Celltech
Testing and Engineering Services Lab

Test Report Serial Number:	45461956 R1.0
Test Report Date:	6 August 2024
Project Number:	1660

SAR Test Report - New Application

Applicant:

GARMIN

Garmin International Inc.
1200 East 151 St.
Olathe, KS, 66062
USA

Maximum *reported* SAR		
DTS - 2.4GHz WLAN:	0.40	1g Head (W/kg)
DSS/DTS Bluetooth:	<0.1	
General Pop. Limit:	1.60	

Maximum *reported* SAR		
DTS - 2.4GHz WLAN:	0.12	10g Extremity (W/kg)
DSS/DTS Bluetooth:	<0.1	
General Pop. Limit:	4.00	

FCC ID:	IC Registration Number
IPH-04862	
Product Model Number / HVIN	Product Name / PMN
A04862	A04862

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

FCC Registration: CA3874

Table of Contents

1.0 DOCUMENT CONTROL

Revision History			
Samples Tested By:	Ben Hewson/ Trevor Whillock	**Date(s) of Evaluation:**	22 June 2024
Report Prepared By:	Ben Hewson	**Report Reviewed By:**	Art Voss

Report Revision	Description of Revision	Revised Section	Revised By	Revision Date
0.1	Draft	n/a	Ben Hewson	29 July 2024
1.0	Initial Release	n/a	Ben Hewson	6 August 2024

2.0 CLIENT AND DEVICE INFORMATION

Client Information	
Applicant Name	**Garmin International Inc.**
Applicant Address	1200 East 151 St
	Olathe, KS, 66062
	USA
Manufacturer Name	**Garmin Corporation**
Manufacturer Address	No. 68, Zhangshu 2nd Rd.
	Xizhi Dist.
	New Taipei City 221
	Taiwan, R.O.C.
DUT Information	
Device Identifier(s):	**FCC ID:** **IPH-04862**
Device Model(s) / HVIN:	A04862
Device Marketing Name / PMN:	A04862
Test Sample Serial No.:	3473001422 - Conducted, 3473001421 - OTA
Software Ver /SVIN:	V8.03
Device Type:	Portable Transceiver
Equipment Class:	Digital Transmission Systems (DTS)
	Spread Spectrum Transmitter (DSS)
	Low Power Communication Device (DXX)
	Global Navigation Satellite System (GNSS) Receivers
	NFC - Low Power Communication Device Transmitter (DXX)
Transmit Frequency Range:	WiFi (DTS): 2412-2462MHz
	BT/BLE/ANT: 2402-2480MHz
	NFC: 13.56MHz
Manuf. Max. Rated Output Power:	WiFi - Digital Transmission System (DTS): 16dBm
	BlueTooth - Spread Spectrum Transmitter (DSS):10.75dBm
	BLE/ANT - Low Power Communication Device Transmitter (DXX): 3dBm
	NFC - Low Power Communication Device Transmitter (DXX): 31.24dBuV/m
Antenna Type and Gain:	-5.8 dBi Max Slot Antenna
Modulation:	WiFi: DSSS, OFDM, CCK, MCS0-7
	BT BR: GFSK
	BT EDR: Pi/4-DQPSK, 8DPSK
	BLE: GMSK
	ANT: GFSK
	NFC: ASK
DUT Power Source:	4.5VDC Rechargeable Li-Ion
DUT Dimensions [LxWxH]	H x W x D: 47mm dia x 10.5mm
Deviation(s) from standard/procedure:	None
Modification of DUT:	None

3.0 SCOPE OF EVALUATION

This Certification Report was prepared on behalf of:

Garmin International Inc.

,(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.

The A04862, operates as a Portable transceiver near extremity, that is capable of operating in the 2.4GHz WiFi and Bluetooth, BLE & ANT frequency bands and has an additional NFC feature that operates at a fixed transmit frequency of 13.56MHz. The device is intended for General Population Use. The product operates from an internal proprietary Li-ion rechargeable battery which can be connected to a compliant USB interface port, AC or DC adapter for charging. Test samples provided by the manufacturer were capable of transmitting at select frequencies and modulations preset by the manufacturer. An additional antenna modification was prepared for one sample allowing the ability to connect test equipment for antenna port conducted power analysis.

Application:

This is an application for a new device certification.

Scope:

The scope of this evaluation limited to the evaluation of SAR for intended applications. It will include evaluation of the 2.4 GHz WiFi/BT transmitters for all required RF exposure configurations including Extremity and Head Configuration as the device may be operational while held to face.

The Test Plan developed for this evaluation is based on the required test channels and configurations which produced the highest worst case SAR and where applicable, SAR test reduction and/or SAR test exclusion may be utilized. The DUT was evaluated for SAR at the maximum tune up tolerance and conducted output power level, preset by the manufacturer and in accordance with the procedures described in RSS-102, IEC/IEEE 62209-1528, FCC KDB 447498 and FCC KDB 248227.

4.0 NORMATIVE REFERENCES

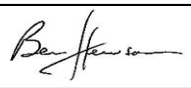
Normative References*	
ANSI / ISO 17025:2017	General Requirements for competence of testing and calibration laboratories
FCC CFR Title 47 Part 2	Code of Federal Regulations
Title 47:	Telecommunication
Part 2.1093:	Radiofrequency Radiation Exposure Evaluation: Portable Devices
IEC International Standard /IEEE International Committee on Electromagnetic Safety	
IEC/IEEE 62209-1528	Measurement procudeure for the assessment of sepcific absorption rate of human expoure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1528; Human models, insturmentation, and procedures (Frequency range of 4 MHz to 10 GHz)
FCC KDB	
KDB 865664 D01v01r04	SAR Measurement Requirements for 100MHz to 6GHz
KDB 865664 D02v01r02	RF Exposure Compliance Reporting and Documentation Considerations
FCC KDB	
KDB 447498 D04v01	RF Exposure Procedures and Equipment Authorization Policies for Mobile and Portable Devices Interim General RF Exposure Guidance
FCC KDB	
KDB 248227 D01v02r02	SAR Guidance for IEEE 802.11 (WiFi) Transmitters
* When the issue number or issue date is omitted, the latest version is assumed.	

5.0 STATEMENT OF COMPLIANCE

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

Applicant:	Model / HVIN:	
Garmin International Inc.	A04862	
Standard(s) Applied:	**Measurement Procedure(s):**	
FCC 47 CFR §2.1093	FCC KDB 865664, FCC KDB 447498, FCC KDB 248227 IEC/IEEE Standard 62209-1528	
Reason For Issue:	**Use Group:**	**Limits Applied:**
[x] New Certification	[x] General Population / Uncontrolled	[x] 1.6W/kg - 1g Volume
[ ] Class I Permissive Change		[ ] 8.0W/kg - 1g Volume
[ ] Class II Permissive Change	[ ] Occupational / Controlled	[x] 4.0W/kg - 10g Volume
Reason for Change:		**Date(s) Evaluated:**
		22 June 2024

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.	 Ben Hewson Celltech Labs Inc. 26 July 2024 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 – 2.4GHz WiFi BT BLE ANT

Conducted Power Measurements													
Band	Mode	Bandwidth (MHz)	Channel	Frequency (MHz)	Modulation	Bit Rate (Mbps)	Measured Power (dBm)	Rated Power (dBm)	Rated Power (W)	Delta (dB)	SAR Test Channel (Y/-)	Duty Cycle (%)	Crest Factor (1/DC)
WLAN 2.4G	802.11b	20	1	2412	CCK	1	14.64	16.00	0.040	-1.36	-	-	-
			6	2437			15.66	16.00	0.040	-0.34	Y	100.0	1.000
			11	2462			12.19	12.50	0.018	-0.31	-	-	-
			13	2472			5.88	6.00	0.004	-0.12	-	-	-
WLAN 2.4G	802.11g	20	1	2412	OFDM	6	15.58	16.00	0.040	-0.42	-	-	-
			6	2437			15.87	16.00	0.040	-0.13	-	-	-
			11	2462			12.66	13.00	0.020	-0.34	-	-	-
WLAN 2.4G	802.11n	20	1	2412	MCS0	0	13.83	14.50	0.028	-0.67	-	-	-
			6	2437			14.31	14.50	0.028	-0.19	-	-	-
			11	2462			13.95	14.50	0.028	-0.55	-	-	-
			13	2472			13.71	14.50	0.028	-0.79	-	-	-
BT	BR	1	0	2402	GFSK	-	8.37	10.75	0.012	-2.38	-	-	-
			38	2440			10.54	10.75	0.012	-0.21	Y	100.0	1.000
			78	2480			9.94	10.75	0.012	-0.81	-	-	-
	2EDR		0	2402	Pi/4-DQPSK	-	8.26	10.00	0.010	-1.74	-	-	-
			38	2440			9.17	10.00	0.010	-0.83	-	-	-
			78	2480			9.81	10.00	0.010	-0.19	-	-	-
	3EDR		0	2402	8DPSK		8.14	10.00	0.010	-1.86	-	-	-
			38	2440			9.12	10.00	0.010	-0.88	-	-	-
			78	2480			9.74	10.00	0.010	-0.26	-	-	-
BT	LE	1	37	2402	GMSK	-	-1.15	3.00	0.002	-4.15	-	-	-
			17	2440			2.88	3.00	0.002	-0.12	-	-	-
			39	2480			-0.97	3.00	0.002	-3.97	-	-	-
BT	LE	2	1	2404	GMSK	-	2.28	3.00	0.002	-0.72	-	-	-
			17	2440			2.96	3.00	0.002	-0.04	-	-	-
			39	2480			-0.81	3.00	0.002	-3.81	-	-	-
ANT	ANT	1	0	2402	GFSK	-	-0.76	3.00	0.002	-3.76	-	-	-
			38	2440			2.84	3.00	0.002	-0.16	-	-	-
			78	2480			-0.60	3.00	0.002	-3.60	-	-	-

The rated power and tolerance are stated for typical transmission modes and data rates. Some modes and data rates may produce lower than rated conducted power levels. Power measurements taken across the various channels, modes and data rates did not produce levels in excess of the Rated Power plus Tolerance. SAR was evaluated using the power level setting and duty cycle specified by the manufacturer to be the max output power and produce the most conservative SAR. SAR was evaluated at the *maximum average* tune up tolerance. See section 2.0 Client and Device Information for details. The *reported* SAR was not scaled down.

8.0 MEASUREMENT METHOD

Table 8.1 Number of Test Channels and SAR test reduction

The intended use of the device would have it transmit as a portable transceiver near extremity and/or held to face. As such the device was evaluated for both Extremity SAR (10g - 0mm) and Head SAR (1g - 10mm).

Wi-Fi SAR Evaluation:
SAR was evaluated in DSSS mode at the maximum duty cycle. The power level setting selected was specified by the manufacturer to be the max output power and produce the most conservative SAR.

The device supports channel 1 thru 13 for 2.5 GHz WLAN, though channel 11- 13 were reduced in power. Per FCC KDB 248227, provided higher maximum output power is not specified for other channels, channels 1, 6 and 11 are used to configure 22 MHz and 20MHz OFDM channels for SAR measurements; otherwise, the closest adjacent channel wth the highest maximum output power specified for production units should be tested instead of channels 1,6 or 11. When 40 MHz channels are supported, and provided higher mazimum putput power is not specified for other applicable 40 MHz cahnnels, channel 6 is used to measure SAR The highest conducted output power was found on Channel 6 and slected for initial evaluation

SAR test reduction methodology was applied to reduce the total number of required test channels from the SAR test evaluation.

When applicable, SAR test reduction methods may be utilized.

802.11b DSSS SAR test reduction is determined according to the following:

a) When the reported SAR of the highest measured maximum output power channel is ≤ to 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

b) When the reported SAR is > 0.8 W/kg, SAR is required for that exposure configuration using the next highest output power channel. When any reported SAR is > 1.2 W/Kg, SAR is required for the third channel.

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

a) When KDB Publication 447498 SAR test exclusion applies to the OFDM configuration.

b) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.

The initial test configuration for 2.4 GHz is determined by the 802.11 configuration with the highest maximum output power specified for production units, including tune-up tolerance, in each standalone and aggregated frequency band.

When the same maximum output power was specified for multiple transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwith, lowest order modulation and lowest data rate. When the maximum ouput power are the same for multiple test channels, SAR is measured using the channel closest to the middle frequency band. When all the channels have the same maximum output power use the higher number channel.

When the reported SAR of the initial test configuration is > 0.8 W/kg, SAR measurement is required for subsequent next highest measured output power channel(s) in the initial test configuration until reported SAR is ≤ 1.2 W/kg or all required channels are tested.

1-g SAR Estimates Based on Area Scans per KDB 447498 - the SAR measurements in 2.4Ghz met the conditions and were evaluated using the provisions of 447498 , with SAR measurements below 1.0W/kg and no warning messages.

Table 8.2 Exemptions for Single RF Source

Per FCC KDB 447498 D04 Appendix B Exemptions for Single RF Sources

B.4 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the available maximum time averaged power may be used if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

The separation distance is the smallest distance from any part of the antenna or radiating structure to all persons, and for portable or mobile devices this is from the device outer housing to the closest antenna.

P_{th} (mW) = ERP_{20cm}(mW) = 2040f **for 0.3GHz ≤ f < 1.5GHz (B.1)**

P_{th} (mW) = ERP_{20cm}(mW) = 3060 **for 1.5GHz ≤ f ≤ 6GHz (B.1)**

P_{th} (mW) = (ERP_{20cm})(d/20cm)^x **for d ≤ 20cm (B.2)**

P_{th} (mW) = (ERP_{20cm}) **for 20cm < d ≤ 40cm (B.2)**

$x = -\log_{10}(60/(ERP_{20cm})(\sqrt{f})$

where **f** is in GHz, **d** is separation distance (cm), **ERP_{20cm}** is per Formula (B.1).

Transmitter	Frequency (f) (GHz)	Separation Distance (d) (cm)	Average Power (mW)	Antenna Gain (dBi)	ERP or Avg. Power (mW)*	P_{th} (mW)
ANT	2.48	0.5	1.5	-5.8	0.39	2.72
BLE	2.48	0.5	1.5	-5.8	0.39	2.72

*If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the available maximum time averaged power may be used if the device antenna or radiating structure does not exceed an electrical length of $\lambda/4$.

The BLE and ANT transmitters has a maximum frequency of 2480MHz. The BLE and ANT power was measured by the client and has a maximum average transmission power of 2.0mW and a minimum antenna separation distance of 5 mm.

Based on 447498 D04 Appendix B the BLE and ANT transmitters are exempt from further evaluation.

NFC Test Exclusion

The field strength of NFC Transmitter was measured and found to be 31.24dBuV/m @3m. The conversion of field strength to EIRP is given by:

EIRP = FS - 104.7 + 20*Log10(d) where FS = field strength, d = measurement distance (3m)
EIRP = 31.24 - 104.7 + 20*Log10(3)
EIRP = -63.7dBm = 0.0000004mW
device qualifies for SAR test exemption per KDB 447498 D04 Appendix B, B.2, 1 mW Blanket Exemption
The test exclusion threshold from the equations above, at 13.56MHz is 3W.
The NFC Transmitter qualifies for SAR Test Exclusion.

Simultaneous SAR Evaluation

Simultaneous transmission cannot occur between any of the 2.4GHz WiFi, Bluetooth or Ant transmitters. Simultaneous transmission can occur between the NFC transmitter and any, and only, one of the 2.4GHz transmitters. The NFC transmitter qualifies for SAR test exclusion and the NFC estimated SAR is less than 0.000 W/kg. The NFC transmitter does not significantly contribute to the *reported* SAR.

9.0 ACCESSORIES EVALUATED

Table 9.0 Accessories Evaluated

Accessory List				
Test Report ID Number	**Manufacturer's Part Number**	**Description**	**SAR Evaluated**	**SAR Tested**
B1	010-12517-00	QuickFit 26 - Silicone Band	**Y**	**Y**
B2	010-12864-08	QuickFit 26 - Metal Band	**Y**	**Y**
B3	010-13010-00	UltraFit Nylon Strap	**Y**	**Y**

10.0 SAR MEASUREMENT SUMMARY

Table 10.0: Measured Results -Extremity 10g

Measured 10g SAR Results - EXTREMITY Configuration																		
Date	Plot ID	Test Frequency (MHz)	DUT Configuration					Accessories	Spacing		Measured SAR (W/kg)	SAR Drift (dB)	Delta Power (dB)	Crest Factor (n)	Fluid Sensitivity (n)	Duty Factor (%)	reported SAR (W/kg)
			Pos	Mode	BW	Mod	BR		DUT (mm)	Antenna (mm)							
Area Scan																	
6/22/2024	E60	2437	Back Touch	802.11b-NA	20	DSSS	1	- Nylon Band -	0	-	0.157	-0.100	-0.340	1.000	1.000	100.000	0.174
6/22/2024	E61	2437	Back Touch	802.11b-NA	20	DSSS	1	- Metal Band -	0	-	0.156	0.140	-0.340	1.000	1.000	100.000	0.169
6/22/2024	E62	2437	Back Touch	802.11b-NA	20	DSSS	1	- Silicone Band -	0	-	0.136	0.000	-0.340	1.000	1.000	100.000	0.147
6/22/2024	E63	2412	Back Touch	802.11b-NA	20	DSSS	1	- Nylon Band -	0	-	0.085	0.180	-1.360	1.000	1.000	100.000	0.116
6/22/2024	E64	2462	Back Touch	802.11b-NA	20	DSSS	1	- Nylon Band -	0	-	0.143	-0.050	-0.310	1.000	1.000	100.000	0.155
6/22/2024	E65	2440	Back Touch	BT BR-NA	1	GFSK	1	- Nylon Band -	0	-	0.028	0.650	-0.210	1.000	1.000	100.000	0.029
Zoom Scan																	
6/22/2024	E60Z	2437	Back Touch	802.11b-NA	20	DSSS	1	- Nylon Band -	0	-	0.111	0.100	-0.340	1.000	1.000	100.000	0.120
6/22/2024	E65Z	2440	Back Touch	BT BR-NA	1	GFSK	1	- Nylon Band -	0	-	0.018	0.740	-0.210	1.000	1.000	100.000	0.019
Applicable SAR Limit								Use Group					Limit				
FCC CFR 2.1093			Health Canada Safety Code 6					General Population/User Unaware					4 W/kg				

Table 10.1: Measured Results -Head – Held-to Face 1g

Measured 1g SAR Results - FACE Configuration																		
Date	Plot ID	Test Frequency (MHz)	DUT Configuration					Accessories	Spacing		Measured SAR (W/kg)	SAR Drift (dB)	Delta Power (dB)	Crest Factor (n)	Fluid Sensitivity (n)	Duty Factor (%)	reported SAR (W/kg)
			Pos	Mode	BW	Mod	BR		DUT (mm)	Antenna (mm)							
Area Scan																	
6/22/2024	F60	2437	Front 10mm	802.11b-NA	20	DSSS	1	Nylon Band	10		0.381	-0.040	-0.340	1.000	1.000	100.000	0.416
6/22/2025	F61	2412	Front 10mm	802.11b-NA	20	DSSS	1	Nylon Band	10		0.254	-0.020	-1.360	1.000	1.000	100.000	0.349
6/22/2026	F62	2462	Front 10mm	802.11b-NA	20	DSSS	1	Nylon Band	10		0.357	-0.280	-0.310	1.000	1.000	100.000	0.409
6/22/2027	F63	2440	Front 10mm	BT BR-NA	1	GFSK	1	Nylon Band	10		0.076	0.100	-0.210	1.000	1.000	100.000	0.079
Zoom Scan																	
6/22/2024	F60Z	2437	Front 10mm	802.11b-NA	20	DSSS	1	Nylon Band	10		0.353	-0.200	-0.340	1.000	1.000	100.000	0.400
6/22/2027	F63Z	2440	Front 10mm	BT BR-NA	1	GFSK	1	Nylon Band	10		0.073	0.290	-0.210	1.000	1.000	100.000	0.077
Applicable SAR Limit								Use Group					Limit				
FCC CFR 2.1093			Health Canada Safety Code 6					General Population/User Unaware					1.6 W/kg				

11.0 SCALING OF MAXIMUM MEASURE SAR

Table 11.0 SAR Scaling – Extremity 10g

Scaling of Maximum Measured SAR (10g)						
Measured Parameters		Configuration				
		Extremity	Extremity			
Plot ID		E60Z	E65Z			
Maximum Measured SAR_M		0.111	0.018			(W/kg)
Frequency		2437	2440			(MHz)
Drift	Power Drift	0.100 (2)	0.740 (6)			(dB)
Conducted Power		15.660	10.540			(dBm)
DC	Transmiter Duty Cycle	(3)	(7)			(%)
DF	Use Duty Factor	100.0 (4)	100.0 (8)			(%)
Fluid Deviation from Target						
Δe	Permitivity	-6.11%	-6.07%			
Δσ	Conductivity	7.16%	7.82%			
Fluid Sensitivity Calculation (1g)			EEE 62209-1528			
Delta SAR = Ce * Δe + Cσ * Δσ						
$Ce = (0.003456*f^3) - (0.03531*f^2) + (0.07675*f) - 0.186$						
$Cσ = (0.004479*f^3) - (0.01586*f^2) - (0.1972*f) + 0.7717$						
f	Frequency (GHz)	2.437	2.44			
Ce		-0.159	-0.159			
Cσ		0.262	0.261			
Ce * Δe		0.010	0.010			
Cσ * Δσ		0.019	0.020			
ΔSAR		0.028 (1)	0.030 (5)			(%)
Manufacturer's Tuneup Tolerance						
Measured Conducted Power		15.660	10.540			(dBm)
Rated Conducted Power		16.000	10.750			(dBm)
ΔP		-0.340	-0.210			(dB)
Transmitter Duty Cycle [Crest Factor]						
Transmiter Duty Cycle (DC)		100.0	100.0			(%)
CF (1/DC)		1.00 (3)	1.00 (7)			
SAR Adjustment for Fluid Sensitivity						
$SAR_1 = SAR_M$ X [ΔSAR]		0.111 (1)	0.018 (5)			(W/kg)
SAR Adjustment for Tuneup Tolerance						
$SAR_2 = SAR_1$ + [ΔP]		**0.120**	**0.019**			(W/kg)
SAR Adjustment for Drift						
$SAR_3 = SAR_2$ + [Drift]		0.120 (2)	0.019 (6)			(W/kg)
SAR Adjustment for Transmitter Duty Cycle [Crest Factor]						
$SAR_4 = SAR_3$ x [CF]		0.120 (3)	0.019 (7)			(W/kg)
SAR Adjustment for Use Duty Factor						
$SAR_5 = SAR_4$ x [DF]		0.120 (4)	0.019 (8)			(W/kg)
reported 1g SAR						
reported SAR		**0.12**	**0.02**			(W/kg)

Table 11.1 SAR Scaling – Head – Held to Face 1g

Scaling of Maximum Measured SAR (1g)							
Measured Parameters		Configuration					
		Face	Face				
Plot ID		F60Z	F63Z				
Maximum Measured SAR_M		0.353	0.073				(W/kg)
Frequency		2437	2440				(MHz)
Drift	Power Drift	-0.200	0.290 (13)				(dB)
Conducted Power		15.660	10.540				(dBm)
DC	Transmiter Duty Cycle	(10)	(14)				(%)
DF	Use Duty Factor	100.0 (11)	100.0 (15)				(%)
Fluid Deviation from Target							
Δe	Permitivity	-6.11%	-6.07%				
Δσ	Conductivity	7.16%	7.82%				

Fluid Sensitivity Calculation (1g)		IEC/IEEE 62209-1528 7.8.2					
Delta SAR = Ce * Δe + Cσ * Δσ						(8)	
$Ce = (-0.0007854*f^3) + (0.009402*f^2) - (0.02742*f) - 0.2026$						(9)	
$Cσ = (0.009804*f^3) - (0.08661*f^2) + (0.02981*f) + 0.7829$						(10)	
f	Frequency (GHz)	2.437	2.44				
Ce		-0.225	-0.225				
Cσ		0.483	0.482				
Ce * Δe		0.014	0.014				
Cσ * Δσ		0.035	0.038				
ΔSAR		0.048 (9)	0.051 (12)				(%)

Manufacturer's Tuneup Tolerance					
Measured Conducted Power	15.660	10.540			(dBm)
Rated Conducted Power	16.000	10.750			(dBm)
ΔP	-0.340	-0.210			(dB)

Transmitter Duty Cycle [Crest Factor]					
Transmiter Duty Cycle (DC)	100.0	100.0			(%)
CF (1/DC)	1.00 (10)	1.00 (14)			

SAR Adjustment for Fluid Sensitivity					
$SAR_1 = SAR_M$ X [ΔSAR]	0.353 (9)	0.073 (12)			(W/kg)

SAR Adjustment for Tuneup Tolerance					
$SAR_2 = SAR_1 + [ΔP]$	**0.382**	**0.077**			(W/kg)

SAR Adjustment for Drift					
$SAR_3 = SAR_2 + [Drift]$	**0.400**	0.077 (13)			(W/kg)

SAR Adjustment for Transmitter Duty Cycle [Crest Factor]					
$SAR_4 = SAR_3$ x [CF]	0.400 (10)	0.077 (14)			(W/kg)

SAR Adjustment for Use Duty Factor					
$SAR_5 = SAR_4$ x [DF]	0.400 (11)	0.077 (15)			(W/kg)

reported 1g SAR					
reported SAR	**0.40**	**0.08**			(W/kg)

NOTES to Table
Scaling of the Maximum Measured SAR is based on the highest Face, Body, Extremity and/or Head SAR measured of ALL test channels, configurations and accessories used during THIS evaluation. The Measured Fluid Deviation parameters, Drift, Conducted Power, Duty Cycle [Crest] and Use Duty Factor apply only to those test frequencies and configurations producing the highest SAR. The *reported* SAR is the accumulation of all SAR Adjustments from the applicable steps above. The Plot ID is for identification of the SAR Measurement Plot(s) in the Annexes of this report. NOTE: The above adjustments have been applied to ALL Measured SAR values. In some cases, the highest Measure SAR may not have produced the highest *reported* SAR after all adjustments have been made. NOTE: Some of the above adjustments may not be applicable to each configuration. They are identified by grayed fields.
SAR_1 Per IEC/IEEE 62209-1528, FCC KDB 865664, ISED RSS-102 and ISED Notice 2012-DRS0529, SAR adjustment is applied when the calculated ΔSAR, resulting from the equations indicated, is negative (-). ΔSAR is given as a percentage (%). The SAR is MULTIPLIED by this scaling factor only when the scaling factor is negative (-).
SAR_2 Per IEC/IEEE 62209-1528, FCC KDB 865664 and ISED RSS-102, adjustment is required only when the difference (ΔP) between the Measured Conducted Power and the Manufacturer's Rated Conducted Power is (-) Negative. ΔP is given in dB. The absolute value of ΔP is ADDED (logarithmically) to the SAR when ΔP is negative (-).
SAR_3 Per IEC/IEEE 62209-1528, FCC KDB 865664 and ISED RSS-102, adjustment is required only when Measured Drift is negative (-). The absolute value of Measured Drift is ADDED (logarithmically) to the SAR. Drift is given in dB. The absolute value of Drift is ADDED (logarithmically) to the SAR when Drift is negative (-).
SAR_4 Per IEC/IEEE 62209-1528, FCC KDB 865664 and ISED RSS-102, when the transmit Duty Cyle (DC) is less than 100%, the *reported* SAR must be scaled to 100% by the Crest Factor (CF). CF = 1/DC where DC is in decimal. CF is given as a decimal. The SAR is MULTIPLIED by this scaling factor only when the scaling factor is greater than 1.
SAR_5 Use Duty Factor applies to Push-To-Talk (PTT) transceivers or other devices whereby the user has some control of the transmitter on-off period. Per IEC/IEEE 62209-1528, FCC KDB 447498, FCC KDB 643646 and ISED RSS-102, a Duty Factor (DF) of 50% may be applied. In cases where Voice Activated transmit is employed, a DF of 75% may be applied. DF is given as a percentage (5). The SAR is MULTIPLIED by this scaling factor only when the scaling factor is less than 100%.
***reported* SAR** The *reported* SAR is the Maximum SAR after all applicable adjustments have been made and is indicated on the cover page of this report.

Note (1): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529
Note (2): Crest Factor = 1 (100% Duty Cycle), Crest Factor Adjustment not Required.
Note (3): Use Duty Factor is 100%. No Duty Factor Correction applied.
Note (4): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529
Note (5): Power Drift is Positive, Drift Adjustment not Required.
Note (6): Crest Factor = 1 (100% Duty Cycle), Crest Factor Adjustment not Required.
Note (7): Use Duty Factor is 100%. No Duty Factor Correction applied.

12.0 SAR EXPOSURE LIMITS

Table 12.0 Exposure Limits

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

13.0 DETAILS OF SAR EVALUATION

13.0 Day Log

DAY LOG								
Date	Ambient Temp (° C)	Fluid Temp (° C)	Relative Humidity (%)	Barometric Pressure (kPa)	Fluid Dielectric	SPC	Test	Task
22 Jun 2024	22.5	23.0	39%	101.1	x	x	x	2450 Head TSL

*Per IEC/IEEE 62209-1528, test series was started within 24 hours of Fluid Parameter Measurement

13.1 DUT Setup and Configuration

DUT Setup and Configuration	
1	The device was evaluated for Extremity at a 0mm distance, for Head (held-to-face) at a 10mm distance, from a flat phantom filled with head tissue-equivalent medium. The DUT was evaluated for SAR in accordance with the procedures as described in FCC KDB 447498, 248227, 865664 and IEC/IEEE 62209-1528.
2	2.4GHz 802.11g/n OFDM SAR Test Exclusion As Per KDB 248227 D01v02r02 - 5.2.2, b) When the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2W/kg When applying this formula to 10-g, the threshold should be multiplied by 2.5, i.e. when 10-g extremity SAR s considered the threshold adjusted SAR is ≤ 3.0W/kg Maximum 802.11g/n OFDM specified power(POFDM)= 16.0dBm (39.8mW) Maximum 802.11b DSSS specified power (PDSSS)= 16.0dBm (39.8mW) Ratio OFDM/DSSS power = 100% Highest reported SAR (SARMAX)= 0.40W/kg POFDM/PDSSS X SARMAX = 0.40W/kg ≤ 3.0 W/kg (Extremity) and ≤ 1.5 W/kg (Body) and SAR test exclusion applies.
3	The Device was capable of transmitting at various modulations, data rates and duty cycles. The Conducted Power was highest when measured in DSSS Mode-5.5 Mbps at 100% Duty cycle than any other configuration in the 2.4GHz Band. The DUT was evaluated for SAR at the maximum conducted output power level, preset by the manufacturer.
4	Bluetooth was evaluated for SAR in BT BR (GFSK) mode with a transmit duty cycle of 100% in the worst-case configuration from the WiFi test evaluation.The Duty cycle could not be altered in test mode or by the user. The DUT was evaluated for SAR at the maximum conducted output power level, preset by the manufacturer.
5	Each SAR evaluation was performed with a fully charged battery.

13.2 DUT Positioning

DUT Positioning
Positioning
The DUT Positioner was securely fastened to the Phantom Platform. Registration marks were placed on the DUT and the Positioner to ensure consistent positioning of the DUT for each test evaluation.
FACE Configuration
Head SAR - (held- to-face). Devices that are designed to be near extremity and may operate with in a mode for voice communication, with the device positioned next to the mouth. When next-to-mouth SAR evaluation is required, the device is positioned at 10mm from a flat phantom filled with head tissue-equivalent medium.
BODY Configuration
Devices that are designed to be worn on the Body are positioned on the device holder with the surface of the DUT being 5mm from bottom of the phantom in the Body configuration.
HEAD Configuration
This device is not intended to be held to the ear and was not tested in the HEAD configuration.
LIMB Worn Configuration
Extremity SAR - (limb-worn) Devices that are designed to be near extremity are positioned with the back side directly against the phantom surface with the strap removed or opened to allow direct contact of the DUT to the phantom surface.

13.3 General Procedures and Report

a

General Procedures and Reporting
General Procedures
The fluid dielectric parameters of the Active Tissue Simulating Liquid (TSL) were measured as described in this Section, recorded and entered into the DASY Measurement Server. Active meaning the TSL used during the SAR evaluation of the DUT. The temperature of the Active TSL was measured and recorded prior to performing a System Performance Check (SPC). An SPC was performed with the Active TSL prior to the start of the test series. The temperature of the Active TSL was measured throughout the day and the Active TSL temperature was maintained to ± 0.5°C. The Active TSL temperature was maintained to within ±1.0°C throughout the test series. TSL analysis and SPC were repeated when the Active TSL use exceeded 84 hours. An Area Scan exceeding the length and width of the DUT projection was performed and the locations of all maximas within 2dB of the Peak SAR recorded. A Zoom Scan centered over the Peak SAR location(s) was performed and the 1g and 10g SAR values recorded. The resolutions of the Area Scan and Zoom Scan are described in the Scan Resolution table(s) in this Section. A Power Reference Measurement was taken at the phantom reference point immediately prior to the Area Scan. A Power Drift measurement was taken at the phantom reference point immediately following the Zoom Scan to determine the power drift. A Z-Scan from the *Maximum Distance to Phantom Surface* to the fluid surface was performed following the power drift measurement.
Reporting
Where appropriate 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 or compensated for a 100% transmit duty cycle. A duty cycle compensation (crest factor) and fluid sensitivy scaling factor is shown, as well as other information such as transmit channel and frequency, modulation, accessories tested and DUT-phantom separation distance. In the Scaling of Maximum Measured SAR Section of this report, the highest measured SAR in the BODY and/or FACE and/or EXTREMITY (limb-worn) configurations, within the entire scope of this assessment, are, when applicable, scaled for Fluid Sensitivity, Manufacturer's Tune-Up Tolerance, Simultaneous Transmission and Drift. With the exception of Duty Cycle correction/compensation, SAR values are ONLY scaled up, not down. The final results of this scaling is the *reported SAR* which appears on the Cover Page of this report.

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\IEE 62209-1528 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 IEC\IEEE 62209-1528 "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**
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**
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**
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 SAR MEASUREMENT VARIABILITY & UNCERTAINTY

Table 14.1 Measurement Variability

Per FCC KDB Publication 865664, SAR measurement variability is not required to be assessed for each frequency band where all measured SAR values are <0.8 W/kg for 1g and < 2.0 W/kg for 10g.

Table 14.2 Measurement Uncertainty

Per FCC KDB 865664 when the highest measured SAR is <1.5 W/kg for 1 g and < 3.75 W/kg for 10g all frequency bands, the extensive SAR measurement uncertainty analysis tables described in IEEE std 1528-2013 are not required.

15.0 FLUID DIELECTRIC PARAMETERS

Table 15.0 Fluid Dielectric Parameters 2450MHz HEAD TSL

FLUID DIELECTRIC PARAMETERS								Fluid Sensitivity Calculation IEC/IEEE 62209-1528 7.8.2			
Date: 22-Jun-2024		Fluid Temp: 23C		Frequency: 2450MHz		Tissue: Head		ΔSAR	ΔSAR	SAR Correction Factor (1)	
Freq (MHz)		Test ε	Test σ (S/m)	Target ε	Target σ (S/m)	Deviation Permittivity	Deviation Conductivity	1g	10g	1g	10g
2410.0000		36.7800	1.8400	39.2700	1.76	-6.34%	4.55%	0.036	0.022	1.000	1.000
2412.0000	*	36.7980	1.8440	39.2660	1.76	-6.29%	4.65%	0.037	0.022	1.000	1.000
2420.0000		36.8700	1.8600	39.2500	1.77	-6.06%	5.08%	0.038	0.023	1.000	1.000
2430.0000		36.8100	1.8800	39.2400	1.78	-6.19%	5.62%	0.041	0.025	1.000	1.000
2437.0000	*	36.8310	1.9150	39.2260	1.79	-6.11%	7.16%	0.048	0.028	1.000	1.000
2440.0000	*	36.8400	1.9300	39.2200	1.79	-6.07%	7.82%	0.051	0.030	1.000	1.000
2450.0000		36.8800	1.9100	39.2000	1.80	-5.92%	6.11%	0.043	0.025	1.000	1.000
2460.0000		36.8500	1.9100	39.1900	1.81	-5.97%	5.52%	0.040	0.024	1.000	1.000
2462.0000	*	36.8740	1.9080	39.1860	1.81	-5.90%	5.30%	0.039	0.023	1.000	1.000
2470.0000		36.9700	1.9000	39.1700	1.82	-5.62%	4.40%	0.034	0.020	1.000	1.000
2472.0000	*	36.9440	1.9020	39.1680	1.82	-5.68%	4.39%	0.034	0.020	1.000	1.000
2480.0000		36.8400	1.9100	39.1600	1.83	-5.92%	4.37%	0.034	0.021	1.000	1.000

*Channel Frequency Tested

16.0 SYSTEM VERIFICATION TEST RESULTS

Table 16.0 System Verification Results 2450MHz HEAD TSL

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
22 Jun 2024		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	23.0	23	39%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
36.24	39.20	-7.55%	1.93	1.80	7.22%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
14.10	13.50	4.44%	6.36	6.32	0.63%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
54.83	52.50	4.44%	25.06	24.90	0.63%

Prior to the SAR evaluations, system checks were performed on the planar section of the phantom and a SPEAG validation dipole in accordance with the procedures described in IEC/IEEE 62209-1528 and FCC KDB 865664,

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 17.0 System Validation Summary

SAR Validation Summary Chart							
Validation Date	Probe Model	Probe S/N	Validation Source	Frequency (MHz)	Validation Results		
					Linearity	Isotropy	Extrapolation
	✓ = Complete				✓ = Not Required		
30-May-24	EX3DV4	7826	D2450V2	2450	Pass	Pass	Pass

18.0 MEASUREMENT SYSTEM SPECIFICATIONS

Table 18.0 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.	7826
Construction	Triangular core fiber optic detection system
Frequency	10 MHz to 6 GHz
Linearity	±0.2 dB (30 MHz to 3 GHz)
Phantom	
Type	MFP V5.1C Planar Phantom
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	> 8 Liter

Table 18.1

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 (e.g. DGBE)
Calibration:	ISO/IEC 17025
Frequency:	4 MHz - 10 GHz; Linearity: ± 0.2 dB (30 MHz - 10 GHz)
Directivity:	± 0.1 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)
Dynamic Range:	10 μW/g to > 100 mW/g; Linearity: ± 0.2 dB (noise: typically <1 mW/g)
Dimensions:	Overall length: 337 mm; (tip: 20 mm) Tip diameter: 2.5 mm; Tip (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
Application:	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields); the only probe that enables compliance testing for frequencies up to 6 GHz with precision of better than 30%

EX3DV4 E-Field Probe

Phantom Specification

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

ELI Phantom

Phantom Specification

The SAM V4.0 phantom is a flat 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, IEC\IEEE 62209-1528.

SAM Phantom

Phantom Specification

The MFP V5.1C phantom is a flat 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, IEC\IEEE 62209-1528.

MFP 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 19.0 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	13-May-24	13-May-25
-EX3DV4 E-Field Probe	00357	7826	15-May-24	15-May-25
-D2450V2 Validation Dipole	00219	825	15-May-24	15-May-25
ELI Phantom	00247	1234	CNR	CNR
SAM Phantom	00154	1033	CNR	CNR
MFP Phantom	00355	1177/2	CNR	CNR
HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
Gigatronics 8652A Power Meter	00007	1835801	10-May-22	10-May-25
Gigatronics 80701A Power Sensor	00186	1837002	COU	COU
Gigatronics 80334A Power Sensor	00237	1837001	10-May-22	10-May-25
HP 8753ET Network Analyzer	00134	US39170292	6-Jan-24	6-Jan-27
Rohde & Schwarz SMR20 Signal Generator	00006	100104	COU	COU
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
Bipolar Power Supply 6299A	00086	1144A02155	CNR	CNR
DC-18G 10W 30db Attenuator	00102	-	COU	COU
R&S FSP40 Spectrum Analyzer	00241	100500	9-Aug-21	9-Aug-24
HP 8566B Spectrum Analyzer	00051	2747A055100	6-Jul-24	6-Jul-27
RF Cable-SMA	00311	-	CNR	CNR
HP Calibration Kit	00145	-	CNR	CNR

CNR = Calibration Not Required
SB=Stand By
COU = Calibrate on Use

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

20.0 FLUID COMPOSITION

Table 20.0 Fluid Composition 2450MHz HEAD TSL

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

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

END OF REPORT

APPENDIX A – SYSTEM VERIFICATION PLOTS

DUT: D2450V2 - SN825; Type: D2450V2; Serial: SN825
Procedure Name: SPC 2450H_Input=250mw, 1gTarget=[12.15]13.5][14.85]W/kg 10g Target=[5.68][6.32][6.95] 2 2 2

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.91 S/m; ε_r = 36.88; ρ = 1000 kg/m^3
Phantom section: Left Section

Date/Time: 6/22/2024 12:57:01 PM

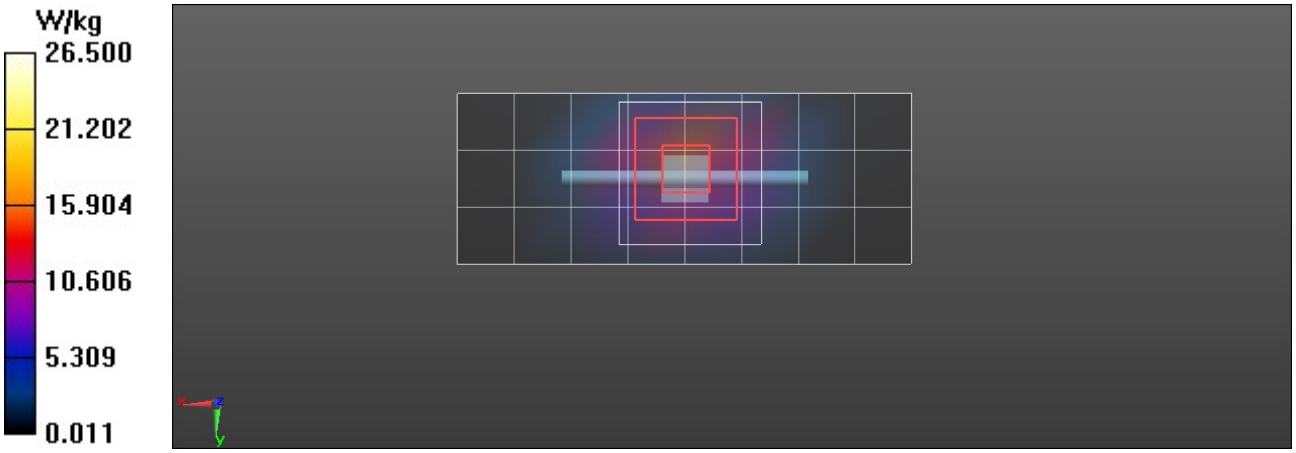
DASY5 Configuration:

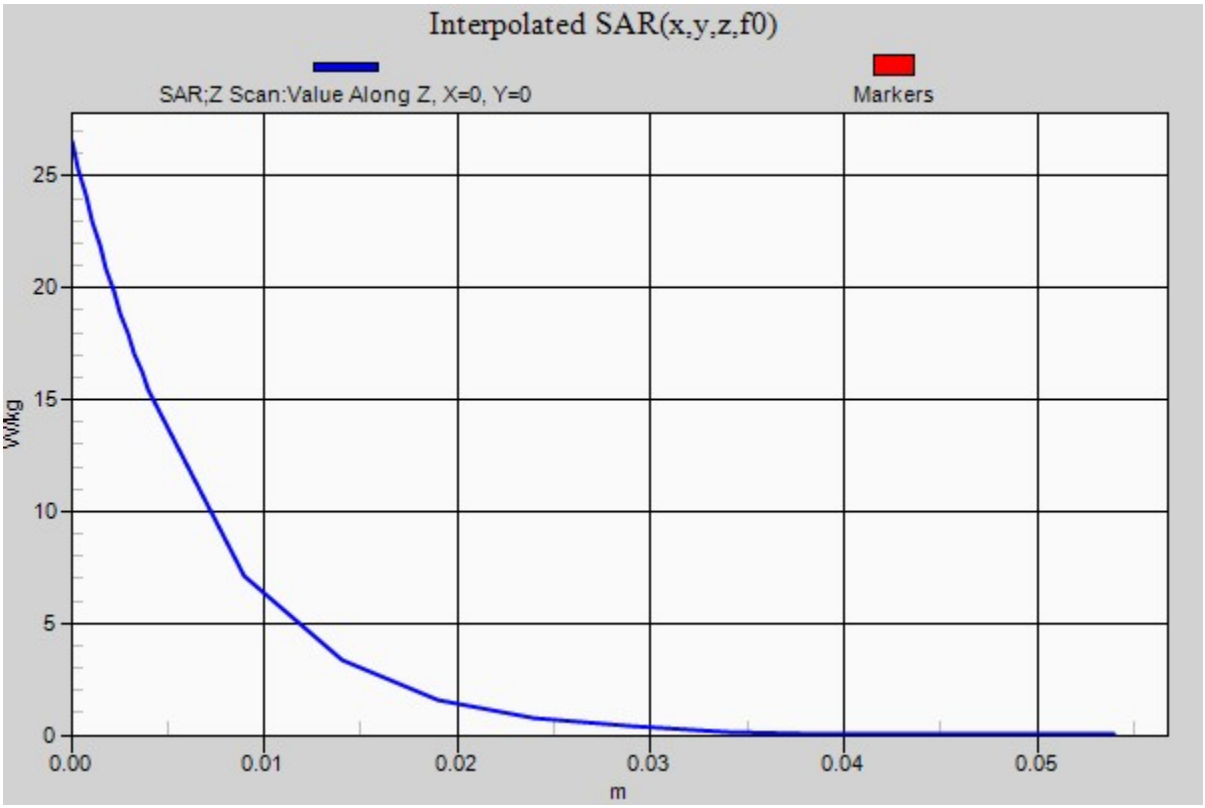
- Probe: EX3DV4 - SN7826; ConvF(7.5, 7.2, 7.38) @ 2450 MHz; Calibrated: 5/15/2024
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 5/13/2024
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: xxxx
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

SPC/SPC 2450H_Input=250mw, 1gTarget=[12.15]13.5][14.85]W/kg 10g Target=[5.68][6.32][6.95] 2 2 2/Area Scan (9x4x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 14.6 W/kg

SPC/SPC 2450H_Input=250mw, 1gTarget=[12.15]13.5][14.85]W/kg 10g Target=[5.68][6.32][6.95] 2 2 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.88 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 31.3 W/kg
SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.36 W/kg
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 45.8%
Maximum value of SAR (measured) = 15.8 W/kg

SPC/SPC 2450H_Input=250mw, 1gTarget=[12.15]13.5][14.85]W/kg 10g Target=[5.68][6.32][6.95] 2 2 2/Z Scan (1x1x22): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 6.632 (6.491, 6.697) [mm]
Maximum value of SAR (interpolated) = 26.5 W/kg


W/kg
26.500
21.202
15.904
10.606
5.309
0.011


Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
25
20
15
10
5
0
0.00
0.01
0.02
0.03
0.04
0.05
m

APPENDIX B – MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

E60/E60Z

DUT: A04862; Type: Extremity Worn Transmitter; Serial: 473001421
Procedure Name: E60-A04862, Extremity-Back Side, 2437 MHz,B3 Nylon Band, WIFI, CCK-1Mbps

Communication System: UID 0, CW (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.915 S/m; ε_r = 36.831; ρ = 1000 kg/m^3
Phantom section: Left Section

Date/Time: 6/22/2024 1:29:23 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN7826; ConvF(7.5, 7.2, 7.38) @ 2437 MHz; Calibrated: 5/15/2024
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 5/13/2024
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1177/2
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

2450H/E60-A04862, Extremity-Back Side, 2437 MHz,B3 Nylon Band, WIFI, CCK-1Mbps/Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm

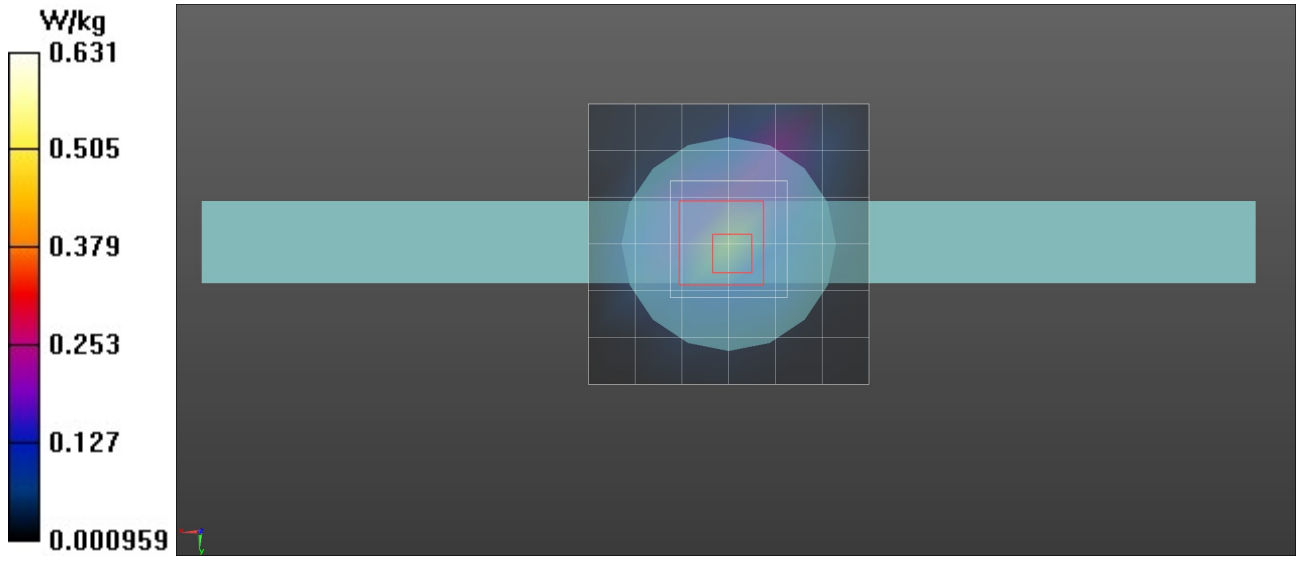
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.469 W/kg

2450H/E60-A04862, Extremity-Back Side, 2437 MHz,B3 Nylon Band, WIFI, CCK-1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.23 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.650 W/kg
SAR(1 g) = 0.285 W/kg; SAR(10 g) = 0.111 W/kg
Smallest distance from peaks to all points 3 dB below = 6.4 mm
Ratio of SAR at M2 to SAR at M1 = 51.9%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.368 W/kg

2450H/E60-A04862, Extremity-Back Side, 2437 MHz,B3 Nylon Band, WIFI, CCK-1Mbps/Z Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=20mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = n/a (n/a, 7.208) [mm]
Maximum value of SAR (interpolated) = 0.631 W/kg



F60/F60Z

DUT: A04862; Type: Extremity Worn Transmitter; Serial: 473001421
Procedure Name: F60- A04862, Face - Front Side, 10mm, 2437 MHz, B1, WIFI, CCK-1Mbps

Communication System: UID 0, CW (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.915 S/m; ε_r = 36.831; ρ = 1000 kg/m^3
Phantom section: Left Section

Date/Time: 6/22/2024 2:11:57 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN7826; ConvF(7.5, 7.2, 7.38) @ 2437 MHz; Calibrated: 5/15/2024
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 5/13/2024
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 1177/2
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

2450H/F60- A04862, Face - Front Side, 10mm, 2437 MHz, B1, WIFI, CCK-1Mbps/Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.364 W/kg

2450H/F60- A04862, Face - Front Side, 10mm, 2437 MHz, B1, WIFI, CCK-1Mbps/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.51 V/m; Power Drift = -0.20 dB
Peak SAR (extrapolated) = 0.662 W/kg
SAR(1 g) = 0.353 W/kg; SAR(10 g) = 0.167 W/kg
Smallest distance from peaks to all points 3 dB below = 10.4 mm
Ratio of SAR at M2 to SAR at M1 = 53.5%

Info: Interpolated medium parameters used for SAR evaluation.

Warning: Maximum averaged SAR over 10 g is located on the boundary of the measurement cube. This cube might not incorporate the absolute averaged SAR. Please consider a refinement of the Area Scan measurement.
Maximum value of SAR (measured) = 0.397 W/kg

2450H/F60- A04862, Face - Front Side, 10mm, 2437 MHz, B1, WIFI, CCK-1Mbps/Z Scan (1x1x17): Measurement grid: dx=20mm, dy=20mm, dz=20mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = n/a (n/a, 7.600) [mm]
Maximum value of SAR (interpolated) = 0.532 W/kg