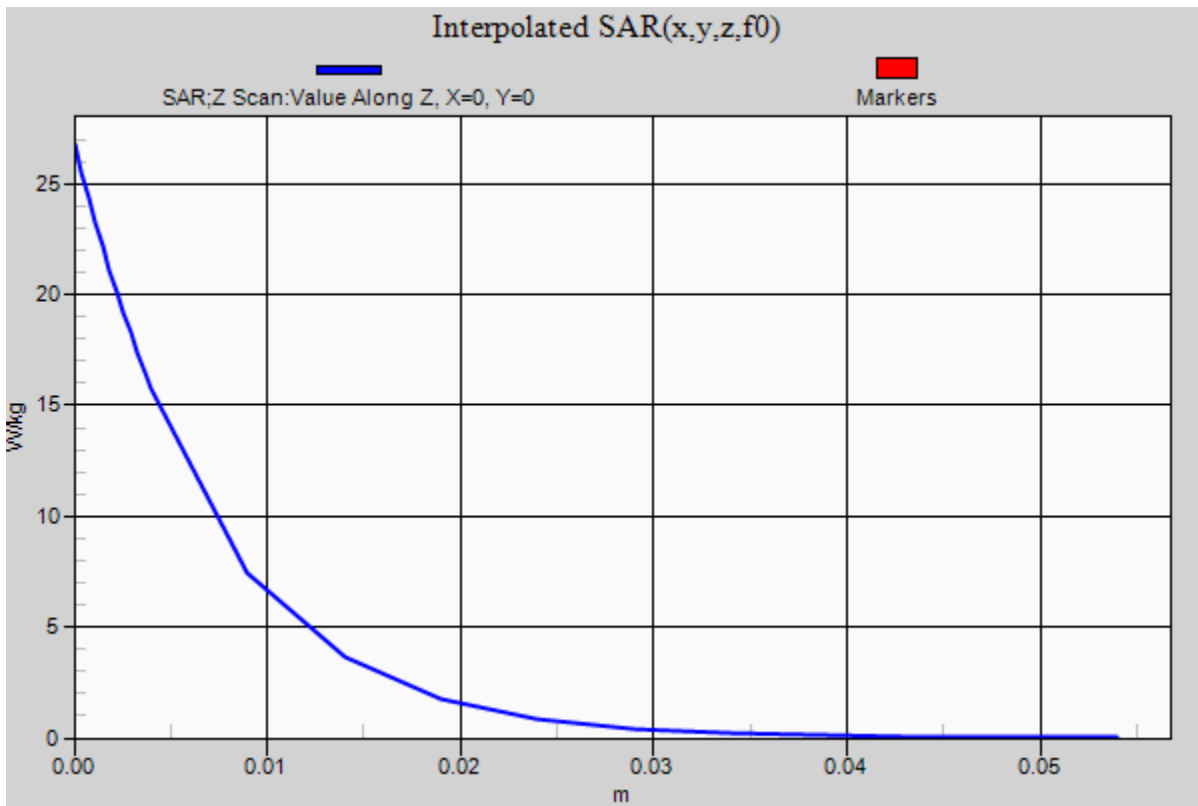
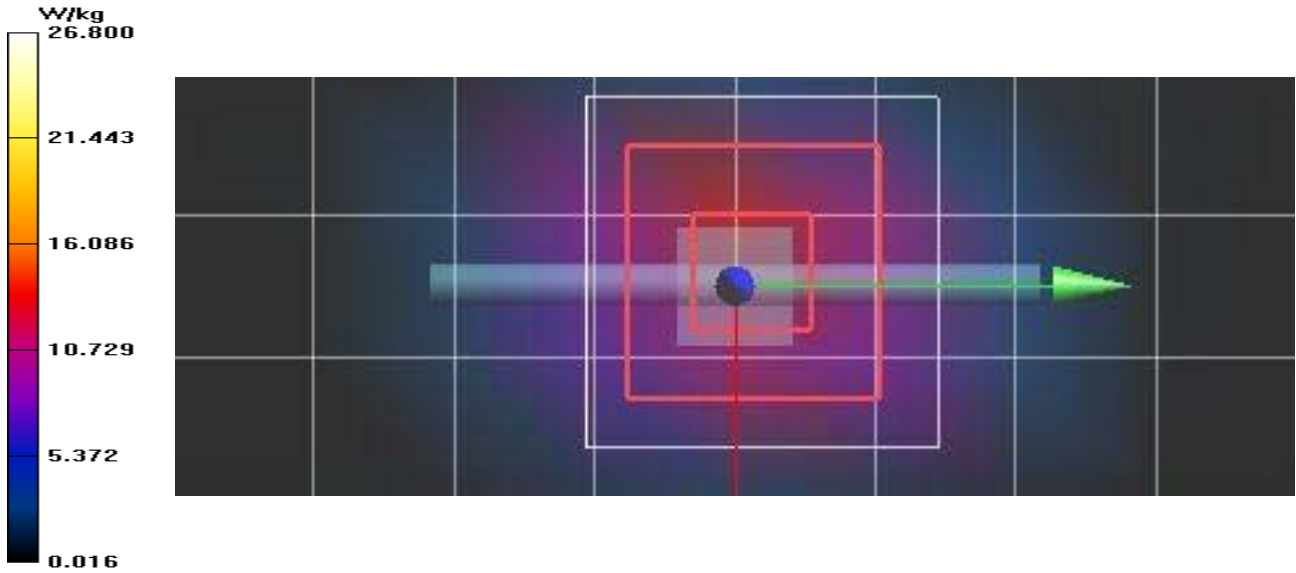
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.45, 6.45, 6.45) @ 2450 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

**SPC/SPC 2450H Input=250mw, Target=[11.86]13.18][14.50]W/kg/Area Scan (4x9x1):** Measurement grid: dx=12mm, dy=12mm  
Maximum value of SAR (measured) = 13.6 W/kg

**SPC/SPC 2450H Input=250mw, Target=[11.86]13.18][14.50]W/kg/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 95.15 V/m; Power Drift = 0.02 dB  
Peak SAR (extrapolated) = 30.3 W/kg  
**SAR(1 g) = 14 W/kg; SAR(10 g) = 6.38 W/kg**  
Smallest distance from peaks to all points 3 dB below = 10.4 mm  
Ratio of SAR at M2 to SAR at M1 = 47.2%  
Maximum value of SAR (measured) = 15.9 W/kg

**SPC/SPC 2450H Input=250mw, Target=[11.86]13.18][14.50]W/kg/Z Scan (1x1x22):** Measurement grid: dx=20mm, dy=20mm, dz=5mm  
Penetration depth = 6.949 (6.698, 7.075) [mm]  
Maximum value of SAR (interpolated) = 26.8 W/kg



**DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:825**  
**Procedure Name: SPC 2450H\_Input=250mw, Target=[11.86]13.18][14.50]W/kg**

Communication System: UID 0, CW (0); Frequency: 2450 MHz; Duty Cycle: 1:1  
Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.87$  S/m;  $\epsilon_r = 35.5$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section

Date/Time: 12/2/2021 10:27:39 AM

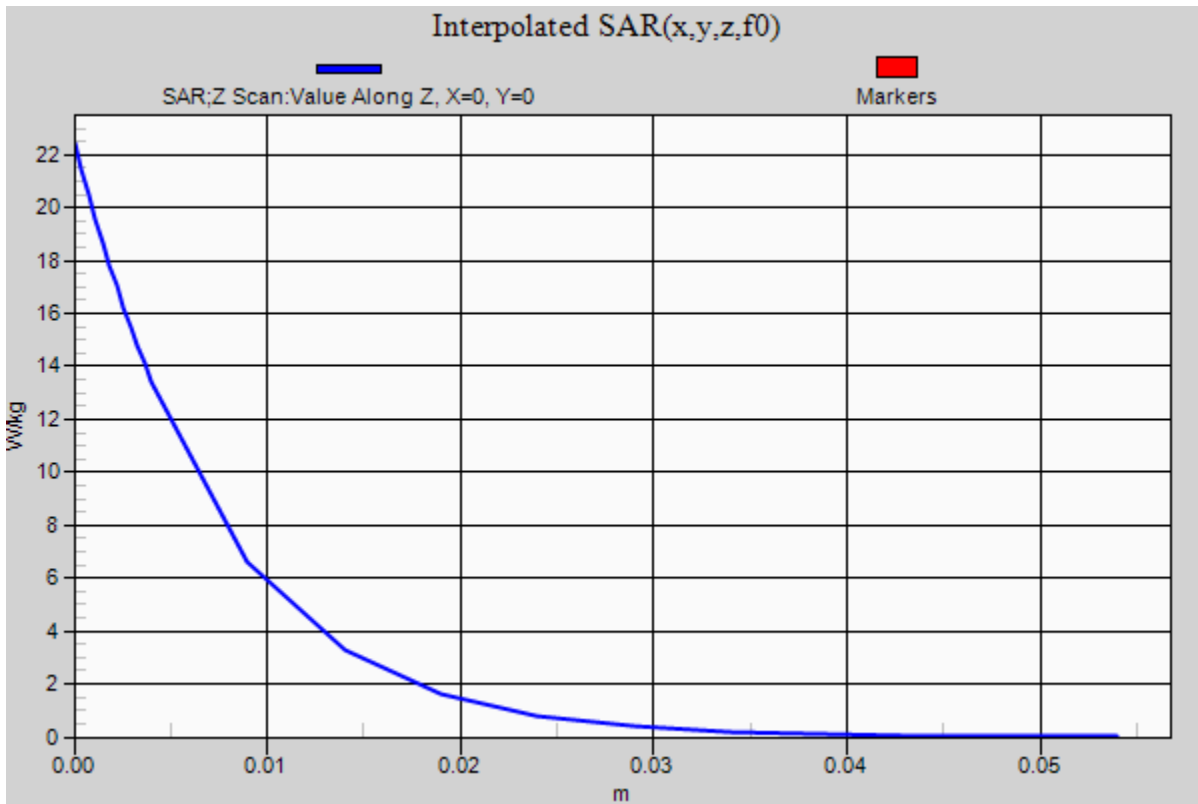
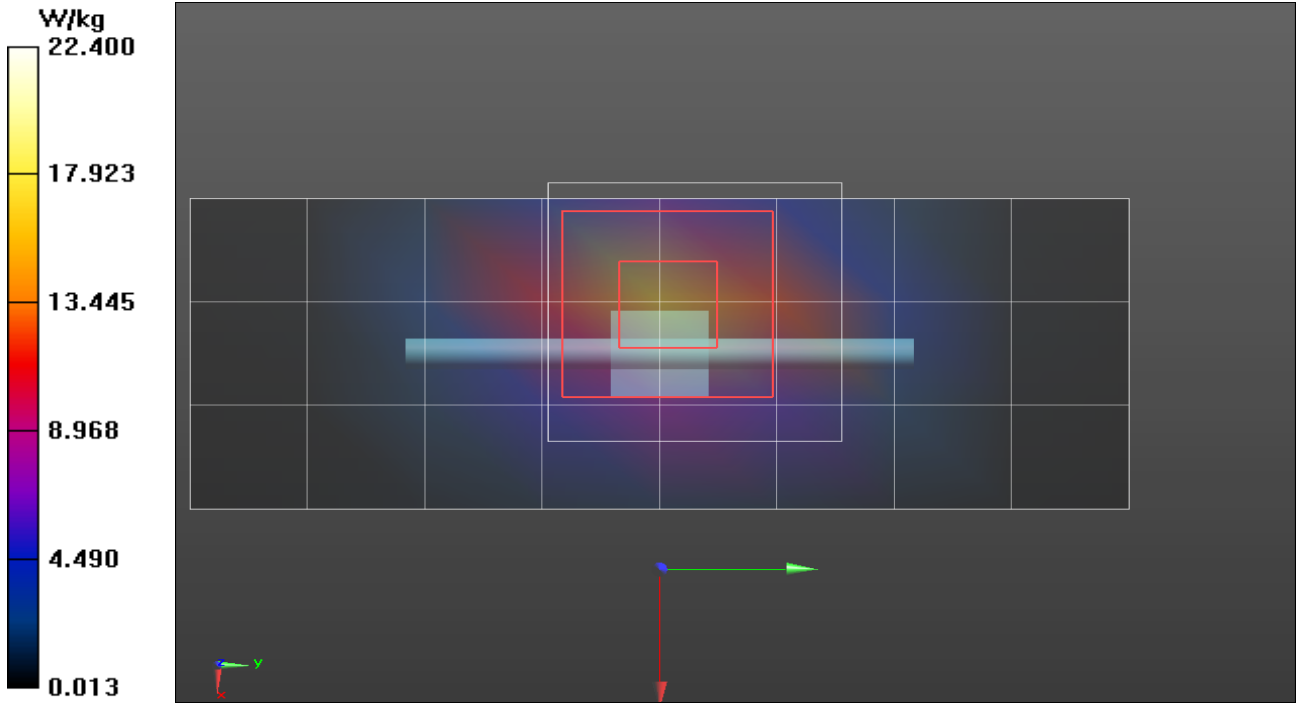
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.45, 6.45, 6.45) @ 2450 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: Twin-SAM V4.0 (30deg probe tilt); Type: QD 000 P40 CC; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

**SPC/SPC 2450H\_Input=250mw, Target=[11.86]13.18][14.50]W/kg/Area Scan (4x9x1):** Measurement grid: dx=12mm, dy=12mm  
Maximum value of SAR (measured) = 16.3 W/kg

**SPC/SPC 2450H\_Input=250mw, Target=[11.86]13.18][14.50]W/kg/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 84.91 V/m; Power Drift = 0.08 dB  
Peak SAR (extrapolated) = 32.1 W/kg  
**SAR(1 g) = 14.4 W/kg; SAR(10 g) = 6.60 W/kg**  
Smallest distance from peaks to all points 3 dB below = 10 mm  
Ratio of SAR at M2 to SAR at M1 = 46.4%  
Maximum value of SAR (measured) = 16.2 W/kg

**SPC/SPC 2450H\_Input=250mw, Target=[11.86]13.18][14.50]W/kg/Z Scan (1x1x22):** Measurement grid: dx=20mm, dy=20mm, dz=5mm  
Penetration depth = 7.191 (7.026, 7.143) [mm]  
Maximum value of SAR (interpolated) = 22.4 W/kg



## APPENDIX B – MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

**DUT: A04247; Type: Transmitter; Serial: FFP U2**  
**Procedure Name: B26-A04247, Body-Button Side, 2402 GFSK Ant**

Communication System: UID 0, CW (0); Frequency: 2402 MHz; Duty Cycle: 1:1  
Medium parameters used (interpolated):  $f = 2402$  MHz;  $\sigma = 1.816$  S/m;  $\epsilon_r = 35.826$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
Phantom section: Flat Section

Date/Time: 12/3/2021 9:57:07 AM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.45, 6.45, 6.45) @ 2402 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: Twin-SAM V4.0 (30deg probe tilt); Type: QD 000 P40 CC; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

**2450H/B26-A04247, Body-Button Side, 2402 GFSK Ant/Area Scan (6x12x1):** Measurement grid: dx=12mm, dy=12mm

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

Maximum value of SAR (measured) = 0.201 W/kg

**2450H/B26-A04247, Body-Button Side, 2402 GFSK Ant/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.106 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 0.546 W/kg

**SAR(1 g) = 0.199 W/kg; SAR(10 g) = 0.073 W/kg**

Smallest distance from peaks to all points 3 dB below = 6.3 mm

Ratio of SAR at M2 to SAR at M1 = 40.4%

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

Maximum value of SAR (measured) = 0.244 W/kg

**2450H/B26-A04247, Body-Button Side, 2402 GFSK Ant/Z Scan (1x1x19):** Measurement grid: dx=20mm, dy=20mm, dz=20mm

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

Penetration depth = n/a (n/a, 6.380) [mm]

Maximum value of SAR (interpolated) = 0.208 W/kg

