Celltech
Testing and Engineering Services Lab

Test Report Serial Number:	45461937 R1.0
Test Report Date:	15 May 2024
Project Number:	1651

SAR Test Report - New Application

Applicant:

GARMIN

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

Maximum *reported* SAR			
Body (1g)	DTS	0.11	W/kg
	DSS	<0.1	
	UNII	1.27	
General Pop. Limit:		1.60	
Extremity (10g)	DTS	0.15	
	DSS	<0.1	
	UNII	0.66	
General Pop. Limit:		4.00	

FCC ID: **IPH-04856**

IC Registration Number:

Product Model Number / HVIN: **04856**

Product Name / PMN: **A04856**

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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ilac-MRA ACCREDITED

Test Lab Certificate: 2470.01

Industry Canada

IC Registration 3874A

FC

FCC Registration: CA3874

Table of Contents

1.0 REVISION HISTORY

Revision History			
Samples Tested By:	Ben Hewson/Trevor Whillock	**Date(s) of Evaluation:**	9,12-13,19 March 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	10 May 2024
1.0	Initial Release	n/a	Ben Hewson	15 May 2024

2.0 CLIENT AND DEVICE INFORMATION

DUT Information	
Device Identifier(s):	**FCC ID:** IPH-04856
Device Model(s) / HVIN:	A04856
Device Marketing Name / PMN:	A04856
EUT Name:	A04856
Test Sample Serial No.:	OTA: 8C0000153 COND: 8C0000149
Device Type:	Personal Navigation Device
FCC Equipment Class:	PCS Licensed Transmitter (PCB)
	Digital Transmission System (DTS)
	Part 15 Spread Spectrum Transmitter (DSS)
	Unlicensed National Information Infrastructure (NII)
	Short Range Devices (SRD)
Transmit Frequency Range:	BT (DTS, DSS): 2402-2480MHz
	WiFi (DTS): 2412-2462MHz
	U-NII-1: 5180 - 5240, U-NII-3: 5745-5825
Manuf. Max. Rated Output Power:	BT BR (DSS): 8.5 dBm
	BT 2EDR (DTS): 6 dBm
	BT 3EDR (DTS): 6.25 dBm
	BT LE (DTS): 6.5 dBm
	802.11b (DTS): 17 dBm
	802.11g (DTS): 17 dBm
	802.11n (DTS): 17.5 dBm
	U-NII-1/802.11a20: 15.5 dBm
	U-NII-1/802.11n20: 14.5 dBm
	U-NII-1/802.11n40: 13 dBm
	U-NII-1/802.11ac80: 13 dBm
	U-NII-3/802.11a20: 16.5 dBm
	U-NII-3/802.11n20: 16 dBm
	U-NII-3/802.11n40: 15 dBm
	U-NII-3/802.11ac80: 15 dBm
Antenna Type and Gain:	PIFA 2.4GHz: 3.4dBi, 5GHz UNII-1: 4dBi, UNII-3: 4.2dBi
Modulation:	BT BR: GFSK
	BT 2EDR: π/4-DQPSK
	Bt 3EDR: 8DPSK
	BLE: GMSK
	WiFi: CCK, DSSS, OFDM, CCK, MCS
DUT Power Source:	5V USB, Internal Li-Ion Battery
DUT Dimensions [LxWxH]	L x W x H: 243mm x 154mm x 18mm
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 A04856 FCC ID: IPH-04856, is a Low Power Digital Transmitter that offers use as a hand-held, transportation mounted or portable configuration , with a Wi-Fi transceiver that is capable of operating in the 2.4GHz WiFi, 5GHz U-NII-1 & 3 frequency bands as well as 2.4Ghz BT/BLE frequency bands. The device has one inter-laced antenna, covering the 2.4GHZ and a 5Ghz frequencies. 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 and non-intended applications. It will include evaluation of the 2.4 GHz WiFi, U-NII transmitters for all required RF exposure configurations including Extremity and certain Body Configuration as the device may be operational while in hand or on person.

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 IEC/IEEE 62209-1528, FCC KDB 447498 and FCC KDB 248227.

4.0 NORMATIVE REFERENCES

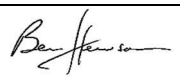
Normative References*	
ANSI / ISO 17025	General Requirements for competence of testing and calibration laboratories
FCC CFR Title 47 Part 2	Code of Federal Regulations
Title 47:	Telecommunication
Part 2.1093:	Radiofrequency Radiation Exposure Evaluation: Portable Devices
IEC International Standard / 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
FCC KDB	
KDB 447498 D04v01	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.	A04856	
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:**
		9, 12-13, 19 March 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. 10 May 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

DASY 6 Measurement Controller

7.0 RF CONDUCTED POWER MEASUREMENT

Table 7.1 Conducted Power Measurements, WLAN, BT, U-NII

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)	Duty Cycle (%)	Crest Factor (1/DC)	SAR Test Channel (Y/-)
WLAN 2.4G	802.11b	20	1	2412	DSSS	1	16.50	17.00	0.050	-0.50	99.5	1.01	Y
			6	2437			16.45	17.00	0.050	-0.55	99.5	1.01	Y
			11	2462			16.44	17.00	0.050	-0.56	99.5	1.01	Y
	802.11g	20	1	2412	OFDM	6	16.28	17.00	0.050	-0.72	97.3	1.03	-
			6	2437			16.28	17.00	0.050	-0.72	97.3	1.03	-
			11	2462			16.58	17.00	0.050	-0.42	97.3	1.03	-
	802.11n	20	1	2412	MCS	0	16.85	17.50	0.056	-0.65	97.1	1.03	-
			6	2437			16.87	17.50	0.056	-0.63	97.1	1.03	-
			11	2462			17.07	17.50	0.056	-0.43	97.1	1.03	-
BT	BR	1	2	2402	GFSK	-	7.11	8.50	0.007	-1.39	77.1	1.30	-
			41	2441			8.39	8.50	0.007	-0.11	77.1	1.30	Y
			80	2480			6.74	8.50	0.007	-1.76	77.1	1.30	-
	2EDR	1	2	2402	Pi/4-DQPSK	-	5.19	6.00	0.004	-0.81	77.1	1.30	-
			41	2441			5.90	6.00	0.004	-0.10	77.1	1.30	-
			80	2480			4.74	6.00	0.004	-1.26	77.1	1.30	-
	3EDR	1	2	2402	8DPSK	-	5.53	6.25	0.004	-0.72	77.1	1.30	-
			41	2441			6.19	6.25	0.004	-0.06	77.1	1.30	-
			80	2480			5.06	6.25	0.004	-1.19	77.1	1.30	-
	LE	1	37	2402	GFSK	-	5.37	6.50	0.004	-1.13	77.1	1.30	-
			17	2440				6.25	0.004	-6.25	77.1	1.30	-
			39	2480			5.65	6.25	0.004	-0.60	77.1	1.30	-
U-NII-1	802.11a	20	36	5180	OFDM	6	15.22	15.50	0.035	-0.28	97.3	1.03	Y
			40	5200			15.22	15.50	0.035	-0.28	97.3	1.03	Y
			44	5220			15.13	15.50	0.035	-0.37	97.3	1.03	-
			48	5240			15.15	15.50	0.035	-0.35	97.3	1.03	Y
	802.11n	20	36	5180	MCS	0	14.11	14.50	0.028	-0.39	96.8	1.03	-
			40	5200			14.11	14.50	0.028	-0.39	96.8	1.03	-
			44	5220			13.98	14.50	0.028	-0.52	96.8	1.03	-
			48	5240			13.98	14.50	0.028	-0.52	96.8	1.03	-
	802.11n40	40	36	5180	MCS	0	12.89	13.00	0.020	-0.11	95	1.05	-
			44	5220			12.88	13.00	0.020	-0.12	95	1.05	-
	802.11ac80	80	36	5180	MCS	0	12.57	13.00	0.020	-0.43	91	1.10	-
U-NII-3	802.11a	20	149	5745	OFDM	6	16.36	16.50	0.045	-0.14	97.3	1.03	Y
			153	5765			16.27	16.50	0.045	-0.23	97.3	1.03	-
			157	5785			16.28	16.50	0.045	-0.22	97.3	1.03	Y
			161	5805			16.23	16.50	0.045	-0.27	97.3	1.03	-
			165	5825			16.25	16.50	0.045	-0.25	97.3	1.03	Y
	802.11n	20	149	5745	MCS	0	15.93	16.00	0.040	-0.07	97.3	1.03	-
			153	5765			15.65	16.00	0.040	-0.35	97.3	1.03	-
			157	5785			15.65	16.00	0.040	-0.35	97.3	1.03	-
			161	5805			15.67	16.00	0.040	-0.33	97.3	1.03	-
			165	5825			15.71	16.00	0.040	-0.29	97.3	1.03	-
	802.11n40	40	151	5755	MCS	0	14.94	15.00	0.032	-0.06	95	1.05	-
			159	5795			14.91	15.00	0.032	-0.09	95	1.05	-
	802.11ac80	80	155	5775	MCS	0	14.69	15.00	0.032	-0.31	91	1.10	-

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 specified by the manufacture 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 (*Nc*)

Table 8.1 Number of Test Channels

The intended use of the device is to be mounted on a vehicle' dashboard; however, the device could transmit while held in hand or on person. As such the device was evaluated for both Body and Extremity use.

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.

As per FCC KDB 248227, the required 802.11 test channels are Ch1, Ch 6 and Ch 11; Channel 6 was selected for the initial SAR 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 and 5 GHz OFDM transmission modes 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. An initial test position was established for Both UNII1 and UNII 3 bands.

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.

Table 8.2 Antenna Distances

As per KDB 447498 D04V01, Appendix B, Sec B.4 SAR -based Exemption where appropriate SAR test exclusion based on antenna test separation distances may be applied.

The seperation distance is the smallest distance from any part of the antenna or radiating strucuture for all persons, during operation at the applicable ERP.
For mobile or portable devices, the seperation distance is from the outer housing of the device where it is closest to the antenna.
The SAR-based exemption formula for available time-averaged power or ERP, whichever is greater, of less than or equal to threshold P_{th} (mW) is given at 1.1307(b)3(i)(B) and is repeated as B.2 *(method is for seperation distances from 0.5 to 40 cm, and at freq from 0.3 to 6 GHz)*

$$P_{th}\,(\text{mW}) = ERP_{20\,\text{cm}}\,(\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \quad \text{(B.1)}$$

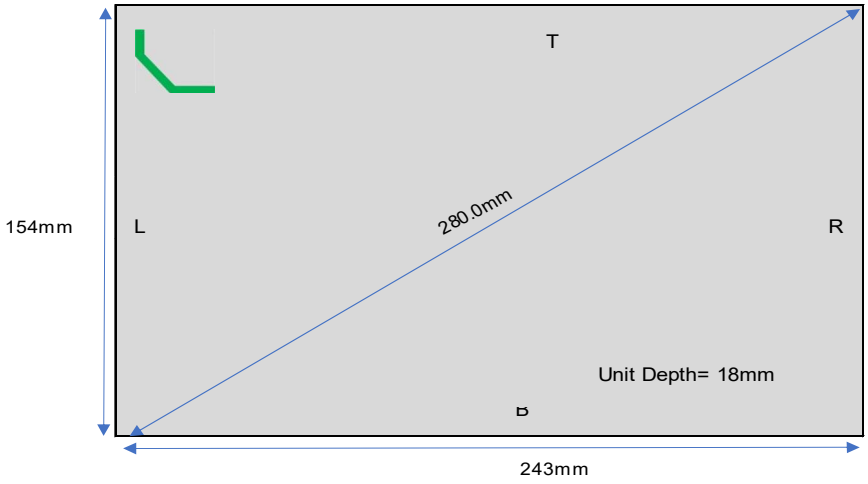
$$P_{th}\,(\text{mW}) = \begin{cases} ERP_{20\,\text{cm}}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\,\text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \quad \text{(B.2)}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\,\text{cm}}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and $ERP_{20\text{cm}}$ is per Formula (B.1).

Topographic View
Front Facing



Antenna	Top Edge (mm)	Left Edge (mm)	Bottom Edge (mm)	Right Edge (mm)	Front Depth (mm)	Back Depth (mm)
WLAN/BT/ UNII	17.4	6.2	110.9	207.5	10.0	8.0

Table 8.3 Body SAR test Exclusion Workchart

SAR Test Exclusion Analysis Antenna Separation to DUT Surfaces					
BODY Configuration (1g)		Band			
		2.4GHz WiFi	5GHz WLAN U-NII-1	5GHz WLAN U-NII-3	BT/BLE ANT
DUT Power / DUT Position	Frequency (MHz)	2462	5240	5745	2480
	Power (mW)	17.00	15.50	16.50	8.50
	Antenna Gain (dBi)	3.40	4.00	4.20	3.40
	Antenna Gain (dBd)	1.25	1.85	2.05	1.25
	Total ERP (mW)	22.67	23.73	26.45	11.33
Back Side	Separation Distance (mm)	8.00	8.00	8.00	8.00
	Exclusion Threshold (Pth)(mW)	6.69	3.94	3.70	6.65
	Testing Required	Yes	Yes	Yes	Yes

~ Pth(mW) = ERP_{20cm}(mW) = 2040f for 0.3GHz ≤ f < 1.5GHz
~ Pth(mW) = ERP_{20cm}(mW) = 3060 for 1.5GHz ≤ f ≤ 6GHz
~ Pth(mW) = ERP_{20cm}(mW) * (d / 20cm)^{X} where x = -log10(60 / ERP_{20cm} √f) for d ≤ 20cm
~ Pth(mW) = ERP_{20cm}(mW)) for 20cm < d ≤ 40cm
~ Total ERP = Power + Gain(dBd)
~ Gain(dBd) = Gain(dBi) - 2.15

Table 8.4 Extremity SAR test Exclusion Workchart

SAR Test Exclusion Analysis Antenna Separation to DUT Surfaces					
EXTREMITY Configuration (10g)		Band			
		2.4GHz WiFi	5GHz WLAN U-NII-1	5GHz WLAN U-NII-3	BT/BLE ANT
DUT Power / DUT Position	Frequency (MHz)	2462	5240	5745	2480
	Power (mW)	17.00	15.50	16.50	8.50
	Antenna Gain (dBi)	3.40	4.00	4.20	3.40
	Antenna Gain (dBd)	1.25	1.85	2.05	1.25
	Total ERP (mW)	22.67	23.73	26.45	11.33
Front Side	Separation Distance (mm)	10	10	10	10
	Exclusion Threshold (Pth)(mW)	25.56	15.64	14.73	25.44
	Testing Required	No	Yes	Yes	No
Back Side	Separation Distance (mm)	8.00	8.00	8.00	8.00
	Exclusion Threshold (Pth)(mW)	16.71	9.86	9.24	16.63
	Testing Required	Yes	Yes	Yes	No
Bottom Edge	Separation Distance (mm)	110.90	110.90	110.90	110.90
	Exclusion Threshold (Pth)(mW)	2490.30	2260.71	2234.24	2487.98
	Testing Required	No	No	No	No
Top Edge	Separation Distance (mm)	17.40	17.40	17.40	17.40
	Exclusion Threshold (Pth)(mW)	73.34	49.14	46.80	73.06
	Testing Required	No	No	No	No
Left Edge	Separation Distance (mm)	6.20	6.20	6.20	6.20
	Exclusion Threshold (Pth)(mW)	10.29	5.82	5.43	10.23
	Testing Required	Yes	Yes	Yes	Yes
Right Edge	Separation Distance (mm)	207.50	207.50	207.50	207.50
	Exclusion Threshold (Pth)(mW)	8205.22	8254.92	8260.99	8205.70
	Testing Required	No	No	No	No

~ Pth(mW) = ERP_{20cm}(mW) = 2040f for 0.3GHz ≤ f < 1.5GHz
~ Pth(mW) = ERP_{20cm}(mW) = 3060 for 1.5GHz ≤ f ≤ 6GHz
~ Pth(mW) = ERP_{20cm}(mW) * (d / 20cm)^{X} where x = -log10(60 / ERP_{20cm} √f) for d ≤ 20cm
~ Pth(mW) = ERP_{20cm}(mW) for 20cm < d ≤ 40cm
~ Pth(mW) = ERP_{20cm}(mW) X 2.5 for 10g Extremity
~ Total ERP = Power + Gain(dBd)
~ Gain(dBd) = Gain(dBi) - 2.15

9.0 ACCESSORIES EVALUATED

Table 9.1 Manufacturer's Accessory List

There are no manufacturer's accessories available when used in a portable application.

10.0 SAR MEASUREMENT SUMMARY

Table 10.1: Measured Results – Body 1g

Measured 1g SAR Results - BODY 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)							
2.4GHZ WLAN & BT																	
3/9/2024	B52Z	2437	Back	802.11b-NA	20	DSSS	1	- - - -	0	0	0.092	2.140	-0.550	1.028	1.000	100.000	0.107
3/9/2024	B59Z	2441	Left	802.15-NA		BT BR		- - - -	0	0	0.077	0.300	-0.030	1.000	1.000	100.000	0.077
5GHZ UNII-1 & UNI-3																	
3/13/2024	BB1	5200	Back Only	UNII-1-NA	20	OFDM	6	- - - -	5	5	1.060	0.300	-0.280	1.028	1.000	100.000	1.162
3/13/2024	BB2	5220	Back Only	UNII-1-NA	20	OFDM	6	- - - -	5	5	0.897	-0.100	-0.370	1.028	1.000	100.000	1.027
3/13/2024	BB1Z	5200	Back Only	UNII-1-NA	20	OFDM	6	- - - -	5	5	1.130	0.620	-0.280	1.028	1.000	100.000	1.239
3/19/2024	BB3	5745	Back Only	UNII-3-NA	20	OFDM	6	- - - -	5	5	1.280	0.060	-0.140	1.028	1.000	100.000	1.359
3/19/2024	BB4	5825	Back Only	UNII-3-NA	20	OFDM	6	- - - -	5	5	1.200	-0.060	-0.150	1.028	1.000	100.000	1.294
3/19/2024	BB3Z	5745	Back Only	UNII-3-NA	20	OFDM	6	- - - -	5	5	1.200	0.150	-0.140	1.028	1.000	100.000	1.274
Applicable SAR Limit								Use Group					Limit				
FCC CFR 2.1093			Health Canada Safety Code 6					General Population/User Unaware					1.6 W/kg				

Table 10.2: 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)							
2.4GHZ WLAN & BT																	
3/9/2024	E51	2437	Front	802.11b-NA	20	DSSS	1	- - - -	0	0	0.031	2.480	-0.550	1.028	1.000	100.000	0.036
3/9/2024	E52	2437	Back	802.11b-NA	20	DSSS	1	- - - -	0	0	0.048	2.140	-0.550	1.028	1.000	100.000	0.056
3/9/2024	E53	2437	Left	802.11b-NA	20	DSSS	1	- - - -	0	0	0.106	0.030	-0.550	1.028	1.000	100.000	0.124
3/9/2024	E54	2437	Top	802.11b-NA	20	DSSS	1	- - - -	0	0	0.004	1.120	-0.550	1.028	1.000	100.000	0.005
3/9/2024	E56	2462	Left	802.11b-NA	20	DSSS	1	- - - -	0	0	0.129	-0.050	-0.240	1.028	1.000	100.000	0.142
3/9/2024	E58	2412	Left	802.11b-NA	20	DSSS	1	- - - -	0	0	0.144	0.030	-0.500	1.028	1.000	100.000	0.166
3/9/2024	E59	2441	Left	802.15-NA		BT BR		- - - -	0	0	0.039	0.260	-0.030	1.000	1.000	100.000	0.039
3/9/2024	E58Z	2412	Left	802.11b-NA	20	DSSS	1	- - - -	0	0	0.127	-0.160	-0.500	1.028	1.000	100.000	0.152
3/9/2024	E59Z	2441	Left	802.15-NA		BT BR		- - - -	0	0	0.034	0.300	-0.030	1.000	1.000	100.000	0.034
5GHZ UNII-1 & UNI-3																	
3/13/2024	E71	5200	Front	UNII-1-NA	20	OFDM	6	- - - -	0	0	0.131	0.000	-0.280	1.028	1.000	100.000	0.144
3/13/2024	E72	5200	Back	UNII-1-NA	20	OFDM	6	- - - -	0	0	0.528	1.570	-0.280	1.028	1.000	100.000	0.579
3/13/2024	E73	5200	Left	UNII-1-NA	20	OFDM	6	- - - -	0	0	0.342	0.020	-0.280	1.028	1.000	100.000	0.375
3/13/2024	E74	5200	Top	UNII-1-NA	20	OFDM	6	- - - -	0	0	0.036	0.980	-0.280	1.028	1.000	100.000	0.039
3/13/2024	E75	5180	Back	UNII-1-NA	20	OFDM	6	- - - -	0	0	0.500	0.290	-0.280	1.028	1.000	100.000	0.548
3/13/2024	E76	5240	Back	UNII-1-NA	20	OFDM	6	- - - -	0	0	0.455	3.050	-0.350	1.028	1.000	100.000	0.507
3/13/2024	E72Z	5200	Back	UNII-1-NA	20	OFDM	6	- - - -	0	0	0.481	0.750	-0.280	1.028	1.000	100.000	0.527
3/19/2024	E78	5745	Back	UNII-3-NA	20	OFDM	6	- - - -	0	0	0.667	0.040	-0.140	1.028	1.000	100.000	0.708
3/19/2024	E78Z	5745	Back	UNII-3-NA	20	OFDM	6	- - - -	0	0	0.609	-0.090	-0.140	1.028	1.000	100.000	0.660
Applicable SAR Limit								Use Group					Limit				
FCC CFR 2.1093			Health Canada Safety Code 6					General Population/User Unaware					4 W/kg				

11.0 SCALING OF MAXIMUM MEASURE SAR

Table 11.1 SAR Scaling 1g -

Scaling of Maximum Measured SAR (1g)								
Measured Parameters		Configuration						
		Body	Body	Body	Body			
Plot ID		B52Z	B59Z	BB1Z	BB3Z			
Maximum Measured SAR_M		0.092	0.077	1.130	1.200			(W/kg)
Frequency		2437	2441	5200	5745			(MHz)
Drift	Power Drift	2.140 (8)	0.300 (11)	0.620 (18)	0.150 (23)			(dB)
Conducted Power		16.450	8.470	15.220	16.360			(dBm)
DC	Transmiter Duty Cycle		(12)					(%)
DF	Use Duty Factor	100.0 (9)	100.0 (13)	100.0 (19)	100.0 (24)			(%)
Fluid Deviation from Target								
Δe	Permitivity	-5.98%	-6.05%	-4.28%	-5.23%			
Δσ	Conductivity	5.99%	6.14%	3.87%	6.62%			

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	2.441	5.2	5.745			
Ce		-0.225	-0.225	-0.201	-0.199			
Cσ		0.483	0.482	-0.026	-0.045			
Ce * Δe		0.013	0.014	0.009	0.010			
Cσ * Δσ		0.029	0.030	-0.001	-0.003			
ΔSAR		0.042 (7)	0.043 (10)	0.008 (17)	0.007 (22)			(%)

Manufacturer's Tuneup Tolerance							
Measured Conducted Power	16.450	8.470	15.220	16.360			(dBm)
Rated Conducted Power	17.000	8.500	15.500	16.500			(dBm)
ΔP	-0.550	-0.030	-0.280	-0.140			(dB)

Transmitter Duty Cycle [Crest Factor]							
Transmiter Duty Cycle (DC)	97.3	100.0	97.3	97.3			(%)
CF (1/DC)	1.03	1.00 (12)	1.03	1.03			

SAR Adjustment for Fluid Sensitivity							
$SAR_1 = SAR_M$ X [ΔSAR]	0.092 (7)	0.077 (10)	1.130 (17)	1.200 (22)			(W/kg)

SAR Adjustment for Tuneup Tolerance							
$SAR_2 = SAR_1$ + [ΔP]	**0.104**	**0.077**	**1.205**	**1.239**			(W/kg)

SAR Adjustment for Drift							
$SAR_3 = SAR_2$ + [Drift]	0.104 (8)	0.077 (11)	1.205 (18)	1.239 (23)			(W/kg)

SAR Adjustment for Transmitter Duty Cycle [Crest Factor]							
$SAR_4 = SAR_3$ x [CF]	**0.107**	0.077 (12)	**1.239**	**1.274**			(W/kg)

SAR Adjustment for Use Duty Factor							
$SAR_5 = SAR_4$ x [DF]	0.107 (9)	0.077 (13)	1.239 (19)	1.274 (24)			(W/kg)

reported 1g SAR							
reported SAR	**0.11**	**0.08**	**1.24**	**1.27**			(W/kg)

Table 11.2 SAR Scaling 10g

Scaling of Maximum Measured SAR (10g)								
Measured Parameters		Configuration						
		Extremity	Extremity	Extremity	Extremity			
Plot ID		E58Z	E59Z	E72Z	E78Z			
Maximum Measured SAR_M		0.127	0.034	0.481	0.609			(W/kg)
Frequency		2412	2441	5200	5745			(MHz)
Drift	Power Drift	-0.160	0.300 (4)	0.750 (15)	-0.090			(dB)
Conducted Power		16.500	8.470	15.220	16.360			(dBm)
DC	Transmiter Duty Cycle		(5)					(%)
DF	Use Duty Factor	100.0 (2)	100.0 (6)	100.0 (16)	100.0 (21)			(%)
Fluid Deviation from Target								
Δe	Permitivity	-5.65%	-6.05%	-4.28%	-5.23%			
Δσ	Conductivity	4.77%	6.14%	3.87%	6.62%			

Fluid Sensitivity Calculation (1g) IEC/IEEE 62209-1528 7.8.2								
Delta SAR = Ce * Δe + Cσ * Δσ (8)								
Ce = $(0.003456*f^3) - (0.03531*f^2) + (0.07675*f) - 0.186$ (11)								
Cσ = $(0.004479*f^3) - (0.01586*f^2) - (0.1972*f) + 0.7717$ (12)								
f	Frequency (GHz)	2.412	2.441	5.2	5.745			
Ce		-0.158	-0.159	-0.256	-0.255			
Cσ		0.267	0.261	-0.053	-0.035			
Ce * Δe		0.009	0.010	0.011	0.013			
Cσ * Δσ		0.013	0.016	-0.002	-0.002			
ΔSAR		0.022 (1)	0.026 (3)	0.009 (14)	0.011 (20)			(%)

Manufacturer's Tuneup Tolerance						
Measured Conducted Power	16.500	8.470	15.220	16.360			(dBm)
Rated Conducted Power	17.000	8.500	15.500	16.500			(dBm)
ΔP	-0.500	-0.030	-0.280	-0.140			(dB)

Transmitter Duty Cycle [Crest Factor]						
Transmiter Duty Cycle (DC)	97.3	100.0	97.3	97.3			(%)
CF (1/DC)	1.03	1.00 (5)	1.03	1.03			

SAR Adjustment for Fluid Sensitivity						
$SAR_1 = SAR_M$ X [ΔSAR]	0.127 (1)	0.034 (3)	0.481 (14)	0.609 (20)			(W/kg)

SAR Adjustment for Tuneup Tolerance						
$SAR_2 = SAR_1$ + [ΔP]	**0.142**	**0.034**	**0.513**	**0.629**			(W/kg)

SAR Adjustment for Drift						
$SAR_3 = SAR_2$ + [Drift]	**0.148**	0.034 (4)	0.513 (15)	**0.642**			(W/kg)

SAR Adjustment for Transmitter Duty Cycle [Crest Factor]						
$SAR_4 = SAR_3$ x [CF]	**0.152**	0.034 (5)	**0.527**	**0.660**			(W/kg)

SAR Adjustment for Use Duty Factor						
$SAR_5 = SAR_4$ x [DF]	0.152 (2)	0.034 (6)	0.527 (16)	0.660 (21)			(W/kg)

reported 1g SAR						
reported SAR	**0.15**	**0.03**	**0.53**	**0.66**			(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): Use Duty Factor is 100%. No Duty Factor Correction applied.
Note (3): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529
Note (4): Power Drift is Positive, Drift Adjustment not Required.
Note (5): Crest Factor = 1 (100% Duty Cycle), Crest Factor Adjustment not Required.
Note (6): Use Duty Factor is 100%. No Duty Factor Correction applied.
Note (7): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529
Note (8): Power Drift is Positive, Drift Adjustment not Required.
Note (9): Use Duty Factor is 100%. No Duty Factor Correction applied.
Note (10): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529
Note (11): Power Drift is Positive, Drift Adjustment not Required.
Note (12): Crest Factor = 1 (100% Duty Cycle), Crest Factor Adjustment not Required.
Note (13): Use Duty Factor is 100%. No Duty Factor Correction applied.
Note (14): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529
Note (15): Power Drift is Positive, Drift Adjustment not Required.
Note (16): Use Duty Factor is 100%. No Duty Factor Correction applied.
Note (17): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529
Note (18): Power Drift is Positive, Drift Adjustment not Required.
Note (19): Use Duty Factor is 100%. No Duty Factor Correction applied.
Note (20): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529
Note (21): Use Duty Factor is 100%. No Duty Factor Correction applied.
Note (22): Delta SAR is Positive, SAR Adjustment for Fluid Sensitivity is not Required, in accordance with ISED Notice 2012-DRS0529
Note (23): Power Drift is Positive, Drift Adjustment not Required.
Note (24): Use Duty Factor is 100%. No Duty Factor Correction applied.

12.0 SAR EXPOSURE LIMITS

Table 12.1 Exposure Limits

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

13.0 DETAILS OF SAR EVALUATION

13.1 Day Log

DAY LOG								
Date	Ambient Temp (°C)	Fluid Temp (°C)	Relative Humidity (%)	Barometric Pressure (kPa)	Fluid Dielectric	SPC	Test	Task
8-Mar-2024	25.9	22.2	20%	102.2	X	X	X	2450H Fluids, SPC & SAR Testing
9-Mar-2024	23.0	22.0	20%	100.7			X	2450H SAR Testing
12 Mar 2024	25.9	23.0	24%	101.1	X	X	X	5250H Fluids, SPC & SAR Testing
13 Mar 2024	24.2	23.0	23%	102.6			X	5250H SAR Testing
19 Mar 2024	25.9	23.6	27%	101.1	X	X	X	5750H Fluids, SPC & SAR Testing

13.2 DUT Setup and Configuration

DUT Setup and Configuration	
1	The device was evaluated for Extremity at a 0mm distance, for Body at a 5mm 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.
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)= 17dBm (50mW) Maximum 802.11b DSSS specified power (PDSSS)= 17 dBm (50mW) Ratio OFDM/DSSS power = 100% Highest reported SAR (SARMAX)= 1.27W/kg POFDM/PDSSS X SARMAX = 0.31 W/kg ≤ 3.0 W/kg (Extremity) and ≤ 1.5 W/kg (Body) and SAR test exclusion applies. UNII-1 rated power is the same or lower in higher order modulations as a result the UNII-1 802.11A OFDM6 SAR value would not be higher, further testing is not required in UNII-1. UNII-3 rated power is the same or lower in higher order modulations as a result the UNII-3 802.11A OFDM6 SAR value would not be higher, further testing is not required in UNII-3.
3	The Device was capable of transmitting at various modulations, data rates and duty cycles. The Conducted Power was measured at the lowest modulation and largest bandwidth and with the Duty cycle noted. The DUT was evaluated for SAR at the maximum conducted output power level, preset by the manufacturer, and adjusted crest factor for 100% duty cycle.
4	Bluetooth was evaluated for SAR in BT BR (GFSK) mode with a transmit duty cycle of noted and with a crest factor adjustment to 100% duty cycle if required, 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 the device battery fully charged.

13.3 DUT Positioning

DUT Positioning
Positioning
The DUT Positioner was securely fastened to the Phantom Platform. Registration marks were placed on the DUT and the Positioner to ensure consistent positioning of the DUT for each test evaluation.
FACE Configuration
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 or on person are positioned on the device holder with a body worn accessory in place against the surface of the phantom, or with-out an accessory at 5mm from the 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.
Extremity Configuration
Devices that are designed to be near extremity, or hand-held are positioned with the back side directly against the phantom surface.

13.4 General Procedures and Report

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

13.5 Fluid Dielectric and Systems Performance Check

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

13.6 Scan Resolution 100MHz to 2GHz

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

13.7 Scan Resolution 2GHz to 3GHz

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

13.8 Scan Resolution 5GHz to 6GHz

Scan Resolution 5GHz to 6GHz	
Maximum distance from the closest measurement point to phantom surface: (Geometric Center of Probe Center)	**4 ± 1 mm**
Maximum probe angle normal to phantom surface. (Flat Section ELI Phantom)	**5° ± 1°**
Area Scan Spatial Resolution ΔX, ΔY	**10 mm**
Zoom Scan Spatial Resolution ΔX, ΔY	**4 mm**
Zoom Scan Spatial Resolution ΔZ (Uniform Grid)	**2 mm**
Zoom Scan Volume X, Y, Z	**22 mm**
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 UNCERTAINTY

Table 14.1 Measurement Variablity

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 15.1 Fluid Dielectric Parameters 2450MHz HEAD TSL

33		FLUID DIELECTRIC PARAMETERS						Fluid Sensitivity Calculation IEC/IEEE 62209-1528 7.8.2			
Date:	8-Mar-2024	Fluid Temp:	22.2	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		37.0800	1.8400	39.2700	1.76	-5.58%	4.55%	0.035	0.021	1.000	1.000
2412.0000	*	37.0480	1.8460	39.2660	1.76	-5.65%	4.77%	0.036	0.022	1.000	1.000
2420.0000		36.9200	1.8700	39.2500	1.77	-5.94%	5.65%	0.041	0.024	1.000	1.000
2430.0000		36.9800	1.8800	39.2400	1.78	-5.76%	5.62%	0.040	0.024	1.000	1.000
2437.0000	*	36.8820	1.8940	39.2260	1.79	-5.98%	5.99%	0.042	0.025	1.000	1.000
2440.0000		36.8400	1.9000	39.2200	1.79	-6.07%	6.15%	0.043	0.026	1.000	1.000
2441.0000	*	36.8440	1.9010	39.2180	1.79	-6.05%	6.14%	0.043	0.026	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		36.7000	1.9200	39.1900	1.81	-6.35%	6.08%	0.043	0.026	1.000	1.000
2462.0000	*	36.7000	1.9260	39.1860	1.81	-6.34%	6.29%	0.044	0.026	1.000	1.000
2470.0000		36.7000	1.9500	39.1700	1.82	-6.31%	7.14%	0.048	0.028	1.000	1.000
2472.0000	*	36.6920	1.9460	39.1680	1.82	-6.32%	6.81%	0.047	0.027	1.000	1.000
2480.0000		36.6600	1.9300	39.1600	1.83	-6.38%	5.46%	0.040	0.024	1.000	1.000

*Channel Frequency Tested

Table 15.2 Fluid Dielectric Parameters 5250MHz HEAD TSL

28		FLUID DIELECTRIC PARAMETERS						Fluid Sensitivity Calculation IEC/IEEE 62209-1528 7.8.2			
Date:	12-Mar-2024	Fluid Temp:	23	Frequency:	5250MHz	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
5170.0000		35.7400	4.7700	36.0200	4.62	-0.78%	3.25%	0.001	0.000	1.000	1.000
5180.0000	*	34.9700	4.7400	36.0100	4.63	-2.89%	2.38%	0.005	0.006	1.000	1.000
5190.0000		34.5400	4.7700	36.0000	4.64	-4.06%	2.80%	0.007	0.009	1.000	1.000
5200.0000	*	34.4500	4.8300	35.9900	4.65	-4.28%	3.87%	0.008	0.009	1.000	1.000
5210.0000		34.7700	4.9200	35.9700	4.67	-3.34%	5.35%	0.005	0.006	1.000	1.000
5230.0000		35.5900	4.9400	35.9500	4.69	-1.00%	5.33%	0.001	0.000	1.000	1.000
5240.0000	*	35.8400	4.7200	35.9400	4.70	-0.28%	0.43%	0.000	0.000	1.000	1.000
5250.0000		35.1700	5.0000	35.9300	4.71	-2.12%	6.16%	0.002	0.002	1.000	1.000

*Channel Frequency Tested

Table 15.3 Fluid Dielectric Parameters 5750MHz HEAD TSL

31	FLUID DIELECTRIC PARAMETERS							Fluid Sensitivity Calculation IEC/IEEE 62209-1528 7.8.2			
Date:	19-Mar-2024	Fluid Temp:	23.6	Frequency:	5750MHz	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
5740.0000		33.5800	5.5700	35.3700	5.21	-5.06%	6.91%	0.007	0.010	1.000	1.000
5745.0000	*	33.5150	5.5600	35.3650	5.22	-5.23%	6.62%	0.007	0.011	1.000	1.000
5750.0000		33.4500	5.5500	35.3600	5.22	-5.40%	6.32%	0.008	0.012	1.000	1.000
5780.0000		33.4200	5.6000	35.3200	5.25	-5.38%	6.67%	0.008	0.011	1.000	1.000
5785.0000	*	33.4950	5.5950	35.3150	5.26	-5.15%	6.47%	0.007	0.011	1.000	1.000
5790.0000		33.5700	5.5900	35.3100	5.26	-4.93%	6.27%	0.007	0.011	1.000	1.000
5820.0000		33.3100	5.6800	35.2800	5.29	-5.58%	7.37%	0.008	0.012	1.000	1.000
5825.0000	*	33.4100	5.6750	35.2750	5.30	-5.29%	7.18%	0.007	0.011	1.000	1.000
5830.0000		33.5100	5.6700	35.2700	5.30	-4.99%	6.98%	0.007	0.011	1.000	1.000

*Channel Frequency Tested

16.0 SYSTEM VERIFICATION TEST RESULTS

Table 16.1 - 2450MHz

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
8-Mar-2024		2450	D2450V2		825
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	22.2	26	20%	250	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
36.88	39.20	-5.92%	1.91	1.80	6.11%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
14.10	13.18	6.98%	6.33	6.01	5.41%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
56.40	52.72	6.98%	25.32	24.02	5.43%

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 846224,

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

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

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

Table 16.2 - 5250MHz

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
12 Mar 2024		5250	D5GHzV2		1031
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	23.0	26	24%	50	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
35.17	35.93	-2.12%	5.00	4.71	6.16%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
4.01	3.97	0.92%	1.15	1.15	0.39%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
80.20	79.47	0.92%	23.00	22.91	0.39%

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 846224,

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

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

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

Table 16.3 - 5750MHz

System Verification Test Results					
Date		Frequency (MHz)	Validation Source		
			P/N		S/N
19 Mar 2024		5750	D5GHzV2		1031
Fluid Type	Fluid Temp °C	Ambient Temp °C	Ambient Humidity (%)	Forward Power (mW)	Source Spacing (mm)
Head	23.6	26	27%	50	10
Fluid Parameters					
Permittivity			Conductivity		
Measured	Target	Deviation	Measured	Target	Deviation
33.09	35.36	-6.42%	5.48	5.22	4.98%
Measured SAR					
1 gram			10 gram		
Measured	Target	Deviation	Measured	Target	Deviation
3.53	3.78	-6.54%	1.01	1.10	-8.22%
Measured SAR Normalized to 1.0W					
1 gram			10 gram		
Normalized	Target	Deviation	Normalized	Target	Deviation
70.60	75.54	-6.54%	20.20	22.01	-8.22%

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 846224,

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

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

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

17.0 SYSTEM VALIDATION SUMMARY

Table 17.1 System Validation Summary

SAR Validation Summary Chart							
Validation Date	Probe Model	Probe S/N	Validation Source	Frequency (MHz)	Validation Results		
					Linearity	Isotropy	Extrapolation
	✓ = Complete				✓ = Not Required		
21-Jun-23	EX3DV4	7826	D2450V2	2450	Pass	Pass	Pass
28-Jun-23	EX3DV4	7826	D5GHzV2	5250	Pass	Pass	Pass
30-Jun-23	EX3DV4	7826	D5GHzV2	5750	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	ELI Elliptical Planar Phantom
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	> 30 Liter
Phantom	
Type	Twin SAM Phantom
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	< 25 Liter
Phantom	
Type	Modular Flat Phantom
Shell Material	Fiberglass
Thickness	2mm +/- .2mm
Volume	< 9 Liter

Measurement System Specification (Continued)

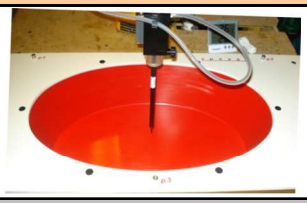
Probe Specification

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

EX3DV4 E-Field Probe

Phantom Specification

The 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 19.1 Equipment List and Calibration

Test Equipment List				
DESCRIPTION	**ASSET NO.**	**SERIAL NO.**	**DATE CALIBRATED**	**CALIBRATION DUE**
Schmid & Partner DASY 6 System	-	-	-	-
-DASY Measurement Server	00158	1078	CNR	CNR
-Robot	00046	599396-01	CNR	CNR
-DAE4	00019	353	16-Apr-23	16-May-24
-EX3DV4 E-Field Probe	00357	7826	16-May-23	16-May-24
-D2450V2 Validation Dipole	00219	825	24-Apr-21	24-Apr-24
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

20.0 FLUID COMPOSITION

Table 20.1 Fluid Composition 2450MHz HEAD TSL

Tissue Simulating Liquid (TSL) Composition				2450MHz Body
Component by Percent Weight				
Water	Glycol	Salt(1)	HEC(2)	Bacteriacide(3)
69.98	30.0	0.02	0.0	0.0

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

Table 20.2 Fluid Composition 5250, 5750MHz HEAD TSL
The 5GHz Head TSL is a SPEAG proprietary broad band fluid:

Type: **HBBL3500-5500V2**
Batch number: **131210-2**
P/N: **SL AAH 502 AC**

END OF REPORT

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 3 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: Flat Section

Date/Time: 3/8/2024 5:51:31 PM

DASY5 Configuration:

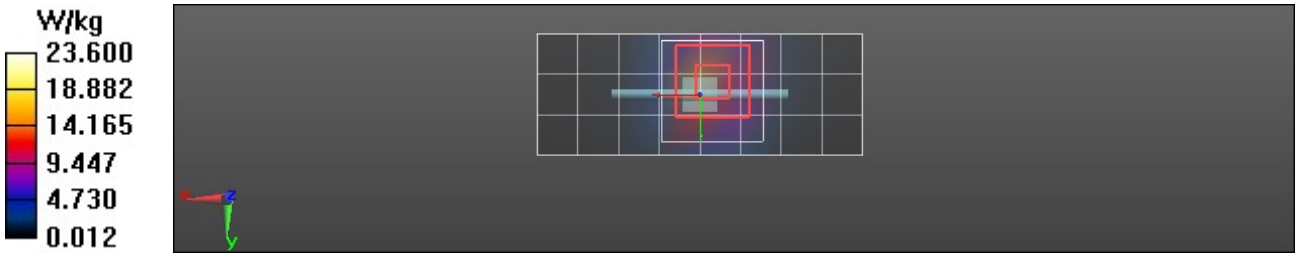
- Probe: EX3DV4 - SN7826; ConvF(7.91, 7.42, 7.62) @ 2450 MHz; Calibrated: 5/16/2023
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/18/2023
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

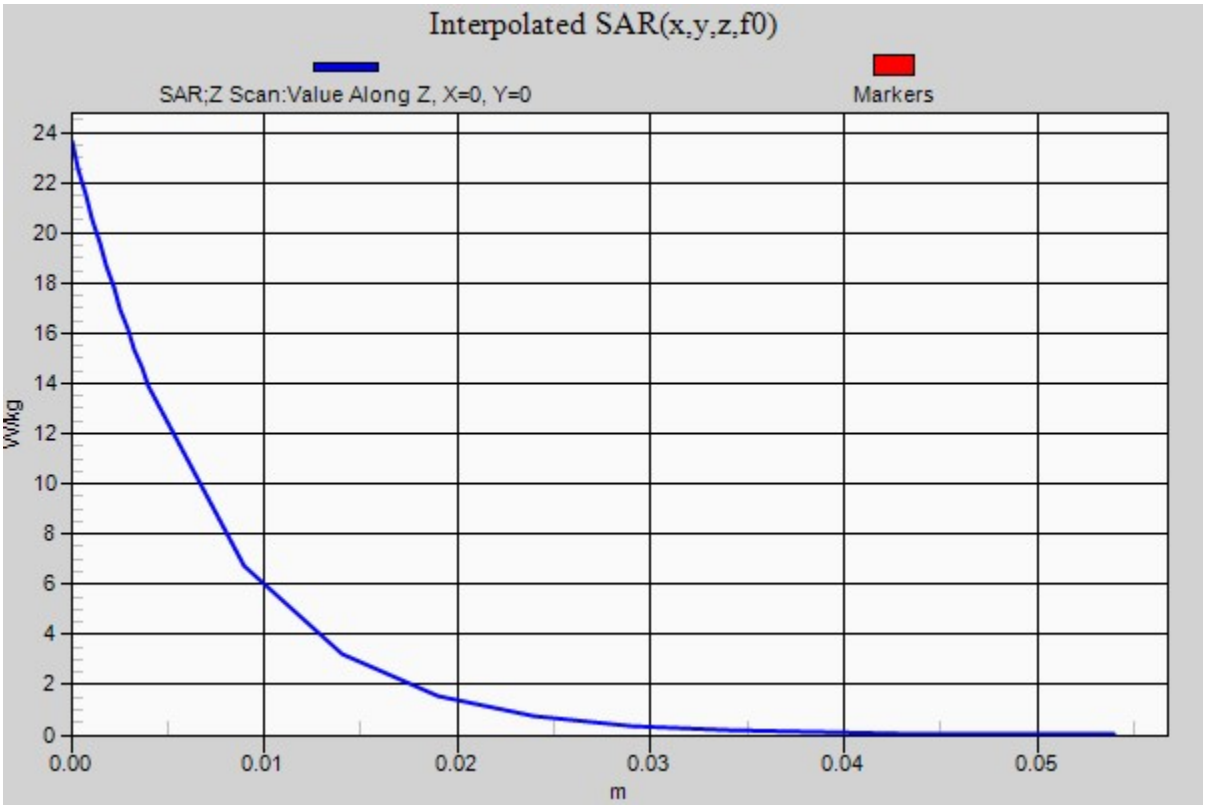
SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg 3 2 2 2/Area Scan (81x31x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Reference Value = 86.16 V/m; Power Drift = 0.14 dB
Fast SAR: SAR(1 g) = 13.9 W/kg; SAR(10 g) = 6.45 W/kg
Maximum value of SAR (interpolated) = 17.2 W/kg

SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg 3 2 2 2/Area Scan (9x4x1): Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 14.4 W/kg

SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg 3 2 2 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 86.16 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 30.6 W/kg
SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.33 W/kg
Smallest distance from peaks to all points 3 dB below = 10 mm
Ratio of SAR at M2 to SAR at M1 = 46.9%
Maximum value of SAR (measured) = 15.9 W/kg

SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg 3 2 2 2/Z Scan (1x1x22): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 6.931 (6.846, 6.941) [mm]
Maximum value of SAR (interpolated) = 23.6 W/kg


W/kg
23.600
18.882
14.165
9.447
4.730
0.012


Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
24
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

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1031
Procedure Name: SPC 5250H Input=50 mw, Target= [3.36[3.74][4.11] Target=79.47W/kg@1000mw 2

Communication System: UID 0, CW (0); Frequency: 5250 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5250 MHz; σ = 5 S/m; ε_r = 35.17; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 3/12/2024 7:59:58 PM

DASY5 Configuration:

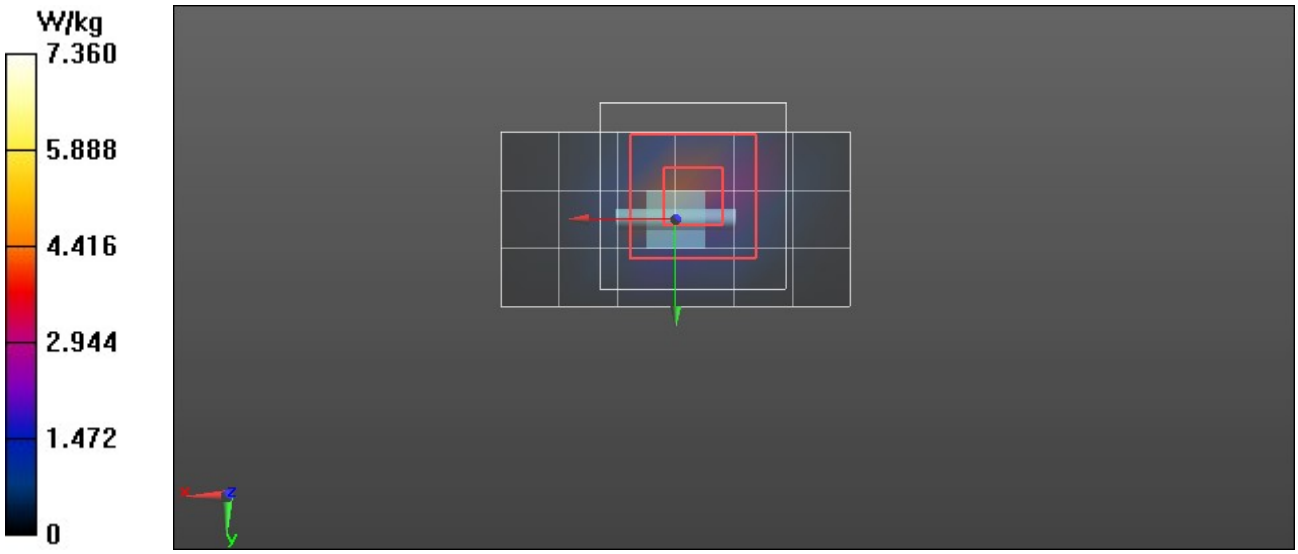
- Probe: EX3DV4 - SN7826; ConvF(5.59, 5.24, 5.42) @ 5250 MHz; Calibrated: 5/16/2023
- Sensor-Surface: 4mm (Mechanical Surface Detection), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/18/2023
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

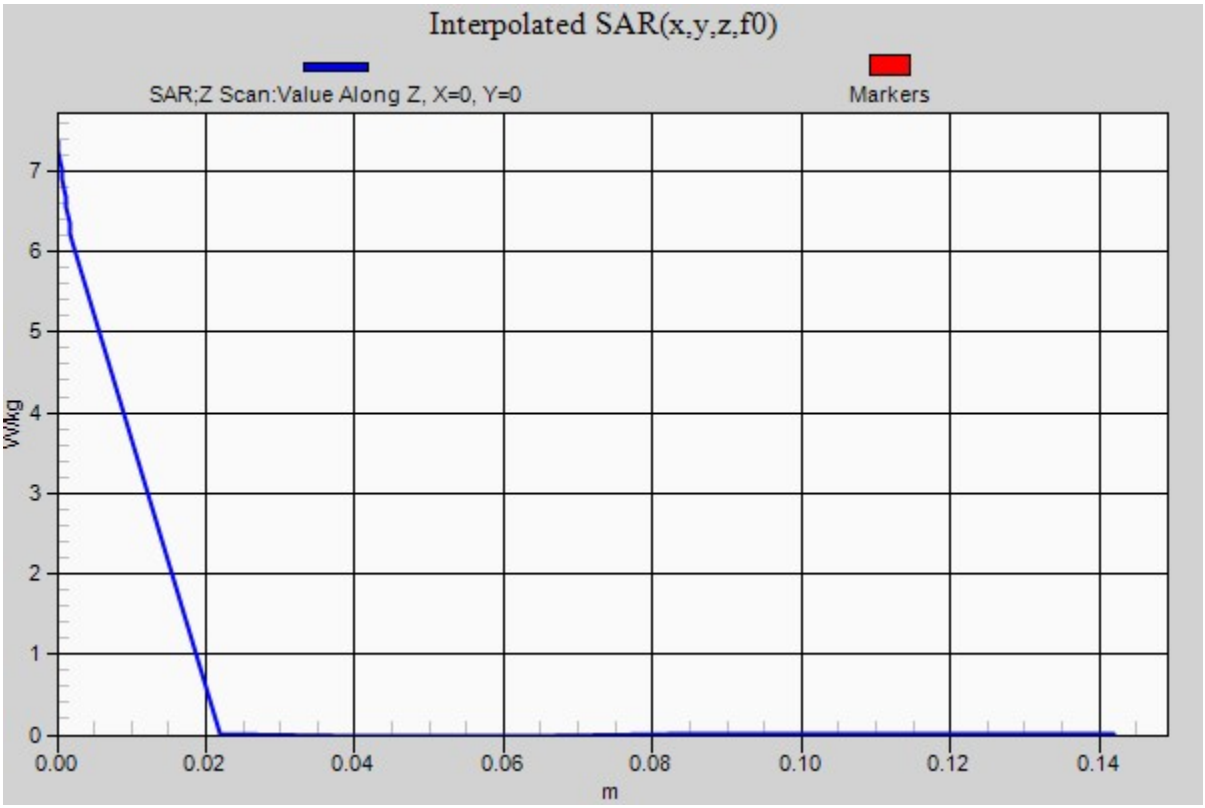
SPC/SPC 5250H Input=50 mw, Target= [3.36[3.74][4.11] Target=79.47W/kg@1000mw 2/Area Scan (61x31x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 26.27 V/m; Power Drift = 0.20 dB
Fast SAR: SAR(1 g) = 3.76 W/kg; SAR(10 g) = 1.09 W/kg
Maximum value of SAR (interpolated) = 4.48 W/kg

SPC/SPC 5250H Input=50 mw, Target= [3.36[3.74][4.11] Target=79.47W/kg@1000mw 2/Area Scan (7x4x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 4.14 W/kg

SPC/SPC 5250H Input=50 mw, Target= [3.36[3.74][4.11] Target=79.47W/kg@1000mw 2/Zoom Scan (9x9x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 26.27 V/m; Power Drift = 0.20 dB
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 4.01 W/kg; SAR(10 g) = 1.15 W/kg
Smallest distance from peaks to all points 3 dB below = 7.2 mm
Ratio of SAR at M2 to SAR at M1 = 53.7%
Maximum value of SAR (measured) = 8.46 W/kg

SPC/SPC 5250H Input=50 mw, Target= [3.36[3.74][4.11] Target=79.47W/kg@1000mw 2/Z Scan (1x1x19): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Penetration depth = n/a (n/a, 2.793) [mm]
Maximum value of SAR (interpolated) = 7.36 W/kg


W/kg
7.360
5.888
4.416
2.944
1.472
0


Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
7
6
5
4
3
2
1
0
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
m

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:xxx
Procedure Name: SPC 5750H Input=50mw, Target=[3.40][3.78][4.16], Target=75.54W/kg@1000 mw 2 2 2

Communication System: UID 0, CW (0); Frequency: 5750 MHz;Duty Cycle: 1:1
Medium parameters used: f = 5750 MHz; σ = 5.55 S/m; ε_r = 33.45; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 3/19/2024 6:26:24 PM

DASY5 Configuration:

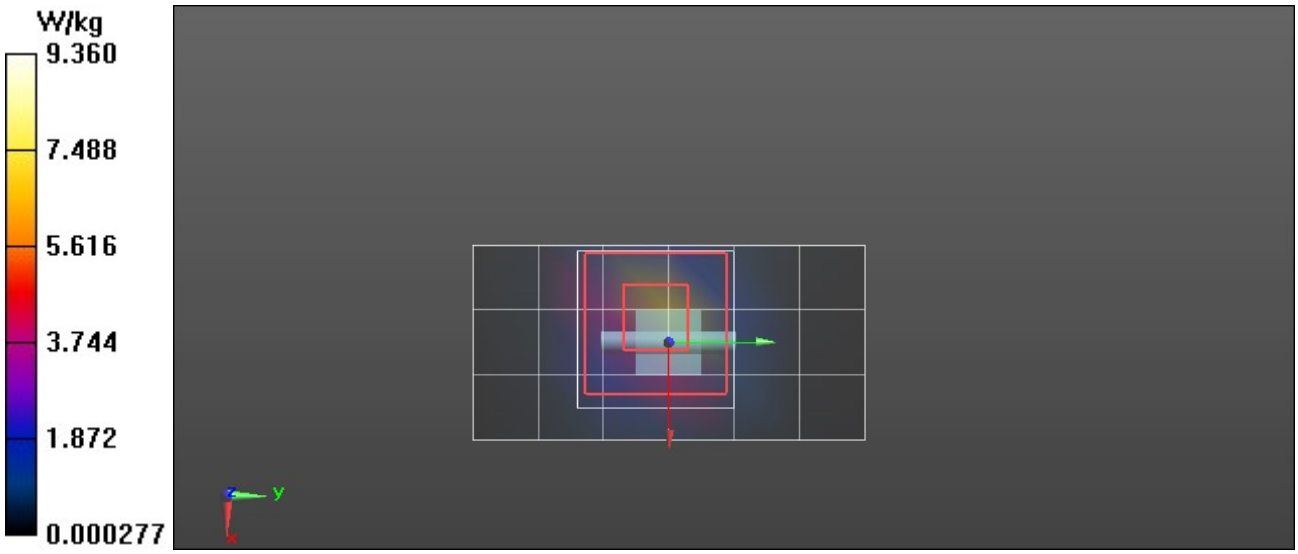
- Probe: EX3DV4 - SN7826; ConvF(5.14, 4.73, 4.93) @ 5750 MHz; Calibrated: 5/16/2023
- Sensor-Surface: 2mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/18/2023
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax; Serial: 1234
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

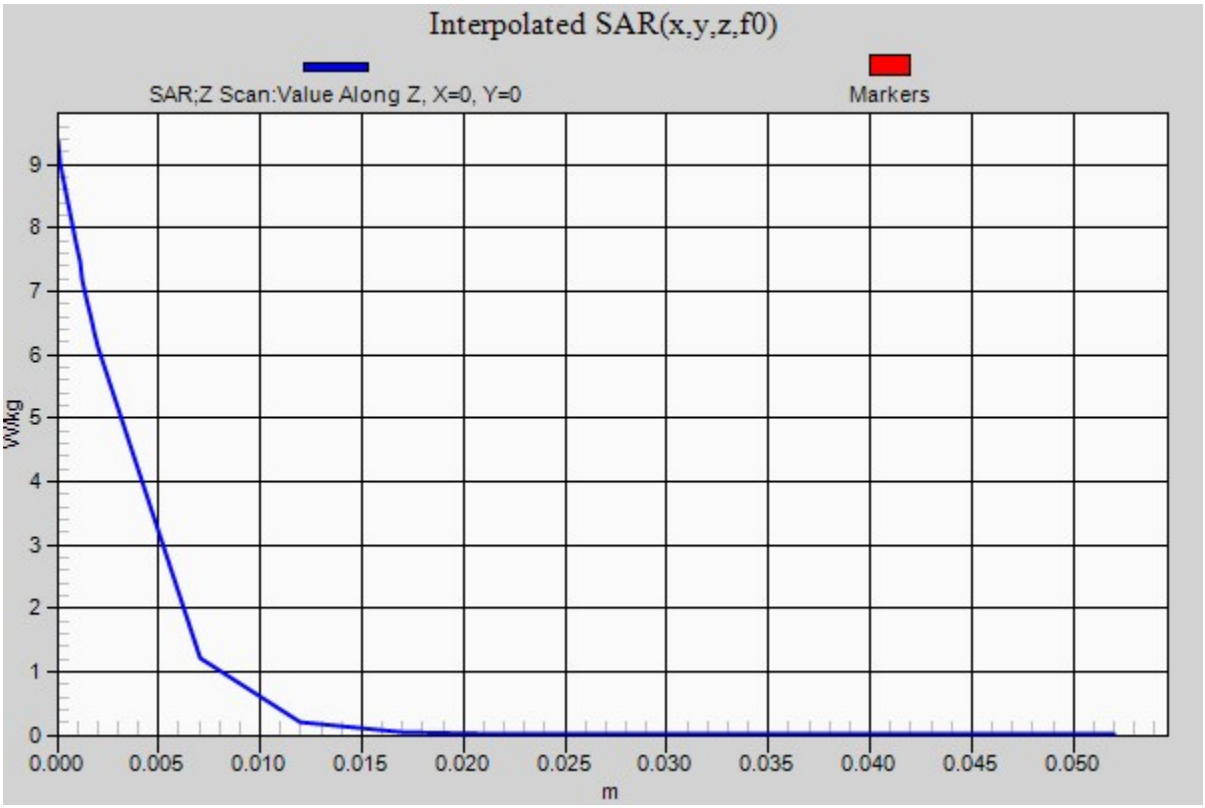
SPC/SPC 5750H Input=50mw, Target=[3.40][3.78][4.16], Target=75.54W/kg@1000 mw 2 2 2/Area Scan (31x61x1): Interpolated grid: dx=1.000 mm, dy=1.000 mm
Reference Value = 24.31 V/m; Power Drift = 0.30 dB
Fast SAR: SAR(1 g) = 3.37 W/kg; SAR(10 g) = 0.941 W/kg
Maximum value of SAR (interpolated) = 7.80 W/kg

SPC/SPC 5750H Input=50mw, Target=[3.40][3.78][4.16], Target=75.54W/kg@1000 mw 2 2 2/Area Scan (4x7x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 6.77 W/kg

SPC/SPC 5750H Input=50mw, Target=[3.40][3.78][4.16], Target=75.54W/kg@1000 mw 2 2 2/Zoom Scan (7x7x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 24.31 V/m; Power Drift = 0.30 dB
Peak SAR (extrapolated) = 15.7 W/kg
SAR(1 g) = 3.53 W/kg; SAR(10 g) = 1.01 W/kg
Smallest distance from peaks to all points 3 dB below = 7.5 mm
Ratio of SAR at M2 to SAR at M1 = 51.5%
Maximum value of SAR (measured) = 7.26 W/kg

SPC/SPC 5750H Input=50mw, Target=[3.40][3.78][4.16], Target=75.54W/kg@1000 mw 2 2 2/Z Scan (1x1x22): Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 2.899 (3.080, 2.693) [mm]
Maximum value of SAR (interpolated) = 9.36 W/kg


W/kg
9.360
7.488
5.616
3.744
1.872
0.000277
y
z
x


Interpolated SAR(x,y,z,f0)
SAR;Z Scan:Value Along Z, X=0, Y=0
Markers
W/kg
9
8
7
6
5
4
3
2
1
0
0.000
0.005
0.010
0.015
0.020
0.025
0.030
0.035
0.040
0.045
0.050
m

APPENDIX B – MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

BB3Z

DUT: A04856; Type: Transmitter; Serial: Sample Proto-Type
Procedure Name: BB3Z - A04856, Back Side-5mm, 5745MHz OFDM 6mb WIFI

Communication System: UID 0, CW (0); Frequency: 5745 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5745 MHz; σ = 5.56 S/m; ε_r = 33.515; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 3/21/2024 9:24:38 AM

DASY5 Configuration:

- Probe: EX3DV4 - SN7826; ConvF(5.14, 4.73, 4.93) @ 5745 MHz; Calibrated: 5/16/2023
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/18/2023
- 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)

5750H/BB3Z - A04856, Back Side-5mm, 5745MHz OFDM 6mb WIFI/Area Scan 2 (9x7x1): Measurement grid: dx=10mm, dy=10mm

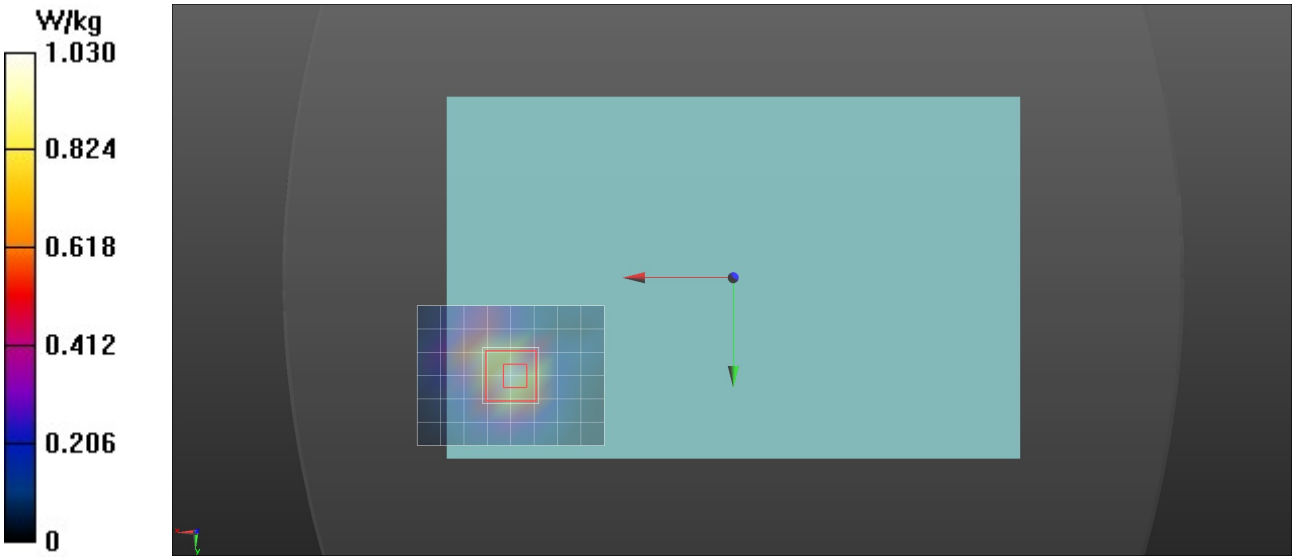
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 1.23 W/kg

5750H/BB3Z - A04856, Back Side-5mm, 5745MHz OFDM 6mb WIFI/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 11.74 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 4.89 W/kg
SAR(1 g) = 1.2 W/kg; SAR(10 g) = 0.443 W/kg
Smallest distance from peaks to all points 3 dB below = 10.2 mm
Ratio of SAR at M2 to SAR at M1 = 50.3%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.31 W/kg

5750H/BB3Z - A04856, Back Side-5mm, 5745MHz OFDM 6mb WIFI/Z Scan (1x1x19): Measurement grid: dx=20mm, dy=20mm, dz=20mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = n/a (n/a, 0) [mm]
Maximum value of SAR (interpolated) = 1.03 W/kg



B59Z

DUT: A04856; Type: Transmitter; Serial: Sample Proto-Type
Procedure Name: B59Z-A04856, Left Edge, 2441MHz BT BR

Communication System: UID 0, CW (0); Frequency: 2441 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2441 MHz; σ = 1.901 S/m; ε_r = 36.844; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 3/12/2024 3:33:12 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN7826; ConvF(7.91, 7.42, 7.62) @ 2441 MHz; Calibrated: 5/16/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/18/2023
- 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/B59Z-A04856, Left Edge, 2441MHz BT BR/Area Scan (10x6x1): Measurement grid: dx=12mm, dy=12mm

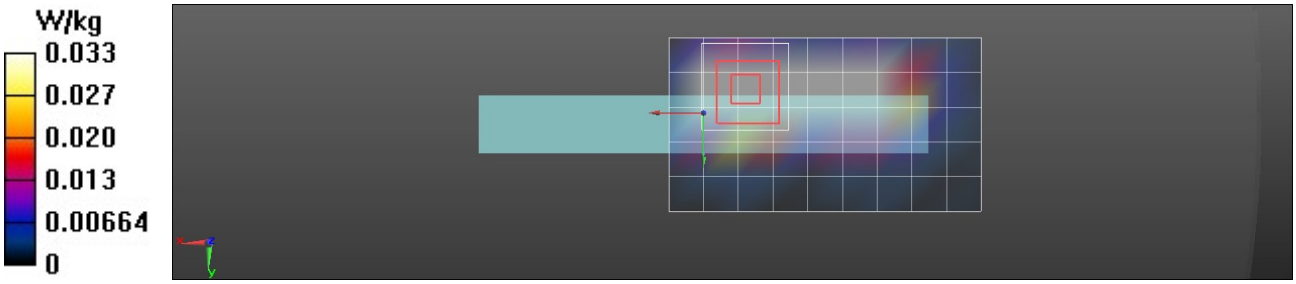
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0979 W/kg

2450H/B59Z-A04856, Left Edge, 2441MHz BT BR/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.596 V/m; Power Drift = 0.30 dB
Peak SAR (extrapolated) = 0.192 W/kg
SAR(1 g) = 0.077 W/kg; SAR(10 g) = 0.034 W/kg
Smallest distance from peaks to all points 3 dB below = 8.5 mm
Ratio of SAR at M2 to SAR at M1 = 39.3%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.142 W/kg

2450H/B59Z-A04856, Left Edge, 2441MHz BT BR/Z Scan (1x1x19): Measurement grid: dx=20mm, dy=20mm, dz=20mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = n/a (n/a, 4.642) [mm]
Maximum value of SAR (interpolated) = 0.0332 W/kg



E58Z

DUT: A04856; Type: Transmitter; Serial: Sample Proto-Type
Procedure Name: E58Z-A04856, Left Edge, 2412MHz 1mb WIFI

Communication System: UID 0, CW (0); Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.846 S/m; ε_r = 37.048; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 3/12/2024 3:52:56 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN7826; ConvF(7.91, 7.42, 7.62) @ 2412 MHz; Calibrated: 5/16/2023
- Sensor-Surface: 1.4mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/18/2023
- 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/E58Z-A04856, Left Edge, 2412MHz 1mb WIFI/Area Scan (10x6x1): Measurement grid: dx=12mm, dy=12mm

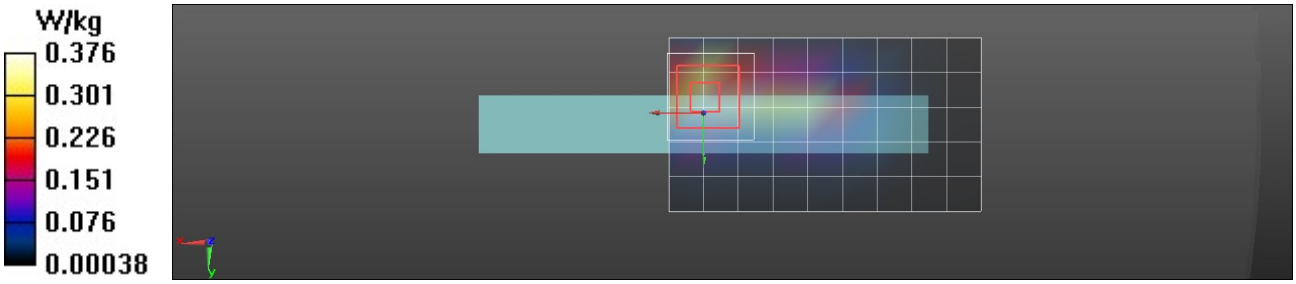
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.454 W/kg

2450H/E58Z-A04856, Left Edge, 2412MHz 1mb WIFI/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.495 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 0.713 W/kg
SAR(1 g) = 0.292 W/kg; SAR(10 g) = 0.127 W/kg
Smallest distance from peaks to all points 3 dB below = 8.2 mm
Ratio of SAR at M2 to SAR at M1 = 41%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.548 W/kg

2450H/E58Z-A04856, Left Edge, 2412MHz 1mb WIFI/Z Scan (1x1x19): Measurement grid: dx=20mm, dy=20mm, dz=20mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = n/a (n/a, 6.742) [mm]
Maximum value of SAR (interpolated) = 0.376 W/kg



E78Z

DUT: A04856; Type: Transmitter; Serial: Sample Proto-Type
Procedure Name: E78Z-A04856, Back Side, 5745MHz OFDM 6mb WIFI

Communication System: UID 0, CW (0); Frequency: 5745 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 5745 MHz; σ = 5.56 S/m; ε_r = 33.515; ρ = 1000 kg/m^3
Phantom section: Flat Section

Date/Time: 3/20/2024 6:28:03 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN7826; ConvF(5.14, 4.73, 4.93) @ 5745 MHz; Calibrated: 5/16/2023
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/18/2023
- 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)

5750H/E78Z-A04856, Back Side, 5745MHz OFDM 6mb WIFI/Area Scan (9x7x1): Measurement grid: dx=10mm, dy=10mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 2.41 W/kg

5750H/E78Z-A04856, Back Side, 5745MHz OFDM 6mb WIFI/Zoom Scan (7x7x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 13.85 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 12.2 W/kg
SAR(1 g) = 2.09 W/kg; SAR(10 g) = 0.609 W/kg
Smallest distance from peaks to all points 3 dB below = 7.6 mm
Ratio of SAR at M2 to SAR at M1 = 51.5%

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 5.45 W/kg

5750H/E78Z-A04856, Back Side, 5745MHz OFDM 6mb WIFI/Z Scan (1x1x19): Measurement grid: dx=20mm, dy=20mm, dz=20mm

Info: Interpolated medium parameters used for SAR evaluation.
Penetration depth = n/a (n/a, 0) [mm]
Maximum value of SAR (interpolated) = 1.41 W/kg