TEST REPORT

Report Number: 105559103MPK-004
Project Number: G105559103
Report Issue Date: May 2, 2024
Revision Date: July 29, 2024

Testing performed on the
Robotic Surgical System
Model Number: Ottava Apollo

to

FCC Part 15 Subpart C (15.209)
ISED RSS-210 Issue 10

For

Auris Health, Inc.

Test Performed by:	**Test Authorized by:**
Intertek	Auris Health, Inc.
1365 Adams Court	150 Shoreline Drive
Menlo Park, CA 94025 USA	Redwood City, CA 94065 USA

Prepared by: _____ **Date:** July 29, 2024
Kenneth Reyes

Reviewed by: _____ **Date:** July 29, 2024
Anderson Soungpanya

Report No. 105559103MPK-004	
Equipment Under Test:	Robotic Surgical System – Surgical Table
Model Number:	Ottava Apollo
Applicant:	Auris Health, Inc
Contact:	Lawrence Bruno
Address:	150 Shoreline Drive Redwood City, CA 94065
Country:	USA
Tel. Number:	510-219-7232
Email:	lbruno@its.jnj.com
Applicable Regulation:	FCC Part 15 Subpart C (15.209) ISED RSS-210 Issue 10
Date of Test:	09/22/2023 to 11/03/2023

We attest to the accuracy of this report:

Kenneth Reyes
EMC Sr. Project Engineer

Anderson Soungpanya
EMC Team Leader

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1.0 Summary of Tests

NFC Transmitter:

TEST	REFERENCE FCC 15C	REFERENCE RSS-210	RESULTS
Radiated Emissions	15.209	RSS 210 (4.3)	Complies
Line Conducted Emissions	15.207	RSS-GEN	Complies
Occupied Bandwidth	15.215(c)	RSS-GEN	Complies
Antenna requirement	15.203	RSS-GEN	Complies[2]

[1] The EUT utilizes a permanently attached Internal Antenna.

2.0 General Description

2.1 Product Description

Auris Health, Inc. supplied the following description of the EUT:

The Ottava Robotic Surgical System delivers precision Minimally Invasive Surgery (MIS) using advanced robotic tools. The Ottava system is comprised of the essential sub-systems called the Surgical Table and Arms (with Tool Driver), the Physician Console (with HID), and the Tower (with Vision). The Ottava Surgical Table includes the operating table with additional structures to support four Robotic Arms. The Physician Console provides the Surgeon with the means for controlling the instruments and Robot Arms through a set of user Haptic Interface Devices (HID), Foot Pedals and visualizing the surgical site in a 3D ergonomic environment. The Tower is the functionally central component responsible for processing the surgeon input commands and transferring the robotic control to the Surgical Table/Arms plus processing all procedural video and case data.

Overview of the EUT

Applicant name & address	Auris Health, Inc. 150 Shoreline Drive Redwood City, CA 94065 USA
Contact info / Email	Lawrence Bruno / lbruno@its.jnj.com
Model	Ottava Apollo
NFC Transmitter	
Operating Frequency	125 kHz
Number of Channels	1
Type of Modulation	FSK
Antenna Type	Coil Antenna

EUT receive date: September 22, 2023
EUT receive condition: The pre-production version of the EUT was received in good condition with no apparent damage. As declared by the Applicant, it is identical to the production units.
Test start date: September 22, 2023
Test completion date: November 3, 2023

2.2 Related Submittal(s) Grants

None

2.3 Test Methodology

Radiated tests were performed at an antenna to EUT distance of 10 meters, unless stated otherwise in this test report. All other measurements were made in accordance with the procedures in part 2 of CFR 47 7, ANSI C63.10: 2013, RSS-210 Issue 10 & RSS-GEN Issue 5.

2.4 Test Facility

The radiated emission test site and conducted measurement facility used to collect the data is 10m semi-anechoic chamber located in Menlo Park, California. This test facility and site measurement data have been fully placed on file with the FCC and Industry Canada (Site # 2042L-1).

2.5 Measurement Uncertainty

Compliance with the limits was based on the results of the measurements and doesn't take into account the measurement uncertainty.

Estimated Measurement Uncertainty

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 1 GHz	**1 GHz – 2.5 GHz**	**> 2.5 GHz**
RF Power and Power Density – antenna conducted	-	0.7 dB	-
Unwanted emissions - antenna conducted	1.1 dB	1.3 dB	1.9 dB
Bandwidth – antenna conducted	-	30 Hz	-

Measurement	Expanded Uncertainty (k=2)		
	0.15 MHz – 30MHz	**30 MHz – 1 GHz**	**1 GHz – 18 GHz**
Radiated emissions	-	4.7	5.1 dB
AC mains conducted emissions	2.1 dB	-	-

3.0 System Test Configuration

3.1 Support Equipment

Support Equipment			
Component Name	**Component Sub-Assembly Description**	**Serial Number or Part No. & Rev**	**Notes**
Linux Laptop	Test Script Laptop	Type #: 20QU-S43200 S/N: R9-0ZC0YG	n/a

Equipment Under Test

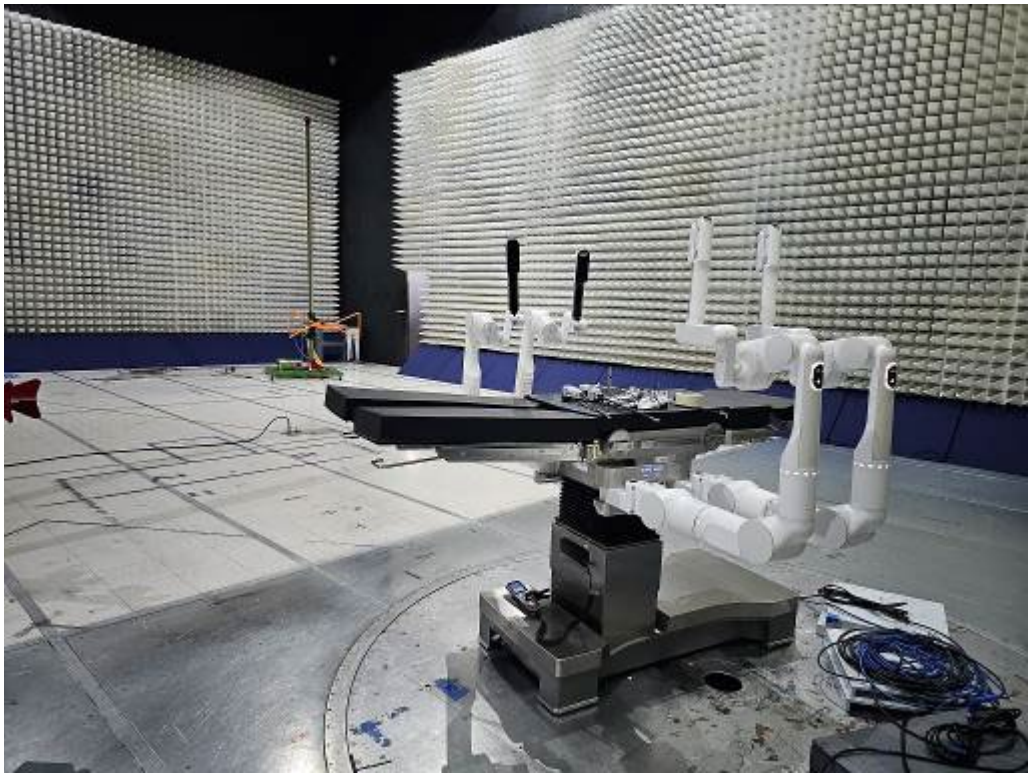
Equipment Under Test			
Description	**Manufacturer**	**Part Number**	**Serial Number**
Ottava Apollo – Robotic Surgical System	Auris Health	System #6	500
Surgical Table	Auris Health	210-005758-00, Rev. 5	500
Physician Console	Auris Health	210-006000-03, Rev. 07	502
Tower	Auris Health	210-007000-00, Rev. 23	502

3.2 Block Diagram of Test Setup

The diagram shown below details the interconnection of the EUT and support equipment. For specific layout, refer to the test configuration photograph in the relevant section of this report.

Note: All Measurements were made Radiated with the EUT's antenna in place.

EUT Photo



3.3 Justification

For radiated emission measurements the EUT is floor-standing and placed on a ground plane. The EUT was configured to continuously transmit. The highest clock frequency used in the device is 3.2GHz therefore radiated spurious was measured up to 18GHz.

The 125kHz NFC Transmitter was measured for Radiated Spurious. Data is presented with the worst-case configuration (the configuration which resulted in the highest emission levels).

3.4 Software Exercise Program

The Ottava Apollo - Robotic Surgical System – Surgical Table was operating at in following modes:

a. NFC Mode: The device was continuously transmitting @ 125kHz signal with a NFC radio.

3.5 Mode of Operation during test

The Ottava Apollo - Robotic Surgical System – Surgical Table was set up to continuously transmit at 125kHz.

3.6 Modifications required for Compliance

No modifications were made by the manufacturer to bring the EUT into compliance.

3.7 Additions, deviations and exclusions from standards

No additions, deviations or exclusion have been made from standard.

4.0 Measurement Results

4.1 Field Strength of Fundamental and Radiated Emissions Outside the band

4.1.1 Requirements

§15.209 Radiated emission limits; general requirements.

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

4.1.2 Procedure

Radiated Measurements Below 30 MHz

During the test the EUT is rotated, and the measuring antenna angles are varied during the search for maximum signal level.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for below 30 MHz were made at 10 meters. Data results below are corrected for distance back to 30 meters.

Radiated Measurements Above 30 MHz

During the test the EUT is rotated and the measuring antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at ten meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. Measurements for above 30 MHz were made at 10 meters.

Radiated emission measurements were performed from 9kHz to 1 GHz.
Analyzer resolution is:

200Hz or greater for 9kHz to 150kHz
9 kHz or greater for 150kHz to 30 MHz
120 kHz or greater for 30MHz to 1000 MHz
For those frequencies quasi-peak detector applies

Data includes of the worst-case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included.

Field Strength 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 is as follows:

FS = RA + AF + CF – AG – DCF

Where FS = Field Strength in dB (μV/m)

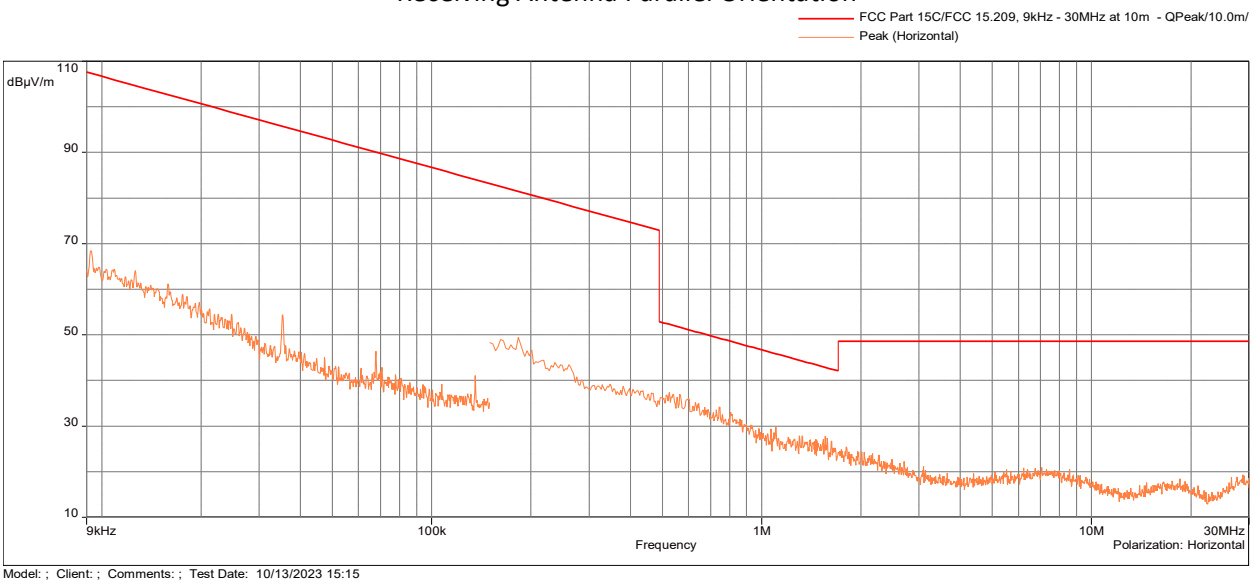
RA = Receiver Amplitude (including preamplifier) in dB (μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB (1/m)
AG = Amplifier Gain in dB
DCF = Distance Correction Factor

Note: FS was measured with loop antenna below 30MHz. No Radio Emissions found for above 1GHz.

4.1.3 Test Result 15.209

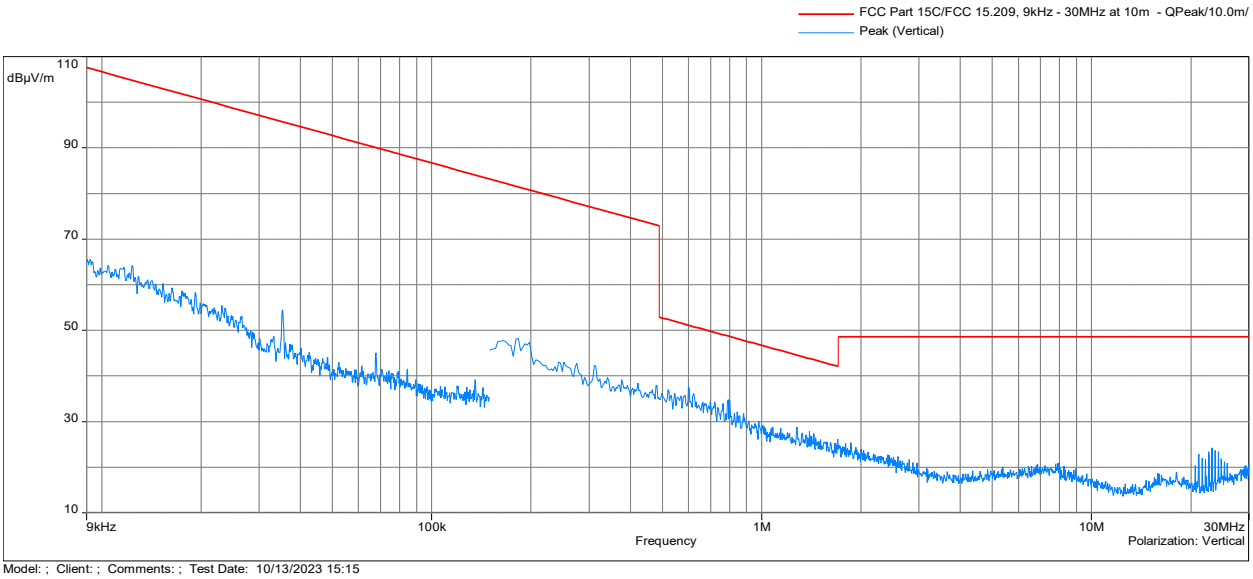
Radiated Spurious Emissions from 9 kHz to 30MHz

Receiving Antenna Parallel Orientation



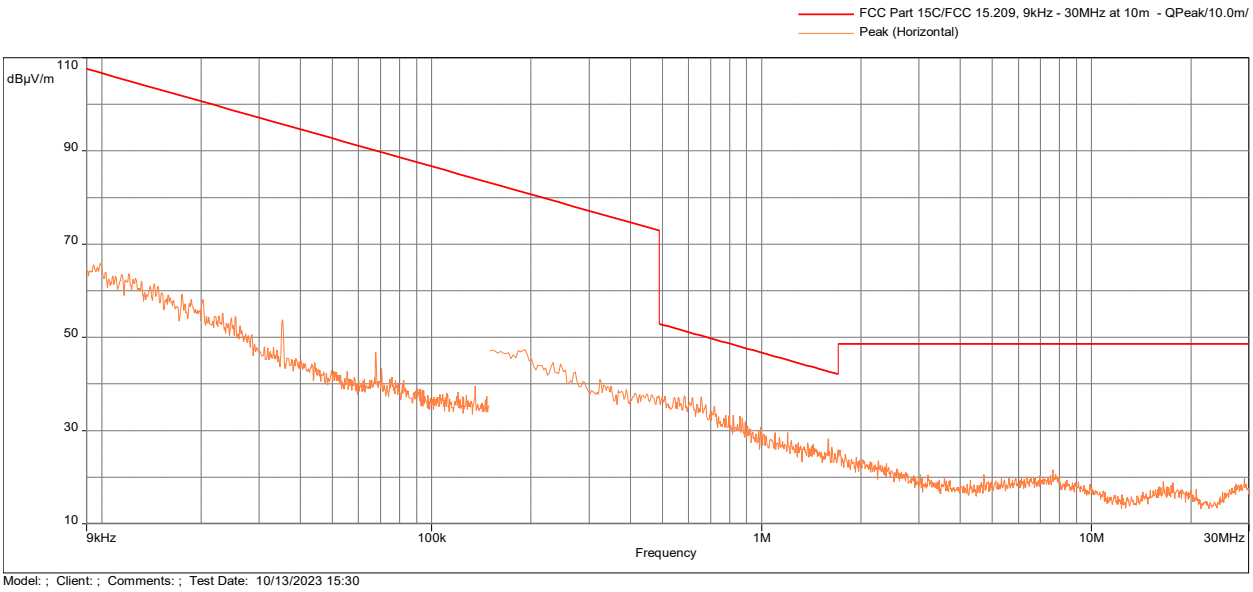
Frequency (MHz)	Peak @10m (dBµV/m)	Limit Q-Peak @10m (dBµV/m)	Margin (dB)	Angle (°)	Polarization	Correction (dB)
0.125	40.90	84.76	-43.86	205.50	Parallel	31.19
0.565	36.97	51.67	-14.70	267.50	Parallel	20.26
0.526	37.43	52.28	-14.86	242.75	Parallel	20.65
1.559	27.82	42.88	-15.06	259.00	Parallel	11.73
0.747	34.15	49.25	-15.09	227.00	Parallel	18.13
1.580	27.44	42.76	-15.32	259.00	Parallel	11.64
1.628	26.76	42.5	-15.74	6.50	Parallel	11.43
0.009	68.43	107.35	-38.91	205.25	Parallel	56.10

Receiving Antenna Perpendicular Orientation



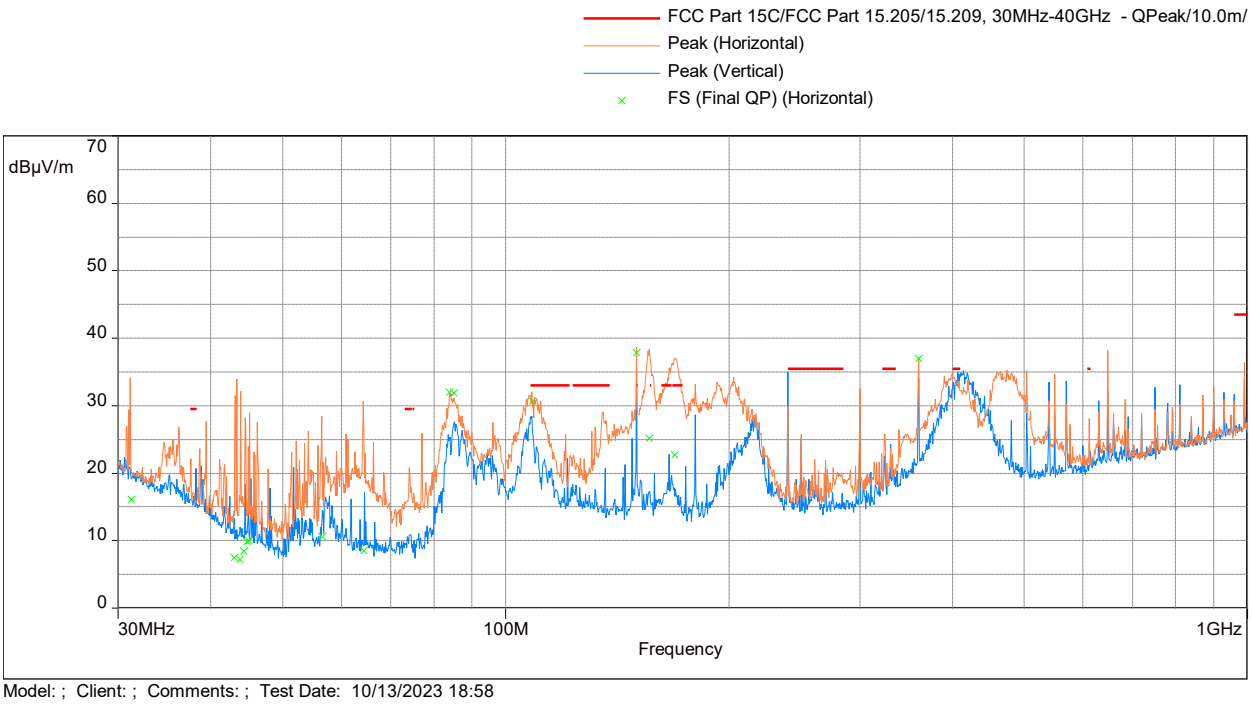
Frequency (MHz)	Peak @10m (dBµV/m)	Limit Q-Peak @10m (dBµV/m)	Margin (dB)	Angle (°)	Polarization	Correction (dB)
0.125	39.05	84.76	-45.71	156.00	Perpendicular	31.19
0.601	37.67	51.14	-13.47	141.75	Perpendicular	19.88
0.792	34.85	48.74	-13.89	233.75	Perpendicular	17.51
0.801	34.6	48.65	-14.05	125.25	Perpendicular	17.38
0.622	36.19	50.84	-14.65	163.00	Perpendicular	19.65
0.762	33.95	49.08	-15.12	171.25	Perpendicular	17.93
1.278	28.81	44.59	-15.79	238.25	Perpendicular	12.87

Receiving Antenna Coplanar Orientation



Frequency (MHz)	Peak @10m (dBµV/m)	Limit Q-Peak @10m (dBµV/m)	Margin (dB)	Angle (°)	Polarization	Correction (dB)
0.125	39.84	84.76	-44.92	15.00	Coplanar	31.19
0.657	37.18	50.35	-13.17	342.5	Coplanar	19.24
0.616	37.14	50.92	-13.78	134.75	Coplanar	19.72
0.583	37.49	51.40	-13.90	159.75	Coplanar	20.07
0.720	35.26	49.57	-14.31	242.75	Coplanar	18.48
1.595	28.22	42.68	-14.46	105.25	Coplanar	11.58
0.860	33.11	48.02	-14.91	346.5	Coplanar	16.47

Radiated Spurious Emissions from 30 to 1000 MHz



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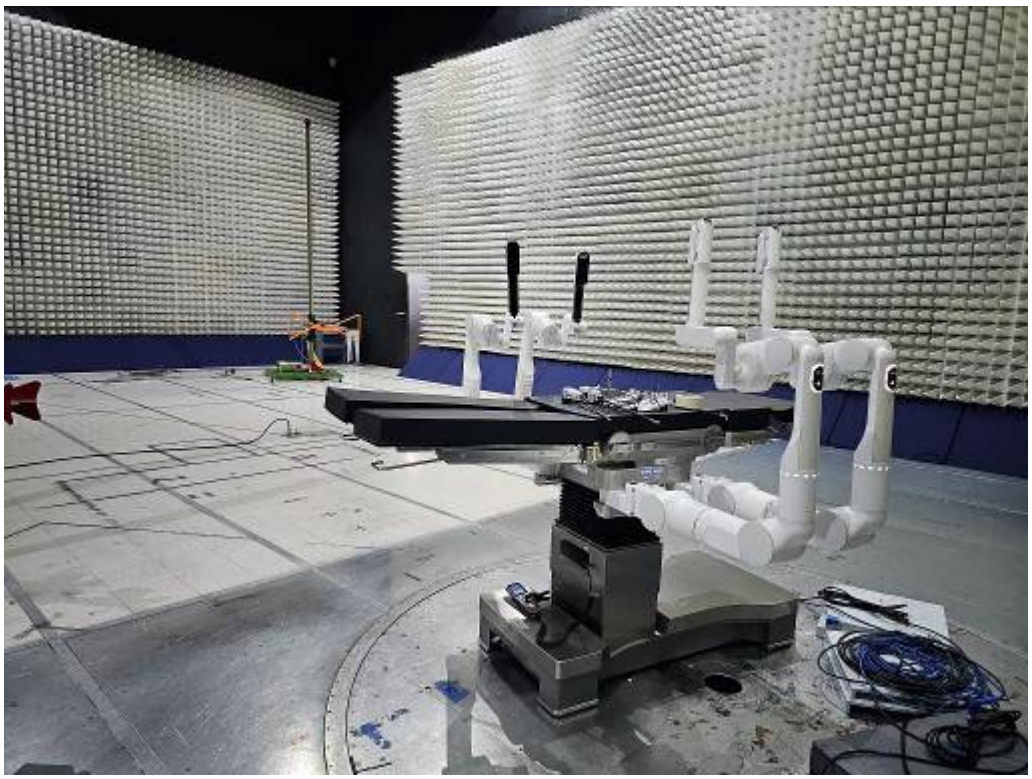
Frequency (MHz)	QP FS @10m dB(uV/m)	Limit Q-Peak @10m (dBµV/m)	Margin (dB)	Azimuth (deg)	Height (m)	Polarization	Correction (dB)
400.0873	35.10	35.5	-0.40	326	2	Horizontal	400.0873
407.0067	35.02	35.5	-0.48	67	2.99	Vertical	407.0067
240.005	35.05	35.5	-0.45	331	1.99	Vertical	240.005
108.6263	30.67	33	-2.33	330.25	1	Horizontal	108.6263
168.8527	22.69	33	-10.31	311.75	1.44	Horizontal	168.8527

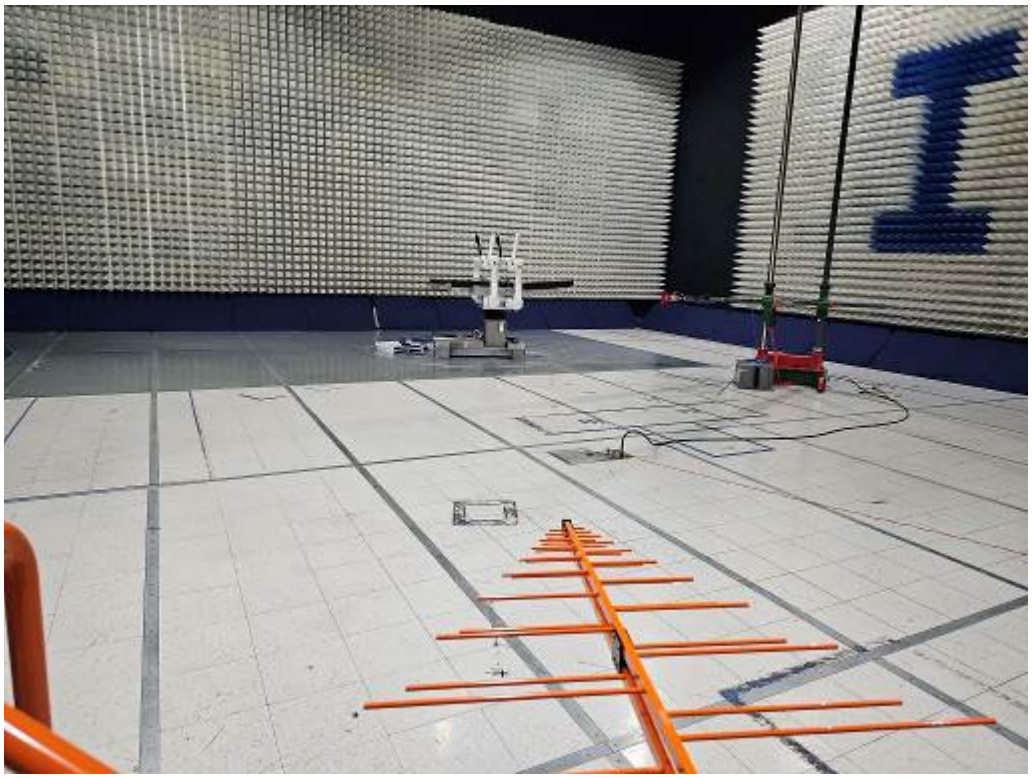
Note: FS = RA + Correction
Correction = AF + CF –AG

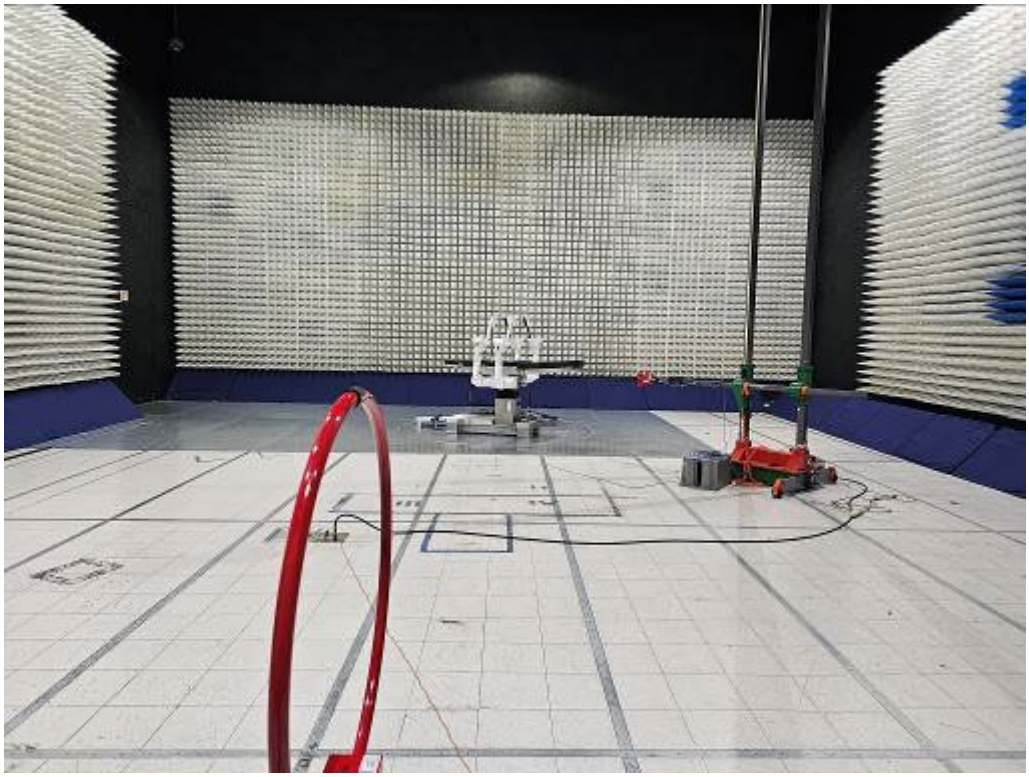
Result	**Complies** by 0.4 dB for 15.209: No Radio Emissions found above 1GHz.

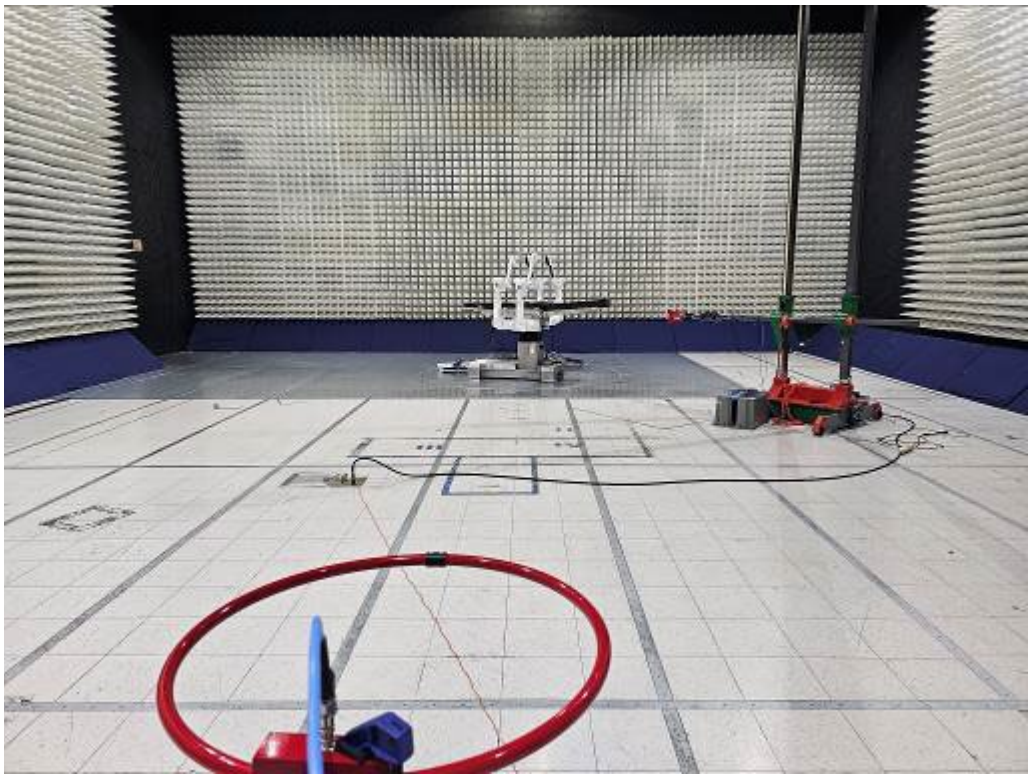
4.1.4 Test Configuration Photographs

The following photographs show the testing configurations used.









4.3 Occupied Bandwidth
FCC 15.215

4.3.1 Requirements

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§15.217 through 15.257, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

4.3.2 Procedure

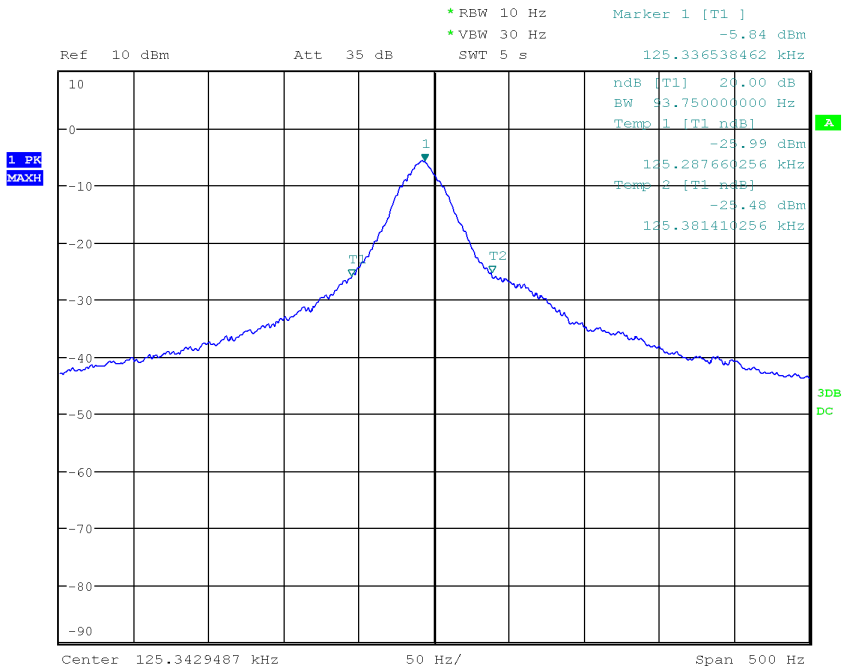
The EUT was setup to transmit in normal operating condition.

Measurements were made with the loop antenna in close proximity of the EUT. Following the procedures of ANSI 63.10: 2013, the 20dB bandwidth measurements were taken. The following plots show Occupied Bandwidth.

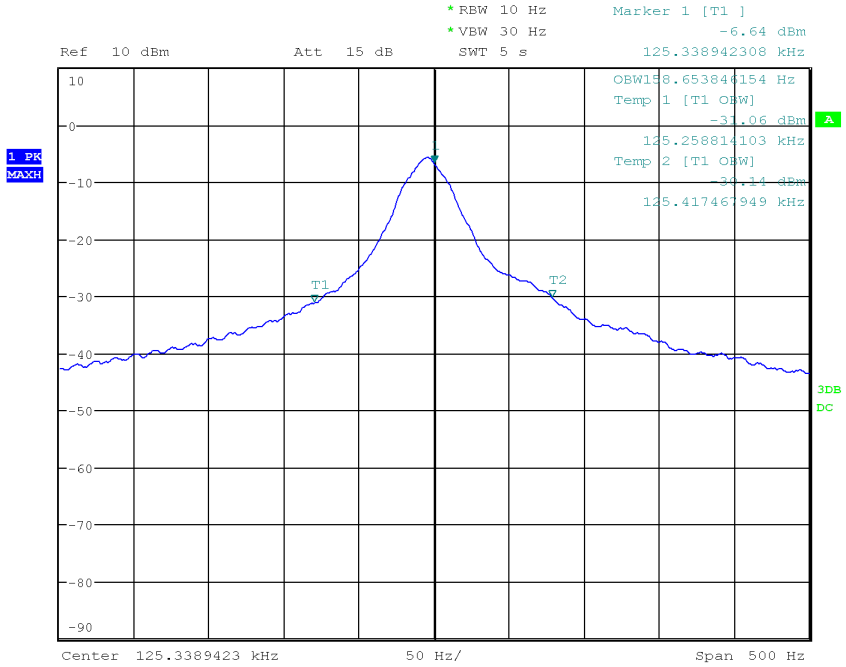
4.3.3 Test Results

Frequency (kHz)	-20 dB Channel Bandwidth (Hz)	99% Channel Bandwidth (Hz)
125	94	159

-20dB Channel Bandwidth Plot



99% Channel Bandwidth Plot



Date: 13.OCT.2023 14:33:54

4.4 Conducted Emissions FCC Part 15 Subpart C 15.207

4.4.1 Method

Tests are performed in accordance with FCC Part 15 Subpart C (15.207) & RSS 210.

TEST SITE: 10m ALSE

Measurement Uncertainty

Measurement	Frequency Range	Expanded Uncertainty (k=2)	Ucispr
AC Line Conducted Emissions	150 kHz - 30 MHz	2.1 dB	3.4dB

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.

4.4.2 Procedure:

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

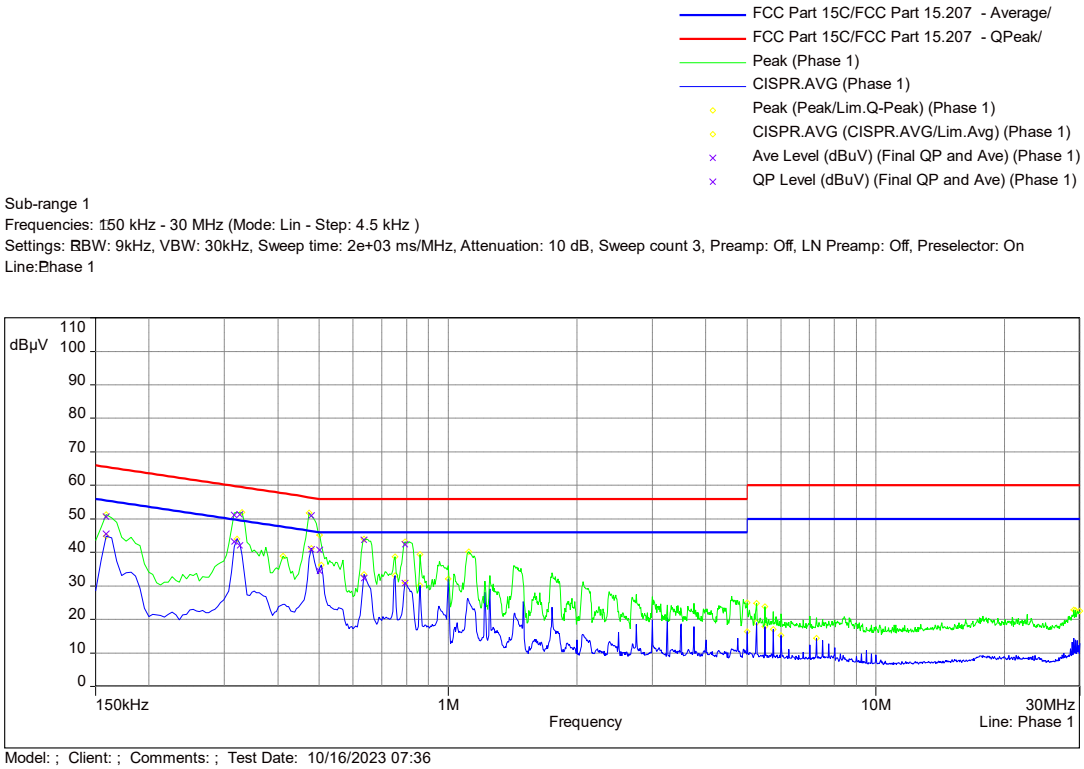
The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials. Its dimensions are 1m by 1.5m, but may be extended for larger EUT.

Floor standing EUT are placed on a horizontal metal ground plane and isolated from the ground plane by resting on an insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

EUT was placed in transmission mode then tested for conducted emissions per 15.207 to ensure the device complies with 15.207.

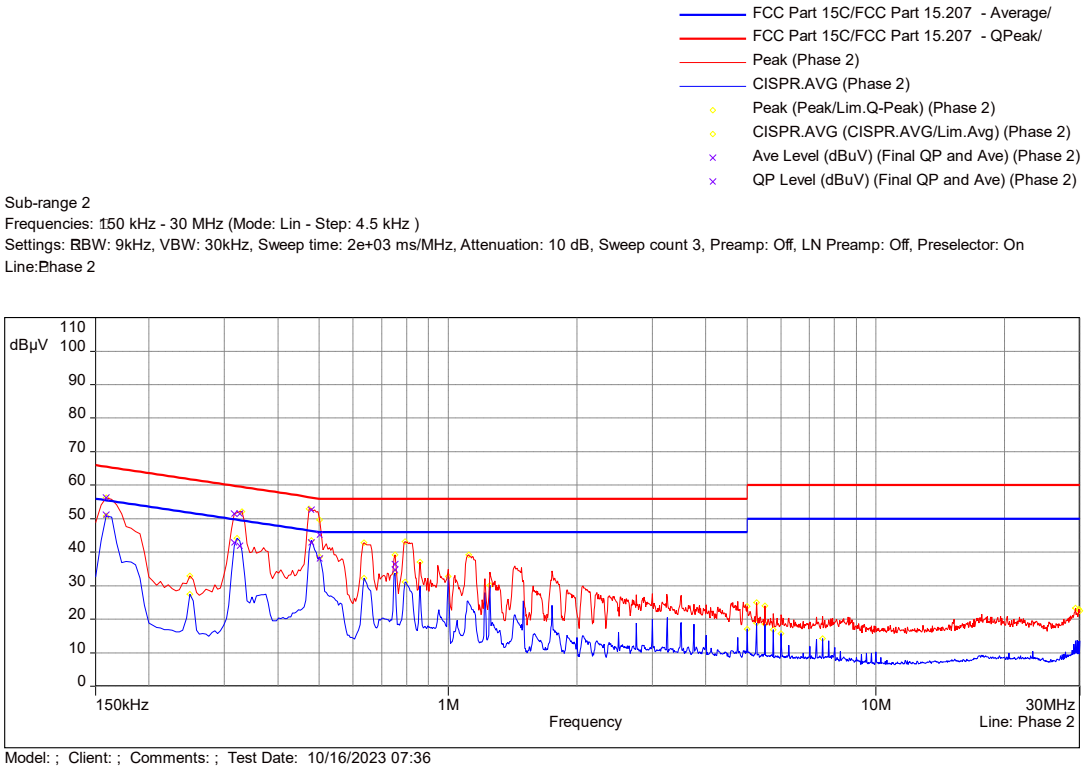
4.4.3 Test Result 15.207

Conducted Disturbance, 120V 60Hz, 9kHz to 30MHz



Sub-range 1
Frequencies: 150 kHz - 30 MHz (Mode: Lin - Step: 4.5 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 2e+03 ms/MHz, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On
Line: Phase 1

Model: ; Client: ; Comments: ; Test Date: 10/16/2023 07:36



Sub-range 2
Frequencies: 150 kHz - 30 MHz (Mode: Lin - Step: 4.5 kHz)
Settings: RBW: 9kHz, VBW: 30kHz, Sweep time: 2e+03 ms/MHz, Attenuation: 10 dB, Sweep count 3, Preamp: Off, LN Preamp: Off, Preselector: On
Line: Phase 2

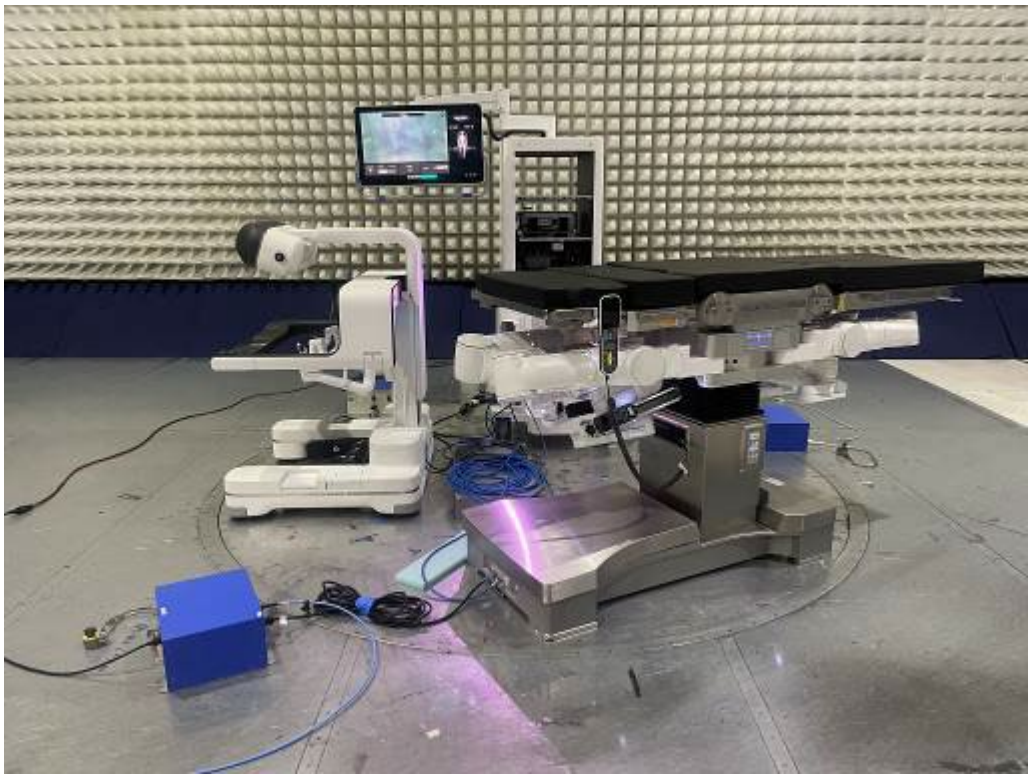
Model: ; Client: ; Comments: ; Test Date: 10/16/2023 07:36

Frequency (MHz)	Peak (dBµV)	Lim. Q-Peak (dBµV)	Margin (dB)	Line	Correction (dB)
0.476833	52.58	56.37	-3.79	Phase 2	10.57
0.477282	50.92	56.37	-5.45	Phase 1	10.57
0.327212	51.45	59.45	-8	Phase 2	10.55
0.326506	51.23	59.45	-8.22	Phase 1	10.55
0.317859	51.39	59.68	-8.29	Phase 2	10.55
0.318436	51.1	59.68	-8.58	Phase 1	10.55
0.159593	56.22	65.52	-9.3	Phase 2	10.54
0.500679	45.12	56	-10.88	Phase 2	10.57
0.634558	43.6	56	-12.4	Phase 1	10.58
0.795423	42.4	56	-13.6	Phase 1	10.58
0.159417	50.6	65.52	-14.92	Phase 1	10.54
0.50066	40.78	56	-15.22	Phase 1	10.57
0.750949	36.34	56	-19.66	Phase 2	10.58

Frequency (MHz)	Peak (dBµV)	Lim. Avg (dBµV)	Margin (dB)	Line	Correction (dB)
0.476833	42.79	46.37	-3.58	Phase 2	10.57
0.159593	51.08	55.52	-4.44	Phase 2	10.54
0.477282	40.92	46.37	-5.45	Phase 1	10.57
0.318436	43.26	49.68	-6.42	Phase 1	10.55
0.317859	42.93	49.68	-6.75	Phase 2	10.55
0.326506	42.08	49.45	-7.37	Phase 1	10.55
0.327212	41.84	49.45	-7.61	Phase 2	10.55
0.500679	38.07	46	-7.93	Phase 2	10.57
0.159417	45.49	55.52	-10.03	Phase 1	10.54
0.750949	34.74	46	-11.26	Phase 2	10.58
0.50066	34.46	46	-11.54	Phase 1	10.57
0.634558	32.3	46	-13.7	Phase 1	10.58
0.795423	30.77	46	-15.23	Phase 1	10.58

Result: **Complies** by 3.58 dB

4.4.4 Setup Photographs:



5.0 List of test equipment

Measurement equipment used for emission compliance testing utilized the equipment on the following list:

Equipment	Manufacturer	Model/Type	Asset #	Cal Int	Cal Due
EMI Receiver	Rohde and Schwarz	ESU40	ITS 00961	12	03/14/2024
EMI Receiver	Rohde and Schwarz	ESR7	ITS 01607	12	10/18/2024
Passive Loop Antenna	ETS Lindgren	6512	ITS 01573	12	11/30/2024
Bi-Log Antenna	SunAR RF Motion	JB1	ITS 01577	12	02/20/2024
Horn Antenna	ETS Lindgren	3117-PA	ITS 01325	12	11/26/2024
Pre-Amplifier	Sonoma Instrument	310N	ITS 01714	12	11/17/2024
Loop Sensor	Solar Electronics	7334-1	ITS 001608	12	11/21/2024
Transient Limiter	Com-Power	LIT-153A	ITS 01457	12	09/27/2024
LISN	Com-Power	LIN-115A	ITS 01283	12	12/11/2024

Software used for emission compliance testing utilized the following:

Name	Manufacturer	Version	Template/Profile
BAT-EMC	Nexio	3.20.0.14	Auris Health.bpp

6.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 / G105559103	KR	AS	May 2, 2024	Original document
1.1 / G105559103	KR	AS	July 29, 2024	Added 125kHz Fundamental Amplitude and updated OBW Table.

END OF REPORT