| | |
|---|---|
| Test Report Serial Number: | 45461411 R0.0 |
| Test Report Date: | 13 December 2017 |
| Project Number: | 1390 |

# SAR Test Report - New Filing

Applicant:

**Cobra Electronics Corporation**
**6500 West Cortland Street**
**Chicago, IL, 60707**
**USA**

| Maximum Reported 1g SAR | | | |
|---|---|---|---|
| FCC | HEAD: | <0.1 | W/kg |
| | BODY: | <0.1 | |
| ISEDC | HEAD: | <0.1 | |
| | BODY: | <0.1 | |
| General Pop. Limit: | | 1.60 | |

FCC ID: **BBOHH50WXST**

IC Registration Number: **906A-HH50WXST**

Product Model Number / HVIN: **HH50WXST**

Product Name / PMN: **HH50WXST**

In Accordance With:

**FCC 47 CFR §2.1093**
Radiofrequency Radiation Exposure Evaluation: Portable Devices

**IC RSS-102 Issue 5**
Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands)

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-1**

**FCC Registration: 714830**

## Table of Contents



## 1.0 DOCUMENT CONTROL

| Revision History | | | | |
|---|---|---|---|---|
| **Samples Tested By:** | Trevor Whillock | **Date(s) of Evaluation:** | | 4 - 13 December, 2017 |
| **Report Prepared By:** | Art Voss, P.Eng. | **Report Reviewed By:** | | Art Voss |
| **Report Revision** | **Description of Revision** | **Revised Section** | **Revised By** | **Revision Date** |
| 0.0 | Draft Release | n/a | Trevor Whillock | 13 December 2017 |
| 1.0 | Initial Release- Revised Table 2.0 as per client request | n/a | Trevor Whillock | 13 December 2017 |

## 2.0 CLIENT AND DEVICE INFORMATION

| Client Information | | |
|---|---|---|
| **Applicant Name** | **Cobra Electronics Corporation** | |
| **Applicant Address** | 6500 West Cortland Street | |
| | Chicago, IL, 60707 | |
| | USA | |
| **DUT Information** | | |
| **Device Identifier(s):** | **FCC ID:** | **BBOHH50WXST** |
| | **IC:** | **906A-HH50WXST** |
| **Type of Equipment:** | FCC Part 95(subpart D) radio equipment- non- licensed | |
| | General Radio Service Equipment Operating in the Band(26.960-27.410MHz) RSS-236. | |
| **DUT Description** | Two-Way CB Radio | |
| **Device Model(s) / HVIN:** | HH50WXST | |
| **Device Marketing Name / PMN:** | HH50WXST | |
| **Test Sample Serial No.:** | T/A Sample - Identical Prototype | |
| **Transmit Frequency Range:** | 26.965 - 27.405 MHz | |
| **Number of Channels:** | Fixed | |
| **Manuf. Max. Rated Output Power:** | 4 Watts | |
| **Modulation:** | AM Analog | |
| **Duty Cycle:** | 50% PTT Duty Cycle | |
| **DUT Power Source:** | See Section 8.0 | |
| **Deviation(s) from standard/procedure:** | None | |
| **Modification of DUT:** | None | |

## 3.0 NORMATIVE REFERENCES

| Normative References* | |
|---|---|
| ANSI / ISO 17025:2005 | General Requirements for competence of testing and calibration laboratories |
| FCC CFR Title 47 Part 2<br>Title 47:<br>Part 2.1093: | Code of Federal Regulations<br>Telecommunication<br>Radiofrequency Radiation Exposure Evaluation: Portable Devices |
| Health Canada<br>Safety Code 6 (2015) | Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3kHz to 300GHz |
| Industry Canada Spectrum Management & Telecommunications Policy<br>RSS-102 Issue 5: | Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) |
| IEEE International Committee on Electromagnetic Safety<br>IEEE 1528-2013: | IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques |
| IEC International Standard<br>IEC 62209-2 2010 | Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 2 |
| FCC KDB<br>KDB 865664 D01v01r04 | SAR Measurement Requirements for 100MHz to 6GHz |
| FCC KDB<br>KDB 447498 D01v06 | Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies |
| FCC KDB<br>KDB 643646 D01v01r03 | SAR Test Reduction Considerations for Occupational PTT Radios |
| * When the issue number or issue date is omitted, the latest version is assumed. | |

## 4.0 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: | |
|---|---|---|
| Cobra Electronics Corporation | HH50WXST | |
| **Standard(s) Applied:** | **Measurement Procedure(s):** | |
| FCC 47 CFR §2.1093<br>Health Canada's Safety Code 6 | FCC KDB 865664, FCC KDB 447498,<br>Industry Canada RSS-102 Issue 5<br>IEEE Standard 1528-2013, IEC 62209-2 | |
| **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 | [ ] 4.0W/kg - 10g Volume |
| **Reason for Change:** | | **Date(s) Evaluated:** |
| Original Filing | | December 9 & 11, 2017 |

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.
08December 2017
Date

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

## 5.0 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 VM bus computer.


DASY 6 SAR System with SAM Phantom


DASY 6 Measurement Controller

## 6.0 RF CONDUCTED POWER MEASUREMENT

**Table 6.0 Conducted Power Measurements P1 1.5V Alkaline**

| Conducted Power Measurements | | | | | | |
|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Measured Power (dBm) | Rated Power (dBm) | Rated Power (W) | Delta (dBm) | SAR Test Channel (Y/N) |
| 1 | 26.9650 | 35.61 | 36.00 | 4.00 | -0.39 | Y |
| 2 | 26.9750 | 35.57 | 36.00 | 4.00 | -0.43 | N |
| 18 | 27.1750 | 35.56 | 36.00 | 4.00 | -0.44 | Y |
| 19 | 27.1850 | 35.54 | 36.00 | 4.00 | -0.46 | N |
| 20 | 27.2050 | 35.53 | 36.00 | 4.00 | -0.47 | N |
| 39 | 27.3950 | 35.53 | 36.00 | 4.00 | -0.47 | Y |
| 40 | 27.4050 | 35.49 | 36.00 | 4.00 | -0.51 | N |
| Notes: | | | | | | |
| The Conducted Power of the DUT was measured at the antenna port, the unit was tested at 100% duty cycle transmit. | | | | | | |

**Table 6.1 Conducted Power Measurements P2 1.2V NiMH**

| Conducted Power Measurements | | | | | | |
|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Measured Power (dBm) | Rated Power (dBm) | Rated Power (W) | Delta (dBm) | SAR Test Channel (Y/N) |
| 1 | 26.9650 | 34.92 | 36.00 | 4.00 | -1.08 | Y |
| 2 | 26.9750 | 34.92 | 36.00 | 4.00 | -1.08 | N |
| 18 | 27.1750 | 34.87 | 36.00 | 4.00 | -1.13 | Y |
| 19 | 27.1850 | 34.86 | 36.00 | 4.00 | -1.14 | N |
| 20 | 27.2050 | 34.86 | 36.00 | 4.00 | -1.14 | N |
| 39 | 27.3950 | 34.84 | 36.00 | 4.00 | -1.16 | Y |
| 40 | 27.4050 | 34.83 | 36.00 | 4.00 | -1.17 | N |
| Notes: | | | | | | |
| The Conducted Power of the DUT was measured at the antenna port, the unit was tested at 100% duty cycle transmit. | | | | | | |

**Table 6.2 Conducted Power Measurements P3 Power Supply w/ battery**

| Conducted Power Measurements | | | | | | |
|---|---|---|---|---|---|---|
| Channel | Frequency (MHz) | Measured Power (dBm) | Rated Power (dBm) | Rated Power (W) | Delta (dBm) | SAR Test Channel (Y/N) |
| 1 | 26.9650 | 35.92 | 36.00 | 4.00 | -0.08 | Y |
| 2 | 26.9750 | 35.91 | 36.00 | 4.00 | -0.09 | N |
| 18 | 27.1750 | 35.91 | 36.00 | 4.00 | -0.09 | Y |
| 19 | 27.1850 | 35.91 | 36.00 | 4.00 | -0.09 | N |
| 20 | 27.2050 | 35.91 | 36.00 | 4.00 | -0.09 | N |
| 39 | 27.3950 | 35.91 | 36.00 | 4.00 | -0.09 | Y |
| 40 | 27.405( | 35.90 | 36.00 | 4.00 | -0.10 | N |
| Notes: | | | | | | |
| The Conducted Power of the DUT was measured at the antenna port, the unit was tested at 100% duty cycle transmit. | | | | | | |

*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. Continuous Wave (CW) mode is a test mode not typical with normal transmission modes and may produce higher 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 CW mode at the Maximum output power level setting and produced the most conservative SAR. The *reported* SAR was not scaled down.

## 7.0 NUMBER OF TEST CHANNELS ($N_C$)

| Number of Required Test Channels | | | | | | |
|---|---|---|---|---|---|---|
| Frequency | | | Number of Channels | | Spacing | |
| $f_{LOW}$ (MHz) | $f_{HIGH}$ (MHz) | $f_C$ (MHz) | KDB 447498 ($N_C$) | IEC 62209 ($N_C$) | KDB 447498 (MHz) | IEC 62209 (MHz) |
| 26.965 | 27.405 | **27.185** | **1** | **3** | | **0.2** |

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

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

The number of channels tested was based on Low, Mid and High CB Channels.

## 8.0 ACCESSORIES EVALUATED

**Table 8.0 Manufacturer's Accessory List**

| Manufacturer's Accessory List | | | | | | |
|---|---|---|---|---|---|---|
| **Test Report ID Number** | **Manufacturer's Part Number** | **Description** | **UDC Group[2]** | **Type II Group[3]** | **SAR[4] Evaluated** | **SAR[5] Tested** |
| | | **Antenna Accessory** | | | | |
| **T1** | HH-ANT | Rubber Duck Antenna | **n/a** | **n/a** | **Y** | **Y** |
| **T2** | HG-TA | Telescope Antenna | **n/a** | **n/a** | **Y** | **Y** |
| **T3** | HH-MINI | Magnet Mount Antenna* | **n/a** | **n/a** | **Y** | **Y** |
| | | **Battery Accessory** | | | | |
| **P1** | – | Battery Pack (AA 1.5V) Alkaline Non Rechargeable | **n/a** | **n/a** | **Y** | **Y** |
| **P2** | – | Battery Pack (AA 1.5V) NiMH Rechargeable | **n/a** | **n/a** | **Y** | **Y** |
| **P3** | CLA-HH50 | DC Power Cords | **n/a** | **n/a** | **Y** | **Y** |
| | SJB1600100PU | DC Power Cord Battery Charging Adapter | **n/a** | **n/a** | – | – |
| | – | AC Adapter | **n/a** | **n/a** | – | – |
| | | **Body-Worn Accessory** | | | | |
| **B1** | – | Plastic Belt-Clip | **n/a** | **n/a** | **Y** | **Y** |
| | | **Audio Accessory** | | | | |
| **A1** | PMR-SM | Speaker-Microphone | **n/a** | **n/a** | **Y** | **Y** |
| **A2** | PMR-EBM | Ear-bud Mic with PTT | **n/a** | **n/a** | **Y** | **Y** |

*This antenna evaluated for MPE

# 9.0 SAR MEASUREMENT SUMMARY

**Table 9.0: Measured Results – BODY**

| Measured SAR Results (1g) - BODY Configuration (FCC/ISEDC) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Plot ID | DUT M/N | Test Frequency (MHz) | Modulation | Accessories | | | | DUT Spacing | | Conducted Power (dBm) | Measured SAR (1g) | | SAR* Drift (dB) |
| | | | | | Antenna ID | Battery ID | Body ID | Audio ID | DUT (mm) | Antenna (mm) | | 100% DC (W/kg) | 50% DC (W/kg) | |
| BODY | | | | | | | | | | | | | | |
| 09 Dec 2017 | B1 | HH50 | 26.965 | CW | T1 | P2 | B1 | A1 | 0 | 30 | 34.92 | 0.070 | 0.035 | - |
| 09 Dec 2017 | B2 | HH50 | 26.965 | CW | T1 | P2 | B1 | A2 | 0 | 30 | 34.92 | 0.046 | 0.023 | - |
| 11 Dec 2017 | B3 | HH50 | 26.965 | CW | T1 | P3-(PS w / Batt) | B1 | A1 | 0 | 30 | 35.92 | 0.023 | 0.011 | - |
| 09 Dec 2017 | B4 | HH50 | 26.965 | CW | T1 | P1 | B1 | A1 | 0 | 30 | 35.61 | 0.100 | 0.050 | - |
| 11 Dec 2017 | B5 | HH50 | 27.175 | CW | T1 | P1 | B1 | A1 | 0 | 30 | 35.56 | 0.054 | 0.027 | - |
| 11 Dec 2017 | B6 | HH50 | 27.405 | CW | T1 | P1 | B1 | A1 | 0 | 30 | 35.49 | 0.036 | 0.018 | - |
| 11 Dec 2017 | B7 | HH50 | 26.965 | CW | T2 | P1 | B1 | A1 | 0 | 30 | 35.61 | 0.000 | 0.000 | - |
| 11 Dec 2017 | B8 | HH50 | 26.965 | CW | T3 | P1 | B1 | A1 | 0 | 30 | 35.61 | 0.131 | 0.066 | - |
| SAR Limit | | | | | | Spatial Peak | | | BODY | | RF Exposure Category | | | |
| FCC 47 CFR 2.1093 | | | Health Canada Safety Code 6 | | | 1 Gram Average | | | 1.6 W/kg | | General Population | | | |

*Due to the low measured SAR and location of the Phantom Reference Point, drift measurements were not indicative of the actual power drift. Conductive power measurements made prior to the beginning of the tests and at the end of the tests produced an average drift of -0.2dB.

**Table 9.1: Measured Results – FACE**

| Measured SAR Results (1g) - FACE Configuration (FCC/ISEDC) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Date | Plot ID | DUT M/N | Test Frequency (MHz) | Modulation | Accessories | | | | DUT Spacing | | Conducted Power (dBm) | Measured SAR (1g) | | SAR* Drift (dB) |
| | | | | | Antenna ID | Battery ID | Body ID | Audio ID | DUT (mm) | Antenna (mm) | | 100% DC (W/kg) | 50% DC (W/kg) | |
| FACE | | | | | | | | | | | | | | |
| 11 Dec 2017 | F1 | HH50 | 26.965 | CW | T1 | P1 | n/a | n/a | 25 | 32 | 35.61 | 0.060 | 0.030 | - |
| 11 Dec 2017 | F2 | HH50 | 26.965 | CW | T2 | P1 | n/a | n/a | 25 | 32 | 35.61 | 0.001 | 0.000 | - |
| 11 Dec 2017 | F3 | HH50 | 26.965 | CW | T3 | P1 | n/a | n/a | 25 | 32 | 35.61 | 0.007 | 0.003 | - |
| SAR Limit | | | | | | Spatial Peak | | | FACE | | RF Exposure Category | | | |
| FCC 47 CFR 2.1093 | | | Health Canada Safety Code 6 | | | 1 Gram Average | | | 1.6 W/kg | | General Population | | | |

*Due to the low measured SAR and location of the Phantom Reference Point, drift measurements were not indicative of the actual power drift. Conductive power measurements made prior to the beginning of the tests and at the end of the tests produced an average drift of -0.2dB.

# 10.0 SCALING OF MAXIMUM MEASURE SAR

**Table 10.0 SAR Scaling**

| Scaling of Maximum Measured SAR (1) | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Measured* Fluid Deviation | | Measured Conducted Power | | Measured Drift | | Measured SAR (1g) | | | | | |
| Plot ID | Configuration | Freq (MHz) | Permittivity | Conductivity | (dBm) | | (dB) | | (W/kg) | | | | | |
| B8 | Body | 26.965 | -4.7% | -1.30% | 35.6 | | -0.200 | | 0.066 | | | | | |
| F1 | Face | 26.965 | -4.70% | -1.30% | 35.6 | | -0.200 | | 0.060 | | | | | |
| **Step 1** | | | | | | | | | | | | | | |
| Fluid Sensitivity Adjustment | | | | | | | | | | | | | | |
| | Scale Factor | | Measured SAR | | Step 1 Adjusted SAR (1g) | | | | | | | | | |
| Plot ID | (%) | X | (W/kg) | = | (W/kg) | | | | | | | | | |
| B8 | -3.280% | X | 0.066 | = | 0.066 | | | | | | | | | |
| F1 | -3.280% | X | 0.060 | = | 0.060 | | | | | | | | | |
| **Step 2** | | | | | | | | | | | | | | |
| Manufacturer's Tune-Up Tolerance | | | | | | | | | | | | | | |
| | Measured Conducted Power | Rated Power | Delta | | Step 1 Adjusted SAR | | Step 2 Adjusted SAR (1g) | | | | | | | |
| Plot ID | (dBm) | (dBm) | (dB) | + | (W/kg) | = | (W/kg) | | | | | | | |
| B8 | 35.6 | 36.0 | -0.4 | + | 0.066 | = | 0.072 | | | | | | | |
| F1 | 35.6 | 36.0 | -0.4 | + | 0.060 | = | 0.066 | | | | | | | |
| **Step 3 (ISED)** | | | | | | | | | | | | | | |
| Drift Adjustment | | | | | | | | | | | | | | |
| | Measured Drift | | Step 2 Adjusted SAR | | Step 3 Adjusted SAR (1g) | | | | | | | | | |
| Plot ID | (dB) | + | (W/kg) | = | (W/kg) | | | | | | | | | |
| B8 | -0.200 | + | 0.072 | = | 0.075 | | | | | | | | | |
| F1 | -0.200 | + | 0.066 | = | 0.069 | | | | | | | | | |
| **Step 4 (FCC)** | | | | | | | | | | | | | | |
| Simultaneous Transmission - Bluetooth and/or WiFi | | | | | | | | | | | | | | |
| | Rated Output Power (Pmax) | Freq | Separation Distance | Estimated SAR | | Step 2 Adjusted SAR | | Step 4 Adjusted SAR (1g) | | | | | | |
| Plot ID | (mW) | (MHz) | (mm) | (W/kg) | + | (W/kg) | = | (W/kg) | | | | | | |
| B8 | | | 0 | | + | | = | 0.080 | | | | | | |
| F1 | | | 0 | | + | | = | 0.118 | | | | | | |
| **Step 5** | | | | | | | | | | | | | | |
| Reported SAR | | | | | | | | | | | | | | |
| | FCC From Steps 1 through 2 | | ISED From Steps 1 through 3 | | | | | | | | | | | |
| Plot ID | 1g SAR (W/kg) | | 1g SAR (W/kg) | | | | | | | | | | | |
| B8 | 0.072 | | 0.075 | | | | | | | | | | | |
| F1 | 0.066 | | 0.069 | | | | | | | | | | | |

*Fluid dielectric targets above and below 30MHz are not publish. Fluid deviation is based on the 30MHz target.

| NOTES to Table 9.0 |
|---|
| (1) Scaling of the Maximum Measured SAR is based on the highest, 100% duty cycle, Face, Body and/or Head SAR measured of ALL test channels, configurations and accessories used during THIS evaluation. The Measured Fluid Deviation parameters apply only to deviation of the tissue equivalent fluids used at the frequencies which produced the highest measured SAR. The Measured Conducted Power applies to the Conducted Power measured at the frequencies producing the highest Face and Body SAR. The Measured Drift is the SAR drift associated with that specific SAR measurement. The Reported SAR is the accumulation of all SAR Adjustments from the applicable Steps 1 through 4. The Plot ID is for indentification of the SAR Measurement Plots in Annex A of this report. NOTE: Some of the scaling factors in Steps 1 through 4 may not apply and are identified by light gray text. |
| **Step 1** |
| Per IEC-62209-1 and FCC KDB 865664. Scaling required only when Measured Fluid Deviation is greater than 5%. If the Measured Fluid Deviation is greater than 5%, Table 10.1 will be shown and will indicate the SAR scaling factor in percent (%). SAR is MULTIPLIED by this scaling factor only when the scaling factor is positive (+). |
| **Step 2** |
| Per KDB 447498. Scaling required only when the difference (Delta) between the Measured Conducted Power and the Manufacturer's Rated Conducted Power is (-) Negative. The absolute value of Delta is ADDED to the SAR. |
| **Step 3** |
| Per IEC 62209-1. Scaling required only when Measured Drift is (-) Negative. The absolute value of Measured Drift is added to Reported or Simultaneous Reported SAR. |
| **Step 4** |
| Per KDB 447498 4.3.2. The SAR, either measured or calculated, of ANY and ALL simultaneous transmitters must be added together and includes all contributors. |
| **Step 5** |
| The Reported SAR is the Maximum Final Adjusted Cumulative SAR from the applicable Steps 1 through 4 and are reported on Page 1 of this report. |

| | |
|---|---|
| I attest that the data reported herein is true and accurate within the tolerance of the Measurement Instrument Uncertainty; that all tests and measurements were performed in accordance with accepted practices or procedures; and that all tests and measurements were performed by me or by trained personnel under my direct supervision. The results of this investigation are based solely on the test sample(s) provided by the client which were not adjusted, modified or altered in any manner whatsoever, except as required to carry out specific tests or measurements. This test report has been completed in accordance with ISO/IEC 17025. |  <br>Trevor Whillock<br>Test Lab Engineer<br>Celltech Labs Inc.<br>6 December 2017<br>Date |

# 11.0 SAR EXPOSURE LIMITS

**Table 11.0 Exposure Limits**

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

## 12.0 DETAILS OF SAR EVALUATION

### 12.0 Day Log

| DAY LOG | | | | Fluid Dielectric | SPC | Test |
|---|---|---|---|---|---|---|
| Date | Ambient Temp °C | Fluid Temp °C | Humidity | | | |
| 8 Dec 2017 | 28 | 21.2 | 36% | X | X | |
| 9 Dec 2017 | 27 | 21.2 | 36% | | | X |
| 11 Dec 2017 | 27 | 20.8 | 36% | | | X |

## 12.1 DUT Setup and Configuration

| DUT Setup and Configuration |
|---|
| **Overview** |
| The HH50WXST was evaluated for *Body* and *Face* SAR at the maximum conducted output power level, preset by the manufacturer, with a fully charged battery in unmodulated continuous transmit operation (Continuous Wave mode at 100% duty cycle) with the transmit key continuously depressed. For a Push-To-Talk (PTT) device with a manually operated transmit pushbutton, a 50% duty cycle compensation for the *reported SAR* was used, as per FCC KDB 447498 (6.1).<br><br>The test procedures outlined in FCC KDB 447498 " General SAR Test Reduction Considerations for " as well as FCC KDB 865664, ISEDC RSS-102 and IEEE 1528 were used throughout the evaluation of this device in the LMR bands. |

## 12.2 DUT Positioning

| DUT Positioning |
|---|
| **Positioning** |
| The DUT Positioner was securely fastened to the Phantom Platform. Registration marks were placed on the DUT and the Positioner to ensure consistent positioning of the DUT for each test evaluation. |
| **FACE Configuration** |
| The DUT was securely clamped into the device holder with the surface of the DUT normally held to the user's face facing the phantom. The device holder was adjusted to ensure that the horizontal axis of the DUT was parallel to the bottom of the phantom. A 25mm spacer block was used to set the separation distance between the DUT and the phantom to 25mm. When applicable and unless by design, the antenna of the DUT was prevented from sagging away from the phantom. The spacer block was removed before testing. |
| **BODY Configuration** |
| Body-Worn and Audio Accessories were affixed to the DUT in the manner in which they are intended to be used. The DUT, with its accessories, were securely clamped into the device holder with the surface of the DUT normally in contact with the body in direct contact with the bottom of the phantom, or 0mm separation from the DUT's accessory to the phantom. Body-Worn Accessory straps, linkages, etc. were positioned in a fashion resembling that for which they were intended to be used. Audio Accessory cables, etc., were positioned in a fashion resembling that for which they were intended to be used. |
| **HEAD Configuration** |
| This device is not intended to be held to the ear and was not tested in the HEAD configuration. |

## 12.3 General Procedures and Report

| General Procedures and Reporting |
|---|
| **General Procedures** |
| The fluid dielectric parameters of the Active Tissue Simulating Liquid (TSL) were measured as described in this Section, recorded and entered into the DASY Measurement Server. Active meaning the TSL used during the SAR evaluation of the DUT. The temperature of the Active TSL was measured and recorded prior to performing a System Performance Check (SPC). An SPC was performed with the Active TSL prior to the start of the test series. The temperature of the Active TSL was measured throughout the day and the Active TSL temperature was maintained to $\pm$ 0.5$^{o}$C. The Active TSL temperature was maintained to within $\pm$1.0$^{o}$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** |
| The 1g SAR, 10g SAR and power drift measurements are recorded in the SAR Measurement Summary tables in the SAR Measurement Summary Section of this report. The SAR values shown in the 100% DC (Duty Cycle) column are the SAR values reported by the SAR Measurement Server with the DUT operating at 100% transmit duty cycle. These tables also include other information such as transmit channel and frequency, modulation, accessories tested and DUT-phantom separation distance.<br><br>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. |

## 12.4 Fluid Dielectric and Systems Performance Check

| Fluid Dielectric and Systems Performance Check |
|---|
| **Fluid Dielectric Measurement Procedure** |
| The fluid dielectric parameters of the Tissue Simulating Liquid (TSL) are measured using the Open-Ended Coax Method connected to an Agilent 8753ET Network Analyzer connected to a measurement server running Aprel Dielectric Property Measurement System. A frequency range of ± 100MHz for frequencies > 300MHz, ± 50MHz for frequencies ≤ 300MHz and ± 20MHz for frequencies ≤ 30MHz with frequency step size of 10MHz (5MHz below 100MHz) 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 OET Bulletin 65 Supplement C 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.<br>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.<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. |

## 12.5 Scan Resolution 100MHz to 2GHz

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

## 12.6 Scan Resolution 2GHz to 3GHz

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

## 12.7 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 | |

# 13.0 MEASUREMENT UNCERTAINTIES

**Table 13.0 Measurement Uncertainty**

| UNCERTAINTY BUDGET FOR DEVICE EVALUATION (IEEE 1528-2013 Table 9) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Uncertainty Component** | **IEEE 1528 Section** | **Uncertainty Value ±%** | **Probability Distribution** | **Divisor** | **ci 1g** | **ci 10g** | **Uncertainty Value ±% (1g)** | **Uncertainty Value ±% (10g)** | **$V_i$ or $V_{eff}$** |
| **Measurement System** | | | | | | | | | |
| Probe Calibration* | E.2.1 | 6.6 | Normal | 1 | 1 | 1 | 6.60 | 6.60 | ∞ |
| Axial Isotropy* | E.2.2 | 4.7 | Rectangular | 1.732050808 | 0.7 | 0.7 | 1.9 | 1.9 | ∞ |
| Hemispherical Isotropy* | E.2.2 | 9.6 | Rectangular | 1.732050808 | 0.7 | 0.7 | 3.9 | 3.9 | ∞ |
| Boundary Effect* | E.2.3 | 8.3 | Rectangular | 1.732050808 | 1 | 1 | 4.8 | 4.8 | ∞ |
| Linearity* | E.2.4 | 4.7 | Rectangular | 1.732050808 | 1 | 1 | 2.7 | 2.7 | ∞ |
| System Detection Limits* | E.2.4 | 1.0 | Rectangular | 1.732050808 | 1 | 1 | 0.6 | 0.6 | ∞ |
| Modulation Response | E.2.5 | 4.0 | Rectangular | 1.732050808 | 1 | 1 | 2.3 | 2.3 | ∞ |
| Readout Electronics* | E.2.6 | 1.0 | Normal | 1 | 1 | 1 | 1.0 | 1.0 | ∞ |
| Response Time* | E.2.7 | 0.8 | Rectangular | 1.732050808 | 1 | 1 | 0.5 | 0.5 | ∞ |
| Integration Time* | E.2.8 | 1.4 | Rectangular | 1.732050808 | 1 | 1 | 0.8 | 0.8 | ∞ |
| RF Ambient Conditions - Noise | E.6.1 | 0.0 | Rectangular | 1.732050808 | 1 | 1 | 0.0 | 0.0 | ∞ |
| RF Ambient Conditions - Reflection | E.6.1 | 0.0 | Rectangular | 1.732050808 | 1 | 1 | 0.0 | 0.0 | ∞ |
| Probe Positioner Mechanical Tolerance* | E.6.2 | 0.4 | Rectangular | 1.732050808 | 1 | 1 | 0.2 | 0.2 | ∞ |
| Probe Positioning wrt Phantom Shell* | E.6.3 | 2.9 | Rectangular | 1.732050808 | 1 | 1 | 1.7 | 1.7 | ∞ |
| Extrapolation, interpolation & integration algorithms for max. SAR evaluation* | E.5 | 3.9 | Rectangular | 1.732050808 | 1 | 1 | 2.3 | 2.3 | ∞ |
| **Test Sample Related** | | | | | | | | | |
| Test Sample Positioning | E.4.2 | 0.3 | Normal | 1 | 1 | 1 | 0.3 | 0.3 | 5 |
| Device Holder Uncertainty* | E.4.1 | 3.6 | Normal | 1 | 1 | 1 | 3.6 | 3.6 | ∞ |
| SAR Drift Measurement** | E.2.9 | 0.0 | Rectangular | 1.732050808 | 1 | 1 | 0.0 | 0.0 | ∞ |
| SAR Scaling*** | E.6.5 | 2.0 | Rectangular | 1.732050808 | 1 | 1 | 1.2 | 1.2 | ∞ |
| **Phantom and Tissue Parameters** | | | | | | | | | |
| Phantom Uncertainty* | E.3.1 | 4.0 | Rectangular | 1.732050808 | 1 | 1 | 2.3 | 2.3 | ∞ |
| SAR Correction Uncertainty | E.3.2 | 1.2 | Normal | 1 | 1 | 0.84 | 1.2 | 1.0 | ∞ |
| Liquid Conductivity (measurement) | E.3.3 | 6.8 | Normal | 1 | 0.78 | 0.71 | 5.3 | 4.8 | 10 |
| Liquid Permittivity (measurement) | E.3.3 | 5.3 | Normal | 1 | 0.23 | 0.26 | 1.2 | 1.4 | 10 |
| Liquid Conductivity (Temperature) | E.3.2 | 0.1 | Rectangular | 1.732050808 | 0.78 | 0.71 | 0.1 | 0.0 | ∞ |
| Liquid Permittivity Temperature) | E.3.2 | 0.0 | Rectangular | 1.732050808 | 0.23 | 0.26 | 0.0 | 0.0 | ∞ |
| **Effective Degrees of Freedom(1)** | | | | | | | | **$V_{eff}$ =** | **873.2** |
| **Combined Standard Uncertainty** | | | **RSS** | | | | **12.59** | **12.40** | |
| **Expanded Uncertainty (95% Confidence Interval)** | | | **k=2** | | | | **25.18** | **24.80** | |
| **Measurement Uncertainty Table in accordance with IEEE Standard 1528-2003** | | | | | | | | | |

(1) The Effective Degrees of Freedom is > 30 therefore a coverage factor of k=2 represents an approximate confidence level of 95%.

* Provided by SPEAG

**Table 13.1 Calculation of Degrees of Freedom**

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

## 14.0 FLUID DIELECTRIC PARAMETERS

**Table 14.0 Fluid Dielectric Parameters 150MHz HEAD TSL**

**********
Aprel Laboratory
Test Result for UIM Dielectric Parameter
Fri 08/Dec/2017 9:56:58
Freq Frequency(GHz)
Test_e Epsilon of UIM
Test_s Sigma of UIM
**********

| Freq | Test_e | Test_s |
|---|---|---|
| 0.025 | 53.00 | 0.73 |
| 0.030 | 52.40 | 0.74 |
| 0.035 | 52.00 | 0.75 |

| FLUID DIELECTRIC PARAMETERS | | | | | | | |
|---|---|---|---|---|---|---|---|
| Date: | 8 Dec 2017 | Fluid Temp: | 21.2 | Frequency: | 30MHz | Tissue: | Head |
| Freq (MHz) | | Test_e | Test_s | Target_e | Target_s | Deviation Permittivity | Deviation Conductivity |
| 25.0000 | | 53.0000 | 0.7300 | 55.0 | 0.75 | -3.6% | -2.7% |
| 30.0000 | | 52.4000 | 0.7400 | 55.0 | 0.75 | -4.7% | -1.3% |
| 35.0000 | | 52.0000 | 0.7500 | 55.0 | 0.75 | -5.4% | 0.0% |

Fluid dielectric targets above and below 30MHz are not published. Deviation based on 30MHz target.

## 15.0 SYSTEM VERIFICATION TEST RESULTS

**Table 15.0 System Verification Results 30MHz HEAD TSL**

| System Verification Test Results | | | | | |
|---|---|---|---|---|---|
| Date | | Frequency (MHz) | Validation Source | | |
| | | | P/N | | S/N |
| 8 Dec 2017 | | 30 | CLA-30 | | 1005 |
| Fluid Type | Fluid Temp °C | Ambient Temp °C | Ambient Humidity (%) | Forward Power (mW) | Source Spacing (mm) |
| Head | 21.2 | 28 | 36% | 1000 | 0 |
| Fluid Parameters | | | | | |
| Permittivity | | | Conductivity | | |
| Measured | Target | Deviation | Measured | Target | Deviation |
| 52.40 | 55.00 | -4.70% | 0.75 | 0.76 | -1.30% |
| Measured SAR | | | | | |
| 1 gram | | | 10 gram | | |
| Measured | Target | Deviation | Measured | Target | Deviation |
| 1.21 | 1.25 | -3.20% | 0.76 | 0.78 | -2.56% |
| Measured SAR Normalized to 1.0W | | | | | |
| 1 gram | | | 10 gram | | |
| Normalized | Target | Deviation | Normalized | Target | Deviation |
| 1.21 | 1.27 | -4.72% | 0.76 | 0.79 | -3.79% |

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

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

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

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

# 16.0 MEASUREMENT SYSTEM SPECIFICATIONS

**Table 16.0 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 V52.10.0.1446 |
| | Postprocessing Software: SEMCAD X, V14.6.10( Deployment Build ) |
| **Connecting Lines** | Optical downlink for data and status info., Optical uplink for commands and clock |
| **DASY Measurement Server** | |
| **Function** | Real-time data evaluation for field measurements and surface detection |
| **Hardware** | Intel ULV Celeron CPU 400 MHz; 128 MB chip disk; 128 MB RAM |
| **Connections** | COM1, COM2, DAE, Robot, Ethernet, Service Interface |
| **E-Field Probe** | |
| **Model** | EX3DV4 |
| **Serial No.** | 3600 |
| **Construction** | Triangular core fiber optic detection system |
| **Frequency** | 10 MHz to 6 GHz |
| **Linearity** | ±0.2 dB (30 MHz to 3 GHz) |
| **Phantom** | |
| **Type** | ELI Elliptical Planar Phantom |
| **Shell Material** | Fiberglass |
| **Thickness** | 2mm +/- .2mm |
| **Volume** | > 30 Liter |

## Measurement System Specification

### Probe Specification

| | |
|---|---|
| Construction: | Symmetrical design with triangular core;<br>Built-in shielding against static charges<br>PEEK enclosure material (resistant to organic solvents, glycol) |
| Calibration: | In air from 10 MHz to 2.5 GHz<br>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)<br>± 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;<br>Body diameter: 12 mm; Tip diameter: 6.8 mm<br>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, IEEE 1528-2013, IEC 62209-1 and IEC 62209-2.

**ELI Phantom**

### Device Positioner Specification

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

**Device Positioner**

## 17.0 TEST EQUIPMENT LIST

**Table 17.0 Equipment List and Calibration**

| Test Equipment List | | | | |
|---|---|---|---|---|
| **DESCRIPTION** | **ASSET NO.** | **SERIAL NO.** | **DATE CALIBRATED** | **CALIBRATION INTERVAL** |
| Schmid & Partner DASY System | - | - | - | - |
| -DASY Measurement Server | 294 | 1078 | CNR | CNR |
| -Robot | - | 599396-01 | CNR | CNR |
| -DAE4 | 19 | 353 | 24-Apr-17 | Annual |
| -EX3DV4 E-Field Probe | 213 | 3600 | 27-Apr-17 | Annual |
| -CLA-30 Validation Dipole | 300 | 1005 | 23-Nov-17 | Triennial |
| -CLA150 Validation Source | 251 | 4007 | 27-Apr-17 | Triennial |
| -D835V2 Validation Dipole | 217 | 4D075 | 23-Apr-15 | Triennial |
| -D450V3 Validation Dipole | 221 | 1068 | 21-Apr-15 | Triennial |
| -D2450V2 Validation Dipole | 219 | 825 | 23-Apr-15 | Triennial |
| -D5GHzV2 Validation Dipole | 126 | 1031 | 20-Apr-15 | Triennial |
| ELI Phantom | 247 | - | CNR | CNR |
| HP 85070C Dielectric Probe Kit | 33 | none | CNR | CNR |
| Gigatronics 8652A Power Meter | 110 | 1835801 | 29-Feb-16 | Triennial |
| Gigatronics 80701A Power Sensor | 248 | 1833687 | 29-Feb-16 | Triennial |
| HP 8753ET Network Analyzer | 134 | US39170292 | Extended | Triennial |
| Rohde & Schwarz SMR20 Signal Generator | 6 | 100104 | 29-May-17 | Triennial |
| Amplifier Research 5S1G4 Power Amplifier | 106 | 26235 | CNR | CNR |

CNR = Calibration Not Required

## 18.0 FLUID COMPOSITION

**Table 18.0 Fluid Composition 150MHz HEAD TSL**

| | | | 150MHz Head | |
|---|---|---|---|---|
| **Tissue Simulating Liquid (TSL) Composition** | | | | |
| **Component by Percent Weight** | | | | |
| **Water** | **Sugar** | **Salt(1)** | **HEC(2)** | **Bacteriacide(3)** |
| 38.35 | 55.5 | 5.15 | 0.9 | 0.1 |

(1) Non-Iodinized

(2) **H**ydroxy**E**thyl-**C**ellulose: Sigma-Aldrich P/N 54290-500g

(3) Dow Chemical Dowicil 75 Antimicrobial Perservative

Note: 150MHz HEAD TSL formulation was used during this evaluation.

# APPENDIX A – SYSTEM VERIFICATION PLOTS

Date/Time: 12/8/2017 1:46:23 PM

Test Laboratory: Celltech Labs

**SPC-150H Dec 08 2017**
**DUT: CLA-30; Type: CLA-30; Serial: 1xxx**

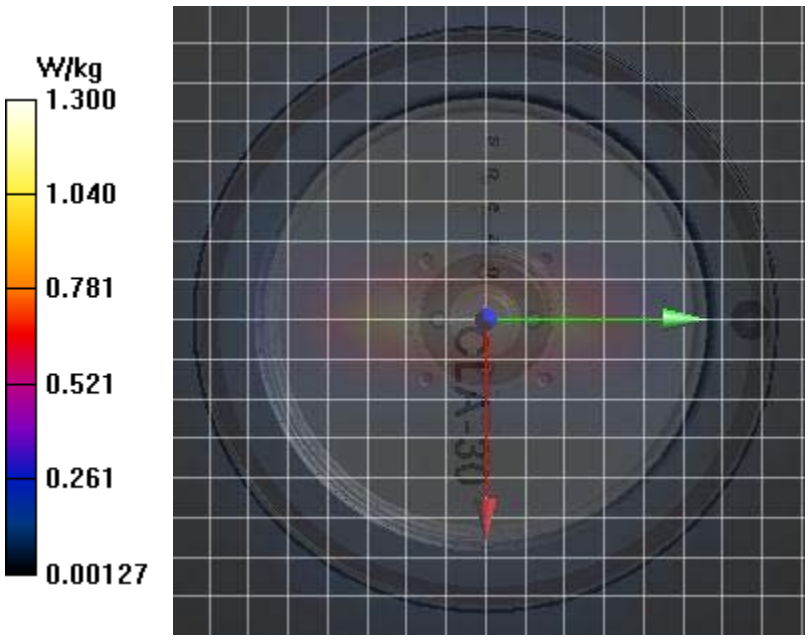
Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 30 MHz;Communication System PAR: 0 dB; PMF: 1

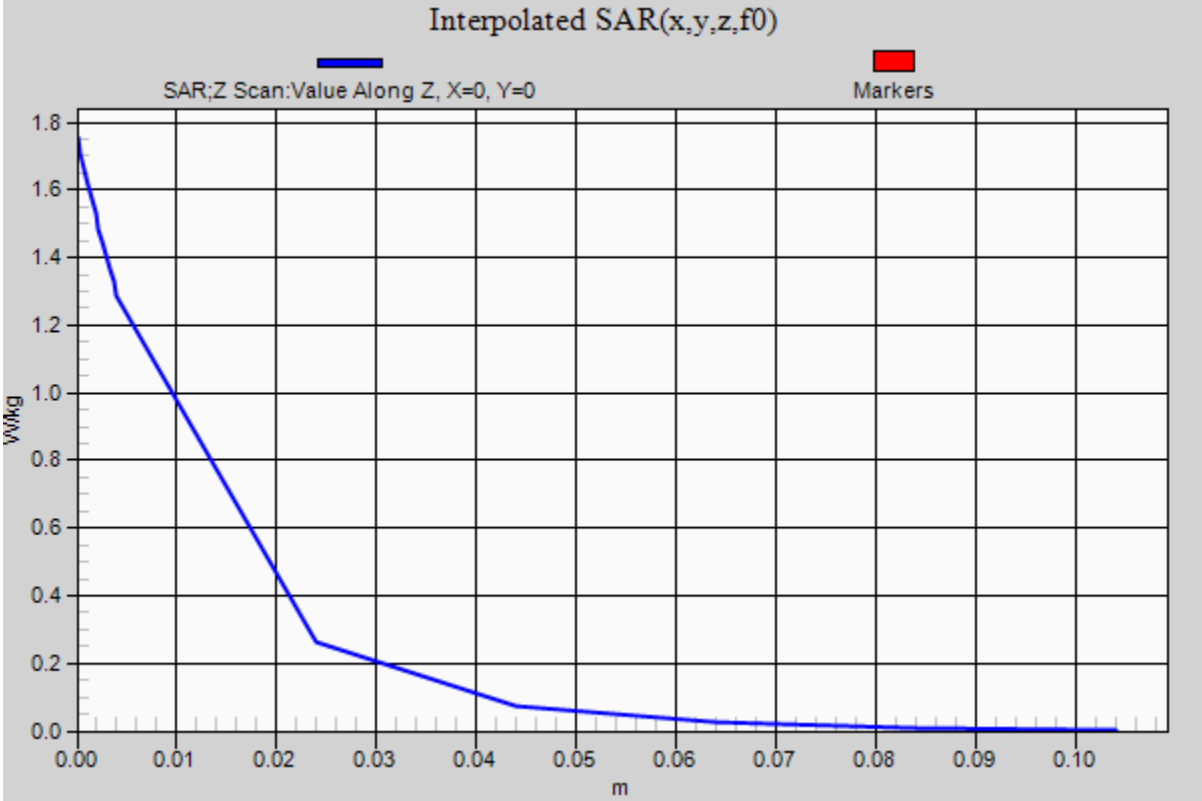
Medium: TSL_150H[08DEC17]
Medium parameters used: f = 30 MHz; $\sigma$ = 0.74 S/m; $\varepsilon_r$ = 52.4; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600 --add ConvF; ConvF(12.17, 12.17, 12.17); Calibrated: 11/23/2017;
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection), z = -1.5, 31.0, 101.0
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.0(1446);

**Frequency: 30 MHz**
**SPC 150H/30MHz Input=1.0W, Target=1.25W/kg/Area Scan (21x21x1):** Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.30 W/kg
**SPC 150H/ 30MHz Input=1.0W, Target=1.25W/kg/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 42.52 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 1.96 W/kg
**SAR(1 g) = 1.21 W/kg; SAR(10 g) = 0.761 W/kg**
**SPC 150H/ 30MHz Input=1.0W, Target=1.25W/kg/Z Scan (1x1x17):** Measurement grid: dx=20mm, dy=20mm, dz=20mm
Penetration depth = n/a (n/a, 12.57) [mm]
Maximum value of SAR (interpolated) = 1.75 W/kg





# APPENDIX B – MEASUREMENT PLOTS OF MAXIMUMUM MEASURED SAR

**Plot B8**

Date/Time: 12/11/2017 12:54:08 PM

Test Laboratory: Celltech Labs

**Cobra Test 150H Dec 11 2017**

**DUT: HH50 Body w. Antenna T3; Type: Sample; Serial: IMEI Number**

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 26.965 MHz;Communication System PAR: 0 dB; PMF: 1

Medium: TSL_150H[08DEC17]
Medium parameters used (interpolated): f = 26.965 MHz; $\sigma$ = 0.734 S/m; $\varepsilon_r$ = 52.764; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600 --add ConvF; ConvF(12.17, 12.17, 12.17); Calibrated: 11/23/2017;
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = -1.5, 31.0, 101.0
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.0(1446);

**Frequency: 26.965 MHz**

**150H/B8*-HH50 26.965MHz Body, w/ bc, A1, Ant T3, P1/Area Scan (6x28x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.131 W/kg

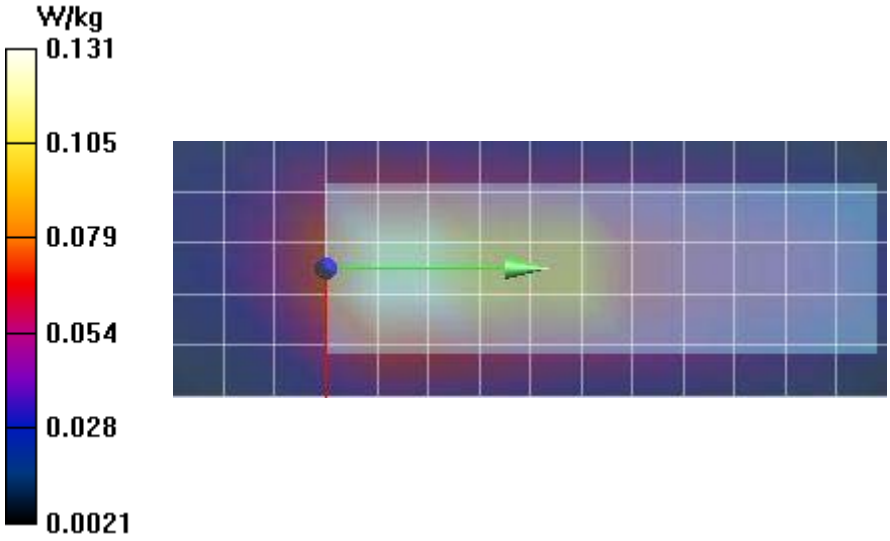
**150H/B8*-HH50 26.965MHz Body, w/ bc, A1, Ant T3, P1/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Peak SAR (extrapolated) = 0.233 W/kg
**SAR(1 g) = 0.131 W/kg; SAR(10 g) = 0.080 W/kg**

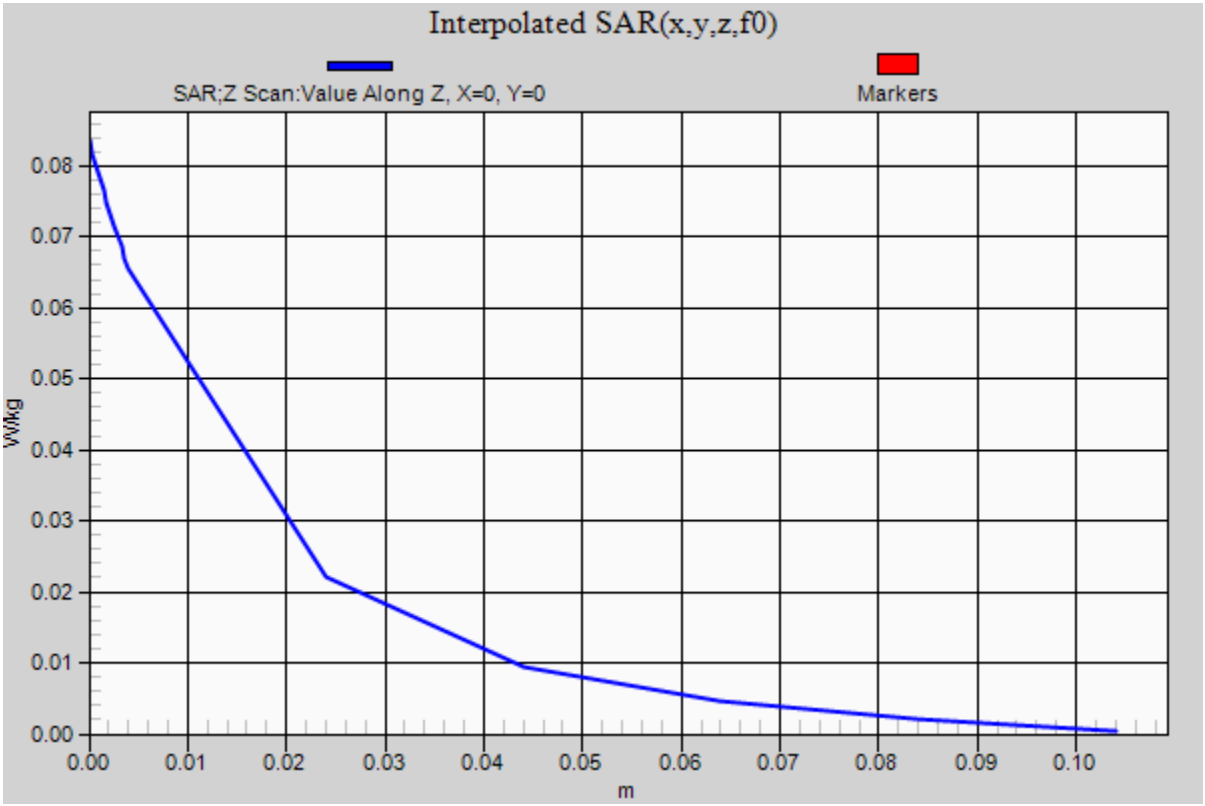
Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.140 W/kg

**150H/B8*-HH50 26.965MHz Body, w/ bc, A1, Ant T3, P1/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, 18.50) [mm]
Maximum value of SAR (interpolated) = 0.0835 W/kg



**Plot F1**

Date/Time: 12/11/2017 1:37:13 PM

Test Laboratory: Celltech Labs

**Cobra Test 150H Dec 11 2017**

**DUT: DUT Sample Brick w. Antenna; Type: Sample; Serial: IMEI Number**

Communication System: UID 0, CW (0); Communication System Band: FullSpan (0.0 - 6000.0 MHz); Frequency: 26.965 MHz;Communication System PAR: 0 dB; PMF: 1

Medium: TSL_150H[08DEC17]
Medium parameters used (interpolated): f = 26.965 MHz; $\sigma$ = 0.734 S/m; $\varepsilon_r$ = 52.764; $\rho$ = 1000 kg/m$^3$
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY Configuration:

- Probe: EX3DV4 - SN3600 --add ConvF; ConvF(12.17, 12.17, 12.17); Calibrated: 11/23/2017;
  - Modulation Compensation:
- Sensor-Surface: 4mm (Mechanical Surface Detection (Locations From Previous Scan Used)), Sensor-Surface: 4mm (Mechanical Surface Detection), z = -1.5, 31.0, 101.0
- Electronics: DAE4 Sn353; Calibrated: 4/24/2017
- Phantom: ELI V5.0 (20deg probe tilt); Type: QD OVA 002 Ax;
- DASY52 52.10.0(1446);

**Frequency: 26.965 MHz**

**150H/F1*-HH50 26.965MHz Body, Ant T1, P1/Area Scan (6x28x1):** Measurement grid: dx=15mm, dy=15mm

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0818 W/kg

**150H/F1*-HH50 26.965MHz Body, Ant T1, P1/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=7.5mm, dy=7.5mm, dz=5mm
Peak SAR (extrapolated) = 0.0890 W/kg
**SAR(1 g) = 0.060 W/kg; SAR(10 g) = 0.041 W/kg**

Info: Interpolated medium parameters used for SAR evaluation.
Maximum value of SAR (measured) = 0.0633 W/kg

**150H/F1*-HH50 26.965MHz Body, Ant T1, P1/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, 31.23) [mm]
Maximum value of SAR (interpolated) = 0.00632 W/kg