



Test Report Serial Number:	45461486 R1.0
Test Report Date:	11 March 2019
Project Number:	1437

## SAR Test Report - New Certification

Applicant:



**UNIDEN AMERICAN CORPORATION**  
 3001 Gateway Drive, Suite 130  
 Irving, Texas, 75038  
 USA

Maximum Reported 1g SAR			W/kg
FCC	FACE	1.04	
	BODY	0.49	
ISED	FACE	1.08	
	BODY	0.51	
General Pop. Limit:		1.60	

FCC ID:

**AMWUT661**

Product Model Number / HVIN

**Atlantis 275**

ISED Registration Number

**513C-UT661**

Product Name / PMN

**Atlantis 275**

In Accordance With:

**FCC 47 CFR §2.1093**

Radiofrequency Radiation Exposure Evaluation: Portable Devices

**IC RSS-102 Issue 5**

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

Approved By:

**Ben Hewson, President**

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 Canada



Test Lab Certificate: 2470.01



IC Registration 3874A-1



FCC Registration: CA3874

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## 1.0 DOCUMENT CONTROL

<b>Samples Tested By:</b>	Trevor Whillock		
<b>Report Prepared By:</b>	Art Voss		
<b>Report Reviewed By:</b>	Ben Hewson		
<b>Report Issue Number</b>	<b>Description</b>	<b>By</b>	<b>Report Issue Date</b>
R0.0	Draft	Trevor Whillock	08 March 2019
R1.0	Initial Release	Trevor Whillock	11 March 2019

## 2.0 CLIENT AND DEVICE INFORMATION

Client Information	
<b>Applicant Name</b>	<b>UNIDEN AMERICA CORPORATION</b>
<b>Applicant Address</b>	3001 Gateway Drive, Suite 130
	Irving, Texas, 75063
	USA
DUT Information	
<b>Device Identifier(s):</b>	<b>FCC ID</b> <b>AMWUT661</b>
	<b>ISED:</b> <b>513C-UT661</b>
<b>Type of Equipment:</b>	Licensed Non-Broadcast Transmitter Held to Face (TNF) FCC Part 80(VHF)
	RSS- 182- Maritime Radio Transmitters and Receivers(156-162.5MHz)
<b>Device Model(s) / HVIN:</b>	Atlantis 275
<b>Device Marketing Name / PMN:</b>	Atlantis 275
<b>Test Sample Serial No.:</b>	T/A Sample - Identical Prototype
<b>Transmit Frequency Range:</b>	VHF Band: Tx: 156.05-157.425 MHz, Rx: 156.05 - 162.55MHz
<b>Number of Channels:</b>	See Section 8.0
<b>Manuf. Max. Rated Output Power:</b>	30dBm (1W), 34dBm, (2.5W), 37.3 dBm +/- 0.5dB, (6W)
<b>Modulation:</b>	FM
<b>Duty Cycle:</b>	50% PTT Duty Cycle
<b>DUT Power Source:</b>	(P1) Li-Ion Rechargeable
<b>Deviation(s) from standard/procedure:</b>	None
<b>Modification of DUT:</b>	None

### **3.0 SCOPE OF EVALUATION**

The Atlantis 275, FCC ID: AMWUT661, ISED: 513C-UT661 is a VHF PTT Radio Transceiver that operates in the 156.05-162.55 MHz frequency band. The device is intended for General Population Use. The product operates from an internal proprietary Li-ion rechargeable battery which can be connected to an AC-DC Charging Cradle or DC adapter accessory for charging. Test samples provided by the manufacturer were capable of transmitting at select frequencies and power levels preset by the manufacturer. Test equipment was connected via the antenna port for conducted power analysis. The DUT was evaluated for SAR at the maximum conducted output power level, preset by the manufacturer and in accordance with the procedures described in IEEE 1528, IEC 62209-2, FCC KDB 865646, 447498, 643646, and RSS 102. A description of the device, operating configuration, detailed summary of the test results, methodology and procedures used in the evaluation, equipment used and the various provisions of the rules are included within this test report.

## 4.0 NORMATIVE REFERENCES

<b>Normative References*</b>	
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)
Industry Canada Spectrum Management & Telecommunications Policy RSS-182 Issue 5:	Maritime Radio Transmitters and Receivers in the Band 156-162.5 MHz
IEEE International Committee on Electromagnetic Safety IEEE 1528-2013:	IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques
IEC International Standard IEC 62209-2 2010	Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 2
FCC KDB KDB 865664 D01v01r04	SAR Measurement Requirements for 100MHz to 6GHz
FCC KDB KDB 447498 D01v06	Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies
FCC KDB KDB 643646 D01	SAR Test Reduction Consideration for Occupational PTT Radio
* When the issue number or issue date is omitted, the latest version is assumed.	

## 5.0 STATEMENT OF COMPLIANCE

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

<b>Applicant:</b> <b>UNIDEN AMERICA CORPORATION</b>	<b>Model / HVIN:</b> <b>Atlantis 275</b>
<b>Standard(s) Applied:</b> <b>FCC 47 CFR §2.1093</b> <b>Health Canada's Safety Code 6</b>	<b>Measurement Procedure(s):</b> <b>FCC KDB 865664, FCC KDB 447498, FCC KDB 643646,</b> <b>Industry Canada RSS-102 Issue 5 and RSS-182 Issue 5</b> <b>IEEE Standard 1528-2013, IEC 62209-2</b>
<b>Reason For Issue:</b> <input checked="" type="checkbox"/> <b>New Certification</b> <input type="checkbox"/> <b>Class I Permissive Change</b> <input type="checkbox"/> <b>Class II Permissive Change</b>	<b>Use Group:</b> <input checked="" type="checkbox"/> <b>General Population / Uncontrolled</b> <input type="checkbox"/> <b>Occupational / Controlled</b>
<b>Reason for Change:</b> <b>Original Filing</b>	<b>Limits Applied:</b> <input checked="" type="checkbox"/> <b>1.6W/kg - 1g Volume</b> <input type="checkbox"/> <b>8.0W/kg - 1g Volume</b> <input type="checkbox"/> <b>4.0W/kg - 10g Volume</b>
	<b>Date(s) Evaluated:</b> <b>February 26th-Mar 1st &amp; Mar 4th-7th, 2019</b>

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.**

**11 March 2019**

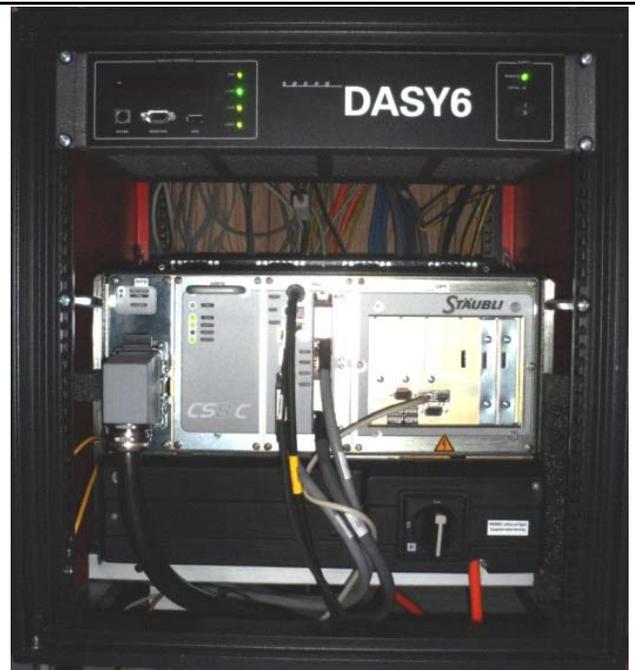
Date



## 6.0 SAR MEASUREMENT SYSTEM

### SAR Measurement System

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



**DASY 6 SAR System with SAM Phantom**

**DASY 6 Measurement Controller**

## 7.0 RF CONDUCTED POWER MEASUREMENT

**Table 7.0 Conducted Power Measurements P1 Li-Ion Rechargeable**

Conducted Power Measurements						
Channel	Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Rated Power (W)	Delta (dBm)	SAR Test Channel (Y/N)
1	156.050	37.12	37.8	6.03	-0.68	Y
74	156.725	37.12	37.8	6.03	-0.68	Y
87	157.375	37.14	37.8	6.03	-0.66	Y
88	157.375	37.14	37.8	6.03	-0.66	Y

The rated power and tolerance are stated for typical transmission modes and data rates. SAR was evaluated using the 6W power level setting specified by the manufacture to be the max output power and produce the most conservative SAR. SAR was evaluated at the maximum tune up tolerance. See section 2.0 Client and Device Information for details. The reported SAR was not scaled down.

## 8.0 NUMBER OF TEST CHANNELS ( $N_C$ ) AND CONFIGURATIONS

Number of Required Test Channels						
Frequency			Number of Channels		Spacing	
$f_{LOW}$ (MHz)	$f_{HIGH}$ (MHz)	$f_C$ (MHz)	KDB 447498 ( $N_C$ )	IEC 62209 ( $N_C$ )	KDB 447498 (MHz)	IEC 62209 (MHz)
156.05	162.55	159.3	3	3	3.3	3.3
<p><b>KDB 447498:</b> <math>N_C = \text{RoundUp} \{ [ 100 ( F_{HIGH} - F_{LOW} ) / F_C ]^{0.5} \times ( F_C / 100 )^{0.2} \}</math></p> <p><b>IEC 62209-1:</b> <math>N_C = 2 \times \{ \text{RoundUp} [ 10 ( F_{HIGH} - F_{LOW} ) / F_C ] \} + 1</math></p>						

See Section 13.1 for DUT Setup and Configuration details

**9.0 ACCESSORIES EVALUATED**

**Table 9.0 Accessories Evaluated**

<b>Manufacturer's Accessory List</b>						
<b>Test Report ID Number</b>	<b>Manufacturer's Part Number</b>	<b>Description</b>	<b>UDC Group<sup>(2)</sup></b>	<b>Type II Group<sup>(3)</sup></b>	<b>SAR<sup>(4)</sup> Evaluated</b>	<b>SAR<sup>(5)</sup> Tested</b>
<b>Antenna Accessory</b>						
<b>T1</b>	BATG0573001	1/4 Wavelength Stub Antenna	n/a	n/a	Y	Y
<b>Battery Accessory</b>						
<b>P1</b>	-	Internal Battery Pack Li-Ion Rechargeable	n/a	n/a	Y	Y
<b>Body-Worn Accessory</b>						
<b>B1</b>	GCL111078ZZ	Plastic Belt-Clip	n/a	n/a	Y	Y
<b>Audio Accessory</b>						
<b>A1</b>	BZAG0147001	Speaker Mic	n/a	n/a	Y	Y

## 10.0 SAR MEASUREMENT SUMMARY

Table 10.0: Measured Results - FACE

Measured SAR Results (1g) - FACE Configuration (FCC/ISED)																	
Date	Plot ID	DUT		Test Frequency (MHz)	Modulation	Accessories				DUT Spacing		Conducted Power (dBm)	Measured SAR (1g)		SAR Drift (dB)		
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		100% DC (W/kg)	50% DC (W/kg)			
26 Feb 2019	F1	Atlantis 275	FACE	156.05	FM	T1	P1	n/a	n/a	25	51	37.12	1.310	0.655	-0.440		
27 Feb 2019	F2	Atlantis 275	FACE	156.725	FM	T1	P1	n/a	n/a	25	51	37.12	1.530	0.765	-0.530		
01 Mar 2019	F3	Atlantis 275	FACE	157.425	FM	T1	P1	n/a	n/a	25	51	37.14	1.660	0.830	-0.410		
01 Mar 2019	F4*	Atlantis 275	FACE	157.375	FM	T1	P1	n/a	n/a	25	51	37.14	1.720	0.860	-0.180		
SAR Limit							Spatial Peak				BODY/HEAD		RF Exposure Category				
FCC 47 CFR 2.1093							Health Canada Safety Code 6				1 Gram Average		1.6 W/kg		General Population		

\* Per KDB643646 D01V01r03 A1.C, SAR was measured on the immediate adjacent channel.

Table 10.1: Measured Results - BODY

Measured SAR Results (1g) - BODY Configuration (FCC/ISED)																	
Date	Plot ID	DUT		Test Frequency (MHz)	Modulation	Accessories				DUT Spacing		Conducted Power (dBm)	Measured SAR (1g)		SAR Drift (dB)		
		M/N	Type			Antenna ID	Battery ID	Body ID	Audio ID	DUT (mm)	Antenna (mm)		100% DC (W/kg)	50% DC (W/kg)			
04 Mar 2019	B1	Atlantis 275	BODY	156.05	FM	T1	P1	B1	A1	0	42	37.12	0.838	0.419	-0.170		
06 Mar 2019	B2	Atlantis 275	BODY	156.725	FM	T1	P1	B1	A1	0	42	37.12	0.590	0.295	-0.190		
07 Mar 2019	B3	Atlantis 275	BODY	157.425	FM	T1	P1	B1	A1	0	42	37.14	0.270	0.135	-0.290		
SAR Limit							Spatial Peak				BODY/HEAD		RF Exposure Category				
FCC 47 CFR 2.1093							Health Canada Safety Code 6				1 Gram Average		1.6 W/kg		General Population		

See Section 8.0 for required test channel details

Note: This device is not intended to be used or transmit while placed in the user's pocket or within the user's apparel.

## 11.0 SCALING OF MAXIMUM MEASURED SAR

Table 11.0 SAR Scaling

Scaling of Maximum Measured SAR <sup>(1)</sup>								
Plot ID	Configuration	Freq (MHz)	Measured Fluid Deviation		Measured Conducted Power (dBm)	Measured Drift (dB)	Measured SAR (1g) (W/kg)	
			Permittivity	Conductivity				
F4	FACE	157.375			37.14	-0.180	0.868	
B1	BODY	156.05			37.12	-0.170	0.419	
Step 1								
Fluid Sensitivity Adjustment								
Plot ID	Scale Factor (%)		X	Measured SAR (W/kg)	=	Step 1 Adjusted SAR (1g) (W/kg)		
	F4	3.21%					X	0.868
B1	n/a	X	0.419	=	0.419			
Step 2								
Manufacturer's Tune-Up Tolerance								
Plot ID	Measured Conducted Power (dBm)	Rated Power (dBm)	Delta (dB)	+	Step 1 Adjusted SAR (W/kg)	=	Step 2 Adjusted SAR (1g) (W/kg)	
	F4	37.14	37.80					-0.66
B1	37.12	37.80	-0.68	+	0.419	=	0.490	
Step 3 (ISED)								
Drift Adjustment								
Plot ID	Measured Drift (dB)	+	Step 2 Adjusted SAR (W/kg)	=	Step 3 Adjusted SAR (1g) (W/kg)			
	F4					-0.180	+	1.040
B1	-0.170	+	0.490	=	0.510			
Step 4 (FCC)								
Simultaneous Transmission - Bluetooth and/or WiFi								
Plot ID	Rated Output Power (Pmax) (mW)	Freq (MHz)	Separation Distance (mm)	Estimated SAR SAR (W/kg)	+	Step 2 Adjusted SAR (W/kg)	=	Step 4 Adjusted SAR (1g) (W/kg)
	F4	n/a	n/a	n/a				
B1	n/a	n/a	n/a	n/a	+	0.490	=	0.490
Step 5								
Reported SAR								
Plot ID	FCC From Steps 1, 2 and 4 1g SAR (W/kg)			ISED From Steps 1 through 3 1g SAR (W/kg)				
	F4	1.040			1.084			
B1	0.490			0.510				

NOTES to Table 11.0	
<p>(1) Scaling of the Maximum Measured SAR is based on the highest, 100% duty cycle, Face, Body and/or Head SAR measured of ALL test channels, configurations and accessories used during THIS evaluation. The Measured Fluid Deviation parameters apply only to deviation of the tissue equivalent fluids used at the frequencies which produced the highest measured SAR. The Measured Conducted Power applies to the Conducted Power measured at the frequencies producing the highest Face and Body SAR. The Measured Drift is the SAR drift associated with that specific SAR measurement. The Reported SAR is the accumulation of all SAR Adjustments from the applicable Steps 1 through 5. The Plot ID is for identification of the SAR Measurement Plots in Annex A of this report.</p> <p>NOTE: Some of the scaling factors in Steps 1 through 5 may not apply and are identified by light gray text.</p>	
<b>Step 1</b>	Per IEC-62209-1 and FCC KDB 865664. Scaling required only when Measured Fluid Deviation is greater than 5%. If the Measured Fluid Deviation is greater than 5%, Table 11.1 will be shown and will indicate the SAR scaling factor in percent (%). SAR is MULTIPLIED by this scaling factor only when the scaling factor is positive (+).
<b>Step 2</b>	Per KDB 447498. Scaling required only when the difference (Delta) between the Measured Conducted Power and the Manufacturer's Rated Conducted Power is (-) Negative. The absolute value of Delta is ADDED to the SAR.
<b>Step 3</b>	Per IEC 62209-1. Scaling required only when Measured Drift is (-) Negative. The absolute value of Measured Drift is added to Reported or Simultaneous Reported SAR.
<b>Step 4</b>	Per KDB 447498 4.3.2. The SAR, either measured or calculated, of ANY and ALL simultaneous transmitters must be added together and includes all contributors.
<b>Step 5</b>	Per RSS-102. The SAR, either measured or calculated, of ANY and ALL simultaneous transmitters must be added together and includes all contributors.
<b>Step 6</b>	The Reported SAR is the Maximum Final Adjusted Cumulative SAR from the applicable Steps 1 through 5 are reported on Page 1 of this report.

**Table 11.1 Fluid Sensitivity Calculation (1g)**

Fluid Sensitivity Calculation (1g)	
Delta SAR = Ce * Delta Er + C(sigma)*Delta Sigma	
Frequency (GHz)	Plot ID
<b>0.157375</b>	<b>F4</b>
Ce	-0.2067
Cσ	0.7855
Δ E	-6.01%
Δσ	2.51%
<b>ΔSAR</b>	<b>3.21%</b>
<b>Scale Factor Is Positive. Scaling Required</b>	

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.

  
 Trevor Whillock  
 Test Lab Engineer  
 Celltech Labs Inc.  
 11 March 2019  
 Date

## 12.0 SAR EXPOSURE LIMITS

Table 12.0 Exposure Limits

SAR RF EXPOSURE LIMITS			
FCC 47 CFR§2.1093	Health Canada Safety Code 6	General Population / Uncontrolled Exposure <sup>(4)</sup>	Occupational / Controlled Exposure <sup>(5)</sup>
Spatial Average <sup>(1)</sup> (averaged over the whole body)		0.08 W/kg	0.4 W/kg
Spatial Peak <sup>(2)</sup> (Head and Trunk averaged over any 1 g of tissue)		<b>1.6 W/kg</b>	8.0 W/kg
Spatial Peak <sup>(3)</sup> (Hands/Wrists/Feet/Ankles averaged over 10 g)		<b>4.0 W/kg</b>	20.0 W/kg
(1) The Spatial Average value of the SAR averaged over the whole body.			
(2) The Spatial Peak value of the SAR averaged over any 1 gram of tissue, defined as a tissue volume in the shape of a cube and over the appropriate averaging time.			
(3) The Spatial Peak value of the SAR averaged over any 10 grams of tissue, defined as a tissue volume in the shape of a cube and over the appropriate averaging time.			
(4) Uncontrolled environments are defined as locations where there is potential exposure to individuals who have no knowledge or control of their potential exposure.			
(5) Controlled environments are defined as locations where there is potential exposure to individuals who have knowledge of their potential exposure and can exercise control over their exposure.			

## 13.0 DETAILS OF SAR EVALUATION

### 13.0 Day Log

DAY LOG					Fluid Dielectric	SPC	Test
Date	Ambient Temp °C	Fluid Temp °C	Pressure (kPa)	Humidity			
26 Feb 2019	23	22.2	103.0	26%	X	X	X
27 Feb 2019	23	22.3	102.5	26%			X
28 Feb 2019	23	22.4	102.1	25%			X
01 Mar 2019	23	22.4	102.4	27%	X		X
04 Mar 2019	23	22.4	103.6	26%	X	X	X
05 Mar 2019	23	22.7	103.6	25%			X
06 Mar 2019	23	23.1	101.1	25%			X
07 Mar 2019	23	23.1	101.0	27%	X		X

\* Testing exceeded 48hrs, additional measurement per IEEE 1528

### 13.1 DUT Setup and Configuration

DUT Setup and Configuration	
1	The test procedures outlined in FCC KDB 643646 "SAR Test Reduction Considerations for Occupational PTT Radios" as well as FCC KDB 865664, ISEDC RSS-102 and IEEE 1528 were used throughout the evaluation of this device.
2	The DUT was evaluated at the maximum conducted output power level, preset by the manufacturer, with a fully charged battery in a 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).

### 13.2 DUT Positioning

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

### 13.4 Fluid Dielectric and Systems Performance Check

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

### 13.5 Scan Resolution 100MHz to 2GHz

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

### 13.6 Scan Resolution 2GHz to 3GHz

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

### 13.7 Scan Resolution 5GHz to 6GHz

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

## 14.0 MEASUREMENT UNCERTAINTIES

**Table 14.0 Measurement Uncertainty**

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEEE 1528-2013 Table 9)									
Uncertainty Component	IEEE 1528 Section	Uncertainty Value ±%	Probability Distribution	Divisor	ci 1g	ci 10g	Uncertainty Value ±% (1g)	Uncertainty Value ±% (10g)	V <sub>i</sub> or V <sub>eff</sub>
<b>Measurement System</b>									
Probe Calibration*	E.2.1	6.6	Normal	1	1	1	6.60	6.60	∞
Axial Isotropy*	E.2.2	4.7	Rectangular	1.732050808	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy*	E.2.2	9.6	Rectangular	1.732050808	0.7	0.7	3.9	3.9	∞
Boundary Effect*	E.2.3	8.3	Rectangular	1.732050808	1	1	4.8	4.8	∞
Linearity*	E.2.4	4.7	Rectangular	1.732050808	1	1	2.7	2.7	∞
System Detection Limits*	E.2.4	1.0	Rectangular	1.732050808	1	1	0.6	0.6	∞
Modulation Response	E.2.5	4.0	Rectangular	1.732050808	1	1	2.3	2.3	∞
Readout Electronics*	E.2.6	1.0	Normal	1	1	1	1.0	1.0	∞
Response Time*	E.2.7	0.8	Rectangular	1.732050808	1	1	0.5	0.5	∞
Integration Time*	E.2.8	1.4	Rectangular	1.732050808	1	1	0.8	0.8	∞
RF Ambient Conditions - Noise	E.6.1	0.0	Rectangular	1.732050808	1	1	0.0	0.0	∞
RF Ambient Conditions - Reflection	E.6.1	0.0	Rectangular	1.732050808	1	1	0.0	0.0	∞
Probe Positioner Mechanical Tolerance*	E.6.2	0.4	Rectangular	1.732050808	1	1	0.2	0.2	∞
Probe Positioning wrt Phantom Shell*	E.6.3	2.9	Rectangular	1.732050808	1	1	1.7	1.7	∞
Extrapolation, interpolation & integration algorithms for max. SAR evaluation*	E.5	3.9	Rectangular	1.732050808	1	1	2.3	2.3	∞
<b>Test Sample Related</b>									
Test Sample Positioning	E.4.2	0.3	Normal	1	1	1	0.3	0.3	5
Device Holder Uncertainty*	E.4.1	3.6	Normal	1	1	1	3.6	3.6	∞
SAR Drift Measurement**	E.2.9	0.0	Rectangular	1.732050808	1	1	0.0	0.0	∞
SAR Scaling***	E.6.5	2.0	Rectangular	1.732050808	1	1	1.2	1.2	∞
<b>Phantom and Tissue Parameters</b>									
Phantom Uncertainty*	E.3.1	4.0	Rectangular	1.732050808	1	1	2.3	2.3	∞
SAR Correction Uncertainty	E.3.2	1.2	Normal	1	1	0.84	1.2	1.0	∞
Liquid Conductivity (measurement)	E.3.3	6.8	Normal	1	0.78	0.71	5.3	4.8	10
Liquid Permittivity (measurement)	E.3.3	5.3	Normal	1	0.23	0.26	1.2	1.4	10
Liquid Conductivity (Temperature)	E.3.2	0.1	Rectangular	1.732050808	0.78	0.71	0.1	0.0	∞
Liquid Permittivity Temperature)	E.3.2	0.0	Rectangular	1.732050808	0.23	0.26	0.0	0.0	∞
<b>Effective Degrees of Freedom<sup>(1)</sup></b>								<b>V<sub>eff</sub> =</b>	<b>873.2</b>
<b>Combined Standard Uncertainty</b>			<b>RSS</b>				<b>12.59</b>	<b>12.40</b>	
<b>Expanded Uncertainty (95% Confidence Interval)</b>			<b>k=2</b>				<b>25.18</b>	<b>24.80</b>	
<b>Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003</b>									

(1) The Effective Degrees of Freedom is > 30 therefore a coverage factor of k=2 represents an approximate confidence level of 95%.

\* Provided by SPEAG

**Table 14.1 Calculation of Degrees of Freedom**

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

## 15.0 FLUID DIELECTRIC PARAMETERS

**Table 15.0 Fluid Dielectric Parameters 150MHz HEAD TSL**

\*\*\*\*\*  
 Aprel Laboratory  
 Test Result for UIM Dielectric Parameter  
 Tue 26/Feb/2019 09:59:08  
 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	56.15	0.70
0.1100	54.17	0.73	51.24	0.72
0.1200	53.70	0.74	50.44	0.71
0.1300	53.23	0.75	51.31	0.74
0.1400	52.77	0.75	49.77	0.72
0.1500	52.30	0.76	52.55	0.74
0.1600	51.83	0.77	47.51	0.74
0.1700	51.37	0.77	49.20	0.76
0.1800	50.90	0.78	47.44	0.76
0.1900	50.43	0.79	49.34	0.78
0.2000	49.97	0.80	47.99	0.79

FLUID DIELECTRIC PARAMETERS							
Date:	26 Feb 2019	Fluid Temp:	22.2	Frequency:	150MHz	Tissue:	Head
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	
100.0000		56.1500	0.7000	54.6300	0.72	2.78%	-2.78%
110.0000		51.2400	0.7200	54.1700	0.73	-5.41%	-1.37%
120.0000		50.4400	0.7100	53.7000	0.74	-6.07%	-4.05%
130.0000		51.3100	0.7400	53.2300	0.75	-3.61%	-1.33%
140.0000		49.7700	0.7200	52.7700	0.75	-5.69%	-4.00%
150.0000		52.5500	0.7400	52.3000	0.76	0.48%	-2.63%
156.0500	*	49.5008	0.7400	52.0157	0.77	-4.83%	-3.40%
156.7250	*	49.1606	0.7400	51.9839	0.77	-5.43%	-3.49%
157.3750	*	48.8330	0.7400	51.9534	0.77	-6.01%	-3.57%
157.4250	*	48.8078	0.7400	51.9510	0.77	-6.05%	-3.57%
160.0000		47.5100	0.7400	51.8300	0.77	-8.33%	-3.90%
170.0000		49.2000	0.7600	51.3700	0.77	-4.22%	-1.30%
180.0000		47.4400	0.7600	50.9000	0.78	-6.80%	-2.56%
190.0000		49.3400	0.7800	50.4300	0.79	-2.16%	-1.27%
200.0000		47.9900	0.7900	49.9700	0.80	-3.96%	-1.25%

\*Channel Frequency Tested

**Table 15.1 Fluid Dielectric Parameters 150MHz HEAD TSL**

\*\*\*\*\*  
 Aprel Laboratory  
 Test Result for UIM Dielectric Parameter  
 Fri 01/Mar/2019 15:36:29  
 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	62.48	0.72
0.1100	54.17	0.73	51.64	0.71
0.1200	53.70	0.74	52.14	0.75
0.1300	53.23	0.75	50.25	0.74
0.1400	52.77	0.75	50.88	0.76
0.1500	52.30	0.76	51.48	0.77
0.1600	51.83	0.77	51.10	0.78
0.1700	51.37	0.77	52.18	0.77
0.1800	50.90	0.78	50.83	0.79
0.1900	50.43	0.79	49.18	0.82
0.2000	49.97	0.80	48.79	0.82

FLUID DIELECTRIC PARAMETERS							
Date:	01 Mar 2019	Fluid Temp:	23.3	Frequency:	150MHz	Tissue:	Head
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	
100.0000	62.4800	0.7200	54.6300	0.72	14.37%	0.00%	
110.0000	51.6400	0.7100	54.1700	0.73	-4.67%	-2.74%	
120.0000	52.1400	0.7500	53.7000	0.74	-2.91%	1.35%	
130.0000	50.2500	0.7400	53.2300	0.75	-5.60%	-1.33%	
140.0000	50.8800	0.7600	52.7700	0.75	-3.58%	1.33%	
150.0000	51.4800	0.7700	52.3000	0.76	-1.57%	1.32%	
156.0500	* 51.2501	0.7761	52.0157	0.77	-1.47%	1.31%	
156.7250	* 51.2245	0.7767	51.9839	0.77	-1.46%	1.30%	
157.3750	* 51.1998	0.7774	51.9534	0.77	-1.45%	1.30%	
157.4250	* 51.1979	0.7774	51.9510	0.77	-1.45%	1.30%	
160.0000	51.1000	0.7800	51.8300	0.77	-1.41%	1.30%	
170.0000	52.1800	0.7700	51.3700	0.77	1.58%	0.00%	
180.0000	50.8300	0.7900	50.9000	0.78	-0.14%	1.28%	
190.0000	49.1800	0.8200	50.4300	0.79	-2.48%	3.80%	
200.0000	48.7900	0.8200	49.9700	0.80	-2.36%	2.50%	

\*Channel Frequency Tested

**Table 15.2 Fluid Dielectric Parameters 150MHz BODY TSL**

```

*****
                Aprel Laboratory
                Test Result for UIM Dielectric Parameter
                Mon 04/Mar/2019 13:50:16
                Freq   Frequency(GHz)
FCC_eH FCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon
FCC_sH FCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma
                FCC_eB       FCC Limits for Body Epsilon
                FCC_sB       FCC Limits for Body Sigma
                Test_e Epsilon of UIM
                Test_s Sigma of UIM
*****
                Freq FCC_eB FCC_sB Test_e Test_s
                0.1000 63.13  0.76  72.05  0.76
                0.1100 62.89  0.77  66.14  0.78
                0.1200 62.64  0.78  66.17  0.74
                0.1300 62.39  0.78  67.07  0.76
                0.1400 62.15  0.79  67.71  0.79
                0.1500 61.90  0.80  63.29  0.78
                0.1600 61.65  0.81  63.30  0.77
                0.1700 61.41  0.82  63.33  0.79
                0.1800 61.16  0.82  65.24  0.78
                0.1900 60.91  0.83  62.88  0.78
                0.2000 60.67  0.84  62.89  0.79
    
```

FLUID DIELECTRIC PARAMETERS							
Date:	4 Mar 2019	Fluid Temp:	22.4	Frequency:	150MHz	Tissue:	Body
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	
100.0000		72.0500	0.7600	63.1300	0.76	14.13%	0.00%
110.0000		66.1400	0.7800	62.8900	0.77	5.17%	1.30%
120.0000		66.1700	0.7400	62.6400	0.78	5.64%	-5.13%
130.0000		67.0700	0.7600	62.3900	0.78	7.50%	-2.56%
140.0000		67.7100	0.7900	62.1500	0.79	8.95%	0.00%
150.0000		63.2900	0.7800	61.9000	0.80	2.25%	-2.50%
156.0500	*	63.2961	0.7740	61.7488	0.81	2.51%	-3.98%
156.7250	*	63.2967	0.7733	61.7319	0.81	2.53%	-4.15%
157.4250	*	63.2974	0.7726	61.7144	0.81	2.57%	-4.32%
160.0000		63.3000	0.7700	61.6500	0.81	2.68%	-4.94%
170.0000		63.3300	0.7900	61.4100	0.82	3.13%	-3.66%
180.0000		65.2400	0.7800	61.1600	0.82	6.67%	-4.88%
190.0000		62.8800	0.7800	60.9100	0.83	3.23%	-6.02%
200.0000		62.8900	0.7900	60.6700	0.84	3.66%	-5.95%

\*Channel Frequency Tested

**Table 15.3 Fluid Dielectric Parameters 150MHz BODY TSL**

\*\*\*\*\*  
 Aprel Laboratory  
 Test Result for UIM Dielectric Parameter  
 Thu 07/Mar/2019 13:57:14  
 Freq Frequency(GHz)  
 FCC\_eHFCC Bulletin 65 Supplement C ( June 2001) Limits for Head Epsilon  
 FCC\_sHFCC Bulletin 65 Supplement C (June 2001) Limits for Head Sigma  
 FCC\_eB FCC Limits for Body Epsilon  
 FCC\_sB FCC Limits for Body Sigma  
 Test\_e Epsilon of UIM  
 Test\_s Sigma of UIM  
 \*\*\*\*\*

Freq	FCC_e B	FCC_sB	Test_e	Test_s
0.1000	63.13	0.76	67.85	0.76
0.1100	62.89	0.77	69.55	0.77
0.1200	62.64	0.78	66.26	0.78
0.1300	62.39	0.78	63.54	0.79
0.1400	62.15	0.79	64.71	0.77
0.1500	61.90	0.80	64.16	0.77
0.1600	61.65	0.81	65.37	0.80
0.1700	61.41	0.82	63.35	0.79
0.1800	61.16	0.82	63.03	0.79
0.1900	60.91	0.83	65.30	0.79
0.2000	60.67	0.84	63.63	0.81

FLUID DIELECTRIC PARAMETERS							
Date:	7 Mar 2019	Fluid Temp:	22.8	Frequency:	150MHz	Tissue:	Body
Freq (MHz)	Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity	
100.0000		67.8500	0.7600	63.1300	0.76	7.48%	0.00%
110.0000		69.5500	0.7700	62.8900	0.77	10.59%	0.00%
120.0000		66.2600	0.7800	62.6400	0.78	5.78%	0.00%
130.0000		63.5400	0.7900	62.3900	0.78	1.84%	1.28%
140.0000		64.7100	0.7700	62.1500	0.79	4.12%	-2.53%
150.0000		64.1600	0.7700	61.9000	0.80	3.65%	-3.75%
156.0500	*	64.8921	0.7882	61.7488	0.81	5.09%	-2.22%
156.7250	*	64.9737	0.7902	61.7319	0.81	5.25%	-2.05%
157.4250	*	65.0584	0.7923	61.7144	0.81	5.42%	-1.88%
160.0000		65.3700	0.8000	61.6500	0.81	6.03%	-1.23%
170.0000		63.3500	0.7900	61.4100	0.82	3.16%	-3.66%
180.0000		63.0300	0.7900	61.1600	0.82	3.06%	-3.66%
190.0000		65.3000	0.7900	60.9100	0.83	7.21%	-4.82%
200.0000		63.6300	0.8100	60.6700	0.84	4.88%	-3.57%

\*Channel Frequency Tested

## 16.0 SYSTEM VERIFICATION TEST RESULTS

**Table 16.0 System Verification Results 150MHz HEAD TSL**

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
26 Feb 2019		150	CLA-150		4007
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	22.2	23	26%	1000	0
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
52.55	52.30	0.48%	0.74	0.76	-2.63%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
4.16	3.90	6.67%	2.75	2.58	6.59%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
4.16	3.87	7.49%	2.75	2.56	7.42%
<p>Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEEE 1528-2013, FCC KDB 846224 and IEC 62209-1.</p> <p>The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer.</p> <p>The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.</p> <p>The forward power applied was same forward power applied by the calibration lab during the calibration of this validation source.</p>					

**Table 16.1 System Verification Results 150MHz BODY TSL**

<b>System Verification Test Results</b>					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
26 Feb 2019		150	CLA-150		4007
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	22.2	23	26%	1000	0
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
52.55	52.30	0.48%	0.74	0.76	-2.63%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
4.16	3.90	6.67%	2.75	2.58	6.59%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
4.16	3.87	7.49%	2.75	2.56	7.42%
<p>Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEEE 1528-2013, FCC KDB 846224 and IEC 62209-1.</p> <p>The dielectric parameters of the simulated tissue mixture were measured prior to the system performance check using a Dielectric Probe Kit and a Network Analyzer.</p> <p>The forward power was applied to the dipole and the system was verified to a tolerance of +10% from the system manufacturer's dipole calibration target SAR value.</p> <p>The forward power applied was same forward power applied by the calibration lab during the calibration of this validation source.</p>					

## 17.0 SYSTEM VALIDATION SUMMARY

**Table 17.0 System Validation Summary**

System Validation Summary												
Frequency (MHz)	Validation Date	Probe Model	Probe S/N	Validation Source	Source S/N	Tissue	Tissue Dielectrics		Validation Results			
							Permittivity	Conductivity	Sensitivity	Linearity	Isotropy	
30	24-Sep-18	EX3DV4	3600	CLA-30	1005	Head	50.15	0.72	Pass	Pass	Pass	
150	27-Jun-18	EX3DV4	3600	CLA-150	4007	Body	66.48	0.79	Pass	Pass	Pass	
150	11-Jul-18	EX3DV4	3600	CLA-150	4007	Head	51.51	0.81	Pass	Pass	Pass	
450	08-May-17	EX3DV4	3600	D450V3	1068	Body	54.65	0.95	Pass	Pass	Pass	
450	16-May-17	EX3DV4	3600	D450V3	1068	Head	43.70	0.83	Pass	Pass	Pass	
835	03-May-18	EX3DV4	3600	D835V2	4d075	Body	53.31	1.00	Pass	Pass	Pass	
835	19-May-17	EX3DV4	3600	D835V2	4d075	Head	42.01	0.89	Pass	Pass	Pass	
900	08-May-18	EX3DV4	3600	D900V2	045	Body	54.46	1.10	Pass	Pass	Pass	
900	02-Aug-17	EX3DV4	3600	D900V2	045	Head	39.10	0.93	Pass	Pass	Pass	
1640	06-May-18	EX3DV4	3600	1620-S-2	207-00102	Body	39.87	1.27	Pass	Pass	Pass	
1640	07-May-18	EX3DV4	3600	1620-S-2	207-00102	Head	39.87	1.27	Pass	Pass	Pass	
1800	21-Jul-17	EX3DV4	3600	D1800V2	247	Body	54.77	1.53	Pass	Pass	Pass	
1800	18-Jul-17	EX3DV4	3600	D1800V2	247	Head	40.70	1.33	Pass	Pass	Pass	
2450	23-May-18	EX3DV4	3600	D2450V2	825	Body	49.51	1.92	Pass	Pass	Pass	
2450	24-May-18	EX3DV4	3600	D2450V2	825	Head	37.95	1.87	Pass	Pass	Pass	
5250	24-Jul-18	EX3DV4	3600	D5GHzV2	1031	Body	46.42	5.69	Pass	Pass	Pass	
5250	24-Jul-18	EX3DV4	3600	D5GHzV2	1031	Head	35.96	4.99	Pass	Pass	Pass	
5750	25-Jul-18	EX3DV4	3600	D5GHzV2	1031	Body	47.10	5.60	Pass	Pass	Pass	

## 18.0 MEASUREMENT SYSTEM SPECIFICATIONS

Table 18.0 Measurement System Specifications

Measurement System Specification	
<b>Specifications</b>	
Positioner	Stäubli Unimation Corp. Robot Model: TX90XL
Repeatability	+/- 0.035 mm
No. of axis	6.0
<b>Data Acquisition Electronic (DAE) System</b>	
<b>Cell Controller</b>	
Processor	Intel(R) Core(TM) i7-7700
Clock Speed	3.60 GHz
Operating System	Windows 10 Professional
<b>Data Converter</b>	
Features	Signal Amplifier, multiplexer, A/D converter, and control logic
Software	Measurement Software: DASY6, V 6.4.0.12171 / DASY52 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
<b>DASY Measurement Server</b>	
Function	Real-time data evaluation for field measurements and surface detection
Hardware	Intel ULV Celeron CPU 400 MHz; 128 MB chip disk; 128 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface
<b>E-Field Probe</b>	
Model	EX3DV4
Serial No.	3600
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
<b>Phantom</b>	
Type	ELI Elliptical Planar Phantom
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	> 30 Liter

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 $\pm 8\%$ )	
Frequency:	10 MHz to > 6 GHz; Linearity: $\pm 0.2$ dB (30 MHz to 3 GHz)	
Directivity:	$\pm 0.2$ dB in head tissue (rotation around probe axis) $\pm 0.4$ dB in head tissue (rotation normal to probe axis)	
Dynamic Range:	5 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.2$ dB	
Surface Detect:	$\pm 0.2$ mm repeatability in air and clear liquids over diffuse reflecting surfaces	
Dimensions:	Overall length: 330 mm; Tip length: 16 mm; Body diameter: 12 mm; Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm	
Application:	General dosimetry up to 3 GHz; Compliance tests of mobile phone	
<b>EX3DV4 E-Field Probe</b>		
Phantom Specification		
<p>The ELI V5.0 phantom is an elliptical planar fiberglass shell phantom with a shell thickness of 2.0mm +/- .2mm at the planar area. This phantom conforms to OET Bulletin 65, Supplement C, IEEE 1528-2013, IEC 62209-1 and IEC 62209-2.</p>		
<b>ELI Phantom</b>		
Device Positioner Specification		
<p>The DASY device positioner has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of <math>65^\circ</math>. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.</p>		
<b>Device Positioner</b>		

## 19.0 TEST EQUIPMENT LIST

**Table 19.0 Equipment List and Calibration**

Test Equipment List				
DESCRIPTION	ASSET NO.	SERIAL NO.	DATE CALIBRATED	CALIBRATION DUE
Schmid & Partner DASY 6 System	-	-	-	-
-DASY Measurement Server	00158	1078	CNR	CNR
-Robot	00046	599396-01	CNR	CNR
-DAE4	00019	353	20-Apr-18	20-Apr-19
-EX3DV4 E-Field Probe	00213	3600	25-Apr-18	25-Apr-19
-CLA 30 Validation Dipole	00300	1005	23-Nov-17	23-Nov-20
-CLA150 Validation Dipole	00251	4007	27-Apr-17	27-Apr-20
-D450V3 Validation Dipole	00221	1068	23-Apr-18	23-Apr-21
-D835V2 Validation Dipole	00217	4D075	20-Apr-18	20-Apr-21
-D900V2 Validation Dipole	00020	54	24-Apr-17	24-Apr-20
-D1640/1620-S-2 Validation Dipole	00299	207-00102	07-Nov-17	07-Nov-20
-D2450V2 Validation Dipole	00219	825	24-Apr-18	24-Apr-21
-D5GHzV2 Validation Dipole	00126	1031	26-Apr-18	26-Apr-21
ELI Phantom	00247	-	CNR	CNR
HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
*Gigatronics 8652A Power Meter	00110	1835801	SB	SB
*Gigatronics 80701A Power Sensor	00248	1833687	SB	SB
HP 8753ET Network Analyzer	00134	US39170292	29-Dec-17	29-Dec-20
Rohde & Schwarz SMR20 Signal Generator	00006	100104	29-May-17	29-May-20
Amplifier Research 10W1000C Power Amplifier	00041	27887	CNR	CNR
Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Narda Directional Coupler 3020A	00064	-	CNR	CNR
Traceable VWR Thermometer	00291	-	19-Nov-16	19-Nov-19
Traceable VWR Jumbo Humidity/Thermometer	00295	170120555	17-Feb-17	17-Feb-20
DC-18G 10W 30db Attenuator	00102	-	COU	COU
R&S FSP40 Spectrum Analyzer	00241	100500	15-May-18	15-May-21
RF Cable-SMA	00311	-	CNR	CNR
HP Calibration Kit	00145	-	10-Feb-17	10-Feb-20

CNR = Calibration Not Required

SB=Stand By

COU = Calibrate on Use

\*During the test evaluation Asset 00241 was utilized for power measurements and SPC verification from Feb 28th-Mar 07, 2019. Asset 00248 and Asset 00110 were used for reference measurements only.

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

## 20.0 FLUID COMPOSITION

Table 20.0 Fluid Composition 150MHz BODY TSL

Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Sugar	Salt <sup>(1)</sup>	HEC <sup>(2)</sup>	Bacteriacide <sup>(3)</sup>
46.6	49.7	2.6	1.0	0.1

(1) Non-Iodinized

(2) HydroxyEthyl-Cellulose: Sigma-Aldrich P/N 54290-500g

(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

Table 20.1 Fluid Composition 150MHz HEAD TSL

Tissue Simulating Liquid (TSL) Composition				
Component by Percent Weight				
Water	Sugar	Salt <sup>(1)</sup>	HEC <sup>(2)</sup>	Bacteriacide <sup>(3)</sup>
38.35	55.5	5.15	0.9	0.1

(1) Non-Iodinized

(2) HydroxyEthyl-Cellulose: Sigma-Aldrich P/N 54290-500g

(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

## APPENDIX A – SYSTEM VERIFICATION PLOTS

Date/Time: 2/26/2019 1:16:36 PM

Test Laboratory: Celltech Labs

**SPC-150H Feb 26 2019**

**DUT: CLA-150; Type: CLA-150; Serial: 4007**

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 150 MHz; Communication System PAR: 0 dB; PMF: 1

Medium: TSL\_150H[26FE19]

Medium parameters used:  $f = 150$  MHz;  $\sigma = 0.74$  S/m;  $\epsilon_r = 52.55$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(9.75, 9.75, 9.75); Calibrated: 4/25/2018, ConvF(9.75, 9.75, 9.75); Calibrated: 4/25/2018, ConvF(9.75, 9.75, 9.75); Calibrated: 4/25/2018;
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = 16.0, 31.0, 151.0$
- Electronics: DAE4 Sn353; Calibrated: 4/20/2018
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS2 52.10.1(1476);

**Frequency: 150 MHz**

**SPC/SPC 150H Input=1.0W, Target=3.90W/kg/Area Scan (9x9x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 4.27 W/kg

**SPC/SPC 150H Input=1.0W, Target=3.90W/kg/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 75.81 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 6.42 W/kg

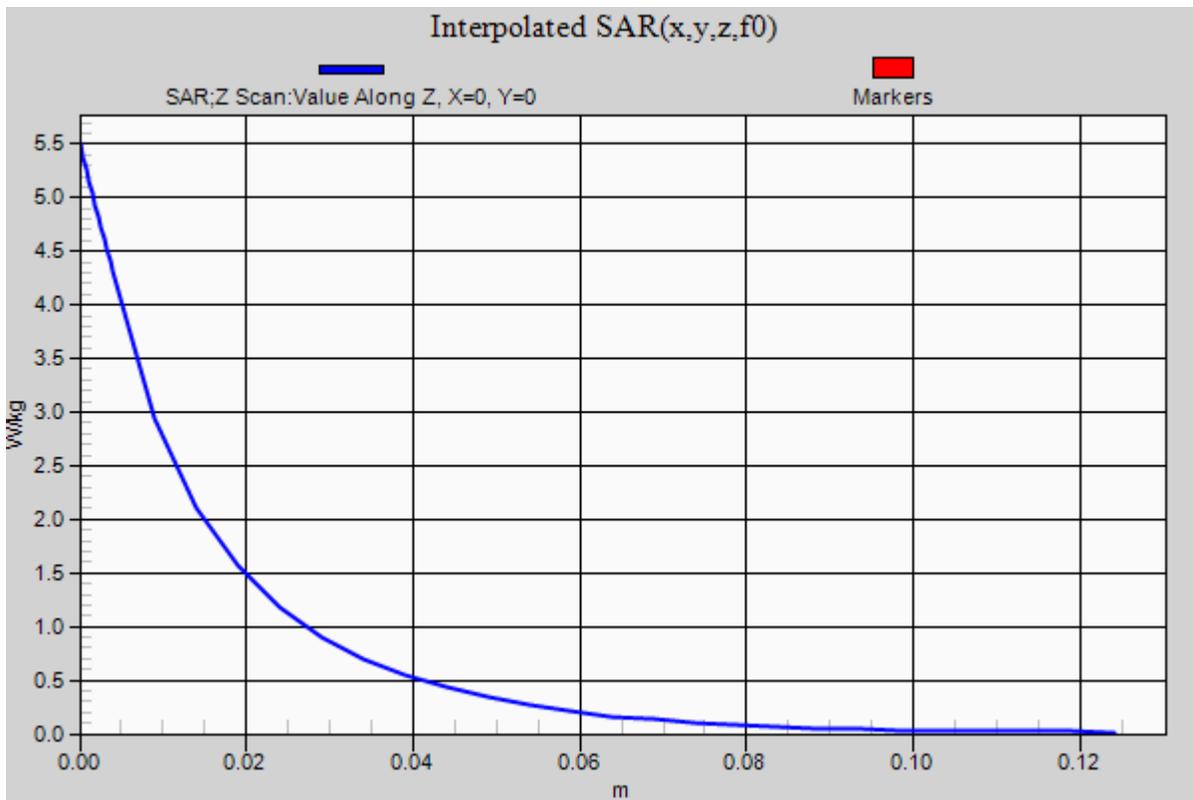
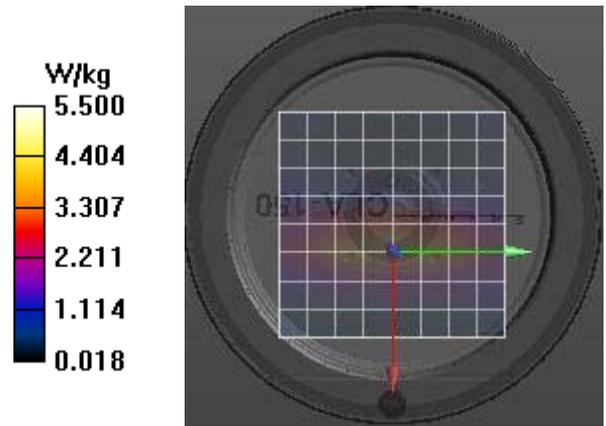
**SAR(1 g) = 4.16 W/kg; SAR(10 g) = 2.75 W/kg**

Maximum value of SAR (measured) = 4.45 W/kg

**SPC/SPC 150H Input=1.0W, Target=3.90W/kg/Z Scan (1x1x36):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Penetration depth = 15.03 (13.11, 16.57) [mm]

Maximum value of SAR (interpolated) = 5.50 W/kg



Date/Time: 3/4/2019 2:06:46 PM

Test Laboratory: Celltech Labs

**SPC-150B Mar 04 2019**

**DUT: CLA-150; Type: CLA-150; Serial: 4007**

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 150 MHz; Communication System PAR: 0 dB; PMF: 1

Medium: TSL\_150B[04MR19]

Medium parameters used:  $f = 150$  MHz;  $\sigma = 0.78$  S/m;  $\epsilon_r = 63.29$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(9.62, 9.62, 9.62); Calibrated: 4/25/2018, ConvF(9.62, 9.62, 9.62); Calibrated: 4/25/2018, ConvF(9.62, 9.62, 9.62); Calibrated: 4/25/2018;
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = 16.0, 31.0, 151.0$
- Electronics: DAE4 Sn353; Calibrated: 4/20/2018
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS2 52.10.1(1476);

**Frequency: 150 MHz**

**SPC/SPC 150B Input=1.0W, Target=4.08W/kg/Area Scan (8x9x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 3.82 W/kg

**SPC/SPC 150B Input=1.0W, Target=4.08W/kg/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 71.61 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 5.95 W/kg

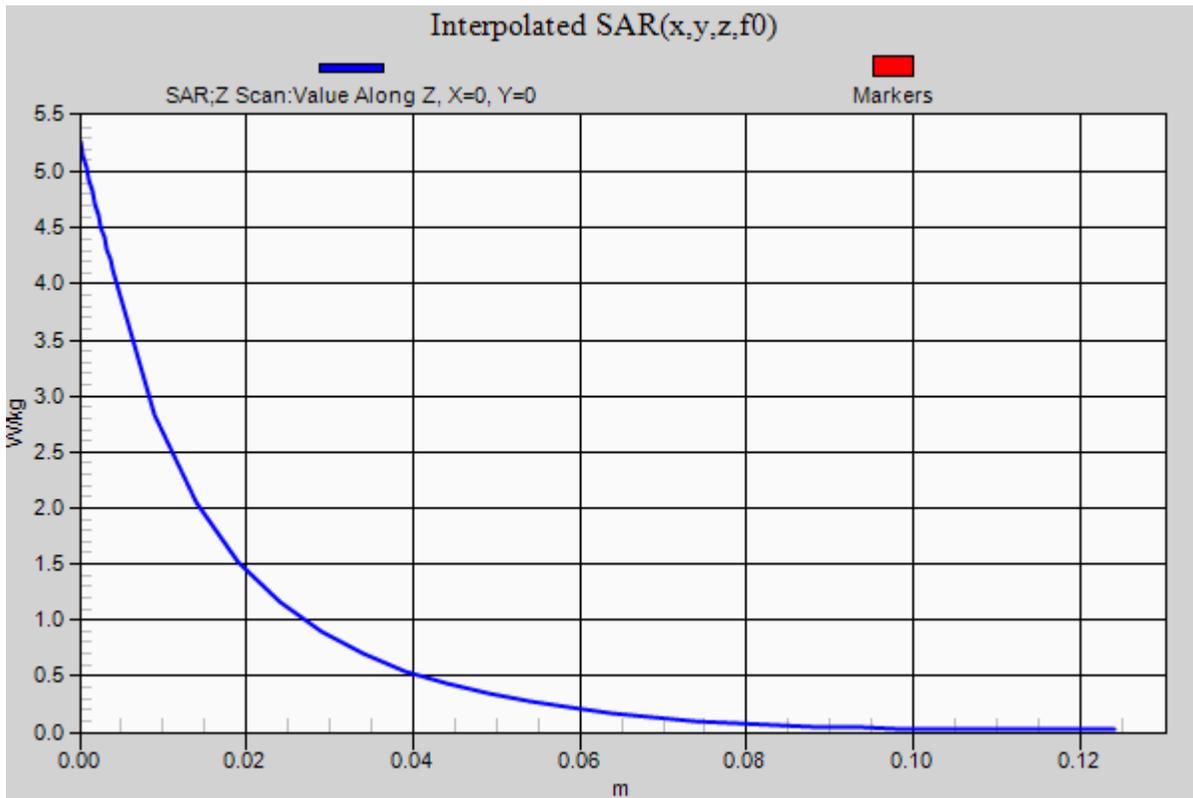
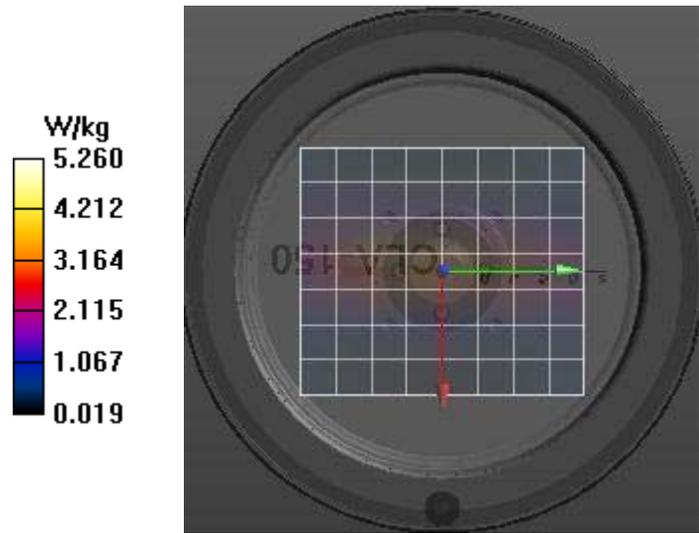
**SAR(1 g) = 3.9 W/kg; SAR(10 g) = 2.6 W/kg**

Maximum value of SAR (measured) = 4.19 W/kg

**SPC/SPC 150B Input=1.0W, Target=4.08W/kg/Z Scan (1x1x36):** Measurement grid: dx=20mm, dy=20mm, dz=5mm

Penetration depth = 15.29 (13.31, 17.01) [mm]

Maximum value of SAR (interpolated) = 5.26 W/kg



## APPENDIX B – MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

### Plot B1

Date/Time: 3/4/2019 2:43:15 PM

Test Laboratory: Celltech Labs

**Uniden-Atlantis 275 150B Mar 04 2019**

**DUT: Atlantis 275; Type: Sample; Serial: IMEI Number**

Communication System: UID 0, FM (0); Communication System Band: FM; Frequency: 156.05 MHz; Communication System PAR: 0 dB; PMF: 1.12202e-005

Medium: TSL\_150B[04MR19]

Medium parameters used (interpolated):  $f = 156.05$  MHz;  $\sigma = 0.774$  S/m;  $\epsilon_r = 63.296$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(9.62, 9.62, 9.62); Calibrated: 4/25/2018, ConvF(9.62, 9.62, 9.62); Calibrated: 4/25/2018, ConvF(9.62, 9.62, 9.62); Calibrated: 4/25/2018;
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0, 151.0$
- Electronics: DAE4 Sn353; Calibrated: 4/20/2018
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS5 52.10.1(1476);

**Frequency: 156.05 MHz**

**150B/B1-Atlantis 275, Body Config- Back Side(25mm), Bat P1, Pwr 6W, 156.05MHz/Area Scan (8x21x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 1.01 W/kg

**150B/B1-Atlantis 275, Body Config- Back Side(25mm), Bat P1, Pwr 6W, 156.05MHz/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 29.68 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 1.10 W/kg

**SAR(1 g) = 0.838 W/kg; SAR(10 g) = 0.621 W/kg**

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

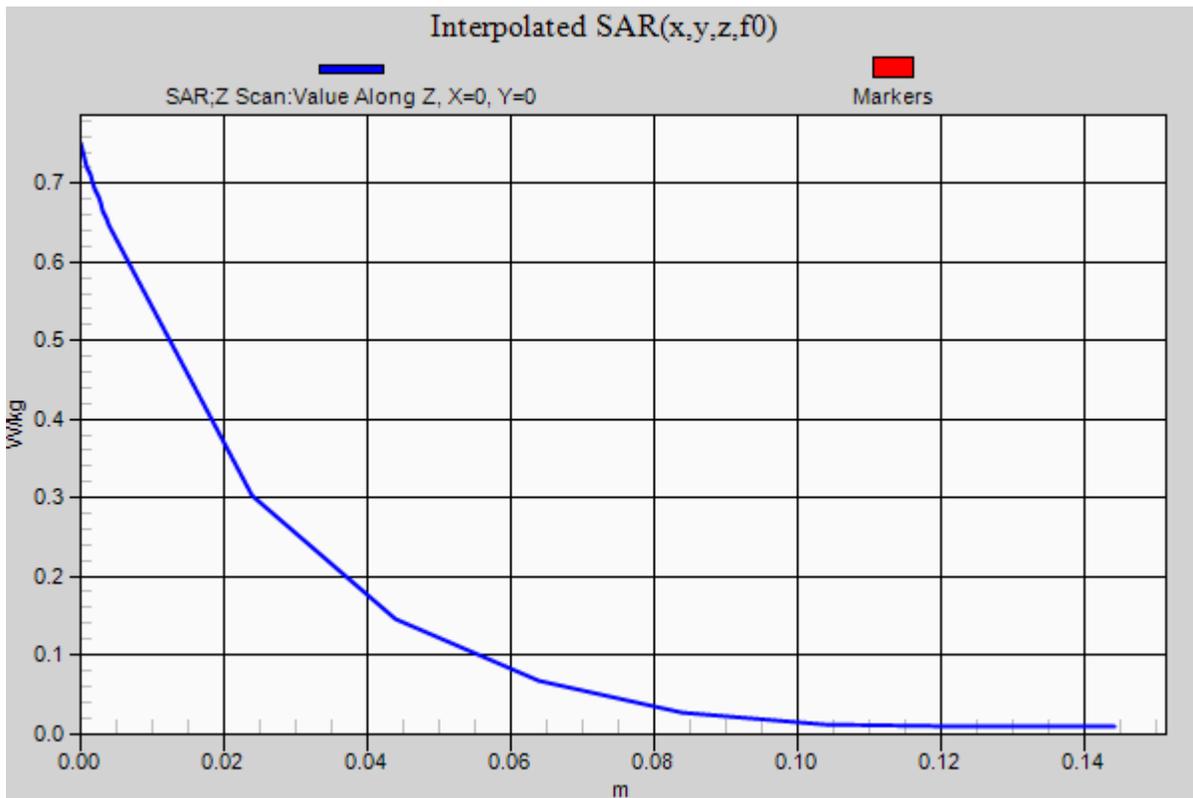
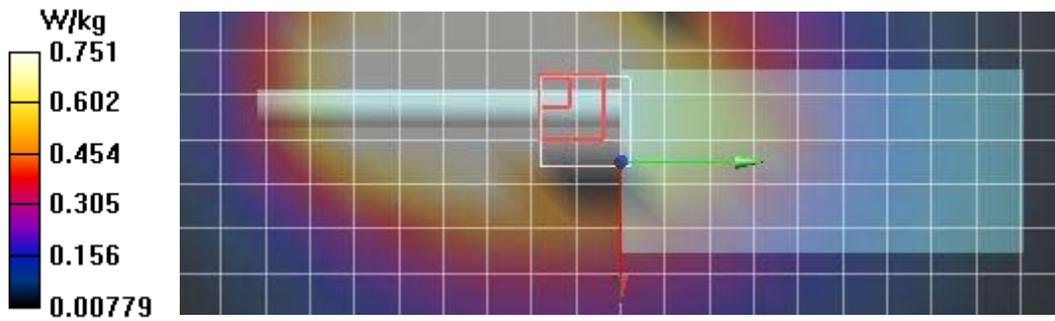
Maximum value of SAR (measured) = 0.904 W/kg

**150B/B1-Atlantis 275, Body Config- Back Side(25mm), Bat P1, Pwr 6W, 156.05MHz/Z Scan (1x1x19):** Measurement grid: dx=20mm, dy=20mm, dz=20mm

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

Penetration depth = n/a (n/a, 26.42) [mm]

Maximum value of SAR (interpolated) = 0.751 W/kg



## Plot F4

Date/Time: 3/1/2019 3:15:18 PM

Test Laboratory: Celltech Labs

**Uniden-Atlantis 275 150H Mar 01 2019**

**DUT: Atlantis 275; Type: Sample; Serial: IMEI Number**

Communication System: UID 0, FM (0); Communication System Band: FM; Frequency: 157.375 MHz; Communication System PAR: 0 dB; PMF: 1.12202e-005

Medium: TSL\_150H[26FE19]

Medium parameters used (interpolated):  $f = 157.375$  MHz;  $\sigma = 0.74$  S/m;  $\epsilon_r = 48.833$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASYS5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(9.75, 9.75, 9.75); Calibrated: 4/25/2018, ConvF(9.75, 9.75, 9.75); Calibrated: 4/25/2018, ConvF(9.75, 9.75, 9.75); Calibrated: 4/25/2018;
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection),  $z = -1.5, 31.0, 151.0$
- Electronics: DAE4 Sn353; Calibrated: 4/20/2018
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASYS2 52.10.1(1476);

**Frequency: 157.375 MHz**

**150H/F4-Atlantis 275,Face Config- Front Side(25mm), Bat P1, Pwr 6W,157.425MHz 2/Area Scan (8x21x1):** Measurement grid: dx=15mm, dy=15mm

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

Maximum value of SAR (measured) = 1.84 W/kg

**150H/F4-Atlantis 275,Face Config- Front Side(25mm), Bat P1, Pwr 6W,157.425MHz 2/Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm

Reference Value = 49.27 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 2.18 W/kg

**SAR(1 g) = 1.72 W/kg; SAR(10 g) = 1.36 W/kg**

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

Maximum value of SAR (measured) = 1.79 W/kg

**150H/F4-UT659Z,Face Config- Front Side(25mm), Bat P1, Pwr 6W,157.425MHz 2/Z Scan (1x1x19):** Measurement grid: dx=20mm, dy=20mm, dz=20mm

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

Penetration depth = n/a (n/a, 22.90) [mm]

Maximum value of SAR (interpolated) = 2.04 W/kg

