Test Report Serial Number:	45461765 R2.0
Test Report Date:	20 December 2022
Project Number:	1603

SAR Test Report - New Certification

Applicant:

Maximum Reported 10g SAR			
Extremity (wrist)	Wifi (DTS)	0.25	W/kg
	BT/BLE (DSS)	<0.1	
General Pop. Limit:		4.00	

Garmin International Inc.

1200 East 151 St.
Olathe, KS, 66062
USA

FCC ID:	ISED Registration Number
IPH-04578	
Product Model Number / HVIN	Product Name / PMN
A04578	A04578

In Accordance With:

FCC 47 CFR §2.1093

Radiofrequency Radiation Exposure Evaluation: Portable Devices

Approved By:

Ben Hewson, President
Celltech Labs Inc.
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Canada

Test Lab Certificate: 2470.01

IC Registration 3874A

FCC Registration: CA3874

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1.0 DOCUMENT CONTROL

Revision History					
Samples Tested By:	Trevor Whillock/ Ben Hewson		**Date(s) of Evaluation:**	19 & 20 Sep 2022	
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	24 November 2022
1.0	Initial Release		n/a	Art Voss	6 December 2022
2.0	Revised Rated Power		2, 7	Art Voss	20 December 2022

2.0 CLIENT AND DEVICE INFORMATION

Client Information		
Applicant Name	**Garmin International Inc.**	
Applicant Address	1200 East 151 St	
	Olathe, KS, 66062	
	USA	
DUT Information		
Device Identifier(s):	**FCC ID:**	**IPH-04578**
	ISED ID:	
Device Model(s) / HVIN:	A04578	
Device Marketing Name / PMN:	A04578	
Test Sample Serial No.:	3361277594 - Conducted, 3361277722 - OTA	
Device Type:	Extremity Worn Digital 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): 18.60dBm	
	BlueTooth - Spread Spectrum Transmitter (DSS): 9.50dBm	
	BLE/ANT - Low Power Communication Device Transmitter (DXX): 2.80dBm	
	NFC - Low Power Communication Device Transmitter (DXX): -36dBm	
Antenna Type and Gain:	-3.6dBi Max	
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:	3VDC Rechargeable Li-Ion	
DUT Dimensions [LxWxH]	H x W x D: 65mm dia x 4.5mm	
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.

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

The A04578, FCC ID: IPH-04578, is a wrist-worn transceiver that is capable of operating in the 2.4GHz WiFi and Bluetooth frequency bands and has an additional NFC feature that operates at a fixed transmit frequency of 13.56MHz. The device is not capable of simultaneous transmission between transmitters. 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.

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
IEC International Standard /IEEE International Committee on Electromagnetic Safety IEC/IEEE 62209-1528-2020:	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)
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 248227 D01v02r02	SAR Test Guidane 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.	A04578	
Standard(s) Applied:	**Measurement Procedure(s):**	
FCC 47 CFR §2.1093	FCC KDB 865664, FCC KDB 447498, FCC KDB 248227 IEEE Standard 1528-2013, IEC 62209-2	
Reason For Issue:	**Use Group:**	**Limits Applied:**
[x] New Certification	[x] General Population / Uncontrolled	[ ] 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:**
		September 19 & 20, 2022

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.

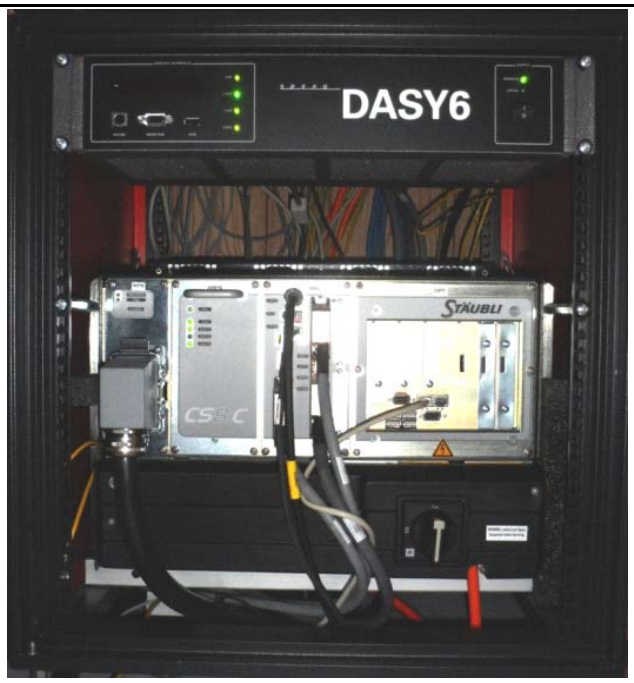
I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel 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.	 Trevor Whillock Test Lab Engineer Celltech Labs Inc. 2 November 2022 Date

6.0 SAR MEASUREMENT SYSTEM

SAR Measurement System

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

DASY 6 SAR System with SAM Phantom



DASY 6 Measurement Controller

7.0 RF CONDUCTED POWER MEASUREMENT

Table 7.0 Conducted Power Measurements

A04578-Conducted Power Measurements-Average										
Channel	Frequency (MHz)	Measured Power (dBm)	Max* Rated Power (dBm)	Max* Rated Power (W)	Delta (dB)	SAR Test Channel (Y/N)	Mode	BW (MHz)	Modulation	
6	2437	18.30					WLAN 2.4G	20	DSSS-1Mbps	802.11b
		18.34							DSSS-2Mbps	
		18.56							DSSS-5.5Mbps	
		18.31							DSSS-11Mbps	
1	2412	15.76	18.60	0.07	-2.84	-			DSSS-5.5Mbps	
6	2437	18.56	18.60	0.07	-0.04	Y				
11	2462	15.47	18.60	0.07	-3.13	-				
6	2437	15.84							OFDM-6Mbps	802.11g
		15.79							OFDM-9Mbps	
		16.08							OFDM-12Mbps	
		13.90							OFDM-36Mbps	
		13.03							OFDM-54Mbps	
1	2412	11.43	16.10	0.04	-4.67	-			OFDM-12Mbps	
6	2437	16.08	16.10	0.04	-0.02					
11	2462	11.01	16.10	0.04	-5.09	-				
6	2437	17.10							MCS-0	802.11n
		16.23							MCS-3	
		11.67							MCS-7	
1	2412	11.19	17.10	0.05	-5.91	-			MCS-0	
6	2437	17.10	17.10	0.05	0.00	-				
11	2462	9.85	17.10	0.05	-7.25	-				

* Including Tune-Up Tolerance

Table 7.1 Conducted Power Measurements

Conducted Power Measurement Results: BlueTooth									
Mode	**Channel Number**	**Frequency (MHz)**	**Modulation**	**Bit Rate (Mbps)**	**Measured Power [P_{Meas}] (dBm)**	**Max* Rated Power *(dBm)***	**Max* Rated Power *(W)***	**Delta (dB)**	**SAR Test Channel (Y/N)**
BT BR	2	2402.00	GFSK	-	8.44	9.10	0.008	-0.66	-
	40	2440.00	GFSK		9.02	9.10	0.008	-0.08	-
	80	2480.00	GFSK		8.89	9.10	0.008	-0.21	-
BT EDR2	2	2402.00	P1/4-DQPSK	2	8.51	9.50	0.009	-0.99	-
	40	2440.00	P1/4-DQPSK		9.21	9.50	0.009	-0.29	-
	80	2480.00	P1/4-DQPSK		9.48	9.50	0.009	-0.02	**Y**
BT EDR3	2	2402.00	8-DPSK	3	7.99	8.80	0.008	-0.81	-
	40	2440.00	8-DPSK		8.45	8.80	0.008	-0.35	-
	80	2480.00	8-DPSK		8.78	8.80	0.008	-0.02	-
BLE1	0	2402.00	GMSK	1	-1.75	2.60	0.002	-4.35	-
	19	2440.00	GMSK		2.59	2.60	0.002	-0.01	-
	39	2480.00	GMSK		-0.43	2.60	0.002	-3.03	-
BLE2	0	2402.00	GMSK	2	-1.76	2.80	0.002	-4.56	-
	19	2440.00	GMSK		2.79	2.80	0.002	-0.01	-
	39	2480.00	GMSK		-0.91	2.80	0.002	-3.71	-
ANT	2	2402.00	GFSK	-	-2.39	2.00	0.002	-4.39	-
	40	2440.00	GFSK		1.80	2.00	0.002	-0.20	-
	80	2480.00	GFSK		-2.39	2.00	0.002	-4.39	-

* Including Tune-Up Tolerance

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 NUMBER OF TEST CHANNELS (N_C)

WiFi SAR Evaluation:

SAR was evaluated in DSSS mode with a sample rate of 5.5 Mbps at a 100% duty cycle. The power level setting selected was specified by the manufacturer to be the max output power and produce the most conservative SAR.

As per FCC KDB 248227, the required 802.11 test channels are Ch 1, Ch 6 and Ch 11.
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.

While 1-g SAR thresholds are specified in the procedures for SAR test reduction and exclusion, these thresholds should be multiplied by 2.5 when 10-g extremity SAR is considered.

2.4 GHz 802.11g/n OFDM SAR Test Exclusion Requirements

a) When KDB Publication 248227 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.

When applying this formula to EU Extremity limits the adjusted SAR is ≤ 1.5W/kg, and for Body limits is ≤ 3.0W/kg.

See 13.1 for details.

BT/BLE/ANT SAR Test Evaluation:

Bluetooth was evaluated for SAR at a transmit duty cycle of 100 % in the worst-case configuration from the WiFi test evaluation.
The duty cycle cannot be altered in test mode or by the user.

General SAR Test Reduction Considerations:

As per KDB 447498D01 4.4.1,

Testing of other required channels within the operating mode of a frequency band is not required when the reported 1-g or 10-g SAR for the mid band or highest output power channel is:

a) ≤ 0.8W/kg or 2.0W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100Mhz

BLE/ANT was not evaluated for SAR.

Per FCC KDB 447498 4.3.1 the BLE/ANT transmitter meets the standalone SAR test exclusion criteria. See section 11.0 for details.

NOTE: This device is not capable of simultaneous transmission between the BT/BLE/ANT and WiFi transmitters.
Due to the nature of this device, WiFi and Bluetooth were evaluated for standalone SAR only.

NFC:

The RFID transmitter is a low power communication device transmitter and does not require standalone SAR evaluation.
Simultaneous transmission evaluation with it and the 802.11b/g/n or BT 802.15 is not required

9.0 ACCESSORIES EVALUATED

Table 9.0 Accessories Evaluated

Manufacturer's Accessory List				
Test Report ID Number	**Manufacturer's Part Number**	**Description**	**SAR Evaluated**	**SAR Tested**
B1	010-13111-02	Silicone Band	**Y**	**Y**
B2	010-12496.20	Metal Band	**Y**	**Y**

10.0 SAR MEASUREMENT SUMMARY

Table 10.0: Measured Results

Measured 10g SAR Results - EXTREMITY Configuration															
Date	Plot ID	Test Frequency (*MHz*)	DUT Configuration					Accessories				DUT Spacing		Measured SAR (*W/kg*)	SAR Drift (*dB*)
			Pos	Mode	BW	Mod	BR	Antenna ID	Battery ID	Body ID	Audio ID	DUT (*mm*)	Antenna (*mm*)		
20 Sep 2022	E55	2437	**Back Side**	**802.11b**	**20**	**DSSS**	**5.5**	-	Li-ion	B1	-	**0**	**0**	0.244	-0.110
20 Sep 2022	E57	2437	**Back Side**	**802.11b**	**20**	**DSSS**	**5.5**	-	Li-ion	B2	-	**0**	**0**	0.179	0.890
20 Sep 2022	E60	2480	**Back Side**	**BT**	**2**	**EDR**	**2**	-	Li-ion	B1	-	**0**	**0**	0.046	-0.060
Applicable SAR Limit								**Use Group**						**Limit**	
FCC 2.1093			**Canada Health Safety Code 6**					**General Population/User Unaware**						**4 W/kg**	

11.0 SCALING OF MAXIMUM MEASURE SAR

Table 11.0 SAR Scaling – Extremity

Scaling of Maximum Measured SAR (10g)					
Measured Parameters		Configuration			
		Extremity- WiFi	Extremity -BT		
Plot ID		E55	E60		
Maximum Measured SAR_M		0.244	0.046		(W/kg)
Frequency		2437	2480		(MHz)
Drift	Power Drift	-0.110	-0.060		(dB)
Conducted Power		18.560	9.480		(dBm)
DC	Transmit Duty Cycle	100.000	100.0		(%)
Fluid Deviation from Target					
Δe	Permitivity	-7.46%	-8.27%		
Δσ	Conductivity	-1.90%	0.00%		

Fluid Sensitivity Calculation (10g)		IEC 62209-2 Annex F			
Delta SAR = Ce * Δe + Cσ * Δσ					(F.1)
$Ce = (0.003456*f^3) - (0.03531*f^2) + (0.07675*f) - 0.186$					(F.4)
$Cσ = (0.004479*f^3) - (0.01586*f^2) - (0.1972*f) + 0.7717$					(F.5)
f	Frequency (GHz)	2.437	2.48		
Ce		-0.159	-0.160		
Cσ		0.262	0.253		
Ce * Δe		0.012	0.013		
Cσ * Δσ		-0.005	0.000		
ΔSAR		0.007 (3)	0.013 (3)		(%)

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

Manufacturer's Tuneup Tolerance				
Measured Conducted Power	18.560	9.480		(dBm)
Rated Conducted Power	18.600	9.500		(dBm)
ΔP	-0.040	-0.020		(dB)

Crest Factor				
Transmit Duty Cycle (DC)	100.000	100.0		(%)
CF (1/DC)	1.000 (5)	1.00 ###		

Note(5): Crest Factor = 1 (100% Duty Cycle), Crest Factor Adjustment not Required.

SAR Adjustment for Fluid Sensitivity				
$SAR_1 = SAR_M$ X [ΔSAR]	0.244	0.046		(W/kg)
SAR Adjustment for Tuneup Tolerance				
$SAR_2 = SAR_1$ + [ΔP]	0.246	0.046		(W/kg)
SAR Adjustment for Drift				
$SAR_3 = SAR_2$ + [Drift]	0.252	0.047		(W/kg)
SAR Adjustment for Crest Factor				
$SAR_4 = SAR_3$ x [CF]	0.252	0.047		(W/kg)
***reported* 10g SAR**				
SAR_4	**0.25**	**0.05**		(W/kg)

The SAR test exclusion threshold for the BLE/ANT transmitter as per FCC KDB 447498 4.3.1 is as follows:

[(*max. power of channel, including tune-up tolerance, mW*) / (*min. test separation distance, mm*)] X [√f(GHz)] ≤ 7.5 for 10-g SAR
[1.9)/(5)] X [√2.441] = 1.237≤ 7.5

Where:
max. power of channel, including tune-up tolerance, mW = 1.9 mW
min. test separation distance, mm = 5mm
f(GHz) = 2.441 GHz

Therefore; the BLE/ANT Transmitter meets the SAR test exclusion criteria.

NOTE: This device is not capable of simultaneous transmission between the BT/BLE/ANT and WiFi transmitters.
Due to the nature of this device, WiFi and Bluetooth were evaluated for standalone SAR only.

The RFID transmitter is a low power communication device transmitter and does not require standalone SAR evaluation. Simultaneous transmission evaluation with it and the 802.11b/g/n or BT 802.15 is not required. When applying this formula to EU Extremity limits the adjusted SAR is ≤ 1.5W/kg, and for Body limits is ≤ 3.0W/kg.

NOTES to Table 11.0
(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.

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
19 Sep 2022	22.4	24.2	34%	101.4	X	X	X	2450H Fluids, SPC & SAR Eval
20 Sep 2022	21.9	21.3	32%	101.4			X	2450H SAR Testing

*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	This device although the intended use is to be wrist-worn with the back side of the device in contact with the human skin. The device was evaluated for Extremity (wrist worn), from a flat phantom filled with head tissue-equivalent medium.The DUT evaluated in combination with accessory P/N: 010-13111-02 was found to be the worst case setup configuration and produced the highest SAR. The DUT was evaluated for SAR in accordance with the procedures described IEC/IEEE 62209-1528, IEC 62209-1, IEC 62209-2, ACMA Radiocommunications and ICNIRP.
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 EU Extremity limits the adjusted SAR is ≤ 1.5W/kg, and for Body limits is ≤ 3.0W/kg. Maximum 802.11g/n OFDM specified power(POFDM)= 16.08 dBm Maximum 802.11b DSSS specified power (PDSSS)= 18.56 dBm Ratio OFDM/DSSS power = -2.48 dBm (56.49%) Highest reported* SAR (SARMAX)= 0.250 W/kg POFDM/PDSSS X SARMAX = 0.14 W/kg ≤ 3.0 W/kg (Extremity) and ≤ 1.5 W/kg (Body) Since the ratio of the ODFM/DSSS specified power is less than one (0dB), the reported SAR would not exceed 3.0 W/kg (Extremity) or 1.5 W/kg (Body) *The reported SAR in this case is the measured SAR adjusted for fluid sensitivity.
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-EDR2 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
Devices that are designed to be worn on the wrist and may operate with in speaker 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
The DUT was securely clamped into the device holder with the surface of the DUT being 2mm 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
The DUT was positioned with the back side directly against the phantom surface with the strap opened to allow direct contact or 0mm of the DUT and watch band to the phantom surface.

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 14.0 Measurement Uncertainty

UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEC/IEEE 62209-1528, 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 IEC/IEEE 62209-1528									

(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

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

Table 14.1 Calculation of Degrees of Freedom

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

15.0 FLUID DIELECTRIC PARAMETERS

Table 15.0 Fluid Dielectric Parameters 2450MHz HEAD TSL

****
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Mon 19/Oct/2022 15:24:05
Freq Frequency(GHz)
FCC_eH FCC OET 65 Supplement C (June 2001) Limits for Head Epsilon
FCC_sH FCC OET 65 Supplement C (June 2001) Limits for Head Sigma
Test_e Epsilon of UIM
Test_s Sigma of UIM
****

Freq	FCC_eH	FCC_sH	Test_e	Test_s
2.3500	39.38	1.71	38.25	1.76
2.3600	39.36	1.72	38.37	1.78
2.3700	39.34	1.73	38.34	1.77
2.3800	39.32	1.74	38.31	1.81
2.3900	39.31	1.75	38.23	1.81
2.4000	39.29	1.76	38.42	1.82
2.4100	39.27	1.76	38.34	1.82
2.4200	39.25	1.77	38.33	1.84
2.4300	39.24	1.78	38.28	1.84
2.4400	39.22	1.79	38.25	1.84
2.4500	39.20	1.80	38.06	1.84
2.4600	39.19	1.81	38.20	1.87
2.4700	39.17	1.82	38.13	1.87
2.4800	39.16	1.83	38.06	1.89
2.4900	39.15	1.84	37.99	1.91
2.5000	39.14	1.85	38.15	1.91
2.5100	39.12	1.87	38.06	1.94
2.5200	39.11	1.88	38.11	1.95
2.5300	39.10	1.89	37.96	1.92
2.5400	39.09	1.90	37.83	1.95
2.5500	39.07	1.91	37.92	1.98

FLUID DIELECTRIC PARAMETERS

Date:	19 Sep 2022	Fluid Temp:	24.2	Frequency:	2450MHz	Tissue:	Head

Freq (MHz)		Test_e	Test_s	Target_e	Target_s	Deviation Permittivity	Deviation Conductivity
2350.0000		36.5000	1.7000	39.3800	1.71	-7.31%	-0.58%
2360.0000		36.4900	1.6800	39.3600	1.72	-7.29%	-2.33%
2370.0000		36.6500	1.6800	39.3400	1.73	-6.84%	-2.89%
2380.0000		36.4700	1.6800	39.3200	1.74	-7.25%	-3.45%
2390.0000		36.3400	1.6900	39.3100	1.75	-7.56%	-3.43%
2400.0000		36.5000	1.7000	39.2900	1.76	-7.10%	-3.41%
2410.0000		36.2700	1.6900	39.2700	1.76	-7.64%	-3.98%
2420.0000		36.2300	1.7300	39.2500	1.77	-7.69%	-2.26%
2430.0000		36.3000	1.7600	39.2400	1.78	-7.49%	-1.12%
2437.0000	*	36.3000	1.7530	39.2260	1.79	-7.46%	-1.90%
2440.0000		36.3000	1.7500	39.2200	1.79	-7.45%	-2.23%
2450.0000		36.1000	1.7600	39.2000	1.80	-7.91%	-2.22%
2460.0000		36.0800	1.8000	39.1900	1.81	-7.94%	-0.55%
2470.0000		36.2400	1.8100	39.1700	1.82	-7.48%	-0.55%
2480.0000	*	35.9200	1.8300	39.1600	1.83	-8.27%	0.00%
2490.0000		36.0500	1.8300	39.1500	1.84	-7.92%	-0.54%
2500.0000		36.0000	1.8400	39.1400	1.85	-8.02%	-0.54%
2510.0000		35.9500	1.8500	39.1200	1.87	-8.10%	-1.07%
2520.0000		35.8800	1.8500	39.1100	1.88	-8.26%	-1.60%
2530.0000		35.8700	1.8700	39.1000	1.89	-8.26%	-1.06%
2540.0000		35.6300	1.8800	39.0900	1.90	-8.85%	-1.05%
2550.0000		35.6500	1.8900	39.0700	1.91	-8.75%	-1.05%

*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
19 Sep 2022		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	24.2	22	34%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
36.10	39.20	-7.91%	1.76	1.80	-2.22%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
13.80	13.18	4.70%	6.25	6.01	4.08%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
55.20	52.72	4.71%	25.00	24.02	4.10%

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

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

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

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

17.0 SYSTEM VALIDATION SUMMARY

Table 17.0 System Validation Summary

SAR Validation SummaryChart							
Validation Date	Validation Source	Source S/N	Validation Frequency	Tissue	Linearity	Isotropy	Extrapolation
3-May-22	D2450V2	825	2450	Head	✓	✓	✓

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.	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

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

EX3DV4 E-Field Probe

Phantom Specification

The ELI V5.0 phantom is an elliptical planar fiberglass shell phantom with a shell thickness of 2.0mm +/- .2mm at the planar area. This phantom conforms to OET Bulletin 65, Supplement C, IEC/IEEE 62209-1528, 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 19.0 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	14-Apr-22	14-Apr-23
-EX3DV4 E-Field Probe	00213	3600	20-Apr-22	20-Apr-23
-CLA 30 Validation Dipole	00300	1005	18-Mar-20	18-Mar-23
-CLA150 Validation Dipole	00251	4007	18-Mar-20	18-Mar-23
-D450V3 Validation Dipole	00221	1068	27-Apr-21	27-Apr-24
-D835V2 Validation Dipole	00217	4D075	27-Apr-21	27-Apr-24
-D900V2 Validation Dipole	00020	54	16-Mar-20	16-Mar-23
ALS-D-01640-S-2	00299	207-00102	15-Dec-20	15-Dec-23
-D1800V2 Validation Dipole	00222	247	16-Mar-20	16-Mar-23
-D1900V2 Validation Dipole	00218	5d107	16-Mar-20	16-Mar-23
-D2450V2 Validation Dipole	00219	825	24-Apr-21	24-Apr-24
-D5GHzV2 Validation Dipole	00126	1031	27-Apr-21	27-Apr-24
ELI Phantom	00247	1234	CNR	CNR
SAM Phantom	00154	1033	CNR	CNR
HP 85070C Dielectric Probe Kit	00033	none	CNR	CNR
HP 8753ET Network Analyzer	00134	US39170292	6-Jan-21	6-Jan-24
Rohde & Schwarz SMR20 Signal Generator	00006	100104	11-Aug-20	11-Aug-23
Amplifier Research 10W1000C Power Amplifier	00041	27887	CNR	CNR
Amplifier Research 5S1G4 Power Amplifier	00106	26235	CNR	CNR
Narda Directional Coupler 3020A	00064	-	CNR	CNR
Kangaroo VWR Humidity/Thermometer	00334	192385455	5-Aug-19	6-Aug-22
Digital Multi Meter DMR-1800	00250	TE182	23-Jun-20	23-Jun-23
Bipolar Power Supply 6299A	00086	1144A02155	CNR	CNR
DC-18G 10W 30db Attenuator	00102	-	COU	COU
R&S FSP40 Spectrum Analyzer	00241	100500	9-Aug-21	9-Aug-24
HP 8566B Spectrum Analyzer	00051	2747A055100	29-Jun-20	29-Jun-23
RF Cable-SMA	00311	-	CNR	CNR
HP Calibration Kit	00145	-	CNR	CNR

CNR = Calibration Not Required

COU = Calibrate on Use

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

Table 20.0

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

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

APPENDIX A – SYSTEM VERIFICATION PLOTS

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:825
Procedure Name: SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg 1G target = 52.719 2 2

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.76 S/m; ε_r = 36.1; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 9/19/2022 11:39:45 AM

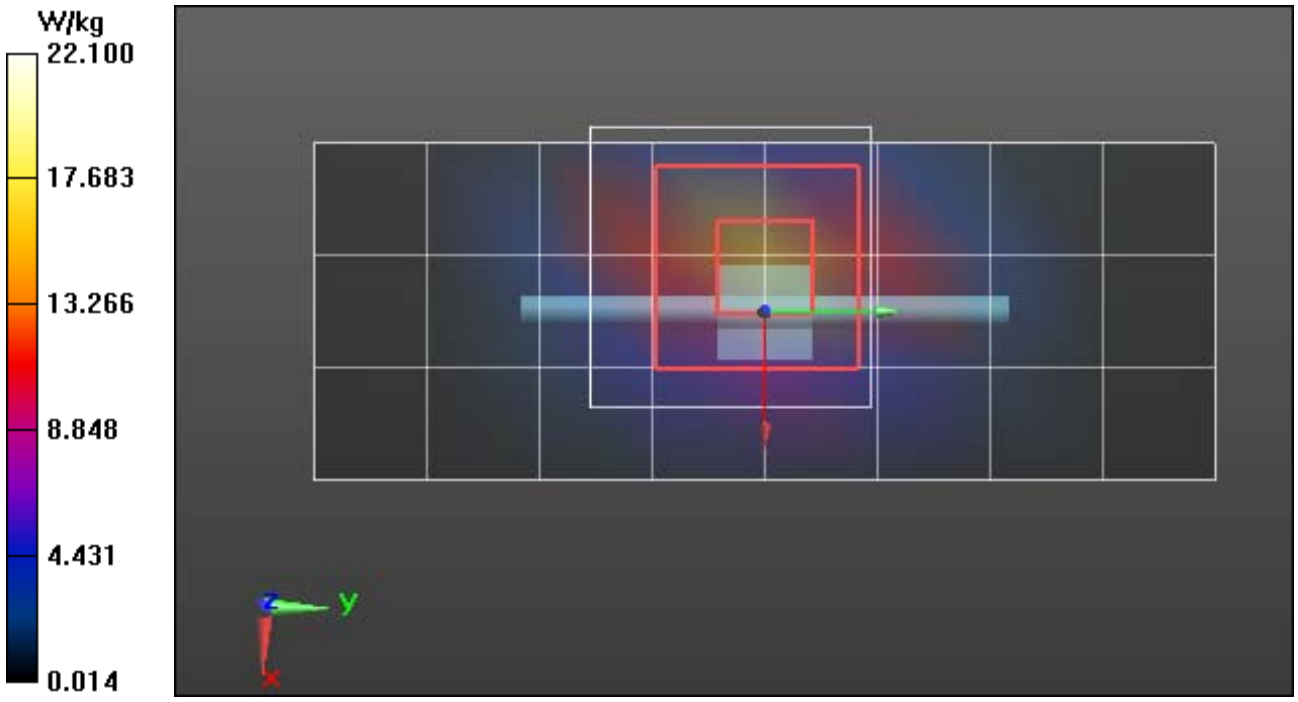
DASY5 Configuration:

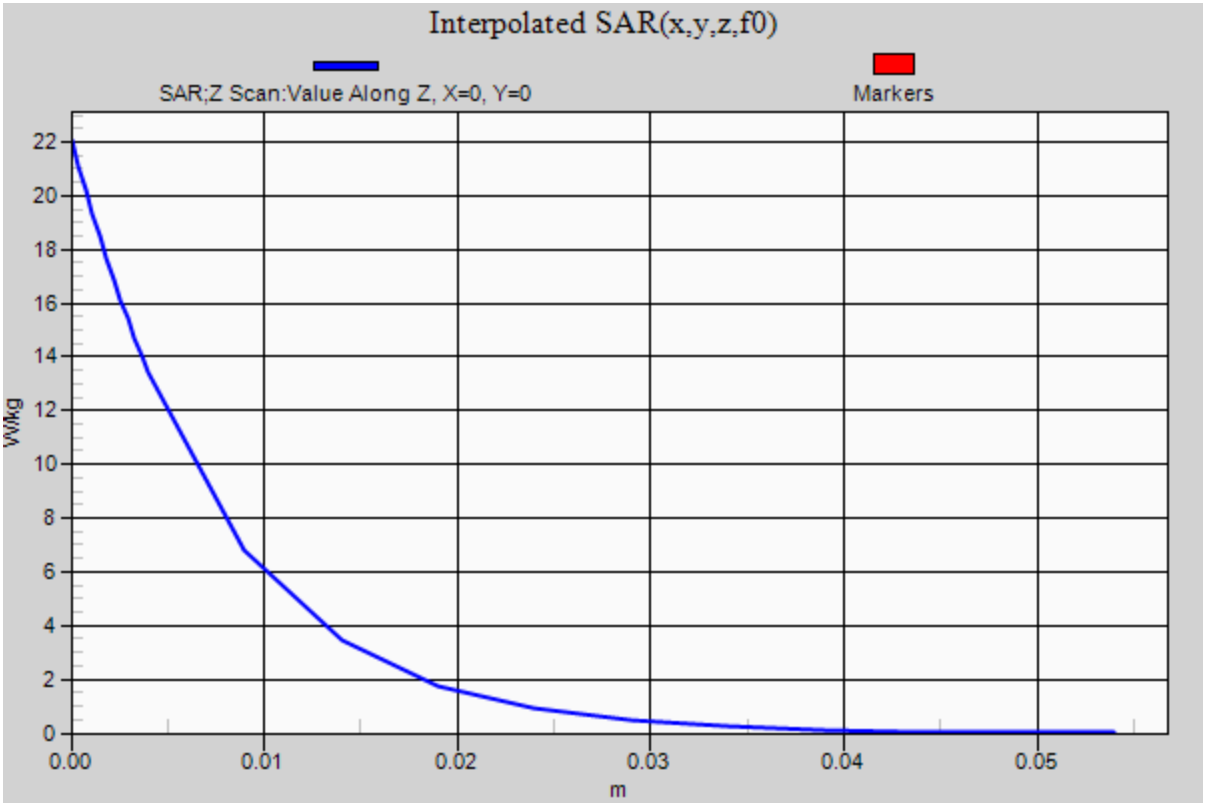
- Probe: EX3DV4 - SN3600; ConvF(6.58, 6.58, 6.58) @ 2450 MHz; Calibrated: 4/20/2022
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/14/2022
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg 1G target = 52.719 2 2/Area Scan (4x9x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 15.7 W/kg

SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg 1G target = 52.719 2 2/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 87.36 V/m; Power Drift = 0.25 dB
Peak SAR (extrapolated) = 29.3 W/kg
SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.25 W/kg
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 48.7%
Maximum value of SAR (measured) = 15.7 W/kg

SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg 1G target = 52.719 2 2/Z Scan (1x1x22): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 7.344 (7.325, 7.436) [mm]
Maximum value of SAR (interpolated) = 22.1 W/kg


W/kg
22.100
17.683
13.266
8.848
4.431
0.014
z
y
x


Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
22
20
18
16
14
12
10
8
6
4
2
0
0.00
0.01
0.02
0.03
0.04
0.05
m

APPENDIX B – MEASUREMENT PLOTS OF MAXIMUMUM MEASURED SAR

Plot E55

DUT: A04578 - SN 3425573111; Type: Body Worn Transmitter; Serial: Sample Prototype
Procedure Name: E55-A04578,Body-Back Side, 2437 MHz,5.5 bits B1- Silcone Band-WIFI 2

Communication System: UID 0, CW (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.753 S/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 9/20/2022 3:59:08 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.58, 6.58, 6.58) @ 2437 MHz; Calibrated: 4/20/2022
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/14/2022
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

2450H/E55-A04578,Body-Back Side, 2437 MHz,5.5 bits B1- Silcone Band-WIFI 2/Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm

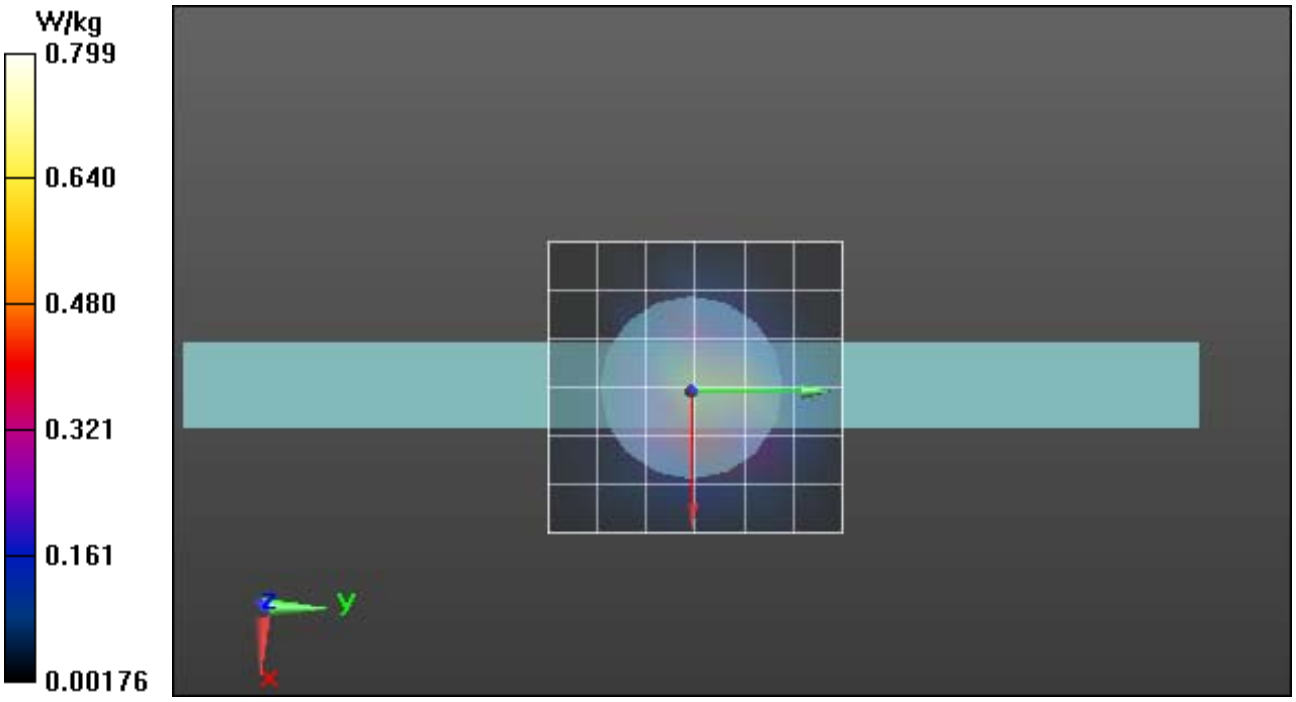
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.563 W/kg

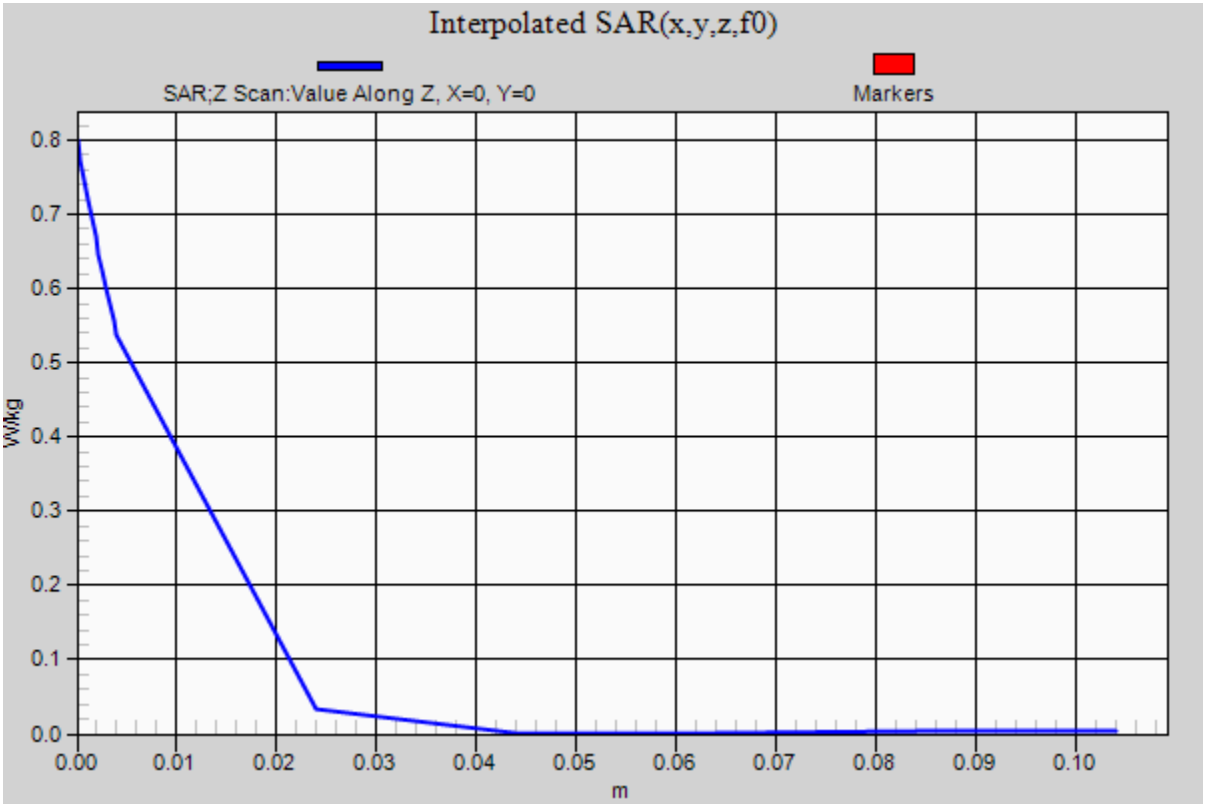
2450H/E55-A04578,Body-Back Side, 2437 MHz,5.5 bits B1- Silcone Band-WIFI 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.82 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 1.04 W/kg
SAR(1 g) = 0.505 W/kg; SAR(10 g) = 0.243 W/kg
Smallest distance from peaks to all points 3 dB below = 12 mm
Ratio of SAR at M2 to SAR at M1 = 48.4%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.562 W/kg

2450H/E55-A04578,Body-Back Side, 2437 MHz,5.5 bits B1- Silcone Band-WIFI 2/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, 7.290) [mm]
Maximum value of SAR (interpolated) = 0.799 W/kg


W/kg
0.799
0.640
0.480
0.321
0.161
0.00176
z
y
x


Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
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

Plot E60

DUT: A04578 - SN 3425573111; Type: Body Worn Transmitter; Serial: Sample Prototype
Procedure Name: E60-A04578,Body-Touch Back Side, 2480MHz, 2 bits Silicone Band-BT-EDR2

Communication System: UID 0, CW (0); Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.753 S/m; ε_r = 36.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 9/20/2022 7:08:35 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.58, 6.58, 6.58) @ 2437 MHz; Calibrated: 4/20/2022
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/14/2022
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

2450H/E60-A04578,Body-Touch Back Side, 2480MHz, 2 bits Silicone Band-BT-EDR2/Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.115 W/kg

2450H/E60-A04578,Body-Touch Back Side, 2480MHz, 2 bits Silicone Band-BT-EDR2/Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.875 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.203 W/kg
SAR(1 g) = 0.097 W/kg; SAR(10 g) = 0.046 W/kg
Smallest distance from peaks to all points 3 dB below = 9.9 mm
Ratio of SAR at M2 to SAR at M1 = 50.4%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.108 W/kg

2450H/E60-A04578,Body-Touch Back Side, 2480MHz, 2 bits Silicone Band-BT-EDR2/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, 6.181) [mm]
Maximum value of SAR (interpolated) = 0.166 W/kg