NEUROS MEDICAL INC

TEST REPORT

SCOPE OF WORK
EMC TESTING – ALTIUS WIRELESS CHARGER

REPORT NUMBER
105246853BOX-017F

ISSUE DATE	**[REVISED DATE]**
09/18/2023	Original issue

DOCUMENT CONTROL NUMBER
Non-Specific Radio Report Shell Rev. October 2022

EMC TEST REPORT

(FULL COMPLIANCE)

Report Number: 105246853BOX-017F
Project Number: G105246853

Report Issue Date: 09/18/2023

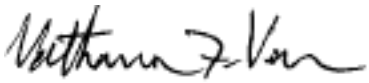
Model(s) Tested: FG-603-000
Model(s) Partially Tested: None
Model(s) Not Tested but declared equivalent by the client: None

Standards: FCC Part 15 Subpart C (15.209): 01/2023
FCC Part 15 Subpart B: 01/2023
FCC Part 18: 01/2023
RSS-102 Issue 5: 03/2015
ISED SPR-002 Issue 2: 10/2022
Supplementary Procedure for Assessing Compliance with RSS-102 Nerve Stimulation Exposure Limits

Tested by:
Intertek
70 Codman Hill Road
Boxborough, MA 01719
USA

Client:
Neuros Medical Inc
35010 Chardon Road, Suite 210
Willoughby, OH 44094
USA

Report prepared by:



Vathana Ven/Senior Staff Engineer, EMC

Report reviewed by:

Kouma Sinn/Senior Staff Engineer, EMC

Table of Contents

1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted in the relevant section of this report.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test full name	Result
3	Client Information	--
4	Description of Equipment Under Test and Variant Models	--
5	System Setup and Method	--
6	Radiated Emissions and Human RF Exposure FCC Part 15 Subpart C (15.209): 01/2023, FCC Part 15 Subpart B: 01/2023, FCC Part 18: 01/2023, RSS-102 Issue 5: 03/2015, ISED SPR-002 Issue 2: 10/2022	Pass
7	Occupied Bandwidth FCC Part 15, Subpart C	Pass
8	AC Mains Conducted Emissions FCC Part 15 Subpart C (15.209): 01/2023, FCC Part 15 Subpart B: 01/2023, FCC Part 18: 01/2023	N/A*
9	Revision History	--

Note: *Wireless charger is battery powered

3 Client Information

This EUT was tested at the request of:

Client: Neuros Medical Inc
35010 Chardon Road, Suite 210
Willoughby, OH 44094
USA

Contact: Raymond Zackowski
Telephone: 4805161383
Email: rzackowski@neurosmedical.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Neuros Medical Inc
35010 Chardon Road, Suite 210
Willoughby, OH 44094
USA

Equipment Under Test			
Description	Manufacturer	Model Number	Serial Number
Altius Battery Charger	Neuros Medical	FG-603-000	0359,0360,0361

Receive Date:	01/06/2023
Received Condition:	Good
Type:	Production

Description of Equipment Under Test (provided by client)
The device is a wireless battery charger

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
Battery power	N/A	N/A	N/A

Operating modes of the EUT:

No.	Descriptions of EUT Exercising
1	Config 2: Wireless charger set for charging the IPG during testing. Wireless transmitter transmitting at maximum power.

Software used by the EUT:

No.	Descriptions of EUT Exercising
1	IPG Charger 0.6

Radio/Receiver Characteristics	
Frequency Band(s)	386 kHz – 485 kHz
Modulation Type(s)	CW
Maximum Output Power	N/A, Electric field strength of the fundamental is Magnetic field strength of the fundamental
Test Channels	N/A
Occupied Bandwidth	245.14 Hz
Frequency Hopper: Number of Hopping Channels	N/A
Frequency Hopper: Channel Dwell Time	N/A
Frequency Hopper: Max interval between two instances of use of the same channel	N/A
MIMO Information (# of Transmit and Receive antenna ports)	N/A
Equipment Type	Standalone
Antenna Type and Gain	Integral

Variant Models:

The following variant models were not tested as part of this evaluation; but have been identified by the manufacturer as being electrically identical models, depopulated models, or with reasonable similarity to the model(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

None

5 System Setup and Method

Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	Charger cable	0.5	N/A	Yes	EUT

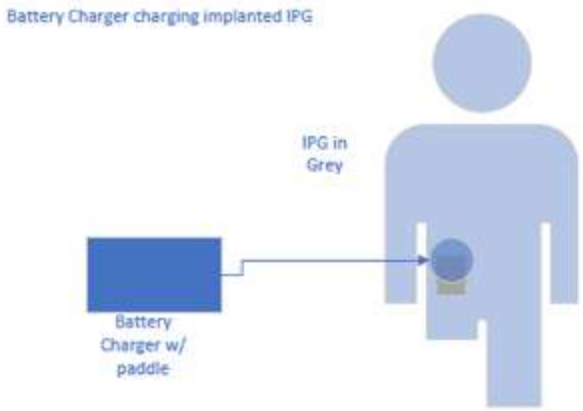
Support Equipment			
Description	Manufacturer	Model Number	Serial Number
Altius IPG	Neuros Medical	FG-601-000	0326,0383,0388

5.1 Method:

Configuration as required by FCC Part 15 Subpart C (15.209): 01/2023, FCC Part 15 Subpart B: 01/2023, FCC Part 15: 01/2023, RSS-102 Issue 5: 03/2015, ISED SPR-002 Issue 2: 10/2022, ANSI C63.4:2014, ANSI C63.10:2013, FCC/OET MP–5:02/1986.

5.2 EUT Block Diagram:

Config 2.



6 Radiated Emissions and Human RF Exposure

6.1 Method

Tests are performed in accordance with FCC/OET MP-5, RSS-102, ANSI C 63.10, ANSI C 63.4, and ISED SPR-002.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
Radiated Emissions, 10m	30-1000 MHz	4.9 dB	6.3 dB
Radiated Emissions, 3m	30-1000 MHz	4.5 dB	6.3 dB
Radiated Emissions, 3m	1-6 GHz	4.4 dB	5.2 dB
Radiated Emissions, 3m	6-15 GHz	5.2 dB	5.5 dB
Radiated Emissions, 3m	15-18 GHz	4.8 dB	5.5 dB
Radiated Emissions, 3m	18-40 GHz	4.8 dB	N/A

As shown in the table above our radiated emissions U_{lab} is less than the corresponding U_{CISPR} reference value in CISPR 16-4-2 Table 1, hence the compliance of the product is only based on the measured value, and no measurement uncertainty correction is required, based on CISPR 22 and CISPR 11 (for 2006 and later revisions) Clause 11.

Sample Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG
Where FS = Field Strength in dBμV/m
RA = Receiver Amplitude (including preamplifier) in dBμV
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB/m
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows.

Assume a receiver reading of 52.0 dBμV is obtained. The antenna factor of 7.4 dB/m and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dBμV/m. This value in dBμV/m was converted to its corresponding level in μV/m.

RA = 52.0 dBμV
AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB
FS = 32 dBμV/m

To convert from dBμV to μV or mV the following was used:

$UF = 10^{(NF / 20)}$ where UF = Net Reading in μV
NF = Net Reading in dBμV

Example:

FS = RA + AF + CF – AG = 52.0 + 7.4 + 1.6 – 29.0 = 32.0
$UF = 10^{(32\ dB\mu V / 20)}$ = 39.8 μV/m

Alternately, when BAT-EMC Emission Software is used, the "Level" includes all losses and gains and is compared directly in the "Margin" column to the "Limit". The "Correction" includes Antenna Factor, Preamp, and Cable Loss. These are already accounted for in the "Level" column.

6.2 Test Equipment Used:

Equipment used on 01/17/2023

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV007'	Weather Station Vantage Vue	Davis	6250	MS191212003	03/08/2022	03/08/2023
NAR001'	Exposure Level Tester ELT-400	NARDA	2304/03	M-0170	08/24/2022	08/24/2023
NAR002'	Magnetic Field Probe 100 cm2	NARDA	2300/90.10	M-0187	08/24/2022	08/24/2023
SCH7'	Electromagnetic Radiation Meter Set	Schaffner	EMC-20	AP-0044	04/08/2022	04/08/2023

Equipment used on 09/12/2023 to 09/14/2023

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
CBL052'	9kHz-1GHz BNC cable 25 ft long	Belden	RG58A/U	CBL052	11/08/2022	11/08/2023
DAV006'	Weather Station	Davis	6250	MS191218071	02/21/2023	02/21/2024
IW002'	2 meter Armored cable	Insulated Wire	2800-NPS	002	10/11/2022	10/11/2023
145-422'	10Amp Pre-amp to under floor	Utiflex	UFB311A-0-2756-70070	145-422	02/18/2023	02/18/2024
145-420'	Receiver to floor cable	Utiflex	UFB311A-2-0591-70070	145-420	02/18/2023	02/18/2024
145019'	Active Loop Antenna (9 KHz to 30 MHz)	EMCO	6502/1	9902-3267	02/27/2023	02/27/2024
145145'	Broadband Hybrid Antenna 30 MHz - 3 GHz	Sunol Sciences Corp.	JB3	A122313	06/16/2022	06/16/2023
PRE10'	30-1000MHz pre-amp	ITS	PRE10	PRE10	02/17/2023	02/17/2024
145-424'	9kHz to 40GHz Cable	Huber and Suhner	Sucoflex	145-424	02/18/2023	02/18/2024
HS001'	DC-18GHz cable 1.5m long	Huber & Suhner	SucoFlex 106A	HS001	01/25/2023	01/25/2024
HS003'	10m under floor cable	Huber-Schuner	10m-1	HS003	02/18/2023	02/18/2024

Software Utilized:

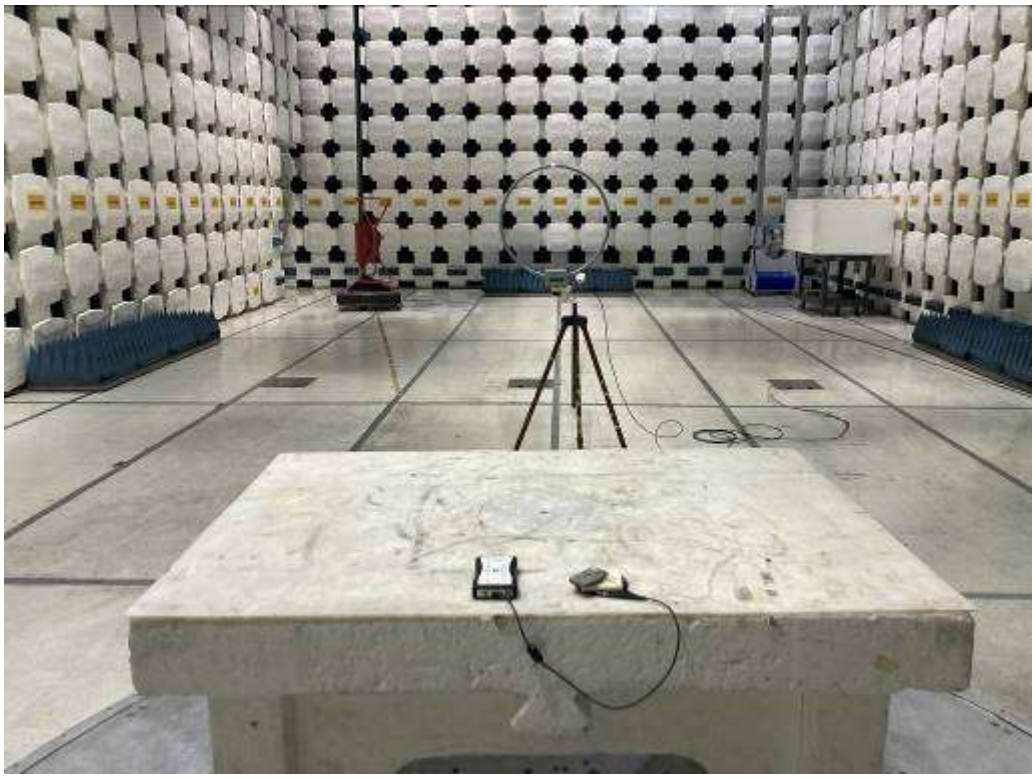
Name	Manufacturer	Version
BAT-EMC	Nexio	3.18.0.16

6.3 Results:

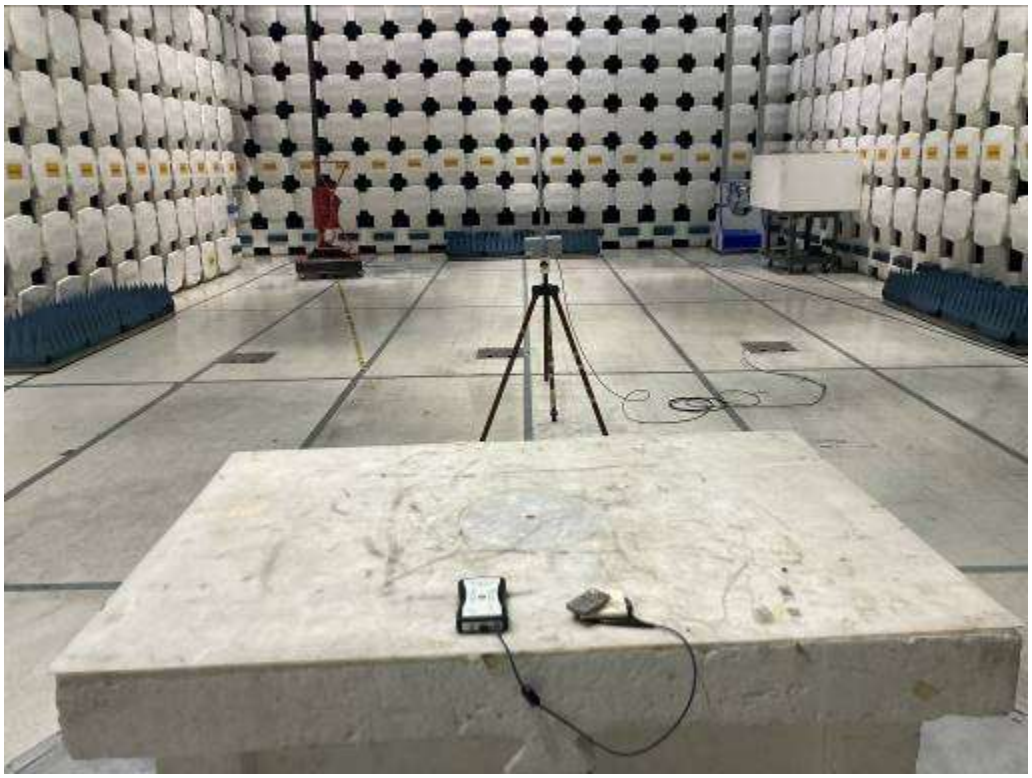
The sample tested was found to Comply.

6.4 Setup Photographs:

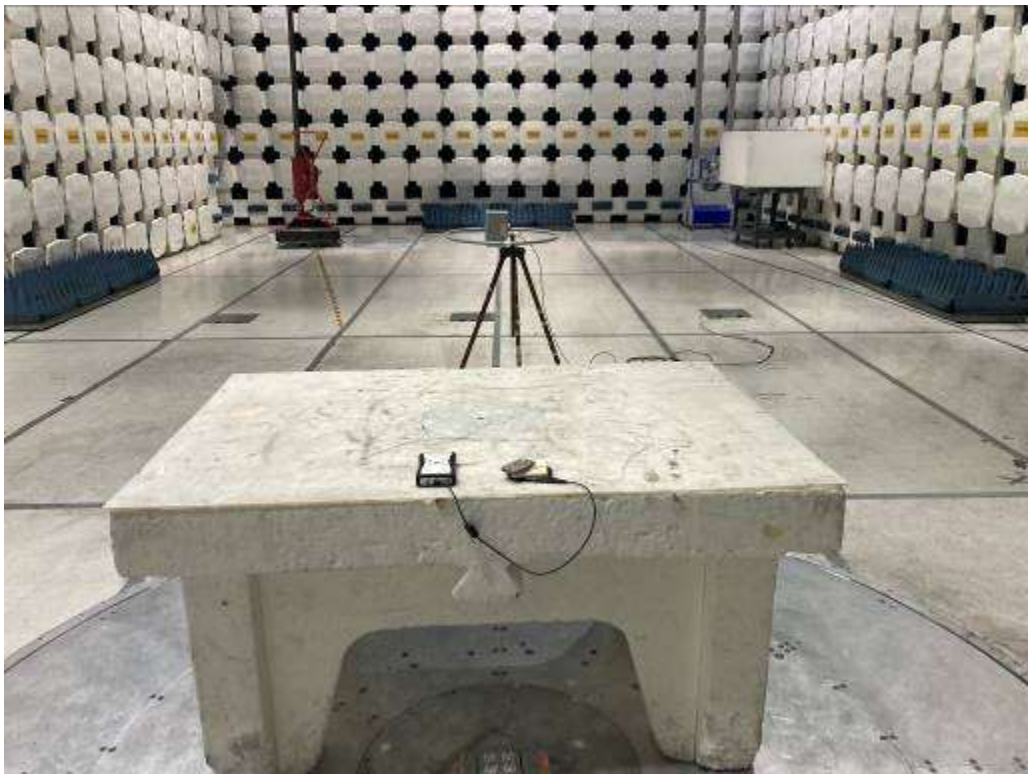
Config 2 – Wirelessly Charging IPG – 9kHz – 30MHz, 15.209, Loop antenna on X-Axis



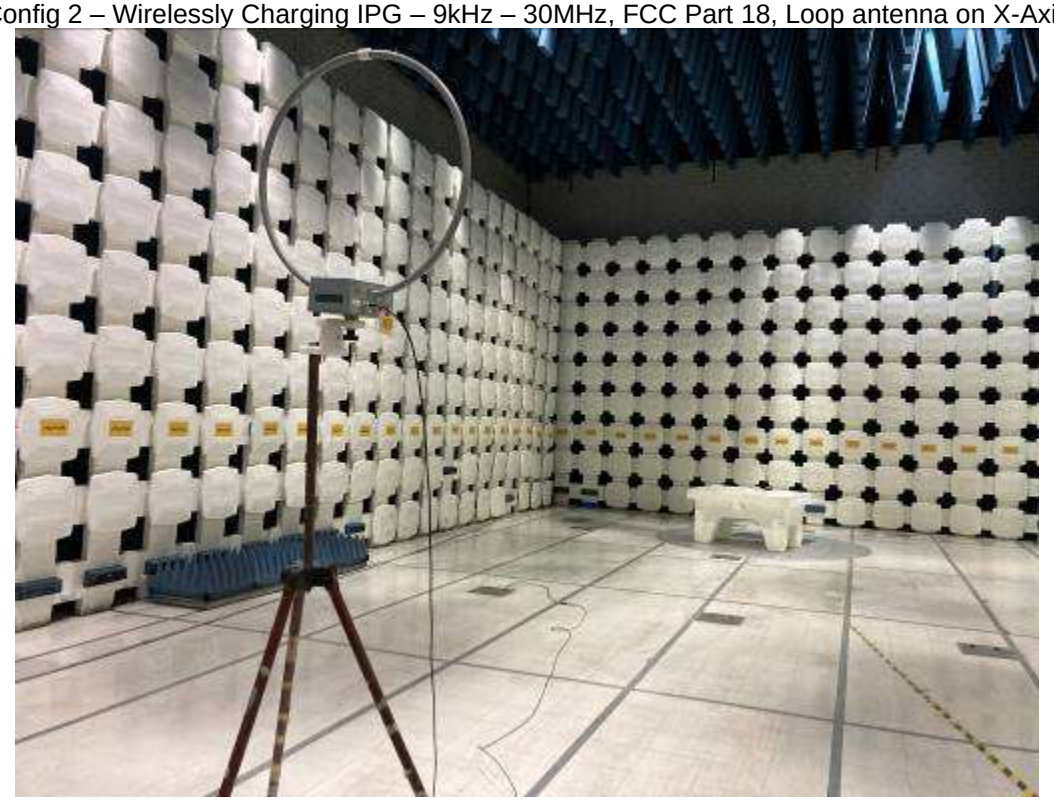
Config 2 – Wirelessly Charging IPG – 9kHz – 30MHz, 15.209, Loop antenna on Y-Axis



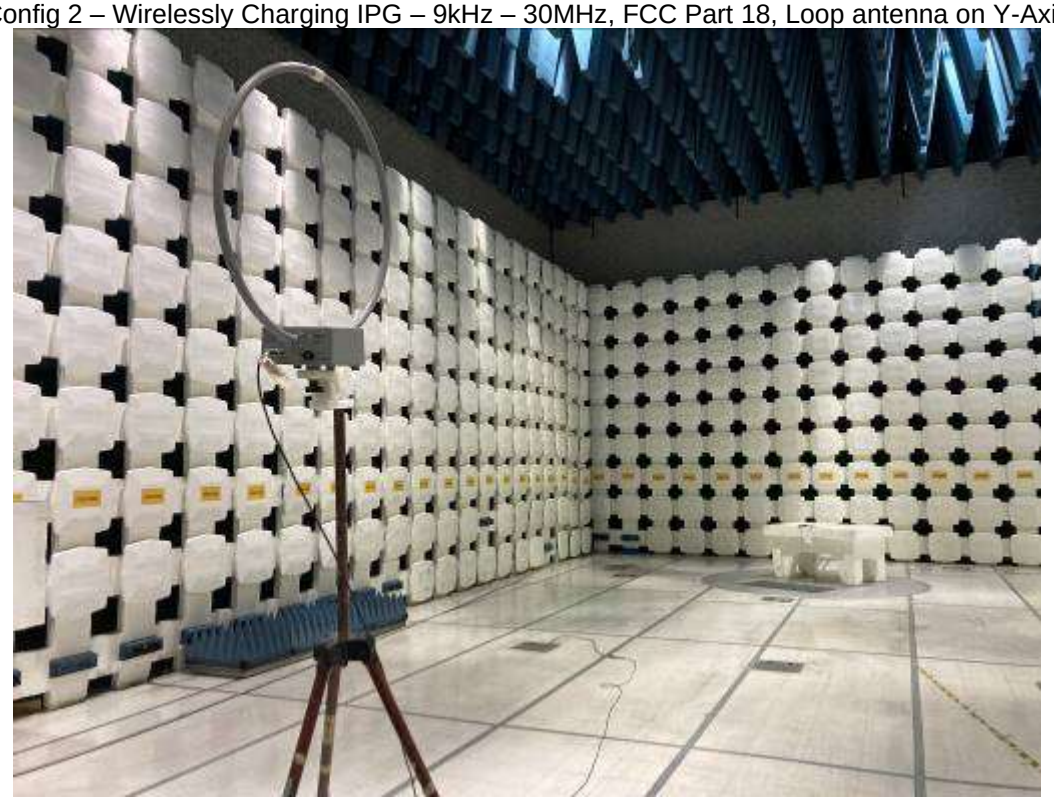
Config 2 – Wirelessly Charging IPG – 9kHz – 30MHz, 15.209, Loop antenna on Z-Axis

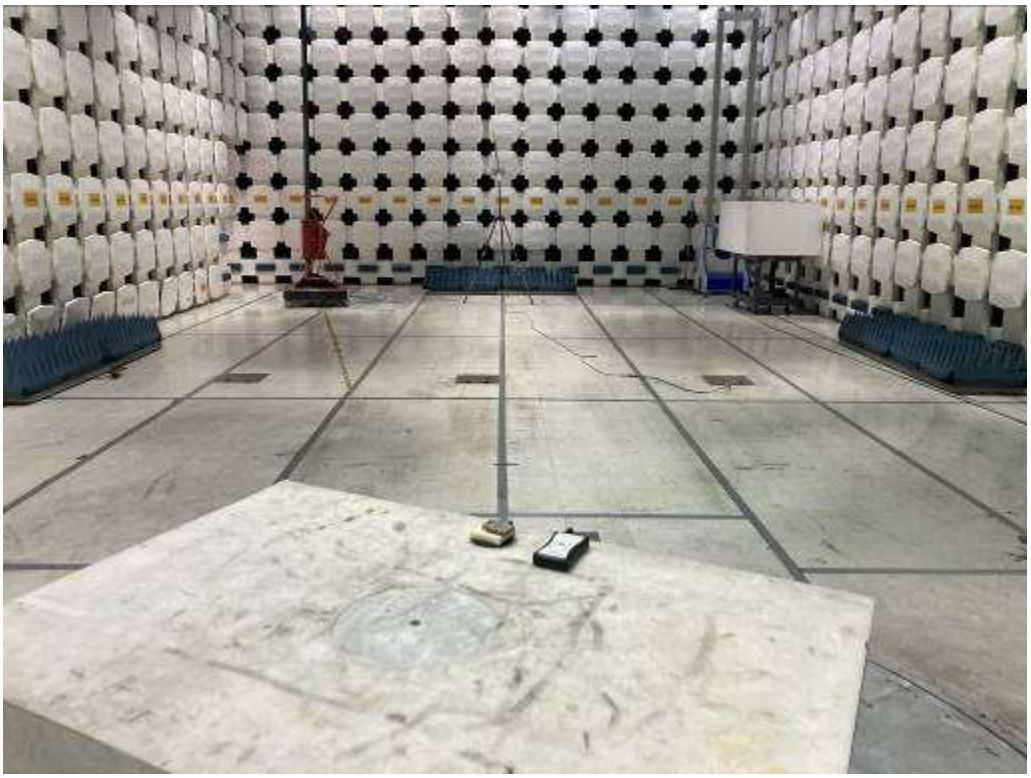


Config 2 – Wirelessly Charging IPG – 9kHz – 30MHz, FCC Part 18, Loop antenna on X-Axis

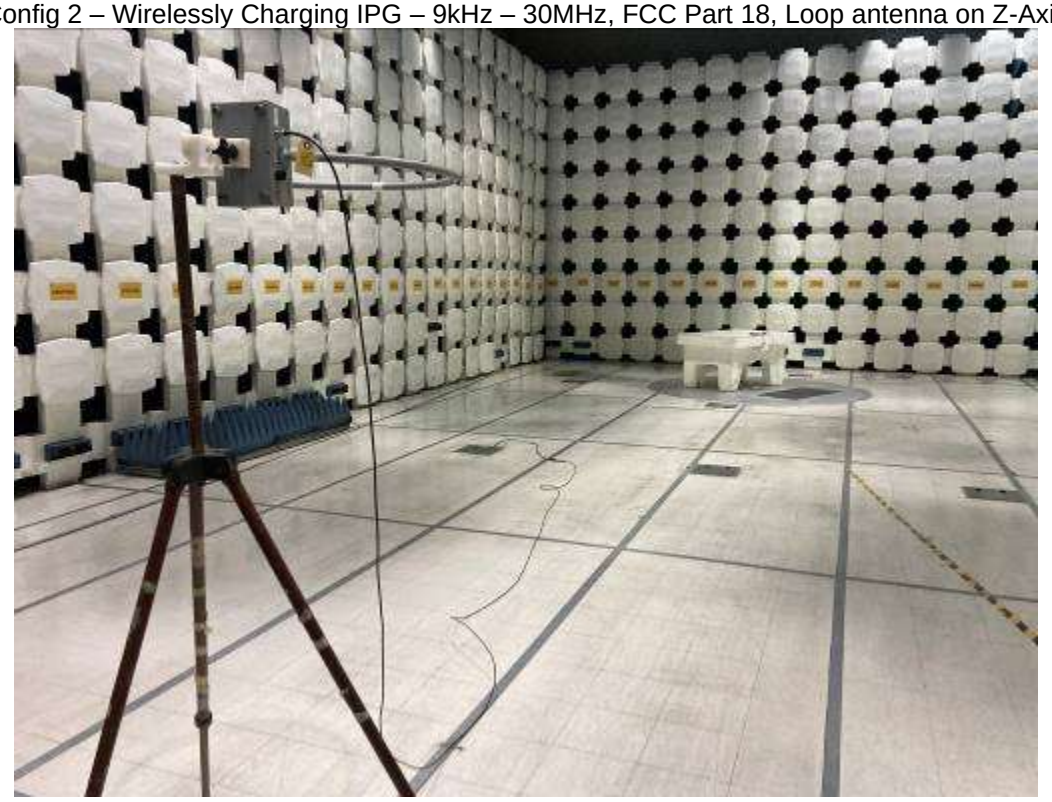


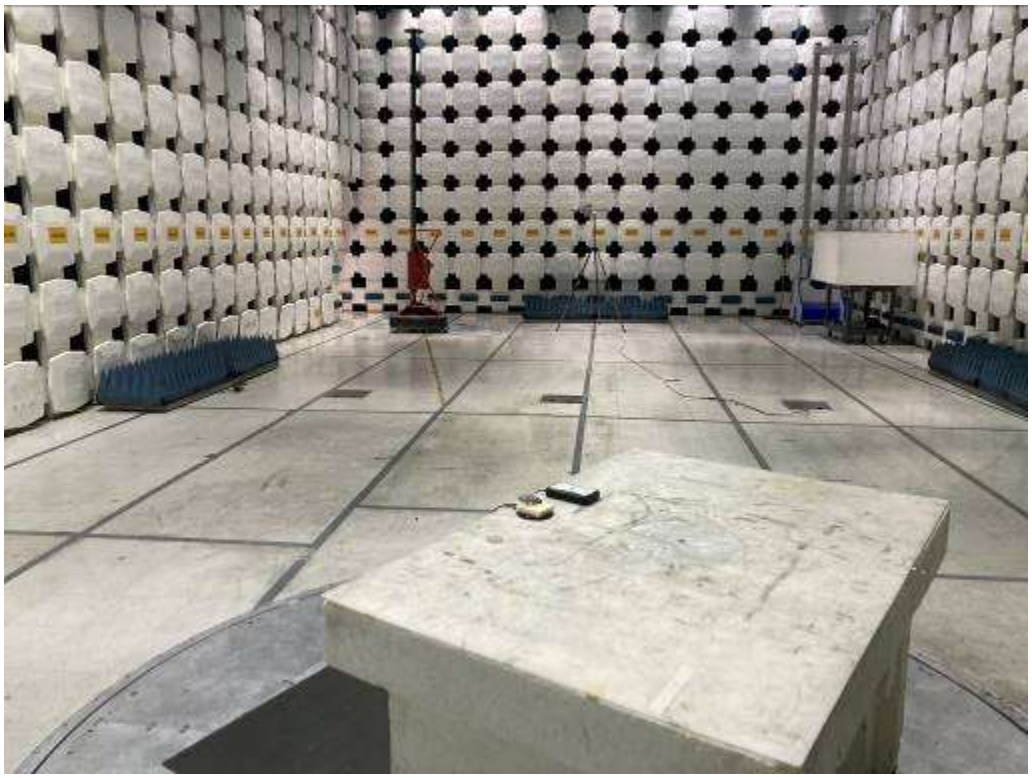
Config 2 – Wirelessly Charging IPG – 9kHz – 30MHz, FCC Part 18, Loop antenna on Y-Axis



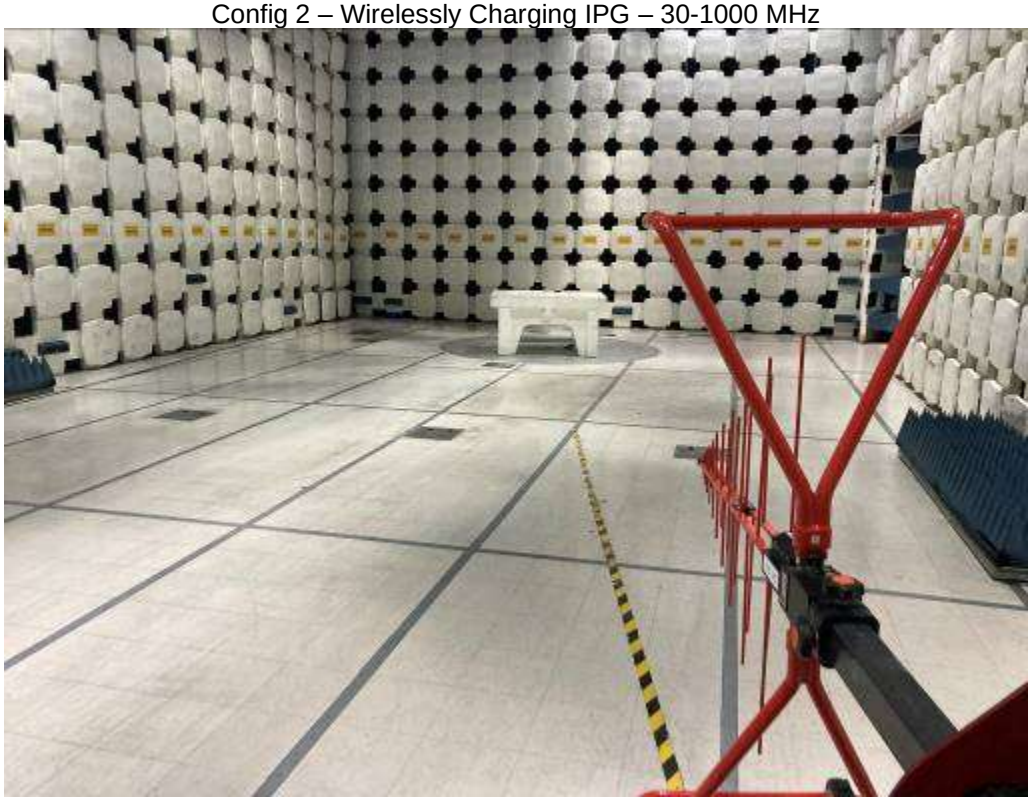


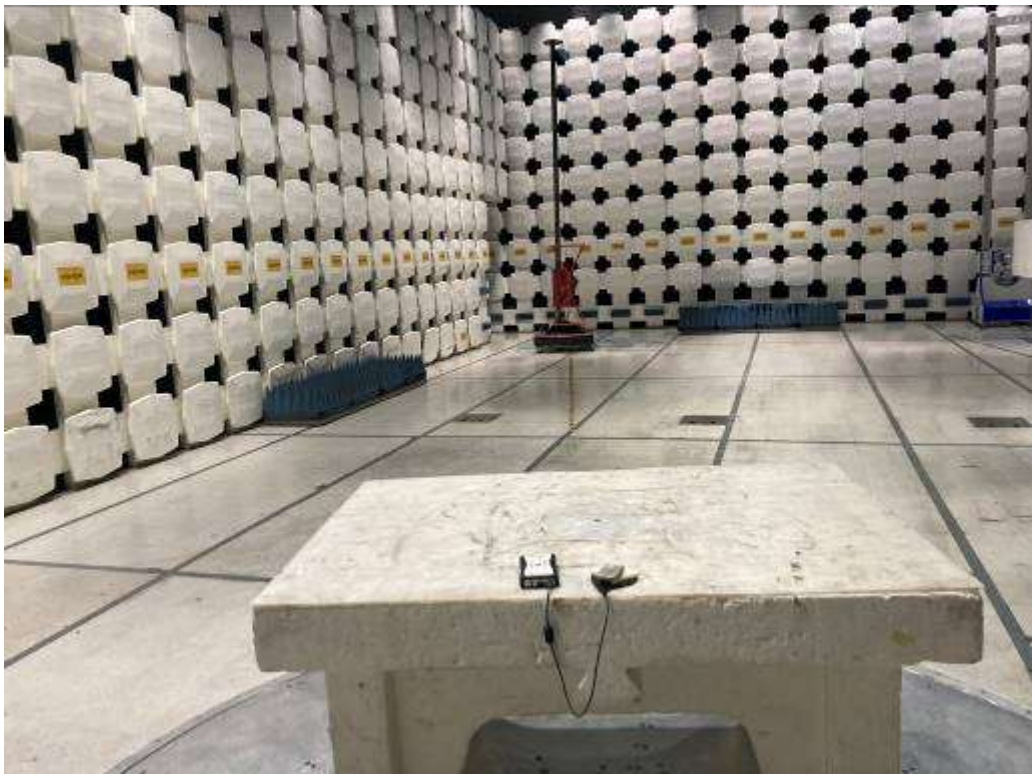
Config 2 – Wirelessly Charging IPG – 9kHz – 30MHz, FCC Part 18, Loop antenna on Z-Axis





Config 2 – Wirelessly Charging IPG – 30-1000 MHz





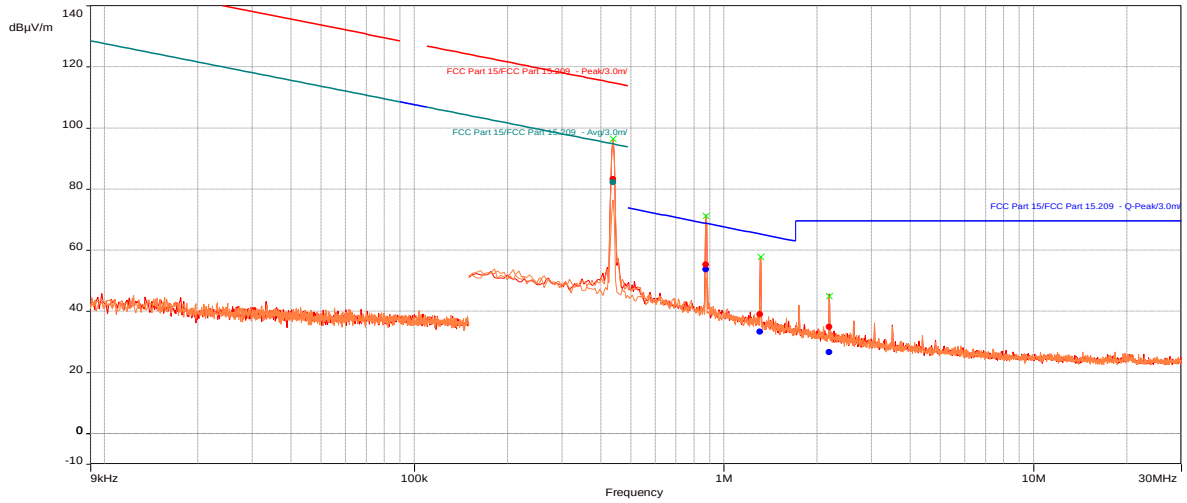
6.5 Plots/Data:

RE 9kHz-30MHz Loop antenna, Electric Field, 3M Location (FCC 15.209) Config 2

Test Information:

Date and Time	9/13/2023 5:30:30 PM
Client and Project Number	Neuros Medical_G105246853
Engineer	Vathana Ven
Temperature	22 deg C
Humidity	50%
Atmospheric Pressure	1003 mB
Comments	RE 9kHz-30MHz Loop antenna, Electric Field, 3M Location (FCC 15.209)_Charging mode

Graph:



Results:

QuasiPeak (PASS) (3)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
0.8754	53.73	68.77	-15.04	20.80	1.00	Vertical	9k	13.10
1.30515	33.35	65.28	-31.94	131.70	1.00	Vertical	9k	13.14
2.18715	26.66	69.54	-42.88	325.30	1.00	Vertical	9k	12.84

Peak (PASS) (4)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
0.43755	83.27	114.77	-31.50	94.80	1.00	Vertical	9k	13.19
0.8754	55.31	68.77	-13.46	20.80	1.00	Vertical	9k	13.10
1.30515	39.12	65.28	-26.16	131.70	1.00	Vertical	9k	13.14
2.18715	34.99	69.54	-34.55	325.30	1.00	Vertical	9k	12.84

Average (PASS) (1)

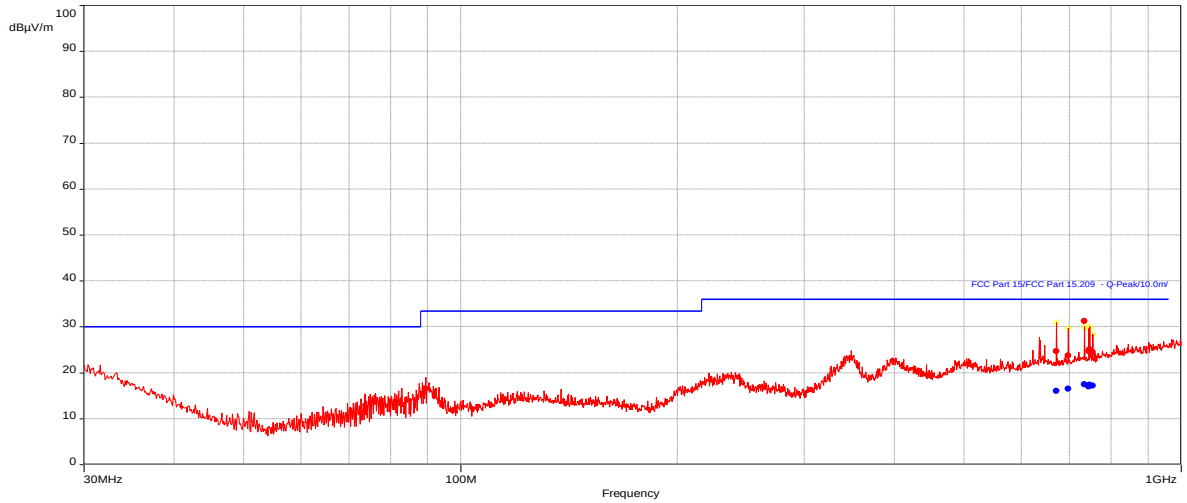
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
0.43755	82.21	94.77	-12.56	94.80	1.00	Vertical	9k	13.19

RE 30-1000MHz_Config 2_Wireless charging, FCC 15.209

Test Information:

Date and Time	9/12/2023 5:21:26 PM
Client and Project Number	Neuros Medical_G105246853
Engineer	Vathana Ven
Temperature	23 deg C
Humidity	45%
Atmospheric Pressure	1005 mB
Comments	Stepped angle__USE THIS FOR TESTING_ RE 30-1000MHz_Charging mode

Graph:



Results:

QuasiPeak (PASS) (6)

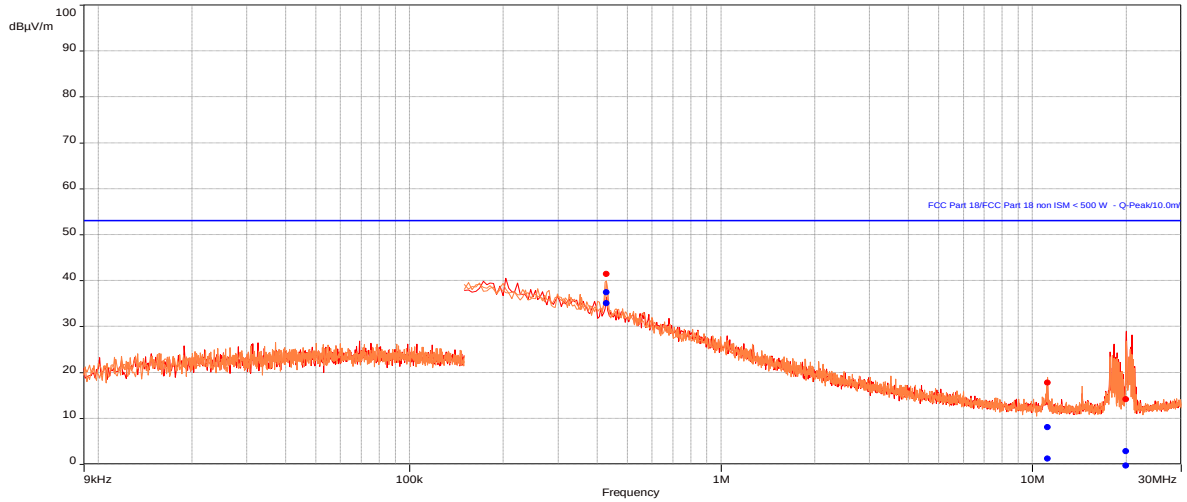
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	RBW	Correction (dB)
670.95	16.05	36.00	-19.95	162.60	4.00	Vertical	120000.00	120k	-9.78
697.39	16.51	36.00	-19.49	287.50	1.15	Vertical	120000.00	120k	-9.06
734.286	17.50	36.00	-18.50	360.00	1.57	Vertical	120000.00	120k	-8.46
744.222	17.06	36.00	-18.94	266.70	2.01	Vertical	120000.00	120k	-8.30
746.76	17.42	36.00	-18.58	58.30	2.01	Vertical	120000.00	120k	-8.22
753.802	17.18	36.00	-18.82	329.30	3.33	Vertical	120000.00	120k	-8.19

RE 9kHz-30MHz Loop antenna, Electric Field, 3M Location (FCC Part 18), Config 2

Test Information:

Date and Time	9/14/2023 6:31:32 PM
Client and Project Number	Neuros Medical
Engineer	Vathana Ven
Temperature	24 deg C
Humidity	41%
Atmospheric Pressure	1006 mB
Comments	RE 9kHz-30MHz Loop antenna, Electric Field, 10M Location (FCC Part 18)_Charging mode

Graph:



Results:

QuasiPeak (PASS) (3)

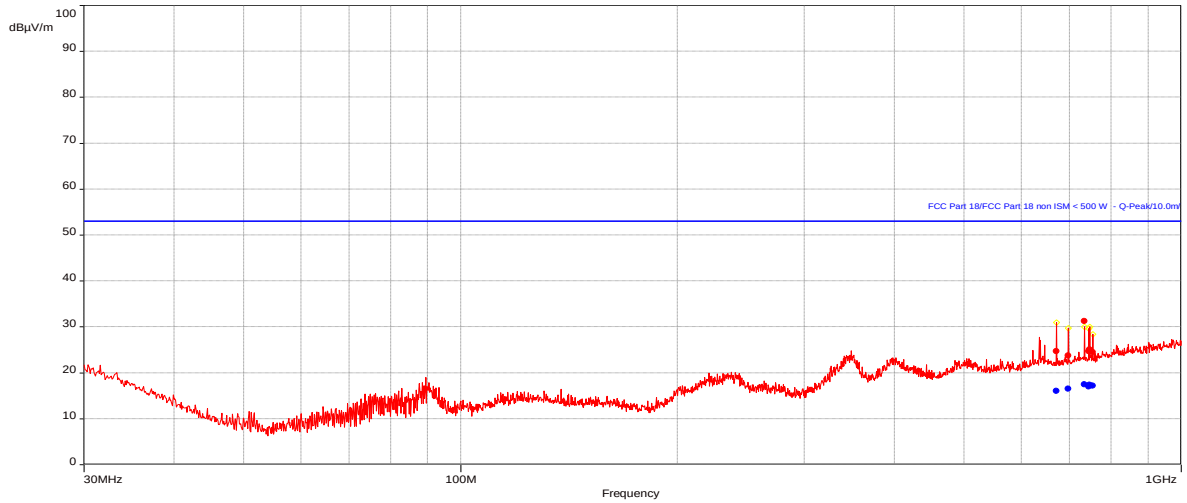
Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
0.42855	49.69	57.5	-7.81	165.00	2.00	Vertical	9k	12.27
11.17815	19.03	57.5	-38.47	222.70	2.00	Vertical	9k	10.97
19.98735	13.91	57.5	-43.59	211.00	2.00	Vertical	9k	10.7

RE 30-1000MHz_Config 2_Wireless charging, FCC Part 18

Test Information:

Date and Time	9/12/2023 5:21:26 PM
Client and Project Number	Neuros Medical_G105246853
Engineer	Vathana Ven
Temperature	23 deg C
Humidity	45%
Atmospheric Pressure	1005 mB
Comments	Stepped angle__USE THIS FOR TESTING_ RE 30-1000MHz_Charging mode

Graph:



Results:

QuasiPeak (PASS) (6)

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Azimuth (°)	Height (m)	Pol.	RBW	Correction (dB)
670.95	16.05	53.06	-37.01	162.60	4.00	Vertical	120k	-9.78
697.39	16.51	53.06	-36.55	287.50	1.15	Vertical	120k	-9.06
734.286	17.50	53.06	-35.56	360.00	1.57	Vertical	120k	-8.46
744.222	17.06	53.06	-36.0	266.70	2.01	Vertical	120k	-8.30
746.76	17.42	53.06	-35.64	58.30	2.01	Vertical	120k	-8.22
753.802	17.18	53.06	-35.88	329.30	3.33	Vertical	120k	-8.19

6.6 Human RF Exposure

Electric Field

The field strength limits are established in Health Canada's RF exposure guideline, Safety Code 6.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous

EUT Location (worst-case)	Measured Value (V/m rms)	Limit (V/m rms)
Rear	59	83

Note: Test was performed with probe touching the EUT i.e. 0 mm from EUT and 10 cm from EUT, worst case results are reported here. The values indicated above are highest instantaneous values observed on the meter used for measurement.

Magnetic Field

The field strength limits are established in Health Canada's RF exposure guideline, Safety Code 6.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Reference Period (minutes)
0.003-10	83	90	-	Instantaneous

EUT Location (worst-case)	**Measured Value (uT)**	**Measured Value (A/m rms)**	**Limit (A/m rms)**
Top	4.7	3.73	90

Note: Test was performed with probe touching the EUT i.e. 0 mm from EUT and 10 cm from EUT, worst case results are reported here. The values indicated above are highest instantaneous values observed on the meter used for measurement.

Calculated Value (A/m) = Measured Value (uT) /1.26

Product Standard: FCC 47CFR Part 18, FCC 47CFR Part 15.209				Limit applied: Class B, ISM < 500 W Pretest Verification w/BB source:			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
01/16/2023	Vathana Ven	N/A	Battery	Config 2	22	23	996
09/12/2023	Vathana Ven	N/A	Battery	Config 2	23	45	1005
09/13/2023	Vathana Ven	N/A	Battery	Config 2	22	50	1003
09/14/2023	Vathana Ven	N/A	Battery	Config 2	24	41	1006

Deviations, Additions, or Exclusions:

7 Occupied Bandwidth

7.1 Method

Tests are performed in accordance with ANSI C63.10.

TEST SITE: 10m ALSE

The 10m ALSE is 13m (Length) x 21m (Depth) x 10m (Height) with the effective size in terms of space from the tips of the absorber is 12m (Length) x 20m (Depth) x 8.5m (Height). This chamber achieves broadband performance using a unique arrangement of hybrid and ferrite tile absorber. This chamber has a built in 3m diameter turntable (Embedded type). The metal structure of the table makes electrical connection around the entire circumference of the turntable to the ground plane with a metal brush type connection. The turntable is located on one end of the chamber and the antennas are mounted 3 and 10 meters away at the other end of the chamber on the adjustable an Antenna Mast. The antenna mast is a non-conductive bore sighted type with remote control of antenna height and polarization. The Antenna Mast and the turntable can be remotely controlled through the controller located in the adjacent Control room. A Styrofoam table 80 cm high is used for table-top equipment.

7.2 Test Equipment Used:

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
DAV007'	Weather Station Vantage Vue	Davis	6250	MS191212003	03/08/2022	03/08/2023
ETS003'	9kHz-30MHz Active Loop Antenna	ETS Lindgren	6502	00143396	09/06/2022	09/06/2023
ROS005-1'	Signal and Spectrum Analyzer	Rohde and Shwartz	FSW43	100646	11/18/2022	11/18/2023
CBL2014-1'	RG58C/U, BNC (M)	Pomona	2249-C-180	CBL2014-1	02/10/2022	02/10/2023

Software Utilized:

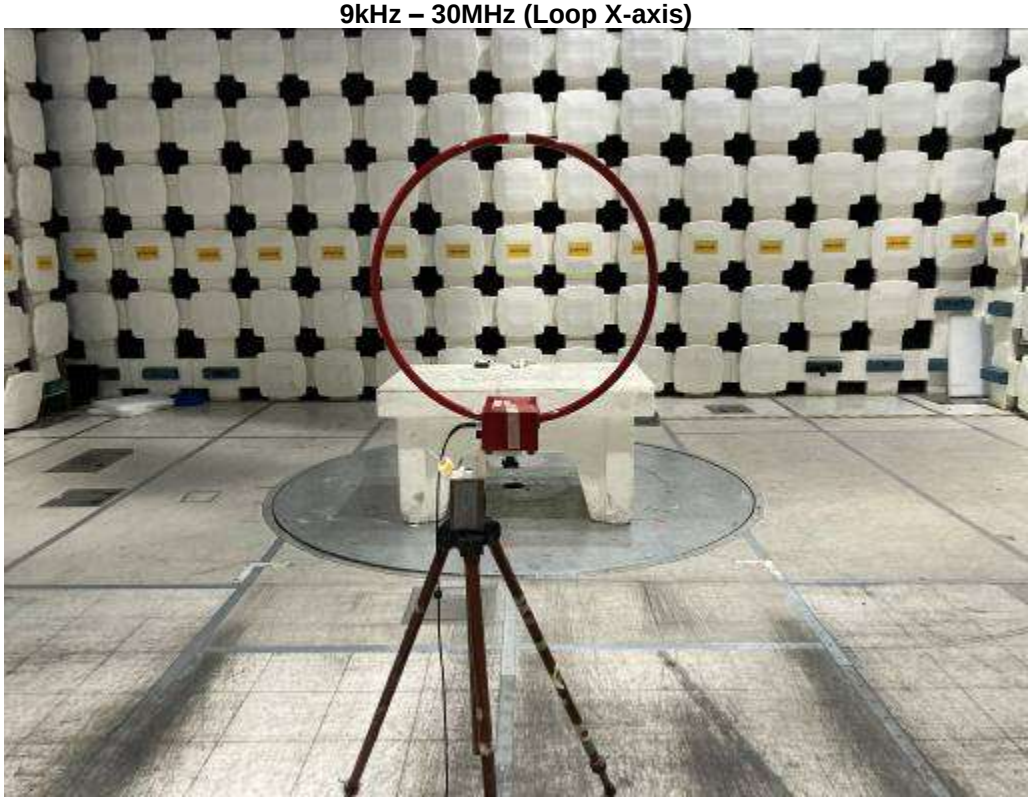
Name	Manufacturer	Version
N/A	N/A	N/A

7.3 Results:

The sample tested was found to Comply.

7.4 Setup Photographs:

9kHz – 30MHz (Loop X-axis)



7.5 Plots/Data:

Occupied Bandwidth 245.14 Hz

05:22:22 PM 01/17/2023

	Product Standard: FCC PART15C			Limit applied: N/A			
Test Date	Test Personnel/ Initials	Supervising Engineer/ Initials	Input Voltage	Mode	Atmospheric Data		
					Temp C°	Relative Humidity %	Atmospheric Pressure mbar
01/17/2023	Vathana Ven	N/A	Battery	Config 2	22	26	992

Deviations, Additions, or Exclusions:

8 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	09/18/2023	105246853BOX-017F	VFV	KPS	Original Issue