Celltech
Testing and Engineering Services Lab

Test Report Serial Number:	45461711 R1.0
Test Report Date:	21 February 2022
Project Number:	1569

SAR Test Report - C2PC

Applicant:

L3HARRIS™
FAST. FORWARD.

L3Harris Corporation
221 Jefferson Ridge Parkway
Lynchburg, VA, 24501
USA

Maximum *reported* 1g SAR			
Equipment Class	Head	Body	W/kg
TNF	2.14	5.00	
PCS	0.37	0.45	
DTS	<0.1	<0.1	
DSS	<0.1	<0.1	
U-NII	<0.1	<0.1	
Simultaneous	2.51	5.45	
Limit:	8.00	8.00	

FCC ID: **OWDTR-0164-E**
Product Model Number / HVIN: **XL-400P**

IC Registration Number: **3636B-0164**
Product Name / PMN: **EXTREME**

In Accordance With:

FCC 47 CFR §2.1093
Radiofrequency Radiation Exposure Evaluation: Portable Devices

Health Canada Safety Code 6
Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3kHz to 300GHz

Approved By:

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

ilac-MRA [ACCREDITED]
Test Lab Certificate: 2470.01

Industry Canada
IC Registration 3874A

FC
FCC Registration: CA3874

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1.0 DOCUMENT CONTROL

Revision History					
Samples Tested By:	Ben Hewson, Trevor Whillock		**Date(s) of Evaluation:**	31 Jan - 16 Feb, 2022	
Report Prepared By:	Art Voss, P.Eng.		**Report Reviewed By:**	Ben Hewson	
Report Revision	**Description of Revision**		**Revised Section**	**Revised By**	**Revision Date**
0.1	Draft		n/a	Art Voss	16 February 2022
0.2	Revised Draft		n/a	Art Voss	20 February 2022
1.0	Initial Release		n/a	Art Voss	21 February 2022

2.0 APPLICANT AND DEVICE INFORMATION

Applicant Information		
Applicant Name	**L3Harris Corporation**	
Applicant Address	221 Jefferson Ridge Parkway	
	Lynchburg, VA, 24501	
	USA	
DUT Information		
Device Identifier(s):	**FCC ID:**	**OWDTR-0164-E**
	ISED:	**3636B-0164**
Device Marketing Name / PMN:	XL-400P	
Host Marketing Name / HMN:	XL-400P	
Device Model(s) / HVIN:	EXTREME	
Test Sample Serial No.:	A40330000602	
Equipment Class (FCC):	Licensed Non-Broadcast Transmitter Held to Face (TNF) FCC Part 90 - LMRS	
Equipment Class (ISED):	Land Mobile Radio - Portable	
Transmit Frequency Range (FCC):	VHF Band: 136 - 174MHz	
	UHF Band: 378 - 522MHz	
	700 Band: 763 - 776MHz, 793 - 806MHz	
	800 Band: 806 - 825MHz, 851 - 870MHz	
Transmit Frequency Range (ISED):	VHF Band: 138 - 144MHz, 148 - 149.9MHz, 150.05 - 174MHz	
	UHF Band: 406.1 - 430MHz, 450 - 470MHz	
	700 Band: 768 - 776MHz, 798-806MHz	
	800 Band: 806 - 824MHz, 851 - 870MHz	
Number of Channels:	Programmable	
Transmitter Rated Power (Max): **Including Tune-Up Tolerance**	VHF Band: 7.2W (38.6dBm)	
	UHF Band: 6W (37.8dBm)	
	700 Band: 3W (34.8dBm)	
	800 Band: 3.6W (35.6dBm)	
Duty Cycle:	BT, WLAN: 100%, LMR: 50% PTT Duty Cycle	
DUT Power Source:	7.2VDC Li-Ion Rechargeable Battery Pack	
Deviation(s) from standard/procedure:	None	
Modification of DUT:	None	

Integrated Module Information	
Module Manufacturer:	Texas Instruments Inc.
Device Identifier(s):	**FCC ID:** Z64-WL18DBMOD
	IC ID: 451I-WL18DBMOD
Device Type:	WiFi and BlueTooth Module
Module Device Model(s) / HVIN:	WL1837MODGI
Equipment Class (FCC):	Digital Transmission System (DTS)
	Part 15 Spread Spectrum Transmitter (DSS)
	Unlicensed National Information Infrastructure Transmitter (U-NII)
Equipment Class (ISED):	Wireless Local Area Network Device
Transmit Frequency Range: (1)	WiFi : 2412-2462MHz
	U-NII-1: 5180 - 5240MHz, U-NII-3: 5745 - 5825MHz
	Bluetooth: 2402 - 2480MHz
Manuf. Max. Rated Output Power:	WiFi: 243.2mW (23.85dBm)
	U-NII-1: 49.9mW (16.98dBm), U-NII-3: 61.4mW (17.88dBm)
	Bluetooth: 14.6mW (11.6dBm)

Integrated Module Information	
Module Manufacturer:	Sierra Wireless Inc.
Device Identifier(s):	**FCC ID:** N7NEM75S
	IC ID: 2417C-EM75S
Device Type:	LTE Module(3)
Module Device Model(s) / HVIN:	EM7565-9
Equipment Class (FCC):	PCS Licensed Transmitter
Equipment Class (ISED):	Cellular Network - Other Portable Device
Transmit Frequency Range: (1)(2)	LTE Band 2: 1850 - 1910MHz
	LTE Band 4: 1710 - 1755MHz
	LTE Band 5: 824 - 849MHz
	LTE Band 7: 2500 - 2570MHz
	LTE Band 12: 699 - 716MHz
	LTE Band 13: 777-787MHz
	LTE Band 14: 788 - 798MHz
	LTE Band 17: 704 - 716MHz
Manuf. Max. Rated Output Power:	282mW (24.5dBm)

(1) The transmit modes and/or frequency bands indicated are those utilized by the host integrator and may not be indicative of all modes and/or frequency bands available for the modular device.

(2) Uplink frequencies.

(3) LTE: 3GPP Release 11. Carrier Aggregation supported for downlink Only.

Note: Per FCC KDB 941225, a PAG is not required for downlink-only carrier aggregation.

3.0 SCOPE OF EVALUATION

This Certification Report was prepared on behalf of:

L3Harris 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.

Device Description:

The XL-400P, FCC ID: OWDTR-0164-E, IC ID: 3636B-0164, is an Occupational multiband (VHF, UHF, 7/800 Band) LMR transceiver containing a pre-certified WiFi/Bluetooth module and an optional pre-certified LTE module. All transmitters are capable of simultaneous transmission.

Regulatory Requirement:

As per FCC 47 CFR Part §2.1093 and Health Canada Safety Code 6, an RF Exposure (SAR) evaluation report is required for this *Equipment* and the results of the RF Exposure evaluation appear in this report.

Filing:

This is an application Class II Permissive Change for the addition of the LTE module option.

Filing:

The scope of this investigation is to evaluate the SAR for intended use applications. The SAR for the XL-400P was originally evaluated for the LMR and WiFi/Bluetooth bands. There is a slight form-factor change with the LTE option on the back side of the device near the top. The location of the LMR and WiFi/Bluetooth transceivers and their radiating elements have not changed relative to the original filing. The Test Plan includes the evaluation of the LTE bands, including the analysis of all simultaneous transmission conditions, for all required RF exposure configurations and accessories types. The Test Plan leverages data from the original filing and is based the test channels, configurations and accessories producing the highest worst case SAR. Where applicable, SAR test reduction and/or SAR test exclusion may be utilized. Test procedures are based on the requirements IEEE 1528-62209, IEC 62209-2, FCC KDB 865646, 447498, 643646 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 Title 47: Part 2.1093:	Code of Federal Regulations Telecommunication Radiofrequency Radiation Exposure Evaluation: Portable Devices
Health Canada Safety Code 6 (2015)	Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3kHz to 300GHz
Industry Canada Spectrum Management & Telecommunications Policy RSS-102 Issue 5:	Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)
IEEE International Committee on Electromagnetic Safety IEEE 1528-2013:	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
IEC International Standard IEC 62209-2 2010	Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 2
IEC International Standard /IEEE International Committee on Electromagnetic Safety IEC/IEEE 62209-1528	Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528; Human models, instrumentation, and procedures (Frequency range of 4 MHz to 10 GHz)
FCC KDB KDB 865664 D01v01r04	SAR Measurement Requirements for 100MHz to 6GHz
FCC KDB KDB 447498 D01v07	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
FCC KDB KDB 643646 D01v01r03	SAR Test Reduction Considerations for Occupational PTT Radios
* When the issue number or issue date is omitted, the latest version is assumed.	

5.0 STATEMENT OF COMPLIANCE

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

Applicant:	Date(s) Evaluated:
L3Harris Corporation	31 January - 16 February, 2022
Module Product Name / PMN:	**Module Product Model Number / HVIN:**
XL-400P	-
Host Marketing Name / HMN:	**Host Product Model Number / HVIN:**
XL-400P	EXTREME

Standard(s) Applied:

FCC 47 CFR §2.1093

Health Canada's Safety Code 6

Measurement Procedures:

FCC KDB 865664, FCC KDB 447498, FCC KDB 247228, FCC KDB 643646

Industry Canada RSS-102 Issue 5

IEEE Standard 1528-2013, IEC 62209-2, IEC/IEEE 62209-1528

Use Group:	Limits Applied:
[ ] General Population / User Unaware	[ ] 1.6W/kg - 1g Volume - Body/Head/Face
[X] Occupational / User Aware	[X] 8.0W/kg - 1g Volume - Body/Head/Face
	[ ] 4.0W/kg - 10g Volume - Extremity

Reason for Issue:

[ ] New Certification

[X] Class II Permissive Change

Reason for Change:

Addition of an optional modular LTE transceiver

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

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

Art Voss, P.Eng.
Technical Manager
Celltech Labs Inc.
16 February 2022
Date

6.0 SAR MEASUREMENT SYSTEM

SAR Measurement System

Celltech Labs Inc. SAR measurement facility employs a Dosimetric Assessment System (DASY™) manufactured by Schmid & Partner Engineering AG (SPEAG™) of Zurich, Switzerland. The DASY6 measurement system is comprised of the measurement server, a robot controller, a computer, a near-field probe, a probe alignment sensor, an Elliptical Planar Phantom (ELI) phantom and a specific anthropomorphic mannequin (SAM) phantom for Head and/or Body SAR evaluations. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF). A cell controller system contains the power supply, robot controller and a teach pendant (Joystick) to control the robot's servo motors. The Staubli robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical form the DAE to digital electronic signal and transfers data to the DASY6 measurement server. The DAE4 utilizes a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16-bit AD-converter, a command decoder and a control logic unit. Transmission to the DASY6 measurement server is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe-mounting device includes two different sensor systems for frontal and sidewise probe contacts. The sensor systems are also used for mechanical surface detection and probe collision detection. The robot utilizes a controller with built in VME-bus computer.

DASY 6 SAR System

DASY 6 Measurement Controller

7.0 RF CONDUCTED POWER MEASUREMENT

Table 7.1 Conducted Power Measurements TNF - VHF

Conducted Power Measurements						
Frequency (MHz)	Channel Width (N/W)	Measured Power (dBm)	Measured Power (W)	Rated* Power (dBm)	Rated* Power (W)	Delta (dB)
VHF						
136.0125	N	38.32	6.79	38.60	7.24	-0.28
136.0125	W	38.31	6.78	38.60	7.24	-0.29
138.0125	N	38.32	6.79	38.60	7.24	-0.28
138.0125	W	38.31	6.78	38.60	7.24	-0.29
141.0125	N	38.32	6.79	38.60	7.24	-0.28
141.0125	W	38.32	6.79	38.60	7.24	-0.28
143.9875	N	38.32	6.79	38.60	7.24	-0.28
143.9875	W	38.33	6.81	38.60	7.24	-0.27
148.0125	N	38.32	6.79	38.60	7.24	-0.28
148.0125	W	38.31	6.78	38.60	7.24	-0.29
150.0125	N	38.30	6.76	38.60	7.24	-0.30
150.0125	W	38.30	6.76	38.60	7.24	-0.30
156.8000	N	38.33	6.81	38.60	7.24	-0.27
156.8000	W	38.33	6.81	38.60	7.24	-0.27
162.0125	N	38.30	6.76	38.60	7.24	-0.30
162.0125	W	38.29	6.75	38.60	7.24	-0.31
173.9875	N	38.32	6.79	38.60	7.24	-0.28
173.9875	W	38.30	6.76	38.60	7.24	-0.30

* Including Tune-Up Tolerance

All measurements with DUT = HP

Table 7.2 Conducted Power Measurements TNF - UHF

Conducted Power Measurements						
Frequency (MHz)	Channel Width (N/W)	Measured Power (dBm)	Measured Power (W)	Rated* Power (dBm)	Rated* Power (W)	Delta (dB)
UHF						
378.0125	N	37.79	6.01	37.80	6.03	-0.01
378.0125	W	37.76	5.97	37.80	6.03	-0.04
406.1125	N	37.75	5.96	37.80	6.03	-0.05
406.1125	W	37.74	5.94	37.80	6.03	-0.06
418.0000	N	37.66	5.83	37.80	6.03	-0.14
418.0000	W	37.66	5.83	37.80	6.03	-0.14
429.9875	N	37.78	6.00	37.80	6.03	-0.02
429.9875	W	37.76	5.97	37.80	6.03	-0.04
450.0125	N	37.75	5.96	37.80	6.03	-0.05
450.0125	W	37.76	5.97	37.80	6.03	-0.04
453.9875	N	37.74	5.94	37.80	6.03	-0.06
453.9875	W	37.74	5.94	37.80	6.03	-0.06
456.0125	N	37.77	5.98	37.80	6.03	-0.03
456.0125	W	37.78	6.00	37.80	6.03	-0.02
459.0250	NB	37.57	5.71	37.80	6.03	-0.23
459.0250	WB	37.60	5.75	37.80	6.03	-0.20
459.9750	NB	37.55	5.69	37.80	6.03	-0.25
459.9750	WB	37.55	5.69	37.80	6.03	-0.25
469.9875	N	37.63	5.79	37.80	6.03	-0.17
469.9875	W	37.63	5.79	37.80	6.03	-0.17
511.9875	N	37.67	5.85	37.80	6.03	-0.13
511.9875	W	37.66	5.83	37.80	6.03	-0.14
521.9875	N	37.59	5.74	37.80	6.03	-0.21
521.9875	W	37.59	5.74	37.80	6.03	-0.21

* Including Tune-Up Tolerance

All measurements with DUT = HP

Table 7.3 Conducted Power Measurements TNF – 7/800 Band

Conducted Power Measurements						
Frequency (MHz)	Channel Width (N/W)	Measured Power (dBm)	Measured Power (W)	Rated* Power (dBm)	Rated* Power (W)	Delta (dB)
7/800						
763.0000	N	34.29	2.69	34.80	3.02	-0.51
768.0125	N	34.32	2.70	34.80	3.02	-0.48
769.0125	N	34.33	2.71	34.80	3.02	-0.47
772.0125	N	34.28	2.68	34.80	3.02	-0.52
774.9875	N	34.33	2.71	34.80	3.02	-0.47
775.9875	N	34.27	2.67	34.80	3.02	-0.53
793.0125	N	34.26	2.67	34.80	3.02	-0.54
798.0125	N	34.33	2.71	34.80	3.02	-0.47
799.0125	N	34.35	2.72	34.80	3.02	-0.45
802.0125	N	34.34	2.72	34.80	3.02	-0.46
804.9875	N	34.29	2.69	34.80	3.02	-0.51
805.9875	N	34.33	2.71	34.80	3.02	-0.47
806.0125	W	35.03	3.18	35.60	3.63	-0.57
815.0000	WB	34.95	3.13	35.60	3.63	-0.65
823.9875	W	35.04	3.19	35.60	3.63	-0.56
824.9875	W	35.01	3.17	35.60	3.63	-0.59
851.0125	W	35.06	3.21	35.60	3.63	-0.54
860.0000	WB	35.11	3.24	35.60	3.63	-0.49
868.9875	W	35.12	3.25	35.60	3.63	-0.48
869.9875	W	35.16	3.28	35.60	3.63	-0.44

* Including Tune-Up Tolerance

All measurements with DUT = HP

Table 7.4 Conducted Power Measurements PCS – LTE Band 2

LTE Conducted Power Measurement									
LTE Band:		2			Channel Bandwidth:		20MHz		
Lower Band Edge		1850(MHz)			Upper Band Edge:		1910(MHz)		
Modulation	RB Size	RB Offset	Low 18700 1860(MHz)		Mid 18900 1880(MHz)		High 19100 1900(MHz)		Chan Pos EARFCN Chan Freq
			Conducted Power (dBm)						RB Pos
				X		X		X	
QPSK	1	0	24.10		24.32	x	24.44	x	Low
	1	50	24.12		24.21		24.31		Mid
	1	99	24.13	x	24.20		24.15		High
	50	0	23.79	x	23.79	x	24.01	x	Low
	50	50	23.74		23.78		23.85		High
	100	0	23.78		23.73		23.98	x	Mid
16QAM	1	0	24.09		24.05		23.90		Low
	1	50	24.11	x	23.93		24.22	x	Mid
	1	99	24.11		23.95	x	24.09		High
	50	0	23.78	x	23.77	x	23.98	x	Low
	50	50	23.70		23.77		23.80		High
	100	0	22.74		22.75		23.00	x	Mid

x = Required Test Channel

= Required for highest conducted power

= Required if SAR > 0.8W/kg or conducted power > 1 and 50% RB

= Required if SAR > 1.45W/kg oe conducted power > 1/2dB of QPSK

Note: Device does not support 64QAM

Table 7.5 Conducted Power Measurements PCS – LTE Band 4

LTE Conducted Power Measurement									
LTE Band:		4			Channel Bandwidth:				20MHz
Lower Band Edge		1710(MHz)			Upper Band Edge:				1755(MHz)
Modulation	RB Size	RB Offset	Low 20050 1720(MHz)		Mid 20175 1732.5(MHz)		High 20300 1745(MHz)		Chan Pos EARFCN Chan Freq
			Conducted Power (dBm)						RB Pos
				X		X		X	
QPSK	1	0	23.96	x	23.89	x	24.03	x	Low
	1	50	23.85		23.75		23.88		Mid
	1	99	23.90		23.78		23.95		High
	50	0	23.92	x	23.87	x	23.99	x	Low
	50	50	23.83		23.86		23.94		High
	100	0	22.88		22.89		23.01	x	Mid
16QAM	1	0	23.20	x	23.18	x	23.61	x	Low
	1	50	23.05		23.08		23.49		Mid
	1	99	23.12		23.12		23.56		High
	50	0	22.90	x	22.85	x	22.95	x	Low
	50	50	22.81		22.85		22.93		High
	100	0	21.95		21.90		22.11	x	Mid

x = Required Test Channel

= Required for highest conducted power

= Required if SAR > 0.8W/kg or conducted power > 1 and 50% RB

= Required if SAR > 1.45W/kg oe conducted power > 1/2dB of QPSK

Note: Device does not support 64QAM

Table 7.6 Conducted Power Measurements PCS – LTE Band 5

LTE Conducted Power Measurement									
LTE Band:		5			Channel Bandwidth:				10MHz
Lower Band Edge		824(MHz)			Upper Band Edge:				849(MHz)
Modulation	RB Size	RB Offset	Low 20450 829(MHz)		Mid 20525 836.5(MHz)		High 20600 844(MHz)		Chan Pos EARFCN Chan Freq
			Conducted Power (dBm)						RB Pos
				X		X		X	
QPSK	1	0	24.21		24.47	x	24.32		Low
	1	25	24.25		24.43		24.25	x	Mid
	1	49	24.31	x	24.45		24.21		High
	25	0	24.15		24.30	x	24.12	x	Low
	25	25	24.20	X	24.26		24.10		High
	50	0	24.20	X	24.17		24.13		Mid
16QAM	1	0	23.50		23.83	x	23.57	x	Low
	1	25	23.53		23.75		23.53		Mid
	1	49	23.61	x	23.75		23.52		High
	25	0	24.08		24.18	x	24.10	x	Low
	25	25	24.18	x	24.15		24.07		High
	50	0	23.25	x	23.21		23.15		Mid

x = Required Test Channel

= Required for highest conducted power

= Required if SAR > 0.8W/kg or conducted power > 1 and 50% RB

= Required if SAR > 1.45W/kg oe conducted power > 1/2dB of QPSK

Note: Device does not support 64QAM

Table 7.7 Conducted Power Measurements PCS – LTE Band 7

LTE Conducted Power Measurement									
LTE Band:		7			Channel Bandwidth:				20MHz
Lower Band Edge		2500(MHz)			Upper Band Edge:				2570(MHz)
Modulation	RB Size	RB Offset	Low 20850 2510(MHz)		Mid 21100 2535(MHz)		High 21350 2560(MHz)		Chan Pos EARFCN Chan Freq
			Conducted Power (dBm)						RB Pos
				X		X		X	
QPSK	1	0	24.31		24.34	x	24.47	x	Low
	1	50	24.21		24.31		24.21		Mid
	1	99	24.36	x	24.21		24.18		High
	50	0	24.29		24.33		24.32	x	Low
	50	50	24.35	x	24.35	x	24.14		High
	100	0	24.28	x	24.26		24.23		Mid
16QAM	1	0	23.09		23.18	x	23.30	x	Low
	1	50	23.12		23.11		23.00		Mid
	1	99	23.17	x	23.10		22.77		High
	50	0	22.75		22.75		22.80	x	Low
	50	50	22.81	x	22.84	x	22.63		High
	100	0	21.91	x	21.87		21.72		Mid

x = Required Test Channel

= Required for highest conducted power

= Required if SAR > 0.8W/kg or conducted power > 1 and 50% RB

= Required if SAR > 1.45W/kg oe conducted power > 1/2dB of QPSK

Note: Device does not support 64QAM

Table 7.8 Conducted Power Measurements PCS – LTE Band 12

LTE Conducted Power Measurement									
LTE Band:		12			Channel Bandwidth:				10MHz
Lower Band Edge		699(MHz)			Upper Band Edge:				716(MHz)
Modulation	RB Size	RB Offset	Low 23060 704(MHz)		Mid 23095 707.5(MHz)		High 23130 711(MHz)		Chan Pos EARFCN Chan Freq
			Conducted Power (dBm)						RB Pos
				X		X		X	
QPSK	1	0	24.32	x	24.29		23.39		Low
	1	25	24.32		24.33		23.46		Mid
	1	49	24.31		24.50	x	23.50	x	High
	25	0	23.90	x	23.85		23.82		Low
	25	25	23.86		24.08	x	23.97	x	High
	50	0	23.90		23.92	x	23.90		Mid
16QAM	1	0	23.50		23.85		23.37		Low
	1	25	23.40		23.87	x	23.46		Mid
	1	49	23.95	x	24.00		23.48	x	High
	25	0	23.88	x	23.35		23.82		Low
	25	25	23.86		23.57	x	23.97	x	High
	50	0	22.94	x	22.95		22.95		Mid

x = Required Test Channel

= Required for highest conducted power

= Required if SAR > 0.8W/kg or conducted power > 1 and 50% RB

= Required if SAR > 1.45W/kg oe conducted power > 1/2dB of QPSK

Note: Device does not support 64QAM

Table 7.9 Conducted Power Measurements PCS – LTE Band 13

LTE Conducted Power Measurement									
LTE Band:		13	Channel Bandwidth:					10MHz	
Lower Band Edge		777(MHz)	Upper Band Edge:					787(MHz)	
Modulation	RB Size	RB Offset	Low 23230 782(MHz)		Mid 23230 782(MHz)		High 23230 782(MHz)		Chan Pos EARFCN Chan Freq
			Conducted Power (dBm)						RB Pos
				X		X		X	
QPSK	1	0	n/a		24.21	x	n/a		Low
	1	25	n/a		24.07		n/a		Mid
	1	49	n/a		23.97		n/a		High
	25	0	n/a		23.23		n/a		Low
	25	25	n/a		23.97	x	n/a		High
	50	0	n/a		23.24	x	n/a		Mid
16QAM	1	0			23.78				Low
	1	25			23.86	x			Mid
	1	49			23.60				High
	25	0			23.20	x			Low
	25	25			23.10				High
	50	0			22.21	x			Mid

x = Required Test Channel

= Required for highest conducted power

= Required if SAR > 0.8W/kg or conducted power > 1 and 50% RB

= Required if SAR > 1.45W/kg oe conducted power > 1/2dB of QPSK

Note: Device does not support 64QAM

Table 7.10 Conducted Power Measurements PCS – LTE Band 14

LTE Conducted Power Measurement									
LTE Band:		14	Channel Bandwidth:					10MHz	
Lower Band Edge		788(MHz)	Upper Band Edge:					798(MHz)	
Modulation	RB Size	RB Offset	Low 23330 793(MHz)		Mid 23330 793(MHz)		High 23330 793(MHz)		Chan Pos EARFCN Chan Freq
			Conducted Power (dBm)						RB Pos
				X		X		X	
QPSK	1	0	n/a		24.48	x	n/a		Low
	1	25	n/a		23.57		n/a		Mid
	1	49	n/a		24.20		n/a		High
	25	0	n/a		24.00		n/a		Low
	25	25	n/a		24.11	x	n/a		High
	50	0	n/a		24.03	x	n/a		Mid
16QAM	1	0			24.12				Low
	1	25			24.10				Mid
	1	49			24.20	x			High
	25	0			23.96				Low
	25	25			24.11	x			High
	50	0			23.13	x			Mid

x = Required Test Channel

= Required for highest conducted power

= Required if SAR > 0.8W/kg or conducted power > 1 and 50% RB

= Required if SAR > 1.45W/kg oe conducted power > 1/2dB of QPSK

Note: Device does not support 64QAM

Table 7.11 Conducted Power Measurements PCS – LTE Band 17

LTE Conducted Power Measurement									
LTE Band:		17	Channel Bandwidth:					10MHz	
Lower Band Edge		704(MHz)	Upper Band Edge:					716(MHz)	
Modulation	RB Size	RB Offset	Low 23780 709(MHz)		Mid 23790 710(MHz)		High 23800 711(MHz)		Chan Pos EARFCN Chan Freq
			Conducted Power (dBm)						RB Pos
				X		X		X	
QPSK	1	0	23.37		24.22	x	22.65		Lower
	1	25	23.49		24.02		23.33	x	Mid
	1	49	24.16	x	23.57		22.84		Upper
	25	0	23.02		23.35	x	23.36		Lower
	25	25	23.11	x	23.21		23.80	x	Upper
	50	0	23.07		23.25		23.79	x	Mid
16QAM	1	0	22.94		23.62	x	22.87		Lower
	1	25	22.59		23.16		23.05	x	Mid
	1	49	23.21	x	23.02		23.00		Upper
	25	0	23.62	x	23.18	x	23.10	x	Lower
	25	25	23.42		23.18		22.98		Upper
	50	0	22.55		22.87	x	22.28		Mid

x = Required Test Channel

= Required for highest conducted power

= Required if SAR > 0.8W/kg or conducted power > 1 and 50% RB

= Required if SAR > 1.45W/kg oe conducted power > 1/2dB of QPSK

Note: Device does not support 64QAM

Table 7.12 Conducted Power Measurements PCS – LTE Band 66

LTE Conducted Power Measurement									
LTE Band:		66	Channel Bandwidth:					20MHz	
Lower Band Edge		1710(MHz)	Upper Band Edge:					1780(MHz)	
Modulation	RB Size	RB Offset	Low 132072 1720(MHz)		Mid 132322 1745(MHz)		High 132572 1770(MHz)		Chan Pos EARFCN Chan Freq
			Conducted Power (dBm)						RB Pos
				X		X		X	
QPSK	1	0	23.05		23.80	x	23.46		Low
	1	50	23.80	x	23.25		23.85	x	Mid
	1	99	22.94		22.84		23.11		High
	50	0	22.93		23.58	x	23.76	x	Low
	50	50	23.03	x	23.49		23.67		High
	100	0	22.27		22.64		22.71	x	Mid
16QAM	1	0	22.66		23.07	x	23.40	x	Low
	1	50	22.71	x	22.13		22.67		Mid
	1	99	22.63		22.34		22.71		High
	50	0	22.25		21.86	x	22.87	x	Low
	50	50	22.43	x	22.80		22.23		High
	100	0	21.25		21.76	x	21.67		Mid

x = Required Test Channel

= Required for highest conducted power

= Required if SAR > 0.8W/kg or conducted power > 1 and 50% RB

= Required if SAR > 1.45W/kg oe conducted power > 1/2dB of QPSK

Note: Device does not support 64QAM

NOTE: The measured conducted power in the smaller bandwidths for each band and RB configuration was less than 1/2dB greater than the *equivalent* RB configuration of the respective largest bandwidth.

*The rated power and tolerance are stated for typical transmission modes and data rates. Some modes and data rates may produce lower than rated conducted power levels. Continuous Wave (CW) mode is a test mode not typical with normal transmission modes and may produce higher than rated conducted power levels Power measurements taken across the various channels, modes and data rates did not produce levels in excess of the Rated Power plus Tolerance. SAR was evaluated using .CW mode at the Maximum output power level setting and produced the most conservative SAR. The *reported* SAR was not scaled down.

8.0 NUMBER OF TEST CHANNELS (N_C)

The number of test channels for testing the LMR channel bands is based on the worst-case channels and configurations from the original filing as well the highest conducted output power channel obtained during this evaluation.

The *required test channels* used for the LTE evaluation is based on FCC KDB 941225 D05v02r05 as follows:

5.2.1. QPSK with 1 RB allocation
Start with the largest channel bandwidth then measure SAR for QPSK with 1 RB allocation, using the RB offset and *required test channel* combination with the highest maximum output power among RB offsets at the upper edge, middle, and lower edge of each *required test channel*. When the *reported SAR* is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and *required test channel*s is not required for 1 RB allocation; otherwise, SAR is required for the remaining *required test channel*s and only for the RB offset configuration with the highest output power for that channel.6 When the *reported SAR* of a *required test channel* is > 1.45 W/kg, SAR is required for all three RB offset configurations for that *required test channel*.

5.2.2. QPSK with 50% RB allocation
The procedures required for 1 RB allocation in 5.2.1 are applied to measure the SAR for QPSK with 50% RB allocation.

5.2.3. QPSK with 100% RB allocation
For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations, and the highest *reported SAR* for 1 RB and 50% RB allocation in 5.2.1 and 5.2.2 are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the *reported SAR* is > 1.45 W/kg, the remaining *required test channel*s must also be tested.

5.2.4. Higher order modulations
For each modulation besides QPSK; e.g., 16-QAM, 64-QAM, apply the QPSK procedures in 5.2.1, 5.2.2, and 5.2.3 to determine the QAM configurations that may need SAR measurement. For each configuration identified as required for testing, SAR is required only when the highest maximum output power for the configuration in the higher order modulation is > ½ dB higher than the same configuration in QPSK or when the *reported SAR* for the QPSK configuration is > 1.45 W/kg.

5.3. Other channel bandwidth standalone SAR test requirements
For the other channel bandwidths used by the device in a frequency band, apply all the procedures required for the largest channel bandwidth in 5.2 to determine the channels and RB configurations that need SAR testing, then only measure SAR when the highest maximum output power of a configuration requiring testing in the smaller channel bandwidth is > ½ dB higher than the equivalent channel configurations in the largest channel bandwidth configuration, or the *reported SAR* of a configuration for the largest channel bandwidth is > 1.45 W/kg. The equivalent channel configuration for the RB allocation, RB offset and modulation, etc., is determined for the smaller channel bandwidth according to the same number of RB allocated in the largest channel bandwidth. For example, 50 RB in 10 MHz channel bandwidth does not apply to 5 MHz channel bandwidth; therefore, this cannot be tested in the smaller channel bandwidth. However, 50% RB allocation in 10 MHz channel bandwidth is equivalent to 100% RB allocation in 5 MHz channel bandwidth; therefore, these are the equivalent configurations to be compared to determine the specific channel and configuration in the smaller channel bandwidth that need SAR testing.

Note: LTE Band 66 completely encompassed Band 4, Band 12 completely encompasses Band 17. Only the channels and RB configurations having the highest conducted output power will be evaluated for band pair.

9.0 ACCESSORIES EVALUATED

Table 9.1 Manufacturer's Accessory List

Note: Most of the accessories listed below were evaluated in part or in whole in the original filing.

Change History				
Change ID	Date	Change Type	Description of Change	Test Report Serial Number
40	26 Mar 2021	New Cert	Initial Filing - XL-400P Fire Radio 14100-1000-01 - OWDTR-0164-E	45461651R3
42	19 Aug 2021	C1PC	Addition of ESM with NFPA Cable Dongle 14100-4700-21 Addition of Extreme Radio Case and Straps 14100-5200-01,-02,03,-04	45461685
44	16 Feb 2022	C2PC	LTE Addtion to XL-400P	45461531
44	16 Feb 2022	C2PC	Added 14100-4000-05, -06 Batteries	45461531

Manufacturer's Accessory List					
Test Report ID Number	Manufacturer's Part Number	Description	Change ID[1]	SAR[4] Evaluated	SAR[5] Tested
Antenna					
T13	14100-4300-01	Fire Radio, Helical, Flex (136 - 870MHz)	40	Y	Y

Manufacturer's Accessory List					
Test Report ID Number	Manufacturer's Part Number	Description	Change ID[1]	SAR[4] Evaluated	SAR[5] Tested
Battery					
P9	14100-4000-01	Li-Ion, Battery FGD, 7.2VDC, 4.2Ah, 30.2Wh	40	Y	Y
P10	14100-4000-05	Li-Ion, Battery XTRM, 7.2VDC, 4.2Ah, 30.2Wh	44	Y	Y
P11	14100-4000-06	Li-Ion Battery, XTRM, 7.2VDC,3.61Ah, 26Wh	44	Y	Y

Manufacturer's Accessory List							
Test Report ID Number	Manufacturer's Part Number	Description	Change ID[1]	UDC Group[2]	Type II Group[3]	SAR[4] Evaluated	SAR[5] Tested
		Audio Accessory					
A1	12082-0600-01	Standard Speaker Microphone	1	7A	PB	Y	Y
A2	12082-0600-02	Storm Speaker Microphone	1	7A	PB	Y	Y
A4	12082-0650-01	Microphone, Palm, 2-Wire Black	1	7A	IL	Y	Y
A11	12082-0650-08	Headset, LTWT, OTH, Single Ear, IN-Line PTT	3	7A	IL	Y	N
A12	12082-0650-09	Headset, LTWT, BTH, Dual Ear, In_Line PTT	3	7A	IL	Y	N
A13	12082-0650-10	Headset, LTWT, BTH, Dual Ear, Pig Tail PTT	3	7A	PT	Y	Y
A14	12082-0650-11	Headset, LTWT, BTH, Dual In-Ear, In_Line PTT	3	7A	IL	Y	N
A15	12082-0650-12	Headset, LTWT, BTH, Dual In-Ear, Pig Tail PTT	3	7A	PT	Y	Y
A16	12082-0650-13	Headset, Heavy Duty, BTH, w/PTT, XG-100P	3	7A	IL	Y	Y
A17	12082-0650-14	Headset, Heavy Duty, OTH, w/PTT, XG-100P	3	7A	IL	Y	N
A20	12082-0650-17	Skull MIC, w/Body PTT, Earcup, XG-100P	3	9	BB	Y	Y
A21	12082-0650-18	Throat MIC, w/Acoustic Tube, Body PTT	3	9	BB	Y	N
A22	12082-0650-19	Throat MIC, w/Acoustic Tube, Body & Ring PTT	3	9	RB	Y	N
A24	12082-0684-01	BlueTooth, Covert, Earpiece, MIC, PTT	3	BT	n/a	Y	N
A26	LS103239V1	Earphone, Lapel MIC, 2.5mm	3	n/a	n/a	Y	Y
A27	LS103239V2	Earphone, Lapel MIC, 2.5mm, Right Angle	4	n/a	n/a	Y	N
A28	12082-0600-03	Storm Speaker Microphone 18"	6	7A	PB	Y	Y
A29	12082-0600-04	Storm Speaker Microphone 25.6"	6	7A	PB	Y	Y
A30	12082-0600-05	Storm Speaker Microphone 30"	6	7A	PB	Y	Y
A32	14035-4700-01	SPEAKER MIC, REVO NC2, C1D2 LMR	27	7A	PB	Y	Y
A34	14035-4750-01	SPEAKER MIC, 500F, C1D1 LMR	29	9	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	1		Adpt	Y	N
A38	14100-4700-21	Spkr MIC, NFPA 1802, Grn, Cable and Dongle	42	10	PB	Y	Y
A39	14100-4700-22	Spkr MIC, Grn, Stgt Cable	42	10	PB	Y	N
A40	14100-4700-24	Spkr MIC, NFPA 1802, Blk, Cable and Dongle	42	10	PB	Y	N
A41	14100-4700-25	Spkr MIC, XL, Blk, Stgt Cable	42	10	PB	Y	N
A42	14100-4700-27	Spkr MIC, NFPA 1802, Yel, Cable and Dongle	42	10	PB	Y	N
A43	14100-4700-28	Spkr MIC, XL, Yel, Stgt Cable	42	10	PB	Y	N

10.0 SAR MEASUREMENT SUMMARY

Table 10.1: Measured Results – TNF BODY

Measured SAR Results (1g) - BODY Configuration (FCC/ISED)															
Date	Plot ID	DUT		Test Frequency (*MHz*)	Band	Accessories				DUT Spacing		Conducted Power (*dBm*)	Measured SAR (1g)		SAR Drift (*dB*)
		M/N	Configuration			Antenna ID	Battery ID	Body ID	Audio ID	DUT (*mm*)	Antenna (*mm*)		100% DC (*W/kg*)	50% DC (*W/kg*)	
3 Feb 2022	B1	XL-400P	Back-Touch	456.0125	UHF	T13	P9	B1	A1	0	35	**37.78**	8.830	4.415	-0.300
3 Feb 2022	B2	XL-400P	Back-Touch	456.0125	UHF	T13	P11	B1	A1	0	35	**37.78**	8.470	4.235	-0.610
3 Feb 2022	B3	XL-400P	Back-Touch	456.0125	UHF	T13	P10	B1	A1	0	35	**37.78**	9.540	**4.770**	-0.180
3 Feb 2022	B4	XL-400P	Back-Touch	453.9875	UHF	T13	w/c-P10	B1	A1	0	35	**37.74**	7.840	3.920	-0.660
3 Feb 2022	B5	XL-400P	Back-Touch	378.0125	UHF	T13	w/c-P10	B1	A1	0	35	**37.79**	5.210	2.605	-0.180
4 Feb 2022	B6	XL-400P	Back-Touch	851.0125	700/800	T13	P10	B1	A1	0	35	**35.06**	2.670	1.335	-0.490
4 Feb 2022	B7	XL-400P	Back-Touch	775.9875	700/800	T13	P10	B1	A1	0	35	**34.27**	2.400	1.200	-0.050
4 Feb 2022	B8	XL-400P	Back-Touch	869.9875	700/800	T13	P10	B1	A1	0	35	**35.16**	2.670	1.335	-0.100
11 Feb 2022	B28	XL-400P	Back-Touch	143.9875	VHF	T13	P10	B1	A1	0	35	**38.33**	2.610	1.305	-0.190
11 Feb 2022	B29	XL-400P	Back-Touch	162.0125	VHF	T13	P10	B1	A1	0	35	**38.3**	1.750	0.875	-0.950
11 Feb 2022	B30	XL-400P	Back-Touch	156.8	VHF	T13	P10	B1	A1	0	35	**38.33**	1.950	0.975	-0.510
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 10.2: Measured Results – TNF FACE

Measured SAR Results (1g) - FACE Configuration (FCC/ISED)															
Date	Plot ID	DUT		Test Frequency (*MHz*)	Band	Accessories				DUT Spacing		Conducted Power (*dBm*)	Measured SAR (1g)		SAR Drift (*dB*)
		M/N	Configuration			Antenna ID	Battery ID	Body ID	Audio ID	DUT (*mm*)	Antenna (*mm*)		100% DC (*W/kg*)	50% DC (*W/kg*)	
3 Feb 2022	F1	XL-400P	Front Facing	456.0125	UHF	T13	P9	n/a	n/a	25	70	**37.78**	4.060	2.030	-0.370
3 Feb 2022	F2	XL-400P	Front Facing	456.0125	UHF	T13	P10	n/a	n/a	25	70	**37.78**	3.980	1.990	-0.280
3 Feb 2022	F3	XL-400P	Front Facing	456.0125	UHF	T13	P11	n/a	n/a	25	70	**37.78**	3.950	1.975	-0.360
3 Feb 2022	F4	XL-400P	Front Facing	453.9875	UHF	T13	w/c-P10	n/a	n/a	25	70	**37.74**	4.060	**2.030**	-0.160
3 Feb 2022	F5	XL-400P	Front Facing	378.0125	UHF	T13	w/c-P10	n/a	n/a	25	70	**37.79**	1.060	0.530	-0.340
4 Feb 2022	F6	XL-400P	Front Facing	851.0125	700/800	T13	P10	n/a	n/a	25	70	**35.06**	1.360	0.680	0.210
4 Feb 2022	F7	XL-400P	Front Facing	775.9875	700/800	T13	P10	n/a	n/a	25	70	**34.27**	1.270	0.635	-0.350
4 Feb 2022	F8	XL-400P	Front Facing	869.9875	700/800	T13	P10	n/a	n/a	25	70	**35.16**	1.300	0.650	0.320
11 Feb 2022	F25	XL-400P	Front Facing	143.9875	VHF	T13	P10	n/a	n/a	25	70	**38.33**	0.858	0.429	-0.050
11 Feb 2022	F26	XL-400P	Front Facing	162.0125	VHF	T13	P10	n/a	n/a	25	70	**38.3**	0.724	0.362	-0.780
11 Feb 2022	F27	XL-400P	Front Facing	156.8	VHF	T13	P10	n/a	n/a	25	70	**38.33**	0.730	0.365	-0.360
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 10.3: Measured Results – PCS BODY

Measured SAR Results (1g) - BODY Configuration (FCC/ISED)														
Date	Plot ID	DUT			Test Frequency (*MHz*)	Band	Accessories				DUT Spacing (*mm*)	Conducted Power (*dBm*)	Measured SAR (1g) (*W/kg*)	SAR Drift (*dB*)
		M/N	Configuration				Antenna ID	Battery ID	Body ID	Audio ID				
			# RB	RB Offset										
5 Feb 2022	B9	XL-400P	1	Low	782	LTE - Band 13	T13	P9	B1	A1	0	24.21	0.271	0.500
5 Feb 2022	B10	XL-400P	1	Low	782	LTE - Band 13	T13	P10	B1	A1	0	24.21	0.239	-0.010
5 Feb 2022	B11	XL-400P	1	Low	782	LTE - Band 13	T13	P11	B1	A1	0	24.21	0.290	-0.090
5 Feb 2022	B12	XL-400P	25	High	782	LTE - Band 13	T13	P11	B1	A1	0	23.97	0.247	-0.040
5 Feb 2022	B13	XL-400P	50	Mid	782	LTE - Band 13	T13	P11	B1	A1	0	23.24	0.264	-0.050
5 Feb 2022	B14	XL-400P	1	Mid	836.5	LTE - Band 5	T13	P11	B1	A1	0	24.47	0.197	0.120
5 Feb 2022	B15	XL-400P	25	Mid	836.5	LTE - Band 5	T13	P11	B1	A1	0	24.3	0.191	0.260
5 Feb 2022	B16	XL-400P	50	Mid	836.5	LTE - Band 5	T13	P11	B1	A1	0	24.2	0.196	0.230
5 Feb 2022	B17	XL-400P	1	Mid	793	LTE - Band 14	T13	P11	B1	A1	0	24.48	0.306	-0.030
6 Feb 2022	B18	XL-400P	25	High	793	LTE - Band 14	T13	P11	B1	A1	0	24.11	0.263	-0.160
6 Feb 2022	B19	XL-400P	50	Mid	793	LTE - Band 14	T13	P11	B1	A1	0	24.03	0.263	-0.020
8 Feb 2022	B20	XL-400P	1	High	707.5	LTE - Band 12	T13	P11	B1	A1	0	24.5	0.160	0.100
8 Feb 2022	B21	XL-400P	25	High	707.5	LTE - Band 12	T13	P11	B1	A1	0	24.08	0.189	-0.140
9 Feb 2022	B22	XL-400P	1	Low	2560	LTE - Band 7	T13	P11	B1	A1	0	24.47	**0.432**	-0.040
9 Feb 2022	B23	XL-400P	50	High	2535	LTE - Band 7	T13	P11	B1	A1	0	24.35	0.351	0.280
10 Feb 2022	B24	XL-400P	1	Low	1900	LTE - Band 2	T13	P11	B1	A1	0	24.44	0.098	2.150
10 Feb 2022	B25	XL-400P	50	Low	1900	LTE - Band 2	T13	P11	B1	A1	0	24.01	0.086	1.060
10 Feb 2022	B26	XL-400P	1	Low	1745	LTE - Band 4	T13	P11	B1	A1	0	24.03	0.115	0.590
11 Feb 2022	B27	XL-400P	50	Low	1745	LTE - Band 4	T13	P11	B1	A1	0	23.99	0.094	0.640
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 10.4: Measured Results – PCS FACE

Measured SAR Results (1g) - FACE Configuration (FCC/ISED)														
Date	Plot ID	DUT			Test Frequency (*MHz*)	Band	Accessories				DUT Spacing (*mm*)	Conducted Power (*dBm*)	Measured SAR (1g) (*W/kg*)	SAR Drift (*dB*)
		M/N	Configuration				Antenna ID	Battery ID	Body ID	Audio ID				
			# RB	RB Offset										
6 Feb 2022	F9	XL-400P	1	Low	782	LTE - Band 13	T13	P11	n/a	n/a	25	24.21	0.107	0.060
6 Feb 2022	F10	XL-400P	25	High	782	LTE - Band 13	T13	P11	n/a	n/a	25	23.97	0.079	0.270
6 Feb 2022	F11	XL-400P	50	Mid	782	LTE - Band 13	T13	P11	n/a	n/a	25	23.24	0.082	0.410
6 Feb 2022	F12	XL-400P	1	Low	836.5	LTE - Band 5	T13	P11	n/a	n/a	25	24.47	0.085	0.150
6 Feb 2022	F13	XL-400P	25	High	836.5	LTE - Band 5	T13	P11	n/a	n/a	25	24.3	0.072	0.260
6 Feb 2022	F15	XL-400P	1	Mid	793	LTE - Band 14	T13	P11	n/a	n/a	25	24.48	0.121	0.190
6 Feb 2022	F16	XL-400P	25	High	793	LTE - Band 14	T13	P11	n/a	n/a	25	24.11	0.113	0.140
8 Feb 2022	F17	XL-400P	1	High	707.5	LTE - Band 12	T13	P11	n/a	n/a	25	24.5	0.133	0.120
8 Feb 2022	F18	XL-400P	25	High	707.5	LTE - Band 12	T13	P11	n/a	n/a	25	24.08	0.134	0.320
9 Feb 2022	F19	XL-400P	1	Low	2560	LTE - Band 7	T13	P11	n/a	n/a	25	24.47	0.115	0.050
9 Feb 2022	F20	XL-400P	50	High	2535	LTE - Band 7	T13	P11	n/a	n/a	25	24.35	0.089	3.270
10 Feb 2022	F21	XL-400P	1	Low	1900	LTE - Band 2	T13	P11	n/a	n/a	25	24.44	**0.369**	0.350
10 Feb 2022	F22	XL-400P	50	Low	1900	LTE - Band 2	T13	P11	n/a	n/a	25	24.01	0.330	0.700
10 Feb 2022	F23	XL-400P	1	Low	1745	LTE - Band 4	T13	P11	n/a	n/a	25	24.03	0.158	0.540
10 Feb 2022	F24	XL-400P	50	Low	1745	LTE - Band 4	T13	P11	n/a	n/a	25	23.99	0.122	0.480
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 10.5: Measured Results – Body - DTS/DSS

Note: Data below extracted from original filing, test report serial number 45461651 R4.0 dated 8 March 2021

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) (*W/kg*)	SAR Drift (*dB*)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (*mm*)	Antenna (*mm*)			
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
3/4/2021	B17	FireRadio	PTT	2402	GMSK	FireAnt	5050-01	N/A	N/A	0	n/a	4.3	0.000	0.000
3/4/2021	B18	FireRadio	PTT	2480	GMSK	FireAnt	5050-01	N/A	N/A	0	n/a	5.1	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 10.6: Measured Results – Face - DTS/DSS

Note: Data below extracted from original filing, test report serial number 45461651 R4.0 dated 8 March 2021

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) (*W/kg*)	SAR Drift (*dB*)
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (*mm*)	Antenna (*mm*)			
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	25	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
3/4/2021	F31	FireRadio	PTT	2402	GMSK	FireAnt	5050-01	N/A	N/A	25	n/a	4.3	0.000	0.000
3/4/2021	F32	FireRadio	PTT	2480	GMSK	FireAnt	5050-01	N/A	N/A	25	n/a	5.1	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		

11.0 SCALING OF MAXIMUM MEASURE SAR

Table 11.1 SAR Scaling - TNF

Scaling of Maximum Measured SAR (1g)					
Measured Parameters		Configuration			
		Face	Body	Head	
Plot ID		F4	B3		
Maximum Measured SAR_M		2.030	4.770		(W/kg)
Frequency		453.9875	456.0125		(MHz)
Power Drift		-0.160	-0.180		(dB)
Conducted Power		37.740	37.780		(dBm)
Fluid Deviation from Target					
Δe	Permitivity	4.87% (2)	4.63% (2)		
Δσ	Conductivity	-0.23% (2)	0.23% (2)		

Note(2): Fluid Dielectric Parameters are Within 5% of Targets. SAR Adjustment for Fluid Sensitivity is not Required.

Fluid Sensitivity Calculation (1g)			IEC 62209-2 Annex F		
Delta SAR = Ce * Δe + Cσ * Δσ					(F.1)
$Ce = (-0.0007854*f^3) + (0.009402*f^2) - (0.02742*f) - 0.2026$					(F.2)
$Cσ = (0.009804*f^3) - (0.08661*f^2) + (0.02981*f) + 0.7829$					(F.3)
f	Frequency (GHz)	0.4539875	0.4560125		
Ce		-0.213	-0.213		
Cσ		0.779	0.779		
Ce * Δe		-0.010	-0.010		
Cσ * Δσ		-0.002	0.002		
ΔSAR		-0.012	-0.008		(%)

Manufacturer's Tuneup Tolerance				
Measured Conducted Power	37.740	37.780		(dBm)
Rated Conducted Power	37.800	37.800		(dBm)
ΔP	-0.060	-0.020		(dB)

SAR Adjustment for Fluid Sensitivity				
$SAR_1 = SAR_M * ΔSAR$	2.030	4.770		(W/kg)

SAR Adjustment for Tuneup Tolerance				
$SAR_2 = SAR_1 + [ΔP]$	2.058	4.792		(W/kg)

SAR Adjustment for Drift				
$SAR_3 = SAR_2 + Drift$	2.135	4.995		(W/kg)

reported SAR				
SAR_3	**2.14**	**5.00**		(W/kg)

Table 11.2 SAR Scaling - PCS

Scaling of Maximum Measured SAR (1g)					
Measured Parameters		Configuration			
		Face	Body	Head	
Plot ID		F21	B22		
Maximum Measured SAR_M		0.369	0.432		(W/kg)
Frequency		1900	2560		(MHz)
Power Drift		0.350 (1)	-0.040		(dB)
Conducted Power		24.440	24.470		(dBm)
Fluid Deviation from Target					
Δe	Permitivity	-8.85%	0.13% (2)		
Δσ	Conductivity	1.43% (2)	-5.73%		

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

Note(2): Fluid Dielectric Parameters are Within 5% of Targets. SAR Adjustment for Fluid Sensitivity is not Required.

Fluid Sensitivity Calculation (1g)		IEC 62209-2 Annex F			
Delta SAR = Ce * Δe + Cσ * Δσ					(F.1)
$Ce = (-0.0007854*f^3) + (0.009402*f^2) - (0.02742*f) - 0.2026$					(F.2)
$C\sigma = (0.009804*f^3) - (0.08661*f^2) + (0.02981*f) + 0.7829$					(F.3)
f	Frequency (GHz)	1.9	2.56		
Ce		-0.226	-0.224		
Cσ		0.594	0.456		
Ce * Δe		0.020	0.000		
Cσ * Δσ		0.008	-0.026		
ΔSAR		0.029 (3)	-0.026		(%)

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

Manufacturer's Tuneup Tolerance				
Measured Conducted Power	24.440	24.470		(dBm)
Rated Conducted Power	24.500	24.500		(dBm)
ΔP	-0.060	-0.030		(dB)

SAR Adjustment for Fluid Sensitivity				
$SAR_1 = SAR_M * \Delta SAR$	0.369	0.443		(W/kg)

SAR Adjustment for Tuneup Tolerance				
$SAR_2 = SAR_1 + [\Delta P]$	0.374	0.446		(W/kg)

SAR Adjustment for Drift				
$SAR_3 = SAR_2 + Drift$	0.374	0.451		(W/kg)

reported SAR				
SAR_3	**0.37**	**0.45**		(W/kg)

NOTES to Table11.1
(1) Scaling of the Maximum Measured SAR is based on the highest, 100% duty cycle for Face, Body and/or Head icluding ALL test channels, configurations and accessories used during THIS evaluation. The Measured Fluid Deviation parameters apply only to deviation of the tissue equivalent fluids used at the frequencies which produced the highest measured SAR. The Measured Conducted Power applies to the Conducted Power measured at the frequencies producing the highest Face and Body SAR. The Measured Drift is the SAR drift associated with that specific SAR measurement. The Reported SAR is the accumulation of all SAR Adjustments from the applicable Steps 1 through 4. The Plot ID is for indentification of the SAR Measurement Plots in Annex A of this report. NOTE: Some of the scaling factors in Steps 1 through 4 may not apply and are identified by light gray text.
Step 1
Per IEC-62209-1 and FCC KDB 865664. Scaling required only when Measured Fluid Deviation is greater than 5%. If the Measured Fluid Deviation is greater than 5%, Table 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 or Simultaneous Reported SAR.
Step 4
Per KDB 447498 4.3.2. The SAR, either measured or calculated, of ANY and ALL simultaneous transmitters must be added together and includes all contributors.
Step 5
The Reported SAR is the Maximum Final Adjusted Cumulative SAR from the applicable Steps 1 through 4 and are reported on Page 1 of this report.

Simultaneous Transmission Analysis

Introduction

The XL-400P incorporates an integrated pre-certified WiFi/BlueTooth transceiver and an optional pre-certified LTE transceiver capable of simultaneously transmitting, in any combination, with the LMR transmitter. As per FCC KDB 447498, simultaneous transmission analysis is required for devices capable of simultaneous transmission. The WiFi/BT and LTE 1g SAR are subject to General Population limits of 1.6W/kg. The LMR 1g 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 SAR test exclusion may be applied.

SAR for each transmission band, transmission mode and/or equipment class was evaluated with Body-Worn and Audio Accessories in the BODY and HEAD configurations. Since the modular WiFi/Bluetooth transciever, and the associated circuits, and the location of those cirtuits and radiating element has not changed since the original filing, and the proximity of the LTE module and radiating element is such that it would not impact the WiFi/Bluetooth SAR, the WiFi/Bluetooth SAR data from the original filing is appropriate. Only the Maximum maximum *reported* SAR for each band and equipment class is used in the Sum-of-the-Ratios calculation and the worst case of all possible combinations is considered.

Table 11.3 List of Possible Simultaneous Transmitter Combinations

Simultaneous Transmitter Combinations Worst Case HEAD and BODY Configuration				
Transmitter Type				
TNF	DSS	DTS	U-NII	PCS
X	X			X
X		X		X
X			X	X

Table 11.4 Sum of the Ratios Analysis

Analysis of Sum-of-the-Ratios For All Simultaneous Transmitters Configurations																	
Config.	Transmitter Type															Sum of Ratios	Sum of SARs (W/kg)
	LMR (TNF)			BlueTooth (DSS)			WiFi 2.4 (DTS)			WiFi 5 (U-NII)			LTE (PCS)				
	Standalone SAR (W/kg)	Limit (W/kg)	Ratio to Limit	*Standalone* SAR (W/kg)	Limit (W/kg)	Ratio to Limit	*Standalone* SAR (W/kg)	Limit (W/kg)	Ratio to Limit	*Standalone* SAR (W/kg)	Limit (W/kg)	Ratio to Limit	*Standalone* SAR (W/kg)	Limit (W/kg)	Ratio to Limit		
HEAD	2.140	8.000	0.268	0.001	1.600	0.001							0.370	1.600	0.231	0.499	2.511
	2.140	8.000	0.268				0.001	1.600	0.001				0.370	1.600	0.231	0.499	2.511
	2.140	8.000	0.268							0.001	1.600	0.001	0.370	1.600	0.231	0.499	**2.511**
BODY	5.000	8.000	0.625	0.001	1.600	0.001							0.450	1.600	0.281	0.907	5.451
	5.000	8.000	0.625				0.001	1.600	0.001				0.450	1.600	0.281	0.907	5.451
	5.000	8.000	0.625							0.002	1.600	0.001	0.450	1.600	0.281	0.907	**5.452**

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	Test	Task
02 Feb 2022	19.4	19.2	21%	102.7	X	X	X	450H Fluids&SPC
03 Feb 2022	18.5	18.3	22%	102.7	X		X	450H Fluids & SAR Testing
03 Feb 2022	22.5	21.0	18%	103.2	X	X	X	835H Fluids&SPC, SAR Testing
04 Feb 2022	21.3	19.0	20%	102.8			X	835H SAR Testing
5 Feb 2022	24.2	23.7	20%	102.9			X	835H SAR Testing
6 Feb 2022	23.5	23.6	19%	103.3			X	835H SAR Testing
08 Feb 2022	23.7	22.2	20%	103.2	X	X	X	750H Fluids&SPC, SAR Testing
09 Feb 2022	25.0	23.5	19%	103.4	X	X	X	2450H Fluids&SPC, SAR Testing
10 Feb 2022	25.2	21.8	21%	102.9	X	X	X	1800H Fluids&SPC, SAR Testing
11 Feb 2022	24.5	21.9	19%	103.8	X	X	X	150H Fluids&SPC, SAR Testing

13.2 DUT Setup and Configuration

DUT Setup and Configuration
Overview
The XL-400P was evaluated for *Body* and *Face* SAR at the maximum conducted output power level, preset by the manufacturer, with a fully charged battery in unmodulated continuous transmit operation (FM mode at 100% duty cycle) with the transmit key continuously depressed. For a Push-To-Talk (PTT) device with a manually operated transmit pushbutton, a 50% duty cycle compensation for the *reported SAR* was used, as per FCC KDB 447498 (6.1).

13.3 DUT Positioning

DUT Positioning
Positioning
The DUT Positioner was securely fastened to the Phantom Platform. Registration marks were placed on the DUT and the Positioner to ensure consistent positioning of the DUT for each test evaluation.
FACE Configuration
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.

13.4 General Procedures and Report

General Procedures and Reporting
General Procedures
The fluid dielectric parameters of the Active Tissue Simulating Liquid (TSL) were measured as described in this Section, recorded and entered into the DASY Measurement Server. Active meaning the TSL used during the SAR evaluation of the DUT. The temperature of the Active TSL was measured and recorded prior to performing a System Performance Check (SPC). An SPC was performed with the Active TSL prior to the start of the test series. The temperature of the Active TSL was measured throughout the day and the Active TSL temperature was maintained to ± 0.5°C. The Active TSL temperature was maintained to within ±2.0°C throughout the test series. The liquid parameters shall be measured within 24 hours before the start of a test series and if it takes longer than 48 hours, the liquid parameters shall also be measured at the end of the test series. An Area Scan exceeding the length and width of the DUT projection was performed and the locations of all maximas within 2dB of the Peak SAR recorded. A Zoom Scan centered over the Peak SAR location(s) was performed and the 1g and 10g SAR values recorded. The resolutions of the Area Scan and Zoom Scan are described in the Scan Resolution table(s) in this Section. A Power Reference Measurement was taken at the phantom reference point immediately prior to the Area Scan. A Power Drift measurement was taken at the phantom reference point immediately following the Zoom Scan to determine the power drift. A Z-Scan from the *Maximum Distance to Phantom Surface* to the fluid surface was performed following the power drift measurement.
Reporting
The 1g SAR, 10g SAR and power drift measurements are recorded in the SAR Measurement Summary tables in the SAR Measurement Summary Section of this report. The SAR values shown in the 100% DC (Duty Cycle) column are the SAR values reported by the SAR Measurement Server with the DUT operating at 100% transmit duty cycle. These tables also include other information such as transmit channel and frequency, modulation, accessories tested and DUT-phantom separation distance. In the Scaling of Maximum Measured SAR Section of this report, the highest measured SAR in the BODY configuration, within the entire scope of this assessment, are, when applicable, scaled for Fluid Sensitivity, Manufacturer's Tune-Up Tolerance, Simultaneous Transmission and Drift. With the exception of Duty Cycle correction/compensation, SAR values are ONLY scaled up, not down. The final results of this scaling is the *reported SAR* which appears on the Cover Page of this report.

13.5 Fluid Dielectric and Systems Performance Check

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

13.6 Scan Resolution 100MHz to 2GHz

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

13.7 Scan Resolution 2GHz to 3GHz

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

13.8 Scan Resolution 5GHz to 6GHz

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

14.0 MEASUREMENT UNCERTAINTIES

Table 14.1 Measurement Uncertainty

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEEE 1528-2013 Table 9)									
Source of Uncertainty	**IEEE 1528 Section**	**Toler ±%**	**Prob Dist**	**Div**	**c_i**	**c_i**	**Stand Unct ±%**	**Stand Unct ±%**	**V_i or V_{eff}**
Measurement System					**(1g)**	**(10g)**	**(1g)**	**(10g)**	
EX3DV4 Probe Calibration** (*k*=1)	E.2.1	6.7	N	1	1	1	**6.7**	**6.7**	∞
Axial Isotropy** (*k*=1)	E.2.2	0.6	R	√3	0.7	0.7	**0.2**	**0.2**	∞
Hemispherical Isotropy** (*k*=1)	E.2.2	3.2	R	√3	0.7	0.7	**1.3**	**1.3**	∞
Boundary Effect*	E.2.3	1.0	R	√3	1	1	0.6	0.6	∞
Linearity** (*k*=1)	E.2.4	**0.5**	R	√3	1	1	**0.3**	**0.3**	∞
System Detection Limits*	E.2.4	1.0	R	√3	1	1	0.6	0.6	∞
Modulation Response** (*k*=1)	E.2.5	**8.3**	R	√3	1	1	**4.8**	**4.8**	∞
Readout Electronics*	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time*	E.2.7	0.8	R	√3	1	1	0.5	0.5	∞
Integration Time*	E.2.8	2.6	R	√3	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	**0.0**	R	√3	1	1	0.0	0.0	**10**
RF Ambient Conditions - Reflection	E.6.1	**0.0**	R	√3	1	1	0.0	0.0	**10**
Probe Positioner Mechanical Tolerance*	E.6.2	0.0	R	√3	1	1	0.0	0.0	∞
Probe Positioning wrt Phantom Shell*	E.6.3	0.4	R	√3	1	1	0.2	0.2	∞
Post-processing*	E.5	2.0	R	√3	1	1	1.2	1.2	∞
Test Sample Related									
Test Sample Positioning	E.4.2	**2.2**	N	1	1	1	2.2	2.2	**5**
Device Holder Uncertainty*	E.4.1	3.6	N	1	1	1	3.6	3.6	∞
SAR Drift Measurement[2]	E.2.9	0.0	R	√3	1	1	0.0	0.0	∞
SAR Power Scaling[3]	E.6.5	0.0	R	√3	1	1	0.0	0.0	∞
Phantom and Tissue Parameters									
Phantom Uncertainty*	E.3.1	6.1	R	√3	1	1	3.5	3.5	∞
SAR Correction Uncertainty	E.3.2	**1.6**	N	1	1	0.84	1.6	1.3	∞
Liquid Conductivity (measurement)	E.3.3	**5.0**	N	1	0.78	0.71	3.9	3.6	**10**
Liquid Permittivity (measurement)	E.3.3	**5.0**	N	1	0.23	0.26	1.2	1.3	**10**
Liquid Conductivity (Temperature)	E.3.2	**0.4**	R	√3	0.78	0.71	0.2	0.2	**10**
Liquid Permittivity Temperature)	E.3.2	**0.2**	R	√3	0.23	0.26	0.0	0.0	**10**
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

Table 14.2 Calculation of Degrees of Freedom

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

15.0 FLUID DIELECTRIC PARAMETERS

Table 15.1 Fluid Dielectric Parameters 150MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Fri 11/Feb/2022 11:03:30
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	56.03	0.68
0.1100	54.17	0.73	53.85	0.68
0.1200	53.70	0.74	51.90	0.68
0.1300	53.23	0.75	53.33	0.68
0.1400	52.77	0.75	49.52	0.70
0.1500	52.30	0.76	51.55	0.70
0.1600	51.83	0.77	49.68	0.71
0.1700	51.37	0.77	49.27	0.72
0.1800	50.90	0.78	47.54	0.73
0.1900	50.43	0.79	48.24	0.75
0.2000	49.97	0.80	48.47	0.76

FLUID DIELECTRIC PARAMETERS						
Date: 11 Feb 2022	Fluid Temp: 21.9		Frequency:	150MHz	Tissue:	Head
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
100.0000	56.0300	0.6800	54.6300	0.72	2.56%	-5.56%
110.0000	53.8500	0.6800	54.1700	0.73	-0.59%	-6.85%
120.0000	51.9000	0.6800	53.7000	0.74	-3.35%	-8.11%
130.0000	53.3300	0.6800	53.2300	0.75	0.19%	-9.33%
140.0000	49.5200	0.7000	52.7700	0.75	-6.16%	-6.67%
150.0000	51.5500	0.7000	52.3000	0.76	-1.43%	-7.89%
160.0000	49.6800	0.7100	51.8300	0.77	-4.15%	-7.79%
170.0000	49.2700	0.7200	51.3700	0.77	-4.09%	-6.49%
180.0000	47.5400	0.7300	50.9000	0.78	-6.60%	-6.41%
190.0000	48.2400	0.7500	50.4300	0.79	-4.34%	-5.06%
200.0000	48.4700	0.7600	49.9700	0.80	-3.00%	-5.00%

Table 15.2 Fluid Dielectric Parameters 450MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 03/Feb/2022 15:39:19
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	47.62	0.76
0.3600	44.58	0.87	47.88	0.77
0.3700	44.46	0.87	47.56	0.78
0.3800	44.34	0.87	47.12	0.80
0.3900	44.22	0.87	47.64	0.81
0.4000	44.10	0.87	46.88	0.81
0.4100	43.98	0.87	46.97	0.83
0.4200	43.86	0.87	46.48	0.84
0.4300	43.74	0.87	46.12	0.85
0.4400	43.62	0.87	46.53	0.86
0.4500	43.50	0.87	45.83	0.86
0.4600	43.45	0.87	45.25	0.88
0.4700	43.40	0.87	44.94	0.89
0.4800	43.34	0.87	44.48	0.89
0.4900	43.29	0.87	44.56	0.91
0.5000	43.24	0.87	44.63	0.91
0.5100	43.19	0.87	44.74	0.92
0.5200	43.14	0.88	44.37	0.94
0.5300	43.08	0.88	44.24	0.95
0.5400	43.03	0.88	44.28	0.95
0.5500	42.98	0.88	44.41	0.95

FLUID DIELECTRIC PARAMETERS

Date:	3 Feb 2022	Fluid Temp:	23.2	Frequency:	450MHz	Tissue:	Head

Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
350.0000	47.6200	0.7600	44.7000	0.87	6.53%	-12.64%
360.0000	47.8800	0.7700	44.5800	0.87	7.40%	-11.49%
370.0000	47.5600	0.7800	44.4600	0.87	6.97%	-10.34%
380.0000	47.1200	0.8000	44.3400	0.87	6.27%	-8.05%
390.0000	47.6400	0.8100	44.2200	0.87	7.73%	-6.90%
400.0000	46.8800	0.8100	44.1000	0.87	6.30%	-6.90%
410.0000	46.9700	0.8300	43.9800	0.87	6.80%	-4.60%
420.0000	46.4800	0.8400	43.8600	0.87	5.97%	-3.45%
430.0000	46.1200	0.8500	43.7400	0.87	5.44%	-2.30%
440.0000	46.5300	0.8600	43.6200	0.87	6.67%	-1.15%
450.0000	45.8300	0.8600	43.5000	0.87	5.36%	-1.15%
460.0000	45.2500	0.8800	43.4500	0.87	4.14%	1.15%
470.0000	44.9400	0.8900	43.4000	0.87	3.55%	2.30%
480.0000	44.4800	0.8900	43.3400	0.87	2.63%	2.30%
490.0000	44.5600	0.9100	43.2900	0.87	2.93%	4.60%
500.0000	44.6300	0.9100	43.2400	0.87	3.21%	4.60%
510.0000	44.7400	0.9200	43.1900	0.87	3.59%	5.75%
520.0000	44.3700	0.9400	43.1400	0.88	2.85%	6.82%
530.0000	44.2400	0.9500	43.0800	0.88	2.69%	7.95%
540.0000	44.2800	0.9500	43.0300	0.88	2.90%	7.95%
550.0000	44.4100	0.9500	42.9800	0.88	3.33%	7.95%

Table 15.3 Fluid Dielectric Parameters 750MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Tue 08/Feb/2022 11:11:25
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
0.6500	42.46	0.89	39.95	0.74
0.6600	42.41	0.89	40.15	0.75
0.6700	42.36	0.89	39.84	0.76
0.6800	42.31	0.89	40.13	0.78
0.6900	42.25	0.89	39.56	0.79
0.7000	42.20	0.89	39.61	0.79
0.7100	42.15	0.89	39.55	0.82
0.7200	42.10	0.89	39.27	0.82
0.7300	42.05	0.89	39.10	0.83
0.7400	41.99	0.89	39.11	0.83
0.7500	41.94	0.89	38.70	0.85
0.7600	41.89	0.89	38.86	0.85
0.7700	41.84	0.89	38.67	0.86
0.7800	41.79	0.90	38.46	0.87
0.7900	41.73	0.90	38.40	0.87
0.8000	41.68	0.90	38.24	0.88
0.8100	41.63	0.90	38.11	0.90
0.8200	41.58	0.90	37.88	0.90
0.8300	41.53	0.90	37.88	0.92
0.8400	41.50	0.91	37.70	0.92
0.8500	41.50	0.92	37.94	0.94

FLUID DIELECTRIC PARAMETERS

Date:	8 Feb 2022	Fluid Temp:	22.2	Frequency:	750MHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
650.0000		39.9500	0.7400	42.4600	0.89	-5.91%	-16.85%
660.0000		40.1500	0.7500	42.4100	0.89	-5.33%	-15.73%
670.0000		39.8400	0.7600	42.3600	0.89	-5.95%	-14.61%
680.0000		40.1300	0.7800	42.3100	0.89	-5.15%	-12.36%
690.0000		39.5600	0.7900	42.2500	0.89	-6.37%	-11.24%
700.0000		39.6100	0.7900	42.2000	0.89	-6.14%	-11.24%
710.0000		39.5500	0.8200	42.1500	0.89	-6.17%	-7.87%
720.0000		39.2700	0.8200	42.1000	0.89	-6.72%	-7.87%
730.0000		39.1000	0.8300	42.0500	0.89	-7.02%	-6.74%
740.0000		39.1100	0.8300	41.9900	0.89	-6.86%	-6.74%
750.0000		38.7000	0.8500	41.9400	0.89	-7.73%	-4.49%
760.0000		38.8600	0.8500	41.8900	0.89	-7.23%	-4.49%
770.0000		38.6700	0.8600	41.8400	0.89	-7.58%	-3.37%
780.0000		38.4600	0.8700	41.7900	0.90	-7.97%	-3.33%
790.0000		38.4000	0.8700	41.7300	0.90	-7.98%	-3.33%
800.0000		38.2400	0.8800	41.6800	0.90	-8.25%	-2.22%
810.0000		38.1100	0.9000	41.6300	0.90	-8.46%	0.00%
820.0000		37.8800	0.9000	41.5800	0.90	-8.90%	0.00%
830.0000		37.8800	0.9200	41.5300	0.90	-8.79%	2.22%
840.0000		37.7000	0.9200	41.5000	0.91	-9.16%	1.10%
850.0000		37.9400	0.9400	41.5000	0.92	-8.58%	2.17%

*Channel Frequency Tested

Table 15.4 Fluid Dielectric Parameters 835MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 03/Feb/2022 18:40:06
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	39.72	0.83
0.7450	41.97	0.89	39.66	0.84
0.7550	41.92	0.89	39.54	0.85
0.7650	41.86	0.89	39.30	0.86
0.7750	41.81	0.90	39.46	0.89
0.7850	41.76	0.90	39.60	0.91
0.7950	41.71	0.90	38.96	0.91
0.8050	41.66	0.90	38.69	0.93
0.8150	41.60	0.90	38.80	0.94
0.8250	41.55	0.90	38.32	0.96
0.8350	41.50	0.90	38.09	0.95
0.8450	41.50	0.91	38.13	0.95
0.8550	41.50	0.92	38.20	0.96
0.8650	41.50	0.93	38.03	0.96
0.8750	41.50	0.94	37.76	0.97
0.8850	41.50	0.95	37.71	0.99
0.8950	41.50	0.96	37.76	1.01
0.9050	41.50	0.97	37.63	1.02
0.9150	41.50	0.98	37.33	1.03
0.9250	41.48	0.98	37.47	1.04
0.9350	41.46	0.99	37.27	1.06

FLUID DIELECTRIC PARAMETERS

Date:	3 Feb 2022	Fluid Temp:	21	Frequency:	835MHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
735.0000		39.7200	0.8300	42.0200	0.89	-5.47%	-6.74%
745.0000		39.6600	0.8400	41.9700	0.89	-5.50%	-5.62%
755.0000		39.5400	0.8500	41.9200	0.89	-5.68%	-4.49%
765.0000		39.3000	0.8600	41.8600	0.89	-6.12%	-3.37%
775.0000		39.4600	0.8900	41.8100	0.90	-5.62%	-1.11%
785.0000		39.6000	0.9100	41.7600	0.90	-5.17%	1.11%
795.0000		38.9600	0.9100	41.7100	0.90	-6.59%	1.11%
805.0000		38.6900	0.9300	41.6600	0.90	-7.13%	3.33%
815.0000		38.8000	0.9400	41.6000	0.90	-6.73%	4.44%
825.0000		38.3200	0.9600	41.5500	0.90	-7.77%	6.67%
835.0000		38.0900	0.9500	41.5000	0.90	-8.22%	5.56%
845.0000		38.1300	0.9500	41.5000	0.91	-8.12%	4.40%
855.0000		38.2000	0.9600	41.5000	0.92	-7.95%	4.35%
865.0000		38.0300	0.9600	41.5000	0.93	-8.36%	3.23%
875.0000		37.7600	0.9700	41.5000	0.94	-9.01%	3.19%
885.0000		37.7100	0.9900	41.5000	0.95	-9.13%	4.21%
895.0000		37.7600	1.0100	41.5000	0.96	-9.01%	5.21%
905.0000		37.6300	1.0200	41.5000	0.97	-9.33%	5.15%
915.0000		37.3300	1.0300	41.5000	0.98	-10.05%	5.10%
925.0000		37.4700	1.0400	41.4800	0.98	-9.67%	6.12%
935.0000		37.2700	1.0600	41.4600	0.99	-10.11%	7.07%

*Channel Frequency Tested

Table 15.5 Fluid Dielectric Parameters 1800MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 10/Feb/2022 11:32:51
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
1.7000	40.16	1.34	37.40	1.21
1.7100	40.14	1.35	37.40	1.23
1.7200	40.13	1.35	37.42	1.24
1.7300	40.11	1.36	37.17	1.25
1.7400	40.09	1.37	37.00	1.28
1.7500	40.08	1.37	37.21	1.26
1.7600	40.06	1.38	36.96	1.27
1.7700	40.05	1.38	36.93	1.27
1.7800	40.03	1.39	36.97	1.28
1.7900	40.02	1.39	37.03	1.31
1.8000	40.00	1.40	36.92	1.28
1.8100	40.00	1.40	36.97	1.31
1.8200	40.00	1.40	37.03	1.31
1.8300	40.00	1.40	36.71	1.34
1.8400	40.00	1.40	36.93	1.35
1.8500	40.00	1.40	36.76	1.37
1.8600	40.00	1.40	36.60	1.36
1.8700	40.00	1.40	36.60	1.38
1.8800	40.00	1.40	36.77	1.40
1.8900	40.00	1.40	36.69	1.39
1.9000	40.00	1.40	36.46	1.42

FLUID DIELECTRIC PARAMETERS

Date:	10 Feb 2022	Fluid Temp:	20.7	Frequency:	1800MHz	Tissue:	Head

Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
1700.0000	37.4000	1.2100	40.1600	1.34	-6.87%	-9.70%
1710.0000	37.4000	1.2300	40.1400	1.35	-6.83%	-8.89%
1720.0000	37.4200	1.2400	40.1300	1.35	-6.75%	-8.15%
1730.0000	37.1700	1.2500	40.1100	1.36	-7.33%	-8.09%
1740.0000	37.0000	1.2800	40.0900	1.37	-7.71%	-6.57%
1750.0000	37.2100	1.2600	40.0800	1.37	-7.16%	-8.03%
1760.0000	36.9600	1.2700	40.0600	1.38	-7.74%	-7.97%
1770.0000	36.9300	1.2700	40.0500	1.38	-7.79%	-7.97%
1780.0000	36.9700	1.2800	40.0300	1.39	-7.64%	-7.91%
1790.0000	37.0300	1.3100	40.0200	1.39	-7.47%	-5.76%
1800.0000	36.9200	1.2800	40.0000	1.40	-7.70%	-8.57%
1810.0000	36.9700	1.3100	40.0000	1.40	-7.58%	-6.43%
1820.0000	37.0300	1.3100	40.0000	1.40	-7.43%	-6.43%
1830.0000	36.7100	1.3400	40.0000	1.40	-8.23%	-4.29%
1840.0000	36.9300	1.3500	40.0000	1.40	-7.68%	-3.57%
1850.0000	36.7600	1.3700	40.0000	1.40	-8.10%	-2.14%
1860.0000	36.6000	1.3600	40.0000	1.40	-8.50%	-2.86%
1870.0000	36.6000	1.3800	40.0000	1.40	-8.50%	-1.43%
1880.0000	36.7700	1.4000	40.0000	1.40	-8.07%	0.00%
1890.0000	36.6900	1.3900	40.0000	1.40	-8.28%	-0.71%
1900.0000	36.4600	1.4200	40.0000	1.40	-8.85%	1.43%

*Channel Frequency Tested

Table 15.6 Fluid Dielectric Parameters 2600MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Wed 09/Feb/2022 11:25:28
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
2.5000	39.14	1.85	39.49	1.77
2.5100	39.12	1.87	39.59	1.77
2.5200	39.11	1.88	39.49	1.78
2.5300	39.10	1.89	39.34	1.81
2.5400	39.09	1.90	39.37	1.82
2.5500	39.07	1.91	39.27	1.81
2.5600	39.06	1.92	39.11	1.81
2.5700	39.05	1.93	39.05	1.84
2.5800	39.03	1.94	39.13	1.85
2.5900	39.02	1.95	39.11	1.85
2.6000	39.01	1.96	39.04	1.84
2.6100	39.00	1.97	38.87	1.90
2.6200	38.98	1.99	38.98	1.88
2.6300	38.97	2.00	39.13	1.91
2.6400	38.96	2.01	38.96	1.92
2.6500	38.95	2.02	38.63	1.92
2.6600	38.93	2.03	38.56	1.91
2.6700	38.92	2.04	38.57	1.95
2.6800	38.91	2.05	38.41	1.96
2.6900	38.89	2.06	38.63	1.97
2.7000	38.88	2.07	38.65	2.02

FLUID DIELECTRIC PARAMETERS

Date:	9 Feb 2022	Fluid Temp:	23.5	Frequency:	0HeaMHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2500.0000		39.4900	1.7700	39.1400	1.85	0.89%	-4.32%
2510.0000		39.5900	1.7700	39.1200	1.87	1.20%	-5.35%
2520.0000		39.4900	1.7800	39.1100	1.88	0.97%	-5.32%
2530.0000		39.3400	1.8100	39.1000	1.89	0.61%	-4.23%
2540.0000		39.3700	1.8200	39.0900	1.90	0.72%	-4.21%
2550.0000		39.2700	1.8100	39.0700	1.91	0.51%	-5.24%
2560.0000		39.1100	1.8100	39.0600	1.92	0.13%	-5.73%
2570.0000		39.0500	1.8400	39.0500	1.93	0.00%	-4.66%
2580.0000		39.1300	1.8500	39.0300	1.94	0.26%	-4.64%
2590.0000		39.1100	1.8500	39.0200	1.95	0.23%	-5.13%
2600.0000		39.0400	1.8400	39.0100	1.96	0.08%	-6.12%
2610.0000		38.8700	1.9000	39.0000	1.97	-0.33%	-3.55%
2620.0000		38.9800	1.8800	38.9800	1.99	0.00%	-5.53%
2630.0000		39.1300	1.9100	38.9700	2.00	0.41%	-4.50%
2640.0000		38.9600	1.9200	38.9600	2.01	0.00%	-4.48%
2650.0000		38.6300	1.9200	38.9500	2.02	-0.82%	-4.95%
2660.0000		38.5600	1.9100	38.9300	2.03	-0.95%	-5.91%
2670.0000		38.5700	1.9500	38.9200	2.04	-0.90%	-4.41%
2680.0000		38.4100	1.9600	38.9100	2.05	-1.29%	-4.39%
2690.0000		38.6300	1.9700	38.8900	2.06	-0.67%	-4.37%
2700.0000		38.6500	2.0200	38.8800	2.07	-0.59%	-2.42%

*Channel Frequency Tested

16.0 SYSTEM VERIFICATION TEST RESULTS

Table 16.1 System Verification Results 150MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
11 Feb 2022		150	CLA-150		4007
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	21.9	25	19%	1000	0
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
51.55	52.30	-1.43%	0.70	0.76	-7.89%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
3.89	3.89	0.00%	2.56	2.57	-0.39%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
3.89	3.87	0.52%	2.56	2.56	0.00%

Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEEE 1528-2013, FCC KDB 846224, IEC 62209-1 and IEC 62209-1528.

The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer.

The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.

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

Table 16.2 System Verification Results 450MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
02 Feb 2022		450	D450V3		1068
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	19.2	19	21%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
46.33	43.50	6.51%	0.81	0.87	-6.90%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
1.24	1.20	3.03%	0.83	0.79	5.57%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
4.96	4.81	3.03%	3.34	3.16	5.57%

Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEEE 1528-2013, FCC KDB 846224, IEC 62209-1 and IEC 62209-1528.

The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer.

The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.

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

Table 16.3 System Verification Results 750MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
08 Feb 2022		750	D750V3		1061
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	22.2	24	20%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
38.70	41.94	-7.73%	0.85	0.89	-4.49%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
1.98	2.08	-4.81%	1.33	1.37	-2.92%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
7.92	8.33	-4.92%	5.32	5.48	-2.92%

Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEEE 1528-2013, FCC KDB 846224, IEC 62209-1 and IEC 62209-1528.

The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer.

The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.

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

Table 16.4 System Verification Results 835MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
03 Feb 2022		835	D835V2		4d075
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	21.0	23	18%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
38.09	41.50	-8.22%	0.95	0.90	5.56%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
2.44	2.41	1.24%	1.57	1.55	1.29%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
9.76	9.45	3.28%	6.28	6.11	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, IEC 62209-1 and IEC 62209-1528.

The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer.

The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.

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

Table 16.5 System Verification Results 1800MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
10 Feb 2022		1800	D1800V2		247
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	21.8	25	21%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
36.92	40.00	-7.70%	1.28	1.40	-8.57%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
9.26	9.75	-5.03%	4.86	5.10	-4.71%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
37.04	39.60	-6.46%	19.44	20.60	-5.63%

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, IEC 62209-1 and IEC 62209-1528.

The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer.

The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.

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

Table 16.6 System Verification Results 2600MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
10 Feb 2022		2600	ALS-D-2600-S-2		225-00906
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	21.8	25	21%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
39.04	39.01	0.08%	1.84	1.96	-6.12%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
13.00	13.85	-6.14%	5.77	6.20	-6.95%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
52.00	55.41	-6.15%	23.08	24.80	-6.95%

Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEEE 1528-2013, FCC KDB 846224, IEC 62209-1 and IEC 62209-1528.

The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer.

The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.

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

17.0 SYSTEM VALIDATION SUMMARY

Table 17.1 System Validation Summary

System Validation Summary											
Frequency (MHz)	Validation Date	Probe Model	Probe S/N	Validation Source	Source S/N	Tissue	Tissue Dielectrics		Validation Results		
							Permitivity	Conductivity	Sensitivity	Linearity	Isotropy
30	31-May-19	EX3DV4	3600	CLA-30	1005	Head	52.40	0.75	Pass	Pass	Pass
150	6-Nov-21	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	21-Nov-21	EX3DV4	3600	D750V3	1061	Head	44.27	0.83	Pass	Pass	Pass
835	19-Nov-21	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	12-Jun-21	EX3DV4	3600	1620-S-2	207-00102	Head	39.87	1.27	Pass	Pass	Pass
1800	25-Nov-21	EX3DV4	3600	D1800V2	247	Head	54.77	1.53	Pass	Pass	Pass
2450	29-Jun-21	EX3DV4	3600	D2450V2	825	Head	38.53	1.85	Pass	Pass	Pass
5250	25-May-21	EX3DV4	3600	D5GHzV2	1031	Head	33.74	4.9	Pass	Pass	Pass
5750	28-May-21	EX3DV4	3600	D5GHzV2	1031	Head	34.99	5.10	Pass	Pass	Pass

18.0 MEASUREMENT SYSTEM SPECIFICATIONS

Table 18.1 Measurement System Specifications

Measurement System Specification	
Specifications	
Positioner	Stäubli Unimation Corp. Robot Model: TX90XL
Repeatability	+/- 0.035 mm
No. of axis	6.0
Data Acquisition Electronic (DAE) System	
Cell Controller	
Processor	Intel(R) Core(TM) i7-7700
Clock Speed	3.60 GHz
Operating System	Windows 10 Professional
Data Converter	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY6, V 6.4.0.12171 / DASY52 V52.10.0.1446
	Postprocessing Software: SEMCAD X, V14.6.10(Deployment Build)
Connecting Lines	Optical downlink for data and status info., Optical uplink for commands and clock
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 ELI V5.0 phantom is an elliptical planar fiberglass shell phantom with a shell thickness of 2.0mm +/- .2mm at the planar area. This phantom conforms to OET Bulletin 65, Supplement C, IEEE 1528-2013, IEC 62209-1 and IEC 62209-2.

ELI Phantom

Device Positioner Specification

The DASY device positioner has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of 65^{O}. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

Device Positioner

19.0 TEST EQUIPMENT LIST

Table 19.1 Equipment List and Calibration

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

CNR = Calibration Not Required

COU = Calibrate on Use

20.0 FLUID COMPOSITION

Table 20.1 Fluid Composition 150MHz HEAD TSL

Tissue Simulating Liquid (TSL) Composition				150MHz Head
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

Tissue Simulating Liquid (TSL) Composition				450MHz Head
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 750MHz HEAD TSL

Tissue Simulating Liquid (TSL) Composition				750MHz Head
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 835MHz HEAD TSL

Tissue Simulating Liquid (TSL) Composition				835MHz Head
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 20.5 Fluid Composition 1800MHz HEAD TSL

Tissue Simulating Liquid (TSL) Composition				1800MHz Head
Component by Percent Weight				
Water	Glycol	Salt(1)	HEC(2)	Bacteriacide(3)
54.8	44.9	0.3	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 20.6 Fluid Composition 2600MHz HEAD TSL

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

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

APPENDIX A – SYSTEM VERIFICATION PLOTS

DUT: Dipole 450 MHz D450V3; Type: D450V3; Serial: D450V3 - SN:1068
Procedure Name: SPC 450H, Input 250mW, Target[1.08315][1.2035][1.32385] W/kg 2

Communication System: UID 0, CW (0); Frequency: 450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 450 MHz; σ = 0.81 S/m; ε_r = 46.33; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/2/2022 8:23:20 PM

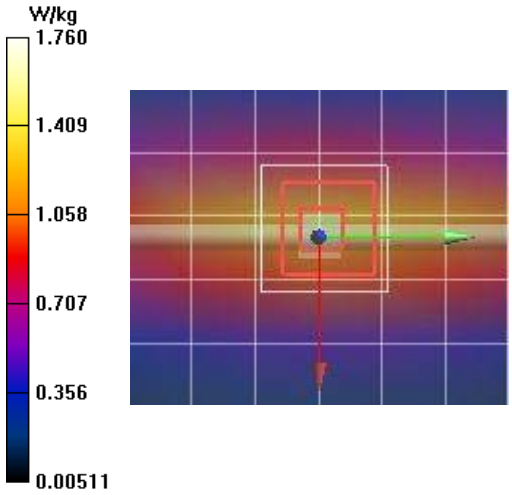
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(8.69, 8.69, 8.69) @ 450 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

SPC/SPC 450H, Input 250mW, Target[1.08315][1.2035][1.32385] W/kg 2/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.30 W/kg

SPC/SPC 450H, Input 250mW, Target[1.08315][1.2035][1.32385] W/kg 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 40.40 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.82 W/kg
SAR(1 g) = 1.24 W/kg; SAR(10 g) = 0.834 W/kg
Ratio of SAR at M2 to SAR at M1 = 68.2%
Maximum value of SAR (measured) = 1.33 W/kg

SPC/SPC 450H, Input 250mW, Target[1.08315][1.2035][1.32385] W/kg 2/Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 13.91 (13.04, 14.71) [mm]
Maximum value of SAR (interpolated) = 1.76 W/kg



DUT: Dipole 835 MHz D835V2; Type: D835V2; Serial: D835V2 - SN:4d075
Procedure Name: SPC 835H, 1W Target=9.319W/kg ,6.011W/kg ,Input 250mW Target=2.33, 1.50 2 2

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 = 38.09; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/3/2022 7:22:10 PM

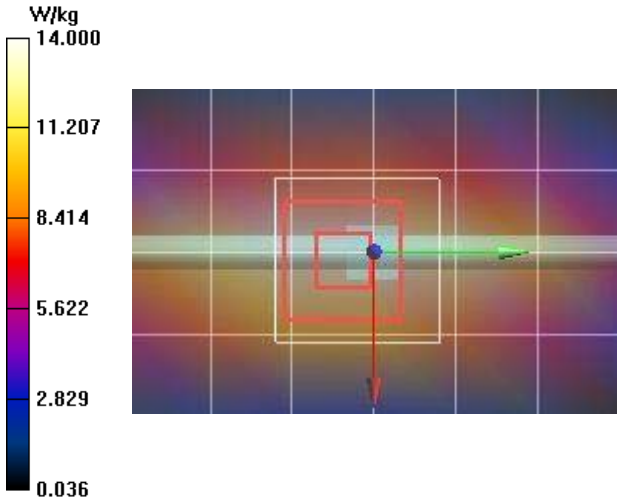
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(7.92, 7.92, 7.92) @ 835 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

SPC/SPC 835H, 1W Target=9.319W/kg ,6.011W/kg ,Input 250mW Target=2.33, 1.50 2 2/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 10.5 W/kg

SPC/SPC 835H, 1W Target=9.319W/kg ,6.011W/kg ,Input 250mW Target=2.33, 1.50 2 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 105.5 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 14.9 W/kg
SAR(1 g) = 9.77 W/kg; SAR(10 g) = 6.28 W/kg
Ratio of SAR at M2 to SAR at M1 = 65.5%
Maximum value of SAR (measured) = 10.6 W/kg

SPC/SPC 835H, 1W Target=9.319W/kg ,6.011W/kg ,Input 250mW Target=2.33, 1.50 2 2/Z Scan (1x1x28): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 12.49 (11.93, 13.08) [mm]
Maximum value of SAR (interpolated) = 14.0 W/kg



DUT: Dipole 750 MHz D750V3; Type: D750V3; Serial: D750V3 - SN:1061
Procedure Name: SPC 750H,Target=[1.82][2.08] [2.28] W/kg,Input_250mW 3 2 2, Procedure Name: SPC 750H,Target=[1.82][2.08] [2.28] W/kg,Input_250mW_

Communication System: UID 0, CW (0); Frequency: 750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 750 MHz; σ = 0.85 S/m; ε_r = 38.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/8/2022 1:29:09 PM

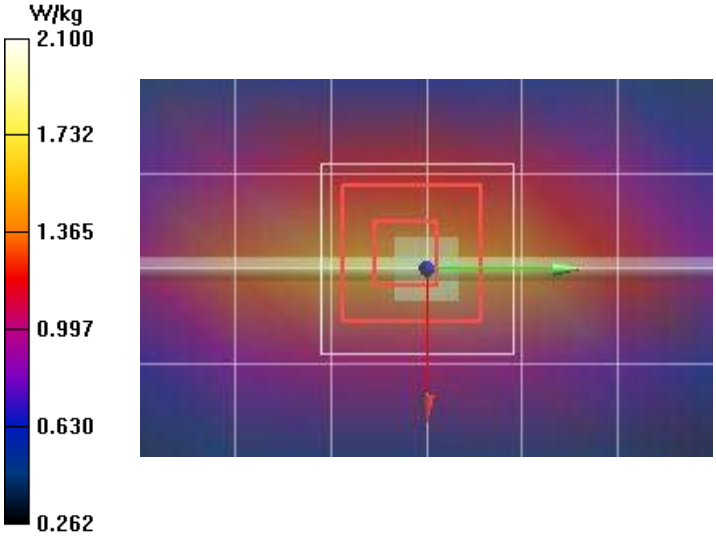
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(8.06, 8.06, 8.06) @ 750 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

SPC/SPC 750H,Target=[1.82][2.08] [2.28] W/kg,Input_250mW 3 2 2/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 2.10 W/kg

SPC/SPC 750H,Target=[1.82][2.08] [2.28] W/kg,Input_250mW 3 2 2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 49.66 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 2.90 W/kg
SAR(1 g) = 1.98 W/kg; SAR(10 g) = 1.33 W/kg
Ratio of SAR at M2 to SAR at M1 = 68.4%
Maximum value of SAR (measured) = 2.12 W/kg

SPC/SPC 750H,Target=[1.82][2.08] [2.28] W/kg,Input_250mW_/Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.46 W/kg



DUT: Dipole 2600 MHz ALS-D-2600-S-2; Type: D2600V2; Serial: ALS-D-2600-S-2 - SN:22500906
Procedure Name: SPC 2600H Input=1W, Target=[55.645][24.572]W/kg [250mw [12.52][13.91][15.30]

Communication System: UID 0, CW (0); Frequency: 2600 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2600 MHz; σ = 1.84 S/m; ε_r = 39.04; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/9/2022 5:10:57 PM

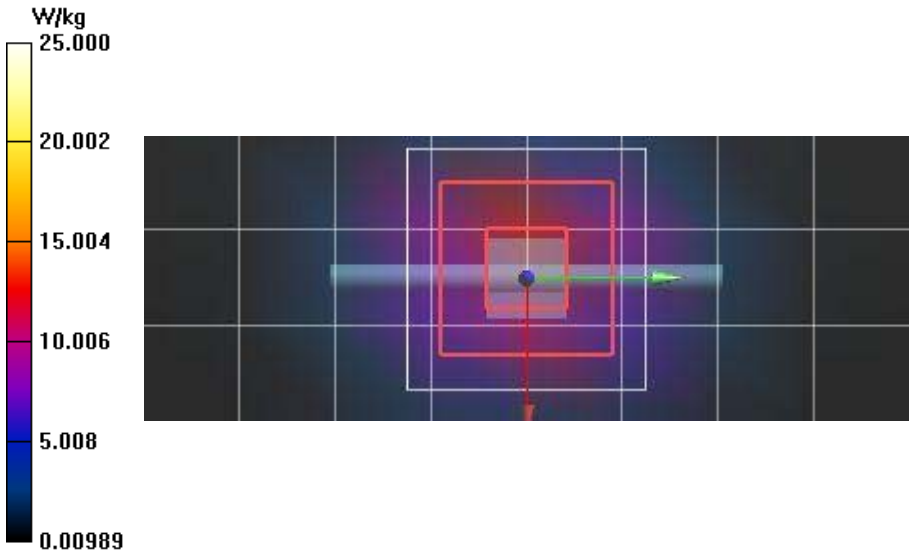
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.35, 6.35, 6.35) @ 2600 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

SPC/SPC 2600H Input=1W, Target=[55.645][24.572]W/kg [250mw [12.52][13.91][15.30]/Area Scan (4x9x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 12.7 W/kg

SPC/SPC 2600H Input=1W, Target=[55.645][24.572]W/kg [250mw [12.52][13.91][15.30]/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.95 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 28.4 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 5.77 W/kg
Smallest distance from peaks to all points 3 dB below = 10.4 mm
Ratio of SAR at M2 to SAR at M1 = 46.9%
Maximum value of SAR (measured) = 14.8 W/kg

SPC/SPC 2600H Input=1W, Target=[55.645][24.572]W/kg [250mw [12.52][13.91][15.30]/Z Scan (1x1x22): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 6.900 (6.594, 6.939) [mm]
Maximum value of SAR (interpolated) = 25.0 W/kg



DUT: CLA-150; Type: CLA-150; Serial: 4007
Procedure Name: SPC 150H Input=1.0W, Target[3.5][3.89][4.3]W/kg_

Communication System: UID 0, CW (0); Frequency: 150 MHz;Duty Cycle: 1:1
Medium parameters used: f = 150 MHz; σ = 0.7 S/m; ε_r = 51.55; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/11/2022 12:42:31 PM

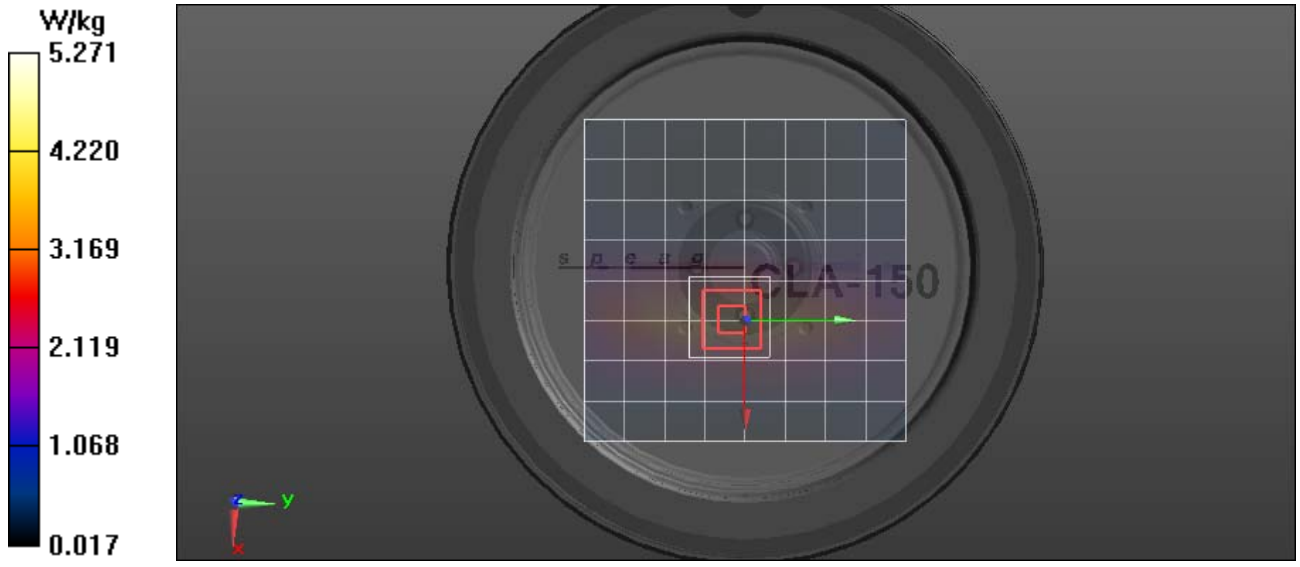
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(9.45, 9.45, 9.45) @ 150 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

SPC/SPC 150H Input=1.0W, Target[3.5][3.89][4.3]W/kg_/Area Scan (9x9x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 4.10 W/kg

SPC/SPC 150H Input=1.0W, Target[3.5][3.89][4.3]W/kg_/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 76.98 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 6.05 W/kg
SAR(1 g) = 3.89 W/kg; SAR(10 g) = 2.56 W/kg
Ratio of SAR at M2 to SAR at M1 = 67%
Maximum value of SAR (measured) = 4.18 W/kg

SPC/SPC 150H Input=1.0W, Target[3.5][3.89][4.3]W/kg_/Z Scan (1x1x36): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 14.61 (12.56, 16.15) [mm]
Maximum value of SAR (interpolated) = 5.27 W/kg



DUT: Dipole 1800 MHz D1800V2; Type: D1800V2; Serial: D1800V2 - SN:247
Procedure Name: SPC 1800H Input=250mW, Target=[9.75][5.10]W/kg_

Communication System: UID 0, CW (0); Frequency: 1800 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1800 MHz; σ = 1.28 S/m; ε_r = 36.92; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/10/2022 12:07:15 PM

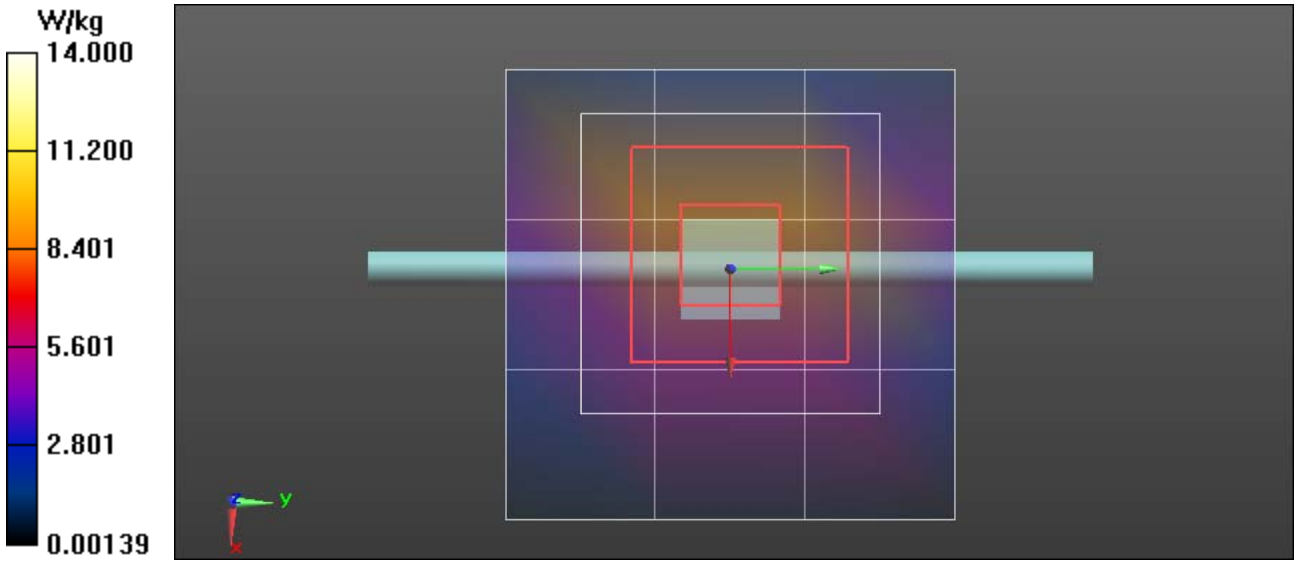
DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(7.23, 7.23, 7.23) @ 1800 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

SPC/SPC 1800H Input=250mW, Target=[9.75][5.10]W/kg_/Area Scan (4x4x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 8.94 W/kg

SPC/SPC 1800H Input=250mW, Target=[9.75][5.10]W/kg_/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 89.93 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 17.0 W/kg
SAR(1 g) = 9.26 W/kg; SAR(10 g) = 4.86 W/kg
Smallest distance from peaks to all points 3 dB below = 12 mm
Ratio of SAR at M2 to SAR at M1 = 55.6%
Maximum value of SAR (measured) = 10.3 W/kg

SPC/SPC 1800H Input=250mW, Target=[9.75][5.10]W/kg_/Z Scan (1x1x19): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Penetration depth = n/a (n/a, 9.043) [mm]
Maximum value of SAR (interpolated) = 14.0 W/kg



APPENDIX B – MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

Plot B3

DUT: Harris XL-400P Fire Radio; Type: PTT; Serial:
Procedure Name: B3- XL-400P ESM 456MHz Body, P10 B1

Communication System: UID 0, CW (0); Frequency: 456 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 456 MHz; σ = 0.816 S/m; ε_r = 45.922; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/3/2022 11:16:12 AM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(8.69, 8.69, 8.69) @ 456 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

450H/B3- XL-400P ESM 456MHz Body, P10 B1/Area Scan 2 (8x9x1): Measurement grid: dx=15mm, dy=15mm

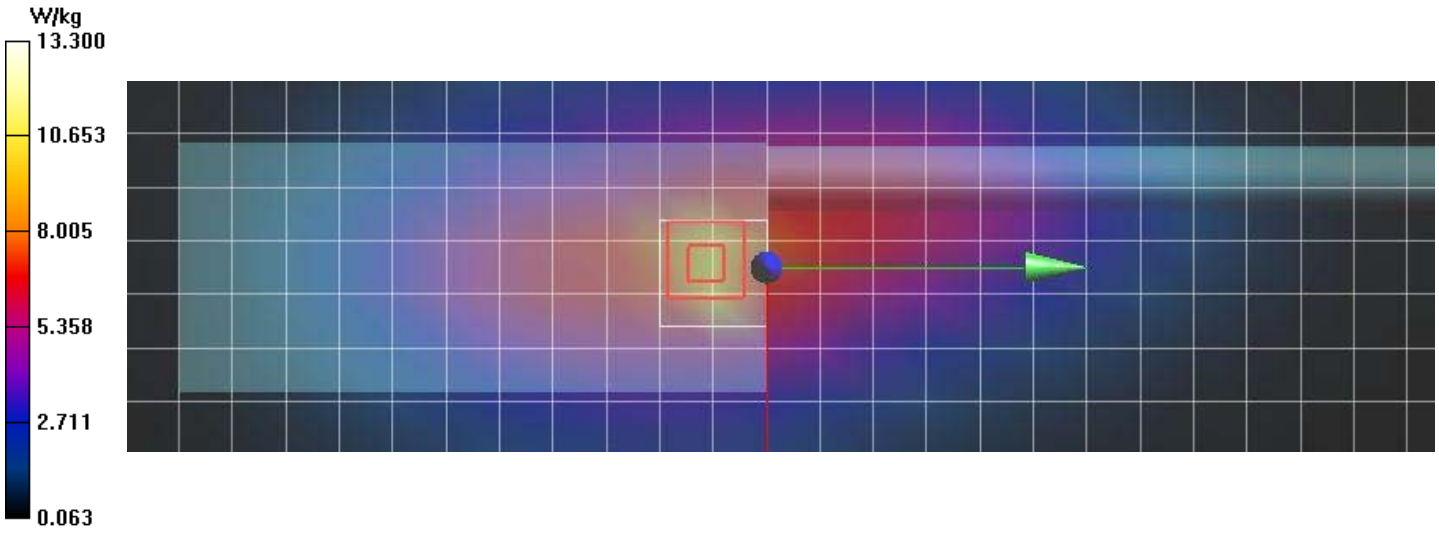
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 9.72 W/kg

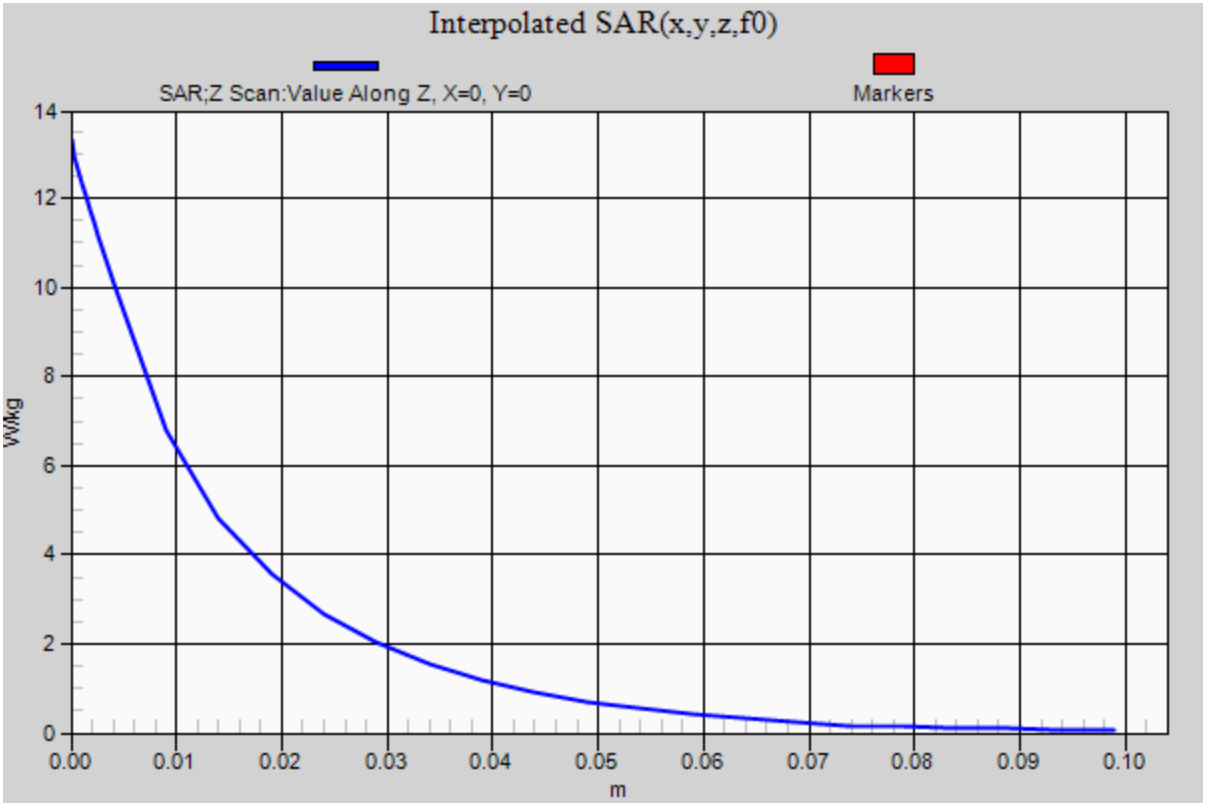
450H/B3- XL-400P ESM 456MHz Body, P10 B1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 94.63 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 14.9 W/kg
SAR(1 g) = 9.54 W/kg; SAR(10 g) = 6.35 W/kg
Ratio of SAR at M2 to SAR at M1 = 67.3%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 10.2 W/kg

450H/B3- XL-400P ESM 456MHz Body, P10 B1/Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = 14.71 (12.62, 16.44) [mm]
Maximum value of SAR (interpolated) = 13.3 W/kg





Plot F4

DUT: Harris XL-400P Fire Radio; Type: PTT; Serial:
Procedure Name: F4- XL-400P ESM 456MHz Face, P10 W/C 25mm

Communication System: UID 0, CW (0); Frequency: 456 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 456 MHz; σ = 0.816 S/m; ε_r = 45.922; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/3/2022 1:26:23 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(8.69, 8.69, 8.69) @ 456 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

450H/F4- XL-400P ESM 456MHz Face, P10 W/C 25mm/Area Scan 2 (8x9x1): Measurement grid: dx=15mm, dy=15mm

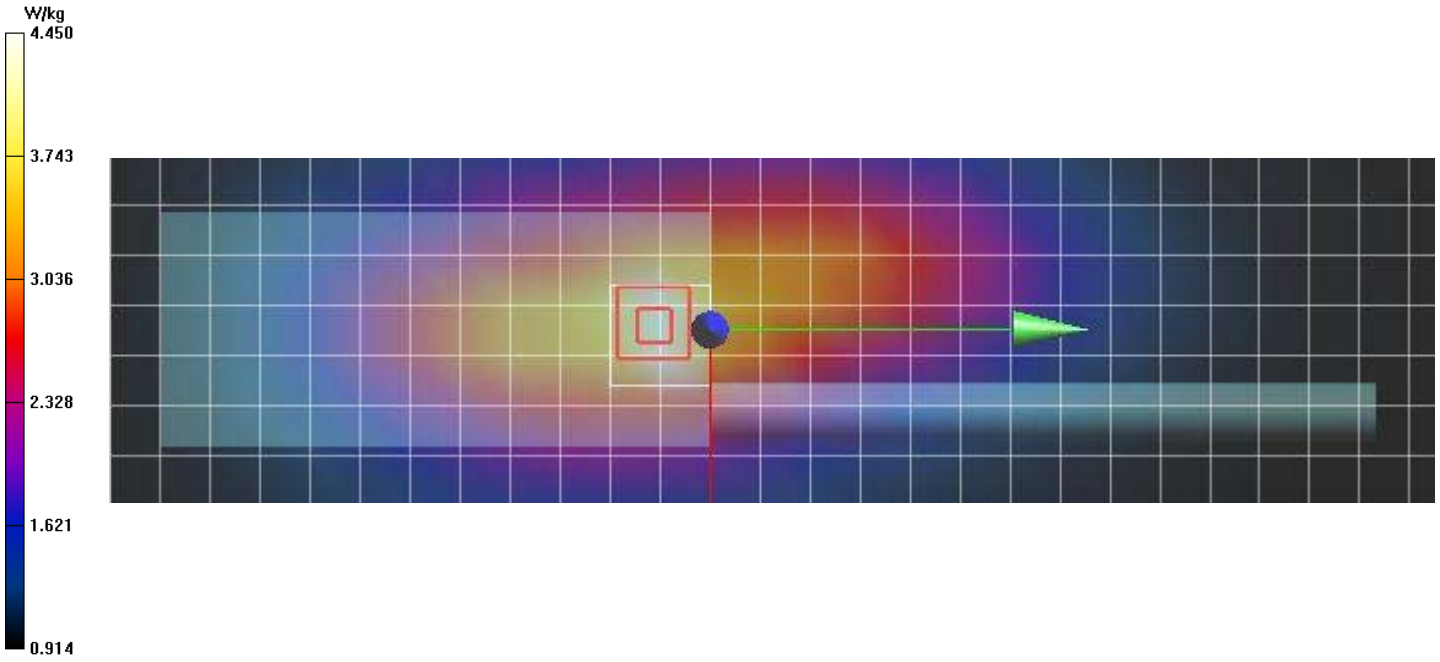
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 4.45 W/kg

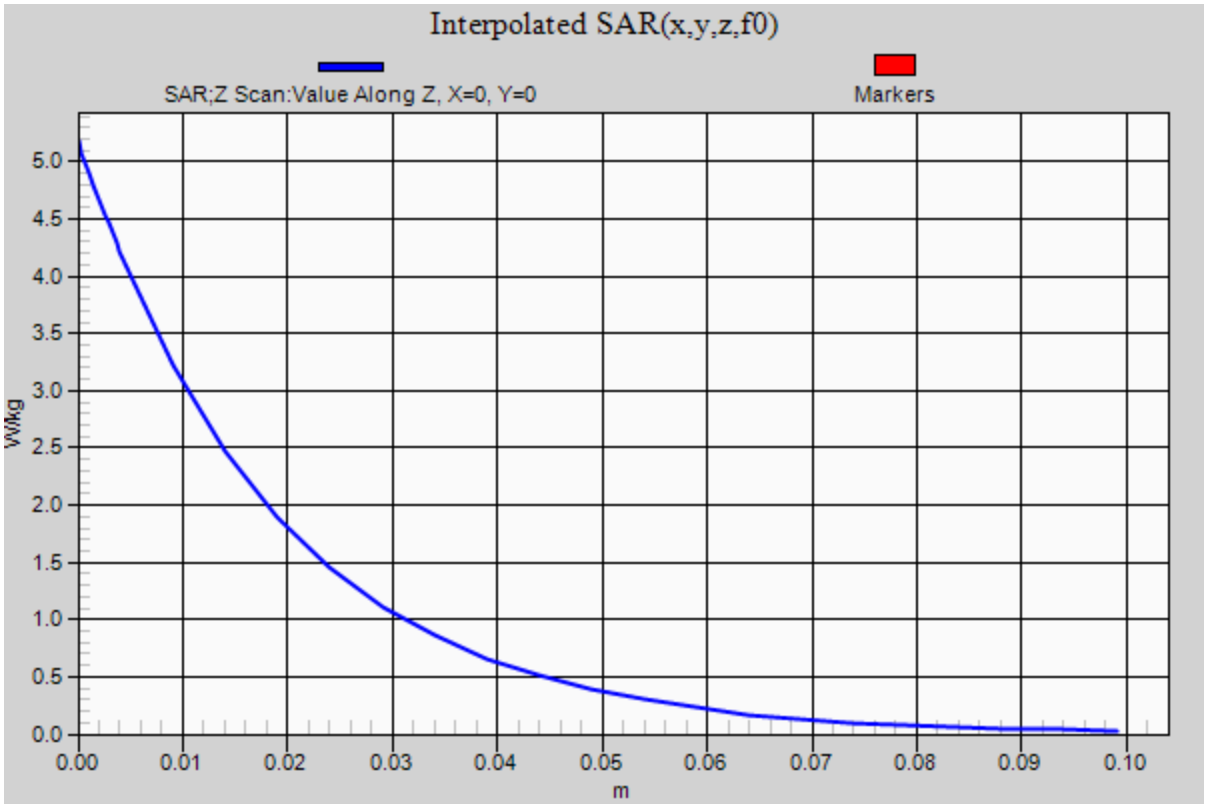
450H/F4- XL-400P ESM 456MHz Face, P10 W/C 25mm/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 74.51 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 5.19 W/kg
SAR(1 g) = 4.06 W/kg; SAR(10 g) = 3.08 W/kg
Ratio of SAR at M2 to SAR at M1 = 76.7%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 4.25 W/kg

450H/F4- XL-400P ESM 456MHz Face, P10 W/C 25mm/Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = 18.87 (18.82, 18.84) [mm]
Maximum value of SAR (interpolated) = 5.18 W/kg





Plot B22

DUT: Harris XL-400P Fire Radio; Type: PTT; Serial:
Procedure Name: B22- XL-400P ESM LTE 2560MHz Body CB20, RB1, OS-LOW, P11 B1

Communication System: UID 0, CW (0); Frequency: 2560 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2560 MHz; σ = 1.81 S/m; ε_r = 39.11; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/9/2022 6:42:24 PM

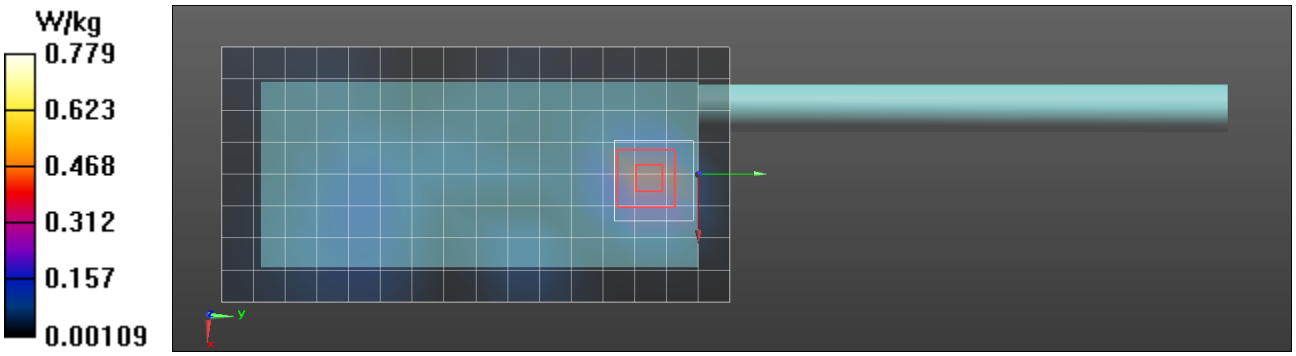
DASY5 Configuration:

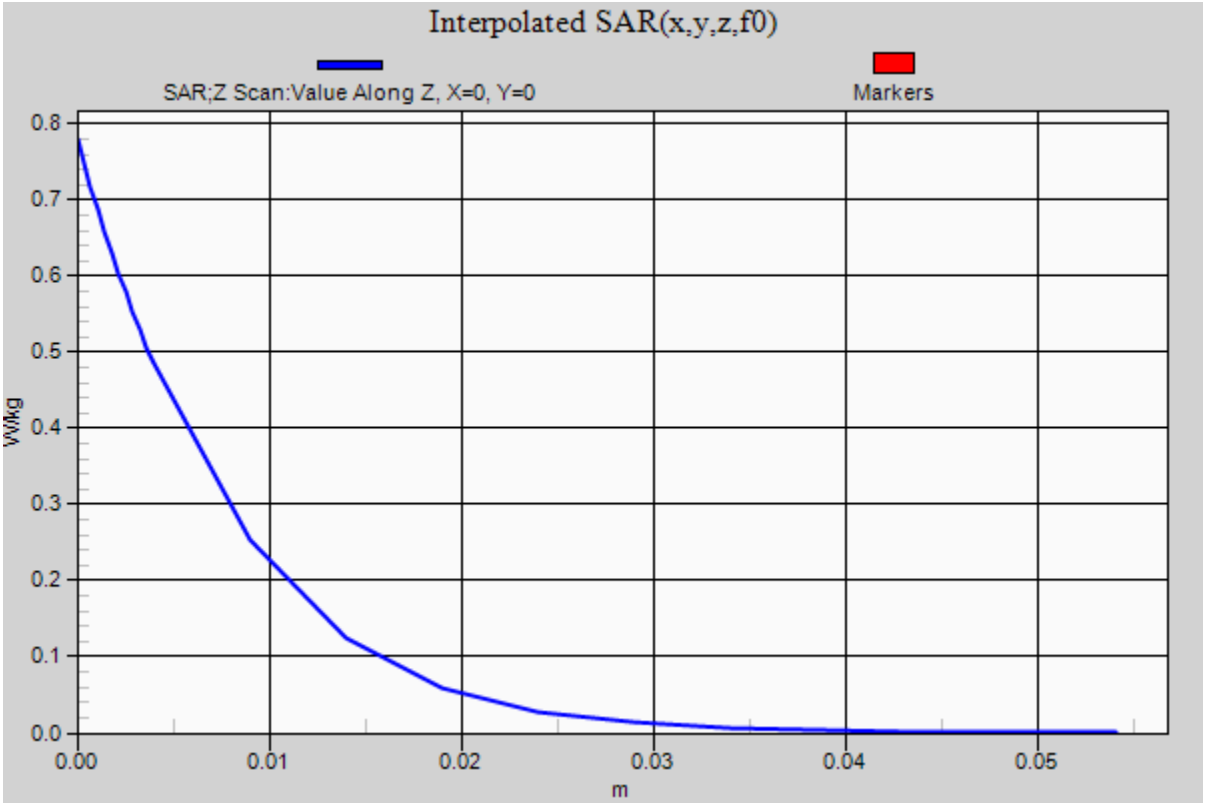
- Probe: EX3DV4 - SN3600; ConvF(6.35, 6.35, 6.35) @ 2560 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

2600H/B22- XL-400P ESM LTE 2560MHz Body CB20, RB1, OS-LOW, P11 B1/Area Scan (9x17x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.421 W/kg

2600H/B22- XL-400P ESM LTE 2560MHz Body CB20, RB1, OS-LOW, P11 B1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.365 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.816 W/kg
SAR(1 g) = 0.432 W/kg; SAR(10 g) = 0.199 W/kg
Smallest distance from peaks to all points 3 dB below = 11 mm
Ratio of SAR at M2 to SAR at M1 = 53.8%
Maximum value of SAR (measured) = 0.496 W/kg

2600H/B22- XL-400P ESM LTE 2560MHz Body CB20, RB1, OS-LOW, P11 B1/Z Scan (1x1x22): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 7.050 (7.716, 6.706) [mm]
Maximum value of SAR (interpolated) = 0.779 W/kg





Plot F21

DUT: Harris XL-400P Fire Radio; Type: PTT; Serial:
Procedure Name: F21- XL-400P ESM LTE 1900MHz Face CB20, RB1, OS-LOW, P11

Communication System: UID 0, CW (0); Frequency: 1900 MHz;Duty Cycle: 1:1
Medium parameters used: f = 1900 MHz; σ = 1.42 S/m; ε_r = 36.46; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 2/10/2022 4:44:10 PM

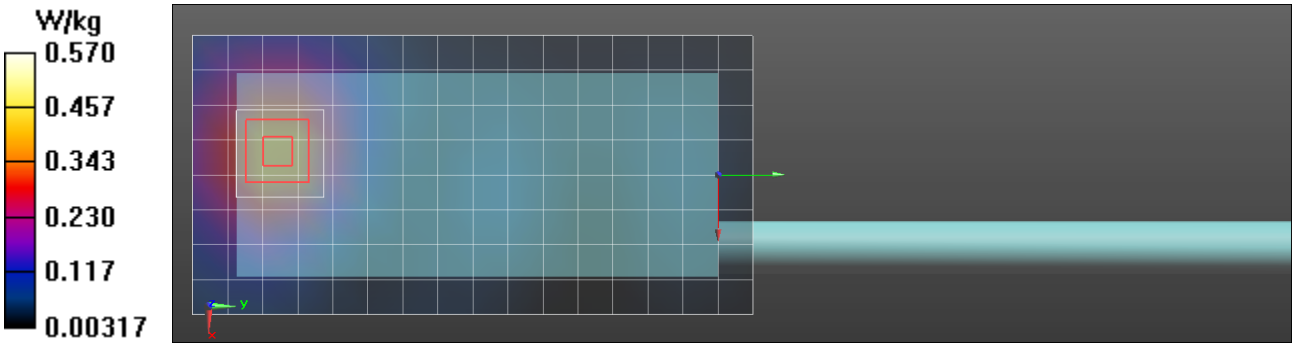
DASY5 Configuration:

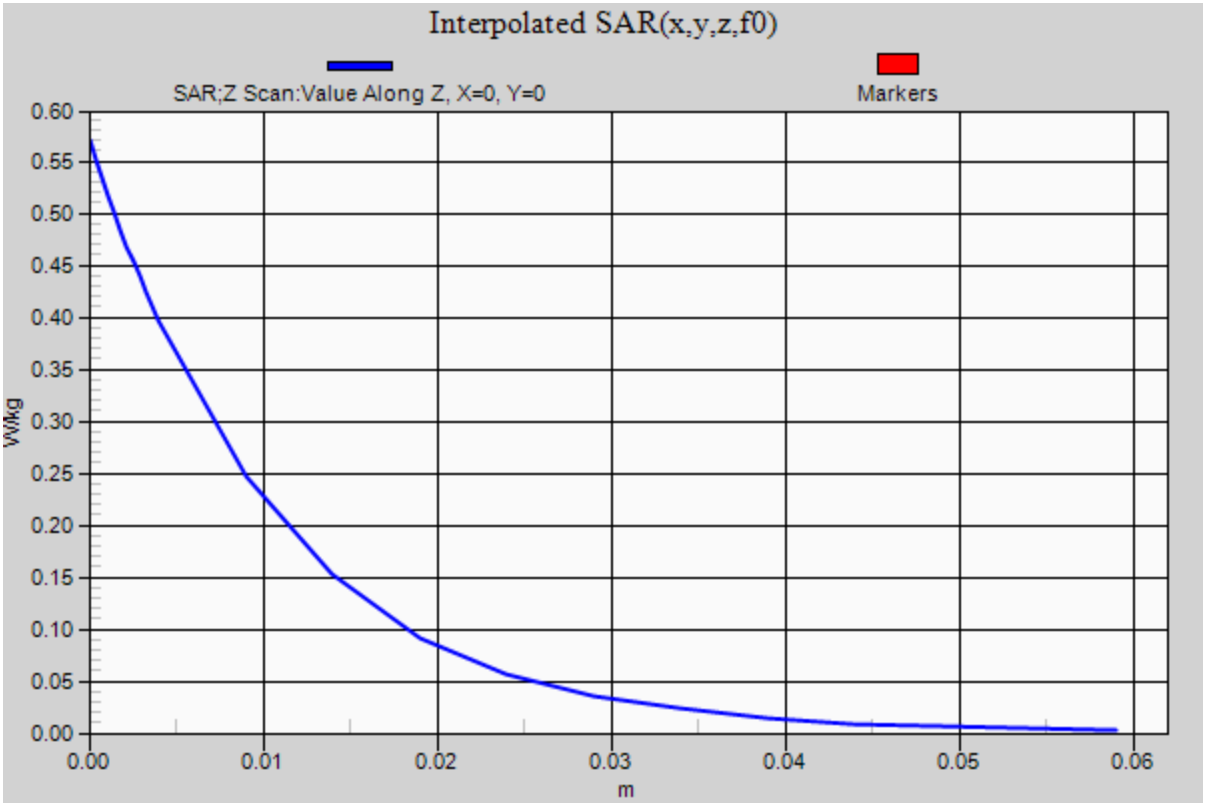
- Probe: EX3DV4 - SN3600; ConvF(7.16, 7.16, 7.16) @ 1900 MHz; Calibrated: 4/28/2021
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/22/2021
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

1800H/F21- XL-400P ESM LTE 1900MHz Face CB20, RB1, OS-LOW, P11/Area Scan (9x17x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 0.373 W/kg

1800H/F21- XL-400P ESM LTE 1900MHz Face CB20, RB1, OS-LOW, P11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.986 V/m; Power Drift = 0.35 dB
Peak SAR (extrapolated) = 0.585 W/kg
SAR(1 g) = 0.369 W/kg; SAR(10 g) = 0.228 W/kg
Ratio of SAR at M2 to SAR at M1 = 61.6%
Maximum value of SAR (measured) = 0.395 W/kg

1800H/F21- XL-400P ESM LTE 1900MHz Face CB20, RB1, OS-LOW, P11/Z Scan (1x1x23): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 10.33 (10.49, 10.02) [mm]
Maximum value of SAR (interpolated) = 0.570 W/kg


W/kg
0.570
0.457
0.343
0.230
0.117
0.00317


Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.00
0.01
0.02
0.03
0.04
0.05
0.06
m