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Emissions
Test Report

EUT Name: Neuropace Wand

Model No.: W-02

CFR 47 Part 15.205, 15.207, 15.209: 2017

Prepared for:

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Re-issue Date: September 22, 2017
Report Number: 31762317.001

Statement of Compliance

Manufacturer:	NeuroPace, Inc. 455 Bernardo Ave. Mountain View, CA 94043 (650) 237-2700
Requester / Applicant:	Patrick Mulligan
Name of Equipment:	Neuropace Wand
Model No.	W-02
Type of Equipment:	Intentional Radiator
Application of Regulations:	CFR 47 Part 15.205, 15.207, 15.209: 2017
Test Dates:	19-20 July 2017

Guidance Documents:

Emissions: ANSI C63.10: 2013

Test Methods:

Emissions: ANSI C63.10: 2013

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that the equipment described above has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by A2LA or any agency of the U.S. Government. This report contains data that are not covered by A2LA accreditation. This report shall not be reproduced except in full, without the written authorization of TUV Rheinland of North America.

Eddie Mariscal	22 Sept. 2017	David Spencer	22 Sept. 2017
Test Engineer	Date	A2LA Signatory	Date

Testing Cert #3331.02 **US5254** **2932M-1**

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the CFR 47 Part 15.205, 15.207, 15.209: 2017 based on the results of testing performed on 19-20 July 2017 on the Neuropace Wand Model W-02 manufactured by NeuroPace, Inc.. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Table 1: Summary of Test Results

Test	Test Method ANSI C63.10 2013	Test Parameters (from Standard)	Result
Restricted Bands of Operation	CFR47 15.205	Class B	**Complied**
AC Conducted Emission	CFR47 15.207	Class B	**Complied**
Fundamental Field Strength	CFR47 15.209	Class B	**Complied**
Spurious Emission in Transmitted Mode	CFR47 15.209	Class B	**Complied**

Note: AC conducted emission was done on the Host tablets power supply. The EUT gets powered from the Host USB..

1.4 Special Accessories

No special accessories were necessary in order to achieve compliance.

1.5 Equipment Modifications

None

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin, Ct., Fremont, CA 94538, are recognized by the Commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Pleasanton Registration No. US5254, Fremont Registration No. US5251). The laboratory Scopes of Accreditation include Title 47 CFR Parts 15, 18 and 90. The accreditations are updated every three years.

2.1.2 A2LA

TUV Rheinland of North America EMC test facilities are accredited by the American Association for Laboratory Accreditation (A2LA). The laboratories have been assessed and accredited by A2LA in accordance with ISO Standard 17025:2005 (Testing Certificate #3331.02). The Scope of Laboratory Accreditation includes emission and immunity testing. The accreditations are updated annually.

2.1.3 Industry Canada

The Pleasanton 5-meter Semi-Anechoic Chamber, Registration No. 2932M-1, has been accepted by Industry Canada to perform testing to 3 and 5 meters based on the test procedures described in ANSI C63.4-2009. The Fremont 10-meter Semi-Anechoic Chamber, Registration No. 2932D-1, has been accepted by Industry Canada to perform testing to 3 and 10 meters based on the test procedures described in ANSI C63.4-2009.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Ct., Fremont, CA 94538, have been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No. for Pleasanton: A-0031

VCCI Registration No. for Fremont: A-0032

2.2 Test Facilities and EMC Software

Test facilities are located at 1279 Quarry Lane, Ste. A, Pleasanton, California 94566, U.S.A. and 5015 Brandin Ct., Fremont, 94538, U.S.A. (Fremont is the Pleasanton Annex).

2.2.1 Emission Test Facility

The Semi-Anechoic Chambers and AC Line Conducted measurement facilities used to collect radiated and conducted emissions data have been constructed in accordance with ANSI C63.7:1992. The Fremont 10 meter semi-anechoic chamber has been measured in accordance with and verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2009 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04), at test distances of 3 and 10 meters. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02) June 6, 2017. The Pleasanton 5 meter semi-anechoic chamber has been verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2009 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04) at a test distance of 3 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02).

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7 m x 3.7 m x 3.175 mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on an insulated mat with a surface resistivity of 10^9 Ohms/square on a 1.6 m x 0.8 m x 0.8 m high non-conductive table with a 3.175 mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50 cm x 50 cm x 3.175 mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 10m semi-anechoic chamber with absorber added to floor.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9 m x 3.7 m x 3.175 mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.2.3 EMC Software - Fremont

Manufacturer	Name	Version	Test Type
Hewlett-Packard	HP85876B	A.01.00 970825	Radiated & Conducted Emissions
EMISoft	Vasona	5.0	Radiated & Conducted Emissions
ETS-Lindgren	TILE	4.2.A	Radiated Emissions > 1 GHz
ETS-Lindgren	TILE	V.3.4.K.22	Radiated & Conducted Immunity
Haefely	WinFEAT	1.6.3	Surge
Thermo Electron - Keytek	CEWare32	3.0	EFT/Surge/Voltage Dips & Interrupt
Voltech	IEC61000-3	1.15.07RC	Harmonic & Flicker

2.2.4 EMC Software - Pleasanton

Manufacturer	Name	Version	Test Type
ETS-Lindgren	TILE	3.4.K.14 @ 4.0.A.5	Radiated & Conducted Emissions
EMISoft	Vasona	5.0	Radiated & Conducted Emissions
Agilent	Agilent MXE	A.11.02	Radiated & Conducted Emissions
ETS-Lindgren	TILE	3.4.K.14	Radiated & Conducted Immunity
Thermo Electron - Keytek	CEWare32	4.00	EFT/Surge/Voltage Dips & Interrupt
Voltech	IEC61000-3	1.21.07RC2	Harmonic & Flicker

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBμV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty Emissions

Per CISPR 16-4-2	U_{lab}	U_{cispr}
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		

Voltech PM6000A

The estimated combined standard uncertainty for harmonic current and flicker measurements is ± 5.0%.	Per CISPR 16-4-2

2.3.3 Measurement Uncertainty Immunity

The estimated expanded uncertainty for ESD immunity measurements is ± 8.2%.	Per IEC 61000-4-2
The estimated expanded uncertainty for radiated immunity measurements is ± 4.10 dB.	Per IEC 61000-4-3
The estimated expanded uncertainty for EFT fast transient immunity measurements is ± 5.84%.	Per IEC 61000-4-4
The estimated expanded uncertainty for surge immunity measurements is ± 5.84 %.	Per IEC 61000-4-4
The estimated expanded uncertainty for conducted immunity measurements with CDN is ± 3.66 dB	Per IEC 61000-4-6
The estimated expanded uncertainty for power frequency magnetic field immunity is ± 11.6%.	Per IEC 61000-4-8
The estimated expanded uncertainty for voltage variation and interruption measurements is ± 3.48%.	Per IEC 61000-4-11

The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

3 Product Information

3.1 Product Description

The equipment under test (EUT) is the Wand. The Wand is a USB peripheral to the physician Programmer or patient Remote Monitor laptop used to wirelessly communicate with an implanted Neurostimulator. The Wand and Neurostimulator communicate by inductive telemetry in the range 20-50kHz. The Neurostimulator and Wand do not perform transmit functions at the same time. The NeuroPace® Wand enables the user to interrogate and program the implanted Neurostimulator. The patient's physician uses a NeuroPace® Programmer and Wand to interrogate and program the Neurostimulator during surgery and at office follow up visits. The inductive telemetry Wand must be placed within several centimeters of the implanted Neurostimulator to perform efficient telemetry.

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3.2 Equipment Configuration

A description of the equipment configuration is given in Section 7. The EUT was tested as called for in the test standard and was configured and operated in a manner consistent with its intended use. The EUT was powered by the Host USB and allowed to reach intended operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce the worst case radiation for emissions testing.

3.3 Operating Mode

A description of the operation mode is given in Section 7. In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce the worst case radiation for emissions testing.

3.4 Unique Antenna Connector

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of CFR47 Parts 15.211, 15.213, 15.217, 15.219, or 15.221.

3.4.1 Results

The Neuropace Wand uses a trace on the circuit board as a telemetry coil. It is not a user serviceable or replaceable component. This coil is used for inductive telemetry communication.

4 Emissions

Testing was performed in accordance with CFR 47 Part 15.205, 15.207 and 15.209. These test methods are listed under the laboratory's A2LA Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices. Procedures described in Section 8 of the standard were used.

4.1 Intentional Radiator Fundamental Field Strength

The fundamental field strength of an Intentional Radiator are emissions within the operating frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 15.209: 2016

4.1.1 Test Methodology

4.1.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

To determine the worst axis, the pre-scans were performed on X-Axis, Y-Axis, and Z-Axis.

4.1.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

The final scans were performed on the worst case orientation for 20 kHz to 50kHz.

See Test Plan Section for the setup mode and configuration

4.1.1.3 Deviations

None.

4.1.2 Intentional Radiator Field Strength Emissions Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.209

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490.....	2400/F(kHz)	300
0.490-1.705.....	24000/F(kHz)	30
1.705-30.0.....	30	30
30-88.....	100 **	3
88-216.....	150 **	3
216-960.....	200 **	3
Above 960.....	500	3

4.1.3 Test Results (Mode 2)

The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

The EUT is continuously transmitting within its operating band of 20–50 kHz. The two highest emissions were noted at 22 kHz and 44 kHz. The field strength levels for these two frequencies are noted below.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

SOP 1 Radiated Emissions

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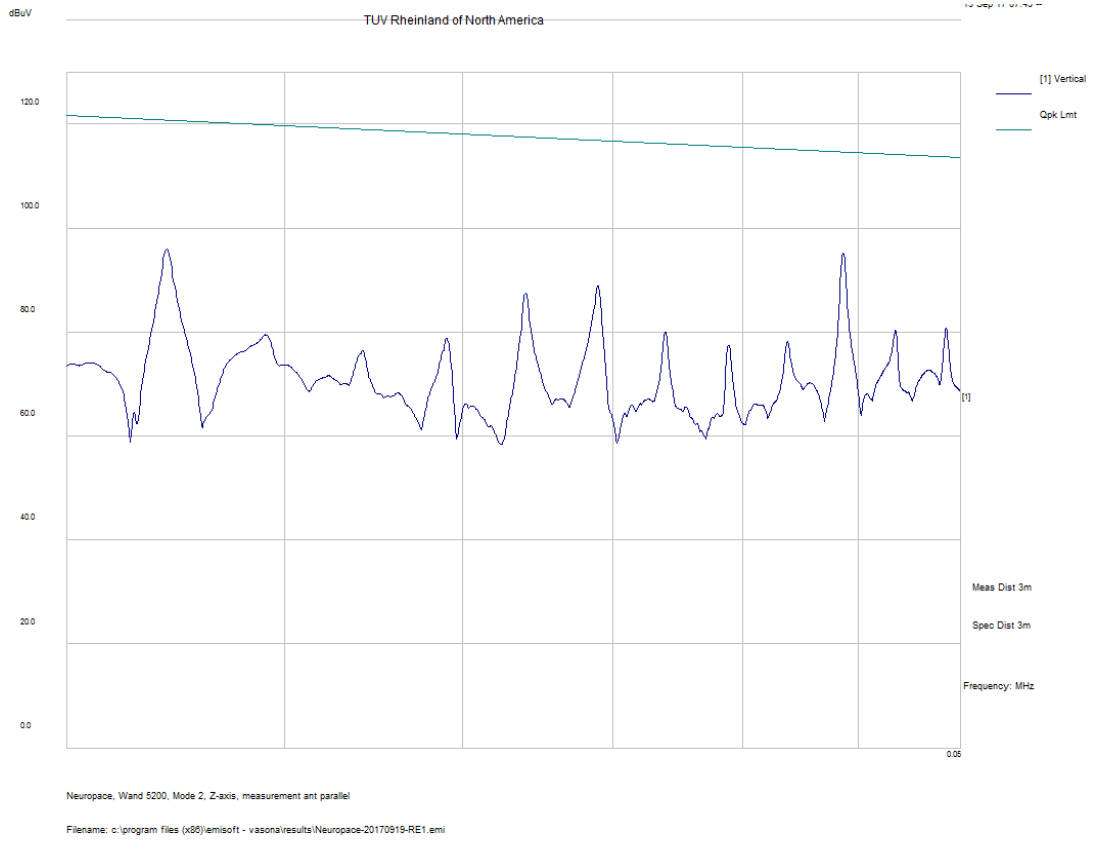
EUT Name	Neuropace Wand	**Date**	September 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2/ Z axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502 – Ant Parallel	**Performed by**	Eddie Mariscal

Antenna Parallel to the EUT (20 kHz – 50 kHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.044	80.53	2.02	12.59	95.14	Pk	V	100	0	114.66	-19.52
0.022	79.39	2.01	14.47	95.88	Pk	V	100	0	120.68	-24.8



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

SOP 1 Radiated Emissions

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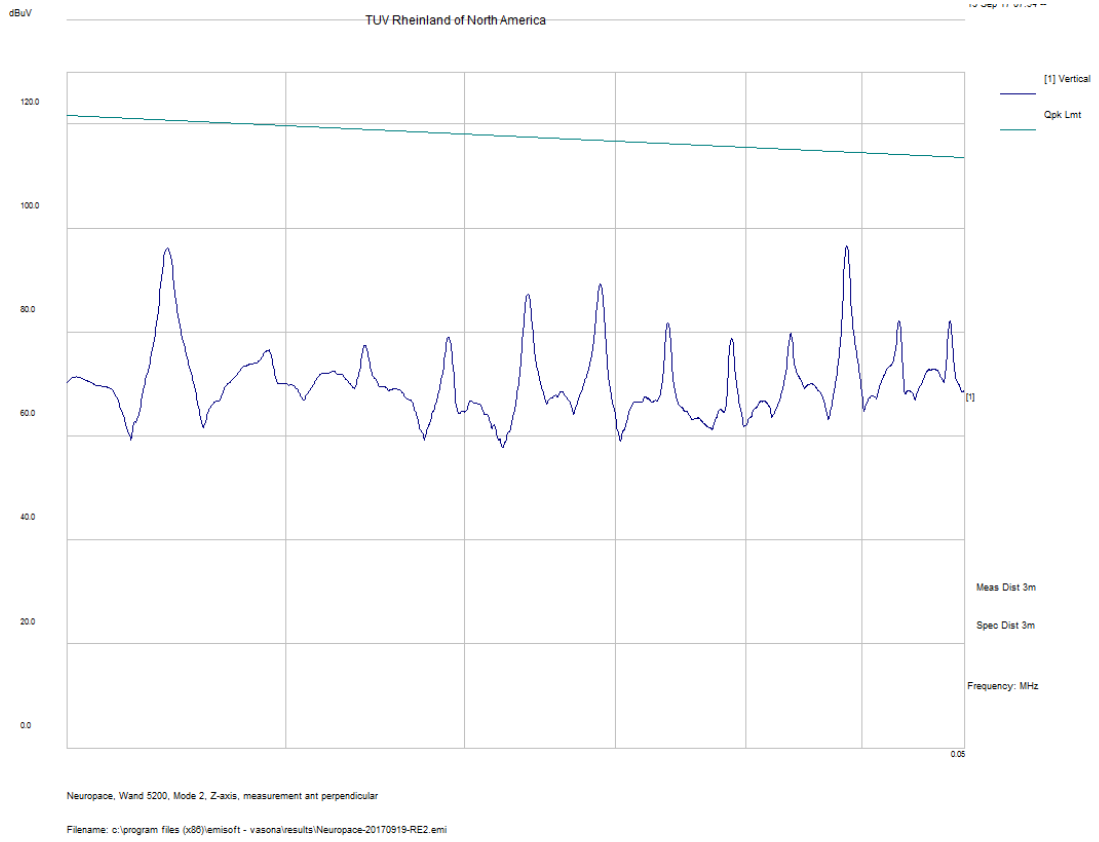
EUT Name	Neuropace Wand	**Date**	September 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2/ Z axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502 – Ant Perpendicular	**Performed by**	Eddie Mariscal

Antenna Perpendicular to the EUT (20 kHz – 50 kHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.044	81.88	2.02	12.59	96.49	Pk	V	141	0	114.66	-18.18
0.022	79.64	2.01	14.47	96.13	Pk	V	141	0	120.68	-24.55



4.2 Intentional Radiator Spurious Emissions

Intentional Radiator spurious emissions are emissions outside the frequency range of the equipment when the equipment is in transmit mode; per requirement of CFR47 15.205 and 15.209: 2016

4.2.1 Test Methodology

4.2.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 120 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

To determine the worst axis, the pre-scans performed on X-Axis, Y-Axis, and Z-Axis.

4.2.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

The final scans performed on all 3 axis for 9 kHz to 1 GHz.

See Test Plan Section for the setup mode and configuration

4.2.1.3 Deviations

None.

4.2.2 Intentional Radiator Spurious Emission Limit

The spurious emissions of the transmitter shall not exceed the values in CFR47 Part 15.205, 15.209

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490.....	2400/F(kHz)	300
0.490-1.705.....	24000/F(kHz)	30
1.705-30.0.....	30	30
30-88.....	100 **	3
88-216.....	150 **	3
216-960.....	200 **	3
Above 960.....	500	3

4.2.3 Test Results (Mode 2)

The final measurement data was taken under the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

SOP 1 Radiated Emissions

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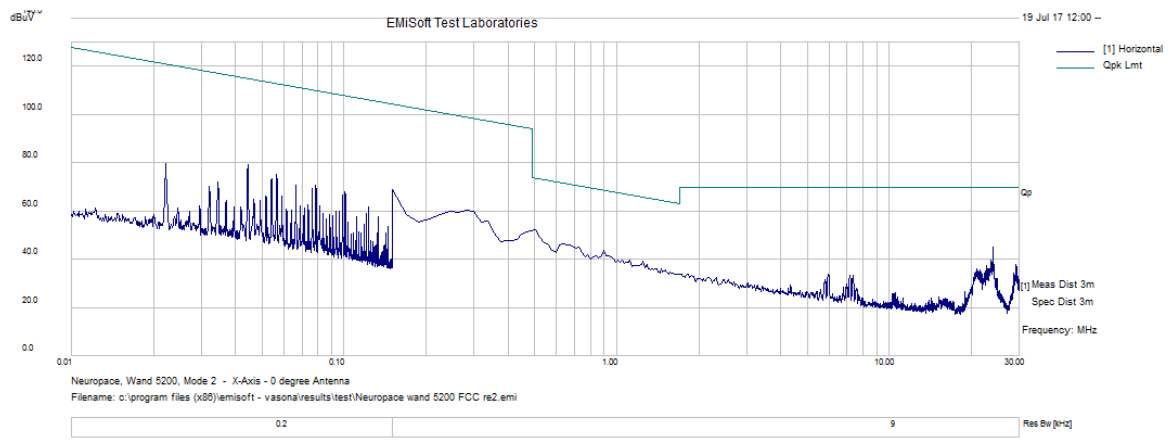
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2/ X axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.504469	40.11	0.97	11.3	52.39	Peak [Scan]	0°	100	296	73.55	-21.16
23.99269	34.3	1.37	9.5	45.17	Peak [Scan]	0°	100	330	69.54	-24.37
0.89625	31.05	1.02	11.4	43.47	Peak [Scan]	0°	100	313	68.56	-25.09
0.635063	33.88	1	11.3	46.18	Peak [Scan]	0°	100	337	71.55	-25.37
1.250719	26.45	1.03	11.57	39.05	Peak [Scan]	0°	100	301	65.66	-26.61
24.08597	27.41	1.37	9.48	38.27	Peak [Scan]	0°	100	337	69.54	-31.28



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

SOP 1 Radiated Emissions

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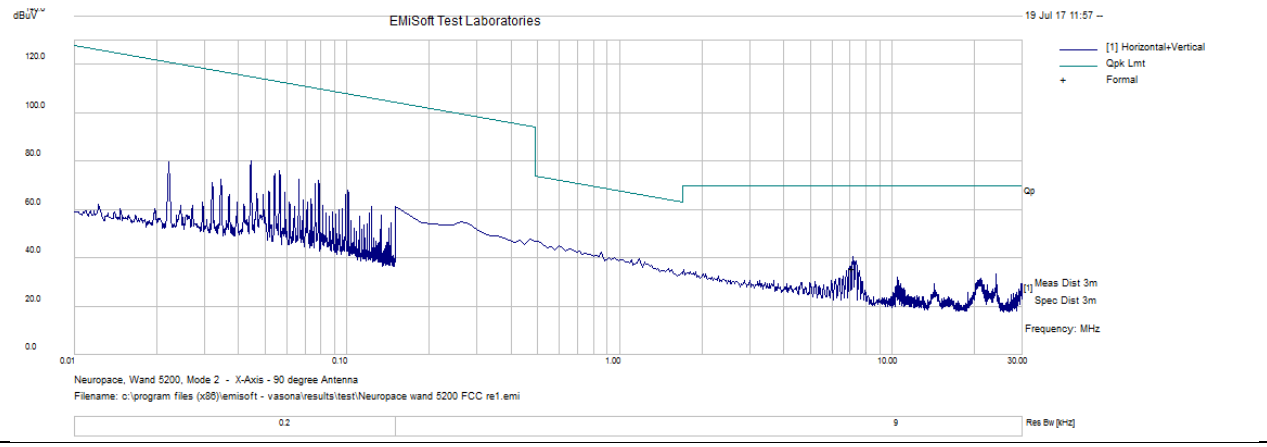
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2/ X axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing 90° angle from EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
7.184	27.64	1.18	10.88	39.7	Peak [Scan]	90°	104	250	69.54	-29.84
0.044284	65.99	1.01	12.49	79.49	Peak [Scan]	90°	104	250	114.68	-35.19
0.054246	59.85	1.01	12	72.86	Peak [Scan]	90°	104	250	112.92	-40.06
0.07888	56.07	1.01	11.61	68.69	Peak [Scan]	90°	104	250	109.67	-40.98
0.066597	56.25	1.01	11.8	69.05	Peak [Scan]	90°	104	250	111.14	-42.09
0.076443	54.51	1.01	11.63	67.15	Peak [Scan]	90°	104	250	109.94	-42.79
7.184	27.64	1.18	10.88	39.7	Peak [Scan]	90°	104	250	69.54	-29.84



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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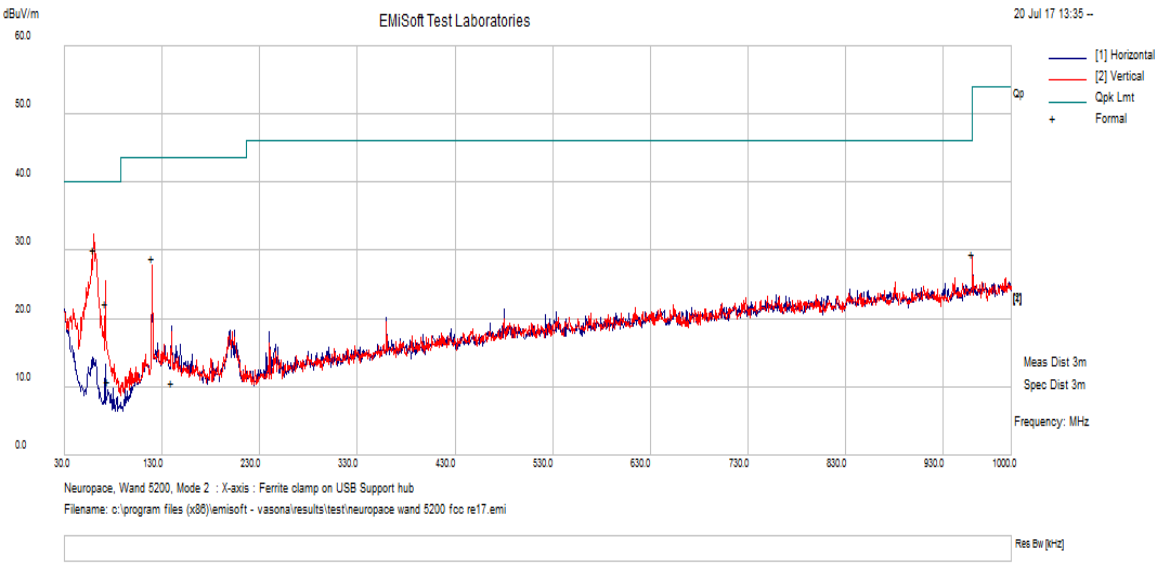
EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	25°C / 38% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2 / X axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / Sunol Science JB3	**Performed by**	Gary Jorgenson

(30 MHz – 1000 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity (H/V)	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
119.9973	41.81	1.95	-14.85	28.91	Quasi Max	V	102	70	43.5	-14.59
960.0996	29.75	4.18	-4.43	29.5	Quasi Max	H	104	81	54	-24.5
60.00381	49.68	1.63	-21.07	30.24	Quasi Max	V	193	147	40	-9.76
72.00744	41.16	1.71	-20.47	22.4	Quasi Max	V	320	216	40	-17.6
74.61563	29.75	1.73	-20.53	10.95	Quasi Max	V	126	278	40	-29.06
139.9519	24	2.04	-15.24	10.81	Quasi Max	H	119	278	43.5	-32.69



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: None

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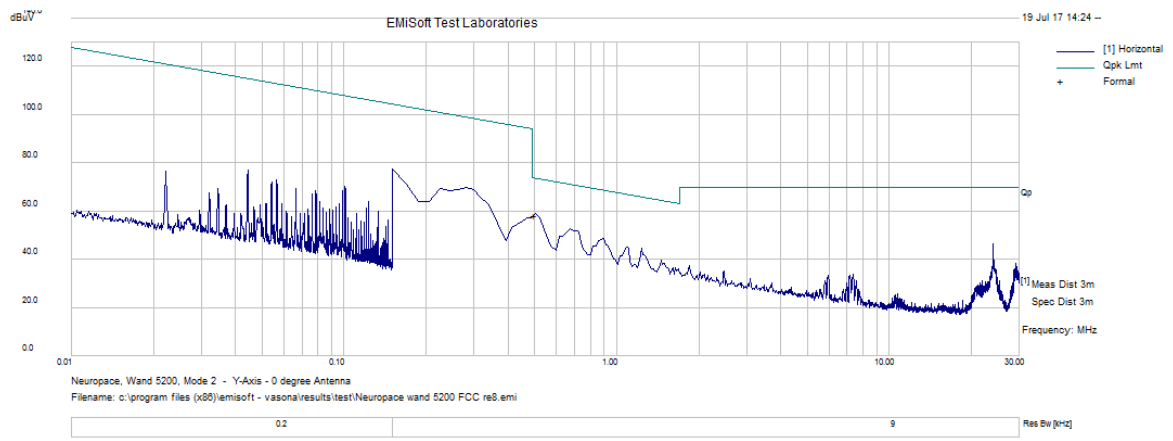
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2/ Y axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.504469	46.43	0.97	11.3	58.71	Peak [Scan]	0°	100	308	73.55	-14.84
0.672375	40.22	1	11.3	52.52	Peak [Scan]	0°	100	284	71.05	-18.53
0.89625	36.16	1.02	11.4	48.57	Peak [Scan]	0°	100	305	68.56	-19.98
1.232063	32.07	1.03	11.57	44.68	Peak [Scan]	0°	100	292	65.79	-21.11
1.082813	32.18	1.02	11.59	44.8	Peak [Scan]	0°	100	292	66.91	-22.12
23.99269	35.46	1.37	9.5	46.33	Peak [Scan]	0°	100	334	69.54	-23.21



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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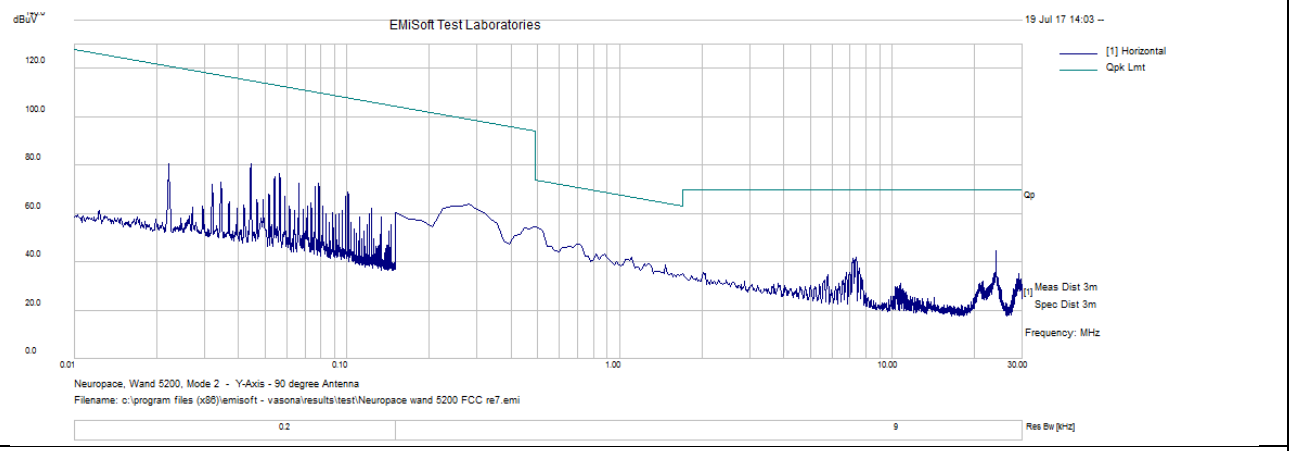
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2/ Y axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing 90° angle from EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.691031	35.13	1	11.3	47.43	Peak [Scan]	90°	100	359	70.81	-23.38
23.99269	33.85	1.37	9.5	44.72	Peak [Scan]	90°	100	331	69.54	-24.82
0.821625	30.98	1.01	11.32	43.31	Peak [Scan]	90°	100	348	69.31	-26
1.232063	26.61	1.03	11.57	39.22	Peak [Scan]	90°	100	261	65.79	-26.58
7.369969	29.98	1.18	10.86	42.02	Peak [Scan]	90°	100	297	69.54	-27.52
7.183406	29.35	1.18	10.88	41.41	Peak [Scan]	90°	100	305	69.54	-28.13
0.691031	35.13	1	11.3	47.43	Peak [Scan]	90°	100	359	70.81	-23.38



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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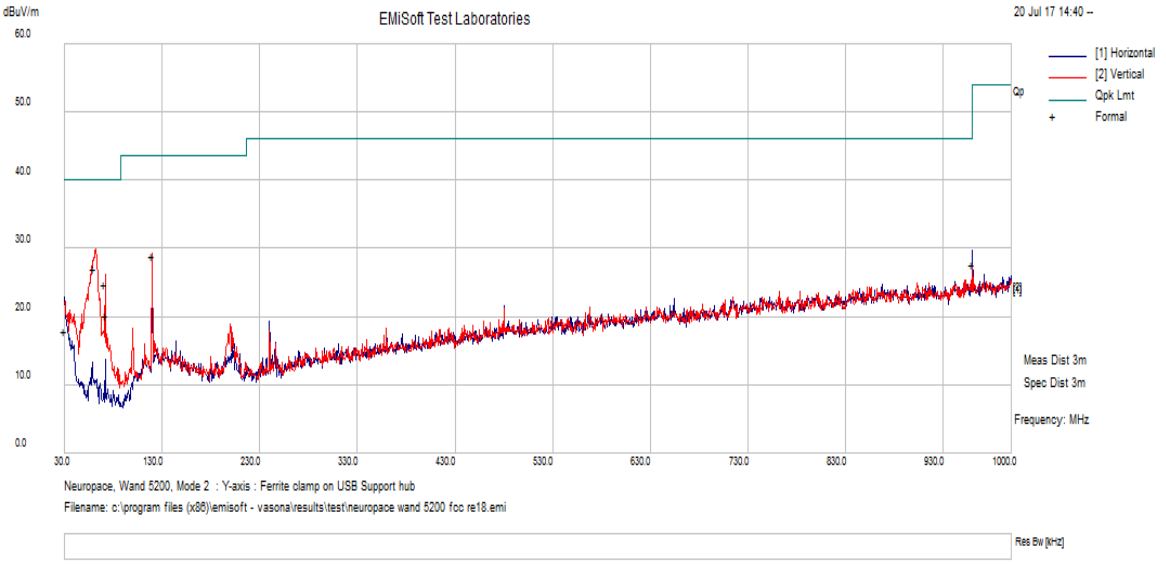
EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	25°C / 38% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2 / Y axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / Sunol Science JB3	**Performed by**	Gary Jorgenson

(30 MHz – 1000 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity (H/V)	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
60.018	46.54	1.63	-21.07	27.1	Quasi Max	V	235	20	40	-12.9
960.1207	27.99	4.18	-4.43	27.75	Quasi Max	H	177	43	54	-26.26
119.9987	41.94	1.95	-14.85	29.04	Quasi Max	V	103	59	43.5	-14.46
72.00181	39.01	1.71	-20.47	20.25	Quasi Max	V	104	166	40	-19.75
71.98975	43.66	1.71	-20.47	24.89	Quasi Max	V	156	209	40	-15.11
30.08663	23.62	1.42	-7.14	17.9	Quasi Max	H	198	304	40	-22.11



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: None

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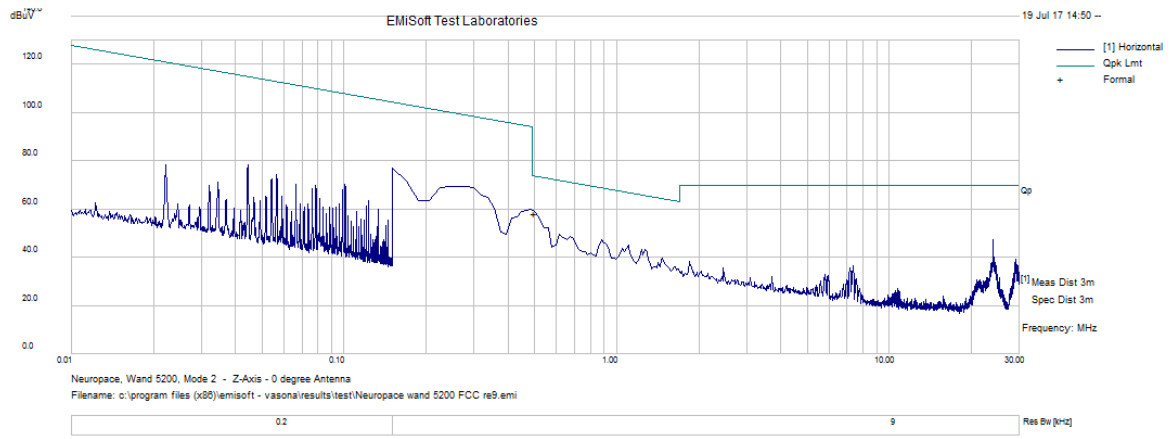
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2/ Z axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.491	47.2	0.97	11.28	59.46	Peak [Scan]	0°	100	360	73.78	-14.32
0.877594	35.04	1.01	11.38	47.43	Peak [Scan]	0°	100	328	68.74	-21.31
1.101469	32.24	1.03	11.59	44.85	Peak [Scan]	0°	100	296	66.76	-21.91
23.99269	36.36	1.37	9.5	47.23	Peak [Scan]	0°	100	354	69.54	-22.31
0.616406	37.15	1	11.3	49.44	Peak [Scan]	0°	100	318	71.81	-22.36
1.232063	30.72	1.03	11.57	43.32	Peak [Scan]	0°	100	312	65.79	-22.47



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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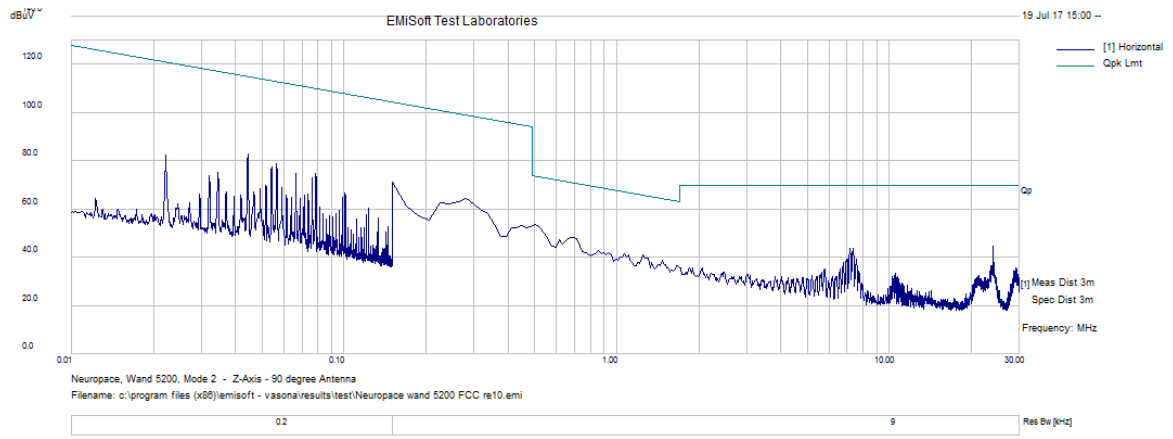
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2/ Z axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing 90° angle from EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.5	41.11	0.97	11.3	53.38	Peak [Scan]	90°	100	354	73.62	-20.24
0.691031	35.9	1	11.3	48.2	Peak [Scan]	90°	100	345	70.81	-22.62
1.250719	28.48	1.03	11.57	41.08	Peak [Scan]	90°	100	343	65.66	-24.58
23.99269	33.56	1.37	9.5	44.43	Peak [Scan]	90°	100	2	69.54	-25.11
7.16475	31.39	1.18	10.88	43.45	Peak [Scan]	90°	100	326	69.54	-26.09
7.332656	31.39	1.18	10.87	43.44	Peak [Scan]	90°	100	327	69.54	-26.1



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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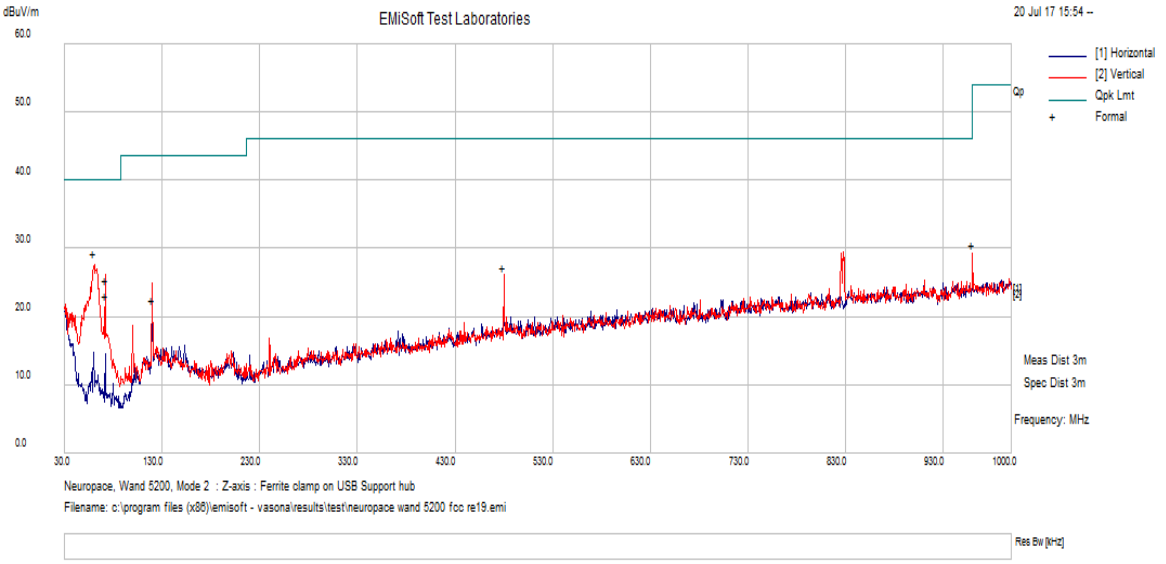
EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	25°C / 38% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 2 / Z axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / Sunol Science JB3	**Performed by**	Gary Jorgenson

(30 MHz – 1000 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity (H/V)	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
60.00031	48.87	1.63	-21.07	29.44	Quasi Max	V	164	10	40	-10.57
960.1181	30.89	4.18	-4.43	30.64	Quasi Max	V	110	25	54	-23.36
71.99038	41.9	1.71	-20.47	23.13	Quasi Max	V	140	103	40	-16.87
120.0252	35.41	1.95	-14.84	22.51	Quasi Max	V	112	219	43.5	-20.99
480.0601	35.03	3.14	-10.92	27.26	Quasi Max	V	131	296	46	-18.74
72.02194	44.23	1.71	-20.47	25.47	Quasi Max	V	105	323	40	-14.53



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: None

4.2.4 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = FIM - AMP + CBL + ACF

Where: FIM = Field Intensity Meter (dBμV)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

4.2.5 Test Results (Mode 3)

The final measurement data indicates the worst case operating modes, configurations, and/or cable positions. It also reflects the results including any modifications and/or special accessories listed in Sections 1.4 and 1.5.

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.2.5.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and without any modifications or special accessories implemented as the manufacturer intends.

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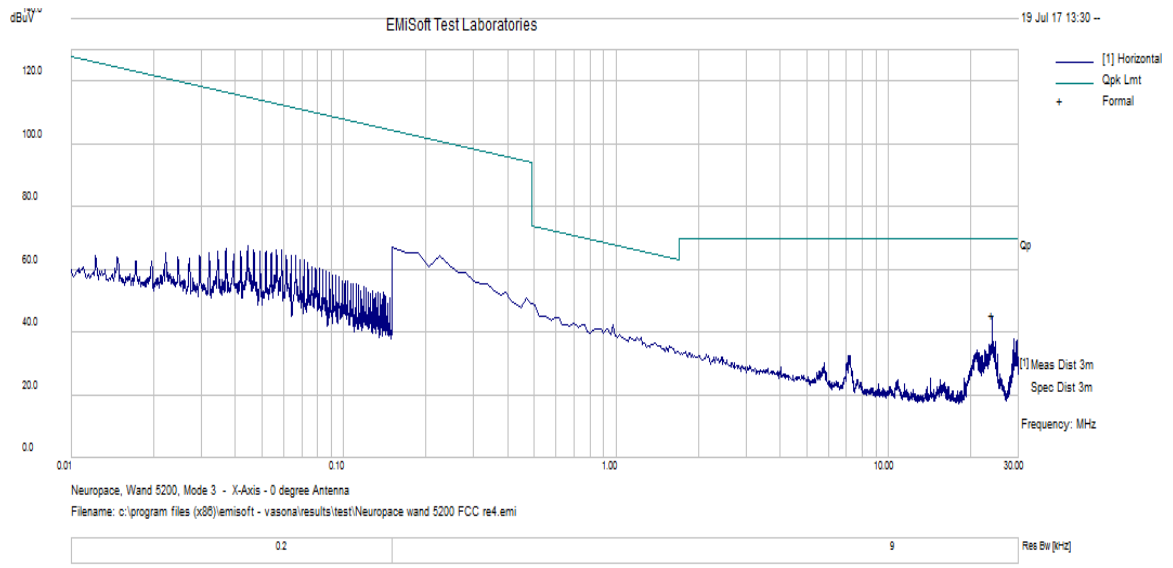
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 3 / X axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
23.99269	34.29	1.37	9.5	45.17	Peak [Scan]	0°	100	300	69.54	-24.37
0.59775	32.28	1	11.3	44.57	Peak [Scan]	0°	100	306	72.07	-27.5
1.026844	26.47	1.02	11.6	39.09	Peak [Scan]	0°	100	226	67.37	-28.28
28.86197	27.87	1.41	8.53	37.81	Peak [Scan]	0°	100	286	69.54	-31.73
29.49628	27.62	1.41	8.4	37.43	Peak [Scan]	0°	100	326	69.54	-32.11
24.08597	26.35	1.37	9.48	37.2	Peak [Scan]	0°	100	310	69.54	-32.34



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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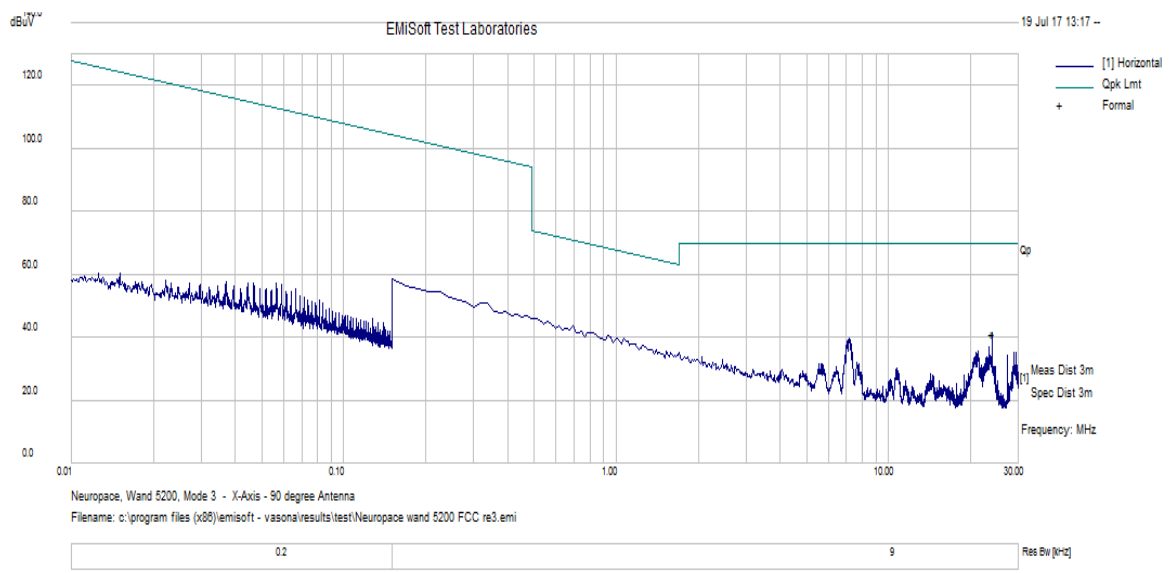
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 3 / X axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing 90° angle from EUT (9 kHz – 150 kHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.560438	32.78	0.99	11.3	45.06	Peak [Scan]	90°	100	326	72.63	-27.57
0.933563	28.06	1.02	11.47	40.55	Peak [Scan]	90°	100	356	68.2	-27.65
23.99269	30.59	1.37	9.5	41.46	Peak [Scan]	90°	100	347	69.54	-28.08
1.530563	22.9	1.05	11.54	35.48	Peak [Scan]	90°	100	155	63.91	-28.43
7.146094	27.32	1.18	10.88	39.39	Peak [Scan]	90°	100	290	69.54	-30.15
23.93672	26.65	1.37	9.51	37.53	Peak [Scan]	90°	100	324	69.54	-32.01
0.560438	32.78	0.99	11.3	45.06	Peak [Scan]	90°	100	326	72.63	-27.57



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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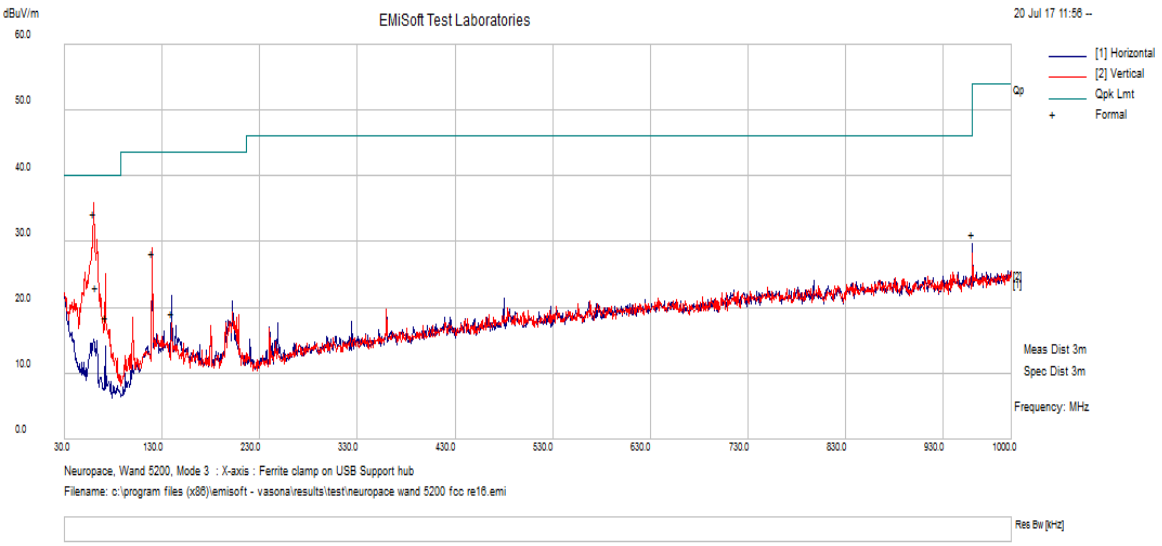
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 3 / X axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / Sunol Science JB3	**Performed by**	Gary Jorgenson

(30 MHz – 1000 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity (H/V)	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
59.99213	53.71	1.63	-21.07	34.27	Quasi Max	V	104	12	40	-5.73
119.9974	41.21	1.95	-14.85	28.31	Quasi Max	V	104	50	43.5	-15.19
960.1171	31.51	4.18	-4.43	31.27	Quasi Max	H	101	79	54	-22.73
72.00619	37.45	1.71	-20.47	18.69	Quasi Max	V	315	187	40	-21.32
139.9994	32.33	2.04	-15.24	19.13	Quasi Max	H	186	276	43.5	-24.37
62.58944	42.47	1.65	-20.97	23.15	Quasi Max	V	301	322	40	-16.86



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: None

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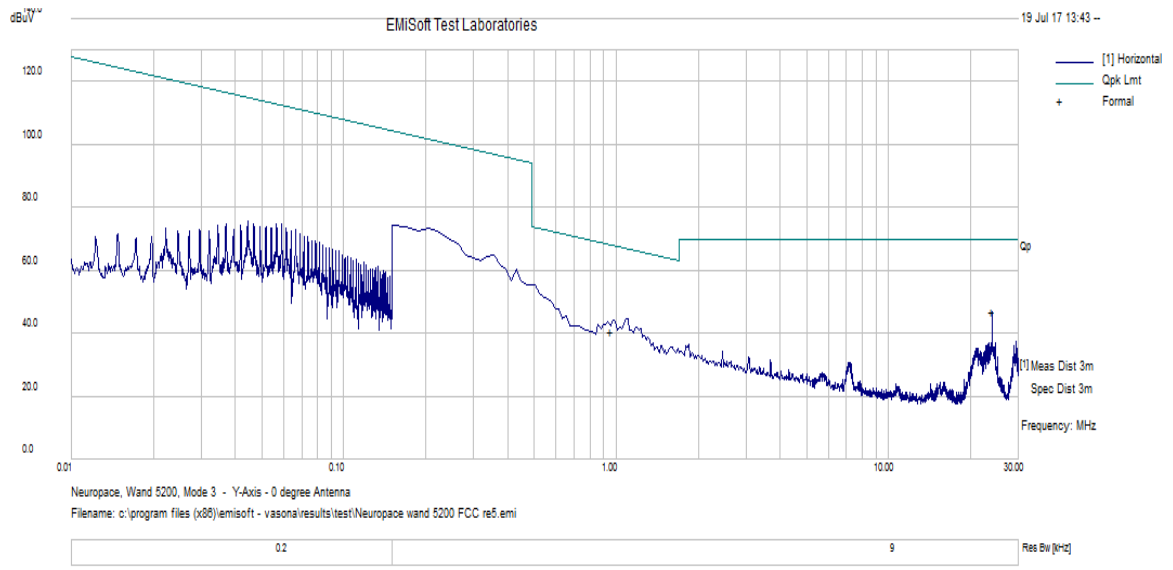
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 3 / Y axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
1.082813	31.92	1.02	11.59	44.53	Peak [Scan]	0°	100	299	66.91	-22.38
23.99269	35.72	1.37	9.5	46.59	Peak [Scan]	0°	100	311	69.54	-22.95
0.616406	35.57	1	11.3	47.86	Peak [Scan]	0°	100	333	71.81	-23.94
1.306688	26.26	1.04	11.56	38.86	Peak [Scan]	0°	100	310	65.28	-26.42
0.15	61.8	0.99	11.24	74.03	Peak [Scan]	0°	100	323	104.08	-30.05
0.355219	52.8	0.99	11.1	64.88	Peak [Scan]	0°	100	299	96.59	-31.71



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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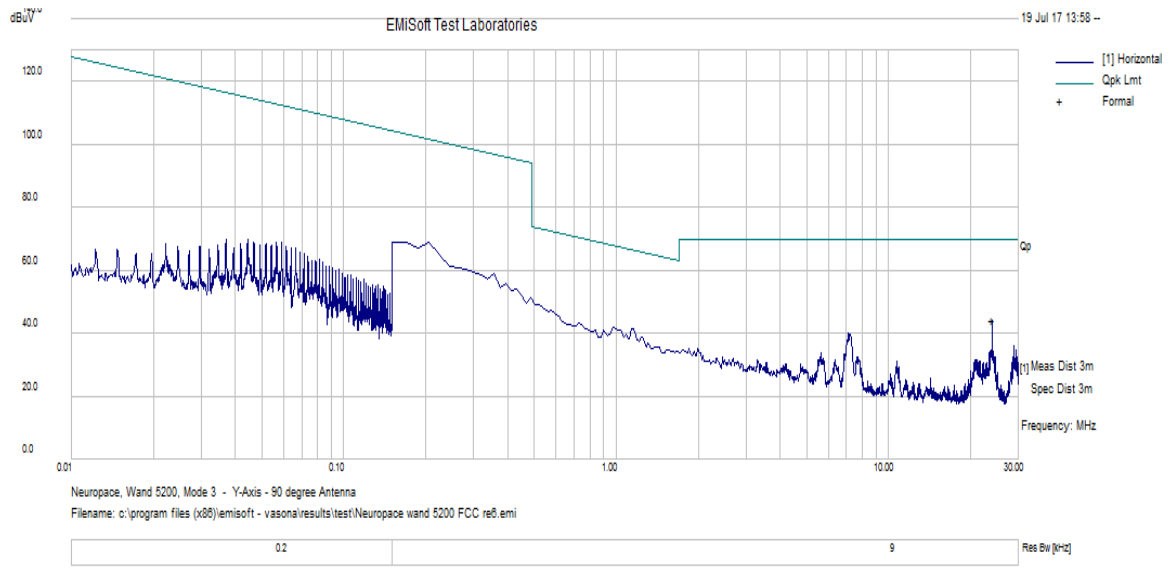
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 3 / Y axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing 90° angle from EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
23.99269	33.39	1.37	9.5	44.26	Peak [Scan]	90°	100	312	69.54	-25.28
0.728344	31.03	1	11.3	43.33	Peak [Scan]	90°	100	182	70.36	-27.03
1.306688	24.29	1.04	11.56	36.88	Peak [Scan]	90°	100	352	65.28	-28.4
7.108781	28.17	1.18	10.89	40.24	Peak [Scan]	90°	100	309	69.54	-29.3
28.86197	25.89	1.41	8.53	35.83	Peak [Scan]	90°	100	350	69.54	-33.71
29.47763	24.89	1.41	8.4	34.71	Peak [Scan]	90°	100	354	69.54	-34.83



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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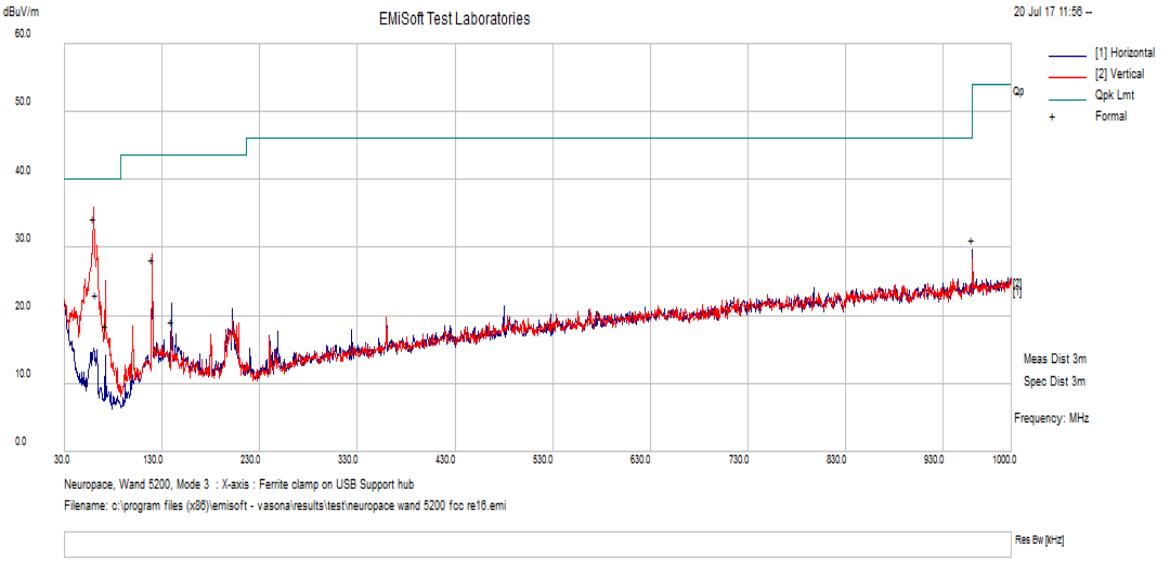
EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	25°C / 38% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 3 / Y axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / Sunol Science JB3	**Performed by**	Gary Jorgenson

(30 MHz – 1000 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity (H/V)	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
59.99213	53.71	1.63	-21.07	34.27	Quasi Max	V	104	12	40	-5.73
119.9974	41.21	1.95	-14.85	28.31	Quasi Max	V	104	50	43.5	-15.19
960.1171	31.51	4.18	-4.43	31.27	Quasi Max	H	101	79	54	-22.73
72.00619	37.45	1.71	-20.47	18.69	Quasi Max	V	315	187	40	-21.32
139.9994	32.33	2.04	-15.24	19.13	Quasi Max	H	186	276	43.5	-24.37
62.58944	42.47	1.65	-20.97	23.15	Quasi Max	V	301	322	40	-16.86



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: None

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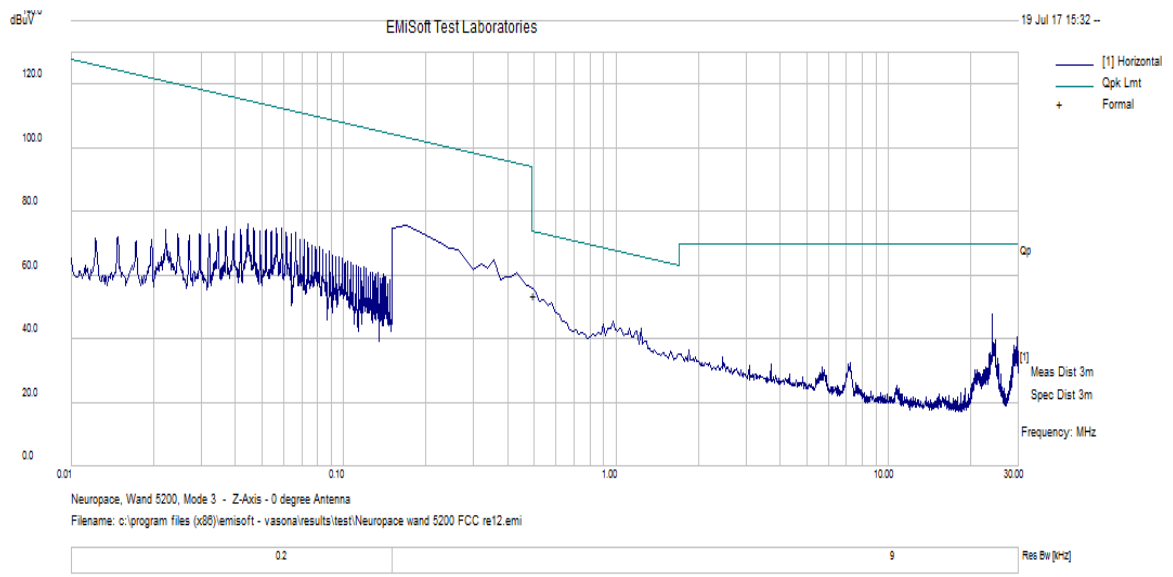
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 3 / Z axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.541781	39.97	0.98	11.3	52.26	Peak [Scan]	0°	100	309	72.93	-20.67
23.99269	36.6	1.37	9.5	47.47	Peak [Scan]	0°	100	359	69.54	-22.07
0.970875	32.86	1.02	11.54	45.42	Peak [Scan]	0°	100	304	67.86	-22.44
1.232063	30.63	1.03	11.57	43.24	Peak [Scan]	0°	100	320	65.79	-22.56
0.168656	63.55	0.99	11.22	75.76	Peak [Scan]	0°	100	309	103.06	-27.3
1.381313	24.01	1.04	11.55	36.6	Peak [Scan]	0°	100	346	64.8	-28.2
0.541781	39.97	0.98	11.3	52.26	Peak [Scan]	0°	100	309	72.93	-20.67



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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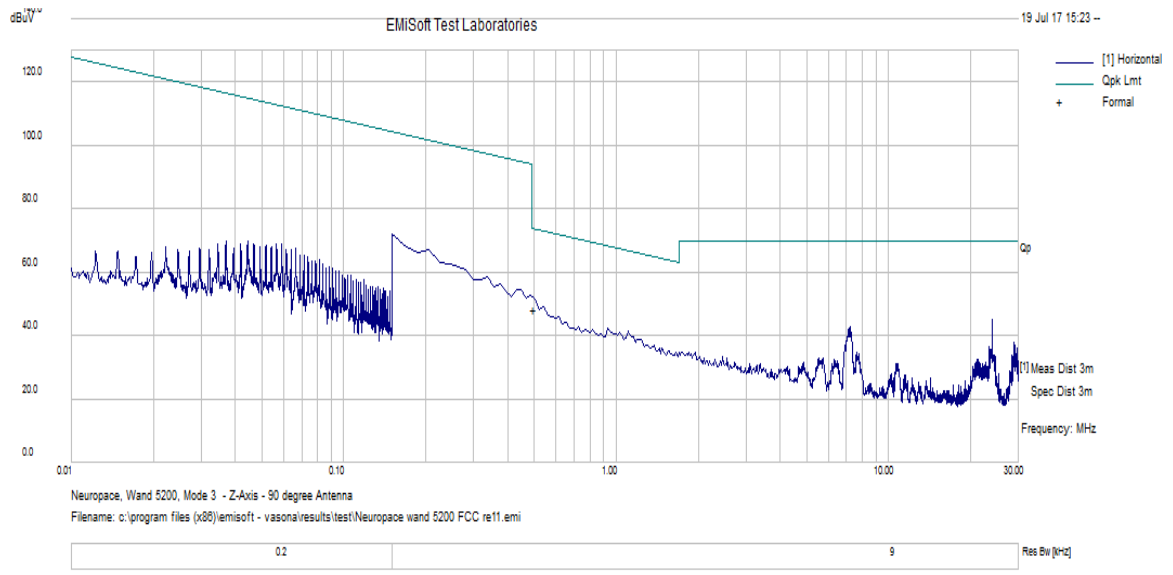
EUT Name	Neuropace Wand	**Date**	July 19, 2017
EUT Model	W-02	**Temp / Hum in**	26°C / 36% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 3 / Z axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / EMCO 6502	**Performed by**	Gary Jorgenson

Loop facing 90° angle from EUT (9 kHz – 30 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
0.541781	36.84	0.98	11.3	49.12	Peak [Scan]	90°	100	233	72.93	-23.81
23.99269	34.27	1.37	9.5	45.14	Peak [Scan]	90°	100	355	69.54	-24.4
7.202063	30.46	1.18	10.88	42.52	Peak [Scan]	90°	100	314	69.54	-27.02
0.728344	30.57	1	11.3	42.87	Peak [Scan]	90°	100	92	70.36	-27.48
1.306688	24.19	1.04	11.56	36.79	Peak [Scan]	90°	100	339	65.28	-28.5
28.93659	27.88	1.41	8.51	37.8	Peak [Scan]	90°	100	319	69.54	-31.74



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: RBW / VBW Setting: 200 Hz / 1kHz for 9 kHz – 150 kHz; 9 kHz / 30 kHz for 150 kHz – 30 MHz.

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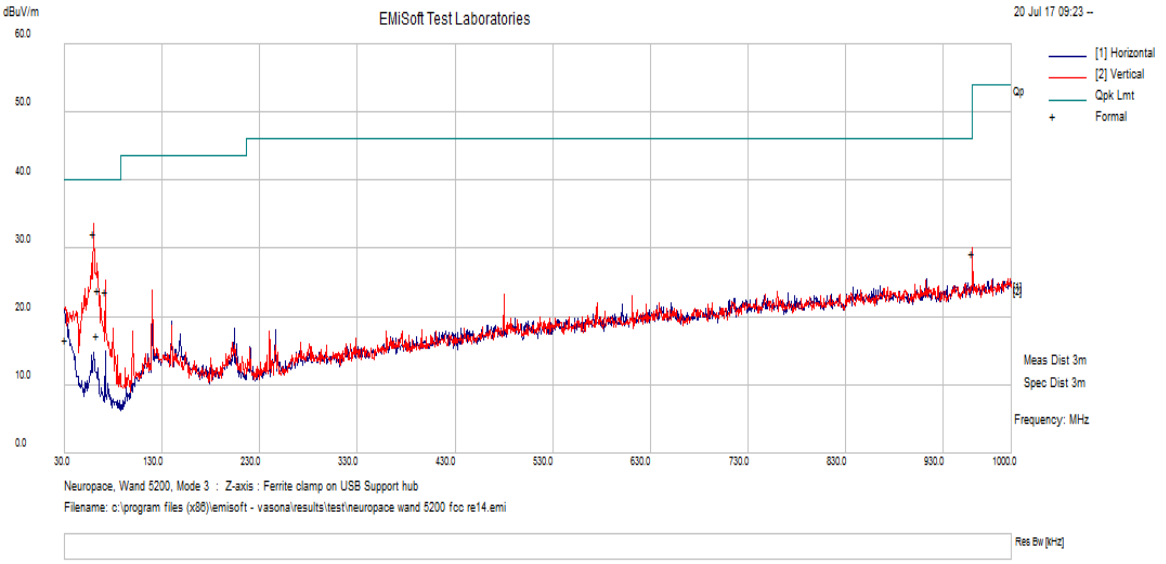
EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	25°C / 38% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Integral Antenna / TX mode 3 / Z axis	**Line AC / Freq**	N/A – EUT DC powered
Standard	CFR47 Part 15.205 and 15.209	**RBW / VBW**	See Note
Dist/Ant Used	3m / Sunol Science JB3	**Performed by**	Gary Jorgenson

(30 MHz – 1000 MHz)

Frequency (MHz)	Raw (dBuV/m)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Detector	Polarity (H/V)	Height (cm)	Azimuth (deg)	Limit (dBuV/m)	Margin (dB)
64.71331	43.08	1.66	-20.8	23.95	Quasi Max	V	185	9	40	-16.05
960.1136	29.55	4.18	-4.43	29.31	Quasi Max	V	105	35	54	-24.69
71.99488	42.55	1.71	-20.47	23.79	Quasi Max	V	113	251	40	-16.21
31.03094	23.17	1.43	-7.81	16.79	Quasi Max	V	306	325	40	-23.21
63.40719	36.61	1.65	-20.93	17.33	Quasi Max	V	251	332	40	-22.67
60.00944	51.7	1.63	-21.07	32.26	Quasi Max	V	102	353	40	-7.74



Spec Margin = E-Field QP/Ave - Limit, E-Field QP/Ave = FIM QP/Ave + Total CF ± Uncertainty
Total CF= Amp Gain + Cable Loss + ANT Factor

Combined Standard Uncertainty $u_c(y)$ = ± 3.2 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Note: None

4.2.6 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBμV/m) = FIM - AMP + CBL + ACF

Where: FIM = Field Intensity Meter (dBμV)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

4.3 AC Conducted Emissions

Testing was performed in accordance with ANSI C63.10:2013. These test methods are listed under the laboratory's A2LA Scope of Accreditation.

This test measures the levels emanating from the EUT' AC input port, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

The AC conducted emissions of equipment under test shall not exceed the values in CFR47 Part 15.207

4.3.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50 μH / 50 Ω LISNs.

Testing is performed in Lab 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the semi-anechoic chamber is a 2m x 2m solid aluminum frame and panel, and it is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN.

4.3.1.1 Deviations

There were no deviations from this test methodology.

4.3.2 Test Results (Modes 1, 2 & 3)

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s)

Table 2: AC Conducted Emissions – Test Results

Test Conditions: Conducted Measurement at Normal Conditions only		
Antenna Type: Attached	**Level: 48**	
Setup Type: Table Top	**AC Power:** 120 Vac, 60 Hz	
Ambient Temperature: 24°C	**Relative Humidity:** 46% rh	
Test ID #	**Frequency Range**	**Test Result**
CE- 1	0.15 to 30 MHz	Pass
CE - 2	0.15 to 30 MHz	Pass
CE - 3	0.15 to 30 MHz	Pass
CE - 4	0.15 to 30 MHz	Pass
CE - 5	0.15 to 30 MHz	Pass
CE - 6	0.15 to 30 MHz	Pass
Note: PGM-5001 was served as host for EUT. The wand is powered via USB port.		

Note: See Appendix for Test description.

SOP 2 Conducted Emissions

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EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	24°C /46% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Host AC / Freq**	120 Vac, 60 Hz
Standard	CFR47 Part 15.207	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab#2 / Com-Power L1-215-A	**Performed by**	Gary Jorgenson

Frequency MHz	QP dBuV	QP Limit dBuV	QP Margin dB	Avg dBuV	Avg Limit dBuV	Ave Margin dB	Line
Test ID: CE - 1, 150 kHz to 30 MHz, Mode 1, Line to Ground							
0.162012	50.08	65.36	-15.28	34.83	46	-24.72	1
4.884335	29.35	56	-26.65	21.28	50	-18.08	1
19.43966	39.75	60	-20.25	31.92	46	-14.44	1
0.647868	40.37	56	-15.63	31.56	50	-18.32	1
19.4717	39.86	60	-20.14	31.68	46	-23.86	1
2.259072	29.64	56	-26.36	22.14	46	-24.72	1
Test ID: CE - 2, 150 kHz to 30 MHz, Mode 1, Neutral to Ground							
0.169443	50.7	64.99	-14.29	31.69	54.99	-23.3	2
4.479629	27.68	56	-28.32	18.08	46	-27.92	2
0.594301	33	56	-23	21.78	46	-24.22	2
0.646617	36.78	56	-19.22	28.82	46	-17.18	2
4.552447	28.21	56	-27.79	18.79	46	-27.21	2
0.15	51.97	66	-14.03	33.37	56	-22.63	2

Spec Margin = QP./Ave. - Limit, ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 2.4 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: EUT was setup as table top equipment. Host battery was low and charging.

SOP 2 Conducted Emissions

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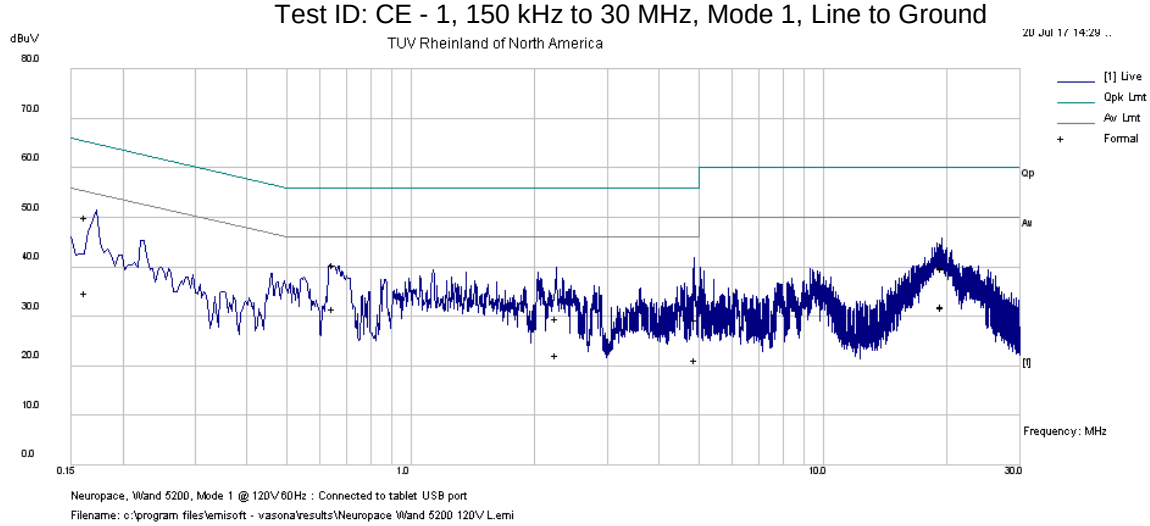
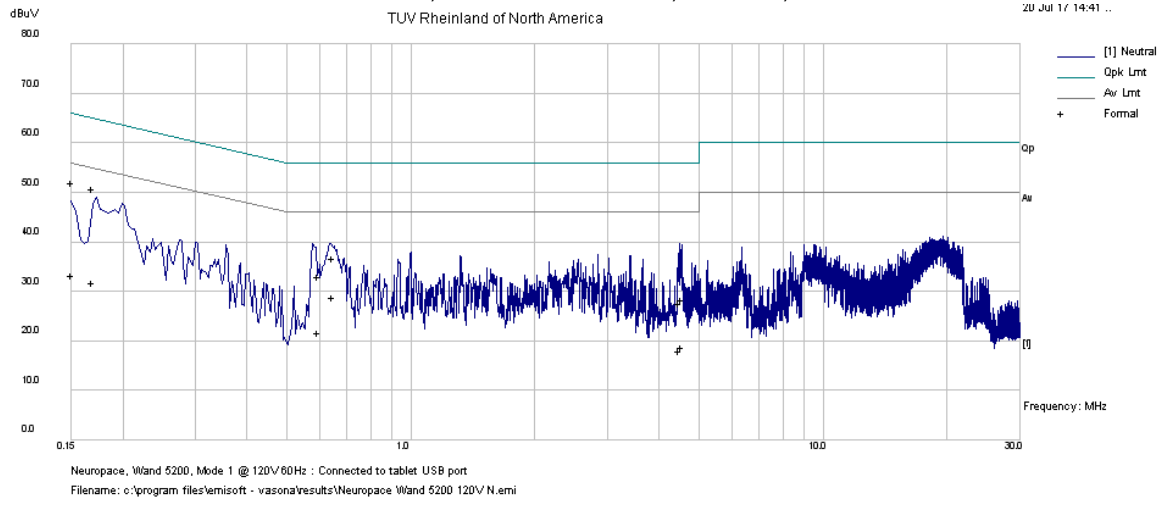
EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	24°C /46% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Host AC / Freq**	120 Vac, 60 Hz
Standard	CFR47 Part 15.207	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab#2 / Com-Power L1-215-A	**Performed by**	Gary Jorgenson

Test ID: CE - 1, 150 kHz to 30 MHz, Mode 1, Line to Ground



Test ID: CE - 2, 150 kHz to 30 MHz, Mode 1 , Neutral to Ground



Notes: Class B Limit.

SOP 2 Conducted Emissions

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EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	24°C /46% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Host AC / Freq**	120 Vac, 60 Hz
Standard	CFR47 Part 15.207	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab#2 / Com-Power L1-215-A	**Performed by**	Gary Jorgenson

Frequency MHz	QP dBuV	QP Limit dBuV	QP Margin dB	Avg dBuV	Avg Limit dBuV	Ave Margin dB	Line
Test ID: CE - 3, 150 kHz to 30 MHz, Mode 2, Line to Ground							
0.155964	44.37	65.68	-21.31	31.94	55.68	-23.74	1
4.068443	29.93	56	-26.07	19.12	46	-26.88	1
4.235697	29.5	56	-26.5	18.61	46	-27.39	1
4.003549	28.04	56	-27.96	18.08	46	-27.92	1
3.554261	27.68	56	-28.32	17.1	46	-28.9	1
4.015705	27.74	56	-28.26	17.3	46	-28.7	1
Test ID: CE - 4, 150 kHz to 30 MHz, Mode 2, Neutral to Ground							
0.168878	52.85	65.02	-12.17	40.38	55.02	-14.64	2
0.15002	48.75	66	-17.25	33.23	56	-22.76	2
3.781611	32.27	56	-23.73	20.76	46	-25.24	2
3.673599	28.88	56	-27.12	18.44	46	-27.56	2
0.173134	48.75	64.81	-16.06	35.18	54.81	-19.63	2
4.003549	30.78	56	-25.22	21.9	46	-24.1	2

Spec Margin = QP./Ave. - Limit, ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 2.4 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: EUT was setup as table top equipment. Host battery was low and charging.

SOP 2 Conducted Emissions

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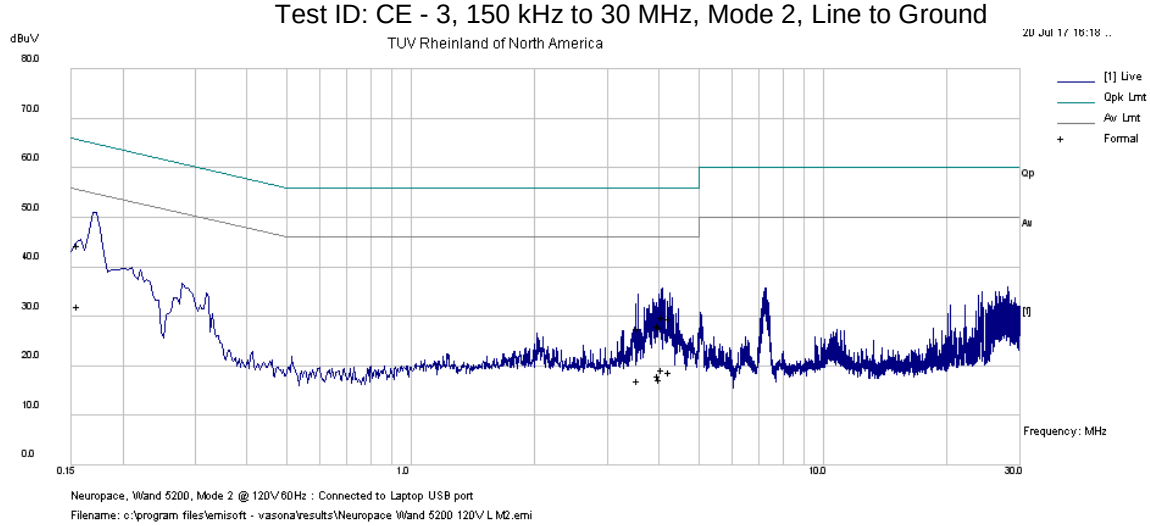
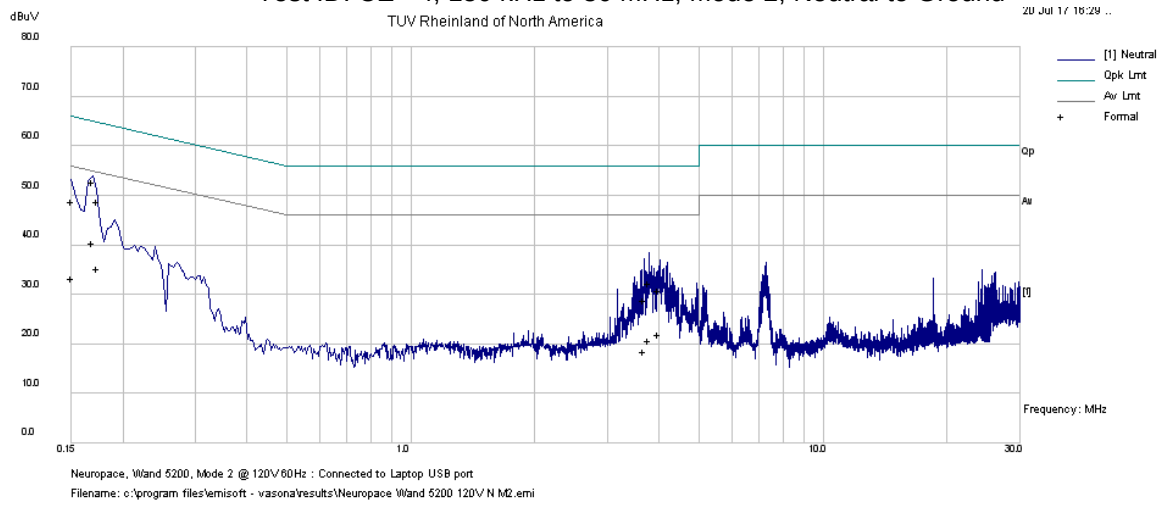
EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	24°C /46% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Host AC / Freq**	120 Vac, 60 Hz
Standard	CFR47 Part 15.207	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab#2 / Com-Power L1-215-A	**Performed by**	Gary Jorgenson

Test ID: CE - 3, 150 kHz to 30 MHz, Mode 2, Line to Ground



Test ID: CE - 4, 150 kHz to 30 MHz, Mode 2, Neutral to Ground



Notes: Class B Limit.

SOP 2 Conducted Emissions

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EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	24°C /46% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Host AC / Freq**	120 Vac, 60 Hz
Standard	CFR47 Part 15.207	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab#2 / Com-Power L1-215-A	**Performed by**	Gary Jorgenson

Frequency MHz	QP dBuV	QP Limit dBuV	QP Margin dB	Avg dBuV	Avg Limit dBuV	Ave Margin dB	Line
Test ID: CE - 5, 150 kHz to 30 MHz, Mode 3, Line to Ground							
0.15	45.14	66	-20.86	29.59	56	-26.41	1
4.004643	30.74	56	-25.26	20.05	46	-25.95	1
3.657697	25.92	56	-30.08	16.46	46	-29.54	1
0.169491	49.63	64.99	-15.36	35.67	54.99	-19.32	1
0.225246	39.4	62.62	-23.23	29.95	52.62	-22.67	1
3.891882	31.83	56	-24.17	20.2	46	-25.8	1
Test ID: CE - 6, 150 kHz to 30 MHz, Mode 3, Neutral to Ground							
0.167423	51.8	65.09	-13.29	37.44	55.09	-17.64	2
0.15	48.46	66	-17.54	32.5	56	-23.5	2
4.001397	29.69	56	-26.31	19.28	46	-26.72	2
3.89484	33.48	56	-22.52	21.41	46	-24.59	2
3.784251	30.78	56	-25.22	19.75	46	-26.25	2
4.173557	30.91	56	-25.09	19.9	46	-26.1	2

Spec Margin = QP./Ave. - Limit, ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 2.4 dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: EUT was setup as table top equipment. Host battery was low and charging.

SOP 2 Conducted Emissions

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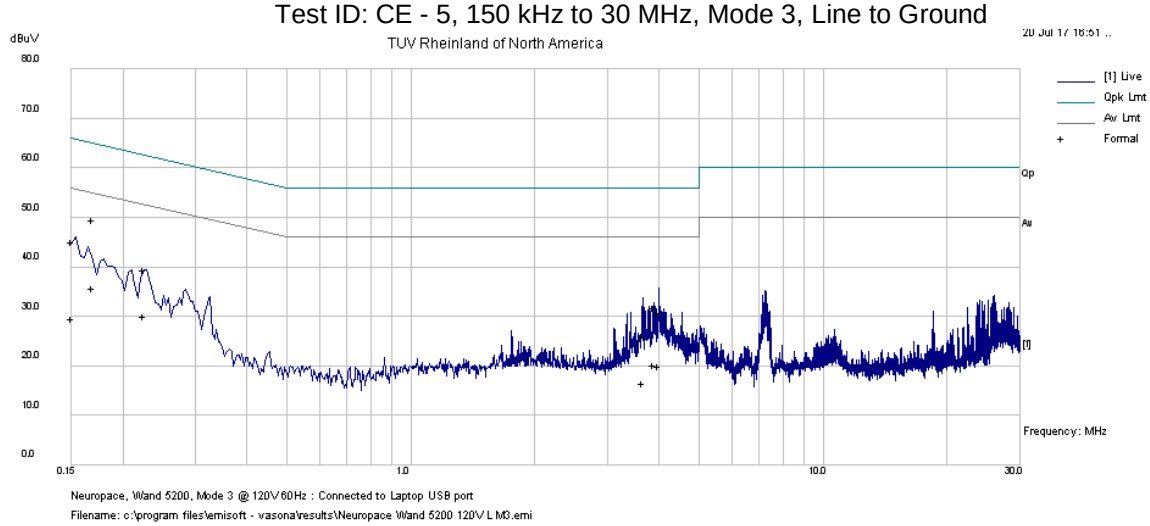
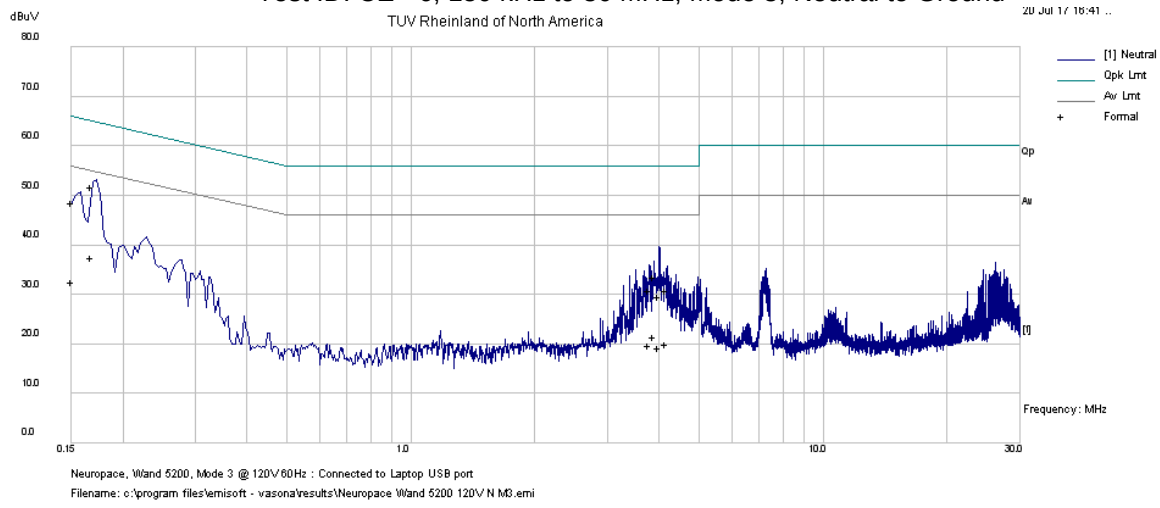
EUT Name	Neuropace Wand	**Date**	July 20, 2017
EUT Model	W-02	**Temp / Hum in**	24°C /46% rh
EUT Serial	W200017	**Temp / Hum out**	N/A
EUT Config.	Attached Antenna	**Host AC / Freq**	120 Vac, 60 Hz
Standard	CFR47 Part 15.207	**RBW / VBW**	9 kHz / 30 kHz
Lab/LISN	Lab#2 / Com-Power L1-215-A	**Performed by**	Gary Jorgenson

Test ID: CE - 5, 150 kHz to 30 MHz, Mode 3, Line to Ground



Test ID: CE - 6, 150 kHz to 30 MHz, Mode 3, Neutral to Ground



Notes: Class B Limit.

5 Test Equipment Use List

5.1 Equipment List

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy	Test
EMI Receiver	Agilent	MXE N9038A	MY51210195	01/17/2017	01/17/2018	RE
Preamplifier, 9 kHz – 1 GHz	Sonoma	310N	213221	01/18/2017	01/18/2018	RE
Bilog Antenna	Sunol Sciences	JB3	A020502	02/17/2016	02/17/2018	RE
Loop Antenna	EMCO	6502	00062531	05/17/2017	05/17/2018	RE
EMI Receiver	Rohde & Schwarz	ESIB40	839283/005	01/16/2017	01/16/2018	CE
L.I.S.N.	Com-Power	LI-215	192002	03/16/2017	03/16/2018	CE
Transient Limiter	Com-Power	LIT-930	531582	01/18/2017	01/18/2018	CE

Note: CE = Conducted Emissions and RE=Radiated Emissions

6 EMC Test Plan

6.1 Introduction

This section provides a description of the Equipment Under Test (EUT), configurations, operating conditions, and performance acceptance criteria. It is an overview of information provided by the manufacturer so that the test laboratory may perform the requested testing.

6.2 Customer

Table 3: Customer Information

Company Name	NeuroPace, Inc.
Address	455 Bernardo Ave.
City, State, Zip	Mountain View, CA 94043
Country	USA
Phone	(650) 237-2700
Fax	(650) 237-2701

Table 4: Technical Contact Information

Name	Patrick Mulligan
E-mail	pmulligan@neuropace.com
Phone	(650) 237-2700
Fax	(650) 237-2701

6.3 Equipment Under Test (EUT)

Table 5: EUT Specifications

Dimensions	3.5 x 7.0 x 1.7 in.
Mass	0.6 lbs
Supply	Powered via USB V1.1 $V_{nominal}$: 5.0 Vdc
Environment	Indoor
Operating Temperature Range:	0 to 35 °C
Feeds:	☒ Yes: Quantity 1
Operating Band	Inductive Telemetry
Transmitter Frequency Band	20 kHz to 50 kHz
Rated Power Output	< 224 pW
# Operating Channel	1
Antenna Type	Separate receive coil antenna and transmit coil antenna (both integrated)
Antenna Gain	Not Specific (Unknown)
Modulation Type	☐ AM ☐ FM ☐ Phase ☒ Other describe: Half Duplex.
Type of Equipment	☒ Table Top ☐ Wall-mount ☐ Floor standing cabinet ☒ Other *Describe: Hand Held*
Clocks/Oscillating Frequency	~ 20 kHz - 50 kHz, 1 MHz, 20MHz, 48 MHz, 80 MHz.

Table 6: Interface Specifications

Interface Type	Cabled with what type of cable?	Is the cable shielded?	Maximum potential length of the cable?	Metallic (M), Coax (C), Fiber (F), or Not Applicable?
USB	Attached USB	☒ Yes	☒ 2 meters	☒ M

Table 7: Supported Equipment

Equipment	Manufacturer	Model	Serial
Neurostimulator	Neuropace	RNS-320	191463 & 191390
Laptop	Dell	T07G002	
Tablet	Neuropace (Dell OEM)	PGM-5001	P2395

Table 8: Samples used for Testing

Device	Serial #	Requirements	Scan Type
Neuropace Wand	W200017	CFR47 Part 15.207	Conducted emissions
Neuropace Wand	W200017	CFR47 Part 15.205, 15.209,	Pre-scan, radiated measurement for 3 orientations.
Neuropace Wand	W200017	CFR47 Part 15.205, 15.209	Final, radiated measurement for 3 orientations.

6.4 Test Setup

6.4.1 Setup Photos

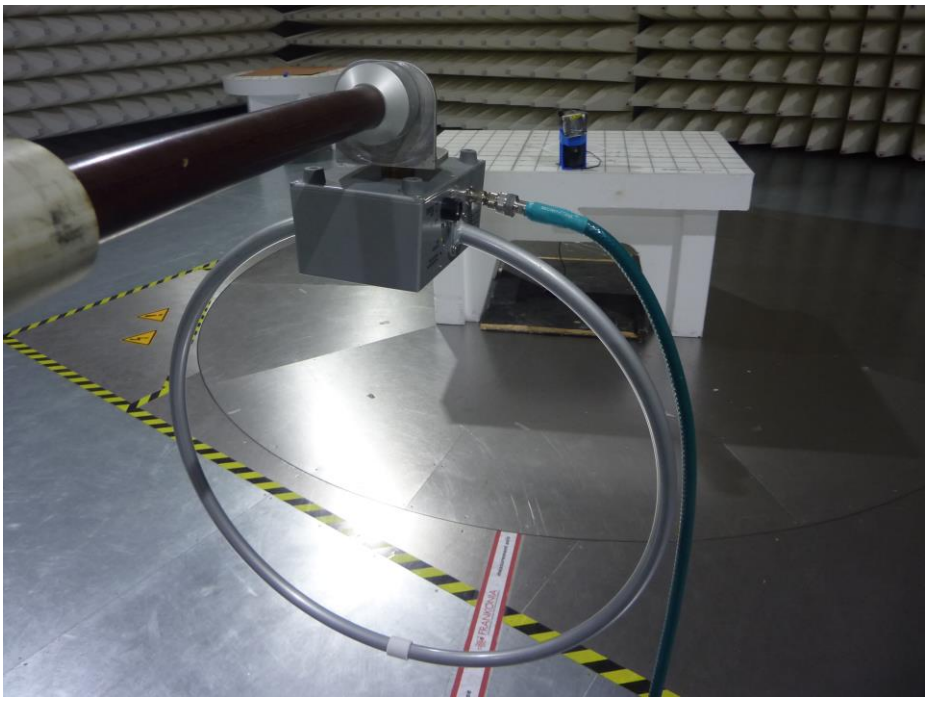


Figure 1: Radiated Emissions – 9kHz – 30MHz – Front

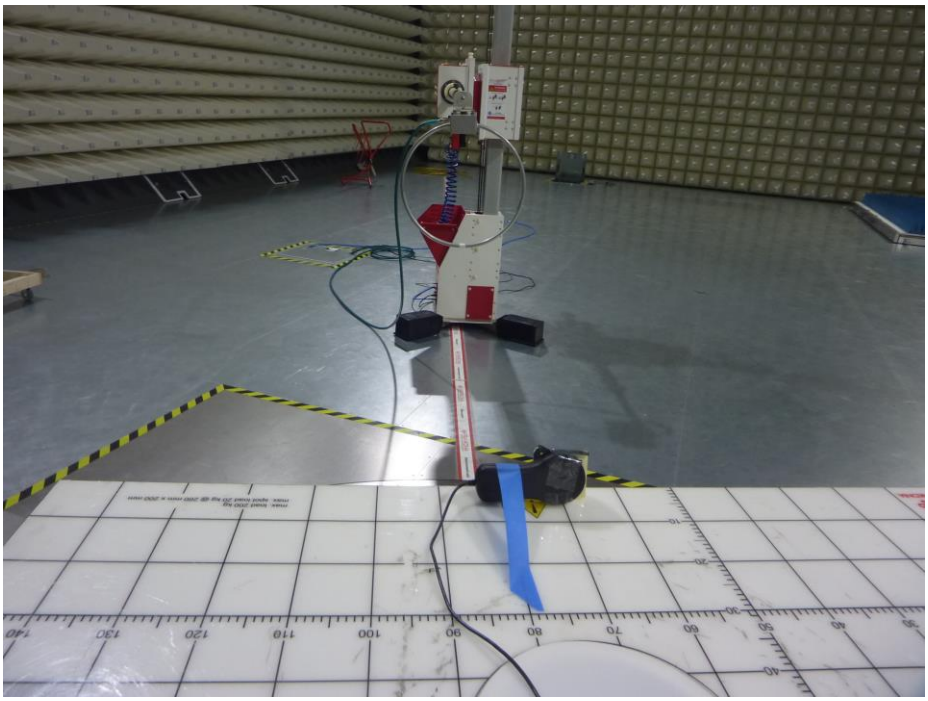


Figure 2: Radiated Emissions – 9kHz – 30MHz – Rear

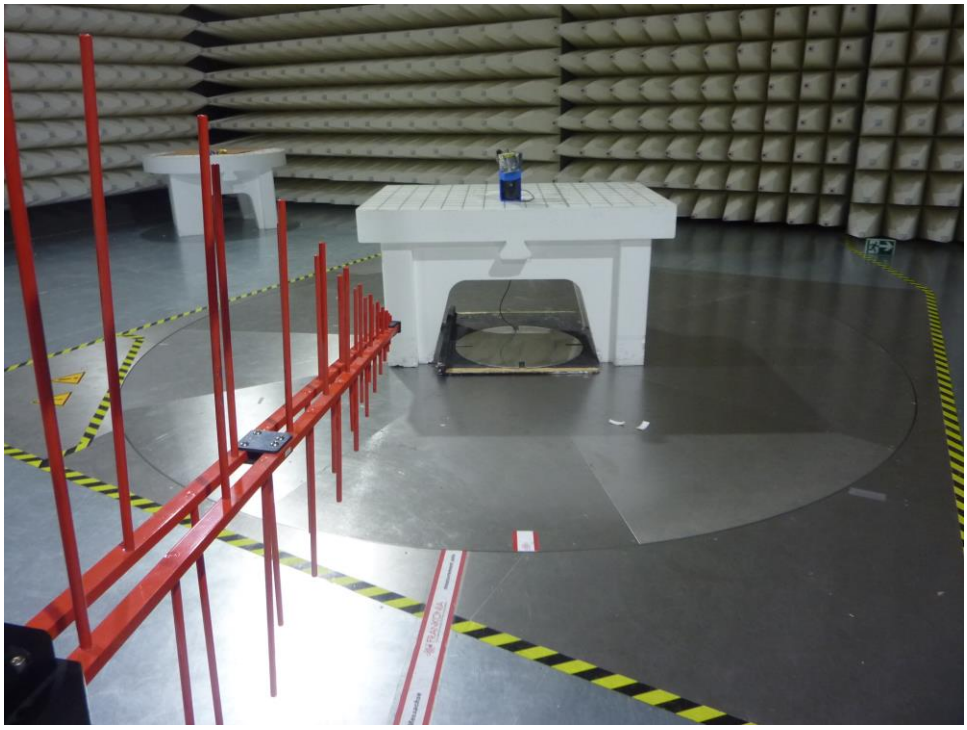


Figure 3: Radiated Emissions – 30 – 1000MHz – Front

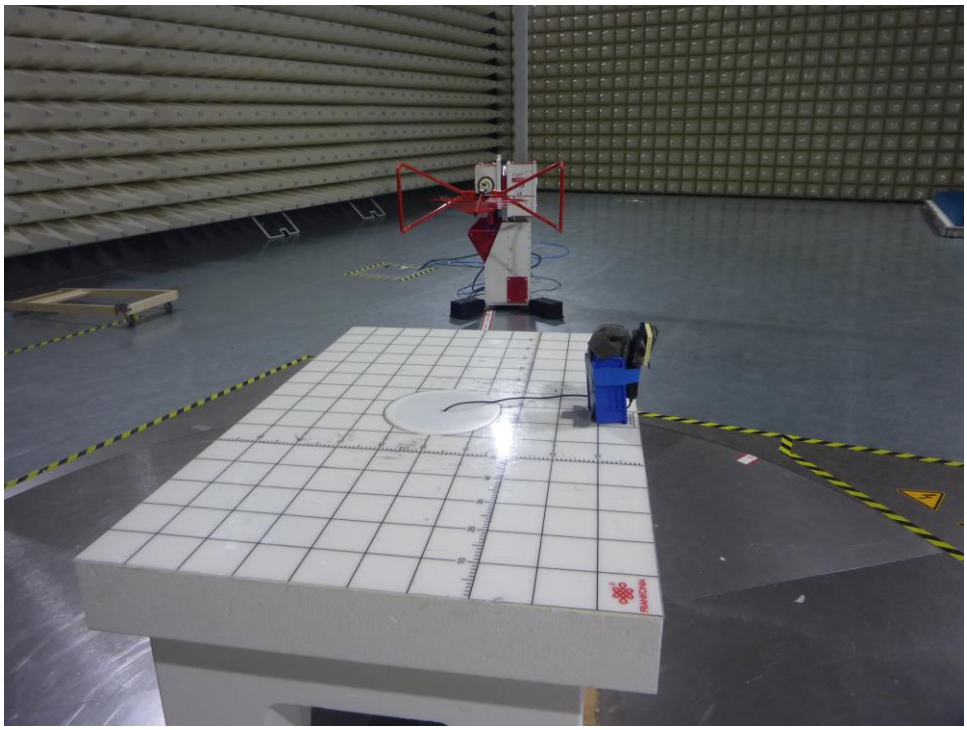


Figure 4: Radiated Emissions – 30 – 1000MHz – Rear

Figure 5: AC Conducted Emissions – Mode 2 – Front

Figure 6: AC Conducted Emissions – Mode 2 – Rear

Figure 5: AC Conducted Emissions – Mode 3 – Front

Figure 6: AC Conducted Emissions – Mode 3 – Rear

6.4.2 Test Configuration

Table 9: Description of Test Configuration used for Radiated Measurement.

Device	Antenna	Mode	Setup Photo (X-Axis)	Setup Photo (Y-Axis)	Setup Photo (Z-Axis)
Neuropace Wand	Attached	Transmit/ Receive			
Remark: Pre-scans were performed on all three orientations.					

6.4.3 Test Software

Software Mode 1 – Running real-time ECoG's using the Clinical Programmer
Software Mode 2 - On the laptop, run the following in cmd.exe: "python wand5200_fcc_test1.py"
Software Mode 3 - On the laptop, run the following in cmd.exe: "python wand5200_fcc_test2.py"

6.4.4 Test Mode

Software Mode	Wand 5200 Mode	Notes
1	Receive RT-ECoGs	Worst case high speed clock operation plus receiver enabled.
2	Transmit High TX Power	Worst case, high power transmit operation.
3	Transmit High TX Rate	Worst case, high speed clock operation.

6.4.5 Radiated Emission Test Matrix

Table 10: Test Matrix for Radiated Emission

Test #	Freq Range	Software Mode	Orientation	Antenna Distance	Notes
1	30 MHz – 1 GHz	2	X	3m	None
2	30 MHz – 1 GHz	3	X	3m	None
3	30 MHz – 1 GHz	2	Y	3m	None
4	30 MHz – 1 GHz	3	Y	3m	None
5	30 MHz – 1 GHz	2	Z	3m	None
6	30 MHz – 1 GHz	3	Z	3m	None
7	9 kHz – 30 MHz	2	Z	3m	None
8	9 kHz – 30 MHz	3	Z	3m	None
9	9 kHz – 30 MHz	2	Y	3m	None
10	9 kHz – 30 MHz	3	Y	3m	None
11	9 kHz – 30 MHz	2	X	3m	None
12	9 kHz – 30 MHz	3	X	3m	None

6.4.6 AC Conducted Emission Test Matrix

Table 11: Test Matrix for AC Conducted Emission

Test ID	Freq Range	Device s/w Mode	Tablet Battery	Notes
CE	150 kHz – 30 MHz	1	Battery Charging	Line - Ground
CE	150 kHz – 30 MHz	1	Battery Charging	Neutral - Ground
CE	150 kHz – 30 MHz	2	Battery Charging	Line - Ground
CE	150 kHz – 30 MHz	2	Battery Charging	Neutral - Ground
CE	150 kHz – 30 MHz	3	Battery Charging	Line - Ground
CE	150 kHz – 30 MHz	3	Battery Charging	Neutral - Ground

6.5 Test Specifications

Testing requirements

Table 12: Test Requirements

Emissions	
Standard	Requirement
CFR 47 Part 15.205, 15.207, 15.209	All, intended for Neuropace Wand Model W-02.

7 Revision History

Revision No.	Date	Reason for Change	Author
0	July 28, 2017	Original Document	N/A
1	Aug. 16, 2017	Corrected information in Sections 2.2.1, 3.4.1, 4.2.2, 6.4.3 and table 7.	GAJ
2	Sept. 22, 2017	Updated test results to include fundamental field strength measurements. Included test setup photos.	EM

Note: Latest revision report will replace all previous reports.

END OF REPORT