Celltech
Testing and Engineering Services Lab

Test Report Serial Number:	45461651 R4.0
Test Report Date:	5 April 2021
Project Number:	1533

SAR Test Report - New Certification

Applicant:

HARRIS

Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA, 24501
USA

Maximum Reported 1g SAR				
FCC	LMR	FACE:	1.41	W/kg
		BODY:	2.78	
ISED		FACE:	1.41	
		BODY:	2.78	
Simultaneous:			2.78	
Occupational Limit:			8.00	

FCC ID:	ISED Registration Number
OWDTR-0165-E	3636B-0164
Product Name / PMN	Product Model Number / HVIN
XL-400P	EXTREME

In Accordance With:

FCC 47 CFR §2.1093

Radiofrequency Radiation Exposure Evaluation: Portable Devices

IC RSS-102 Issue 5

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

Approved By:

Ben Hewson, President
Celltech Labs Inc.
21-364 Lougheed Rd.
Kelowna, BC, V1X 7R8
Canada

Test Lab Certificate: 2470.01

IC Registration 3874A-1

FCC Registration: 714830

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1.0 DOCUMENT CONTROL

Revision History				
Samples Tested By:	Jasmeet Gill, Trevor Whillock		**Date(s) of Evaluation:**	8 Sep 2020 - 7 Mar 2021
Report Prepared By:	Jasmeet Gill, Art Voss, P.Eng.		**Report Reviewed By:**	Art Voss
Report Revision	**Description of Revision**	**Revised Section**	**Revised By**	**Revision Date**
0.1	Draft Release	n/a	Art Voss	5 March 2021
1.0	Initial Release	n/a	Art Voss	8 March 2021
2.0	Revised Rated Power	2.0, 6.0	Art Voss	25 March 2021
	Revised ScalingTable 10.1	10.0		
	Revised *reported* SAR	10.0		
		11.0		
		Cover		
3.0	Removed Reference to 2477MHz WiFi Channel	6.0	Art Voss	26 March 2021
4.0	Removed Reference to UHF Band	ALL	Art Voss	5 April 2021

2.0 CLIENT AND DEVICE INFORMATION

Client Information		
Applicant Name	Harris Corporation	
Applicant Address	221 Jefferson Ridge Parkway	
	Lynchburg, VA, 24501	
	USA	
DUT Information		
Device Identifier(s):	FCC ID:	OWDTR-0165-E
	ISED:	3636B-0164
Device Marketing Name / PMN:	XL-400P	
Device Model(s) / HVIN:	EXTREME	
Test Sample Serial No.:	A40330000113	
Equipment Class (FCC):	Licensed Non-Broadcast Transmitter Held to Face (TNF) FCC Part 90 - LMRS	
	Digital Transmission System (DTS) FCC Part 15C - WiFi	
	Spread Spectrum Transmitter (DSS) FCC Part 15C - BT	
	Unlicensed National Information Infrastructure (NII) FCC Part 15E - WiFi	
Equipment Class (ISED):	Land Mobile Radio Transmitter/Receiver (27.41-960MHz) RSS-119	
	WLAN RSS-247 - WiFi 2412 - 2462MHz	
	BlueTooth Device RSS-247 - BT	
	WLAN RSS-247 - WiFi 5180 - 5240MHz	
	Spread Spectrum/Digital Device (5725 - 5850MHz) RSS-247	
Transmit Frequency Range (FCC):	VHF Band: 136 - 174MHz	
	700 Band: 763 - 776MHz, 793 - 806MHz	
	800 Band: 806 - 825MHz, 851 - 870MHz	
	BT: 2402-2480MHz	
	WiFI 2.4G: 2412-2462MHz	
	WiFi 5G: 5180-5240MHz, 5745-5825MHz	
Transmit Frequency Range (ISED):	VHF Band: 138 - 144MHz, 148 - 149.9MHz, 150.05 - 174MHz	
	UHF Band: 406.1 - 430MHz, 450 - 470MHz	
	800 Band: 806 - 824MHz, 851 - 870MHz	
	BT: 2402-2480MHz	
	WiFi 2.4G: 2412-2462MHz	
	WiFi 5G: 5180-5240MHz, 5745-5825MHz	
Number of Channels:	Programmable	
Transmitter Rated Power (Max): Including Tune-Up Tolerance	VHF Band: 7.2W (38.6dBm)	
	700 Band: 3W (34.8dBm)	
	800 Band: 3.6W (35.6dBm)	
	BT: 0.0049W (6.9dBm)	
	WLAN 2.4G: 0.234W (23.85dBm)	
	WLAN 5G: 5180-5240MHz: 0.0499W (16.98dBm)	
	WLAN 5G: 5745-5825MHz: 0.0698W (18.43dBm)	
Duty Cycle:	BT/BLE, WLAN: 100%, LMR: 50% PTT Duty Cycle	
DUT Power Source:	7.2VDC Li-Ion Rechargeble Battery Pack	
Deviation(s) from standard/procedure:	None	
Modification of DUT:	None	

3.0 SCOPE OF EVALUATION/DATA REUSE

This Certification Report was prepared on behalf of:

Harris Corporation

,(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.

As per FCC 47 CFR Part §2.1091 and §2.1093, an RF Exposure evaluation report is required for this *Equipment* and the results of the RF Exposure evaluation appear in this report.

The XL-400P, FCC ID: **OWDTR-0165-E** , IC ID: **3636B-0165**, is a Dual-band(VHF,7/800) Push-To-Talk (PTT), Licensed Mobile Radio Service (LMRS) transceiver intended for Occupational Use. This "host" employs WiFi and Bluetooth transceivers. The XL-400P is similar to the XL-200P, FCC ID: OWDTR-0133-E, IC ID: 3636B-0133 , which has been previously evaluated for SAR and the results of those previous evaluations were taken into consideration when developing the XL-400P SAR Test Plan. The XL-400P was previously evaluated during an initial Pre-Compliance evaluation and results of that investigation are used in this report. In additional, the XL-400P uses some of the same accessories as the XL-200P and these accessories and additional accessories were also taken into consideration and/or evaluated.

Application:

This is an application for a new device certification.

Scope:

The scope of this evaluation is to evaluate the SAR for intended use applications. It will include an extensive evaluation of the LMR transmitter and all simultaneous transmission conditions that can occur with this host device. The analysis of the Standalone and Simultaneous Transmission SAR if found in Section 11.0 of this report.

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 IEEE 1528, IEC 62209-2, FCC KDB 865664, 447498, and RSS 102.

4.0 NORMATIVE REFERENCES

Normative References*	
ANSI / ISO 17025:2017	General Requirements for competence of testing and calibration laboratories
FCC CFR Title 47 Part 2	Code of Federal Regulations
Title 47:	Telecommunication
Part 2.1093:	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 2019	Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 2
FCC KDB	
KDB 248227 D01v02r02	SAR Guidance for IEEE 802.11 (WiFi) Transmitters
FCC KDB	
KDB 447498 D01v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
FCC KDB	
KDB 643646 D01v01r03	SAR Test Reduction Considerations for Occupational PTT Radios
FCC KDB	
KDB 690783 D01v01r03	SAR Listings on Equipment Authorization Grants
FCC KDB	
KDB 865664 D01v01r04	SAR Measurement Requirements for 100MHz to 6GHz

* 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:	Model Name / PMN:	
Harris Corporation	**XL-400P**	
Standard(s) Applied:	**Measurement Procedure(s):**	
FCC 47 CFR §2.1093 **Health Canada's Safety Code 6**	**FCC KDB 865664, FCC KDB 447498, FCC KDB 643646, FCC KDB 941225** **Industry Canada RSS-102 Issue 5** **IEEE Standard 1528-2013, IEC 62209-2**	
Reason For Issue:	**Use Group:**	**Limits Applied:**
[X] **New Certification** [ ] **Class I Permissive Change** [ ] **Class II Permissive Change**	[ ] **General Population / Uncontrolled** [X] **Occupational / Controlled**	[ ] **1.6W/kg - 1g Volume** [X] **8.0W/kg - 1g Volume** [ ] **4.0W/kg - 10g Volume**
Reason for Change:		**Date(s) Evaluated:**
Original Filing		

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 w ithin the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements w ere performed in accordance w ith accepted practices or procedures; and that all tests and measurements w ere 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 w hich w ere not adjusted, modified or altered in any manner w hatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance w ith ISO/IEC 17025.	Art Voss, P.Eng. Technical Manager Celltech Labs Inc. 5 March 2021 Date PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. F. VOSS # 31327

6.0 RF CONDUCTED POWER MEASUREMENT

Conducted Power Measurements						
Channel	Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Rated Power (W)	Delta (dBm)	SAR Test Channel (Y/N)
LMR						
	136.0	37.77	38.60	7.20	0.83	Y
	143.0	37.69	38.60	7.20	0.91	Y
	150.0	37.10	38.60	7.20	1.50	Y
	158.0	37.77	38.60	7.20	0.83	Y
	168.0	37.78	38.60	7.20	0.82	Y
	174.0	37.78	38.60	7.20	0.82	Y
	763.0	34.23	34.80	3.00	0.57	Y
	768.0	34.21	34.80	3.00	0.59	Y
	772.0	34.14	34.80	3.00	0.66	Y
	776.0	34.11	34.80	3.00	0.69	Y
	798.0	34.12	34.80	3.00	0.68	Y
	806.0	33.83	35.60	3.60	1.77	Y
	816.0	33.64	35.60	3.60	1.96	Y
	851.0	33.56	35.60	3.60	2.04	Y
	861.0	33.62	35.60	3.60	1.98	Y
WiFi						
1	2412	23.70	23.85	0.234	0.15	Y
6	2437	23.65	23.85	0.234	0.2	Y
11	2462	23.72	23.85	0.234	0.13	Y
36	5180	16.52	16.98	0.0499	0.46	Y
44	5220	16.21	16.98	0.0499	0.77	Y
48	5240	16.48	16.98	0.0499	0.5	Y
132	5660	18.31	18.43	0.0698	0.12	Y
157	5785	18.05	18.43	0.0698	0.38	Y
165	5825	18.25	18.43	0.0698	0.18	Y

7.0 NUMBER OF TEST CHANNELS (N_C)

The number of test channels and test configurations were determined in accordance with FCC KDB 447498.

8.0 ACCESSORIES EVALUATED

Table 8.1 Manufacturer's Accessory List

Manufacturer's Accessory List						
Test Report ID Number	Manufacturer's Part Number	Description	Change ID(1)	Type II Group(3)	SAR(4) Evaluated	SAR(5) Tested
Antenna						
T13	14100-4300-01	Helical, Flex, Xtrm, 136 - 870MHz	40	n/a	Y	Y

Manufacturer's Accessory List						
Test Report ID Number	Manufacturer's Part Number	Description	Change ID(1)	Type II Group(3)	SAR(4) Evaluated	SAR(5) Tested
Battery						
P9	14100-4000-01	Battery, Li-Ion, FGD	1	n/a	Y	Y

Manufacturer's Accessory List						
Test Report ID Number	Manufacturer's Part Number	Description	Change ID(1)	Type II Group(3)	SAR(4) Evaluated	SAR(5) Tested
Audio Accessory						
A1	12082-0600-01	Standard Speaker Microphone	1	PB	Y	Y
A2	12082-0600-02	Speaker Microphone, Emer Button	1	PB	Y	N
A4	12082-0650-01	Microphone, Palm, 2-Wire Black	1	IL	Y	N
A6	12082-0650-03	Microphone, Mini Lapel, 3-Wire Black	1	IL	Y	N
A11	12082-0650-08	Headset, LTWT, OTH, Single Ear, IN-Line PTT	3	IL	Y	N
A12	12082-0650-09	Headset, LTWT, BTH, Dual Ear, In_Line PTT	3	IL	Y	N
A13	12082-0650-10	Headset, LTWT, BTH, Dual Ear, Pig Tail PTT	3	PT	Y	N
A14	12082-0650-11	Headset, LTWT, BTH, Dual In-Ear, In_Line PTT	3	IL	Y	N
A15	12082-0650-12	Headset, LTWT, BTH, Dual In-Ear, Pig Tail PTT	3	IL	Y	N
A16	12082-0650-13	Headset, Heavy Duty, BTH, w/PTT	3	IL	Y	N
A17	12082-0650-14	Headset, Heavy Duty, OTH, w/PTT	3	IL	Y	N
A20	12082-0650-17	Skull MIC, w/Body PTT, Earcup	3	BB	Y	N
A21	12082-0650-18	Throat MIC, w/Acoustic Tube, Body PTT	3	BB	Y	N
A22	12082-0650-19	Throat MIC, w/Acoustic Tube, Body & Ring PTT	3	BB	Y	N
A24	12082-0684-01	BlueTooth, Covert, Earpiece, MIC, PTT	3	BT	Y	N
A26	LS103239V1	Earphone, Lapel MIC, 2.5mm	3	n/a	Y	N
A27	LS103239V2	Earphone, Lapel MIC, 2.5mm, Right Angle	4	n/a	Y	N
A28	12082-0600-03	Microphone, Antenna Speaker, EMRG, 18"	6	PB	Y	N
A29	12082-0600-04	Microphone, Antenna Speaker, EMRG, 25.6"	6	PB	Y	N
A30	12082-0600-05	Microphone, Antenna Speaker, EMRG, 30"	6	PB	Y	N
A32	14035-4700-01	SPEAKER MIC, REVO NC2, C1D2 LMR	27	PB	Y	N
A34	14035-4750-01	SPEAKER MIC, 500F, C1D1 LMR	29	PB	Y	N
A35	12082-0800-02	SPEAKER MIC,WIRELESS,BLUETOOTH,ADVANCED		BT	Y	N
A36	12082-0800-03	SPEAKER MIC,WIRELESS,BLUETOOTH,ADV,ANZ		BT	Y	N
A37	14002-0197-01	Adapter, 6-Pin HIROSE, Ext Cable		Adpt	Y	N

Manufacturer's Accessory List						
Test Report ID Number	Manufacturer's Part Number	Description	Change ID(1)	Type II Group(3)	SAR(4) Evaluated	SAR(5) Tested
Body-Worn Accessory						
B1	12082-1290-01	Metal Belt Clip, 0mm	1	Y	Y	Y
B2	12082-3230-01	D-Swivel	1	Y	Y	N

(1) Change ID: Indicates the change number in which the accessory was added.
(3) Type II Group: "y" indicates that this accessory was evaluated with similar devices and found to have no significant contribution to the *reported SAR*
(4) SAR Evaluated: Indicates the accessory was visually evaluated and may or may not have tested.
(5) SAR Tested: Indicates the accessory was SAR tested during the course of this investigation.

9.0 SAR MEASUREMENT SUMMARY

Table 9.1: Measured Results LMR – BODY

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)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		100% DC (W/kg)	50% DC (W/kg)	
VHF Body															
9/14/2020	B8	FireRadio	PTT	136	CW	T13	P9	B1	A1	0	35	37.77	1.240	0.620	-0.430
9/14/2020	B9	FireRadio	PTT	143	CW	T13	P9	B1	A1	0	35	37.69	1.880	0.940	-0.180
9/14/2020	B10	FireRadio	PTT	150	CW	T13	P9	B1	A1	0	35	37.71	1.470	0.735	-0.280
9/14/2020	B11	FireRadio	PTT	158	CW	T13	P9	B1	A1	0	35	37.77	1.430	0.715	-0.150
9/14/2020	B12	FireRadio	PTT	168	CW	T13	P9	B1	A1	0	35	37.78	1.510	0.755	-0.320
9/14/2020	B13	FireRadio	PTT	174	CW	T13	P9	B1	A1	0	35	37.78	0.537	0.269	-0.410
9/17/2020	B21	FireRadio	PTT	174	CW	T13	P9	B1	A1	0	35	37.78	0.427	0.214	-0.280
2/10/2021	B1 Basline	FR Eng Ev	PTT	143	CW	T13	P9	B1	A1	0	35	37.69	2.100	1.050	-0.160
2/10/2021	B2	FireRadio	PTT	143	CW	T13	P9	B1	A1	0	35	37.69	0.487	0.244	-0.170
UHF Body															
SAR Limit								Spatial Peak		Head/Body		RF Exposure Category			
FCC 47 CFR 2.1093				Health Canada Safety Code 6				1 Gram Average		8.0 W/kg		Occupational/User Aware			

Table 9.1: Measured Results LMR – BODY (Cont)

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)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		100% DC (W/kg)	50% DC (W/kg)	
7/800 Body															
9/9/2020	B1	FireRadio	PTT	768	CW	T13	P9	B1	A1	0	35	34.21	4.090	2.045	-0.010
9/9/2020	B2	FireRadio	PTT	776	CW	T13	P9	B1	A1	0	35	34.11	4.330	2.165	-0.244
9/9/2020	B3	FireRadio	PTT	798	CW	T13	P9	B1	A1	0	35	34.12	2.130	1.065	-0.710
9/9/2020	B4	FireRadio	PTT	806	CW	T13	P9	B1	A1	0	35	33.83	1.900	0.950	-0.030
9/9/2020	B5	FireRadio	PTT	816	CW	T13	P9	B1	A1	0	35	33.64	3.480	1.740	-0.342
9/9/2020	B6	FireRadio	PTT	851	CW	T13	P9	B1	A1	0	35	33.56	4.020	2.010	-0.420
9/10/2020	B7	FireRadio	PTT	861	CW	T13	P9	B1	A1	0	35	33.62	1.510	0.755	-0.130
3/2/2021	B1-6 Baseline	FR Eng Ev	PTT	776	CW	T13	P9	B1	A1	0	35	34.11	2.460	1.230	-0.400
3/2/2021	B1-7 Baseline	FR Eng Ev	PTT	768	CW	T13	P9	B1	A1	0	35	34.21	3.770	1.885	-0.410
3/2/2021	B2-9	FireRadio	PTT	776	CW	T13	P9	B1	A1	0	35	34.11	2.460	1.230	0.050
3/2/2021	B2-10	FireRadio	PTT	768	CW	T13	P9	B1	A1	0	35	34.21	2.610	1.305	-0.380
3/2/2021	B2-11	FireRadio	PTT	851	CW	T13	P9	B1	A1	0	35	34.56	5.270	2.635	-0.010
SAR Limit							Spatial Peak			Head/Body		RF Exposure Category			
FCC 47 CFR 2.1093				Health Canada Safety Code 6			1 Gram Average			8.0 W/kg		Occupational/User Aware			

Table 9.2: Measured Results WLAN 2.4GHz & 5GHz Band – BODY

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)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		100% DC (W/kg)	50% DC (W/kg)	
3/3/2021	B12	FireRadio	PTT	2412	DSSS	FireAnt	5050-01	Belt Clip	SpkrMic	0	n/a	23.7	0.000		-0.120
3/4/2021	B13	FireRadio	PTT	2437	DSSS	FireAnt	5050-01	Belt Clip	SpkrMic	0	n/a	23.65	0.000		0.000
3/4/2021	B14	FireRadio	PTT	2462	DSSS	FireAnt	5050-01	Belt Clip	SpkrMic	0	n/a	23.72	0.000		-0.150
3/7/2021	B15	FireRadio	PTT	5180	OFDM	FireAnt	5050-01	Belt Clip	SpkrMic	0	n/a	16.52	0.001		0.000
3/7/2021	B16	FireRadio	PTT	5660	OFDM	FireAnt	5050-01	Belt Clip	SpkrMic	0	n/a	18.31	0.000		0.000
SAR Limit							Spatial Peak			Head/Body		RF Exposure Category			
FCC 47 CFR 2.1093				Health Canada Safety Code 6			1 Gram Average			1.6 W/kg		General Population			

Table 9.3: Measured Results LMR – FACE

Measured SAR Results (1g) - FACE Configuration (FCC/ISED)															
Date	Plot ID	DUT		Test Frequency (MHz)	Modulation	Accessories				DUT Spacing		Conducted Power (dBm)	Measured SAR (1g)		SAR Drift (dB)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		100% DC (W/kg)	50% DC (W/kg)	
VHF Face															
9/15/2020	F6	FireRadio	PTT	168	CW	T13	P9	n/a	n/a	25	55	37.78	0.421	0.211	-0.370
9/17/2020	F7	FireRadio	PTT	143	CW	T13	P9	n/a	n/a	25	55	37.69	0.482	0.241	-0.360
2/10/2021	F1 Baseline	FR Eng Ev	PTT	143	CW	T13	P9	n/a	n/a	25	55	37.69	0.792	0.396	-0.300
2/10/2021	F2	FireRadio	PTT	143	CW	T13	P9	n/a	n/a	25	55	37.69	0.828	0.414	-0.260
2/10/2021	F3	FireRadio	PTT	136	CW	T13	P9	n/a	n/a	25	55	37.77	1.660	0.830	-0.400
2/10/2021	F4	FireRadio	PTT	150	CW	T13	P9	n/a	n/a	25	55	37.1	0.724	0.362	-0.190
2/11/2021	F5	FireRadio	PTT	158	CW	T13	P9	n/a	n/a	25	55	37.77	1.130	0.565	-0.090
2/11/2021	F6	FireRadio	PTT	168	CW	T13	P9	n/a	n/a	25	55	37.78	1.060	0.530	-0.200
2/11/2021	F7	FireRadio	PTT	174	CW	T13	P9	n/a	n/a	25	55	37.78	0.693	0.347	-0.740
SAR Limit							Spatial Peak			Head/Body		RF Exposure Category			
FCC 47 CFR 2.1093				Health Canada Safety Code 6			1 Gram Average			8.0 W/kg		Occupational/User Aware			

Table 9.3: Measured Results LMR – FACE (Cont)

Measured SAR Results (1g) - FACE Configuration (FCC/ISED)															
Date	Plot ID	DUT		Test Frequency (MHz)	Modulation	Accessories				DUT Spacing		Conducted Power (dBm)	Measured SAR (1g)		SAR Drift (dB)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		100% DC (W/kg)	50% DC (W/kg)	
7/800 Face															
9/10/2020	F1	FireRadio	PTT	768	CW	T13	P9	n/a	n/a	25	55	34.21	0.425	0.213	-0.481
9/10/2020	F2	FireRadio	PTT	776	CW	T13	P9	n/a	n/a	25	55	34.11	0.354	0.177	-0.442
9/10/2020	F3	FireRadio	PTT	798	CW	T13	P9	n/a	n/a	25	55	34.12	0.602	0.301	-0.350
9/10/2020	F5	FireRadio	PTT	851	CW	T13	P9	n/a	n/a	25	55	34.56	0.980	0.490	-0.190
3/2/2021	F1-16 Baseline	FR Eng Ev	PTT	851	CW	T13	P9	n/a	n/a	25	55	33.56	2.060	1.030	-0.160
3/2/2021	F2-17	FireRadio	PTT	768	CW	T13	P9	n/a	n/a	25	55	34.21	1.210	0.605	0.040
3/2/2021	F3-18	FireRadio	PTT	776	CW	T13	P9	n/a	n/a	25	55	34.11	0.899	0.450	0.140
3/2/2021	F4-19	FireRadio	PTT	798	CW	T13	P9	n/a	n/a	25	55	34.12	1.220	0.610	-0.130
3/2/2021	F5-20	FireRadio	PTT	806	CW	T13	P9	n/a	n/a	25	55	33.83	1.570	0.785	-0.160
3/3/2021	F6-21	FireRadio	PTT	816	CW	T13	P9	n/a	n/a	25	55	33.64	1.320	0.660	0.000
3/3/2021	F7-22	FireRadio	PTT	851	CW	T13	P9	n/a	n/a	25	55	33.56	2.390	1.195	0.150
3/3/2021	F8-23	FireRadio	PTT	861	CW	T13	P9	n/a	n/a	25	55	33.62	2.420	1.210	0.470
SAR Limit							Spatial Peak			Head/Body		RF Exposure Category			
FCC 47 CFR 2.1093				Health Canada Safety Code 6			1 Gram Average			8.0 W/kg		Occupational/User Aware			

Table 9.5: Measured Results WLAN 2.4G & BT Band – FACE

Measured SAR Results (1g) - FACE Configuration (FCC/ISED)															
Date	Plot ID	DUT		Test Frequency (*MHz*)	Modulation	Accessories				DUT Spacing		Conducted Power (*dBm*)	Measured SAR (1g)		SAR Drift (*dB*)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (*mm*)	Antenna (*mm*)		100% DC (*W/kg*)	50% DC (*W/kg*)	
3/4/2021	F24	**FireRadio**	**PTT**	2412	**DSSS**	FireAnt	5050-01	N/A	N/A	**25**	**n/a**	**23.7**	0.000		0.000
3/4/2021	F25	**FireRadio**	**PTT**	2437	**DSSS**	FireAnt	5050-01	N/A	N/A	**25**	**n/a**	**23.65**	0.000		0.000
3/4/2021	F26	**FireRadio**	**PTT**	2462	**DSSS**	FireAnt	5050-01	N/A	N/A	**25**	**n/a**	**23.72**	0.000		0.000
3/4/2021	F27*	**FireRadio**	**PTT**	2462	**DSSS**	FireAnt	5050-01	N/A	N/A	**0**	**n/a**	**23.72**	0.000		0.000
3/6/2021	F28	**FireRadio**	**PTT**	5180	**OFDM**	FireAnt	5050-01	N/A	N/A	**25**	**n/a**	**16.52**	0.002		0.000
3/7/2021	F29	**FireRadio**	**PTT**	5240	**OFDM**	FireAnt	5050-01	N/A	N/A	**25**	**n/a**	**16.48**	0.000		0.000
3/7/2021	F30	**FireRadio**	**PTT**	5660	**OFDM**	FireAnt	5050-01	N/A	N/A	**25**	**n/a**	**18.31**	0.000		0.000
SAR Limit							**Spatial Peak**			**Head/Body**		**RF Exposure Category**			
FCC 47 CFR 2.1093				**Health Canada Safety Code 6**			**1 Gram Average**			**1.6 W/kg**		**General Population**			

* Due to the extremely low SAR, these measurements were made with a 0mm separation as verification of DUT operation. Since this was an exceptional test configuration, these measurement values will not be used as the *reported* SAR.

10.0 SCALING OF MAXIMUM MEASURE SAR

Table 10.1 SAR Scaling – LMR

Scaling of Maximum Measured SAR (1g)					
Measured Parameters		Configuration			
		Face	Body	Head	
Plot ID		F8-23	B2-11		
Maximum Measured SAR_M		1.210	2.635		(W/kg)
Frequency		861	851		(MHz)
Power Drift		0.470 (1)	-0.010		(dB)
Conducted Power		33.620	34.560		(dBm)
Fluid Deviation from Target					
Δe	Permitivity	-4.01%	-3.74%		
Δσ	Conductivity	7.78%	6.11%		

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*f³) + (0.009402*f²) - (0.02742*f) - 0.2026				(F.2)	
Cσ = (0.009804*f³) - (0.08661*f²) + (0.02981*f) + 0.7829				(F.3)	
f	Frequency (GHz)	0.861	0.851		
Ce		-0.220	-0.220		
Cσ		0.751	0.752		
Ce * Δe		0.009	0.008		
Cσ * Δσ		0.058	0.046		
ΔSAR		0.067	0.054		(%)

Manufacturer's Tuneup Tolerance				
Measured Conducted Power	33.620	34.560		(dBm)
Rated Conducted Power	34.000	34.000		(dBm)
ΔP	-0.380	0.560 (4)		(dB)

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

SAR Adjustment for Fluid Sensitivity				
$SAR_1 = SAR_M$ * ΔSAR	1.291	2.778		(W/kg)

SAR Adjustment for Tuneup Tolerance				
$SAR_2 = SAR_1$ + [ΔP]	1.409	2.778		(W/kg)

SAR Adjustment for Drift				
$SAR_3 = SAR_2$ + Drift	1.409	2.784		(W/kg)

reported SAR				
FCC = SAR_2	**1.41**	**2.78**		(W/kg)
ISED = SAR_3	**1.41**	**2.78**		(W/kg)

NOTES to Table
(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, Body and/or Head 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 3. The Plot ID is for indentification of the SAR Measurement Plots in the Annexes of this report. NOTE: Some of the scaling factors in Steps 1 through 3 may not apply and are identified by grayed fields.
Step 1
Per IEC-62209-1 and FCC KDB 865664. Scaling required only when Measured Fluid Deviation is greater than 5%. If the Measured Fluid Deviation is greater than 5%, Table 10.1 will be shown and will indicate the SAR scaling factor in percent (%). SAR is MULTIPLIED by this scaling factor only when the scaling factor is positive (+).
Step 2
Per KDB 447498. Scaling required only when the difference (Delta) between the Measured Conducted Power and the Manufacturer's Rated Conducted Power is (-) Negative. The absolute value of Delta is ADDED to the SAR.
Step 3
Per IEC 62209-1. Scaling required only when Measured Drift is (-) Negative. The absolute value of Measured Drift is added to Reported.
Step 4
The Reported SAR is the Maximum Final Adjusted SAR from the applicable Steps 1 through 3 and are reported on Page 1 of this report.

11.0 ANALYSIS OF SIMULTANEOUS TRANSMISSION

Simultaneous Transmission Analysis

The XL-400P employs Wi-Fi and BlueTooth transmitters capable of simultaneously transmitting with the LMR transmitter. The Wi-Fi and BlueTooth transmitters share the same antenna and the transmissions are interleaved such that only one transmitter is transmitting at a time. As per FCC KDB 447498, simultaneous transmission analysis is required for devices capable of simultaneous transmission. The Wi-Fi and BT SAR are subject to General Population limits of 1.6W/kg. The LMR SAR is subject to Occupational limits of 8.0W/kg. To determine compliance when different SAR limits are applied to the different transmit modes, the Sum-of-the-Ratios of the SAR to the respective SAR limit is applied. When the Sum-of-the-Ratios is ≤ 1.0, Simultaneous Transmission SAR Test Exclusion may be applied.

When the Sum-of-the-Ratios exceeds 1.0, the SAR to Peak Location Separation Ration (SPLSR) may be used to determine simultaneous transmission SAR test exclusion. However, the equation for determining this exclusion applies to General Population limits only. Reference KDB Inquiry 4285674. When mixed Occupational and General Population exposure limits are used, the SAR of the Occupational configuration is normalize to the General Population limit. For example if $SAR_{Occupational}$ = 6.4W/kg and SAR_{GenPop} = 0.65W/kg, normalizing the Occupational SAR to General Population limits yields $SAR_{OccNorm}$ = 1.28W/kg. The SPLSR equation of KDB 447498 4.3.1 c) becomes

$$(SAR_1 + SAR_2)^{1.5}/R_i \leq 0.04 = (SAR_{OccNorm} + SAR_{GenPop})^{1.5}/R_i = (1.28 + 0.65)^{1.5}/R_i \leq 0.04$$

SAR for each transmission band, transmission mode and/or equipment class was evaluated with Body-Worn and Audio Accessories in the BODY configuration and with no Accessories in the HEAD configurations. Only the Maximum *reported* SAR for BODY and HEAD configuration is used in the Sum-of-the-Ratios or SPLSR calculation and the worst case of all possible combinations is considered.

Table 11.1 List of Possible Transmitters

List of Possible Transmitters				
Type	Class	Frequency Range		Rated Output Power (dBm)
		Lower (MHz)	Upper (MHz)	
VHF	TNF	136.0	174.0	38.60
LMR 700		764.0	806.0	34.80
LMR 800		806.0	869.0	35.60
BlueTooth	DSS	2402.0	2480.0	6.90
WiFi 2.4	DTS	2412.0	2462.0	23.85
WiFi 5	NII	5150.0	5240.0	16.98
WiFi 5	NII	5745.0	5825.0	18.43

Table 11.2 List of Possible Transmitters Combinations

Simultaneous Transmitter Combinations				
Configuration Number	Transmitter			
	LMR 7/800	BlueTooth	WiFi 2.4	WiFi 5
1	X	X		
2	X		X	
3	X			X

(grey box) Indicates this configuration is not supported

Table 11.3 Analysis of Sum-of-the-Ratios

Analysis of Sum-of-the-Ratios For All Transmitters and Configurations											
Configuration Number	Configuration	Transmitter Type								Sum of Ratios	Sum of SARs
		LMR Band		BlueTooth		WiFi 2.4		WiFi 5			
		stand-alone SAR *(W/kg)*	Ratio to Limit	*stand-alone* SAR *(W/kg)*	Ratio to Limit	*stand-alone* SAR *(W/kg)*	Ratio to Limit	*stand-alone* SAR *(W/kg)*	Ratio to Limit		
		SAR Limit = 8.0W/kg (Occupational)		*SAR Limit = 1.6W/kg (General Population)*							*(W/kg)*
FCC											
1	HEAD	1.410	0.176	0.000	0.000					0.176	1.410
2						0.000	0.000			0.176	1.410
3								0.002	0.001	0.178	1.412
1	BODY	2.780	0.348	0.000	0.000					0.348	2.780
2						0.000	0.000			0.348	2.780
3								0.001	0.001	0.348	2.781
ISED											
1	HEAD	1.410	0.176	0.000	0.000					0.176	1.410
2						0.000	0.000			0.176	1.410
3								0.002	0.001	0.178	1.412
1	BODY	2.780	0.348	0.000	0.000					0.348	2.780
2						0.000	0.000			0.348	2.780
3								0.001	0.001	0.348	2.781

(Grey box) Indicates this combination is not supported

Simultaneous Transmission SAR Test Exclusion may be determined by applying the Sum-of-the-Ratios for the worst case combinations of all simultaneously transmitting transmitters. From the above table, none of the stand-alone transmitters exceed their respective limit. Additionally, the Sum-of-the-Ratios for the worst case combinations of the transmitters with General Population limits do not exceed 1.0.

12.0 SAR EXPOSURE LIMITS

Table 12.1 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

Table 13.1 Day Log

DAY LOG									
Date	Ambient Temp (° C)	Fluid Temp (° C)	Relative Humidity (%)	Barometric Pressure (kPa)	Fluid Dielectric	SPC	DUT Test	TSL	Comments
8 Sep 2020	21	21.2	32%	103.1	X	X		835H	
9 Sep 2020	22	21.3	32%	102.5			X	835H	
10 Sep 2020	22	21.3	37%	102.3			X	835H	
14 Sep 2020	24	21.8	37%	101.3	X	X	X	150H	
14 Sep 2020	23	22.2	44%	101.4			X	150H	
15 Sep 2020	22	23.2	43%	102.1	X		X	150H	
16 Sep 2020	22	23.4	42%	102.1			X	150H	
17 Sep 2020	23	23.5	40%	102.0			X	150H	
17 Sep 2020	23	22.8	40%	102.0	X	X	X	450H	
18 Sep 2020	23	23.1	40%	101.1			X	450H	
Feb 4 2021	24	22.7	25%	102.3	x	x	x	150H	
Feb 5 2021	24	23.2	25%	101.8			x	150H	
Feb 8 2021	23	24.0	21%	102.4	x	x	x	150H	Preliminary Testing
Feb 10 2021	23	23.0	16%	103.1			x	150H	
Feb 11 2021	25	22.9	14%	103.8			x	150H	
Feb 11 2021	25	23.6	14%	103.8	x	x		450H	
Feb 12 2021	23	22.5	14%	102.9			x	450H	
March 2 2021	25	22.1	19%	101.1	x	x	x	835H	
March 3 2021	24	22.4	22%	101.2	x	x	x	835H	
March 4 2021	23	22.6	21%	101.6			x	2450H	
March 6 2021	21	20.4	25%	101.2	x	x	x	5250H	
March 6 2021	21	20.4	25%	101.2	x	x	x	5750H	

Table 13.2 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
The DUT was securely clamped into the device holder with the surface of the DUT normally held to the user's face facing the phantom. The device holder was adjusted to ensure that the horizontal axis of the DUT was parallel to the bottom of the phantom. A 25mm spacer block was used to set the separation distance between the DUT and the phantom to 25mm. When applicable and unless by design, the antenna of the DUT was prevented from sagging away from the phantom. The spacer block was removed before testing.
BODY Configuration
Body-Worn and Audio Accessories were affixed to the DUT in the manner in which they are intended to be used. The DUT, with its accessories, were 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. Body-Worn Accessory straps, linkages, etc. were positioned in a fashion resembling that for which they were intended to be used. Audio Accessory cables, etc., were positioned in a fashion resembling that for which they were intended to be used.
HEAD Configuration
This device is not intended to be held to the ear and was not tested in the HEAD configuration.

Table 13.3 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 ±1.0°C throughout the test series. TSL analysis and SPC were repeated when the Active TSL use exceeded 84 hours. 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. The SAR values in the 50% DC column have been scaled by 50% for 50% Push-To-Talk duty cycle compensation. 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 and FACE configurations, 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.

Table 13.4 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 OET Bulletin 65 Supplement C targets for HEAD or BODY for the entire fluid measurement range. Fluid adjustment are made if the dielectric parameters are > 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.

Table 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)	**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	

Table 13.6 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	

Table 13.7 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 14.1 Measurement Uncertainty

IEEE 1528 Table E.9

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEEE 1528-2013 Table 9)										
Source of Uncertainty	**IEEE 1528 Section**	**Toler ±%**	**Prob Dist**	**Div**	**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	1.00	1	1	1	**6.7**	**6.7**	∞
Axial Isotropy** (*k*=1)	E.2.2	0.6	R	1.73	√3	0.7	0.7	**0.2**	**0.2**	∞
Hemispherical Isotropy** (*k*=1)	E.2.2	3.2	R	1.73	√3	0.7	0.7	**1.3**	**1.3**	∞
Boundary Effect*	E.2.3	1.0	R	1.73	√3	1	1	0.6	0.6	∞
Linearity** (*k*=1)	E.2.4	**0.5**	R	1.73	√3	1	1	**0.3**	**0.3**	∞
System Detection Limits*	E.2.4	1.0	R	1.73	√3	1	1	0.6	0.6	∞
Modulation Response** (*k*=1)	E.2.5	**8.3**	R	1.73	√3	1	1	**4.8**	**4.8**	∞
Readout Electronics*	E.2.6	0.3	N	1.00	1	1	1	0.3	0.3	∞
Response Time*	E.2.7	0.8	R	1.73	√3	1	1	0.5	0.5	∞
Integration Time*	E.2.8	2.6	R	1.73	√3	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	**0.0**	R	1.73	√3	1	1	0.0	0.0	**10**
RF Ambient Conditions - Reflection	E.6.1	**0.0**	R	1.73	√3	1	1	0.0	0.0	**10**
Probe Positioner Mechanical Tolerance*	E.6.2	0.0	R	1.73	√3	1	1	0.0	0.0	∞
Probe Positioning wrt Phantom Shell*	E.6.3	0.4	R	1.73	√3	1	1	0.2	0.2	∞
Post-processing*	E.5	2.0	R	1.73	√3	1	1	1.2	1.2	∞
Test Sample Related										
Test Sample Positioning	E.4.2	**2.2**	N	1.00	1	1	1	2.2	2.2	**5**
Device Holder Uncertainty*	E.4.1	3.6	N	1.00	1	1	1	3.6	3.6	∞
SAR Drift Measurement(2)	E.2.9	0.0	R	1.73	√3	1	1	0.0	0.0	∞
SAR Power Scaling(3)	E.6.5	0.0	R	1.73	√3	1	1	0.0	0.0	∞
Phantom and Tissue Parameters										
Phantom Uncertainty*	E.3.1	6.1	R	1.73	√3	1	1	3.5	3.5	∞
SAR Correction Uncertainty	E.3.2	**1.6**	N	1.00	1	1	0.84	1.6	1.3	∞
Liquid Conductivity (measurement)	E.3.3	**5.0**	N	1.00	1	0.78	0.71	3.9	3.6	**10**
Liquid Permittivity (measurement)	E.3.3	**5.0**	N	1.00	1	0.23	0.26	1.2	1.3	**10**
Liquid Conductivity (Temperature)	E.3.2	**0.4**	R	1.73	√3	0.78	0.71	0.2	0.2	**10**
Liquid Permittivity Temperature)	E.3.2	**0.2**	R	1.73	√3	0.23	0.26	0.0	0.0	**10**
Effective Degrees of Freedom(1)									**V_{eff} =**	**1141**
Combined Standard Uncertainty			**RSS**					**11.1**	**11.0**	
Expanded Uncertainty (95% Confidence Interval)			**k=2**					**22.2**	**21.9**	
Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003										

(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 DASY4

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

Table 14.2 Calculation of Degrees of Freedom

Table 14.2	
Calculation of the Degrees and Effective Degrees of Freedom	
$v_i = n - 1$	$$v_{eff} = \frac{u_c^4}{\sum_{i=1}^{m} \frac{c_i^4 u_i^4}{v_i}}$$

15.0 FLUID DIELECTRIC PARAMETERS

Note: Effective February 19, 2019 TCB Workshop: FCC has permitted the use of single head-tissue simulating liquid specified in IEC 62209-1 for all SAR tests. TSL can be changed in a Permissive Change. If SAR increased and Original SAR > 1.2W/kg, additional SAR measurements will be required.

Table 15.1 Fluid Dielectric Parameters 835MHz HEAD TSL, 8 September 2020

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Tue 08/Sep/2020 13:42:49
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
0.7350	42.02	0.89	40.50	0.78
0.7450	41.97	0.89	40.43	0.80
0.7550	41.92	0.89	40.61	0.81
0.7650	41.86	0.89	40.41	0.81
0.7750	41.81	0.90	40.34	0.84
0.7850	41.76	0.90	40.04	0.84
0.7950	41.71	0.90	39.76	0.84
0.8050	41.66	0.90	39.97	0.86
0.8150	41.60	0.90	39.93	0.86
0.8250	41.55	0.90	39.51	0.87
0.8350	41.50	0.90	39.33	0.88
0.8450	41.50	0.91	39.19	0.90
0.8550	41.50	0.92	39.10	0.90
0.8650	41.50	0.93	38.93	0.92
0.8750	41.50	0.94	38.89	0.92
0.8850	41.50	0.95	38.83	0.94
0.8950	41.50	0.96	38.82	0.94
0.9050	41.50	0.97	38.67	0.94
0.9150	41.50	0.98	38.44	0.95
0.9250	41.48	0.98	38.16	0.96
0.9350	41.46	0.99	38.43	0.97

Table 15.2 Fluid Dielectric Analysis 835MHz HEAD TSL, 8 September 2020

FLUID DIELECTRIC PARAMETERS							
Date:	8 Sep 2020	Fluid Temp:	21.2	Frequency:	835MHz	Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
735.0000		40.5000	0.7800	42.0200	0.89	-3.62%	-12.36%
745.0000		40.4300	0.8000	41.9700	0.89	-3.67%	-10.11%
755.0000		40.6100	0.8100	41.9200	0.89	-3.13%	-8.99%
765.0000		40.4100	0.8100	41.8600	0.89	-3.46%	-8.99%
775.0000		40.3400	0.8400	41.8100	0.90	-3.52%	-6.67%
785.0000		40.0400	0.8400	41.7600	0.90	-4.12%	-6.67%
795.0000		39.7600	0.8400	41.7100	0.90	-4.68%	-6.67%
805.0000		39.9700	0.8600	41.6600	0.90	-4.06%	-4.44%
815.0000		39.9300	0.8600	41.6000	0.90	-4.01%	-4.44%
825.0000		39.5100	0.8700	41.5500	0.90	-4.91%	-3.33%
835.0000		39.3300	0.8800	41.5000	0.90	-5.23%	-2.22%
845.0000		39.1900	0.9000	41.5000	0.91	-5.57%	-1.10%
855.0000		39.1000	0.9000	41.5000	0.92	-5.78%	-2.17%
865.0000		38.9300	0.9200	41.5000	0.93	-6.19%	-1.08%
875.0000		38.8900	0.9200	41.5000	0.94	-6.29%	-2.13%
885.0000		38.8300	0.9400	41.5000	0.95	-6.43%	-1.05%
895.0000		38.8200	0.9400	41.5000	0.96	-6.46%	-2.08%
905.0000		38.6700	0.9400	41.5000	0.97	-6.82%	-3.09%
915.0000		38.4400	0.9500	41.5000	0.98	-7.37%	-3.06%
925.0000		38.1600	0.9600	41.4800	0.98	-8.00%	-2.04%
935.0000		38.4300	0.9700	41.4600	0.99	-7.31%	-2.02%

*Channel Frequency Tested

Table 15.3 Fluid Dielectric Parameters 150MHz HEAD TSL, 14 September 2020

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Fri 14/Sep/2020 13:12:10
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
0.1000	54.63	0.72	56.02	0.69
0.1100	54.17	0.73	51.89	0.69
0.1200	53.70	0.74	52.02	0.69
0.1300	53.23	0.75	51.71	0.69
0.1400	52.77	0.75	49.81	0.69
0.1500	52.30	0.76	49.90	0.69
0.1600	51.83	0.77	48.95	0.71
0.1700	51.37	0.77	47.66	0.71
0.1800	50.90	0.78	47.94	0.73
0.1900	50.43	0.79	47.60	0.74
0.2000	49.97	0.80	48.14	0.74

Table 15.4 Fluid Dielectric Analysis 150MHz HEAD TSL, 14 September 2020

FLUID DIELECTRIC PARAMETERS							
Date: 14 Sep 2020		Fluid Temp: 21.7		Frequency:	150MHz	Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
100.0000		56.0200	0.6900	54.6300	0.72	2.54%	-4.17%
110.0000		51.8900	0.6900	54.1700	0.73	-4.21%	-5.48%
120.0000		52.0200	0.6900	53.7000	0.74	-3.13%	-6.76%
130.0000		51.7100	0.6900	53.2300	0.75	-2.86%	-8.00%
140.0000		49.8100	0.6900	52.7700	0.75	-5.61%	-8.00%
150.0000		49.9000	0.6900	52.3000	0.76	-4.59%	-9.21%
160.0000		48.9500	0.7100	51.8300	0.77	-5.56%	-7.79%
170.0000		47.6600	0.7100	51.3700	0.77	-7.22%	-7.79%
180.0000		47.9400	0.7300	50.9000	0.78	-5.82%	-6.41%
190.0000		47.6000	0.7400	50.4300	0.79	-5.61%	-6.33%
200.0000		48.1400	0.7400	49.9700	0.80	-3.66%	-7.50%

*Channel Frequency Tested

Table 15.5 Fluid Dielectric Parameters 450MHz HEAD TSL, 17 September 2020

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***************************************************************
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 17/Sep/2020 11:48:45
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
0.3500	44.70	0.87	45.75	0.79
0.3600	44.58	0.87	45.55	0.79
0.3700	44.46	0.87	45.87	0.79
0.3800	44.34	0.87	45.04	0.79
0.3900	44.22	0.87	45.36	0.79
0.4000	44.10	0.87	45.01	0.79
0.4100	43.98	0.87	44.63	0.79
0.4200	43.86	0.87	44.19	0.80
0.4300	43.74	0.87	43.94	0.82
0.4400	43.62	0.87	43.92	0.80
0.4500	43.50	0.87	43.69	0.82
0.4600	43.45	0.87	43.61	0.84
0.4700	43.40	0.87	43.35	0.86
0.4800	43.34	0.87	42.81	0.87
0.4900	43.29	0.87	43.04	0.88
0.5000	43.24	0.87	42.45	0.88
0.5100	43.19	0.87	42.29	0.88
0.5200	43.14	0.88	42.19	0.91
0.5300	43.08	0.88	42.07	0.92
0.5400	43.03	0.88	42.09	0.90
0.5500	42.98	0.88	41.96	0.91

Table 15.6 Fluid Dielectric Analysis 150MHz HEAD TSL, 17 September 2020

FLUID DIELECTRIC PARAMETERS							
Date: 17 Sep 2020		Fluid Temp: 22.8		Frequency:	450MHz	Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
350.0000		45.7500	0.7900	44.7000	0.87	2.35%	-9.20%
360.0000		45.5500	0.7900	44.5800	0.87	2.18%	-9.20%
370.0000		45.8700	0.7900	44.4600	0.87	3.17%	-9.20%
380.0000		45.0400	0.7900	44.3400	0.87	1.58%	-9.20%
390.0000		45.3600	0.7900	44.2200	0.87	2.58%	-9.20%
400.0000		45.0100	0.7900	44.1000	0.87	2.06%	-9.20%
410.0000		44.6300	0.7900	43.9800	0.87	1.48%	-9.20%
420.0000		44.1900	0.8000	43.8600	0.87	0.75%	-8.05%
430.0000		43.9400	0.8200	43.7400	0.87	0.46%	-5.75%
440.0000		43.9200	0.8000	43.6200	0.87	0.69%	-8.05%
450.0000		43.6900	0.8200	43.5000	0.87	0.44%	-5.75%
460.0000		43.6100	0.8400	43.4500	0.87	0.37%	-3.45%
470.0000		43.3500	0.8600	43.4000	0.87	-0.12%	-1.15%
480.0000		42.8100	0.8700	43.3400	0.87	-1.22%	0.00%
490.0000		43.0400	0.8800	43.2900	0.87	-0.58%	1.15%
500.0000		42.4500	0.8800	43.2400	0.87	-1.83%	1.15%
510.0000		42.2900	0.8800	43.1900	0.87	-2.08%	1.15%
520.0000		42.1900	0.9100	43.1400	0.88	-2.20%	3.41%
530.0000		42.0700	0.9200	43.0800	0.88	-2.34%	4.55%
540.0000		42.0900	0.9000	43.0300	0.88	-2.18%	2.27%
550.0000		41.9600	0.9100	42.9800	0.88	-2.37%	3.41%

*Channel Frequency Tested

Table 15.7 Fluid Dielectric Parameters 150MHz HEAD TSL, 4 February 2021

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 04/Feb/2021 11:27:31
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
0.1000	54.63	0.72	56.92	0.68
0.1100	54.17	0.73	54.61	0.70
0.1200	53.70	0.74	56.22	0.70
0.1300	53.23	0.75	52.74	0.72
0.1400	52.77	0.75	53.75	0.70
0.1500	52.30	0.76	51.84	0.72
0.1600	51.83	0.77	51.22	0.71
0.1700	51.37	0.77	51.75	0.74
0.1800	50.90	0.78	50.35	0.77
0.1900	50.43	0.79	49.90	0.74
0.2000	49.97	0.80	48.99	0.75

Table 15.8 Fluid Dielectric Analysis 150MHz HEAD TSL, 4 February 2021

FLUID DIELECTRIC PARAMETERS							
Date: 4 Feb 2021		Fluid Temp: 22.7		Frequency: 150MHz		Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
100.0000		56.9200	0.6800	54.6300	0.72	4.19%	-5.56%
110.0000		54.6100	0.7000	54.1700	0.73	0.81%	-4.11%
120.0000		56.2200	0.7000	53.7000	0.74	4.69%	-5.41%
130.0000		52.7400	0.7200	53.2300	0.75	-0.92%	-4.00%
140.0000		53.7500	0.7000	52.7700	0.75	1.86%	-6.67%
150.0000		51.8400	0.7200	52.3000	0.76	-0.88%	-5.26%
160.0000		51.2200	0.7100	51.8300	0.77	-1.18%	-7.79%
170.0000		51.7500	0.7400	51.3700	0.77	0.74%	-3.90%
180.0000		50.3500	0.7700	50.9000	0.78	-1.08%	-1.28%
190.0000		49.9000	0.7400	50.4300	0.79	-1.05%	-6.33%
200.0000		48.9900	0.7500	49.9700	0.80	-1.96%	-6.25%

*Channel Frequency Tested

Table 15.9 Fluid Dielectric Parameters 150MHz HEAD TSL, 8 February 2021

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Mon 08/Feb/2021 14:18:46
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
0.1000	54.63	0.72	52.65	0.70
0.1100	54.17	0.73	54.62	0.73
0.1200	53.70	0.74	51.19	0.73
0.1300	53.23	0.75	55.06	0.73
0.1400	52.77	0.75	52.68	0.74
0.1500	52.30	0.76	51.23	0.76
0.1600	51.83	0.77	49.54	0.75
0.1700	51.37	0.77	49.99	0.75
0.1800	50.90	0.78	48.79	0.80
0.1900	50.43	0.79	49.00	0.78
0.2000	49.97	0.80	48.38	0.79

Table 15.10 Fluid Dielectric Analysis 150MHz HEAD TSL, 8 February 2021

FLUID DIELECTRIC PARAMETERS							
Date: 8 Feb 2021		Fluid Temp: 24		Frequency:	150MHz	Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
100.0000		52.6500	0.7000	54.6300	0.72	-3.62%	-2.78%
110.0000		54.6200	0.7300	54.1700	0.73	0.83%	0.00%
120.0000		51.1900	0.7300	53.7000	0.74	-4.67%	-1.35%
130.0000		55.0600	0.7300	53.2300	0.75	3.44%	-2.67%
136.0000	*	53.6320	0.7360	52.9540	0.75	1.28%	-1.87%
140.0000		52.6800	0.7400	52.7700	0.75	-0.17%	-1.33%
143.0000	*	52.2450	0.7460	52.6290	0.75	-0.73%	-0.93%
150.0000	*	51.2300	0.7600	52.3000	0.76	-2.05%	0.00%
158.0000	*	49.8780	0.7520	51.9240	0.77	-3.94%	-2.08%
160.0000		49.5400	0.7500	51.8300	0.77	-4.42%	-2.60%
168.0000	*	49.9000	0.7500	51.4620	0.77	-3.04%	-2.60%
170.0000		49.9900	0.7500	51.3700	0.77	-2.69%	-2.60%
174.0000	*	49.5100	0.7700	51.1820	0.77	-3.27%	-0.52%
180.0000		48.7900	0.8000	50.9000	0.78	-4.15%	2.56%
190.0000		49.0000	0.7800	50.4300	0.79	-2.84%	-1.27%
200.0000		48.3800	0.7900	49.9700	0.80	-3.18%	-1.25%

*Channel Frequency Tested

Table 15.11 Fluid Dielectric Parameters 450MHz HEAD TSL, 11 February 2021

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 11/Feb/2021 16:21:37
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
0.3500	44.70	0.87	48.83	0.81
0.3600	44.58	0.87	48.35	0.83
0.3700	44.46	0.87	47.66	0.85
0.3800	44.34	0.87	48.03	0.86
0.3900	44.22	0.87	47.81	0.87
0.4000	44.10	0.87	47.24	0.86
0.4100	43.98	0.87	47.18	0.86
0.4200	43.86	0.87	46.95	0.87
0.4300	43.74	0.87	47.02	0.87
0.4400	43.62	0.87	46.53	0.88
0.4500	43.50	0.87	45.70	0.90
0.4600	43.45	0.87	45.95	0.91
0.4700	43.40	0.87	46.08	0.91
0.4800	43.34	0.87	45.13	0.93
0.4900	43.29	0.87	45.01	0.94
0.5000	43.24	0.87	44.75	0.95
0.5100	43.19	0.87	45.21	0.95
0.5200	43.14	0.88	44.84	0.95
0.5300	43.08	0.88	44.24	0.98
0.5400	43.03	0.88	44.28	0.96
0.5500	42.98	0.88	44.22	0.96

Table 15.12 Fluid Dielectric Analysis 450MHz HEAD TSL, 11 February 2021

FLUID DIELECTRIC PARAMETERS							
Date:	11 Feb 2021	Fluid Temp:	23.6	Frequency:	450MHz	Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
350.0000		48.8300	0.8100	44.7000	0.87	9.24%	-6.90%
360.0000		48.3500	0.8300	44.5800	0.87	8.46%	-4.60%
370.0000		47.6600	0.8500	44.4600	0.87	7.20%	-2.30%
378.0000	*	47.9560	0.8580	44.3640	0.87	8.10%	-1.38%
380.0000		48.0300	0.8600	44.3400	0.87	8.32%	-1.15%
390.0000		47.8100	0.8700	44.2200	0.87	8.12%	0.00%
400.0000		47.2400	0.8600	44.1000	0.87	7.12%	-1.15%
406.0000	*	47.2040	0.8600	44.0280	0.87	7.21%	-1.15%
410.0000		47.1800	0.8600	43.9800	0.87	7.28%	-1.15%
418.0000	*	46.9960	0.8680	43.8840	0.87	7.09%	-0.23%
420.0000		46.9500	0.8700	43.8600	0.87	7.05%	0.00%
430.0000	*	47.0200	0.8700	43.7400	0.87	7.50%	0.00%
440.0000		46.5300	0.8800	43.6200	0.87	6.67%	1.15%
450.0000	*	45.7000	0.9000	43.5000	0.87	5.06%	3.45%
454.0000	*	45.8000	0.9040	43.4800	0.87	5.34%	3.91%
456.0000	*	45.8500	0.9060	43.4700	0.87	5.48%	4.14%
460.0000		45.9500	0.9100	43.4500	0.87	5.75%	4.60%
470.0000		46.0800	0.9100	43.4000	0.87	6.18%	4.60%
480.0000		45.1300	0.9300	43.3400	0.87	4.13%	6.90%
490.0000		45.0100	0.9400	43.2900	0.87	3.97%	8.05%
500.0000		44.7500	0.9500	43.2400	0.87	3.49%	9.20%
510.0000		45.2100	0.9500	43.1900	0.87	4.68%	9.20%
520.0000		44.8400	0.9500	43.1400	0.88	3.94%	7.95%
530.0000		44.2400	0.9800	43.0800	0.88	2.69%	11.36%
540.0000		44.2800	0.9600	43.0300	0.88	2.90%	9.09%
550.0000		44.2200	0.9600	42.9800	0.88	2.89%	9.09%

*Channel Frequency Tested

Table 15.13 Fluid Dielectric Parameters 835MHz HEAD TSL, 2 March 2021

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Tue 02/Mar/2021 12:52:10
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
0.7350	42.02	0.89	41.35	0.86
0.7450	41.97	0.89	41.64	0.87
0.7550	41.92	0.89	41.27	0.87
0.7650	41.86	0.89	41.48	0.90
0.7750	41.81	0.90	41.19	0.89
0.7850	41.76	0.90	40.94	0.89
0.7950	41.71	0.90	40.74	0.91
0.8050	41.66	0.90	40.50	0.91
0.8150	41.60	0.90	40.24	0.91
0.8250	41.55	0.90	40.07	0.92
0.8350	41.50	0.90	39.96	0.95
0.8450	41.50	0.91	39.94	0.96
0.8550	41.50	0.92	39.95	0.98
0.8650	41.50	0.93	39.76	1.01
0.8750	41.50	0.94	39.63	1.01
0.8850	41.50	0.95	39.65	1.02
0.8950	41.50	0.96	39.61	1.01
0.9050	41.50	0.97	39.21	1.01
0.9150	41.50	0.98	39.06	1.02
0.9250	41.48	0.98	39.06	1.01
0.9350	41.46	0.99	38.97	1.03

Table 15.14 Fluid Dielectric Analysis 835MHz HEAD TSL, 11 February 2021

FLUID DIELECTRIC PARAMETERS							
Date: 2 Mar 2021		Fluid Temp: 22.1		Frequency: 835MHz		Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
735.0000		41.3500	0.8600	42.0200	0.89	-1.59%	-3.37%
745.0000		41.6400	0.8700	41.9700	0.89	-0.79%	-2.25%
755.0000		41.2700	0.8700	41.9200	0.89	-1.55%	-2.25%
763.0000	*	41.4380	0.8940	41.8720	0.89	-1.04%	0.45%
765.0000		41.4800	0.9000	41.8600	0.89	-0.91%	1.12%
768.0000	*	41.3930	0.8970	41.8450	0.89	-1.08%	0.45%
772.0000	*	41.2770	0.8930	41.8250	0.90	-1.31%	-0.45%
775.0000		41.1900	0.8900	41.8100	0.90	-1.48%	-1.11%
776.0000	*	41.1650	0.8900	41.8050	0.90	-1.53%	-1.11%
785.0000		40.9400	0.8900	41.7600	0.90	-1.96%	-1.11%
795.0000		40.7400	0.9100	41.7100	0.90	-2.33%	1.11%
798.0000	*	40.6680	0.9100	41.6950	0.90	-2.46%	1.11%
805.0000		40.5000	0.9100	41.6600	0.90	-2.78%	1.11%
806.0000	*	40.4740	0.9100	41.6540	0.90	-2.83%	1.11%
815.0000		40.2400	0.9100	41.6000	0.90	-3.27%	1.11%
816.0000	*	40.2230	0.9110	41.5950	0.90	-3.30%	1.22%
825.0000		40.0700	0.9200	41.5500	0.90	-3.56%	2.22%
835.0000		39.9600	0.9500	41.5000	0.90	-3.71%	5.56%
845.0000		39.9400	0.9600	41.5000	0.91	-3.76%	5.49%
851.0000	*	39.9460	0.9720	41.5000	0.92	-3.74%	6.11%
855.0000		39.9500	0.9800	41.5000	0.92	-3.73%	6.52%
861.0000	*	39.8360	0.9980	41.5000	0.93	-4.01%	7.78%
865.0000		39.7600	1.0100	41.5000	0.93	-4.19%	8.60%
875.0000		39.6300	1.0100	41.5000	0.94	-4.51%	7.45%
885.0000		39.6500	1.0200	41.5000	0.95	-4.46%	7.37%
895.0000		39.6100	1.0100	41.5000	0.96	-4.55%	5.21%
905.0000		39.2100	1.0100	41.5000	0.97	-5.52%	4.12%
915.0000		39.0600	1.0200	41.5000	0.98	-5.88%	4.08%
925.0000		39.0600	1.0100	41.4800	0.98	-5.83%	3.06%
935.0000		38.9700	1.0300	41.4600	0.99	-6.01%	4.04%

*Channel Frequency Tested

Table 15.15 Fluid Dielectric Parameters 2450MHz HEAD TSL, 3 March 2021

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***************************************************************************
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Wed 03/Mar/2021 14:57:35
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	38.24	1.79
2.3600	39.36	1.72	38.47	1.82
2.3700	39.34	1.73	38.40	1.83
2.3800	39.32	1.74	38.30	1.84
2.3900	39.31	1.75	38.23	1.84
2.4000	39.29	1.76	38.28	1.85
2.4100	39.27	1.76	37.97	1.88
2.4200	39.25	1.77	38.02	1.87
2.4300	39.24	1.78	37.71	1.89
2.4400	39.22	1.79	37.78	1.91
2.4500	39.20	1.80	37.80	1.91
2.4600	39.19	1.81	37.91	1.93
2.4700	39.17	1.82	38.05	1.95
2.4800	39.16	1.83	37.75	1.95
2.4900	39.15	1.84	37.90	1.96
2.5000	39.14	1.85	37.97	1.96
2.5100	39.12	1.87	37.72	1.98
2.5200	39.11	1.88	37.70	1.99
2.5300	39.10	1.89	37.52	2.02
2.5400	39.09	1.90	37.52	2.00
2.5500	39.07	1.91	37.50	2.04

Table 15.16 Fluid Dielectric Analysis 2450MHz HEAD TSL, 3 March 2021

FLUID DIELECTRIC PARAMETERS							
Date:	3 Mar 2021	Fluid Temp:	23.6	Frequency:	2450MHz	Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2350.0000		38.2400	1.7900	39.3800	1.71	-2.89%	4.68%
2360.0000		38.4700	1.8200	39.3600	1.72	-2.26%	5.81%
2370.0000		38.4000	1.8300	39.3400	1.73	-2.39%	5.78%
2380.0000		38.3000	1.8400	39.3200	1.74	-2.59%	5.75%
2390.0000		38.2300	1.8400	39.3100	1.75	-2.75%	5.14%
2400.0000		38.2800	1.8500	39.2900	1.76	-2.57%	5.11%
2410.0000		37.9700	1.8800	39.2700	1.76	-3.31%	6.82%
2420.0000		38.0200	1.8700	39.2500	1.77	-3.13%	5.65%
2430.0000		37.7100	1.8900	39.2400	1.78	-3.90%	6.18%
2440.0000		37.7800	1.9100	39.2200	1.79	-3.67%	6.70%
2450.0000		37.8000	1.9100	39.2000	1.80	-3.57%	6.11%
2460.0000		37.9100	1.9300	39.1900	1.81	-3.27%	6.63%
2470.0000		38.0500	1.9500	39.1700	1.82	-2.86%	7.14%
2480.0000		37.7500	1.9500	39.1600	1.83	-3.60%	6.56%
2490.0000		37.9000	1.9600	39.1500	1.84	-3.19%	6.52%
2500.0000		37.9700	1.9600	39.1400	1.85	-2.99%	5.95%
2510.0000		37.7200	1.9800	39.1200	1.87	-3.58%	5.88%
2520.0000		37.7000	1.9900	39.1100	1.88	-3.61%	5.85%
2530.0000		37.5200	2.0200	39.1000	1.89	-4.04%	6.88%
2540.0000		37.5200	2.0000	39.0900	1.90	-4.02%	5.26%
2550.0000		37.5000	2.0400	39.0700	1.91	-4.02%	6.81%

*Channel Frequency Tested

Table 15.17 Fluid Dielectric Parameters 5250MHz HEAD TSL, 6 March 2021

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Aprel Laboratory
Test Result for UIM Dielectric Parameter
Sat 06/Mar/2021 11:06:38
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	35.96	4.48
5.1600	36.03	4.61	35.93	4.49
5.1700	36.02	4.62	35.91	4.50
5.1800	36.01	4.63	35.88	4.51
5.1900	36.00	4.64	35.86	4.52
5.2000	35.99	4.65	35.83	4.53
5.2100	35.97	4.67	35.80	4.54
5.2200	35.96	4.68	35.78	4.55
5.2300	35.95	4.69	35.75	4.56
5.2400	35.94	4.70	35.73	4.57
5.2500	35.93	4.71	35.70	4.58
5.2600	35.92	4.72	35.68	4.59
5.2700	35.91	4.73	35.65	4.60
5.2800	35.89	4.74	35.62	4.61
5.2900	35.88	4.75	35.60	4.62
5.3000	35.87	4.76	35.57	4.63
5.3100	35.86	4.77	35.55	4.64
5.3200	35.85	4.78	35.52	4.64
5.3300	35.84	4.79	35.50	4.65
5.3400	35.83	4.80	35.47	4.66
5.3500	35.81	4.81	35.44	4.67

Table 15.18 Fluid Dielectric Analysis 5250MHz HEAD TSL, 6 March 2021

FLUID DIELECTRIC PARAMETERS							
Date:	6 Mar 2021	Fluid Temp:	20.4	Frequency:	5250MHz	Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
5150.0000		35.9600	4.4800	36.0400	4.60	-0.22%	-2.61%
5160.0000		35.9300	4.4900	36.0300	4.61	-0.28%	-2.60%
5170.0000		35.9100	4.5000	36.0200	4.62	-0.31%	-2.60%
5180.0000		35.8800	4.5100	36.0100	4.63	-0.36%	-2.59%
5190.0000		35.8600	4.5200	36.0000	4.64	-0.39%	-2.59%
5200.0000		35.8300	4.5300	35.9900	4.65	-0.44%	-2.58%
5210.0000		35.8000	4.5400	35.9700	4.67	-0.47%	-2.78%
5220.0000		35.7800	4.5500	35.9600	4.68	-0.50%	-2.78%
5230.0000		35.7500	4.5600	35.9500	4.69	-0.56%	-2.77%
5240.0000		35.7300	4.5700	35.9400	4.70	-0.58%	-2.77%
5250.0000		35.7000	4.5800	35.9300	4.71	-0.64%	-2.76%
5260.0000		35.6800	4.5900	35.9200	4.72	-0.67%	-2.75%
5270.0000		35.6500	4.6000	35.9100	4.73	-0.72%	-2.75%
5280.0000		35.6200	4.6100	35.8900	4.74	-0.75%	-2.74%
5290.0000		35.6000	4.6200	35.8800	4.75	-0.78%	-2.74%
5300.0000		35.5700	4.6300	35.8700	4.76	-0.84%	-2.73%
5310.0000		35.5500	4.6400	35.8600	4.77	-0.86%	-2.73%
5320.0000		35.5200	4.6400	35.8500	4.78	-0.92%	-2.93%
5330.0000		35.5000	4.6500	35.8400	4.79	-0.95%	-2.92%
5340.0000		35.4700	4.6600	35.8300	4.80	-1.00%	-2.92%
5350.0000		35.4400	4.6700	35.8100	4.81	-1.03%	-2.91%

*Channel Frequency Tested

Table 15.19 Fluid Dielectric Parameters 5750MHz HEAD TSL, 6 March 2021

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Aprel Laboratory
Test Result for UIM Dielectric Parameter
Sat 06/Mar/2021 11:19:26
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	34.41	5.05
5.6600	35.46	5.13	34.40	5.06
5.6700	35.45	5.14	34.39	5.07
5.6800	35.44	5.15	34.38	5.08
5.6900	35.43	5.16	34.37	5.09
5.7000	35.41	5.17	34.35	5.10
5.7100	35.40	5.18	34.34	5.11
5.7200	35.39	5.19	34.33	5.12
5.7300	35.38	5.20	34.32	5.13
5.7400	35.37	5.21	34.31	5.14
5.7500	35.36	5.22	34.30	5.15
5.7600	35.35	5.23	34.29	5.16
5.7700	35.33	5.24	34.27	5.17
5.7800	35.32	5.25	34.26	5.18
5.7900	35.31	5.26	34.25	5.19
5.8000	35.30	5.27	34.24	5.20
5.8100	35.29	5.28	34.23	5.21
5.8200	35.28	5.29	34.22	5.22
5.8300	35.27	5.30	34.21	5.23
5.8400	35.25	5.31	34.19	5.24
5.8500	35.24	5.32	34.18	5.25

Table 15.20 Fluid Dielectric Analysis 5750MHz HEAD TSL, 6 March 2021

FLUID DIELECTRIC PARAMETERS							
Date:	6 Mar 2021	Fluid Temp:	20.4	Frequency:	5750MHz	Tissue:	Head
Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
5650.0000		34.4100	5.0500	35.4700	5.12	-2.99%	-1.37%
5660.0000		34.4000	5.0600	35.4600	5.13	-2.99%	-1.36%
5670.0000		34.3900	5.0700	35.4500	5.14	-2.99%	-1.36%
5680.0000		34.3800	5.0800	35.4400	5.15	-2.99%	-1.36%
5690.0000		34.3700	5.0900	35.4300	5.16	-2.99%	-1.36%
5700.0000		34.3500	5.1000	35.4100	5.17	-2.99%	-1.35%
5710.0000		34.3400	5.1100	35.4000	5.18	-2.99%	-1.35%
5720.0000		34.3300	5.1200	35.3900	5.19	-3.00%	-1.35%
5730.0000		34.3200	5.1300	35.3800	5.20	-3.00%	-1.35%
5740.0000		34.3100	5.1400	35.3700	5.21	-3.00%	-1.34%
5750.0000		34.3000	5.1500	35.3600	5.22	-3.00%	-1.34%
5760.0000		34.2900	5.1600	35.3500	5.23	-3.00%	-1.34%
5770.0000		34.2700	5.1700	35.3300	5.24	-3.00%	-1.34%
5780.0000		34.2600	5.1800	35.3200	5.25	-3.00%	-1.33%
5790.0000		34.2500	5.1900	35.3100	5.26	-3.00%	-1.33%
5800.0000		34.2400	5.2000	35.3000	5.27	-3.00%	-1.33%
5810.0000		34.2300	5.2100	35.2900	5.28	-3.00%	-1.33%
5820.0000		34.2200	5.2200	35.2800	5.29	-3.00%	-1.32%
5830.0000		34.2100	5.2300	35.2700	5.30	-3.01%	-1.32%
5840.0000		34.1900	5.2400	35.2500	5.31	-3.01%	-1.32%
5850.0000		34.1800	5.2500	35.2400	5.32	-3.01%	-1.32%

*Channel Frequency Tested

16.0 SYSTEM VERIFICATION TEST RESULTS

Table 16.1 System Verification Results 835MHz HEAD TSL, 8 September 2020

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
8 Sep 2020		835	D835V2		4d075
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	21.2	21	32%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
39.33	41.50	-5.23%	0.88	0.90	-2.22%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
2.41	2.41	0.00%	1.56	1.55	0.65%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
9.64	9.45	2.01%	6.24	6.11	2.13%

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.

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 150MHz HEAD TSL, 14 September 2020

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
14 Sep 2020		150	CLA-150		4007
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	21.8	24	37%	1000	0
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
49.90	52.30	-4.59%	0.69	0.76	-9.21%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
3.60	3.89	-7.46%	2.39	2.57	-7.00%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
3.60	3.87	-6.98%	2.39	2.56	-6.64%

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.

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 450MHz HEAD TSL, 17 September 2020

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
17 Sep 2020		450	D450V3		1068
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	22.8	23	40%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
43.69	43.50	0.44%	0.82	0.87	-5.75%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
1.15	1.13	1.77%	0.78	0.75	3.32%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
4.60	4.53	1.55%	3.11	3.02	3.05%

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.

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 16.4 System Verification Results 150MHz HEAD TSL, 4 February 2021

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
Feb 4 2021		150	CLA-150		4007
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	22.7	24	25%	1000	0
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
51.84	52.30	-0.88%	0.72	0.76	-5.26%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
3.73	3.89	-4.11%	2.44	2.57	-5.06%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
3.73	3.87	-3.62%	2.44	2.56	-4.69%

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.

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 16.5 System Verification Results 150MHz HEAD TSL, 8 February 2021

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
Feb 8 2021		150	CLA-150		4007
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	24.0	23	21%	1000	0
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
51.23	52.30	-2.05%	0.76	0.76	0.00%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
3.98	3.89	2.31%	2.65	2.57	3.11%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
3.98	3.87	2.84%	2.65	2.56	3.52%

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.

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 16.6 System Verification Results 450MHz HEAD TSL, 11 February 2021

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
Feb 11 2021		450	D450V3		1068
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	23.6	25	14%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
45.70	43.50	5.06%	0.90	0.87	3.45%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
1.14	1.13	0.88%	0.78	0.75	3.05%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
4.56	4.53	0.66%	3.10	3.02	2.78%

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.

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 16.7 System Verification Results 835MHz HEAD TSL, 2 March 2021

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
March 2 2021		835	D835V2		4d075
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	22.1	25	19%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
39.96	41.50	-3.71%	0.95	0.90	5.56%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
2.33	2.41	-3.32%	1.49	1.55	-3.87%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
9.32	9.45	-1.38%	5.96	6.11	-2.45%

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.

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 16.8 System Verification Results 2450MHz HEAD TSL, 3 March 2021

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
March 3 2021		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	22.4	24	22%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
37.80	39.20	-3.57%	1.91	1.80	6.11%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
13.80	13.30	3.76%	6.30	6.16	2.27%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
55.20	52.10	5.95%	25.20	24.30	3.70%

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.

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 16.9 System Verification Results 5250MHz HEAD TSL, 6 March 2021

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
March 6 2021		5250	D5GHzV2		1031
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	20.4	21	25%	55	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
35.70	35.93	-0.64%	4.58	4.71	-2.76%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
4.40	4.39	0.13%	1.28	1.26	1.63%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
80.00	80.00	0.00%	23.27	22.90	1.63%

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.

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 16.10 System Verification Results 5750MHz HEAD TSL, 6 March 2021

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
March 6 2021		5750	D5GHzV2		1031
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	20.4	21	25%	55	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
34.30	35.36	-3.00%	5.15	5.22	-1.34%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
4.67	4.42	5.61%	1.34	1.25	6.86%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
84.91	80.40	5.61%	24.36	22.80	6.86%

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.

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 MEASUREMENT SYSTEM SPECIFICATIONS

Table 17.1 Measurement System

SAR Measurement System

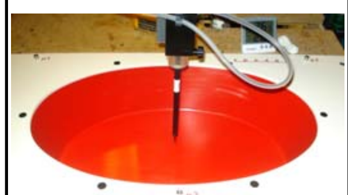
Celltech Labs Inc. SAR measurement facility employs a Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY6 measurement system is comprised of the measurement server, a robot controller, a computer, a near-field probe, a probe 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

Table 17.2 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 6.4.0.12171 / 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
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	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 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 SAM 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 DASY4 device positioner has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65^{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**

18.0 TEST EQUIPMENT LIST

Table 18.1 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	17-Mar-20	17-Mar-23
-EX3DV4 E-Field Probe	00213	3600	25-Mar-20	25-Mar-23
-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	23-Apr-18	23-Apr-21
-D750V3 Validation Dipole	00238	1061	21-Mar-19	21-Mar-22
-D835V2 Validation Dipole	00217	4D075	20-Apr-18	20-Apr-21
-D900V2 Validation Dipole	00020	54	16-Mar-20	16-Mar-23
-D2450V2 Validation Dipole**	00219	825	24-Apr-18	24-Apr-21
-D5GHzV2 Validation Dipole	00126	1031	26-Apr-18	26-Apr-21
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
Traceable VWR Thermometer	00334	192385455	6-Aug-19	6-Aug-21
Kangaroo VWR Humidity/Thermometer	00334	192385455	5-Aug-19	6-Aug-22
Bipolar Power Supply 6299A	00086	1144A02155	CNR	CNR
DC-18G 10W 30db Attenuator	00102	-	COU	COU
R&S FSP40 Spectrum Analyzer	00241	100500	15-May-18	15-May-21
RF Cable-SMA	00311	-	CNR	CNR
HP Calibration Kit	00145	-	CNR	CNR

CNR = Calibration Not Required

SB=Stand By

COU = Calibrate on Use

*Verifed and Extended

* *Per KDB 865664 3.2.2; Supporting documentation is included in the report for validation dipoles exceeding the recommended anual calibration cycle.
When applicable, reference Appendix F

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.

19.0 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		
							Permitivity	Conductivity	Sensitivity	Linearity	Isotropy
30	31-May-20	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	27-May-20	EX3DV4	3600	D2450V2	825	Head	37.21	1.95	Pass	Pass	Pass
5250	29-May-20	EX3DV4	3600	D5GHzV2	1031	Head	34.44	5.07	Pass	Pass	Pass
5750	28-May-20	EX3DV4	3600	D5GHzV2	1031	Head	35.16	5.56	Pass	Pass	Pass

20.0 FLUID COMPOSITION

Table 20.1 Fluid Composition 150MHz HEAD TSL

150			150MHz Head	
Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Sugar	Salt(1)	HEC(2)	Bacteriacide(3)
38.35	55.5	5.15	0.9	0.1

(1) Non-Iodinized
(2) **H**ydroxy**E**thyl-**C**ellulose: Sigma-Aldrich P/N 54290-500g
(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

Table 20.2 Fluid Composition 450MHz HEAD TSL

450			450MHz Head	
Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Sugar	Salt(1)	HEC(2)	Bacteriacide(3)
38.56	56.32	3.95	0.98	0.19

(1) Non-Iodinized
(2) **H**ydroxy**E**thyl-**C**ellulose: Sigma-Aldrich P/N 54290-500g
(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

Table 20.3 Fluid Composition 835MHz HEAD TSL

835			835MHz Head	
Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Sugar	Salt(1)	HEC(2)	Bacteriacide(3)
40.71	56.63	1.48	0.99	0.19

(1) Non-Iodinized
(2) **H**ydroxy**E**thyl-**C**ellulose: Sigma-Aldrich P/N 54290-500g
(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

Table 20.4 Fluid Composition 2450MHz HEAD TSL

2450			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

Table 20.5 Fluid Composition 5250MHz Head TSL AND 5750MHz Head TSL

This is a proprietary composition by SPEAG.

APPENDIX A – SYSTEM VERIFICATION PLOTS

Plot A.1 System Verification Plot, 835MHz, 8 September 2020

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:4d075
Procedure Name: SPC 835H,Target=[2.169][2.41][2.651]W/kg,Input 250mW 2

Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.88 S/m; ε_r = 39.33; ρ = 1000 kg/m^3
Phantom section: Flat Section

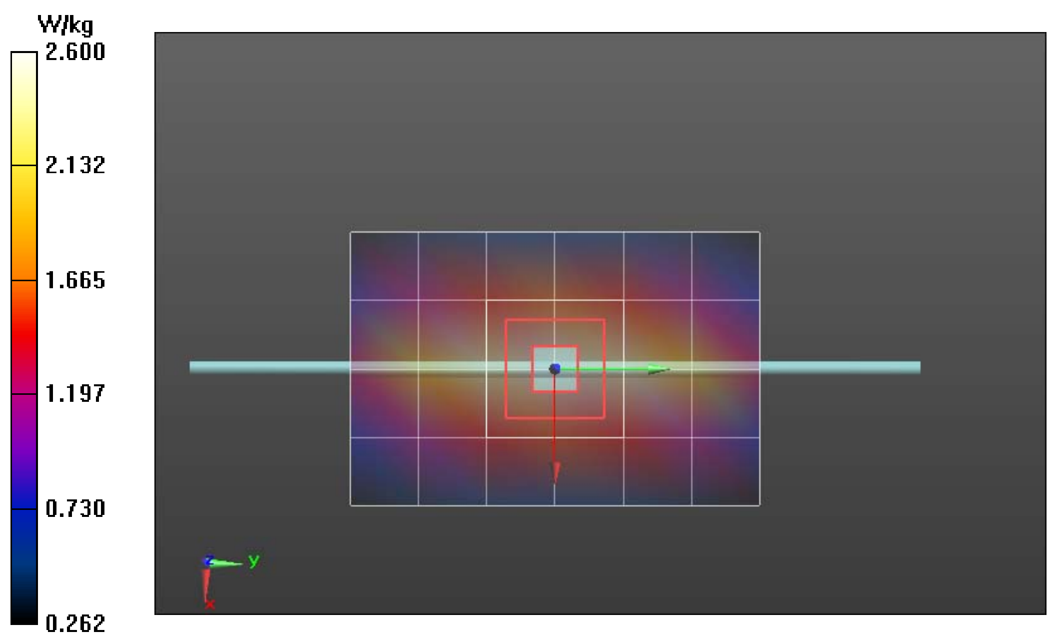
Date/Time: 9/8/2020 2:41:28 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(8.17, 8.17, 8.17) @ 835 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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 835H,Target=[2.169][2.41][2.651]W/kg,Input 250mW 2/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.60 W/kg

SPC/SPC 835H,Target=[2.169][2.41][2.651]W/kg,Input 250mW 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 54.32 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.56 W/kg
Ratio of SAR at M2 to SAR at M1 = 66.3%
Maximum value of SAR (measured) = 2.60 W/kg



Plot A.2 System Verification Plot, 150MHz, 14 September 2020

DUT: CLA-150; Type: CLA-150; Serial: 4007
Procedure Name: SPC 150H Input=1.0W, Target=3.90W/kg

Communication System: UID 0, CW (0); Frequency: 150 MHz;Duty Cycle: 1:1
Medium parameters used: f = 150 MHz; σ = 0.69 S/m; ε_r = 49.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

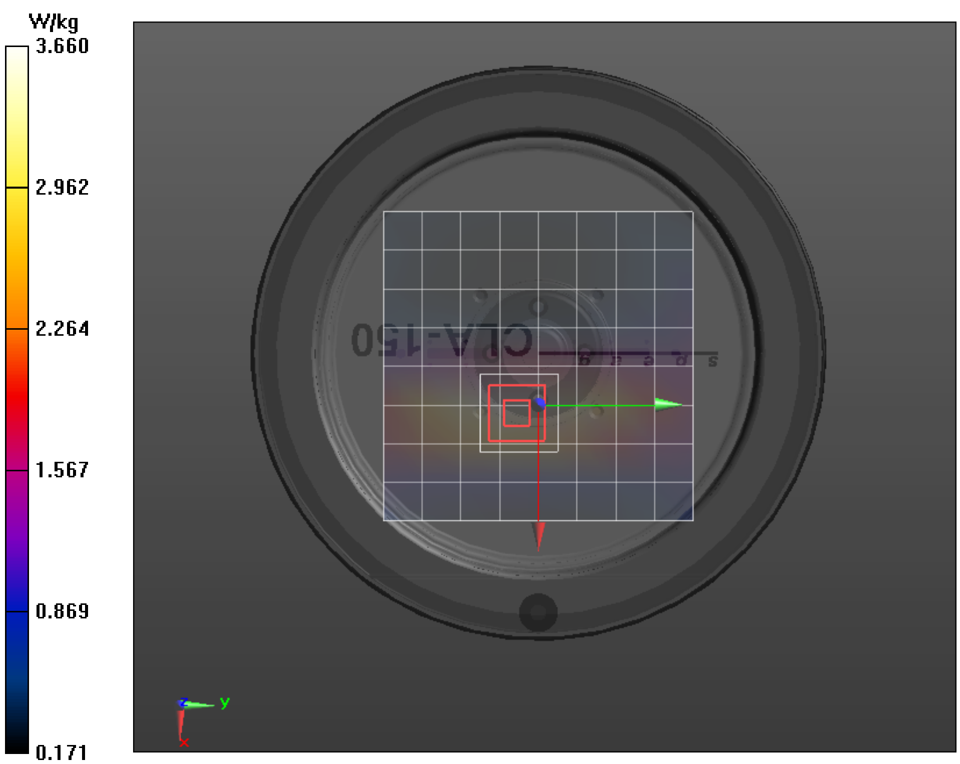
Date/Time: 9/14/2020 1:42:14 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(9.59, 9.59, 9.59) @ 150 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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 150H Input=1.0W, Target=3.90W/kg/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.66 W/kg

SPC/SPC 150H Input=1.0W, Target=3.90W/kg/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 73.03 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 5.56 W/kg
SAR(1 g) = 3.6 W/kg; SAR(10 g) = 2.39 W/kg
Ratio of SAR at M2 to SAR at M1 = 67.6%
Maximum value of SAR (measured) = 3.87 W/kg



Plot A.3 System Verification Plot, 450MHz, 17 September 2020

DUT: Dipole 450 MHz D450V3; Type: D450V3; Serial: D450V3 - SN:1068
Procedure Name: SPC 450H, Input 250mW, Taget[1.13][0.753] W/kg

Communication System: UID 0, CW (0); Frequency: 450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 450 MHz; σ = 0.82 S/m; ε_r = 43.69; ρ = 1000 kg/m^3
Phantom section: Flat Section

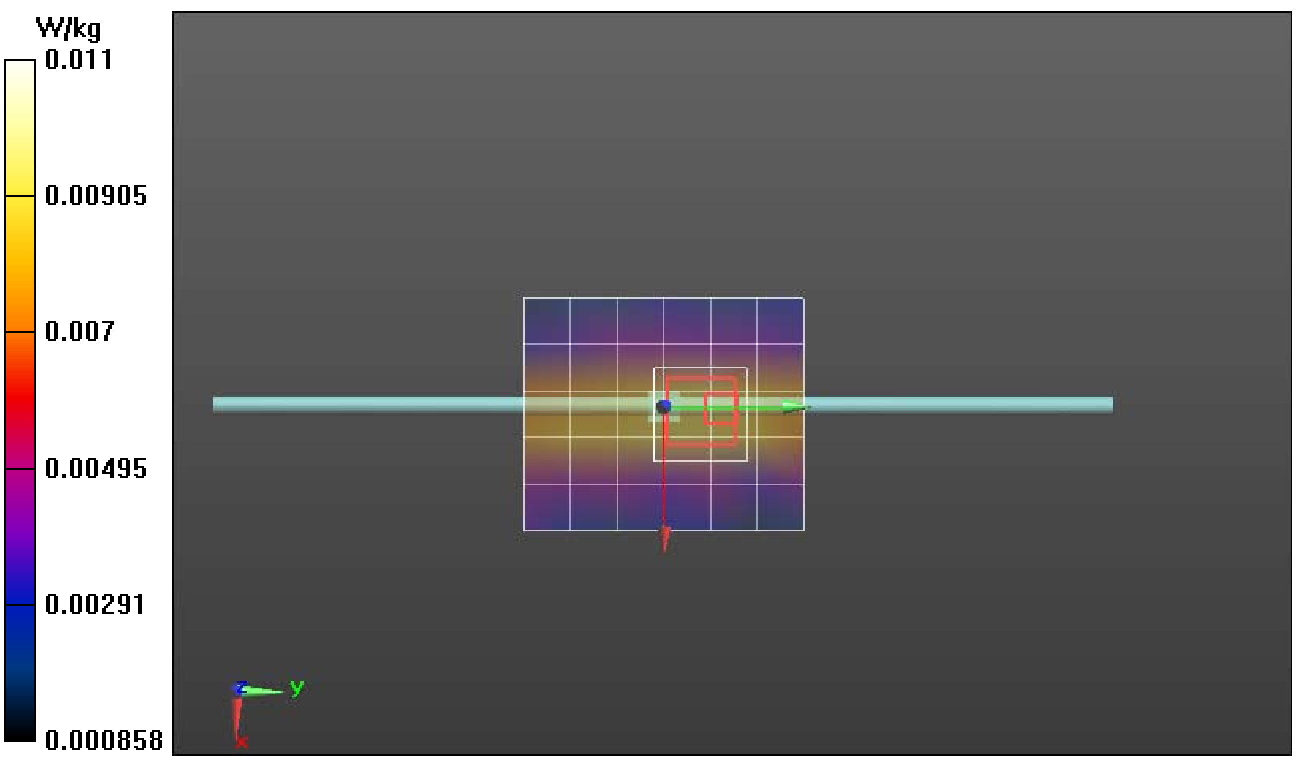
Date/Time: 9/17/2020 12:05:44 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(8.84, 8.84, 8.84) @ 450 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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 450H, Input 250mW, Taget[1.13][0.753] W/kg/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.00890 W/kg

SPC/SPC 450H, Input 250mW, Taget[1.13][0.753] W/kg/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 3.535 V/m; Power Drift = -0.31 dB
Peak SAR (extrapolated) = 0.0210 W/kg
SAR(1 g) = 0.010 W/kg; SAR(10 g) = 0.00637 W/kg
Ratio of SAR at M2 to SAR at M1 = 56.4%
Maximum value of SAR (measured) = 0.0111 W/kg



Plot A.4 System Verification Plot, 150MHz, 4 February 2021

DUT: CLA-150; Type: CLA-150; Serial: 4007
Procedure Name: SPC 150H Input=1.0W, Target=3.89W/kg

Communication System: UID 0, CW (0); Frequency: 150 MHz;Duty Cycle: 1:1
Medium parameters used: f = 150 MHz; σ = 0.72 S/m; ε_r = 51.84; ρ = 1000 kg/m^3
Phantom section: Flat Section

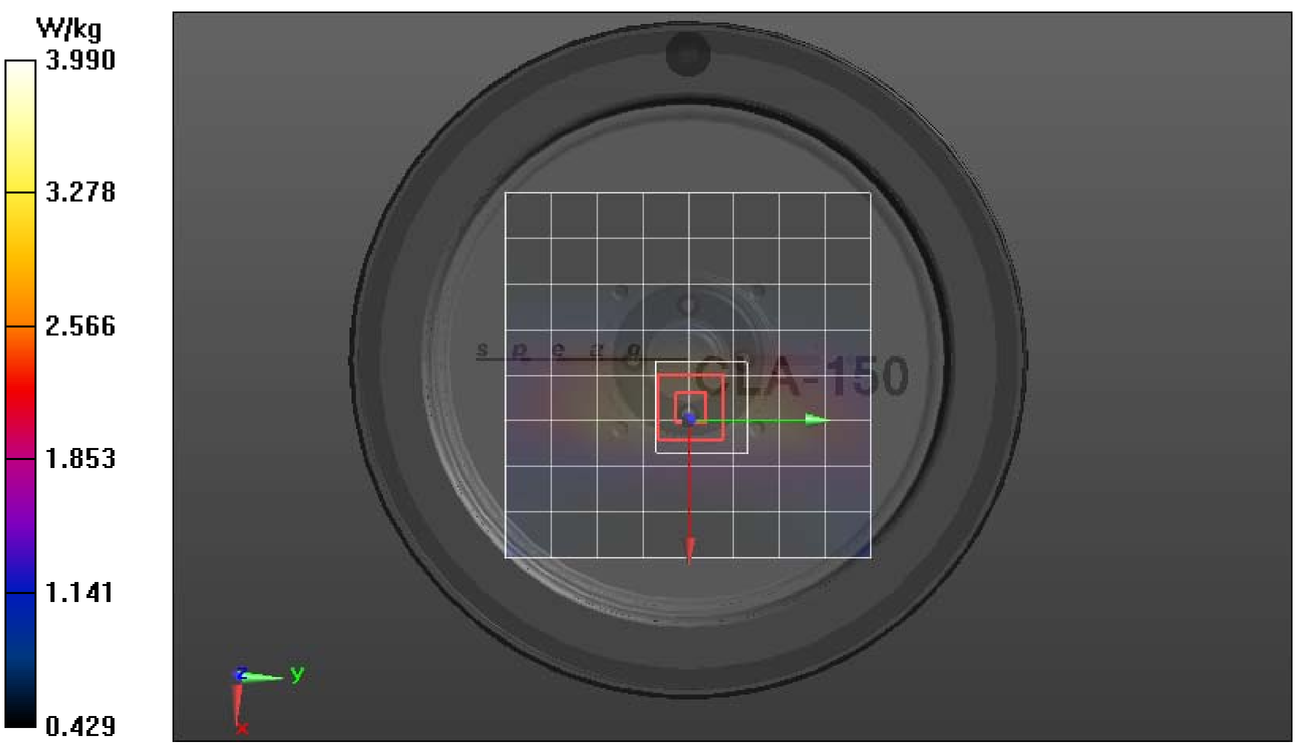
Date/Time: 2/4/2021 12:27:56 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(9.59, 9.59, 9.59) @ 150 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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 150H Input=1.0W, Target=3.89W/kg/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.75 W/kg

SPC/SPC 150H Input=1.0W, Target=3.89W/kg/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 72.25 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 5.80 W/kg
SAR(1 g) = 3.73 W/kg; SAR(10 g) = 2.44 W/kg
Smallest distance from peaks to all points 3 dB below = 20.2 mm
Ratio of SAR at M2 to SAR at M1 = 66.8%
Maximum value of SAR (measured) = 3.99 W/kg



Plot A.5 System Verification Plot, 150MHz, 8 February 2021

DUT: CLA-150; Type: CLA-150; Serial: 4007
Procedure Name: SPC 150H Input=1.0W, Target=3.89W/kg

Communication System: UID 0, CW (0); Frequency: 150 MHz;Duty Cycle: 1:1
Medium parameters used: f = 150 MHz; σ = 0.76 S/m; ε_r = 51.23; ρ = 1000 kg/m^3
Phantom section: Flat Section

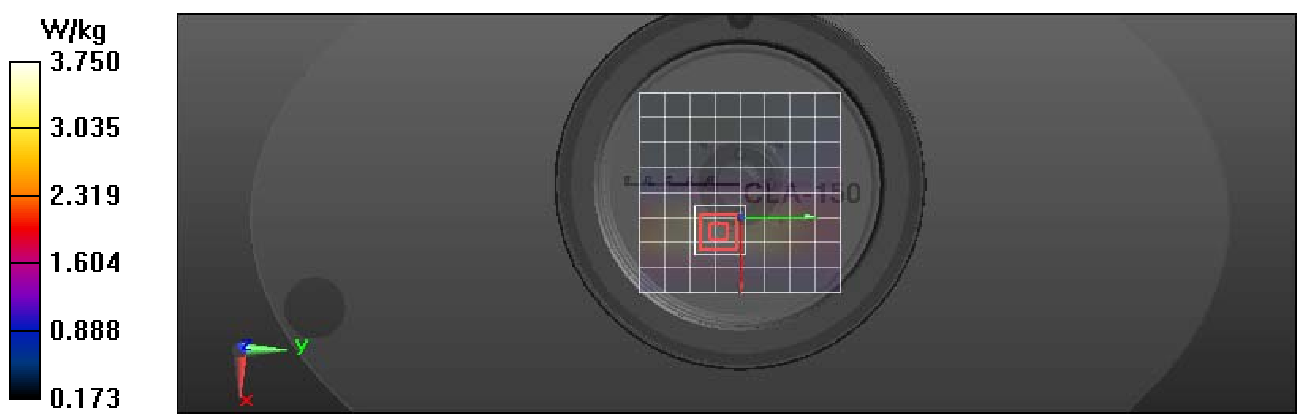
Date/Time: 2/8/2021 2:52:04 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(9.59, 9.59, 9.59) @ 150 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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 150H Input=1.0W, Target=3.89W/kg/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 3.75 W/kg

SPC/SPC 150H Input=1.0W, Target=3.89W/kg/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 67.90 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 6.11 W/kg
SAR(1 g) = 3.98 W/kg; SAR(10 g) = 2.65 W/kg
Smallest distance from peaks to all points 3 dB below = 21.2 mm
Ratio of SAR at M2 to SAR at M1 = 67.6%
Maximum value of SAR (measured) = 4.27 W/kg



Plot A.6 System Verification Plot, 450MHz, 11 February 2021

DUT: Dipole 450 MHz D450V3; Type: D450V3; Serial: D450V3 - SN:1068
Procedure Name: SPC 450H, Input 250mW, Taget[1.13][0.753] W/kg

Communication System: UID 0, CW (0); Frequency: 450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 450 MHz; σ = 0.9 S/m; ε_r = 45.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

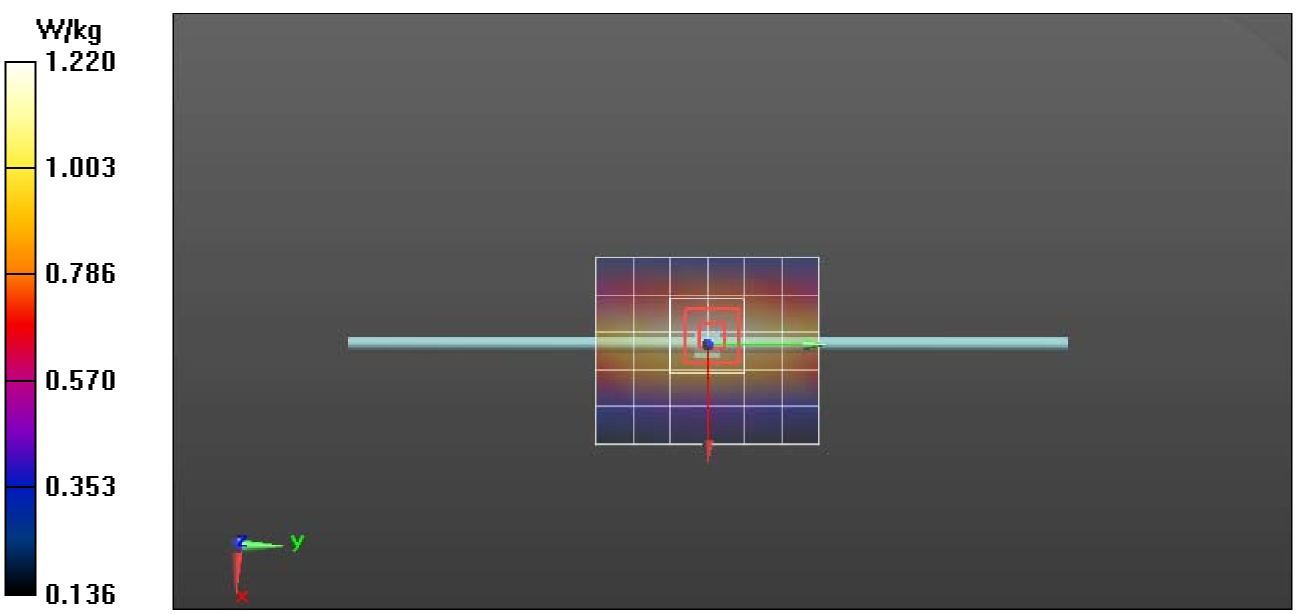
Date/Time: 2/11/2021 5:13:08 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(8.84, 8.84, 8.84) @ 450 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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 450H, Input 250mW, Taget[1.13][0.753] W/kg/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.22 W/kg

SPC/SPC 450H, Input 250mW, Taget[1.13][0.753] W/kg/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 36.56 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.64 W/kg
SAR(1 g) = 1.14 W/kg; SAR(10 g) = 0.776 W/kg
Ratio of SAR at M2 to SAR at M1 = 69.2%
Maximum value of SAR (measured) = 1.22 W/kg



Plot A.7 System Verification Plot, 835MHz, 2 March 2021

DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:4d075
Procedure Name: SPC 835H,Target=2.41W/kg,1.55W/kg,Input 250mW

Communication System: UID 0, CW (0); Frequency: 835 MHz;Duty Cycle: 1:1
Medium parameters used: f = 835 MHz; σ = 0.95 S/m; ε_r = 39.96; ρ = 1000 kg/m^3
Phantom section: Flat Section

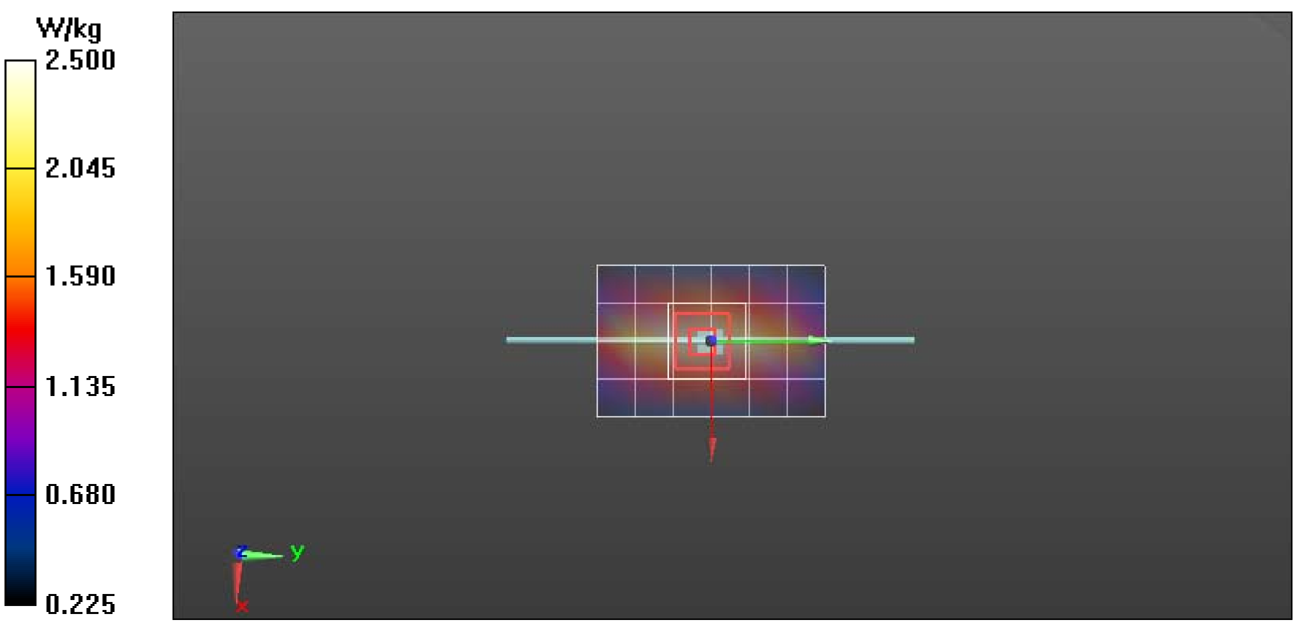
Date/Time: 3/2/2021 1:06:52 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(8.17, 8.17, 8.17) @ 835 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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 835H,Target=2.41W/kg,1.55W/kg,Input 250mW/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.50 W/kg

SPC/SPC 835H,Target=2.41W/kg,1.55W/kg,Input 250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 51.30 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.60 W/kg
SAR(1 g) = 2.33 W/kg; SAR(10 g) = 1.49 W/kg
Ratio of SAR at M2 to SAR at M1 = 65.1%
Maximum value of SAR (measured) = 2.52 W/kg



Plot A.7 System Verification Plot, 2450MHz, 3 March 2021

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:825
Procedure Name: SPC 2450H Input=250mw, Target=[14.63][13.3][11.97]W/kg

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.91 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

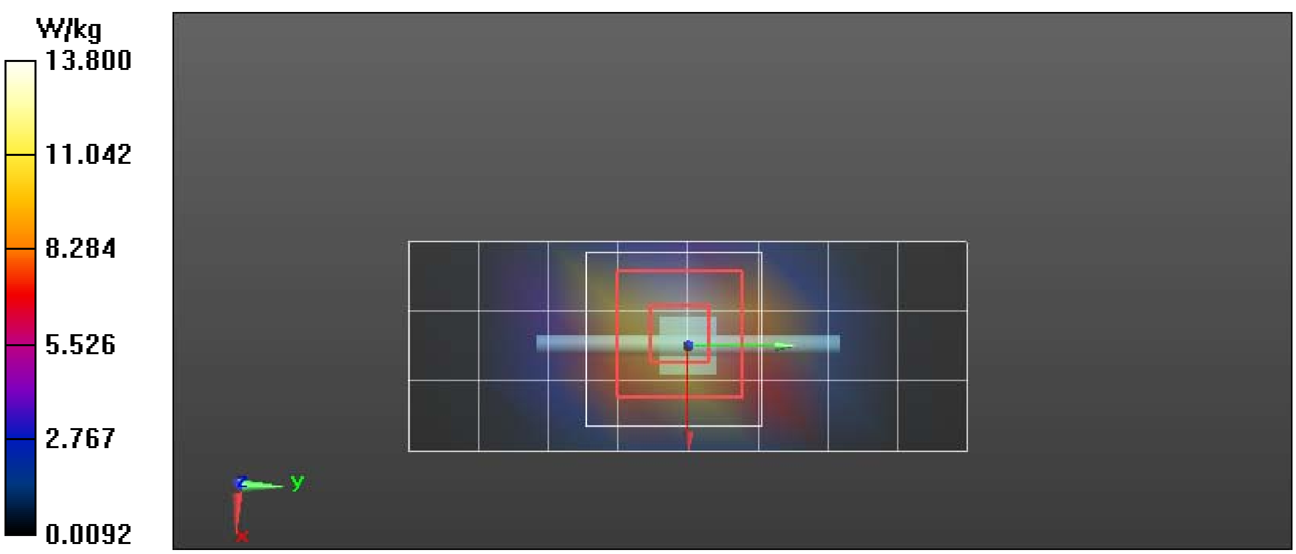
Date/Time: 3/3/2021 4:05:17 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.45, 6.45, 6.45) @ 2450 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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=[14.63][13.3][11.97]W/kg/Area Scan (4x9x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 13.8 W/kg

SPC/SPC 2450H Input=250mw, Target=[14.63][13.3][11.97]W/kg/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.88 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 29.8 W/kg
SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.3 W/kg
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 47.4%
Maximum value of SAR (measured) = 15.6 W/kg



Plot A.8 System Verification Plot, 5250MHz, 6 March 2021

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1031
Procedure Name: SPC 5250H Input=55 mw, Target= [3.96][4.4][4.83], Target=7.99W/kg@100mw

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 = 35.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

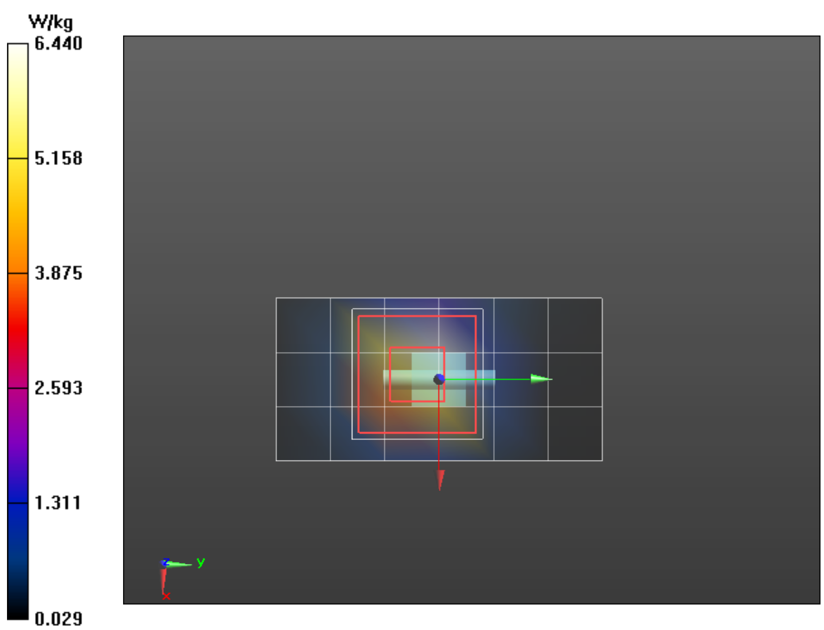
Date/Time: 3/6/2021 12:01:24 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(4.47, 4.47, 4.47) @ 5250 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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=55 mw, Target= [3.96][4.4][4.83], Target=7.99W/kg@100mw/Area Scan (4x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 6.44 W/kg

SPC/SPC 5250H Input=55 mw, Target= [3.96][4.4][4.83], Target=7.99W/kg@100mw/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 30.57 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 17.4 W/kg
SAR(1 g) = 4.4 W/kg; SAR(10 g) = 1.28 W/kg
Smallest distance from peaks to all points 3 dB below = 7.4 mm
Ratio of SAR at M2 to SAR at M1 = 54.9%
Maximum value of SAR (measured) = 9.17 W/kg



Plot A.9 System Verification Plot, 5750MHz, 6 March 2021

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx
Procedure Name: SPC 5750H Input=55 mw, Target=[3.978][4.42][4.862], Target=8.04W/kg@100mw

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5750 MHz; σ = 5.15 S/m; ε_r = 34.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 3/6/2021 12:27:12 PM

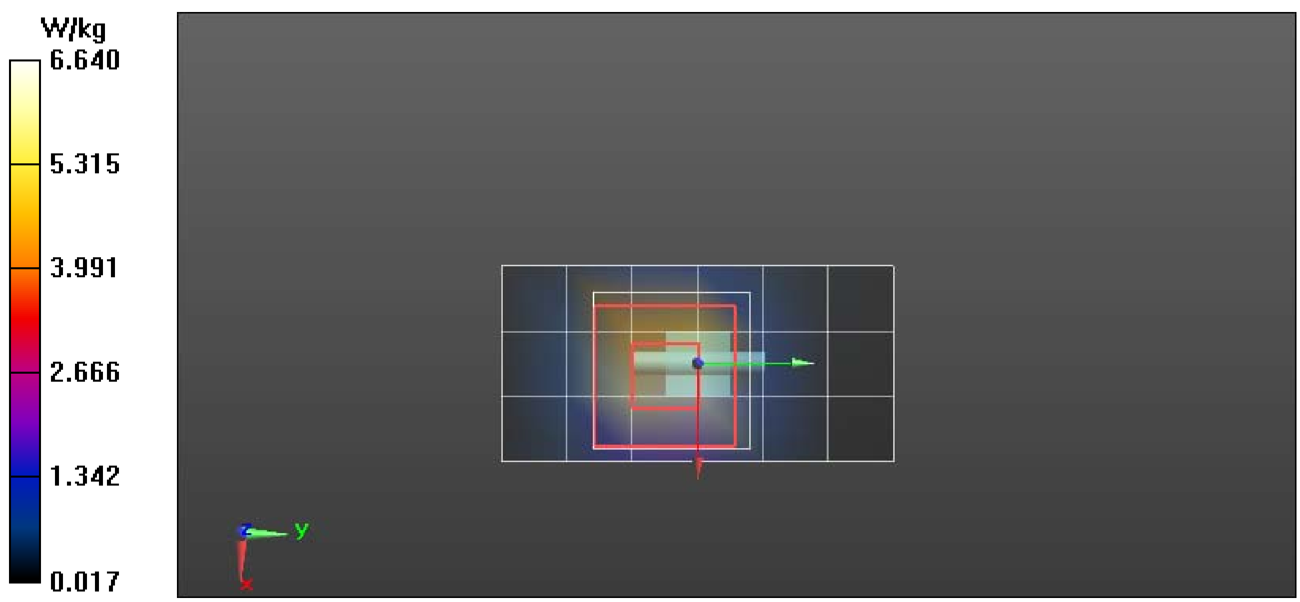
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(4.12, 4.12, 4.12) @ 5750 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- 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=55 mw, Target=[3.978][4.42][4.862], Target=8.04W/kg@100mw/Area Scan (4x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 6.64 W/kg

SPC/SPC 5750H Input=55 mw, Target=[3.978][4.42][4.862], Target=8.04W/kg@100mw/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 27.98 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 20.6 W/kg
SAR(1 g) = 4.67 W/kg; SAR(10 g) = 1.34 W/kg
Smallest distance from peaks to all points 3 dB below = 7.5 mm
Ratio of SAR at M2 to SAR at M1 = 51.4%

Maximum value of SAR (measured) = 9.85 W/kg



APPENDIX B – MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

Plot B1-3 Baseline

DUT: Harris XL-400P Fire Radio; Type: PTT; Serial: Not Specified
Procedure Name: B1-3 - Baseline comparison w/ Eng Eval 456MHz Body, BC

Communication System: UID 0, CW (0); Frequency: 456 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 456 MHz; σ = 0.906 S/m; ε_r = 45.85; ρ = 1000 kg/m^3
Phantom section: Flat Section
Date/Time: 2/12/2021 9:50:50 AM
DASY5 Configuration:

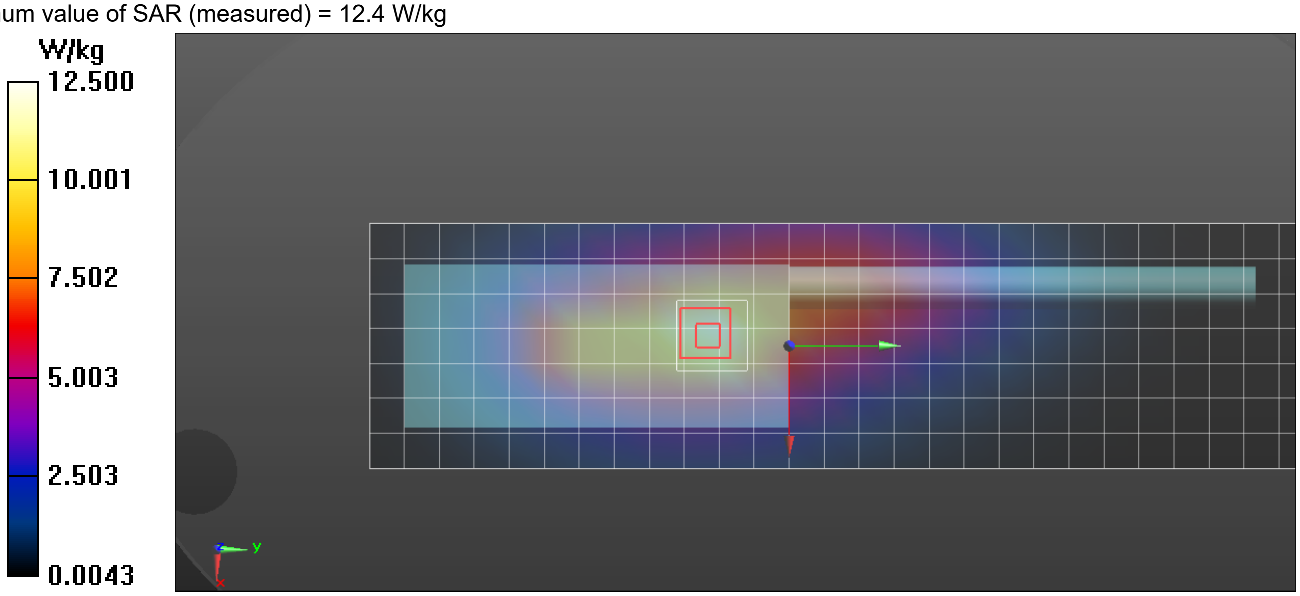
- Probe: EX3DV4 - SN3600; ConvF(8.84, 8.84, 8.84) @ 456 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

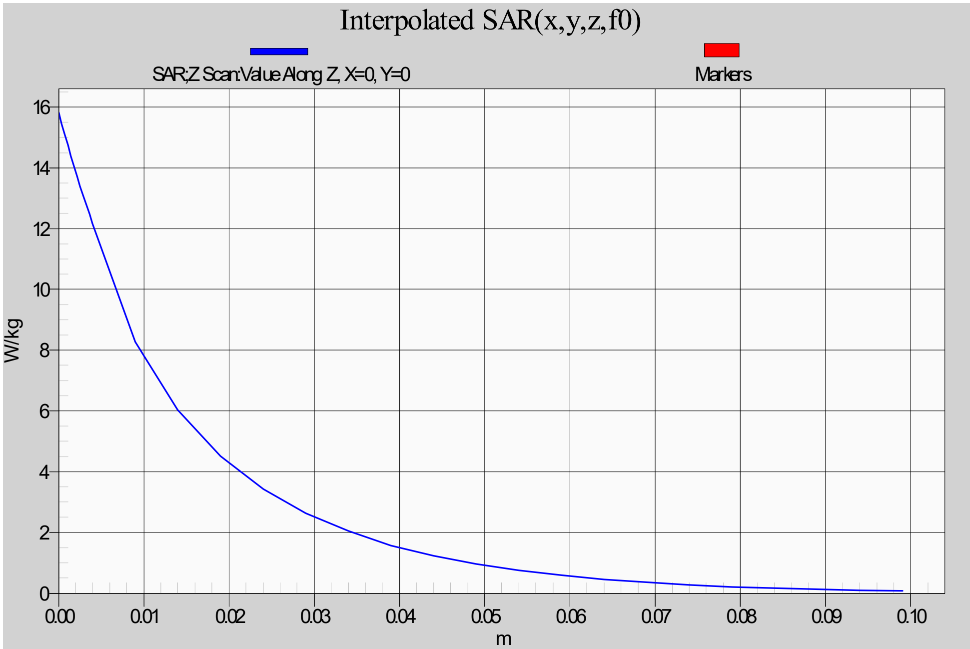
450H/B1-3 - Baseline comparison w/ Eng Eval 456MHz Body, BC/Area Scan (8x28x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 12.5 W/kg

450H/B1-3 - Baseline comparison w/ Eng Eval 456MHz Body, BC/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 87.20 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 11.7 W/kg; SAR(10 g) = 7.85 W/kg
Ratio of SAR at M2 to SAR at M1 = 67.6%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 12.4 W/kg




Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
16
14
12
10
8
6
4
2
0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
m

Plot F8-15

DUT: Harris XL-400P Fire Radio; Type: PTT; Serial: Not Specified
Procedure Name: F8-15 - XL-400P 454MHz Face

Communication System: UID 0, CW (0); Frequency: 454 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 454 MHz; σ = 0.904 S/m; ε_r = 45.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Date/Time: 2/12/2021 5:50:01 PM
DASY5 Configuration:

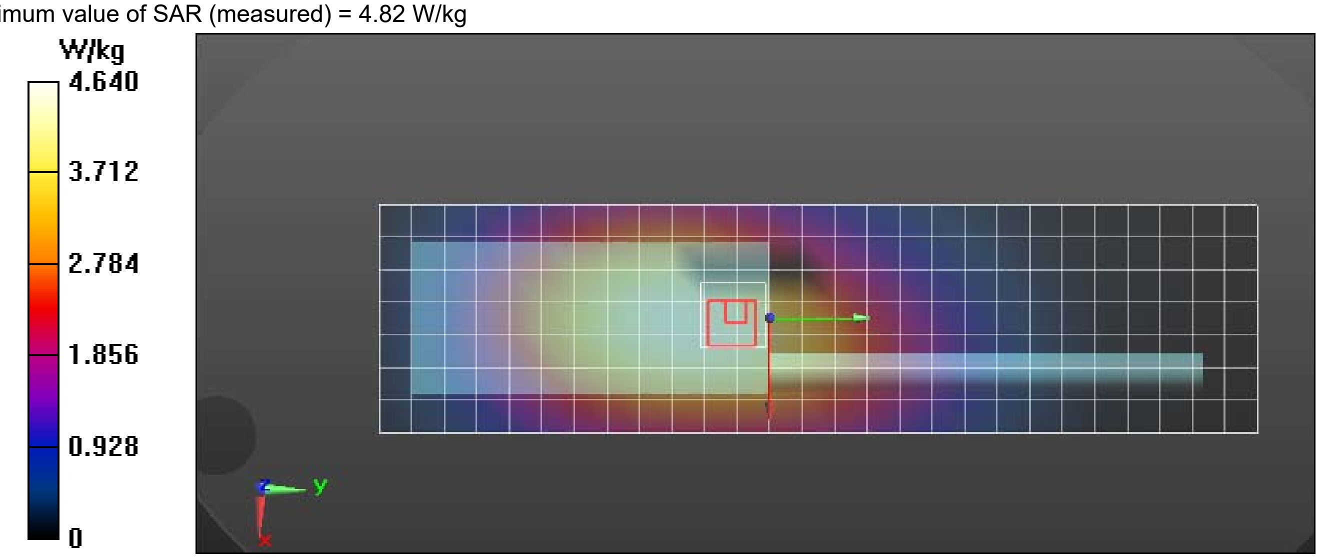
- Probe: EX3DV4 - SN3600; ConvF(8.84, 8.84, 8.84) @ 454 MHz; Calibrated: 3/25/2020
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 3/17/2020
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

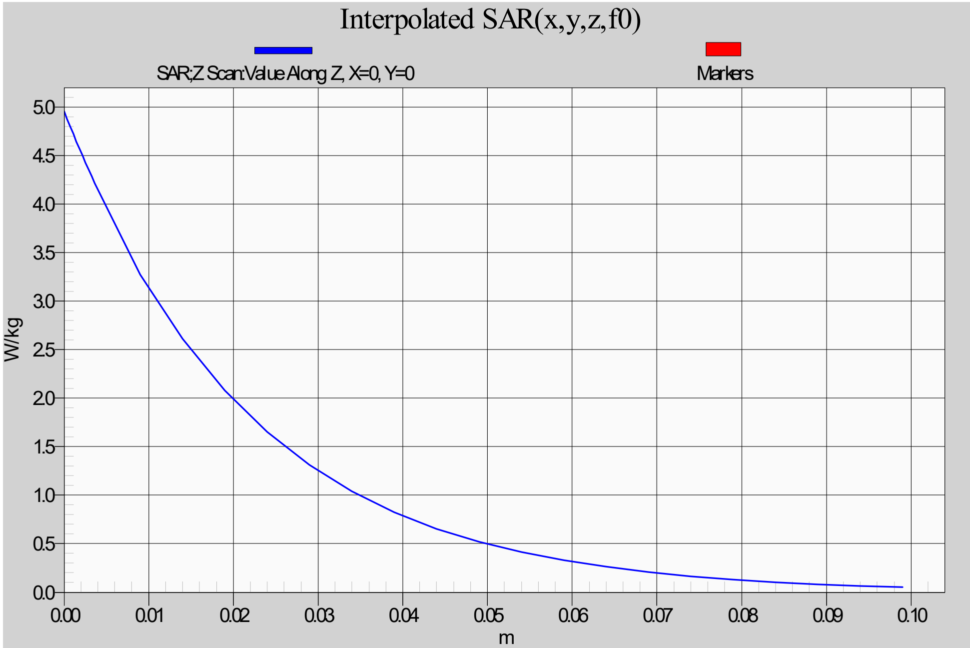
450H/F8-15 - XL-400P 454MHz Face/Area Scan (8x28x1): Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 4.64 W/kg

450H/F8-15 - XL-400P 454MHz Face/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 66.56 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 9.88 W/kg
SAR(1 g) = 5.58 W/kg; SAR(10 g) = 3.87 W/kg
Smallest distance from peaks to all points 3 dB below = 3.4 mm
Ratio of SAR at M2 to SAR at M1 = 77.7%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 4.82 W/kg




Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
m

