| | |
|---|---|
| Test Report Serial Number: | 45461860 R1.0 |
| Test Report Date: | 3 May 2023 |
| Project Number: | 1630 |

# SAR Test Report - Class II Permissive Change

Applicant:

**Cooper Industries (Electrical) Inc.**
**#74-1833 Coast Meridian Road**
**Port Coquitlam, BC, V3C 6G5**
**Canada**

| Maximum *reported* 1g & 10gSAR | | |
|---|---|---|
| Body: | 0.17 | W/kg |
| General Pop. Limit: | 1.60 | |
| Extremity: | <0.1 | |
| General Pop. Limit: | 4.00 | |

FCC ID: **IA9TD11024**

Product Model Number / HVIN: **TD110-24**

Product Name / PMN: **TD110**

In Accordance With:

**FCC 47 CFR §2.1093**

Radiofrequency Radiation Exposure Evaluation: Portable Devices

Approved By:

**Ben Hewson, President**
Celltech Labs Inc.
21-364 Lougheed Rd.
Kelowna, BC, V1X 7R8
Canada

**Test Lab Certificate: 2470.01**

**IC Registration 3874A**

**FCC Registration: CA3874**

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# 1.0 DOCUMENT CONTROL

| Revision History | | | |
|---|---|---|---|
| **Samples Tested By:** | Ben Hewson/Trevor Whillock | **Date(s) of Evaluation:** | 3 April 2023 |
| **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 | 18 April 2023 |
| 0.2 | Revised Coducted Power Measurements | All | Art Voss | 24 April 2023 |
| 0.3 | Revisions per Client | All | Art Voss | 27 April 2023 |
| 1.0 | Initial Release | All | Art Voss | 3 May 2023 |

## 2.0 CLIENT AND DEVICE INFORMATION

| Client Information | | |
|---|---|---|
| **Applicant Name** | **Cooper Industries (Electrical) Inc** | |
| **Applicant Address** | #74-1833 Coast Meridian Road | |
| | Port Coquitlam, BC, V3C 6G5 | |
| | Canada | |
| **DUT Information** | | |
| **Device Identifier(s):** | **FCC ID:** | **IA9TD11024** |
| | **ISED ID:** | |
| **Device Model(s) / HVIN:** | TD110-24 | |
| **Device Marketing Name / PMN:** | TD110 | |
| **Test Sample Serial No.:** | Conducted: 1E252136, OTA: 1E291787 | |
| **Device Type:** | Handheld Remote Control Device | |
| **Equipment Class** | Digital Transmission System (DTS) | |
| **Transmit Frequency Range:** | 2403.1 - 2479.8MHz | |
| **Manuf. Max. Rated Output Power:** | 12.04dBm | |
| **Antenna Type and Gain:*** | 2.62dBi | |
| **Modulation:** | FSK | |
| **DUT Power Source:** | 3.2VDC, 1200mAh LiFePO4 (rechargeable) | |
| **DUT Dimensions [LxWxH]** | L x W x H: 135mm x 70mm x 30mm | |
| **Deviation(s) from standard/procedure:** | None | |
| **Modification of DUT:** | None | |

* Antenna information provided by applicant

# 3.0 SCOPE OF EVALUATION

This Certification Report was prepared on behalf of:

**Cooper Industries (Electrical) Inc**

,(the '*Applicant*"), in accordance with the applicable Federal Communications Commission (FCC) CFR 47 rule parts and regulations (the '*Rules*'). The scope of this investigation was limited to only the equipment, devices and accessories (the '*Equipment*') supplied by the *Applicant*. The tests and measurements performed on this *Equipment* were only those set forth in the applicable *Rules* and/or the Test and Measurement Standards they reference. The *Rules* applied and the Test and Measurement Standards used during this evaluation appear in the Normative References section of this report. The limits set forth in the technical requirements of the applicable *Rules* were applied to the measurement results obtained during this evaluation and ,unless otherwise noted, these limits were used as the Pass/Fail criteria. The Pass/Fail statements made in this report apply to only the tests and measurements performed on only the *Equipment* tested during this evaluation. Where applicable and permissible, information including test and measurement data and/or results from previous evaluations of same or similar equipment, devices and/or accessories may be cited in this report.

**Device Description:**

The TD110 is a handheld, 2.4GHz remote control device.

**Regulatory Requirement:**

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

**Filing:**

This is an application for a Class II Permissive Change to correct the RF Exposure exhibit in the current filing.

**Scope:**

The scope of this evaluation is to evaluate the SAR for intended use applications. It will include evaluation of the 2450MHz band transmitter for all required RF exposure configurations. Although the intended use is to be held-in-hand, the device could operate while worn on the body. Extremity and Body configurations will be investigated. The Test Plan developed for this evaluation is based on the required test channels and configurations producing the highest worst case SAR. Where applicable, SAR test reduction and/or SAR test exclusion may be utilized. Test procedures are based on the requirements IEC/IEEE 62209-1528, FCC KDB 447498 and 865664..

## 4.0 NORMATIVE REFERENCES

| Normative References* | |
|---|---|
| ANSI / ISO 17025 | General Requirements for competence of testing and calibration laboratories |
| Health Canada | |
| Safety Code 6 | Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3kHz to 300GHz |
| Industry Canada Spectrum Management & Telecommunications Policy | |
| RSS-102 | Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) |
| Notice 2016-DRS001 | Applicability of Latest FCC RF Exposure KDB Procedures and Other Procedures |
| 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 447498 D01v06 | Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies |
| * 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: | |
|---|---|---|
| Cooper Industries (Electrical) Inc | TD110-24 | |
| **Standard(s) Applied:** | **Measurement Procedure(s):** | |
| FCC 47 CFR §2.1093 | FCC KDB 865664, FCC KDB 447498, FCC KDB 248227<br>IEC/IEEE Standard 62209-1528 | |
| **Reason For Issue:** | **Use Group:** | **Limits Applied:** |
| [ ] New Certification | [x] General Population / Uncontrolled | [X] 1.6W/kg - 1g Volume |
| [ ] Class I Permissive Change | | [ ] 8.0W/kg - 1g Volume |
| [X] Class II Permissive Change | [ ] Occupational / Controlled | [x] 4.0W/kg - 10g Volume |
| **Reason for Change:** | | **Date(s) Evaluated:** |
| To correct the existing RF Exposure exhibit | | 3 April 2023 |

The results of this investigation are based solely on the test sample(s) provided by the applicant which was not adjusted, modified or altered in any manner whatsoever except as required to carry out specific tests or measurements. A description of the device, operating configuration, detailed summary of the test results, methodologies and procedures used during this evaluation, the equipment used and the various provisions of the rules are included in this test report.

I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025.

Art Voss, P.Eng.
Technical Manager
Celltech Labs Inc.

18 April 2023
Date

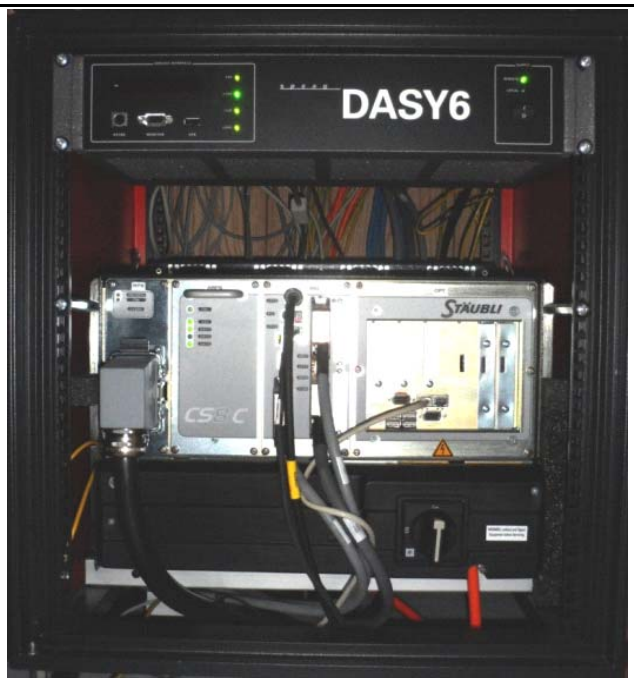

 

# 6.0 SAR MEASUREMENT SYSTEM

## 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 7.1 Conducted Power Measurements – 2.4GHz**

| TD110 -Conducted Power Measurements | | | | | | |
|---|---|---|---|---|---|---|
| **Channel** | **Frequency** *(MHz)* | **Measured Power** *(dBm)* | **Rated Power** *(dBm)* | **Delta** *(dB)* | **SAR Test Channel** *(Y/N)* | **Modulation** |
| Low | 2403.1 | 11.93 | 12.04 | -0.11 | **Y** | FSK |
| Mid | 2441.4 | 10.80 | 12.04 | -1.24 | **Y** | |
| High | 2479.8 | 11.04 | 12.04 | -1.00 | **Y** | |

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 ($N_C$) / SAR TEST REDUCTION

**Required Test Chanels**

In accordance w ith FCC KDB 447498, the number of test channels is given by:

$$\mathbf{N_c = Round\{[100(f_{high} - f_{low})^{0.5} X (f_c/100)^{0.2}\}}$$

$$N_c = Round\{[100(2480 - 2403)^{0.5} X (2441.5/100)^{0.2}\} = 3 \text{ required test channels}$$

**General Test Reduction**

General SAR test reduction per FCC KDB 447498D01

Testing of other required channels w ithin the operating mode of a frequency band is not required w hen the *reported* 1-g or 10-g SAR for the mid band or highest output pow er channel is:

≤ 0.8W/kg or 2.0W/kg, for 1-g or 10-g respectively, w hen the transmission band is ≤ 100Mhz.

# 9.0 ACCESSORIES EVALUATED

**Table 9.1 Accessories Evaluated**

| Manufacturer's Accessories Evaluated | | | | |
|---|---|---|---|---|
| Test Report ID Number | Manufacturer's Part Number | Description | SAR Evaluated | SAR Tested |
| B1 | ASSM-2881-01 | Lanyard, Blue | Y | N |
| | ASSM-2881-02 | Lanyard, Yellow | N | N |

# 10.0 SAR MEASUREMENT SUMMARY

**Table 10.1: Measured Results, Body**

| 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 | reported SAR (W/kg) |
| | | | Pos | Mod | | DUT (mm) | Antenna (mm) | | | | | | |
| 4/3/2023 | B5 | 2403.1 | Front | FSK | | 0 | 0 | 0.116 | -0.210 | -0.110 | 1.000 | 1.000 | 0.125 |
| 4/3/2023 | B6 | 2403.1 | Back | FSK | | 0 | 0 | 0.022 | 0.590 | -0.110 | 1.000 | 1.000 | 0.022 |
| 4/3/2023 | B7 | 2441.4 | Front | FSK | | 0 | 0 | 0.111 | -0.190 | -1.240 | 1.000 | 1.000 | 0.154 |
| 4/3/2023 | B8 | 2479.8 | Front | FSK | | 0 | 0 | 0.126 | -0.260 | -1.000 | 1.000 | 1.000 | 0.168 |
| Applicable SAR Limit | | | | | Use Group | | | | | Limit | | | |
| FCC CFR 2.1093 | | | Health Canada Safety Code 6 | | General Population/User Unaware | | | | | 1.6 W/kg | | | |

**Table 10.1: Measured Results, Extremity**

| 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 | reported SAR (W/kg) |
| | | | Pos | Mod | | DUT (mm) | Antenna (mm) | | | | | | |
| 4/3/2023 | E1 | 2403.1 | Top | FSK | | 0 | 0 | 0.005 | 0.150 | -0.110 | 1.000 | 1.000 | 0.005 |
| 4/3/2023 | E2 | 2403.1 | Bottom | FSK | | 0 | 0 | 0.022 | 0.360 | -0.110 | 1.000 | 1.000 | 0.022 |
| 4/3/2023 | E3 | 2403.1 | Side 1 | FSK | | 0 | 0 | 0.023 | 0.200 | -0.110 | 1.000 | 1.000 | 0.024 |
| 4/3/2023 | E4 | 2403.1 | Side 2 | FSK | | 0 | 0 | 0.008 | 2.130 | -0.110 | 1.000 | 1.000 | 0.009 |
| 4/3/2023 | E5 | 2403.1 | Front | FSK | | 0 | 0 | 0.057 | -0.210 | -0.110 | 1.000 | 1.000 | 0.061 |
| 4/3/2023 | E6 | 2403.1 | Back | FSK | | 0 | 0 | 0.011 | 0.590 | -0.110 | 1.000 | 1.000 | 0.011 |
| 4/3/2023 | E7 | 2441.4 | Front | FSK | | 0 | 0 | 0.055 | -0.190 | -1.240 | 1.000 | 1.000 | 0.077 |
| 4/3/2023 | E8 | 2479.8 | Front | FSK | | 0 | 0 | 0.062 | -0.260 | -1.000 | 1.000 | 1.000 | 0.083 |
| 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 – Body**

| Scaling of Maximum Measured SAR (1g) | | | | | |
|---|---|---|---|---|---|
| Measured Parameters | | Configuration | | | |
| | | Body | | | |
| Plot ID | | B8 | | | |
| Maximum Measured $SAR_M$ | | 0.126 | | | (W/kg) |
| Frequency | | 2479.8 | | | (MHz) |
| Drift | Power Drift | -0.260 | | | (dB) |
| Conducted Power | | 11.040 | | | (dBm) |
| DC | Transmit Duty Cycle | 100.000 | | | (%) |
| Fluid Deviation from Target | | | | | |
| Δe | Permitivity | -7.44% | | | |
| Δσ | Conductivity | 1.07% | | | |

| 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) |
| $C\sigma = (0.009804*f^3) - (0.08661*f^2) + (0.02981*f) + 0.7829$ | | | | | (10) |
| f | Frequency (GHz) | 2.4798 | | | |
| Ce | | -0.225 | | | |
| Cσ | | 0.474 | | | |
| Ce * Δe | | 0.017 | | | |
| Cσ * Δσ | | 0.005 | | | |
| ΔSAR | | 0.022 (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 | 11.040 | | | (dBm) |
| Rated Conducted Power | 12.040 | | | (dBm) |
| ΔP | -1.000 | | | (dB) |

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

| Crest Factor | | | | |
|---|---|---|---|---|
| Transmit Duty Cycle (DC) | 100.000 | | | (%) |
| CF (1/DC) | 1.000 (5) | | | |

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

**Table 11.1 SAR Scaling – Body (Cont)**

| Scaling of Maximum Measured SAR (1g) | | | | | |
|---|---|---|---|---|---|
| Measured Parameters | | Configuration | | | |
| | | Body | | | |
| Plot ID | | B8 | | | |
| Maximum Measured $SAR_M$ | | 0.126 | | | (W/kg) |
| Frequency | | 2479.8 | | | (MHz) |
| Drift | Power Drift | -0.260 | | | (dB) |
| Conducted Power | | 11.040 | | | (dBm) |
| DC | Transmit Duty Cycle | 100.000 | | | (%) |
| SAR Adjustment for Fluid Sensitivity | | | | | |
| $SAR_1 = SAR_M$ X [ΔSAR] | | 0.126 | | | (W/kg) |
| SAR Adjustment for Tuneup Tolerance | | | | | |
| $SAR_2 = SAR_1$ + [ΔP] | | 0.159 | | | (W/kg) |
| SAR Adjustment for Drift | | | | | |
| $SAR_3 = SAR_2$ + [Drift] | | 0.168 | | | (W/kg) |
| SAR Adjustment for Crest Factor | | | | | |
| $SAR_4 = SAR_3$ x [CF] | | 0.168 | | | (W/kg) |
| *reported* 1g SAR | | | | | |
| $SAR_4$ | | **0.17** | | | (W/kg) |

**Table 11.2 SAR Scaling – Extremity**

| Scaling of Maximum Measured SAR (10g) | | | | | |
|---|---|---|---|---|---|
| Measured Parameters | | Configuration | | | |
| | | Extremity | | | |
| Plot ID | | E8 | | | |
| Maximum Measured $SAR_M$ | | 0.062 | | | (W/kg) |
| Frequency | | 2479.8 | | | (MHz) |
| Drift | Power Drift | -0.260 | | | (dB) |
| Conducted Power | | 11.040 | | | (dBm) |
| DC | Transmit Duty Cycle | 100.000 | | | (%) |
| Fluid Deviation from Target | | | | | |
| Δe | Permitivity | -7.44% | | | |
| Δσ | Conductivity | 1.07% | | | |

| Fluid Sensitivity Calculation (10g) 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) | 2.4798 | | | |
| Ce | | -0.160 | | | |
| Cσ | | 0.253 | | | |
| Ce * Δe | | 0.012 | | | |
| Cσ * Δσ | | 0.003 | | | |
| ΔSAR | | 0.015 (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 | 11.040 | | | (dBm) |
| Rated Conducted Power | 12.040 | | | (dBm) |
| ΔP | -1.000 | | | (dB) |

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

| Crest Factor | | | | |
|---|---|---|---|---|
| Transmit Duty Cycle (DC) | 100.000 | | | (%) |
| CF (1/DC) | 1.000 (5) | | | |

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

## Table 11.2 SAR Scaling – Extremity (Cont)

| Scaling of Maximum Measured SAR (10g) | | | | | |
|---|---|---|---|---|---|
| Measured Parameters | | Configuration | | | |
| | | Extremity | | | |
| Plot ID | | E8 | | | |
| Maximum Measured $SAR_M$ | | 0.062 | | | (W/kg) |
| Frequency | | 2479.8 | | | (MHz) |
| Drift | Power Drift | -0.260 | | | (dB) |
| Conducted Power | | 11.040 | | | (dBm) |
| DC | Transmit Duty Cycle | 100.000 | | | (%) |
| **SAR Adjustment for Fluid Sensitivity** | | | | | |
| $SAR_1 = SAR_M$ X [ΔSAR] | | 0.062 | | | (W/kg) |
| **SAR Adjustment for Tuneup Tolerance** | | | | | |
| $SAR_2 = SAR_1$ + [ΔP] | | 0.078 | | | (W/kg) |
| **SAR Adjustment for Drift** | | | | | |
| $SAR_3 = SAR_2$ + [Drift] | | 0.083 | | | (W/kg) |
| **SAR Adjustment for Crest Factor** | | | | | |
| $SAR_4 = SAR_3$ x [CF] | | 0.083 | | | (W/kg) |
| ***reported* 10g SAR** | | | | | |
| $SAR_4$ | | **0.08** | | | (W/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\IEEE 62209-1528 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\IEEE 62209-1528. 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. |

**Table 11.3 SAR Test Exclusion, Test Reduction and Simultaneous Analysis**

SAR Test Exclusion was not applied.

SAR Test Reduction was not applied.

The TD110 does not contain multiple transmitters. Simultaneous Transmission analysis is not applicable.

# 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 |
| 03 Apr 2023 | 24.5 | 24.4 | 18% | 101.5 | X | X | X | 2450H |

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

### 13.2 DUT Setup and Configuration

| DUT Setup and Configuration | |
|---|---|
| 1 | The device was evaluated for Extremity and Body configurations on a flat phantom filled with head tissue-equivalent medium. The DUT was evaluated for SAR in accordance with the procedures described in RSS-102, IEC/IEEE 62209-1528, FCC KDB 447498, 865664, 248227. |
| 2 | The DUT was configured to transmit at maximum output power with continuous FSK. |
| 3 | Each SAR evaluation was performed with a fully charged battery. |

### 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** |
| 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** |
| Devices that are designed to be worn on the Body are positioned on the device holder with the surface of the DUT being 5mm from bottom of the phantom in the Body configuration. |
| **HEAD Configuration** |
| This device is not intended to be held to the ear and was not tested in the HEAD configuration. |
| **Limb Worn Configuration** |
| Devices that are designed to be worn on the wrist are positioned with the back side directly against the phantom surface with the strap removed or opened to allow direct contact of the DUT to the phantom surface. |

## 13.4 General Procedures and Reporting

a

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

## 13.5 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\IEE 62209-1528 and FCC KDB 865664 are applied to the highest measured SAR. A TSL with dielectric parameters > 10% in the DUT test frequency range are not used. |
| **Systems Performance Check** |
| The fluid dielectric parameters of the Active TSL are entered into the DASY Measurement Server at each of the 10MHz step size intervals. Active meaning the TSL used during the SAR evaluation of the DUT. The DASY Measurement System will automatically interpolate the dielectric parameters for DUT test frequencies that fall between the 10MHz step intervals.<br>A Systems Performance Check (SPC) is performed in accordance with IEC\IEEE 62209-1528 "System Check" and FCC KDB 865664 "System Verification". A validation source, dipole or Confined Loop Antenna (CLA), is placed under the geometric center of the phantom and separated from the phantom in accordance to the validation source's Calibration Certificate data. A CW signal set to the frequency of the validate source's and SAR measurement probe's calibration frequency with a forward power set to the validation source's Calibration Certificate data power setting is applied to the validation source. An Area Scan is centered over the projection of the validation source's feed point and an Area Scan is taken. A Zoom Scan centered over the Peak SAR measurement of the Area Scan and the 1g and 10g SAR is measured. The measured 1g and 10g SAR is compared to the 1g and 10g SAR measurements from the validation source's Calibration Certificate. When required, the measured SAR is normalized to 1.0W and compared to the normalized SAR indicated on the validation source's Calibration Certificate. The SPC is considered valid when the measured and normalized SAR is ≤ 10% of the measured and normalize SAR of the validation source's Calibration Certificate.<br>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** |
| **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 2GHz to 3GHz

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

### 13.7 Scan Resolution 5GHz to 6GHz

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

# 14.0 MEASUREMENT UNCERTAINTIES

**Table 14.1 Measurement Uncertainty**

Measurement uncertainty table is not required per KDB 865664 D01 v01r04 section 2.8.2 page 12. SAR measurement uncertainty analysis is required in SAR reports only when the highest measured SAR in a frequency band is ≥ 1.5 W/kg for 1-g SAR. The equivalent ratio (1.5/1.6) should be applied to extremity and occupational exposure conditions. The highest reported SAR value is less than 1.5W/kg. Therefore, the measurement uncertainty table is not required.

# 15.0 FLUID DIELECTRIC PARAMETERS

**Table 15.1 Fluid Dielectric Parameters 2450MHz HEAD TSL**

**********
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Mon 03/Apr/2023 10:54:16
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 | 39.89 | 1.71 | 36.88 | 1.70 |
| 2.3600 | 39.36 | 1.72 | 36.75 | 1.70 |
| 2.3700 | 39.34 | 1.73 | 36.93 | 1.72 |
| 2.3800 | 39.32 | 1.74 | 36.70 | 1.71 |
| 2.3900 | 39.31 | 1.75 | 36.74 | 1.73 |
| 2.4000 | 39.29 | 1.76 | 36.62 | 1.72 |
| 2.4100 | 39.27 | 1.76 | 36.70 | 1.74 |
| 2.4200 | 39.25 | 1.77 | 36.44 | 1.75 |
| 2.4300 | 39.24 | 1.78 | 36.42 | 1.75 |
| 2.4400 | 39.22 | 1.79 | 36.43 | 1.79 |
| 2.4500 | 39.20 | 1.80 | 36.51 | 1.78 |
| 2.4600 | 39.19 | 1.81 | 36.50 | 1.82 |
| 2.4700 | 39.17 | 1.82 | 36.65 | 1.82 |
| 2.4800 | 39.16 | 1.83 | 36.24 | 1.85 |
| 2.4900 | 39.15 | 1.84 | 36.40 | 1.82 |
| 2.5000 | 39.14 | 1.85 | 36.41 | 1.82 |
| 2.5100 | 39.12 | 1.87 | 36.30 | 1.86 |
| 2.5200 | 39.11 | 1.88 | 36.29 | 1.86 |
| 2.5300 | 39.10 | 1.89 | 36.21 | 1.90 |
| 2.5400 | 39.09 | 1.90 | 36.18 | 1.89 |
| 2.5500 | 39.07 | 1.91 | 36.19 | 1.90 |

| 31 | FLUID DIELECTRIC PARAMETERS | | | | | | | Fluid Sensitivity Calculation IEC/IEEE 62209-1528 7.8.2 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Date: | 3-Apr-2023 | Fluid Temp: | 24.4 | 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 |
| 2400.0000 | | 36.6200 | 1.7200 | 39.2900 | 1.76 | -6.80% | -2.27% | 0.004 | 0.005 | 1.000 | 1.000 |
| 2403.1000 | * | 36.6448 | 1.7262 | 39.2838 | 1.76 | -6.72% | -1.92% | 0.006 | 0.005 | 1.000 | 1.000 |
| 2410.0000 | | 36.7000 | 1.7400 | 39.2700 | 1.76 | -6.54% | -1.14% | 0.009 | 0.007 | 1.000 | 1.000 |
| 2440.0000 | | 36.4300 | 1.7900 | 39.2200 | 1.79 | -7.11% | 0.00% | 0.016 | 0.011 | 1.000 | 1.000 |
| 2441.4000 | * | 36.4412 | 1.7886 | 39.2172 | 1.79 | -7.08% | -0.16% | 0.015 | 0.011 | 1.000 | 1.000 |
| 2450.0000 | | 36.5100 | 1.7800 | 39.2000 | 1.80 | -6.86% | -1.11% | 0.010 | 0.008 | 1.000 | 1.000 |
| 2470.0000 | | 36.6500 | 1.8200 | 39.1700 | 1.82 | -6.43% | 0.00% | 0.014 | 0.010 | 1.000 | 1.000 |
| 2479.8000 | * | 36.2482 | 1.8494 | 39.1602 | 1.83 | -7.44% | 1.07% | 0.022 | 0.015 | 1.000 | 1.000 |
| 2480.0000 | | 36.2400 | 1.8500 | 39.1600 | 1.83 | -7.46% | 1.09% | 0.022 | 0.015 | 1.000 | 1.000 |

*Channel Frequency Tested

## 16.0 SYSTEM VERIFICATION TEST RESULTS

**Table 16.1 System Verification Results 2450MHz HEAD TSL**

| System Verification Test Results | | | | | |
|---|---|---|---|---|---|
| Date | | Frequency (MHz) | Validation Source | | |
| | | | P/N | | S/N |
| 03 Apr 2023 | | 2450 | D2450V2 | | 825 |
| Fluid Type | Fluid Temp °C | Ambient Temp °C | Ambient Humidity (%) | Forward Power (mW) | Source Spacing (mm) |
| Head | 24.4 | 25 | 18% | 250 | 10 |
| Fluid Parameters | | | | | |
| Permittivity | | | Conductivity | | |
| Measured | Target | Deviation | Measured | Target | Deviation |
| 36.51 | 39.20 | -6.86% | 1.78 | 1.80 | -1.11% |
| Measured SAR | | | | | |
| 1 gram | | | 10 gram | | |
| Measured | Target | Deviation | Measured | Target | Deviation |
| 13.60 | 13.18 | 3.19% | 6.21 | 6.01 | 3.41% |
| Measured SAR Normalized to 1.0W | | | | | |
| 1 gram | | | 10 gram | | |
| Normalized | Target | Deviation | Normalized | Target | Deviation |
| 54.40 | 52.72 | 3.19% | 24.84 | 24.02 | 3.44% |

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 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 18.1 Measurement System Specifications**

| Measurement System Specification | |
|---|---|
| **Specifications** | |
| **Positioner** | Stäubli Unimation Corp. Robot Model: TX90XL |
| **Repeatability** | +/- 0.035 mm |
| **No. of axis** | 6.0 |
| **Data Acquisition Electronic (DAE) System** | |
| **Cell Controller** | |
| **Processor** | Intel(R) Core(TM) i7-7700 |
| **Clock Speed** | 3.60 GHz |
| **Operating System** | Windows 10 Professional |
| **Data Converter** | |
| **Features** | Signal Amplifier, multiplexer, A/D converter, and control logic |
| **Software** | Measurement Software: DASY6, V 6.4.0.12171 / DASY52 V10.2(1504) |
| | Postprocessing Software: SEMCAD X, V14.6.12(7470) |
| **Connecting Lines** | Optical downlink for data and status info., Optical uplink for commands and clock |
| **DASY Measurement Server** | |
| **Function** | Real-time data evaluation for field measurements and surface detection |
| **Hardware** | Intel ULV Celeron CPU 400 MHz; 128 MB chip disk; 128 MB RAM |
| **Connections** | COM1, COM2, DAE, Robot, Ethernet, Service Interface |
| **E-Field Probe** | |
| **Model** | EX3DV4 |
| **Serial No.** | 3600 |
| **Construction** | Triangular core fiber optic detection system |
| **Frequency** | 10 MHz to 6 GHz |
| **Linearity** | ±0.2 dB (30 MHz to 3 GHz) |
| **Phantom** | |
| **Type** | MFP V5.1C Planar Phantom |
| **Shell Material** | Fiberglass |
| **Thickness** | 2mm +/- .2mm |
| **Volume** | > 8 Liter |

**Table 18.1**

## Measurement System Specification (Continued)

### Probe Specification

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

**EX3DV4 E-Field Probe**

### Phantom Specification

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

**ELI Phantom**

### Phantom Specification

The SAM V4.0 phantom is a flat planar fiberglass shell phantom with a shell thickness of 2.0mm +/- .2mm at the planar area. This phantom conforms to OET Bulletin 65, Supplement C, IEC\IEEE 62209-1528.

**SAM Phantom**

### Phantom Specification

The MFP V5.1C phantom is a flat planar fiberglass shell phantom with a shell thickness of 2.0mm +/- .2mm at the planar area. This phantom conforms to OET Bulletin 65, Supplement C, IEC\IEEE 62209-1528.

**MFP Phantom**

### Device Positioner Specification

The DASY device positioner has two scales for device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear openings). The plane between the ear openings and the mouth tip has a rotation angle of $65^{O}$. The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections.

**Device Positioner**

# 19.0 TEST EQUIPMENT LIST

**Table 19.1 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 | 14-Apr-22 | 14-Apr-23 |
| -EX3DV4 E-Field Probe | 00213 | 3600 | 20-Apr-22 | 20-Apr-23 |
| -D2450V2 Validation Dipole | 00219 | 825 | 24-Apr-21 | 24-Apr-24 |
| MFP Phantom | 00355 | 1177/2 | 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 | 5-Jan-23 |
| 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 20.1 Fluid Composition 2450MHz HEAD TSL**

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

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

## END OF REPORT

# APPENDIX A – SYSTEM VERIFICATION PLOTS

**DUT: 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**

Communication System: UID 0, CW (0); Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; $\sigma$ = 1.78 S/m; $\varepsilon_r$ = 36.51; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section

Date/Time: 4/3/2023 11:58:58 AM

DASY5 Configuration:

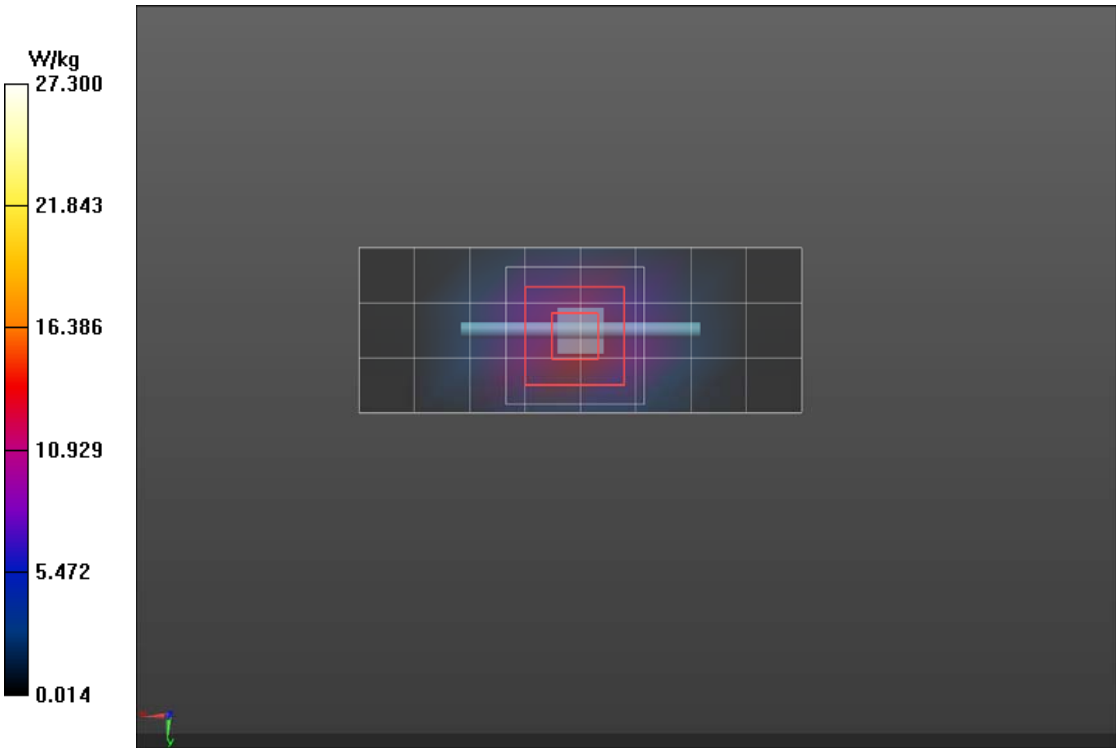
- Probe: EX3DV4 - SN3600; ConvF(6.58, 6.58, 6.58) @ 2450 MHz; Calibrated: 4/20/2022
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn353; Calibrated: 4/14/2022
- Phantom: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 00355
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

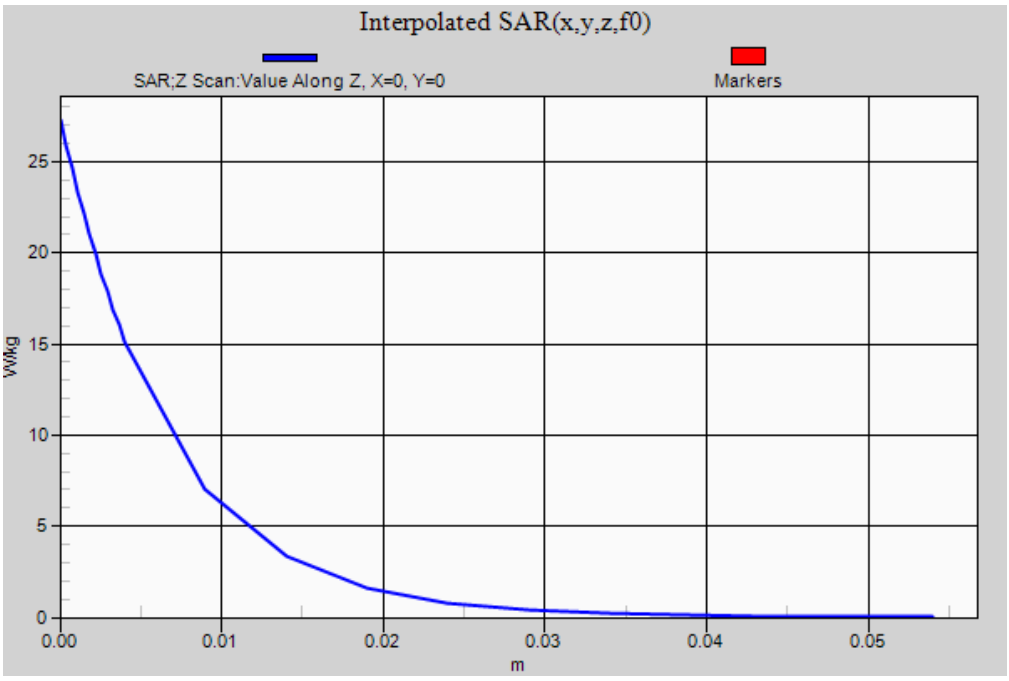
**SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg/Area Scan (9x4x1):** Measurement grid: dx=12mm, dy=12mm
Maximum value of SAR (measured) = 13.4 W/kg

**SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.66 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 29.7 W/kg
**SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.21 W/kg**
Smallest distance from peaks to all points 3 dB below = 10.4 mm
Ratio of SAR at M2 to SAR at M1 = 46.7%
Maximum value of SAR (measured) = 15.4 W/kg

**SPC/SPC 2450H_Input=250mw, Target=[11.86]13.18][14.50]W/kg/Z Scan (1x1x22):** Measurement grid: dx=20mm, dy=20mm, dz=5mm
Penetration depth = 6.812 (6.561, 6.953) [mm]
Maximum value of SAR (interpolated) = 27.3 W/kg


W/kg
27.300
21.843
16.386
10.929
5.472
0.014


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

# APPENDIX B – MEASUREMENT PLOTS OF MAXIMUM MEASURED SAR

## Plot E8/B8, DUT Front

**DUT: EATON TD110; Type: TD110; Serial: SAMPLE**
**Procedure Name: E8/B8 - Front**

Communication System: UID 0, CW (0); Frequency: 2479 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2479 MHz; $\sigma$ = 1.847 S/m; $\varepsilon_r$ = 36.281; $\rho$ = 1000 kg/m$^3$
Phantom section: Left Section

Date/Time: 4/3/2023 5:00:37 PM

DASY5 Configuration:

- Probe: EX3DV4 - SN3600; ConvF(6.58, 6.58, 6.58) @ 2479 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: MFP_V5.1C (20deg probe tilt); Type: QD 000 P51 Cx; Serial: 00355
- Measurement SW: DASY52, Version 52.10 (3); SEMCAD X Version 14.6.13 (7474)

**2450H TD110/E8/B8 - Front/Area Scan (13x9x1):** Measurement grid: dx=12mm, dy=12mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.139 W/kg

**2450H TD110/E8/B8 - Front/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.065 V/m; Power Drift = -0.26 dB
Peak SAR (extrapolated) = 0.253 W/kg
**SAR(1 g) = 0.126 W/kg; SAR(10 g) = 0.062 W/kg**
Smallest distance from peaks to all points 3 dB below = 11.4 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) = 0.136 W/kg

**2450H TD110/E8/B8 - Front/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, 7.216) [mm]
Maximum value of SAR (interpolated) = 0.0231 W/kg