RF Exposure Lab

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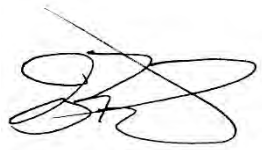
CERTIFICATE OF COMPLIANCE
RF EXPOSURE EVALUATION

Abbott Neuromodulation		Dates of Test:	April 2, 2024
6901 Preston Road		Test Report Number:	SAR.20240401
Plano, TX 75024			
		Lab Designation Number: US1195	

FCC ID:	PX2-ORMET1
Model(s):	3886ABT
Serial Number:	Eng 1
Equipment Type:	Wireless Power Transfer
Classification:	WPT Transmitter
TX Frequency Range:	68 kHz
Frequency Tolerance:	± 2.5 ppm
Maximum RF Output:	68 kHz – -26.23 dBm EIRP
Signal Modulation:	ASK
Antenna Type:	Internal
Application Type:	Certification
Standard(s):	KDB680106 v04
Maximum E-Field	27.31 V/m
Maximum H-Field	1.11 A/m
Distance to Probe:	0 mm

This wireless mobile device has been shown to meet the requirements for RF exposure testing for uncontrolled environment/general exposure limits specified in above listed standards. The device has also been shown to meet the simultaneous requirements of each standard as well (See test report).

I attest to the accuracy of the data. I assume full responsibility for the completeness of these calculations and vouch for the qualifications of all persons making them.



Jay M. Moulton
Vice President

ACCREDITED
Testing Certificate # 2387.01

Table of Contents

Comment/Revision	Date
Original Release	April 8, 2024

Note: The latest version supersedes all previous versions listed in the above table. The latest version shall be used.

1. Introduction

This report shows RF exposure evaluation of the Abbott Neuromodulation Model 3886ABT Wireless Power Transfer with KDB680106 v04.

2. Radiation Sources

Radio	Description	
None	Frequency (MHz)	68 kHz
	Maximum Power (dBm)	-26.23 dBm (EIRP)
	Maximum Duty Cycle (%)	5%

3. 3886ABT Test Setup

Testing Position at 20 mm
All distances have the probe move away from the device

4. RF Exposure Classifications

Device Types	
Fixed	A fixed device is defined as a device physically secured at one fixed location and cannot be easily re-located.
Mobile	A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.
Portable	A portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.

Exposure Categories	
Occupational / Controlled	Limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.
General population / uncontrolled	Exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or cannot exercise control over their exposure.

5. RF Exposure Limits

FCC Requirements

ECFR CONTENT

Table 1 to § 1.1310(e)(1)—Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
0.3–3.0	614	1.63	*(100)	≤6
3.0–30	1842/f	4.89/f	*($900/f^2$)	<6
30–300	61.4	0.163	1.0	<6
300–1,500			f/300	<6
1,500–100,000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	<30
1.34–30	824/f	2.19/f	*($180/f^2$)	<30
30–300	27.5	0.073	0.2	<30
300–1,500			f/1500	<30
1,500–100,000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

Note: For frequencies below 300 kHz, use the limits at 300 kHz.

6. General Conditions

- This report is only in reference to the item that has undergone the assessment.
- This report does not constitute or imply on its own an approval of the product by the Certification Bodies or Competent Authorities.

7. Environmental Conditions

The following limits were not exceeded during the test:

Temperature	Min. = 15 °C Max. = 35 °C
Relative Humidity	Min. = 30% Max. = 60%

8. Test Equipment

	Serial Number	Last Cal. Date	Cal. Due Date
• Wavecontrol SMP2	19SN1179	04/13/2022	04/13/2024
• WP400-3	19WP120054	04/13/2022	04/13/2024
• WPH60	19WP110048	04/13/2022	04/13/2024
• WPF6	19WP060233	04/13/2022	04/13/2024

- Positioning Apparatus used is a plastic tripod to hold the meter and probe at a specified position

9. EUT Description

The description of the antenna is listed below

- There is one antenna in the device
- The element is a 6 turn flat concentric PCB antenna with an impedance of 100 µH
- The shielding or field shaping is not applicable
- The overall dimensions of the device is 114 mm x 60 mm x 17 mm
- The distance from the antenna to the outside of the enclosure is 2 mm
- The position of the antenna 25 mm from the top centered directly in the middle of the device
- The enclosure over the antenna is plastic material

10. RF exposure Evaluation Results

The measurements for the 3886ABT was conducted at 20 mm distance from the device to the center of the probe diameter. A pre-scan of the around the antenna was conducted first by moving the probe around all areas of the device being tested. The movement was conducted at a very slow pace to find the peak value for the device. Once the peak position was determined for the device, the meter and probe were installed on the positioning apparatus for conducting the final measurements.

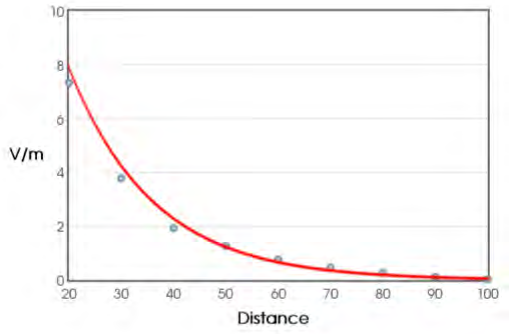
The highest value of the device was then tested every 10 mm moving away from the antenna. All the values were used to extrapolate to the 0 mm distance. The equation used to extrapolate the value to zero is $y = a * b^x$, where x is the distance and y is the measured value. Below are all the measured values for the e- and h-field on the back side of the device which was the highest measured position.

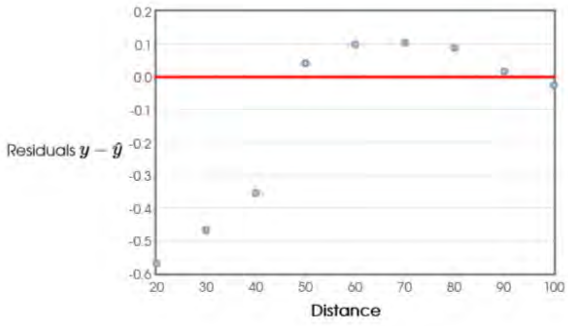
E-Field		H-Field	
Distance	Meas. Value	Distance	Meas. Value
20 mm	7.33 V/m	20 mm	0.55 A/m
30 mm	3.78 V/m	30 mm	0.35 A/m
40 mm	1.93 V/m	40 mm	0.26 A/m
50 mm	1.27 V/m	50 mm	0.18 A/m
60 mm	0.76 V/m	60 mm	0.14 A/m
70 mm	0.46 V/m	70 mm	0.09 A/m
80 mm	0.28 V/m	80 mm	0.06 A/m
90 mm	0.12 V/m	90 mm	0.04 A/m
100 mm	0.03 V/m	100 mm	0.03 A/m

The regression equation for the E-Field calculates to be $27.3123 * 0.9399^{(mm)}$.
The correlation for the E-Field calculates to be r = -0.9856.
The R-square for the E-Field calculates to be $r^2 = 0.9715$.

The extrapolated value at 10 mm is 14.70 V/m.
The extrapolated value at 0 mm is 27.31 V/m.

Below is the scatter plot and residual plot for the E-Field measurements.

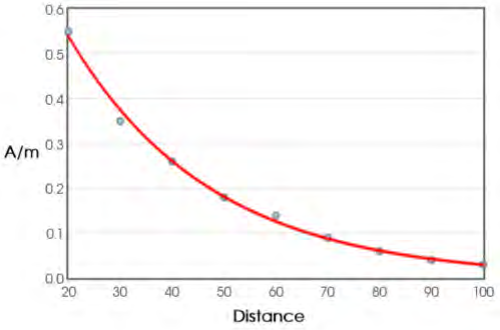


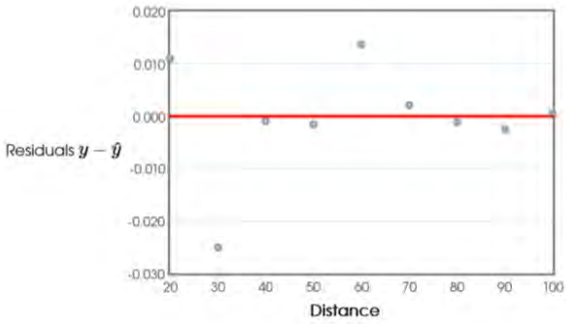


The regression equation for the H-Field calculates to be 1.1136 * 0.9644 (mm).
The correlation for the H-Field calculates to be r = -0.9987.
The R-square for the H-Field calculates to be r^2 = 0.9974.

The extrapolated value at 10 mm is 0.77 A/m.
The extrapolated value at 0 mm is 1.11 A/m.

Below is the scatter plot and residual plot for the H-Field measurements.





Frequency	E-Field Measurement	Limit [V/m]	% Limit	Verdict
68 kHz	27.31	614	4.4	Pass

Frequency	H-Field Measurement	Limit [A/m]	% Limit	Verdict
68 kHz	1.11	1.63	68.1	Pass

There are no other transmitters in the device. Therefore, TER was not required to be evaluated for this device.

Appendix A – Calibration Certificates

Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 220411-085519-f52052

ACCREDITED ISO/IEC 17025 CALIBRATION LABORATORY AC-1498.20

Model Number	WP400-3; SMP2
Manufacturer	Wavecontrol
Description	Field Probe
Serial Number	19WP120054; 19SN1179
Customer Asset No.	N/A

Customer
RF Exposure Lab, LLC
802 N. Twin Oaks Valley Rd
Suite 105
San Marcos, CA 92069
USA

Date of Calibration	04/13/2022
Temperature	23°C
Humidity	48% RH

Location of Calibration
Keysight Technologies Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures and in compliance with ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994 (R2002). The quality management system is registered to ISO 9001:2015.

Calibration Standard(s)
IEEE Std 1309-2013

Calibration Method(s)
Substitution

Calibration Procedure(s)
909579

Calibration Software
Probe Comparison 1.4.1

As Received Conditions
The measured values of the equipment were observed in specification at the points tested.

Action Taken
No action was taken.

As Completed Conditions
The measured values of the equipment were observed in specification at the points tested.

Calibration Due
Based on the customer's request, the next calibration is due on 13 Apr 2024

Remarks or Special Requirements

This calibration report shall not be reproduced, except in full. The documented results relate to the equipment calibrated only.

The test limits stated in the report correspond to the published specifications of the equipment, at the points tested.

Keysight Technologies, Inc.
1346 Yellowwood Road
Kimballton, IA 51543
United States

Brandt Langer Iowa Service Center Manager

Certificate of Calibration

ISO/IEC 17025:2017 and ANSI/NCSL Z540.1-1994

Certificate Number 220411-085519-f52052

Traceability Information

Technician Name Dave Grabill

Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Calibration Equipment Used

Manufacturer	Model Number	Model Description	Equipment ID	Cal Due Date	Certificate Number
Agilent Technologies, Inc.	33250A	Function/Arbitrary Waveform Generator	11101	06/03/2022	210602-130008-794ded
AR	350AH1	Amp	11453	NA	NA
Crown	5002VZ	Amp	11069	NA	NA
EMCO	5101	TEM Cell	10420	NA	2003121920
Hewlett-Packard	8564E	Spectrum Analyzer	10029	06/02/2022	210527-143459-612042
Combinova	FD1	Field Detector	10348	01/31/2023	220104-091355-ad0560
Combinova	FD2	Field Detector	10347	02/28/2023	220201-110452-66d607
Schwarzbeck Mess-Elektronik	FESP 5133-7/41	Loop	11285	10/31/2022	211018-135220-351697
Schwarzbeck Mess-Elektronik	HHS 5204-12	Helmholtz Coil	11091	NA	NA
Holaday	HI-3624	ELF Magnetic Field Meter	10569	09/30/2022	210901-094617-c4f116
Holaday	HI-3627	ELF Magnetic Field Meter	10570	03/31/2023	220309-140426-5aaae9

Compliance with Specification

Unless otherwise noted, the calibration results are reported without factoring in the effect of uncertainty on the assessment of compliance/specification.

In Specification/Out of Specification Explanation

The standard criteria to determine the "In Specification/Out of Specification" status is based on one or more of the following conditions, as requested by the client:

1. If the manufacturer has a specified specification for the item being calibrated, then the calibration values are compared to this specification, and the values must fall within the manufacturer's specification. The specification may be obtained from the manufacturer's web site, data sheets, equipment manuals, etc.
2. Where specifications are called out in a published standard, the calibration results are compared to this specification, and the measured values must fall within the standard's specification.
3. In cases where the manufacturer, standard, or client does not identify any relevant specifications, applicable calibration results are compared to historical data with a +/- 3 dB specification.

Uncertainty of Measurement

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008(GUM). The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95%. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Parameter	Range	MU (+/-)
Magnetic Field Strength Meters - AC	0.20 mG to 20 G	0.33% + 1.2 mG

Customer Name: RF Exposure Lab, LLC
Probe Manufacturer: Wavecontrol
Probe Model: WP400-3; SMP2
Probe Serial No.: 19WP120054; 19SN1179
Notes:
CAL CERT #: 220411-085519-f52052

Electric Field

Linearity - 50Hz

E Field (V/m)	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	Mean CF
800	1.05	0.41	1.04	0.34	1.04	0.35	1.04
750	1.04	0.32	1.04	0.33	1.03	0.27	1.04
500	1.04	0.30	1.03	0.22	1.02	0.18	1.03
250	1.04	0.32	1.04	0.35	1.04	0.32	1.04
100	1.01	0.09	1.03	0.29	0.99	-0.05	1.01
50	1.03	0.22	1.03	0.30	1.03	0.23	1.03
20	1.01	0.05	1.04	0.32	1.04	0.31	1.03

Frequency Response

25Hz-100kHz: 750V/m / 10Hz, 200-400kHz: 300V/m

Freq Hz	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	Mean CF
10	1.31	2.37	1.30	2.31	1.31	2.37	1.31
25	1.14	1.16	1.16	1.26	1.15	1.23	1.15
50	1.06	0.54	1.07	0.56	1.07	0.61	1.07
100	1.09	0.77	1.09	0.77	1.10	0.83	1.10
500	1.10	0.82	1.09	0.72	1.10	0.81	1.09
1000	1.10	0.82	1.09	0.71	1.10	0.83	1.10
2000	1.18	1.44	1.17	1.33	1.17	1.39	1.17
10000	1.07	0.57	1.05	0.45	1.07	0.57	1.06
100000	1.07	0.56	1.06	0.50	1.06	0.48	1.06
200000	1.00	0.04	1.00	0.03	1.00	0.02	1.00
300000	1.05	0.44	1.05	0.46	1.05	0.43	1.05
400000	1.06	0.51	1.03	0.27	1.06	0.48	1.05

Customer Name: RF Exposure Lab, LLC
Probe Manufacturer: Wavecontrol
Probe Model: WP400-3; SMP2
Probe Serial No.: 19WP120054; 19SN1179
Notes:
CAL CERT #: 220411-085519-f52052

Magnetic Field

Linearity - 50Hz

B Field (uT)	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	Mean CF
2000	1.00	0.02	1.00	0.00	1.00	0.00	1.00
1500	0.97	-0.26	0.96	-0.33	0.96	-0.36	0.96
1000	0.97	-0.26	0.97	-0.23	0.97	-0.28	0.97
750	0.96	-0.37	0.96	-0.35	0.95	-0.40	0.96
500	0.96	-0.35	0.96	-0.32	0.96	-0.37	0.96
250	0.97	-0.30	0.97	-0.24	0.97	-0.29	0.97
100	0.95	-0.41	0.96	-0.35	0.95	-0.41	0.96
50	0.97	-0.30	0.97	-0.23	0.97	-0.28	0.97
10	0.97	-0.25	0.98	-0.18	0.98	-0.22	0.98
5	0.98	-0.20	0.98	-0.15	0.98	-0.19	0.98

Frequency Response

10Hz-2kHz: 100uT / 10-200kHz: 25uT

Freq Hz	X axis CF	X axis dB	Y axis CF	Y axis dB	Z axis CF	Z axis dB	Mean CF
10	0.93	-0.67	0.93	-0.65	0.93	-0.63	0.93
30	1.02	0.15	1.02	0.17	1.02	0.19	1.02
50	0.95	-0.46	0.95	-0.44	0.95	-0.43	0.95
100	0.98	-0.17	0.98	-0.15	0.98	-0.14	0.98
500	1.01	0.08	1.01	0.12	1.02	0.13	1.01
1000	0.95	-0.43	0.96	-0.38	0.96	-0.38	0.96
2000	0.94	-0.52	0.95	-0.49	0.95	-0.49	0.94
10000	0.88	-1.09	0.88	-1.14	0.88	-1.12	0.88
100000	0.87	-1.16	0.87	-1.25	0.87	-1.26	0.87
200000	0.88	-1.16	0.86	-1.30	0.86	-1.28	0.87