Celltech
Testing and Engineering Services Lab

Test Report Serial Number:	45461701 R2.0
Test Report Date:	22 December 2021
Project Number:	1556

SAR Test Report - Class II Permissive Change

Applicant:

clarius

Clarius Mobile Health Corp
350-3605 Gilmore Way
Burnaby, BC, V5G 4X5
Canada

Maximum Reported 1g SAR			
FCC / ISED	DTS BODY:	<0.1	W/kg
	NII BODY:	<0.1	
General Pop. Limit:		1.60	

Maximum Reported 10g SAR			
FCC / ISED	DTS Extremity:	0.82	W/kg
	NII Extremity:	0.22	
General Pop. Limit:		4.00	

FCC ID:
2AWLS-CUSMOD1

IC Registration Number
26188-CUSMOD1

Product Model Number / HVIN
CUSMOD1

Product Name / PMN
Clarius Module

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

ilac-MRA ACCREDITED
Test Lab Certificate: 2470.01

Industry Canada
IC Registration 3874A

FC
FCC Registration: CA3874

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1.0 DOCUMENT CONTROL

Revision History				
Samples Tested By:	Ben Hewson, Trevor Whillock	**Date(s) of Evaluation:**		5 Oct - 30 Oct, 2021
Report Prepared By:	Art Voss, P.Eng.	**Report Reviewed By:**		Ben Hewson
Report Revision	**Description of Revision**	**Revised Section**	**Revised By**	**Revision Date**
0.1	Draft	n/a	Art Voss	10 December 2021
1.0	Initial Release	n/a	Art Voss	17 December 2021
2.0	Revised to Include NII SAR	Cover 10, 11	Art Voss	22 December 2021

2.0 CLIENT AND DEVICE INFORMATION

Client Information		
Applicant Name	**Clarius Mobile Health Corp**	
Applicant Address	350-3605 Gilmore Way	
	Burnaby, BC, V5G 4X5	
	Canada	
DUT Information		
Device Identifier(s):	**FCC ID:**	**2AWLS-CUSMOD1**
	IC:	**26188-CUSMOD1**
Module Product Marketing Name / PMN:	Clarius Module	
Module Model Number / HVIN:	CUSMOD1	
Host Marketing Name / HMN:	Clarius Scanner	
Host Model Number(s) / HVIN	L7 HD, L7VET HD, L7 HD3, L7VET HD3	
	C3 HD, C3VET HD, C3 HD3, C3VET HD3	
	C7 HD, C7VET HD, C7 HD3, C7VET HD3	
	L15 HD, L20 HD, L15 HD3, L20 HD3	
	EC7 HD, PA HD, EC7 HD3, PA HD3	
	3DC3	
FCC Equipment Class:	Digital Transmission System (DTS) FCC Part 15	
	Spread Spectrum Transmitter (DSS) FCC Part 15	
	Digital Transmission System (DTS) FCC Part 15, RSS 247	
	Unlicensed National Information Infrastructure (NII) FCC Part 15	
	Modular Approval	
ISED	Spread Spectrum/Digital Device (2400–2483.5 MHz), RSS-247	
	Spread Spectrum/Digital Device (2400–2483.5 MHz), RSS-210	
	Spread Spectrum/Digital Device (5725-5850MHz), RSS-210	
	WiFi Device, RSS-247	
	Modular Approval	
Transmit Frequency Range:	DTS, Spread Spectrum/Digital Device: 2412-2462MHz	
	DTS, Spread Spectrum/Digital Device: 2402-2480MHz	
	DSS, Spread Spectrum/Digital Device: 2402-2480MHz	
	U-NII, WiFi Device: 5180-5320MHz, 5745-5825MHz	
Number of Channels:	Programmable	
Manuf. Max. Rated Output Power:	DTS, Spread Spectrum/Digital Device: 2412-2462MHz: **23.7dBm (0.2432W)**	
	DTS, Spread Spectrum/Digital Device: 2402-2480MHz: **7.0dBm (0.0049W)**	
	DSS, Spread Spectrum/Digital Device: 2402-2480MHz: **11.6dBm (0.0146W)**	
	U-NII, WiFi Device: 5180-5320MHz: **17dBm (0.0525W)**	
	U-NII, WiFi Device: 5745-5825MHz: **18.4dBm (0.0698W)**	
DUT Power Source:	Rechargeable Li-Ion,	
Deviation(s) from standard/procedure:	None	
Modification of DUT:	None	

3.0 SCOPE OF EVALUATION

This Certification Report was prepared on behalf of:

Clarius Mobile Health Corp

,(the '*Applicant*"), in accordance with the applicable Federal Communications Commission (FCC) CFR 47 and Innovation, Scientific and Economic Development (ISED) Canada rules parts and regulations (the '*Rules*'). The scope of this investigation was limited to only the equipment, devices and accessories (the '*Equipment*') supplied by the *Applicant*. The tests and measurements performed on this *Equipment* were only those set forth in the applicable *Rules* and/or the Test and Measurement Standards they reference. The *Rules* applied and the Test and Measurement Standards used during this evaluation appear in the Normative References section of this report. The limits set forth in the technical requirements of the applicable *Rules* were applied to the measurement results obtained during this evaluation and ,unless otherwise noted, these limits were used as the Pass/Fail criteria. The Pass/Fail statements made in this report apply to only the tests and measurements performed on only the *Equipment* tested during this evaluation. Where applicable and permissible, information including test and measurement data and/or results from previous evaluations of same or similar equipment, devices and/or accessories may be cited in this report.

Equipment Description

The CUSMOD1 is a certified single module containing 2.4GHz and 5GHz WiFi and 2.4GHz BlueTooth transmitters. The module is currently integrated into the following host model numbers/HVINs:

L7 HD, L7VET HD

C3 HD, C3VET HD

C7 HD, C7VET HD

L5 HD, L20 HD

EC7 HD, PA HD

The module is being integrated into the following host model numbers/HVINs:

L7 HD3, L7VET HD3

C3 HD3, C3VET HD3

C7 HD3, C7VET HD3

L5 HD3, L20 HD3

EC7 HD3, PA HD3

3DC3

The Clarius HD3 Series hosts *(Equipment)* are portable Medical and Veterinarian ultrasound devices which stream video data via WiFi to another WiFi connected device. The *Equipment* is handheld by the operator while in contact with a patient. The *Equipment* ceases to transmit when the ultrasound transducer element is no longer in contact with the patient. Since the *Equipment* is both handheld (the operator) and in contact with the body (the patient), two RF exposure conditions exist, Extremity and Body. The separation distance between the radiating element and the patient is no less than 100mm. The BlueTooth transmitter is used for a very brief credential and configuration exchange lasting no longer than 10 seconds after which it no longer transmits. The WiFi and Bluetooth transmitters do not simultaneous transmit. The 2.4GHz WiFi and 5GHz WiFi transmitters do not simultaneously transmit.

The Clarius HD3 Series hosts *(Equipment)* are all identical in all aspects of RF circuitry, transmit power, antenna configuration and physical size with the exception of the ultrasound transducer element. The Clarius HD3 Series hosts vary from the HD Series hosts as follows:

Form Factor: The HD3 Series is slightly different than the HD Series.

Battery: The HD3 Series battery is integrated into the device, the HD Series battery was removable.

Antenna: The HD3 Series antenna has modified from the HD Series to improve efficiency while maintaining the same gain.

Note: The CUSMOD1 module has not modified in any manner.

Application:

This is an application for a Class II Permissive Change to add the above HD3 Series hosts to the existing module grant.

Regulatory Requirement:

Due to the variations between the HD Series hosts and the HD3 Series hosts, as per FCC KDB 178919 D01v06r04 - Permissive Change Policy and FCC 47 CFR §2.1093, an RF Exposure (SAR) evaluation report is required for this *Equipment* and the results of the RF Exposure (SAR) evaluation appear in this report.

Scope:

The scope of this evaluation is to evaluate the SAR for intended use applications. It will include evaluation of the 2.4 GHz and 5GHz WiFi transmitter for all required RF exposure configurations. The SAR Test Plan includes the evaluation of the *Equipment* in an "Extremity" configuration including all surfaces of the *Equipment* as intended for use by the operator. The SAR Test Plan also includes evaluation of the *Equipment* in the "Body" configuration in its intended use while in contact with the patient. Since each variant is identical in nature with the exception of the ultrasound transducer element, a default variant will be used to evaluate the Equipment in the Extremity configuration and each variant will be evaluated in the Body configuration.

The SAR Test Plan developed for this evaluation is based on the required test channels and configurations which produce the highest worst case SAR from previous evaluations and where applicable, SAR test reduction and/or SAR test exclusion may be utilized. The *Equipment* will be evaluated for SAR at the maximum output power level, preset by the manufacturer and in accordance with the procedures described in IEEE 1528, IEC 62209-2, IEC 62209-1528, FCC KDB 865646, 447498, and 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 IEC 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
FCC KDB KDB 248227 D01v02r02	SAR Guidance for IEEE 802.11 (WiFi) Transmitters
* 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.

Applicant:	**Date(s) Evaluated:**
Clarius Mobile Health Corp	5 Oct - 30 Oct, 2021
Module Product Name / PMN:	**Module Product Model Number / HVIN:**
Clarius Module	CUSMOD1
Host Marketing Name / HMN:	**Host Product Model Number / HVIN:**
Clarius Scanner	L7 HD3, L7VET HD3, C3 HD3, C3VET HD3, C7 HD3, 3DC3 C7VET HD3, L15 HD3, L20 HD3, EC7 HD3, PA HD3
Standard(s) Applied:	
FCC 47 CFR §2.1093 Health Canada's Safety Code 6	
Measurement Procedures:	
FCC KDB 865664, FCC KDB 447498, FCC KDB 247228 Industry Canada RSS-102 Issue 5 IEEE Standard 1528-2013, IEC 62209-2	
Use Group:	**Limits Applied:**
[X] General Population / User Unaware	[X] 1.6W/kg - 1g Volume - Body
[ ] Occupational / User Aware	[X] 4.0W/kg - 10g Volume - Extremity
Reason for Issue:	
[ ] New Certification	[X] Class II Permissive Change
Reason for Change:	
Revise Grant to Add Host Model Variants	

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

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

Art Voss, P.Eng.
Technical Manager
Celltech Labs Inc.
10 December 2021
Date

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 7.1 Conducted Power Measurements

Conducted Power Measurements						
Channel	Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Rated Power (W)	Delta (dBm)	SAR Test Channel (Y/N)
1	2412	23.7	23.7	0.234	0	Y
6	2437	23.7	23.7	0.234	0	Y
11	2462	23.7	23.7	0.234	0	Y
13	2472	23.7	23.7	0.234	0	Y
36	5180	17.0	17.0	0.053	0	Y
44	5220	17.0	17.0	0.053	0	Y
48	5240	17.0	17.0	0.053	0	Y
149	5745	18.4	18.4	0.070	0	Y
157	5785	18.4	18.4	0.070	0	Y
165	5825	18.4	18.4	0.070	0	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)

SAR was evaluated on the worst case channels from previous evaluations or channels which exhibit high SAR. SAR was also evaluated on the low, mid and high channels of the 5GHz U-NII-1 and U-NII-3 bands

BT/BLE SAR Test Evaluation: The output power of the BT/BLE transmitter is 4.9mW which is below the SAR test exclusion threshold for Extremity Configuration. BT/BLE was not evaluated for SAR.

NOTE: This device is not capable of simultaneous transmission between the BT/BLE and WiFi transmitters or the 2.4GHz and 5GHz WiFi transmitters.

9.0 ACCESSORIES EVALUATED

Manufacturer's Accessories Tested - See Addendums for Complete Manufacturer's List

Test Report ID Number	Manufacturer's Part Number	Description	SAR Evaluated
Miscelaneous			
M1	FANHD3012109	Clip-On Fan	X

10.0 SAR MEASUREMENT SUMMARY

Table 10.1: Measured Results – Extremity, 2.4GHz Band

Measured SAR Results (10g) - Extremity Configuration (FCC/ISED)										
Date	Plot ID	DUT		Test Frequency (*MHz*)	Mode	DUT Spacing		Conducted Power (*dBm*)	Measured SAR (10g) 100% DC (*W/kg*)	SAR Drift (*dB*)
		M/N	Configuration			DUT (*mm*)	Antenna (*mm*)			
10/05/2021	EB1	C3 HD3	Right	2457	802.11b	0	n/a	23.7	0.002	-2.950
10/05/2021	EB2	C3 HD3	Left	2457	802.11b	0	n/a	23.7	0.002	-4.800
10/06/2021	EB3	C3 HD3	Front	2457	802.11b	0	n/a	23.7	0.000	0.001
10/06/2021	EB4	C3 HD3	Back	2457	802.11b	0	n/a	23.7	0.153	0.370
10/06/2021	EB7	C3 HD3	Bottom	2457	802.11b	0	n/a	23.7	0.000	0.001
10/07/2021	EB17	C3 HD3	Back	2437	802.11b	0	n/a	23.7	0.663	0.340
10/07/2021	**EB18**	**C3 HD3**	**Back**	**2437**	**802.11b**	**0**	**n/a**	**23.7**	**0.699**	**-0.700**
10/07/2021	EB19	L20 HD3	Back	2437	802.11b	0	n/a	23.7	0.557	-1.220
10/07/2021	EB20	C3 HD3	Back	2437	802.11b	0	n/a	23.7	0.692	-0.070
10/07/2021	EB21	L15 HD3	Back	2412	802.11b	0	n/a	23.7	0.574	-0.800
10/07/2021	EB22	C3 HD3	Front	2457	802.11b	0	n/a	23.7	0.000	0.001
10/07/2021	EB23	3DC3 HD3	Back	2412	802.11b	0	n/a	23.7	0.332	2.000
10/07/2021	EB24	L20 HD4	Back	2412	802.11b	0	n/a	23.7	0.573	-1.960
10/07/2021	EB25	C3 HD4	Back	2472	802.11b	0	n/a	23.7	0.638	-0.720
10/07/2021	EB26	3DC3 HD3	Back	2472	802.11b	0	n/a	23.7	0.398	-1.290
SAR Limit						Head/Body		RF Exposure Category		
FCC 47 CFR 2.1093				Health Canada Safety Code 6		4.0 W/kg		General Population/User Unaware		

*Due to extremely low SAR, these tests failed to complete.

Table 10.2: Measured Results – Extremity, 5GHz Band

Measured SAR Results (10g) - Extremity Configuration (FCC/ISED)										
Date	Plot ID	DUT		Test Frequency (*MHz*)	Mode	DUT Spacing		Conducted Power (*dBm*)	Measured SAR (10g) 100% DC (*W/kg*)	SAR Drift (*dB*)
		M/N	Configuration			DUT (*mm*)	Antenna (*mm*)			
10/26/2021	E30	L7 HD3	Back	5240	802.11a-UNI-1	0	n/a	17	0.107	6.520
10/26/2021	E31	L7 HD3	Front*	5240	802.11a-UNI-1	0	n/a	17	0.000	0.000
10/27/2021	E32	L7 HD3	Back	5200	802.11a-UNI-1	0	n/a	17	0.115	0.350
10/27/2021	E33	L7 HD3	Back	5180	802.11a-UNI-1	0	n/a	17	0.087	1.110
10/27/2021	E34	L7 HD3	Back	5240	802.11a-UNI-1	0	n/a	17	0.095	3.070
10/27/2021	E35	L20 HD3	Left Side	5200	802.11a-UNI-1	0	n/a	17	0.000	0.000
10/27/2021	E36	L20 HD3	Right Side	5200	802.11a-UNI-1	0	n/a	17	0.000	0.000
10/27/2021	E37	L7 HD3	Back w/fan	5200	802.11a-UNI-1	0	n/a	17	0.144	0.900
10/28/2021	E38	3DC3 HD3	Back w/fan	5200	802.11a-UNI-1	0	n/a	17	0.216	0.000
10/28/2021	E39	C7 HD3	Back w/fan	5180	802.11a-UNI-1	0	n/a	17	0.085	-3.840
10/28/2021	E70	C7 HD3	Back	5745	802.11a-UNI-3	0	n/a	18.4	0.091	3.640
10/28/2021	E71	C7 HD3	Back	5785	802.11a-UNI-3	0	n/a	18.4	0.117	-1.850
10/28/2021	E72	C7 HD3	Back	5825	802.11a-UNI-3	0	n/a	18.4	0.118	0.630
10/28/2021	E73	C7 HD3	Back	5825	802.11a-UNI-3	0	n/a	18.4	0.074	0.890
10/30/2021	E74	PA HD3	Back	5825	802.11a-UNI-3	0	n/a	18.4	0.160	-0.210
10/30/2021	E75	L20 HD3	Back	5825	802.11a-UNI-3	0	n/a	18.4	0.128	2.630
10/30/2021	E76	L15 HD3	Back	5825	802.11a-UNI-3	0	n/a	18.4	0.116	7.190
10/30/2021	E77-DNU	EC7 HD3*	Back	5825	802.11a-UNI-3	0	n/a	18.4	0.076	999.000
10/30/2021	E78	3DC3 HD3	Back	5825	802.11a-UNI-3	0	n/a	18.4	0.098	0.230
10/30/2021	E79	L7 HD3	Back	5825	802.11a-UNI-3	0	n/a	18.4	0.120	1.690
10/30/2021	E80	EC7 HD3	Back	5825	802.11a-UNI-3	0	n/a	18.4	0.097	2.710
10/30/2021	E81	L20 HD3*	Left Side	5825	802.11a-UNI-3	0	n/a	18.4	0.000	999.000
10/30/2021	E82	L20 HD3	Right Side	5825	802.11a-UNI-3	0	n/a	18.4	0.000	
SAR Limit						Head/Body		RF Exposure Category		
FCC 47 CFR 2.1093				Health Canada Safety Code 6		4.0 W/kg		General Population/User Unaware		

*Due to extremely low SAR, these tests failed to complete.

Table 10.3: Measured Results - Body

Measured SAR Results (1g) - BODY Configuration (FCC/ISED)										
Date	Plot ID	DUT		Test Frequency (*MHz*)	Mode	DUT Spacing		Conducted Power (*dBm*)	Measured SAR (1g) 100% DC (*W/kg*)	SAR Drift (*dB*)
		M/N	Configuration			DUT (*mm*)	Antenna (*mm*)			
10/06/2021	B6	C3 HD3	Tip	2457	802.11b	0	n/a	23.7	0.000	0.001
10/06/2021	B8	L7 HD3	Tip	2457	802.11b	0	n/a	23.7	0.000	-1.680
10/06/2021	B9	L15 HD3	Tip	2457	802.11b	0	n/a	23.7	0.000	9.450
10/06/2021	B10	L20 HD3	Tip*	2457	802.11b	0	n/a	23.7	0.000	-0.290
10/06/2021	B11	C7 HD3	Tip*	2457	802.11b	0	n/a	23.7	0.000	0.001
10/07/2021	B12	L20 HD3	Tip*	2457	802.11b	0	n/a	23.7	0.000	4.370
10/07/2021	B13	PA HD3	Tip	2457	802.11b	0	n/a	23.7	0.000	3.520
10/07/2021	B14	3DC3 HD3	Tip	2457	802.11b	0	n/a	23.7	0.000	3.890
10/07/2021	**B15**	**EC7 HD3**	**Tip**	**2457**	**802.11b**	**0**	**n/a**	**23.7**	**0.001**	**4.260**
10/07/2021	B16	EC7 HD3	Tip	2457	802.11b	0	n/a	23.7	0.001	-7.540
10/27/2021	B50	L7 HD3	Tip*	5200	802.11a-UNI-1	0	n/a	17	0.000	0.000
10/27/2021	B51	PA HD3	Tip	5200	802.11a-UNI-1	0	n/a	17	0.000	4.990
10/27/2021	B52	L20 HD3	Tip	5200	802.11a-UNI-1	0	n/a	17	0.000	0.000
10/27/2021	B53	L15 HD3	Tip	5200	802.11a-UNI-1	0	n/a	17	0.000	0.000
10/27/2021	B54	EC7 HD3	Tip	5200	802.11a-UNI-1	0	n/a	17	0.000	5.200
10/27/2021	B55	C7 HD3	Tip	5200	802.11a-UNI-1	0	n/a	17	0.000	0.000
10/27/2021	B56	3DC3 HD3	Tip	5200	802.11a-UNI-1	0	n/a	17	0.000	0.001
SAR Limit						Head/Body		RF Exposure Category		
FCC 47 CFR 2.1093				Health Canada Safety Code 6		1.6 W/kg		General Population/User Unaware		

*Due to extremely low SAR, these measurements failed to complete.

Note: Body SAR was evaluated on the worst-case channel configurations from Tables 10.1 and 10.2

11.0 SCALING OF MAXIMUM MEASURED SAR

Table 11.1 SAR Scaling, Extremity

Scaling of Maximum Measured SAR (10g)					
Measured Parameters		Configuration			
		Extremity	Extremity	Head	
Plot ID		EB18	E38		
Maximum Measured SAR_M		0.699	0.216		(W/kg)
Frequency		2437	5200		(MHz)
Power Drift		-0.700	0.000 (1)		(dB)
Conducted Power		37.700	17.000		(dBm)
Fluid Deviation from Target					
Δe	Permitivity	-9.50%	-6.17%		
Δσ	Conductivity	0.28%	0.65%		

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

Fluid Sensitivity Calculation (10g)			IEC 62209-2 Annex F		
Delta SAR = Ce * Δe + Cσ * Δσ					(F.1)
$Ce = (0.003456*f^3) - (0.03531*f^2) + (0.07675*f) - 0.186$					(F.4)
$C\sigma = (0.004479*f^3) - (0.01586*f^2) - (0.1972*f) + 0.7717$					(F.5)
f	Frequency (GHz)	2.437	5.2		
Ce		-0.159	-0.256		
Cσ		0.262	-0.053		
Ce * Δe		0.015	0.016		
Cσ * Δσ		0.001	0.000		
ΔSAR		0.016 (3)	0.015 (3)		(%)

Note(3): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529

Manufacturer's Tuneup Tolerance				
Measured Conducted Power	37.700	17.000		(dBm)
Rated Conducted Power	37.700	17.000		(dBm)
ΔP	0.000 (4)	0.000 (4)		(dB)

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

SAR Adjustment for Fluid Sensitivity				
$SAR_1 = SAR_M * \Delta SAR$	0.699	0.216		(W/kg)

SAR Adjustment for Tuneup Tolerance				
$SAR_2 = SAR_1 + [\Delta P]$	0.699	0.216		(W/kg)

SAR Adjustment for Drift				
$SAR_3 = SAR_2 + Drift$	0.821	0.216		(W/kg)

reported SAR				
reported SAR	**0.82**	**0.22**		(W/kg)

Table 11.2 SAR Scaling, Body

Scaling of Maximum Measured SAR (1g)					
Measured Parameters		Configuration			
		Extremity	Body	Head	
Plot ID			B15		
Maximum Measured SAR_M			0.001		(W/kg)
Frequency			2457		(MHz)
Power Drift			4.260 (1)		(dB)
Conducted Power			37.700		(dBm)
Fluid Deviation from Target					
Δe	Permitivity		-9.49%		
Δσ	Conductivity		0.17%		

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

Fluid Sensitivity Calculation (1g) IEC 62209-2 Annex F					
Delta SAR = Ce * Δe + Cσ * Δσ (F.1)					
$Ce = (-0.0007854*f^3) + (0.009402*f^2) - (0.02742*f) - 0.2026$ (F.2)					
$C\sigma = (0.009804*f^3) - (0.08661*f^2) + (0.02981*f) + 0.7829$ (F.3)					
f	Frequency (GHz)		2.457		
Ce			-0.225		
Cσ			0.479		
Ce * Δe			0.021		
Cσ * Δσ			0.001		
ΔSAR		(3)	0.022 (3)		(%)

Note(3): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529

Manufacturer's Tuneup Tolerance					
Measured Conducted Power			37.700		(dBm)
Rated Conducted Power			37.700		(dBm)
ΔP		0.000 (4)	0.000 (4)		(dB)

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

SAR Adjustment for Fluid Sensitivity				
$SAR_1 = SAR_M * \Delta SAR$		0.001		(W/kg)

SAR Adjustment for Tuneup Tolerance				
$SAR_2 = SAR_1 + [\Delta P]$		0.001		(W/kg)

SAR Adjustment for Drift				
$SAR_3 = SAR_2 + Drift$		0.001		(W/kg)

reported SAR				
reported SAR		0.00		(W/kg)

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

[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] X [√f(GHz)] ≤ 7.5 for 10-g SAR

[(14.6)/(25)] X [√2.462] = 0.92 ≤ 7.5

Where:
maximum power of channel, including tune-up tolerance, mW = 14.6 mW
minimum separation distance, mm = 25mm
f(GHz) = 2.462 GHz

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

NOTE: This device is not capable of simultaneous transmission between the BT/BLE and WiFi transmitters.
Due to the nature of this device, WiFi and Bluetooth 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 indentification 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.
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 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 (+).
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 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 4
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 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.

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(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.			

13.0 DETAILS OF SAR EVALUATION

13.1 Day Log

DAY LOG								
Date	Ambient Temp (°C)	Fluid Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)	Fluid Dielectric	SPC	Test	Task
04 Oct 2021	25.4	24.9	32%	101.0	X	X		2450H Fluid, SPC
05 Oct 2021	23.5	22.2	35%	100.7			X	2450H SAR Testing
06 Oct 2021	25.4	21.7	30%	101.6			X	2450H SAR Testing
07 Oct 2021	23.8	22.9	31%	102.2			X	2450H SAR Testing
25 Oct 2021	22.6	20.6	25%	102.9	X	X		5250H Fluid, SPC
26 Oct 2021	24.2	19.0	34%	100.4			X	5250H SAR Testing
27 Oct 2021	21.5	20.0	35%	101.6			X	5250H SAR Testing
28 Oct 2021	22.6	19.8	34%	101.9			X	5250H SAR Testing
28 Oct 2021	22.6	19.8	34%	101.9	X	X		5750H Fluid, SPC
28 Oct 2021	22.6	19.8	34%	101.9			X	5750H SAR Testing
30 Oct 2021	23.0	21.1	26%	103.3			X	5750H SAR Testing

*Per IEEE 1528 Test Series was started within 24 hours and completed within 48 hours of Fluid Parameter Measurements

13.2 DUT Setup and Configuration

DUT Setup and Configuration

Overview

The Clarius HD3 series scanners are a portable handheld Medical and Veterinarian Ultrasound scanner which streams video data via WiFi to another WiFi connected device. The device is intended to be handheld by the operator while it is in contact with a patient. The WiFi transmitter ceases to transmit once the transducer is no longer in contact with the patient. Since both Extremity and Body RF exposures exist, both configurations were evaluated.

The Clarius HD3 series scanners are identical in all aspects of RF circuitry, RF Transmit Power, Transmit Antenna, physical size and form factor with the exception of the Ultrasound Transducer element. As such, a default device was selected for Extremity SAR evaluation and each variant was evaluated for Body SAR. Extremity SAR was evaluated on all surfaces of the device, e.g. Front, Back, Left Side, Right Side, Top and Bottom (Tip). The worst case channel configuration in the 2.4GHz, 5250MHz and 5750MHz were used for the Body SAR channel configuration.

The device was configured to transmit at its highest output power as set in the test-mode firmware, on each of the test channels identified in the SAR test plan.

Since in all cases the 1g SAR was less 0.1W/kg, SAR Test reduction was applied to the SAR Test Plan and only the worst case configurations were investigated further.

13.3 DUT Positioning

DUT Positioning
Positioning
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.
FACE Configuration
This device is not intended to be held to the face and was not tested in the FACE configuration.
BODY Configuration
The DUT was securely clamped into the device holder with the surface of the DUT normally in contact with the body in direct contact with the bottom of the phantom, or 0mm separation from the DUT's accessory to the phantom surface.
HEAD Configuration
This device is not intended to be held to the ear and was not tested in the HEAD configuration.
Limb Worn Configuration
The DUT was positioned with the back side directly against the phantom surface with the strap opened to allow direct contact or 0mm of the DUT and watch band to the phantom surface.

13.4 General Procedures and Report

General Procedures and Reporting
General Procedures
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 ± 0.5°C. The Active TSL temperature was maintained to within ±2.0°C 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. 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 *Maximum Distance to Phantom Surface* to the fluid surface was performed following the power drift measurement.
Reporting
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. 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 ONLY scaled up, not down. The final results of this scaling is the *reported SAR* which appears on the Cover Page of this report.

13.5 Fluid Dielectric and Systems Performance Check

Fluid Dielectric and Systems Performance Check
Fluid Dielectric Measurement Procedure
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 ± 100MHz for frequencies > 300MHz and ± 50MHz for frequencies ≤ 300MHz with frequency step size of 10MHz 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 23°C 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 > 5% in range that the DUT is to be tested. If the adjustments fail to bring the parameters to ≤ 5% but are < 10%, 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 > 10% in the DUT test frequency range are not used.
Systems Performance Check
The fluid dielectric parameters of the Active TSL are entered into the DASY Measurement Server at each of the 10MHz 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 10MHz step intervals. 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 ≤ 10% of the measured and normalize SAR of the validation source's Calibration Certificate. 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 ± 1°C of the initial fluid analysis.

13.6 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)	**4 ± 1 mm**
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	**5° ± 1°**
Area Scan Spatial Resolution ΔX, ΔY	**15 mm**
Zoom Scan Spatial Resolution ΔX, ΔY	**7.5 mm**
Zoom Scan Spatial Resolution ΔZ (Uniform Grid)	**5 mm**
Zoom Scan Volume X, Y, Z	**30 mm**
Phantom	**ELI**
Fluid Depth	**150 ± 5 mm**
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 2GHz to 3GHz

Scan Resolution 2GHz to 3GHz	
Maximum distance from the closest measurement point to phantom surface: (Geometric Center of Probe Center)	**4 ± 1 mm**
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	**5° ± 1°**
Area Scan Spatial Resolution ΔX, ΔY	**12 mm**
Zoom Scan Spatial Resolution ΔX, ΔY	**5 mm**
Zoom Scan Spatial Resolution ΔZ (Uniform Grid)	**5 mm**
Zoom Scan Volume X, Y, Z	**30 mm**
Phantom	**ELI**
Fluid Depth	**150 ± 5 mm**
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	

13.8 Scan Resolution 5GHz to 6GHz

Scan Resolution 5GHz to 6GHz	
Maximum distance from the closest measurement point to phantom surface: (Geometric Center of Probe Center)	**4 ± 1 mm**
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	**5° ± 1°**
Area Scan Spatial Resolution ΔX, ΔY	**10 mm**
Zoom Scan Spatial Resolution ΔX, ΔY	**4 mm**
Zoom Scan Spatial Resolution ΔZ (Uniform Grid)	**2 mm**
Zoom Scan Volume X, Y, Z	**22 mm**
Phantom	**ELI**
Fluid Depth	**100 ± 5 mm**
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 (IEEE 1528-2013 Table 9)									
Source of Uncertainty	**IEEE 1528 Section**	**Toler ±%**	**Prob Dist**	**Div**	**c_i**	**c_i**	**Stand Unct ±%**	**Stand Unct ±%**	**V_i or V_{eff}**
Measurement System					**(1g)**	**(10g)**	**(1g)**	**(10g)**	
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 w rt 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	∞
Test Sample Related									
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(2)	E.2.9	0.0	R	√3	1	1	0.0	0.0	∞
SAR Pow er Scaling(3)	E.6.5	0.0	R	√3	1	1	0.0	0.0	∞
Phantom and Tissue Parameters									
Phantom Uncertainty*	E.3.1	6.1	R	√3	1	1	3.5	3.5	∞
SAR Correction Uncertainty	E.3.2	**1.9**	N	1	1	0.84	1.9	1.6	∞
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**
Effective Degrees of Freedom(1)								**V_{eff} =**	**1161**
Combined Standard Uncertainty			**RSS**				**11.1**	**11.0**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**				**22.3**	**22.0**	
Measurement Uncertainty Table in accordance with IEEE Standard 1528-2013									

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

15.0 FLUID DIELECTRIC PARAMETERS

****** Note ******

For fluid parameters outside the +/- 5% tolerance, SAR was adjusted in accordance with the Fluid Sensitivity requirements of IEC 62209-1528. See Section 11.0.

Table 15.1 Fluid Dielectric Parameters 2450MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Mon 04/Oct/2021 15:27:41
Freq Frequency(GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
2.3500	39.38	1.71	35.58	1.72
2.3600	39.36	1.72	35.85	1.71
2.3700	39.34	1.73	35.73	1.71
2.3800	39.32	1.74	35.75	1.72
2.3900	39.31	1.75	35.55	1.74
2.4000	39.29	1.76	35.56	1.76
2.4100	39.27	1.76	35.60	1.77
2.4200	39.25	1.77	35.62	1.79
2.4300	39.24	1.78	35.52	1.75
2.4400	39.22	1.79	35.49	1.81
2.4500	39.20	1.80	35.50	1.81
2.4600	39.19	1.81	35.46	1.81
2.4700	39.17	1.82	35.56	1.83
2.4800	39.16	1.83	35.59	1.85
2.4900	39.15	1.84	35.51	1.86
2.5000	39.14	1.85	35.34	1.85
2.5100	39.12	1.87	35.38	1.86
2.5200	39.11	1.88	35.48	1.85
2.5300	39.10	1.89	35.29	1.90
2.5400	39.09	1.90	35.21	1.90
2.5500	39.07	1.91	35.41	1.93

FLUID DIELECTRIC PARAMETERS

Date:	4 Oct 2021	Fluid Temp:	24.9	Frequency:	2450MHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2350.0000		35.5800	1.7200	39.3800	1.71	-9.65%	0.58%
2360.0000		35.8500	1.7100	39.3600	1.72	-8.92%	-0.58%
2370.0000		35.7300	1.7100	39.3400	1.73	-9.18%	-1.16%
2380.0000		35.7500	1.7200	39.3200	1.74	-9.08%	-1.15%
2390.0000		35.5500	1.7400	39.3100	1.75	-9.56%	-0.57%
2400.0000		35.5600	1.7600	39.2900	1.76	-9.49%	0.00%
2410.0000		35.6000	1.7700	39.2700	1.76	-9.35%	0.57%
2412.0000	*	35.6040	1.7740	39.2660	1.76	-9.33%	0.68%
2420.0000		35.6200	1.7900	39.2500	1.77	-9.25%	1.13%
2430.0000		35.5200	1.7500	39.2400	1.78	-9.48%	-1.69%
2437.0000	*	35.4990	1.7920	39.2260	1.79	-9.50%	0.28%
2440.0000		35.4900	1.8100	39.2200	1.79	-9.51%	1.12%
2450.0000		35.5000	1.8100	39.2000	1.80	-9.44%	0.56%
2457.0000	*	35.4720	1.8100	39.1930	1.81	-9.49%	0.17%
2460.0000		35.4600	1.8100	39.1900	1.81	-9.52%	0.00%
2470.0000		35.5600	1.8300	39.1700	1.82	-9.22%	0.55%
2472.0000	*	35.5660	1.8340	39.1680	1.82	-9.20%	0.66%
2480.0000		35.5900	1.8500	39.1600	1.83	-9.12%	1.09%
2490.0000		35.5100	1.8600	39.1500	1.84	-9.30%	1.09%
2500.0000		35.3400	1.8500	39.1400	1.85	-9.71%	0.00%
2510.0000		35.3800	1.8600	39.1200	1.87	-9.56%	-0.53%
2520.0000		35.4800	1.8500	39.1100	1.88	-9.28%	-1.60%
2530.0000		35.2900	1.9000	39.1000	1.89	-9.74%	0.53%
2540.0000		35.2100	1.9000	39.0900	1.90	-9.93%	0.00%
2550.0000		35.4100	1.9300	39.0700	1.91	-9.37%	1.05%

*Channel Frequency Tested

Table 15.2 Fluid Dielectric Parameters 5250MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Mon 25/Oct/2021 14:11:32
Freq Frequency(GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
5.1500	36.04	4.60	33.95	4.58
5.1600	36.03	4.61	33.80	4.55
5.1700	36.02	4.62	33.98	4.59
5.1800	36.01	4.63	34.00	4.55
5.1900	36.00	4.64	34.05	4.60
5.2000	35.99	4.65	33.77	4.68
5.2100	35.97	4.67	33.80	4.63
5.2200	35.96	4.68	33.87	4.68
5.2300	35.95	4.69	34.05	4.70
5.2400	35.94	4.70	33.76	4.75
5.2500	35.93	4.71	33.85	4.71
5.2600	35.92	4.72	33.78	4.71
5.2700	35.91	4.73	33.83	4.76
5.2800	35.89	4.74	33.79	4.70
5.2900	35.88	4.75	33.45	4.79
5.3000	35.87	4.76	33.72	4.79
5.3100	35.86	4.77	33.67	4.77
5.3200	35.85	4.78	33.56	4.76
5.3300	35.84	4.79	33.77	4.79
5.3400	35.83	4.80	33.93	4.90
5.3500	35.81	4.81	33.94	4.81

FLUID DIELECTRIC PARAMETERS

Date:	25 Oct 2021	Fluid Temp:	20.2	Frequency:	5250MHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
5150.0000		33.9500	4.5800	36.0400	4.60	-5.80%	-0.43%
5160.0000		33.8000	4.5500	36.0300	4.61	-6.19%	-1.30%
5170.0000		33.9800	4.5900	36.0200	4.62	-5.66%	-0.65%
5180.0000	*	34.0000	4.5500	36.0100	4.63	-5.58%	-1.73%
5190.0000		34.0500	4.6000	36.0000	4.64	-5.42%	-0.86%
5200.0000	*	33.7700	4.6800	35.9900	4.65	-6.17%	0.65%
5210.0000		33.8000	4.6300	35.9700	4.67	-6.03%	-0.86%
5220.0000		33.8700	4.6800	35.9600	4.68	-5.81%	0.00%
5230.0000		34.0500	4.7000	35.9500	4.69	-5.29%	0.21%
5240.0000	*	33.7600	4.7500	35.9400	4.70	-6.07%	1.06%
5250.0000		33.8500	4.7100	35.9300	4.71	-5.79%	0.00%
5260.0000		33.7800	4.7100	35.9200	4.72	-5.96%	-0.21%
5270.0000		33.8300	4.7600	35.9100	4.73	-5.79%	0.63%
5280.0000		33.7900	4.7000	35.8900	4.74	-5.85%	-0.84%
5290.0000		33.4500	4.7900	35.8800	4.75	-6.77%	0.84%
5300.0000		33.7200	4.7900	35.8700	4.76	-5.99%	0.63%
5310.0000		33.6700	4.7700	35.8600	4.77	-6.11%	0.00%
5320.0000		33.5600	4.7600	35.8500	4.78	-6.39%	-0.42%
5330.0000		33.7700	4.7900	35.8400	4.79	-5.78%	0.00%
5340.0000		33.9300	4.9000	35.8300	4.80	-5.30%	2.08%
5350.0000		33.9400	4.8100	35.8100	4.81	-5.22%	0.00%

*Channel Frequency Tested

Table 15.3 Fluid Dielectric Parameters 5750MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 28/Oct/2021 13:59:15
Freq Frequency(GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
5.6500	35.47	5.12	32.90	5.24
5.6600	35.46	5.13	32.59	5.22
5.6700	35.45	5.14	32.88	5.25
5.6800	35.44	5.15	32.72	5.25
5.6900	35.43	5.16	32.32	5.26
5.7000	35.41	5.17	32.69	5.31
5.7100	35.40	5.18	32.76	5.33
5.7200	35.39	5.19	32.39	5.36
5.7300	35.38	5.20	32.46	5.37
5.7400	35.37	5.21	32.71	5.34
5.7500	35.36	5.22	32.57	5.41
5.7600	35.35	5.23	32.84	5.43
5.7700	35.33	5.24	32.62	5.38
5.7800	35.32	5.25	32.54	5.37
5.7900	35.31	5.26	32.85	5.38
5.8000	35.30	5.27	32.57	5.34
5.8100	35.29	5.28	32.48	5.39
5.8200	35.28	5.29	32.60	5.45
5.8300	35.27	5.30	32.39	5.43
5.8400	35.25	5.31	32.19	5.50
5.8500	35.24	5.32	32.59	5.52

FLUID DIELECTRIC PARAMETERS

Date:	28 Oct 2021	Fluid Temp:	21.3	Frequency:	5750MHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
5650.0000		32.9000	5.2400	35.4700	5.12	-7.25%	2.34%
5660.0000		32.5900	5.2200	35.4600	5.13	-8.09%	1.75%
5670.0000		32.8800	5.2500	35.4500	5.14	-7.25%	2.14%
5680.0000		32.7200	5.2500	35.4400	5.15	-7.67%	1.94%
5690.0000		32.3200	5.2600	35.4300	5.16	-8.78%	1.94%
5700.0000		32.6900	5.3100	35.4100	5.17	-7.68%	2.71%
5710.0000		32.7600	5.3300	35.4000	5.18	-7.46%	2.90%
5720.0000		32.3900	5.3600	35.3900	5.19	-8.48%	3.28%
5730.0000		32.4600	5.3700	35.3800	5.20	-8.25%	3.27%
5740.0000		32.7100	5.3400	35.3700	5.21	-7.52%	2.50%
5745.0000	*	32.6400	5.3750	35.3650	5.22	-7.71%	3.07%
5750.0000		32.5700	5.4100	35.3600	5.22	-7.89%	3.64%
5760.0000		32.8400	5.4300	35.3500	5.23	-7.10%	3.82%
5770.0000		32.6200	5.3800	35.3300	5.24	-7.67%	2.67%
5780.0000		32.5400	5.3700	35.3200	5.25	-7.87%	2.29%
5785.0000	*	32.6950	5.3750	35.3150	5.26	-7.42%	2.28%
5790.0000		32.8500	5.3800	35.3100	5.26	-6.97%	2.28%
5800.0000		32.5700	5.3400	35.3000	5.27	-7.73%	1.33%
5810.0000		32.4800	5.3900	35.2900	5.28	-7.96%	2.08%
5820.0000		32.6000	5.4500	35.2800	5.29	-7.60%	3.02%
5825.0000	*	32.4950	5.4400	35.2750	5.30	-7.88%	2.74%
5830.0000		32.3900	5.4300	35.2700	5.30	-8.17%	2.45%
5840.0000		32.1900	5.5000	35.2500	5.31	-8.68%	3.58%
5850.0000		32.5900	5.5200	35.2400	5.32	-7.52%	3.76%

*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
04 Oct 2021		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	24.9	25	32%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
35.50	39.20	-9.44%	1.81	1.80	0.56%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
12.50	13.18	-5.16%	5.68	6.01	-5.41%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
50.00	52.72	-5.16%	22.72	24.02	-5.39%

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, IEC 62209-1 and IEC 62209-1528.

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.

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.

The forward power applied was same forward power applied by the calibration lab during the calibration of this validation source.

Table 16.2 System Verification Results 5250MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
25 Oct 2021		5250	D5GHzV2		1031
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	20.6	23	25%	50	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
33.85	35.93	-5.79%	4.71	4.71	0.00%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
4.14	3.97	4.19%	1.23	1.15	7.38%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
82.80	79.47	4.19%	24.60	22.91	7.38%

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, IEC 62209-1 and IEC 62209-1528.

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.

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.

The forward power applied was same forward power applied by the calibration lab during the calibration of this validation source.

Table 16.3 System Verification Results 5750MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
28 Oct 2021		5750	D5GHzV2		1031
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	19.8	23	34%	50	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
32.57	35.36	-7.89%	5.41	5.22	3.64%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
3.58	3.78	-5.22%	1.01	1.10	-8.22%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
71.60	75.54	-5.22%	20.20	22.01	-8.22%

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, IEC 62209-1 and IEC 62209-1528.

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.

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.

The forward power applied was same forward power applied by the calibration lab during the calibration of this validation source.

17.0 SYSTEM VALIDATION SUMMARY

Table 17.1 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		
							Permitivity	Conductivity	Sensitivity	Linearity	Isotropy
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 18.1 Measurement System Specifications

Measurement System Specification	
Specifications	
Positioner	Stäubli Unimation Corp. Robot Model: TX90XL
Repeatability	+/- 0.035 mm
No. of axis	6.0
Data Acquisition Electronic (DAE) System	
Cell Controller	
Processor	Intel(R) Core(TM) i7-7700
Clock Speed	3.60 GHz
Operating System	Windows 10 Professional
Data Converter	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY6, V 6.10.0.12 / DASY52 V10.3(1513)
	Postprocessing Software: SEMCAD X, V14.6.13(7474)
Connecting Lines	Optical downlink for data and status info., Optical uplink for commands and clock
DASY Measurement Server	
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
E-Field Probe	
Model	EX3DV4
Serial No.	3600
Construction	Triangular core fiber optic detection system
Frequency	4 MHz -10GHz
Linearity	±0.2 dB (30 MHz to 10 GHz)
Phantom	
Type	ELI Elliptical Planar Phantom
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	> 30 Liter

Measurement System Specification

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 ± 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 µW/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

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.

ELI Phantom

Device Positioner Specification

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^{O}. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

Device Positioner

19.0 TEST EQUIPMENT LIST

Table 19.1 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			2450MHz Head	
Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Glycol	Salt(1)	HEC(2)	Bacteriacide(3)
52.0	48.0	0.0	0.0	0.0

(1) Non-Iodinized
(2) **H**ydroxy**E**thyl-**C**ellulose: 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][14.50]W/kg

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.81 S/m; ε_r = 35.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 10/4/2021 3:59:52 PM

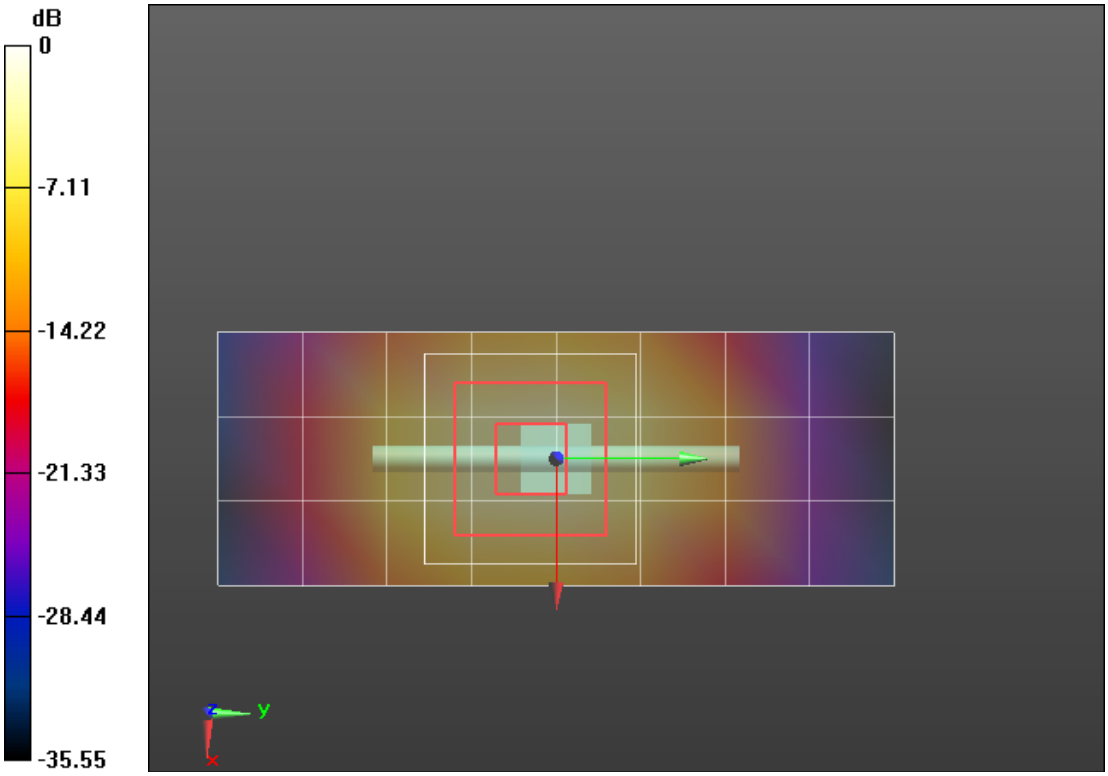
DASY5 Configuration:

- 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)

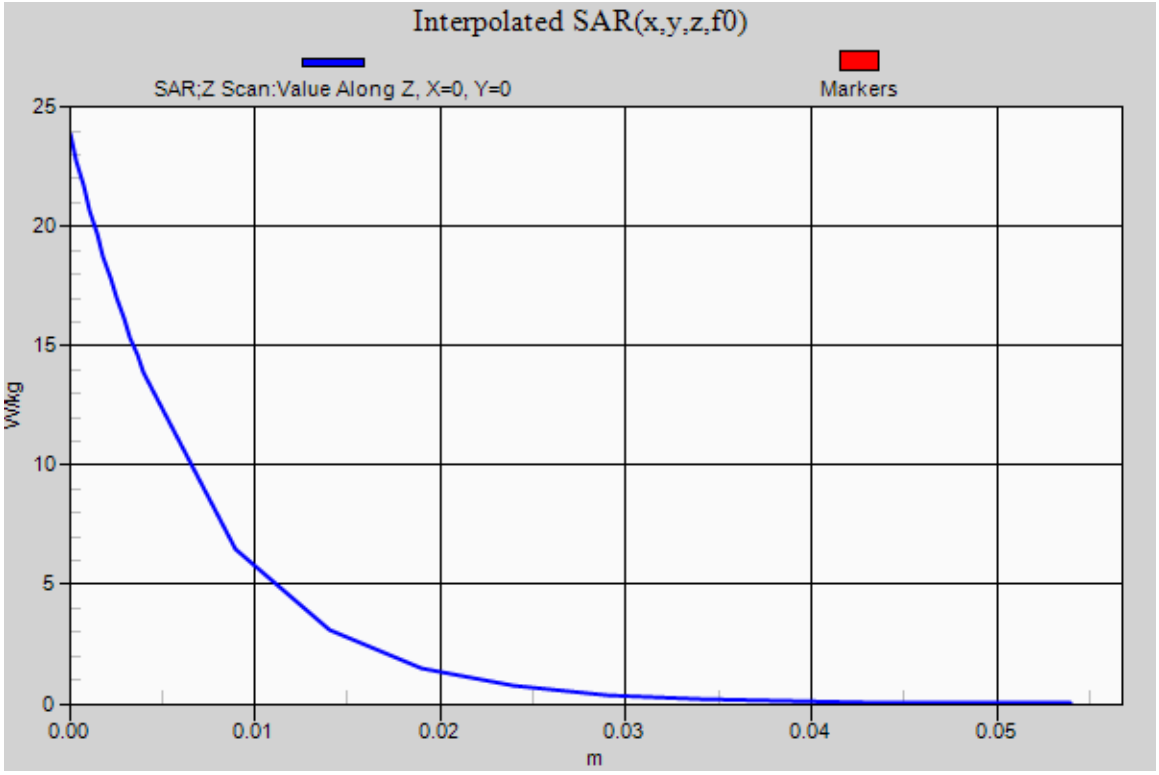
SPC/SPC 2450H Input=250mw, Target=[11.86]13.18][14.50]W/kg/Area Scan (4x9x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 10.9 W/kg

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 = 87.96 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 27.2 W/kg
SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.68 W/kg
Smallest distance from peaks to all points 3 dB below = 10.2 mm
Ratio of SAR at M2 to SAR at M1 = 46.8%
Maximum value of SAR (measured) = 14.2 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 = 6.825 (6.563, 6.965) [mm]
Maximum value of SAR (interpolated) = 23.9 W/kg



0 dB = 23.9 W/kg = 13.78 dBW/kg



DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1031
Procedure Name: SPC 5250H Input=45 mw, Target= [3.21[3.58][3.93] Target=79.47W/kg@1000mw

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5250 MHz; σ = 4.58 S/m; ε_r = 33.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 10/31/2021 11:42:03 AM

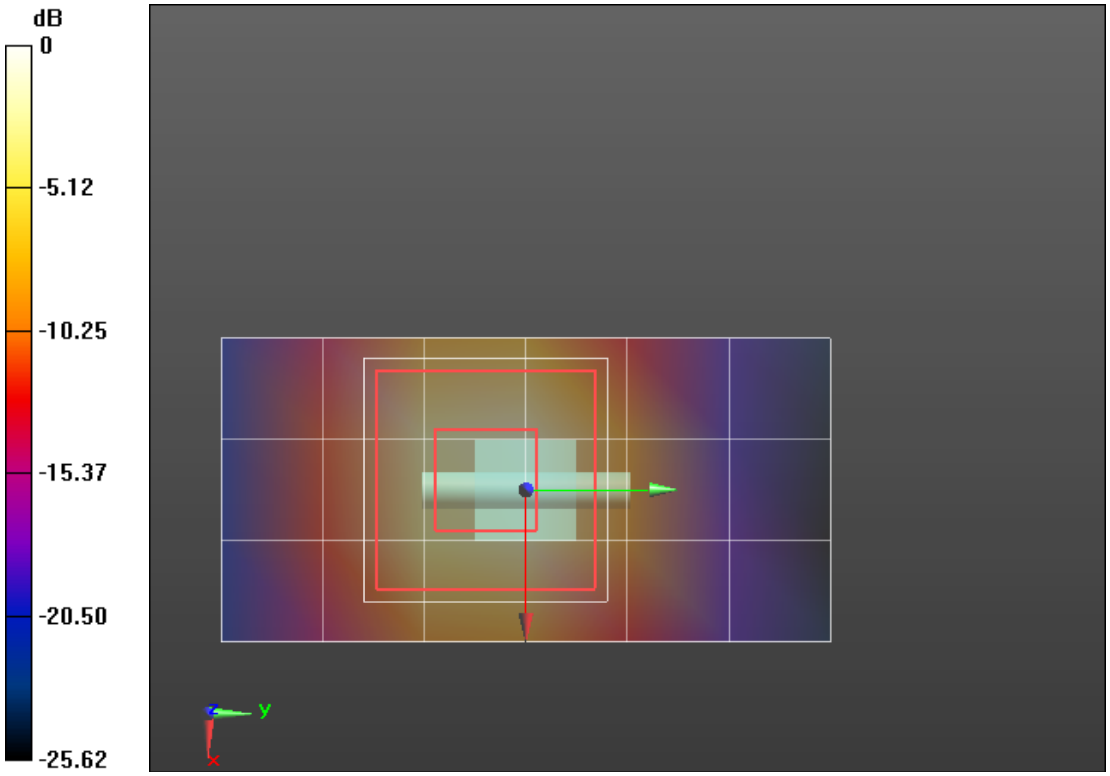
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(4.41, 4.41, 4.41) @ 5250 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 2mm (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)

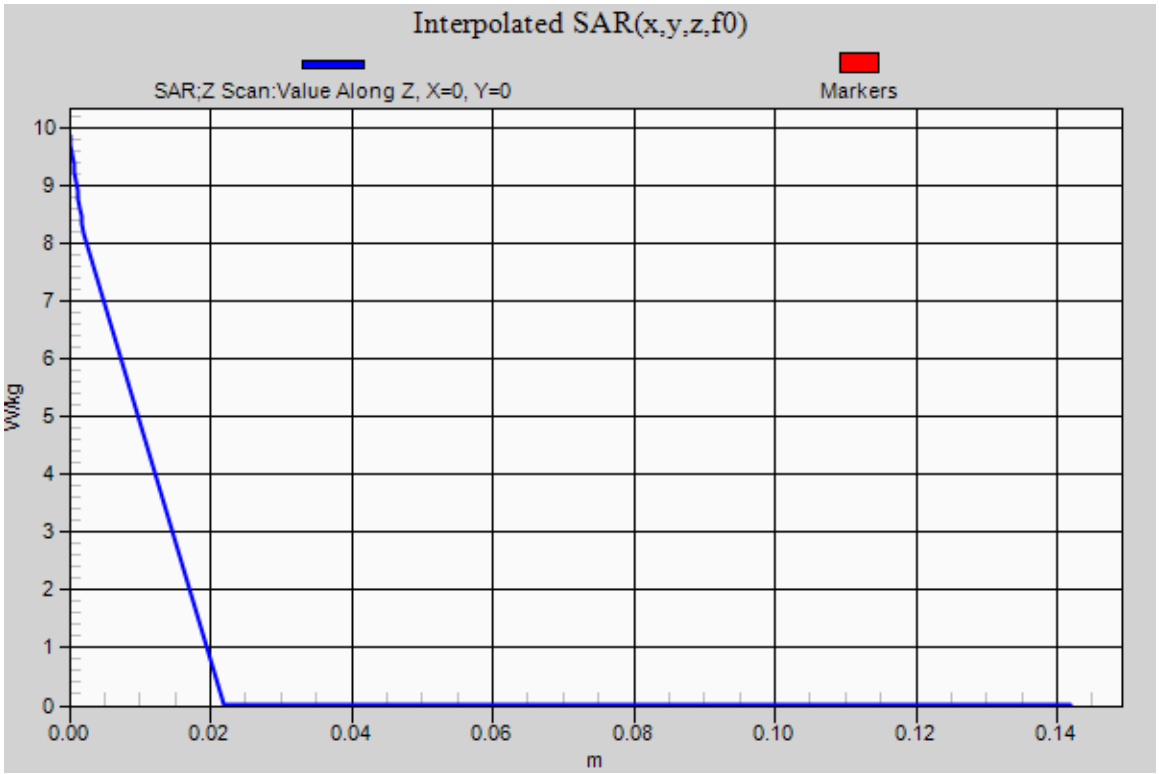
SPC/SPC 5250H Input=45 mw, Target= [3.21[3.58][3.93] Target=79.47W/kg@1000mw/Area Scan (4x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 7.02 W/kg

SPC/SPC 5250H Input=45 mw, Target= [3.21[3.58][3.93] Target=79.47W/kg@1000mw/Zoom Scan (7x7x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 33.29 V/m; Power Drift = -0.30 dB
Peak SAR (extrapolated) = 19.1 W/kg
SAR(1 g) = 4.71 W/kg; SAR(10 g) = 1.37 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 54.3%
Maximum value of SAR (measured) = 9.75 W/kg

SPC/SPC 5250H Input=45 mw, Target= [3.21[3.58][3.93] Target=79.47W/kg@1000mw/Z Scan (1x1x19):
Measurement grid: dx=20mm, dy=20mm, dz=20mm
Penetration depth = n/a (n/a, 2.953) [mm]
Maximum value of SAR (interpolated) = 9.85 W/kg



0 dB = 9.85 W/kg = 9.93 dBW/kg



DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx
Procedure Name: SPC 5750H Input=50mw, Target=[3.40][3.78][4.16], Target=75.54W/kg@1000mw

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5750 MHz; σ = 5.41 S/m; ε_r = 32.57; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 10/28/2021 3:32:59 PM

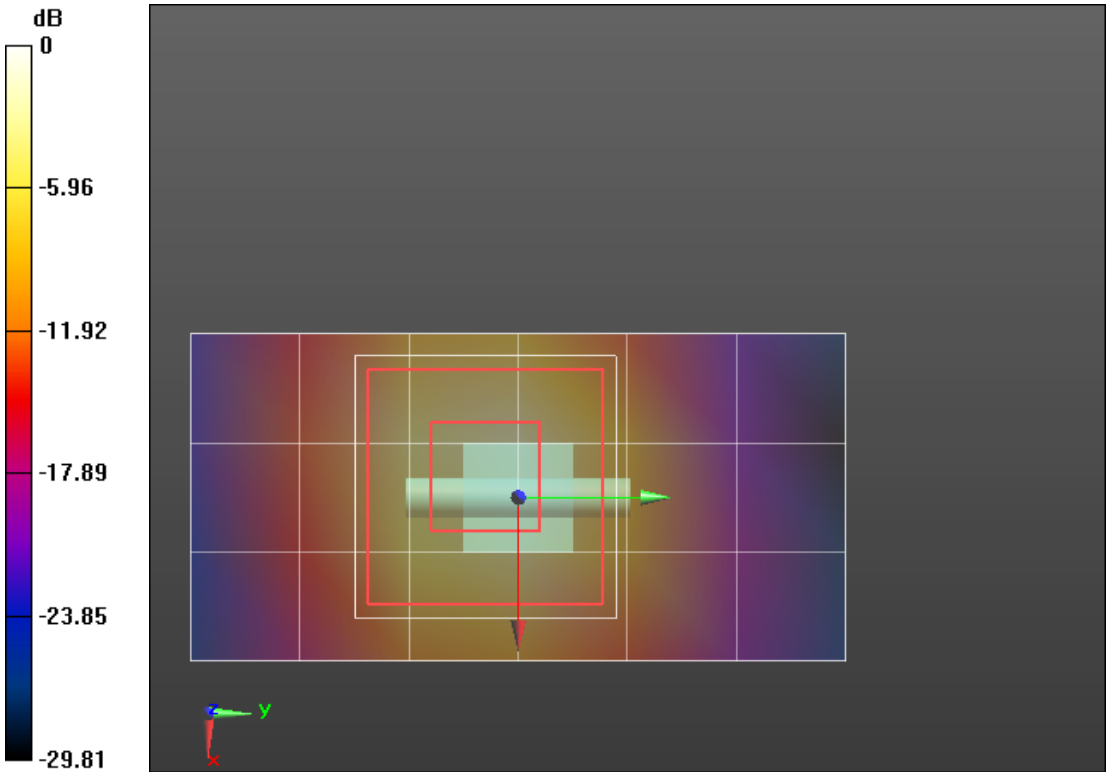
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(4.06, 4.06, 4.06) @ 5750 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 2mm (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)

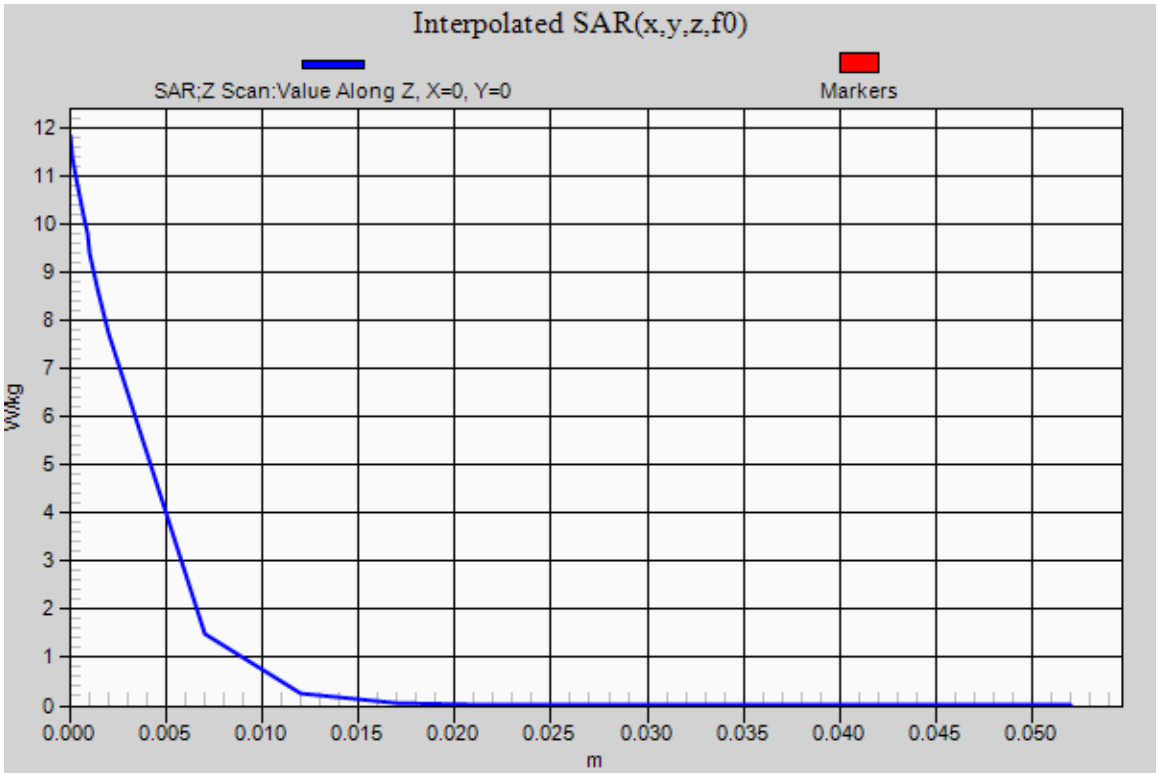
SPC/SPC 5750H Input=50mw, Target=[3.40][3.78][4.16], Target=75.54W/kg@1000mw/Area Scan (4x7x1):
Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 7.04 W/kg

SPC/SPC 5750H Input=50mw, Target=[3.40][3.78][4.16], Target=75.54W/kg@1000mw/Zoom Scan (7x7x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 27.60 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 18.3 W/kg
SAR(1 g) = 3.59 W/kg; SAR(10 g) = 1.01 W/kg
Smallest distance from peaks to all points 3 dB below = 7.6 mm
Ratio of SAR at M2 to SAR at M1 = 50.9%
Maximum value of SAR (measured) = 8.55 W/kg

SPC/SPC 5750H Input=50mw, Target=[3.40][3.78][4.16], Target=75.54W/kg@1000mw/Z Scan (1x1x22):
Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 2.838 (3.032, 2.838) [mm]
Maximum value of SAR (interpolated) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg



APPENDIX B – MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

Plot EB18

C3 HD3; Type: Transmitter; Serial: Not Specified
Procedure Name: B18- [C3] 2.4G WiFi - Back, Ch 6 (2437MHz)

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2437 MHz;Duty Cycle: 1:1.53886
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.792 S/m; ε_r = 35.499; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 10/7/2021 3:04:38 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.45, 6.45, 6.45) @ 2437 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)

2450 H/B18- [C3] 2.4G WiFi - Back, Ch 6 (2437MHz)/Area Scan 2 (12x17x1): Measurement grid: dx=12mm, dy=12mm

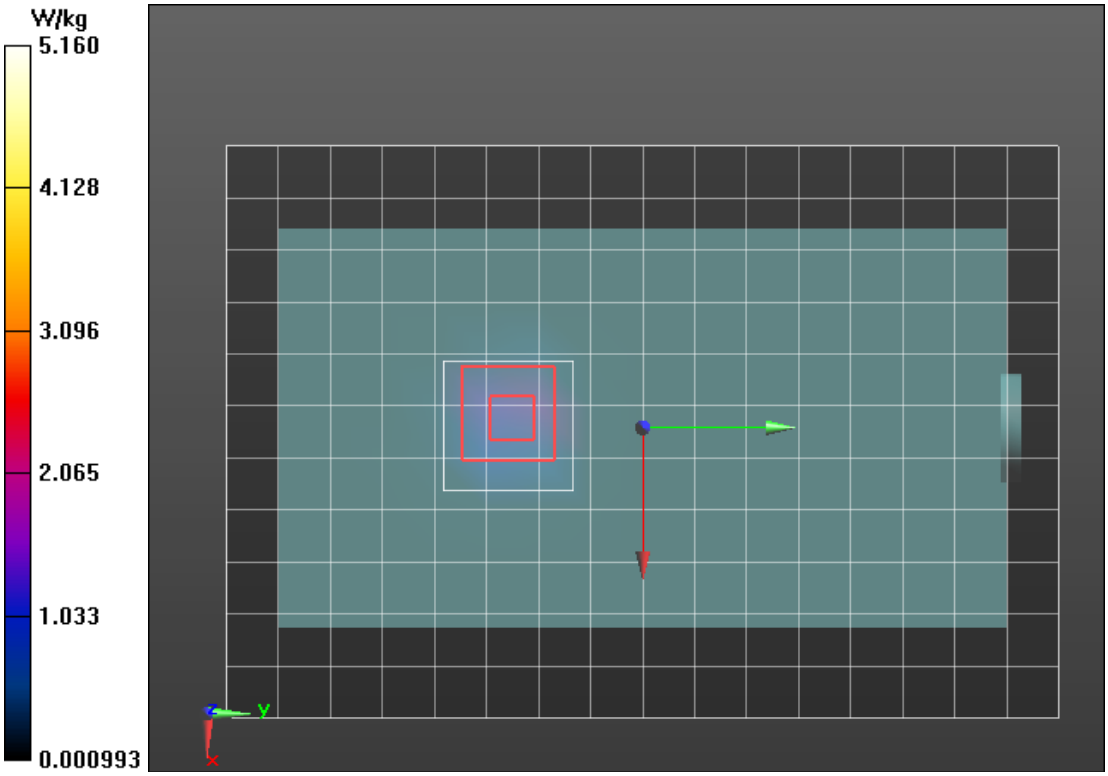
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.84 W/kg

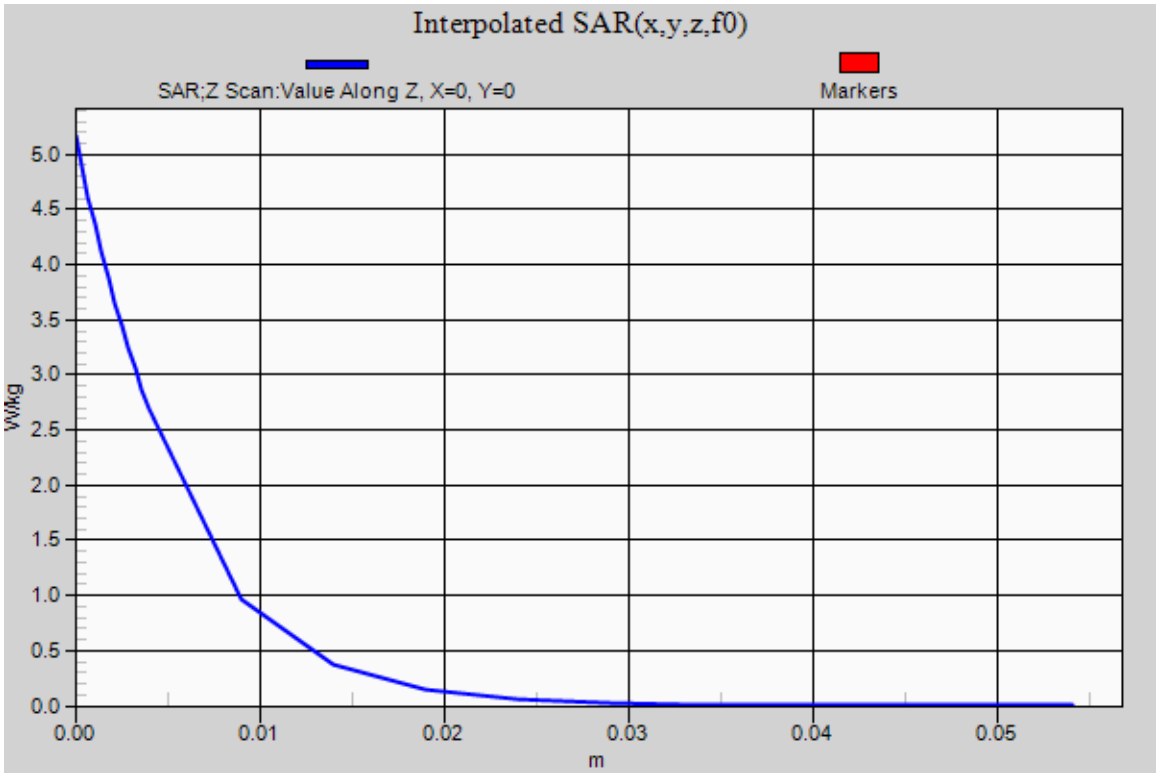
2450 H/B18- [C3] 2.4G WiFi - Back, Ch 6 (2437MHz)/Zoom Scan (7x7x4)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.596 V/m; Power Drift = -0.70 dB
Peak SAR (extrapolated) = 8.78 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 0.699 W/kg
Smallest distance from peaks to all points 3 dB below = 6.1 mm
Ratio of SAR at M2 to SAR at M1 = 36.2%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.76 W/kg

2450 H/B18- [C3] 2.4G WiFi - Back, Ch 6 (2437MHz)/Z Scan (1x1x22): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = 5.186 (4.921, 5.407) [mm]
Maximum value of SAR (interpolated) = 5.16 W/kg





Plot B15

EC7 HD3; Type: Transmitter; Serial: Not Specified
Procedure Name: B15 - [EC7 HD3] 2.4G WiFi - Tip, Ch 11 (2462MHz)

Communication System: UID 10012 - CAB, IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps); Frequency: 2457 MHz;Duty Cycle: 1:1.53886
Medium parameters used (interpolated): f = 2457 MHz; σ = 1.81 S/m; ε_r = 35.472; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 10/7/2021 1:13:57 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.45, 6.45, 6.45) @ 2457 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)

2450 H/B15 - [EC7 HD3] 2.4G WiFi - Tip, Ch 11 (2462MHz)/Prescan Top (6x10x1): Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.00233 W/kg

2450 H/B15 - [EC7 HD3] 2.4G WiFi - Tip, Ch 11 (2462MHz)/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.4660 V/m; Power Drift = 4.26 dB
Peak SAR (extrapolated) = 0.00335 W/kg
SAR(1 g) = 0.00119 W/kg; SAR(10 g) = 0.000448 W/kg
Ratio of SAR at M2 to SAR at M1 = 80.1%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.00207 W/kg

2450 H/B15 - [EC7 HD3] 2.4G WiFi - Tip, Ch 11 (2462MHz)/Z Scan (1x1x22): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = 3.013 (4.636, 9.249) [mm]
Maximum value of SAR (interpolated) = 0.00173 W/kg