Celltech
Testing and Engineering Services Lab

Test Report Serial Number:	45461564 R2.0
Test Report Date:	7 January 2020
Project Number:	1478

SAR Test Report - Class II Permissive Change

Applicant:

KENWOOD

JVCKenwood USA Corporation
5000 Research Court, Suite 700
Suwanee, GA, 30024
USA

Maximum Reported 1g SAR			
FCC	FACE:	5.09	W/kg
	BODY:	6.88	
Occupational Limit:		8.00	

FCC ID:

ALH437300

Product Model Number(s) / HVIN
TK-3000
BC200U

Product Name(s) / PMN
TK-3000
BC200U

In Accordance With:

FCC 47 CFR §2.1093

Radiofrequency Radiation Exposure Evaluation: Portable Devices

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-1

FC

FCC Registration: CA3874

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1.0 DOCUMENT CONTROL

Revision History				
Samples Tested By:	Art Voss/Trevor Whillock	**Date(s) of Evaluation:**		9-13 December 2019
Report Prepared By:	Art Voss	**Report Reviewed By:**		Ben Hewson
Report Revision	**Description of Revision**	**Revised Section**	**Revised By**	**Revision Date**
0.1	Initial Draft Release	n/a	Art Voss	17 December 2019
0.2	Revised HVIN/PMN	All	Art Voss	19 December 2019
	Revised Client Information (Canada)	C, 2.0		
1.0	Initial Release	n/a	Art Voss	20 December 2019
2.0	Revised Client Information (US)	C, 2.0	Art Voss	9 January 2020

2.0 CLIENT AND DEVICE INFORMATION

Client Information		
Applicant Name	**JVCKenwood USA Corporation**	
Applicant Address	5000 Research Court, Suite 700	
	Suwanee, GA, 30024	
	USA	
DUT Information		
Device Identifier(s):	**FCC ID:**	**ALH437300**
	IC:	**282A-437300**
Type of Equipment:	Licensed Non-Broadcast Transmitter Held to Face (TNF) FCC Part 90	
Device Model(s) / HVIN:	TK-3000 , BC200U	
Device Marketing Name(s) / PMN:	TK-3000 , BC200U	
Test Sample Serial No.:	T/A Sample - Identical Prototype	
Transmit Frequency Range:	440-480MHz	
Number of Channels:	Programmable	
Manuf. Max. Rated Output Power:	4W / 36dBm +/- 0.5dB	
Modulation:	LMR: FM	
Duty Cycle:	50% PTT Duty Cycle, 75% VOX Duty Cycle	
DUT Power Source:	See Manufacturer's Accessory List	
Deviation(s) from standard/procedure:	None	
Modification of DUT:	None	

3.0 SCOPE OF EVALUATION

Preface:

This Certification Report was prepared on behalf of:

JVCKENWOOD USA 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:

The HVIN: TK-3000, PMN: TK-3000 and HVIN: BC200U, PMN: BC200U are identical hardware variants and vary only for marketing purposes. They are referenced as TK-3000 throughout this report. The TK-3000 is a portable, UHF, Push-To-Talk (PTT) FM Transceiver intended to be used as an Occupational Use device. The device can be used Held-To-Face as well as attached to the Body and used with a Speaker/MIC. The device is also capable of Voice Activated (VOX) transmission.

Requirement:

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

Application:

This is an application for a Class II Permissive Change.

Background:

This device was originally evaluated in October 2010 (the *"Previous Investigation"*) and certified by the FCC under FCC ID: **ALH437300** in accordance with the *Rules* current at the time, including the standards and procedures of IEEE 1528-2003, IEC 62209-1: 2005 and FCC KDB 447498D01 v04. Although some of these standards and procedures have been superseded by later versions, the measurement procedures and measurement equipment that were employed during the *Previous Investigation* are still valid under the current revisions of these standards and procedures, including the requirements of FCC KDB 447498D01 v06r01. The results of the *Previous Investigation* , as they appear in Celltech Labs' SAR Test Report ID: **100710ALH-T1057-S90U** (the "*Previous Report*") , appear in this report, along with the results of this investigation.

Scope:

During the course of the Previous Investigation, the TK-3000 was evaluated with the following accessories:

Part Number	Description
KRA-27M	Whip Antenna
KNB-63L	Li-Ion Battery (7.4V, 1130mAh)
KMC-24	Speaker-Microphone
KHB-10	Belt Clip

The scope of this investigation leverages test result data from the Previous Investigation as it appears in Previous Report. It will include an evaluation of the TK-3000 to the worst case Face configuration indicated in the Previous Report, with the accessories indicated above, as a base-line measurement to validate the findings of the Previous Investigation and to provide a comparison for the results of this investigation. This Face and Body configurations will be evaluated in Head TSL exclusively. Since Head and Body TSL was used during the Pervious Investigation and only Head TSL is to be used during this investigation, only the Face configuration can be used as the base-line measurement. This investigation will include the evaluation of two antenna additions, KRA-23M and KRA-42M, and one battery addition, KNB-65L. Since the TK-3000 has Voice Activated (VOX) transmission capability, the reported SAR will indicate VOX scaling (75% Duty Factor) rather than the PTT scaling (50% Duty Factor) that was reported in the Previous Report. The antenna additions will be evaluated across the frequency range they cover within the operating band of the DUT. The default battery will be determined by the battery producing the highest conducted power and highest initial SAR. The remaining battery will be evaluated to the worst case configuration obtained during the evaluation.

4.0 NORMATIVE REFERENCES

Normative References*	
ANSI / ISO 17025:2005	General Requirements for competence of testing and calibration laboratories
FCC CFR Title 47 Part 2 Title 47: Part 2.1093:	Code of Federal Regulations Telecommunication Radiofrequency Radiation Exposure Evaluation: Portable Devices
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 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:**
Kenwood USA Corportation	9 December - 13 December 2019
Product Name / PMN:	**Product Model Number / HVIN:**
TK-3000 and BC200U	TK-3000 and BC200U
Standard(s) Applied:	
FCC 47 CFR §2.1093	
Measurement Procedures:	
FCC KDB 865664, FCC KDB 447498, FCC KDB 643646 IEEE Standard 1528-2013, IEC 62209-2	
Use Group:	**Limits Applied:**
[ ] General Population / User Unaware	[ ] 1.6W/kg - 1g Volume
[X] Occupational / User Aware	[X] 8.0W/kg - 1g Volume
Reason for Issue:	
[ ] New Certification	[X] Class II Permissive Change
Reason for Change:	
Addition of KRA-23M and KRA-42M Antenna, KNB-65L Battery	

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.
17 December 2019
Date

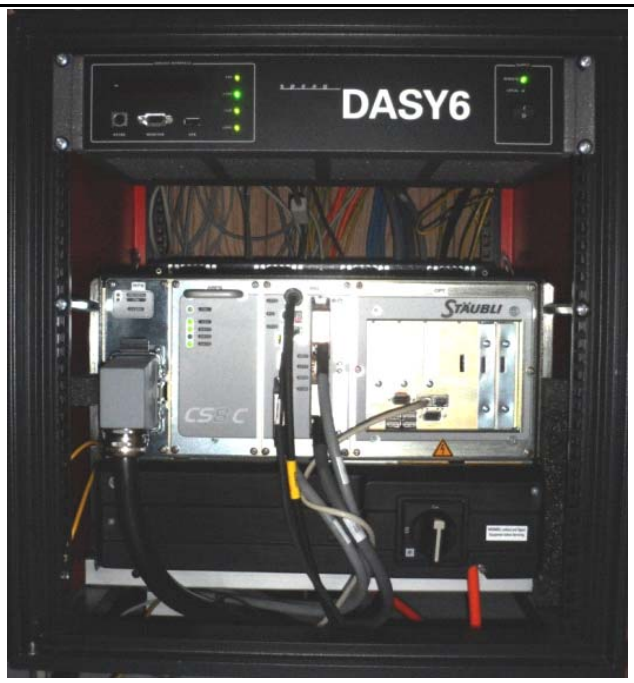
PROFESSIONAL ENGINEER PROVINCE OF BRITISH COLUMBIA A. F. VOSS # 31327

6.0 SAR MEASUREMENT SYSTEM

SAR Measurement System

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

DASY 6 SAR System with SAM Phantom



DASY 6 Measurement Controller

7.0 RF CONDUCTED POWER MEASUREMENT

Table 7.1 Conducted Power Measurements

Conducted Power Measurements							
Channel	Frequency (MHz)	Measured Power (dBm)	Rated Power (dBm)	Rated Power (W)	Delta (dBm)	SAR Test Channel (Y/N)	Battery
1	440.000	36.08	36.00	4.00	0.08	Y	KNB-65L
2	450.000	36.15			0.15	Y	
3	460.000	36.14			0.14	Y	
4	470.000	36.08			0.08	Y	
5	480.000	36.07			0.07	Y	
1x	440.000	36.00	36.00	4.00	0.00	Y	KNB-63L
1	440.000	36.13			0.13	Y	
2	450.000	36.13			0.13	Y	
2x	453.000	36.00			0.00	Y	
3	460.000	36.19			0.19	Y	
3x	467.000	36.00			0.00	Y	
4	470.000	36.17			0.17	Y	
4x	480.000	36.00			0.00	Y	
5	480.000	36.15			0.15	Y	

8.0 NUMBER OF TEST CHANNELS (N_C)

Table 8.1 Number of Required Test Channels

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*)
440	480	**460**	**5**	**3**	**10.0**	**20.0**

KDB 447498: $N_C = \text{RoundUp}\{ [100 (F_{HIGH} - F_{LOW})/Fc]^{0.5} \text{ X } (F_C/100)^{0.2} \}$

IEC 62209-1: $N_C = 2 \text{ X } \{ \text{RoundUp} [10 (F_{HIGH} - F_{LOW}) / F_C] \} + 1$

9.0 ACCESSORIES EVALUATED

Table 9.1 Accessories Evaluated

Manufacturer's Accessories List			
Test Report ID Number	**Manufacturer's Part Number**	**Description**	**SAR Evaluated**
Antenna			
T1	KRA-27M	UHF Whip Antenna (440 - 490MHz)	**Yes**
T2	KRA-23M	UHF Helical Antenna (440 - 490MHz)	**Yes**
T3	KRA-42M	UHF Stub Antenna (440 - 490MHz)	**Yes**
Battery			
P1	KNB-63L	Li-Ion (7.4V, 1130mAh)	**Yes**
P2	KNB-65L	Li-Ion (7.4V, 1520mAh)	**Yes**
Body-Worn Accessory			
B1	KBH-10	Belt Clip	**Yes**
Audio Accessory			
A1	KMC-45	Speaker-Microphone	**Yes**

10.0 SAR MEASUREMENT SUMMARY

Table 10.1: Measured Results – Face Configuration

Measured SAR Results (1g) - FACE Configuration (FCC/ISEDC)															
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*)	75% DC (*W/kg*)	
7 Oct 2010	FO1	TK-3000	PTT	440	CW-W	T1	P1	n/a	n/a	25	42	36	4.670	3.503	-0.464
7 Oct 2010	FO2	TK-3000	PTT	453	CW-W	T1	P1	n/a	n/a	25	42	36	4.760	3.570	-0.553
7 Oct 2010	FO3	TK-3000	PTT	467	CW-W	T1	P1	n/a	n/a	25	42	36	6.050	4.538	-0.444
7 Oct 2010	FO4	TK-3000	PTT	480	CW-W	T1	P1	n/a	n/a	25	42	36	5.900	4.425	-0.499
10 Dec 2019	FBL1	TK-3000	PTT	467	CW-W	T1	P2	n/a	n/a	25	42	37.08	5.020	3.765	0.370
12 Dec 2019	FBL2	TK-3000	PTT	467	CW-W	T1	P1	n/a	n/a	25	42	37.08	5.090	3.818	0.430
12 Dec 2019	F1	TK-3000	PTT	440	CW-W	T2	P1	n/a	n/a	25	42	37.13	2.990	2.243	-0.370
12 Dec 2019	F2	TK-3000	PTT	450	CW-W	T2	P1	n/a	n/a	25	42	37.13	3.090	2.318	-0.810
12 Dec 2019	F3	TK-3000	PTT	460	CW-W	T2	P1	n/a	n/a	25	42	37.19	4.860	3.645	-0.540
12 Dec 2019	F4	TK-3000	PTT	470	CW-W	T2	P1	n/a	n/a	25	42	37.17	4.930	3.698	-0.530
12 Dec 2019	F5	TK-3000	PTT	480	CW-W	T2	P1	n/a	n/a	25	42	37.15	4.410	3.308	-0.500
12 Dec 2019	F6	TK-3000	PTT	440	CW-W	T3	P1	n/a	n/a	25	42	37.13	2.080	1.560	-1.060
12 Dec 2019	F7	TK-3000	PTT	450	CW-W	T3	P1	n/a	n/a	25	42	37.13	3.260	2.445	-0.880
12 Dec 2019	F8	TK-3000	PTT	460	CW-W	T3	P1	n/a	n/a	25	42	37.19	4.160	3.120	-0.290
12 Dec 2019	F9	TK-3000	PTT	470	CW-W	T3	P1	n/a	n/a	25	42	37.17	3.070	2.303	-0.240
12 Dec 2019	F10	TK-3000	PTT	480	CW-W	T3	P1	n/a	n/a	25	42	37.15	3.070	2.303	-0.540
12 Dec 2019	F11	TK-3000	PTT	470	CW-W	T2	P2	n/a	n/a	25	42	37.19	4.700	3.525	-0.060
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			

FO1 through FO4 from *Previous Report*
FBL1 and FBL2 are the base-line measurements

Table 10.2: Measured Results – Body Configuration

Measured SAR Results (1g) - BODY Configuration (FCC/ISEDC)															
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*)	75% DC (*W/kg*)	
7 Oct 2010	BO1	TK-3000	PTT	440	CW-W	T1	P1	B1	A1	0	38	36	5.710	4.283	-0.314
7 Oct 2010	BO2	TK-3000	PTT	453	CW-W	T1	P1	B1	A1	0	38	36	6.040	4.530	-0.220
7 Oct 2010	BO3	TK-3000	PTT	467	CW-W	T1	P1	B1	A1	0	38	36	8.180	6.135	-0.327
7 Oct 2010	BO4	TK-3000	PTT	480	CW-W	T1	P1	B1	A1	0	38	36	7.870	5.903	-0.463
12 Dec 2019	B1	TK-3000	PTT	440	CW-W	T2	P1	B1	A1	0	38	37.08	5.130	3.848	-0.700
12 Dec 2019	B2	TK-3000	PTT	450	CW-W	T2	P1	B1	A1	0	38	37.13	6.330	4.748	-0.480
12 Dec 2019	B3	TK-3000	PTT	460	CW-W	T2	P1	B1	A1	0	38	37.13	8.110	6.083	-0.470
12 Dec 2019	B4	TK-3000	PTT	470	CW-W	T2	P1	B1	A1	0	38	37.19	7.390	5.543	-0.300
12 Dec 2019	B5	TK-3000	PTT	480	CW-W	T2	P1	B1	A1	0	38	37.17	6.420	4.815	-0.370
13 Dec 2019	B6	TK-3000	PTT	440	CW-W	T3	P1	B1	A1	0	38	37.13	3.990	2.993	-0.950
13 Dec 2019	B7	TK-3000	PTT	450	CW-W	T3	P1	B1	A1	0	38	37.13	5.670	4.253	-0.640
13 Dec 2019	B8	TK-3000	PTT	460	CW-W	T3	P1	B1	A1	0	38	37.19	6.220	4.665	-0.280
13 Dec 2019	B9	TK-3000	PTT	470	CW-W	T3	P1	B1	A1	0	38	37.17	4.640	3.480	-0.230
13 Dec 2019	B10	TK-3000	PTT	480	CW-W	T3	P1	B1	A1	0	38	37.15	4.530	3.398	-0.490
13 Dec 2019	B11	TK-3000	PTT	460	CW-W	T2	P2	B1	A1	0	38	37.13	7.080	5.310	-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			

BO1 through BO4 from *Previous Report*

11.0 SCALING OF MAXIMUM MEASURED SAR

Table 11.1 SAR Scaling

Scaling of Maximum Measured SAR (1g)					
Measured Parameters		Configuration			
		Face	Body	Head	
Plot ID		FO3	BO3		
Maximum Measured SAR_M		4.538	6.135		(W/kg)
Frequency		467	467		(MHz)
Power Drift		-0.444	-0.327		(dB)
Conducted Power		36.000	36.000		(dBm)
Fluid Deviation from Target					
Δe	Permitivity	2.07% (2)	2.62% (2)		
Δσ	Conductivity	3.45% (2)	3.19% (2)		

SAR_M = Measured SAR X 75% VOX Duty Factor

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)	0.467	0.467		
Ce		-0.213	-0.213		
Cσ		0.779	0.779		
Ce * Δe		-0.004	-0.006		
Cσ * Δσ		0.027	0.025		
ΔSAR		0.022	0.019 (3)		(%)

Note(3): Delta SAR is negative, SAR Adjustment for Fluid Sensitivity is not Required.

Manufacturer's Tuneup Tolerance				
Measured Conducted Power	36.000	36.000		(dBm)
Rated Conducted Power *	36.500	36.500		(dBm)
ΔP	-0.500 (4)	-0.500 (4)		(dB)

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

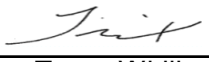
SAR Adjustment for Fluid Sensitivity				
$SAR_1 = SAR_M * ΔSAR$	4.538	6.135		(W/kg)

SAR Adjustment for Tuneup Tolerance				
$SAR_2 = SAR_1 + [ΔP]$	5.091	6.884		(W/kg)

SAR Adjustment for Drift				
$SAR_3 = SAR_2 + Drift$	5.639	7.422		(W/kg)

reported SAR				
$FCC = SAR_2$	5.09	6.88		(W/kg)
$ISED = SAR_3$	5.64	7.42		(W/kg)

NOTES to Table 11.1
(1) Scaling of the Maximum Measured SAR is based on the highest, 100% duty cycle, Face, Body and/or Head SAR measured of ALL test channels, configurations and accessories used during THIS evaluation. The Measured Fluid Deviation parameters apply only to deviation of the tissue equivalent fluids used at the frequencies which produced the highest measured SAR. The Measured Conducted Power applies to the Conducted Power measured at the frequencies producing the highest Face and Body SAR. The Measured Drift is the SAR drift associated with that specific SAR measurement. The Reported SAR is the accumulation of all SAR Adjustments from the applicable Steps 1 through 4. The Plot ID is for indentification of the SAR Measurement Plots in Annex A of this report. NOTE: Some of the scaling factors in Steps 1 through 4 may not apply and are identified by light gray text.
Step 1
Per IEC-62209-1 and FCC KDB 865664. Scaling required only when Measured Fluid Deviation is greater than 5%. If the Measured Fluid Deviation is greater than 5%, Table 9.1 will be shown and will indicate the SAR scaling factor in percent (%). SAR is MULTIPLIED by this scaling factor only when the scaling factor is positive (+).
Step 2
Per KDB 447498. Scaling required only when the difference (Delta) between the Measured Conducted Power and the Manufacturer's Rated Conducted Power is (-) Negative. The absolute value of Delta is ADDED to the SAR.
Step 3
Per IEC 62209-1. Scaling required only when Measured Drift is (-) Negative. The absolute value of Measured Drift is added to Reported or Simultaneous Reported SAR.
Step 4
Per KDB 447498 4.3.2. The SAR, either measured or calculated, of ANY and ALL simultaneous transmitters must be added together and includes all contributors.
Step 5
The Reported SAR is the Maximum Final Adjusted Cumulative SAR from the applicable Steps 1 through 4 and are reported on Page 1 of this report.

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. 27 November 2019 Date

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
7 Oct 2010	24	22.6	35%	101.1	X	X	X	
7 Oct 2010	24	22.5	35%	101.1	X	X	X	
9 Dec 2019	22	23.2	28%	102.8	X	X		
10 Dec 2019	25	23.4	27%	102.7			X	Preliminary Baseline Measurment and Prescan
11 Dec 2019	24	23.0	26%	102.7			X	SAR Evaluation 450H
12 Dec 2019	25	23.4	25%	101.3			X	SAR Evaluation 450H
13 Dec 2019	24	23.0	25%	101.8	X		X	SAR Evaluation 450H/Fluids Per IEEE 1528

13.2 DUT Setup and Configuration

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.

13.3 General Procedures and Report

General Procedures and Reporting
General Procedures
The fluid dielectric parameters of the Active Tissue Simulating Liquid (TSL) were measured as described in this Section, recorded and entered into the DASY Measurement Server. Active meaning the TSL used during the SAR evaluation of the DUT. The temperature of the Active TSL was measured and recorded prior to performing a System Performance Check (SPC). An SPC was performed with the Active TSL prior to the start of the test series. The temperature of the Active TSL was measured throughout the day and the Active TSL temperature was maintained to ± 0.5°C. The Active TSL temperature was maintained to within ±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.

13.4 Fluid Dielectric and Systems Performance Check

Fluid Dielectric and Systems Performance Check
Fluid Dielectric Measurement Procedure
The fluid dielectric parameters of the Tissue Simulating Liquid (TSL) are measured using the Open-Ended Coax Method connected to an Agilent 8753ET Network Analyzer connected to a measurement server running Aprel Dielectric Property Measurement System. A frequency range of ± 100MHz for frequencies > 300MHz and ± 50MHz for frequencies ≤ 300MHz with frequency step size of 10MHz is used. The center frequency is centered around the SAR measurement probe's calibration point for that TSL frequency range. A calibration of the setup is performed using a short-open-deionized water (at 23°C in a 300ml beaker) method. A sample of the TSL is placed in a 300ml beaker and the open-ended coax is submerged approximately 8mm below the fluid surface in the approximate center of the beaker. A check of the setup is made to ensure no air is trapped under the open-ended coax. The sample of TSL is measured and compared to the FCC 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.

13.5 Scan Resolution 100MHz to 2GHz

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

13.6 Scan Resolution 2GHz to 3GHz

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

13.7 Scan Resolution 5GHz to 6GHz

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

14.0 MEASUREMENT UNCERTAINTIES

Table 14.1 Measurement Uncertainty

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 DASY

Table 14.2 Calculation of Degrees of Freedom

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

15.0 FLUID DIELECTRIC PARAMETERS

Table 15.1 Fluid Dielectric Parameters 450MHz BODY TSL

From *Previous Report*

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Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 07/Oct/2010 18:43:09
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
0.3500	57.70	0.93	59.18	0.87
0.3600	57.60	0.93	58.87	0.88
0.3700	57.50	0.93	58.70	0.89
0.3800	57.40	0.93	58.93	0.91
0.3900	57.30	0.93	58.57	0.90
0.4000	57.20	0.93	58.79	0.91
0.4100	57.10	0.93	58.75	0.91
0.4200	57.00	0.94	58.14	0.92
0.4300	56.90	0.94	57.83	0.93
0.4400	56.80	0.94	57.82	0.93
0.4500	56.70	0.94	58.16	0.96
0.4600	56.66	0.94	58.34	0.97
0.4700	56.62	0.94	58.02	0.97
0.4800	56.58	0.94	57.87	0.97
0.4900	56.54	0.94	57.57	0.98
0.5000	56.51	0.94	56.81	0.99
0.5100	56.47	0.94	57.28	0.99
0.5200	56.43	0.95	57.31	1.01
0.5300	56.39	0.95	56.97	1.01
0.5400	56.35	0.95	56.49	1.02
0.5500	56.31	0.95	56.77	1.04

FLUID DIELECTRIC PARAMETERS

Date:	7 Oct 2010	Fluid Temp:	22.5	Frequency:	450MHz	Tissue:	Body

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
350.0000		59.1800	0.8700	57.7000	0.93	2.56%	-6.45%
360.0000		58.8700	0.8800	57.6000	0.93	2.20%	-5.38%
370.0000		58.7000	0.8900	57.5000	0.93	2.09%	-4.30%
380.0000		58.9300	0.9100	57.4000	0.93	2.67%	-2.15%
390.0000		58.5700	0.9000	57.3000	0.93	2.22%	-3.23%
400.0000		58.7900	0.9100	57.2000	0.93	2.78%	-2.15%
410.0000		58.7500	0.9100	57.1000	0.93	2.89%	-2.15%
420.0000		58.1400	0.9200	57.0000	0.94	2.00%	-2.13%
430.0000		57.8300	0.9300	56.9000	0.94	1.63%	-1.06%
440.0000	*	57.8200	0.9300	56.8000	0.94	1.80%	-1.06%
450.0000	*	58.1600	0.9600	56.7000	0.94	2.57%	2.13%
453.0000	*	58.2140	0.9630	56.6880	0.94	2.69%	2.45%
460.0000	*	58.3400	0.9700	56.6600	0.94	2.97%	3.19%
467.0000	*	58.1160	0.9700	56.6320	0.94	2.62%	3.19%
470.0000	*	58.0200	0.9700	56.6200	0.94	2.47%	3.19%
480.0000	*	57.8700	0.9700	56.5800	0.94	2.28%	3.19%
490.0000		57.5700	0.9800	56.5400	0.94	1.82%	4.26%
500.0000		56.8100	0.9900	56.5100	0.94	0.53%	5.32%
510.0000		57.2800	0.9900	56.4700	0.94	1.43%	5.32%
520.0000		57.3100	1.0100	56.4300	0.95	1.56%	6.32%
530.0000		56.9700	1.0100	56.3900	0.95	1.03%	6.32%
540.0000		56.4900	1.0200	56.3500	0.95	0.25%	7.37%
550.0000		56.7700	1.0400	56.3100	0.95	0.82%	9.47%

*Channel Frequency Tested

Table 15.2 Fluid Dielectric Parameters 450MHz HEAD TSL

From *Previous Report*

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Aprel Laboratory
Test Result for UIM Dielectric Parameter
Thu 07/Oct/2010
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	47.25	0.81
0.3600	44.58	0.87	47.18	0.82
0.3700	44.46	0.87	47.07	0.83
0.3800	44.34	0.87	47.14	0.85
0.3900	44.22	0.87	46.22	0.85
0.4000	44.10	0.87	46.62	0.86
0.4100	43.98	0.87	46.04	0.86
0.4200	43.86	0.87	46.07	0.87
0.4300	43.74	0.87	44.92	0.87
0.4400	43.62	0.87	44.94	0.88
0.4500	43.50	0.87	45.24	0.89
0.4600	43.45	0.87	44.77	0.90
0.4700	43.40	0.87	44.12	0.90
0.4800	43.34	0.87	44.44	0.91
0.4900	43.29	0.87	45.09	0.91
0.5000	43.24	0.87	43.94	0.92
0.5100	43.19	0.87	43.92	0.93
0.5200	43.14	0.88	43.42	0.94
0.5300	43.08	0.88	43.12	0.96
0.5400	43.03	0.88	43.62	0.97
0.5500	42.98	0.88	43.22	0.99

FLUID DIELECTRIC PARAMETERS

Date:	7 Oct 2010	Fluid Temp:	22.6	Frequency:	450MHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
350.0000		47.2500	0.8100	44.7000	0.87	5.70%	-6.90%
360.0000		47.1800	0.8200	44.5800	0.87	5.83%	-5.75%
370.0000		47.0700	0.8300	44.4600	0.87	5.87%	-4.60%
380.0000		47.1400	0.8500	44.3400	0.87	6.31%	-2.30%
390.0000		46.2200	0.8500	44.2200	0.87	4.52%	-2.30%
400.0000		46.6200	0.8600	44.1000	0.87	5.71%	-1.15%
410.0000		46.0400	0.8600	43.9800	0.87	4.68%	-1.15%
420.0000		46.0700	0.8700	43.8600	0.87	5.04%	0.00%
430.0000		44.9200	0.8700	43.7400	0.87	2.70%	0.00%
440.0000	*	44.9400	0.8800	43.6200	0.87	3.03%	1.15%
450.0000	*	45.2400	0.8900	43.5000	0.87	4.00%	2.30%
453.0000	*	45.0990	0.8930	43.4850	0.87	3.71%	2.64%
460.0000	*	44.7700	0.9000	43.4500	0.87	3.04%	3.45%
467.0000	*	44.3150	0.9000	43.4150	0.87	2.07%	3.45%
470.0000	*	44.1200	0.9000	43.4000	0.87	1.66%	3.45%
480.0000	*	44.4400	0.9100	43.3400	0.87	2.54%	4.60%
490.0000		45.0900	0.9100	43.2900	0.87	4.16%	4.60%
500.0000		43.9400	0.9200	43.2400	0.87	1.62%	5.75%
510.0000		43.9200	0.9300	43.1900	0.87	1.69%	6.90%
520.0000		43.4200	0.9400	43.1400	0.88	0.65%	6.82%
530.0000		43.1200	0.9600	43.0800	0.88	0.09%	9.09%
540.0000		43.6200	0.9700	43.0300	0.88	1.37%	10.23%
550.0000		43.2200	0.9900	42.9800	0.88	0.56%	12.50%

*Channel Frequency Tested

Table 15.3 Fluid Dielectric Parameters 450MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Mon 09/Dec/2019 15:56:28
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
0.3500	44.70	0.87	45.08	0.73
0.3600	44.58	0.87	44.54	0.74
0.3700	44.46	0.87	44.15	0.77
0.3800	44.34	0.87	44.45	0.77
0.3900	44.22	0.87	44.03	0.77
0.4000	44.10	0.87	43.82	0.77
0.4100	43.98	0.87	43.78	0.79
0.4200	43.86	0.87	43.02	0.79
0.4300	43.74	0.87	43.88	0.80
0.4400	43.62	0.87	42.78	0.81
0.4500	43.50	0.87	42.96	0.83
0.4600	43.45	0.87	42.65	0.82
0.4700	43.40	0.87	42.92	0.85
0.4800	43.34	0.87	42.59	0.85
0.4900	43.29	0.87	42.48	0.85
0.5000	43.24	0.87	41.87	0.87
0.5100	43.19	0.87	42.25	0.88
0.5200	43.14	0.88	41.41	0.87
0.5300	43.08	0.88	41.24	0.90
0.5400	43.03	0.88	41.50	0.90
0.5500	42.98	0.88	40.88	0.90

FLUID DIELECTRIC PARAMETERS

Date:	9 Dec 2019	Fluid Temp:	23.2	Frequency:	450MHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
350.0000		45.0800	0.7300	44.7000	0.87	0.85%	-16.09%
360.0000		44.5400	0.7400	44.5800	0.87	-0.09%	-14.94%
370.0000		44.1500	0.7700	44.4600	0.87	-0.70%	-11.49%
380.0000		44.4500	0.7700	44.3400	0.87	0.25%	-11.49%
390.0000		44.0300	0.7700	44.2200	0.87	-0.43%	-11.49%
400.0000		43.8200	0.7700	44.1000	0.87	-0.63%	-11.49%
410.0000		43.7800	0.7900	43.9800	0.87	-0.45%	-9.20%
420.0000		43.0200	0.7900	43.8600	0.87	-1.92%	-9.20%
430.0000		43.8800	0.8000	43.7400	0.87	0.32%	-8.05%
440.0000	*	42.7800	0.8100	43.6200	0.87	-1.93%	-6.90%
450.0000	*	42.9600	0.8300	43.5000	0.87	-1.24%	-4.60%
460.0000	*	42.6500	0.8200	43.4500	0.87	-1.84%	-5.75%
470.0000	*	42.9200	0.8500	43.4000	0.87	-1.11%	-2.30%
480.0000	*	42.5900	0.8500	43.3400	0.87	-1.73%	-2.30%
490.0000		42.4800	0.8500	43.2900	0.87	-1.87%	-2.30%
500.0000		41.8700	0.8700	43.2400	0.87	-3.17%	0.00%
510.0000		42.2500	0.8800	43.1900	0.87	-2.18%	1.15%
520.0000		41.4100	0.8700	43.1400	0.88	-4.01%	-1.14%
530.0000		41.2400	0.9000	43.0800	0.88	-4.27%	2.27%
540.0000		41.5000	0.9000	43.0300	0.88	-3.56%	2.27%
550.0000		40.8800	0.9000	42.9800	0.88	-4.89%	2.27%

*Channel Frequency Tested

Table 15.4 Fluid Dielectric Parameters 450MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Fri 13/Dec/2019 13:32:39
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	44.77	0.76
0.3600	44.58	0.87	44.55	0.79
0.3700	44.46	0.87	44.43	0.79
0.3800	44.34	0.87	44.20	0.80
0.3900	44.22	0.87	44.37	0.80
0.4000	44.10	0.87	43.74	0.81
0.4100	43.98	0.87	43.46	0.81
0.4200	43.86	0.87	43.13	0.81
0.4300	43.74	0.87	43.42	0.81
0.4400	43.62	0.87	42.76	0.82
0.4500	43.50	0.87	41.85	0.84
0.4600	43.45	0.87	42.47	0.83
0.4700	43.40	0.87	42.42	0.86
0.4800	43.34	0.87	42.33	0.85
0.4900	43.29	0.87	42.24	0.85
0.5000	43.24	0.87	41.20	0.87
0.5100	43.19	0.87	41.84	0.88
0.5200	43.14	0.88	41.30	0.89
0.5300	43.08	0.88	41.32	0.90
0.5400	43.03	0.88	40.98	0.90
0.5500	42.98	0.88	40.87	0.92

FLUID DIELECTRIC PARAMETERS

Date:	13 Dec 2019	Fluid Temp:	23	Frequency:	450MHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
350.0000		44.7700	0.7600	44.7000	0.87	0.16%	-12.64%
360.0000		44.5500	0.7900	44.5800	0.87	-0.07%	-9.20%
370.0000		44.4300	0.7900	44.4600	0.87	-0.07%	-9.20%
380.0000		44.2000	0.8000	44.3400	0.87	-0.32%	-8.05%
390.0000		44.3700	0.8000	44.2200	0.87	0.34%	-8.05%
400.0000		43.7400	0.8100	44.1000	0.87	-0.82%	-6.90%
410.0000		43.4600	0.8100	43.9800	0.87	-1.18%	-6.90%
420.0000		43.1300	0.8100	43.8600	0.87	-1.66%	-6.90%
430.0000		43.4200	0.8100	43.7400	0.87	-0.73%	-6.90%
440.0000	*	42.7600	0.8200	43.6200	0.87	-1.97%	-5.75%
450.0000	*	41.8500	0.8400	43.5000	0.87	-3.79%	-3.45%
460.0000	*	42.4700	0.8300	43.4500	0.87	-2.26%	-4.60%
470.0000	*	42.4200	0.8600	43.4000	0.87	-2.26%	-1.15%
480.0000	*	42.3300	0.8500	43.3400	0.87	-2.33%	-2.30%
490.0000		42.2400	0.8500	43.2900	0.87	-2.43%	-2.30%
500.0000		41.2000	0.8700	43.2400	0.87	-4.72%	0.00%
510.0000		41.8400	0.8800	43.1900	0.87	-3.13%	1.15%
520.0000		41.3000	0.8900	43.1400	0.88	-4.27%	1.14%
530.0000		41.3200	0.9000	43.0800	0.88	-4.09%	2.27%
540.0000		40.9800	0.9000	43.0300	0.88	-4.76%	2.27%
550.0000		40.8700	0.9200	42.9800	0.88	-4.91%	4.55%

*Channel Frequency Tested

16.0 SYSTEM VERIFICATION TEST RESULTS

Table 16.1 System Verification Results 450MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
9 Dec 2019		450	D450V3		1068
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	23.2	22	28%	250	15
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
42.96	43.50	-1.24%	0.83	0.87	-4.60%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
1.06	1.13	-6.19%	0.72	0.75	-4.65%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
4.24	4.53	-6.40%	2.87	3.02	-4.90%

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

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

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

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

17.0 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		
							Permittivity	Conductivity	Sensitivity	Linearity	Isotropy
30	31-May-19	EX3DV4	3600	CLA-30	1005	Head	52.40	0.75	Pass	Pass	Pass
150	12-Aug-19	EX3DV4	3600	CLA-150	4007	Head	49.46	0.79	Pass	Pass	Pass
450	13-Aug-19	EX3DV4	3600	D450V3	1068	Head	43.70	0.83	Pass	Pass	Pass
750	20-Jun-19	EX3DV4	3600	D750V3	1061	Head	44.27	0.83	Pass	Pass	Pass
835	15-Aug-19	EX3DV4	3600	D835V2	4d075	Head	42.01	0.89	Pass	Pass	Pass
1800	18-Jun-19	EX3DV4	3600	D1800V2	247	Head	41.20	1.39	Pass	Pass	Pass
2450	02-Apr-19	EX3DV4	3600	D2450V2	825	Head	36.58	1.85	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 V10.2(1504)
	Postprocessing Software: SEMCAD X, V14.6.12(7470)
Connecting Lines	Optical downlink for data and status info., Optical uplink for commands and clock
DASY Measurement Server	
Function	Real-time data evaluation for field measurements and surface detection
Hardware	Intel ULV Celeron CPU 400 MHz; 128 MB chip disk; 128 MB RAM
Connections	COM1, COM2, DAE, Robot, Ethernet, Service Interface
E-Field Probe	
Model	EX3DV4
Serial No.	3600
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
Phantom	
Type	ELI Elliptical Planar Phantom
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	> 30 Liter

Measurement System Specification (Continued)

Probe Specification

Construction:	Symmetrical design with triangular core; Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, glycol)
Calibration:	In air from 10 MHz to 2.5 GHz In head simulating tissue at frequencies of 900 MHz and 1.8 GHz (accuracy ± 8%)
Frequency:	10 MHz to > 6 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
Directivity:	± 0.2 dB in head tissue (rotation around probe axis) ± 0.4 dB in head tissue (rotation normal to probe axis)
Dynamic Range:	5 µW/g to > 100 mW/g; Linearity: ± 0.2 dB
Surface Detect:	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
Dimensions:	Overall length: 330 mm; Tip length: 16 mm; Body diameter: 12 mm; Tip diameter: 6.8 mm Distance from probe tip to dipole centers: 2.7 mm
Application:	General dosimetry up to 3 GHz; Compliance tests of mobile phone

EX3DV4 E-Field Probe

Phantom Specification

The SAM V5.0 phantom is an elliptical planar fiberglass shell phantom with a shell thickness of 2.0mm +/- .2mm at the planar area. This phantom conforms to OET Bulletin 65, Supplement C, IEEE 1528-2013, IEC 62209-1 and IEC 62209-2.

ELI Phantom

Device Positioner Specification

The 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	19-Mar-19	19-Mar-20
-EX3DV4 E-Field Probe	00213	3600	26-Mar-19	26-Mar-20
-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
-D750V3 Validation Dipole	00238	1061	19-Mar-19	19-Mar-22
-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	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	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	00334	192385455	06-Aug-19	06-Aug-21
Traceable VWR Jumbo Humidity/Thermometer	00295	170120555	17-Feb-17	17-Feb-20
Digital Multi Meter DMR-1800	00250	TE182	6-22-17	6-22-20
Bipolar Power Supply 6299A	00086	1144A02155	CNR	CNR
DC-18G 10W 30db Attenuator	00102	-	COU	COU
R&S FSP40 Spectrum Analyzer	00241	100500	15-May-18	15-May-21
RF Cable-SMA	00311	-	CNR	CNR
HP Calibration Kit	00145	-	10-Feb-17	10-Feb-20
Rental Equipment				
R&S Base Station (Mobile Phone)	n/a	153128	08-Apr-19	08-Apr-20

CNR = Calibration Not Required

SB=Stand By

COU = Calibrate on Use

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

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

20.0 FLUID COMPOSITION

Note: Effective February 19, 2019 TCB Workshop: FCC has permitted the use of single head-tissue simulating liquid specified in IEC 62209-1 for all SAR tests.

Table 20.1 Fluid Composition 450MHz HEAD TSL

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

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

APPENDIX A – SYSTEM VERIFICATION PLOTS

Date/Time: 12/9/2019 4:26:44 PM

Test Laboratory: Celltech Labs

SPC-450H Dec 09 2019

DUT: Dipole 450 MHz D450V3; Type: D450V3; Serial: D450V3 - SN:1068

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 450 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 450 MHz; σ = 0.83 S/m; ε_r = 42.96; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

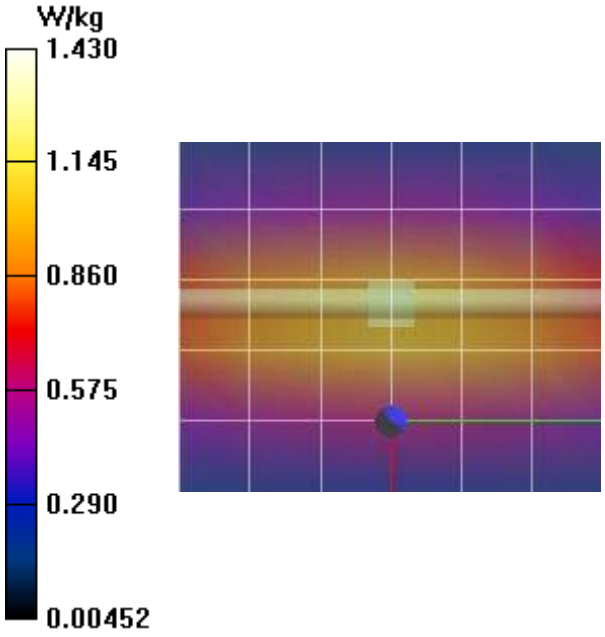
DASY Configuration:

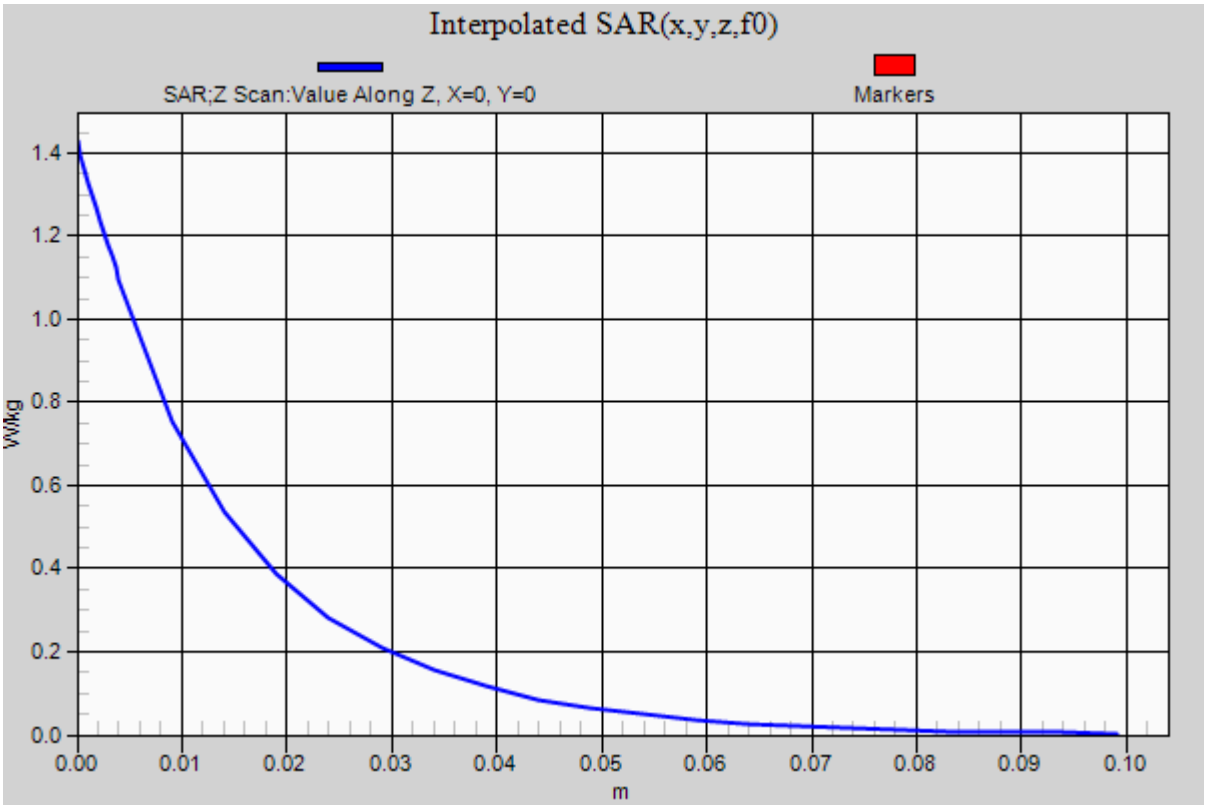
- Probe: EX3DV4 - SN3600; ConvF(8.79, 8.79, 8.79) @ 450 MHz; Calibrated: 3/26/2019
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = -1.5, 31.0, 151.0
- Electronics: DAE4 Sn353; Calibrated: 3/19/2019
- Phantom: Twin-SAM V4.0 (30deg probe tilt); Type: QD 000 P40 CC; Serial: xxxx
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

SPC/SPC 450H, Input 250mW, Taget[1.13][0.753] W/kg/Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.06 W/kg

SPC/SPC 450H, Input 250mW, Taget[1.13][0.753] W/kg/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 36.48 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.55 W/kg
SAR(1 g) = 1.06 W/kg; SAR(10 g) = 0.718 W/kg
Maximum value of SAR (measured) = 1.13 W/kg

SPC/SPC 450H, Input 250mW, Taget[1.13][0.753] W/kg/Z Scan (1x1x31): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 14.68 (13.39, 15.28) [mm]
Maximum value of SAR (interpolated) = 1.43 W/kg


W/kg
1.430
1.145
0.860
0.575
0.290
0.00452


Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
m

APPENDIX B – MEASUREMENT PLOTS OF MAXIMUMUM MEASURED SAR

From *Previous Report*
Plot FO3

Date Tested: 10/07/2010

Face-held SAR - Li-Ion Battery KNB-63L - Whip Antenna T90-0196-05 UHF K - 467.0 MHz

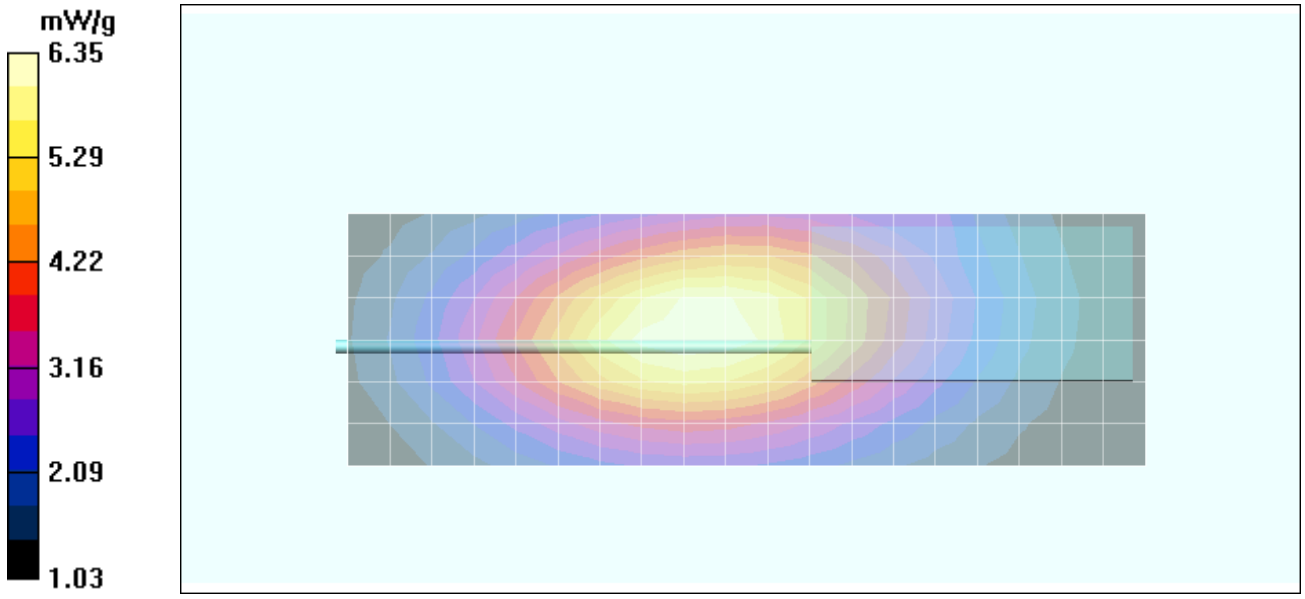
DUT: Kenwood TK-3000; Type: Portable FM UHF PTT Radio Transceiver; Serial: No. 00000028

Ambient Temp: 23.8°C; Fluid Temp: 22.6°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

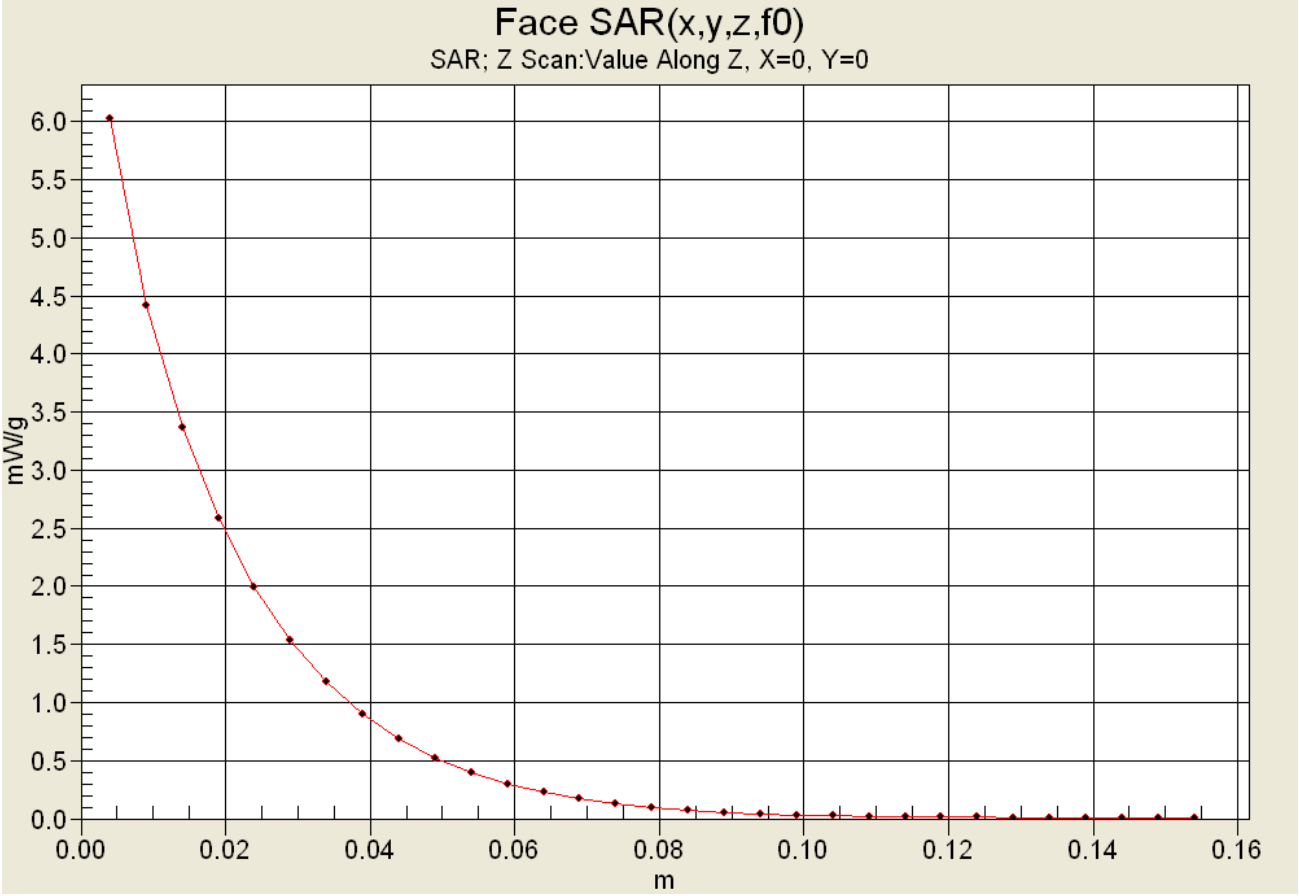
Communication System: CW
Frequency: 467 MHz; Duty Cycle: 1:1
Medium: HSL450 Medium parameters used (interpolated): f = 467 MHz; σ = 0.9 mho/m; ε_r = 44.3; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.25, 7.25, 7.25); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Face-held SAR - 2.5 cm Spacing from Front of DUT to Planar Phantom
Area Scan (7x20x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (measured) = 4.55 mW/g
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 84.0 V/m; Power Drift = -0.444 dB
Peak SAR (extrapolated) = 8.39 W/kg
SAR(1 g) = 6.05 mW/g; SAR(10 g) 4.45 mW/g
Maximum value of SAR (measured) = 6.35 mW/g



Z-Axis Scan


Face SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
m

From *Previous Report*
Plot BO3

Date Tested: 10/07/2010

Body-worn SAR - Li-Ion Battery KNB-63L - Whip Antenna T90-0196-05 UHF K - 467.0 MHz

DUT: Kenwood TK-3000; Type: Portable FM UHF PTT Radio Transceiver; Serial: No. 00000028

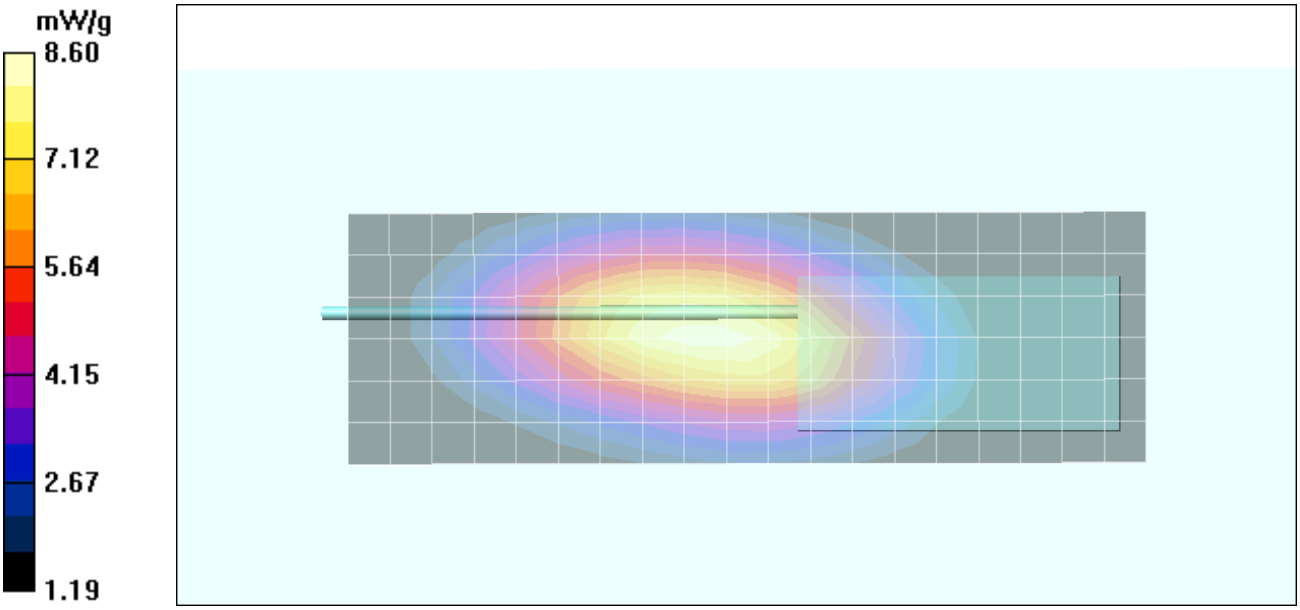
Body-worn Accessory: Belt-Clip P/N: J29-0751-05; Audio Accessory: Speaker-Microphone P/N: KMC-45

Ambient Temp: 24.0°C; Fluid Temp: 22.5°C; Barometric Pressure: 101.1 kPa; Humidity: 35%

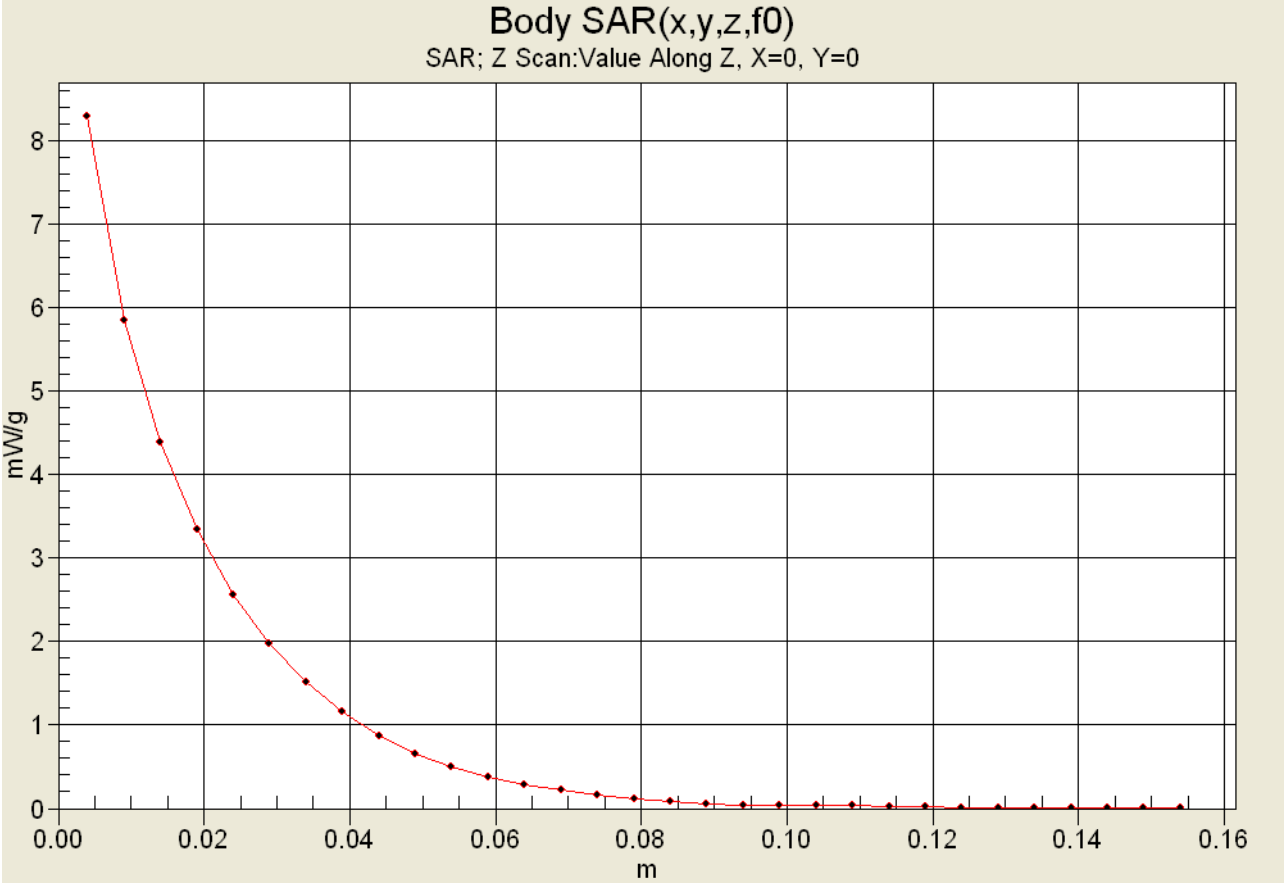
Communication System: CW
Frequency: 467 MHz; Duty Cycle: 1:1
Medium: MSL450 Medium parameters used (interpolated): f = 467 MHz; σ = 0.97 mho/m; ε_r = 58.1; ρ = 1000 kg/m^3

- Probe: ET3DV6 - SN1590; ConvF(7.73, 7.73, 7.73); Calibrated: 15/07/2010
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 27/04/2010
- Phantom: Side Planar; Type: Plexiglas; Serial: 161
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Body-worn SAR - 1.8 cm Belt-Clip Spacing from Back of DUT to Planar Phantom
Area Scan (7x20x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 8.42 mW/g
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 95.3 V/m; Power Drift = -0.327 dB
Peak SAR (extrapolated) = 12.1 W/kg
SAR(1 g) = 8.18 mW/g; SAR(10 g) = 5.85 mW/g
Maximum value of SAR (measured) = 8.60 mW/g



Z-Axis Scan



Plot B3

Date/Time: 12/12/2019 4:46:12 PM

Test Laboratory: Celltech Labs

Kenwood TK-3000 450H TSL Face 13 Dec 2019

DUT: Kenwood TK-3000; Type: PTT;

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 460 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 460 MHz; σ = 0.82 S/m; ε_r = 42.65; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

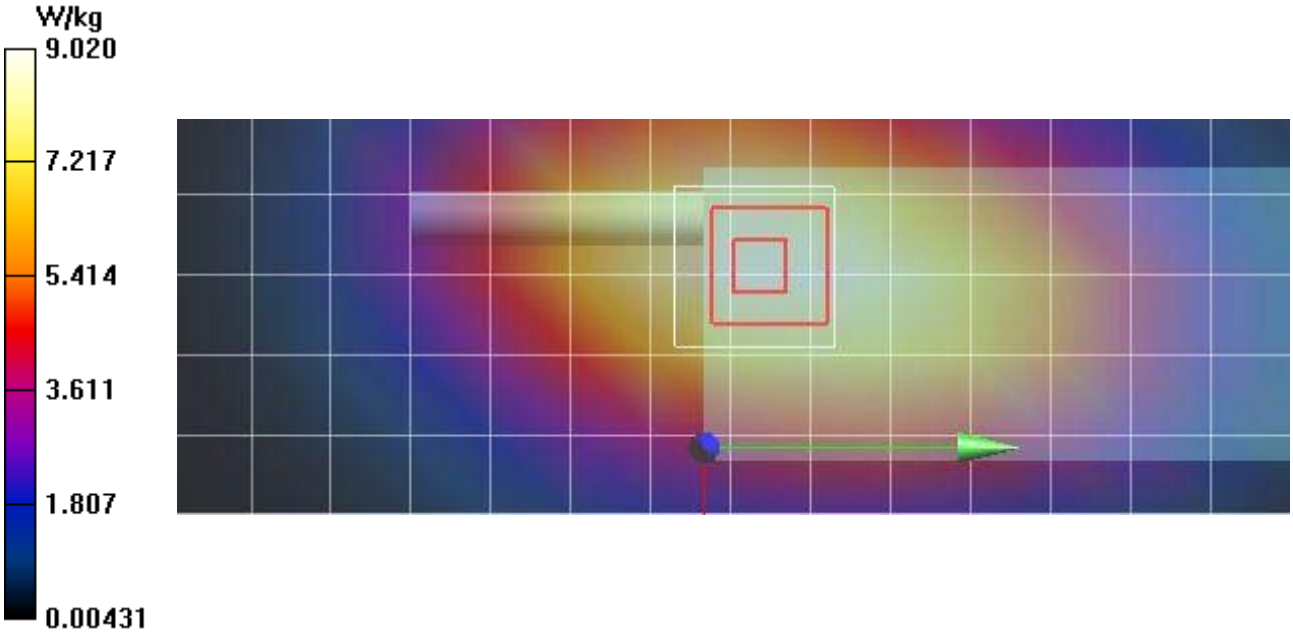
DASY Configuration:

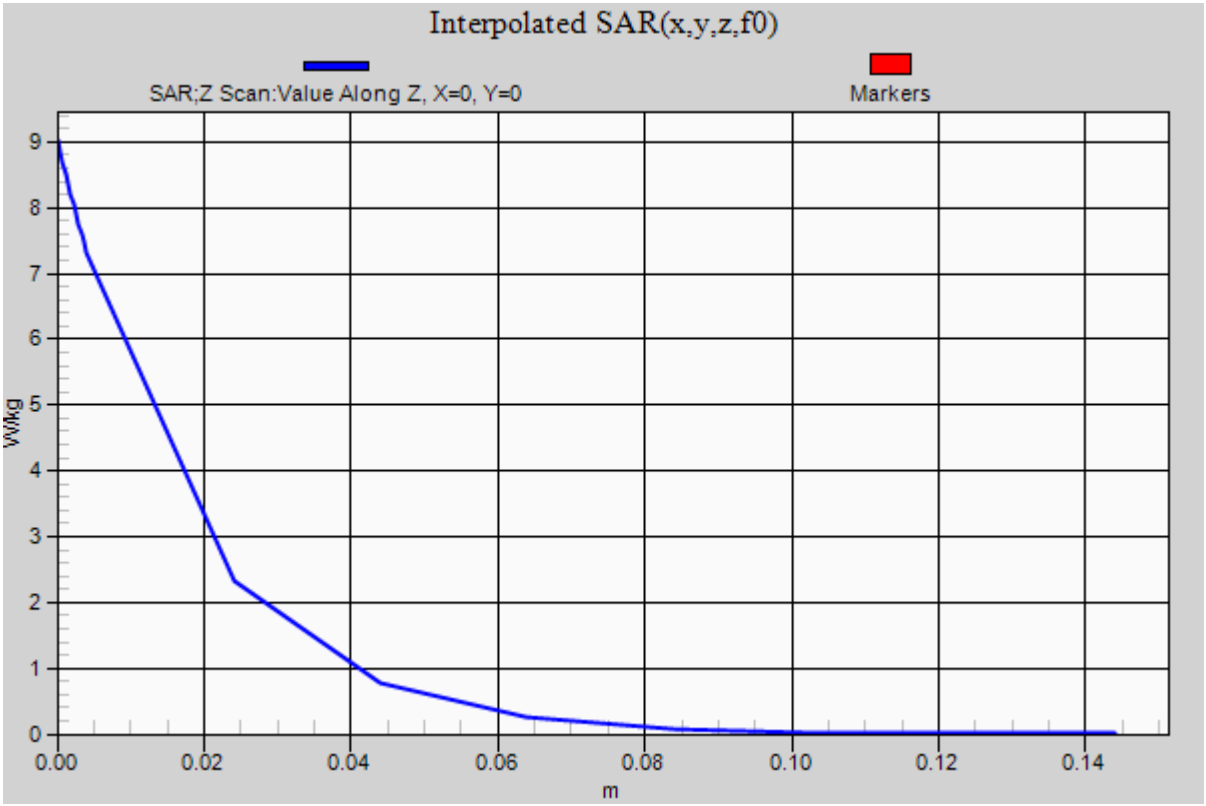
- Probe: EX3DV4 - SN3600; ConvF(8.79, 8.79, 8.79) @ 460 MHz; Calibrated: 3/26/2019
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = -1.5, 31.0, 151.0
- Electronics: DAE4 Sn353; Calibrated: 3/19/2019
- Phantom: Twin-SAM V4.0 (30deg probe tilt); Type: QD 000 P40 CC; Serial: xxxx
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

450H TSL/B3 460MHz Body KNB-63L, KRA-23M/Area Scan (6x16x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 9.33 W/kg

450H TSL/B3 460MHz Body KNB-63L, KRA-23M/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 100.3 V/m; Power Drift = -0.47 dB
Peak SAR (extrapolated) = 11.0 W/kg
SAR(1 g) = 8.11 W/kg; SAR(10 g) = 5.88 W/kg
Maximum value of SAR (measured) = 8.58 W/kg

450H TSL/B3 460MHz Body KNB-63L, KRA-23M/Z Scan (1x1x19): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Penetration depth = n/a (n/a, 17.50) [mm]
Maximum value of SAR (interpolated) = 9.02 W/kg





Plot F4

Date/Time: 12/12/2019 11:37:18 AM

Test Laboratory: Celltech Labs

Kenwood TK-3000 450H TSL Face 13 Dec 2019

DUT: Kenwood TK-3000; Type: PTT;

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 470 MHz;Communication System PAR: 0 dB; PMF: 1
Medium parameters used: f = 470 MHz; σ = 0.85 S/m; ε_r = 42.92; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600; ConvF(8.79, 8.79, 8.79) @ 470 MHz; Calibrated: 3/26/2019
  - 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: 3/19/2019
- Phantom: Twin-SAM V4.0 (30deg probe tilt); Type: QD 000 P40 CC; Serial: xxxx
- DASY52 52.10.2(1504); SEMCAD X 14.6.12(7470)

450H TSL/F4 470MHz Face KNB-63L, KRA-23M/Area Scan (6x16x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 5.47 W/kg

450H TSL/F4 470MHz Face KNB-63L, KRA-23M/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Reference Value = 80.31 V/m; Power Drift = -0.53 dB
Peak SAR (extrapolated) = 6.51 W/kg
SAR(1 g) = 4.93 W/kg; SAR(10 g) = 3.65 W/kg
Maximum value of SAR (measured) = 5.18 W/kg

450H TSL/F4 470MHz Face KNB-63L, KRA-23M/Z Scan (1x1x19): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Penetration depth = n/a (n/a, 18.29) [mm]
Maximum value of SAR (interpolated) = 5.92 W/kg